DESIGN DATA				
Traffic	Average Daily			
Current 2024	Pass: 63	Trucks: 27	Total: 90	
Forecast 2044	Pass: 138	Trucks: 59	Total: 197	
Clear Zone Distance: 18'		Design Speed: 55 MPH		
Minimum Sight Dist. for Stopping: 495'		Bridges: Sta. 175+55		
Sight Dist. for No Passing Zone: N/A				
Pavement Design Life: N/A				

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	23734	1	1

MORTON COUNTY, NORTH DAKOTA

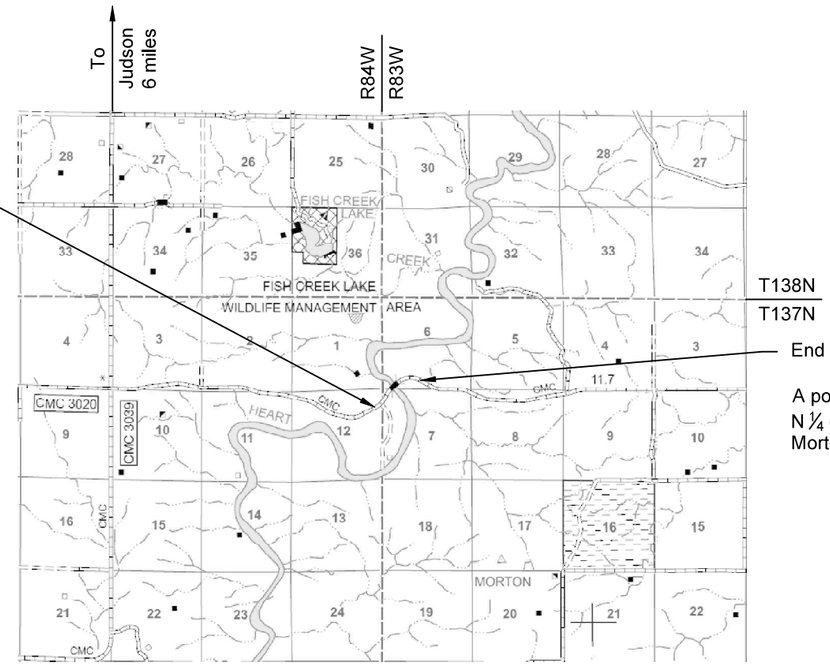
PLANS FOR

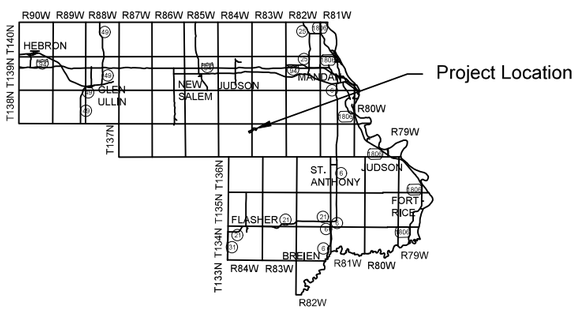
BRIDGE REPLACEMENT
BRIDGE NUMBER 30-143-19.0 (30-143-19.1)

FEDERAL AID PROJECT NO. BRC-3020(080)
MORTON COUNTY ROAD 137 (CMC 3020)
PROJECT IS LOCATED 9 MILES SOUTH AND 3 MILES EAST OF JUDSON, NORTH DAKOTA
PROJECT CONSISTS OF THE REPLACEMENT OF A BRIDGE STRUCTURE WITH A
336' THREE SPAN BRIDGE, ROAD GRADING, AGGREGATE SURFACING,
GUARDRAIL, AND INCIDENTALS

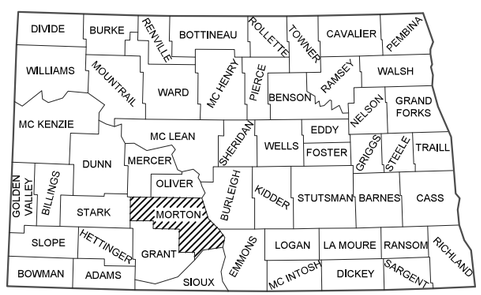
GOVERNING SPECIFICATIONS	Date Published and Adopted by the North Dakota Department of Transportation
Standard Specifications	4/1/2023
Supplemental Specifications	NONE

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
BRC-3020(080)	0.777	0.777





SKETCH MAP OF MORTON COUNTY



STATE COUNTY MAP

DESIGNER
John Sauber, PE/PLS

DESIGNER
Joseph Baneck, PE

DESIGNER
Jared Walters

Morton County Commissioners
Nathan Boehm
Andy Zachmeier
Ron Leingang
Jackie Buckley
Raymond Morrell

SAUBER ENGINEERING

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

APPROVED DATE October 13, 2023

Joseph Baneck, PE /s/
Sauber Engineering, Inc

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PLAN SECTIONS

SPECIAL PROVISIONS

Number	Description
SSP 1	Temporary Erosion and Sediment Best Management Practices
SSP 2	Federal Migratory Bird Treaty Act
PSP 42(23)	Permits and Environmental Considerations

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-704-7	Breakaway Systems For Construction Zone Signs - Perforated Tube
D-704-8	Breakaway Systems For Construction Zone Signs - U-Channel Post
D-704-9	Construction Sign Details - Terminal And Guide Signs
D-704-10	Construction Sign Details - Regulatory Signs
D-704-11	Construction Sign Details - Warning Signs
D-704-13	Barricade And Channelizing Device Details
D-704-14	Construction Sign Punching And Mounting Details
D-704-15	Road Closure Layouts
D-704-20	Terminal And Seal Coat Sign Layouts
D-704-22	Construction Truck And Temporary Detour Layouts
D-704-30	Windrow Marking
D-704-31	Construction Sign Layout - Non-Signalized Low Volume One Lane Closure
D-704-50	Portable Sign Support Assembly
D-708-6	Erosion And Siltation Controls - Median Or Ditch Inlet Protection
D-714-1	Reinforced Concrete Pipe Culverts And End Sections (Round Pipe)
D-714-4	Round Corrugated Steel Pipe Culverts And End Sections
D-714-11	Traversable End Sections For Corrugated Steel Pipe Culverts
D-714-22	Concrete Pipe, Cattle Pass, or Precast Concrete Box Culvert Ties
D-714-25	Transverse Mainline Pipe Installation Detail - Pipes More Than 4 Feet Below Top of Subgrade
D-752-1	Standard Barbed Wire Fence
D-754-23	Perforated Tube Assembly Details
D-754-24, 25	Mounting Details Perforated Tube
D-754-24A	Breakaway Coupler System For Perforated Tubes
D-754-29	Sign Punching, Stringer and Support Location Details Regulatory, Warning and Guide Signs
D-764-38	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
D-764-51	MASH Sequential Kinking Terminal - Wood Post
D-764-60	MGS W-Beam Transition with Approach Curb to Concrete Single Slope or Jersey Barrier
D-764-61	Single Slope to Thrie Beam Connector Plate Details
D-900-1	Bridge Bench Marks

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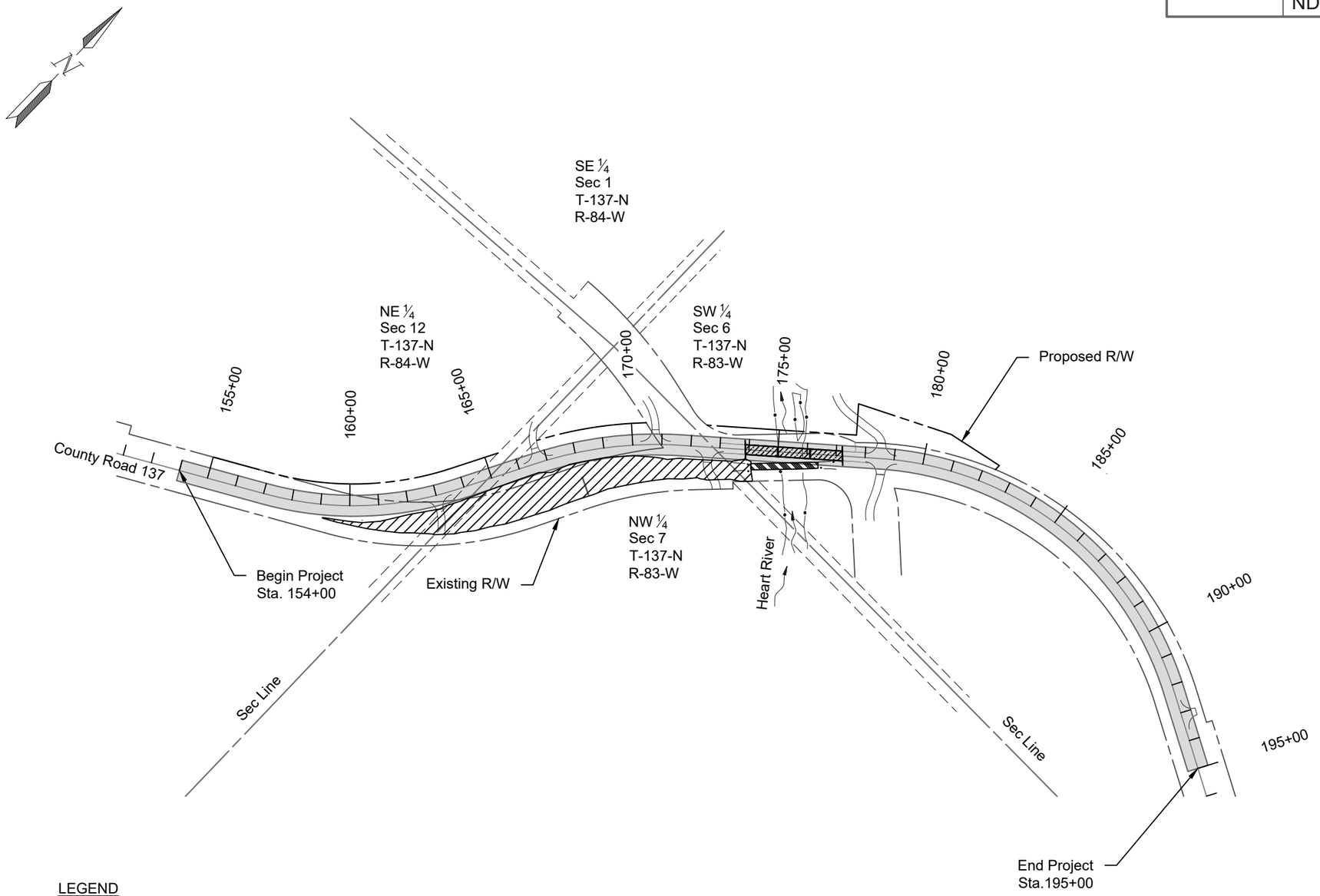

LEGEND

- Reconstruction of New Roadway and Alignment
- Obliterate Existing Roadway
- Install New 3-span Concrete Bridge
- Remove Existing Structure

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Scope of Work

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

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NOTES

105-P01 UTILITIES: The Vertical and horizontal utility locations shown in the plans are approximate. Plan locations should not be interpreted as exact for bidding or construction purposes.

107-P01 MAINTAINING TRAFFIC –DROP-OFFS: If, at the end of the work-day, drop-offs greater than 2 inches and less than 18 inches or slopes steeper than 4:1 exist between the edge of a traffic lane and the outside edge of the proposed roadway, perform one of the following actions:

- Construct a traversable wedge in the area of the drop-off or steep slope; or
- Close the lane adjacent to the drop-off or steep slope and provide 24-hour flagging or pilot car operations.

When constructing a wedge, construct a wedge composed of aggregate or earthen materials with a 4:1 or flatter slope along the entire length of the area. Compact materials using Type C compaction, as specified in 203.04 G.4, "Compaction Control Type C".

Install stackable vertical panels that meet the requirements of Section 704.03 H, "Stackable Vertical Panels", along the edge of the driving lane closest to the wedge.

The Engineer will measure stackable vertical panels as specified in Section 704.05, "Method of Measurement" and will pay for panels as specified in Section 704.06, "Basis of Payment".

The Engineer will not measure material used to construct the wedge. Include the cost of materials, equipment, labor, and incidentals required for this operation in the price bid for other items.

If a 4:1 or flatter wedge is not installed, provide 24 hour flagging or pilot car operations and associated traffic control at no additional cost to the County.

The requirements of Section 704.04 O, "Traffic Control for Uneven Pavement" apply to drop-offs created by milling or the placement of hot mix asphalt.

108-P01 SCHEDULE: Plan operations so the new bridge is in service and open to the traveling public on October 12, 2024 and the existing bridge is removed by March 15, 2025.

201-P01 CLEARING & GRUBBING/REMOVAL OF TREES: The Contractor shall remove all obstructions along this project in accordance to all laws and requirements as may be mandated by a federal, state, or local agency. The obstructions to be removed shall include, but are not limited to all trees, tree stumps, shrubs, hedges, brush, and any other extraneous materials within the right of way as directed by the Engineer in the field. All material shall become property of the Contractor and disposed of outside of the county right of way. All cost associated with labor, equipment, removals, and disposal of materials shall be included in associated bid items. Refer to Environmental Note EN-3 for removal procedures.

202-P01 REMOVAL OF TEMPORARY WIDENING: Restore the area impacted by the construction of the temporary widening to the original contours where other grading is not identified in the cross sections.

All costs to remove the surfacing and embankment associated with the temporary widening and to restore the impacted areas shall be included in the bid item “Common Excavation – Type B”.

202-P02 FENCE REMOVAL: Notify landowners in writing, with a copy to the Engineer, a minimum of 30 days in advance of fence removal. Immediately prior to removing fence, coordinate verbally with adjacent landowners. Additional information, including property owners contact information will be available from the Engineer.

Salvage the existing fence posts on the entire project and all other fencing items on the west side of the bridge in a manner acceptable to the Engineer, and stockpile near right-of-way line at a location designated by the Engineer. Remove all other fence items and dispose of in accordance with the specifications. Include all costs for salvaging fence items in the bid item “Remove Existing Fence”.

203-010 SHRINKAGE: 25 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 TOPSOIL: The existing topsoil shall be removed and salvaged. Removal is based upon a 6” depth. Upon completion of the grading operation, the topsoil shall be spread evenly over disturbed areas and seeded. Measurements for all topsoil shall be plan quantity.

203-P02 EMBANKMENT: Placement of embankment material will be in accordance with Section 203.04 G.3 of the Standard Specification. After the topsoil has been removed all embankment areas shall be scarified to a depth of 6” and re-compacted. Benching of the existing embankment shall be required. The cost for scarifying, recompacting and benching shall be included in the bid item “Common Excavation – Type B”.

Measurement of “Common Excavation – Type B” will be plan quantity.

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NOTES

203-P03 BORROW-EXCAVTION: All borrow needed for the project shall be furnished by the contractor.

251-P01 SEEDING & COVER CROP: Measurements for seeding and cover crop shall be plan quantity.

253-P01 MULCH: Measurements for mulch shall be plan quantity.

256-P01 REMOVE & REPLACE RIPRAP: Remove and stockpile all existing riprap in the areas identified in the plans. The existing riprap is a combination of both riprap and grouted riprap. Incorporate the stockpiled riprap in the areas identified for riprap under the bridge.

261-P01 TEMPORARY EROSION CONTROL: Use the existing topsoil to create an earthen berm at the limits of construction. The topsoil berm in conjunction with the existing vegetation and the devices shown in the plans will serve as the temporary erosion control.

Build the berm to a 1.0 foot minimum height. Allow stormwater to drain through the berm as needed by placing intermittent weirs along the length of the berm. Construct the weirs no more than 5.0 feet wide and place fiber rolls across the weir on the downstream side of the berm. If stormwater is present at the time of the weir construction, place fiber rolls prior to construction of the weir. 100 LF has been added to the quantity of Fiber Rolls 12IN for the weirs and other areas where runoff leaves the site as directed by the Engineer.

When the grading operations are complete, spread the topsoil berm over the distributed area in preparation for the permanent erosion control measures. The topsoil berm is not a sperate pay item. All costs associated with constructing, maintaining and removing the berm shall be included in the bid item “Topsoil”.

302-P01 TRAFFIC SURFACE AGGREGATE: Use Aggregate Surfacing Course Class 13 for surfacing during Temporary Traffic Control Operations.

156 Tons of Traffic Surface Aggregate has been provided to maintain traffic as required during construction.

704-P01 TRAFFIC CONTROL: The traffic control devices list has been developed using the following layouts on the Standard Drawing for traffic control:

1. Standards D-704-7, 8, 9, 10, 11, 13, 14
2. Standard D-704-15, layout A
3. Standard D-704-20, layout G
4. Standard D-704-22, layout K and L; and
5. Standard D-704-30
6. Standard D-704-31

704-P02 WORK ZONE TRAFFIC CONTROL: Maintain traffic through the project for the duration of the project. Provide a minimum of one lane for traffic at all times and during all construction operations.

714-P01 REMOVE & RELAY PIPE: Wrap joints on the concrete pipe in Type S2 geotextile fabric.

706-P01 FIELD OFFICE: Provide a field office meeting the requirements of Standard Specification 706.02 A with a minimum floor area of 230 square feet, minimum exterior width of 8 feet and a minimum ceiling height of 7 feet.

752-P01 TEMPORARY FENCE: Reset the existing locked gates with the temporary fence. Include the costs for resetting the existing locked gates in the bid item “Temporary Fence”.

752-P02 VEHICLE GATE: Replicate the locked gate at Sta. 178+68 Lt with an identical locked gate that has a 30 foot opening. Reset locked gates at all other approaches.

752-P03 FENCE BARBED WIRE 3 STRAND-STEEL POST: Install a smooth wire line in place of the bottom barbed wire line on the 3 strand fence. Cost for the smooth wire fence line shall be included in the bid item “Fence Barbed Wire 3 Strand-Steel Post”.

752-P04 FENCE POSTS: Use steel posts for all, Double Brace Assemblies, Fence Terminals, Vehicle Gate, and Corner Brace Assemblies.

754-P01 SIGNS: All signs and supports removed from the project will become property of Morton County, delivered to the Highway Department. Contractor will call Morton County Highway Department (701) 667-3346 to arrange delivery or pick up of the signs and supports. Any signs and supports deemed unusable by Morton County will become property of the contractor.

764-P01 MGS W-BEAM GUARDRAIL: Install MGS W-beam guardrail with pre-punched slotted holes at 3’-1½” mark as shown on D-764-40. Do not drill holes in standard W-beam guardrail to convert it to MGS W-beam guardrail.

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ENVIRONMENTAL NOTES

ENVIRONMENTAL NOTES (EN): The North Dakota Department of Transportation, Morton County, 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 Heart 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).

EN-3 THREATENED AND ENDANGERED SPECIES: The project is located near/within suitable habitat for the species listed in the following table:

SPECIES	HABITAT	PRESENCE
Northern Long-Eared Bat	Forested/Wooded Areas/Bridges/Box Culverts/Caves/Mines	Active Season: April 1 - October 31* Inactive Season: November 1 - March 31*

*Time frames can differ slightly, depending on the year

If any of the above threatened and endangered species are identified within 1 mile of the project, the Contractor will notify the Engineer immediately and cease construction activities in the vicinity until an avoidance area is established. The Engineer will establish an avoidance area that is at least a 0.5 mile and immediately coordinate with the USFWS (701-355-8513), FHWA (701-221-9464), and NDDOT Environmental and Transportation Services (701-328-2592). The Contractor will not resume work within the avoidance area until the Engineer has confirmed with the agencies that work may proceed (either the species have left the area, or approved avoidance/minimization measures have been implemented).

Conduct tree removal activities outside of the active season for the northern long-eared bat (April 1 – October 31).

Ensure tree removal is limited to that specified in the project plans. The Engineer will install bright colored flagging/fencing prior to any tree clearing to ensure the Contractor stays within clearing limits.

Do not cut down documented NLEB roosts or trees within 0.25 miles of roosts, or documented foraging habitat during any time of year.

To completely avoid direct effects to roosting bats, perform bridge removal work during the winter hibernation period (November 1 – March 31).

EN-4 TEMPORARY WETLAND IMPACT: Temporary impact areas within wetlands and or other waters are incorporated into the plans for this project. Remove temporary fill placed and sedimentation in wetlands or other waters. Restore these wetlands to preconstruction contours.

NOTIFICATIONS TO BE FILED BY CONTRACTOR:

- North Dakota Department of Environmental Quality – NDPDES Permits obtained by contractor, owner is Morton County

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Estimated Quantities

SPEC	CODE	ITEM DESCRIPTION	UNIT	TOTAL
103	0100	CONTRACT BOND	L SUM	1
201	0330	CLEARING & GRUBBING	L SUM	1
201	0370	REMOVAL OF TREES 10IN	EA	6
201	0380	REMOVAL OF TREES 18IN	EA	3
201	0390	REMOVAL OF TREES 30IN	EA	1
202	0105	REMOVAL OF STRUCTURE	L SUM	1
202	0170	REMOVAL OF CULVERTS-ALL TYPES & SIZES	LF	346
202	0312	REMOVE EXISTING FENCE	LF	5990
203	0102	COMMON EXCAVATION-TYPE B	CY	28595
203	0109	TOPSOIL	CY	8968
203	0140	BORROW-EXCAVATION	CY	10810
203	0180	ROADWAY OBLITERATION	LF	1500
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
216	0100	WATER	M GAL	496
251	0200	SEEDING CLASS II	ACRE	13
251	2000	TEMPORARY COVER CROP	ACRE	13
253	0101	STRAW MULCH	ACRE	26
255	0103	ECB TYPE 3	SY	4466
256	0300	RIPRAP GRADE III	CY	1757
256	0701	REMOVE AND REPLACE RIPRAP	CY	1000
260	0200	SILT FENCE SUPPORTED	LF	660
260	0201	REMOVE SILT FENCE SUPPORTED	LF	660
261	0112	FIBER ROLLS 12IN	LF	2900
261	0113	REMOVE FIBER ROLLS 12IN	LF	2420
261	0120	FIBER ROLLS 20IN	LF	2880
261	0121	REMOVE FIBER ROLLS 20IN	LF	1440
262	0100	FLOTATION SILT CURTAIN	LF	210
262	0101	REMOVE FLOTATION SILT CURTAIN	LF	210
302	0050	TRAFFIC SERVICE AGGREGATE	TON	156
302	0356	AGGREGATE SURFACE COURSE CL 13	TON	3980
602	0130	CLASS AAE-3 CONCRETE	CY	457
602	1130	CLASS AE-3 CONCRETE	CY	302.2
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	1195
604	9915	PRESTRESSED I-BEAM-54IN	LF	1657.5
612	0115	REINFORCING STEEL-GRADE 60	LBS	22728
612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS	101808
616	0364	STRUCTURAL STEEL M270-GRADE 36	LBS	2252
622	0010	STEEL H-PILE TIPS HP 14 X 102	EA	14
622	0014	STEEL H-PILING POINTS 12 X 53	EA	12
622	0040	STEEL PILING HP 12 X 53	LF	900
622	0070	STEEL PILING HP 14 X 102	LF	980
702	0100	MOBILIZATION	L SUM	1
704	0100	FLAGGING	MHR	1200
704	1000	TRAFFIC CONTROL SIGNS	UNIT	1127

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Estimated Quantities

SPEC	CODE	ITEM DESCRIPTION	UNIT	TOTAL
704	1052	TYPE III BARRICADE	EA	8
704	1060	DELINEATOR DRUMS	EA	11
704	1080	STACKABLE VERTICAL PANELS	EA	40
704	1081	VERTICAL PANELS-BACK TO BACK	EA	10
706	0400	FIELD OFFICE	EA	1
709	0100	GEOSYNTHETIC MATERIAL TYPE G	SY	40
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	4136
714	3010	END SECT-CONC REINF 18IN	EA	2
714	4099	PIPE CONDUIT 18IN-APPROACH	LF	208
714	4106	PIPE CONDUIT 24IN-APPROACH	LF	242
714	9659	REMOVE & RELAY PIPE-ALL TYPES & SIZES	LF	66
752	0110	FENCE BARBED WIRE 3 STRAND-STEEL POST	LF	1810
752	0320	FENCE BARBED WIRE 4 STRAND-STEEL POST	LF	4180
752	0905	TEMPORARY FENCE	LF	5990
752	0993	FENCE TERMINAL	EA	4
752	2100	VEHICLE GATE	EA	6
752	3160	CORNER ASSEMBLY BARBED WIRE-STEEL POST	EA	1
752	3996	DOUBLE BRACE ASSEMBLY-STEEL POST	EA	4
754	0110	FLAT SHEET FOR SIGNS-TYPE XI REFL SHEETING	SF	25.2
754	0206	STEEL GALV POSTS-TELESCOPING PERFORATED TUBE	LF	64.4
764	0131	W-BEAM GUARDRAIL	LF	207.6
764	0145	W-BEAM GUARDRAIL END TERMINAL	EA	4
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS	LF	248
930	3000	BRIDGE BENCH MARKS	SET	1

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Basis of Estimate

Materials

Traffic Surface Aggregate	1.875 Tons/CY
Aggregate Surface Course Class 13	1.875 Tons/CY

Traffic Surface Aggregate for Temporary Widening

6" depth; 16' wide; 280' long	156 Tons

Water

Dust Palliative	25 MGal/Mile
Traffic Surface Aggregate	20 Gal/Ton
Aggregate Surface Course Class 13	20 Gal/Ton
Embankment	10 Gal/CY

Topsoil

6" Depth - Construction limits and roadway obliteration limits minus existing road surface

Seeding, Mulching, Temporary Cover Crop

Based on a width 10' outside the construction limits, but inside the proposed R/W, and includes area covered by the roadway obliteration.

Fiber Rolls

12IN Inlet Protection	240 LF
12IN Perimeter Protection	2,560 LF
12IN Weirs/As Directed by Engineer	100 LF
20IN Ditch Checks	2,880 LF

Traffic Control

Stackable Vertical Panels based on delineating roadway at the beginning and end of project.

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Basis of Estimate

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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	EARTHWORK SUMMARY			
	203 0102 Common Excavation- Type B	[1]Embankment	203 0140 Borrow Excavation	203 0109 [2]Topsoil
LOCATION	(CY)	(CY)	(CY)	(CY)
Temporary Widening	280	280	-	-
[3]Remove Temporary Widening	280	-	-	-
County Road 137	[4]28,035	39,125	[5]10,810	8,968
Project Total	28,595	39,405	10,810	8,968

[1]Volumes have been adjusted to account for 25% shrinkage.

[2]All Topsoil will be spread evenly over the site.

[3]Material Removed for Temporary Widening has been incorporated in the proposed roadway embankment

[4]4,000 CY of estimated suitable Channel Excavation material has been incorporated into the bid item "Common Excavation - Type B".

[5]Borrow Excavation = Embankment - Common Excavation from CR 137 and Removed Temporary Widening.

[6]Matrial from the "Roadway Obliteration" has been included in the earthwork quantities.

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Earthwork Summary

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

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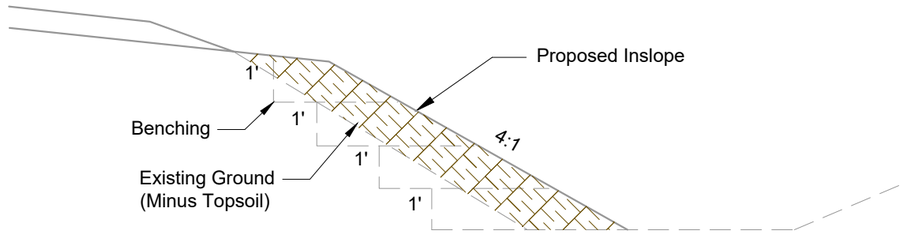
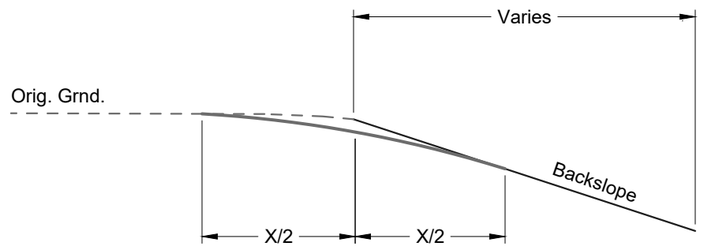


BENCHING TYPICAL SECTION

Not to Scale



Backslope Rounding Where X = 10'
Unless Restricted By Height Of Backslope

BACKSLOPE ROUNDING

Not to Scale

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Benching & Backslope Detail

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

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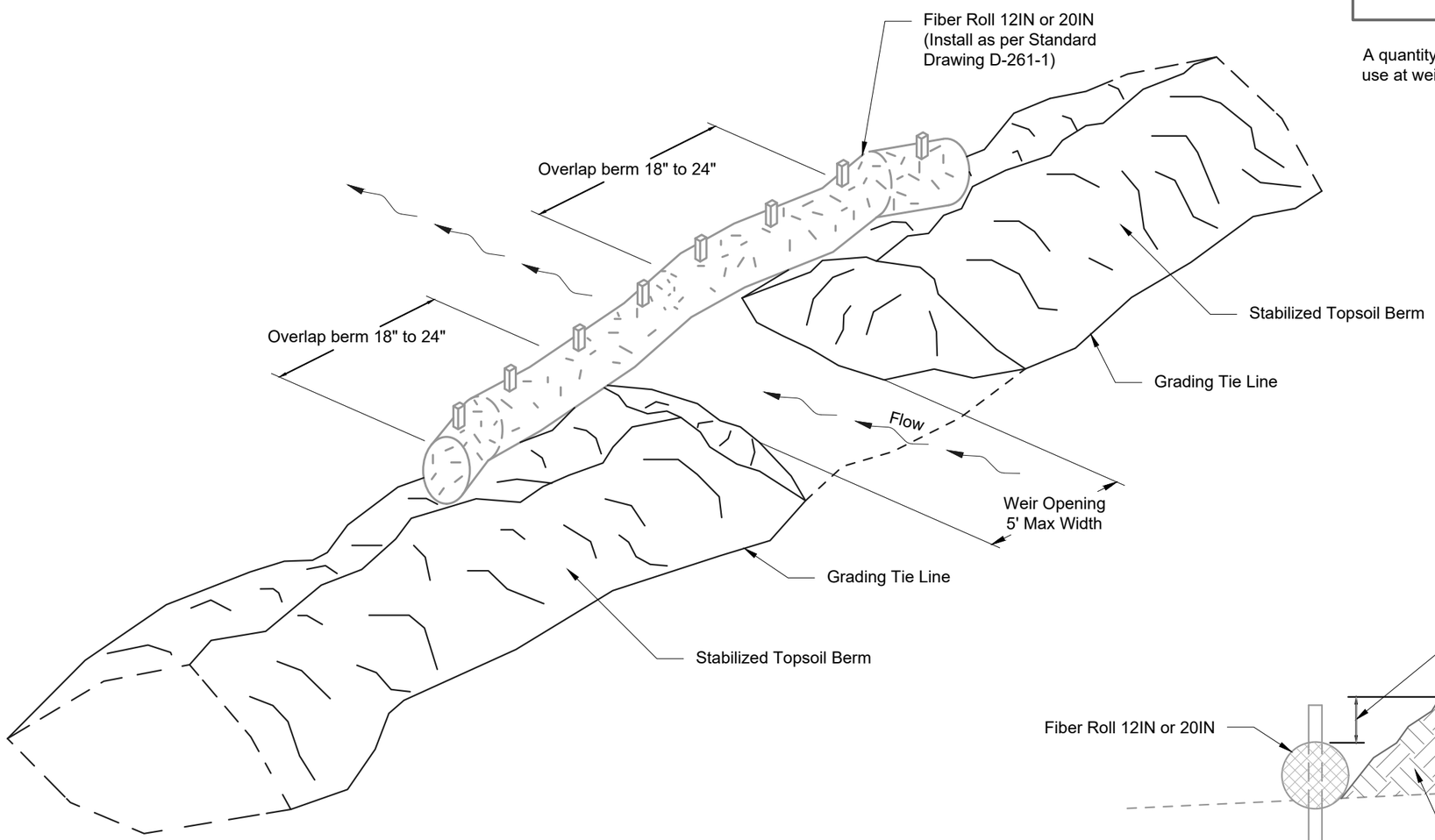
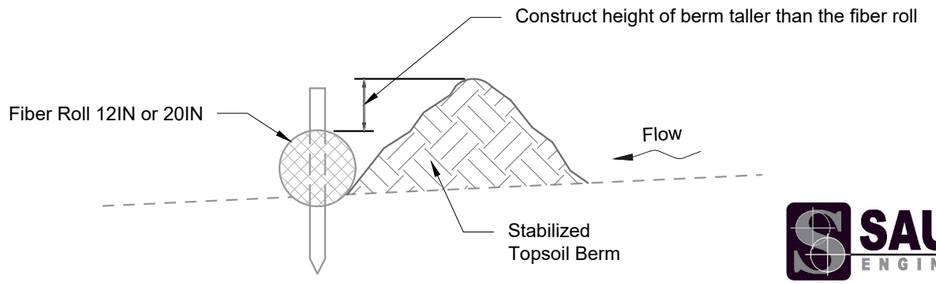
	ND	BRC-3020(080)	20	2

A quantity of 100 LF of Fiber Roll 12IN has been included in the quantities for use at weirs. The Engineer will measure the actual quantity required in the field.





Topsoil Berm Detail

Notes:

1. Windrow the existing topsoil from the foreslope to create a berm at the grading tie line.
2. Stabilize berms in accordance with the Construction General Permit.
3. Place weirs intermittently throughout the length of the berm to allow stormwater to drain through the berm.
4. Avoid placing weirs adjacent to waterbodies.
5. Install fiber rolls as the weirs are created in the topsoil berm.
6. Include costs to create, stabilize, maintain, and dismantle the berm in the unit price bid for "Topsoil".
7. Include costs for fiber rolls in the unit price bid for "Fiber Rolls 12IN" or "Fiber Rolls 20IN".

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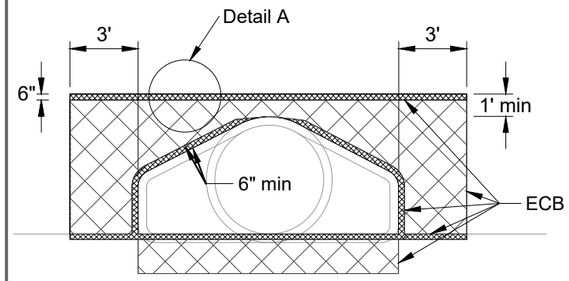
Temporary Topsoil Berm & Weir Detail

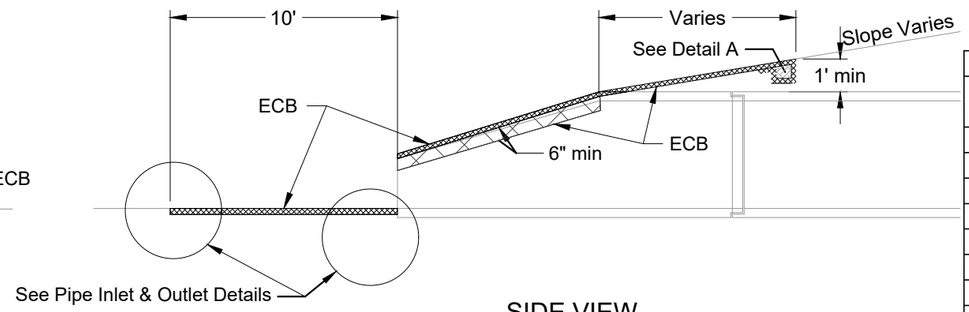
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	20	3

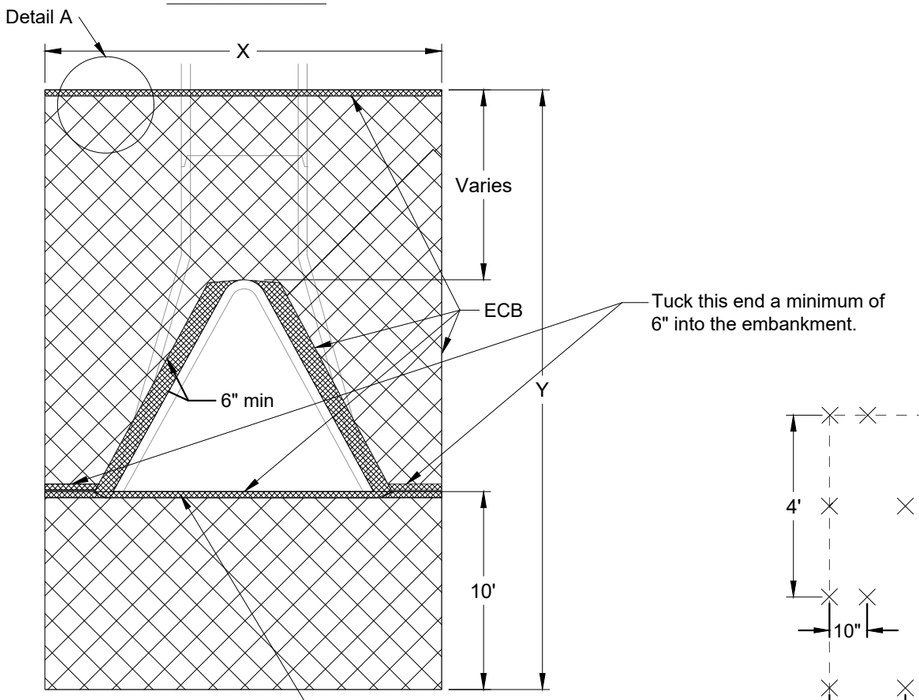


FRONT VIEW



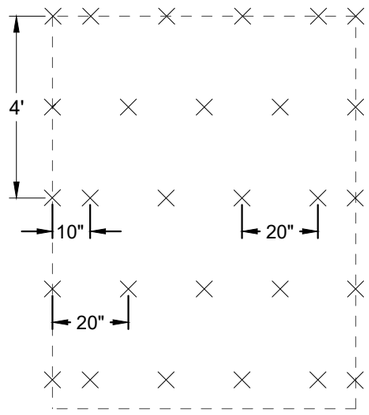
SIDE VIEW

Erosion Control Blanket (ECB)								
Location to be protected	Culvert Type	Pipe Diam	No.	Unit Quantity	Total Quantity			
Station	APPR/CL	(Inch)		(SY)	Type 1 (SY)	Type 2 (SY)	Type 3 (SY)	Type 4 (SY)
163+00 R	APPR	18	1	22			44	
166+72 L	APPR	18	1	22			44	
168+00	CL	18	1	20			40	
170+78 L	APPR	24	1	24			48	
172+49 R	APPR	24	1	24			48	
178+57 R	APPR	24	1	24			48	
178+68 L	APPR	18	1	22			44	
					Total (SYs)		316	



TOP VIEW

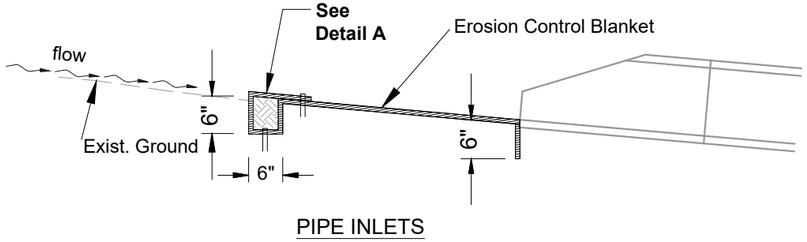
NOTE: Tuck the ECB a minimum of 6" into the embankment (against the flared end section) around the opening of the flared end section.



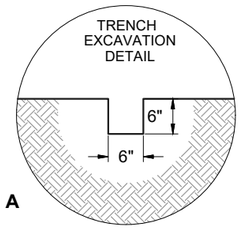
STAPLE PATTERN

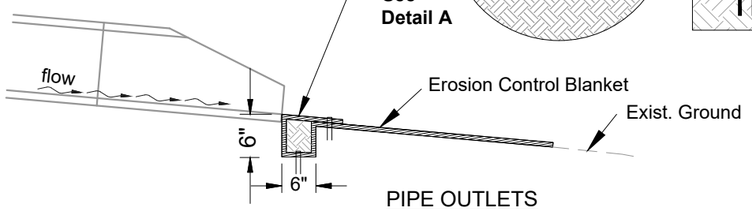
APPROACH CULVERTS				
DIA	X	Y	Surface area to be protected	ECB
In	Ft	Ft	SF	SY
15	9.0	20.0	176.0	20
18	9.5	20.7	190.7	22
21	9.5	21.0	190.9	22
24	10.5	21.6	214.1	24
27	11.0	22.0	226.3	25
30	11.6	22.5	241.5	27
36	12.7	23.3	268.8	30
42	13.3	23.3	279.7	31
48	13.8	24.0	293.2	33
54	14.5	23.4	300.6	34
60	15.0	23.0	307.5	35
66	15.6	24.0	325.6	37
72	16.2	24.5	340.6	38
Note: Quantities based on 8:1 slope.				

CENTERLINE CULVERTS													
DIA	X	Y	Surface area to be protected	ECB		DIA	X	Y	Surface area to be protected	ECB		DIA	X	Y	Surface area to be protected	ECB
In	Ft	Ft	SF	SY		In	Ft	Ft	SF	SY		In	Ft	Ft	SF	SY
24	10.5	19.6	193.1	22		24	10.5	17.6	172.1	20						
27	11.0	20.0	204.3	23		27	11.0	18.0	182.3	21						
30	11.6	20.5	218.3	25		30	11.6	18.5	195.1	22						
36	12.7	21.2	242.1	27		36	12.7	19.2	216.7	24						
42	13.3	21.2	251.8	28		42	13.3	19.2	225.2	25						
48	13.8	22.0	265.6	30		48	13.8	20.0	238.0	27						
54	14.5	21.5	273.7	31		54	14.5	19.5	244.7	28						
60	15.0	21.0	278.3	31		60	15.0	19.0	248.3	28						
66	15.6	22.0	295.7	33		66	15.6	20.0	264.5	30						
72	16.2	22.5	309.2	35		72	16.2	20.5	276.8	31						
Note: Quantities based on 6:1 slope.						Note: Quantities based on 4:1 slope.										

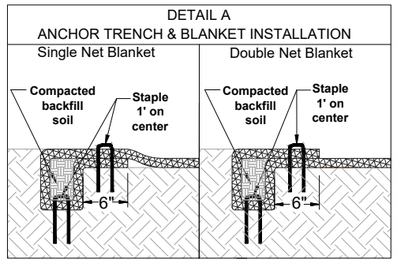


PIPE INLETS





PIPE OUTLETS



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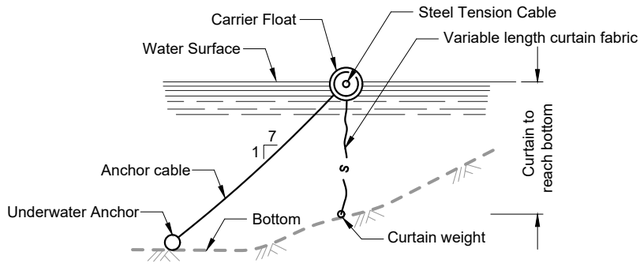
Erosion Control at Culvert Flared End Sections

Bridge Replacement
Bridge No. 30-143-19.1

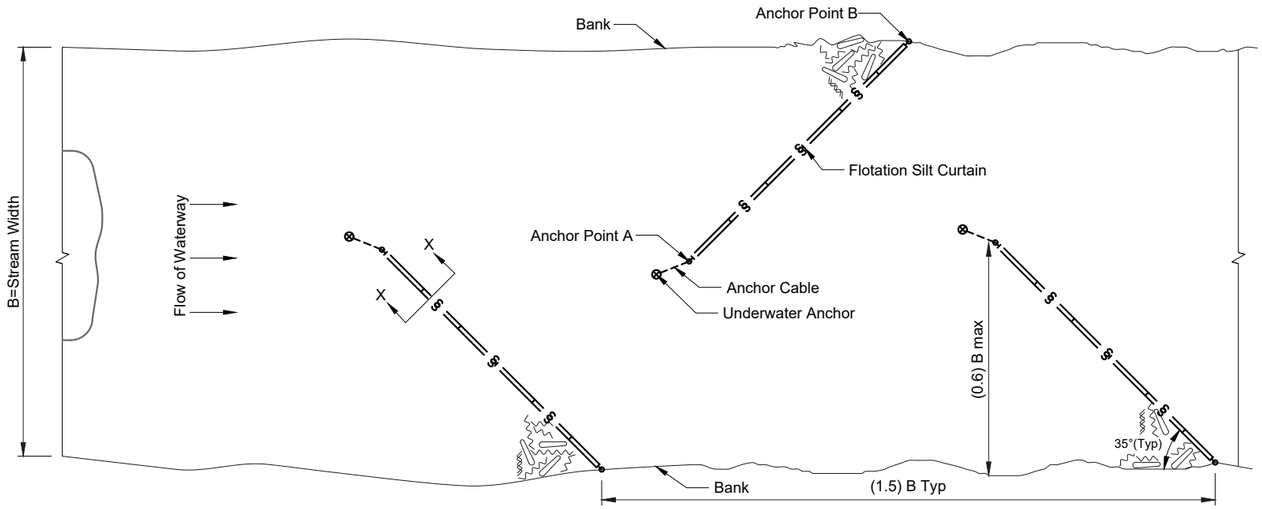
Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	20	4



SECTION X-X

FLOTATION SILT CURTAINS



PLAN VIEW

FLOTATION SILT CURTAIN - TYPE HERRING BONE PATTERN

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Temporary Erosion Control - Flotation Silt Curtain

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	20	5

Curve PCL-CR137-1

P.C. Station 157+06.17
P.I. Station 160+51.26
Delta = 33°24'23" (LT)
Degree = 4°58'56"
Tangent = 345.09'
Length = 670.51'
Radius = 1,150.00'
P.T. Station 163+76.68

Station	Left Slope	Right Slope
155+24.49	-3.57	-3.57
156+10.17	-3.57	0.0
156+95.85	-3.57	3.57
157+54.17	-6.0	6.0
163+28.69	-6.0	6.0
164+06.69	-3.57	3.57
165+21.27	0.0	0.0

Curve PCL-CR137-2

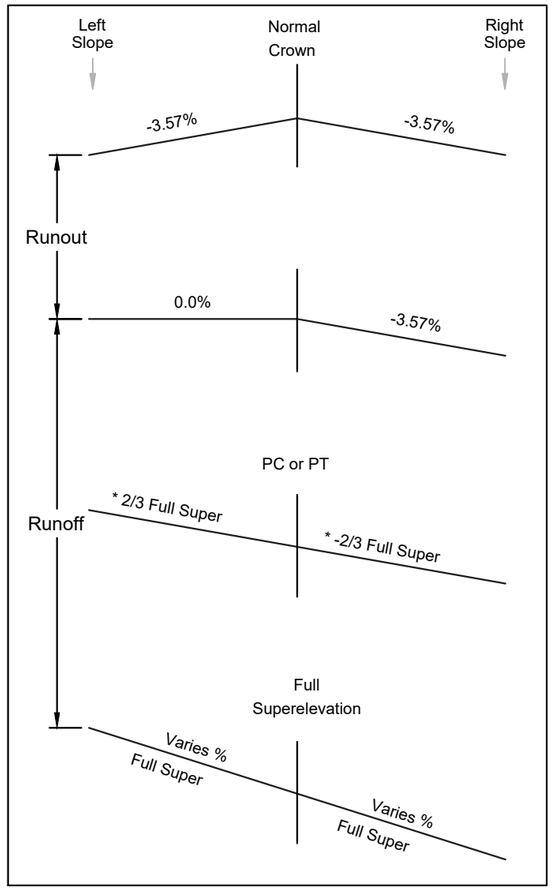
P.C. Station 166+61.11
P.I. Station 169+16.77
Delta = 21°55'23" (RT)
Degree = 4°20'26"
Tangent = 255.66'
Length = 505.07'
Radius = 1,320.00'
P.T. Station 171+66.18

Station	Left Slope	Right Slope
165+21.27	0.0	0.0
166+35.86	3.57	-3.57
167+07.44	5.8	-5.8
171+19.85	5.8	-5.8
171+73.29	3.57	-3.57
172+58.85	0.0	-3.57
173+44.41	-3.57	-3.57

Curve PCL-CR137-3

P.C. Station 178+52.59
P.I. Station 186+32.65
Delta = 69°00'00" (RT)
Degree = 5°02'53"
Tangent = 780.06'
Length = 1,366.85'
Radius = 1,135.00'
P.T. Station 192+19.45

Station	Left Slope	Right Slope
177+30.59	-2.08	-2.08
177+80.59	0.0	-2.08
178+30.51	2.08	-2.08
179+24.59	6.0	-6.0
191+71.45	6.0	-6.0
192+29.77	3.57	-3.57
193+15.45	0.0	-3.57
194+01.13	-3.57	-3.57



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Note:

1. Calculations based on AASHTO method five. A design speed of 55 mph and maximum superelevation of 6% were used.

* 2. P.C. Station 178+52.59 is located at ½ Full Super.

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Superelevation Table

Bridge Replacement
Bridge No. 30-143-19.1

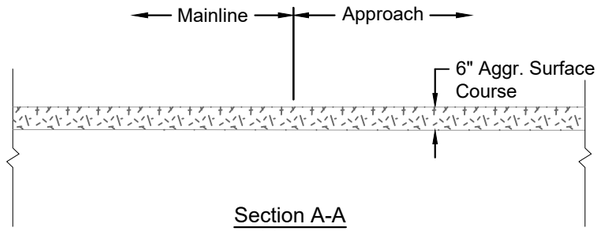
Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	20	6

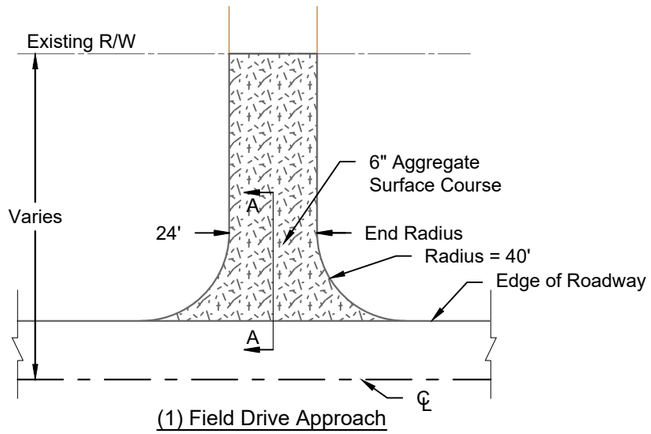
Notes:

1. Actual aggregate surface course locations may vary in the field, as approved by the Engineer.

2. Quantity totals have been included in the bid items of the "Estimate of Quantities" of the plans.



Section A-A
(not to scale)



(1) Field Drive Approach

BASIS OF ESTIMATE		(1)	
ITEM	UNIT	Field Drive	TOTALS
Number of Locations	#	6	6
Aggregate Surface Course CL 13	TON	582	582

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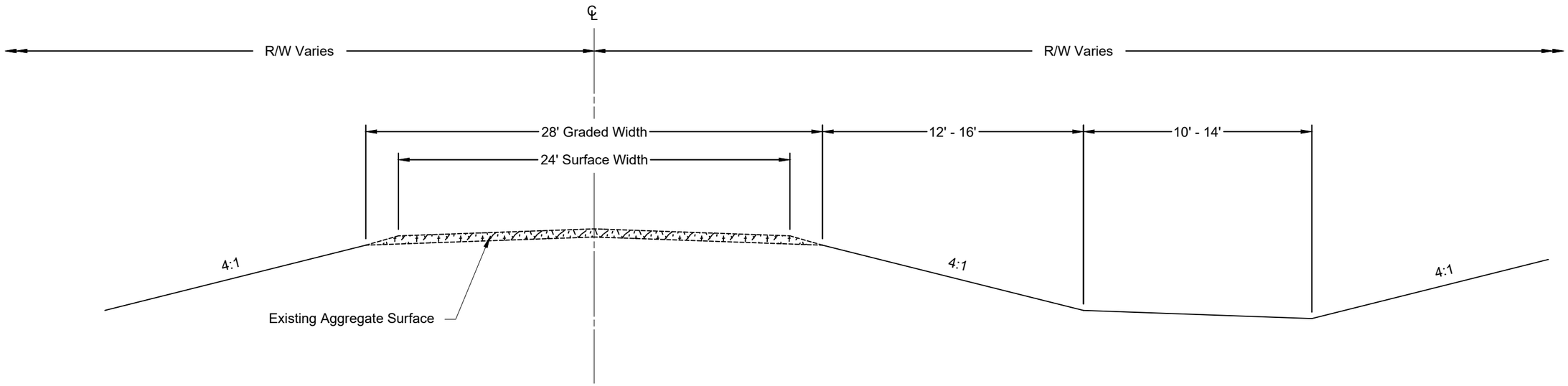
Approach Details

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	30	1



Existing Typical Section

County Road 137

Sta. 154+00 to Sta. 174+12.07
Sta. 176+43.57 to Sta. 195+00

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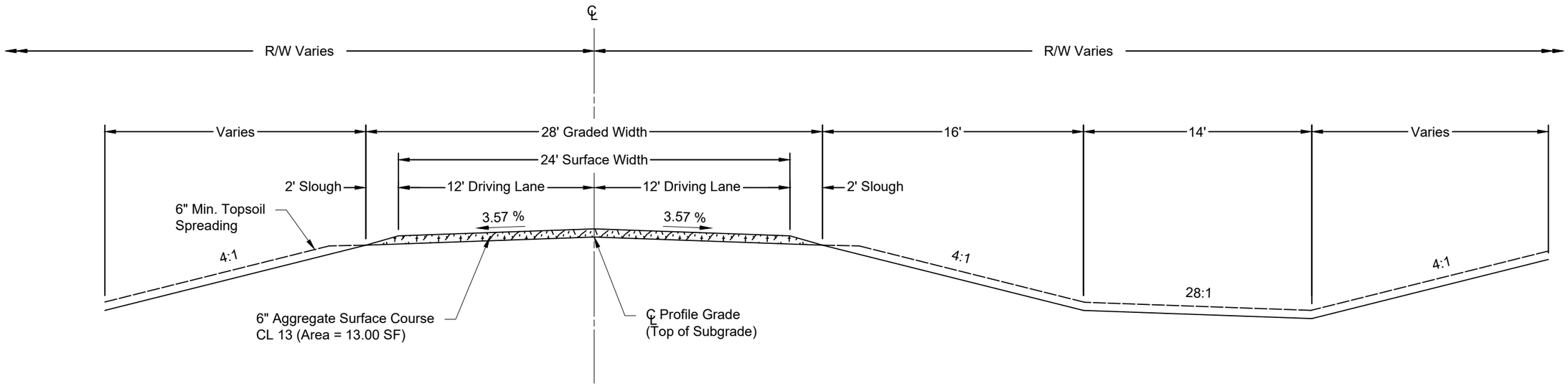
Existing Typical Section

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	30	2



Roadway Symmetrical About Centerline

Proposed Typical Section

County Road 137

Sta. 154+00 to Sta. 173+87
Sta. 177+23 to Sta. 195+00

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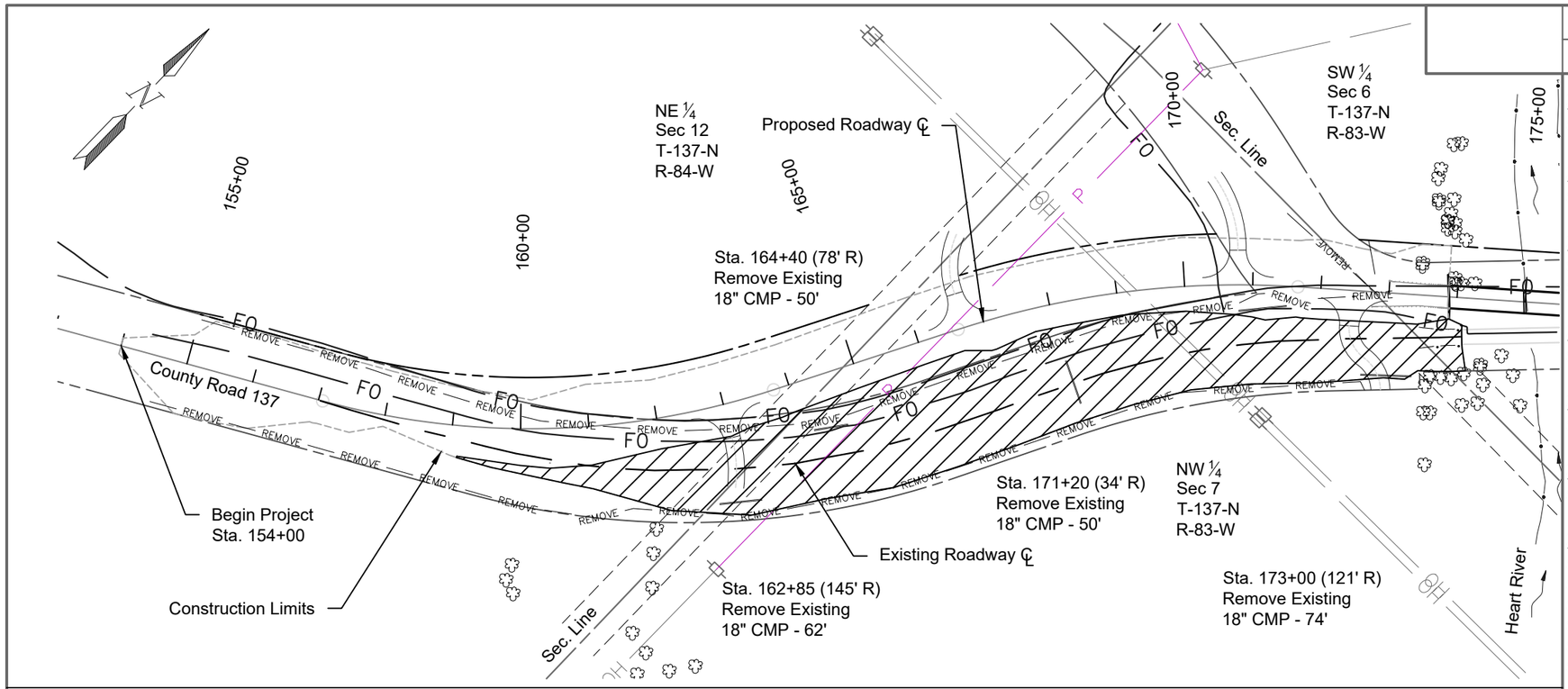
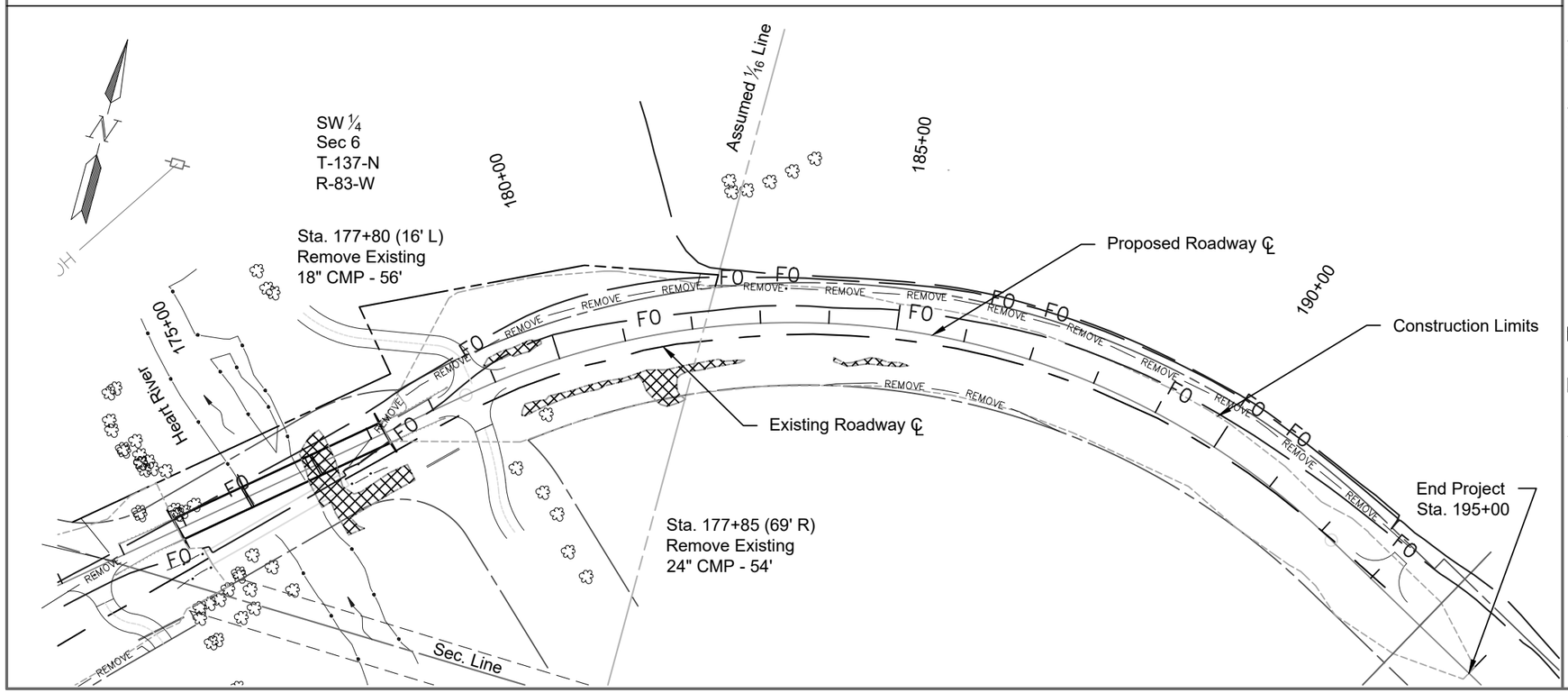
Proposed Typical Section

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND





STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	40	1

203 0180 ROADWAY OBLITERATION

Sta. 159+00 to Sta. 174+00 Rt	1,500 LF

201 0330 CLEARING & GRUBBING

Sta. 154+00 to Sta. 195+00	1 L Sum

201 0370 REMOVAL OF TREES 10IN

Sta. 174+00 Lt	5 EA
Sta. 179+50 Rt	1 EA

201 0380 REMOVAL OF TREES 18IN

Sta. 174+00 Lt	3 EA

201 0390 REMOVAL OF TREES 30IN

Sta. 174+00 Lt	1 EA

202 0105 REMOVAL OF STRUCTURE

Sta. 174+12 to Sta. 176+44 Rt	1 L Sum

202 0170 REMOVAL OF CULVERTS-ALL TYPES & SIZES

Sta. 162+85 Rt	62 LF
Sta. 164+40 Rt	50 LF
Sta. 171+20 Rt	50 LF
Sta. 173+00 Rt	74 LF
Sta. 177+80 Lt	56 LF
Sta. 177+85 Rt	54 LF

202 0312 REMOVE EXISTING FENCE

Sta. 154+00 to Sta. 195+00	5,990 LF

256 0701 REMOVE AND REPLACE RIPRAP

Sta. 175+00 to Sta. 185+50	1,000 CY

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LEGEND

- Roadway Obliteration
- Remove and Replace Riprap
- — REMOVE — Remove Existing Fence

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Removals

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	51	1

Begin Station / Location	Begin Offset	End Station / Location	End Offset	Pipe Installation (Pay Item)			Allowable Material	Required Diameter	Steel Pipe Coatings	Steel Pipe Corrugations or Spiral Ribs	Steel Pipe Minimum Thickness	Geosythetic Material - Type G (Pay Item)	(*) End Sections		Applicable Backfill
				In	Bid Item	LF		In	Type		In	SY	Begin EA	End EA	
162+65	60' Rt	163+35	60' Rt	18	Pipe Conduit - Approach	70'	Reinforced Concrete Pipe - Class III **(barrel length = 63 LF)**	18					FES	FES	Specification 714.04 A
							Corrugated Steel Pipe	18	Z, A, P	2	0.064				
							Spiral Rib Steel Pipe	18	Z, A, P	3/4, 1	0.064				
166+40	60' Lt	167+04	60' Lt	18	Pipe Conduit - Approach	64'	Reinforced Concrete Pipe - Class III **(barrel length = 57 LF)**	18					FES	FES	Specification 714.04 A
							Corrugated Steel Pipe	18	Z, A, P	2	0.064				
							Spiral Rib Steel Pipe	18	Z, A, P	3/4, 1	0.064				
168+00	36' Lt	168+00	30' Rt	18	Remove & Relay Pipe- All Types & Sizes	66'	Reindorced Concrete Pipe **(barrel length = 66 LF)**	18				40	[1]FES	[1]FES	D-714-25
170+40	60' Lt	171+16	60' Lt	24	Pipe Conduit - Approach	76'	Reinforced Concrete Pipe - Class III **(barrel length = 71 LF)**	24					FES	FES	Specification 714.04 A
							Corrugated Steel Pipe	24	Z, A, P	2	0.064				
							Spiral Rib Steel Pipe	24	Z, A, P	3/4, 1	0.064				
172+08	72' Rt	172+92	72' Rt	24	Pipe Conduit - Approach	84'	Reinforced Concrete Pipe - Class III **(barrel length = 79 LF)**	24					FES	FES	Specification 714.04 A
							Corrugated Steel Pipe	24	Z, A, P	2	0.064				
							Spiral Rib Steel Pipe	24	Z, A, P	3/4, 1	0.064				
178+05	44' Rt	178+87	44' Rt	24	Pipe Conduit - Approach	82'	Reinforced Concrete Pipe - Class III **(barrel length = 80 LF)**	24					TES (6:1)	TES (6:1)	Specification 714.04 A
							Corrugated Steel Pipe	24	Z, A, P	2	0.064				
							Spiral Rib Steel Pipe	24	Z, A, P	3/4, 1	0.064				
178+21	44' Lt	178+95	44' Lt	18	Pipe Conduit - Approach	74'	Reinforced Concrete Pipe - Class III **(barrel length = 72 LF)**	18					TES (6:1)	TES (6:1)	Specification 714.04 A
							Corrugated Steel Pipe	18	Z, A, P	2	0.064				
							Spiral Rib Steel Pipe	18	Z, A, P	3/4, 1	0.064				

Corrugations: **2** = 2-2/3"x1/2"
3 = 3"x1"
5 = 5"x1"

Coatings: **Z** = Zinc
A = Aluminum
P = Polymeric (over Zinc or Aluminum)

Spiral Ribs: **3/4** = 3/4"x3/4"@7-1/2"
1 = 3/4"x1"@11-1/2"

(*) End sections are measured and paid for separately for pipe extensions.
FES = Flared End Section
TES = Traversable End Section
[1]Include the barrel length on the FES in the bid item "End Sect-conc reinf 18IN"

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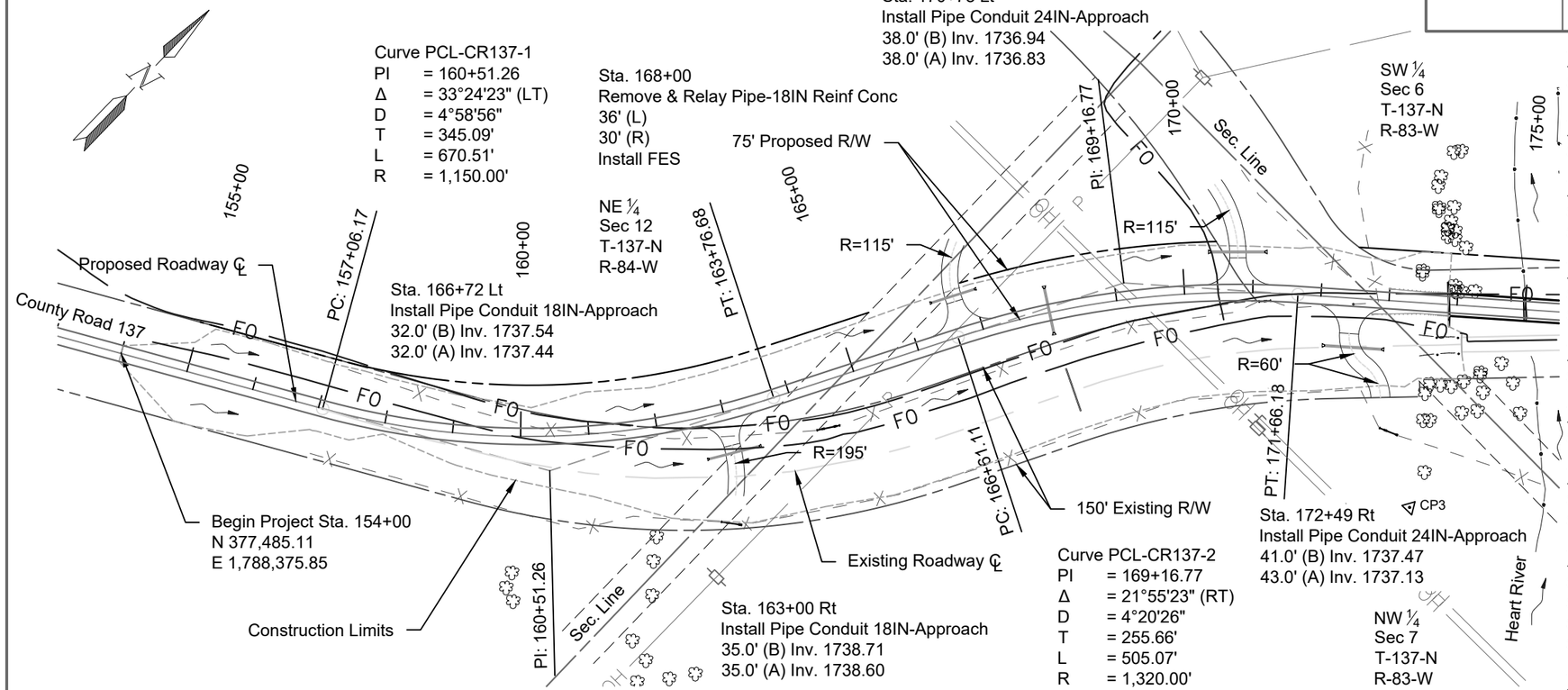
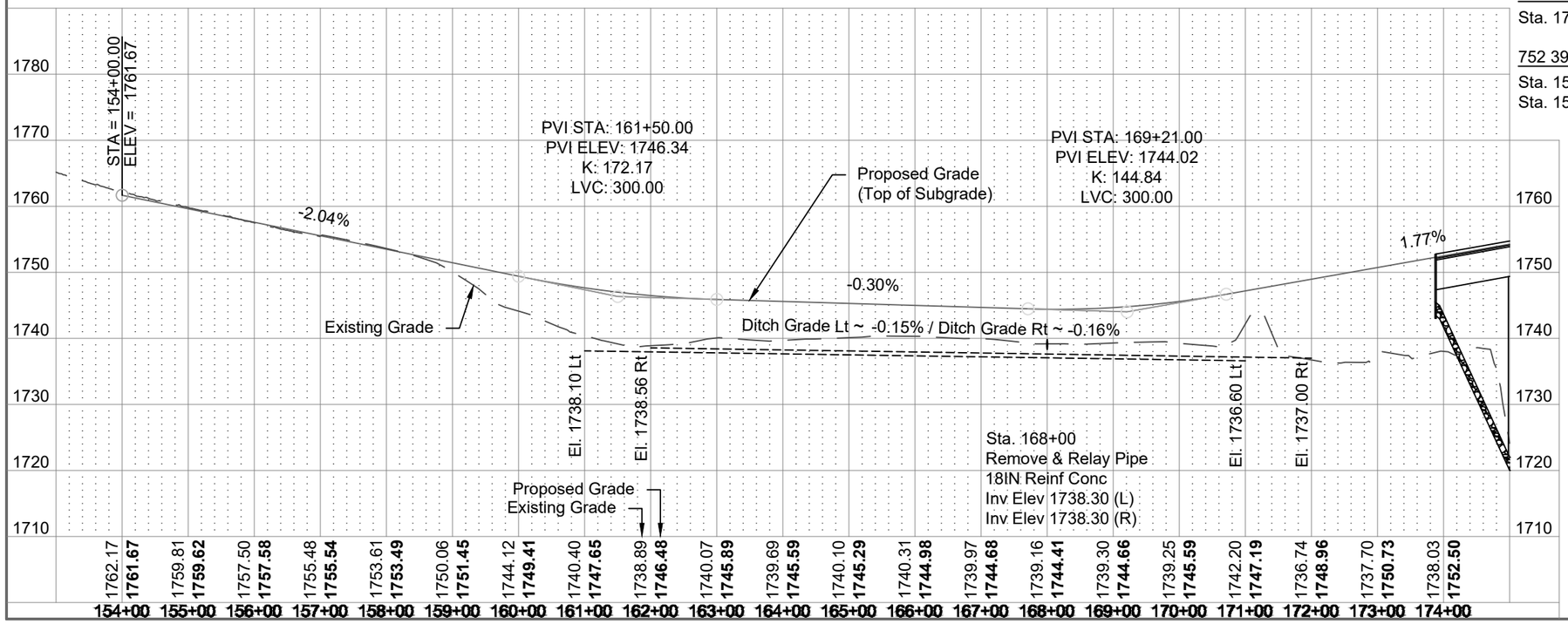
Allowable Pipe List

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	60	1





709 0100 GEOSYNTHETIC MATERIAL TYPE G
Sta. 168+00 40 SY

714 3010 END SECT-CONC REINF 18IN
Sta. 168+00 2 EA

714 4099 PIPE CONDUIT 18IN-APPROACH
Sta. 163+00 Rt 70 LF
Sta. 166+72 Lt 64 LF

714 4106 PIPE CONDUIT 24IN-APPROACH
Sta. 170+78 Lt 76 LF
Sta. 172+49 Rt 84 LF

714 9659 REMOVE & RELAY PIPE-ALL TYPES & SIZES
Sta. 168+00 66 LF

752 0320 FENCE BARBED WIRE 4 STRAND-STEEL POST
Sta. 154+00 to Sta. 174+00 3,880 LF

752 0993 FENCE TERMINAL
Sta. 173+87 Lt 1 EA
Sta. 173+87 Rt 1 EA

752 2100 VEHICLE GATE
Sta. 163+00 Rt 1 EA
Sta. 166+72 Lt 1 EA
Sta. 170+78 Lt 1 EA
Sta. 172+64 Rt 1 EA

752 3160 CORNER ASSEMBLY BARBED WIRE-STEEL POST
Sta. 172+90 Lt 1 EA

752 3996 DOUBLE BRACE ASSEMBLY-STEEL POST
Sta. 154+00 Lt 1 EA
Sta. 154+00 Rt 1 EA

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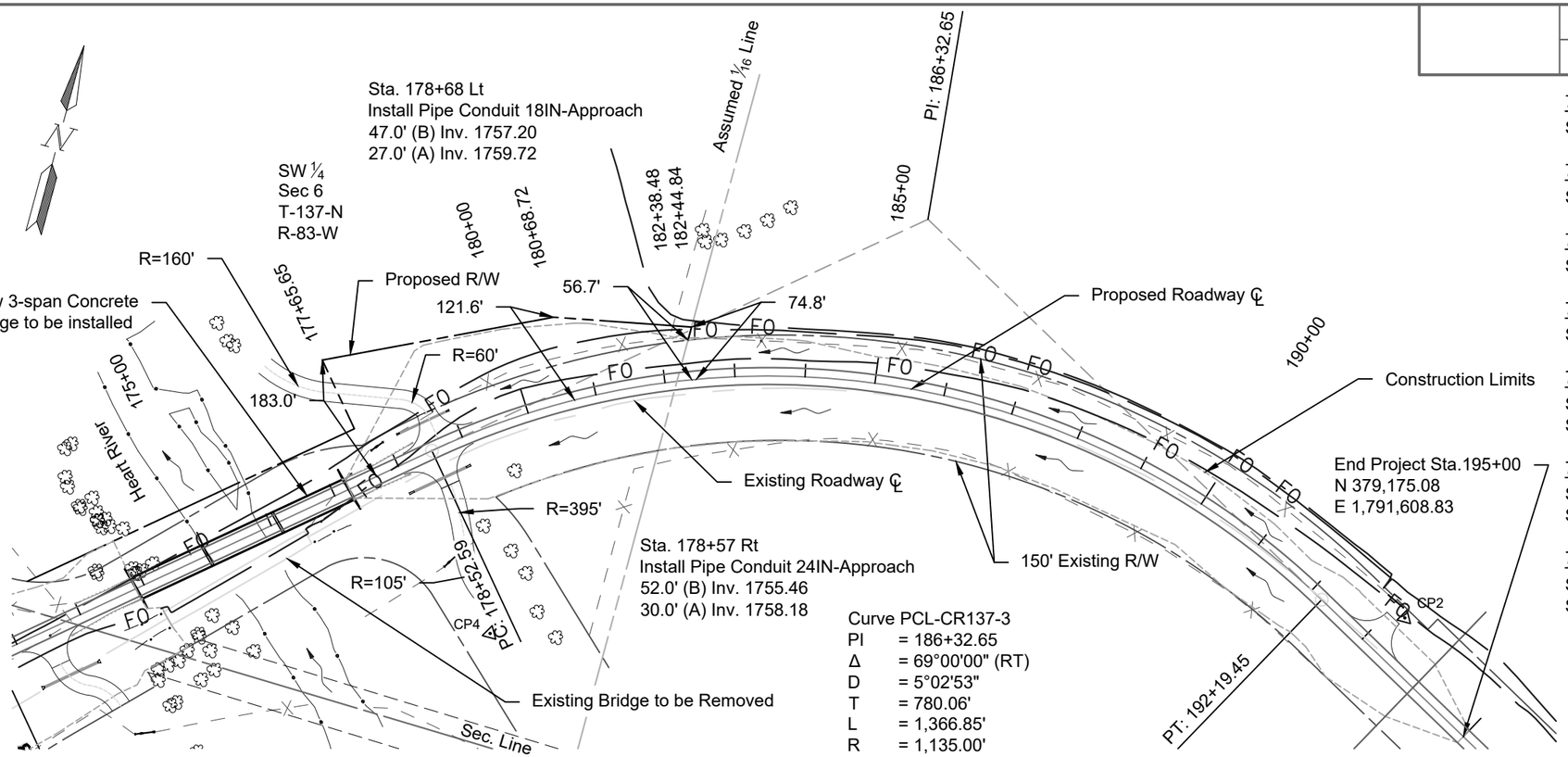
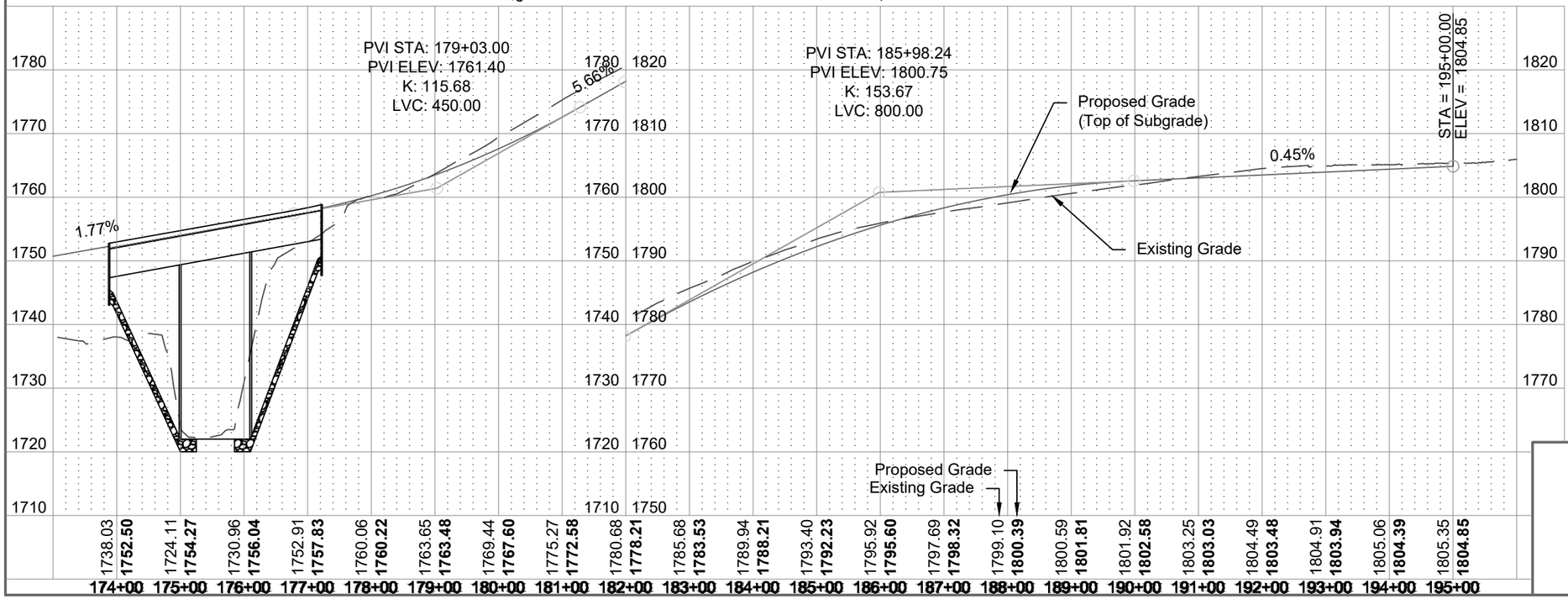
Plan & Profile
Sta. 154+00 to Sta. 174+00
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	60	2





714 4099 PIPE CONDUIT 18IN-APPROACH
Sta. 178+68 Lt 74 LF

714 4106 PIPE CONDUIT 24IN-APPROACH
Sta. 178+57 Rt 82 LF

752 0110 FENCE BARBED WIRE 3 STRAND-STEEL POST
Sta. 174+00 Lt to Sta. 195+00 Lt 1,810 LF

752 0320 FENCE BARBED WIRE 4 STRAND-STEEL POST
Sta. 174+00 Rt to Sta. 195+00 Rt 300 LF

752 0993 FENCE TERMINAL
Sta. 177+23 Lt 1 EA
Sta. 177+23 Rt 1 EA

752 2100 VEHICLE GATE
Sta. 178+57 Lt 1 EA
Sta. 178+57 Rt 1 EA

752 3996 DOUBLE BRACE ASSEMBLY-STEEL POST
Sta. 185+80 Lt 1 EA
Sta. 185+80 Rt 1 EA

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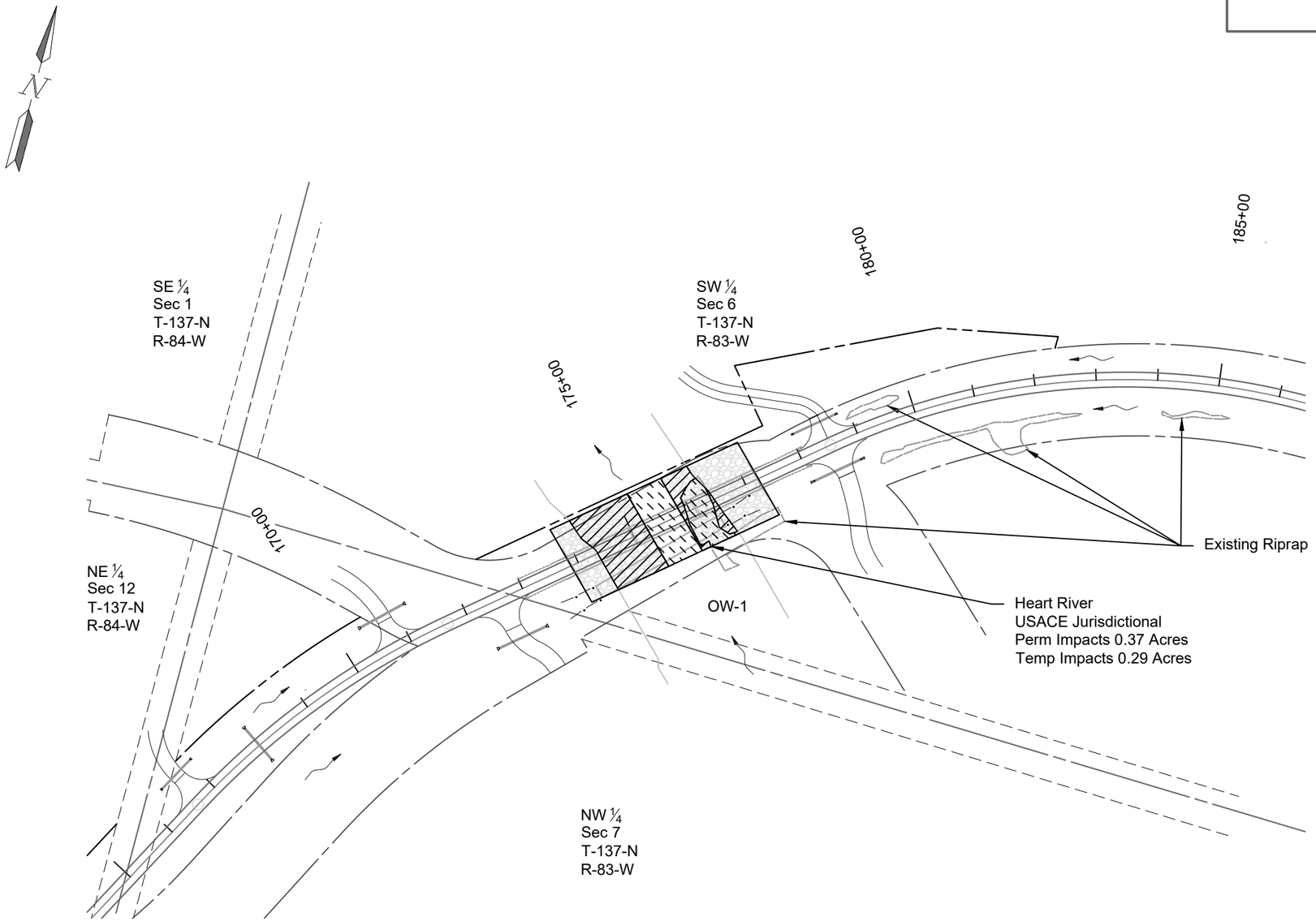
Plan & Profile
Sta. 174+00 to Sta. 195+00
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	75	1



Other Waters Impact Table

Number	Location	Type	Feature	USACE Jurisdictional[1]	Impacts to Other Waters: Acres: Temp.	Acres: Perm. (Fill/Drain)	Acres: Perm. (Cut)	Linear Feet: Temp.	Linear Feet: Perm. (Fill/Drain)	Linear Feet: Perm. (Cut)	Other Water Mitigation: Mitigation Proposed: EO 11990	Mitigation Proposed: USACE	Mitigation Proposed: USFWS	USACE Mitigation Bank: Location	USACE Mitigation Bank: Acre(s)	Onsite Mitigaiton Method: Mitigation Location; ratio	Onsite Mitigaiton Method: Acre(s)	Onsite Constructed Location: Onsite Constructed Site #	Onsite Constructed Location: Onsite Constructed Size Acre(s)
OW-1	Sec 6, T-137-N R-83-W	Perennial Stream	Natural	Yes	0.290	0.370	0.000	136.000	136.000	0.000	Y	Y	N	-	-	-	-	-	-
				Totals	**0.290**	**0.370**	**0.000**	**136.000**	**136.000**	**0.000**					**0.000**		**0.000**		**0.000**

[1] A wetland Jurisdictional Determination was issued by the USACE on 3/7/2023; NWO-2009-02245-BIS.

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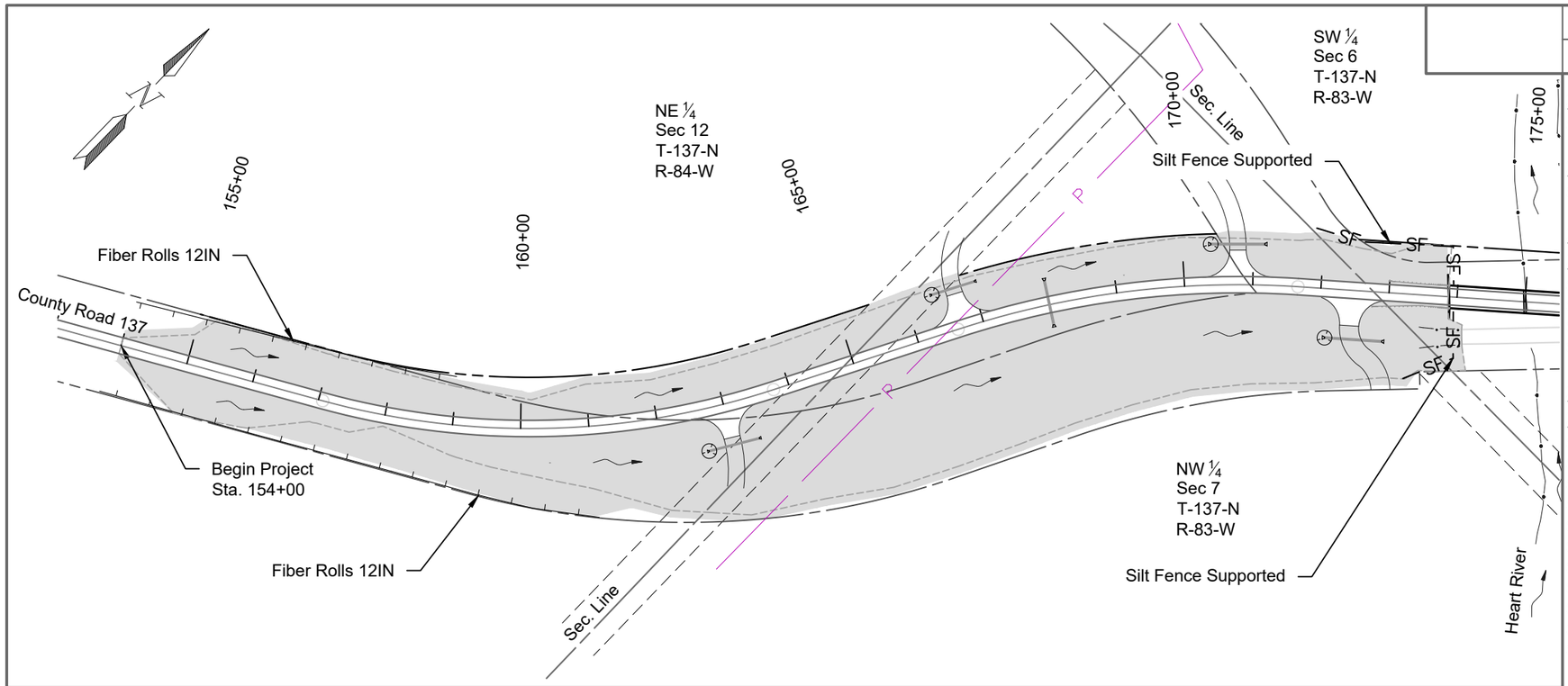
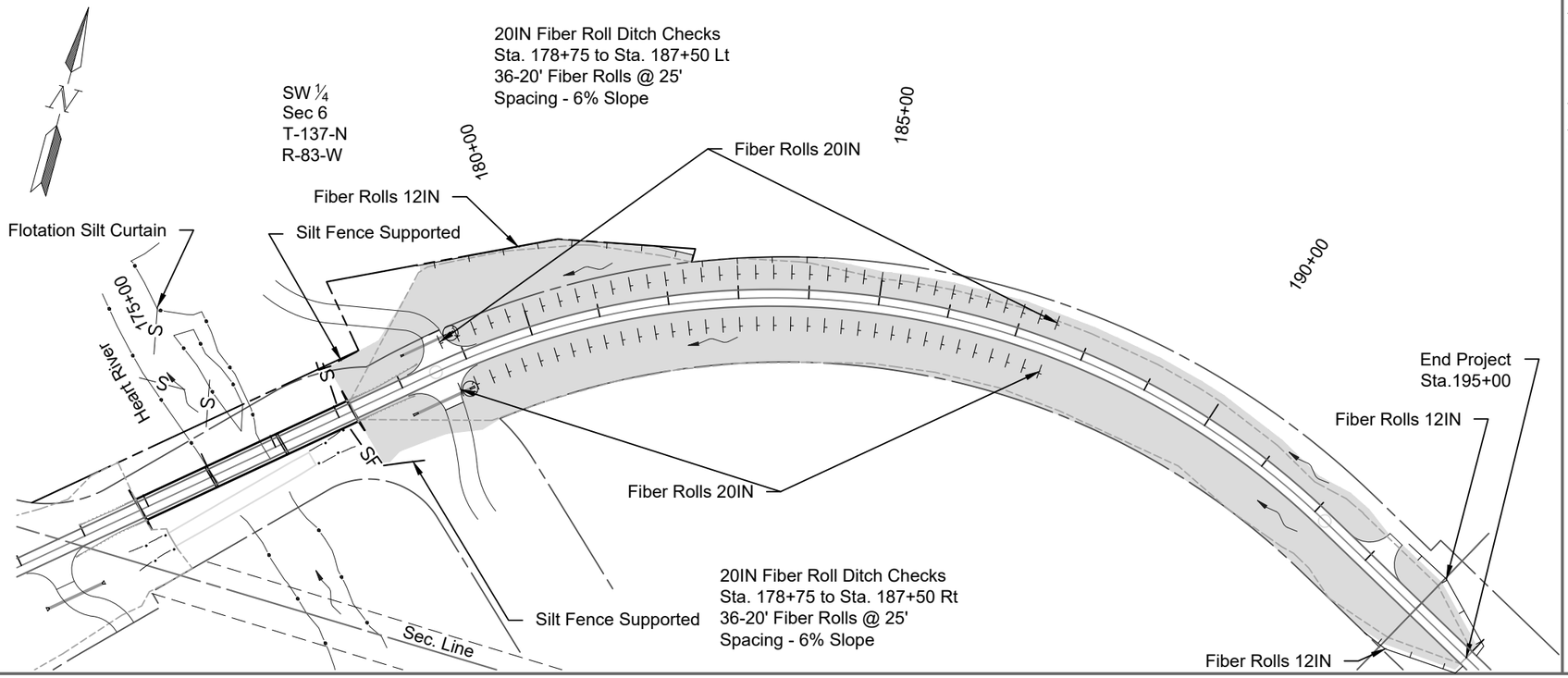
Wetland Impacts

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND





STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	76	1

251 2000 TEMPORARY COVER CROP

Sta. 154+00 to Sta. 195+00	13.00 Acre

253 0101 STRAW MULCH

Sta. 154+00 to Sta. 195+00	13.00 Acre

260 0200 SILT FENCE SUPPORTED &
260 0201 REMOVE SILT FENCE SUPPORTED

Sta. 173+00 Lt	260 LF
Sta. 174+00 Rt	150 LF
Sta. 177+50 Lt	110 LF
Sta. 177+50 Rt	140 LF

261 0112 FIBER ROLLS 12IN &
261 0113 REMOVE FIBER ROLLS 12IN

Sta. 154+00 to Sta. 159+00 Lt	480 LF
Sta. 154+00 to Sta. 161+00 Rt	760 LF
Sta. 162+65 Rt	20 LF
Sta. 166+40 Lt	20 LF
Sta. 170+40 Lt	20 LF
Sta. 172+08 Rt	20 LF
Sta. 178+87 Rt	20 LF
Sta. 178+95 Lt	20 LF
Sta. 178+50 to Sta. 184+00 Lt	600 LF
Sta. 193+00 to Sta. 195+00 Lt	200 LF
Sta. 193+50 to Sta. 195+00 Rt	160 LF

261 0120 FIBER ROLLS 20IN &
261 0121 REMOVE FIBER ROLLS 20IN

Sta. 178+75 to Sta. 187+50 Lt	720 LF
Sta. 178+75 to Sta. 187+50 Rt	720 LF

262 0100 FLOTATION SILT CURTAIN &
262 0101 REMOVE FLOTATION SILT CURTAIN

Sta. 175+00 Lt	210 LF

SAUBER ENGINEERING

LEGEND

- — SF — Silt Fence Supported
- Fiber Rolls 12IN
- — S — Flotation Silt Curtain
- Temporary Cover Crop & Straw Mulch

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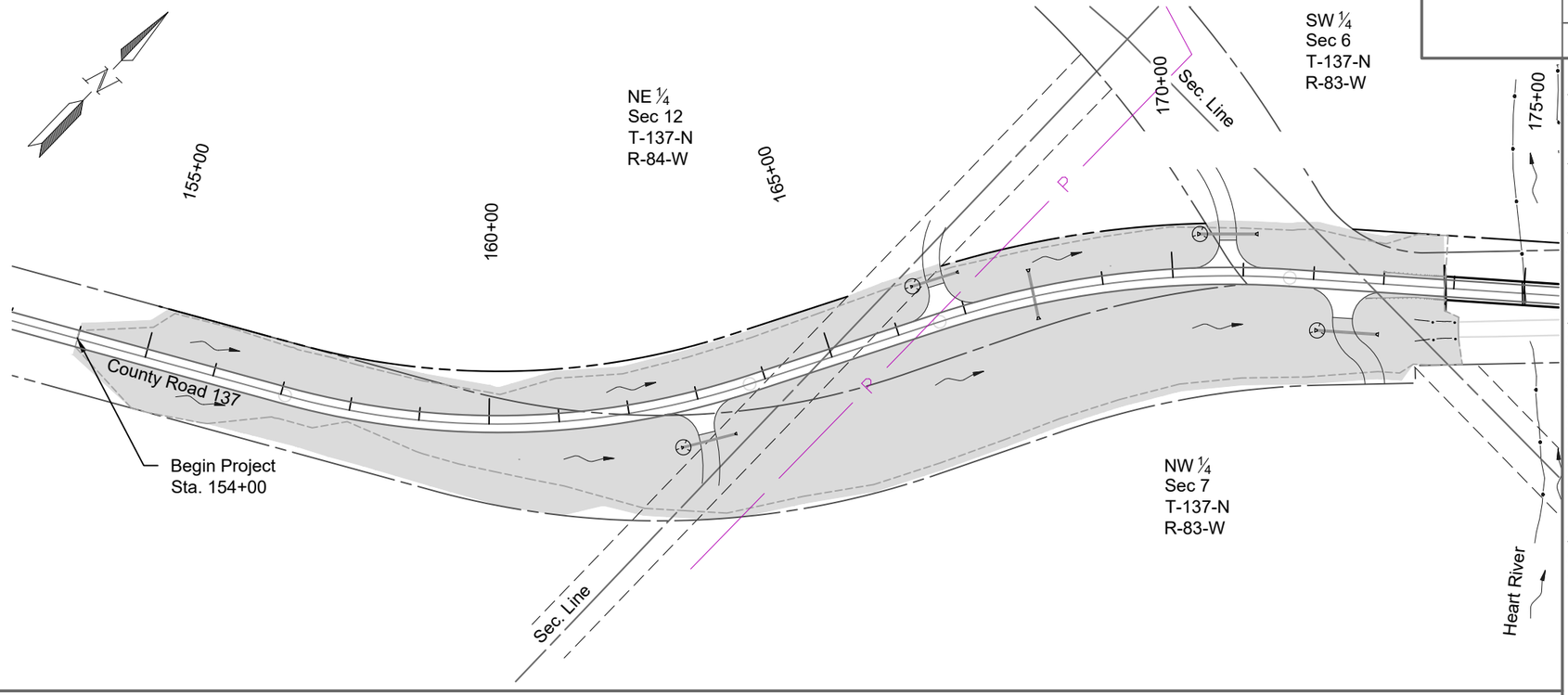
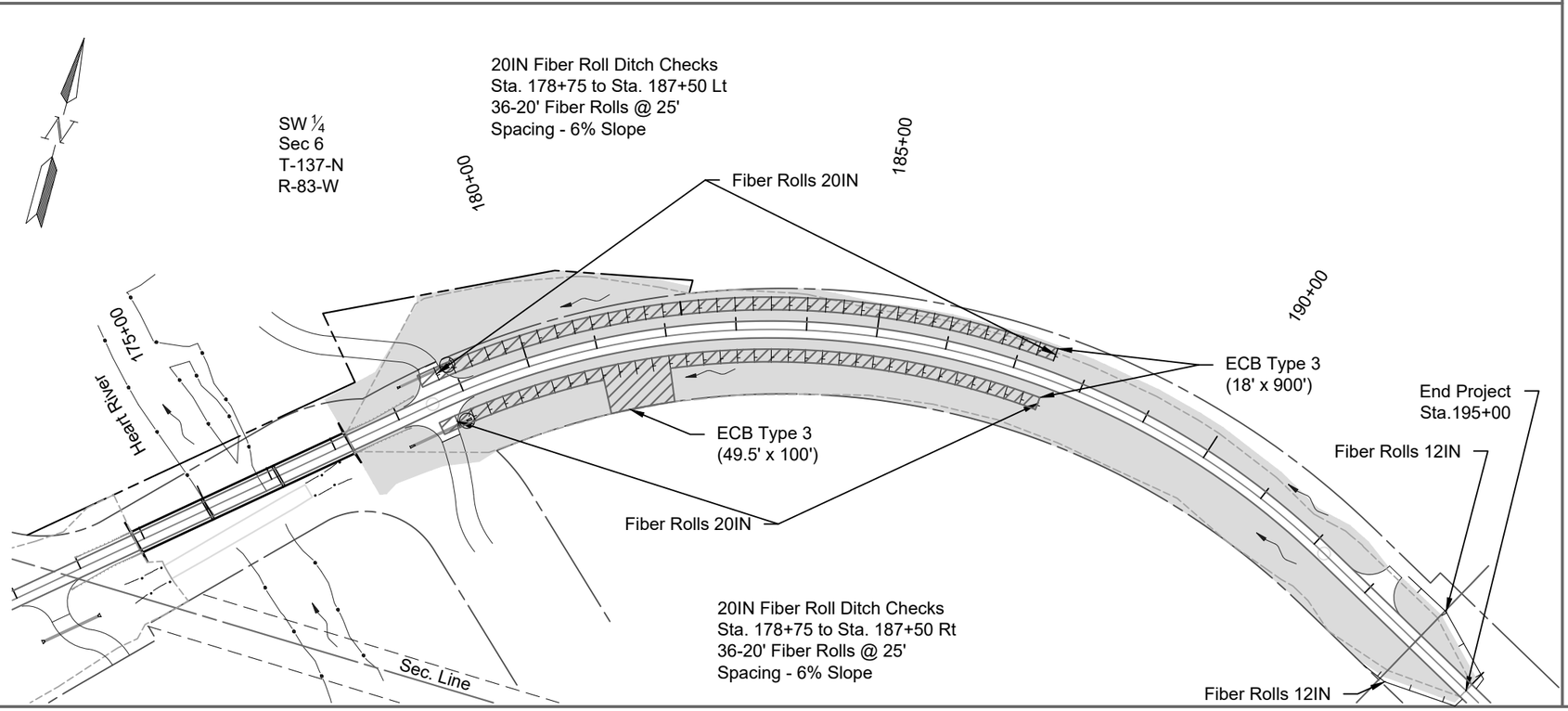
Temporary Erosion Control

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND





STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	77	1

251 0200 SEEDING CLASS II	
Sta. 154+00 to Sta. 195+00	13.00 Acre
253 0101 STRAW MULCH	
Sta. 154+00 to Sta. 195+00	13.00 Acre
255 0103 ECB TYPE 3	
Sta. 178+50 to Sta. 187+50 Lt	1800 SY
Sta. 178+50 to Sta. 187+50 Rt	2350 SY
261 0112 FIBER ROLLS 12IN	
Sta. 162+65 Rt	20 LF
Sta. 166+40 Lt	20 LF
Sta. 170+40 Lt	20 LF
Sta. 172+08 Rt	20 LF
Sta. 178+87 Rt	20 LF
Sta. 178+95 Lt	20 LF
Sta. 193+00 to Sta. 195+00 Lt	200 LF
Sta. 193+50 to Sta. 195+00 Rt	160 LF
261 0120 FIBER ROLLS 20IN	
Sta. 178+75 to Sta. 187+50 Lt	720 LF
Sta. 178+75 to Sta. 187+50 Rt	720 LF

LEGEND

- Fiber Rolls 12IN & 20IN
- Seeding Class II & Straw Mulch
- ECB Type 3

SAUBER ENGINEERING

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Permanent Erosion Control

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - COUNTY ROAD 137

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	81	1

HORIZONTAL ALIGNMENT

PNT	STATION	NORTHING	EASTING
PI	154+00.00	377,485.11	1,788,375.85
PC	157+06.17	377,631.72	1,788,644.64
PI	160+51.26	377,796.97	1,788,947.59
PT	163+76.68	378,101.70	1,789,109.51
PC	166+61.11	378,352.88	1,789,242.97
PI	169+16.77	378,578.65	1,789,362.93
PT	171+66.18	378,743.30	1,789,558.51
PC	178+52.59	379,185.38	1,790,083.62
PI	186+32.65	379,687.76	1,790,680.36
PT	192+19.45	379,310.69	1,791,363.24
PI	195+00.00	379,175.08	1,791,608.83

CURVE DATA

ARC DEFINITION
Curve PCL-CR137-1
PI Sta = 160+51.26
Delta = 33°24'23" (LT)
Da = 4°58'56"
R = 1,150.00'
T = 345.09'
L = 670.51'
Curve PCL-CR137-2
PI Sta = 169+16.77
Delta = 21°55'23" (RT)
Da = 4°20'26"
R = 1,320.00'
T = 255.66'
L = 505.07'
Curve PCL-CR137-3
PI Sta = 186+32.65
Delta = 69°00'00" (RT)
Da = 5°02'53"
R = 1,135.00'
T = 780.06'
L = 1,366.85'

US PUBLIC LAND SURVEY DATA

DESC.	SEC-TWP-RGE	NORTHING	EASTING
NW Sec Cor	12-137-84	378,567.20	1,783,924.82
N Qtr Cor	12-137-84	378,693.08	1,786,557.36
NE Sec Cor	12-137-84	378,827.78	1,789,156.66
E Qtr Cor	12-137-84	376,204.57	1,789,170.32
N Qtr Cor	7-137-83	378,760.81	1,791,681.66
NE Sec Cor	7-137-83	378,767.12	1,794,310.54

SURVEY CONTROL POINTS

PNT	NORTHING	EASTING	ELEV	STATION	OFFSET
CP1	377,184.71	1,787,327.71	1829.24	142+63	76.5' Lt
CP2	379,316.54	1,791,484.29	1804.09	193+23	63.6' Lt
CP3	378,631.98	1,789,892.75	1742.03	173+50	300.4' Rt
CP4	378,961.30	1,790,239.87	1773.82	178+28	272.0' Rt

NOTES:

Date Survey Completed: 7/26/22

☐ Assumed Coordinates

☒ All coordinates on this sheet are Morton County ground coordinates. They are derived from the "North Dakota Coordinate System of 1983", NAD83 (2011), South Zone Combination Factor (cf) = 1.0001515230

All coordinates and measurements on this document derived from the International Foot definition.

INITIALIZING BENCH MARK

☒ NAVD-88

☐ _____

☐ GEOID12B ☐ _____

☐ GEOID18

SAUBER ENGINEERING

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	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**	**2**	**28**	**56**
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	
G20-4b-36	36"x30"	WAIT FOR PILOT CAR		18	
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**	**2**	**59**	**118**
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)		11	
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**	**6**	**32**	**192**
R1-2-60	60"x60"	YIELD		29	
R1-50P-24	**24"x24"**	**TAKE TURNS (Mounted on stop sign post)**	**2**	**11**	**22**
R2-1-36	36"x48"	SPEED LIMIT __ (Portable only)		30	
R2-1-48	**48"x60"**	**SPEED LIMIT __**	**2**	**39**	**78**
R2-1aP-24	**24"x18"**	**MINIMUM FEE $80 (Mounted on Speed Limit post)**	**2**	**10**	**20**
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		35	
W1-4b-48	48"x48"	TWO LANE REVERSE CURVE RIGHT or LEFT		35	
W1-6-48	48"x24"	ONE DIRECTION LARGE ARROW		26	
W3-1-48	**48"x48"**	**STOP AHEAD**	**2**	**35**	**70**
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**	**2**	**35**	**70**
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		35	
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**	**2**	**35**	**70**
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)		14	
W14-3-64	64"x48"	NO PASSING ZONE		28	
W16-2P-30	**30"x24"**	**__ FEET PLAQUE (Mounted on warning sign post)**	**3**	**10**	**30**
W20-1-48	48"x48"	ROAD WORK AHEAD or _FT or _ MILE		35	
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**	**3**	**35**	**105**
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	

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
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		35	
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	
W24-1-48	48"x48"	DOUBLE REVERSE CURVE		35	

SPECIAL SIGNS

SPEC & CODE			
704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS**	**1127**

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	**FLAGGING**	**MHR**	**1200**
704-1048	PORTABLE RUMBLE STRIPS	EACH	
704-1050	TYPE I BARRICADES	EACH	
704-1052	**TYPE III BARRICADES**	**EACH**	**8**
704-1060	**DELINEATOR DRUMS**	**EACH**	**11**
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**	**40**
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/

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Traffic Control Devices List

Bridge Replacement

Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	100	2

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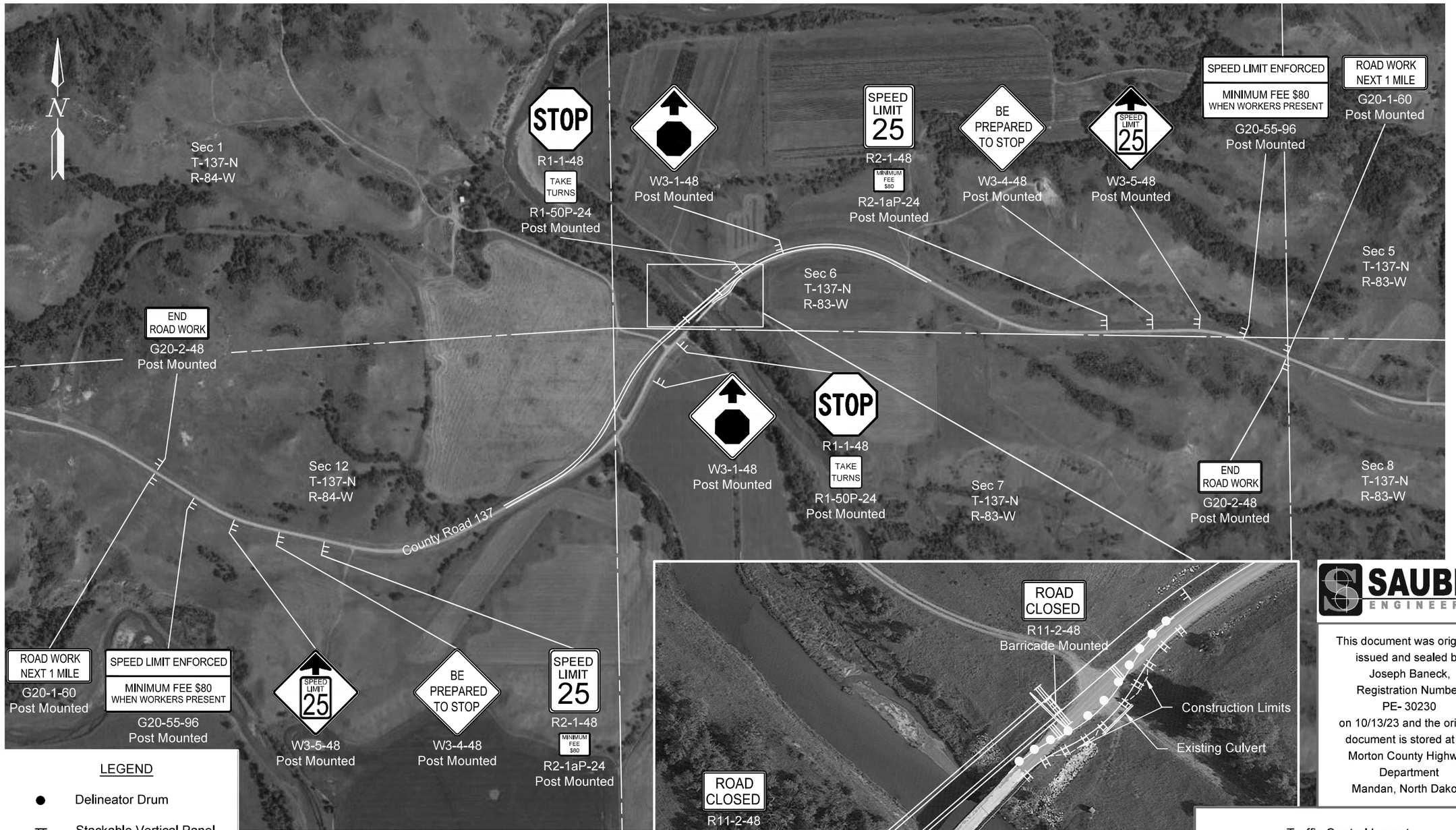
Traffic Control Layout

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	100	3



LEGEND

- ● Delineator Drum
- Stackable Vertical Panel Back to Back
- Highway Sign
- Type 3 Barricade

Note:
Once the new bridge is open to the traveling public, move Type 3 Barricade and R11-2-48 signs to the existing structure.

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Traffic Control Layout

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	110	1

Station / RP	Sign No.	Assembly No.	Flat Sheet for signs IV SF	Flat Sheet for signs XI SF	Sign Support Legnth 1st LF	2nd LF	3rd LF	4th LF	Verticle Clearance FT	Support Size	Max Post Length LF	Sleeve Length 1st LF	2nd LF	3rd LF	4th LF	Sleeve Size	Anchor Ea.	Anchor LF	Anchor Size	Reset Sign Panel EA	Reset Sign Support EA	Break-Away EA	Comments
157+00 Rt	W1-4L-30	19		6.3	12.1				5.0	2.5 x 2.5 12 ga	14.5						1	4	3 x 3 7 ga				
172+00 Lt	W1-4L-30	19		6.3	12.1				5.0	2.5 x 2.5 12 ga	14.5						1	4	3 x 3 7 ga				
177+40 Rt	W1-2R-30	19		6.3	12.1				5.0	2.5 x 2.5 12 ga	14.5						1	4	3 x 3 7 ga				
194+50 Lt	W1-2L-30	19		6.3	12.1				5.0	2.5 x 2.5 12 ga	14.5						1	4	3 x 3 7 ga				
Sub total			0.0	25.2		Total	48.4										Total	16.0		0	0	0	
Grand Total			0.0	25.2		Total	48.4										Total	16.0		0	0	0	

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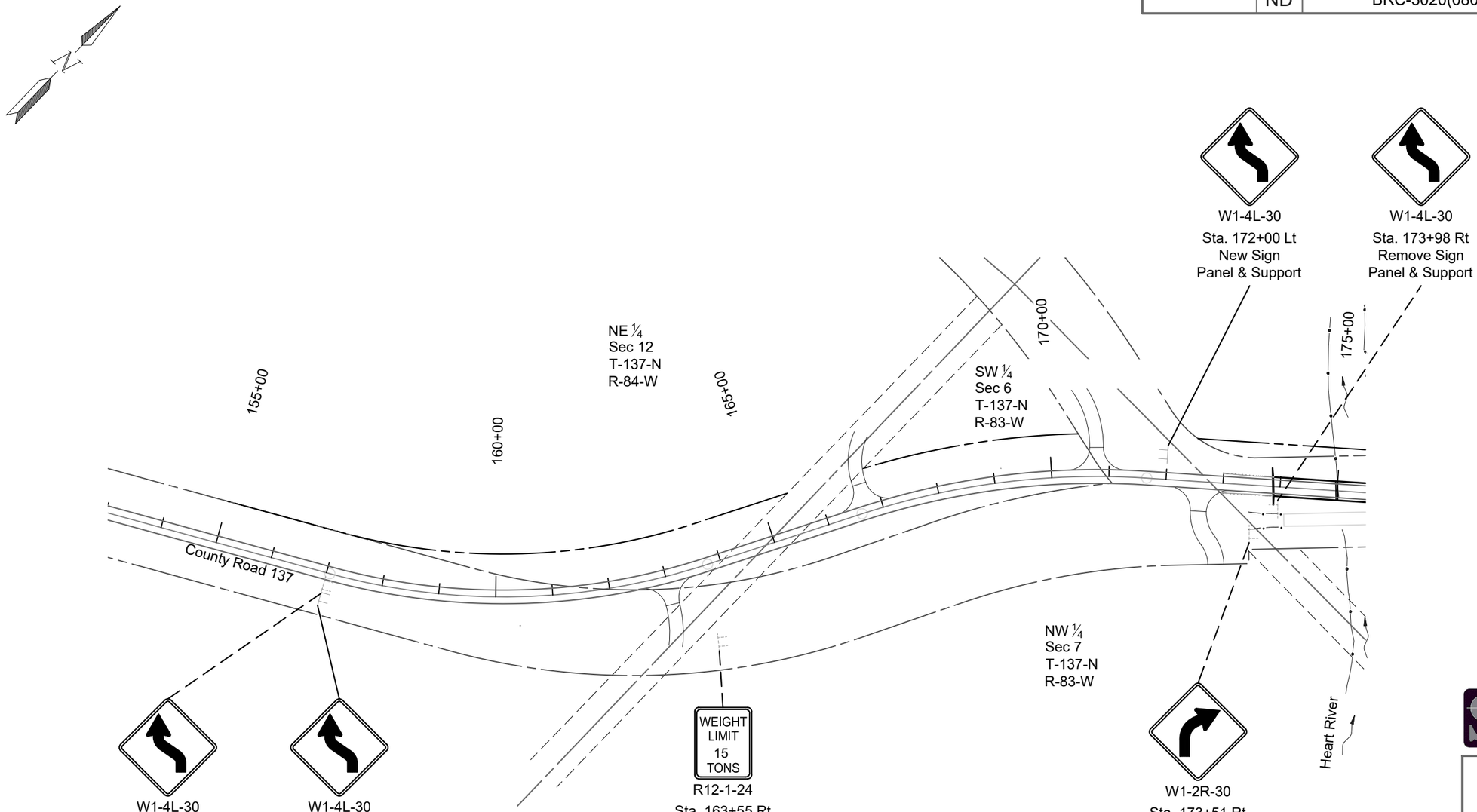
Sign Summary

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	110	2



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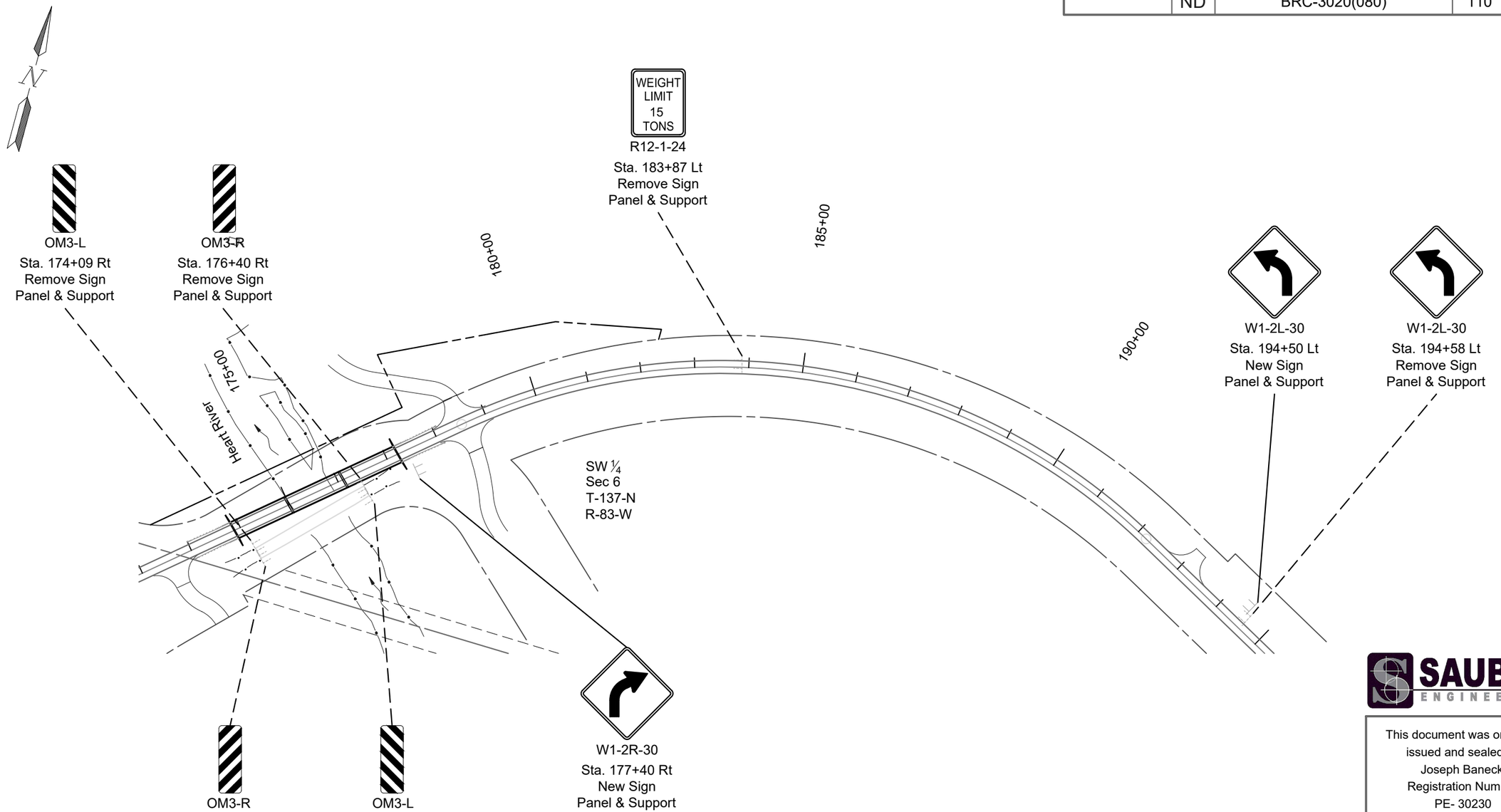
Permanent Signs

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	110	3



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Permanent Signs

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

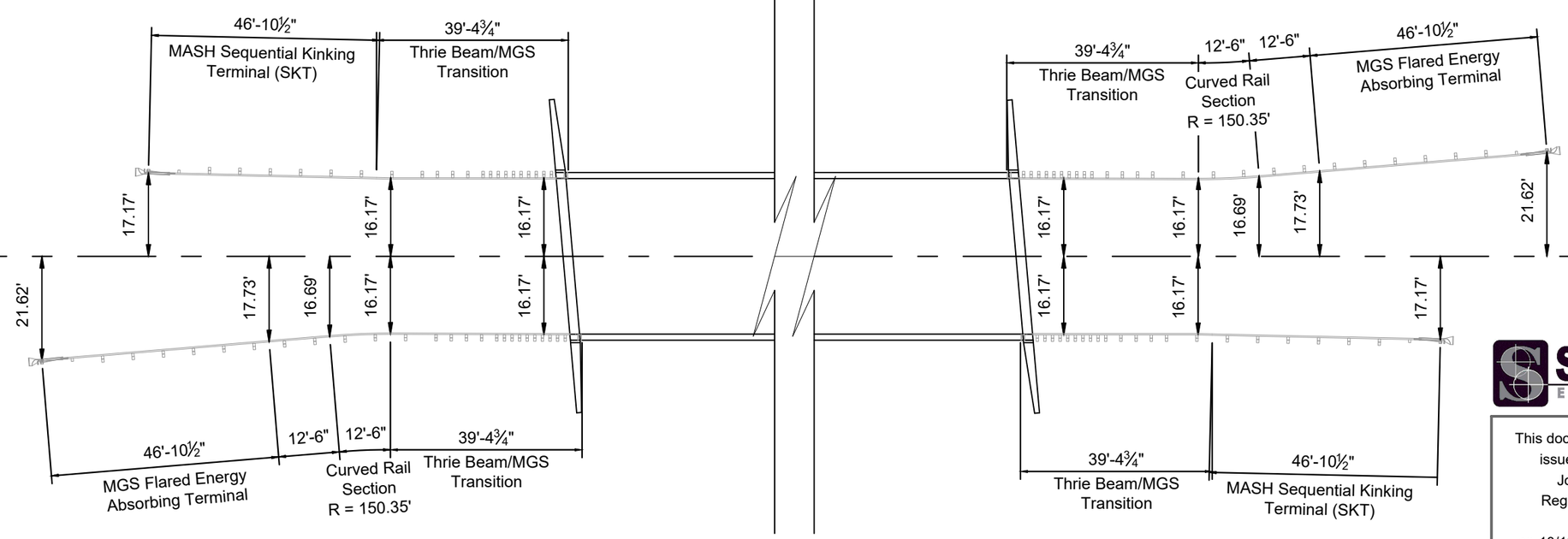
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	130	1

764 0131 W-BEAM GUARDRAIL

Sta. 173+27 to Sta. 173+91 Rt	64.4 LF
Sta. 173+49 to Sta. 173+88 Lt	39.4 LF
Sta. 177+19 to Sta. 177+83 Lt	64.4 LF
Sta. 177+22 to Sta. 177+61 Rt	39.4 LF

764 0145 W-BEAM GUARDRAIL END TERMINAL

Sta. 173+02 to Sta. 173+49 Lt	1 EA
Sta. 173+05 to Sta. 173+52 Rt	1 EA
Sta. 177+58 to Sta. 178+05 Lt	1 EA
Sta. 177+61 to Sta. 178+08 Rt	1 EA



Notes:
1. Refer to Standard Drawing D-764-60 for MGS W-Beam Transition with Approach Curb to Concrete Single Slope or Jersey Barrier.
   Note: This project will use Connection to Concrete Single Slope Bridge Rail and Traffic Barriers.
2. Refer to Standard Drawing D-764-48 - Non-Flared Guardrail with Tangent End Terminal for grading under proposed guardrail.
   Note: No 2" HMA Pavement is used on this project.
3. Refer to Standard Drawing D-764-38 for MGS Flared Energy Absorbing Terminal - Wood Post.
4. Refer to Standard Drawing D-764-51 for MASH Sequential Kinking Terminal - Wood Post.
5. All offsets are to the back face of the rail elements.

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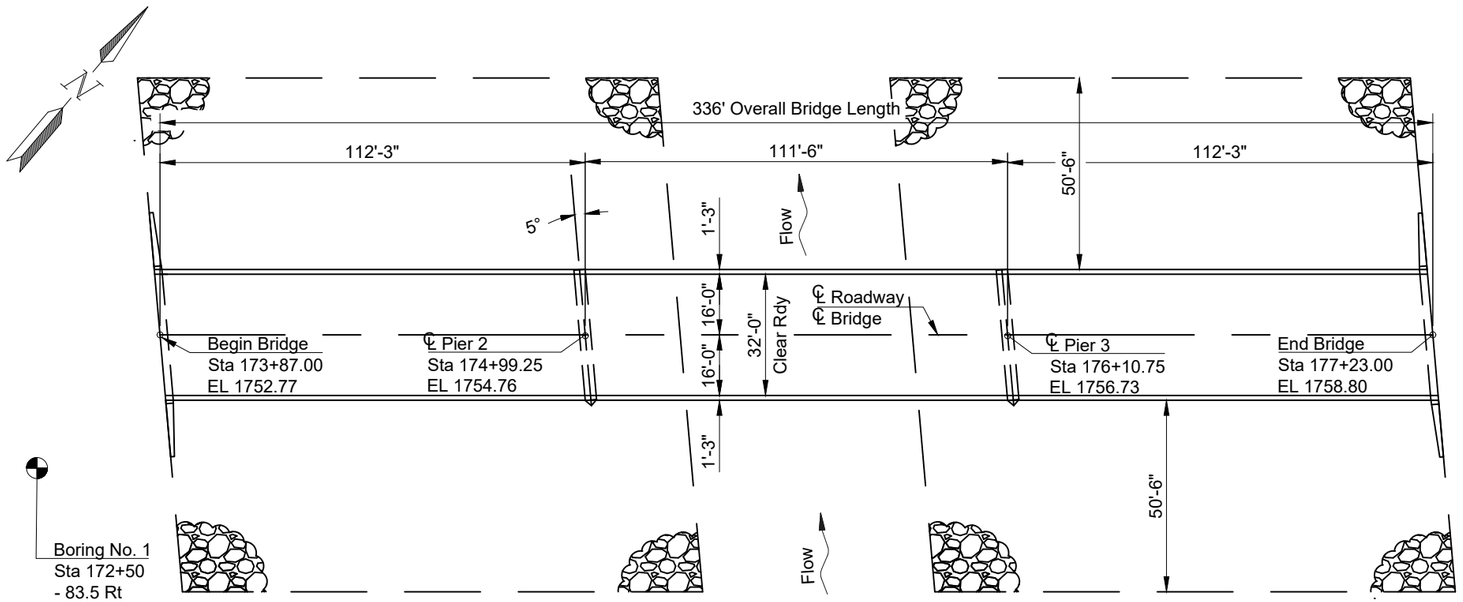
Thrie/MGS W-Beam Guardrail Layout

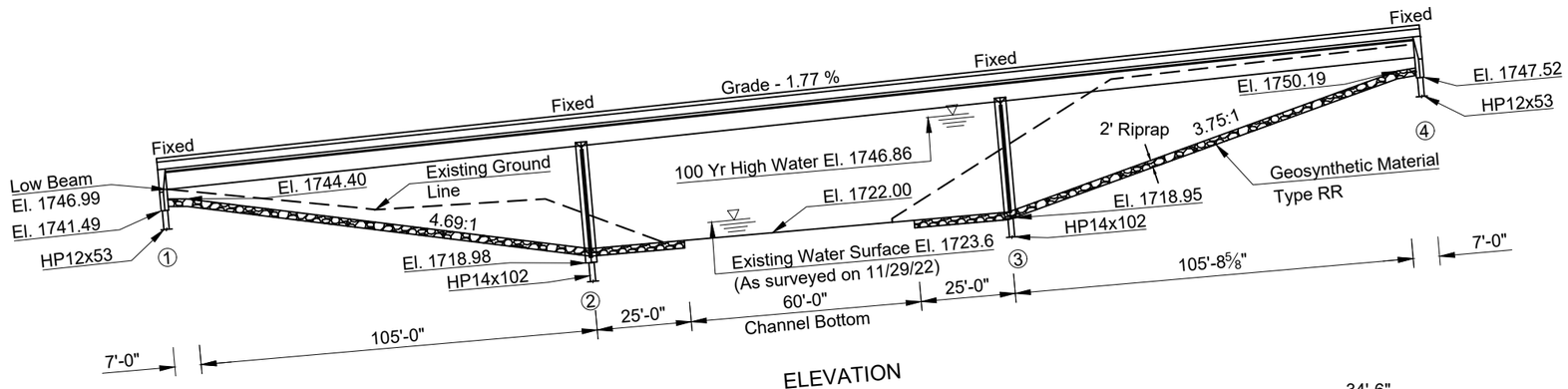
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	1



PLAN



ELEVATION

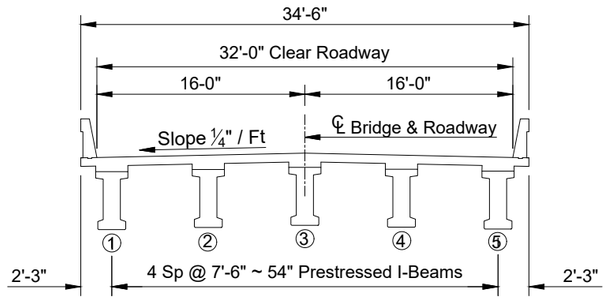
HYDRAULIC DATA:

Drainage Area	2930	sq mi
Design Frequency	25	yr
Design Discharge	24,100	cfs
Design Stage (upstream)	1743.81	ft
Stream Gradient	0.0003	ft/ft
Waterway Provided Below Design Stage	4264	sq ft
Waterway Provided Below Clearance Elevation	6172.5	sq ft
Average Velocity of Flow in Natural Channel	5	fps
Depth of Flow	21.4	ft
Velocity of Flow Under Bridge	5.6	fps
100-Year Frequency Discharge	39,500	cfs
100-Year Frequency Stage	1746.86	ft
Overtopping Stage	1745.6	ft
Overtopping Discharge	39,300	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
HL-93 Design Load
F.W.S 15 psf



TYPICAL SECTION

SURVEY CONTROL POINTS			
POINT	NORTHING	EASTING	ELEVATION
CP1	377,184.71	1,787,327.71	1829.24
CP2	379,316.54	1,791,484.29	1804.09
CP3	378,631.98	1,789,892.75	1742.03
CP4	378,961.30	1,790,239.87	1773.82

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Bridge Layout

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	170	2

NOTES

100 SCOPE OF WORK: This project consists of building a new 3-span prestressed concrete I-beam bridge with an overall bridge length of 336’-0” and a clear roadway width of 32’-0”.

100 GENERAL: Include the cost of furnishing and placing preformed expansion joint filler, concrete inserts, rebar couplers, silicone sealant, waterproof membrane, and other miscellaneous items in the bid price for Class AE-3 and AAE-3 concrete.

107 HAZARDOUS MATERIAL: The existing structural steel is painted with lead-based paint. Remove and dispose of any loose and peeling paint found on the existing structural steel according to the North Dakota Department of Health’s management of lead-based paint debris.

202 REMOVAL OF STRUCTURE: The existing structure is a 3-span steel girder Bridge with a cast-in-place concrete deck, 231'-6" long with a clear roadway width of 22'-4", and concrete substructures. Existing bridge piling will be cut off a minimum of 1 foot below the bottom of the channel excavation. Include all work required to remove the bridge in the contract unit price for “Removal of Structure.”

210 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”. All other excavation required to shape the new channel shall be included in the lump sum bid item “Channel Excavation”. There is an estimated quantity of 6,000 CY of Channel Excavation.

Any unsuitable channel excavation material shall be disposed of off the right-of-way at a site selected by the contractor and approved by the Engineer. Disposal in wetland areas will not be approved. All costs for hauling and disposing of unsuitable or excess channel excavation shall be included in the price bid for “Channel Excavation”.

256 RIPRAP: Remove and replace existing riprap. Do not use broken concrete for riprap.

602 DIAPHRAGMS AND ENDWALLS: Place intermediate diaphragm concrete before the deck concrete and allow the diaphragms to cure at least 72 hours before deck placement. Place the pier diaphragm and endwall concrete at the same time as the deck concrete.

Maintain plan beam spacing and alignment at all piers diaphragms, intermediate diaphragms, and endwalls.

602 DECK CONRETE: Beams have slight variations in the anticipated camber. To build the deck to the designated thickness will require slight adjustments in deck elevation and/or riser dimensions. These adjustments result in minor concrete quantity discrepancies. The Contractor shall consider this quantity discrepancy when he bids the unit price for Class AAE-3 concrete. The county will pay plan quantity of Class AAE-3.

Place the Concrete Deck uphill from station 173+87 to station 177+23.

612 REINFORCING STEEL: All reinforcing shall be Grade 60. All dimensions for bars are out to out. An “E” following the initial letter in the bar callout indicates an epoxy coated bar. Verify the quantity, size, and shape of the bar reinforcement against the structure drawings and immediately notify the Engineer of any discrepancies. Discrepancies in the bar list will not be cause for adjustment of the contract unit price.

622 PILING: Drive piling with a diesel hammer with an operational energy of at least 140,756 foot-pound-tons (minimum ram weight of 6,000 pounds) computed by the formula:

$W(E–30,800) + 0.914E$

W = Weight of the ram (tons)
E = Rated hammer energy

Run the hammer at an energy that produces a penetration at bearing between ½” and 3 inches in the last 10 blows.

604 PRESTRESSED I-BEAM – 54IN: The contractor will submit shop drawings for review to the Engineer before fabrication of the prestressed concrete beams. The beams may not be incorporated into the structure until the shop drawings are reviewed and accepted.

Prestressed I-beams will not be cast any earlier than 90 days before the deck is placed, nor later than 30 days prior.

616 STRUCTURAL STEEL: Use ASTM A36 structural steel.

Provide shop drawings for the ice nose to the Engineer for review.

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	3

		Dead Load Deflection Only		Screed El. Girder 1	Screed El. Girder 2	Screed El. Girder 3	Screed El. Girder 4	Screed El. Girder 5
Begin Bridge								
	1'-3"	0.000		1752.48	1752.63	1752.77	1752.60	1752.43
End of Beam								
Abut 1		0.000		1752.48	1752.63	1752.77	1752.60	1752.43
		0.052		1752.73	1752.88	1753.02	1752.85	1752.69
		0.098		1752.98	1753.12	1753.27	1753.10	1752.93
		0.134		1753.21	1753.36	1753.50	1753.33	1753.17
		0.157		1753.43	1753.58	1753.72	1753.56	1753.39
		0.165		1753.64	1753.79	1753.93	1753.76	1753.59
		0.157		1753.83	1753.98	1754.12	1753.95	1753.79
		0.134		1754.01	1754.15	1754.30	1754.13	1753.96
		0.098		1754.17	1754.32	1754.46	1754.29	1754.12
		0.052		1754.32	1754.47	1754.61	1754.44	1754.28
End of Beam	10 Eq Sp = 110'-6"	0.000		1754.47	1754.62	1754.76	1754.59	1754.42
Pier 2								
	1'-0"	0.000		1754.47	1754.62	1754.76	1754.59	1754.42
End of Beam								
Pier 2		0.000		1754.47	1754.62	1754.76	1754.59	1754.42
		0.052		1754.72	1754.86	1755.01	1754.84	1754.67
		0.098		1754.96	1755.11	1755.25	1755.08	1754.92
		0.134		1755.20	1755.34	1755.49	1755.32	1755.15
		0.157		1755.42	1755.56	1755.71	1755.54	1755.37
		0.165		1755.62	1755.77	1755.91	1755.74	1755.57
		0.157		1755.81	1755.95	1756.10	1755.93	1755.76
		0.134		1755.98	1756.13	1756.27	1756.11	1755.94
		0.098		1756.14	1756.29	1756.43	1756.27	1756.10
		0.052		1756.30	1756.44	1756.58	1756.42	1756.25
End of Beam	10 Eq Sp = 110'-6"	0.000		1756.44	1756.59	1756.73	1756.56	1756.39
Pier 3								
	1'-0"	0.000		1756.44	1756.59	1756.73	1756.56	1756.39
End of Beam								
Pier 3		0.000		1756.44	1756.59	1756.73	1756.56	1756.39
		0.052		1756.69	1756.84	1756.98	1756.81	1756.64
		0.098		1756.94	1757.08	1757.23	1757.06	1756.89
		0.134		1757.17	1757.32	1757.46	1757.29	1757.12
		0.157		1757.39	1757.54	1757.68	1757.51	1757.35
		0.165		1757.60	1757.74	1757.89	1757.72	1757.55
		0.157		1757.79	1757.93	1758.08	1757.91	1757.74
		0.136		1757.97	1758.12	1758.26	1758.09	1757.93
		0.099		1758.15	1758.30	1758.44	1758.27	1758.11
		0.054		1758.33	1758.48	1758.62	1758.45	1758.29
End of Beam	10 Eq Sp = 110'-6"	0.000		1758.51	1758.66	1758.80	1758.63	1758.46
Abut 4								
End Bridge	1'-3"	0.000		1758.51	1758.66	1758.80	1758.63	1758.46

SCREED ELEVATIONS

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	0300	RIPRAP GRADE III	CY	1,757
256	0701	REMOVE AND REPLACE RIPRAP	CY	1,000
602	0130	CLASS AAE-3 CONCRETE	CY	457
602	1130	CLASS AE-3 CONCRETE	CY	302.2
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	1,195
604	9915	PRESTRESSED I-BEAM-54IN	LF	1,657.5
612	0115	REINFORCING STEEL-GRADE 60	LBS	22,728
612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS	101,808
616	0364	STRUCTURAL STEEL M270-GRADE 36	LBS	2,252
622	0010	STEEL H-PILE TIPS HP 14 X 102	EA	14
622	0014	STEEL H-PILING POINTS 12 X 53	EA	12
622	0040	STEEL PILING HP 12 X 53	LF	900
622	0070	STEEL PILING HP 14 X 102	LF	980
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	4,136
930	3000	BRIDGE BENCH MARKS	SET	1

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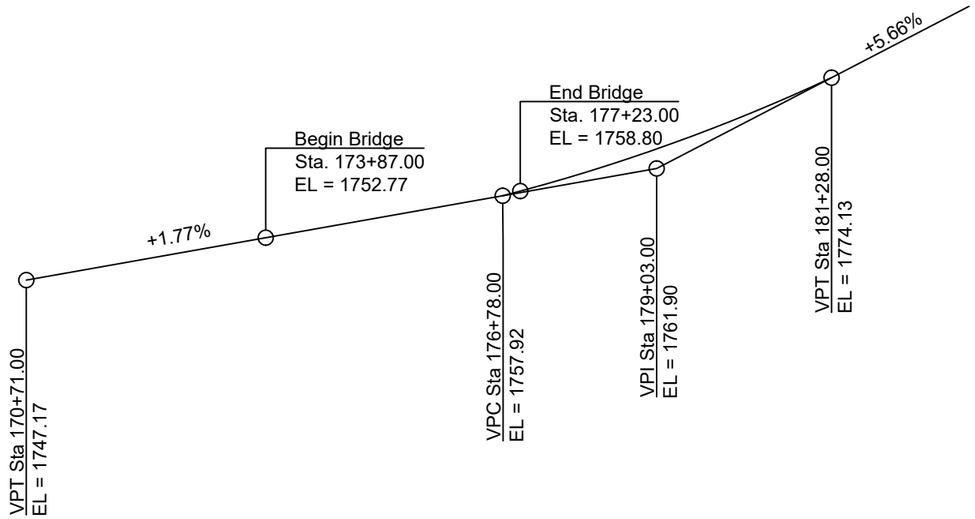
Screed Elevations & Bid Items

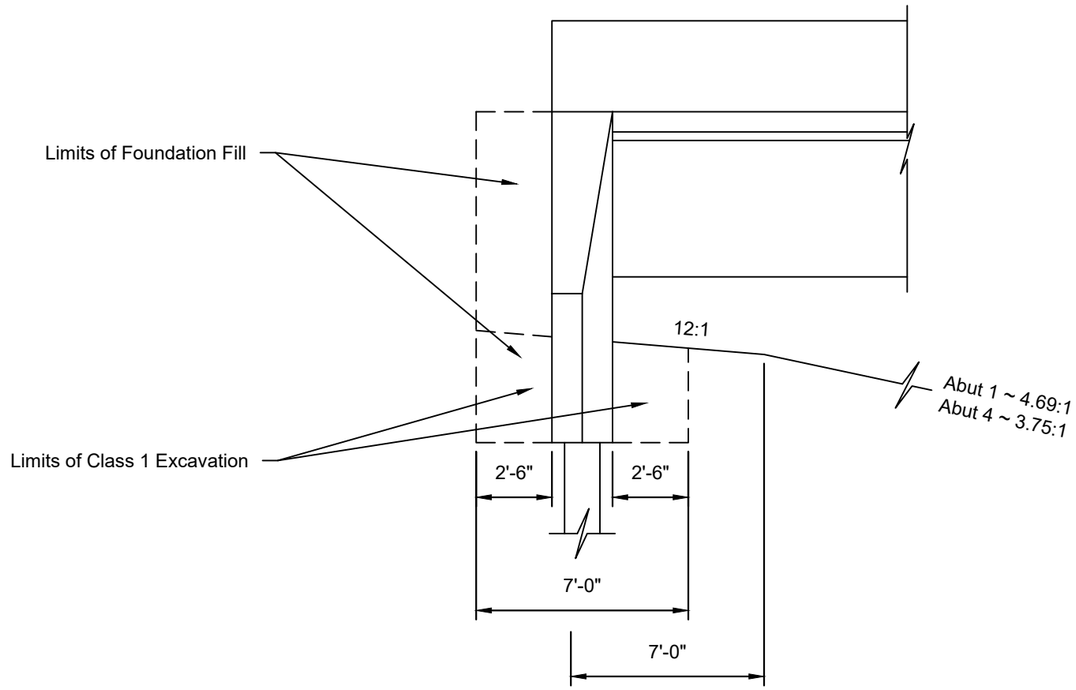
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	4



VERTICAL CURVE DATA



DETAIL AT ABUTMENT

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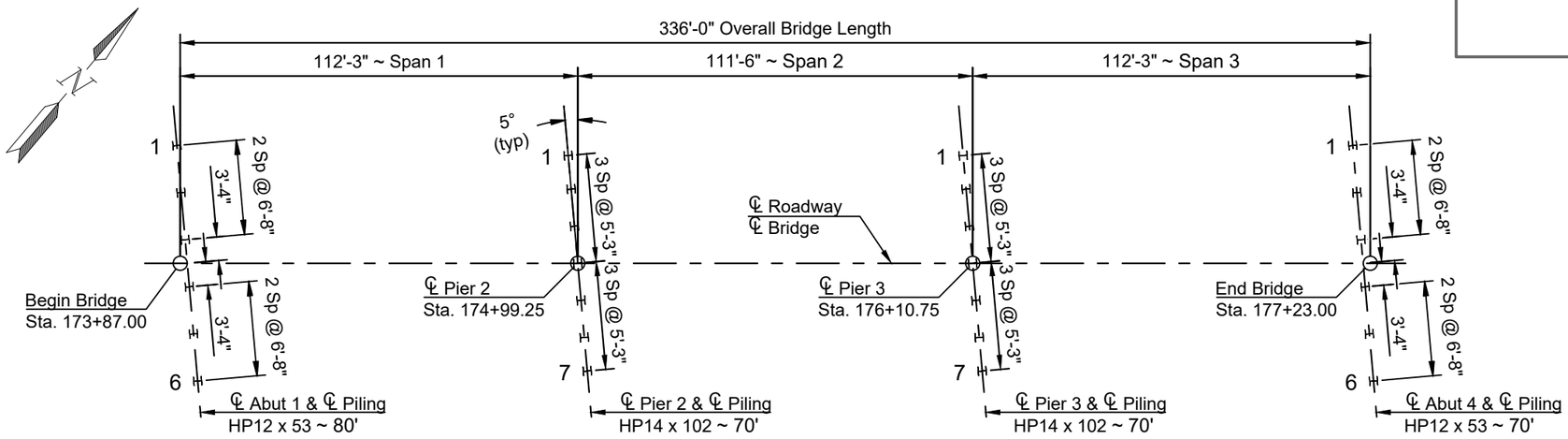
Vertical Curve & Detail at Abutment

Bridge Replacement
Bridge No. 30-143-19.1

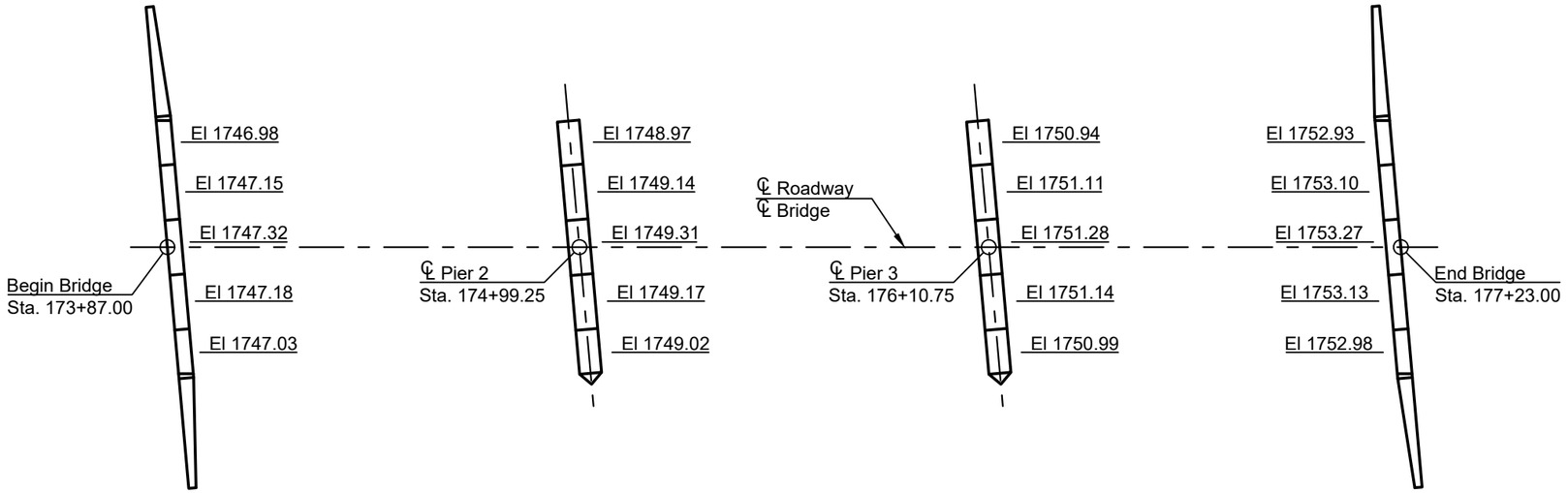
Morton County, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	170	5



Drive the HP12 x 53 Pile to 130 tons.
Drive the HP14 x 102 Pile to 250 tons.

PILING LAYOUT



Elevations shown are to top of finished concrete.

BEARING ELEVATIONS

PILE COORDINATES											
Abut 1			Pier 2			Pier 3			Abut 4		
PILE	NORTHING	EASTING	PILE	NORTHING	EASTING	PILE	NORTHING	EASTING	PILE	NORTHING	EASTING
1	378,897.93	1,789,716.40	1	378,968.93	1,789,802.15	1	379,040.74	1,789,887.45	1	379,113.04	1,789,971.91
6	378,874.40	1,789,740.01	7	378,946.69	1,789,824.46	7	379,018.50	1,789,909.76	6	379,089.50	1,789,995.52

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).

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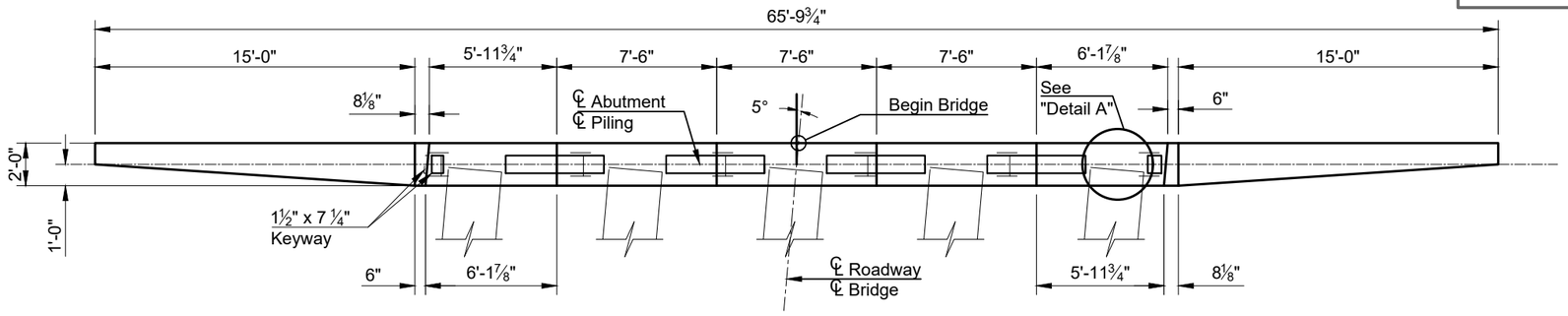
Bearing Elevations & Piling Layout

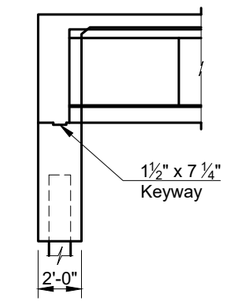
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

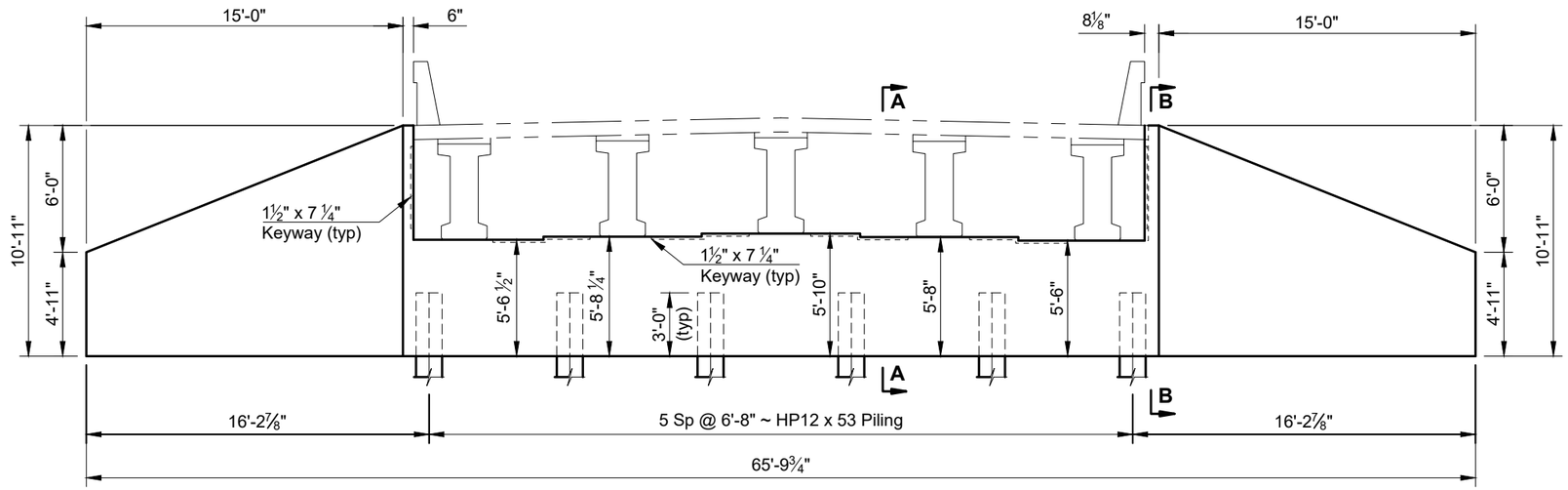
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	6



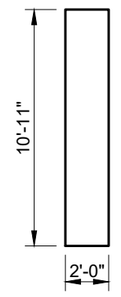
PLAN



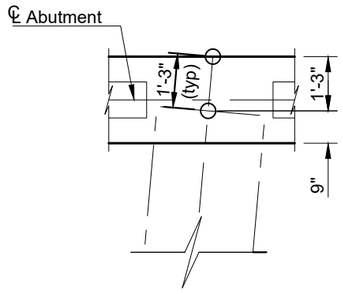
A-A



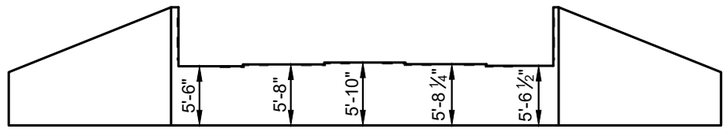
ELEVATION



B-B



DETAIL A



(SHOWING BACKWALL HEIGHTS, FACING EAST)

Abutment 1 Elevation

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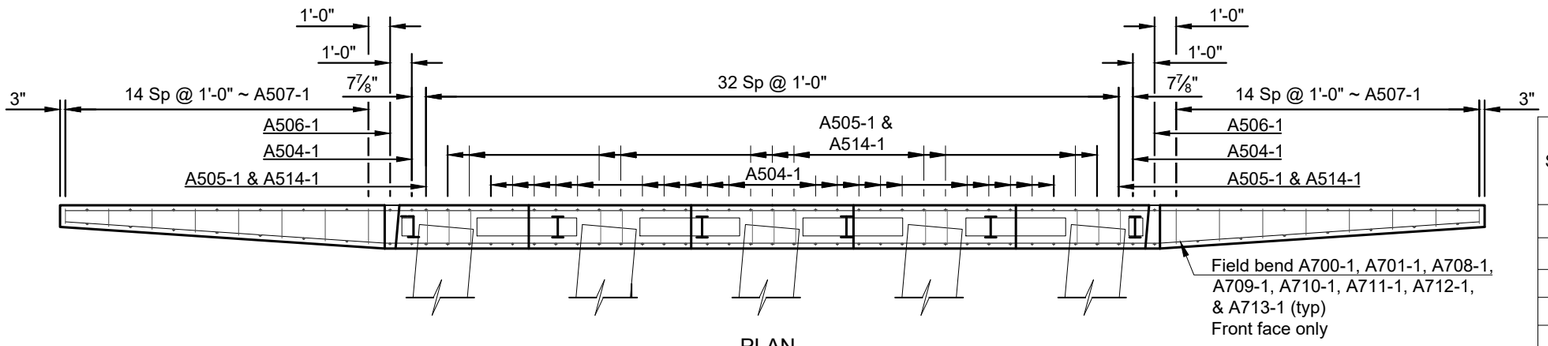
QUANTITIES

SEE DWG 30-143-19.1-7

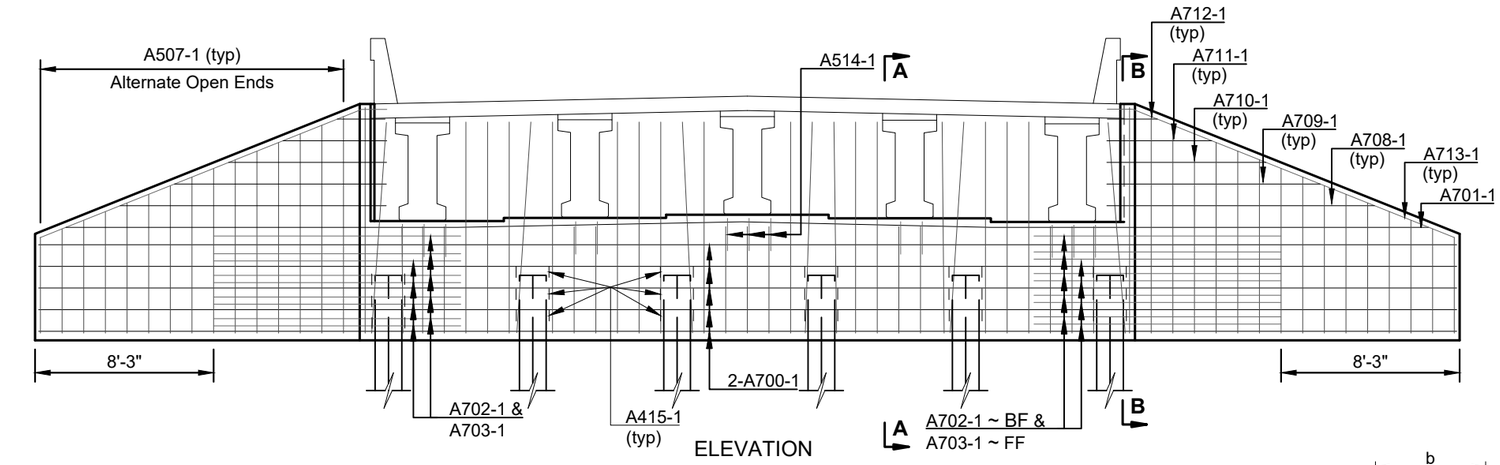
Abutment 1 Details
(Showing Dimensions)
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

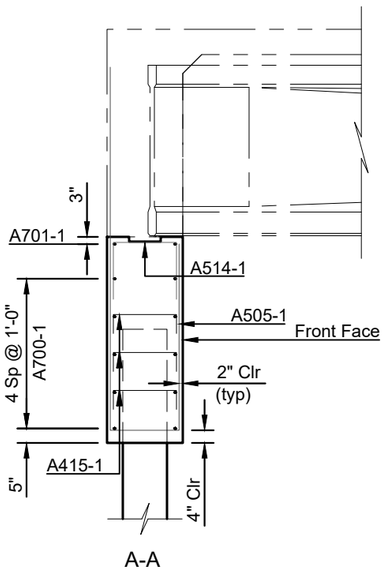
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	7



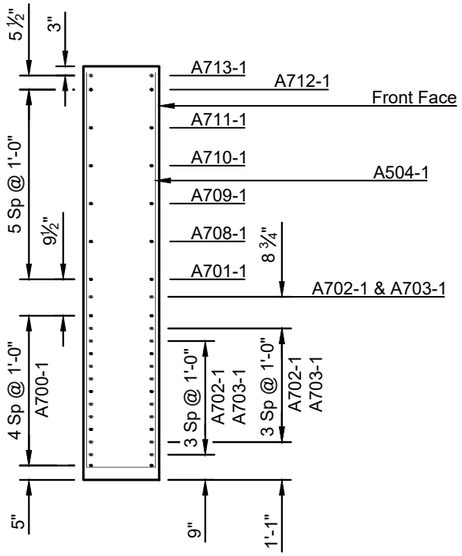
PLAN



ELEVATION



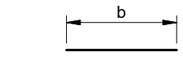
A-A



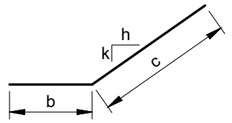
B-B

BILL OF REINFORCING STEEL, GRADE 60 (ONE ABUTMENT)

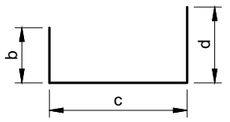
SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS							
				a	b	c	d	e	g	h	k
7	A700-1	10	68'-10"		60'-0"	3'-7"	8'-10"	1	65'-3"		
7	A701-1	2	66'-6"		60'-0"	3'-7"	6'-6"	1	62'-11"		
7	A702-1	18	11'-5"		11'-5"						
7	A703-1	18	11'-5"		4'-8"	6'-9"				15	1
5	A504-1	22	21'-0"		9'-8"	1'-8"	9'-8"				
5	A505-1	13	16'-4"		5'-0"	1'-8"	9'-8"				
5	A506-1	2	22'-6"		10'-5"	1'-8"	10'-5"				
5	A507-1	2	233'-2"	8"	4'-5"	10'-0"	1'-7"	14			
7	A708-1	4	12'-4"		12'-4"						
7	A709-1	4	9'-10"		9'-10"						
7	A710-1	4	7'-4"		7'-4"						
7	A711-1	4	4'-10"		4'-10"						
7	A712-1	4	2'-3"		2'-3"						
7	A713-1	4	17'-2"		1'-2"	16'-0"				12	4.8
5	A514-1	13	4'-8"		1'-6"	1'-8"	1'-6"				
4	A415-1	36	2'-8"		6"	1'-8"	6"				



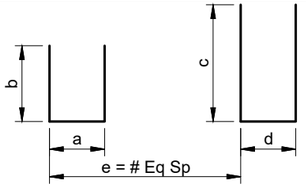
A702-1 A708-1 A709-1
A710-1 A711-1 A712-1



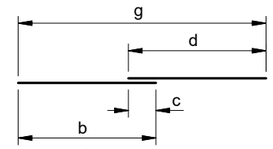
A703-1 A713-1



A504-1 A505-1 A506-1
A514-1 A415-1



A507-1



c = Lap Splice (typ)
e = # of "b" Length Pieces in a Set
Total Length per Set = e x b + d

A700-1 A701-1

SAUBER ENGINEERING

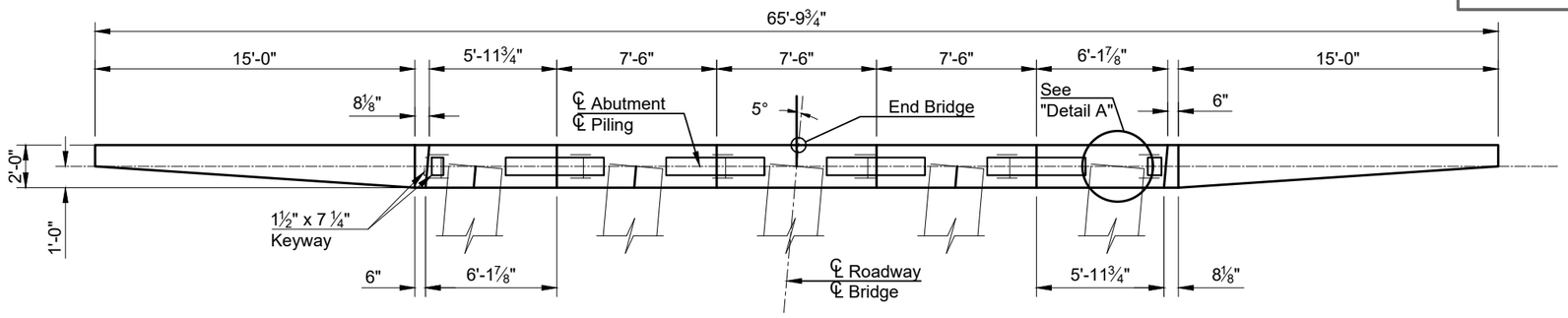
This document was originally issued and sealed by Joseph Baneck, Registration Number PE- 30230 on 10/13/23 and the original document is stored at the Morton County Highway Department Mandan, North Dakota

QUANTITIES	(ONE ABUTMENT)
CLASS AE-3 CONCRETE	29.2 CY
REINFORCING STEEL-GRADE 60	4,322 LBS

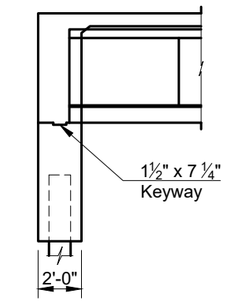
Abutment 1 Details
(Showing Reinforcing)
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

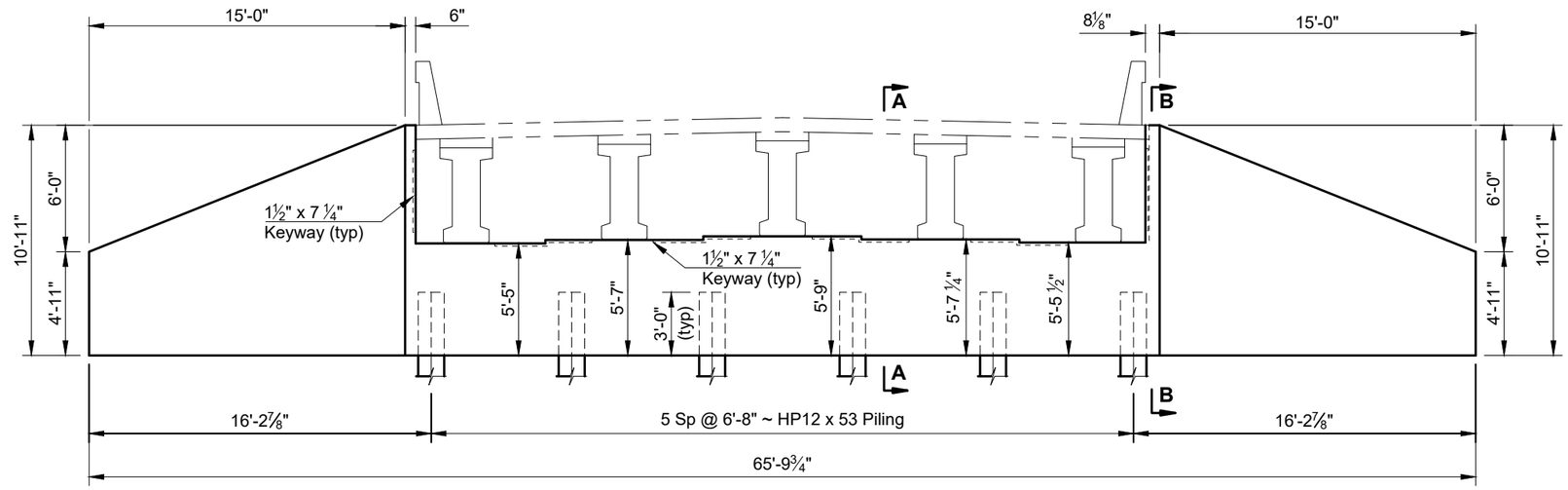
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	8



PLAN

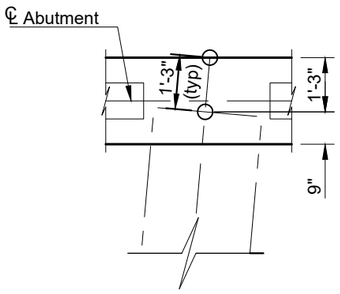


A-A

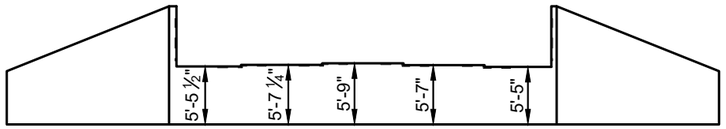


ELEVATION

B-B



DETAIL A



(SHOWING BACKWALL HEIGHTS, FACING WEST)

Abutment 4 Elevation

SAUBER ENGINEERING

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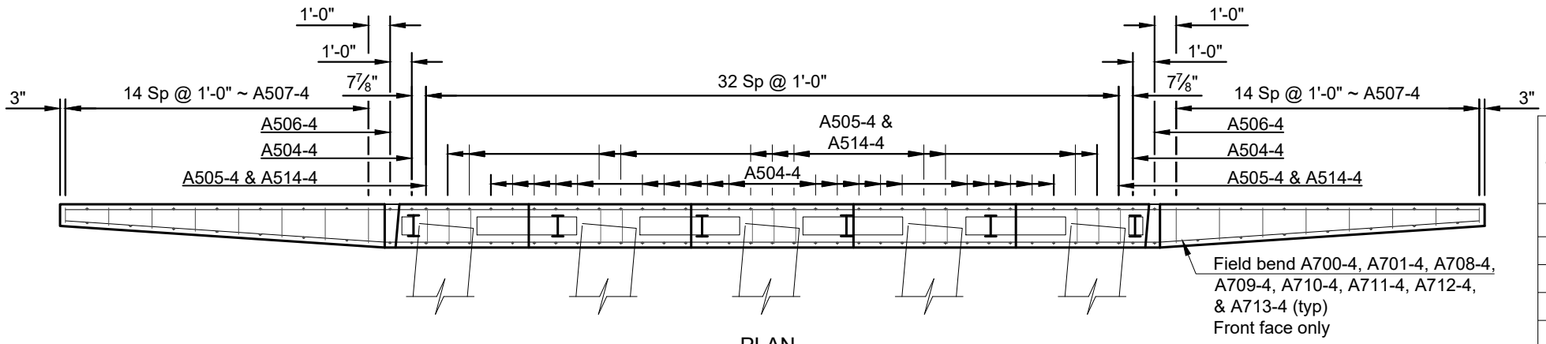
QUANTITIES

SEE DWG 30-143-19.1-9

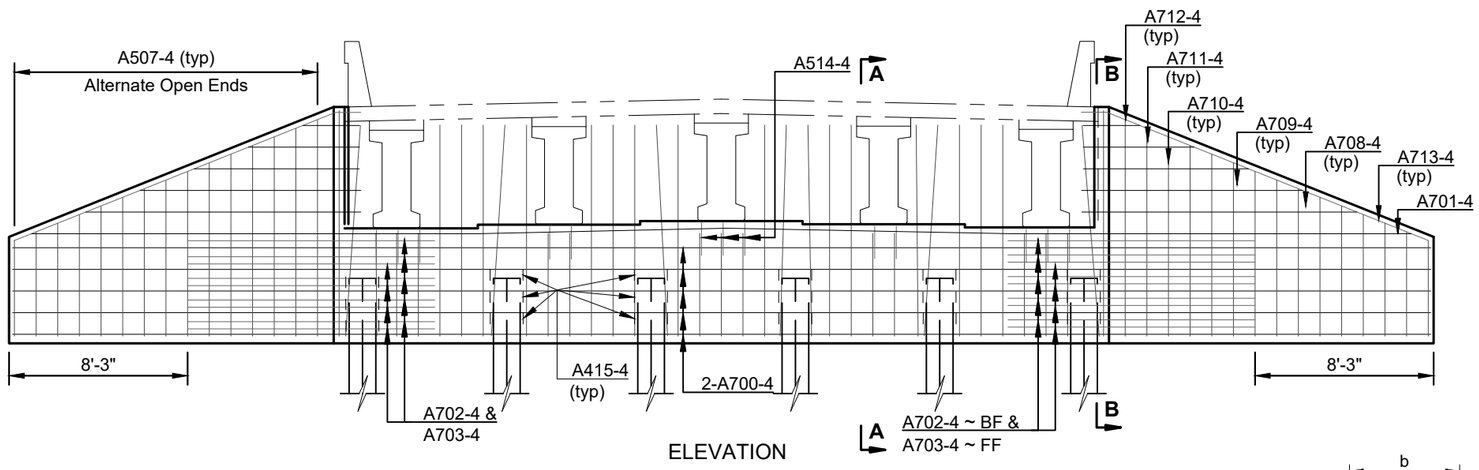
Abutment 4 Details
(Showing Dimensions)
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

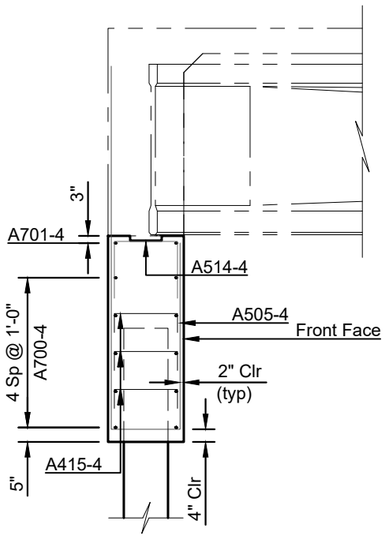
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	9



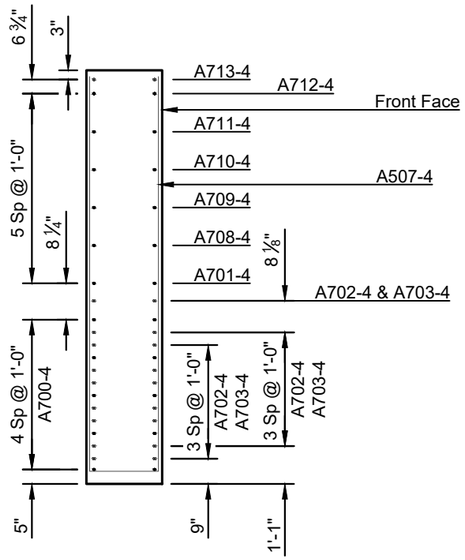
PLAN



ELEVATION



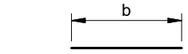
A-A



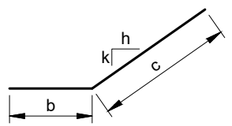
B-B

BILL OF REINFORCING STEEL, GRADE 60 (ONE ABUTMENT)

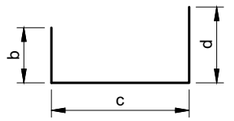
SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS							
				a	b	c	d	e	g	h	k
7	A700-4	10	68'-10"		60'-0"	3'-7"	8'-10"	1	65'-3"		
7	A701-4	2	67'-4"		60'-0"	3'-7"	7'-4"	1	63'-9"		
7	A702-4	18	11'-5"		11'-5"						
7	A703-4	18	11'-5"		4'-8"	6'-9"				15	1
5	A504-4	22	21'-0"		9'-8"	1'-8"	9'-8"				
5	A505-4	13	16'-3"		4'-11"	1'-8"	9'-8"				
5	A506-4	2	22'-6"		10'-5"	1'-8"	10'-5"				
5	A507-4	2	233'-2"	8"	4'-5"	10'-0"	1'-7"	14			
7	A708-4	4	12'-8"		12'-8"						
7	A709-4	4	10'-2"		10'-2"						
7	A710-4	4	7'-7"		7'-7"						
7	A711-4	4	5'-1"		5'-1"						
7	A712-4	4	2'-7"		2'-7"						
7	A713-4	4	17'-2"		1'-2"	16'-0"				12	4.8
5	A514-4	13	4'-8"		1'-6"	1'-8"	1'-6"				
4	A415-4	36	2'-8"		6"	1'-8"	6"				



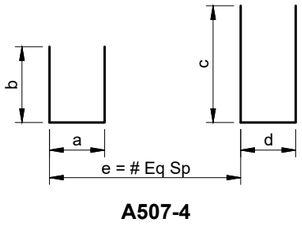
A702-4 A708-4 A709-4
A710-4 A711-4 A712-4



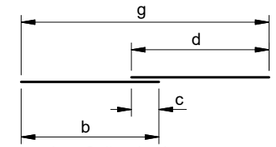
A703-4 A713-4



A504-4 A505-4 A506-4
A514-4 A415-4



A507-4



c = Lap Splice (typ)
e = # of "b" Length Pieces in a Set
Total Length per Set = e x b + d

A700-4 A701-4

SAUBER ENGINEERING

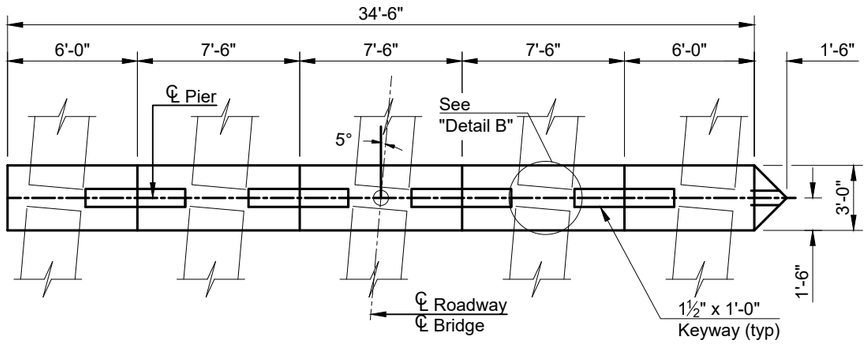
This document was originally issued and sealed by Joseph Baneck, Registration Number PE- 30230 on 10/13/23 and the original document is stored at the Morton County Highway Department Mandan, North Dakota

QUANTITIES	(ONE ABUTMENT)
CLASS AE-3 CONCRETE	29.0 CY
REINFORCING STEEL-GRADE 60	4,337 LBS

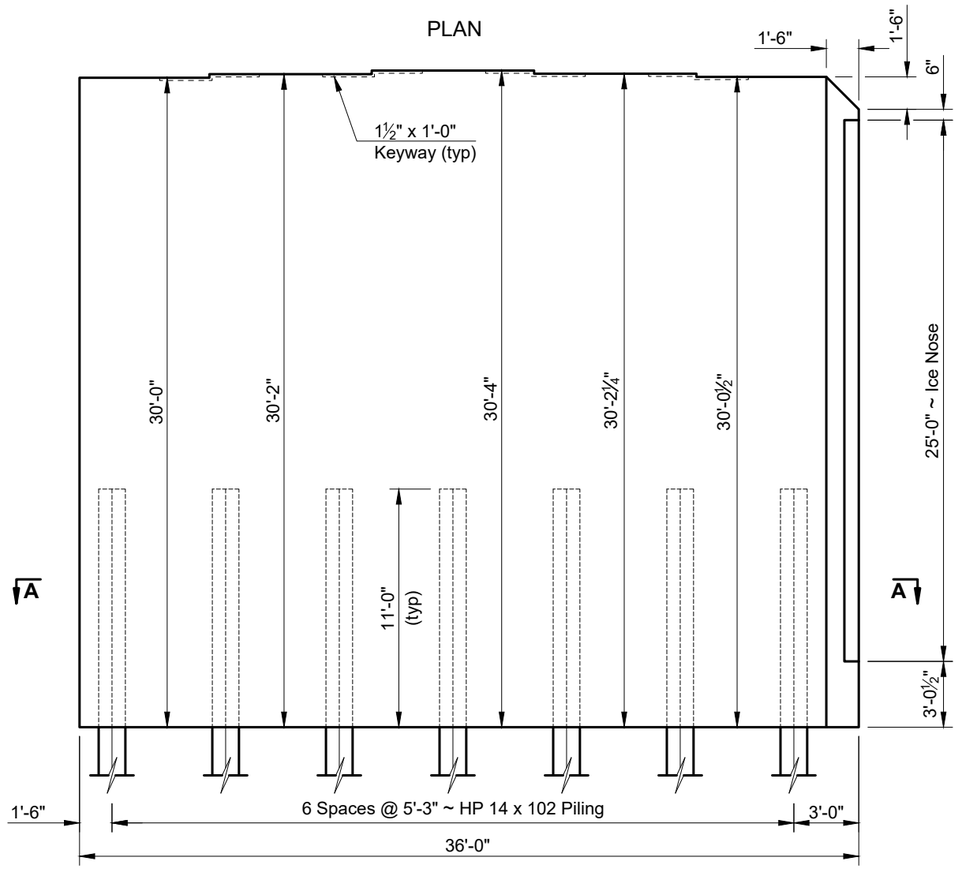
Abutment 4 Details
(Showing Reinforcing)
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	10

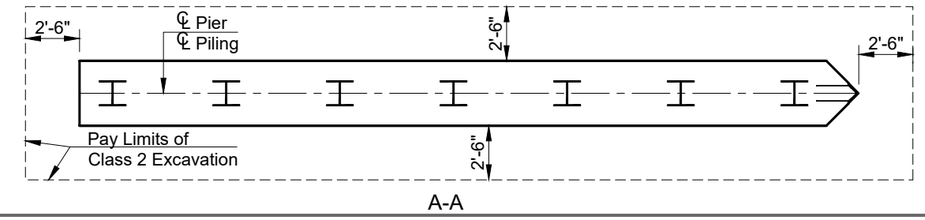


PLAN



ELEVATION

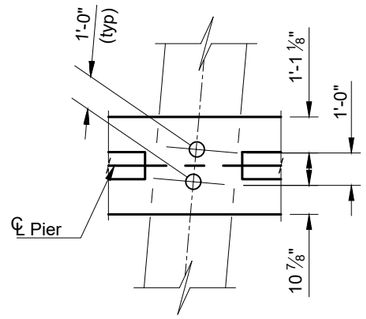
END VIEW



A-A

Galvanize in accordance with Section 854 after fabrication.

ICE NOSE DETAIL



DETAIL B

SAUBER ENGINEERING

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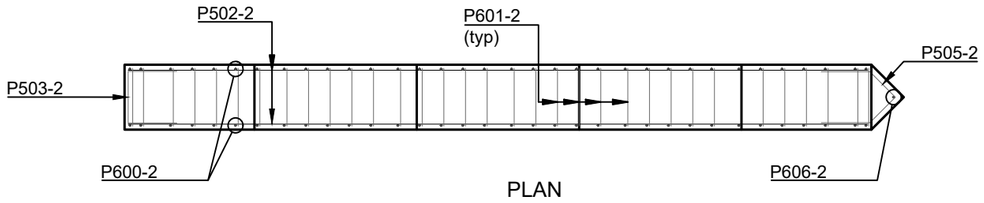
QUANTITIES

SEE DWG 30-143-19.1-11

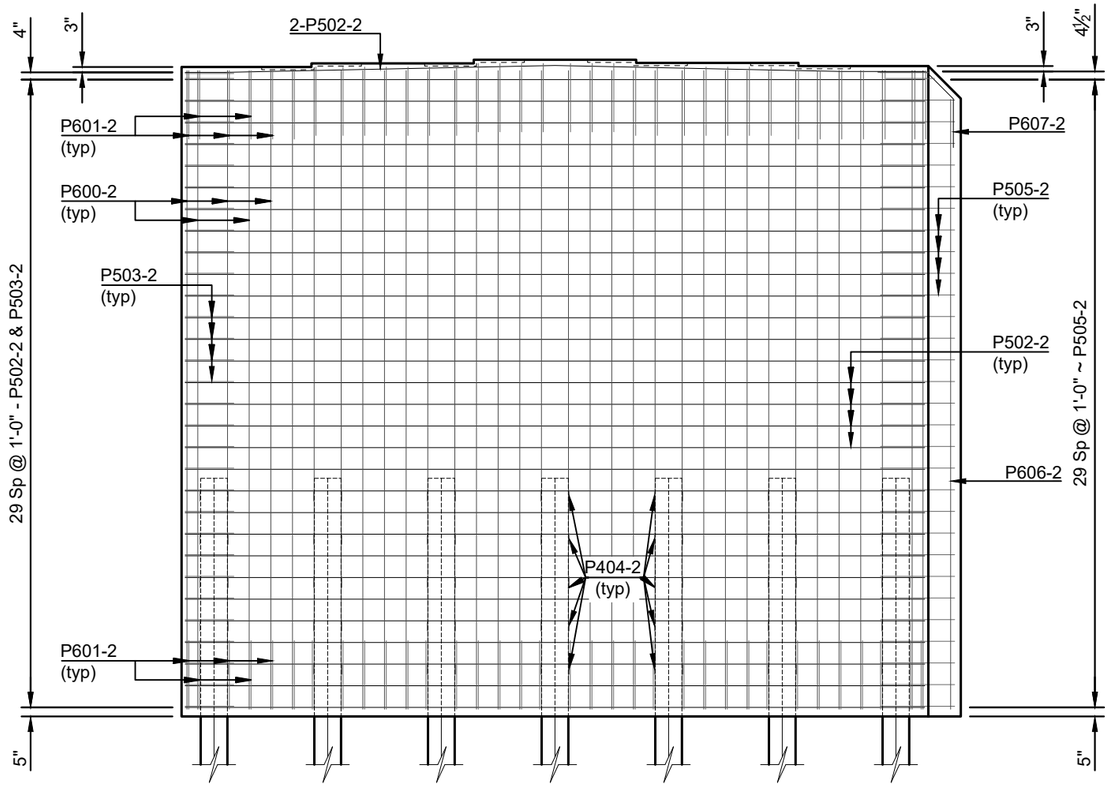
Pier 2 Details
(Showing Dimensions)
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

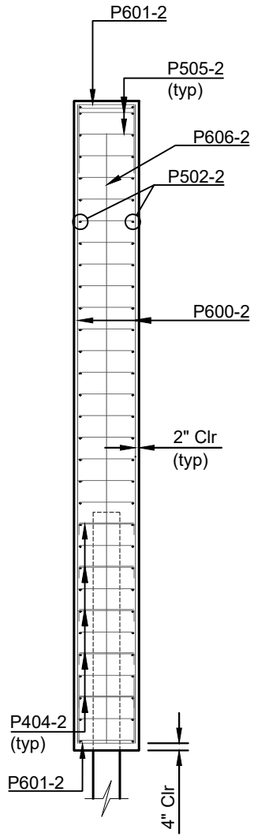
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	11



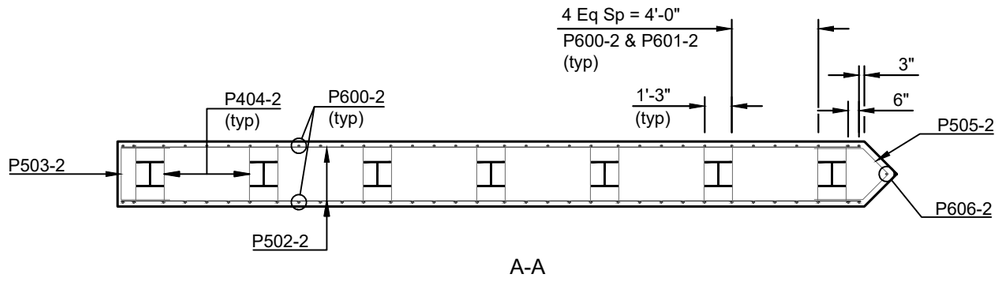
PLAN



ELEVATION



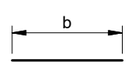
END VIEW



A-A

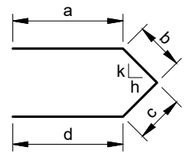
BILL OF REINFORCING STEEL, GRADE 60 (PIER)

SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS							
				a	b	c	d	e	g	h	k
6	P600-2	68	29'-6"		29'-6"						
6	P601-2	68	9'-0"		3'-2"	2'-8"	3'-2"				
5	P502-2	62	34'-2"		34'-2"						
5	P503-2	31	7'-0"		2'-3"	2'-6"	2'-3"				
4	P404-2	70	3'-8"		6"	2'-8"	6"				
5	P505-2	31	7'-10"	2'-3"	1'-8"	1'-8"	2'-3"			12	12
6	P606-2	1	28'-2"		28'-2"						
6	P607-2	1	6'-3"	2'-3"	1'-9"	2'-3"				12	12

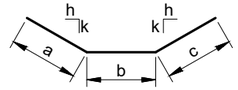


P600-2 P502-2 P606-2

P601-2 P503-2 P404-2



P505-2



P607-2

SAUBER ENGINEERING

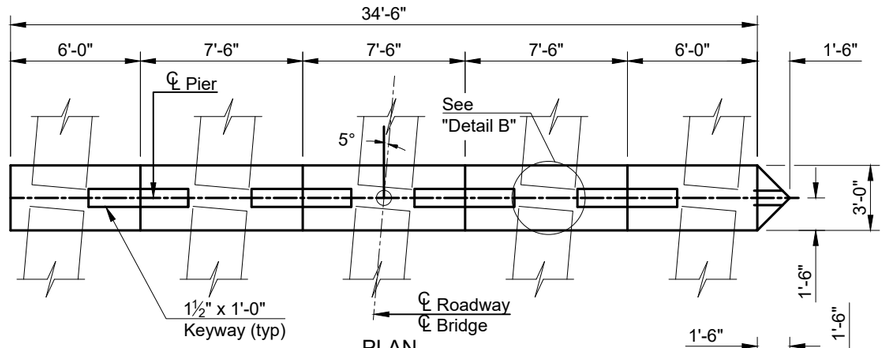
This document was originally issued and sealed by Joseph Baneck, Registration Number PE- 30230 on 10/13/23 and the original document is stored at the Morton County Highway Department Mandan, North Dakota

QUANTITIES	(ONE PIER)
CLASS AE-3 CONCRETE	118.1 CY
REINFORCING STEEL-GRADE 60	6,844 LBS
STRUCTURAL STEEL M270-GRADE 36	1,083 LBS

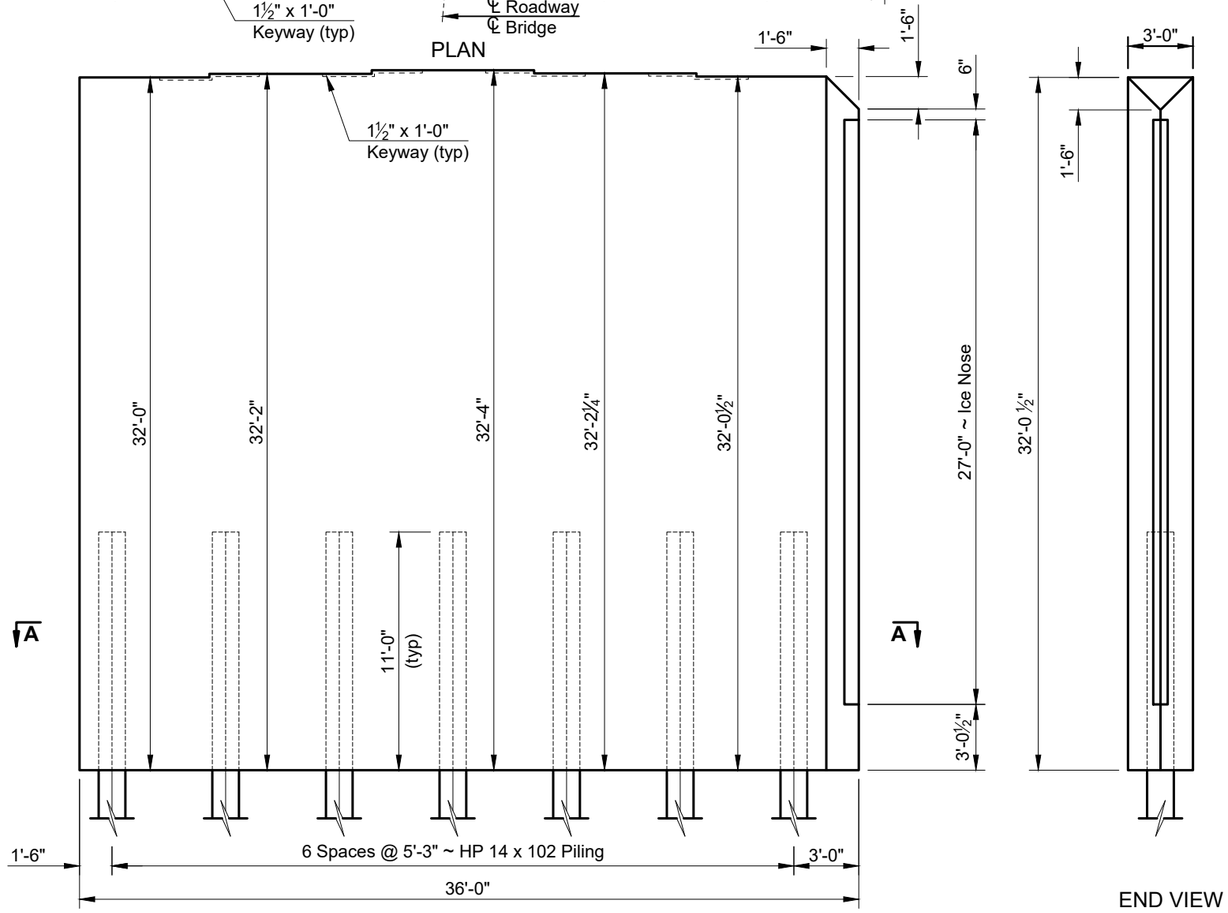
Pier 2 Details
(Showing Reinforcing)
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	12

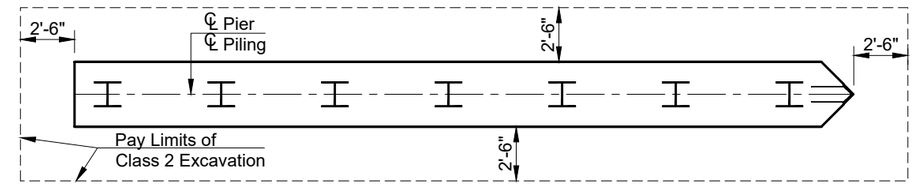


PLAN

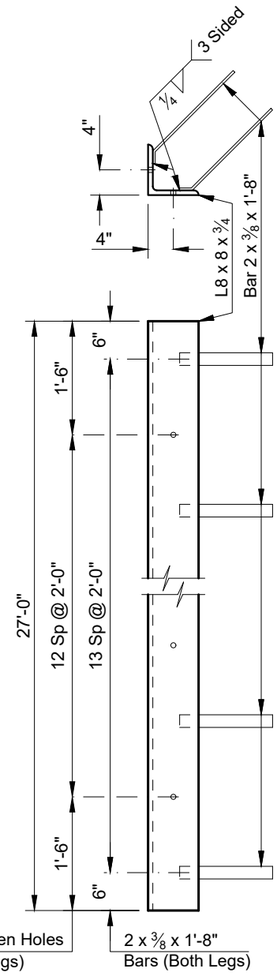


ELEVATION

END VIEW

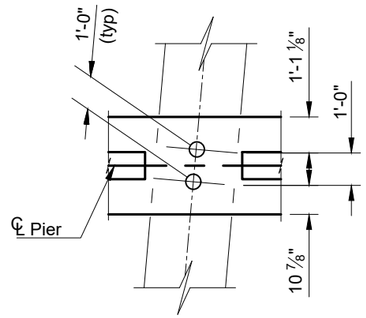


A-A



Galvanize in accordance with Section 854 after fabrication.

ICE NOSE DETAIL



DETAIL B

SAUBER ENGINEERING

This document was originally issued and sealed by Joseph Baneck, Registration Number PE- 30230 on 10/13/23 and the original document is stored at the Morton County Highway Department Mandan, North Dakota

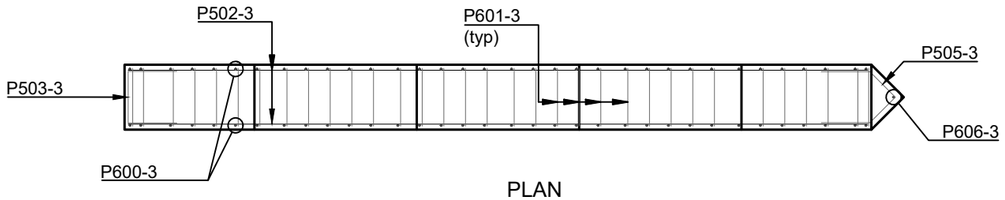
QUANTITIES

SEE DWG 30-143-19.1-13

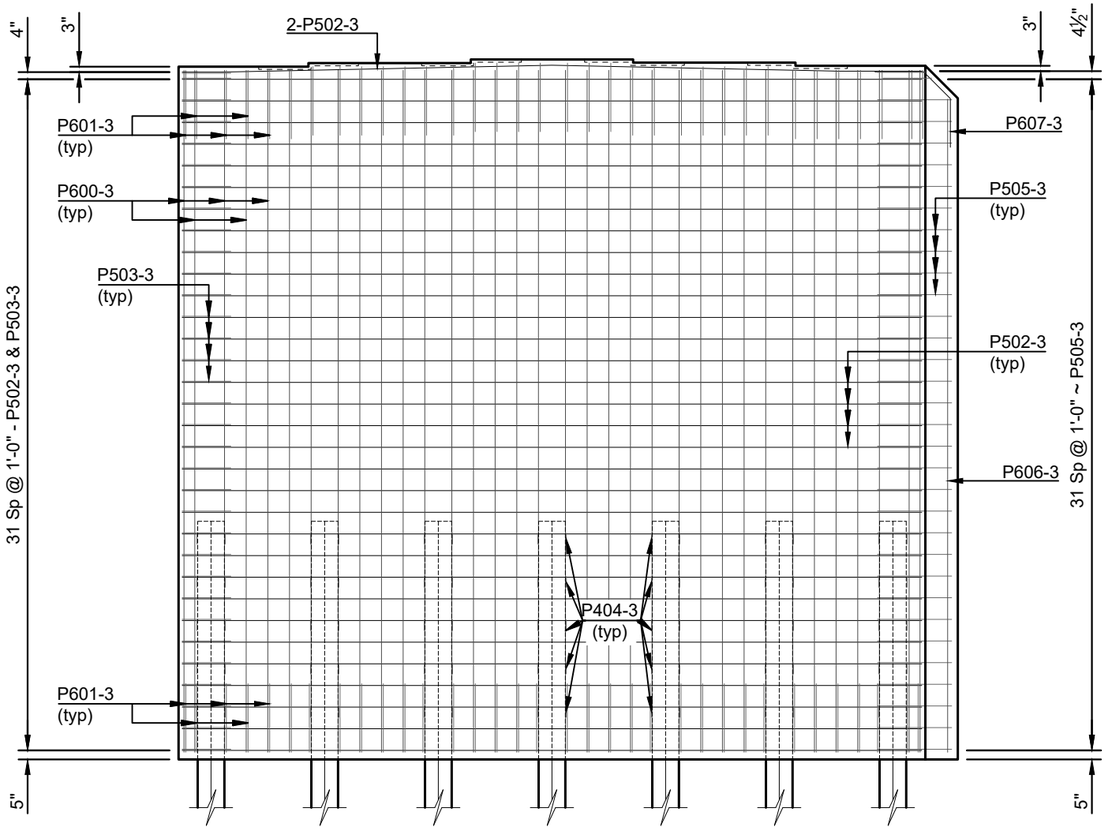
Pier 3 Details
(Showing Dimensions)
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

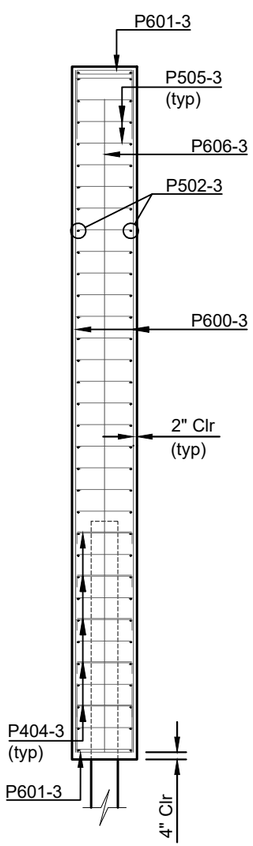
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	13



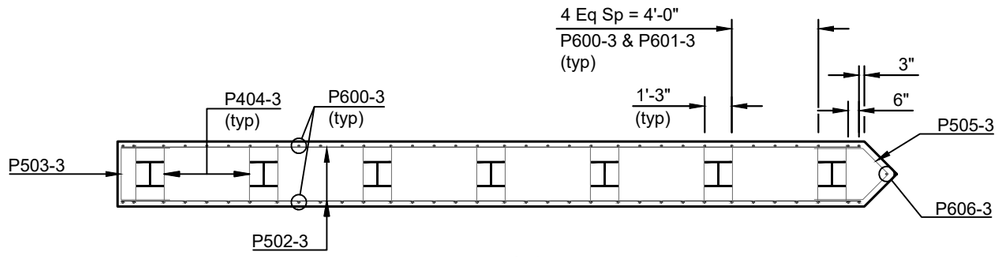
PLAN



ELEVATION



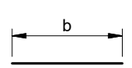
END VIEW



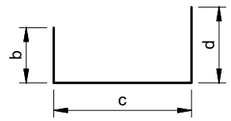
A-A

BILL OF REINFORCING STEEL, GRADE 60 (PIER)

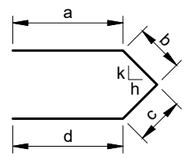
SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS							
				a	b	c	d	e	g	h	k
6	P600-3	68	31'-6"		31'-6"						
6	P601-3	68	9'-0"		3'-2"	2'-8"	3'-2"				
5	P502-3	66	34'-2"		34'-2"						
5	P503-3	33	7'-0"		2'-3"	2'-6"	2'-3"				
4	P404-3	70	3'-8"		6"	2'-8"	6"				
5	P505-3	33	7'-10"	2'-3"	1'-8"	1'-8"	2'-3"			12	12
6	P606-3	1	30'-2"		30'-2"						
6	P607-3	1	6'-3"	2'-3"	1'-9"	2'-3"				12	12



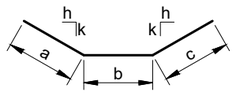
P600-3 P502-3 P606-3



P601-3 P503-3 P404-3



P505-3



P607-3

SAUBER ENGINEERING

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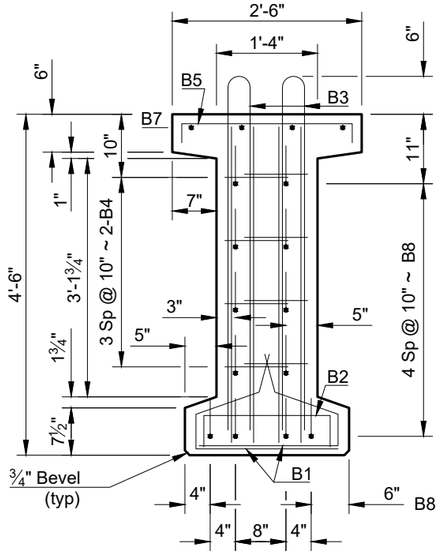
QUANTITIES	(ONE PIER)
CLASS AE-3 CONCRETE	125.9 CY
REINFORCING STEEL-GRADE 60	7,225 LBS
STRUCTURAL STEEL M270-GRADE 36	1,169 LBS

Pier 3 Details
(Showing Reinforcing)
Bridge Replacement
Bridge No. 30-143-19.1

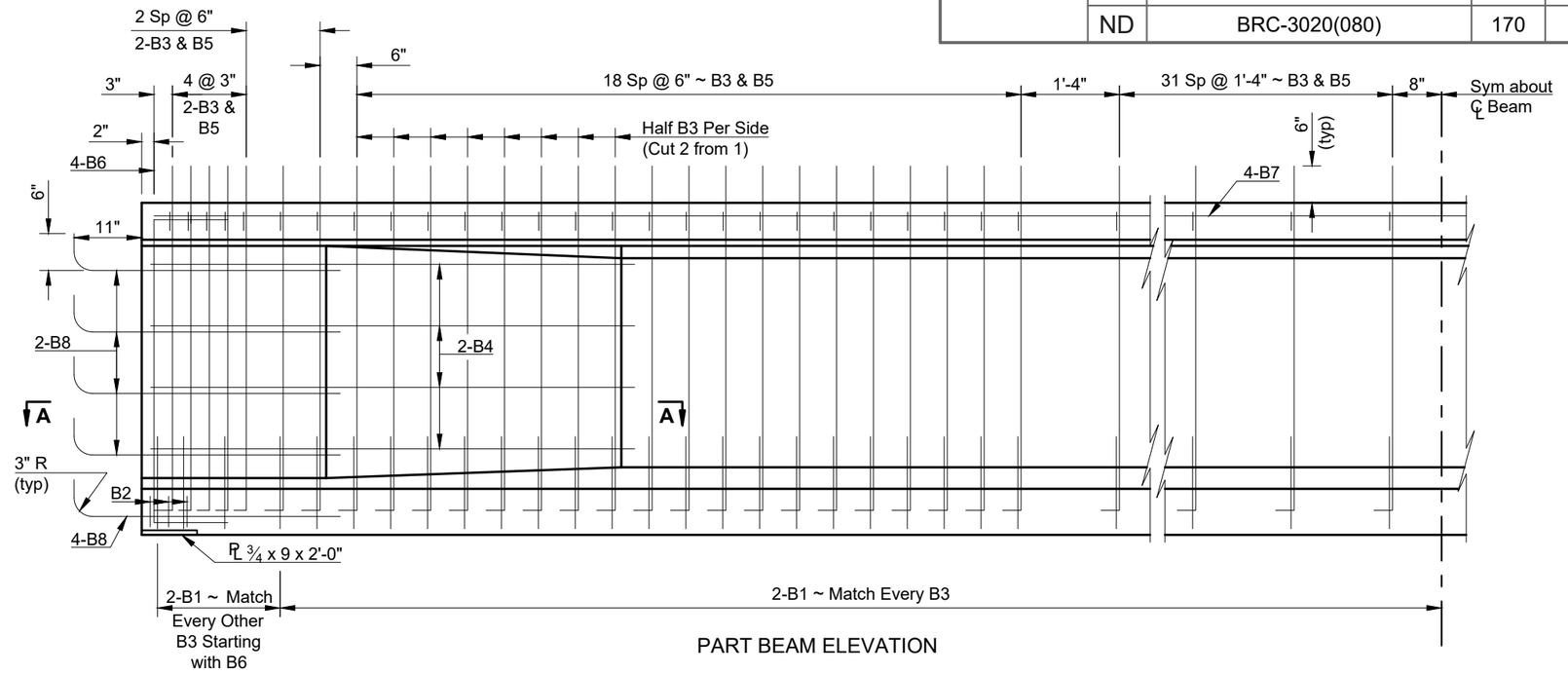
Morton County, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	170	14

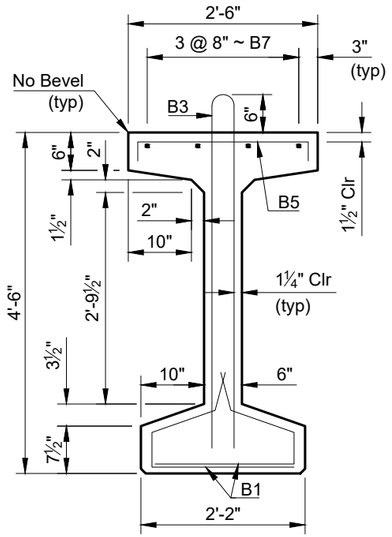


(DETAILS NOT SHOWN ARE SAME AS "SECTION @ ℄")

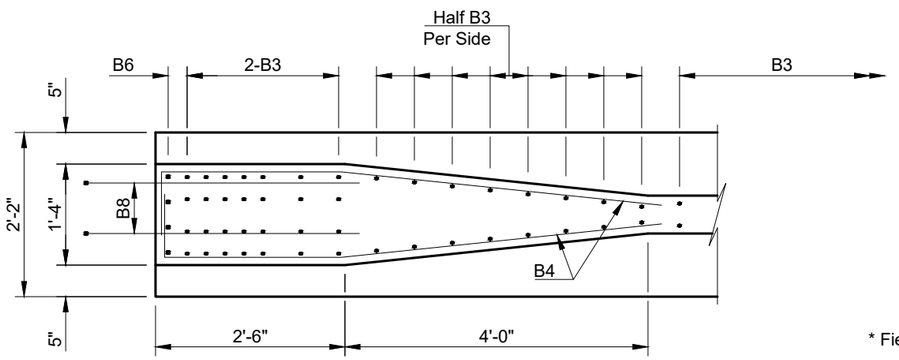
END VIEW



PART BEAM ELEVATION



SECTION @ ℄



A-A

BEAM SECTION DATA
WT = 729.8 LBS/FT + 3524 LBS FOR END BLOCKS
CROSS SECTIONAL AREA AT ℄ SPAN = 677 IN^2
C.G. (FROM BOTTOM) = 26.8 IN
I = 265,433 IN^4
S_B = 9915.3 IN^3
END AREA = 1038 IN^2

BAR LIST ~ ONE BEAM				
MARK	SIZE	NO.	LENGTH	SHAPE
B1	4	224	3'-9"	BENT
B2	5	6	2'-6"	BENT
B3	4	130	10'-0"	BENT
B4	4	16	7'-5"	BENT
B5	3	116	2'-9"	BENT
B6	5	8	6'-2"	BENT
B7	5	16	29'-11"	STR
* B8	5	24	4'-0"	STR

* Field bend as shown (Grade 40)

SAUBER ENGINEERING

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QUANTITIES	(ONE BEAM)
BEAM LENGTH	110.5 LF

Pre-Tensioned 54" Prestressed I-Beam

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

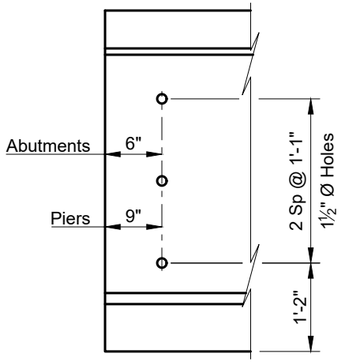
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	15

NOTES:

Select the final prestress force (remaining after all losses have been accounted for) and its corresponding center of gravity from those on a curve determined by the three values shown in the "Prestressing Data" table.

Provide holes and inserts in the beams at locations shown to accommodate the diaphragm bars.

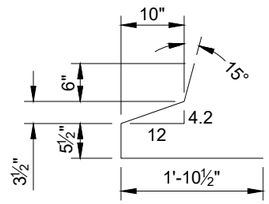
Minor changes to the shape of the beam and to reinforcing steel may be made to accommodate the forms of various contractors and their construction methods with the approval of the Engineer.



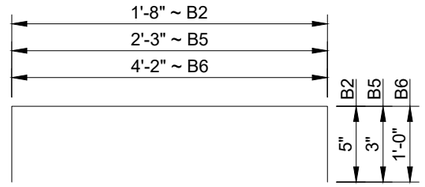
(Use holes for all beams at the Abutments & for the interior beams only at the Piers. Use Inserts for the exterior beams at the Piers.)

ELEVATION

BEAM END DETAIL

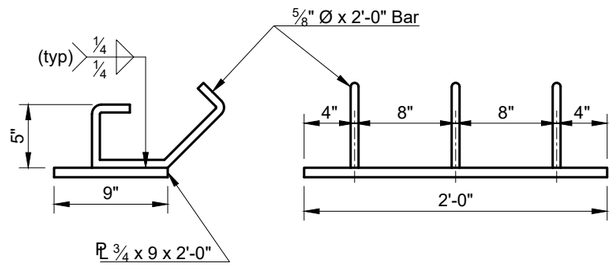


B1



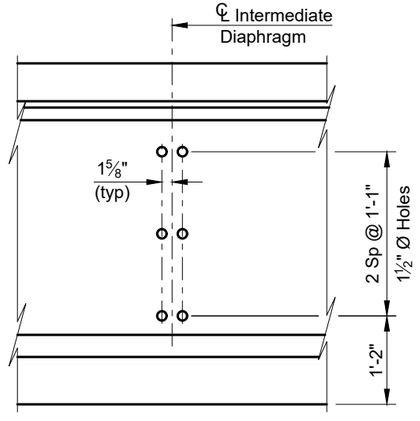
B2, B5 & B6

PRESTRESSING DATA					
C.G.	FINAL FORCE	DETENSION STRENGHT	ACCEPTANCE STRENGTH	WIGHT (TONS)	BEAM LENGTH
4.25"	1157.4 k	6000 psi (Min)	7000 psi (Min)	42.1	110'-6"
4.5"	1158.9 k				
4.75"	1160.4 k				



(Use ASTM A36 steel, hot dipped galvanized, for the bearing plate. Include the costs in the bid price for the beam.)

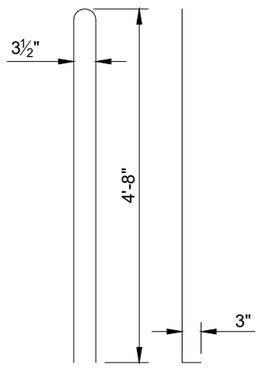
BEARING DETAIL



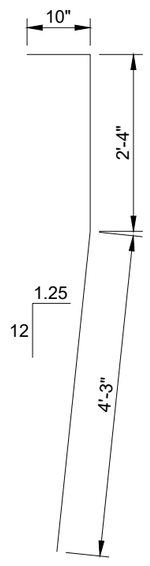
(Use holes for interior beams only. Use inserts for the exterior beams. See Dwg 30-143-19.1-16 for locations.)

ELEVATION

INTERMEDIATE DIAPHRAGM DETAIL



B3



B4

(Dimensions Shown are out to out.)

BENT BAR DETAILS

SAUBER ENGINEERING

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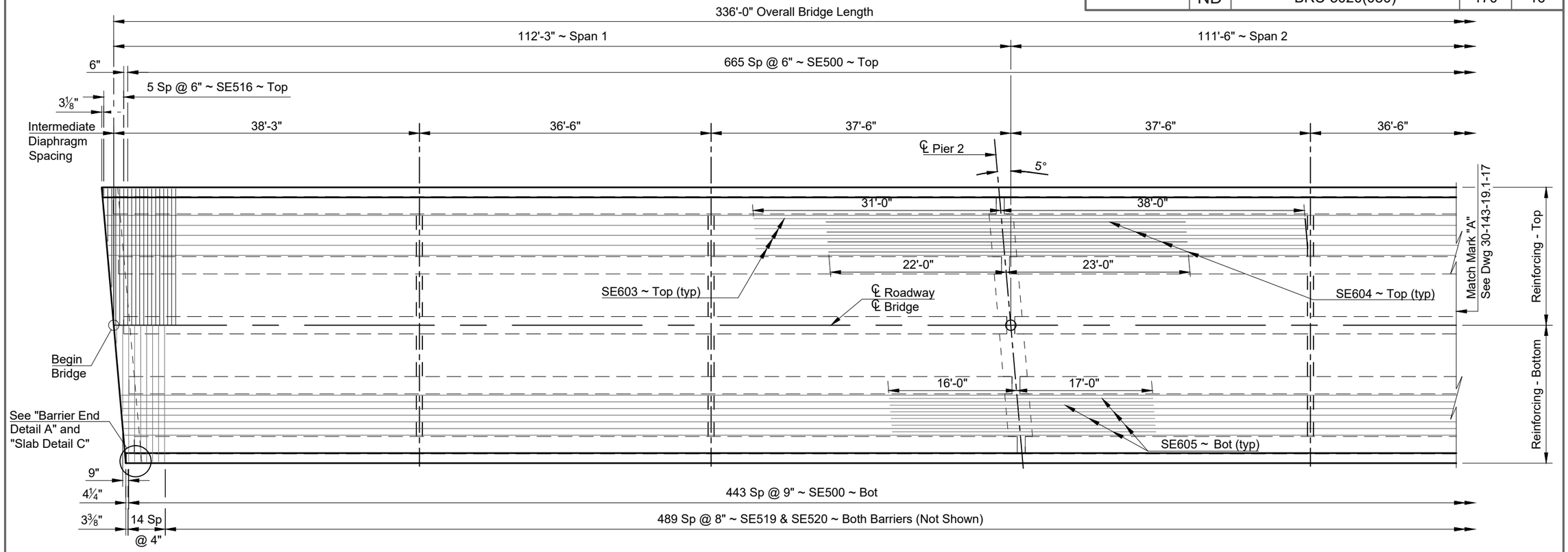
Pre-Tensioned 54" Prestressed I-Beam

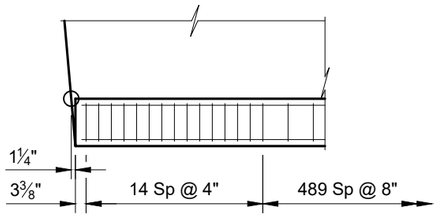
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

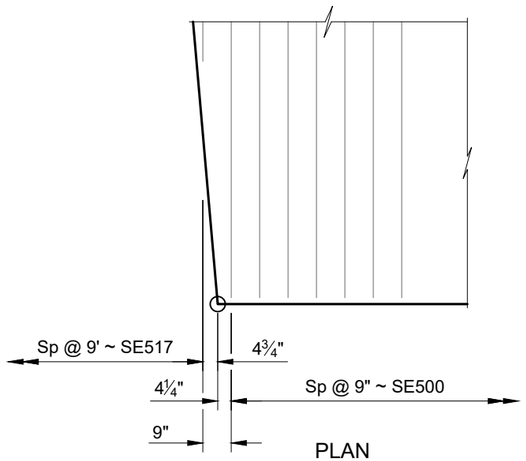
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	16



HALF PLAN



PLAN
BARRIER END DETAIL A



PLAN
SLAB DETAIL C

SAUBER ENGINEERING

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QUANTITIES

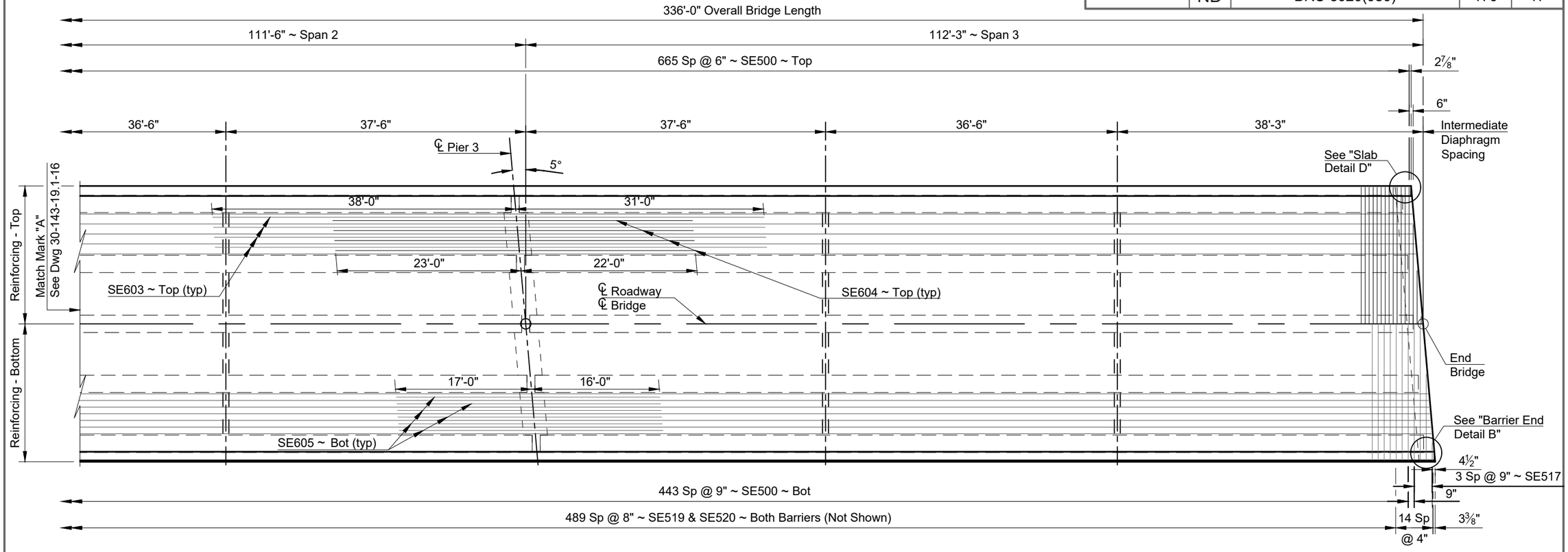
SEE DWG 30-143-19.1-22

Half Slab Layout

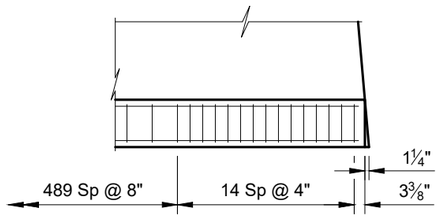
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

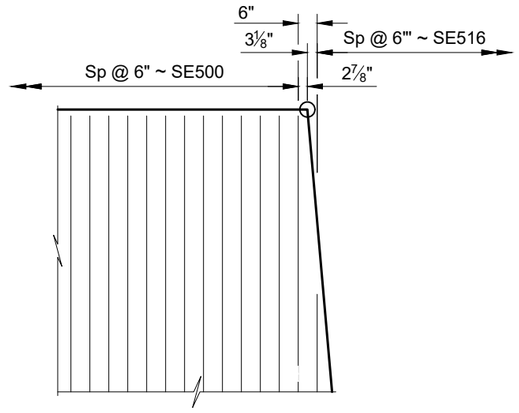
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	170	17



HALF PLAN



PLAN
BARRIER END DETAIL B



PLAN
SLAB DETAIL D

SAUBER ENGINEERING

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QUANTITIES

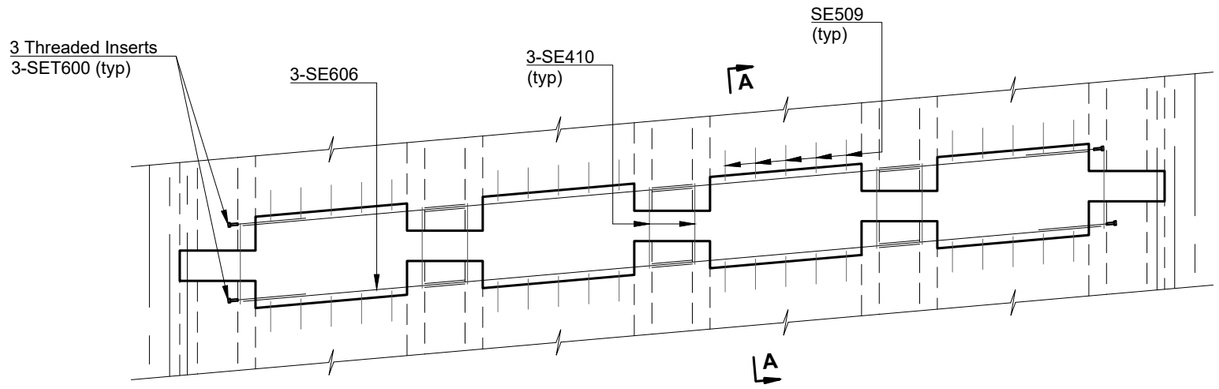
SEE DWG 30-143-19.1-22

Half Slab Layout

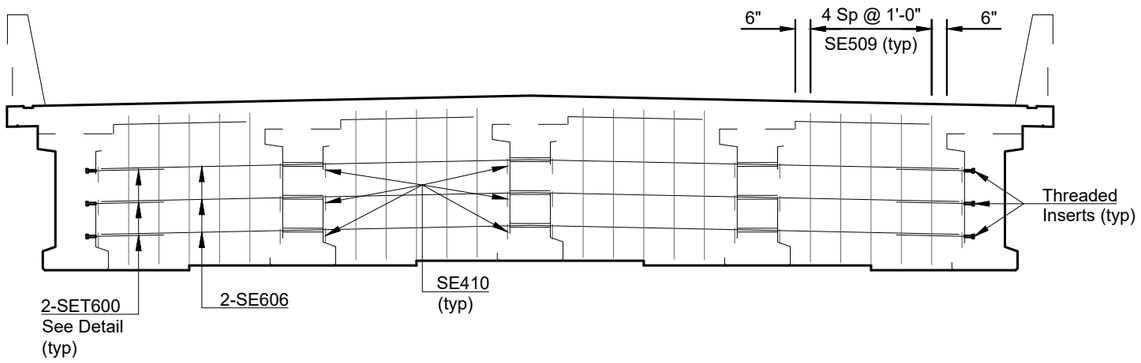
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

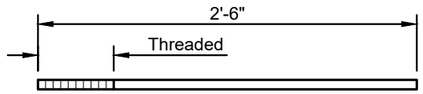
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	18



PLAN

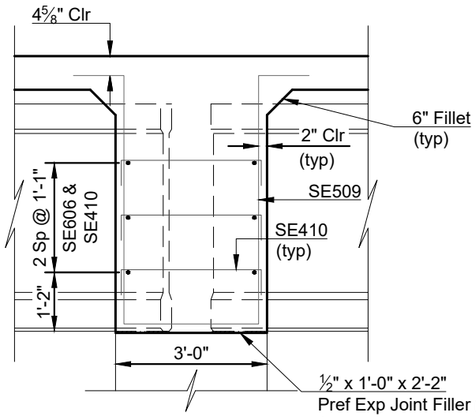


ELEVATION



No. 6 Reinforcing Steel ~ Include in the Prestessed Beam bid item.

SET600 DETAIL



A-A

SAUBER ENGINEERING

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QUANTITIES

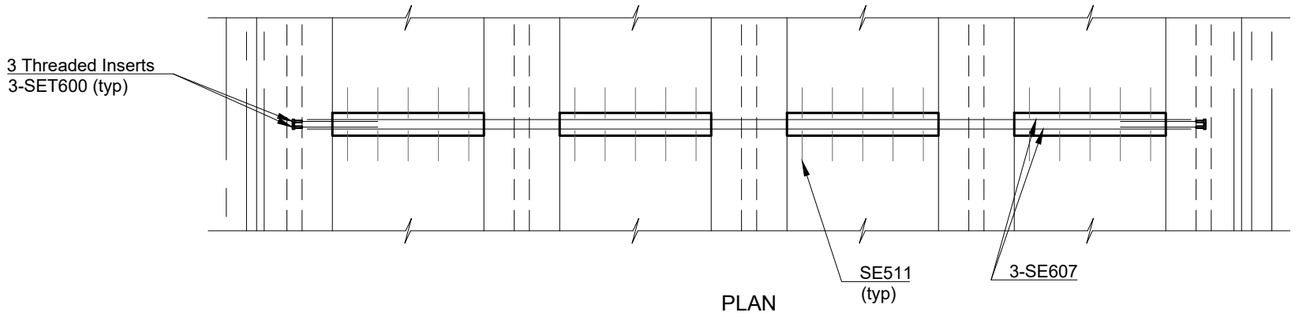
SEE DWG 30-143-19.1-22

Pier Diaphragm Details

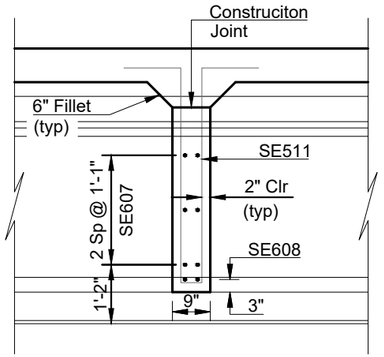
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

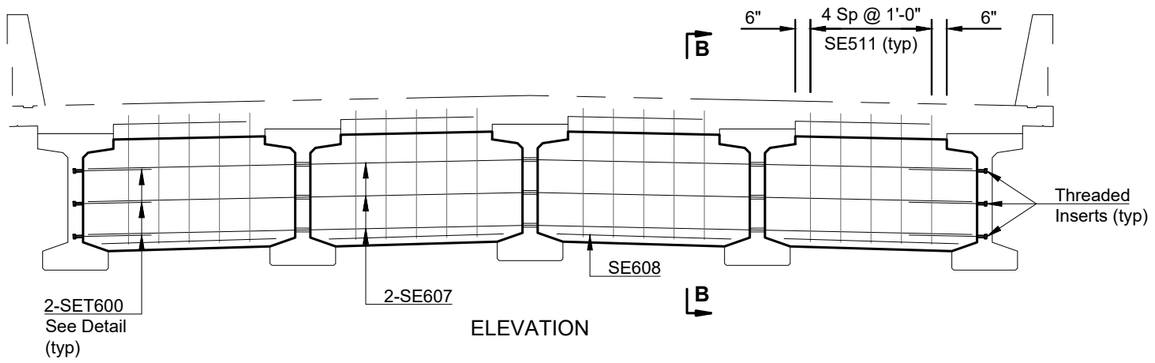
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	19



PLAN



B-B



ELEVATION

SAUBER ENGINEERING

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QUANTITIES

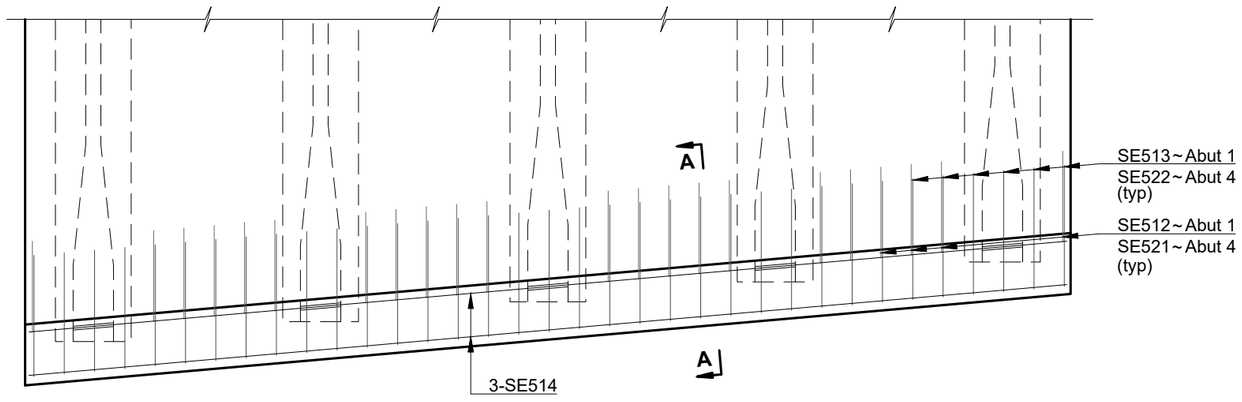
SEE DWG 30-143-19.1-22

Intermediate Diaphragm Details

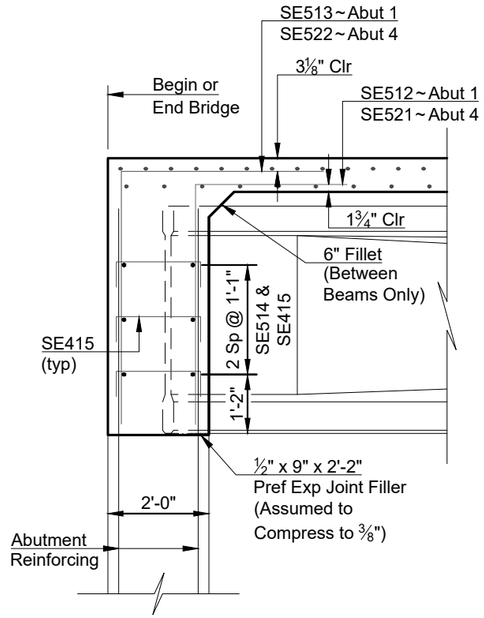
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

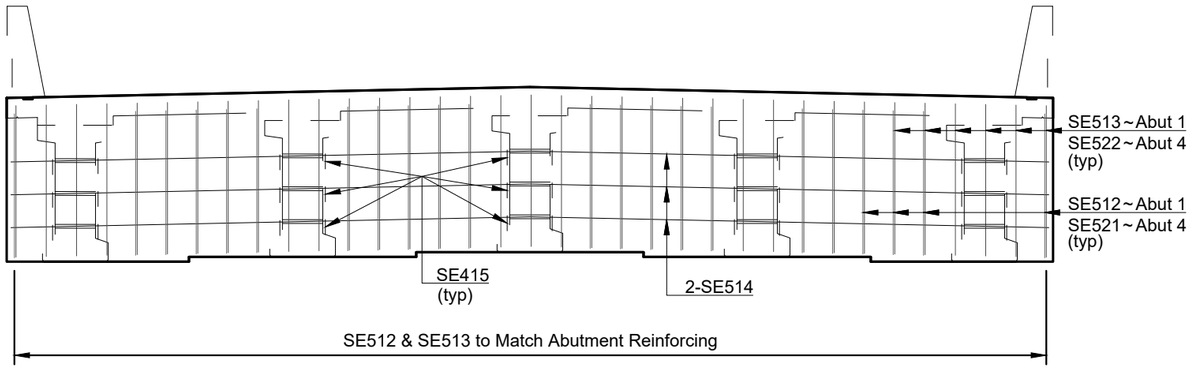
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	20



PLAN



A-A



ELEVATION

SAUBER ENGINEERING

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QUANTITIES

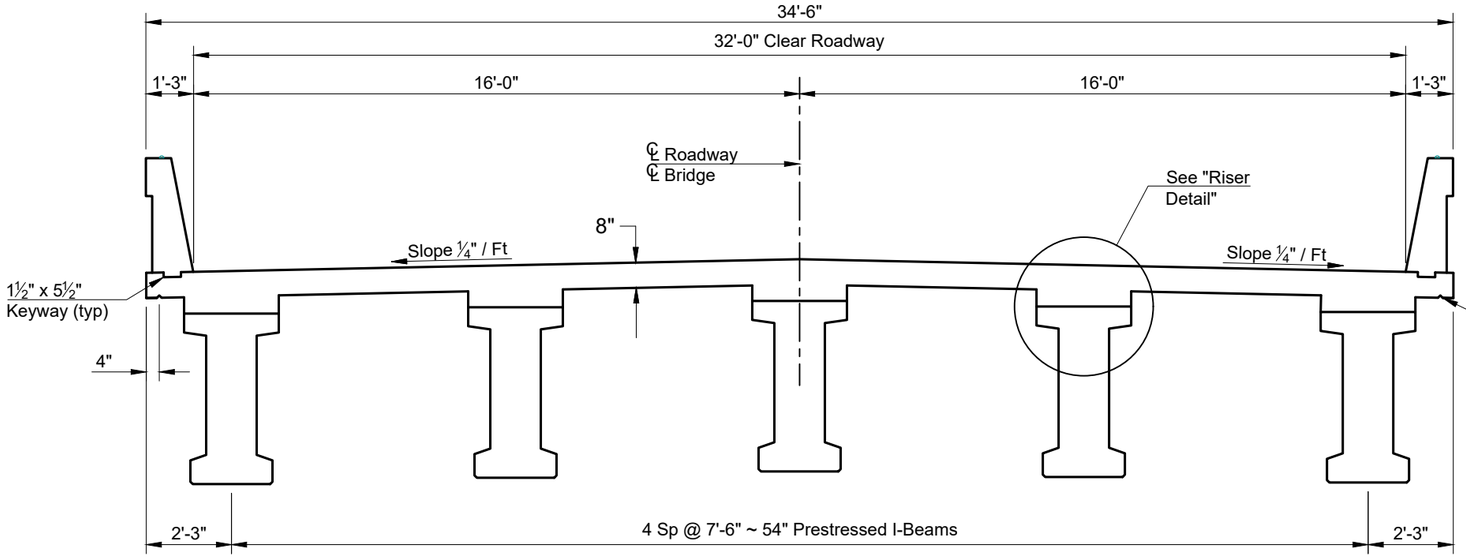
SEE DWG 30-143-19.1-22

Endwall Details

Bridge Replacement
Bridge No. 30-143-19.1

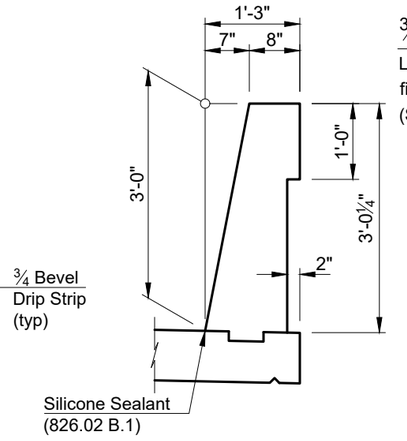
Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	170	21

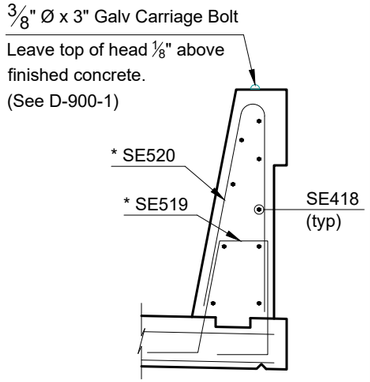


(SHOWING DIMENSIONS)

SLAB SECTION



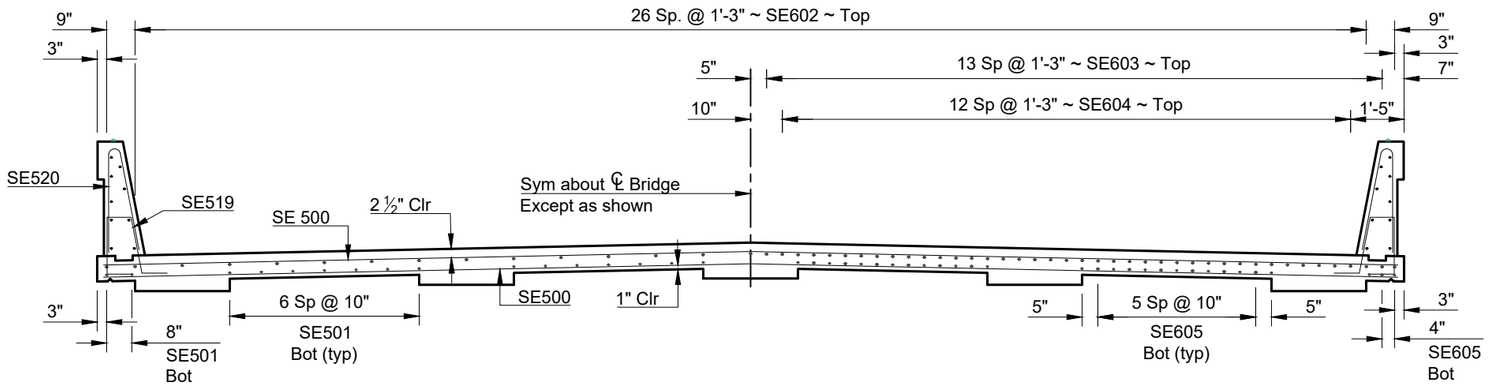
SHOWING DIMENSIONS



* Provide a 1 ½" clearance to the barrier reinforcing.

SHOWING REINFORCING

BARRIER DETAIL

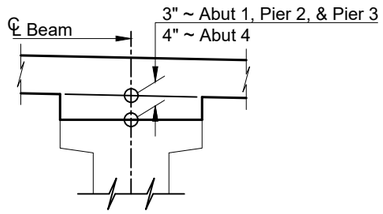


(SHOWING REINFORCING BETWEEN SUPPORTS)

(SHOWING REINFORCING OVER PIERS)

SLAB SECTION

The dimension shown is located at the supports. The anticipated midspan riser is ½". Adjust the riser to maintain the 8" slab thickness.



RISER DETAIL

SAUBER ENGINEERING

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QUANTITIES

SEE DWG 30-143-19.1-22

Slab Section

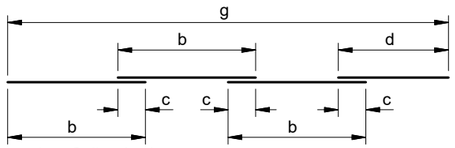
Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-3020(080)	170	22

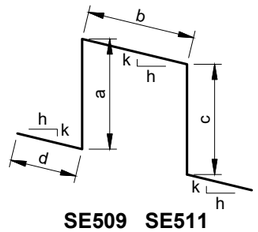
BILL OF REINFORCING STEEL, GRADE 60 (SUPERSTRUCTURE)

SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS							
				a	b	c	d	e	g	h	k
5	SE500	1,110	34'-2"		34'-2"						
5	SE501	32	350'-8"		60'-0"	3'-0"	50'-8"	5	335'-8"		
6	SE602	29	354'-0"		60'-0"	3'-8"	54'-0"	5	335'-8"		
6	SE603	56	72'-8"		60'-0"	3'-8"	12'-8"	1	69'-0"		
6	SE604	52	45'-0"		45'-0"						
6	SE605	52	33'-0"		33'-0"						
6	SE606	12	28'-5"		28'-5"						
6	SE607	36	29'-2"		29'-2"						
6	SE608	48	5'-9"		5'-9"						
5	SE509	40	14'-4"	4'-10"	2'-8"	4'-10"	1'-0"			12	0
4	SE410	48	3'-8"		6"	2'-8"	6"				
5	SE511	120	10'-9"	4'-2"	5"	4'-2"	1'-0"			12	0
5	SE512	44	7'-7"		4'-7"	3'-0"					
5	SE513	70	8'-11"		4'-11"	4'-0"					
5	SE514	12	34'-3"		34'-3"						
4	SE415	60	2'-8"		6"	1'-8"	6"				
5	SE516	2	91'-0"	11"	29'-5"			5			
5	SE517	2	60'-2"	2'-2"	27'-11"			3			
4	SE418	18	345'-7"		60'-0"	2'-0"	45'-7"	5	335'-7"		
5	SE519	1,036	4'-11"	1'-6"	7"			10"	8"	2.3	12
5	SE520	1,036	5'-7"	9"	2'-7"	5"				2.3	12
5	SE521	44	7'-8"		4'-8"	3'-0"					
5	SE522	70	9'-0"		5'-0"	4'-0"					

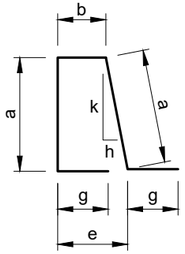


c = Lap Splice (typ)
e = # of "b" Length Pieces in a Set
Total Length per Set = e x b + d

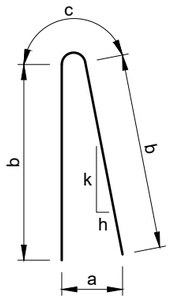
SE501 SE602 SE603 SE418



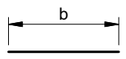
SE509 SE511



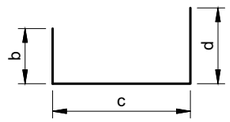
SE519



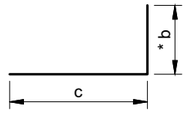
SE520



SE500 SE604 SE605 SE606 SE607 SE608 SE514

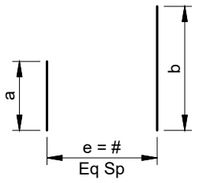


SE410 SE415



SE512 SE513 SE521 SE522

* b = Vertical Leg



SE516 SE517

SAUBER ENGINEERING

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QUANTITIES	(SUPERSTRUCTURE)
CLASS AAE-3 CONCRETE	457.0 CY
REINFORCING STEEL-GRADE 60 (EPOXY)	101,808 LBS

Superstructure Reinforcing Details

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	175	1

Boring Log No. B-1

Location: See Exploration Plan
Latitude: 46.7038° Longitude: -101.2125°
Depth (Ft.) Elevation.: 1758.0 (Ft.)

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Unconfined Compressive Strength (psf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
		2.5 1755.5									
1		**AGGREGATE SURFACE & BASE COURSE**, brown, frozen									
		5.0 1753			16	23-22-17 N=39		12.4			
		FILL - SILTY SAND, trace gravel, brown, frost to 3 feet, inclusions of clay									
					16	5-5-5 N=10		11.1		NP	
2		**SILTY SAND (SM)**, fine grained, brown to light brown, loose to medium dense			14	2-2-4 N=6					46
					12	2-3-4 N=7		13.2			
					24						32
		18.0 1740			12	2-4-4 N=8		11.4		22-19-3	40
5		**LEAN CLAY (CL)**, grayish brown, stiff, laminations of silt			24		2330	29.8	91	45-16-29	96
		25.0 1733									
		POORLY GRADED SAND WITH SILT (SP-SM), fine to medium grained, brownish gray, loose, iron oxide staining, lenses of clay			14	3-5-6 N=11					
3					18	3-4-5 N=9		15.3			9
		34.0 1724	▽								
		POORLY GRADED SAND (SP), trace gravel, fine to coarse grained, reddish brown, medium dense, waterbearing			16	3-5-7 N=12		24.0			4
		39.0 1719									
6		**POORLY GRADED SAND (SP)**, fine to medium grained, gray, medium dense to dense, lenses of coal			16	12-14-14 N=28		30.5			
					15	7-8-9 N=17		45.4			
					16	10-11-11 N=22		33.2			

Boring Log No. B-1

Location: See Exploration Plan
Latitude: 46.7038° Longitude: -101.2125°
Depth (Ft.) Elevation.: 1758.0 (Ft.)

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Unconfined Compressive Strength (psf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
6		**POORLY GRADED SAND (SP)**, fine to medium grained, gray, medium dense to dense, lenses of coal *(continued)*									
		seam of coal at 59 feet:			15	9-10-11 N=21		33.3			8
					14	7-11-13 N=24		27.4			
					12	7-10-13 N=23		26.8			5
					16	13-16-17 N=33		23.0			
		73.0 1685									
4		**POORLY GRADED SAND WITH GRAVEL (SP)**, fine to coarse grained, brown and gray, dense, seams and lenses of coal			14	13-16-19 N=35		23.8			2
		79.0 1679									
6		**POORLY GRADED SAND WITH CLAY (SP-SC)**, trace gravel, fine to medium grained, gray, very dense, lenses of clay			10	19-32-50/3"		29.4			
					15	16-50/5"		25.9	102	45-14-31	
		89.9 1668.08			5	50/5"		30.6			6
		Boring Terminated at 89.92 Feet									

SAUBER ENGINEERING

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Bridge Boring Logs

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-3020(080)	175	2

Boring Log No. B-2

Location: See Exploration Plan
Latitude: 46.7028° Longitude: -101.2139°
Depth (Ft.) Elevation.: 1744.7 (Ft.)

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Unconfined Compressive Strength (psf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0									
		AGGREGATE SURFACE & BASE COURSE, brown, frozen 2.0 1742.7									
2		**SILTY SAND (SM)**, fine grained, brown, loose, lenses of clay			17	14-15-20 N=35		33.1			
					24			11.9		24-16-8	40
		9.0 1735.7			13	2-2-2 N=4		11.1			33
3		**POORLY GRADED SAND (SP)**, fine to medium grained, brown to brownish gray, loose, iron oxide staining			16	2-3-3 N=6		4.3			7
		2-inch seam of silt at 12 feet			17	1-2-5 N=7		6.8			
		½-inch seam of clay at 15 feet			24			7.4		NP	5
		19.0 1725.7									
4		**POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC)**, fine to coarse grained, reddish brown, medium dense, waterbearing			12	3-10-9 N=19		14.5			
					14	5-7-8 N=15		15.4			13
		tube crushed			0						
		34.0 1710.7									
3		**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, gray, loose, waterbearing			12	3-4-5 N=9		48.9			7
		no sample; transition from hollow stem auger to mud rotary drilling techniques									
		44.0 1700.7									
6		**POORLY GRADED SAND WITH SILT (SP-SM)**, trace gravel, fine to coarse grained, gray, dense, lenses of coal to 52 feet, waterbearing			12	8-11-11 N=22		22.7			9
					14	8-17-23 N=40					

Boring Log No. B-2

Location: See Exploration Plan
Latitude: 46.7028° Longitude: -101.2139°
Depth (Ft.) Elevation.: 1744.7 (Ft.)

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Unconfined Compressive Strength (psf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
6		**POORLY GRADED SAND WITH SILT (SP-SM)**, trace gravel, fine to coarse grained, gray, dense, lenses of coal to 52 feet, waterbearing *(continued)*			15	10-18-25 N=43		20.5			10
		59.0 1685.7									
7		**SANDY FAT CLAY (CH)**, dark gray, hard, lenses and seams of sand and silt			17	13-26-40 N=66	3870	24.8	101		
					16	19-30-50/2"					
					12	17-50/3"		23.0	101		
		77.0 1667.7									
6		**SILTY SAND (SM)**, fine to medium grained, gray, very dense, waterbearing			16	26-50/4"	5760	24.0	97		
					14	35-50/3"		27.7	100		40
					6	50/4"		37.6			
					5	50/5"		29.1		NP	
		94.0 1650.7									
7		**FAT CLAY (CH)**, gray, very stiff to hard, laminations of silt			18	12-17-25 N=42	5000	31.6	92		
		100.8 1643.87			18	19-29-50/4"	14260	23.5	104		
		Boring Terminated at 100.83 Feet									

SAUBER ENGINEERING

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Bridge Boring Logs

Bridge Replacement
Bridge No. 30-143-19.1

Morton County, ND

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
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
08-16-22	General Revisions

KIRK J. HOFF
REGISTERED
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PE-4683
ENGINEER
NORTH DAKOTA
08/16/22

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
HTCG	high tension cable guardrail
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 ℄	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
VSFS	vehicle speed feedback sign
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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08/16/22

NDDOT ABBREVIATIONS

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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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
EQUINOR	Equinor Pipeline
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
PAAP	Plains All American Pipeline
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
WAWSA	Western Area Water Supply Authority
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

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04-23-18	General Revisions
09-20-18	General Revisions
12-18-20	General Revisions
08-16-22	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

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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

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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

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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)

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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)

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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

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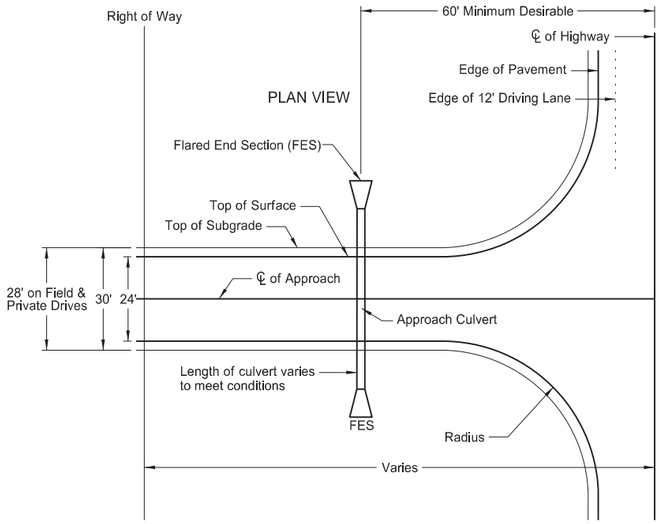
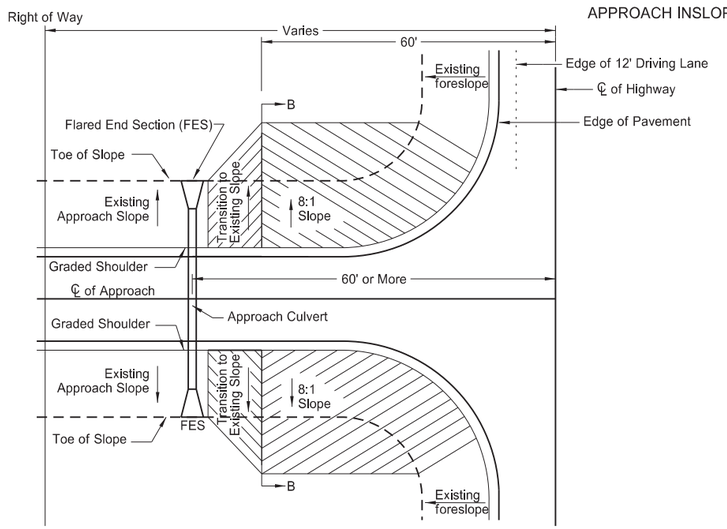
STANDARD RURAL APPROACHES

D-203-8

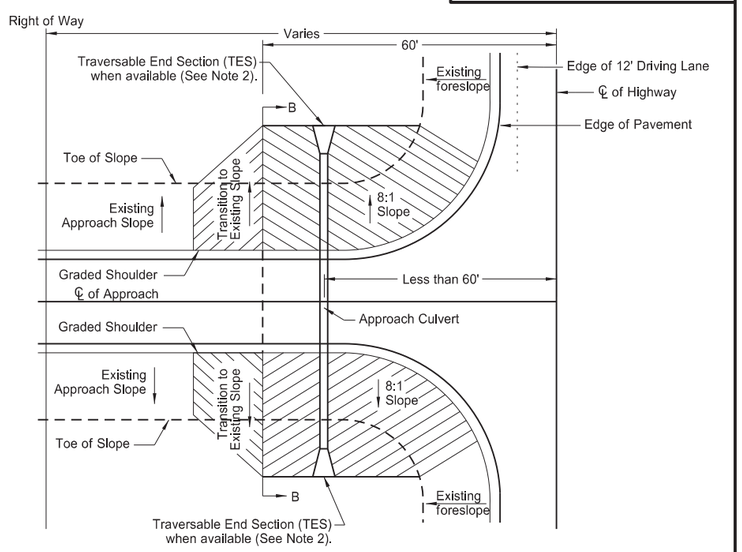


APPROACH INSLOPES



CASE 1

APPROACH PIPE LOCATED
60' OR MORE FROM ℄



CASE 2

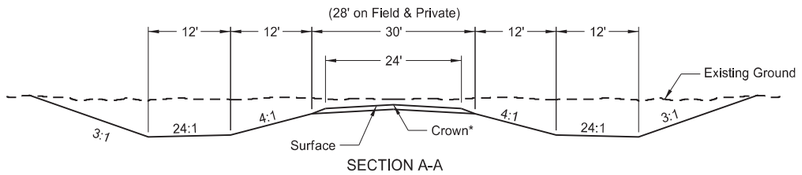
APPROACH PIPE LOCATED
LESS THAN 60' FROM ℄

Approach Pipe Traversable End Sections (TES)

RCP	CSP	CSP Arch
15"	15"	
18"	18"	21"x15"
		24"x18"
24"	24"	28"x20"

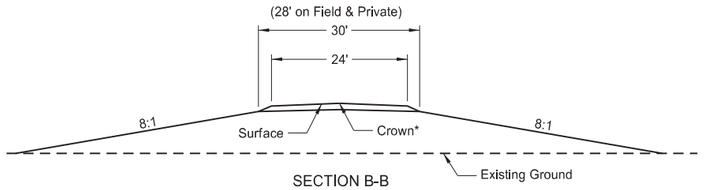
CRITERIA FOR RURAL APPROACH TYPES

	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)

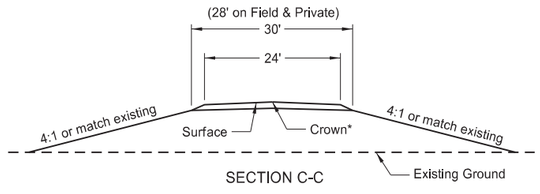


SECTION A-A

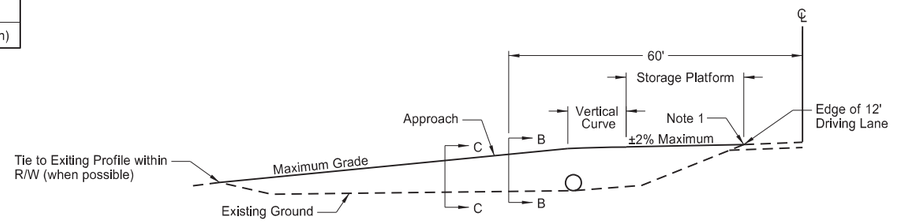
*2.1% crown for paved surface
*3.0% crown for gravel surface



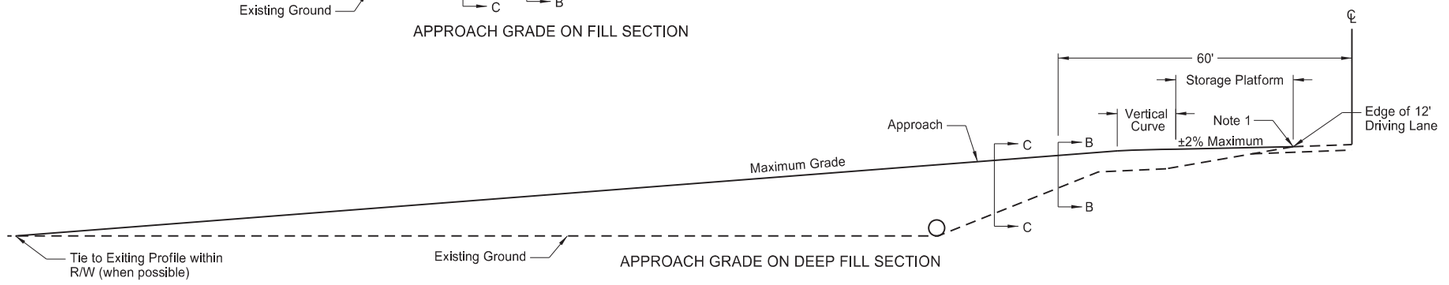
SECTION B-B



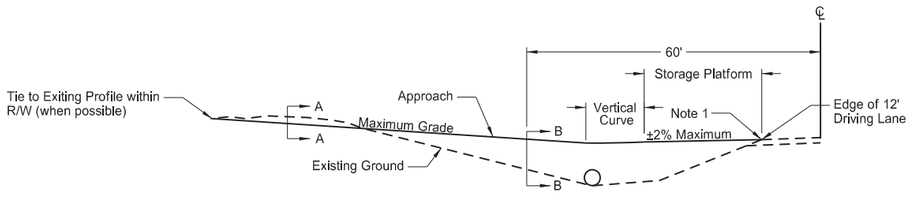
SECTION C-C



APPROACH GRADE ON FILL SECTION



APPROACH GRADE ON DEEP FILL SECTION



APPROACH GRADE ON CUT SECTION

NOTES:

1. 5% Max Rollover between approach storage platform and highway.
2. Approach pipes up to 24" diameter are acceptable (with traversable end sections) for Case 2. Install approach pipes larger than 24" diameter in accordance with Case 1.

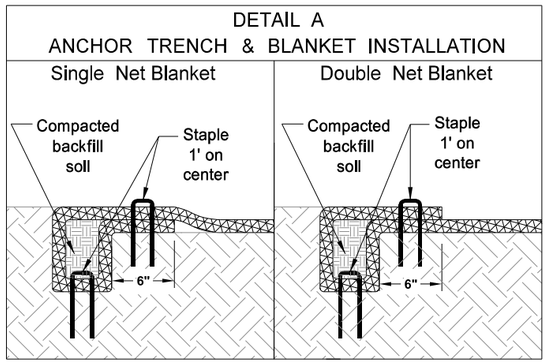
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-25-14	
REVISIONS	
DATE	CHANGE
06-30-17	Revised Radius, Storage Platform, Inslope dimensions, and Note 1
10-25-19	Changed "Inslope" to "Foreslope"
06-29-22	Added "TES", Table, and Note 2

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

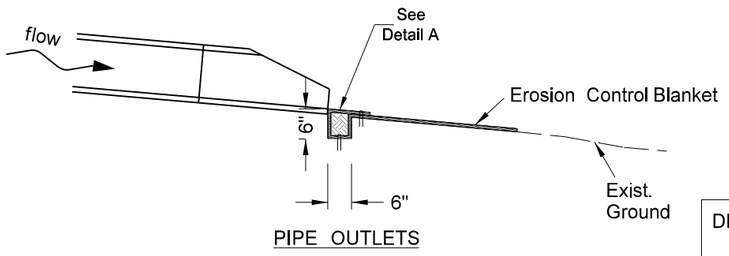
06/29/22

D-255-2

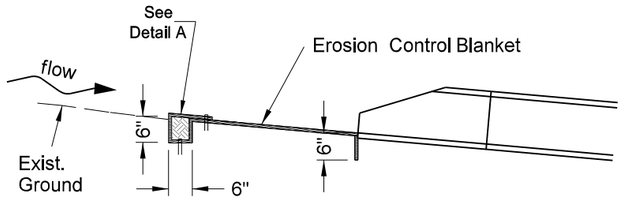
EROSION AND SILTATION CONTROL
EROSION CONTROL BLANKET INSTALLATION



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

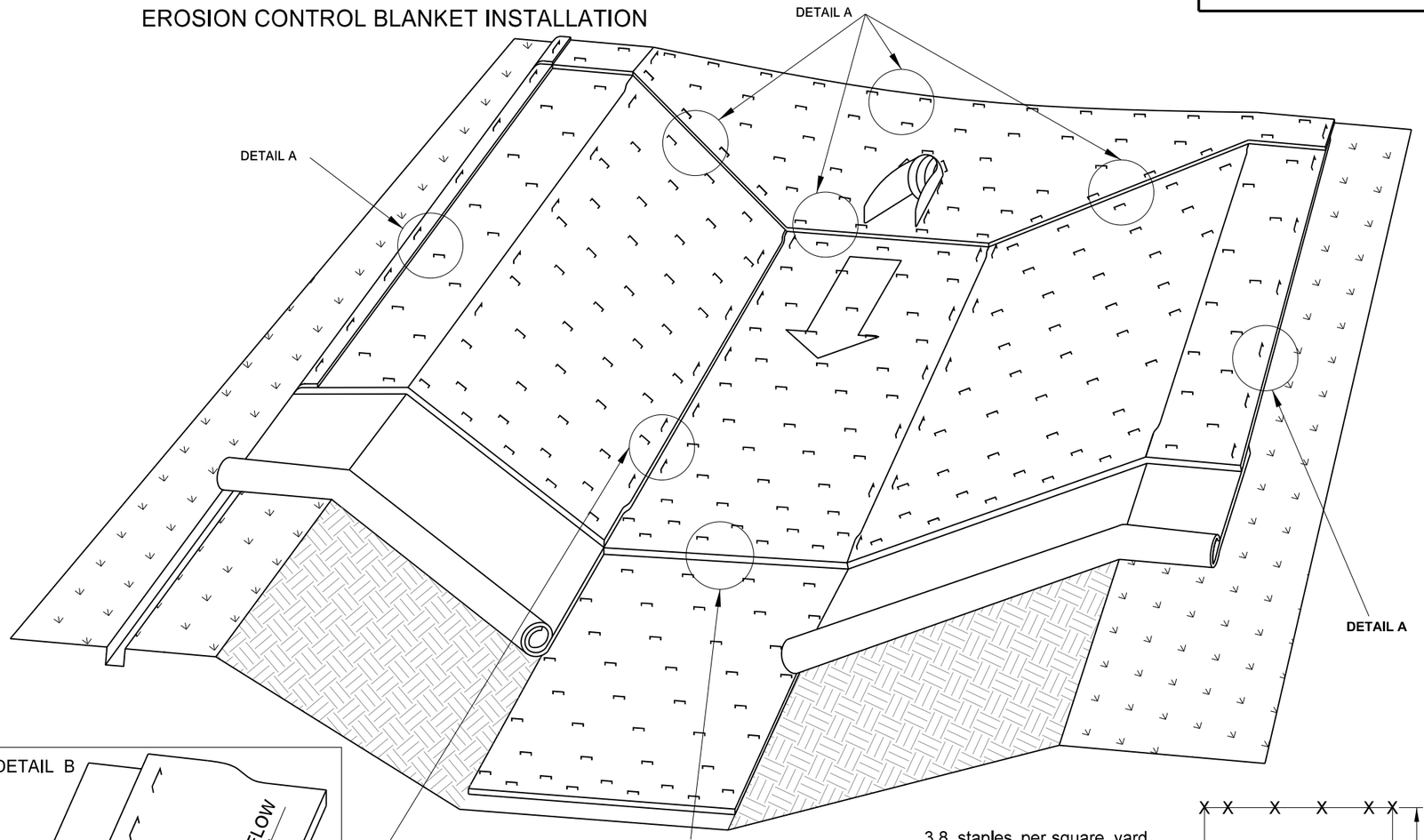


PIPE OUTLETS

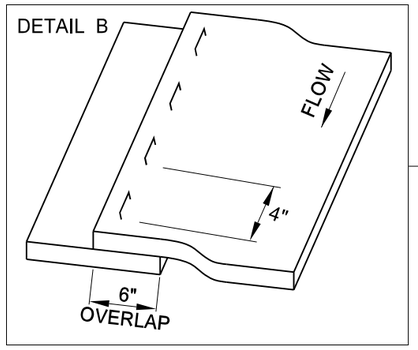


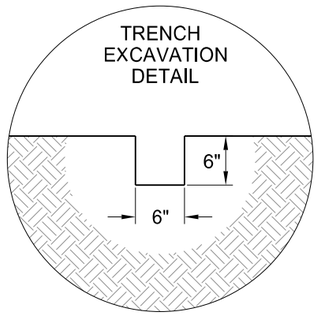
PIPE INLETS

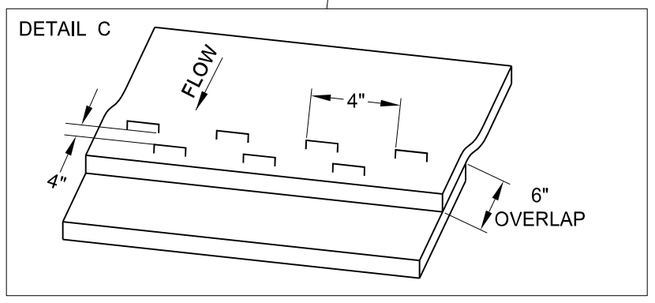
INSTALLATION AT PIPE ENDS



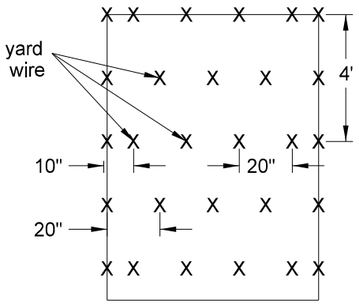
BLANKET LAYOUT
CHANNEL OR SLOPE INSTALLATION







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



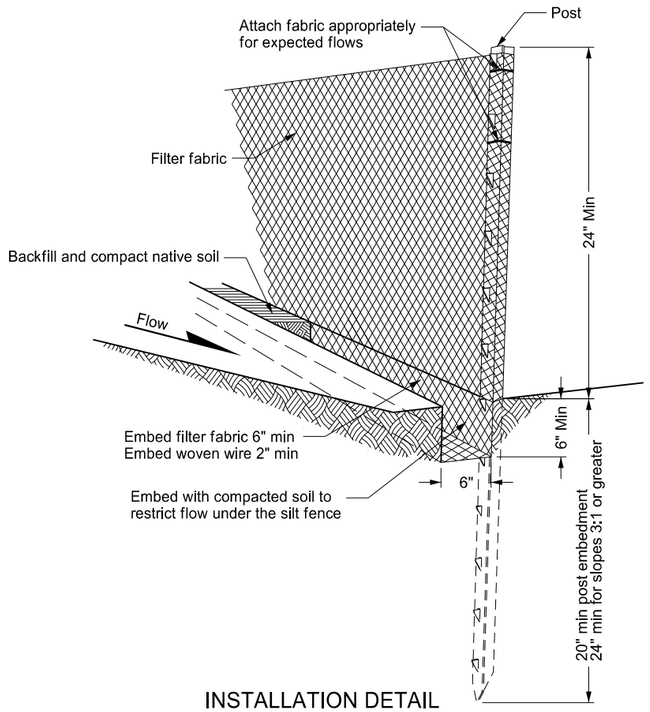
STAPLE PATTERN

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

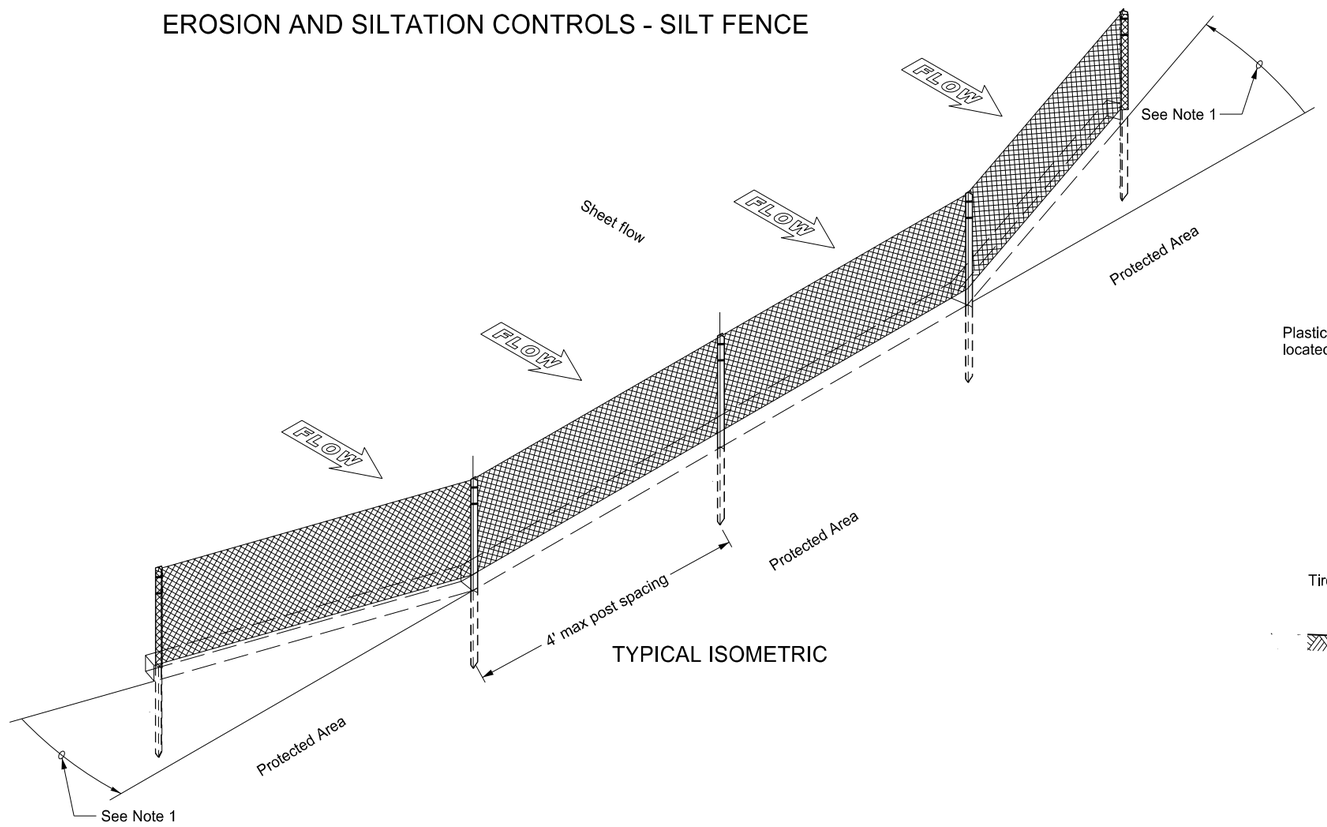
EROSION AND SILTATION CONTROLS - SILT FENCE

D-260-1

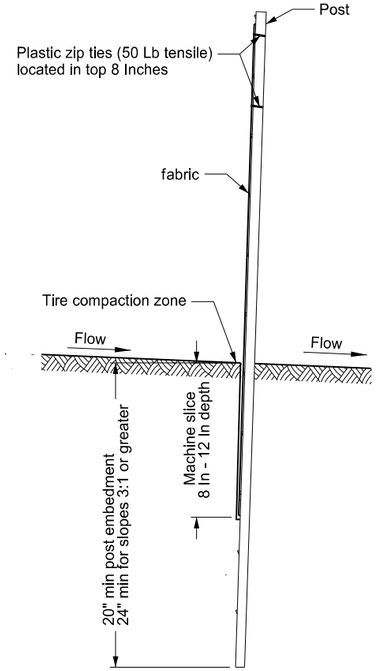


INSTALLATION DETAIL

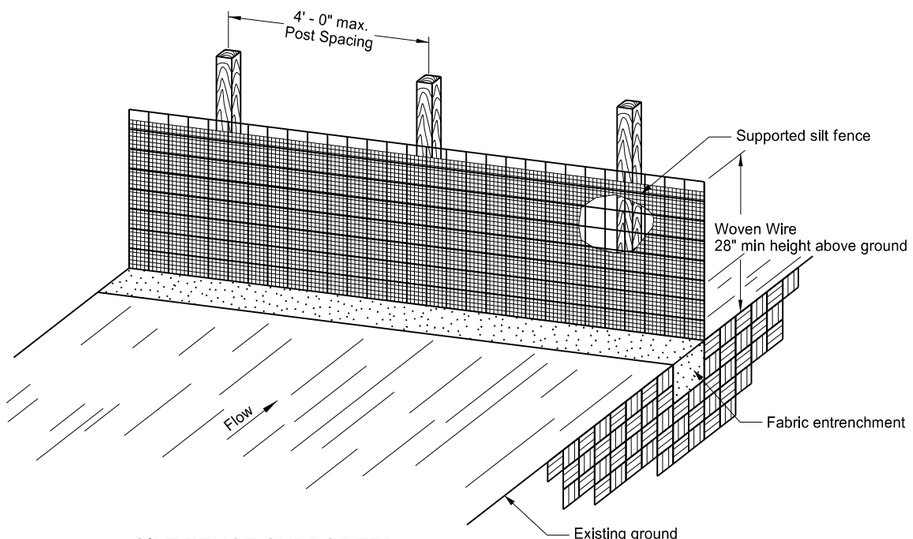
Minimize disturbance of ground around trench and smooth surface after excavation to avoid concentrating flows. Compact to prevent undercutting flows.



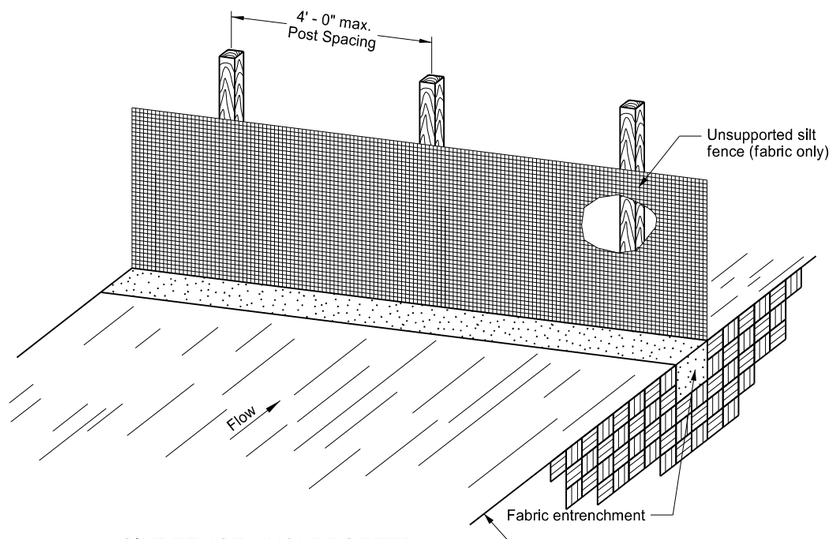
TYPICAL ISOMETRIC



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.

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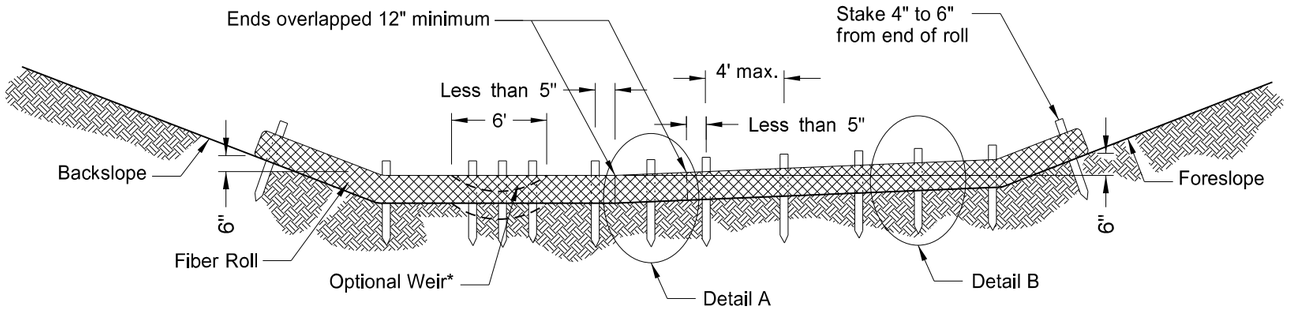
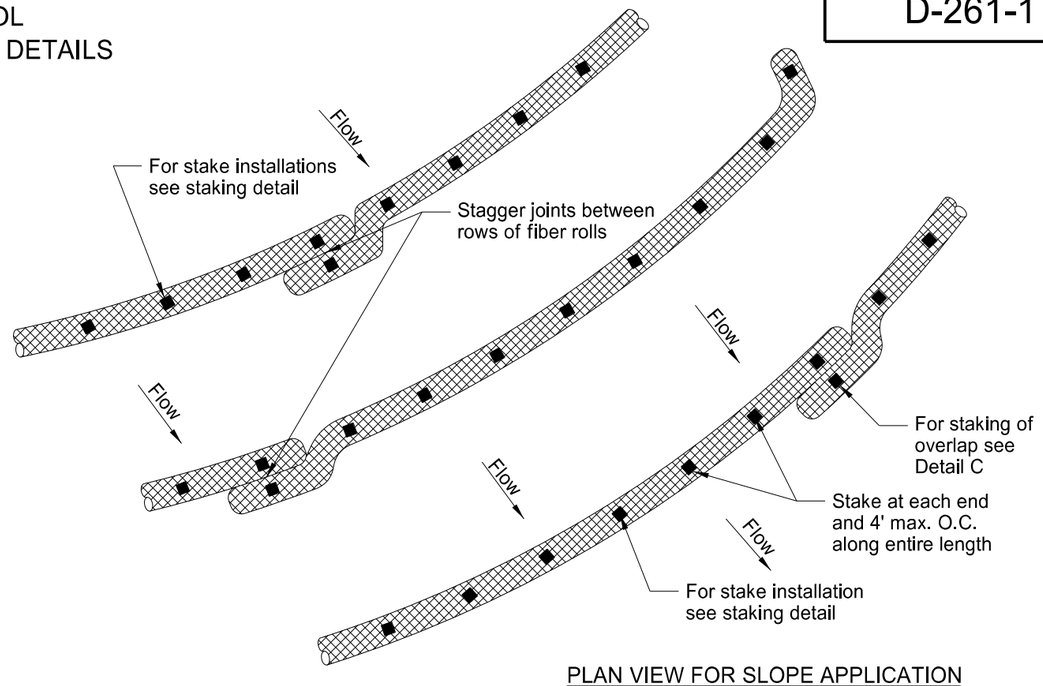
EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

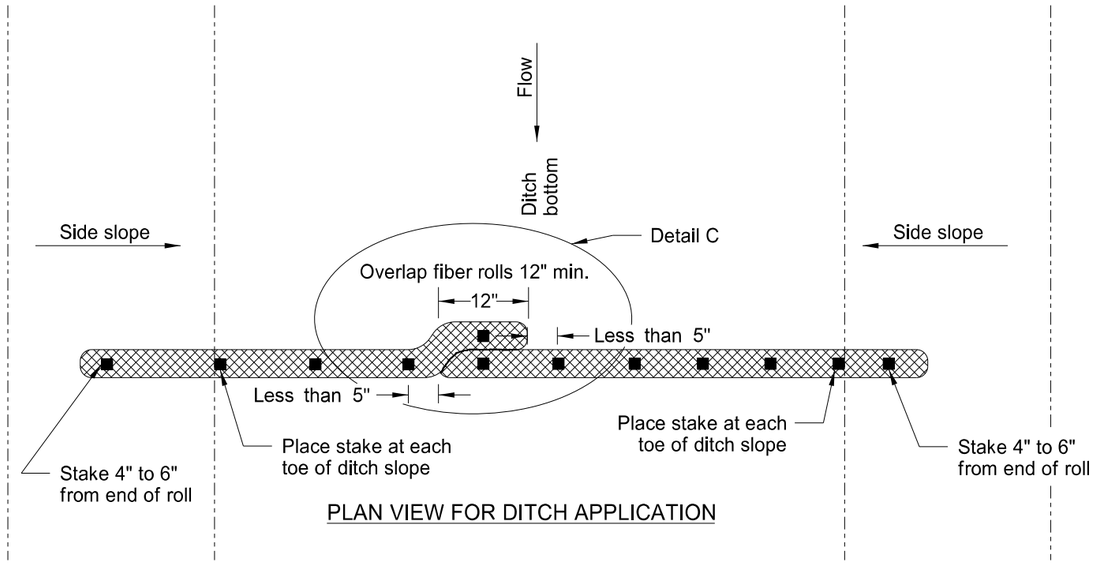


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

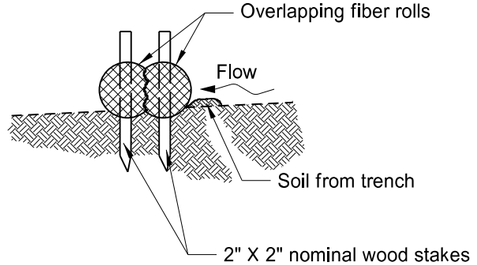
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



PLAN VIEW FOR SLOPE APPLICATION

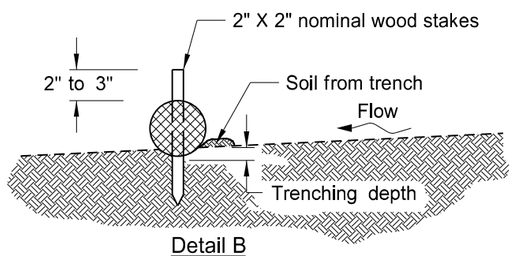


PLAN VIEW FOR DITCH APPLICATION



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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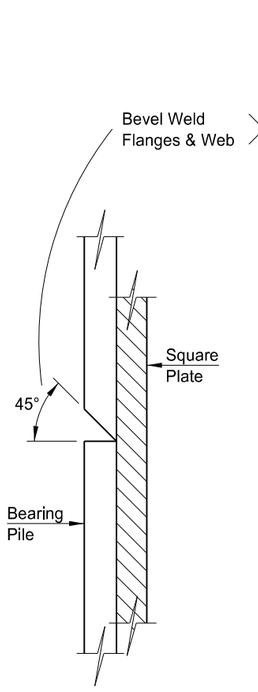
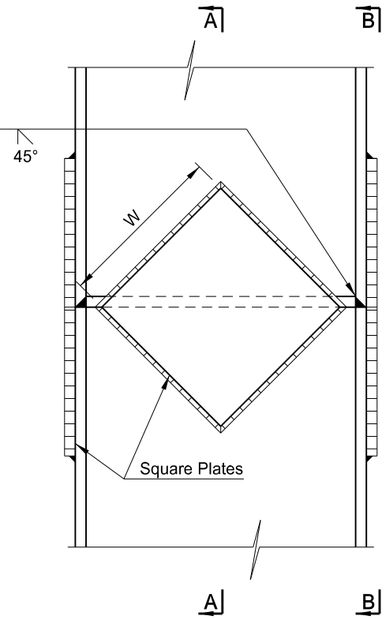
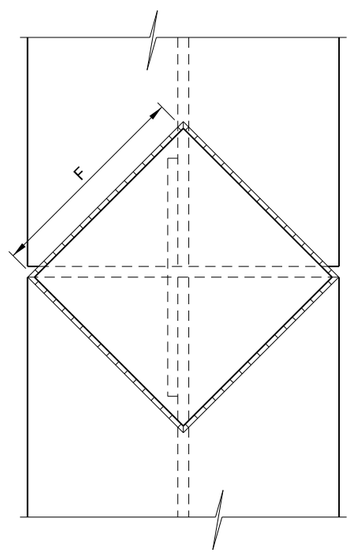
PILE SPLICE DETAILS

D-622-1

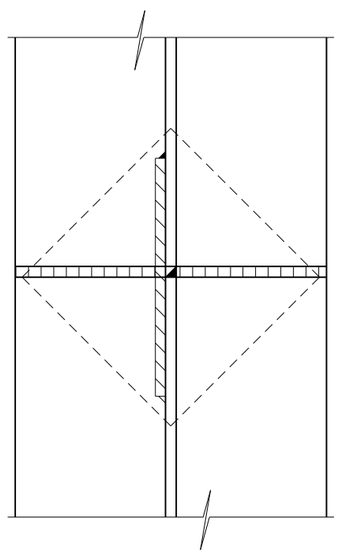


ENLARGED VIEW



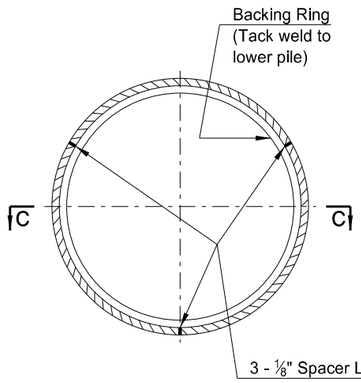


B-B

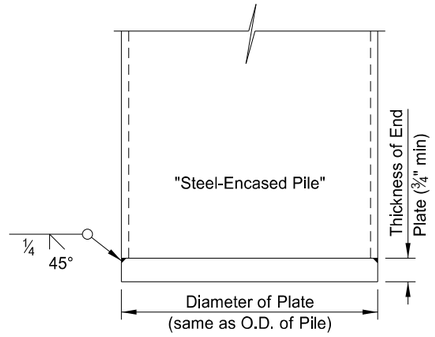


A-A

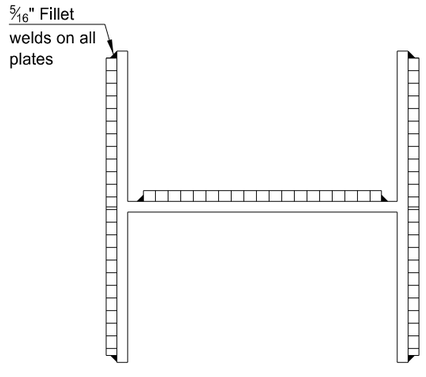
Flame scarf inside of both flanges and one side of web of upper section.



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

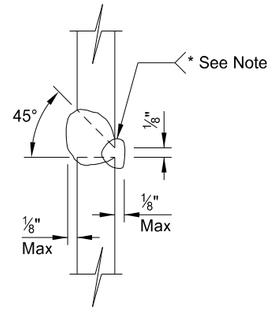


END PLATE DETAIL

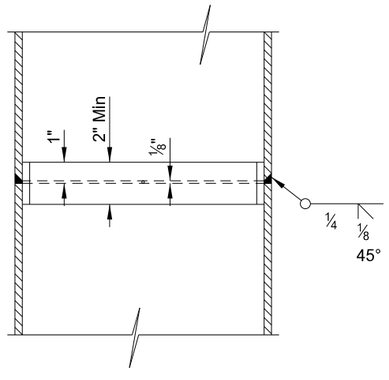


PILE	8"	10"	12"	14"
"F" FLANGE	5"	6½"	8"	10"
"W" WEB	4"	5½"	6½"	8"

H-PILE SPLICE DETAIL

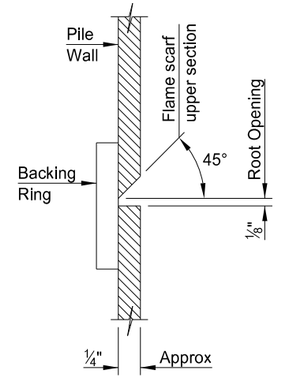


ALTERNATE H-PILE SPLICE DETAIL



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.

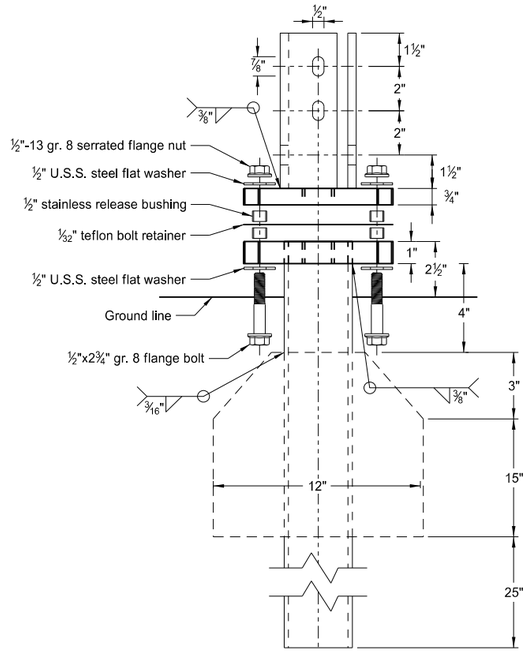
The thickness of the steel square plates shall at a minimum be as thick as the flanges and web of the pile being spliced.

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

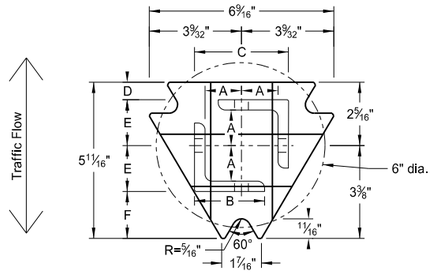
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

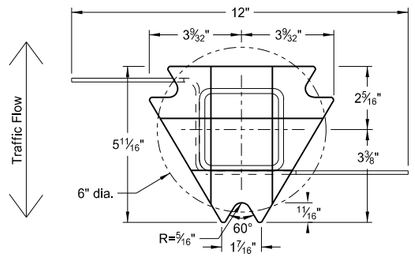


Multi-Directional
Slip Base Assembly

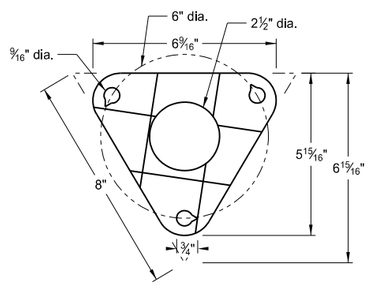
Perforated Tube



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.

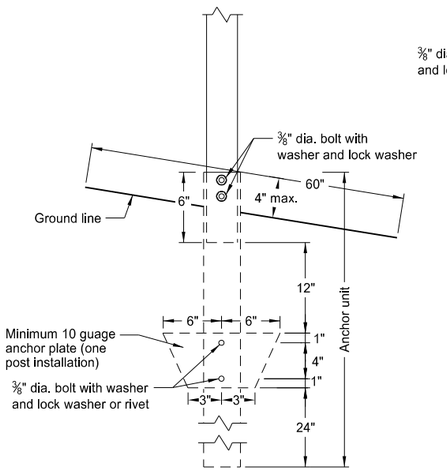
Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thick-ness Gauge	Sleeve Size in.	Wall Thick-ness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2¼
1	2¼	12			No	2½
1	2½	12			(A)	3
1	2½	10			Yes	
1	2¼	12	2	12	Yes	
1	2½	12	2¼	12	Yes	
2	2	12			No	2¼
2	2¼	12			No	2½
2	2½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

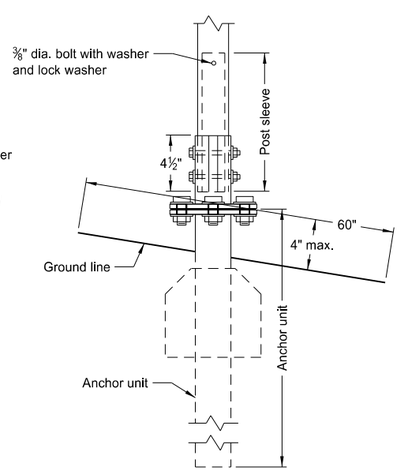
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2³/16"x10 ga.	1⁹/64"	2½"	3¹/32"	2⁵/32"	1³³/64"	1⅞"
2½"x10 ga.	1⁹/32"	2½"	3⁵/16"	⅝"	1²¹/32"	1¾"

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

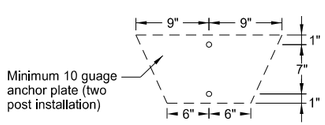
(B) For additional wind load, insert the 2³/16"x10 ga. into 2½"x10 ga.



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

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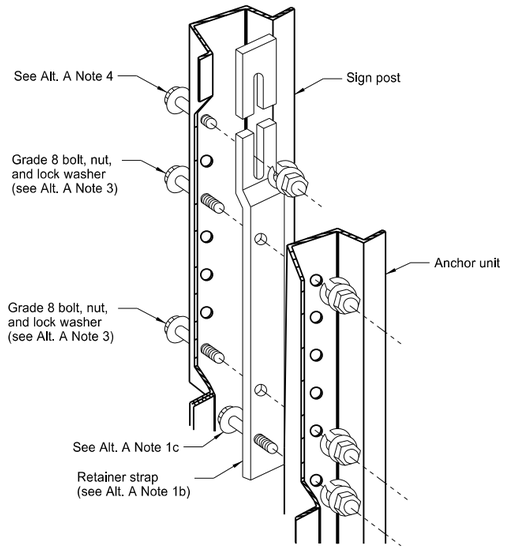
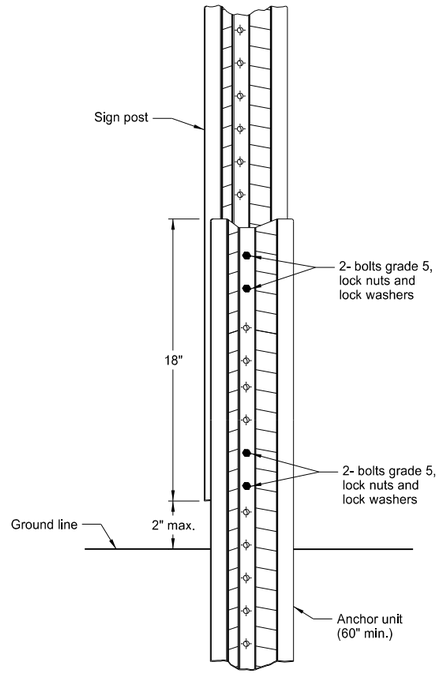
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

U-Channel Post

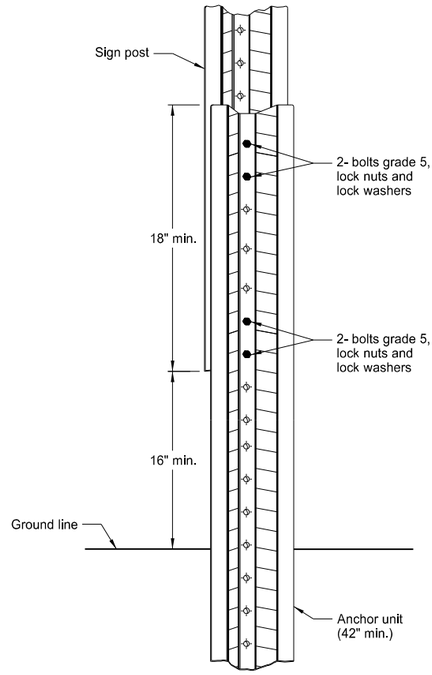


Detail A



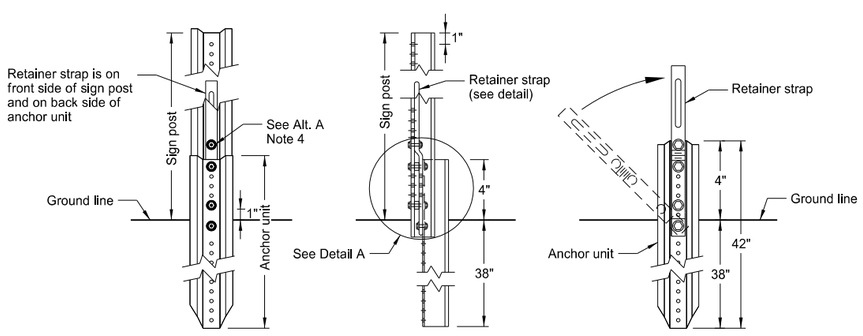
Breakaway U-Channel Splice Detail
Alternate B
(2.5 and 3 lb/ft)

Install a maximum of 3 posts within 7'.



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

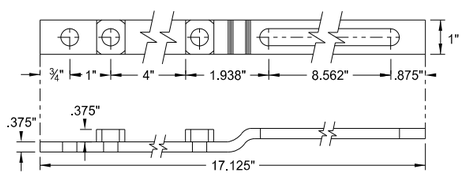
Install a maximum of 3 posts within 7'.



Front View Side View Back View

Breakaway U-Channel Detail
Alternate A

Install a maximum of 2 posts within 7'.



Retainer Strap Detail

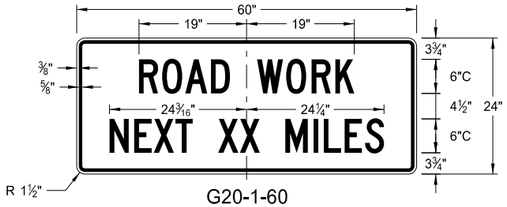
Alternate A Steps of Installation:

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.

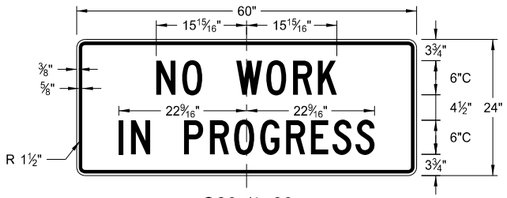
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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
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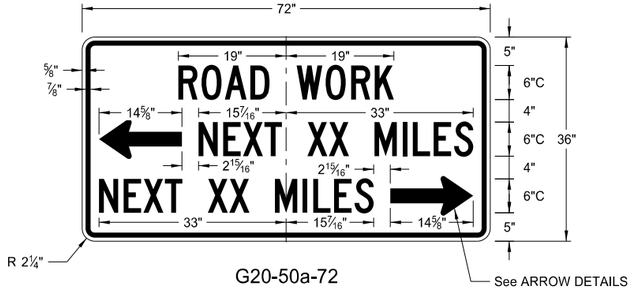
Background: orange



G20-50a-72
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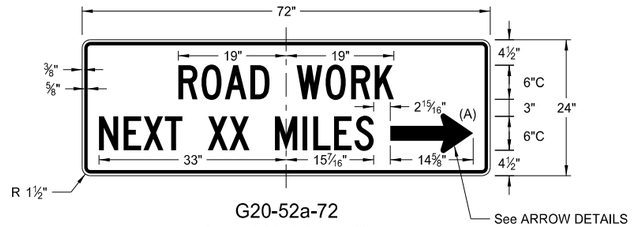
Background: orange



G20-52a-72
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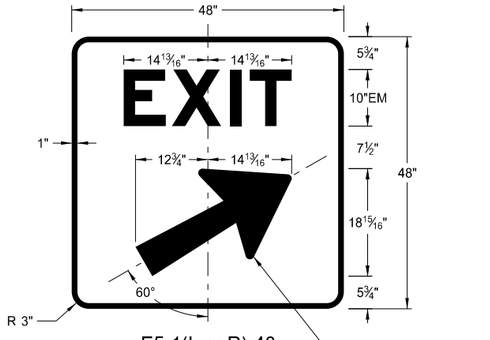
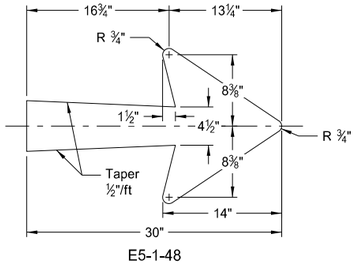
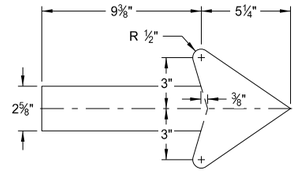
Background: orange



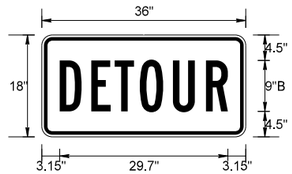
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



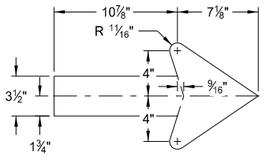
E5-1-48



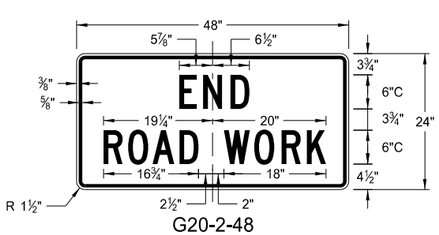
G20-50a-72
G20-52a-72



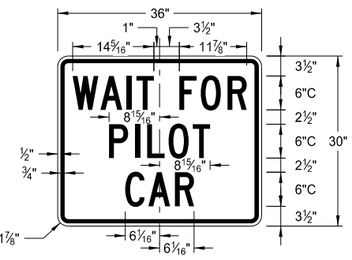
M4-8-36
Legend: black (non-refl)
Background: orange



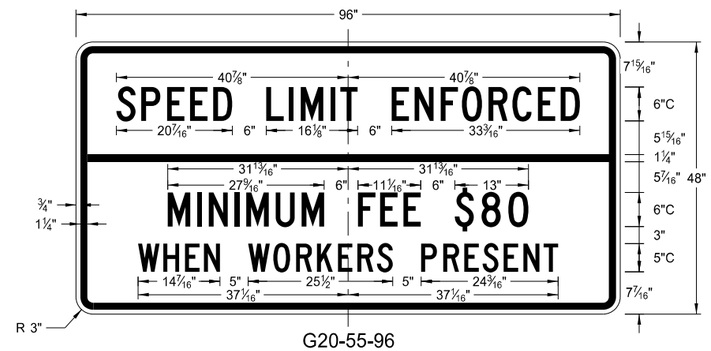
M4-9(L or R)-30
Right or Left



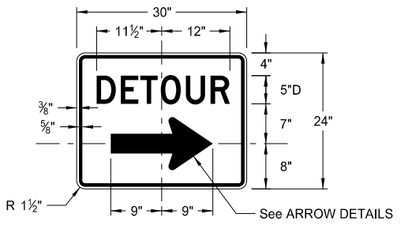
G20-2-48
Legend: black (non-refl)
Background: orange



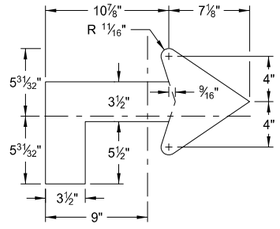
G20-4b-36
Legend: black (non-refl)
Background: orange



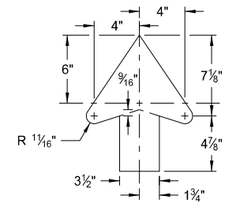
G20-55-96
Legend: black (non-refl)
Background: orange



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

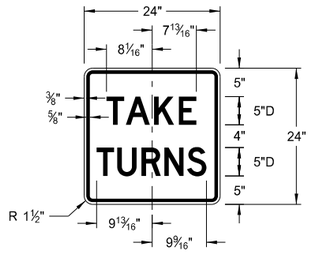
NOTES:

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

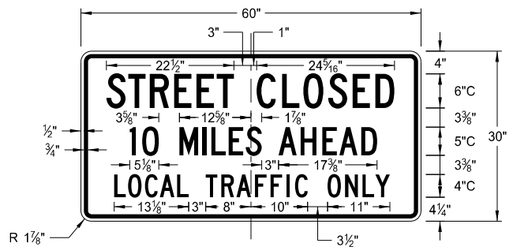
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Added sign & background color
10-03-19	New Design Engineer PE Stamp

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

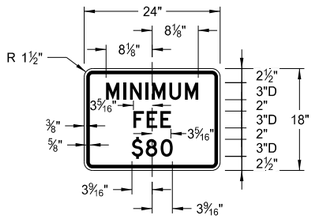
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



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



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



R2-1aP-24
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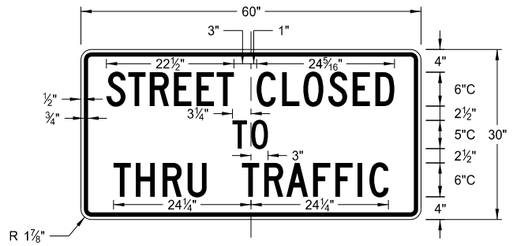
Background: white



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

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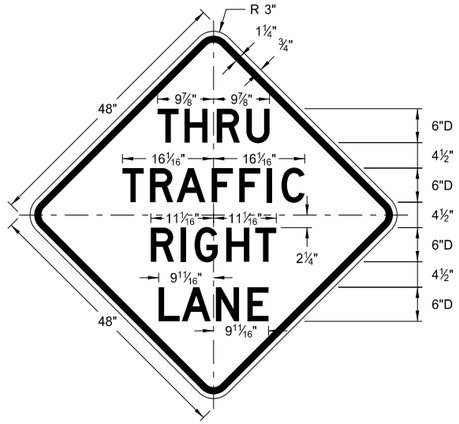
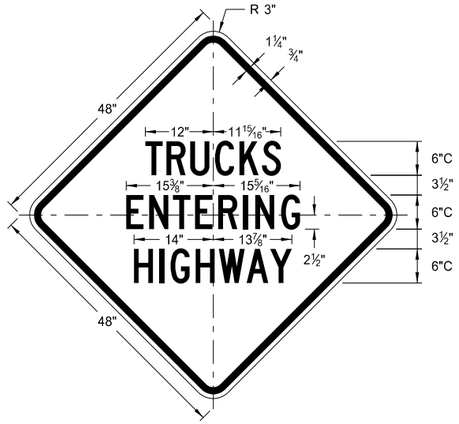
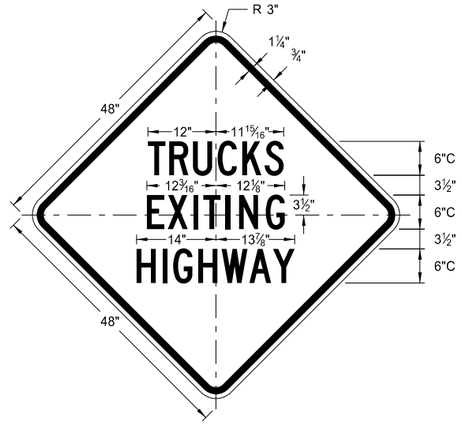
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



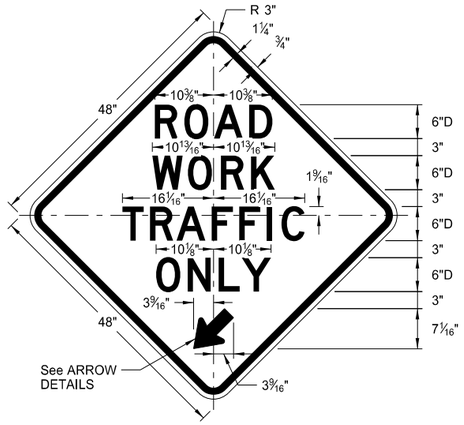
W5-8-48
Legend: black (non-refl)
Background: orange



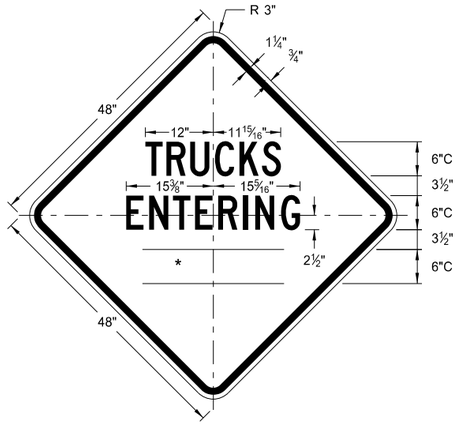
W8-53-48
Legend: black (non-refl)
Background: orange



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



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



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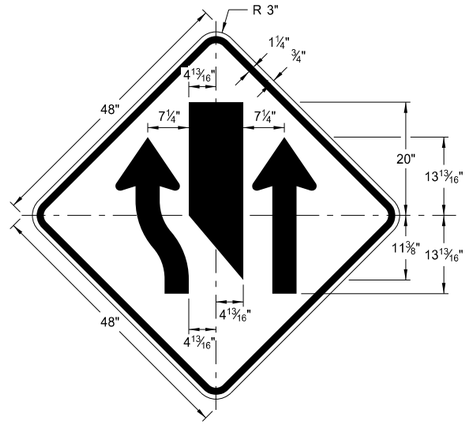
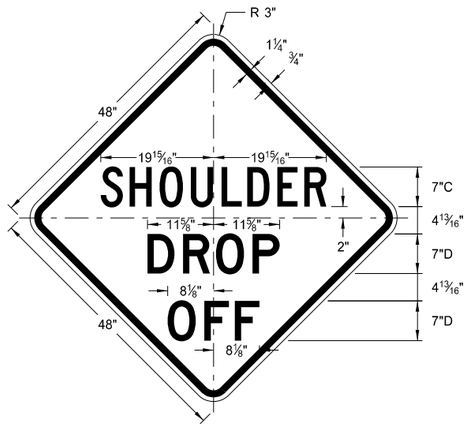
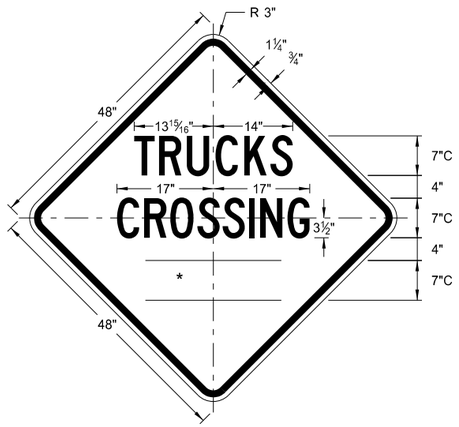
Background: orange



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



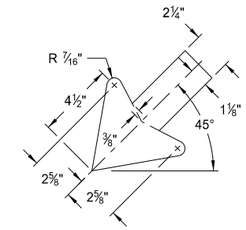
W8-9a-48
Legend: black (non-refl)
Background: orange



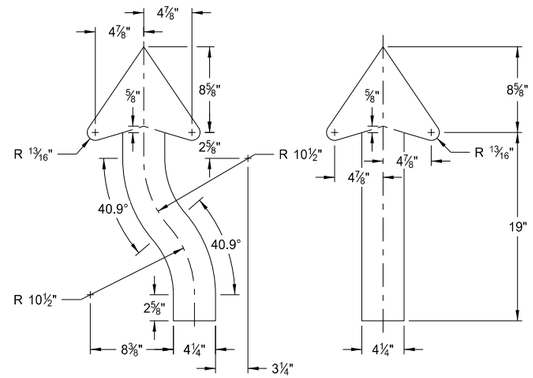
W8-55-48
Legend: black (non-refl)
Background: orange

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

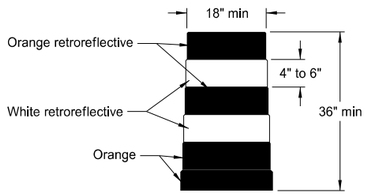
ARROW DETAILS

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

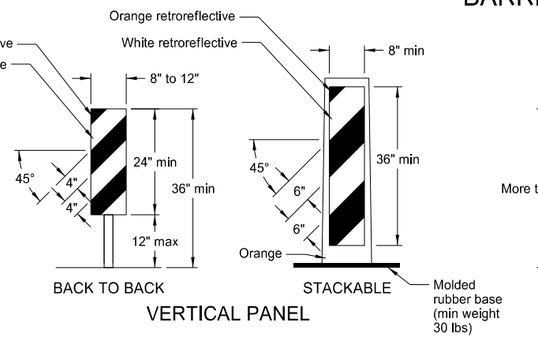
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



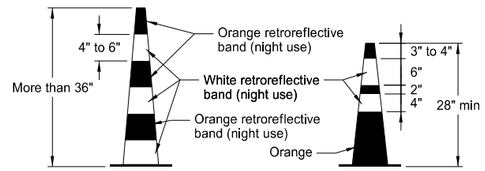
DELINEATOR DRUM

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.



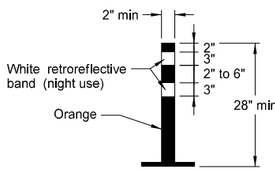
VERTICAL PANEL

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.



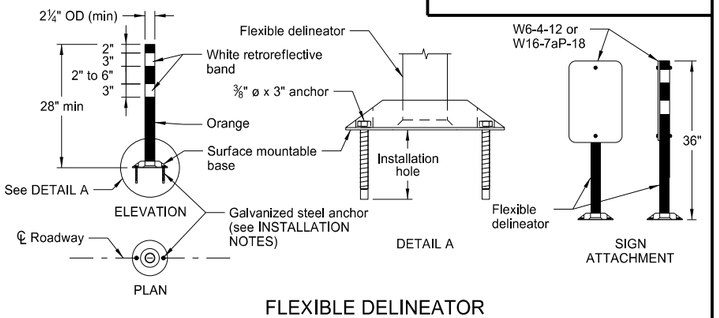
TRAFFIC CONE

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

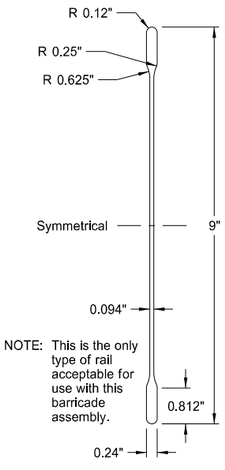
Provide retroreflectorization of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

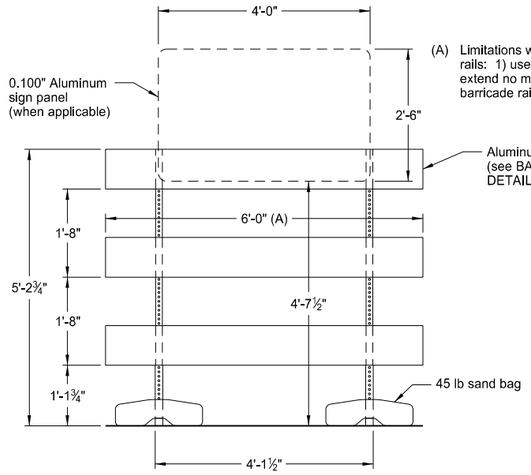
INSTALLATION NOTES:

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.



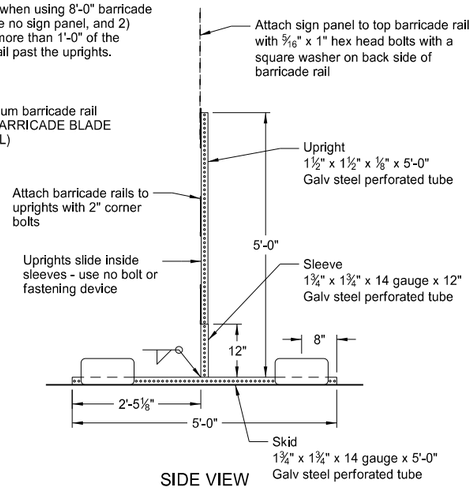
NOTE: This is the only type of rail acceptable for use with this barricade assembly.

BARRICADE BLADE DETAIL



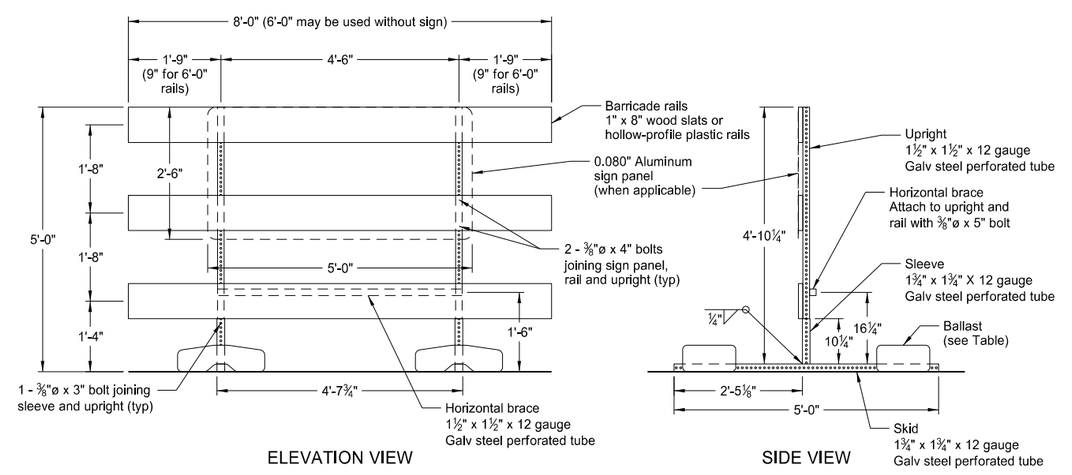
(A) Limitations when using 8'-0" barricade rails: 1) use no sign panel, and 2) extend no more than 1'-0" of the barricade rail past the uprights.

ELEVATION VIEW



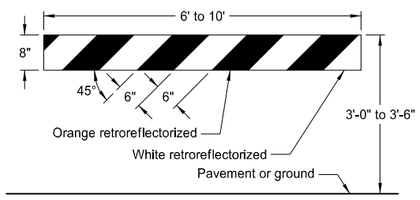
SIDE VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

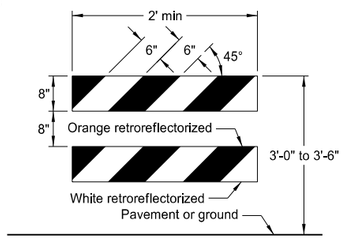


BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

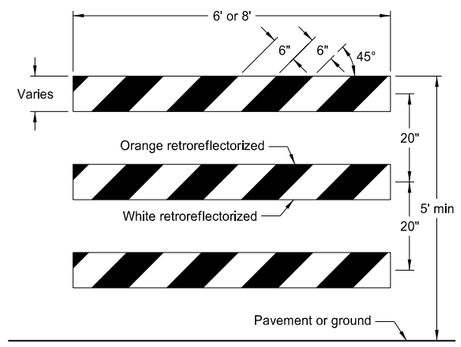
NOTE: For barricade markings use alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Place retroreflective sheeting on both sides of the rails with a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the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



TYPE I BARRICADE

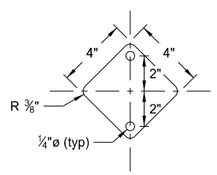


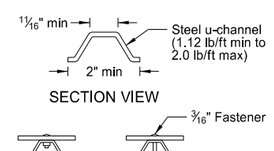
TYPE II BARRICADE

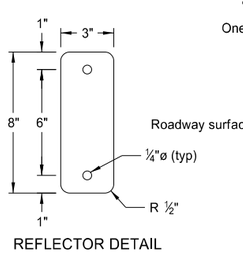


TYPE III BARRICADE

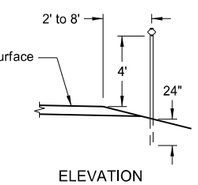
BARRICADE RAIL DETAILS







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.

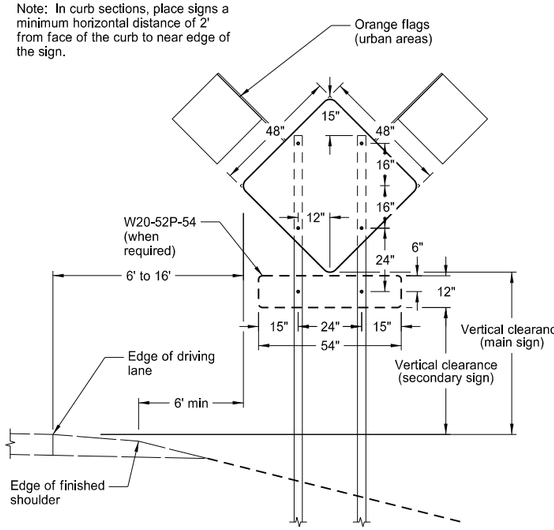
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
9-27-17 11-01-19	Updated to active voice Revised details for Flexible Delineator

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

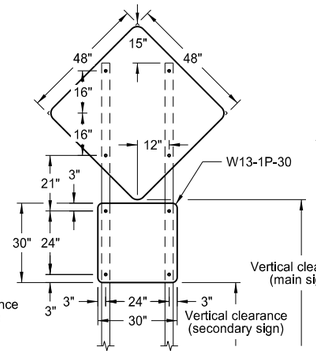
CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

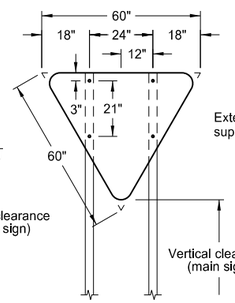
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



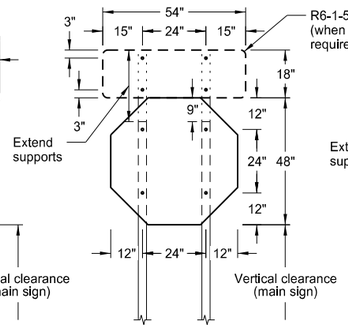
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



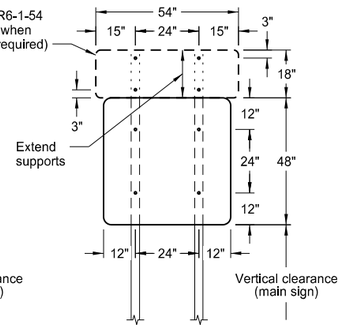
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



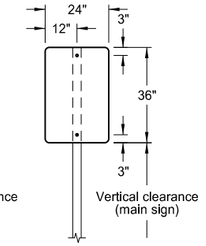
R1-2-60 - YIELD SIGN



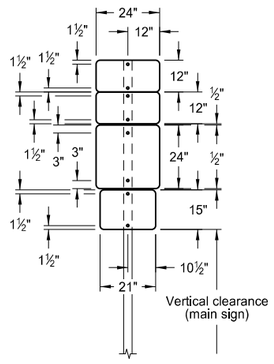
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



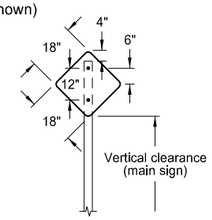
48" x 48" SIGN
(with R6-1-54 sign as required)



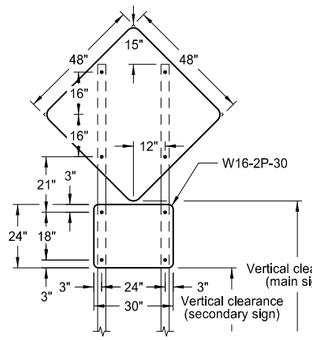
24" x 36" SIGN



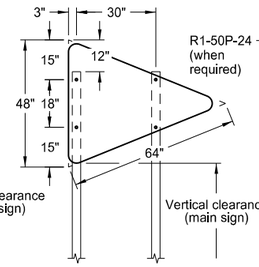
24" x 24"
ROUTE MARKER
ASSEMBLY



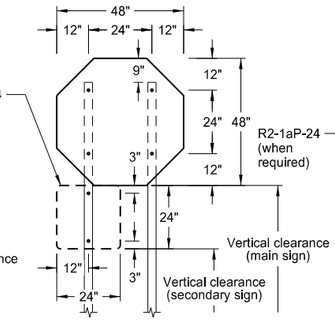
18" x 18"
DIAMOND SIGN



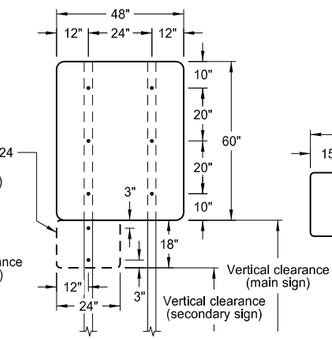
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



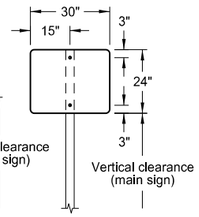
W14-3-64 - PENNANT SIGN



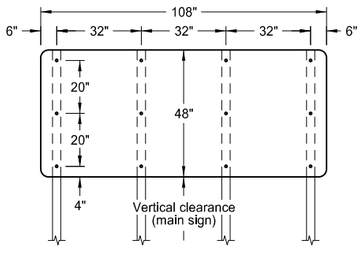
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



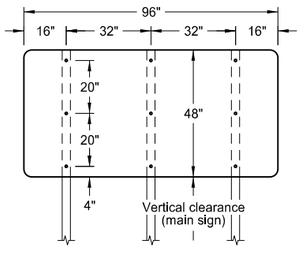
48" x 48" SIGN
(with R2-1aP-24 sign as required)



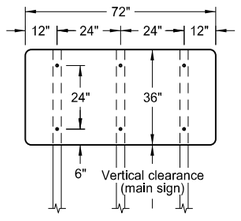
30" x 24" SIGN



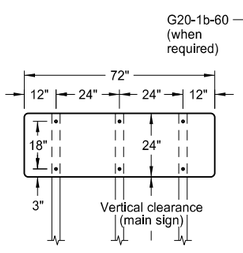
108" x 48" SIGN



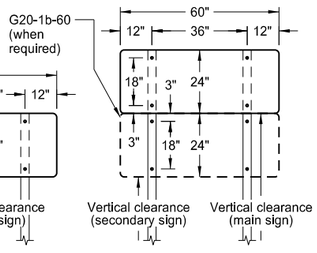
96" x 48" SIGN



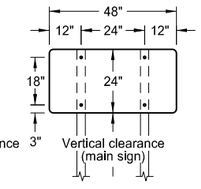
72" x 36" SIGN



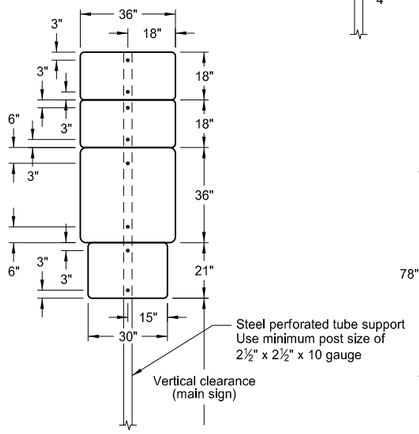
72" x 24" SIGN



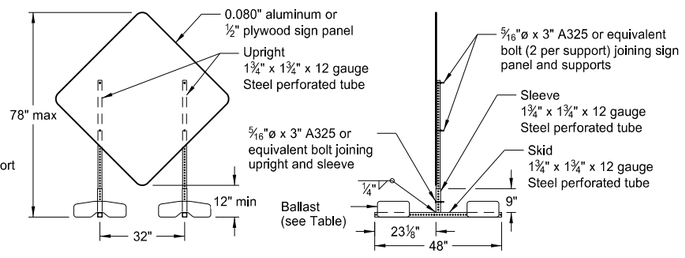
60" x 24" SIGN



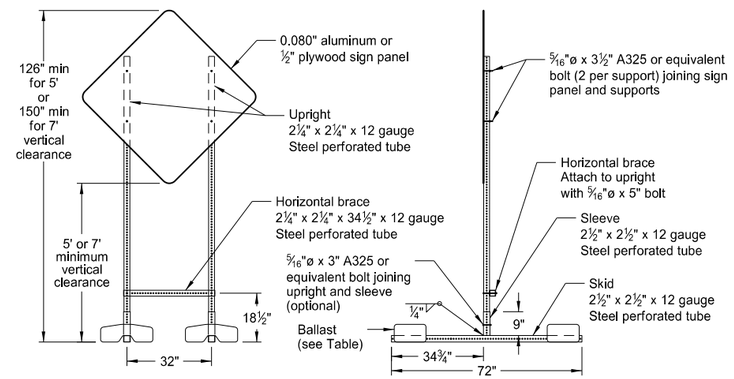
48" x 24" SIGN



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

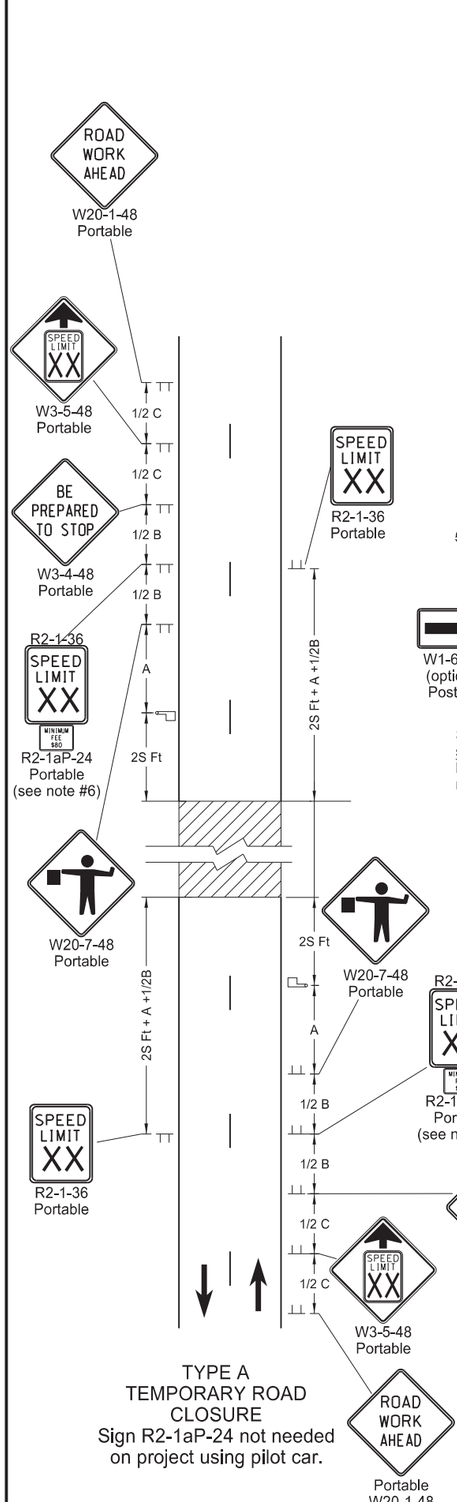
Note: The number of sandbags are based on a wind speed of 55 MPH. Place sandbags at or near the ends of skids.

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

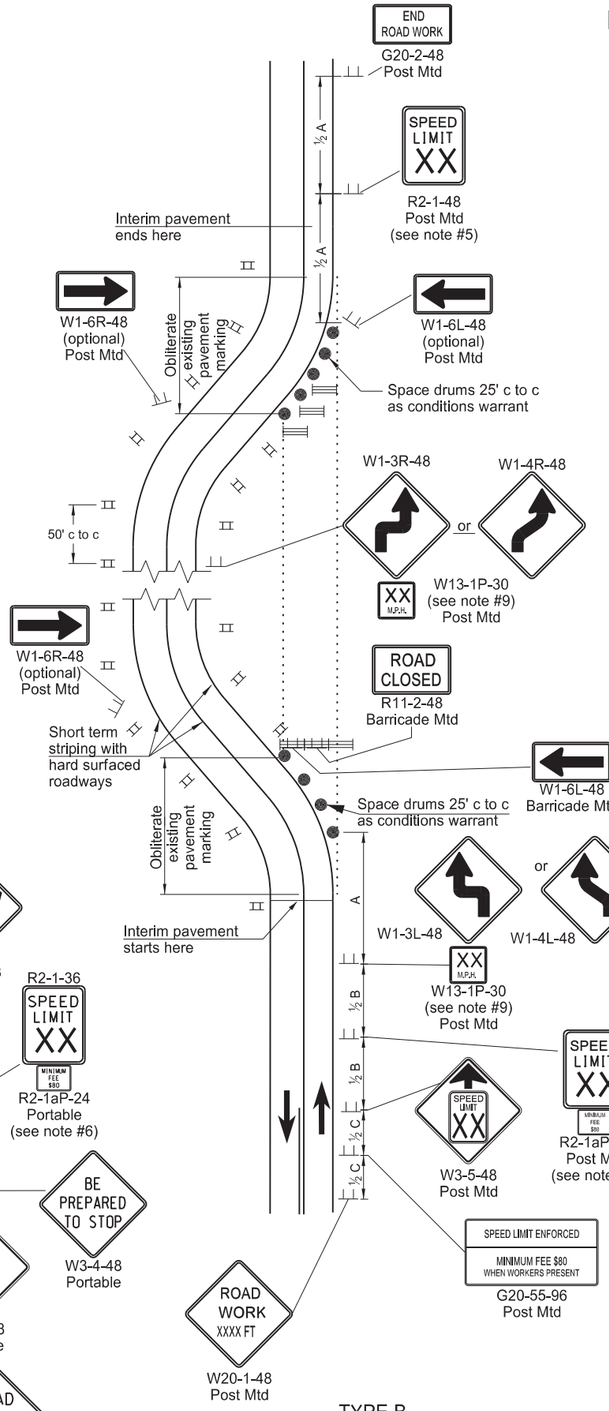
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

ROAD CLOSURE LAYOUTS

D-704-15

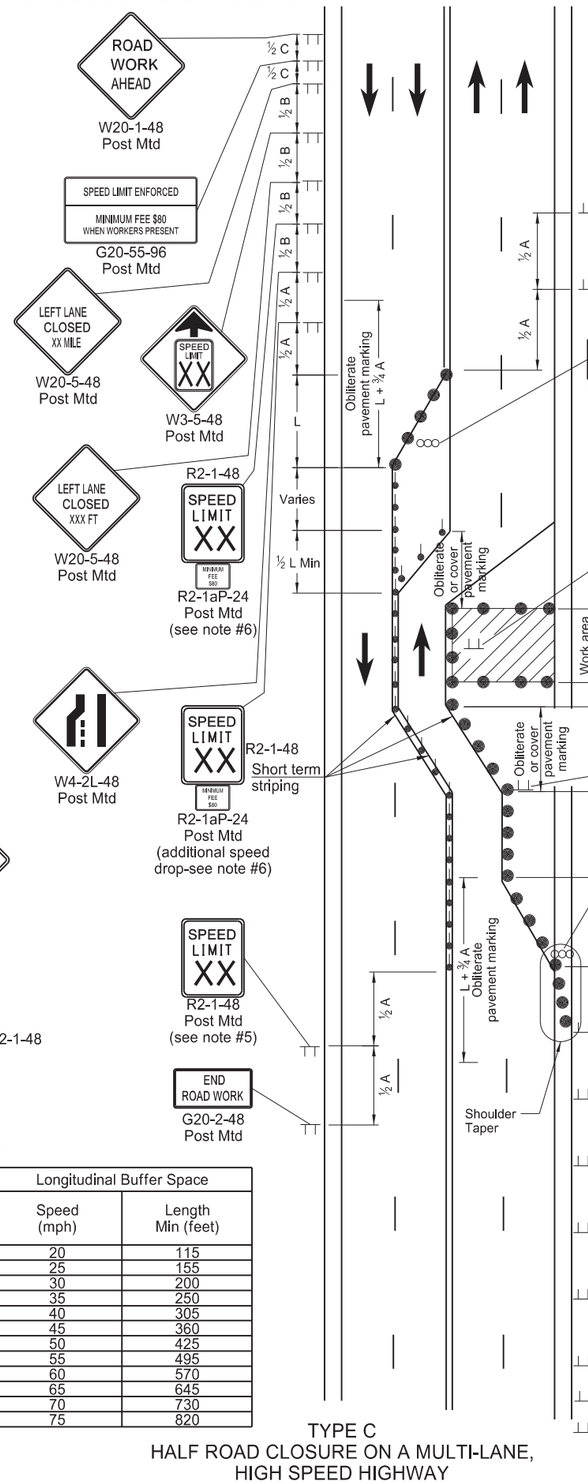


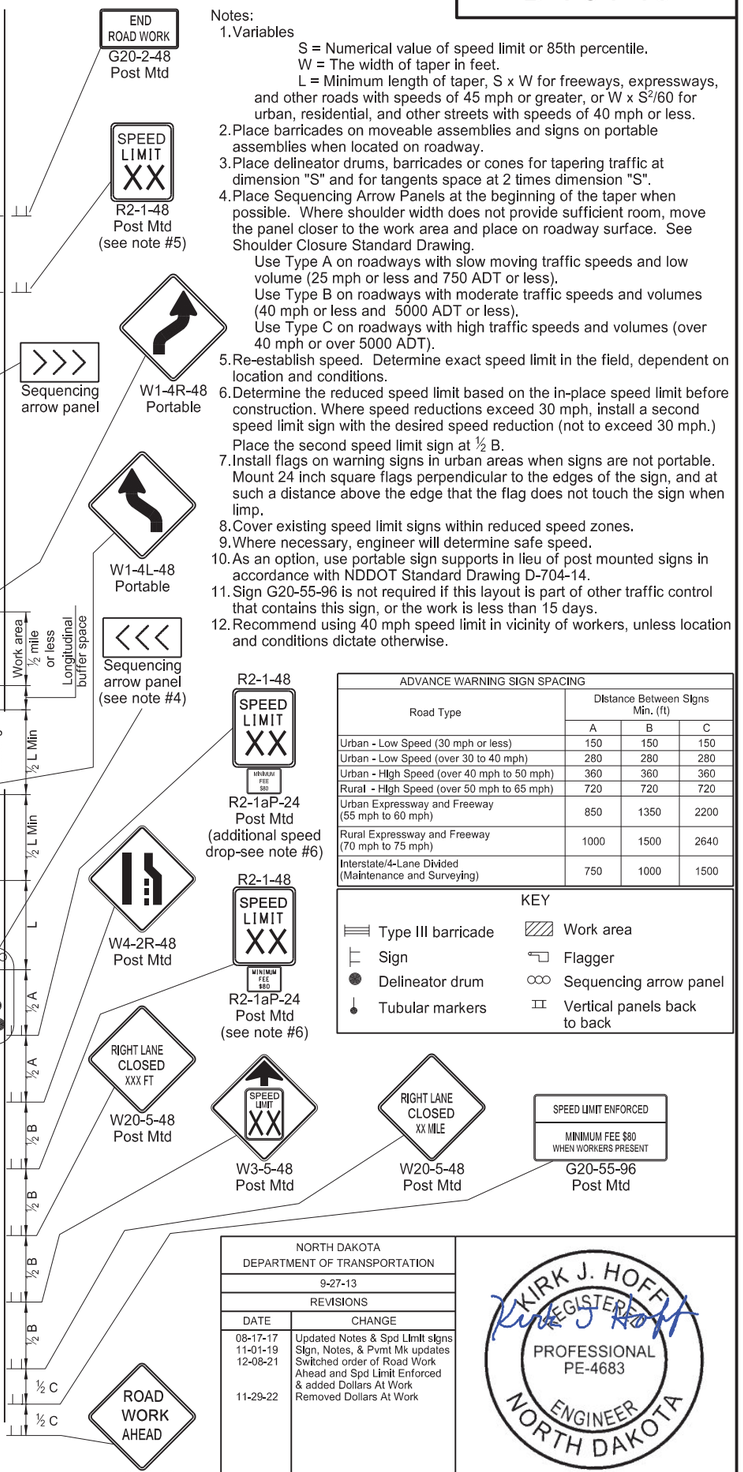
TYPE A
TEMPORARY ROAD CLOSURE
Sign R2-1aP-24 not needed on project using pilot car.



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.

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

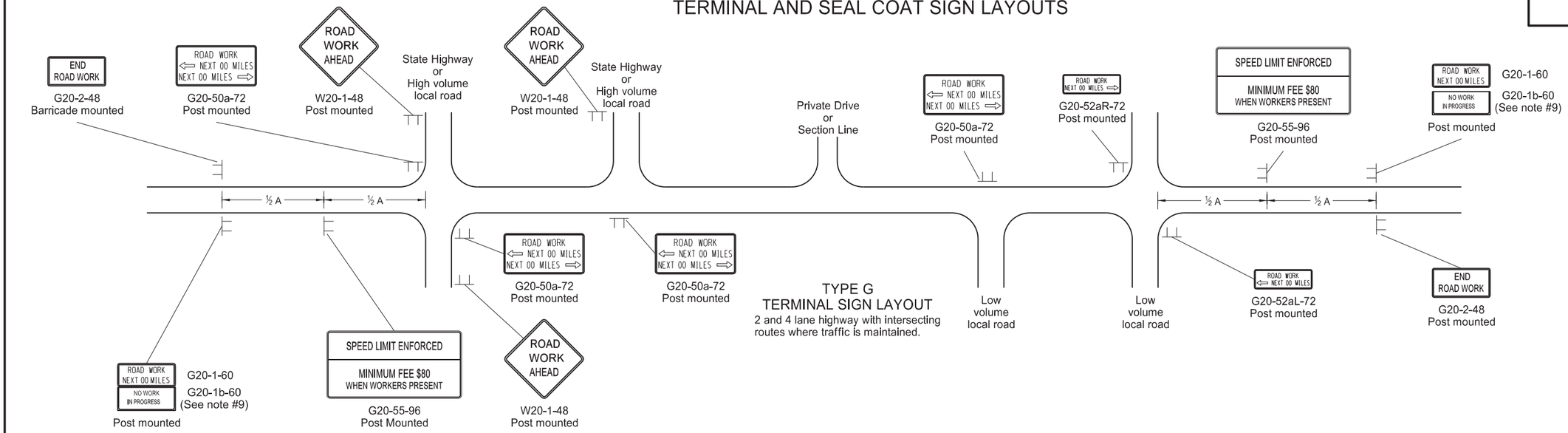
DATE	CHANGE
08-17-17	Updated Notes & Spd Limit signs
11-01-19	Sign, Notes, & Pvmt Mk updates
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work

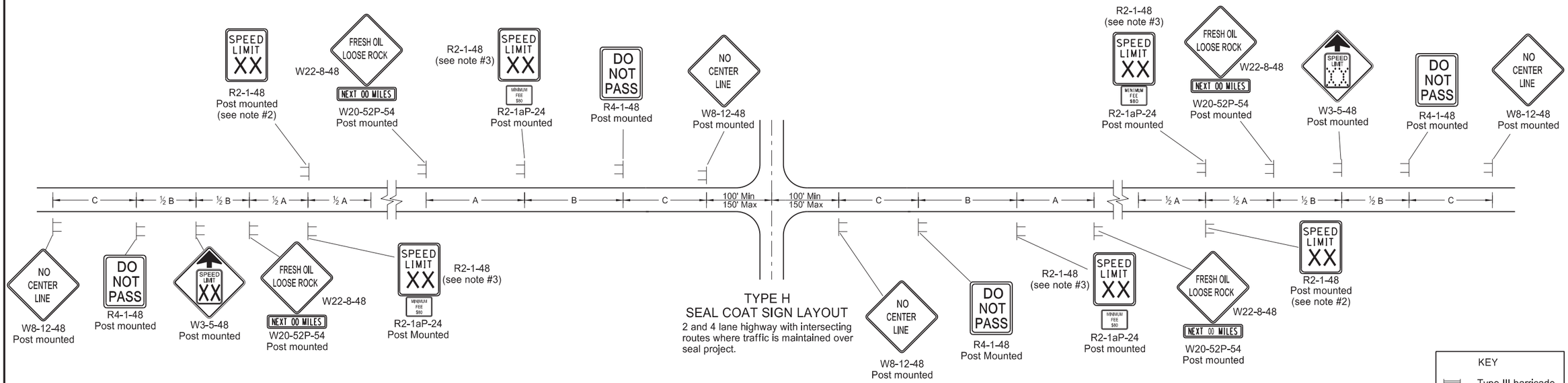
KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

11/29/22

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.

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	Updated notes & sign numbers
11-01-19	Updated note & sign
12-08-21	Switched order of Road Work and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work

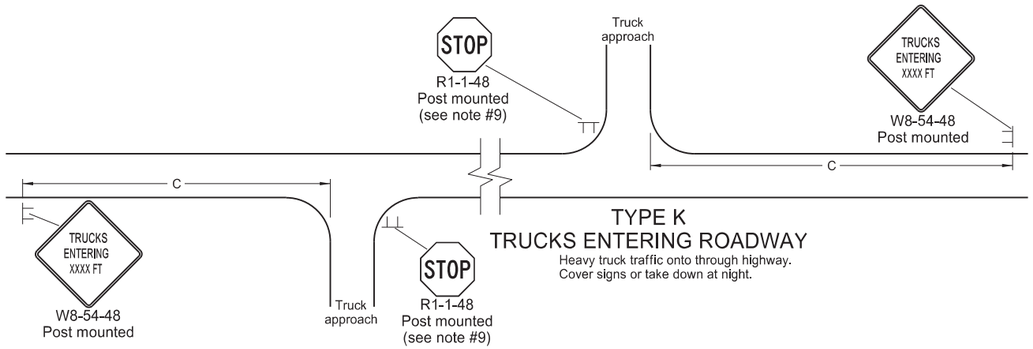
KIRK J. HOFF REGISTERED PROFESSIONAL PE-4683 ENGINEER NORTH DAKOTA

11/29/22

CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

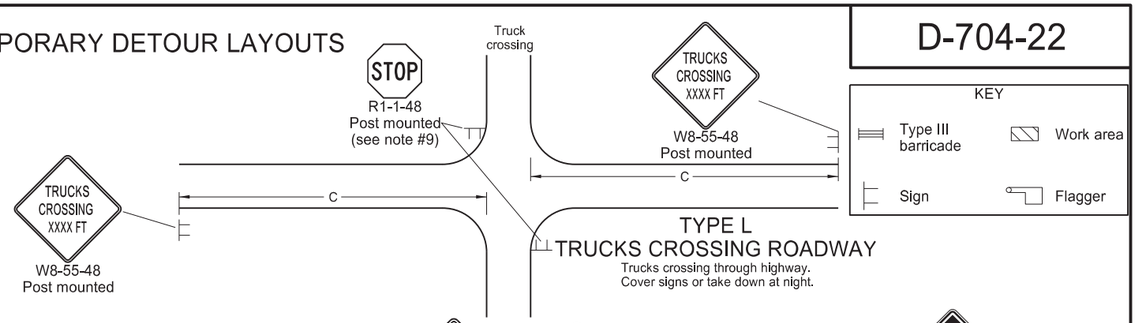
D-704-22

KEY
- Type III barricade
- Work area
- Sign
- Flagger



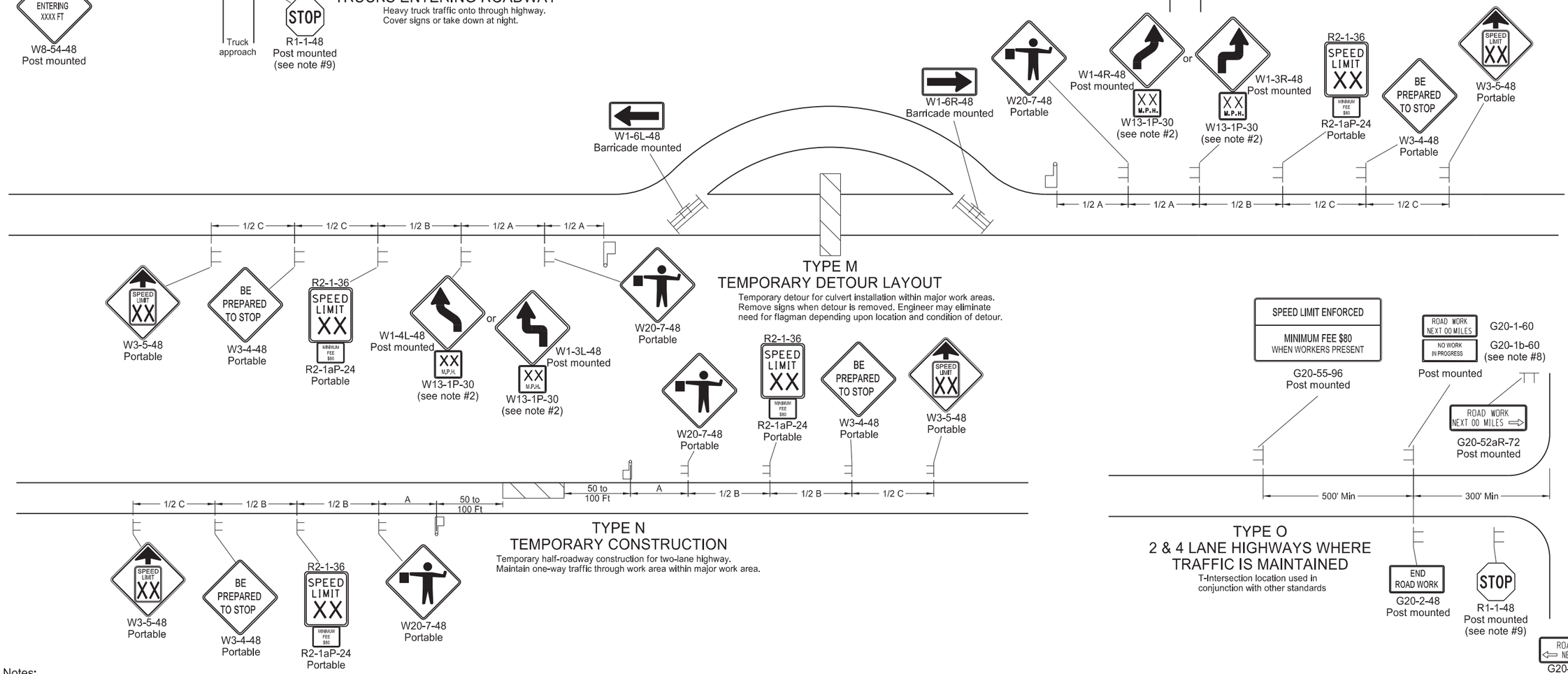
TYPE K
TRUCKS ENTERING ROADWAY

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.

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	Update notes & sign numbers
11-01-19	Revised sign numbers & note 7
12-09-21	Added Speed Limit Enforced and Dollars At Work signs
11-29-22	Removed Dollars At Work

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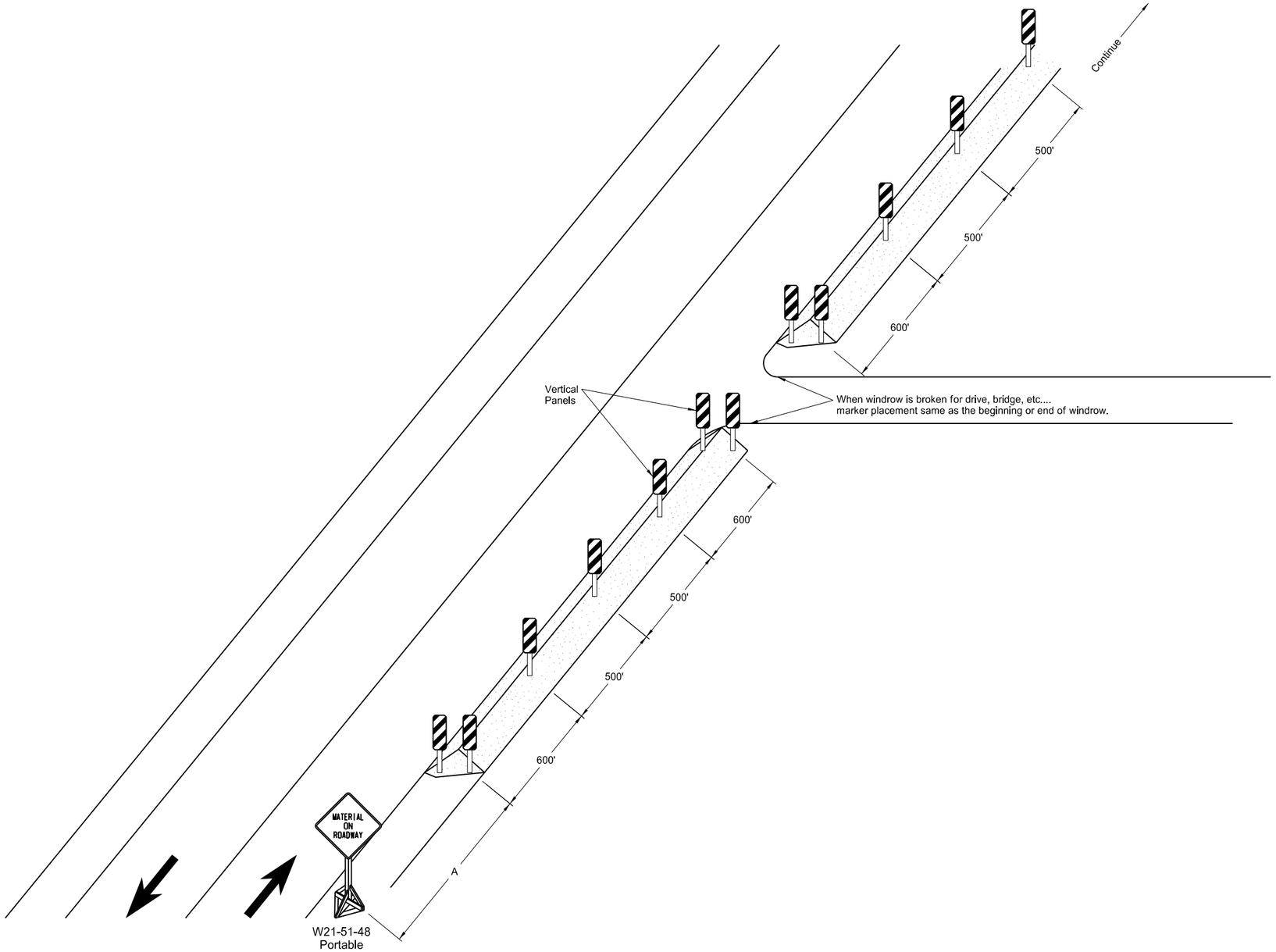
11/29/22

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

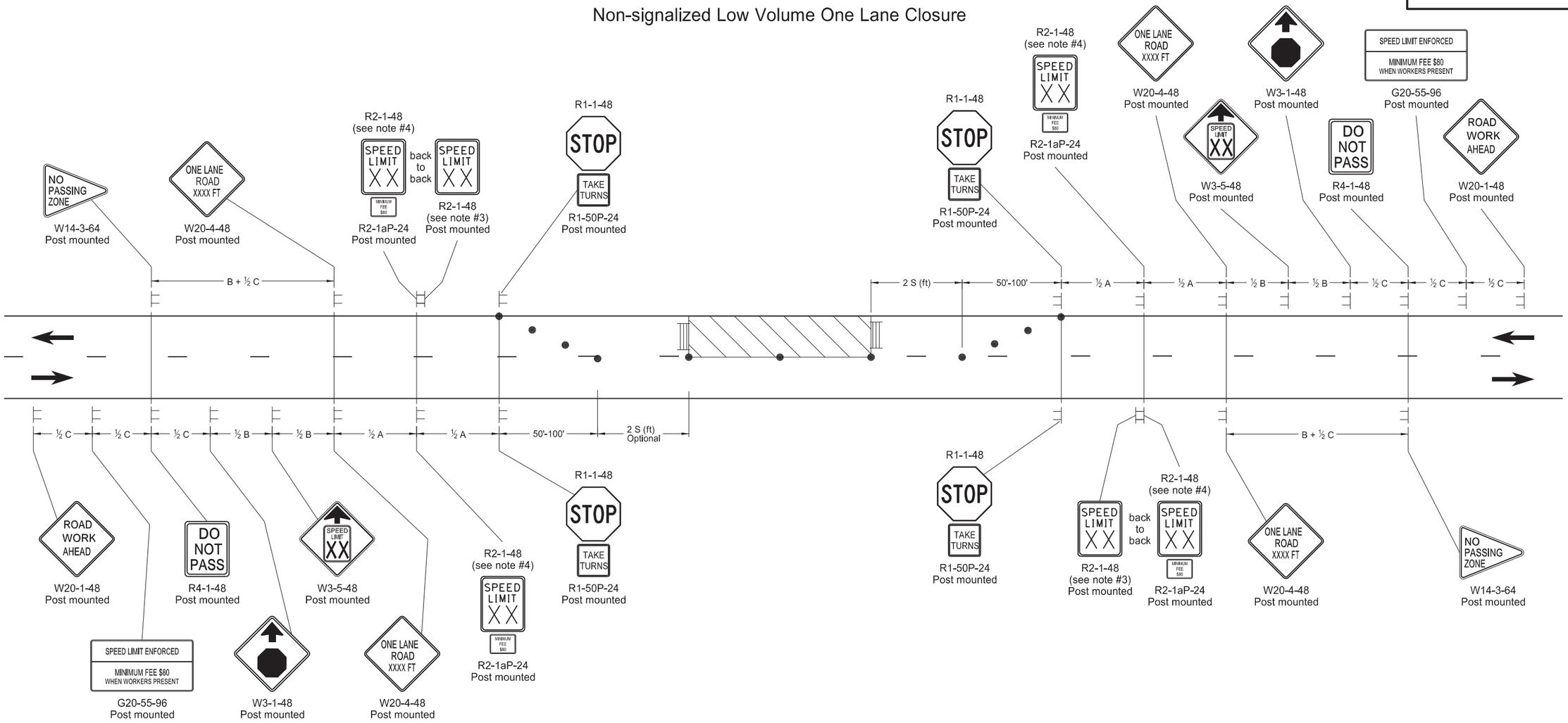
9-27-13

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

CONSTRUCTION SIGN LAYOUT
Non-signalized Low Volume One Lane Closure



KEY

- Type III barricade
- Work area
- Sign
- Delineator drum

Notes:

1. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
2. Place delineator drums or cones used for tapering traffic at 3 equal spaces and delineator drums for tangents at dimension "S". "S" = the numerical value of speed limit.
3. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
4. 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.
5. 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.
6. Cover existing speed limit signs within a reduced speed zone.
7. Covered (when approved by engineer) or obliterated pavement marking measured as "Obliteration of Pavement Marking".
8. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
9. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or work is less than 15 days.
10. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

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	Updated notes & sign numbers
11-01-19	Revised note 8 & sign numbers
12-03-19	Corrected sign number
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work

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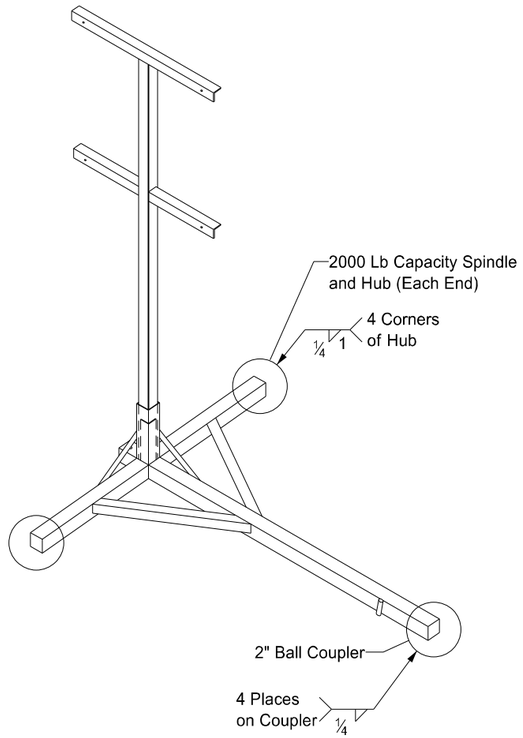
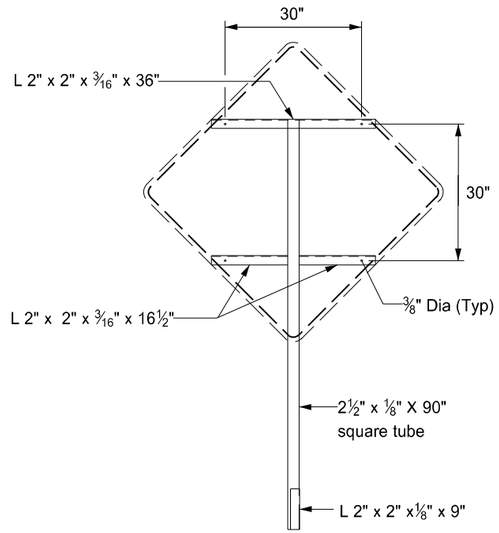
11/29/22

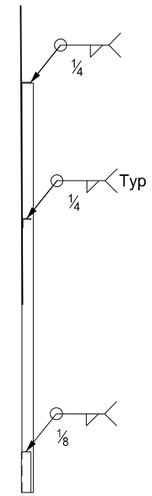
PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50





FRONT

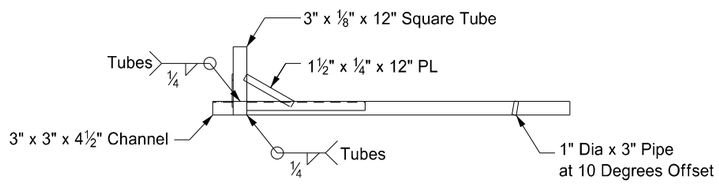


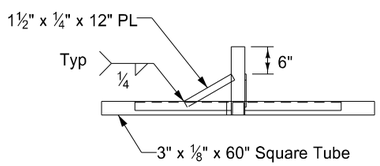
RIGHT

SIGN SUPPORT

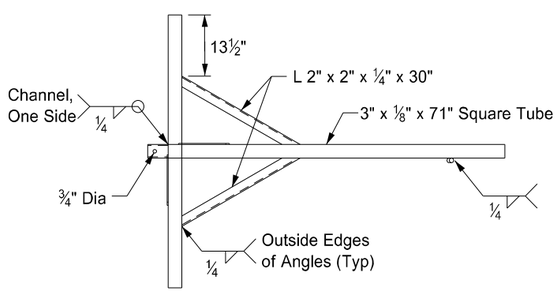
Notes:

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.

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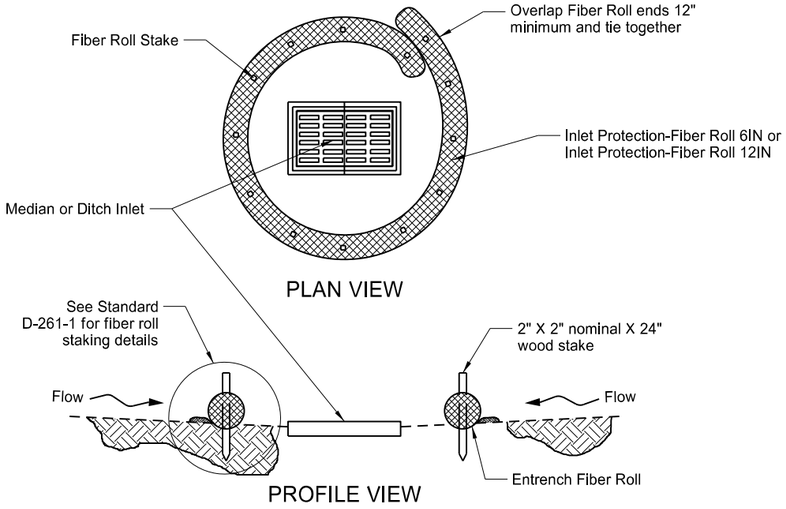
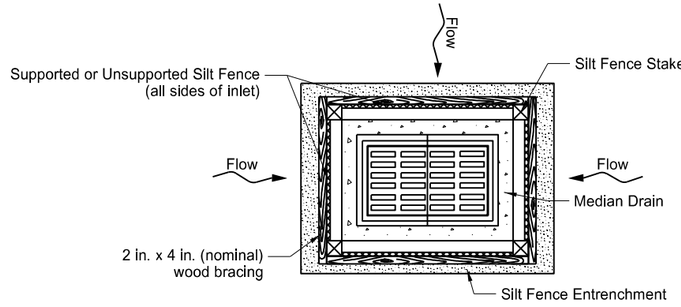
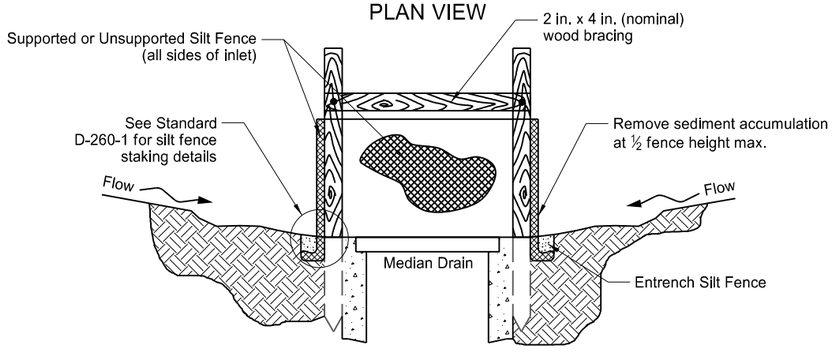
12 02 2020

EROSION AND SILTATION CONTROLS
MEDIAN OR DITCH INLET PROTECTION

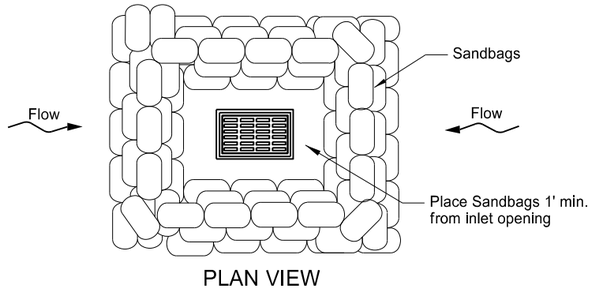


FIBER ROLL PROTECTION (MEDIAN OR DITCH INLET)

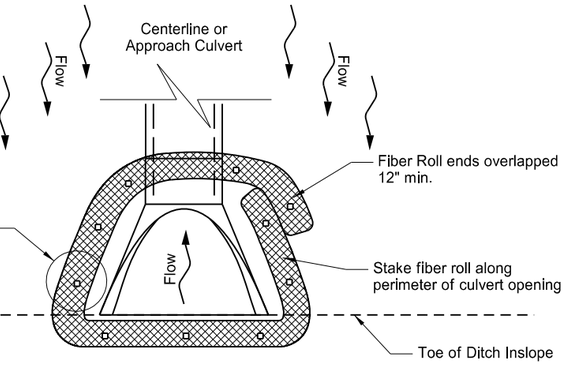




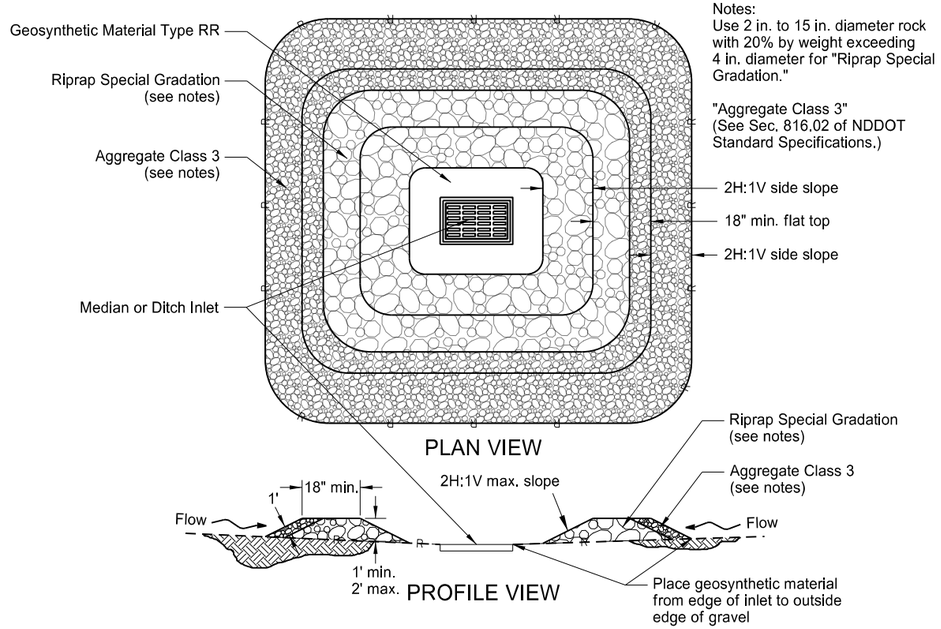
SILT FENCE PROTECTION (MEDIAN OR DITCH INLET)



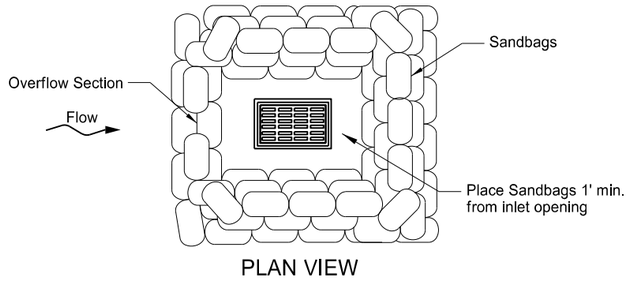
SANDBAG PROTECTION (LOW POINT)



FIBER ROLL PROTECTION (INLET OF CULVERT)



GRAVEL INLET PROTECTION (MEDIAN OR DITCH INLET)



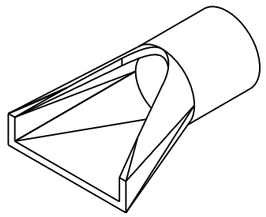
SANDBAG PROTECTION (ON SLOPE)

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.

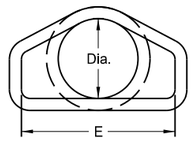
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8-27-19 and the original document is stored at the North Dakota Department of Transportation

REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS
(Round Pipe)

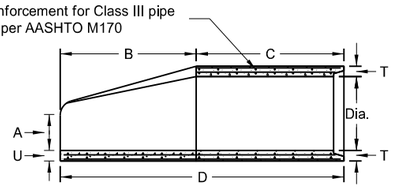
FLARED END SECTION						
TERMINAL DIMENSIONS						
DIA	A	B	C	D	E	U
12	0'-4"	2'-0"	4'-0⅞"	6'-0⅞"	2'-0"	2"
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2¼"
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2½"
21	0'-9"	3'-0"	3'-1"	6'-1"	3'-6"	2¾"
24	0'-9½"	3'-7½"	2'-6"	6'-1½"	4'-0"	3"
27	0'-10½"	4'-0"	2'-1½"	6'-1½"	4'-6"	3¼"
30	1'-0"	4'-6"	1'-7¾"	6'-1¾"	5'-0"	3½"
36	1'-3"	5'-3"	2'-9"	8'-0"	6'-0"	4"
42	1'-9"	5'-3"	2'-9"	8'-0"	6'-6"	4½"
48	2'-0"	6'-0"	2'-0"	8'-0"	7'-0"	5"
54	2'-3"	5'-5"	2'-9¼"	8'-2¼"	7'-6"	5½"
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	5"
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	5½"
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	6"
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	6½"
84	3'-0"	7'-6½"	1'-9"	9'-3½"	10'-0"	6½"
90	3'-5"	7'-3½"	2'-0"	9'-3½"	11'-0"	6½"



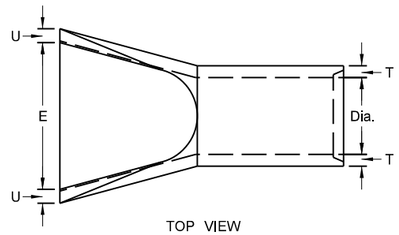
PERSPECTIVE



END VIEW



SIDE VIEW



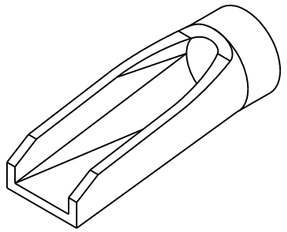
TOP VIEW

REINFORCED CONCRETE PIPE - FLARED END SECTION
Reinforcement to be equivalent to Class III RCP

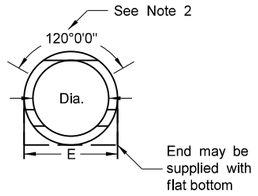
NOTES:

1. All reinforcing steel shall meet AASHTO M170 requirements.
2. All circular, longitudinal, and elliptical reinforcement shall be assembled and securely fastened in cage fashion so as to maintain reinforcement in exact shape and correct positions within the forms.
3. Laying length of pipe: 12" to 66" (incl.) = not less than 4 feet
   66" to 108" (incl.) = not less than 6 feet
4. Joints shall be sealed with rubber gaskets or with sealer approved by the engineer whenever pipe are specified for storm drain or sanitary sewers.
5. For Class IV and Class V reinforced concrete pipe and end section sizes which do not have reinforcement specified by AASHTO M170, shop drawings and design calculations shall be prepared and sealed by a Professional Engineer and submitted for the Engineer's review.

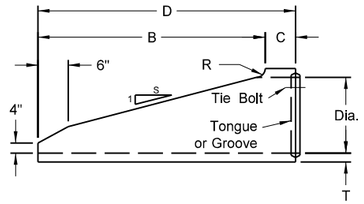
TRAVERSABLE END SECTION						
DIA	B	C	D	E	R	S
15"	4'	9"	4'-9"	1'-7½"	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	3"	6
24"	6'	1'	7'	2'-6"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3½"	4
36"	7'-3"	15"	8'-6"	3'-8"	3"	4



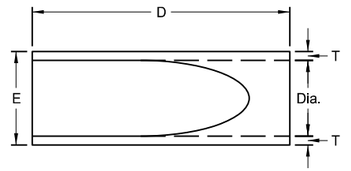
PERSPECTIVE



END VIEW



SIDE VIEW



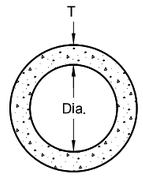
TOP VIEW

REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION
Reinforcement to be equivalent to Class III RCP

NOTES (Traversable End Section):

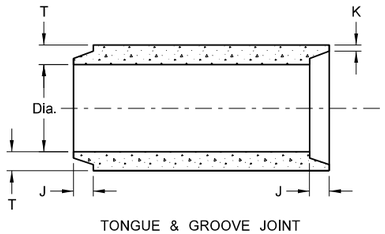
1. Manufactured in accordance with applicable portions of ASTM C76/AASHTO M170.
2. Reinforcement per Class III RCP with double reinforcement in the upper 120° of the full barrel portion.

All Classifications of Round Concrete Pipe					
Internal Dia. of pipe in Inches	Cross-Sectional Water Area	Weight per lin. foot of Pipe Std. Wall	Joint J Groove End Min./Max.	Joint K Tongue End Min.	Minimum Wall Thickness (T)
Dia	Sq. ft.	Lbs.	In.	In.	In.
12	0.79	92	1⅛-2⅛	¾	2
15	1.23	127	1⅛-2¼	⅞	2¼
18	1.77	168	1⅛-2⅛	1	2½
21	2.40	214	1⅛-3⅛	1⅛	2¾
24	3.14	265	2¾-3¾	1⅛	3
27	3.98	322	2¾-4	1¼	3¼
30	4.91	384	3¼-4¼	1¼	3½
33	5.94	452	3¼-4¼	1½	3¾
36	7.07	524	3¼-4¼	1½	4
42	9.62	685	3¾-4¾	1¾	4½
48	12.57	685	3⅞-4¾	1⅞	5
54	15.90	1070	4⅛-5¼	2	5½
60	19.63	1296	4½-5½	2¼	6
66	23.76	1542	5-6	2⅝	6½
72	28.27	1810	5⅛-6¾	2⅞	7
78	33.18	2098	6¼-7¼	2⅞	7½
84	38.48	2410	5⅛-7¾	3⅜	8
90	44.18	2793	6¾-8½	3⅛	8½
96	50.27	3092	7-8¼	3½	9
102	56.75	3466	7-8¼	3½	9½
108	63.62	3864	7¼-8½	3¾	10

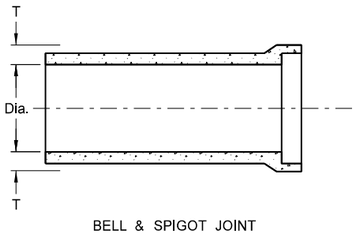


END VIEW

CIRCULAR PIPE

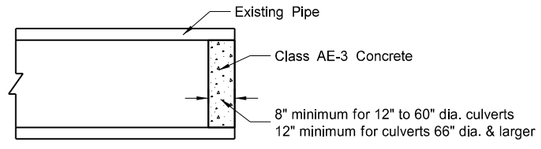


TONGUE & GROOVE JOINT



BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE



CONCRETE PIPE PLUG

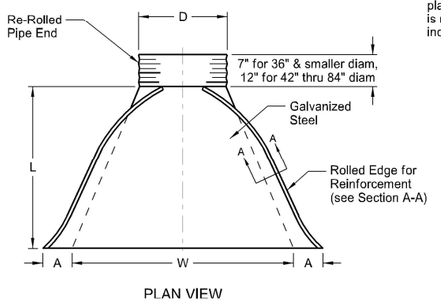
SEE STANDARD DRAWING D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-12-14	
REVISIONS	
DATE	CHANGE
01-21-15	Revised Note 5
11-21-16	Revised End Section Dimensions
09-18-19	Updated Perspective View Details

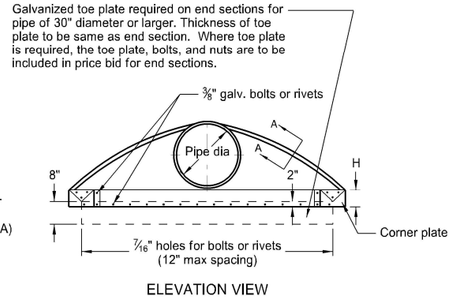
This document was originally issued and sealed by Jon Ketterling Registration Number PE-4684, on 9/18/19 and the original document is stored at the North Dakota Department of Transportation

ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

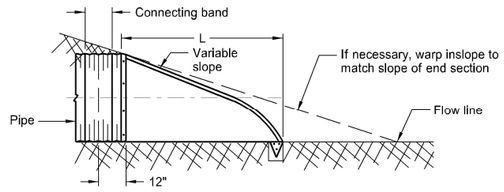
D-714-4



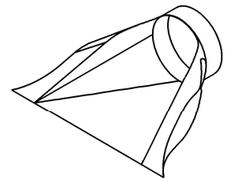
PLAN VIEW



ELEVATION VIEW



TYPICAL CROSS SECTION
(showing connector section)



PERSPECTIVE VIEW

** PIPE DIA.	GALVANIZED THICKNESS	END SECTION DIMENSIONS A	B	H	L	W	APPROX. SLOPE	BODY
IN	IN	IN	IN	IN	IN	IN	RATE	PIECE
15	0.064 - 0.079	7	8	6	26	30	2½:1	1
18	0.064 - 0.109	8	10	6	31	36	2½:1	1
24	0.064 - 0.109	10	13	6	41	48	2½:1	1
30	0.064 - 0.109	12	16	8	51	60	2½:1	1 or 2
36	0.064 - 0.109	14	19	9	60	72	2½:1	2
42	0.064 - 0.138	16	22	11	69	84	2½:1	2
48	0.064 - 0.168	18	27	12	78	90	2¼:1	2
54	0.064 - 0.168	18	30	12	84	102	2:1	2
*60	0.064 - 0.168	18	33	12	87	114	1¾:1	3
*66	0.064 - 0.168	18	36	12	87	120	1½:1	3
*72	0.064 - 0.168	18	39	12	87	126	1½:1	3
*78	0.064 - 0.168	18	42	12	87	132	1¼:1	3
*84	0.064 - 0.168	18	45	12	87	138	1⅛:1	3

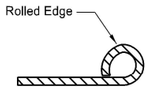
* These sizes have 0.109" sides and 0.138" center panels.

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

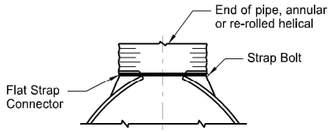
Manufacturers tolerances of above dimensions will be allowed.

Splices to be the lap riveted type.

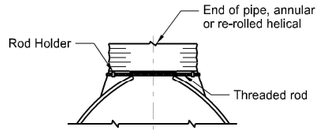
Multiple panel bodies shall have lap seams which are to be tightly joined with ⅜" dia. galv. bolts or rivets. Nuts to be torqued to 25 foot-lbs ±.



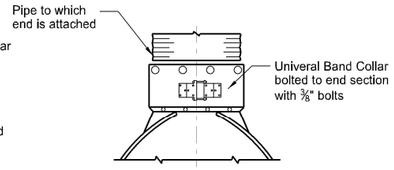
SECTION A-A



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



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

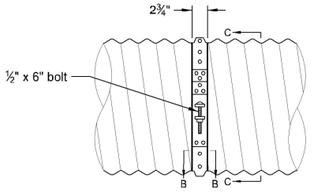


TYPE #3
For all pipe sizes

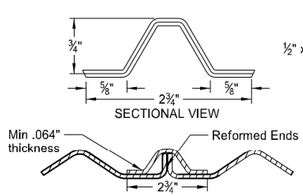
COUPLING BAND DIMENSIONS				
COUPLING TYPE	CORRUGATION PITCH x DEPTH	PIPE SIZE	COUPLING BAND LENGTH	MIN. BAND THICKNESS
Hat Band	2⅔" x ½"	12" - 48"	2¾"	.064"
Annular Band	2⅔" x ½"	12" - 72"	12"	.052"
		78" - 84"	12"	.079"
	3" x 1"	48" - 120"	14"	.052"
Hugger Band	2⅔" x ½" Rerolled End	12" - 72"	10½"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



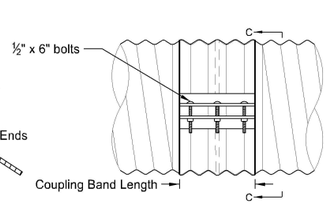
SIDE VIEW



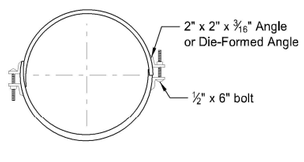
SECTIONAL VIEW

SECTION B-B

HAT BAND FOR FLANGED END PIPE

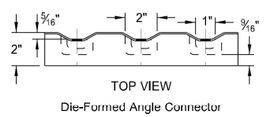


SIDE VIEW

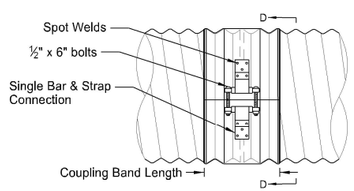


SECTION C-C
Angle Connection

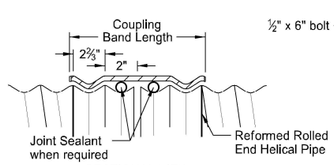
ANNULAR BAND



TOP VIEW
Die-Formed Angle Connector

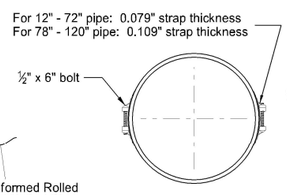


SIDE VIEW

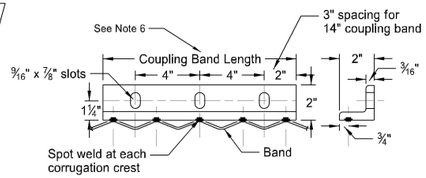


SECTIONAL VIEW

HUGGER COUPLING BAND



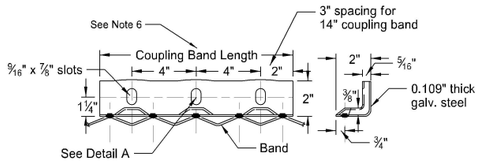
SECTION D-D
Bar & Strap Connection



SIDE VIEW

END VIEW

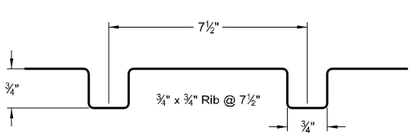
2" x 2" x 3/16" Angle Connector

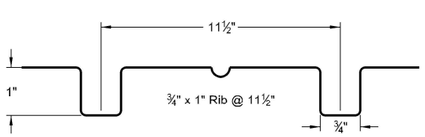


SIDE VIEW

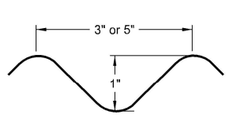
END VIEW

Die-Formed Angle Connector

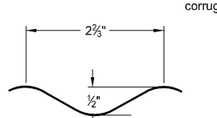




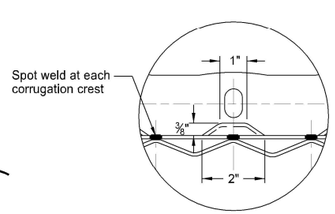
SPIRAL RIB CORRUGATIONS



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
09-23-22	Galvanized Thickness Table

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09/23/22

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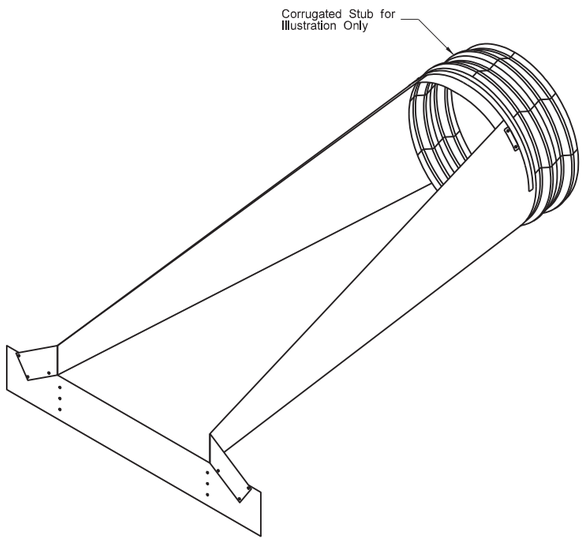
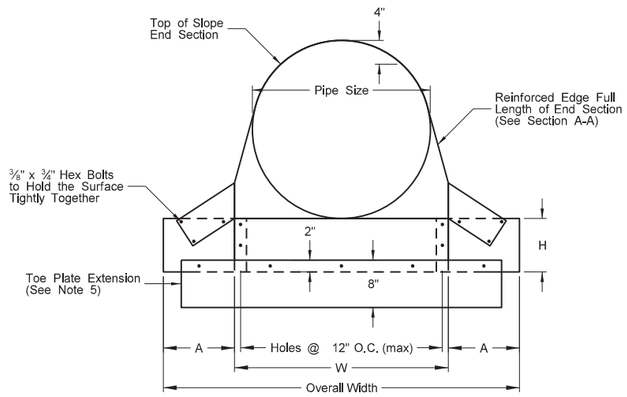
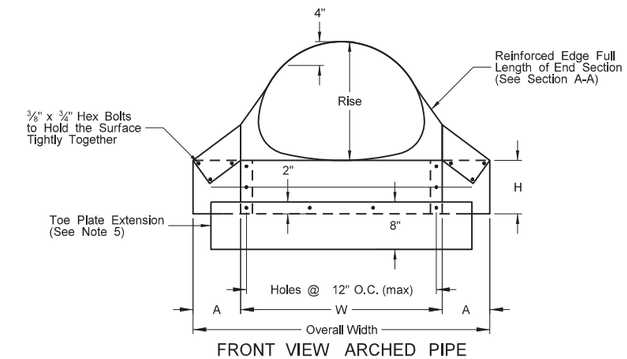
TRAVERSABLE END SECTIONS FOR CORRUGATED STEEL PIPE CULVERTS



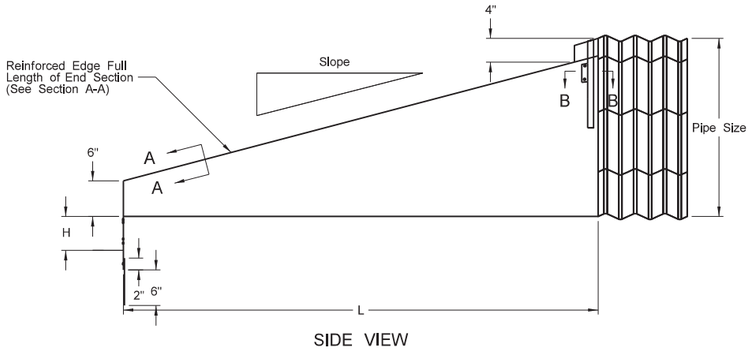
ISOMETRIC VIEW



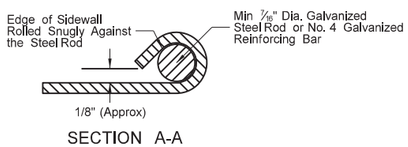
FRONT VIEW CIRCULAR PIPE



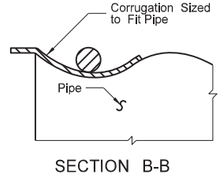
FRONT VIEW ARCHED PIPE



SIDE VIEW



SECTION A-A



SECTION B-B

TRAVERSABLE END SECTIONS FOR CIRCULAR PIPES										
Pipe Dia. (in.)	Min. Thick.		Dimensions (inches)				L Dimensions			
	in.	Gauge	A	H	W	Overall Width	Slope	Length (in.)	Slope	Length (in.)
15	.064	16	8	6	21	37	4:1	20	6:1	30
18	.064	16	8	6	24	40	4:1	32	6:1	48
24	.064	16	8	6	30	46	4:1	56	6:1	84
30	.109	12	12	9	36	60	4:1	80	6:1	120

TRAVERSABLE END SECTIONS FOR ARCHED PIPES												
Equiv. Dia. (in.)	(inches)		Min. Thick.		Dimensions (inches)				L Dimensions			
	Span	Rise	in.	Gauge	A	H	W	Overall Width	Slope	Length (in.)	Slope	Length (in.)
18	21	15	.064	16	8	6	27	43	4:1	20	6:1	30
21	24	18	.064	16	8	6	30	46	4:1	32	6:1	48
24	28	20	.064	16	8	6	34	50	4:1	40	6:1	60

NOTES:

1. See Standard Drawing D-714-04 for end section to pipe details.
2. Use a ½" diameter rod or strap type connection for 15", 18", and 24" diameter end sections to attach to corrugated steel pipe.
3. Use a ⅝" diameter rod type connection for 30" diameter round end sections to attach to corrugated steel pipe.
4. Use a ½" diameter rod type connection for all sizes of arched pipe end sections to attach to corrugated steel pipe.
5. Use the same gauge material for the toe plate extension as the end section. Use a dimension with a width 6" less than the overall width.
6. For centerline crossings, use end sections with a dimension "W" of 36" or less where a single culvert is required to convey the flow and a dimension "W" of 30" or less where multiple culverts are required to convey the flow.
7. For approach crossings, use end sections with a dimension "W" of 24" or less where a single culvert is required to convey the flow and a dimension "W" of 21" where multiple culverts are required to convey the flow.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-23-09	
REVISIONS	
DATE	CHANGE
8-6-21	Notes 2-7, Lables

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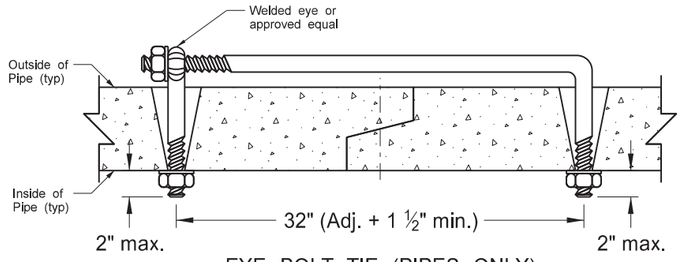
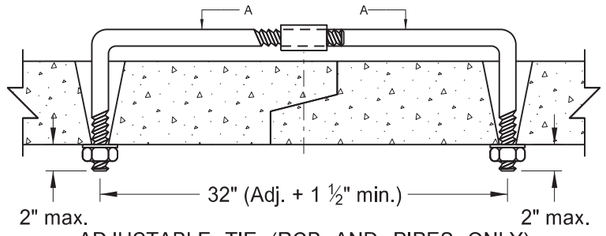
CONCRETE PIPE, CATTLE PASS, OR PRECAST CONCRETE BOX CULVERT TIES

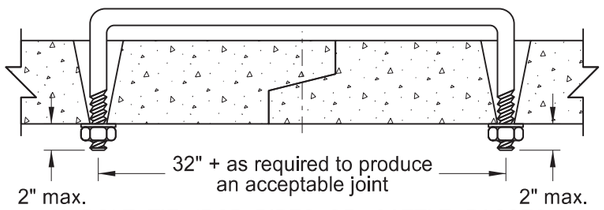
D-714-22



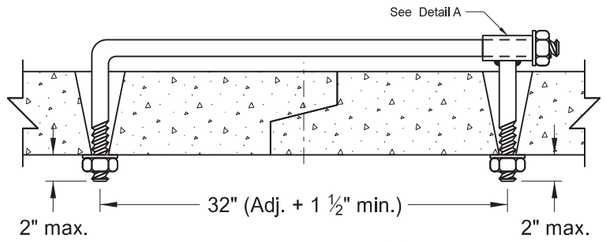
EYE BOLT TIE (PIPES ONLY)



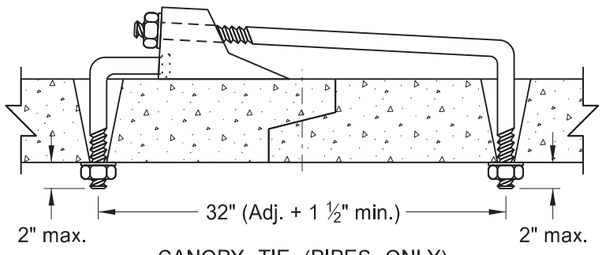
ADJUSTABLE TIE (RCB AND PIPES ONLY)



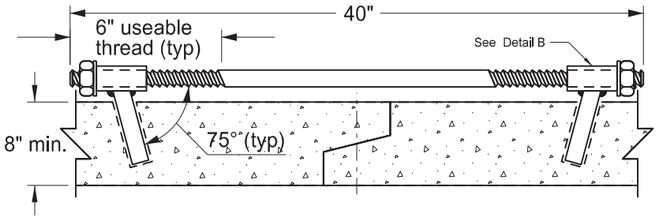
U BOLT TIE (RCB, PIPES, OR CATTLE PASSES)



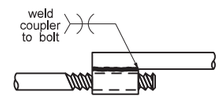
WELDED TIE (RCB AND PIPES ONLY)



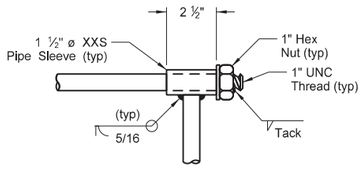
CANOPY TIE (PIPES ONLY)



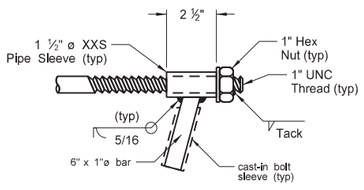
HIDDEN TIE (RCB ONLY)



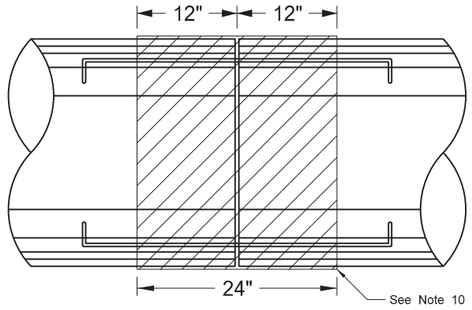
SECTION A-A



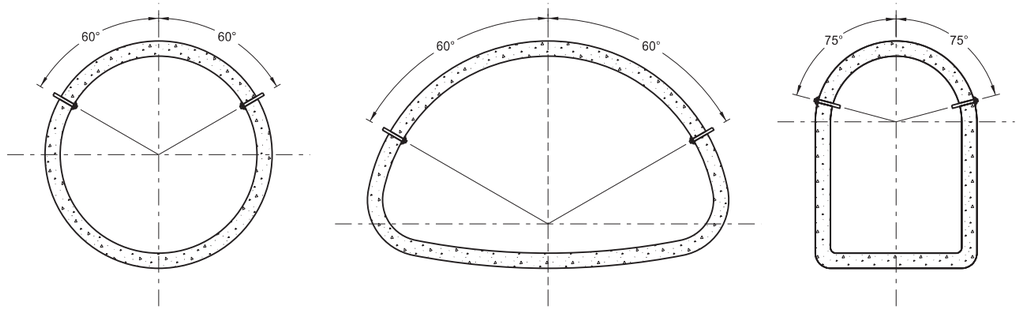
DETAIL A



DETAIL B



PLAN VIEW (PIPES ONLY)



END VIEW

REQUIRED SIZE OF TIE BOLTS		
Pipe Size	Thread ø	XXS Pipe Sleeve Inner ø
18" - 24"	⅝" See note 3	¾"
30" - 66"	¾"	1"
72" - 120"	1"	1 ¼"
RCB/Cattle Pass		

NOTES:

1. The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
2. Insert pipe ties from the inside of the pipes and grout into place for Cattle Pass and Jacked and Bored pipes. Jacked and bored pipes with a diameter of 24" or less do not require pipe ties.
3. Nuts and washers are not required on Jacked and Bored pipes or pipes with a 24" diameter or less. Insert and grout tie bars into place where nuts and washers are not used.
4. Do not use pipe ties to pull the pipe or RCB sections tight. The ties are only for holding sections together.
5. Use only tie bolt assemblies that have been hot dip galvanized in accordance with ASTM A 153.
6. Holes in pipes to accommodate tie bolts can be precast or drilled. Tapered holes are permitted when precast. Use holes that have a diameter ¼" larger than the diameter of the thread. In precast RCB's, use holes that contain cast-in bolt sleeves with an inside diameter of 1 ¼".
7. Select the type of tie bolt used from those shown.
8. Include the cost of precasting or drilling the required holes and furnishing and installing the tie bolts in the price bid for the appropriate conduit or RCB pay item.
9. Tie all centerline and approach RCP culvert joints. Tie the first three joints including the end section of all free ends of storm drain systems. Free ends are defined as any storm drain end which does not terminate at an inlet or manhole. Outfall culverts with end sections which drain adjacent ditches are examples of free ends.
10. Place joint wrap prior to installing ties. Firmly secure the wrap around the full perimeter. For concrete pipes, overlap the joint by 12" in both directions. For box culverts, use a waterproof membrane that meets ASTM C877 (Type III). Provide a membrane that is a minimum of 12" wide and center it at the joint. Provide a minimum overlap of 2.5" at the seams.
11. Use tie bolts that conform to ASTM A 36. Use heavy hex nuts that conform to ASTM A 563. Use washers that conform to ASTM F 436, Type 1. Use welded pipe sleeves and cast-in bolt sleeves that conform to ASTM A 53, Grade B.
12. Tie RCB's at locations shown on the plans.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
3-18-14	
REVISIONS	
DATE	CHANGE
7-21-15	Note 8
6-6-17	Notes 2-11, Table, Title, Lables
8-11-21	Notes 2-12, Table, Lable

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08/11/21

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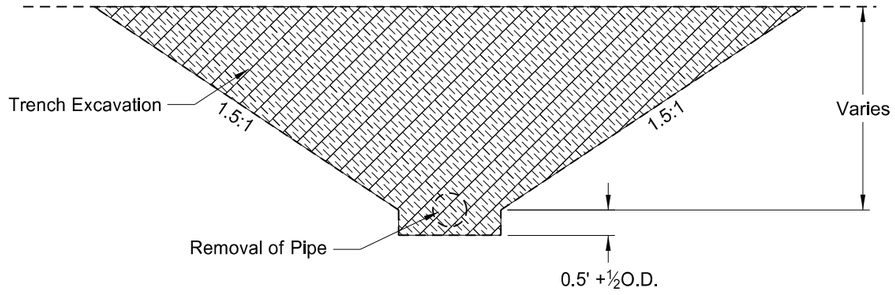
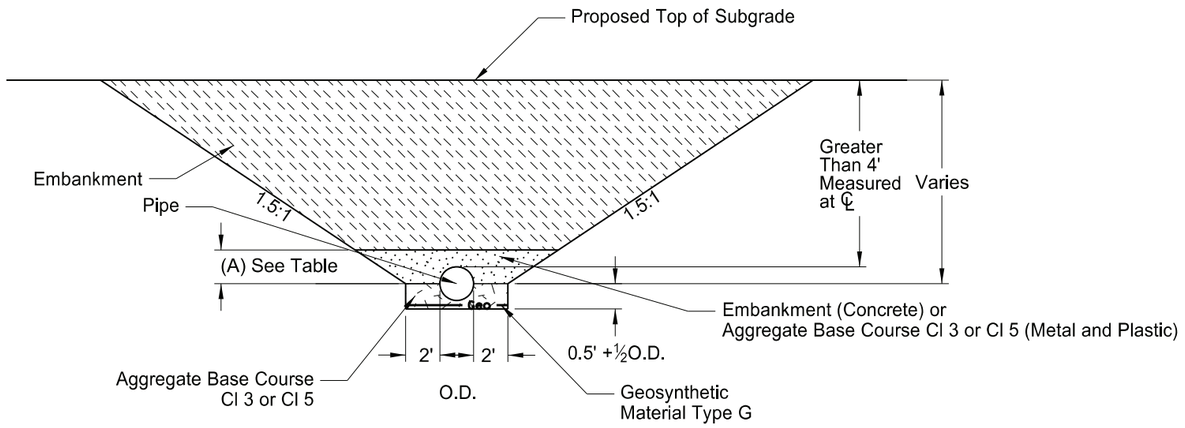
TRANSVERSE MAINLINE PIPE INSTALLATION DETAIL
PIPES MORE THAN 4 FEET BELOW TOP OF SUBGRADE

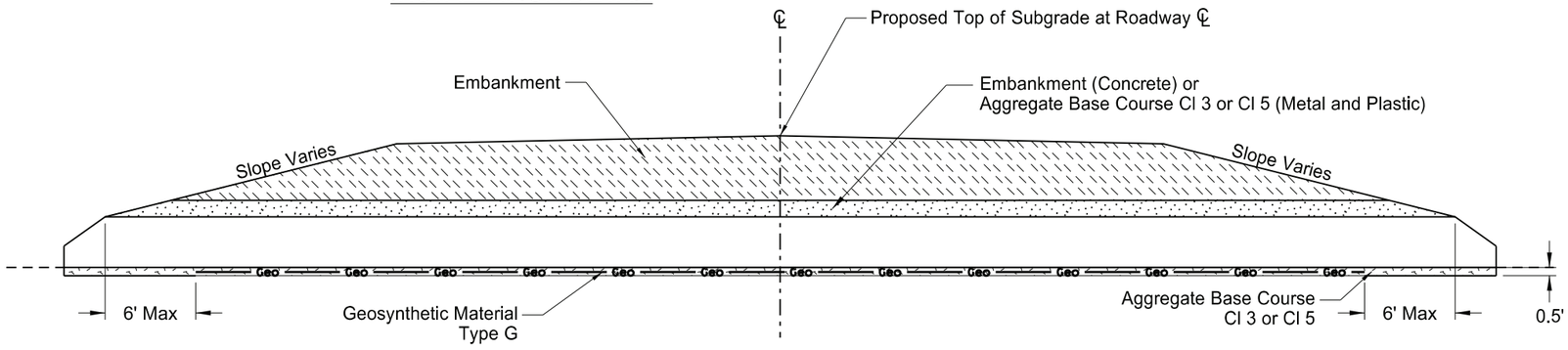
D-714-25



EXCAVATION DETAIL



INSTALLATION DETAIL



CROSS SECTION

Pay Items
1) Pipe*
2) Geosynthetic Material Type G
3) Removal of Pipe (if required)

*Included in Pipe Pay Item
1) Pipe
2) Trench excavation
3) Aggregate Base Course Cl 3 or Cl 5
4) Embankment

NOTES:

1) This drawing applies to new/replaced mainline and paved intersection roadways (including ramps). It does not include pipes in approaches.

2) Embankment may be either Borrow Excavation or Common Excavation - Type A.

Backfill Dimensions	
Pipe Materials	Dimension (A)
Concrete	0.5 O.D.
Metal and Plastic	0.5 O.D. + 1 Foot

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

7-26-13

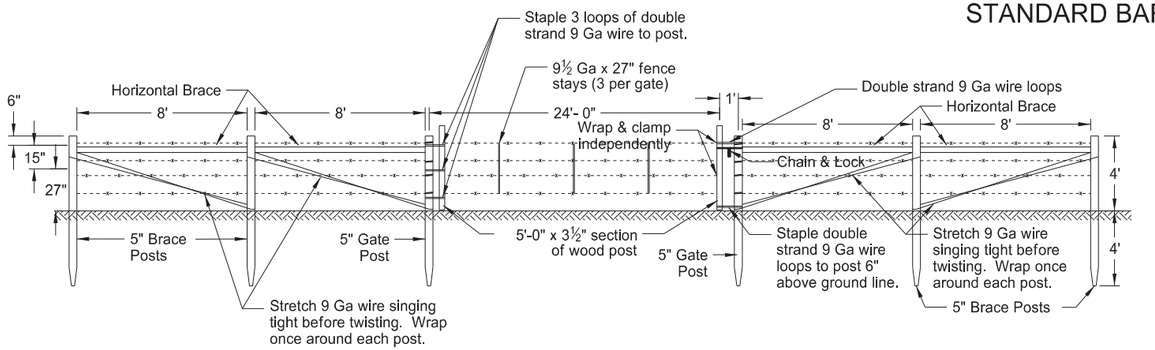
REVISIONS

DATE	CHANGE
10-15-13	Label Formatting
1-21-14	Nomenclature
9-18-15	Title Rewording
12-10-15	Added Plastic Pipe
5-27-20	Replaced R1 Fabric with Geogrid Changed bedding depth

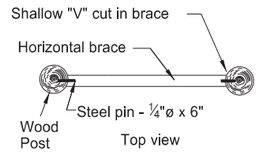
REGISTERED PROFESSIONAL ENGINEER
MATTHEW C KURLE
PE-8777
DATE
05/27/20
NORTH DAKOTA
DocuSign

STANDARD BARBED WIRE FENCE

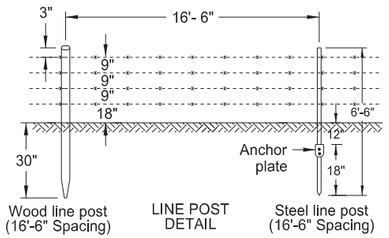
D-752-1



VEHICLE GATE



HORIZONTAL BRACE DETAIL



NOTES

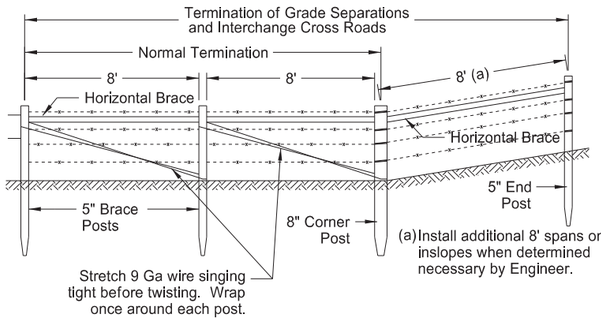
1. No deduction in measured pay length of fence made for gates, corner assemblies, double brace assemblies, fence terminals, or depression fencing. Include all costs for abutment fencing in the price bid for fencing bid items.

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.

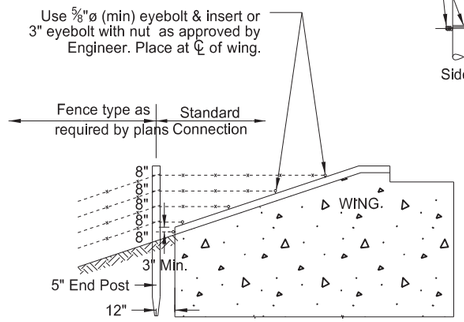
3. Include all costs of furnishing and installing inserts and eyebolts in the unit price bid for fencing bid items. Use eyebolts galvanized according to AASHTO designation M-30; inserts of corrosion resistant material do not require galvanization. Use concrete inserts capable of developing the full strength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

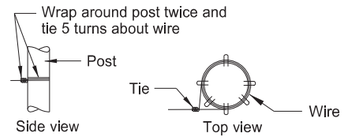
5. Include the cost of bracing at vehicle gates in the price bid for "Vehicle Gate."



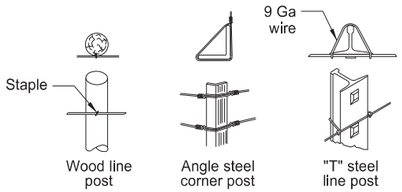
FENCE TERMINAL



DETAIL FOR TYING FENCE TO WINGS OF ABUTMENTS

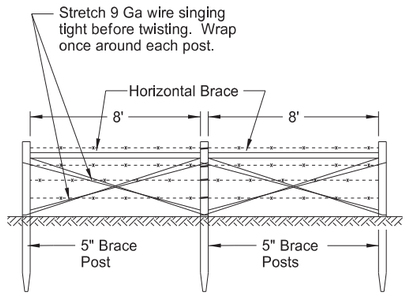


WRAP-AROUND DETAIL

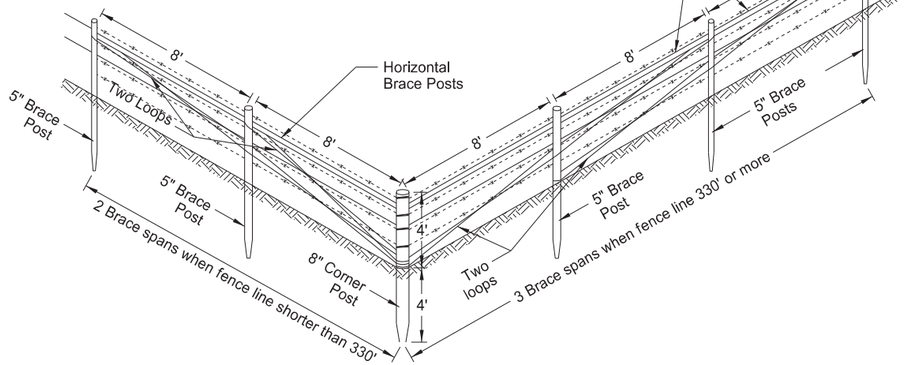


FASTENING TO POSTS

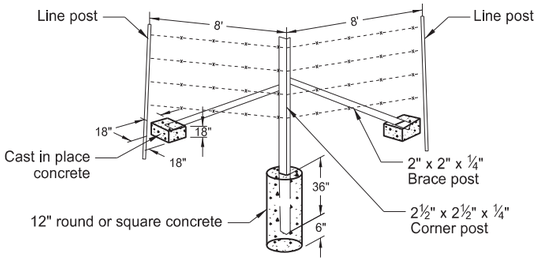
POST SIZES					
	TREATED WOOD		STEEL		
USE OF POST	Post dia.	Post length	Post length	Post wt. Lbs/Ft	Anchor wt. Lbs.
Line post	3½"	6'-6"	6'-6"	1.33	0.67
Corner post	8"	8'	7'	4.10	(Conc.)
End post	5"	8'			
Brace post	5"	8'	7'	3.19	(Conc.)
Gate post	5"	8'			
Horizontal brace	4"	8'	As appoved by the Engineer		



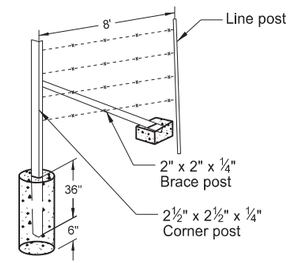
DOUBLE BRACE ASSEMBLY



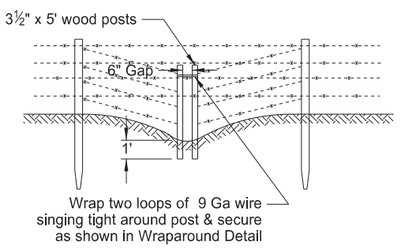
CORNER ASSEMBLY



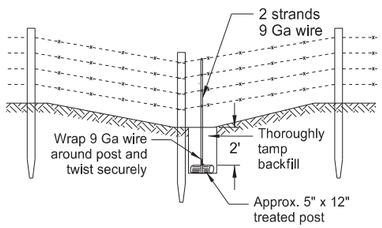
CORNER AND DOUBLE BRACE ASSEMBLY STEEL POSTS



FENCE TERMINAL STEEL POSTS

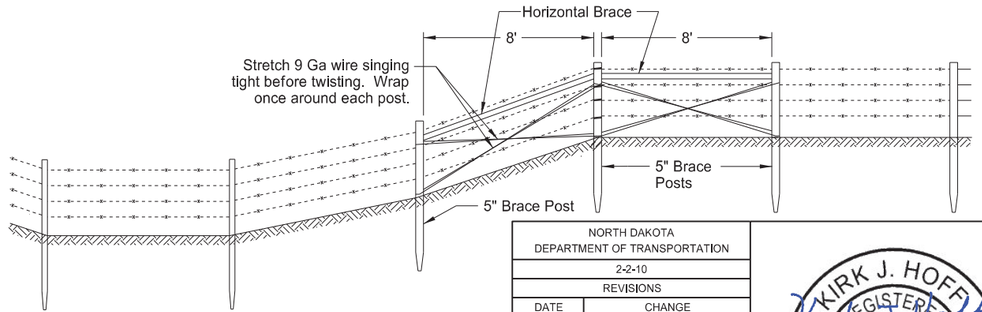


BREAK-AWAY FENCE FOR NARROW DEPRESSIONS SUBJECT TO FLOODING



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.



FENCING FOR WIDE DEPRESSIONS

Use double brace installation, as shown, on opposite side of depression.

Decrease line post spacing as needed due to terrain.

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.
02-23-23	Revised post spacing/brace size.

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

02/23/23

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.

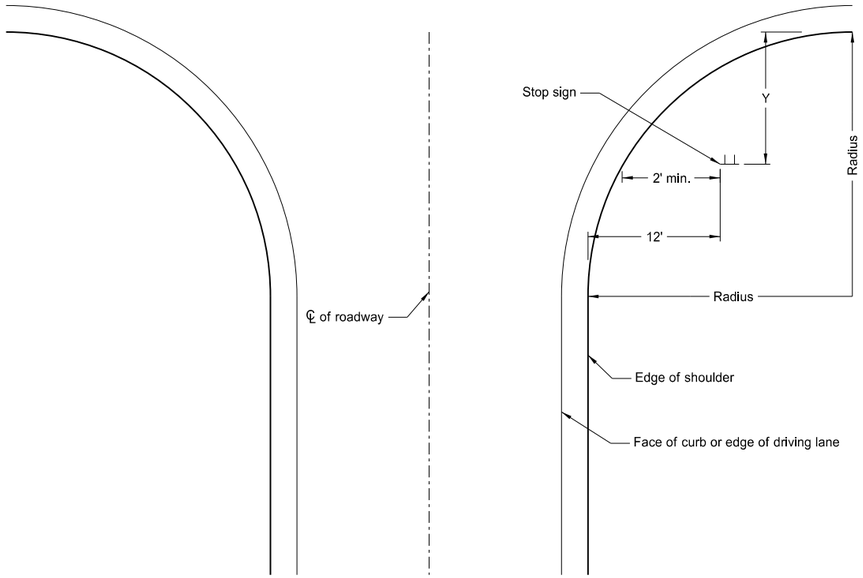
   Install signs on expressways a minimum height of 7'.

   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.

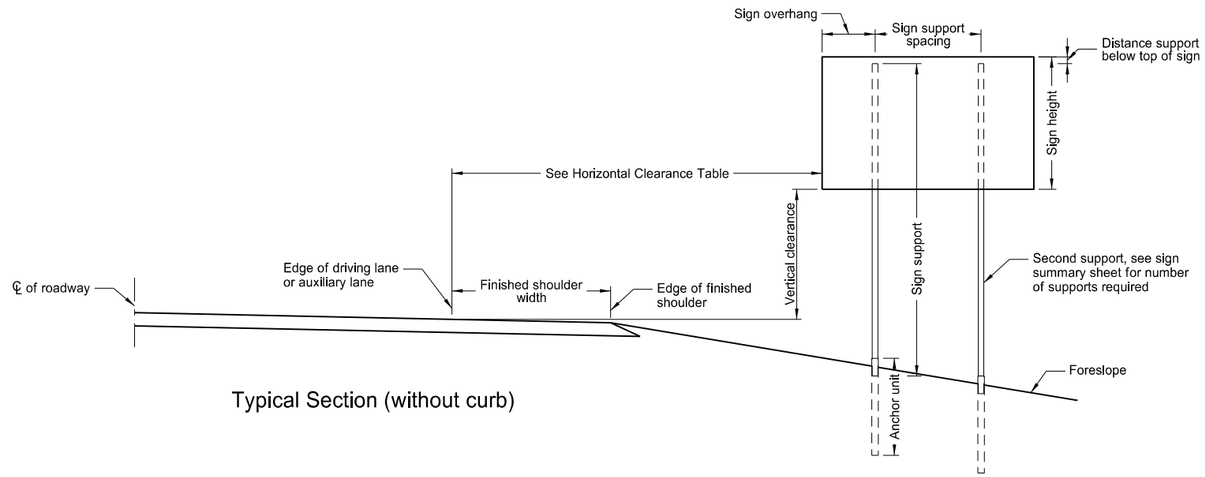
4. Provide a horizontal clearance from edge of shared use path to edge of sign of 3', except where width is limited. Provide a minimum clearance of 2'.



Stop Sign Location
Wide Throat Intersection

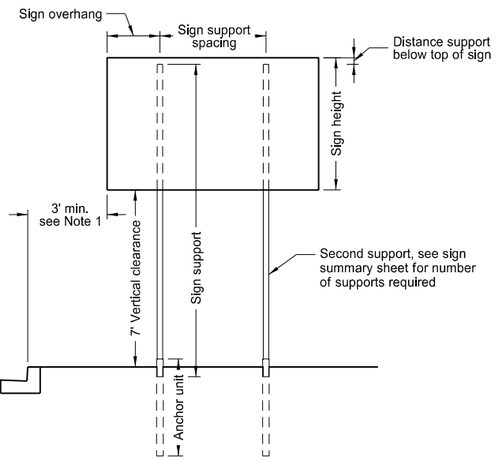
Use layout for the placement of "Stop" signs.

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



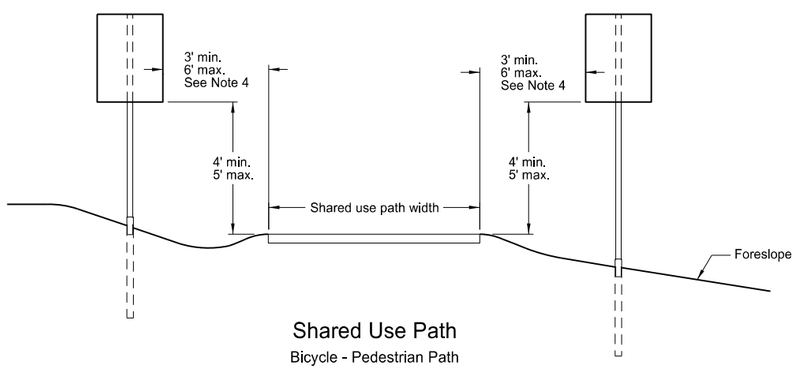
Typical Section (without curb)

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.

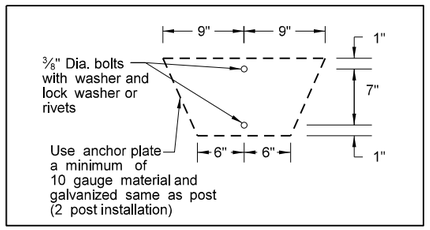
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/29/19 and the original document is stored at the North Dakota Department of Transportation

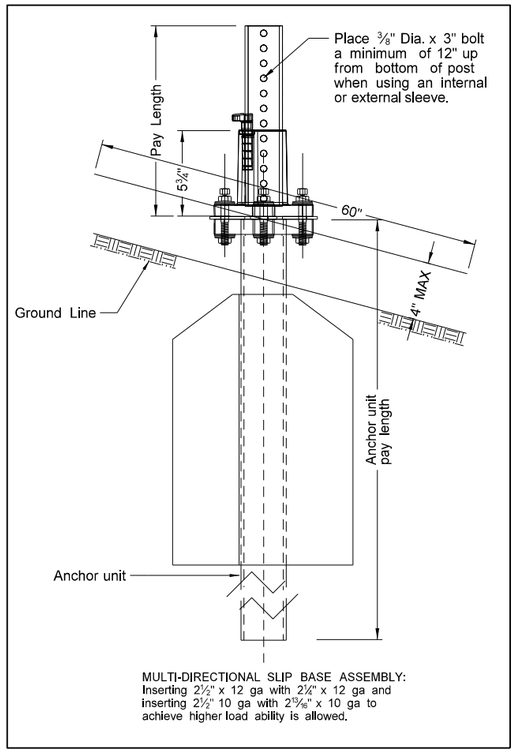
Mounting Details Perforated Tube

D-754-24

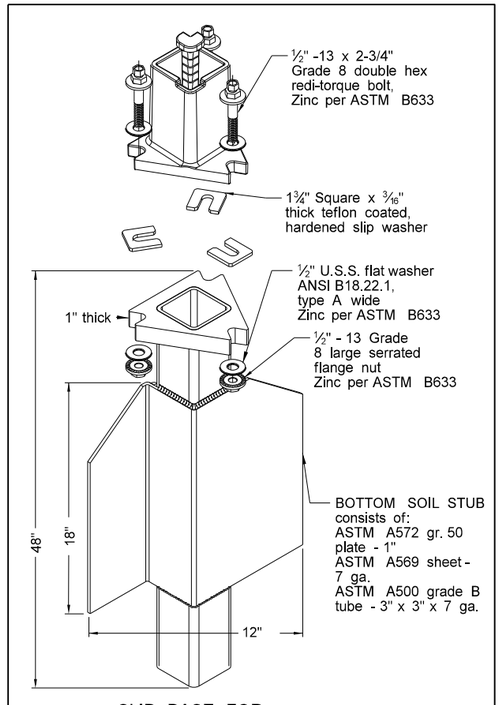
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thick-ness Gauge
1	2	12			No	2¼	12
1	2¼	12			No	2½	12
1	2½	12			(B)	3(C)	7
1	2½	10			Yes		7
1	2¼	12	2½(D)	12	Yes		7
1	2½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

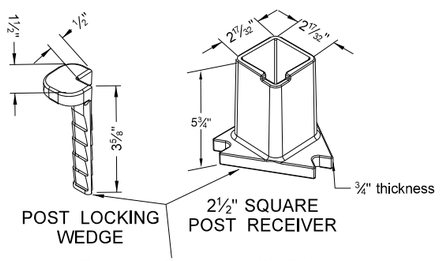




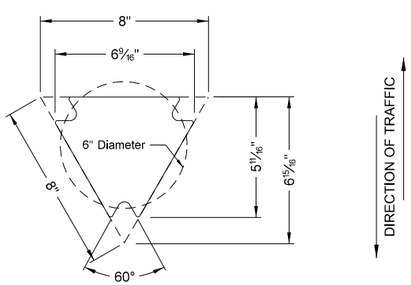
MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:
Inserting 2½" x 12 ga with 2¼" x 12 ga and inserting 2½" 10 ga with 2⅜16" x 10 ga to achieve higher load ability is allowed.



SLIP BASE FOR 2½" POST



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



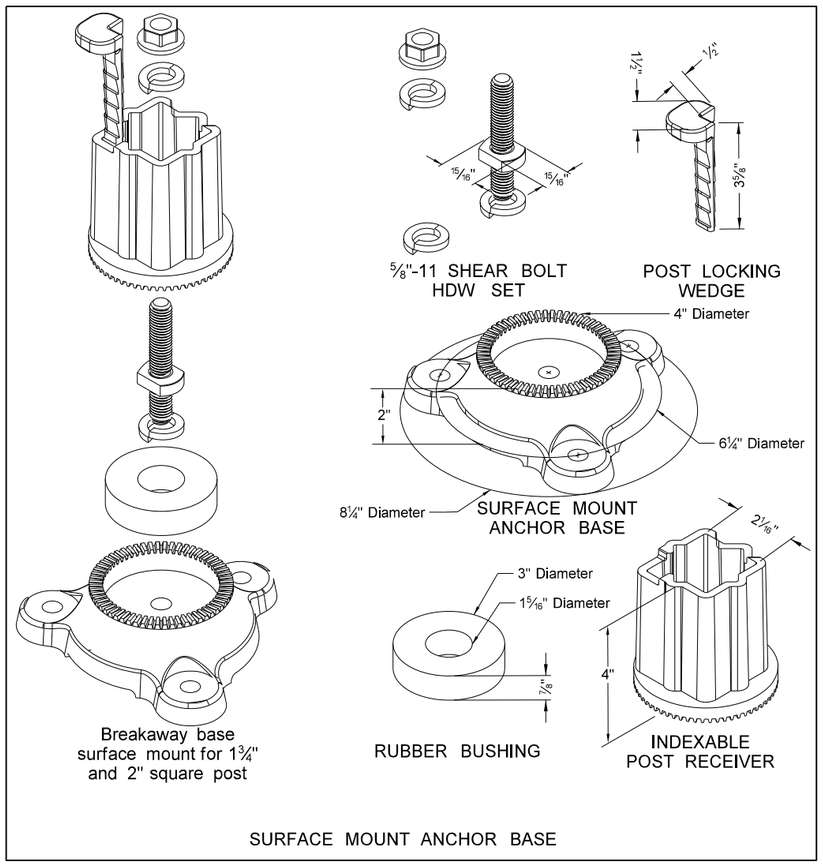
SLIP BASE DETAIL

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:

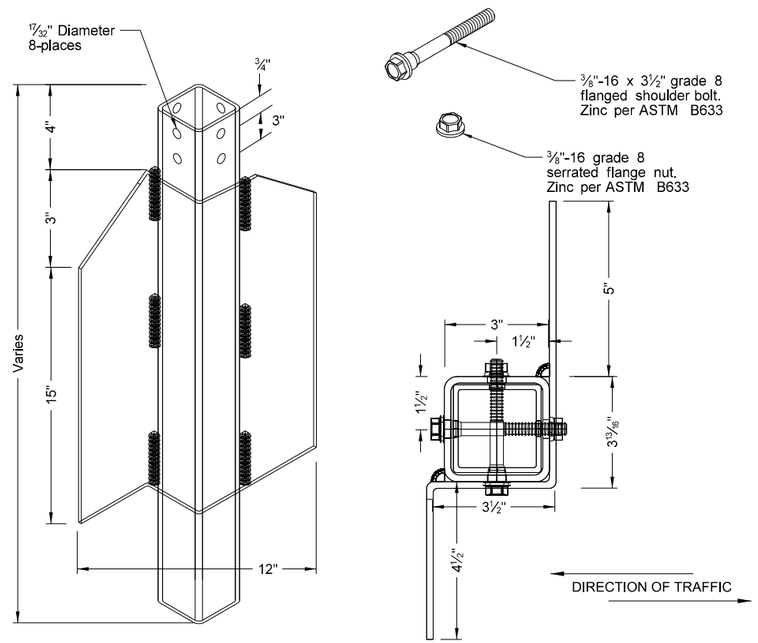
1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.
2. Provide 7 guage HRPO commmercial quality ASTM A569 and 3" x 3" x 7" guage ASTM A500 grade B anchor material with 43.9 KSI yield strength and 59.3 KSI tensile 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)



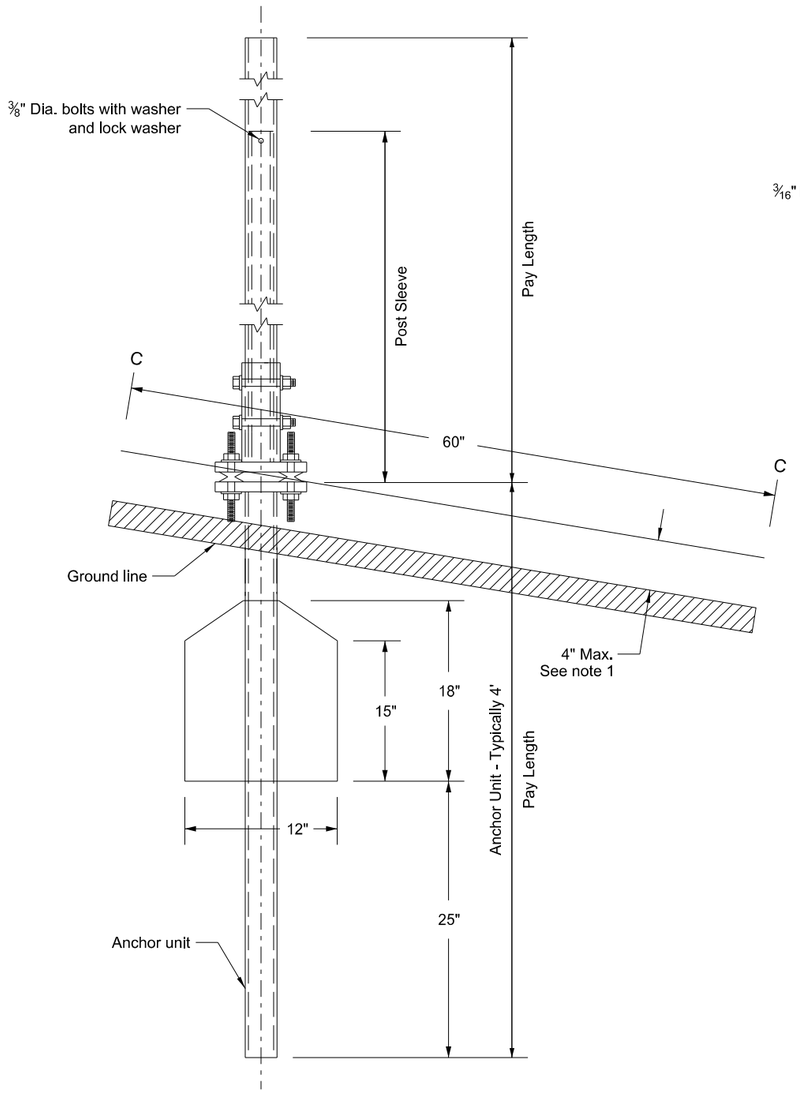
3" ANCHOR UNIT

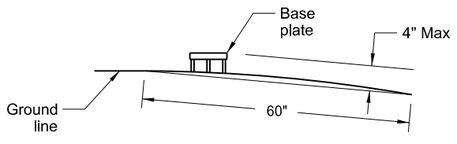
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice & corrected max height of base.
8-29-19	New Design Engineer PE Stamp.

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

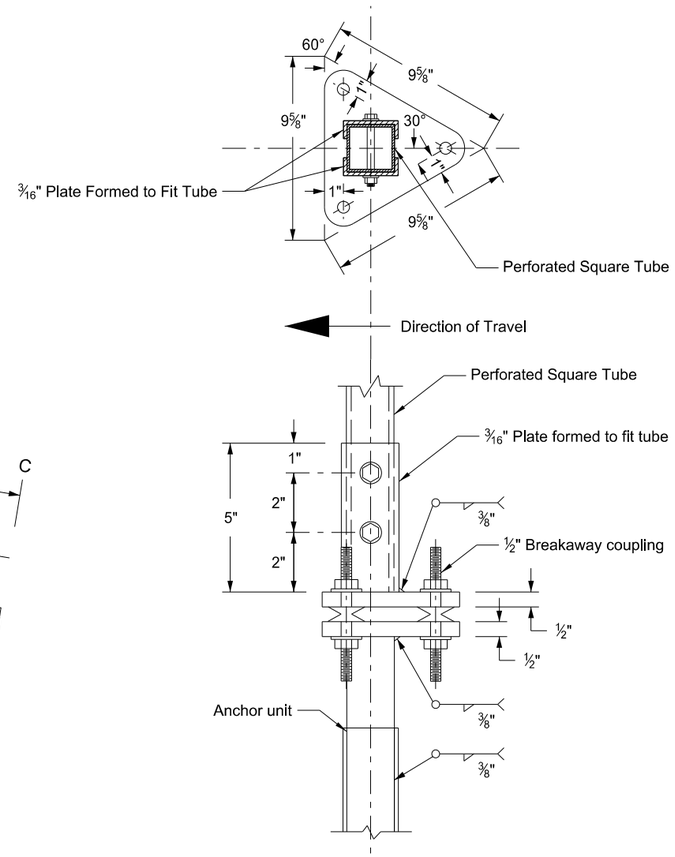
D-754-24A





Section C-C

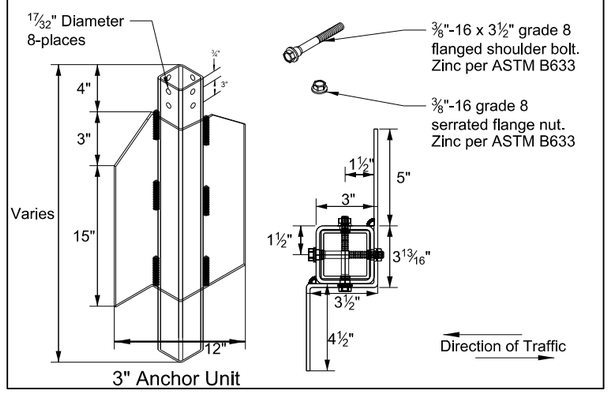
Max protection of the stub post is 4" above a 60" chord aligned radially to the center line of the highway and connecting any point, within the length of the chord, on the ground surface on one side of the support to a point in the ground surface on the other side.



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.

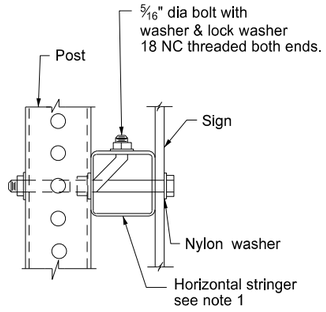
(C) - 3" anchor unit

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.

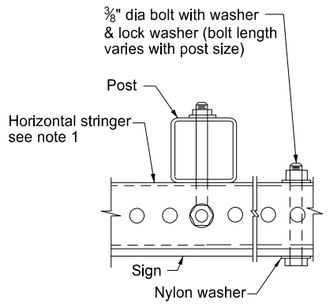
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

Mounting Details Perforated Tube

D-754-25

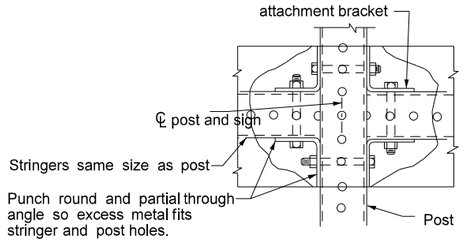


Side View



Top View

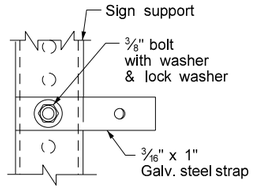
STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)



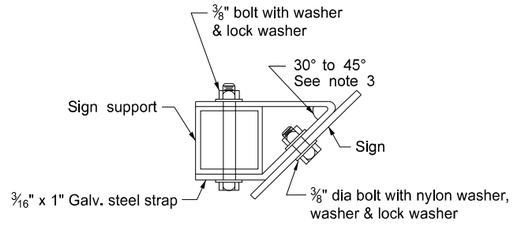
STREET NAME SIGNS AND ONE WAY SIGNS
SINGLE POST ASSEMBLY
ONE STRINGER OR BACK TO BACK MOUNTING

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.

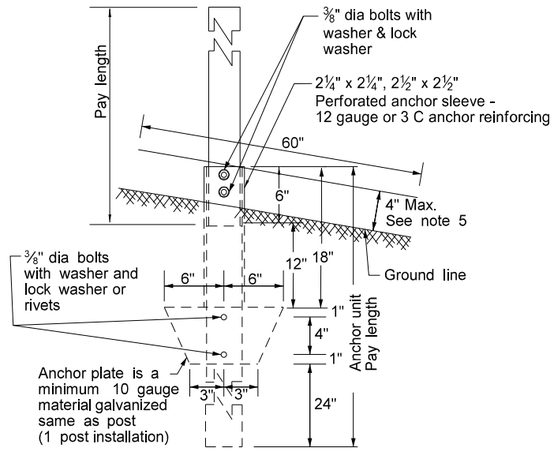


Side View



Top View

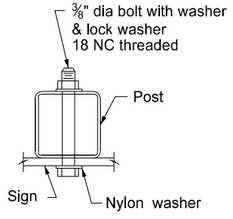
STRAP DETAIL



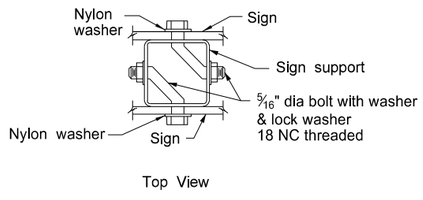
ANCHOR UNIT AND POST ASSEMBLY

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.

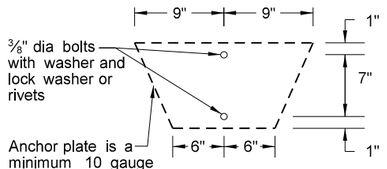


BOLT MOUNTING



Top View

BACK TO BACK MOUNTING



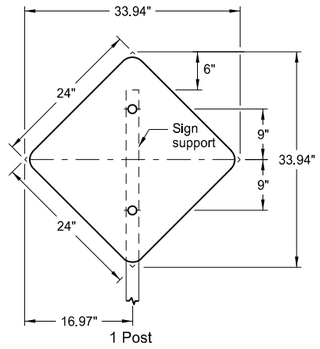
Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In.4	Cross Sect. area In.2	Section Modulus In.3
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
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.

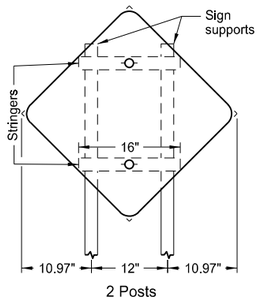
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
7-8-14	Revised Note 3.
8-30-18	Updated notes to active voice.
8-30-19	New Design Engr PE Stamp.

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

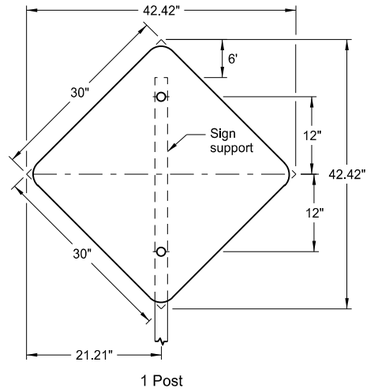


1 Post



2 Posts

Assembly No. 18



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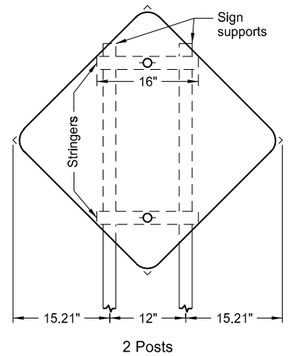
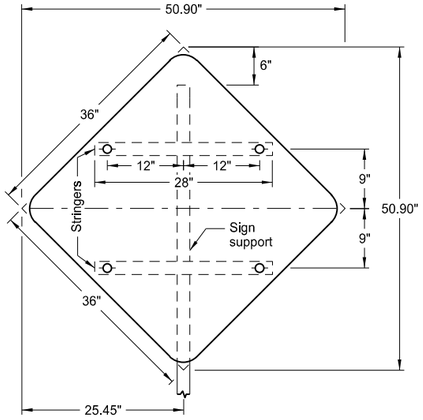
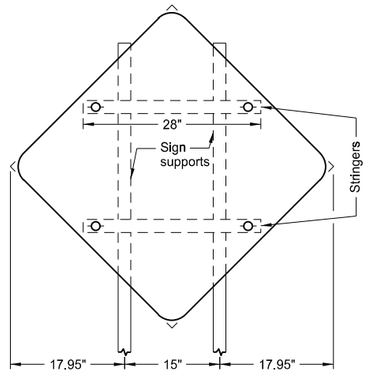


2 Posts

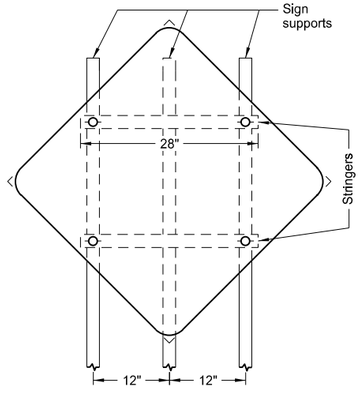
Assembly No. 19



1 Post

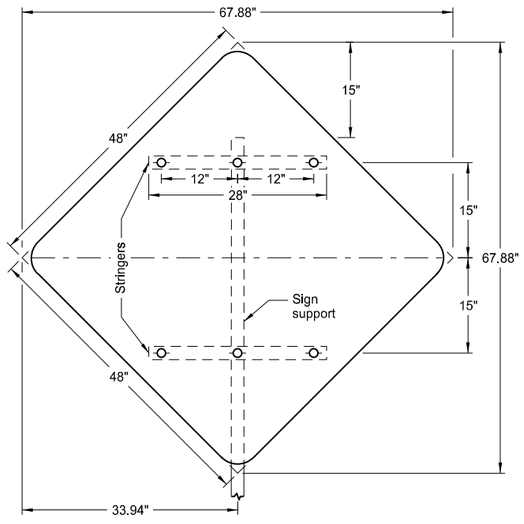


2 Posts

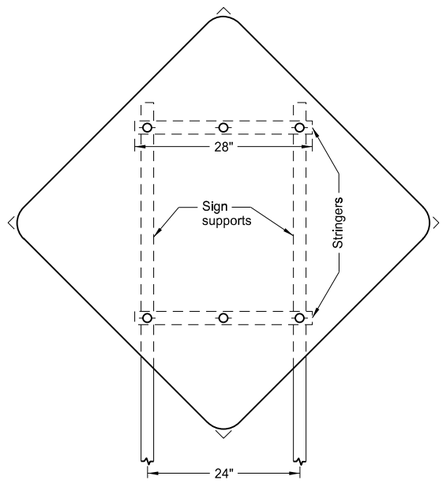


3 Posts

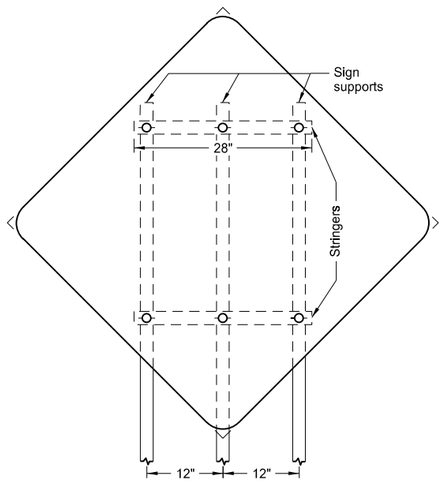
Assembly No. 20



1 Post



2 Posts



3 Posts

Assembly No. 21

Notes:

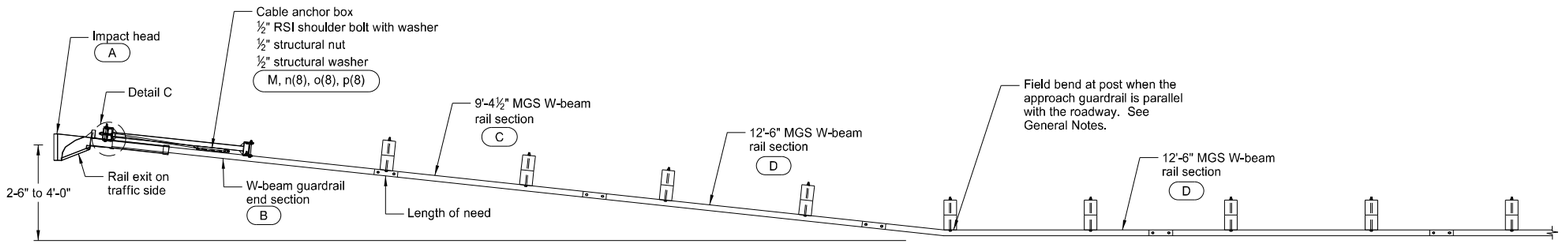
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

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.

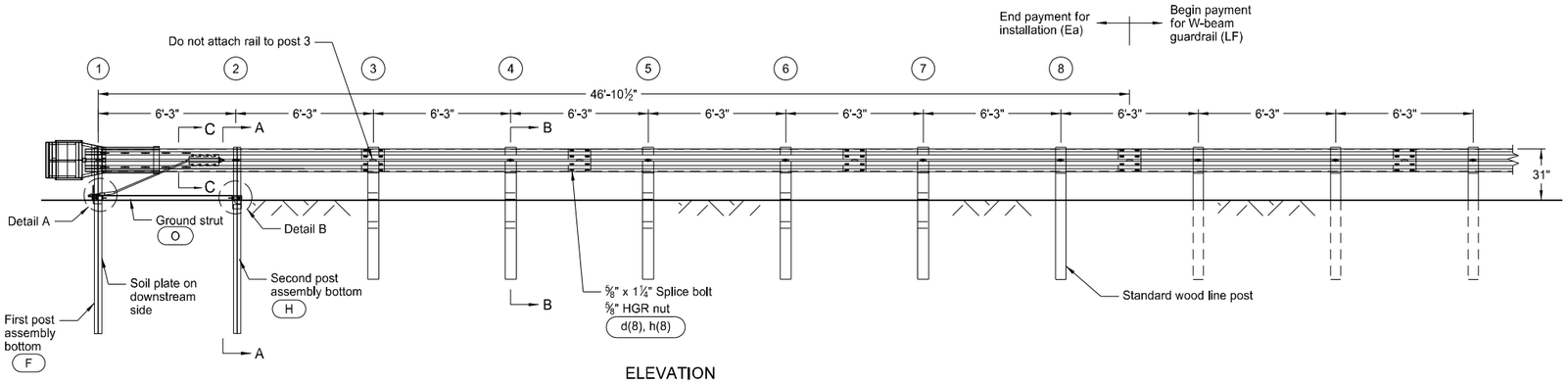
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

MGS FLARED ENERGY ABSORBING TERMINAL - WOOD POST

D-764-38



PLAN



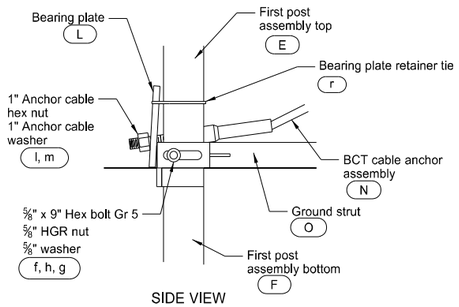
ELEVATION

ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	F3000	IMPACT HEAD	1
B	SF1303	W-BEAM GUARDRAIL END SECTION, 12 Ga	1
C	G12025	9'-4½" MGS W-BEAM RAIL SECTION, 12 Ga	1
D	G1203A	12'-6" MGS W-BEAM RAIL SECTION, 12 Ga	2
E	UHP1A	FIRST POST ASSEMBLY TOP	1
F	HP1B	FIRST POST ASSEMBLY BOTTOM	1
G	UHP2A	SECOND POST ASSEMBLY TOP	1
H	HP2B	SECOND POST ASSEMBLY BOTTOM	1
J	UP671	WOOD CRT POST	5
K	P675	WOOD BLOCKOUT OR RECYCLE EQUIVALENT	5
L	E750	BEARING PLATE	1
M	S760	CABLE ANCHOR BOX	1
N	E770	BCT CABLE ANCHOR ASSEMBLY	1
O	S785	GROUND STRUT HINGED POST	1
		HARDWARE	
a	B5160304A	⅝" x 3" HEX BOLT A325	2
b	W0516	⅝" WASHER	4
c	N0516	⅝" HEX NUT	2
d	B580122	⅝" Dia x 1¼" SPLICE BOLT	33
e	B581802	⅝" Dia X 18" HGR BOLT	5
f	B580904A	⅝" Dia x 9" HEX BOLT GRD 5	1
g	W050	⅝" WASHER	7
h	N050	⅝" Dia HGR NUT	39
j	B340854A	¾" Dia x 8½" HEX BOLT GRD A449	1
k	N030	¾" Dia HEX NUT	1
l	N100	1" ANCHOR CABLE HEX NUT	2
m	W100	1" ANCHOR CABLE WASHER	2
n	SB12A	½" RSI SHOULDER BOLT WITH WASHER	8
o	N012A	½" STRUCTURAL NUT	8
p	W012A	½" STRUCTURAL WASHER	8
r	CT-100ST	BEARING PLATE RETAINER TIE	1

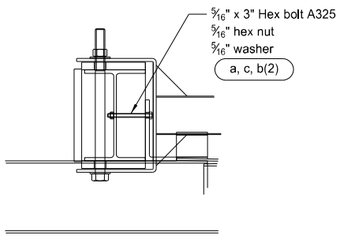
NOTE: Standard wood line post, block, and associated hardware not included in Bill of Materials Table.

GENERAL NOTES:

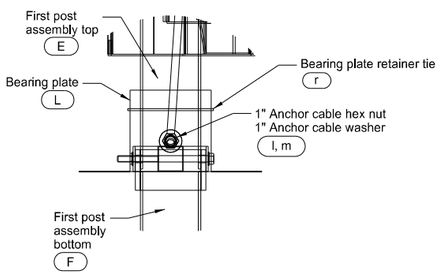
1. Wood posts are required with the Flared Energy Absorbing Terminal except posts 1 and 2.
2. Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
3. Flare the Flared Energy Absorbing Terminal when the approach guardrail is parallel with the roadway. When the approach guardrail is flared at 16:1 to 10:1, ensure the Flared Energy Absorbing Terminal has only the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, ensure the Flared Energy Absorbing Terminal is turned parallel to the roadway.
4. Site grade as necessary to ensure the lower sections of the posts do not protrude more than 4" above the ground (measured along a 5' cord).
5. Install the lower section of the hinged posts without the upper post attached. If the post is placed in a drilled hole, compact the backfill material to prevent settlement.
6. Install the breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent cable from twisting when tightening nuts.
7. "Toe nail" the wood blockouts to the rectangular wood posts with two 20 penny galvanized nails to prevent them from turning when the wood shrinks.



SIDE VIEW

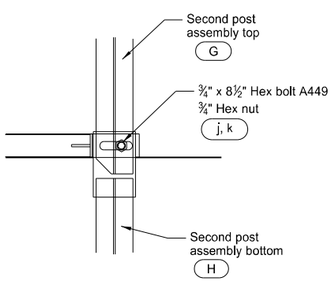


DETAIL C
Post 1 (Impact Head connection)

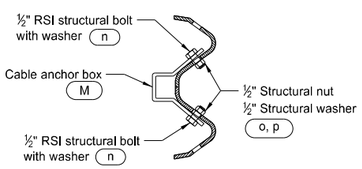


FRONT VIEW

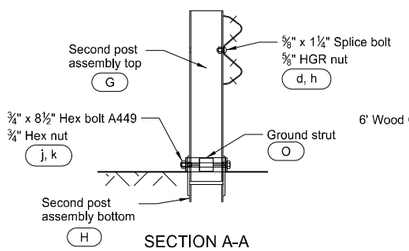
DETAIL A
Post 1



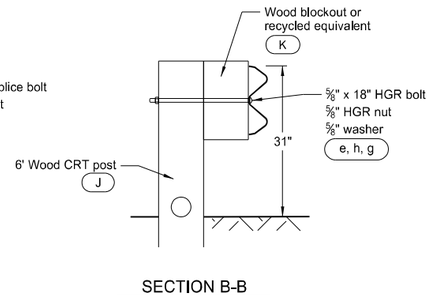
DETAIL B
Post 2



SECTION C-C



SECTION A-A
Post 2



SECTION B-B
Posts 3 through 7

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.

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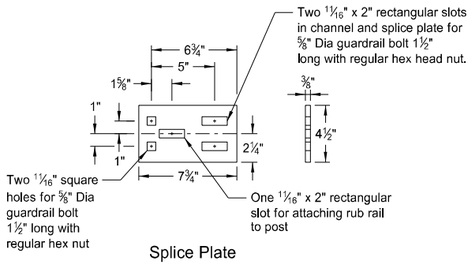
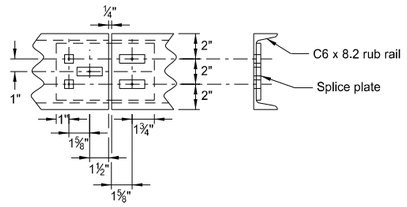
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA
Kirk J Hoff
12 02 2020

MGS W-BEAM GUARDRAIL GENERAL DETAILS

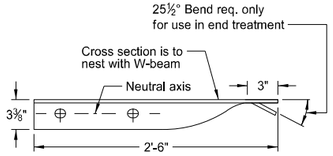
D-764-40

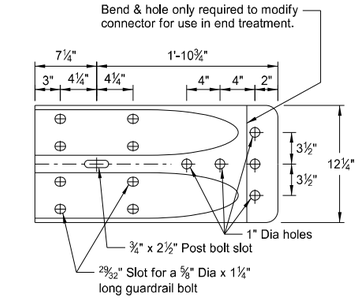


Splice Plate

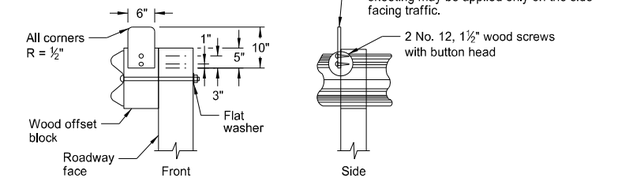


Splice Detail



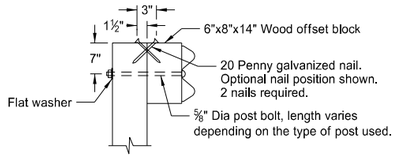


W BEAM TERMINAL CONNECTOR



REFLECTORIZED PLATE DETAIL

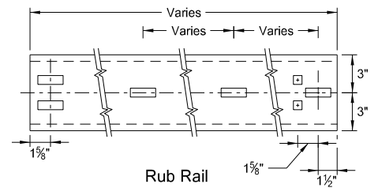
NOTE: Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.



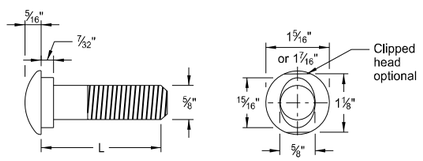
TYPICAL WOOD POST ATTACHMENT DETAIL

NOTES:

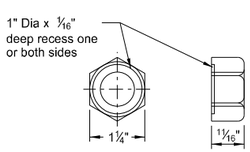
1. Begin reflector plates at the first post and space at 25' centers on guardrail less than 250' length and at 50' centers for guardrail over 250' length. Provide the reflector the same color as the pavement marking adjacent to it unless noted otherwise on the plans.
2. Replacing bituminous material at guardrail post: Dispose all excess earth from excavations for guard posts as directed by the engineer. Replace bituminous material wherever guardrail is installed after mat has been laid. Cost of excavation and replacing of bituminous material to be included in the price bid for other items.
3. Fit the Object Marker within the vertical edges of the Impact Plate. Provide type XI retroreflective sheeting meeting the requirements of Section 894.02.E of the standard specifications. Apply the sheeting to 0.100 Aluminum sheeting meeting the requirements of Section 894.01.A. Attach the Object Marker to the Impact Head Plate with rivets or other attachment device. Ensure the rivets or attachment device are non-rust. Slope the stripes downward toward the roadway side.
4. Guardrail installation height tolerance = ±1".



C6x8.2 RUB RAIL AND SPLICE PLATE

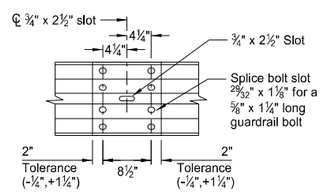


5/8" Diameter Guardrail Bolt	
L	Thread Length
1 1/4"	Full length thread
2"	1 3/4" Min thread length
9 1/2"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length



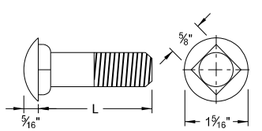
5/8" Dia recess nut

5/8" GUARDRAIL BOLT & RECESS NUT



SPLICE DETAIL

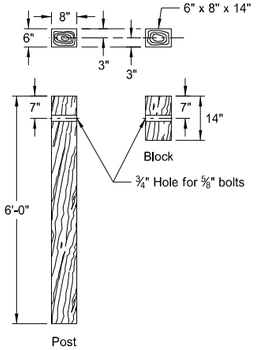
NOTE: Do not install center bolt in the 3/4" x 2 1/2" slot at mid span splices.



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

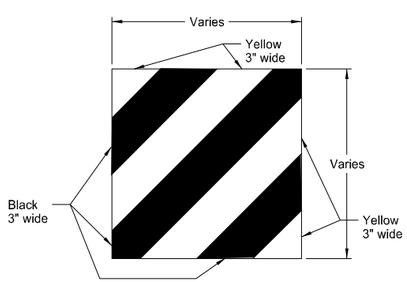
5/8" Dia hex nut

5/8" CARRIAGE BOLT & NUT

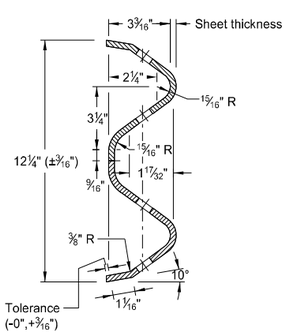


6" x 8" WOOD POST & BLOCK

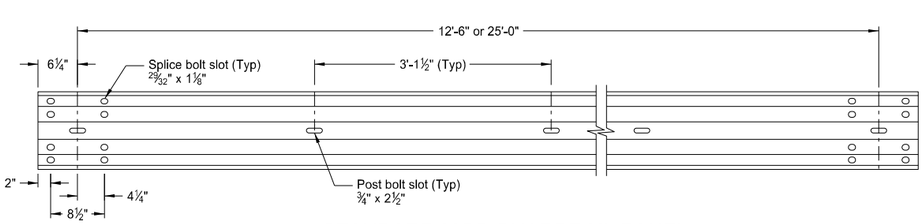
NOTE: Where soil conditions require, alternate lengths may be specified, in 6" increments.



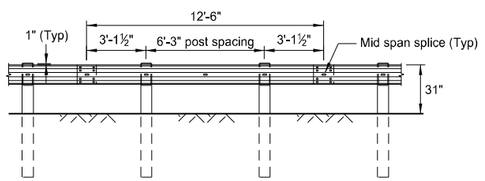
IMPACT HEAD OBJECT MARKER



W-BEAM CROSS SECTION



STANDARD MGS GUARDRAIL PANEL



STANDARD MGS GUARDRAIL SYSTEM

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12-02-20	Updated clipped head to optional

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Kirk J Hoff

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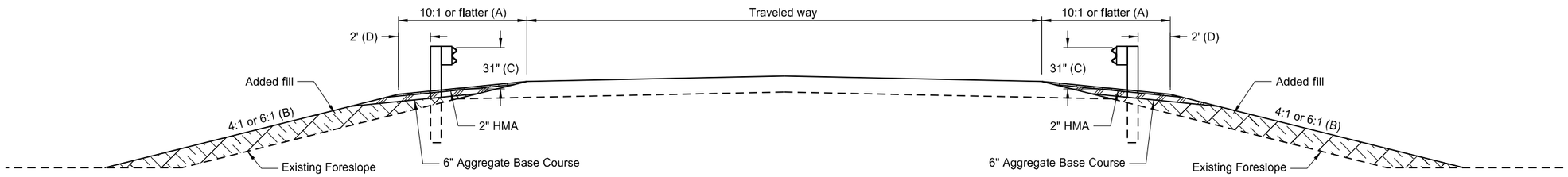
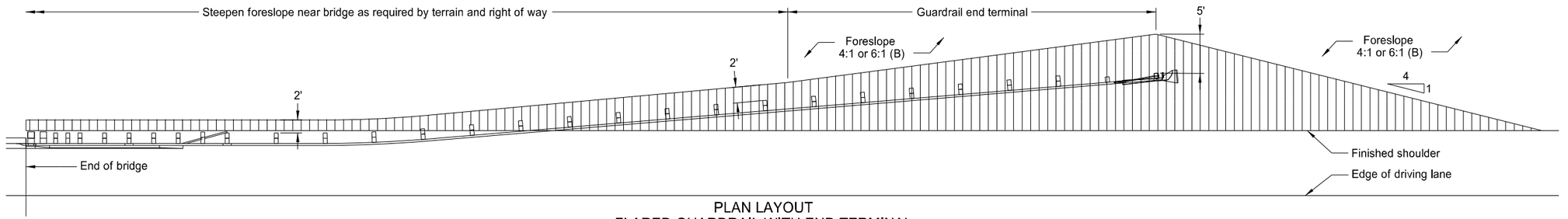
D-764-48

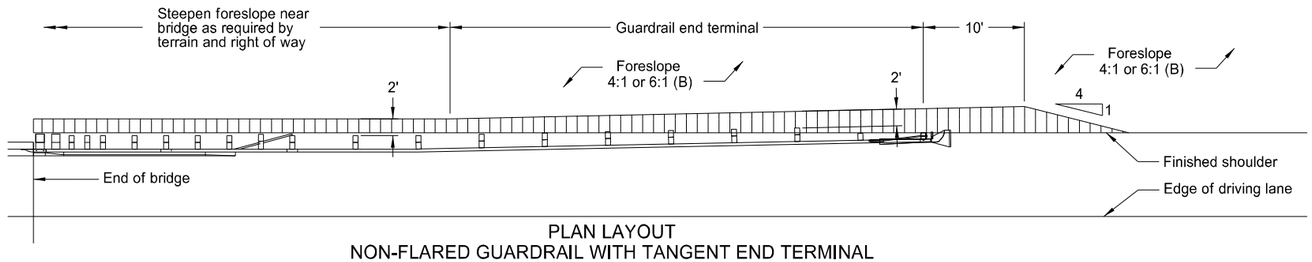
TYPICAL GRADING AT BRIDGE ENDS WITH MGS W-BEAM GUARDRAIL



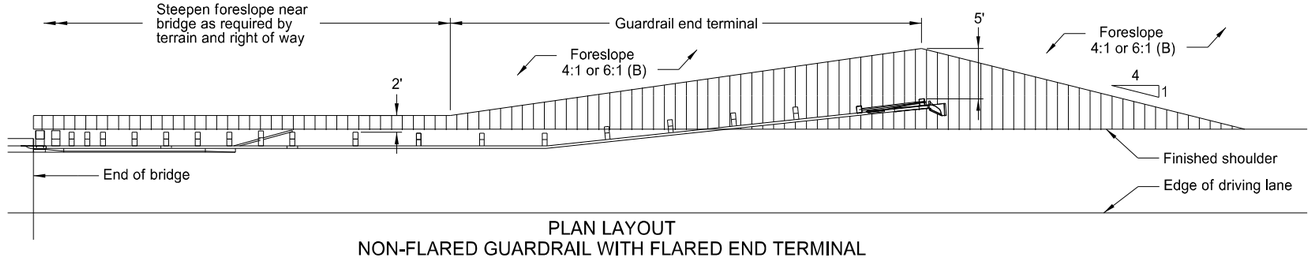
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

(A) Use slope flatter than 10:1 when required to provide proper guardrail height.

(B) When normal foreslope is 4:1, use added fill slope of 4:1. When normal foreslope is 6:1, use added fill slope of 6:1.

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

(D) Vary dimension at end terminals per Plan Layouts shown on this sheet.

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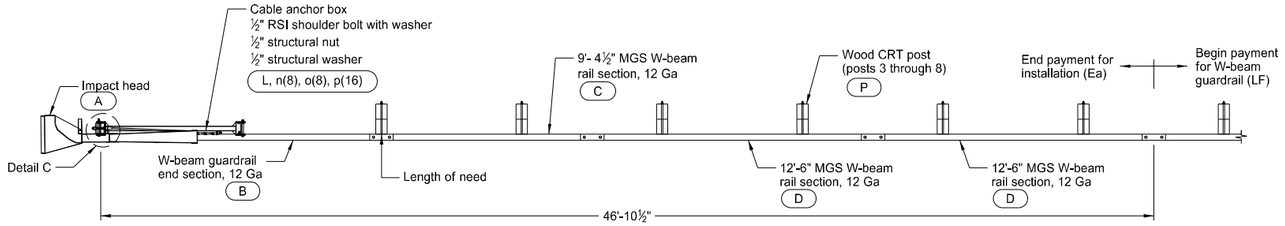
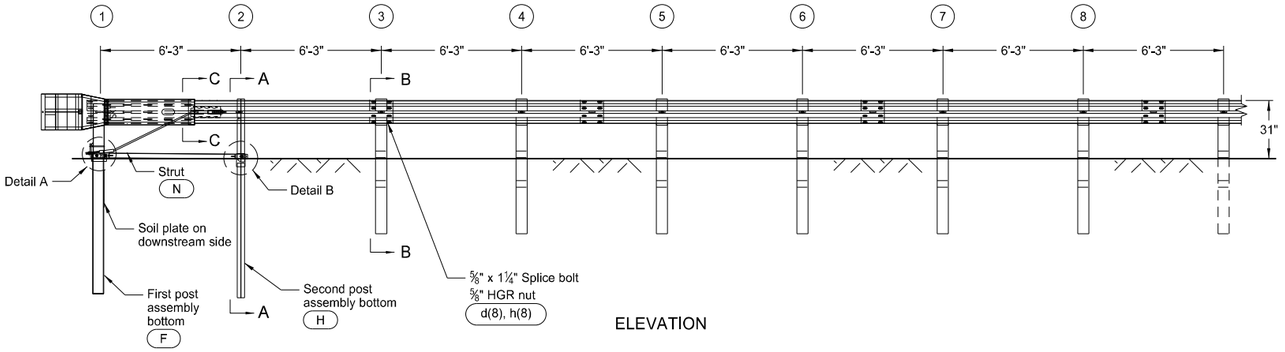
MASH SEQUENTIAL KINKING TERMINAL - WOOD POST

D-764-51



PLAN

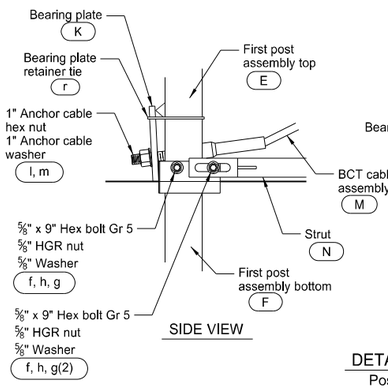


ELEVATION

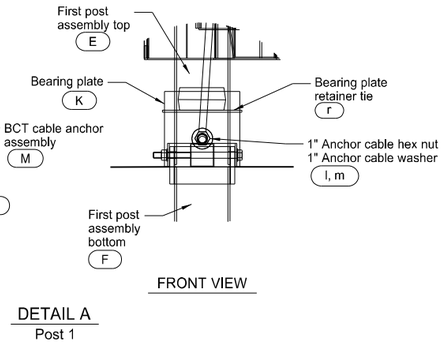
GENERAL NOTES:

1. Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
2. Flare the MSKT at a rate of up to 25:1, as needed to prevent the impact head from encroaching on the shoulder.
3. Site grade as necessary to ensure the lower sections of posts do not protrude more than 4" above the ground (measured along a 5' cord).
4. Install the lower section of the hinged posts without the upper post attached. If the post is placed in a drilled hole, compact the backfill material to prevent settlement.
5. Install breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent the cable from twisting when tightening nuts.
6. "Toe nail" the wood blockouts to the rectangular wood posts at post 3 through post 8 with two 20 penny galvanized nails to prevent them from turning when the wood warps.

ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	MS3000	IMPACT HEAD	1
B	SF1303	W-BEAM GUARDRAIL END SECTION, 12 Ga	1
C	G12025	9'-4½" MGS W-BEAM RAIL SECTION, 12 Ga	1
D	G1203A	12'-6" MGS W-BEAM RAIL SECTION, 12 Ga	2
E	MTPHP1A	FIRST POST ASSEMBLY TOP (6" X 6" X⅛" Tube)	1
F	MTPHP1B	FIRST POST ASSEMBLY BOTTOM (6' W6X15)	1
G	UHP2A	SECOND POST ASSEMBLY TOP	1
H	HP2B	SECOND POST ASSEMBLY BOTTOM	1
K	E750	BEARING PLATE	1
L	S760	CABLE ANCHOR BOX	1
M	E770	BCT CABLE ANCHOR ASSEMBLY	1
N	MS785	STRUT	1
P	UP671	6' WOOD CRT POST	6
R	P675	WOOD BLOCKOUT OR RECYCLED EQUIVALENT	6
		HARDWARE	
a	B5160104A	5/16" x 1" HEX BOLT GR 5	2
b	W0516	5/16" WASHER	4
c	N0516	5/16" HEX NUT	2
d	B580122	⅝" Dia x 1¼" SPLICE BOLT	33
e	B581802	⅝" Dia x 18" HGR BOLT (POSTS 3 THRU 8)	6
f	B580904A	⅝" x 9" HEX BOLT GR 5	2
g	W050	⅝" WASHER	9
h	N050	⅝" Dia HGR NUT	35
j	B340854A	¾" Dia x 8½" HEX BOLT GRD A449	1
k	N030	¾" Dia HEX NUT	1
l	N100	1" ANCHOR CABLE HEX NUT	2
m	W100	1" ANCHOR CABLE WASHER	2
n	SB12A	½" RSI SHOULDER BOLT WITH WASHER	8
o	N012A	½" STRUCTURAL NUT	8
p	W012A	½" STRUCTURAL WASHER	8
r	CT-100ST	BEARING PLATE RETAINER TIE	1

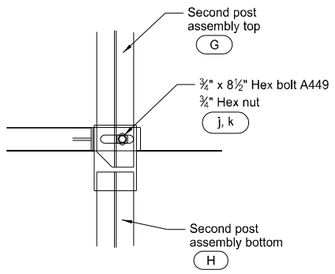


SIDE VIEW



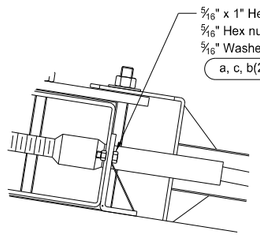
FRONT VIEW

DETAIL A
Post 1

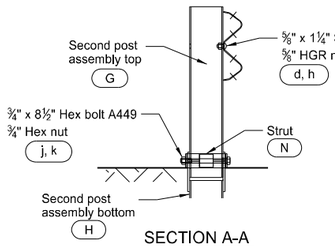


SIDE VIEW

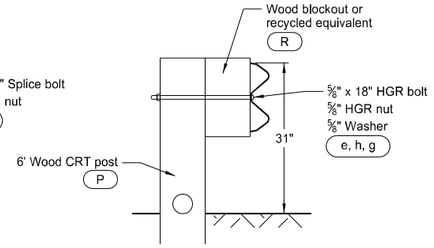
DETAIL B
Post 2



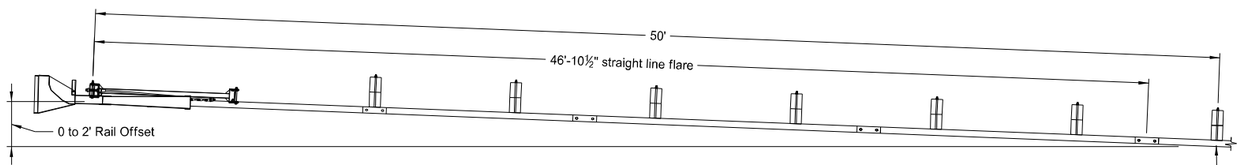
DETAIL C
Post 1 (Impact Head connection)



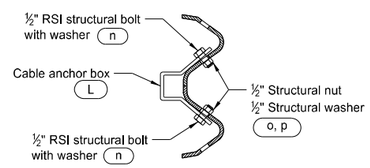
SECTION A-A
Post 2



SECTION B-B
Posts 3 through 8



FLARED INSTALLATION
25:1 maximum flare rate



SECTION C-C

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
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12-02-20	Updated notes to active voice.

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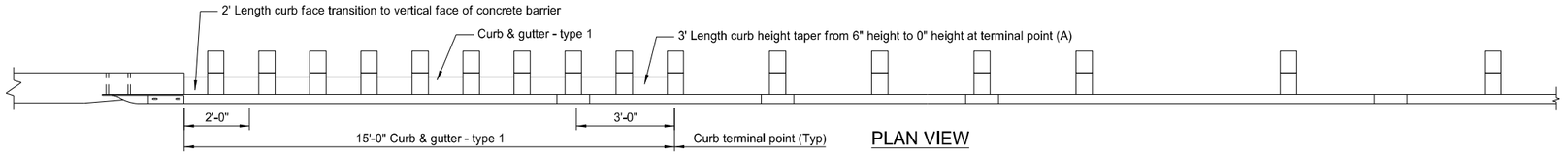
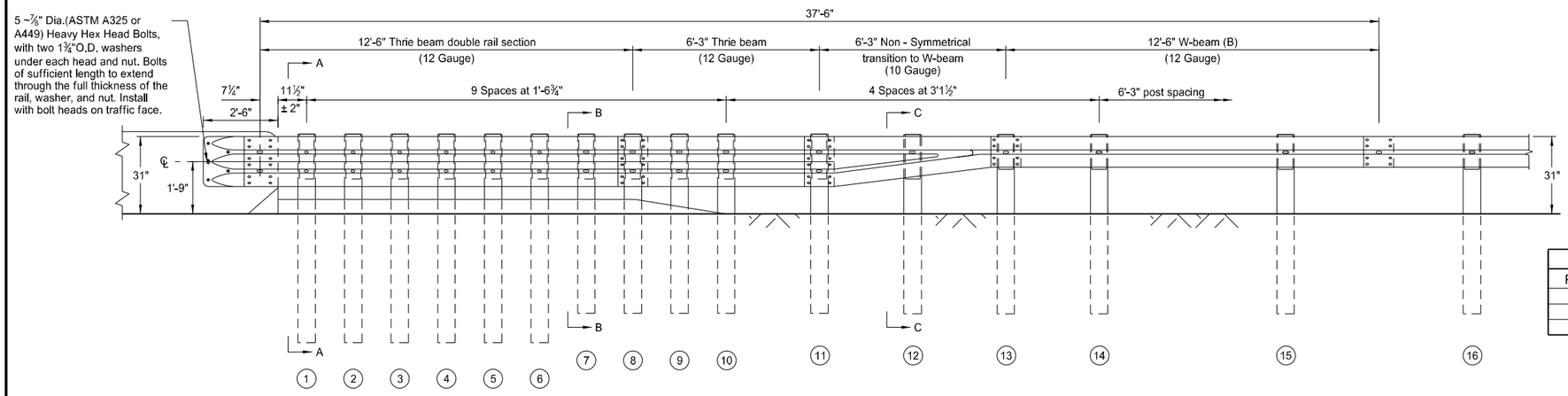
MGS W-BEAM TRANSITION WITH APPROACH CURB TO CONCRETE SINGLE SLOPE OR JERSEY BARRIER

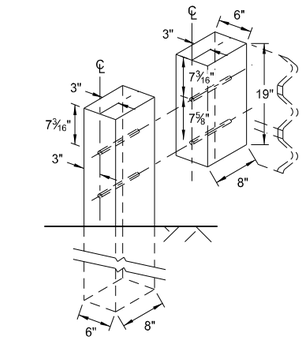
D-764-60



PLAN VIEW

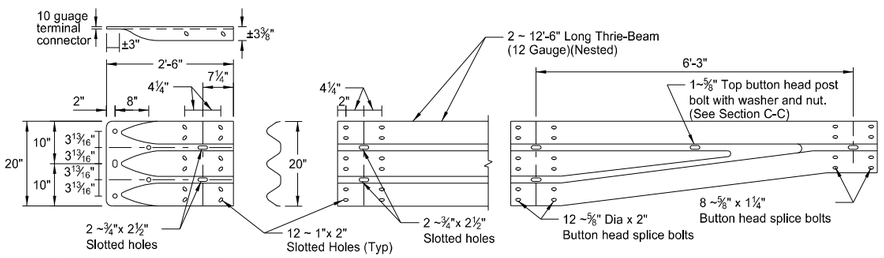


ELEVATION VIEW



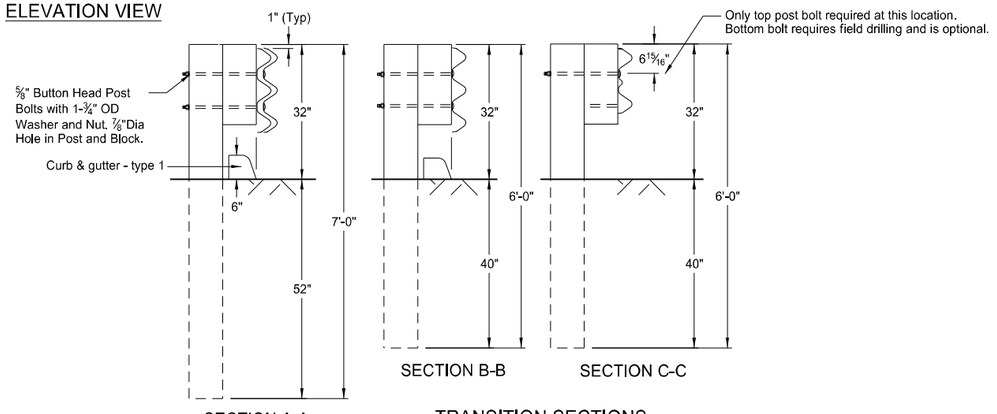
WOOD BLOCK
TO RECTANGULAR WOOD POST
(At posts 1 to 11)

TRANSITION POST AND TIMBER BLOCKOUT SIZING		
POST NO.	POST SIZE	BLOCKOUT SIZE
1-6	6" X 8" X 7'-0" long	6" X 8" X 19"
7-12	6" X 8" X 6'-0" long	6" X 8" X 19"
13-16	6" X 8" X 6'-0" long	6" X 8" X 14"



THRIE-BEAM TERMINAL CONNECTION

NON - SYMMETRICAL TRANSITION
TO W-BEAM (10 GAUGE)

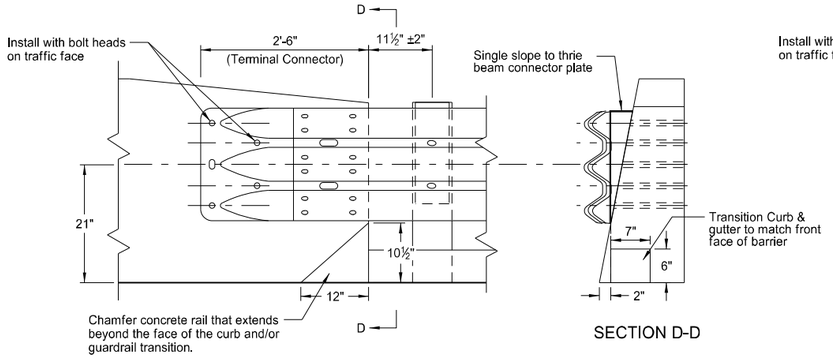


SECTION A-A

SECTION B-B

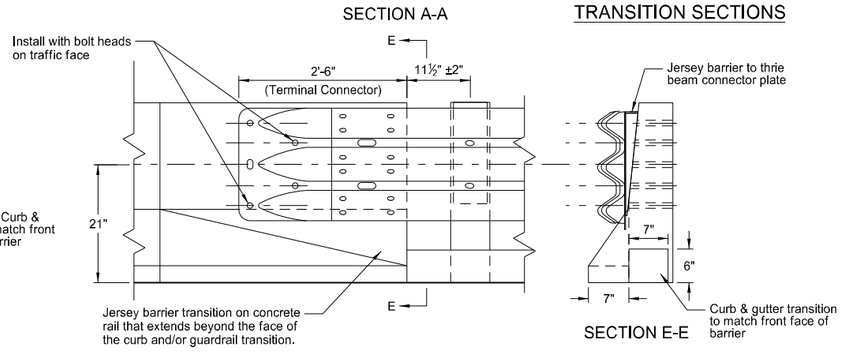
SECTION C-C

TRANSITION SECTIONS



SECTION D-D

CONNECTION TO CONCRETE SINGLE SLOPE BRIDGE RAIL AND TRAFFIC BARRIERS



SECTION E-E

CONNECTION TO CONCRETE JERSEY BARRIER BRIDGE RAIL AND TRAFFIC BARRIERS

(A) Where curb is required to continue past 15' length, taper the curb down to 3" height at the terminal point shown above, instead of 0" height. Use 3" height curb between posts 10 and 16.

(B) Install 12'-6" length W-beam double rail section at location where curb extends past 15' length.

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12-02-20	Updated notes to active voice.

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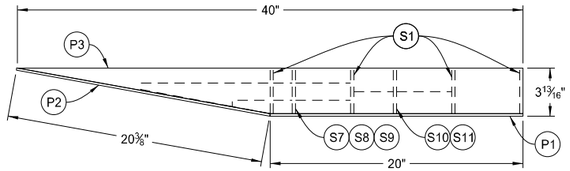
12 02 2020

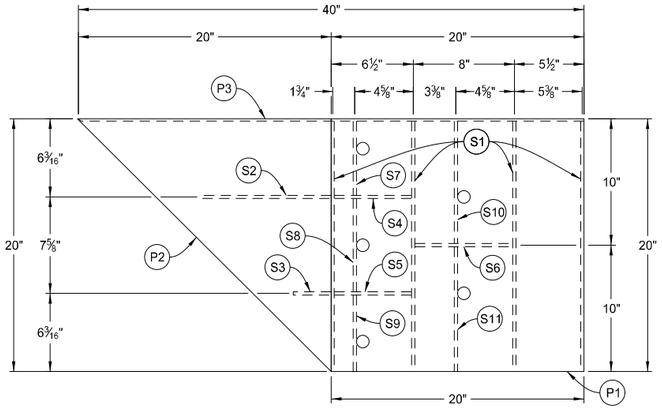
SINGLE SLOPE TO THRIE BEAM CONNECTOR PLATE DETAILS

D-764-61

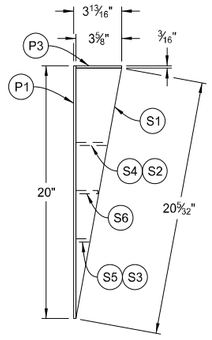


PLAN

NOTE: Assembly Detail is shown for guardrail installation on right hand side of entrance end of bridge barrier. Mirror for opposite side installation.

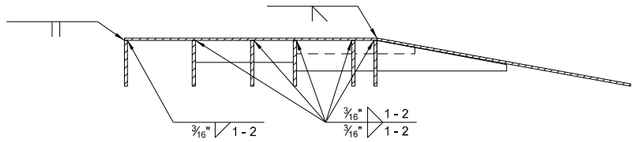


ELEVATION

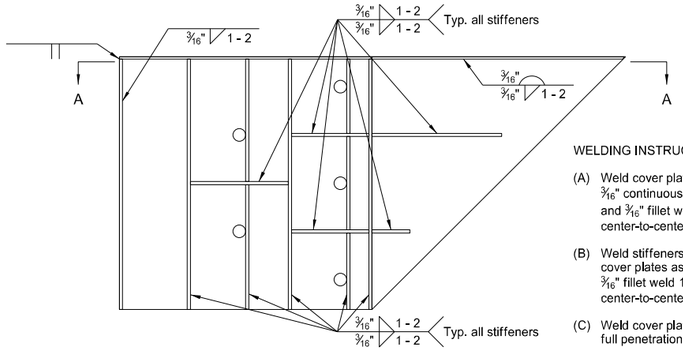


END

ASSEMBLY DETAIL
(Front View)

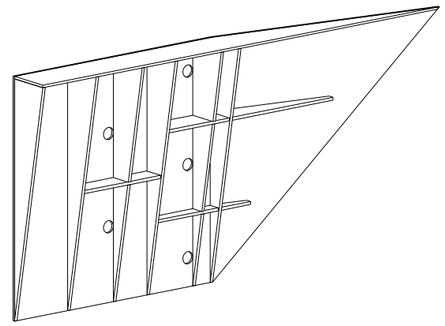


SECTION A-A



ELEVATION

WELDING DETAIL
(Back View)



PICTORIAL DRAWING
(Showing Back of Connector Plate)

WELDING INSTRUCTIONS:

(A) Weld cover plate P3 as follows: 3/16" continuous back weld on exterior sides and 3/16" fillet weld 1" long spaced at 2" center-to-center on interior sides.

(B) Weld stiffeners located on the inside of the cover plates as follows: 3/16" fillet weld 1" long spaced at 2" center-to-center.

(C) Weld cover plates P1 and P2 together with full penetration groove weld.

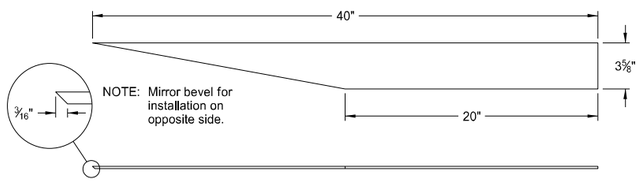


PLATE P3
Quantity: 1

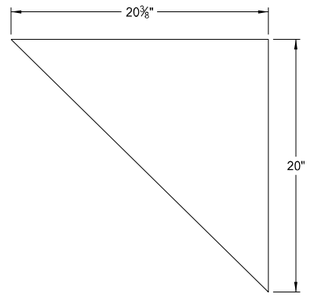


PLATE P2
Quantity: 1

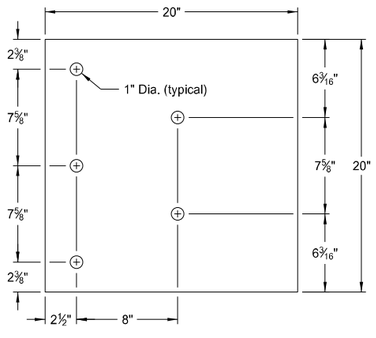
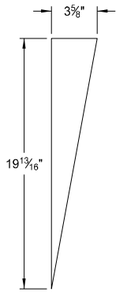
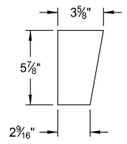


PLATE P1
Quantity: 1

COVER PLATES



TYPE S1
Quantity: 4



TYPE S7
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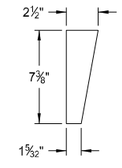
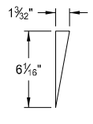
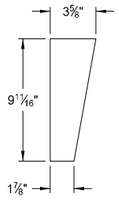


TYPE S8
Quantity: 1

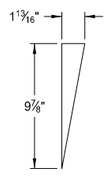


TYPE S9
Quantity: 1

VERTICAL PLATES



TYPE S10
Quantity: 1



TYPE S11
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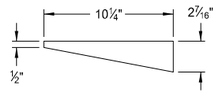

TYPE S2
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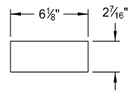

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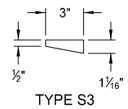

TYPE S3
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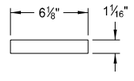
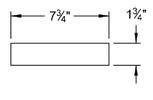


TYPE S5
Quantity: 1



TYPE S6
Quantity: 1

HORIZONTAL PLATES

STIFFENER PLATES

NOTES:

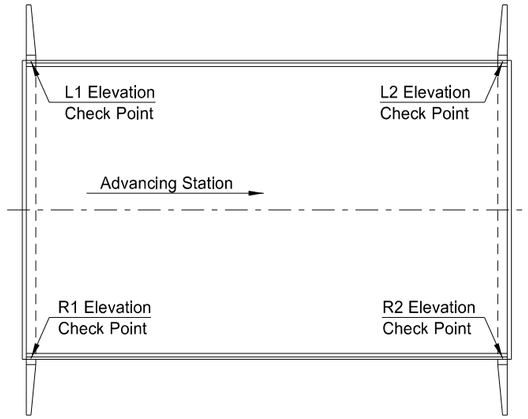
1. Fabricate cover plates P1, P2, and P3 from 3/16" thick ASTM A36 Grade structural steel.
2. Fabricate stiffener plates from 1/4" thick ASTM A36 Grade structural steel.
3. Galvanize connector plate in accordance with AASHTO M111.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.

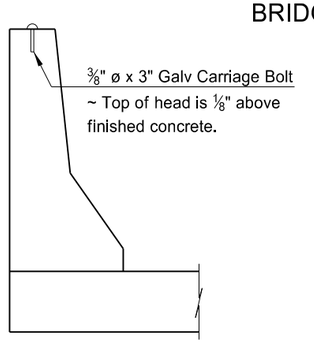
KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA
Kirk J Hoff
12 02 2020

BRIDGE BENCH MARKS

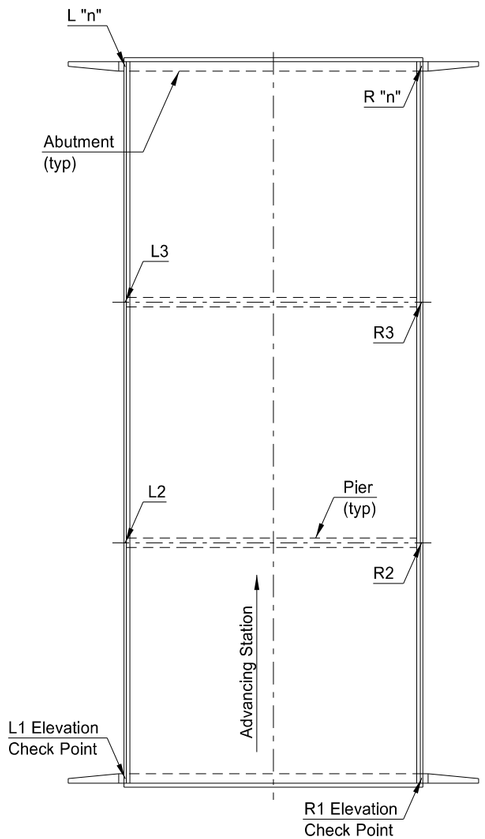
D-900-1



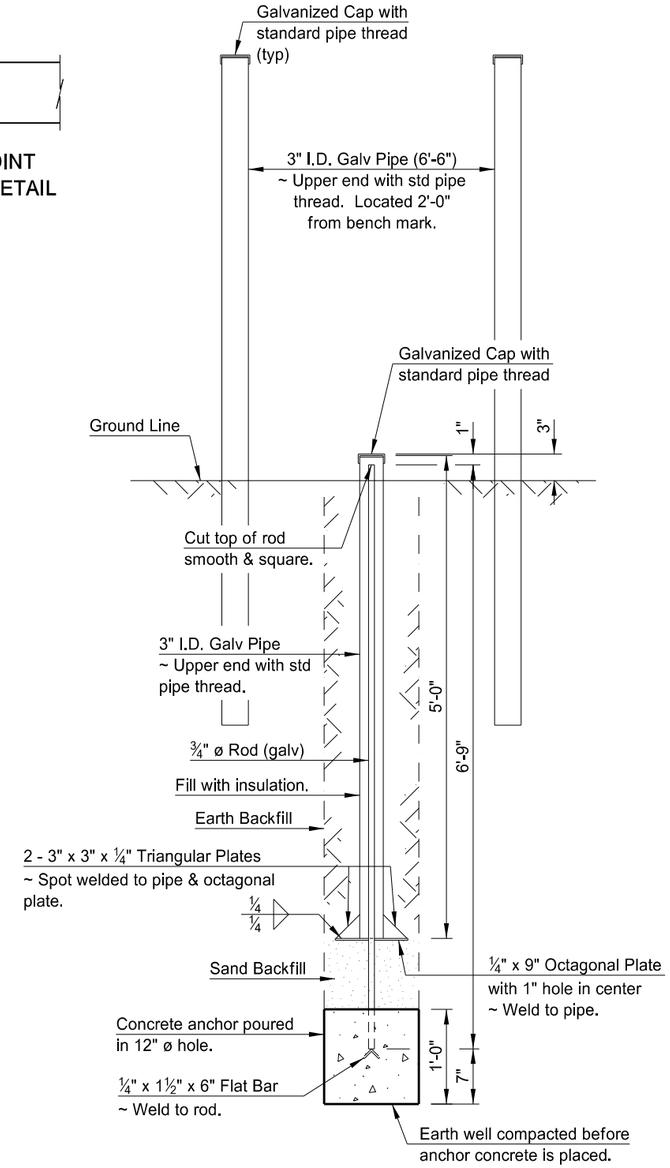
GENERAL LAYOUT FOR
SINGLE SPAN



CHECK POINT
LOCATION DETAIL



GENERAL LAYOUT FOR
MULTIPLE SPAN



BENCH MARK DETAIL

NOTES:

Elevation check points shall consist of ⅜" ø x 3" galvanized carriage bolts (or equal) set in the concrete barrier at the points indicated on the General Layout sketches. The top of the bolt head shall project above the finished concrete ⅛". Elevation check points shall be placed on each barrier over each unit of the substructure for each bridge at a structural location.

Two bench marks as detailed hereon shall be set at diagonal opposite positions away from the structure location and at least 300 feet from the nearest point on the bridge or bridges (if more than one at a location). These bench marks shall be constructed as detailed on this sheet and located near the Highway Right of Way lines. The two pipes shall extend 4'-0" above ground and be painted with two coats of white paint suitable for galvanized steel surfaces.

The Project Engineer shall run a set of levels determining the elevation of each check point on the structure and the two bench marks immediately after the completion of the bridge. Bench Mark #1 can be listed as having elevation 1000 or the actual surveyed elevation. This information shall be recorded on SFN 13420 and submitted to the Bridge Engineer with adequate information locating each check point and bench mark.

All metal parts are to be hot dip galvanized after punching, shearing, welding and fabrication.

Threads of cap and pipe are not to be galvanized. At the time of installation these threads are to be coated with synthetic grease with teflon and cap screwed to a snug fit.

METHOD OF MEASUREMENT:

Each set of Bridge Bench Marks consisting of two bench marks and the required number of elevation check points shall be considered as one unit for bidding purposes and the quantity to be paid for shall be the number of sets of bridge bench marks which have been installed complete in place and accepted by the Engineer.

BASIS OF PAYMENT:

Bridge Bench Marks shall be paid for at the contract price bid for each set of Bridge Bench Marks, which price shall be full compensation for all excavation, backfill and clean-up, and for furnishing, hauling and placing all elevation check points, galvanized pipe, caps, rods, sand backfill, concrete, rock equipment, tools and incidentals, including galvanizing and greasing, necessary to complete this item.

GALVANIZING:

After fabrication the complete assembly shall be hot-dip galvanized.

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

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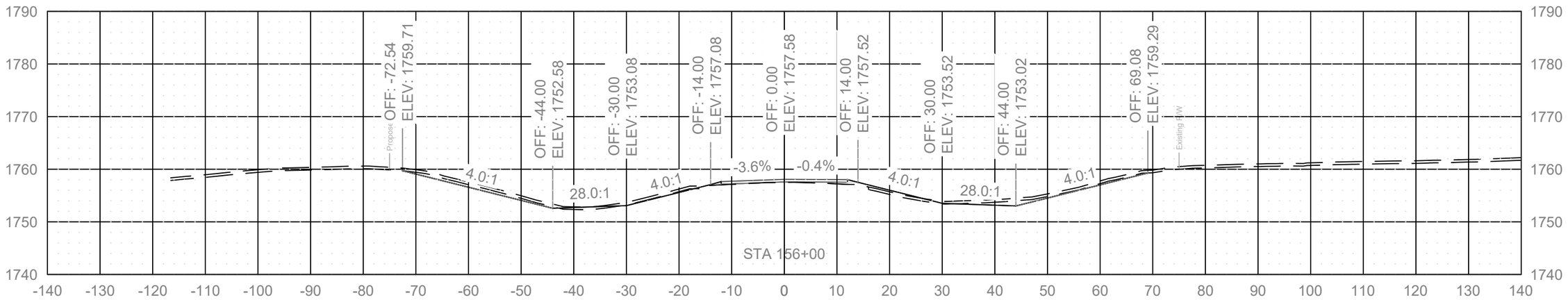

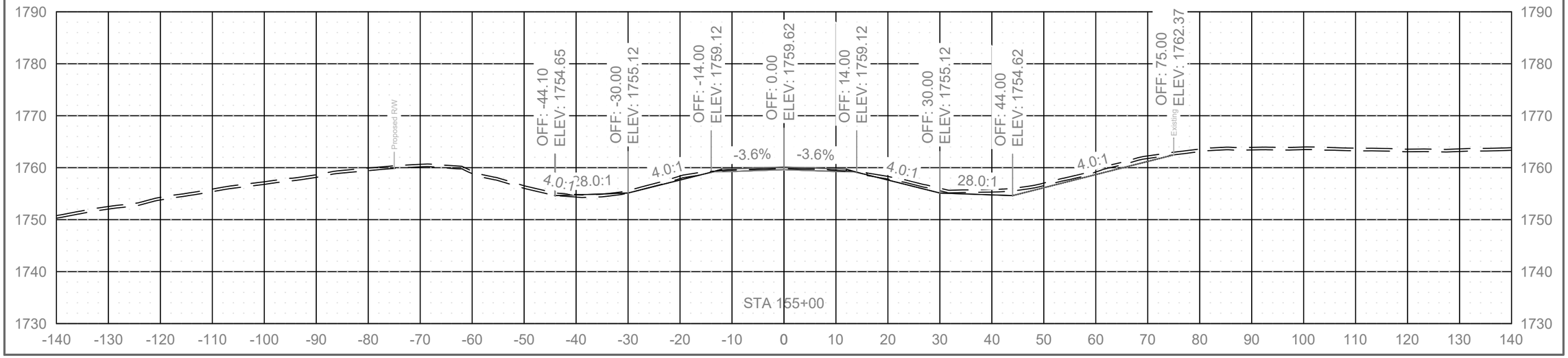

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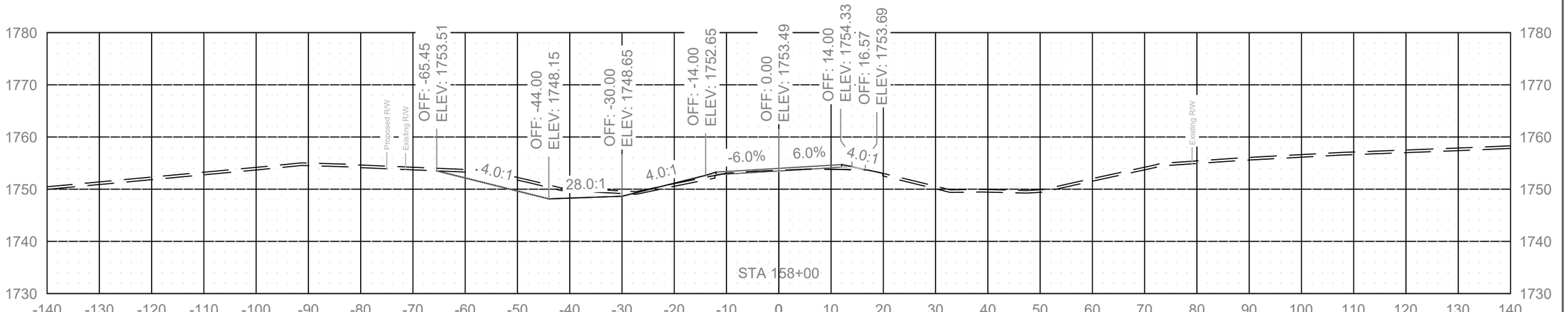

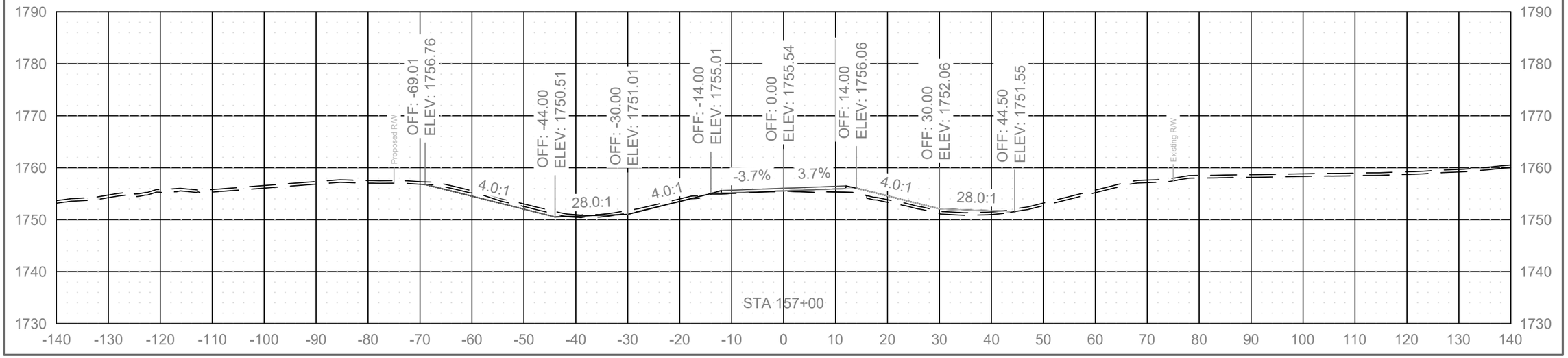

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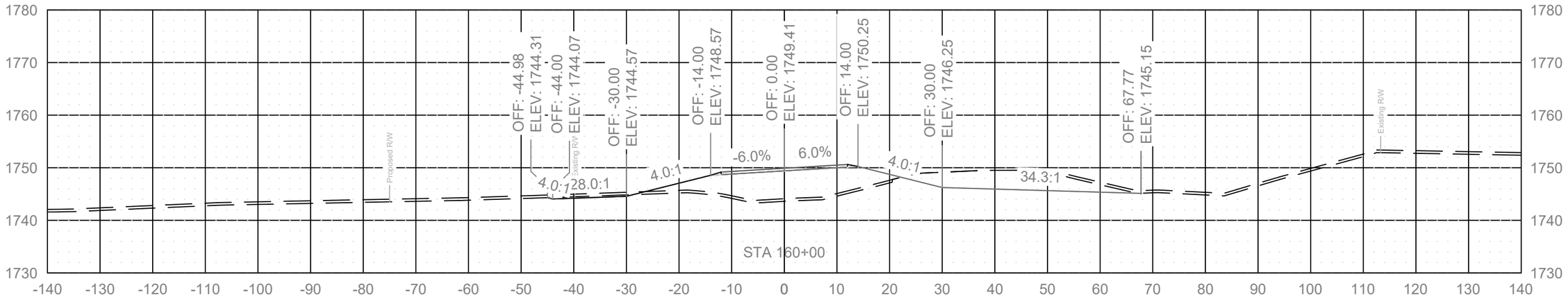

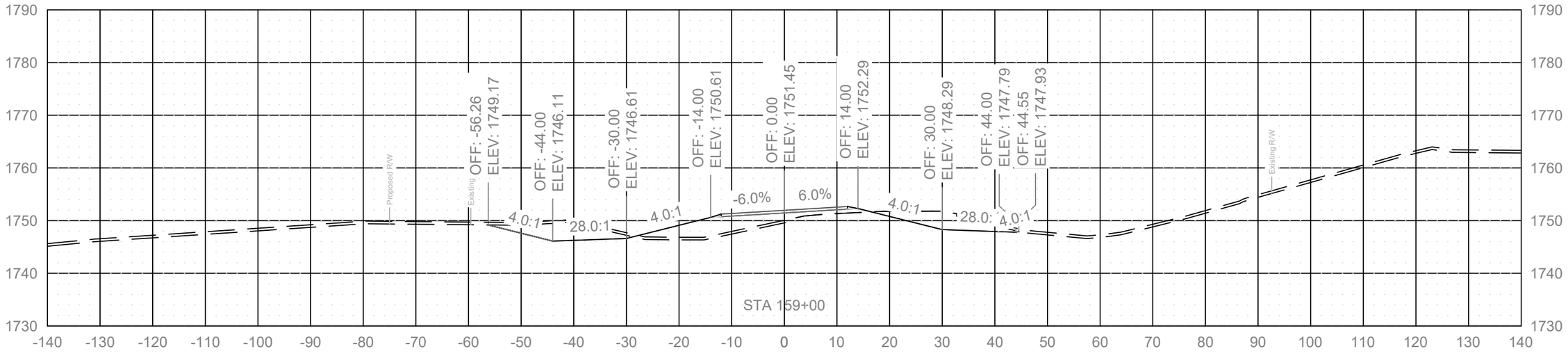

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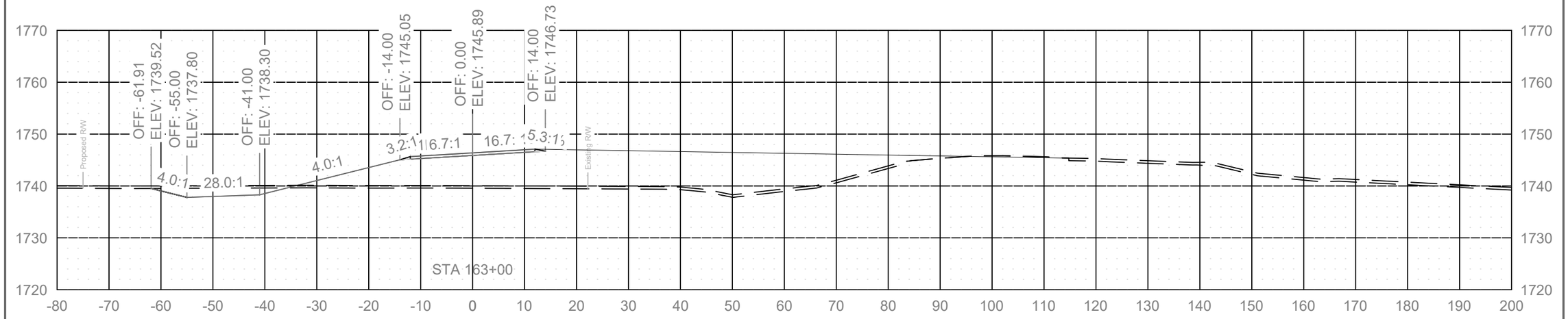

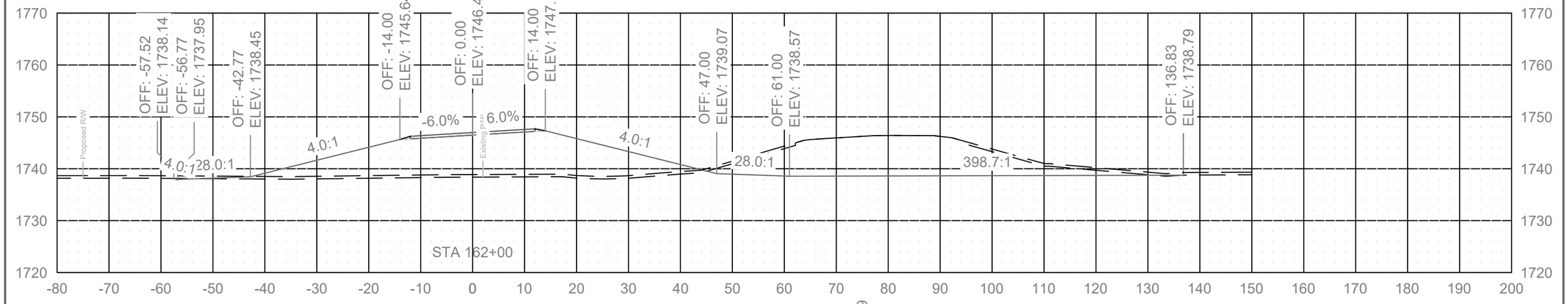

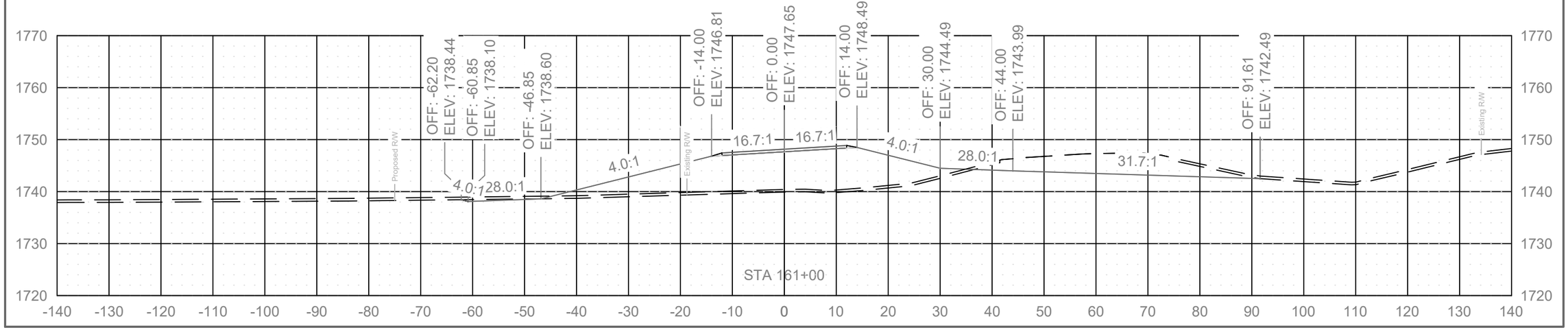

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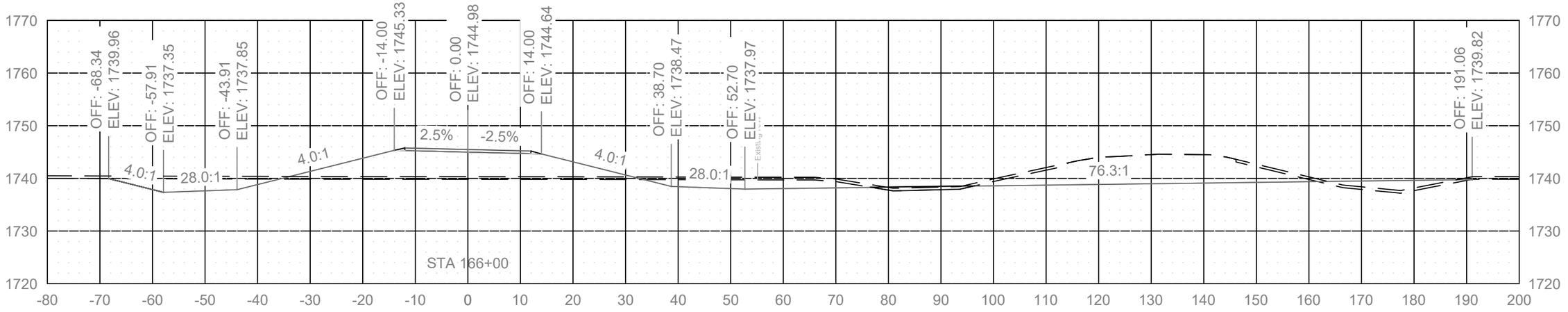

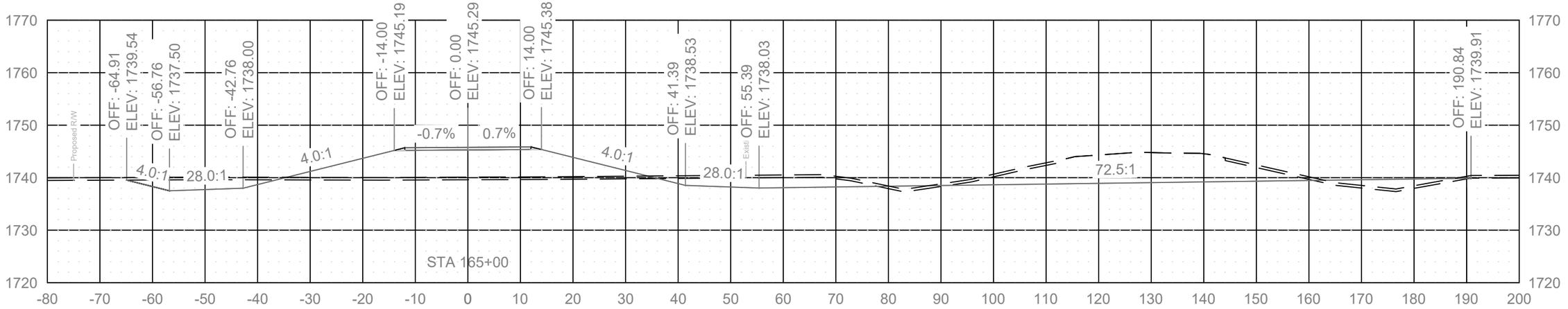

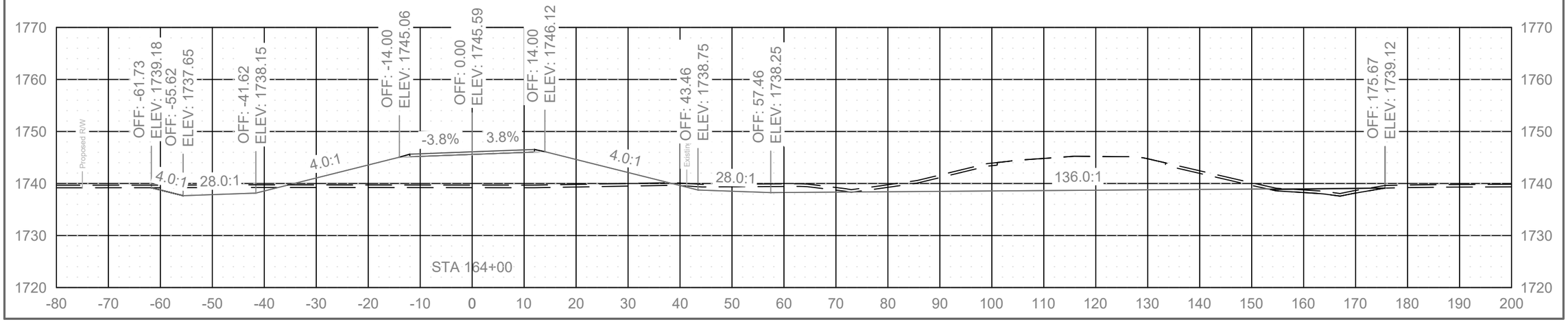

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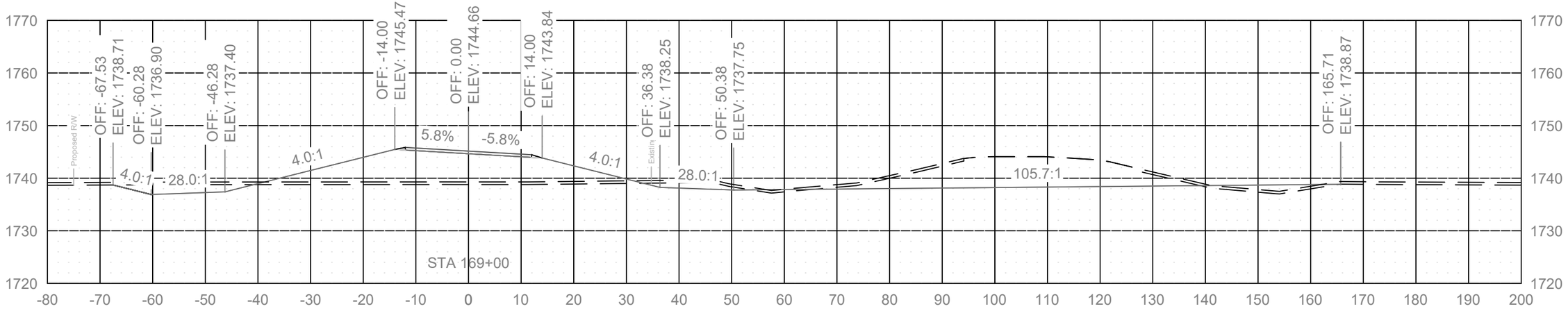

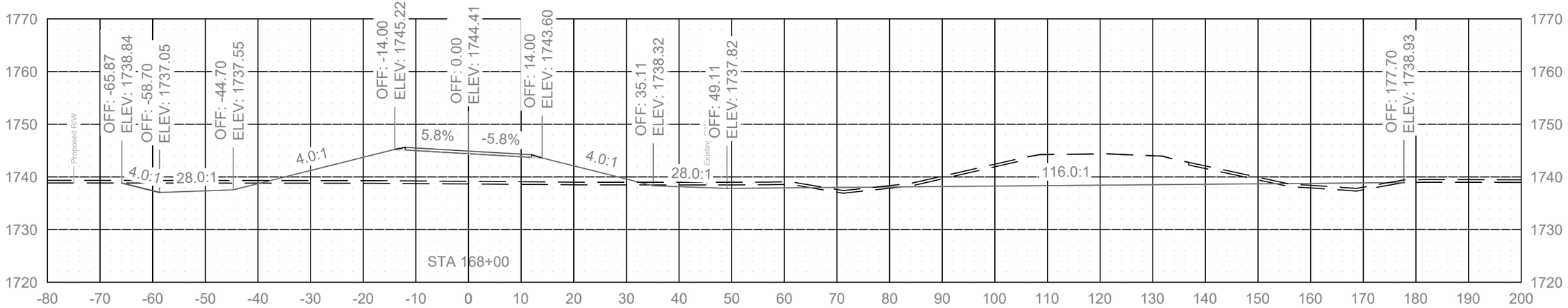

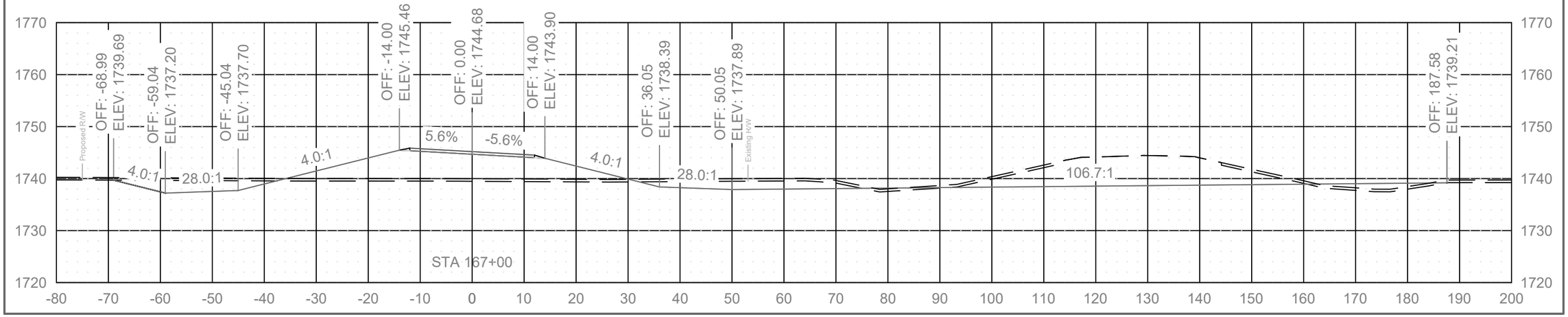

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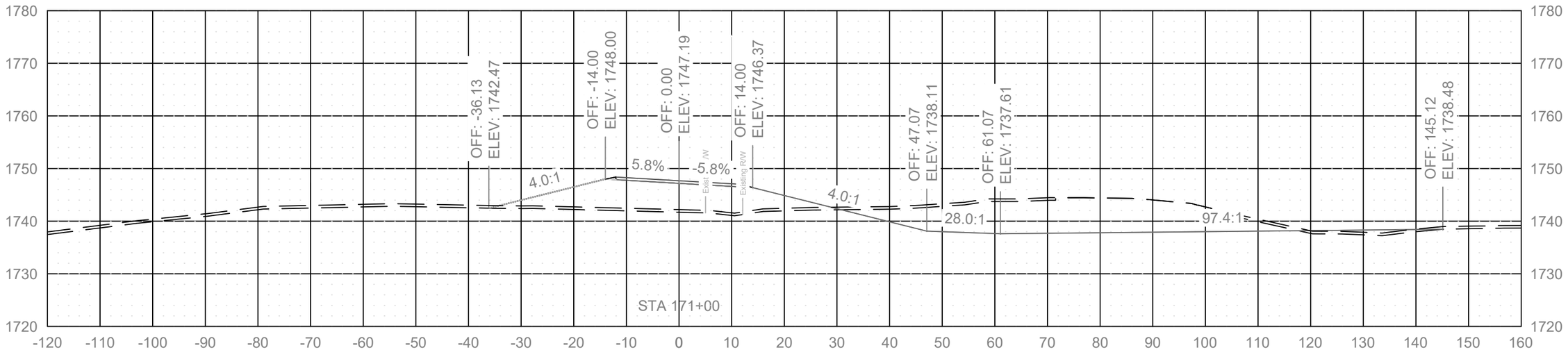

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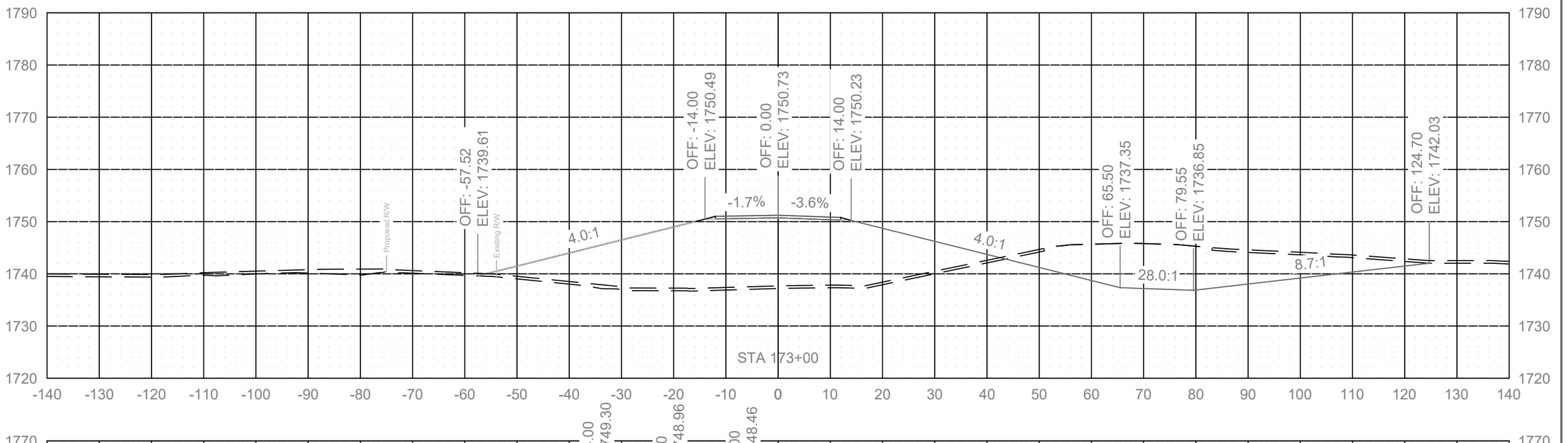

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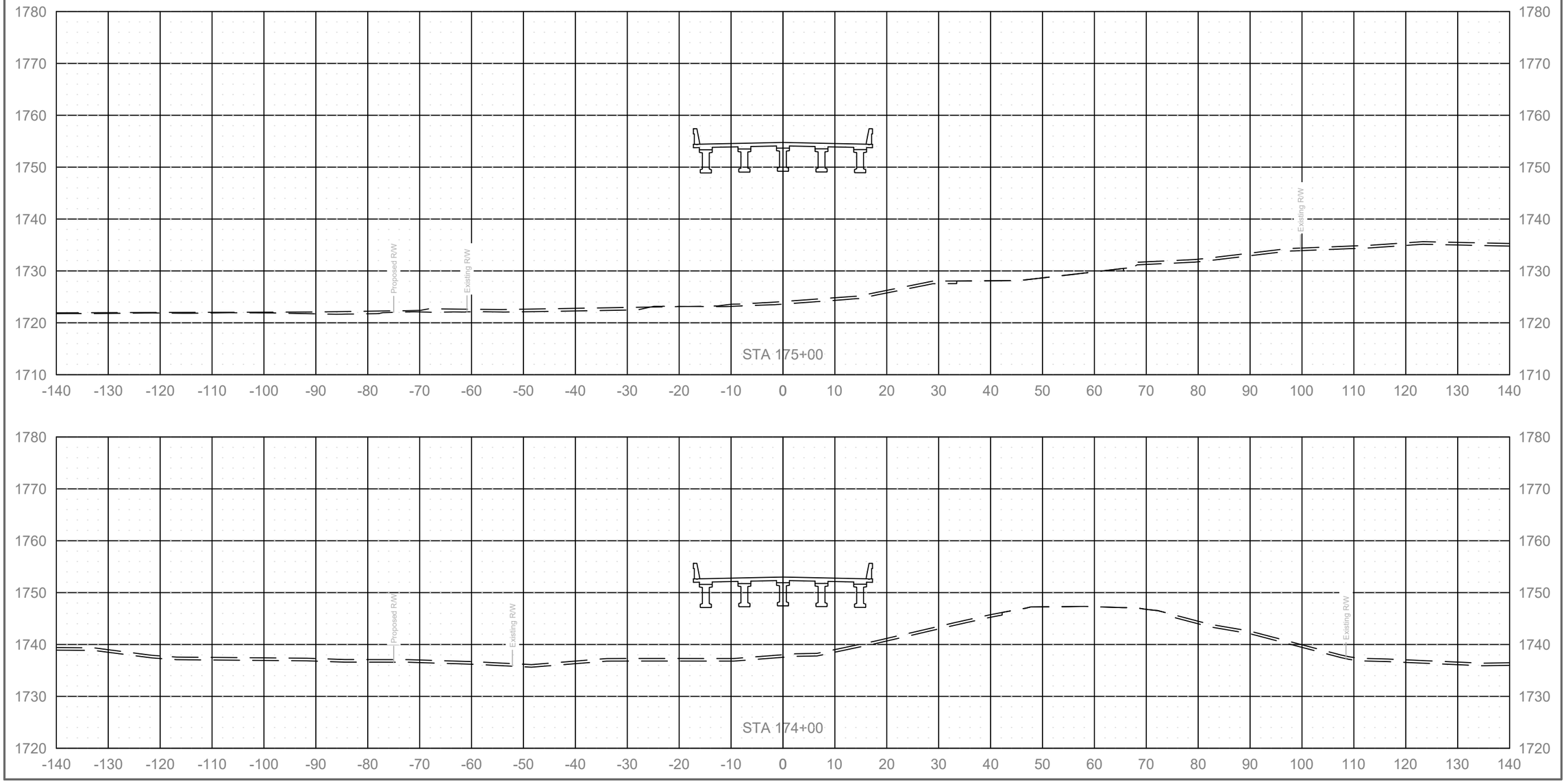

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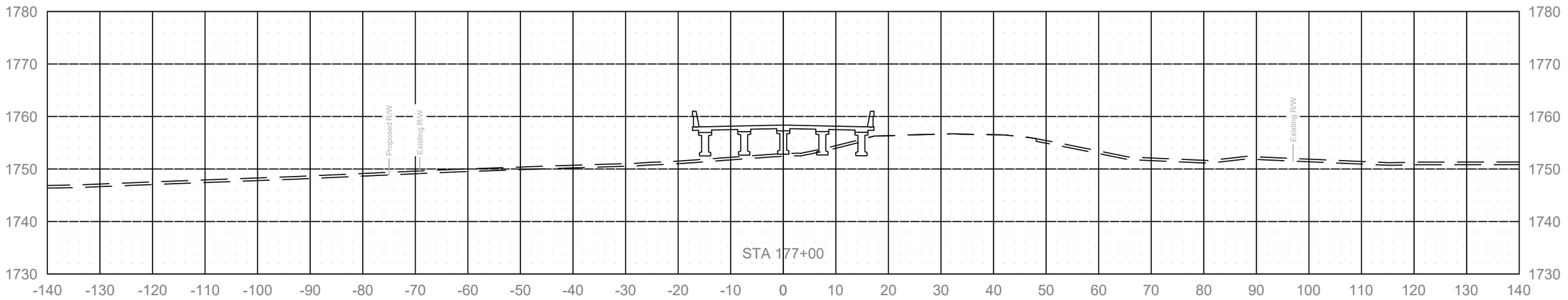

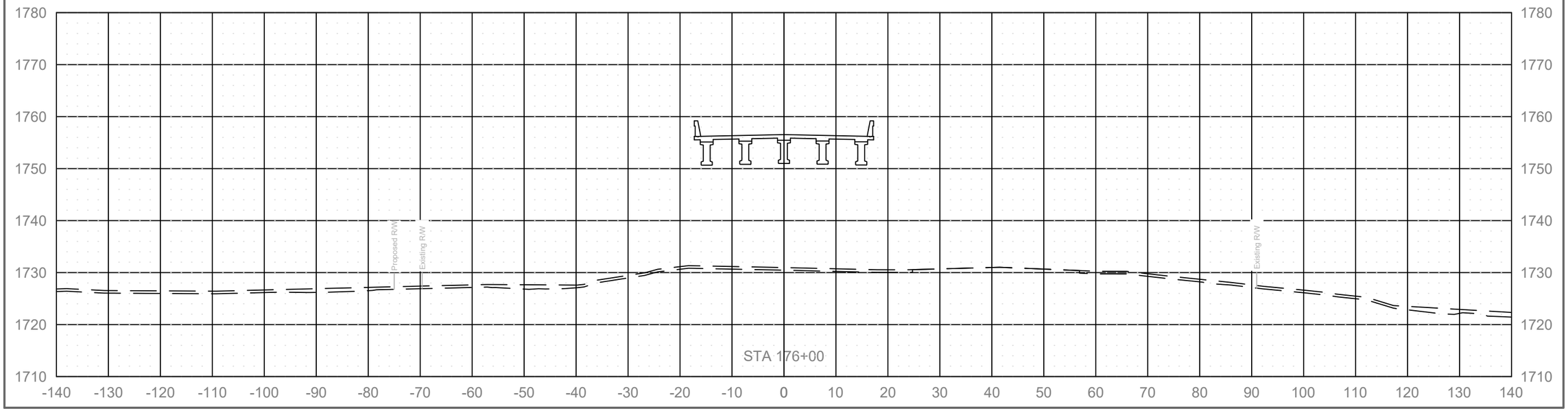

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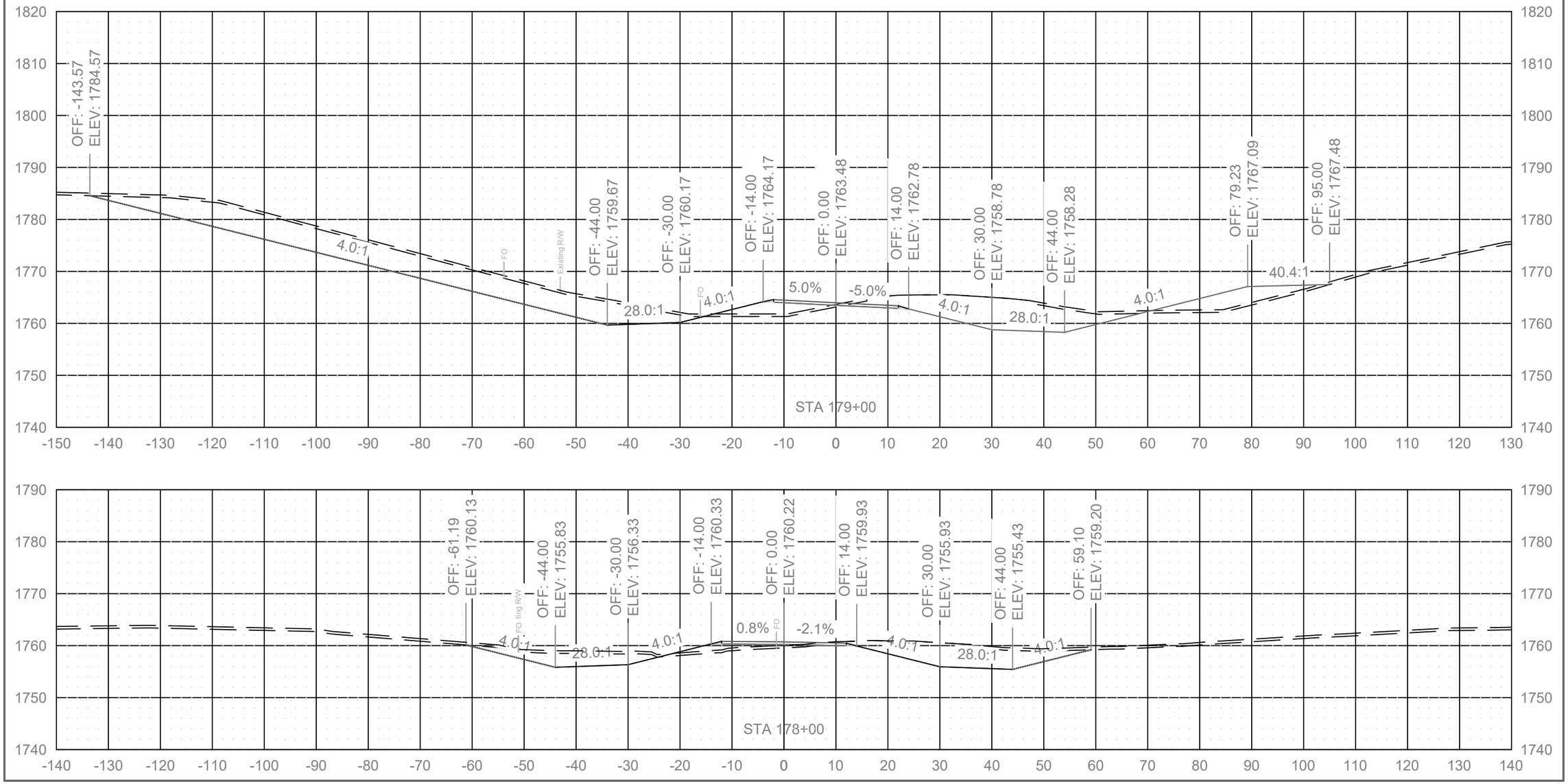

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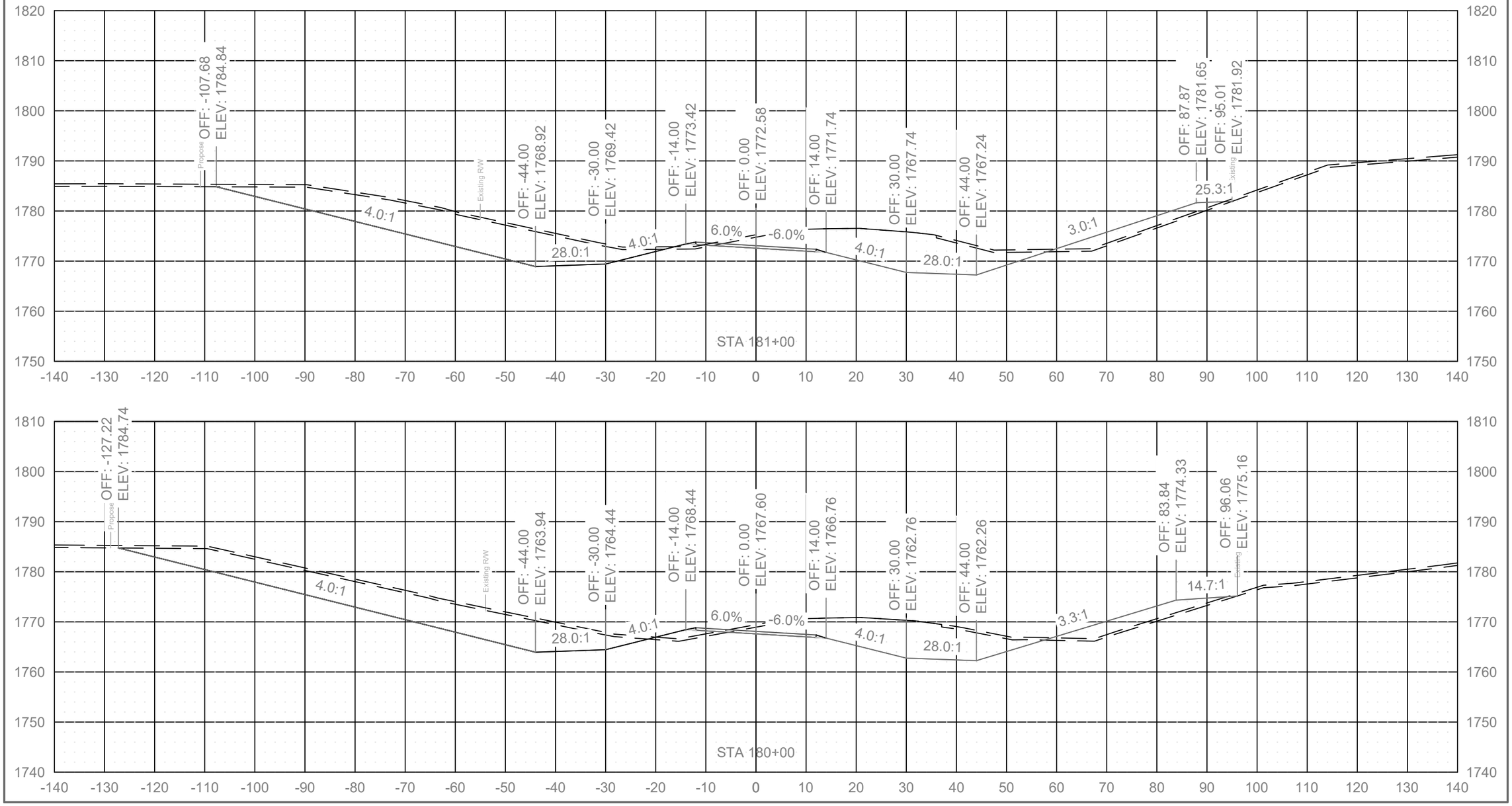

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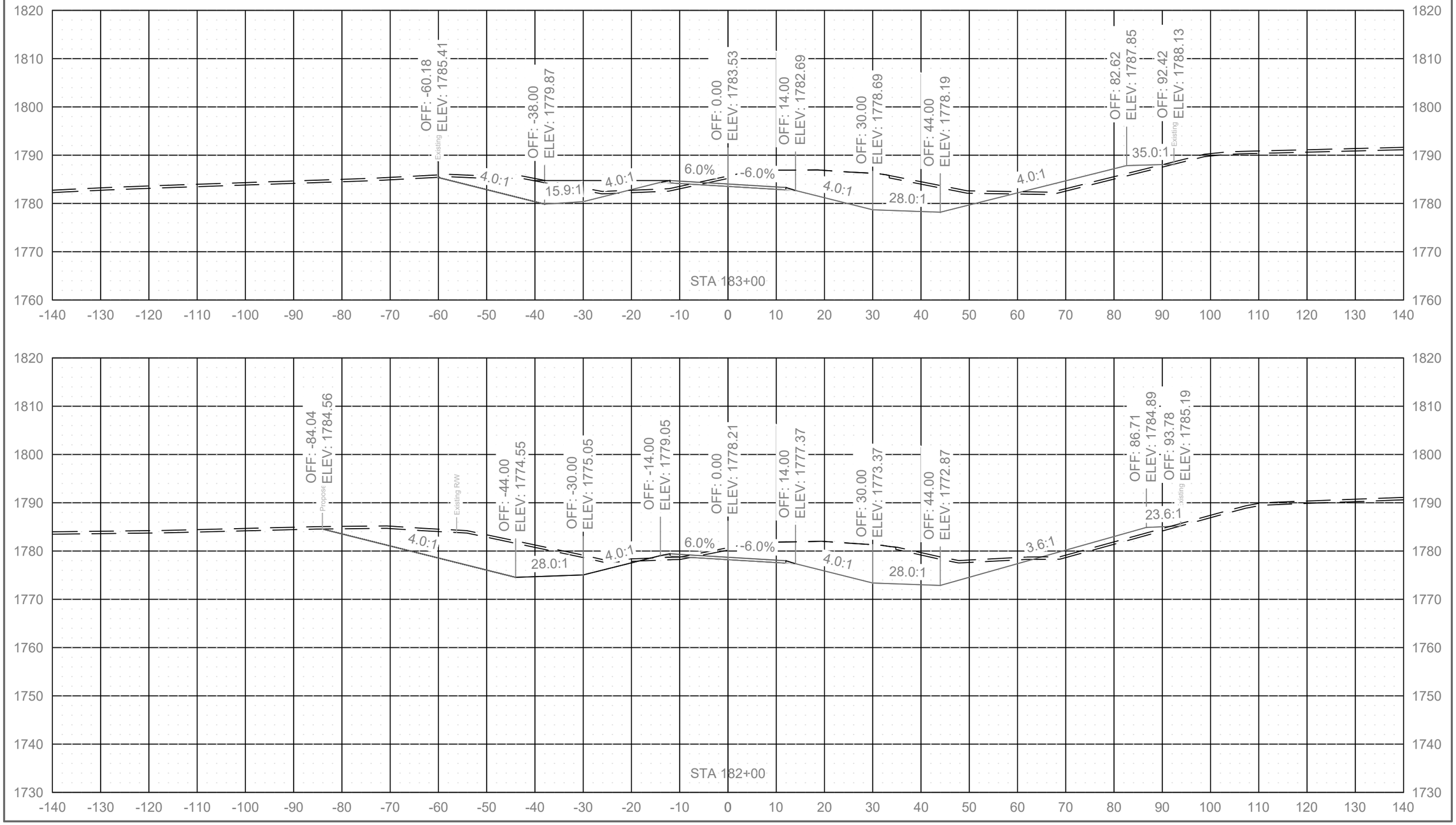

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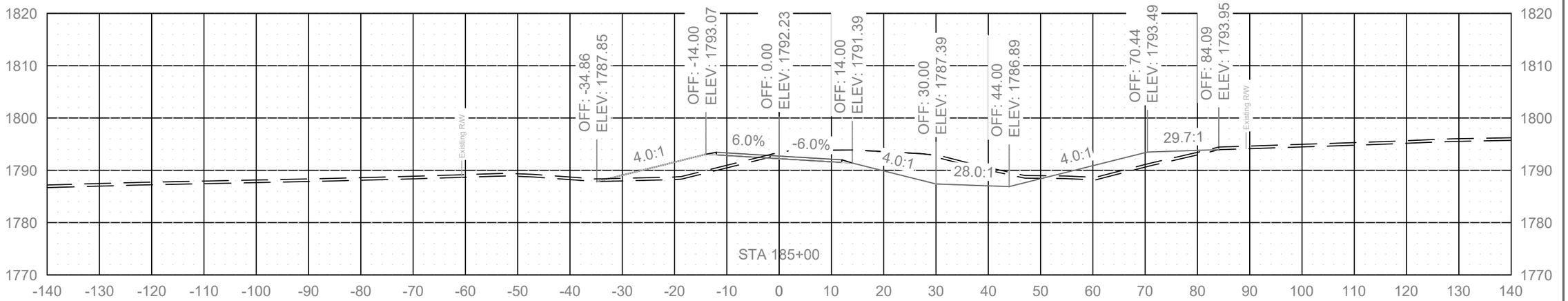

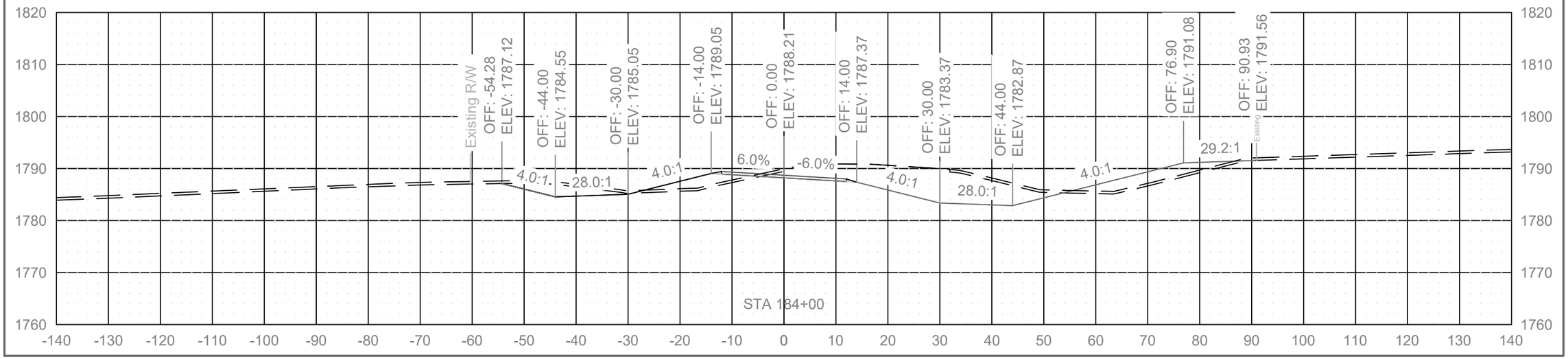

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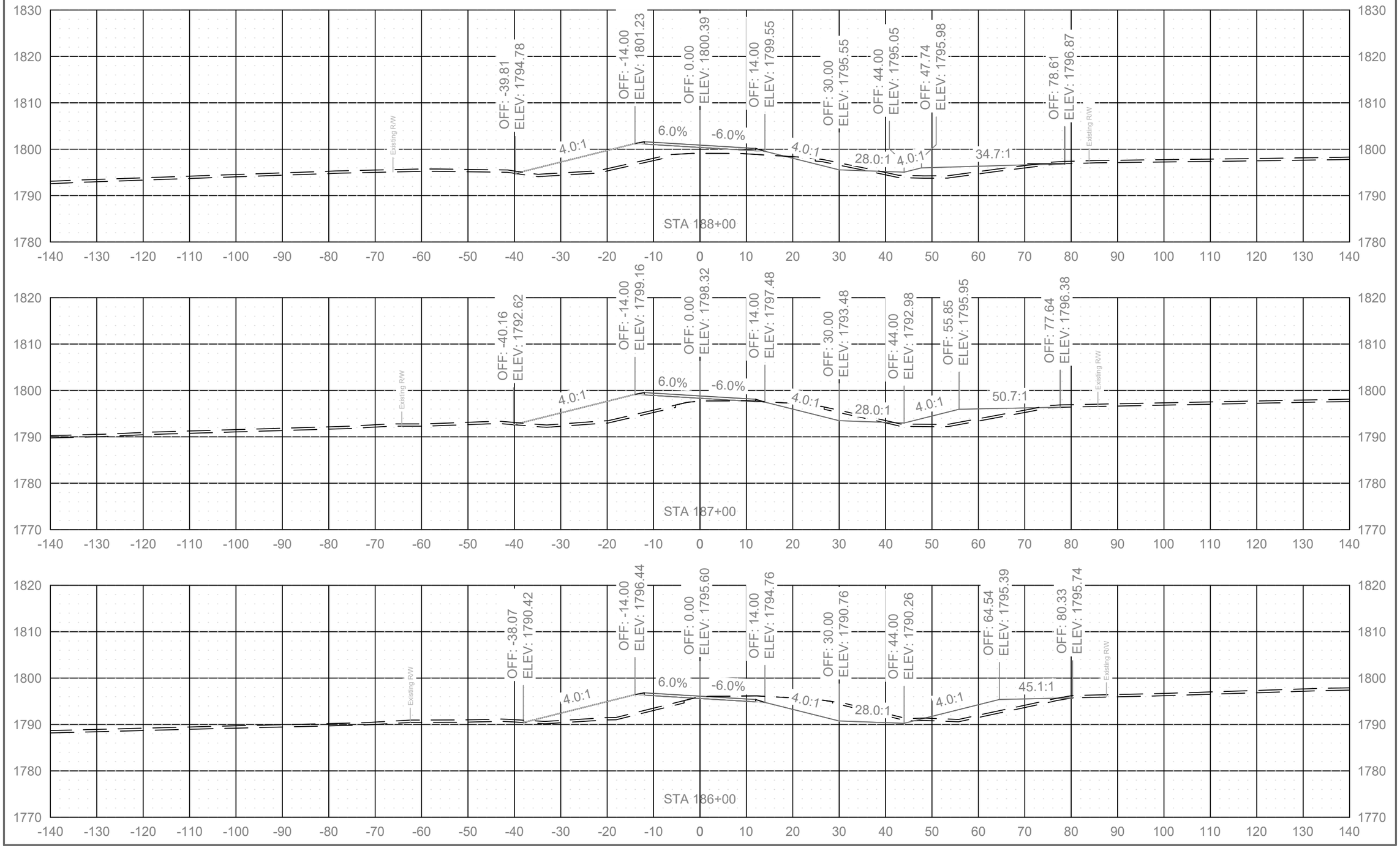

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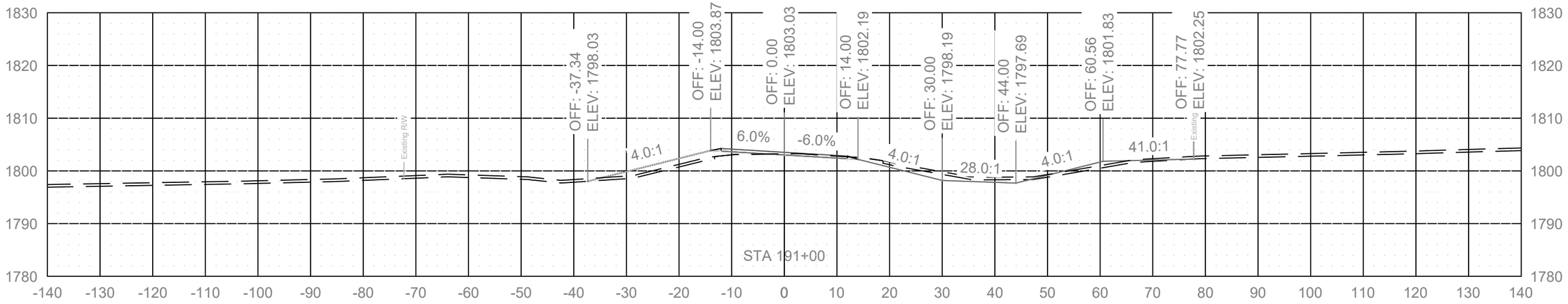

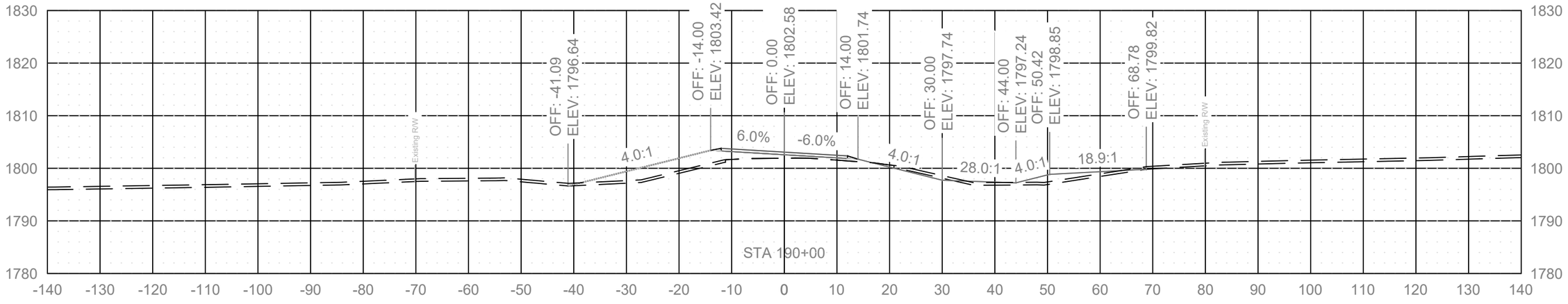

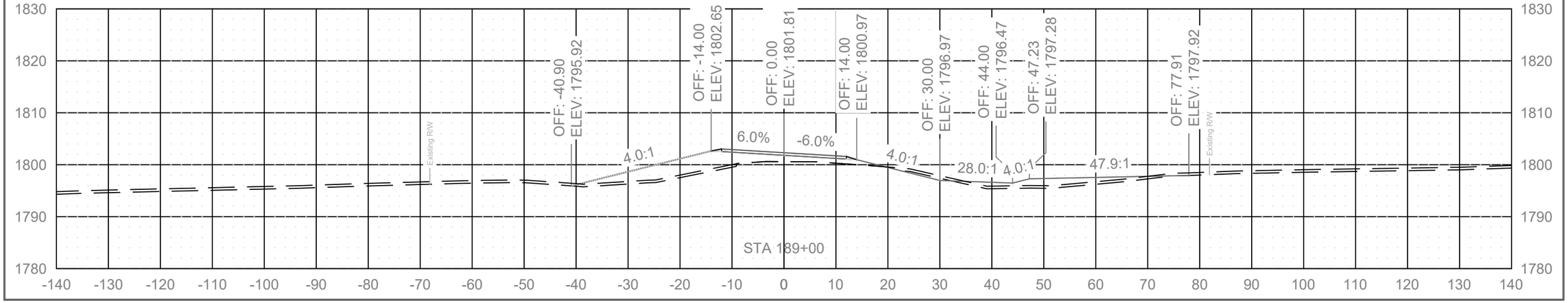

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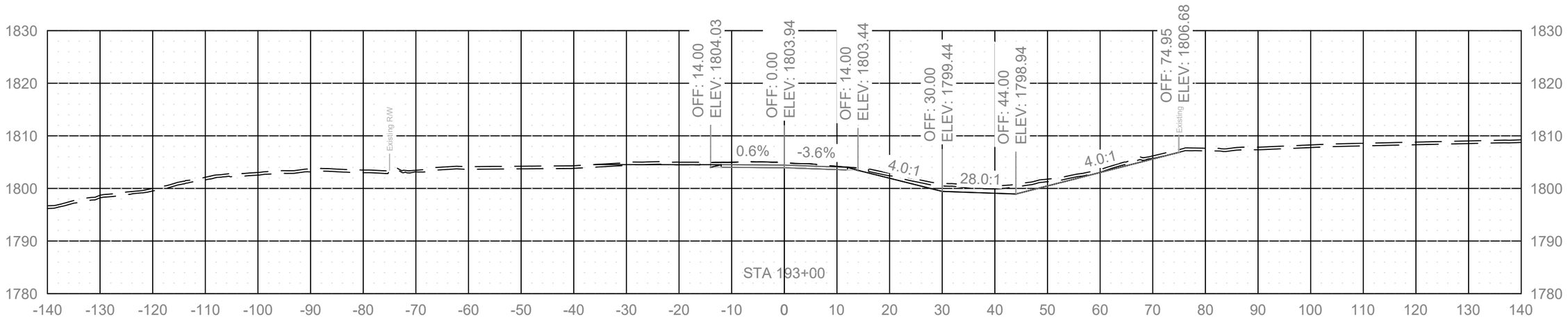

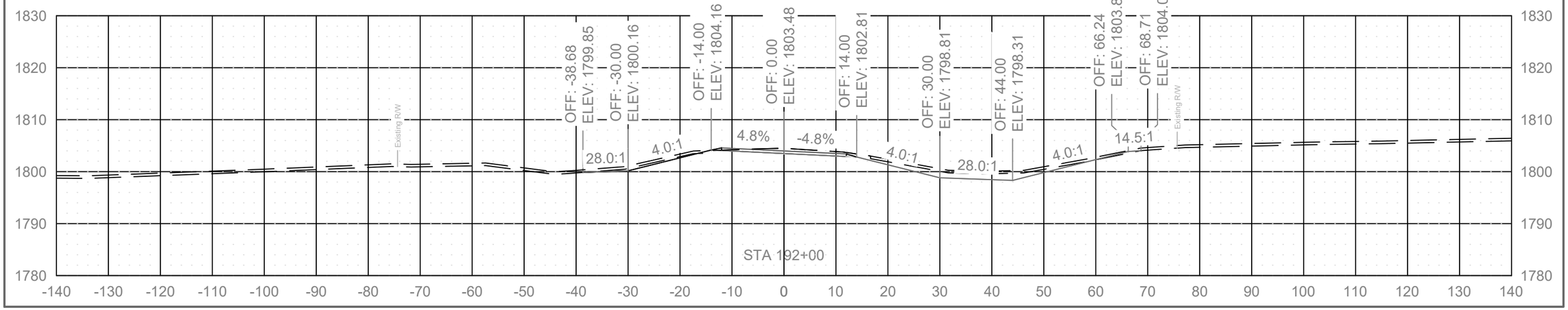

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