DESIGN DATA				
Traffic	Average Daily			
Current 2020	Pass: 60	Trucks: 20	Total: 80	
Forecast 2038	Pass: 112	Trucks: 38	Total: 150	
Clear Zone Distance: 10'		Design Speed: 50		
Minimum Sight Dist. for Stopping: 425'		Bridges: HL-93		

	STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	22368	1	1

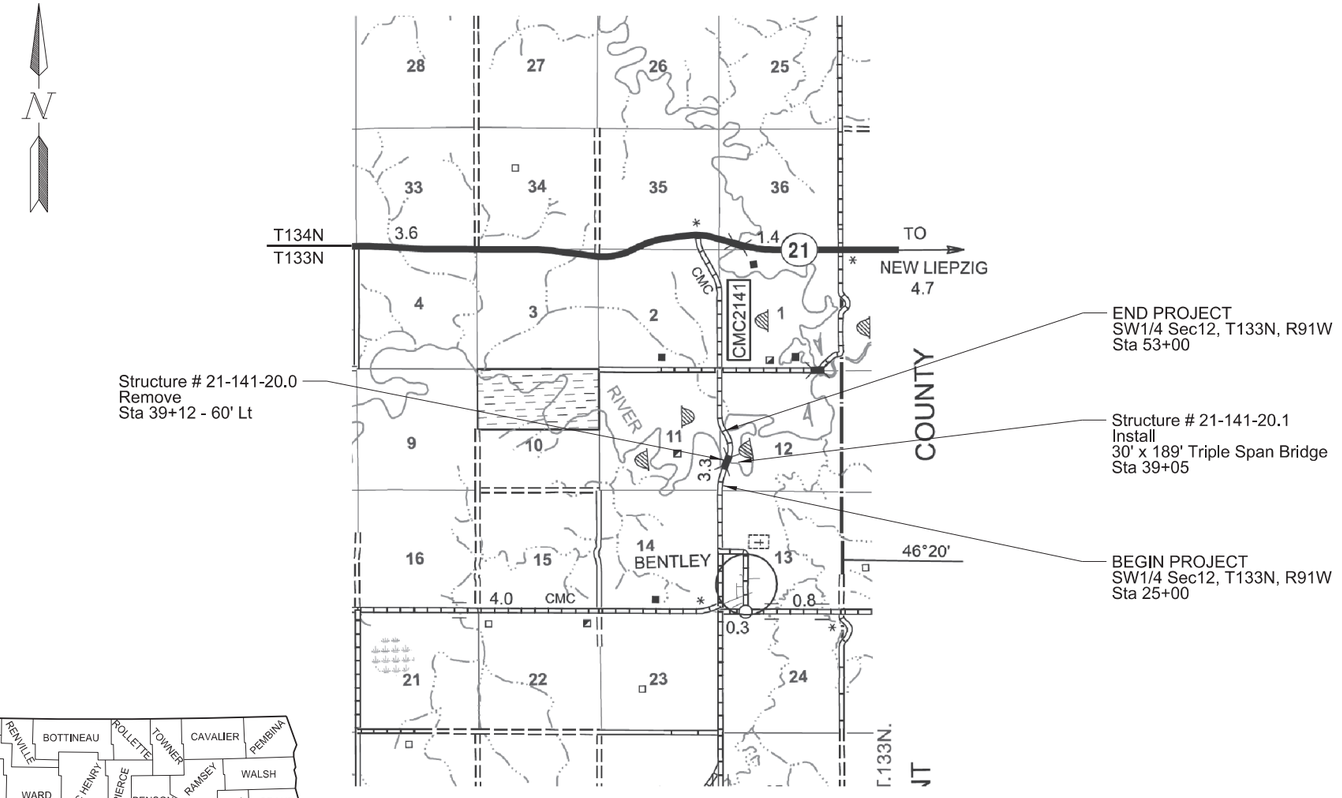
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

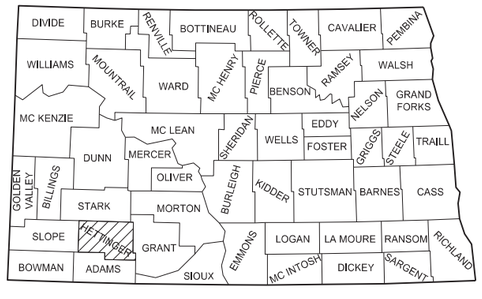
Federal Aid Project
BRC-2141(001)

Hettinger County
CMC 2141 (79th Ave SW), 1.2 miles North of Bentley, ND
Bentley Bridge Replacement - Existing Structure No. 21-141-20.0
New Structure No. 21-141-20.1
Removal of Structure, Roadway Obliteration, 30' x 189' Triple Span Bridge, Grading & Incidentals

GOVERNING SPECIFICATIONS	Date Published and Adopted by the North Dakota Department of Transportation
Standard Specifications	1/1/2022
Supplemental Specifications	NONE

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
BRC-2141(001) \ Bridge Replacement	0.530	0.530





STATE COUNTY MAP

DESIGNER
William Doerr, PE /s/
DESIGNER
Daniel Cichosz, PE /s/
DESIGNER
Jamie Van Zee /s/
DESIGNER
Joe Green /s/

BROSZ ENGINEERING, INC.

REGISTERED PROFESSIONAL ENGINEER
WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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1	1	Title Sheet
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8	1 - 2	Quantities
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60	1 - 3	Plan & Profile
75	1 - 2	Wetland Impacts
76	1 - 2	Temporary Erosion Control
77	1 - 2	Permanent Erosion Control
80	1	Fencing Layouts
82	1	Survey Data Layouts
100	1 - 2	Work Zone Traffic Control
130	1 - 2	Guardrail
170	1 - 19	Bridges and Box Culverts
175	1 - 3	Soil Boring Logs
200	1 - 12	Cross Sections

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Number	Description
PSP 18(22)	Permits and Environmental Considerations
SSP 1	Temporary Erosion and Sediment Best Management Practices
SSP 2	Federal Migratory Bird Treaty Act

LIST OF STANDARD DRAWINGS

Number	Description
D-101-1, 2, 3, 4	NDDOT Abbreviations
D-101-10	NDDOT Utility Company and Organization Abbreviations
D-101-20, 21	Line Styles
D-101-30, 31, 32, 33	Symbols
D-203-8	Standard Rural Approaches
D-255-2	Erosion And Siltation Control - Erosion Control Blanket Installation
D-260-1	Erosion And Siltation Controls - Silt Fence
D-261-1	Erosion Control - Fiber Roll Placement Details
D-622-1	Pile Splice Details
D-704-6	Construction Sign Details Project Funding Sign
D-704-7, 8	Breakaway Systems For Construction Zone Signs - Perforated Tube
D-704-9	Construction Sign Details - Terminal And Guide Signs
D-704-10	Construction Sign Details - Regulatory Signs
D-704-11, 11A	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-704-22	Construction Truck And Temporary Detour Layouts
D-704-26	Miscellaneous Sign Layouts
D-704-30	Windrow Marking
D-704-50	Portable Sign Support Assembly
D-708-6	Erosion And Siltation Controls - Median Or Ditch Inlet Protection
D-714-4	Round Corrugated Steel Pipe Culverts And End Sections
D-752-1	Standard Barbed Wire Fence
D-754-23	Perforated Tube Assembly Details
D-754-24	Mounting Details Perforated Tube
D-754-24A	Breakaway Coupler System For Perforated Tubes
D-754-25	Mounting Details Perforated Tube
D-754-26, 27, 28, 29	Sign Punching, Stringer and Support Location Details Regulatory, Warning and Guide Signs
D-764-38	MGS Flared Energy Absorbing Terminal - Wood Post
D-764-40	MGS W-Beam Guardrail General Details
D-764-48	Typical Grading at Bridge Ends with MGS W-Beam Guardrail

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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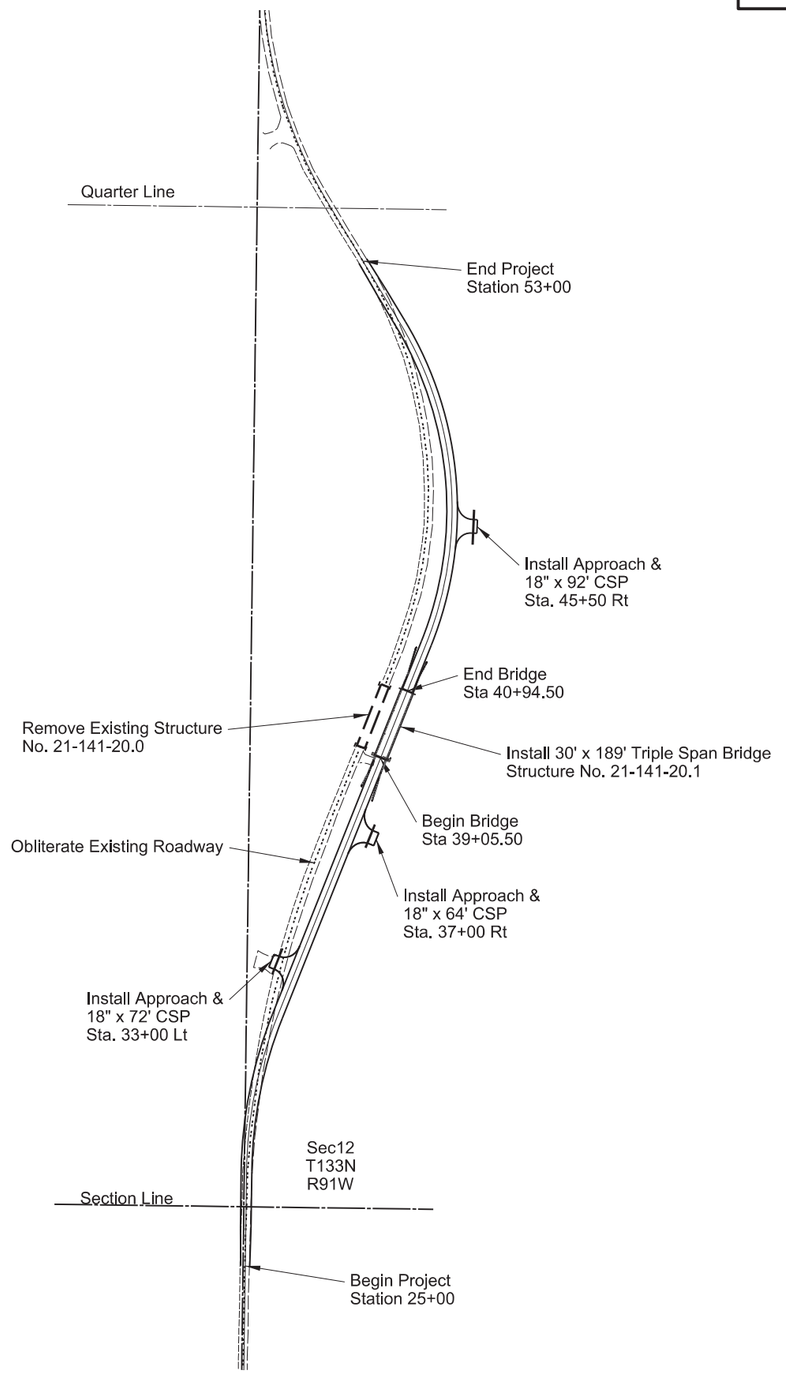
N

Scale: 1"= 400.00



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PE-7113
DATE 03/22/2022
NORTH DAKOTA

Scope of Work

Bentley Bridge Replacement

Hettinger County

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NOTES

GENERAL NOTES

105-P01 **UTILITY COORDINATION:** Coordinate your work schedule with the utility companies, the County and the Engineer. The County will be responsible for the cost of any utility adjustments, except in cases of negligence by the Contractor.

Work around power poles, telephone lines, pipelines and other utilities not designated for adjustments. Coordinate your schedule with the utility owners for utilities that will require adjustments.

105-P02 **RIGHT OF WAY:** Permanent Easements and Temporary Construction Easements have been obtained by Hettinger County and are shown in the plans. Utilize Temporary Construction Easements for cutting slopes, construction staging and stockpiling topsoil. Minimize impacts within the Temporary Construction Easement areas as much as possible.

201-P01 **CLEARING & GRUBBING:** Include the cost to remove and dispose of all trees, stumps and brush within the construction area or wherever designated in the plans in the contract lump sum price for "Clearing and Grubbing." No field measurements will be taken. This includes the cost of removing and disposing of large trees. Exercise care in your construction operations to ensure that trees, shrubs and native grasses outside of the construction area are not disturbed.

202-P01 **REMOVE AGGREGATE SURFACING:** After the new structure and roadway are complete and opened to traffic, remove and salvage the existing aggregate surfacing prior to roadway obliteration. Salvage and stockpile the existing aggregate surfacing within the roadway right of way at a location approved by the Engineer. Stockpile the material with a loader in a single location. The County will retain ownership of the material. The estimated depth of existing aggregate surfacing is 4 inches. No additional payment will be made for deviations in the depth of material. Include all costs associated with this work in the unit price bid for “Remove Aggregate Base & Surfacing”.

203-010 **SHRINKAGE:** 30 percent additional volume is included for shrinkage in earth embankment.

203-385 **AVERAGE HAUL:** No average haul has been computed for this project.

203-P01 **EMBANKMENT CONSTRUCTION:** Use Compaction Control Type A with method “ND T 180”. Borrow material shall consist of approved natural compactable soil. The soil shall not be saturated or contain organic material.

302-P01 **PLACEMENT AND COMPACTION:** Delete the first sentence of Section 302.04 B in its entirely and insert the following:

Haul, place, lay, and compact aggregate on a damp surface in two (2) equal depth lifts.

704-P01 **TRAFFIC CONTROL:** The existing roadway and bridge will be left in place for traffic while the proposed road and bridge are constructed. Close the proposed roadway by installing three Type III Barricades with a road closed sign on each end. When making the connection into the existing roadway maintain one lane of traffic with flagging at all times during working hours. Open the roadway to two-way traffic during non-working hours and leave the work area free of all hazards. Furnish flagging as specified in Section 704, “Temporary Traffic Control” when needed. All flagging hours shall be incidental to the cost of the project. Remove the traffic control devices for flagging when it is not being used and reinstall when flagging is needed. Obliterate the existing roadway only after the new bridge is completed, the aggregate surfacing has been installed, and the new segment of roadway is opened to traffic.

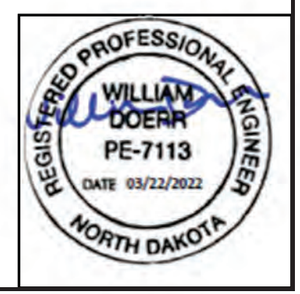
714-P01 **APPROACH CULVERTS:** Provide approach culverts that are zinc galvanized and meet the requirements of Section 830.02 B of the Standard Specifications.

752-P01 **REMOVAL EXISTING FENCING:** Remove and stockpile the existing fencing materials on the property of the adjacent landowner with the approval of the Engineer.

752-P02 **TEMPORARY FENCING:** Place temporary fencing prior to removing existing fencing. Place temporary fencing around temporary construction easements where existing fence is removed until permanent fencing is in place. Field fit temporary fencing in areas of deep draws or wooded areas, with the approval of the Engineer. Verify the need for temporary fence with the landowner. The cost to install and remove temporary fencing is included in the price bid for “Temporary Fence”.

752-P03 **PERMANENT FENCING:** Double brace assemblies will be paid as corner assemblies

752-P04 **VEHICLE GATE:** Install vehicle gates with double brace assemblies as shown in Standard Drawing D-752-1. Include the cost of all materials and labor to install brace assemblies and gate in the EA bid item for “Vehicle Gate”.



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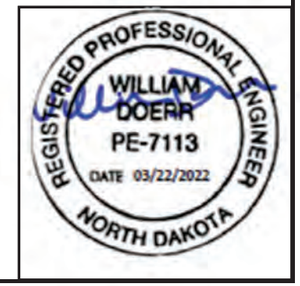
ENVIRONMENTAL NOTES

ENVIRONMENTAL NOTES (EN): Hettinger County, the North Dakota Department of Transportation, and the Federal Highway Administration have made environmental commitments to secure approval of this project. The following environmental notes are requirements to comply with these commitments:

EN-1 SPAWNING RESTRICTION: Do not work within the Cannonball River from April 15 to June 1.

EN-2 AQUATIC NUISANCE SPECIES (ANS): Equipment that was last used outside of North Dakota or within a Class I infested waterbody (identified on the North Dakota Game and Fish Department (NDGFD) website) requires an inspection by NDGFD. Notify the NDGFD at least 10 business days prior to pumps, watercraft, or any equipment entering a public water to allow the NDGFD sufficient time to inspect any and all such equipment for ANS. Contact the NDGFD ANS Coordinator, Ben Holen by e-mail - bholen@nd.gov for equipment inspections. Supply one of the following to the engineer as proof of compliance prior to work taking place in the water: (1) the NDGFD inspection report, (2) documented NDGFD correspondence (email or signed letter).



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Estimated Quantities

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE				TOTAL
103	0100	CONTRACT BOND	L SUM	1				1
201	0330	CLEARING & GRUBBING	L SUM	1				1
202	0105	REMOVAL OF STRUCTURE	L SUM	1				1
202	0120	REMOVE AGGREGATE BASE & SURFACING	L SUM	1				1
202	0174	REMOVAL OF PIPE ALL TYPES AND SIZES	LF	48				48
202	0312	REMOVE EXISTING FENCE	LF	3602				3602
203	0101	COMMON EXCAVATION-TYPE A	CY	16396				16396
203	0109	TOPSOIL	CY	2877				2877
203	0140	BORROW-EXCAVATION	CY	13249				13249
203	0180	ROADWAY OBLITERATION	LF	2300				2300
210	0099	CLASS 1 EXCAVATION	L SUM	1				1
210	0111	CLASS 2 EXCAVATION	L SUM	1				1
210	0127	CHANNEL EXCAVATION	L SUM	1				1
210	0201	FOUNDATION PREPARATION	EA	1				1
216	0100	WATER	M GAL	404				404
251	0200	SEEDING CLASS II	ACRE	11				11
251	2000	TEMPORARY COVER CROP	ACRE	11				11
253	0101	STRAW MULCH	ACRE	22				22
255	0103	ECB TYPE 3	SY	874				874
256	0200	RIPRAP GRADE II	CY	1128				1128
260	0200	SILT FENCE SUPPORTED	LF	160				160
260	0201	REMOVE SILT FENCE SUPPORTED	LF	160				160
261	0112	FIBER ROLLS 12IN	LF	1390				1390
261	0113	REMOVE FIBER ROLLS 12IN	LF	640				640
262	0100	FLOTATION SILT CURTAIN	LF	330				330
262	0101	REMOVE FLOTATION SILT CURTAIN	LF	330				330
302	0356	AGGREGATE SURFACE COURSE CL 13	TON	3178				3178
602	0130	CLASS AAE-3 CONCRETE	CY	196				196
602	1130	CLASS AE-3 CONCRETE	CY	282				282
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	683				683
604	9900	PRESTRESSED I-BEAM-36IN	LF	929				929
612	0115	REINFORCING STEEL-GRADE 60	LBS	40275				40275
612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS	43670				43670
616	0364	STRUCTURAL STEEL M270-GRADE 36	LBS	4606				4606
622	0014	STEEL H-PILING POINTS 12 X 53	EA	42				42
622	0040	STEEL PILING HP 12 X 53	LF	920				920
622	1200	STEEL TEST PILING HP 12 X 53	LF	140				140
624	0128	TRAFFIC RAIL-STEEL	LF	378				378
702	0100	MOBILIZATION	L SUM	1				1
704	1000	TRAFFIC CONTROL SIGNS	UNIT	914				914
704	1052	TYPE III BARRICADE	EA	6				6
704	1080	STACKABLE VERTICAL PANELS	EA	16				16
704	1081	VERTICAL PANELS-BACK TO BACK	EA	10				10
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	1456				1456
714	5015	PIPE CORR STEEL .064IN 18IN	LF	228				228
752	0200	FENCE BARBED WIRE 4 STRAND	LF	3423				3423
752	0905	TEMPORARY FENCE	LF	2858				2858

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Estimated Quantities

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE				TOTAL
752	2100	VEHICLE GATE	EA	3				3
752	3140	CORNER ASSEMBLY BARBED WIRE	EA	11				11
764	0131	W-BEAM GUARDRAIL	LF	222				222
764	0145	W-BEAM GUARDRAIL END TERMINAL	EA	4				4
930	9537	ABUTMENT UNDERDRAIN SYSTEM	EA	2				2

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Topsoil

4" Depth

Water

25 MGal/Mile Dust Palliative
10 Gal/C.Y. for Excavation
30 Gal/C.Y. for Aggregate

Temporary Cover Crop with Straw Mulch & Seeding Cl II with Straw Mulch

Sta 26+00-Lt to 39+10-Lt	2.78	Acre
Sta 26+00-Rt to 39+10-Rt	2.82	Acre
Sta 39+10-Rt to 52+00-Rt	2.53	Acre
Sta 39+10-Lt to 52+00-Lt	2.67	Acre

Riprap Grade II

2.75' Depth; Length and Width as shown on the plans

Aggregate Surface Course CL 13 @ 1.875 Ton/CY

Sta 26+00 to 36+25 6" Depth - 15.75 SqFT - 110 Ton/Sta
Sta 36+25 to 39+10 9" Depth - 23.63 SqFT - 164 Ton/Sta
Sta 40+95 to 43+50 9" Depth - 23.63 SqFT - 164 Ton/Sta
Sta 43+50 to 53+00 6" Depth - 15.75 SqFT - 110 Ton/Sta

40 Ton/Field Drive

Location	203-0101 Common Excavation - Type A (CY) Pay Item	Embankment (CY)	203-0140 Borrow Excavation (CY) Pay Item	203-0109 Topsoil (CY) *Pay Item
	A	B	C = B-A	D
25+00 to 53+00	16,396	29,645	13,249	2,877
Total	16,396	29,645	13,249	2,877

* Topsoil Volumes Computed from Surface Areas Measurements at a 4" Depth.

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DATE 03/22/2022
NORTH DAKOTA

Basis of Estimate

Bentley Bridge Replacement

Hettinger County

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T.S. Station 26+42.85
S.C. Station 28+02.61

P.C. Station 27+49.89
P.I. Station 29+62.20
Delta = 20° 59' 34.00" (RT)
Degree = 5° 00' 00.00"
Tangent = 212.31
Length = 419.85
Radius = 1145.92
External = 19.50
P.T. Station 31+69.75

C.S. Station 31+17.03
S.T. Station 32+76.79

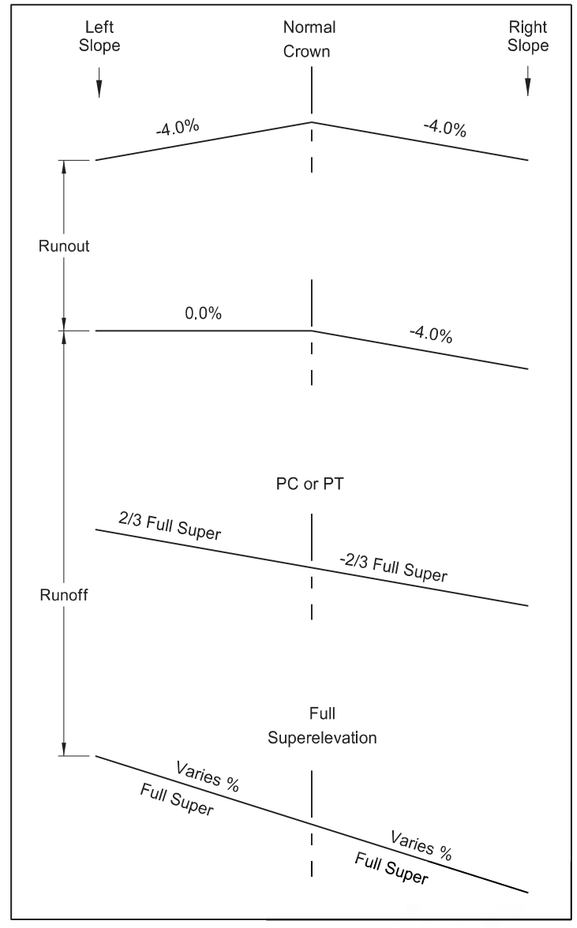
Station	Left Slope	Right Slope
TS - 164'	-4.0	-4.0
TS	0.0	-4.0
SC	4.0	-4.0
CS	4.0	-4.0
ST	0.0	-4.0
ST + 164'	-4.0	-4.0

T.S. Station 41+20.97
S.C. Station 42+84.82

P.C. Station 42+30.75
P.I. Station 47+01.71
Delta = 52° 44' 23.00" (LT)
Degree = 6° 01' 52.00"
Tangent = 470.96
Length = 874.46
Radius = 950.00
External = 110.33
P.T. Station 51+05.21

C.S. Station 50+51.14
S.T. Station 52+14.99

Station	Left Slope	Right Slope
TS - 164'	-4.0	-4.0
TS	-4.0	0.0
SC	-4.0	4.0
CS	-4.0	4.0
ST	-4.0	0.0
ST + 80	-2.0	-2.0



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PE-7113
DATE 03/22/2022
NORTH DAKOTA

Note: Calculations based on AASHTO method five. A design speed of 50 mph and maximum superelevation of 4% were used.

Superelevation Table

Bentley Bridge Replacement

Hettinger County

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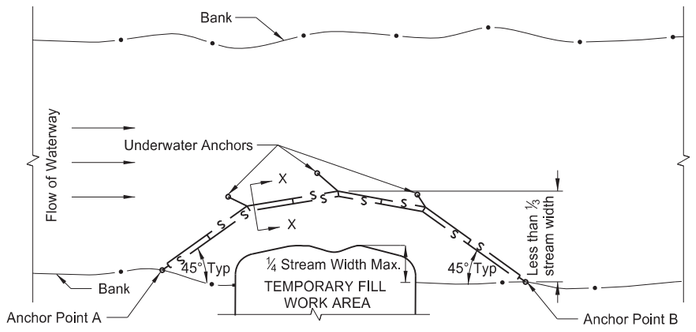
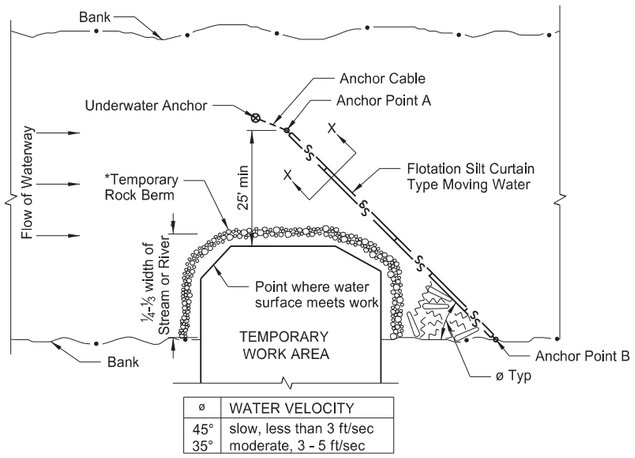
TYPICAL INSTALLATIONS
May vary with conditions



PLAN VIEW

FLOTATION SILT CURTAIN - TYPE WORK AREA

DESIGN GUIDELINES:
When temporary work encroaches less than ¼ of the width of stream.



ø	WATER VELOCITY
45°	slow, less than 3 ft/sec
35°	moderate, 3 - 5 ft/sec

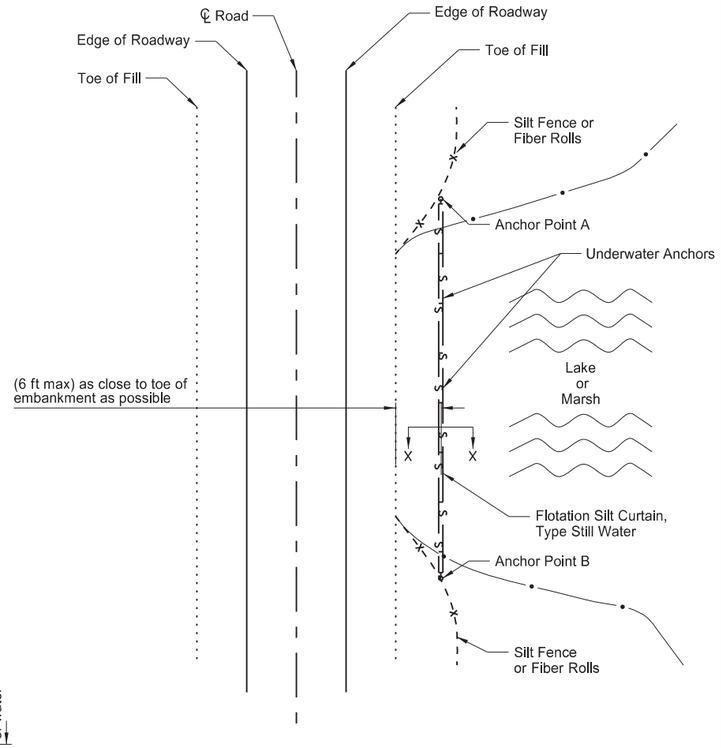
PLAN VIEW

FLOTATION SILT CURTAIN - TYPE MOVING WATER

DESIGN GUIDELINES:
When temporary work encroaches more than ¼ but less than ⅓ width of the stream.

For narrow waterways, the curtain may be placed 1 foot above the bottom of waterway to allow water flow.

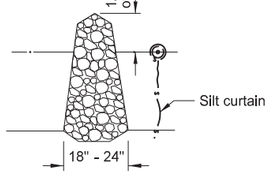
*In areas where the plans call for riprap at the bridge, provide a temporary rock berm. Include all costs for the temporary rock berm in price bid for the "Riprap".



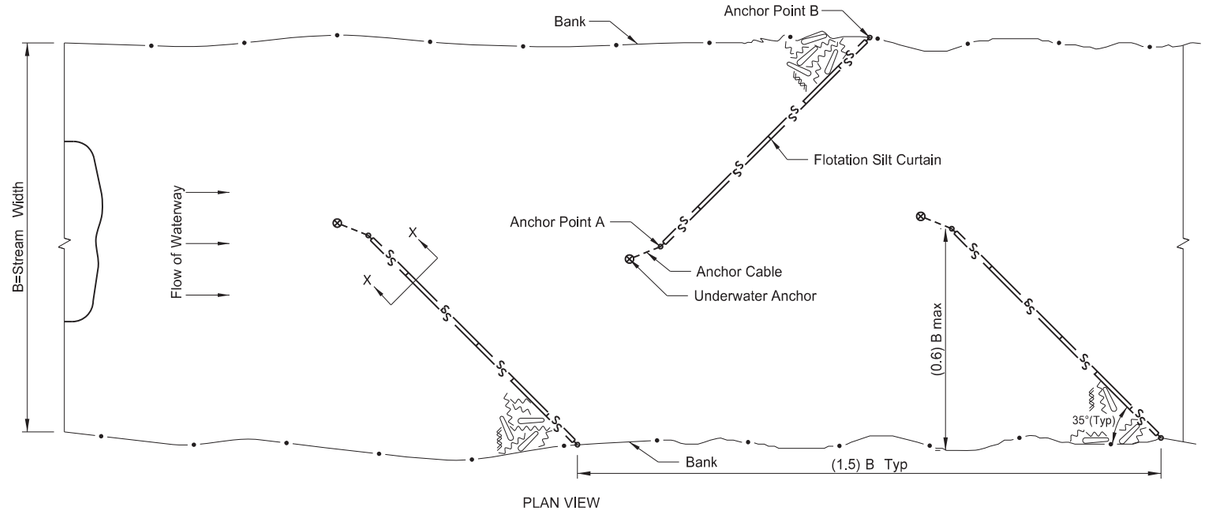
PLAN VIEW

FLOTATION SILT CURTAIN - TYPE STILL WATER

Extend silt curtain onto shore and anchor there also.



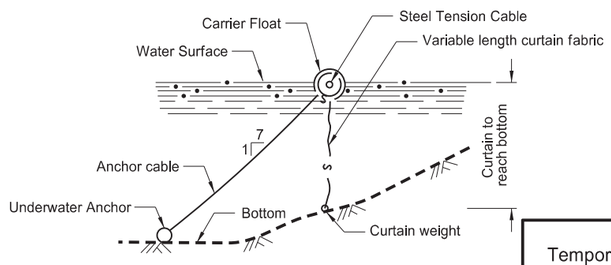
TEMPORARY ROCK BERM



PLAN VIEW

FLOTATION SILT CURTAIN - TYPE HERRING BONE PATTERN

DESIGN GUIDELINES:
When temporary work encroaches more than ⅓ width of the stream
Or where stream width doesn't allow use of Type Moving Water



SECTION X-X
FLOTATION SILT CURTAINS

Note:
Maximum water velocity for moving water = 5 ft/sec

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Temporary Erosion Control - Flotation Silt Curtain

Bentley Bridge Replacement

Hettinger County

3/22/2022 2:00:27 PM josh S:\2020proj\2011B\Design\Plan_Sheets\020GD_002_DFLOTATION_SILT_CURTAIN.dgn

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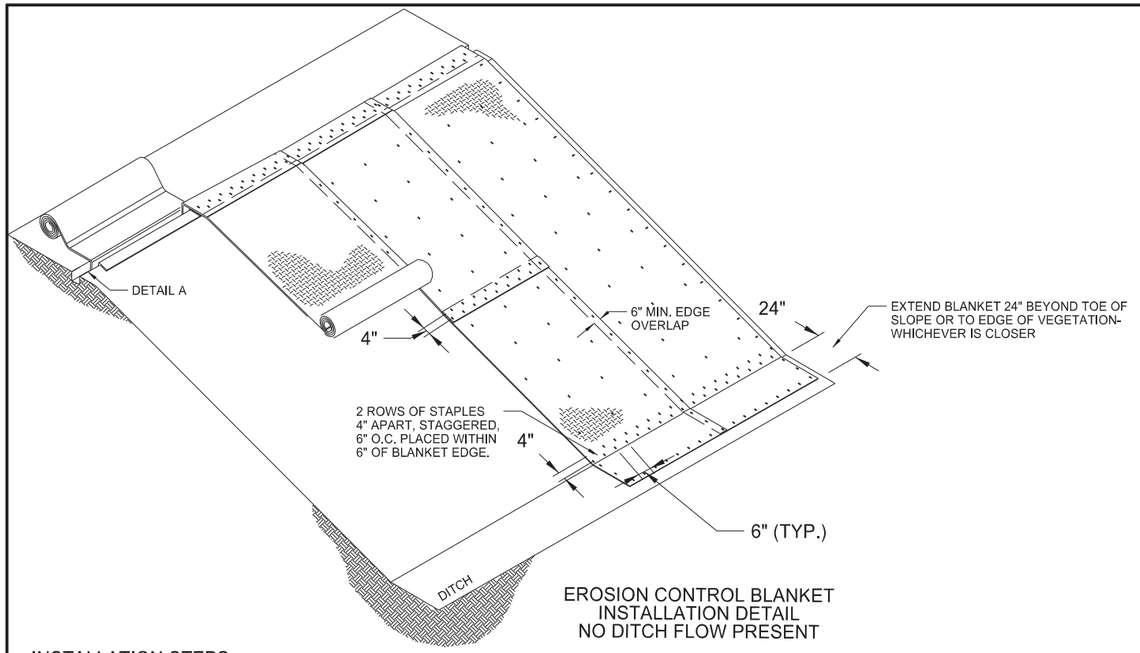
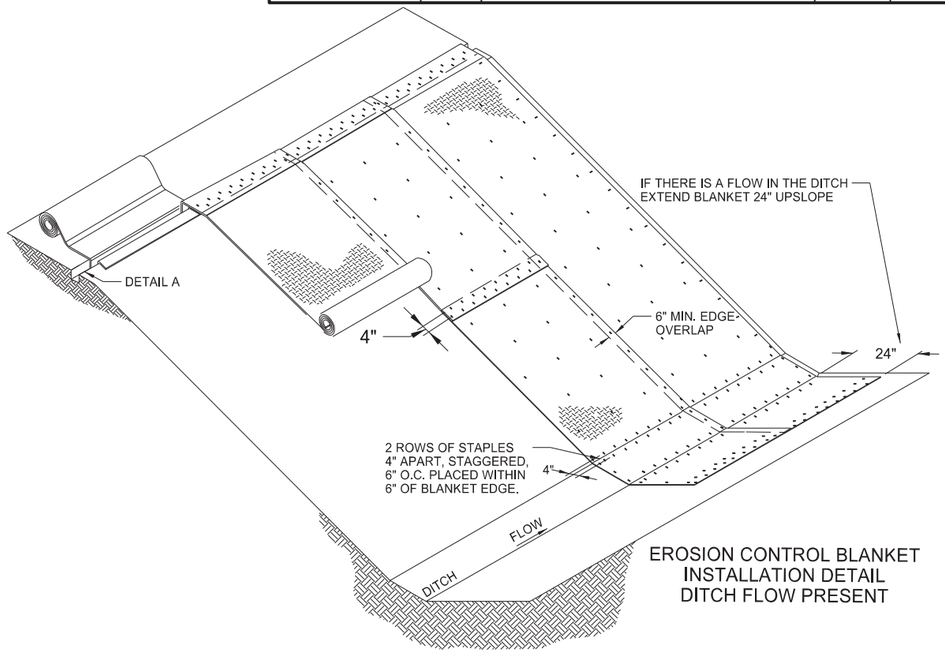


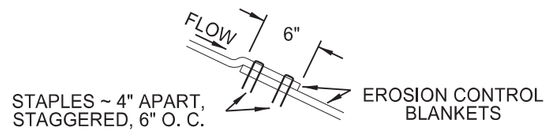
EROSION CONTROL BLANKET
INSTALLATION DETAIL
NO DITCH FLOW PRESENT



EROSION CONTROL BLANKET
INSTALLATION DETAIL
DITCH FLOW PRESENT

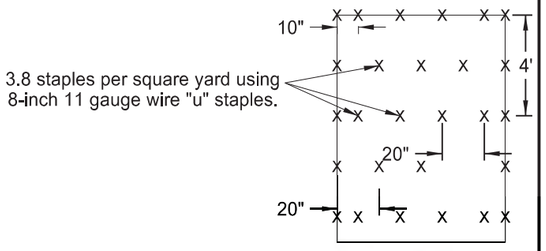
INSTALLATION STEPS:

1. Prepare smooth slope per spec. section 255
2. Amend soil and seed, as specified.
3. Dig anchor trench. Set aside native soil removed from trench.
4. Secure blanket in anchor trench, staking or stapling blanket as shown.
5. Replace native soil previously removed from trench.
6. Staple blanket as shown so there are no gaps between the blanket and the soil. Staple while unrolling blanket to minimize walking on blanket.
7. Install splices a minimum 24 inches prior to toe of slope.



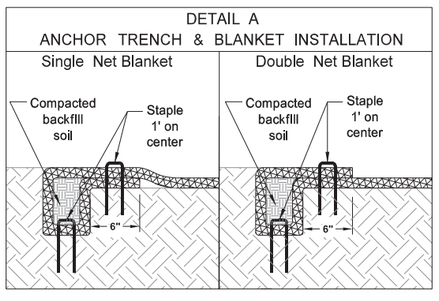
STAPLES ~ 4" APART, STAGGERED, 6" O. C.

EROSION CONTROL BLANKETS

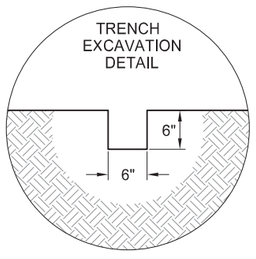


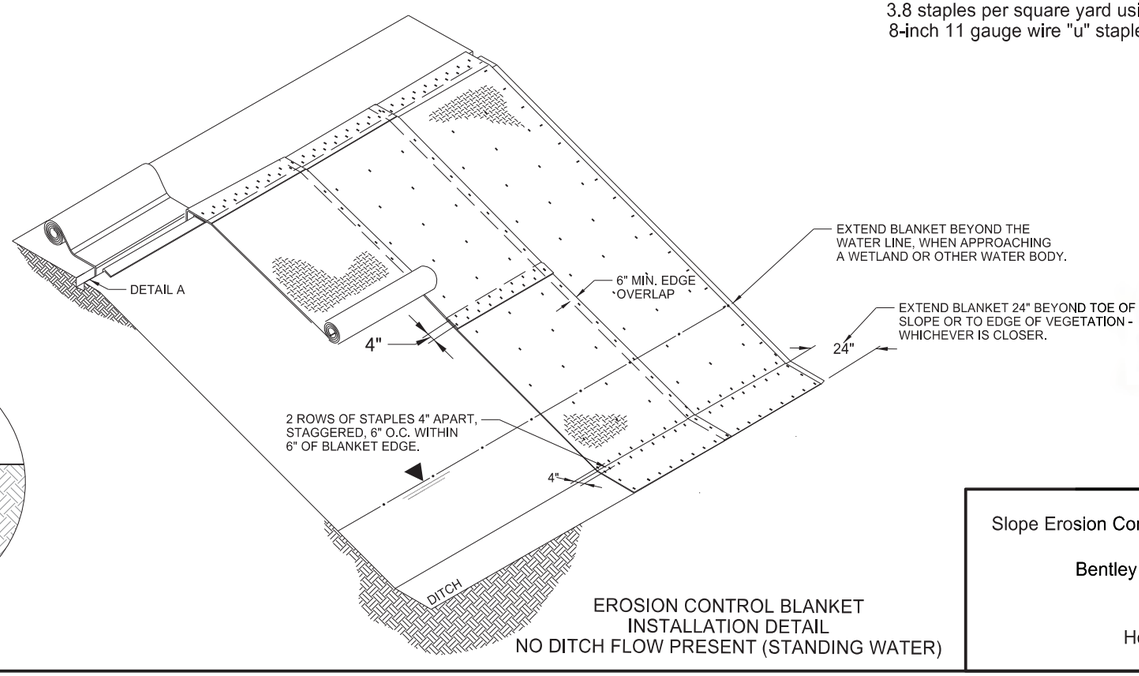
3.8 staples per square yard using 8-inch 11 gauge wire "u" staples.

STAPLE PATTERN



NOTE:
Install Single Net Blanket with netting on top of installed blanket.





EROSION CONTROL BLANKET
INSTALLATION DETAIL
NO DITCH FLOW PRESENT (STANDING WATER)

REGISTERED PROFESSIONAL ENGINEER
WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

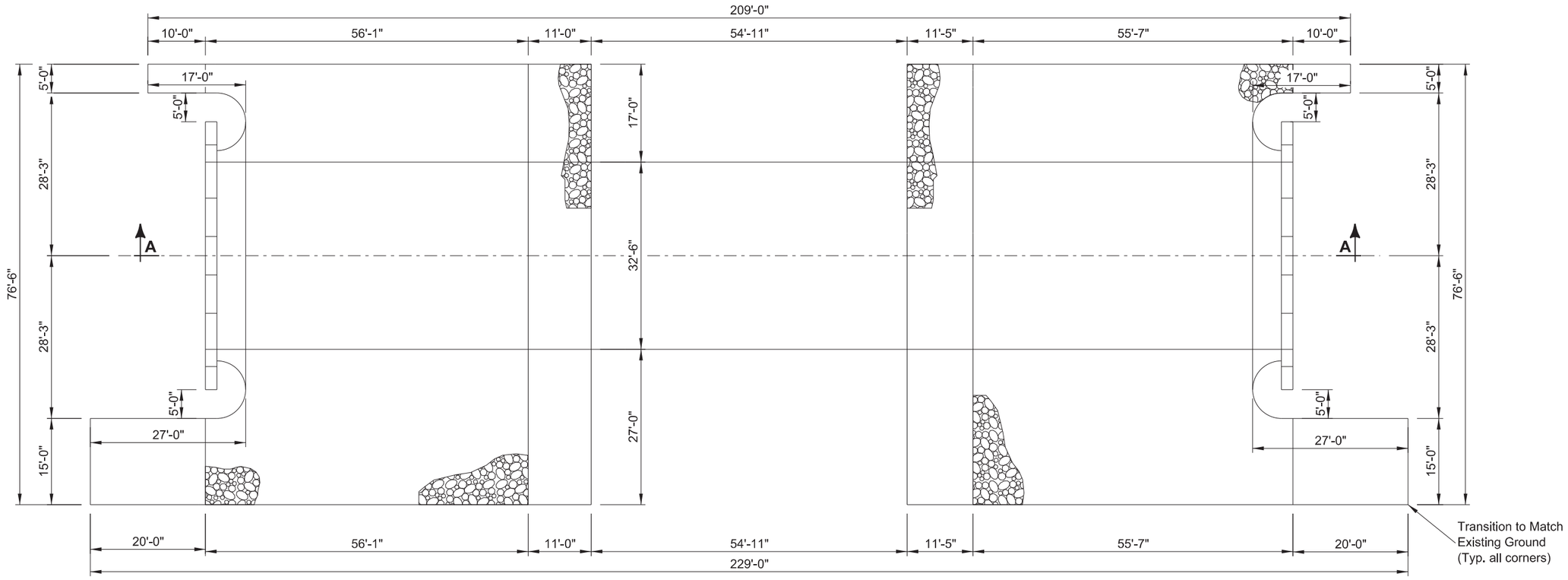
Slope Erosion Control Blanket Installation Details

Bentley Bridge Replacement

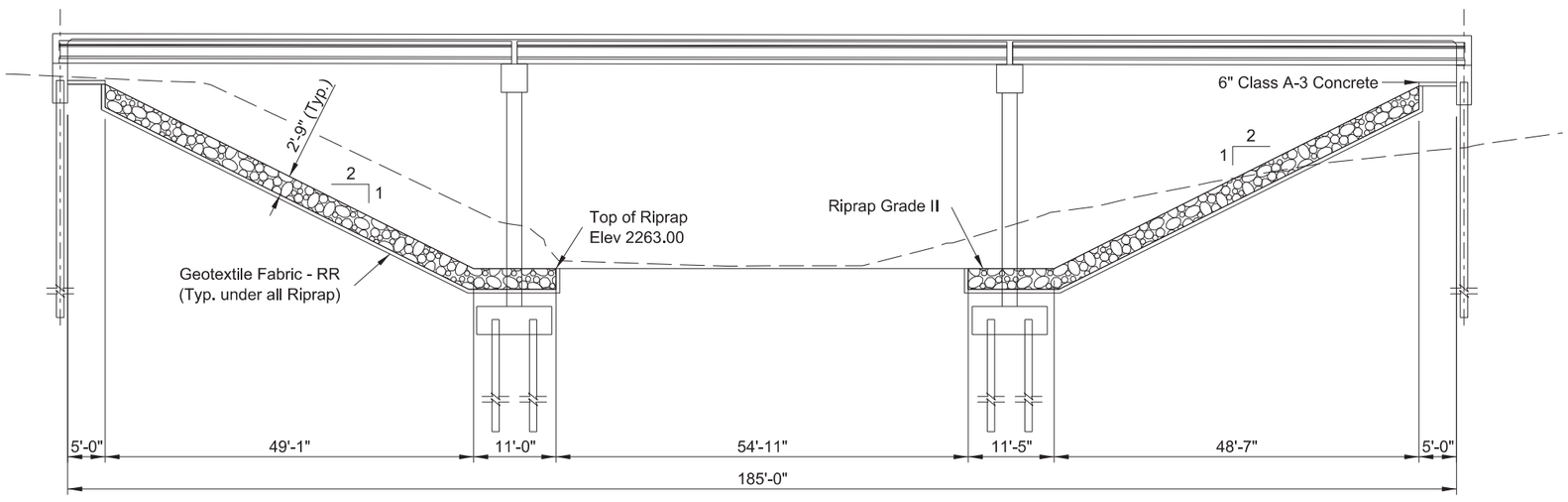
Hettinger County

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	20	4

Scale: 1"= 20.00



Plan



Sec. A-A

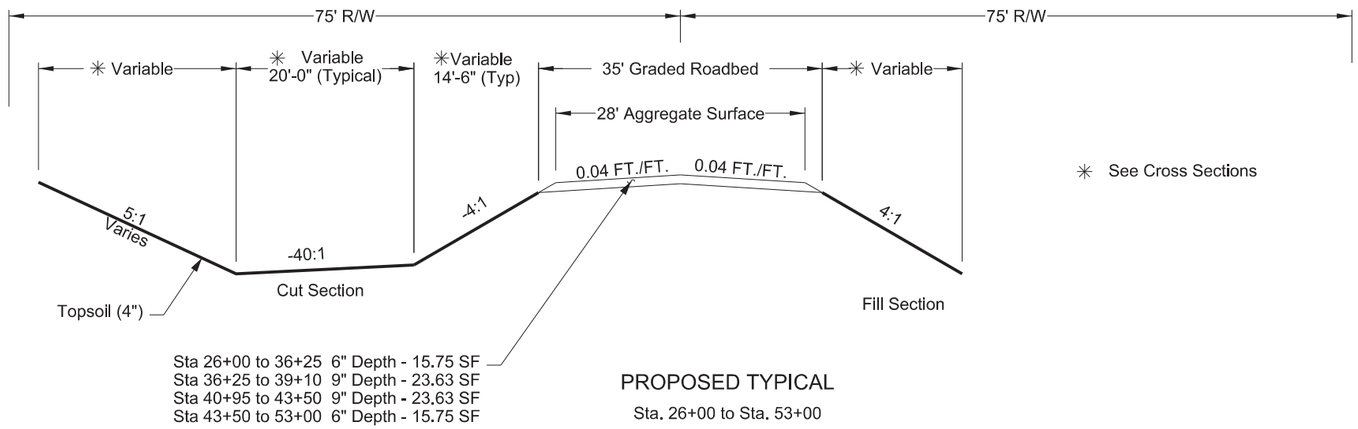
REGISTERED PROFESSIONAL ENGINEER
WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

Riprap Details

Bentley Bridge Replacement

Hettinger County

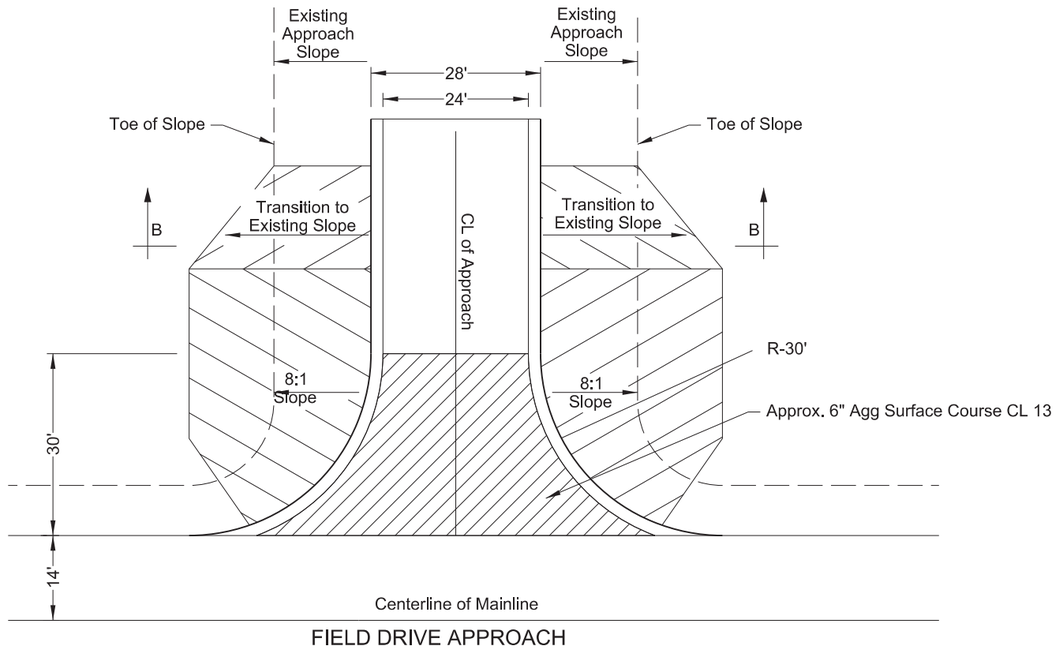
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	30	1



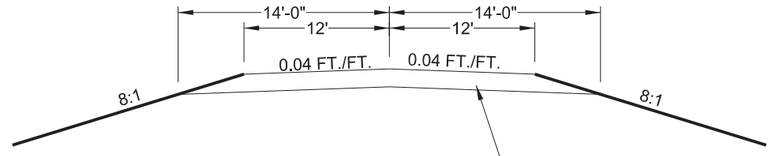
✳ See Cross Sections

PROPOSED TYPICAL

Sta. 26+00 to Sta. 53+00



FIELD DRIVE APPROACH



B-B

6" of Base Course Plus
Salvage Gravel Surfacing
(6" Total Thickness)

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WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

Proposed Typical Sections

Bentley Bridge Replacement

Hettinger County

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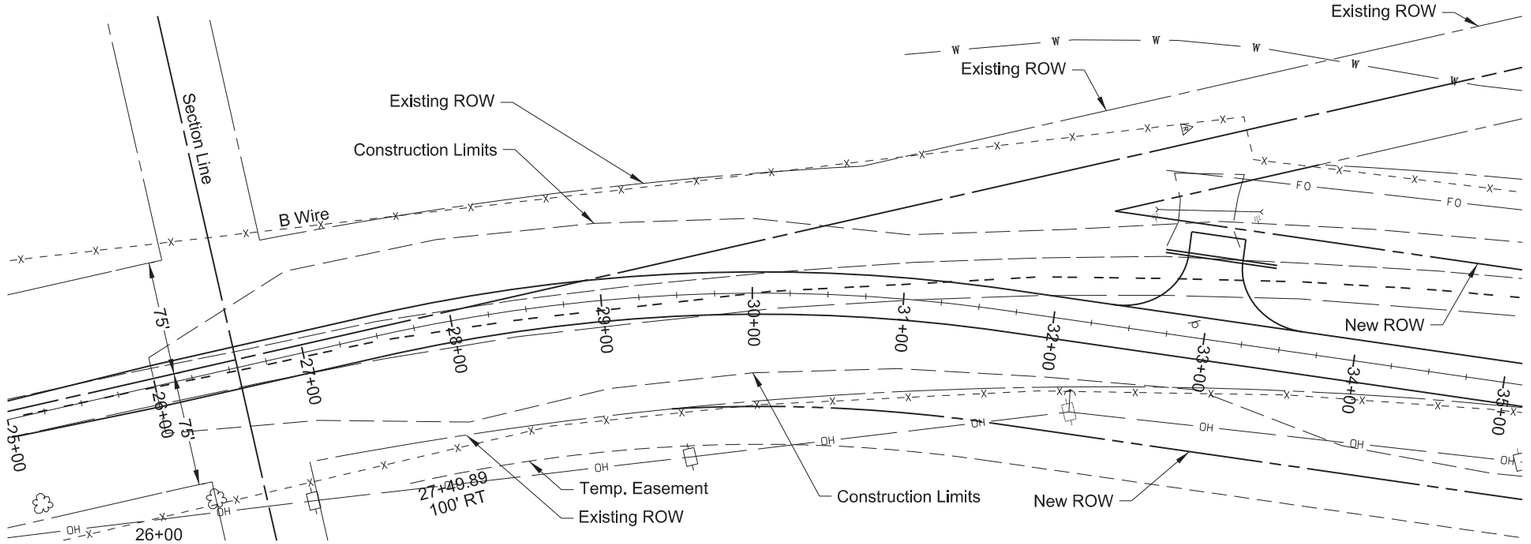
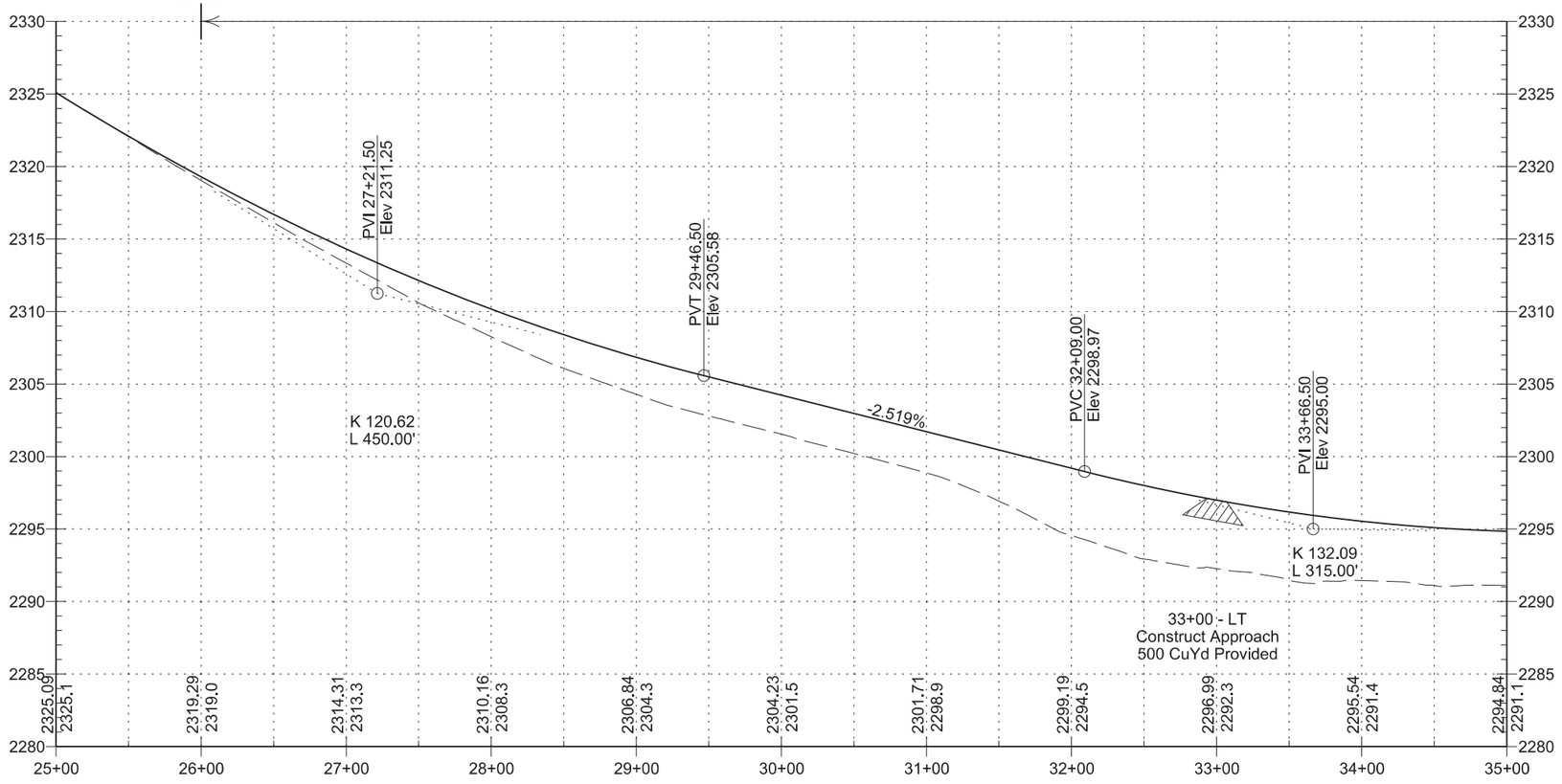
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-2141(001)	60	1

Note: Blend into Existing Road at Sta 25+00

Scale: 1"= 100.00





SPEC	CODE	BID ITEM	QUANTITY	UNIT
202	0174	REMOVAL OF PIPE ALL TYPES AND SIZES		
		32+92 LT	48	LF
203	0180	ROADWAY OBLITERATION		
		28+00 LT to 51+00 LT	2300	LF
714	5015	PIPE CORR STEEL .064IN 18IN		
		33+00 LT	72	LF

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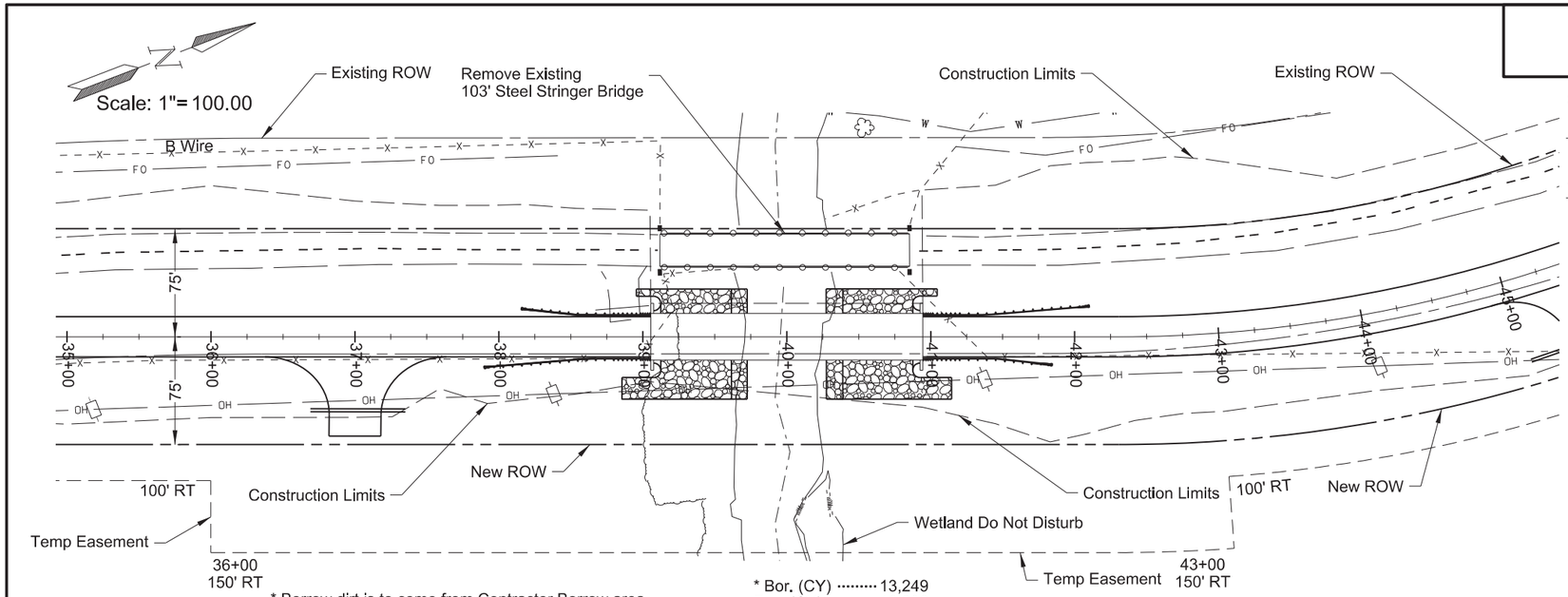
PE-7113
DATE 03/22/2022
NORTH DAKOTA

Plan & Profile
Sta 25+00 to Sta 35+00
Bentley Bridge Replacement

Hettinger County

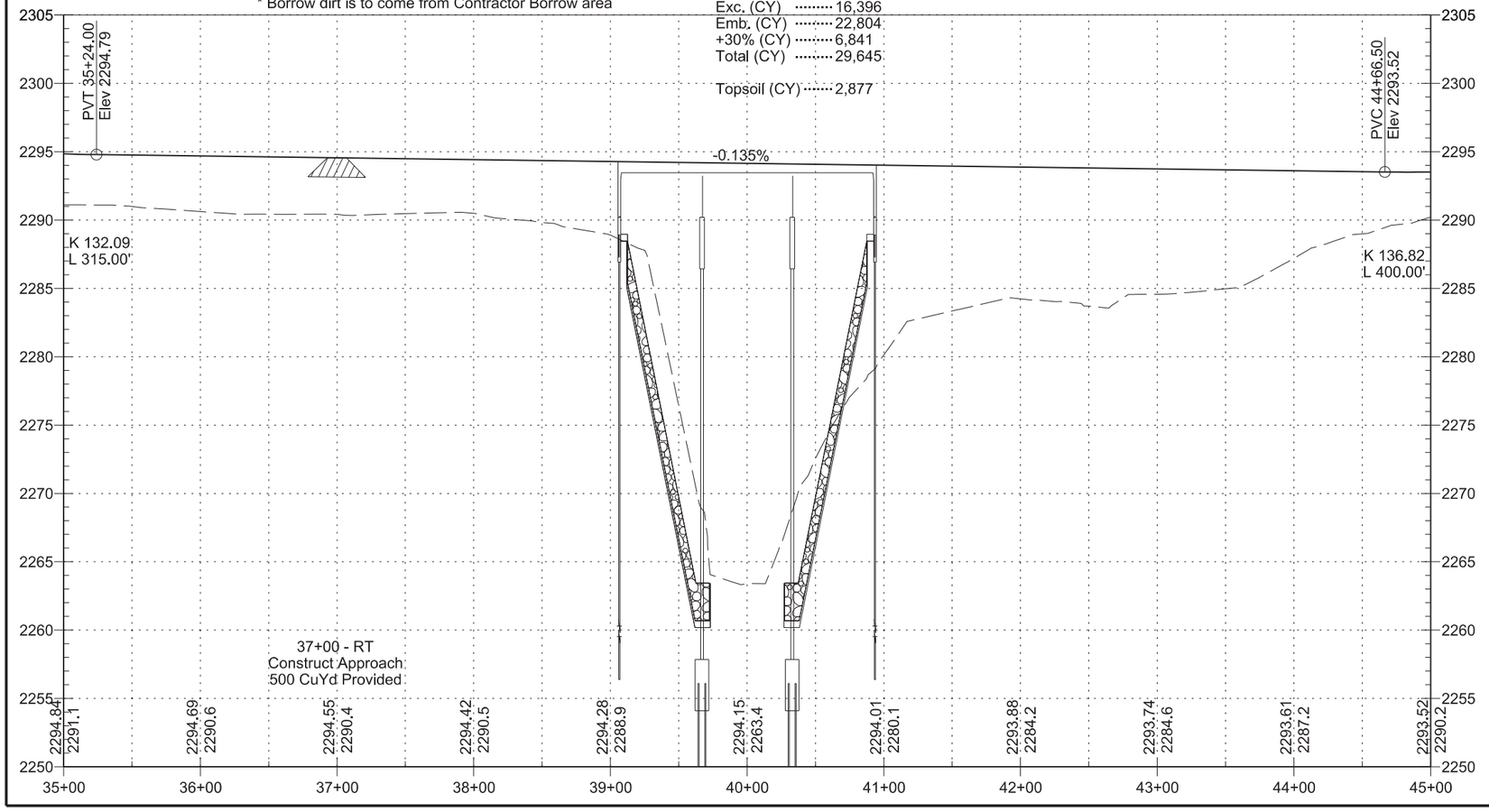
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	60	2

SPEC	CODE	BID ITEM	QUANTITY	UNIT
201	0330	CLEARING & GRUBBING		
		39+25 CL	1	LSUM
714	5015	PIPE CORR STEEL .064IN 18IN		
		37+00 RT	64	LF



* Borrow dirt is to come from Contractor Borrow area

* Bor. (CY)	13,249
Exc. (CY)	16,396
Emb. (CY)	22,804
+30% (CY)	6,841
Total (CY)	29,645
Topsoil (CY)	2,877



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WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

Plan & Profile
Sta 35+00 to Sta 45+00
Bentley Bridge Replacement

Hettinger County

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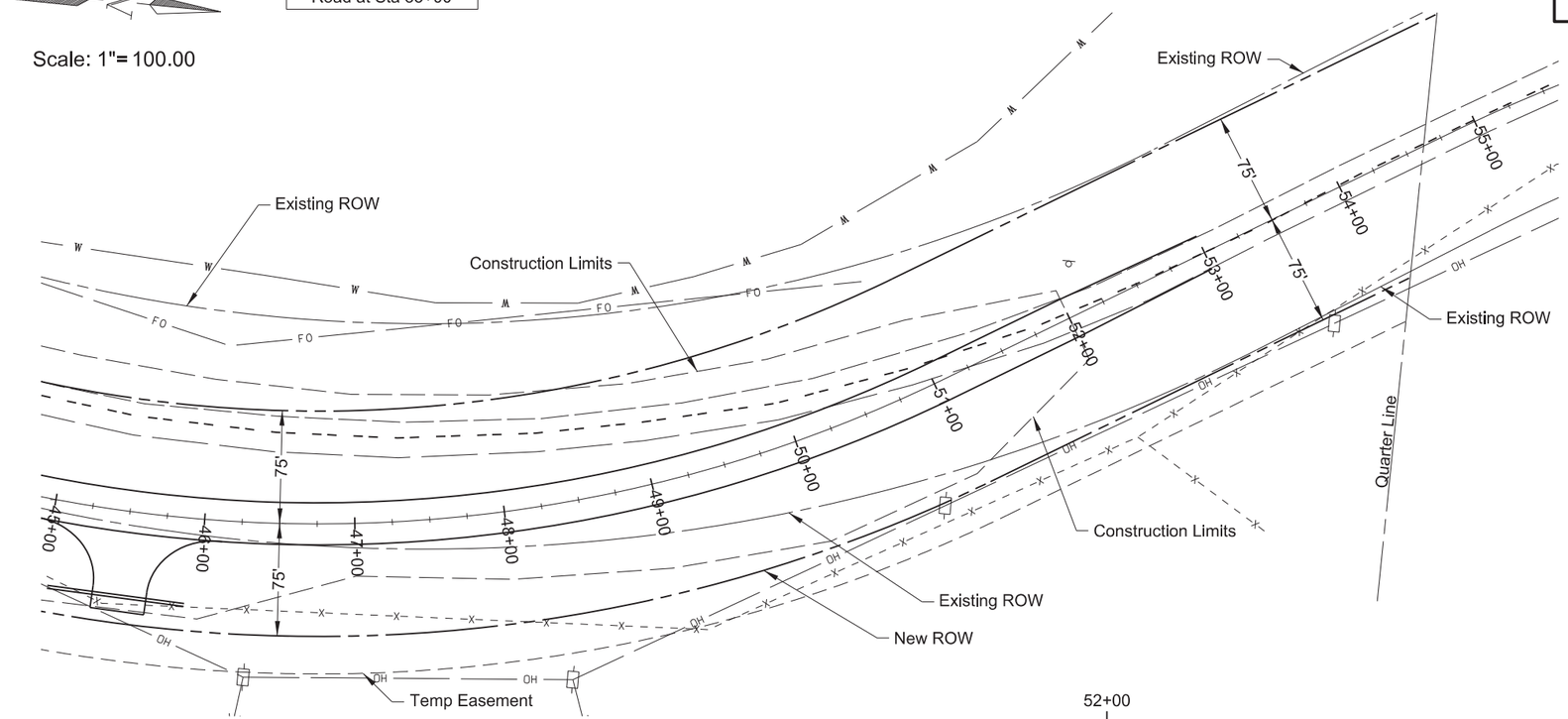
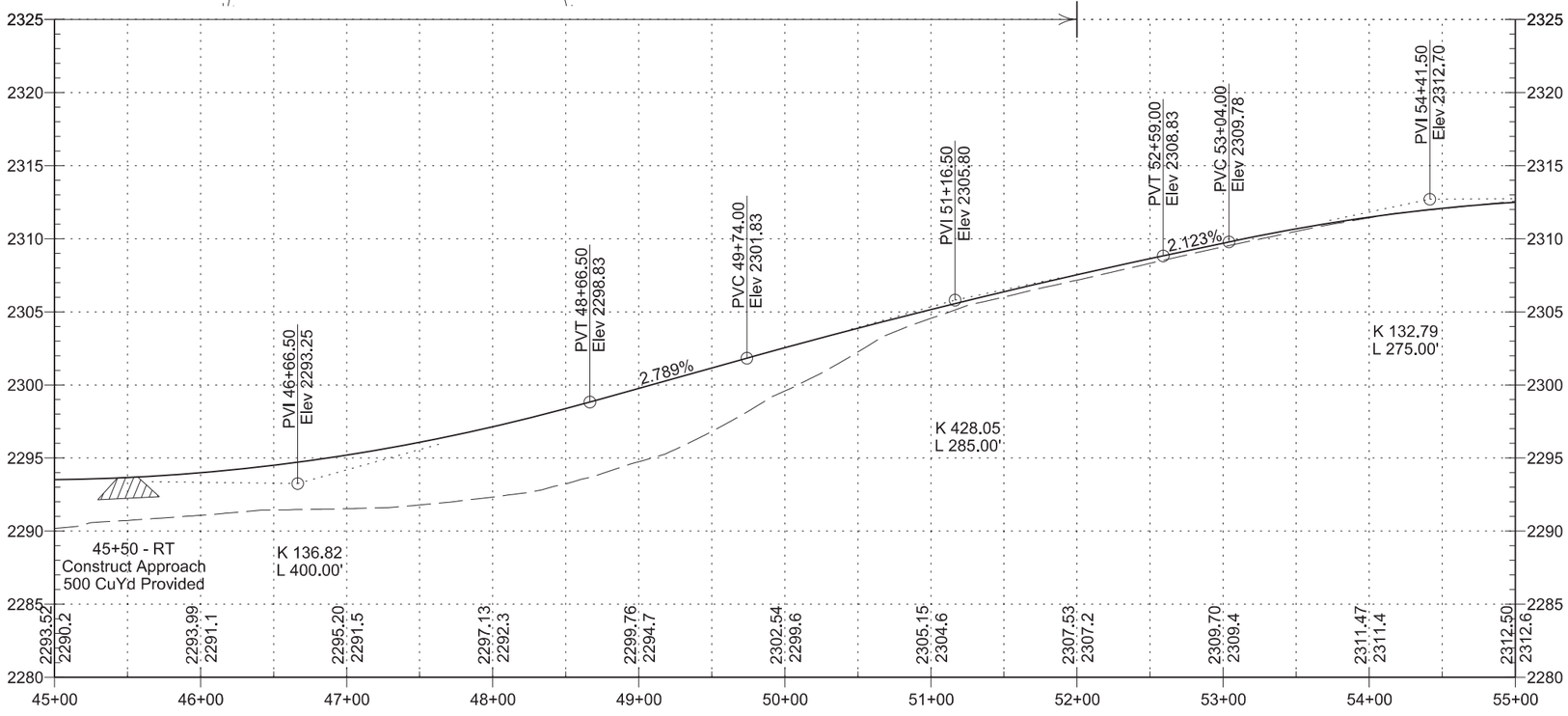
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	60	3

SPEC	CODE	BID ITEM	QUANTITY	UNIT
714	5015	PIPE CORR STEEL .064IN 18IN		
		45+50 RT	92	LF

Note: Blend into Existing Road at Sta 53+00

Scale: 1"= 100.00





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WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

Plan & Profile
Sta 45+00 to Sta 55+00
Bentley Bridge Replacement

Hettinger County

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-2141(001)	75	1

Wetland Impact Table

Wetland Number	Location	Wetland Feature	USACE Jurisdictional Wetlands[1]	Wetland Impacts Acre(s)		USFWS Easement Impacts Acre(s)		Wetland Mitigation											
								Mitigation Required			USACE/11990 Bank		11990 Bank		USFWS Bank		Onsite			
				Temp.	Perm.	Temp.	Perm.	EO 11990	USACE	USFWS	Location	Acre(s)	Location	Acre(s)	Location	Acre(s)	Mitigation Location; Ratio	Acre(s)	Constructed Site #	Constructed Size Acre(s)
1	Sec.12, T133N, R91W	Natural	Yes	0.00	0.00			N	N	N										
2b	Sec. 12, T133N, R91W	Natural	Yes	0.00	0.00			N	N	N										
3	Sec.14, T133N, R91W	Natural	Yes	0.00	0.00			N	N	N										
				0.00	**0.00**	**0.00**	**0.00**					**0.00**		**0.00**		**0.00**		**0.00**		**0.00**

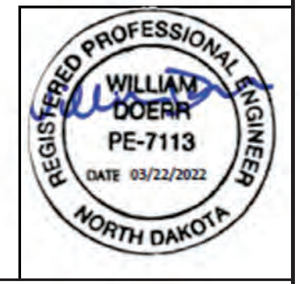
Other Waters Impact Table

Other Waters											Other Water Mitigation				
			Size				Impacts to Other Waters				Mitigation Required				
Number	Location	Type	Acre(s)	Linear Feet	Feature	USACE Jurisdictional[1]	Acre(s) Temp	Acre(s) Perm	Linear Feet Temp	Linear Feet Perm	EO 11990	USACE	USFWS	Mitigation Location; ratio	Method
OW 2a	Sec.12, T133N, R91W	Named Stream	0.70	500	Natural	Yes	0.33	0.01	200.00	76.50	N	N	N	NA	NA
		Totals	**0.70**	**500**			**0.33**	**0.01**	**200.00**	**76.50**					

[1] A wetland Jurisdictional Determination was not performed and thus it is assumed the USACE has jurisdiction; reference NWO-2021-02168-BIS.

[2] 1199 Mitigation requirements – All impacts to natural wetlands (natural/jurisdictional and natural/non-jurisdictional), regardless of size, as well as impacts greater than 0.10 acre to wetlands require mitigation. USACE Mitigation Requirements – All jurisdictional impacts greater than 0.10 acre to each resource (cumulative. eg 1a ,1b,1c..etc.) requires mitigation. Other Water impact greater than 300 linear feet requires mitigation.

[3] 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), and temporary impacts do not require mitigation.



Wetlands Mitigation and Environmental

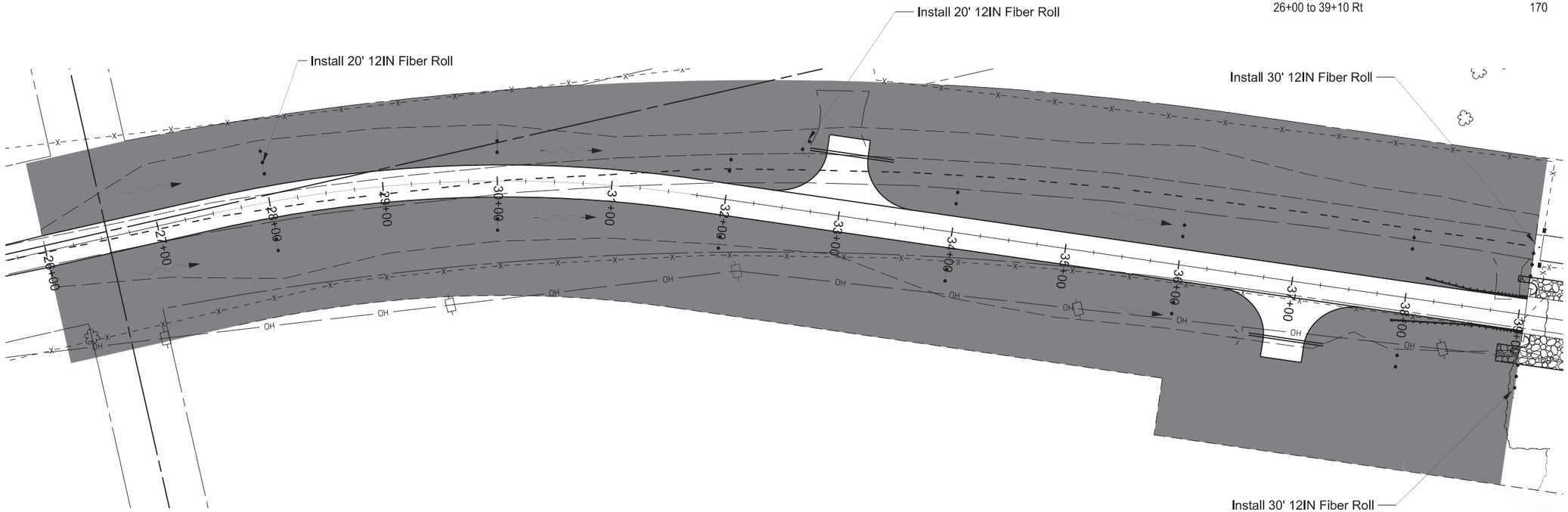
Hettinger County

Bentley Bridge Replacement

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	76	1

Scale: 1"= 100.00

SPEC	CODE	BID ITEM	QUANTITY	UNIT
251	2000	TEMPORARY COVER CROP		
		26+00 to 39+10 Lt	2.78	ACRE
		26+00 to 39+10 Rt	2.82	ACRE
253	0101	STRAW MULCH		
		26+00 to 39+10 Lt	2.78	ACRE
		26+00 to 39+10 Rt	2.82	ACRE
261	0112	FIBER ROLL 12IN		
		26+00 to 39+10 Lt	170	LF
		26+00 to 39+10 Rt	170	LF
261	0113	REMOVE FIBER ROLLS 12IN		
		26+00 to 39+10 Lt	170	LF
		26+00 to 39+10 Rt	170	LF



REGISTERED PROFESSIONAL ENGINEER
WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

LEGEND

- Flow Direction
- 12IN Fiber Roll
- Silt Fence
- Flotation Silt Curtain
- Seeding/Mulch Area

Temporary Erosion Control
Sta 25+00 to Sta 39+10
Bentley Bridge Replacement

Hettinger County

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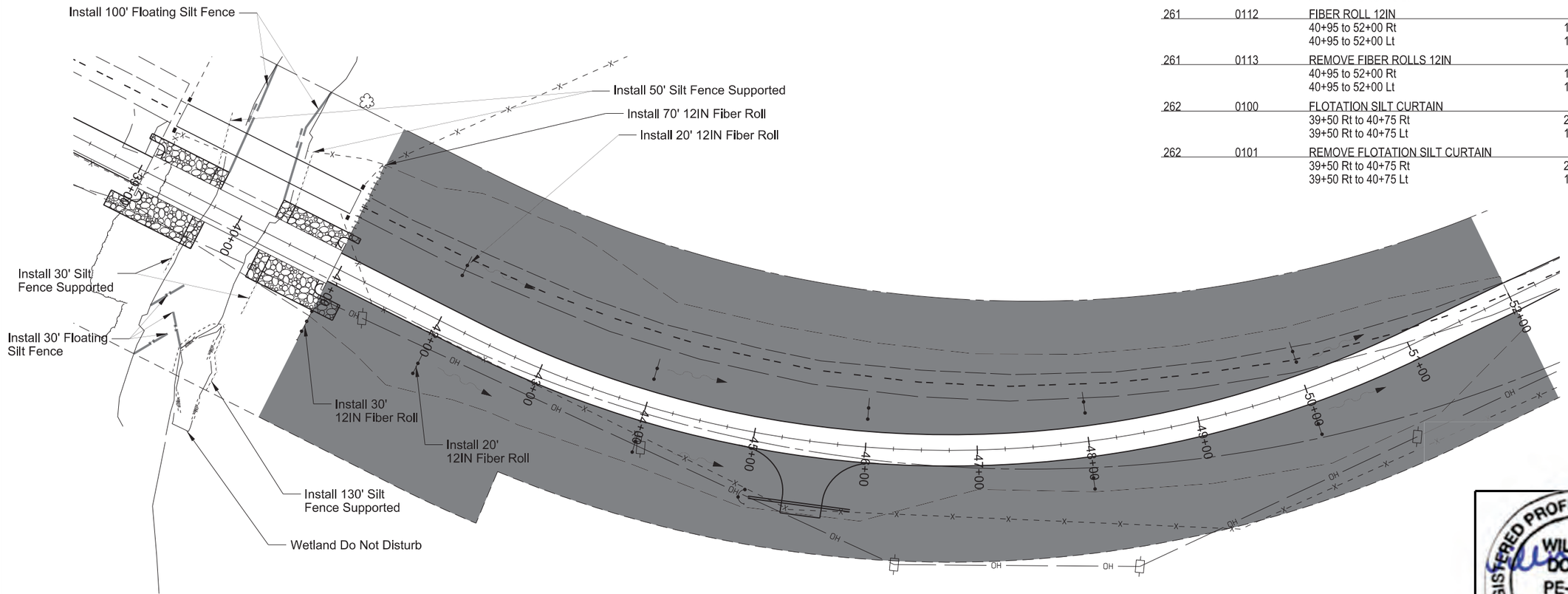
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	76	2

Scale: 1"= 100.00



SPEC	CODE	BID ITEM	QUANTITY	UNIT
251	2000	TEMPORARY COVER CROP		
		40+95 to 52+00 Lt	2.67	ACRE
		40+95 to 52+00 Rt	2.53	ACRE
253	0101	STRAW MULCH		
		40+95 to 52+00 Lt	2.67	ACRE
		40+95 to 52+00 Rt	2.53	ACRE
260	0200	SILT FENCE SUPPORTED		
		39+50 Rt to 40+75 Rt	60	LF
		39+50 Rt to 40+75 Lt	100	LF
260	0201	REMOVE SILT FENCE SUPPORTED		
		39+50 Rt to 40+75 Rt	60	LF
		39+50 Rt to 40+75 Lt	100	LF
261	0112	FIBER ROLL 12IN		
		40+95 to 52+00 Rt	170	LF
		40+95 to 52+00 Lt	130	LF
261	0113	REMOVE FIBER ROLLS 12IN		
		40+95 to 52+00 Rt	170	LF
		40+95 to 52+00 Lt	130	LF
262	0100	FLOTATION SILT CURTAIN		
		39+50 Rt to 40+75 Rt	200	LF
		39+50 Rt to 40+75 Lt	130	LF
262	0101	REMOVE FLOTATION SILT CURTAIN		
		39+50 Rt to 40+75 Rt	200	LF
		39+50 Rt to 40+75 Lt	130	LF

LEGEND

- Flow Direction
- 12IN Fiber Roll
- Silt Fence
- Flotation Silt Curtain
- Seeding/Mulch Area

REGISTERED PROFESSIONAL ENGINEER
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PE-7113
DATE 03/22/2022
NORTH DAKOTA

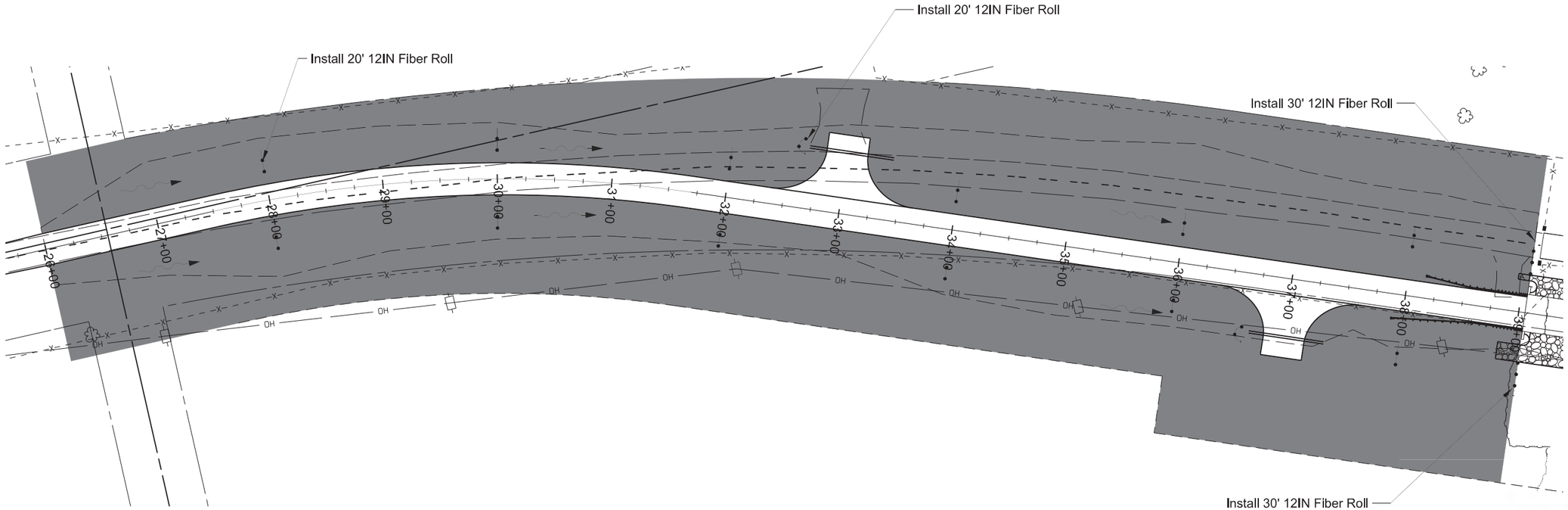
Temporary Erosion Control
Sta 39+10 to Sta 52+00
Bentley Bridge Replacement

Hettinger County

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	77	1

Scale: 1"= 100.00

SPEC	CODE	BID ITEM	QUANTITY	UNIT
251	0200	SEEDING CLASS II		
		26+00 to 39+10 Lt	2.78	ACRE
		26+00 to 39+10 Rt	2.82	ACRE
253	0101	STRAW MULCH		
		26+00 to 39+10 Lt	2.78	ACRE
		26+00 to 39+10 Rt	2.82	ACRE
261	0112	FIBER ROLL 12IN		
		26+00 to 39+10 Rt	170	LF
		26+00 to 39+10 Lt	170	LF



REGISTERED PROFESSIONAL ENGINEER
WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

LEGEND

- Flow Direction
- 12IN Fiber Roll
- ECB
- Seeding/Mulch Area

Permanent Erosion Control
Sta 25+00 to Sta 39+10
Bentley Bridge Replacement

Hettinger County

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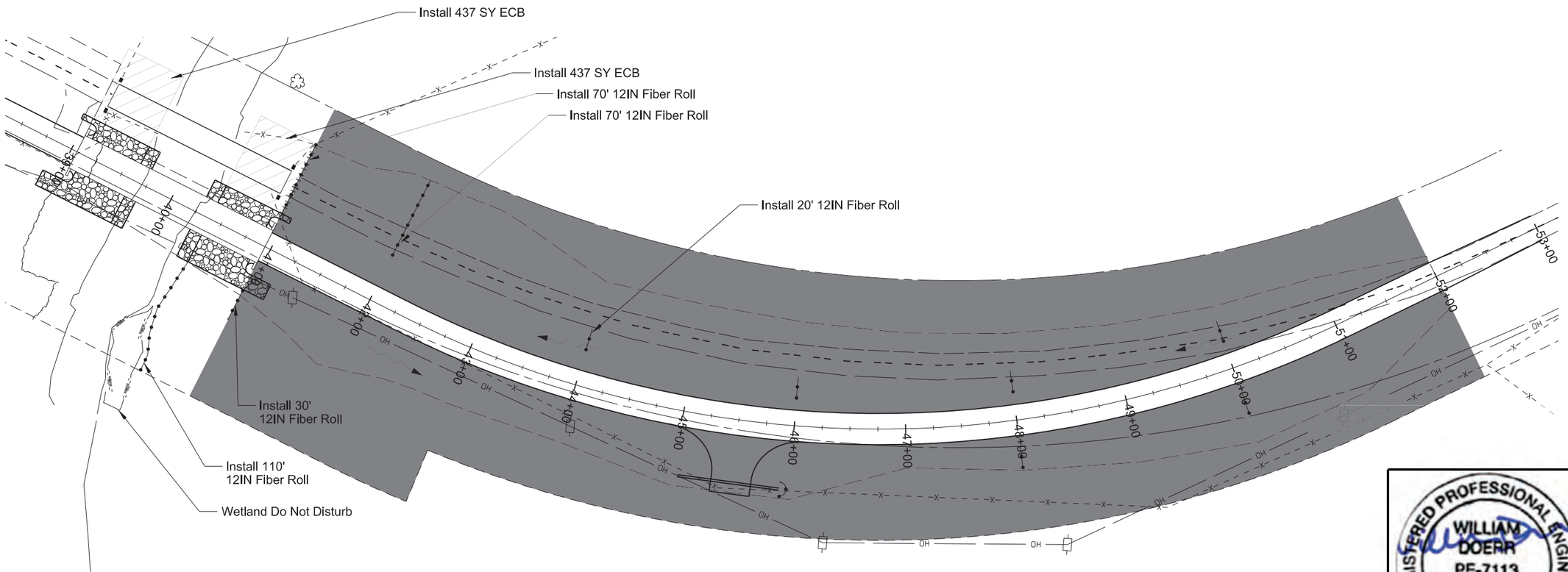
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	77	2

Scale: 1"= 100.00

SPEC	CODE	BID ITEM	QUANTITY	UNIT
251	0200	SEEDING CLASS II		
		40+95 to 52+00 Lt	2.67	ACRE
		40+95 to 52+00 Rt	2.53	ACRE
253	0101	STRAW MULCH		
		40+95 to 52+00 Lt	2.67	ACRE
		40+95 to 52+00 Rt	2.53	ACRE
255	0101	ECB TYPE 1		
		39+06 to 39+63 Lt	437	SY
		40+39 to 40+96 Lt	437	SY
261	0112	FIBER ROLL 12IN		
		40+95 to 52+00 Rt	170	LF
		40+95 to 52+00 Lt	240	LF



REGISTERED PROFESSIONAL ENGINEER
WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

LEGEND

- Flow Direction
- 12IN Fiber Roll
- ECB
- Seeding/Mulch Area

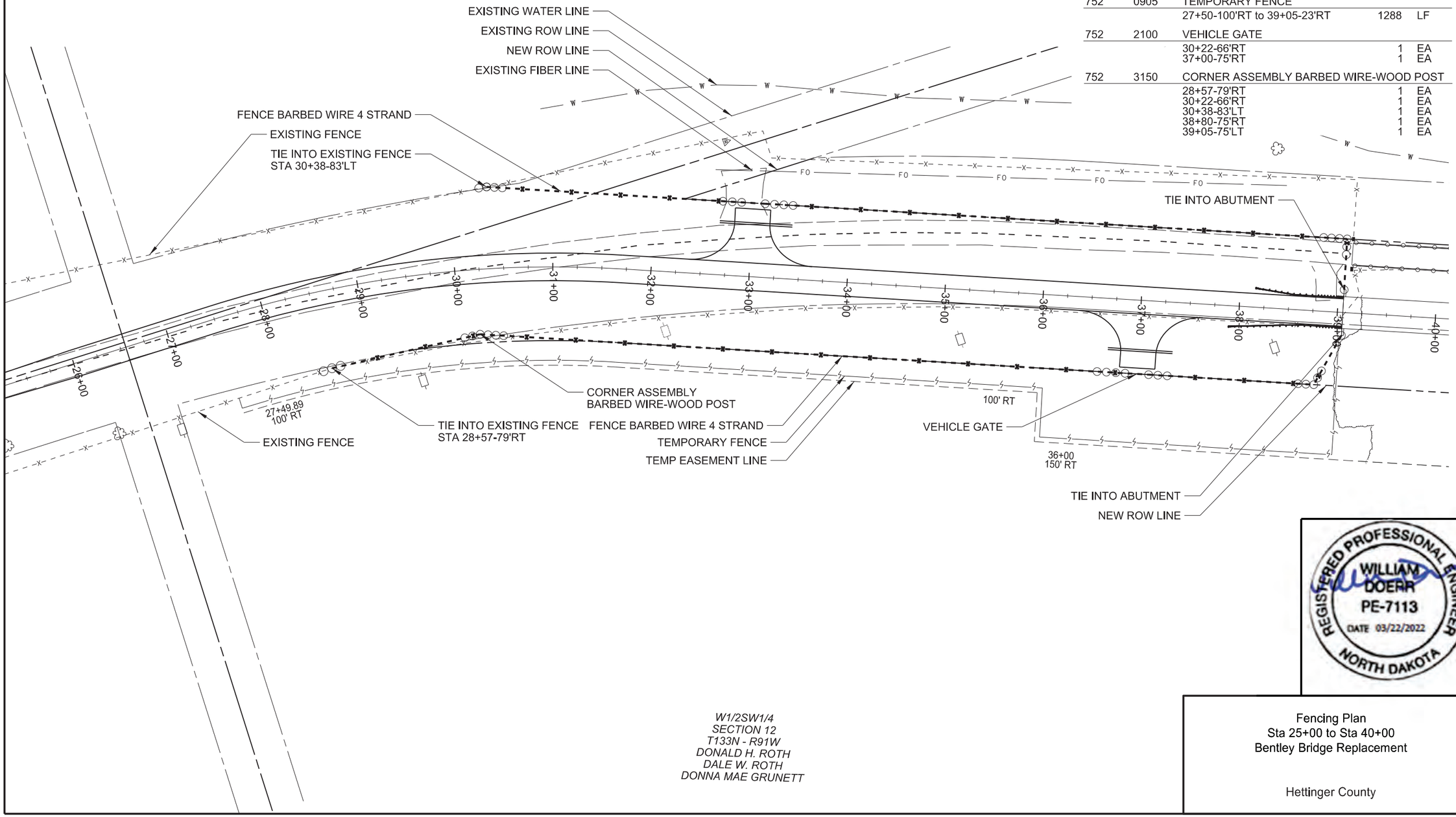
Permanent Erosion Control
Sta 39+10 to Sta 52+00
Bentley Bridge Replacement

Hettinger County

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	80	1

Scale: 1"= 100.00

SPEC	CODE	BID ITEM	QUANTITY	UNIT
202	0312	REMOVAL EXISTING FENCE		
		28+57-79'RT to 39+00-CL	1190	LF
		30+37-83'RT to 39+12-78'LT	970	LF
752	0200	FENCE BARBED WIRE 4 STRAND		
		28+57-79'RT to 39+05-23'RT	1062	LF
		30+37-83'LT to 39+05-23'LT	929	LF
752	0905	TEMPORARY FENCE		
		27+50-100'RT to 39+05-23'RT	1288	LF
752	2100	VEHICLE GATE		
		30+22-66'RT	1	EA
		37+00-75'RT	1	EA
752	3150	CORNER ASSEMBLY BARBED WIRE-WOOD POST		
		28+57-79'RT	1	EA
		30+22-66'RT	1	EA
		30+38-83'LT	1	EA
		38+80-75'RT	1	EA
		39+05-75'LT	1	EA



W1/2SW1/2
SECTION 12
T133N - R91W
DONALD H. ROTH
DALE W. ROTH
DONNA MAE GRUNETT

REGISTERED PROFESSIONAL ENGINEER
WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

Fencing Plan
Sta 25+00 to Sta 40+00
Bentley Bridge Replacement

Hettinger County

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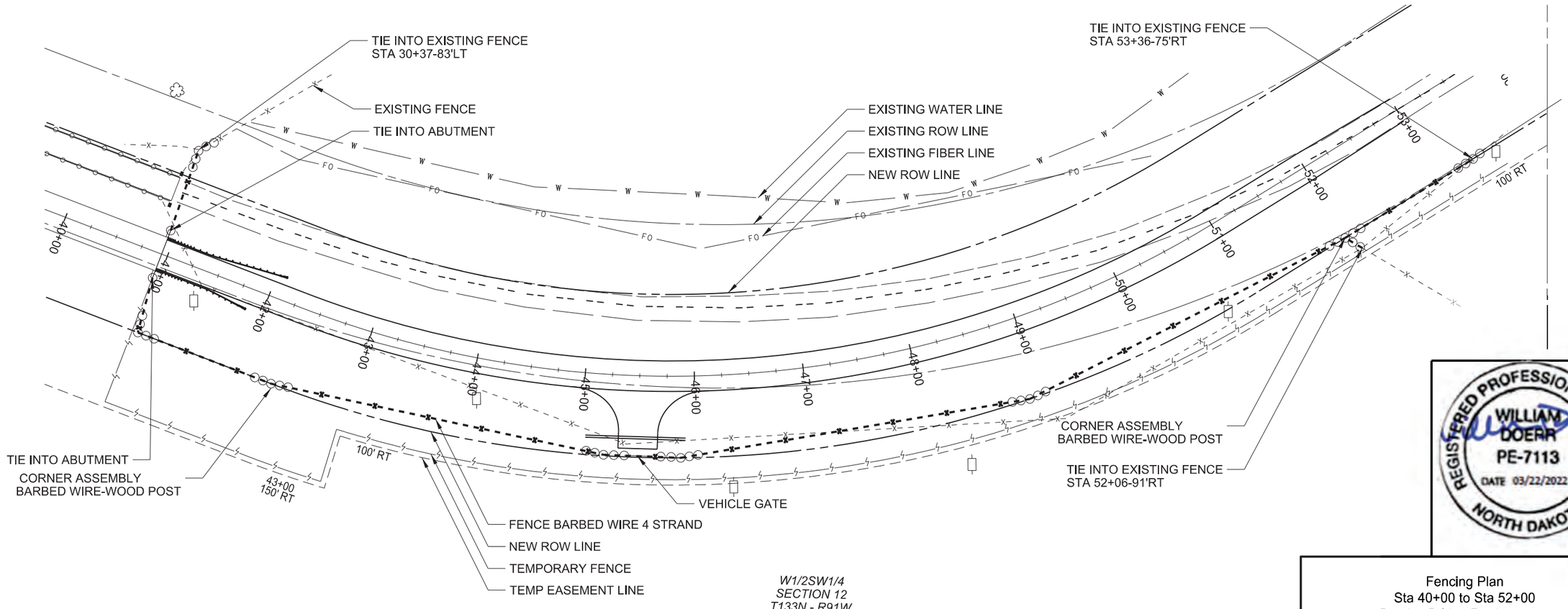
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	80	2

Scale: 1"= 100.00

SPEC	CODE	BID ITEM	QUANTITY	UNIT
202	0312	REMOVAL EXISTING FENCE		
		40+27-82'RT to 40+92-101'LT	92	LF
		40+78-45'LT to 53+36-75'RT	1350	LF
752	0200	FENCE BARBED WIRE 4 STRAND		
		40+92-101'LT to 40+93-23'LT	78	LF
		40+93-23'RT to 53+36-75'RT	1354	LF
752	0905	TEMPORARY FENCE		
		40+94-23'LT to 54+00-100'RT	1570	LF
752	2100	VEHICLE GATE		
		45+50-75'RT	1	EA
752	3150	CORNER ASSEMBLY BARBED WIRE-WOOD POST		
		40+92-101'LT	1	EA
		41+00-75'RT	1	EA
		42+31-75'RT	1	EA
		48+90-75'RT	1	EA
		52+00-75'RT	1	EA
		53+36-75'RT	1	EA



W1/2SW1/2
SECTION 12
T133N - R91W
DONALD H. ROTH
DALE W. ROTH
DONNA MAE GRUNETT

REGISTERED PROFESSIONAL ENGINEER
WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

Fencing Plan
Sta 40+00 to Sta 52+00
Bentley Bridge Replacement

Hettinger County

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	82	1

Project Name: Bentley Bridge Replacement
Description: Proposed Horizontal Alignment
Horizontal Alignment Name: 2011 Horizontal

	STATION	NORTHING	EASTING
Element: Linear			
POB ( )	0+16.50	247442.03	1572397.40
PI ( )	19+72.07	249397.36	1572428.24
Tangent Direction:	N 0^54'13" E		
Tangent Length:	1955.57		
Element: Linear			
PI ( )	19+72.07	249397.36	1572428.24
PC ( )	27+49.89	250175.10	1572438.86
Tangent Direction:	N 0^46'57" E		
Tangent Length:	777.82		
Element: Circular			
PC ( )	27+49.89	250175.10	1572438.86
PI ( )	29+62.20	250387.39	1572441.76
CC ( )		250159.45	1573584.67
PT ( )	31+69.75	250584.55	1572520.52
Radius:	1145.92		
Design Speed(mph):	50.00		
Superelevation:	3.900%		
Delta:	20^59'34" Right		
Degree of Curve(Arc):	5^00'00"		
Length:	419.85		
Tangent:	212.31		
Chord:	417.51		
Middle Ordinate:	19.18		
External:	19.50		
Tangent Direction:	N 0^46'57" E		
Radial Direction:	S 89^13'03" E		
Chord Direction:	N 11^16'44" E		
Radial Direction:	S 68^13'29" E		
Tangent Direction:	N 21^46'31" E		
Element: Linear			
PT ( )	31+69.75	250584.55	1572520.52
PC ( )	42+30.75	251569.85	1572914.12
Tangent Direction:	N 21^46'31" E		
Tangent Length:	1061.00		
Element: Circular			
PC ( )	42+30.75	251569.85	1572914.12
PI ( )	47+01.71	252007.20	1573088.83
CC ( )		251922.27	1572031.91
PT ( )	51+05.21	252411.05	1572846.52
Radius:	950.00		
Design Speed(mph):	50.00		
Superelevation:	-4.000%		
Delta:	52^44'23" Left		
Degree of Curve(Arc):	6^01'52"		
Length:	874.46		
Tangent:	470.96		
Chord:	843.91		
Middle Ordinate:	98.85		
External:	110.33		
Tangent Direction:	N 21^46'31" E		
Radial Direction:	S 68^13'29" E		
Chord Direction:	N 4^35'40" W		
Radial Direction:	N 59^02'08" E		
Tangent Direction:	N 30^57'52" W		
Element: Linear			
PT ( )	51+05.21	252411.05	1572846.52
PC ( )	54+78.85	252731.44	1572654.28
Tangent Direction:	N 30^57'52" W		
Tangent Length:	373.64		

Control Point	Northing	Easting	Elevation
1	250726.29	1572431.23	2295.27
2	249006.74	1572490.49	2361.60
3	252944.20	1572468.76	2314.00
4	251957.18	1573036.59	2290.71

Survey Calibration	
Vertical Datum	NAVD 88
Geoid Model	Geoid 18 (Conus)
Vertical Units	International Feet
Coordinate System	US State Plane NAD 1983
Zone	North Dakota South 3302
Horizontal Units	International Feet
Ground Scale Factor	1 (Grid Coordinates)

REGISTERED PROFESSIONAL ENGINEER
WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

Proposed Horizontal Alignment Description

Bentley Bridge Replacement

Hettinger County

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-2141(001)	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
E5-1-48	48"x48"	EXIT GORE		35	
G20-1-60	60"x24"	ROAD WORK NEXT __ MILES		28	
G20-1b-60	60"x24"	NO WORK IN PROGRESS (Sign and installation only)		18	
G20-2-48	**48"x24"**	**END ROAD WORK**	**2**	**26**	**52**
G20-4-36	36"x18"	PILOT CAR FOLLOW ME (Mounted to back of pilot car)		18	
G20-10-108	108"x48"	CONTRACTOR SIGN		70	
G20-50a-72	72"x36"	ROAD WORK NEXT __ MILES RT & LT ARROWS		43	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW		36	
G20-55-96	96"x48"	SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT		59	
I2-5-96	**96"x48"**	**YOUR HIGHWAY DOLLARS AT WORK**	**2**	**59**	**118**
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)		10	
M1-4-24	24"x24"	U.S. ROUTE MARKER (Post and installation only)		10	
M1-5-24	24"x24"	STATE ROUTE MARKER (Post and installation only)		10	
M3-1-24	24"x12"	NORTH (Mounted on route marker post)		7	
M3-2-24	24"x12"	EAST (Mounted on route marker post)		7	
M3-3-24	24"x12"	SOUTH (Mounted on route marker post)		7	
M3-4-24	24"x12"	WEST (Mounted on route marker post)		7	
M4-8-24	24"x12"	DETOUR (Mounted on route marker post)		7	
M4-9-30	30"x24"	DETOUR ARROW RIGHT or LEFT/AHD AND RT or LT		15	
M4-10-48	48"x18"	DETOUR (INSIDE ARROW) RIGHT or LEFT (Mounted on barricade)		7	
M5-1-21	21"x15"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)		7	
M5-1-30	30"x21"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)		9	
M6-1-21	21"x15"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)		7	
M6-1-30	30"x21"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)		9	
M6-3-21	21"x15"	DIRECTIONAL ARROW UP (Mounted on route marker post)		7	
R1-1-48	48"x48"	STOP		32	
R1-2-60	60"x60"	YIELD		29	
R2-1-36	36"x48"	SPEED LIMIT __ (Portable only)		30	
R2-1-48	48"x60"	SPEED LIMIT __		39	
R2-1aP-24	24"x18"	MINIMUM FEE $80 (Mounted on Speed Limit post)		10	
R3-2-48	48"x48"	NO LEFT TURN		35	
R4-1-48	48"x60"	DO NOT PASS		39	
R4-7-48	48"x60"	KEEP RIGHT		39	
R5-1-48	48"x48"	DO NOT ENTER		35	
R6-1-54	54"x18"	ONE WAY RIGHT or LEFT (Mounted on STOP or DO NOT ENTER post)		14	
R7-1-12	12"x18"	NO PARKING ANY TIME		11	
R10-6-24	24"x36"	STOP HERE ON RED		16	
R11-2-48	**48"x30"**	**ROAD CLOSED (Mounted on barricade)**	**2**	**12**	**24**
R11-2a-48	48"x30"	STREET CLOSED (Mounted on barricade)		12	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC (Mounted on barricade)		15	
W1-3-48	48"x48"	REVERSE TURN RIGHT or LEFT		35	
W1-4-48	**48"x48"**	**REVERSE CURVE RIGHT or LEFT**	**2**	**35**	**70**
W1-4b-48	48"x48"	TWO LANE REVERSE CURVE RIGHT or LEFT		35	
W1-6-48	**48"x24"**	**ONE DIRECTION LARGE ARROW**	**2**	**26**	**52**
W3-1-48	48"x48"	STOP AHEAD		35	
W3-3-48	48"x48"	SIGNAL AHEAD		35	
W3-4-48	**48"x48"**	**BE PREPARED TO STOP**	**2**	**35**	**70**
W3-5-48	48"x48"	SPEED REDUCTION AHEAD		35	
W4-2-48	48"x48"	LANE ENDS RIGHT or LEFT		35	
W5-1-48	48"x48"	ROAD NARROWS		35	
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE		35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW		35	
W6-3-48	48"x48"	TWO WAY TRAFFIC		35	
W8-1-48	**48"x48"**	**BUMP**	**2**	**35**	**70**
W8-3-48	48"x48"	PAVEMENT ENDS		35	
W8-7-48	48"x48"	LOOSE GRAVEL		35	
W8-11-48	48"x48"	UNEVEN LANES		35	
W8-12-48	48"x48"	NO CENTER LINE		35	
W8-17-48	48"x48"	SHOULDER DROP-OFF SYMBOL		35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY		35	
W8-54-48	**48"x48"**	**TRUCKS ENTERING AHEAD or __ FT or _ MILE**	**2**	**35**	**70**
W8-55-48	48"x48"	TRUCKS CROSSING AHEAD or __ FT or _ MILE		35	
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY		35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL		35	
W13-1P-30	**30"x30"**	**__ MPH ADVISORY SPEED PLAQUE (Mounted on warning sign post)**	**2**	**14**	**28**
W14-3-64	64"x48"	NO PASSING ZONE		28	
W16-2P-30	30"x24"	__ FEET PLAQUE (Mounted on warning sign post)		10	
W20-1-48	**48"x48"**	**ROAD WORK AHEAD or _FT or _ MILE**	**6**	**35**	**210**
W20-2-48	48"x48"	DETOUR AHEAD or __ FT or _ MILE		35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or __ FT or _ MILE		35	
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or __ FT or _ MILE		35	
W20-5-48	48"x48"	RIGHT or CENTER or LEFT LANE CLOSED AHEAD or __ FT or _ MILE		35	
W20-7-48	**48"x48"**	**FLAGGER**	**2**	**35**	**70**
W20-8-18	**18"x18"**	**STOP - SLOW PADDLE Back to Back**	**2**	**5**	**10**
W20-52P-54	54"x12"	NEXT __ MILES (Mounted on warning sign post)		12	
W21-1-48	48"x48"	WORKERS		35	
W21-2-48	48"x48"	FRESH OIL		35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT or _ MILE		35	
W21-5-48	48"x48"	SHOULDER WORK		35	
W21-5a-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED		35	
W21-5b-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT or _ MILE		35	
W21-6-48	48"x48"	SURVEY CREW		35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT		35	
W21-51-48	**48"x48"**	**MATERIAL ON ROADWAY**	**2**	**35**	**70**
W21-52-48	48"x48"	PAVEMENT BREAKS		35	
W21-53-48	48"x48"	RUMBLE STRIPS AHEAD		35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK		35	

SPECIAL SIGNS

SPEC & CODE

704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS**	**914**

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	FLAGGING	MHR	
704-1048	PORTABLE RUMBLE STRIPS	EACH	
704-1050	TYPE I BARRICADES	EACH	
704-1052	**TYPE III BARRICADES**	**EACH**	**6**
704-1060	DELINEATOR DRUMS	EACH	
704-1065	TRAFFIC CONES	EACH	
704-1067	TUBULAR MARKERS	EACH	
704-1070	DELINEATOR	EACH	
704-1072	FLEXIBLE DELINEATORS	EACH	
704-1080	**STACKABLE VERTICAL PANELS**	**EACH**	**16**
704-1081	**VERTICAL PANELS - BACK TO BACK**	**EACH**	**10**
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH	
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH	
704-1087	SEQUENCING ARROW PANEL - TYPE C	EACH	
704-1500	OBLITERATION OF PVMT MK	SF	
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF	
704-3510	PRECAST CONCRETE MED BARRIER - STATE FURNISHED	EACH	
762-0200	RAISED PAVEMENT MARKERS	EACH	
762-0420	SHORT TERM 4IN LINE - TYPE R	LF	
762-0430	SHORT TERM 4IN LINE - TYPE NR	LF	

NOTE:
If additional signs are required, units will be calculated using the formula from Section III-18.06 of the Design Manual.
http://www.dot.nd.gov/

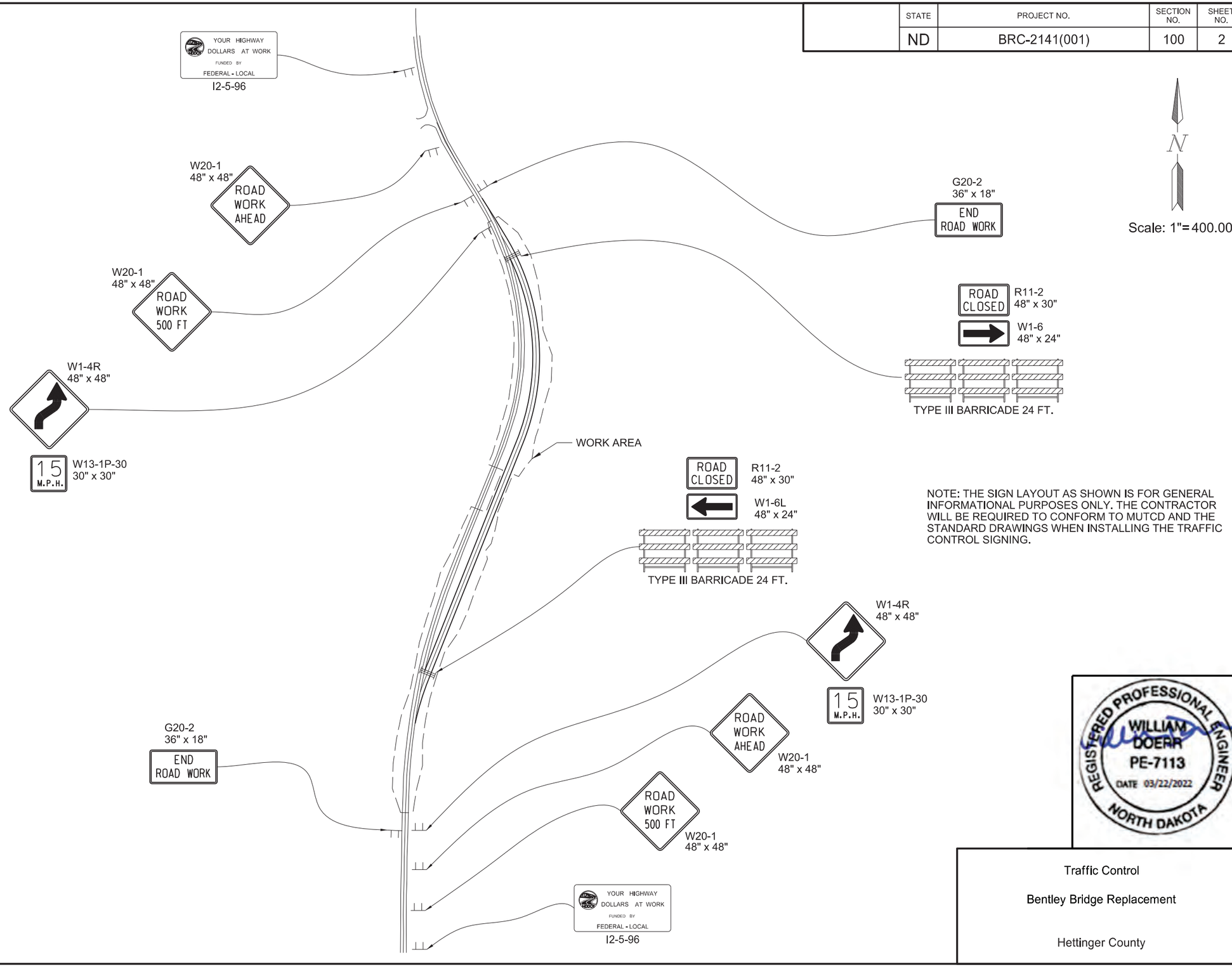
REGISTERED PROFESSIONAL ENGINEER
WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

Traffic Control Devices List

Bentley Bridge Replacement

Hettinger County

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	100	2



N

Scale: 1"=400.00

NOTE: THE SIGN LAYOUT AS SHOWN IS FOR GENERAL INFORMATIONAL PURPOSES ONLY. THE CONTRACTOR WILL BE REQUIRED TO CONFORM TO MUTCD AND THE STANDARD DRAWINGS WHEN INSTALLING THE TRAFFIC CONTROL SIGNING.

REGISTERED PROFESSIONAL ENGINEER
WILLIAM DOERR
PE-7113
DATE 03/22/2022
NORTH DAKOTA

Traffic Control

Bentley Bridge Replacement

Hettinger County

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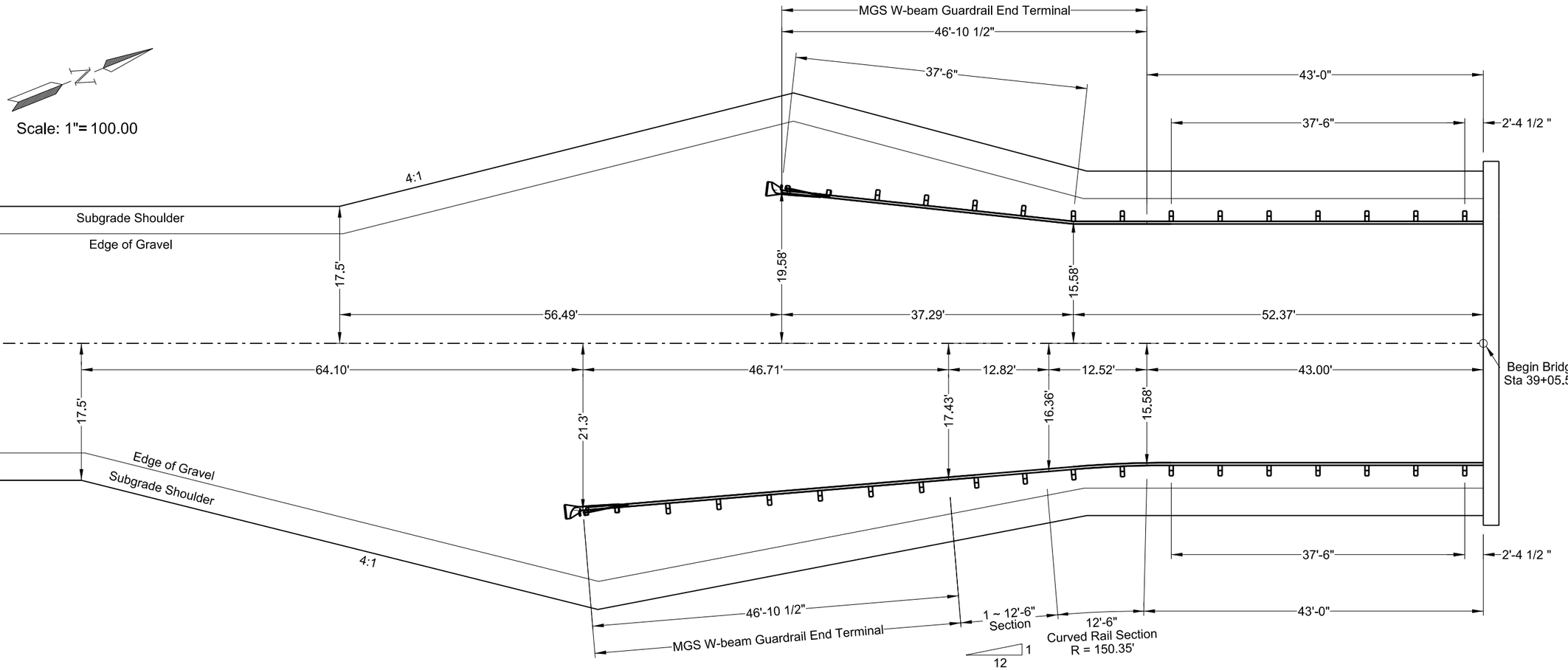
23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	130	1



NOTES:

1. Install a FLEAT end terminal at this location.
   See Standard D-764-38.

2. Refer to Standard Drawing D764-40 for additional details.

QUANTITIES	
W-Beam Guardrail End Terminal	4 EA
W-Beam Guardrail	222 LF

REGISTERED PROFESSIONAL ENGINEER
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DATE 03-22-2022
NORTH DAKOTA

W-Beam Guardrail Layout
at Beginning of Bridge
Bentley Road Bridge

Hettinger County

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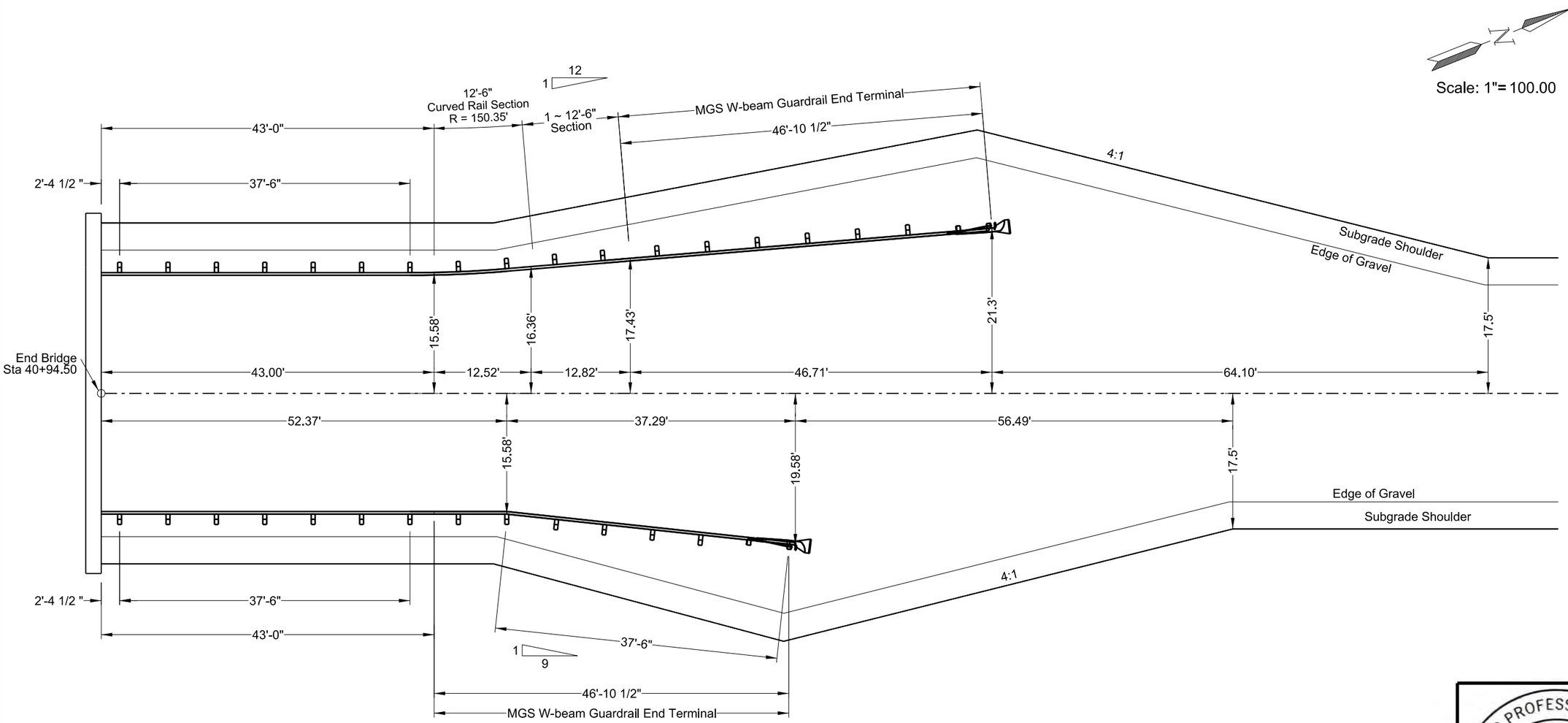
23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	130	2



NOTES:

1. Install a FLEAT end terminal at this location.
   See Standard D-764-38.
2. Refer to Standard Drawing D764-40 for additional details.

REGISTERED PROFESSIONAL ENGINEER
DANIEL CICHOSZ
PE-8767
DATE 03-22-2022
NORTH DAKOTA

W-Beam Guardrail Layout
at End of Bridge
Bentley Road Bridge

Hettinger County

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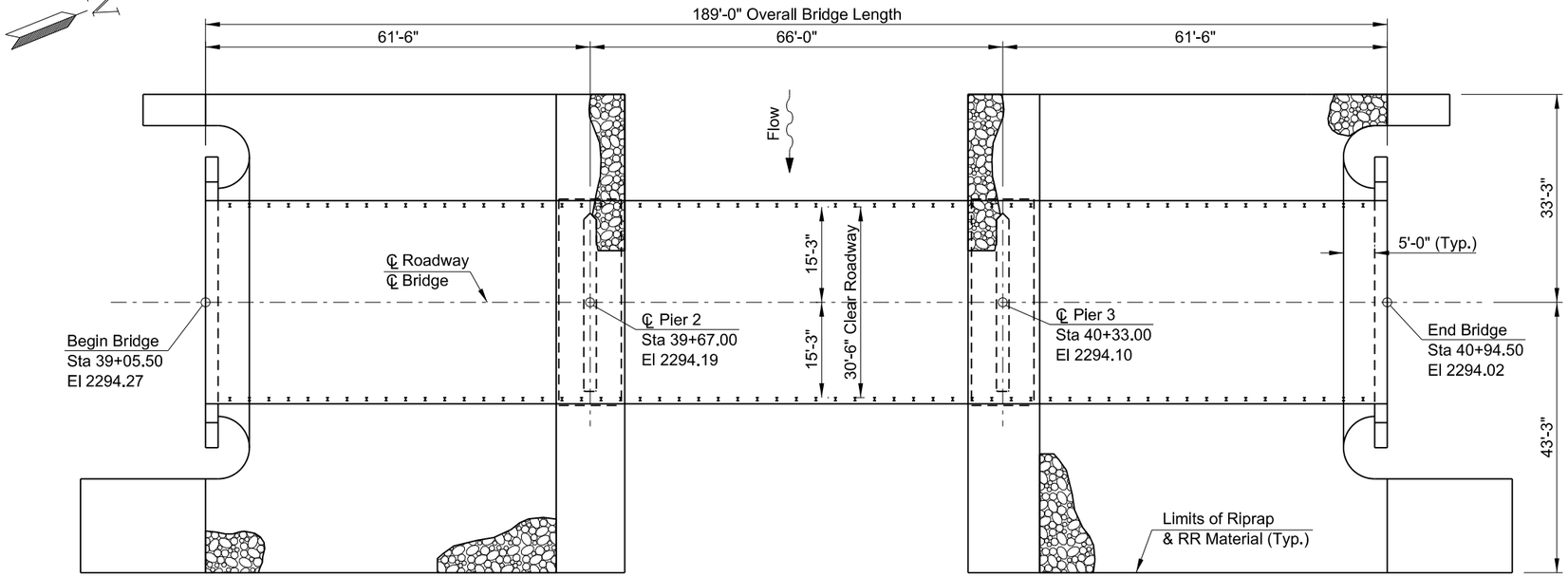
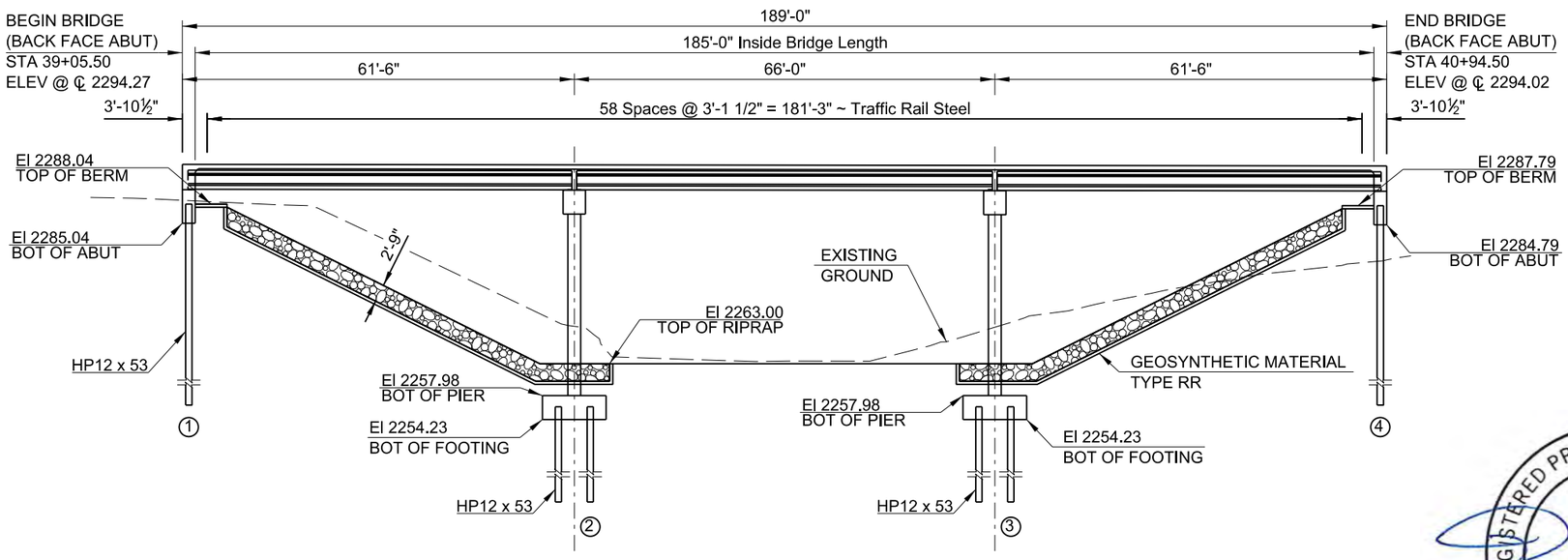
23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	170	1



PLAN



ELEVATION

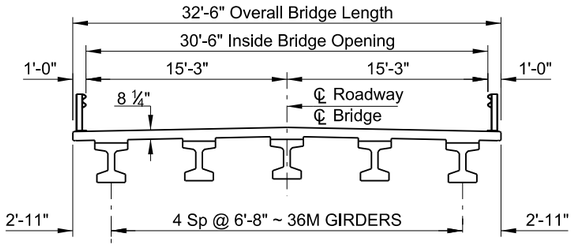
HYDRAULIC DATA:

Drainage Area	858	sq mi
Stream Gradient	0.0007	ft/ft
Design Frequency	25	yr
Design Discharge	7,900	cfs
Design Headwater Stage	2285.2	ft
Design Tailwater Stage	2285.2	ft
Velocity Through Bridge	5.1	fps
100-Year Frequency Discharge	12,080	cfs
100-Year Frequency Headwater	2287.3	ft
Overtopping Stage	2293.5	ft
Overtopping Discharge	31,500 ±	cfs

DESIGN STRENGTHS:

f'c = 3,000 psi ~ Class AE-3 Concrete
f'c = 4,000 psi ~ Class AAE-3 Concrete
f'c = 7,000 psi ~ Prestressed Beam Concrete
fy = 60,000 psi ~ Reinforcing Steel

Load & Resistance Factor Design



TYPICAL SECTON

SPECIAL PROVISIONS	
SSP 2	MIGRATORY BIRD TREATY ACT

STANDARD DRAWINGS

D-622-1, D-714-18

F.W.S. 15 PSF

HL-93 DESIGN LOADING

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER
BRIDGE LAYOUT

PROJECT: BRC-2141(001)
STATION: 40+00.00
HETTINGER COUNTY

REGISTERED PROFESSIONAL ENGINEER
DANIEL CICHOSZ
PE-8767
DATE 03-22-2022
NORTH DAKOTA

DATE BRIDGE ENGINEER

23 U.S.C. 409
NDDOT Reserves All Objections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-2141(001)	170	2

STRUCTURAL NOTES

100-P01 **SCOPE OF WORK:** This project consists of building a new 3-span prestressed concrete I-beam bridge with an overall bridge length of 189'-0" and a clear roadway width of 30'-6".

100-P02 **GENERAL:** The cost of furnishing and placing preformed expansion joint filler, concrete inserts, grout pads and other miscellaneous items shall be included in the bid price for "CLASS AE-3 CONCRETE" and "CLASS AAE-3 CONCRETE.

All exposed concrete corners shall be chamfered ¾" unless noted otherwise.

The physical properties of the elastomeric bearing pads shall conform to the requirements of Section 18.2 of the AASHTO LFRD Bridge Construction Specification and the AASHTO Materials Specification M251.The elastomeric bearing pads shall conform to Grade 60 (durometer).The cost of the pads shall be incidental to the contract unit price per cubic yard for "CLASS AAE-3 CONCRETE". Certification that pads are 60 durometer and meet the requirements of AASHTO LFRD Bridge Construction Specification Section 18.2 and AASHTO Materials Specification M251 shall be furnished to the Engineer with the shop drawings. No laminated bearing pads will be allowed.

Scrapers shall not be driven across the new structure.

202-P01 **REMOVAL OF STRUCTURE:** The existing structure is a three span concrete bridge with steel girders, concrete deck, and metal railing. The abutments and bents are concrete with timber piling under the concrete pile caps. The structure is 22' wide by 174' long. All materials removed and salvaged from the structure shall become property of the Contractor and disposed of at their expense. All bridge piling shall be removed to a minimum of 1' below the bottom of the flow line of the river.

Payment for removing, salvaging, and disposing of the existing bridge and piling in accordance with the standard specifications shall be included in the lump sum price for the bid item "Removal of Structure" and include the cost of removing all components of the bridge, loading, hauling and any other incidentals to complete this work.

210-P01 **EXCAVATION:** The excavation at the abutments, as shown, shall be included in the lump sum bid item "CLASS 1 EXCAVATION". The excavation at the piers, as shown, shall be included in the lump sum bid item, "CLASS 2 EXCAVATION".

For informational purposes, the quantity of Class 1 Excavation is estimated at 47 cubic yards, and the quantity of Class 2 Excavation is estimated at 591 cubic yards. The quantities are based on the plan shown dimensions and will not be measured.

210-P02 **CHANNEL EXCAVATION:** Any unsuitable or excess channel excavation material shall be disposed of at a location determined by the contractor and acceptable to the Engineer. All costs associated with excavating, hauling, and leveling the material shall be included in the unit bid price for "CHANNEL EXCAVATION".

210-P03 **SELECT BACKFILL:** Select back fill shall meet the requirements of Section 816.02, Class 3. The backfill shall be placed in layers of not more than 6 inches, moistened or dried as required, and thoroughly compacted with mechanical tamping equipment. Moisture and density controls shall be in accordance with Section 203.04G Type A of the Standard Specifications. All costs associated with hauling, leveling, and compacting the material shall be included in the unit bid price for "ABUTMENT UNDERDRAIN SYSTEM".

210-P04 **FOUNDATION PREPARATION:** High groundwater elevations may be present on this project. Dewatering may be required in the wet areas to handle water seeping. Fluctuations in the groundwater level may occur due to rainfall, spring thaw, drainage, or other factors. Bidders should recognize the possibility of changes in the existing water conditions. The bidder is responsible for examining the site of the proposed work, becoming familiar with the site conditions, both soil and water conditions, before submitting a proposal. The County assumes no responsibility for the soil and water conditions encountered during construction. The submission of a bidding proposal will be considered conclusive evidence that the bidder is satisfied with the conditions to be encountered in performing the work and as to the requirements of the proposed contract.

All costs relating to and incorporated with dewatering shall be considered included in the bid item "Foundation Preparation", Lump Sum.

606-P01 **DECK CONCRETE:** The girders will have minor differences in anticipated camber. To build the deck to the designated thickness will require slight adjustments in deck elevation and/or riser thickness. These adjustments in the haunch will result in minor concrete quantity discrepancies. The deck concrete will not be measured and payment for furnishing and installing the deck concrete shall be included in the unit price per cubic yard for "CLASS AAE-3 CONCRETE."

Girder lift hooks shall be cut off prior to placement of deck concrete.

The deck concrete shall be placed at a minimum rate of 50 CY per hour.

Deck Tining shall be stopped 18 inches from the sides of the deck, and 6 inches from the end of the deck.

606-P02 **DIAPHGRAMS AND ENDWALLS:** The diaphragms and the end walls/top of the abutments above the construction joint shall be placed at the same time as the deck. Placement of diaphragms at the bents shall not slow down the rate of concrete placement and finishing. The contractor shall place the concrete in the diaphragms ahead of the deck concrete in such a manner that advancement of the deck concrete reaches the diaphragm just as placement of concrete in the diaphragm is complete. The tops of the abutment shall have a broomed finish.

606-P03 **DECK CONCRETE SLAB CURING:** The deck shall be cured by the wet-cure method. The surface shall be kept moist between the final finish and the beginning of the wet-cure by means of a light fog spray. The wet cure material shall be placed and the wet-cure started not later than 30 minutes after the finish of the completed area unless directed otherwise by the Engineer. The wet-cure method shall consist of covering the deck with a double thickness of burlap or a geotextile fabric capable of retaining moisture. The burlap or fabric shall be kept continuously moist for the next seven days. The burlap or fabric shall be moistened at a minimum every four hours. If strong winds or high temperatures are present, the watering rate shall be increased. Covering the deck with curing compounds will not be allowed. No vehicles or equipment not required in the curing process shall be on the bridge deck.

STRUCTURAL NOTES

606-P04 **PENETRATING WATER REPELLENT TREATMENT:** Penetrating water repellant shall be applied to the entire concrete deck surface.

612-P01 **REINFORCING STEEL:** All reinforcing steel shall be grade 60, FY=60 ksi. Dimensions are given out to out and to tangent unless noted otherwise. Fabrications and tolerances shall follow the CRSI manual of Standard Practice. Minimum clear cover shall be 2 inches unless noted otherwise.

622-P01 **PILING**: Piling shall meet AASHTO M 270, Grade 50. Pile shoes are required on all piling.

622-P02 **PILING**: Piling shall be driven with air, steam or diesel hammers, gravity hammers will not be allowed. Piling shall be driven with a hammer with a rated energy and ram weight not less than 24,154 foot-pound-tons, as computed by the formula W(E-8,085) + 0.598E, 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 an average penetration at bearing between 1/2" and 3 inches.

The contractor shall submit to the Engineer the certification and information concerning the performance of the pile hammer to be used a minimum of (1) week prior to use.

624-P01 **RAILING**: Railings shall be furnished and installed as shown in the details for Type T101 rail. All equipment, labor, and materials, including bolts and hardware, shall be incidental to the unit price bid per lineal foot for "Traffic Rail-Steel." The pay limits shall be as shown on the drawings. It shall be the contractor's responsibility to verify that the plate/bolt assemblies are installed at the proper location and elevation to assure that the bolts are of proper length and projection.

708-P01 **RIPRAP-GRADE II:** Place riprap on the prepared slopes as shown in the plans and as determined in the field by the Engineer.

Include all costs to furnish and install the riprap and all incidentals required to complete this work and dispose of any waste material generated from excavating to the limits of the riprap shown in the plans, unit price bid per cubic yard for "Riprap-Grade II".

Remove and salvage the existing riprap under the old bridge. Salvage and stockpile the existing riprap within the roadway right of way at a location approved by the Engineer. Stockpile the existing riprap in a single location. The County will retain ownership of the existing riprap. Include all costs associated with removing and stockpiling the existing riprap in the unit price bid for "Riprap-Grade II".

709-P01 **GEOTEXTILE FABRIC-TYPE RR:** The Geotextile Fabric-Type RR shall be placed under all riprap and up the vertical face between the riprap and earth edge. The minimum lap for all Type RR fabric shall be 2'-0".

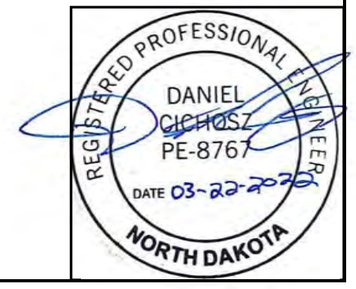
SHOP DRAWINGS: The Contractor shall submit the following shop drawings to the Engineer via email at danielc@broszengineering.com or paper at Brosz Engineering Inc., PO Box 357, Bowman, ND 58623 for review:

1. Prestressed Concrete I-Beam
2. Traffic Rail-Steel
3. Structural Steel

FALSEWORK: The Contractor shall be required to include along with his Falsework Plans details for the construction of an adequate "Walk-Way" including railing.

FALL PROTECTION: The Contractor shall install a Fall Protection System conforming to OSHA Regulations. When working on the girders prior to decking installation, a Horizontal Lifeline – or other OSHA approved system shall be installed. The Contractor shall have one Personal Fall Arrest System (PFAS) available for use by a Department Inspector. The PFAS shall be compatible with the installed Fall Protection System.

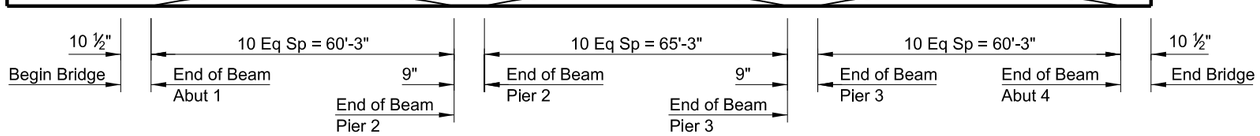
Modifications to any bridge components used to accommodate the Fall Protection System shall be shown on the Falsework Plans and/or the appropriate Shop Plans. Field welding to bridge components will not be allowed. Field placed concrete inserts or drilled-in anchor bolts will be allowed if approved by the Engineer. All costs associated with providing the Fall Protection System shall be incidental to the other contract items.



23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	170	4

Tenth Points	Dead Load Deflection (Ft)	Centerline Beam 5	Centerline Beam 4	Centerline Beam 3	Centerline Beam 2	Centerline Beam 1
0	0.000	2294.00	2294.14	2294.27	2294.14	2294.00
1	0.012	2294.01	2294.14	2294.27	2294.14	2294.01
2	0.022	2294.01	2294.14	2294.28	2294.14	2294.01
3	0.030	2294.01	2294.14	2294.28	2294.14	2294.01
4	0.035	2294.01	2294.14	2294.27	2294.14	2294.01
5	0.037	2294.00	2294.13	2294.27	2294.13	2294.00
6	0.035	2293.99	2294.12	2294.26	2294.12	2293.99
7	0.030	2293.98	2294.11	2294.24	2294.11	2293.98
8	0.022	2293.96	2294.09	2294.23	2294.09	2293.96
9	0.012	2293.94	2294.08	2294.21	2294.08	2293.94
10	0.000	2293.92	2294.06	2294.19	2294.06	2293.92
	0.000	2293.92	2294.06	2294.19	2294.06	2293.92
1	0.016	2293.93	2294.06	2294.19	2294.06	2293.93
2	0.030	2293.93	2294.07	2294.20	2294.07	2293.93
3	0.042	2293.94	2294.07	2294.20	2294.07	2293.94
4	0.048	2293.93	2294.07	2294.20	2294.07	2293.93
5	0.051	2293.93	2294.06	2294.19	2294.06	2293.93
6	0.048	2293.92	2294.05	2294.18	2294.05	2293.92
7	0.042	2293.90	2294.03	2294.17	2294.03	2293.90
8	0.030	2293.88	2294.01	2294.15	2294.01	2293.88
9	0.016	2293.86	2293.99	2294.12	2293.99	2293.86
10	0.000	2293.83	2293.97	2294.10	2293.97	2293.83
	0.000	2293.83	2293.97	2294.10	2293.97	2293.83
1	0.016	2293.84	2293.97	2294.11	2293.97	2293.84
2	0.030	2293.85	2293.98	2294.11	2293.98	2293.85
3	0.042	2293.85	2293.98	2294.12	2293.98	2293.85
4	0.048	2293.85	2293.98	2294.11	2293.98	2293.85
5	0.051	2293.84	2293.98	2294.11	2293.98	2293.84
6	0.048	2293.83	2293.96	2294.10	2293.96	2293.83
7	0.042	2293.82	2293.95	2294.08	2293.95	2293.82
8	0.030	2293.80	2293.93	2294.06	2293.93	2293.80
9	0.016	2293.77	2293.91	2294.04	2293.91	2293.77
10	0.000	2293.75	2293.88	2294.02	2293.88	2293.75



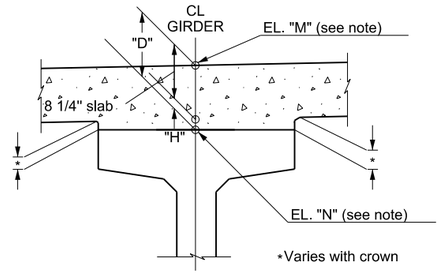
Beam 1 is the west beam.

SCREED ELEVATION

NOTE:

Elevations are to top of finished roadway.
Beam #1 is the west beam.
The deal load deflection shown is for D.L. of the slab, and haunch and but does not include D.L. of beams.

The table contains the information necessary to determine the depth of concrete over the girders at points shown. Elevation "M" is the design elevation at the top of slab before any concrete has been poured. Elevation "N" is a field measured elevation taken on top of the girders at the points shown with the girders in their positions on the bearings. This elevation must be taken after erection is completed, but prior to placing any of the false work. Girders shall not be supported between bearings when elevations are taken.



DETAIL "E"

Based on a "D" of 11 inches at the centerline of each bent and abutment (see "Abutment Details Sheet"), it is anticipated that the mid-span haunch dimension "H" over the centerline of each girder will be 2-1/4 inches in spans 1 and 3 and 2 inches in span 2. If "H" is less than zero or greater than 3 1/2 inches, The Bowman office of Brosz Engineering Inc. must be notified immediately.

BRIDGE BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
202	0105	REMOVAL OF STRUCTURE	L SUM	1
210	0099	CLASS 1 EXCAVATION	L SUM	1
210	0111	CLASS 2 EXCAVATION	L SUM	1
210	0127	CHANNEL EXCAVATION	L SUM	1
210	0201	FOUNDATION PREPARATION	EA	1
256	0200	RIPRAP GRADE II	CY	1,128.0
602	0130	CLASS AAE-3 CONCRETE	CY	196.0
602	1130	CLASS AE-3 CONCRETE	CY	282.0
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	683
604	9900	PRESTRESSED I-BEAM-36 IN	LF	929
612	0115	REINFORCING STEEL-GRADE 60	LBS	40,275
612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS	43,670
616	0364	STRUCTURAL STEEL M270-GRADE 36	LBS	4,606
622	0014	STEEL H-PILING POINTS 12 X 53	EA	42
622	0040	STEEL PILING HP 12 X 53	LF	920
622	1200	STEEL TEST PILING HP 12 X 53	LF	140
624	0128	TRAFFIC RAIL STEEL	LF	378
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	1,456
930	9537	ABUTMENT UNDERDRAIN SYSTEM	EA	2

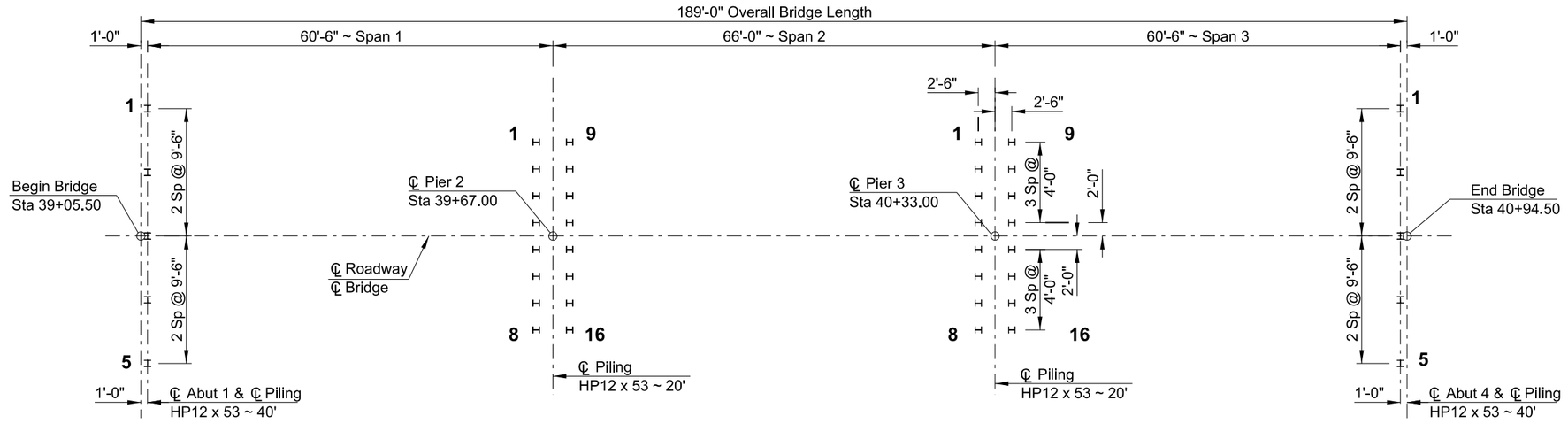
BENTLEY ROAD BRIDGE

OVER CANNONBALL RIVER

SCREED ELEVATIONS & BID ITEM QUANTITIES

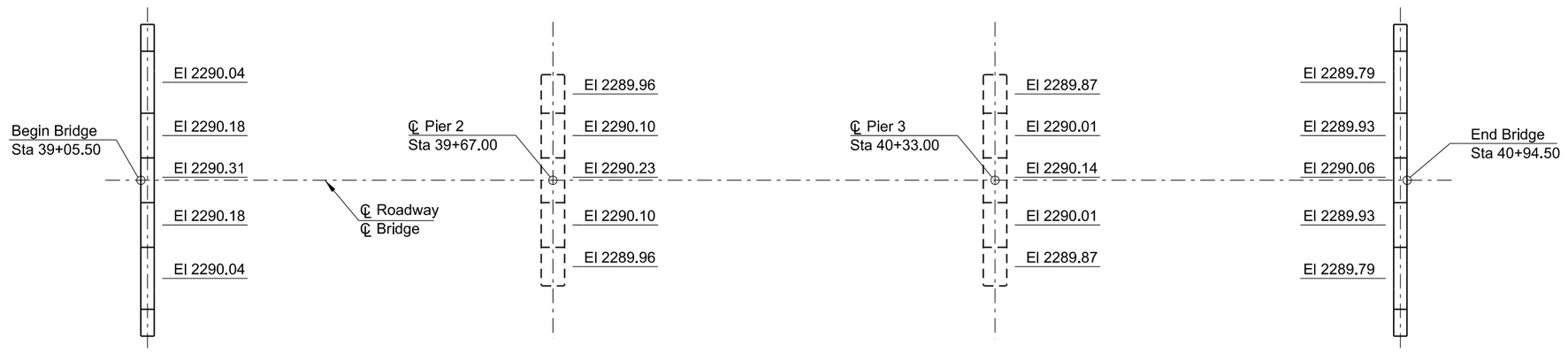
23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	170	5



HP12 x 53 Pile shall be driven to 130 tons.

PILING LAYOUT



Elevations shown are to top of finished concrete.

BEARING ELEVATIONS

NOTE:

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).

PILE COORDINATES

	PILE	NORTHING	EASTING
ABUT 1	1	251,275.78	1,572,776.19
	5	251,261.69	1,572,811.48
PIER 2	1	251,327.79	1,572,802.35
	8	251,317.40	1,572,828.35
	9	251,332.43	1,572,804.20
	16	251,322.05	1,572,830.21
PIER 3	1	251,389.08	1,572,826.83
	8	251,378.69	1,572,852.84
	9	251,393.72	1,572,828.69
	16	251,383.34	1,572,854.69
ABUT 4	1	251,449.44	1,572,845.56
	5	251,435.34	1,572,880.85

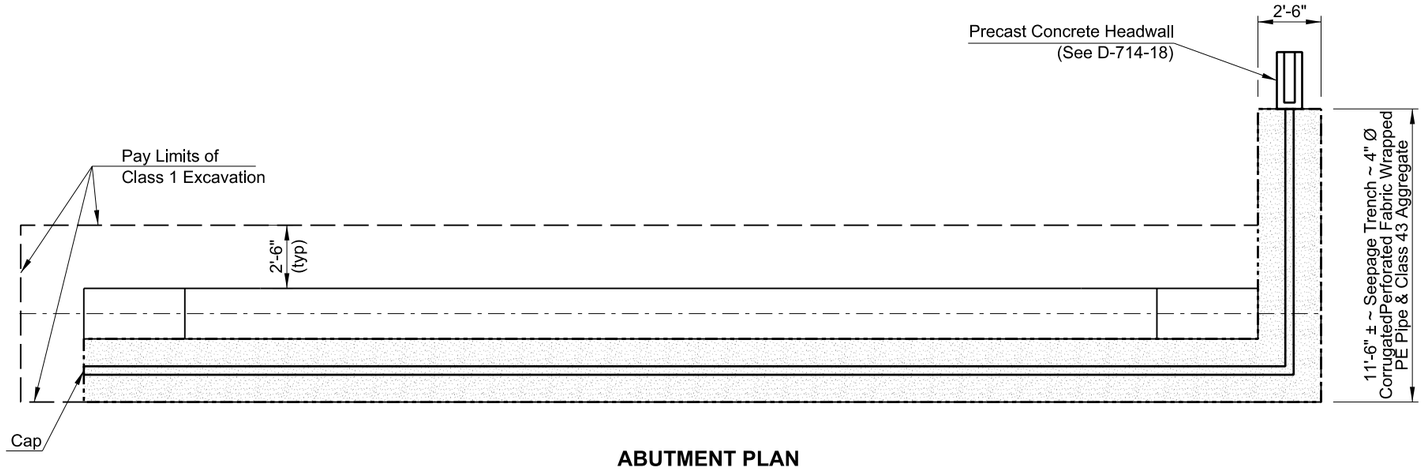
REGISTERED PROFESSIONAL ENGINEER
DANIEL CICHOSZ
PE-8767
DATE 03-22-2022
NORTH DAKOTA

BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

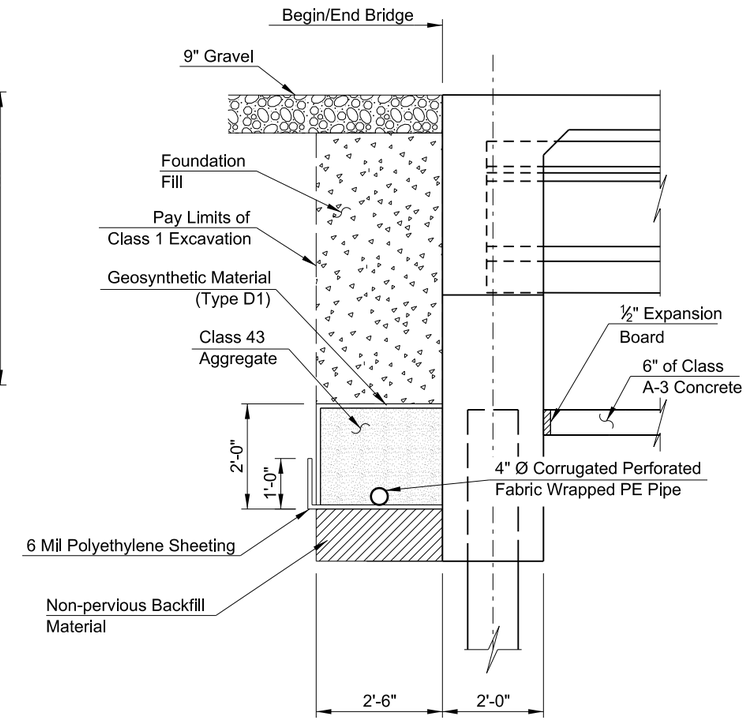
PILING LAYOUT &
BEARING ELEVATIONS

23 U.S.C. 409
NDDOT Reserves All Objections

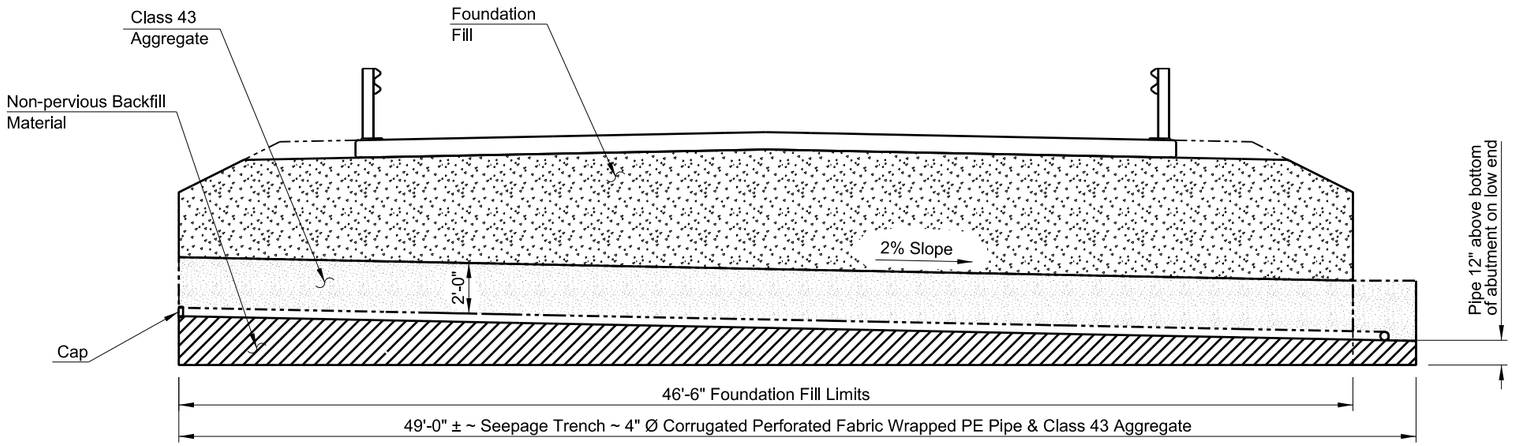
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	170	6



ABUTMENT PLAN



DETAIL AT ABUTMENT

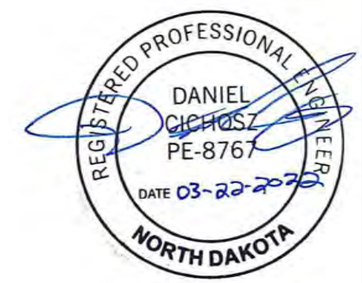


ABUTMENT PLAN

NOTES:

Use corrugated perforated fabric wrapped PE pipe that meets the requirements of Section 830.03 A.4. Provide fabric wrapping for the pipe that meets the requirements of Section 858.01 for D3 or D4 drainage fabric. Provide aggregate that meets the requirements of Section 816.03, Class 43. Provide foundation fill that meets the requirements of Section 210.

Include the cost to furnish and place the foundation fill, aggregate, corrugated perforated pipe and headwalls in the pay item "Abutment Underdrain System."



BENTLEY ROAD BRIDGE

OVER CANNONBALL RIVER

ABUTMENT UNDERDRAIN & EXCAVATION DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
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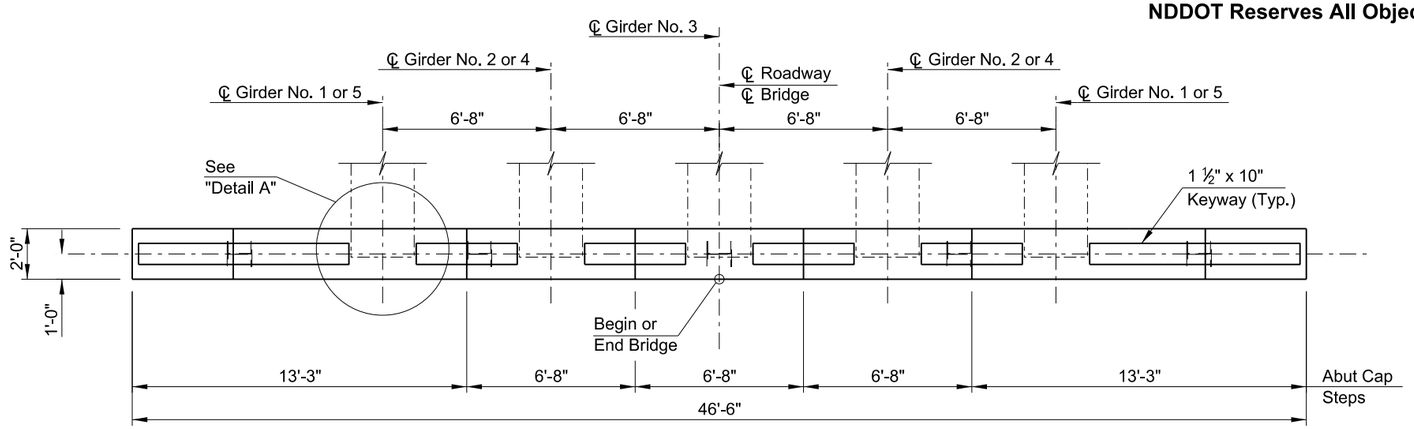
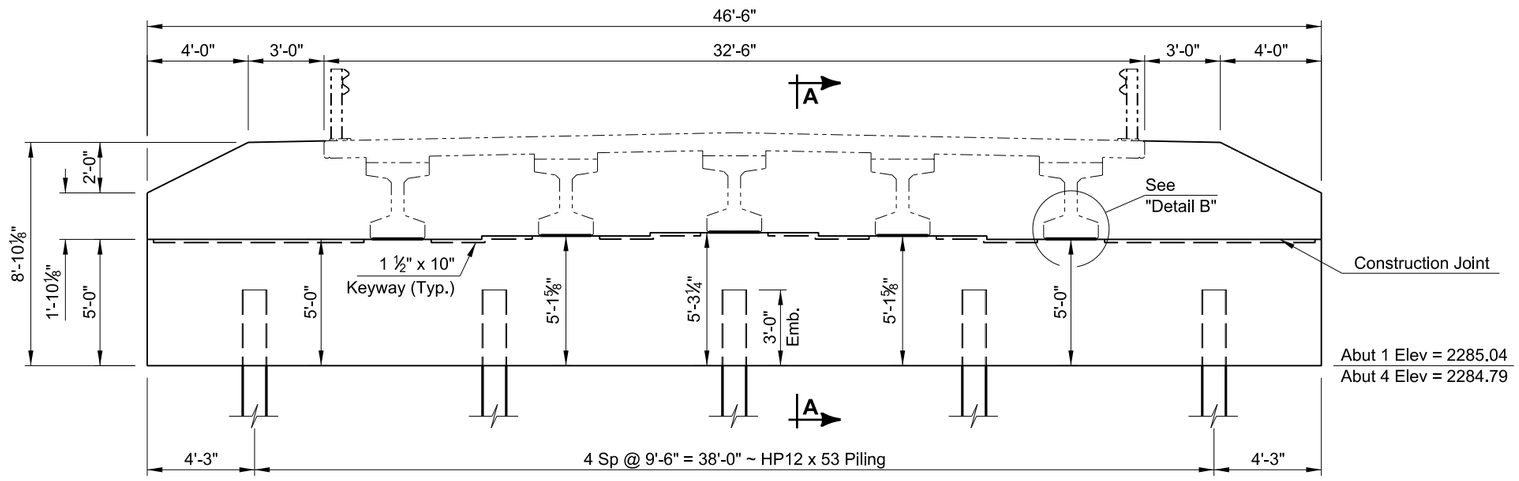
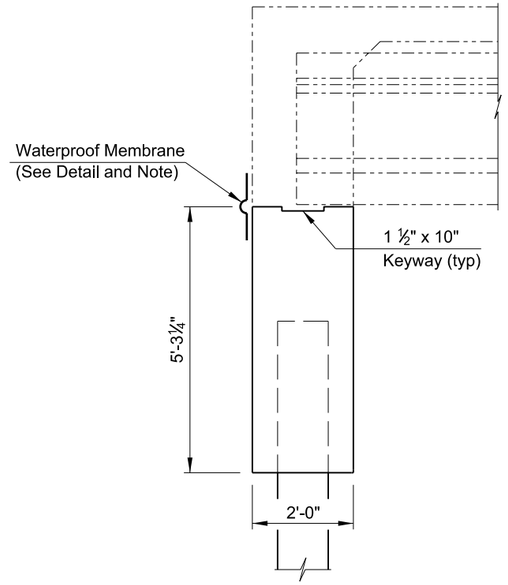


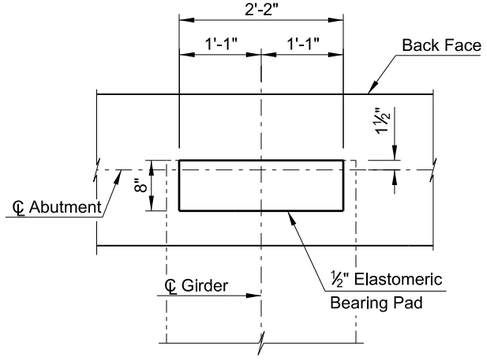
PLAN



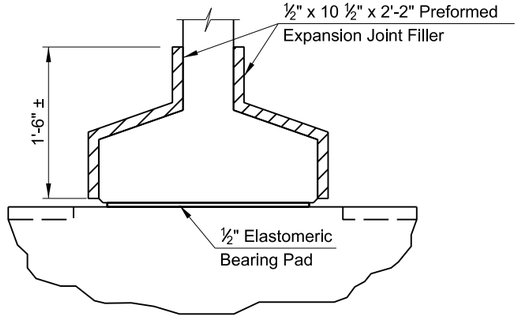
ELEVATION



A-A

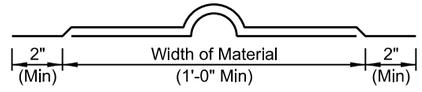


DETAIL A



(Typical at Girder Ends Abutments Only)

DETAIL B



Use waterproof membrane that meets the requirements of Section 602.03 B. Include the cost of the waterproof membrane in the contract unit price for "Class AE-3 Concrete."

WATERPROOF MEMBRANE DETAIL

QUANTITIES

SEE DWG 170-4

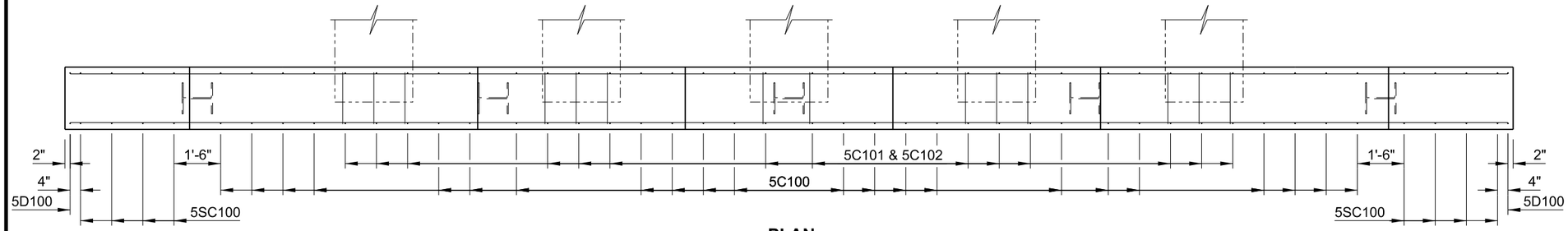
BENTLEY ROAD BRIDGE OVER CANNONBALL RIVER

(SHOWING DIMENSIONS)

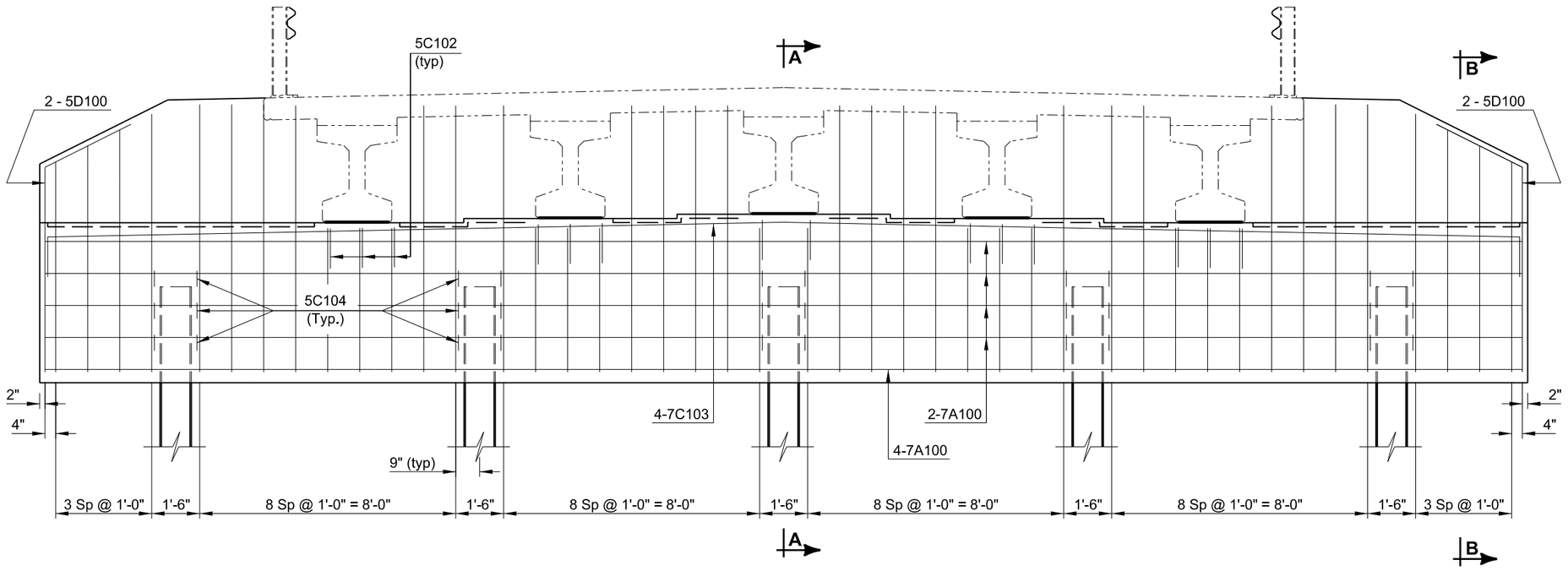
ABUTMENT DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

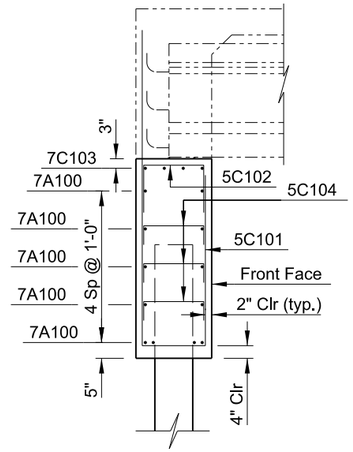
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	170	8



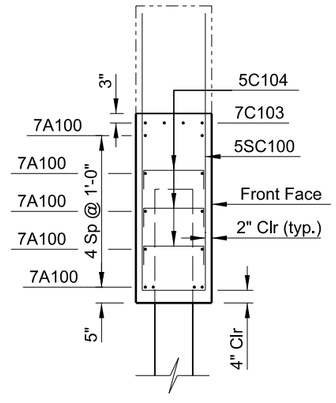
PLAN



ELEVATION



A-A



B-B

QUANTITIES	(ONE ABUTMENT)
CLASS AE-3 CONCRETE	17.5 CY
REINFORCING STEEL	2,481 LBS

REGISTERED PROFESSIONAL ENGINEER
DANIEL CICHOSZ
PE-8767
DATE 03-22-2022
NORTH DAKOTA

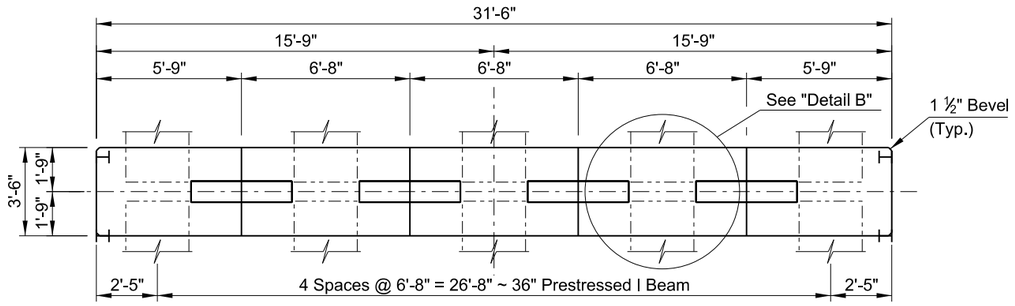
BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

(SHOWING REINFORCING)

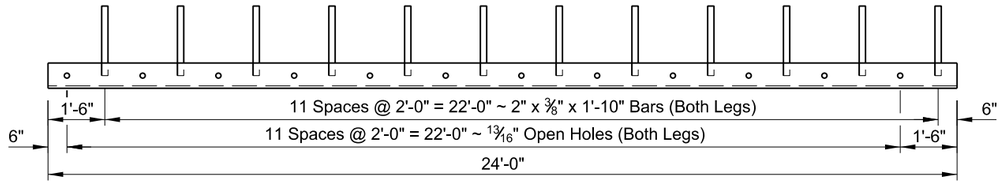
ABUTMENT DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

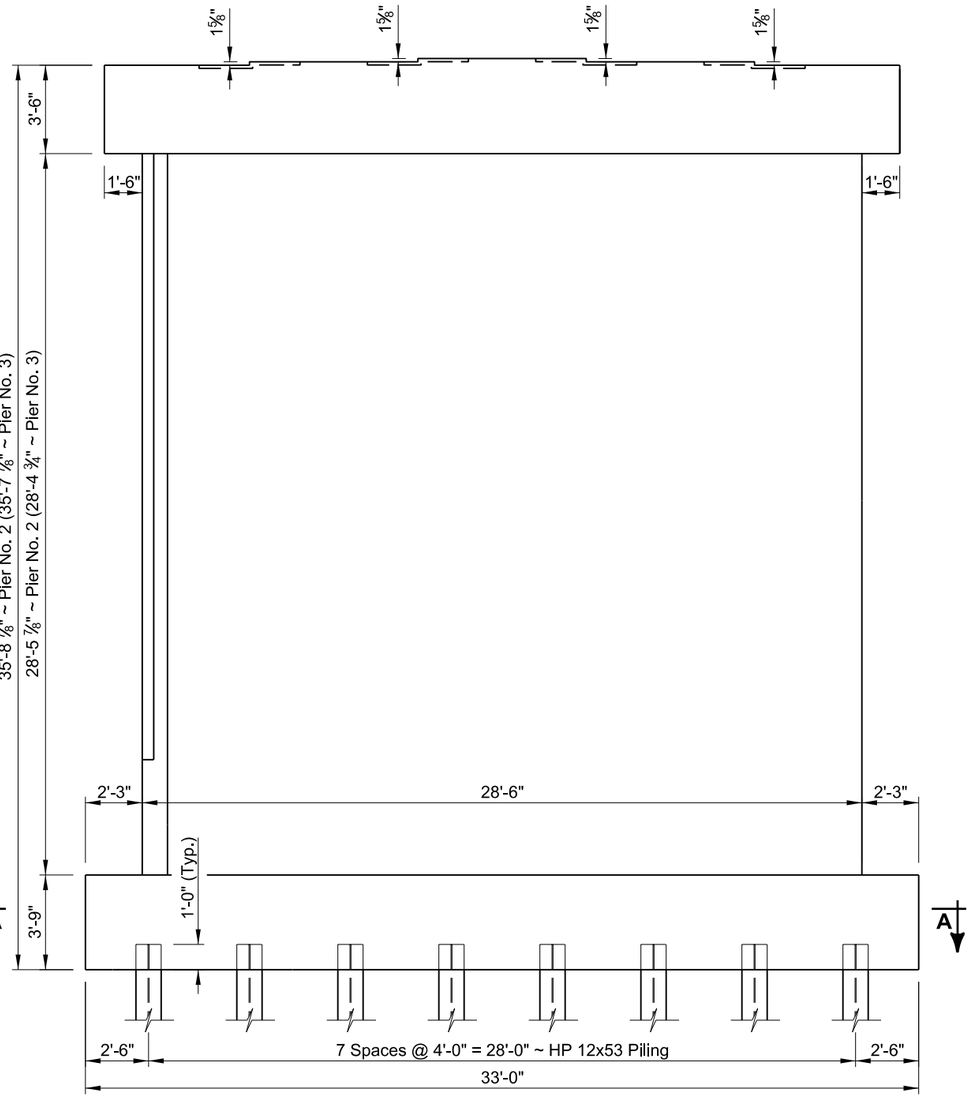
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	170	9



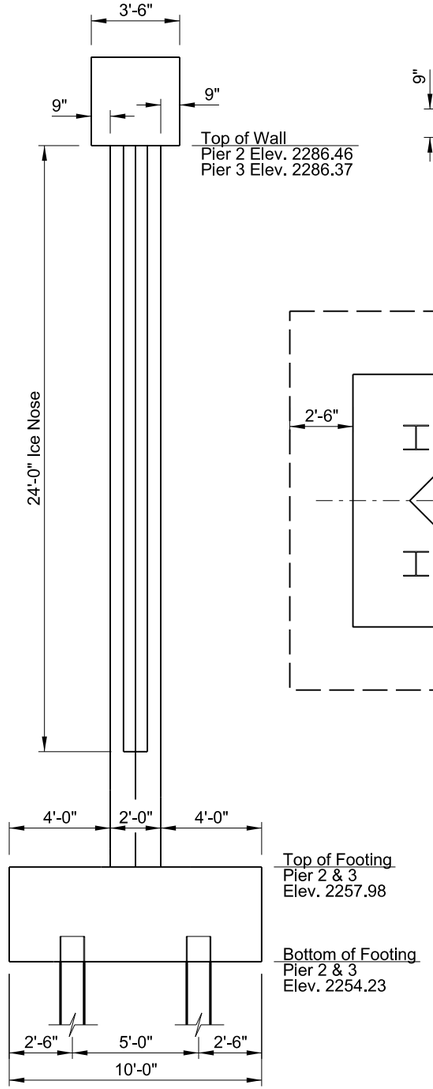
PLAN



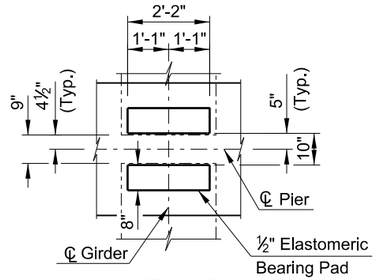
ICE NOSE DETAIL



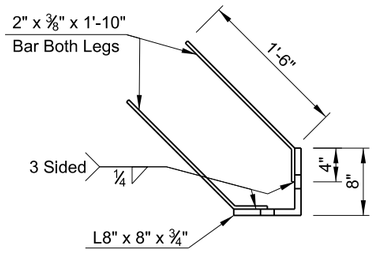
ELEVATION



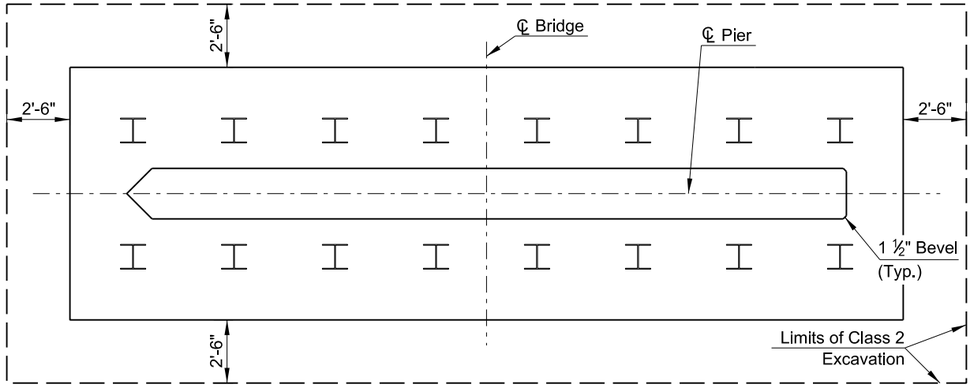
END VIEW



DETAIL B



BAR DETAIL



A-A

QUANTITIES

SEE DWG 170-4

BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

(SHOWING DIMENSIONS)

PIER DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

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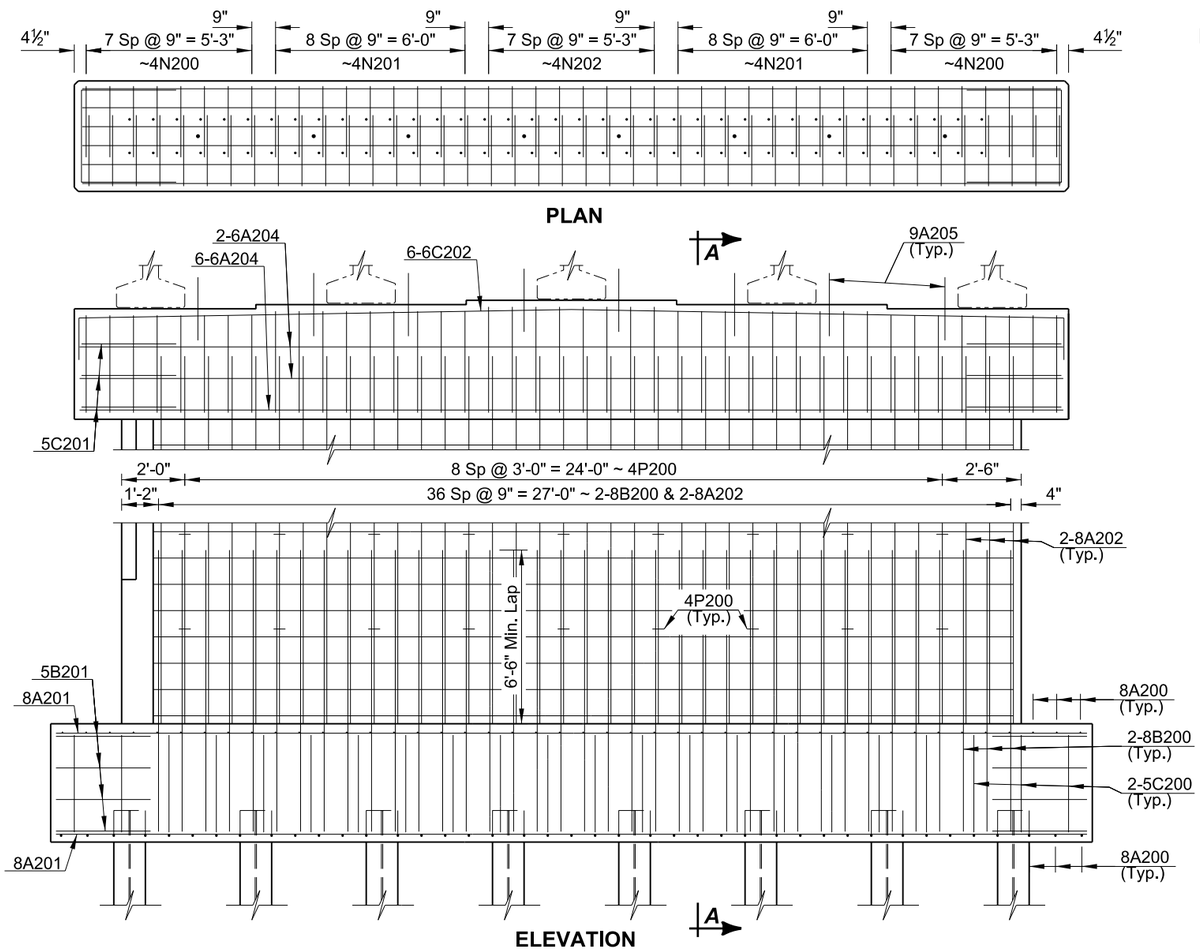
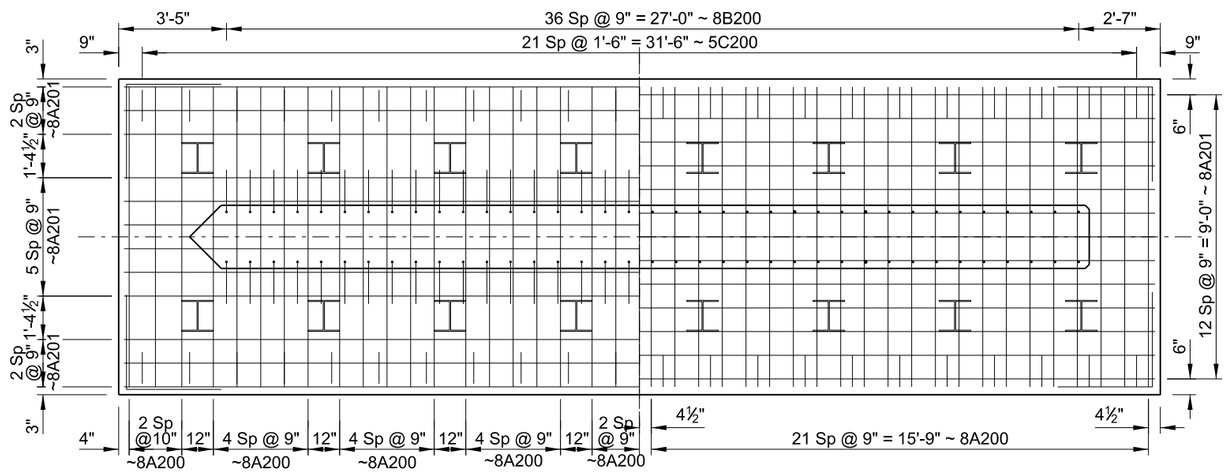
	ND	BRC-2141(001)	170	10



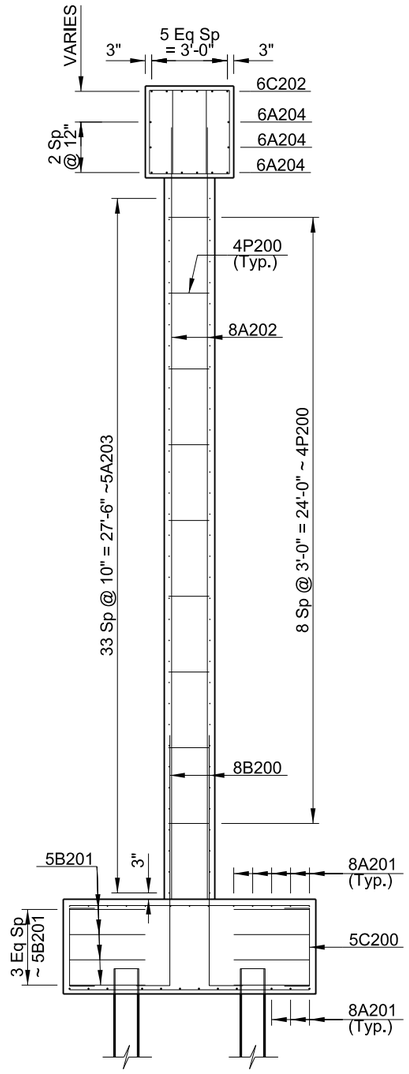
PLAN

ELEVATION

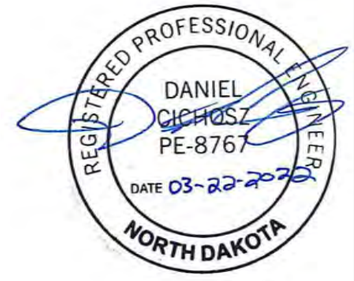


(SHOWING REINFORCING BOTTOM MAT) (SHOWING REINFORCING TOP MAT)

PLAN FOOTING



A-A



QUANTITIES	(ONE PIER)
CLASS AE-3 CONCRETE	119.6 CY
REINFORCING STEEL	16,681 LBS
STRUCTURAL STEEL	1,046 LBS

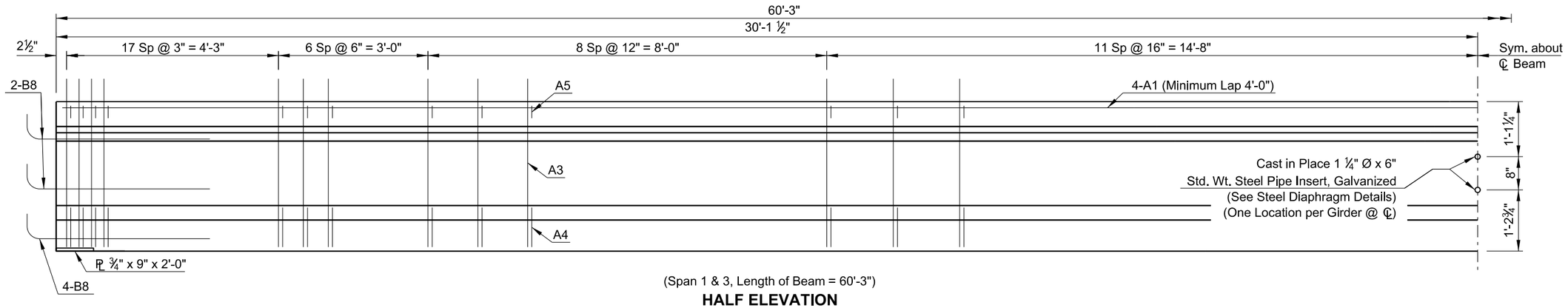
BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

(SHOWING REINFORCING)

PIER DETAILS

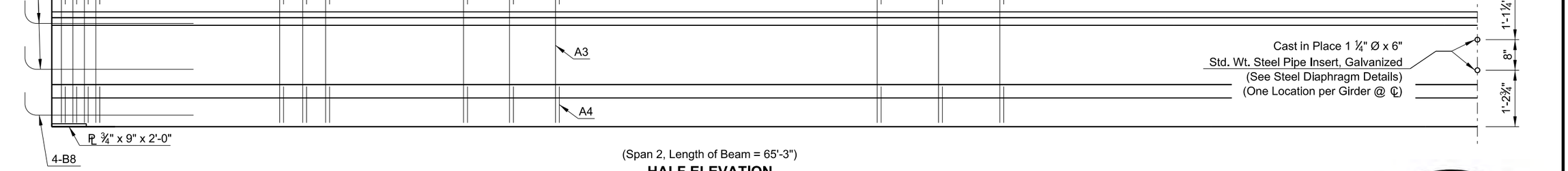
23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	170	11



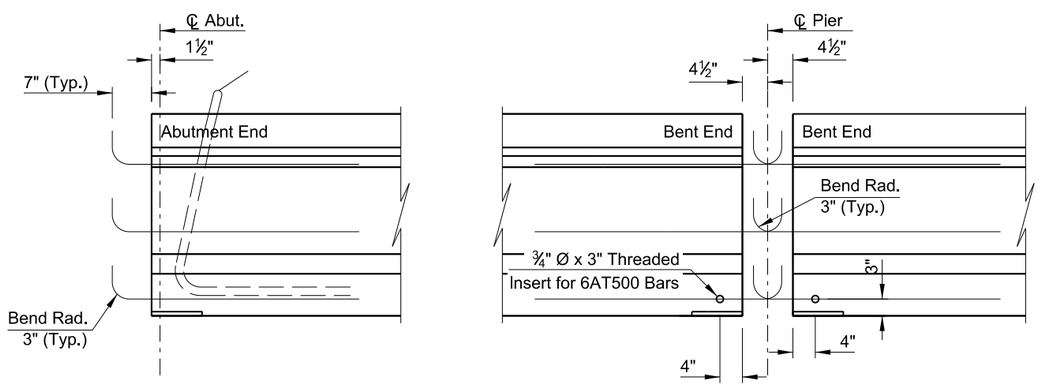
(Span 1 & 3, Length of Beam = 60'-3")

HALF ELEVATION



(Span 2, Length of Beam = 65'-3")

HALF ELEVATION



DETAIL "X"

QUANTITIES
SEE DWG 170-4

BEAM SECTION DATA
WT = 594.0 LBS/FT
CROSS SECTIONAL AREA = 570 IN^2
C.G. (FROM BOTTOM) = 17.96 IN
I = 93,528 IN^4
S_b = 5,208 IN^3

BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

PRE-TENSIONED 36"
PRESTRESSED I-Beam

NOTES:

At least 14 days prior to the forming and pouring of any beams, the Contractor shall submit shop drawings to the Engineer for review. The shop drawings shall include design calculations showing the total initial prestress force taken from the contract drawings 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.

Shop 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.

All reinforcing steel shall have a clearance of 1"unless otherwise noted.

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 tined transversely for bond.

Provide handling hooks or devices as required by the Contractor. Hooks or devices provided will be subject to approval by the Engineer and shall be installed withing 4'-0"of the end of beams, as shown on the "Typical Lifting Detail". The design of the lifting devices shall be the design of the fabricator.

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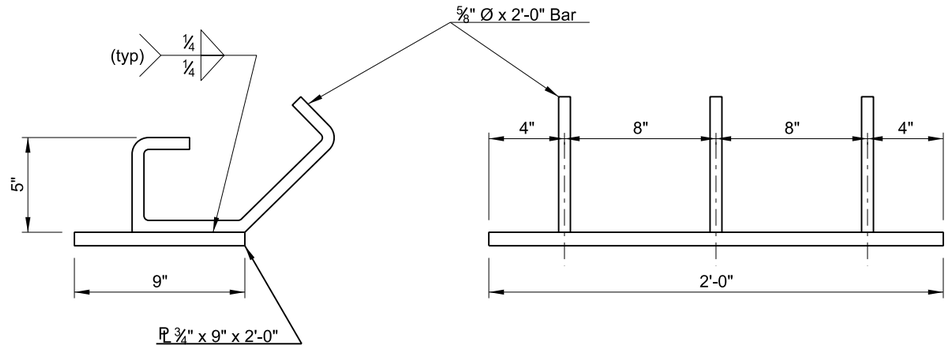
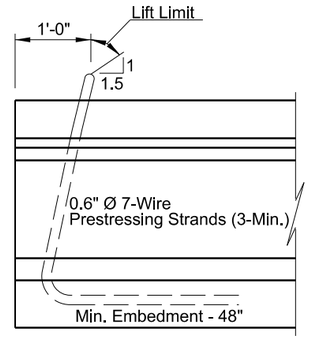


(Bearing Plate to be Structural Steel M 270 Grade 36
hot dipped galvanized and included in the bid price for the beam.)

BEARING DETAIL

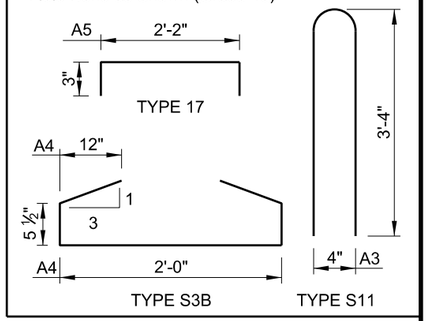


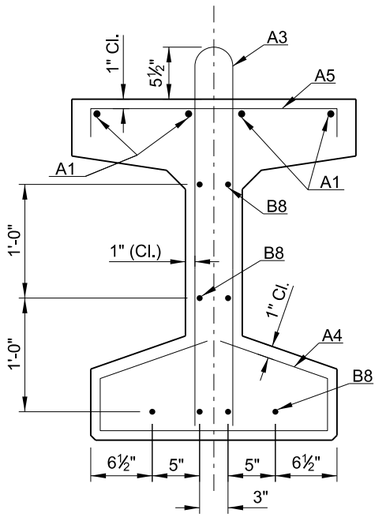
TYPICAL LIFTING DETAIL

REINFORCING SCHEDULE
(For One Girder)

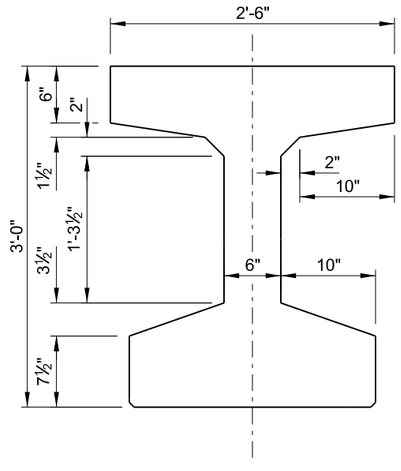
	MARK	NO.	SIZE	LENGTH	TYPE
60'-3" Girder	A1	16	6	23'-0"	Str.
	A3	85	4	6'-10"	S11
	A4	85	4	5'-0"	S3B
	A5	85	4	2'-8"	17
	*B8	16	5	4'-0"	Str.
65'-3" Girder	A1	16	6	24'-6"	Str.
	A3	93	4	6'-10"	S11
	A4	93	4	5'-0"	S3B
	A5	93	4	2'-8"	17
	*B8	16	5	4'-0"	Str.

* Field Bend as Shown (Grade 40)

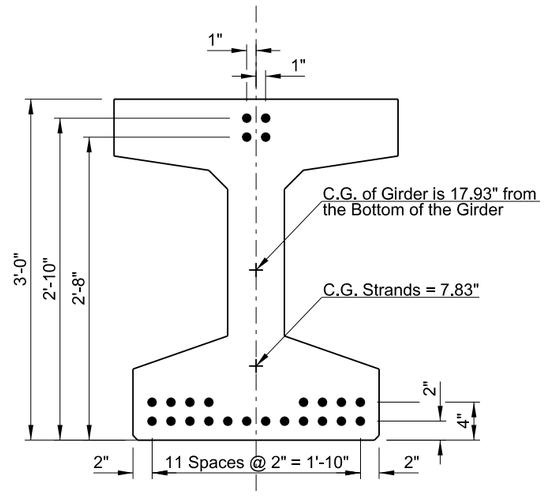




MILD STEEL DETAILS



SECTION DIMENSIONS
Type 36M Girders (End View)



STRAND PATTERN (SPANS 1,2,&3)
(24) - 0.6" Low Relaxation Strands
C.G. = 7.83" from bottom

PRESTRESSING DATA

C.G.	FINAL FORCE	DETENSION STRENGTH	ACCEPTANCE STRENGTH	WEIGHT (TONS)	BEAM LENGTH
7.83"	1,054.6 k	6,000 psi (Min)	7,000 psi (Min)	17.9	60'-3"
7.83"	1,054.6 k	6,000 psi (Min)	7,000 psi (Min)	19.4	65'-3"

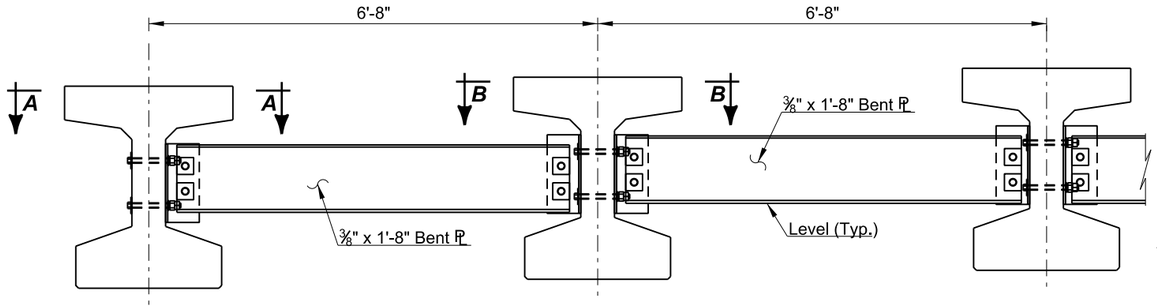
REGISTERED PROFESSIONAL ENGINEER
DANIEL CICHOSZ
PE-8767
DATE 03-22-2022
NORTH DAKOTA

BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

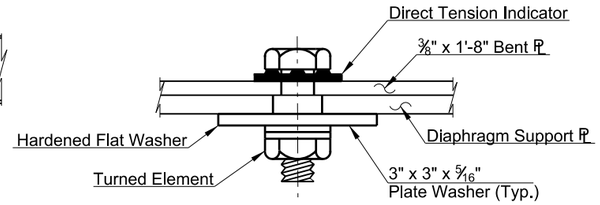
PRE-TENSIONED 36"
PRESTRESSED I-BEAM

23 U.S.C. 409
NDDOT Reserves All Objections

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-2141(001)	170	13



SECTIONS AT DIAPHRAGM



DIRECT TENSION INDICATOR DETAIL

NOTES:

1. All steel for the diaphragms including plate washers shall conform to ASTM A36 and shall be galvanized in accordance with ASTM A123 or ASTM 153. Bolts, nuts, and washers shall be galvanized in accordance with ASTM F2329.

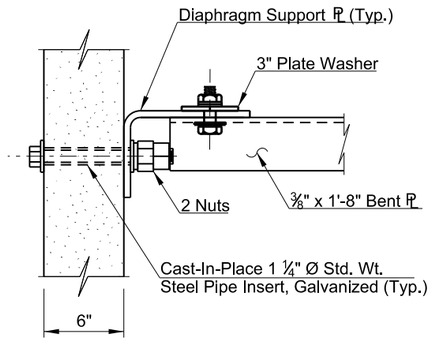
2. The steel diaphragms between adjacent girders shall be installed as soon as possible and in conjuction with girder erection.

3. The estimated weight shown below is the estimated weight of the ⅜" x 1'-8" Bent Plate Diaphragms and the ½" Support Plate. A C12x30 may be substituted for the ⅜" Bent Plate Diaphragm.

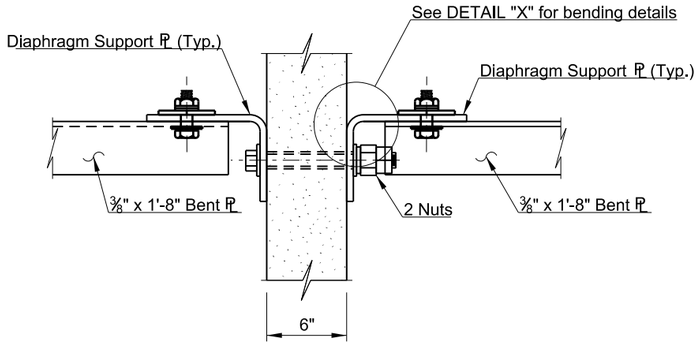
4. All costs associated with furnishing, fabricating, assembly and installation of diaphragms, bolts and all hardware shall be incidental to the contract lump sum price for Structural Steel, Miscellaneous.

ESTIMATED QUANTITIES		
Item	Unit	Quantity
Structural Steel M270-Grade 36	LBS	2514

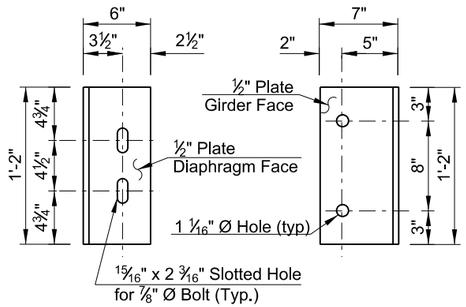
For informational purposes only, the estimated weight of structural steel is 838 Lbs per Diaphragm location.



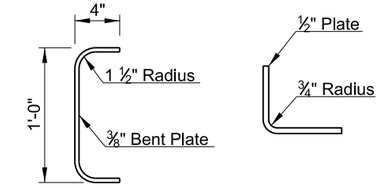
A-A



B-B

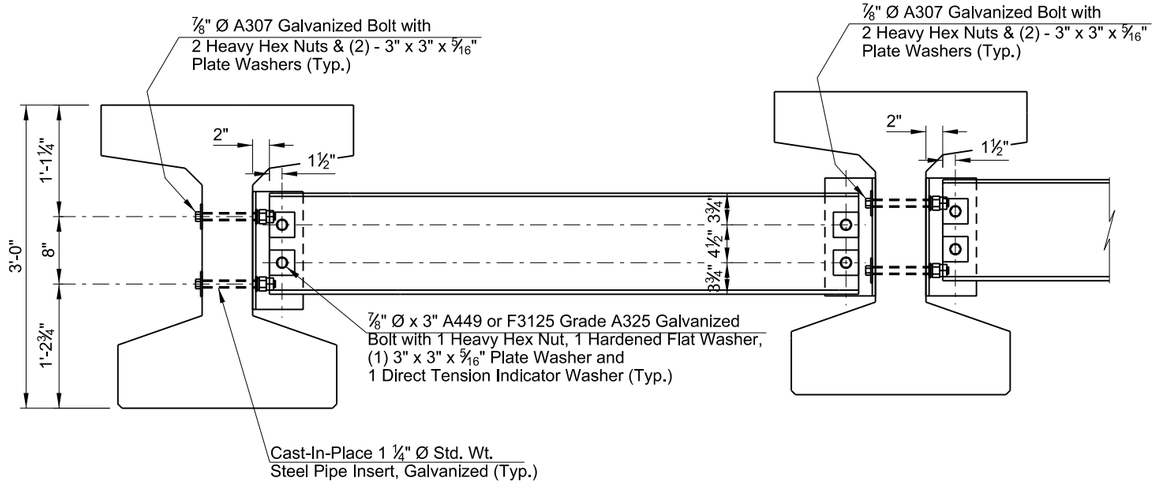


DIAPHRAGM SUPPORT PLATE



END VIEW BENT PLATE DIAPHRAGM

DETAIL "X"



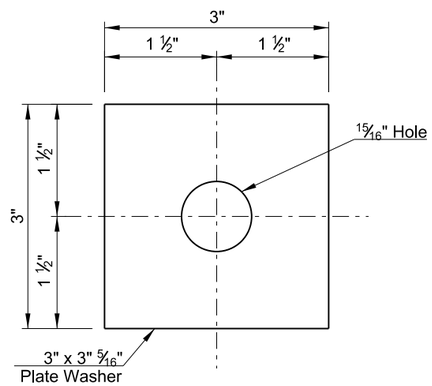


PLATE WASHER DETAIL

REGISTERED PROFESSIONAL ENGINEER
DANIEL CICHOSZ
PE-8767
DATE 03-22-2022
NORTH DAKOTA

QUANTITIES

SEE DWG 170-4

BENTLEY ROAD BRIDGE OVER CANNONBALL RIVER

STEEL DIAPHRAGM DETAILS

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NDDOT Reserves All Objections

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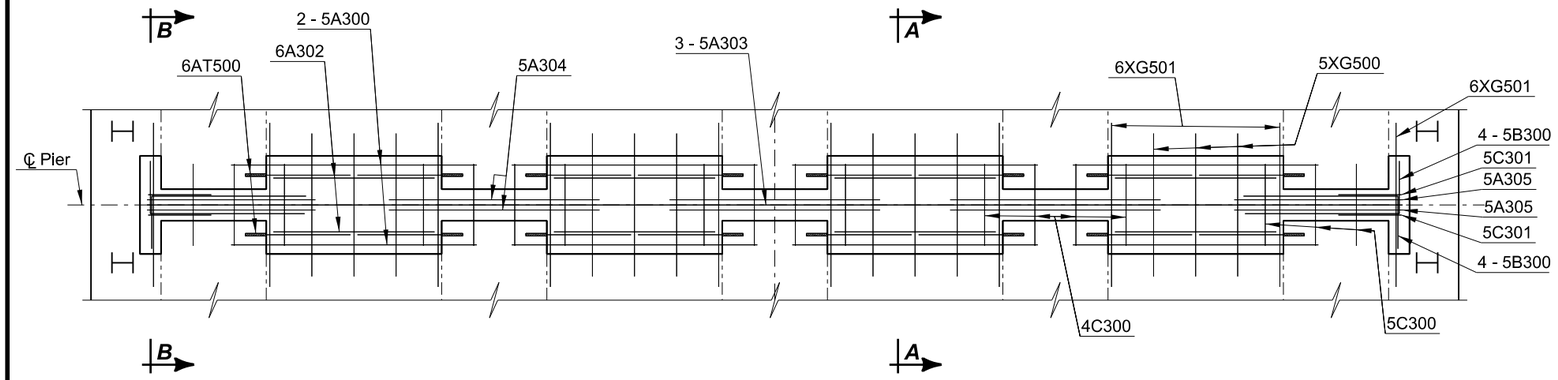
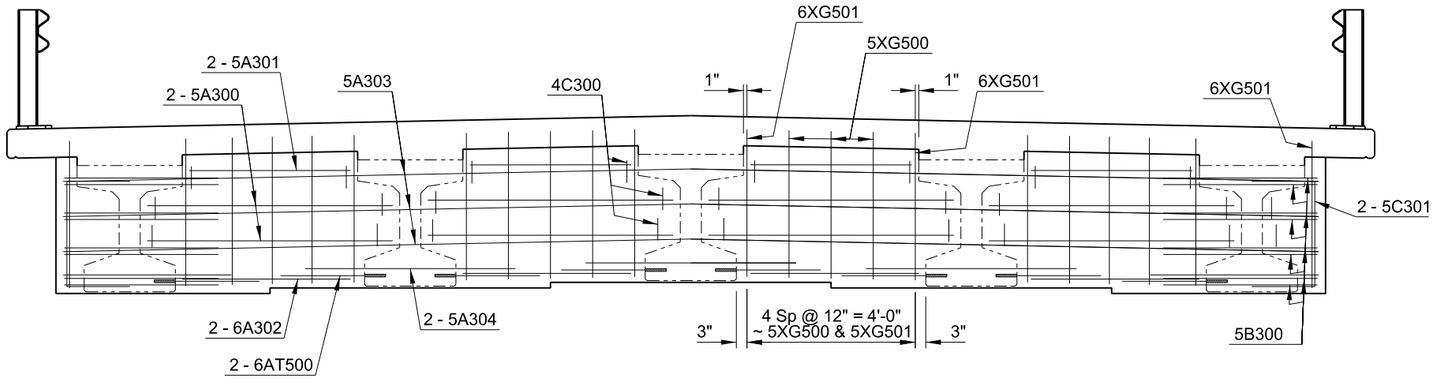
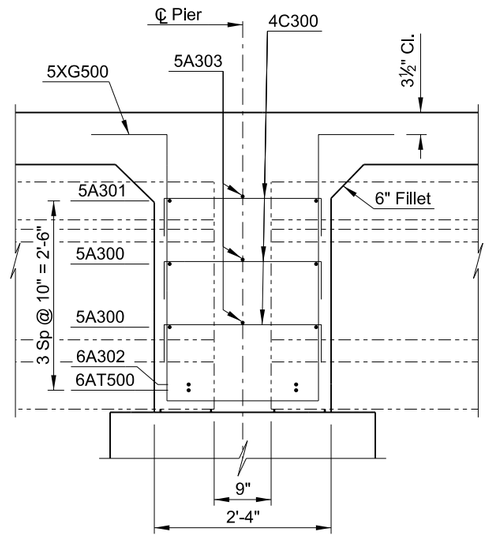


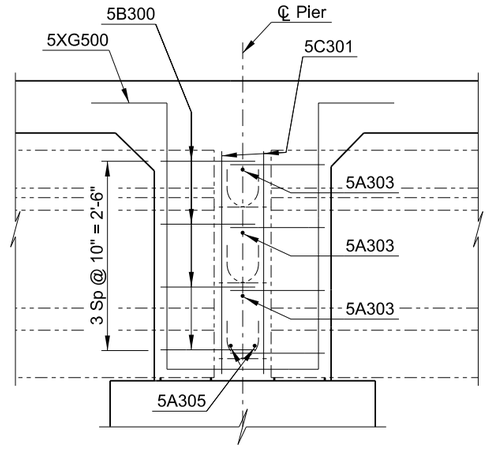
PLAN



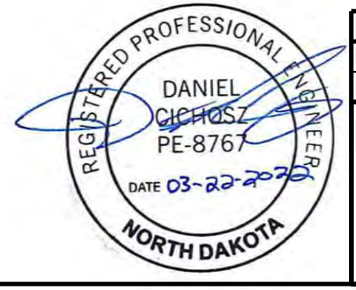
ELEVATION



A-A



B-B



QUANTITIES

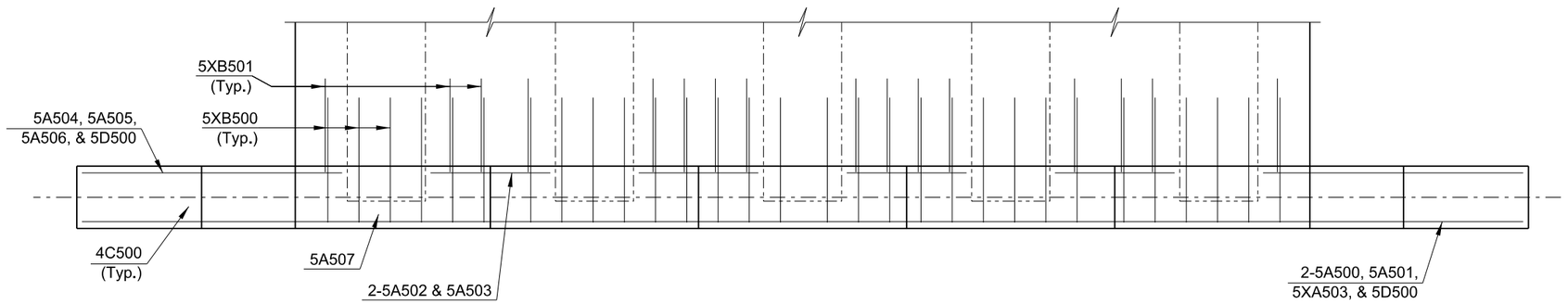
SEE DWG 170-4, 170-18

BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

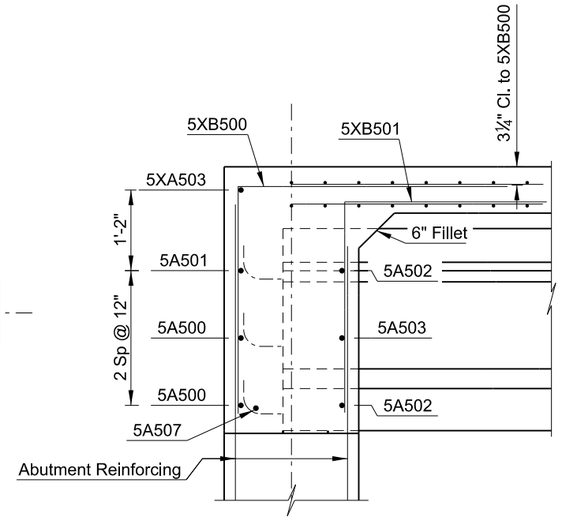
BENT DIAPHRAGM DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

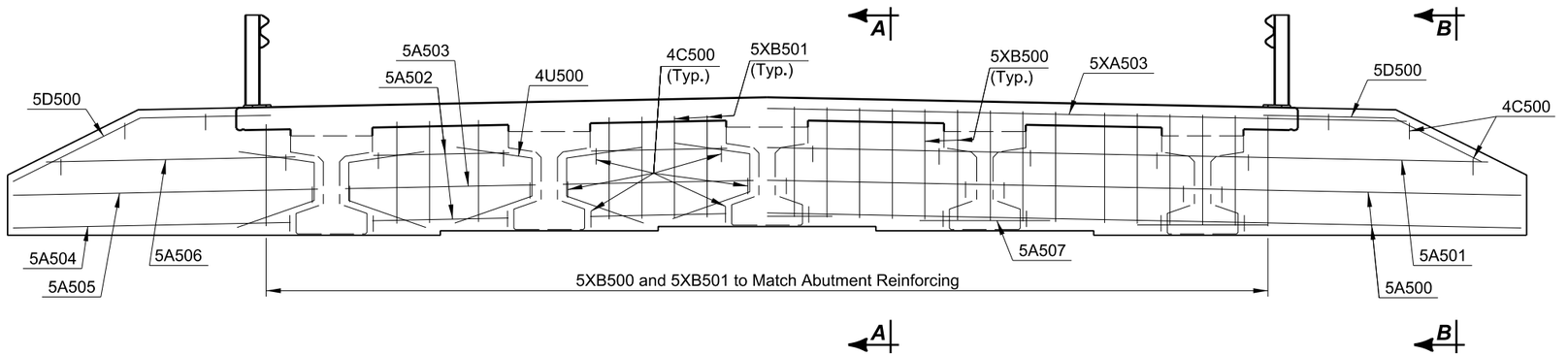
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	170	15



PLAN



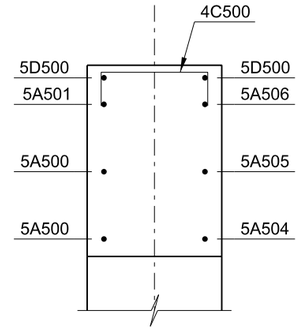
A-A



(SHOWING FRONT FACE)

ELEVATION

(SHOWING BACK FACE)



B-B

REGISTERED PROFESSIONAL ENGINEER
DANIEL CICHOSZ
PE-8767
DATE 03-22-2022
NORTH DAKOTA

QUANTITIES

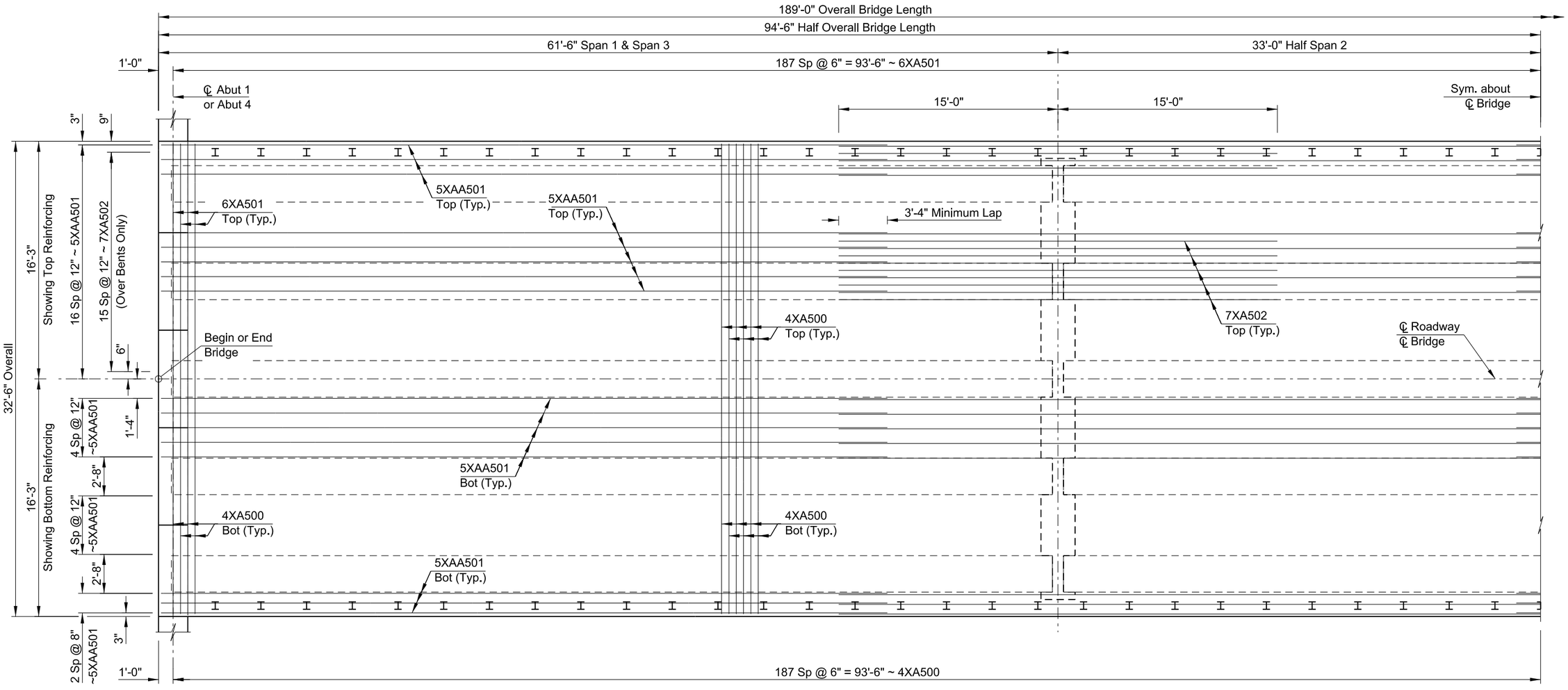
SEE DWG 170-4, 170-18

**BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER**

ENDWALL DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-2141(001)	170	16



PLAN

REGISTERED PROFESSIONAL ENGINEER
DANIEL CICHOSZ
PE-8767
DATE 03-22-2020
NORTH DAKOTA

QUANTITIES

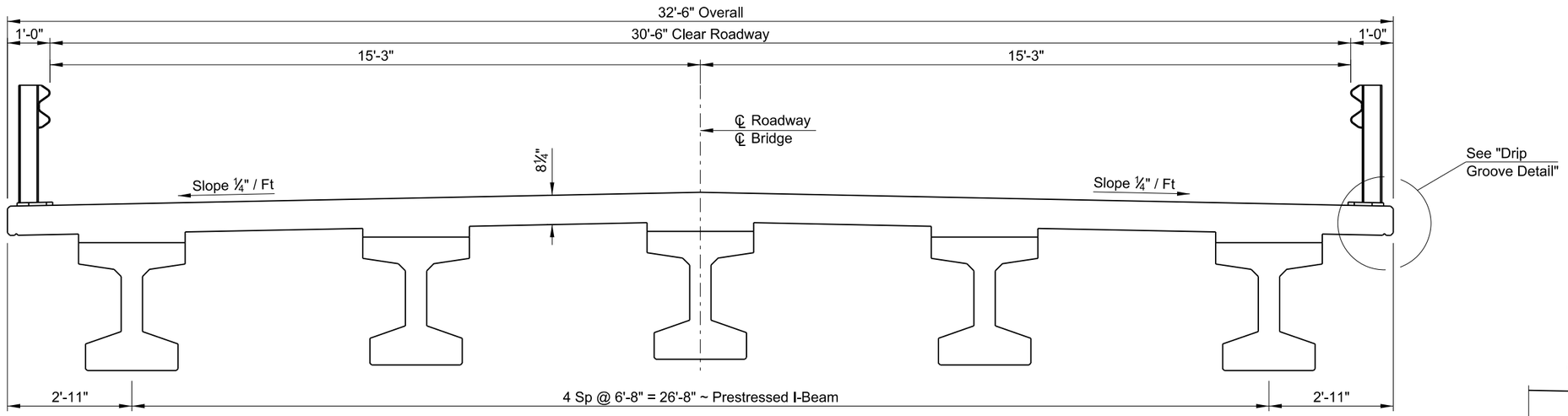
SEE DWG 170-4, 170-18

BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

HALF SLAB LAYOUT

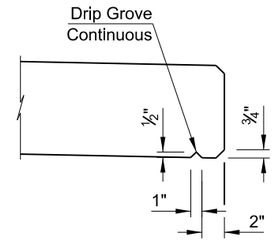
23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	170	17

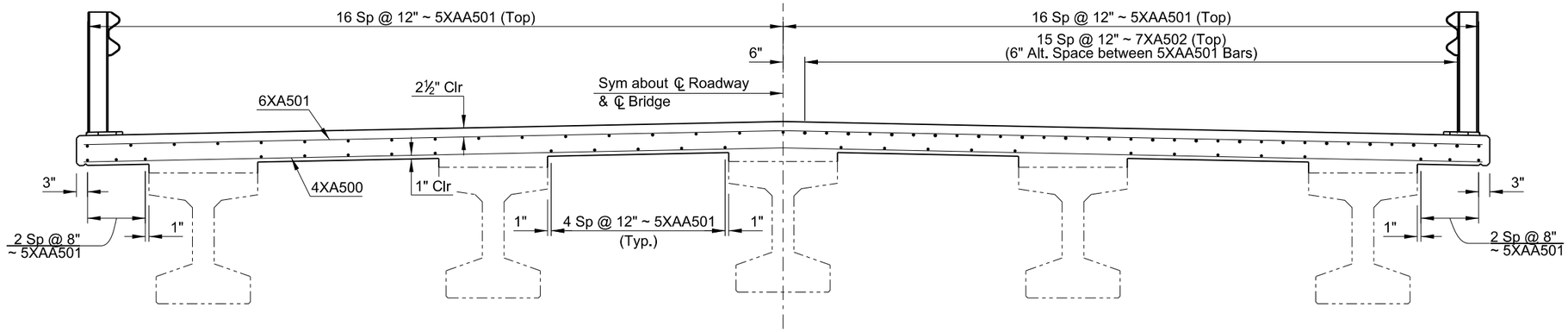


(SHOWING DIMENSIONS)

SLAB SECTION



DRIP GROOVE DETAIL



(SHOWING REINFORCING BETWEEN SUPPORTS)

(SHOWING REINFORCING OVER PIERS)

SLAB SECTION

REGISTERED PROFESSIONAL ENGINEER
DANIEL CICHOSZ
PE-8767
DATE 03-22-2022
NORTH DAKOTA

QUANTITIES

SEE DWG 170-4, 170-18

BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

SLAB SECTION

BILL OF REINFORCING STEEL, GRADE 60

LETTER PREFIX OF BAR MARK DENOTES SHAPE ~ SEE BAR DETAILS

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-2141(001)	170	18

LOCATION	SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS a	b	c	d	e	f	g	h	k
ABUTMENTS	7	A100	24	46'-2"		46'-2"							
	5	C100	44	18'-4"		8'-4"	1'-8"	8'-4"					
	5	C101	28	14'-6"		8'-4"	1'-8"	4'-6"					
	5	C102	28	4'-2"		1'-3"	1'-8"	1'-3"					
	7	C103	8	48'-8"		1'-3"	46'-2"	1'-3"					
	5	C104	60	2'-8"		6"	1'-8"	6"					
	5	D100	8	9'-5"		6'-5"	3'-0"					6	12
	5	SC100	4	64'-8"	1'-8"	6'-6"	8'-0"	1'-8"	3				
PIERS	8	A200	170	9'-6"		9'-6"							
	8	A201	50	32'-6"		32'-6"							
	8	A202	148	30'-6"		30'-6"							
	5	A203	136	27'-3"		27'-3"							
	6	A204	20	31'-2"		31'-2"							
	9	A205	16	2'-0"		2'-0"							
	8	B200	148	12'-0"		1'-6"	10'-6"						
	5	B201	32	6'-0"		3'-0"	3'-0"						
	5	C200	88	5'-1"		1'-0"	3'-1"	1'-0"					
	5	C201	12	8'-11"		3'-0"	2'-11"	3'-0"					
	6	C202	12	33'-10"		1'-4"	31'-2"	1'-4"					
	4	N200	64	11'-10"	2'-3"	3'-2"	6"					0	12
	4	N201	72	12'-0"	2'-3"	3'-3"	6"					0	12
	4	N202	32	12'-4"	2'-3"	3'-5"	6"					0	12
	4	P200	162	2'-6"		1'-8"	3"			2"	5"		
DIAPHRAGMS	5	A300	32	5'-10"		5'-10"							
	5	A301	16	3'-10"		3'-10"							
	6	A302	16	4'-0"		4'-0"							
	5	A303	6	29'-10"		29'-10"							
	5	A304	12	5'-0"		5'-0"							
	5	A305	8	4'-0"		4'-0"							
	6	AT500	32	2'-6"		2'-6"		5"	minimum				
	5	B300	32	4'-11"		1'-3"	3'-8"						
	4	C300	56	3'-4"		8"	2'-0"	8"					
	5	C301	8	8'-11"		1'-6"	2'-6"	1'-6"					
SUPERSTRUCTURE REGULAR	5	A500	4	46'-2"		46'-2"							
	5	A501	2	44'-2"		44'-2"							
	5	A502	16	4'-2"		4'-2"							
	5	A503	8	5'-10"		5'-10"							
	5	A504	4	8'-6"		8'-6"							
	5	A505	4	9'-4"		9'-4"							
	5	A506	4	7'-8"		7'-8"							
	5	A507	10	4'-0"		4'-0"							
	4	C500	72	2'-8"		6"	1'-8"	6"					
	5	D500	8	8'-4"		4'-0"	4'-4"					12	5.7
	4	U500	20	6'-2"		1'-2"	2'-6"					3	12
SUPERSTRUCTURE EPOXY	4	XA500	375	32'-2"		32'-2"							
	6	XA501	375	32'-2"		32'-2"							
	7	XA502	64	30'-0"		30'-0"							
	5	XA503	2	39'-2"		39'-2"							
	5	XAA501	59	198'-8"		49'-8"	3'-4"		4		188'-8"		
	5	XB500	60	7'-5"		3'-5"	4'-0"						
	5	XB501	32	6'-2"		3'-2"	3'-0"						
	5	XG500	24	10'-6"	3'-6"	2'-0"	3'-6"	9"				12	0
	6	XG501	20	11'-0"	3'-6"	2'-0"	3'-6"	12"				12	0

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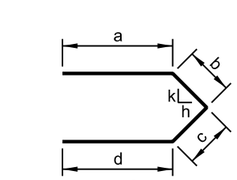
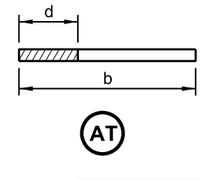
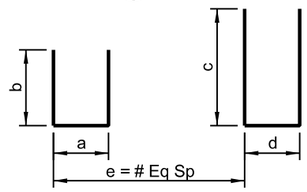
NDDOT Reserves All Objections

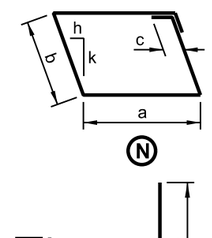
NOTES:

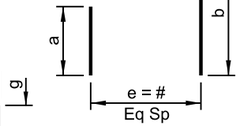
1. All dimensions are out to out of bars.
2. Nominal length of each bent bar or cut bar is the sum total of the detailing dimensions for that bar, unless otherwise noted.
3. Turn adjacent "AA" bars end for end so that the splice locations are staggered.
4. The "f" dimension indicates the inside radius unless otherwise noted.
5. An "X" preceding a bar designation indicates an epoxy coated bar.

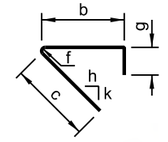


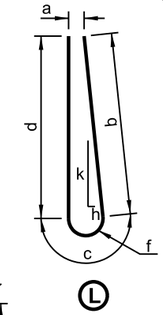


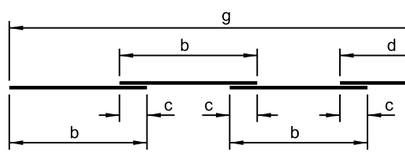


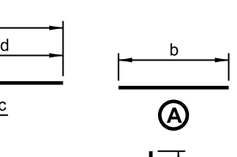


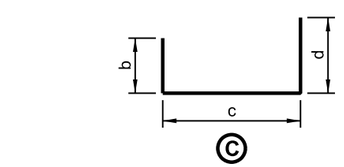


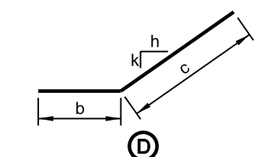


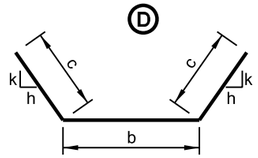


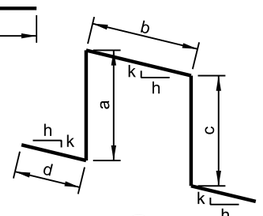


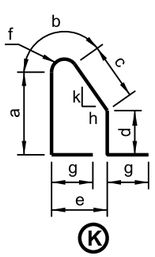












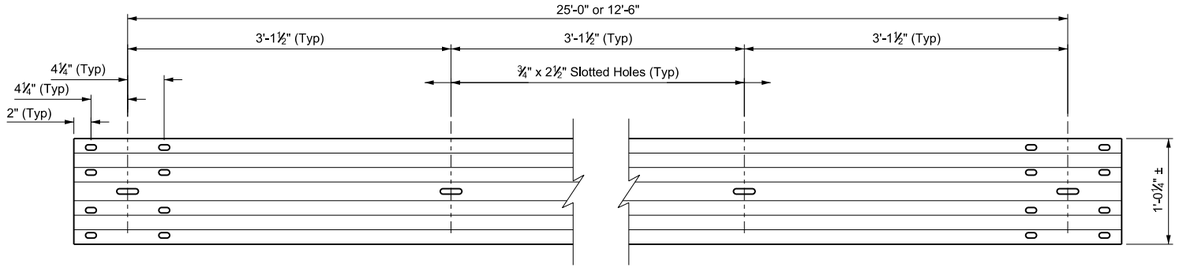
REGISTERED PROFESSIONAL ENGINEER
DANIEL CICHOSZ
PE-8767
DATE 03-22-2022
NORTH DAKOTA

BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

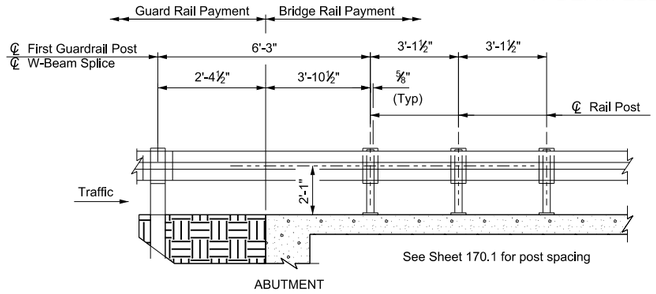
REINFORCING BAR LIST & DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

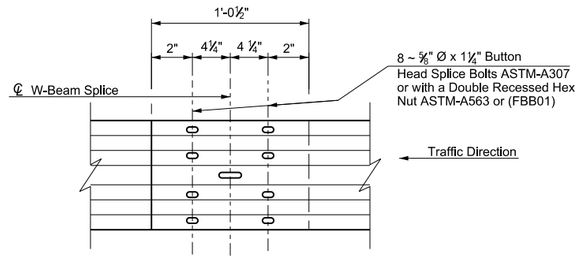
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	170	19



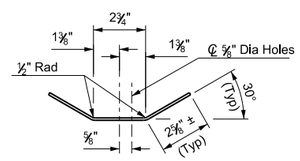
W-BEAM ELEVATION



(AT BEGIN BRIDGE)
INSIDE ELEVATION OF RAIL



W-BEAM SPLICE ELEVATION



(PLAN)
BACKER PLATE

(ELEVATION)
BACKER PLATE

CONSTRUCTION NOTES:

Install post perpendicular to adjacent roadway grade. Use epoxy mortar under post base plates if gaps larger than 1/16" exist.

Round or chamfer exposed edges of rail post and backer plate to approximately 1/16" by grinding prior to galvanizing. Work drawings are required for this rail.

MATERIAL NOTES:

Galvanize all steel components. Use anchor bolts for base plates that are ⅝" Dia ASTM F3125 Gr 325 or A449 bolts or ASTM A193 Gr B7 or F1554 Gr 105 threaded rod with one ASTM F436 hardened steel washer and one regular lock washer placed under each heavy hex nut. Use nuts conforming to A563 requirements. One additional heavy hex nut must be furnished and tack welded for each threaded rod.

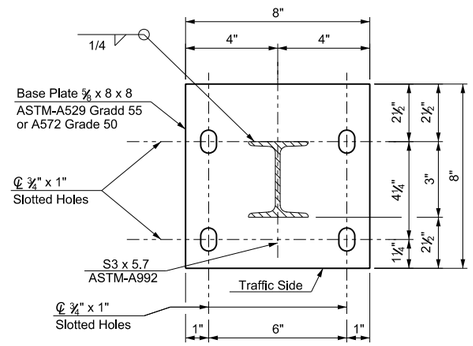
Use W-beam meeting the requirements of Section 862 of the Standard Specifications except as modified in these plans. The Contractor may furnish rail elements of 25'-0", or 12'-6" (Nominal) lengths. Use W-Beams with slotted holes at 3'-1½".

GENERAL NOTES:

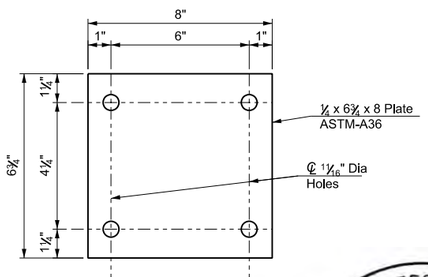
This railing has been successfully evaluated by full-scale crash test to meet MASH TL-3 criterial. This railing can be used for speeds of 50 mph and greater.

This rail is designed to deflect approximately 4' to 4'-6" as it contains and redirects the errant vehicle. This rail may not be installed on top of or behind curbs that project above finished grade, on bridges with expansion joints providing more than 5" movement, on retaining walls, or on grade separations and interchanges.

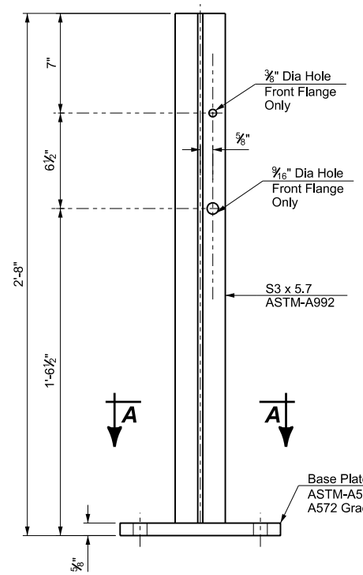
Repairs to impact-damaged post and base plate unit are not permitted. Replace all impact damaged posts with a new post and base plate unit.



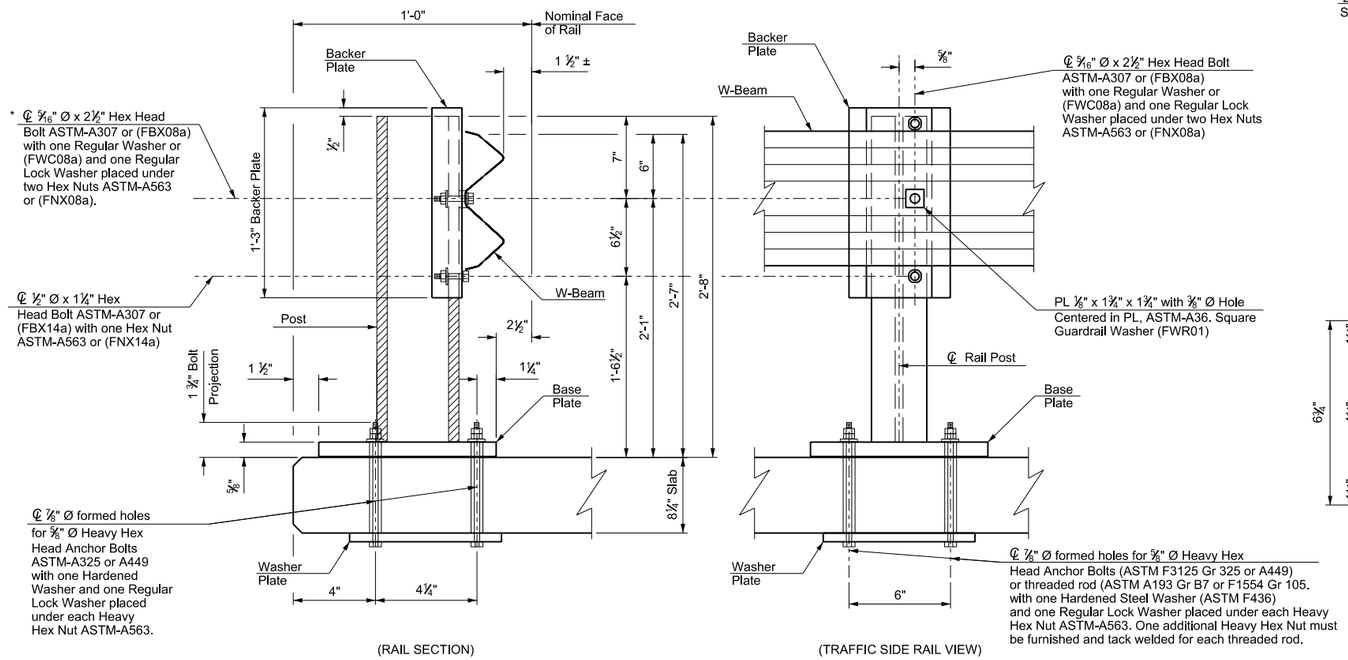
SECTION A-A



WASHER PLATE DETAIL



POST ELEVATION



RAIL DETAILS ON BRIDGE SLAB

* Tighten the first hex nut by hand until the top and bottom edges of the W-Beam engage the Backer Plate (Backer Plate should be snug against the post). Then tighten hex nut one revolution with wrench and secure with the second hex nut.

REGISTERED PROFESSIONAL ENGINEER
DANIEL CICHOSZ
PE-8767
DATE 03-22-2022
NORTH DAKOTA

QUANTITIES

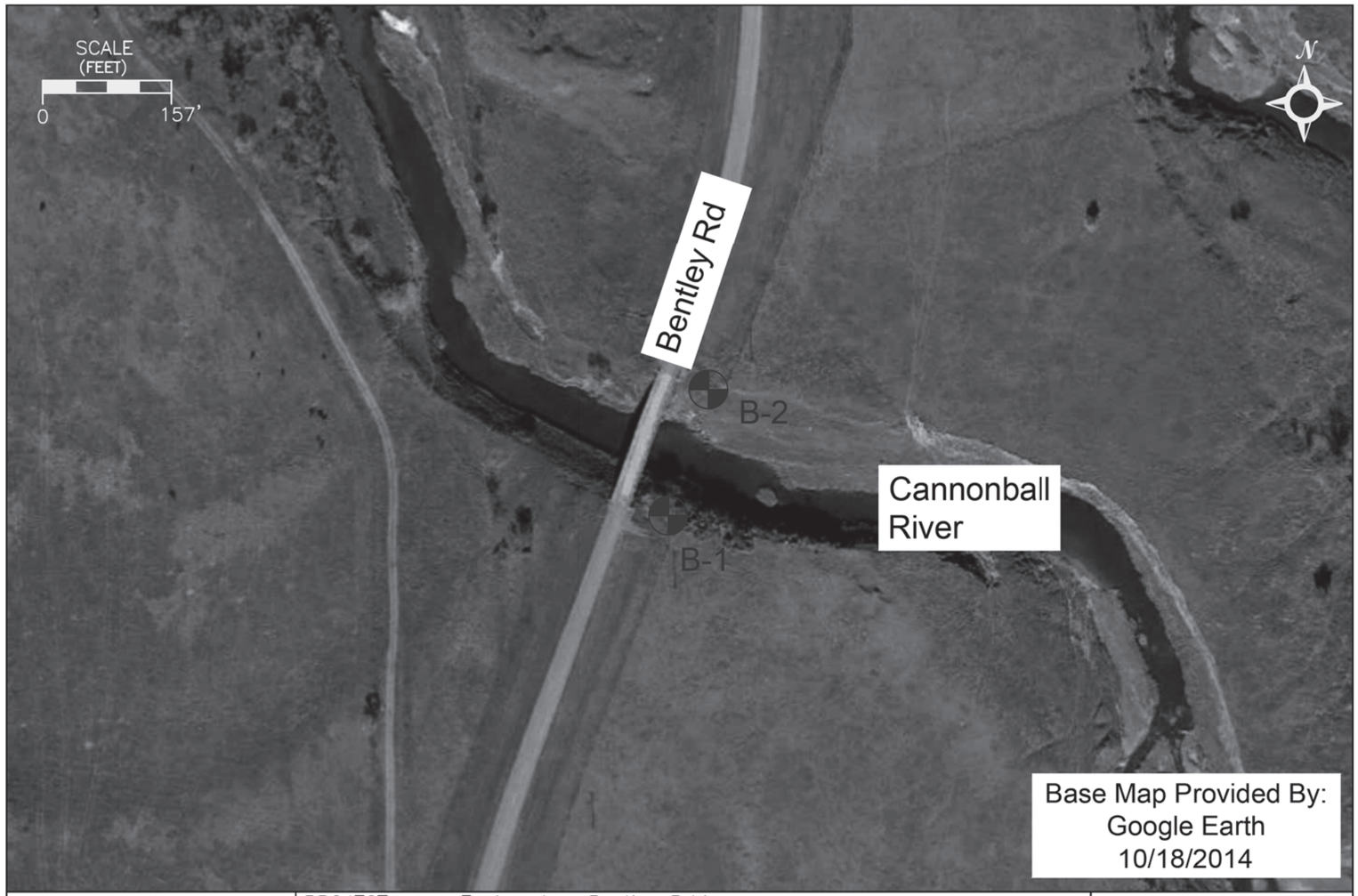
SEE DWG 170-4

BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

TRAFFIC RAIL - STEEL DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	175	1



AMERICAN ENGINEERING TESTING, INC.	PROJECT: rosz Engineering, Bentley Bridge Williston, North Dakota	PROJ. NO. 37–20740
	SUBJECT: Boring Location Map	DATE: October 29, 2020
	SCALE: Approximate Scale 1"=157' — DRAWN BY: TNT	REVIEWED BY: HTF

BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

GEOTECH

BORING LOGS

23 U.S.C. 409
NDDOT Reserves All Objections

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-2141(001)	175	2

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **37-20740** LOG OF BORING NO. **1 (p. 1 of 2)**

PROJECT: **Brosz Engineering, Bentley Bridge; Mott, ND**

SURFACE ELEVATION: **2288.3** LATITUDE: _____ LONGITUDE: _____

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N160	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
1	Top soil, dark brown	TOPSOIL									
2	**SILTY SAND**, trace roots, dark brown, loose **(SM)**	COARSE ALLUVIUM	22	M	SS	20					
3			19	M	SS	18	13				
4	**SILTY SAND**, with white incursions, light brown to grey, loose to very loose **(SM)**										
5			18	M	SS	15	12				
6											
7											
8			6	M	SS	15	8				
9											
10			8	M	SS	15	9				49
11	**CLAYEY SAND**, dark brown, loose to very loose **(SC)**	MIXED ALLUVIUM									
12			5	M	SS	18					
13											
14											
15			4	M	SS	20					
16											
17											
18											
19											
20	**CLAYEY SAND**, with oxidized iron staining, traces of lignite, reddish brown, medium dense **(SC)**		19	M	SS	18	25				
21											
22											
23											
24											
25	**Weakly Cemented SANDSTONE**, grey, very hard	SLOPE FORMATION	126	M/WB	SS	18	22				8
26											
27											
28											
29											
30			121	M/WB	SS	16	24				31
31											
32											
33											
34											
35			117	M/WB	SS	14	15				33
36											
37											
38											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-24½'	**3.25" HSA**							
24½'-64½'	**RD w/DM**	**9/16/20**		**26'**	**24.5'**	**-**	**-**	**24'**
BORING COMPLETED:	**9/16/20**							
DR: **TT**	LG: **KM** Rig: **39**							

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG 37-20740 PRELIM BORING LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 12/8/20

03/2011 01-DHR-060

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **37-20740** LOG OF BORING NO. **1 (p. 2 of 2)**

PROJECT: **Brosz Engineering, Bentley Bridge; Mott, ND**

LATITUDE: _____ LONGITUDE: _____

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N160	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
40	**Weathered CLAYSTONE**, light to dark brown, very hard	SLOPE FORMATION *(continued)*	111	M/WB	SS	16					
41											
42											
43											
44											
45	**Weakly Cemented SANDSTONE**, grey, very hard		110	M/WB	SS	15					
46											
47											
48	**LIGNITE**, black										
49											
50			107	M/WB	SS	4					
51											
52	**Weathered CLAYSTONE**, traces of lignite, grey, medium hard to very hard										
53											
54											
55			38	M/WB	SS	12					
56											
57											
58											
59											
60			99	M/WB	SS	18					
61											
62											
63											
64											
65			72	M/WB	SS	22					
66	**Bottom of Boring**										

81012_JG.GDT 12/8/20

BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

GEOTECH

BORING LOGS

23 U.S.C. 409
NDDOT Reserves All Objections

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-2141(001)	175	3

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **37-20740** LOG OF BORING NO. **2 (p. 1 of 2)**

PROJECT: **Brosz Engineering, Bentley Bridge; Mott, ND**

SURFACE ELEVATION: **2282.4** LATITUDE: _____ LONGITUDE: _____

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N160	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
1	Top soil, light brown	TOPSOIL									
2	**SILTY SAND**, with trace roots, tan, loose **(SM)**	COARSE ALLUVIUM	40	M	SS	21					
3			15	M	SS	20	6				
4											
5	**SILTY SAND**, with white incursions, traces of lignite, tan, loose **(SM)**		10	M	SS	19	6				
6											
7											
8			7	M	SS	16	9				
9											
10	**SANDY LEAN CLAY**, brown, soft to stiff **(CL)**	FINE ALLUVIUM	8	M	SS	17					
11											
12			6	M	SS	16	18		27	17	
13											
14											
15			6	M	SS	17	18				64
16											
17											
18											
19											
20			12	▼	SS	16					
21	**SILTY SAND**, grey, loose **(SM)**	COARSE ALLUVIUM									
22	**SILT WITH SAND**, with laminations of clay, traces of lignite, grey, hard, water bearing **(ML)**										
23											
24											
25			129	WB	SS	12	21				71
26											
27											
28	**Weathered CLAYSTONE**, traces of lignite, brown to grey, very hard	SLOPE FORMATION									
29											
30			88	M/WB	SS	17	23		53	17	
31											
32											
33											
34	**LIGNITE**, black										
35	**Weathered CLAYSTONE**, grey, very hard		118	M/WB	SS	20	26				99
36											
37											
38											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-24½'	**3.25" HSA**							
24½'-64½'	**RD w/DM**	**9/17/20**		**26'**	**24.5'**	**-**	**-**	**21'**
BORING COMPLETED:	**9/17/20**							
DR: **TT**	LG: **KM** Rig: **39**							

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

03/2011 01-DHR-060

AET_CORP W-LAT-LONG 37-20740 PRELIM BORING LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 12/8/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **37-20740** LOG OF BORING NO. **2 (p. 2 of 2)**

PROJECT: **Brosz Engineering, Bentley Bridge; Mott, ND**

LATITUDE: _____ LONGITUDE: _____

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N160	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
40	**SILTSTONE**, with sand, grey, very hard	SLOPE FORMATION *(continued)*	114	M/WB	SS	14					
41											
42											
43											
44	**LIGNITE**, black										
45			110	M/WB	SS						
46											
47											
48	**Weathered CLAYSTONE**, grey, hard										
49											
50			67	M/WB	SS	19					
51											
52											
53											
54	Becomes very hard with laminations of silt at 54 feet										
55			103	M/WB	SS	23					
56											
57											
58											
59											
60			100	M/WB	SS	24					
61											
62											
63											
64	**Weakly Cemented SANDSTONE**, dark brown, very hard		101	M/WB	SS	3					
65											
66	**Bottom of Boring**										

81012_JG.GDT 12/8/20

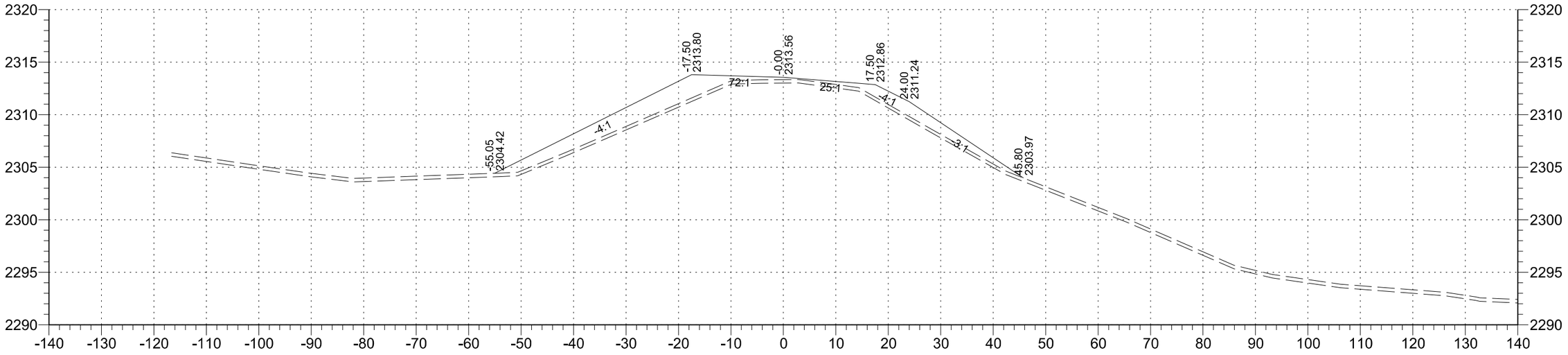
BENTLEY ROAD BRIDGE
OVER CANNONBALL RIVER

GEOTECH

BORING LOGS

MAINLINE CROSS-SECTIONS

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	200	1



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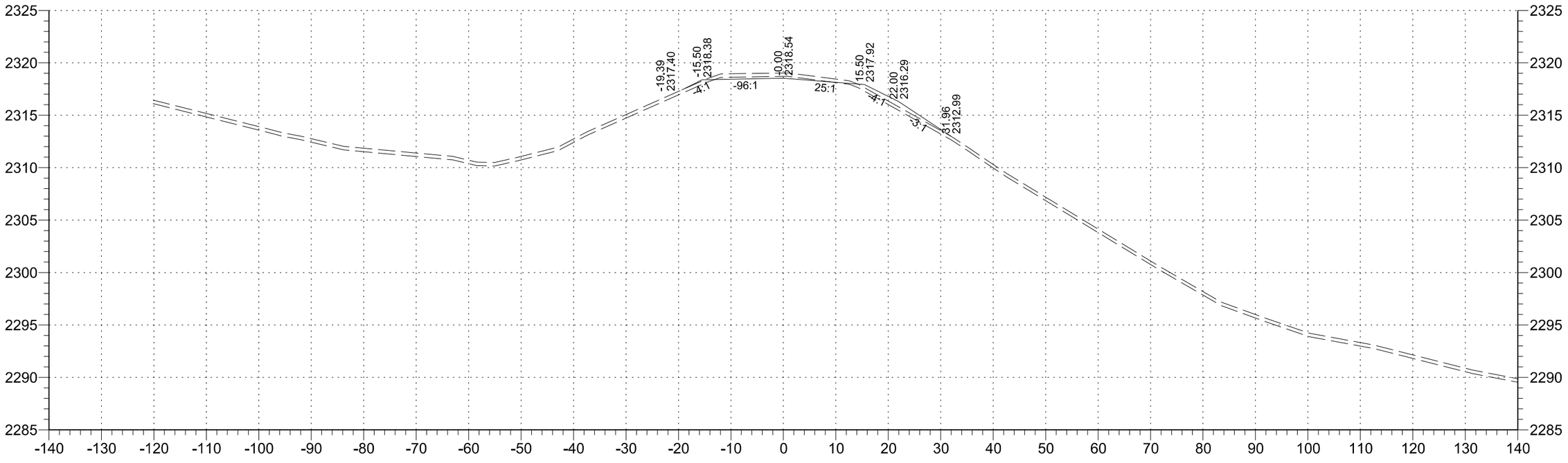

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MAINLINE CROSS-SECTIONS

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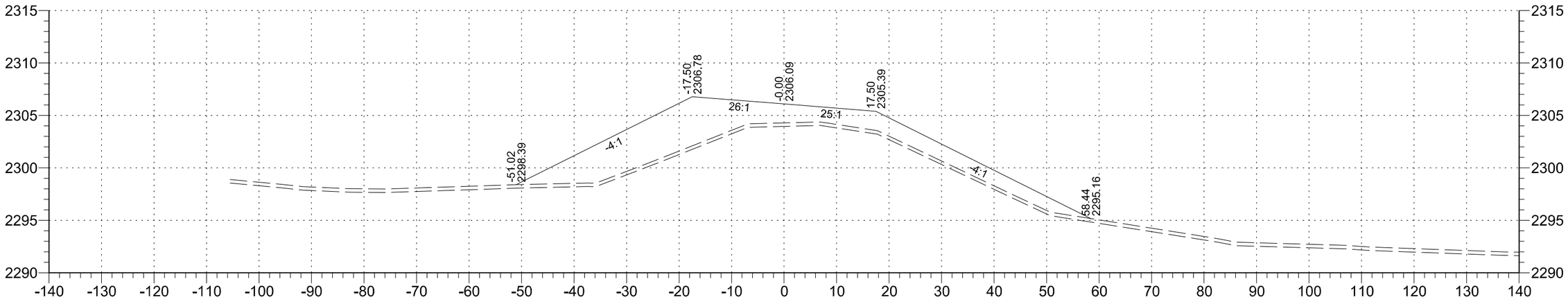
	ND	BRC-2141(001)	200	2



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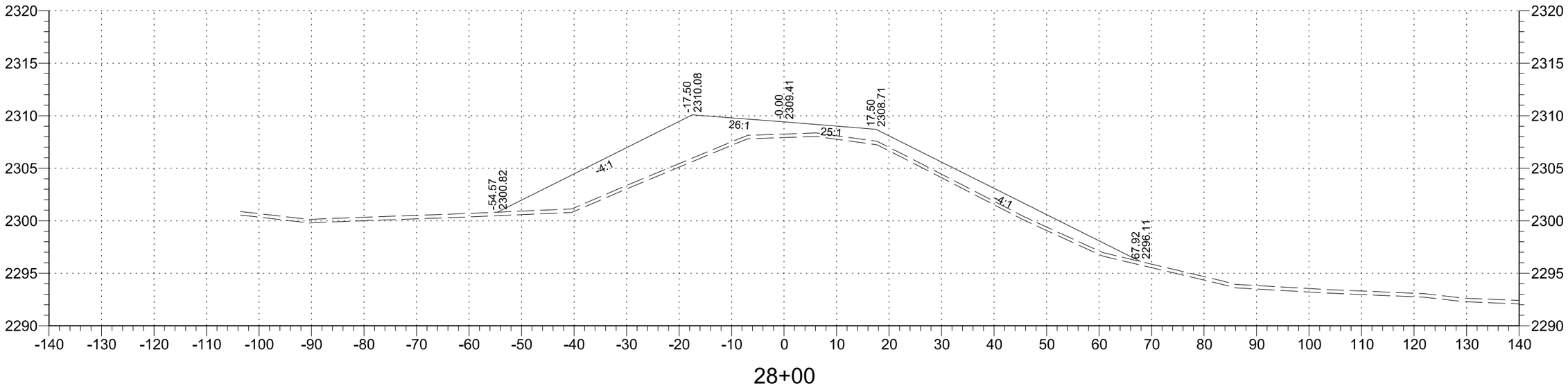

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MAINLINE CROSS-SECTIONS

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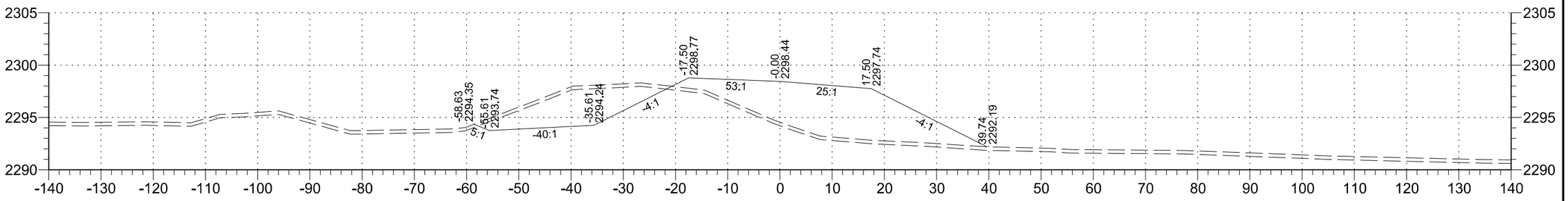

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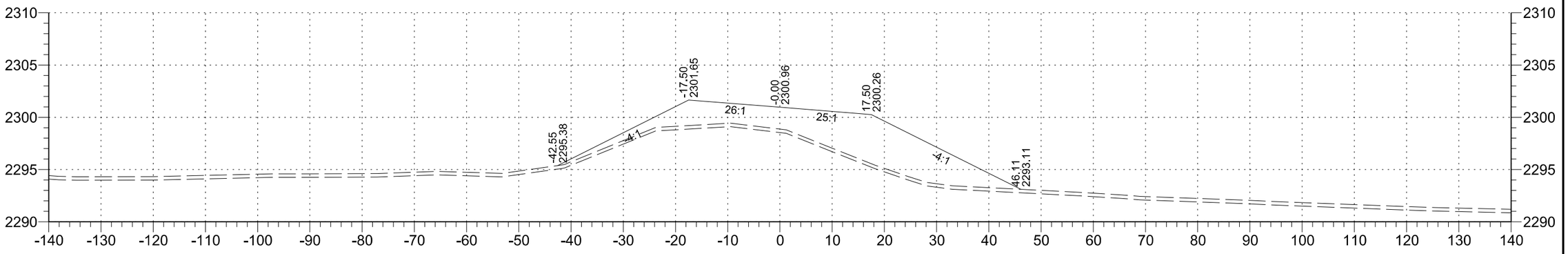

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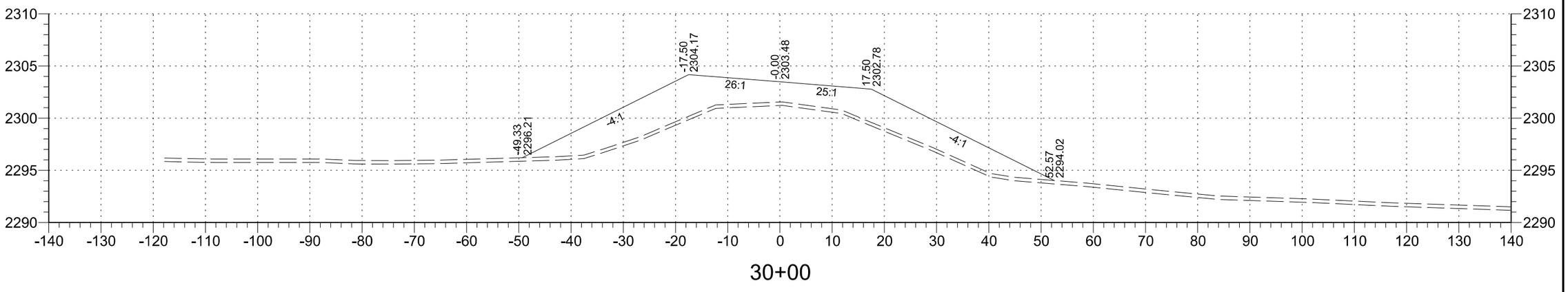

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MAINLINE CROSS-SECTIONS

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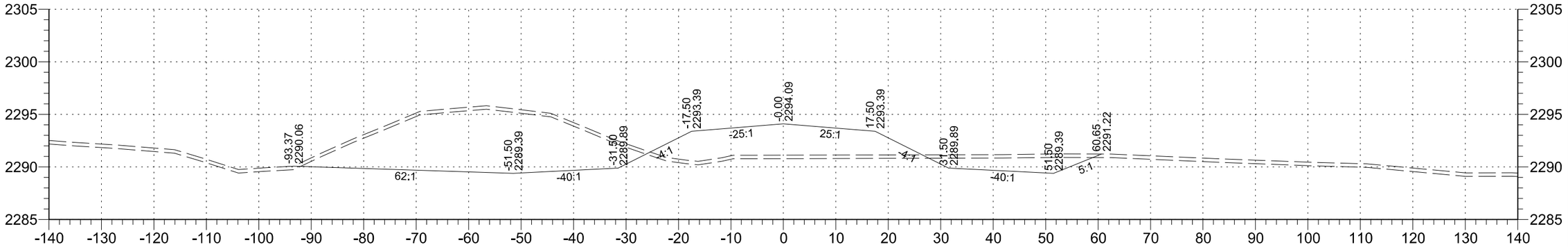

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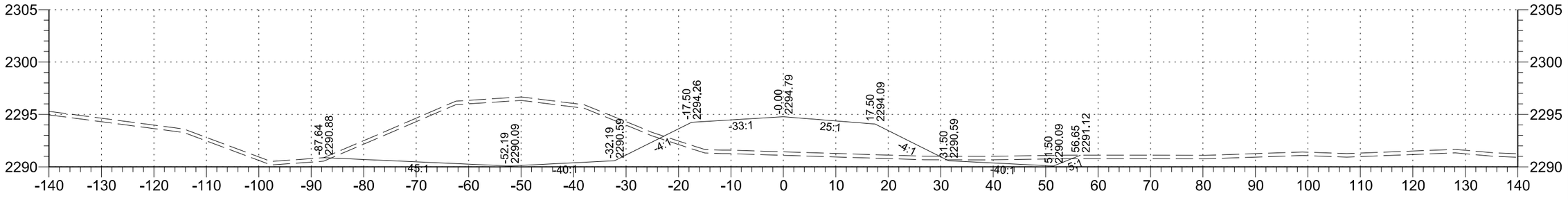

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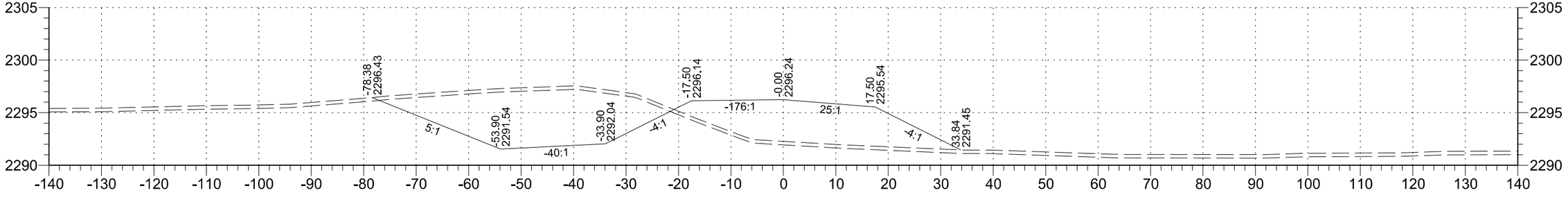

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MAINLINE CROSS-SECTIONS

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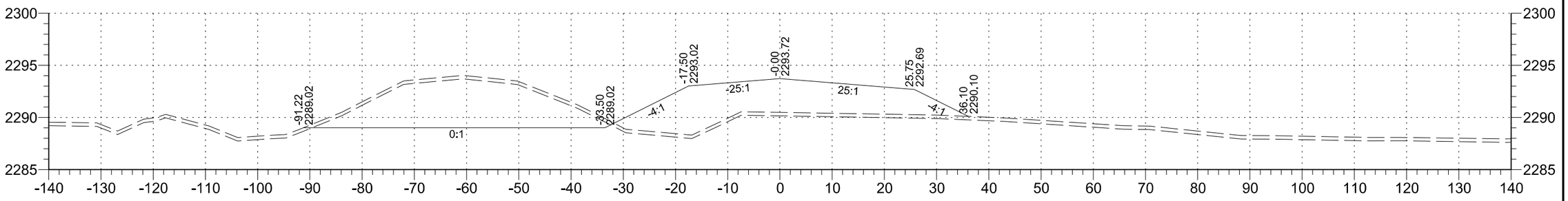

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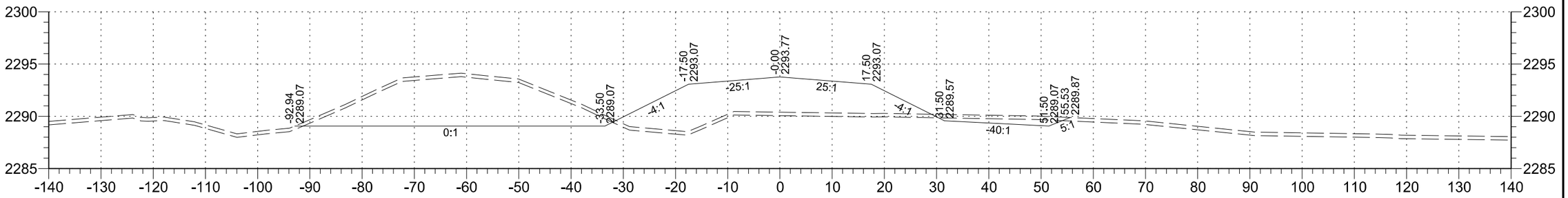

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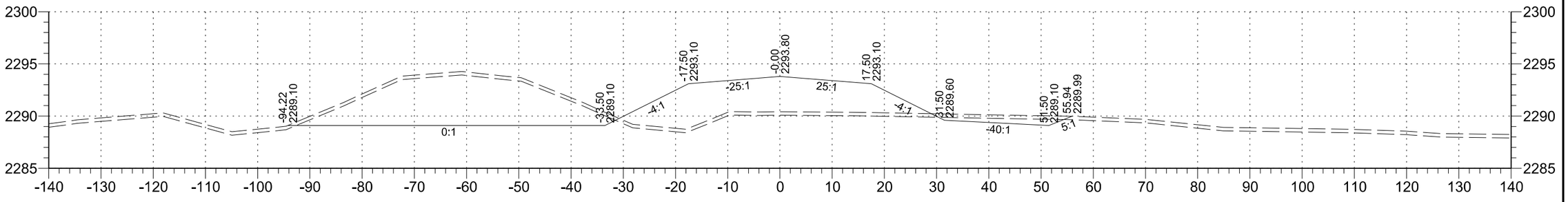

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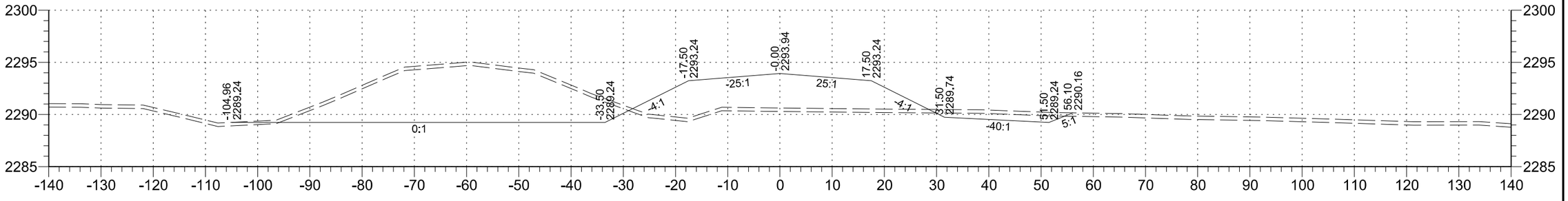

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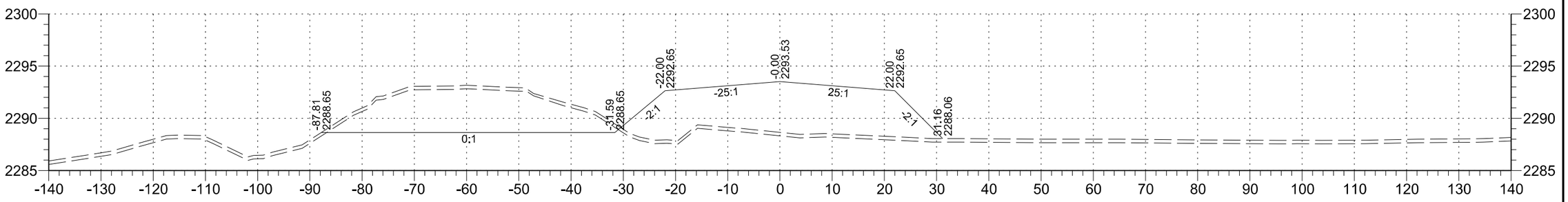
MAINLINE CROSS-SECTIONS

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-2141(001)	200	6



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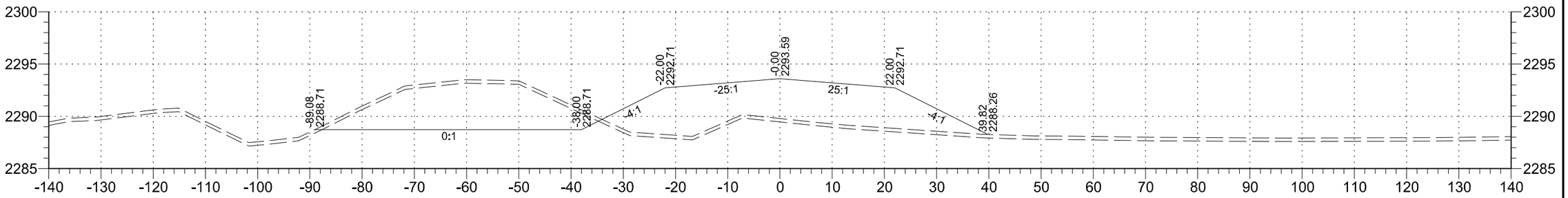

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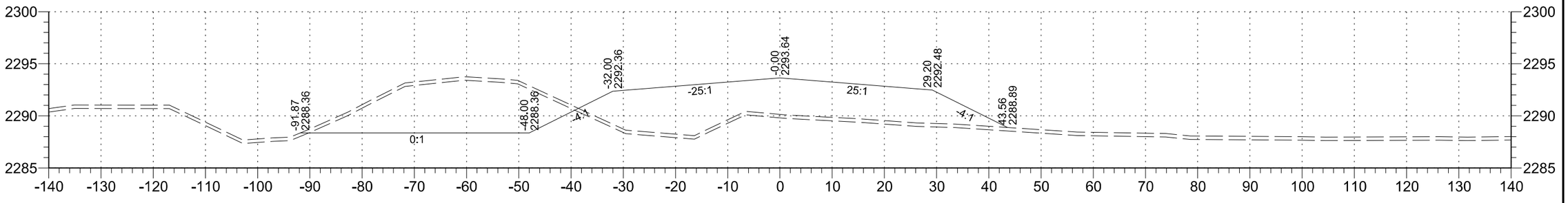

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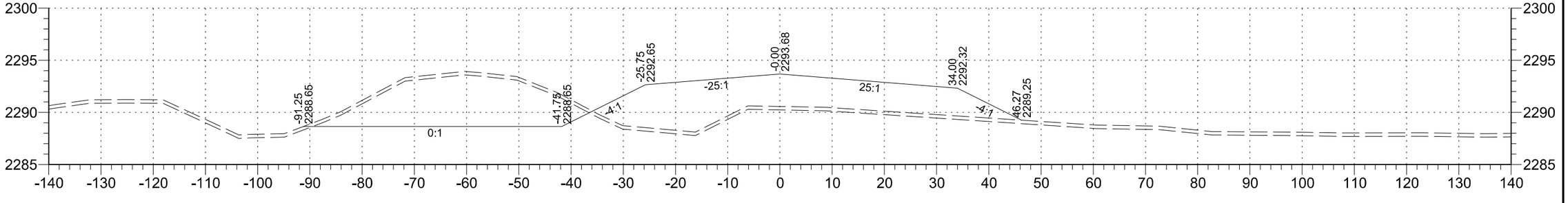

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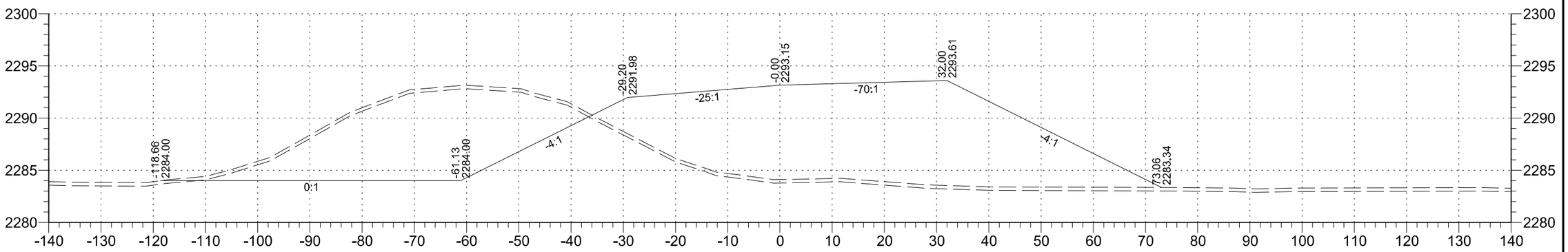

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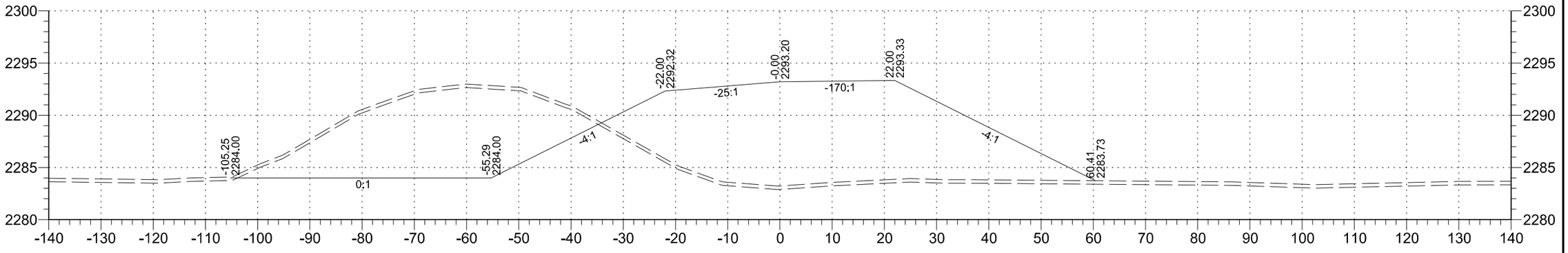

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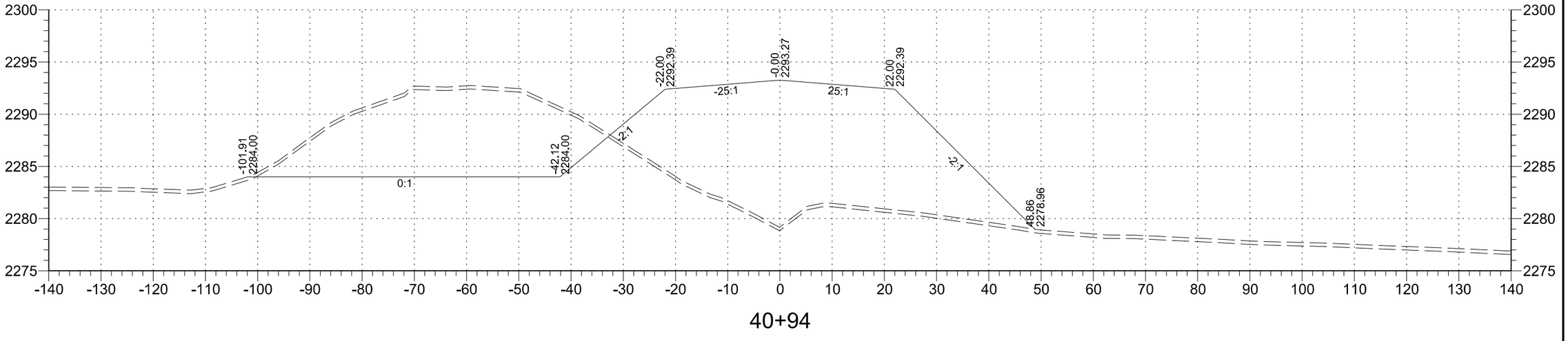

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MAINLINE CROSS-SECTIONS

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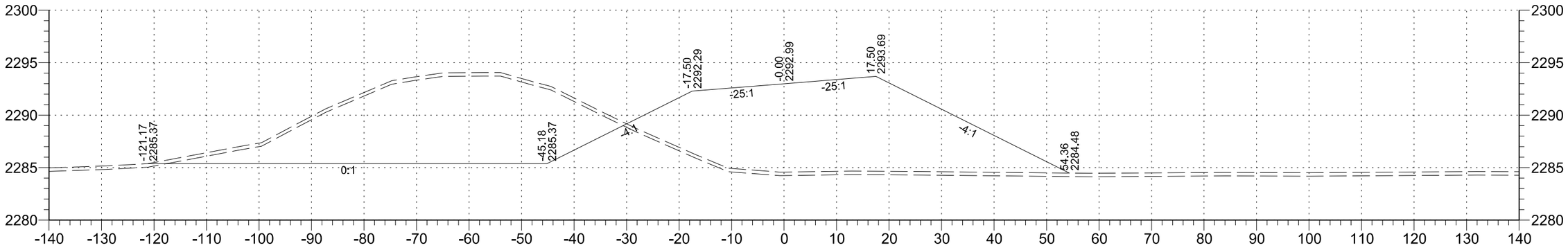

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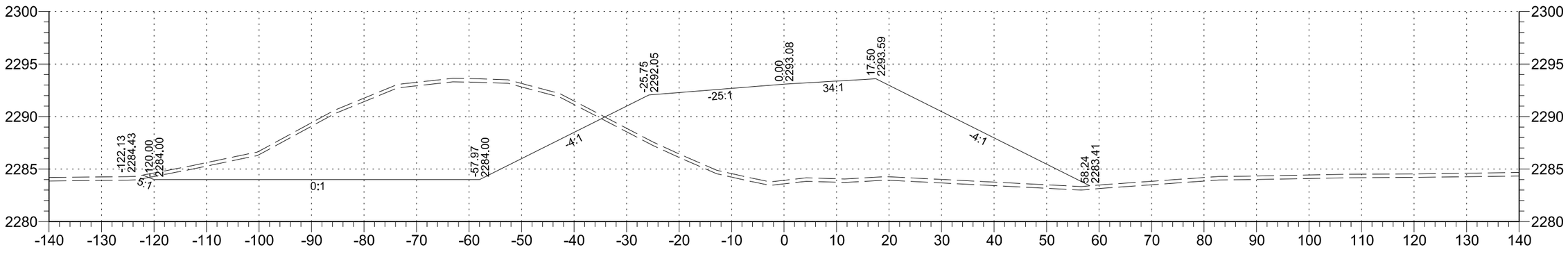

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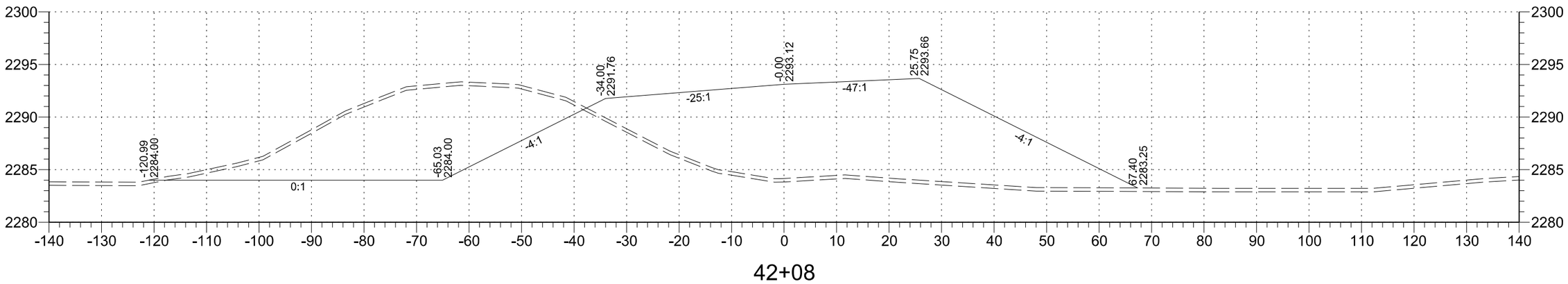

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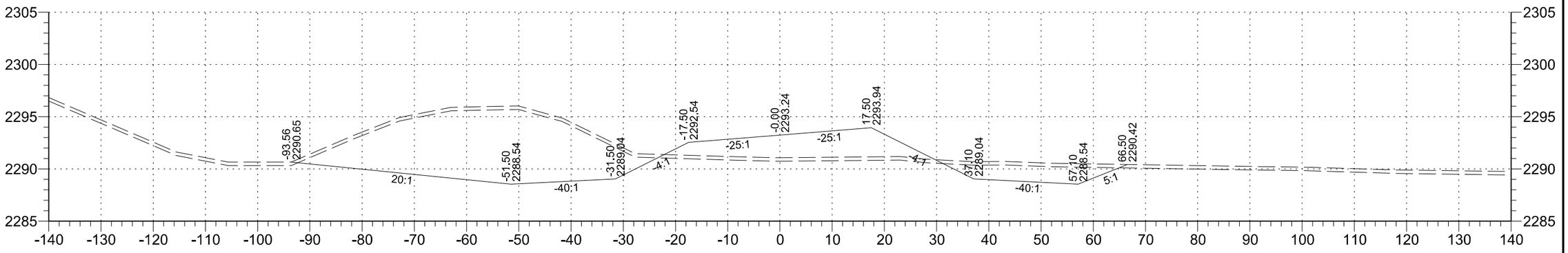

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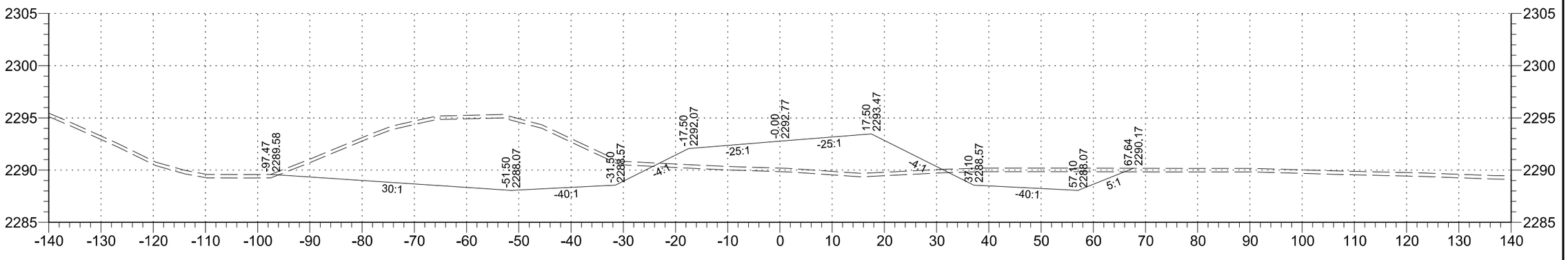

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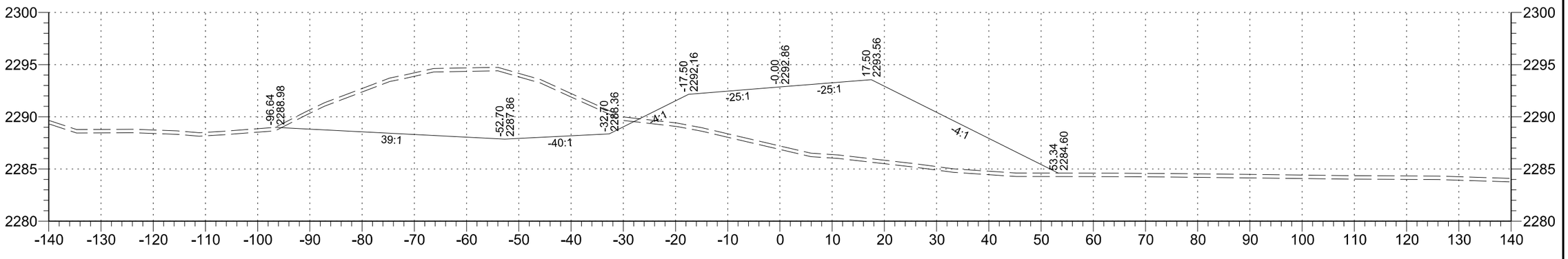

44+00

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MAINLINE CROSS-SECTIONS

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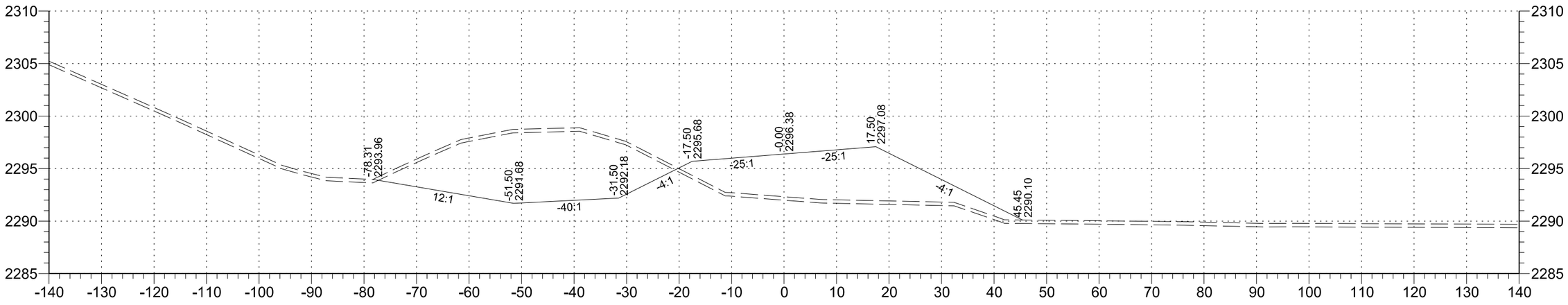

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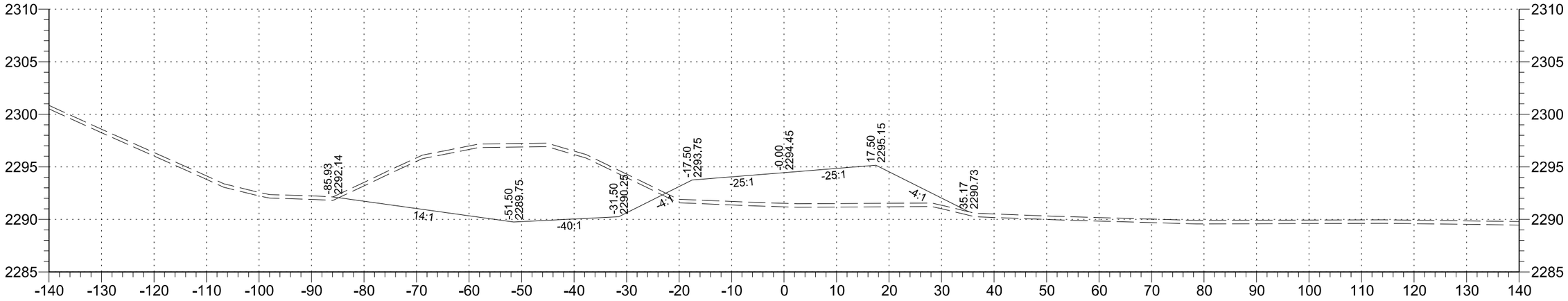

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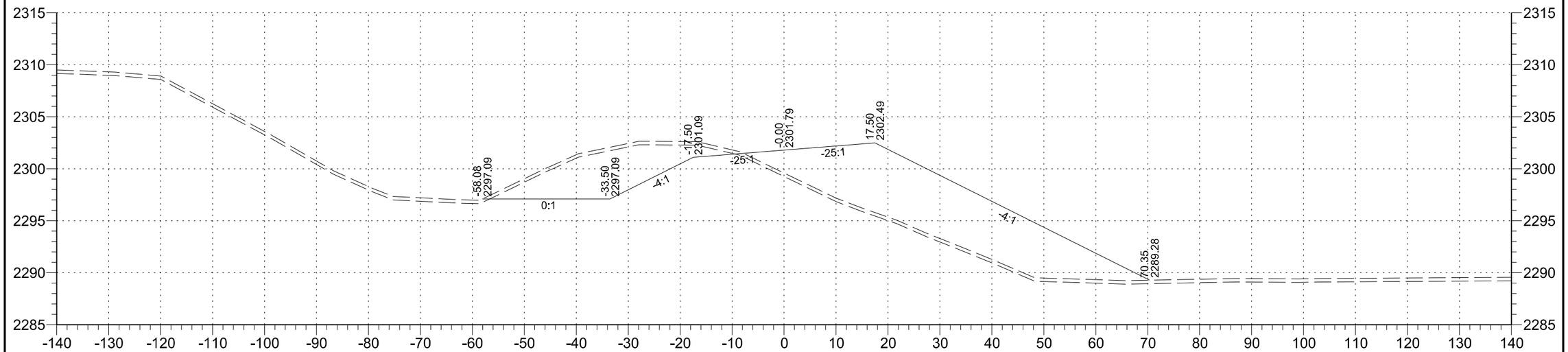

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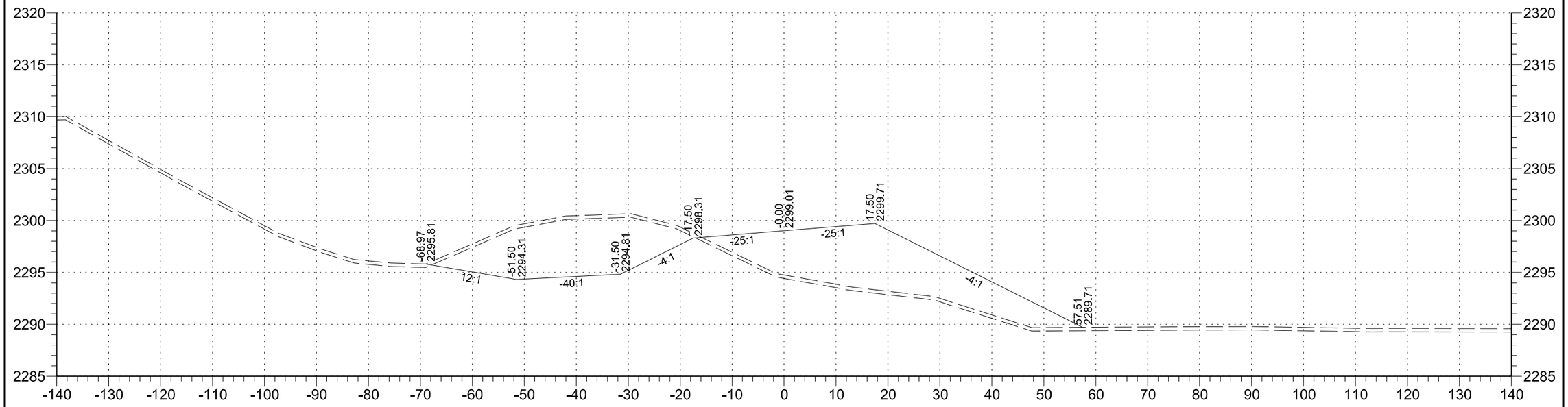

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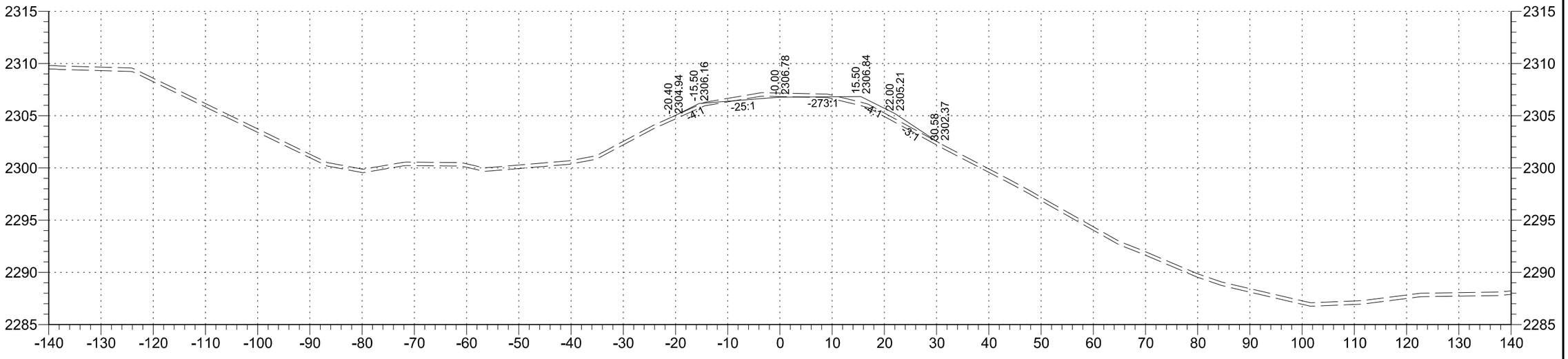

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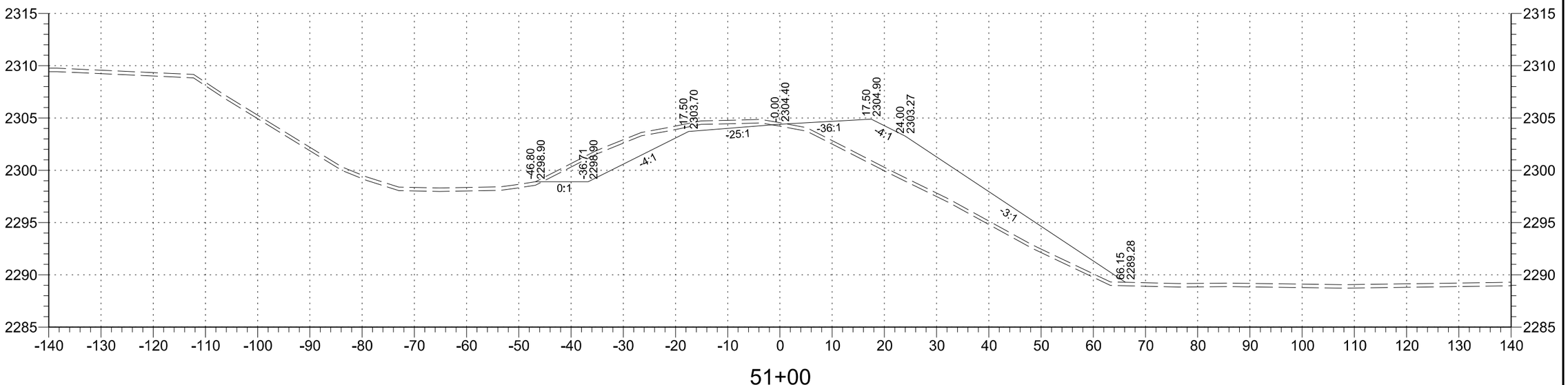

51+00

NDDOT ABBREVIATIONS

D-101-1

?	This is a special text character used in the labeling of existing features. It indicates a feature that has an unknown characteristic, potentially based on: lack of description, location accuracy or purpose.
Abn	abandoned
Abut	abutment
Adj	adjusted
Aggr	aggregate
Ahd	ahead
ARV	air release valve
Align	alignment
Al	alley
Alt	alternate
Alum	aluminum
ADA	Americans with Disabilities Act
&	and
Appr	approach
Approx	approximate
ACP	asbestos cement pipe
Asph	asphalt
AC	asphalt cement
Assmd	assumed
@	at
Atten	attenuation
ATR	automatic traffic recorder
Ave	Avenue
Avg	average
ADT	average daily traffic
Bk	back
BF	back face
Balc	balcony
B Wire	barbed wire
Barr	barricade
Btry	battery
BI	beehive inlet
Beg	begin
BG	below grade
BM	bench mark
Bkwy	bikeway
Bit	bituminous
Blk	block
BH	bore hole
Bot	bottom
Blvd	Boulevard
Bndry	boundary
Brkwy	breakaway
Br	bridge
Bldg	building
Bus.	business
BV	butterfly valve
Byp	bypass
C Gdrl	cable guardrail
Calc	calculate
CIP	cast iron pipe
CB	catch basin
CRS	cationic rapid setting
C Gd	cattle guard
C To C	center to center
CL or ℄	centerline
Ch	chain
Chnlk	chain-link
Ch Blk	channel block
Ch Ch	channel change
Chk	check
Chsld	chiseled
Cir	circle
Cl	class
Clnt	clean-out
Clr	clear
Cl&gr	clearing & grubbing
Comb.	combination
Coml	commercial
Compr	compression
CADD	computer aided drafting & design
Conc	concrete
CECB	concrete erosion control blanket
Cond	conductor
Const	construction
Cont	continuous
CSB	continuous split barrel sample
Contr	contraction
Contr	contractor
CP	control point
Coord	coordinate
Cor	corner
Corr	corrected
CAES	corrugated aluminum end section
CAP	corrugated aluminum pipe
CMES	corrugated metal end section
CMP	corrugated metal pipe
CPVCP	corrugated poly-vinyl chloride pipe
CSES	corrugated steel end section
CSFES	corrugated steel flared end section
CSP	corrugated steel pipe
CSTES	corrugated steel traversable end section
Co	County
Crse	course
Ct	Court
Xarm	cross arm
Xbuck	cross buck
Xsec	cross sections
Xing	crossing
Xrd	crossroad
Crn	crown
Culv	culvert
C&G	curb & gutter
CI	curb inlet
CR	curb ramp
C	cut
Dd Ld	dead load
Defl	deflection
Defm	deformed
Dlnt	delineate
Dlntr	delineator
Depr	depression
Desc	description
Det	detail
DWP	detectable warning panel
Dtr	detour
Dia or ø	diameter
Dir	direction
Dist	distance
DM	disturbed material
DB	ditch block
DG	ditch grade
Dbl	double
Dn	down
Dwg	drawing
Dr	drive
Drwy	driveway
DI	drop inlet
D	dry density
DSDS	dynamic speed display sign
Ea	each
Esmt	easement
E	East
EB	Eastbound
Elast	elastomeric
EL	electric locker
E Mtr	electric meter
Elec	electric/al
EDM	electronic distance meter
Elev or El	elevation
Ellipt	elliptical
Emb	embankment
Emuls	emulsion/emulsified
ES	end section
Engr	engineer
ESS	environmental sensor station
Eq	equal
Evgr	evergreen
Exc	excavation
Exst	existing
Exp	expansion
Expy	Expressway
E	external of curve
Extru	extruded
FOS	factor of safety
Fed	Federal
FP	feed point
Fn	fence
Fn P	fence post
FO	fiber optic
FD	field drive
F	fill
FAA	fine aggregate angularity
FH	fire hydrant
Fl	flange
Flrd	flared
FES	flared end section
F Bcn	flashing beacon
FA	flight auger sample
FL	flow line
Ftg	footing
FM	force main
Fnd	found
Fdn	foundation
Frac	fractional
Frwy	freeway
Frt	front
FF	front face
F Disp	fuel dispenser
FFP	fuel filler pipes
FLS	fuel leak sensor
Furn	furnish/ed

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
04-23-18	General Revisions
09-20-18	General Revisions
12-18-20	General Revisions

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
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NORTH DAKOTA

Kirk J Hoff

12 18 2020

NDDOT ABBREVIATIONS

D-101-2

Galv	galvanized
Gar	garage
Gs L	gas line
G Reg	gas line regulator
GMV	gas main valve
G Mtr	gas meter
GSV	gas service valve
GVP	gas vent pipe
GV	gate valve
Ga	gauge
Gov	government
Grd	graded/grade
Grnd	ground
GWM	ground water monitor
Gdrl	guardrail
Gtr	gutter
H Plg	H piling
Hdwl	headwall
Ht	height
Hel	helical
HDPE	high density polyethylene
HM	high mast
HP	high pressure
HPS	high pressure sodium
Hwy	highway
Hor	horizontal
HBP	hot bituminous pavement
HMA	hot mix asphalt
Hyd	hydrant
Ph	hydrogen ion content
Id	identification
Incl	inclinometer tube
IMH	inlet manhole
ID	inside diameter
Inst	instrument
Intchg	interchange
Intmdt	intermediate
Intscn	intersection
Inv	invert
IP	iron pipe
Jt	joint
Jct	junction

Ln	lane
Lg	large
Lat	latitude
Lt	left
Lens	lenses
Lvl	level
Lvlng	leveling
Lht	light
LP	light pole
Ltg	lighting
Liq	liquid
LL	liquid limit
Loc	location
Long.	longitude
Lp	loop
LD	loop detector
Lum	luminaire
Mb	mailbox
ML	main line
MH	manhole
Mkd	marked
Mkr	marker
Mkg	marking
MA	mast arm
Matl	material
Max	maximum
MC	meander corner
Meas	measure
Mdn	median
MD	median drain
MC	medium curing
MGS	Midwest Guardrail System
MM	mile marker
MP	mile post
Min	minimum
Misc	miscellaneous
Mon	monument
Mnd	mound
Mtbl	mountable
Mtd	mounted
Mtg	mounting
Mk	muck
Neop	neoprene
Ntwk	network
N	North
NE	North East
NW	North West
NB	Northbound
No. or #	number

Obsc	obscure(d)
Ocpd	occupied
Ocpy	occupy
O/s	offset
OC	on center
C	one dimensional consolidation
OC	organic content
Orig	original
O To O	out to out
OD	outside diameter
OH	overhead
PMT	pad mounted transformer
Pg	pages
Pntd	painted
Pr	pair
Pnl	panel
Pk	park
PSD	passing sight distance
Pvmt	pavement
Ped	pedestal
Ped	pedestrian
PPP	pedestrian pushbutton post
Pen.	penetration
Perf	perforated
Per.	perimeter
Perm	permanent
PL	pipeline
Pl	place
P&P	plan & profile
PL	plastic limit
Pl or PL	plate
Pt	point
PE	polyethylene
PVC	polyvinyl chloride
PCC	Portland Cement concrete
PP	power pole
Preempt	preemption
Prefab	prefabricated
Prfmd or Pref	preformed
Prep	preperation
Press.	pressure
PRV	pressure relief valve
Prestr	prestressed
Pvt	private
PD	private drive
Prod.	production/produce
Prog	programmed
Prop.	property
Prop Ln	property line
Ppsd	proposed
PB	pull box

Qty	quantity
Qtr	quarter
Rad or R	radius
RR	railroad
Rlwy	railway
Rsd	raised
RC	rapid curing
Rec	record
Rcy	recycle
RAP	recycled asphalt pavement
RPCC	recycled portland cement concrete
Ref	reference
R Mkr	reference marker
RM	reference monument
RP	reference point
Refl	reflectorized
RCB	reinforced concrete box
RCES	reinforced concrete end section
RCFES	reinforced concrete flared end section
RCP	reinforced concrete pipe
RCPS	reinforced concrete pipe sewer
RCTES	reinforced concrete traversable end section
Reinf	reinforcement
Res	reservation
Res	residence
Ret	retaining
Rev	reverse
Rt	right
R/W	right of way
Riv	river
Rd	road
Rdbd	road bed
Rdwy	roadway
RWIS	roadway weather information system
Rk	rock
Rt	route

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Salv	salvage(d)
San	sanitary sewer line
Sec	section
SL	section line
Sep	separation
Seq	sequence
Serv	service
Sht	sheet
Shtng	sheeting
Shldr	shoulder
Sw or Sdwk	sidewalk
SD	sight distance
SN	sign number
Sig	signal
Sgl	single
SRCP	slotted reinforced concrete pipe
SC	slow curing
SS	slow setting
Sm	small
S	South
SE	South East
SW	South West
SB	Southbound
Sp	spaces
Spcl	special
SA	special assembly
SP	special provisions
G	specific gravity
Spk	spike
SB	split barrel sample
SH	sprinkler head
SV	sprinkler valve
Sq	square
Stk	stake
Std	standard
N	standard penetration test
Std Specs	standard specifications
Stm L	steam line
SEC	steel encased concrete
SMA	stone matrix asphalt
SSD	stopping sight distance
SD	storm drain
St	street
SPP	structural plate pipe
SPPA	structural plate pipe arch
Str	structure
Subd	subdivision
Sub	subgrade
Sub Prep	subgrade preperation
Ss	subsoil
SS	supplement specification
Supp	supplemental
Surf	surfacing
Surv	survey
Sym	symmetrical

Tel	telephone
Tel B	Telephone Booth
Tel P	telephone pole
Tv	television
Temp	temperature
Temp	temporary
TBM	temporary bench mark
T	thinwall tube sample
Ts	topsoil
Traf	traffic
TSCB	traffic signal control box
Tr	trail
Transf	transformer
Trans	transition
TT	transmission tower
TES	traversable end section
Trans	transverse
Trtd	treated
Trmt	treatment
Qc	triaxial compression
TERO	tribal employment rights ordinance
Tpl	triple
Typ	typical
Qu	unconfined compressive strength
Ugrnd	underground
Util	utility
VG	valley gutter
Vap	vapor
Vert	vertical
VCP	vitrified clay pipe
Vol	volume
Wkwy	walkway
W	water content
WGV	water gate valve
WL	water line
WM	water main
WMV	water main valve
W Mtr	water meter
WSV	water service valve
WW	water well
Wrng	wearing
WIM	weigh in motion
W	west
WB	westbound
Wrng	wiring
W/	with
W/o	without
WC	witness corner

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NDDOT ABBREVIATIONS

D-101-4

MEASUREMENTS

ac	acres
A	ampere
Bd Ft	board feet
Cd	candela
cm	centimeter
C	coulomb
CF	cubic feet
m3	cubic meter
m3/s	cubic meters per second
CY	cubic yard
CY/mi	cubic yards per mile
D or Deg	degree
F	Fahrenheit
F	farad
ft	feet/foot
Gal	gallon
G	giga
Ha	hectare
H	henry
Hz	hertz
hr	hour(s)
in	inch
J	joule
K	kelvin
kN	kilo newton
kPa	kilo pascal
kg	kilogram
kg/m3	kilogram per cubic meter
km	kilometer
K	Kip(s)
LF	linear foot
L	litre
Lm	lumen
L sum	lump sum
Lx	lux
M Hr	man hour
M	mega
m	meter
m/s	meters per second
mi	mile
mL	milliliter
mm	millimeter
mm/hr	millimeters per hour
n	nano
N	newton
Pa	pascal
lb	pounds
sec	seconds
S	siemens
SF	square feet
km2	square kilometer
m2	square meter
SY	square yard
Sta Yd	station yards
SI	Systems International
T	tesla
T/mi	tons per mile
V	volt
W	watt
Wb	weber

SURVEY DESCRIPTIONS

Az	azimuth
Bs	backsight
Brg	bearing
BP Cap	blue plastic cap
BS	both sides
BC	brass cap
CS	curve to spiral
Eq	equation
E	external of curve
FS	far side
FB	field book
Fs	foresight
Geod	geodetic
GIS	Geographical Information System
GPS	Global Positioning System
HI	height of instrument
IM	iron monument
I Pn	iron pin
LS	Land Surveyor (licensed)
LSIT	Land Surveyor In Training
L	length of curve
LC	long chord
LB	level book
Mer	meridian
M	mid ordinate of curve
NGS	National Geodetic Survey
NS	near side
Obsn	observation
Off Loc	office location
OP Cap	orange plastic cap
PK	Parker-Kalon nail
P Cap	plastic cap
PP Cap	pink plastic cap
PCC	point of compound curve
PC	point of curve
PI	point of intersection
PRC	point of reverse curvature
PT	point of tangent
POC	point on curve
POT	point on tangent
RTP	random traverse point
Rge	range
RP Cap	red plastic cap
SC	spiral to curve
ST	spiral to tangent
Sta	station
SE	superelevation
Tan	tangent
T	tangent (semi)
TS	tangent to spiral
Twp	township
TB	transit book
TP	traverse point
TP	turning point
USC&G	US Coast & Geodetic Survey
USGS	US Geologic Survey
VC	vertical curve
WGS	World Geodetic System
YP Cap	yellow plastic cap
Z	zenith

SOIL TYPES

Cl	clay
Cl F	clay fill
Cl Hvy	clay heavy
Cl Lm	clay loam
Co S	coal slack
C Gr	coarse gravel
CS	coarse sand
FS	fine sand
Gr	gravel
Lig Co	lignite coal
Lig Sl	lignite slack
Lm	loam
Rk	rock
Sd	sand
Sdy Cl	sandy clay
Sdy Cl Lm	sandy clay loam
Sdy Fl	sandy fill
Sdy Lm	sandy loam
Sc	scoria
Sh	shale
Si Cl	silt clay
Si Cl Lm	silty clay loam
Si Lm	silty loam

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
07-01-14

REVISIONS	
DATE	CHANGE
12-18-20	Sheet Added - Continued from D-101-3

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12 18 2020

NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

702COM	702 Communications
ACCENT	Accent Communications
AGASSIZ WU	Agassiz Water Users Incorporated
AGC	Assiociated General Contractors of America
ALL PL	Alliance Pipeline
ALL SEAS WU	All Seasons Water Users Association
AMOCO PI	Amoco Pipeline Company
AMRDA HESS	Amerada Hess Corporation
AT&T	AT&T Corporation
B PAW	Bear Paw Energy Incorporated
BAKER ELEC	Baker Electric
BASIN ELEC	Basin Electric Cooperative Incorporated
BEK TEL	Bek Communications Cooperative
BELLE PL	Belle Fourche Pipeline Company
BLM	Bureau of Land Management
BNSF	Burlington Northern Santa Fe Railway
BOEING	Boeing
BRNS RWD	Barnes Rural Water District
BURK-DIV ELEC	Burke-Divide Electric Cooperative
BURL WU	Burleigh Water Users
CABLE ONE	Cable One
CABLE SERV	Cable Services
CAP ELEC	Capital Electric Cooperative Incorporat
CASS CO ELEC	Cass County Electric Cooperative
CASS RWU	Cass Rural Water Users Incorporated
CAV ELEC	Cavalier Rural Electric Cooperative
CBLCOM	Cablecom Of Fargo
CENEX PL	Cenex Pipeline
CENT PL WATER DIST	Central Pipe Line Water District
CENT PWR ELEC	Central Power Electric Cooperative
CENTURYLINK	CenturyLink
COE	Corps of Engineers
CONS TEL	Consolidated Telephone
CONT RES	Continental Resource Inc
CPR	Canadian Pacific Railway
D O E	Department Of Energy
DAK CARR	Dakota Carrier Network
DAK CENT TEL	Dakota Central Telephone
DAK RWD	Dakota Rural Water District
DGC	Dakota Gasification Company
DICKEY R NET	Dickey Rural Networks
DICKEY RWU	Dickey Rural Water Users Association
DICKEY TEL	Dickey Telephone
DNRR	Dakota Northern Railroad
DOME PL	Dome Pipeline Company
DVELEC	Dakota Valley Electric Cooperative
DVMW	Dakota, Missouri Valley & Western
ENBRDG	Enbridge Pipelines Incorporated
ENVENTIS	Enventis Telephone
FALK MNG	Falkirk Mining Company
FHWA	Federal Highway Administration
G FKS-TRL WD	Grand Forks-traill Water District
GETTY TRD & TRAN	Getty Trading & Transportation
GLDN W ELEC	Golden West Electric Cooperative
GRGS CO TEL	Griggs County Telephone
GTR RAMSEY WD	Greater Ramsey Water District
GT PLNS NAT GAS	Great Plains Natural Gas Company
HALS TEL	Halstad Telephone Company
IDEA1	Idea1
INT-COMM TEL	Inter-Community Telephone Company
KANEB PL	Kaneb Pipeline Company
KEM ELEC	Kem Electric Cooperative Incorporated
KOCH GATH SYS	Koch Gathering Systems Incorporated
LKHD PL	Lakehead Pipeline Company
LNGDN RWU	Langdon Rural Water Users Incorporated
LWR YELL R ELEC	Lower Yellowstone Rural Electric
MCKNZ CON	McKenzie Consolidated Telcom
MCKNZ ELEC	McKenzie Electric Cooperative
MCKNZ WRD	McKenzie County Water Resource District
MCLEOD	McLeod USA
MCLN ELEC	McLean Electric Cooperative
MCLN-SHRDN R WAT	McLean-Sheridan Rural Water
MDU	Montana-dakota Utilities
MIDCO	MidContinent Communications
MIDSTATE TEL	Midstate Telephone Company
MINOT CABLE	Minot Cable Television
MINOT TEL	Minot Telephone Company
MISS VALL COMM	Missouri Valley Communications
MISS W W S	Missouri West Water System
MNKOTA PWR	Minnkota Power
MOR-GRAN-SOU ELEC	Mor-gran-sou Electric Cooperative
MOUNT-WILLI ELEC	Mountrail-williams Electric Cooperative
MRE LBTY TEL	Moore & Liberty Telephone
MUNICIPAL	City Water And Sewer
MUNICIPAL	City Of '.....'
N CENT ELEC	North Central Electric Cooperative
N VALL W DIST	North Valley Water District
ND PKS & REC	North Dakota Parks And Recreation
ND TEL	North Dakota Telephone Company
NDDOT	North Dakota Department of Transportation
NDSU SOIL SCI DEPT	NDSU Soil Science Department
NEMONT TEL	Nemont Telephone
NODAK R ELEC	Nodak Rural Electric Cooperative
NOON FRMS TEL	Noonan Farmers Telephone Company
NPR	Northern Plains Railroad
NSP	Northern States Power
NTH PRAIR RW	Northern Prairie Rural Water Association
NTHN BRDR PL	Northern Border Pipeline
NTHN PLNS ELEC	Northern Plains Electric Cooperative Incorporated
NTHWSTRN REF	Northwestern Refinery Company
NW COMM	Northwest Communication Cooperation
NWRWD	Northwest Rural Water District
ONEOK	Oneok gas
OSHA	Occupational Safety and Health Administration
OTTR TL PWR	Otter Tail Power Company
P L E M	Prairielands Energy Marketing
POLAR COM	Polar Communications
PVT ELEC	Private Electric
QWEST	Qwest Communications
R&T W SUPPLY	R & T Water Supply Association
RED RIV COMM	Red River Rural Communications
RESVTN TEL	Reservation Telephone
ROBRTS TEL	Roberts Company Telephone
R-RIDER ELEC	Roughrider Electric Cooperative
RRVW	Red River Valley & Western Railroad
S CENT REG WD	South Central Regional Water District
S E W U	South East Water Users Incorporated
SCOTT CABLE	Scott Cable Television Dickinson
SHERDN ELEC	Sheridan Electric Cooperative
SHEYN VLY ELEC	Sheyenne Valley Electric Cooperative
SKYTECH	Skyland Technologies Incorporated
SLOPE ELEC	Slope Electric Cooperative Incorporated
SOURIS RIV TELCOM	Souris River Telecommunications
ST WAT COMM	State Water Commission
STATE LN WATER	State Line Water Cooperative
STER ENG	Sterling Energy
STUT RWU	Stutsman Rural Water Users
SW PL PRJ	Southwest Pipeline Project
T M C	Turtle Mountain Communications
TCI	TCI of North Dakota
TESORO HGH PLNS PL	Tesoro High Plains Pipeline
TRI-CNTY WU	Tri-County Water Users Incorporated
TRL CO RWU	Traill County Rural Water Users
UNTD TEL	United Telephone
UPPR SOUR WUA	Upper Souris Water Users Association
US SPRINT	U.S. Sprint
USAF MSL CABLE	U.S.A.F. Missile Cable
USFWS	US Fish and Wildlife Service
USW COMM	U.S. West Communications
VRNDRY ELEC	Verendrye Electric Cooperative
W RIV TEL	West River Telephone Incorporated
WAPA	Western Area Power Administration
WEB	W. E. B. Water Development Association
WILLI RWA	Williams Rural Water Association
WILSTN BAS PL	Williston Basin Interstate Pipeline Company
WLSH RWD	Walsh Water Rural Water District
WOLVRTN TEL	Wolverton Telephone
XLENER	Xcel Energy
YSVR	Yellowstone Valley Railroad

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

07-01-14

REVISIONS

DATE	CHANGE
04-23-18	General Revisions
09-20-18	General Revisions
12-18-20	General Revisions

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LINE STYLES

D-101-20

Existing Topography

- Existing Ground Void
- Existing Cemetary Boundary
- Existing Box Culvert Bridge
- Existing Concrete Surface
- Existing Drainage Structure
- Existing Gravel Surface
- Existing Riprap
- Existing Dirt Surface
- Existing Asphalt Surface
- Existing Tie Point Line
- Existing Railroad Centerline
- Existing Guardrail Cable
- Existing Guardrail Metal
- Existing Edge of Water
- Existing Fence
- Existing Railroad
- Existing Field Line
- Exst Flow
- Existing Curb
- Existing Valley Gutter
- Existing Driveway Gutter
- Existing Curb and Gutter
- Existing Mountable Curb and Gutter

- Existing 3-Cable w Posts
- Site Boundary
- Existing Berm, Dike, Pit, or Earth Dam
- Existing Ditch Block
- Existing Tree Boundary
- Existing Brush or Shrub Boundary
- Existing Retaining Wall
- Existing Planter or Wall
- Existing W-Beam Guardrail with Posts
- Existing Railroad Switch
- Gravel Pit - Borrow Area
- Existing Wet Area-Vegetation Break
- Existing High Tension Cable Guardrail
- Existing High Tension Cable Guardrail with Posts

Proposed Topography

- 3-Cable w Posts
- Flow
- Fence
- Remove Line
- Wall
- Retaining Wall (Plan View)
- W-Beam w Posts
- High Tension Cable Guardrail with Posts

Existing Utilities

- Existing Electrical
- Existing Fiber Optic Line
- Existing TV Fiber Optic
- Existing Gas Pipe
- Existing Overhead Utility Line
- Existing Power
- Existing Fuel Pipeline
- Existing Undefined Above Ground Pipe Line
- Existing Sanitary Sewer
- Existing Sanitary Force Main
- Existing Storm Drain
- Existing Storm Drain Force Main
- Existing Culvert
- Existing Telephone Line
- Existing TV Line
- Existing Water or Steam Line
- Existing Under Drain
- Existing Slotted Drain
- Existing Conduit
- Existing Conductor
- Existing Down Guy Wire Down Guy
- Existing Underground Vault or Lift Station

Proposed Utilities

- 24 Inch Pipe
- Reinforced Concrete Pipe
- Under Drain
- Edge Drain

Traffic Utilities

- Conductor
- Fiber Optic
- Existing Loop Detector
- Existing Double Micro Loop Detector
- Micro Loop Detector Double
- Existing Micro Loop Detector
- Micro Loop Detector
- Signal Head with Mast Arm
- Existing Signal Head with Mast Arm

Sign Structures

- Existing Overhead Sign Structure
- Existing Overhead Sign Structure Cantilever
- Overhead Sign Structure Cantilever

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

07-01-14

REVISIONS

DATE	CHANGE
09-23-16 12-18-20	Added and Revised Items, Organized by Functional Groups General Revisions

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LINE STYLES

D-101-21

Right Of Way

- Easement
- Existing Easement
- Right of Way
- Existing Right of Way
- Existing Right of Way Railroad
- Existing Right of Way Not State Owned
- Existing Government Lot Line
- Existing Adjacent Block Lines
- Existing Adjacent Lot Lines
- Existing Adjacent Property Line
- Existing Adjacent Subdivision Lines
- Sight Distance Triangle Line
- Dimension Leader

Boundary Control

- Existing City Corporate Limits or Reservation Boundary
- Existing State or International Line
- Existing Township
- Existing County
- Existing Section Line
- Existing Quarter Section Line
- Existing Sixteenth Section Line
- Existing Centerline
- Tangent Line

Cross Sections and Typicals

- Existing Ground
- Existing Topsoil (Cross Section View)
- Existing Ground Void (Not Surveyed) (void — void — void — v)
- Existing Concrete
- Existing Aggregate (Cross Section View)
- Existing Curb and Gutter (Cross Section View)
- Existing Asphalt (Cross Section View)
- Existing Reinforcement Rebar

Geotechnical

- Geotextile Fabric Type D (D — D)
- Geogrid (Geo — Geo)
- Geotextile Fabric Type R (R — R)
- Geotextile Fabric Type R1 (R — R)
- Geotextile Fabric Type RR (RR — RR)
- Geotextile Fabric Type S (S — S)
- Subgrade Reinforcement
- Failure Line

Countours

- Depression Contours
- Supplemental Contour

Profile

- Subgrade, Subcut or Ditch Grade
- Topsoil Profile

Striping

- Centerline Pavement Marking
- Barrier with Centerline Pavement Marking
- Barrier Pavement Marking
- Stripe 4 IN Dotted Extension White
- Stripe 8 IN Dotted Extension White
- Stripe 8 IN Lane Drop

Pavement Joints

- Doweled Joint
- Tie Bar 30 Inch 4 Foot Center to Center
- Tie Bar 18 Inch 3 Foot Center to Center
- Tie Bar at Random Spacing

Bridge Details

- Small Hidden Object
- Large Hidden Object
- Phantom Object
- Existing Conditions Object
- Centerline Main
- Centerline Secondary
- Excavation Limits
- Proposed Ground
- Sheet Piling

Erosion Control

- Limits of Const Transition Line
- Bale Check
- Rock Check
- Floating Silt Curtain (S — S)
- Silt Fence (SF — SF)
- Excavation Limits
- Fiber Rolls

Environmental

- Wetland Mitigation
- Existing Wetland Easement USFWS
- Existing Wetland Jurisdictional
- Existing Wetland
- Tree Row

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
09-23-16 12-18-20	Added and Revised Items, Organized by Functional Groups General Revisions

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12 18 2020

SYMBOLS

D-101-30

North Arrow (Half Scale)

Alignment Data Point

Alignment Monument

Spot Elevation

Existing Miscellaneous Spot

Existing Access Control Arrow

Existing Benchmark

Reset USGS Marker

Iron Monument Found

Iron Pin R/W Monument

Property Corner

Iron Pin Reference Monument

Right of Way Marker (Exst, Ppsd, Reset)

Existing Federal Reference Corner

Existing Section Corner (Full, Quarter, Sixteenth, Meander)

Existing Witness Corner

Existing Control Point (CP, GPS-RTK, TRI)

Existing Traverse PI Aerial Panel

Existing Reference Marker Point NGS

Existing EFB Misc

Existing Bush or Shrub

Existing Large Evergreen Tree

Existing Small Evergreen Tree

Existing Large Tree

Existing Small Tree

Existing Tree Trunk

Cairn or Stone Circle

Existing Artifact

Existing Satellite Dish

Existing Weather Station

Existing Windmill or Tower

Reinforced Pavement

CSB Continuous Split Barrel Sample

FA Flight Auger Sample

SB Split Barrel Sample

T Thinwall Tube Sample

N Standard Penetration Test

Incl Inclinometer Tube

Excavation Unit

Existing Ground Water Well Bore Hole

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions

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12 18 2020

SYMBOLS

D-101-31

- Flexible Delineator
- Flexible Delineator Type A (Exst, Ppsd)
- Flexible Delineator Type B (Exst, Ppsd)
- Flexible Delineator Type C (Exst, Ppsd)
- Flexible Delineator Type D (Exst, Ppsd)
- Flexible Delineator Type E (Exst, Ppsd)
- Delineator Type A (Exst, Ppsd, Diamond Grade-Reset)
- Delineator Type B (Exst, Ppsd, Diamond Grade-Reset)
- Delineator Type C (Exst, Ppsd, Diamond Grade)
- Delineator Type D (Exst, Ppsd, Diamond Grade)
- Delineator Type E (Exst, Ppsd, Diamond Grade)
- Barricade (Type I, Type II, Type III}
- Arrow Panel (Caution Mode, Double Direction, Left Directional, Right Directional, Sequencing, Truck Mounted)
- Attenuation Device
- Truck Mounted Attenuator
- Delineator Drums
- Flagger
- Tubular Marker
- Traffic Cone
- Back to Back Vertical Panel Sign

- Highway Sign (Exst, Ppsd)
- Mile Post Type A (Exst-Ppsd-Reset)
- Mile Post Type B (Exst, Ppsd)
- Mile Post Type C (Exst, Ppsd)
- Object Marker Type I (Exst, Ppsd)
- Object Marker Type II (Exst, Ppsd)
- Object Marker Type III (Exst, Ppsd)
- Existing Reference Marker
- Road Closure Gate 18 Ft (Exst, Ppsd)
- Road Closure Gate 28 Ft (Exst, Ppsd)
- Road Closure Gate 40 Ft (Exst, Ppsd)
- Existing Railroad Battery Box
- Existing RR Profile Spot
- Existing Railroad Crossbuck
- Existing Railroad Frog
- Existing Mailbox (Private, Federal)

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions

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12 18 2020

SYMBOLS

D-101-32

- Existing Luminaire
- Luminaire LED
- Existing Light Standard Luminaire
- Relocate Light Standard
- Light Standard Light LED Luminaire
- Light Standard 35 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 50 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 70 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 100 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 150 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 200 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 250 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 310 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 400 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 700 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire
- Emergency Vehicle Detector
- Video Detection Camera

- High Mast Light Standard 3 Luminaire (Exst, Ppsd)
- High Mast Light Standard 4 Luminaire (Exst, Ppsd)
- High Mast Light Standard 5 Luminaire (Exst, Ppsd)
- High Mast Light Standard 6 Luminaire (Exst, Ppsd)
- High Mast Light Standard 7 Luminaire (Exst, Ppsd)
- High Mast Light Standard 8 Luminaire (Exst, Ppsd)
- High Mast Light Standard 9 Luminaire (Exst, Ppsd)
- High Mast Light Standard 10 Luminaire (Exst, Ppsd)
- Overhead Sign Structure Load Center (Exst, Ppsd)
- Traffic Signal Controller (Exst, Ppsd)
- Pad Mounted Traffic Signal Controller (Exst, Ppsd)
- Flashing Beacon (Exst, Ppsd)
- Concrete Foundation (Exst, Ppsd)
- Pipe Mounted Flasher (Exst, Ppsd)
- Pad Mounted Feed Point (Exst, Ppsd)
- Pipe Mounted Feed Point with Pad (Exst, Ppsd)
- Pole Mounted Feed Point (Exst, Ppsd)
- Junction Box (Exst, Ppsd)
- Existing Pedestrian Head with Number
- Existing Signal Head
- Pole Mounted Head
- Existing Lighting Standard Pole

- Existing Traffic Signal Standard
- Pull Box (Exst-Ppsd-Undefined)
- Intelligent Transportation Pull Box (Exst, Ppsd)
- Transformer (Exst, Ppsd)
- Power Pole (Exst-Ppsd-with Transformer)
- Wood Pole (Exst, Ppsd)
- Pedestrian Push Button Post (Exst, Ppsd)
- Existing Pole
- Existing Telephone Pole
- Existing Post
- Connection Conductor (Ground, Neutral, Phase 1, Phase 2)

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions

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12 18 2020

SYMBOLS

D-101-33

Existing Manhole (Electrical, Gas, Telephone)

Water Manhole (Exst, Exst with Valve)

Sanitary Sewer Manhole (Exst, Ppsd, Exst with Valve)

Sanitary Force Main Manhole (Exst, Ppsd, Exst with Valve)

Storm Drain Manhole (Exst, Ppsd, Exst with Inlet, Ppsd with Inlet)

Force Main Storm Drain Manhole (Exst, Exst with Valve)

Manhole (Ppsd, Ppsd 48 Inch, Exst Undefined)

Existing Water Appurtenance

Sprinkler Head (Exst, Ppsd)

Fire Hydrant (Exst, Ppsd)

Cleanout (Exst Sanitary, Underdrain)

Existing Catch Basin Inlet (Round, Square)

Existing Curb Inlet (Round, Square)

Existing Slotted Reinforced Concrete Pipe

Catch Basin (Riser 30 Inch, Beehive, Type A)

Inlet Mountable Curb (Type A, Type B)

Inlet Saddle Base (Type 1, Type 2)

Inlet Special (Catch Basin, Type 1, Type A)

Inlet (Tee, Type 1, Type 2, Type 2 Double)

Median Drain

Headwall (Exst, Ppsd, Ppsd Single with Vegitation Barrier, Ppsd Double with Vegitation Barrier)

Cap or Stub
Exst Gas, Exst Sanitary, Exst Storm Drain, Ppsd Storm Drain, Exst Water

Existing Pedestal
Electrical, Telephone, Fiber Optic Telephone, TV, Fiber Optic TV, Undefined

Existing Pipe Vent
Gas, Fuel, Sanitary, Storm Drain, Water, Undefined

Valve
Exst Gas, Exst Water, Ppsd Water, Exst Undefined

Pump
Sanitary, Storm Drain, Exst Water

Corrugated Metal End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)

Reinforced Concrete End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)

Existing Utility Marker

Existing Meter

Existing Fuel Dispensers

Existing Fuel Filler Pipes

Existing Fuel Leak Sensors

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions Sheet added - Continued from D-101-32

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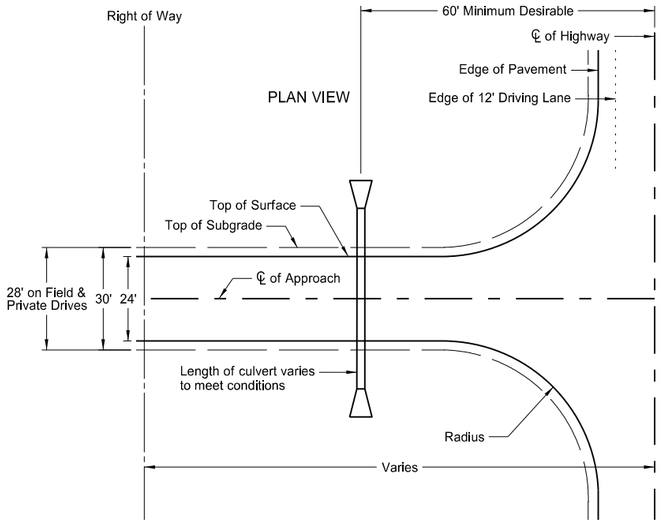
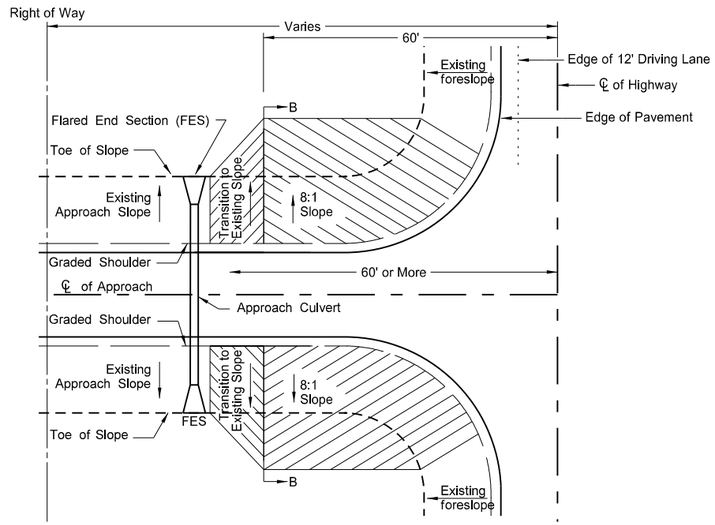
12 18 2020

STANDARD RURAL APPROACHES

D-203-8

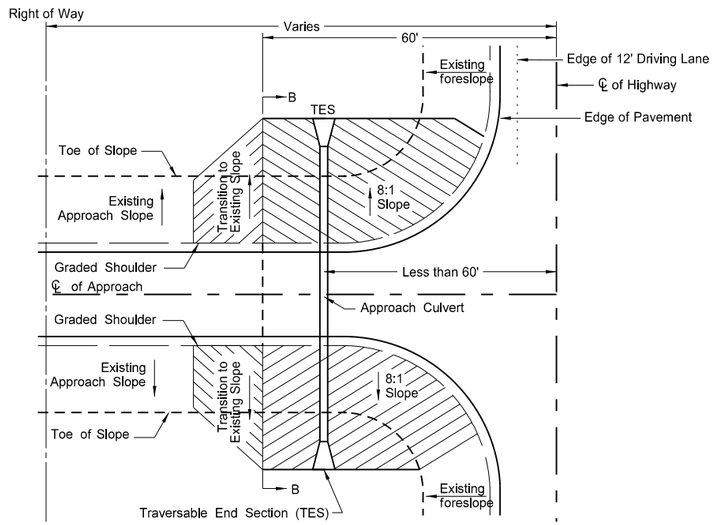


APPROACH INSLOPES



CASE 1

APPROACH PIPE LOCATED
60' OR MORE FROM ℄

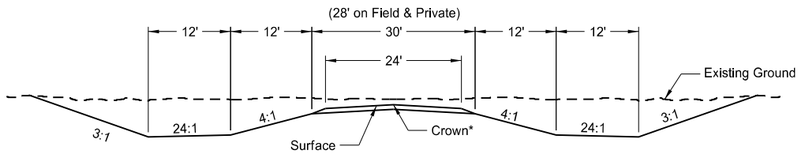


CASE 2

APPROACH PIPE LOCATED
LESS THAN 60' FROM ℄

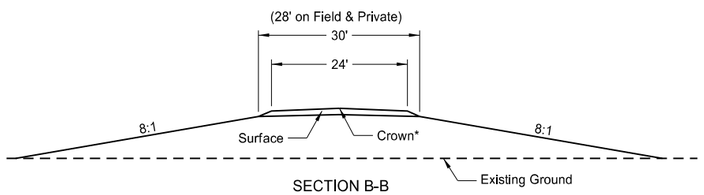
CRITERIA FOR RURAL APPROACH TYPES

	Field Drives	Private Drives	Low Volume Public Roads
Radius	R=40 ft	R=40 ft	R=50 ft
Maximum Grade	10%	7%	7%
Storage Platform	24 ft	24 ft	50 ft
Vertical Curve Length	10 ft	10 ft	Varies (Min. 20 mph)

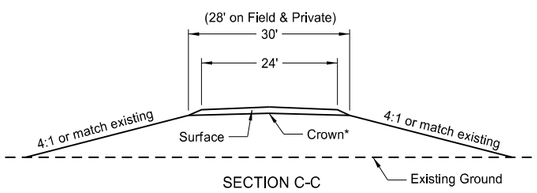


SECTION A-A

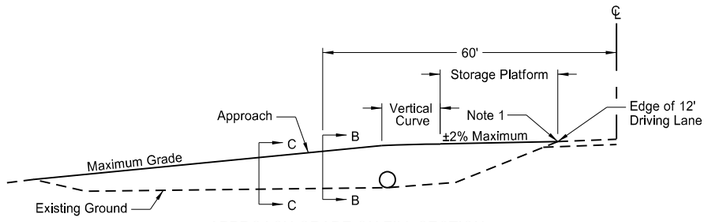
*2.1% crown for paved surface
*3.0% crown for gravel surface



SECTION B-B



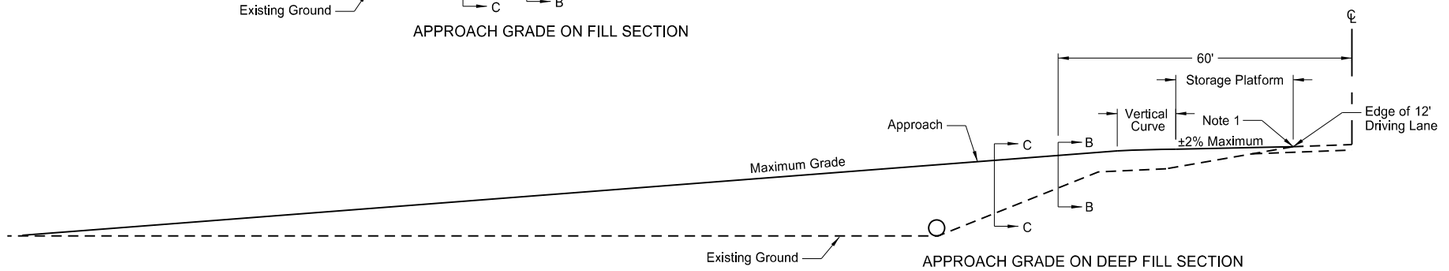
SECTION C-C



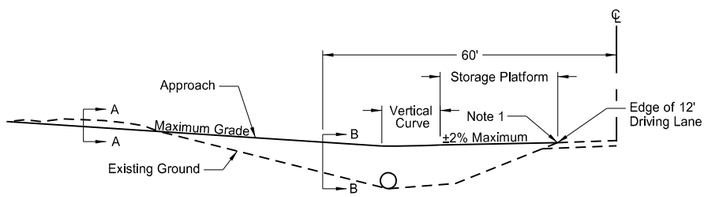
APPROACH GRADE ON FILL SECTION

NOTES:

1. 5% Max Rollover between approach storage platform and highway.



APPROACH GRADE ON DEEP FILL SECTION



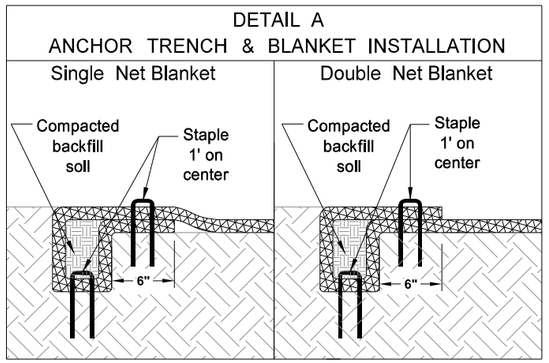
APPROACH GRADE ON CUT SECTION

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-25-14	
REVISIONS	
DATE	CHANGE
6-30-2017	Revised Radius, Storage Platform, Inslope dimensions, and Note 1.
10-25-2019	Changed "Inslope" to "Foreslope".

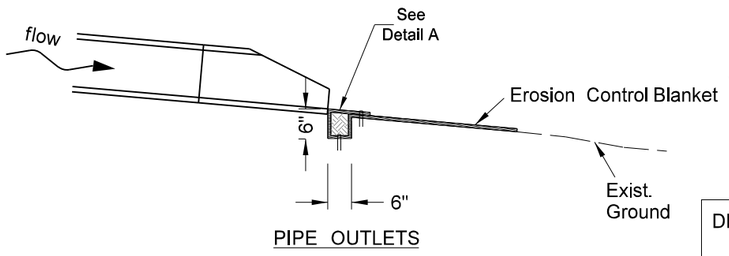
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/25/19 and the original document is stored at the North Dakota Department of Transportation

D-255-2

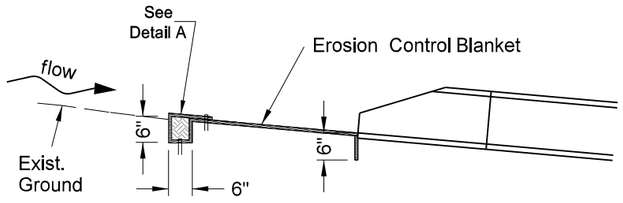
EROSION AND SILTATION CONTROL
EROSION CONTROL BLANKET INSTALLATION



NOTE:
If a Single Net Blanket is used the side with the netting should be on the top once the blanket is installed.

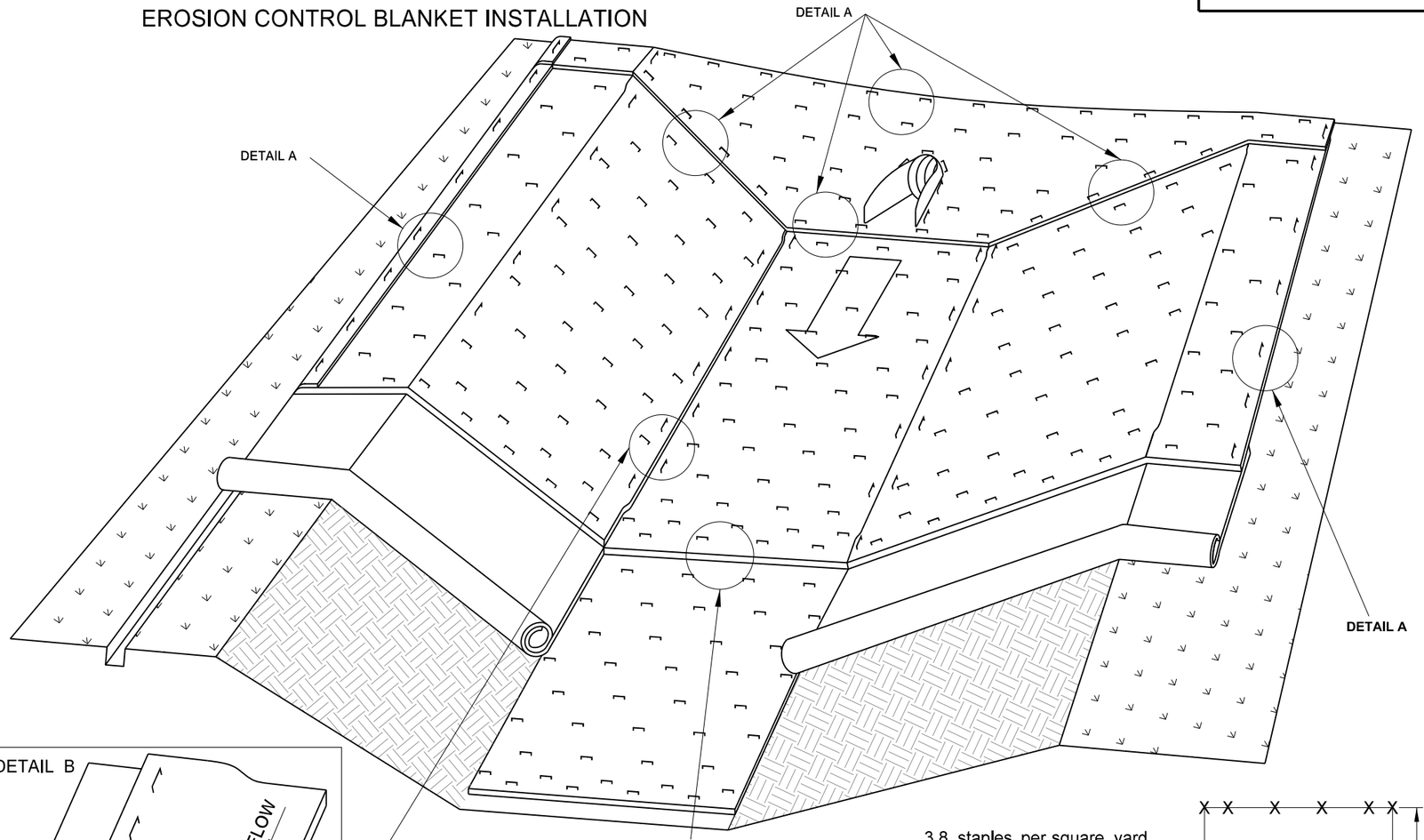


PIPE OUTLETS

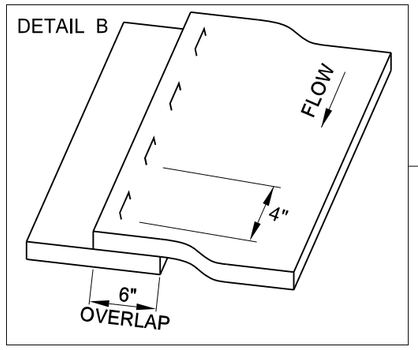


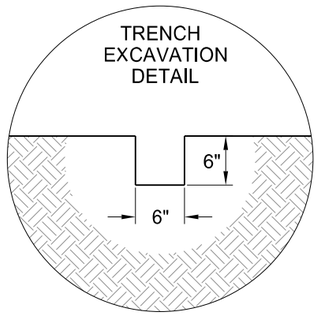
PIPE INLETS

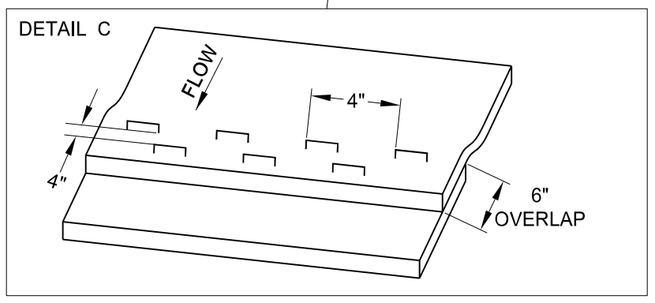
INSTALLATION AT PIPE ENDS



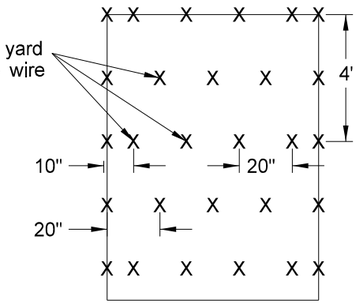
BLANKET LAYOUT
CHANNEL OR SLOPE INSTALLATION







3.8 staples per square yard using 8-inch 11 gauge wire "u" staples.



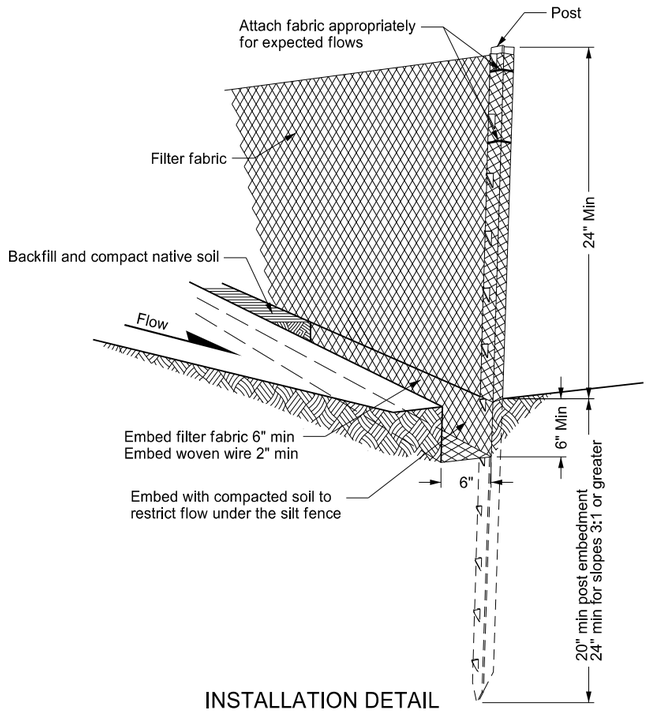
STAPLE PATTERN

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-5 to D-255-2.
07-27-15	Changed Installation details such as trench depth and overlap dimensions.
08-27-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 08/27/19 and the original document is stored at the North Dakota Department of Transportation

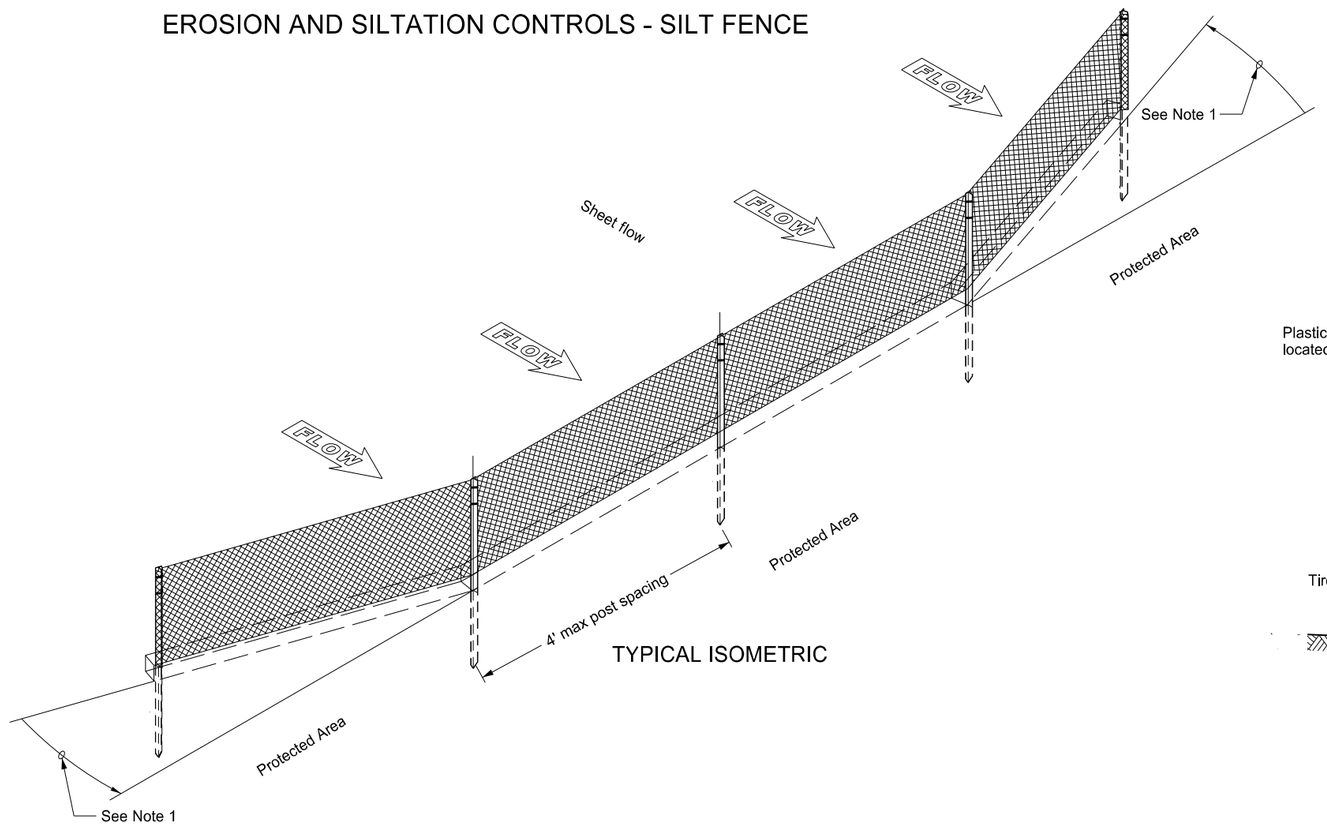
EROSION AND SILTATION CONTROLS - SILT FENCE

D-260-1

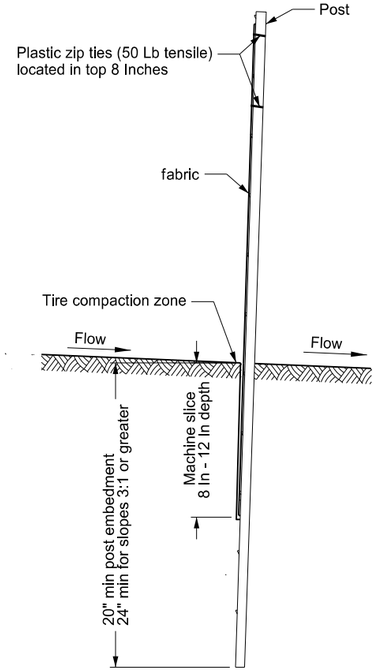


INSTALLATION DETAIL

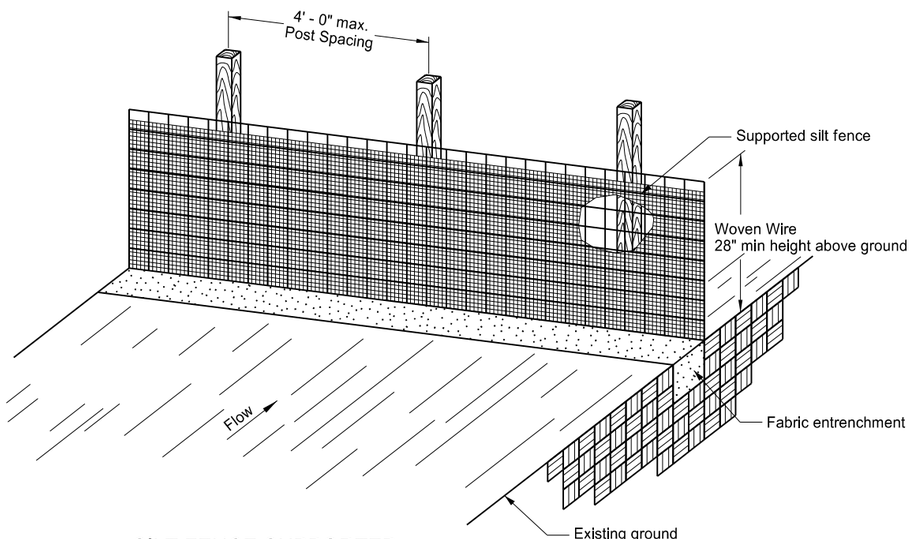
Minimize disturbance of ground around trench and smooth surface after excavation to avoid concentrating flows. Compact to prevent undercutting flows.



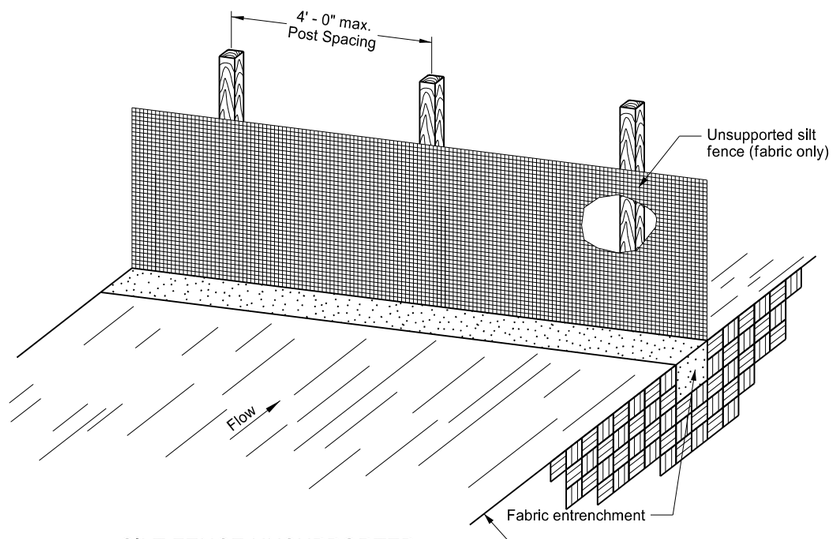
TYPICAL ISOMETRIC



MACHINE SLICED SILT FENCE



SILT FENCE SUPPORTED



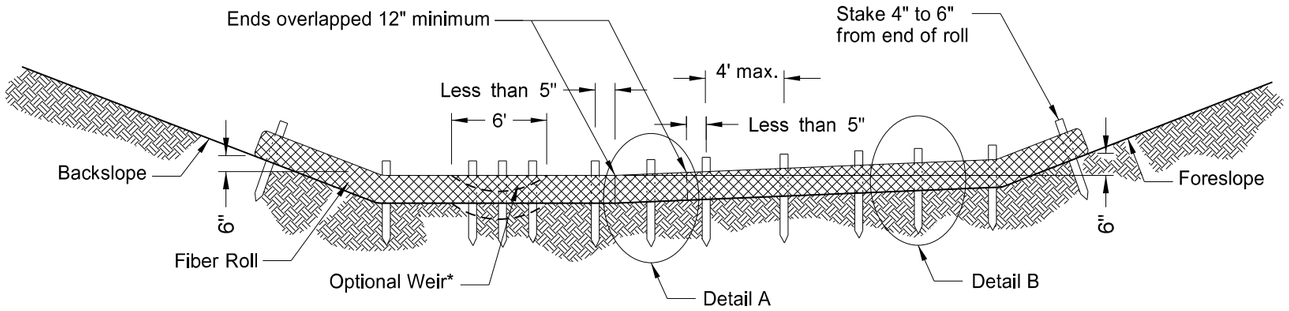
SILT FENCE UNSUPPORTED

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Standard drawing resulted from splitting standard D-708-2.
06-27-16 08-27-19	Revised details & added new ones. New Design Engineer PE Stamp.

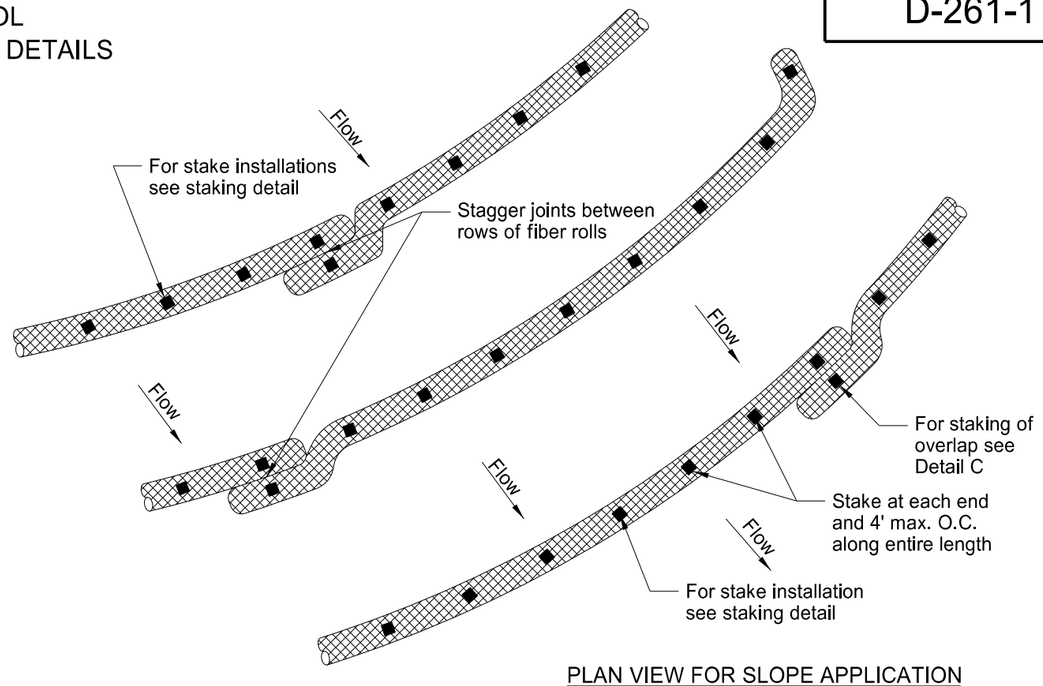
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 08/27/19 and the original document is stored at the North Dakota Department of Transportation

EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

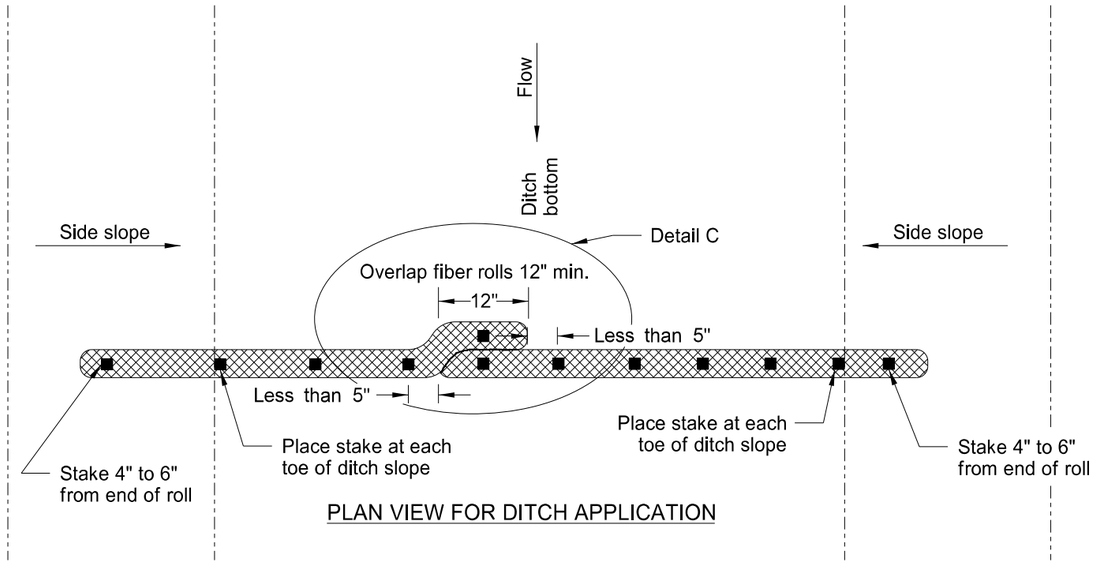


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

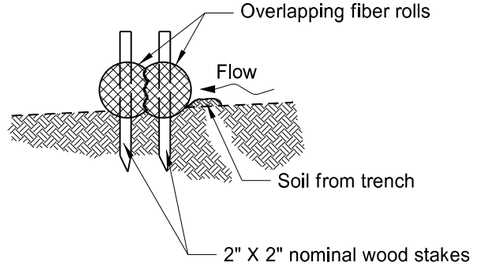
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



PLAN VIEW FOR SLOPE APPLICATION

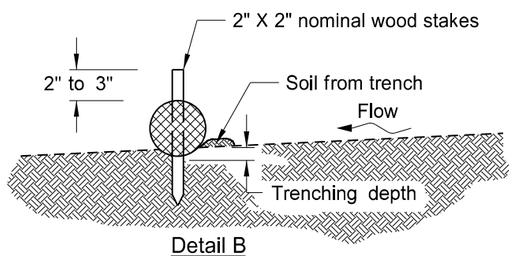


PLAN VIEW FOR DITCH APPLICATION



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.
08-27-19	New Design Engineer PE Stamp

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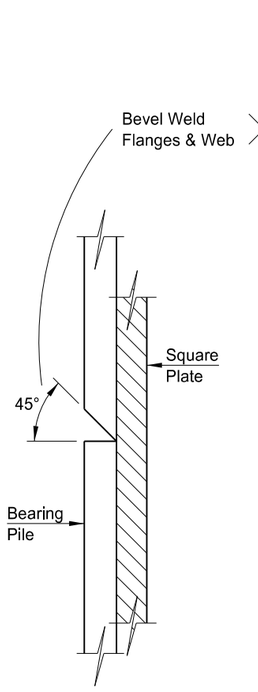
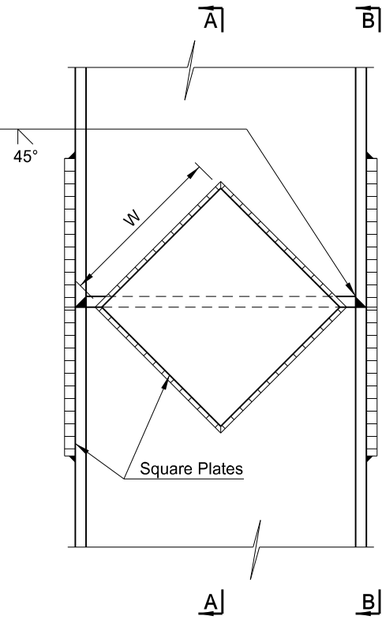
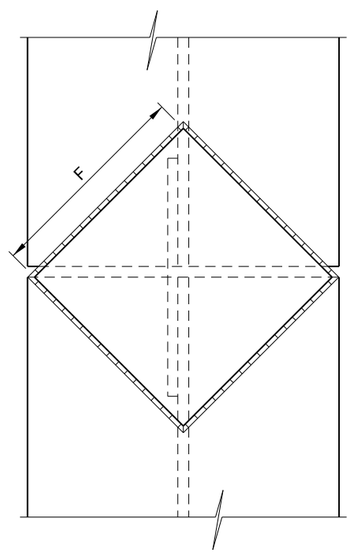
PILE SPLICE DETAILS

D-622-1

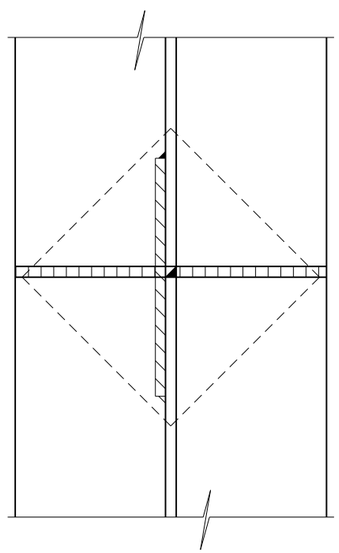


ENLARGED VIEW



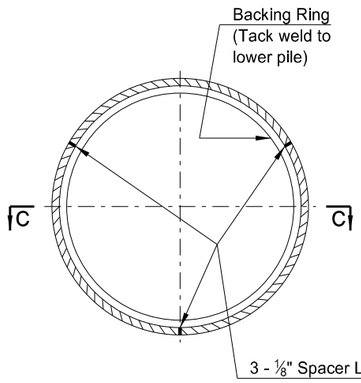


B-B

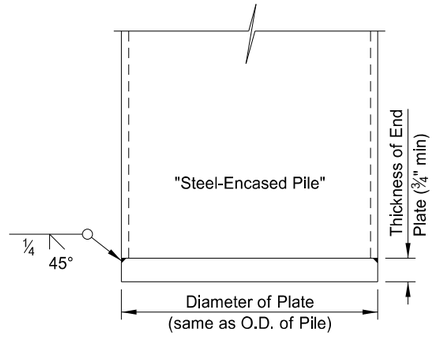


A-A

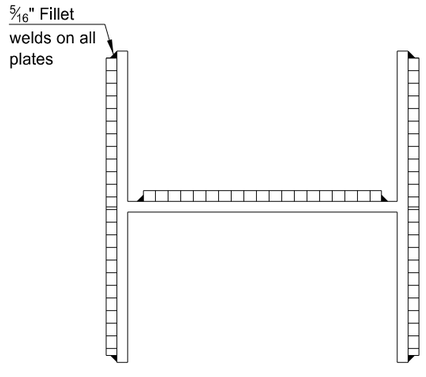
Flame scarf inside of both flanges and one side of web of upper section.



Backing Ring may be made from pile cut-offs or other material of a like quality.

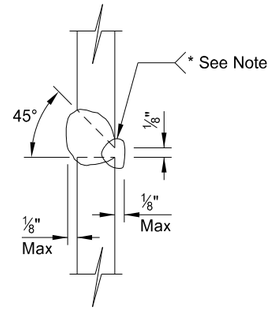


END PLATE DETAIL

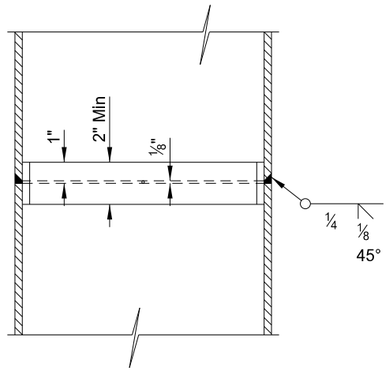


PILE	8"	10"	12"	14"
"F" FLANGE	5"	6½"	8"	10"
"W" WEB	4"	5½"	6½"	8"

H-PILE SPLICE DETAIL

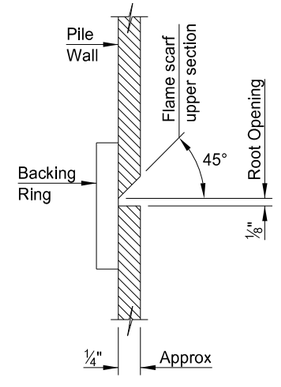


ALTERNATE H-PILE SPLICE DETAIL



C-C

STEEL-ENCASED CONCRETE PILE SPLICE DETAIL



ENLARGED VIEW

NOTES:

Steel H-Pile may be spliced with complete penetration groove welds in both flanges and web in lieu of using the reinforcing plates.

AWS classification E7OXX Low Hydrogen Electrodes shall be used.

* Welds made without the use of backing material shall have the root gouged to sound metal and welded from the second side.

All welding shall conform to the current AASHTO/AWS D1.5 Bridge Welding Code.

The thickness of the steel square plates shall at a minimum be as thick as the flanges and web of the pile being spliced.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09/14/11	
REVISIONS	
DATE	CHANGE
09/03/19	UPDATED SIGNATURE

This document was originally issued and sealed by Jon Ketterling Registration Number PE-4684, on 09/03/19 and the original document is stored at the North Dakota Department of Transportation

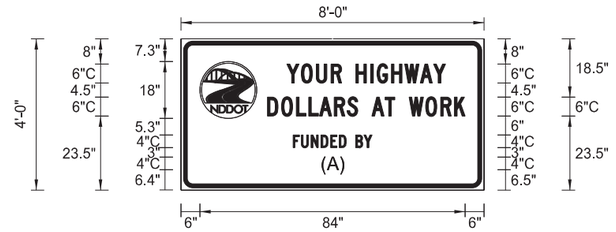
CONSTRUCTION SIGN DETAILS
PROJECT FUNDING SIGN

SIGN NUMBER	I2-5-96
WIDTH X HEIGHT	8'-0" x 4'-0"
BORDER WIDTH	1.25" (inset 0.75")
CORNER RADIUS	3"
MOUNTING	Ground
BACKGROUND	TYPE: XI Reflective
	COLOR: White
LEGEND/BORDER	TYPE: Non-reflective
	COLOR: Black

SYMBOL	X	Y	WID	HT	ANGLE
ND_CIRCLE_LOGO	6	22.8	18	18	0
	44.2	4.2	7.5	8.6	0

STATION(S):

AREA: 32.0 Sq.Ft.



Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

PANEL STYLE: ND_Reg_48_Large.ssi

LETTER POSITION (X)																			LENGTH	SIZE	SERIES
Y	O	U	R	H	I	G	H	W	A	Y									50.3	6	C 2000
33.5	38.1	42.8	47.5	55.4	60.1	62.1	66.7	70.9	75.8	80											
D	O	L	L	A	R	S	A	T	W	O	R	K							62.6	6	C 2000
27.4	31.8	36.5	40.4	43.9	48.5	52.6	60.5	64.7	72.2	77.5	82.3	86.6									
F	U	N	D	E	D	B	Y												25	4	C 2000
35.5	38.1	41.2	44.3	47.4	50.1	55.3	57.9														

(A)

FUNDING SOURCE MESSAGE VARIATIONS
FEDERAL
STATE
FEDERAL - STATE
FEDERAL - LOCAL
FEDERAL - STATE - LOCAL
STATE - LOCAL

Use a horizontal spacing of 3" between words and hyphens. Center message horizontally in sign panel.

Notes:

1) Contact the Communications Division of the NDDOT to obtain a copy of the image for the NDDOT Logo.

2) Contact Project Engineer for funding source message.

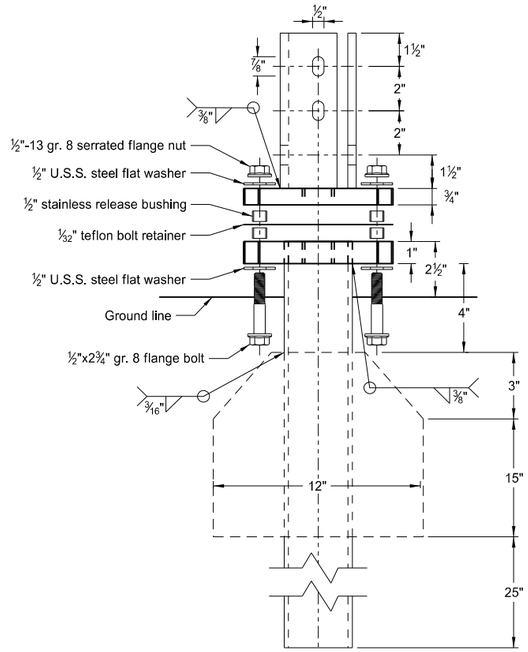
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-08-21	
REVISIONS	
DATE	CHANGE

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

12/08/21

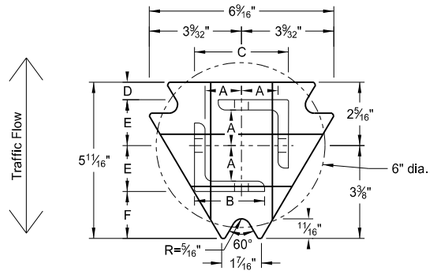
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

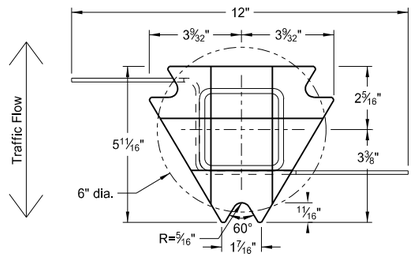


Multi-Directional
Slip Base Assembly

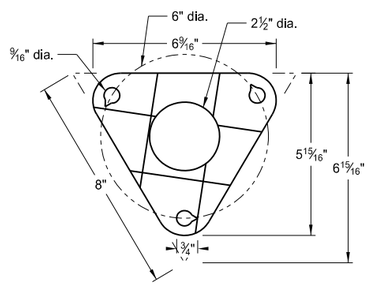
Perforated Tube



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



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



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

Notes:

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

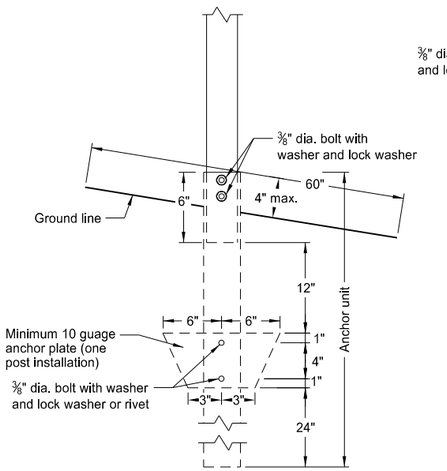
Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thick-ness Gauge	Sleeve Size in.	Wall Thick-ness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2¼
1	2¼	12			No	2½
1	2½	12			(A)	3
1	2½	10			Yes	
1	2¼	12	2	12	Yes	
1	2½	12	2¼	12	Yes	
2	2	12			No	2¼
2	2¼	12			No	2½
2	2½	12			Yes	
2	2½	12			Yes	
2	2¼	10	2	12	Yes	
2	2½	12	2¼	12	Yes	
3 & 4	2½	12			Yes	
3 & 4	2½	10			Yes	
3 & 4	2½	12	2¼	12	Yes	
3 & 4	2¼	12	2	12	Yes	
3 & 4	2½	10	2³/16	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.⁴	Cross Sec. Area in.²	Section Modulus in.³
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2³/16 x 2³/16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.785

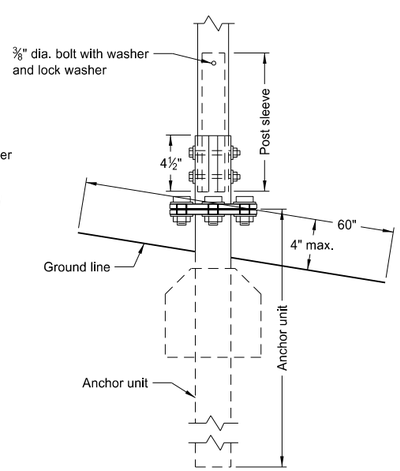
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2³/16"x10 ga.	1⁹/64"	2½"	3¹/32"	2⁵/32"	1³³/64"	1⅞"
2½"x10 ga.	1⁹/32"	2½"	3⁵/16"	⅝"	1²¹/32"	1¾"

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

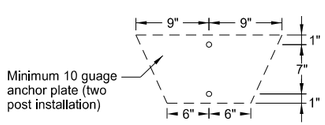
(B) For additional wind load, insert the 2³/16"x10 ga. into 2½"x10 ga.



Anchor Unit and Post Assembly



Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly



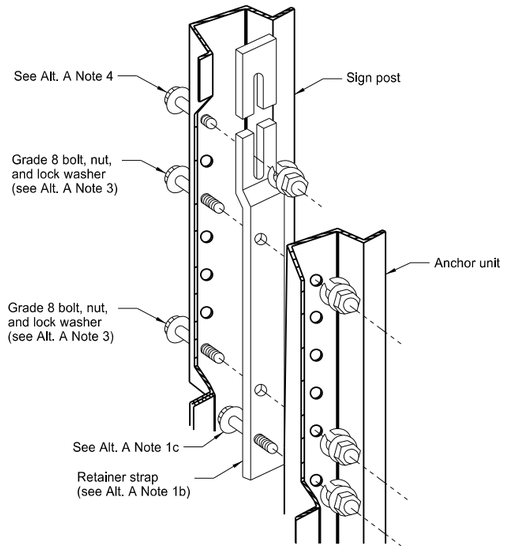
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/03/19 and the original document is stored at the North Dakota Department of Transportation

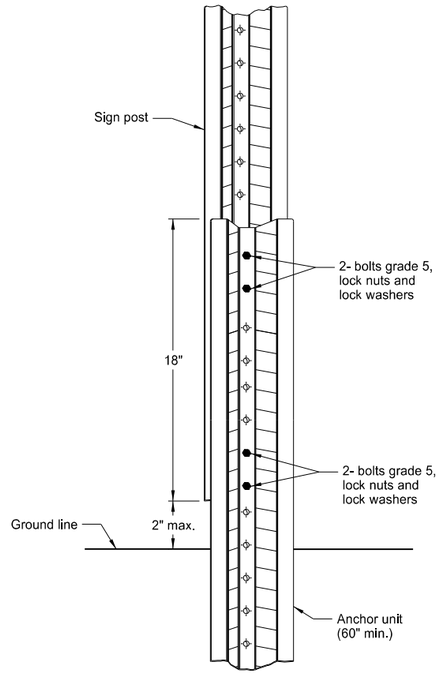
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

U-Channel Post

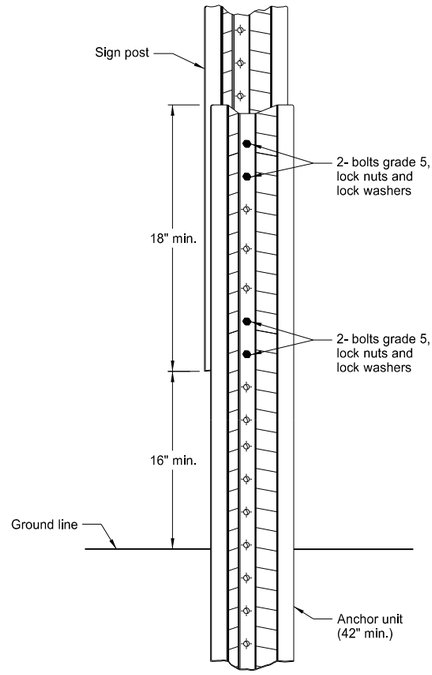


Detail A



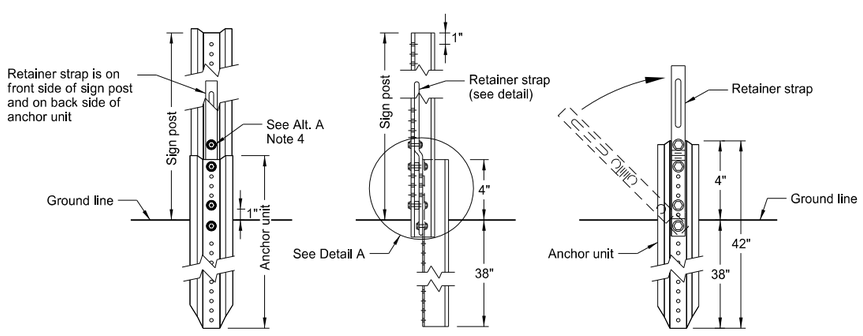
Breakaway U-Channel Splice Detail
Alternate B
(2.5 and 3 lb/ft)

Install a maximum of 3 posts within 7'.



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

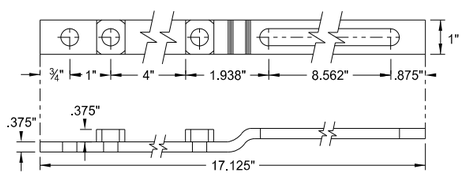
Install a maximum of 3 posts within 7'.



Front View Side View Back View

Breakaway U-Channel Detail
Alternate A

Install a maximum of 2 posts within 7'.



Retainer Strap Detail

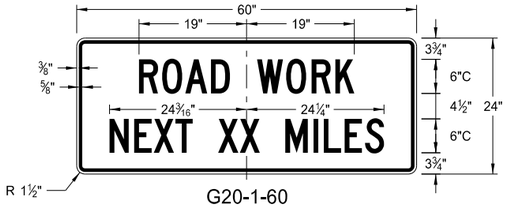
Alternate A Steps of Installation:

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

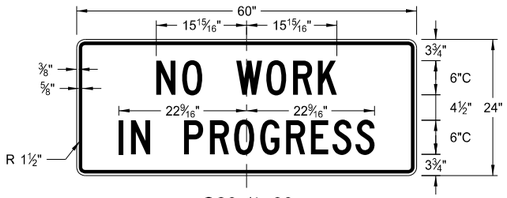
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/03/19 and the original document is stored at the North Dakota Department of Transportation

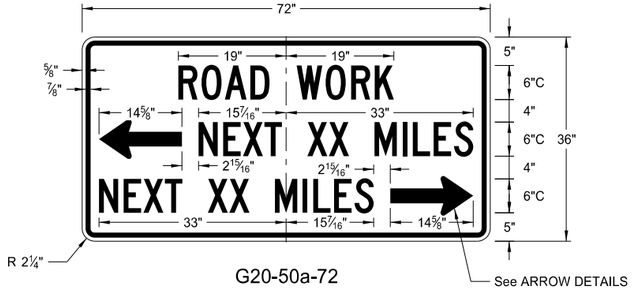
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



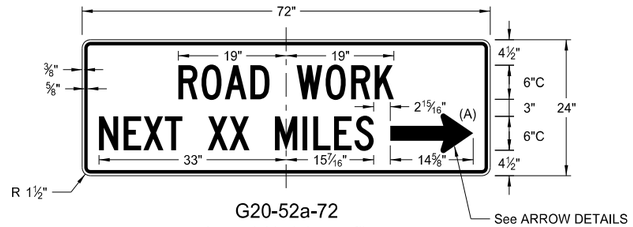
G20-1-60
Legend: black (non-refl)
Background: orange



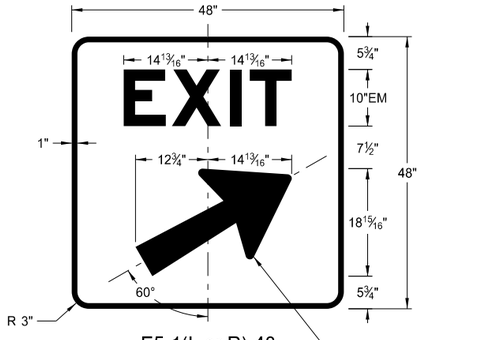
G20-1b-60
Legend: black (non-refl)
Background: orange



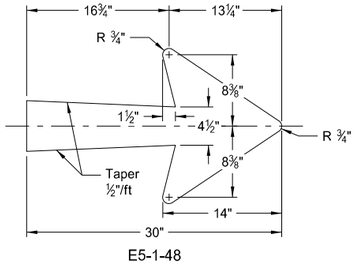
G20-50a-72
Legend: black (non-refl)
Background: orange



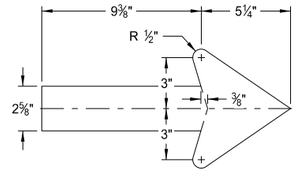
G20-52a-72
Legend: black (non-refl)
Background: orange



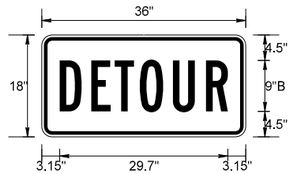
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



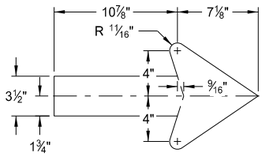
E5-1-48



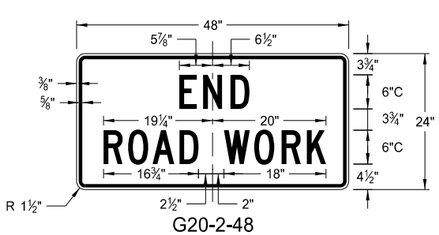
G20-50a-72
G20-52a-72



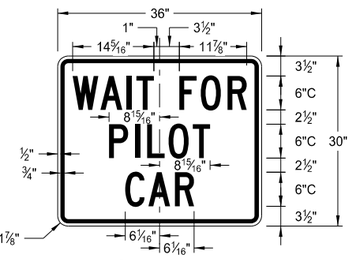
M4-8-36
Legend: black (non-refl)
Background: orange



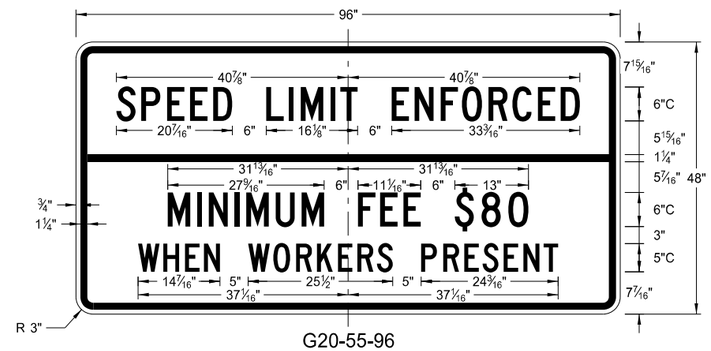
M4-9(L or R)-30
Right or Left



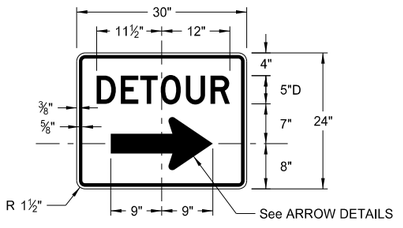
G20-2-48
Legend: black (non-refl)
Background: orange



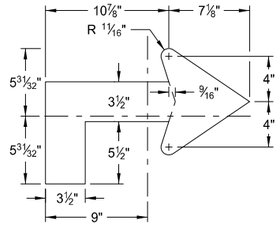
G20-4b-36
Legend: black (non-refl)
Background: orange



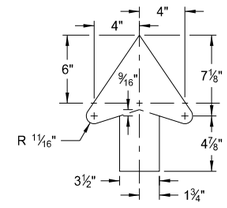
G20-55-96
Legend: black (non-refl)
Background: orange



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



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



M4-9-30
Straight

ARROW DETAILS

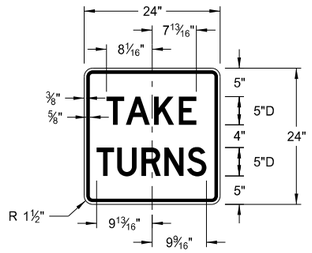
NOTES:

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

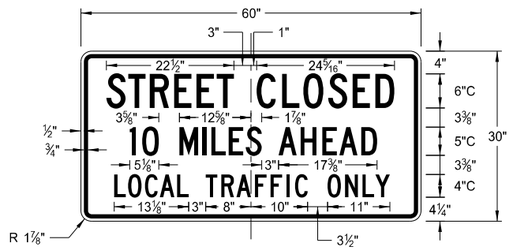
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Added sign & background color
10-03-19	New Design Engineer PE Stamp

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/03/19 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



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



R11-3c-60
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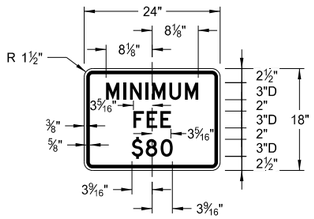
Background: white



R2-1aP-24
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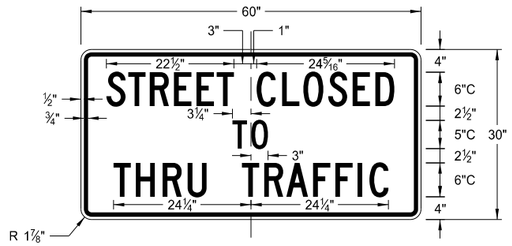
Background: white



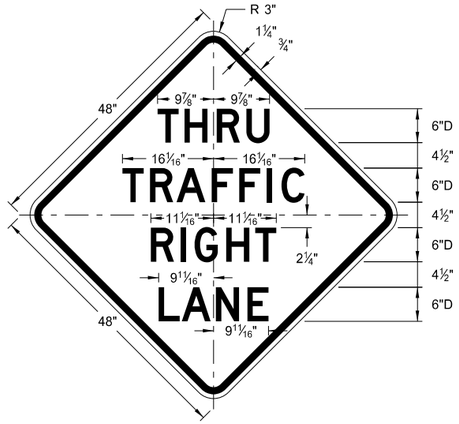
R11-4a-60
Legend: black (non-refl)
Background: white

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

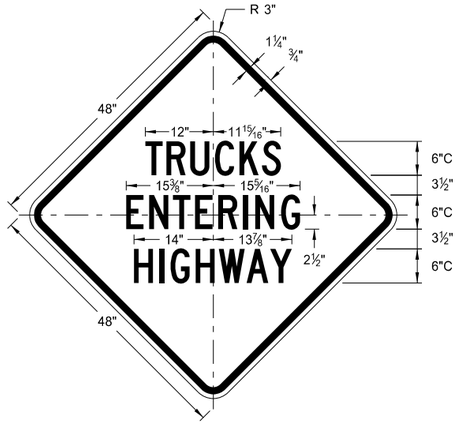
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Revised sign number
10-03-19	New Design Engineer PE Stamp

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/03/19 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN DETAILS
WARNING SIGNS



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



W8-53-48
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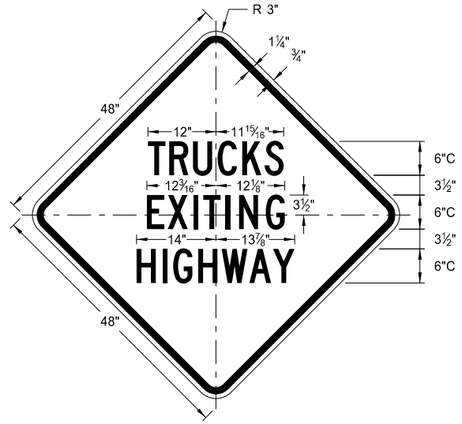
Background: orange



W8-56-48
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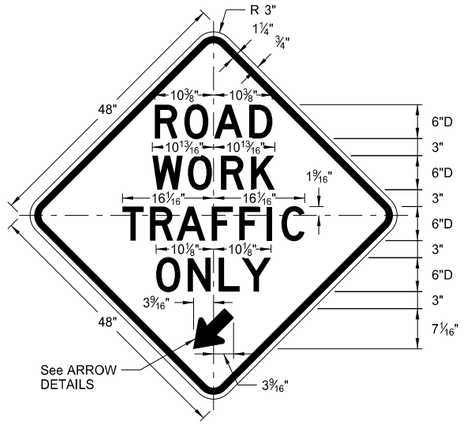
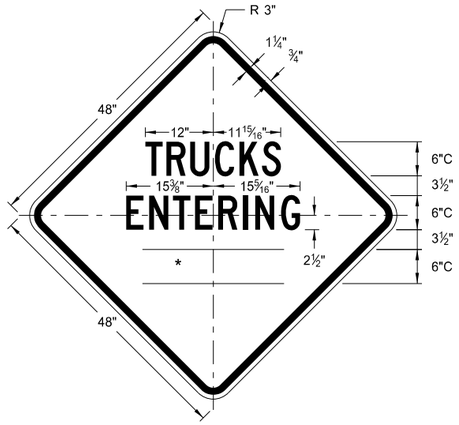


W5-9-48
Legend: black (non-refl)
Background: orange



W8-54-48
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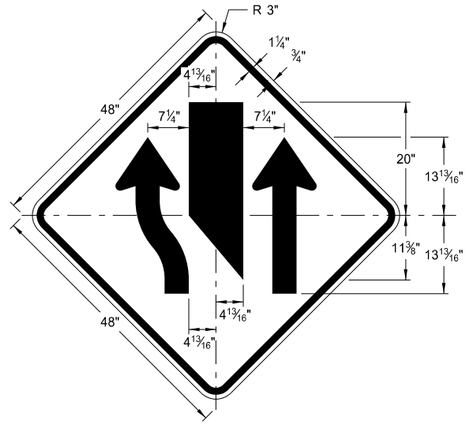
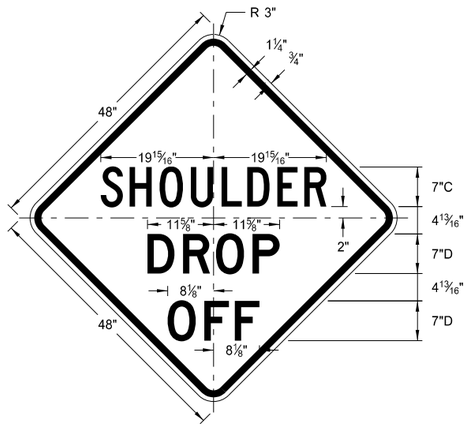
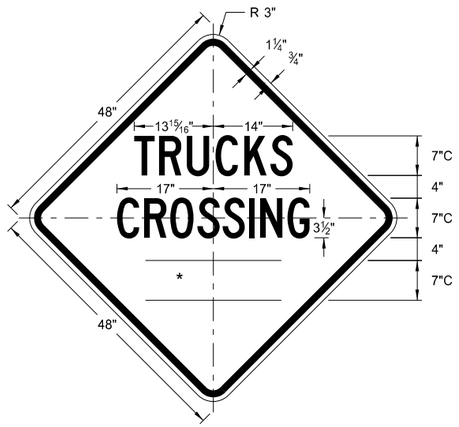
Background: orange



W9-3a-48
Legend: black (non-refl)
Background: orange



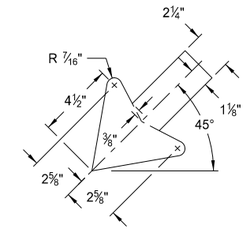
W8-9a-48
Legend: black (non-refl)
Background: orange



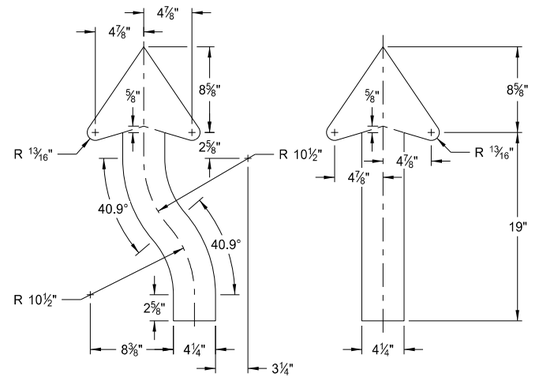
W8-55-48
Legend: black (non-refl)
Background: orange

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

* DISTANCE MESSAGES



W5-9-48



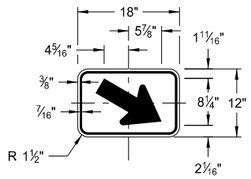
W9-3a-48

ARROW DETAILS

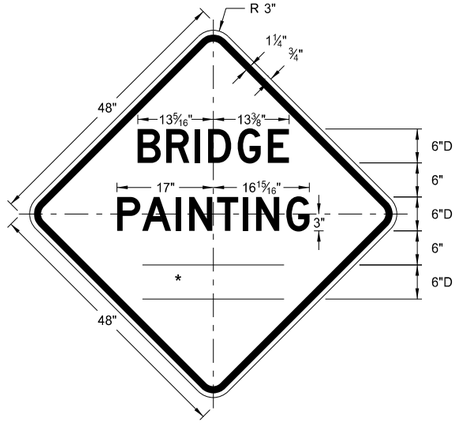
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Updated sign number
5-31-18	Revised sign and arrow details
10-03-19	New Design Engineer PE Stamp

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/03/19 and the original document is stored at the North Dakota Department of Transportation

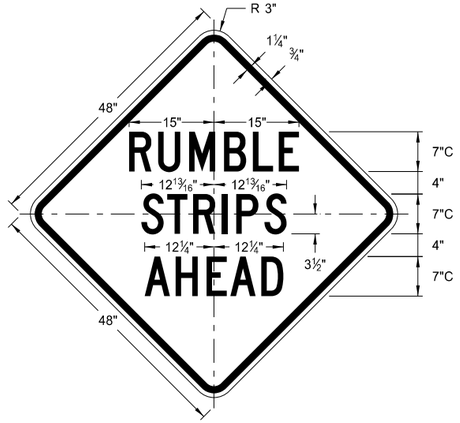
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



W16-7aP-18
Legend: black (non-refl)
Background: orange



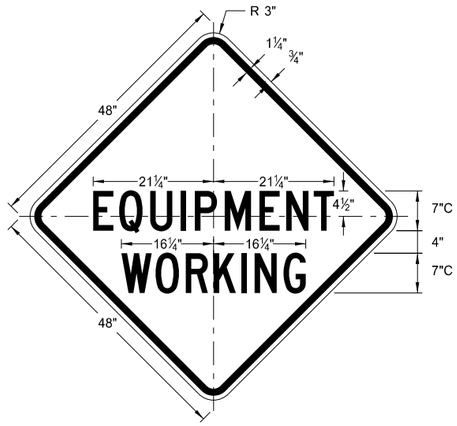
W21-50-48
Legend: black (non-refl)
Background: orange



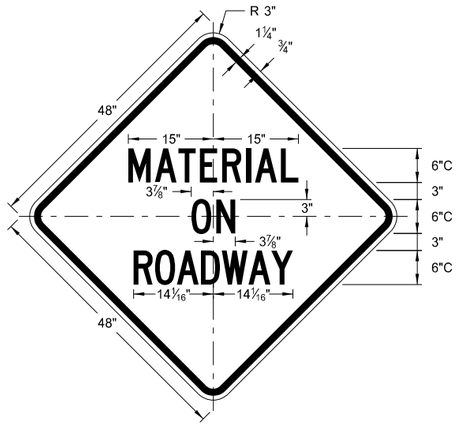
W21-53-48
Legend: black (non-refl)
Background: orange

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

* DISTANCE MESSAGES



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



W21-51-48
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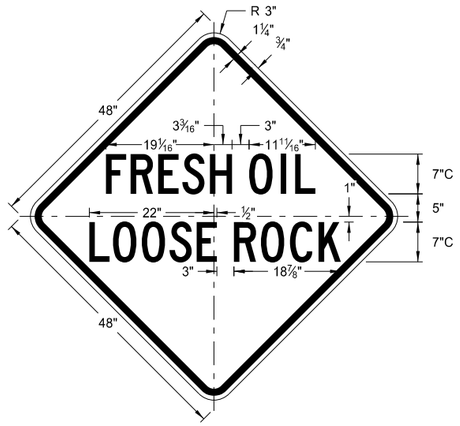
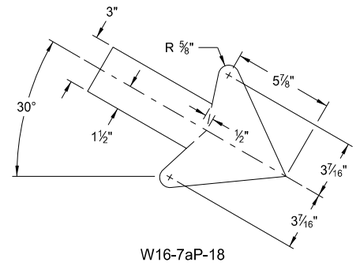
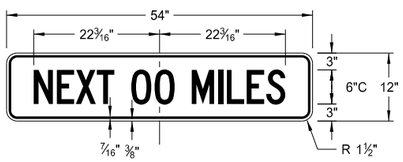


W22-8-48
Legend: black (non-refl)
Background: orange



W16-7aP-18



W20-52P-54
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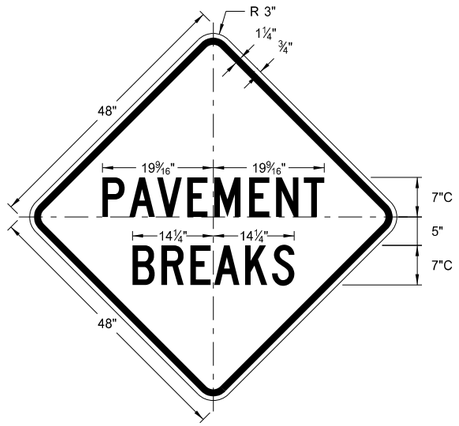
Background: orange



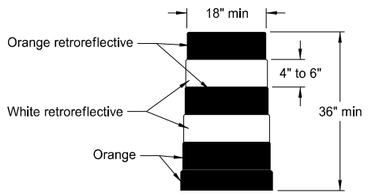
W21-52-48
Legend: black (non-refl)
Background: orange

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
5-31-18	
REVISIONS	
DATE	CHANGE
11-01-19	Added details for sign W16-7aP-18.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

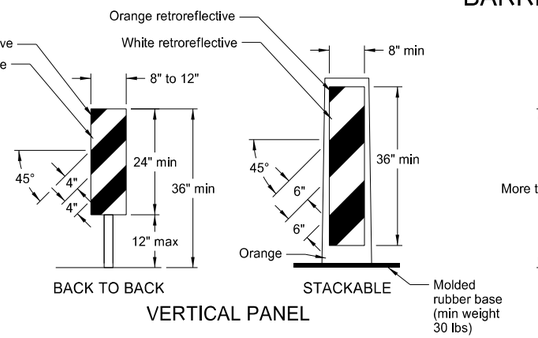
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



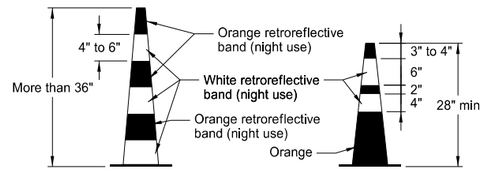
DELINEATOR DRUM

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



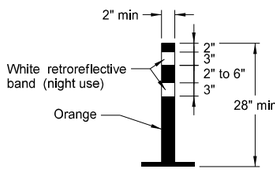
VERTICAL PANEL

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



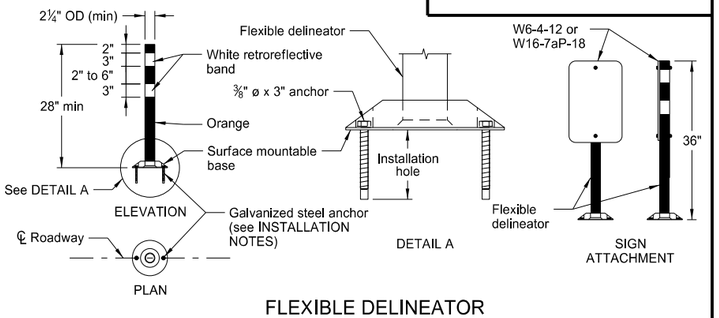
TRAFFIC CONE

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



TUBULAR MARKER

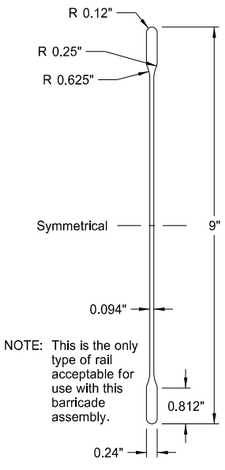
Provide retroreflectorization of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

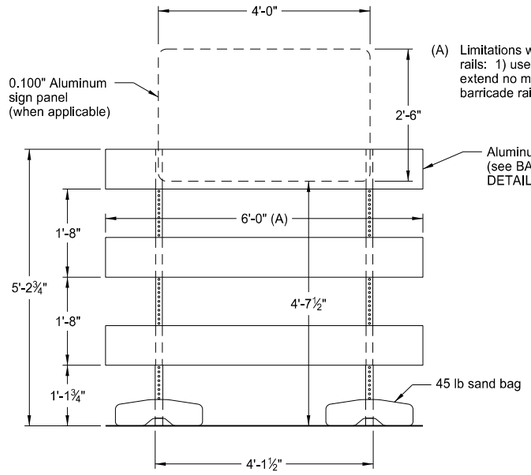
INSTALLATION NOTES:

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



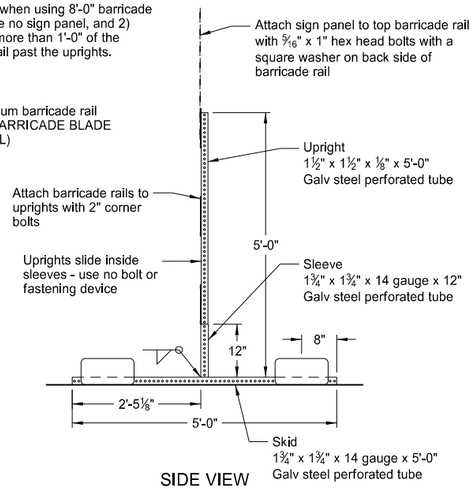
NOTE: This is the only type of rail acceptable for use with this barricade assembly.

BARRICADE BLADE DETAIL



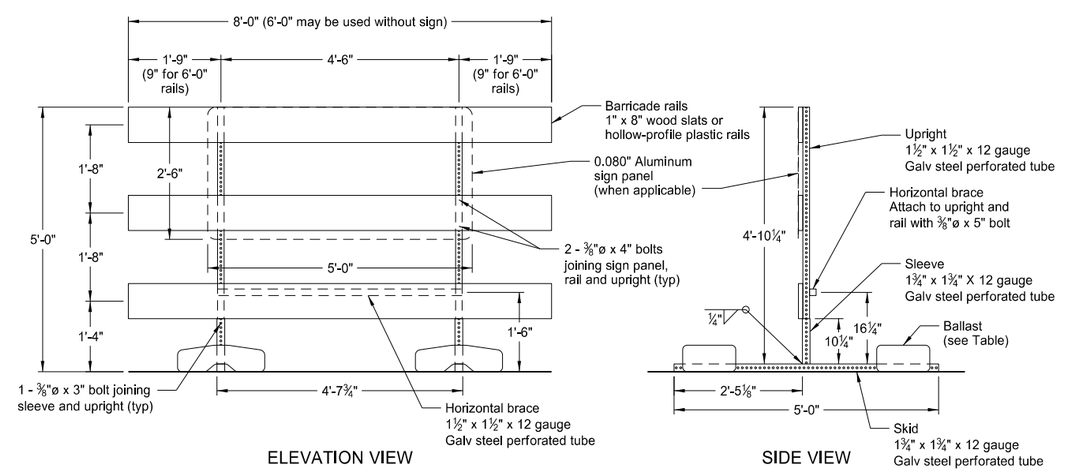
(A) Limitations when using 8'-0" barricade rails: 1) use no sign panel, and 2) extend no more than 1'-0" of the barricade rail past the uprights.

ELEVATION VIEW



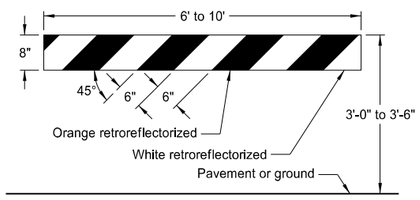
SIDE VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

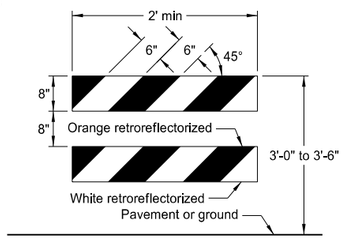


BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

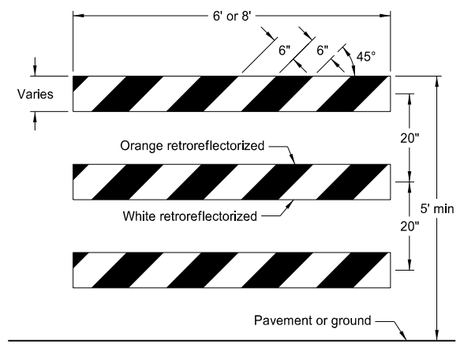
NOTE: For barricade markings use alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Place retroreflective sheeting on both sides of the rails with a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the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



TYPE I BARRICADE

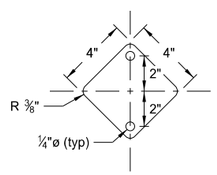


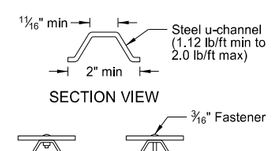
TYPE II BARRICADE

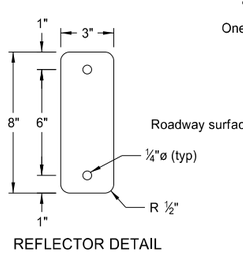


TYPE III BARRICADE

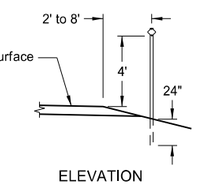
BARRICADE RAIL DETAILS







REFLECTOR DETAIL



ELEVATION

DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

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

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

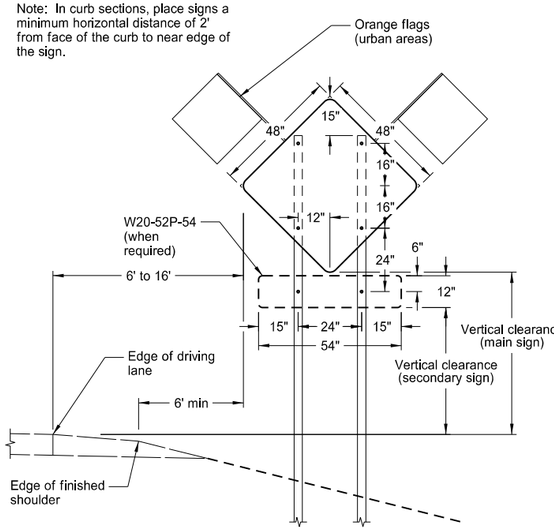
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
9-27-17 11-01-19	Updated to active voice Revised details for Flexible Delineator

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

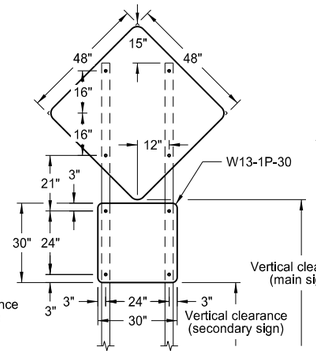
CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

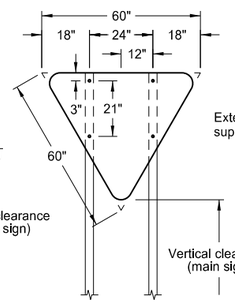
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



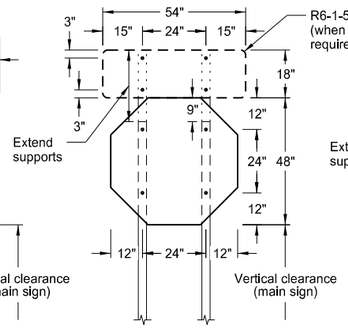
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



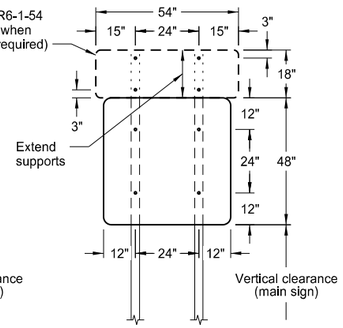
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



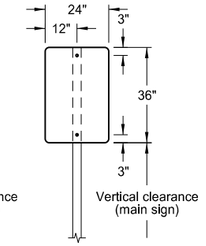
R1-2-60 - YIELD SIGN



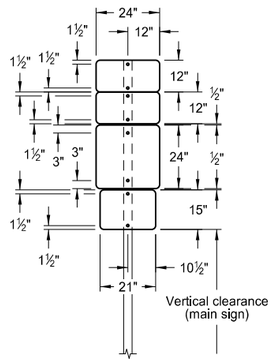
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



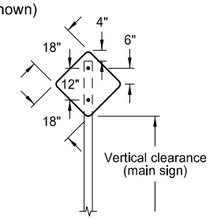
48" x 48" SIGN
(with R6-1-54 sign as required)



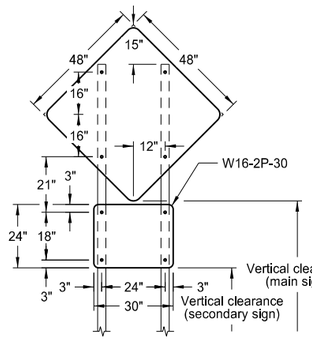
24" x 36" SIGN



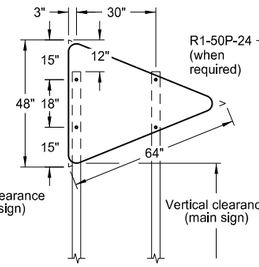
24" x 24"
ROUTE MARKER
ASSEMBLY



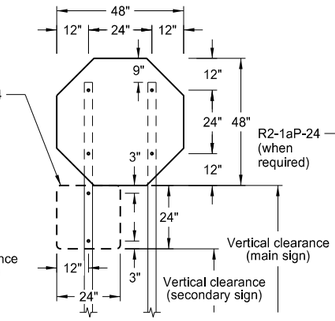
18" x 18"
DIAMOND SIGN



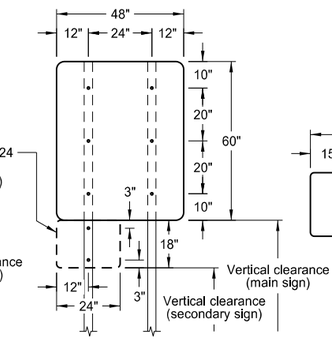
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



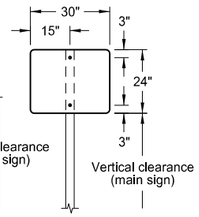
W14-3-64 - PENNANT SIGN



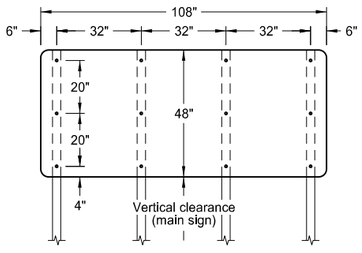
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



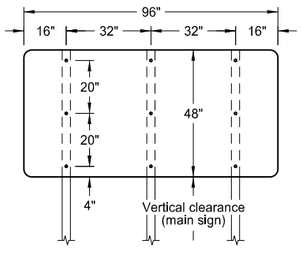
48" x 48" SIGN
(with R2-1aP-24 sign as required)



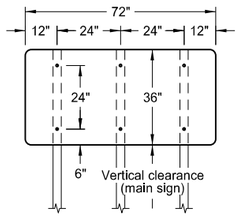
30" x 24" SIGN



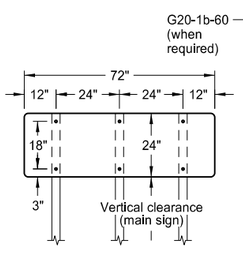
108" x 48" SIGN



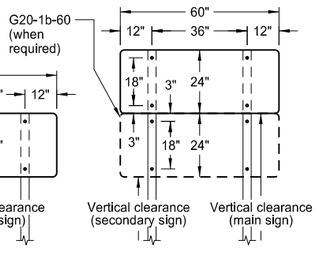
96" x 48" SIGN



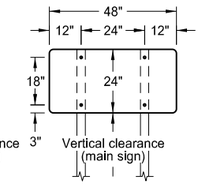
72" x 36" SIGN



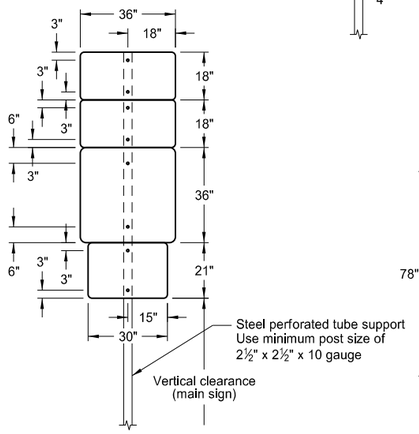
72" x 24" SIGN



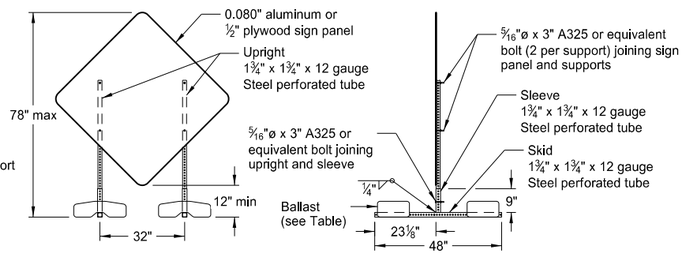
60" x 24" SIGN



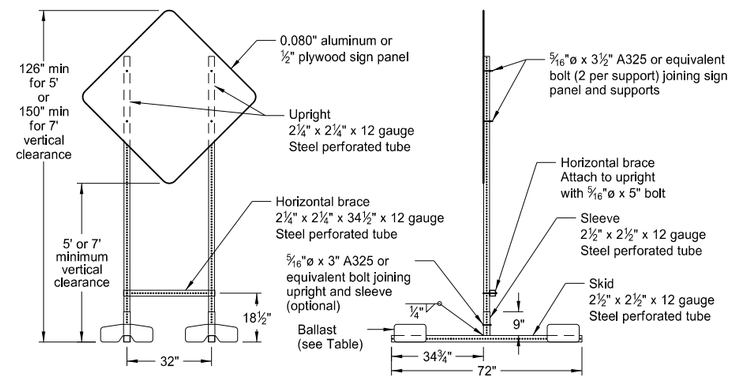
48" x 24" SIGN



36" x 36"
ROUTE MARKER
ASSEMBLY



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

MINIMUM BALLAST
(For each side of sign support base)

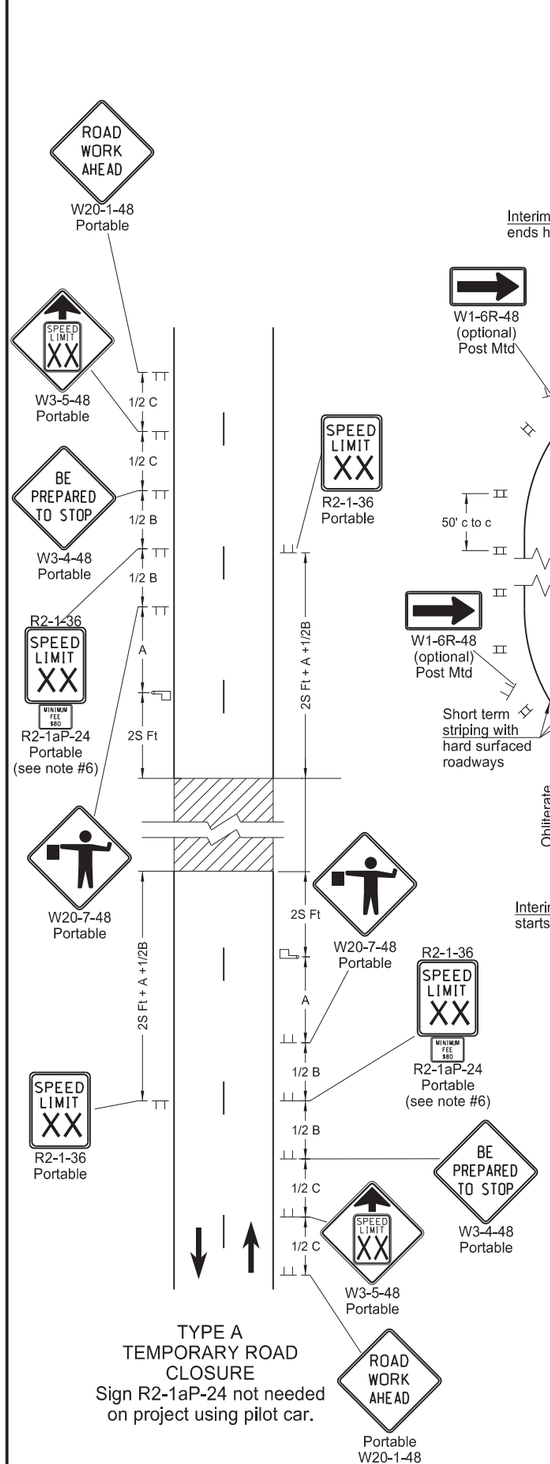
Sign Panel Mounting Height (ft)	Number of 25 lb sandbags for 4' x 4' sign panel
1'	6
5'	8
7'	10

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

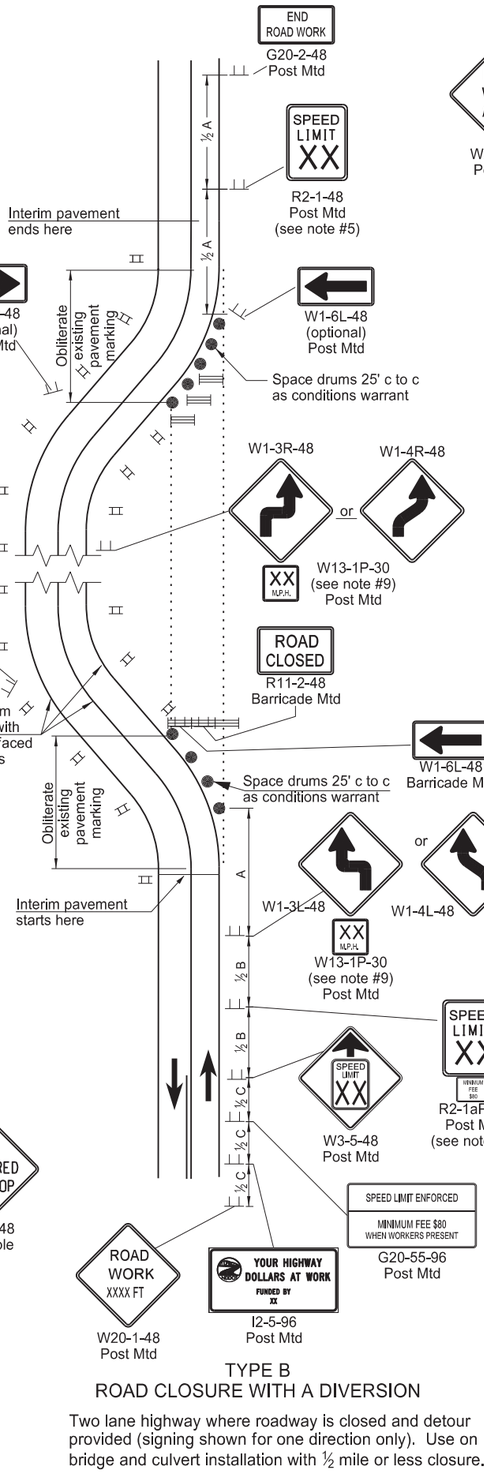
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-13	
REVISIONS	
DATE	CHANGE
11-14-13	Revised Note 6
9-27-17	Updated to active voice
11-01-19	Revised 60"x24" sign detail

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

ROAD CLOSURE LAYOUTS

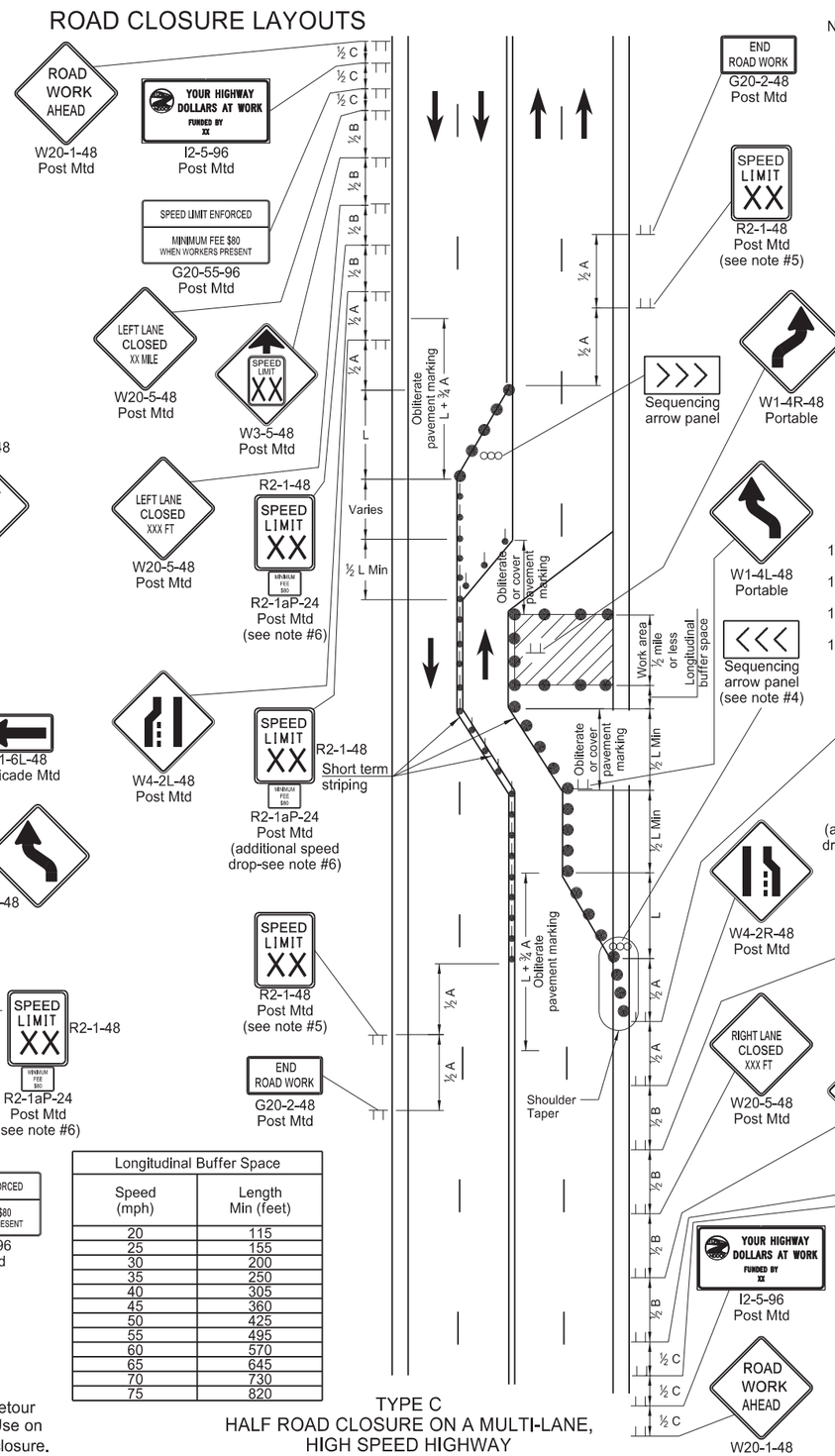


TYPE A
TEMPORARY ROAD CLOSURE
Sign R2-1aP-24 not needed on project using pilot car.



TYPE B
ROAD CLOSURE WITH A DIVERSION
Two lane highway where roadway is closed and detour provided (signing shown for one direction only). Use on bridge and culvert installation with ½ mile or less closure.

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



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

Notes:
1. Variables
   S = Numerical value of speed limit or 85th percentile.
   W = The width of taper in feet.
   L = Minimum length of taper, S x W for freeways, expressways, and other roads with speeds of 45 mph or greater, or W x $S^2/60$ for urban, residential, and other streets with speeds of 40 mph or less.
2. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
3. Place delineator drums, barricades or cones for tapering traffic at dimension "S" and for tangents space at 2 times dimension "S".
4. Place Sequencing Arrow Panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on roadway surface. See Shoulder Closure Standard Drawing.
   Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
   Use Type B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
   Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
5. Re-establish speed. Determine exact speed limit in the field, dependent on location and conditions.
6. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½ B.
7. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
8. Cover existing speed limit signs within reduced speed zones.
9. Where necessary, engineer will determine safe speed.
10. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
11. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.
12. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
13. Sign I2-5-96 is not required if this layout is part of other traffic control that contains this sign.

ADVANCE WARNING SIGN SPACING			
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

KEY

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

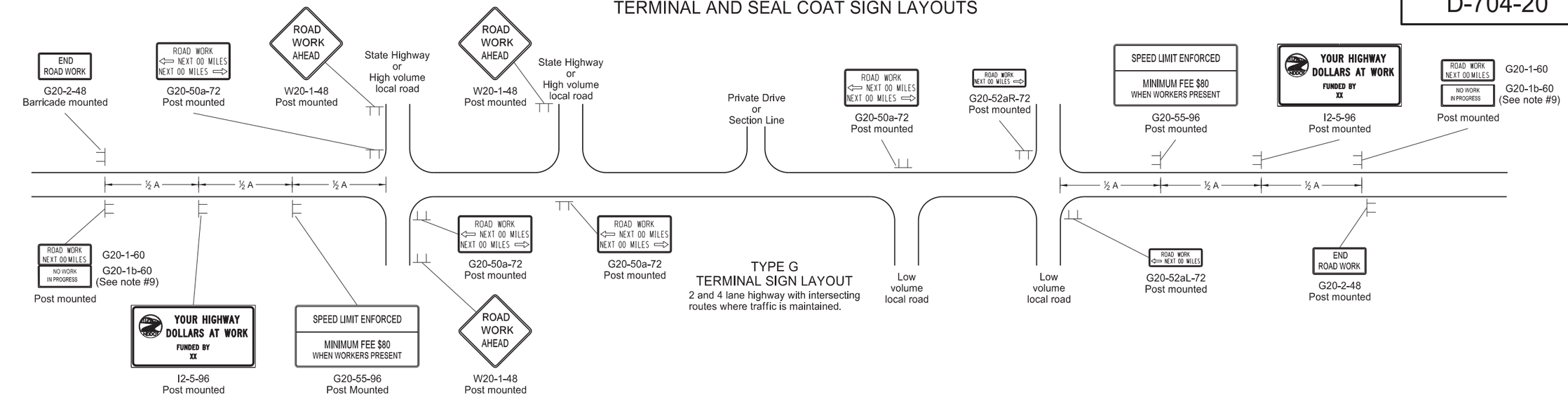
DATE	CHANGE
08-17-17 11-01-19 12-08-21	Updated Notes & Spd Limit signs Sign, Notes, & Pvmt Mk updates Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

12/08/21

TERMINAL AND SEAL COAT SIGN LAYOUTS

D-704-20



Notes:

1. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
2. Determine the exact speed limit in the field, based on location and conditions.
3. Determine the reduced speed limit based on the in place speed limit before construction. Where speed limit reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 MPH.) Place the second speed limit sign at ½ B.
4. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
5. Cover existing speed limit signs within a reduced speed zone.
6. On seal coat projects, place signs R2-1-48, R2-1aP-24, R4-1-48, W22-8-48 and W20-52P-54 after all important intersections and at five mile intervals. Place sign W8-12-48 after all important intersections and at 2 mile intervals until short term center line pavement marking is placed.
7. As an option, use portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Drawing D-704-14.
8. Cover or remove speed limit signs from layout Type H when loose aggregate is removed.
9. Install sign G20-1b-60 when work is suspended for winter.
10. Use other traffic control layouts in immediate work areas. Place sign R2-1aP-24 below speed limit signs in reduced speed limit work areas.
11. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.
12. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
13. Sign I2-5-96 is not required if this layout is a part of other traffic control that contains this sign.

ADVANCE WARNING SIGN SPACING			
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
08-17-17 11-01-19 12-08-21	Updated notes & sign numbers Updated note & sign Switched order of Road Work and Spd Limit Enforced & added Dollars At Work

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

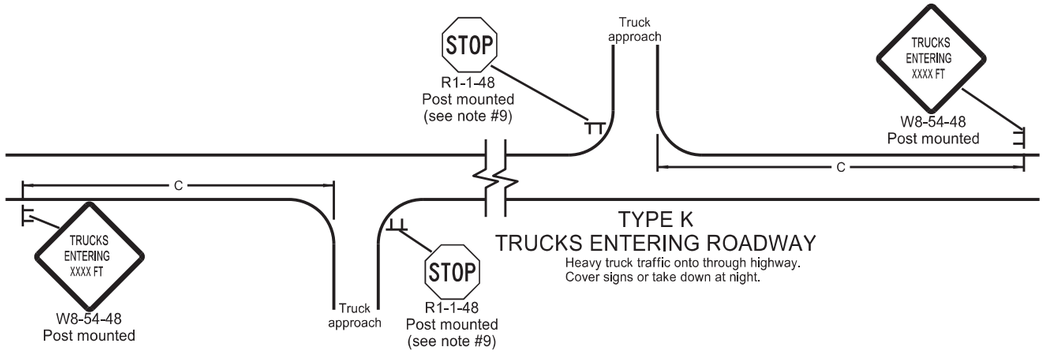
12/08/21

CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

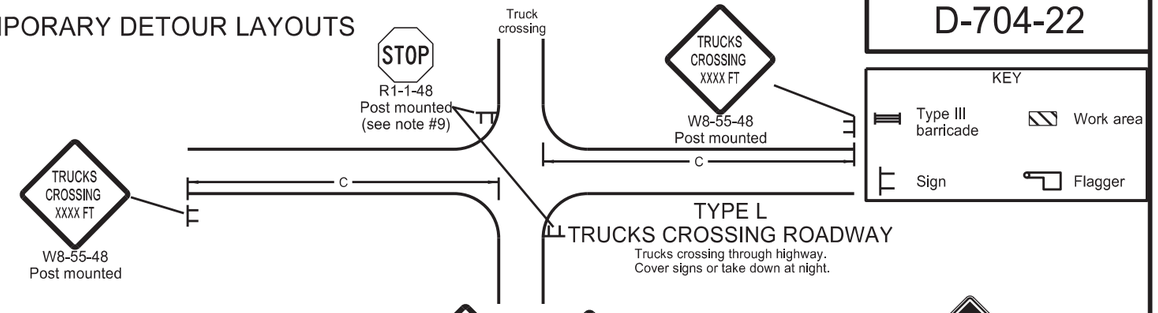
D-704-22

KEY: Type III barricade; Work area; Sign; Flagger

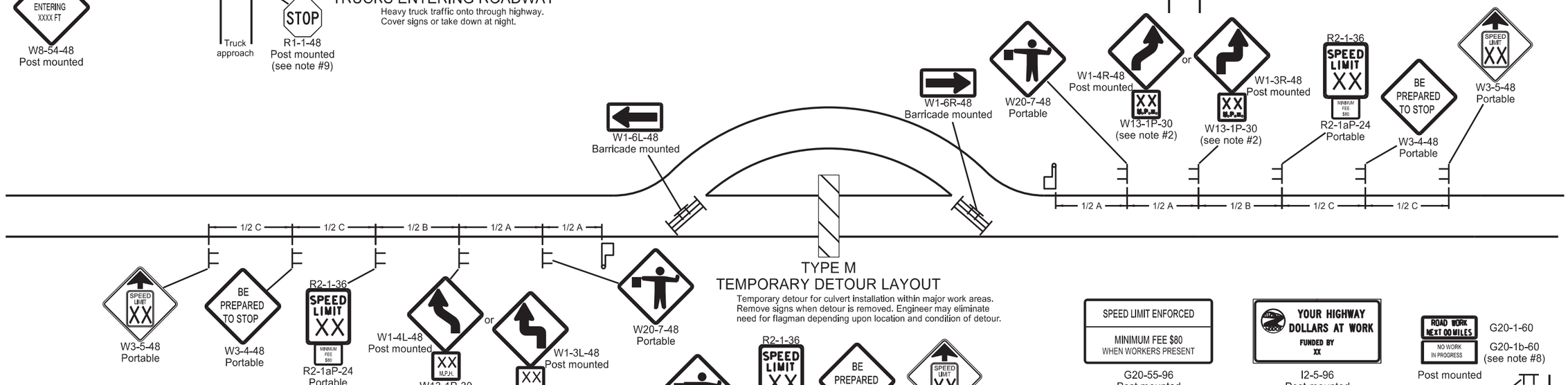
TYPE K
TRUCKS ENTERING ROADWAY
Heavy truck traffic onto through highway.
Cover signs or take down at night.



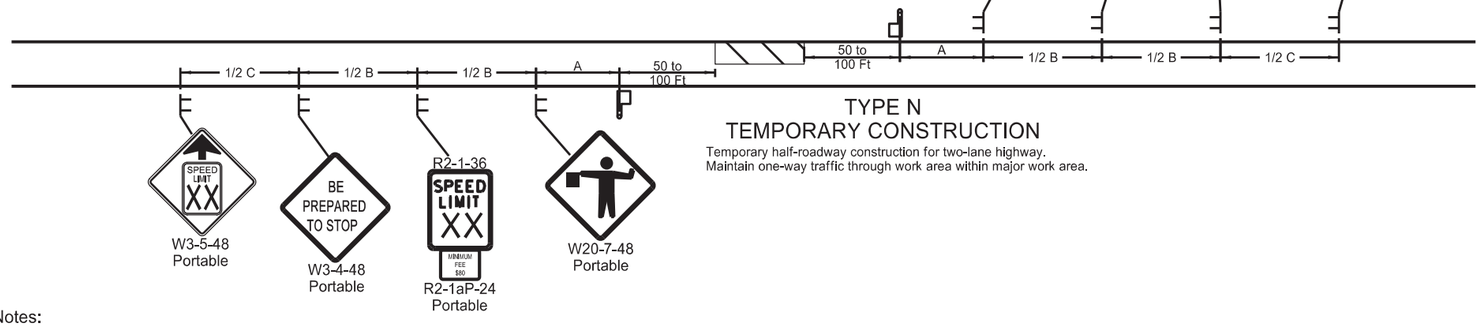
TYPE L
TRUCKS CROSSING ROADWAY
Trucks crossing through highway.
Cover signs or take down at night.

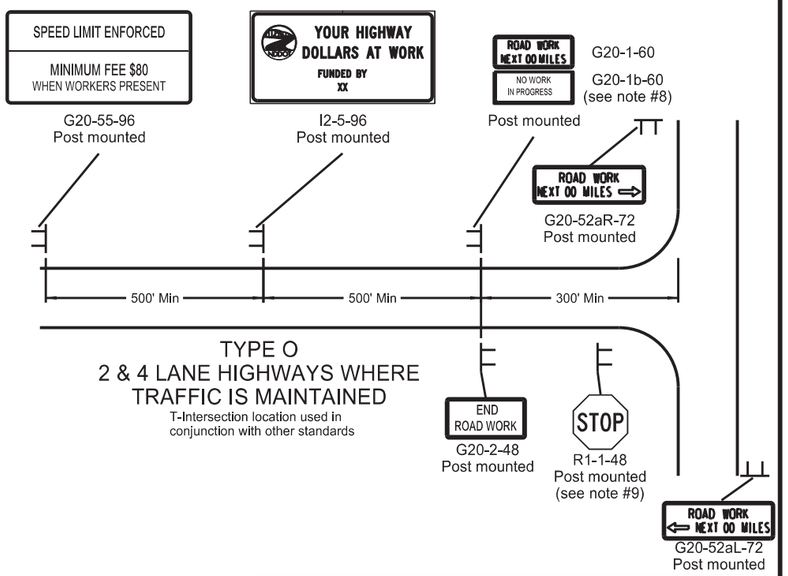


TYPE M
TEMPORARY DETOUR LAYOUT
Temporary detour for culvert installation within major work areas.
Remove signs when detour is removed. Engineer may eliminate need for flagman depending upon location and condition of detour.



TYPE N
TEMPORARY CONSTRUCTION
Temporary half-roadway construction for two-lane highway.
Maintain one-way traffic through work area within major work area.





TYPE O
2 & 4 LANE HIGHWAYS WHERE TRAFFIC IS MAINTAINED
T-Intersection location used in conjunction with other standards

Notes:

1. Place barricades on a moveable assemblies and signs on portable assemblies when located on roadway.
2. Where necessary, safe speed to be determined by the Engineer.
3. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½ B.
4. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
5. Cover existing speed limit signs within a reduced speed zone.
6. Covered (when approved by engineer) or obliterated pavement marking measured as Obliteration of Pavement Marking.
7. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
8. Install sign G20-1b-60 when work is suspended for winter.
9. If existing stop sign is in place, a 48" stop sign is not required.
10. Sign G20-55-96 is not required if layout is part of other traffic control that contains this sign, or if work is less than 15 days.
11. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
12. Sign I2-5-96 is not required if layout is part of other traffic control that contains this sign.

ADVANCE WARNING SIGN SPACING			
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 40mph)	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
08-17-17 11-01-19 12-09-21	Update notes & sign numbers Revised sign numbers & note 7 Added Speed Limit Enforced and Dollars At Work signs

KIRK J. HOFF
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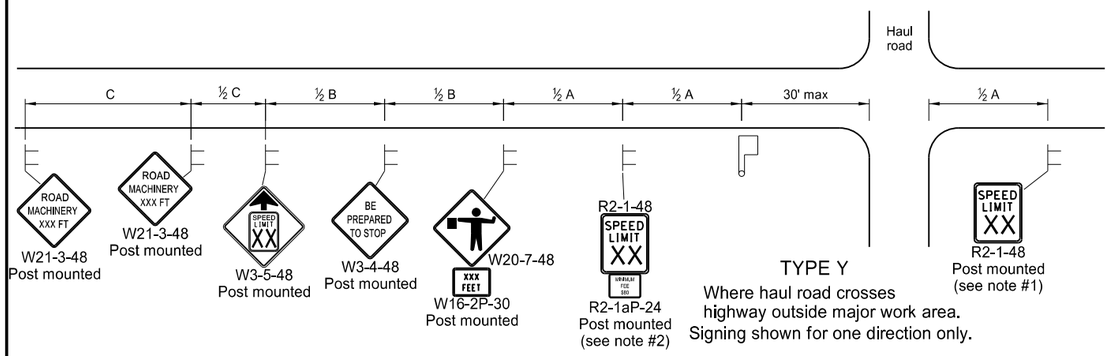
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

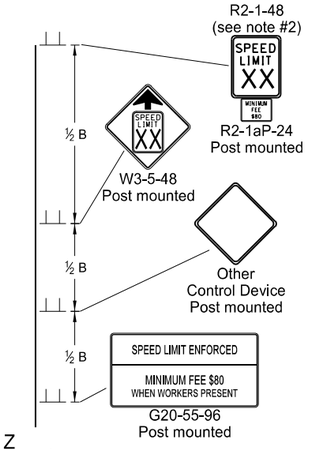
12/09/21

MISCELLANEOUS SIGN LAYOUTS

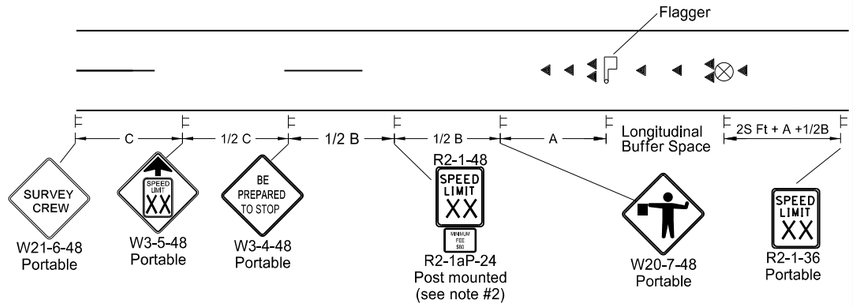
D-704-26



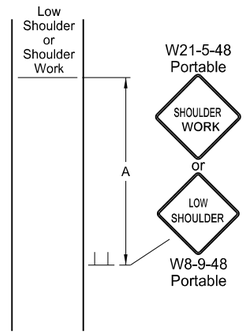
TYPE Y
Where haul road crosses highway outside major work area.
Signing shown for one direction only.



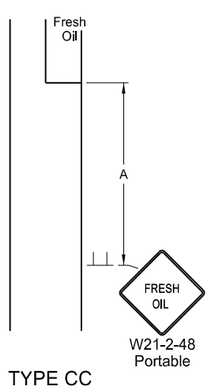
TYPE Z
Where speed zone is needed
Signing shown for one direction only.



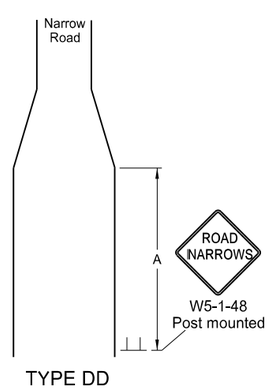
TYPE AA
Where survey crew is used
Signing shown for one direction only.



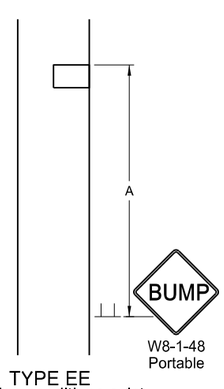
TYPE BB
Within major work area where sign conditions exist



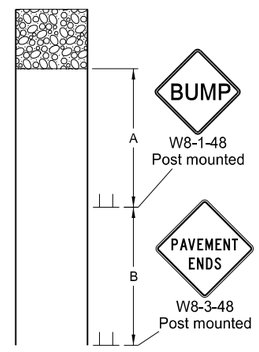
TYPE CC
Where sign conditions exist



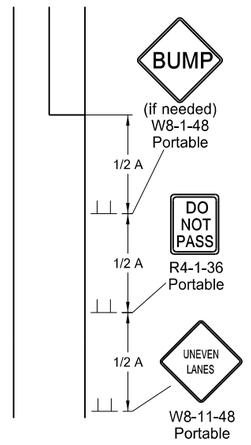
TYPE DD
Where sign conditions exist



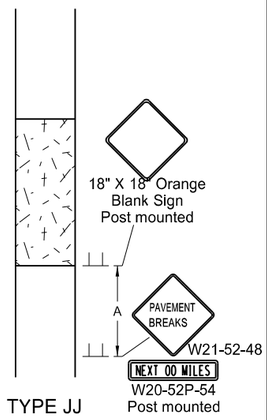
TYPE EE
Where sign conditions exist



TYPE FF
Where sign conditions exist
Signing shown for one direction only.



TYPE GG
Where elevation difference exists between lanes

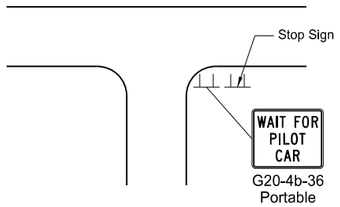


TYPE JJ
For break in pavement.
Install signs when conditions exist and remove when not applicable.
Signing shown for one direction only.

KEY

Flagger	Sign
Cones	Survey Equipment

S = Numerical value of speed limit or 85th percentile.



TYPE KK
At major intersections within pilot car control area

Notes
1. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
2. Determine reduced speed limit based on in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½B.
3. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
4. Cover existing speed limit signs within reduced speed zones.
5. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
6. Sign G20-55-96 is not required if this standard is part of other traffic control layouts, or work is less than 15 days.
7. When pilot car operation is used, place sign G20-4b-36 "Wait For Pilot Car" at major intersections within pilot car control area.
8. Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
9. Layouts shown for one direction only.

ADVANCE WARNING SIGN SPACING			
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

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

* Posted speed, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

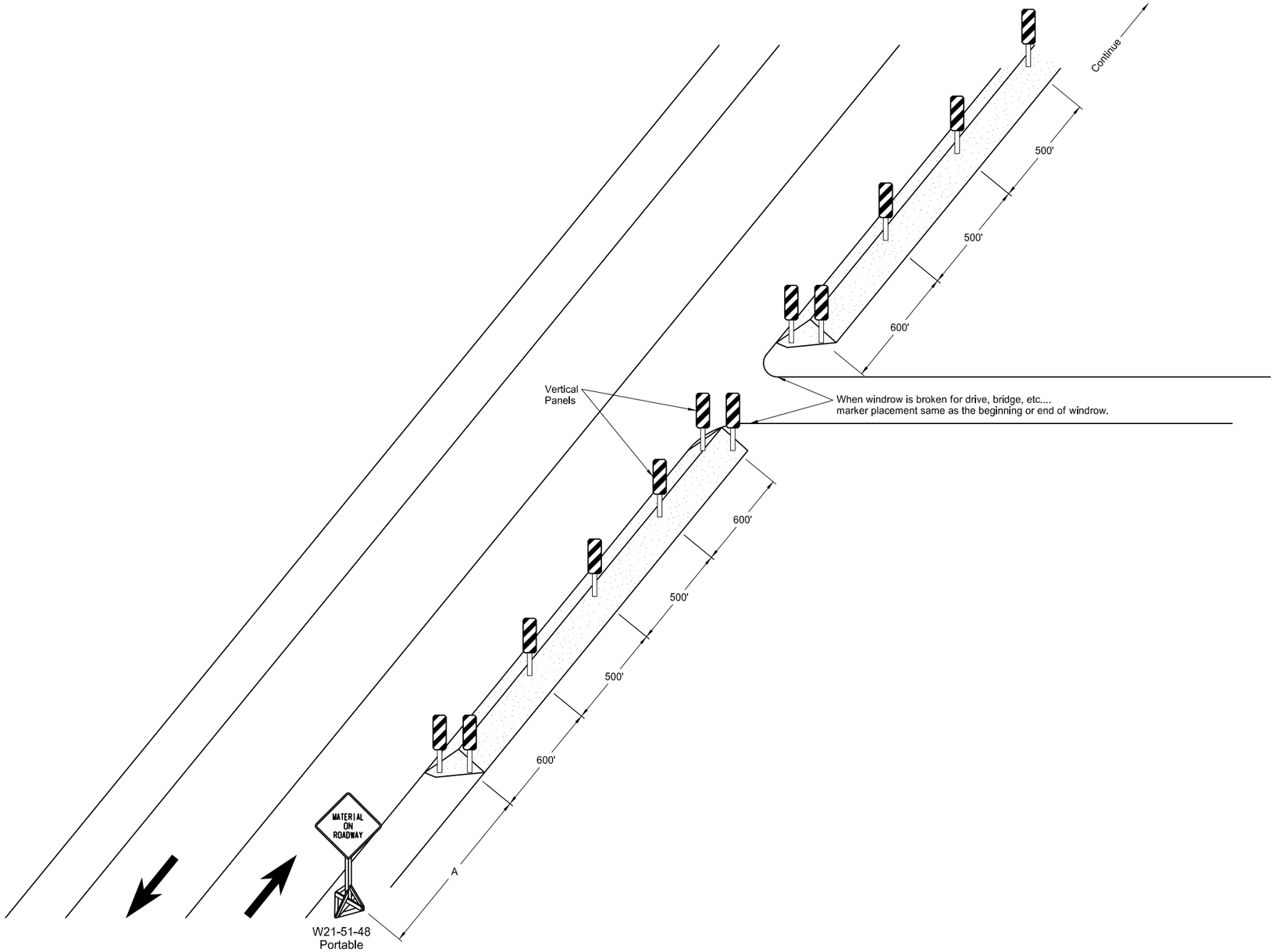
REVISIONS

DATE	CHANGE
8-17-17	Added speed limit signs. Updated notes & sign numbers
11-01-19	Revised note 5 & sign numbers

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

WINDROW MARKING

D-704-30



ADVANCE WARNING SIGN SPACING			
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 (55 mph to 60 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

Notes:
As an option, use portable sign supports in lieu of post mounted sign in accordance with NDDOT Standard Drawing D-704-14.

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

9-27-13

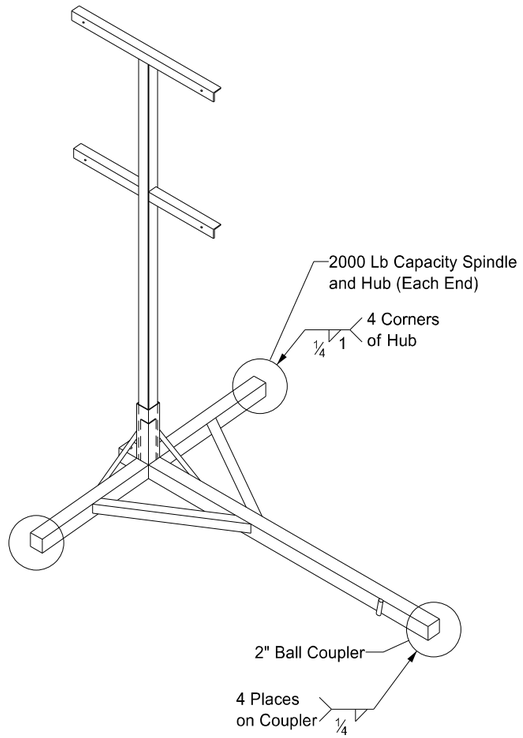
REVISIONS

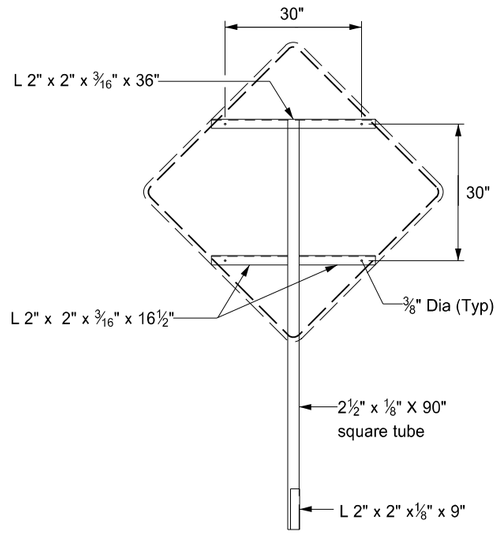
DATE	CHANGE
6-24-14	Revised Note
8-17-17	Updated notes & sign support
11-01-19	Revised note

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

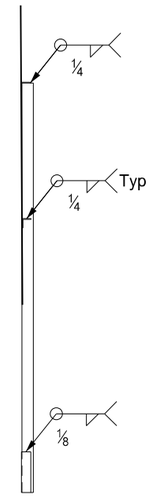
PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50





FRONT

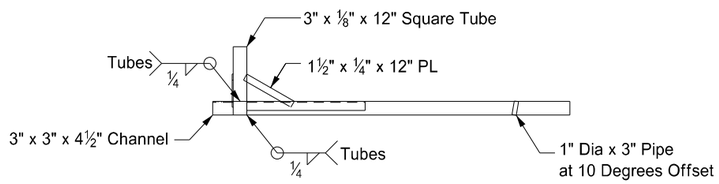


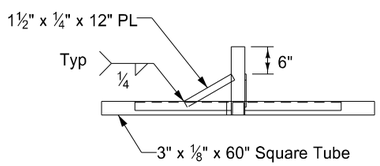
RIGHT

SIGN SUPPORT

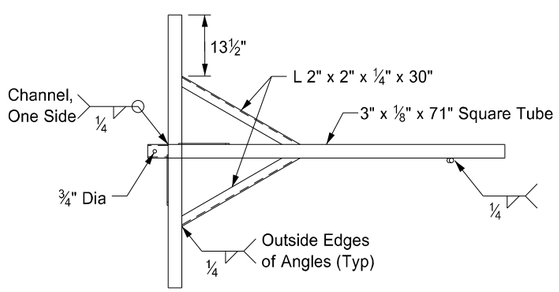
Notes:

1. Maximum 250 pound weight of assembly.
2. Use a 14" wheel and tire.
3. Use no automotive and equipment axle assemblies for trailer-mounted sign supports.
4. Other NCHRP 350 or MASH crash tested assemblies are acceptable.





RIGHT



TOP

TRAILER

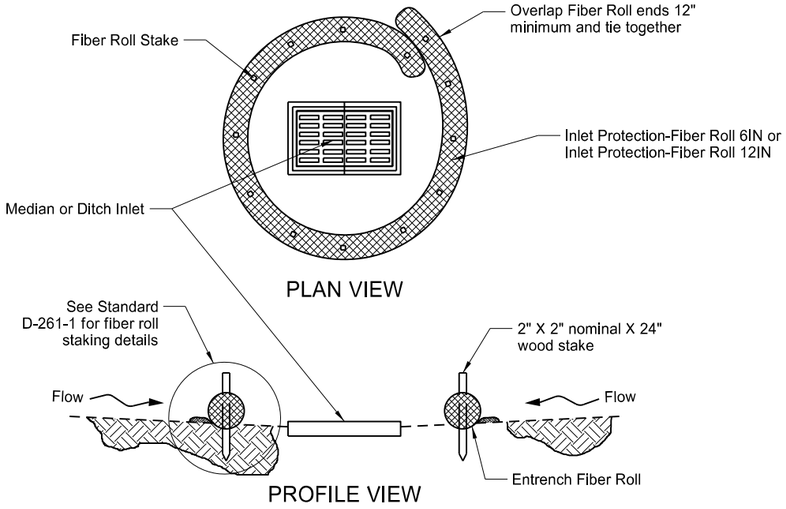
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE
12/02/2020	Updated Note to active voice.

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

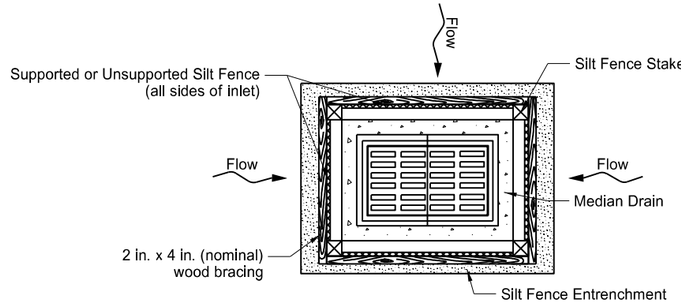
Kirk J Hoff

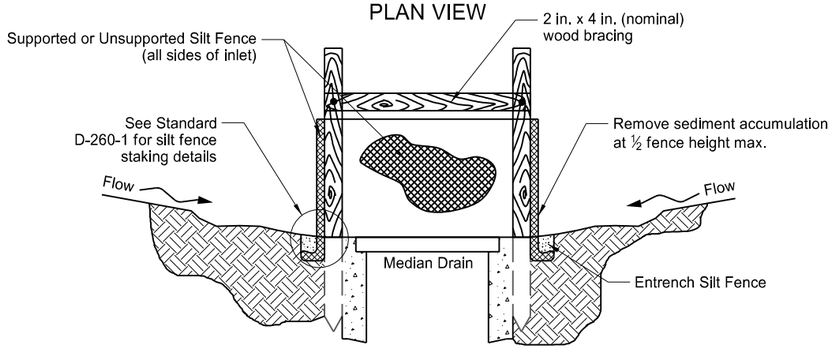
12 02 2020

EROSION AND SILTATION CONTROLS
MEDIAN OR DITCH INLET PROTECTION

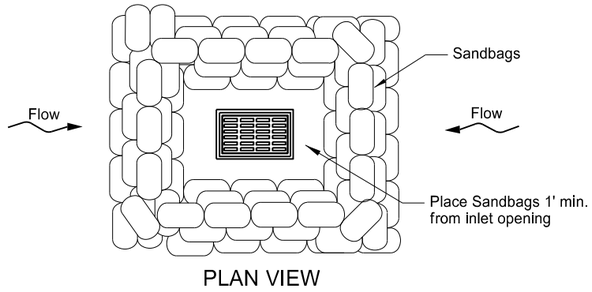


FIBER ROLL PROTECTION (MEDIAN OR DITCH INLET)

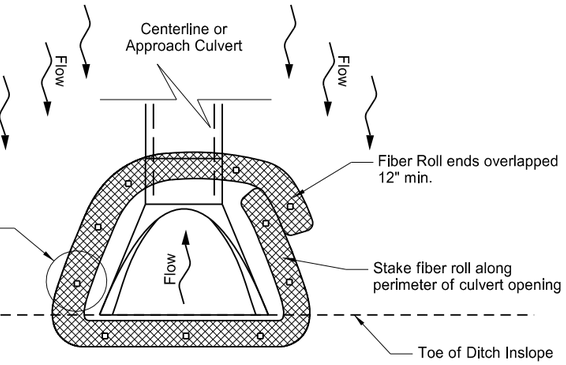




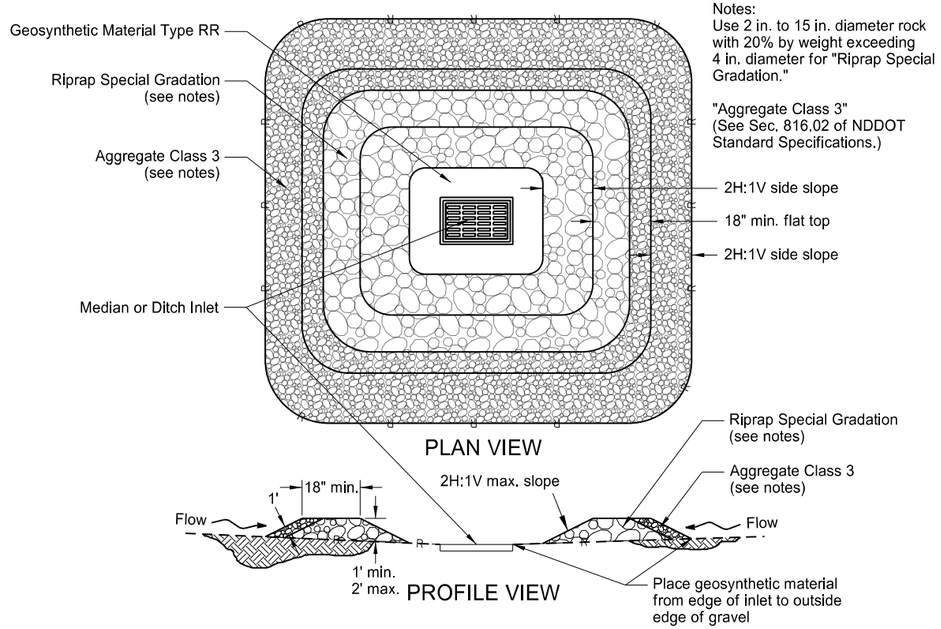
SILT FENCE PROTECTION (MEDIAN OR DITCH INLET)



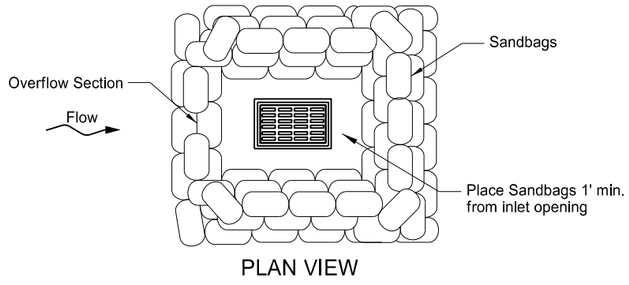
SANDBAG PROTECTION (LOW POINT)



FIBER ROLL PROTECTION (INLET OF CULVERT)



GRAVEL INLET PROTECTION (MEDIAN OR DITCH INLET)



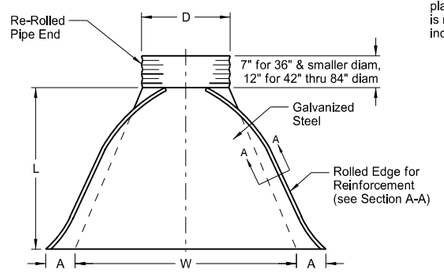
SANDBAG PROTECTION (ON SLOPE)

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.
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp.

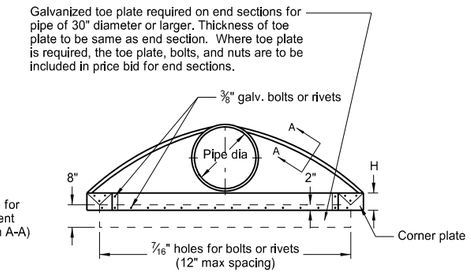
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8-27-19 and the original document is stored at the North Dakota Department of Transportation

ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

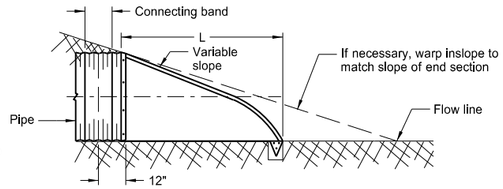
D-714-4



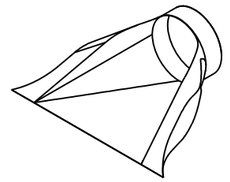
PLAN VIEW



ELEVATION VIEW



TYPICAL CROSS SECTION
(showing connector section)



PERSPECTIVE VIEW

* * PIPE DIA.	GALV. THICK.	END SECTION DIMENSIONS A	B	H	L	W	APPROX. SLOPE	BODY PIECE
IN	IN	IN	IN	IN	IN	IN	RATE	
15	0.064	7	8	6	26	30	2½:1	1
18	0.064	8	10	6	31	36	2½:1	1
24	0.064	10	13	6	41	48	2½:1	1
30	0.079	12	16	8	51	60	2½:1	1 or 2
36	0.079	14	19	9	60	72	2½:1	2
42	0.109	16	22	11	69	84	2½:1	2
48	0.109	18	27	12	78	90	2¼:1	2
54	0.109	18	30	12	84	102	2:1	2
* 60	0.109	18	33	12	87	114	1¾:1	3
* 66	0.109	18	36	12	87	120	1½:1	3
* 72	0.109	18	39	12	87	126	1 1/3 :1	3
* 78	0.109	18	42	12	87	132	1¼:1	3
* 84	0.109	18	45	12	87	138	1 1/6 :1	3

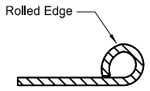
* These sizes have 0.109" sides and 0.138" center panels.

* * Pipe diameter is equal to dimension "D" of end section.

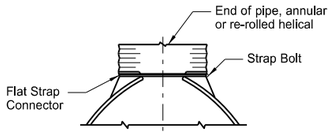
Manufacturers tolerances of above dimensions will be allowed.

Splices to be the lap riveted type.

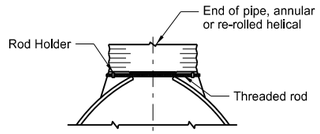
Multiple panel bodies shall have lap seams which are to be tightly joined with ⅜" dia. galv. bolts or rivets. Nuts to be torqued to 25 foot-lbs ±.



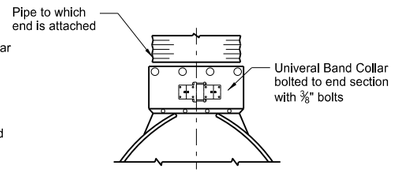
SECTION A-A



TYPE #1
For circular pipes with diameter 24" & smaller



TYPE #2
For circular pipes with diameter 30" through 36"

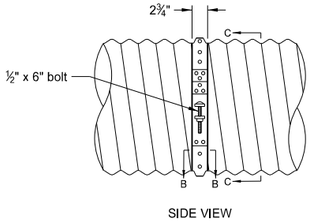


TYPE #3
For all pipe sizes

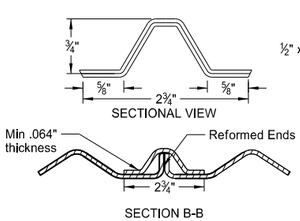
COUPLING BAND DIMENSIONS				
COUPLING TYPE	CORRUGATION PITCH x DEPTH	PIPE SIZE	COUPLING BAND LENGTH	MIN. BAND THICKNESS
Hat Band	2⅔" x ½"	12" - 48"	2¾"	.064"
Annular Band	2⅔" x ½"	12" - 72"	12"	.052"
		78" - 84"	12"	.079"
	3" x 1"	48" - 120"	14"	.052"
Hugger Band	2⅔" x ½" Rerolled End	12" - 72"	10½"	.052"
		78" - 84"	10½"	.079"
	3" x 1" Rerolled End	48" - 120"	10½"	.052"
	5" x 1" Rerolled End	48" - 120"	12"	.064"

NOTES:

1. Pipes and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
2. Top edge of all end sections to have rolled edges for reinforcement (see Section A-A). The reinforced edges are to be supplemented with 2" x 2" x ¼" galv. angle for 60" through 72" dia. and 2½" x 2½" x ¼" galv. angle for 78" and 84" dia.. Angles to be attached by galv. ⅜" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
3. Elongated pipes shall be factory preformed so that the vertical diameter shall be 5% greater and the horizontal diameter 5% less than a circular pipe.
4. Coupling bands shall be two-piece for pipes larger than 36" as shown in Section C-C & D-D details. For pipes 36" and smaller, a one-piece band is acceptable.
5. ½" x 8" bolts may be used as a substitute for the ½" x 6" bolts shown in the details.
6. Coupling bands wider than 14" may be used if a minimum of four ½" bolts with maximum spacing of 5½" are used for the connection.
7. Length of spot welds shall be minimum ½".

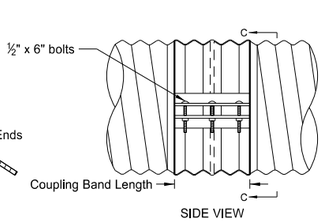


SIDE VIEW

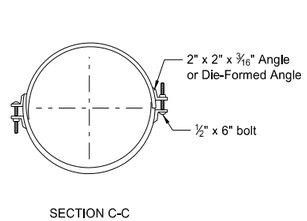


SECTION B-B

HAT BAND FOR FLANGED END PIPE

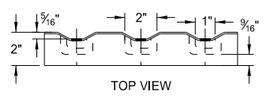


SIDE VIEW



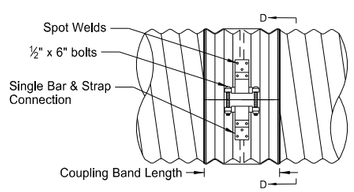
SECTION C-C
Angle Connection

ANNULAR BAND

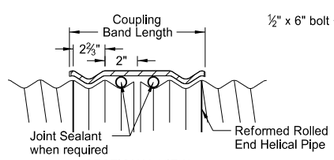


TOP VIEW

Die-Formed Angle Connector

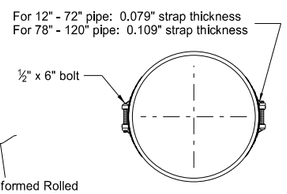


SIDE VIEW

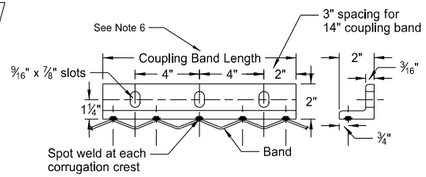


SECTIONAL VIEW

HUGGER COUPLING BAND

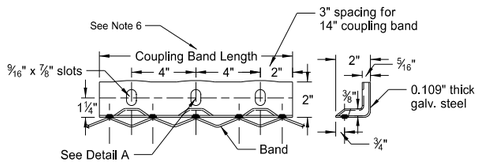


SECTION D-D
Bar & Strap Connection



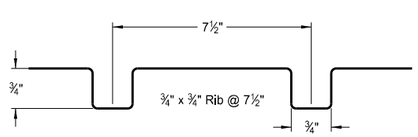
SIDE VIEW END VIEW

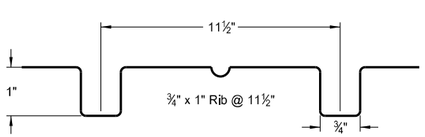
2" x 2" x 3/16" Angle Connector



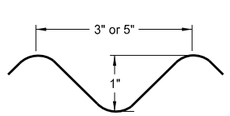
SIDE VIEW END VIEW

Die-Formed Angle Connector

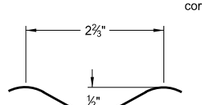




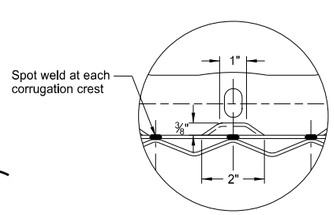
SPIRAL RIB CORRUGATIONS



3" x 1" CORRUGATIONS or
5" x 1" CORRUGATIONS



2⅔" x ½" CORRUGATIONS



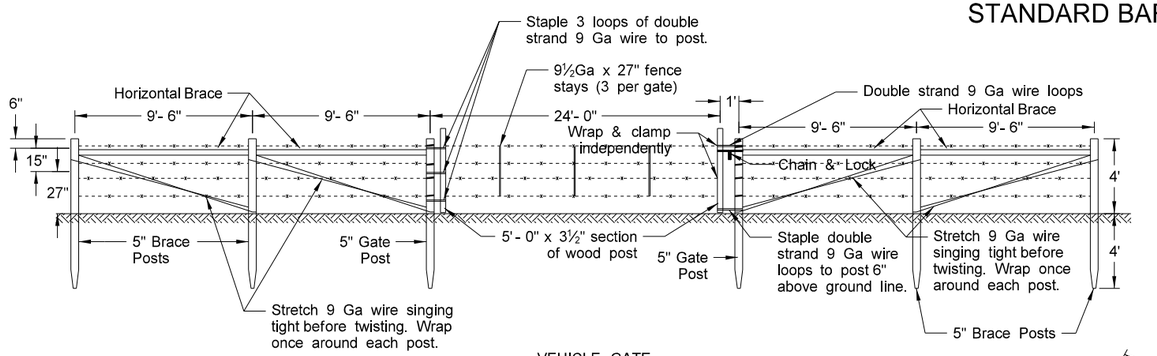
Detail A

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
08-16-13	
REVISIONS	
DATE	CHANGE
01-07-14	End Section Plan View
02-27-14	3" x 1" Corrugation Detail
09-18-19	Added Perspective View Detail

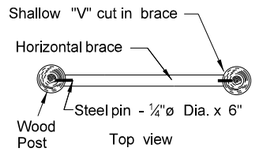
This document was originally issued and sealed by Jon Ketterling Registration Number PE-4684, on 9/18/19 and the original document is stored at the North Dakota Department of Transportation

STANDARD BARBED WIRE FENCE

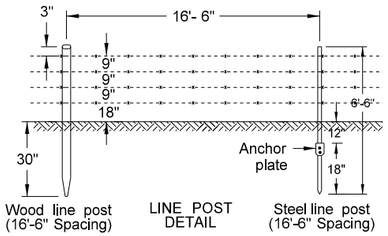
D-752-1



VEHICLE GATE



HORIZONTAL BRACE DETAIL



NOTES

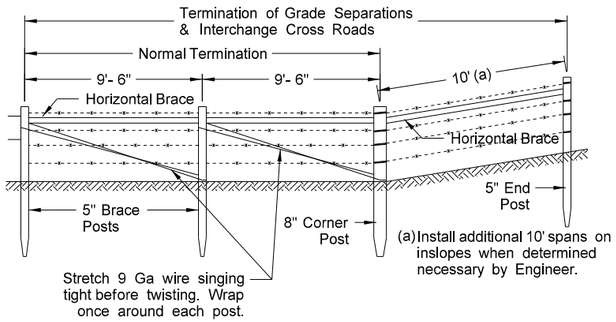
1. No deduction in measured pay length of cable fence made for gates, corner assemblies, double brace assemblies, fence terminals, or depression fencing. Include all costs for abutment fencing in the price bid for fencing bid items.

2. Install double brace assemblies at locations shown on the plans or established by the Engineer. Place adjacent fence terminals, corner assemblies, or double brace assemblies at a maximum spacing of 1,320 feet.

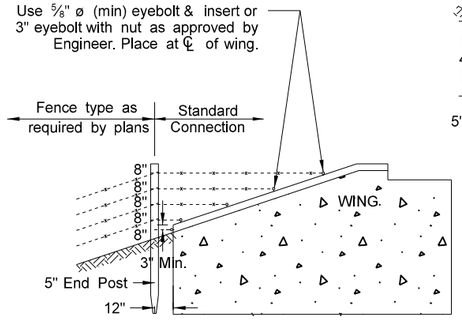
3. Include all costs of furnishing and installing inserts and eyebolts in the unit price bid for fencing bid items. Use eyebolts galvanized according to AASHTO designation M-30; inserts of corrosion resistant material do not require galvanization. Use concrete inserts capable of developing the full strength of the ⅝" diameter threaded eyebolt, when installed in concrete.

4. Determine post type used, either wood or steel, unless otherwise specified in the plans.

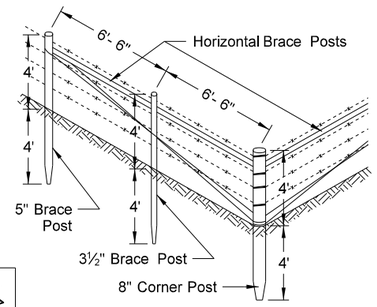
	POST SIZES				
	TREATED WOOD		STEEL		
USE OF POST	Post dia.	Post length	Post length	Post wt. Lbs/Ft	Anchor wt. Lbs.
Line post	3½"	6'-6"	6'-6"	1.33	0.67
Corner post	8"	8'	7'	4.10	(Conc.)
End post	5"	8'			
Brace post	5" / 3½"	8'	7'	3.19	(Conc.)
Gate post	5"	8'			
Horizontal brace	3½"	Var.	As appoved by the Engineer		



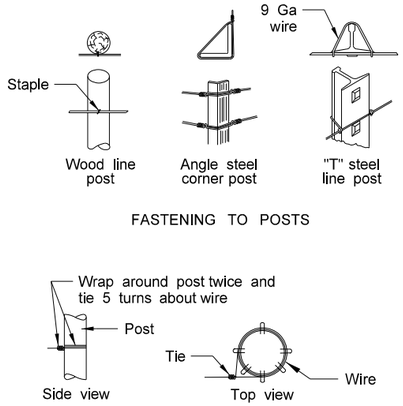
FENCE TERMINAL



DETAIL FOR TYING FENCE TO WINGS OF ABUTMENTS

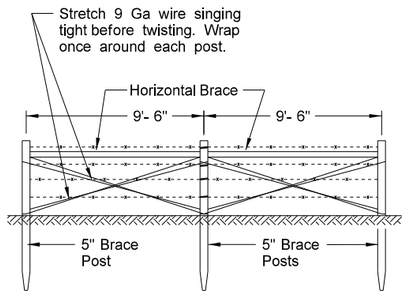


SHORT SPAN DETAIL
(FENCE LINE 100' OR LESS)

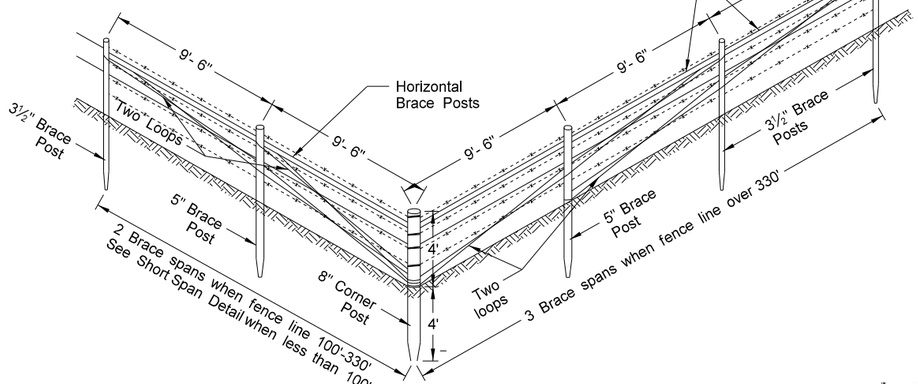


FASTENING TO POSTS

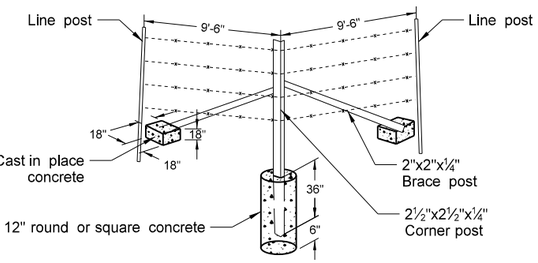
WRAP-AROUND DETAIL



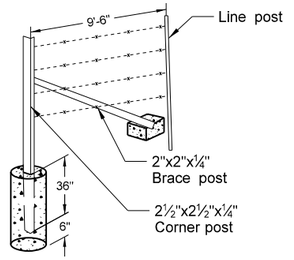
DOUBLE BRACE ASSEMBLY



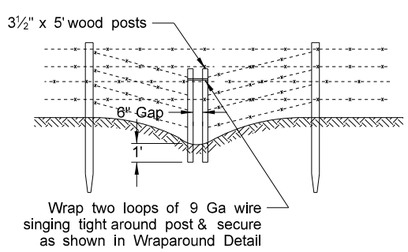
CORNER ASSEMBLY



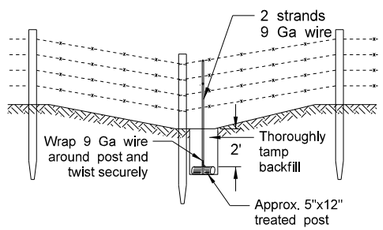
CORNER AND DOUBLE BRACE ASSEMBLY
STEEL POSTS



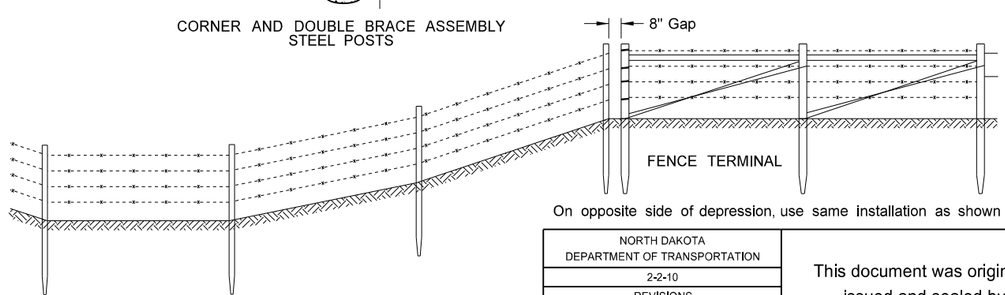
FENCE TERMINAL
STEEL POSTS



BREAK-AWAY FENCE FOR NARROW
DEPRESSIONS SUBJECT TO FLOODING



DETAIL FOR ANCHORING FENCES IN DEPRESSIONS*
*Determine locations in the field and include in price bid for fencing. Use other methods of anchoring fence if approved by the Engineer.



FENCE TERMINAL

On opposite side of depression, use same installation as shown

FENCING FOR WIDE DEPRESSIONS

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-2-10	
REVISIONS	
DATE	CHANGE
10-02-12	Notes, steel assemblies/posts.
11-25-13	Revised Vehicle Gate.
10-17-17	Updated to active voice.

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 10-17-2017 and the original document is stored at the North Dakota Department of Transportation

PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

Notes:

1. Curbed Roadways: Use a 3' clearance from face of the curb except where right of way or sidewalk width is limited; Use a minimum 2' clearance. Increase the horizontal clearance if required to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.

2. Minimum vertical clearance: Provide at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane at the side of the road in rural districts. Provide at least 7' clearance to the bottom of the sign, where parking or pedestrian movements occur.

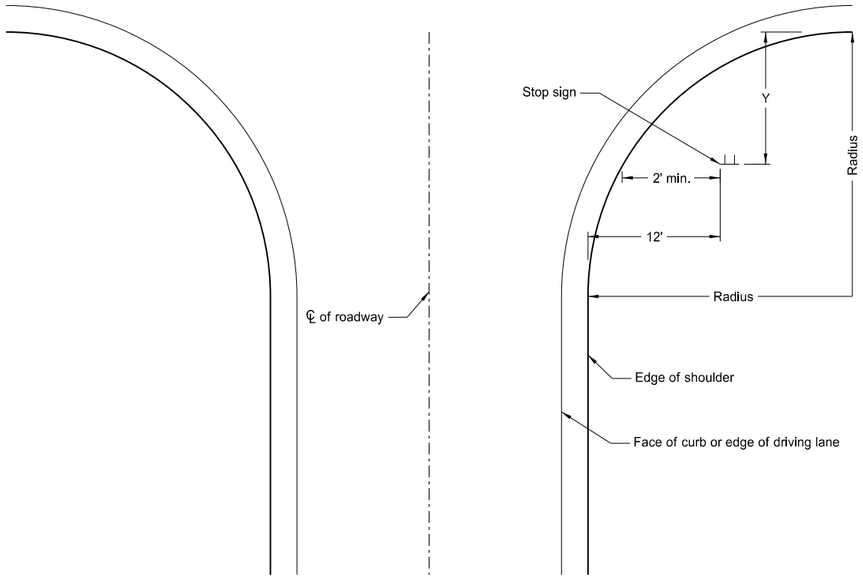
   Install signs on expressways a minimum height of 7'.

   Install adopt-a-highway signs on Freeways at least 7' above the edge of the driving lane.

   Maximum vertical clearance is 6" greater than the minimum vertical clearance.

3. Offset signs: Use a vertical clearance of 5' above the edge of the driving lane for signs placed 30 feet or more from the edge of the traveled way.

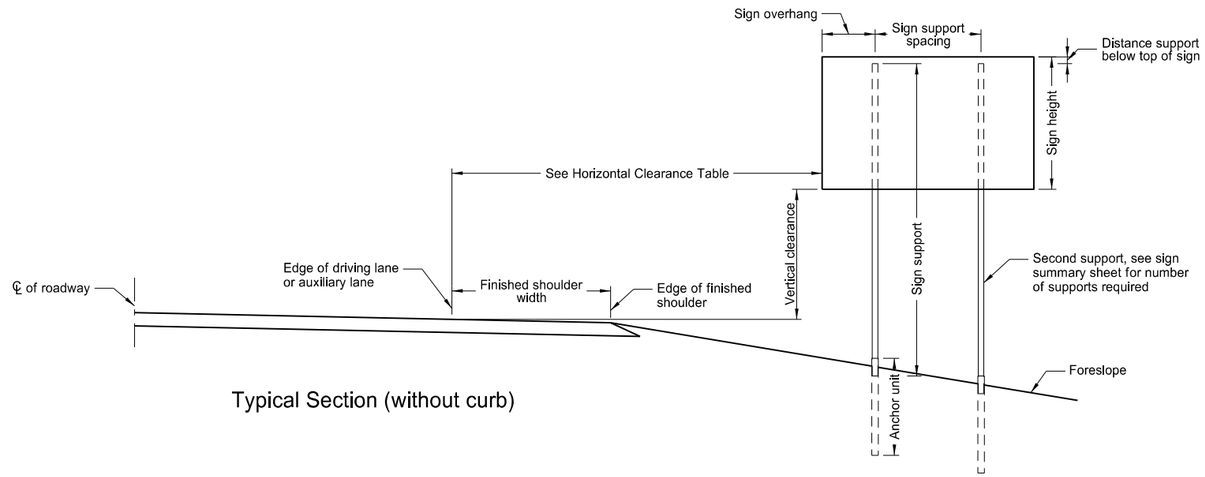
4. Provide a horizontal clearance from edge of shared use path to edge of sign of 3', except where width is limited. Provide a minimum clearance of 2'.



Stop Sign Location
Wide Throat Intersection

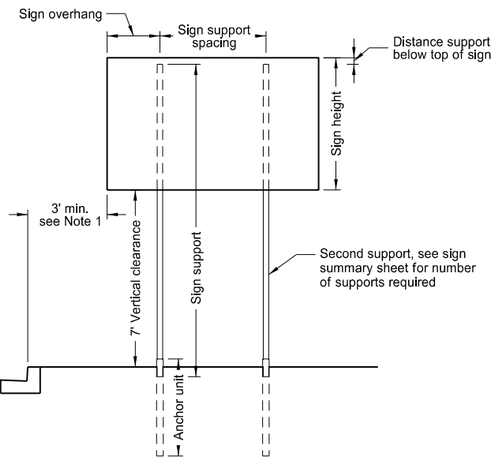
Use layout for the placement of "Stop" signs.

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



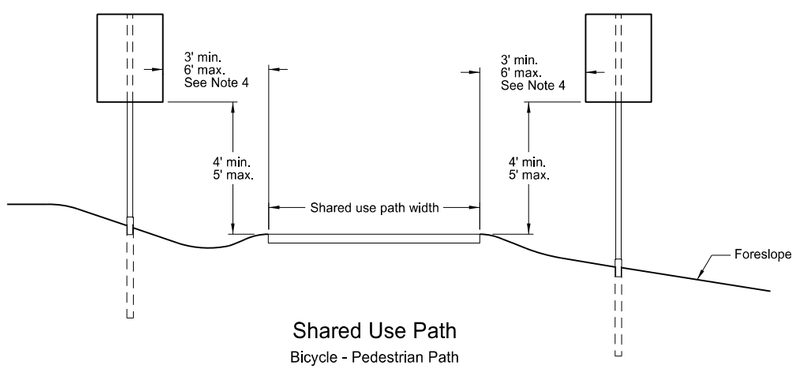
Typical Section (without curb)

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



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.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.

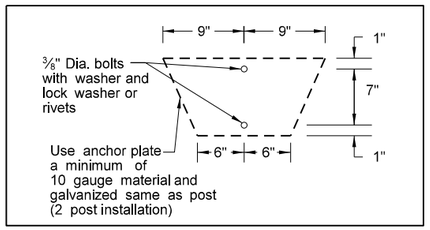
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/29/19 and the original document is stored at the North Dakota Department of Transportation

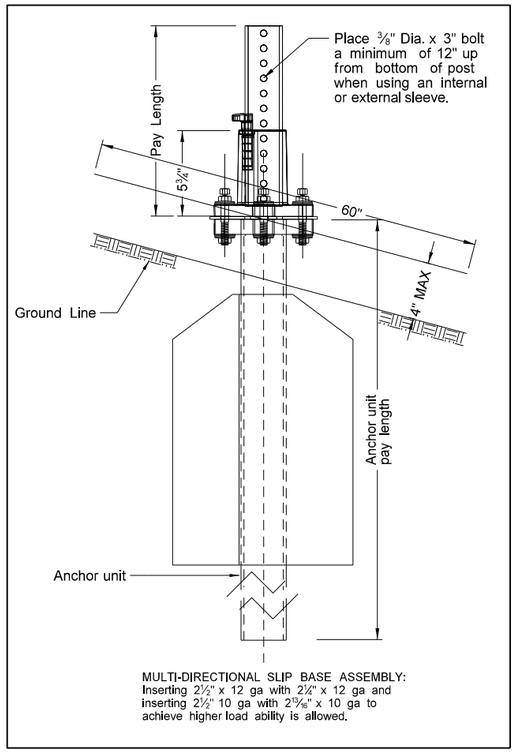
Mounting Details Perforated Tube

D-754-24

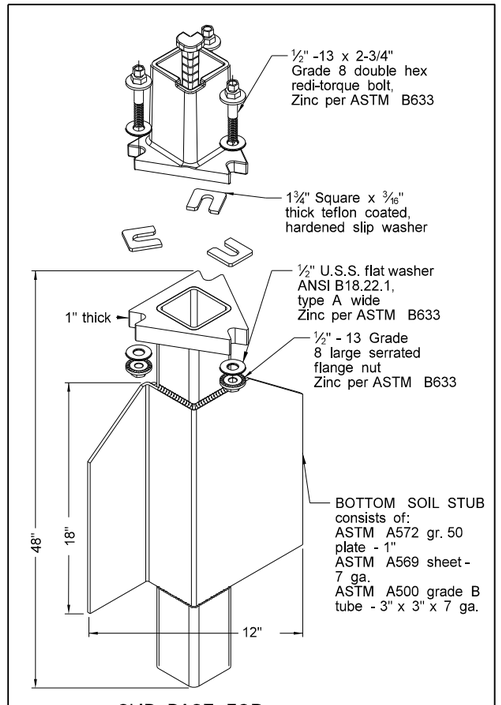
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thick-ness Gauge
1	2	12			No	2¼	12
1	2¼	12			No	2½	12
1	2½	12			(B)	3(C)	7
1	2½	10			Yes		7
1	2¼	12	2½(D)	12	Yes		7
1	2½	12	2¼	12	Yes		7
2	2½	10			Yes		7
2	2¼	12	2½(D)	12	Yes		7
2	2½	12	2¼	12	Yes		7
3 & 4	2½	12			Yes		7
3 & 4	2½	10			Yes		7
3 & 4	2½	12	2¼	12	Yes		7
3 & 4	2¼	12	2½(D)	12	Yes		7
3 & 4	2½	10	2⅜16	10	Yes		7

(B) - Provide a shim as specified by the manufacturer when placing 2½", 12 gauge posts in standard soils without breakaway bases. Provide breakaway base when placing the support in weak soils. The Engineer will determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2½" x 12 ga. x 18" minimum length external sleeve required.

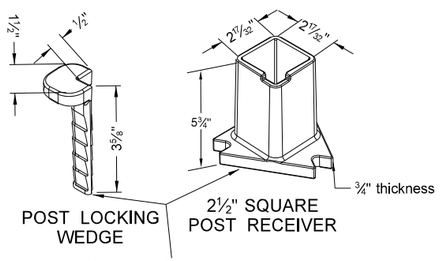




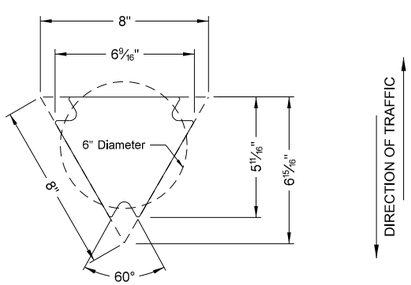
MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:
Inserting 2½" x 12 ga with 2¼" x 12 ga and inserting 2½" 10 ga with 2⅜16" x 10 ga to achieve higher load ability is allowed.



SLIP BASE FOR 2½" POST



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



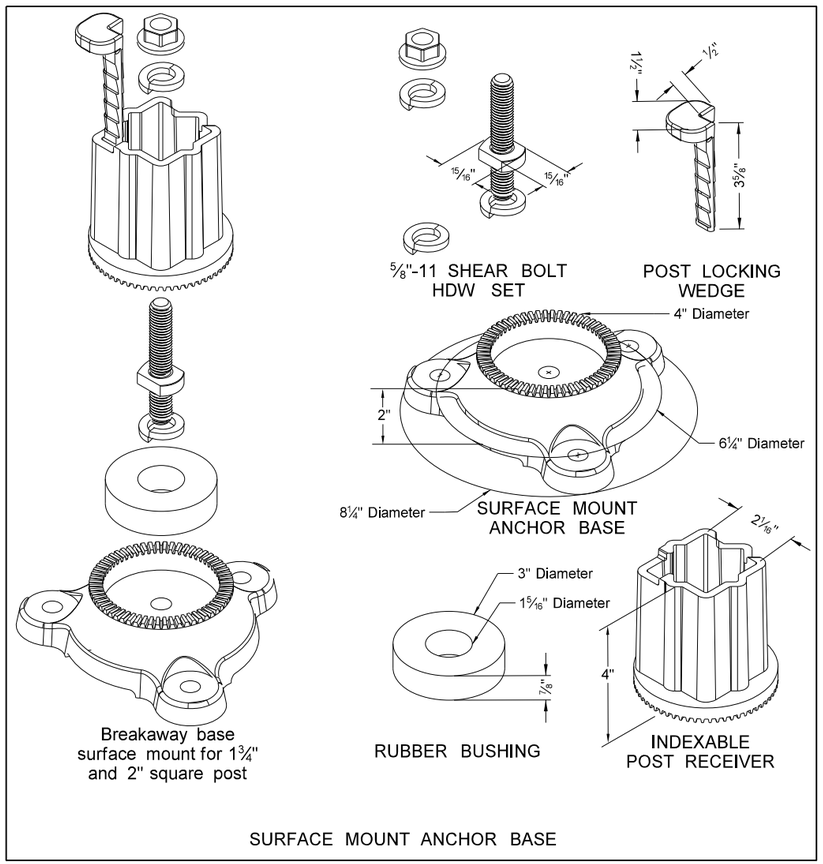
SLIP BASE DETAIL

Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness in.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In.⁴	Cross Sect. Area In.²	Section Modulud In.³
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2⅜16 x 2⅜16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.783

The 2 ⅜16" size 10 gauge is shown as 2.19" size on the plans;
The 2½" size is shown as 2.51" size on the plans.

NOTE:

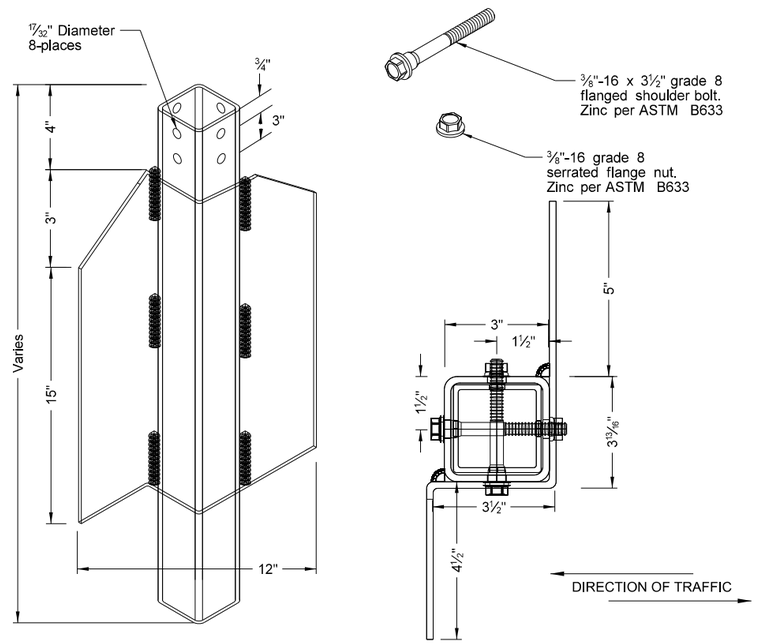
1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.
2. Provide 7 guage HRPO commmercial quality ASTM A569 and 3" x 3" x 7" guage ASTM A500 grade B anchor material with 43.9 KSI yield strength and 59.3 KSI tensile strength. Hot dip galvanize anchor per ASTM A123/153. Tolerances on anchor unit and slip base bottom assembly are +/- 0.005" unless ortherwise noted.
3. Eliminate wings when anchor is used in concrete sidewalk.
4. Provide a minimum 8' distance between the first and fourth post on four post signs.
5. Install in accordance with manufacturers recommendation.
6. Use a minimum ½" diameter x 4" grade 8 concrete fastener for surface mount breakaway base.



SURFACE MOUNT ANCHOR BASE

SHOULDER BOLT

Shimming agent to reduce tolerance between 3" anchor unit and 2½" post.
(use standard ⅜" diameter grade 8 bolt with proper shim)



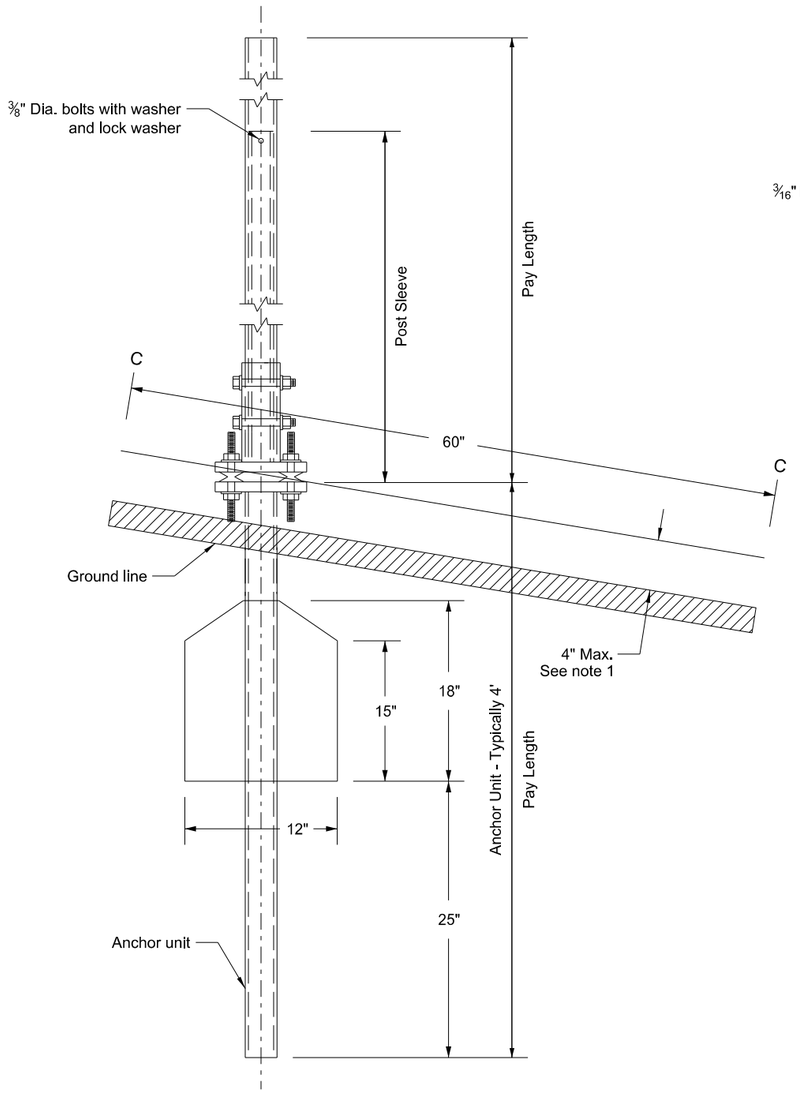
3" ANCHOR UNIT

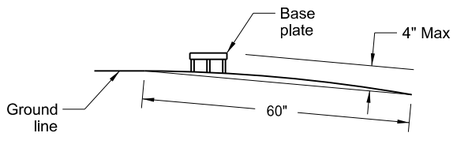
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice & corrected max height of base.
8-29-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683 on 8/29/19 and the original document is stored at the North Dakota Department of Transportation

Breakaway Coupler System for Perforated Tubes

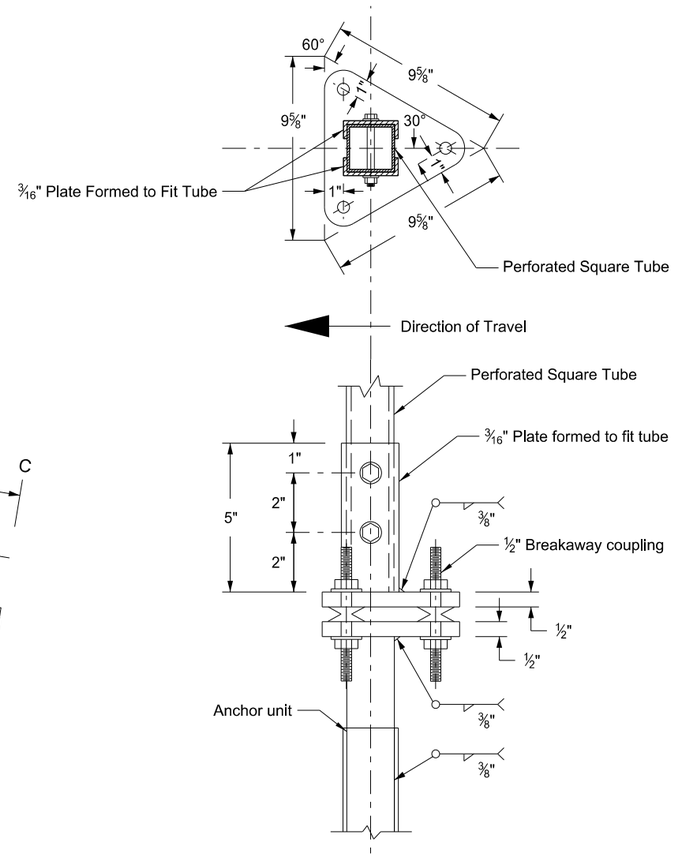
D-754-24A





Section C-C

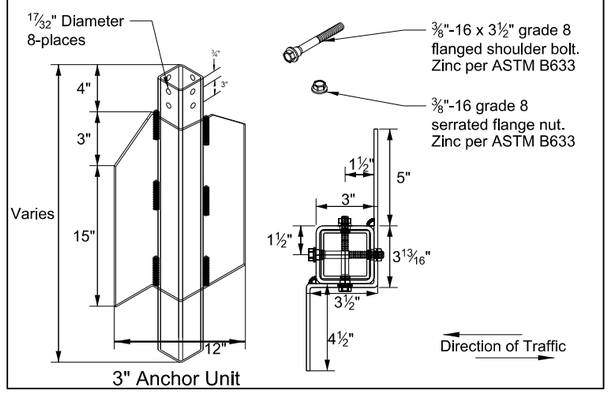
Max protection of the stub post is 4" above a 60" chord aligned radially to the center line of the highway and connecting any point, within the length of the chord, on the ground surface on one side of the support to a point in the ground surface on the other side.



Base Plate with Breakaway Coupler

Shoulder Bolt

Shimming agent to reduce tolerance between 3" anchor unit with 2½" post. (use of standard ⅜" diameter grade 8 bolt allowed with proper shim)



3" Anchor Unit

Notes:

1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.
2. Use anchor unit of the same size and specification as the post.
3. Provide a minimum 8' distance between the first and fourth post on four post signs.
4. Use the breakaway base system on standard D-754-24 or the breakaway coupling system manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements specified by DENT BREAKAWAY IND., INC. which meets the test requirements of NCHRP Report 350.

Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Guage
1	2	12			No	2¼	12
1	2¼	12			No	2½	12
1	2½	12			(B)	3(C)	7
1	2½	10			Yes		7
1	2¼	12	2	12	Yes		7
1	2½	12	2¼	12	Yes		7
2	2½	10			Yes		7
2	2¼	12	2	12	Yes		7
2	2½	12	2¼	12	Yes		7
3 & 4	2½	12			Yes		7
3 & 4	2½	10			Yes		7
3 & 4	2½	12	2¼	12	Yes		7
3 & 4	2¼	12	2	12	Yes		7
3 & 4	2½	10	2 3/16	10	Yes		7

(B) - 2½" 12 gauge posts do not need breakaway bases unless support is placed in boggy, wet, or loose soil areas.

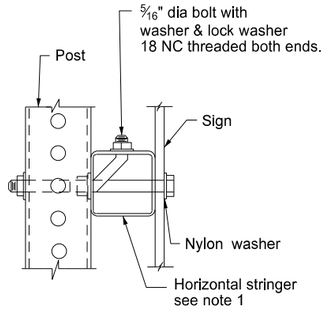
(C) - 3" anchor unit

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engr PE Stamp.

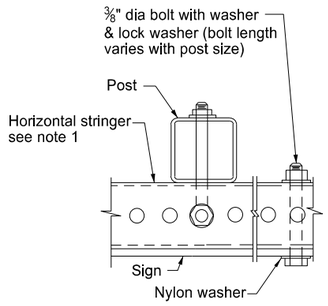
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

Mounting Details Perforated Tube

D-754-25

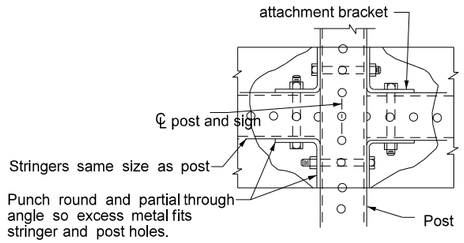


Side View



Top View

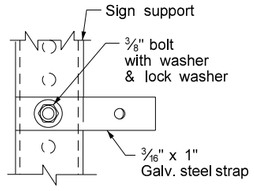
STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)



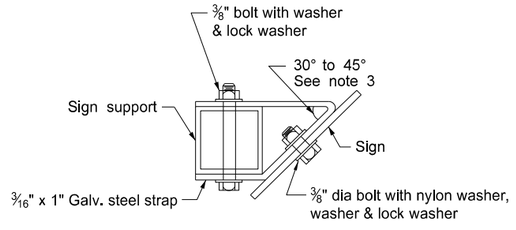
STREET NAME SIGNS AND ONE WAY SIGNS
SINGLE POST ASSEMBLY
ONE STRINGER OR BACK TO BACK MOUNTING

Note:

1. Horizontal stringers - Use perforated tubes or 1¾" x 3/16" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel z bar stringers.
2. Use minimum outside diameter 15/16" ±1/16" and 10 gauge thick metal washers on sign face.
3. Place No Parking signs with directional arrows at a 30 to 45 degree angle with the line of traffic flow. Turning the support to the correct angle for No Parking signs requiring the above angles is allowed. If the No Parking sign is placed with another sign that requires placement at a 90 degree angle with the line of traffic flow, use the detailed angle strap to mount the No Parking sign. Use flat washers and lock washers with all nylon washers.
4. Punching the sign backing and placing the bolt through the sign, the stringer and the post is allowed in lieu of using the bent bolt to attach the post to the stringer.
5. 4" vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.

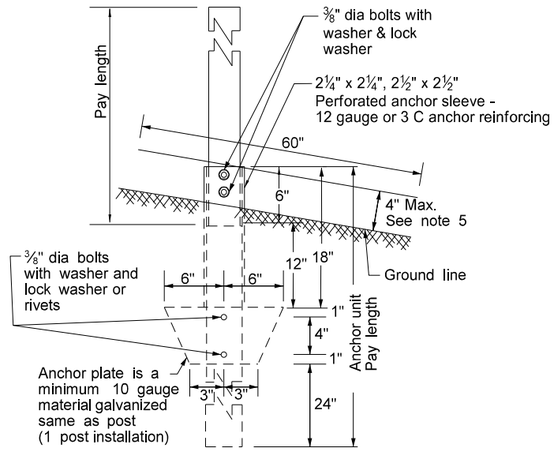


Side View



Top View

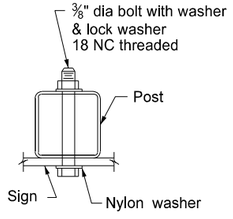
STRAP DETAIL



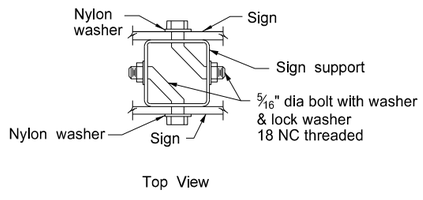
ANCHOR UNIT AND POST ASSEMBLY

Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thick-ness Gauge
1	2	12			No	2¼	12
1	2¼	12			No	2½	12
1	2½	12			(B)	3(C)	7
1	2½	10			Yes		7
1	2¼	12	2½(D)	12	Yes		7
1	2½	12	2¼	12	Yes		7
2	2½	10			Yes		7
2	2¼	12	2½(D)	12	Yes		7
2	2½	12	2¼	12	Yes		7
3 & 4	2½	12			Yes		7
3 & 4	2½	10			Yes		7
3 & 4	2½	12	2¼	12	Yes		7
3 & 4	2¼	12	2½(D)	12	Yes		7
3 & 4	2½	10	2 3/16	10	Yes		7

(B) - When placing 2½", 12 gauge posts in standard soils without breakaway bases, provide a shim as specified by the manufacturer. Provide breakaway base when placing the support in weak soils. Engineer will determine if soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2½" x 12 ga. x 18" minimum length external sleeve required.

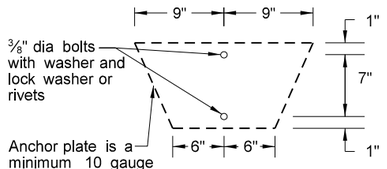


BOLT MOUNTING



Top View

BACK TO BACK MOUNTING



Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In.⁴	Cross Sect. area In.²	Section Modulus In.³
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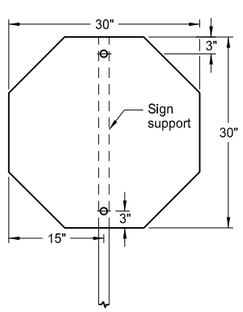
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.783

The 2 3/16" size 10 gauge is shown as 2.19" size on the plans.
The 2½" size is shown as 2.51" size on the plans.

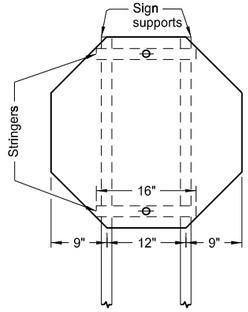
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
7-8-14	Revised Note 3.
8-30-18	Updated notes to active voice.
8-30-19	New Design Engr PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683 , on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

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

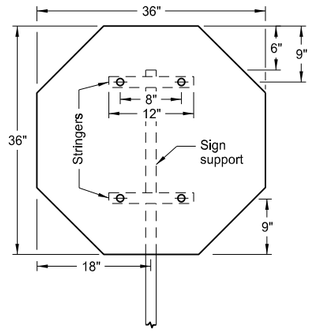


1 Post



2 Posts

Assembly No. 1



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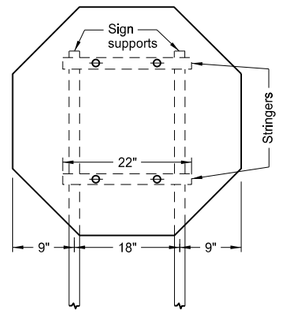
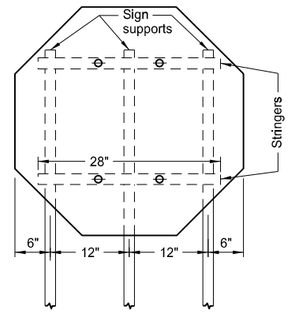


2 Posts

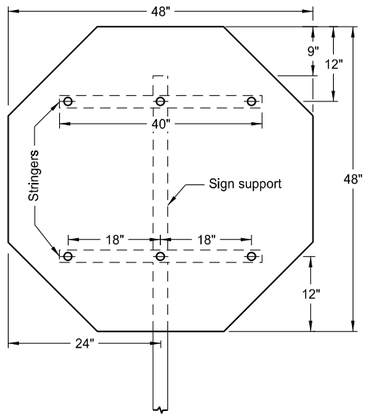


3 Posts

Assembly No. 2

Notes:

1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.



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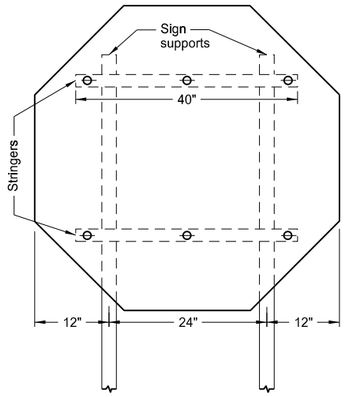
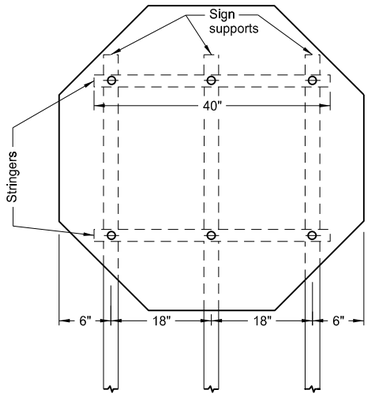
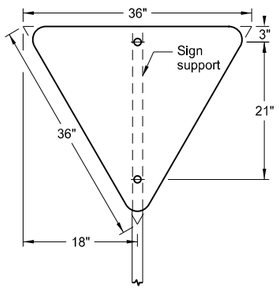


2 Posts



3 Posts

Assembly No. 3



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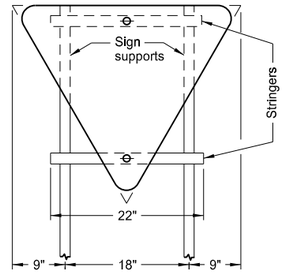
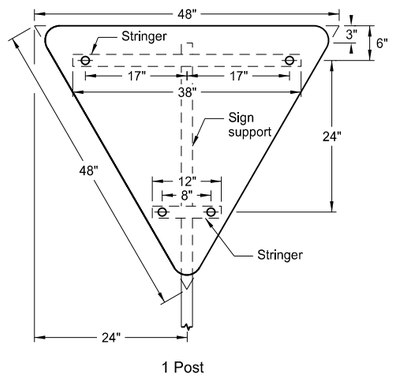
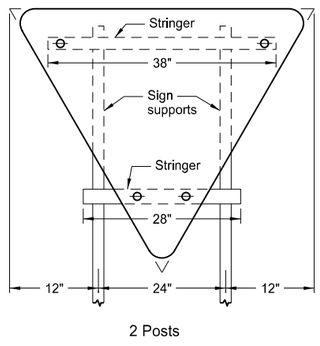


2 Posts

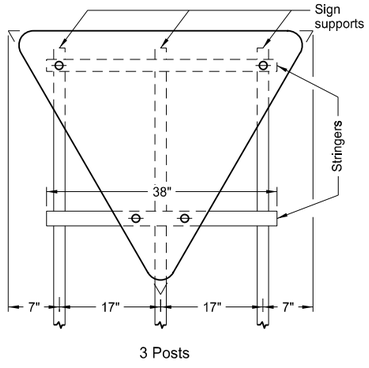
Assembly No. 4



1 Post



2 Posts



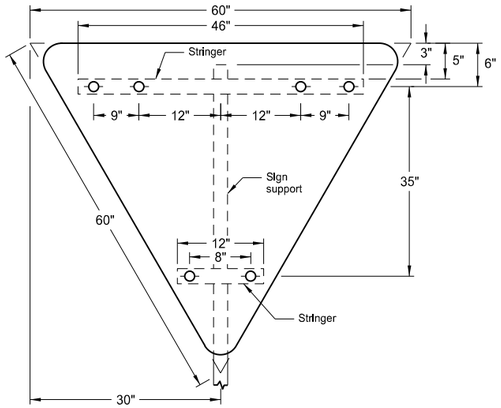
3 Posts

Assembly No. 5

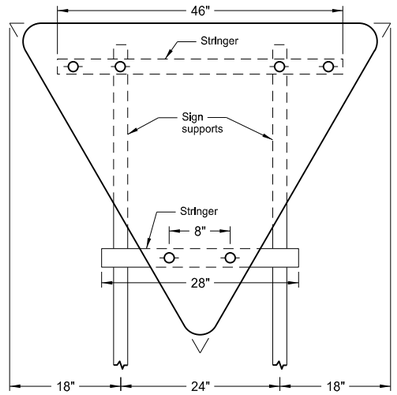
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18 8-30-19	Updated notes to active voice. New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

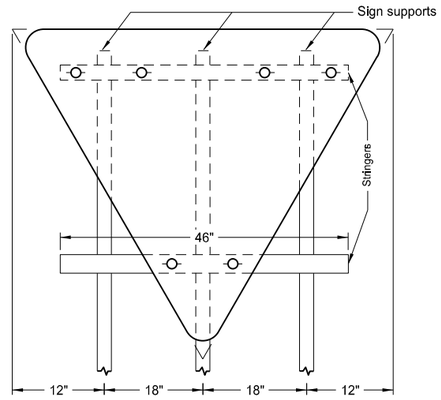
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS



1 Post



2 Posts

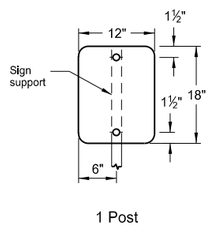


3 Posts

Assembly No. 6

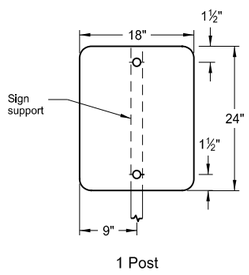
Notes:

1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.



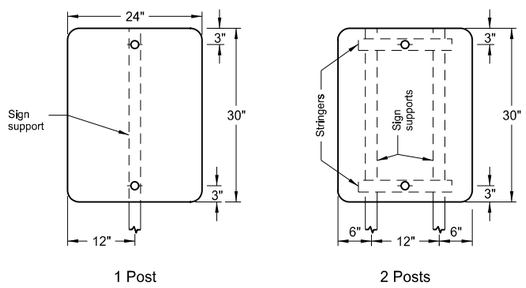
1 Post

Assembly No. 7



1 Post

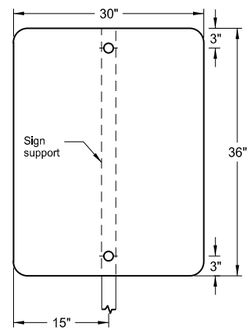
Assembly No. 8



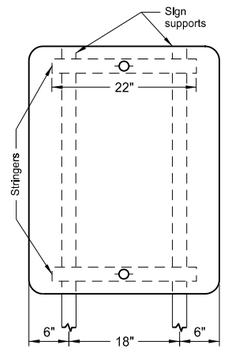
1 Post

2 Posts

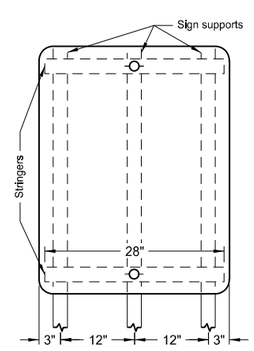
Assembly No. 9



1 Post

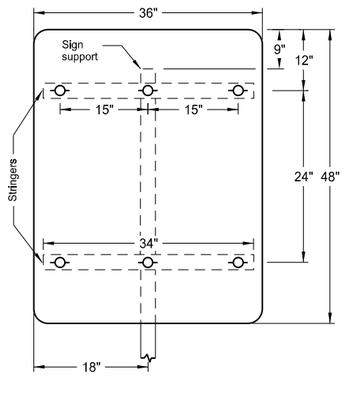


2 Posts

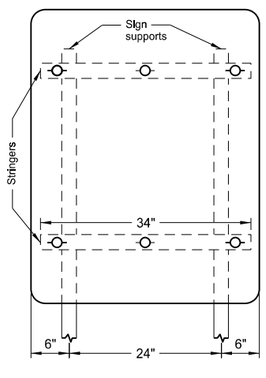


3 Posts

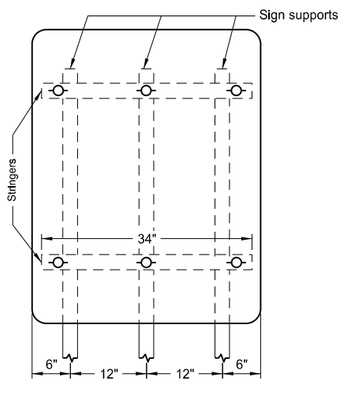
Assembly No. 10



1 Post



2 Posts



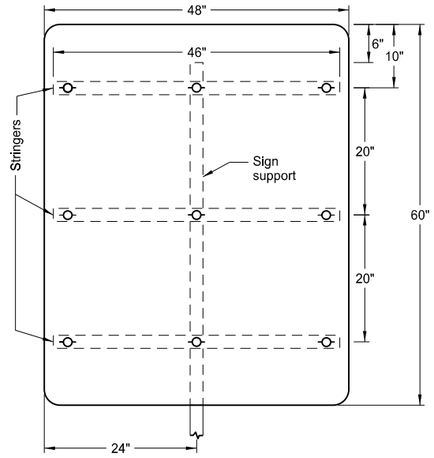
3 Posts

Assembly No. 11

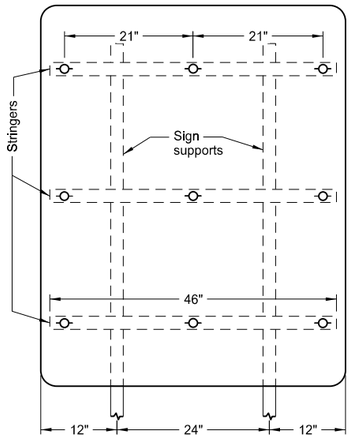
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18 8-30-19	Updated notes to active voice. New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

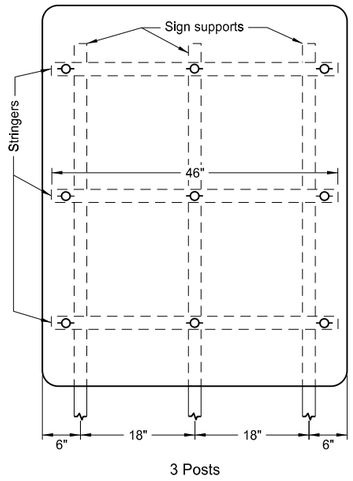
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



1 Post

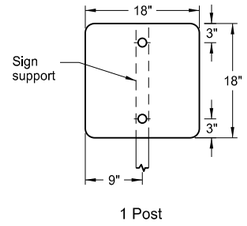


2 Posts



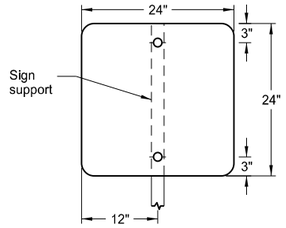
3 Posts

Assembly No. 12

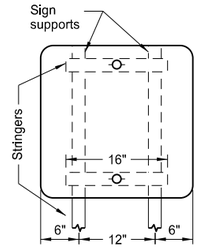


1 Post

Assembly No. 13

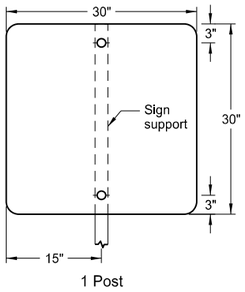


1 Post

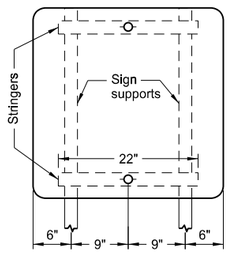


2 Posts

Assembly No. 14

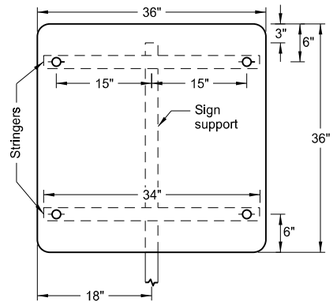


1 Post

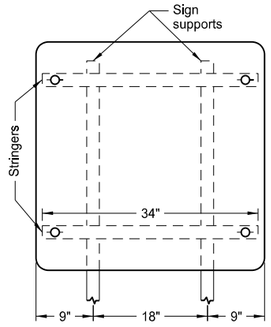


2 Posts

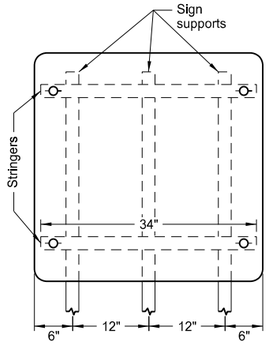
Assembly No. 15



1 Post

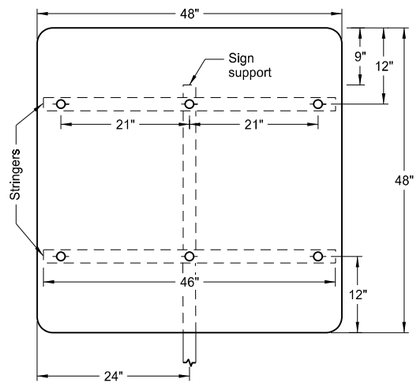


2 Posts

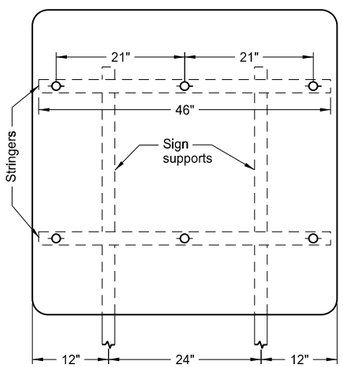


3 Posts

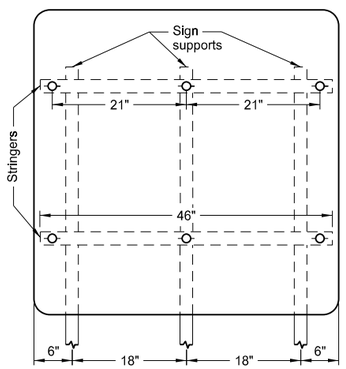
Assembly No. 16



1 Post



2 Posts



3 Posts

Assembly No. 17

Notes:

1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated to active voice & changed Assembly 16 post spacing.
8-30-19	New Design Engineer PE Stamp.

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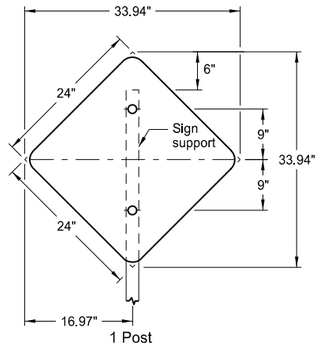
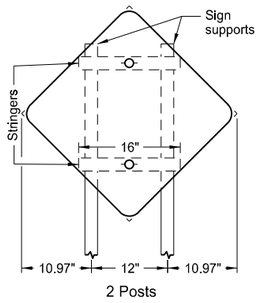
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS

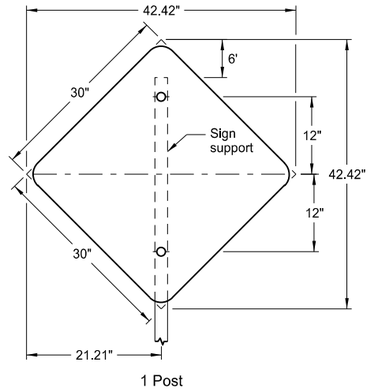


1 Post

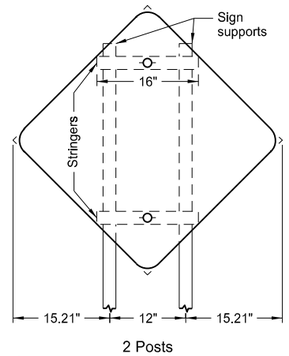


2 Posts

Assembly No. 18

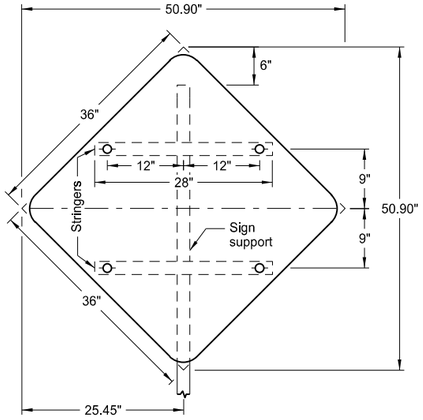


1 Post

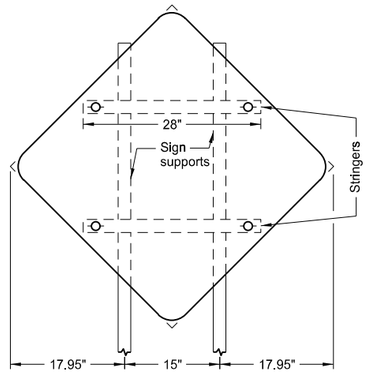


2 Posts

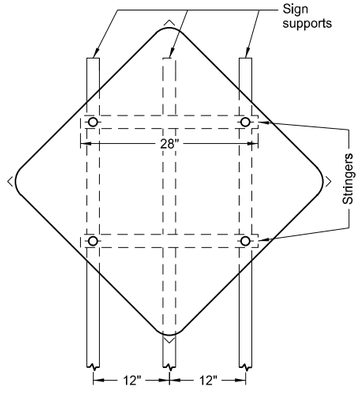
Assembly No. 19



1 Post

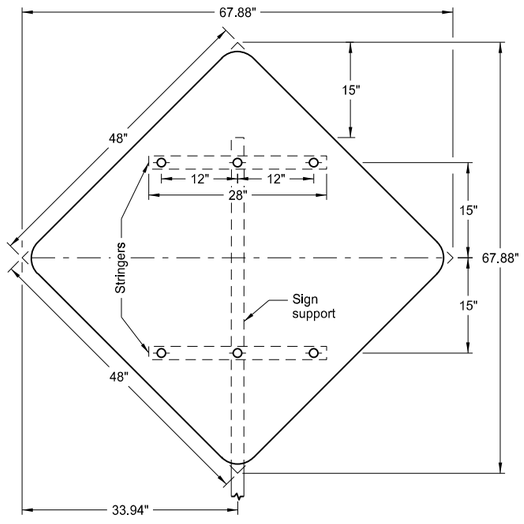


2 Posts

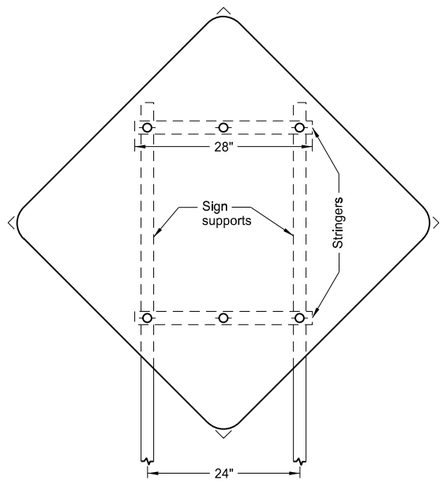


3 Posts

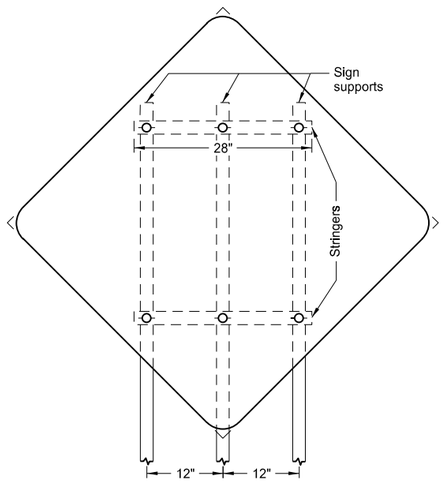
Assembly No. 20



1 Post



2 Posts



3 Posts

Assembly No. 21

Notes:

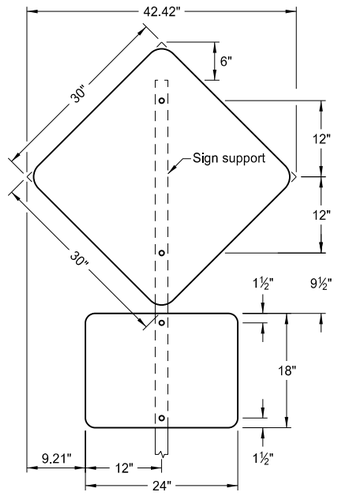
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

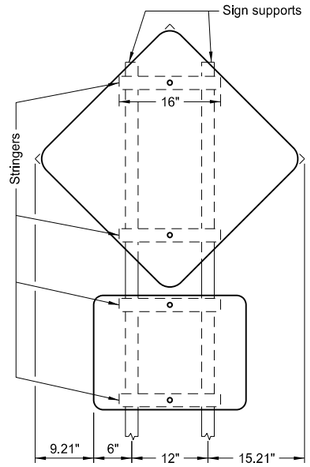
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

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

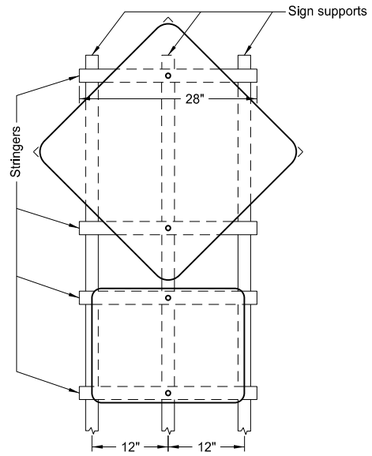
D-754-38



1 Post



2 Posts

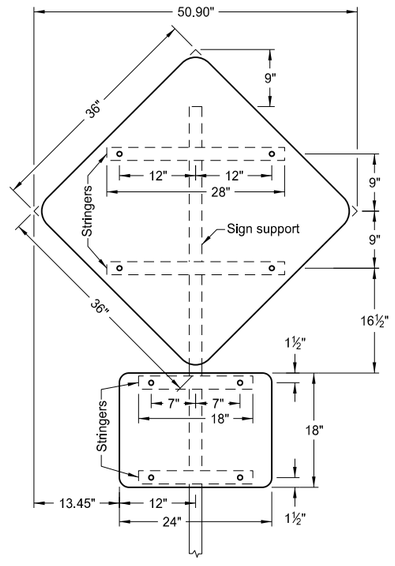


3 Posts

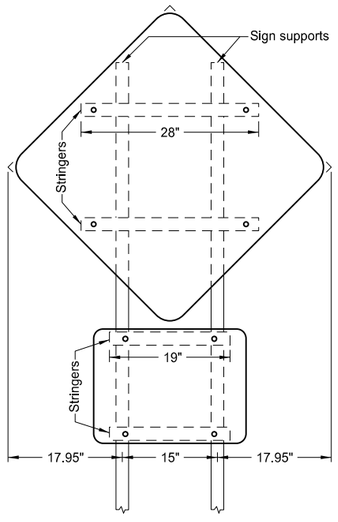
ASSEMBLY NO. 56

Notes:

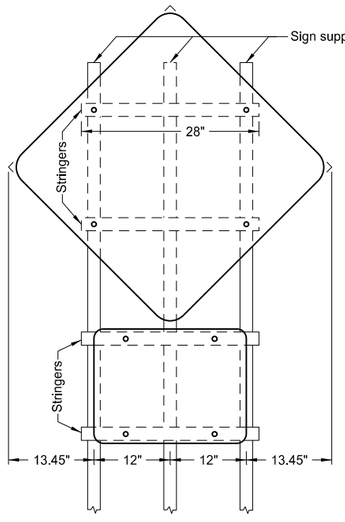
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½"x1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.



1 Post



2 Posts



3 Posts

ASSEMBLY NO. 57

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated to active voice & added Assembly dimensions.
8-30-19	New Design Engineer PE Stamp.

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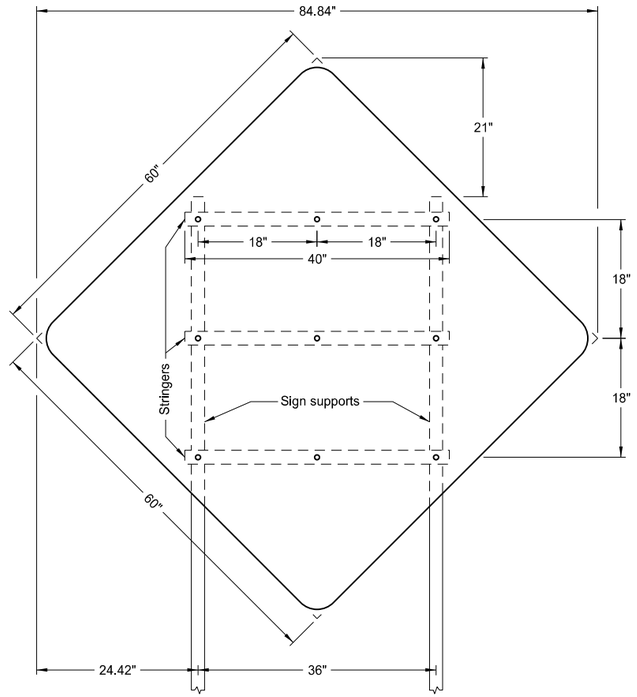
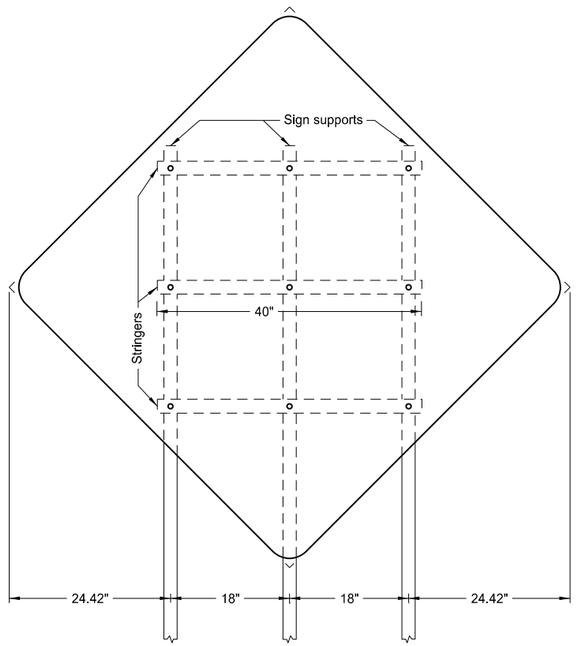
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
REGULATORY, WARNING AND GUIDE SIGNS

D-754-40

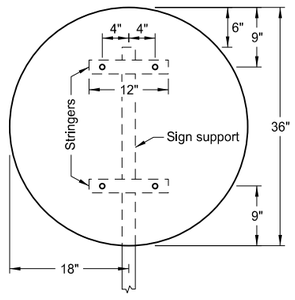


2 Posts

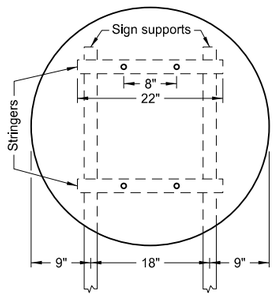


3 Posts

ASSEMBLY NO. 62



1 Post



2 Posts

ASSEMBLY NO. 63

Notes:

1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½"x1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
8-30-18 8-30-19	Updated notes to active voice. New Design Engineer PE Stamp.

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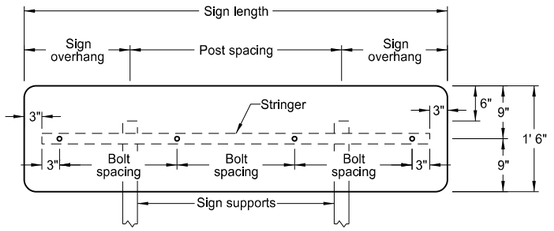
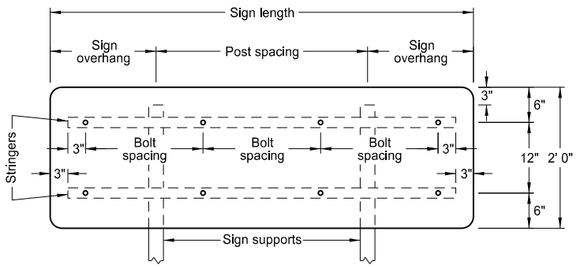
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS

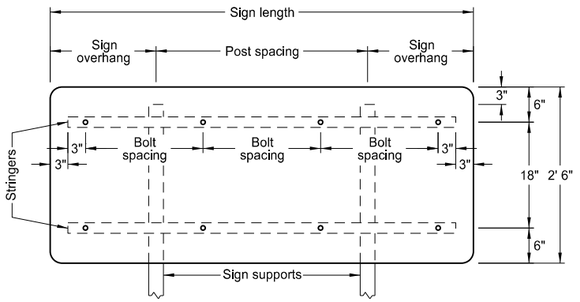
D-754-48



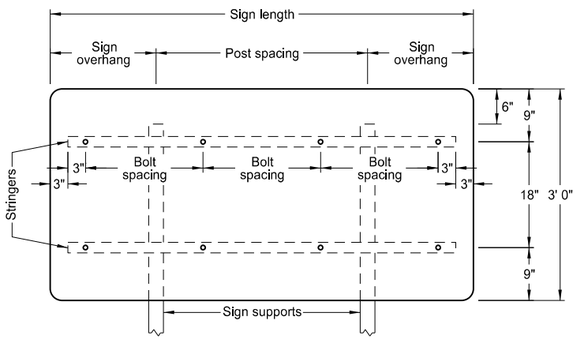
VARIES X 1'-6"



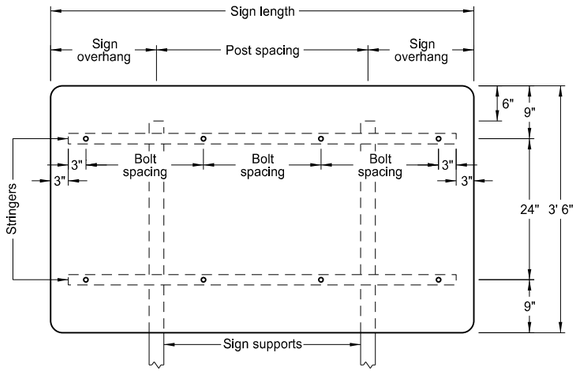
VARIES X 2'-0"



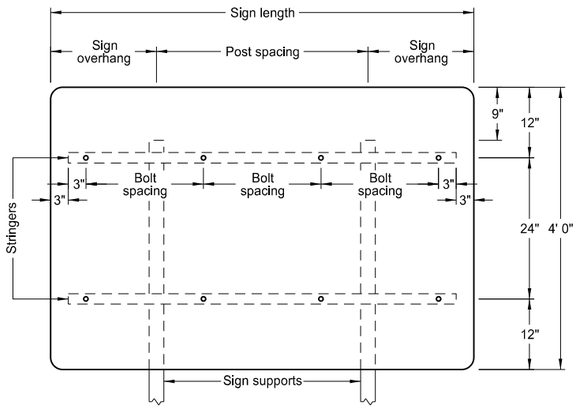
VARIES X 2'-6"



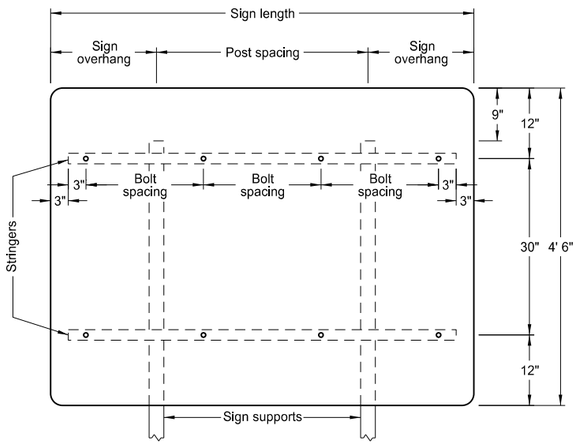
VARIES X 3'-0"



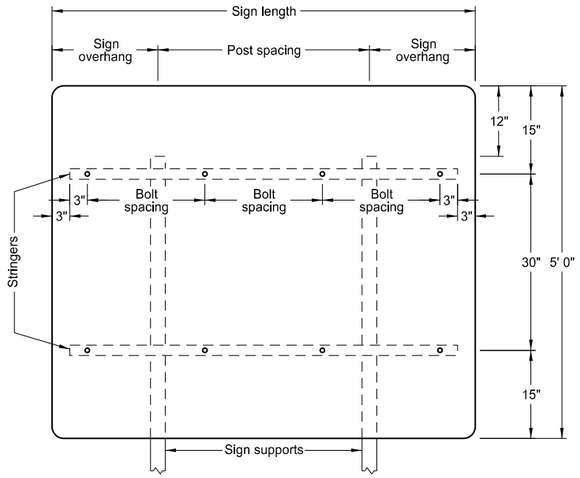
VARIES X 3'-6"



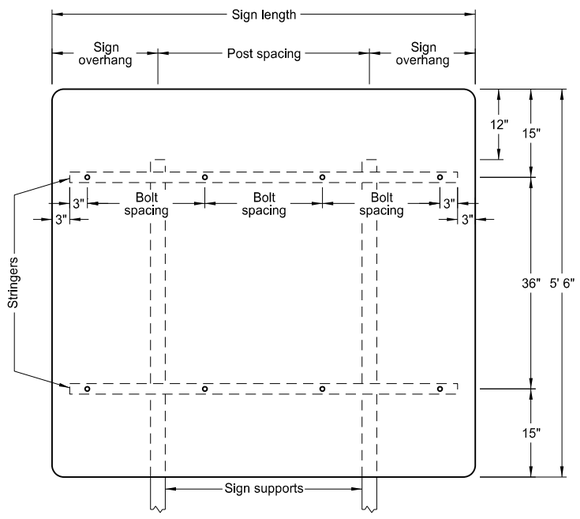
VARIES X 4'-0"



VARIES X 4'-6"



VARIES X 5'-0"



VARIES X 5'-6"

2 POSTS			
Sign Length	Sign Overhang	Post Spacing	Bolt Spacing
4'-0"	1'-0"	2'-0"	18"
4'-6"	1'-3"	2'-0"	21"
5'-0"	1'-0"	3'-0"	24"
5'-6"	1'-3"	3'-0"	18"
6'-0"	1'-6"	3'-0"	20"
6'-6"	1'-3"	4'-0"	22"
7'-0"	1'-6"	4'-0"	24"
7'-6"	1'-9"	4'-0"	2-20" & 2-19"
8'-0"	2'-0"	4'-0"	21"
8'-6"	1'-9"	5'-0"	2-22" & 2-23"
9'-0"	2'-0"	5'-0"	24"
9'-6"	1'-9"	6'-0"	4-20" & 1-22"
10'-0"	2'-0"	6'-0"	2-21" & 3-22"
10'-6"	2'-3"	6'-0"	4-23" & 1-22"
11'-0"	2'-6"	6'-0"	24"
11'-6"	2'-9"	6'-0"	21"
12'-0"	2'-0"	8'-0"	22"
12'-6"	2'-3"	8'-0"	23"
13'-0"	2'-6"	8'-0"	24"
13'-6"	2'-9"	8'-0"	3-22" & 4-21"
14'-0'	3'-0"	8'-0"	2-23" & 5-22"
14'-6"	3'-3"	8'-0"	6-23" & 1-24"
15'-0"	3'-6"	8'-0"	24"
15'-6"	2'-9"	10'-0"	6-22" & 2-21"
16'-0"	3'-0"	10'-0"	4-23" & 4-22"
16'-6"	3'-3"	10'-0"	6-23" & 2-24"
17'-0"	3'-6"	10'-0"	24"
17'-6"	3'-9"	10'-0"	22"
18'-0"	3'-0"	12'-0"	6-23" & 3-22"
18'-6"	3'-3"	12'-0"	6-23" & 3-24"
19'-0"	3'-6"	12'-0"	24"
19'-6"	3'-9"	12'-0"	8-22" & 2-23"
20'-0"	4'-0"	12'-0"	8-23" & 2-22"

Notes:

1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
8-30-18 9-04-19	Updated notes to active voice. New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 9/04/19 and the original document is stored at the North Dakota Department of Transportation