

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	23279	1	1

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

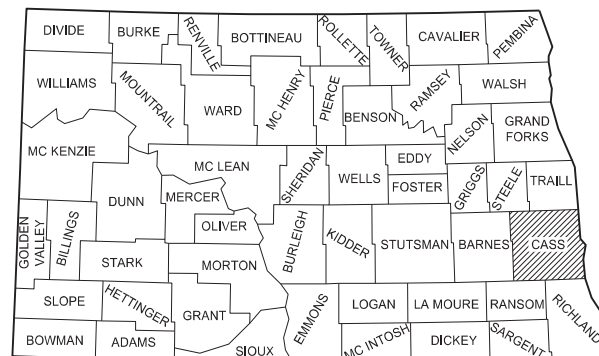
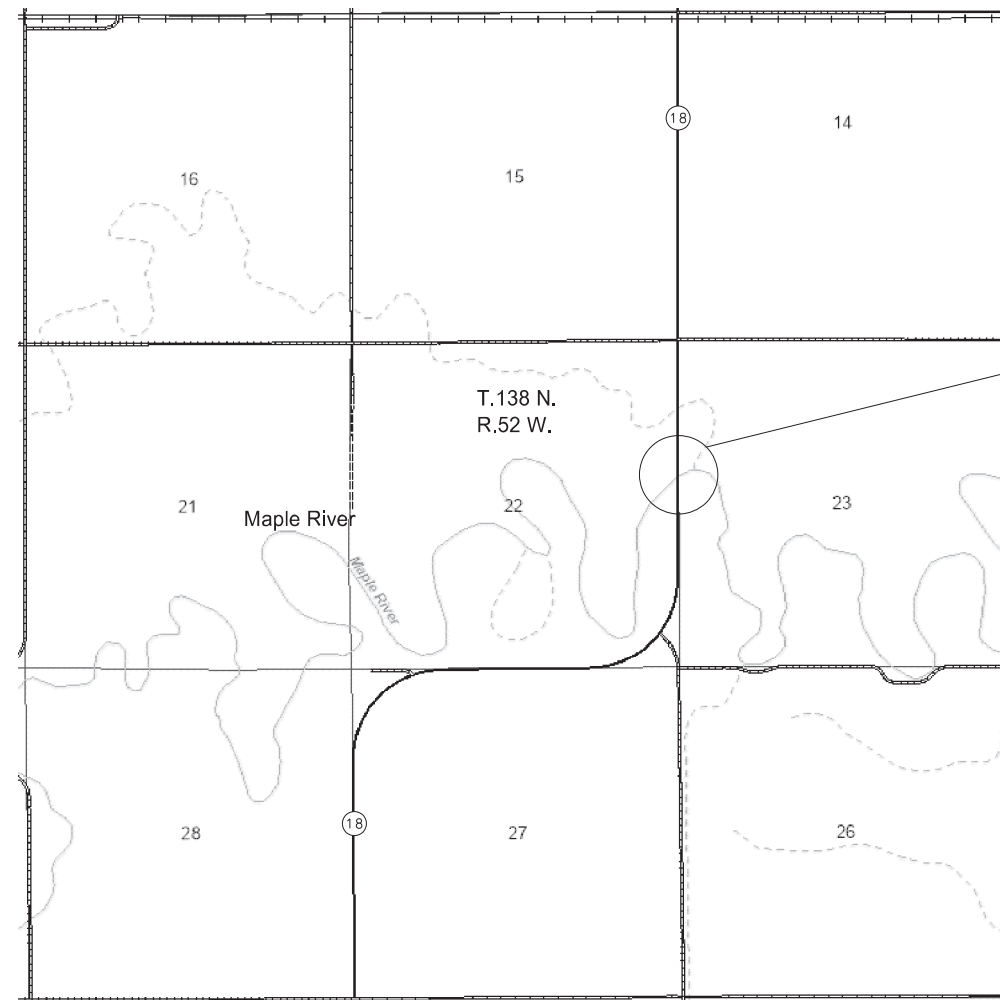
SS-8-018(106)064

Cass County
8 North of Leonard, Maple River

Abutment Repair, Approach Slab Repair &
Bridge Deck Replacement

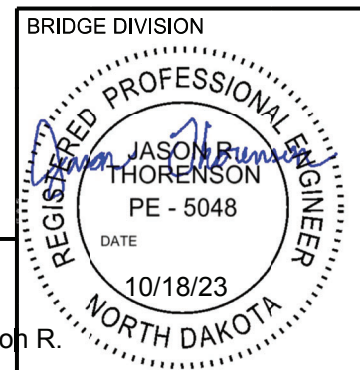
GOVERNING SPECIFICATIONS	Date Published and Adopted by the North Dakota Department of Transportation
Standard Specifications	4/1/2023
Supplemental Specifications	NONE

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
SS-8-018(106)064	NA	NA



STATE COUNTY MAP

Maple River
Br. No. 18-064.955



ND DEPARTMENT OF TRANSPORTATION
OFFICE OF PROJECT DEVELOPMENT

Jason Thorenson

Thorenson, Jason R.
10/18/23

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SPECIAL PROVISIONS

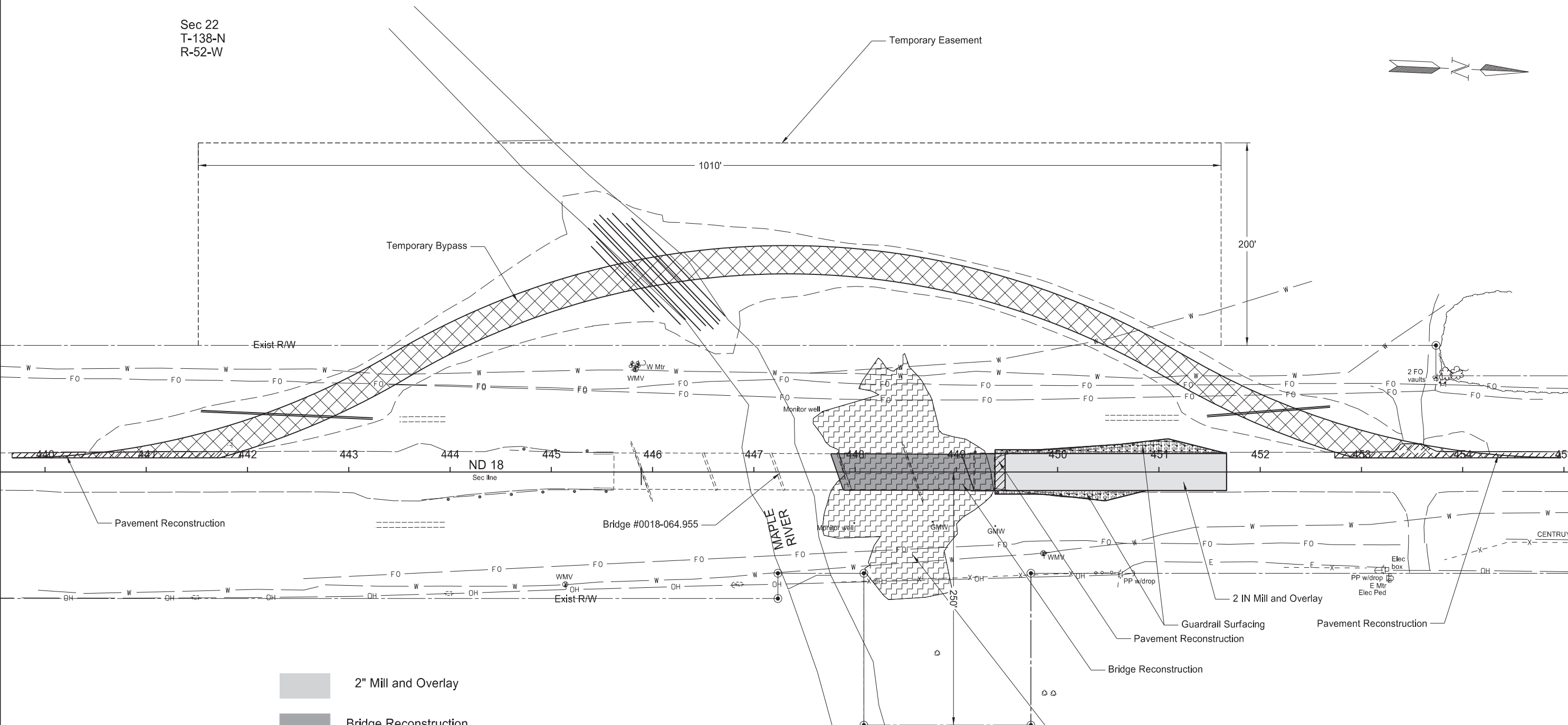
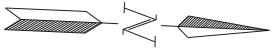
Number	Description
SSP 2	Federal Migratory Bird Treaty Act
PSP 49(23)	Permits and Environmental Considerations
SP 214(23)	Temporary Water Diversion
SP 211(23)	Commercial Grade Asphalt
153(23)	Utility Coordination

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-101-40	Cross Section Legend
D-203-8	Standard Rural Approaches
D-260-1	Erosion And Siltation Controls - Silt Fence
D-261-1	Erosion Control - Fiber Roll Placement 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, 11A	Construction Sign Details - Warning Signs
D-704-13	Barricade And Channelizing Device Details
D-704-14	Construction Sign Punching And Mounting Details
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D-704-24	Shoulder Closures And Bridge Painting Layouts
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D-704-33	Two-Lane Roadway Portable Rumble Strips
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D-704-56	Mobile Operation - Grinding Shoulder Rumble Strips
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D-714-25	Transverse Mainline Pipe Installation Detail - Pipes More Than 4 Feet Below Top of Subgrade
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D-754-23	Perforated Tube Assembly Details
D-754-24	Mounting Details Perforated Tube
D-754-24A	Breakaway Coupler System For Perforated Tubes
D-754-25	Mounting Details Perforated Tube
D-754-26, 29,32	Sign Punching, Stringer and Support Location Details Regulatory, Warning and Guide Signs
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D-754-51	Sign Punching, Stringer and Support Location Details - Route Marker Signs
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D-762-4	Pavement Marking
D-762-11	Short-Term Pavement Marking
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-764-60	MGS W-Beam Transition with Approach Curb to Concrete Single Slope or Jersey Barrier
D-764-62	Jersey Barrier to Thrie Beam Connector Plate Details

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Sec 22
T-138-N
R-52-W



Sec 23
T-138-N
R-52-W

-  2" Mill and Overlay
-  Bridge Reconstruction
-  Guardrail Surfacing
-  Landslide Repair
-  Temporary Bypass
-  Pavement Reconstruction

Scope of Work

ND Hwy 18
Maple River



09/25/23

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105-200 UTILITY COORDINATION: A utility coordination meeting is required.

105-P01 COORDINATION OF PROJECTS: A number of other projects will be under contract during the same construction season in the vicinity of this project. It is the Contractor's responsibility to coordinate activities including, but not limited to, haul routes, scheduling and traffic control devices and transitions between projects.

108-P01 TEMPORARY BYPASS SEQUENCING: Construct the temporary bypass in the following sequence:

1. Place Temporary Erosion Control.
2. Strip topsoil from areas where the temporary bypass will be constructed.
3. Construct the temporary bypass starting with installation of temporary pipe conduits in the river, then progressing to the shoulders of the State Highway, minimizing impacts to the extent practical.
4. Install straw mulch upstream and downstream on the temporary bypass; see section 76 for more details.

202-P01 REMOVAL OF TEMPORARY BYPASS: Obtain the Engineer's approval before removing the temporary bypass. Restore the area impacted by the construction, use, and removal of the bypass to its original condition. Remove the bypass starting at the shoulders and work your way towards the river. The pipes should be the last thing removed.

The Engineer will measure and pay for seeding and mulching and erosion control items as specified in the appropriate section of the Standard Specifications. Include all costs associated with the removal of the earth embankment, aggregate, surfacing, riprap, and pipe in the contract unit price for "Removal of Temporary Bypass".

202-P02 REMOVAL OF RIPRAP – LOOSE ROCK: Remove riprap located at the north end of the bridge. Plan quantity will be used as the measurement for payment for riprap removal.

203-010 SHRINKAGE: 25 percent additional volume has been included for shrinkage in earth embankment.

203-P01 EXCAVATION: Do not stockpile excavated material within the right of way from Station 447+00 to Station 452+00. Excavated material must be removed from the above station within 24 hours of excavation.

Excavate the material within the right of way from Station 447+00 to Station 449+50 from the top down.

203-P02 LANDSLIDE EXCAVATION: Perform landslide repair grading as shown in Section 30, sheet 3 prior to driving substructure piling. Driving piling used for shoring is allowed prior to landslide repair grading.

253-P01 COVER CROP AND STRAW MULCH: Seed temporary cover crop and punch straw mulch on foreslopes of the temporary bypass after it is constructed to meet the requirements of the NDPDES permit.

302-P01 SALVAGED BASE COURSE: An additional 15 tons of salvaged base is provided for grading of the access road into the temporary bypass at Station 453+50. Remove material and re-grade the approach after removing the temporary bypass. Include all costs of removal of temporary approach surfacing and re-grading in the cost for "Removal of Temporary Bypass"

411-P01 MILLING SECTIONS: At the beginning and end of the milling sections, remove the existing bituminous material forming a straight vertical edge to allow placement of the full depth of surfacing.

430-P01 PAVEMENT PATCHING AT ABUTMENT: Place the aggregate base and 5 1/2" hot mix asphalt at the abutment prior to milling and overlaying the mainline.

704-P01 TRAFFIC CONTROL DEVICES: The traffic control devices list has been developed using the layouts shown in the plans and the following layouts show in the Standard Drawings.

D-704-7, 8, 9, 10, 11, 13, and 14 are applicable.

D-704-15 Layout Type B: For the temporary bypass when the bridge and roadway construction is taking place.

D-704-22 Layout Type K: For construction trucks entering from a borrow site, aggregate source, or a Contractor jobsite.

D-704-24 Layout Type R: For temporary roadway closure during the construction and removal of the temporary bypass.

D-704- 27: For pavement marking operations.

D-704-33: For utilizing flagging operations.



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704-P02 PROJECT PHASING: The traffic control details, as indicated on the plans, have been developed on the basis that this project will be constructed in three phases. The work zone traffic control summary list includes the required numbers of devices for each phase.

Phase 1: Construct the temporary bypass. Maintain traffic on ND Hwy 18 while constructing the bypass. During working hours, use signing Layout Type R on Standard Drawing D-704-24.

Phase 2: Place the traveling public on the temporary bypass using signing Layout Type B on Standard Drawing D-704-15. Use the temporary bypass while completing all work on ND Hwy 18.

Phase 3: Remove the temporary bypass while maintaining traffic on ND Hwy 18 using signing Layout Type R on Standard Drawing D-704-24.

706-P01 FIELD OFFICE: Provide a field office which meets the following requirements:

1. The field office shall be a minimum of 450 square feet.
2. Indoor bathroom facilities.
3. Air conditioner (20,000 BTU minimum). The air conditioner must capable of cooling the field office to a temperature of 70 degrees.
4. Lighting (lumens required 110 foot-candles)
5. Minimum of 3 phone jacks, contractor to pay phone bill.
6. Heat, electric, sewer, and water hookups to be furnished by contractor, contractor to pay utility bills.
7. Cabinet space of a minimum of 32 cubic feet.
8. Counter space of a minimum of 40 square feet.
9. The floor is to be free of protrusions so that it will accommodate office equipment.
10. Fax Machine
11. Photocopy machine capable of 11x17 photocopies and toner to last the duration of the project.
12. The location of the field office shall be on, or as close to the project as possible and approved by the Engineer. Any rental fees shall be paid by the Contractor.
13. The field office shall be available for occupancy one week prior to the start of the project and remain available to project completion.
14. The following services will be furnished and paid for by the NDDOT and requested through the Work Management System:
 - a. Telephone
 - b. FAX
 - c. Broadband internet service including State Network access.

All requirements of the Field Office are subject to approval by the Engineer.

714-P01 PIPE CONDUIT 84 IN - APPROACH: Quantities include five 84 inch pipe conduit to convey flow of the Maple River through the temporary bypass. This represents the minimum waterway opening required at this location. In lieu of the five 84 inch pipe, use drainage pipe(s) providing a larger waterway opening, subject to the following criteria and approval by the engineer.

- Maintain a minimum 2 feet of cover over the drainage pipe(s) without altering the vertical profile of the temporary bypass.
- Use drainage pipe(s) or structure(s) free of structural defects with sufficient structural capacity for use as a highway drainage structure.

Used pipe(s) meeting the criteria above may be used in lieu of new pipe(s).

Include all costs to furnish and install the drainage system to convey the flows in the Maple River through the temporary bypass in the price bid for "Pipe Conduit 84IN – Approach".

930-P01 PROTECTION OF INCLINOMETER TUBES: Inclinator tubes exist at the following locations:

- Sta 447+69, 59' Lt
- Sta 447+99, 50' Rt
- Sta 448+74, 51' Rt

Protect all existing instrumentation until project acceptance. Replace instrumentation damaged due to construction activities at no additional cost to the Department.



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SECTION 130

203-P01 GUARDRAIL EMBANKMENT: The embankment material can be from the Common Excavation – Type A with the approval of the Engineer.

Include all costs to locate the embankment material in the contract unit price bid for “Guardrail Embankment.”

748-P01 CURB & GUTTER – TYPE 1 SPECIAL: Install curb and gutter at the Maple River Bridge, RP 64.995, in accordance with Standard Drawing D-748-1, except for transitions provided at each end, as shown on Standard Drawing D-764-60.

Include all costs for constructing the curb and gutter as described above in the contract unit price bid for “Curb & Gutter – Type 1 Special.”

764-P01 REMOVED W-BEAM GUARDRAIL MATERIALS: Deliver the removed guardrail materials to the NDDOT Maintenance Storage Yard in Casselton, and neatly stack them at a location designated by the Engineer. The address of the NDDOT Maintenance Storage Yard is:

Casselton NDDOT
15482 37th St SE
Casselton, ND 58012-9748

Include all costs for delivery of the removed guardrail materials in the contract unit prices bid for “Remove W-Beam Guardrail & Posts,” and “Remove End Treatment & Transition.”



ENVIRONMENTAL NOTES

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

EN-1 SPAWNING RESTRICTION: Do not work within the Maple 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. Preventative measures should be taken to comply with ANS rules enacted by the NDGFD. The NDGFD must be notified 72 hours prior to placement of any equipment in state waters for scheduling an inspection. 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). If an inspection is not required, no follow up documentation is required.

EN-3 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.



ESTIMATE OF QUANTITIES

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SPEC CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
-----	-----	-----	-----	-----
103	0100 CONTRACT BOND	L SUM	1	1
202	0105 REMOVAL OF STRUCTURE	L SUM	1	1
202	0350 REMOVAL OF TEMPORARY BYPASS	EA	1	1
202	0400 REMOVAL OF RIPRAP - LOOSE ROCK	CY	674	674
203	0101 COMMON EXCAVATION-TYPE A	CY	51	51
203	0109 TOPSOIL	CY	2,710	2,710
203	0113 COMMON EXCAVATION-WASTE	CY	2,043	2,043
203	0140 BORROW-EXCAVATION	CY	12,007	12,007
203	0218 GUARDRAIL EMBANKMENT	EA	2	2
210	0099 CLASS 1 EXCAVATION	L SUM	1	1
210	0111 CLASS 2 EXCAVATION	L SUM	1	1
210	0201 FOUNDATION PREPARATION	EA	1	1
216	0100 WATER	M GAL	162	162
251	0200 SEEDING CLASS II	ACRE	2.5	2.5
251	1000 WETLAND SEED	ACRE	0.58	0.58
251	2000 TEMPORARY COVER CROP	ACRE	2.3	2.3
253	0101 STRAW MULCH	ACRE	5.38	5.38
256	0200 RIPRAP GRADE II	CY	948	948
261	0112 FIBER ROLLS 12IN	LF	5,805	5,805
261	0113 REMOVE FIBER ROLLS 12IN	LF	3,635	3,635
262	0100 FLOTATION SILT CURTAIN	LF	105	105
262	0101 REMOVE FLOTATION SILT CURTAIN	LF	105	105
302	0100 SALVAGED BASE COURSE	TON	2,326	2,326
411	0105 MILLING PAVEMENT SURFACE	SY	932	932
430	0500 COMMERCIAL GRADE HOT MIX ASPHALT	TON	1,139	1,139
602	0130 CLASS AAE-3 CONCRETE	CY	165.9	165.9
602	1130 CLASS AE-3 CONCRETE	CY	126.5	126.5
602	1134 PILE SUPPORTED APPROACH SLAB	SY	115.5	115.5
602	1250 PENETRATING WATER REPELLENT TREATMENT	SY	1,508	1,508
602	1260 BRIDGE DECK CRACK SEALING	LF	298	298
612	0115 REINFORCING STEEL-GRADE 60	LBS	11,767	11,767
612	0116 REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS	34,676	34,676
616	0360 STRUCTURAL STEEL	LBS	850.6	850.6

ESTIMATE OF QUANTITIES

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SPEC CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
-----	-----	-----	-----	-----
622	0020 STEEL PILING HP 10 X 42	LF	480	480
622	0040 STEEL PILING HP 12 X 53	LF	325	325
622	0060 STEEL PILING HP 14 X 73	LF	660	660
702	0100 MOBILIZATION	L SUM	1	1
704	0100 FLAGGING	MHR	200	200
704	1000 TRAFFIC CONTROL SIGNS	UNIT	1,179	1,179
704	1048 PORTABLE RUMBLE STRIPS	EA	2	2
704	1052 TYPE III BARRICADE	EA	7	7
704	1060 DELINEATOR DRUMS	EA	18	18
704	1067 TUBULAR MARKERS	EA	27	27
704	1080 STACKABLE VERTICAL PANELS	EA	57	57
704	1500 OBLITERATION OF PAVEMENT MARKING	SF	175	175
706	0400 FIELD OFFICE	EA	1	1
706	0500 AGGREGATE LABORATORY	EA	1	1
709	0100 GEOSYNTHETIC MATERIAL TYPE G	SY	56	56
709	0151 GEOSYNTHETIC MATERIAL TYPE R1	SY	2,334	2,334
714	4099 PIPE CONDUIT 18IN-APPROACH	LF	298	298
714	4157 PIPE CONDUIT 84IN-APPROACH	LF	760	760
720	0130 IRON PIN R/W MONUMENTS	EA	5	5
748	0141 CURB & GUTTER-TYPE 1 SPECIAL	LF	30	30
754	0206 STEEL GALV POSTS-TELESCOPING PERFORATED TUBE	LF	15	15
754	0592 RESET SIGN PANEL	EA	1	1
754	0596 RESET MILE POST	EA	1	1
760	0027 SINUSOIDAL RUMBLE STRIP - ASPHALT CENTERLINE	MILE	0.04	0.04
762	0420 SHORT TERM 4IN LINE-TYPE R	LF	3,609	3,609
762	1104 PVMT MK PAINTED 4IN LINE	LF	3,459	3,459
764	0131 W-BEAM GUARDRAIL	LF	192	192
764	0145 W-BEAM GUARDRAIL END TERMINAL	EA	2	2
764	0151 REMOVE W-BEAM GUARDRAIL & POSTS	LF	192	192
764	2081 REMOVE END TREATMENT & TRANSITION	EA	2	2
900	1000 TEMPORARY STREAM DIVERSION	EA	1	1
930	8230 SHORING	EA	1	1
930	9537 ABUTMENT UNDERDRAIN SYSTEM	EA	1	1

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Spec - Code	Material	Unit	Quantity						Totals
			Temporary Bypass	Mainline Paving Sta 449+38 to Sta 451+67	Mainline Full Depth Sta 449+38 to Sta 449+48	Shoulder Paving Sta 439+67 to 441+93 and Sta 452+74 to 454+97	Guardrail Surfacing	Landslide Repair	
202-0400	Removal of Riprap - Loose Rock	CY	-	-	-	-	-	674	674
256-0200	Riprap Grade II	CY	948	-	-	-	-	-	948
302-0100	Salvaged Base Course @ 1.875 Ton/CY	Ton	1999	-	30	199	84	-	2311
401-0050	**Tack Coat @ 0.05 Gal/SY (1' Lift)	Gal	207	47	0.4	16	13	-	283
401-0050	**Tack Coat @ 0.05 Gal/SY (2' Lift)	Gal	207	47	0.4	16	-	-	270
430-0500	Commercial Grade Hot Mix Asphalt	Ton	934	130	5	40	30	-	1139
430-5803	**PG 58S-28 Asphalt Cement @ 6.0%	Ton	56	8	0.3	2	2	-	68
709-0100	Geosynthetic Material Type G	SY	-	-	56	-	-	-	56
709-0151	Geosynthetic Material Type R1	SY	2334	-	-	-	-	-	2334

**Quantities for Estimation Purpose Only, to be included in the cost of "Commercial Grade Hot Mix Asphalt"

216-0100 Water

20 Gal/Ton for Aggregates	41653 Gal
10 Gal/CY for Borrow	120065 Gal
Total =	162 MGal

Rumble Strips

760 - 0007 - Asphalt Centerline	0.04 Mile
---------------------------------	-----------

Location	203-0101 Common Excavation Type A (Pay Item)	203-0113 Common Excavation Waste (Pay Item)	Embankment*	203-0140 Borrow Excavation (Pay Item)	203-0109 Topsoil (Pay Item)
	CY	CY	CY	CY	CY
	I		J	K=J-I	L
Bypass	26	0	12033	12007	1320
Landslide	0	1833	10	0	1390
Total	26	1833	12043	12007	2710

* 25% volume was added to embankment volumes to allow for shrinkage.

Basis of Estimate

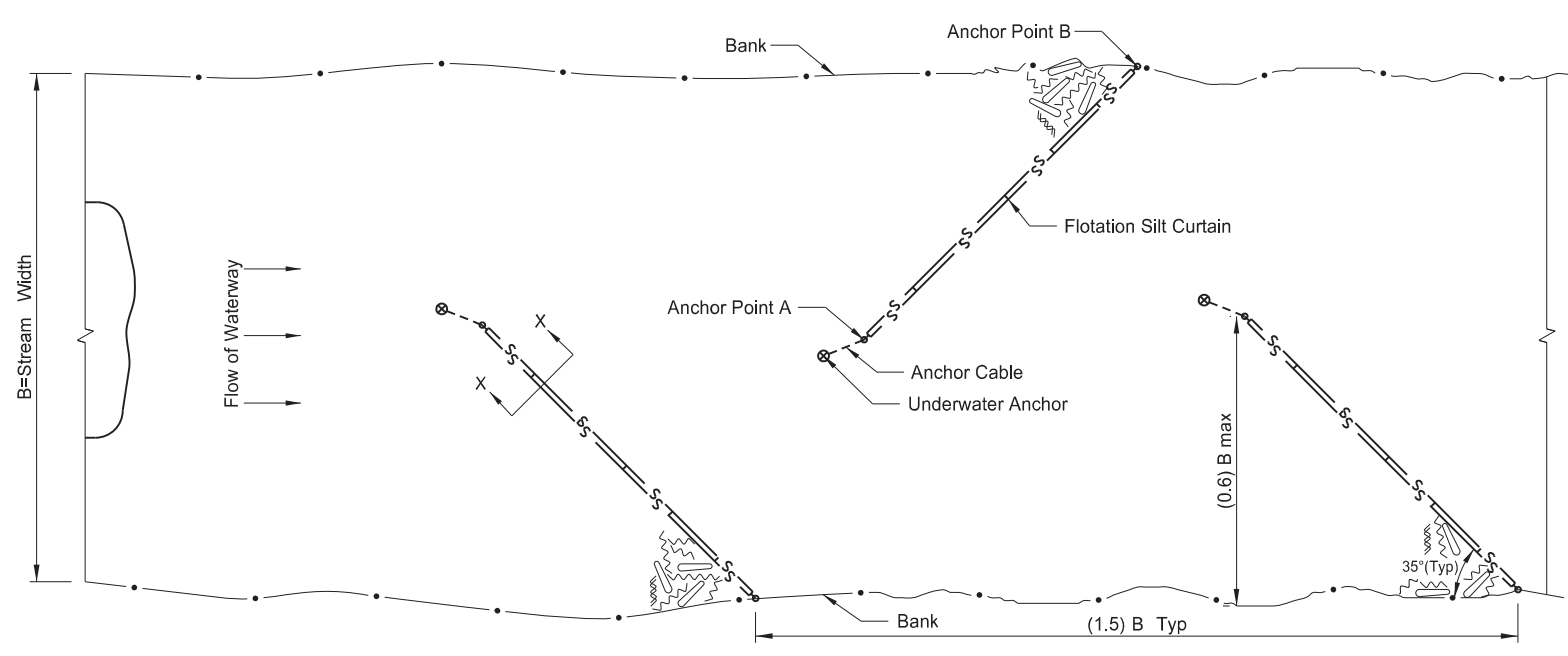
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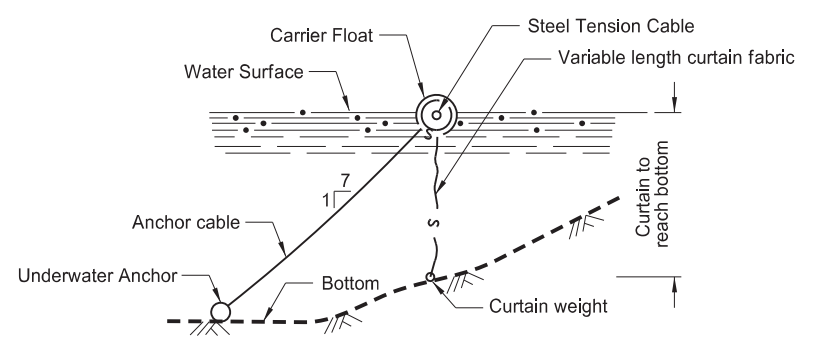
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TYPICAL INSTALLATIONS
May vary with conditions



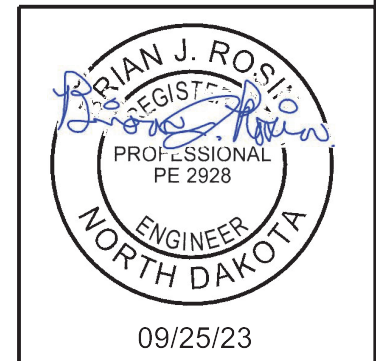
PLAN VIEW
FLOTATION SILT CURTAIN - TYPE HERRING BONE PATTERN

DESIGN GUIDELINES:
When temporary work encroaches more than 1/3 width of the stream
Or where stream width doesn't allow use of Type Moving Water



SECTION X-X
FLOTATION SILT CURTAINS

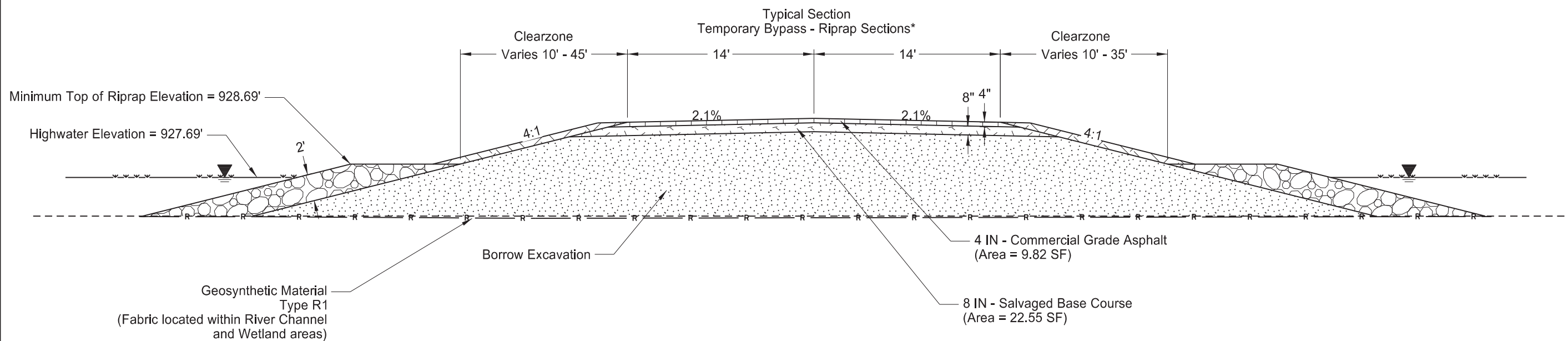
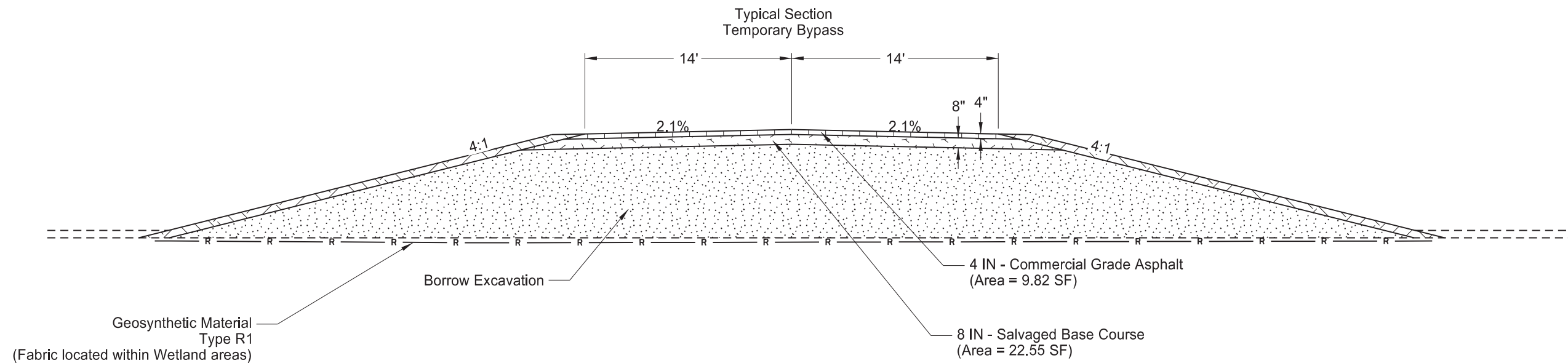
Note:
Maximum water velocity for moving water = 5 ft/sec



Temporary Erosion Control - Flotation Silt Curtain

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*Note: Riprap on the east side of the bypass from Sta 9+30 to Sta 10+20
Riprap on the west side of the bypass from Sta 8+65.5 to Sta 9+55

Typical Section
Temporary Bypass

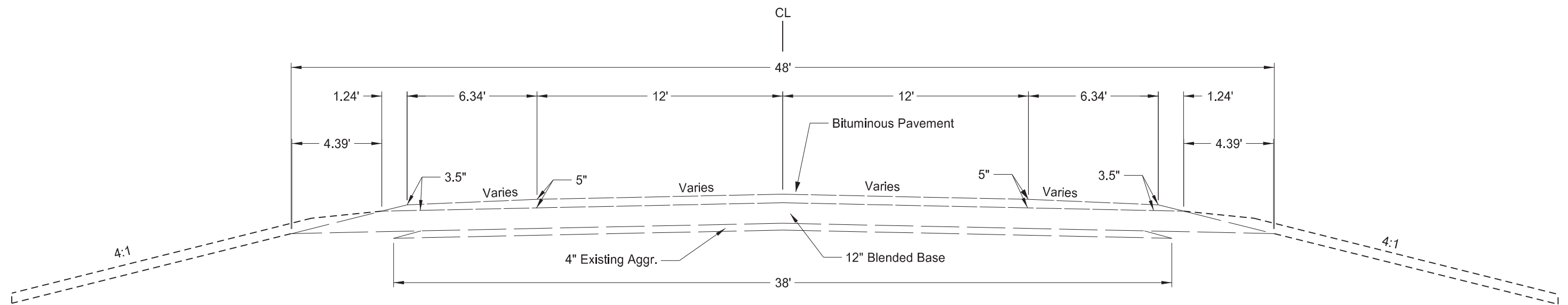
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Existing Typical Section



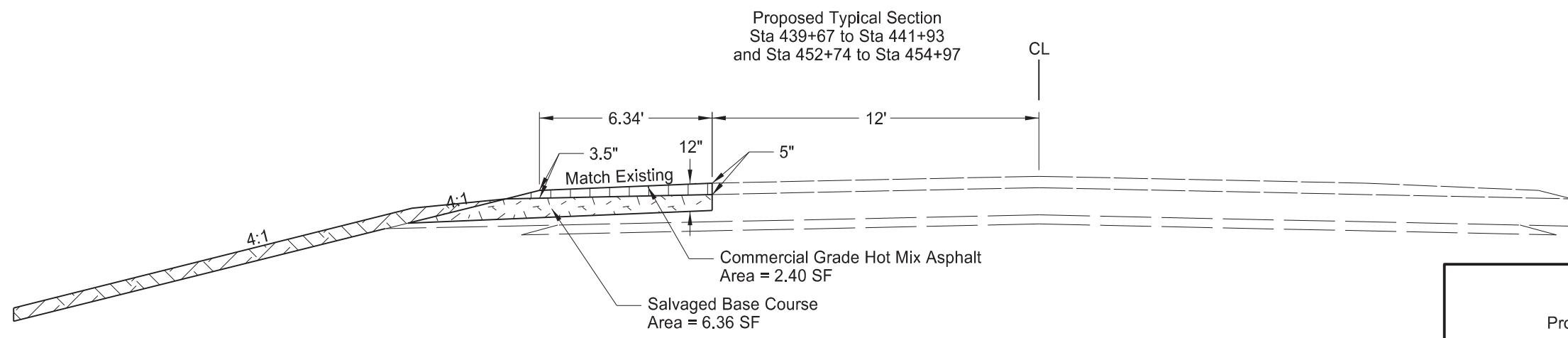
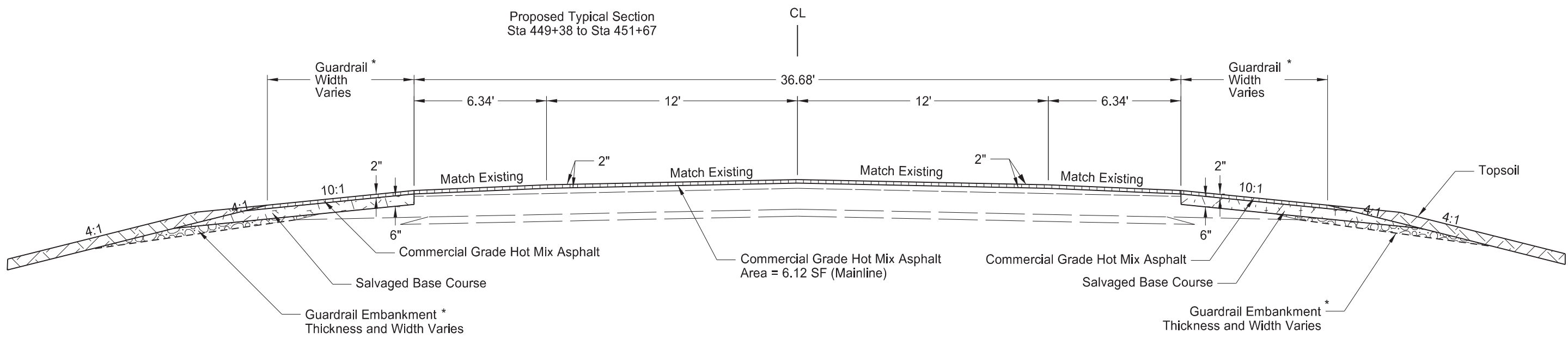
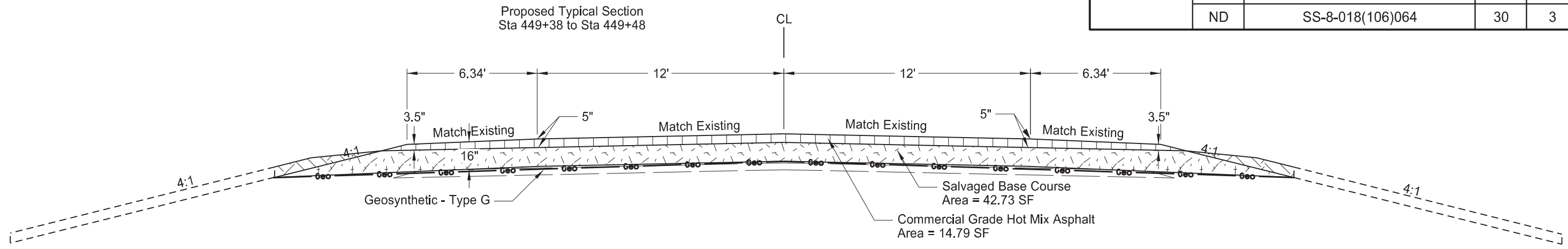
Existing Typical Section

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*Note: See Section 130 for Guardrail Details

Proposed Typical Sections

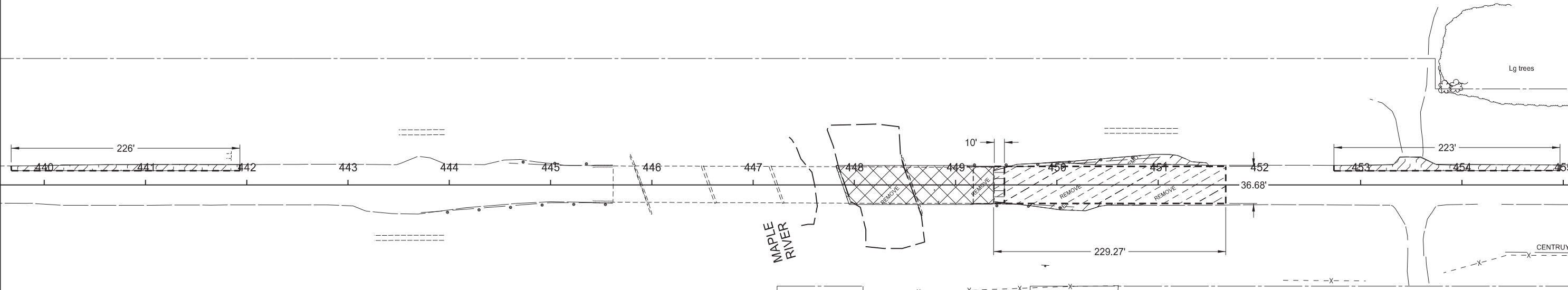
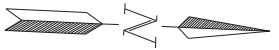
ND Hwy 18
Maple River



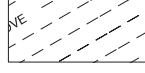


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PE 2928
ENGINEER
NORTH DAKOTA

09/26/23

SPEC	CODE	BID ITEM	QUANTITY	UNIT
203	101	COMMON EXCAVATION-TYPE A Guardrail Surfacing	25	CY
203	113	COMMON EXCAVATION-WASTE Sta 439+67 to Sta 441+93	73	CY
		Sta 449+38 to Sta 449+48	64	CY
		Sta 452+74 to Sta 454+97	73	CY
		Total =	210	CY
411	105	MILLING PAVEMENT SURFACE Sta 449+38 to Sta 451+67	932	SY

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	40	1



-  Common Excavation - Waste (Depth = 16")
-  Common Excavation - Waste (Depth = 12")
-  Milling of Bituminous Surfacing - 2 IN
-  Common Excavation - Type A (Guardrail Surfacing)
-  Removal of Structure See Section 170

Removal Layout

ND Hwy 18
Maple River



09/25/23

Begin Station / Location / Invert Elevation	Begin Offset	End Station / Outlet Elevation	End Offset	Pipe Installation (Pay Item)		Allowable Material	Required Diameter	Steel Pipe Coatings	Steel Pipe Corrugations or Spiral Ribs	Steel Pipe Minimum Thickness	Geosynthetic Material - Type G (Pay Item)	(*) End Sections		Applicable Backfill	
				In	LF							Begin	End		
4+65 Bypass 934.5'	35' Lt	6+21 934.5'	33' Rt 934.5'	18	Pipe Conduit - Approach	170	Reinforced Concrete Pipe - Class III (barrel length = 170 LF)	18							Specification 714.04 A
							Corrugated Steel Pipe	18	A, P	2	0.064				
							Spiral Rib Steel Pipe	18	A, P	3/4, 1	0.064				
							High-Density Polyethylene	18							
							Polypropylene Pipe (AASHTO M330, Type S)	18							
8+82 Bypass 920'	48' Lt	9+40	46' Rt 920'	84	Pipe Conduit - Approach	110	Reinforced Concrete Pipe - Class II (barrel length = 110 LF)	84						Specification 714.04 A	
							Corrugated Steel Pipe	84	A, P	2	0.168				
							Corrugated Steel Pipe	84	A, P	3, 5	0.064				
8+84 Bypass 916'	66' Lt	9+66	62' Rt 916'	84	Pipe Conduit - Approach	152	Reinforced Concrete Pipe - Class II (barrel length = 152 LF)	84						Specification 714.04 A	
							Corrugated Steel Pipe	84	A, P	2	0.168				
							Corrugated Steel Pipe	84	A, P	3, 5	0.064				
8+91 Bypass 914'	72' Lt	9+87	71' Rt 914'	84	Pipe Conduit - Approach	172	Reinforced Concrete Pipe - Class II (barrel length = 172 LF)	84						Specification 714.04 A	
							Corrugated Steel Pipe	84	A, P	2	0.168				
							Corrugated Steel Pipe	84	A, P	3, 5	0.064				
9+03 Bypass 914'	71' Lt	10+01	71' Rt 914'	84	Pipe Conduit - Approach	172	Reinforced Concrete Pipe - Class II (barrel length = 172 LF)	84						Specification 714.04 A	
							Corrugated Steel Pipe	84	A, P	2	0.168				
							Corrugated Steel Pipe	84	A, P	3, 5	0.064				
9+20 Bypass 916'	60' Lt	10+09	63' Rt 916'	84	Pipe Conduit - Approach	154	Reinforced Concrete Pipe - Class II (barrel length = 154 LF)	84						Specification 714.04 A	
							Corrugated Steel Pipe	84	A, P	2	0.168				
							Corrugated Steel Pipe	84	A, P	3, 5	0.064				
16+34 Bypass 936.5	29' Lt	15+20	30' Rt 936	18	Pipe Conduit - Approach	128	Reinforced Concrete Pipe - Class III (barrel length = 128 LF)	18						Specification 714.04 A	
							Corrugated Steel Pipe	18	A, P	2	0.064				
							Spiral Rib Steel Pipe	18	A, P	3/4, 1	0.064				
							High-Density Polyethylene	18							
							Polypropylene Pipe (AASHTO M330, Type S)	18							

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"

(*) There are no end sections. All pipes are temporary pipe.

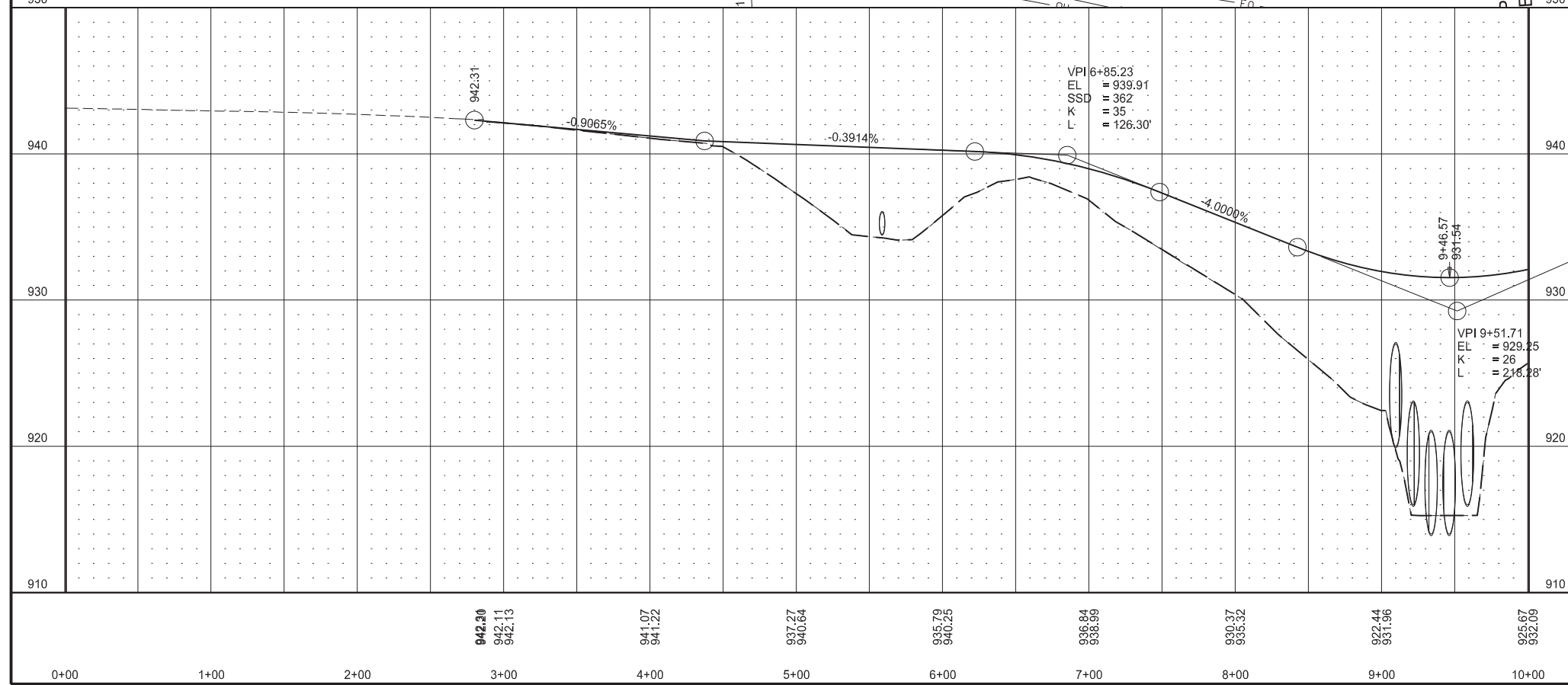
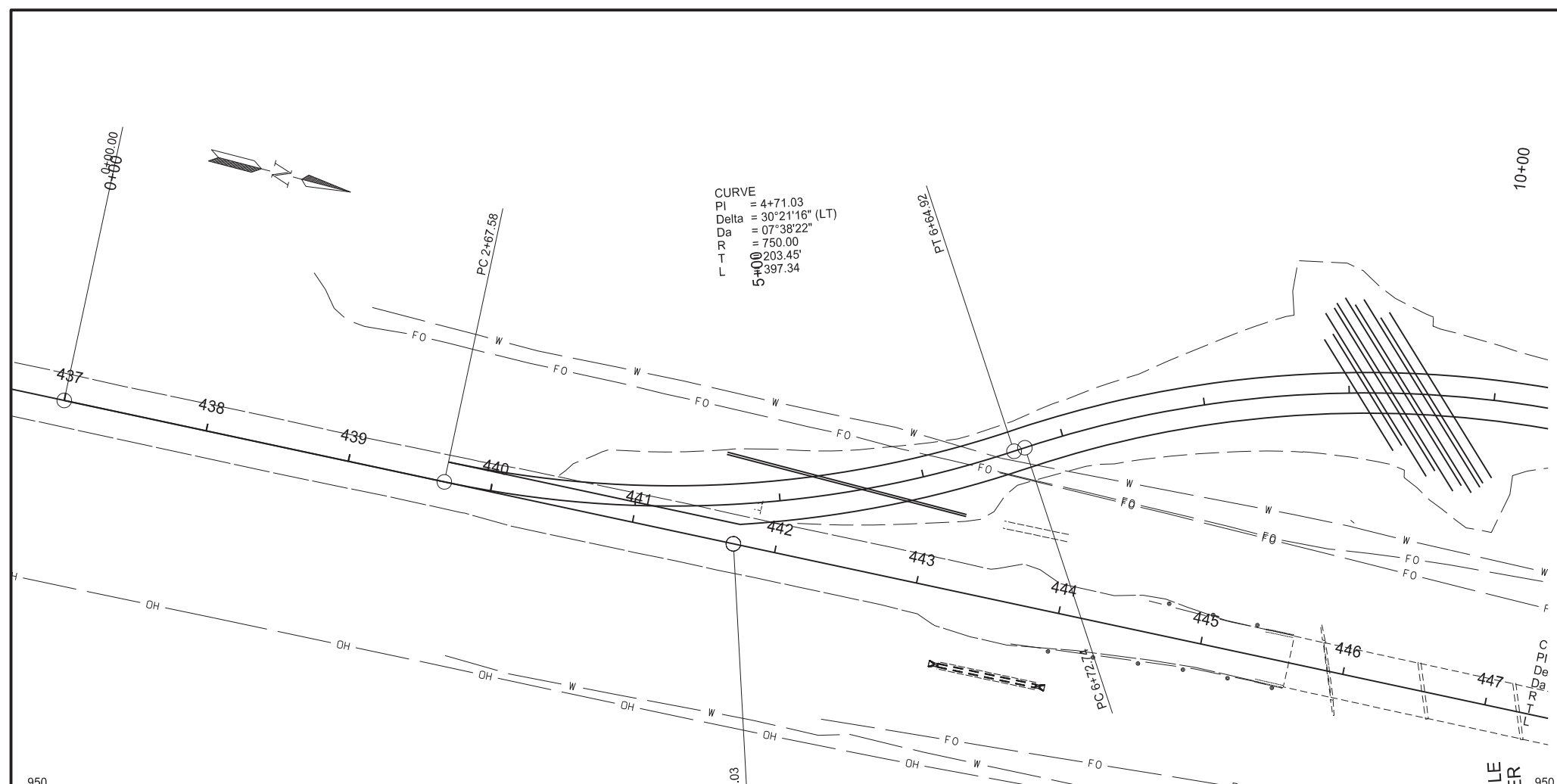
Allowable Pipe List

ND Hwy 18
Maple River



09/25/23

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	60	1



SPEC	CODE	BID ITEM	QUANTITY	UNIT
714	4099	PIPE CONDUIT 18IN-APPROACH Sta 5+58	170	LF
714	4157	PIPE CONDUIT 84IN-APPROACH Sta 9+14 Sta 9+25 Sta 9+35 Sta 9+46 Sta 9+57	110 152 172 172 154	LF LF LF LF LF
Total=			760	LF

Plan and Profile
Temporary Bypass

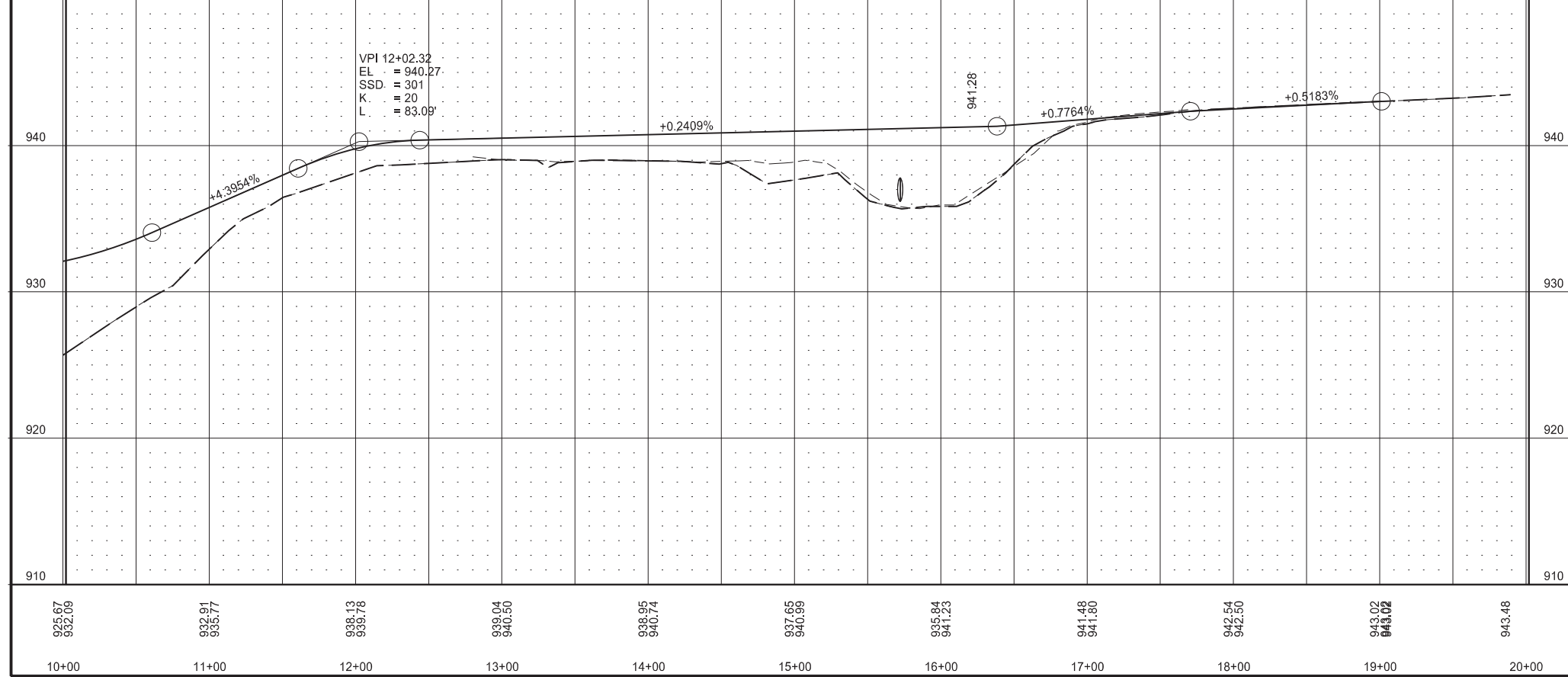
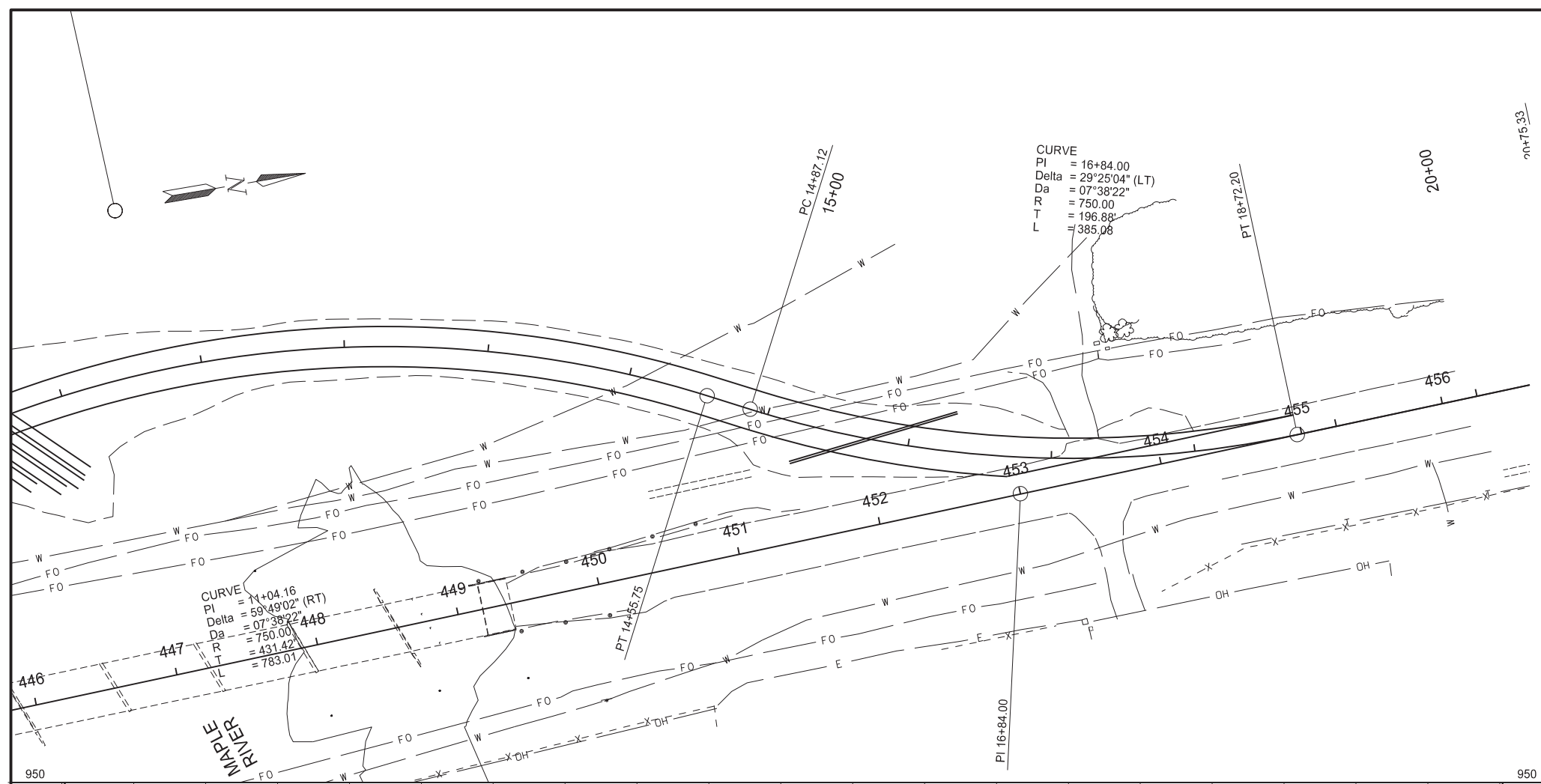
ND Hwy 18
Maple River



09/25/23

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	60	2

SPEC	CODE	BID ITEM	QUANTITY	UNIT
714	4099	PIPE CONDUIT 18IN-APPROACH Sta 15+72	128	LF



Plan and Profile
Temporary Bypass

ND Hwy 18
Maple River




09/25/23

Wetland Impact Table												
Wetland Number	Location	Wetland Type	Wetland Feature	USACE Jurisdictional Wetlands	Wetland Impact					Wetland Mitigation		
					Wetland Impacts Acre(s)			USFWS Easement Impacts Acre(s)		Mitigation Proposed		
					Temp.	Perm. (Fill/Drain)	Perm. (Cut)	Temp.	Perm.	EO 11990	USACE	USFWS
1a	Sec. 22, T138N, R52W	Riverine	Natural	Y	0.222	-	-	-	-	N	N	N
1b	Sec. 23, T138N, R52W	Riverine	Natural	Y	-	-	-	-	-	N	N	N
1d	Sec. 22, T138N, R52W	Riverine	Natural	Y	0.150	-	0.040	-	-	N	N	N
1e	Sec. 23, T138N, R52W	Riverine	Natural	Y	0.039	-	0.103	-	-	N	N	N
2	Sec. 22, T138N, R52W	Ditch	Created	Y	-	-	0.056	-	-	N	N	N
3a	Sec. 22, T138N, R52W	Ditch	Created	Y	-	-	-	-	-	N	N	N
3b	Sec. 22, T138N, R52W	Ditch	Created	Y	0.021	-	-	-	-	N	N	N
4	Sec. 22, T138N, R52W	Ditch	Created	Y	-	-	-	-	-	N	N	N
5a	Sec. 7, T138N, R51W	Ditch	Created	Y	-	-	-	-	-	N	N	N
5b	Sec. 7, T138N, R51W	Ditch	Created	Y	-	-	-	-	-	N	N	N
6a	Sec. 7, T138N, R51W	Riverine	Natural	Y	-	-	-	-	-	N	N	N
6c	Sec. 18, T138N, R51W	Riverine	Natural	Y	-	-	-	-	-	N	N	N
Totals					0.432	0.000	0.199	0	0			

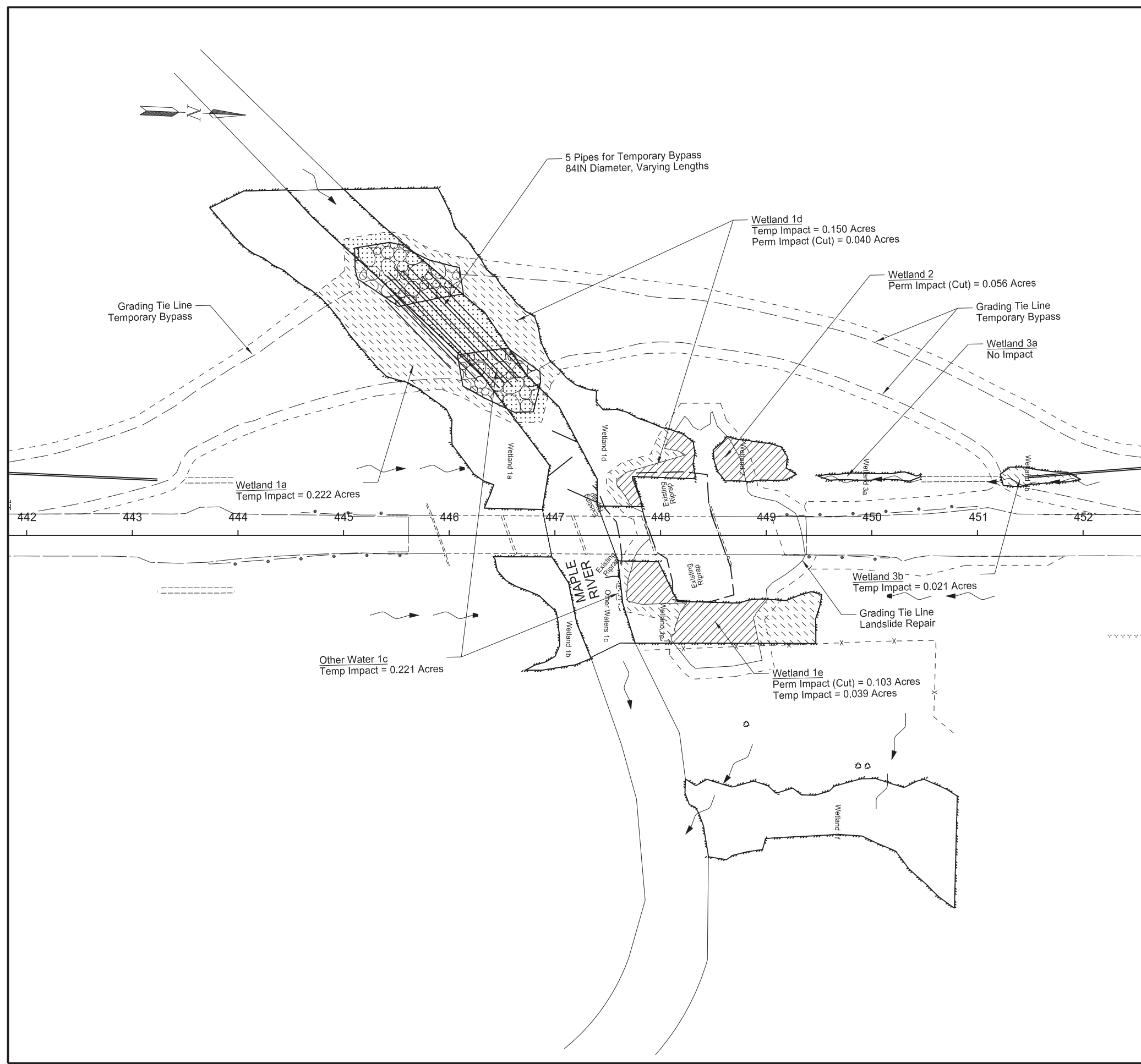
Other Waters Impact Table										
Number	Location	Type	Feature	USACE Jurisdictional	Impacts to Other Waters			Other Water Mitigation		
					Acres			Mitigation Proposed		
					Temp.	Perm. (Fill/Drain)	Perm. (Cut)	EO 11990	USACE	USFWS
OW-1c	Sec. 22-23, T138N, R52W	River	Natural	Y	0.221	0.000	0.000	N	N	N
OW-6b	Sec. 7 & 18, T138N, R51W	River	Natural	Y	-	-	-	N	N	N
Totals					0.221	0.000	0.000			

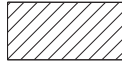
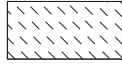



A wetland Jurisdictional Determination was issued by the USACE on 7/29/2022; NWO-2018-00418-BIS.

Impact Summary Table			
Permanent Summary		Temporary Impacts and additional information	
Wetland Type	Total Acre(s)	Water Type	Total Acre(s)
Natural/JD (Fill/Drain)	0.000	Temporary Wetland JD	0.432
Natural/Non-JD (Fill/Drain)	0.000	Non-JD Wetland Temporary	0.000
Artificial/JD (Fill/Drain)	0.000		
Artificial/Non-JD (Fill/Drain)	0.000	Permanent OW	0.000
Total	0.000	Temporary OW	0.221
JD Natural (Cut)	0.143	Permanent OW-d	0.000
JD Artificial (Cut)	0.056	Temporary OW-d	0.000
Non-JD Natural (Cut)	0.000		
Non-JD Artificial (Cut)	0.000		
Total	0.199		

<p>Wetland Impacts</p> <p>ND Hwy 18 Maple River</p>	 <p>09/25/23</p>
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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	75	2



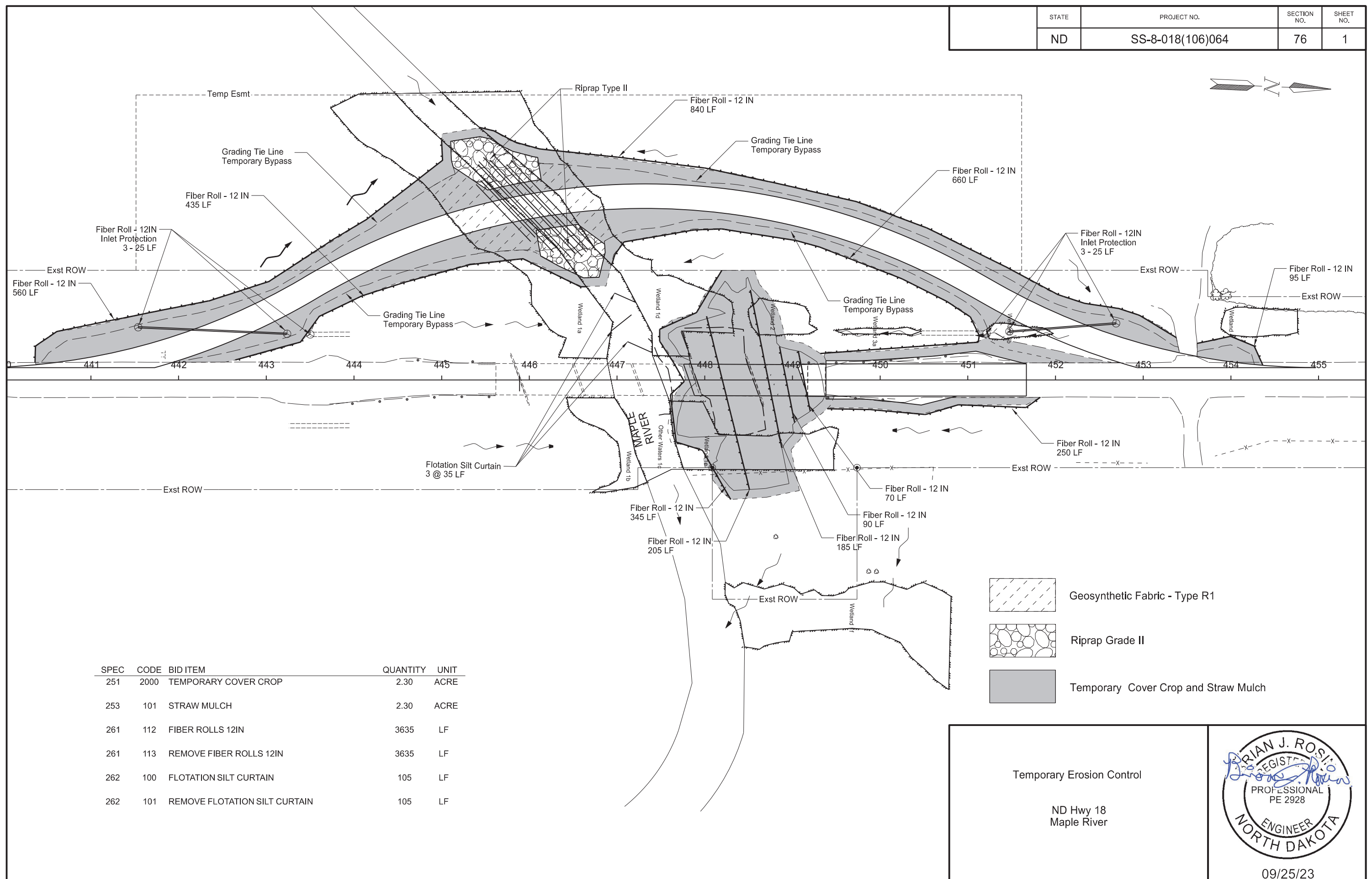
-  Wetland Impact Permanent
-  Wetland Impact Temporary
-  Other Water Impacts Temporary
-  Existing Delineated Wetland
-  Existing Other Waters

Wetland Impacts

ND Hwy 18
Maple River



09/25/23



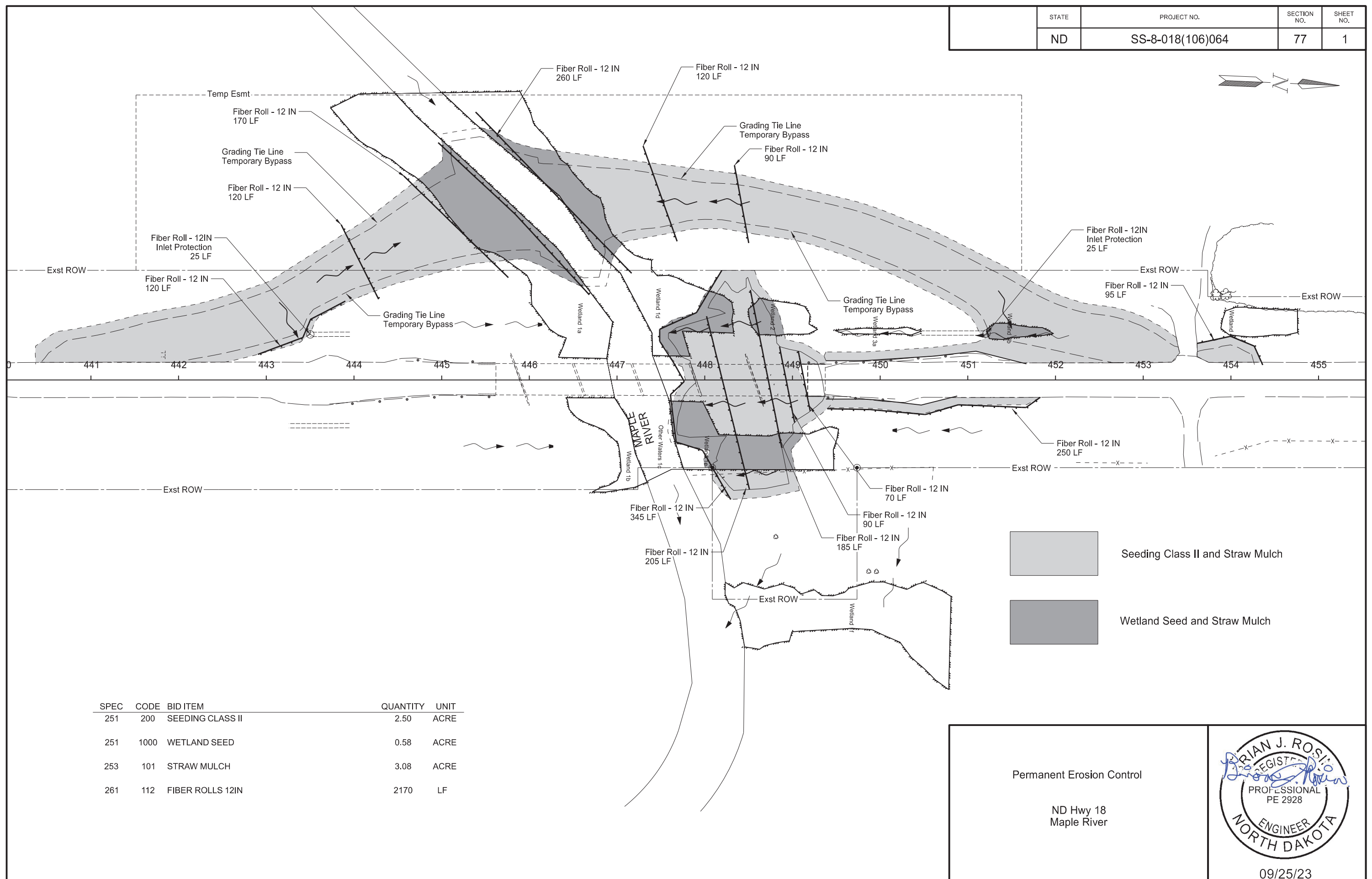
SPEC	CODE	BID ITEM	QUANTITY	UNIT
251	2000	TEMPORARY COVER CROP	2.30	ACRE
253	101	STRAW MULCH	2.30	ACRE
261	112	FIBER ROLLS 12IN	3635	LF
261	113	REMOVE FIBER ROLLS 12IN	3635	LF
262	100	FLOTATION SILT CURTAIN	105	LF
262	101	REMOVE FLOTATION SILT CURTAIN	105	LF

Temporary Erosion Control

ND Hwy 18
Maple River



09/25/23



SPEC	CODE	BID ITEM	QUANTITY	UNIT
251	200	SEEDING CLASS II	2.50	ACRE
251	1000	WETLAND SEED	0.58	ACRE
253	101	STRAW MULCH	3.08	ACRE
261	112	FIBER ROLLS 12IN	2170	LF

Permanent Erosion Control

ND Hwy 18
Maple River



09/25/23

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - 8 NORTH OF LEONARD, MAPLE RIVER

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(103)064	81	1

HORIZONTAL ALIGNMENT				CURVE DATA		US PUBLIC LAND SURVEY DATA				SURVEY CONTROL POINTS							
PNT	STATION	NORTHING	EASTING	ARC DEFINITION		CORNER	IRN	NORTHING	EASTING	PNT	NORTHING	EASTING	ELEV	STATION	OFFSET	ALIGNMENT	MONUMENT
ND 18 (Chain: Align1)						T-138-N R-52-W				PRIMARY CONTROL							
Begin	432+85.05	412,332.97	2,790,478.51			NW Cor Sec 22	7-G	415,652.24	2,785,075.50	GPS 2	410,600.75	2,787,895.45	940.11	N/A	N/A	Align1	18" #5 Rebar
End	468+88.56	415,933.00	2,790,320.35			S Qtr Cor Sec 22	8-J	410,521.77	2,787,921.26	GPS 1	417,209.25	2,790,182.63	940.74	N/A	N/A	Align1	18" #5 Rebar
						NE Cor Sec 22	9-G	415,933.00	2,790,320.35								
						NW Cor Sec 26	9-J	410,652.42	2,790,552.34	SECONDARY CONTROL							
										RTK 40001	413,391.88	2,790,414.77	940.16	443+45	17' Lt	Align1	Magnail
										RTK 51203	413,834.05	2,790,283.36	932.87	447+93	129' Lt	Align1	#5 Rebar
										RTK 40002	414,135.55	2,790,381.78	940.71	450+90	17' Lt	Align1	Magnail
										RTK 40004	421,841.37	2,804,206.11	926.43	N/A	N/A	Align1	#5 Rebar
										RTK 40003	421,807.51	2,803,195.37	925.92	N/A	N/A	Align1	#5 Rebar

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

INITIALIZING BENCH MARK
NDGPS Stations (OPUS)

NAVD-88 GEOID12B _____
 _____ GEOID18

Date Survey
Completed 08/24/2022

Assumed Coordinates
 All coordinates on this sheet are Cass County ground coordinates. They are derived from the NAD83(2011) reference frame; North Dakota South Zone Combination Factor (cf) = 0.9998875



NOTES: Sheet 1 of 1



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	82	1

Point Type	Station	Northing	Easting
Alignment Name:		Align_Landslide	
Description:			
START	0.000 R1	413887.735	2790285.11
END	3+56.698 R1	413973.972	2790631.226

Landslide Alignment Survey Data

ND Hwy 18
Maple River



09/25/23

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-018(106)064	82	2



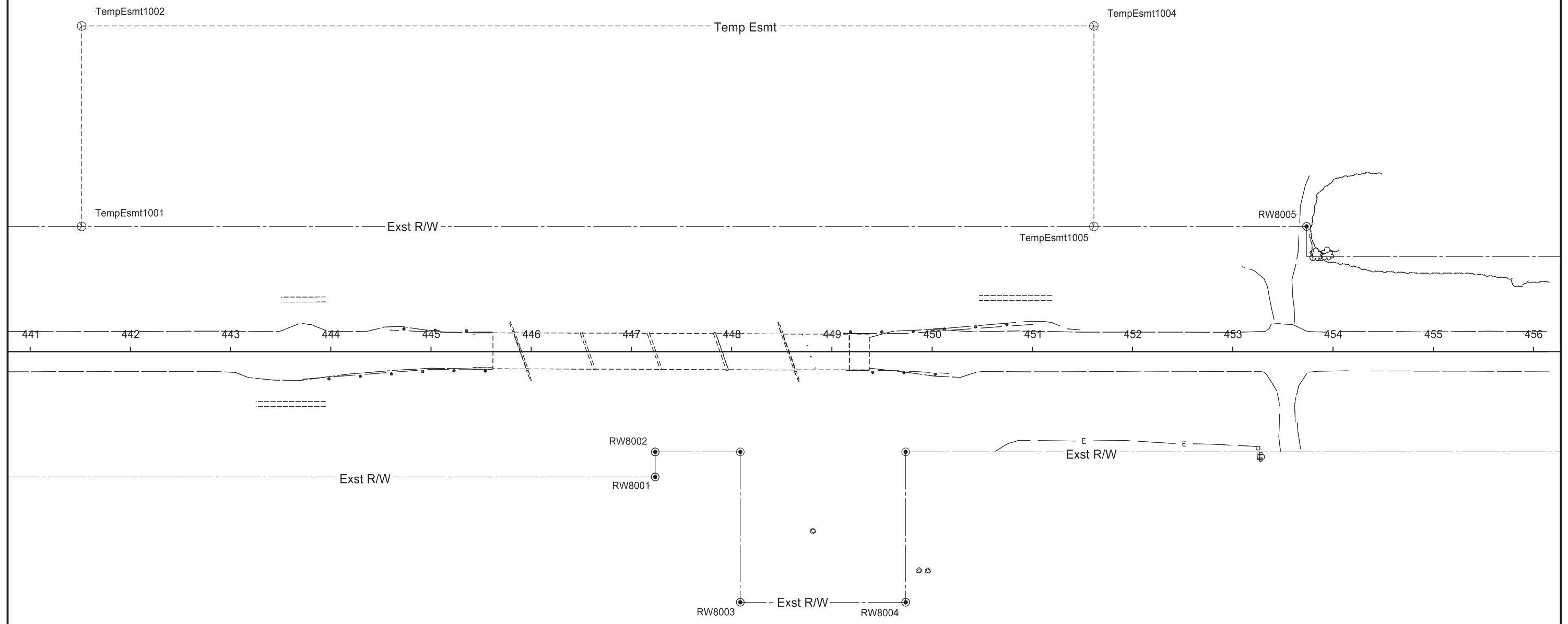
Point Type	Station	Northing	Easting
Alignment Name:		Align_Temp_Bypass	
Description:			
START	0	412747.521	2790460.297
PC	2+67.582	413014.845	2790448.553
COMBINATION PI	4+71.033	413218.1	2790439.623
PT	6+64.922	413388.979	2790329.204
PC	6+72.741	413395.546	2790324.96
COMBINATION PI	11+04.161	413757.898	2790090.813
PT	14+55.749	414142.476	2790286.321
PC	14+87.122	414170.443	2790300.538
COMBINATION PI	16+84.005	414345.949	2790389.76
PT	18+72.199	414542.649	2790381.274
END	20+75.332	414745.593	2790372.519

Temporary Bypass Alignment Survey Data

ND Hwy 18
Maple River



09/25/23



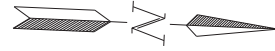
Point	Station	Offset	Northing	Easting	Description
TempEsmt1001	441+51.403	124.976 LT	413193.004	2790315.63	Temporary Easement Limits
TempEsmt1002	441+51.404	324.976 LT	413184.226	2790115.822	Temporary Easement Limits
RW8002	447+23.728	100.023 RT	413774.652	2790515.293	R/W Monument
RW8001	447+23.730	125.025 RT	413775.752	2790540.27	R/W Monument
RW8003	448+08.618	250.025 RT	413866.044	2790661.424	R/W Monument
RW8004	449+73.618	250.025 RT	414030.885	2790654.183	R/W Monument
TempEsmt1005	451+61.403	124.975 LT	414202.031	2790271.303	Temporary Easement Limits
TempEsmt1004	451+61.404	324.975 LT	414193.253	2790071.495	Temporary Easement Limits
RW8005	453+73.619	124.975 LT	414414.042	2790261.989	R/W Monument

Survey Data Points

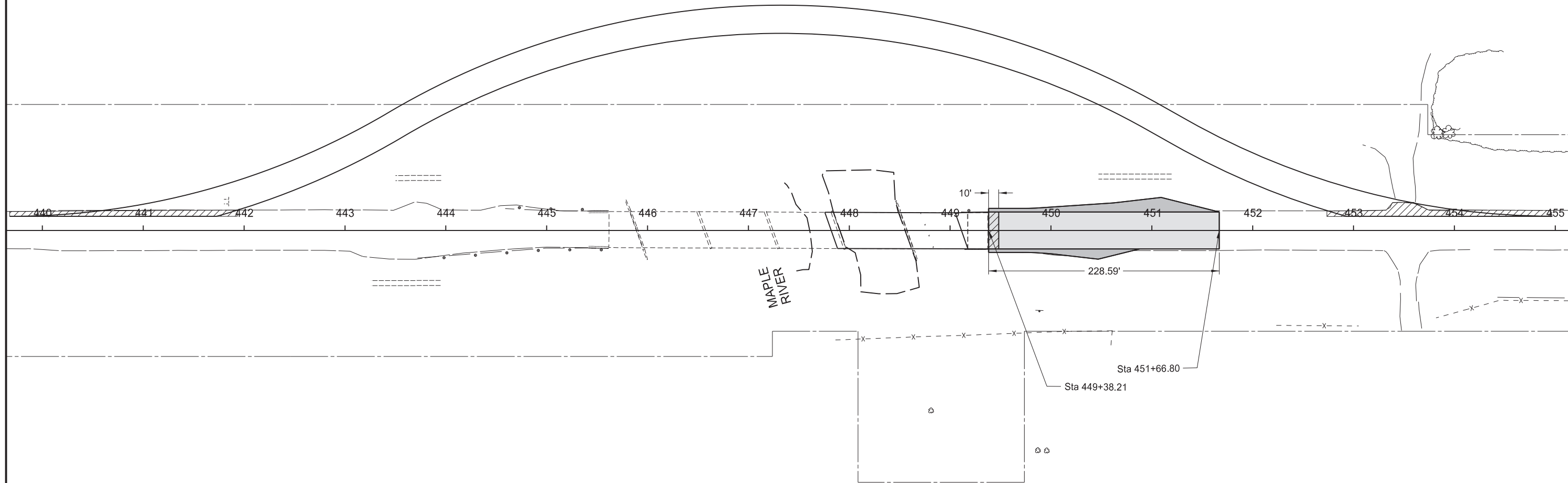
ND Hwy 18
Maple River

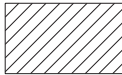
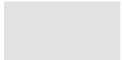
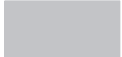



09/25/23



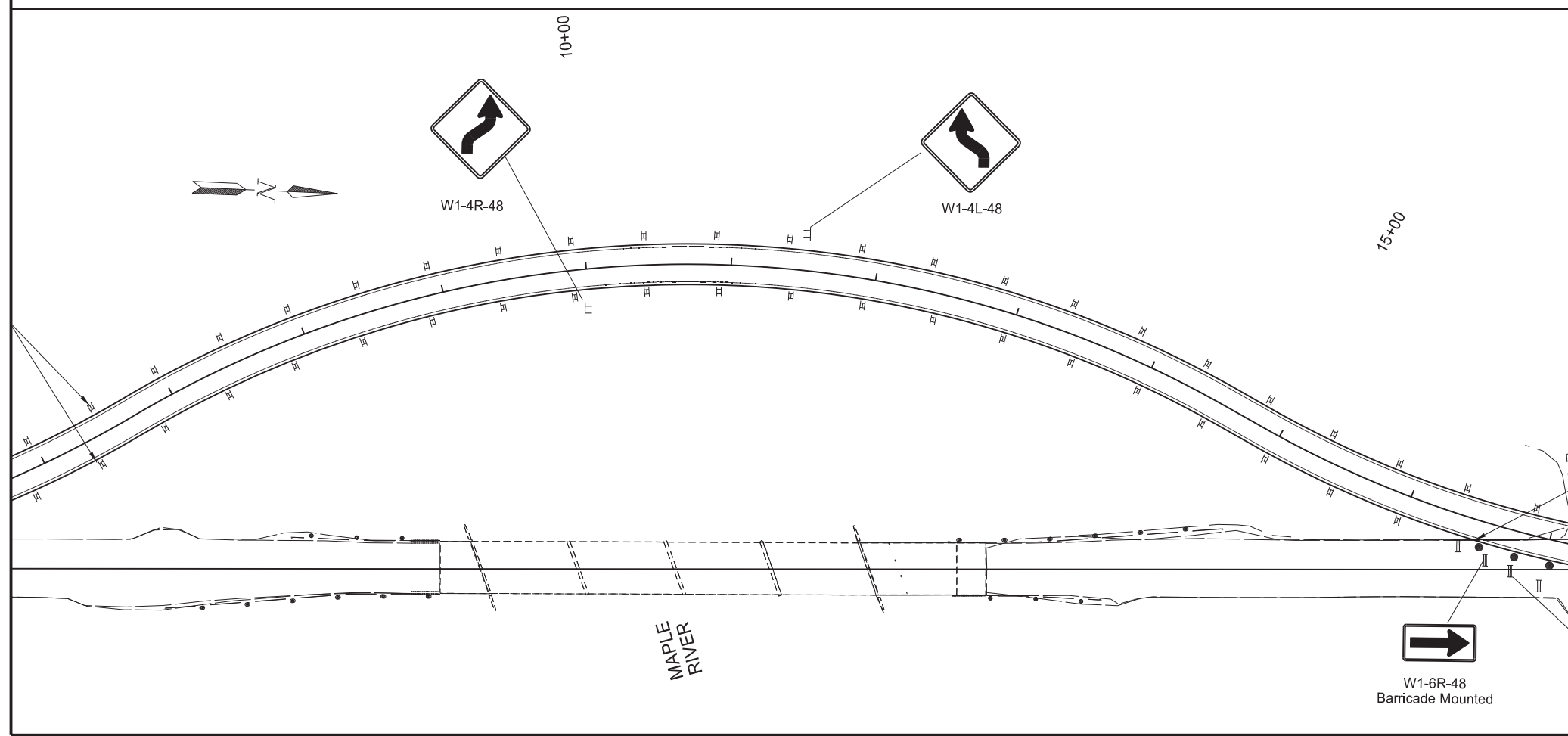
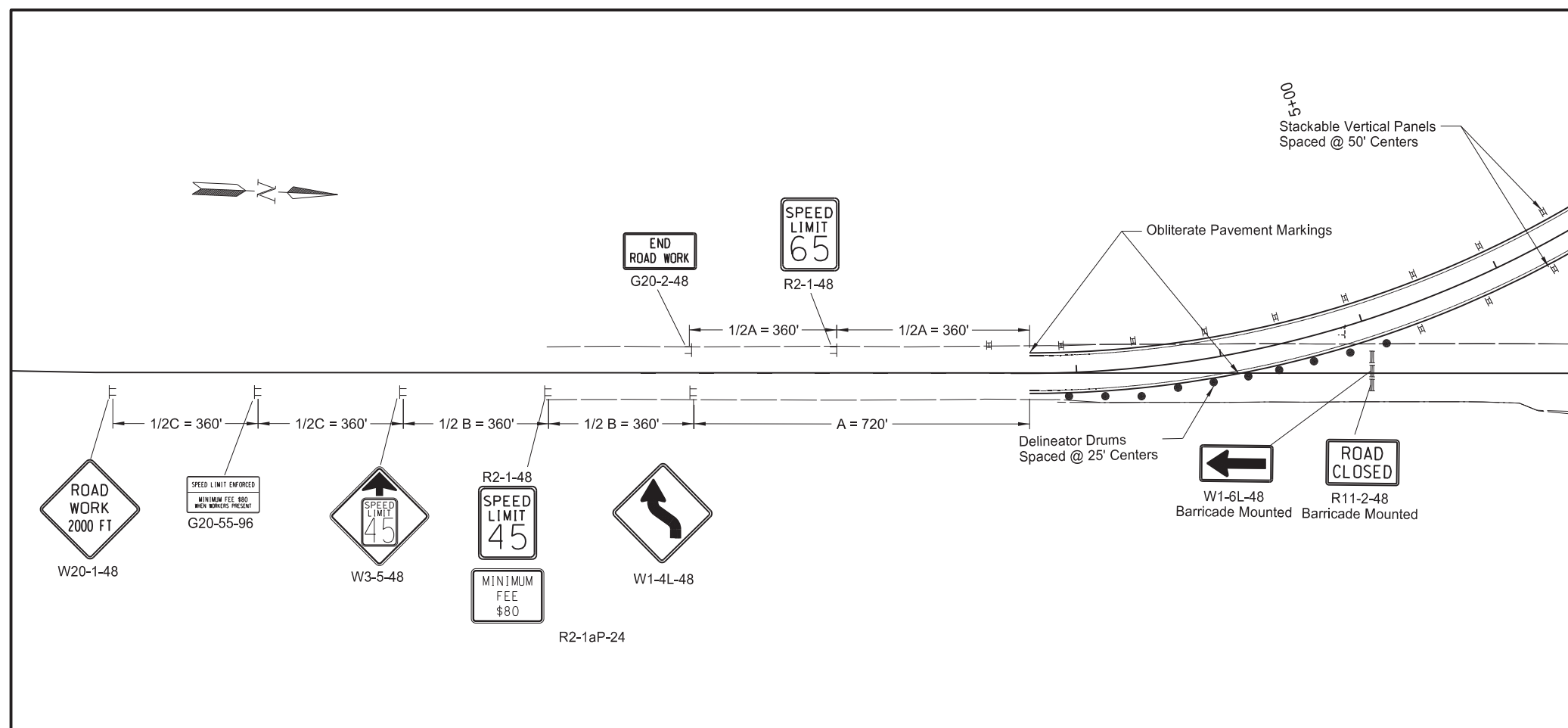
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	90	1



-  Pavement Repair - See Section 30
-  Asphalt Overlay - 2 IN
Commercial Grade Hot Mix Asphalt
-  Guardrail Surfacing - See Section 130

Paving Layout ND Hwy 18 Maple River	 09/25/23
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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	100	2



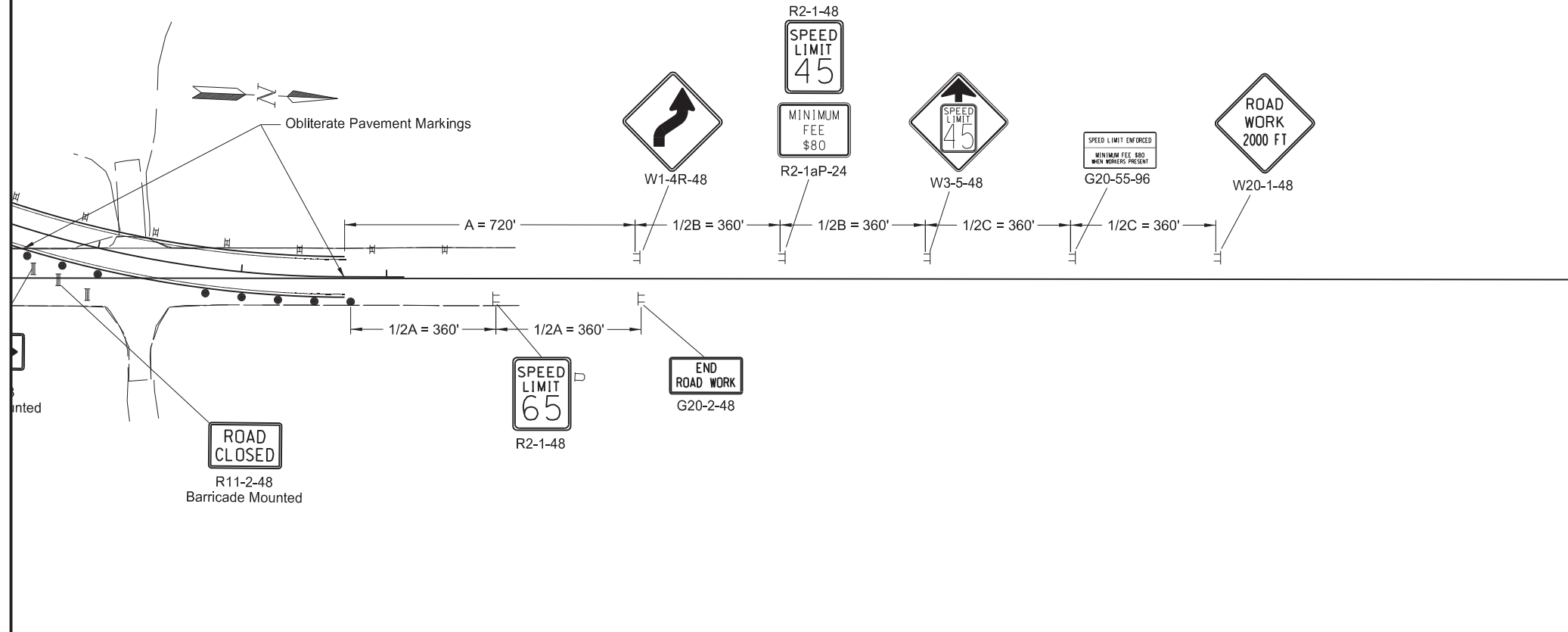
Work Zone Traffic Control
Phase 2

ND Hwy 18
Maple River

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PE 2928
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09/26/23

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	100	3



Work Zone Traffic Control
Phase 2

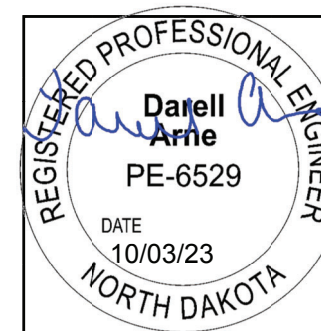
ND Hwy 18
Maple River



09/26/23

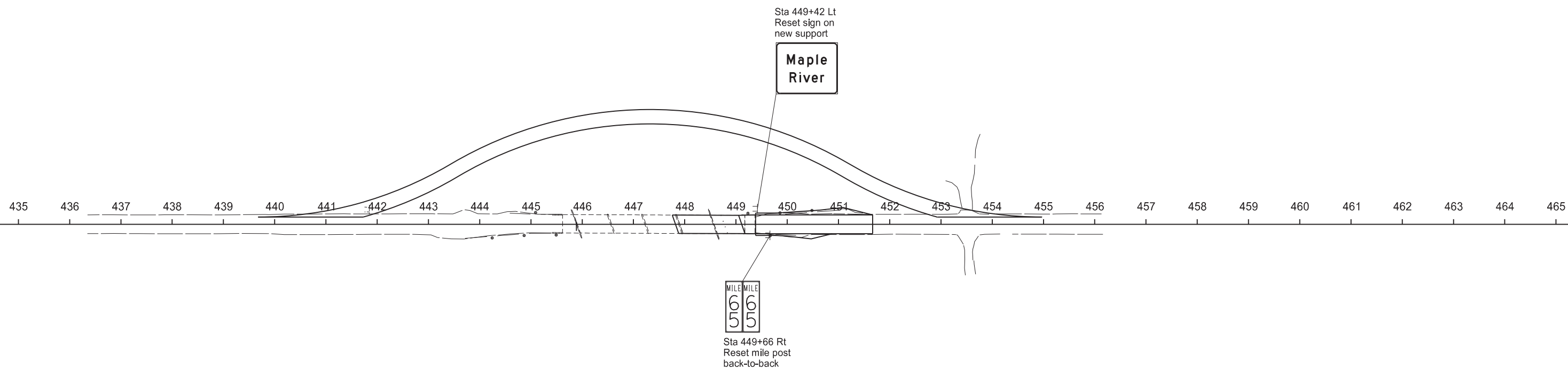
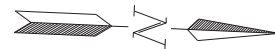
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
N.D.	SS-8-018(106)064	110	1

Station / RP	Sign No.	Assembly No.	Flat Sheet For Signs		Sign Support Length				Vert Clearance FT	Support Size	Max Post Len LF	Sleeve Length				Sleeve Size	Anchor EA	Anchor LF	Anchor Size	Reset Sign Panel EA	Reset Sign Support EA	Break-Away EA	Comments
			IV SF	XI SF	1st LF	2nd LF	3rd LF	4th LF				1st LF	2nd LF	3rd LF	4th LF								
ND Hwy 18																							
449+42 Lt					10.9				5.0	2.5 x 2.5 12 ga	12.3					1	4	3 x 3 7 ga	1				
Sub Total			0.0	0.0	Total	10.9									Total	4.0			1	0	0		
Grand Total			0.0	0.0	Total	10.9									Total	4	0	0	1	0	0		



Sign Summary
 Perforated Tube
 8 North of Leonard
 Maple River
 ND Hwy 18

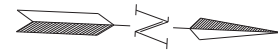
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	ND	SS-8-018(106)064	110	2



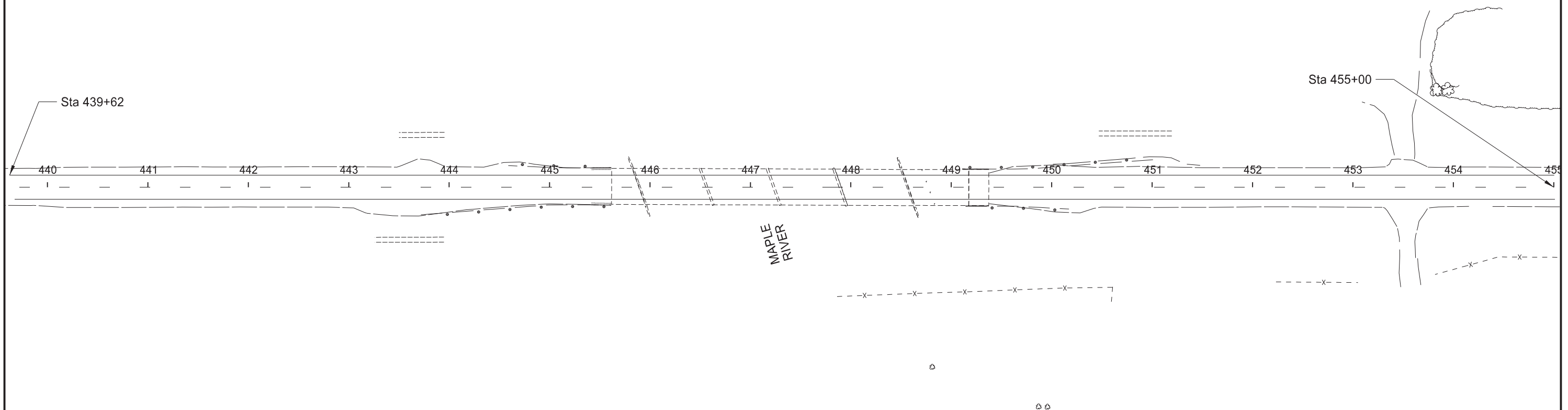
SPEC	CODE	BID ITEM	QTY	UNIT
754	0596	RESET MILE POST Sta 449+66 Rt	1	EA

Sign Layout 8 North of Leonard Maple River ND Hwy 18	
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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-018(106)064	120	1



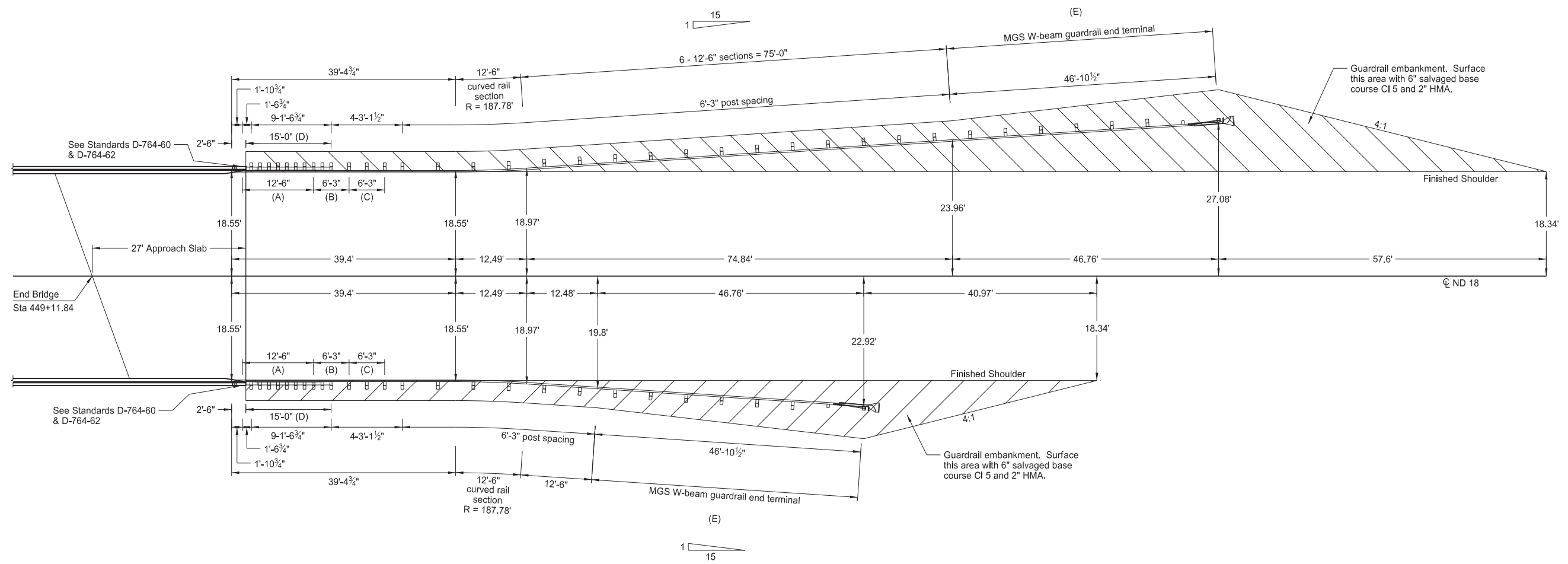
SPEC	CODE	BID ITEM	QUANTITY	UNIT
762	1104	PVMT MK PAINTED 4IN LINE		
		Centerline (10' line, 30 skips) - Yellow	385	LF
		White Edge Line - East Side	1537	LF
		White Edge Line - West Side	1537	LF
		Total=	3459	LF



Pavement Marking ND Highway 18 Maple River	 09/25/23
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23 USC § 407 Documents
 NDDOT Reserves All Objections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	130	1

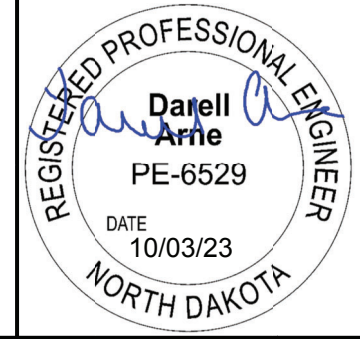


- (A) Thrie beam rail section (double thickness)
- (B) Thrie beam rail section
- (C) Asymmetrical W-Thrie beam transition section
- (D) Curb & gutter - type 1 special. Install in accordance with Standard Drawing D-748-1, except for transitions on each end as shown on Standard Drawing D-764-60.
- (E) Install an MGS FLEAT end terminal at this location. See Standard D-764-38.

Thrie/MGS W-Beam Guardrail Layout
 At End of Bridge

Maple River Bridge
 RP 64.955

ND 18



23 USC § 407 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-018(106)064	130	2

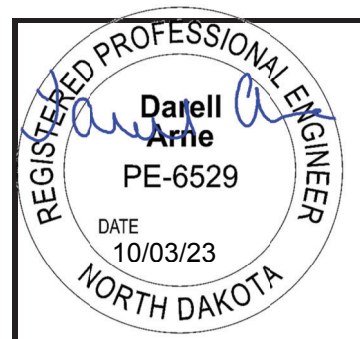
MGS W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

THRIE/MGS W-BEAM GUARDRAIL AT BRIDGE ENDS

	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(B)
LOCATION	5/8" Ø x 18" LONG GUARD- RAIL BOLT	6" x 8" x 6'-0" TIMBER POST	6" x 8" x 14" TIMBER BLOCK	5/8" Ø x 1 1/4" LONG GUARD- RAIL BOLT	12'-6" STRAIGHT W-BEAM RAIL SECTION	12'-6" CURVED W-BEAM RAIL SECTION	REFL- ECTOR- IZED PLATES	6" x 8" x 7" WOOD POST	6" x 8" x 19" WOOD OFF- SET BLOCK	6'-3" W-THRIE BEAM TRANS- ITION SECTION	6'-3" THRIE BEAM SECTION	12'-6" DOUBLE THRIE BEAM SECTION	2'-6" THRIE BEAM TERM- INAL CON- NECTOR	7/8" Ø x 15" LONG HEX HEAD BOLT	JERSEY BARRIER TO THRIE BEAM CONN- ECTOR PLATE	EMBANK- MENT
	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	CY
Sta 449+36.34 to 450+00.71 Rt	30	13	7	68	2	1	6	6	12	1	1	1	1	5	1	10
Sta 449+36.34 to 450+63.10 Lt	40	23	17	108	7	1	9	6	12	1	1	1	1	5	1	10
TOTAL	70	36	24	176	9	2	15	12	24	2	2	2	2	10	2	20

- (A) Include these items in the contract unit price bid for "W-Beam Guardrail".
- (B) The volume of embankment (cubic yards) is for informational purposes only.

SPEC CODE BID ITEM	QTY	UNIT	SPEC CODE BID ITEM	QTY	UNIT
203 0218 GUARDRAIL EMBANKMENT			764 0145 W-BEAM GUARDRAIL END TERMINAL		
Sta 449+38.84 to 450+88.44 Rt	1	Ea	Sta 450+00.71 to 450+47.47 Rt	1	Ea
Sta 449+38.84 to 451+67.46 Lt	1	Ea	Sta 450+63.10 to 451+09.86 Lt	1	Ea
Total	2	Ea	Total	2	Ea
748 0141 CURB & GUTTER - TYPE 1 SPECIAL			764 0151 REMOVE W-BEAM GUARDRAIL & POSTS		
Sta 449+38.84 to 449+53.84 Rt	15	LF	Sta 449+14.49 to 449+66.39 Rt	51.9	LF
Sta 449+38.84 to 449+53.84 Lt	15	LF	Sta 449+10.97 to 450+50.17 Lt	139.4	LF
Total	30	LF	Total	191.3	LF
764 0131 W-BEAM GUARDRAIL			764 2081 REMOVE END TREATMENT & TRANSITION		
Sta 449+36.34 to 450+00.71 Rt	64.4	LF	Sta 449+66.39 to 450+16.38 Rt	1	Ea
Sta 449+36.34 to 450+63.10 Lt	126.9	LF	Sta 450+50.17 to 451+00.04 Lt	1	Ea
Total	191.3	LF	Total	2	Ea



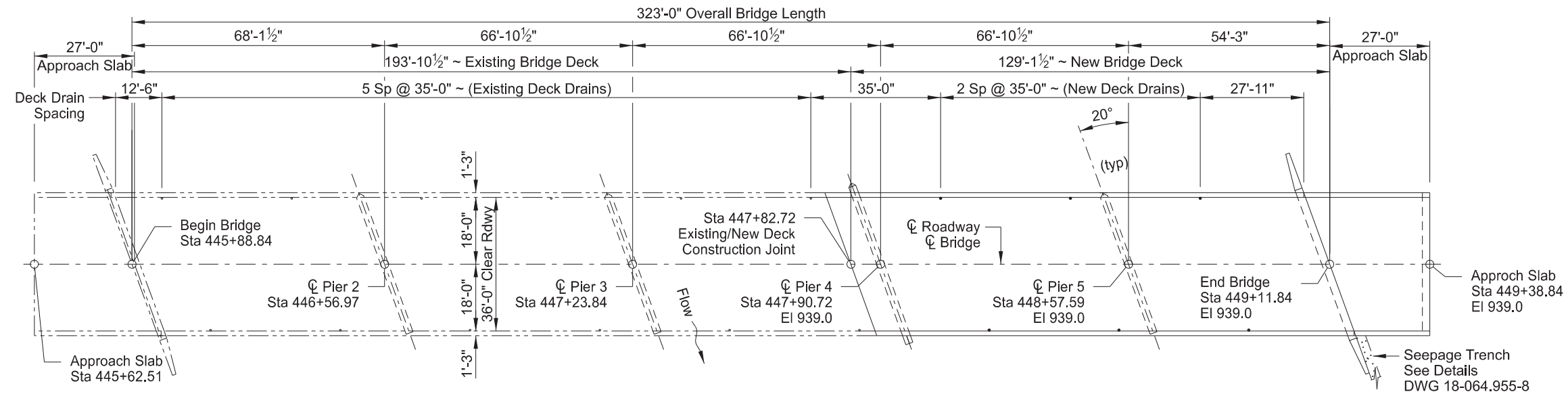
Thrie/MGS W-Beam Guardrail Quantities

Maple River Bridge
RP 64.955

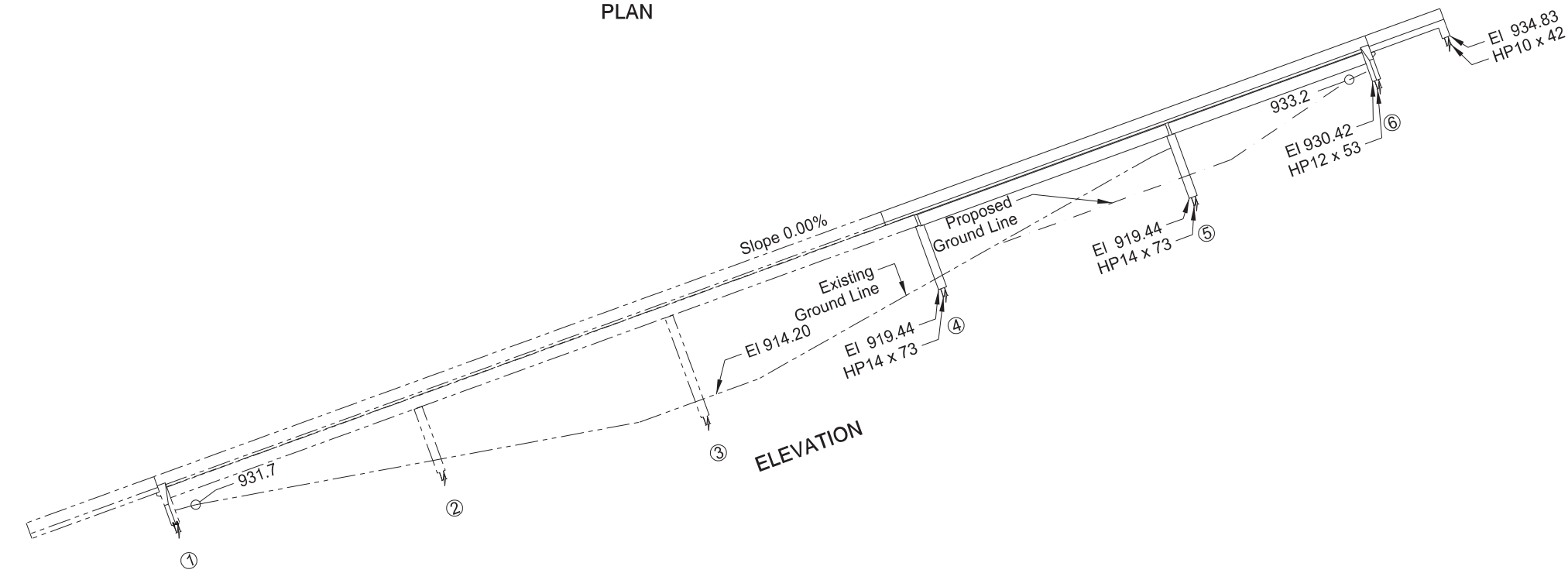
ND 18

23 U.S.C. § 407 Documents
 NDDOT Reserves All Objections

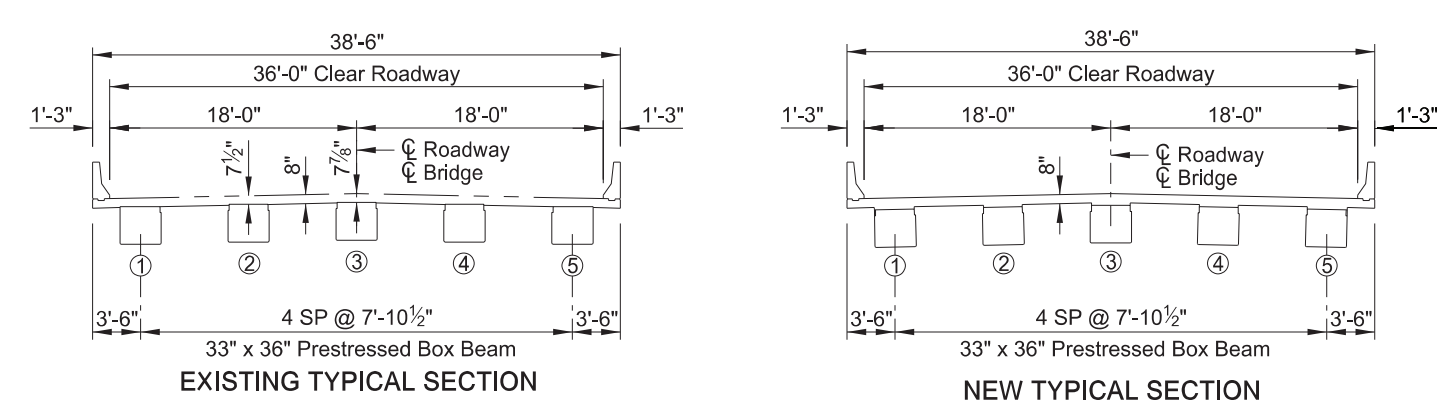
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	1



PLAN



ELEVATION



EXISTING TYPICAL SECTION

NEW TYPICAL SECTION



DESIGN STRENGTHS:

f_c = 3,000 psi ~ Class AE-3 Concrete
 f_c = 4,000 psi ~ Class AAE-3 Concrete
 f_c = 5,500 psi ~ Prestressed Beam Concrete
 f_y = 60,000 psi ~ Reinforcing Steel

Load & Resistance Factor Design

SPECIAL PROVISIONS	
SSP 2	MIGRATORY BIRD TREATY ACT
STANDARD DRAWINGS	
D-622-1, D-714-18, D-900-1	
F.W.S. 15 PSF	
HL-93 DESIGN LOADING	
MAPLE RIVER	
BRIDGE LAYOUT	
ND DEPARTMENT OF TRANSPORTATION BRIDGE DIVISION	
<i>Jason Thorenson</i>	Thorenson, Jason R. 11/06/23
DRAWING NO.	18-064.955-1

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	S-8-018(106)064	170	2

NOTES

- 100 SCOPE OF WORK: This project consists of lengthening the existing bridge by removing a portion of the existing bridge deck, pier 4 and north abutment 5. A new span will be added to the north end using prestressed concrete spread box beams. A new pier 4, pier 5, and abutment 6 will be constructed. The overall bridge length will be lengthened from 270'-0" to 323'-0". Temporarily support the existing superstructure during pier replacement. The existing bridge has a clear roadway width of 36'-0" and has five 33 x 36 prestressed concrete spread box beams. The entire 80 feet of north pile supported approach slab will be removed and replaced and an additional pile supported approach slab will be constructed at the north end of the bridge.
- 100 GENERAL: Include the cost of furnishing and placing preformed expansion joint filler, polystyrene, concrete inserts, silicone sealant, waterproof membrane, and other miscellaneous items in the price bid for Class AE-3 and AAE-3 concrete.
- 202 REMOVAL OF STRUCTURE: Remove designated portions of the structure in a manner that prevents damage to the remaining structure. Remove a portion of the existing bridge deck, pier 4 and abutment 5 as seen on Section 170 Sheet 5. Remove the existing 80'-0" approach slab on the north end of the bridge. Remove piling to 1 foot below final grade. Include the substructure, superstructure, and approach slab concrete removal in the lump sum bid item, "Removal of Structure."
- 210 EXCAVATION: Include the excavation costs at the abutment and approach slab footing, as shown in the "Detail at Abutment", and the excavation costs at the pier 5 in the lump sum bid item, "Class 1 Excavation." Include the excavation costs at pier 4 in the lump sum bid item, "Class 2 Excavation."
- 602 CLASS AE-3 AND AAE-3 CONCRETE: The strength requirements of Section 802.01 A.2 "Class AE and AAE Mixes" are revised to develop a design compressive strength of 3,000 psi (AE-3) and 4,000 psi (AAE-3) at 28 days.
- 602 DIAPHRAGMS AND ENDWALLS: Place the pier diaphragm and endwall concrete at the same time as the deck concrete.
- 602 BRIDGE DECK AND APPROACH SLAB CRACK SEALING: The entire deck will be crack sealed. The cost to crack seal the new deck will be included in the Class AAE-3 Concrete. The existing deck and barrier will be paid separately with the bid item "Crack Sealing". After the penetrating water repellent has been applied and is dry, the Engineer will perform a visual inspection of the bridge deck and approach slabs to determine the need for crack sealing. Repair all cracks designated by the Engineer at this time.

Perform a visual inspection of the bridge deck surface and mark all visible cracks appearing on the top surface 0.007" or greater in width at its widest segment or as directed by the Engineer.

Immediately before applying the sealer, clean the cracks by removing all dust and debris with compressed air. Seal the cracks with a two-part epoxy in accordance with the manufacturer's recommendations. Chase crack with the sealant application to limits of crack, including those portions that are narrower than 0.007" wide. The epoxy sealer

may be Paulco TE-2501 (Viking Paints, Inc.), Dural 50 LM (Euclid Chemical Co.), TK-9000 or TK-2110 (TK Products), or an approved equal. Include all work and materials associated with the deck and approach slab crack sealing in the price bid for the Class AAE-3 Concrete and Approach Slab bid items.

- 602 SURFACE FINISH "D": Apply Surface Finish "D" to the inside and top surfaces of the bridge barrier. Match the surface finish and color to the existing bridge barrier.
- 604 PRESTRESSED BEAMS: Set prestressed beams on bearing seats without field bending substructure or beam reinforcing steel.
- 612 REBAR COUPLERS: Use approved mechanical connectors for the couplers capable of developing 125% of the reinforcing steel specified yield strength. Include the cost of furnishing and placing rebar couplers in the price bid for Grade 60 reinforcing steel.
- 616 STRUCTURAL STEEL: Approximately 850.6 lbs of structural steel has been estimated for the ice noses. Include all costs to provide and install the ice noses in the price bid for "Structural Steel." Shop drawings for ice nose structural steel are not required.
- 622 PILING: Perform landslide repair grading as shown in SEC 60 Sheet 3 prior to driving substructure piling. Drive approach slabs piling with a diesel hammer with with an operational hammer energy and ram weight (minimum of 3,000 pounds) of at least 45,000 foot-pound-tons computed by the formula:

$$W(E-12,936) + 0.704E$$

Drive pier piling with a diesel hammer with an operational hammer energy and ram weight (minimum of 8,000 pounds) of at least 92,000 foot-pound-tons computed by the formula:

$$W(E-44,352) + 0.675E$$

Drive abutment pile with a diesel hammer with an operational hammer energy and ram weight (minimum of 6,700 pounds) of at least 80,000 foot-pound-tons computed by the formula:

$$W(E-22,176) + 0.545E$$

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

Run the hammers at an energy that produces a penetration at bearing between 1/2 inch and 3 inches in the last 10 blows.

Stop pile driving operations if bearing is not yet obtained at a depth approximately 10 feet beyond the estimated depth. Wait 24 hours to allow pile setup to occur. After 24 hours warm the



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NOTES

hammer with a minimum of 20 blows by striking the ground or timber mats. .

900 ELEVATION CHECK POINTS: Prior to removal of the existing concrete, the District will record the elevations of the existing elevation check points at all substructures. Place six new carriage bolts on the top of the barrier at the piers and abutment to serve as elevation check points. Include the cost for this item in the unit price bid for "Class AAE-3 Concrete."

930 SHORING: Support of the superstructure temporarily during pier construction is the responsibility of the Contractor. Use piling as part of the temporary support. The exact size, number and location of these piling will be dependent on the Contractor's shoring design. Submit plans stamped by a PE registered in ND for the shoring to the Engineer for review two weeks before removing Pier 4. Support the superstructure at a point no further than 3'-0" from the front face of the pier. The unfactored deadload reaction per beam at the pier is approximately 27 tons. No live loads will be allowed on the bridge while temporary shoring is provided.

Leave the temporary supports in place until the concrete in the pier has reached 70% of its design strength.

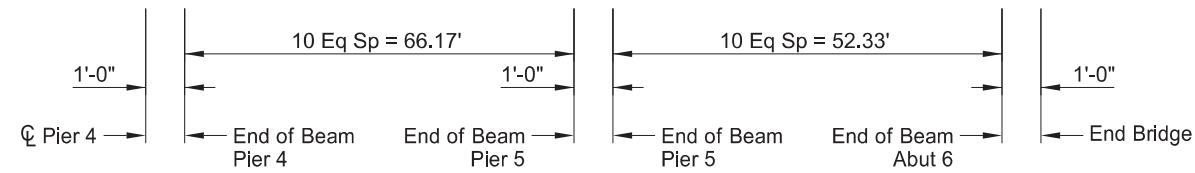
Include all costs for furnishing and driving the HP10 x 42 Pile used for the shoring in the bid item "Steel Piling HP 10 x 42". Payment will be made for a maximum of 4 driven pile. Remove the shoring piling to one foot below final ground surface. Include all labor, equipment and material required for temporary support of the superstructure except the HP10 x 42 piling in the bid item "Shoring."



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 NDDOT Reserves All Objections

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☉ Beam 1	938.67	938.67	938.69	938.70	938.71	938.71	938.72	938.71	938.71	938.70	938.69	938.67	938.67	938.68	938.68	938.69	938.69	938.69	938.69	938.69	938.68	938.68	938.67	938.67
☉ Beam 2	938.84	938.84	938.85	938.86	938.87	938.88	938.88	938.88	938.87	938.86	938.85	938.84	938.84	938.84	938.85	938.85	938.86	938.86	938.86	938.86	938.85	938.85	938.84	938.84
☉ Beam 3	939.00	939.00	939.01	939.03	939.04	939.04	939.04	939.04	939.04	939.03	939.01	939.00	939.00	939.01	939.01	939.02	939.02	939.02	939.02	939.02	939.01	939.01	939.00	939.00
☉ Beam 4	938.84	938.84	938.85	938.86	938.87	938.88	938.88	938.88	938.87	938.86	938.85	938.84	938.84	938.84	938.85	938.85	938.86	938.86	938.86	938.86	938.85	938.85	938.84	938.84
☉ Beam 5	938.67	938.67	938.69	938.70	938.71	938.71	938.72	938.71	938.71	938.70	938.69	938.67	938.67	938.68	938.68	938.69	938.69	938.69	938.69	938.68	938.68	938.67	938.67	938.67



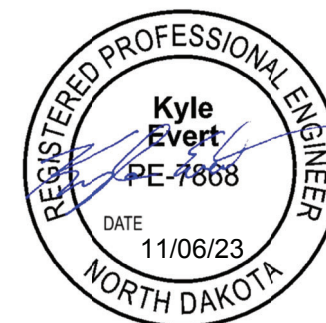
Beam 1 is west beam.
 SCREED ELEVATION

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	0201	FOUNDATION PREPARATION	EA	1
602	0130	CLASS AAE-3 CONCRETE	CY	165.9
602	1130	CLASS AE-3 CONCRETE	CY	126.5
602	1134	PILE SUPPORTED APPROACH SLAB	SY	115.5
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	1,508
602	1260	BRIDGE DECK CRACK SEALING	LF	298
612	0115	REINFORCING STEEL-GRADE 60	LBS	11,767
612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS	34,676
616	0360	STRUCTURAL STEEL	LBS	850.6
622	0020	STEEL PILING HP 10 X 42	LF	480
622	0040	STEEL PILING HP 12 X 53	LF	325
622	0060	STEEL PILING HP 14 X 73	LF	660
930	8230	SHORING	EA	1
930	9537	ABUTMENT UNDERDRAIN SYSTEM	EA	1

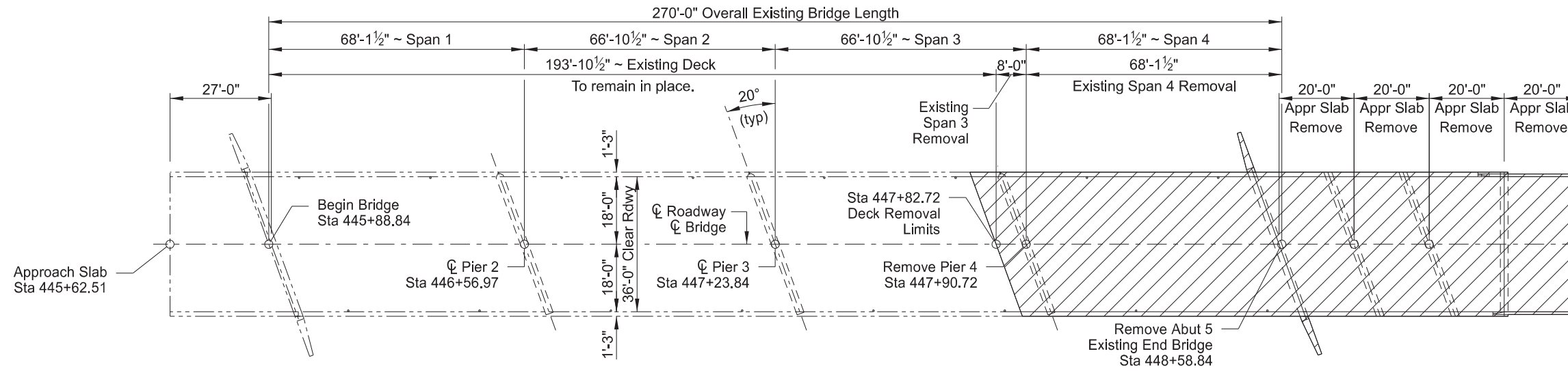
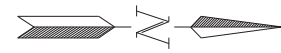
NOTE:

After deck and endwall concrete removal and prior to abutment removal, record the top of existing concrete beam elevations at ☉ Bearing. Submit the top of beam elevations to the Bridge Division for review to see if any adjustments need to be made to the bridge profile and/or bearing seat elevations. Allow the Bridge Division 3 days for review.

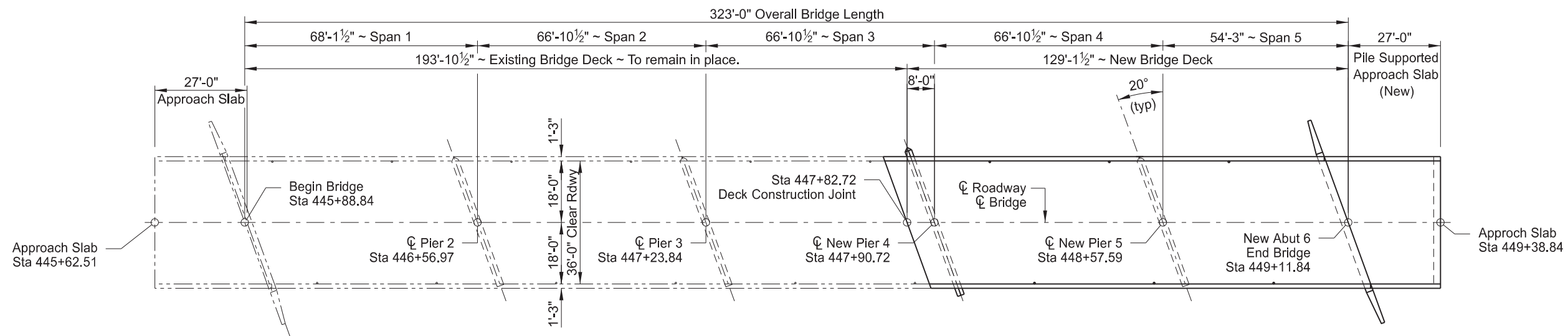


MAPLE RIVER	
SCREED ELEVATIONS, BID ITEMS & QUANTITIES	
DRAWING NO.	18-064.955-4

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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EXISTING BRIDGE PLAN



NEW BRIDGE PLAN

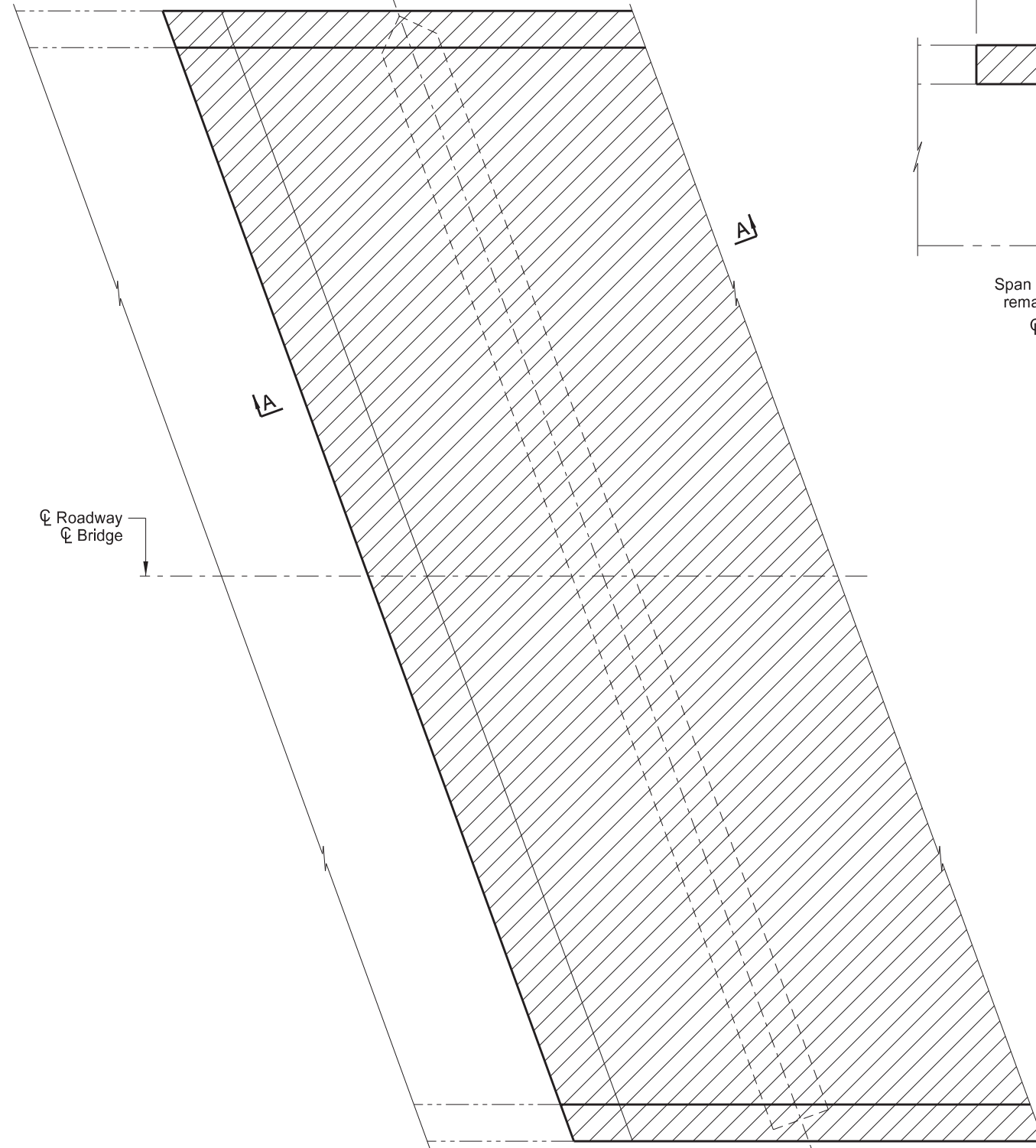
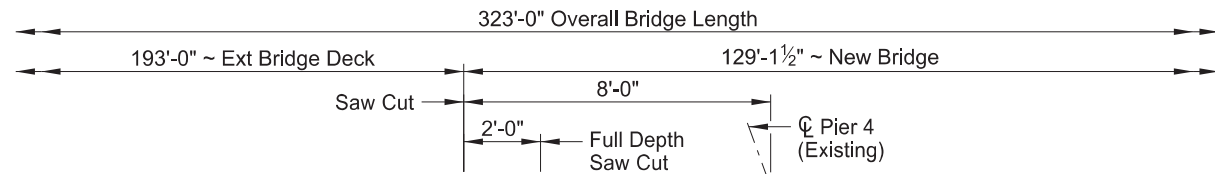
Hatched area indicates concrete bridge deck, substructures & approach slabs to be removed.



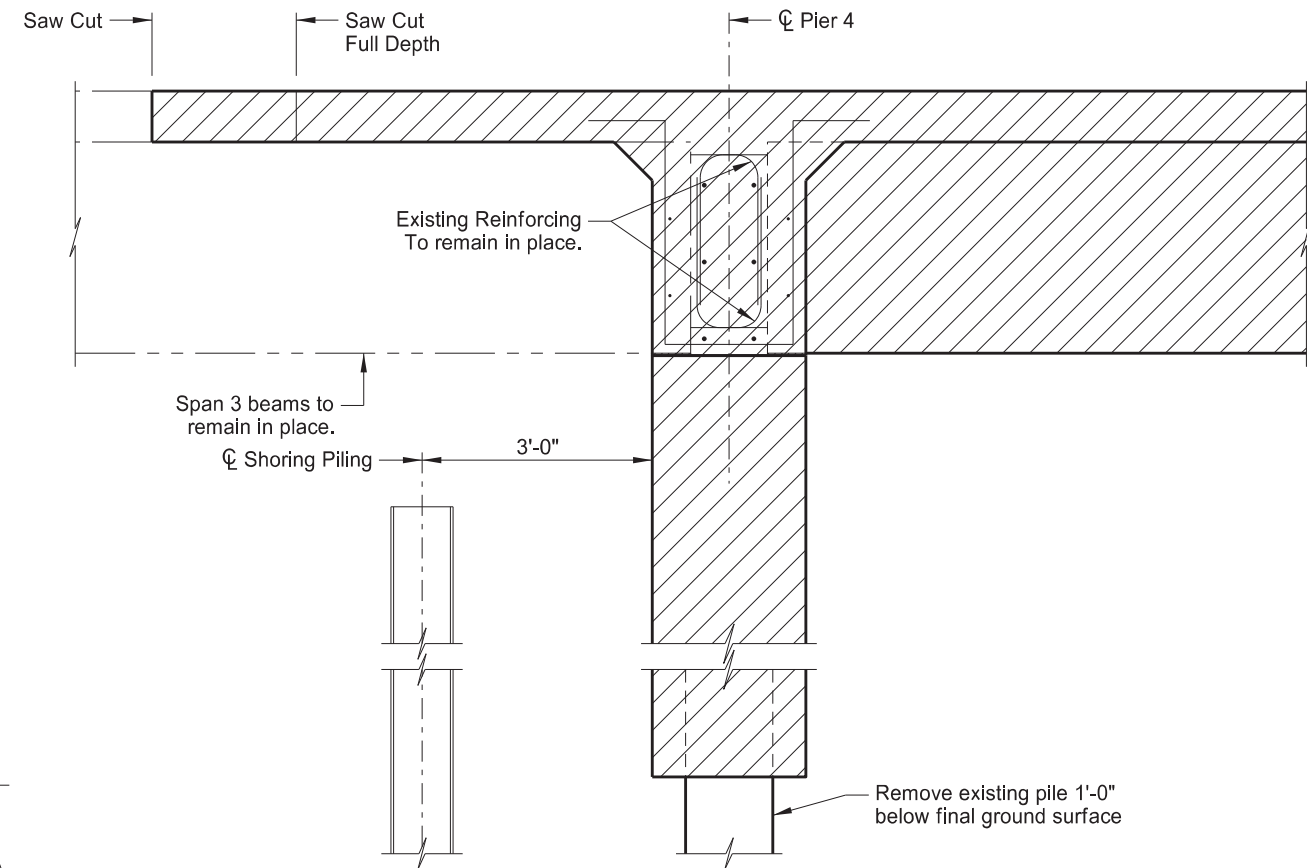
MAPLE RIVER	
EXISTING BRIDGE REMOVAL & NEW BRIDGE LAYOUT	
DRAWING NO.	18-064.955-5

23 U.S.C. § 407 Documents
NDDOT Reserves All Objections

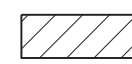
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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PLAN



A-A

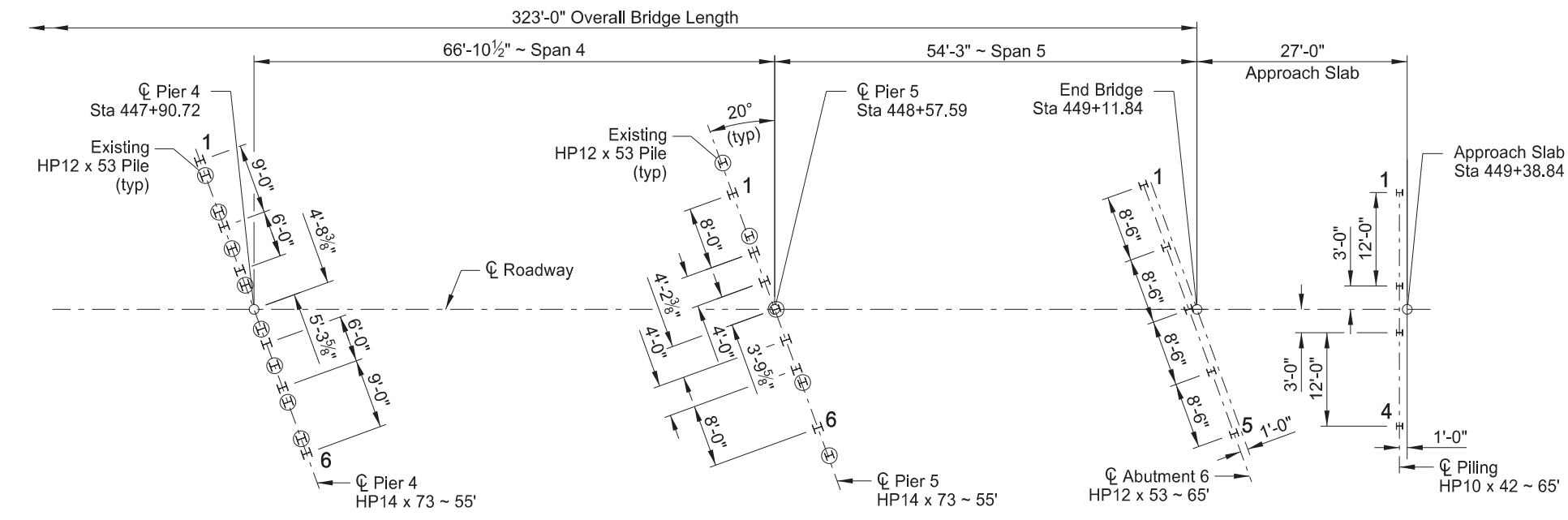
 Hatched area indicates concrete to be removed.



MAPLE RIVER
REMOVAL DETAILS

DRAWING NO. 18-064.955-6

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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NOTE:

For double acting or single acting diesel hammers, calculate the bearing resistance of piles by the following formula:

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

Where:

- ΦRn = Nominal pile bearing resistance, in pounds. The Φ factor is included in equation.
- 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.

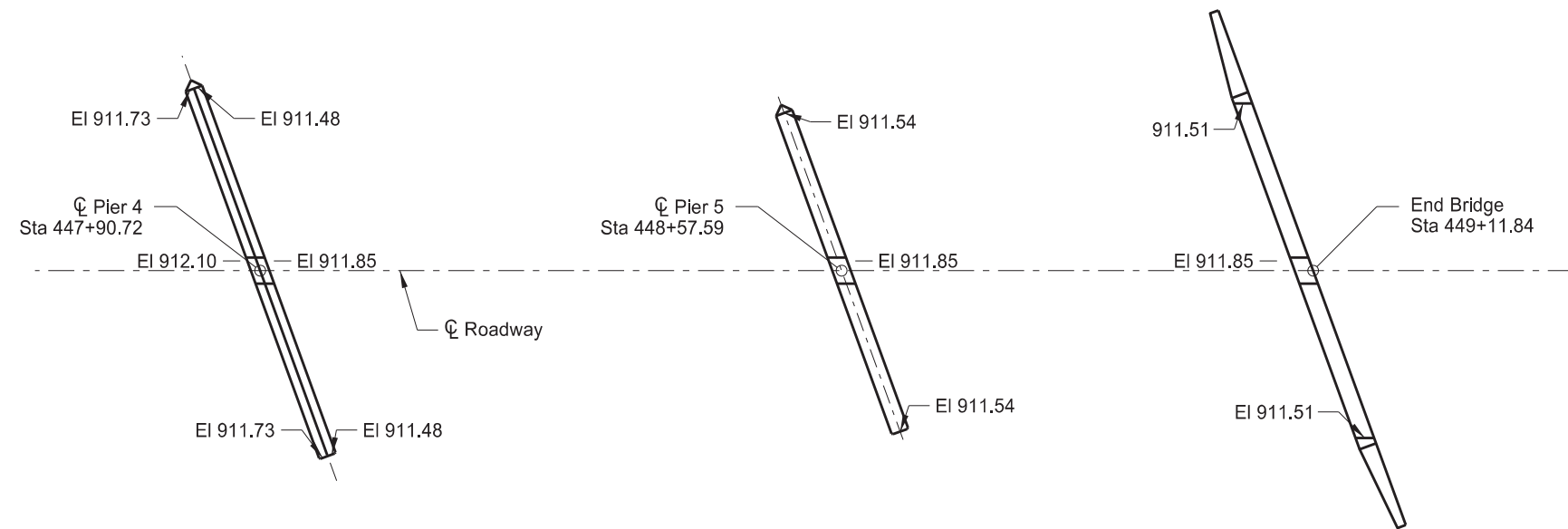
For single acting hammers, calculate E by multiplying observed stroke (ft) and W (lbs).

Drive the HP10 x 42 Pile to 105 tons.
Drive the HP12 x 53 Pile to 130 tons.
Drive the HP14 x 73 Pile to 180 tons.

PILING LAYOUT

NOTES:

The circled pile are existing pile to be removed to cutoff 2'-0" below grade.



Elevations shown are to top of finished concrete.

BEARING ELEVATIONS

PILE COORDINATES			
	PILE	NORTHING	EASTING
PIER 4	1	413,829.41	2,790,393.68
	6	413,844.73	2,790,430.63
PIER 5	1	413,897.95	2,790,394.90
	6	413,910.20	2,790,424.46
ABUT 6	1	413,950.62	2,790,391.45
	5	413,963.64	2,790,422.86
APPR SLAB	1	413,983.52	2,790,390.98
	4	413,984.83	2,790,420.95



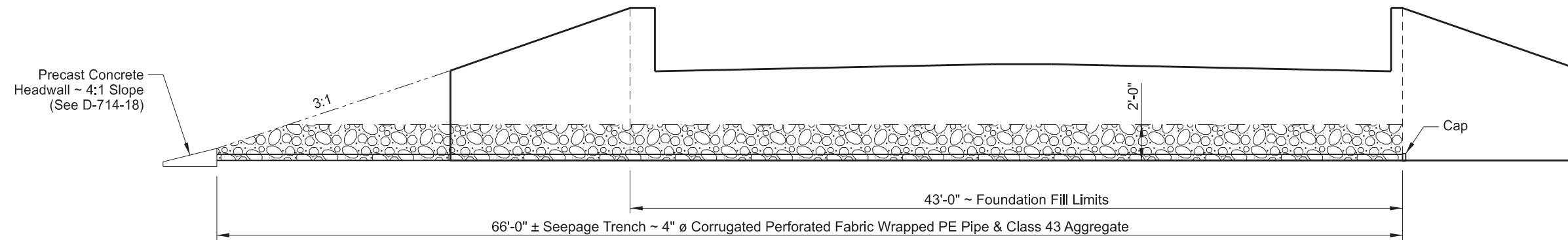
MAPLE RIVER

PILING LAYOUT & BEARING ELEVATIONS

DRAWING NO. 18-064.955-7

23 U.S.C. § 407 Documents
 NDDOT Reserves All Objections

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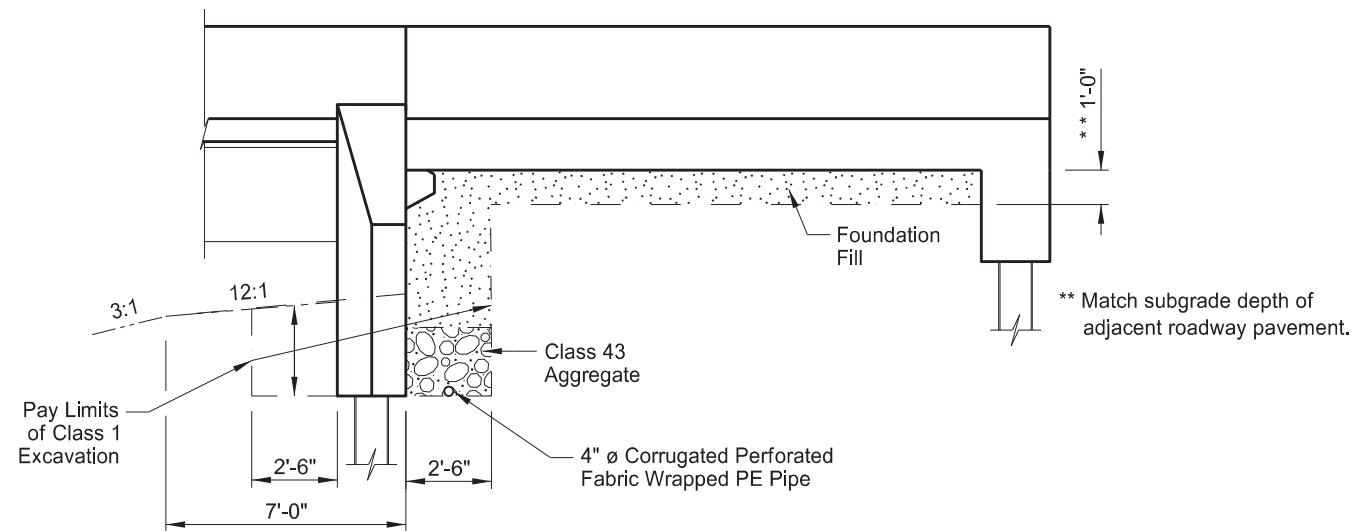


BACK FACE OF ABUTMENT

NOTES:

Use corrugated perforated fabric wrapped PE pipe that meets the requirements of Section 830.03 A.4. Provide fabric wrapping for the pipe that meets the requirements of Section 858.01 for D3 or D4 drainage fabric. Provide aggregate that meets the requirements of Section 816.03, Class 43. Provide foundation fill that meets the requirements of Section 210. Compact the foundation fill beneath the approach slab according to Section 714.04 A.10.

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

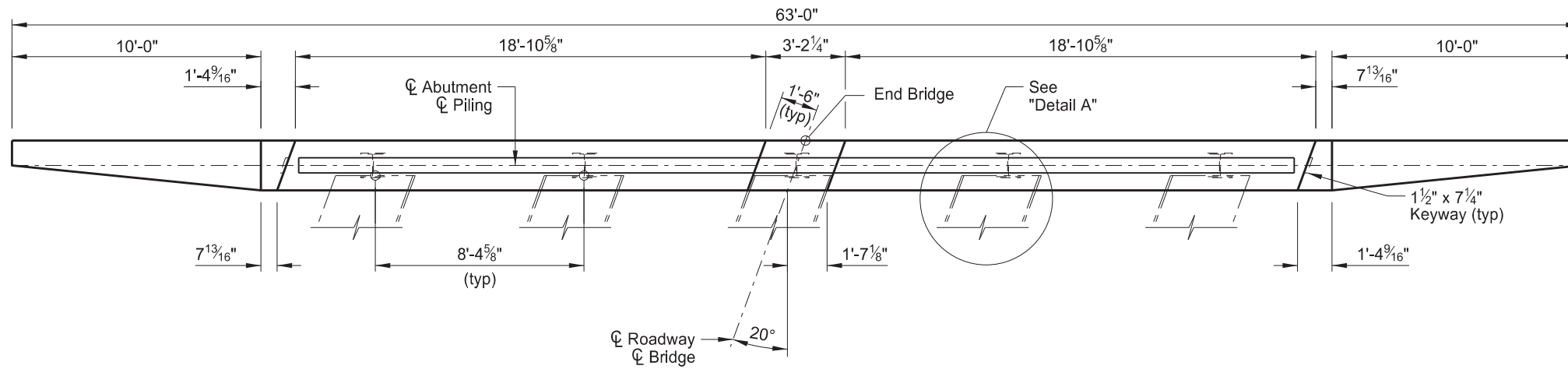


DETAIL AT ABUTMENT

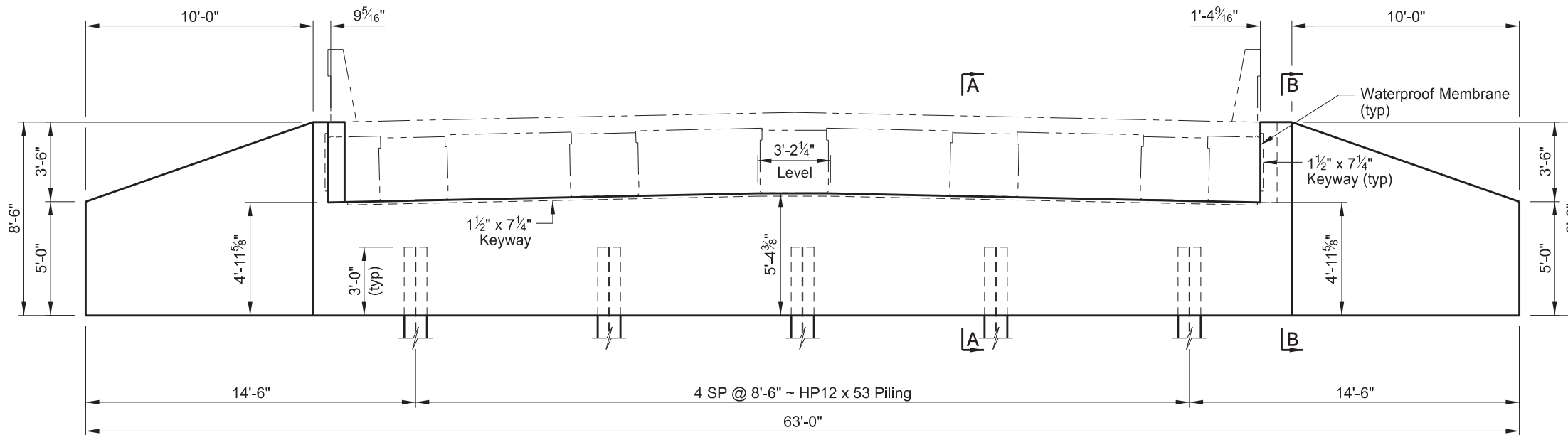


MAPLE RIVER	
ABUTMENT UNDERDRAIN & EXCAVATION DETAILS	
DRAWING NO.	18-064.955-8

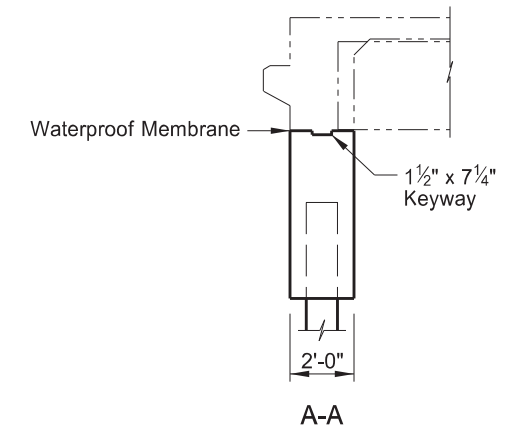
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	9



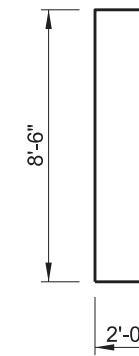
PLAN



ELEVATION



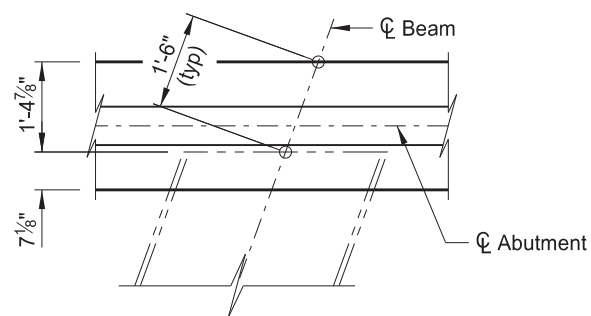
A-A



B-B

NOTE:

Use waterproof membrane that meets the requirements of Section 602.03 B. Center the waterproof membrane (1'-0" minimum width) on the joint.

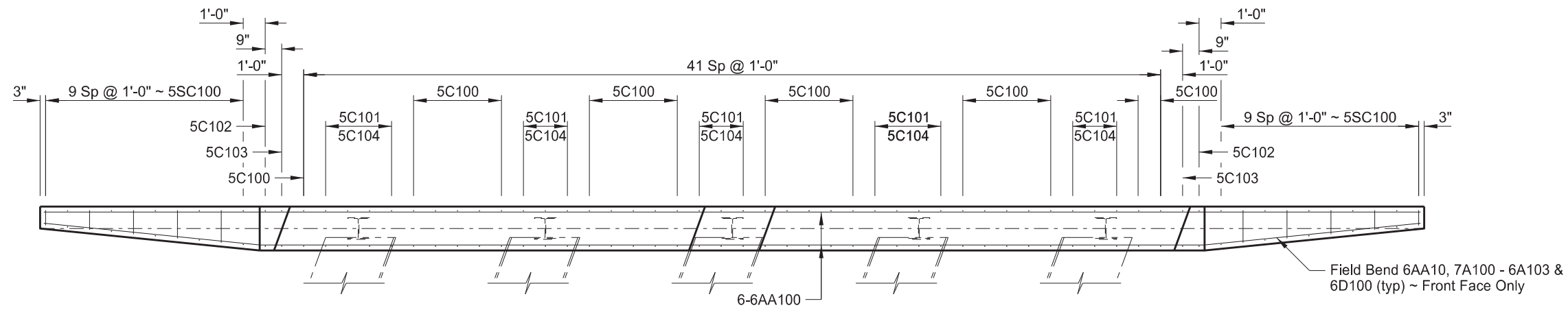


DETAIL A

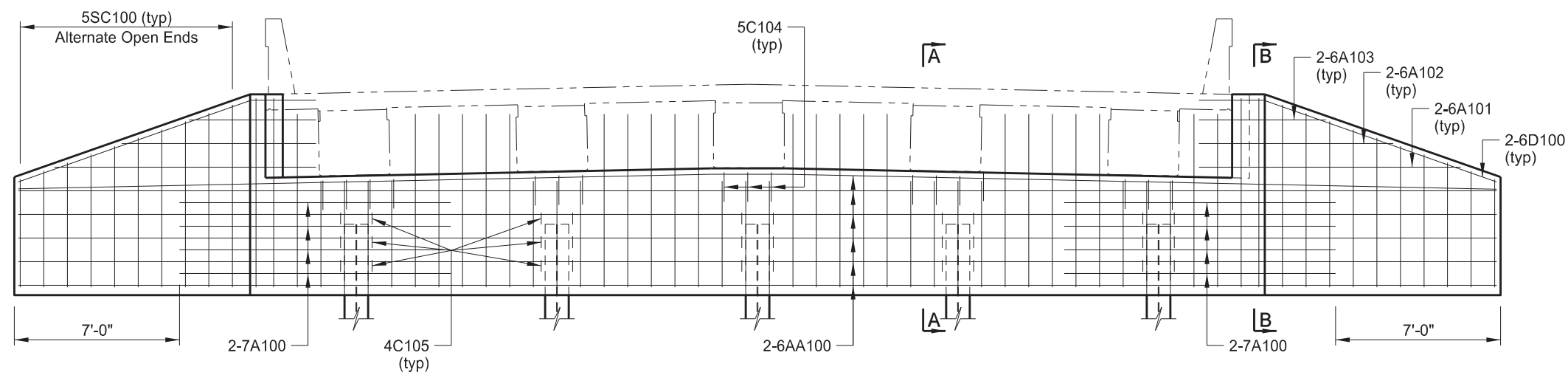


QUANTITIES	
SEE DWG 18-064.955-10	
MAPLE RIVER (SHOWING DIMENSIONS) ABUTMENT 6 DETAILS	
DRAWING NO.	18-064.955-9

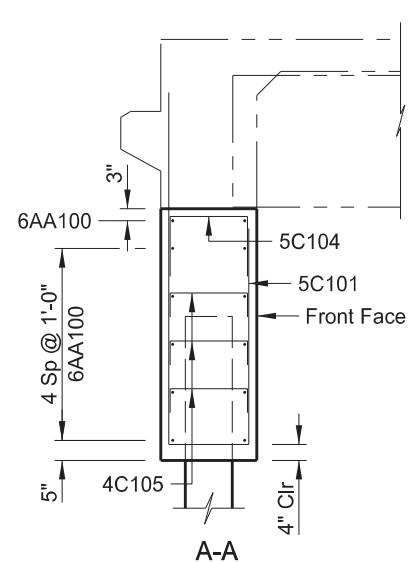
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	10



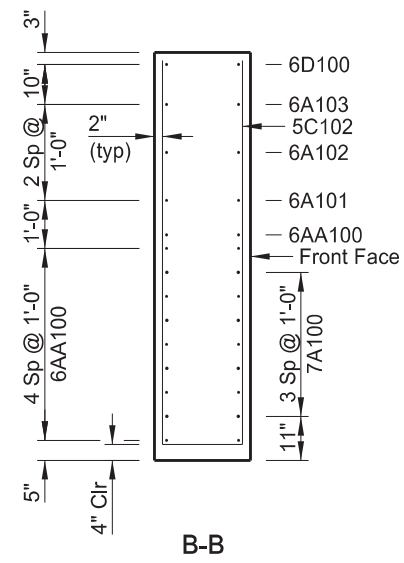
PLAN



ELEVATION



A-A



B-B



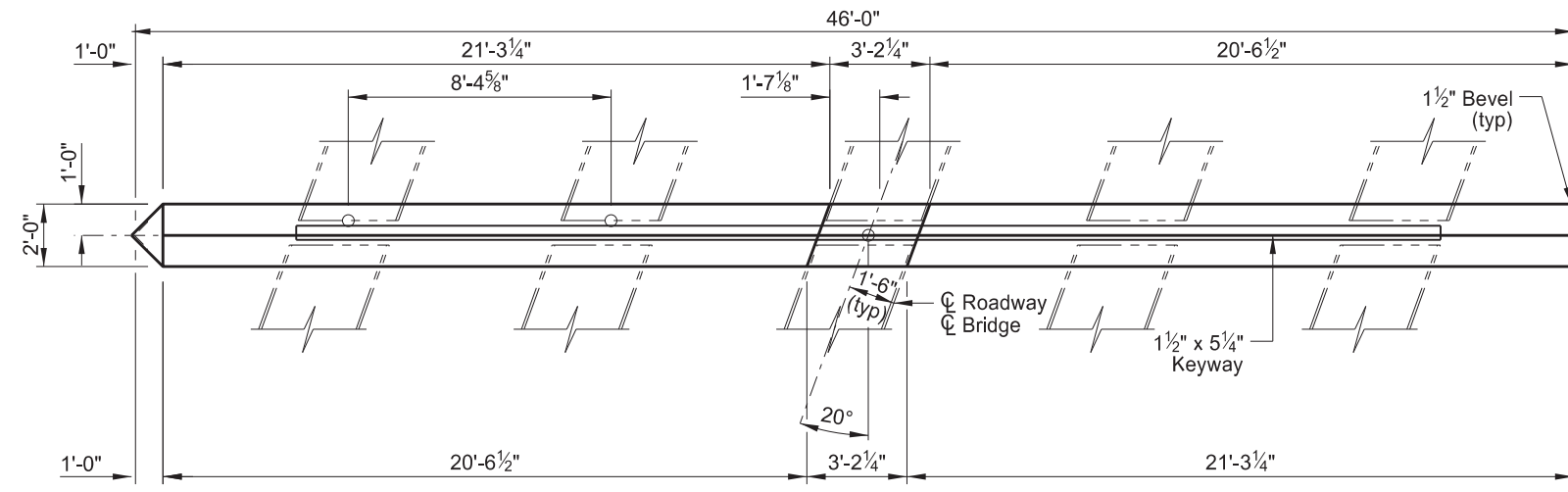
QUANTITIES	(ABUTMENT)
CLASS AE-3 CONCRETE	25.0 CY
REINFORCING STEEL	2,863 LBS

MAPLE RIVER
(SHOWING DIMENSIONS)
ABUTMENT 6 DETAILS

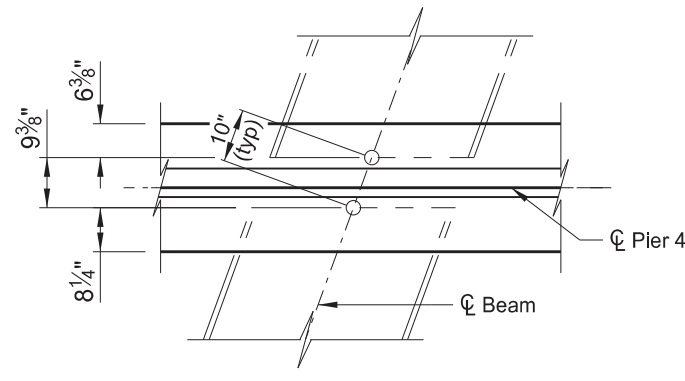
DRAWING NO.	18-064.955-10
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23 U.S.C. § 407 Documents
 NDDOT Reserves All Objections

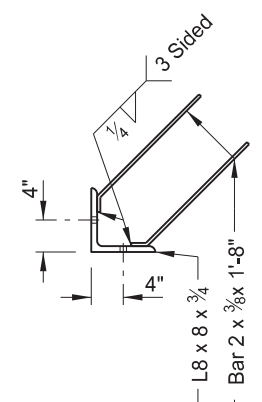
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	11



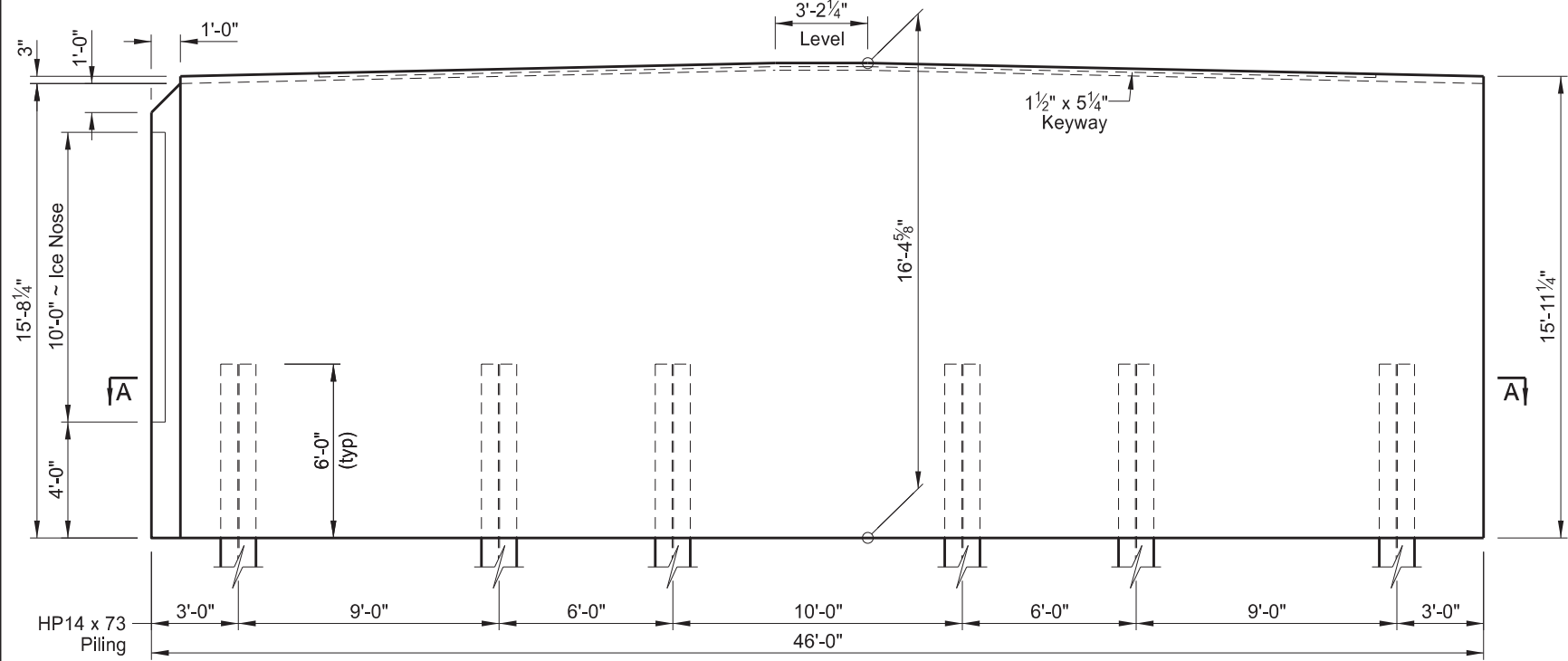
PLAN



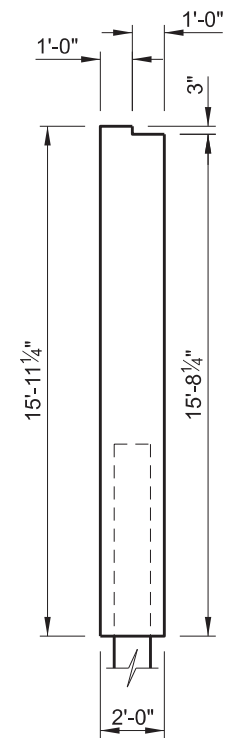
DETAIL B



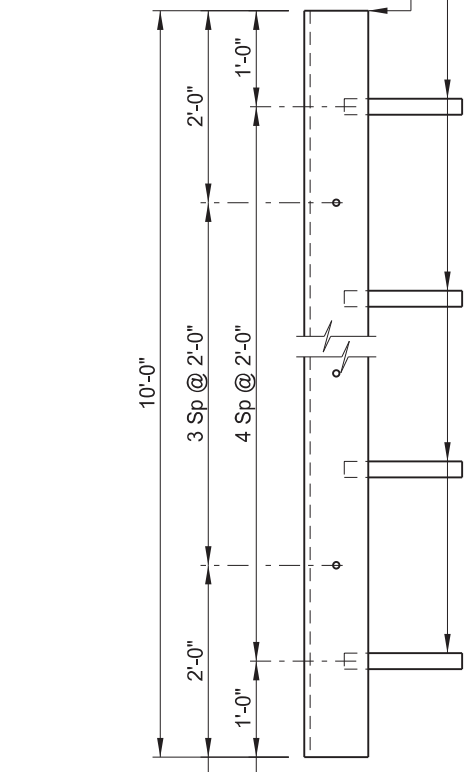
ICE NOSE DETAIL



ELEVATION



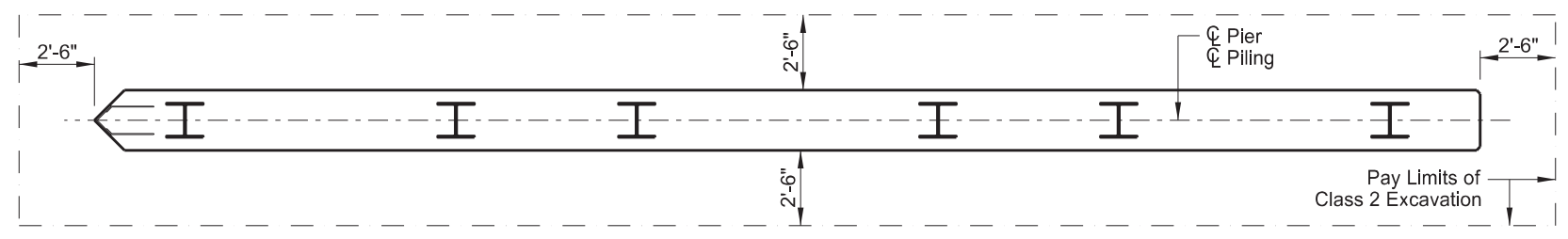
END VIEW



13/16" Open Holes (Both Legs)
 2 x 3/8 x 1'-8" Bars (Both Legs)

Galvanize in accordance with Section 854 after fabrication.

ICE NOSE DETAIL

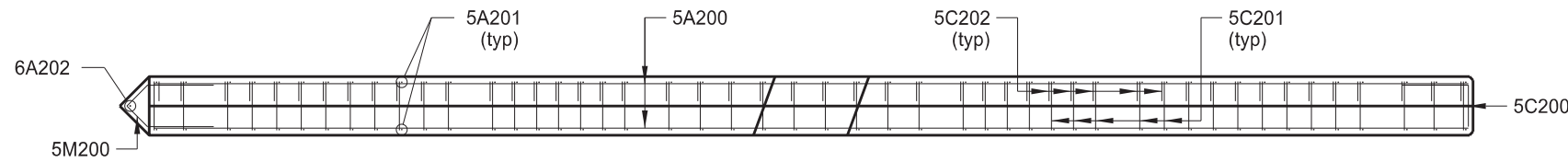


A-A

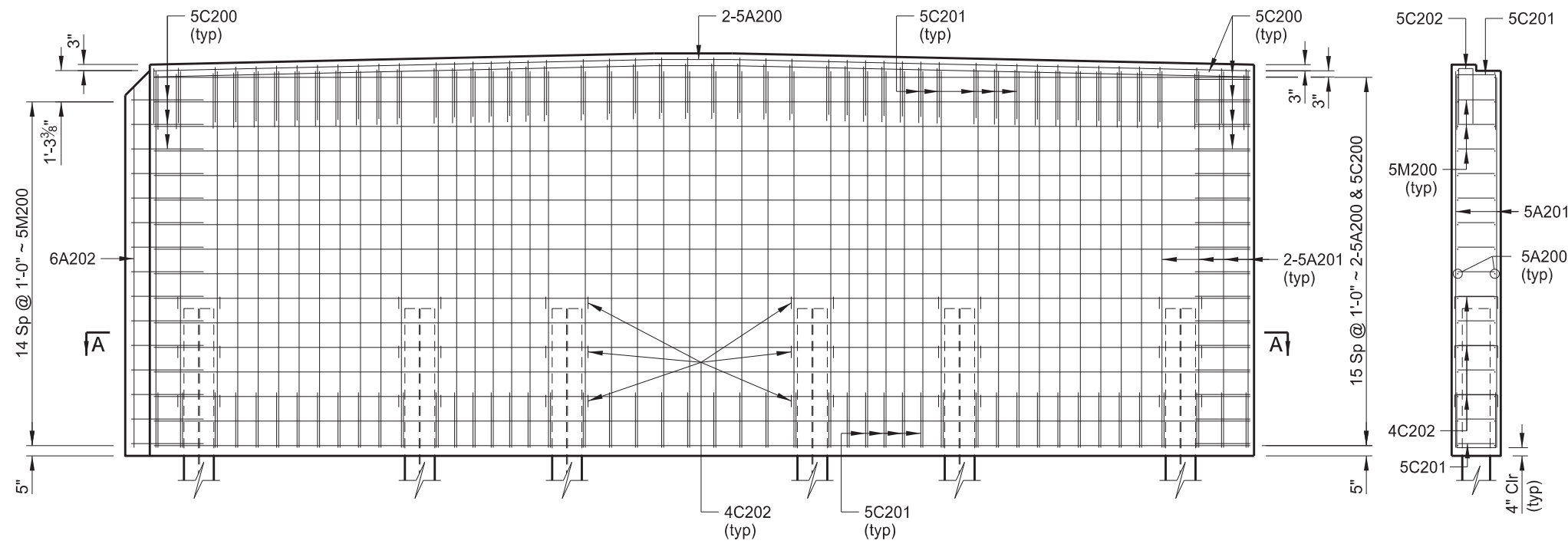


QUANTITIES	
SEE DWG 18-064.955-12	
MAPLE RIVER (SHOWING DIMENSIONS) PIER 4 DETAILS	
DRAWING NO.	18-064.955-11

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	12

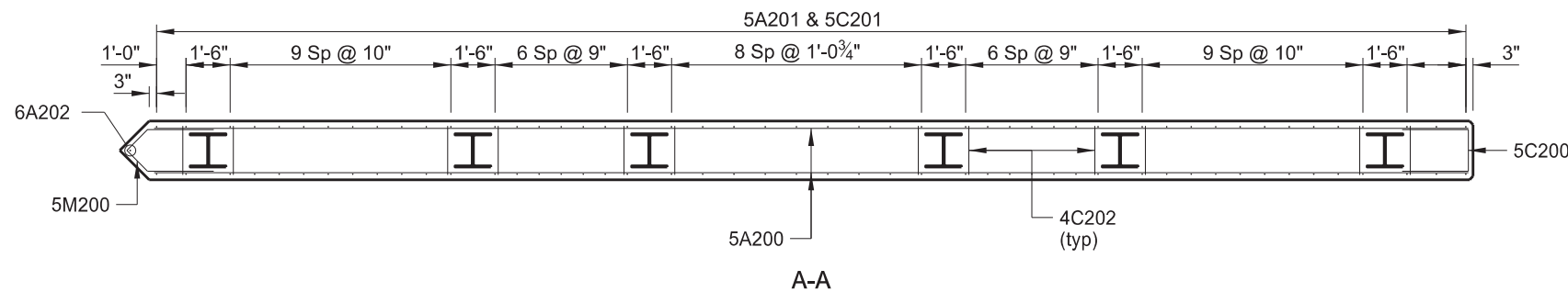


PLAN

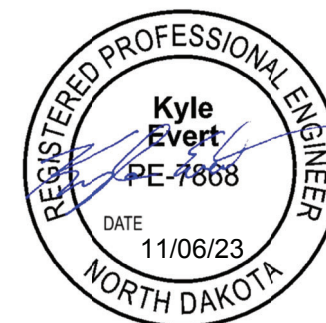


ELEVATION

END VIEW



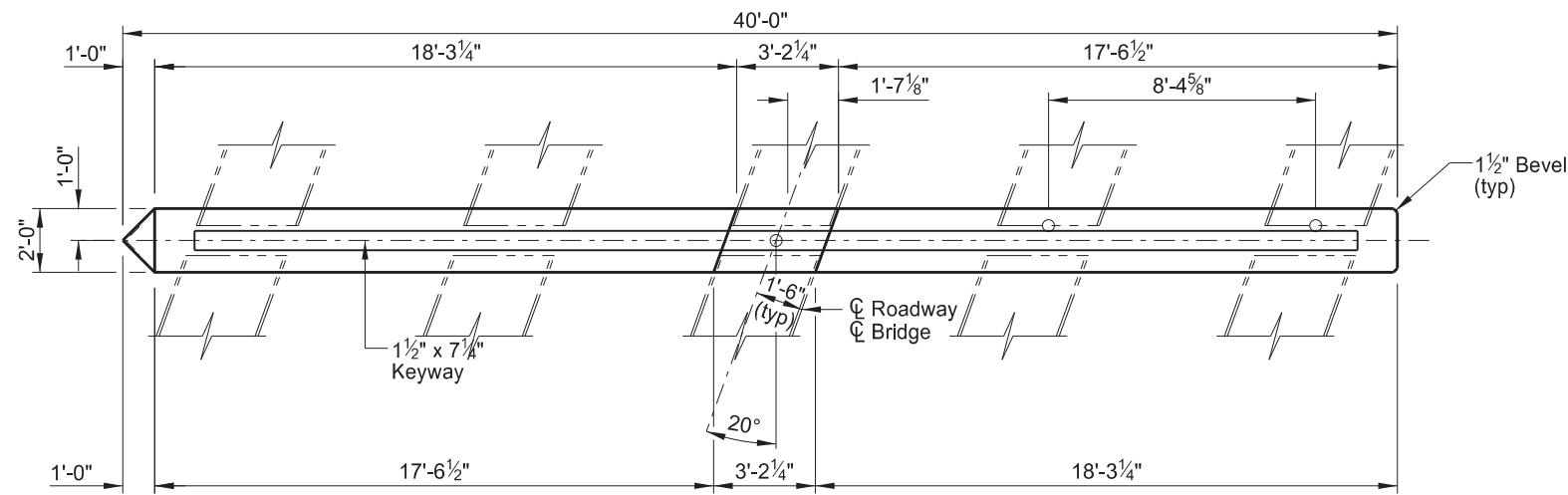
A-A



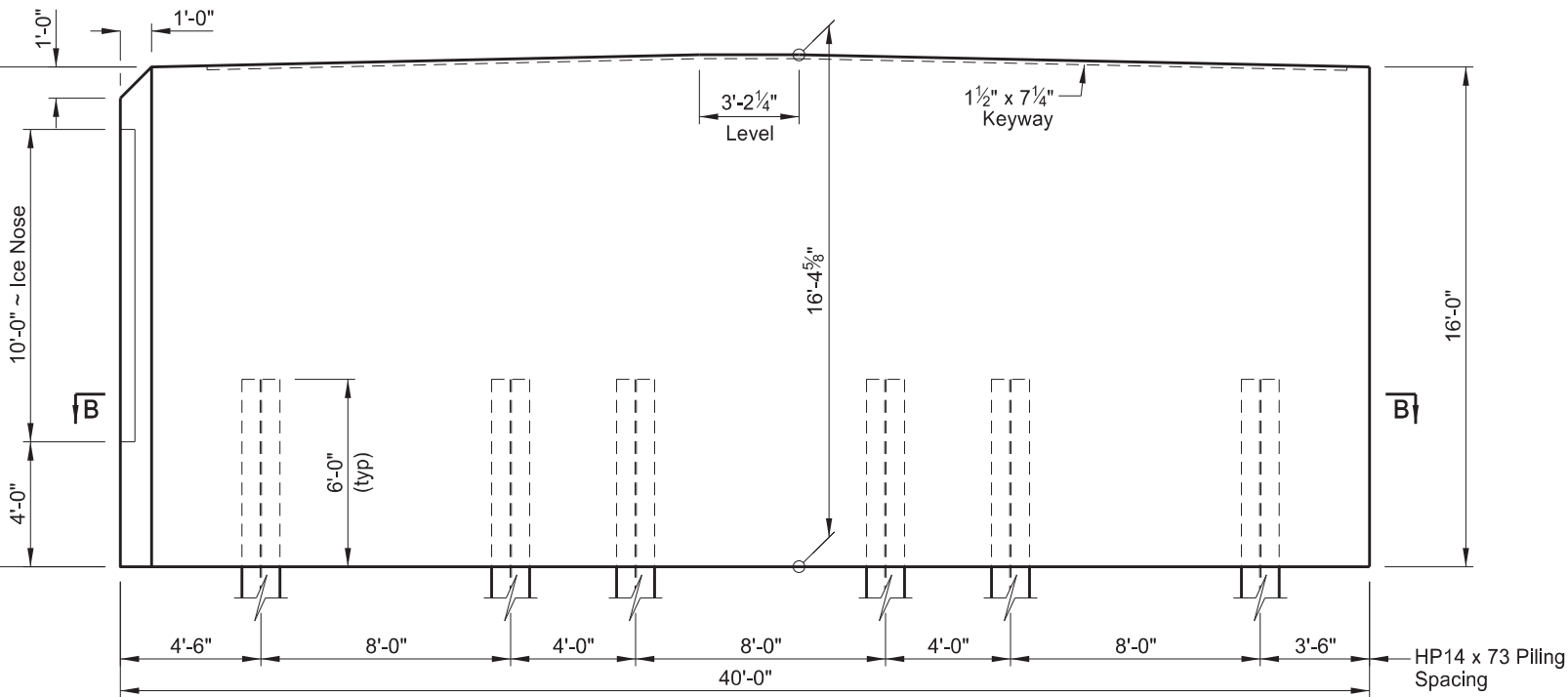
QUANTITIES	
CLASS AE-3 CONCRETE	54.1 CY
REINFORCING STEEL	4,150 LBS
STRUCTURAL STEEL	425.3 LBS
MAPLE RIVER (SHOWING REINFORCING) PIER 4 DETAILS	
DRAWING NO.	18-064.955-12

23 U.S.C. § 407 Documents
 NDDOT Reserves All Objections

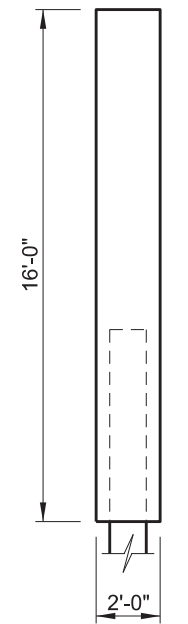
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	13



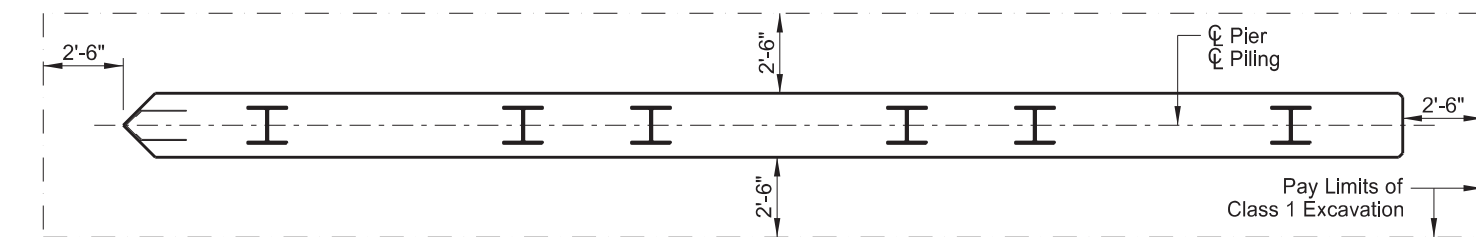
PLAN



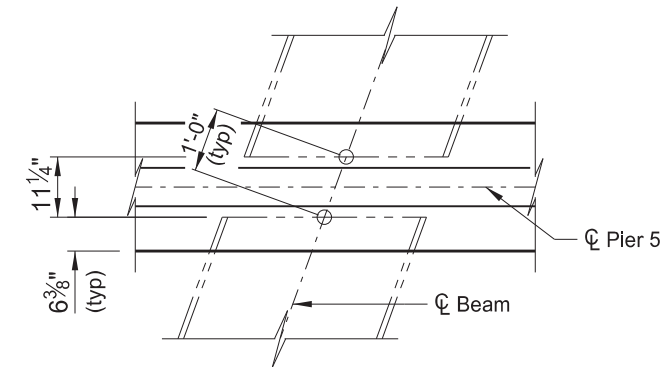
ELEVATION



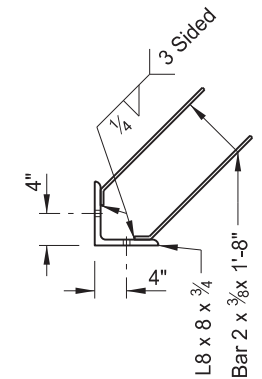
END VIEW



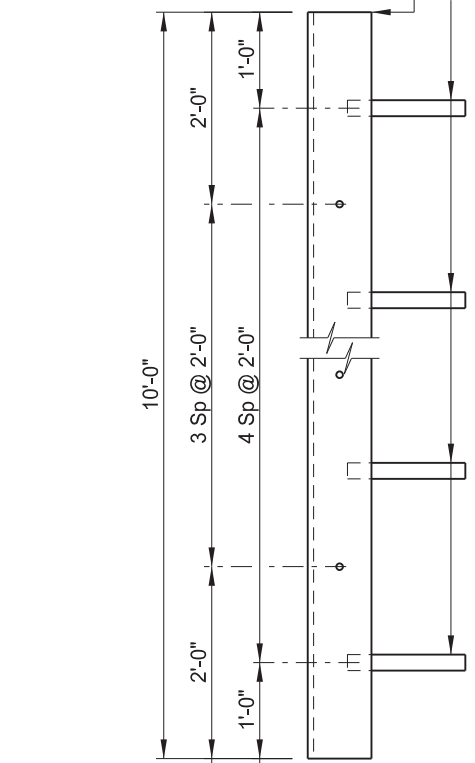
B-B



DETAIL B



ICE NOSE DETAIL



1 3/16" Open Holes (Both Legs)
 2 x 3/8 x 1'-8" Bars (Both Legs)

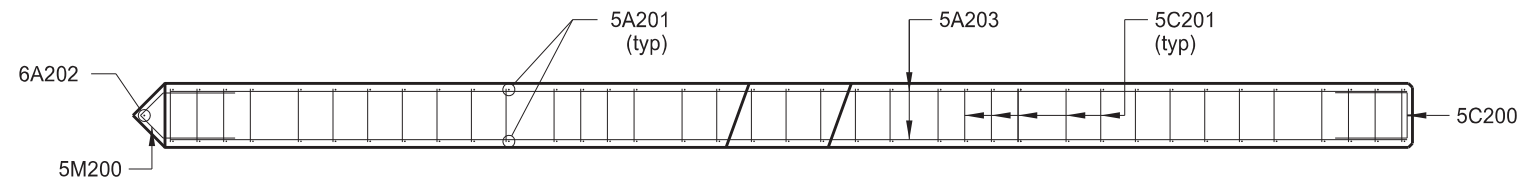
Galvanize in accordance with Section 854 after fabrication.

QUANTITIES	
SEE DWG 18-064.955-14	
MAPLE RIVER (SHOWING DIMENSIONS) PIER 5 DETAILS	
DRAWING NO.	18-064.955-13

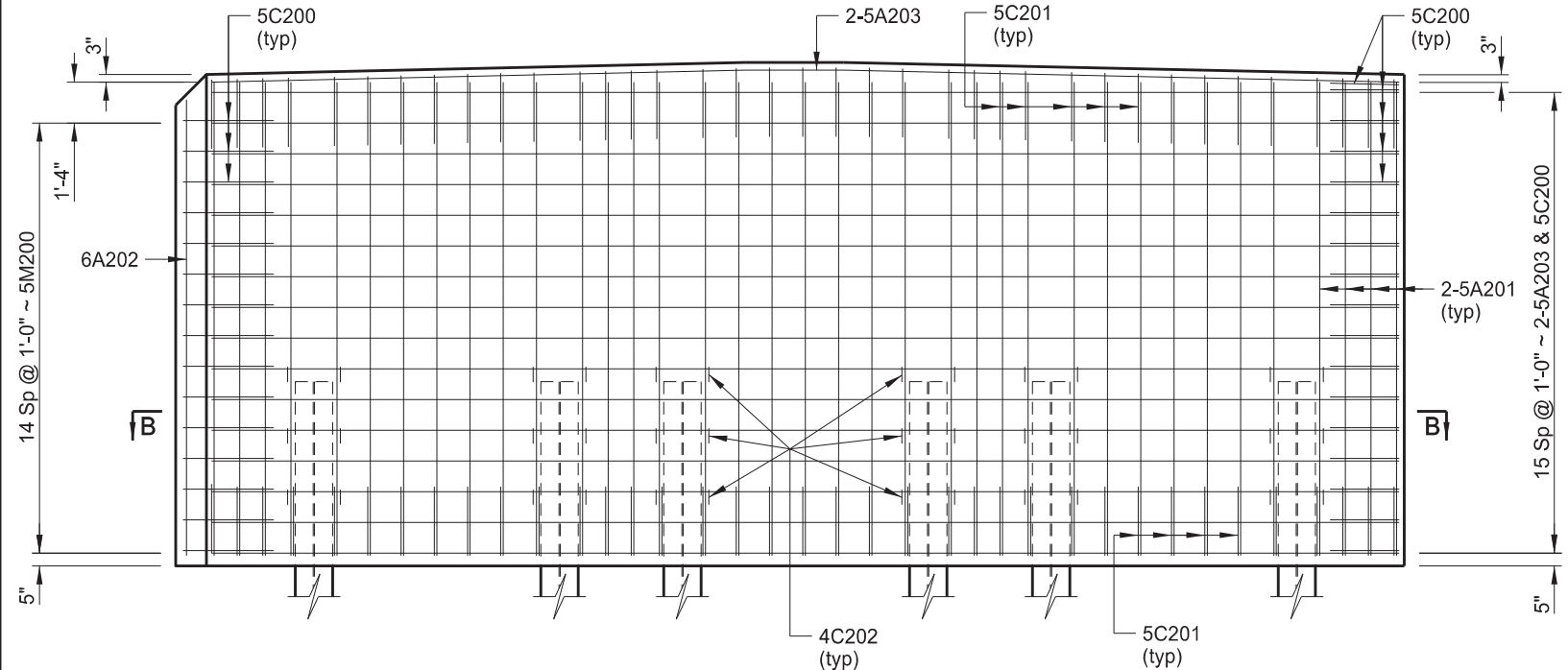


23 U.S.C. § 407 Documents
 NDDOT Reserves All Objections

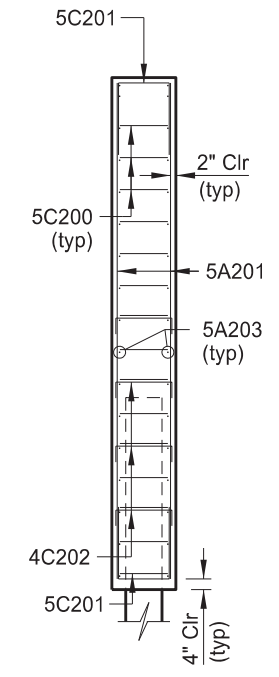
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	14



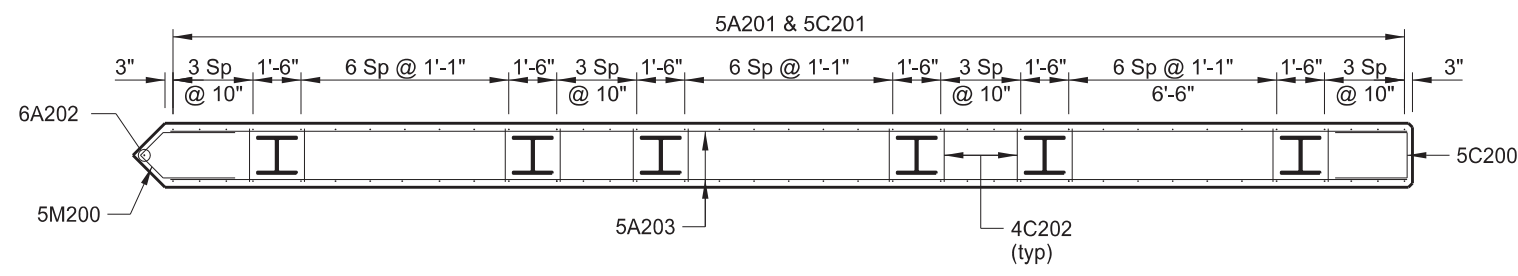
PLAN



ELEVATION



END VIEW



B-B

QUANTITIES	
CLASS AE-3 CONCRETE	47.4 CY
REINFORCING STEEL	3,356 LBS
STRUCTURAL STEEL	467.9 LBS

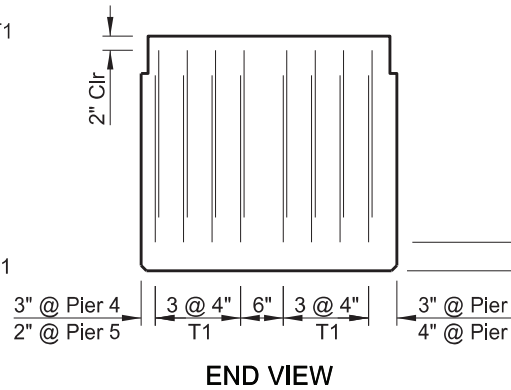
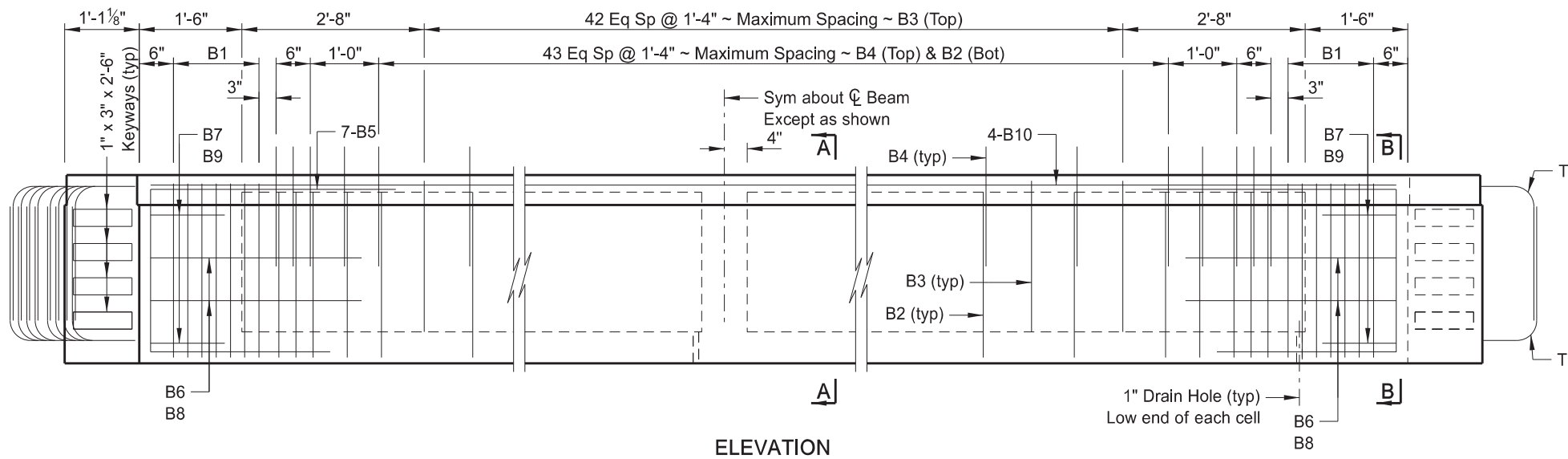
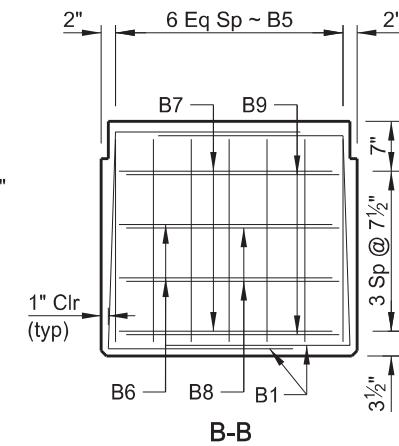
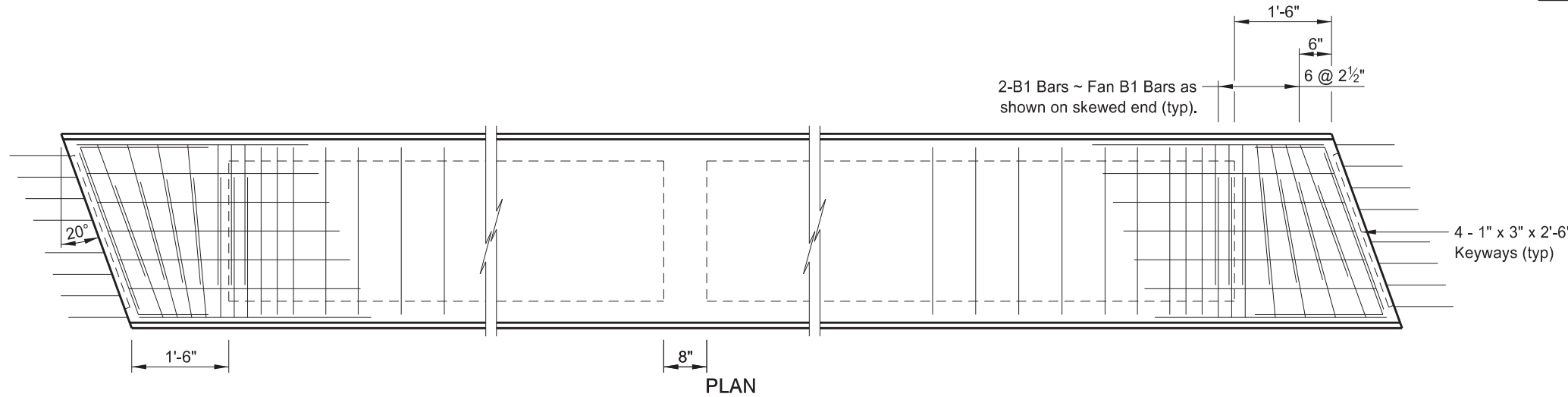


MAPLE RIVER
 (SHOWING REINFORCING)
 PIER 5 DETAILS

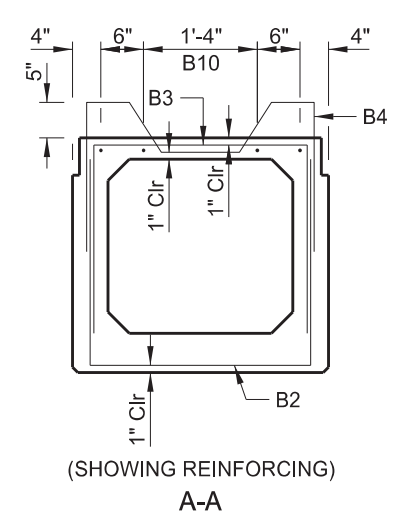
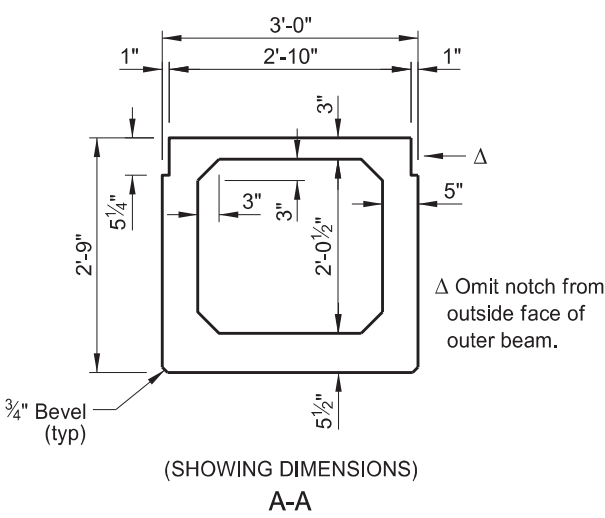
DRAWING NO.	18-064.955-14
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23 U.S.C. § 407 Documents
NDDOT Reserves All Objections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	15



BAR LIST ~ ONE BEAM				
MARK	SIZE	NO.	LENGTH	SHAPE
B1	4	28	6'-11"	BENT
B2	4	52	7'-5"	BENT
B3	4	43	7'-0"	BENT
B4	4	52	6'-9"	BENT
B5	5	14	8'-7"	BENT
B6	4	4	5'-9"	BENT
B7	4	4	3'-9"	BENT
B8	4	4	6'-8"	BENT
B9	4	4	4'-8"	BENT
B10	4	8	34'-3"	STR
T1	4	32	4'-9"	STR



** Field bend as shown (Grade 40).

* Welded Wire Reinforcing with minimum circumferential steel area of 0.15 sq in per ft may be substituted for B2 and B3 bars.

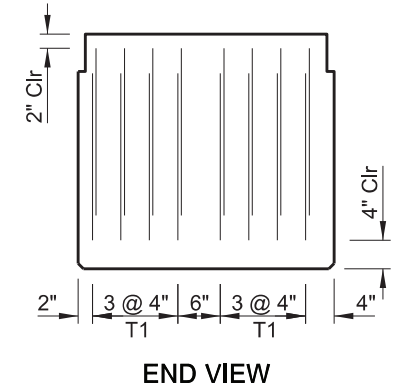
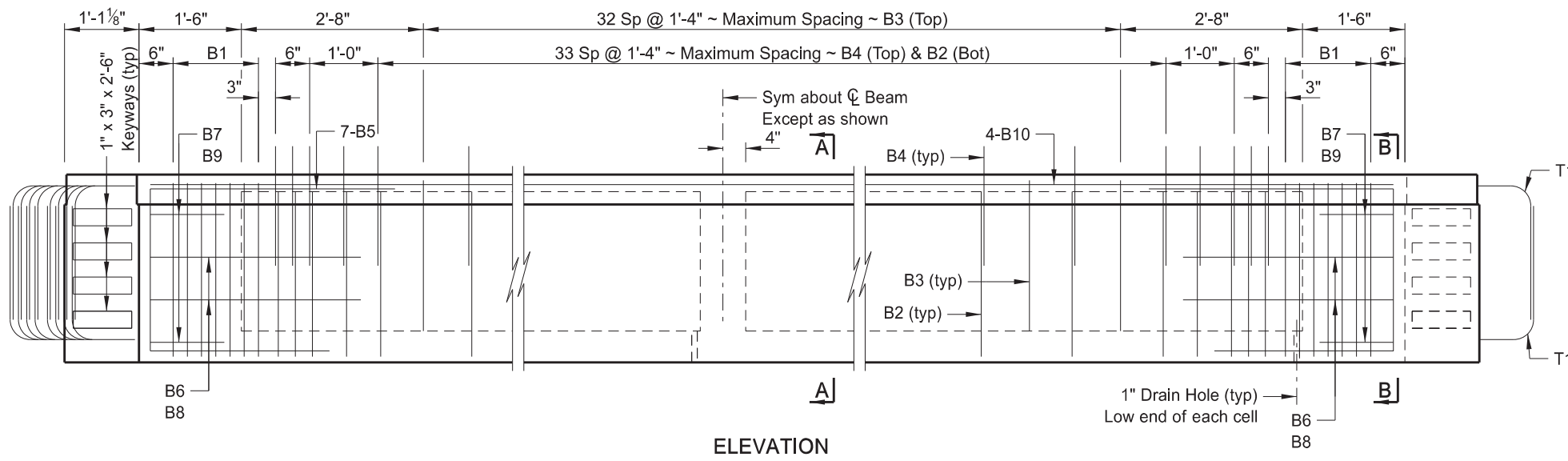
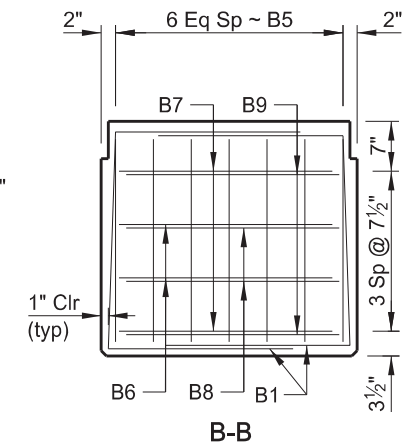
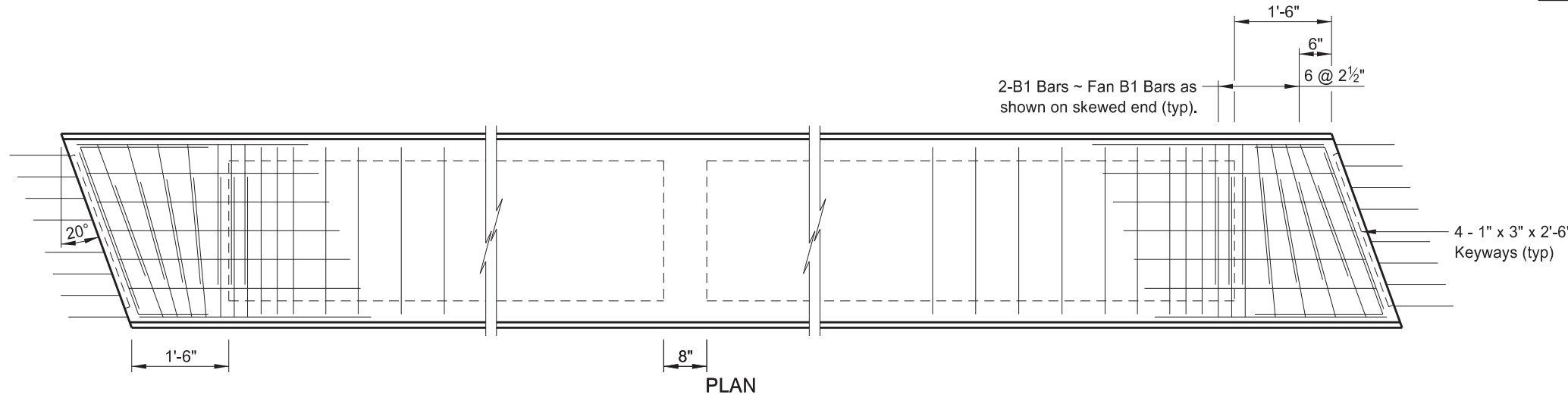


BEAM SECTION DATA	
WT =	601.2 LBS/FT + 3171 LBS
CROSS SECTIONAL AREA =	558.5 IN ²
C.G. (FROM BOTTOM) =	14.85 IN
I =	73,708 IN ⁴
S _B =	4,964 IN ³

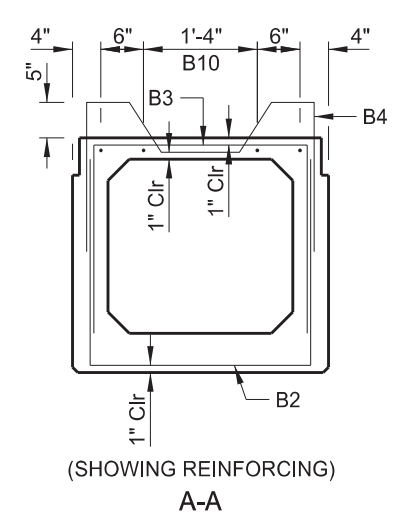
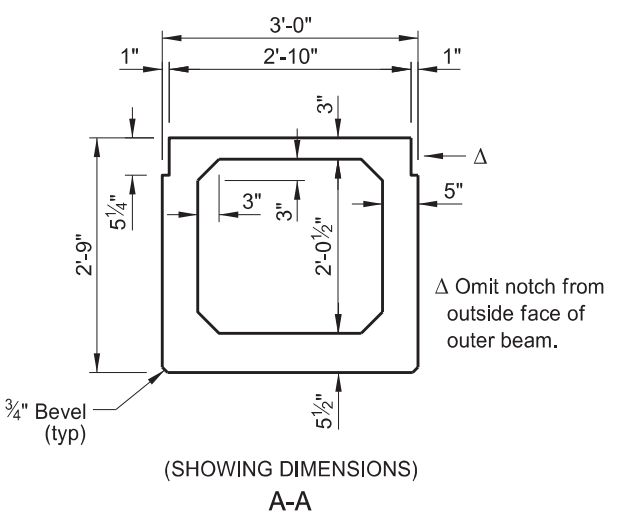
QUANTITIES (ONE BEAM)	
BEAM LENGTH	65.83 LF
MAPLE RIVER	
PRE-TENSIONED 33" X 36" PRESTRESSED SPREAD BOX BEAM	
DRAWING NO.	18-064.955-15

23 U.S.C. § 407 Documents
NDDOT Reserves All Objections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	16



BAR LIST ~ ONE BEAM				
MARK	SIZE	NO.	LENGTH	SHAPE
B1	4	28	6'-11"	BENT
B2	4	42	7'-5"	BENT
B3	4	33	7'-0"	BENT
B4	4	42	6'-9"	BENT
B5	5	14	8'-7"	BENT
B6	4	4	5'-9"	BENT
B7	4	4	3'-9"	BENT
B8	4	4	6'-8"	BENT
B9	4	4	4'-8"	BENT
B10	4	8	27'-6"	STR
T1	4	32	4'-9"	STR



** Field bend as shown (Grade 40).

* Welded Wire Reinforcing with minimum circumferential steel area of 0.15 sq in per ft may be substituted for B2 and B3 bars.



BEAM SECTION DATA	
WT =	601.2 LBS/FT + 3171 LBS
CROSS SECTIONAL AREA =	558.5 IN ²
C.G. (FROM BOTTOM) =	14.85 IN
I =	73,708 IN ⁴
S _B =	4,964 IN ³

QUANTITIES (ONE BEAM)	
BEAM LENGTH	52.25 LF
MAPLE RIVER	
PRE-TENSIONED 33" X 36" PRESTRESSED SPREAD BOX BEAM	
DRAWING NO.	18-064.955-16

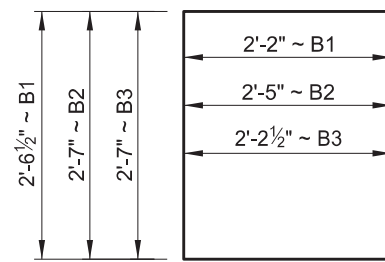
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	17

NOTES:

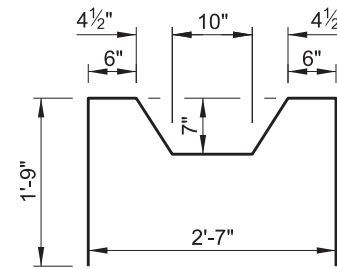
Select the final prestress force (remaining after all losses have been accounted for) and its corresponding center of gravity from those on a curve determined by the three values shown in the "Prestressing Data" table.

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

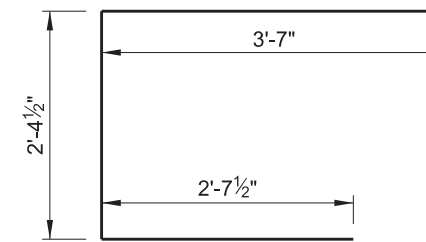
Minor changes to the shape of the beam and to reinforcing steel may be made to accommodate the forms of various contractors and their construction methods with the approval of the Engineer.



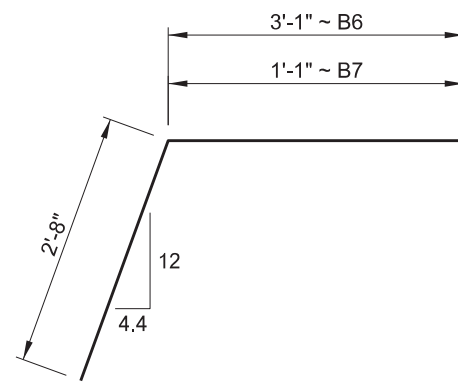
B1, B2 & B3



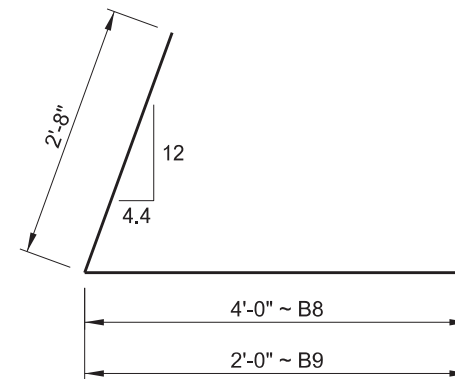
B4



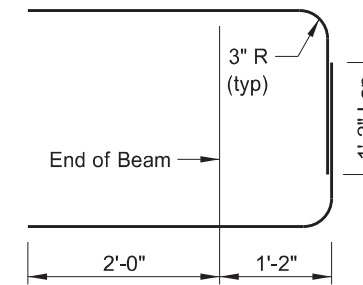
B5



B6 & B7

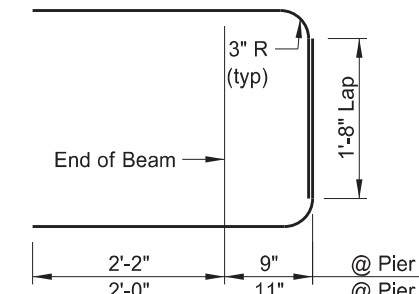


B8 & B9



(AT ABUTMENTS)

T1

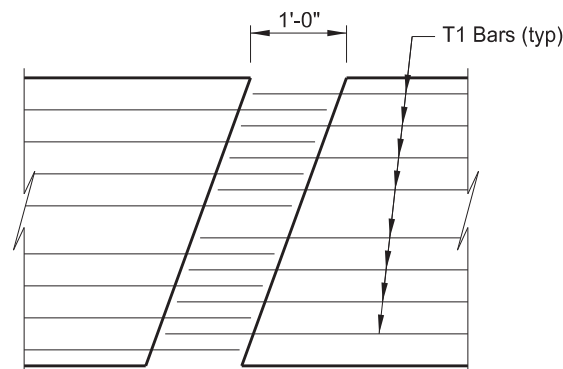


(AT PIERS)

@ Pier 4
@ Pier 5

(DIMENSIONS SHOWN ARE OUT TO OUT)

BENT BAR DETAILS



BEAM END PLAN AT PIER

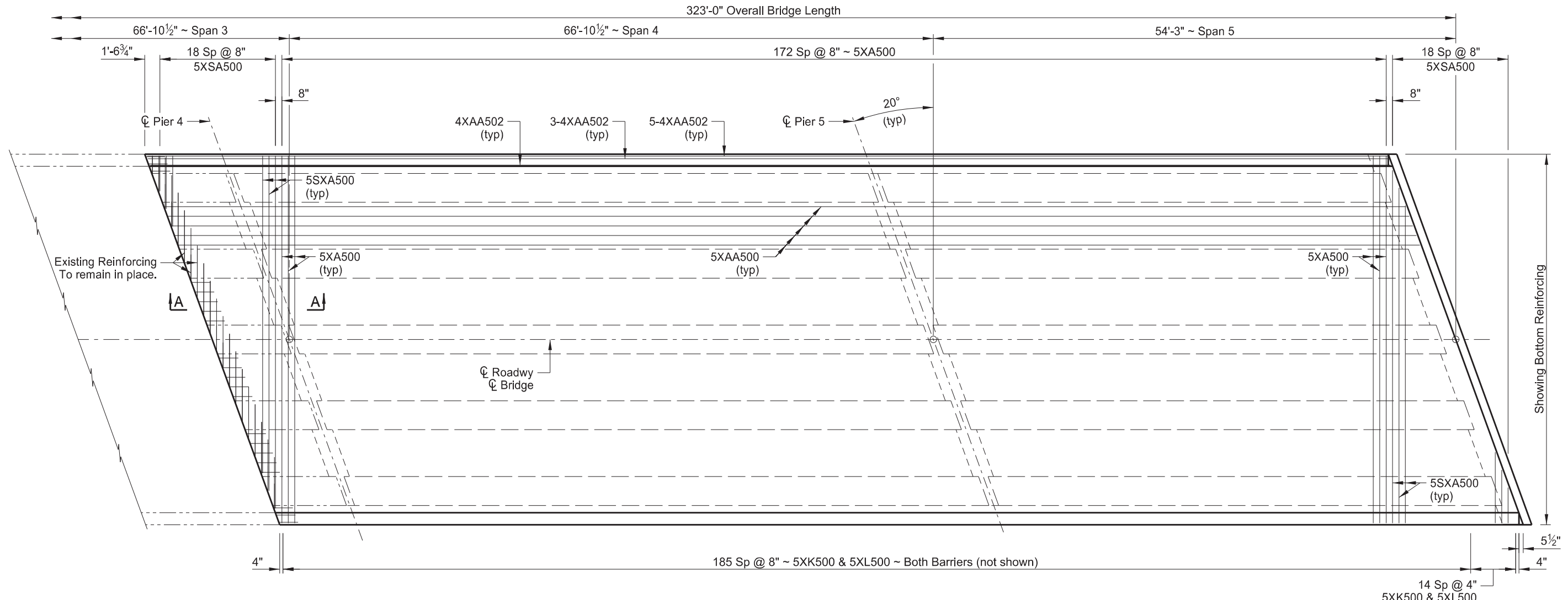


PRESTRESSING DATA					
C.G.	FINAL FORCE	DETENSION STRENGTH	ACCEPTANCE STRENGTH	WEIGHT (TONS)	BEAM LENGTH
2.75"	677.0 k	5.5 psi (Min)	5.5 psi (Min)	21.1	65'-10"
2.94"	683.2 k				
3.25"	693.5 k				
2.75"	399.5 k	5.5 psi (Min)	5.5 psi (Min)	17.5	52'-3"
2.94"	403.1 k				
3.25"	409.2 k				

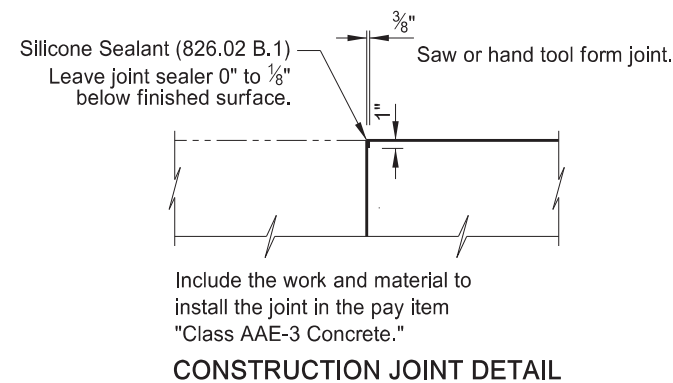
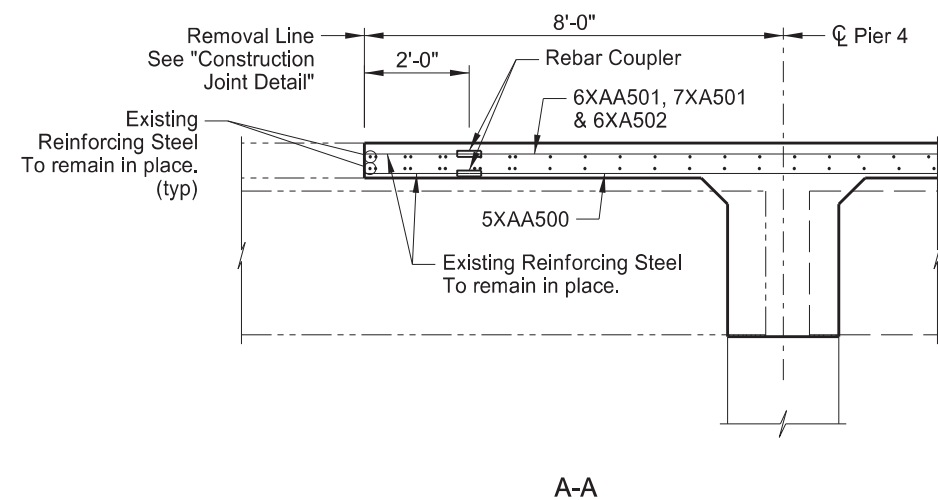
MAPLE RIVER	
PRE-TENSIONED 33" X 36" PRESTRESSED SPREAD BOX BEAM	
DRAWING NO.	18-064.955-17

23 U.S.C. § 407 Documents
 NDDOT Reserves All Objections

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BOTTOM PLAN



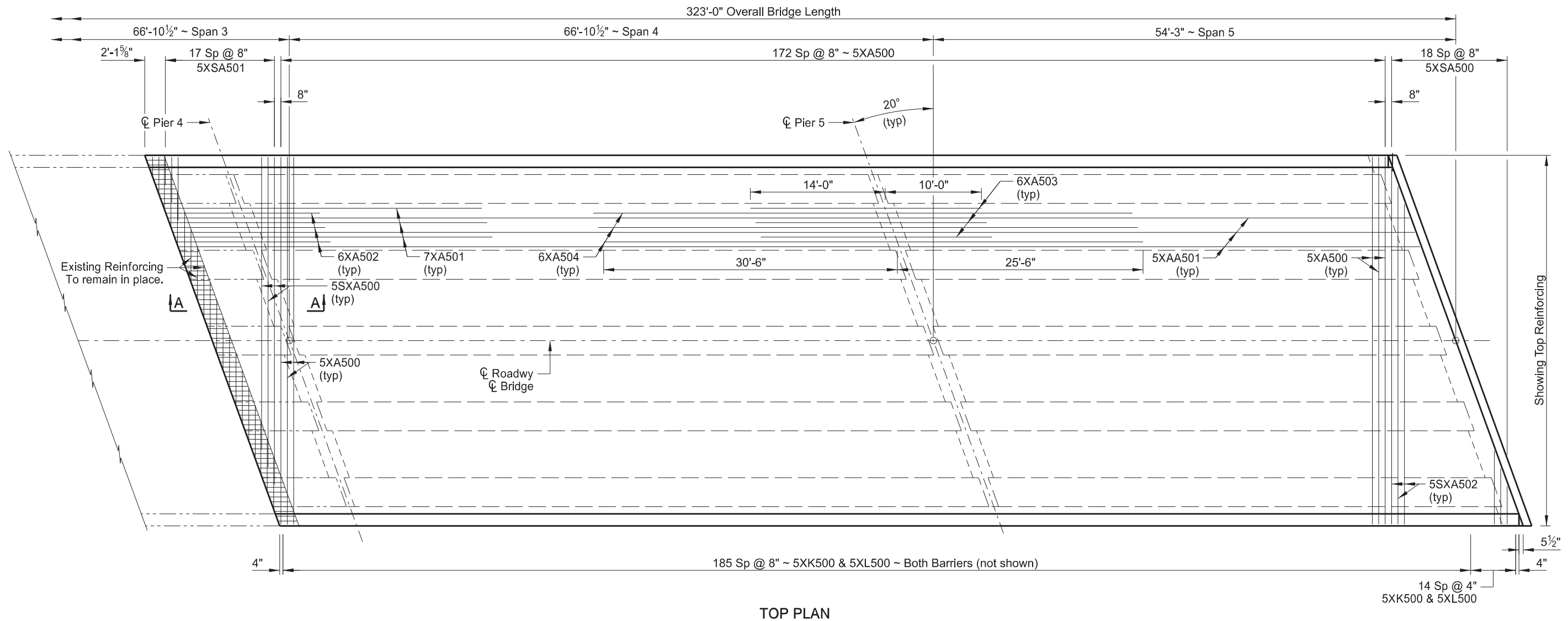
NOTE:
 Couple the 5XAA500, 6XAA501, 7XA501 & 6XA502 bars to the existing reinforcing steel.

QUANTITIES	
SEE DWG 18-064.955-24	
MAPLE RIVER (SHOWING BOTTOM REINFORCING) SLAB LAYOUT	
DRAWING NO.	18-064.955-18



23 U.S.C. § 407 Documents
 NDDOT Reserves All Objections

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ND	SS-8-018(106)064	170	19



TOP PLAN

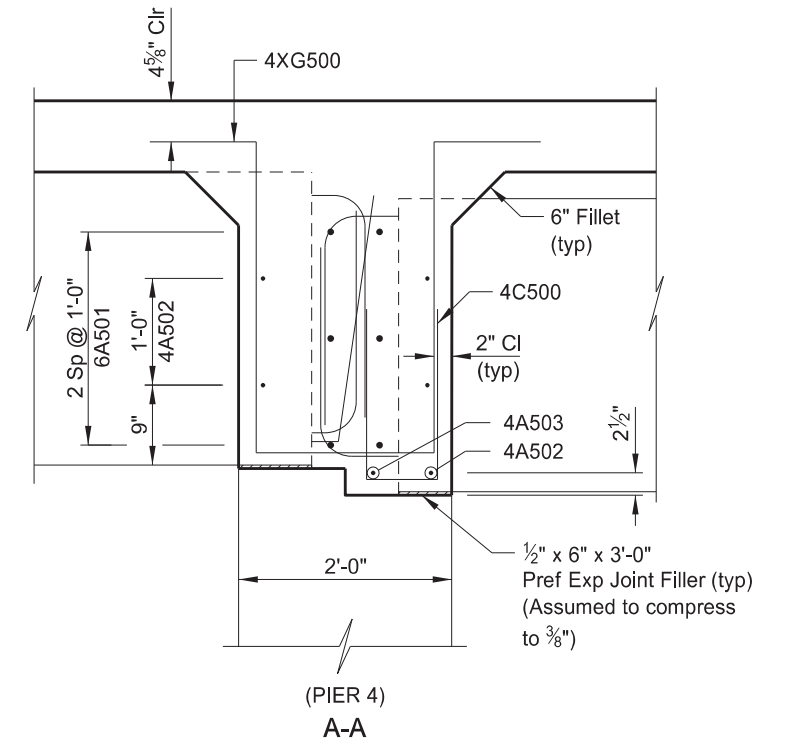
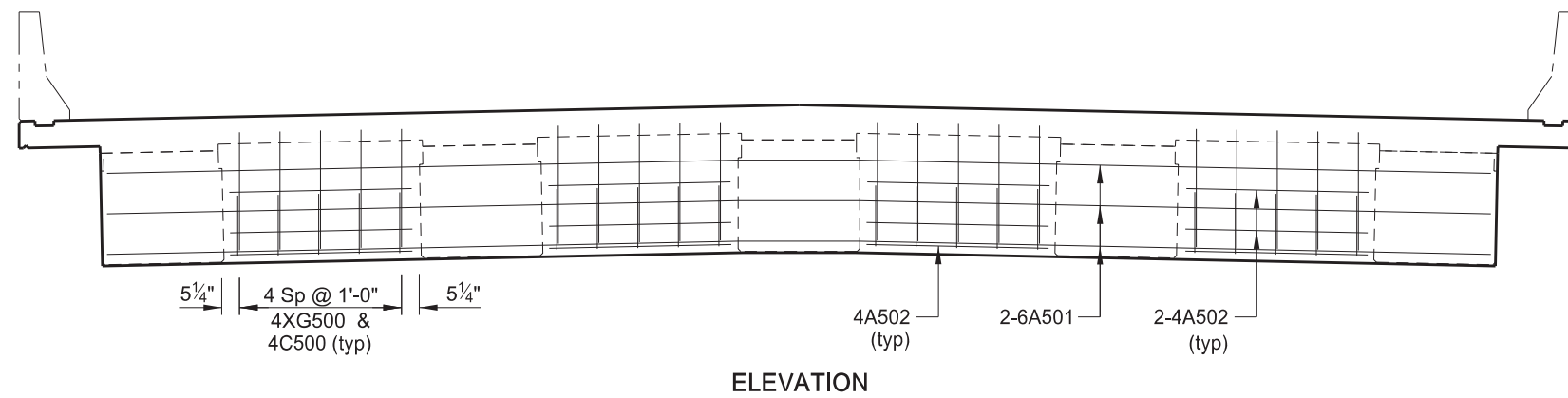
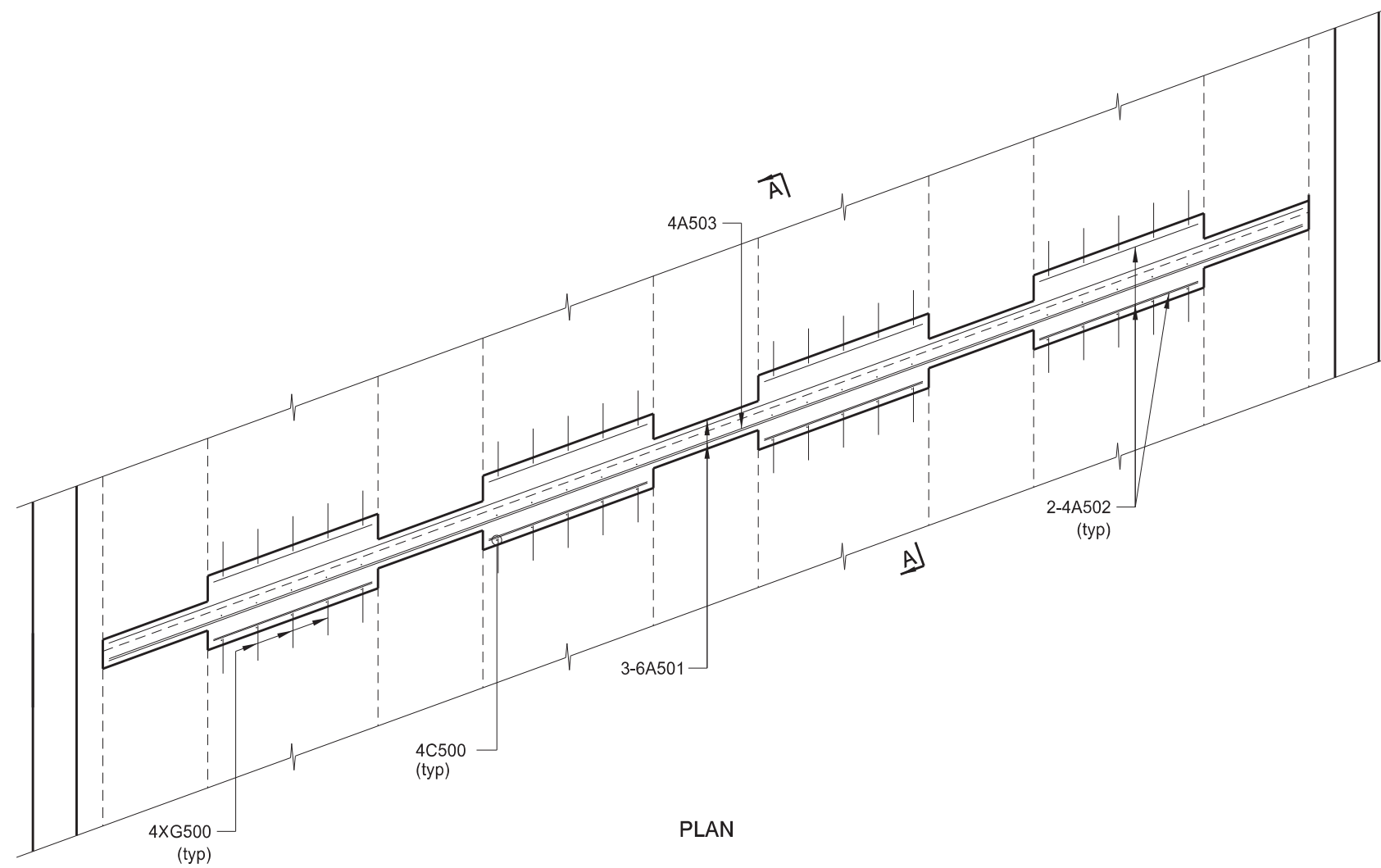
NOTE:
 See Dwg 8-064.955-18 for Section A-A.

QUANTITIES	
SEE DWG 18-064.955-24	
MAPLE RIVER (SHOWING TOP REINFORCING) SLAB LAYOUT	
DRAWING NO.	18-064.955-19



23 U.S.C. § 407 Documents
 NDDOT Reserves All Objections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	20

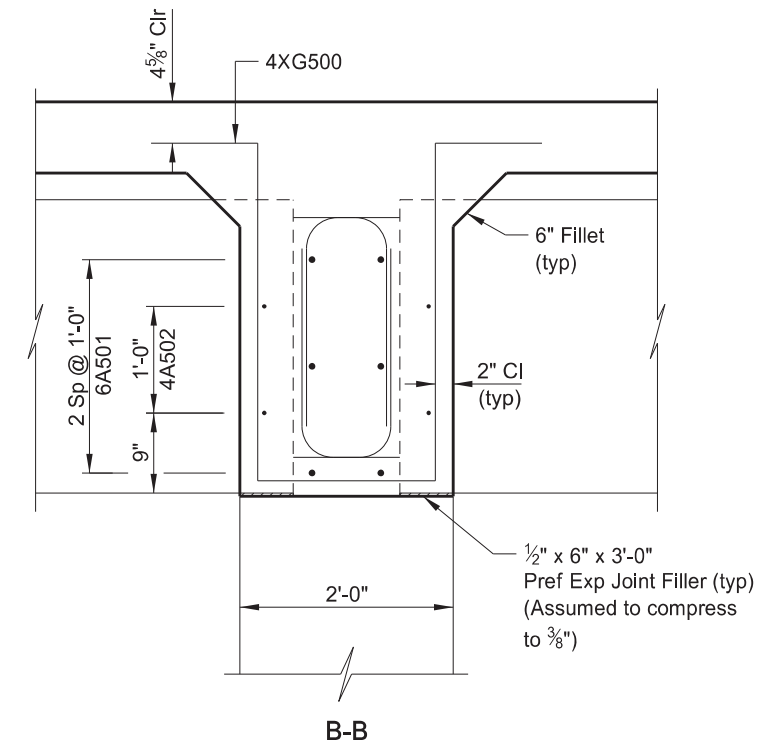
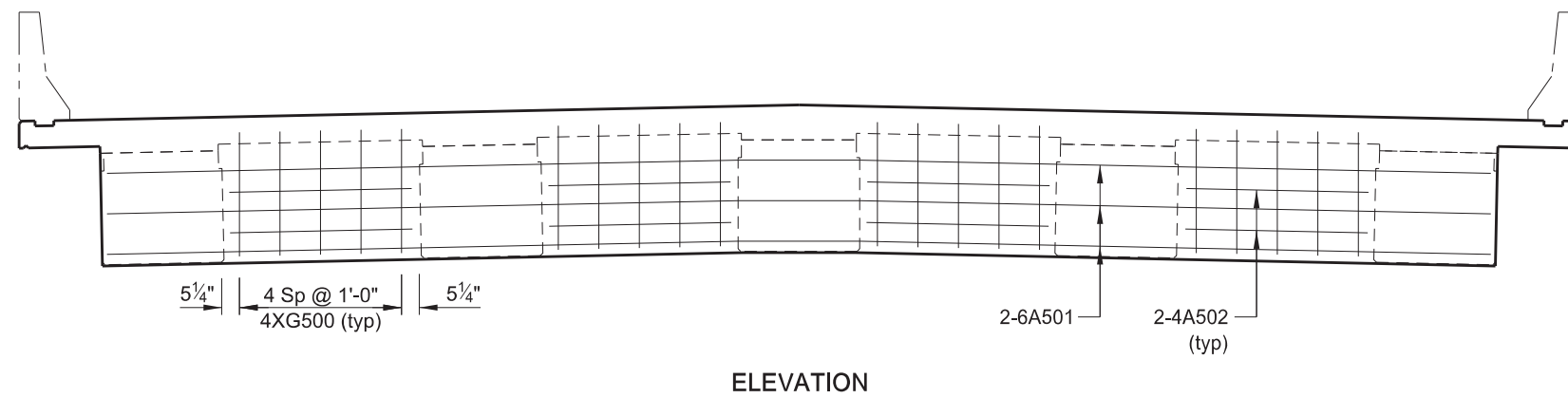
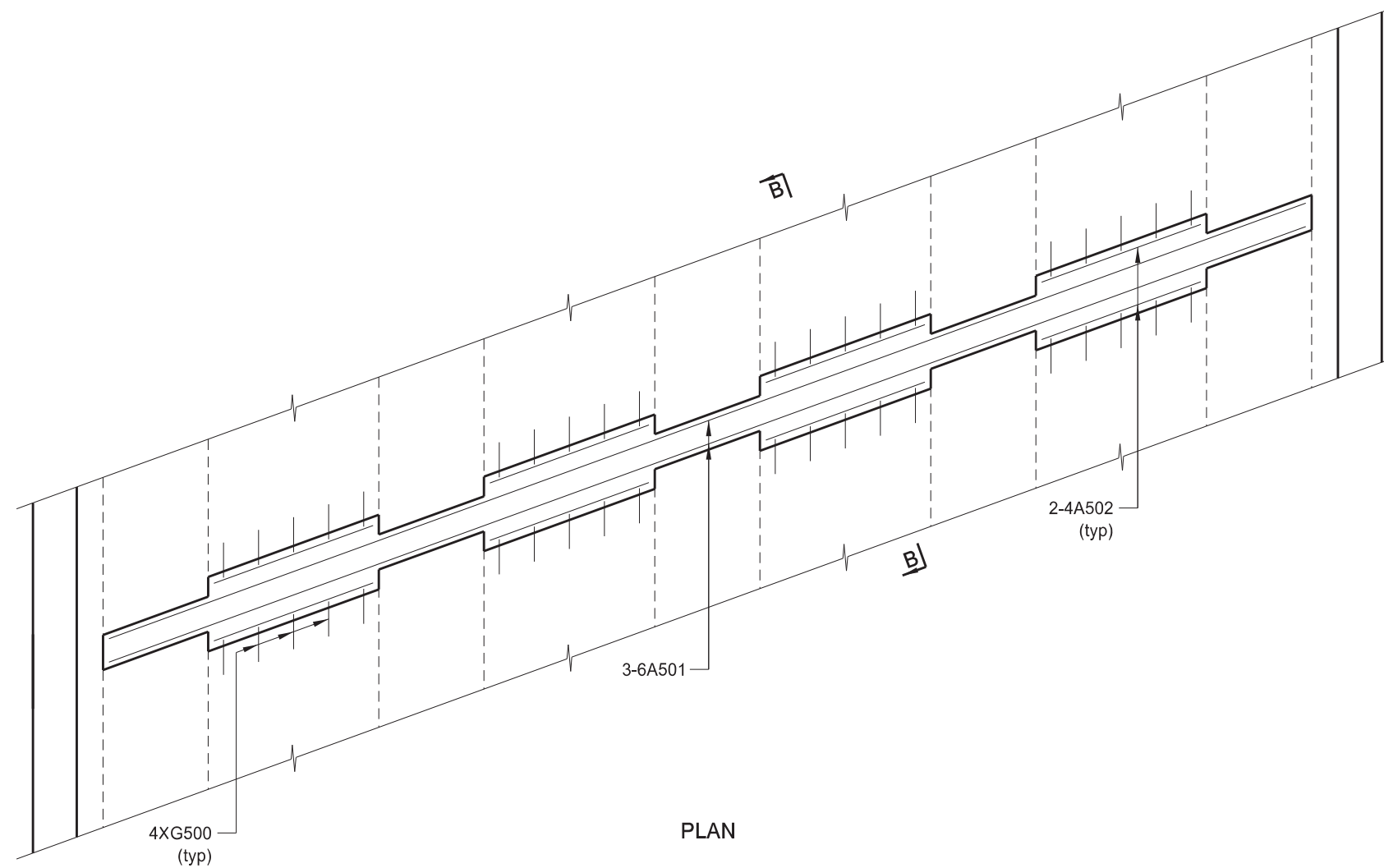


QUANTITIES	
SEE DWG 18-064.955-24	
MAPLE RIVER	
PIER 4 DIAPHRAGM DETAILS	
DRAWING NO.	18-064.955-20



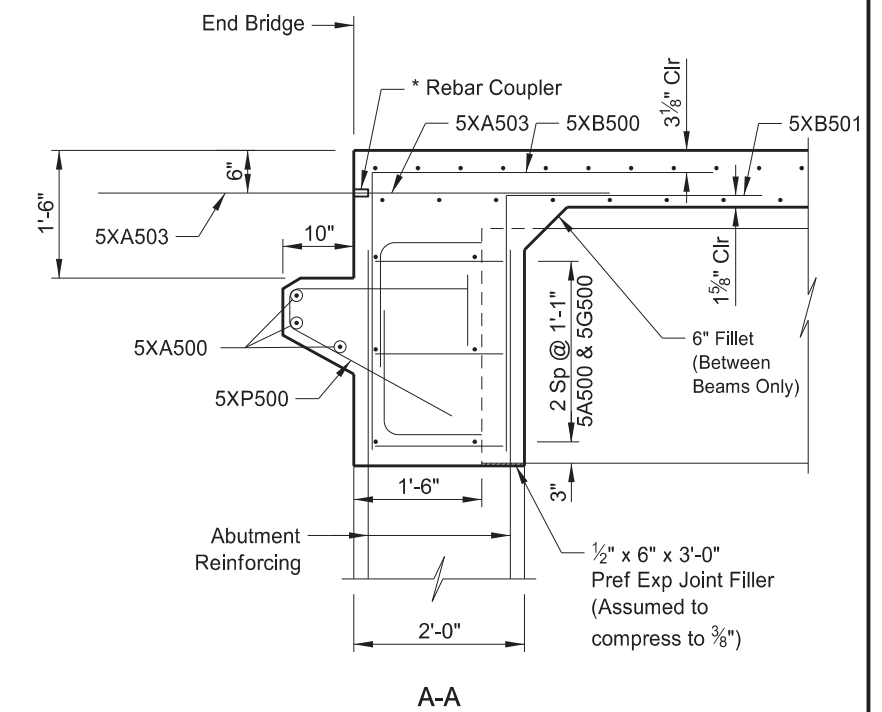
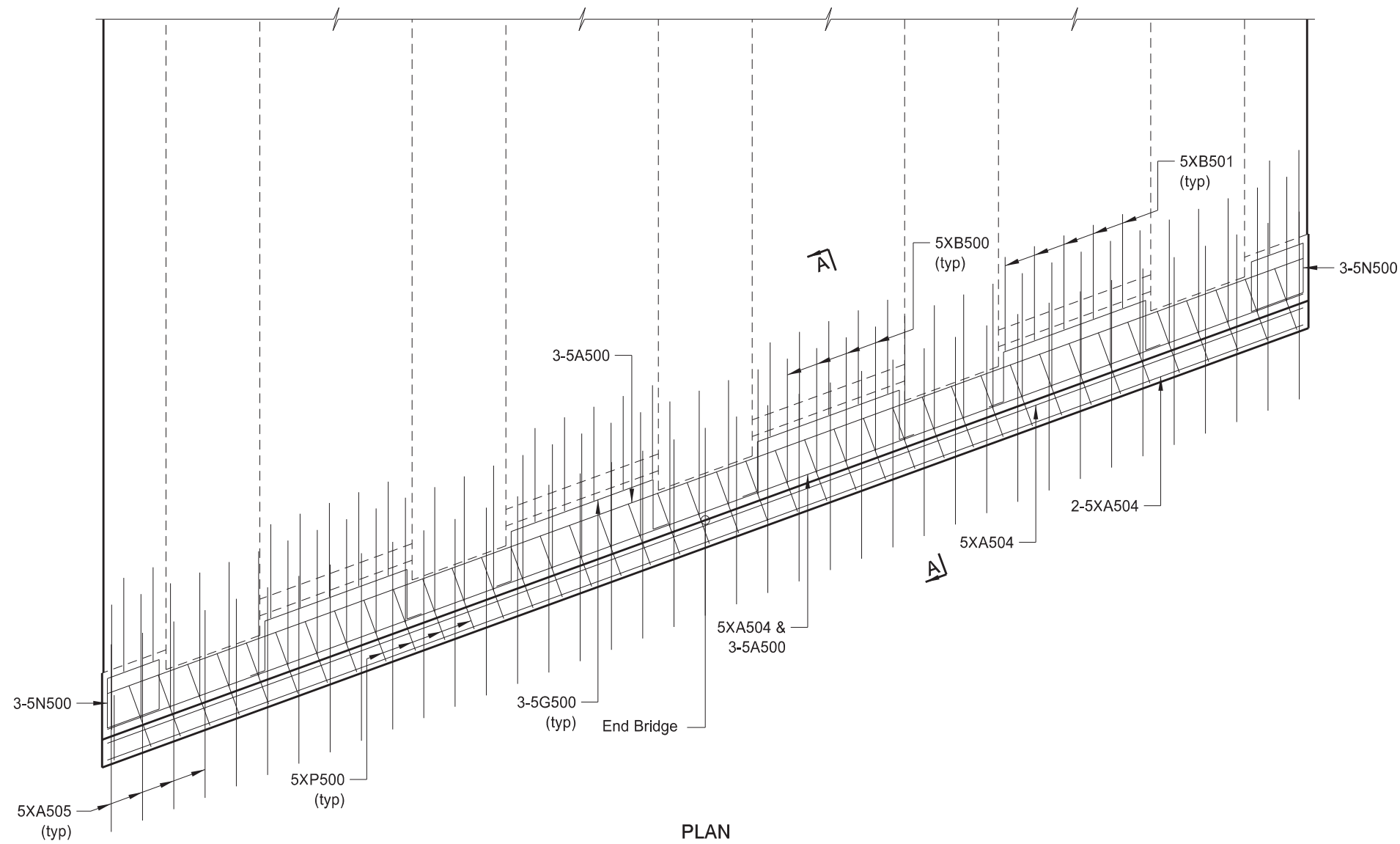
23 U.S.C. § 407 Documents
 NDDOT Reserves All Objections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	21



QUANTITIES	
SEE DWG 18-064.955-24	
MAPLE RIVER	
PIER 5 DIAPHRAGM DETAILS	
DRAWING NO.	18-064.955-21

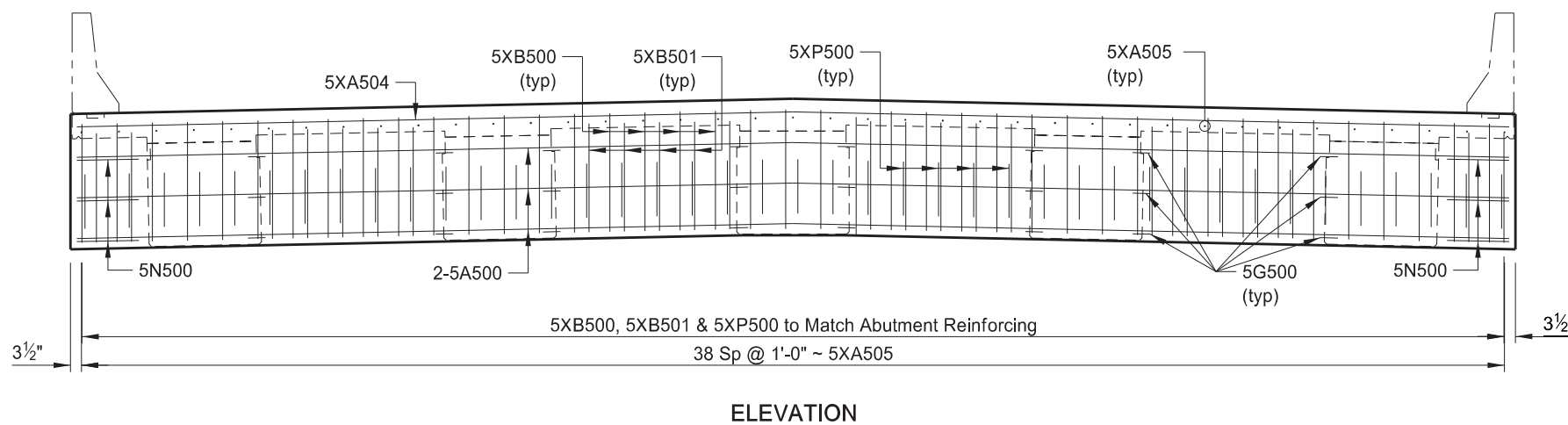
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	22



* The couplers shall be an approved mechanical connector capable of developing 125% of the specified yield strength of the reinforcing steel. The couplers shall be epoxy coated according to Section 836.02A. Damaged epoxy coating on the couplers shall be repaired according to Section 612.04 E.

NOTE:

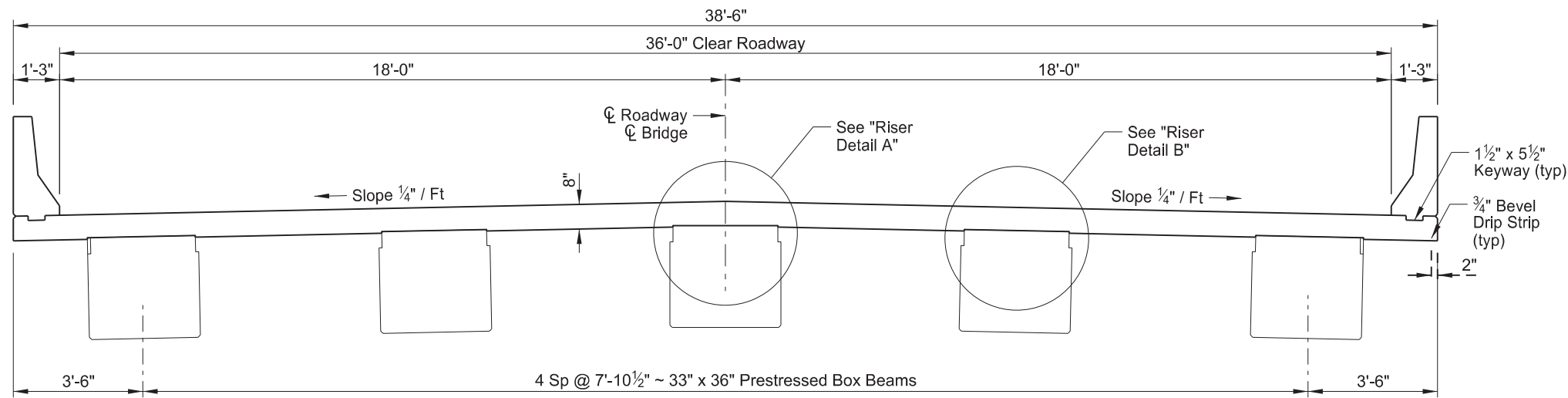
The 5XA503 bars extending into the approach slab shall not be installed until all of the foundation fill is in place.



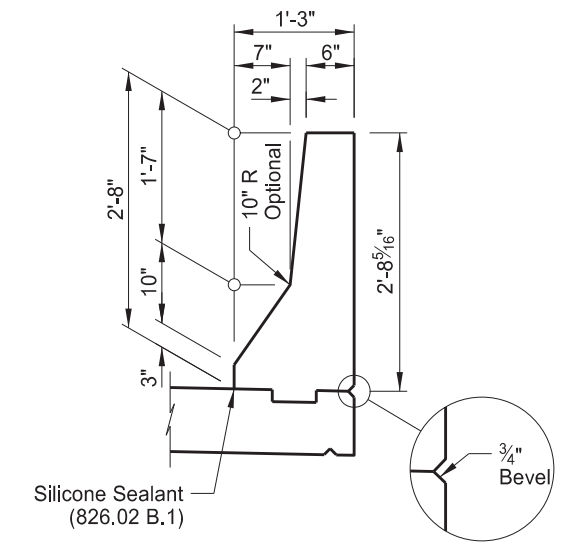
QUANTITIES	
SEE DWG 18-064.955-24	
MAPLE RIVER END BRIDGE STA: 449+11.84 ENDWALL DETAILS	
DRAWING NO.	18-064.955-22

23 U.S.C. § 407 Documents
 NDDOT Reserves All Objections

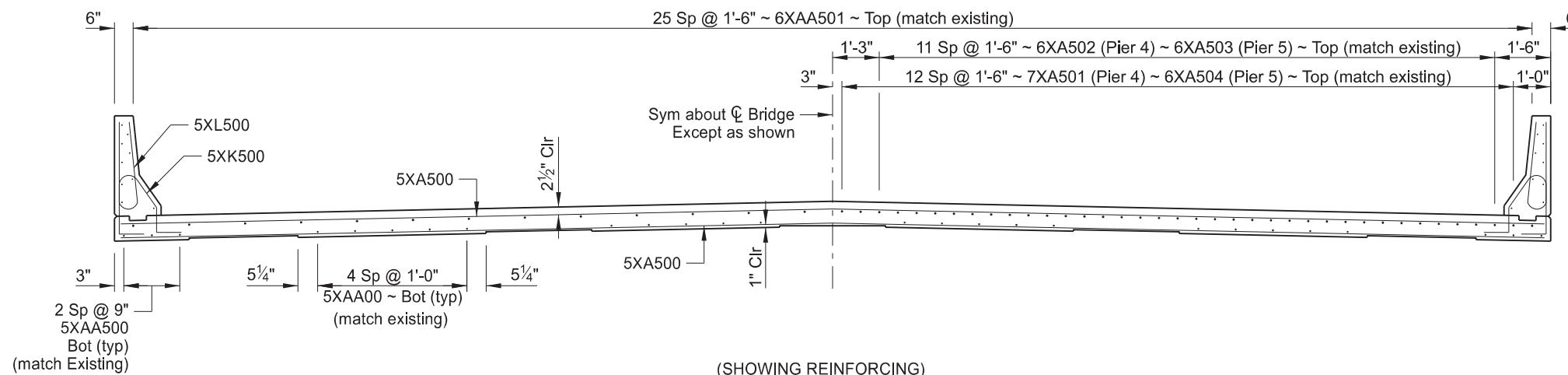
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	23



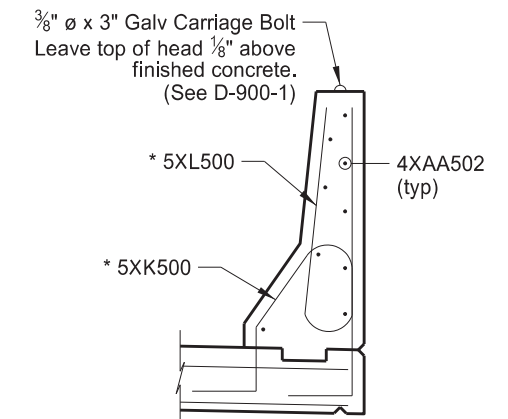
(SHOWING DIMENSIONS)
SLAB SECTION



SHOWING DIMENSIONS

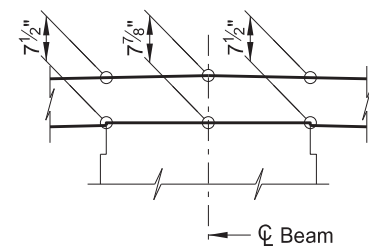


(SHOWING REINFORCING)
SLAB SECTION

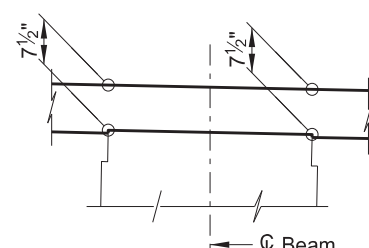


* Provide a 1 1/2" clearance to the barrier reinforcing.

**SHOWING REINFORCING
 BARRIER DETAIL**



RISER DETAIL A



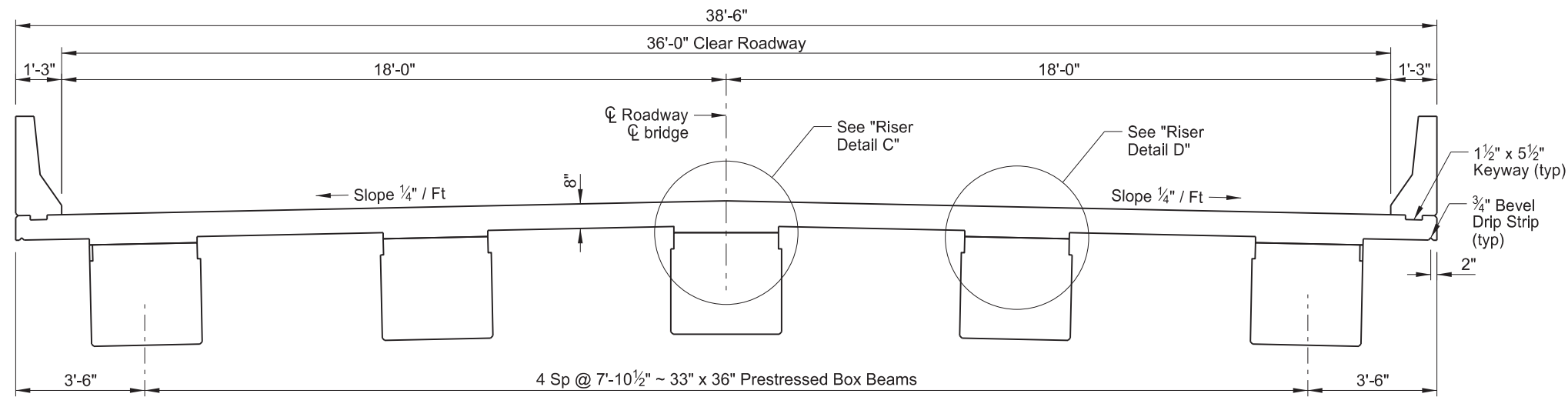
RISER DETAIL B



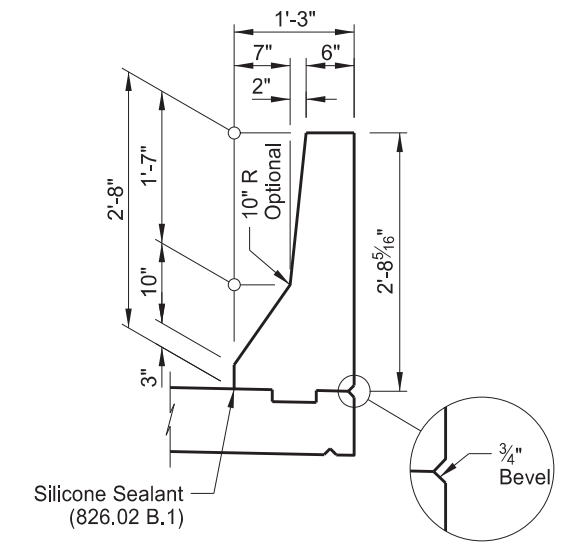
QUANTITIES	
SEE DWG 18-064.955-24	
MAPLE RIVER	
SLAB SECTION SPAN 3	
DRAWING NO.	18-064.955-23

23 U.S.C. § 407 Documents
 NDDOT Reserves All Objections

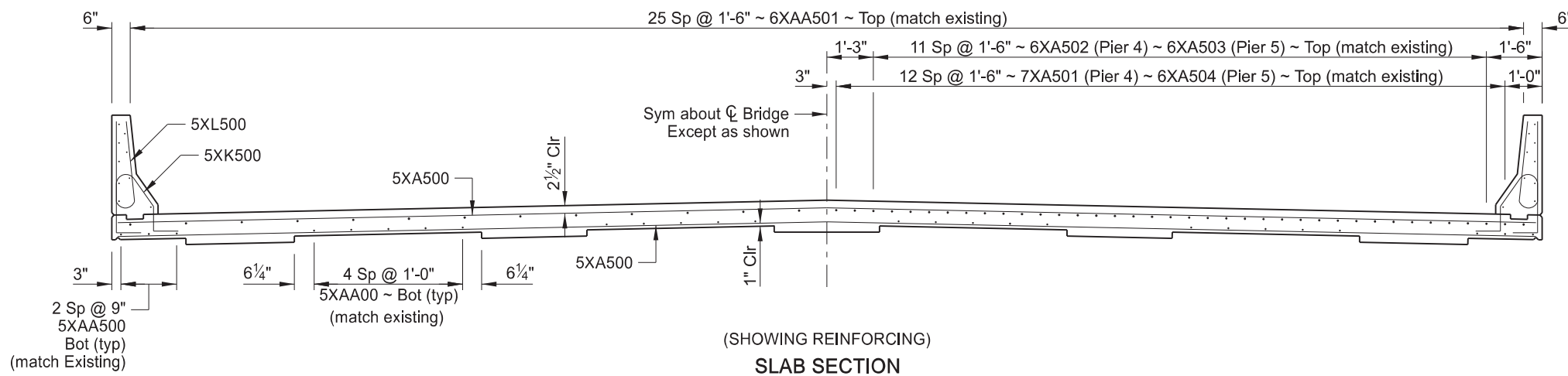
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	24



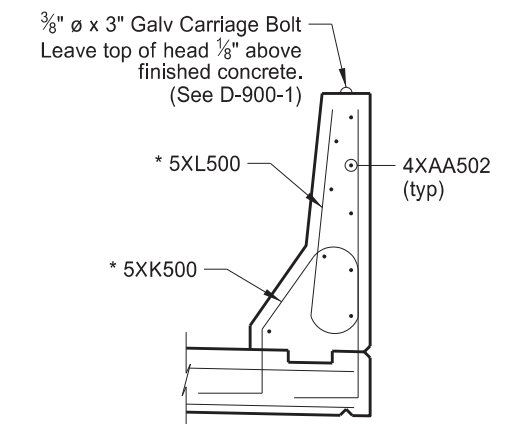
(SHOWING DIMENSIONS)
SLAB SECTION



SHOWING DIMENSIONS

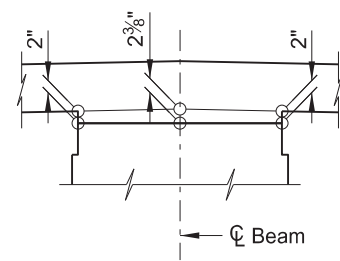


(SHOWING REINFORCING)
SLAB SECTION

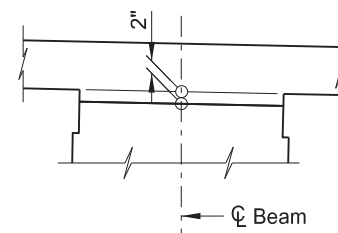


* Provide a 1 1/2" clearance to the barrier reinforcing.
**SHOWING REINFORCING
 BARRIER DETAIL**

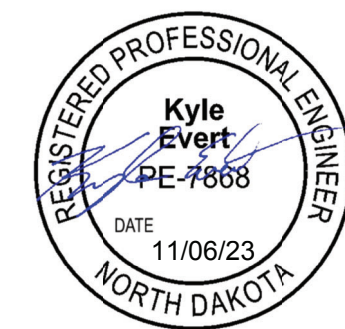
The 2" dimension shown are located at the supports.
 The anticipated midspan riser is 1". Adjust the riser to maintain the 8" slab.



RISER DETAIL C



RISER DETAIL D



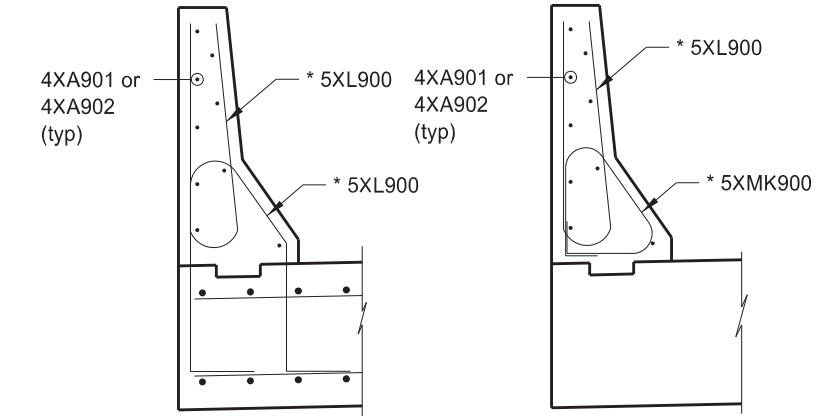
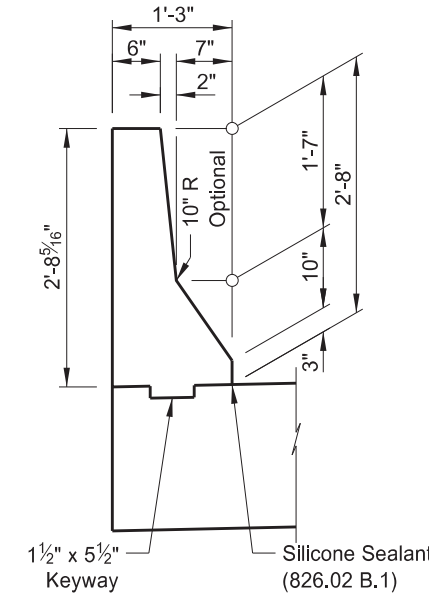
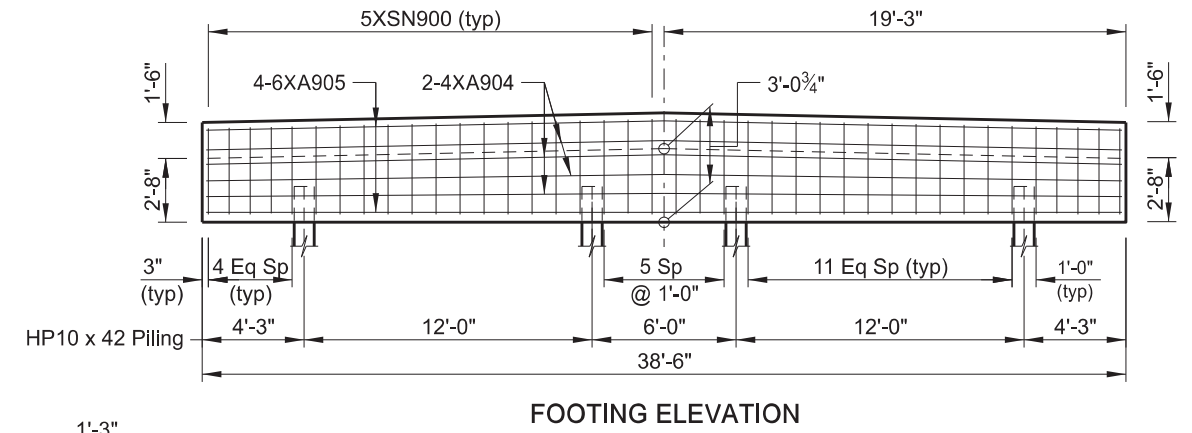
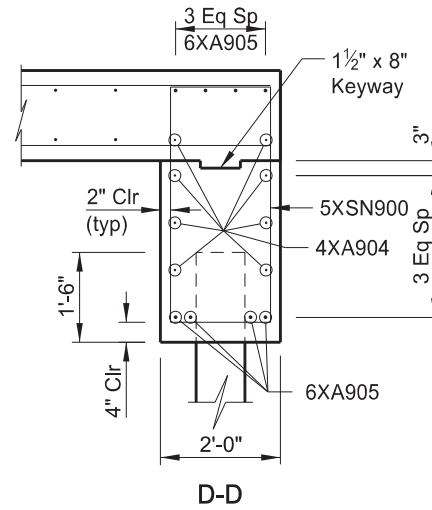
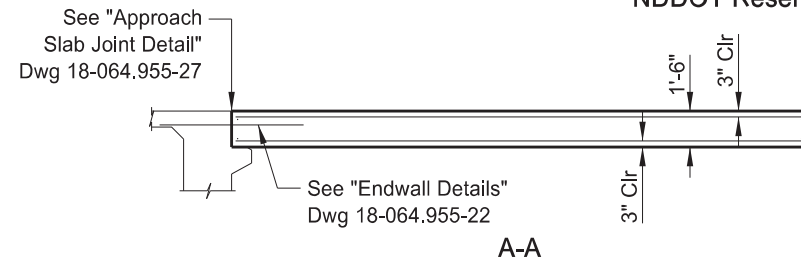
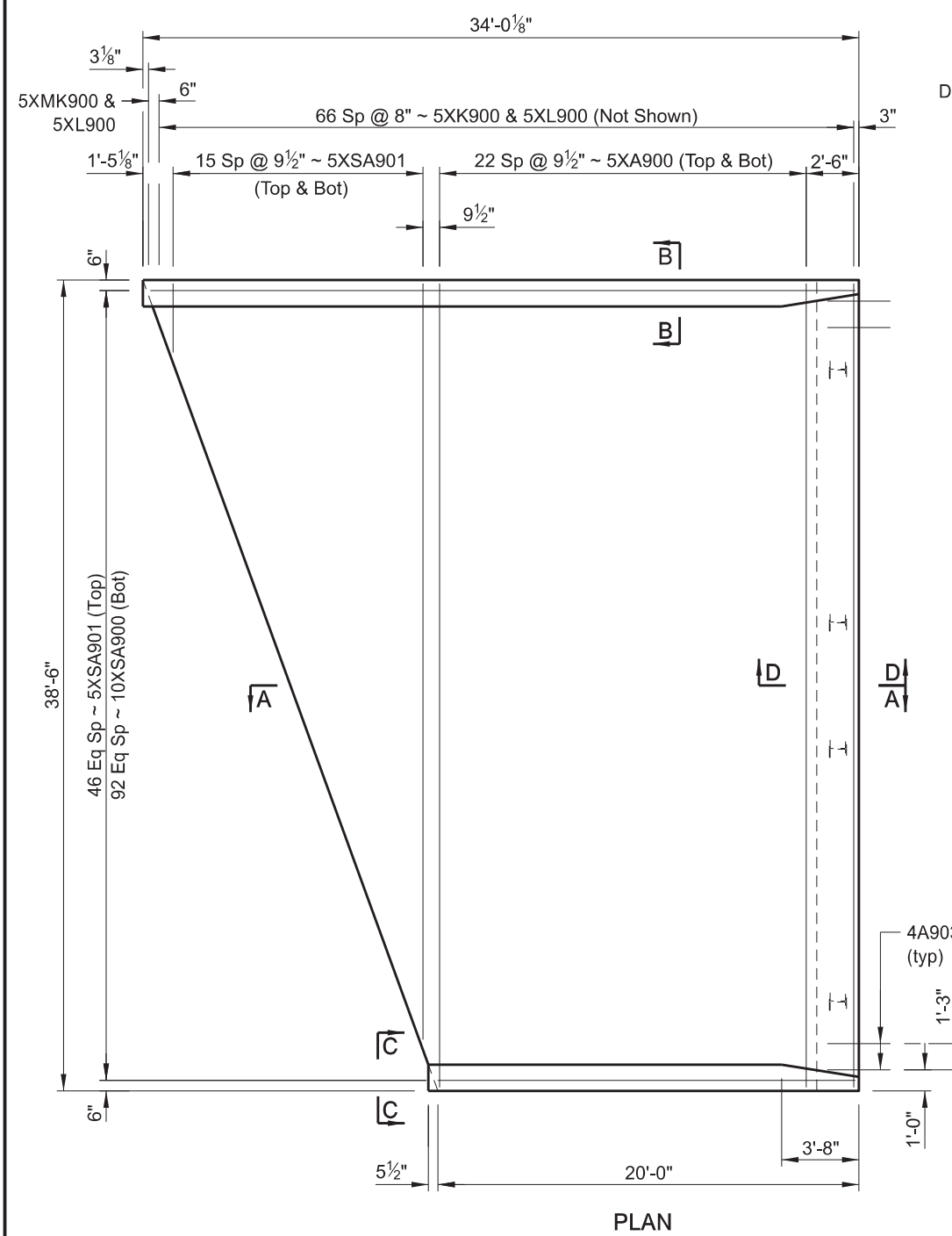
QUANTITIES	
CLASS AAE-3 CONCRETE	165.9 CY
REINFORCING STEEL	1,398 LBS
REINFORCING STEEL (EPOXY)	34,676 LBS

MAPLE RIVER
 SLAB SECTION SPAN 4 AND 5

DRAWING NO.	18-064.955-24
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23 U.S.C. § 407 Documents
NDDOT Reserves All Objections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	26

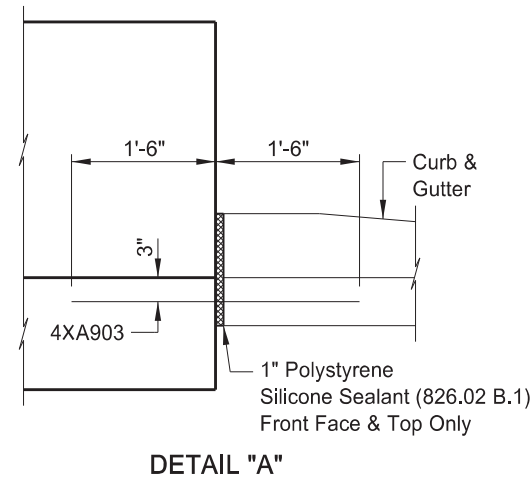
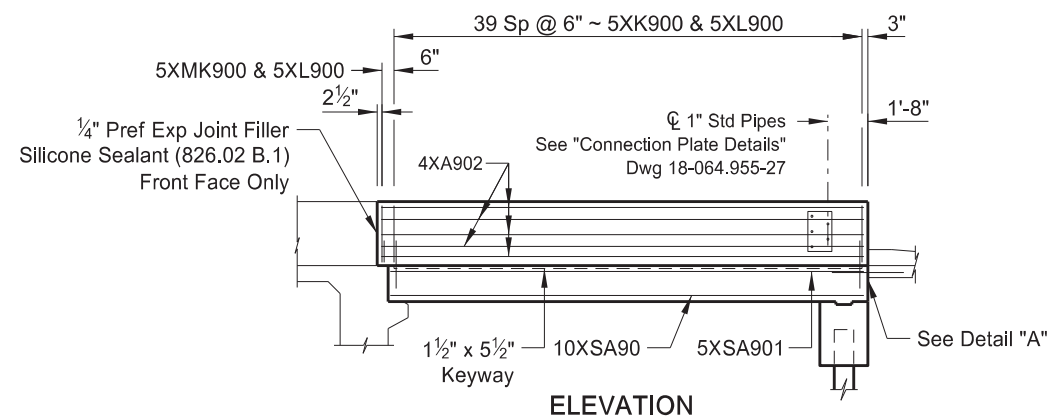


* Provide a 1/2" clearance to the barrier reinforcing.

SHOWING DIMENSIONS

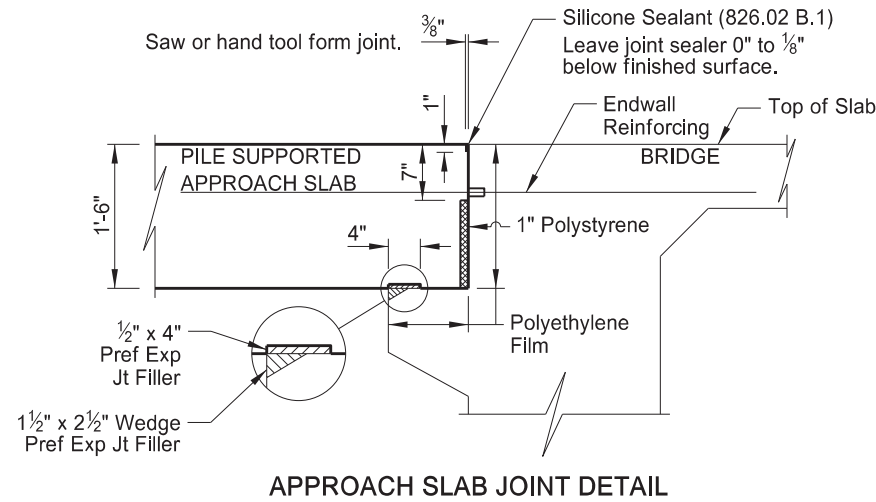
B-B

SHOWING REINFORCING



QUANTITIES	
SEE DWG 18-064.955-27	
MAPLE RIVER	
APPROACH SLAB DETAILS	
DRAWING NO.	18-064.955-26

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	170	27



NOTES

The estimated material quantities shown are for information purposes only. Include the concrete, reinforcing bars, polyethylene film, preformed joint filler, polystyrene, silicone sealant, foundation fill, connection plates and pipes, dowel bars, and labor required to build the approach slabs and barriers in the pay item "Pile Supported Approach Slab" Use Class AE-3 concrete and Grade 60 reinforcing steel. Provide reinforcing steel that meets the requirements of Section 612. Use polyethylene film that meets the requirements of ASTM C171.

The bar marks beginning with an "X" indicate an epoxy coated bar. The dimensions shown in the "Bent Bar Details" are out to out.

Install 5XA904 bars according to manufacturer's recommendations, with a high strength adhesive specifically intended for concrete anchorage (16k min. ultimate pullout) and that meets the requirements of Section 806.02. Provide a minimum anchorage length of 1 foot.

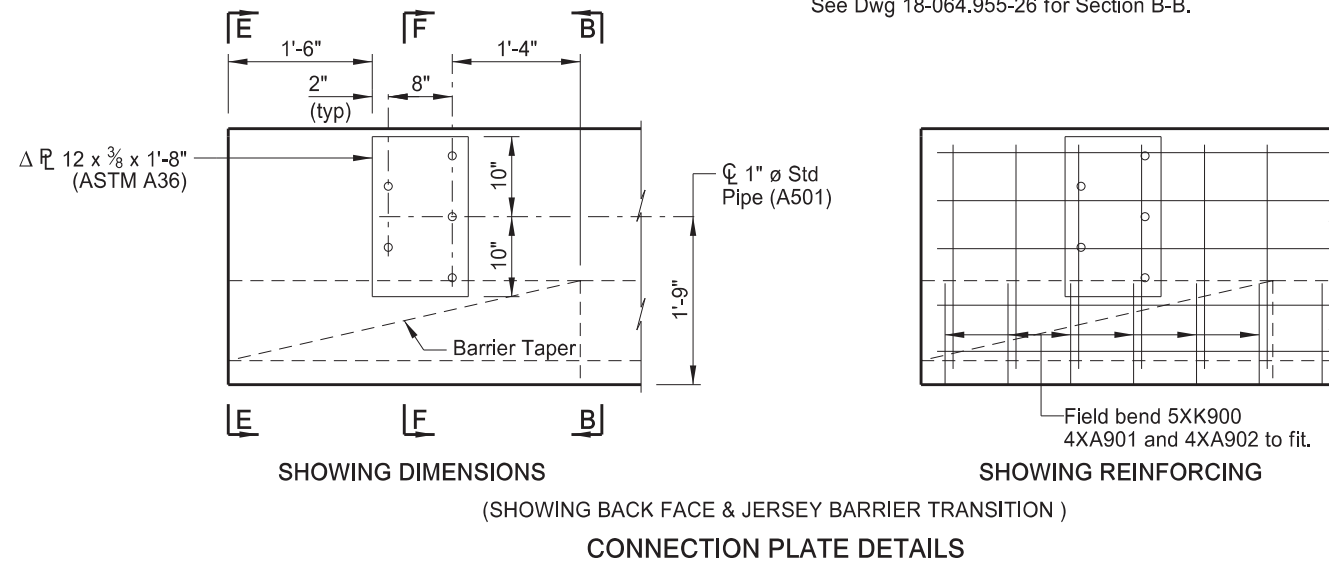
SKEW ANGLE = 20°

BAR LIST - ONE END

SIZE	MARK	NO.	LENGTH
5	XA900	46	38'- 2"
4	XA901	9	33'- 8"
4	XA902	9	20'- 1"
4	XA903	4	3'- 0"
4	XA904	8	38'- 2"
6	XA905	8	38'- 2"
5	XK900	120	6'- 3"
5	XL900	120	5'- 0"
5	SN900	2	236'- 8"
5	XMK900	2	4'- 1"
10	XSA900	1	2569'- 1"
5	XSA901	1	1298'- 4"

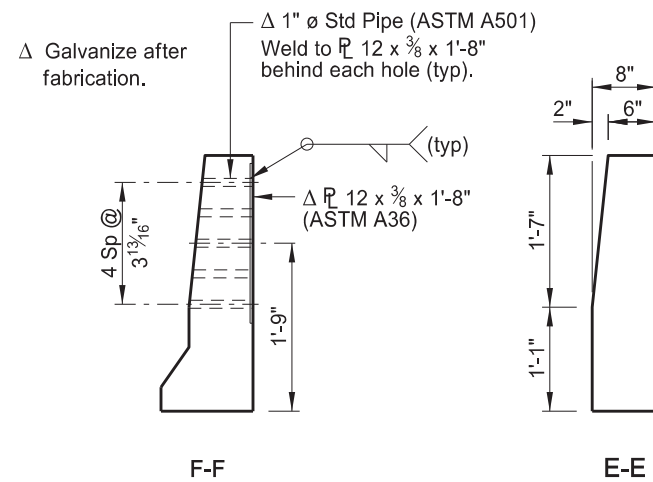
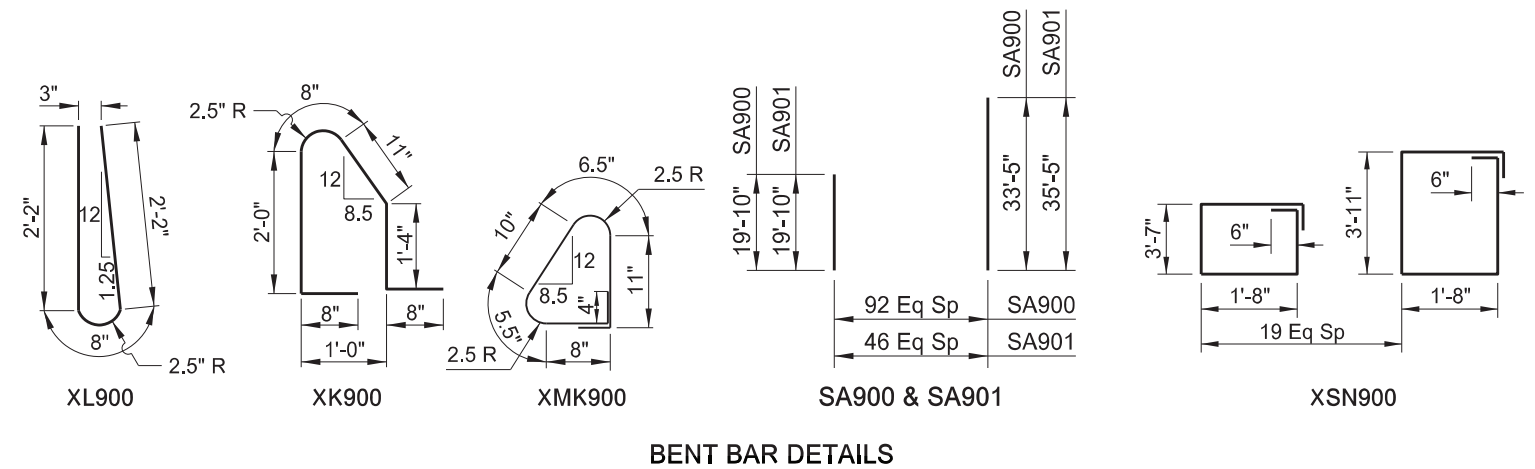
NOTE:

See Dwg 18-064.955-26 for Section B-B.



ESTIMATED MATERIAL QUANTITIES

REINFORCING STEEL (LBS)	CONCRETE (CY)
17,144	56.0



QUANTITIES (ONE SLAB)	
APPROACH SLAB	115.5 SY
MAPLE RIVER	
APPROACH SLAB DETAILS	
DRAWING NO.	18-064.955-27



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	175	1

PROJECT NUMBER SS-8-018(106)064 DATE STARTED 8/31/16 COMPLETED 8/31/16
 PCN 23279 ELEVATION 924 ft
 LOCATION Cass County Northing 413845.67 ft Easting 2790455.13 ft
 DRILLED BY Dallan LOGGED BY Jamie DRILLING METHOD _____
 ENGINEER _____
 NOTES Northing and Easting based on ND Cass County Ground Coordinates, South Zone

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	AASHTO	USCS	SAMPLE TYPE & NUMBER	RECOVERY (%)	SPT N VALUE	MC		TESTS & REMARKS		
									PL	LL			
920	0	Soft to Medium Stiff Moist Grey to Dark Grey Fat Clay		A-7-6	CL	992	20	7	24	49			
				A-7-6	CL	993	10	9		22	49		
				A-7-6	CH	994	55			27	51		
				A-7-6	CH	995	85			24	59		
				A-7-5	CH	996	65			30	87		
				A-7-6	CH	997	90			23	68		
				A-7-5	CH	998	85			31	88		
				A-7-6	CH	999	100			26	75		
				A-7-6	CH	1000	100			29	75		
				A-7-6	CH	1001	100			29	72		
				A-7-5	CH	1002	100			30	77	UU=601psf	
				A-7-6	CH	1003	100			28	107		
				A-7-6	CH	1004	100			29	86	UU=469psf	
				A-7-6	CH	1005	100			28	76		
				A-7-5	CH	1006	100			31	71		
		A-7-6	CH	1007	100			26	63				
		A-7-6	CH	1008	100			25	51	UU=502psf			
		A-7-6	CL	1009	85			24	47				
886.0 ft	38.0 ft	Medium Stiff Wet Grey Silt		A-6	CL	1010	100	7	0	2038			
882.0 ft	42.0 ft	Very Stiff to Hard Glacial Till with Clayey Sand, Gravelly Clay, Lean Clay, Silty Sand, and Silt		A-4	ML	1011	60	7	0	235			
				A-4	ML	1012	75			27	0	2132	
				A-6	SC	1013	75			44	0	2241	
				A-7-6	GC	1014	100			47	0	1835	
				A-6	CL	1015	75			47	0	129	
				A-6	CL	1016	75			81	0	900	
				A-4	SM	1017	100			76	0	128	
				A-4	ML	1018	100			91	0	131	
				A-2-4	SM	1019	100						
				A-6	CL	1020	75						
865.0 ft	59.0 ft	Bottom of borehole at 59.0 ft		A-6	CL	1021	25						

NDDOT LOG 11X17 PLAN SHEET - NDDOT_DATA\TEMP_20180208.GDT - 10/26/23 16:17 - F:\LAB\PROJECTS\GINT18-018(088)064.GPJ

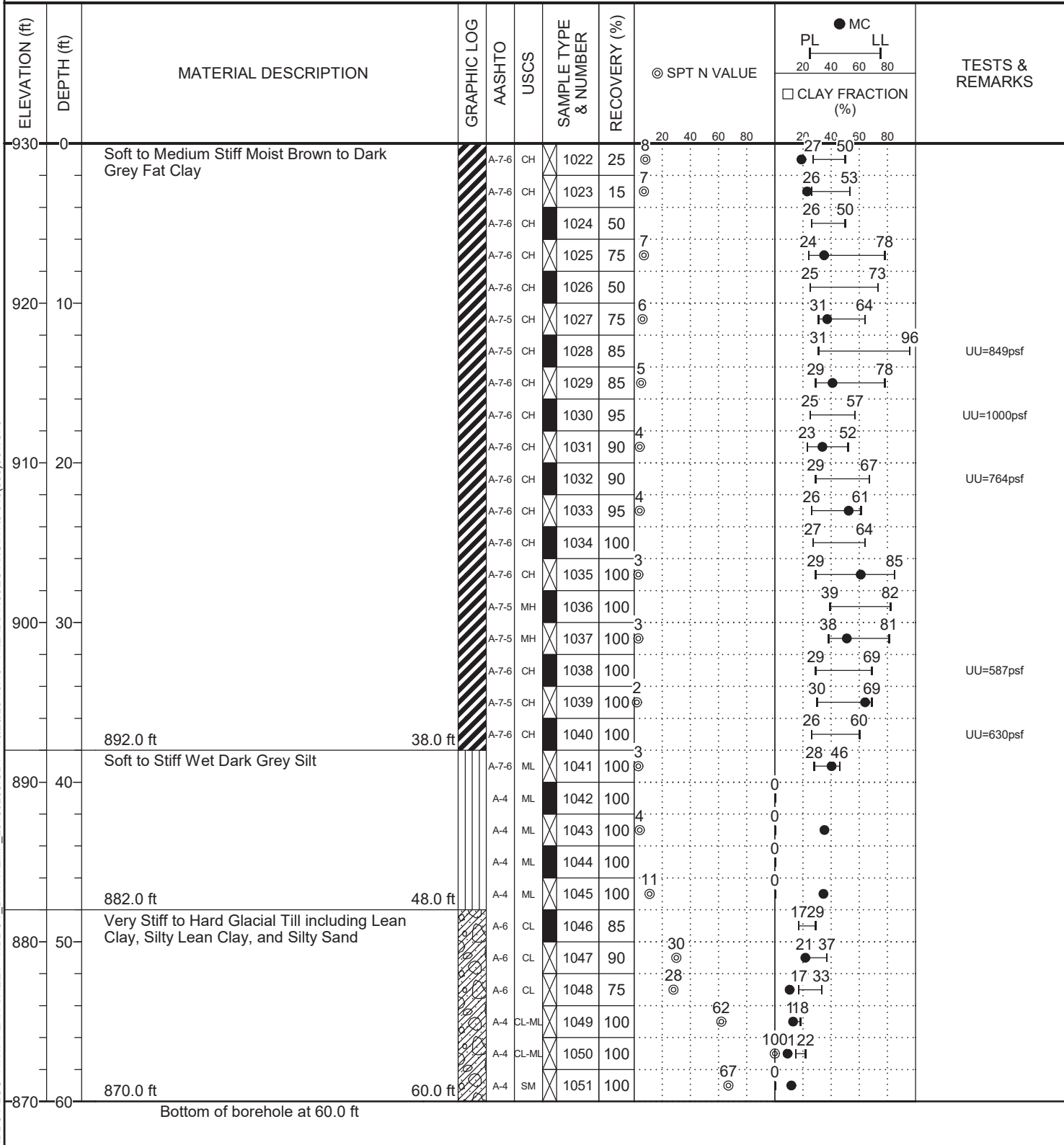


Boring Log 1



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	175	2

PROJECT NUMBER SS-8-018(106)064 DATE STARTED 8/31/16 COMPLETED 8/31/16
 PCN 23279 ELEVATION 930 ft
 LOCATION Cass County Northing 413921.27 ft Easting 2790458.66 ft
 DRILLED BY Dallan LOGGED BY Jamie DRILLING METHOD _____
 ENGINEER _____
 NOTES Northing and Easting based on ND Cass County Ground Coordinates, South Zone



Boring Log 2



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	175	3

PROJECT NUMBER SS-8-018(106)064 DATE STARTED 8/31/16 COMPLETED 8/31/16
 PCN 23279 ELEVATION 933 ft
 LOCATION Cass County Northing 413984.39 ft Easting 2790460.75 ft
 DRILLED BY Dallan LOGGED BY Jamie DRILLING METHOD _____
 ENGINEER _____
 NOTES Northing and Easting based on ND Cass County Ground Coordinates, South Zone

NDDOT LOG 11X17 PLAN SHEET - NDDOT_DATA\TEMP_20180208.GDT - 10/26/23 16:18 - F:\LAB\PROJECTS\GINT\8-018(088)064.GPJ

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	AASHTO	USCS	SAMPLE TYPE & NUMBER	RECOVERY (%)	SPT N VALUE	MC		TESTS & REMARKS	
									PL	LL		
930	0	Soft to Stiff Moist Brown to Dark Grey Fat Clay		A-4	ML	1052	15	8	26	83	UU=859psf	
				A-7-6	CH	1053	70	10	26	89		
				A-7-6	CH	1054	75	5	23	65		
				A-7-6	CH	1055	85	5	25	73		
				A-7-6	CH	1056	85	5	24	76		
				A-7-6	CH	1057	100	5	23	52		
				A-7-6	CH	1058	100	5	24	47		
				A-7-6	CL	1059	100	5	25	76		
				A-7-6	CH	1060	100	6	23	64		
				A-7-6	CH	1061	100	6	25	75		
				A-7-6	CH	1062	100	6	25	74		
				A-7-6	CH	1063	100	6	31	96		
				A-7-5	CH	1064	100	5	31	90		
				A-7-5	CH	1065	100	5	31	82		
				A-7-6	CH	1067	100	3	26	72		
890	40	892.0 ft	A-7-6	CH	1068	85	3	28	50	UU=1121		
		41.0 ft	A-7-5	ML	1069	100	3	30	42			
		Soft Wet Dark Grey Silt	A-4	ML	1070	90	4	0	0			
			A-4	ML	1071	100	4	0	0			
		882.0 ft	A-4	ML	1072	100	4	0	0			
		51.0 ft	A-6	CL	1073	100	19	19	37			
		Very Stiff to Hard Glacial Till including Lean Clay and Silty Sand	A-6	CL	1074	100	71	16	29			
			A-6	CL	1075	100	86	0	0			
		874.0 ft	A-2-4	SM	1076	100	86	0	0			
		59.0 ft	Bottom of borehole at 59.0 ft									



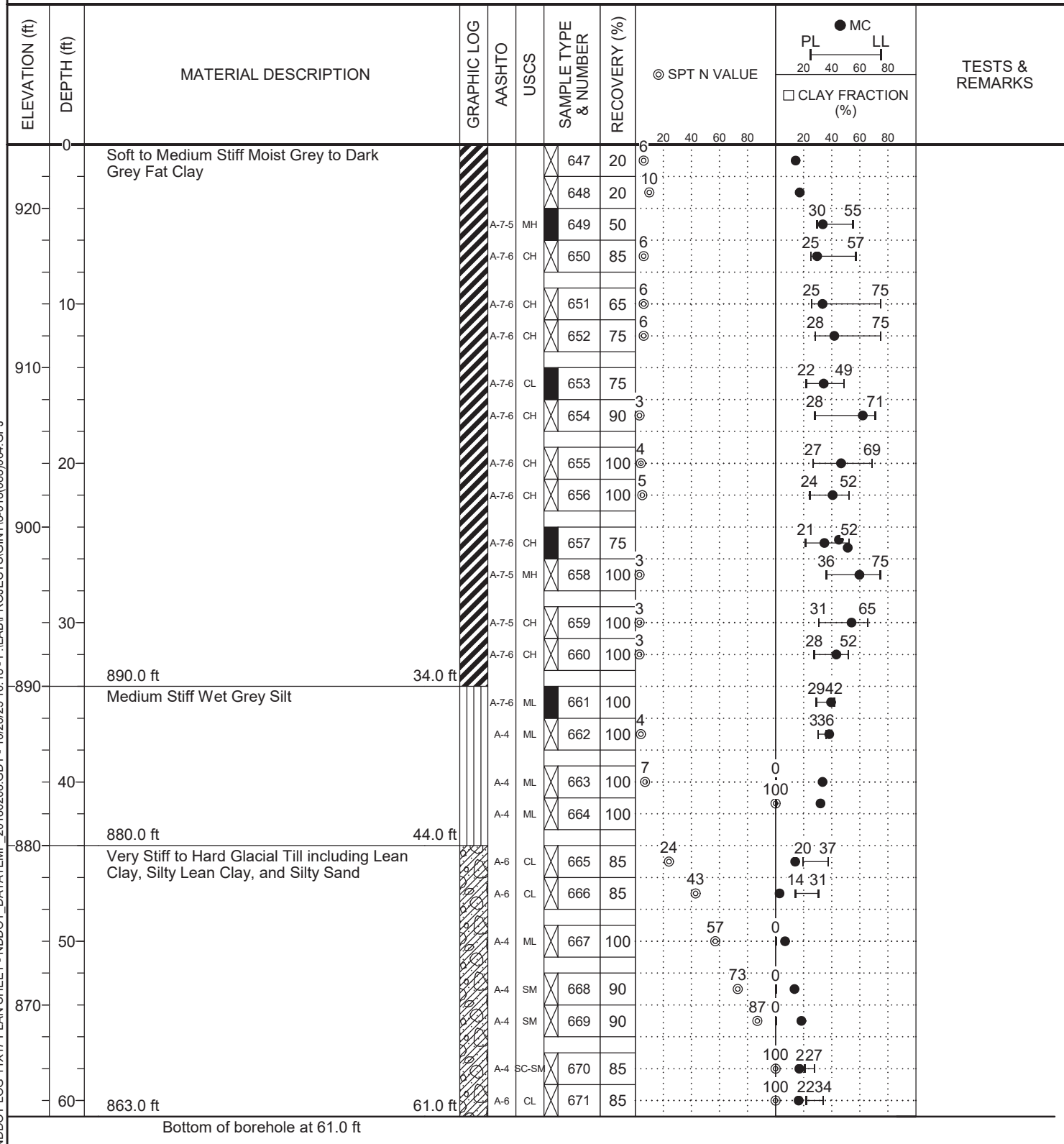
Boring Log 3



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	175	4

PROJECT NUMBER SS-8-018(106)064 DATE STARTED 8/2/17 COMPLETED 8/2/17
 PCN 23279 ELEVATION 924 ft
 LOCATION Cass County Northing 413881.78 ft Easting 2790503.80 ft
 DRILLED BY Dallan LOGGED BY Jamie DRILLING METHOD _____
 ENGINEER _____
 NOTES Northing and Easting based on ND Cass County Ground Coordinates, South Zone

NDDOT LOG 11X17 PLAN SHEET - NDDOT_DATA\TEMP_20180208.GDT - 10/26/23 16:18 - F:\LAB\PROJECTS\GINT\8-018(088)064.GPJ



Boring Log 4



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-018(106)064	175	5

PROJECT NUMBER SS-8-018(106)064 DATE STARTED 8/2/17 COMPLETED 8/2/17
 PCN 23279 ELEVATION 925 ft
 LOCATION Cass County Northing 413826.83 ft Easting 2790350.71 ft
 DRILLED BY Dallan LOGGED BY Jamie DRILLING METHOD _____
 ENGINEER _____
 NOTES Northing and Easting based on ND Cass County Ground Coordinates, South Zone

NDDOT LOG 11X17 PLAN SHEET - NDDOT_DATA\TEMP_20180208.GDT - 10/26/23 16:18 - F:\LAB\PROJECTS\GINT\18-018(088)064.GPJ

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	AASHTO	USCS	SAMPLE TYPE & NUMBER	RECOVERY (%)	SPT N VALUE	MC		TESTS & REMARKS
									PL	LL	
920	0	Soft to Medium Stiff Moist Grey to Dark Grey Fat Clay		A-7-6	CH	672	25	8	25	52	
				A-7-6	CH	673	25	10	24	54	
				A-7-6	CL	674	50	4	23	45	
				A-7-6	CH	675	75	4	25	76	
10				A-7-6	CH	676	90	4	23	69	
				A-7-6	CH	677	100	5	23	67	
				A-7-6	CH	678	90	4	25	63	
				A-7-6	CH	679	100	2	25	71	
				A-7-6	CH	680	100	3	24	68	
				A-7-6	CH	681	100	4	24	65	
				A-7-6	CH	682	100	4	29	76	
				A-7-6	CH	683	100	3	29	78	
				A-7-6	CH	684	100	3	27	63	
				A-7-6	CH	685	100	2	25	54	
890	34.0			891.0 ft Medium Stiff Wet Grey Silt		A-7-6	ML	686	100	0	29
		A-4	ML	687		100	3	0			
		A-4	ML	688		100	5	0			
		A-4	ML	689	100	7	0				
880	43.0	882.0 ft Hard Glacial Till including Lean Clay, Silty Lean Clay, and Silty Sand		A-6	CL	690	100	48	22	40	
		A-6		CL	691	90	48	17	31		
		A-4		CL-ML	692	90	84	100	122		
		A-4		SM	693	100	100				
		A-4		SC-SM	694	100	100	100	121		
		A-4		CL-ML	695	100	100	100	121		
870				A-4	SC	696	100	100	2	31	
864.0	61.0	864.0 ft		A-4	SC	696	100	100	2	31	

Bottom of borehole at 61.0 ft



Boring Log 5

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 C 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
 DInt delineate
 DIntr delineator
 Depr depression
 Desc description
 Det detail
 DWP detectable warning panel
 Dtr detour
 Dia or \emptyset 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
05-20-18	General Revisions
12-18-20	General Revisions
08-16-22	General Revisions



NDDOT ABBREVIATIONS

D-101-2

Galv	galvanized	Ln	lane	Obsc	obscure(d)	Qty	quantity
Gar	garage	Lg	large	Ocpd	occupied	Qtr	quarter
Gs L	gas line	Lat	latitude	Ocpy	occupy		
G Reg	gas line regulator	Lt	left	O/s	offset		
GMV	gas main valve	Lens	lenses	OC	on center	Rad or R	radius
G Mtr	gas meter	Lvl	level	C	one dimensional consolidation	RR	railroad
GSV	gas service valve	Lvng	leveling	OC	organic content	Rlwy	railway
GVP	gas vent pipe	Lht	light	Orig	original	Rsd	raised
GV	gate valve	LP	light pole	O To O	out to out	RC	rapid curing
Ga	gauge	Ltg	lighting	OD	outside diameter	Rec	record
Gov	government	Liq	liquid	OH	overhead	Recy	recycle
Grd	graded/grade	LL	liquid limit			RAP	recycled asphalt pavement
Grnd	ground	Loc	location			RPCC	recycled portland cement concrete
GWM	ground water monitor	Long.	longitude	PMT	pad mounted transformer	Ref	reference
Gdrl	guardrail	Lp	loop	Pg	pages	R Mkr	reference marker
Gtr	gutter	LD	loop detector	Pntd	painted	RM	reference monument
		Lum	luminaire	Pr	pair	RP	reference point
				Pnl	panel	Refl	reflectorized
H Plg	H piling			Pk	park	RCB	reinforced concrete box
Hdwl	headwall	Mb	mailbox	PSD	passing sight distance	RCES	reinforced concrete end section
Ht	height	ML	main line	Pvmt	pavement	RCFES	reinforced concrete flared end section
Hel	helical	MH	manhole	Ped	pedestal	RCP	reinforced concrete pipe
HDPE	high density polyethylene	Mkd	marked	Ped	pedestrian	RCPS	reinforced concrete pipe sewer
HM	high mast	Mkr	marker	PPP	pedestrian pushbutton post	RCTES	reinforced concrete traversable end section
HP	high pressure	Mkg	marking	Pen.	penetration	Reinf	reinforcement
HPS	high pressure sodium	MA	mast arm	Perf	perforated	Res	reservation
HTCG	high tension cable guardrail	Matl	material	Per.	perimeter	Res	residence
Hwy	highway	Max	maximum	Perm	permanent	Ret	retaining
Hor	horizontal	MC	meander corner	PL	pipeline	Rev	reverse
HBP	hot bituminous pavement	Meas	measure	PI	place	Rt	right
HMA	hot mix asphalt	Mdn	median	P&P	plan & profile	R/W	right of way
Hyd	hydrant	MD	median drain	PL	plastic limit	Riv	river
Ph	hydrogen ion content	MC	medium curing	Pl or \bar{P}	plate	Rd	road
		MGS	Midwest Guardrail System	Pt	point	Rdbd	road bed
		MM	mile marker	PE	polyethylene	Rdwy	roadway
Id	identification	MP	mile post	PVC	polyvinyl chloride	RWIS	roadway weather information system
Incl	inclinometer tube	Min	minimum	PCC	Portland Cement concrete	Rk	rock
IMH	inlet manhole	Misc	miscellaneous	PP	power pole	Rt	route
ID	inside diameter	Mon	monument	Preempt	preemption		
Inst	instrument	Mnd	mound	Prefab	prefabricated		
Intchg	interchange	Mtbl	mountable	Prfmd or Pref	performed		
Intmdt	intermediate	Mtd	mounted	Prep	preparation		
Intscn	intersection	Mtg	mounting	Press.	pressure		
Inv	invert	Mk	muck	PRV	pressure relief valve		
IP	iron pipe			Prestr	prestressed		
				Pvt	private		
				PD	private drive		
Jt	joint	Neop	neoprene	Prod.	production/produce		
Jct	junction	Ntwk	network	Prog	programmed		
		N	North	Prop.	property		
		NE	North East	Prop Ln	property line		
		NW	North West	Ppsd	proposed		
		NB	Northbound	PB	pull box		
		No. or #	number				

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NDDOT ABBREVIATIONS

D-101-3

Salv	salvage(d)	Tel	telephone
San	sanitary sewer line	Tel B	Telephone Booth
Sec	section	Tel P	telephone pole
SL	section line	Tv	television
Sep	separation	Temp	temperature
Seq	sequence	Temp	temporary
Serv	service	TBM	temporary bench mark
Sht	sheet	T	thinwall tube sample
Shtng	sheeting	Ts	topsoil
Shldr	shoulder	Traf	traffic
Sw or Sdwk	sidewalk	TSCB	traffic signal control box
SD	sight distance	Tr	trail
SN	sign number	Transf	transformer
Sig	signal	Trans	transition
Sgl	single	TT	transmission tower
SRCP	slotted reinforced concrete pipe	TES	traversable end section
SC	slow curing	Trans	transverse
SS	slow setting	Trtd	treated
Sm	small	Trmt	treatment
S	South	Qc	triaxial compression
SE	South East	TERO	tribal employment rights ordinance
SW	South West	Tpl	triple
SB	Southbound	Typ	typical
Sp	spaces		
Spcl	special	Qu	unconfined compressive strength
SA	special assembly	Ugrnd	underground
SP	special provisions	Util	utility
G	specific gravity		
Spk	spike	VG	valley gutter
SB	split barrel sample	Vap	vapor
SH	sprinkler head	Vert	vertical
SV	sprinkler valve	VCP	vitrified clay pipe
Sq	square	Vol	volume
Stk	stake	VSFS	vehicle speed feedback sign
Std	standard		
N	standard penetration test	Wkwy	walkway
Std Specs	standard specifications	W	water content
Stm L	steam line	WGV	water gate valve
SEC	steel encased concrete	WL	water line
SMA	stone matrix asphalt	WM	water main
SSD	stopping sight distance	WMV	water main valve
SD	storm drain	W Mtr	water meter
St	street	WSV	water service valve
SPP	structural plate pipe	WW	water well
SPPA	structural plate pipe arch	Wrng	wearing
Str	structure	WIM	weigh in motion
Subd	subdivision	W	west
Sub	subgrade	WB	westbound
Sub Prep	subgrade preparation	Wrng	wiring
Ss	subsoil	W/	with
SS	supplement specification	W/o	without
Supp	supplemental	WC	witness corner
Surf	surfacing		
Surv	survey		
Sym	symmetrical		

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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	
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12-18-20	Sheet Added - Continued from D-101-3



NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

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



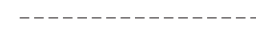



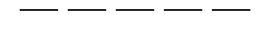


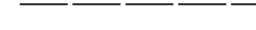

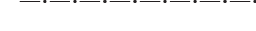











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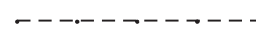
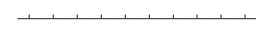


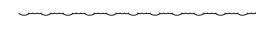
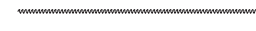
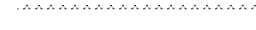








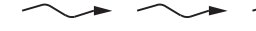
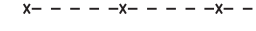
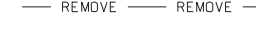




LINE STYLES

D-101-20










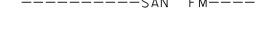












Existing Topography

-  Existing Ground Void
-  Existing Cemetery 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




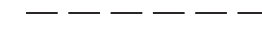
Proposed Topography

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

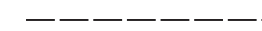
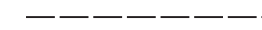
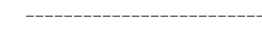


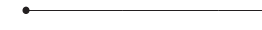

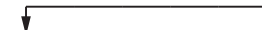

Existing Utilities

-  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

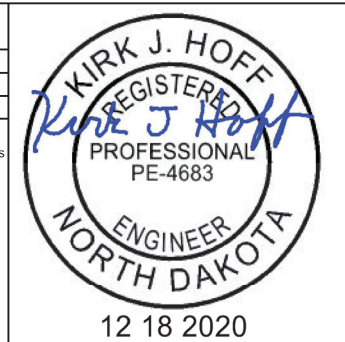
Traffic Utilities

-  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

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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 Typical

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

Geotechnical

- D ----- D ----- Geotextile Fabric Type D
- **Geo** ----- **Geo** ----- Geogrid
- R ----- R ----- Geotextile Fabric Type R
- R ----- R ----- Geotextile Fabric Type R1
- RR ----- RR ----- Geotextile Fabric Type RR
- S ----- S ----- Geotextile Fabric Type S

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

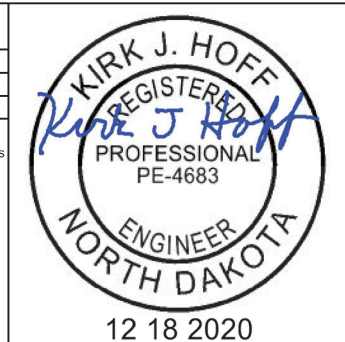
Erosion Control

- Limits of Const Transition Line
- Bale Check
- Rock Check
- s ----- s ----- Floating Silt Curtain
- SF ----- SF ----- Silt Fence
- Excavation Limits
- Fiber Rolls

Environmental

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

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SYMBOLS



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



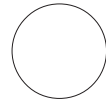
Existing Large Tree



Existing Small Tree



Existing Tree Trunk



Cairn or Stone Circle



Existing Artifact



Existing Satellite Dish



Existing Weather Station



Existing Windmill or Tower



Reinforced Pavement



Continuous Split Barrel Sample



Flight Auger Sample



Split Barrel Sample



Thinwall Tube Sample



Standard Penetration Test



Inclinometer Tube



Excavation Unit



Existing Ground Water Well Bore Hole

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Professional Engineer Seal for Kirk J. Hoff, North Dakota, PE-4683, dated 12 18 2020.

SYMBOLS

D-101-31

	Flexible Delineator		Highway Sign (Exst, Ppsd)
	Flexible Delineator Type A (Exst, Ppsd)		Mile Post Type A (Exst-Ppsd-Reset)
	Flexible Delineator Type B (Exst, Ppsd)		Mile Post Type B (Exst, Ppsd)
	Flexible Delineator Type C (Exst, Ppsd)		Mile Post Type C (Exst, Ppsd)
	Flexible Delineator Type D (Exst, Ppsd)		Object Marker Type I (Exst, Ppsd)
	Flexible Delineator Type E (Exst, Ppsd)		Object Marker Type II (Exst, Ppsd)
	Delineator Type A (Exst, Ppsd, Diamond Grade-Reset)		Object Marker Type III (Exst, Ppsd)
	Delineator Type B (Exst, Ppsd, Diamond Grade-Reset)		Existing Reference Marker
	Delineator Type C (Exst, Ppsd, Diamond Grade)		Road Closure Gate 18 Ft (Exst, Ppsd)
	Delineator Type D (Exst, Ppsd, Diamond Grade)		Road Closure Gate 28 Ft (Exst, Ppsd)
	Delineator Type E (Exst, Ppsd, Diamond Grade)		Road Closure Gate 40 Ft (Exst, Ppsd)
	Barricade (Type I, Type II, Type III)		Existing Railroad Battery Box
			Existing RR Profile Spot
			Existing Railroad Crossbuck
	Arrow Panel (Caution Mode, Double Direction, Left Directional, Right Directional, Sequencing, Truck Mounted)		Existing Railroad Frog
			Existing Mailbox (Private, Federal)
	Truck Mounted Attenuator		
	Delineator Drums		
	Flagger		
	Tubular Marker		
	Traffic Cone		
	Back to Back Vertical Panel Sign		




















































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



KIRK J. HOFF
REGISTERED
Kirk J Hoff
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA
12 18 2020

SYMBOLS

D-101-32

	Existing Luminaire		High Mast Light Standard 3 Luminaire (Exst, Ppsd)		Existing Traffic Signal Standard
	Luminaire LED		High Mast Light Standard 4 Luminaire (Exst, Ppsd)		Pull Box (Exst-Ppsd-Undefined)
	Existing Light Standard Luminaire		High Mast Light Standard 5 Luminaire (Exst, Ppsd)		Intelligent Transportation Pull Box (Exst, Ppsd)
	Relocate Light Standard		High Mast Light Standard 6 Luminaire (Exst, Ppsd)		Transformer (Exst, Ppsd)
	Light Standard Light LED Luminaire		High Mast Light Standard 7 Luminaire (Exst, Ppsd)		Power Pole (Exst-Ppsd-with Transformer)
	Light Standard 35 Watt High Pressure Sodium Vapor Luminaire		High Mast Light Standard 8 Luminaire (Exst, Ppsd)		Wood Pole (Exst, Ppsd)
	Light Standard 50 Watt High Pressure Sodium Vapor Luminaire		High Mast Light Standard 9 Luminaire (Exst, Ppsd)		Pedestrian Push Button Post (Exst, Ppsd)
	Light Standard 70 Watt High Pressure Sodium Vapor Luminaire		High Mast Light Standard 10 Luminaire (Exst, Ppsd)		Existing Pole
	Light Standard 100 Watt High Pressure Sodium Vapor Luminaire		Overhead Sign Structure Load Center (Exst, Ppsd)		Existing Telephone Pole
	Light Standard 150 Watt High Pressure Sodium Vapor Luminaire		Traffic Signal Controller (Exst, Ppsd)		Existing Post
	Light Standard 200 Watt High Pressure Sodium Vapor Luminaire		Pad Mounted Traffic Signal Controller (Exst, Ppsd)		Connection Conductor (Ground, Neutral, Phase 1, Phase 2)
	Light Standard 250 Watt High Pressure Sodium Vapor Luminaire		Flashing Beacon (Exst, Ppsd)		
	Light Standard 310 Watt High Pressure Sodium Vapor Luminaire		Concrete Foundation (Exst, Ppsd)		
	Light Standard 400 Watt High Pressure Sodium Vapor Luminaire		Pipe Mounted Flasher (Exst, Ppsd)		
	Light Standard 700 Watt High Pressure Sodium Vapor Luminaire		Pad Mounted Feed Point (Exst, Ppsd)		
	Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire		Pipe Mounted Feed Point with Pad (Exst, Ppsd)		
	Emergency Vehicle Detector		Pole Mounted Feed Point (Exst, Ppsd)		
	Video Detection Camera		Junction Box (Exst, Ppsd)		
			Existing Pedestrian Head with Number		
			Existing Signal Head		
			Pole Mounted Head		
			Existing Lighting Standard Pole		

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



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12 18 2020

SYMBOLS

D-101-33

			Existing Manhole (Electrical, Gas, Telephone)			Cap or Stub Exst Gas, Exst Sanitary, Exst Storm Drain, Ppsd Storm Drain, Exst Water	
			Water Manhole (Exst, Exst with Valve)				
			Sanitary Sewer Manhole (Exst, Ppsd, Exst with Valve)		Existing Pedestal Electrical, Telephone, Fiber Optic Telephone, TV, Fiber Optic TV, Undefined		
			Sanitary Force Main Manhole (Exst, Ppsd, Exst with Valve)				
			Storm Drain Manhole (Exst, Ppsd, Exst with Inlet, Ppsd with Inlet)		Existing Pipe Vent Gas, Fuel, Sanitary, Storm Drain, Water, Undefined		
			Force Main Storm Drain Manhole (Exst, Exst with Valve)				
			Manhole (Ppsd, Ppsd 48 Inch, Exst Undefined)		Valve Exst Gas, Exst Water, Ppsd Water, Exst Undefined		
			Existing Water Appurtenance				
			Sprinkler Head (Exst, Ppsd)		Pump Sanitary, Storm Drain, Exst Water		
			Fire Hydrant (Exst, Ppsd)				
			Cleanout (Exst Sanitary, Underdrain)		Corrugated Metal End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)		
			Existing Catch Basin Inlet (Round, Square)				
			Existing Curb Inlet (Round, Square)		Reinforced Concrete End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)		
			Existing Slotted Reinforced Concrete Pipe				
			Catch Basin (Riser 30 Inch, Beehive, Type A)		Existing Utility Marker		
			Inlet Mountable Curb (Type A, Type B)		Existing Meter		
			Inlet Saddle Base (Type 1, Type 2)		Existing Fuel Dispensers		
			Inlet Special (Catch Basin, Type 1, Type A)		Existing Fuel Filler Pipes		
			Inlet (Tee, Type 1, Type 2, Type 2 Double)		Existing Fuel Leak Sensors		
			Median Drain				
			Headwall (Exst, Ppsd, Ppsd Single with Vegetation Barrier, Ppsd Double with Vegetation Barrier)				

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

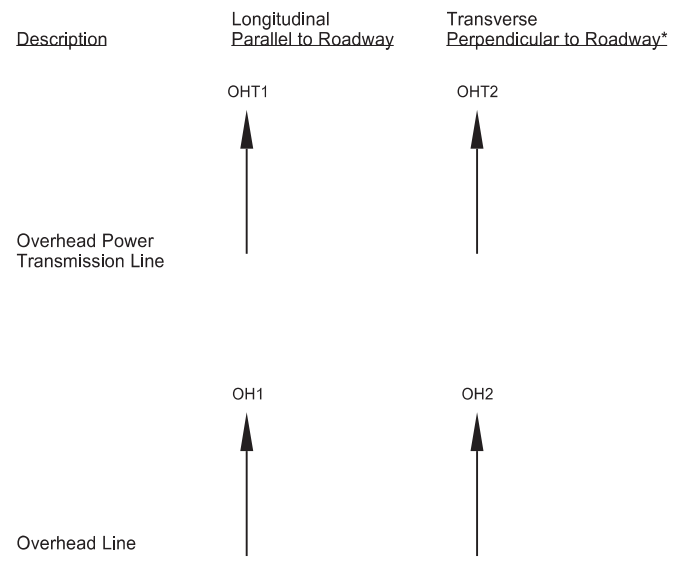


12 18 2020

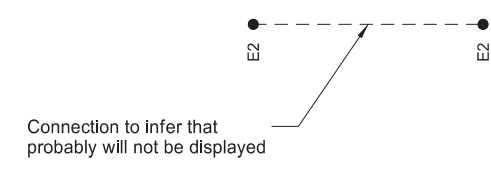
Cross Section Legend

D-101-40

Description	Longitudinal Parallel to Roadway	Transverse Perpendicular to Roadway*
Cable Line	● CBL1	● CBL2
Conduit Line	● CDU1	● CDU2
Electric Line	● E1	● E2
Fiber Optic Line	● F1	● F2
Gas Main Line	● GM1	● GM2
Gas Service Line	● GS1	● GS2
Gas Transmission Line	● GT1	● GT2
Fuel Pipeline	● PL1	● PL2
Sanitary Sewer Force Main	● SSF1	● SSF2
Sanitary Sewer	● SS1	● SS2
Steam Line	● STE1	● STE2
Storm Drain (Assumed Depth)	● SD1	● SD2
Telephone Line	● T1	● T2
TV Line	● TV1	● TV2
Water Main Line	● WM1	● WM2
Water Service Line	● WS1	● WS2



* Usually the transverse utilities are shown on a cross section with 2 or more symbols. The utility runs from one symbol to the other, but the connection may not be shown.



When storm drain invert elevations are NOT used to draw pipe, they will appear as shown to the left. When invert elevations are used to draw pipe, they will be a cross section similar to the graphics shown below.



Light Standard - Multiple Variations
Concrete
Steel
Wood
with Traffic Signal



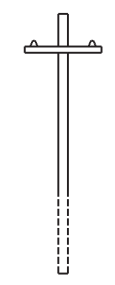
Manhole - Multiple Variations
Electric
Fiber Optic
Gas
Inlet
Sanitary Force Main
Sanitary
Sanitary with Valve
Steam
Storm
Storm Force Main
Storm with Valve
Telephone
Water
Water with Meter
Water with Valve
Water with Air Release Valve



Anchor



Pole - Multiple Variations
Utility
Brace
Feed Point
Guy
Power
Power Structure
Power with Light
Power with Transformer



High Tension Cable Guardrail

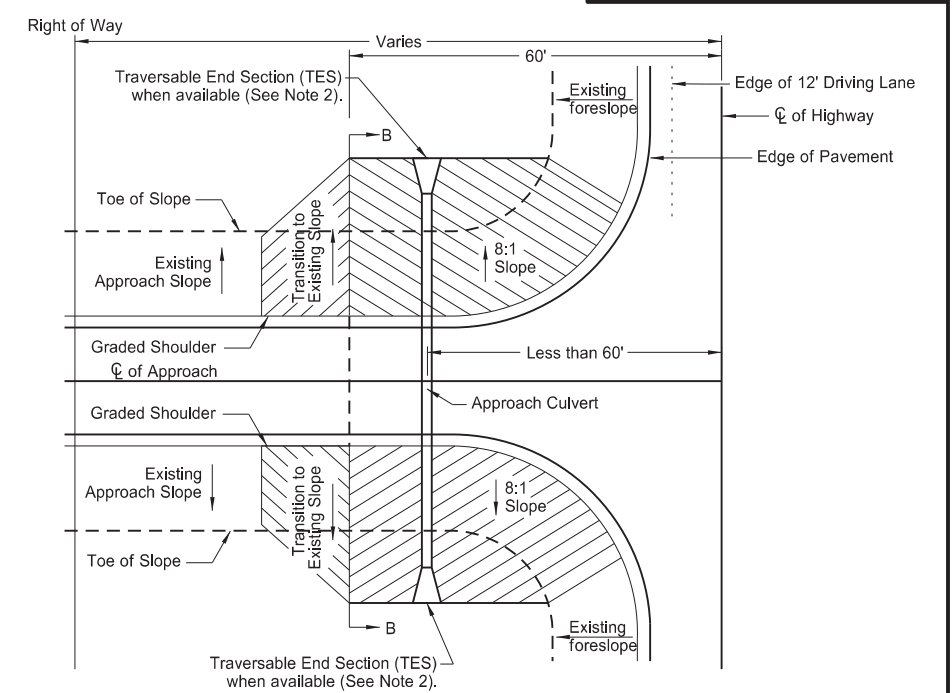
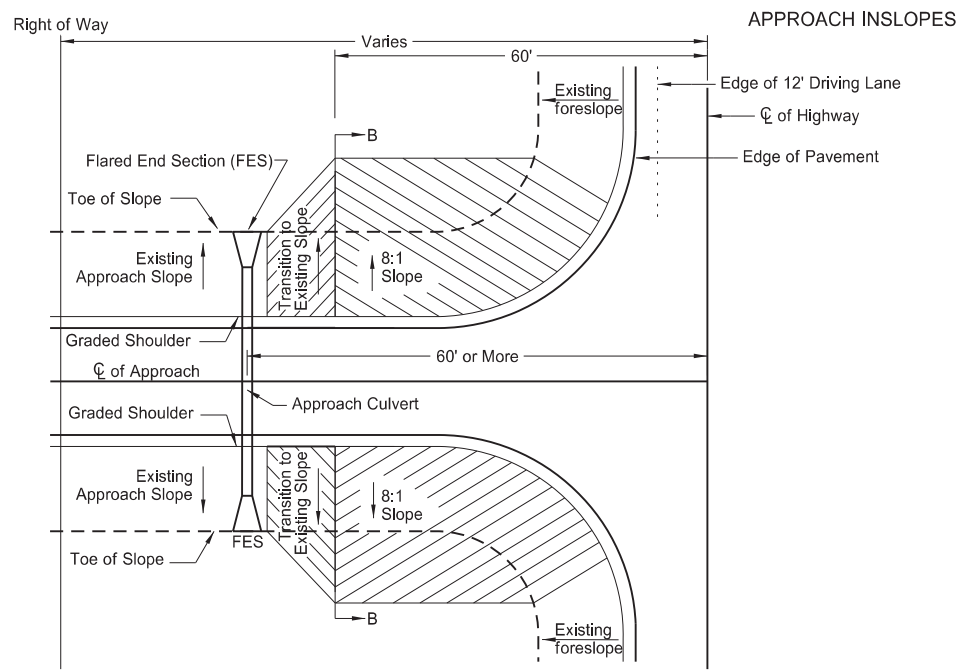
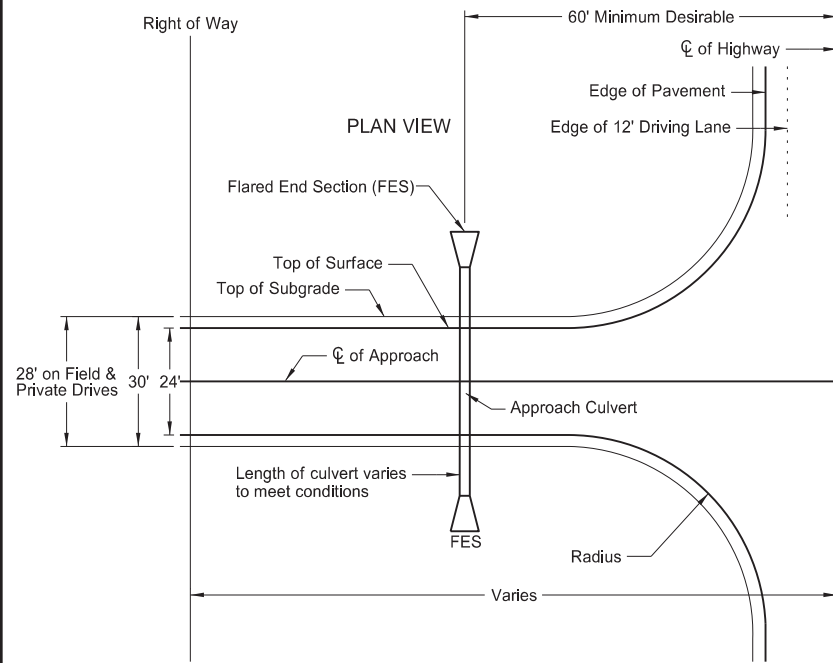


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-20-18	
REVISIONS	
DATE	CHANGE
6/14/2023	CADD Standards Update

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ENGINEER
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06/14/23

STANDARD RURAL APPROACHES



CASE 1

APPROACH PIPE LOCATED 60' OR MORE FROM Cl

CASE 2

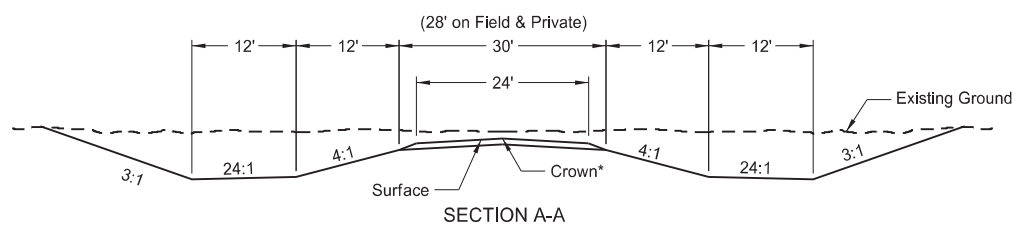
APPROACH PIPE LOCATED LESS THAN 60' FROM Cl

Approach Pipe Traversable End Sections (TES)

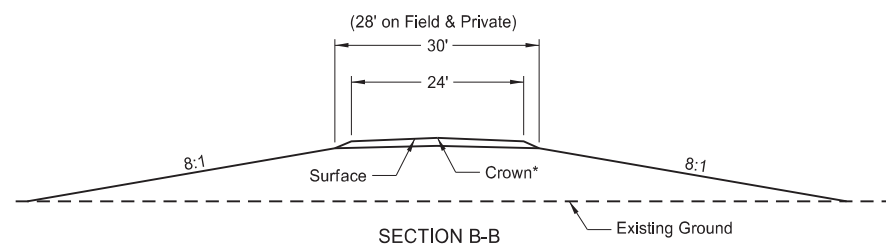
RCP	CSP	CSP Arch
15"	15"	
18"	18"	21"x15"
		24"x18"
24"	24"	28"x20"

CRITERIA FOR RURAL APPROACH TYPES

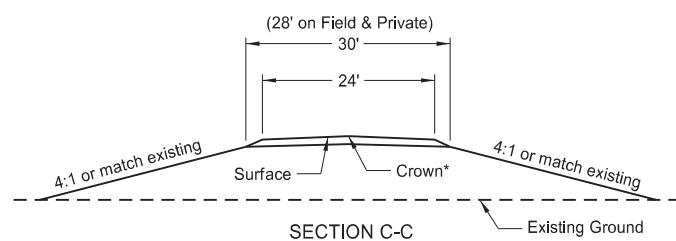
	Field Drives	Private Drives	Low Volume Public Roads
Radius	R=40 ft	R=40 ft	R=50 ft
Maximum Grade	10%	7%	7%
Storage Platform	24 ft	24 ft	50 ft
Vertical Curve Length	10 ft	10 ft	Varies (Min. 20 mph)



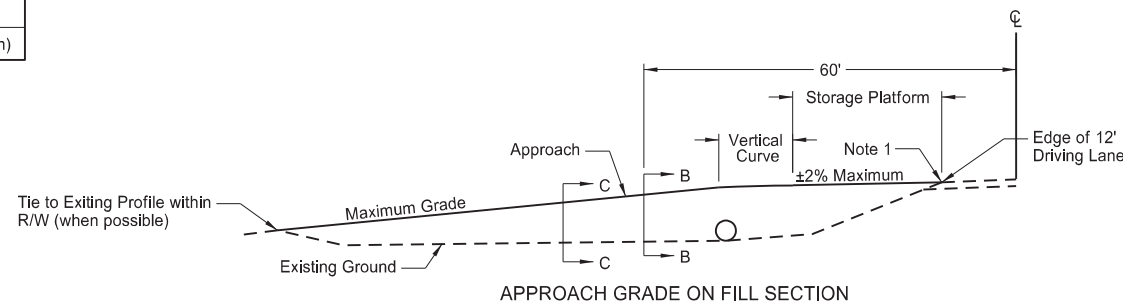
*2.1% crown for paved surface
*3.0% crown for gravel surface



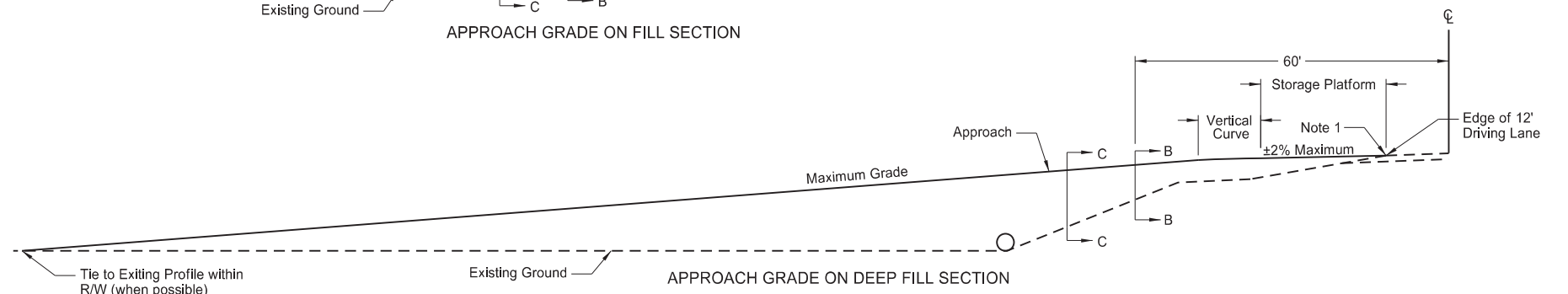
SECTION B-B



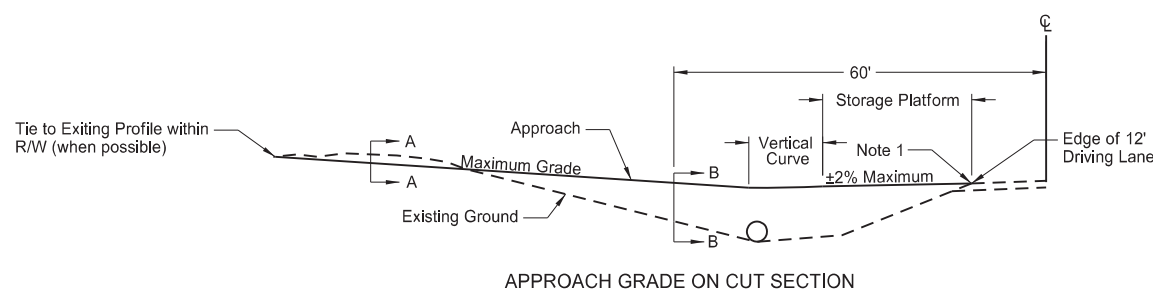
SECTION C-C



APPROACH GRADE ON FILL SECTION



APPROACH GRADE ON DEEP FILL SECTION



APPROACH GRADE ON CUT SECTION

NOTES:

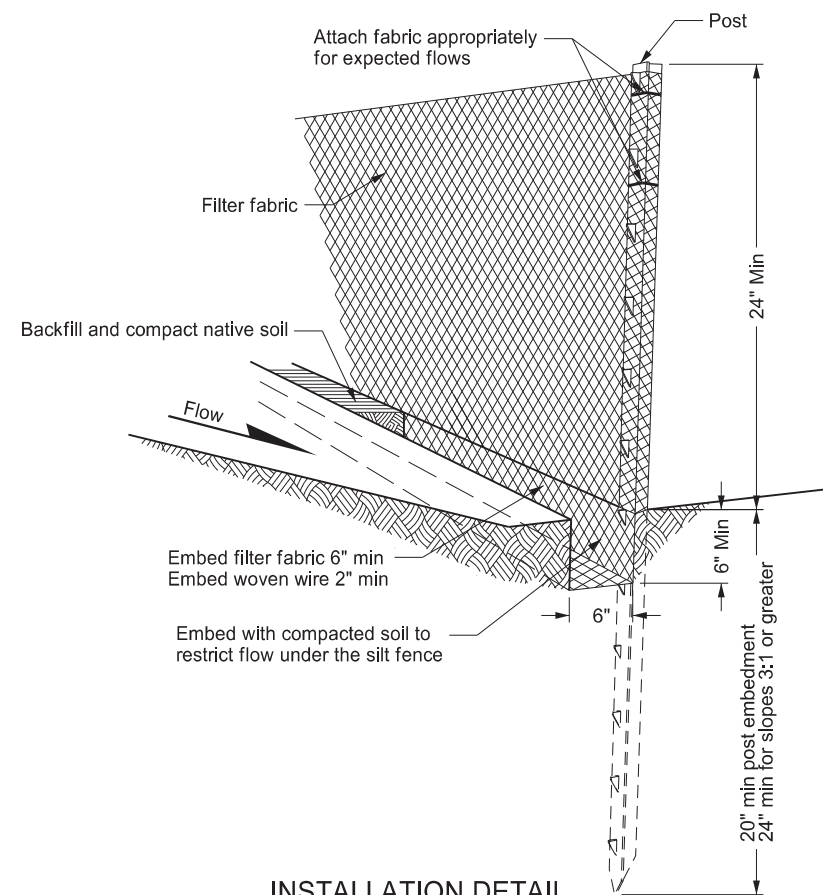
- 5% Max Rollover between approach storage platform and highway.
- Approach pipes up to 24" diameter are acceptable (with traversable end sections) for Case 2. Install approach pipes larger than 24" diameter in accordance with Case 1.

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



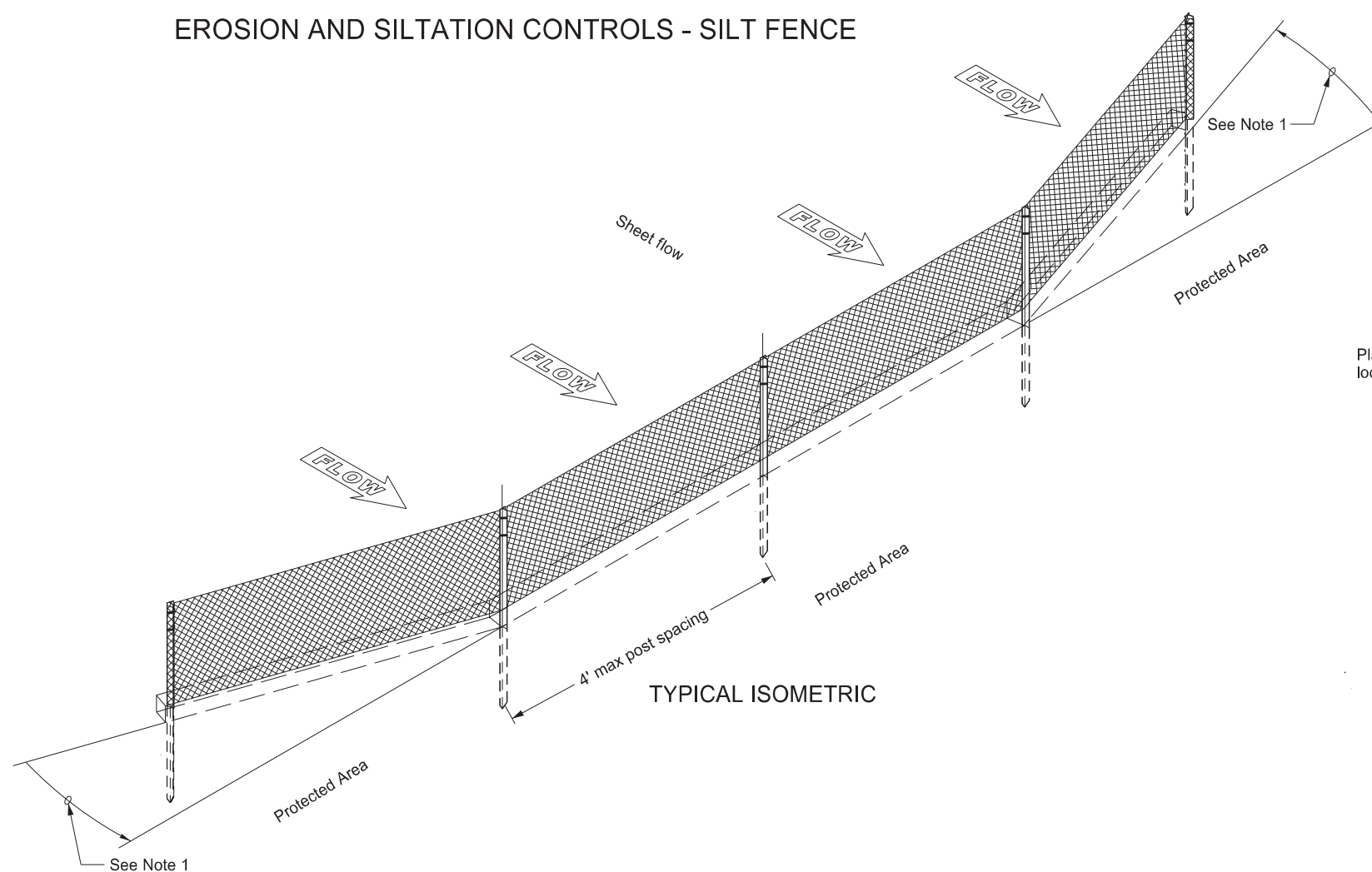
06/29/22

EROSION AND SILTATION CONTROLS - SILT FENCE

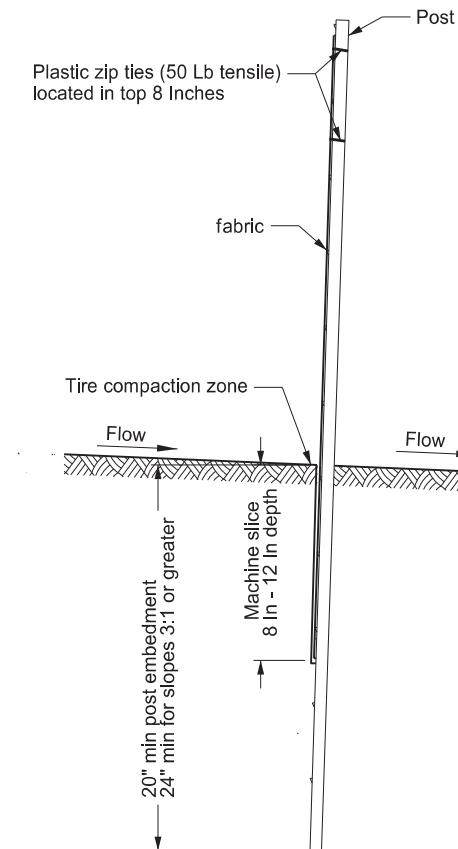


INSTALLATION DETAIL

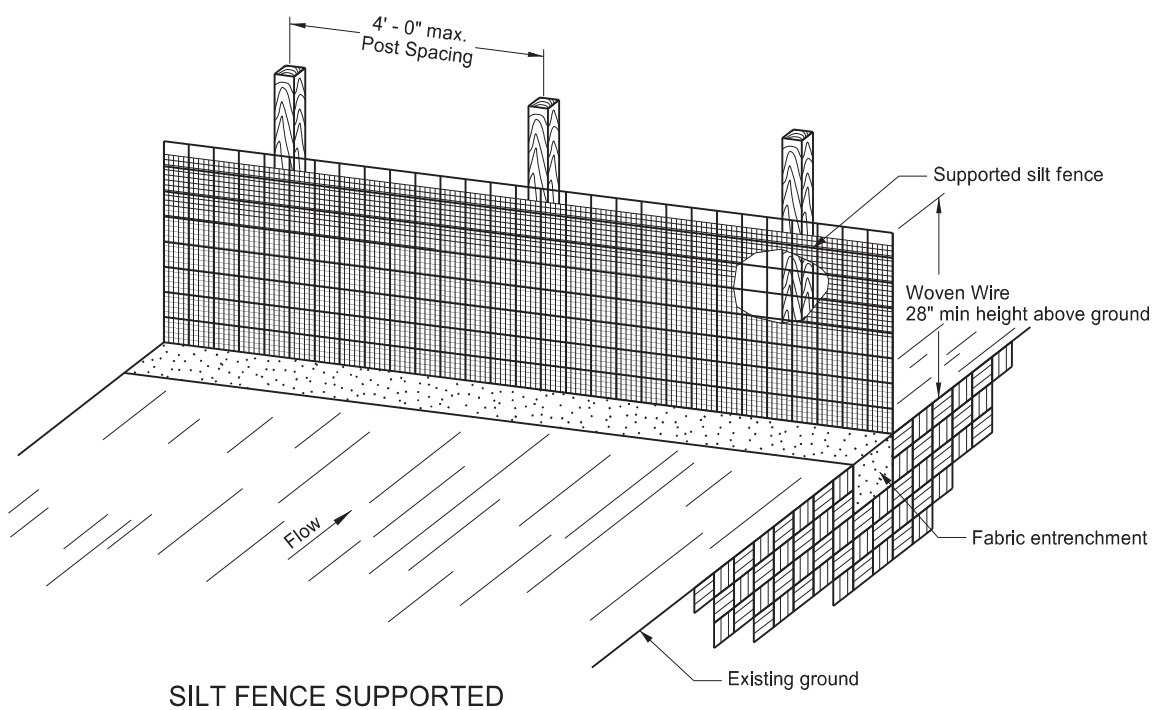
Minimize disturbance of ground around trench and smooth surface after excavation to avoid concentrating flows. Compact to prevent undercutting flows.



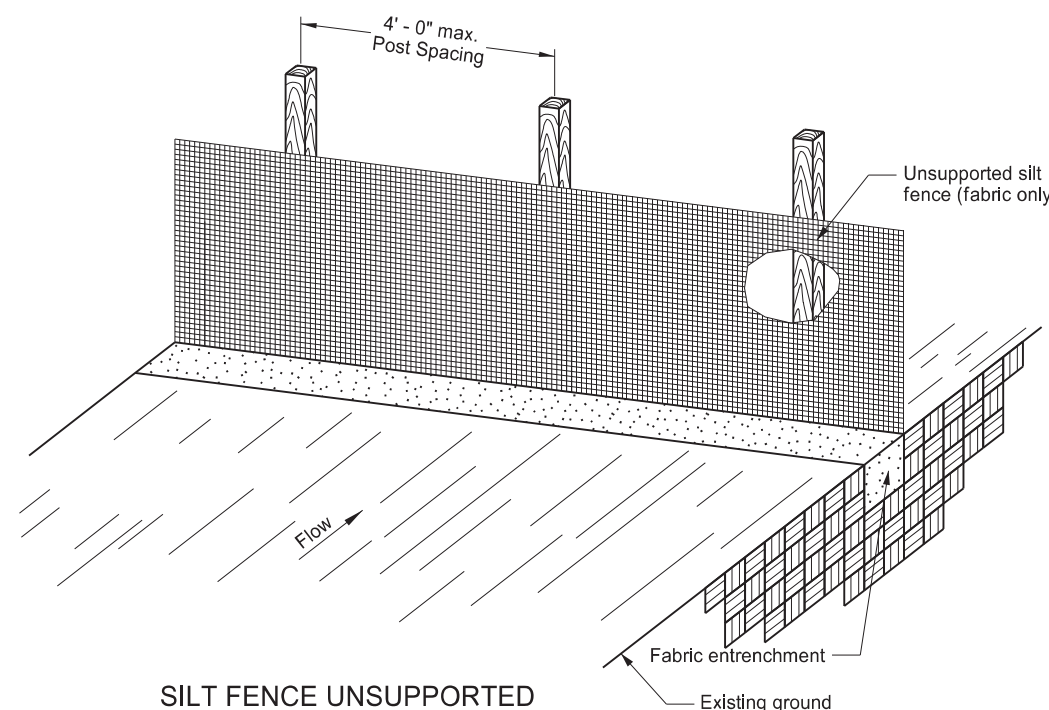
TYPICAL ISOMETRIC



MACHINE SLICED SILT FENCE



SILT FENCE SUPPORTED



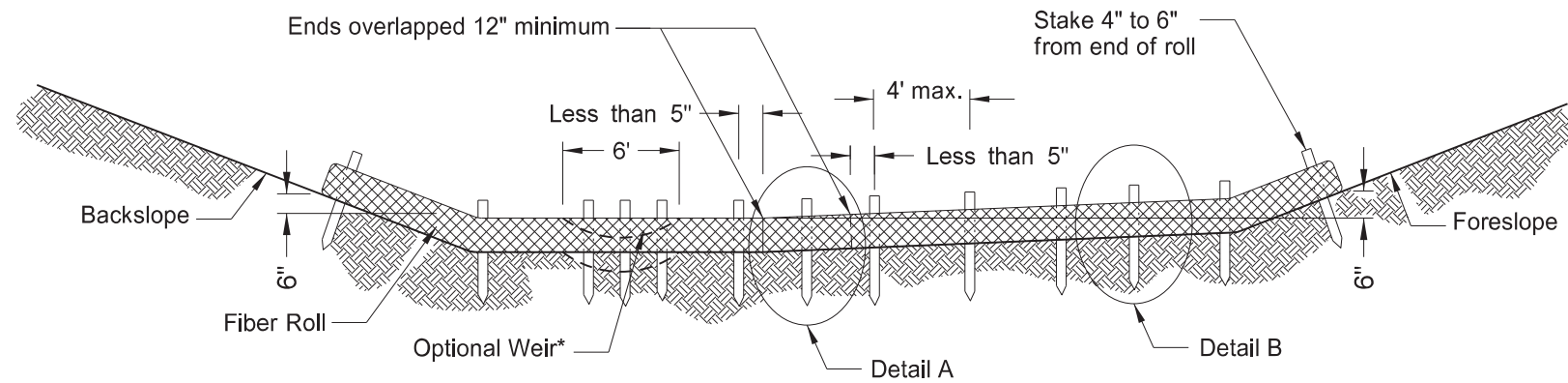
SILT FENCE UNSUPPORTED

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

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

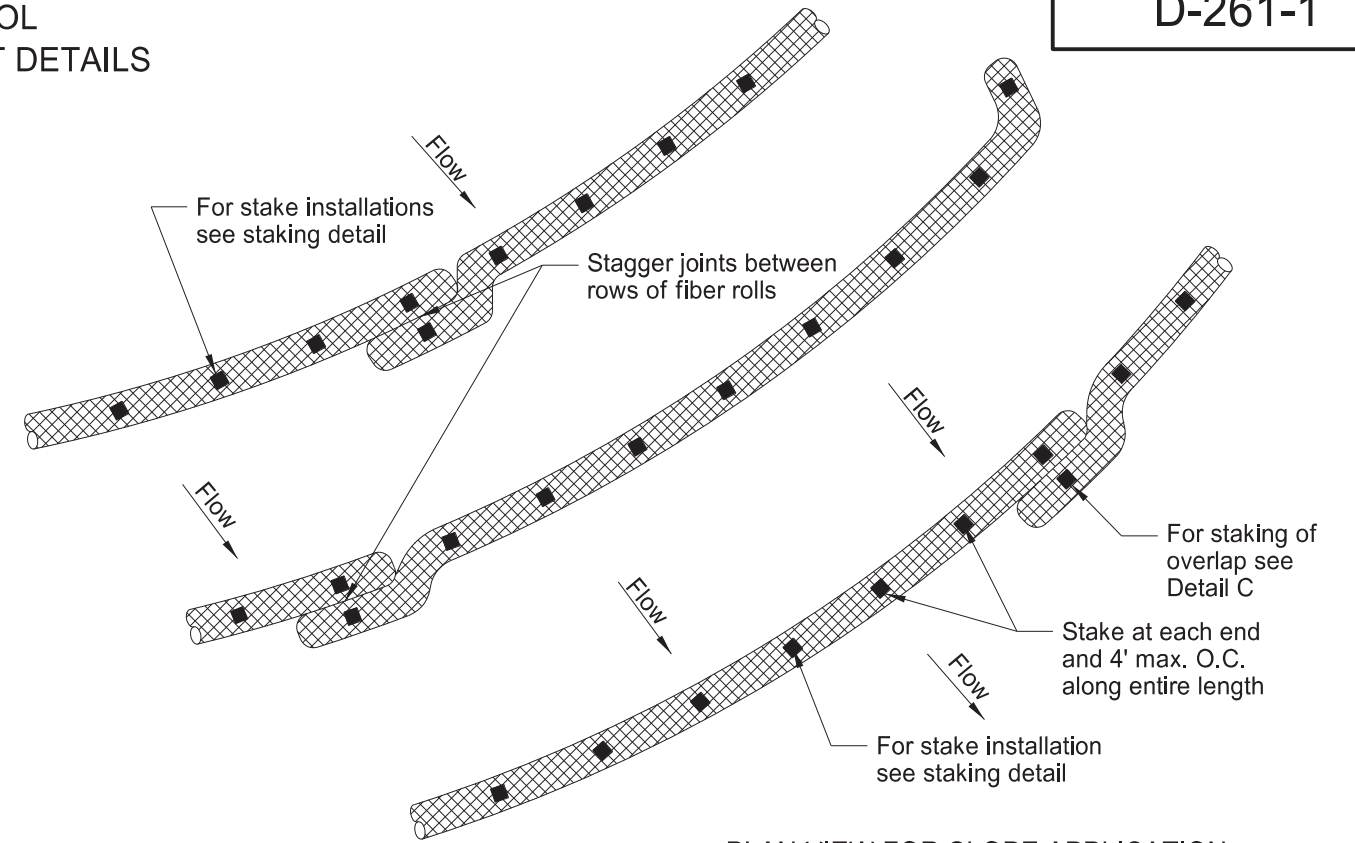
This document was originally issued and sealed by
 Kirk J Hoff,
 Registration Number
 PE- 4683,
 on 08/27/19 and the original document is stored at the
 North Dakota Department
 of Transportation

EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

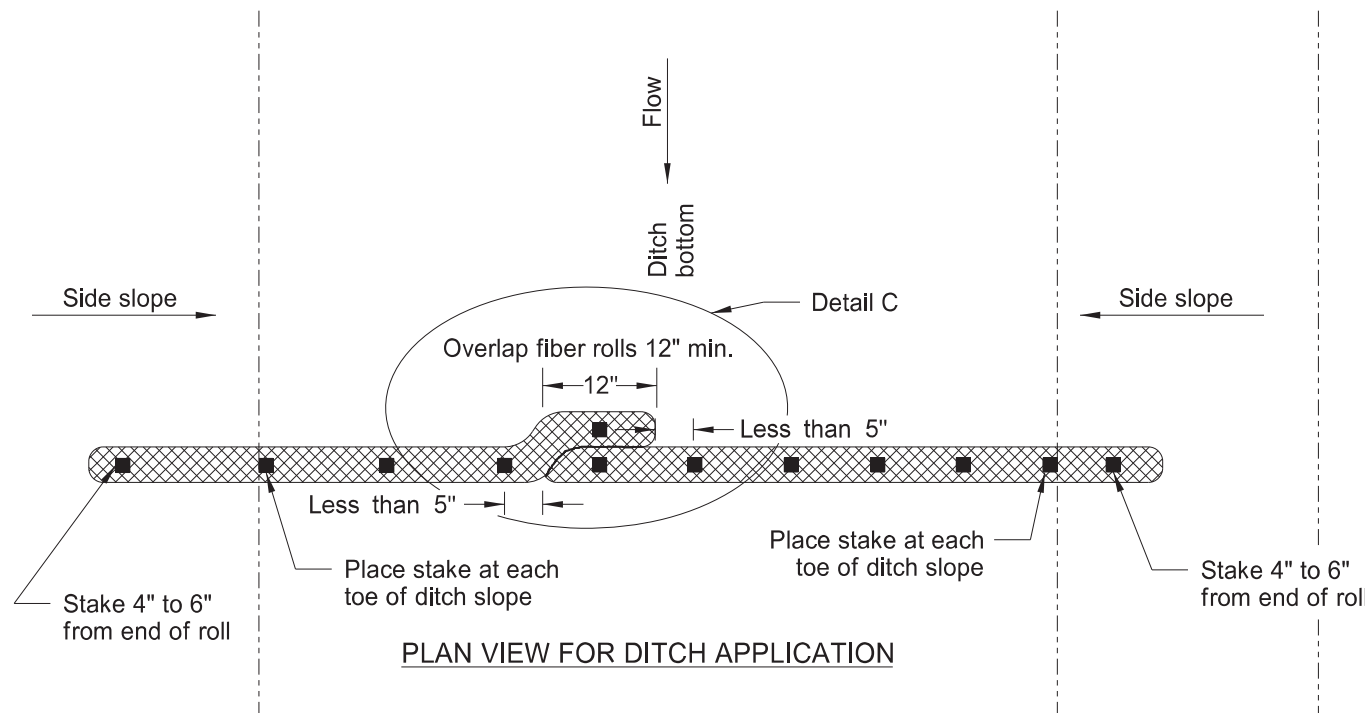


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

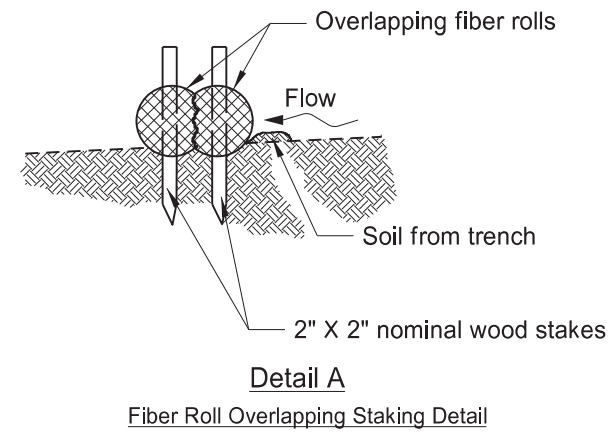
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



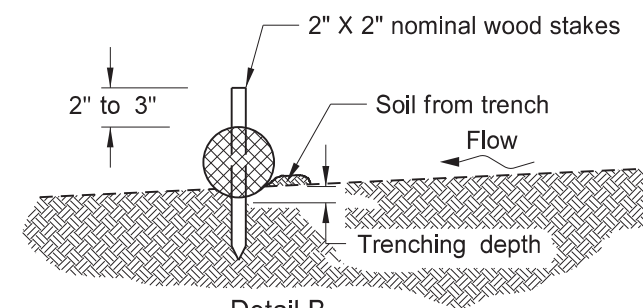
PLAN VIEW FOR SLOPE APPLICATION



PLAN VIEW FOR DITCH APPLICATION



Detail A
Fiber Roll Overlapping Staking Detail



Detail B
Fiber Roll Staking Detail

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

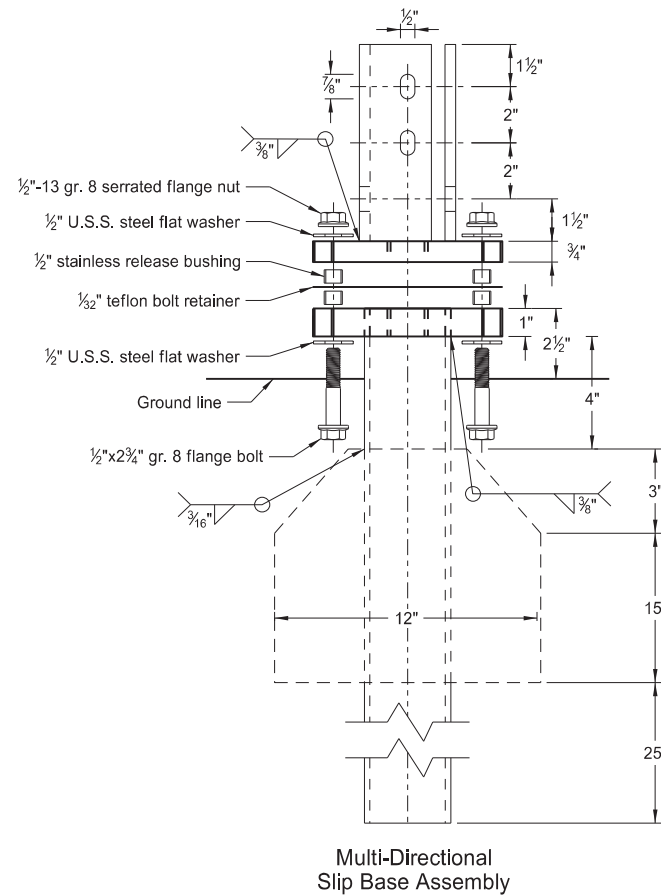
NOTE: Runoff must not be allowed to run under or around roll.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-18-10	
REVISIONS	
DATE	CHANGE
06-10-13	Added plan view for ditch and slope application. Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.
06-26-14	Changed standard drawing number from D-708-7 to D-261-1.
08-27-19	New Design Engineer PE Stamp

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

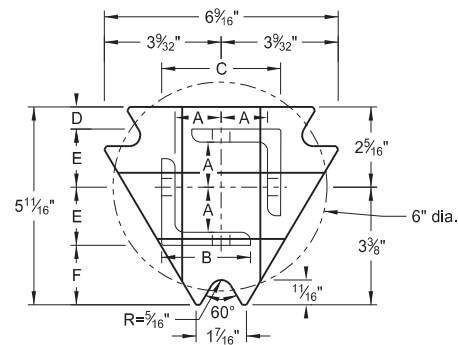
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

Perforated Tube



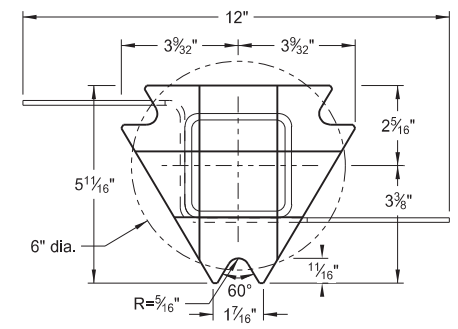
Multi-Directional Slip Base Assembly

Traffic Flow

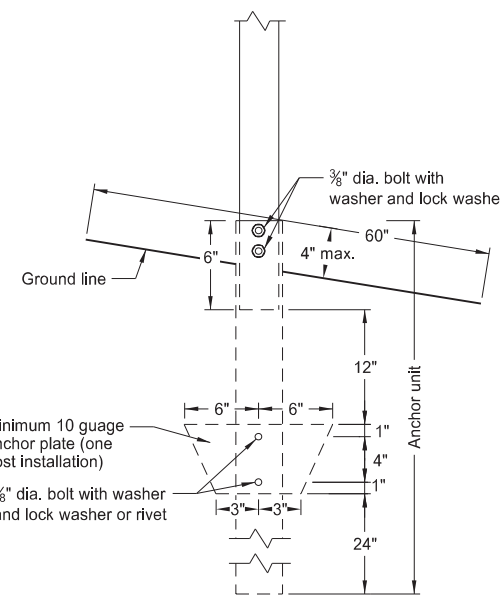


Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2 1/2" x 2 1/2" x 3/8" ASTM A36 structural angle

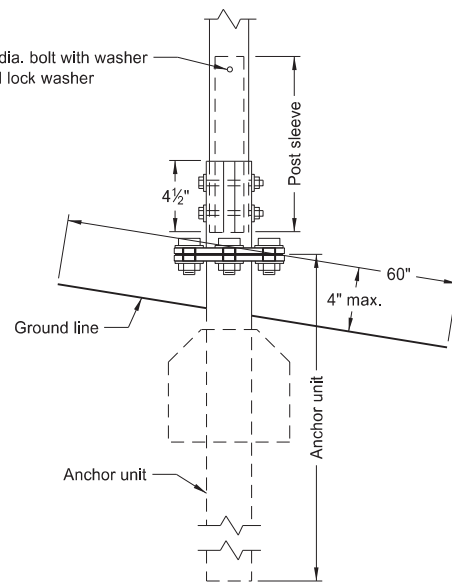
Traffic Flow



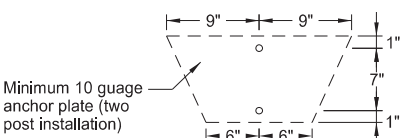
Bottom Soil Stub
Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50



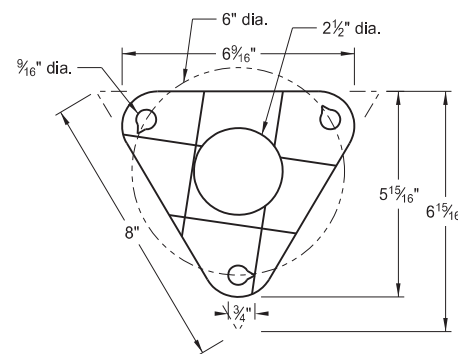
Anchor Unit and Post Assembly



Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly



Minimum 10 gauge anchor plate (two post installation)



Bolt Retainer for Base Connection
Bolt Retainer - 1/2" 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 Thickness Gauge	Sleeve Size in.	Wall Thickness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2 1/4
1	2 1/4	12			No	2 1/2
1	2 1/2	12			(A)	3
1	2 1/2	10			Yes	
1	2 1/2	12	2	12	Yes	
1	2 1/2	12	2 1/4	12	Yes	
2	2	12			No	2 1/4
2	2 1/4	12			No	2 1/2
2	2 1/2	12			Yes	
2	2 1/2	12			Yes	
2	2 1/4	10	2	12	Yes	
2	2 1/2	12	2 1/4	12	Yes	
3 & 4	2 1/2	12			Yes	
3 & 4	2 1/2	10			Yes	
3 & 4	2 1/2	12	2 1/4	12	Yes	
3 & 4	2 1/4	12	2	12	Yes	
3 & 4	2 1/2	10	2 3/16	10	Yes	

Properties of Telescoping Perforated Tube

Tube Size in.	Wall Thickness in.	U.S. Standard Gauge	Weight per Foot lbs.	Moment of Inertia in. ⁴	Cross Sec. Area in. ²	Section Modulus in. ³
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2 1/2 x 2 1/2	0.105	12	3.141	0.804	0.803	0.643
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.785

Top Post Receiver Data Table

Square Post Sizes (B)	A	B	C	D	E	F
2 3/16" x 10 ga.	1 5/16"	2 1/2"	3 1/2"	2 5/32"	1 33/64"	1 7/8"
2 1/2" x 10 ga.	1 3/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"

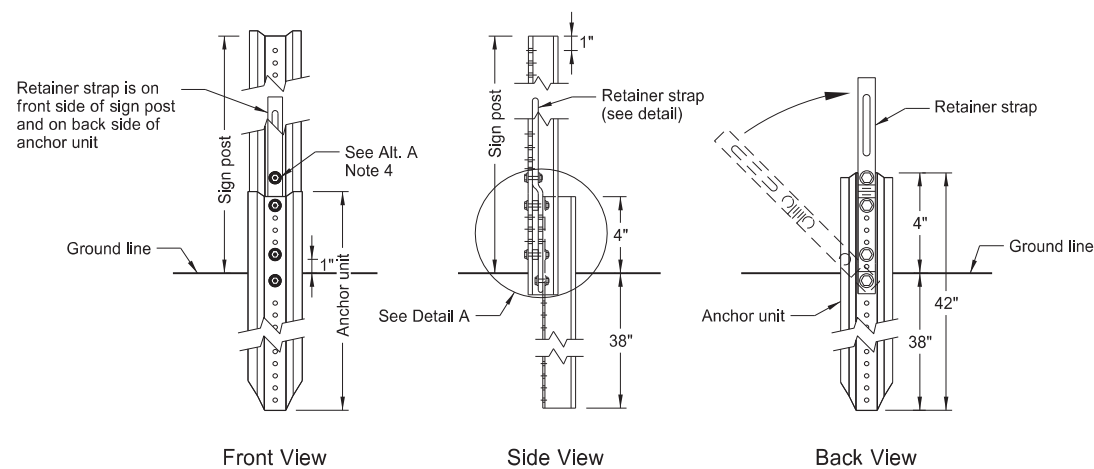
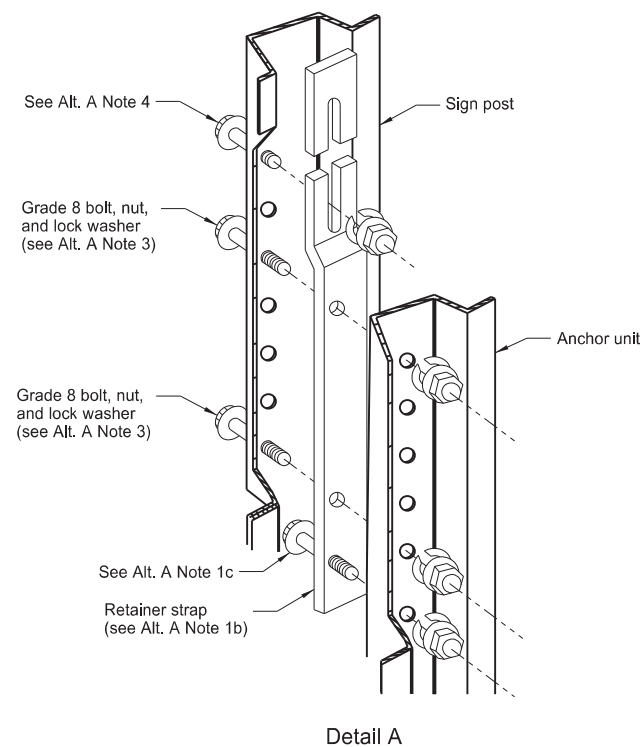
(A) Use breakaway base when support is placed in weak soils. Engineer determines if soils are weak.

(B) For additional wind load, insert the 2 3/16" x 10 ga. into 2 1/2" x 10 ga.

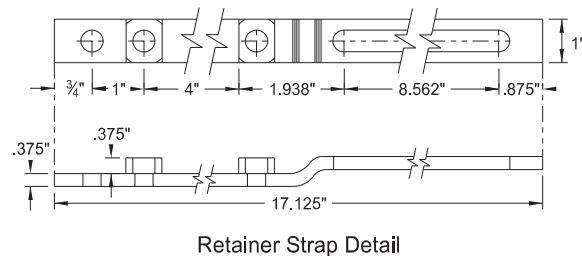
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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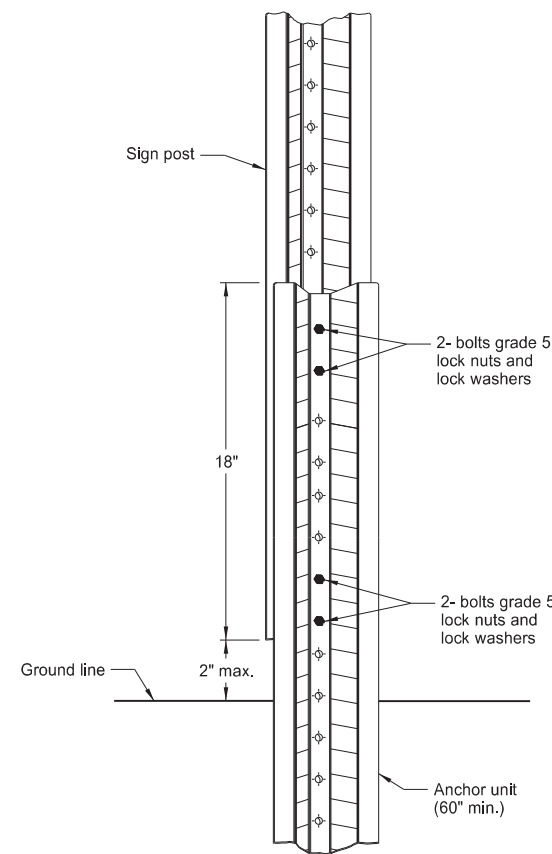
U-Channel Post



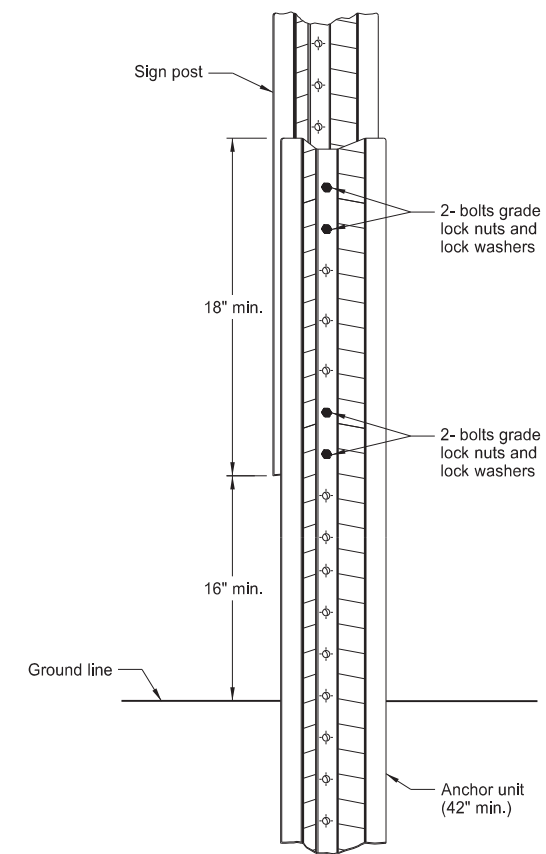
Breakaway U-Channel Detail Alternate A
Install a maximum of 2 posts within 7'.



Retainer Strap Detail



Breakaway U-Channel Splice Detail Alternate B
(2.5 and 3 lb/ft)
Install a maximum of 3 posts within 7'.



Breakaway U-Channel Splice Detail Alternate C
(2.5 and 3 lb/ft)
Install a maximum of 3 posts within 7'.

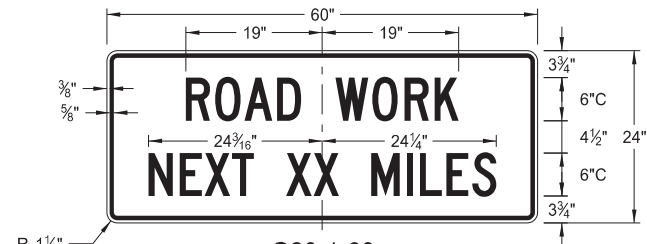
Alternate A Steps of Installation:

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

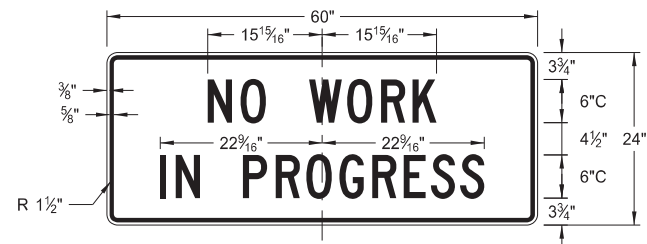
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17 10-03-19	Updated to active voice New Design Engr PE Stamp

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Registration Number
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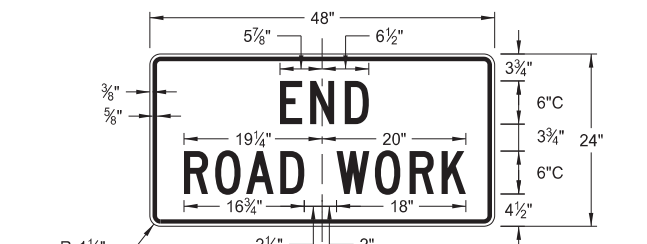
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



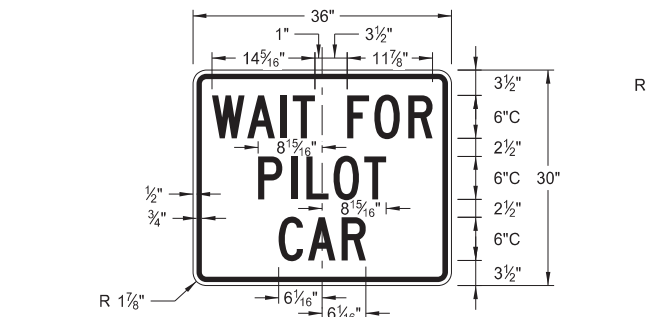
G20-1-60
Legend: black (non-refl)
Background: orange



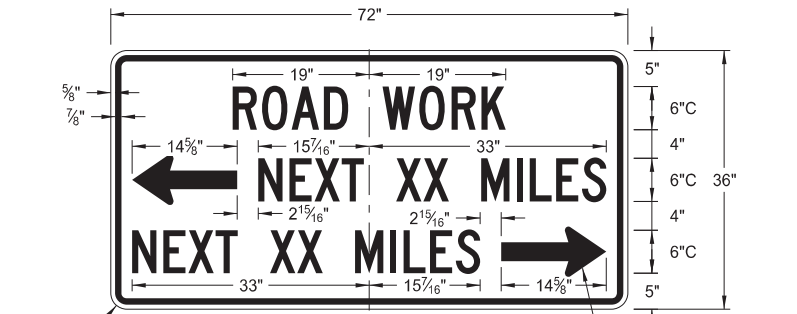
G20-1b-60
Legend: black (non-refl)
Background: orange



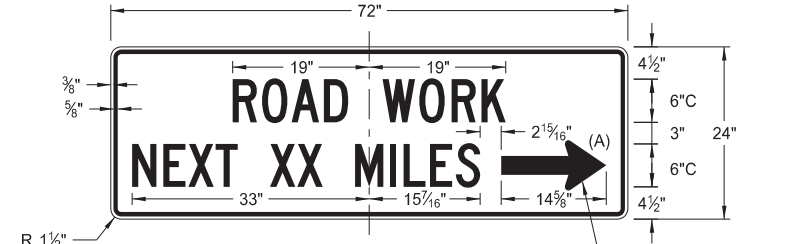
G20-2-48
Legend: black (non-refl)
Background: orange



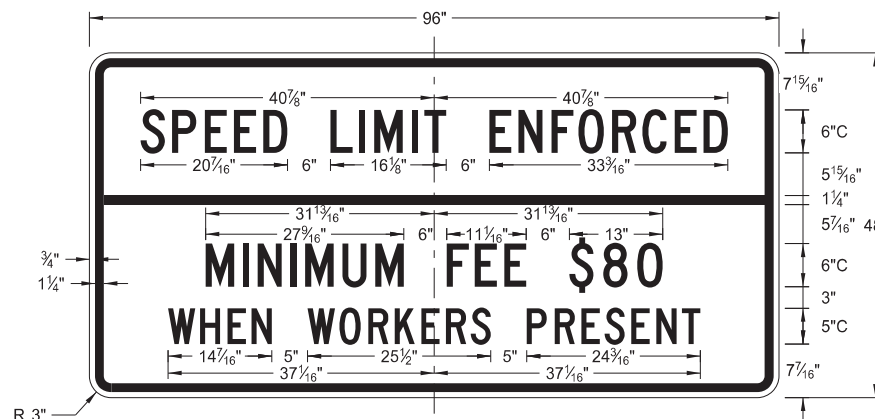
G20-4b-36
Legend: black (non-refl)
Background: orange



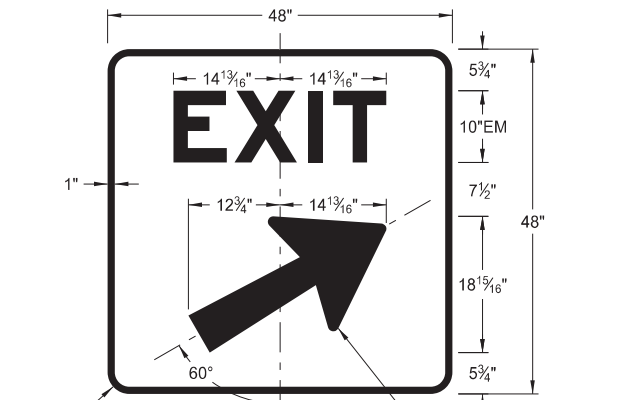
G20-50a-72
Legend: black (non-refl)
Background: orange



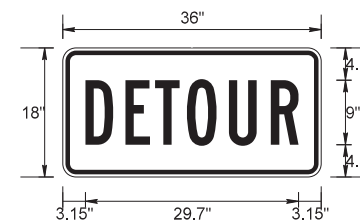
G20-52a-72
Legend: black (non-refl)
Background: orange



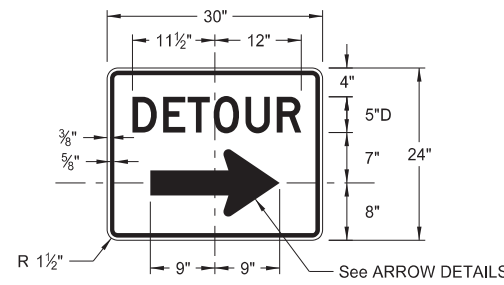
G20-55-96
Legend: black (non-refl)
Background: orange



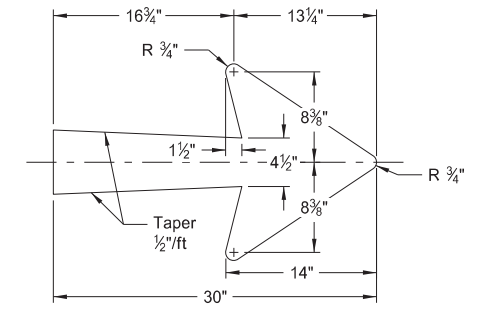
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



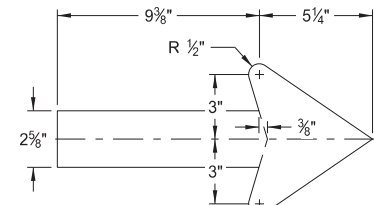
M4-8-36
Legend: black (non-refl)
Background: orange



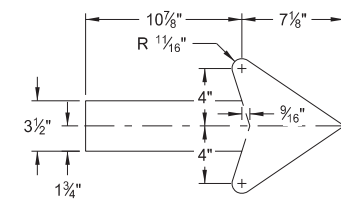
M4-9(L or R)-30 & M4-9-30
Legend: black (non-refl)
Background: orange



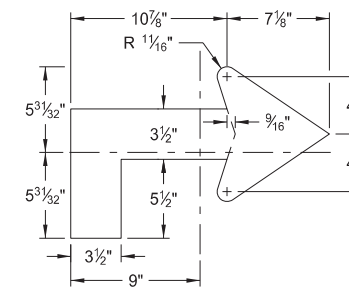
E5-1-48



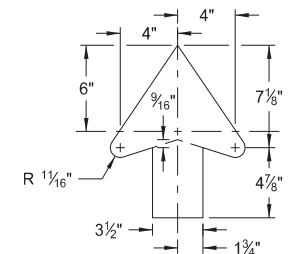
G20-50a-72
G20-52a-72



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



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



M4-9-30
Straight

ARROW DETAILS

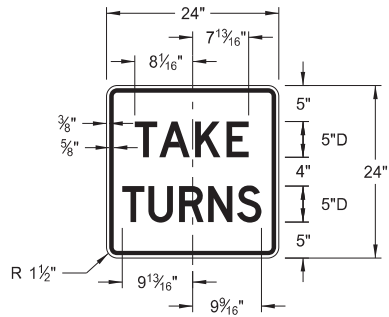
NOTES:

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

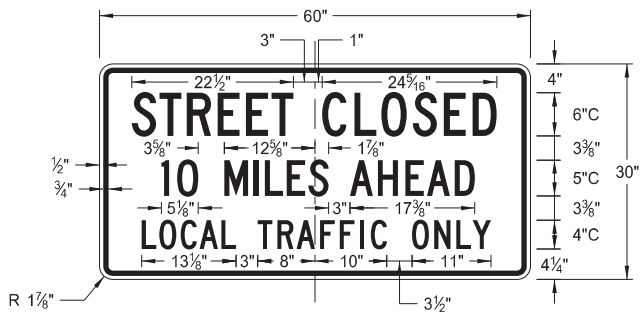
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17 10-03-19	Added sign & background color New Design Engineer PE Stamp

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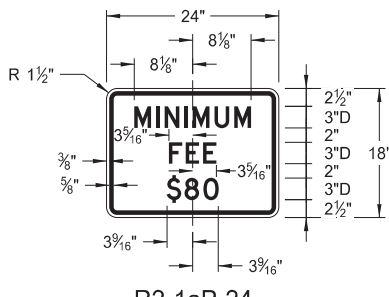
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



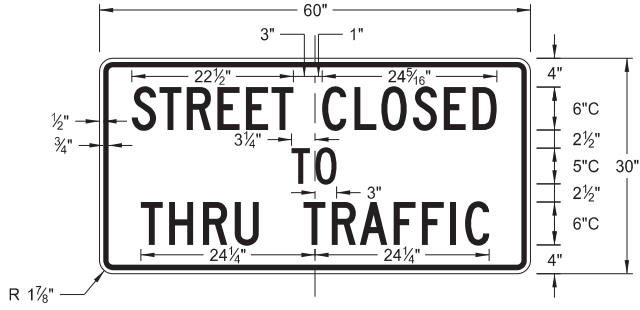
R1-50P-24
Legend: black (non-refl)
Background: white



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



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



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

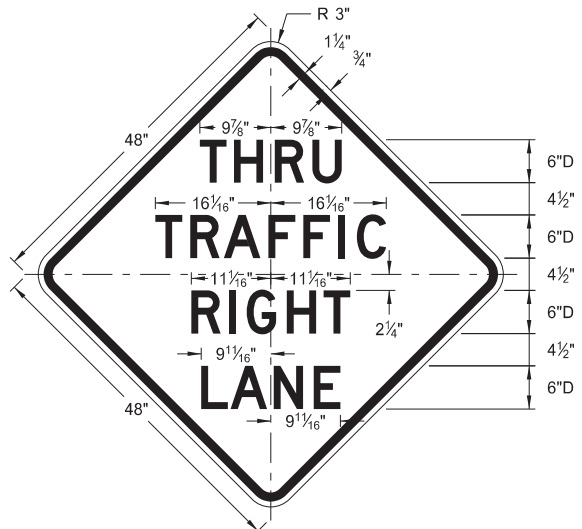


R11-2a-48
Legend: black (non-refl)
Background: white

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

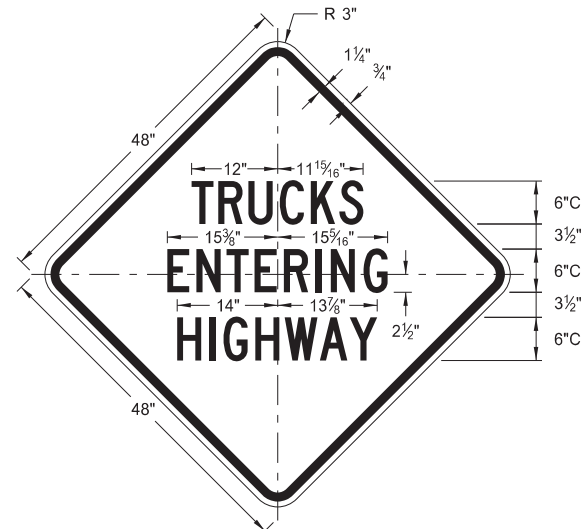
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CONSTRUCTION SIGN DETAILS
WARNING SIGNS



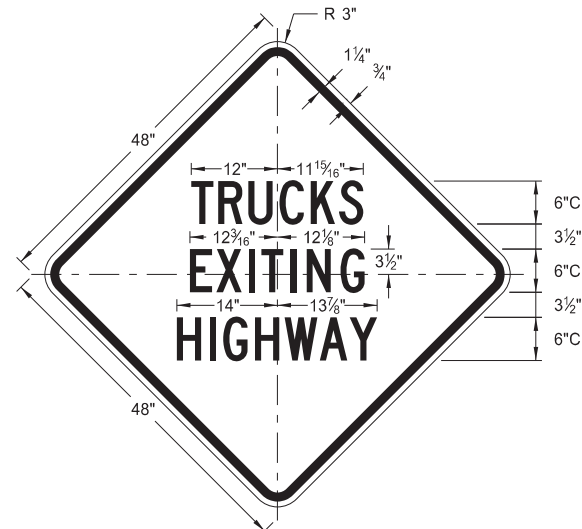
W5-8-48

Legend: black (non-refl)
Background: orange



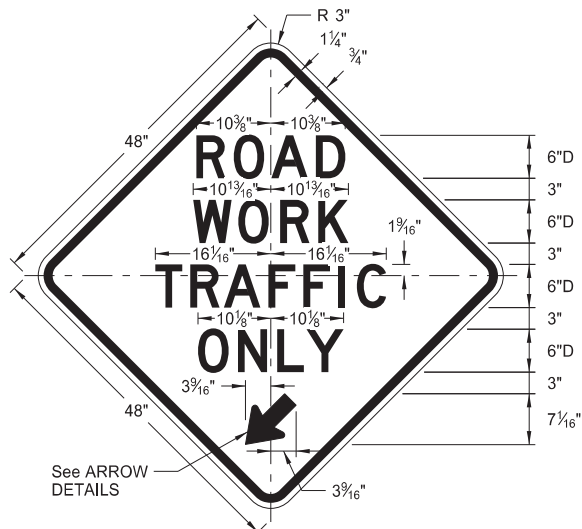
W8-53-48

Legend: black (non-refl)
Background: orange



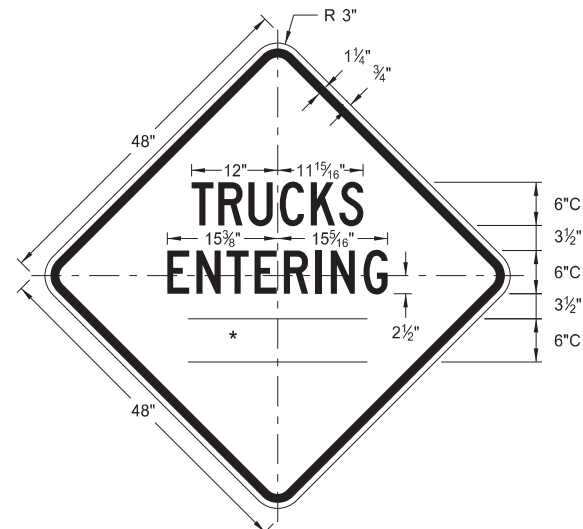
W8-56-48

Legend: black (non-refl)
Background: orange



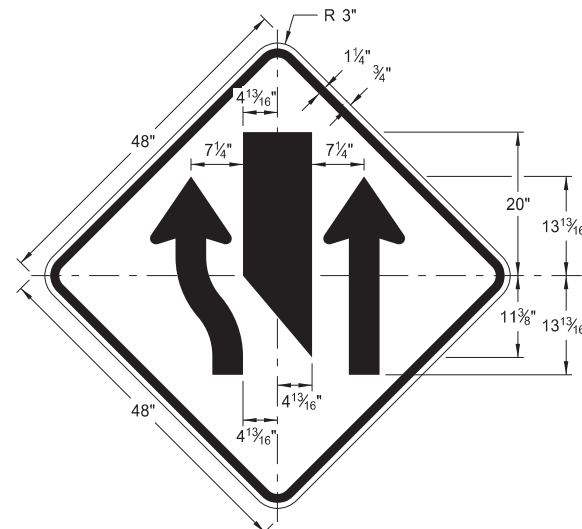
W5-9-48

Legend: black (non-refl)
Background: orange



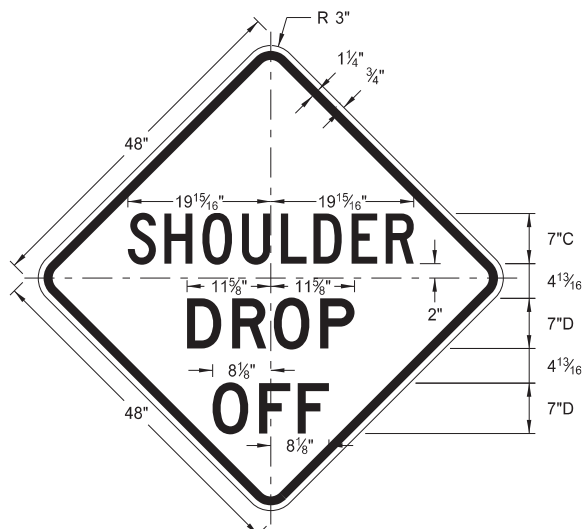
W8-54-48

Legend: black (non-refl)
Background: orange



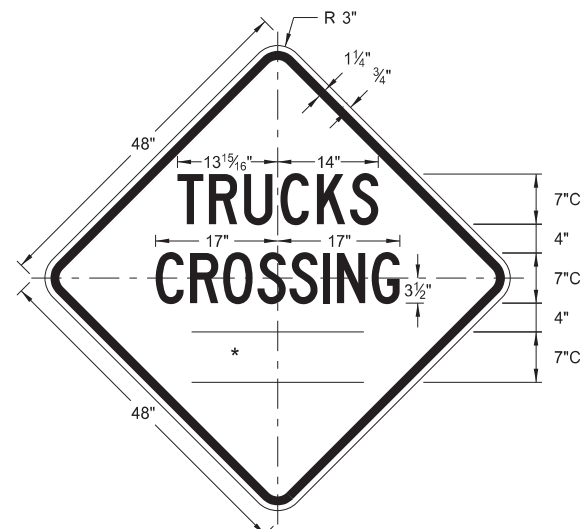
W9-3a-48

Legend: black (non-refl)
Background: orange



W8-9a-48

Legend: black (non-refl)
Background: orange

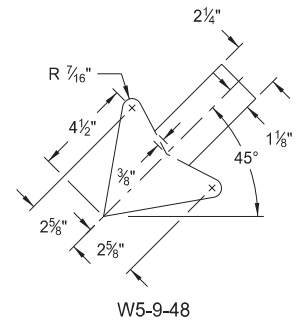


W8-55-48

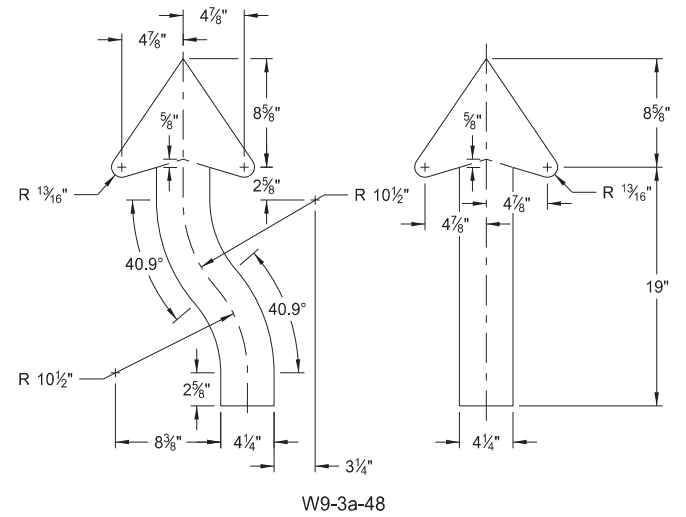
Legend: black (non-refl)
Background: orange

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

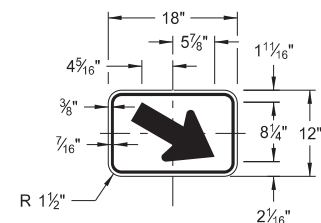
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Updated sign number
5-31-18	Revised sign and arrow details
10-03-19	New Design Engineer PE Stamp

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CONSTRUCTION SIGN DETAILS
WARNING SIGNS

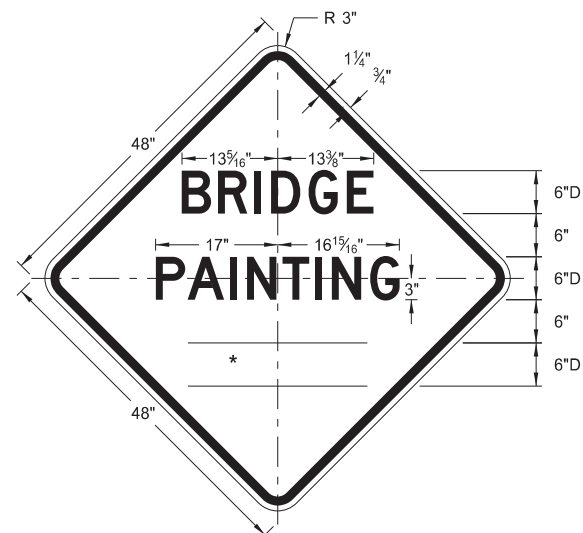
WORD	LETTER SPACING
AHEAD	Standard
200 FT	Standard
350 FT	Standard
500 FT	Standard
1000 FT	Reduce 40%
1500 FT	Reduce 40%
½ MILE	Reduce 50%
1 MILE	Standard

* DISTANCE MESSAGES



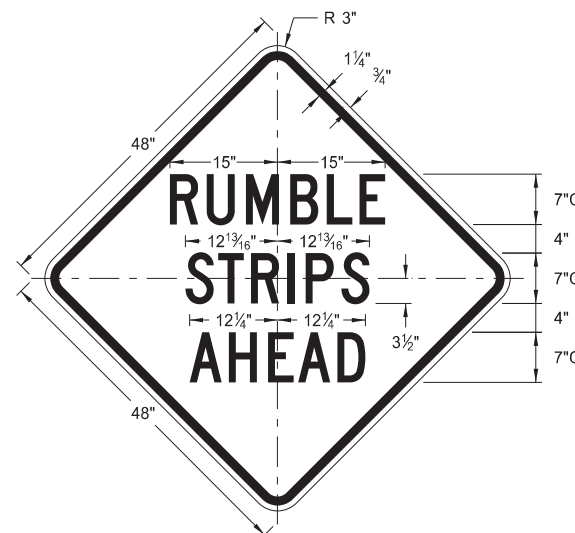
W16-7aP-18

Legend: black (non-refl)
Background: orange



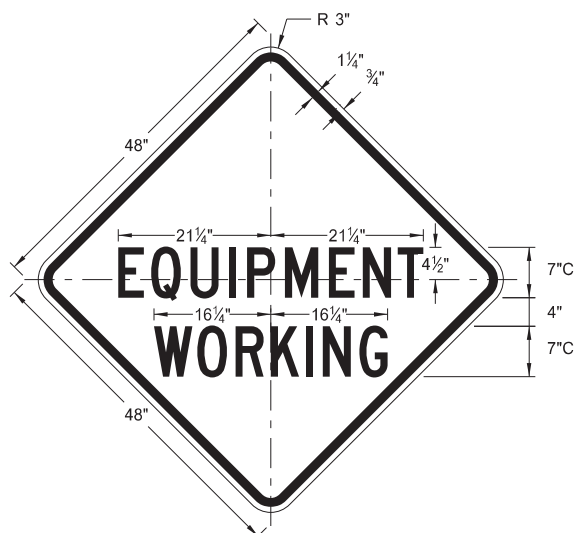
W21-50-48

Legend: black (non-refl)
Background: orange



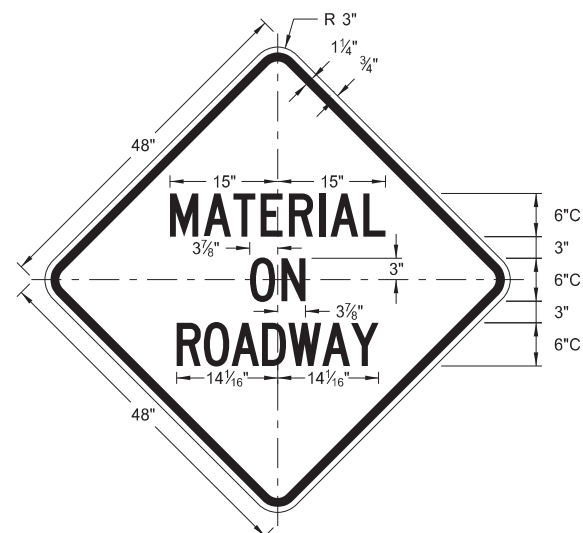
W21-53-48

Legend: black (non-refl)
Background: orange



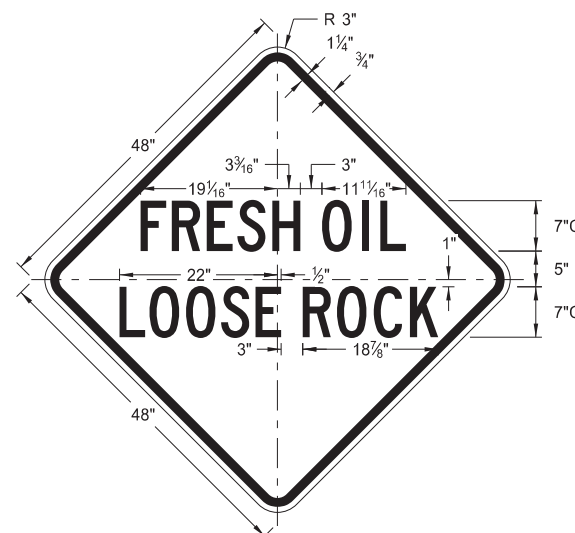
W20-51-48

Legend: black (non-refl)
Background: orange



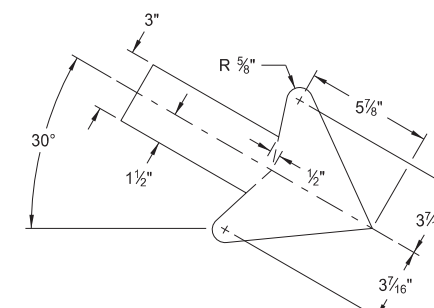
W21-51-48

Legend: black (non-refl)
Background: orange

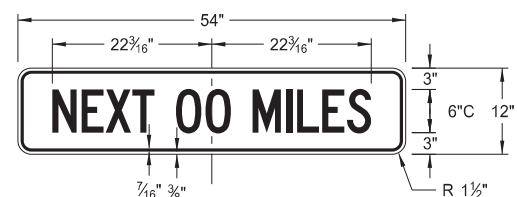


W22-8-48

Legend: black (non-refl)
Background: orange

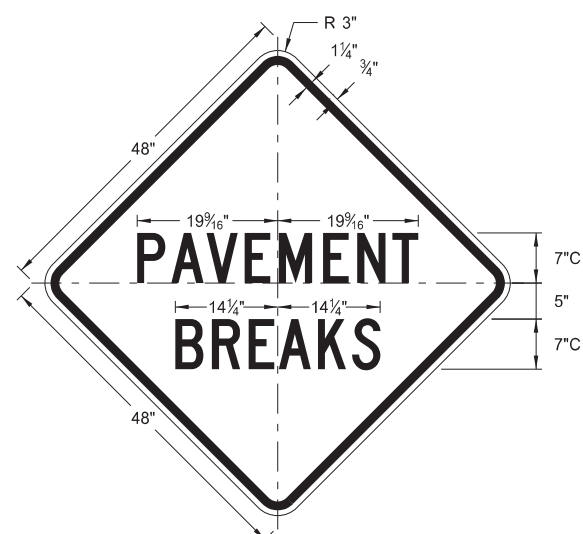


W16-7aP-18



W20-52P-54

Legend: black (non-refl)
Background: orange



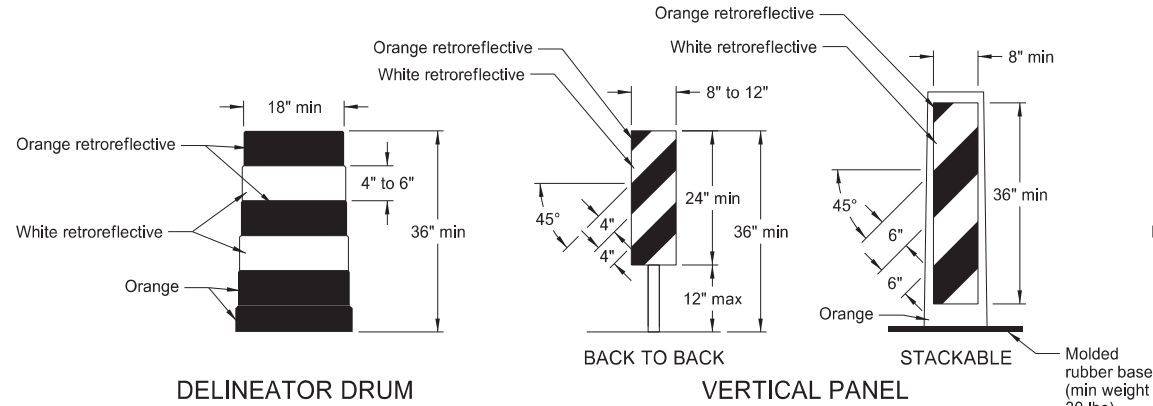
W21-52-48

Legend: black (non-refl)
Background: orange

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

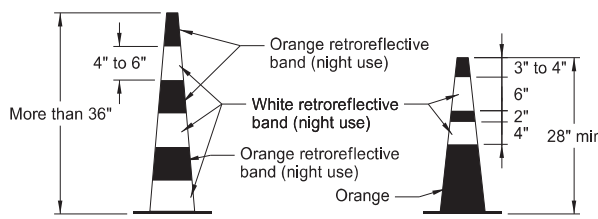
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BARRICADE AND CHANNELIZING DEVICE DETAILS

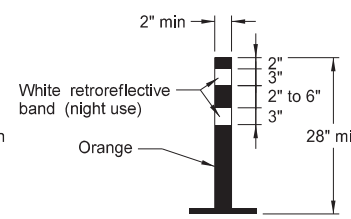


DELINEATOR DRUM

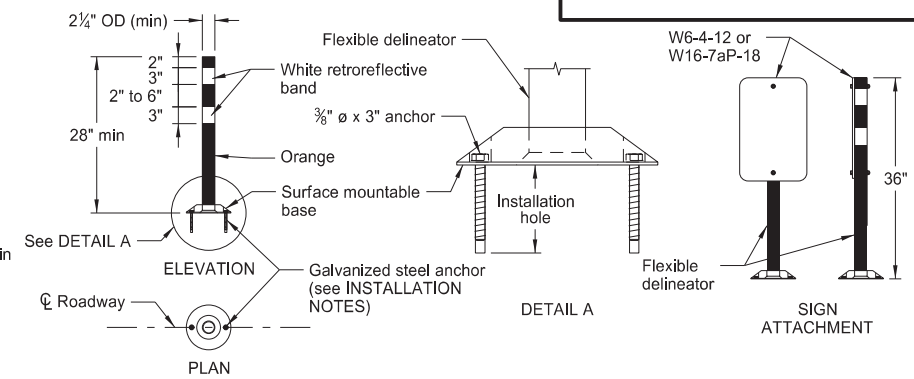
VERTICAL PANEL



TRAFFIC CONE



TUBULAR MARKER



FLEXIBLE DELINEATOR

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.

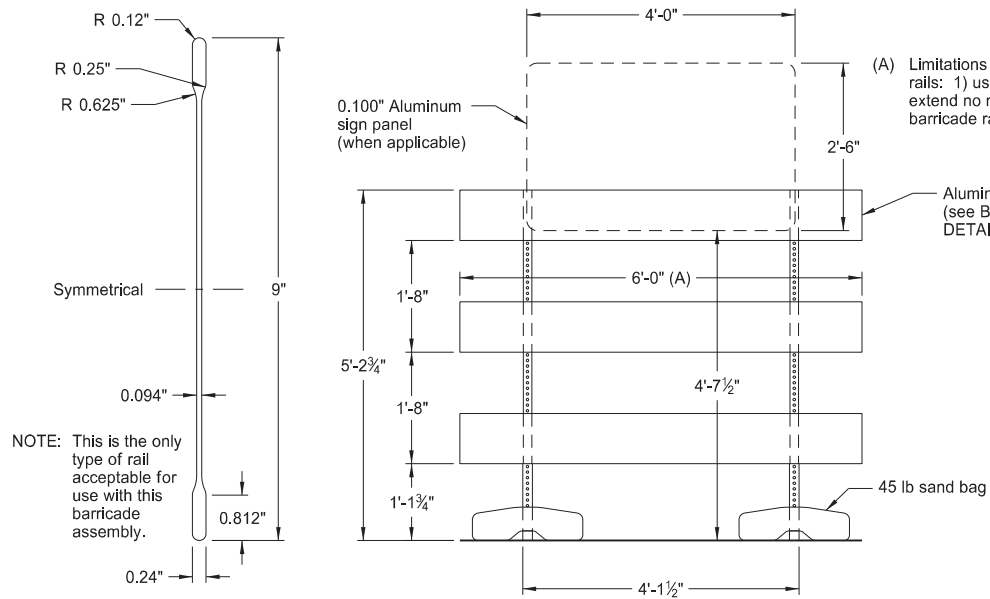
Provide alternating orange and white retroreflective stripes, sloping downward in direction vehicular traffic is to pass. Place retroreflective sheeting on both sides of panel with a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective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

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.

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.

INSTALLATION NOTES:

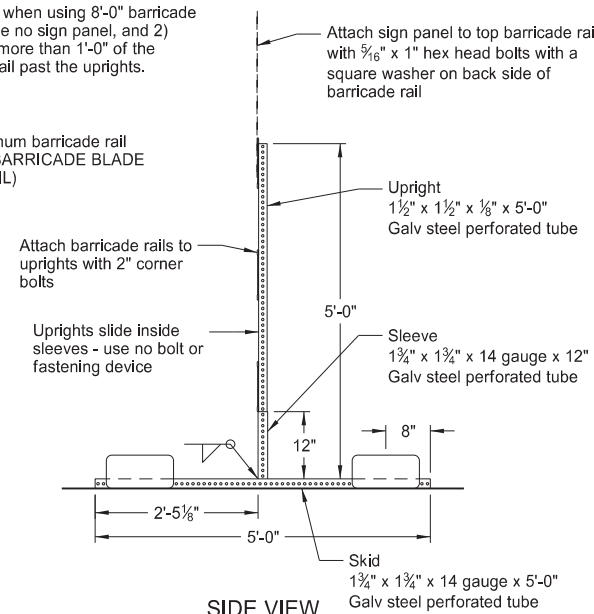
1. Drill installation holes to diameter and depth required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, use an 8" x 8" butyl pad or hot melt butyl. Remove butyl as close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



BARRICADE BLADE DETAIL

ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

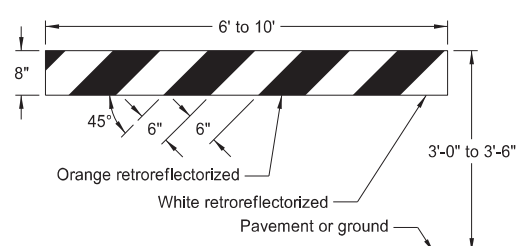


ELEVATION VIEW

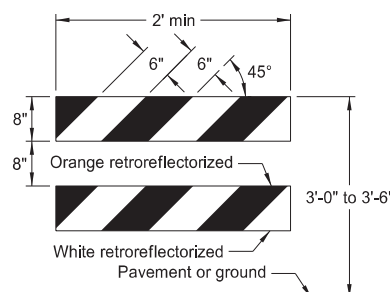
BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

SIDE VIEW

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".

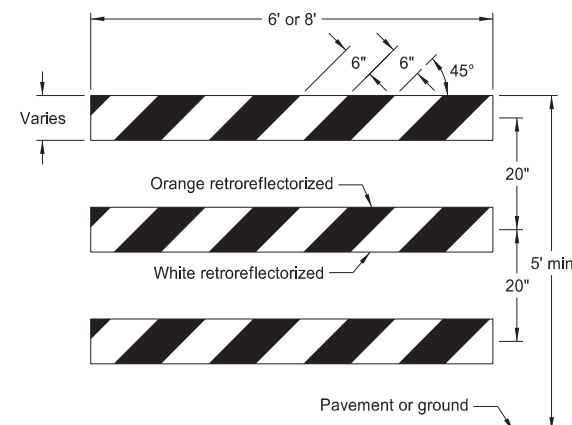


TYPE I BARRICADE

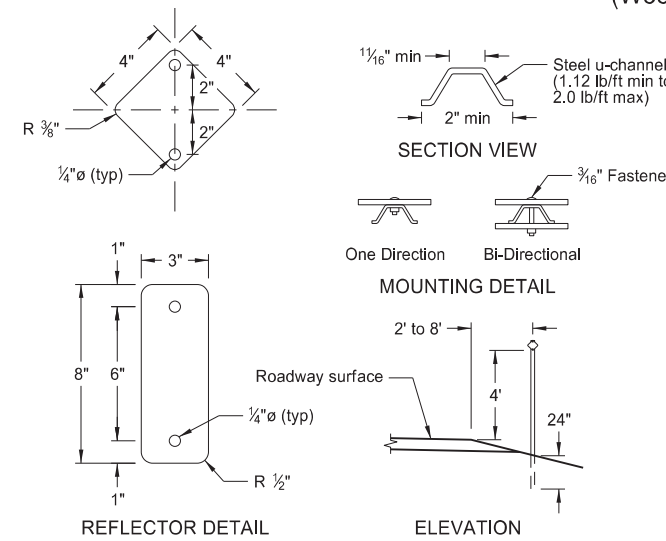


TYPE II BARRICADE

BARRICADE RAIL DETAILS



TYPE III BARRICADE



REFLECTOR DETAIL

ELEVATION

DELINEATORS

MINIMUM BALLAST (For each side of barricade support)

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

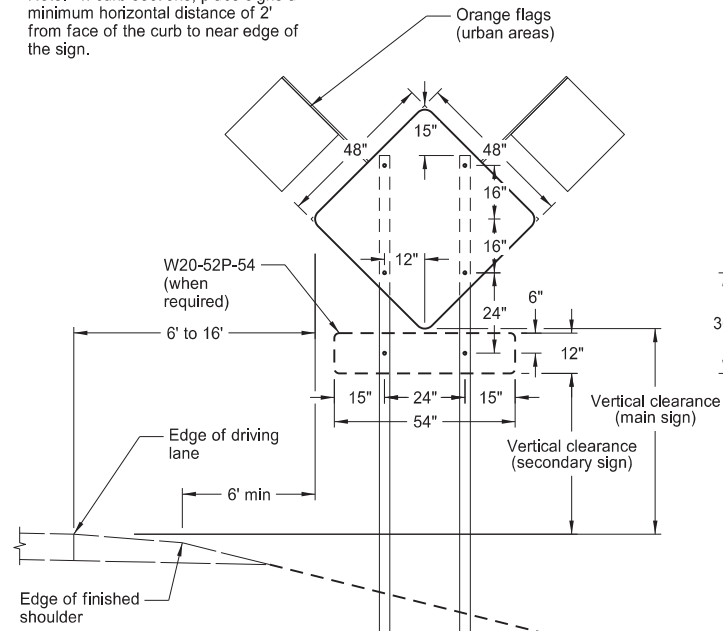
Note: Number of sandbags based on a wind speed of 55 MPH. Sandbags assumed to be placed at or near the ends of the skids.

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

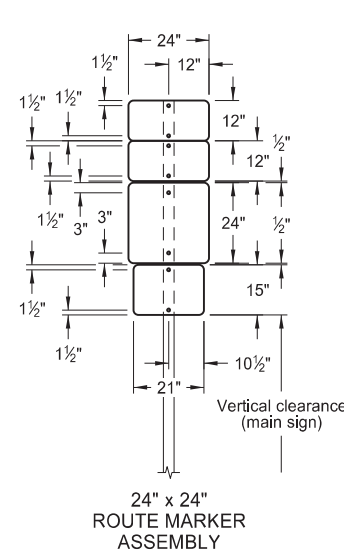
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CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

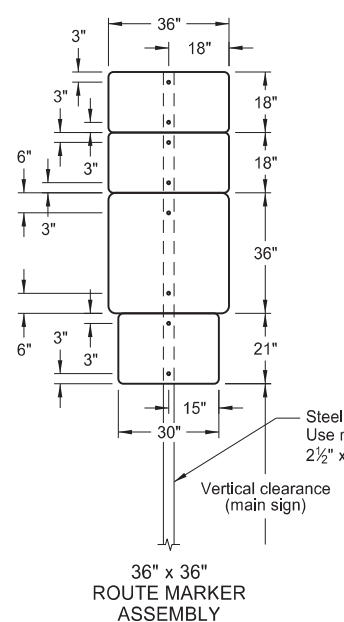
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



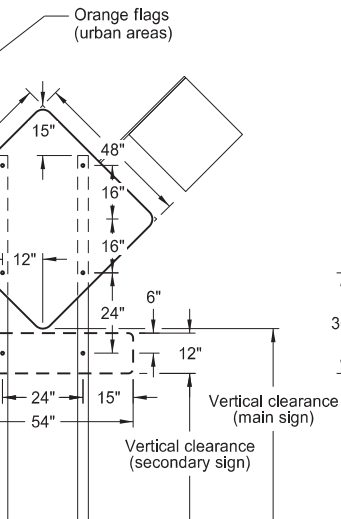
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



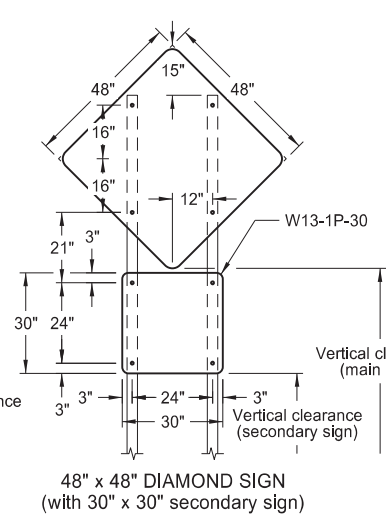
24" x 24" ROUTE MARKER ASSEMBLY



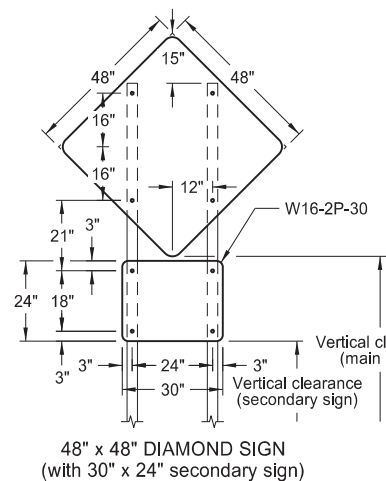
36" x 36" ROUTE MARKER ASSEMBLY



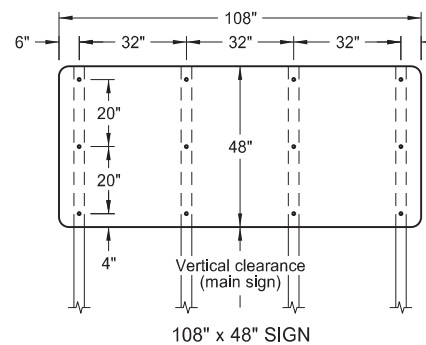
18" x 18" DIAMOND SIGN



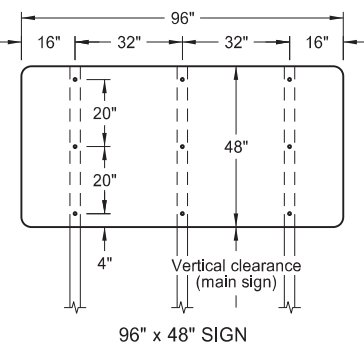
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



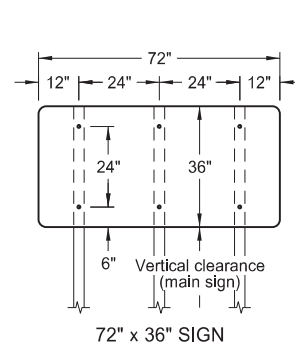
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



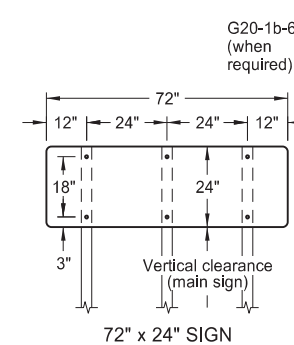
108" x 48" SIGN



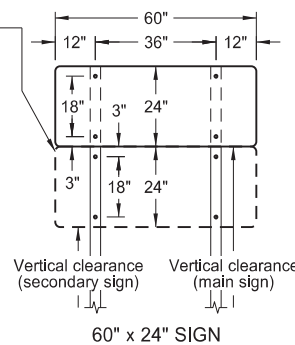
96" x 48" SIGN



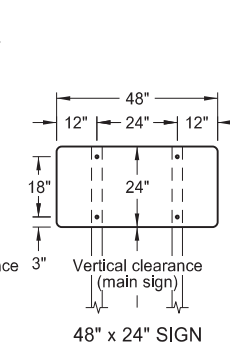
72" x 36" SIGN



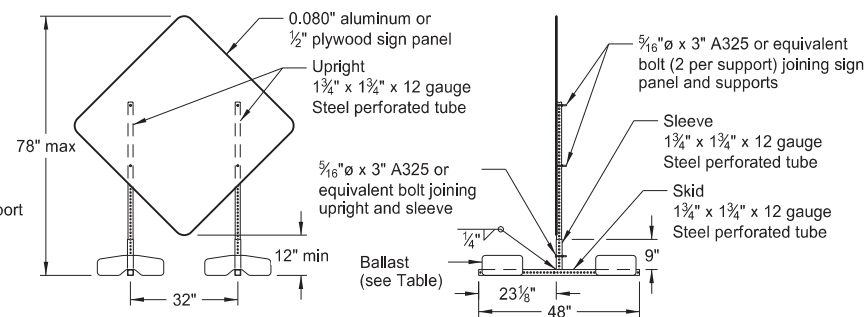
72" x 24" SIGN



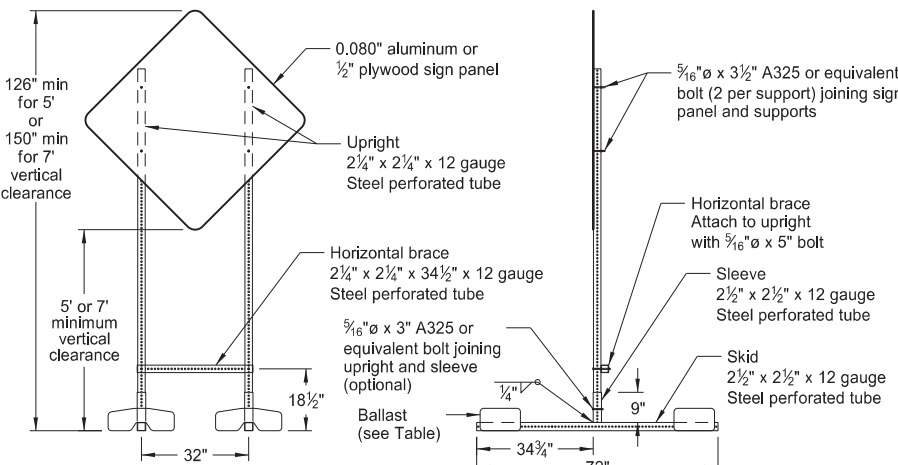
60" x 24" SIGN



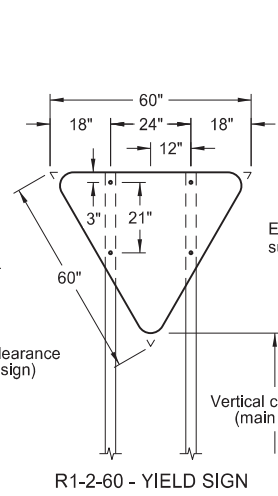
48" x 24" SIGN



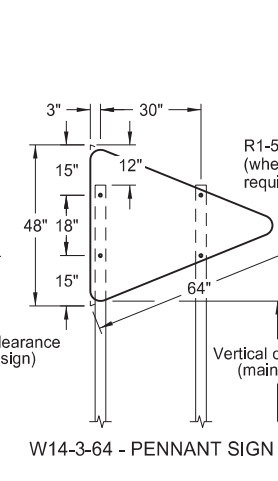
PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



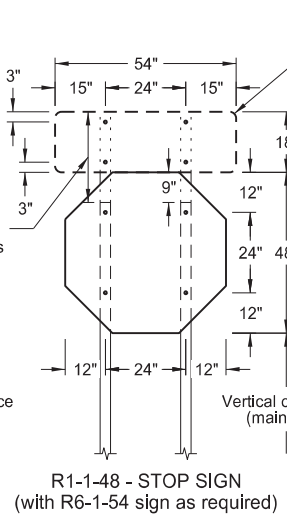
PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT



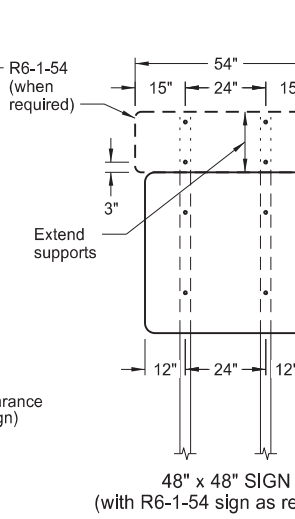
R1-2-60 - YIELD SIGN



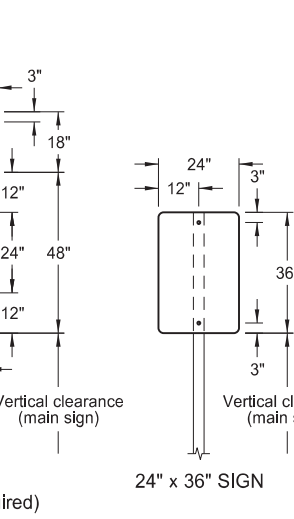
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



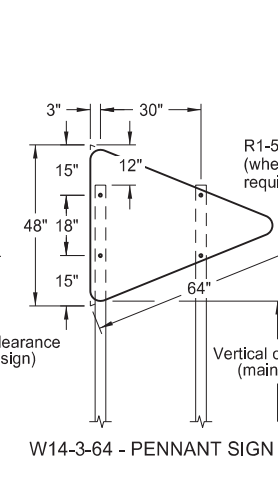
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



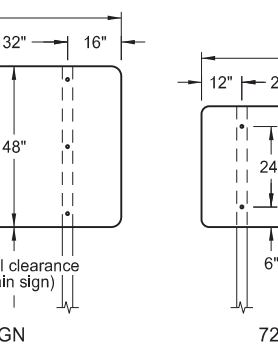
48" x 48" SIGN
(with R6-1-54 sign as required)



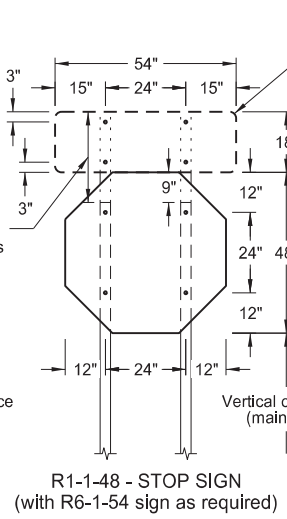
24" x 36" SIGN



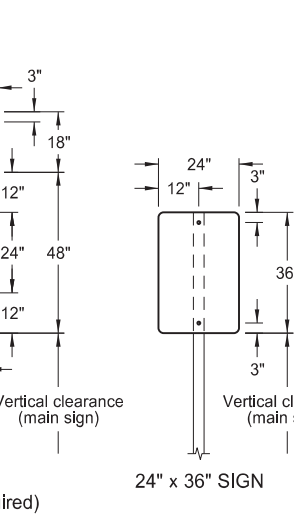
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



W14-3-64 - PENNANT SIGN



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



30" x 24" SIGN

NOTES:

- 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 2 1/2" x 2 1/2" 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.
- Sign Panels: Provide sign panels made of 0.100" aluminum, 1/2" plywood, or other approved material, except where noted. Punch all holes round for 5/16" bolts.
- 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)
- 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 unforeseen 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

Notes:

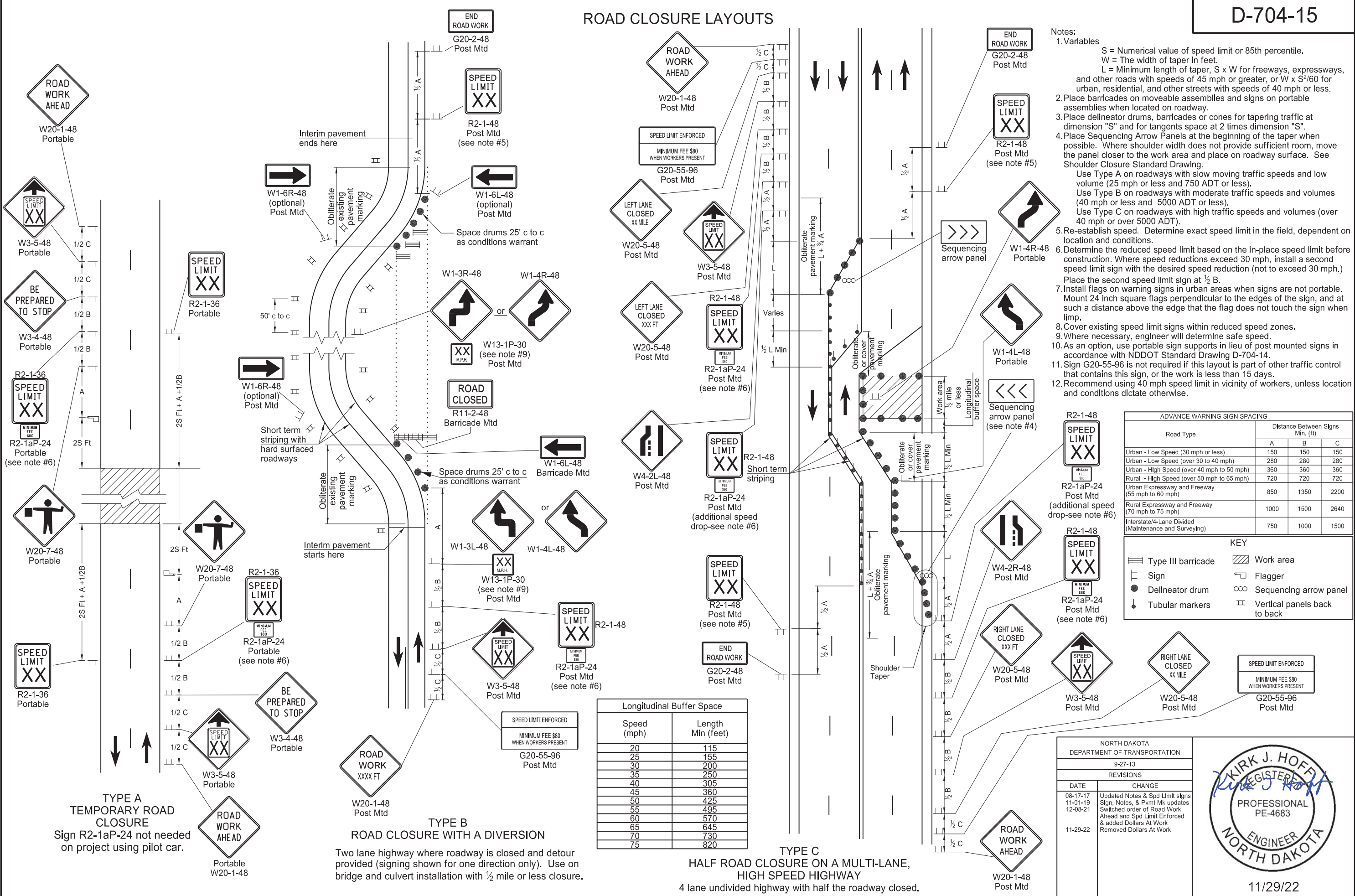
- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of taper in feet.
 - L = Minimum length of taper, S x W for freeways, expressways, and other roads with speeds of 45 mph or greater, or W x S²/60 for urban, residential, and other streets with speeds of 40 mph or less.
 - Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
 - Place delineator drums, barricades or cones for tapering traffic at dimension "S" and for tangents space at 2 times dimension "S".
 - 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).
- Re-establish speed. Determine exact speed limit in the field, dependent on location and conditions.
 - 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 1/2 B.
 - 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.
 - Cover existing speed limit signs within reduced speed zones.
 - Where necessary, engineer will determine safe speed.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - 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.
 - Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

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		Work area
	Sign		Flagger
	Delineator drum		Sequencing arrow panel
	Tubular markers		Vertical panels back to back

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 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 1/2 mile or less closure.

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
08-17-17	Updated Notes & Spd Limit signs
11-01-19	Sign, Notes, & Pmnt 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



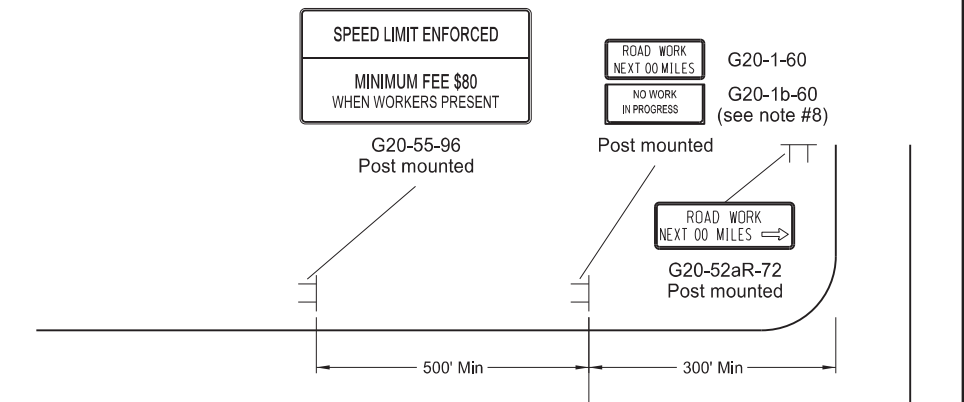
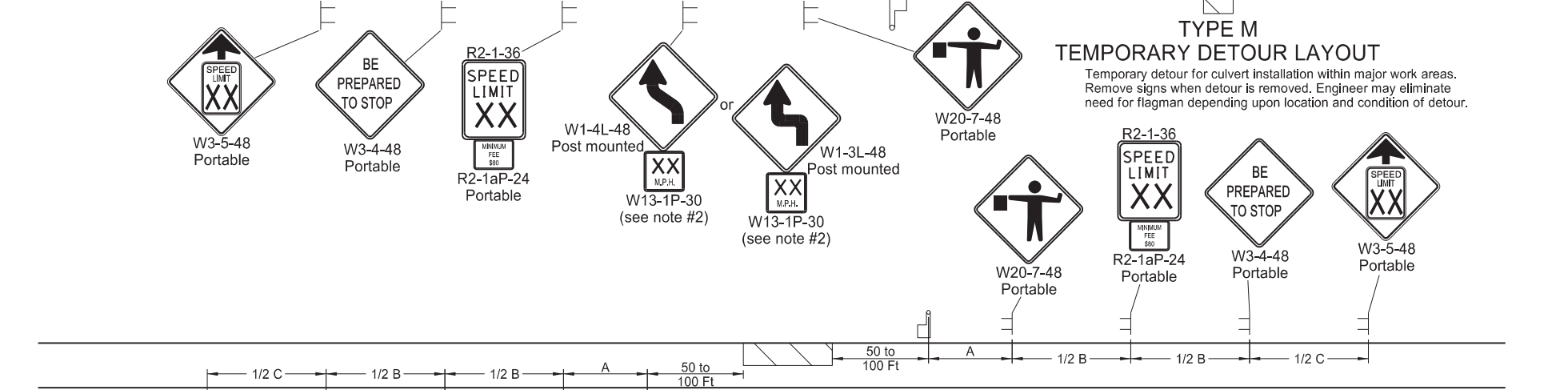
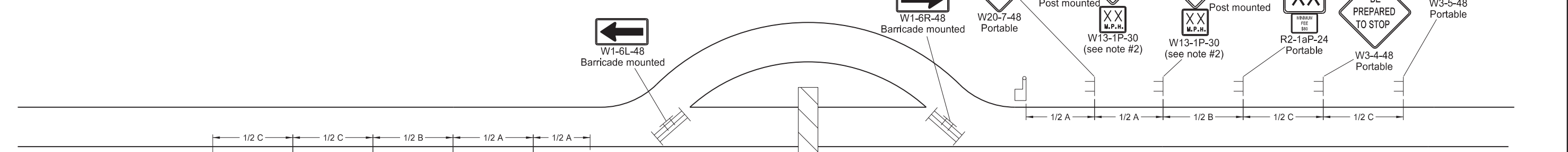
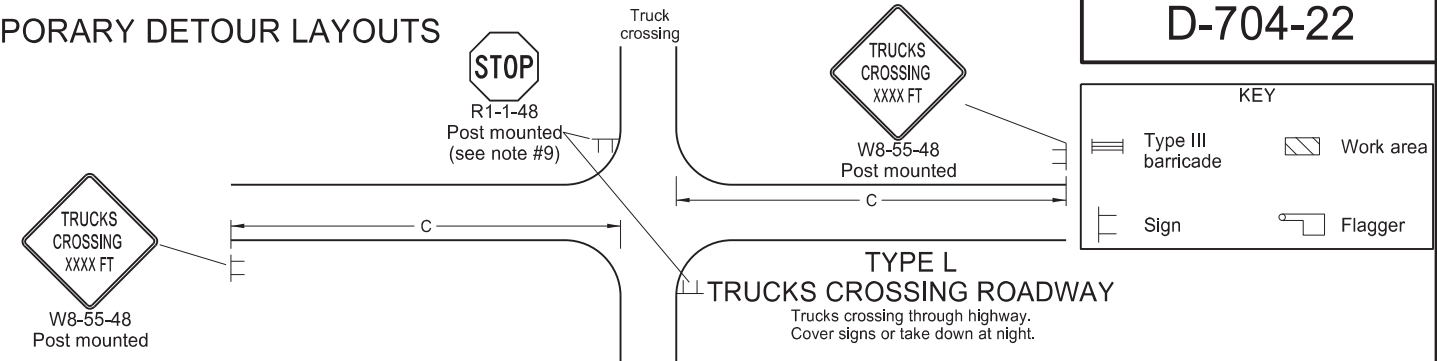
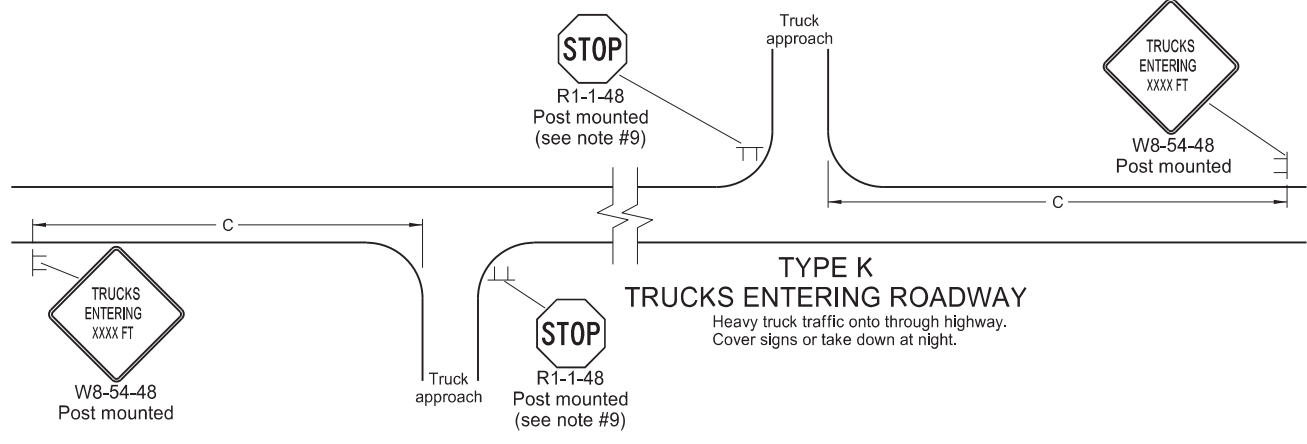
11/29/22

CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

D-704-22

KEY

- Type III barricade
- Sign
- Work area
- Flagger



- Notes:**
- Place barricades on a moveable assemblies and signs on portable assemblies when located on roadway.
 - Where necessary, safe speed to be determined by the Engineer.
 - 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 1/2 B.
 - 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.
 - Cover existing speed limit signs within a reduced speed zone.
 - Covered (when approved by engineer) or obliterated pavement marking measured as Obliteration of Pavement Marking.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - Install sign G20-1b-60 when work is suspended for winter.
 - If existing stop sign is in place, a 48" stop sign is not required.
 - 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.
 - Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

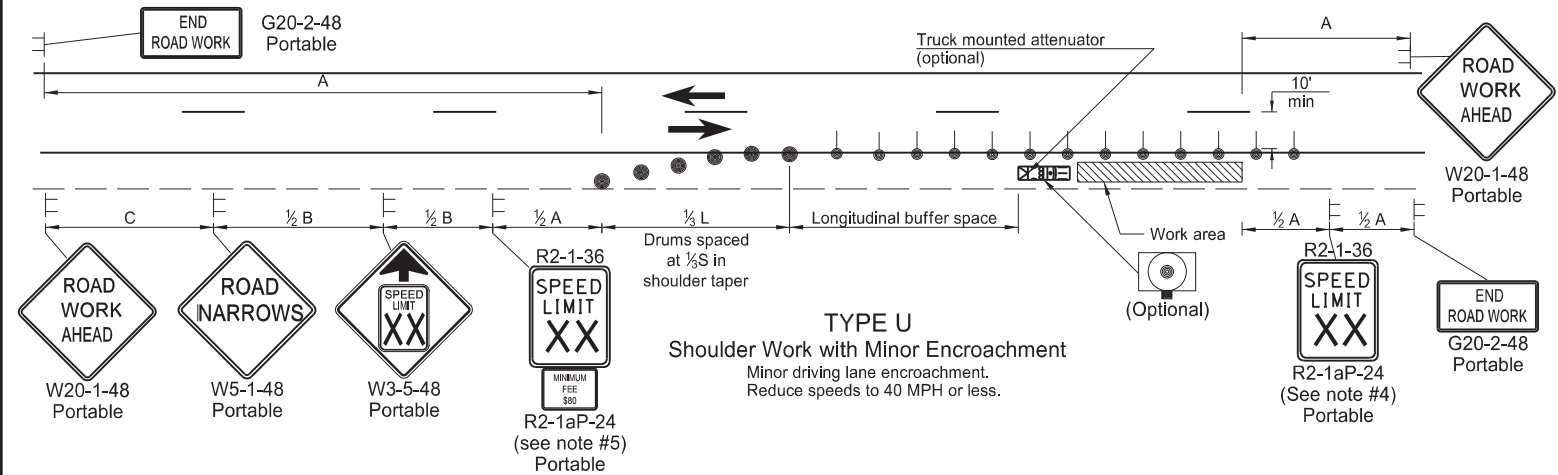
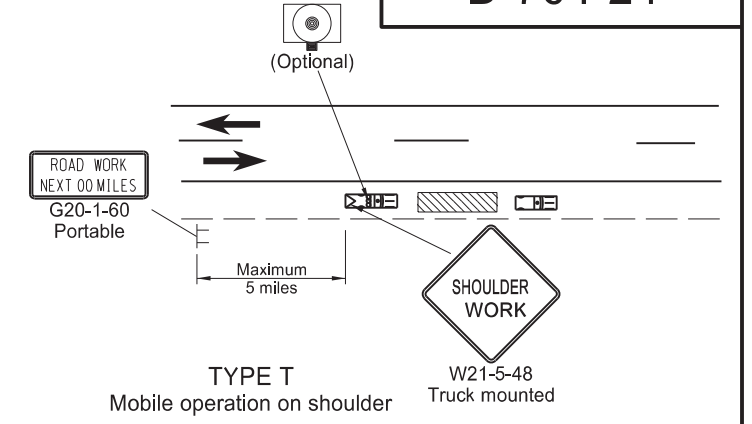
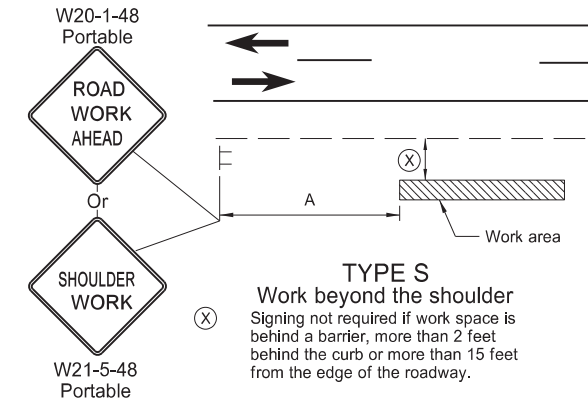
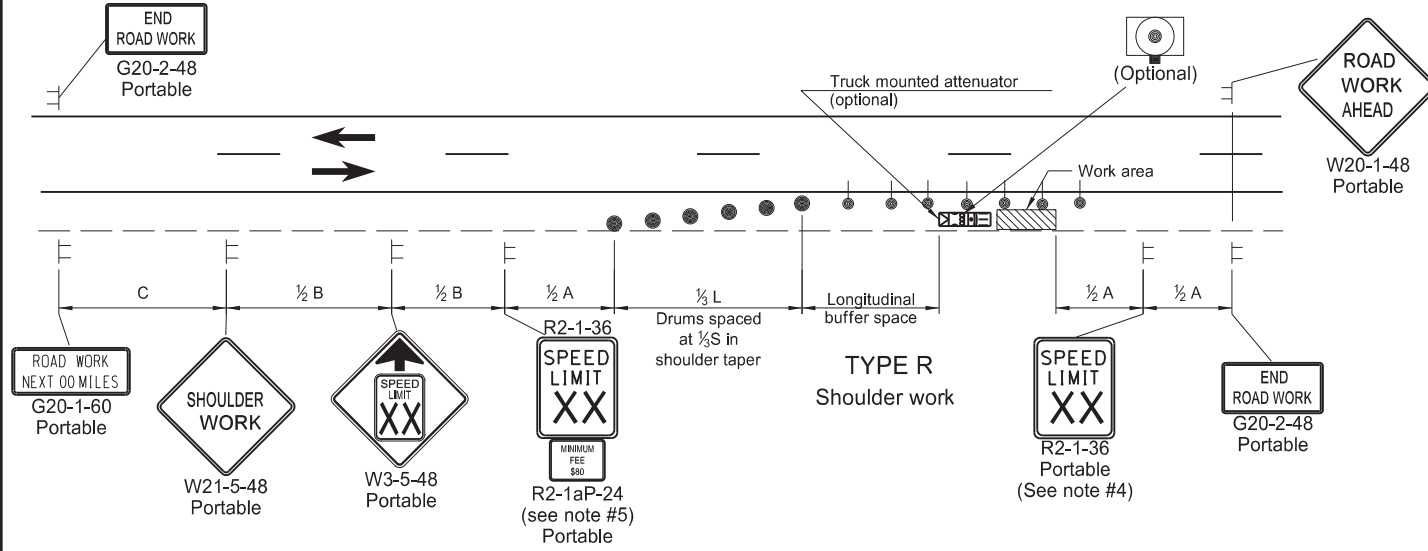
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 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



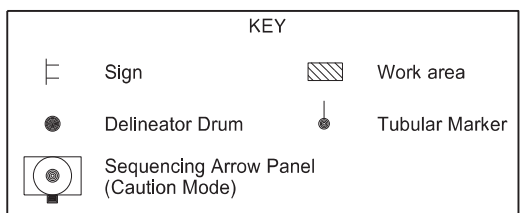
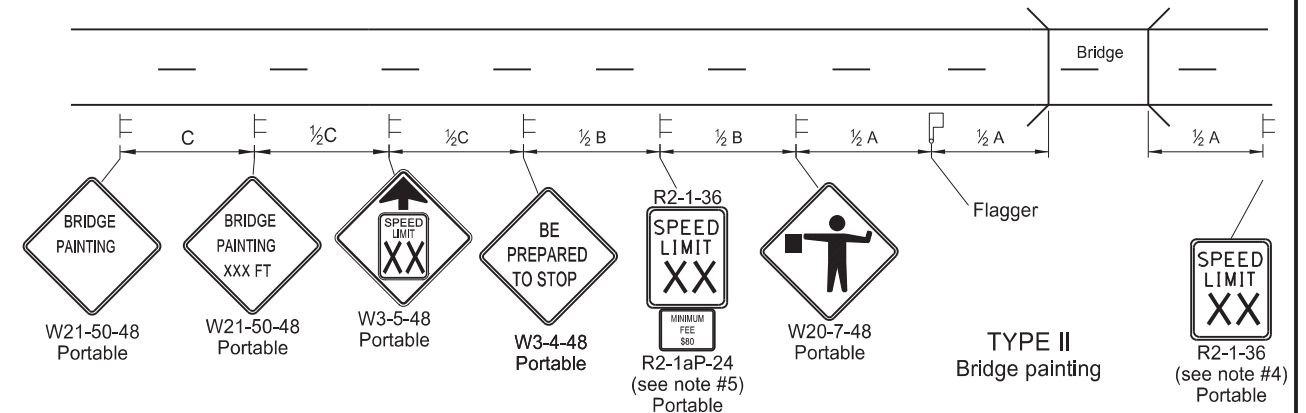
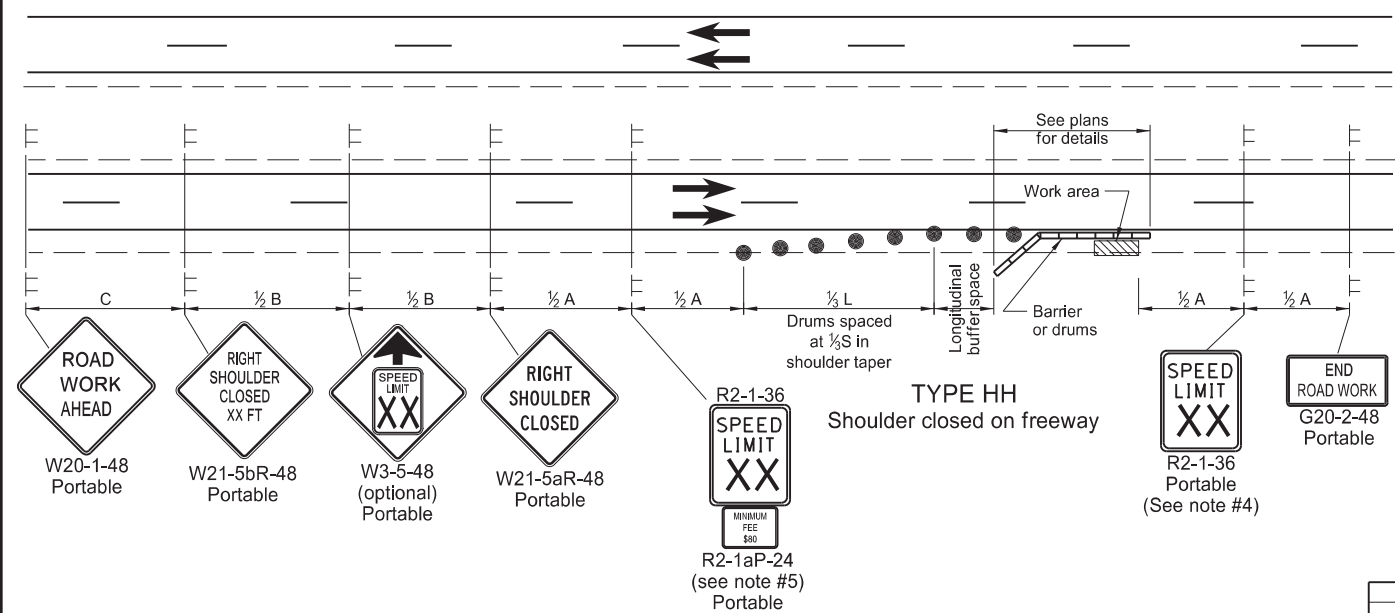
11/29/22

SHOULDER CLOSURES AND BRIDGE PAINTING LAYOUTS



Notes

- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of the taper in feet.
 - L = Minimum length of taper, $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2 / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
- Space delineator drums for tapering traffic at dimension "S". Space delineator drums or tubular markers for tangents at 2 times "S".
- Sequencing Arrow Panels
 - 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).
- Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
- 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 1/2 B.
- 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.
- Cover existing speed limit signs within a reduced speed zone.
- As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
- Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.



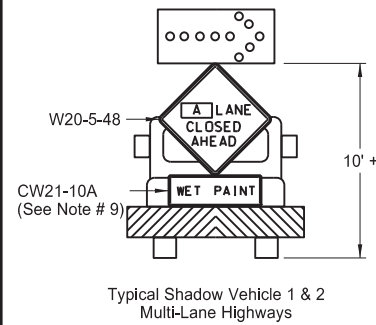
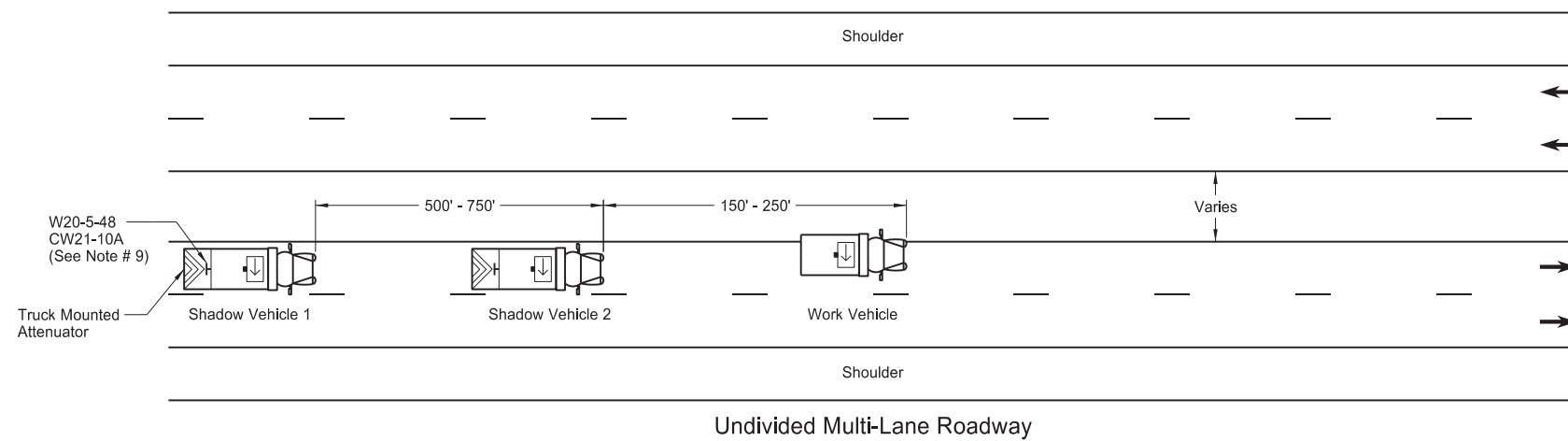
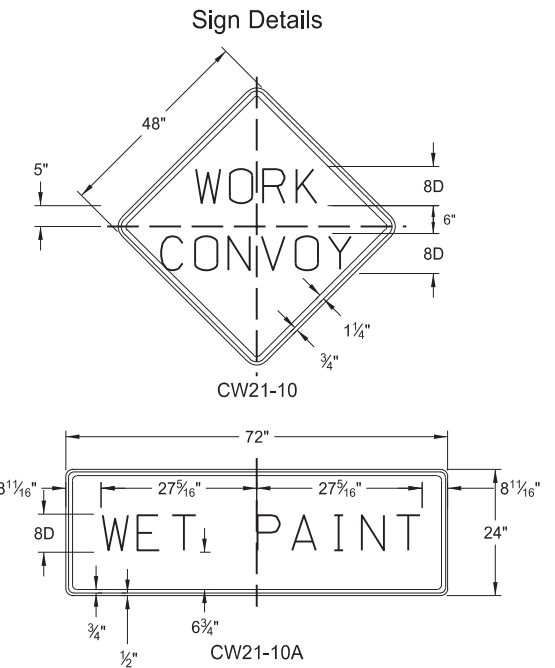
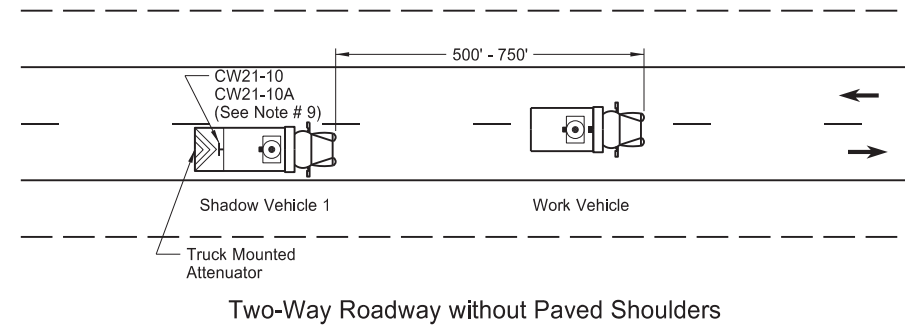
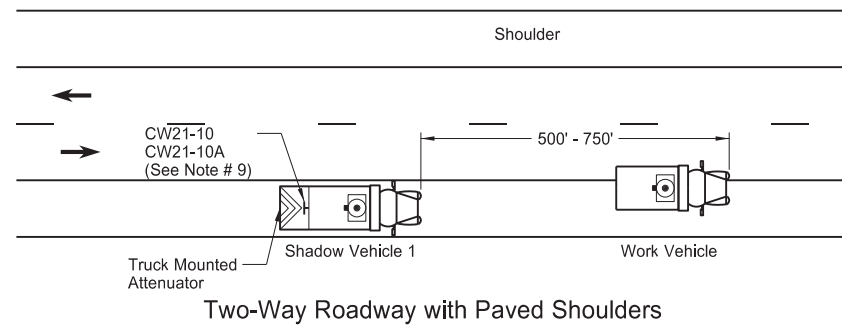
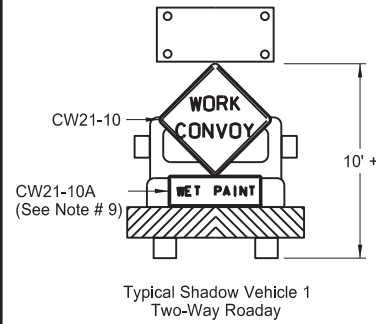
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway 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

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

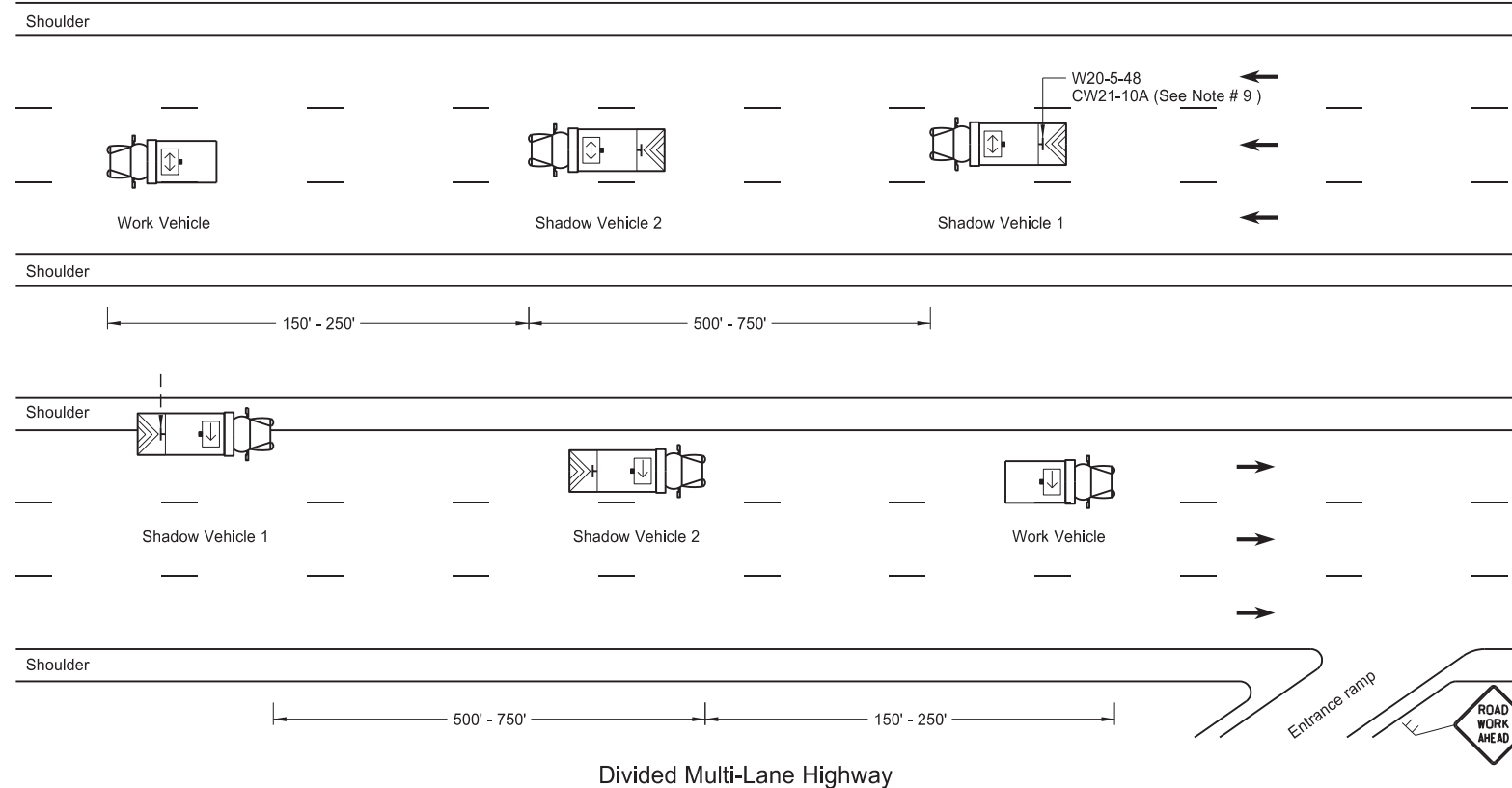
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
8-17-17	Updated notes & revised signs
11-01-19	Revised drum spacing & signs nos.

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

MOBILE OPERATION
(PAVEMENT MARKING)

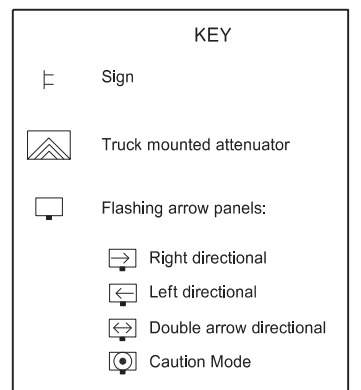


A = Left Right Center



Notes

- Use additional vehicles you choose to be in the convoy with truck mounted attenuators, at your own expense.
- Display yellow rotating beacons or strobe lights on shadow and work vehicles, unless otherwise stated in the plans.
- Use Type B or Type C flashing arrow panels controlled from inside the vehicle.
- Provide each vehicle with two-way electronic communication capability.
- Move shadow vehicle 1 first to shadow other convoy vehicles when convoy changes lane.
- Vary vehicle spacing between shadow vehicle 1 and shadow vehicle 2 based on sight distance restrictions. Motorists approaching the work convoy need to see trail vehicle in time to slow down and/or change lanes as they approach shadow vehicle.
- Sign Colors
Letters = Black
Border = Black
Background = Orange
- As an option, use shadow vehicle 2 the paint tender vehicle.
- Use sign CW21-10A only during painting operation.
- Pull over work and shadow vehicles periodically to allow motor vehicle traffic to pass on two lane - two way roadways.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
6-18-14	Removed shadow vehicle 2 on two lane roadways
9-27-17	Updated to active voice
11-08-19	Changed Standard Heading

This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
on 11/08/19 and the original document is stored at the
North Dakota Department
of Transportation

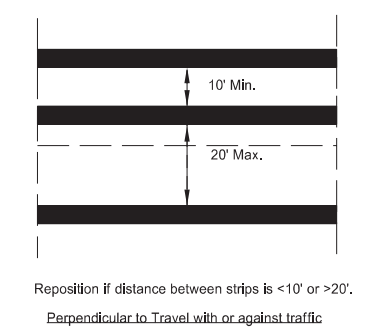
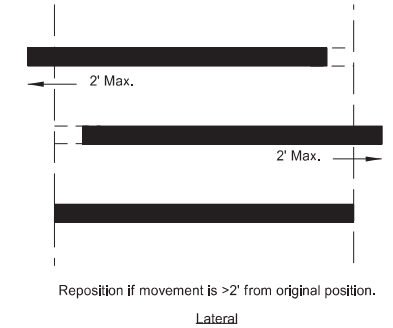
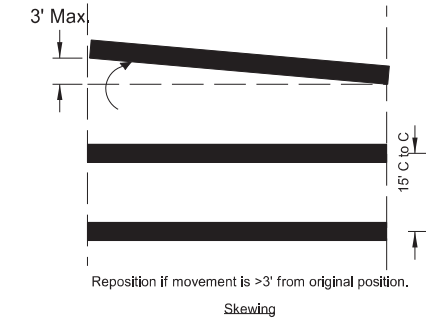
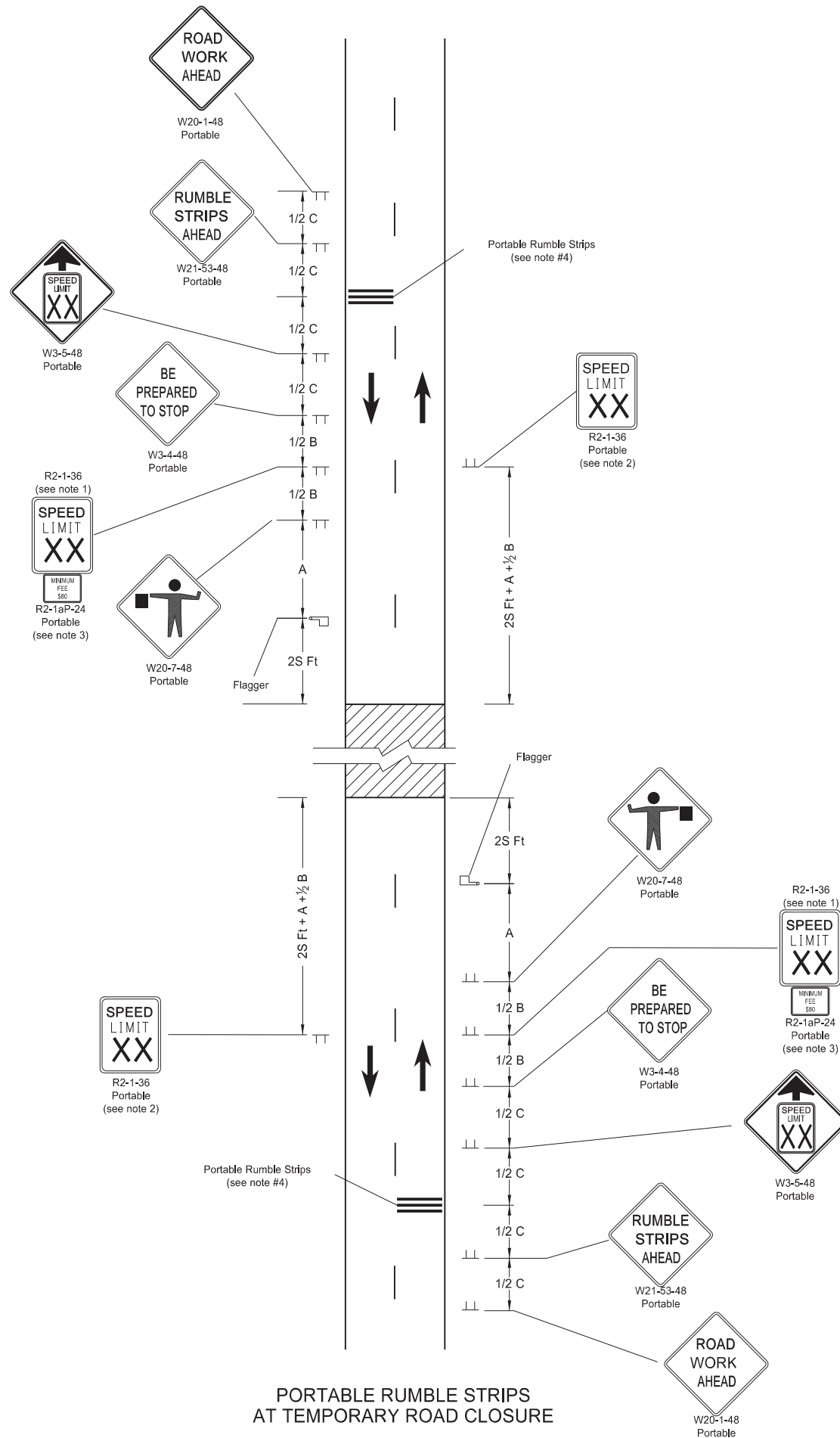
Two-Lane Roadway Portable Rumble Strips

KEY

	Work area
	Flagger
	Sign

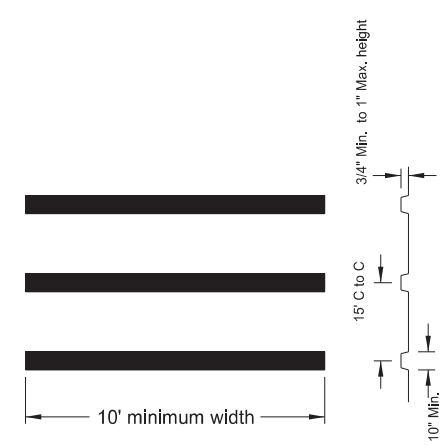
S = Numerical value of speed limit or 85th percentile.

ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - High Speed (over 45 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720



PORTABLE RUMBLE STRIPS ARRAY TYPES OF MOVEMENT AND MAXIMUM ALLOWANCES

- Notes:
- Determine speed in the field based on location and conditions.
 - Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
 - Sign R2-1aP-24 is not required when pilot car operation is used.
 - Do not use rumble strips on a non paved surface or in a pre-construction speed zone of 45 mph or less.



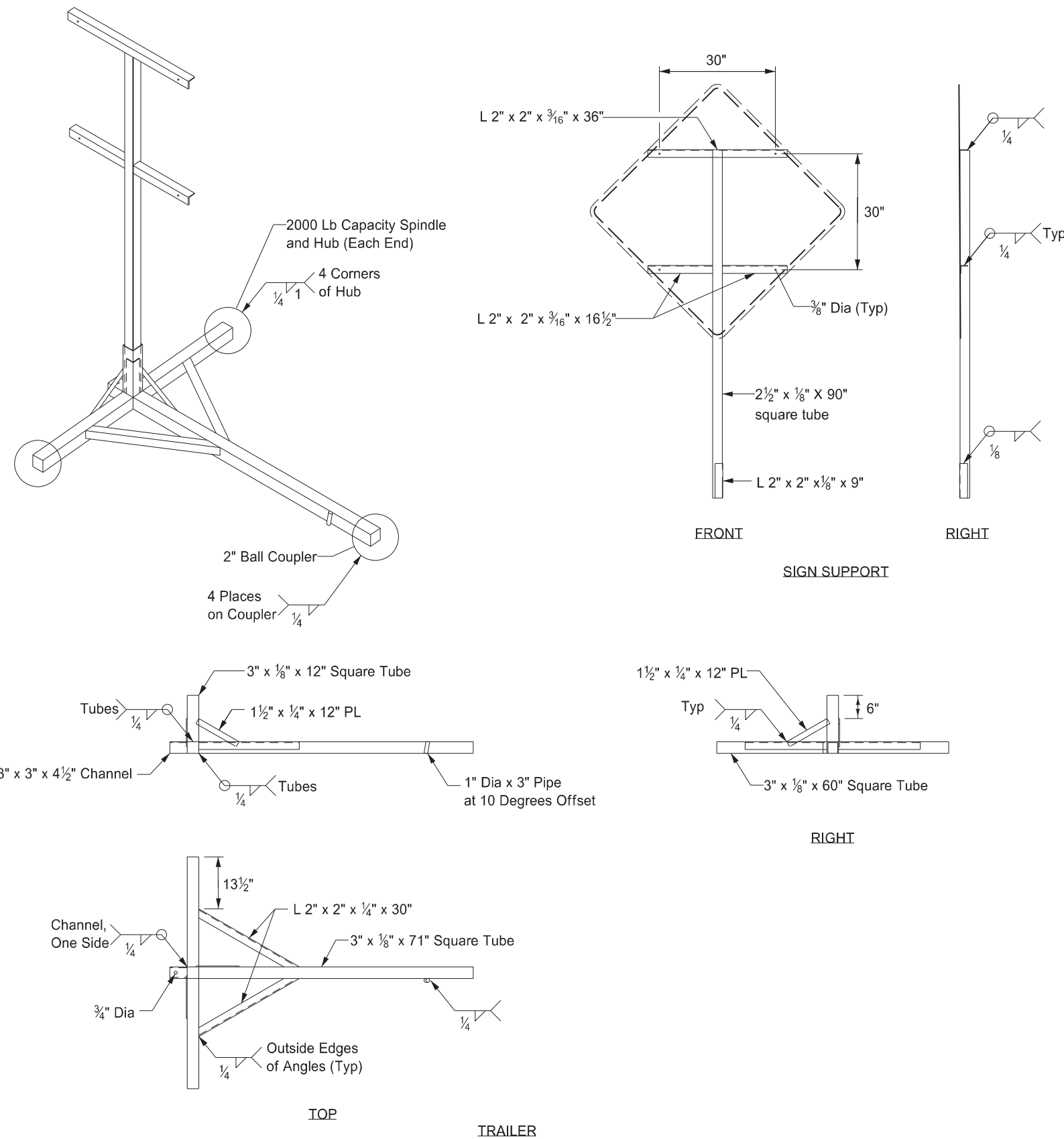
PORTABLE RUMBLE STRIPS AT TEMPORARY ROAD CLOSURE

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION		
02-22-22 REVISIONS		
DATE	CHANGE	<p>03/07/23 Use changed to min 45 mph.</p>
03/07/23		

03/07/23

PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



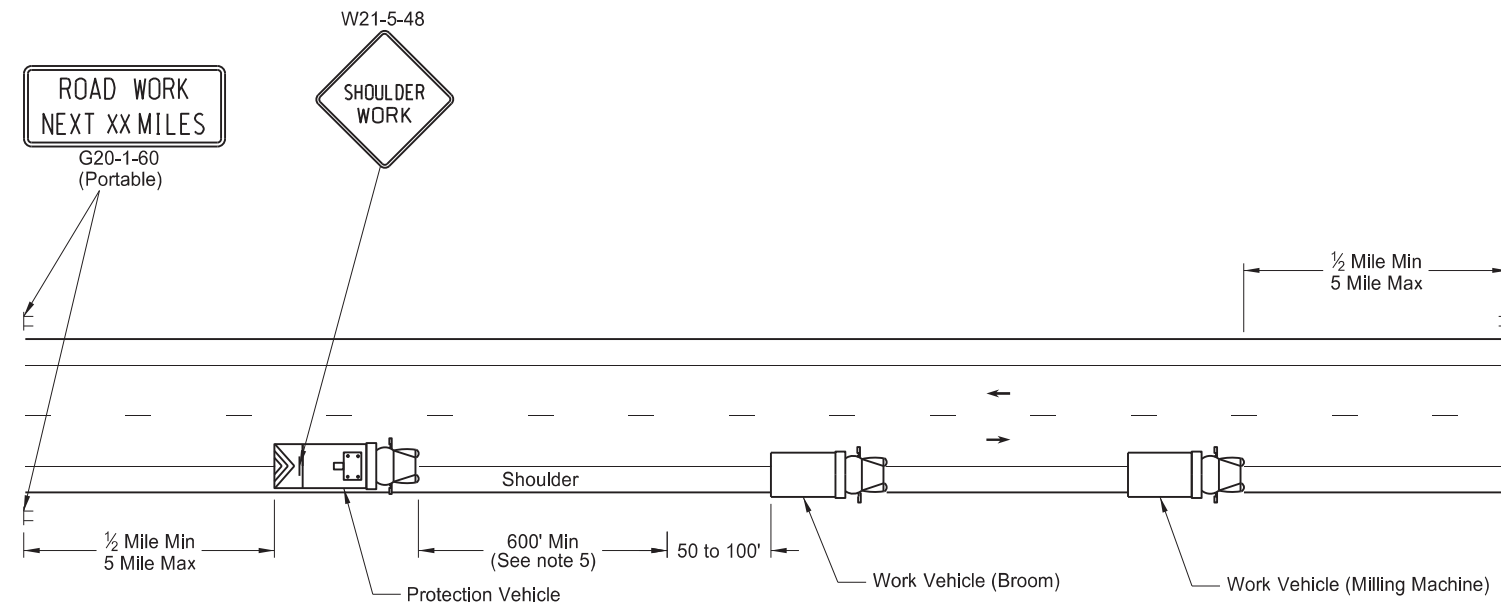
Notes:

- 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.

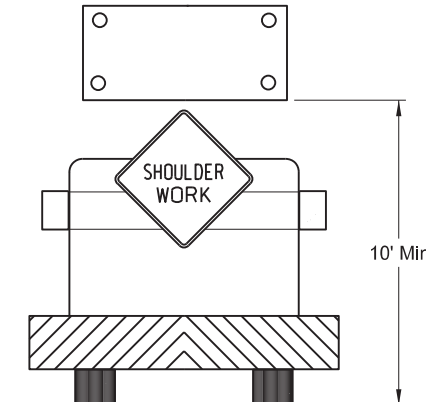
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE
12/02/2020	Updated Note to active voice.

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

MOBILE OPERATION Grinding Shoulder Rumble Strips

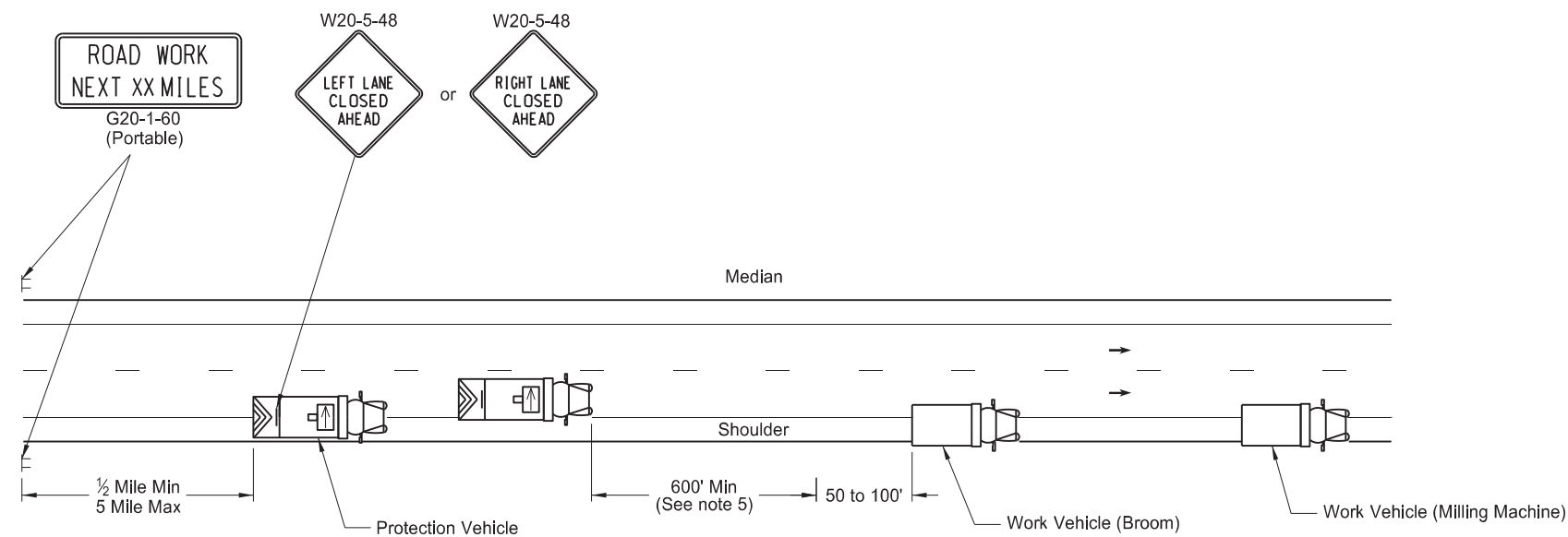


TWO LANE - TWO WAY ROADWAY

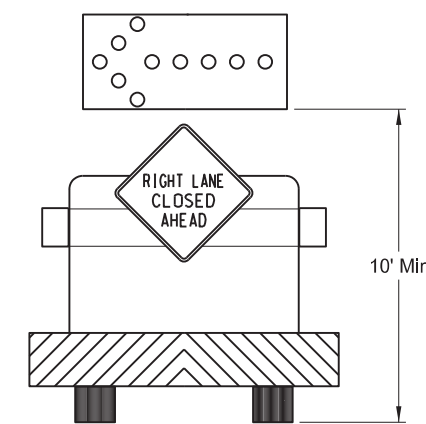


TWO LANE - TWO WAY ROADWAY
Typical Protection Vehicle with
Flashing Arrow Panel In Caution Mode

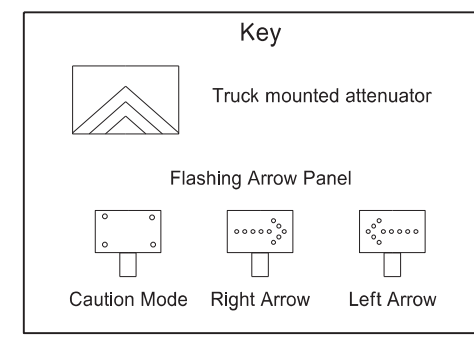
- Notes:
1. Provide truck mounted attenuators on additional vehicles in the convoy, at no additional cost.
 2. Provide rotating, flashing, oscillating, or strobe lights on vehicles.
 3. Provide Type B or Type C flashing arrow panels that are controlled from inside the vehicle.
 4. Provide two - way electronic communication capability in each vehicle.
 5. Vary vehicle spacing between the protection vehicle and work vehicle depending on sight distance restrictions. Keep the spacing of the convoy vehicles such that motorists approaching the work convoy can see the protection vehicle in time to slow down and safely pass the work vehicles.
 6. Move advance Road Work Ahead signs as the work area moves through the construction zone.



INTERSTATE & 4 LANE DIVIDED HIGHWAY



INTERSTATE & 4 LANE DIVIDED HIGHWAY
Typical Protection Vehicle with Flashing Arrow
Panel In Flashing Arrow Mode

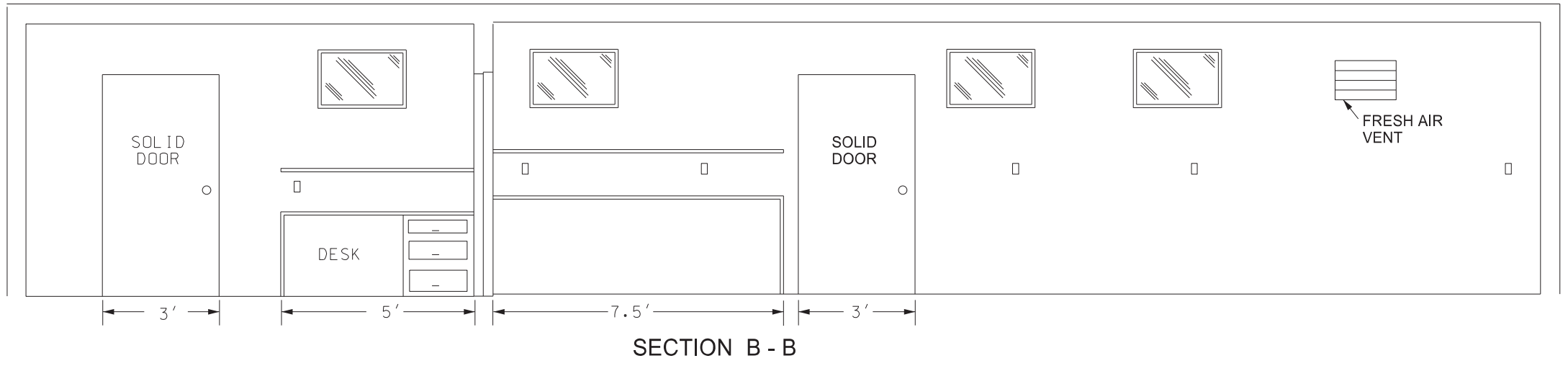
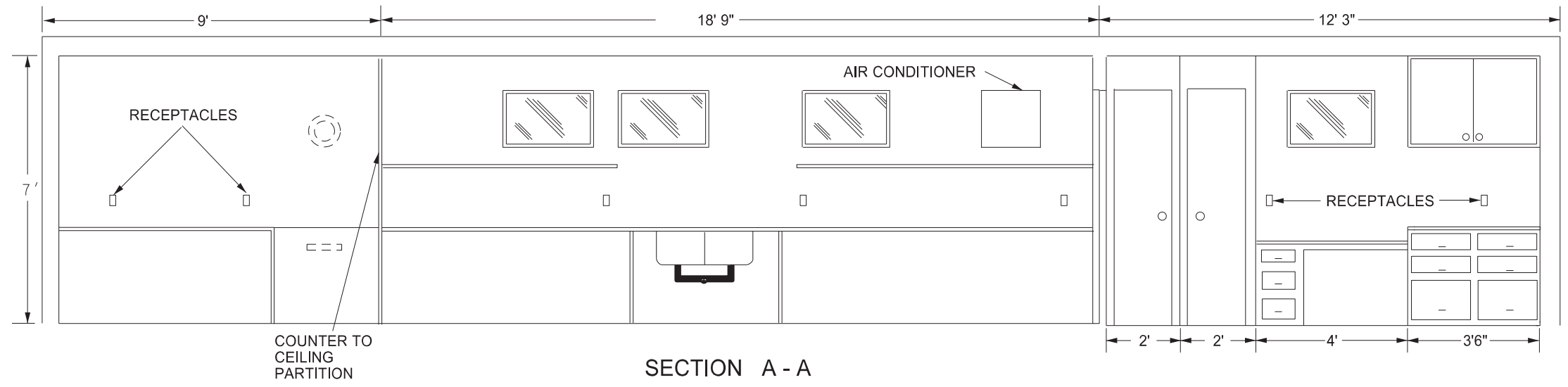
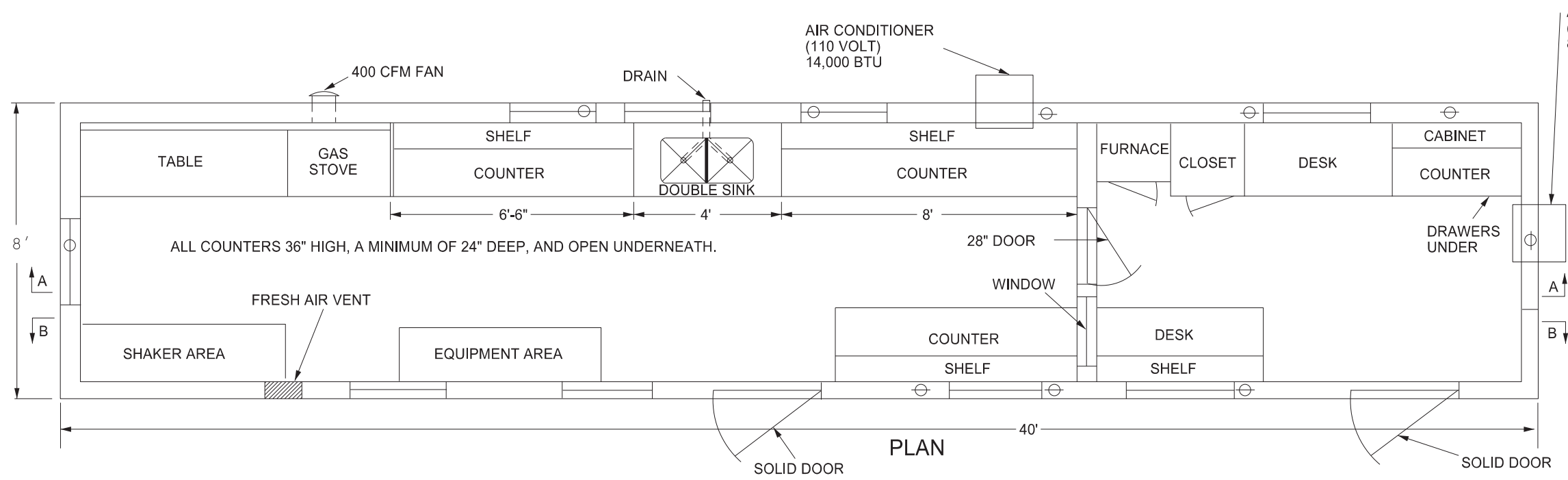


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-15-12	
REVISIONS	
DATE	CHANGE
8-17-17	Updated notes & signs
10-03-19	New Design Engineer PE Stamp

This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
on 10/3/19 and the original document is stored at the North Dakota Department of Transportation

BITUMINOUS LABORATORY

D-706-1



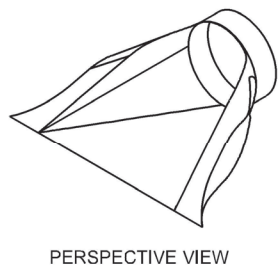
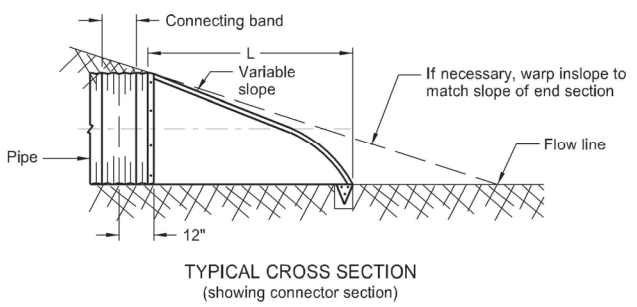
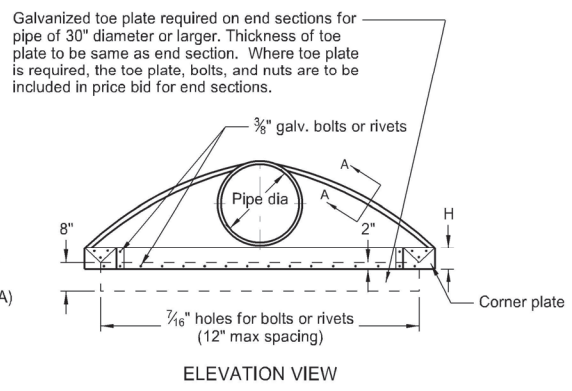
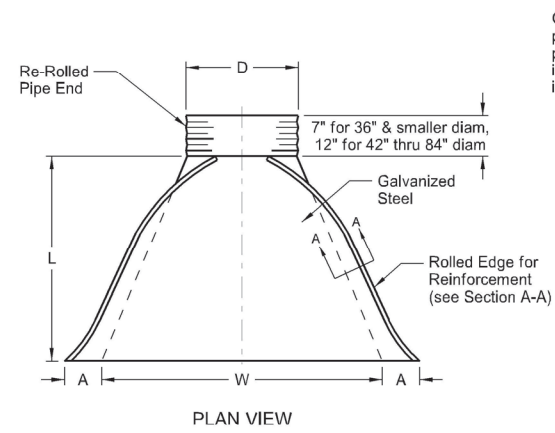
- Provide a laboratory with the following:
1. A 1'x1' shelf at 36" above the regular countertop.
 2. Double compartment stainless steel sink, with each compartment a minimum of 16"x14"x10" deep. Provide water service lines made of copper or plastic and a diameter of 1/2 inch.
 3. An exhaust fan capable of removing inside air at a rate of 400 CFM.
 4. Fresh air vent hinged to open or close manually.
 5. 24" x 48" table capable of holding a 200 lb masonry saw with a minimum clearance of 36" above the table.
 6. A water supply tank with a capacity of 500 gallons and a 20 gallon capacity pressure tank on the pump.
 7. Heavy duty type locks, latches, and hinges for doors made to withstand the intense use in service.
 8. A wall between the office and the work area properly insulated to prevent the transmission of heat and noise.
 9. The steel cable tie downs and ground anchors at each corner of the lab.
 10. Electrical service entrance wired for 100 amps and separate circuits for air conditioners. Space convenience outlets in counter areas a minimum of four feet apart.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
07-30-14	Changed standard's title and revised notes.
01-11-16	Revised notes.
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

ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

D-714-4



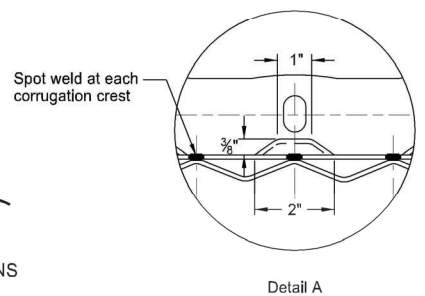
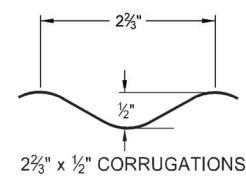
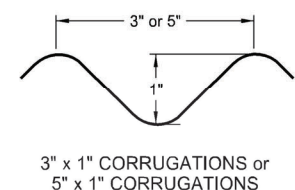
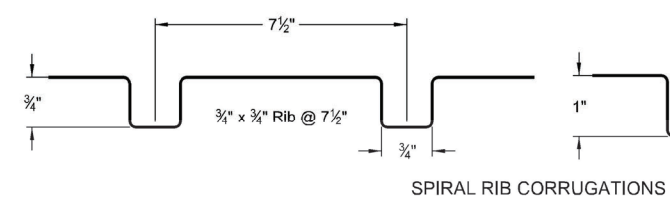
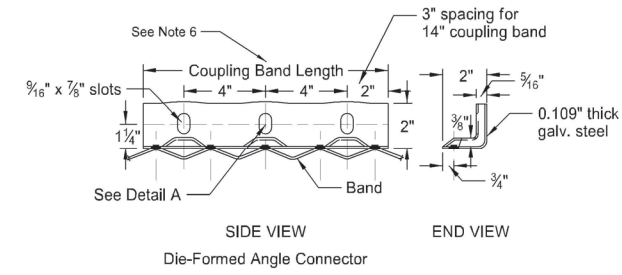
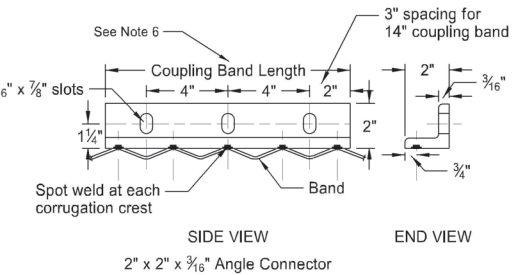
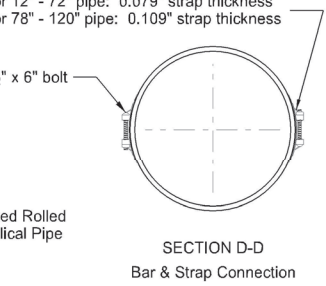
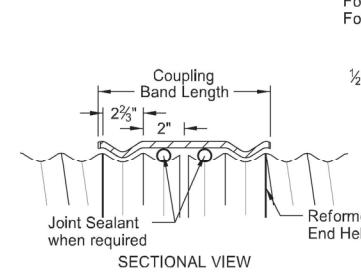
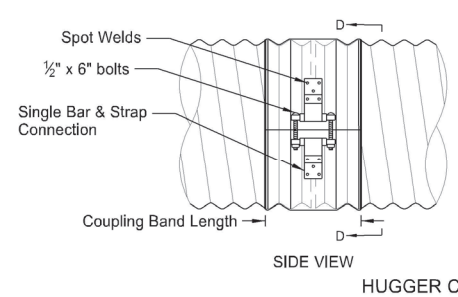
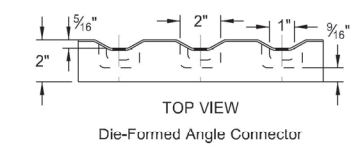
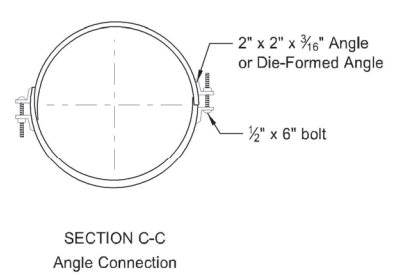
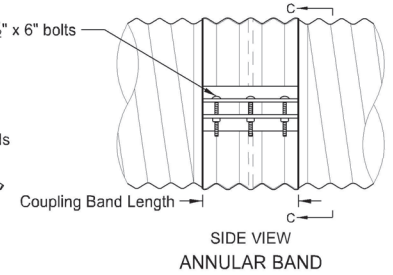
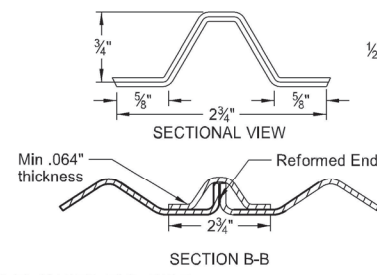
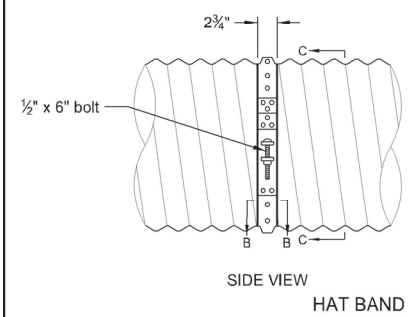
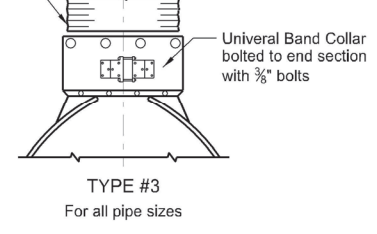
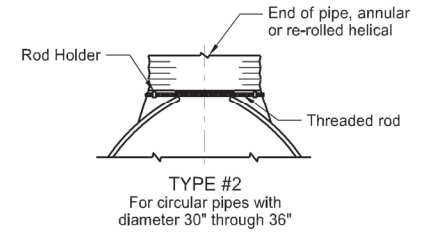
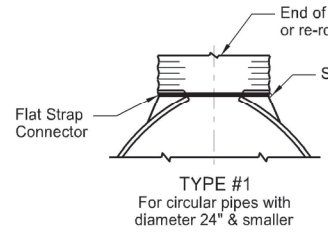
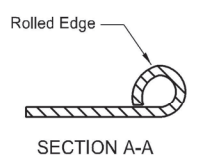
PIPE DIA. IN	GALVANIZED THICKNESS IN	END SECTION DIMENSIONS					APPROX. SLOPE RATE	BODY PIECE
		A IN	B IN	H IN	L IN	W IN		
15	0.064 - 0.079	7	8	6	26	30	2 1/2:1	1
18	0.064 - 0.109	8	10	6	31	36	2 1/2:1	1
24	0.064 - 0.109	10	13	6	41	48	2 1/2:1	1
30	0.064 - 0.109	12	16	8	51	60	2 1/2:1	1 or 2
36	0.064 - 0.109	14	19	9	60	72	2 1/2:1	2
42	0.064 - 0.138	16	22	11	69	84	2 1/2:1	2
48	0.064 - 0.168	18	27	12	78	90	2 1/2:1	2
54	0.064 - 0.168	18	30	12	84	102	2:1	2
+60	0.084 - 0.168	18	33	12	87	114	1 1/2:1	3
+66	0.064 - 0.168	18	36	12	87	120	1 1/2:1	3
+72	0.064 - 0.168	18	39	12	87	126	1 1/2:1	3
+78	0.064 - 0.168	18	42	12	87	132	1 1/2:1	3
+84	0.064 - 0.168	18	45	12	87	138	1 1/2:1	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 3/8" dia. galv. bolts or rivets. Nuts to be torqued to 25 foot-lbs ±.

- NOTES:
- Pipes and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
 - 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 3/16" galv. angle for 60" through 72" dia. and 2 1/2" x 2 1/2" x 1/4" galv. angle for 78" and 84" dia.. Angles to be attached by galv. 3/8" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
 - 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.
 - 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.
 - 1/2" x 8" bolts may be used as a substitute for the 1/2" x 6" bolts shown in the details.
 - Coupling bands wider than 14" may be used if a minimum of four 1/2" bolts with maximum spacing of 5 1/2" are used for the connection.
 - Length of spot welds shall be minimum 1/2".

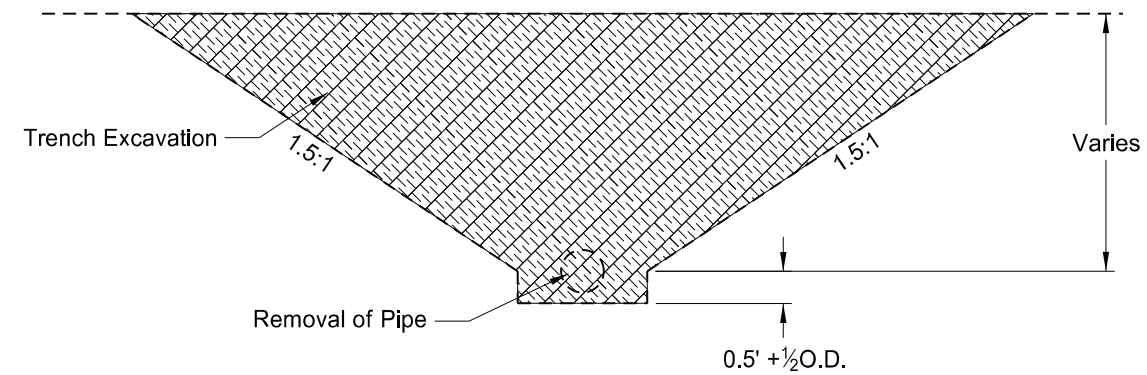
COUPLING BAND DIMENSIONS				
COUPLING TYPE	CORRUGATION PITCH x DEPTH	PIPE SIZE	COUPLING BAND LENGTH	MIN. BAND THICKNESS
Hat Band	2 3/8" x 1/2"	12" - 48"	2 3/4"	.064"
		12" - 72"	12"	.052"
Annular Band	2 3/8" x 1/2"	78" - 84"	12"	.079"
		48" - 120"	14"	.052"
Hugger Band	2 3/8" x 1/2" Rerolled End	12" - 72"	10 1/2"	.052"
		78" - 84"	10 1/2"	.079"
	3" x 1" Rerolled End	48" - 120"	10 1/2"	.052"
		5" x 1" Rerolled End	48" - 120"	12"



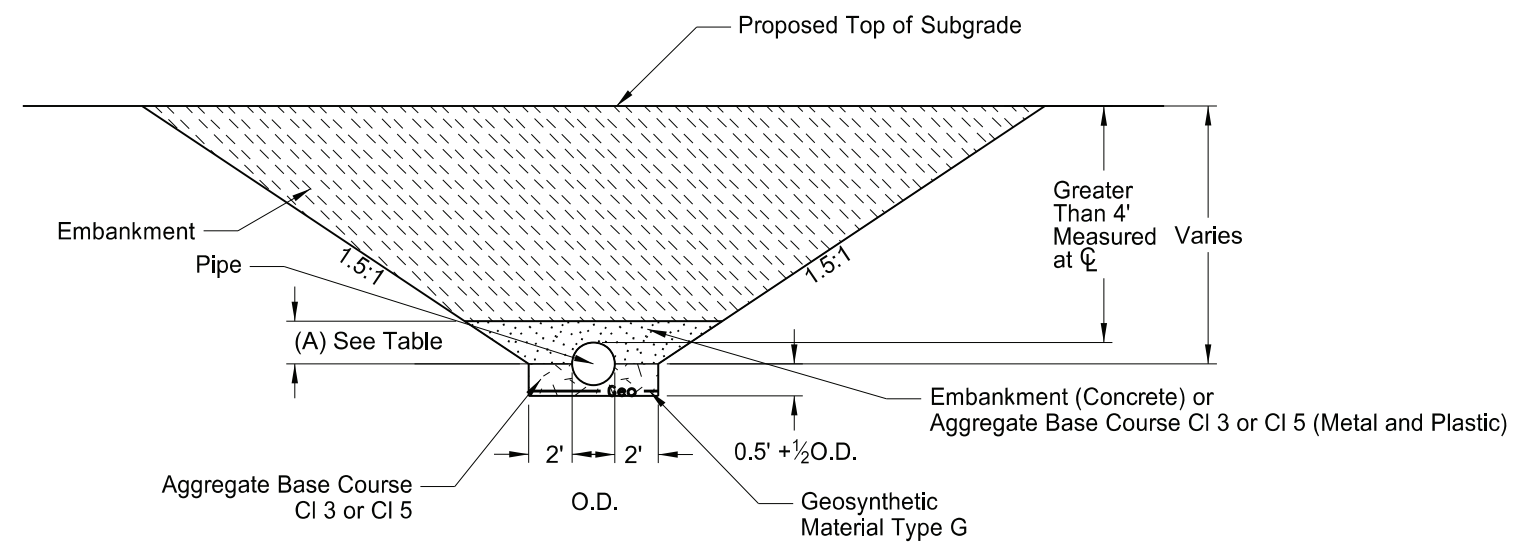
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
08-16-13	
REVISIONS	
DATE	CHANGE
01-07-14	End Section Plan View
02-27-14	3" x 1" Corrugation Detail
09-18-19	Added Perspective View Detail
09-23-22	Galvanized Thickness Table

THAN D KETT
PROFESSIONAL ENGINEER
PE-4684
NORTH DAKOTA
09/23/22

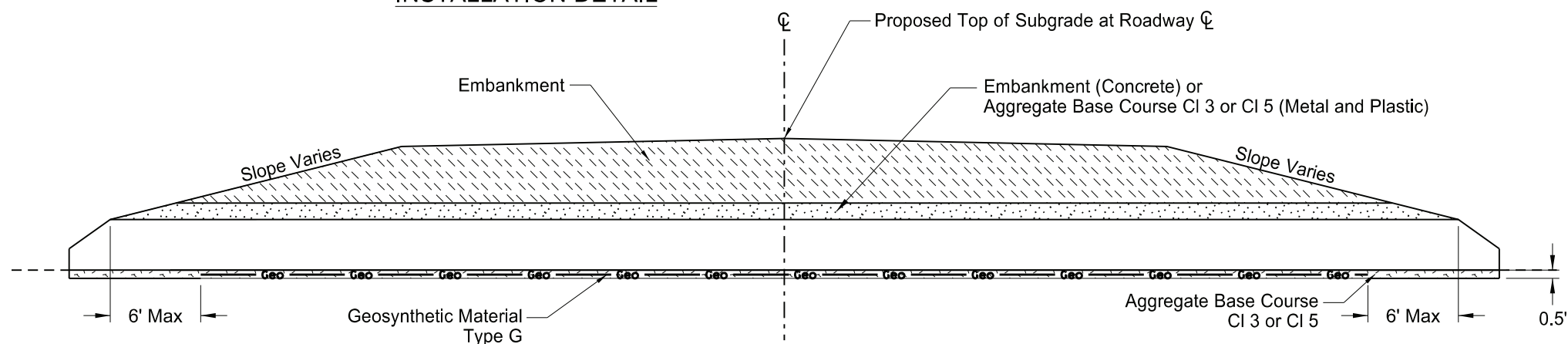
TRANSVERSE MAINLINE PIPE INSTALLATION DETAIL
PIPES MORE THAN 4 FEET BELOW TOP OF SUBGRADE



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

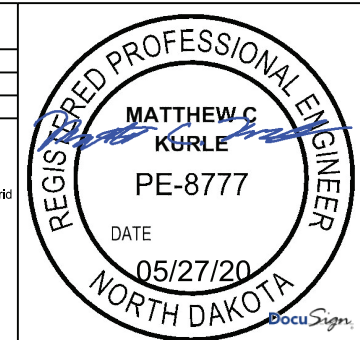
- 1) Pipe
- 2) Trench excavation
- 3) Aggregate Base Course CI 3 or CI 5
- 4) Embankment

NOTES:

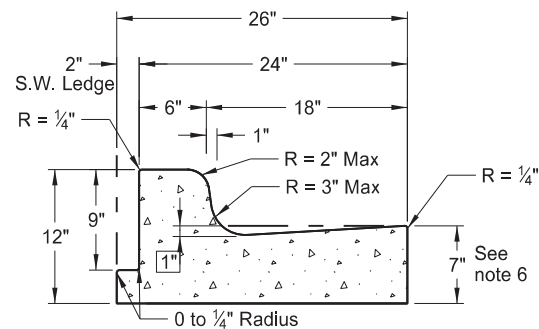
- 1) This drawing applies to new/replaced mainline and paved intersection roadways (including ramps). It does not include pipes in approaches.
- 2) Embankment may be either Borrow Excavation or Common Excavation - Type A.

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

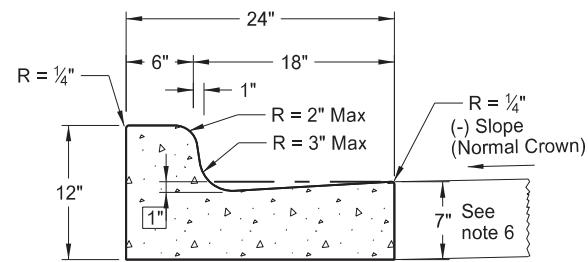
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-26-13	
REVISIONS	
DATE	CHANGE
10-15-13	Label Formatting
1-21-14	Nomenclature
9-18-15	Title Rewording
12-10-15	Added Plastic Pipe
5-27-20	Replaced R1 Fabric with Geogrid Changed bedding depth



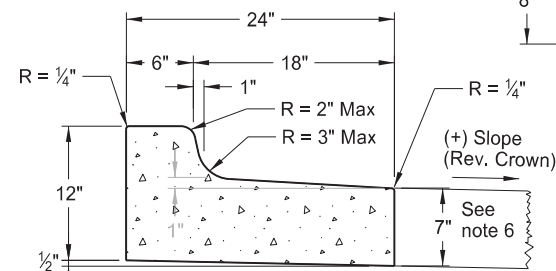
Curb & Gutter and Valley Gutter



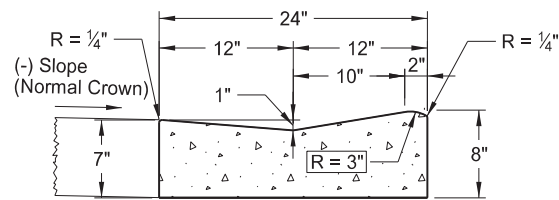
Curb & Gutter Type 1 (Sec. A & B)
Adjacent to Concrete Sidewalk,
Median, or Parking Lot.
(Sec. A shown. See Sec B for
additional details.)



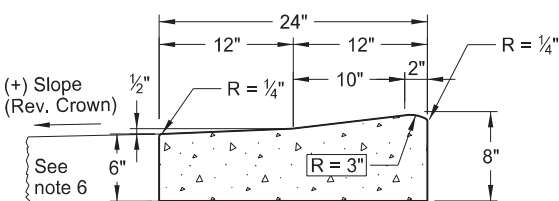
Curb & Gutter Type 1 (Sec. A)



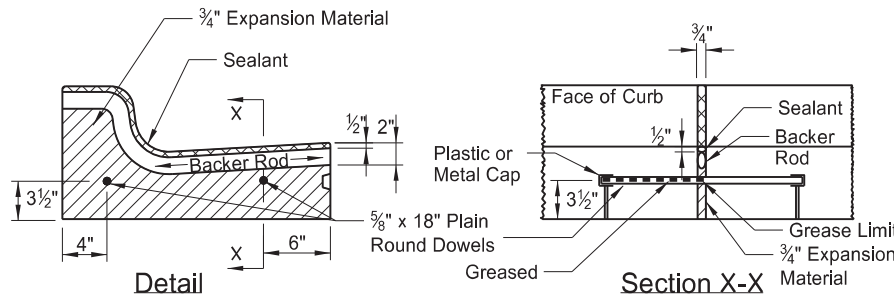
Curb & Gutter Type 1 (Sec. B)



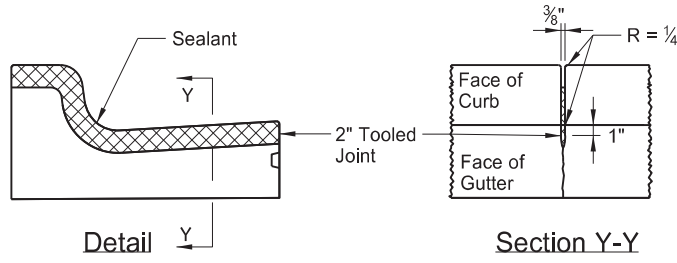
Mountable Curb & Gutter Type 1 (Sec. A)



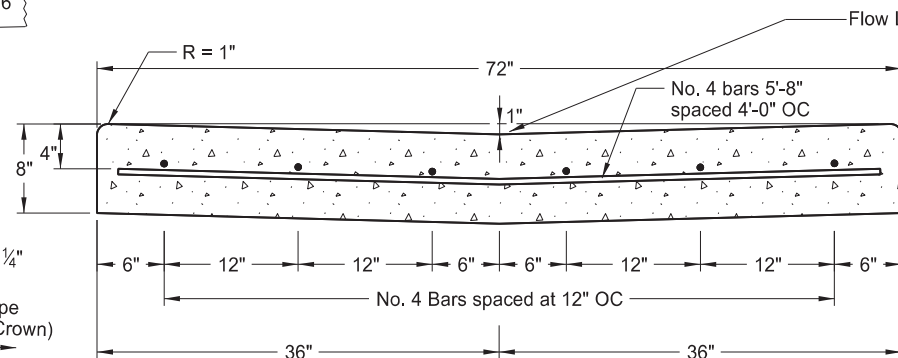
Mountable Curb & Gutter Type 1 (Sec. B)



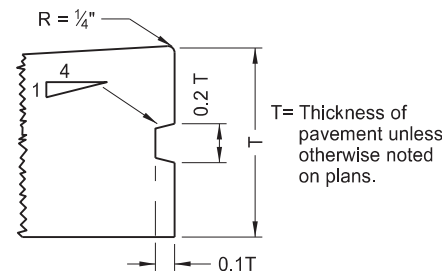
Isolation Joint



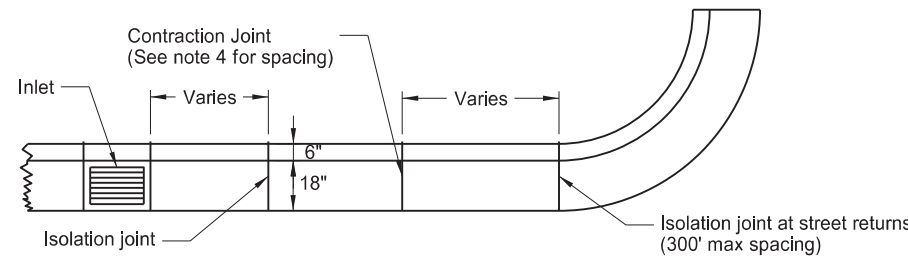
Contraction Joint
(10' Max Spacing)



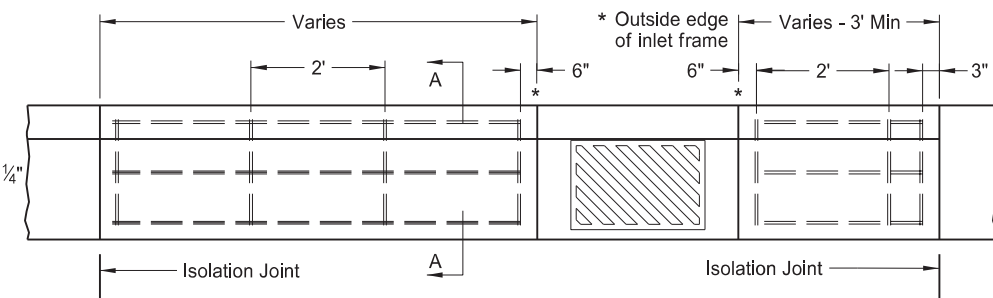
72" Concrete Valley Gutter Detail



Keyway Detail for Curb & Gutter
(To be used with PCC Pavement and Drives)

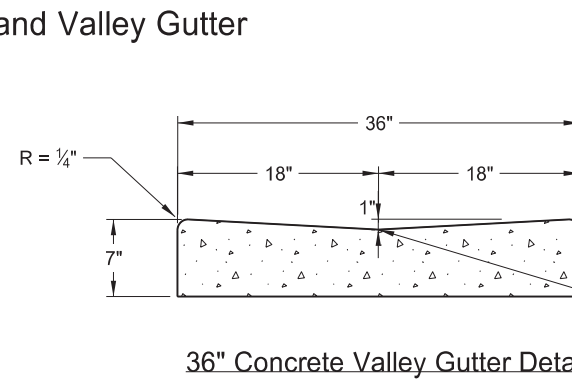


Joint Location Detail

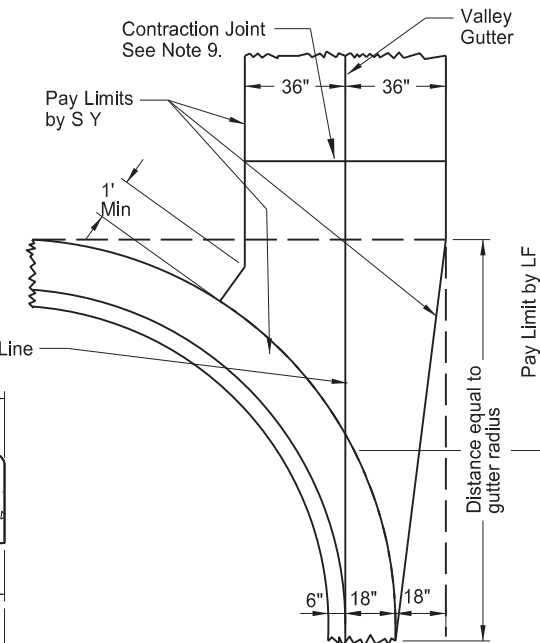


Curb & Gutter Reinforcing at Inlets

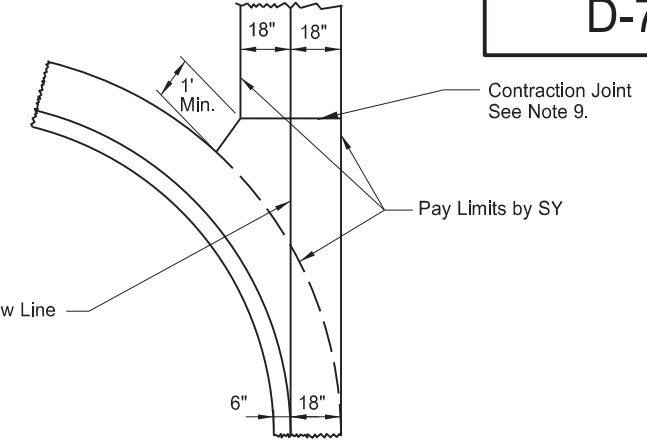
NOTE: Use #4 deformed reinforcing bars without splices. Include all costs for reinforcing bars at inlet locations (even inlets located on radii) in the price bid for "Curb and Gutter - Type 1." Extend reinforcement to the second joint (rebar placed through the first joint) in cases where the 3' min. panel length cannot be obtained.



36" Concrete Valley Gutter Detail



72" Concrete Valley Gutter Plan



36" Concrete Valley Gutter Plan

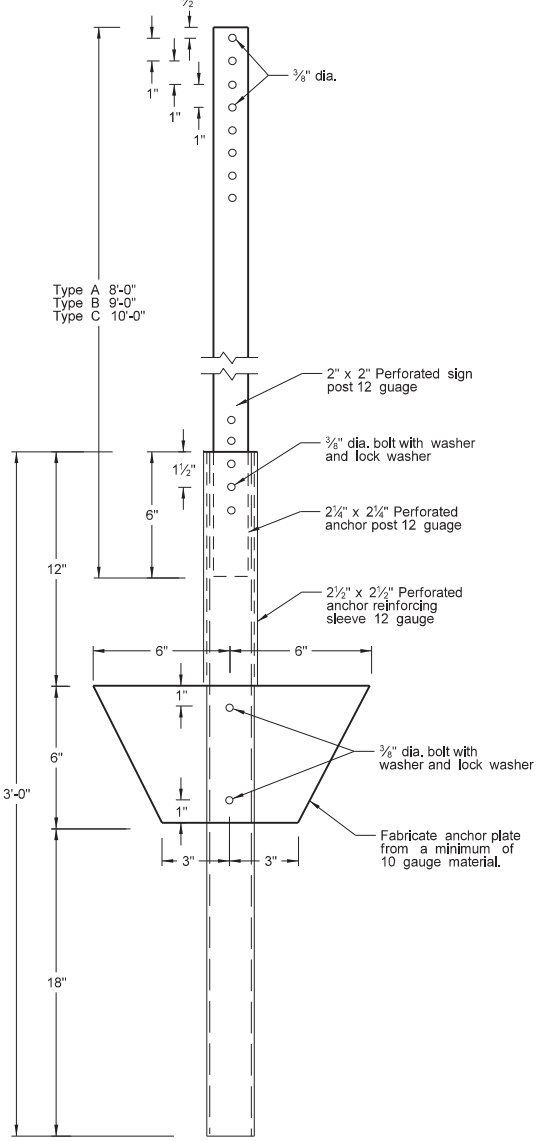
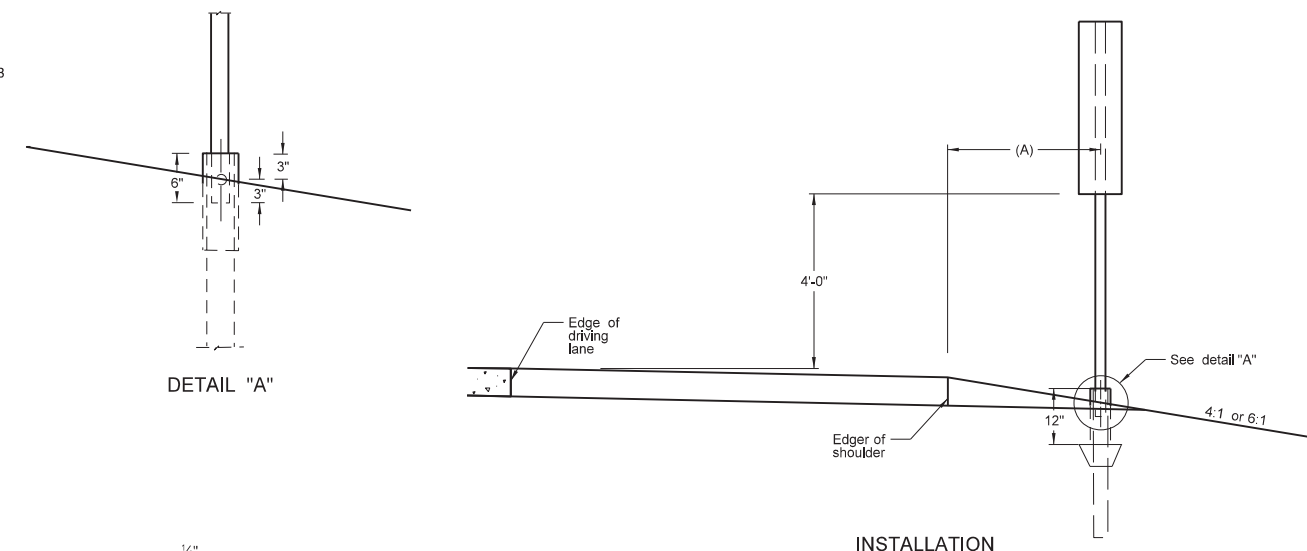
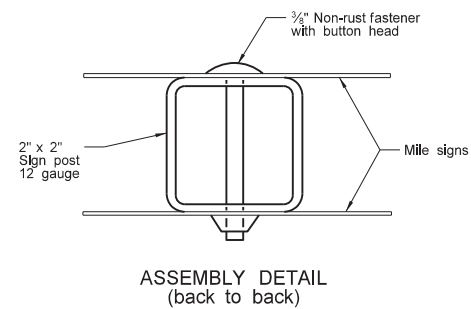
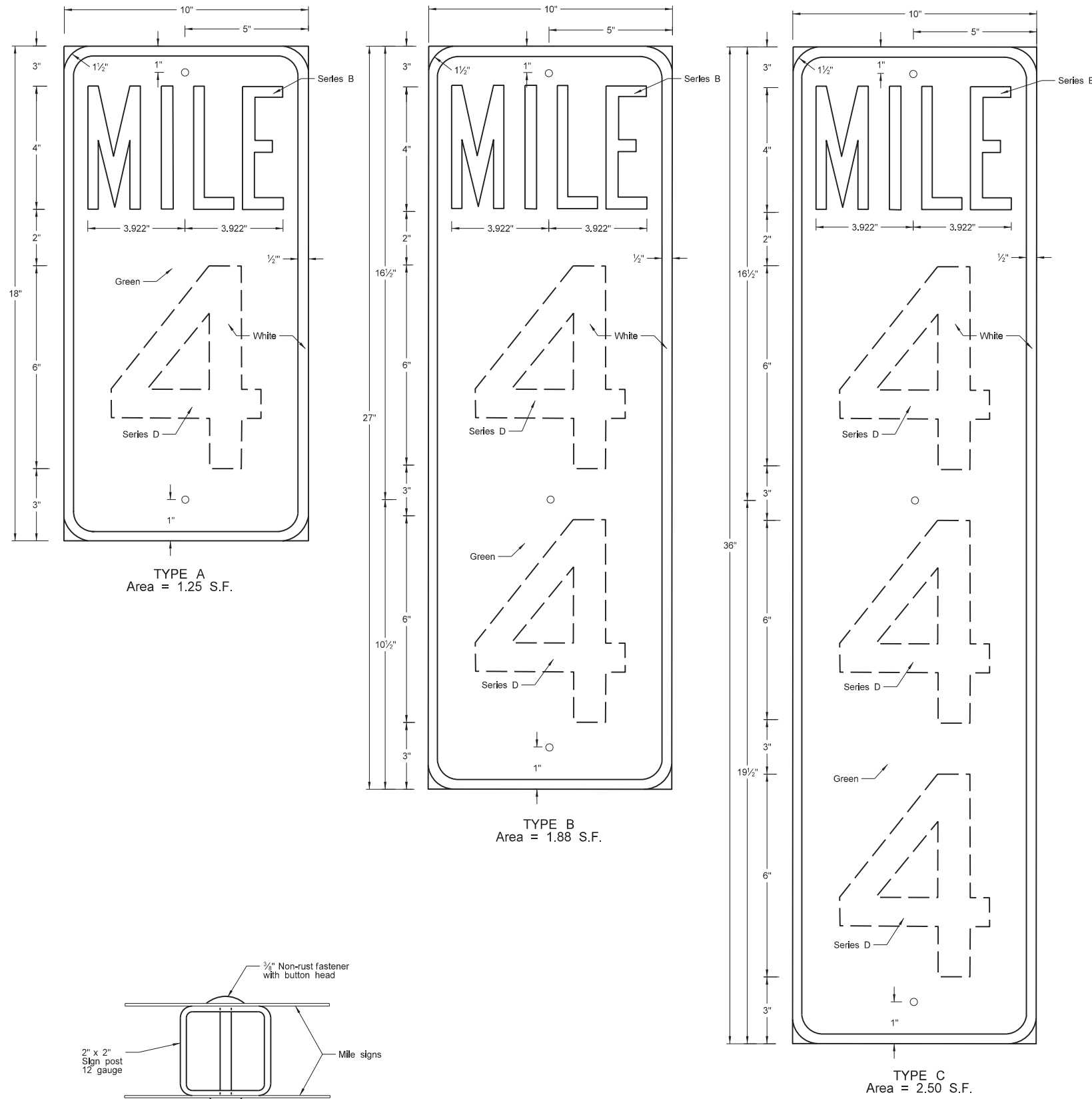
NOTES:

1. Use Curb and Gutter Type 1 (Sec. A & B). Use section "A" with (-) pavement slopes and section "B" with (+) pavement slopes.
2. Contraction Joints: Tool the Curb & Gutter 2" as shown on the contraction joint details.
3. Isolation Joints: Use 3/4" expansion joint filler for isolation joint material. Form the backer rod and joint sealant opening with a pre-cut piece of wood or other material approved by the engineer. Dowel supports are not required on the second pour at a cold joint. Install plastic or metal caps and greased dowels in the cold joint for the second pour.
4. Joint Spacing: For hot bituminous pavements use a 10' max joint spacing for the curb and gutter with panels on each side of the inlets. For concrete pavements match the joint spacing for the curb and gutter to the pavement joint on PCC Pavements (approximately 15' spacing.)
5. Joint sealing: Seal contraction and isolation joints as shown in the details. Use joint sealant for contraction joints that conforms to section 826.02B. Use sealant for expansion joints specified in note 3 above. Tool and install sealant in accordance with the manufacturer's recommendations.
6. Face of Gutter Depth: For hot bituminous pavement use 7" gutter depth as shown. For PCC pavements, match the gutter depth to the depth of adjacent PCC pavement or to construct a 7" depth as shown.
7. Tie curb and gutter to abutting PCC pavement with No. 3 bars, 1'-6" in length, spaced at 4' centers.
8. On street returns and other locations where new curb and gutter ends and does not abut existing curb and gutter, taper the last two (2) feet of the curb from 6" in height to 0". Install a 1/2" premolded full depth isolation joint, the same shape as the curb and gutter just ahead of the taper. Install an 18" tie bar across the joint.
9. Valley Gutter Joints: Form, saw, or score 1/8" min. to 3/8" max. width contraction joints (a minimum 2" depth) at approx 10' intervals. Seal the joints with hot poured elastic type joint sealer (Section 826.02A.2 of the Standard Specifications.) Include all costs for the joint and sealant in the price bid for Valley Gutter.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-7-2013	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
08-27-19	New Design Engr 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

(CONVENTIONAL USE) REFERENCE MARKERS



(A) 8' Clearance to finished shoulder or in line with existing delineator posts.

- NOTES:**
 Installation: Install posts along right shoulder.
 Sign: Fabricate backing of 0,080 aluminum.
 Fasteners: Attach signs to post with tension pin type fastener or other suitable vandal resistant non-rust fastener.
 Reflective Sheeting: Use Type IV sheeting.
 Numbers: Use screened or applied copy numbers of the series shown.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
7-8-14	Revised post and reflective sheeting notes
8-30-18	Updated to active voice.
8-29-19	New Design Engineer PE Stamp.

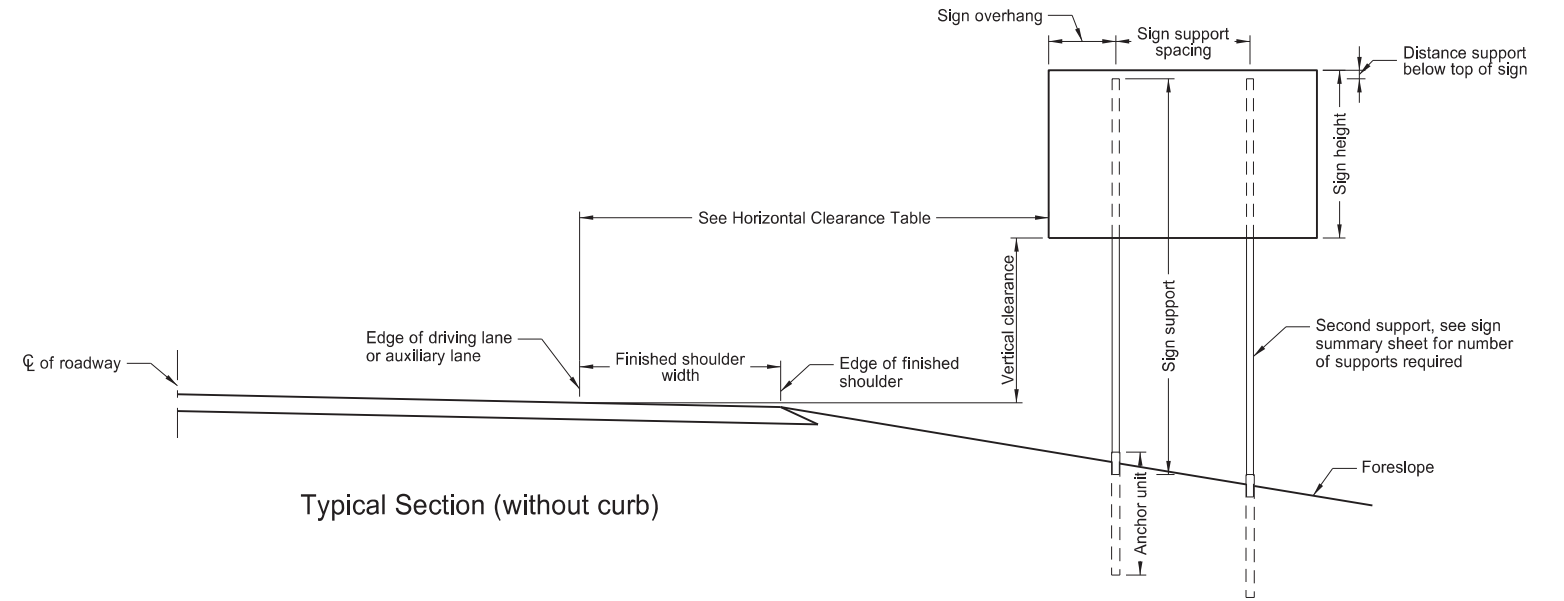
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 Registration Number
 PE-4683,
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 North Dakota Department
 of Transportation

PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

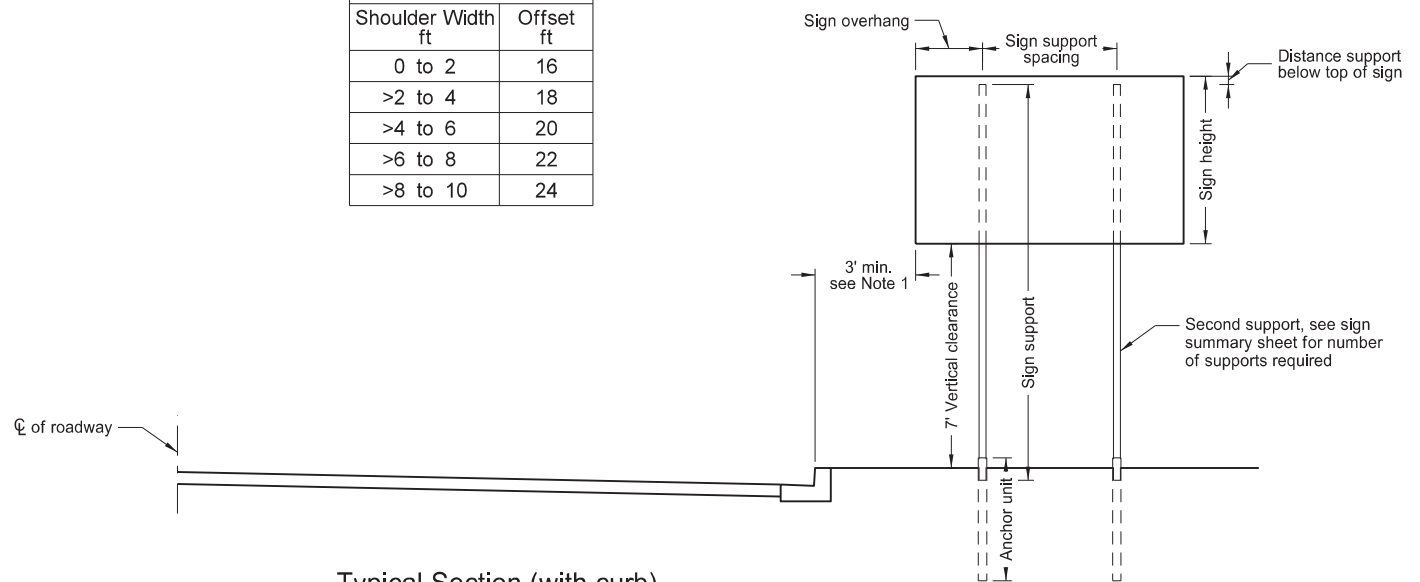
Notes:

1. Curbed Roadways: Use a 3' clearance from face of the curb except where right of way or sidewalk width is limited; Use a minimum 2' clearance. Increase the horizontal clearance if required to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.
2. Minimum vertical clearance: Provide at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane at the side of the road in rural districts. Provide at least 7' clearance to the bottom of the sign, where parking or pedestrian movements occur.
Install signs on expressways a minimum height of 7'.
Install adopt-a-highway signs on Freeways at least 7' above the edge of the driving lane.
Maximum vertical clearance is 6" greater than the minimum vertical clearance.
3. Offset signs: Use a vertical clearance of 5' above the edge of the driving lane for signs placed 30 feet or more from the edge of the traveled way.
4. Provide a horizontal clearance from edge of shared use path to edge of sign of 3', except where width is limited. Provide a minimum clearance of 2'.

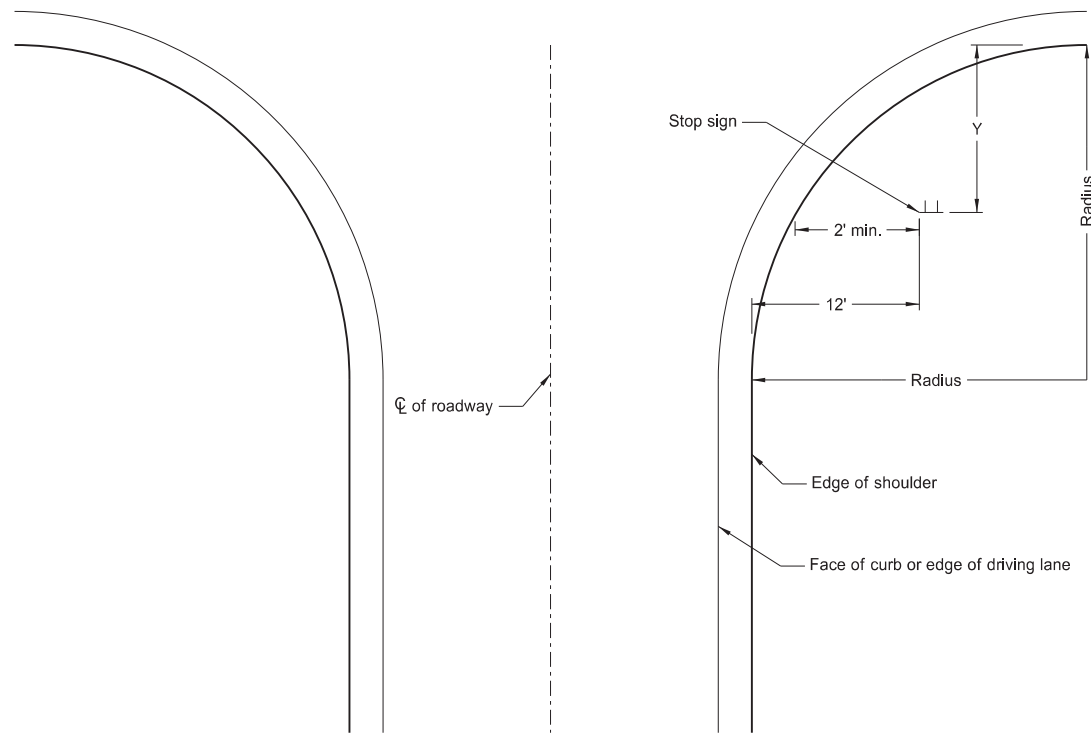


Typical Section (without curb)

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



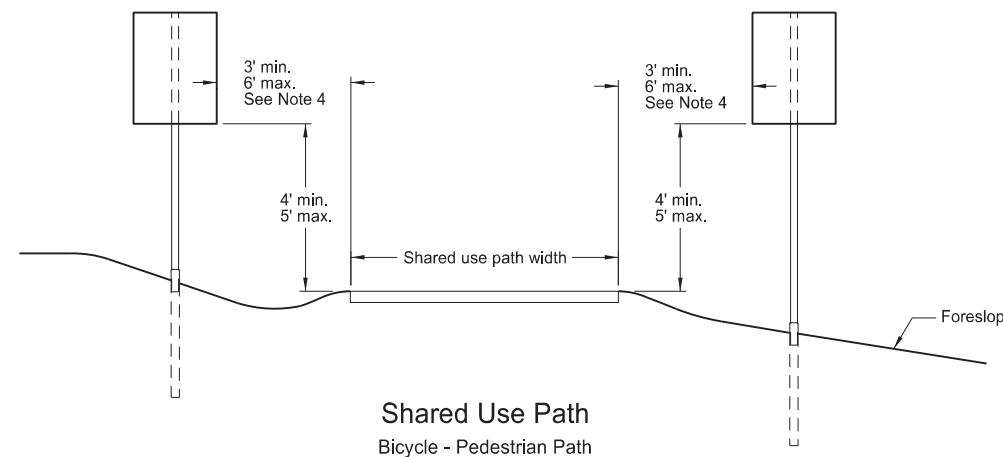
Typical Section (with curb)
Residential or Business District



Stop Sign Location
Wide Throat Intersection

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



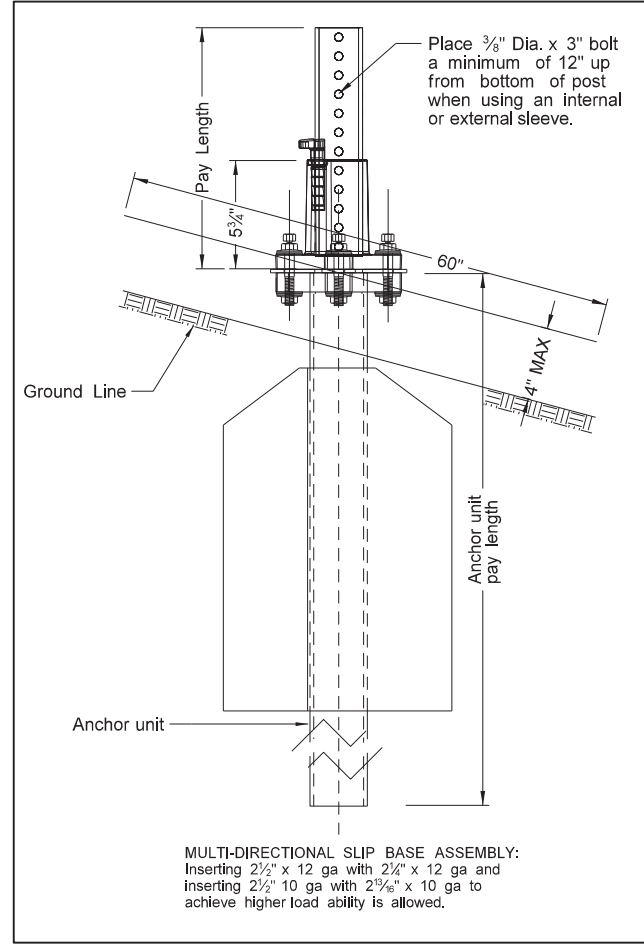
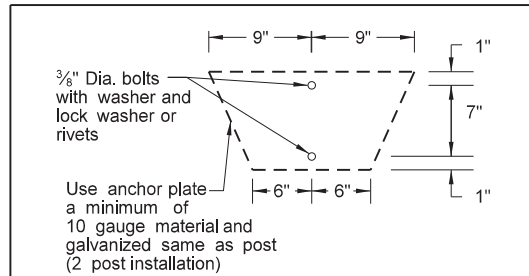
Shared Use Path
Bicycle - Pedestrian Path

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 volcs.
8-29-19	New Design Engineer PE Stamp.

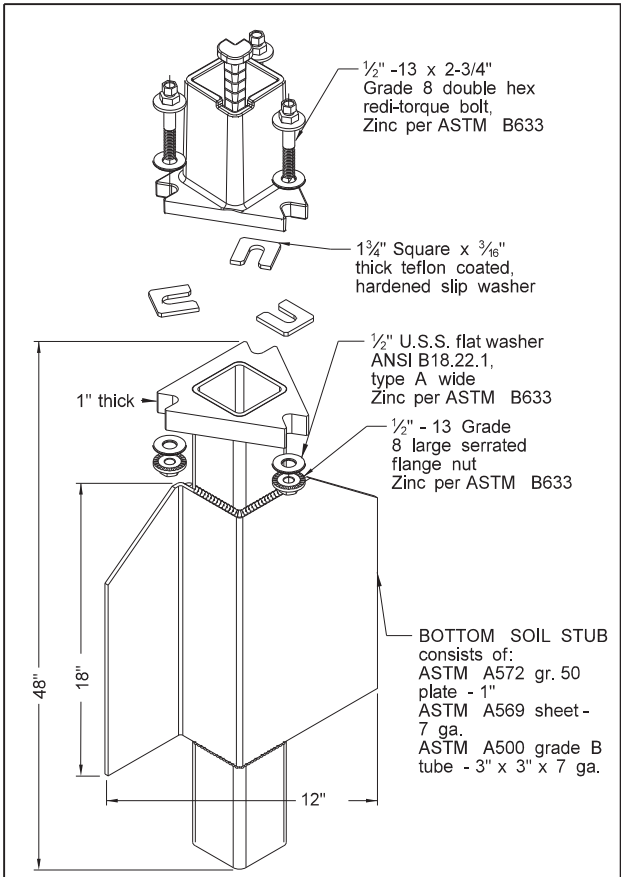
This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
on 8/29/19 and the original document is stored at the North Dakota Department of Transportation

Telescoping Perforated Tube							
Number of Posts	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2 1/2(D)	12	Yes		7
1	2 1/2	12	2 1/4	12	Yes		7
2	2 1/2	10			Yes		7
2	2 1/4	12	2 1/2(D)	12	Yes		7
2	2 1/2	12	2 1/4	12	Yes		7
3 & 4	2 1/2	12			Yes		7
3 & 4	2 1/2	10			Yes		7
3 & 4	2 1/2	12	2 1/4	12	Yes		7
3 & 4	2 1/4	12	2 1/2(D)	12	Yes		7
3 & 4	2 1/2	10	2 3/8	10	Yes		7

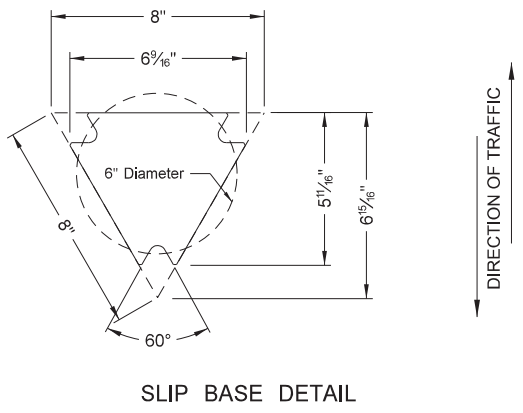
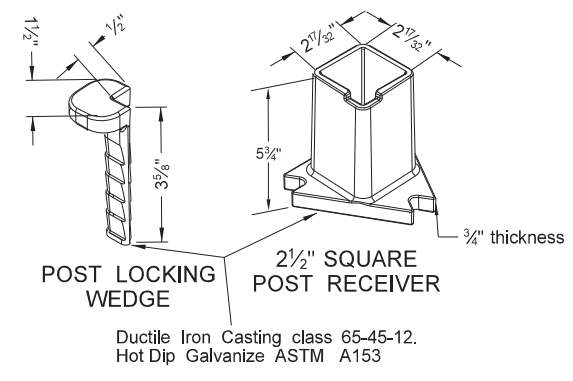
(B) - Provide a shim as specified by the manufacturer when placing 2 1/2", 12 gauge posts in standard soils without breakaway bases. Provide breakaway base when placing the support in weak soils. The Engineer will determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
 (C) - 3" anchor unit
 (D) - 2 1/2" x 12 ga. x 18" minimum length external sleeve required.



Mounting Details Perforated Tube



SLIP BASE FOR 2 1/2" POST

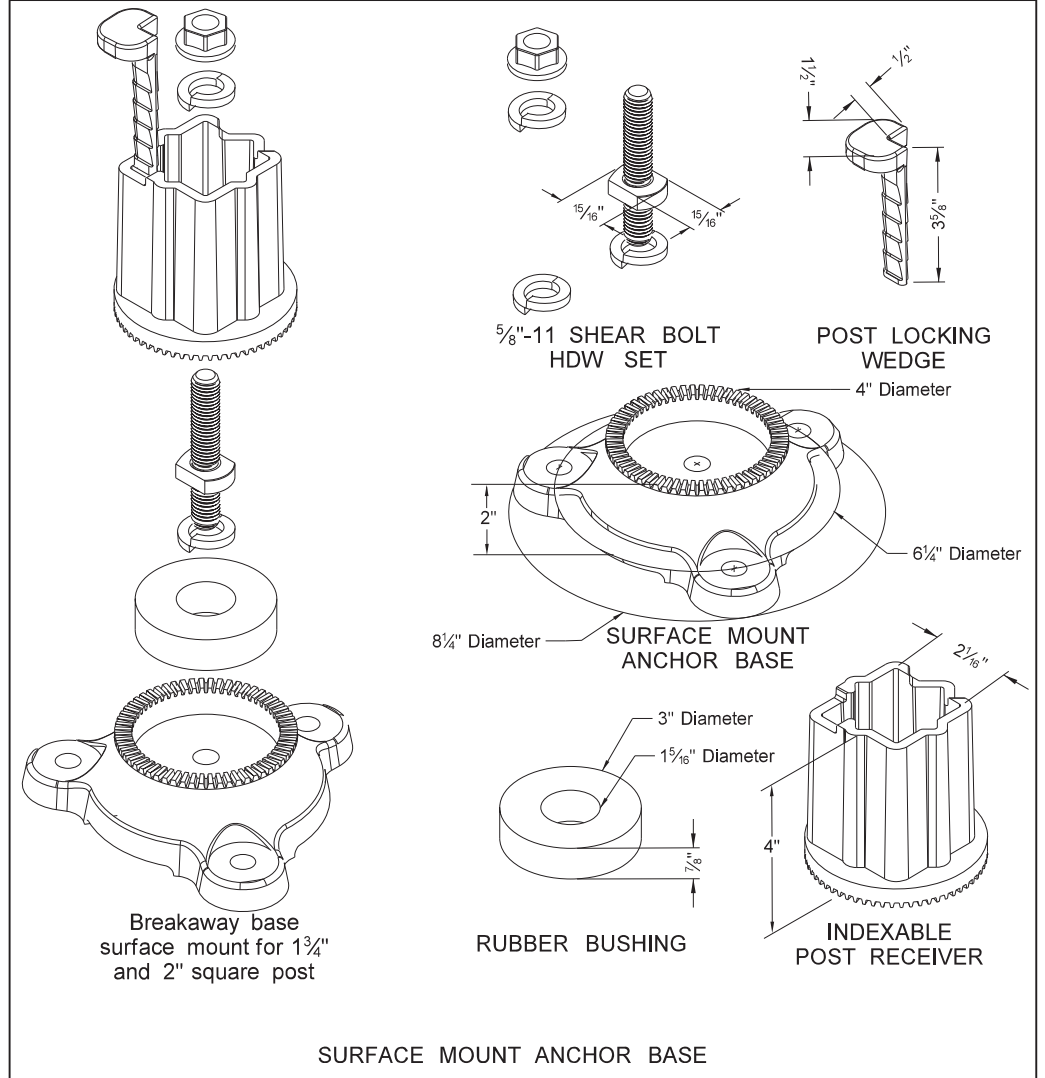


SLIP BASE DETAIL

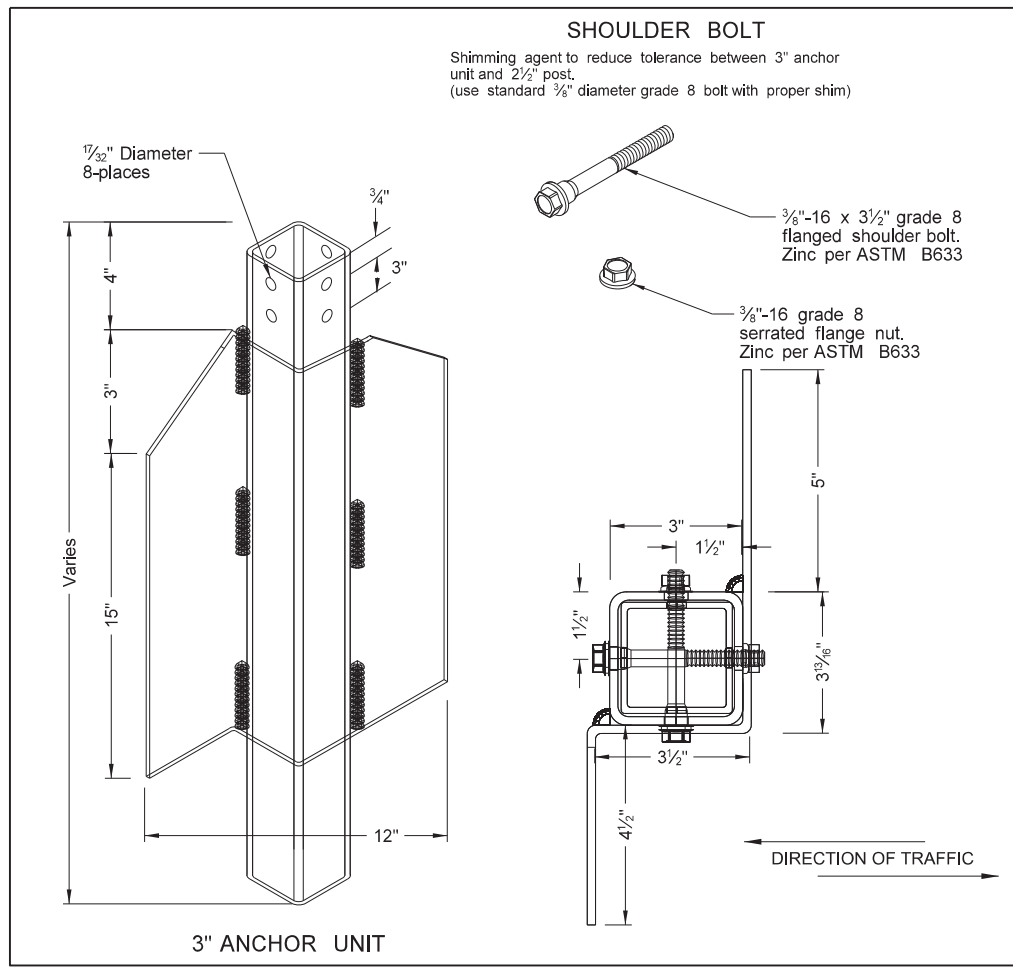
Properties of Telescoping Perforated Tubes							
Tube Size In.	Wall Thickness in.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. Area In. ²	Section Modulus In. ³	
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172	
2 x 2	0.105	12	2.416	0.372	0.590	0.372	
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499	
2 3/8 x 2 3/8	0.135	10	3.432	0.605	0.841	0.590	
2 1/2 x 2 1/2	0.105	12	3.141	0.804	0.803	0.643	
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.783	

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

- NOTE:
- 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.
 - Provide 7 gauge HRPO commercial quality ASTM A569 and 3" x 3" x 7" gauge 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 otherwise noted.
 - Eliminate wings when anchor is used in concrete sidewalk.
 - Provide a minimum 8" distance between the first and fourth post on four post signs.
 - Install in accordance with manufacturers recommendation.
 - Use a minimum 1/2" diameter x 4" grade 8 concrete fastener for surface mount breakaway base.



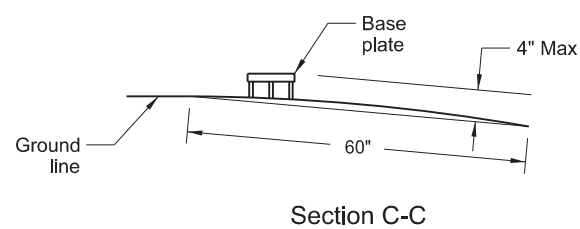
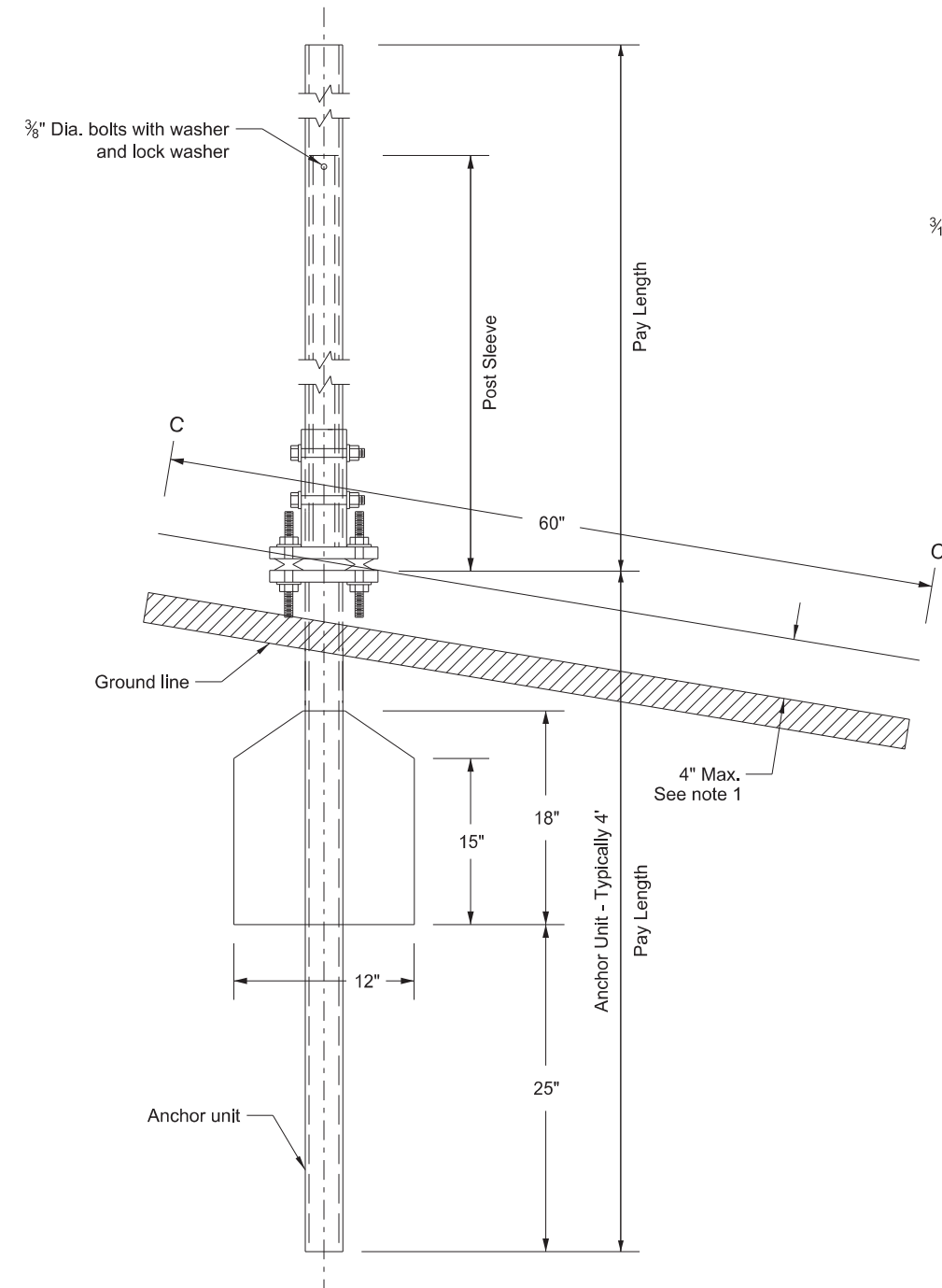
SURFACE MOUNT ANCHOR BASE



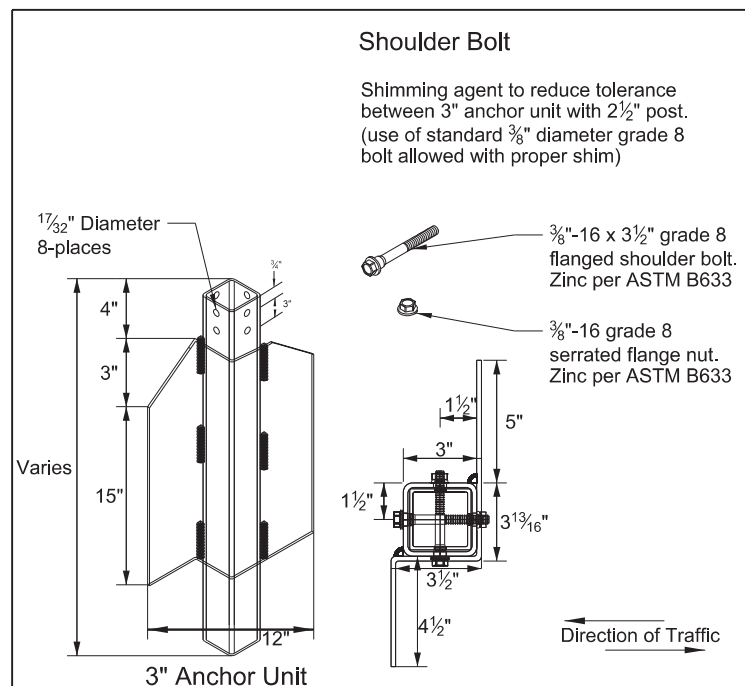
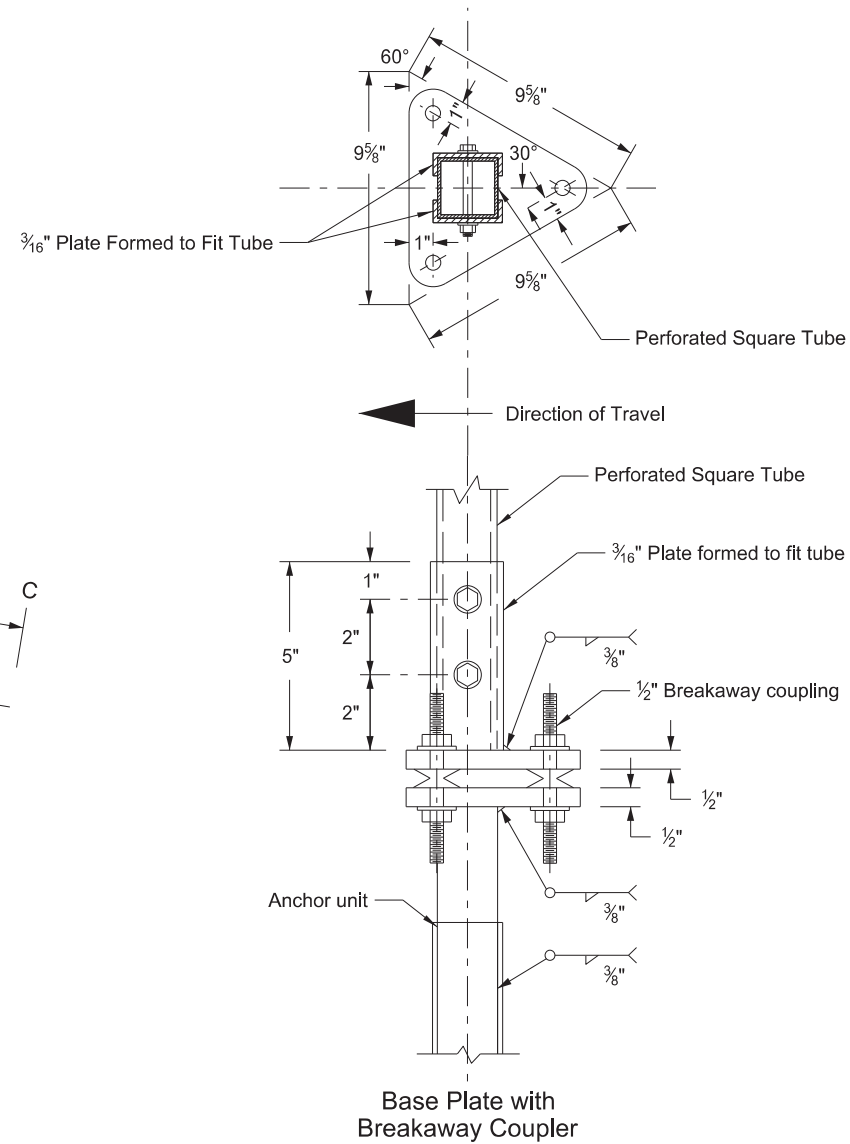
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice & corrected max height of base.
8-29-19	New Design Engineer PE Stamp.

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 Registration Number
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Breakaway Coupler System for Perforated Tubes



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.



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 Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2	12	Yes		7
1	2 1/2	12	2 1/4	12	Yes		7
2	2 1/2	10			Yes		7
2	2 1/4	12	2	12	Yes		7
2	2 1/2	12	2 1/4	12	Yes		7
3 & 4	2 1/2	12			Yes		7
3 & 4	2 1/2	10			Yes		7
3 & 4	2 1/2	12	2 1/4	12	Yes		7
3 & 4	2 1/4	12	2	12	Yes		7
3 & 4	2 1/2	10	2 3/16	10	Yes		7

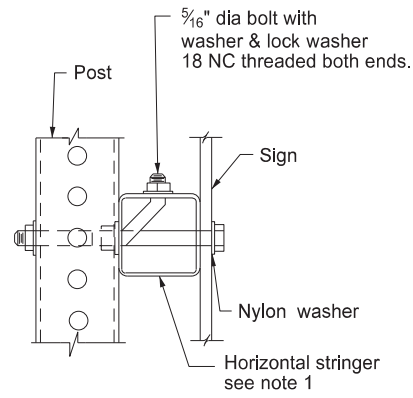
(B) - 2 1/2" 12 gauge posts do not need breakaway bases unless support is placed in boggy, wet, or loose soil areas.

(C) - 3" anchor unit

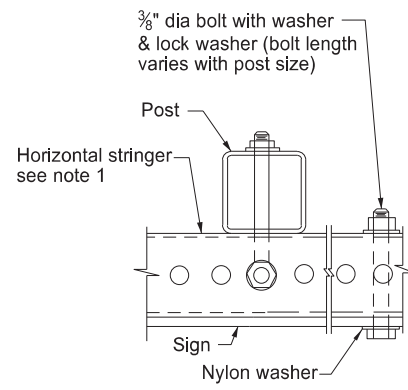
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engr PE Stamp.

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Mounting Details Perforated Tube

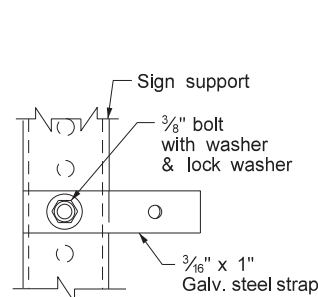


Side View

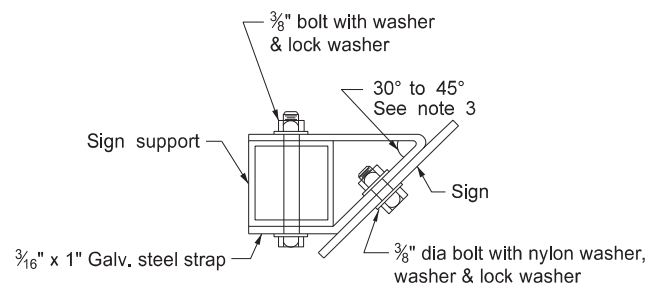


Top View

STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)

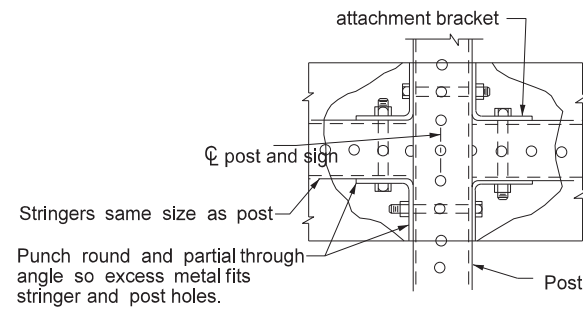


Side View



Top View

STRAP DETAIL

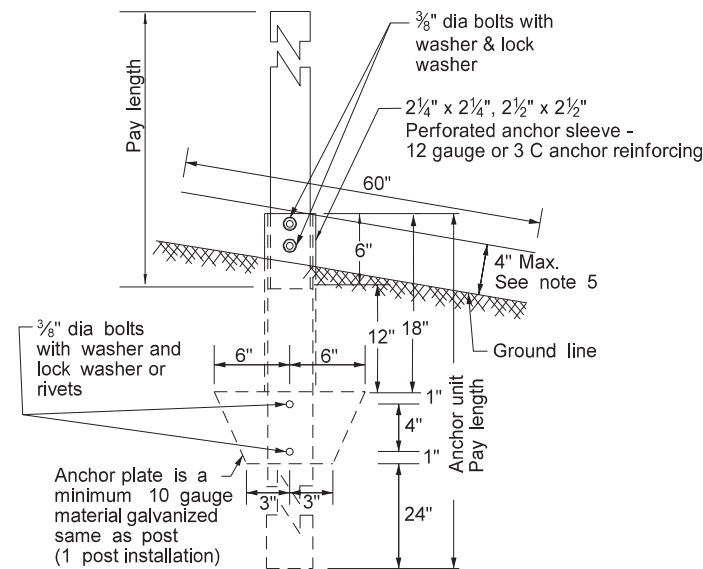


Punch round and partial through angle so excess metal fits stringer and post holes.

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

Note:

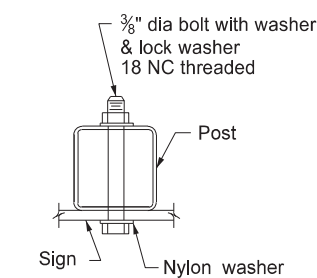
- Horizontal stringers - Use perforated tubes or 1 3/4" x 3/16" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel z bar stringers.
- Use minimum outside diameter 1 5/16" ± 1/16" and 10 gauge thick metal washers on sign face.
- Place No Parking signs with directional arrows at a 30 to 45 degree angle 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.
- 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.
- 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.



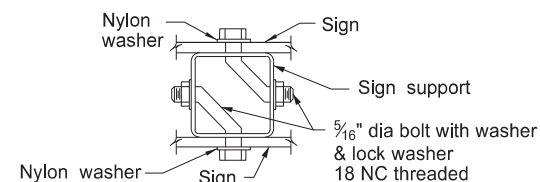
ANCHOR UNIT AND POST ASSEMBLY

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

(B) - When placing 2 1/2", 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) - 2 1/2" x 12 ga. x 18" minimum length external sleeve required.

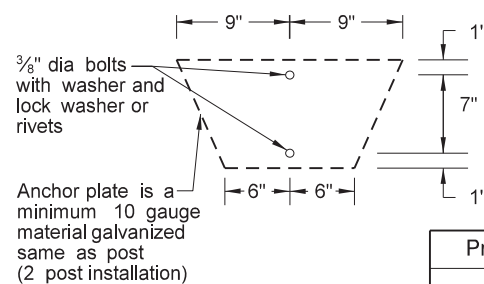


BOLT MOUNTING



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
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2 1/2 x 2 1/2	0.105	12	3.141	0.804	0.803	0.643
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.783

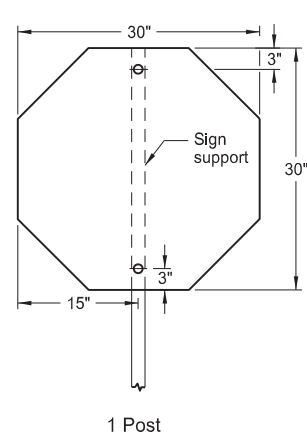
The 2 3/16" size 10 gauge is shown as 2.19" size on the plans.
The 2 1/2" size is shown as 2.51" size on the plans.

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

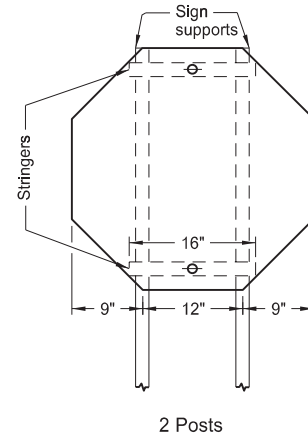
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS

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

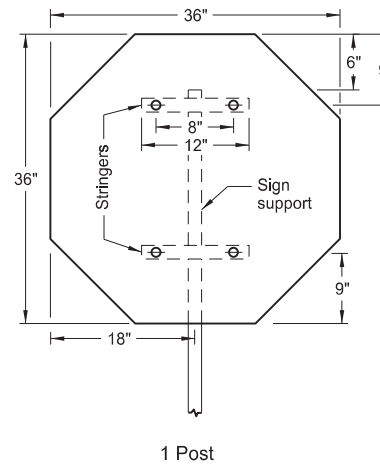


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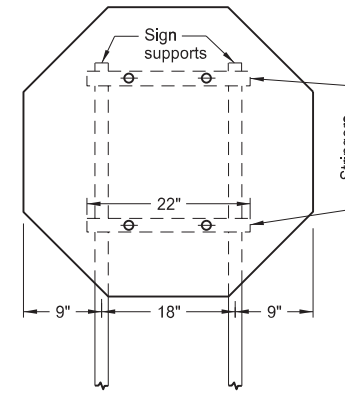
Assembly No. 1



2 Posts

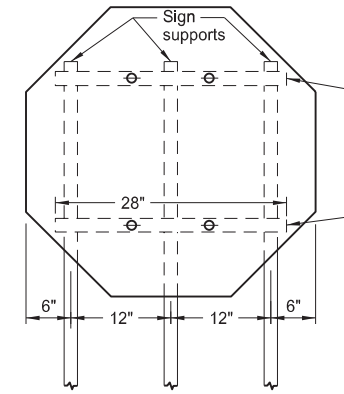


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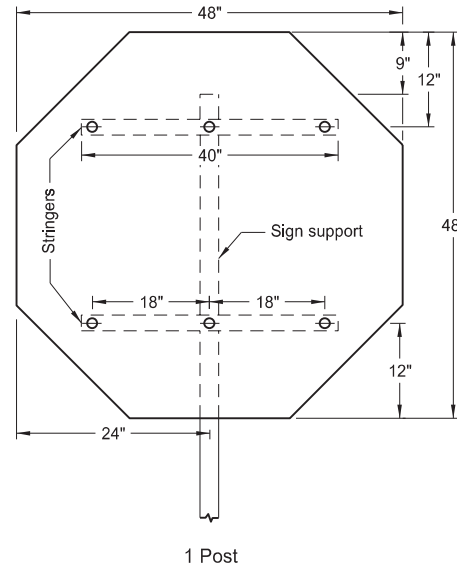


2 Posts

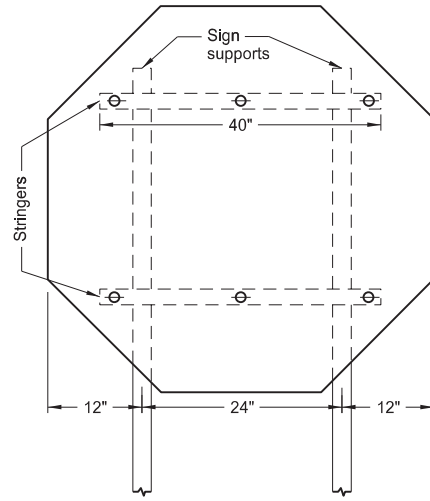
Assembly No. 2



3 Posts

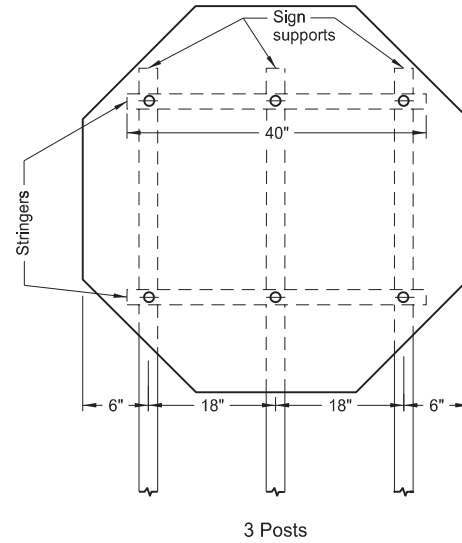


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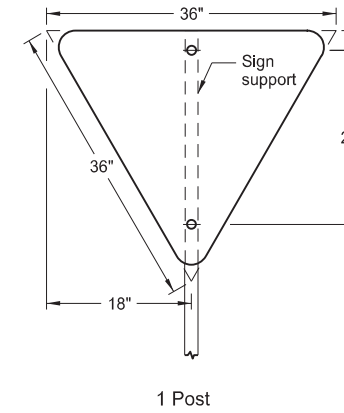


2 Posts

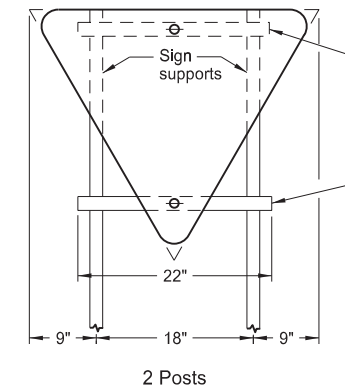
Assembly No. 3



3 Posts

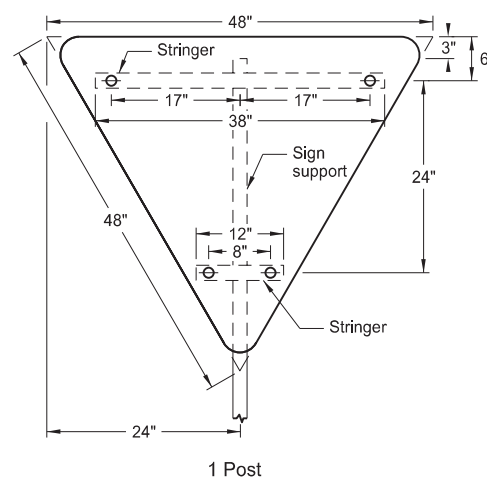


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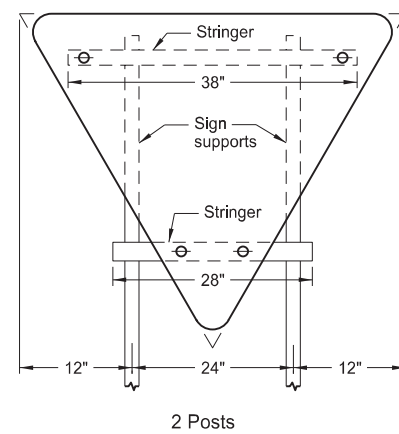


2 Posts

Assembly No. 4

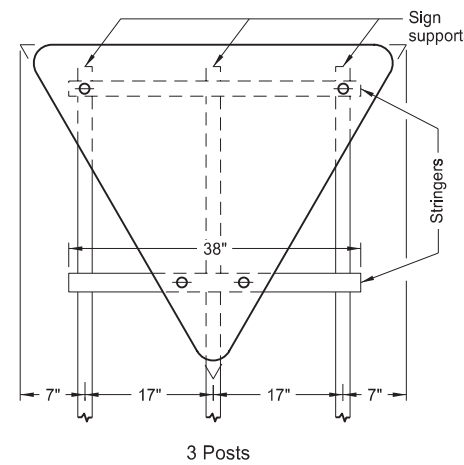


1 Post



2 Posts

Assembly No. 5

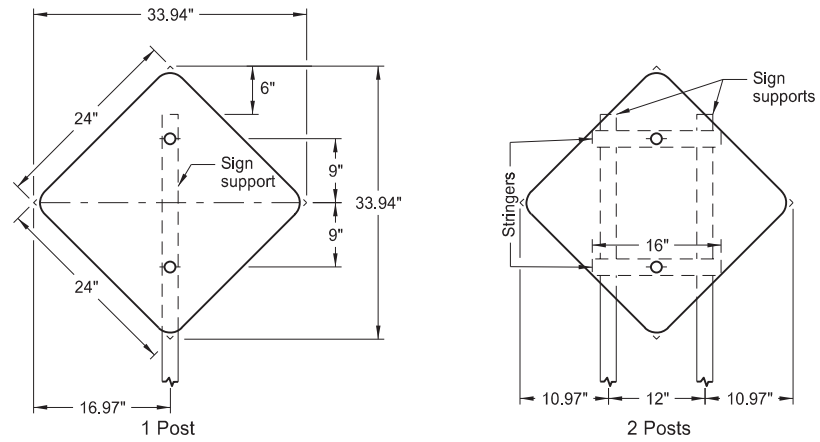


3 Posts

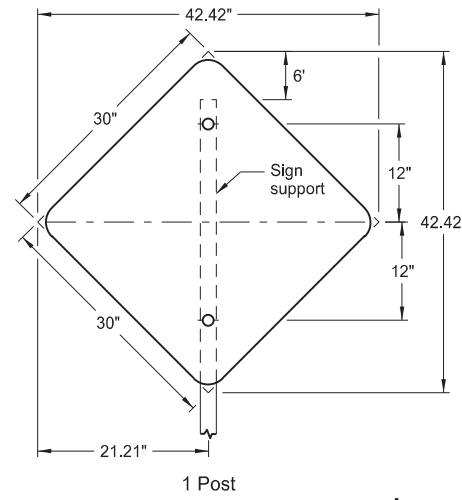
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

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

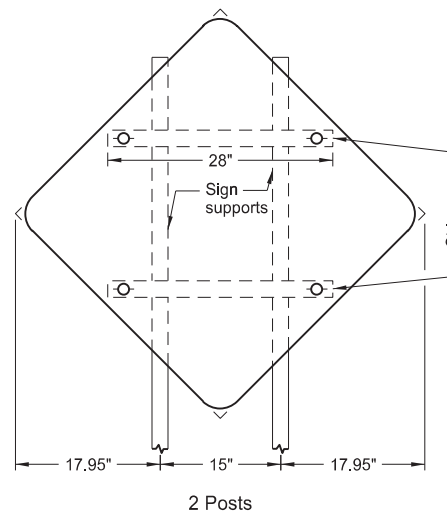
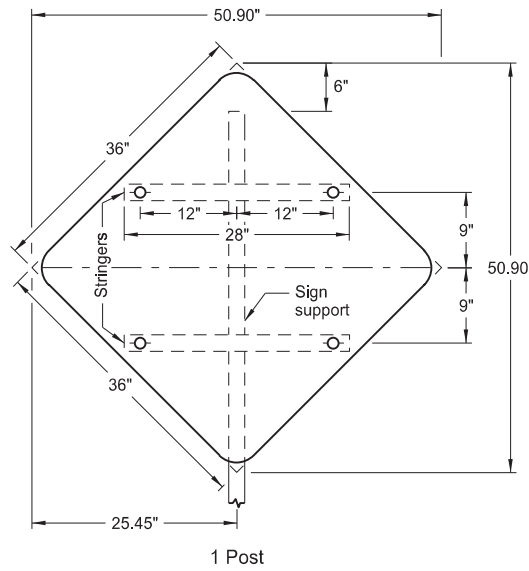
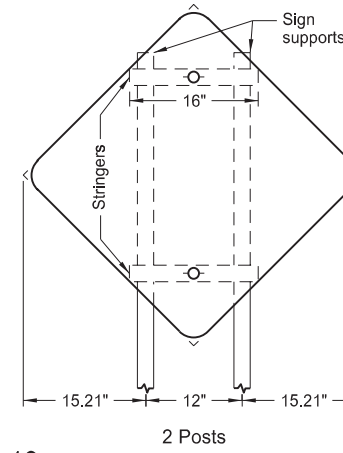
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



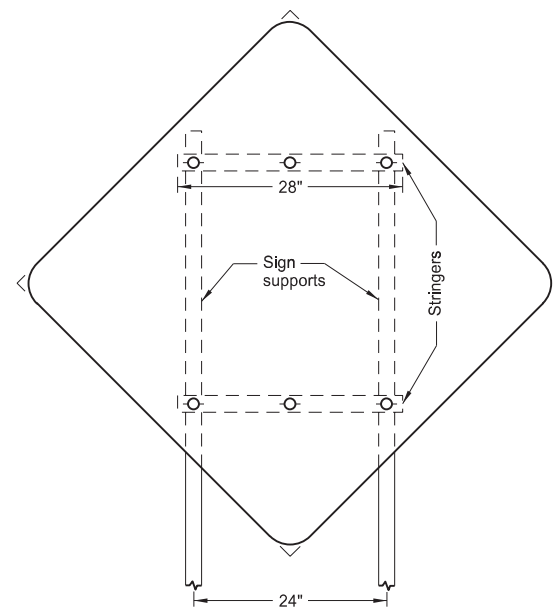
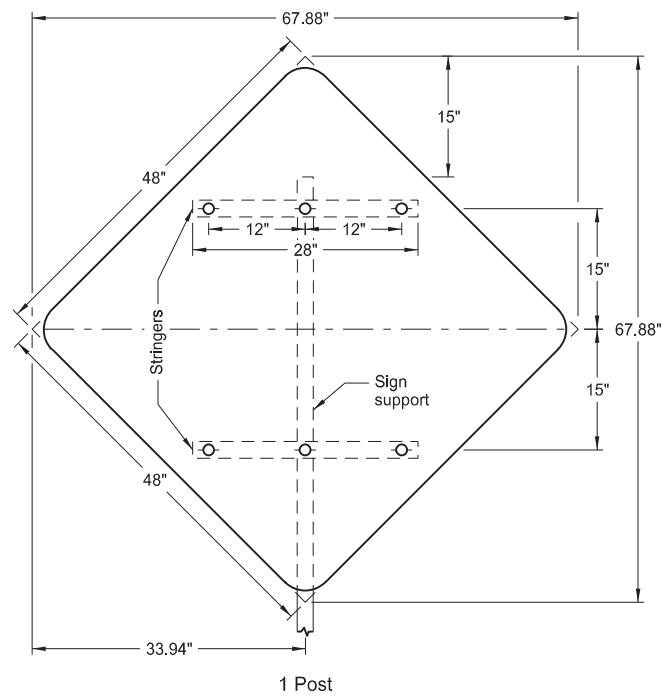
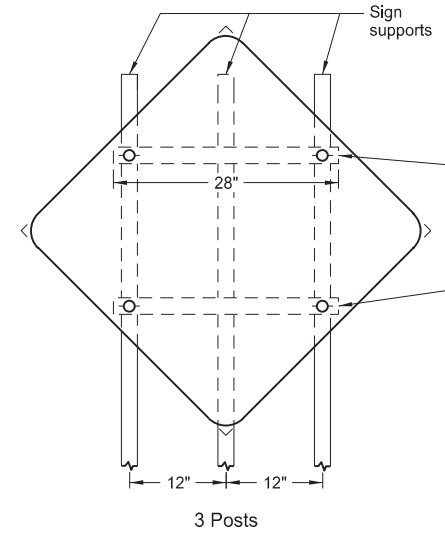
Assembly No. 18



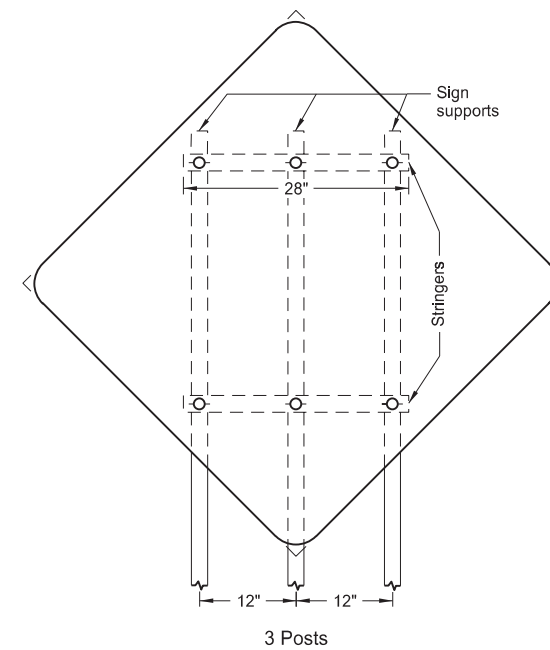
Assembly No. 19



Assembly No. 20



Assembly No. 21



Notes:

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

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

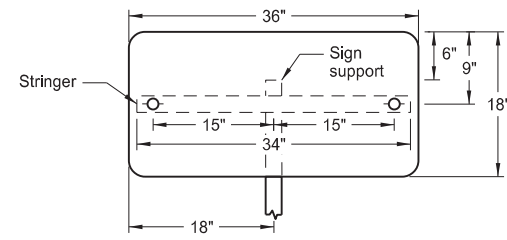
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

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

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

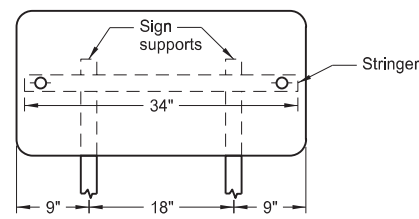
Notes:

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

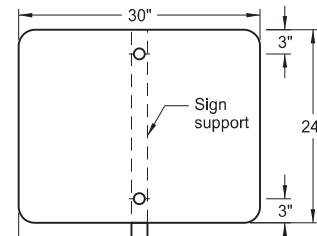


1 Post

Assembly No. 31

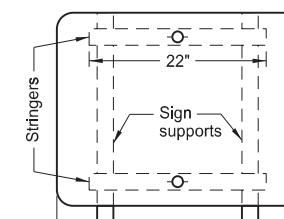


2 Posts

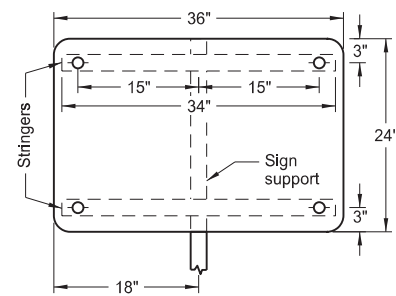


1 Post

Assembly No. 32

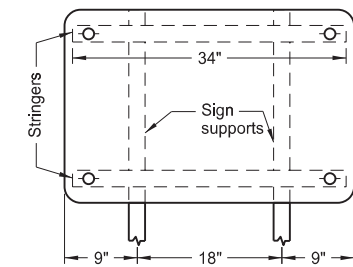


2 Posts

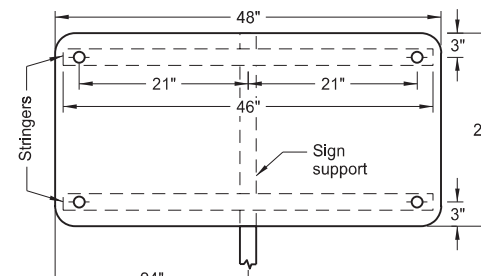


1 Post

Assembly No. 33

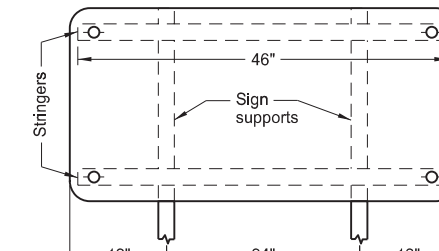


2 Posts

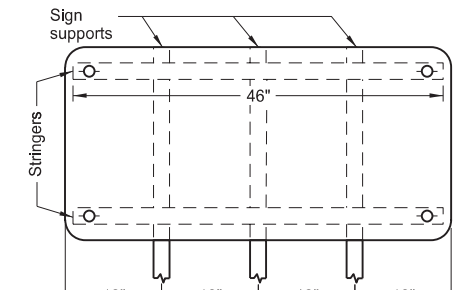


1 Post

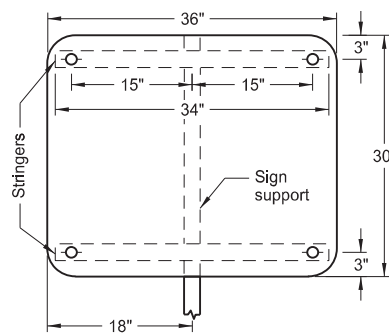
Assembly No. 34



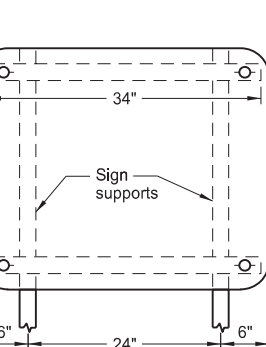
2 Posts



3 Posts

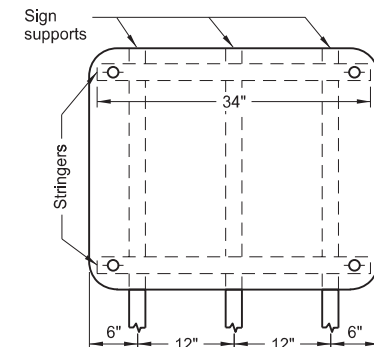


1 Post

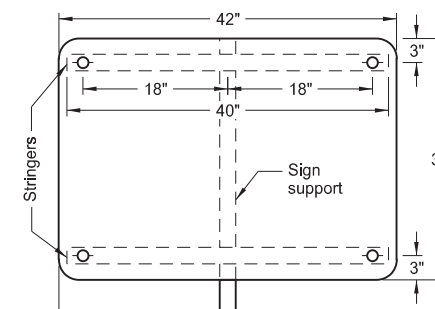


2 Posts

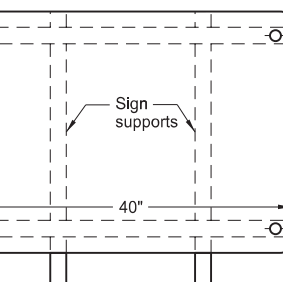
Assembly No. 35



3 Posts

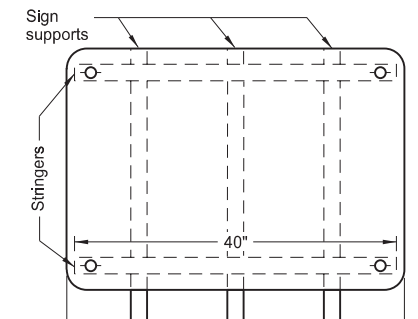


1 Post

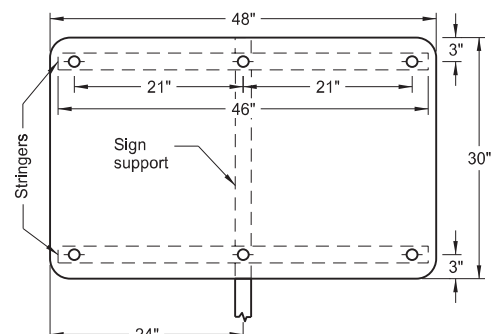


2 Posts

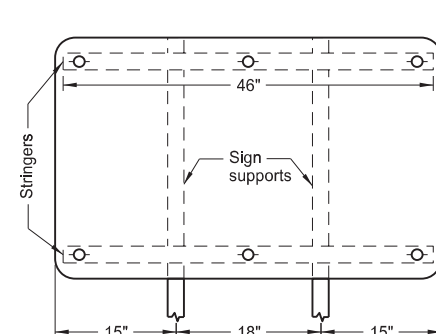
Assembly No. 36



3 Posts

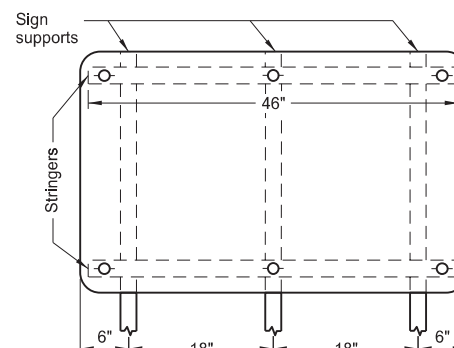


1 Post



2 Posts

Assembly No. 37

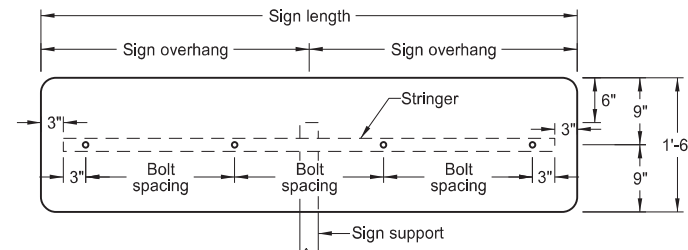


3 Posts

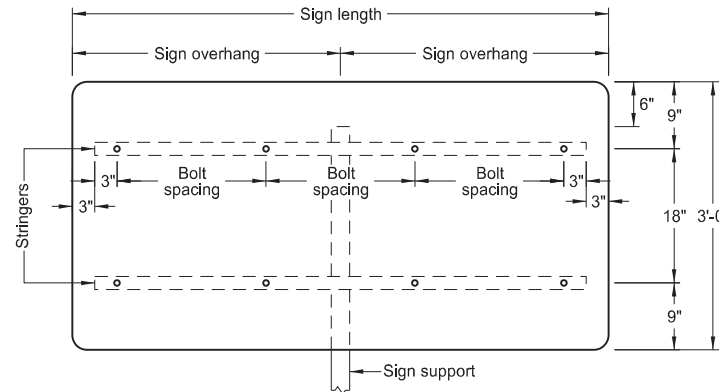
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

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

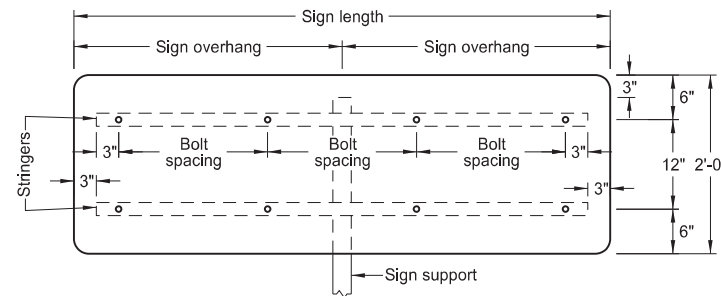
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS



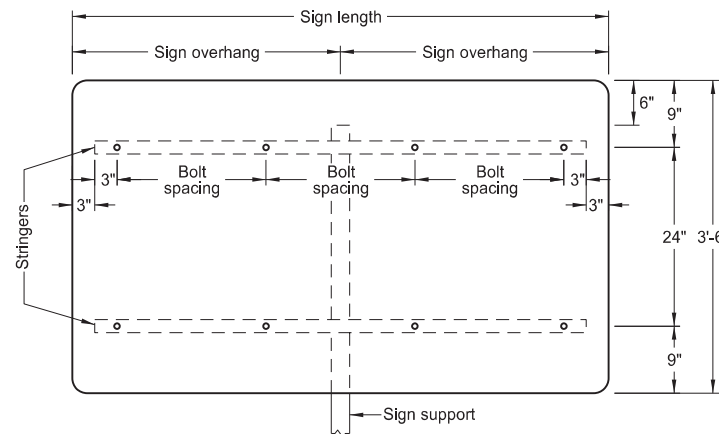
VARIES X 1'-6"



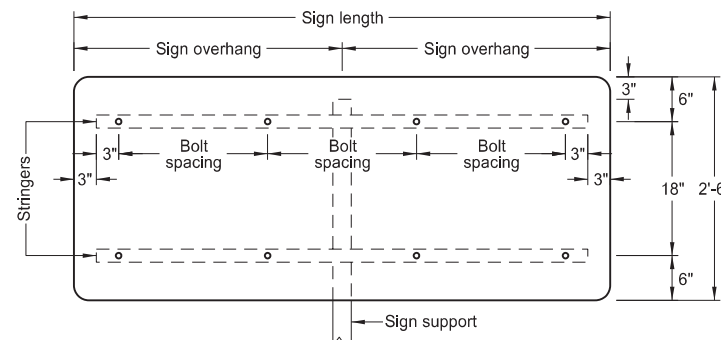
VARIES X 3'-0"



VARIES X 2'-0"



VARIES X 3'-6"



VARIES X 2'-6"

1 POST		
Sign Length	Sign Overhang	Bolt Spacing
4'-0"	2'-0"	18"
4'-6"	2'-3"	21"
5'-0"	2'-6"	24"
5'-6"	2'-9"	18"
6'-0"	3'-0"	20"
6'-6"	3'-3"	22"
7'-0"	3'-6"	24"
7'-6"	3'-9"	2-20" & 2-19"
8'-0"	4'-0"	21"
8'-6"	4'-3"	2-22" & 2-23"
9'-0"	4'-6"	24"
9'-6"	4'-9"	4-20" & 1-22"
10'-0"	5'-0"	2-21" & 3-22"
10'-6"	5'-3"	4-23" & 1-22"
11'-0"	5'-6"	24"
11'-6"	5'-9"	21"
12'-0"	6'-0"	22"

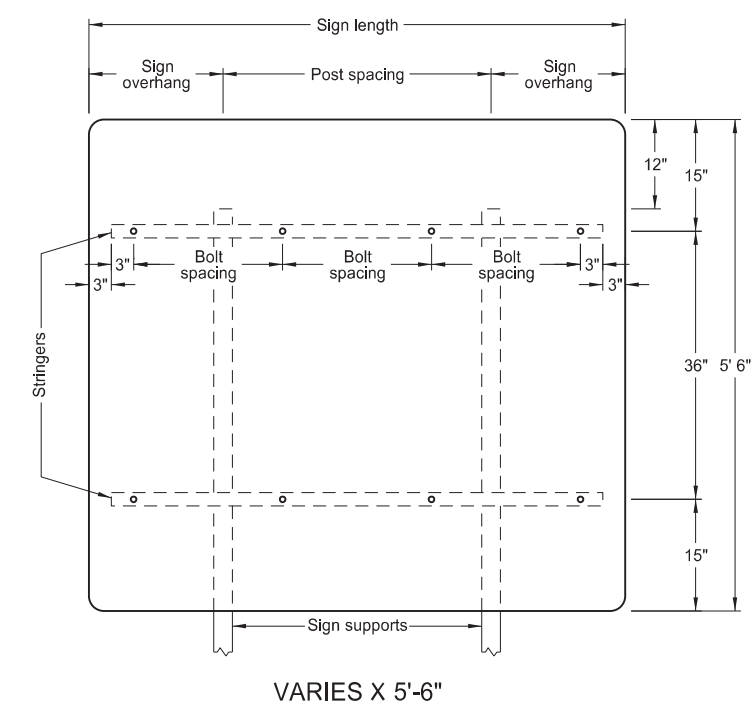
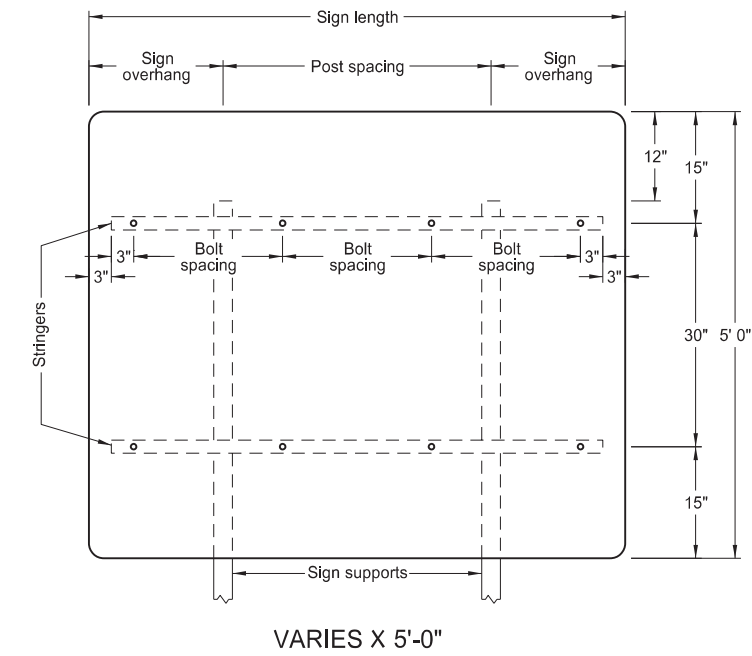
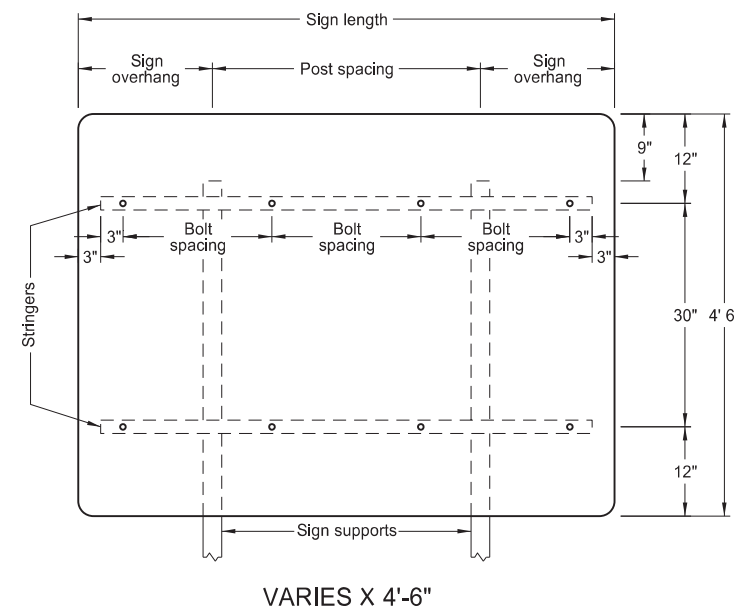
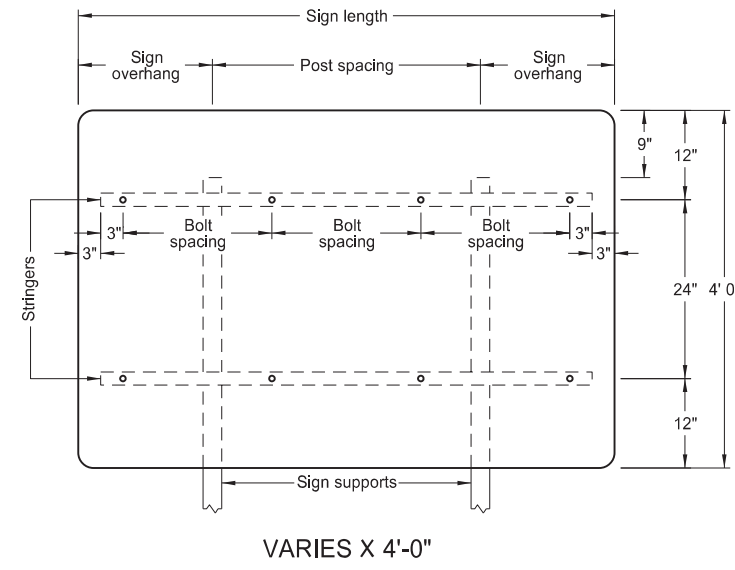
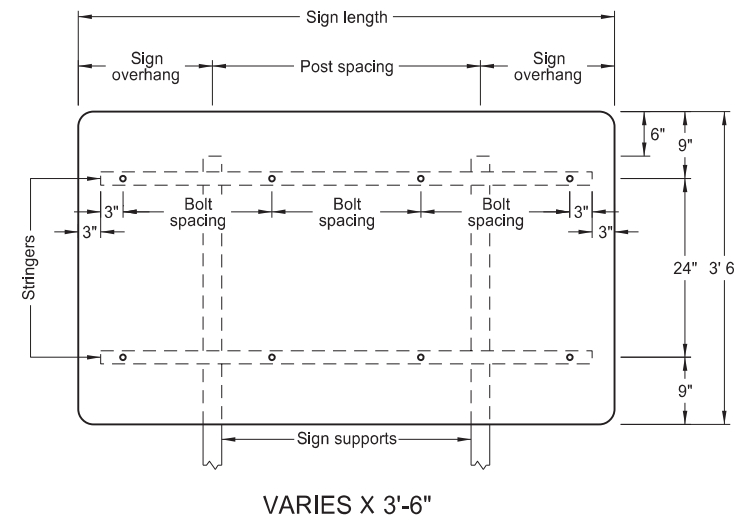
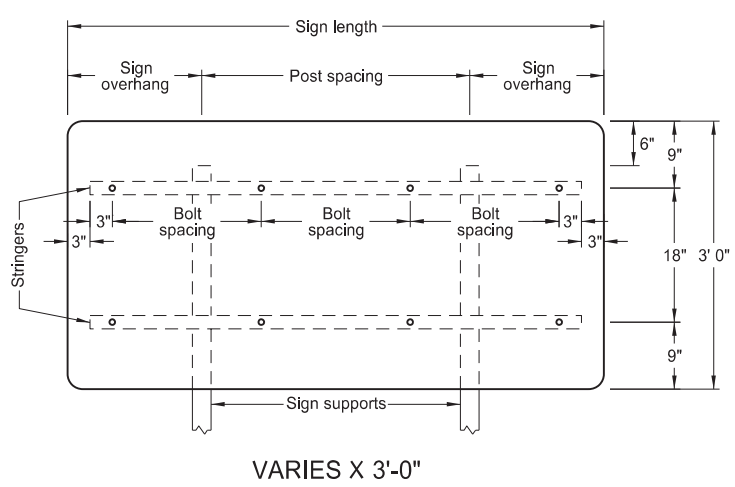
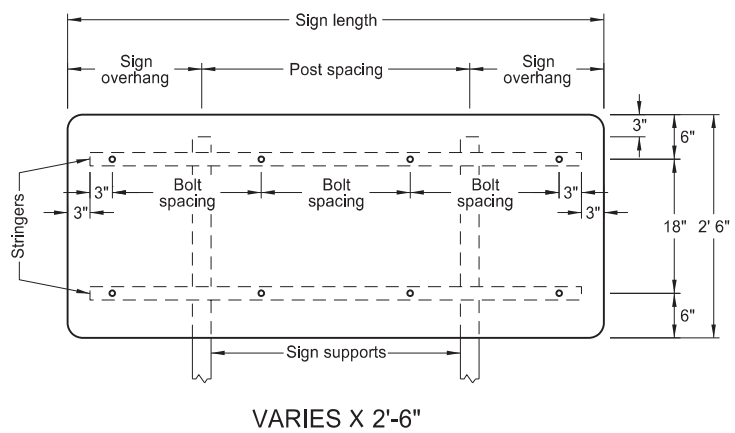
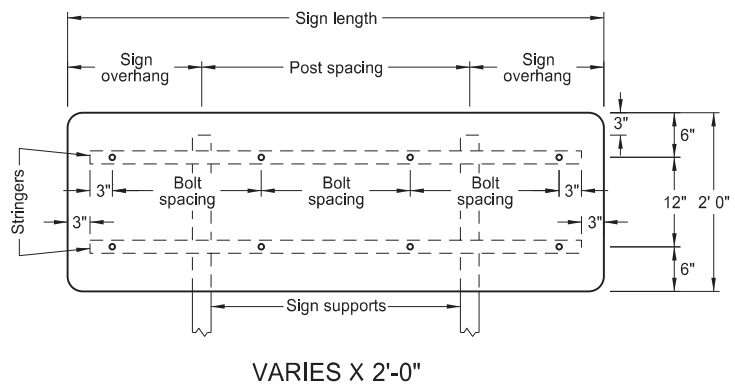
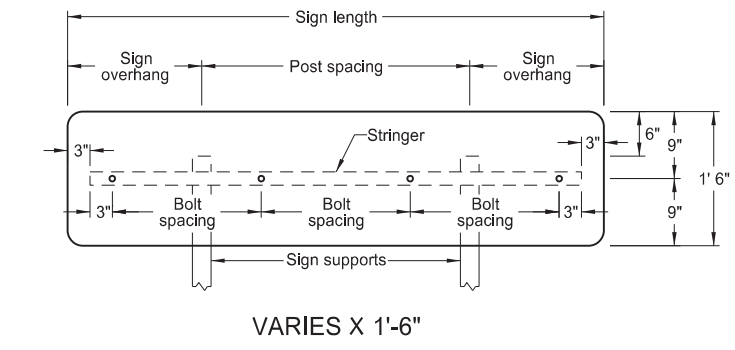
Notes:

1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.
4. Attach single stringer to single post signs with special stringer angle, shown on "Mounting Details Perforated Tube" standard drawing.

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

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 Registration Number
 PE- 4683,
 on 9/04/19 and the original document is stored at the
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 of Transportation

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



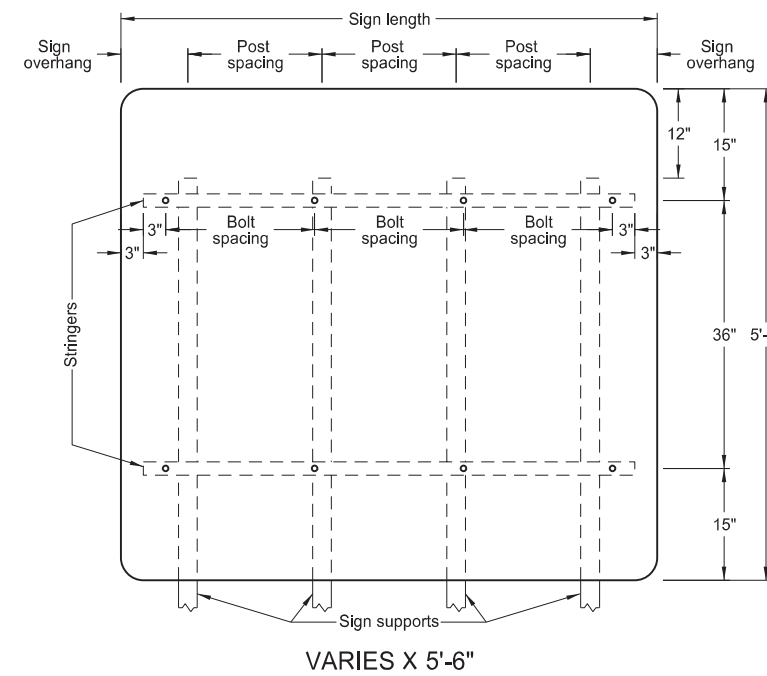
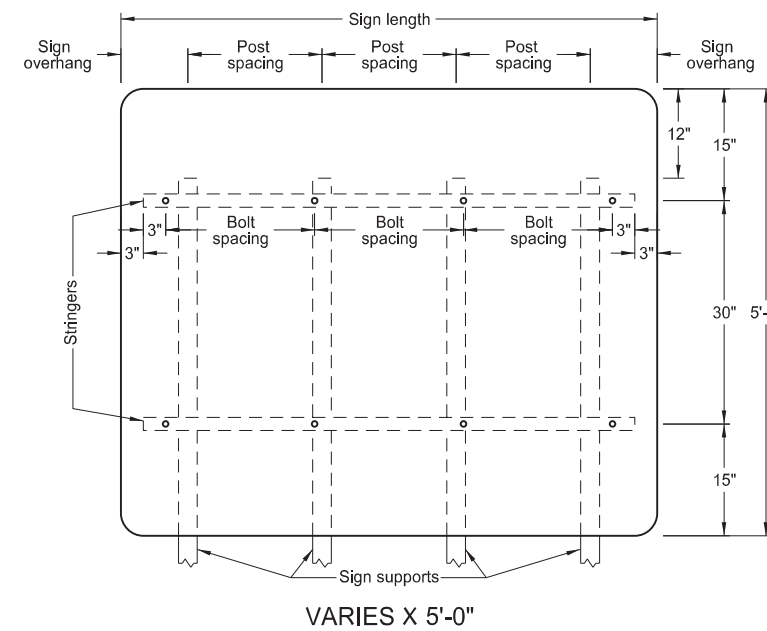
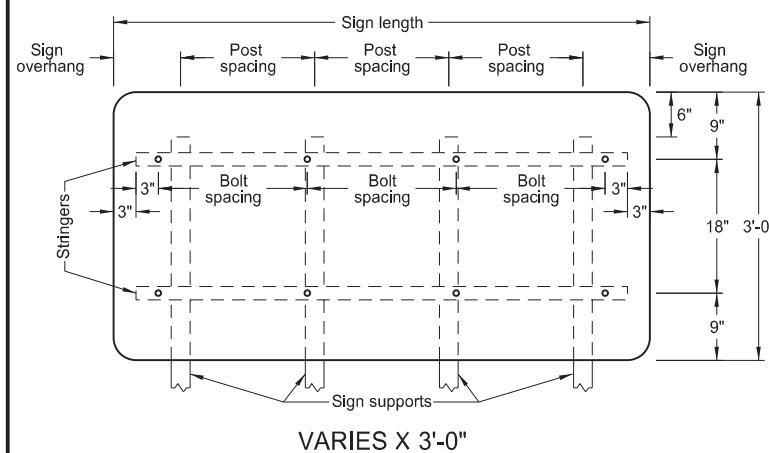
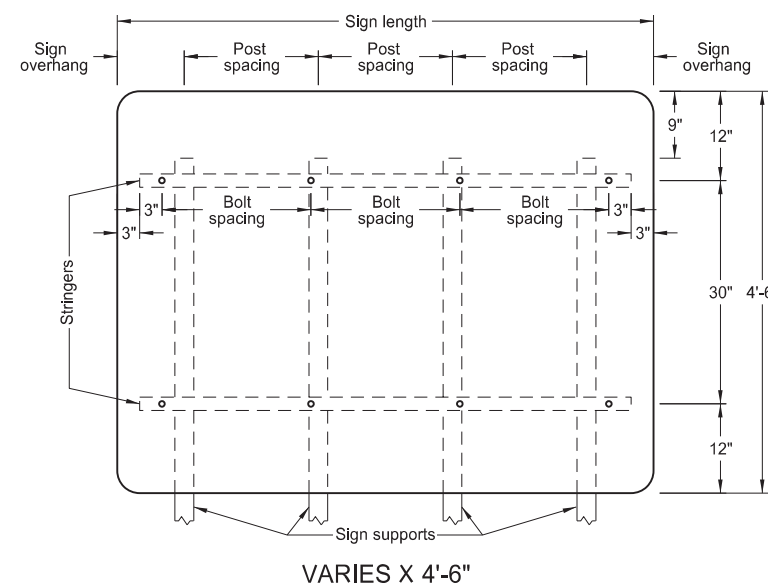
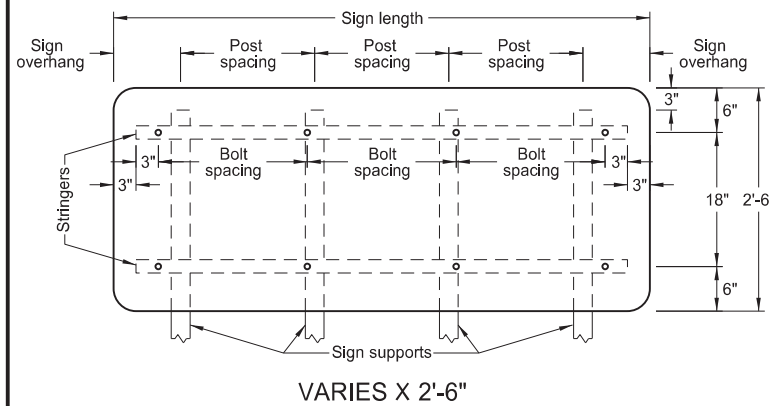
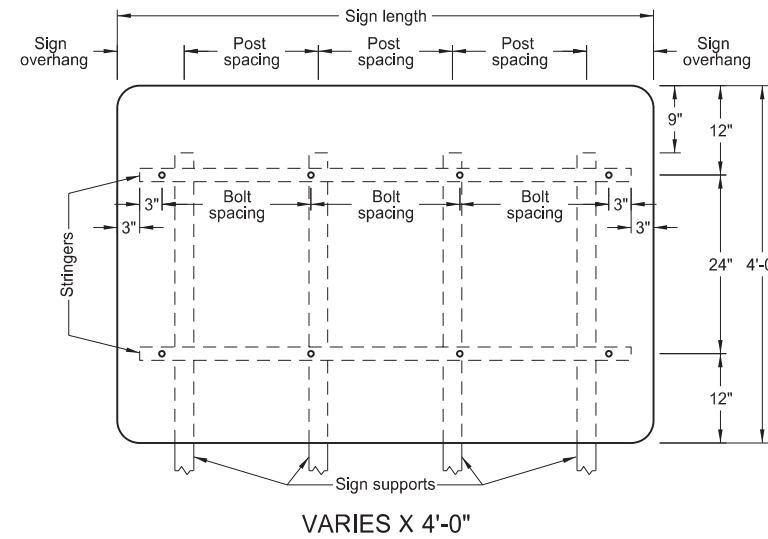
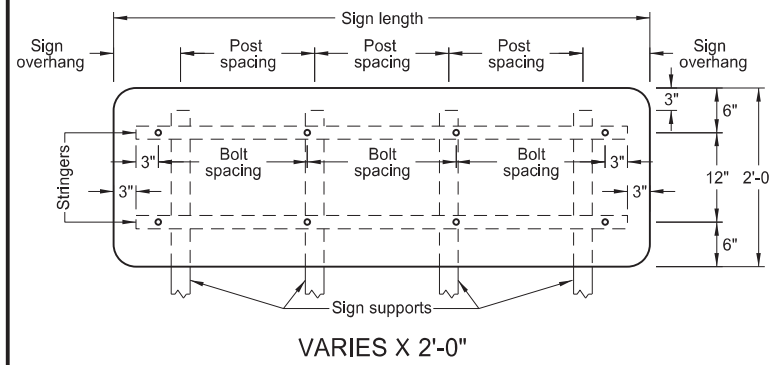
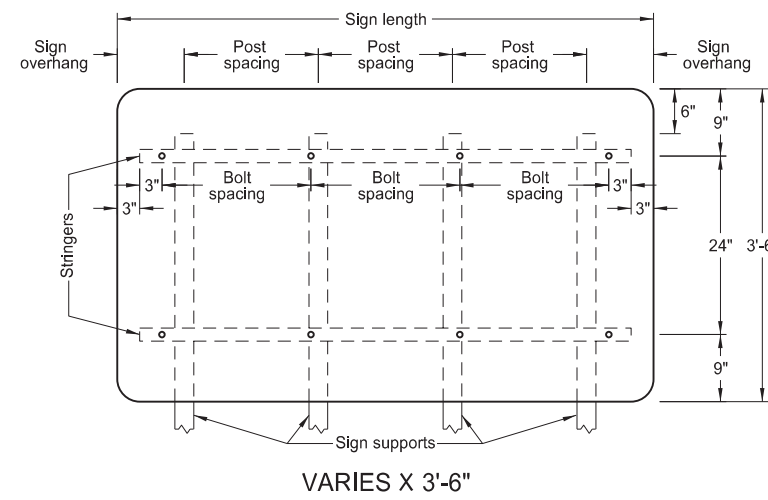
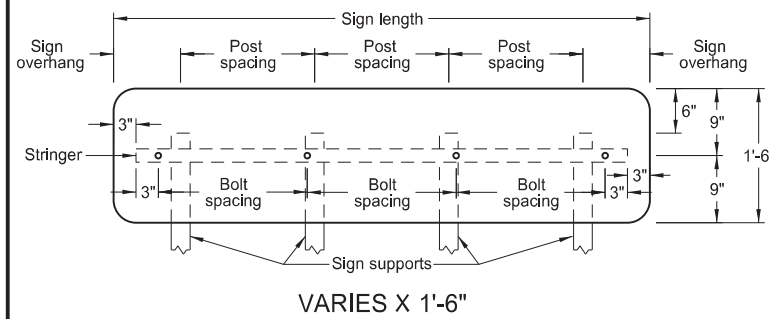
2 POSTS			
Sign Length	Sign Overhang	Post Spacing	Bolt Spacing
4'-0"	1'-0"	2'-0"	18"
4'-6"	1'-3"	2'-0"	21"
5'-0"	1'-0"	3'-0"	24"
5'-6"	1'-3"	3'-0"	18"
6'-0"	1'-6"	3'-0"	20"
6'-6"	1'-3"	4'-0"	22"
7'-0"	1'-6"	4'-0"	24"
7'-6"	1'-9"	4'-0"	2-20" & 2-19"
8'-0"	2'-0"	4'-0"	21"
8'-6"	1'-9"	5'-0"	2-22" & 2-23"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

- Notes:
1. Use 0.100 inch minimum thickness sign backing material.
 2. Use 1 1/2" x 1 1/2" perforated square tube stringers.
 3. Punch holes round for 3/8" bolt.

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

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 Registration Number
 PE- 4683,
 on 9/04/19 and the original document is stored at the North Dakota Department of Transportation

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



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

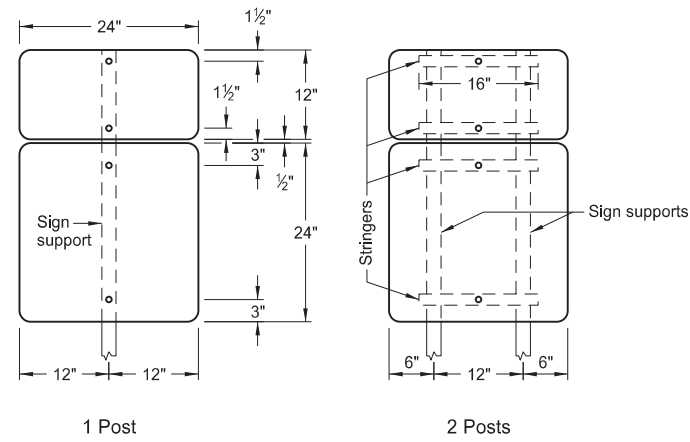
- Notes:
1. Use 0.100 inch minimum thickness sign backing material.
 2. Use 1½" x 1½" perforated square tube stringers.
 3. Punch holes round for ⅜" bolt.

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

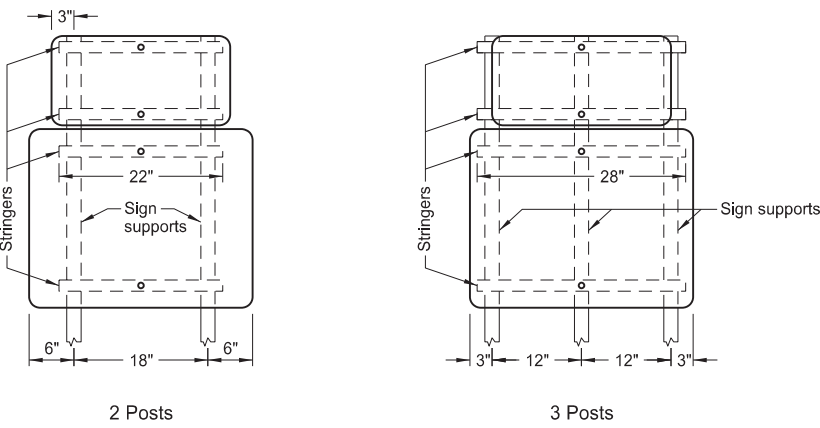
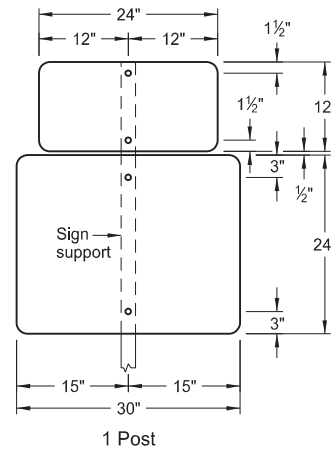
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 of Transportation

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

D-754-51



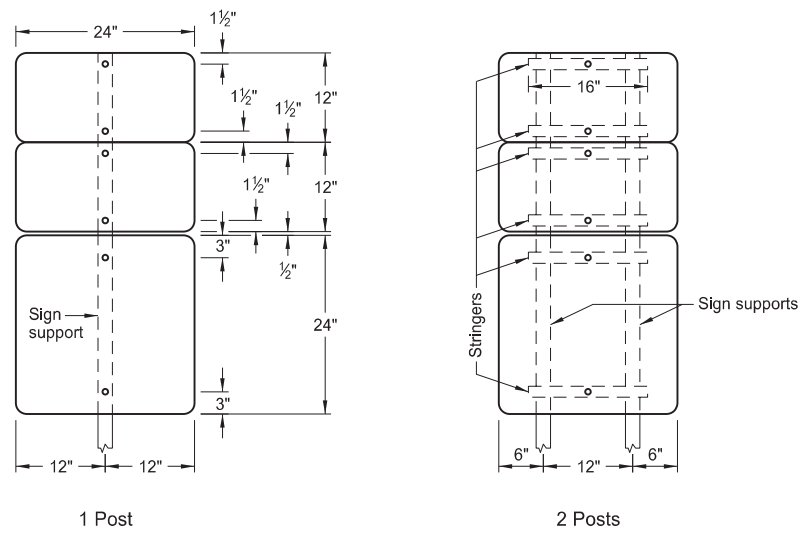
ASSEMBLY NO. 371



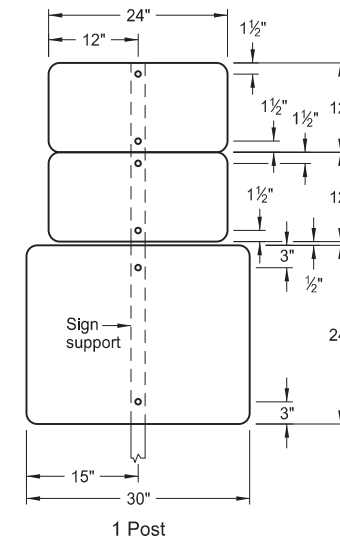
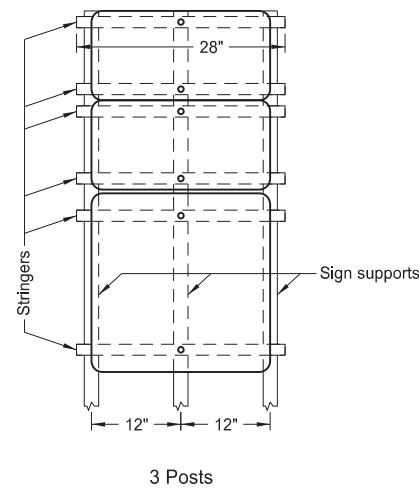
ASSEMBLY NO. 372

Notes:

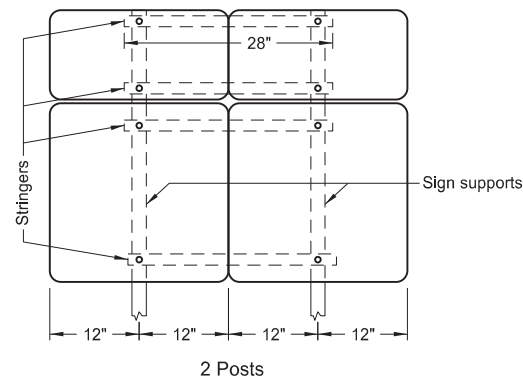
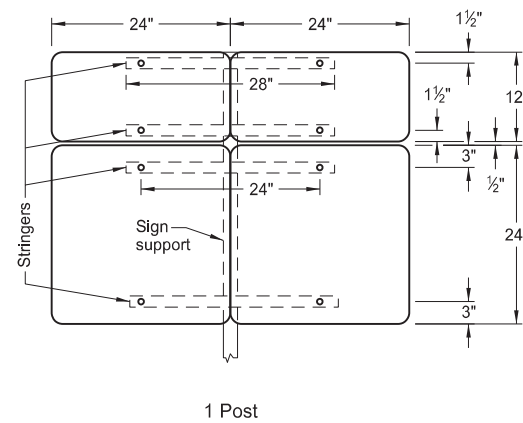
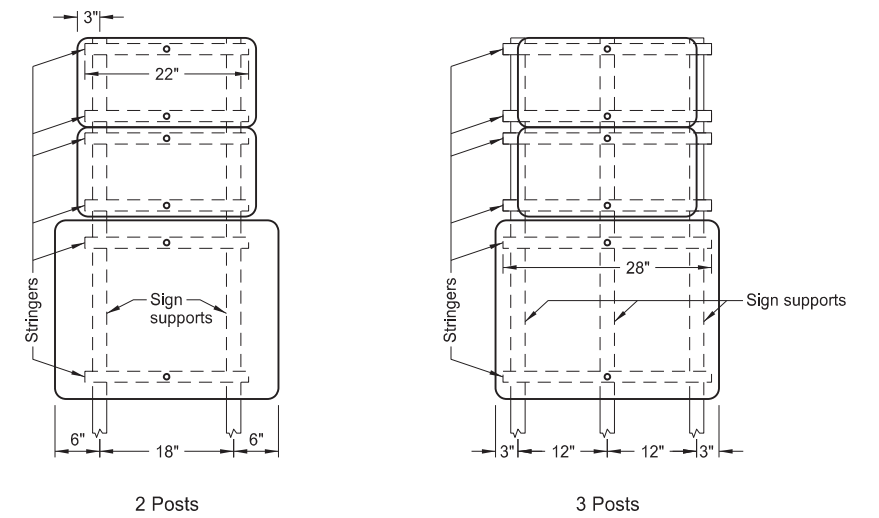
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1 1/2"x1 1/2" perforated square tube stringers.
3. Punch holes round for 3/8" bolt.



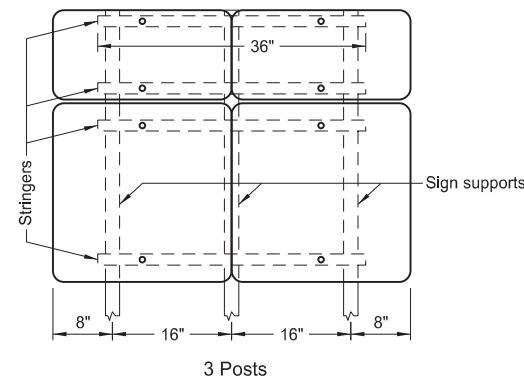
ASSEMBLY NO. 373



ASSEMBLY NO. 374



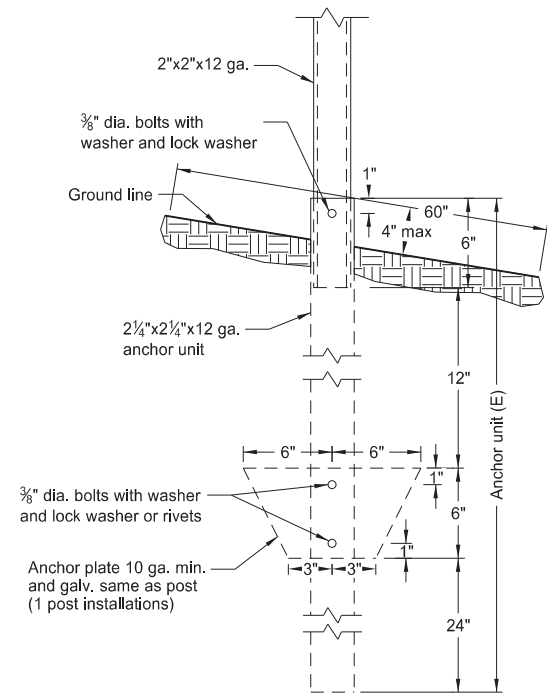
ASSEMBLY NO. 375



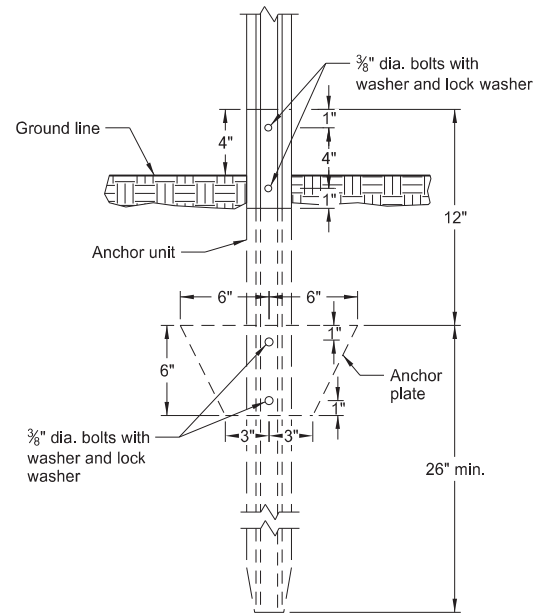
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
9-04-19	New Design Engineer PE Stamp.

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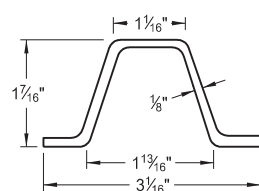
OBJECT MARKERS



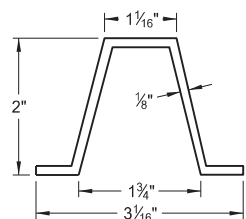
Perforated Tube Anchor Unit Assembly



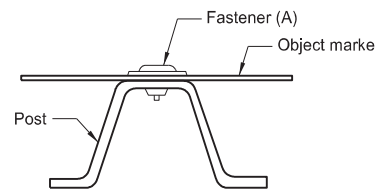
U-Channel Anchor Unit Assembly



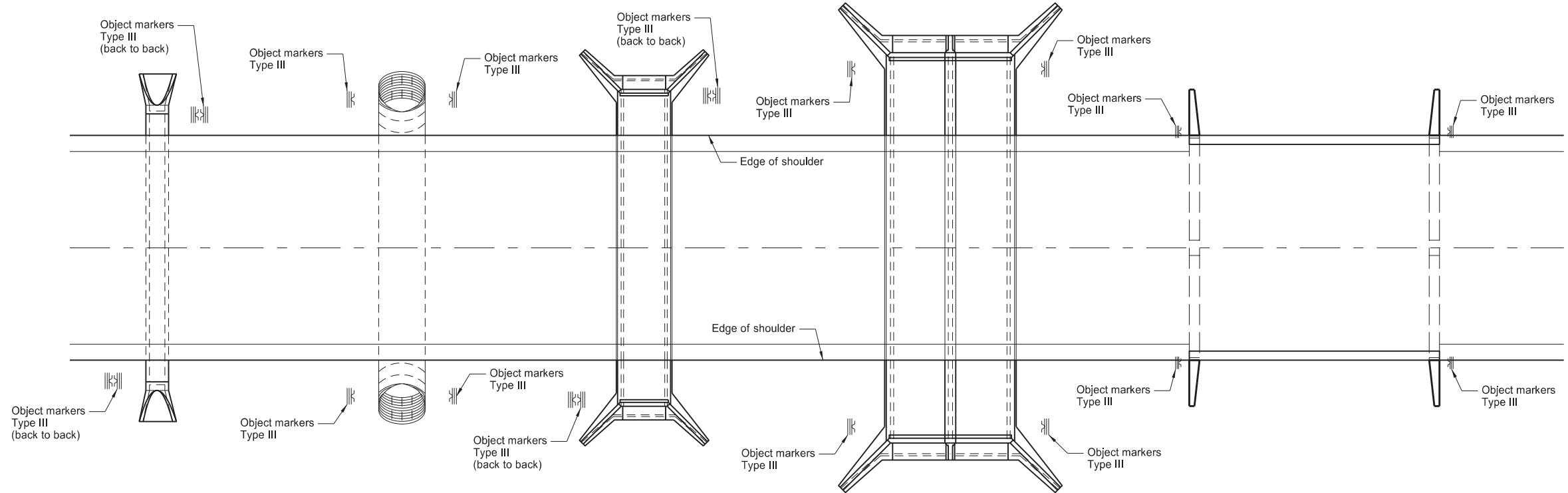
Steel Post Detail
 Approx. 2 lb/ft



Aluminum Post Detail
 Approx. 0.88 lb/ft



Fastener Detail



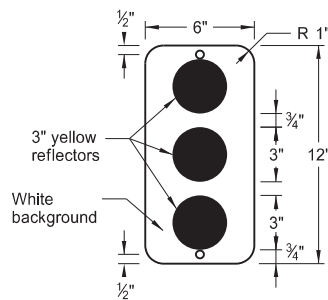
Pipe Culverts
 10' max

Pipe Culverts
 greater than 10'

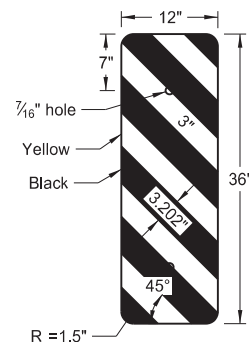
Box Culverts
 10' max

Box Culverts
 greater than 10'

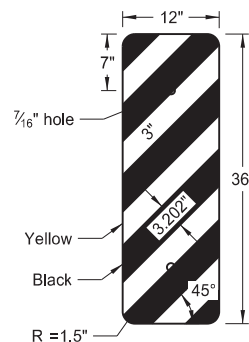
Bridges (B)



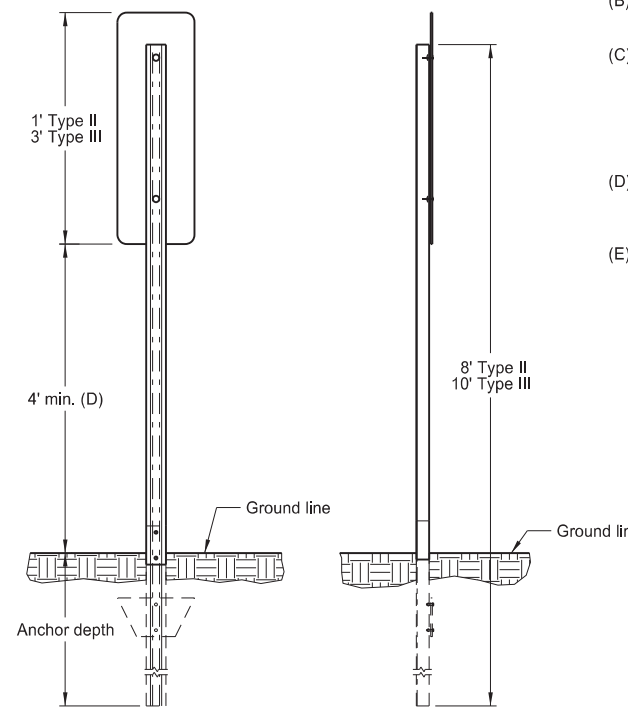
Object Marker
 OM2-1V (C)
 Type II



Object Marker Left
 OM-3L (C)
 Type III



Object Marker Right
 OM-3R (C)
 Type III



Object Marker
 Installation Detail

Notes:

- (A) Use 3/8" dia. tension pin type or other non-rust vandal resistant fastener with min. outside dia. 1 3/16" flat washer.
- (B) At locations of approach guardrail with reflectors and end terminal with impact head object markers, do not install object markers.
- (C) Use two object markers for back to back mountings. On bridges where the distance between wheel guards is less than the approach width, mount object markers vertically on steel posts in front of the bridge railing on each side of highway to mark the horizontal clearance. Use 0.100" minimum thickness sheet aluminum for sign backing material. Use ASTM Type XI sheeting for Type III object markers and ASTM Type IV background sheeting with ASTM Type XI reflectors for Type II object markers.
- (D) When object marker is located 8' or less from shoulder or curb, provide 4' minimum vertical clearance from near edge of traveled way to bottom of sign. When located more than 8' from shoulder or curb provide 4' minimum vertical clearance from ground to bottom of sign.
- (E) Use 4" vertical clearance for anchor or breakaway base. Provide 4"x60" measurement above and below post location and back and ahead of post.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-18-14	Revised Note C
8-30-18	Updated notes to active voice and removed note.
9-05-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by
 Kirk J Hoff,
 Registration Number
 PE- 4683,
 on 9/05/19 and the original document is stored at the North Dakota Department of Transportation

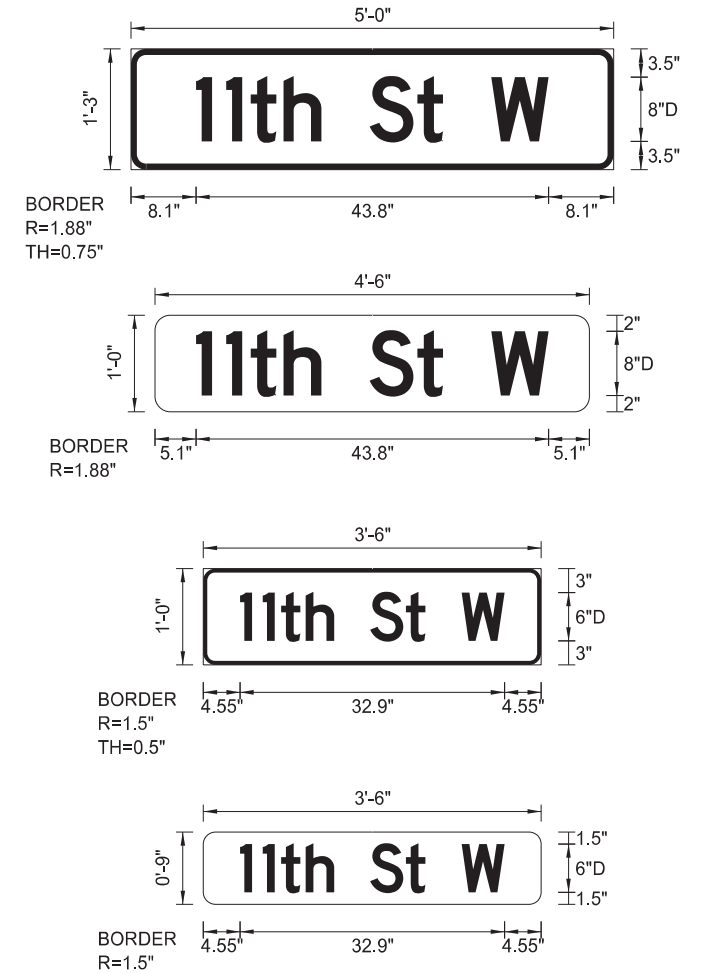
911 SIGN SUPPORT INFORMATION AND SIGN DETAILS

D-754-86

POST INFORMATION FOR VARIOUS SIGN CONFIGURATIONS														
ASSEMBLY NUMBER	STREET NAME SIGN SIZE	VERTICAL CLEARANCE	MAXIMUM POST LENGTH	NUMBER OF POSTS	SUPPORT SIZE	SLEEVE LENGTH (A)			SLEEVE SIZE	ANCHOR			BREAKAWAY	
						1st	2nd	3rd		NUMBER	LENGTH	SIZE		
						LF	LF	LF						
Inches	LF	LF	LF											
Special Assembly 1	48"x15"	7	14.5	1	2.5 x 2.5 12 ga						1	4.0	3 x 3 7 ga	
	54"x15"	7	16.1	1	2.5 x 2.5 12 ga						1	4.0	3 x 3 7 ga	
	60"x15"	7	18.9	1	2.25 x 2.25 12 ga	2.6			2 x 2 12 ga		1	4.0	3 x 3 7 ga	1
	66"x15"	7	15.8	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	72"x15"	7	14.6	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	78"x15"	7	17.6	2	2.5 x 2.5 12 ga						2	4.0	3 x 3 7 ga	2
	84"x15"	7	15.8	2	2.25 x 2.25 12 ga						2	4.0	2.5 x 2.5 12 ga	
	90"x15"	7	15.3	2	2.5 x 2.5 12 ga						2	4.0	3 x 3 7 ga	2
	96"x15"	7	17.4	2	2.5 x 2.5 10 ga						2	4.0	3 x 3 7 ga	2
	48"x12"	7	17.5	1	2.5 x 2.5 12 ga						1	4.0	3 x 3 7 ga	
	54"x12"	7	15.2	1	2.25 x 2.25 12 ga						1	4.0	2.5 x 2.5 12 ga	
	60"x12"	7	14.2	1	2.5 x 2.5 12 ga						1	4.0	3 x 3 7 ga	
	66"x12"	7	15.9	1	2.5 x 2.5 12 ga						1	4.0	3 x 3 7 ga	
	72"x12"	7	14.7	1	2.5 x 2.5 12 ga						1	4.0	3 x 3 7 ga	
	78"x12"	7	15.7	2	2 x 2 12 ga						2	4.0	2.25 x 2.25 12 ga	
	84"x12"	7	15.6	2	2.25 x 2.25 12 ga						2	4.0	2.5 x 2.5 12 ga	
	90"x12"	7	18.6	2	2.5 x 2.5 12 ga						2	4.0	3 x 3 7 ga	2
	96"x12"	7	17.5	2	2.5 x 2.5 12 ga						2	4.0	3 x 3 7 ga	2
	24"x12"	5	20.3	1	2 x 2 12 ga						1	4.0	2.25 x 2.25 12 ga	
	30"x12"	5	16.4	1	2 x 2 12 ga						1	4.0	2.25 x 2.25 12 ga	
	36"x12"	5	13.8	1	2 x 2 12 ga						1	4.0	2.25 x 2.25 12 ga	
	42"x12"	5	14.7	1	2 x 2 12 ga						1	4.0	2.25 x 2.25 12 ga	
	48"x12"	5	12.9	1	2 x 2 12 ga						1	4.0	2.25 x 2.25 12 ga	
	54"x12"	5	15.2	1	2.25 x 2.25 12 ga						1	4.0	2.5 x 2.5 12 ga	
	60"x12"	5	13.8	1	2.25 x 2.25 12 ga						1	4.0	2.5 x 2.5 12 ga	
	24"x9"	5	24.1	1	2 x 2 12 ga						1	4.0	2.25 x 2.25 12 ga	
	30"x9"	5	21	1	2 x 2 12 ga						1	4.0	2.25 x 2.25 12 ga	
	36"x9"	5	17.3	1	2 x 2 12 ga						1	4.0	2.25 x 2.25 12 ga	
	42"x9"	5	15.4	1	2 x 2 12 ga						1	4.0	2.25 x 2.25 12 ga	
	48"x9"	5	13.5	1	2 x 2 12 ga						1	4.0	2.25 x 2.25 12 ga	
54"x9"	5	14.8	1	2 x 2 12 ga						1	4.0	2.25 x 2.25 12 ga		
60"x9"	5	13.3	1	2 x 2 12 ga						1	4.0	2.25 x 2.25 12 ga		
Special Assembly 2	24"x12"	5	17.2	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	30"x12"	5	16.3	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	36"x12"	5	15.4	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	42"x12"	5	14.6	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	48"x12"	5	15.2	1	2.25 x 2.25 12 ga	4.5			2 x 2 12 ga		1	4.0	3 x 3 7 ga	1
	54"x12"	5	20.6	1	2.5 x 2.5 10 ga	1.5			2.19 x 2.19 10 ga		1	4.0	3 x 3 7 ga	1
	60"x12"	5	16.7	1	2.5 x 2.5 12 ga	3.9			2.25 x 2.25 12 ga		1	4.0	3 x 3 7 ga	1
	24"x9"	5	15.2	1	2.5 x 2.5 12 ga						1	4.0	3 x 3 7 ga	
	30"x9"	5	14.4	1	2.5 x 2.5 12 ga						1	4.0	3 x 3 7 ga	
	36"x9"	5	16.4	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	42"x9"	5	15.8	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	48"x9"	5	14.4	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	54"x9"	5	15.1	1	2.25 x 2.25 12 ga	4.2			2 x 2 12 ga		1	4.0	3 x 3 7 ga	1
	60"x9"	5	14.5	1	2.25 x 2.25 12 ga	4.7			2 x 2 12 ga		1	4.0	3 x 3 7 ga	1

POST INFORMATION FOR VARIOUS SIGN CONFIGURATIONS														
ASSEMBLY NUMBER	STREET NAME SIGN SIZE	VERTICAL CLEARANCE	MAXIMUM POST LENGTH	NUMBER OF POSTS	SUPPORT SIZE	SLEEVE LENGTH (A)			SLEEVE SIZE	ANCHOR			BREAKAWAY	
						1st	2nd	3rd		NUMBER	LENGTH	SIZE		
						LF	LF	LF						
Inches	LF	LF	LF											
Special Assembly 3	24"x12"	5	16.2	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	30"x12"	5	15.3	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	36"x12"	5	15.9	1	2.25 x 2.25 12 ga	4.3			2 x 2 12 ga		1	4.0	3 x 3 7 ga	1
	42"x12"	5	15.2	1	2.25 x 2.25 12 ga	4.8			2 x 2 12 ga		1	4.0	3 x 3 7 ga	1
	48"x12"	5	15.2	1	2.5 x 2.5 12 ga	5			2.25 x 2.25 12 ga		1	4.0	3 x 3 7 ga	1
	54"x12"	5	20.6	1	2.5 x 2.5 10 ga	1.9			2.19 x 2.19 10 ga		1	4.0	3 x 3 7 ga	1
	60"x12"	5	16	1	2.5 x 2.5 12 ga	4.7			2.25 x 2.25 12 ga		1	4.0	3 x 3 7 ga	1
	24"x9"	5	16.8	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	30"x9"	5	16.1	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	36"x9"	5	15.4	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	42"x9"	5	14.9	1	2.5 x 2.5 10 ga						1	4.0	3 x 3 7 ga	1
	48"x9"	5	15.7	1	2.25 x 2.25 12 ga	4.2			2 x 2 12 ga		1	4.0	3 x 3 7 ga	1
Special Assembly 4	24"x12"	5	15.1	1	2.25 x 2.25 12 ga	4.8			2 x 2 12 ga		1	4.0	3 x 3 7 ga	1
	30"x12"	5	15.1	1	2.5 x 2.5 12 ga	5			2.25 x 2.25 12 ga		1	4.0	3 x 3 7 ga	1
	36"x12"	5	17.4	1	2.5 x 2.5 12 ga	3.6			2.25 x 2.25 12 ga		1	4.0	3 x 3 7 ga	1
	42"x12"	5	16.8	1	2.5 x 2.5 12 ga	4.1			2.25 x 2.25 12 ga		1	4.0	3 x 3 7 ga	1
	48"x12"	5	16.1	1	2.5 x 2.5 12 ga	4.5			2.25 x 2.25 12 ga		1	4.0	3 x 3 7 ga	1
	54"x12"	5	15.5	1	2.5 x 2.5 12 ga	4.9			2.25 x 2.25 12 ga		1	4.0	3 x 3 7 ga	1
	60"x12"	5	16.7	1	2.5 x 2.5 10 ga	4.2			2.19 x 2.19 10 ga		1	4.0	3 x 3 7 ga	1
	24"x9"	5	15.5	1	2.25 x 2.25 12 ga	4.2			2 x 2 12 ga		1	4.0	3 x 3 7 ga	1
	30"x9"	5	15	1	2.25 x 2.25 12 ga	4.5			2 x 2 12 ga		1	4.0	3 x 3 7 ga	1
	36"x9"	5	14.5	1	2.25 x 2.25 12 ga	4.8			2 x 2 12 ga		1	4.0	3 x 3 7 ga	1
	42"x9"	5	14.7	1	2.5 x 2.5 12 ga	4.9			2.25 x 2.25 12 ga		1	4.0	3 x 3 7 ga	1
	48"x9"	5	17.2	1	2.5 x 2.5 12 ga	3.5			2.25 x 2.25 12 ga		1	4.0	3 x 3 7 ga	1
Special Assembly 5	24"x12"	5	17.1	2	2.5 x 2.5 10 ga						2	4.0	3 x 3 7 ga	2
	30"x12"	5	16.7	2	2.5 x 2.5 10 ga						2	4.0	3 x 3 7 ga	2
	36"x12"	5	17.7	2	2.25 x 2.25 12 ga	4	4.5		2 x 2 12 ga		2	4.0	3 x 3 7 ga	2
	42"x12"	5	17.3	2	2.25 x 2.25 12 ga	4.3	4.8		2 x 2 12 ga		2	4.0	3 x 3 7 ga	2
	48"x12"	5	16.8	2	2.25 x 2.25 12 ga	4.5	5		2 x 2 12 ga		2	4.0	3 x 3 7 ga	2
	54"x12"	5	16.5	2	2.25 x 2.25 12 ga	4.8	5.3		2 x 2 12 ga		2	4.0	3 x 3 7 ga	2
	60"x12"	5	17.5	3	2.5 x 2.5 12 ga						3	4.0	3 x 3 7 ga	3
	24"x9"	5	17.3	2	2.5 x 2.5 10 ga						2	4.0	3 x 3 7 ga	2
	30"x9"	5	17	2	2.5 x 2.5 10 ga						2	4.0	3 x 3 7 ga	2
	36"x9"	5	16.6	2	2.5 x 2.5 10 ga						2	4.0	3 x 3 7 ga	2
	42"x9"	5	16.3	2	2.5 x 2.5 10 ga						2	4.0	3 x 3 7 ga	2
	48"x9"	5	16	2	2.5 x 2.5 10 ga						2	4.0	3 x 3 7 ga	2
54"x9"	5	17.1	2	2.25 x 2.25 12 ga	4	4.6		2 x 2 12 ga		2	4.0	3 x 3 7 ga	2	
60"x9"	5	16.8	2	2.25 x 2.25 12 ga	4.2	4.8		2 x 2 12 ga		2	4.0	3 x 3 7 ga	2	

(A) The sleeve length shown is for the maximum post length. The required sleeve length is the "sleeve length" minus the difference between the "maximum post length" and the post length required in the field.



Notes:
Use 6 inch legend except on multi-lane divided roads with speeds of 45 mph or greater.
On divided multi-lane roadways, do not place 911 signs on top of stop sign.

When installing signs on existing supports, check support and sleeve size to determine if they meet table requirements. Measure maximum post length from ground to top of street name sign. If calculated support length is greater than maximum post length shown, recalculate support size.

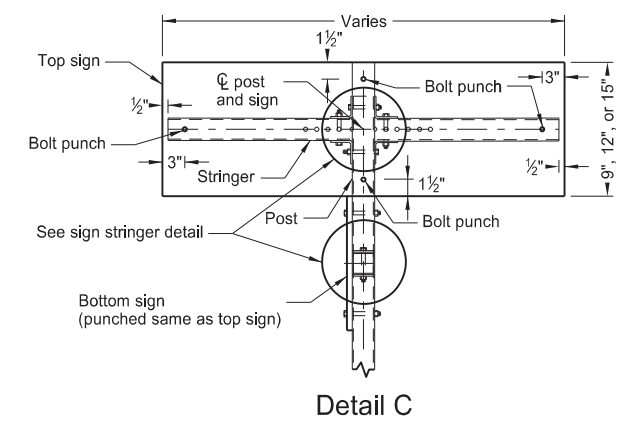
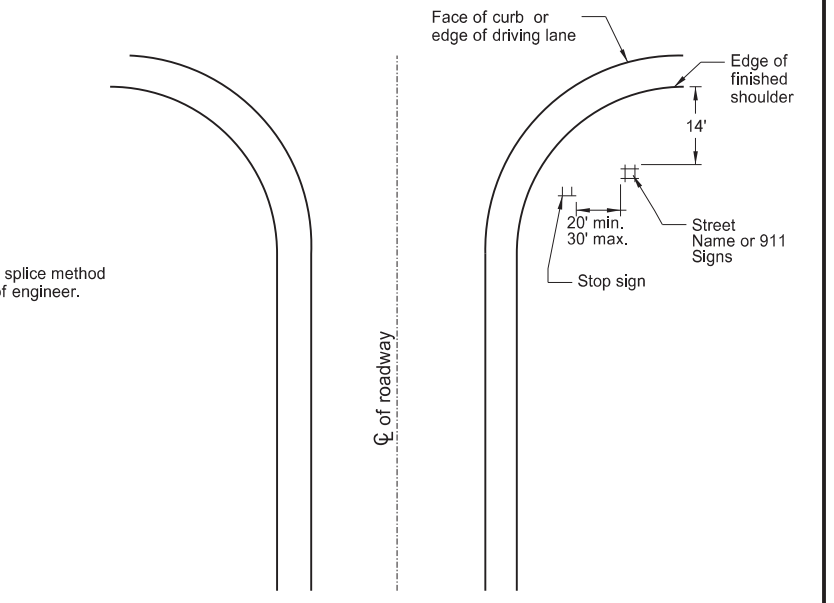
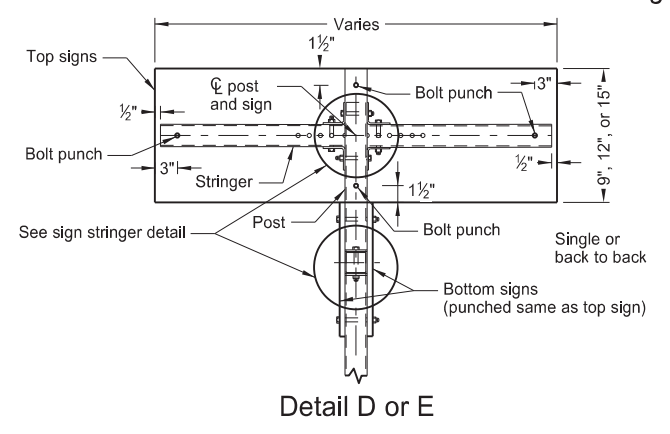
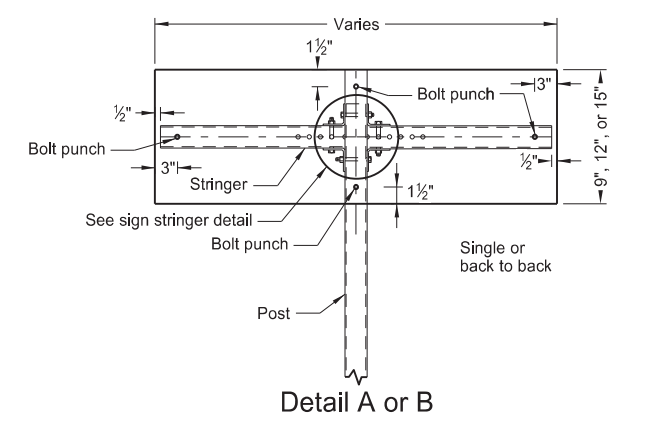
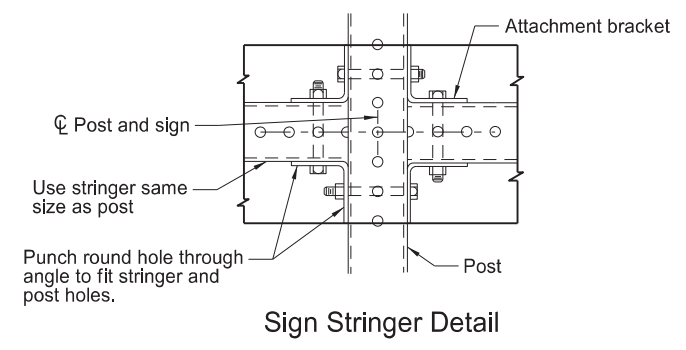
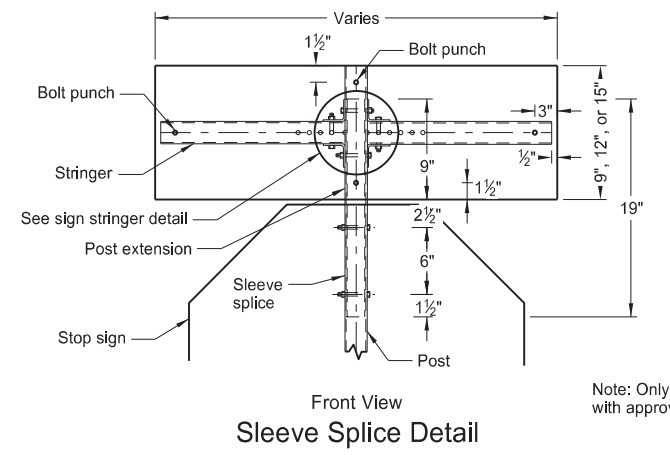
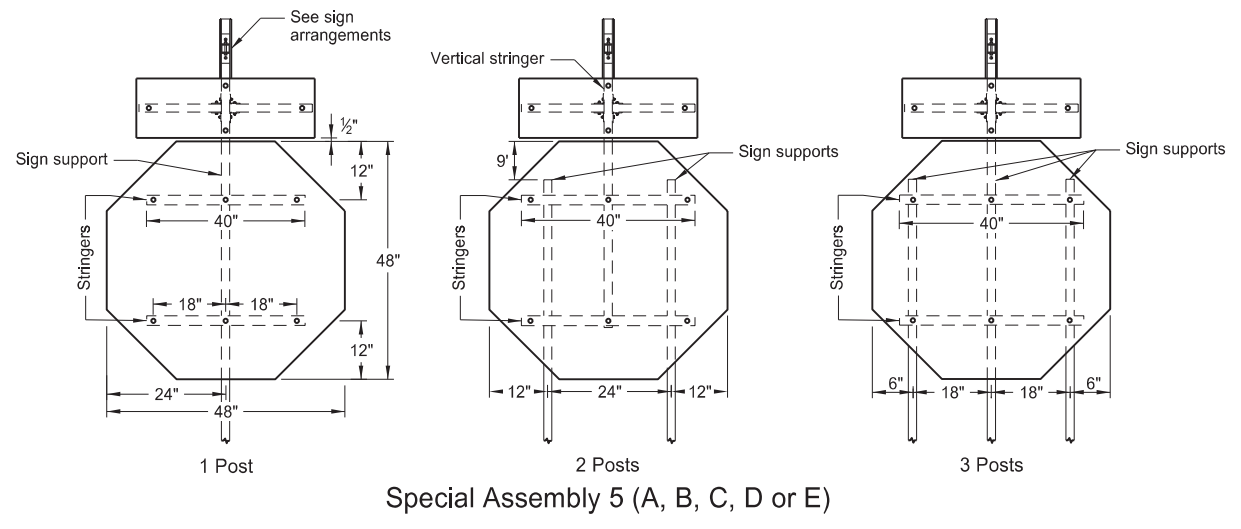
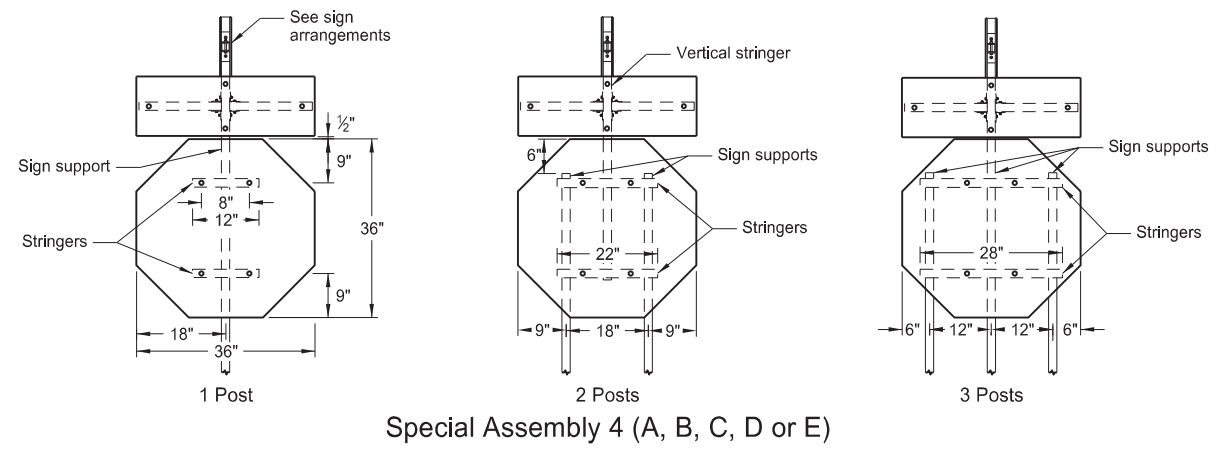
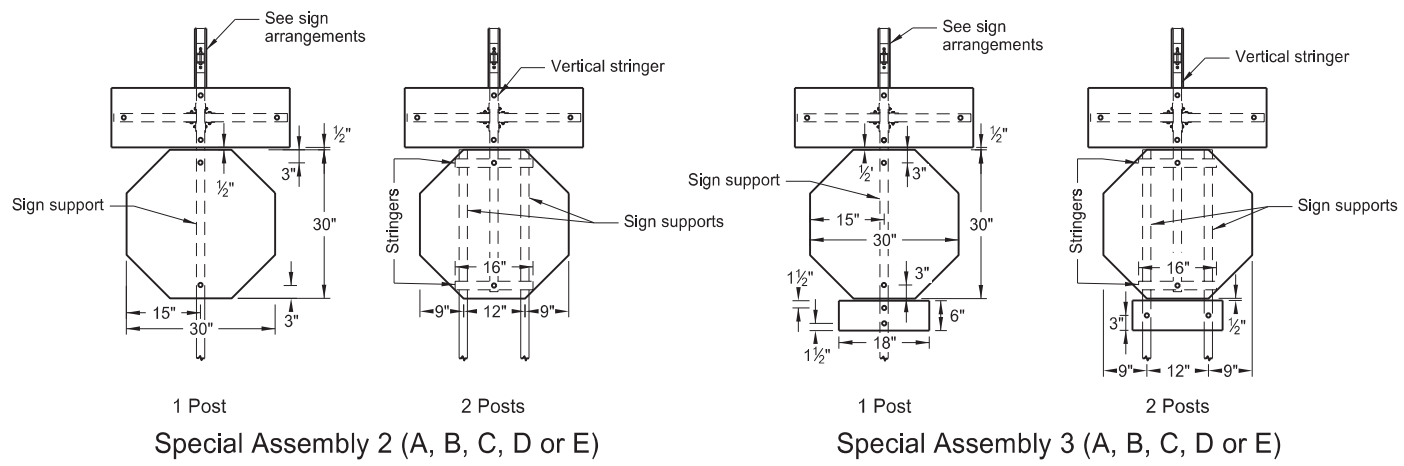
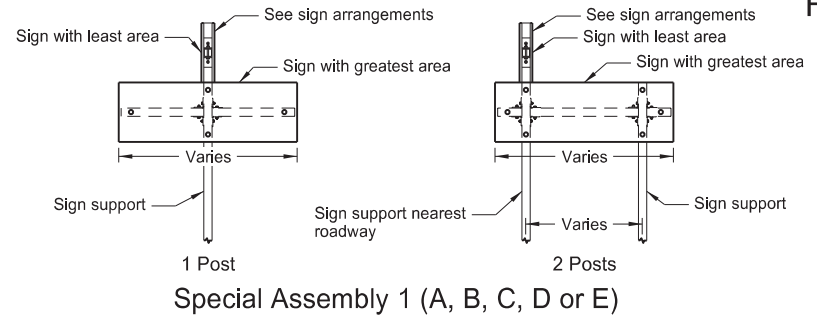
See Standard Drawing D-754-87 for sign punching, stringer and support location details.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-18-14	Revised street name sign layouts.
8-30-18	Revised tables, lettering, & signs
9-05-19	and updated notes to active voice. New Design Engineer PE Stamp.

This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
on 9/05/19 and the original document is stored at the North Dakota Department of Transportation

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR STREET NAME SIGNS AND 911 SIGNS

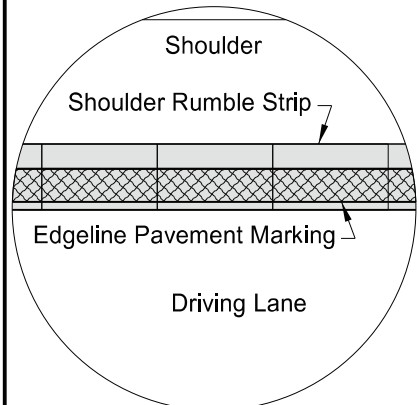
- A - Single sign
- B - Single sign back to back
- C - Single sign each direction
- D - Single sign one direction, back to back other direction
- E - Back to back both directions



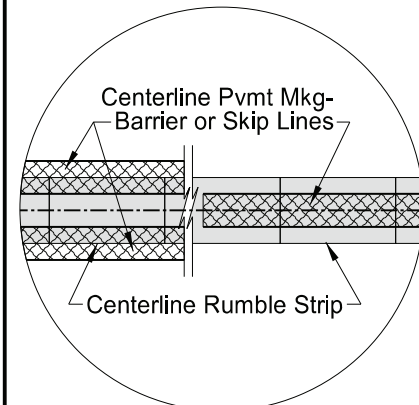
Sign Arrangements

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
8-30-18	Added 2 post layout for SA1 and Updated notes to active voice.
9-05-19	New Design Engineer PE Stamp.

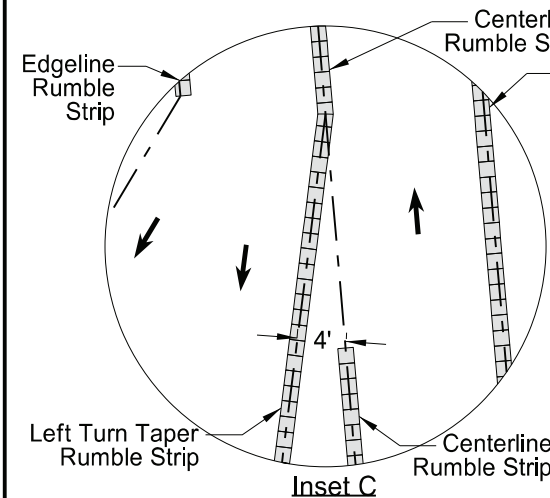
This document was originally issued and sealed by
 Kirk J Hoff,
 Registration Number
 PE- 4683,
 on 9/05/19 and the original document is stored at the North Dakota Department of Transportation



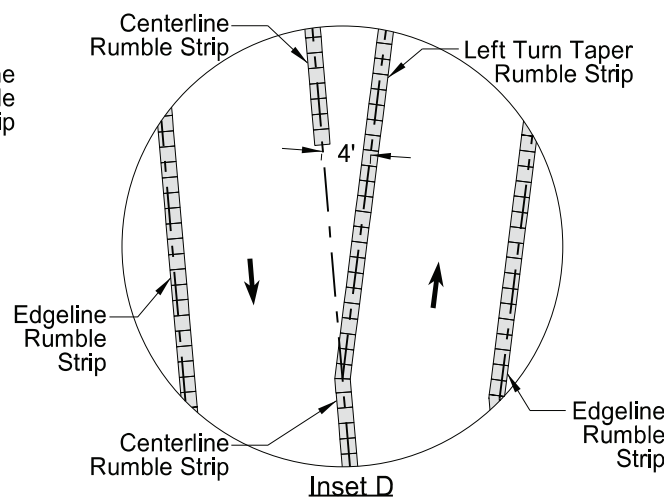
Inset A - Edgeline Rumble Strip
(Layout for opposite shoulder reversed)



Inset B - Centerline Rumble Strip

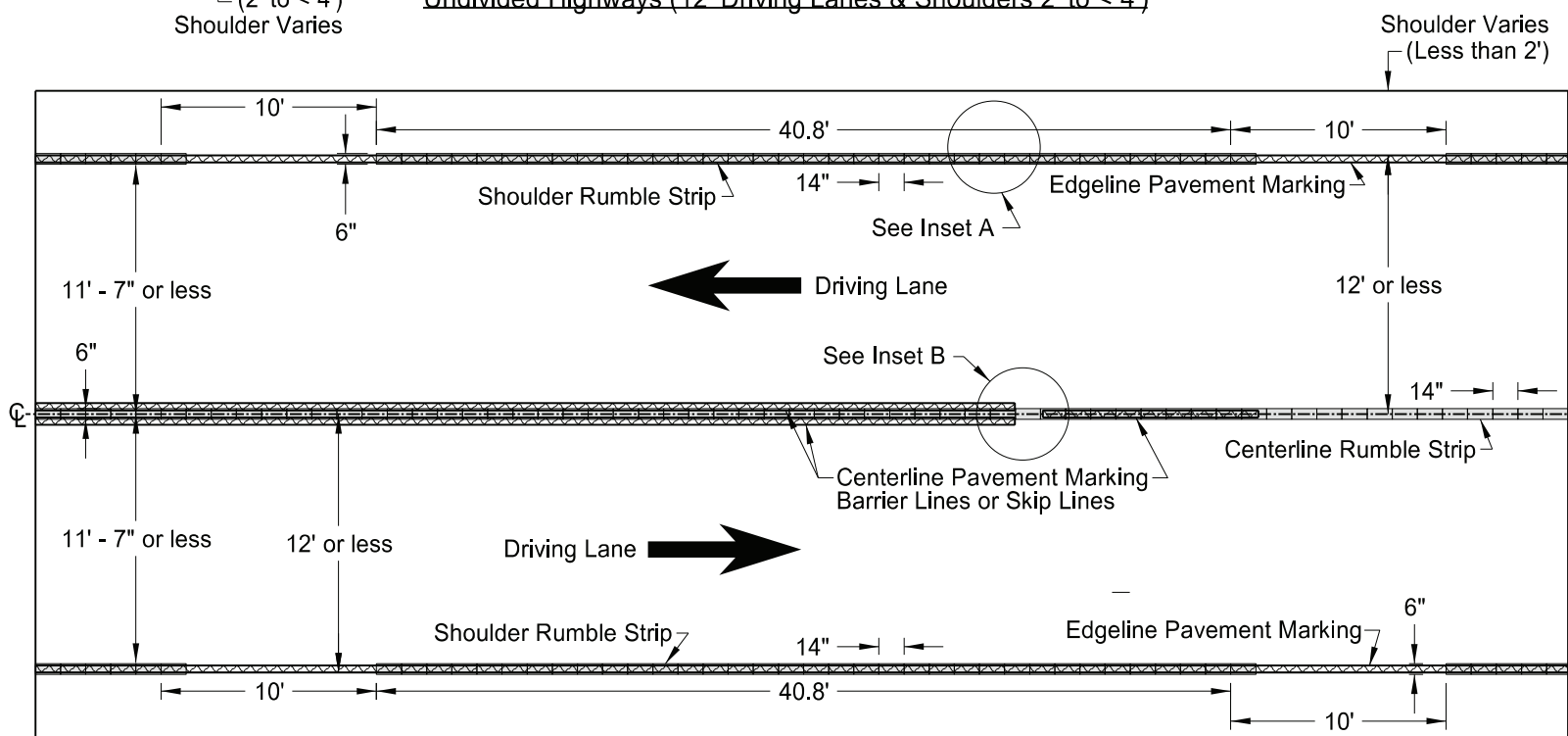
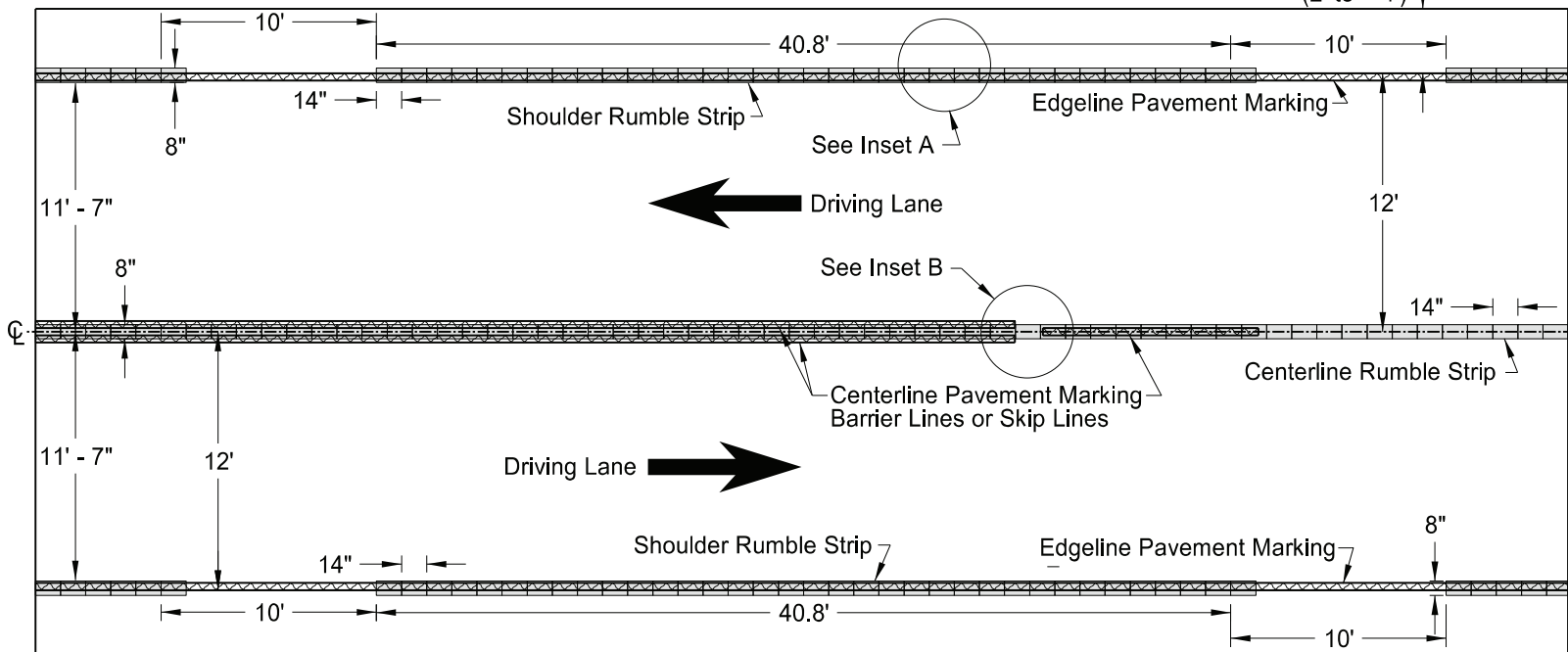
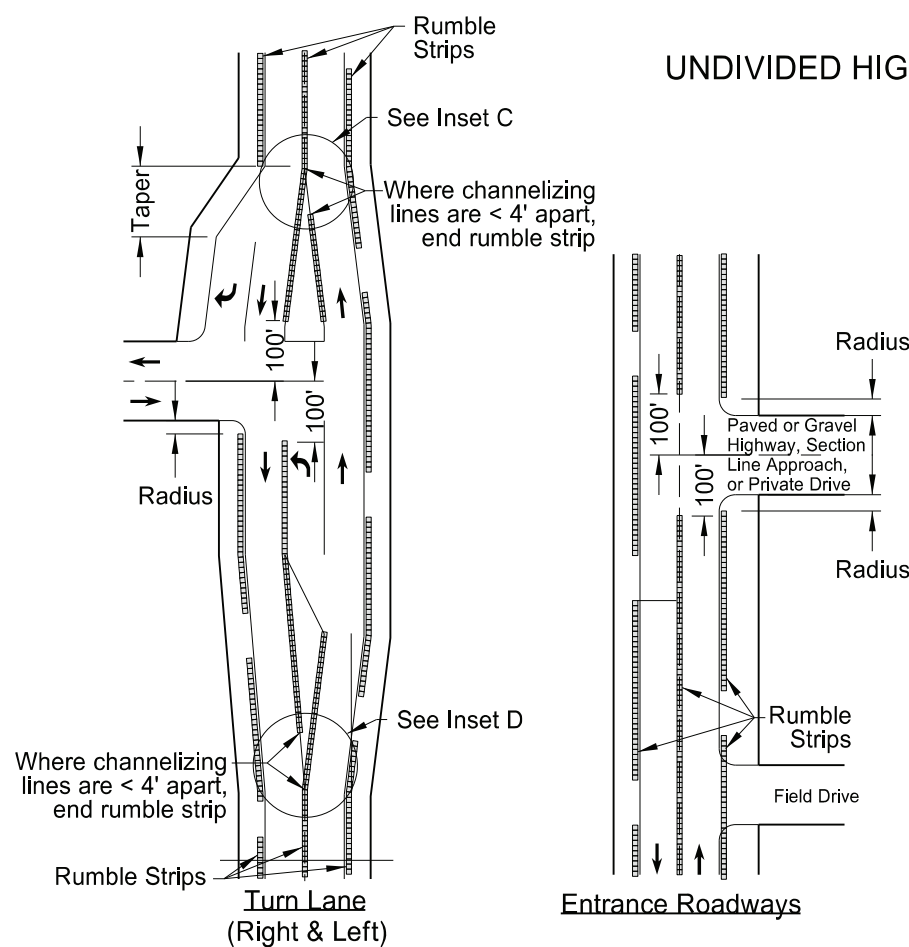


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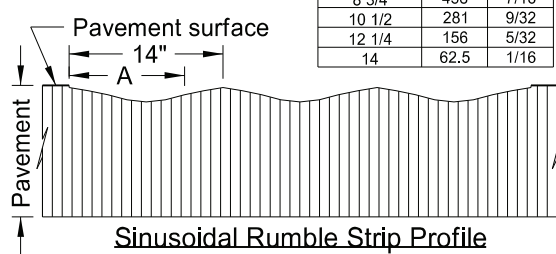


Inset D

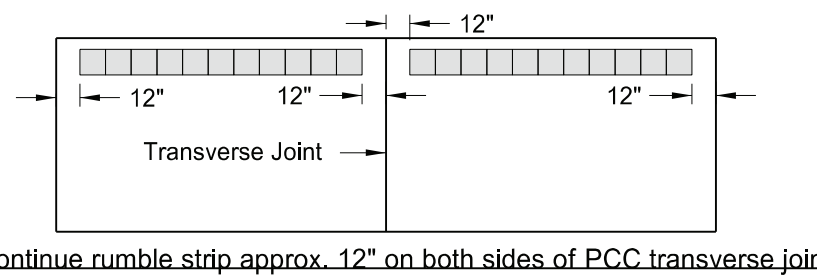
RUMBLE STRIPS
UNDIVIDED HIGHWAYS (SHOULDERS LESS THAN 4')



Milling Depths		
Location A (in)	MIL	Depth in
0	62.5	1/16
1 3/4	156	5/32
3 1/2	281	9/32
5 1/4	438	7/16
7	500	1/2
8 3/4	438	7/16
10 1/2	281	9/32
12 1/4	156	5/32
14	62.5	1/16



NOTES:
1) Discontinue shoulder rumble strips through the entire length of right turn lanes and tapers, and at the radius of paved or gravel highways, section line approaches, or private drives.
2) Discontinue centerline rumble strips 100' before and after paved or gravel highways, section line approaches, or private drives. Place rumble strips at left turn lanes as shown below.
3) No additional quantity provided for centerline rumble strips on left turn tapers. Include all costs for centerline rumble strips on left turn tapers in the price bid for "Sinusoidal Rumble Strip - Asphalt Centerline" or "Sinusoidal Rumble Strip - Concrete Centerline".

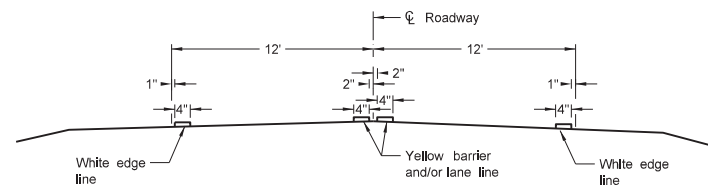


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-29-09	
REVISIONS	
DATE	CHANGE
2-25-10	Note 4 was added.
4-19-10	Revised Note 5, Note 6, and Turn Lane (Right & Left).
9-08-11	Revised Notes and D-760-4. Revised details for rumble strip widths and dimensions.
10-25-19	Added missing dimensions.
11-16-21	Revised turn lane rumble layout.
3-07-23	Added Note 3.
5-26-23	Rumble Strips made Sinusoidal.

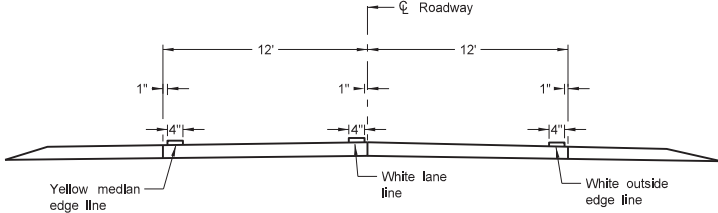


05/26/23

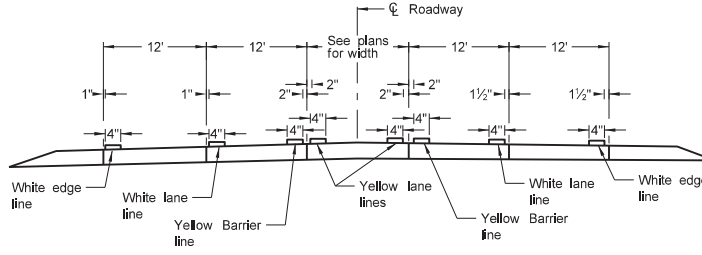
PAVEMENT MARKING



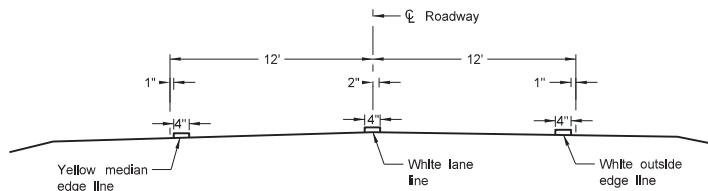
Two Lane Two Way
RURAL ROADWAY



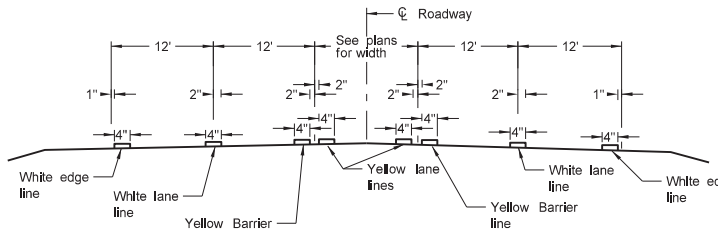
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



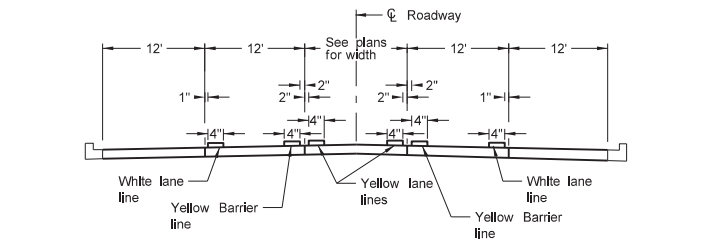
RURAL FIVE LANE ROADWAY
Concrete Section



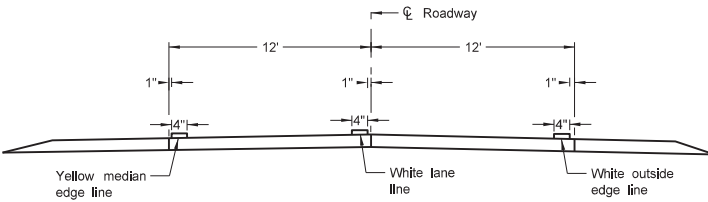
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



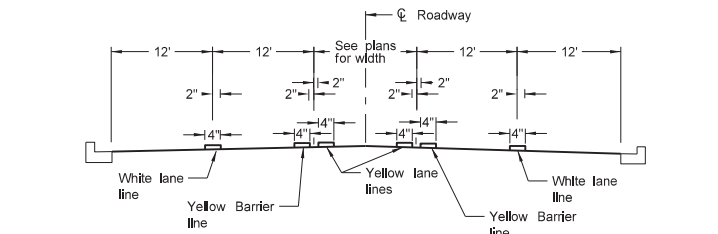
RURAL FIVE LANE ROADWAY
Asphalt Section



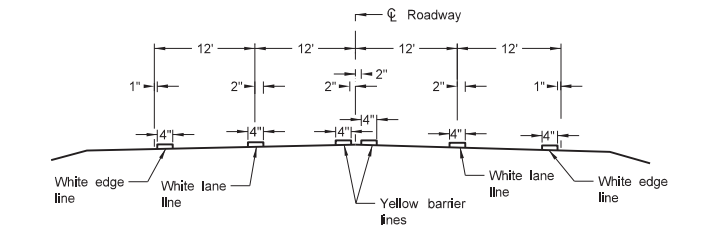
URBAN FIVE LANE SECTION
Concrete Section



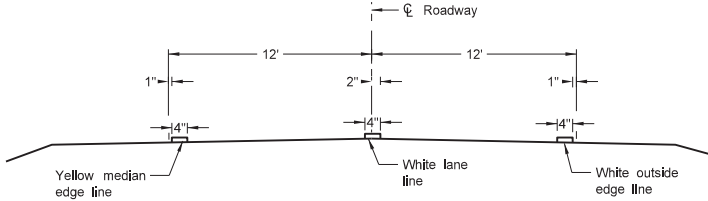
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



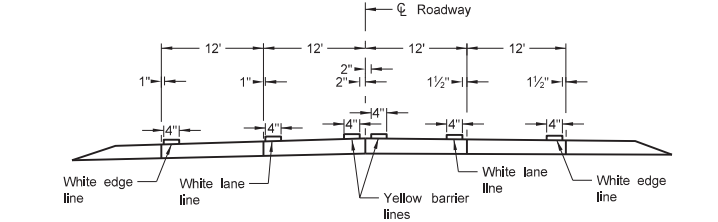
URBAN FIVE LANE SECTION
Asphalt Section



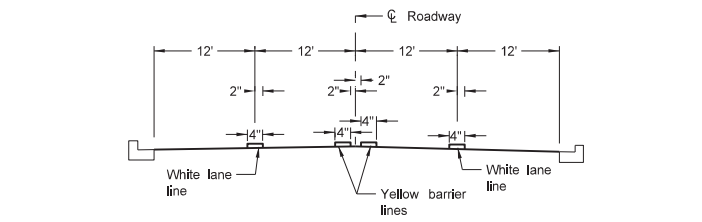
RURAL FOUR LANE ROADWAY
Asphalt Section



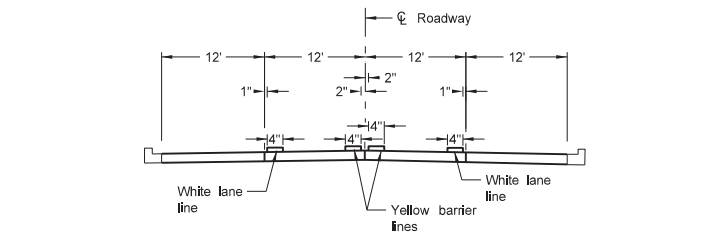
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



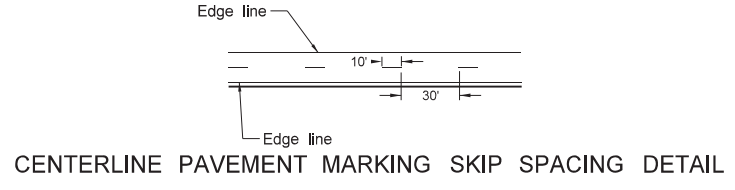
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



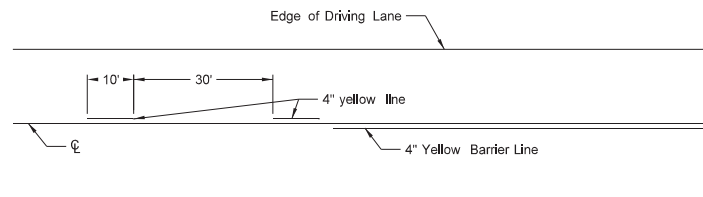
CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

NOTES:
1. Continue edge lines through private drives and field drives. Break edge lines for intersections.

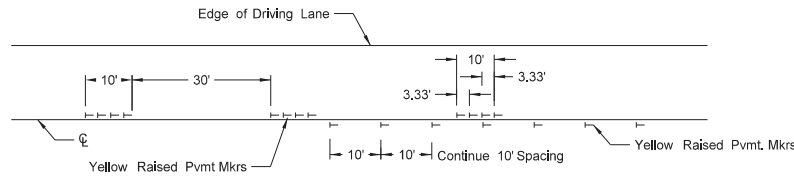
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp.

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

SHORT-TERM PAVEMENT MARKING

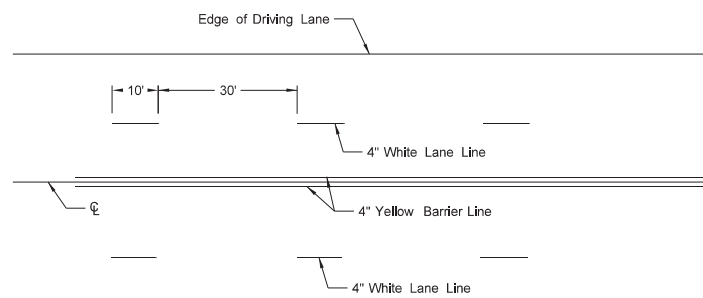


Painted or Tape Lines

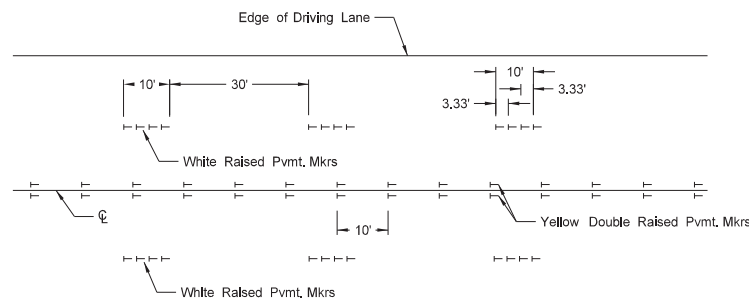


Raised Pavement Markers

TWO-LANE TWO-WAY ROADWAY

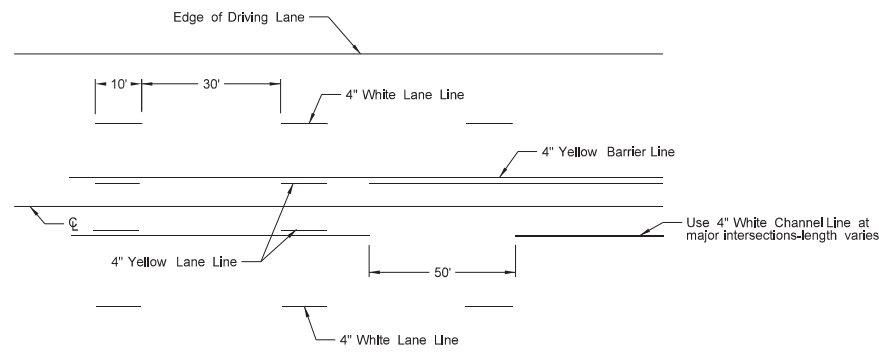


Painted or Tape Lines

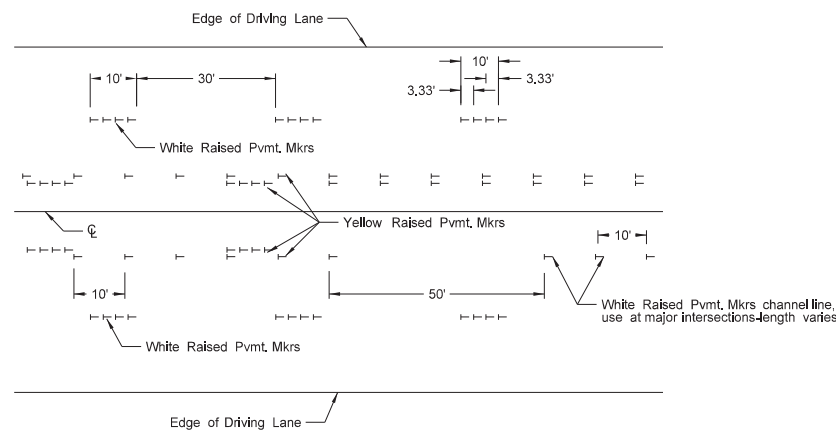


Raised Pavement Markers

FOUR LANE ROADWAY

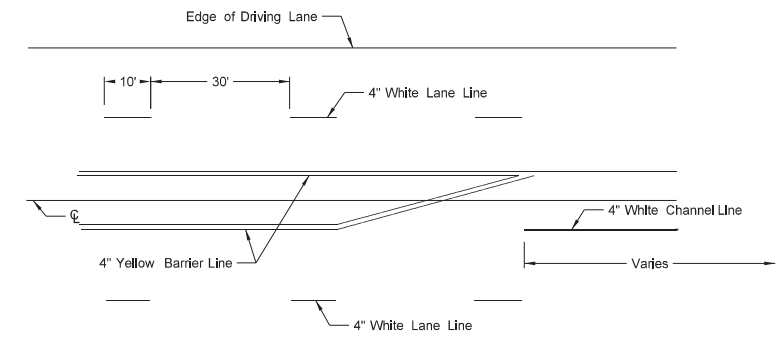


Painted or Tape Lines

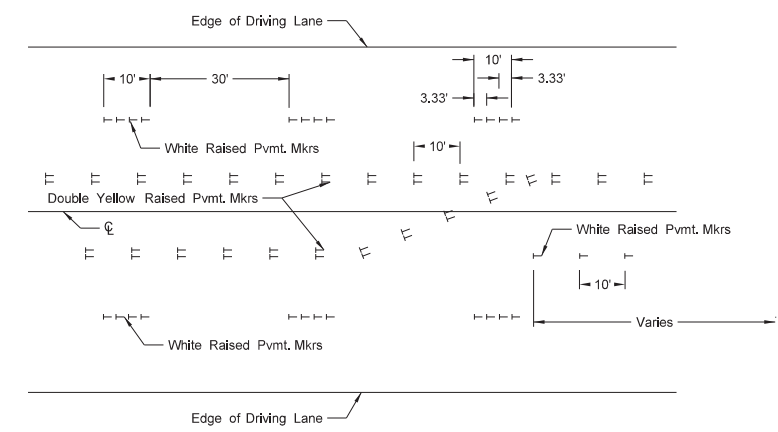


Raised Pavement Markers

FIVE LANE ROADWAY TWO WAY LEFT TURN



Painted or Tape Lines



Raised Pavement Markers

FIVE LANE ROADWAY WITH MARKED ISLANDS

NOTES:

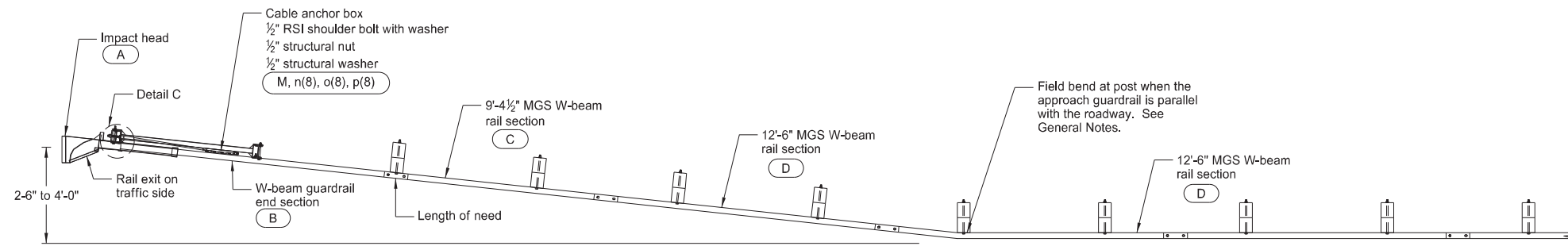
1. Place no passing zones on two-lane two-way roadways as shown. In lieu of short term no passing zone pavement markings, place no passing zone signs. Replace no passing zone signs with short term no passing zone pavement marking within three days.
2. Place short term center line stripe (paint) on top lift to match exact placement of permanent stripe.
3. Remove raised markers and tape markings after permanent pavement marking is installed.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
3-29-16	Re-numbered to be D-762-11 (previously was D-762-6)
10-17-17	Updated to active voice.
8-27-19	New Design Engineer PE Stamp.

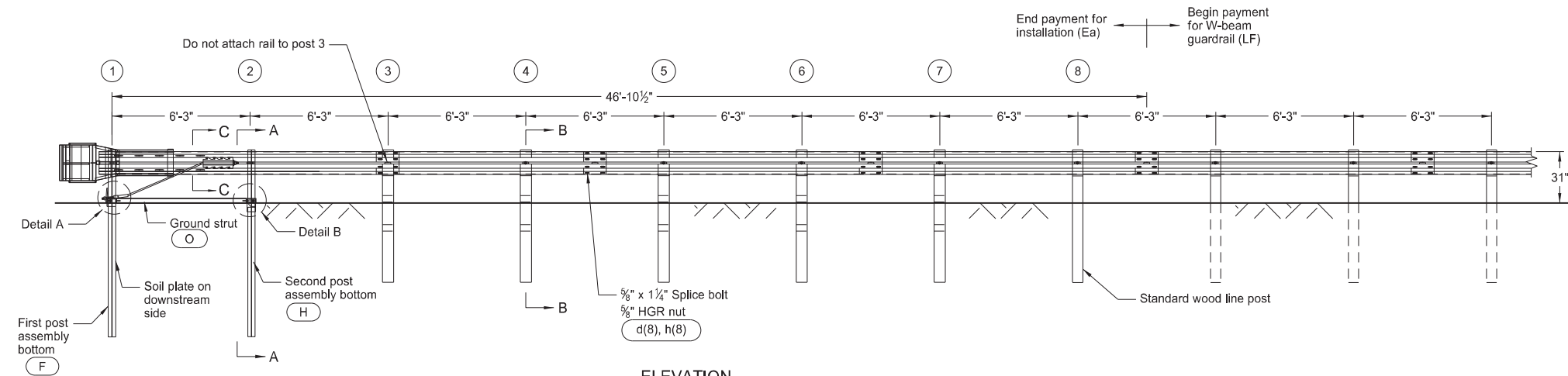
This document was originally issued and sealed by
 Kirk J Hoff,
 Registration Number
 PE-4683,
 on 8/27/19 and the original document is stored at the North Dakota Department of Transportation

MGS FLARED ENERGY ABSORBING TERMINAL - WOOD POST

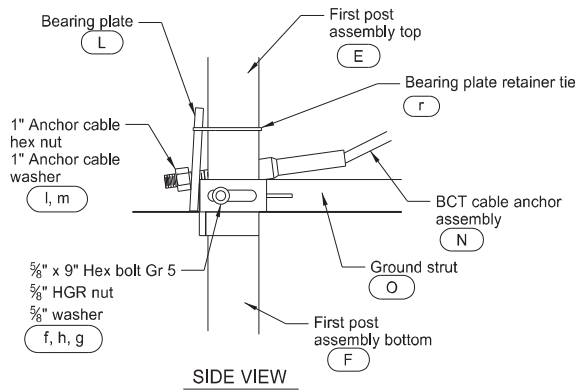
D-764-38



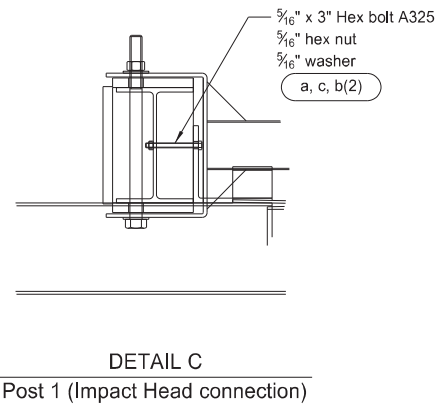
PLAN



ELEVATION

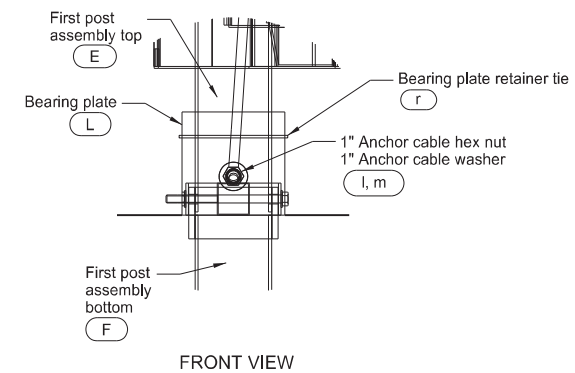


SIDE VIEW



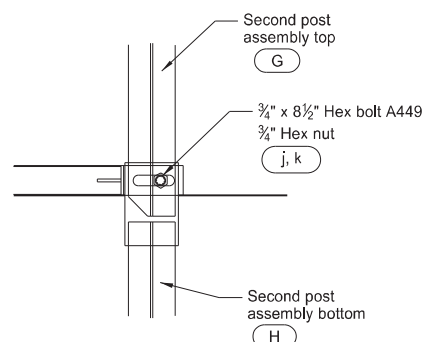
DETAIL C

Post 1 (Impact Head connection)

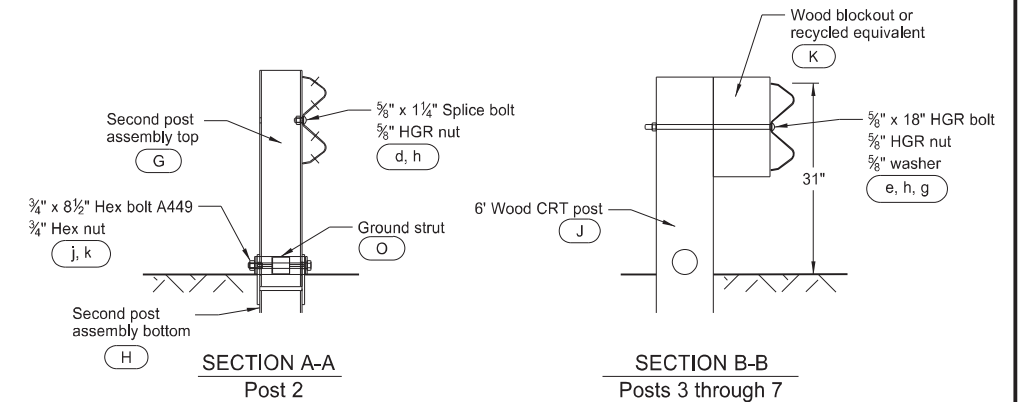


FRONT VIEW

DETAIL A
Post 1

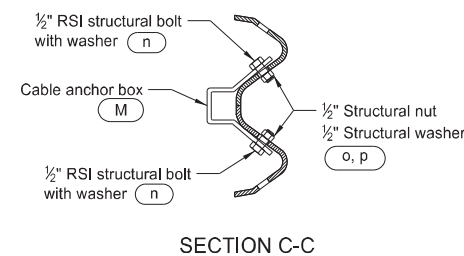


DETAIL B
Post 2



SECTION A-A
Post 2

SECTION B-B
Posts 3 through 7



SECTION C-C

GENERAL NOTES:

- Wood posts are required with the Flared Energy Absorbing Terminal except posts 1 and 2.
- Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
- 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.
- 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).
- 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.
- Install the breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent cable from twisting when tightening nuts.
- "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.

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'-4 1/2" 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	5/16" x 3" HEX BOLT A325	2
b	W0516	5/16" WASHER	4
c	N0516	5/16" HEX NUT	2
d	B580122	5/8" Dia x 1 1/4" SPLICE BOLT	33
e	B581802	5/8" Dia X 18" HGR BOLT	5
f	B580904A	5/8" Dia x 9" HEX BOLT GRD 5	1
g	W050	5/8" WASHER	7
h	N050	5/8" Dia HGR NUT	39
j	B340854A	3/4" Dia x 8 1/2" HEX BOLT GRD A449	1
k	N030	3/4" Dia HEX NUT	1
l	N100	1" ANCHOR CABLE HEX NUT	2
m	W100	1" ANCHOR CABLE WASHER	2
n	SB12A	1/2" RSI SHOULDER BOLT WITH WASHER	8
o	N012A	1/2" STRUCTURAL NUT	8
p	W012A	1/2" 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.

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
7-14-17

REVISIONS
DATE CHANGE
12-02-20 Updated notes to active voice.

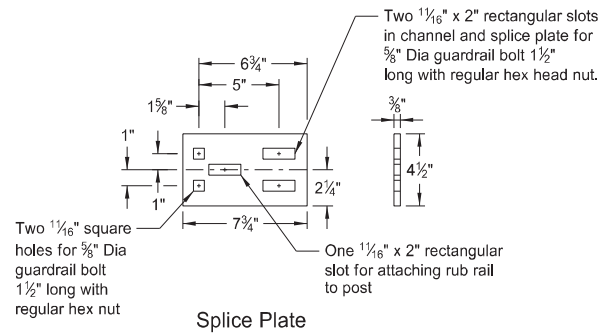


12 02 2020

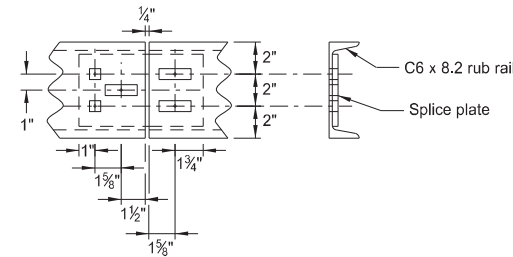
MGS W-BEAM GUARDRAIL GENERAL DETAILS

NOTES:

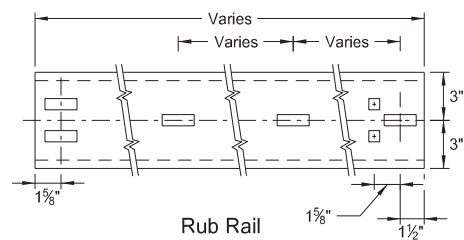
1. Begin reflector plates at the first post and space at 25' centers on guardrail less than 250' length and at 50' centers for guardrail over 250' length. Provide the reflector the same color as the pavement marking adjacent to it unless noted otherwise on the plans.
2. Replacing bituminous material 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".



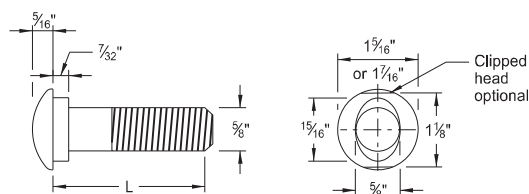
Splice Plate



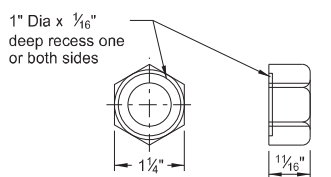
Splice Detail



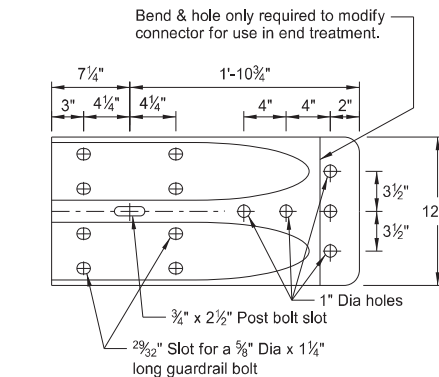
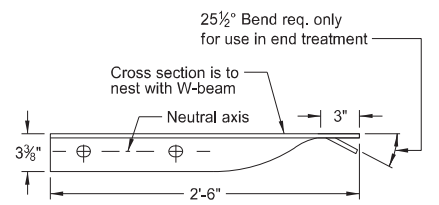
C6x8.2 RUB RAIL AND SPLICE PLATE



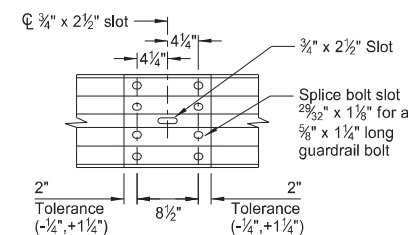
5/8" Diameter Guardrail Bolt	
L	Thread Length
1 1/4"	Full length thread
2"	1 3/4" Min thread length
9 1/2"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length



5/8" GUARDRAIL BOLT & RECESS NUT

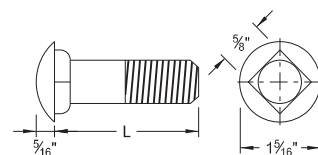


W BEAM TERMINAL CONNECTOR

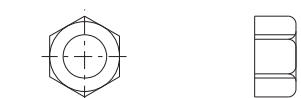


SPLICE DETAIL

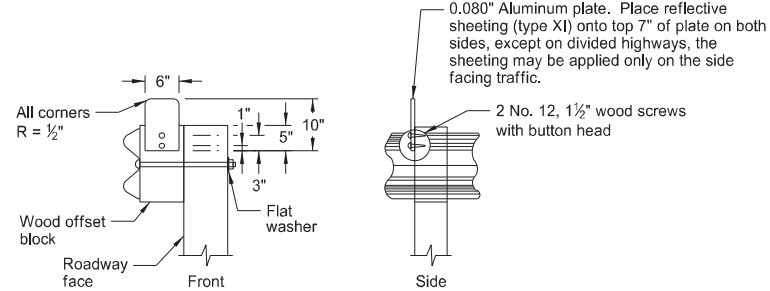
NOTE: Do not install center bolt in the 3/4" x 2 1/2" slot at mid span splices.



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

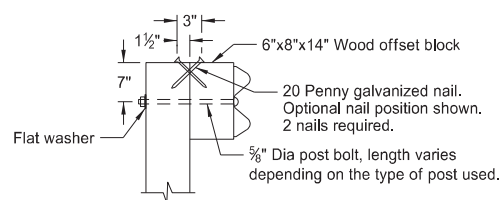


5/8" CARRIAGE BOLT & NUT

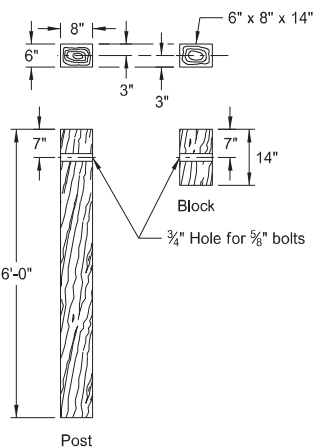


REFLECTORIZED PLATE DETAIL

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

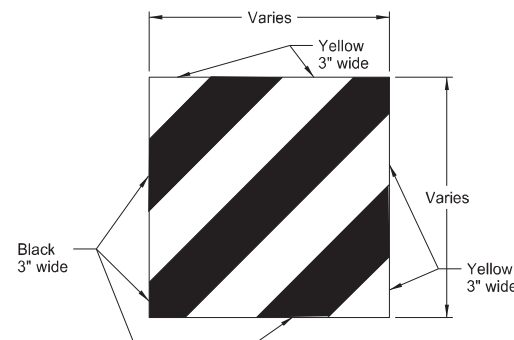


TYPICAL WOOD POST ATTACHMENT DETAIL

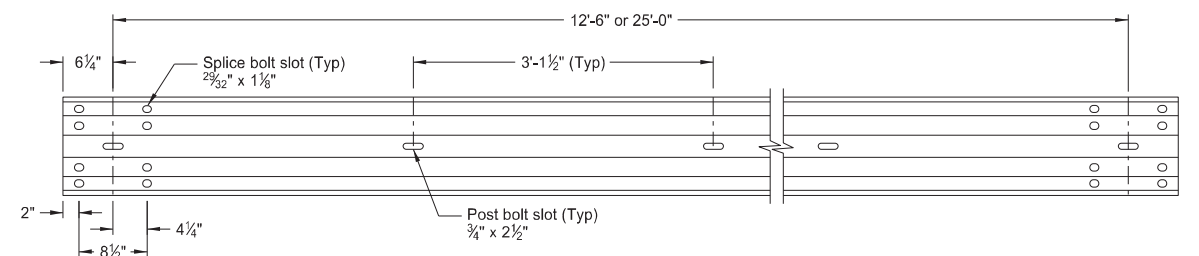


6" x 8" WOOD POST & BLOCK

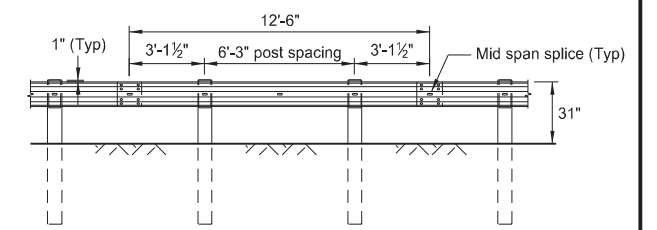
NOTE: Where soil conditions require, alternate lengths may be specified, in 6" increments.



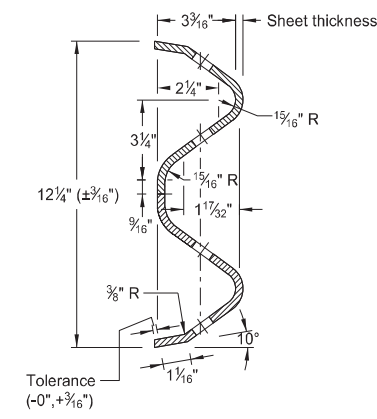
IMPACT HEAD OBJECT MARKER



STANDARD MGS GUARDRAIL PANEL



STANDARD MGS GUARDRAIL SYSTEM



W-BEAM CROSS SECTION

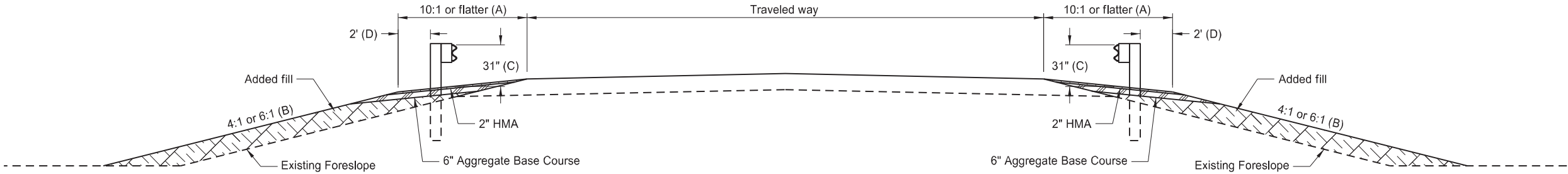
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12-02-20	Updated clipped head to optional



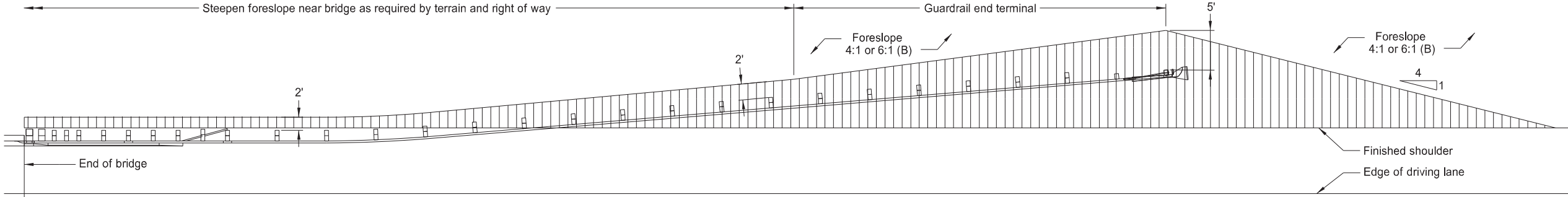
12 02 2020

TYPICAL GRADING AT BRIDGE ENDS
WITH MGS W-BEAM GUARDRAIL

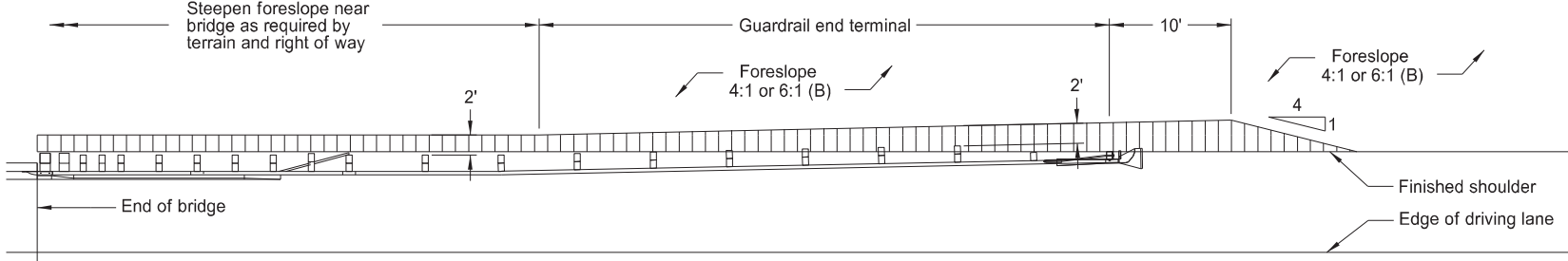
D-764-48



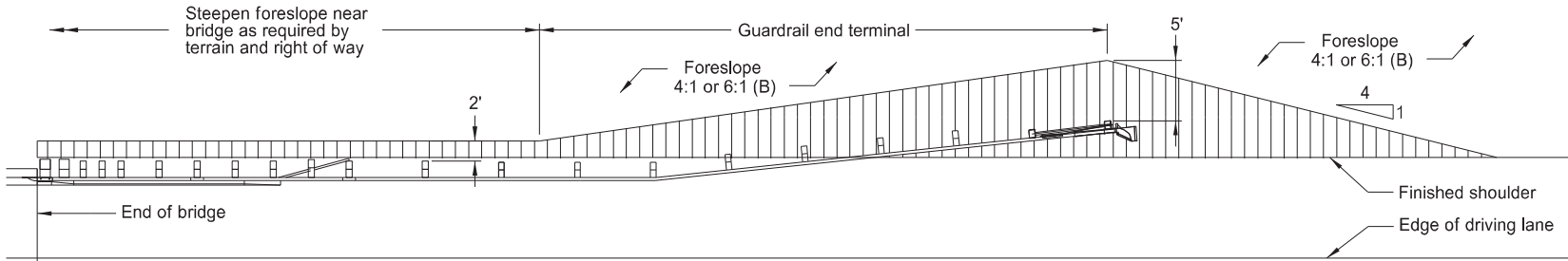
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL



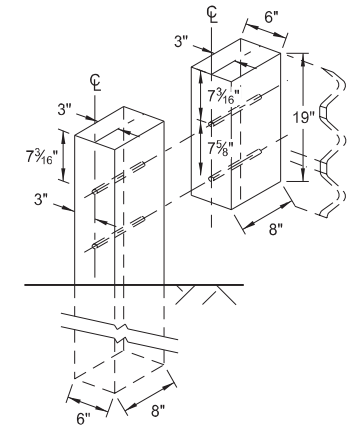
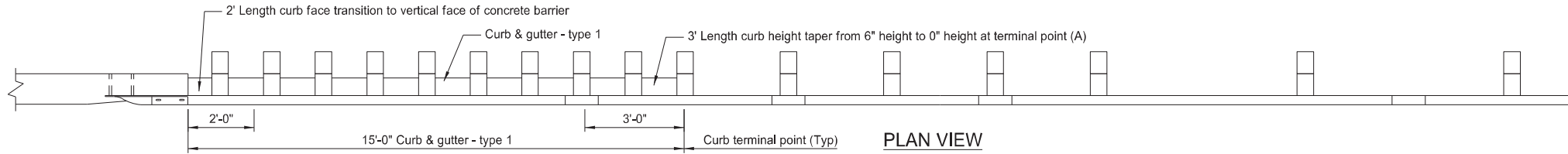
PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

- 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.

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

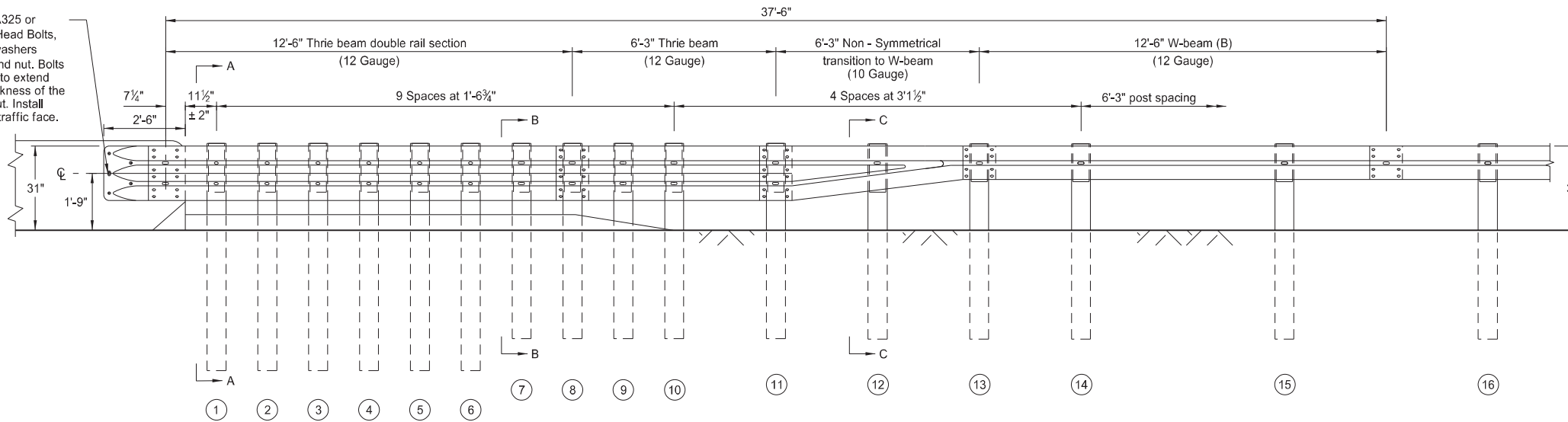
MGS W-BEAM TRANSITION WITH APPROACH CURB TO CONCRETE SINGLE SLOPE OR JERSEY BARRIER

D-764-60



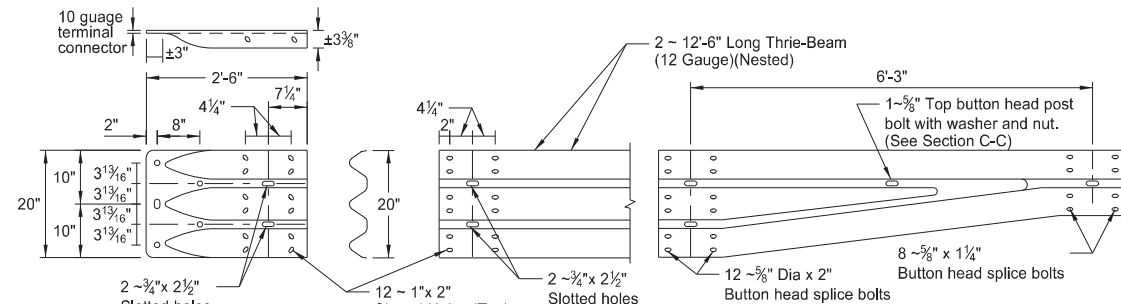
WOOD BLOCK TO RECTANGULAR WOOD POST (At posts 1 to 11)

5 - 5/8" Dia. (ASTM A325 or A449) Heavy Hex Head Bolts, with two 1 3/4" O.D. washers under each head and nut. Bolts of sufficient length to extend through the full thickness of the rail, washer, and nut. Install with bolt heads on traffic face.



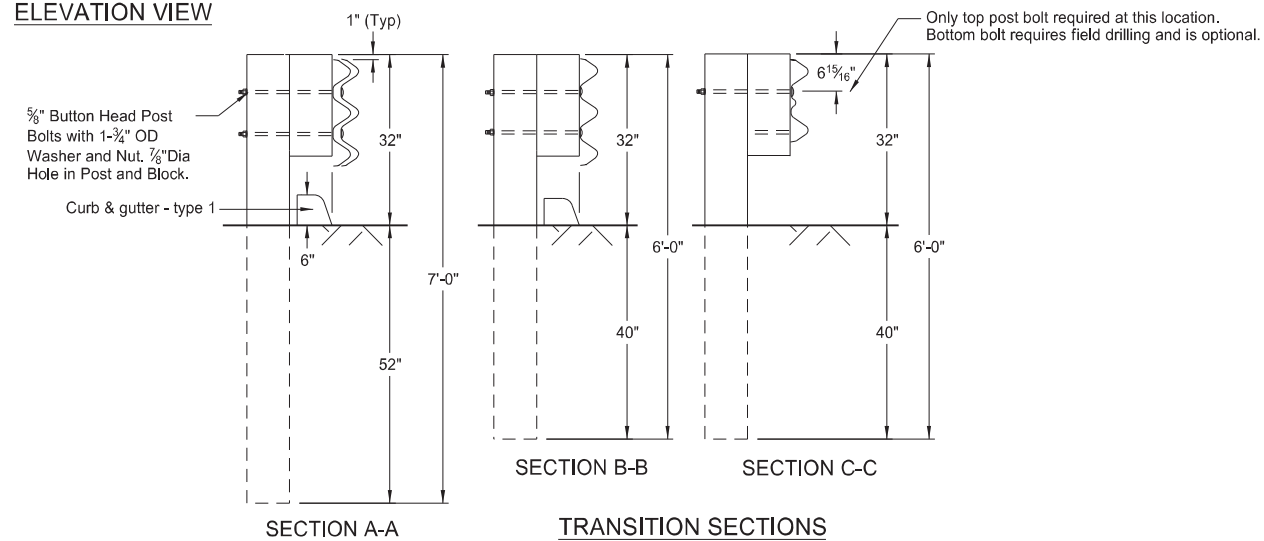
TRANSITION POST AND TIMBER BLOCKOUT SIZING		
POST NO.	POST SIZE	BLOCKOUT SIZE
1-6	6" X 8" X 7'-0" long	6" X 8" X 19"
7-12	6" X 8" X 6'-0" long	6" X 8" X 19"
13-16	6" X 8" X 6'-0" long	6" X 8" X 14"

ELEVATION VIEW

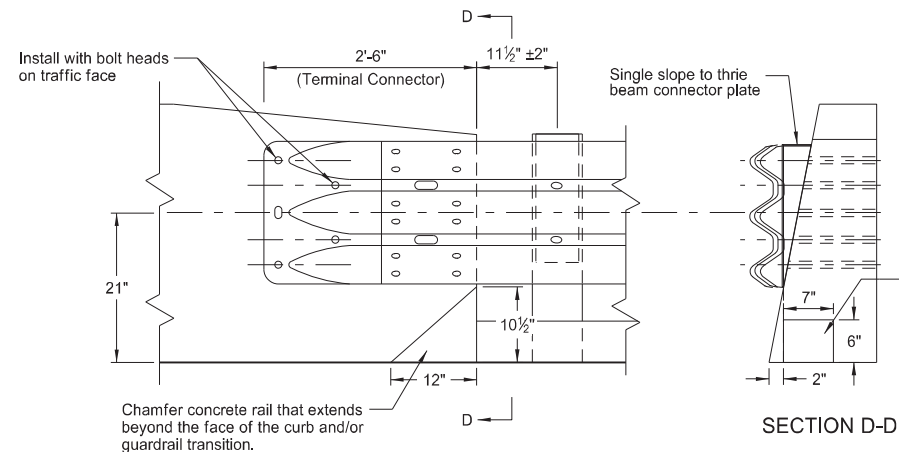


THRIE-BEAM TERMINAL CONNECTION

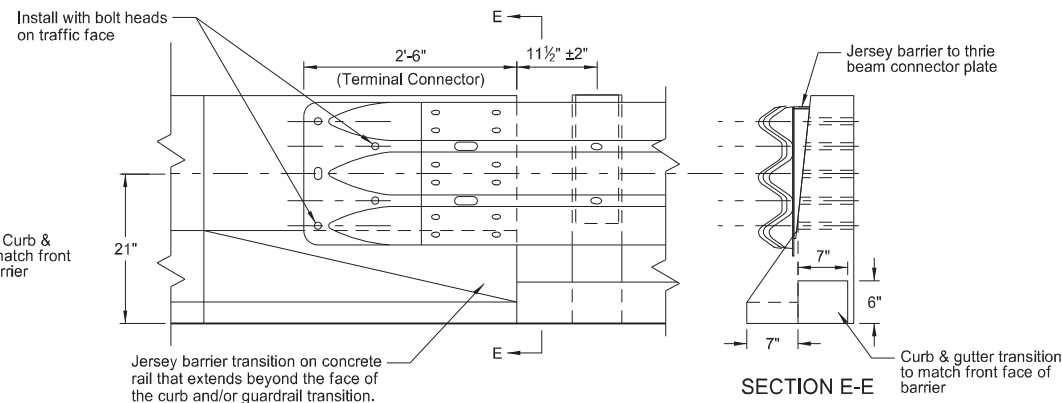
NON-SYMMETRICAL TRANSITION TO W-BEAM (10 GAUGE)



TRANSITION SECTIONS



CONNECTION TO CONCRETE SINGLE SLOPE BRIDGE RAIL AND TRAFFIC BARRIERS



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.

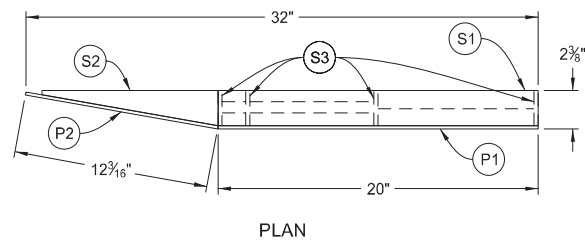
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.



12 02 2020

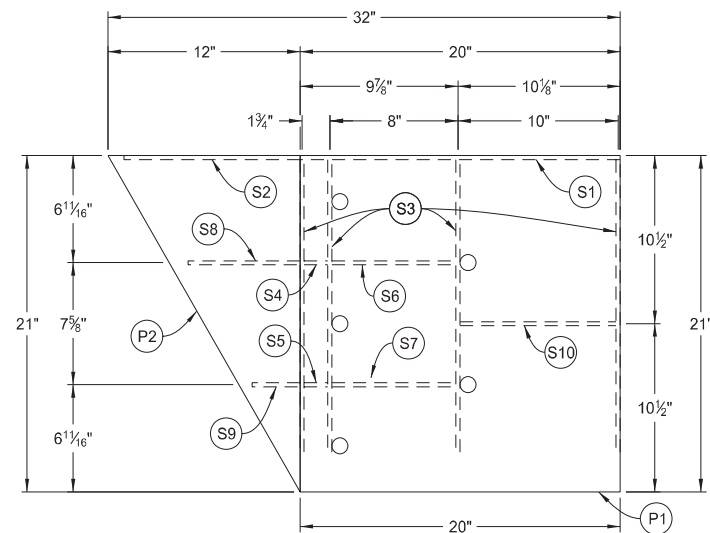
JERSEY BARRIER TO THRIE BEAM CONNECTOR PLATE DETAILS

D-764-62



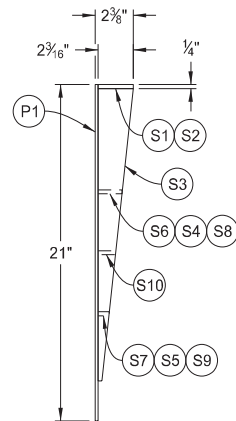
PLAN

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

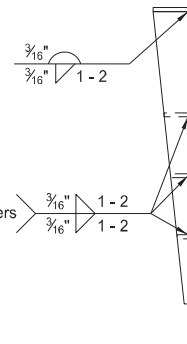


ELEVATION

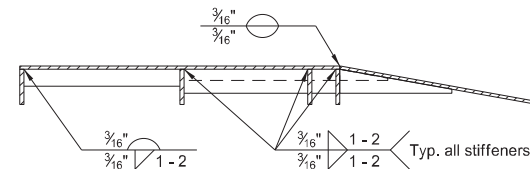
ASSEMBLY DETAIL (Front View)



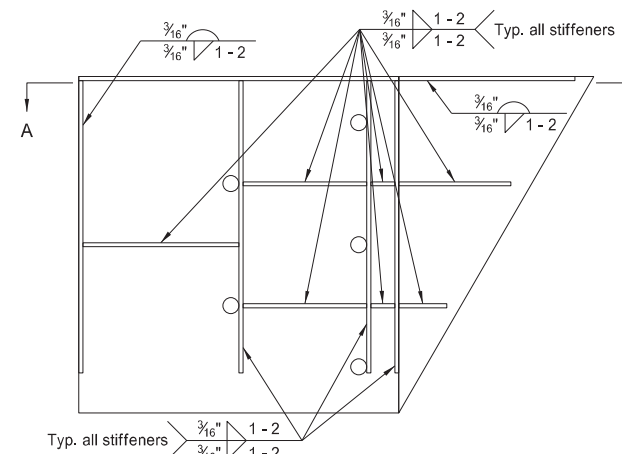
END



END



SECTION A-A

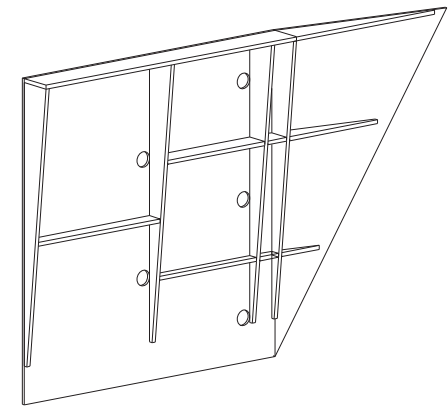


ELEVATION

WELDING DETAIL (Back View)

WELDING INSTRUCTIONS:

- (A) Weld stiffeners located on the outside edges of the cover plates as follows: $\frac{3}{16}$ " continuous back weld on exterior sides and $\frac{3}{16}$ " 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: $\frac{3}{16}$ " fillet weld 1" long spaced at 2" center-to-center.
- (C) Weld cover plates P1 and P2 together with a $\frac{3}{16}$ " continuous back weld on both sides.
- (D) Weld components with E60 rod.



PICTORIAL DRAWING (Showing Back of Connector Plate)

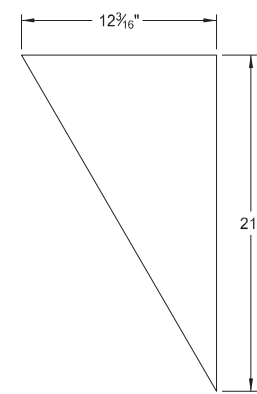


PLATE P2
Quantity: 1

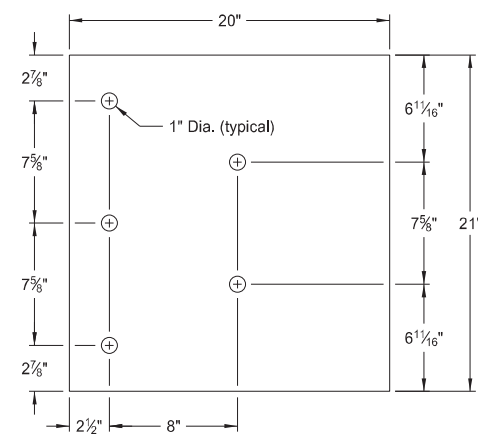
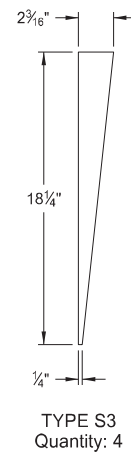


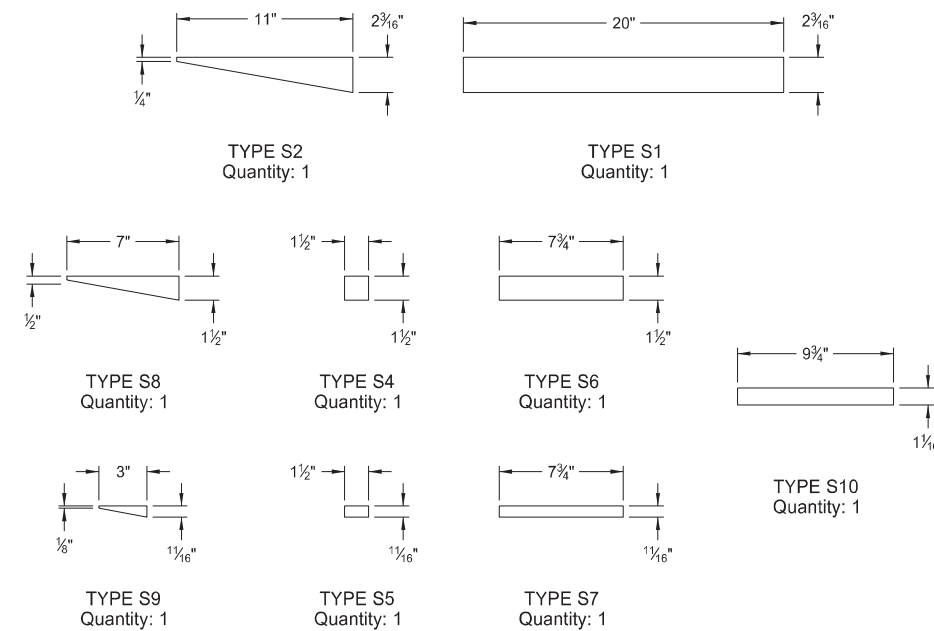
PLATE P1
Quantity: 1

COVER PLATES



TYPE S3
Quantity: 4

VERTICAL PLATES



HORIZONTAL PLATES

STIFFENER PLATES

NOTES:

1. Fabricate cover plates P1 and P2 from $\frac{3}{16}$ " thick ASTM A36 Grade structural steel.
2. Fabricate stiffener plates from $\frac{1}{4}$ " 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.

