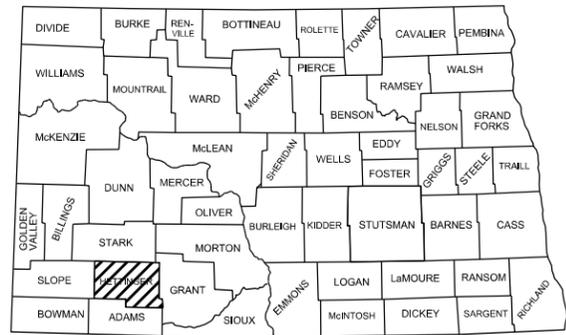


STATE	PROJECT NUMBER	PCN	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	21093	001	1



STATE OF NORTH DAKOTA

# JOB# 2 HETTINGER COUNTY NORTH DAKOTA

Federal Aid Project BRC-CNOB-2137(054)  
Hettinger County

CMC 2137, 1.0 mile south and 8.0 miles east of Mott, ND.  
Cannonball River Structure 21-137-20.0  
Structure Replacement and Grading

H.E.I. PROJECT NO: 14-022

## GOVERNING SPECIFICATIONS

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

## LENGTH OF PROJECT

MILES - GROSS	MILES - NET
0.398	0.398

## DESIGN DATA

TRAFFIC	PASS.	TRUCKS	TOTAL	EST 30TH MAX HR	ESAL'S
CURRENT 2015	--	--	35	--	--
	--	--	--	--	--

MINIMUM SIGHT DISTANCE (STOPPING): 495 FEET

DESIGN SPEED: 55 MPH

SURVEYED BY: KJD                      DATE: JUN 2015  
DESIGNED BY: SCD & AE2S              DATE: AUG 2015  
P.S. & E. REVISIONS BY: TLH              DATE: AUG 2015

## 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.

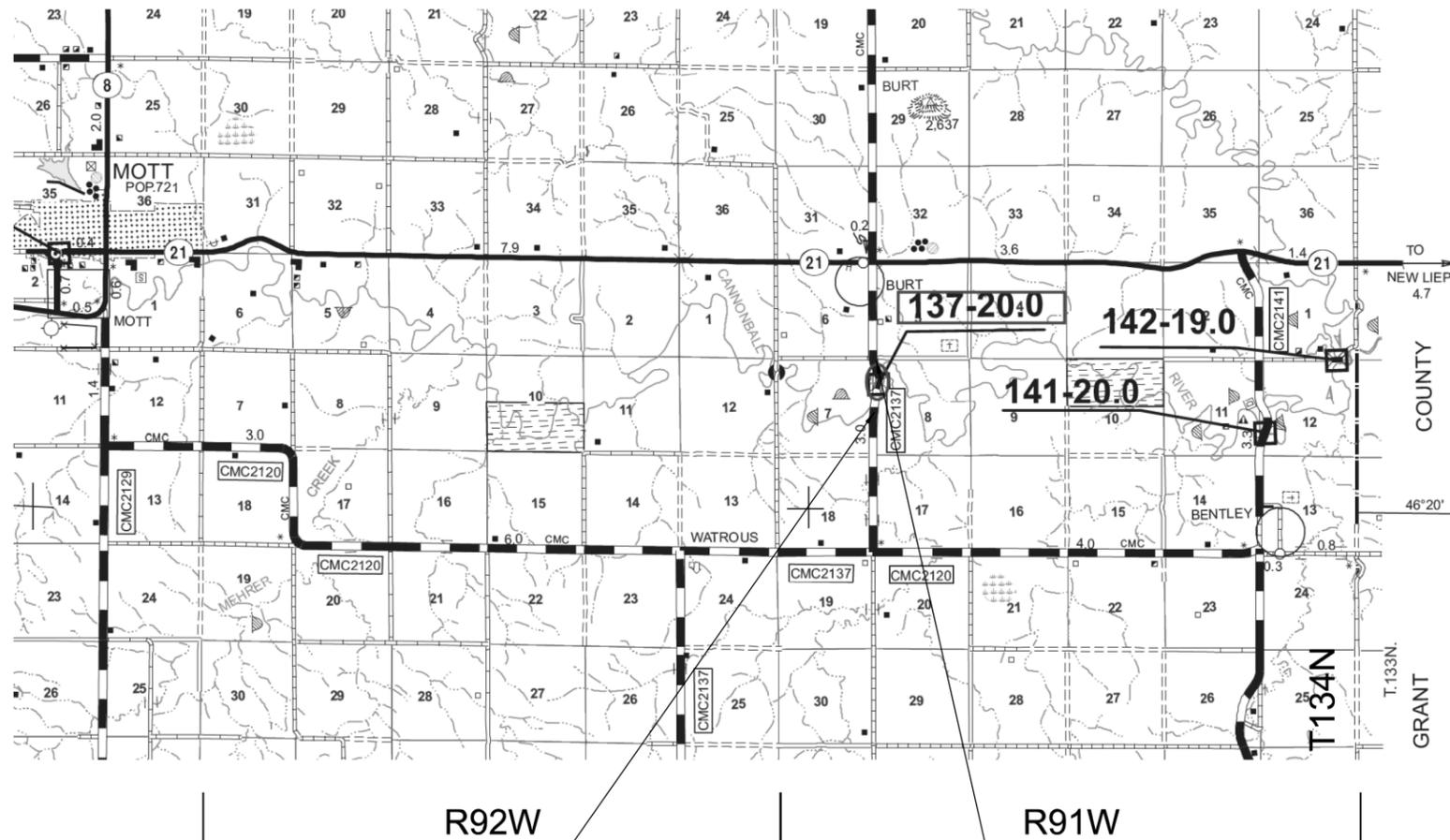
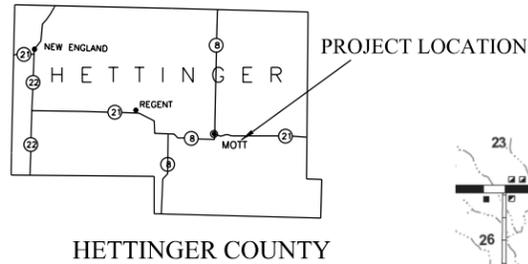
SIGNATURE: Steven C. Dorval, P.E. /s/

APPROVAL DATE: 02-10-16



This document was originally issued and sealed by Steven C. Dorval, Registration Number PE-3972, on 02-10-16 and the original document is stored at the office of Heartland Engineering, Inc. in New England, ND.

**Heartland Engineering, Inc.**



BEGIN PROJECT: BRC-CNOB-2137(054)  
Sta. 29+00, a point approximately  
2,375.52 ft south and 139.48 ft east of the  
NW Corner of Section 8 Township 133  
North, Range 91 West, 5th P.M., Hettinger  
County, North Dakota.

END PROJECT: BRC-CNOB-2137(054)  
Sta. 50+00, a point approximately 312.86  
ft south and 87.41 ft east of the NW  
Corner of Section 8 Township 133 North,  
Range 91 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

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-CNOB-2137(054)	002	1

## TABLE OF CONTENTS

<u>Section</u>	<u>Sheet</u>	<u>Description</u>
001	1	Title Sheet
002	1	Table of Contents & List of Standard Drawings
006	1 - 2	Plan Notes
006	3 - 5	Environmental Commitments
008	1	Summary of Quantities & Basis of Estimate
030	1	Typical Sections
060	1	Plan & Profile Sheet
075	1	Other Waters Delineation
076	1	Temporary Erosion Control
077	1	Permanent Erosion Control
100	1	Traffic Control Devices List
100	2	Traffic Control Devices Layout
170	1	Bridge Layout
170	2	General Notes & Bid Items
170	3	Screed Elevations
170	4	Piling Layout
170	5	Abutment Plan and Elevation
170	6	Abutment Details
170	7	Pier Details
170	8	Pier Details
170	9	Pre-Tensioned 45In Prestressed I-Beam
170	10	Pre-Tensioned 45In Prestressed I-Beam
170	11	Deck Slab Section
170	12	Part Plan - Deck Slab Bot Reinf
170	13	Part Plan - Deck Slab Top Reinf
170	14	Intermediate Diaphragm Details
170	15	Pier Diaphragm Details
170	16	End Wall Details
170	17	Reinforcement Schedule
170	18	Railing Details
170	19	Railing Details
170	20	Approach Guardrail Layout
200	1 - 11	Cross Sections

## LIST OF STANDARD DRAWINGS

<u>Standard #</u>	<u>Description</u>
D-260-01	Erosion and Siltation Controls - Silt Fence
D-261-01	Erosion Control Fiber Roll Placement Details
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-704-15	Road Closure Layouts
D-704-20	Terminal and Seal Coat Sign Layouts
D-704-30	Windrow Marking
D-708-06	Erosion and Siltation Controls Median or Ditch Inlet Protection
D-754-23	Perforated Tube Assembly Details
D-754-24	Mounting Details Perforated Tube
D-754-24A	Breakaway Coupler System for Perforated Tubes
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 5102(14)	Permits and Environmental Considerations

This document was originally issued and sealed by Steven C. Dorval, Registration Number PE-3972, on 02-10-16 and the original document is stored at the office of Heartland Engineering, Inc. in New England, ND.

BRC-CNOB-2137(054)  
HETTINGER COUNTY, ND.



TABLE OF CONTENTS  
&  
STANDARD DRAWINGS LIST

PROJECT NO.	DRAWN BY	CHECKED BY	DATE
14-022	TLH	SCD	02-10-16

Heartland Engineering, Inc.

# PLAN NOTES

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-CNOB-2137(054)	006	1

**105-P02**     **County Responsibilities:** The County will attend to the removal and resetting of existing fences to the new highway right-of-way line.

**107-P01**     **Haul Roads:** Paved county or township roads will not be used for haul roads unless alternative routes do not exist. The contractor is responsible for contacting representatives of nearby counties or other local governments to determine available haul routes, restrictions on those roadways, and work and materials required to maintain and restore those roadways.

All proposed haul roads shall be reviewed and approved by the engineer prior to hauling.

The costs of maintenance and restoration are considered to be included in other items of work.

**107-P02**     **Inert Waste Disposal:** All items designated or determined as a removal and disposal item shall be considered property of the contractor. Said contractor's property shall be disposed of at an approved inert waste disposal site as per section 107.17 of the Standard Specifications. Disposal shall be included in the price bid for "CLEARING & GRUBBING".

**108-P01**     **Completion Date:** The project completion date shall be specified in the contract documents.

The project shall be 100% complete by the specified completion date or liquidated damages will be assessed against the contractor according to Section 108.07 B of the Standard Specifications. The county will not recognize a project as being substantially complete or open to the traveling public to justify the suspension of time charges.

**108-P03**     **Delays:** The contractor shall not hold the owner responsible for any delays to project operations caused by other construction activities outside the project. It is the contractor's responsibility to familiarize their staff with any surrounding construction that may be completed during the life of this project.

No additional time or compensation will be granted for changes to schedules or routes due to other construction activity.

**109-P01**     **Measurement and Payment:** If an item is to be accepted by certification or testing, the material will be included for payment after the item has been incorporated into the project and when the certifications or test results have been received and approved by the engineer.

**203-P01**     **Common Excavation - Type C:** Twenty-five percent (25%) additional volume in yardage computed by the average end area method is allowed for shrinkage in the earth embankment as shown on the plan and profile sheet.

During construction of the roadway, a motor grader and water truck shall be required to be operating within the construction area at all times to obtain uniform mixing, proper moisture content and density as determined by the engineer.

Backslope rounding will be required on the cut sections as shown on the Typical Section. This shall be included in the bid item "COMMON EXCAVATION TYPE-C".

The contractor will be required to complete the finish grading work around the existing facilities that are in the construction area. Any earth mounds, etc. that remain around the facilities shall be leveled. This work shall be included in the price bid for "COMMON EXCAVATION TYPE-C".

Payment for "COMMON EXCAVATION TYPE-C" shall be plan quantity.

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

**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."

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

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

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 III" will be paid according to 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". Several riprap sources exist locally. Contact the engineer for details.

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

**302-P01**     **Aggregate Surface Course:** Hettinger County will supply the "AGGREGATE SURFACE COURSE CL 13" for this project at no cost to the contractor. The contractor will be responsible for paying applicable sales and use tax for the quantity of aggregate surface course received from the county. The aggregate surface course material is located in the E1/2SW1/4 and SE1/4 Sec 22 - T135N - R93W. The county paid \$3.59 per Ton for crushing and royalty for this material. All applicable sales and use taxes shall be included in the price bid for "AGGREGATE SURFACE COURSE CL 13".

The contractor shall furnish a full length certified electronic platform scale, a scale person, printed haul tickets, printed daily reports and a dump person as per section 109.01.J of the Standard Specifications.

Compaction equipment shall meet section 151.01.A of the Standard Specifications. Walk and Roll type pneumatic rollers mounted to motor graders will not be allowed.

This document was originally issued and sealed by Steven C. Dorval, Registration Number PE-3972, on 02-10-16 and the original document is stored at the office of Heartland Engineering, Inc. In New England, ND.

BRC-CNOB-2137(054)  
HETTINGER CO., ND.



PLAN NOTES

PROJECT NO.	DRAWN BY	CHECKED BY	DATE
14-022	TLH	SCD	02-10-16

Heartland Engineering, Inc.

# PLAN NOTES

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-CNOB-2137(054)	006	2

**704-P01**     **Traffic Control:** The construction signing shall be an integral part of the work being performed. At no time shall the project be closed to the traveling public. All traffic control devices shall be installed as per the NDDOT standard drawings and the "Manual on Uniform Traffic Control Devices" (MUTCD) current edition.

The required traffic control signs and devices are included in the "Traffic Control Devices List" and will be measured and paid for at the contract unit price bid for "TRAFFIC CONTROL SIGNS".

All costs associated with supplying, placing, maintaining and removing traffic control items shall be included in the price bid for "Traffic Control Signs".

Any additional devices or flagging required to accommodate the contractor's operations shall be the contractor's responsibility.

The existing bridge and roadway shall remain open to the traveling public until the new bridge and roadway alignment are completed. The existing regulatory and warning signs indicating the existing bridge is open to single lane "take turns" traffic will remain in place until the new bridge and road alignment are open to traffic. Removal of these signs and delineator drums shall be the responsibility of the owner.

After the new bridge and roadway alignment is complete, the new road closed signs and Type III Barricades shown on sheet 100-2 will be moved by the contractor to close off the existing road while Roadway Obliteration and Structure Removal takes place.

**714-P01**     **Culverts:** All steel pipe shall be Aluminized Type 2 and the pipe culvert and coupling bands shall conform to the requirements as set forth under AASHTO M-245 & 246.

The culvert material shall be handled at all times with equipment such as wide canvas slings and wide padded skids designed to prevent damage to the pipe. All handling and hauling equipment shall be reviewed by the engineer before use.

In truck shipments, the pipe shall be supported on wide cradles of suitably padded timbers. All chains, cable or other equipment used for fastening the load must be padded.

Any damage to the culvert materials during the installation of the culvert or before final acceptance of the project shall be repaired or replaced as directed by the engineer at the expense of the contractor.

**764-P01**     **W-Beam Guardrail widening areas:** Cross slopes shall be 25:1 and inslopes shall be 4:1. Widening areas shall be surfaced with 4" of CL13 aggregate surface course.

This document was originally issued and sealed by Steven C. Dorval, Registration Number PE-3972, on 02-10-16 and the original document is stored at the office of Heartland Engineering, Inc. In New England, ND.

BRC-CNOB-2137(054)  
HETTINGER CO., ND.



PLAN NOTES

PROJECT NO.	DRAWN BY	CHECKED BY	DATE
14-022	TLH	SCD	02-10-16

Heartland Engineering, Inc.

# ENVIRONMENTAL COMMITMENTS

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	006	3

**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:** Unavoidable impacts to wetlands will be mitigated onsite, adjacent to the project, or at an approved mitigation site or bank.

**ACTION REQUIRED / TAKEN:** 0.00 acres of permanent impacts to jurisdictional waters and 0.00 acres of permanent impacts to natural/non-jurisdictional wetlands will require mitigation.

Wetland Impact Table															
Wetland Number	Location	Cowardin Class	Wetland Type	Wetland Size Ac.	Wetland Feature	USACE Jurisdictional Wetlands'	Wetland Impacts (acres)		USFWS Easement Impacts		Wetland Mitigation			Onsite Mitigation Acres	
							Temp. Ac.	Perm. Ac.	Temp.	Perm.	Mitigation Required		Location; Acreage; Wetland#; Ratio		
											EO 11990	USACE			USFWS
#1a	Sec.7, T133N, R91W	PEMC	Fringe	0.06	Natural	No	0.00	0.00			N	N	N	NA	0.00
#1c	Sec.8, T133N, R91W	PEMC	Slope	0.03	Natural	No	0.00	0.00			N	N	N	NA	0.00
#1d	Sec.8, T133N, R91W	PEMC	Fringe	0.10	Natural	Yes	0.00	0.00			N	N	N	NA	0.00
<b>Totals</b>				<b>0.19</b>			<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>					<b>0.00</b>

\* A wetland Jurisdictional Determination was issued by the USACE on 5/8/2015; NWO-2015-1458-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.

Other Water Impact Table															
Other Waters										Other Water Mitigation					
Number	Location	Type	Size		Feature	USACE Jurisdictional	Impact to Other Waters				Mitigation Required			Location	Method
			Acres	Linear Feet			Temp.	Perm.	Temp.	Perm.	EO 11990	USACE	USFWS		
#OW1b	Sec.7, T133N, R91W Sec. 5, T133N, R91W	Cannonball River	1.22	880	River	Yes	0.16	0	120	0	Y	Y	N	NA	NA
<b>Totals</b>			<b>1.22</b>	<b>880</b>			<b>0.16</b>	<b>0</b>	<b>120</b>	<b>0</b>					

\*A wetland Jurisdictional Determination was issued by the USACE on 5/8/2015; NWO-2015-1458-BIS.

This document was originally issued and sealed by Steven C. Dorval  
Registration Number PE 3972, on 02-10-16 and the original document is stored at the office of Heartland Engineering, Inc. In New England, ND.

BRC-CNOB-2137(054)  
HETTINGER COUNTY, ND.

	ENVIRONMENTAL COMMITMENTS			
	PROJECT NO. 14-022	DRAWN BY TLH	CHECKED BY SCD	DATE 02-10-16
Heartland Engineering, Inc.				

# ENVIRONMENTAL COMMITMENTS

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-CNOB-2137(054)	006	4

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.
<b>Total</b>	<b>0.00</b>	Temporary OW	0.16ac/120 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

**No. 2:** No construction or demolition activities will take place during the spawning season in the Cannonball River from April 15 to June 1.

**No. 3:** 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, Fred Ryckman, shall be contacted by phone (701.770.0920) or e-mail [fryckman@nd.gov](mailto:fryckman@nd.gov) for equipment inspections, or any additional information regarding ANS prevention protocol.

**No. 4:** Active migratory bird nests with eggs or chicks are protected by the Federal Migratory Bird Treaty Act. Demolition on bridges or box culverts with active nesting can not start until nesting season is over unless measures are taken to prevent nesting.

*Action taken/required:* The Contractor shall not remove any existing bridge or box culvert if active nests are present. The Contractor can legally remove inactive nests prior to the nesting season. After inactive nests are removed the Contractor can use nets or tarps secured to the structure to discourage nesting.

**No. 5:** A storm water discharge permit is required because 4.5 acres will be disturbed.

*Action taken/required:* The Contractor will be required to obtain a storm water discharge permit from the North Dakota Department of Health and shall comply with the requirements contained in the permit.

**No. 6:** Prevent spills of chemical, petroleum products and other wastes from entering bodies of water.

*Action taken/required:* The Contractor will be required to follow safe storage and handling procedures for petroleum products and chemicals. Solid wastes will be disposed of as required by NDDOT Specifications and not placed in floodways.

**No. 7:** Prevent the spread of noxious weeds.

*Action taken/required:* Precautions will be taken to avoid spreading noxious weeds. Seed mixtures used on the project will comply with the NDDOT Standard Specifications for noxious weed content.

This document was originally issued and sealed by Steven C. Dorval Registration Number PE 3972, on 02-10-16 and the original document is stored at the office of Heartland Engineering, Inc. In New England, ND.

BRC-CNOB-2137(054)  
HETTINGER COUNTY, ND.

	ENVIRONMENTAL COMMITMENTS			
	PROJECT NO.	DRAWN BY	CHECKED BY	DATE
	14-022	TLH	SCD	02-10-16
Heartland Engineering, Inc.				

# ENVIRONMENTAL COMMITMENTS

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-CNOB-2137(054)	006	5

**No. 8:** 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.: 15-5417 NDDOT BRC-CNOB-2137(054) PCN 21093. 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. 9:** A US Army Corps of Engineers Section 404 Permit is required.

*Action taken/required:* A USACE permit has been obtained and the project will be covered under Department of The Army Nationwide Permit No. NWO-2015-1458-BIS. The Contractor shall comply with all requirements listed in permit.

**No. 10:** Measures will be taken to minimize fugitive dust emissions.

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

**No. 11:** 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 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: Has been obtained for the project.

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.

This document was originally issued and sealed by Steven C. Dorval Registration Number PE 3972, on 02-10-16 and the original document is stored at the office of Heartland Engineering, Inc. In New England, ND.

BRC-CNOB-2137(054)  
HETTINGER COUNTY, ND.



ENVIRONMENTAL  
COMMITMENTS

PROJECT NO.	DRAWN BY	CHECKED BY	DATE
14-022	TLH	SCD	02-10-16

Heartland Engineering, Inc.

# SUMMARY OF QUANTITIES

# BASIS OF ESTIMATE

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-CNOB-2137(054)	008	1

Item	Spec	Code	Description	Total Quantity	Units	Acceptance
1	103	0100	CONTRACT BOND	1	L SUM	Paid Invoice
2	201	0330	CLEARING & GRUBBING	1	L SUM	
3	202	0105	REMOVAL OF STRUCTURE	1	L SUM	Demolition Plan
4	203	0103	COMMON EXCAVATION - TYPE C	17,700	CY	
5	203	0109	TOPSOIL	2,353	CY	
6	203	0180	ROADWAY OBLITERATION	615	LF	
7	210	0101	CLASS I EXCAVATION	1	L SUM	
8	210	0127	CHANNEL EXCAVATION	1	L SUM	
9	210	0201	FOUNDATION PREPARATION	1	EA	
10	216	0100	WATER	210	M GAL	Water Permit
11	251	0300	SEEDING - CLASS III	4.5	ACRES	Certification
12	253	0101	STRAW MULCH	4.5	ACRES	Certification
13	256	0300	RIPRAP GRADE III	2,330	CY	Pit Certification
14	260	0200	SILT FENCE SUPPORTED	2,330	LF	Certification
15	260	0201	REMOVE SILT FENCE SUPPORTED	2,330	LF	
16	261	0112	FIBER ROLLS 12IN	600	LF	Certification
17	302	0356	AGGRETAGE SURFACE COURSE CL 13	1,404	TON	
18	602	0130	CLASS AAE-3 CONCRETE	167.8	CY	Certification
19	602	1130	CLASS AE-3 CONCRETE	118	CY	Certification
20	602	1250	PENETRATING WATER REPELLENT TREATEMENT	598	SY	Certification
21	604	9910	PRESTRESSED I-BEAM - 45IN	698.7	LF	Certification
22	612	0115	REINFORCING STEEL-GRADE 60	9,134	LBS	Certification
23	612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	38,575	LBS	Certification
24	616	0364	STRUCTURAL STEEL M270-GRADE 36	911.5	LBS	Certification
25	622	0040	STEEL PILING HP 12X53	975	LF	Certification
26	624	0128	TRAFFIC RAIL-STEEL	358.7	LF	Certification
27	702	0100	MOBILIZATION	1	L SUM	
28	704	1000	TRAFFIC CONTROL SIGNS	126	UNITS	Certification
29	704	1052	TYPE III BARRICADE	6	EA	Certification
30	704	1060	DELINEATOR DRUMS	10	EA	Certification
31	709	0155	GEOSYNTHETIC MATERIAL-TYPE RR	1,910	SY	Certification
32	714	0905	PIPE CONC REINF 36" CL III	4	LF	Certification
33	714	3035	END SECT-CONC REINF 36"	1	EA	Certification
34	714	4106	PIPE CONDUIT 24IN-APPROACH	56	LF	Certification
35	764	0131	W-BEAM GUARDRAIL	256.75	LF	Certification
36	764	0145	W-BEAM GUARDRAIL END TERMINAL	4	EA	Certification
37	764	0151	REMOVE W-BEAM GUARDRAIL & POSTS	510	LF	

### Project Length

BOP: STA 29+00

EOP: STA 50+00

Length: 29+00 - 50+00 = 2,100 LF = 0.398 Miles

### Topsoil

4" Depth

### Water

Common Ex: 10 Gal/CY x 17,700 CY / 1,000 Gal/M Gal = 177 M Gal

Agg Surfacing: 10 Gal/Ton x 1,264 Ton / 1,000 Gal/M Gal = 13 M Gal

Dust Control: 50 M Gal/Mile x 0.398 Miles = 20 M gal

Total = 210 M Gal

### Aggregate Surface Course Cl 13 (Volume + 25%)

Mainline: 2,100 LF x 8.66 SF/LF / 27 CF/CY x 1.5 Ton/CY x 1.25 = 1,264 Ton

Private Drive Approach: 1 x 40 Ton Each = 40 Ton

Field Drive Approach: 1 X 40 Ton Each = 40 Ton

Guardrail Widening Areas: 60 Ton

Total = 1,404 Ton

### Seeding - Class III & Straw Mulch

Area between construction limits minus road top is estimated to be 4.5 acres

This document was originally issued and sealed by Steven C. Dorval, Registration Number PE-3972, on 02-10-16 and the original document is stored at the office of Heartland Engineering, Inc. in New England, ND.

**BRC-CNOB-2137(054)  
HETTINGER COUNTY, ND.**



SUMMARY OF QUANTITIES  
&  
BASIS OF ESTIMATE

PROJECT NO.	DRAWN BY	CHECKED BY	DATE
14-022	TLH	SCD	02-10-16

**Heartland Engineering, Inc.**

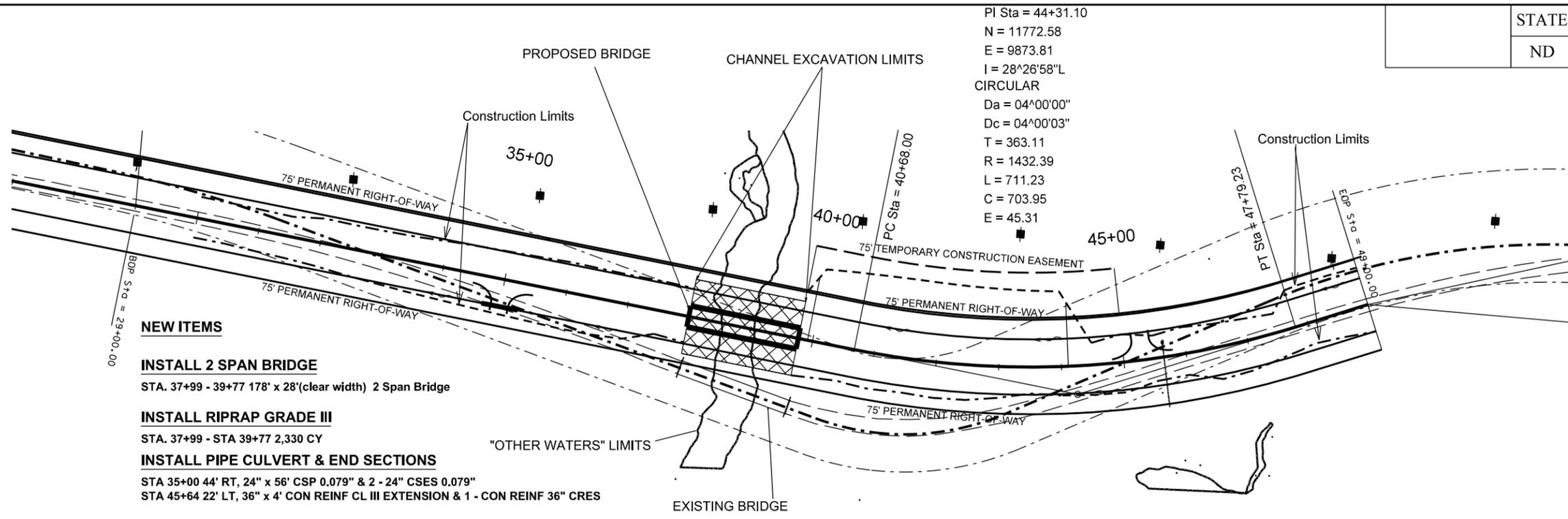


STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-BRO-2137(054)	060	1

PI Sta = 44+31.10  
 N = 11772.58  
 E = 9873.81  
 I = 28°26'58"L  
 CIRCULAR  
 Da = 04°00'00"  
 Dc = 04°00'03"  
 T = 363.11  
 R = 1432.39  
 L = 711.23  
 C = 703.95  
 E = 45.31

**EXISTING ITEMS:**

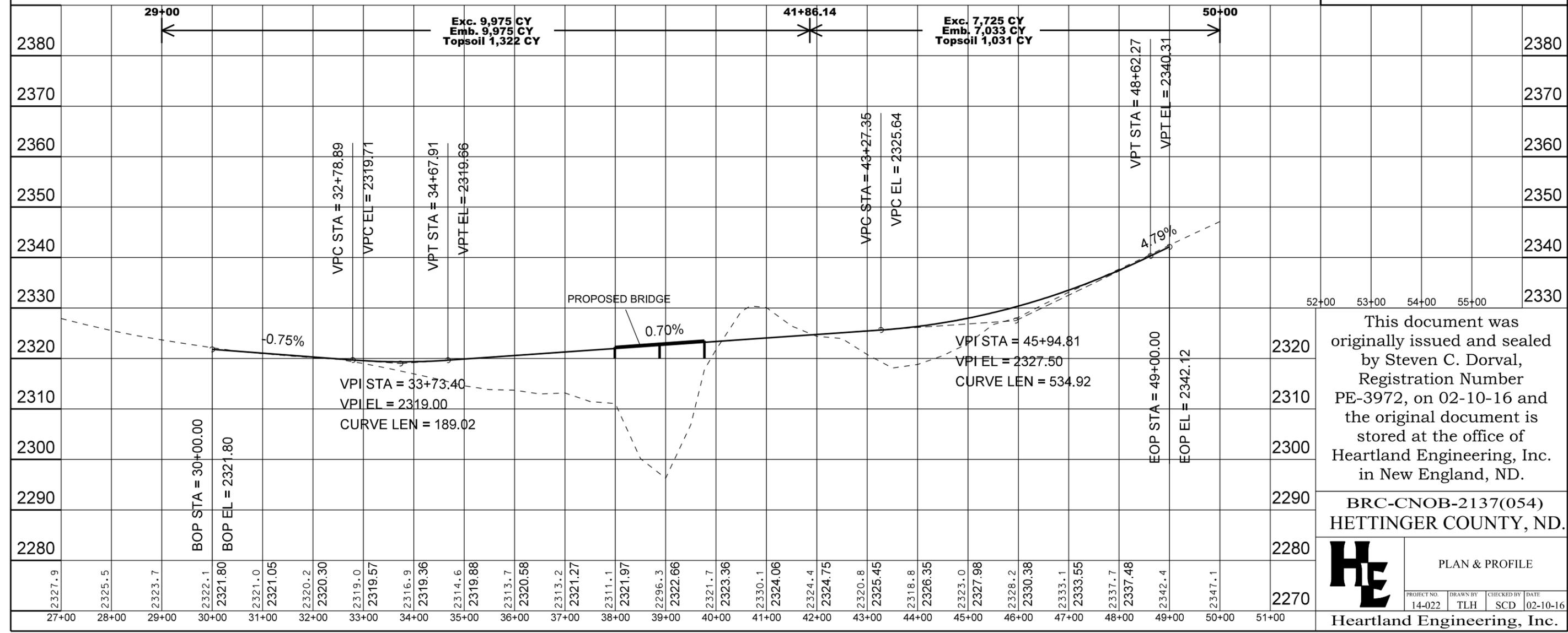
Existing Power:	Power Pole	To Remain
STA 25+65 70' L	Power Pole	To Remain
STA 28+89 69' L	Power Pole	To Remain
STA 32+32 109' L	Power Pole	To Remain
STA 35+29 142' L	Power Pole	To Remain
STA 38+03 175' L	Power Pole	To Remain
STA 40+42 210' L	Power Pole	To Remain
STA 43+33 417' L	Power Pole	To Remain
STA 45+88 177' L	Power Pole	To Remain
STA 48+66 87' L	Power Pole	To Remain



- NEW ITEMS**
- INSTALL 2 SPAN BRIDGE**  
STA. 37+99 - 39+77 178' x 28'(clear width) 2 Span Bridge
  - INSTALL RIPRAP GRADE III**  
STA. 37+99 - STA 39+77 2,330 CY
  - INSTALL PIPE CULVERT & END SECTIONS**  
STA 35+00 44' RT, 24" x 56" CSP 0.079" & 2 - 24" CSES 0.079"  
STA 45+64 22' LT, 36" x 4' CON REINF CL III EXTENSION & 1 - CON REINF 36" CRES

**BENCH MARKS**

NO.	DESC.	LOCATION	ELEVATION
Base	Rebar	Sta. 26+82.72, 320.28' Rt.	2087.08
BM 1	Rebar	Sta. 26+97.07, 444.80' Rt.	2088.22



This document was originally issued and sealed by Steven C. Dorval, Registration Number PE-3972, on 02-10-16 and the original document is stored at the office of Heartland Engineering, Inc. in New England, ND.

**BRC-CNOB-2137(054)**  
**HETTINGER COUNTY, ND.**

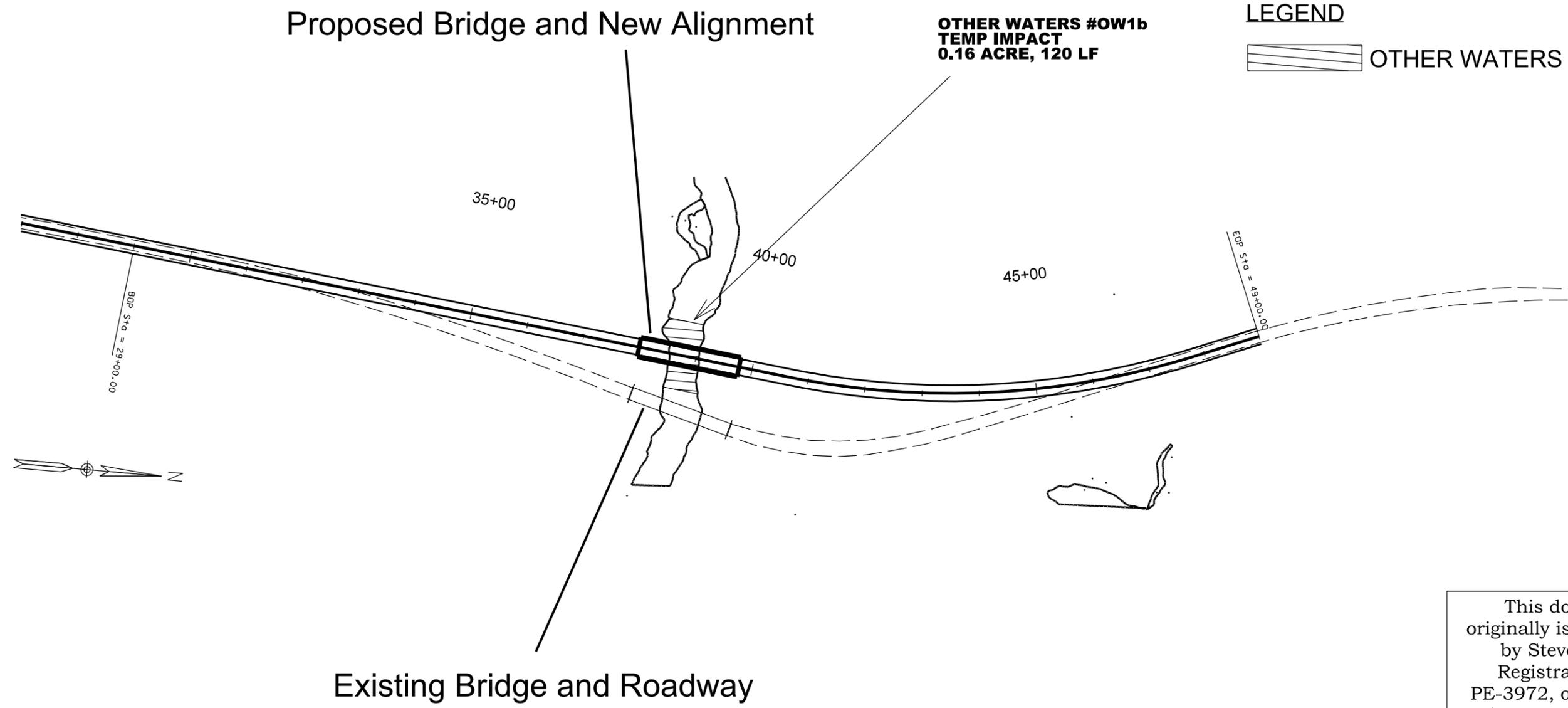
**HE** PLAN & PROFILE

PROJECT NO.	DRAWN BY	CHECKED BY	DATE
14-022	TLH	SCD	02-10-16

Heartland Engineering, Inc.

# OTHER WATERS DELINEATION

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	075	1



This document was originally issued and sealed by Steven C. Dorval, Registration Number PE-3972, on 02-10-16 and the original document is stored at the office of Heartland Engineering, Inc. in New England, ND.

**BRC-CNOB-2137(054)  
HETTINGER COUNTY, ND.**

	OTHER WATERS DELINEATION			
	PROJECT NO.	DRAWN BY	CHECKED BY	DATE
	14-022	TLH	SCD	02-10-16
Heartland Engineering, Inc.				

# TEMPORARY EROSION CONTROL

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	076	1

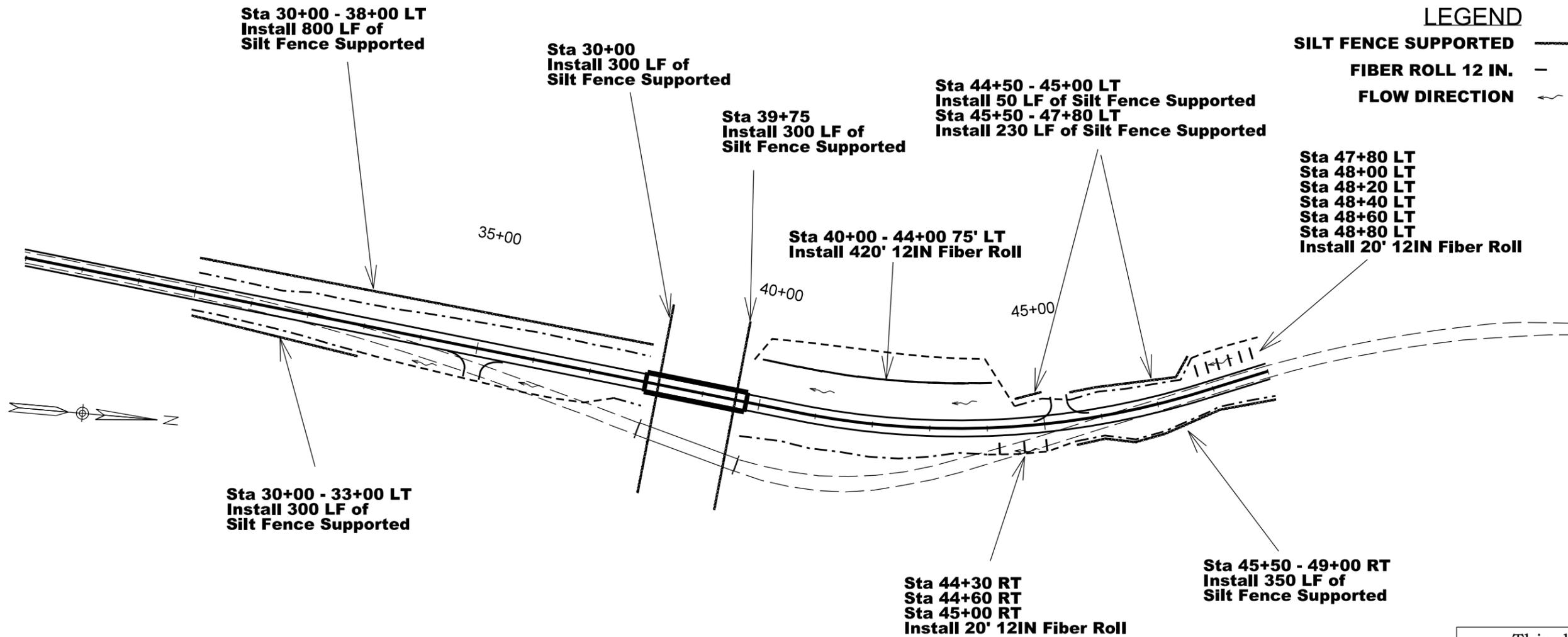
Spec-Code	Bid Item	Qty	Unit
260-0200	Silt Fence Supported	2,330	LF
261-0112	Fiber Rolls 12IN	600	LF

**LEGEND**

**SILT FENCE SUPPORTED** 

**FIBER ROLL 12 IN.** 

**FLOW DIRECTION** 



This document was originally issued and sealed by Steven C. Dorval, Registration Number PE-3972, on 02-10-16 and the original document is stored at the office of Heartland Engineering, Inc. in New England, ND.

BRC-CNOB-2137(054)  
HETTINGER COUNTY, ND.

	TEMPORARY EROSION CONTROL		
	PROJECT NO. 14-022	DRAWN BY TLH	CHECKED BY SCD
Heartland Engineering, Inc.			DATE 02-10-16

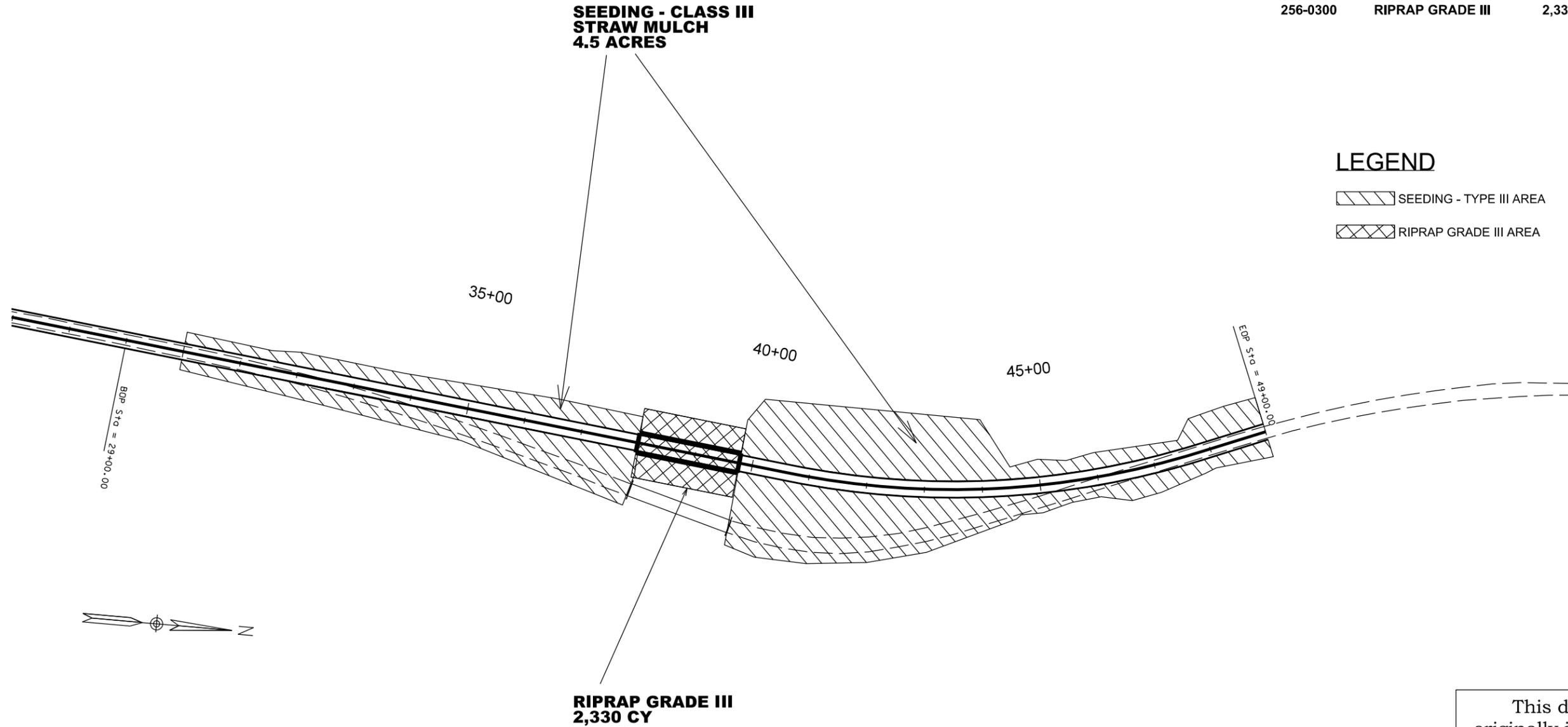
# PERMANENT EROSION CONTROL

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	077	1

Spec-Code	Bid Item	Qty	Unit
251-0300	SEEDING CLASS III	4.5	ACRES
253-0101	STRAW MULCH	4.5	ACRES
256-0300	RIPRAP GRADE III	2,330	CY

## LEGEND

-  SEEDING - TYPE III AREA
-  RIPRAP GRADE III AREA



This document was originally issued and sealed by Steven C. Dorval, Registration Number PE-3972, on 02-10-16 and the original document is stored at the office of Heartland Engineering, Inc. in New England, ND.

BRC-CNOB-2137(054)  
HETTINGER COUNTY, ND.



PERMANENT EROSION CONTROL

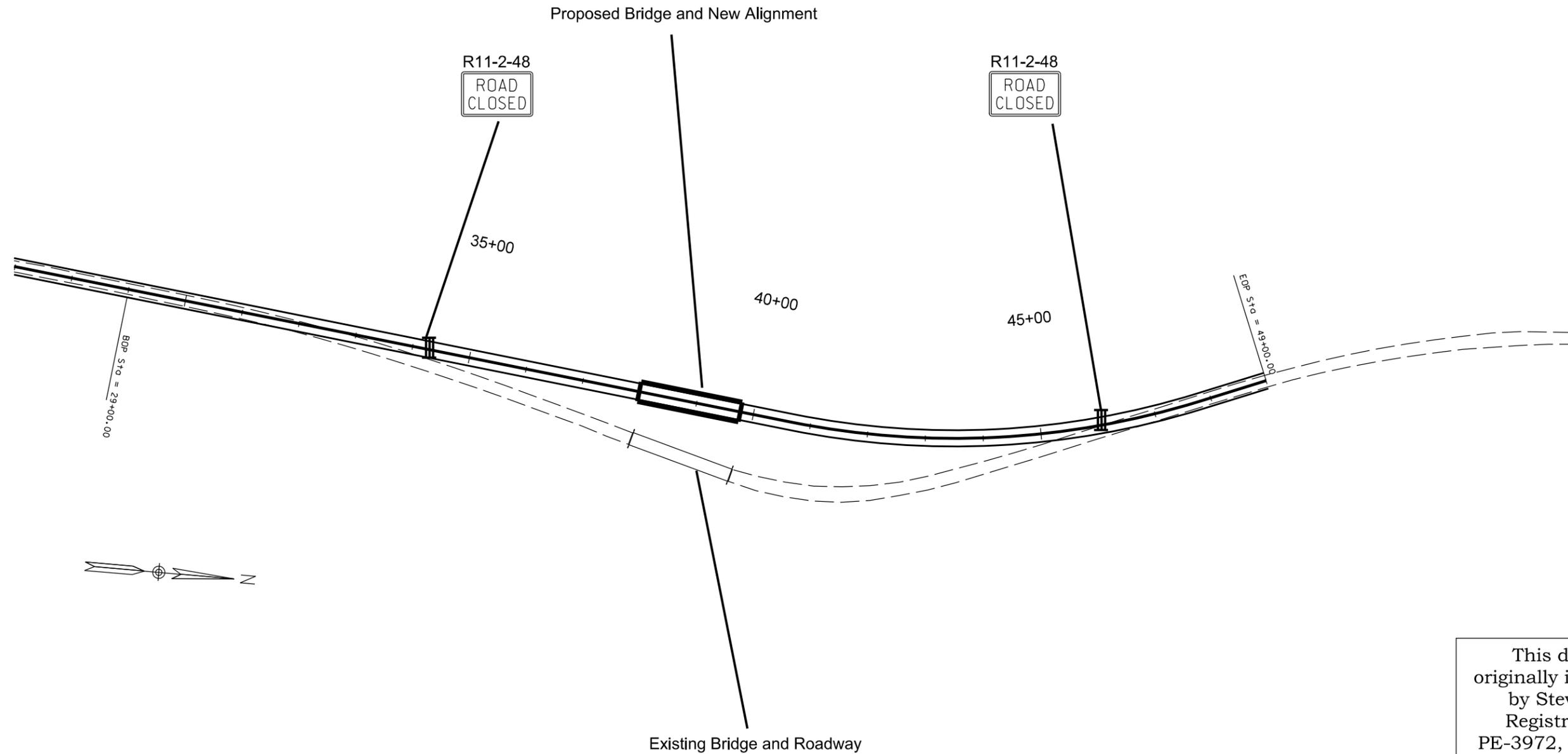
PROJECT NO.	DRAWN BY	CHECKED BY	DATE
14-022	TLH	SCD	02-10-16

Heartland Engineering, Inc.



# TRAFFIC CONTROL DEVICES LAYOUT

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	100	2



This document was originally issued and sealed by Steven C. Dorval, Registration Number PE-3972, on 02-10-16 and the original document is stored at the office of Heartland Engineering, Inc. in New England, ND.

BRC-CNOB-2137(054)  
HETTINGER COUNTY, ND.

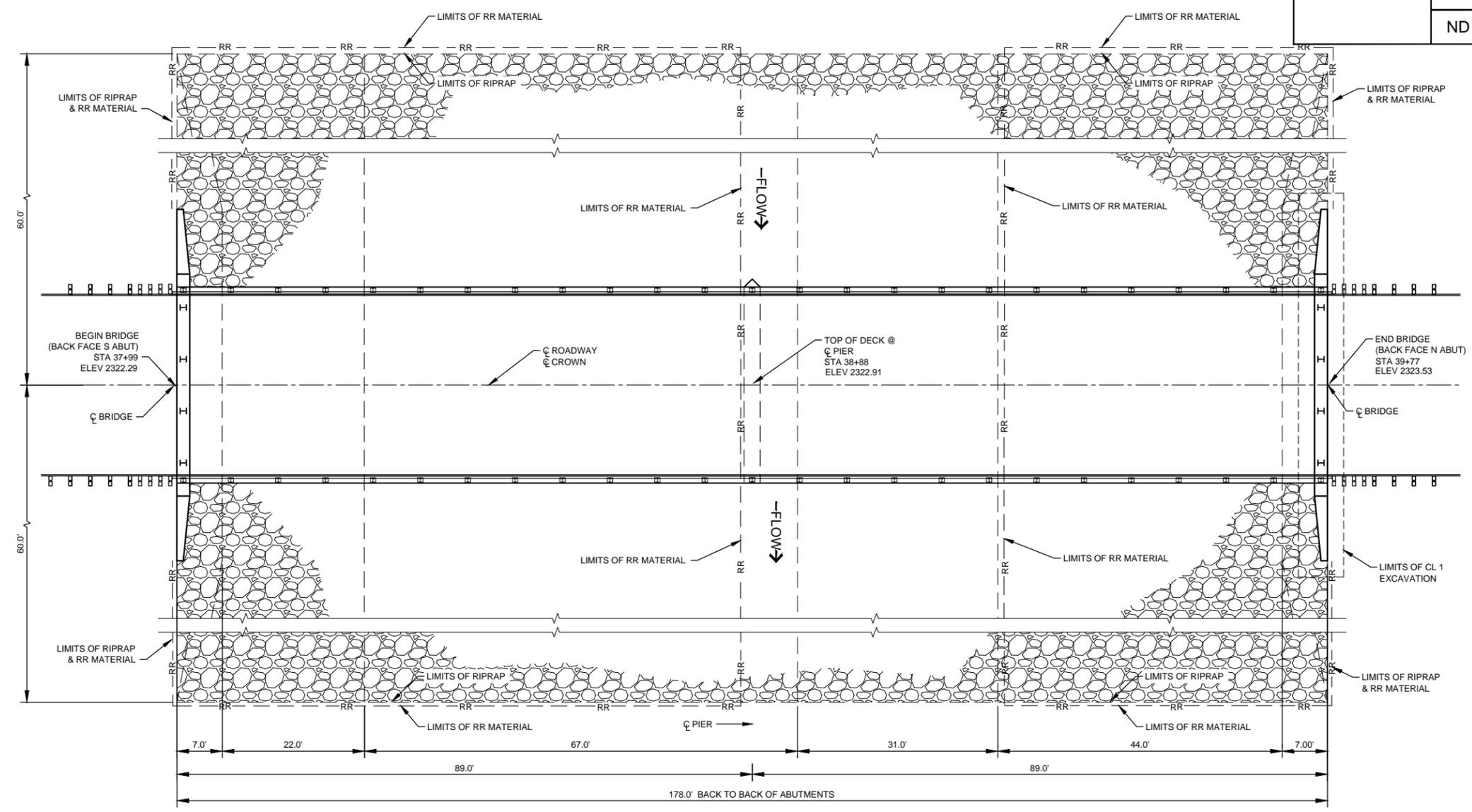


TRAFFIC CONTROL DEVICES LAYOUT

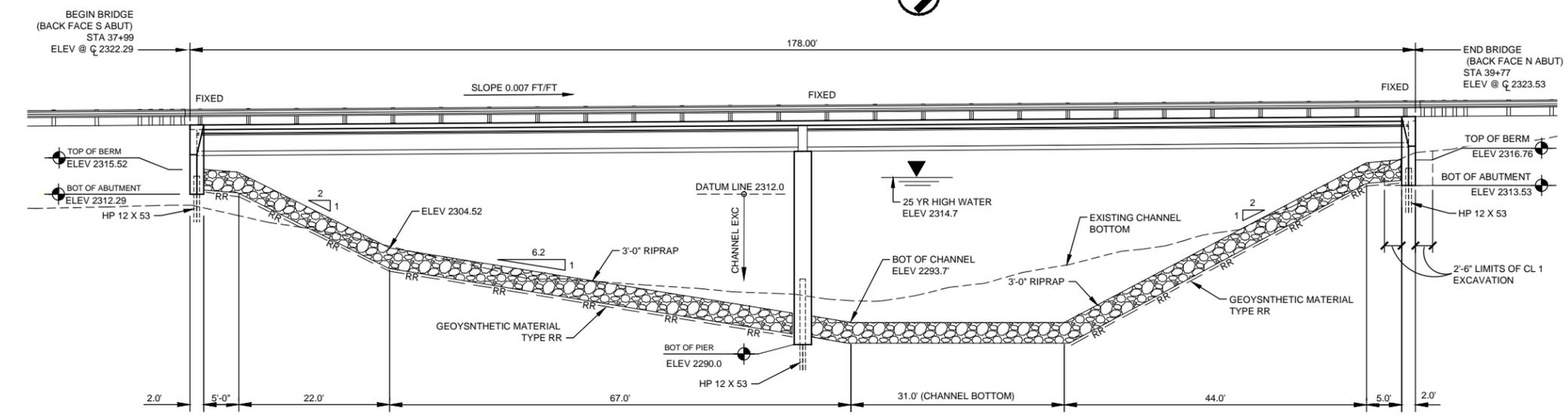
PROJECT NO.	DRAWN BY	CHECKED BY	DATE
14-022	TLH	SCD	02-10-16

Heartland Engineering, Inc.

STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	21093	170	1



**GENERAL PLAN** NORTH



**ELEVATION**

**HYDRAULIC DATA:**

DRAINAGE AREA	819 SQ. MI.
DESIGN FREQUENCY	25 YR
DESIGN DISCHARGE	14,940 CFS
DESIGN STAGE, NAVD88 (UPSTREAM)	2314.71 FT
STREAM GRADIENT	0.00094 FT/FT
WATERWAY PROVIDED BELOW DESIGN STAGE	1,980 SQ. FT
WATERWAY PROVIDED BELOW CLEARANCE ELEVATION	2,560 SQ. FT
VELOCITY OF FLOW UNDER BRIDGE AT DESIGN DISCHARGE	9.5 FT/SEC
VELOCITY OF FLOW UNDER BRIDGE AT 100-YR DISCHARGE	7.57 FT/SEC
100-YEAR FREQUENCY DISCHARGE	24,160 CFS
100-YEAR FREQUENCY STAGE, NAVD88 (DOWNSTREAM)	2317.83 FT
OVERTOPPING STAGE, NAVD88	2319.1 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

This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

<b>AE2</b>			
<b>CANNONBALL RIVER BURT, ND BRIDGE LAYOUT</b>			
DRWN. BY E. Severinson	CHK'D BY P. Johnson	PROJECT NO. P11614-2015-000	DATE SEPT, 2015
<small>File: W:\Hearland Engineering\11614-2015-000\AutoCad\Drawings\02-Structural\BRIDGE DESIGN.dwg</small>			
<small>AE2S • 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 • (t) 701-746-8087 (f) 701-746-0370</small>			

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRC-CNOB-2137(054)	21093	170	2

### GENERAL NOTES

**100-P01 SCOPE OF WORK:** THIS PROJECT CONSISTS OF BUILDING A NEW 2-SPAN PRESTRESSED CONCRETE SPREAD I-BEAM BRIDGE WITH AN OVERALL BRIDGE LENGTH OF 178'-0" 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 184 FOOT THREE SPAN BRIDGE WITH A 24 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 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 CONCRETE FOR THE INTERMEDIATE DIAPHRAGMS SHALL BE PLACED AT LEAST 48 HOURS PRIOR TO THE DECK CONCRETE. 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).

### 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	0201	FOUNDATION PREPARATION	EA	1
256	0300	RIPRAP GRADE III	CY	2,330
602	0130	CLASS AAE-3 CONCRETE	CY	167.8
602	1130	CLASS AE-3 CONCRETE	CY	118
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	598
604	9910	PRESTRESSED I-BEAM-45IN	LF	698.7
612	0115	REINFORCING STEEL - GRADE 60	LBS	9,134
612	0116	REINFORCING STEEL - GRADE 60 - EPOXY COATED	LBS	38,575
616	0364	STRUCTURAL STEEL M270 - GRADE 36	LBS	911.5
622	0020	STEEL PILING HP 12 X 53	LF	975
624	0128	TRAFFIC RAIL-STEEL	LF	358.7
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	1,910
764	0131	W-BEAM GUARDRAIL	LF	256.75
764	0145	W-BEAM GUARDRAIL END TERMINAL	EA	4
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS	LF	510

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

1. PRESTRESSED I-BEAMS
2. TRAFFIC RAIL STEEL

This document was originally issued and sealed by  
Perry Johnson, PE,  
Registration Number PE-3926  
on 08/21/2015 and the original documents are stored at the  
Grand Forks office of  
Advanced Engineering &  
Environmental Services, Inc.



### CANNONBALL RIVER BURT, ND

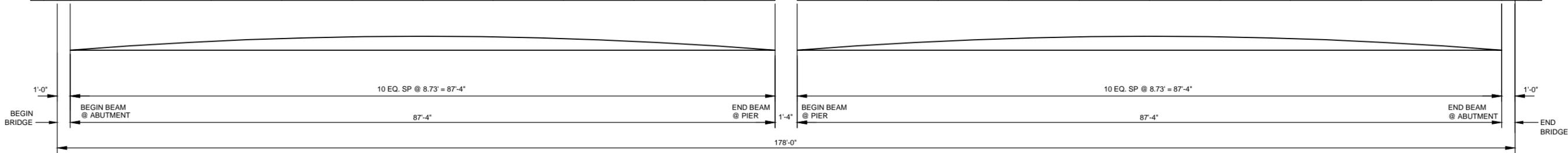
#### GENERAL NOTES AND BID ITEMS

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
E. Severinson	P. Johnson	P11614-2015-000	SEPT, 2015

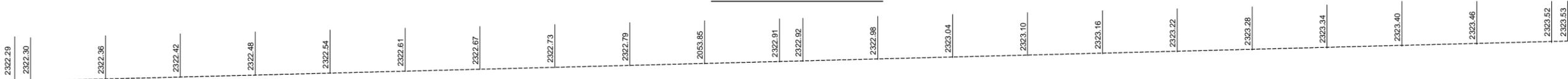
File: W:\Heartland Engineering\T11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg

STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	21093	170	3

CENTERLINE BEAM ELEVATIONS @ TOP OF DECK					CENTERLINE BEAM ELEVATIONS @ TOP OF DECK					
TENTHS POINTS	DEAD LOAD DEFLECTION (FT.)	BEAM NO 4	BEAM NO 3	BEAM NO 2	BEAM NO 1	TENTHS POINTS	DEAD LOAD DEFLECTION (FT.)	BEAM NO 3	BEAM NO 2	BEAM NO 1
0	0.00	2322.06	2322.22	2322.22	2322.06	0	0.00	2322.22	2322.22	2322.06
1	0.028	2322.15	2322.31	2322.31	2322.15	1	0.028	2322.31	2322.31	2322.15
2	0.052	2322.23	2322.39	2322.39	2322.23	2	0.052	2322.39	2322.39	2322.23
3	0.072	2322.31	2322.47	2322.47	2322.31	3	0.072	2322.47	2322.47	2322.31
4	0.084	2322.38	2322.54	2322.54	2322.38	4	0.084	2322.54	2322.54	2322.38
5	0.088	2322.45	2322.61	2322.61	2322.45	5	0.088	2322.61	2322.61	2322.45
6	0.084	2322.50	2322.66	2322.66	2322.50	6	0.084	2322.66	2322.66	2322.50
7	0.072	2322.55	2322.71	2322.71	2322.55	7	0.072	2322.71	2322.71	2322.55
8	0.052	2322.59	2322.75	2322.75	2322.59	8	0.052	2322.75	2322.75	2322.59
9	0.028	2322.63	2322.79	2322.79	2322.63	9	0.028	2322.79	2322.79	2322.63
10	0.00	2322.66	2322.82	2322.82	2322.66	10	0.00	2322.82	2322.82	2322.66
10	0.00	2322.67	2322.83	2322.83	2322.67	10	0.00	2322.83	2322.83	2322.67
9	0.028	2322.76	2322.92	2322.92	2322.76	9	0.028	2322.92	2322.92	2322.76
8	0.052	2322.84	2323.00	2323.00	2322.84	8	0.052	2323.00	2323.00	2322.84
7	0.072	2322.92	2323.08	2323.08	2322.92	7	0.072	2323.08	2323.08	2322.92
6	0.084	2322.99	2323.15	2323.15	2322.99	6	0.084	2323.15	2323.15	2322.99
5	0.088	2323.06	2323.18	2323.18	2323.06	5	0.088	2323.18	2323.18	2323.06
4	0.084	2323.11	2323.27	2323.27	2323.11	4	0.084	2323.27	2323.27	2323.11
3	0.072	2323.16	2323.32	2323.32	2323.16	3	0.072	2323.32	2323.32	2323.16
2	0.052	2323.20	2323.36	2323.36	2323.20	2	0.052	2323.36	2323.36	2323.20
1	0.028	2323.24	2323.40	2323.40	2323.24	1	0.028	2323.40	2323.40	2323.24
0	0.00	2323.27	2323.43	2323.43	2323.27	0	0.00	2323.43	2323.43	2323.27
0	(FT.)	2323.29	2323.45	2323.45	2323.29	0	(FT.)	2323.45	2323.45	2323.29



**SCREED ELEVATIONS**



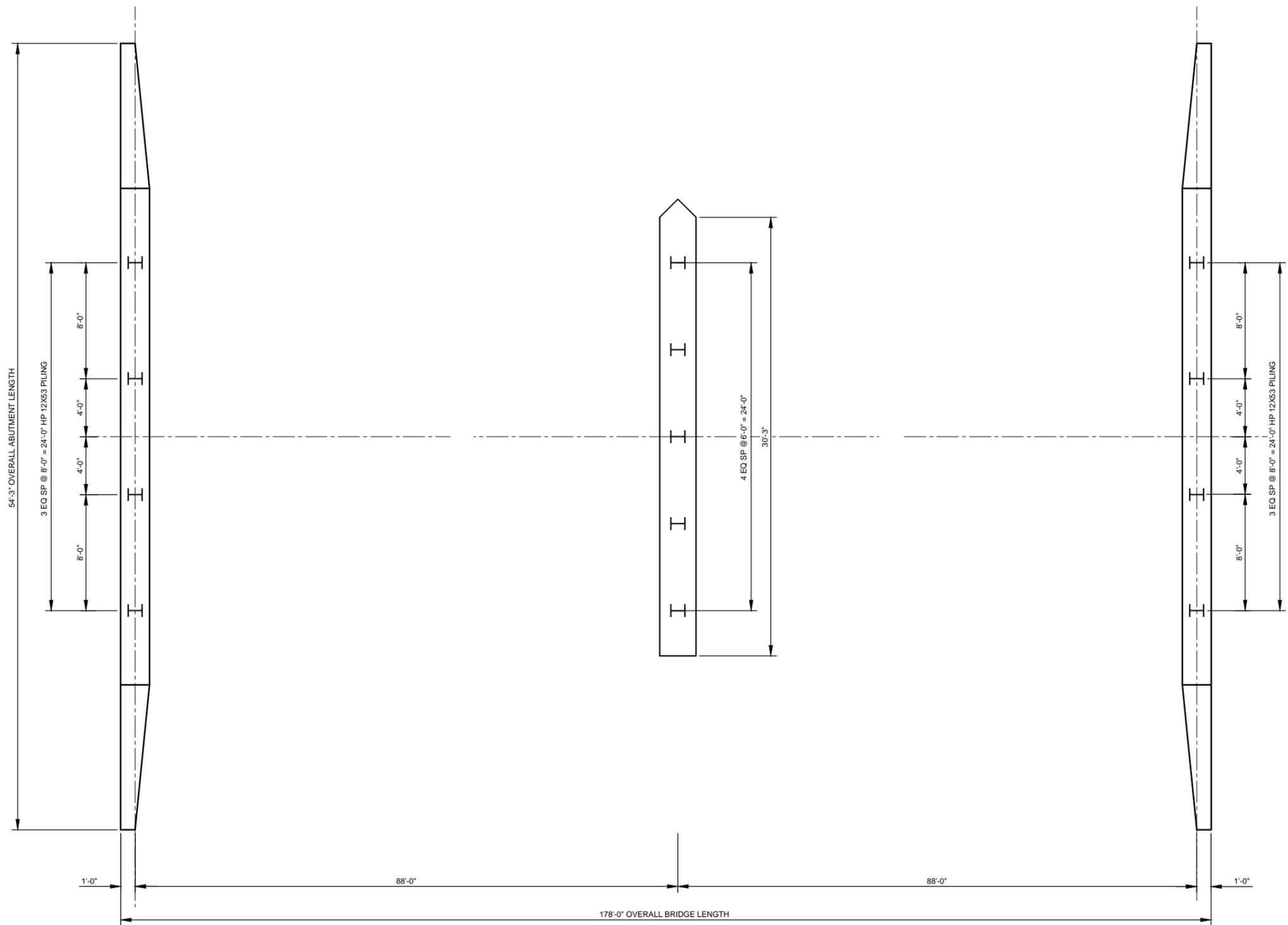
**ELEVATIONS - TOP OF DECK @ CENTERLINE OF ROAD**

This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

<b>AES</b>			
<b>CANNONBALL RIVER BURT, ND</b>			
<b>SCREED ELEVATIONS</b>			
DRWN. BY	CHK'D BY	PROJECT NO.	DATE
E. Severinson	P. Johnson	P11614-2015-000	SEPT, 2015

File: W:\Hearland Engineering\T11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRC-CNOB-2137(054)	21093	170	4

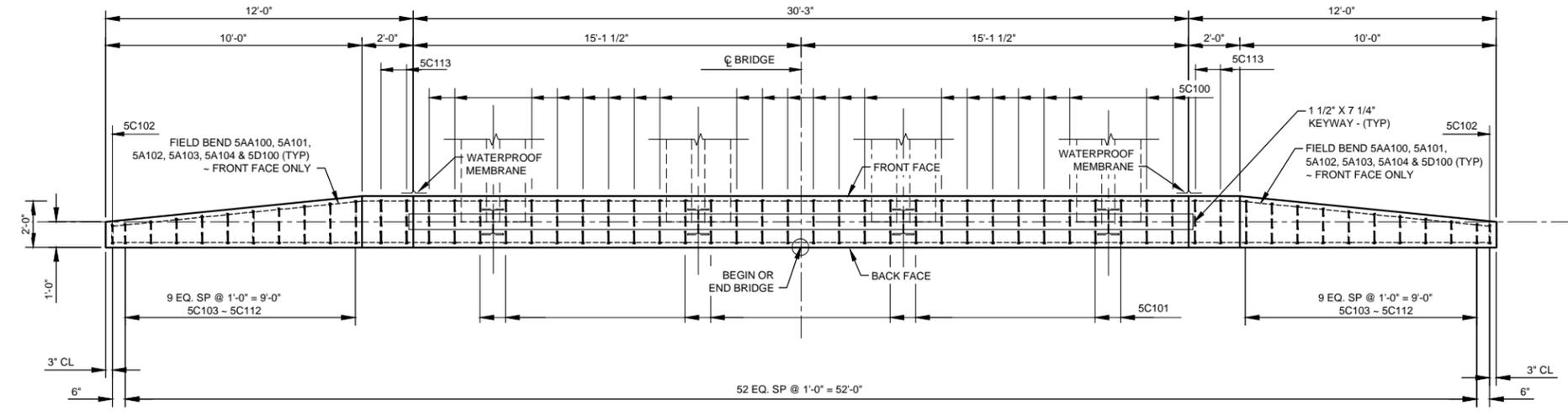


NOTE:  
 HP 12 X 53 PILE IN PIER SHALL BE DRIVEN TO 130.0 TON  
 HP 12 X 53 PILE IN ABUTMENTS SHALL BE DRIVEN TO 130.0 TON

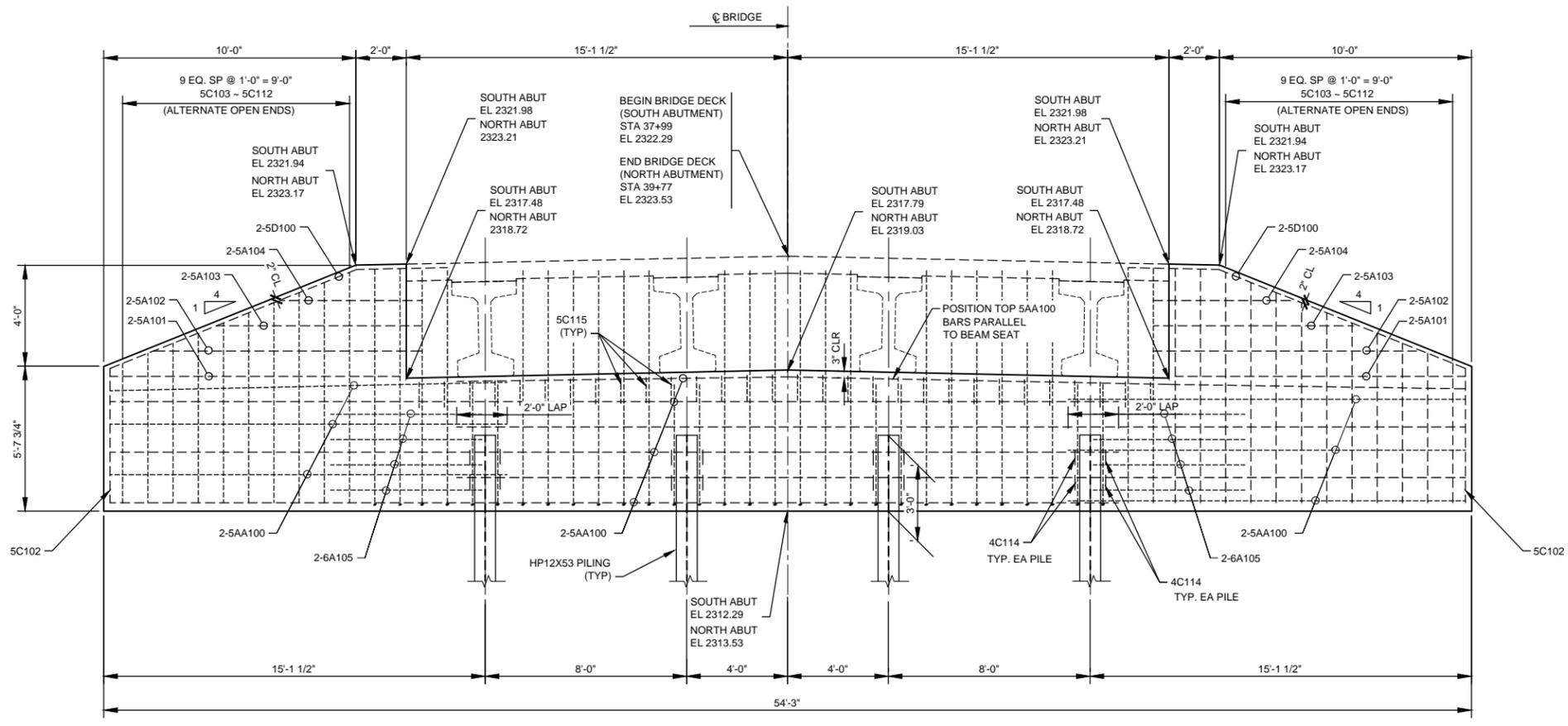
**PLAN VIEW - PILING LAYOUT**

This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

<b>AEZ</b>				<b>CANNONBALL RIVER BURT, ND</b>	
PILING LAYOUT					
DRWN. BY	CHK'D BY	PROJECT NO.	DATE		
E. Severinson	P. Johnson	P11614-2015-000	SEPT, 2015		
<small>File: W:\Hearland Engineering\T11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg</small>					
<small>AEZS • 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 • (t) 701-746-8087 (f) 701-746-0370</small>					



**PLAN VIEW - ABUTMENT**



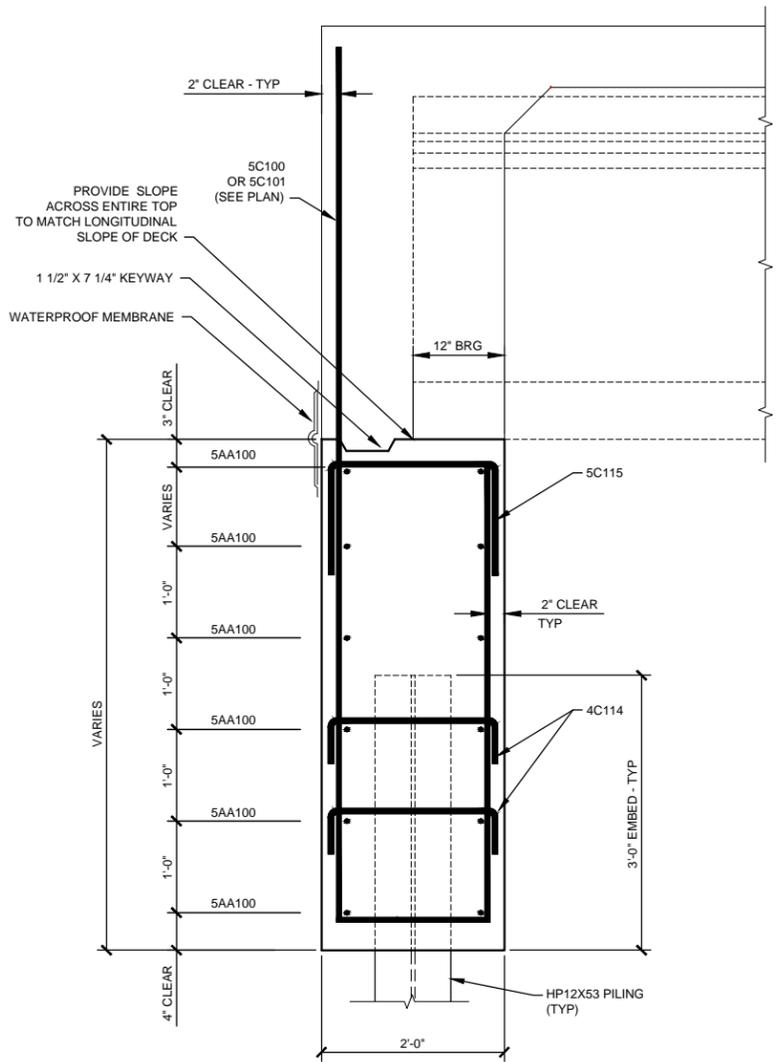
**ELEVATION - ABUTMENT**

This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

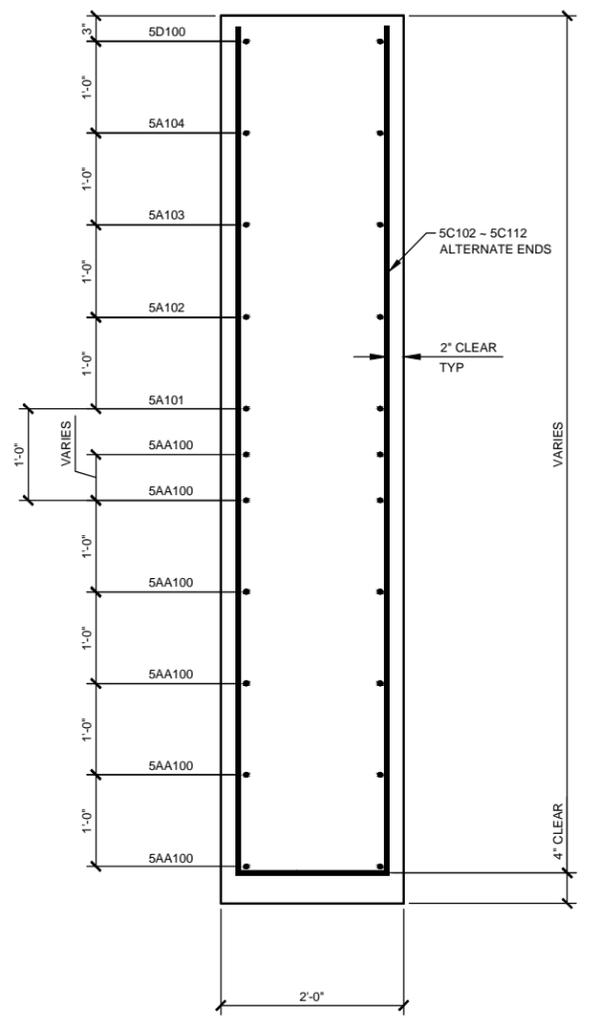
ESTIMATED MATERIAL QUANTITIES (both) ABUTMENTS			
ITEM	DESCRIPTION	UNIT	QUANTITY
602	CLASS AE-3 CONCRETE	CY	53.0
612	REINFORCING STEEL - GRADE 60	LBS	4473.0
622	STEEL PILING HP 12X53	LF	600

<b>AE2S</b>			
<b>CANNONBALL RIVER BURT, ND</b>			
<b>ABUTMENT PLAN &amp; ELEVATION</b>			
DRWN. BY E. Severinson	CHK'D BY P. Johnson	PROJECT NO. P11614-2015-000	DATE SEPT, 2015
File: W:\Heartland Engineering\11614-2015-000\AutoCad\Drawings\02-Structural\BRIDGE DESIGN.dwg			
AE2S • 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 • (t) 701-746-8087 (f) 701-746-0370			

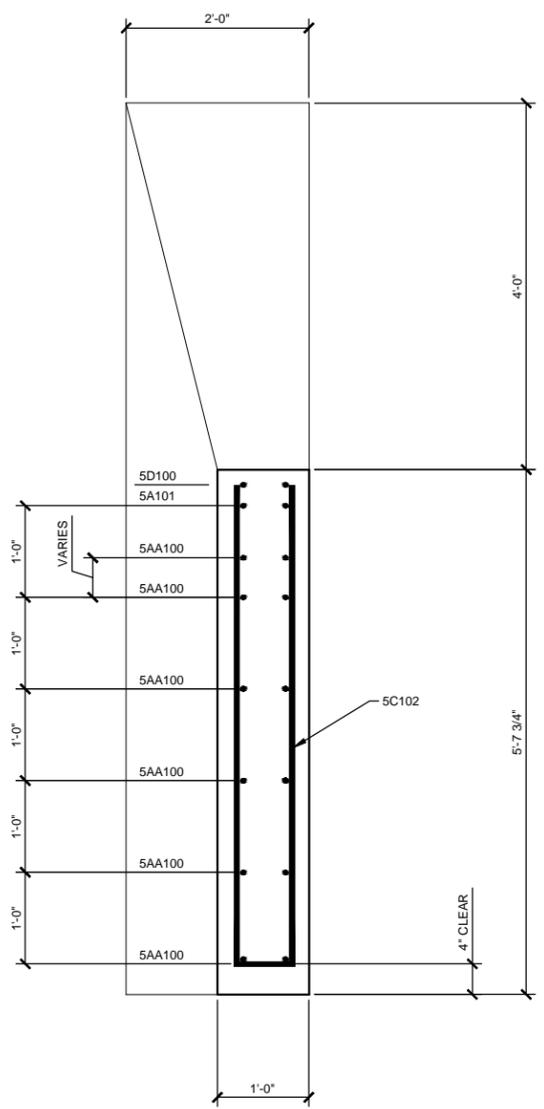
STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	21093	170	6



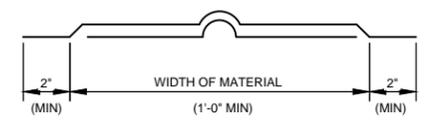
**TYP SECTION THRU BEAM SEAT**



**TYP SECTION THRU WING WALL**



**TYP SECTION @ END OF WING WALL**



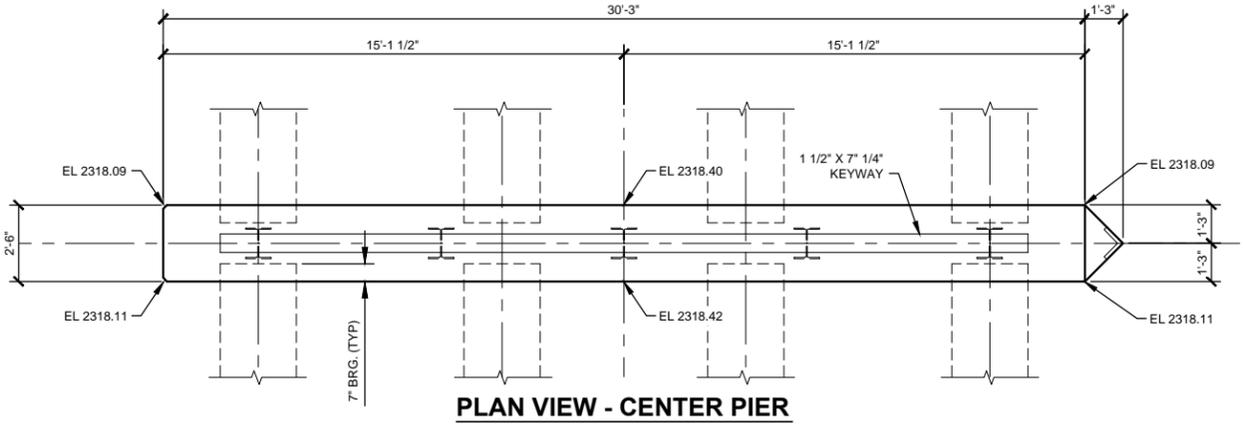
WATERPROOF MEMBRANE SHALL MEET SECTION 602 OF THE NDDOT SPECIFICATIONS. ALL MATERIAL AND WORK SHALL BE INCLUDED IN THE PAY ITEM "CLASS AE-3 CONCRETE"

**WATERPROOF MEMBRANE DETAIL**

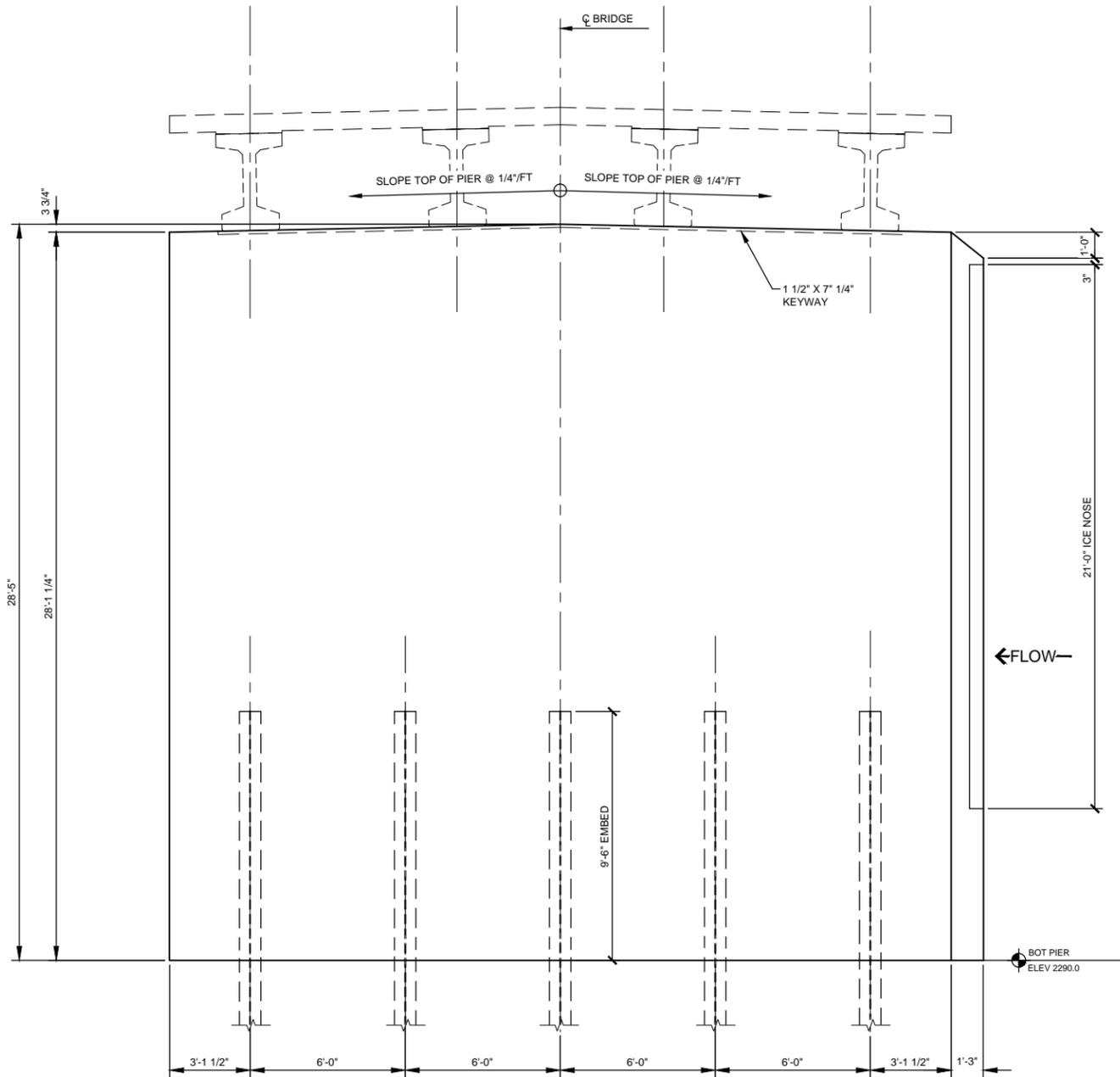
This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

	<b>CANNONBALL RIVER BURT, ND</b>			
	ABUTMENT DETAILS			
DRWN. BY E. Severinson	CHK'D BY P. Johnson	PROJECT NO. P11614-2015-000	DATE SEPT, 2015	
<small>File: W:\Hearland Engineering\11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg</small>				
<small>AE2S • 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 • (t) 701-746-8087 (f) 701-746-0370</small>				

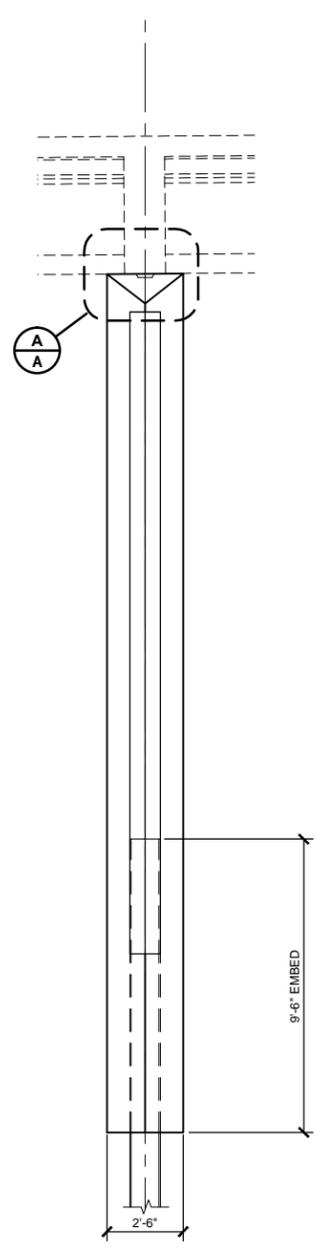
STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	21093	170	7



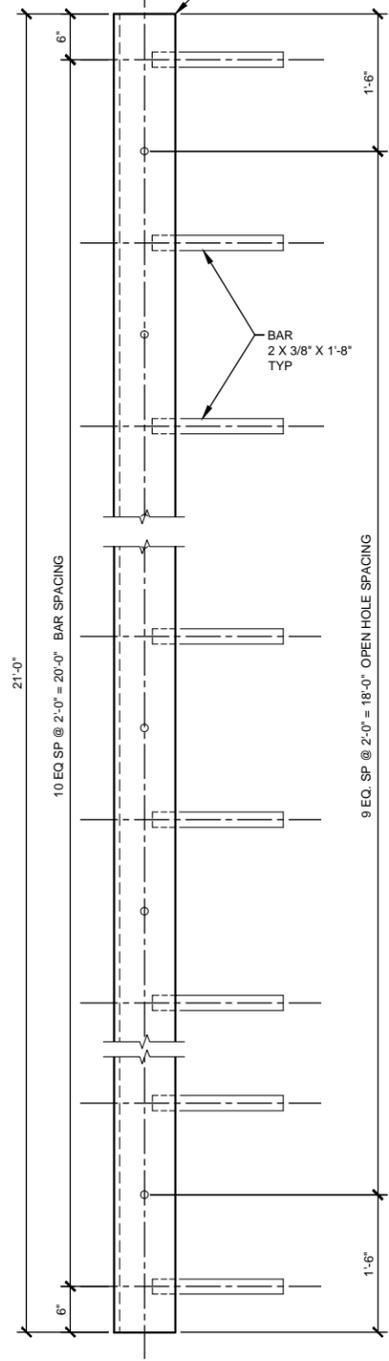
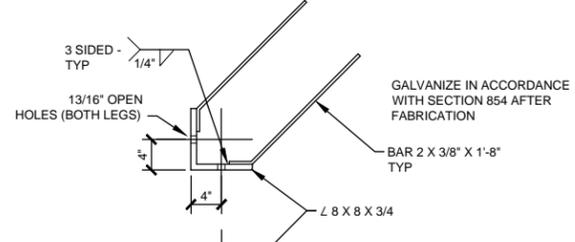
**PLAN VIEW - CENTER PIER**



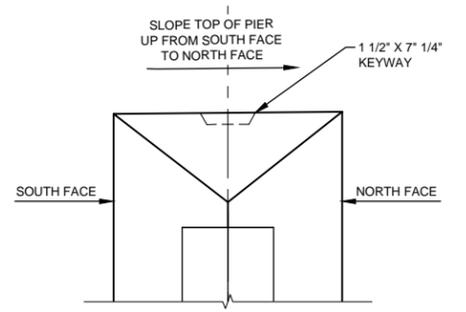
**ELEVATION - CENTER PIER**



**UPSTREAM ELEVATION @ END PIER**



**DETAIL - ICE NOSE**

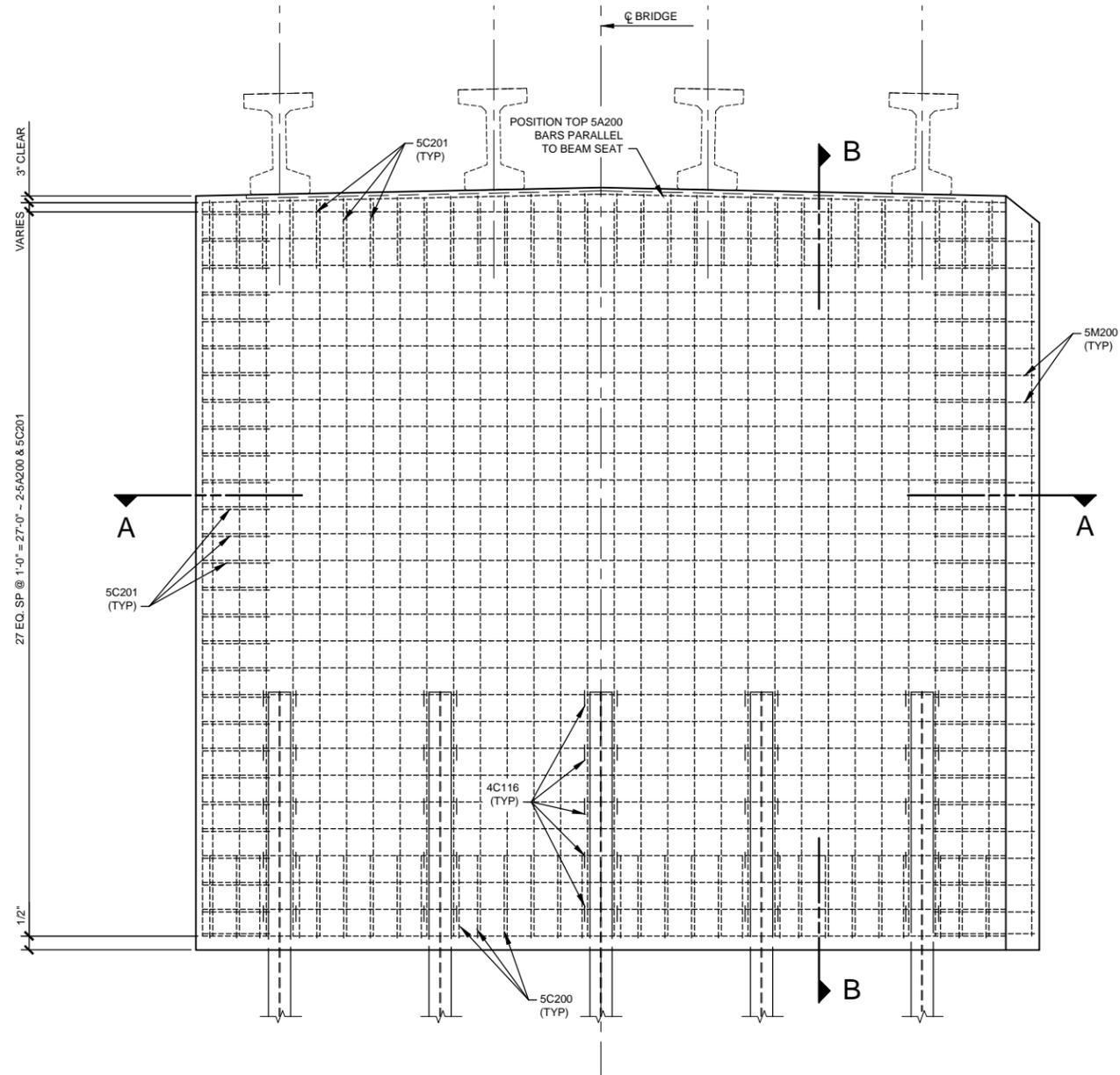


**DETAIL A-A**

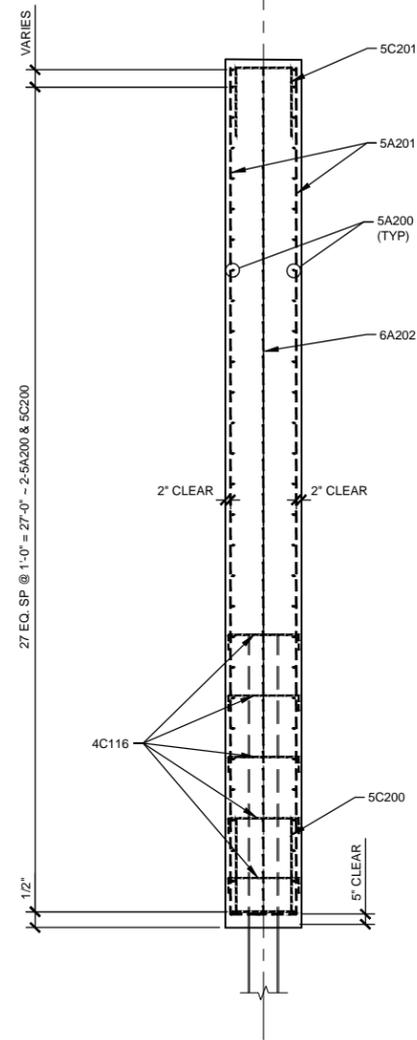
This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

	<b>CANNONBALL RIVER BURT, ND</b>			
	PIER DETAILS			
DRWN. BY E. Severinson	CHK'D BY P. Johnson	PROJECT NO. P11614-2015-000	DATE SEPT, 2015	
<small>File: W:\Heartland Engineering\11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg</small>				
<small>AE2S • 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 • (t) 701-746-8087 (f) 701-746-0370</small>				

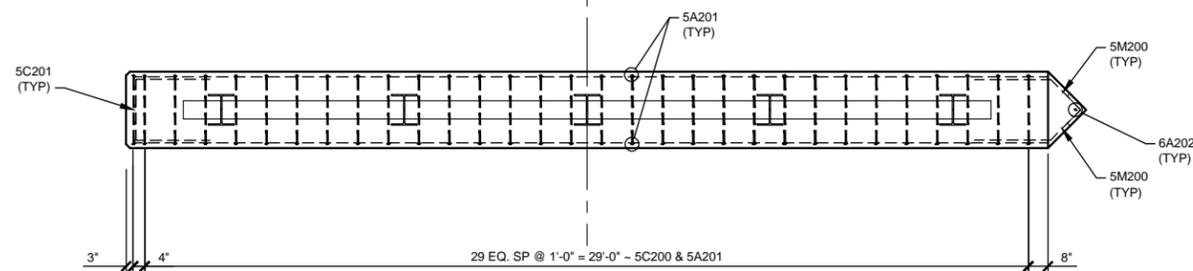
STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	21093	170	8



**ELEVATION CENTER PIER - SHOWING REINFORCING**



**SECTION B-B**



**SECTION A-A**

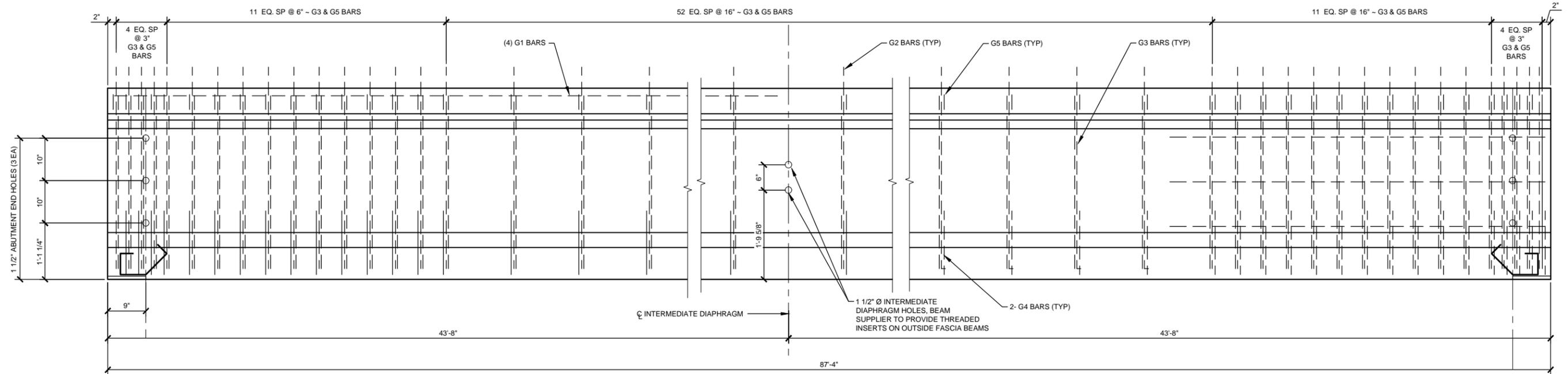
This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

ESTIMATED MATERIAL QUANTITIES - PIER			
ITEM	DESCRIPTION	UNIT	QUANTITY
602	CLASS AE-3 CONCRETE	CY	65.0
612	REINFORCING STEEL - GRADE 60	LBS	4661.0
616	STRUCTURAL STEEL M270-GR 36	LBS	911.5
622	STEEL PILING HP 12X53	LF	375

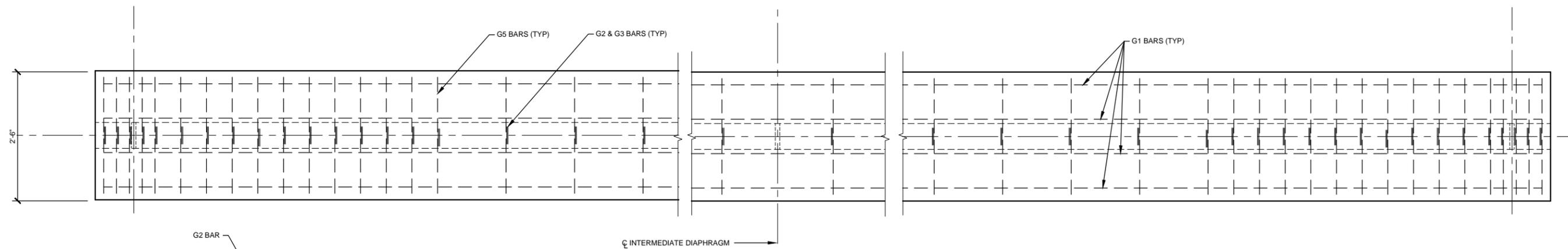
<b>CANNONBALL RIVER BURT, ND</b>			
<b>PIER DETAILS</b>			
DRWN. BY	CHK'D BY	PROJECT NO.	DATE
E. Severinson	P. Johnson	P11614-2015-000	SEPT, 2015

File: W:\Hearland Engineering\T11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg

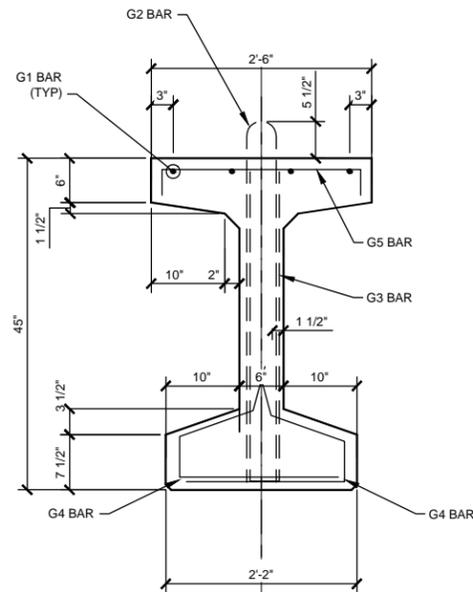
AE2S • 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 • (t) 701-746-8087 (f) 701-746-0370



**BEAM ELEVATION**



**TOP OF BEAM**



**END VIEW**

QUANTITIES (ONE BEAM)	
BEAM LENGTH	= 87.33 LF

BEAM SECTION DATA	
WT	= 672 LB/LFT
CROSS SECTIONAL AREA	= 624 SQ IN.
C.G.	= 22.3 IN
I	= 167,048.0 IN <sup>4</sup>
S <sub>b</sub>	= 7,477.5 IN <sup>3</sup>

BAR LIST ~ ONE BEAM				
MARK	SIZE	NO.	LENGTH	SHAPE
G1	5	4	87'-0"	STR
G2	4	84	8'-5"	BENT
G3	4	168	9'-0"	BENT
G4	4	168	4'-10"	BENT
G5	4	84	2'-9"	BENT

This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

		<b>CANNONBALL RIVER BURT, ND</b>	
		<b>45IN PRESTRESSED I-BEAM</b>	
DRWN. BY E. Severinson	CHKD BY P. Johnson	PROJECT NO. P11614-2015-000	DATE SEPT, 2015

File: W:\Heartland Engineering\11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg

AES • 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	BRC-CNOB-2137(054)	21093	170	10

**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 SHALL SHOW STRAND LAYOUT, PULL DOWN LOCATIONS, TENSIONING FORCES, ELONGATION AND ANY PROPOSED CHANGES IN REINFORCING STEEL.

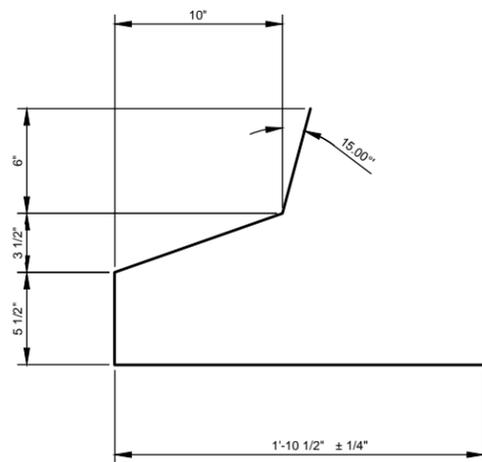
THE FINAL PRESTRESS FORCE (REMAINING AFTER ALL LOSSES HAVE BEEN ACCOUNTED FOR) AND ITS CORRESPONDING CENTER OF GRAVITY, SHALL BE SELECTED FROM THOSE ON A CURVE DETERMINED BY THE THREE VALUES SHOWN. ALL PRESTRESSING STEEL SHALL CONFORM TO AASHTO M203

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

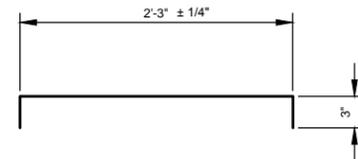
MINOR CHANGES TO THE SHAPE OF THE BEAM AND TO REINFORCING STEEL MAY BE MADE TO ACCOMMODATE THE FORMS OF VARIOUS CONTRACTORS AND THEIR CONSTRUCTION METHODS WITH THE APPROVAL OF THE ENGINEER.

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.

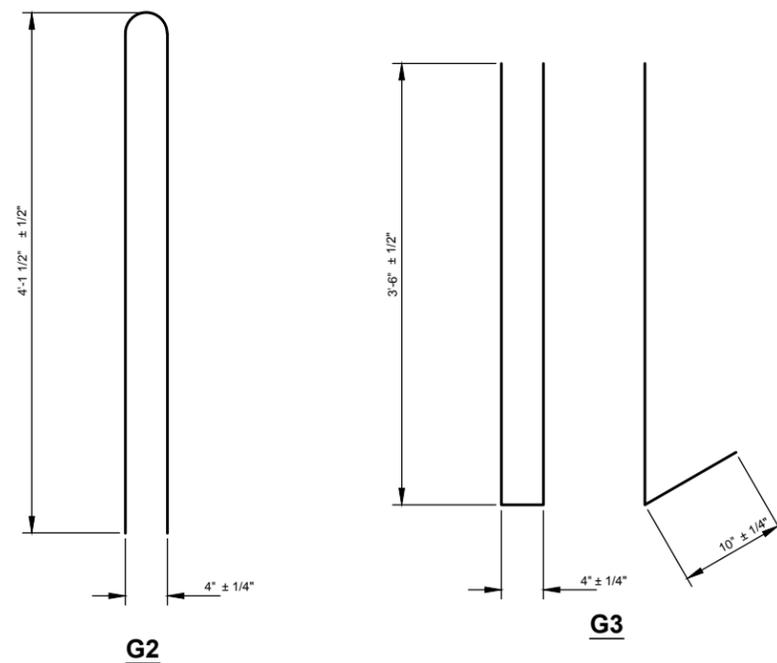


**G4**



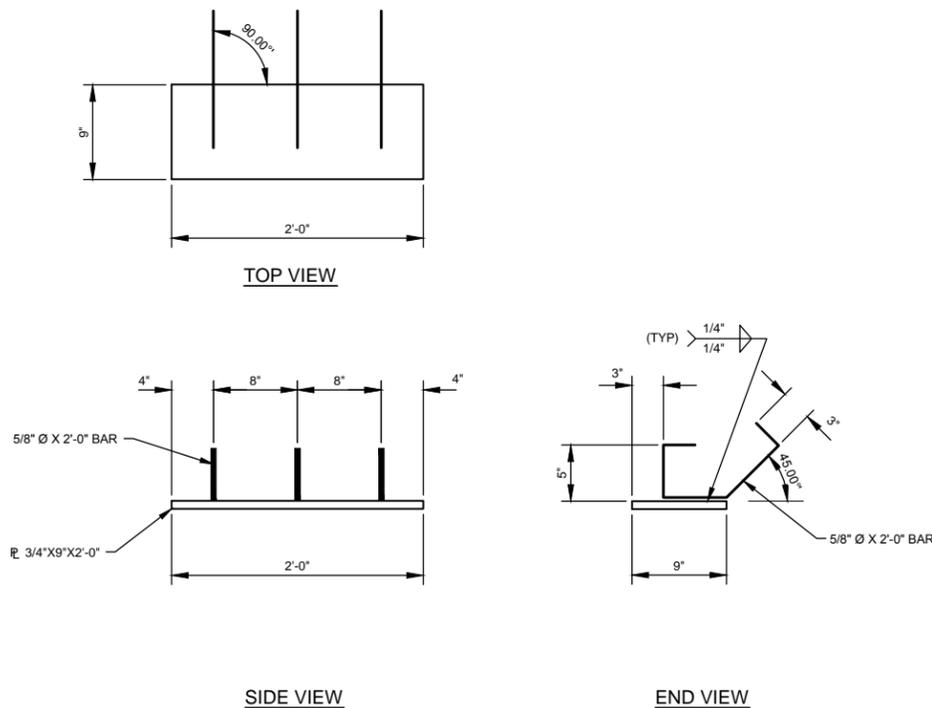
**G5**

PRESTRESSING DATA					
C.G.	FINAL FORCE	DETENSION STRENGTH	ACCEPTANCE STRENGTH	WEIGHT (TONS)	BEAM LENGTH
9.816 IN @ END	43.943 k	6000 psi (MIN)	6000 psi (MIN)	29.34	87'-4"
2.909 IN @ MID	43.943 k				



**G2**

**G3**



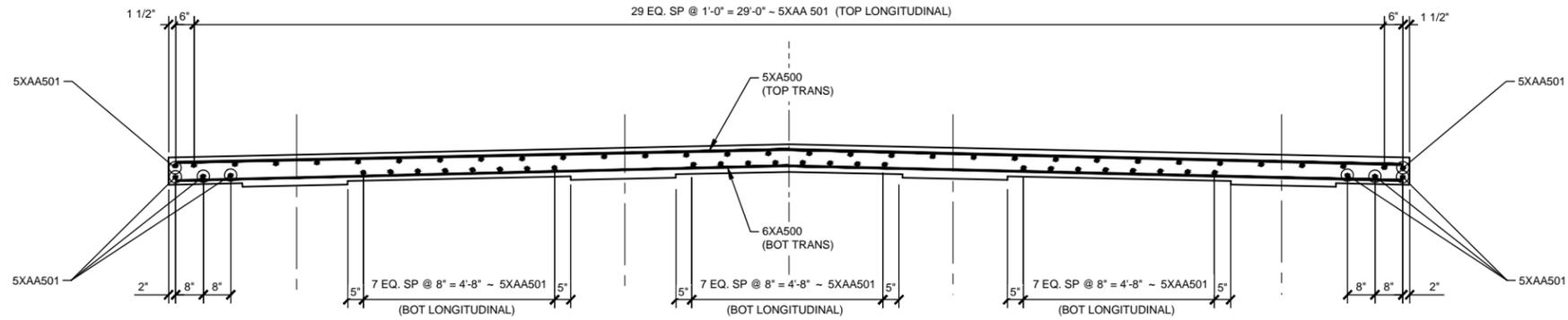
(BEARING PLATE TO BE STRUCTURAL STEEL M270 GRADE 36 HOT DIPPED GALVANIZED AND INCLUDED IN THE BID PRICE FOR THE BEAM.)

**BEARING DETAIL**

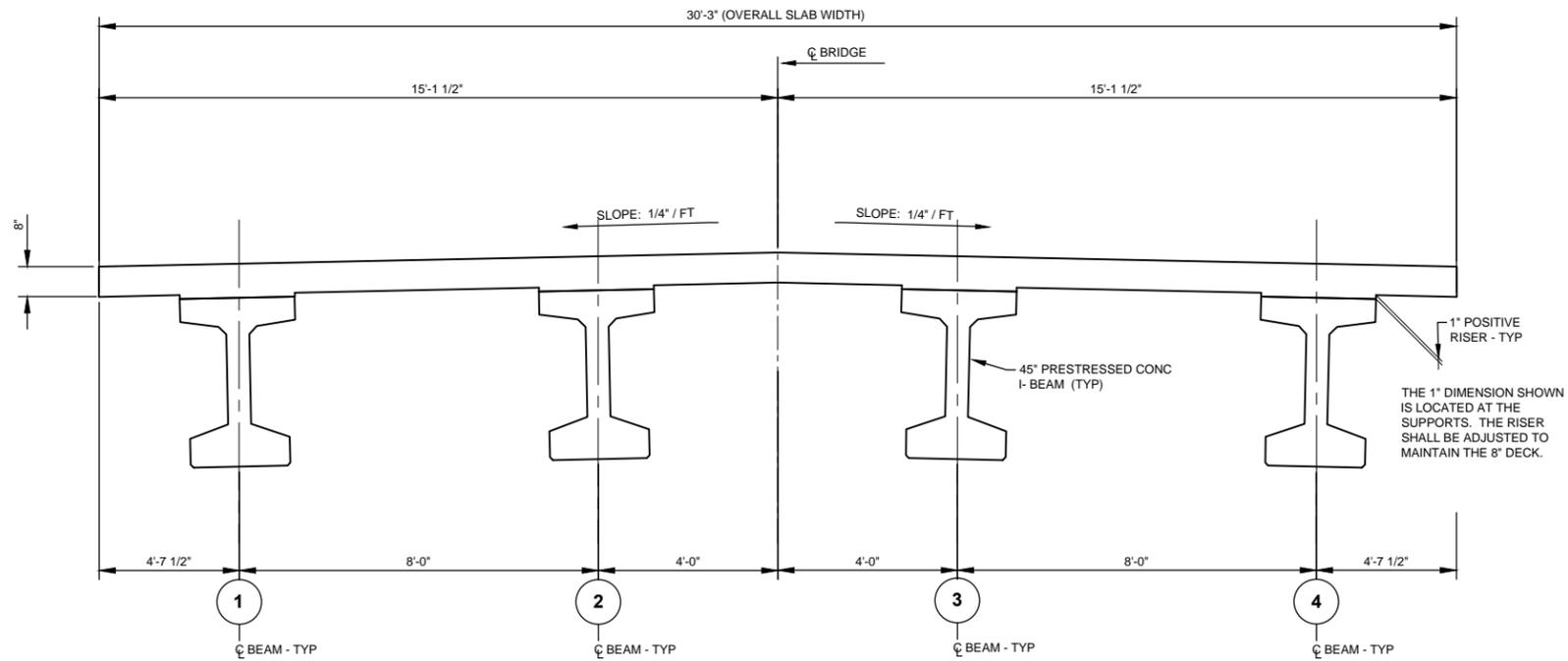
This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

		<b>CANNONBALL RIVER BURT, ND</b>	
		45IN PRESTRESSED I-BEAM	
DRWN. BY E. Severinson	CHK'D BY P. Johnson	PROJECT NO. P11614-2015-000	DATE SEPT, 2015
<small>File: W:\Hearland Engineering\11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg</small>			
<small>AE2S • 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 • (t) 701-746-8087 (f) 701-746-0370</small>			

STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	21093	170	11



**SECTION - SUPERSTRUCTURE SHOWING REINFORCEMENT**



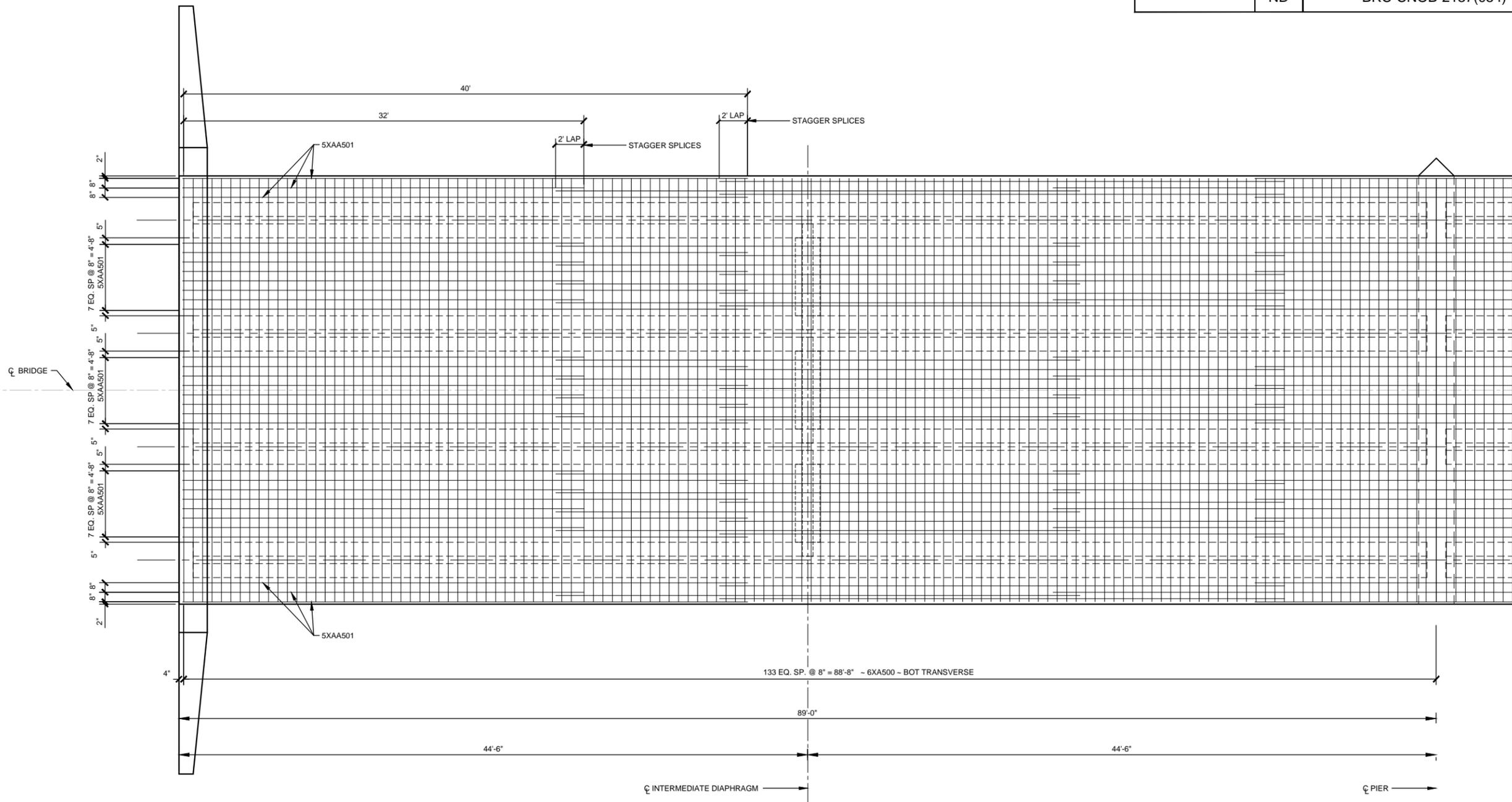
**SECTION - SUPERSTRUCTURE SHOWING DIMENSIONS**

This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

ESTIMATED MATERIAL QUANTITIES SUPERSTRUCTURE			
ITEM	DESCRIPTION	UNIT	QUANTITY
602	CLASS AAE-3 CONCRETE	CY	139.1
612	REINFORCING STEEL - GRADE 60	LBS	35,610.0

		<b>CANNONBALL RIVER BURT, ND</b>	
		DECK SLAB SECTION	
DRWN. BY E. Severinson	CHK'D BY P. Johnson	PROJECT NO. P11614-2015-000	DATE SEPT, 2015
<small>File: W:\Hearland Engineering\11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg</small>			
<small>AE2S • 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 • (t) 701-746-8087 (f) 701-746-0370</small>			

STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	21093	170	12

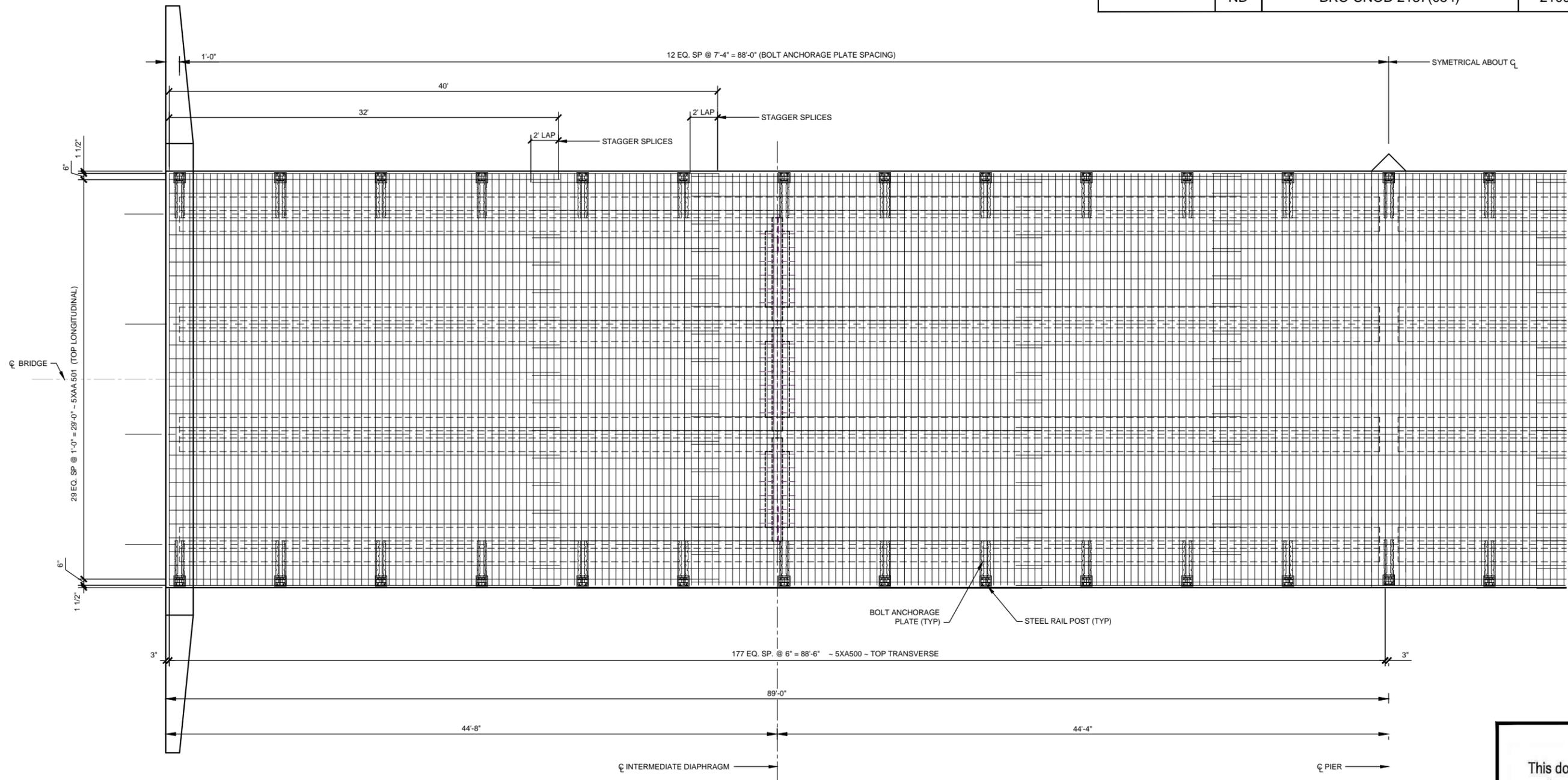


**PART SLAB LAYOUT - BOTTOM REINFORCEMENT**

This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

<b>AE2</b>			
<b>CANNONBALL RIVER BURT, ND SLAB LAYOUT</b>			
DRWN. BY	CHKD BY	PROJECT NO.	DATE
E. Severinson	P. Johnson	P11614-2015-000	SEPT, 2015

STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	21093	170	13

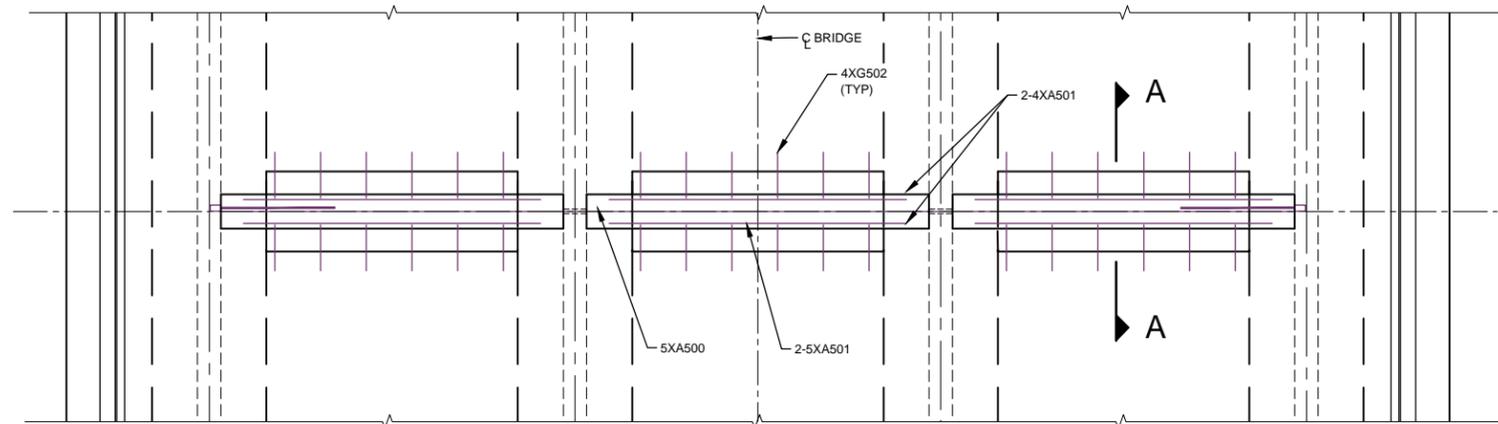


**PART SLAB LAYOUT - TOP SLAB REINFORCEMENT**

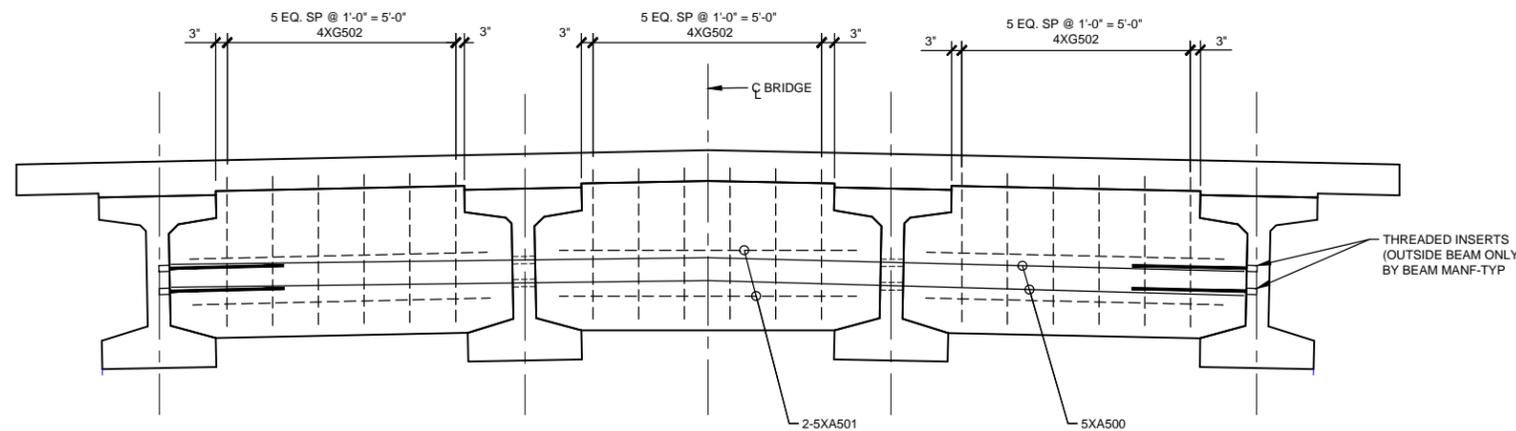
This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

<b>AES</b>			
<b>CANNONBALL RIVER BURT, ND</b>			
<b>PART SLAB - TOP REINFORCEMENT</b>			
DRWN. BY	CHK'D BY	PROJECT NO.	DATE
E. Severinson	P. Johnson	P11614-2015-000	SEPT, 2015
<small>File: W:\Hearland Engineering\11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg</small>			
<small>AE2S • 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 • (t) 701-746-8087 (f) 701-746-0370</small>			

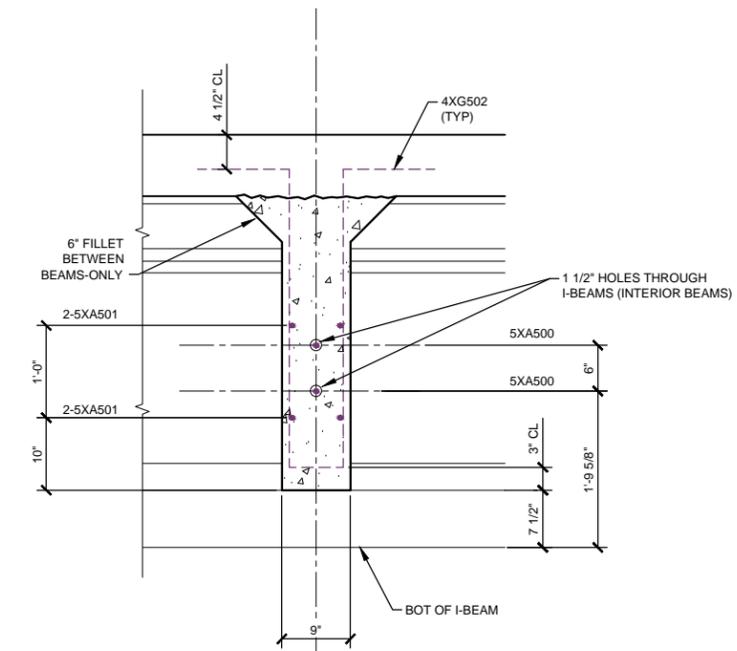
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRC-CNOB-2137(054)	21093	170	14



**PLAN VIEW - INTERMEDIATE DIAPHRAGM**



**ELEVATION - INTERMEDIATE DIAPHRAGM**



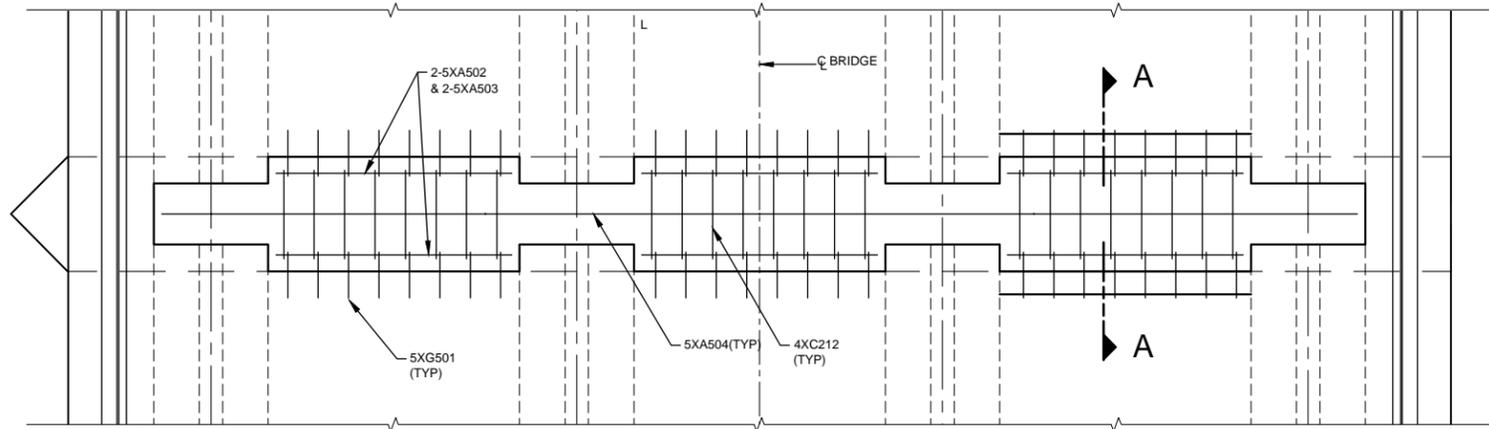
**SECTION A-A**

This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

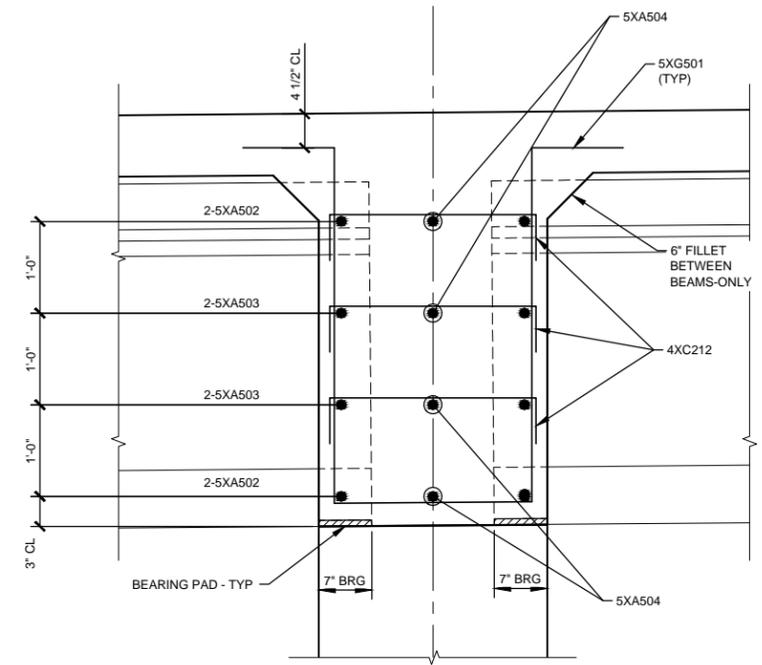
ESTIMATED MATERIAL QUANTITIES (both) INTERMEDIATE - DIAPHRAGMS			
ITEM	DESCRIPTION	UNIT	QUANTITY
602	CLASS AAE-3 CONCRETE	CY	4.1
612	REINFORCING STEEL - GRADE 60	LBS	477.0

<b>AE2S</b>			
<b>CANNONBALL RIVER BURT, ND</b>			
<b>INTERMEDIATE DIAPHRAGM DETAILS</b>			
DRWN. BY E. Severinson	CHK'D BY P. Johnson	PROJECT NO. P11614-2015-000	DATE SEPT, 2015
File: W:\Heartland Engineering\T11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg			
AE2S • 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 • (t) 701-746-8087 (f) 701-746-0370			

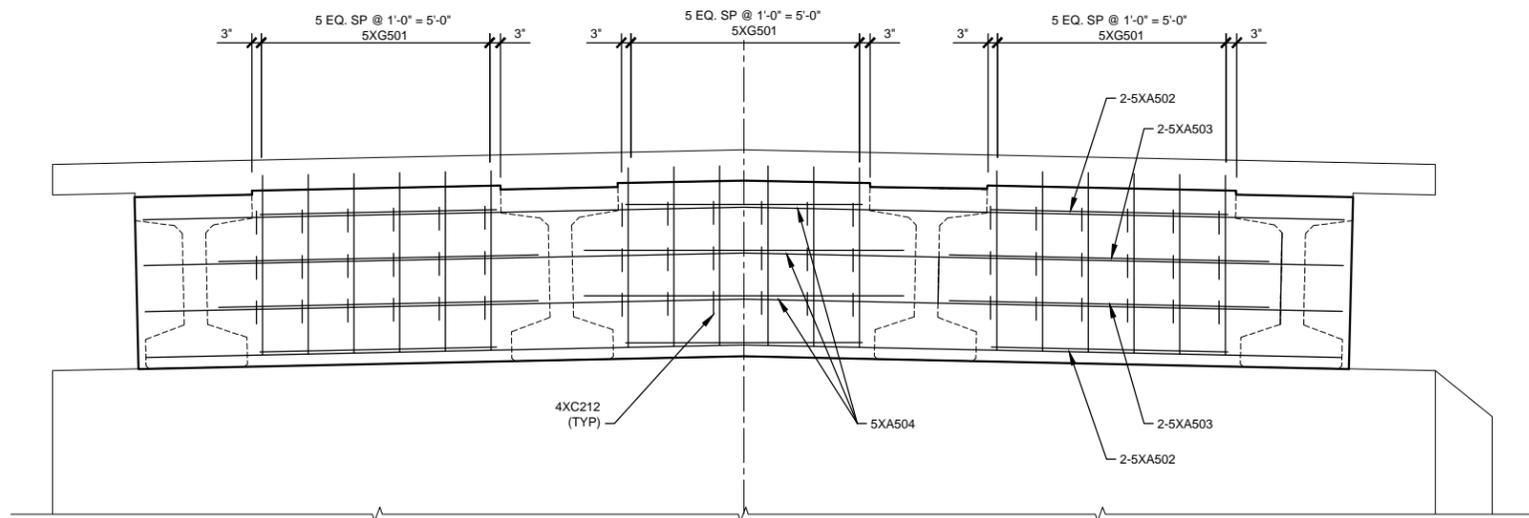
STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	21093	170	15



**PLAN VIEW - PIER DIAPHRAGM**



**SECTION A-A**



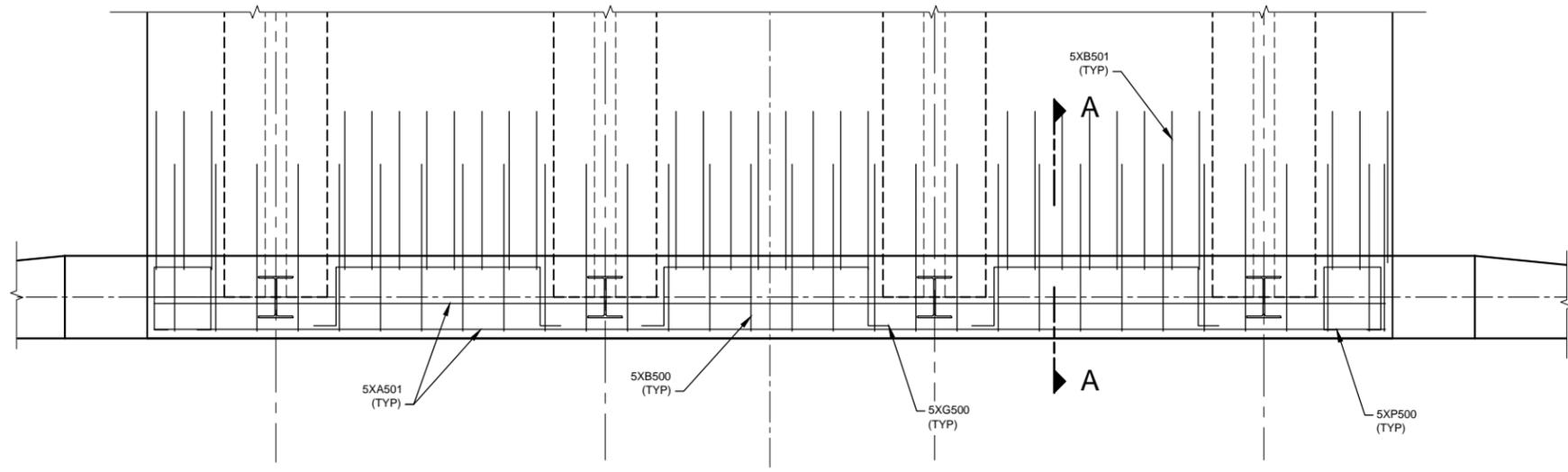
**ELEVATION - PIER DIAPHRAGM**

This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

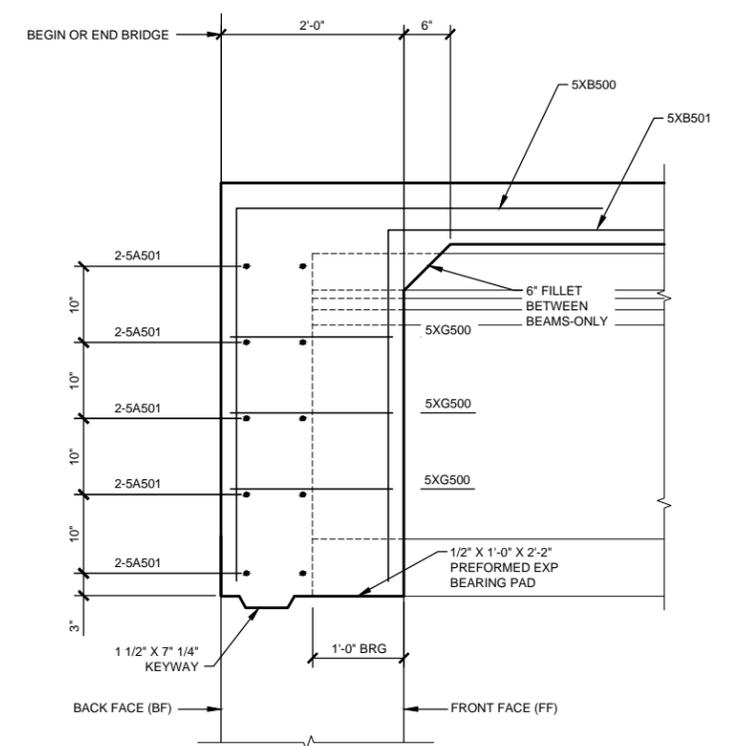
ESTIMATED MATERIAL QUANTITIES PIER DIAPHRAGM			
ITEM	DESCRIPTION	UNIT	QUANTITY
602	CLASS AAE-3 CONCRETE	CY	8.0
612	REINFORCING STEEL - GRADE 60	LBS	635.0

<b>AE2S</b>			
<b>CANNONBALL RIVER BURT, ND</b>			
<b>PIER DIAPHRAGM DETAILS</b>			
DRWN. BY E. Severinson	CHK'D BY P. Johnson	PROJECT NO. P11614-2015-000	DATE SEPT, 2015
File: W:\Hearland Engineering\11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg			
AE2S • 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 • (t) 701-746-8087 (f) 701-746-0370			

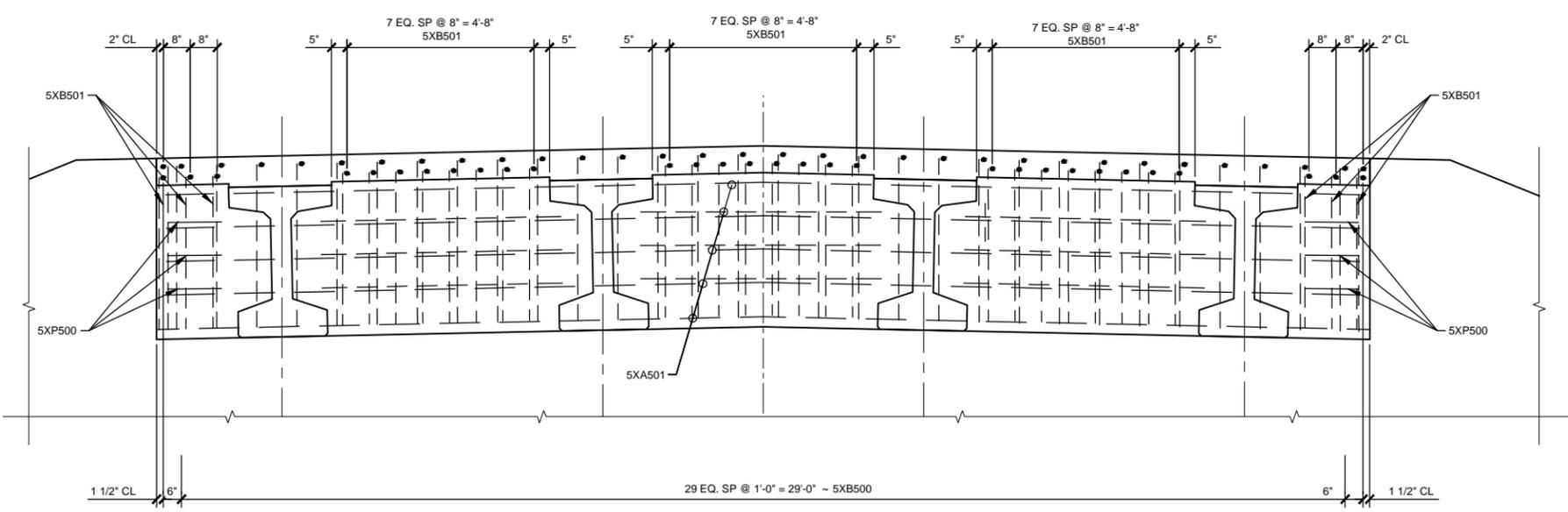
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRC-CNOB-2137(054)	21093	170	16



**PLAN - SHOWING ENDWALL REINF**



**SECTION A-A**



**ELEVATION - SHOWING ENDWALL REINF**

This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

ESTIMATED MATERIAL QUANTITIES BOTH ENDWALLS			
ITEM	DESCRIPTION	UNIT	QUANTITY
602	CLASS AAE-3 CONCRETE	CY	16.6
612	REINFORCING STEEL - GRADE 60	LBS	1853.0

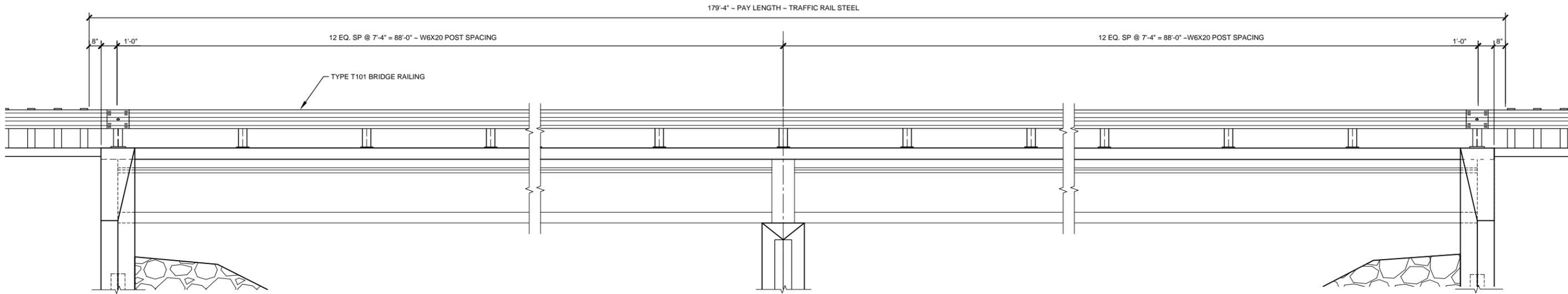
		<b>CANNONBALL RIVER BURT, ND</b>	
		END WALL DETAILS	
DRWN. BY E. Severinson	CHK'D BY P. Johnson	PROJECT NO. P11614-2015-000	DATE SEPT, 2015

File: W:\Hearland Engineering\11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg

AES • 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	BRC-CNOB-2137(054)	21093	170	18



**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 BETWEEN BOLTS 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.

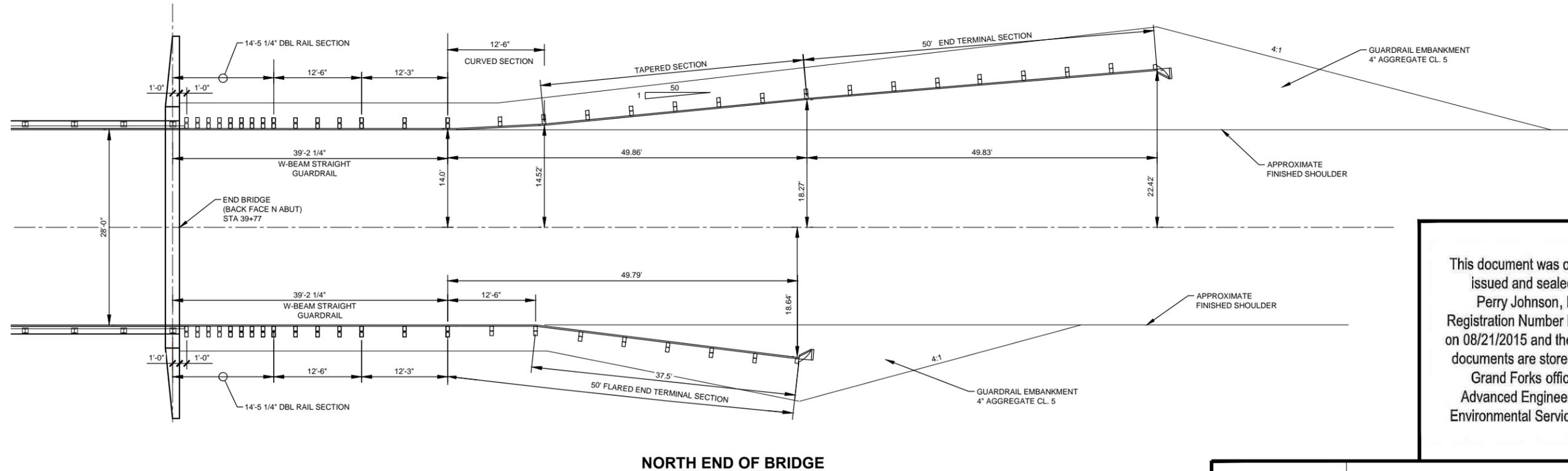
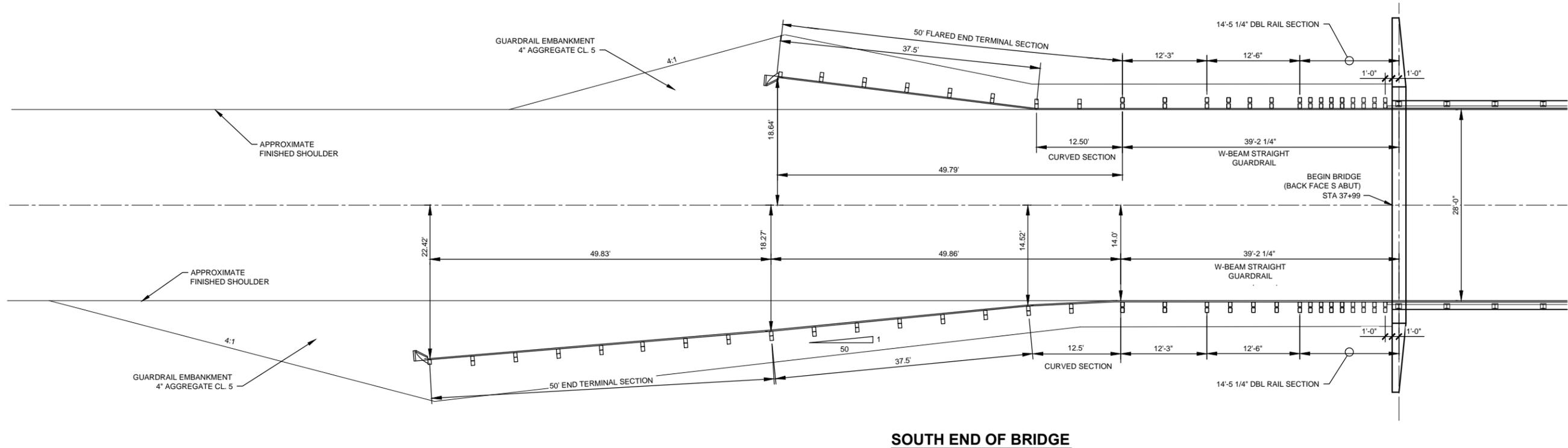
This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

ESTIMATED MATERIAL QUANTITIES - RAILING			
ITEM	DESCRIPTION	UNIT	QUANTITY
624	TRAFFIC RAIL - STEEL	LF	178.0

		<b>CANNONBALL RIVER BURT, ND</b>	
		BRIDGE RAILING ELEVATION	
DRWN. BY E. Severinson	CHK'D BY P. Johnson	PROJECT NO. P11614-2015-000	DATE SEPT, 2015
<small>File: W:\Hearland Engineering\11614-2015-000\AutoCadDrawings\02-Structural\BRIDGE DESIGN.dwg</small>			
<small>AE2S • 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 • (t) 701-746-8087 (f) 701-746-0370</small>			



STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	21093	170	20



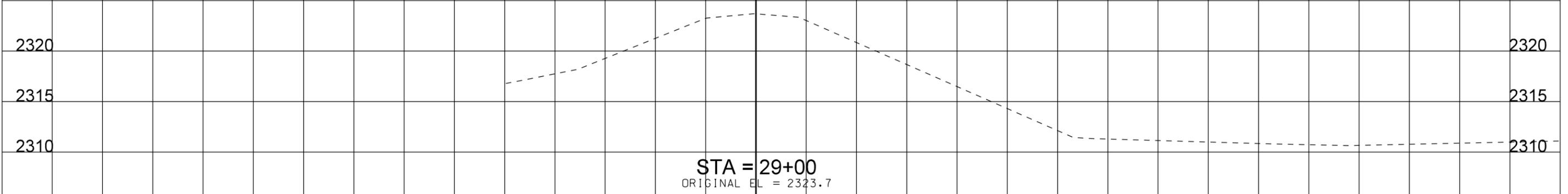
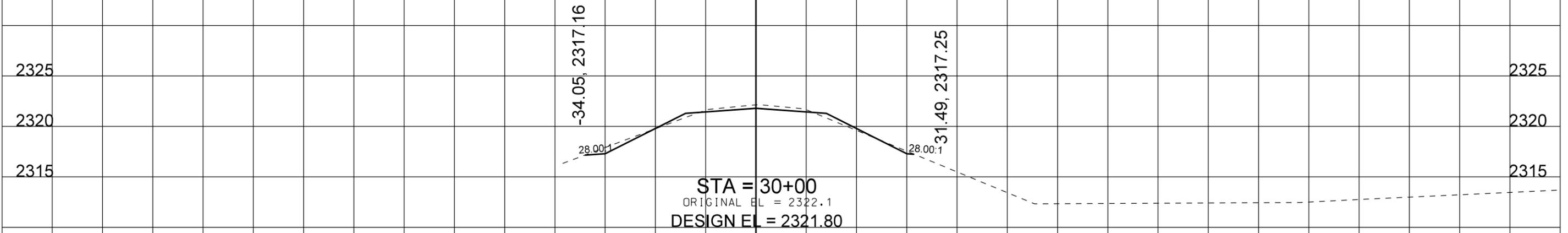
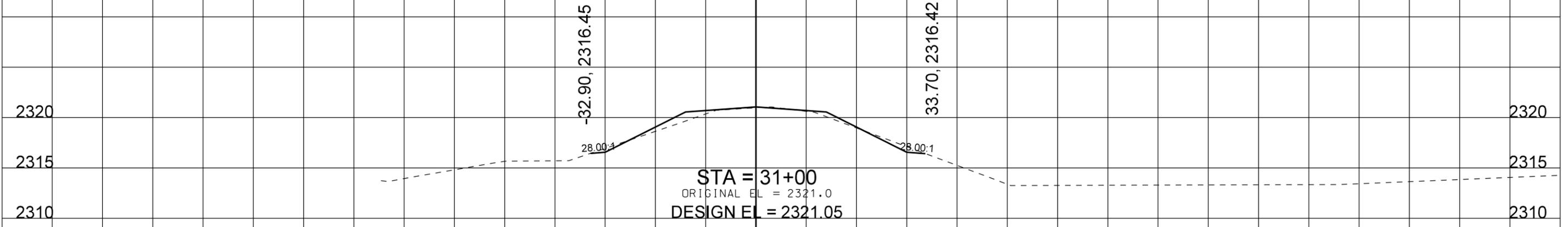
This document was originally issued and sealed by Perry Johnson, PE, Registration Number PE-3926 on 08/21/2015 and the original documents are stored at the Grand Forks office of Advanced Engineering & Environmental Services, Inc.

<b>AE2S</b>			
<b>CANNONBALL RIVER BURT, ND</b>			
<b>APPROACH GUARDRAIL LAYOUT</b>			
DRWN. BY	CHK'D BY	PROJECT NO.	DATE
E. Severinson	P. Johnson	P11614-2015-000	SEPT, 2015
File: W:\Hearland\Engineering\11614-2015-000\AutoCad\Drawings\02-Structural\BRIDGE DESIGN.dwg			
AE2S • 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 • (t) 701-746-8087 (f) 701-746-0370			

140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	200	1

100 110 120 130 140 150

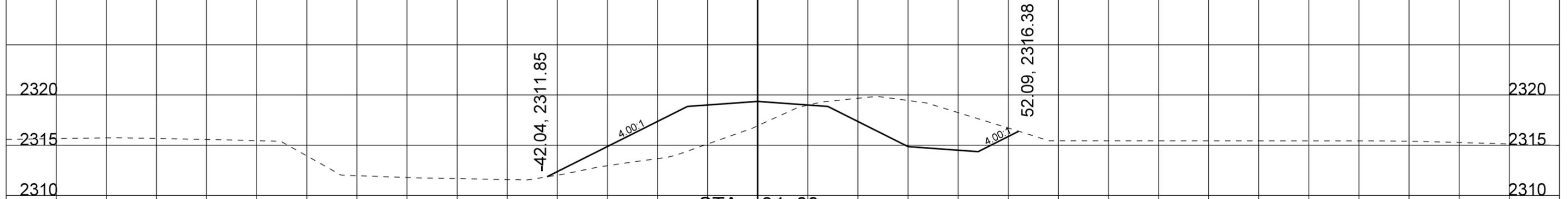


140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

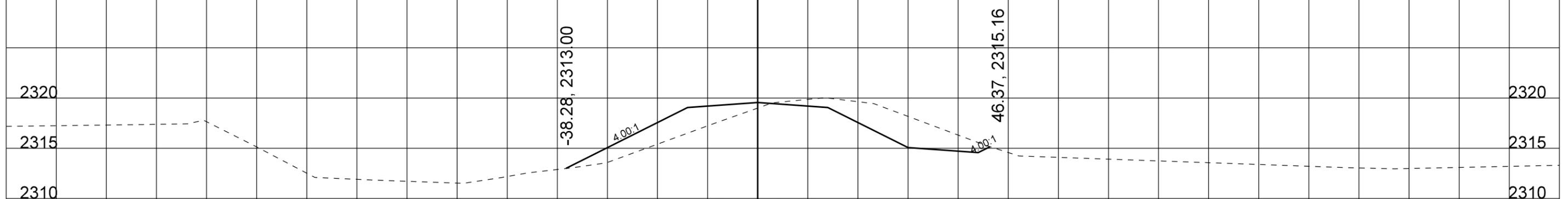
140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	200	2

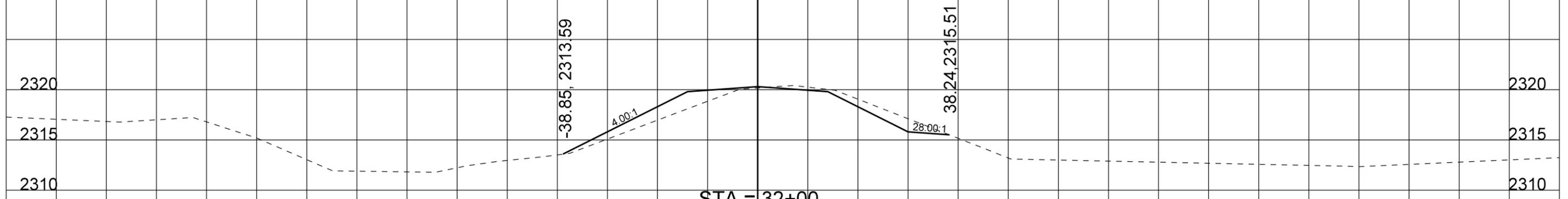
100 110 120 130 140 150



**STA = 34+00**  
 ORIGINAL EL = 2316.9  
 DESIGN EL = 2319.36



**STA = 33+00**  
 ORIGINAL EL = 2319.0  
 DESIGN EL = 2319.57



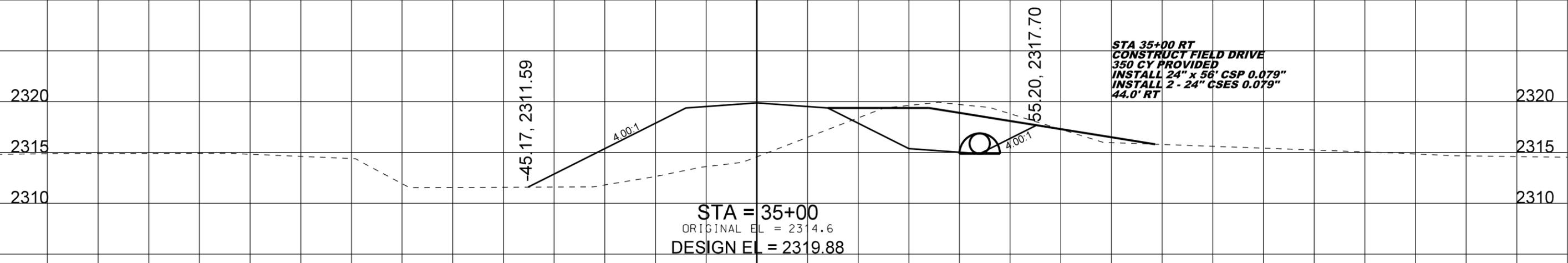
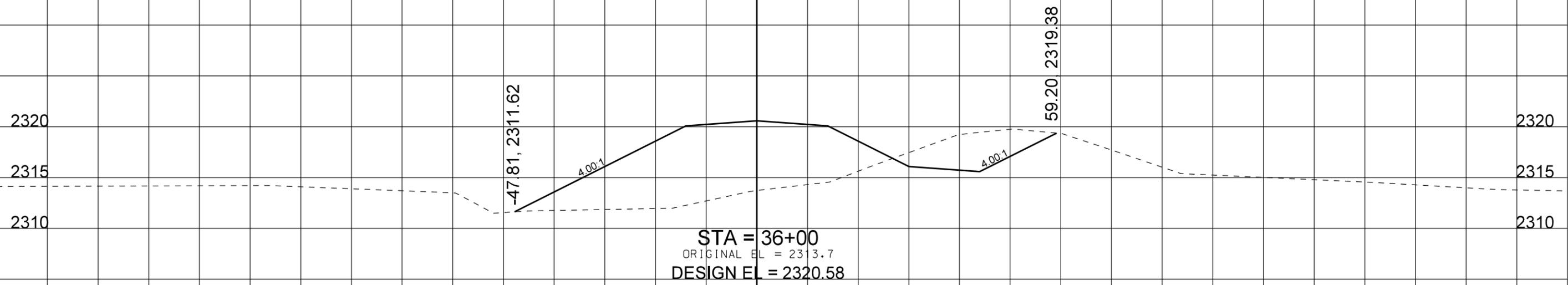
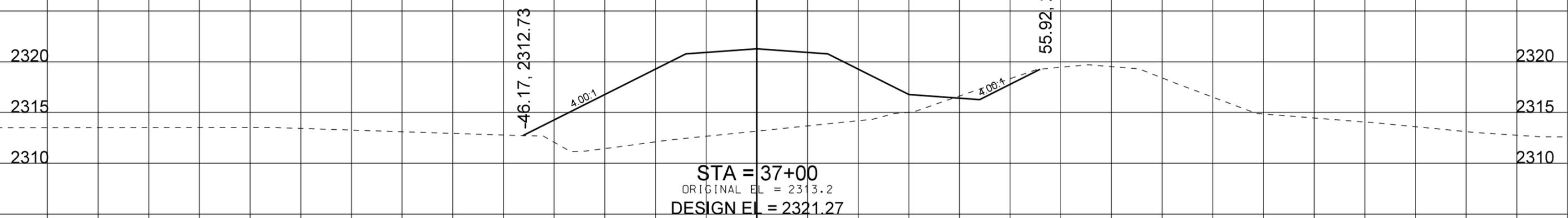
**STA = 32+00**  
 ORIGINAL EL = 2320.2  
 DESIGN EL = 2320.30

140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	200	3

100 110 120 130 140 150

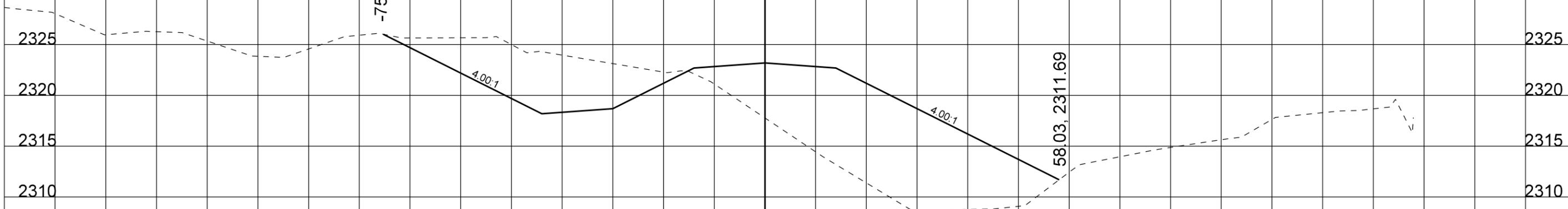


140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

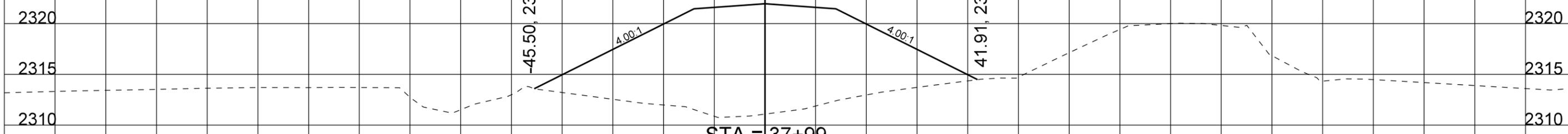
140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	200	4

100 110 120 130 140 150



**STA = 39+77**  
 ORIGINAL EL = 2317.8  
 DESIGN EL = 2323.20



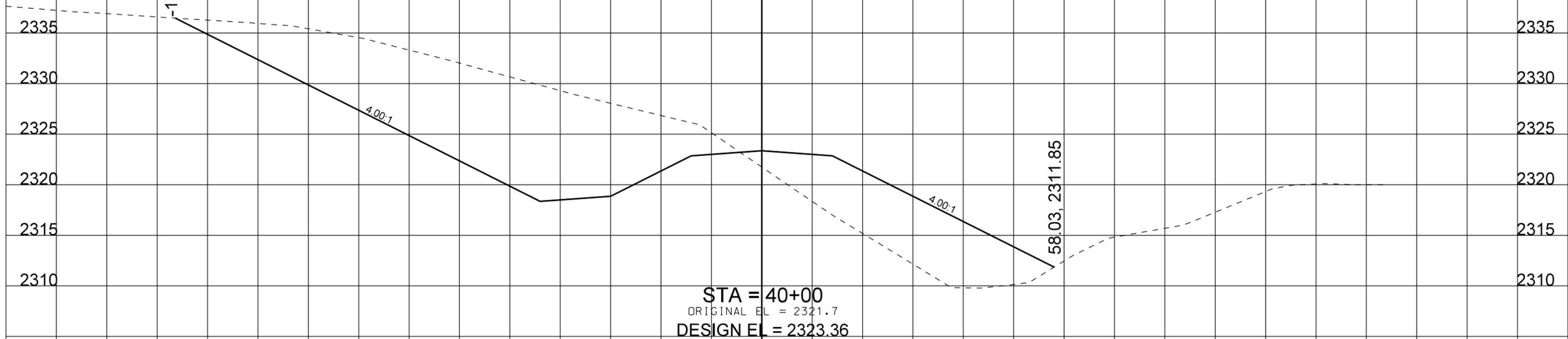
**STA = 37+99**  
 ORIGINAL EL = 2311.1  
 DESIGN EL = 2321.96

140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	200	5

100 110 120 130 140 150

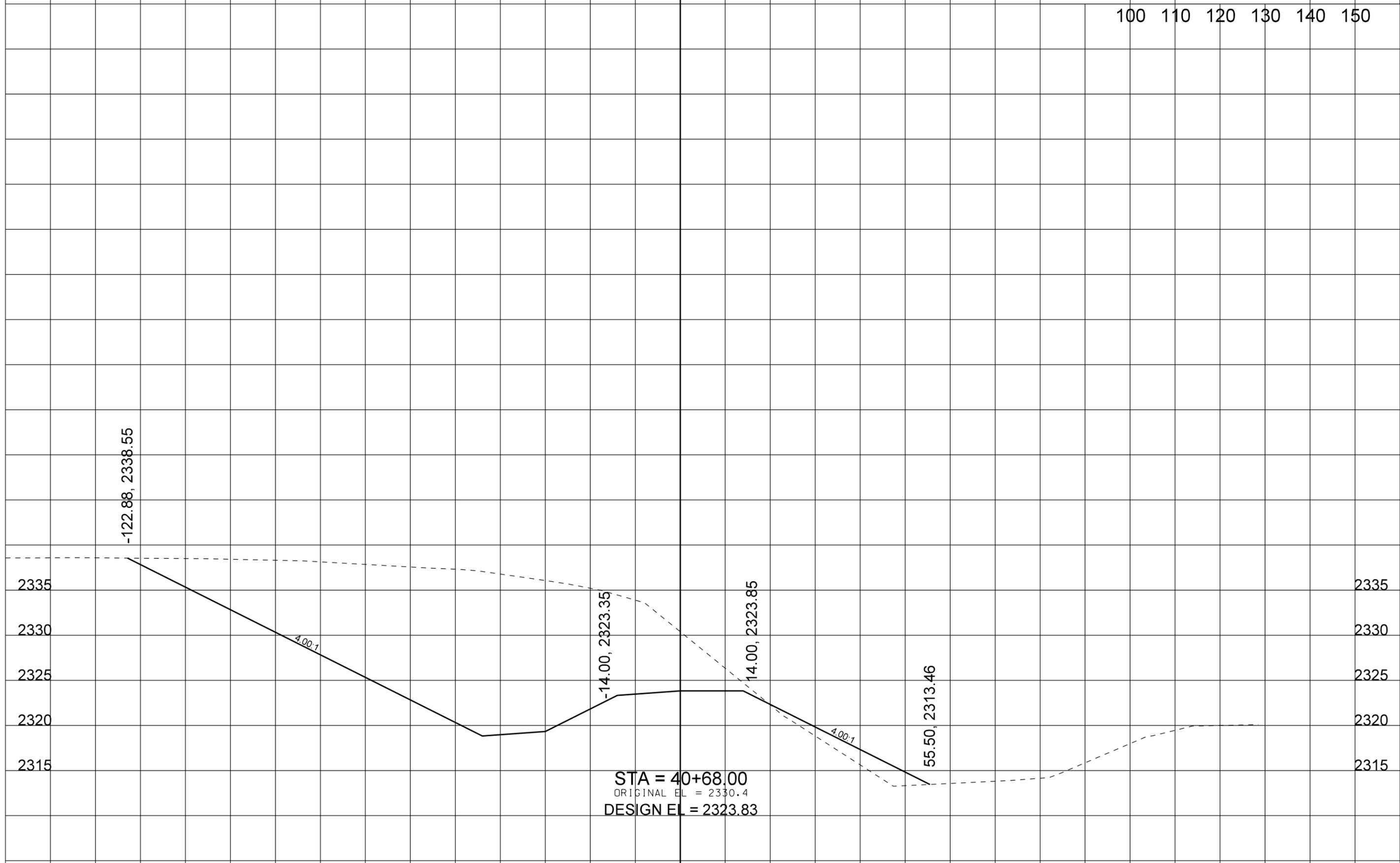


140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	200	6

100 110 120 130 140 150



STA = 40+68.00  
 ORIGINAL EL = 2330.4  
 DESIGN EL = 2323.83

140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	200	7

100 110 120 130 140 150



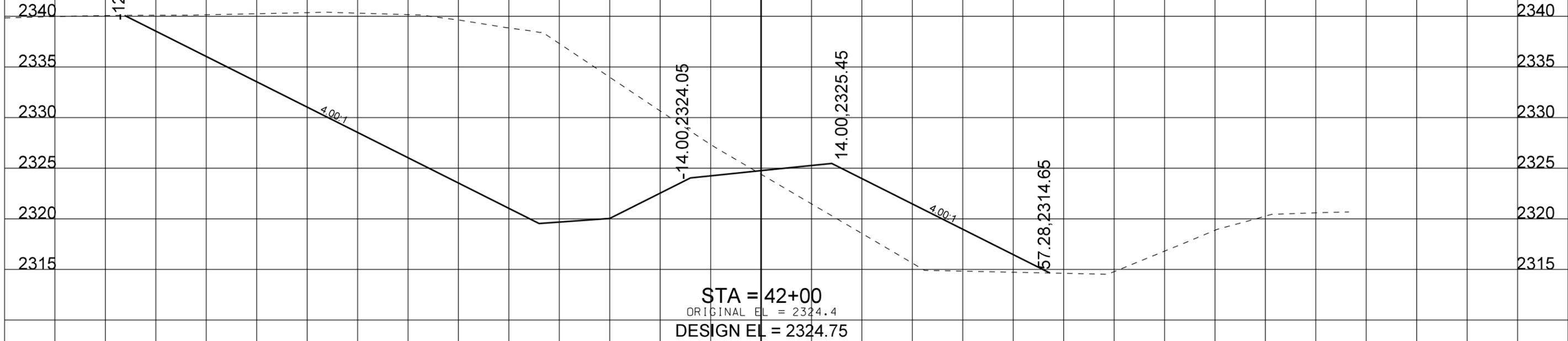
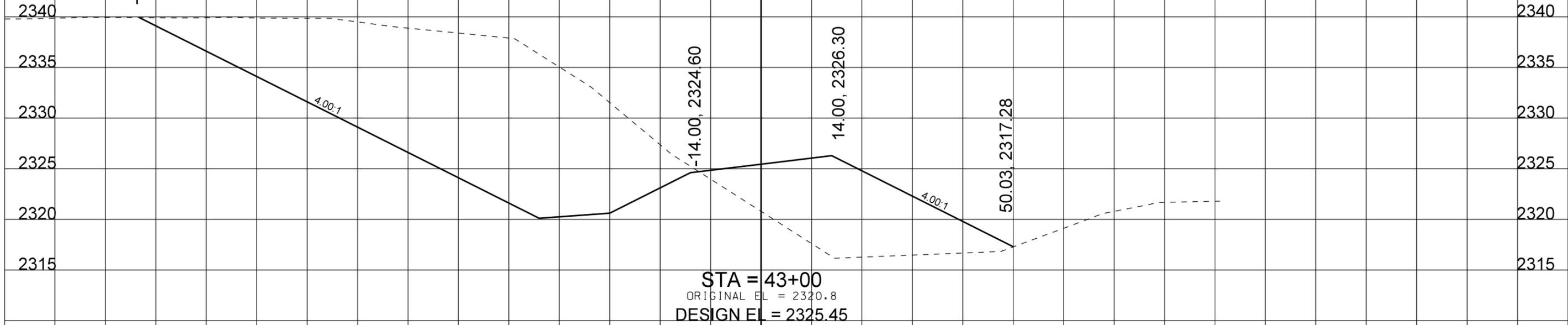
**STA = 41+00**  
 ORIGINAL EL = 2330.1  
 DESIGN EL = 2324.06

140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	200	8

100 110 120 130 140 150

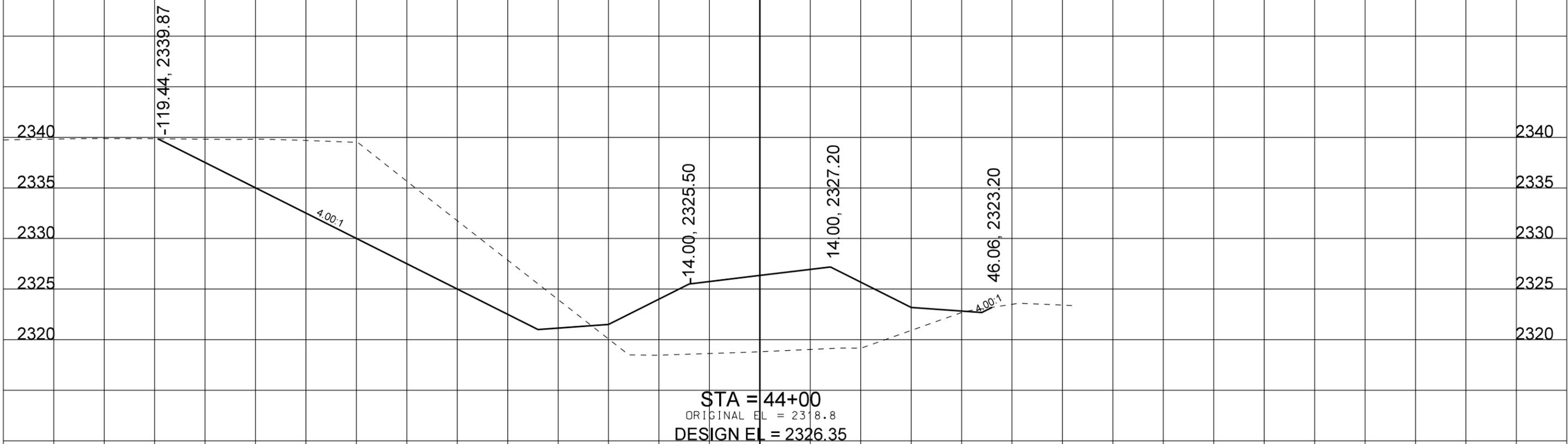
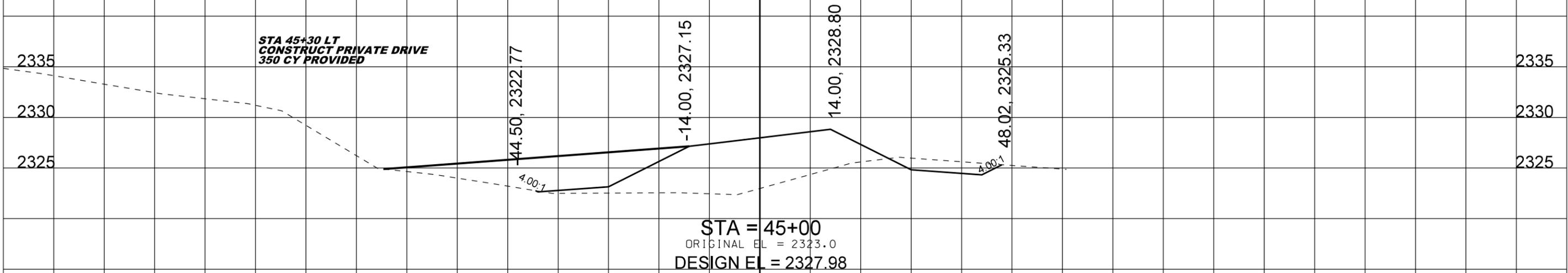


140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

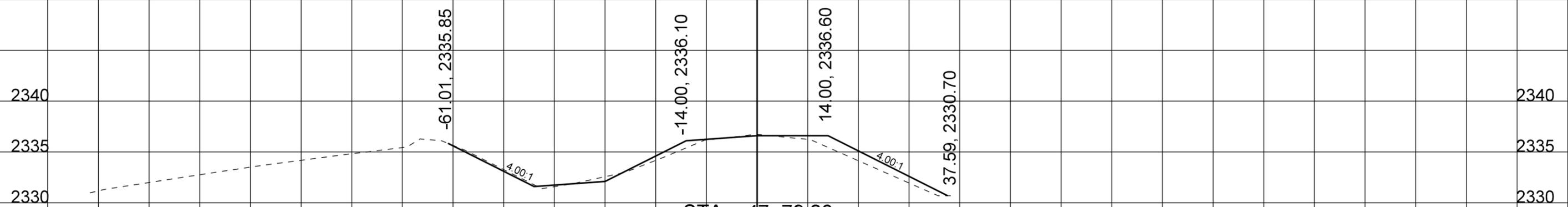
140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	200	9

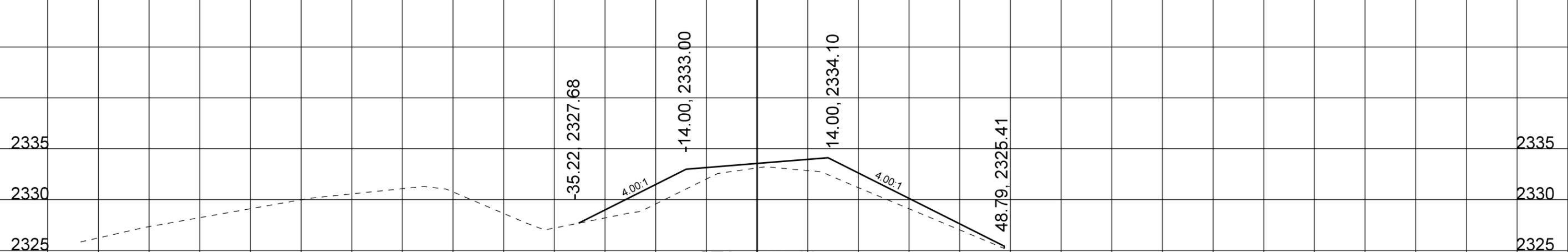
100 110 120 130 140 150



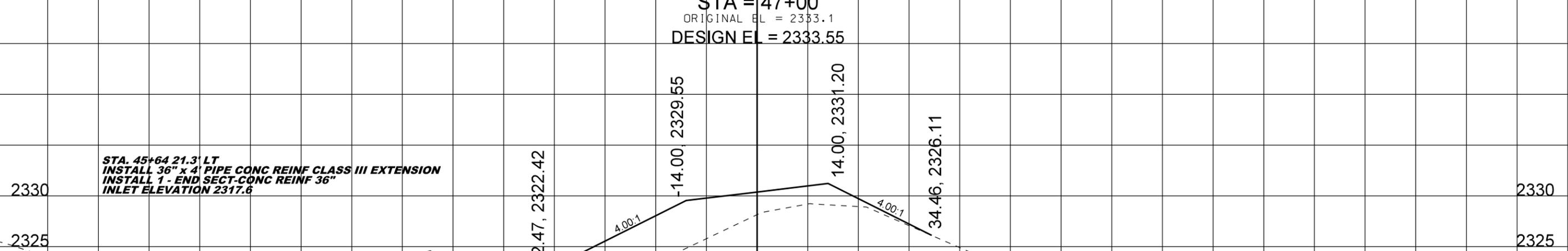
140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



STA = 47+79.23  
 ORIGINAL EL = 2336.7  
 DESIGN EL = 2336.60



STA = 47+00  
 ORIGINAL EL = 2333.1  
 DESIGN EL = 2333.55



STA = 46+00  
 ORIGINAL EL = 2328.2  
 DESIGN EL = 2330.38

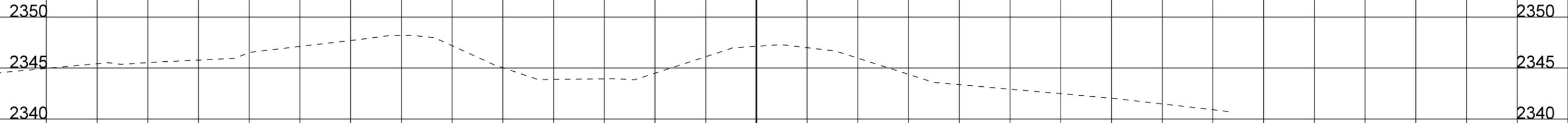
STA. 45+64 21.3' LT  
 INSTALL 36" x 4' PIPE CONC REINF CLASS III EXTENSION  
 INSTALL 1- END SECT-CONC REINF 36"  
 INLET ELEVATION 2317.6



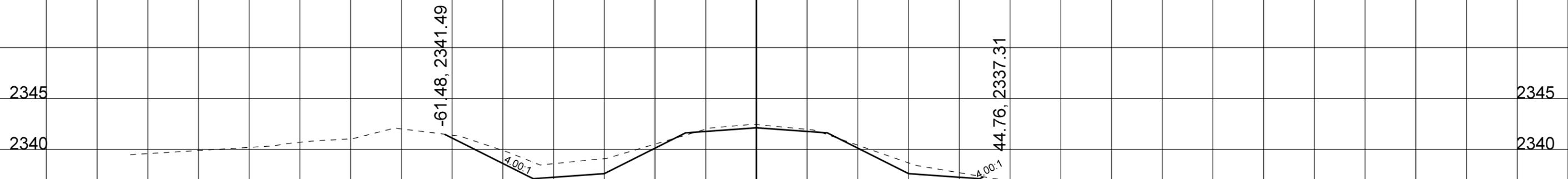
140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOB-2137(054)	200	11

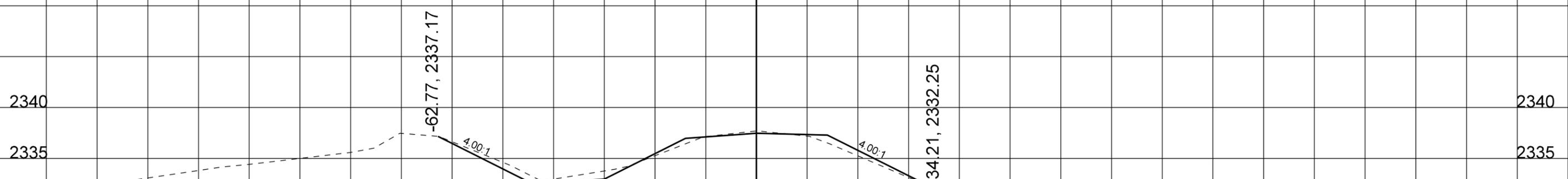
100 110 120 130 140 150



STA = 50+00  
ORIGINAL EL = 2347.1

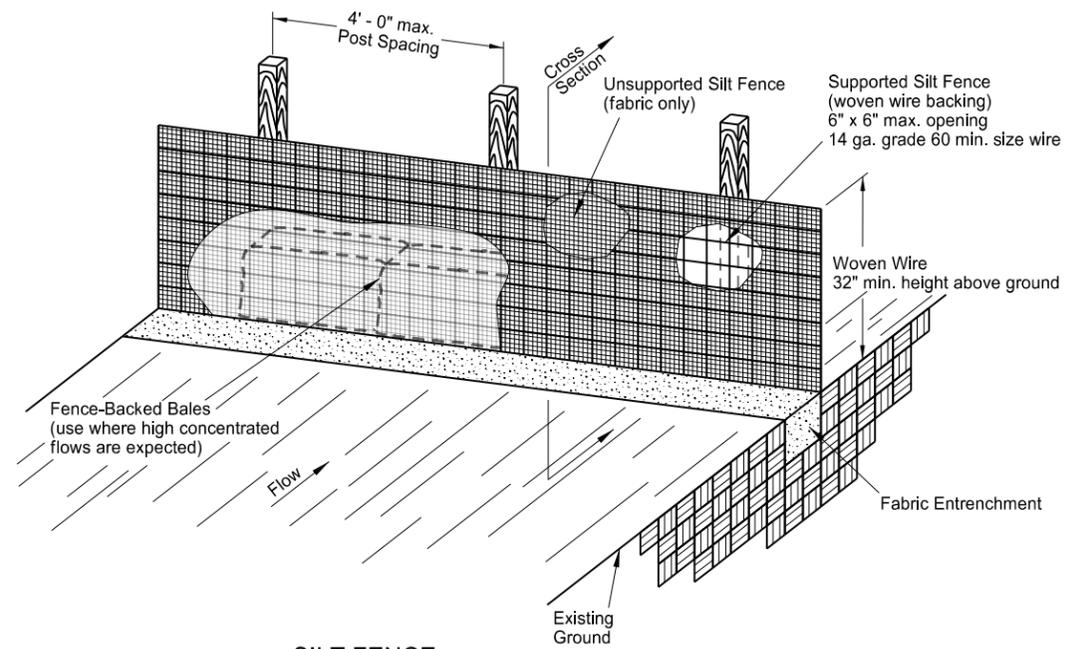


STA = 49+00  
ORIGINAL EL = 2342.4  
DESIGN EL = 2342.12

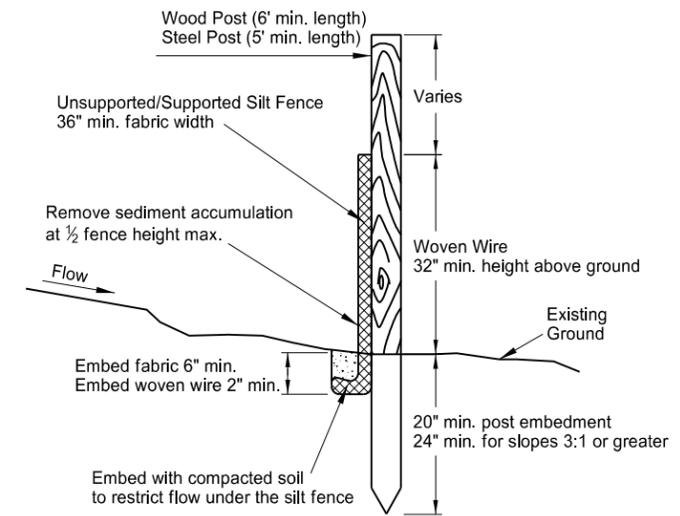


STA = 48+00  
ORIGINAL EL = 2337.7  
DESIGN EL = 2337.48

140 130 120 110 100 90 80 70 60 50 40 30 20 10 CL 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



SILT FENCE  
SUPPORTED AND UNSUPPORTED

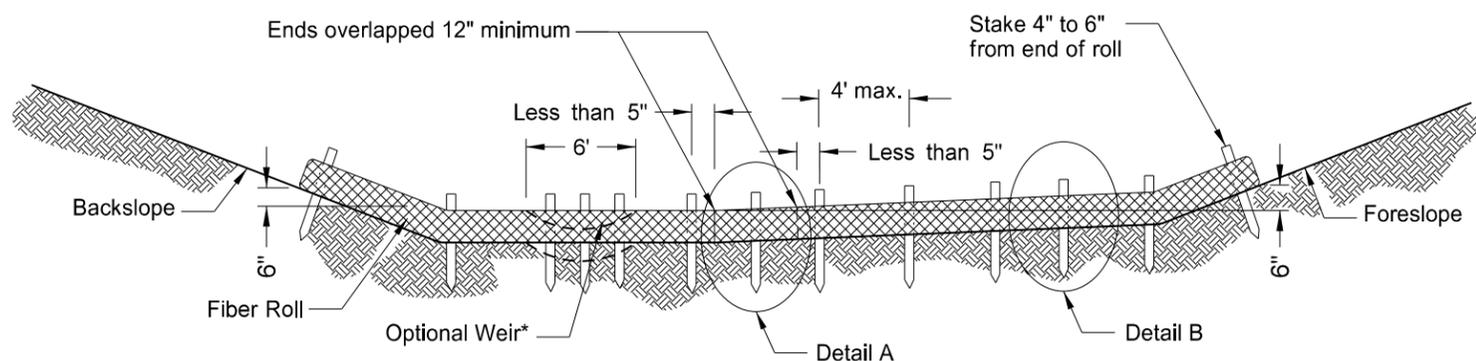


SILT FENCE  
CROSS SECTION

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Standard drawing resulted from splitting standard D-708-2.

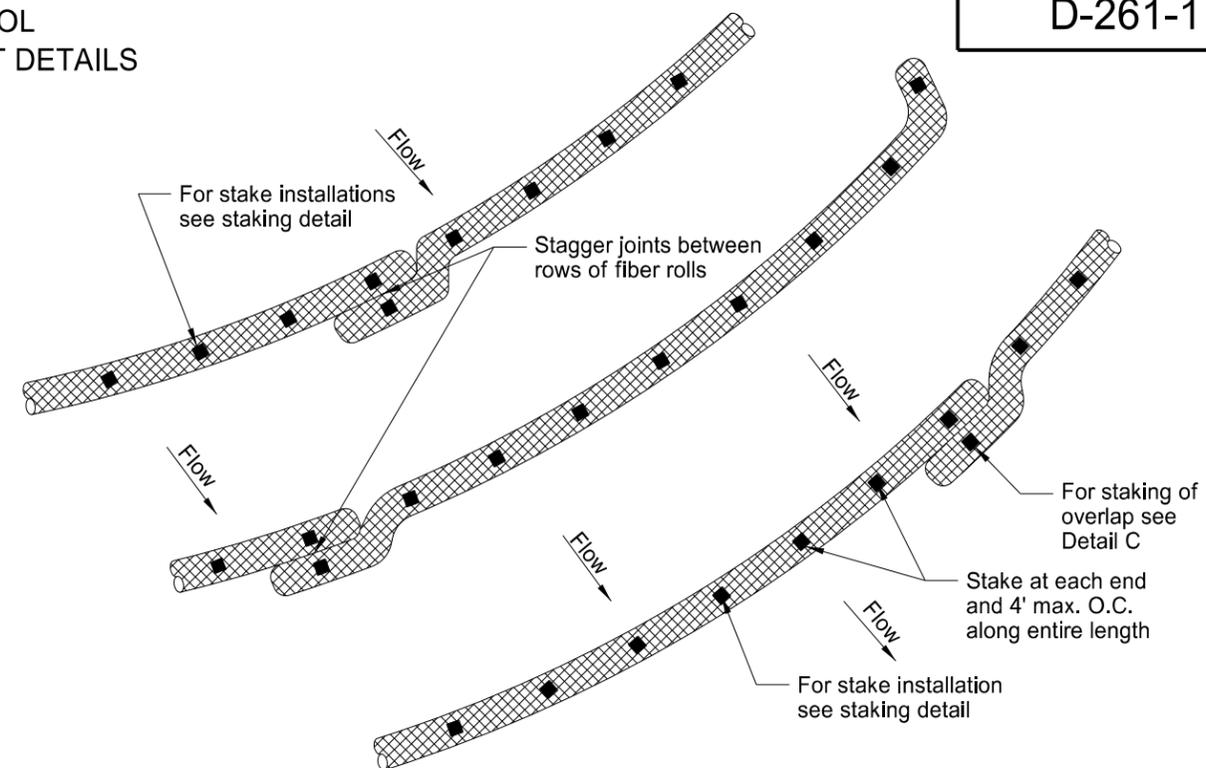
This document was originally issued and sealed by  
 Roger Weigel  
 Registration Number  
 PE-2930,  
 on 06/26/14 and the original document is stored at the North Dakota Department of Transportation

EROSION CONTROL  
FIBER ROLL PLACEMENT DETAILS

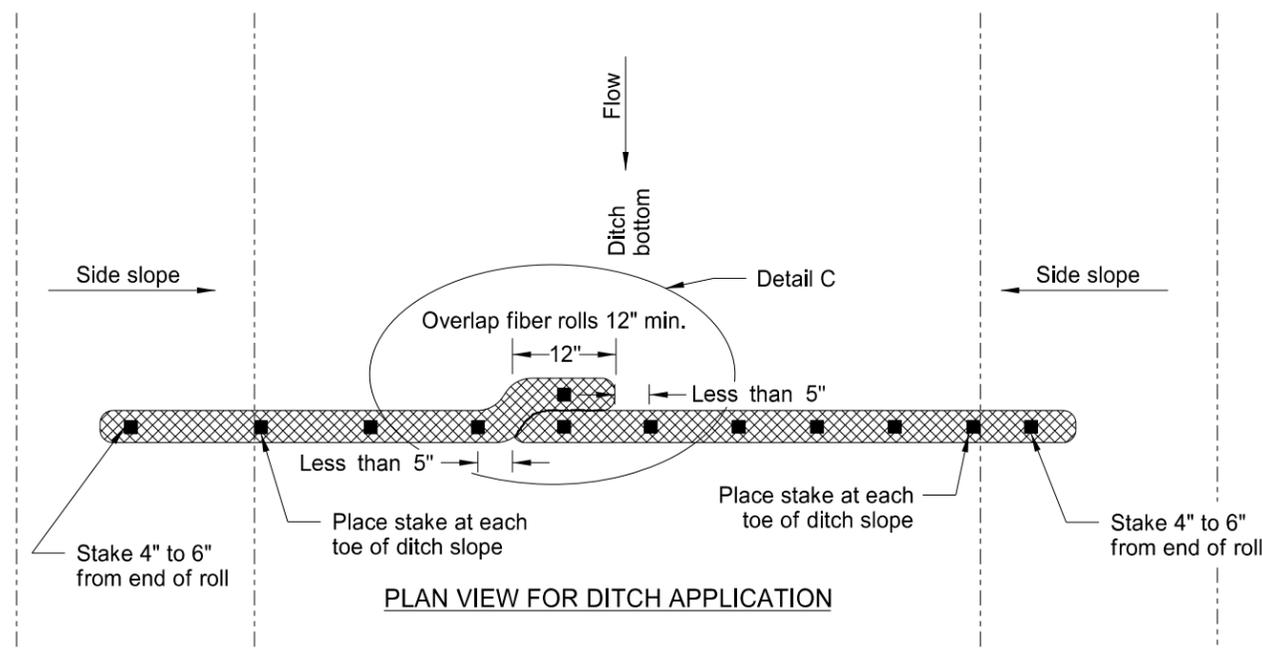


\*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up on adjacent property.

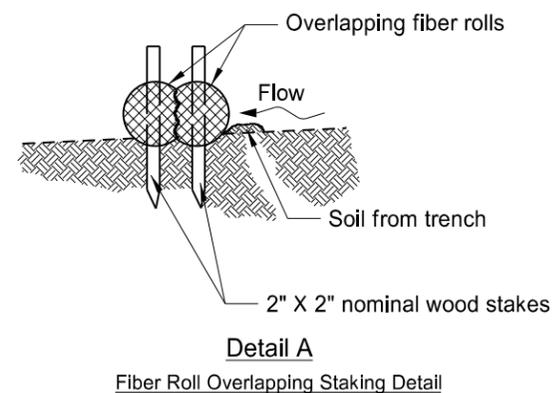
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



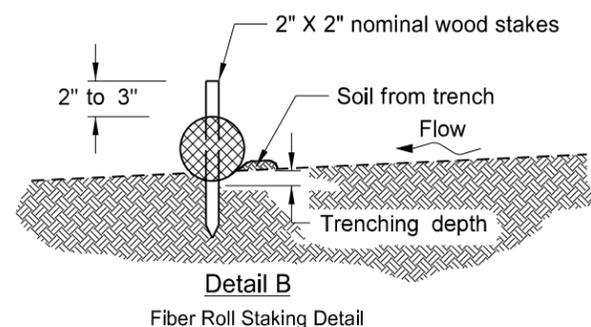
PLAN VIEW FOR SLOPE APPLICATION



PLAN VIEW FOR DITCH APPLICATION



Detail A  
Fiber Roll Overlapping Staking Detail



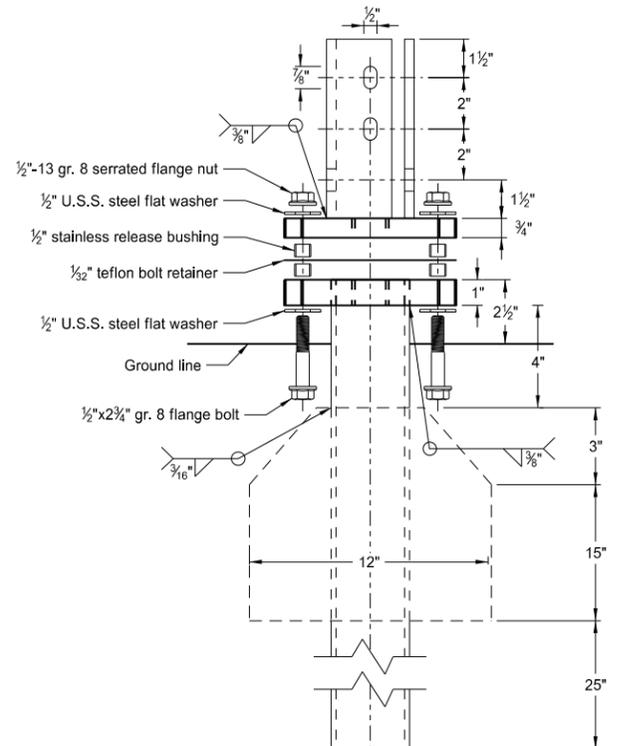
Detail B  
Fiber Roll Staking Detail

FIBER ROLL DIAMETER	NOMINAL STAKE SIZE	MINIMUM STAKE LENGTH	MINIMUM TRENCH DEPTH	MAXIMUM TRENCH DEPTH
6"	2" x 2"	18"	2"	2"
12"	2" x 2"	24"	2"	3"
20"	2" x 2"	36"	3"	5"

NOTE: Runoff must not be allowed to run under or around roll.

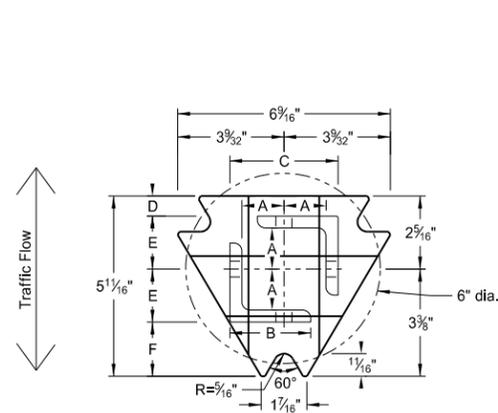
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-18-10	
REVISIONS	
DATE	CHANGE
06-10-13	Added plan view for ditch and slope application, Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.
06-26-14	Changed standard drawing number from D-708-7 to D-261-1

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 06/26/14 and the original document is stored at the North Dakota Department of Transportation

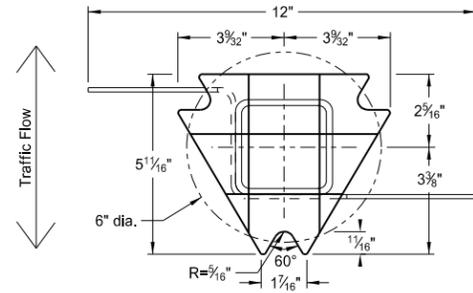


Multi-Directional Slip Base Assembly

Perforated Tube



Top Post Receiver  
Plate - ASTM A572 grade 50  
Angle Receiver - 2 1/2" x 2 1/2" x 3/8" 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

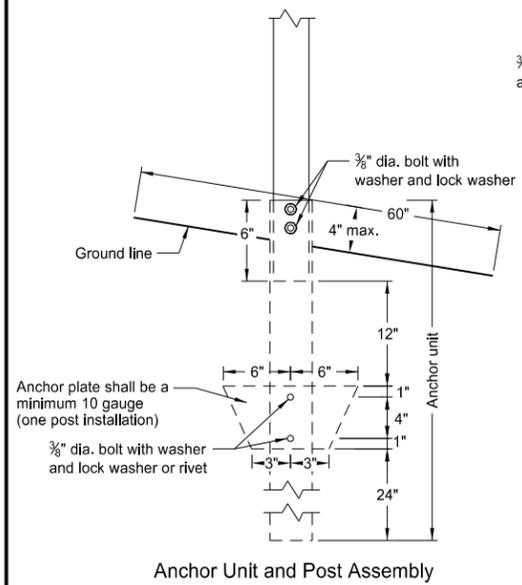
Notes:

1. Slip base bolts shall be torqued as specified by the manufacturer.
2. Anchor shall have a yield strength of 43.9 KSI and tensile strength of 59.3 KSI.
3. The 4" vertical clearance is required for the anchor or breakaway base. The 4"x60" measurement shall be made above and below post location and also back and ahead of the post.
4. When used in concrete sidewalk, anchor shall be same except without the wings.
5. Four post signs shall have over 7' between the first and the fourth posts.

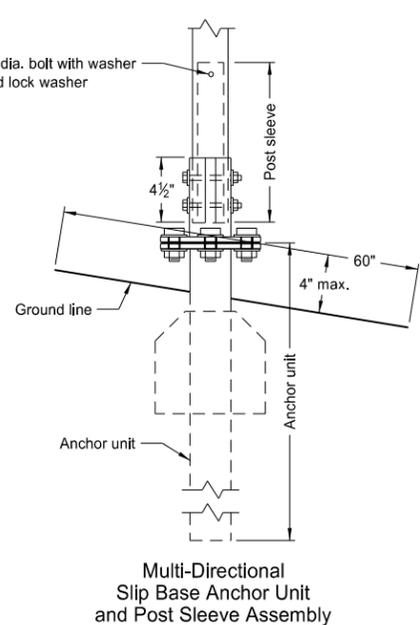
Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thickness Gauge	Sleeve Size in.	Wall Thickness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2 1/4
1	2 1/4	12			No	2 1/2
1	2 1/2	12			(A)	3
1	2 1/2	10			Yes	
1	2 1/4	12	2	12	Yes	
1	2 1/2	12	2 1/4	12	Yes	
2	2	12			No	2 1/4
2	2 1/4	12			No	2 1/2
2	2 1/2	12			Yes	
2	2 1/2	12			Yes	
2	2 1/4	10	2	12	Yes	
2	2 1/2	12	2 1/4	12	Yes	
3 & 4	2 1/2	12			Yes	
3 & 4	2 1/2	10			Yes	
3 & 4	2 1/2	12	2 1/4	12	Yes	
3 & 4	2 1/4	12	2	12	Yes	
3 & 4	2 1/2	10	2 3/16	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. <sup>4</sup>	Cross Sec. Area in. <sup>2</sup>	Section Modulus in. <sup>3</sup>
1 1/2 x 1 1/2	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
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2 1/2 x 2 1/2	0.105	12	3.141	0.804	0.803	0.643
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.785

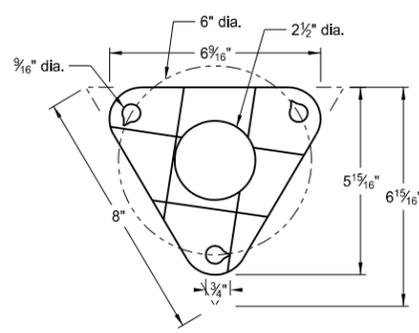
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2 3/16" x 10 ga.	1 9/64"	2 1/2"	3 1/32"	2 5/32"	1 33/64"	1 1/8"
2 1/2" x 10 ga.	1 9/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"



Anchor Unit and Post Assembly



Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly

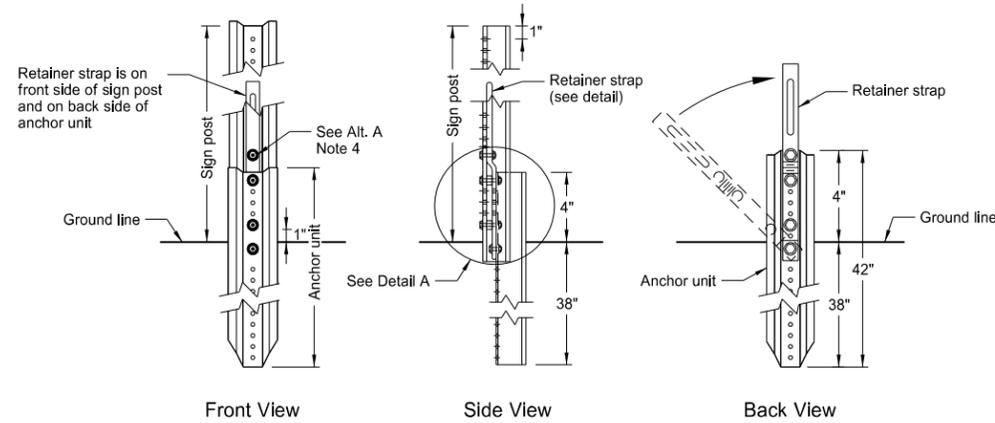
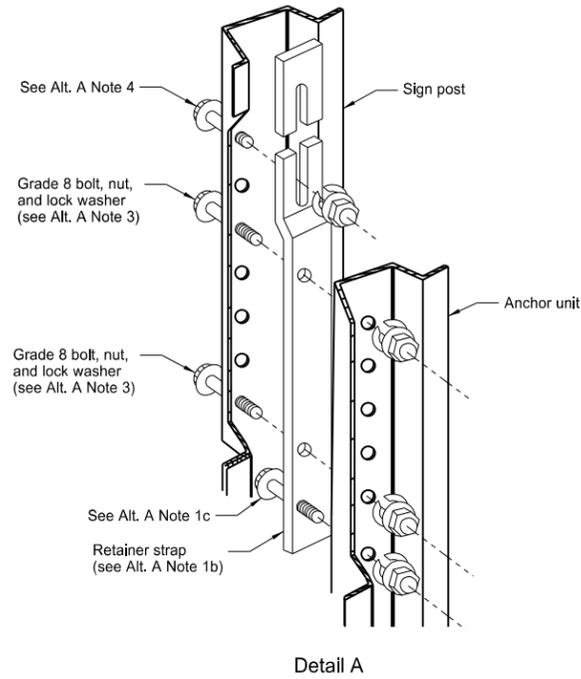


Bolt Retainer for Base Connection  
Bolt Retainer - 1/32" Reprocessed Teflon

- (A) The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak.
- (B) The 2 3/16" x 10 ga. may be inserted into 2 1/2" x 10 ga. for additional wind load.

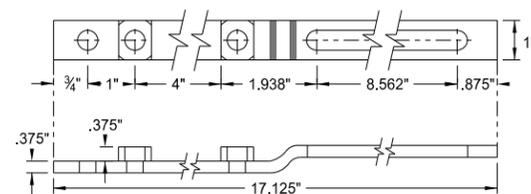
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION		This document was originally issued and sealed by <b>Roger Weigel,</b> Registration Number PE-2930, on 2/28/14 and the original document is stored at the North Dakota Department of Transportation
2-28-14		
REVISIONS		
DATE	CHANGE	

U-Channel Post

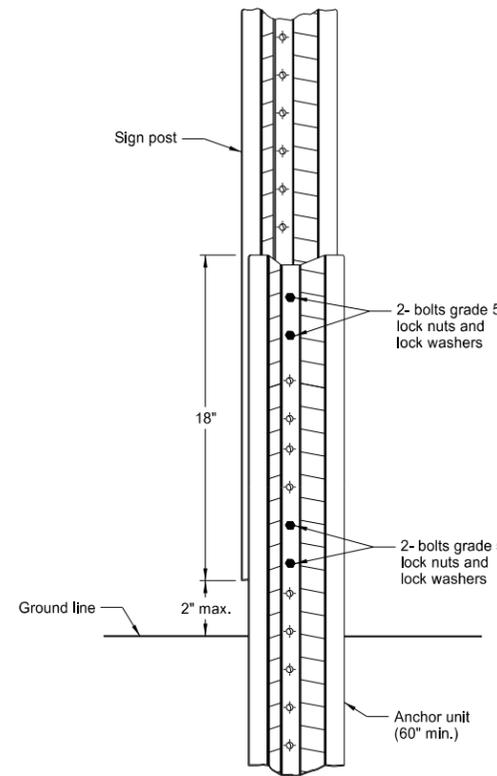


Breakaway U-Channel Detail Alternate A

A maximum of 2 posts shall be installed within 7'.

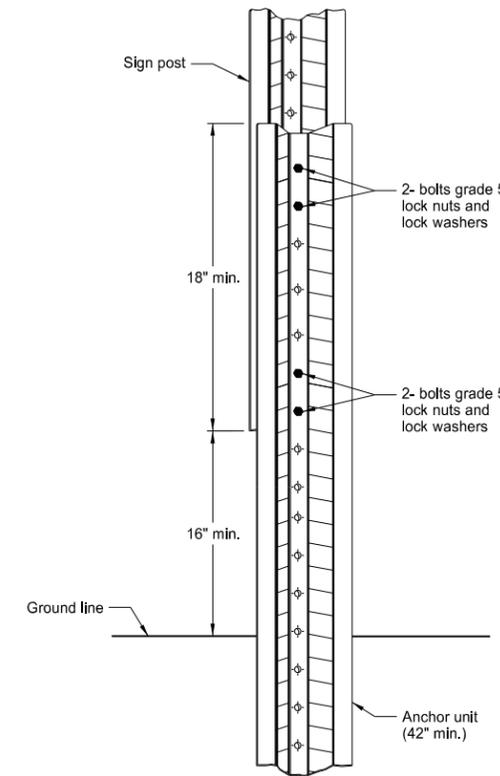


Retainer Strap Detail



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

A maximum of 3 posts shall be installed within 7'.



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

A maximum of 3 posts shall be installed within 7'.

Alternate A Steps of Installation:

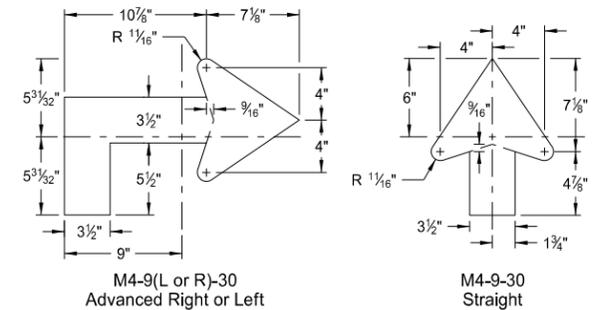
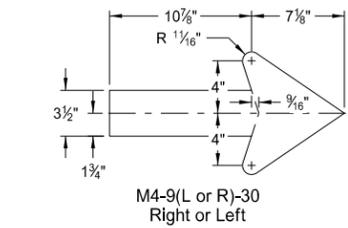
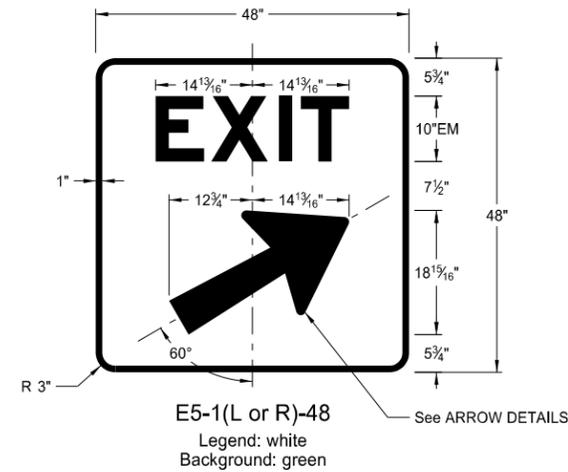
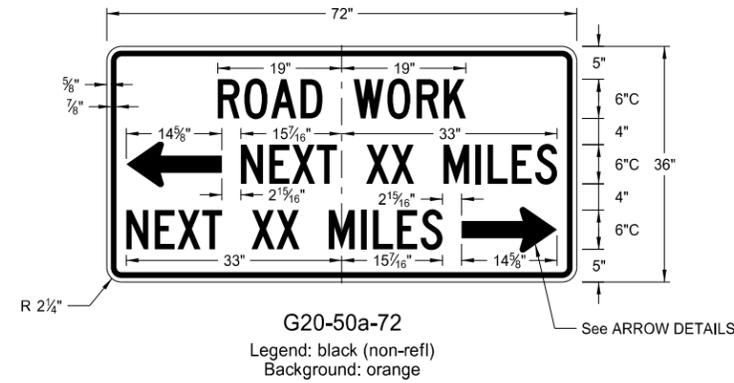
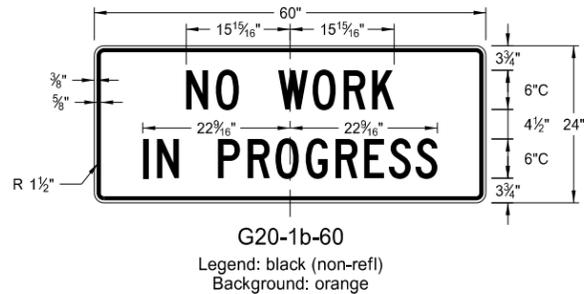
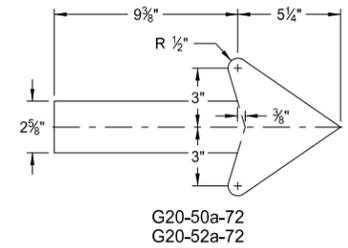
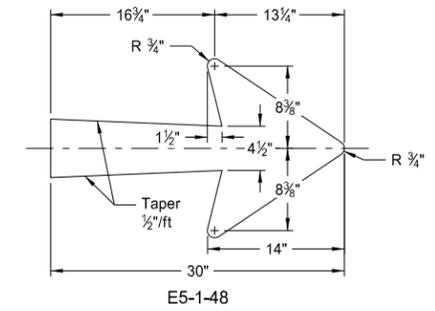
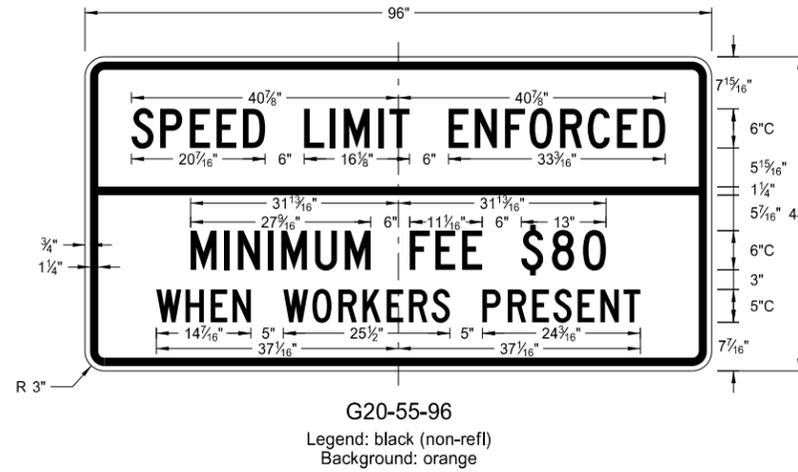
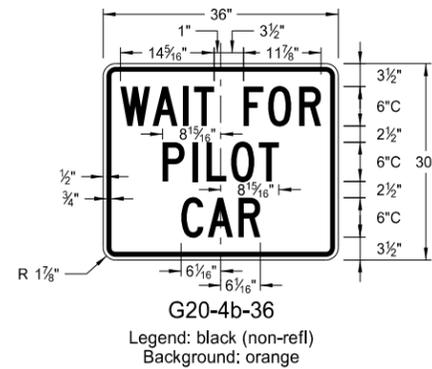
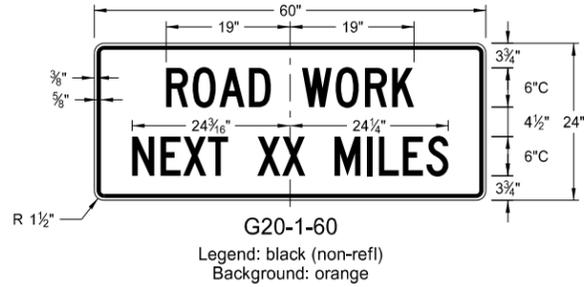
1. a) Drive anchor unit to within 12" of ground level.  
b) Proper assembly established by lining up the bottom hole of retainer strap with the 6th hole from the top of the anchor unit.  
c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.  
d) Rotate strap 90° to left.
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. The base post, strap and sign post shall be properly nested. 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.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE

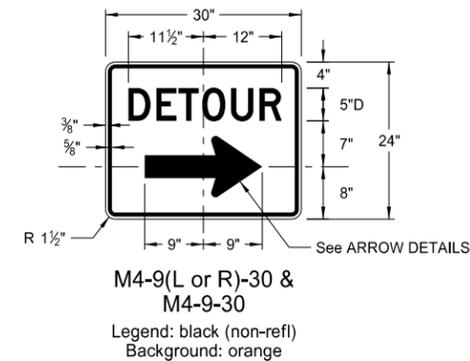
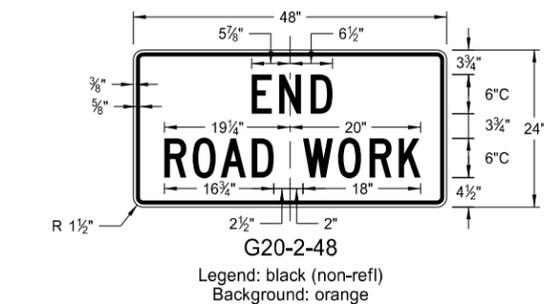
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 2/28/14 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN DETAILS  
 TERMINAL AND GUIDE SIGNS

D-704-9



ARROW DETAILS



NOTES:

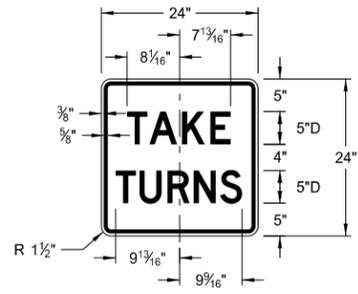
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE

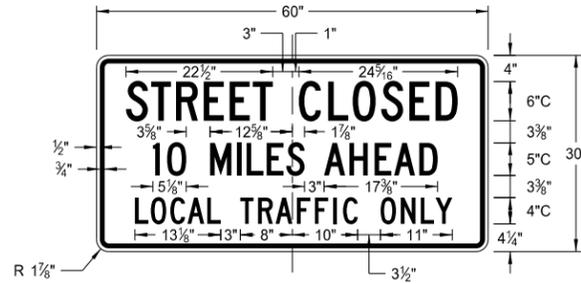
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 8/13/13 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN DETAILS  
REGULATORY SIGNS

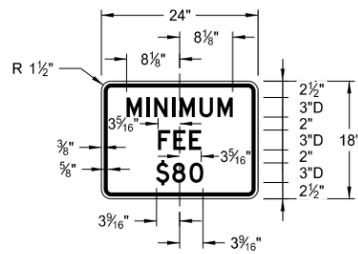
D-704-10



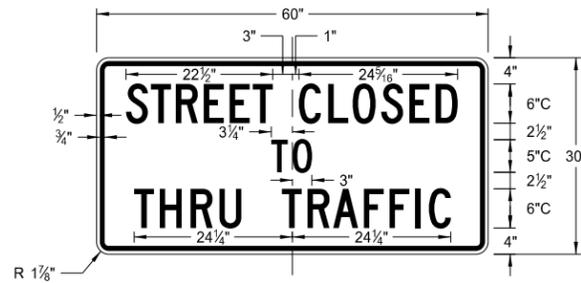
R1-50-24  
Legend: black (non-refl)  
Background: white



R11-3c-60  
Legend: black (non-refl)  
Background: white



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



R11-4a-60  
Legend: black (non-refl)  
Background: white



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

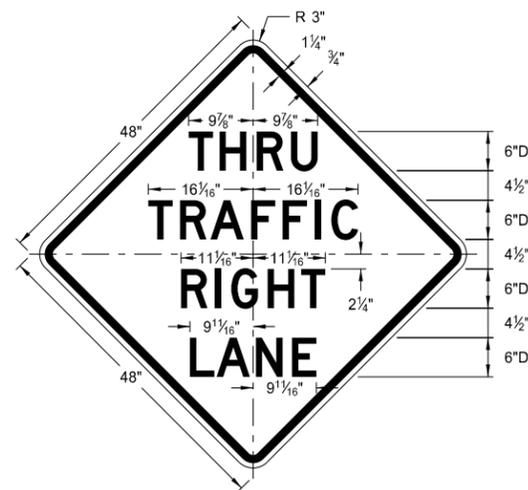
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 8/13/13 and the original document is stored at the North Dakota Department of Transportation

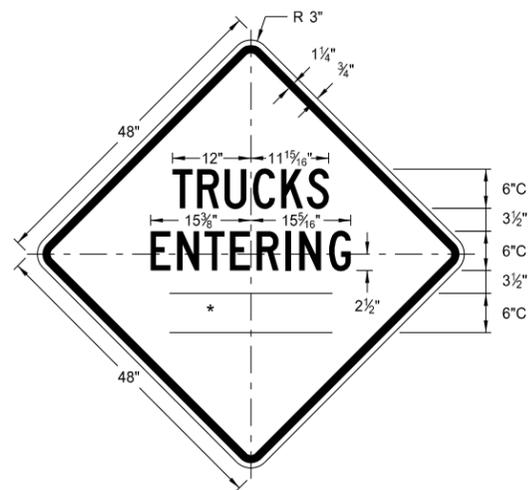
CONSTRUCTION SIGN DETAILS  
WARNING SIGNS

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

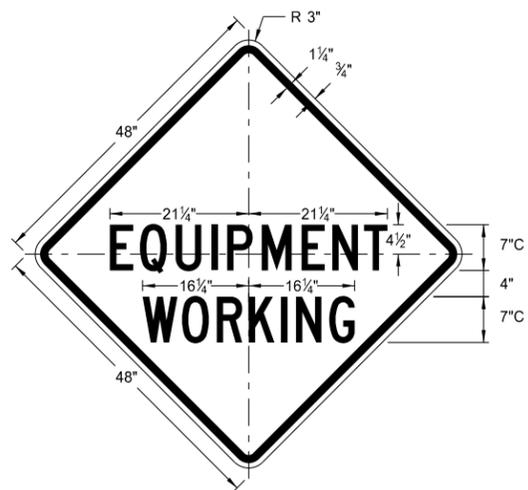
\* DISTANCE MESSAGES



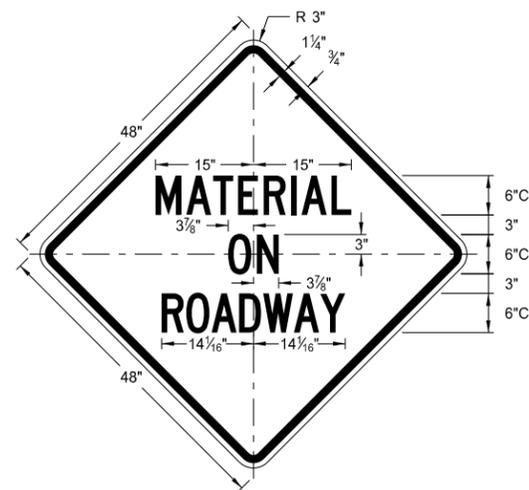
W5-8-48  
Legend: black (non-refl)  
Background: orange



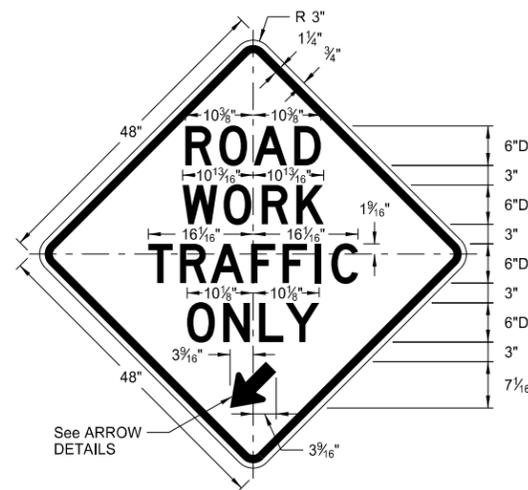
W8-54-48  
Legend: black (non-refl)  
Background: orange



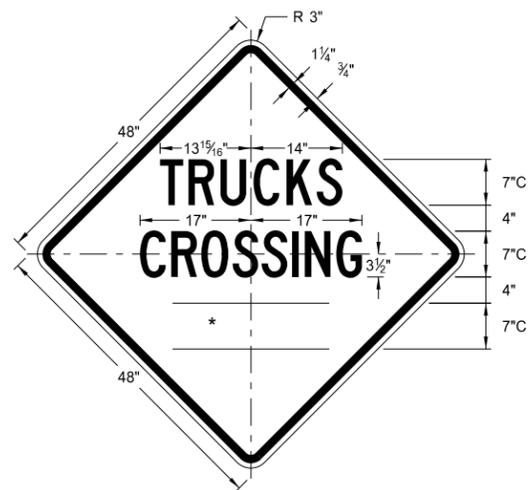
W20-51-48  
Legend: black (non-refl)  
Background: orange



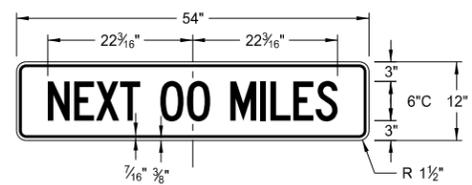
W21-51-48  
Legend: black (non-refl)  
Background: orange



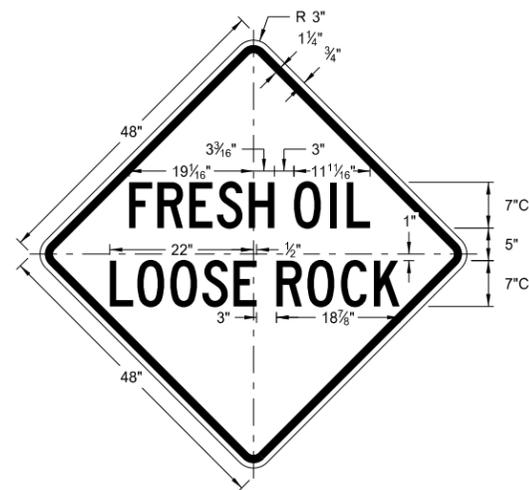
W5-9-48  
Legend: black (non-refl)  
Background: orange



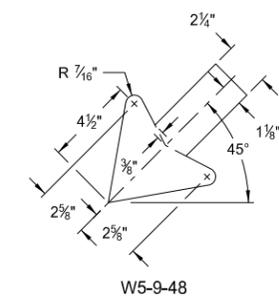
W8-55-48  
Legend: black (non-refl)  
Background: orange



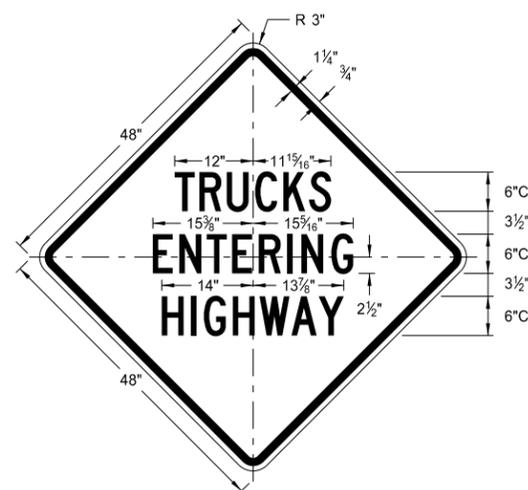
W20-52-54  
Legend: black (non-refl)  
Background: orange



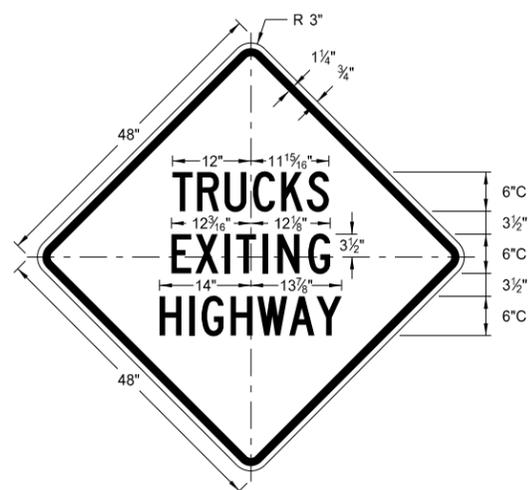
W22-8-48  
Legend: black (non-refl)  
Background: orange



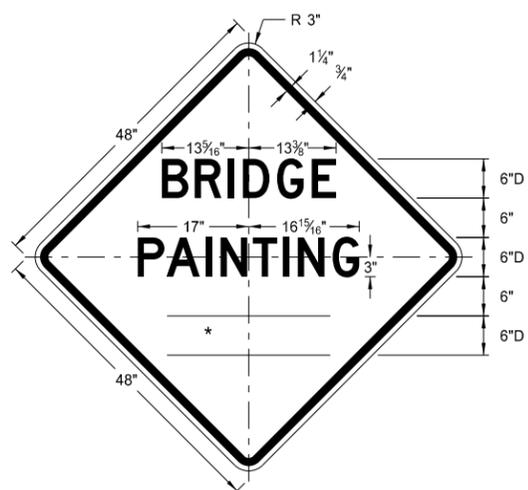
W5-9-48  
ARROW DETAILS



W8-53-48  
Legend: black (non-refl)  
Background: orange



W8-56-48  
Legend: black (non-refl)  
Background: orange

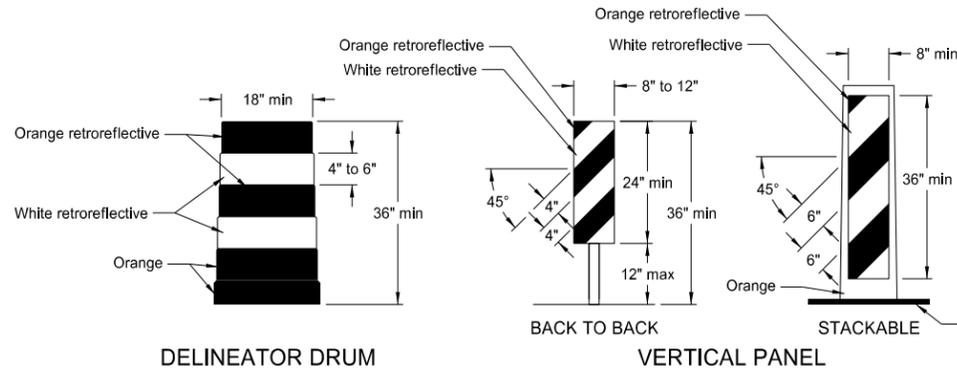


W21-50-48  
Legend: black (non-refl)  
Background: orange

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE

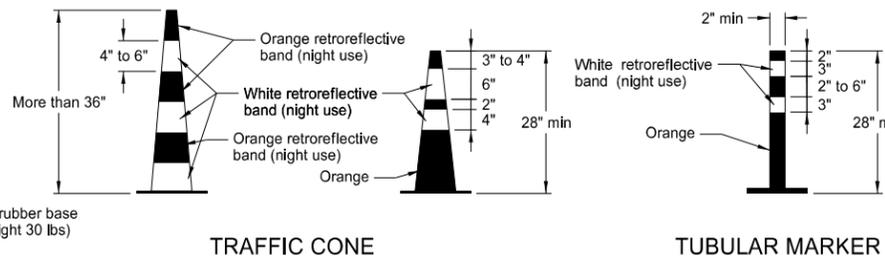
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 8/13/13 and the original document is stored at the North Dakota Department of Transportation

BARRICADE AND CHANNELIZING DEVICE DETAILS



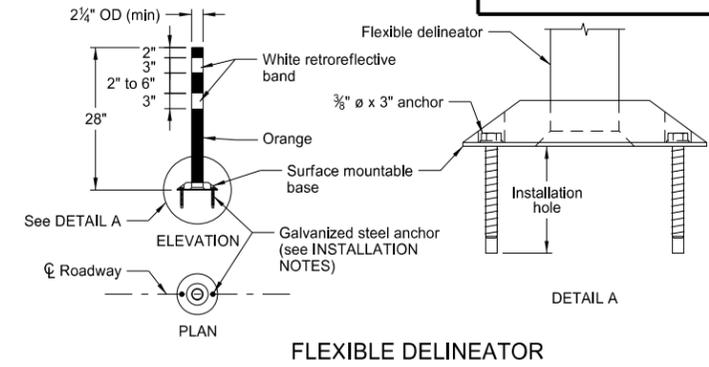
The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectORIZED spaces between the horizontal orange and white stripes shall not exceed 3" wide. Stripes shall not be placed on ribs or indentations in the drum. Drums shall have closed tops that will not allow collection of construction debris or other debris. Ballast shall not be placed on the top of a drum.

Markings for vertical panels shall be alternating orange and white retroreflective stripes, sloping downward in the direction vehicular traffic is to pass. Retroreflective sheeting shall be placed on both sides of panel and shall have 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, a stripe width of 6 inches shall be used.



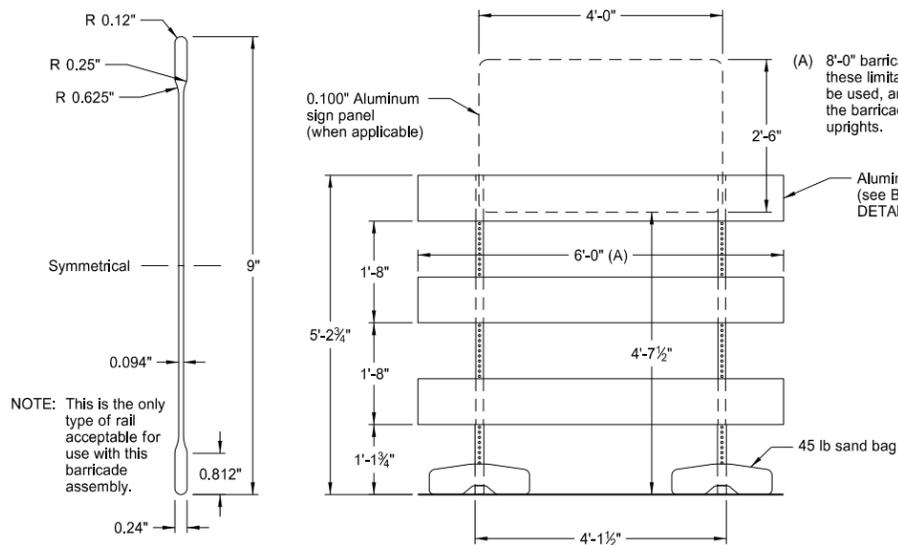
RetroreflectORIZATION of cones more than 36" in height shall be provided by alternating orange and white retroreflective stripes. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectORIZED space between the orange and white stripes shall not exceed 3" wide.

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



INSTALLATION NOTES:

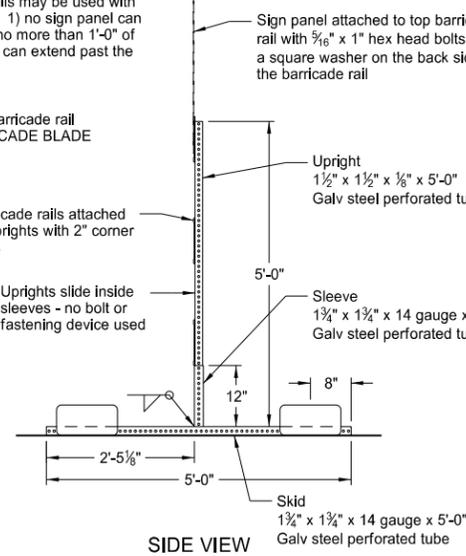
1. Drill installation holes to diameter and depth as required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, the contractor may use an 8" x 8" butyl pad or hot melt butyl.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



BARRICADE BLADE DETAIL

ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

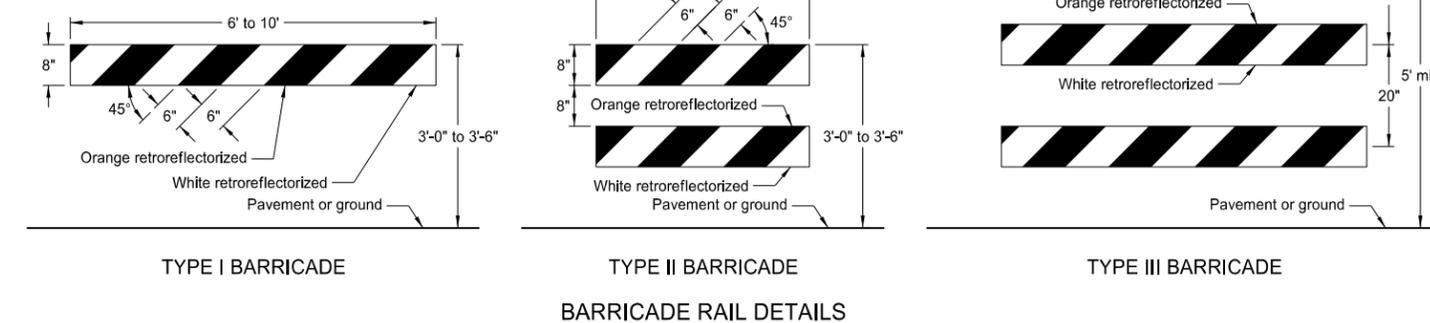


ELEVATION VIEW

SIDE VIEW

BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

NOTE: Markings for barricades shall be alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Retroreflective sheeting shall be placed on both sides of the rails and shall have a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the barricade length is less than 36", the rail stripe width shall be 4".

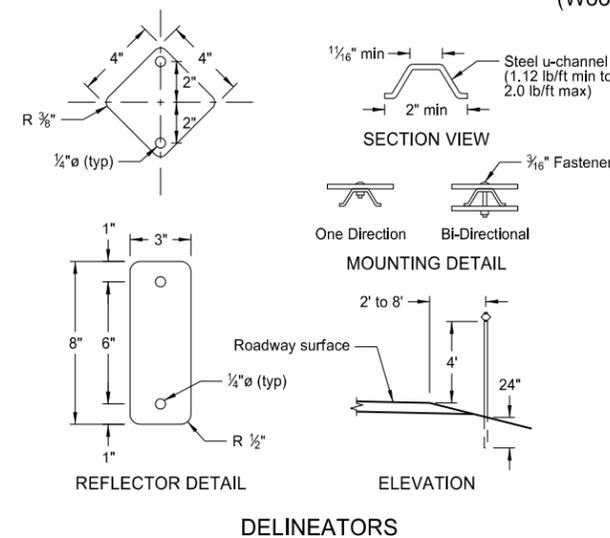


TYPE I BARRICADE

TYPE II BARRICADE

TYPE III BARRICADE

BARRICADE RAIL DETAILS



MINIMUM BALLAST (For each side of barricade support)

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

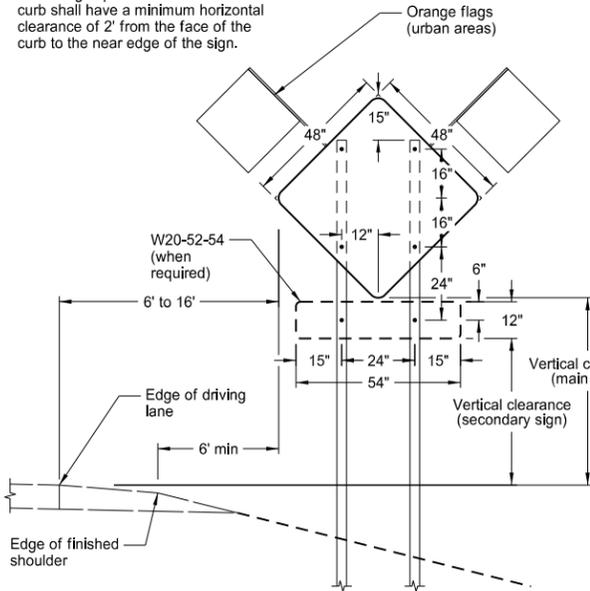
Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE

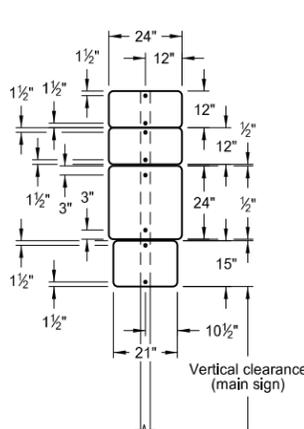
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 10/3/13 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

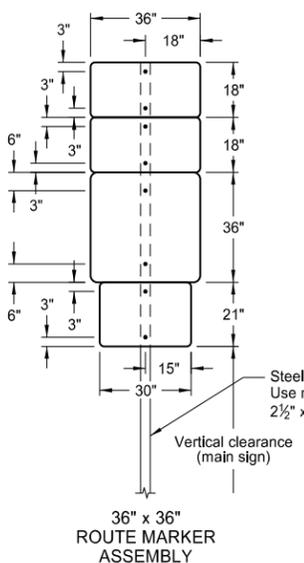
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



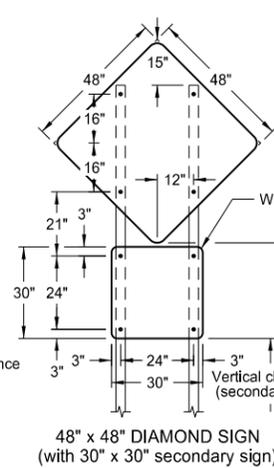
TYPICAL SECTION (48" x 48" diamond warning sign shown)



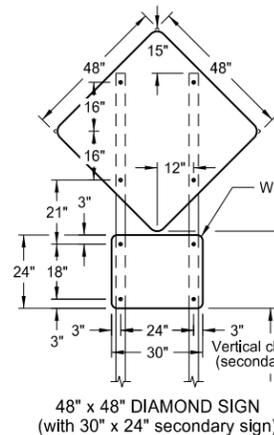
24" x 24" ROUTE MARKER ASSEMBLY



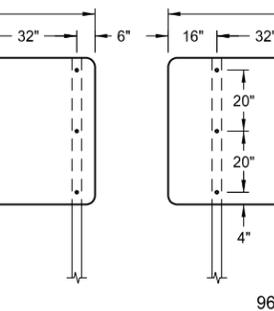
36" x 36" ROUTE MARKER ASSEMBLY



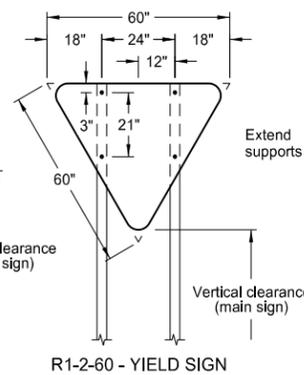
48" x 48" DIAMOND SIGN (with 30" x 30" secondary sign)



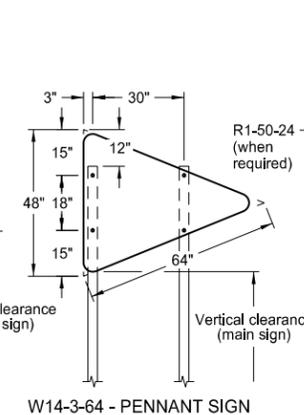
18" x 18" DIAMOND SIGN



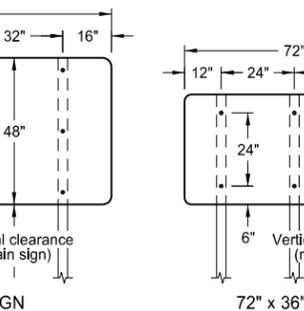
108" x 48" SIGN



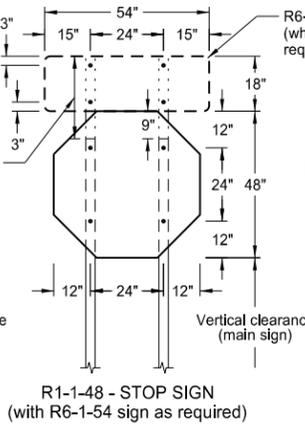
R1-2-60 - YIELD SIGN



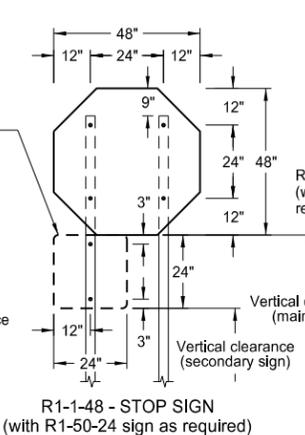
W14-3-64 - PENNANT SIGN



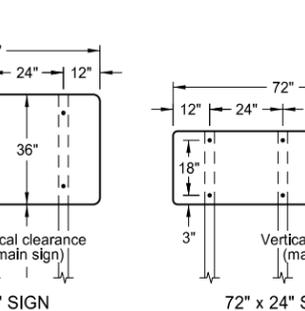
96" x 48" SIGN



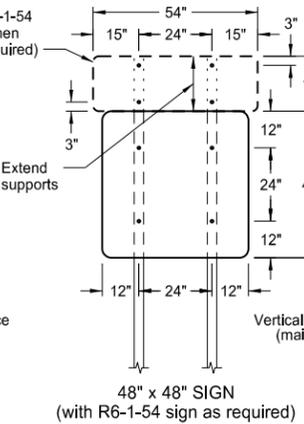
R1-1-48 - STOP SIGN (with R6-1-54 sign as required)



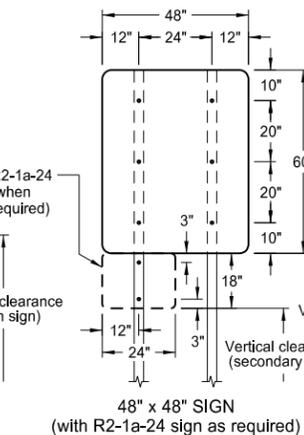
R1-1-48 - STOP SIGN (with R1-50-24 sign as required)



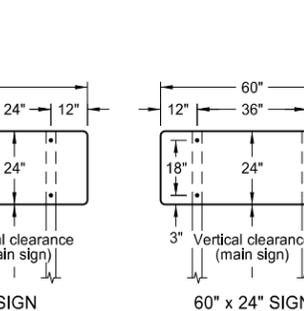
72" x 36" SIGN



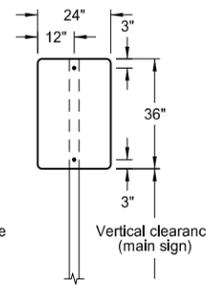
48" x 48" SIGN (with R6-1-54 sign as required)



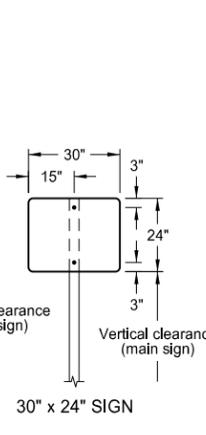
48" x 48" SIGN (with R2-1a-24 sign as required)



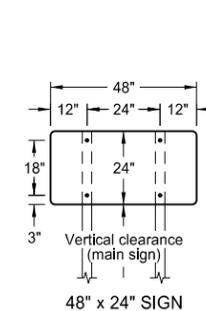
60" x 24" SIGN



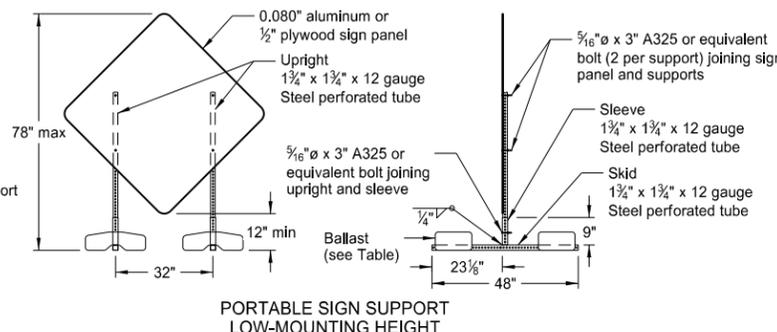
24" x 36" SIGN



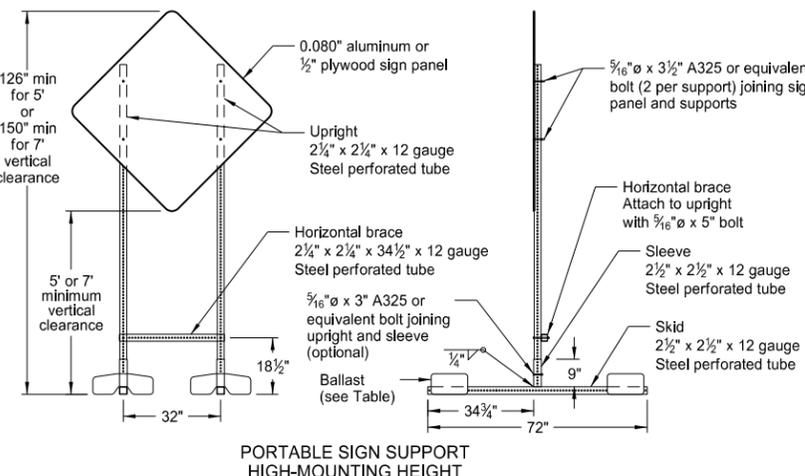
30" x 24" SIGN



48" x 24" SIGN



PORTABLE SIGN SUPPORT LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT HIGH-MOUNTING HEIGHT

NOTES:

1. Sign Supports: Supports shall be galvanized or painted. 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, the minimum post size for assemblies containing a secondary sign is 3.0 lb/ft. Post sizes are based on a wind speed of 55 MPH.

Signs over 50 square feet should be installed on 2 1/2" x 2 1/2" perforated tube supports as a minimum.

Guy wires shall not be attached to sign supports. Wind beams may be attached to u-posts behind the sign panels.

2. Sign Panels: Provide sign panels made of 0.100" aluminum, 1/2" plywood, or other approved material, except where noted. All holes to be punched round for 3/8" bolts.

3. Alternate Messages: The signs that have alternate messages may have these alternate messages placed on a reflectorized plate (without a border) and installed and removed as required. (i.e. "Left" and "Right" message on a 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 as stated above.

Large signs having an area exceeding 50 square feet shall have a minimum clearance of 7'-0" from the ground at the post.

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

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

Signs mounted to the portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT Details shall have 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. The sandbags are assumed to be placed at or near the ends of the skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-13	
REVISIONS	
DATE	CHANGE
11-14-13	Revised Note 6.

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 11/14/13 and the original document is stored at the North Dakota Department of Transportation

ROAD CLOSURE LAYOUTS

Notes

- Variables
  - S = Numerical value of speed limit or 85th percentile.
  - W = The width of taper.
  - L = Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or  $W \times S^2/60$  for urban, residential, and other streets with speeds of 40 mph or less.
- Barricades placed on roadway shall be on a moveable assembly. Signs placed on roadway shall be placed on skid mounted assemblies.
- Delineator drums, barricades or cones used for tapering traffic shall be spaced at the dimension "S". Delineator drums or cones used for tangents shall be spaced at 2 times dimension "S".
- Sequencing Arrow Panels
  - Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface. See Shoulder Closure Standard Drawing.
  - Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
  - Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
  - Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
- Use when work area is 1 mile or longer.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
- G20-55-96 sign is not required if this standard is part of other traffic control layouts, or the work is less than 15 days.

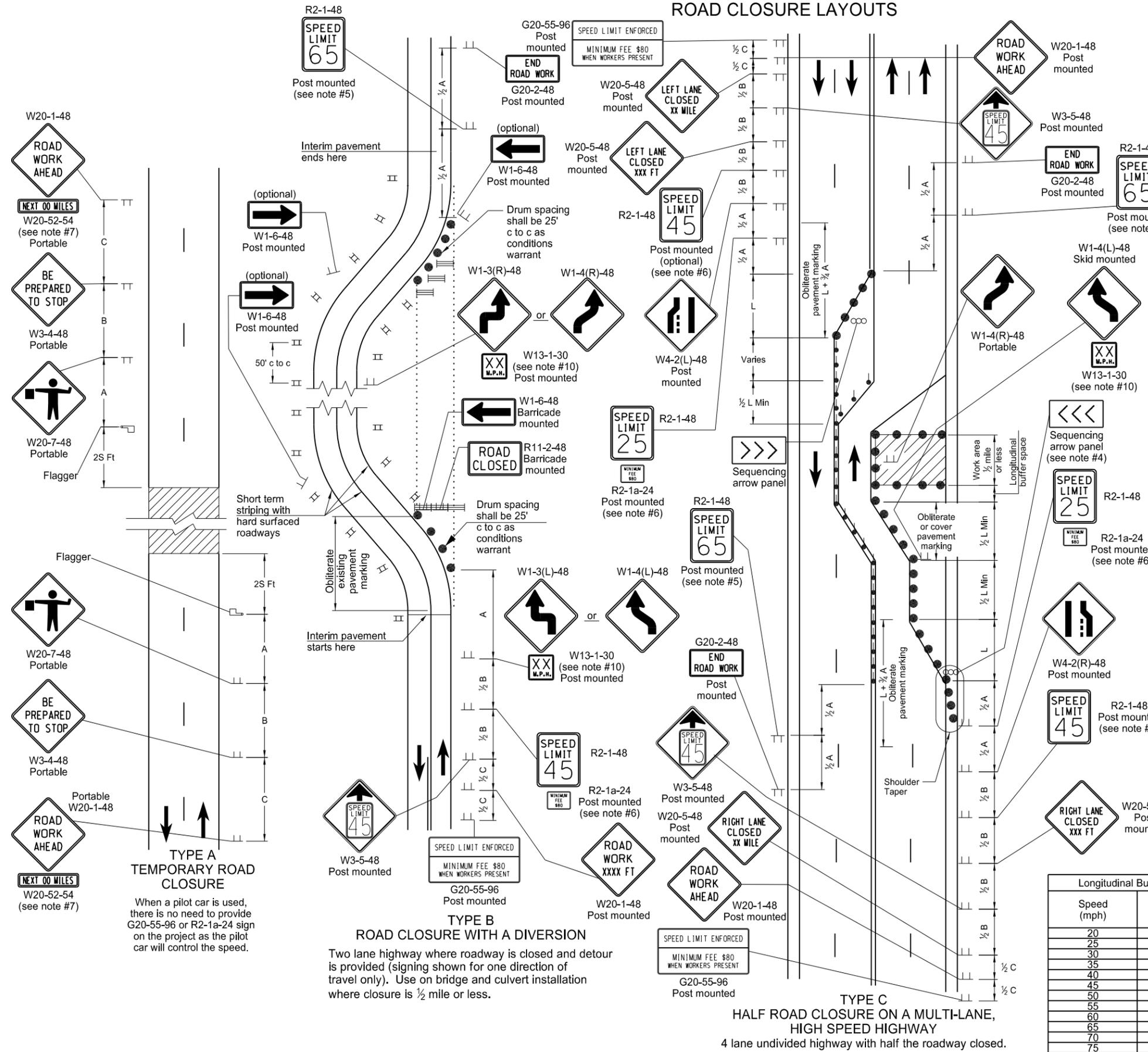
Road Type	ADVANCE WARNING SIGN SPACING		
	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

KEY	
	Type III barricade
	Sign
	Delineator drum
	Tubular markers
	Work area
	Flagger
	Sequencing arrow panel
	Vertical panels back to back

Longitudinal Buffer Space	
Speed (mph)	Length Min (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 09/27/13 and the original document is stored at the North Dakota Department of Transportation



**TYPE A TEMPORARY ROAD CLOSURE**

When a pilot car is used, there is no need to provide G20-55-96 or R2-1a-24 sign on the project as the pilot car will control the speed.

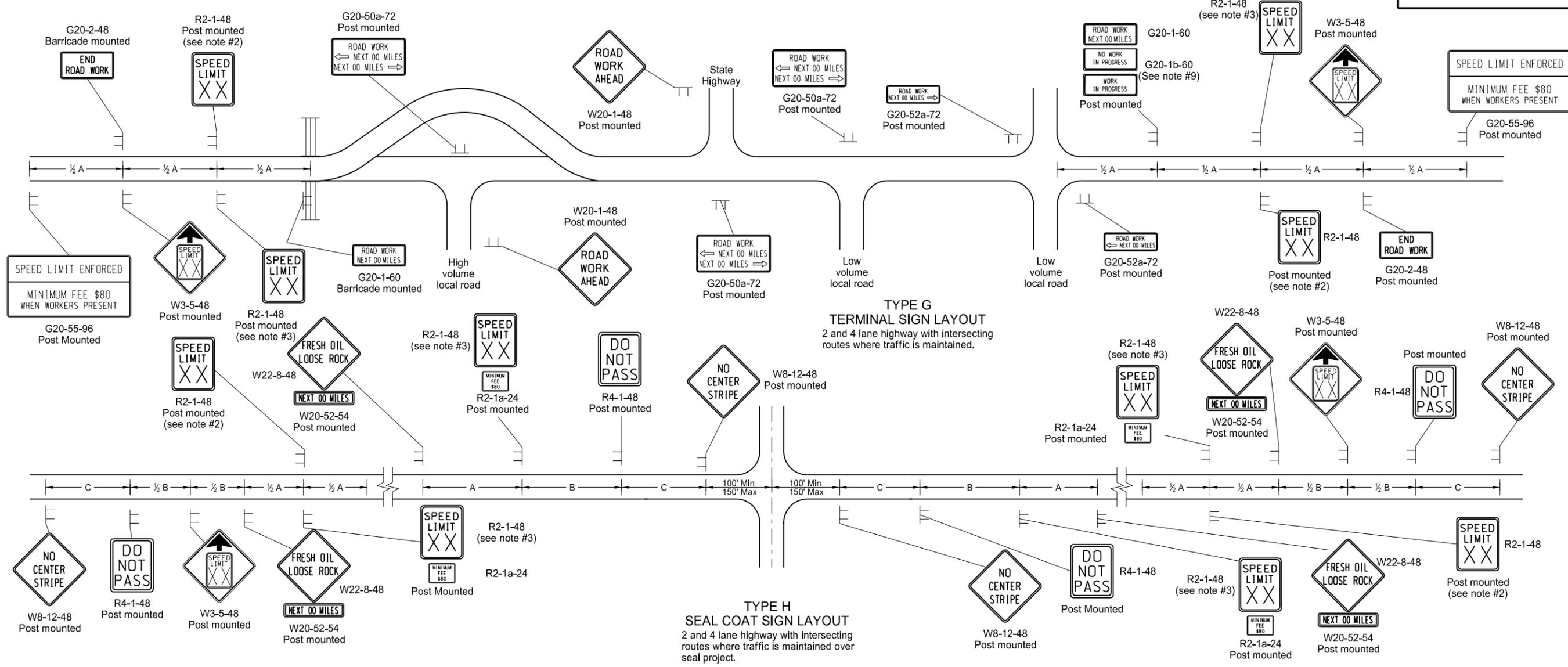
**TYPE B ROAD CLOSURE WITH A DIVERSION**

Two lane highway where roadway is closed and detour is provided (signing shown for one direction of travel only). Use on bridge and culvert installation where closure is 1/2 mile or less.

**TYPE C HALF ROAD CLOSURE ON A MULTI-LANE, HIGH SPEED HIGHWAY**  
4 lane undivided highway with half the roadway closed.

# TERMINAL AND SEAL COAT SIGN LAYOUTS

D-704-20



- Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies.
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 MPH below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 MPH. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- On seal projects, signs R2-1-48, R2-1a-24, R4-1-48, W22-8-48 and W20-52-54 shall be placed just after all important intersections and at five mile intervals thereafter. Sign W8-12-48 shall be placed just after all important intersections and at 2 mile intervals thereafter until the short term center line pavement marking is in place. No short term pavement markings are placed when traffic volumes are 750 ADT or less.
- The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
- Type H construction sign traffic control shall have the speed limit signs covered or removed once the loose aggregate has been removed.
- The contractor shall install the G20-1b-60 sign when work is suspended for winter.
- Other traffic control layouts will be required in the immediate work areas. If the speed limit is reduced in the work area, speed limit signs shall have the R2-1a-24 sign placed below.
- G20-55-96 sign is not required if work is less than 15 days.

**KEY**

≡ Type III barricade

⊥ Sign

Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

NORTH DAKOTA  
DEPARTMENT OF TRANSPORTATION  
9-27-13  
REVISIONS

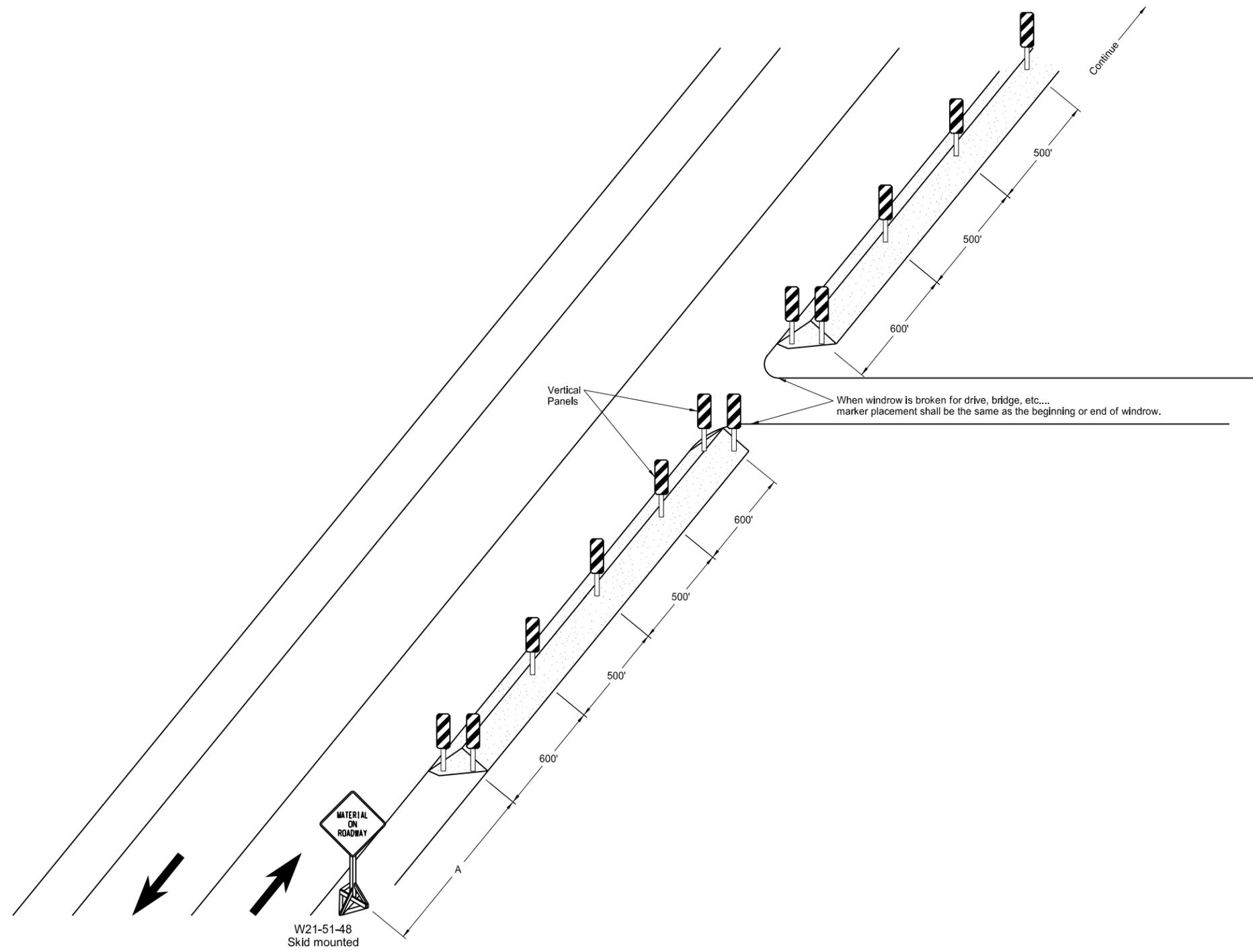
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 09/27/13 and the original document is stored at the North Dakota Department of Transportation

# WINDROW MARKING

D-704-30

Notes:  
The contractor has the option of using portable sign supports in lieu of post mounted sign in accordance with the NDDOT Standard Specifications.

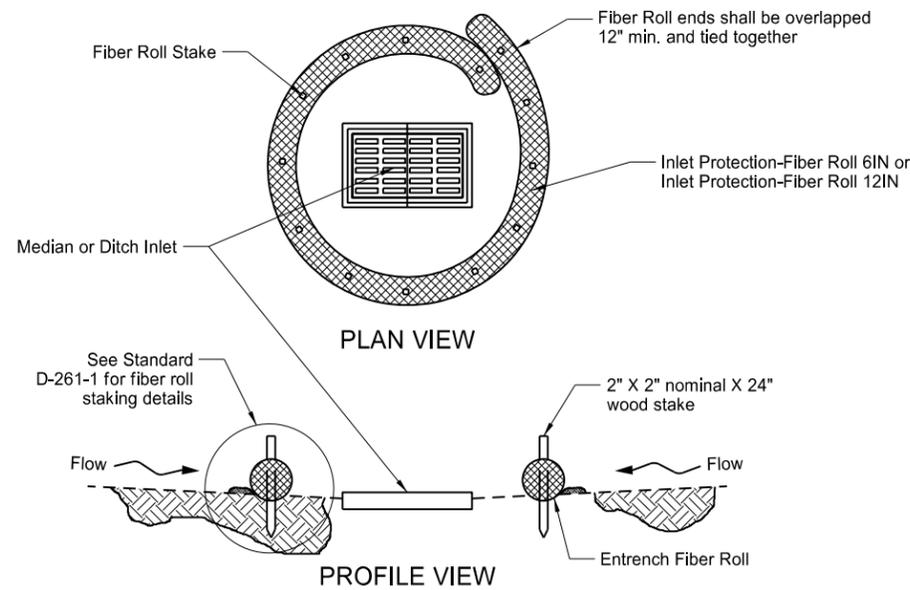


Road Type	ADVANCE WARNING SIGN SPACING		
	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (55 mph to 60 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

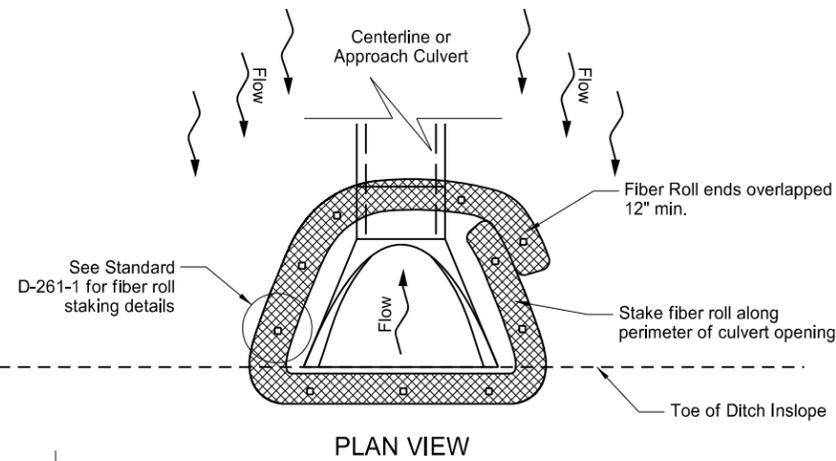
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
6-24-14	Revised Note

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 06/24/14 and the original document is stored at the North Dakota Department of Transportation

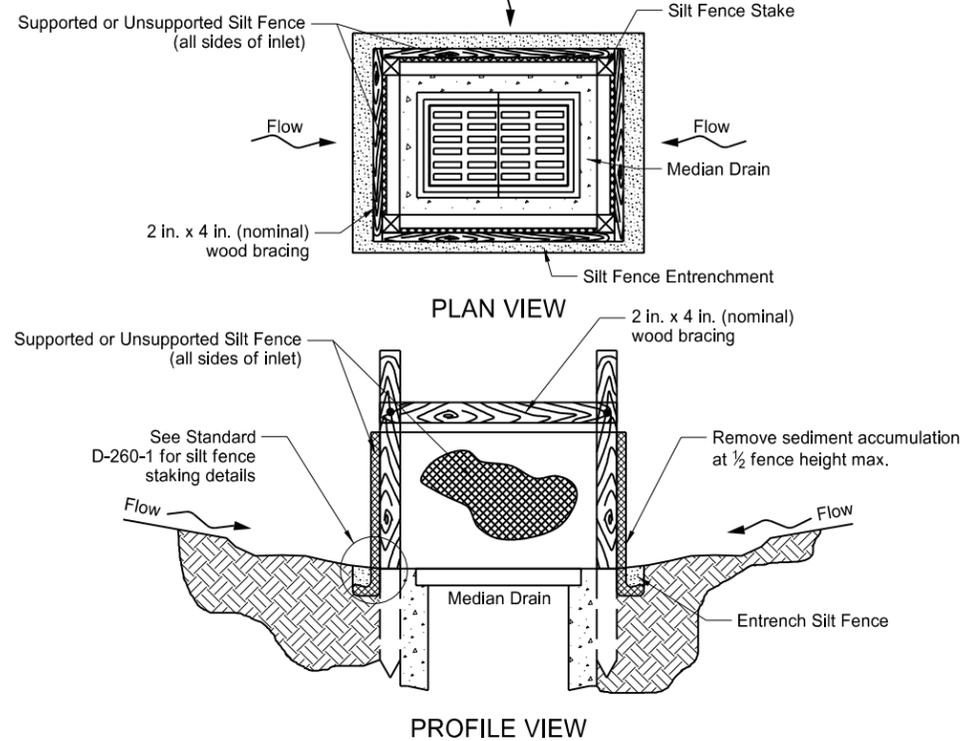
EROSION AND SILTATION CONTROLS  
MEDIAN OR DITCH INLET PROTECTION



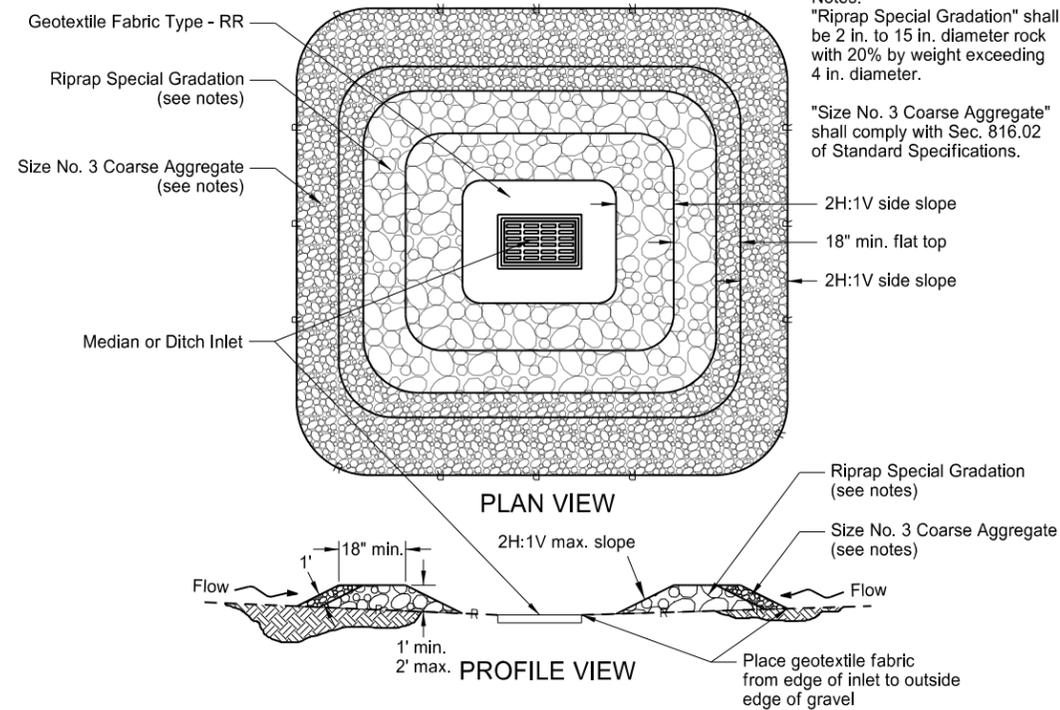
FIBER ROLL PROTECTION (MEDIAN OR DITCH INLET)



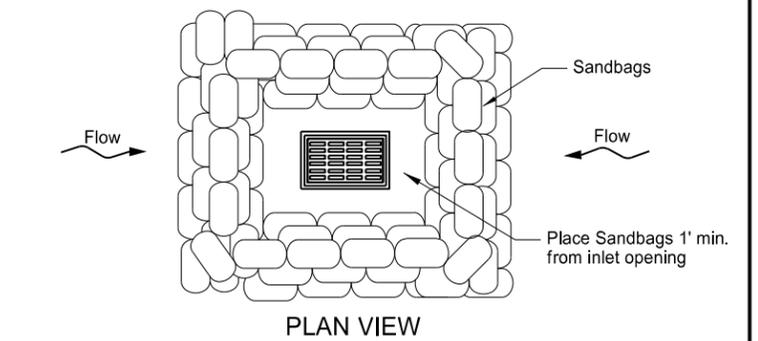
FIBER ROLL PROTECTION (INLET OF CULVERT)



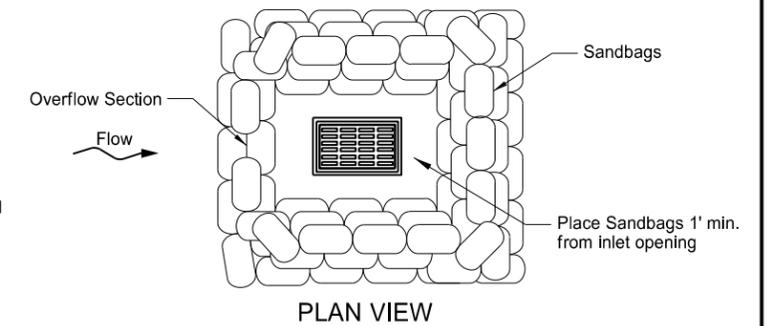
SILT FENCE PROTECTION (MEDIAN OR DITCH INLET)



GRAVEL INLET PROTECTION (MEDIAN OR DITCH INLET)



SANDBAG PROTECTION (LOW POINT)



SANDBAG PROTECTION (ON SLOPE)

Notes:  
"Riprap Special Gradation" shall be 2 in. to 15 in. diameter rock with 20% by weight exceeding 4 in. diameter.  
"Size No. 3 Coarse Aggregate" shall comply with Sec. 816.02 of Standard Specifications.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Updated reference to standard drawing number for fiber roll staking details.
10-01-14	Updated reference to standard drawing number for silt fence.

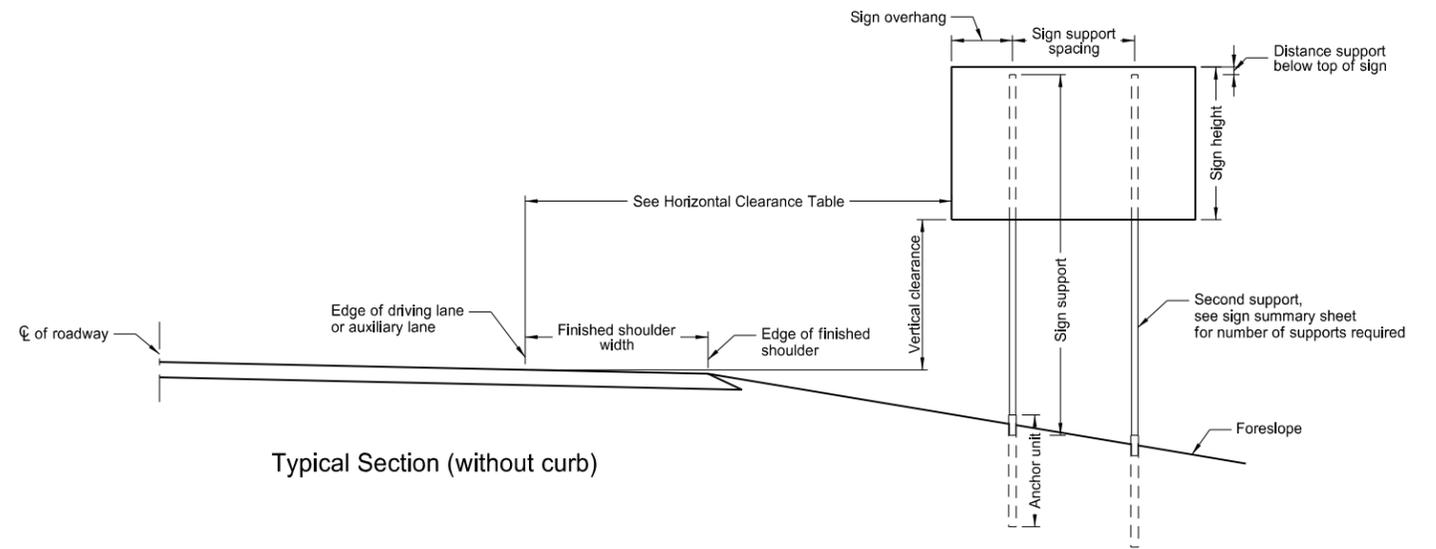
This document was originally issued and sealed by  
**Roger Weigel**  
Registration Number  
**PE-2930**,  
on 10/01/14 and the original document is stored at the North Dakota Department of Transportation

# PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

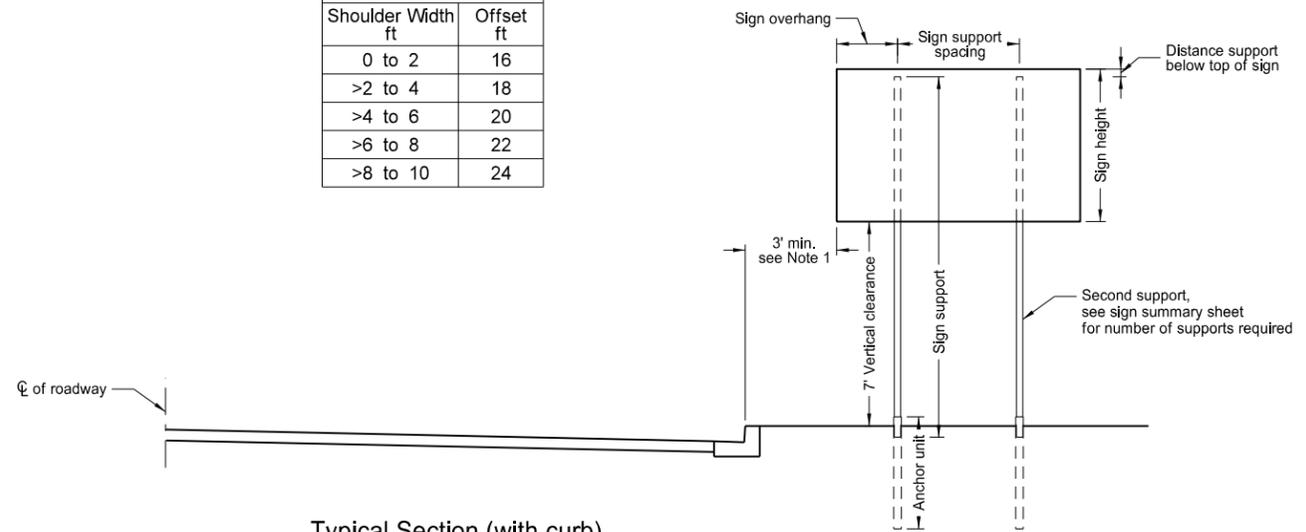
**Notes:**

1. Curbed Roadways: The clearance from the face of the curb should be 3' except where right of way or sidewalk width is limited, a minimum clearance of 2' shall be provided. The horizontal clearance may need to be increased to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.
2. Minimum vertical clearance: Signs installed at the side of the road in rural districts shall be at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least 7'.
- Signs on expressways shall be installed with a minimum height of 7'.
- Adopt-a-highway signs installed on Freeways shall be at least 7' above the edge of the driving lane.
- The vertical clearance shall have a maximum height of 6" above the vertical clearance specified above.
3. Offset signs: Where signs are placed at least 30 feet or more from the edge of the traveled way, the height to the bottom of such sign shall be 5' above the edge of the driving lane.
4. The clearance from edge of shared use path to edge of sign should be 3' except where width is limited, a minimum clearance of 2' shall be provided.

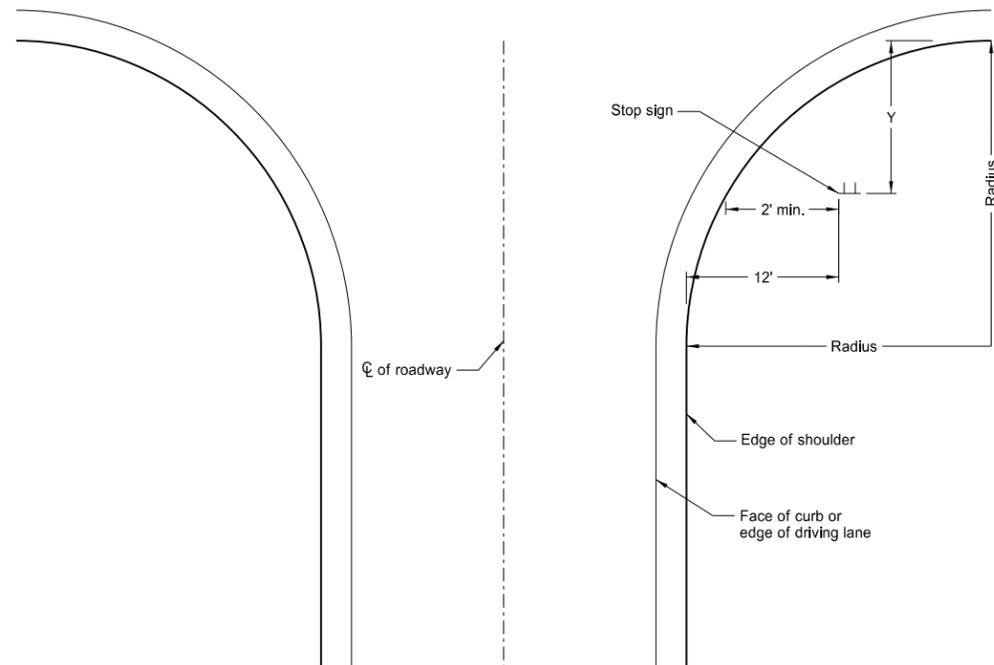


Typical Section (without curb)

Horizontal Clearance Table	
Shoulder Width ft	Offset ft
0 to 2	16
>2 to 4	18
>4 to 6	20
>6 to 8	22
>8 to 10	24



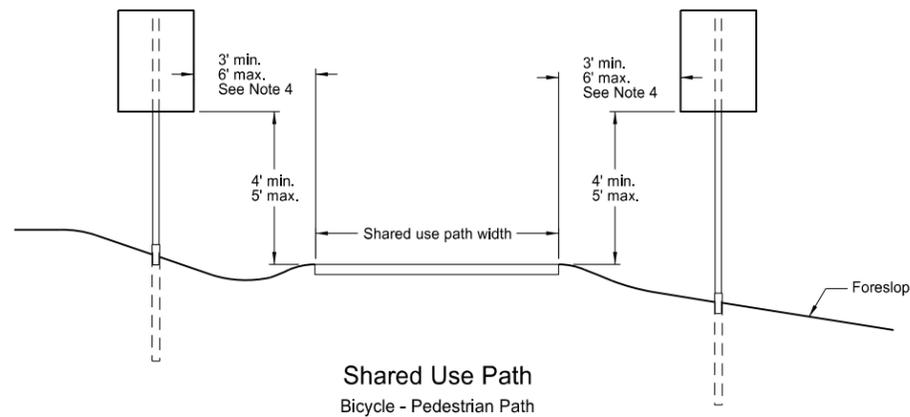
Typical Section (with curb)  
Residential or Business District



Stop Sign Location  
Wide Throat Intersection

This layout is to be used for the placement of "Stop" signs.

Radius ft.	Y-max. ft.	Y-min. ft.
40	50	15
45	50	18
50	50	21
55	50	25
60	50	28
65	50	32
70	50	35
75	50	39
80	50	43



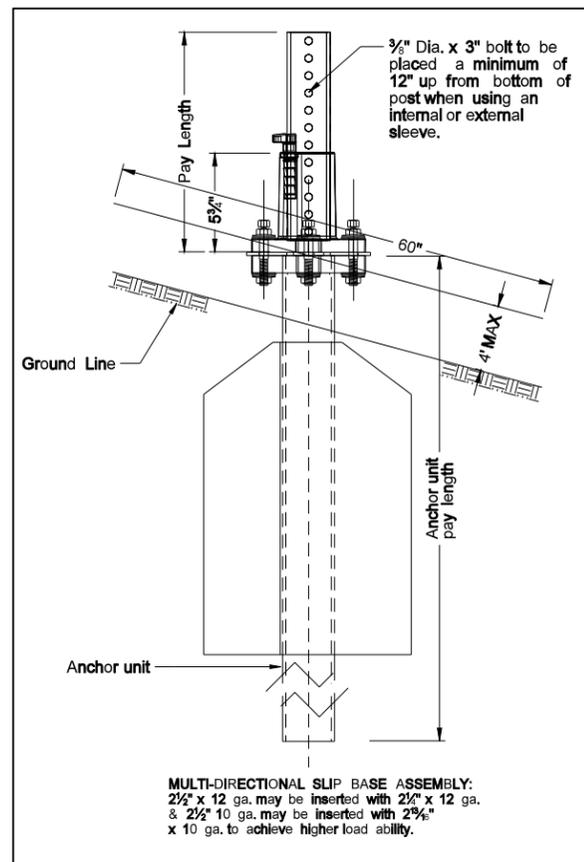
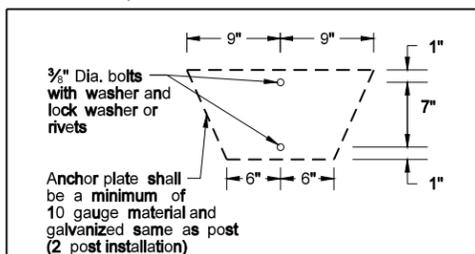
Shared Use Path  
Bicycle - Pedestrian Path

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-8-14	Revised note 2, added note 4.

This document was originally issued and sealed by  
**Roger Weigel**  
 Registration Number  
 PE-2930,  
 on 7/8/14 and the original document is stored at the North Dakota Department of Transportation

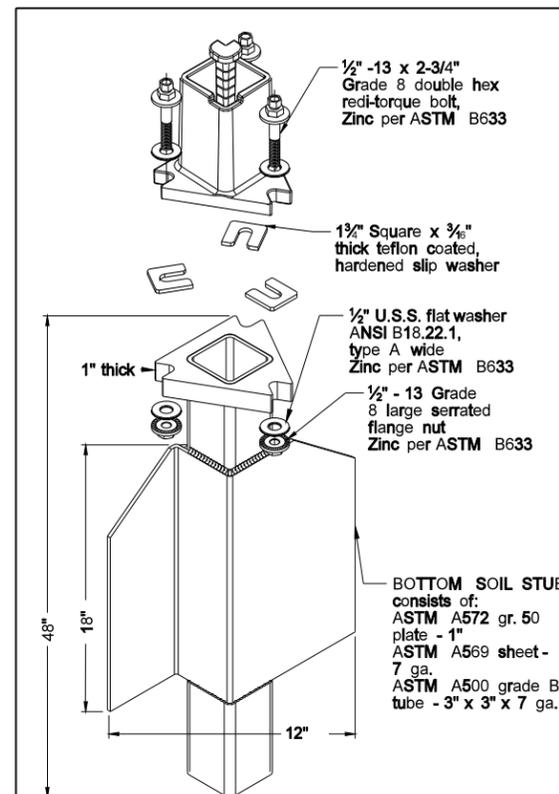
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/2	12
1	2 1/2	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/2	12	2 1/2(D)	12	Yes		7
1	2 1/2	12	2 1/2	12	Yes		7
2	2 1/2	10			Yes		7
2	2 1/2	12	2 1/2(D)	12	Yes		7
2	2 1/2	12	2 1/2	12	Yes		7
3 & 4	2 1/2	12			Yes		7
3 & 4	2 1/2	10			Yes		7
3 & 4	2 1/2	12	2 1/2	12	Yes		7
3 & 4	2 1/2	12	2 1/2(D)	12	Yes		7
3 & 4	2 1/2	10	2 1/2	10	Yes		7

(B) - The 2 1/2", 12 gauge posts do not need breakaway bases when placed in standard soils, but require a shim as specified by the manufacturer. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.  
 (C) - 3" anchor unit  
 (D) - 2 1/2" x 12 ga. x 18" minimum length external sleeve required.

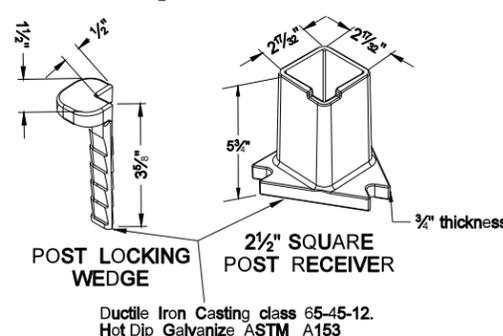


MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:  
 2 1/2" x 12 ga. may be inserted with 2 1/2" x 12 ga. & 2 1/2" 10 ga. may be inserted with 2 3/8" x 10 ga. to achieve higher load ability.

Mounting Details Perforated Tube

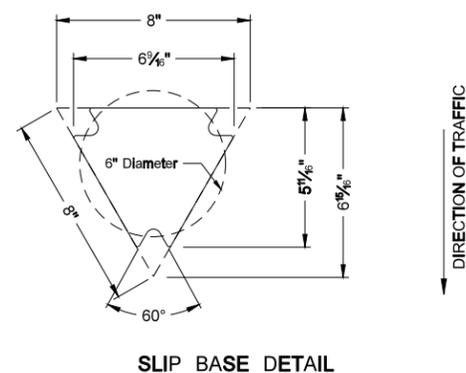


SLIP BASE FOR 2 1/2" POST



2 1/2" SQUARE POST RECEIVER

Ductile Iron Casting class 65-45-12. Hot Dip Galvanize ASTM A153



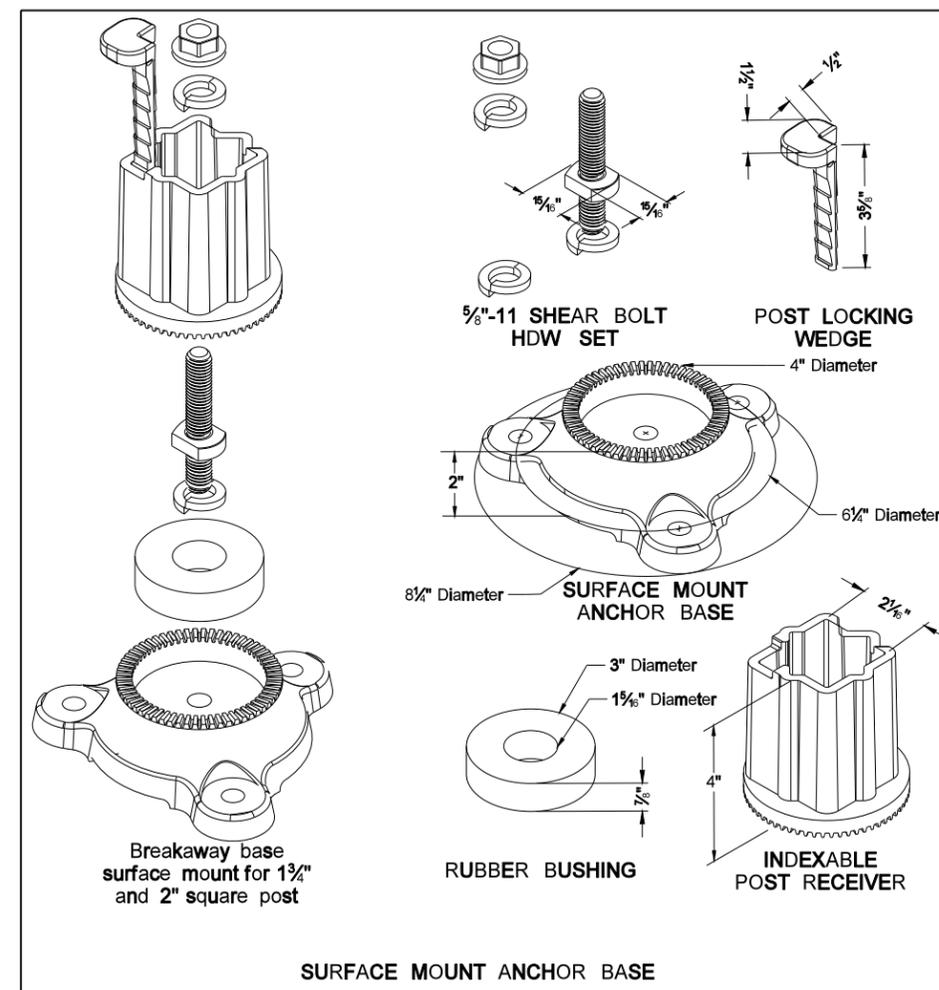
SLIP BASE DETAIL

Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness in.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. <sup>4</sup>	Cross Sect. Area In. <sup>2</sup>	Section Modulus In. <sup>3</sup>
1 1/2 x 1 1/2	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
2 1/2 x 2 1/2	0.105	12	2.773	0.561	0.695	0.499
2 3/8 x 2 3/8	0.135	10	3.432	0.605	0.841	0.590
2 1/2 x 2 1/2	0.105	12	3.141	0.804	0.803	0.643
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.783

The 2 3/8" size 10 gauge is shown as 2.19" size on the plans; The 2 1/2" size is shown as 2.51" size on the plans.

NOTE:

- 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.
- Anchor material shall be 7 gauge H.R.P.O. Commercial quality ASTM A569 and 3" x 3" x 7" gauge ASTM A500 grade B. Anchor shall have a yield strength 43.9 KSI and tensile strength of 59.3 KSI. Anchor shall be hot dipped galvanized per ASTM A123/153. All tolerances on anchor unit and slip base bottom assembly are +/- 0.005" unless otherwise noted.
- When used in concrete sidewalk, anchor shall be the same concept without the wings.
- Four post signs shall have over 8" between the first and fourth posts.
- Installation procedures as per manufacturers recommendation.
- Concrete fasteners for surface mount breakaway base shall be a minimum 1/2" diameter x 4" grade 8.



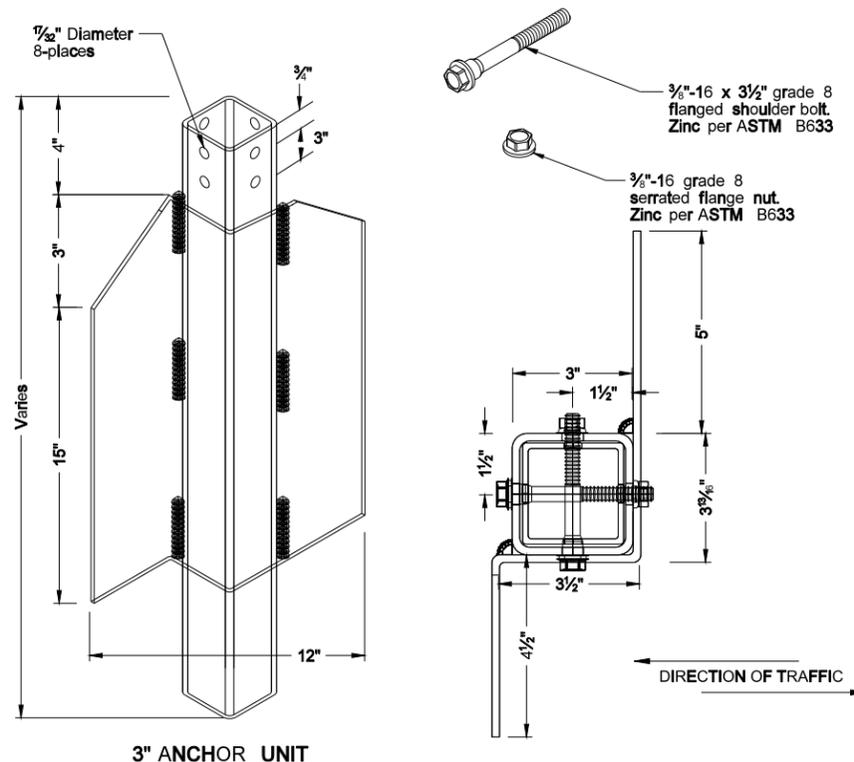
SURFACE MOUNT ANCHOR BASE

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 08/06/09 and the original document is stored at the North Dakota Department of Transportation

SHOULDER BOLT

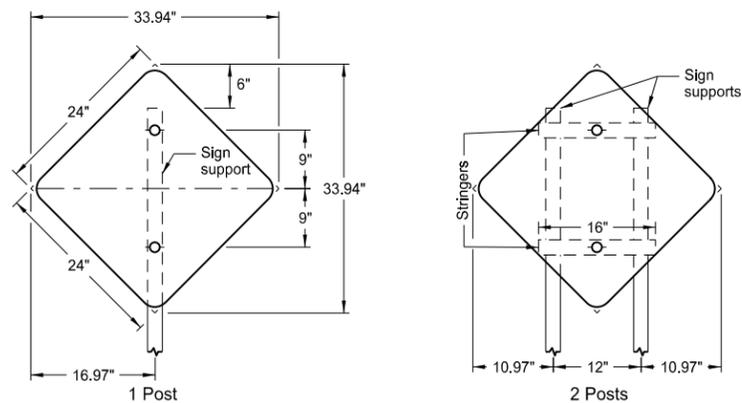
Shimming agent to reduce tolerance between 3" anchor unit and 2 1/2" post. (standard 3/8" diameter grade 8 bolt may be used with proper shim)



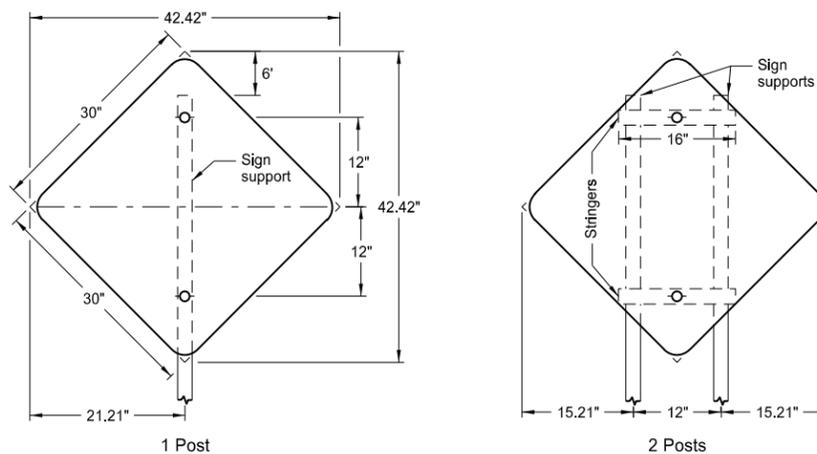
3" ANCHOR UNIT



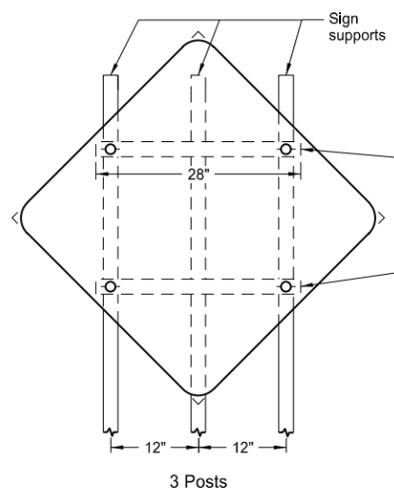
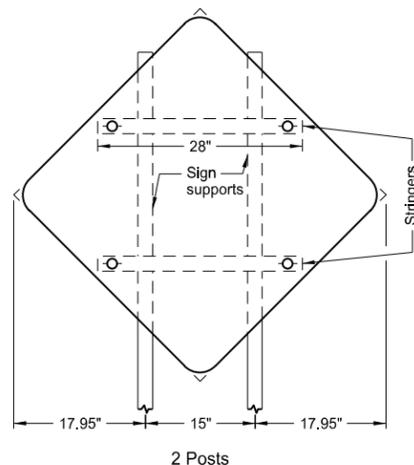
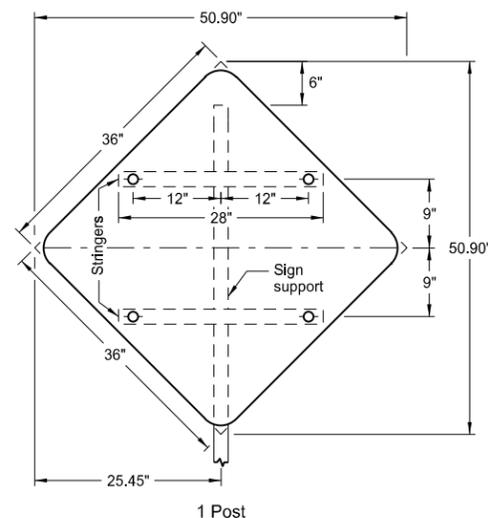
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION  
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



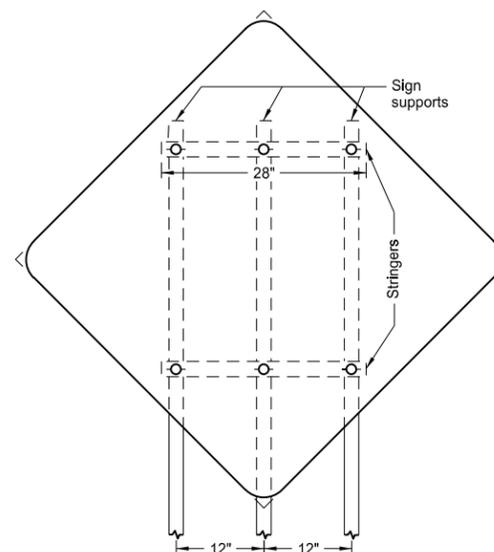
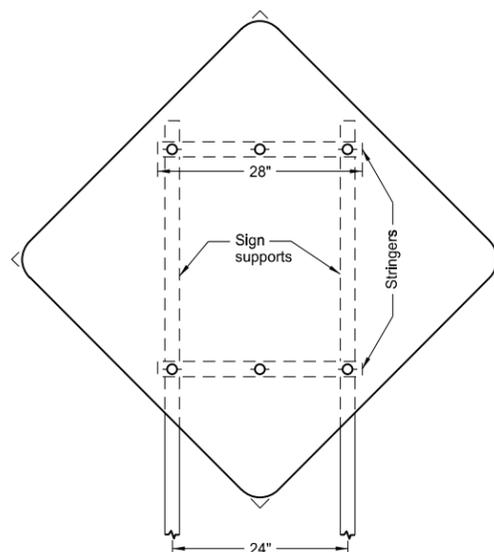
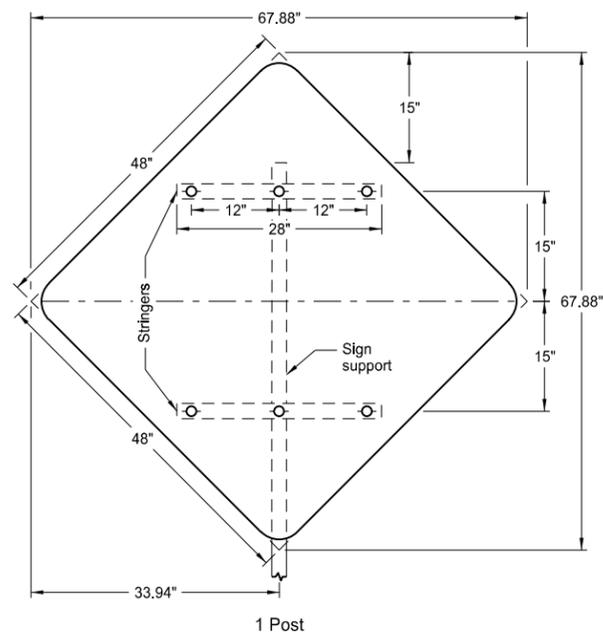
Assembly No. 18



Assembly No. 19



Assembly No. 20



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.

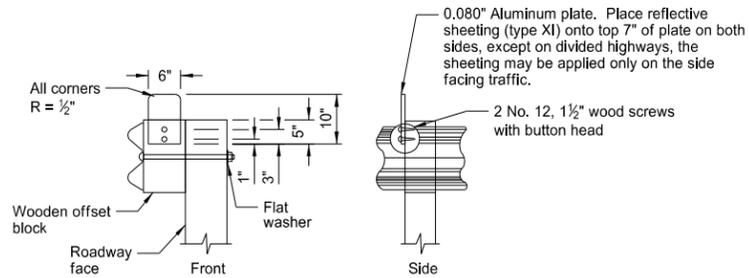
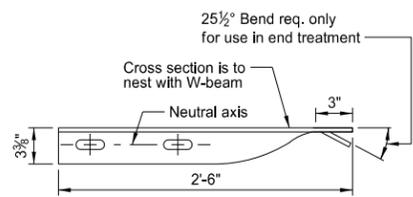
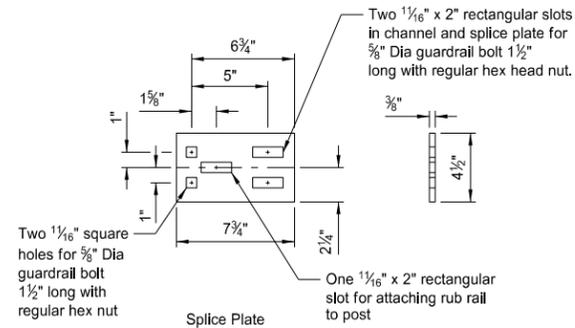
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

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

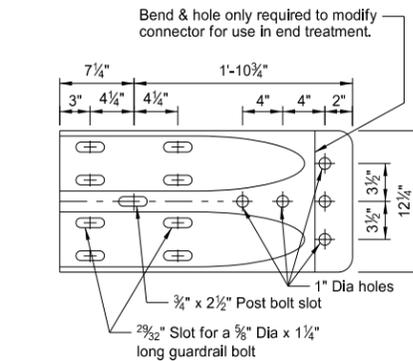
NOTES:

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 =  $-\frac{1}{4}"$ ,  $+1"$ .

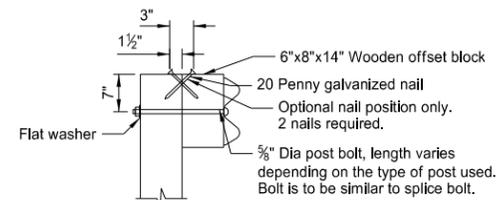


REFLECTORIZED PLATE DETAIL

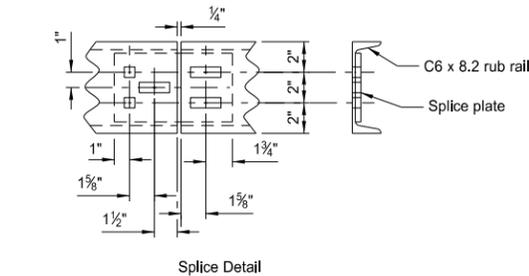
Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.



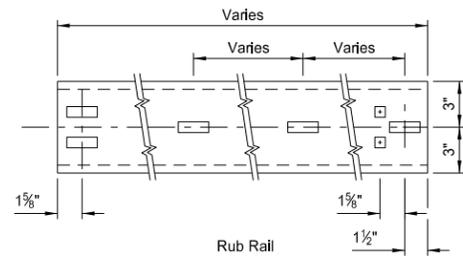
W BEAM TERMINAL CONNECTOR



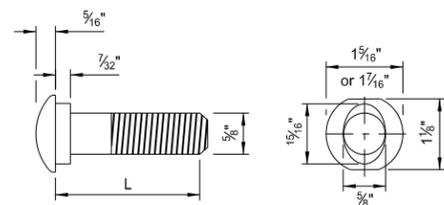
TYPICAL POST ATTACHMENT DETAIL



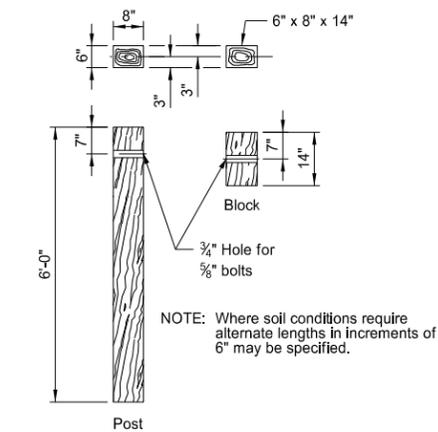
Splice Detail



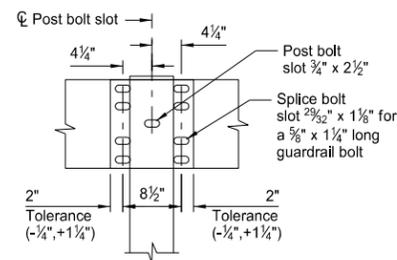
C6x8 RUB RAIL AND SPLICE PLATE



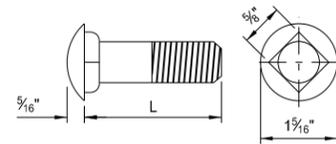
5/8" Diameter Guardrail Bolt	
L	Thread Length
1 1/4"	Full length thread
2"	1 3/4" Min thread length
9 1/2"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length



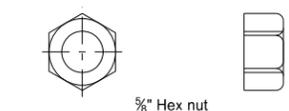
6"x8" TIMBER POST & BLOCK



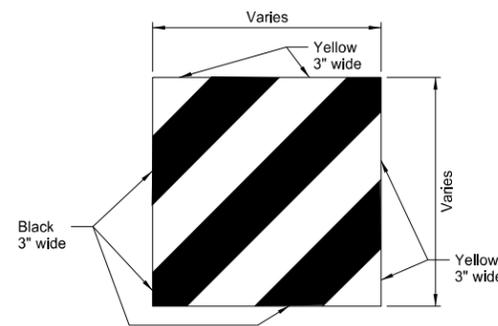
SPLICE DETAIL



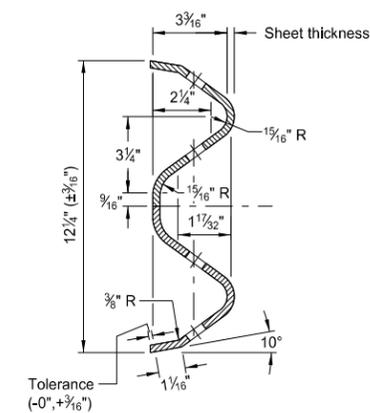
5/8" Diameter Carriage Bolt	
L	Thread Length
1 1/2"	Full length thread
3"	1 1/2" Min thread length
11"	1 3/4" Min thread length
13"	1 3/4" Min thread length



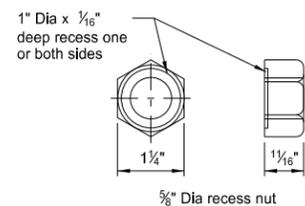
5/8" CARRIAGE BOLT & NUT



IMPACT HEAD OBJECT MARKER



W-BEAM CROSS SECTION



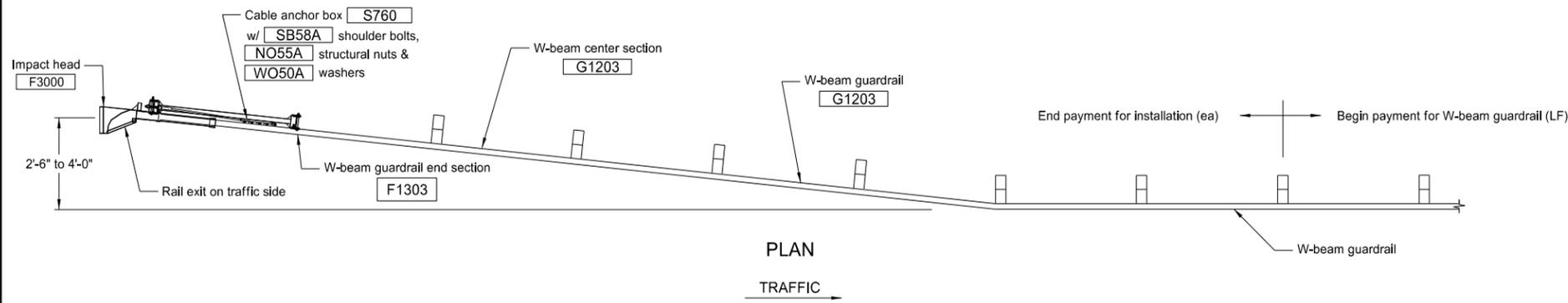
5/8" GUARDRAIL BOLT & RECESS NUT

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE

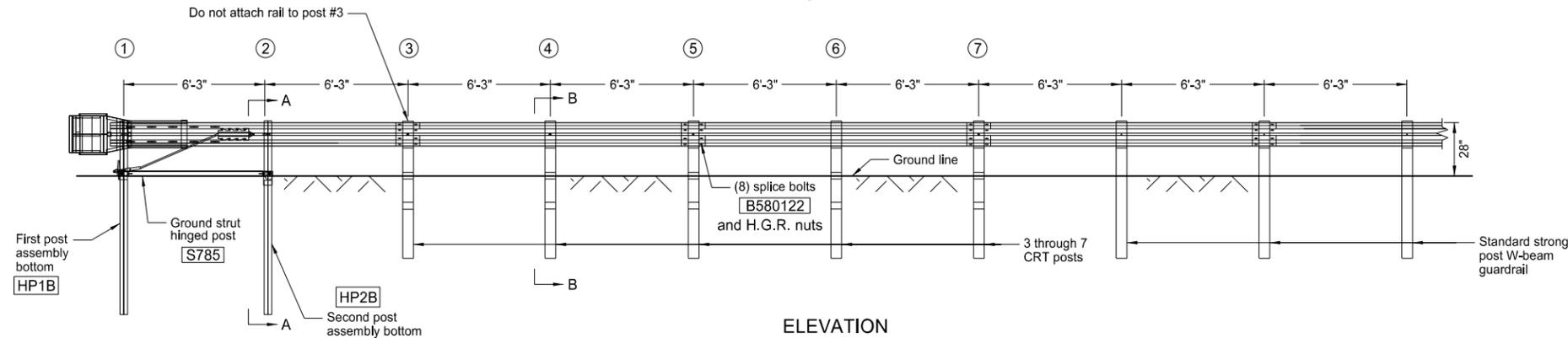
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 10/11/13 and the original document is stored at the North Dakota Department of Transportation

# FLARED ENERGY ABSORBING TERMINAL

D-764-6

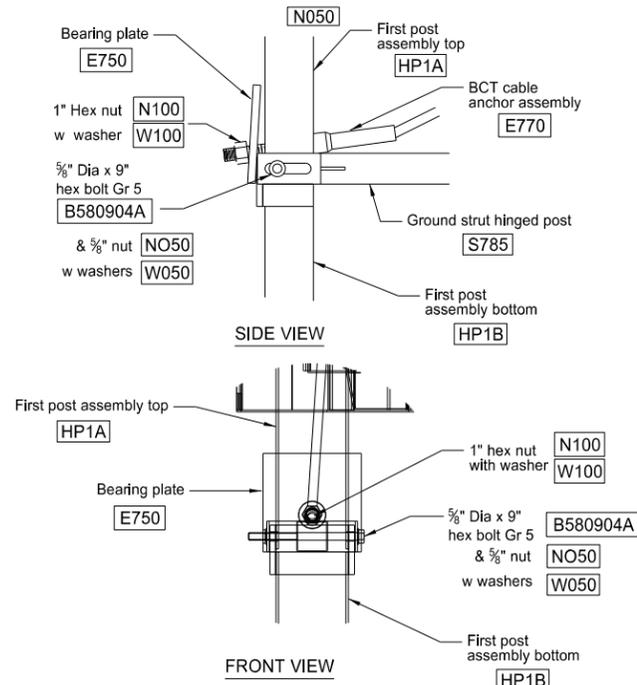


ITEM #	QTY	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA
G1203	2	W-BEAM GUARDRAIL, 12 GA
HP1A	1	FIRST POST ASSEMBLY TOP
HP1B	1	FIRST POST ASSEMBLY BOTTOM
HP2A	1	SECOND POST ASSEMBLY TOP
HP2B	1	SECOND POST ASSEMBLY BOTTOM
P671	5	WOOD CRT POST
P675	5	TIMBER BLOCKOUT 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	1/4 Dia x 4 HEX BOLT
WO14	4	1/4 WASHER
N014	2	1/4 HEX NUT
B580122	17	5/8 Dia x 1 1/4 SPLICE BOLT
B581802	4	5/8 Dia x 10 H.G.R. BOLT (POSTS 3 THRU 6)
B580904A	1	5/8 Dia x 9 HEX BOLT GR 5
W050	5	5/8 WASHER
N050	22	5/8 Dia H.G.R. NUT
B340854A	1	3/4 Dia x 8 1/2 HEX BOLT GR A449
N030	1	3/4 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	1/2 A325 STRUCTURAL NUT
W050A	16	1 1/16 OD x 3/16 ID A325 STR. WASHER

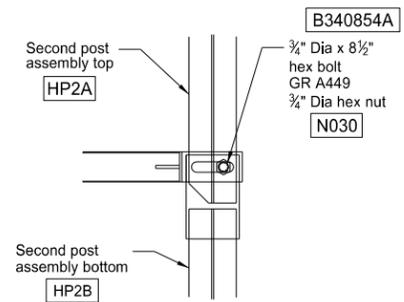


**GENERAL NOTES**

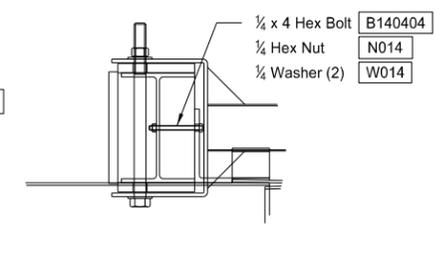
- Wood posts are required with the Flared Energy Absorbing Terminal except posts #1 and #2.
- All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
- The lower sections of the posts shall not protrude more than 4 inches above the ground (measured along a 60 inch cord). Site grading may be necessary to meet this requirement.
- Lower post sections shall not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactory compacted to prevent settlement.
- 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 2 1/2" 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.
- 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.
- 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.
- 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.



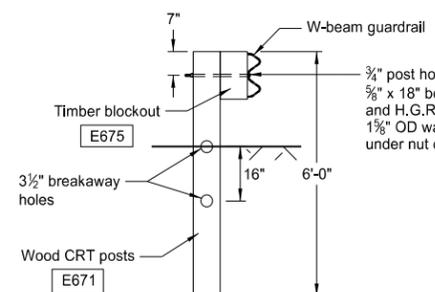
POST #1 CONNECTION DETAILS



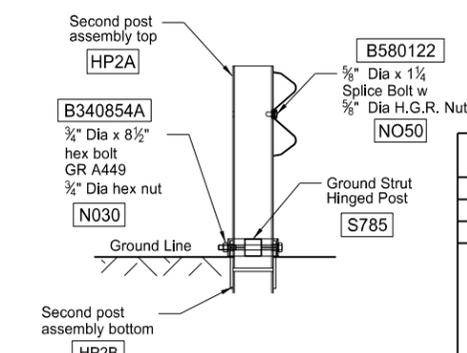
SIDE VIEW DETAIL OF POST #2



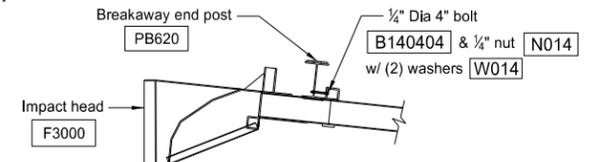
IMPACT HEAD CONNECTION DETAIL



SECTION B-B  
POST 3 THRU 7



SECTION A-A  
at Post #2



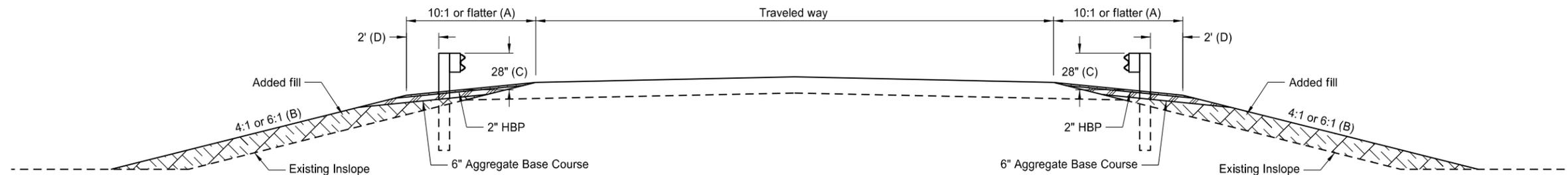
IMPACT HEAD CONNECTING DETAIL

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE

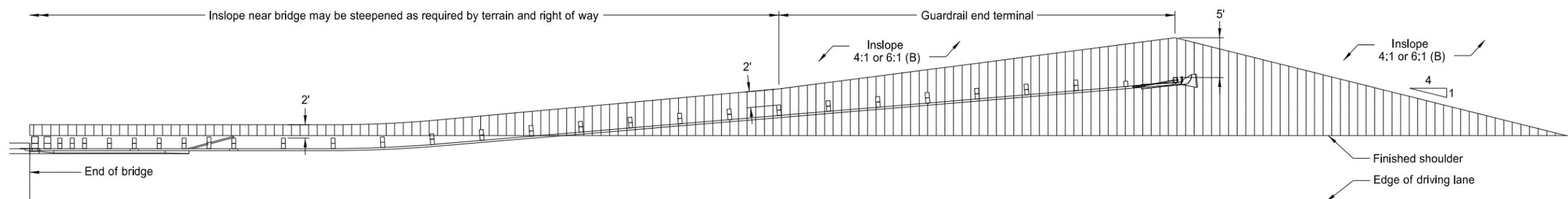
This document was originally issued and sealed by  
**Roger Weigel,**  
 Registration Number  
 PE-2930,  
 on 10/11/13 and the original document is stored at the  
 North Dakota Department  
 of Transportation

TYPICAL GRADING AT BRIDGE ENDS  
WITH W-BEAM GUARDRAIL

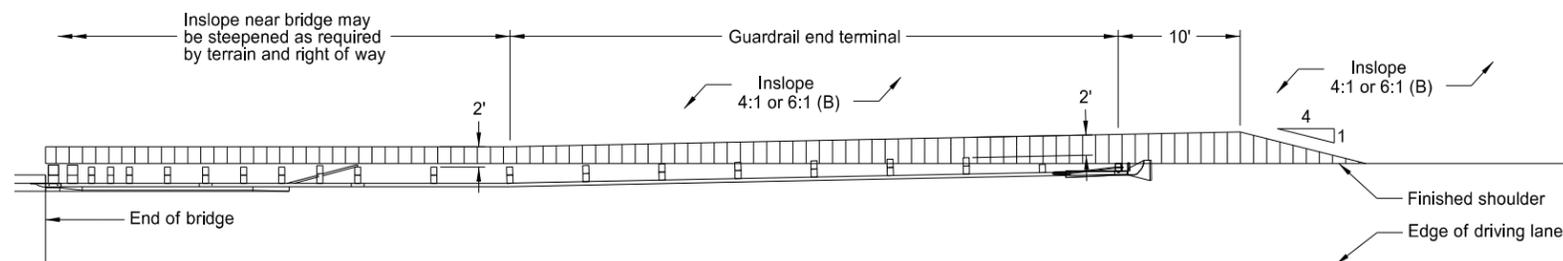
D-764-22



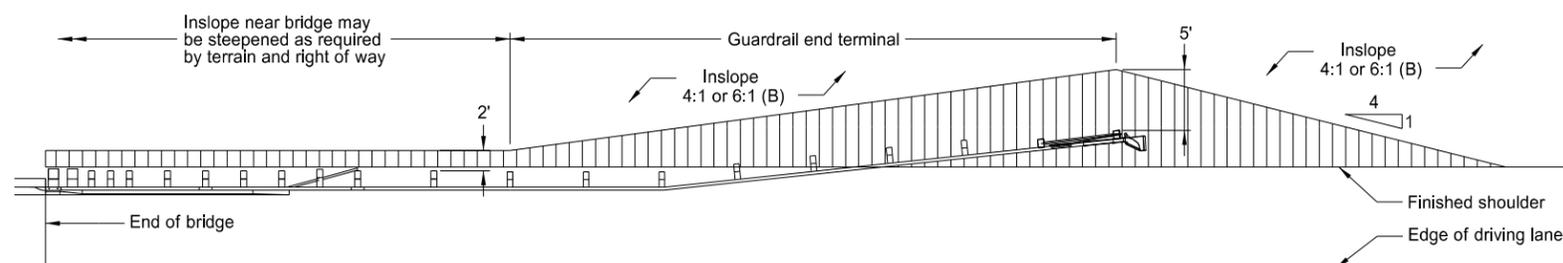
TYPICAL SECTION



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.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 10-3-13 and the original document is stored at the North Dakota Department of Transportation