

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	23636	1	1

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

IM-6-029(164)163

Walsh County
Various Structures - Grand Forks District

Deck Replacement & Joint Seal, Pipe Replacement & Slope Protection

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
IM-6-029(164)163	NA	NA

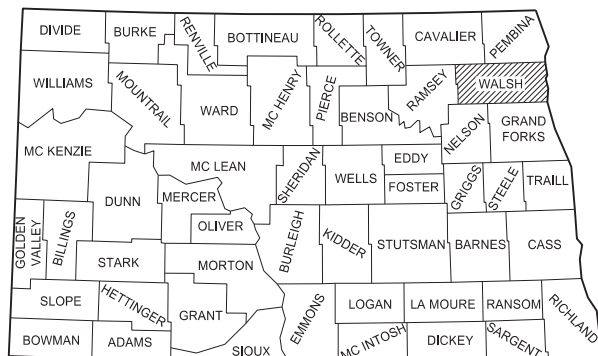
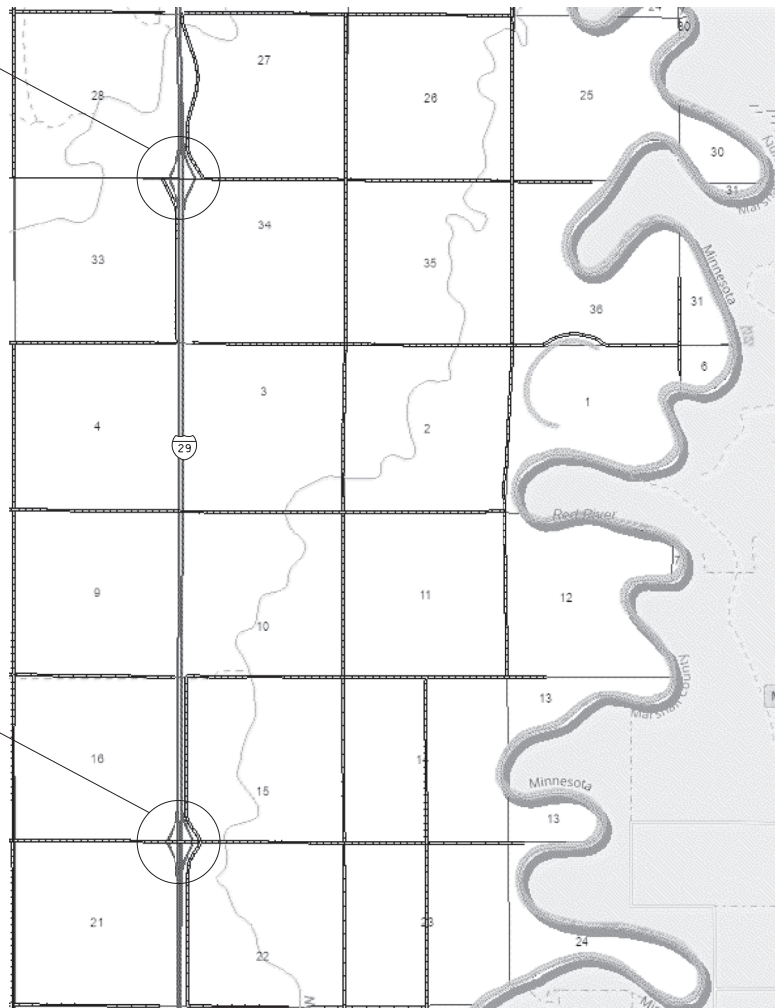


R.51 W.

Minto Interchange
Br. No. 29-167.722

T.156 N.
T.155 N.

Lake Ardoch Interchange
Br. No. 29-163.699



STATE COUNTY MAP

ND DEPARTMENT OF TRANSPORTATION
OFFICE OF PROJECT DEVELOPMENT

Jason Thorenson Jason Thorenson
09/11/23

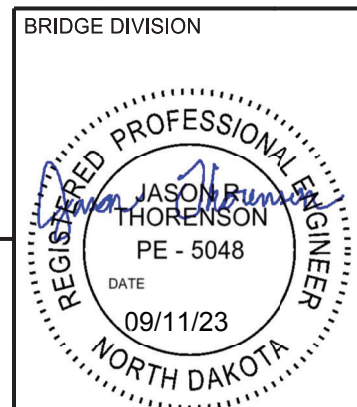


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D-754-22A	Typical Interchange Delineation
D-754-23	Perforated Tube Assembly Details
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D-900-1	Bridge Bench Marks

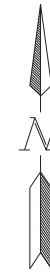
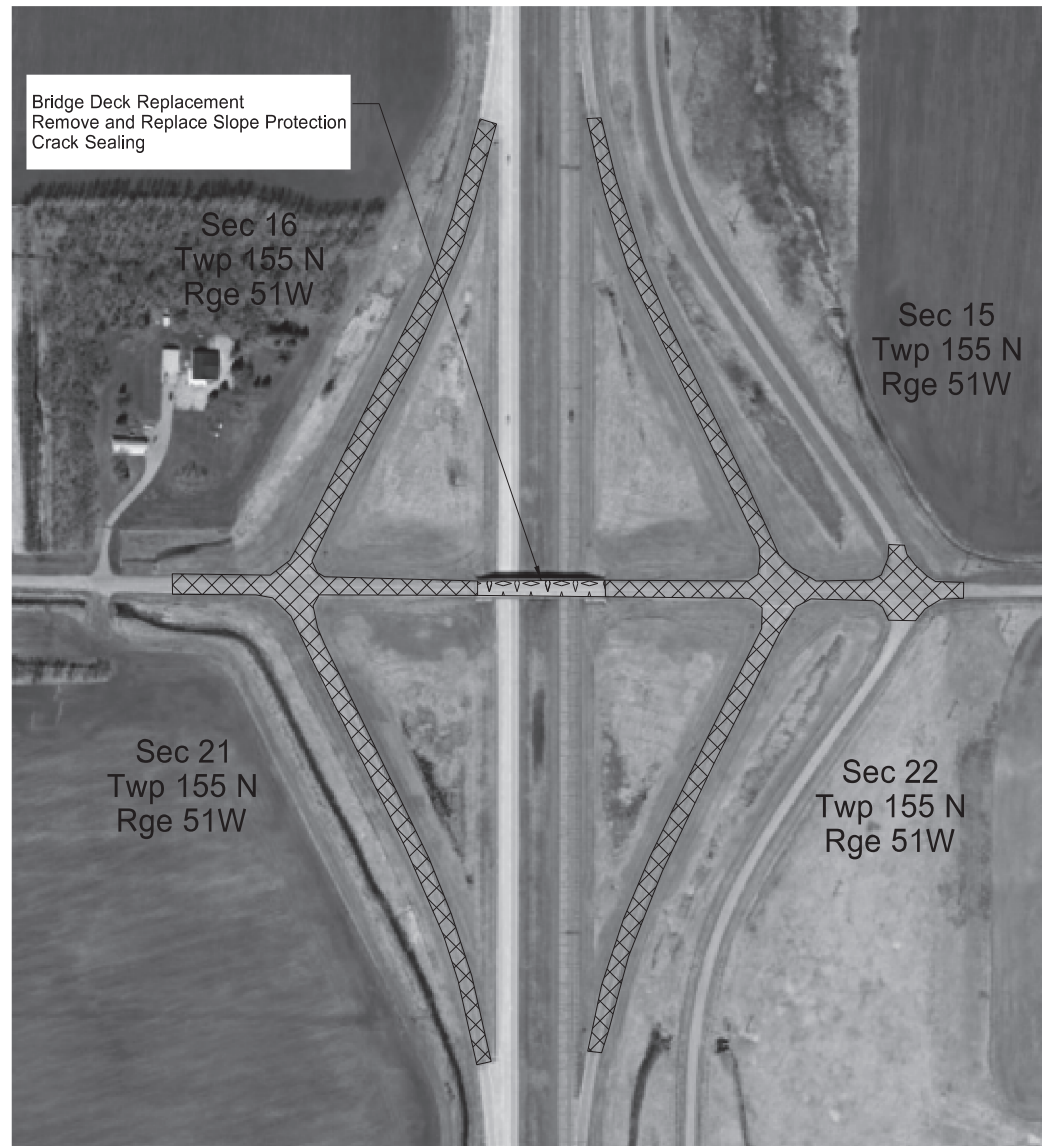
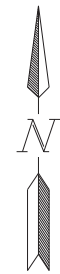
SPECIAL PROVISIONS




Number	Description
SSP 2	Federal Migratory Bird Treaty Act
SP 100(23)	Architectural Surface Finish
PSP 54(23)	Permits and Environmental Considerations

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Exit 164

Exit 168

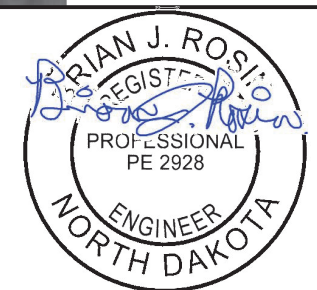


-  2" Mill and Overlay
-  Bridge Work
-  Pipe Replacement

Scope of Work

Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges



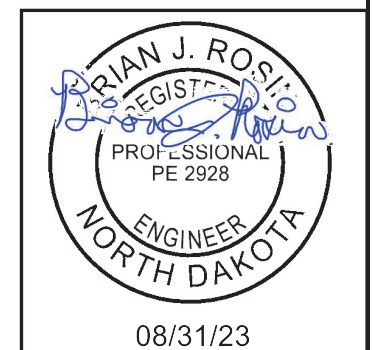
08/31/23

NOTES

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- 108-P01 WORK RESTRICTIONS: Complete all work on the pipe replacement during the crossroad closure for work on Bridge 29-167.722.
- 202-P01 REMOVAL OF BITUMINIOUS SURFACING: Include all costs to remove the existing bituminous surfacing and base in the price bid for "Removal of Bituminous Surfacing."
- 203-P01 EXCAVATION: Include all costs for excavation required to maintain traffic during pipe replacement and embankment to restore the roadway profile in the price bid for "PIPE CONC REINF 60IN CL III."
- 216-P01 WATER: Include all costs for water in the price bid for "AGGREGATE BASE COURSE CL 5."
- 430-P01 FAA SUPERPAVE 43: Include all cost to place prime coat and blotter material CL 44 in the contract unit price for "FAA SUPERPAVE 43".
- 430-P02 PAVEMENT PATCHING AT ABUTMENTS: Place the aggregate base and 5½" HMA at the abutments (detailed on the Patching, Milling, and Paving at Bridge Ends sheet) prior to milling and overlaying the crossroad at each interchange.
- 704-200 STATE FURNISHED MEDIAN BARRIER: Obtain (93) 22.5" x 12.5' concrete barriers. They can be picked up and returned to the Grand Forks District yard at 1951 N Washington in Grand Forks ND 58201. Contact the Grand Forks District office at 701-787-6500 to facilitate the exchanges.
- Section 704.04 J "Precast Concrete Median Barrier (State Furnished)" applies to the contract item "State Furnished Median Barrier".
- Payment for the State Furnished Median Barrier will follow Section 704.06 D "Precast Concrete Median Barrier (State Furnished)". Include all costs associated with median barriers in the contract unit price for "State Furnished Median Barrier".

- 704-450 LANE CLOSURE - SIGNAL CONTROL/FLAGGING CONTROL: Install either the signal controlled lane closure on Standard D-704-16 or the flagging controlled lane closure on Standard D-704-17.
- Obtain an electrical source for traffic signals. Solar powered signals may be used. Place generators a minimum of 60 feet from the roadway centerline unless the generator and signal are part of a trailer mounted unit.
- Place utility poles and equipment a minimum of 60 feet from the roadway centerline and place power conductors a minimum of 6 inches below the ground surface. Remove poles after they are no longer necessary.
- The Engineer will measure individual traffic control devices, other than the signal system and flaggers, shown on the standards. Payment will be made at the respective contract unit price.
- Include the cost of either a traffic signal system or flaggers in the contract unit price for "Lane Closure – Signal Control/Flagging Control".
- 704-511 OBLITERATION OF PAVEMENT MARKINGS: Mask pavement markings designated for obliteration as specified in Section 704.04 N.2, "Masking".
- 704-P01 TRAFFIC CONTROL: Traffic control quantities are based on using two active lane closures on I-29 mainline and one lane closure on the crossroad.
1. Standard D-704-18 – used for interstate lane closure;
 2. Standard D-704-35 – used for ramp access during interstate lane closure;
 3. Sheet 100-2 and 100-3 – used for pipe installation;
 4. Sheets 100-4 through 100-12 – used for crossroad detours.
- 704-P02 BRIDGE DETOUR RESTRICTIONS: Complete all bridge work and remove all detour traffic control on the first bridge before beginning work on the second bridge.



NOTES

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SECTION 130

748-P01 CURB & GUTTER – TYPE 1 SPECIAL: Install curb and gutter at the Lake Ardoch Interchange Crossroad, RP 163.699, and the Minto Interchange Crossroad, RP 167.722 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.”



ENVIRONMENTAL NOTES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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ENVIRONMENTAL NOTES (EN): The North Dakota Department of Transportation and the Federal Highway Administration has made environmental commitments to secure approval of this project. The following environmental notes are requirements to comply with these commitments:

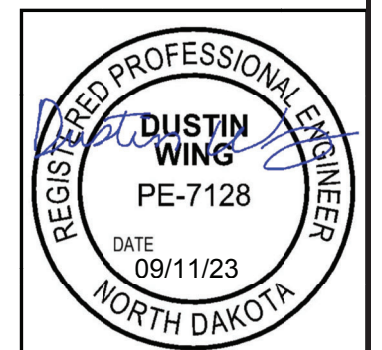
EN-1 THREATENED AND ENDANGERED SPECIES: The project is located near/within suitable habitat for the species listed in the following table.

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

*Time frames can differ slightly, depending on the year

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

EN-2 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	0111 REMOVAL OF CONCRETE	L SUM	1	1
202	0132 REMOVAL OF BITUMINOUS SURFACING	SY	497	497
202	0169 REMOVAL OF END SECTION-ALL TYPES & SIZES	EA	6	6
202	0174 REMOVAL OF PIPE ALL TYPES AND SIZES	LF	539	539
203	0113 COMMON EXCAVATION-WASTE	CY	78	78
210	0102 CLASS 1 EXCAVATION-SITE 1	L SUM	1	1
210	0103 CLASS 1 EXCAVATION-SITE 2	L SUM	1	1
251	0200 SEEDING CLASS II	ACRE	0.37	0.37
251	2000 TEMPORARY COVER CROP	ACRE	0.37	0.37
253	0101 STRAW MULCH	ACRE	0.74	0.74
255	0102 ECB TYPE 2	SY	124	124
261	0112 FIBER ROLLS 12IN	LF	1,174	1,174
302	0050 TRAFFIC SERVICE AGGREGATE	TON	240	240
302	0120 AGGREGATE BASE COURSE CL 5	TON	280	280
401	0050 TACK COAT	GAL	1,294.2	1,294.2
401	0070 FOG SEAL	GAL	1,234.5	1,234.5
411	0100 MILLING PAVEMENT SURFACE	TON	2,682	2,682
430	0043 SUPERPAVE FAA 43	TON	2,894	2,894
430	1000 CORED SAMPLE	EA	35	35
430	5815 PG 58S-34 ASPHALT CEMENT	TON	173.5	173.5
602	0130 CLASS AAE-3 CONCRETE	CY	542.4	542.4
602	1250 PENETRATING WATER REPELLENT TREATMENT	SY	1,700	1,700
612	0115 REINFORCING STEEL-GRADE 60	LBS	1,776	1,776
612	0116 REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS	140,024	140,024
702	0100 MOBILIZATION	L SUM	1	1
704	0100 FLAGGING	MHR	100	100
704	1000 TRAFFIC CONTROL SIGNS	UNIT	3,908	3,908
704	1018 LANE CLOSURE-SIGNAL CONTROL/FLAGGING CONTROL	EA	1	1
704	1041 ATTENUATION DEVICE-TYPE B-55	EA	2	2
704	1045 ATTENUATION DEVICE-TYPE B-75	EA	2	2
704	1052 TYPE III BARRICADE	EA	14	14
704	1060 DELINEATOR DRUMS	EA	140	140

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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SPEC CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
-----	-----	-----	-----	-----
704	1067 TUBULAR MARKERS	EA	119	119
704	1087 SEQUENCING ARROW PANEL-TYPE C	EA	2	2
704	1500 OBLITERATION OF PAVEMENT MARKING	SF	400	400
704	3511 STATE FURNISHED MEDIAN BARRIER	LF	1,160	1,160
706	0550 BITUMINOUS LABORATORY	EA	1	1
706	0600 CONTRACTOR'S LABORATORY	EA	1	1
709	0100 GEOSYNTHETIC MATERIAL TYPE G	SY	530	530
714	1310 PIPE CONC REINF 60IN CL III	LF	320	320
714	3055 END SECT-CONC REINF 60IN	EA	4	4
748	0141 CURB & GUTTER-TYPE 1 SPECIAL	LF	120	120
754	0110 FLAT SHEET FOR SIGNS-TYPE XI REFL SHEETING	SF	38	38
754	0168 DELINEATORS-TYPE D	EA	2	2
754	0206 STEEL GALV POSTS-TELESCOPING PERFORATED TUBE	LF	46	46
762	0420 SHORT TERM 4IN LINE-TYPE R	LF	16,800	16,800
762	0426 SHORT TERM 24IN LINE-TYPE R	LF	24	24
762	0430 SHORT TERM 4IN LINE-TYPE NR	LF	23,660	23,660
762	0436 SHORT TERM 24IN LINE-TYPE NR	LF	390	390
762	1104 PVMT MK PAINTED 4IN LINE	LF	32,212	32,212
762	1124 PVMT MK PAINTED 24IN LINE	LF	195	195
764	0131 W-BEAM GUARDRAIL	LF	466	466
764	0145 W-BEAM GUARDRAIL END TERMINAL	EA	8	8
764	0151 REMOVE W-BEAM GUARDRAIL & POSTS	LF	691	691
764	2081 REMOVE END TREATMENT & TRANSITION	EA	8	8
930	3000 BRIDGE BENCH MARKS	SET	2	2
930	7012 ROADWAY CANOPY	L SUM	1	1
930	8686 AGGREGATE SLOPE PROTECTION	SY	792	792
930	9223 CRACK SEALING	LF	6	6

BID ITEM	UNIT	West Exit 164 - Crossroad		East Exit 164 - Crossroad		West Exit 168 - Crossroad		East Exit 168 - Crossroad		Pipe Replacement	
		Width (ft)	Quantity at location	Width (ft)	Quantity at location	Width (ft)	Quantity at location	Width (ft)	Quantity at location	Width (ft)	Quantity at location
Aggregate Base Course CL 5 @ 1.5 Ton/CY +25%	TON	-	-	-	-	-	-	-	-	30	155
Removal of Bituminous Surfacing	SY	-	-	-	-	-	-	-	-	26	497
Tack Coat @ 0.05 Gal/SY (Top Lift)	GAL	27.5	96.9	27.5	96.9	27.5	70.4	27.5	96.7	28	25.2
Fog Seal @ 0.05 Gal/SY	GAL	26	91.6	26	91.6	26	66.6	26	91.4	26	24.8
Milling Pavement Surface	TON	26	202	26	202	26	146	26	201	-	-
Superpave FAA 43 @ 2 Ton/CY (Top Lift)	TON	26	204	26	204	26	148	26	203	26	69
Superpave FAA 43 @ 2 Ton/CY (Bottom Lift)	TON	-	-	-	-	-	-	-	-	28	89
PG 58S-28 Asphalt Cement @ 6% HMA	TON	-	12.2	-	12.2	-	8.9	-	12.2	-	9.5
Prime Coat @ 0.35 Gal/SY*	GAL	-	-	-	-	-	-	-	-	17	107.1
Blotter Material CL 44* @ 20 lb/SY	TON	-	-	-	-	-	-	-	-	17	3.1

*For estimating purposes only - not to be bid separately.

BID ITEM	UNIT	West Exit 164 - Ramps		East Exit 164 - Ramps		West Exit 168 - Ramps		East Exit 168 - Ramps		Guardrail Exit 164		Guardrail Exit 168		Total Quantity
		Width (ft)	Quantity at location	Width (ft)	Quantity at location	Width (ft)	Quantity at location	Width (ft)	Quantity at location	Width (ft)	Quantity at location	Width (ft)	Quantity at location	
Aggregate Base Course CL 5 @ 1.5 Ton/CY +25%	TON	-	-	-	-	-	-	-	-	Varies	46	Varies	63	280
Removal of Bituminous Surfacing	SY	-	-	-	-	-	-	-	-	-	-	-	-	497
Tack Coat @ 0.05 Gal/SY (Top Lift)	GAL	23	229.9	23	226.8	23	224.8	23	226.6	-	-	-	-	1,294.2
Fog Seal @ 0.05 Gal/SY	GAL	22	219.9	22	216.9	22	215.0	22	216.7	-	-	-	-	1,234.5
Milling Pavement Surface	TON	22	489	22	482	22	478	22	482	-	-	-	-	2,682
Superpave FAA 43 @ 2 Ton/CY (Top Lift)	TON	22	489	22	482	22	478	22	482	Varies	16	Varies	22	2,805
Superpave FAA 43 @ 2 Ton/CY (Bottom Lift)	TON	-	-	-	-	-	-	-	-	-	-	-	-	89
PG 58S-28 Asphalt Cement @ 6% HMA	TON	-	29.3	-	28.9	-	28.7	-	28.9	-	1.0	-	1.3	173.5
Prime Coat @ 0.35 Gal/SY*	GAL	-	-	-	-	-	-	-	-	-	-	-	-	107.1
Blotter Material CL 44 @ 20 lb/SY*	TON	-	-	-	-	-	-	-	-	-	-	-	-	3.1
Common Excavation-Waste	CY	-	-	-	-	-	-	-	-	Varies	33	Varies	45	78


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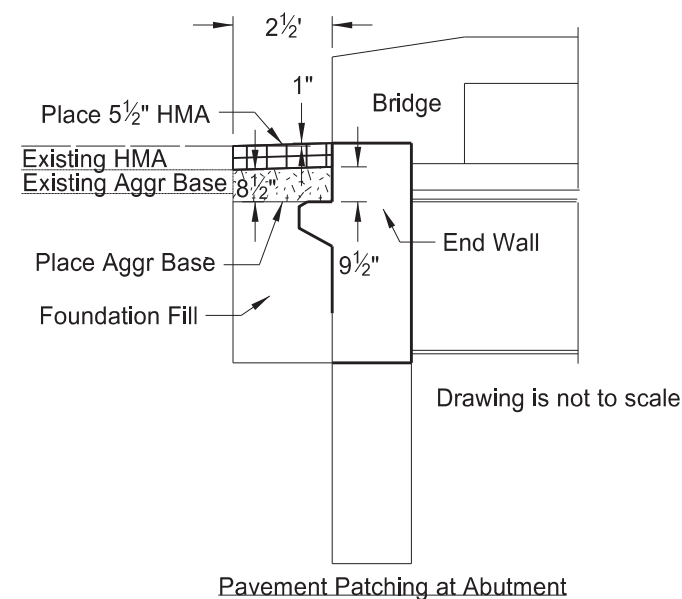
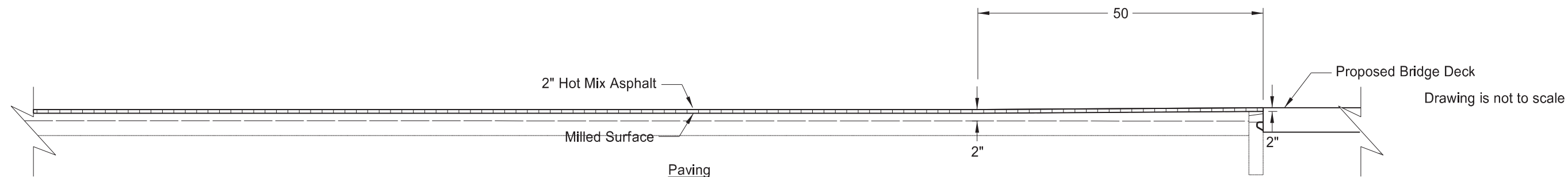
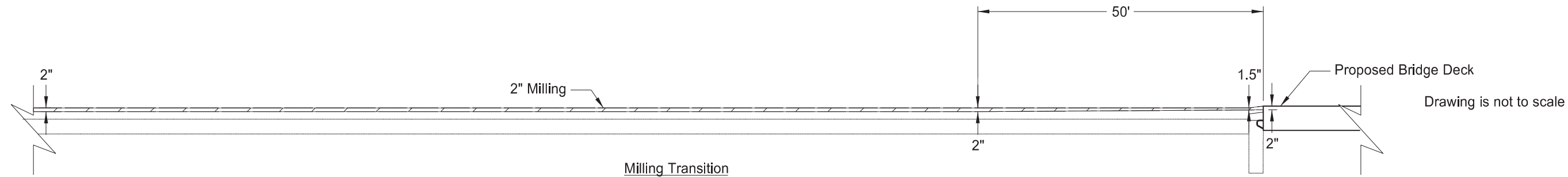
Permanent Pavement Marking		
Exit 164		
Location - Type	Basis	Quantity (LF)
Centerline - Pvmnt MK 4IN Line	Barrier Stripe	3000
Edge Line - Pvmnt MK 4IN Line	Outside Edge (White)	6574
Edge Line - Pvmnt MK 4IN Line	Inside Edge (Yellow)	3574
Pvmnt MK 24IN Line	Stop Bar (White)	100
Exit 168		
Centerline - Pvmnt MK 4IN Line	Barrier Stripe	3000
Edge Line - Pvmnt MK 4IN Line	Outside Edge (White)	6532
Edge Line - Pvmnt MK 4IN Line	Inside Edge (Yellow)	3532
Pvmnt MK 24IN Line	Stop Bar (White)	95

Short Term 4IN - NR		
Location	Basis	Quantity (LF)
Centerline - Milled Surface	Barrier Stripe	4724
Edgeline - Milled Surface Ramps	Outside Edge (White)	7106
Centerline - Top of Final Lift	Barrier Stripe	4724
Edgeline - Top of Lift Ramps	Outside Edge (White)	7106
Short Term 4IN - R		
Traffic Control Standards	Barrier Stripe	16800
Short Term 24IN - NR		
Milled Surface	Stop Bar (White)	195
Top Lift	Stop Bar (White)	195
Short Term 24IN - R		
Lane Closure - Traffic Control Signals	Stop Bar (White)	24

HMA Cored Samples							
Specification Section	A	B		C	Quantity (A x B x C)	Quantity (1 per mile)	Unit
	Distance (Ft)/1000	Lanes	Joints	Lifts			
430.04 I.2.b(2), "Pavement Density Cores" - Ramps	8	2	N/A	1	16	N/A	EA
430.04 I.2.b(2), "Pavement Density Cores" - Crossroad	2	2	N/A	1	4	N/A	EA
430.04 I.2.b(2), "Pavement Density Cores" - Pipe Removal Bottom Lift	1	2	N/A	1	2	N/A	EA
SSP 4 Longitudinal Joint Density in HMA Pavements (Centerline)	11	N/A	1	1	11	N/A	EA
430.04 I.2.b(3), "Pavement Thickness Determination"					N/A	2	EA
Totals					33	2	EA

Water
25 MGal/Mile for Dust Palliative
20 Gal/Ton for Aggregates
10 Gal/CY for Embankment

Basis of Estimate	
Bridge Deck Replacement Pipe Replacement	
Minto and Lake Ardoch Interchanges	
08/31/23	



		Width (ft)	Each Location	Total
Aggregate Base Course CL 5 @ 1.5 Ton/CY +25%	TON	30	4	16
Superpave FAA 43 @ 2 Ton/CY (Top Lift)	TON	26	2	8
PG 58S-28 Asphalt Cement @ 6% HMA	TON	-	0.1	0.4

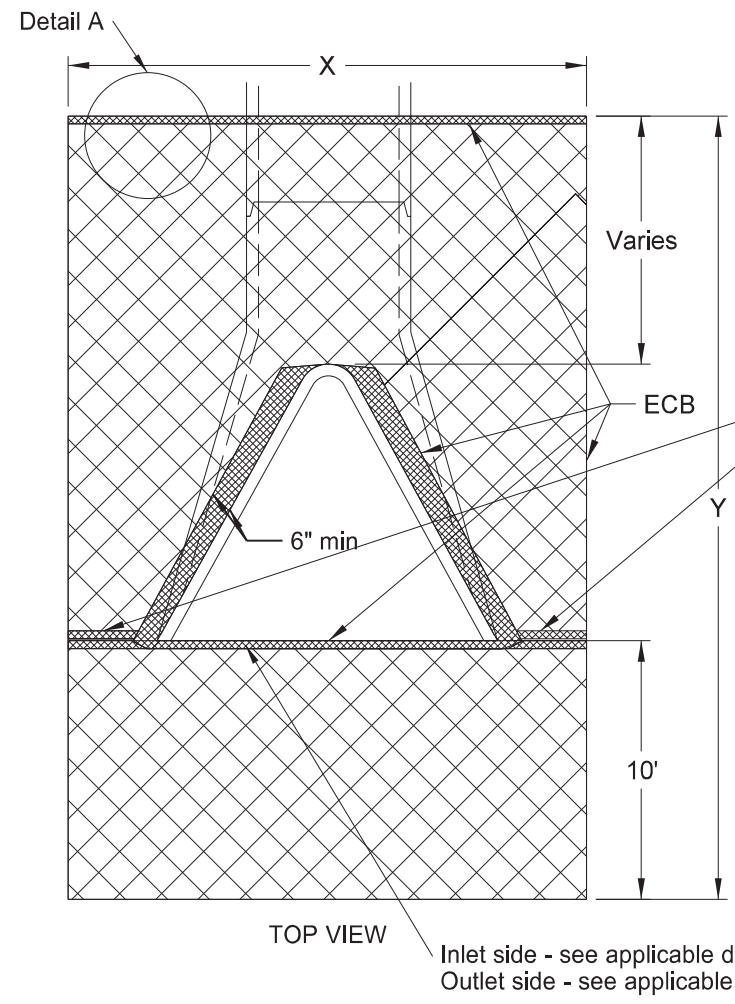
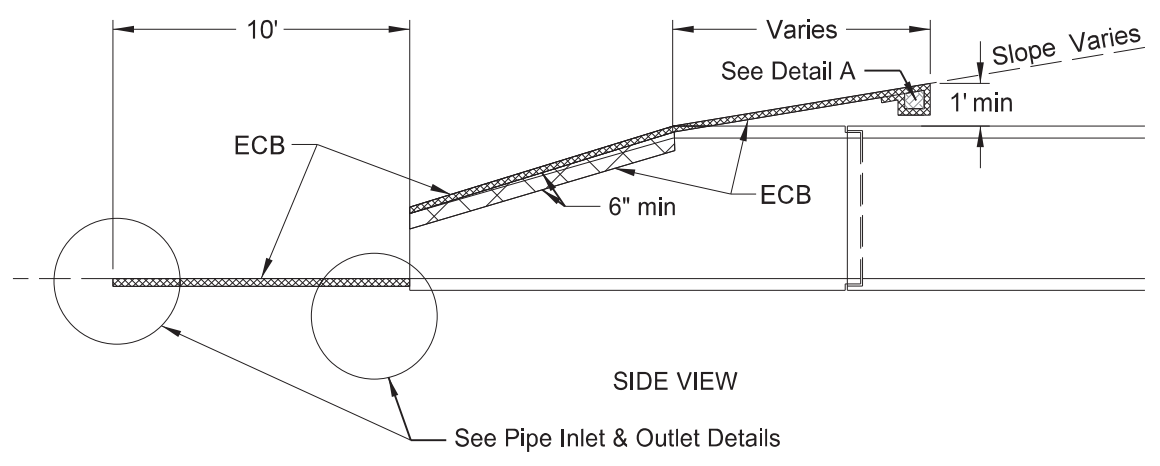
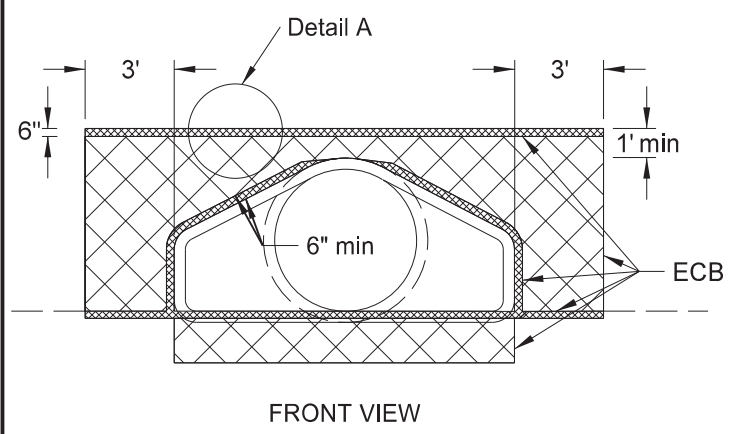


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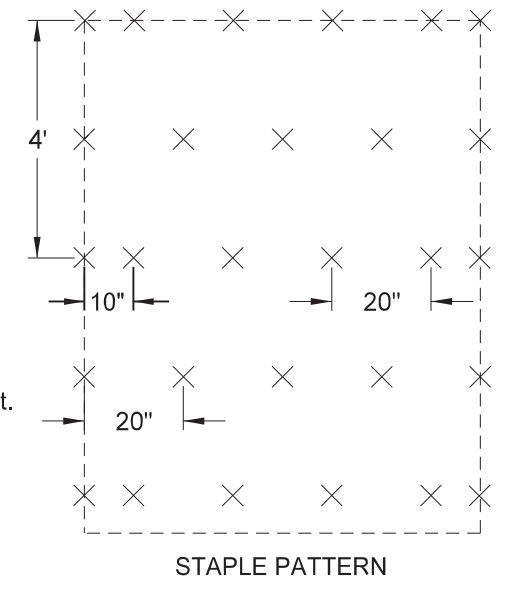
Patching, Milling, and Paving at Bridge Ends
Exit 164 and Exit 168

Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges



Tuck this end a minimum of 6" into the embankment.



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

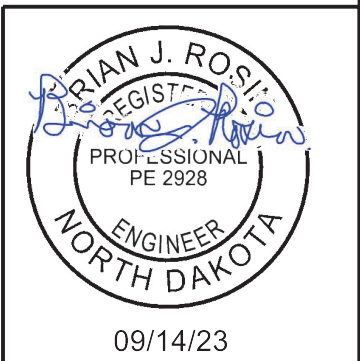
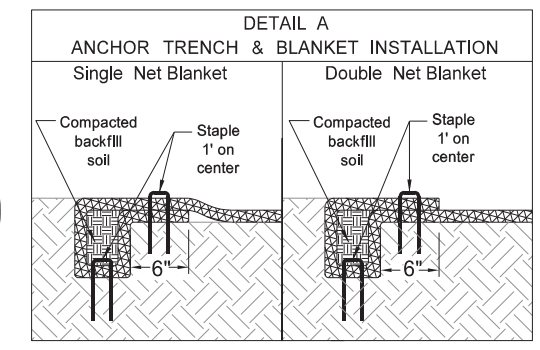
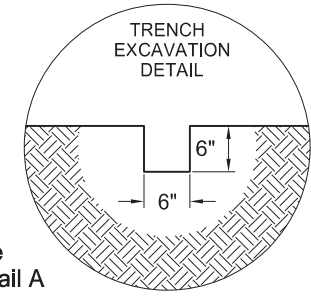
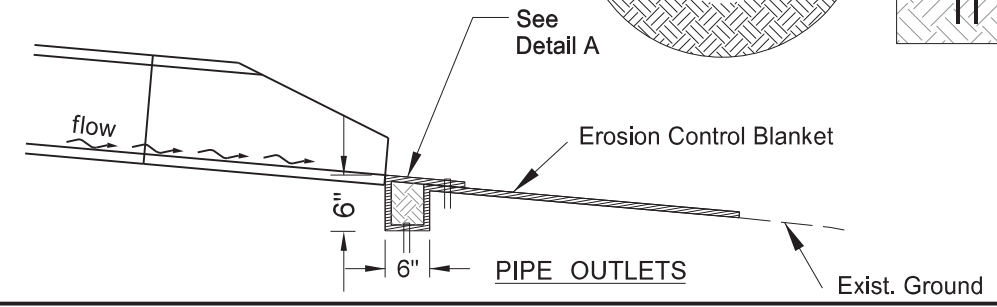
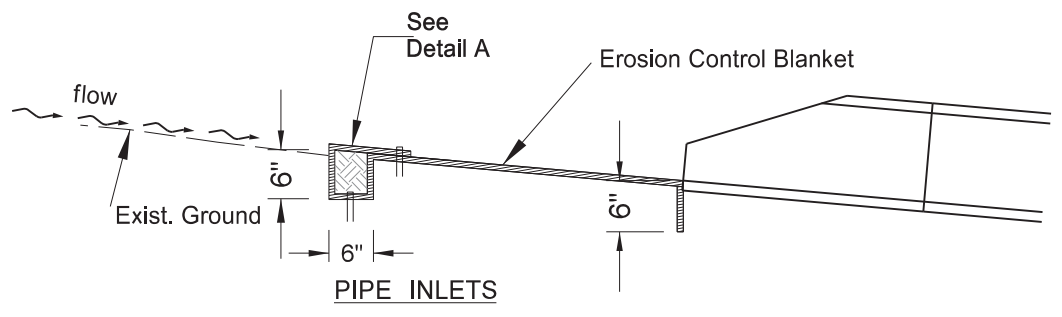
Note: Quantities based on 8:1 slope.

Erosion Control Blanket (ECB)								
Location to be Protected Station	Culvert Type Appr/CL	Pipe Diam (Inch)	No	Unit Quantity (SY)	Total Quantity			
					Type 1 (SY)	Type 2 (SY)	Type 3 (SY)	Type 4 (SY)
10+57 LT	CL	60	1	30	0	30	0	0
10+57 RT	CL	60	1	30	0	30	0	0
10+74 LT	CL	60	1	30	0	30	0	0
10+74 RT	CL	60	1	30	0	30	0	0
Total (SYs)					0	124	0	0

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

Note: Quantities based on 6:1 slope. Note: Quantities based on 4:1 slope.

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

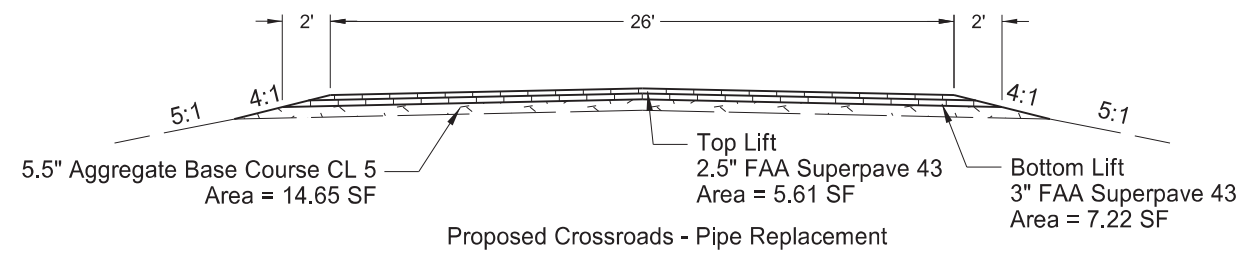
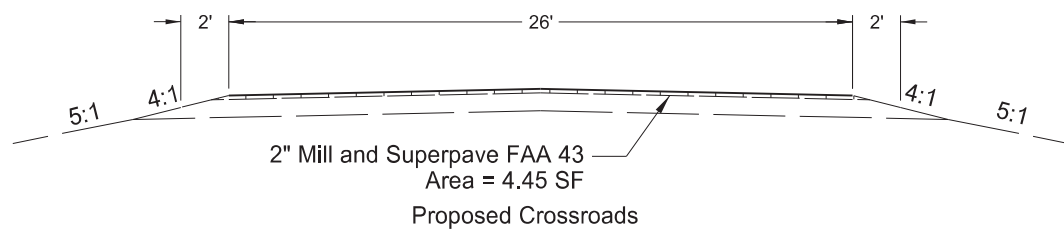
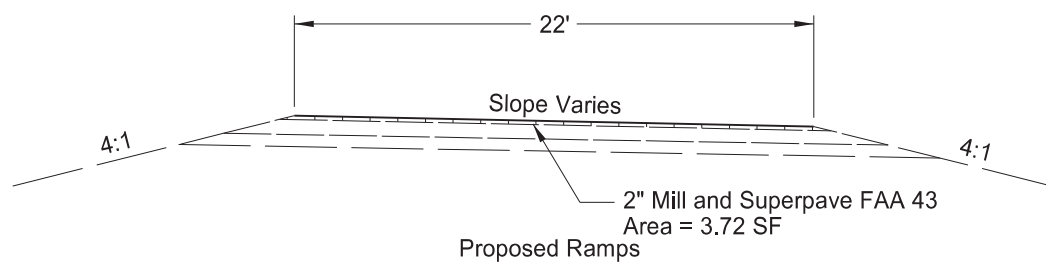
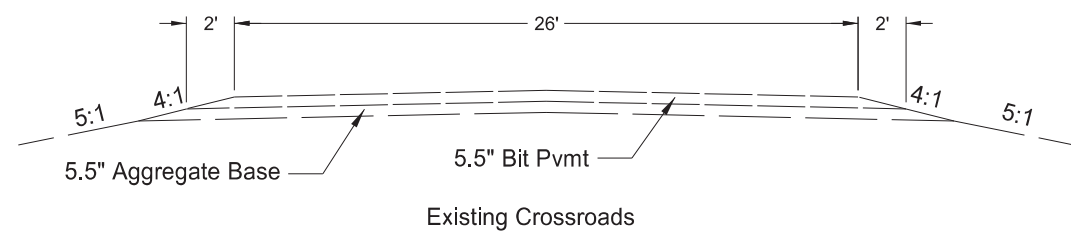
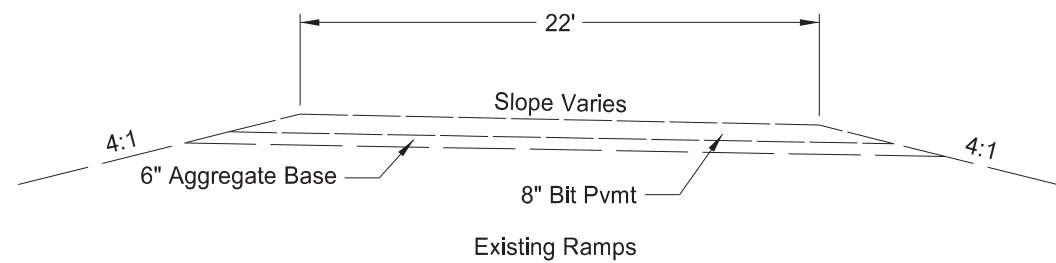


Erosion Control at Culvert Flared End Sections
Minto Interchange

Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardock Interchanges

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(164)163	30	1



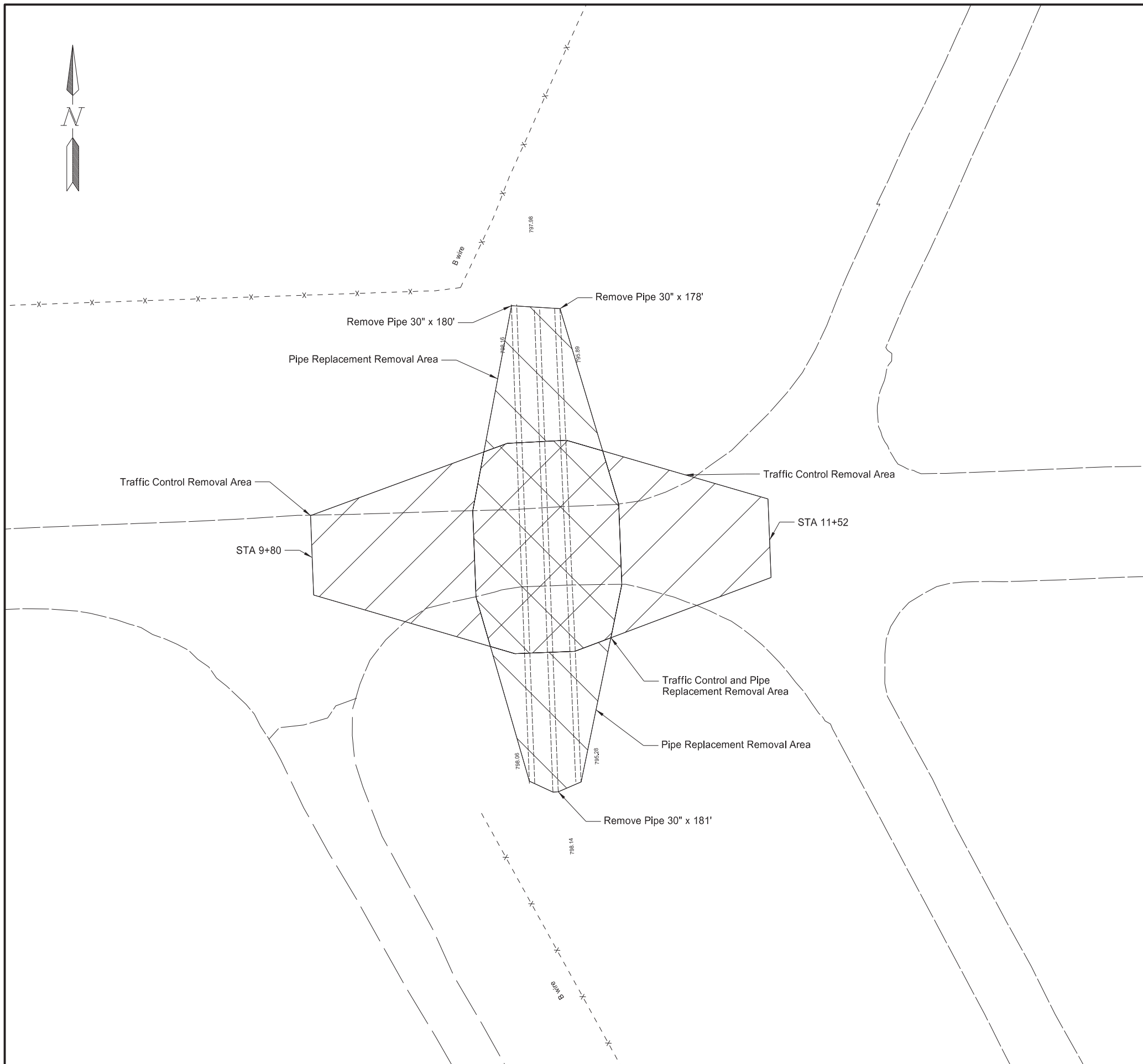
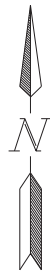
Typicals
Exit 164 and Exit 168

Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges

BRIAN J. ROSE
REGISTERED
PROFESSIONAL
ENGINEER
PE 2928
NORTH DAKOTA

08/31/23



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	40	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	132	REMOVAL OF BITUMINOUS SURFACING	SY	665
202	169	REMOVAL OF END SECTION-ALL TYPES & SIZES	EA	6
202	174	REMOVAL OF PIPE ALL TYPES AND SIZES	LF	539

Removals - Exit 168

Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges

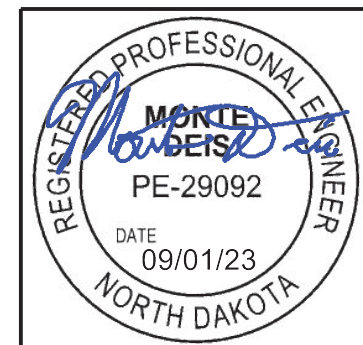


08/31/23

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(164)163	50	1

HYDRAULIC DATA FOR IM-6-029(164)163 (A)									
STATION	EXISTING PIPE	PROPOSED PIPE SIZE	DRAINAGE AREA (ACRES)	25-YEAR DATA				100-YEAR DATA	
				DESIGN DISCHARGE (CFS)	DESIGN HEADWATER (FT)	DESIGN VELOCITY (FPS)	DESIGN STAGE (NAVD 88)	100-YEAR DISCHARGE (CFS)	100-YEAR STAGE (NAVD 88)
10+70	TPL 30" RCP	DBL 60"	1165.4	226.6	5.78	7.20	803.53	330.1	804.40

(A) Hydraulic data provided is for smooth-walled (Manning's n=0.012) type conduits.



Culvert Hydraulic Data
 I-29 Lake Ardoch and Minto Interchanges
 Structures 0029-163.699, 0029-167.722

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(164)163	51	1


Begin Station / Location	Begin Offset	End Station / Location	End Offset	Pipe Installation (Pay Item)		Allowable Material	Required Diameter	Steel Pipe Coatings	Steel Pipe Corrugations or Spiral Ribs	Steel Pipe Minimum Thickness	Geosynthetic Material - Type G (Pay Item)	(*) End Sections		Applicable Backfill
				In	LF							Begin	End	
				In	Bid Item	LF	In	Type		In	SY	EA	EA	
10+64	81' Lt	10+64	79' Rt	60	PIPE CONC REINF 60IN CL III	160'	60				265	FES	FES	Standard D-714-25M
10+75	81' Lt	10+75	79' Rt	60	PIPE CONC REINF 60IN CL III	160'	60				265	FES	FES	Standard D-714-25M

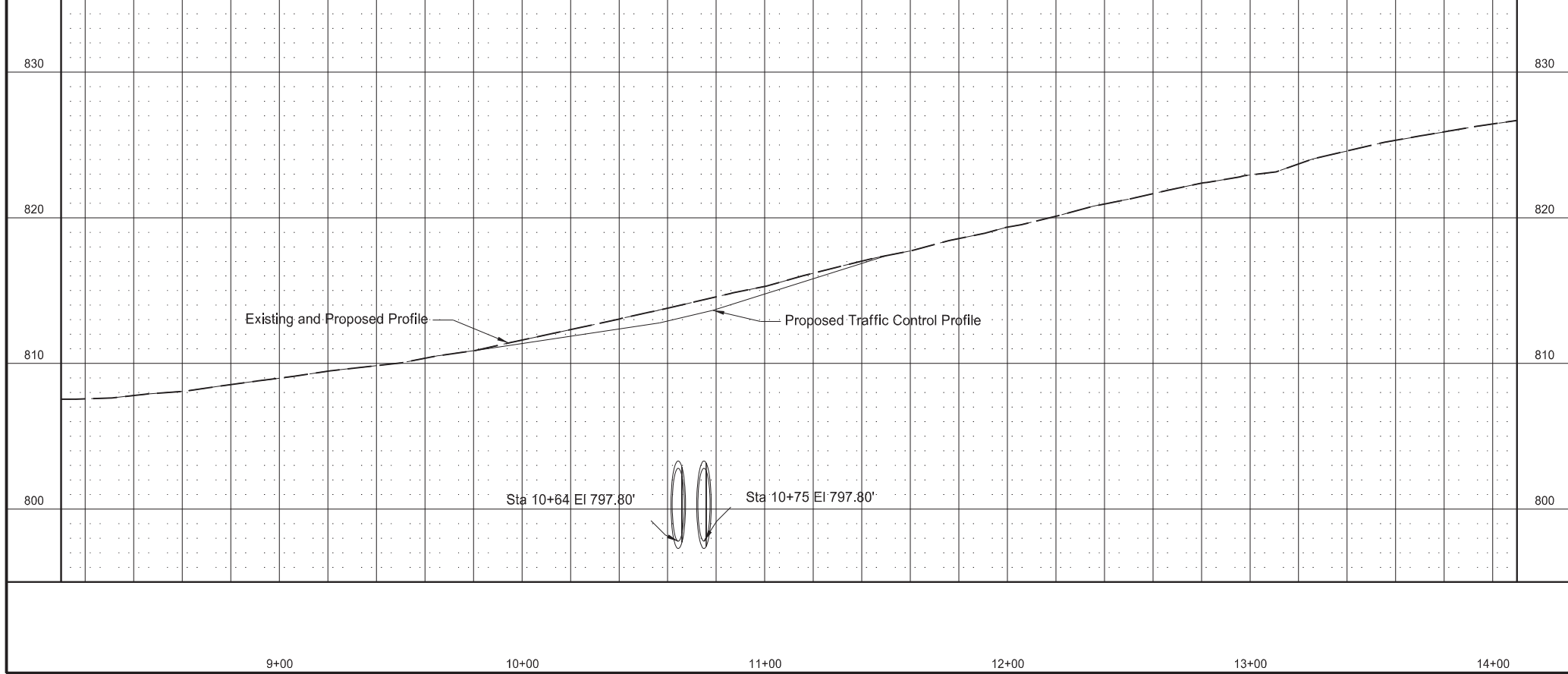
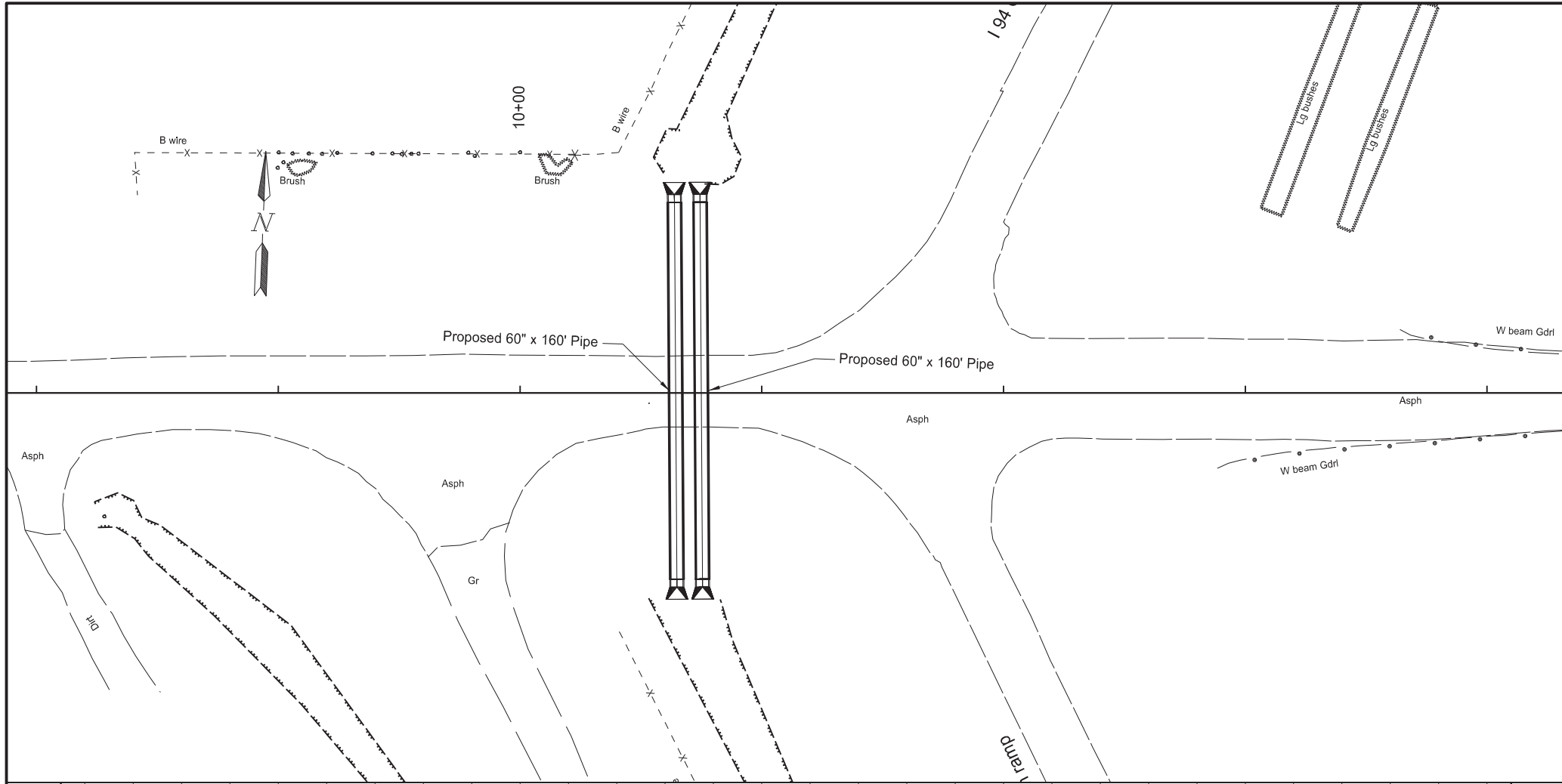
Corrugations: 2 = 2-2/3"x1/2"
3 = 3"x1"
5 = 5"x1"

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

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

(*) End sections are measured and paid for separately for pipe extensions.
FES = Flared End Section
TES = Traversable End Section

Pipe List Exit 168 Bridge Deck Replacement Pipe Replacement Minto and Lake Ardoch Interchanges	 08/31/23
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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	60	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
714	1310	PIPE CONC REINF 60IN CL III	LF	320
714	3055	END SECT-CONC REINF 60IN	EA	4

Plan and Profile
Exit 168



Pipe Replacement
Minto and Lake Ardoch Interchanges


08/31/23

Wetland Impact Table																						
Wetland Number	Location	Wetland Type	Wetland Feature	USACE Jurisdictional Wetlands	Wetland Impacts Acre(s)			USFWS Easement Impacts Acre(s)		Wetland Mitigation												
					Temp.	Perm. (Fill/Drain)	Perm. (Cut)	Temp.	Perm.	Mitigation Required			USACE/11990 Bank		11990 Bank		USFWS Bank		Onsite			
										EO 11990	USACE	USFWS	Location	Acre(s)	Location	Acre(s)	Location	Acre(s)	Mitigation Location; Ratio	Acre(s)	Constructed Site #	Constructed Size Acre(s)
1	SE 1/4 S28 T156N R51W	Created	Ditch	YES	0.018	0.000																
2	NE 1/4 S33 T156N R51W	Created	Ditch	YES	0.011	0.000																
Totals					0.029	0.000																

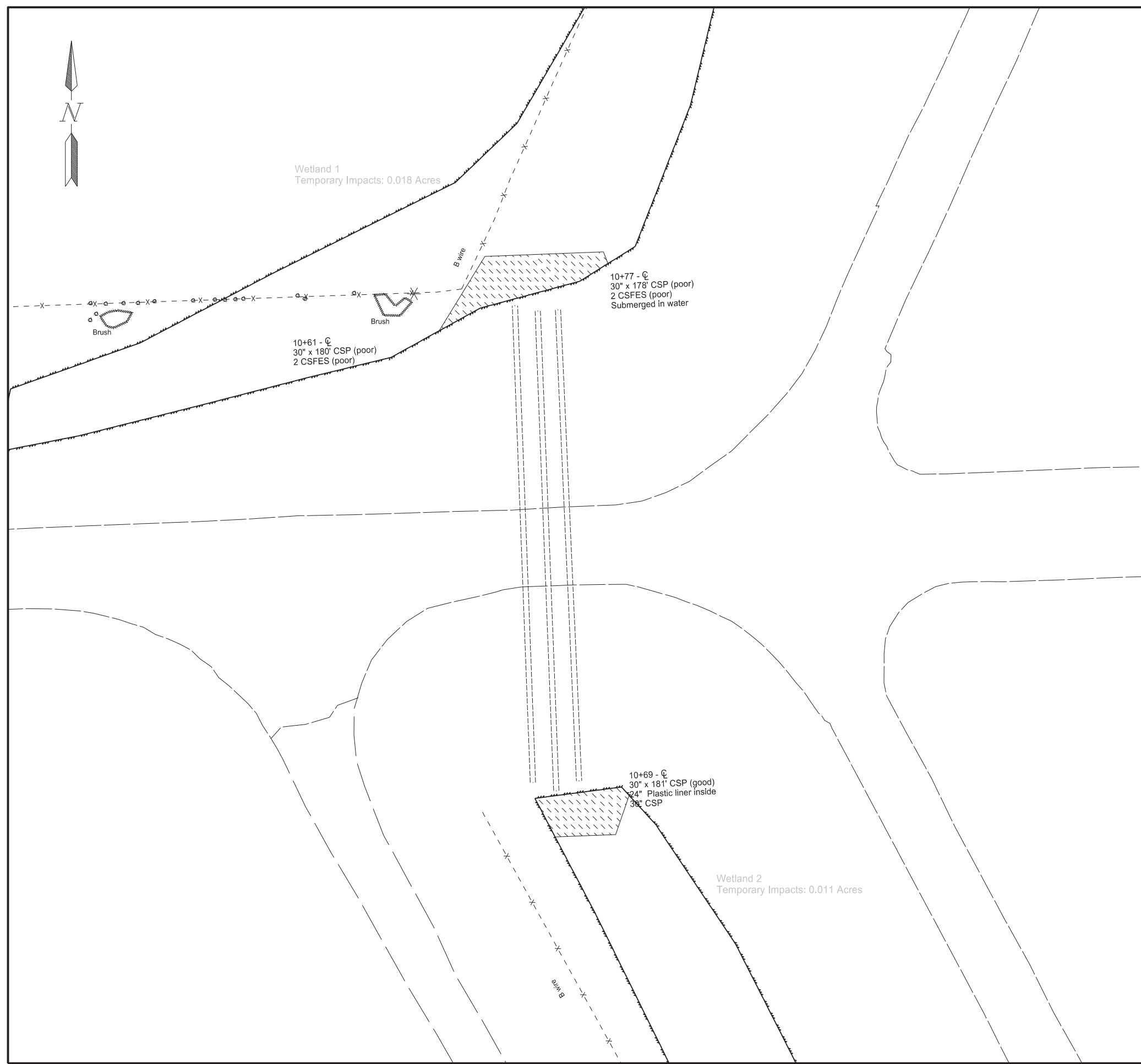
* Waters assume jurisdictional for permitting purposes

Impact Summary Table			
Wetland Type	Permanent Summary Total (Acres)	Temporary Impacts and additional information	
		Wetland Type	Total (Acres)
Natural/JD (Fill/Drain)	0.000	Temporary JD	0.029
Natural/Non-JD	0.000	Non-JD Temporary	0.000
Created/JD (Fill/Drain)	0.000	Permanent JD > 0.10	0.000
Created /Non-JD (Fill/Drain))	0.000	Permanent OW	0
Total	0.000	Temporary OW	0
JD Natural (Cut)	0.000		
JD Created (Cut)	0.000		
Non-JD Natural (Cut)	0.000		
Non-JD Created (Cut)	0.000		
Total	0.000		

Mitigation Summary Table					
	Location	Onsite Acre(s)	11990 Bank Acre(s)	USACE/11990 Bank Acre(s)	USFWS Bank Acre(s)
USACE Only					
EO 11990 Only					
USACE/11990					
USFWS					
Total		0	0	0.000	0

Wetland Impacts Exit 168 Bridge Deck Replacement Pipe Replacement Minto and Lake Ardoch Interchanges	 08/31/23
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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	75	2

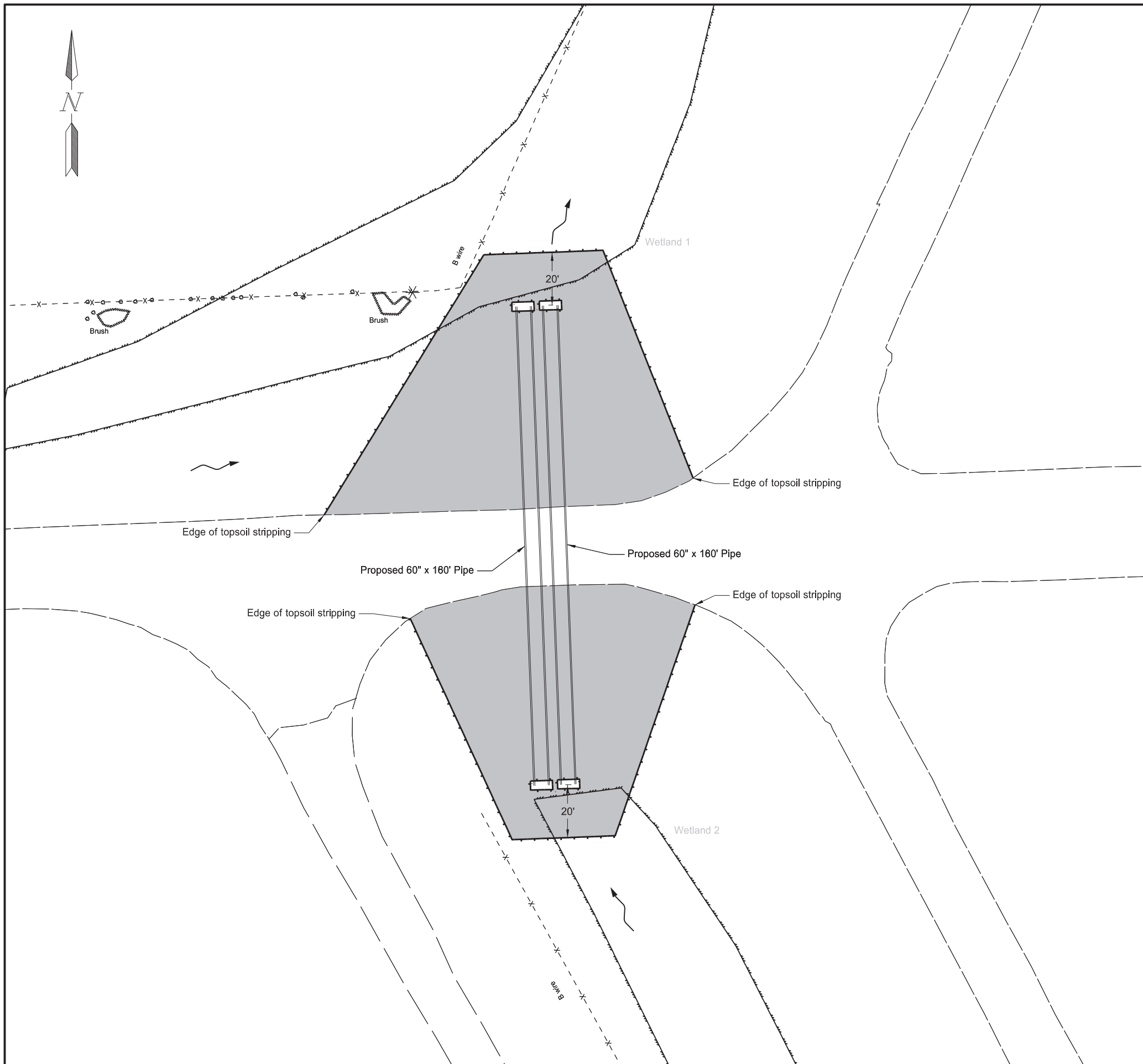


Wetland Impacts
Exit 168

Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges

08/31/23



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	76	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	2000	TEMPORARY COVER CROP	ACRE	0.37
253	101	STRAW MULCH	ACRE	0.37
261	112	FIBER ROLLS 12IN	LF	572

- Temporary Cover Crop and Straw Mulch
- Fiber Rolls

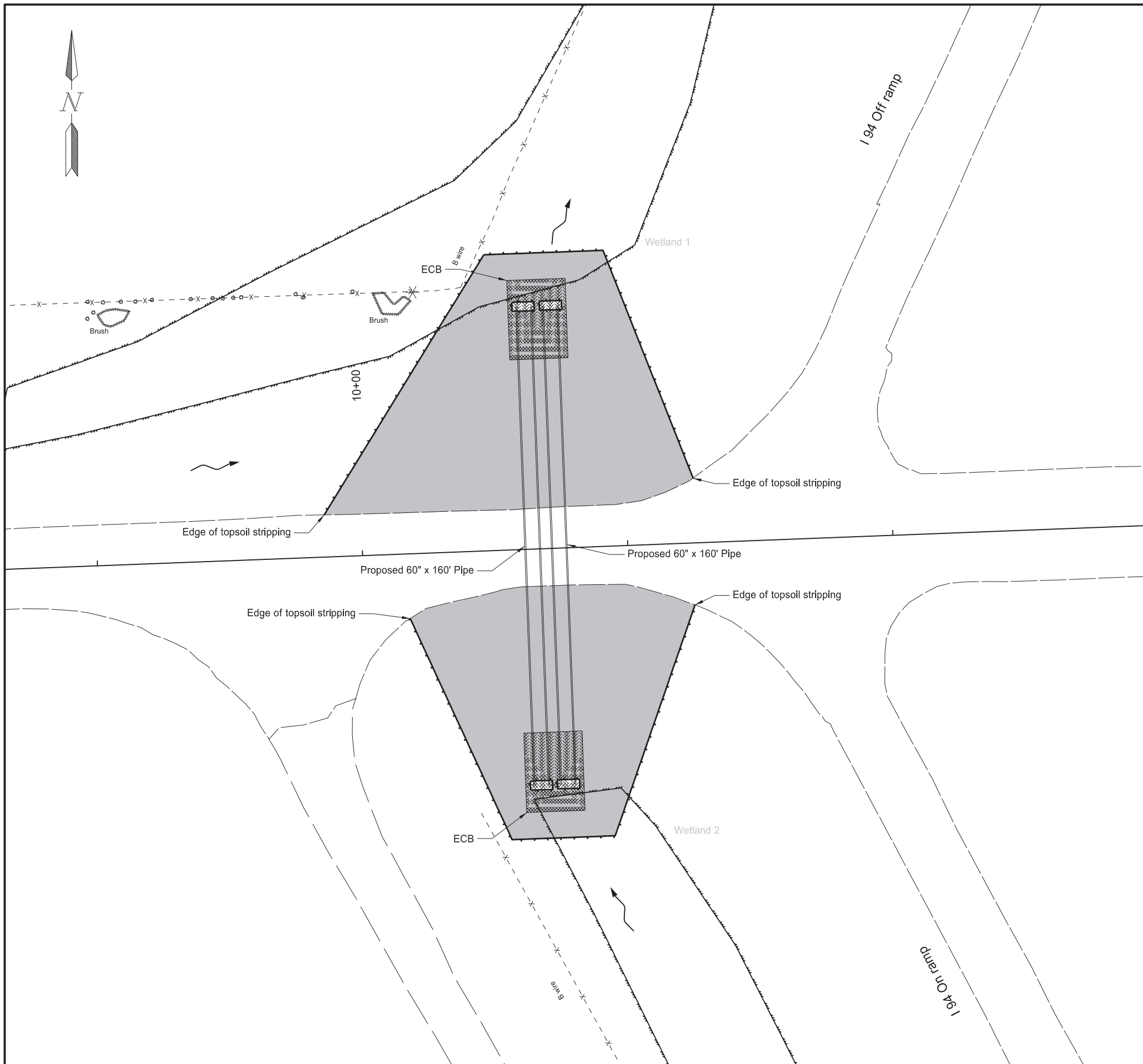
Temporary Erosion Control
Exit 168

Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges



08/31/23



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	77	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	200	SEEDING CLASS II	ACRE	0.37
253	101	STRAW MULCH	ACRE	0.37
261	112	FIBER ROLLS 12IN	LF	572

- Seeding Class II and Straw Mulch
- Fiber Rolls

Permanent Erosion Control
Exit 168

Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges



08/31/23

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
E5-1-48	48"x48"	EXIT GORE		35	
G20-1-60	60"x24"	ROAD WORK NEXT MILES		28	
G20-1b-60	60"x24"	NO WORK IN PROGRESS (Sign and installation only)		18	
G20-2-48	48"x24"	END ROAD WORK	7	26	182
G20-4-36	36"x18"	PILOT CAR FOLLOW ME (Mounted to back of pilot car)		18	
G20-4b-36	36"x30"	WAIT FOR PILOT CAR		18	
G20-50a-72	72"x36"	ROAD WORK NEXT MILES RT & LT ARROWS		43	
G20-52a-72	72"x24"	ROAD WORK NEXT MILES RT or LT ARROW		36	
G20-55-96	96"x48"	SPEED LIMIT ENFORCED - MINIMUM FEE \$80 WHEN WORKERS PRESENT	7	59	413
M1-1-24	24"x24"	INTERSTATE ROUTE MARKER (Post and installation only)	8	10	80
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)	7	11	77
M1-4-24	24"x24"	U.S. ROUTE MARKER (Post and installation only)		10	
M1-5-24	24"x24"	STATE ROUTE MARKER (Post and installation only)		10	
M3-1-24	24"x12"	NORTH (Mounted on route marker post)	4	7	28
M3-1-36	36"x18"	NORTH (Mounted on route marker post)	3	10	30
M3-2-24	24"x12"	EAST (Mounted on route marker post)		7	
M3-3-24	24"x12"	SOUTH (Mounted on route marker post)	5	7	35
M3-3-36	36"x18"	SOUTH (Mounted on route marker post)	3	10	30
M3-4-24	24"x12"	WEST (Mounted on route marker post)		7	
M4-8-24	24"x12"	DETOUR (Mounted on route marker post)	8	7	56
M4-8-30	30"x15"	DETOUR (Mounted on route marker post)	6	4	24
M4-9-30	30"x24"	DETOUR ARROW RIGHT or LEFT/AHD AND RT or LT		15	
M4-10-48	48"x18"	DETOUR (INSIDE ARROW) RIGHT or LEFT (Mounted on barricade)	2	7	14
M5-1-21	21"x15"	ADVANCE TURN ARROW RT or LT (Mounted on route marker post)	2	7	14
M5-1-30	30"x21"	ADVANCE TURN ARROW RT or LT (Mounted on route marker post)		9	
M6-1-21	21"x15"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)	6	7	42
M6-1-30	30"x21"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)		9	
M6-2(I)-30	30"x21"	DIRECTIONAL ARROW DIAGONAL RT or LT (Mounted on route marker post)	3	9	27
M6-3-21	21"x15"	DIRECTIONAL ARROW UP (Mounted on route marker post)		7	
M6-3(I)-30	30"x21"	DIRECTIONAL ARROW UP (Mounted on route marker post)	4	9	36
R1-1-48	48"x48"	STOP		32	
R1-2-60	60"x60"	YIELD		29	
R2-1-36	36"x48"	SPEED LIMIT (Portable only)		30	
R2-1-48	48"x60"	SPEED LIMIT	12	39	468
R2-1aP-24	24"x18"	MINIMUM FEE \$80 (Mounted on Speed Limit post)	7	10	70
R3-2-48	48"x48"	NO LEFT TURN	1	35	35
R4-1-48	48"x60"	DO NOT PASS		39	
R4-7-48	48"x60"	KEEP RIGHT		39	
R5-1-48	48"x48"	DO NOT ENTER		35	
R6-1-54	54"x18"	ONE WAY RIGHT or LEFT (Mounted on STOP or DO NOT ENTER post)		14	
R7-1-12	12"x18"	NO PARKING ANY TIME		11	
R10-6-24	24"x36"	STOP HERE ON RED	3	16	48
R11-2-48	48"x30"	ROAD CLOSED (Mounted on barricade)	2	12	24
R11-2a-48	48"x30"	STREET CLOSED (Mounted on barricade)	2	12	24
R11-3a-60	60"x30"	ROAD CLOSED MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-3c-60	60"x30"	STREET CLOSED MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC (Mounted on barricade)		15	
W1-3-48	48"x48"	REVERSE TURN RIGHT or LEFT		35	
W1-4-48	48"x48"	REVERSE CURVE RIGHT or LEFT	1	35	35
W1-4b-48	48"x48"	TWO LANE REVERSE CURVE RIGHT or LEFT		35	
W1-6-48	48"x24"	ONE DIRECTION LARGE ARROW		26	
W3-1-48	48"x48"	STOP AHEAD		35	
W3-3-48	48"x48"	SIGNAL AHEAD	3	35	105
W3-4-48	48"x48"	BE PREPARED TO STOP		35	
W3-5-48	48"x48"	SPEED REDUCTION AHEAD	7	35	245
W4-2-48	48"x48"	LANE ENDS RIGHT or LEFT	4	35	140
W5-1-48	48"x48"	ROAD NARROWS	1	35	35
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE		35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW		35	
W6-3-48	48"x48"	TWO WAY TRAFFIC		35	
W8-1-48	48"x48"	BUMP		35	
W8-3-48	48"x48"	PAVEMENT ENDS		35	
W8-7-48	48"x48"	LOOSE GRAVEL		35	
W8-11-48	48"x48"	UNEVEN LANES		35	
W8-12-48	48"x48"	NO CENTER LINE		35	
W8-17-48	48"x48"	SHOULDER DROP-OFF SYMBOL		35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY		35	
W8-54-48	48"x48"	TRUCKS ENTERING AHEAD or FT or MILE		35	
W8-55-48	48"x48"	TRUCKS CROSSING AHEAD or FT or MILE		35	
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY		35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL		35	
W13-1P-30	30"x30"	MPH ADVISORY SPEED PLAQUE (Mounted on warning sign post)		14	
W14-3-64	64"x48"	NO PASSING ZONE		28	
W16-2P-30	30"x24"	FEET PLAQUE (Mounted on warning sign post)		10	
W20-1-48	48"x48"	ROAD WORK AHEAD or FT or MILE	9	35	315
W20-2-48	48"x48"	DETOUR AHEAD or FT or MILE	2	35	70
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or FT or MILE	3	35	105
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or FT or MILE	3	35	105
W20-5-48	48"x48"	RIGHT or CENTER or LEFT LANE CLOSED AHEAD or FT or MILE	4	35	140
W20-7-48	48"x48"	FLAGGER	2	35	70
W20-8-18	18"x18"	STOP - SLOW PADDLE Back to Back	2	5	10
W20-52P-54	54"x12"	NEXT MILES (Mounted on warning sign post)		12	

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
W21-1-48	48"x48"	WORKERS		35	
W21-2-48	48"x48"	FRESH OIL		35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or FT or MILE		35	
W21-5-48	48"x48"	SHOULDER WORK		35	
W21-5a-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED		35	
W21-5b-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED AHEAD or FT or MILE		35	
W21-6-48	48"x48"	SURVEY CREW		35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or FT		35	
W21-51-48	48"x48"	MATERIAL ON ROADWAY		35	
W21-52-48	48"x48"	PAVEMENT BREAKS		35	
W21-53-48	48"x48"	RUMBLE STRIPS AHEAD		35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK		35	
W24-1-48	48"x48"	DOUBLE REVERSE CURVE		35	

SPECIAL SIGNS

CONSIGN	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
Consign1	11'x6'	DETOUR I-29 NORTHBOUND CLOSED USE EXIT 164	1	92	92
Consign2	12'-6"x6'	DETOUR EXIT 168 EASTBOUND CLOSED USE EXIT 164	1	102	102
Consign3	11'x6'	DETOUR I-29 SOUTHBOUND CLOSED USE EXIT 172	1	92	92
Consign4	12'-6"x6'	DETOUR EXIT 168 WESTBOUND CLOSED USE EXIT 172	1	102	102
Consign5	11'x6'	DETOUR I-29 NORTHBOUND CLOSED USE EXIT 161	1	92	92
Consign6	12'-6"x6'	DETOUR EXIT 164 EASTBOUND CLOSED USE EXIT 161	1	102	102
Consign7	11'x6'	DETOUR I-29 SOUTHBOUND CLOSED USE EXIT 168	1	92	92
Consign8	12'-6"x6'	DETOUR EXIT 164 WESTBOUND CLOSED USE EXIT 168	1	102	102

SPEC & CODE

SPEC & CODE	DESCRIPTION	TOTAL UNITS
704-1000	TRAFFIC CONTROL SIGNS	3908

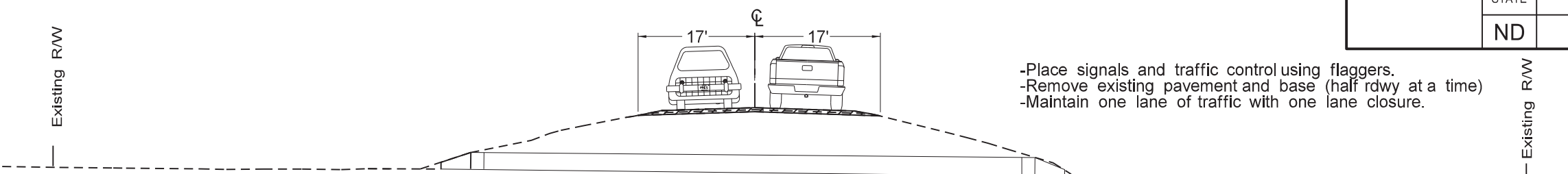
SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	FLAGGING	MHR	100
704-1018	LANE CLOSURE-SIGNAL CONTROL/FLAGGING CONTROL	EACH	1
704-1041	ATTENUATION DEVICE-TYPE B-55	EACH	2
704-1045	ATTENUATION DEVICE-TYPE B-75	EACH	2
704-1048	PORTABLE RUMBLE STRIPS	EACH	
704-1050	TYPE I BARRICADES	EACH	
704-1052	TYPE III BARRICADES	EACH	14
704-1060	DELINEATOR DRUMS	EACH	140
704-1065	TRAFFIC CONES	EACH	
704-1067	TUBULAR MARKERS	EACH	119
704-1070	DELINEATOR	EACH	
704-1072	FLEXIBLE DELINEATORS	EACH	
704-1080	STACKABLE VERTICAL PANELS	EACH	
704-1081	VERTICAL PANELS - BACK TO BACK	EACH	
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH	
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH	
704-1087	SEQUENCING ARROW PANEL - TYPE C	EACH	2
704-1500	OBLITERATION OF PVMT MK	SF	400
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF	
704-3510	PRECAST CONCRETE MED BARRIER - STATE FURNISHED	EACH	
704-3511	STATE FURNISHED MEDIAN BARRIER	LF	1160
762-0200	RAISED PAVEMENT MARKERS	EACH	
762-0420	SHORT TERM 4IN LINE - TYPE R	LF	16800
762-0426	SHORT TERM 24IN LINE-TYPE R	LF	24
762-0430	SHORT TERM 4IN LINE - TYPE NR	LF	23660
762-0436	SHORT TERM 24IN LINE-TYPE NR	LF	390

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



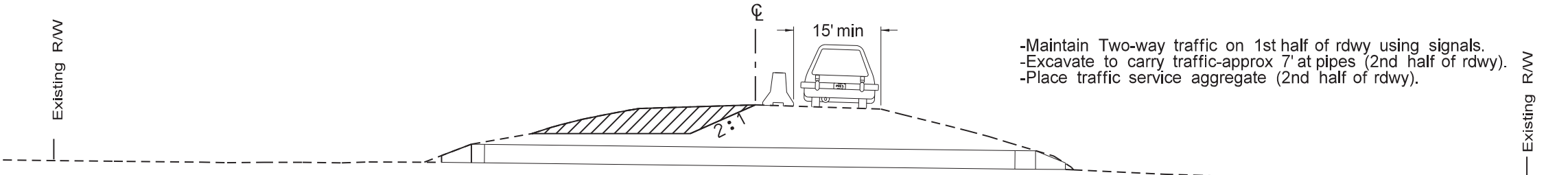
Traffic Control Devices List

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(164)163	100	2



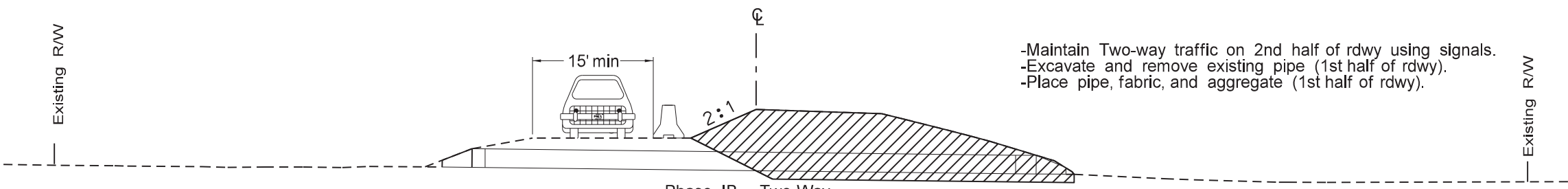
- Place signals and traffic control using flaggers.
- Remove existing pavement and base (half rdwy at a time)
- Maintain one lane of traffic with one lane closure.

Existing Two-Way Two-Lane Traffic



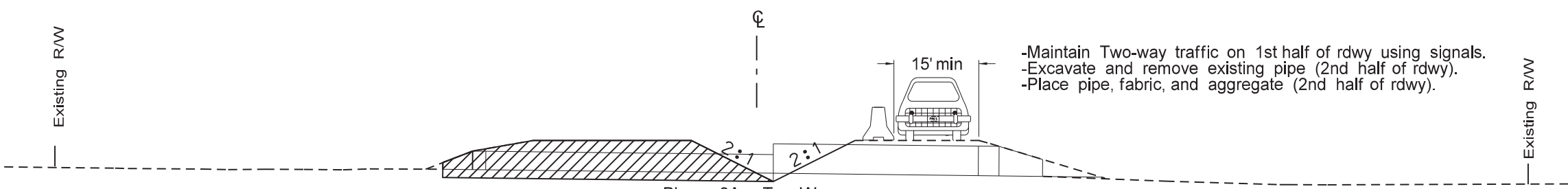
- Maintain Two-way traffic on 1st half of rdwy using signals.
- Excavate to carry traffic-approx 7' at pipes (2nd half of rdwy).
- Place traffic service aggregate (2nd half of rdwy).

Phase 1A - Two-Way One Lane Traffic with Signals



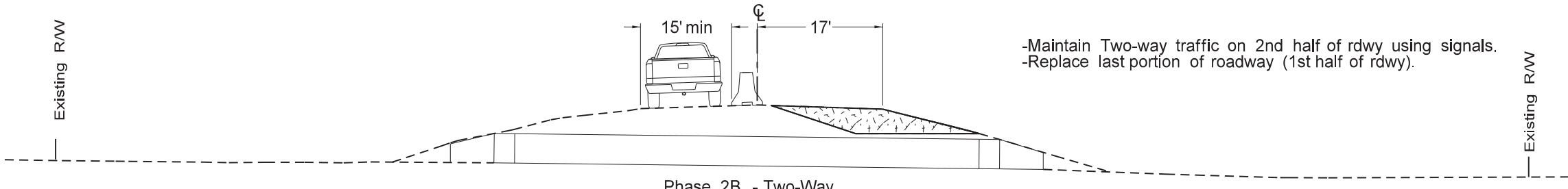
- Maintain Two-way traffic on 2nd half of rdwy using signals.
- Excavate and remove existing pipe (1st half of rdwy).
- Place pipe, fabric, and aggregate (1st half of rdwy).

Phase 1B - Two-Way One Lane Traffic with Signals



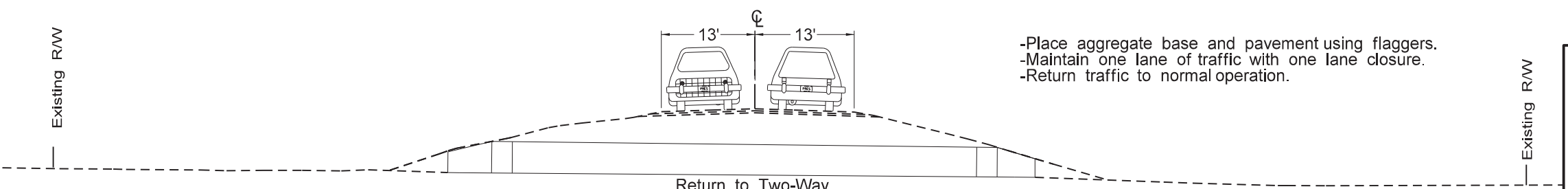
- Maintain Two-way traffic on 1st half of rdwy using signals.
- Excavate and remove existing pipe (2nd half of rdwy).
- Place pipe, fabric, and aggregate (2nd half of rdwy).

Phase 2A - Two-Way One Lane Traffic with Signals



- Maintain Two-way traffic on 2nd half of rdwy using signals.
- Replace last portion of roadway (1st half of rdwy).

Phase 2B - Two-Way One Lane Traffic with Signals



- Place aggregate base and pavement using flaggers.
- Maintain one lane of traffic with one lane closure.
- Return traffic to normal operation.

Return to Two-Way Two-Lane Traffic

240 Tons of Traffic Service Aggregate at a 4" depth has been provided for phases 1A, 1B, 2A, and 2B



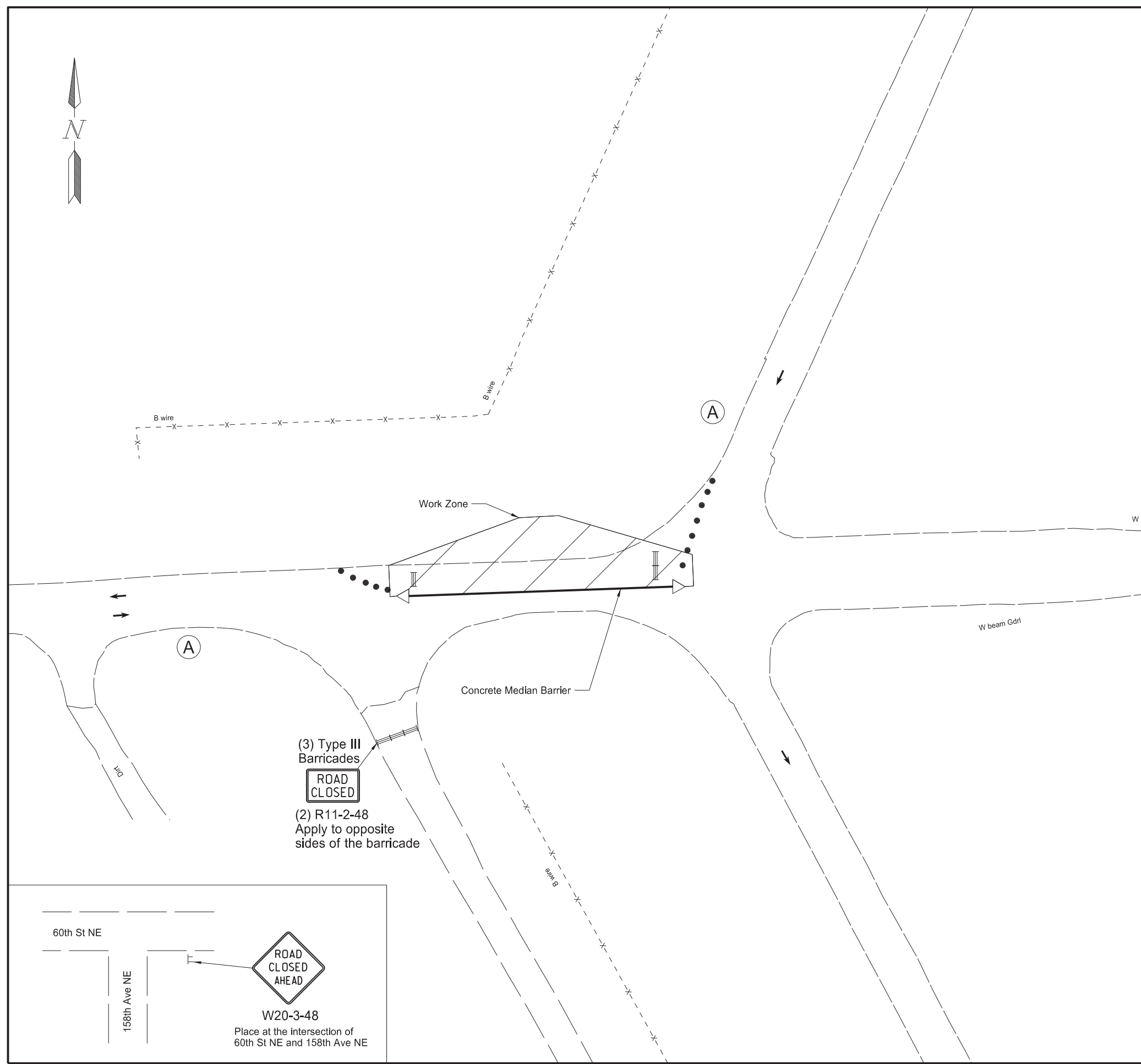
09/06/23

Traffic Control Phasing for CL Pipe Replacement
Exit 168

Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges

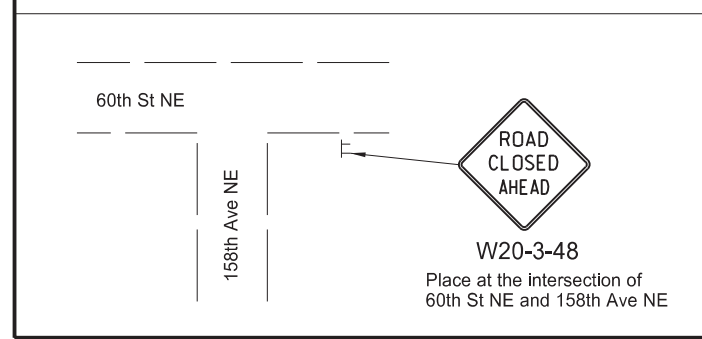
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	100	3



Follow D-704-16 for additional signs and striping

(A) Provide portable traffic control signal

(3) Type III Barricades
ROAD CLOSED
 (2) R11-2-48
 Apply to opposite sides of the barricade



WZTC Pipe Replacement
 Exit 168
 Phase 1A

Bridge Deck Replacement
 Pipe Replacement

Minto and Lake Ardoch Interchanges

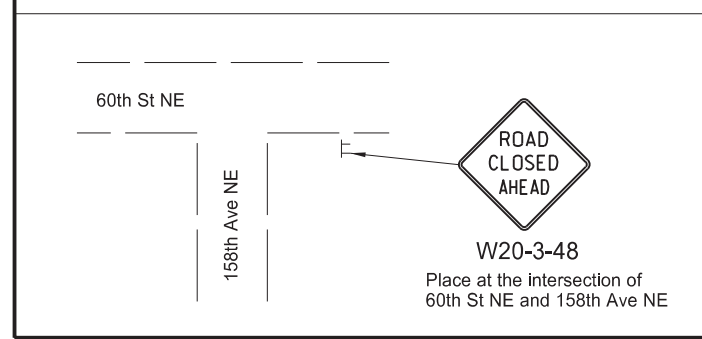
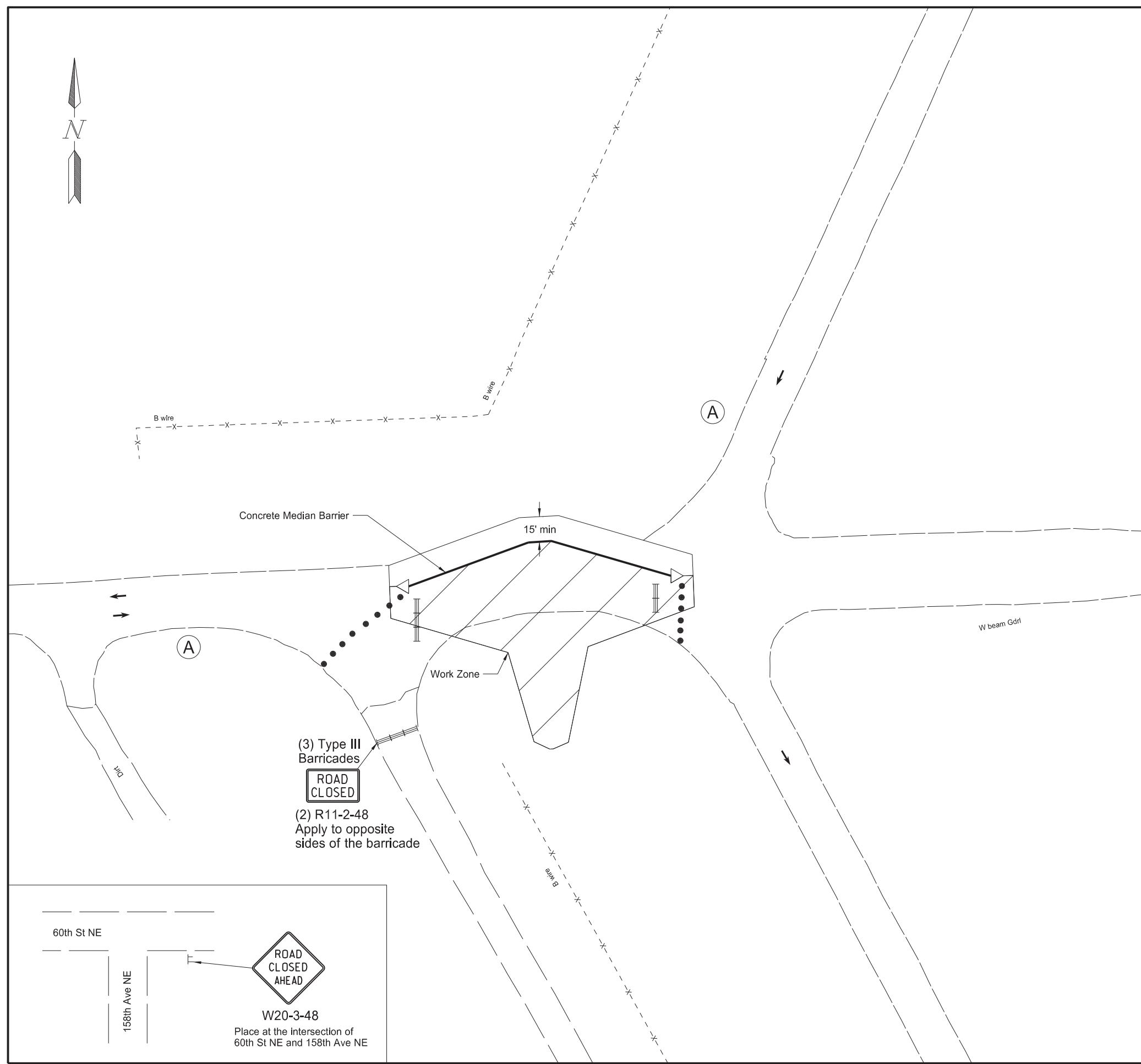


09/06/23

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	100	4

Follow D-704-16 for additional signs and striping

(A) Provide portable traffic control signal



WZTC Pipe Replacement
Exit 168
Phase 1B

Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges

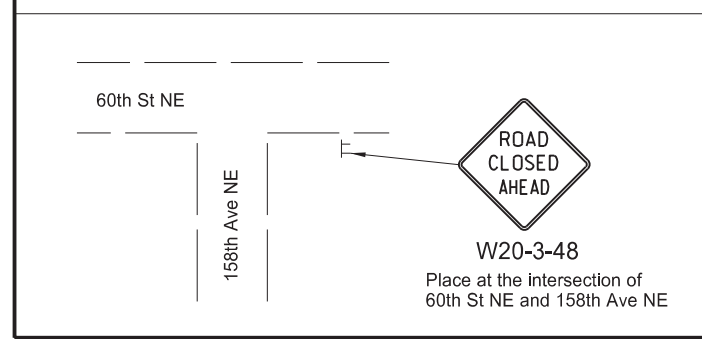
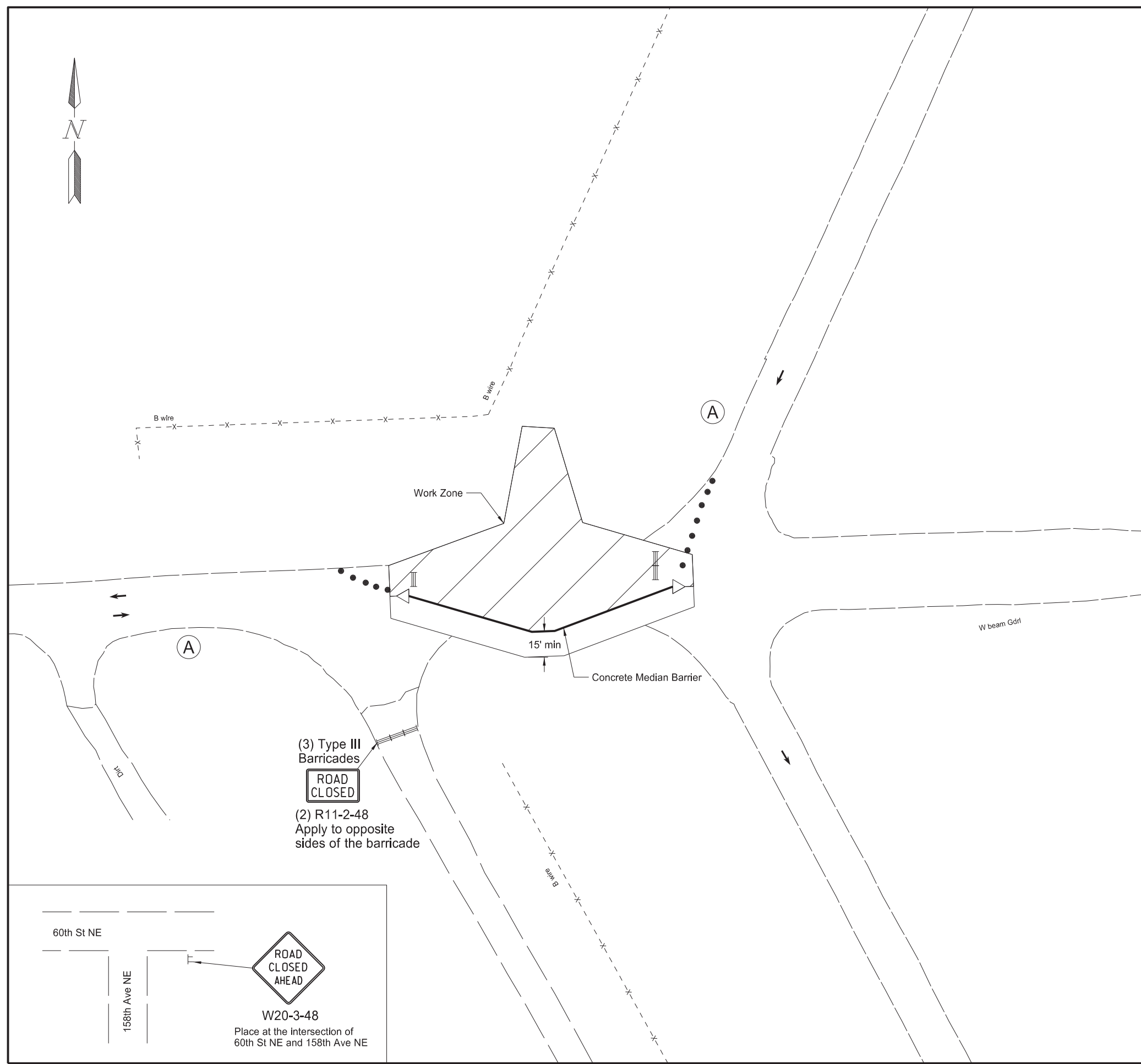
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NORTH DAKOTA
PE 2928

09/06/23

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	100	5

Follow D-704-16 for additional signs and striping

(A) Provide portable traffic control signal



WZTC Pipe Replacement
Exit 168
Phase 2A

Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges

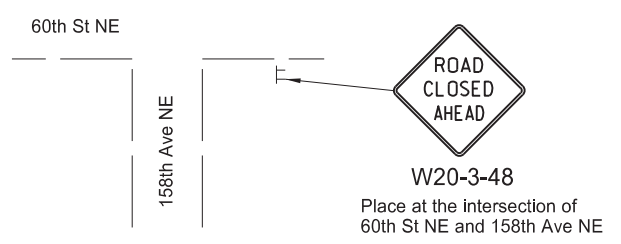
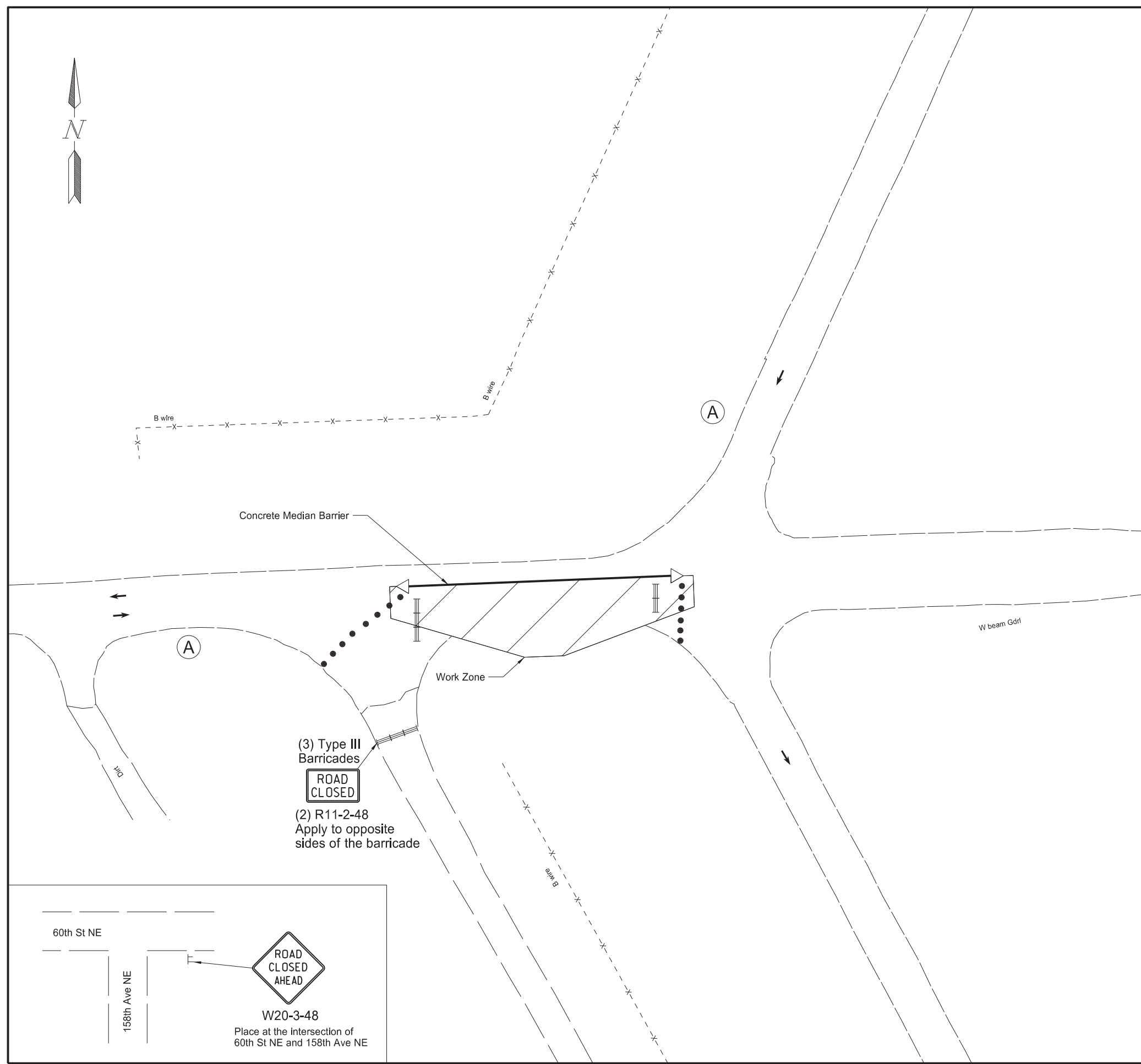
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09/06/23

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	100	6

Follow D-704-16 for additional signs and striping

(A) Provide portable traffic control signal



WZTC Pipe Replacement
Exit 168
Phase 2B

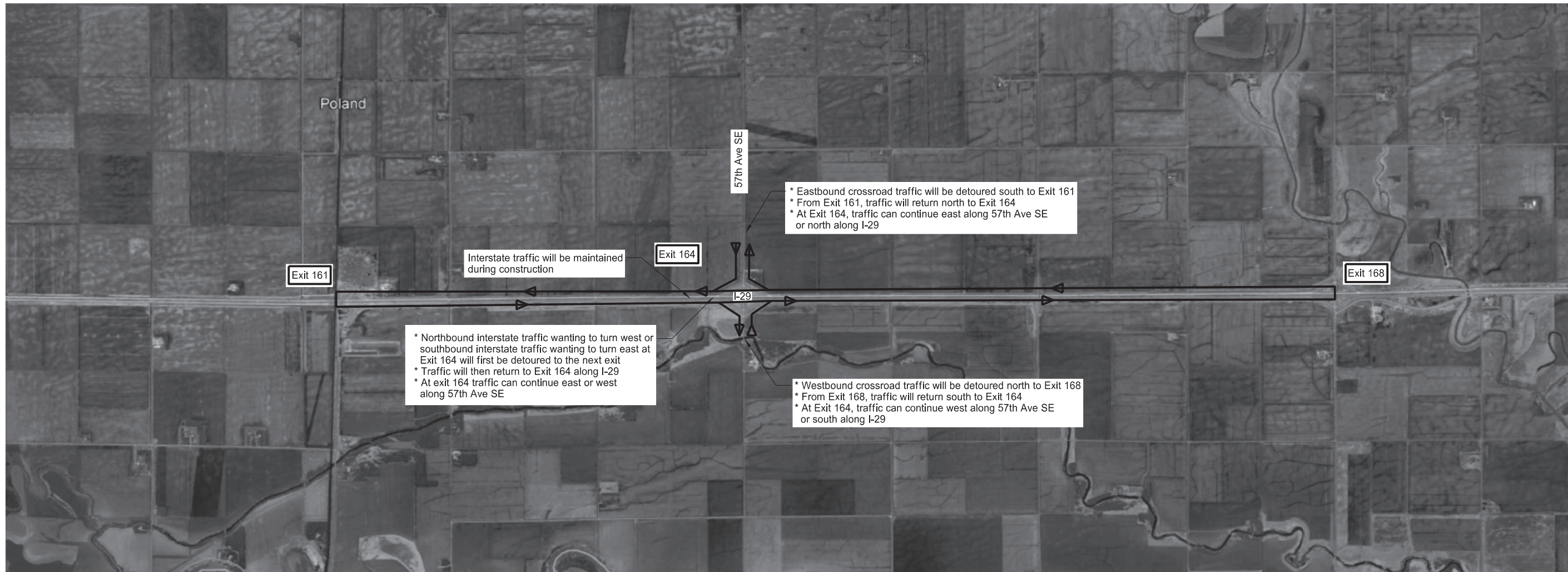
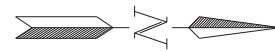
Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges



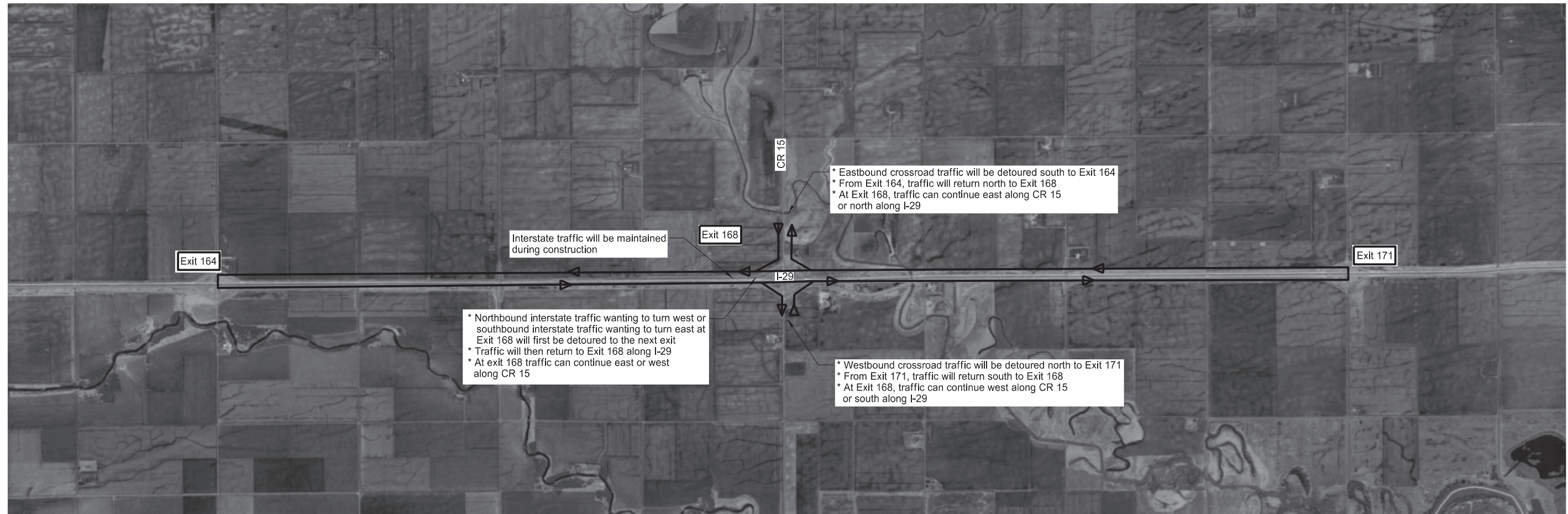
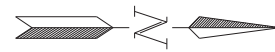
09/06/23

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(164)163	100	7



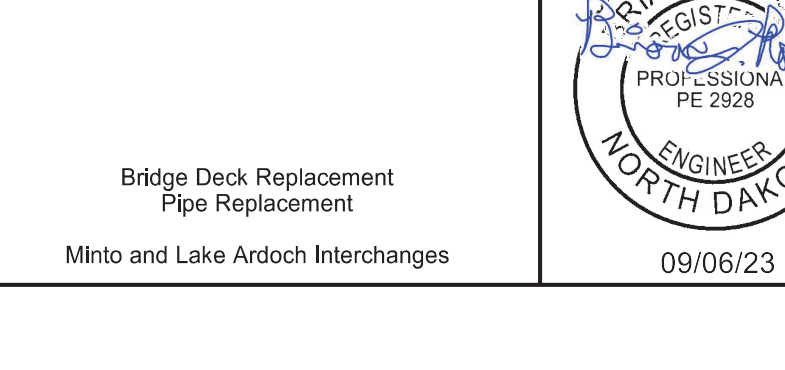
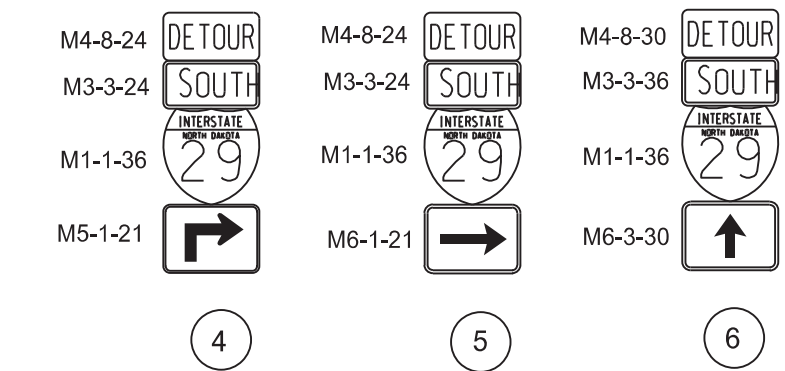
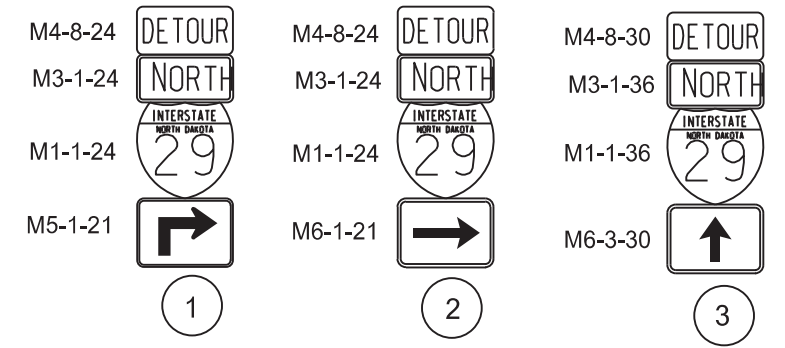
<p>WZTC Exit 164 Bridge Closure Overview</p>	
<p>Bridge Deck Replacement Pipe Replacement</p>	
<p>Minto and Lake Ardoch Interchanges</p>	
	<p>09/06/23</p>

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(164)163	100	8



<p>WZTC Exit 168 Bridge Closure Overview</p> <p>Bridge Deck Replacement Pipe Replacement</p> <p>Minto and Lake Ardoch Interchanges</p>	<p>09/06/23</p>
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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(164)163	100	9



WZTC Exit 164

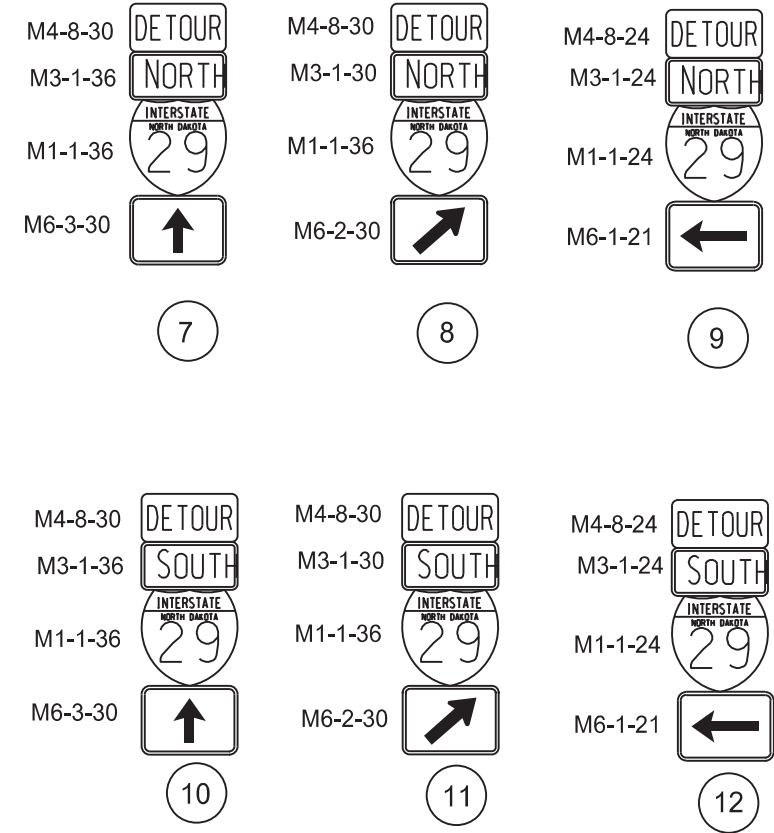
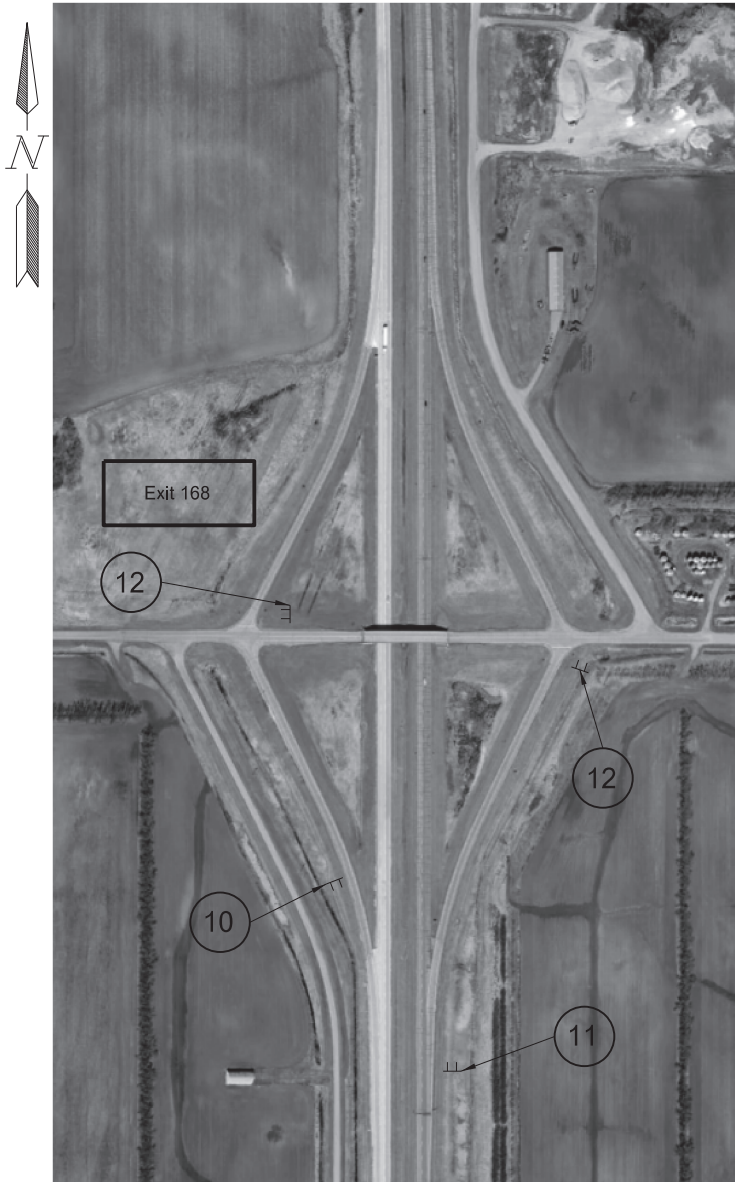
Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges

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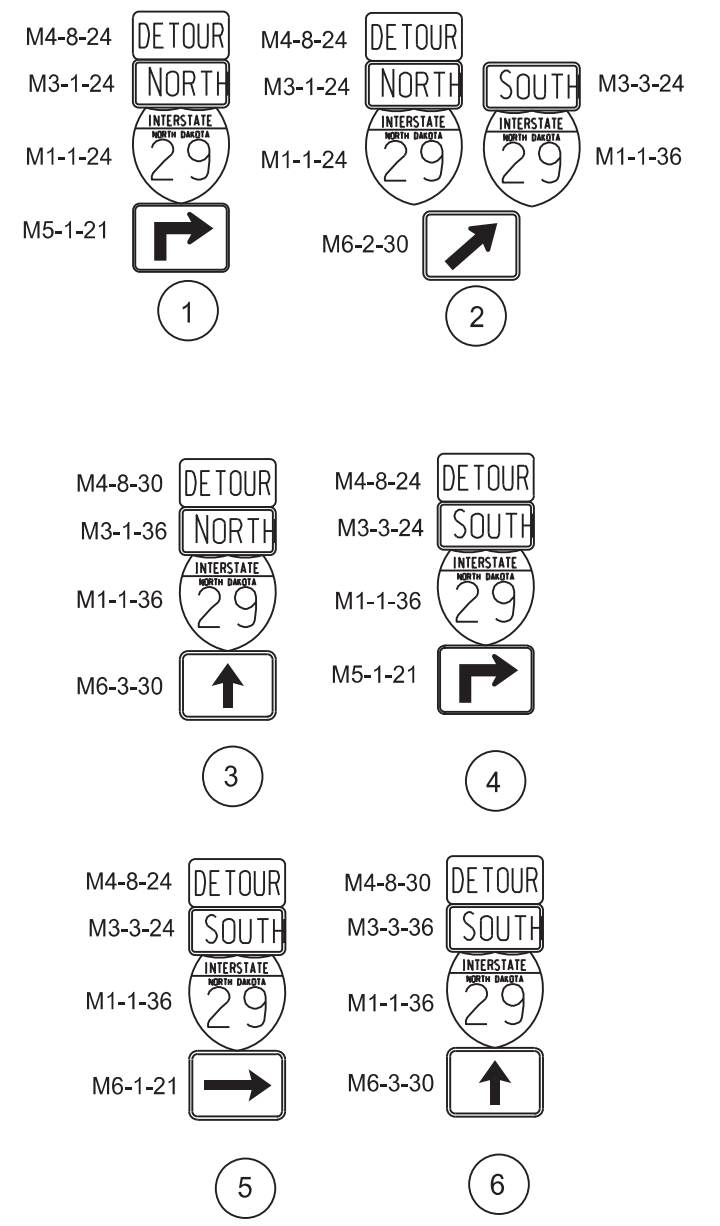
09/06/23

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(164)163	100	10



<p>WZTC Exit 164 Closure</p> <p>Bridge Deck Replacement Pipe Replacement</p> <p>Minto and Lake Ardoch Interchanges</p>	<p>09/06/23</p>
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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	100	11



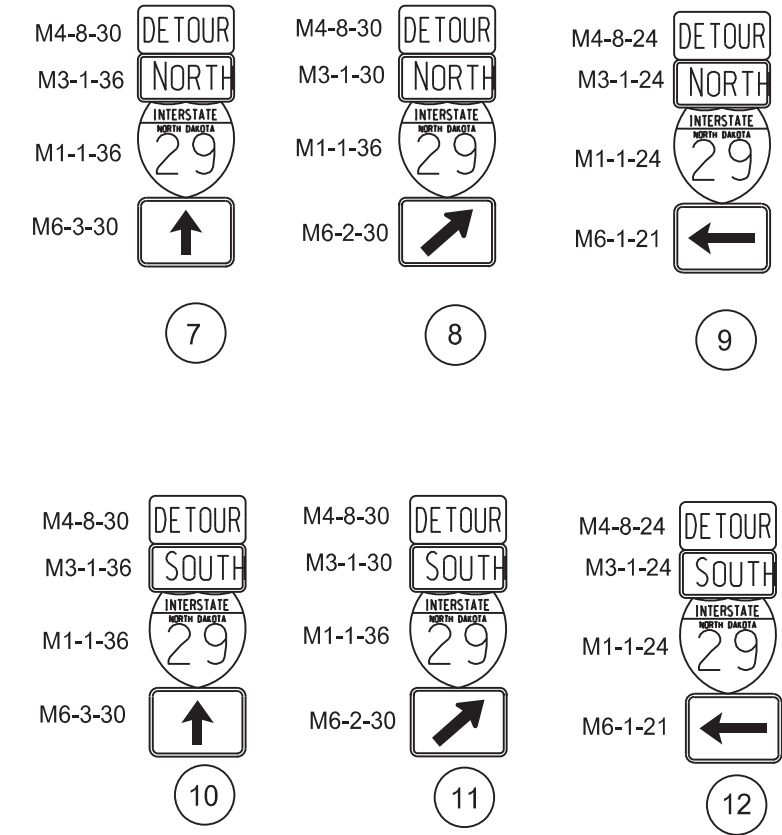
WZTC Exit 168
Bridge Closure

Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges

09/06/23

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(164)163	100	12



WZTC Exit 168 Closure

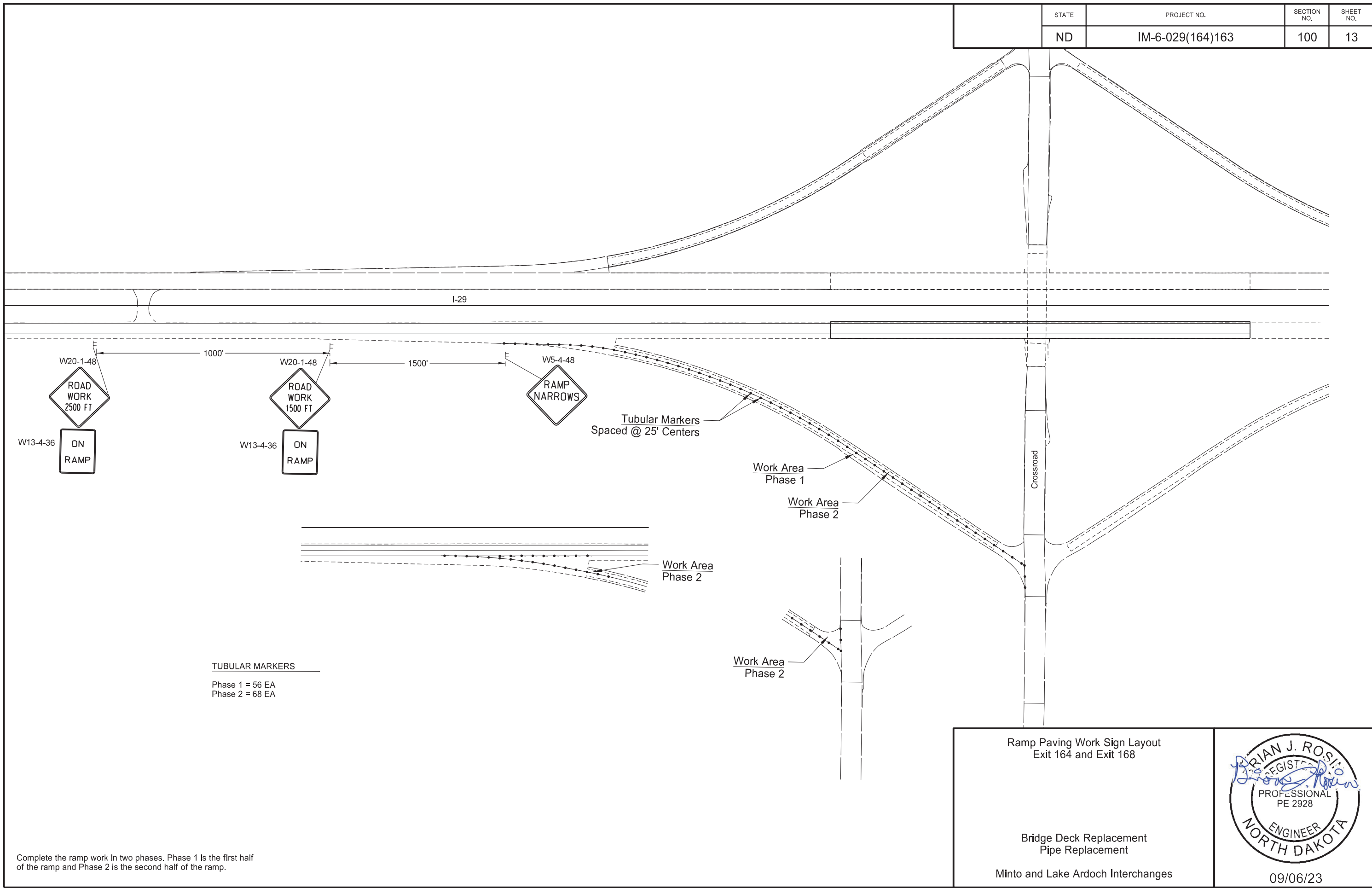
Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(164)163	100	13



TUBULAR MARKERS
Phase 1 = 56 EA
Phase 2 = 68 EA

Complete the ramp work in two phases. Phase 1 is the first half of the ramp and Phase 2 is the second half of the ramp.

Ramp Paving Work Sign Layout
Exit 164 and Exit 168

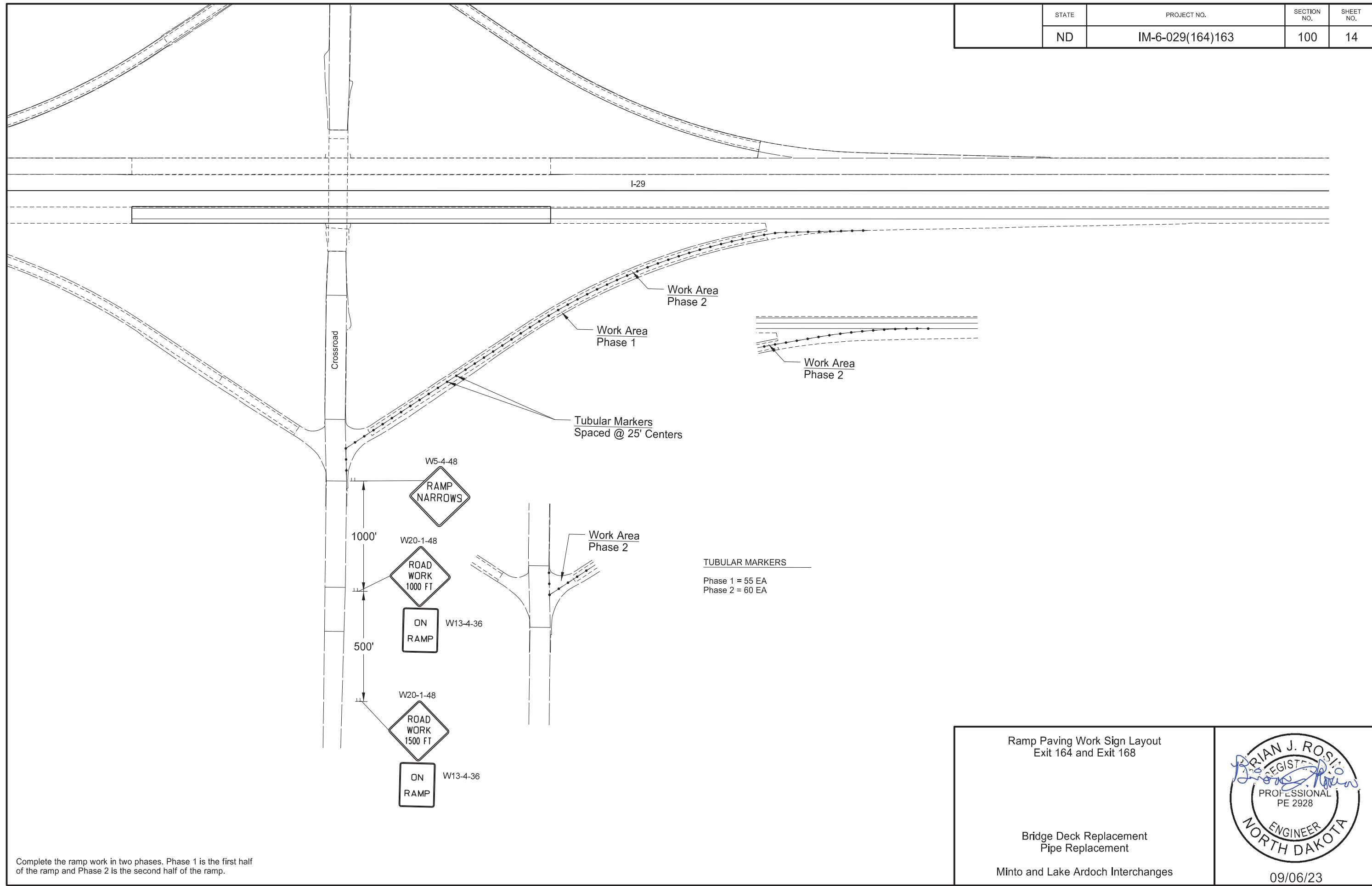
Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges

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09/06/23

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(164)163	100	14



Complete the ramp work in two phases. Phase 1 is the first half of the ramp and Phase 2 is the second half of the ramp.

Ramp Paving Work Sign Layout
Exit 164 and Exit 168

Bridge Deck Replacement
Pipe Replacement

Minto and Lake Ardoch Interchanges

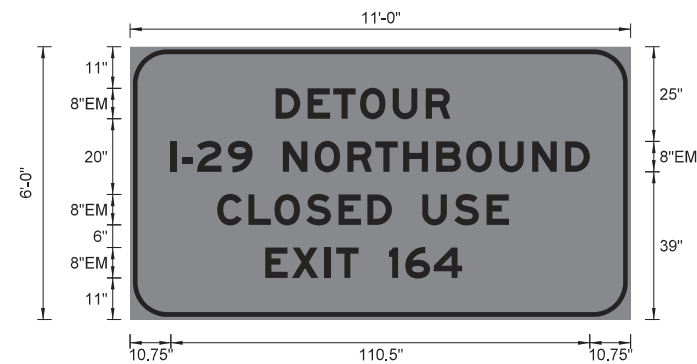


09/06/23

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	100	15

SIGN NUMBER	ConSign1
WIDTH X HEIGHT	11'-0" x 6'-0"
BORDER WIDTH	1.25" (inset 0.75")
CORNER RADIUS	9"
MOUNTING	Ground
BACKGROUND	TYPE: XI Reflective COLOR: Fluorescent Orange
LEGEND/BORDER	TYPE: Non-reflective COLOR: Black

STATION(S): AREA: 66.0 Sq.Ft.



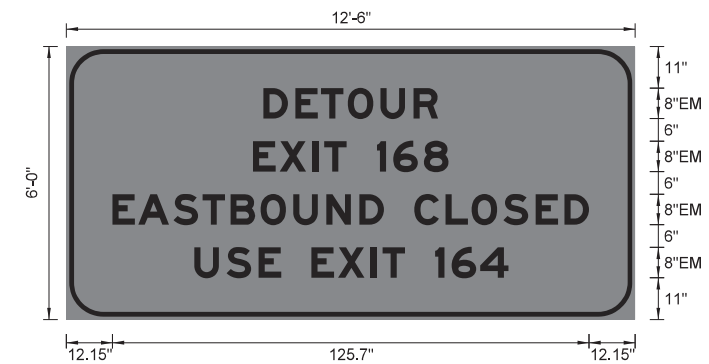
Dimensions are in inches.tenths Letter locations are panel edge to lower left corner

SYMBOL	X	Y	WID	HT	ANGLE

LETTER POSITION (X)													LENGTH	SIZE	SERIES		
D	E	T	O	U	R								46.1	8	EM 2000		
38.4	46.8	53.6	60.6	69.3	78												
I	-	2	9		N	O	R	T	H	B	O	U	N	D	110.5	8	EM 2000
10.8	13.7	17.6	25.8	32.3	40.3	48.7	57.3	64.7	72	80.8	88.7	97.3	106	114.8			
C	L	O	S	E	D		U	S	E						77	8	EM 2000
23	31.2	38.1	46.5	55	62.6	69	77	85.5	94								
E	X	I	T		1	6	4								51.9	8	EM 2000
35.6	42.7	51.3	54.4	60.3	68.3	72.6	80.1										

SIGN NUMBER	ConSign2
WIDTH X HEIGHT	12'-6" x 6'-0"
BORDER WIDTH	1.25" (inset 0.75")
CORNER RADIUS	9"
MOUNTING	Ground
BACKGROUND	TYPE: XI Reflective COLOR: Fluorescent Orange
LEGEND/BORDER	TYPE: Non-reflective COLOR: Black

STATION(S): AREA: 75.0 Sq.Ft.



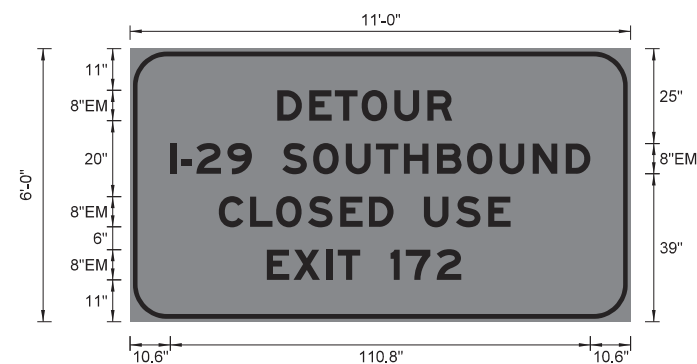
Dimensions are in inches.tenths Letter locations are panel edge to lower left corner

SYMBOL	X	Y	WID	HT	ANGLE

LETTER POSITION (X)													LENGTH	SIZE	SERIES			
D	E	T	O	U	R								46.1	8	EM 2000			
52	60.4	67.2	74.2	82.8	91.6													
E	X	I	T		1	6	8						51.5	8	EM 2000			
49.2	56.3	64.9	68	73.9	81.9	86.2	94.3											
E	A	S	T	B	O	U	N	D		C	L	O	S	E	D	125.7	8	EM 2000
12.2	19	28.2	35.9	43.3	51.2	59.8	68.6	77.3	83.8	91.8	100	106.9	115.3	123.8	131.4			
U	S	E		E	X	I	T		1	6	4					82.8	8	EM 2000
33.8	42.2	50.7	56.6	64.6	71.7	80.3	83.4	89.3	97.3	101.6	109.1							

SIGN NUMBER	ConSign3
WIDTH X HEIGHT	11'-0" x 6'-0"
BORDER WIDTH	1.25" (inset 0.75")
CORNER RADIUS	9"
MOUNTING	Ground
BACKGROUND	TYPE: XI Reflective COLOR: Fluorescent Orange
LEGEND/BORDER	TYPE: Non-reflective COLOR: Black

STATION(S): AREA: 66.0 Sq.Ft.



Dimensions are in inches.tenths Letter locations are panel edge to lower left corner

SYMBOL	X	Y	WID	HT	ANGLE

LETTER POSITION (X)													LENGTH	SIZE	SERIES		
D	E	T	O	U	R								46.1	8	EM 2000		
38.8	47.2	54	61.1	69.7	78.4												
I	-	2	9		S	O	U	T	H	B	O	U	N	D	110.8	8	EM 2000
10.6	13.6	17.5	25.6	32.1	40.1	48.3	56.9	64.8	72.2	80.9	88.8	97.5	106.2	114.9			
C	L	O	S	E	D		U	S	E						77	8	EM 2000
23.4	31.6	38.5	46.9	55.4	63	69.5	77.5	86	94.4								
E	X	I	T		1	7	2								51.3	8	EM 2000
36.1	43.1	51.8	54.8	60.7	68.7	72.7	80.9										

Construction Sign Details

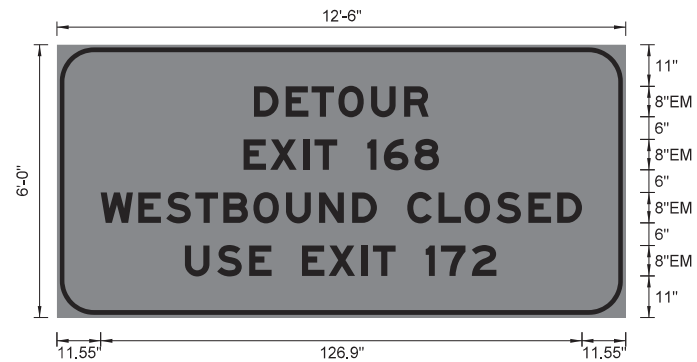
Lake Ardoch Int - Minto Int
Structural Repair

I-29

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	100	16

SIGN NUMBER	ConSign 4
WIDTH X HEIGHT	12'-6" x 6'-0"
BORDER WIDTH	1.25" (inset 0.75")
CORNER RADIUS	9"
MOUNTING	Ground
BACKGROUND	TYPE: XI Reflective COLOR: Fluorescent Orange
LEGEND/BORDER	TYPE: Non-reflective COLOR: Black

STATION(S): AREA: 75.0 Sq.Ft.



Dimensions are in inches.tenths Letter locations are panel edge to lower left corner

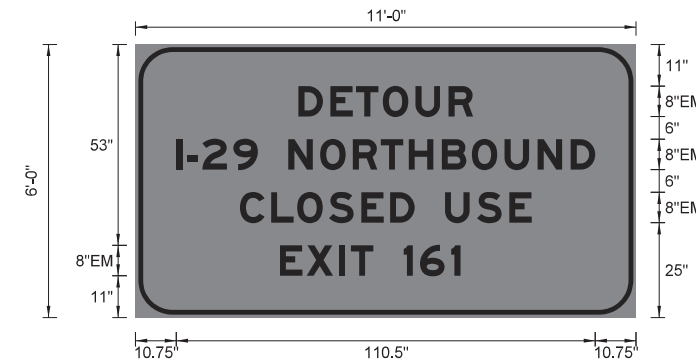
PANEL STYLE: ND_Const_Detour.sst

SYMBOL	X	Y	WID	HT	ANGLE

LETTER POSITION (X)													LENGTH	SIZE	SERIES			
D	E	T	O	U	R								46.1	8	EM 2000			
52	60.4	67.2	74.2	82.8	91.6													
E	X	I	T		1	6	8						51.5	8	EM 2000			
49.2	56.3	64.9	68	73.9	81.9	86.2	94.3											
W	E	S	T	B	O	U	N	D	C	L	O	S	E	D	126.9	8	EM 2000	
11.6	21.5	28.8	36.5	43.9	51.8	60.4	69.2	77.9	84.4	92.4	100.6	107.5	115.9	124.4	132			
U	S	E		E	X	I	T		1	7	2					82.2	8	EM 2000
33.8	42.2	50.7	56.6	64.6	71.7	80.3	83.4	89.3	97.3	101.3	109.4							

SIGN NUMBER	ConSign5
WIDTH X HEIGHT	11'-0" x 6'-0"
BORDER WIDTH	1.25" (inset 0.75")
CORNER RADIUS	9"
MOUNTING	Ground
BACKGROUND	TYPE: XI Reflective COLOR: Fluorescent Orange
LEGEND/BORDER	TYPE: Non-reflective COLOR: Black

STATION(S): none AREA: 66.0 Sq.Ft.



Dimensions are in inches.tenths Letter locations are panel edge to lower left corner

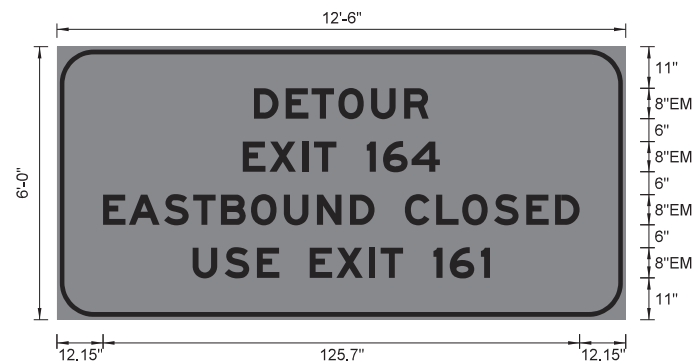
PANEL STYLE: ND_Const_Detour.sst

SYMBOL	X	Y	WID	HT	ANGLE

LETTER POSITION (X)													LENGTH	SIZE	SERIES		
D	E	T	O	U	R								46.1	8	EM 2000		
43	51.4	58.2	65.2	73.8	82.6												
I	-	2	9		N	O	R	T	H	B	O	U	N	D	110.5	8	EM 2000
10.8	13.7	17.6	25.8	32.3	40.3	48.7	57.3	64.7	72	80.8	88.7	97.3	106	114.8			
C	L	O	S	E	D	U	S	E							77	8	EM 2000
27.5	35.8	42.6	51	59.5	67.1	73.6	81.6	90.1	98.6								
E	X	I	T		1	6	1								47.6	8	EM 2000
38.1	45.1	53.8	56.8	62.7	70.7	75	83.3										

SIGN NUMBER	ConSign6
WIDTH X HEIGHT	12'-6" x 6'-0"
BORDER WIDTH	1.25" (inset 0.75")
CORNER RADIUS	9"
MOUNTING	Ground
BACKGROUND	TYPE: XI Reflective COLOR: Fluorescent Orange
LEGEND/BORDER	TYPE: Non-reflective COLOR: Black

STATION(S): AREA: 75.0 Sq.Ft.



Dimensions are in inches.tenths Letter locations are panel edge to lower left corner

PANEL STYLE: ND_Const_Detour.sst

SYMBOL	X	Y	WID	HT	ANGLE

LETTER POSITION (X)													LENGTH	SIZE	SERIES			
D	E	T	O	U	R								46.1	8	EM 2000			
52	60.4	67.2	74.2	82.8	91.6													
E	X	I	T		1	6	4						51.9	8	EM 2000			
49	56.1	64.7	67.8	73.7	81.7	86	93.5											
E	A	S	T	B	O	U	N	D	C	L	O	S	E	D	125.7	8	EM 2000	
12.2	19	28.2	35.9	43.3	51.2	59.8	68.6	77.3	83.8	91.8	100	106.9	115.3	123.8	131.4			
U	S	E		E	X	I	T		1	6	1					78.5	8	EM 2000
35.8	44.2	52.7	58.6	66.6	73.7	82.3	85.4	91.3	99.3	103.6	111.8							

Construction Sign Details

Lake Ardoch Int - Minto Int
Structural Repair

I-29

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
N.D.	IM-6-029(164)163	110	1

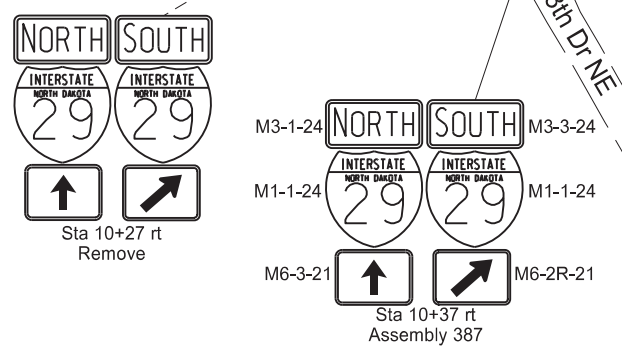
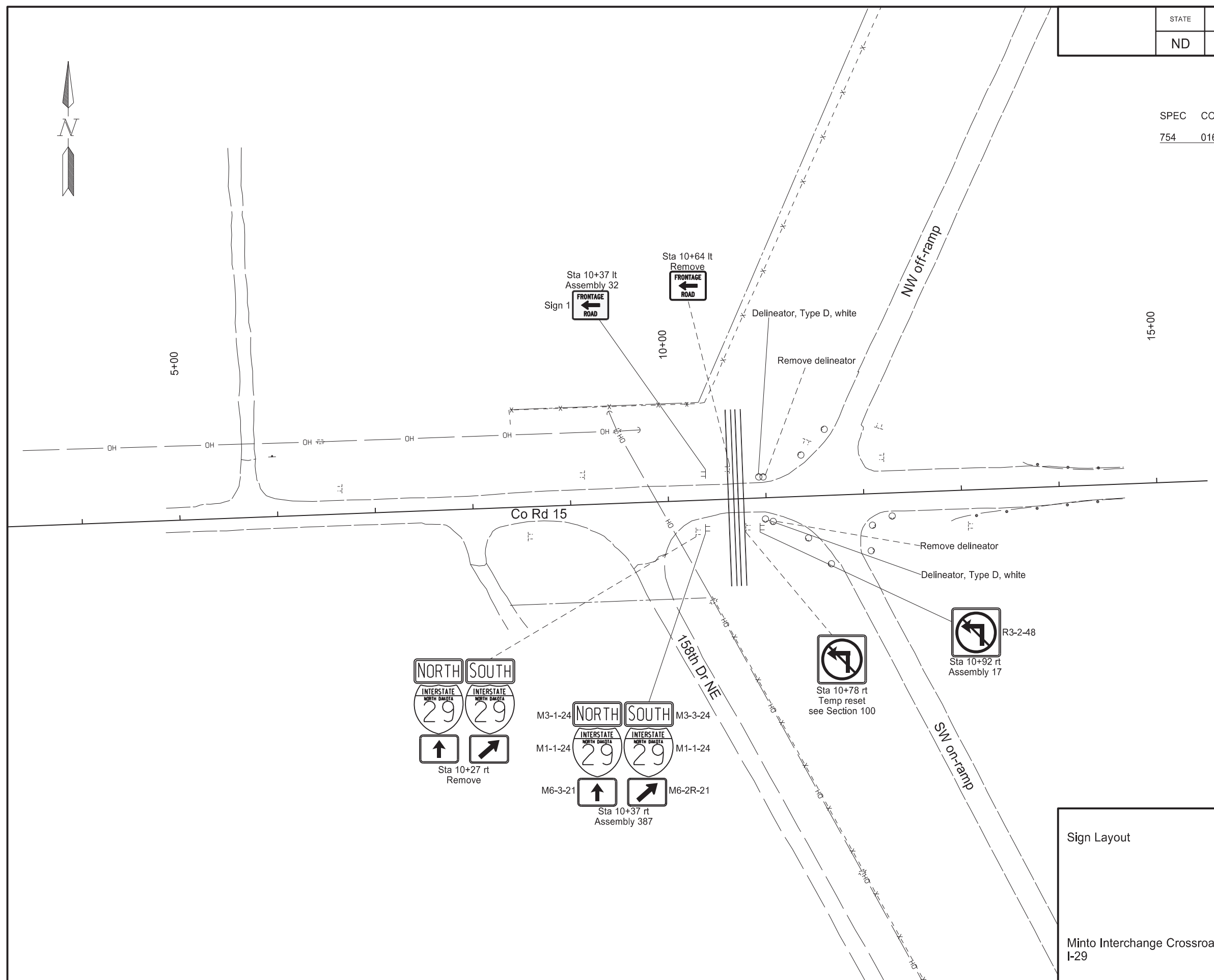
Station / RP	Sign No.	Assembly No.	Flat Sheet For Signs		Sign Support Length				Vert Clearance FT	Support Size	Max Post Len LF	Sleeve Length				Sleeve Size	Anchor EA	Anchor LF	Anchor Size	Reset Sign Panel EA	Reset Sign Support EA	Break-Away EA	Comments
			IV SF	XI SF	1st LF	2nd LF	3rd LF	4th LF				1st LF	2nd LF	3rd LF	4th LF								
10+37 Rt		387		16.4		12.3			5.0	2.5 x 2.5 10 ga	13.7	3.5			2.19 x 2.19 10 ga	1	4	3 x 3 7 ga			1		
10+37 Lt	SN 1	32		5.0		10.3			5.0	2 x 2 12 ga	10.6					1	4	2.25 x 2.25 12 ga					
10+92 Rt		17		16.0		11.2			5.0	2.5 x 2.5 10 ga	12.3	3.6		2.19 x 2.19 10 ga	1	4	3 x 3 7 ga			1			
Sub Total			0.0	37.4		Total	33.8								Total	12.0			0	0	2		
Grand Total			0.0	37.4		Total	33.8								Total	12	0	0	0	0	2		



Sign Summary
Perforated Tube
Minto Interchange Crossroad
I-29

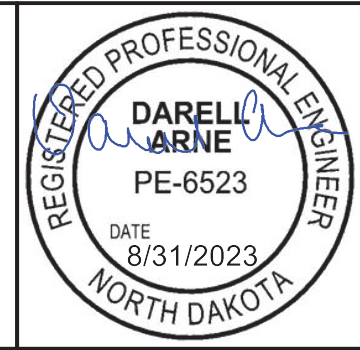
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	110	2

SPEC	CODE	BID ITEM	QTY	UNIT
754	0168	DELINEATORS-TYPE D White delineator	2	EA



Sign Layout

Minto Interchange Crossroad
I-29

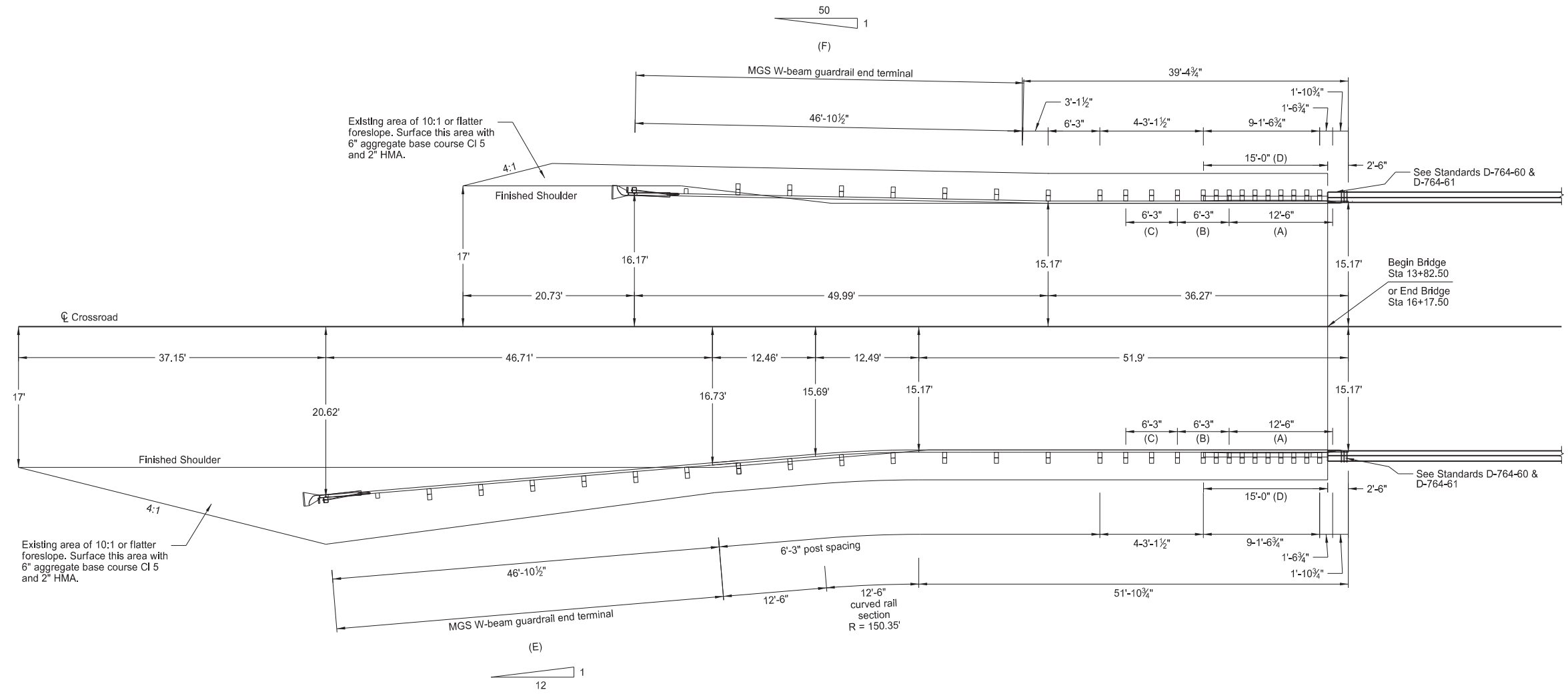


STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	110	3

SIGN NUMBER	Sign 1					STATION(S):	Sta 10+37 ft					AREA: 5.0 Sq.Ft.		
WIDTH X HEIGHT	2'-6" x 2'-0"													
BORDER WIDTH	0.63" (inset 0.38")													
CORNER RADIUS	1.5"													
MOUNTING	Ground													
BACKGROUND	TYPE: IV Reflective COLOR: White													
LEGEND/BORDER	TYPE: Non-reflective COLOR: Black													
SYMBOL	X	Y	WID	HT	ANGLE									
ND_2.625IN	7.5	8.5	7	15	90									
<p>Dimensions are in inches.tenths Letter locations are panel edge to lower left corner</p> <p>PANEL STYLE: ND_Guide_24_Small_White.sst</p>														
LETTER POSITION (X)														
F	R	O	N	T	A	G	E					LENGTH	SIZE	SERIES
4.3	6.9	9.6	12.7	15.4	17.7	20.7	23.6					21.3	4	C 2000
R	O	A	D									10.6	4	C 2000
9.7	12.4	15.1	18											

Sign Details	
Minto Interchange Crossroad I-29	

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	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.
- (F) Install a MASH SKT Terminal at this location. See Standard D-764-51.

Thrie/MGS W-Beam Guardrail Layout
 At Both Ends of Bridge

Lake Ardoch Interchange Crossroad
 RP 163.699

I-29

REGISTERED PROFESSIONAL ENGINEER

DARELL ARNE

PE-6523

DATE
8/31/2023

NORTH DAKOTA

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

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	130	2

MGS W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

THRIE/MGS W-BEAM GUARDRAIL AT BRIDGE ENDS

LOCATION	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
	5/8" Ø x 18" LONG GUARDRAIL BOLT	6" x 8" x 6'-0" TIMBER POST	6" x 8" x 14" TIMBER BLOCK	5/8" Ø x 1 1/4" LONG GUARDRAIL BOLT	12'-6" STRAIGHT W-BEAM RAIL SECTION	12'-6" CURVED W-BEAM RAIL SECTION	REFLECTORIZED PLATES	6" x 8" x 7' WOOD POST	6" x 8" x 19" WOOD OFF-SET BLOCK	6'-3" W-THRIE BEAM TRANSITION SECTION	6'-3" THRIE BEAM SECTION	12'-6" DOUBLE THRIE BEAM SECTION	2'-6" THRIE BEAM TERMINAL CONNECTOR	7/8" Ø x 15" LONG HEX HEAD BOLT	SINGLE SLOPE TO THRIE BEAM CONNECTOR PLATE
	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH
Sta 13+08.15 to 13+85.00 Rt	32	15	9	76	3	1	7	6	12	1	1	1	1	5	1
Sta 13+45.60 to 13+85.00 Lt	26	9	3	52	1		5	6	12	1	1	1	1	5	1
Sta 16+15.00 to 16+54.40 Rt	26	9	3	52	1		5	6	12	1	1	1	1	5	1
Sta 16+15.00 to 16+91.85 Lt	32	15	9	76	3	1	7	6	12	1	1	1	1	5	1
TOTAL	116	48	24	256	8	2	24	24	48	4	4	4	4	20	4

(A) Include these items in the contract unit price bid for "W-Beam Guardrail".

SPEC CODE	BID ITEM	QTY	UNIT	SPEC CODE	BID ITEM	QTY	UNIT
748 0141	CURB & GUTTER - TYPE 1 SPECIAL			764 0151	REMOVE W-BEAM GUARDRAIL & POSTS		
	Sta 13+67.50 to 13+82.50 Rt	15	LF		Sta 12+98.17 to 13+75.00 Rt	76.9	LF
	Sta 13+67.50 to 13+82.50 Rt	15	LF		Sta 13+35.60 to 13+75.00 Lt	39.4	LF
	Sta 16+17.50 to 16+32.50 Rt	15	LF		Sta 16+25.00 to 16+64.40 Rt	39.4	LF
	Sta 16+17.50 to 16+32.50 Lt	15	LF		Sta 16+25.00 to 17+01.83 Lt	76.9	LF
	Total	60	LF		Total	232.6	LF
764 0131	W-BEAM GUARDRAIL			764 2081	REMOVE END TREATMENT & TRANSITION		
	Sta 13+08.15 to 13+85.00 Rt	76.9	LF		Sta 12+61.32 to 12+98.21 Rt	1	Ea
	Sta 13+45.60 to 13+85.00 Lt	39.4	LF		Sta 12+98.38 to 13+35.60 Lt	1	Ea
	Sta 16+15.00 to 16+54.40 Rt	39.4	LF		Sta 16+64.40 to 17+01.62 Rt	1	Ea
	Sta 16+15.00 to 16+91.85 Lt	76.9	LF		Sta 17+01.83 to 17+38.68 Lt	1	Ea
	Total	232.6	LF		Total	4	Ea
764 0145	W-BEAM GUARDRAIL END TERMINAL						
	Sta 12+61.44 to 13+08.15 Rt	1	Ea				
	Sta 12+98.74 to 13+45.60 Lt	1	Ea				
	Sta 16+54.40 to 17+01.26 Rt	1	Ea				
	Sta 16+91.85 to 17+38.56 Lt	1	Ea				
	Total	4	Ea				



Thrie/MGS W-Beam Guardrail Quantities
Lake Ardoch Interchange Crossroad
RP 163.699

MGS W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

THRIE/MGS W-BEAM GUARDRAIL AT BRIDGE ENDS

LOCATION	(A) 5/8" Ø x 18" LONG GUARD- RAIL BOLT	(A) 6" x 8" x 6'-0" TIMBER POST	(A) 6" x 8" x 14" TIMBER BLOCK	(A) 5/8" Ø x 1 1/4" LONG GUARD- RAIL BOLT	(A) 12'-6" STRAIGHT W-BEAM RAIL SECTION	(A) 12'-6" CURVED W-BEAM RAIL SECTION	(A) REFL- ECTOR- IZED PLATES	(A) 6" x 8" x 7' WOOD POST	(A) 6" x 8" x 19" WOOD OFF- SET BLOCK	(A) 6'-3" W-THRIE BEAM TRANS- ITION SECTION	(A) 6'-3" THRIE BEAM SECTION	(A) 12'-6" DOUBLE THRIE BEAM SECTION	(A) 2'-6" THRIE BEAM TERM- INAL CON- NECTOR	(A) 7/8" Ø x 15" LONG HEX HEAD BOLT	(A) SINGLE SLOPE TO THRIE BEAM CONN- ECTOR PLATE
	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH
Sta 13+08.12 to 13+85.00 Rt	32	15	9	76	3	1	7	6	12	1	1	1	1	5	1
Sta 13+45.60 to 13+85.00 Lt	26	9	3	52	1		5	6	12	1	1	1	1	5	1
Sta 16+15.00 to 16+54.40 Rt	26	9	3	52	1		5	6	12	1	1	1	1	5	1
Sta 16+15.00 to 16+91.88 Lt	32	15	9	76	3	1	7	6	12	1	1	1	1	5	1
TOTAL	116	48	24	256	8	2	24	24	48	4	4	4	4	20	4

(A) Include these items in the contract unit price bid for "W-Beam Guardrail".

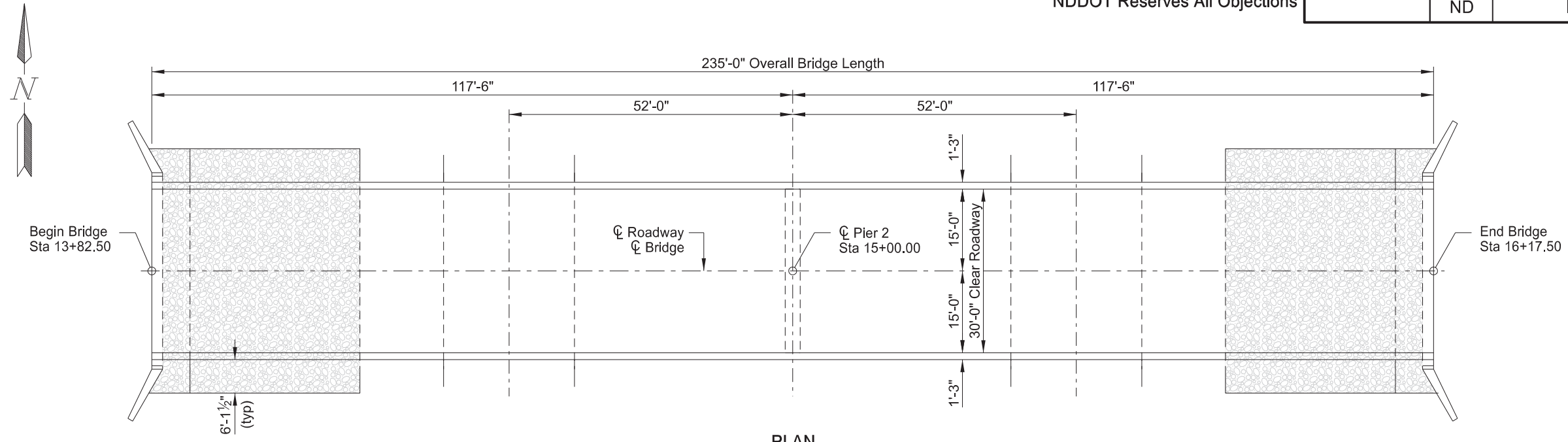
SPEC CODE	BID ITEM	QTY	UNIT	SPEC CODE	BID ITEM	QTY	UNIT
748 0141	CURB & GUTTER - TYPE 1 SPECIAL			764 0151	REMOVE W-BEAM GUARDRAIL & POSTS		
	Sta 13+67.50 to 13+82.50 Rt	15	LF		Sta 12+23.41 to 13+75.00 Rt	151.9	LF
	Sta 13+67.50 to 13+82.50 Lt	15	LF		Sta 12+98.19 to 13+75.00 Lt	76.9	LF
	Sta 16+17.50 to 16+32.50 Rt	15	LF		Sta 16+25.00 to 17+01.81 Rt	76.9	LF
	Sta 16+17.50 to 16+32.50 Lt	15	LF		Sta 16+25.00 to 17+76.59 Lt	151.9	LF
	Total	60	LF		Total	457.6	LF
764 0131	W-BEAM GUARDRAIL			764 2081	REMOVE END TREATMENT & TRANSITION		
	Sta 13+08.12 to 13+85.00 Rt	76.9	LF		Sta 11+86.61 to 12+23.41 Rt	1	Ea
	Sta 13+45.60 to 13+85.00 Lt	39.4	LF		Sta 12+61.39 to 12+98.19 Lt	1	Ea
	Sta 16+15.00 to 16+54.40 Rt	39.4	LF		Sta 17+01.81 to 17+38.61 Rt	1	Ea
	Sta 16+15.00 to 16+91.88 Lt	76.9	LF		Sta 17+76.59 to 18+13.39 Lt	1	Ea
	Total	232.6	LF		Total	4	Ea
764 0145	W-BEAM GUARDRAIL END TERMINAL						
	Sta 12+61.41 to 13+08.12 Rt	1	Ea				
	Sta 12+98.74 to 13+45.60 Lt	1	Ea				
	Sta 16+54.40 to 17+01.26 Rt	1	Ea				
	Sta 16+91.88 to 17+38.59 Lt	1	Ea				
	Total	4	Ea				



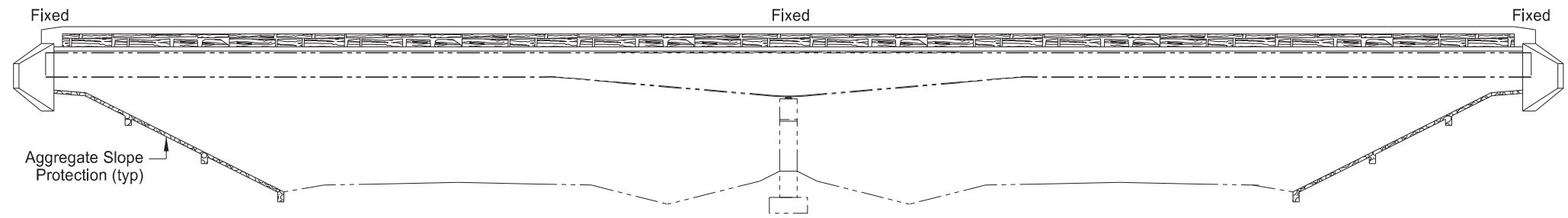
Thrie/MGS W-Beam Guardrail Quantities
Minto Interchange Crossroad
RP 167.722

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

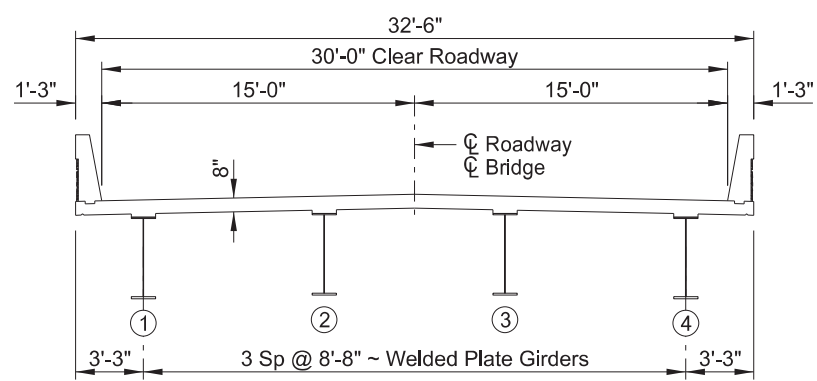
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	170	1



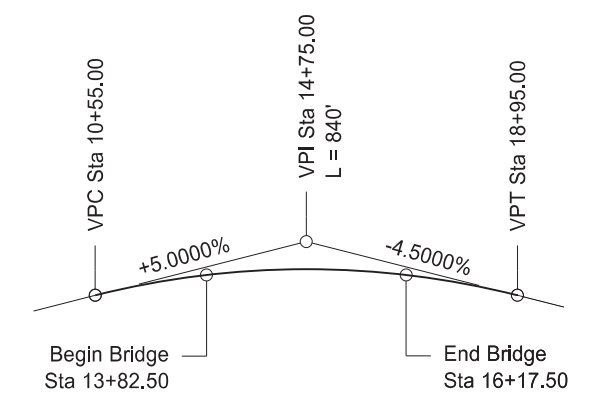
PLAN



ELEVATION



TYPICAL SECTION



VERTICAL CURVE DATA

DESIGN STRENGTHS:
 $f'_c = 4,000 \text{ psi} \sim \text{Class AAE-3 Concrete}$
 $f_y = 60,000 \text{ psi} \sim \text{Reinforcing Steel}$
 Load & Resistance Factor Design
 * Existing Beams Designed for H-20 Design Loading

SPECIAL PROVISIONS	
SSP 2	MIGRATORY BIRD TREATY ACT
SP 100(23)	ARCHITECTURAL SURFACE FINISH

STANDARD DRAWINGS	
D-900-1	

F.W.S. 15 PSF
 HL-93 DESIGN LOADING (BRIDGE DECK)

LAKE ARDOCH INTERCHANGE
 BRIDGE LAYOUT

ND DEPARTMENT OF TRANSPORTATION
 BRIDGE DIVISION
 Jason Thorenson
 09/11/23



DRAWING NO.	29-163.699-1
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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	170	2

100 SCOPE OF WORK: This project consists of removing and replacing the concrete bridge deck at structure 29-163.699 over Interstate 29. This structure is a 2-span, welded plate girder bridge with an overall length of 235'-0". The clear roadway width will remain at 30'-0". The concrete slope protection will be removed and replaced at both abutments.

202 REMOVAL OF CONCRETE: Remove the concrete on the structure, as shown in the "Concrete Removal Details," in a manner that prevents damage to the remaining structure. Use a 15 pound maximum hammer size for the deck removal over the welded plate girders and diaphragms.

Submit SFN 17987 "Asbestos Notification of Demolition and Renovation" to the NDDEQ 10 days before beginning removal of concrete. If asbestos is discovered, the Engineer will issue a contract revision for work related to the asbestos.

Remove the concrete safety shape barriers at all corners of the bridge. Each safety shape transition is 13'-7" and is constructed of approximately 2.1 cubic yards of reinforced concrete. The bottom of the safety shape transition is approximately 2 feet below the finished surface. Include all labor and equipment to remove the concrete on the structure and the concrete safety shape barriers in the unit price bid for "Removal of Concrete." A quantity of 0.5 L SUM will be paid at this location.

210 EXCAVATION: Include the removal of asphalt and the excavation costs at the abutment, as shown in the "Detail at Abutment," in the lump sum bid item "Class 1 Excavation."

602 ENDWALLS: Place the endwall concrete prior to the deck concrete. Allow the endwall to cure a minimum of 5 days before placing the deck concrete.

602 CLASS AAE-3 CONCRETE: Use a design compressive strength of 4,000 psi at 28 days for Class AAE-3 concrete.

602 FALSEWORK: Brace the exterior beams to prevent rotation during deck placement. Design the strength of the bracing to resist the forces induced by the weight of the concrete, forms, equipment, and workers. Submit a bracing plan and design, stamped by a Professional Engineer, to the Engineer to review.

602 PENETRATING WATER REPELLENT TREATMENT: Apply penetrating water repellent treatment to the top of the bridge deck and the concrete pier cap. Apply penetrating water repellent treatment prior to sealing any bridge deck cracks. Do not apply pavement marking or allow traffic until the solution has completely penetrated and the entire driving surface is dry.

If water washing equipment is used for cleaning, provide either a pressure washer with 160°F water at 1,800 psi minimum nozzle pressure or a cold water pressure washer at 3,000 psi minimum nozzle pressure.

602 BRIDGE DECK 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 barriers to determine the need for crack sealing. Mark and repair all cracks appearing on the top surface 0.007" or greater in width or as designated 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 the crack, including those portions that are narrower than 0.007" wide. Use Paulco TE-2501 (Viking Paints, Inc.), Dural 50 LM (Euclid Chemical Co.), TK-9000 or TK-2110 (TK Products), or an approved equal epoxy sealer. Include all work and materials associated with the bridge deck and barrier crack sealing in the price bid for Class AAE-3 Concrete.

602 FORM LINERS: Include the cost to provide and install the form liners in the unit price bid for "Class AAE-3 Concrete."

602 SPECIAL SURFACE FINISH: Apply TexCote XL 70 BridgeCote with Silane to the new barrier and the side of the bridge deck. Do not apply TexCote special surface finish to any form liner areas. Include all special surface finish costs in the unit price bid for "Class AAE-3 Concrete." Seal all cracks in accordance with the manufacturer's recommendations prior to applying the TexCote special surface finish.

Use a medium textured finish and color number 36424 that meets Aerospace Material Specifications (AMS) Standard 595.

602 WEATHER LIMITATIONS: All requests in accordance with 602.04 C.4 "Weather Limitations" require approval from the NDDOT Bridge Division.



LAKE ARDOCH INTERCHANGE	
NOTES	
DRAWING NO.	29-163.699-2

900 ELEVATION CHECK POINTS: Place six bolts on the top of the barriers, in accordance with Std D-900-1, to serve as elevation check points. Include the cost for this item in the unit price bid for Class AAE-3 concrete.

930 ROADWAY CANOPY: A canopy is required to be constructed above the roadway under the existing structure to protect traffic from falling material. The canopy is an added safeguard and does not relieve the Contractor from any responsibility for the safety of the public.

Submit the canopy details, including materials that will be used, to the Engineer for review. The canopy will provide a minimum vertical clearance of 15'-6" above the traveled roadway. The canopy will be extended a minimum distance of 5'-0" beyond the edge of the driving lanes beneath the structure.

Construct the canopy before removing the concrete deck and barrier. The canopy will also be in place before installing forming for the new portion of deck and remain in place until after the new barrier is complete. The canopy may be supported from the ground or suspended from the beams. Complete the installation of the canopy in a minimum amount of time and with the least inconvenience to the public.

Once the bridge barrier is completed, remove the canopy. A quantity of 0.5 L SUM will be paid at this location. Payment for "Roadway Canopy" includes the construction, maintenance, and removal of canopy system.

930 AGGREGATE SLOPE PROTECTION: Remove the existing concrete slope protection and place foundation fill and aggregate slope protection on the embankment slopes as shown. Place the foundation fill in accordance with Section 210.04 B.3.

Clear the subgrade of rubbish and vegetation before placing the aggregate slope protection. Thoroughly compact all loose material. Excavate or backfill as required to obtain the plan cross-section or lines and grades established in the field.

The gradation of the material used to form the slope protection is given in the following chart;

Sieve Size	% Passing
2"	100%
3/4"	5-35%
#4	0-5%

The minimum fractured face requirement of the aggregate is 50% by weight on the portion of the aggregate retained on the No. 4 sieve. To be considered fractured, the rock must have at least one fractured face.

Deposit, spread, consolidate, and shape the aggregate by mechanical or hand methods to provide a uniform depth and density and produce a uniform surface appearance. Apply MC-250 that meets the requirements of Section 818.02 C, "Medium-Curing Cutback Asphalt" at an approximate rate of 1.8 gallons per square yard. The bituminous materials are to penetrate to a depth of not less than one-half the required thickness of the aggregate. Protect adjacent structure surfaces against bituminous splatter.

Include all costs for labor, materials, and equipment to complete this work, including the removals of the existing concrete slope protection and the foundation fill, in the unit price bid for "Aggregate Slope Protection."

930 CRACK SEALING: After the penetrating water repellent has been applied and is dry, the Engineer will perform a visual inspection of the concrete pier cap to determine the need for crack sealing. Mark and repair all cracks appearing on the outer surfaces 0.007" or greater in width or as designated 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 the crack, including those portions that are narrower than 0.007" wide. Use Paulco TE-2501 (Viking Paints, Inc.), Dural 50 LM (Euclid Chemical Co.), TK-9000 or TK-2110 (TK Products), or an approved equal epoxy sealer.

Include all work and materials associated with crack sealing of the concrete pier cap in the price bid for "Crack Sealing."



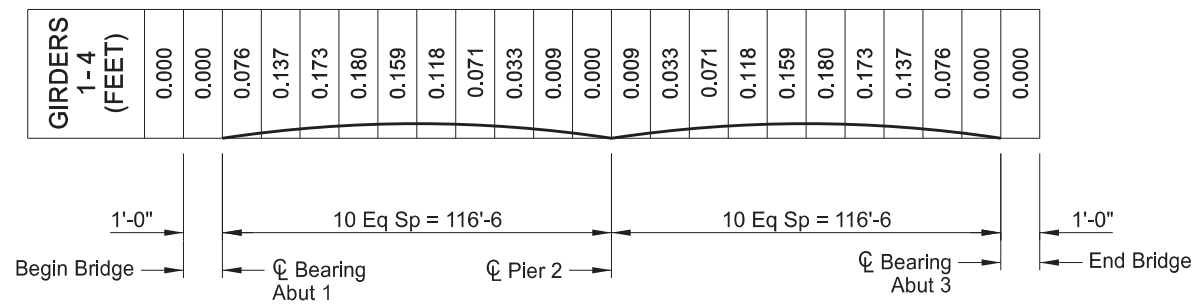
LAKE ARDOCH INTERCHANGE

NOTES

DRAWING NO.

29-163.699-3

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	170	4



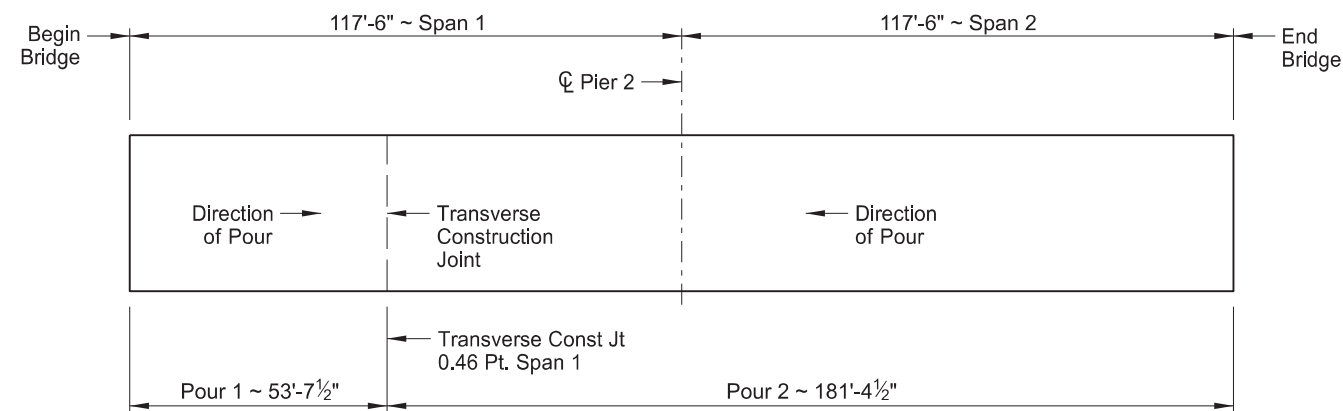
NOTE:

The dead load deflections shown are for the deck and riser dead load only. The screed elevations and riser information will be provided by the Bridge Division within three working days (Monday - Friday) of receiving the following field information:

1. Elevations along ϕ of the existing roadway prior to any removals.
2. Elevations along the tops of the exposed beams following removals.

All elevations are to be taken at the locations shown in the table above.

DEAD LOAD DEFLECTION

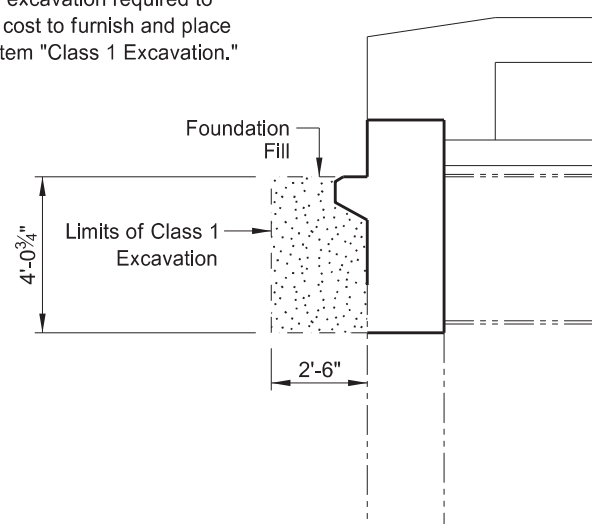


DECK POURING SEQUENCE

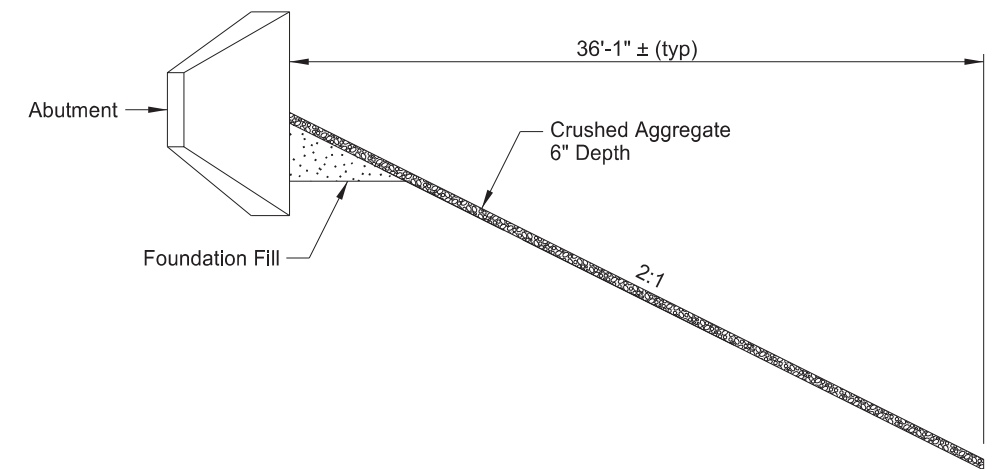
NOTE:

Compact the foundation fill according to section 714.04 A.10.

Include the cost of the Class I excavation required to construct the endwall and the cost to furnish and place the foundation fill in the pay item "Class 1 Excavation."



DETAIL AT ABUTMENT



AGGREGATE SLOPE PROTECTION DETAIL

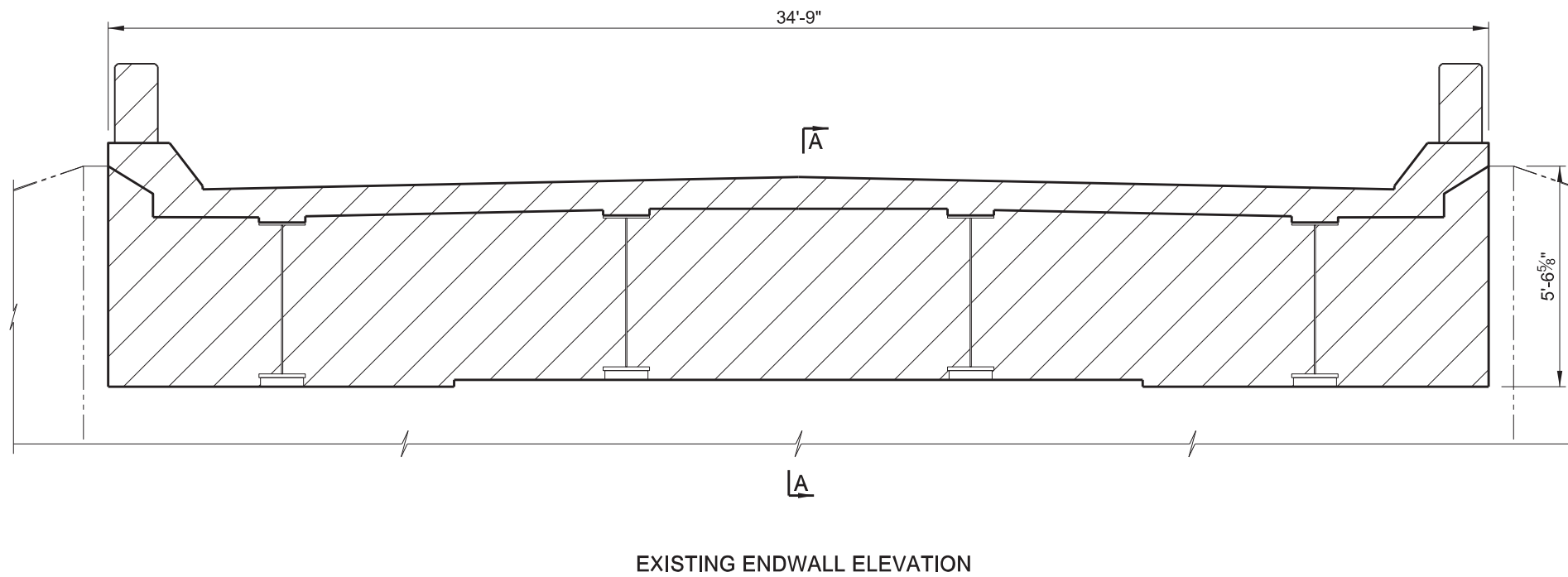
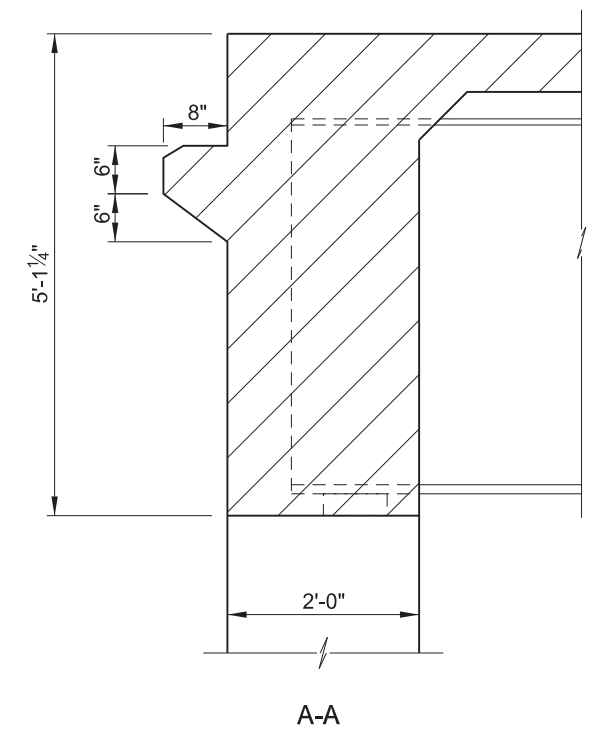
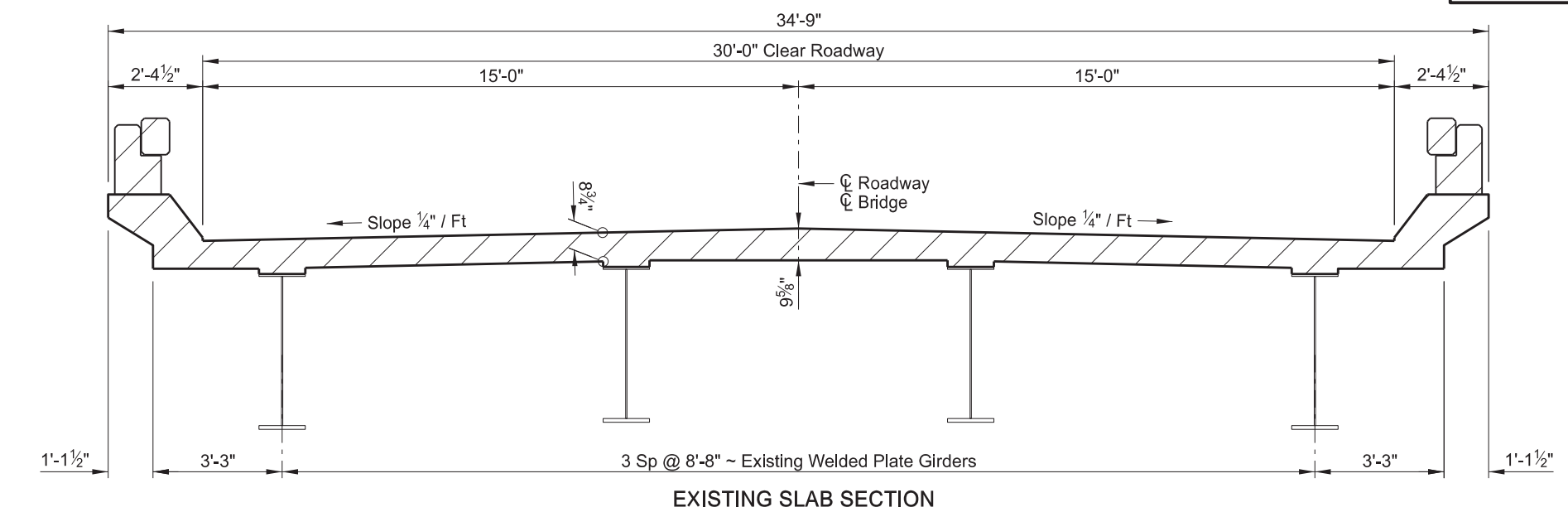
BRIDGE BID ITEMS			
SPEC	CODE	ITEM DESCRIPTION	QUANTITY
202	0111	REMOVAL OF CONCRETE	L SUM 0.5
210	0102	CLASS 1 EXCAVATION-SITE 1	L SUM 1
602	0130	CLASS AAE-3 CONCRETE	CY 271.2
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY 850
612	0115	REINFORCING STEEL-GRADE 60	LBS 888
612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS 70,012
930	3000	BRIDGE BENCH MARKS	SET 1
930	7012	ROADWAY CANOPY	L SUM 0.5
930	8686	AGGREGATE SLOPE PROTECTION	SY 396
930	9223	CRACK SEALING	LF 4

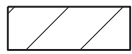


LAKE ARDOCH INTERCHANGE	
DEAD LOAD DEFLECTION, DETAIL AT ABUTMENT & BID ITEM QUANTITIES	
DRAWING NO.	29-163.699-4

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

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	170	5



 The hatched areas indicate concrete to be removed. Carefully remove concrete to ensure no damage is done to the existing reinforcing steel that is to remain in place. Sand blast clean the exposed existing reinforcing bars from any rust scale.



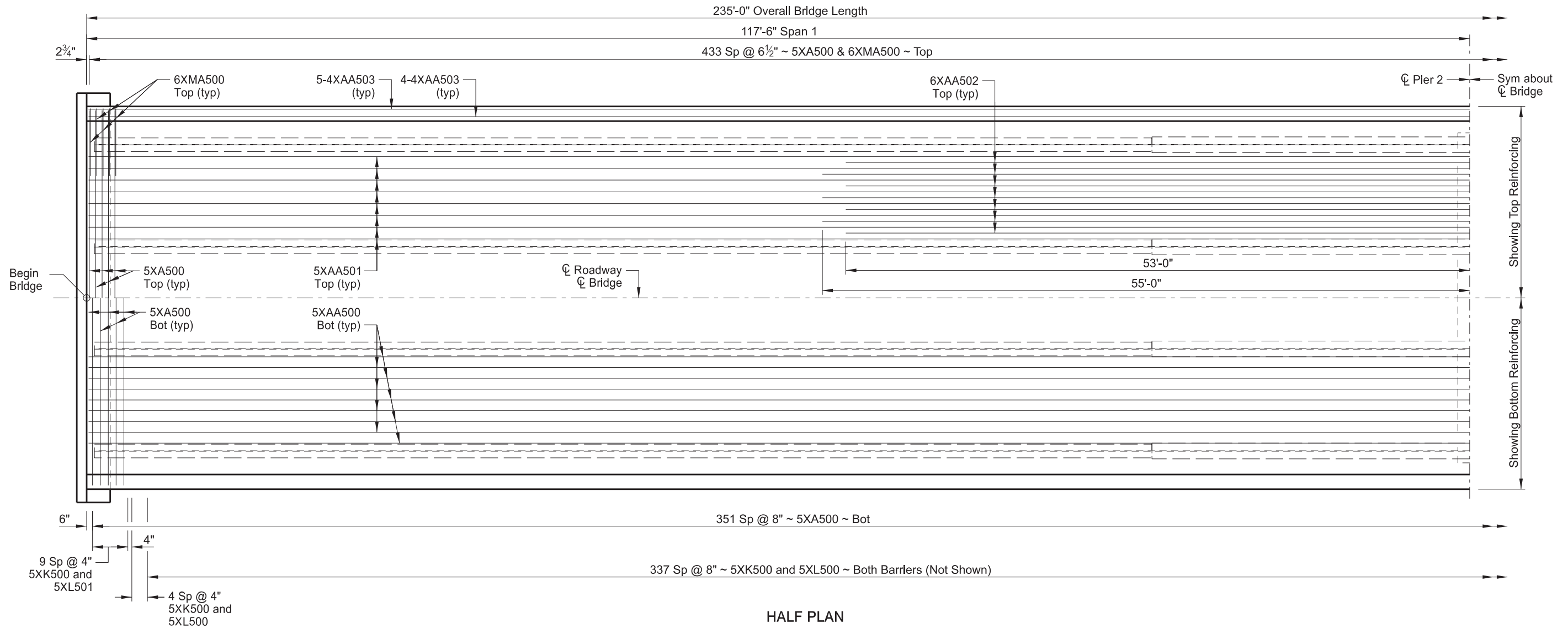
LAKE ARDOCH INTERCHANGE

CONCRETE REMOVAL DETAILS

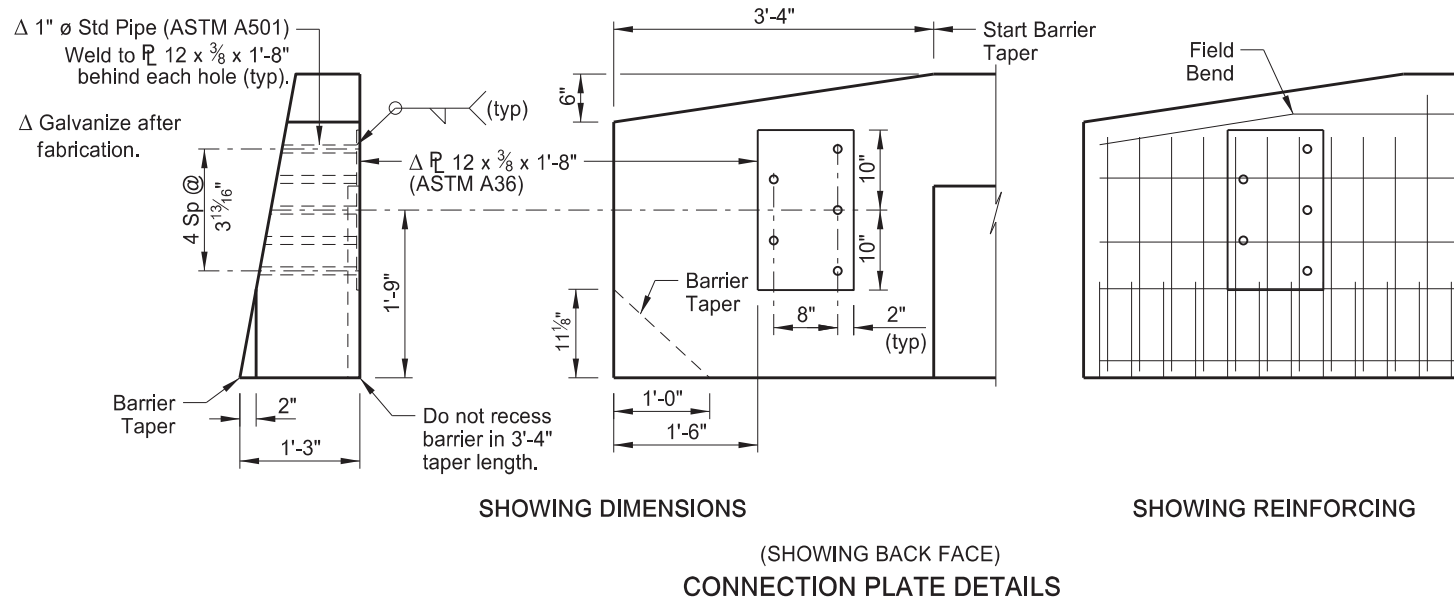
DRAWING NO. 29-163.699-5

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

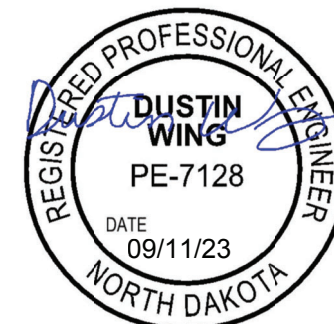
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	170	6



HALF PLAN



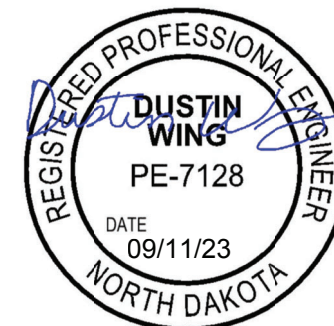
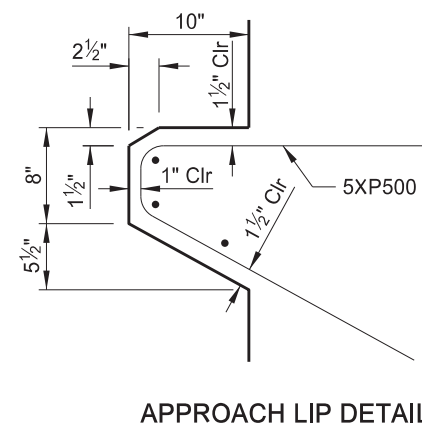
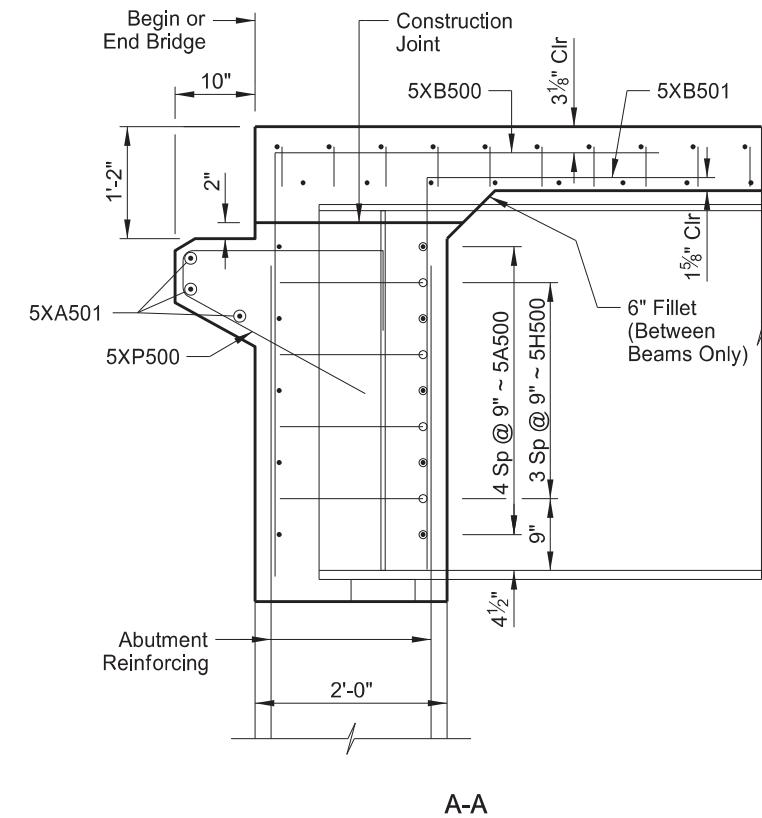
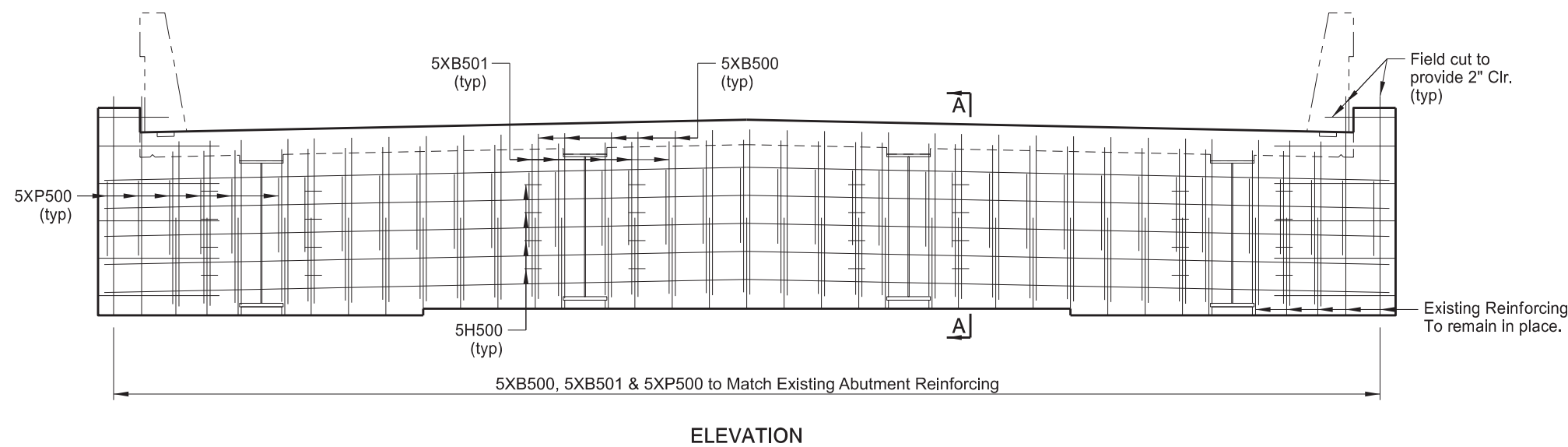
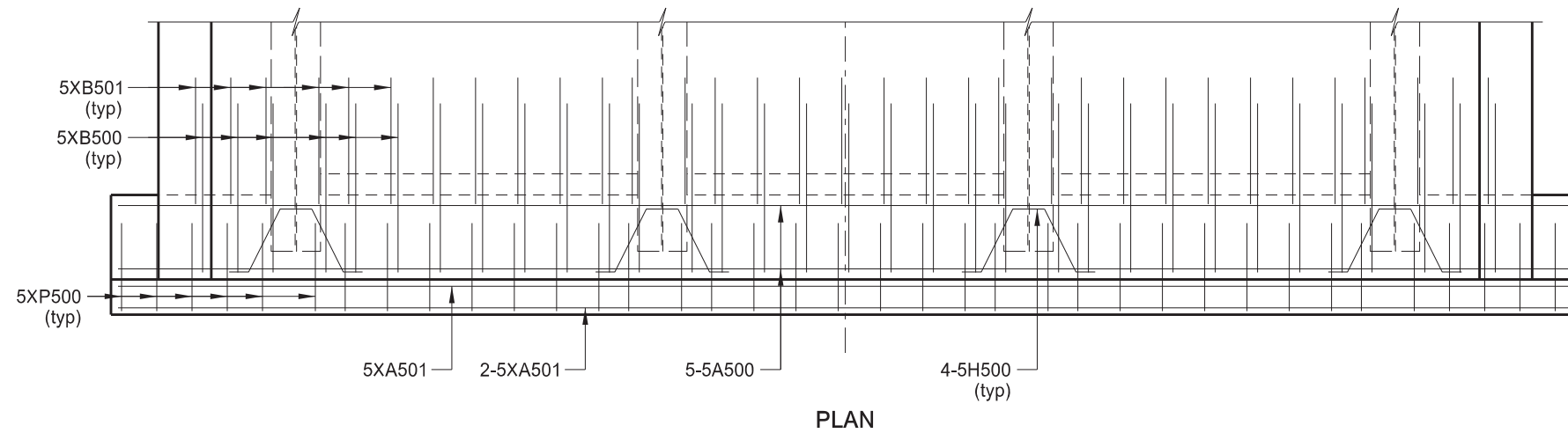
(SHOWING BACK FACE)
 CONNECTION PLATE DETAILS



QUANTITIES	
SEE DWG 29-163.699-8	
LAKE ARDOCH INTERCHANGE	
HALF SLAB LAYOUT	
DRAWING NO.	29-163.699-6

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

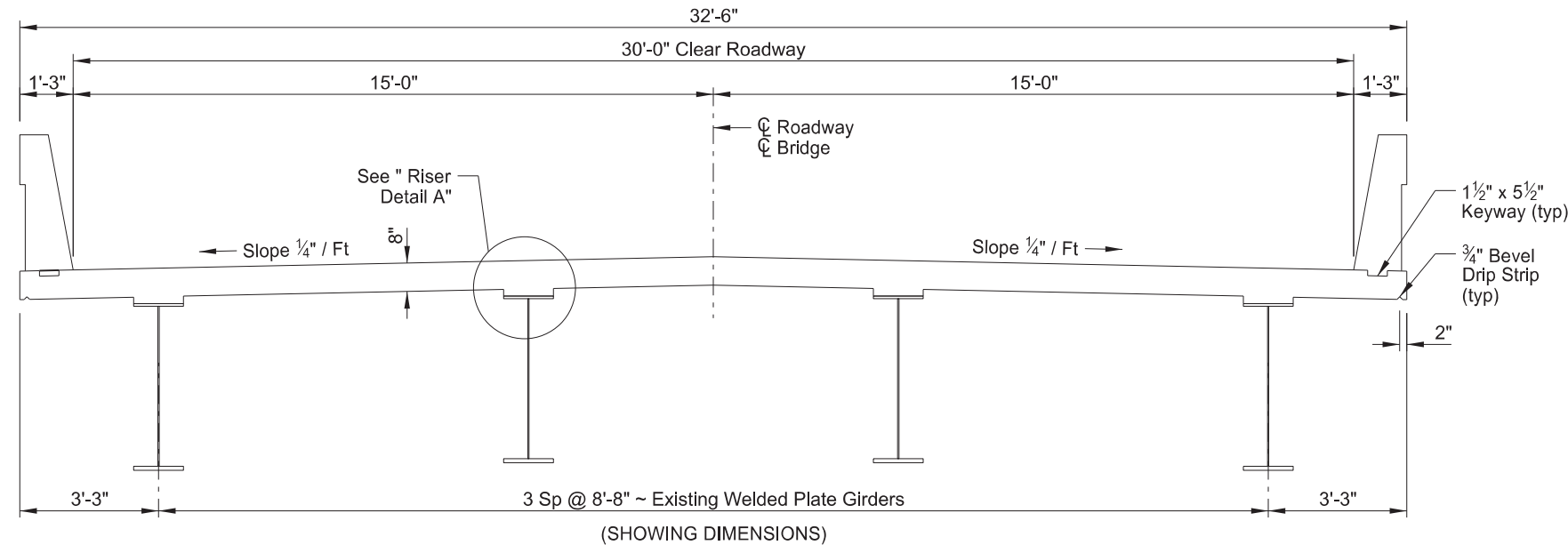
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	170	7



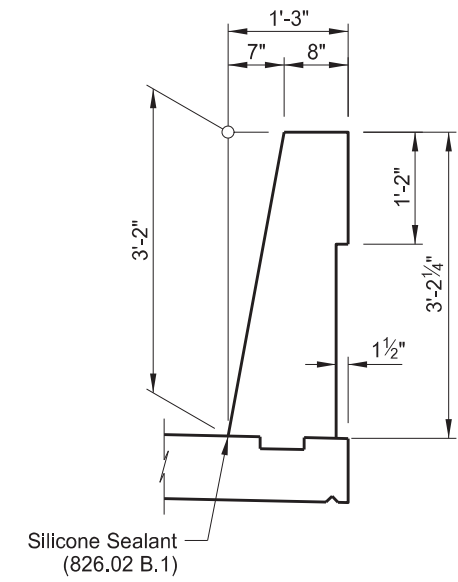
QUANTITIES	
SEE DWG 29-163.699-8	
LAKE ARDOCH INTERCHANGE	
ENDWALL DETAILS	
DRAWING NO.	29-163.699-7

23 U.S.C. § 407 Documents
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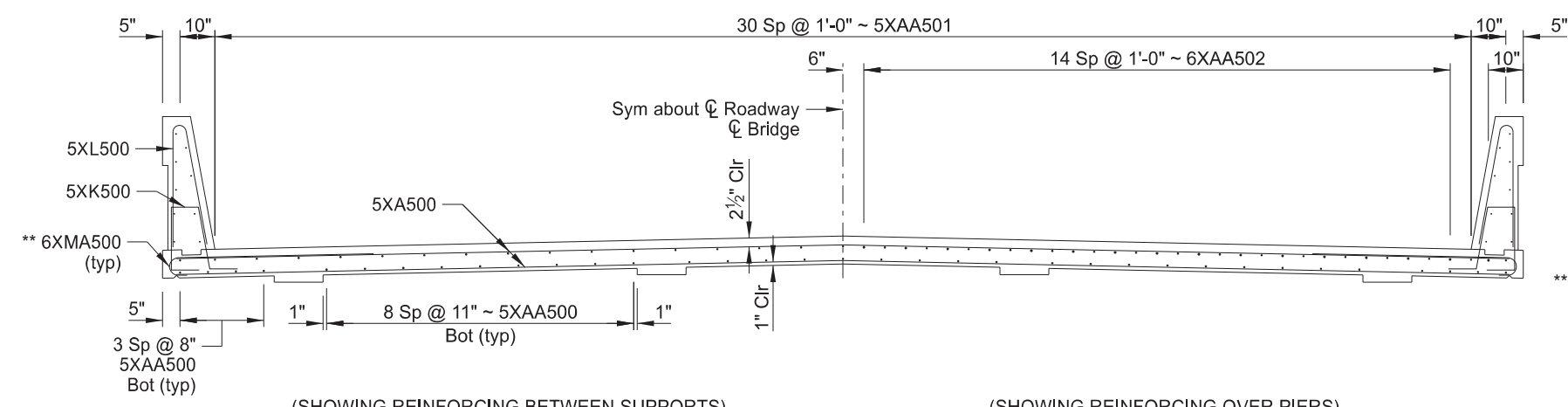
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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SLAB SECTION

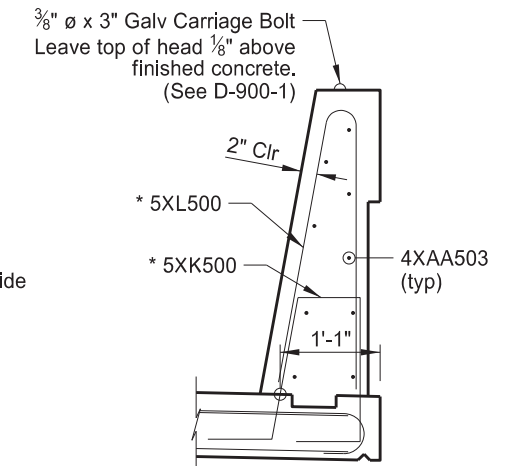


SHOWING DIMENSIONS



SLAB SECTION

** Rotate 6XMA500 reinforcing steel to provide 1" clear from hook to bottom of slab.

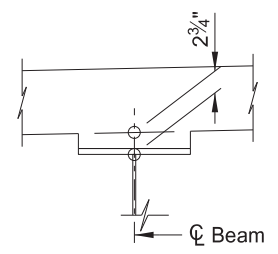


* Provide a 2" clearance from the front face to the barrier reinforcing.

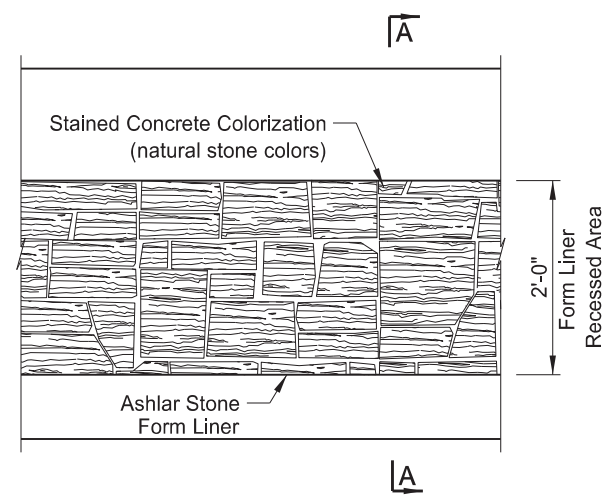
SHOWING REINFORCING

BARRIER DETAIL

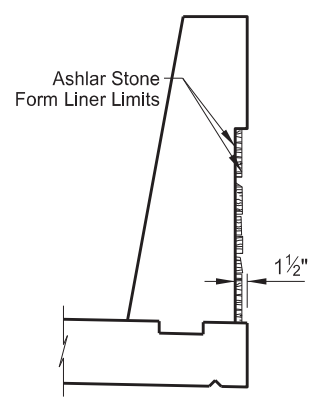
The 2 3/4" dimension shown are located at the supports. Adjust the riser to maintain the 8" slab.



RISER DETAIL A



BARRIER ELEVATION



A-A



QUANTITIES	
CLASS AAE-3 CONCRETE	271.2 CY
REINFORCING STEEL	888 LBS
REINFORCING STEEL (EPOXY)	70,012 LBS

LAKE ARDOCH INTERCHANGE
SLAB SECTION

DRAWING NO.	29-163.699-8
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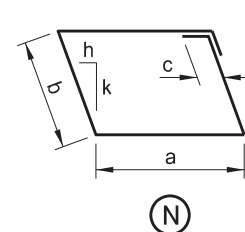
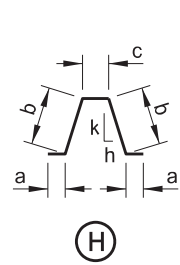
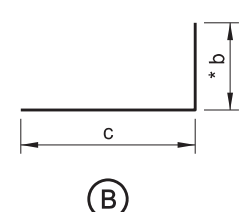
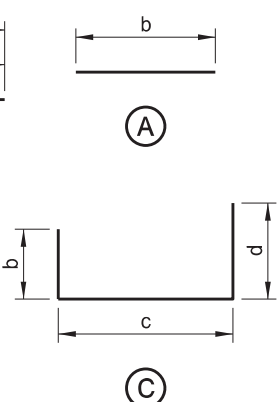
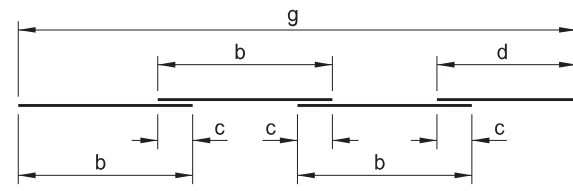
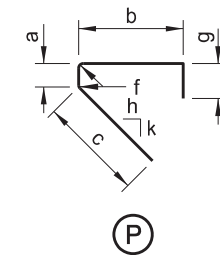
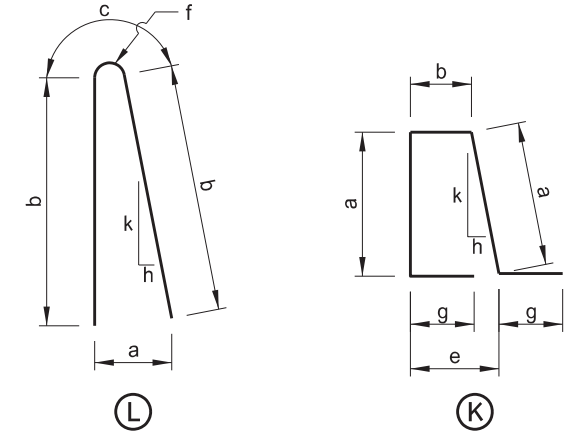
BILL OF REINFORCING STEEL, GRADE 60

LETTER PREFIX OF BAR MARK DENOTES SHAPE ~ SEE BAR DETAILS

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	170	9

LOCATION	SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS								LOCATION	SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS													
					a	b	c	d	e	f	g	h						k	a	b	c	d	e	f	g	h	k				
ABUTMENTS	5	A500	20	34'-5"										REGULAR	5	A500	20	34'-5"		34'-5"											
	5	H500	32	5'-1"											5	H500	32	5'-1"	6"	1'-8"	9"						6	12			
PIERS														SUPERSTRUCTURE	5	XA500	786	31'-10"													
															5	XA501	6	34'-5"		34'-5"											
															5	XB500	66	8'-5"		4'-5"	4'-0"										
															5	XB501	66	7'-2"		4'-2"	3'-0"										
															5	XK500	732	4'-11"	1'-6"	7"				10			8"	2.2	12		
															5	XL500	692	5'-11"	9"	2'-9"	5"					1.25		2.2	12		
															5	XL501	40	5'-3"	9"	2'-5"	5"					1.25		2.2	12		
															5	XP500	74	5'-6"	5"	2'-1"	2'-2"					1.25		10"	12	6.5	
															EPOXY	6	XMA500	868	6'-4"		5'-9"										
																5	XAA500	35	246'-8"	50'-0"	3'-0"	46'-8"	4					234'-8"			
													5	XAA501		33	244'-8"	50'-0"	2'-6"	44'-8"	4					234'-8"					
													6	XAA502		32	111'-0"	60'-0"	3'-0"	51'-0"	1					108'-0"					
														4	XAA503	18	244'-8"	50'-0"	2'-6"	44'-8"	4					234'-8"					

23 U.S.C. § 407 Documents
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c = Lap Splice (typ)
e = # of "b" Length Pieces in a Set
Total Length per Set = e x b + d

* b = Vertical Leg for XB500 and XB501



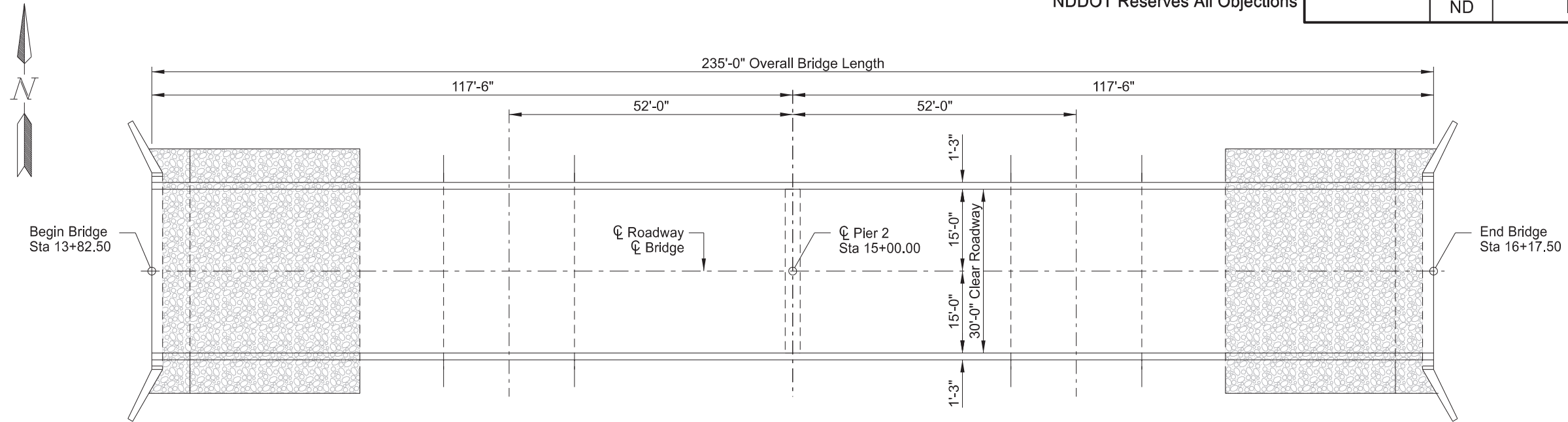
LAKE ARDOCH INTERCHANGE

REINFORCING BAR LIST & DETAILS

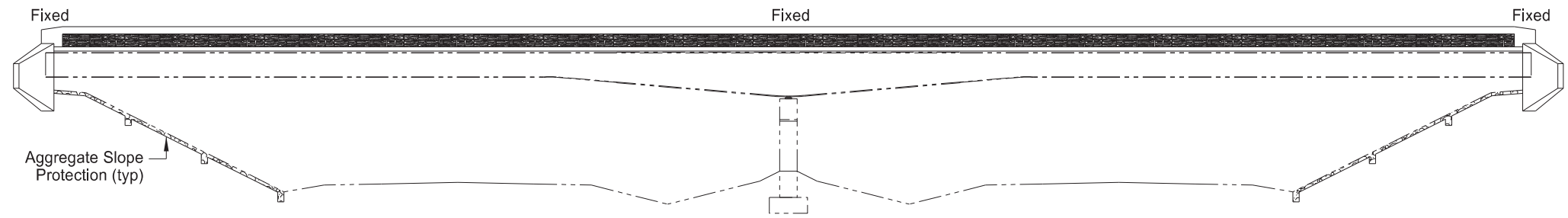
DRAWING NO. 29-163.699-9

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

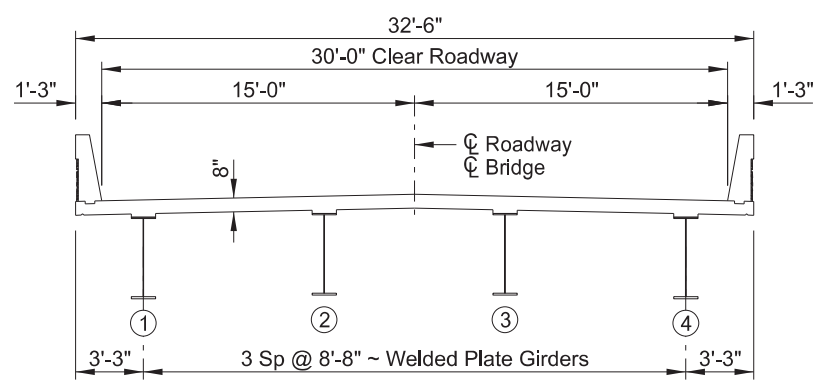
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	170	10



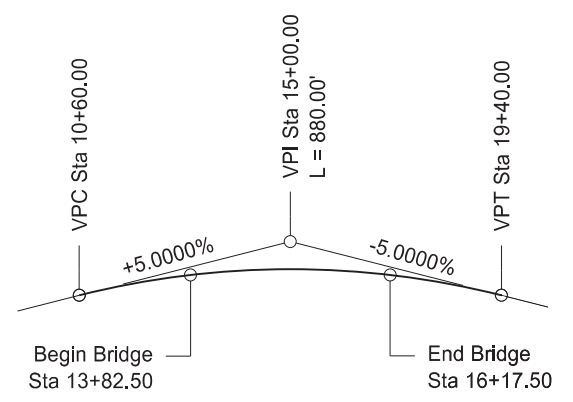
PLAN



ELEVATION



TYPICAL SECTION



VERTICAL CURVE DATA

DESIGN STRENGTHS:
 f'c = 4,000 psi ~ Class AAE-3 Concrete
 fy = 60,000 psi ~ Reinforcing Steel
 Load & Resistance Factor Design
 * Existing Beams Designed for H-20 Design Loading

SPECIAL PROVISIONS	
SSP 2	MIGRATORY BIRD TREATY ACT
SP 100(23)	ARCHITECTURAL SURFACE FINISH
STANDARD DRAWINGS	
D-900-1	
F.W.S. 15 PSF	
HL-93 DESIGN LOADING (BRIDGE DECK)	
MINTO INTERCHANGE	
BRIDGE LAYOUT	
ND DEPARTMENT OF TRANSPORTATION BRIDGE DIVISION	
Jason Thorenson 09/11/23	
DRAWING NO.	29-167.722-1



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	170	11

- 100 SCOPE OF WORK: This project consists of removing and replacing the concrete bridge deck at structure 29-167.722 over Interstate 29. This structure is a 2-span, welded plate girder bridge with an overall length of 235'-0". The clear roadway width will remain at 30'-0". The concrete slope protection will be removed and replaced at both abutments.

- 202 REMOVAL OF CONCRETE: Remove the concrete on the structure, as shown in the "Concrete Removal Details," in a manner that prevents damage to the remaining structure. Use a 15 pound maximum hammer size for the deck removal over the welded plate girders and diaphragms.

Submit SFN 17987 "Asbestos Notification of Demolition and Renovation" to the NDDEQ 10 days before beginning removal of concrete. If asbestos is discovered, the Engineer will issue a contract revision for work related to the asbestos.

Remove the concrete safety shape barriers at all corners of the bridge. Each safety shape transition is 13'-7" and is constructed of approximately 2.1 cubic yards of reinforced concrete. The bottom of the safety shape transition is approximately 2 feet below the finished surface. Include all labor and equipment to remove the concrete on the structure and the concrete safety shape barriers in the unit price bid for "Removal of Concrete." A quantity of 0.5 L SUM will be paid at this location.

- 210 EXCAVATION: Include the removal of asphalt and the excavation costs at the abutment, as shown in the "Detail at Abutment," in the lump sum bid item "Class 1 Excavation."

- 602 ENDWALLS: Place the endwall concrete prior to the deck concrete. Allow the endwall to cure a minimum of 5 days before placing the deck concrete.

- 602 CLASS AAE-3 CONCRETE: Use a design compressive strength of 4,000 psi at 28 days for Class AAE-3 concrete.

- 602 FALSEWORK: Brace the exterior beams to prevent rotation during deck placement. Design the strength of the bracing to resist the forces induced by the weight of the concrete, forms, equipment, and workers. Submit a bracing plan and design, stamped by a Professional Engineer, to the Engineer to review.

- 602 PENETRATING WATER REPELLENT TREATMENT: Apply penetrating water repellent treatment to the top of the bridge deck and the concrete pier cap. Apply penetrating water repellent treatment prior to sealing any bridge deck cracks. Do not apply pavement marking or allow traffic until the solution has completely penetrated and the entire driving surface is dry.

If water washing equipment is used for cleaning, provide either a pressure washer with 160°F water at 1,800 psi minimum nozzle pressure or a cold water pressure washer at 3,000 psi minimum nozzle pressure.

- 602 BRIDGE DECK 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 barriers to determine the need for crack sealing. Mark and repair all cracks appearing on the top surface 0.007" or greater in width or as designated by the Engineer.

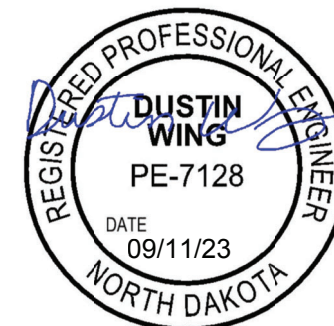
Immediately before applying the sealer, clean the cracks by removing all dust and debris with compressed air. Seal the cracks with a two-part epoxy in accordance with the manufacturer's recommendations. Chase crack with the sealant application to limits of the crack, including those portions that are narrower than 0.007" wide. Use Paulco TE-2501 (Viking Paints, Inc.), Dural 50 LM (Euclid Chemical Co.), TK-9000 or TK-2110 (TK Products), or an approved equal epoxy sealer. Include all work and materials associated with the bridge deck and barrier crack sealing in the price bid for Class AAE-3 Concrete.

- 602 FORM LINERS: Include the cost to provide and install the form liners in the unit price bid for "Class AAE-3 Concrete."

- 602 SPECIAL SURFACE FINISH: Apply TexCote XL 70 BridgeCote with Silane to the new barrier and the side of the bridge deck. Do not apply TexCote special surface finish to any form liner areas. Include all special surface finish costs in the unit price bid for "Class AAE-3 Concrete." Seal all cracks in accordance with the manufacturer's recommendations prior to applying the TexCote special surface finish.

Use a medium textured finish and color number 36424 that meets Aerospace Material Specifications (AMS) Standard 595.

- 602 WEATHER LIMITATIONS: All requests in accordance with 602.04 C.4 "Weather Limitations" require approval from the NDDOT Bridge Division.



MINTO INTERCHANGE	
NOTES	
DRAWING NO.	29-167.722-2

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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900 ELEVATION CHECK POINTS: Place six bolts on the top of the barriers, in accordance with Std D-900-1, to serve as elevation check points. Include the cost for this item in the unit price bid for Class AAE-3 concrete.

930 ROADWAY CANOPY: A canopy is required to be constructed above the roadway under the existing structure to protect traffic from falling material. The canopy is an added safeguard and does not relieve the Contractor from any responsibility for the safety of the public.

Submit the canopy details, including materials that will be used, to the Engineer for review. The canopy will provide a minimum vertical clearance of 15'-6" above the traveled roadway. The canopy will be extended a minimum distance of 5'-0" beyond the edge of the driving lanes beneath the structure.

Construct the canopy before removing the concrete deck and barrier. The canopy will also be in place before installing forming for the new portion of deck and remain in place until after the new barrier is complete. The canopy may be supported from the ground or suspended from the beams. Complete the installation of the canopy in a minimum amount of time and with the least inconvenience to the public.

Once the bridge barrier is completed, remove the canopy. A quantity of 0.5 L SUM will be paid at this location. Payment for "Roadway Canopy" includes the construction, maintenance, and removal of canopy system.

930 AGGREGATE SLOPE PROTECTION: Remove the existing concrete slope protection and place foundation fill and aggregate slope protection on the embankment slopes as shown. Place the foundation fill in accordance with Section 210.04 B.3.

Clear the subgrade of rubbish and vegetation before placing the aggregate slope protection. Thoroughly compact all loose material. Excavate or backfill as required to obtain the plan cross-section or lines and grades established in the field.

The gradation of the material used to form the slope protection is given in the following chart;

Sieve Size	% Passing
2"	100%
3/4"	5-35%
#4	0-5%

The minimum fractured face requirement of the aggregate is 50% by weight on the portion of the aggregate retained on the No. 4 sieve. To be considered fractured, the rock must have at least one fractured face.

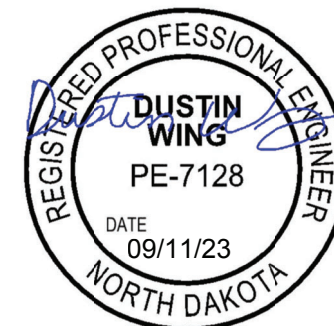
Deposit, spread, consolidate, and shape the aggregate by mechanical or hand methods to provide a uniform depth and density and produce a uniform surface appearance. Apply MC-250 that meets the requirements of Section 818.02 C, "Medium-Curing Cutback Asphalt" at an approximate rate of 1.8 gallons per square yard. The bituminous materials are to penetrate to a depth of not less than one-half the required thickness of the aggregate. Protect adjacent structure surfaces against bituminous splatter.

Include all costs for labor, materials, and equipment to complete this work, including the removals of the existing concrete slope protection and the foundation fill, in the unit price bid for "Aggregate Slope Protection."

930 CRACK SEALING: The Engineer will perform a visual inspection of the concrete pier cap to determine the need for crack sealing. Mark and repair all cracks appearing on the outer surfaces 0.007" or greater in width or as designated by the Engineer.

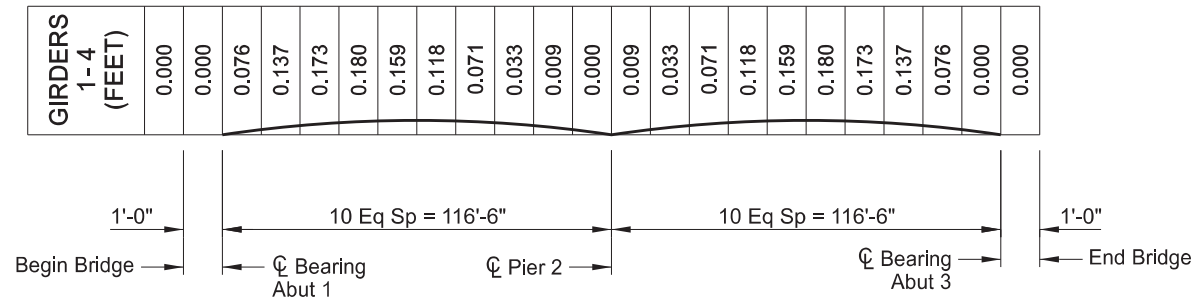
Immediately before applying the sealer, clean the cracks by removing all dust and debris with compressed air. Seal the cracks with a two-part epoxy in accordance with the manufacturer's recommendations. Chase crack with the sealant application to limits of the crack, including those portions that are narrower than 0.007" wide. Use Paulco TE-2501 (Viking Paints, Inc.), Dural 50 LM (Euclid Chemical Co.), TK-9000 or TK-2110 (TK Products), or an approved equal epoxy sealer.

Include all work and materials associated with crack sealing of the concrete pier cap in the price bid for "Crack Sealing."



MINTO INTERCHANGE	
NOTES	
DRAWING NO.	29-167.722-3

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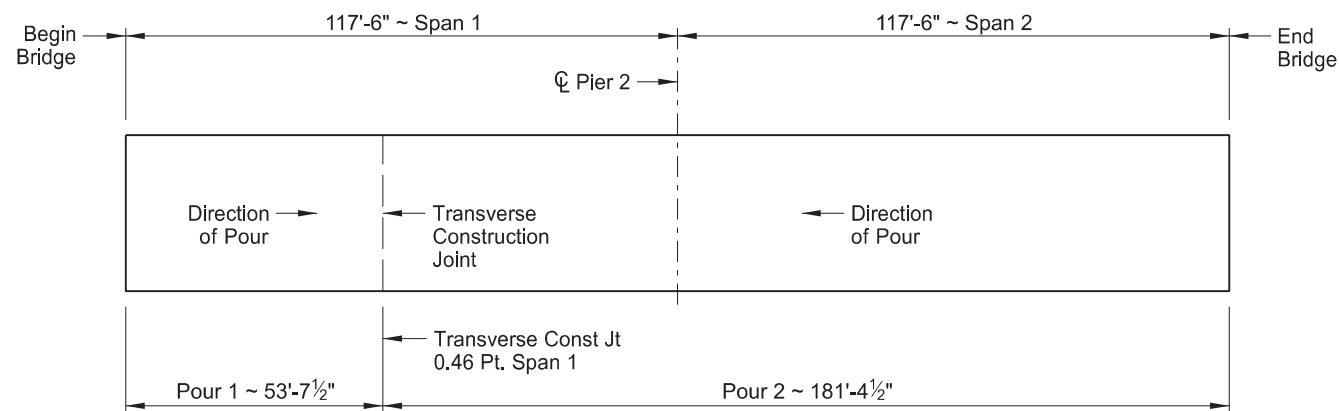
NOTE:

The dead load deflections shown are for the deck and riser dead load only. The screed elevations and riser information will be provided by the Bridge Division within three working days (Monday - Friday) of receiving the following field information:

1. Elevations along ϕ of the existing roadway prior to any removals.
2. Elevations along the tops of the exposed beams following removals.

All elevations are to be taken at the locations shown in the table above.

DEAD LOAD DEFLECTIONS

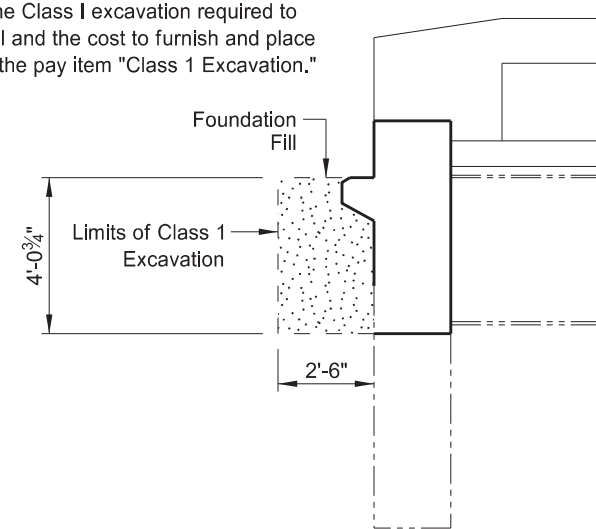


DECK POURING SEQUENCE

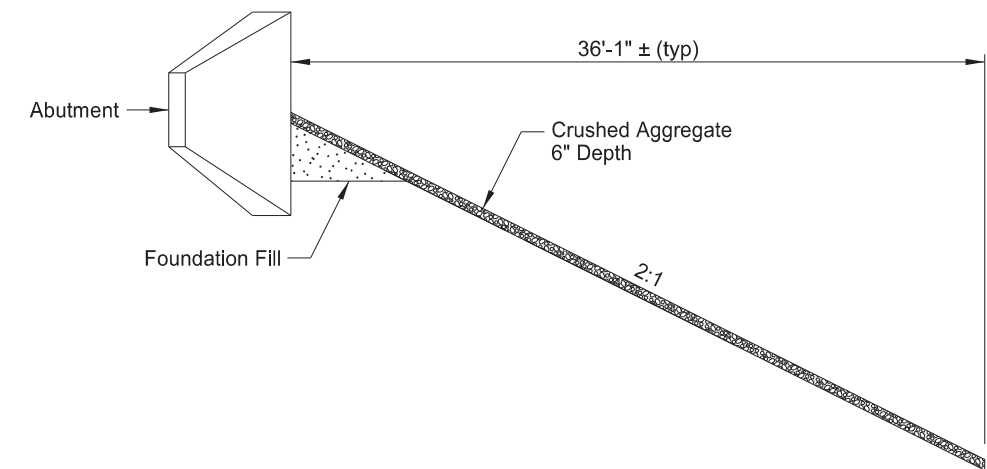
NOTE:

Compact the foundation fill according to section 714.04 A.10.

Include the cost of the Class I excavation required to construct the endwall and the cost to furnish and place the foundation fill in the pay item "Class 1 Excavation."

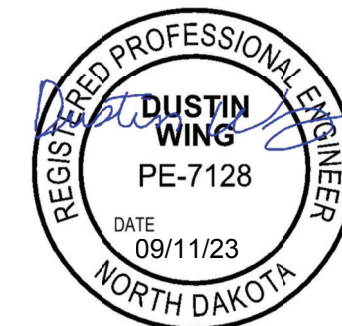


DETAIL AT ABUTMENT



AGGREGATE SLOPE PROTECTION DETAIL

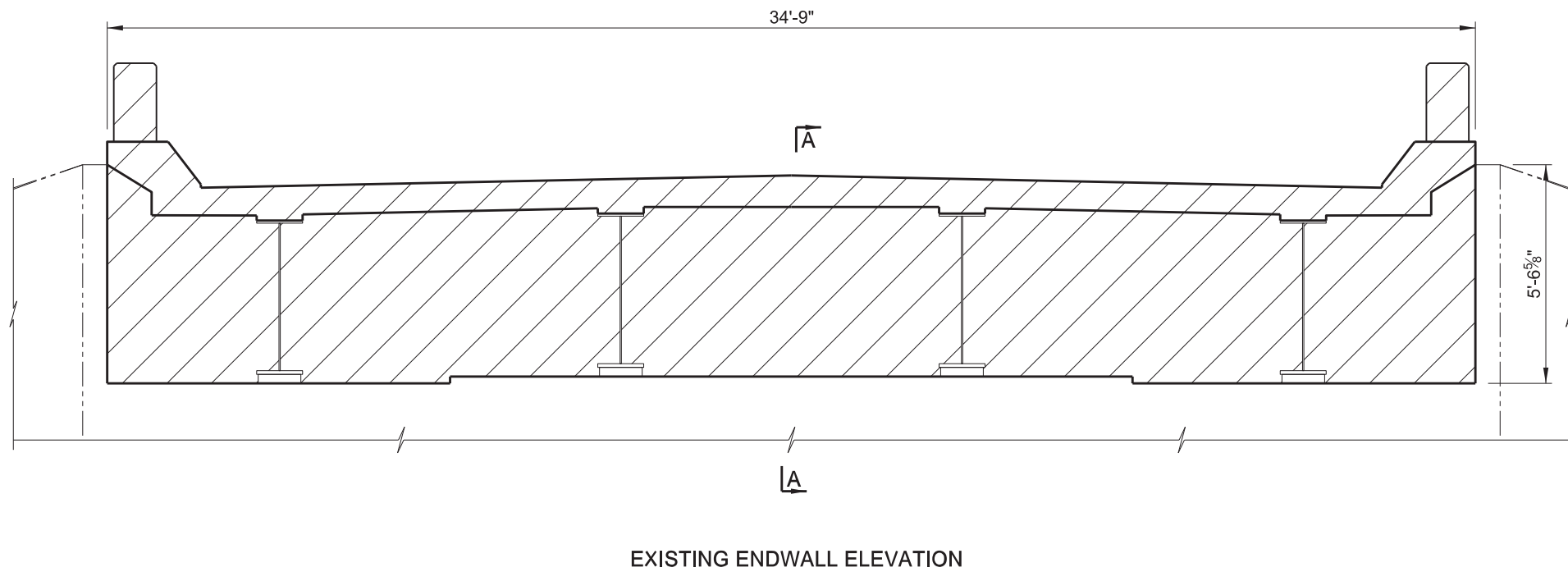
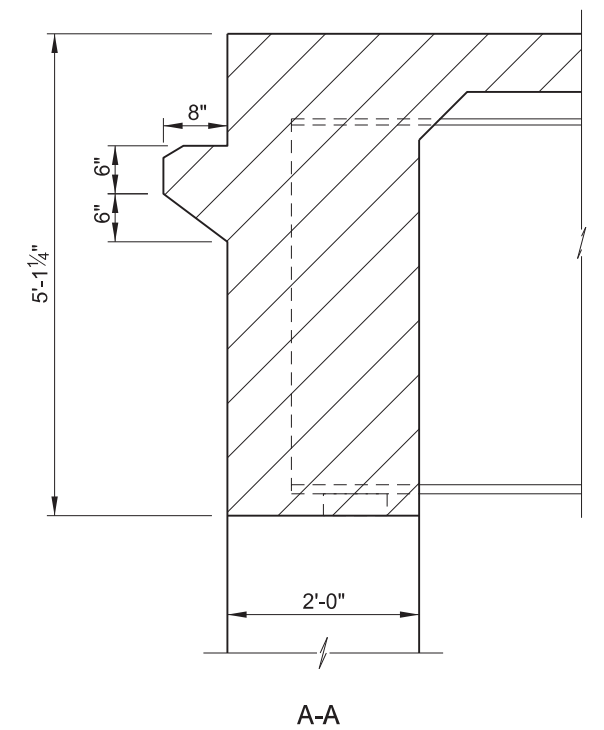
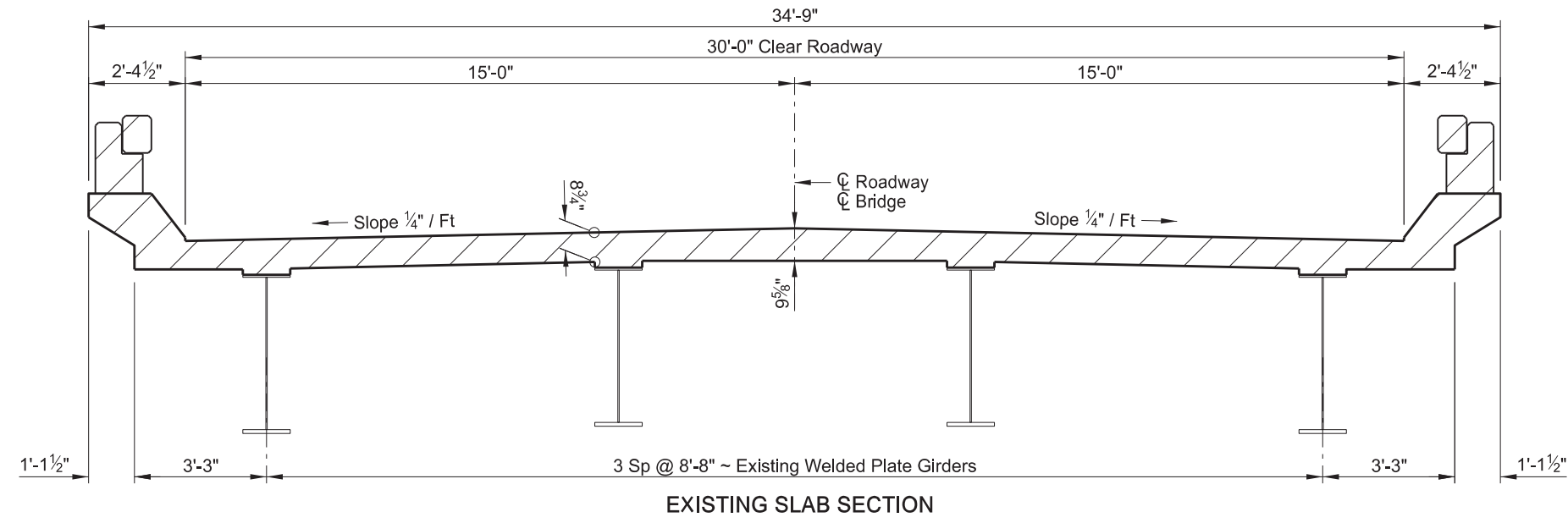
BRIDGE BID ITEMS			
SPEC	CODE	ITEM DESCRIPTION	QUANTITY
202	0111	REMOVAL OF CONCRETE	L SUM 0.5
210	0103	CLASS 1 EXCAVATION-SITE 2	L SUM 1
602	0130	CLASS AAE-3 CONCRETE	CY 271.2
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY 850
612	0115	REINFORCING STEEL-GRADE 60	LBS 888
612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS 70,012
930	3000	BRIDGE BENCH MARKS	SET 1
930	7012	ROADWAY CANOPY	L SUM 0.5
930	8686	AGGREGATE SLOPE PROTECTION	SY 396
930	9223	CRACK SEALING	LF 2




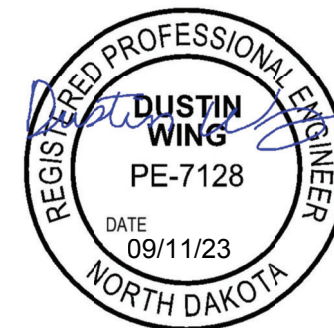
MINTO INTERCHANGE	
DEAD LOAD DEFLECTION, DETAIL AT ABUTMENT & BID ITEM QUANTITIES	
DRAWING NO.	29-167.722-4

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

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 The hatched areas indicate concrete to be removed. Carefully remove concrete to ensure no damage is done to the existing reinforcing steel that is to remain in place. Sand blast clean the exposed existing reinforcing bars from any rust scale.



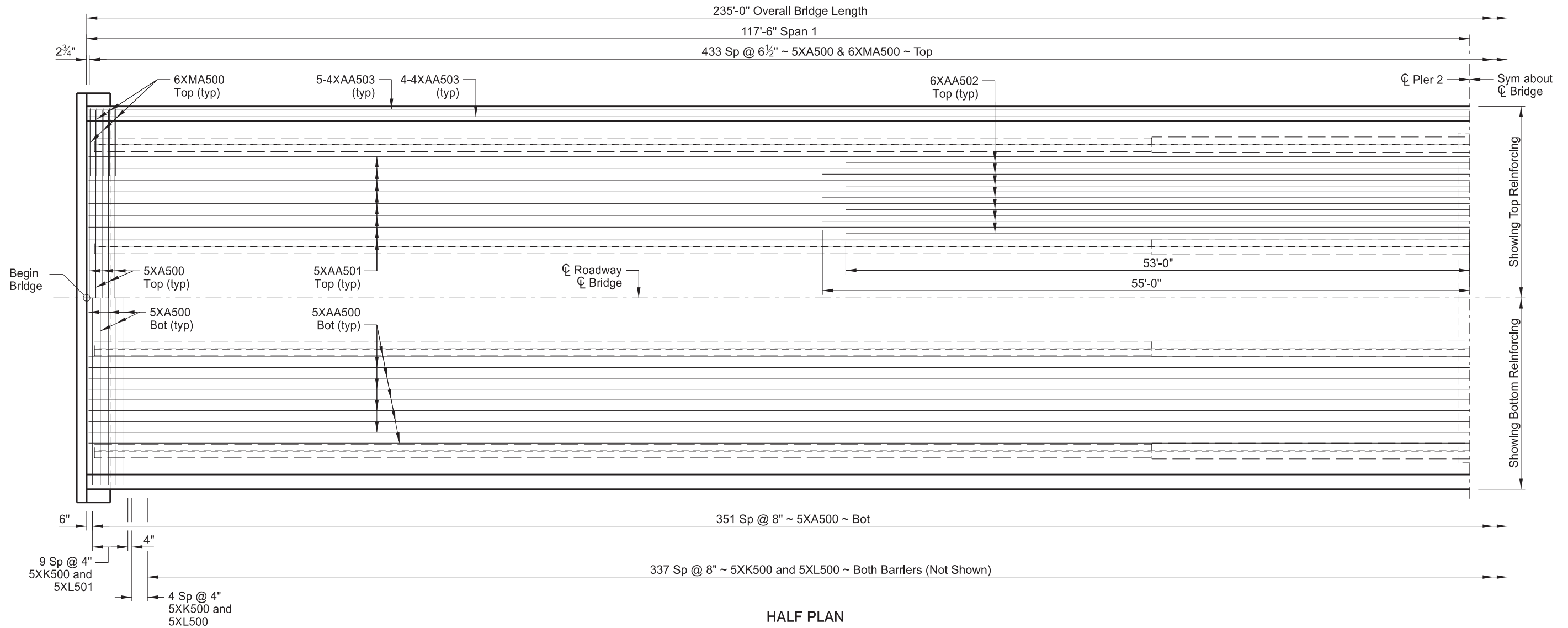
MINTO INTERCHANGE

CONCRETE REMOVAL DETAILS

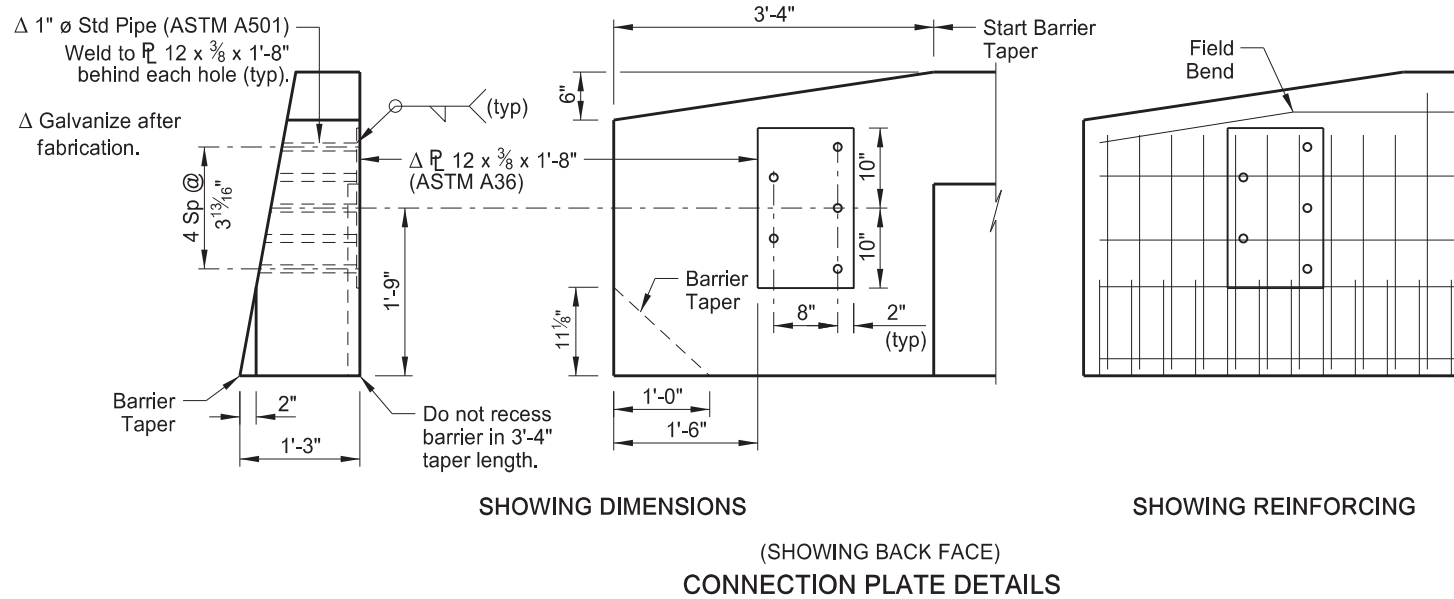
DRAWING NO. 29-167.722-5

23 U.S.C. § 407 Documents
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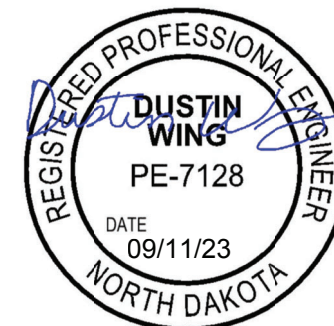
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	170	15



HALF PLAN



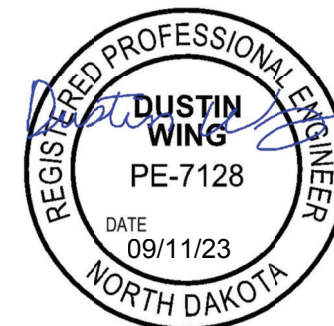
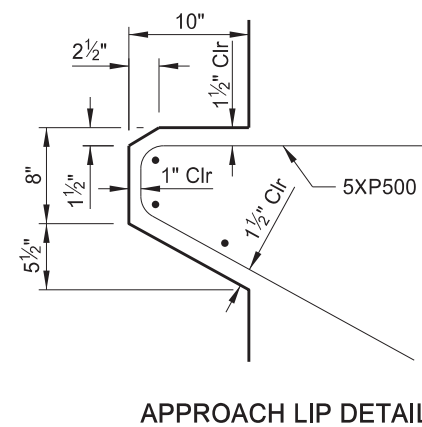
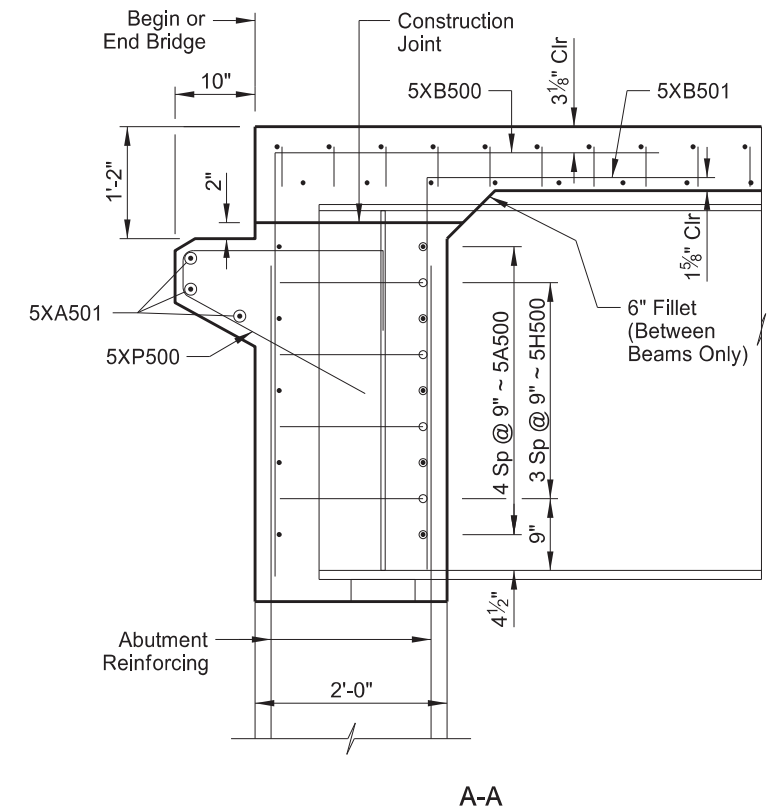
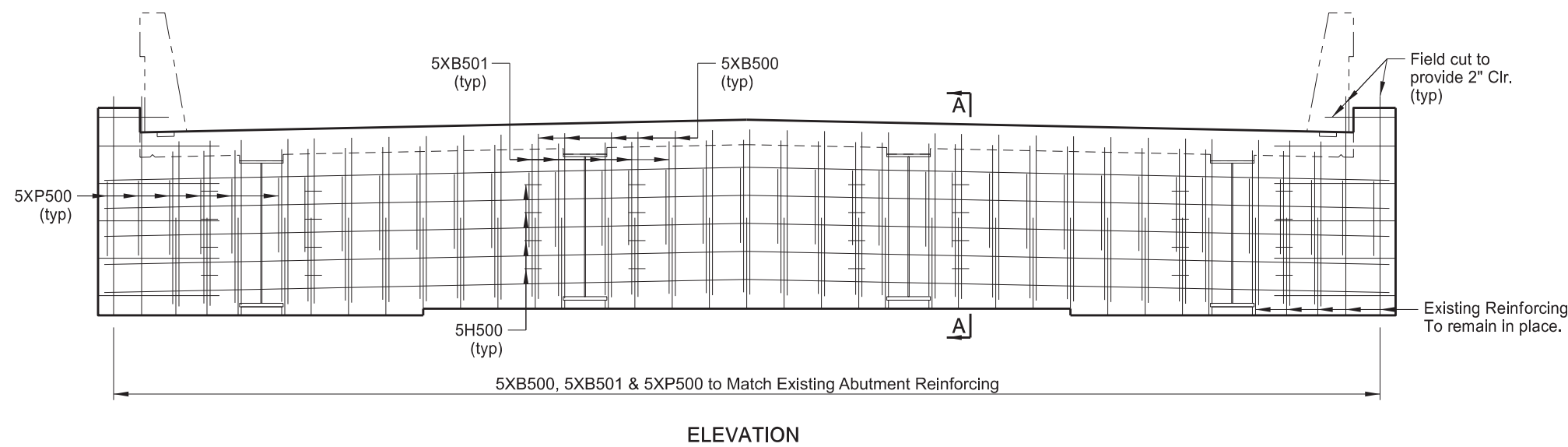
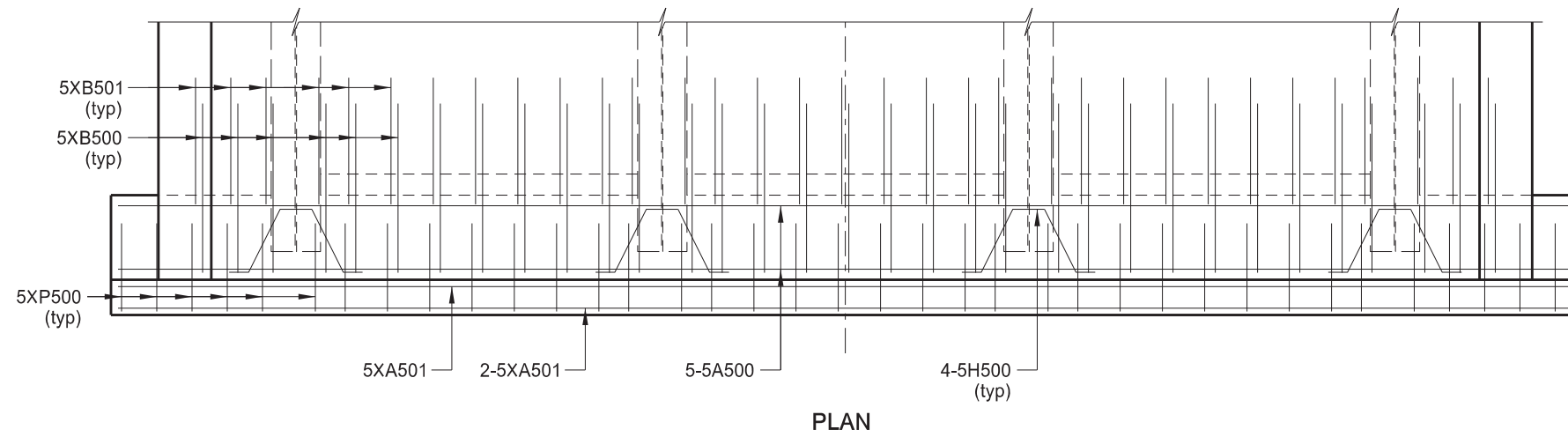
(SHOWING BACK FACE)
 CONNECTION PLATE DETAILS



QUANTITIES	
SEE DWG 29-167.722-8	
MINTO INTERCHANGE	
HALF SLAB LAYOUT	
DRAWING NO.	29-167.722-6

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

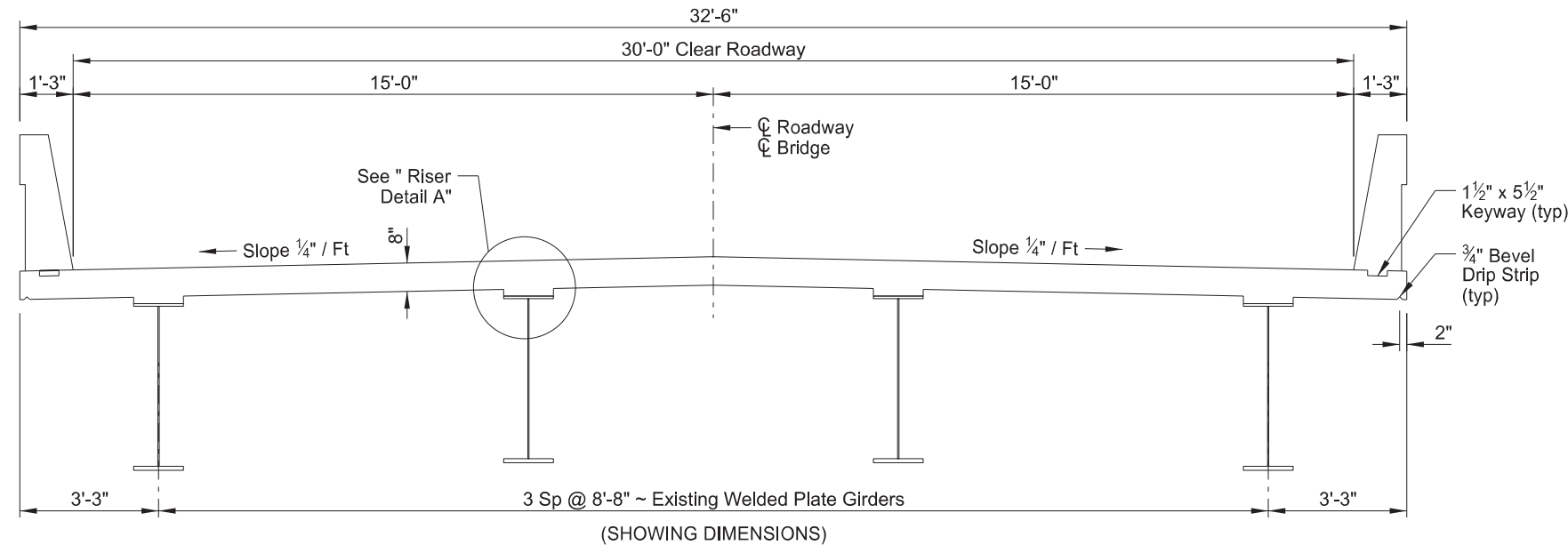
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	170	16



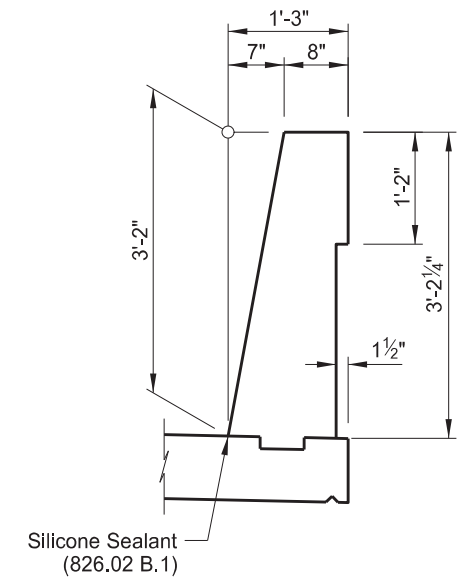
QUANTITIES	
SEE DWG 29-167.722-8	
MINTO INTERCHANGE	
ENDWALL DETAILS	
DRAWING NO.	29-167.722-7

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

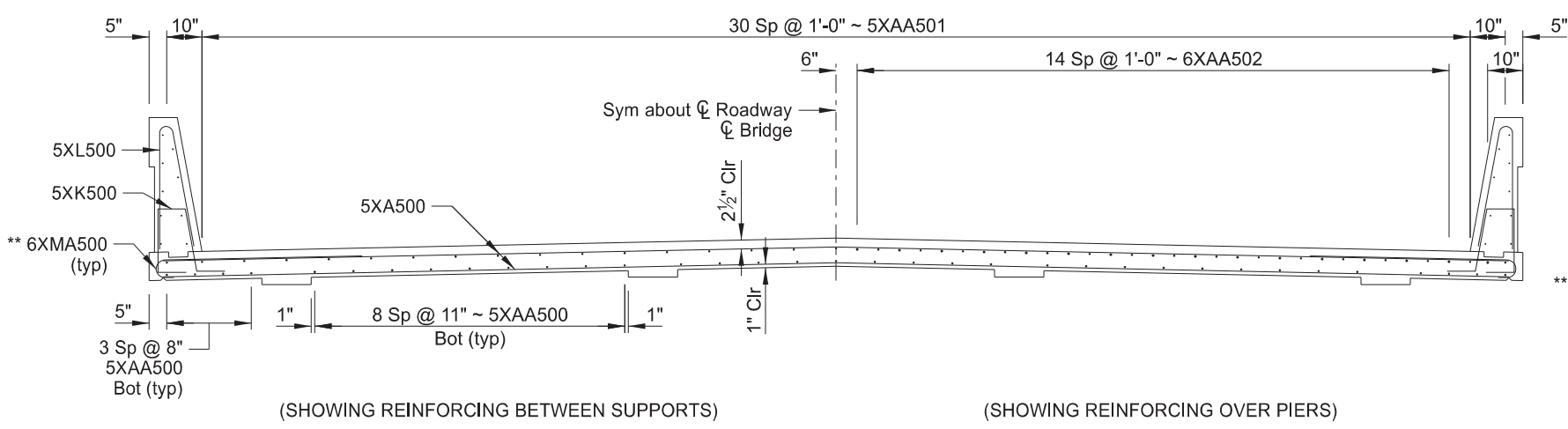
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	170	17



SLAB SECTION

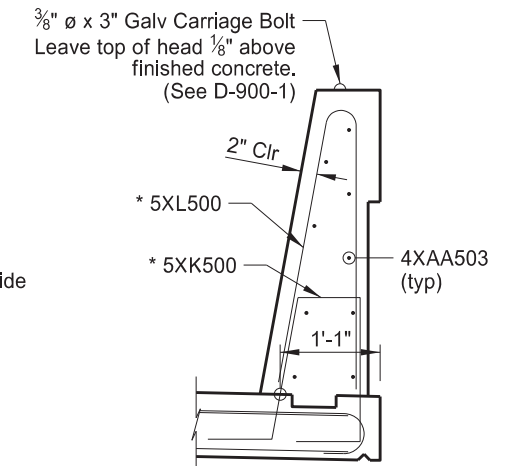


SHOWING DIMENSIONS



SLAB SECTION

** Rotate 6XMA500 reinforcing steel to provide 1" clear from hook to bottom of slab.

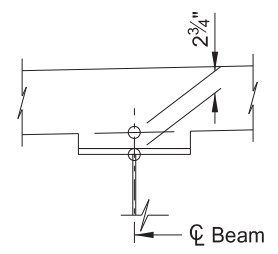


* Provide a 2" clearance from the front face to the barrier reinforcing.

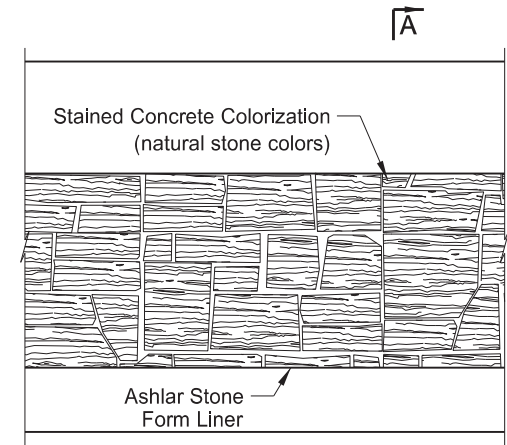
SHOWING REINFORCING

BARRIER DETAIL

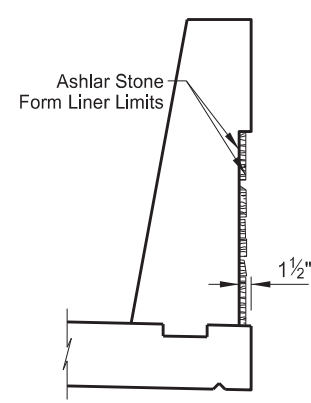
The 2 3/4" dimension shown are located at the supports. Adjust the riser to maintain the 8" slab.



RISER DETAIL A



BARRIER ELEVATION



A-A



QUANTITIES	
CLASS AAE-3 CONCRETE	271.2 CY
REINFORCING STEEL	888 LBS
REINFORCING STEEL (EPOXY)	70,012 LBS

MINTO INTERCHANGE
SLAB SECTION

DRAWING NO. 29-167.722-8

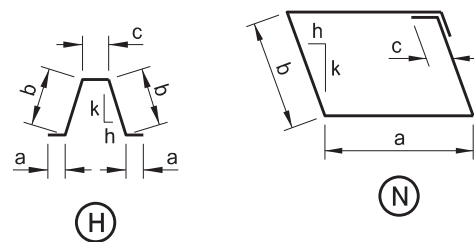
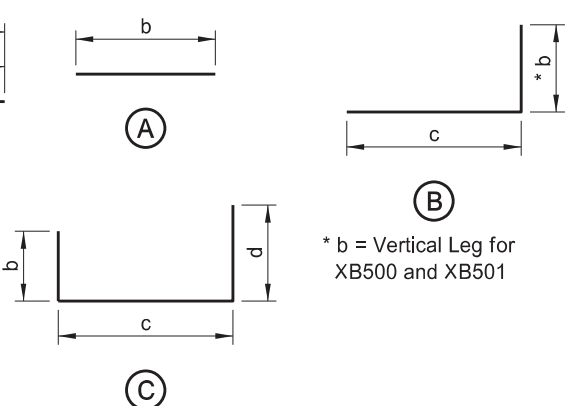
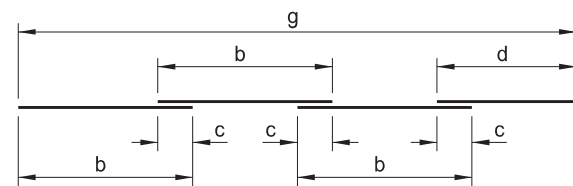
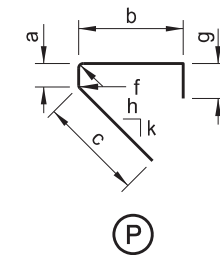
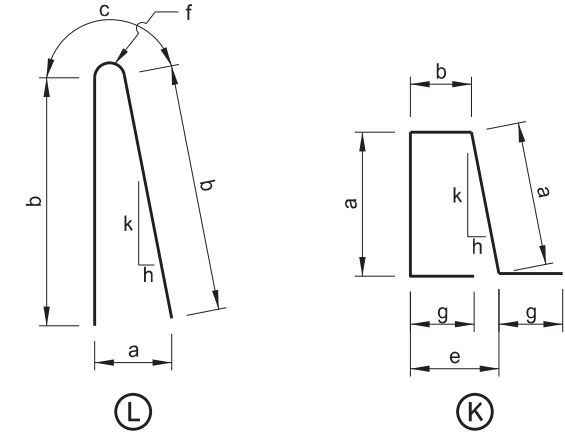
BILL OF REINFORCING STEEL, GRADE 60

LETTER PREFIX OF BAR MARK DENOTES SHAPE ~ SEE BAR DETAILS

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(164)163	170	18

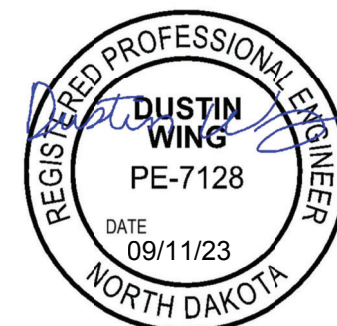
LOCATION	SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS								LOCATION	SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS													
					a	b	c	d	e	f	g	h						k	a	b	c	d	e	f	g	h	k				
ABUTMENTS	5	A500	20	34'-5"										REGULAR	5	A500	20	34'-5"		34'-5"											
	5	H500	32	5'-1"											5	H500	32	5'-1"	6"	1'-8"	9"						6	12			
PIERS														SUPERSTRUCTURE	5	XA500	786	31'-10"		31'-10"											
																5	XA501	6	34'-5"		34'-5"										
																5	XB500	66	8'-5"		4'-5"	4'-0"									
																5	XB501	66	7'-2"		4'-2"	3'-0"									
															EPOXY	5	XK500	732	4'-11"	1'-6"	7"				10			8"	2.2	12	
																	5	XL500	692	5'-11"	9"	2'-9"	5"				1.25		2.2	12	
																	5	XL501	40	5'-3"	9"	2'-5"	5"				1.25		2.2	12	
																	5	XP500	74	5'-6"	5"	2'-1"	2'-2"				1.25		10"	12	6.5
																	6	XMA500	868	6'-4"		5'-9"									
																	5	XAA500	35	246'-8"	50'-0"	3'-0"	46'-8"	4					234'-8"		
														5		XAA501	33	244'-8"	50'-0"	2'-6"	44'-8"	4					234'-8"				
														6		XAA502	32	111'-0"	60'-0"	3'-0"	51'-0"	1					108'-0"				
														4		XAA503	18	244'-8"	50'-0"	2'-6"	44'-8"	4					234'-8"				

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



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

* b = Vertical Leg for XB500 and XB501

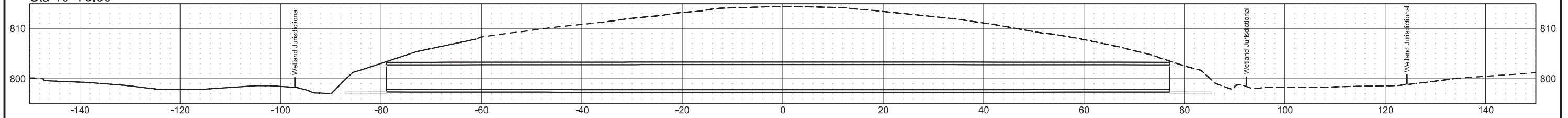


MINTO INTERCHANGE
REINFORCING BAR LIST & DETAILS
DRAWING NO. 29-167.722-9

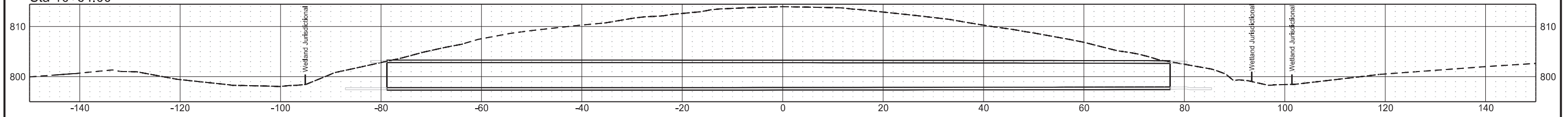
Pipe Cross Sections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(164)163	200	1

Sta 10+75.00



Sta 10+64.00



NDDOT ABBREVIATIONS

D-101-1

? This is a special text character used in the labeling of existing features. It indicates a feature that has an unknown characteristic, potentially based on: lack of description, location accuracy or purpose.

Abn abandoned
 Abut abutment
 Adj adjusted
 Aggr aggregate
 Ahd ahead
 ARV air release valve
 Align alignment
 Al alley
 Alt alternate
 Alum aluminum
 ADA Americans with Disabilities Act
 & and
 Appr approach
 Approx approximate
 ACP asbestos cement pipe
 Asph asphalt
 AC asphalt cement
 Assmd assumed
 @ at
 Atten attenuation
 ATR automatic traffic recorder
 Ave Avenue
 Avg average
 ADT average daily traffic

Bk back
 BF back face
 Balc balcony
 B Wire barbed wire
 Barr barricade
 Btry battery
 BI beehive inlet
 Beg begin
 BG below grade
 BM bench mark
 Bkwy bikeway
 Bit bituminous
 Blk block
 BH bore hole
 Bot bottom
 Blvd Boulevard
 Bndry boundary
 Brkwy breakaway
 Br bridge
 Bldg building
 Bus. business
 BV butterfly valve
 Byp bypass

C Gdrl cable guardrail
 Calc calculate
 CIP cast iron pipe
 CB catch basin
 CRS cationic rapid setting
 C Gd cattle guard
 C To C center to center
 CL or ☉ centerline
 Ch chain
 Chnlk chain-link
 Ch Blk channel block
 Ch Ch channel change
 Chk check
 Chsld chiseled
 Cir circle
 Cl class
 Clnt clean-out
 Clr clear
 Cl&gr clearing & grubbing
 Comb. combination
 Coml commercial
 Compr compression
 CADD computer aided drafting & design
 Conc concrete
 CECB concrete erosion control blanket
 Cond conductor
 Const construction
 Cont continuous
 CSB continuous split barrel sample
 Contr contraction
 Contr contractor
 CP control point
 Coord coordinate
 Cor corner
 Corr corrected
 CAES corrugated aluminum end section
 CAP corrugated aluminum pipe
 CMES corrugated metal end section
 CMP corrugated metal pipe
 CPVCP corrugated poly-vinyl chloride pipe
 CSES corrugated steel end section
 CSFES corrugated steel flared end section
 CSP corrugated steel pipe
 CSTES corrugated steel traversable end section
 Co County
 Crse course
 Ct Court
 Xarm cross arm
 Xbuck cross buck
 Xsec cross sections
 Xing crossing
 Xrd crossroad
 Crn crown

Culv culvert
 C&G curb & gutter
 CI curb inlet
 CR curb ramp
 C cut
 Dd Ld dead load
 Defl deflection
 Defm deformed
 DInt delineate
 DIntr delineator
 Depr depression
 Desc description
 Det detail
 DWP detectable warning panel
 Dtr detour
 Dia or ø diameter
 Dir direction
 Dist distance
 DM disturbed material
 DB ditch block
 DG ditch grade
 Dbl double
 Dn down
 Dwg drawing
 Dr drive
 Drwy driveway
 DI drop inlet
 D dry density

Ea each
 Esmt easement
 E East
 EB Eastbound
 Elast elastomeric
 EL electric locker
 E Mtr electric meter
 Elec electric/al
 EDM electronic distance meter
 Elev or El elevation
 Ellipt elliptical
 Emb embankment
 Emuls emulsion/emulsified
 ES end section
 Engr engineer
 ESS environmental sensor station
 Eq equal
 Evgr evergreen
 Exc excavation
 Exst existing
 Exp expansion
 Expy Expressway
 E external of curve
 Extru extruded

FOS factor of safety
 Fed Federal
 FP feed point
 Fn fence
 Fn P fence post
 FO fiber optic
 FD field drive
 F fill
 FAA fine aggregate angularity
 FH fire hydrant
 Fl flange
 Flrd flared
 FES flared end section
 F Bcn flashing beacon
 FA flight auger sample
 FL flow line
 Ftg footing
 FM force main
 Fnd found
 Fdn foundation
 Frac fractional
 Frwy freeway
 Frt front
 FF front face
 F Disp fuel dispenser
 FFP fuel filler pipes
 FLS fuel leak sensor
 Furn furnish/ed

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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REVISIONS	
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04-23-18	General Revisions
05-20-18	General Revisions
12-18-20	General Revisions
08-16-22	General Revisions



NDDOT ABBREVIATIONS

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	preformed		
Intmdt	intermediate	Mtd	mounted	Prep	preperation		
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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12-18-20	General Revisions
08-16-22	General Revisions

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08/16/22

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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08-16-22	General Revisions



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

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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				

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



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

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



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

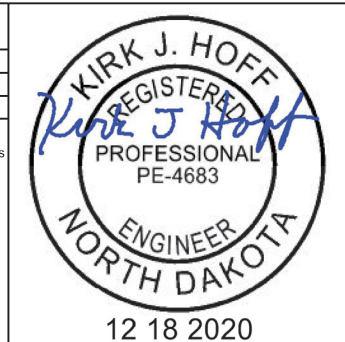
Erosion Control

- 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

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



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



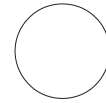
Existing Large Tree



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

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


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

SYMBOLS

D-101-32

 Existing Luminaire  Luminaire LED  Existing Light Standard Luminaire  Relocate Light Standard  Light Standard Light LED Luminaire  Light Standard 35 Watt High Pressure Sodium Vapor Luminaire  Light Standard 50 Watt High Pressure Sodium Vapor Luminaire  Light Standard 70 Watt High Pressure Sodium Vapor Luminaire  Light Standard 100 Watt High Pressure Sodium Vapor Luminaire  Light Standard 150 Watt High Pressure Sodium Vapor Luminaire  Light Standard 200 Watt High Pressure Sodium Vapor Luminaire  Light Standard 250 Watt High Pressure Sodium Vapor Luminaire  Light Standard 310 Watt High Pressure Sodium Vapor Luminaire  Light Standard 400 Watt High Pressure Sodium Vapor Luminaire  Light Standard 700 Watt High Pressure Sodium Vapor Luminaire  Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire  Emergency Vehicle Detector  Video Detection Camera	  High Mast Light Standard 3 Luminaire (Exst, Ppsd)   High Mast Light Standard 4 Luminaire (Exst, Ppsd)   High Mast Light Standard 5 Luminaire (Exst, Ppsd)   High Mast Light Standard 6 Luminaire (Exst, Ppsd)   High Mast Light Standard 7 Luminaire (Exst, Ppsd)   High Mast Light Standard 8 Luminaire (Exst, Ppsd)   High Mast Light Standard 9 Luminaire (Exst, Ppsd)   High Mast Light Standard 10 Luminaire (Exst, Ppsd)   Overhead Sign Structure Load Center (Exst, Ppsd)   Traffic Signal Controller (Exst, Ppsd)   Pad Mounted Traffic Signal Controller (Exst, Ppsd)   Flashing Beacon (Exst, Ppsd)   Concrete Foundation (Exst, Ppsd)   Pipe Mounted Flasher (Exst, Ppsd)   Pad Mounted Feed Point (Exst, Ppsd)   Pipe Mounted Feed Point with Pad (Exst, Ppsd)   Pole Mounted Feed Point (Exst, Ppsd)   Junction Box (Exst, Ppsd)  Existing Pedestrian Head with Number  Existing Signal Head  Pole Mounted Head  Existing Lighting Standard Pole	 Existing Traffic Signal Standard    Pull Box (Exst-Ppsd-Undefined)   Intelligent Transportation Pull Box (Exst, Ppsd)   Transformer (Exst, Ppsd)    Power Pole (Exst-Ppsd-with Transformer)   Wood Pole (Exst, Ppsd)   Pedestrian Push Button Post (Exst, Ppsd)  Existing Pole  Existing Telephone Pole  Existing Post     Connection Conductor (Ground, Neutral, Phase 1, Phase 2)
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NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions



12 18 2020

SYMBOLS

D-101-33

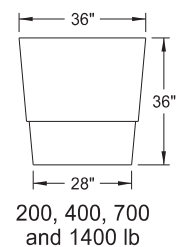
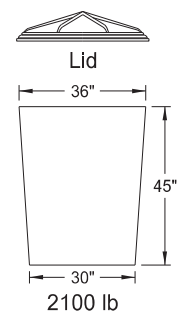
			Existing Manhole (Electrical, Gas, Telephone)			Cap or Stub Exst Gas, Exst Sanitary, Exst Storm Drain, Ppsd Storm Drain, Exst Water	
			Water Manhole (Exst, Exst with Valve)				
			Sanitary Sewer Manhole (Exst, Ppsd, Exst with Valve)		Existing Pedestal Electrical, Telephone, Fiber Optic Telephone, TV, 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

ATTENUATION DEVICE



Outer Containers



200 lb

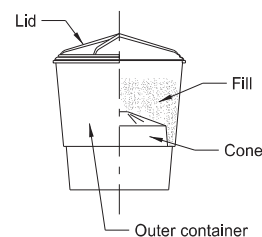


400 lb

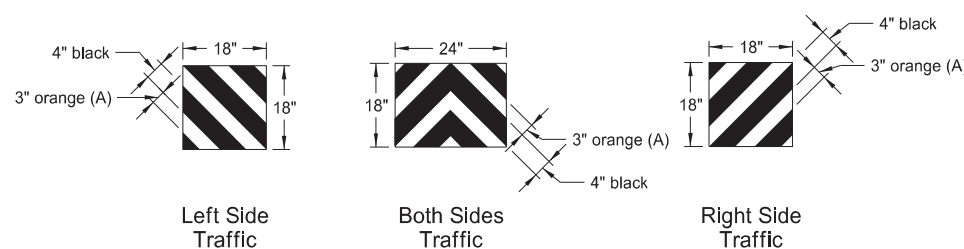


700 lb

Typical Module Construction Detail



Typical Assembly

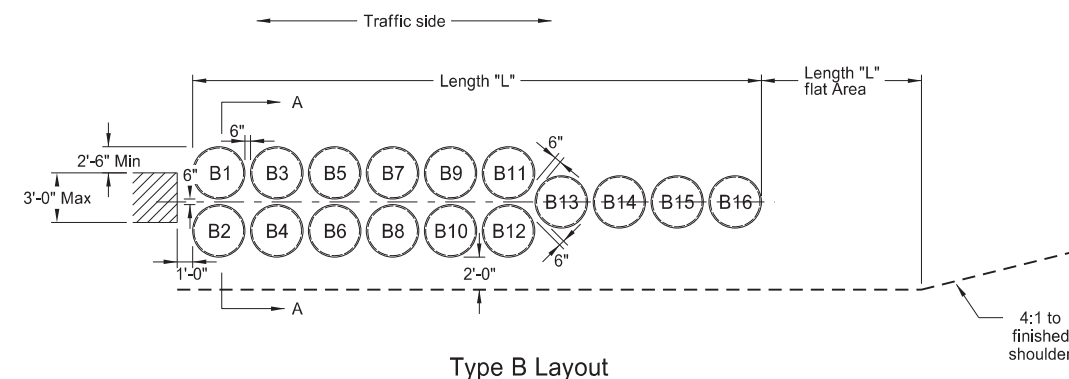


Reflective Sheet Detail

Note:
Apply Type IV reflective sheeting (as specified in the NDDOT Standard Specifications) directly to the outer container of the last attenuation device facing traffic, following the details above. Or apply the sheet to a metallic sheet and attach it to the container with approved fasteners.

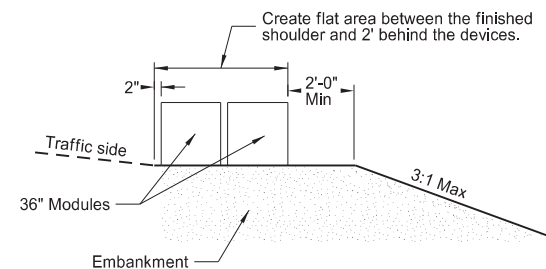
(A) Use 3" orange sheeting for temporary installations, and 3" yellow sheeting for permanent installations.

	Fill Chart				
	Module Weights (LBS)				
Distance from top edge	8 1/2"	5"	4"	3"	0"



Type B Layout

Note:
Angle attenuation devices 10 degrees towards traffic when placed at piers offset from roadway.



Section A-A (Type B Layout)

Type B Attenuation Device												
Module Number	Dash Number											
	75	70	65	60	55	50	45	40	35	30	25	
	Module Weights (LBS)											
B1	2100											
B2	2100											
B3	2100	2100	2100	2100	2100	2100	2100	2100	2100			
B4	2100	2100	2100	2100	2100	2100	2100	2100	2100			
B5	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	
B6	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	
B7	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	
B8	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	
B9	700	700	700	700	700	700	700	700	700	700	700	
B10	700	700	700	700	700	700	700	700	700	700	700	
B11	700	700	700	700	700	700	700	700	700	700	700	
B12	700	700	700	700	700	700	700	700	700	700	700	
B13	700	700	700	700	700	700	700	700	700	700	700	
B14	400	400	400	400	400	400	400	400	400	400	400	
B15	400	400	400	400	400	400	400	400	400	400	400	
B16	200	200	200	200	200	200	200	200	200	200	200	
Length (L)	34.2'	30.7'	30.7'	30.7'	30.7'	30.7'	30.7'	30.7'	30.7'	27.2'	27.2'	
Module Weights (LBS)	Replacement Module											
2100	1	1	1	1	1	1	1	1	1	1	1	
1400	1	1	1	1	1	1	1	1	1	1	1	
700	2	2	2	2	2	2	2	2	2	2	2	
400	1	1	1	1	1	1	1	1	1	1	1	
200	2	2	2	1	1	1	1	1	1	1	1	

Notes:

- Materials
 - Use modules manufactured from frangible polyethylene material which shatters upon impact.
 - Fill modules with class 43 aggregate meeting NDDOT Standard Specifications aggregate requirements. Use fill with a unit weight of at least 100 pounds per cubic foot. Use fill with a moisture content of 2% or less when left over winter.
- Modules

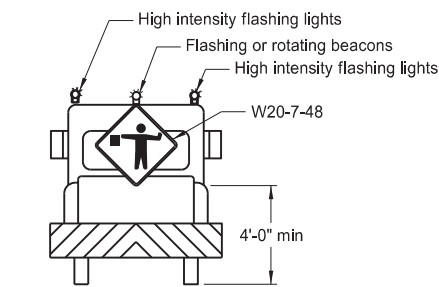
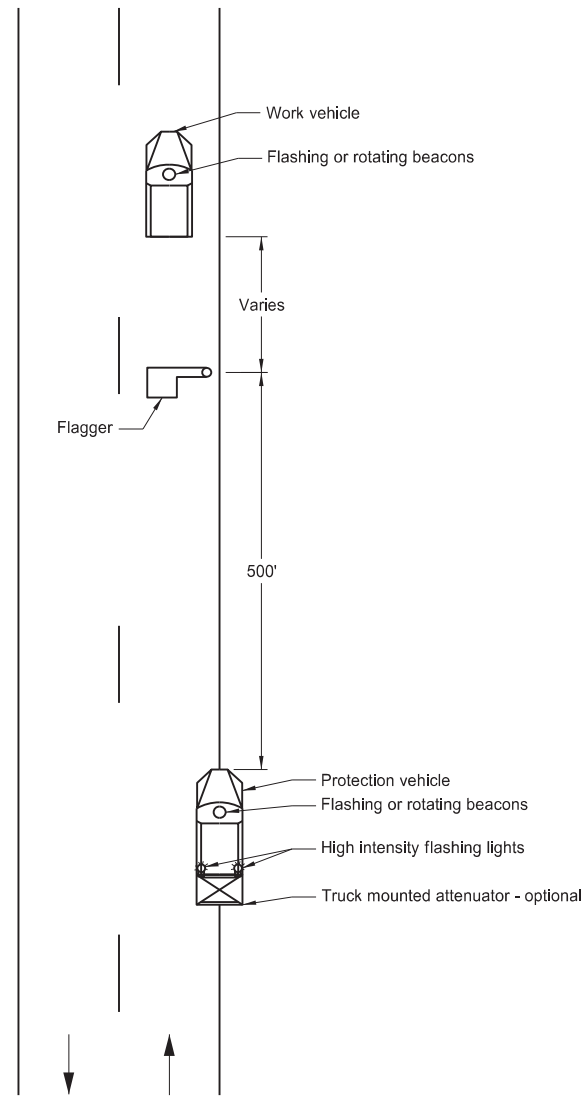
Provide modules in two sizes containing volumes of either 2, 4, 7, 14, or 21 cubic feet minimum.

 - Provide three components for 2, 4, or 7 cubic foot module containers:
 - A 14 C.F., yellow outer container.
 - A black lid securely locking over the top lip of the container.
 - A variable cone-shaped supporting insert capable of supporting 200, 400, or 700 pounds of sand mass to allow for three sizes of modules. Place cone inserts inside the 14 cubic foot container.
 - Provide two components for the 14 cubic foot module container:
 - A 14 C.F., yellow outer container.
 - A black lid securely locking over the top lip of the container.
 - Provide two components for the 21 cubic foot module container:
 - A 36" height X 36" width yellow outer container.
 - A black lid which locks securely over the top of the container.
- For temporary installations use Energite or Fitch attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, TrafFix barrels manufactured by TrafFix Devices, Inc. of San Clemente, CA, or approved equal modules. As an option, place attenuation devices on 3 1/2" maximum thickness pallets to facilitate maintenance.
- For permanent installations use Barrel Attenuation Device consisting of one-piece outer sand container modules with separate detachable lid. Energite attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, TrafFix barrels manufactured by TrafFix Devices, Inc. of San Clemente, CA, or approved equal meet these requirements.
- The Typical Module Construction Detail and Type B Layout are based on the Energite Crash Cushion manufactured by Energy Absorption. Provide any required layouts and details from other sand filled attenuation module manufacturers which differ from those shown here.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
7-18-14	Revised sheeting in reflective sheet detail
9-27-17	Update to active voice
10-03-19	New Design Engr PE Stamp

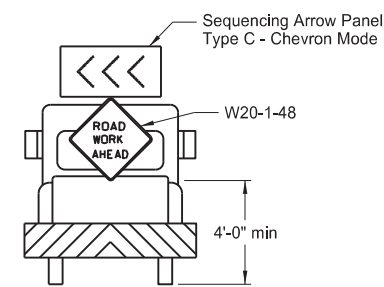
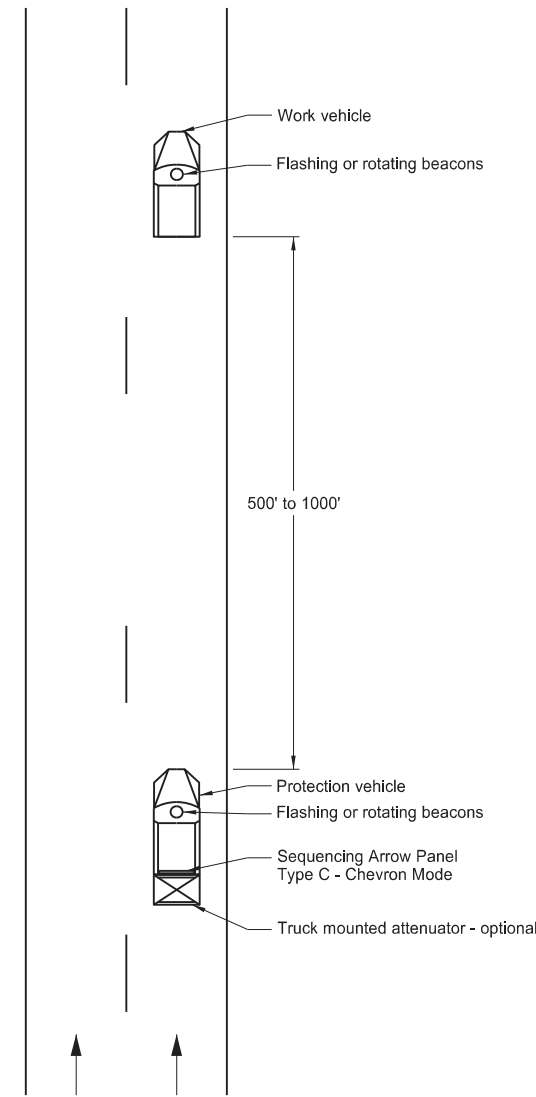
This document was originally issued and sealed by
 Kirk J Hoff,
 Registration Number
 PE- 4683,
 on 10/03/19 and the original document is stored at the
 North Dakota Department
 of Transportation

Two Lane, Two Way Roadways



Typical Protection Vehicle

Multilane Roadways



Typical Protection Vehicle

Notes:

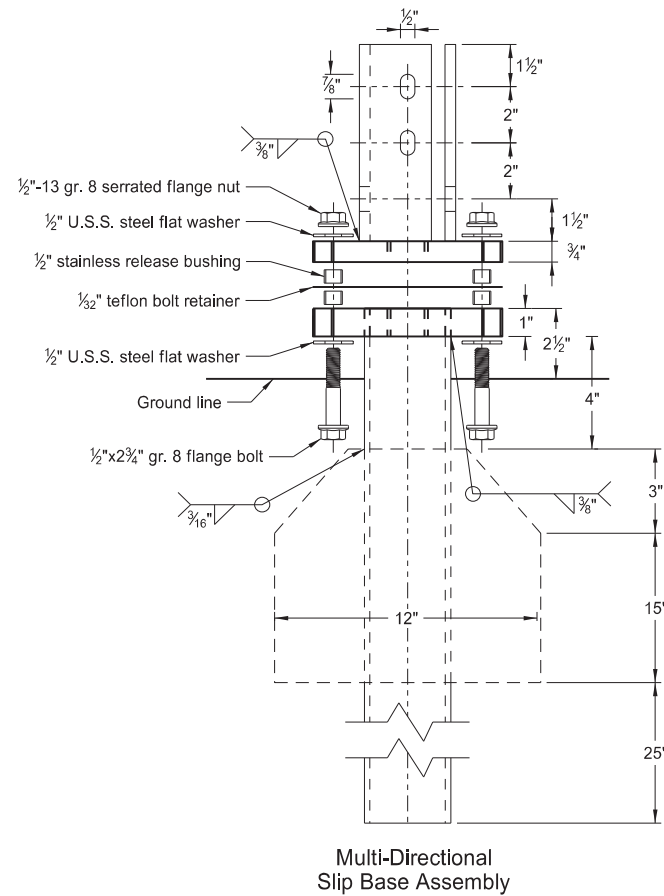
1. Display a 360 degree rotating, flashing, oscillating or strobe light on the working vehicle.
2. Display a 360 degree rotating, flashing, oscillating or strobe light on the shadow vehicle. Operate a sequencing arrow panel Type C in chevron mode on the shadow vehicle for Multilane Roadway.
3. Use these layouts during daylight hours and in areas of good visibility only.
4. Use flagger to protect the work area and warn oncoming traffic for two lane, two way roadway.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
9-27-17 10-03-19	Updated to active voice New Design Engr PE Stamp

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

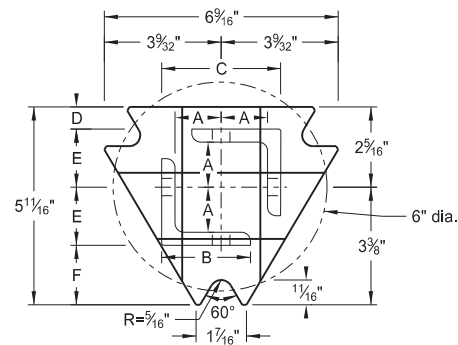
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

Perforated Tube



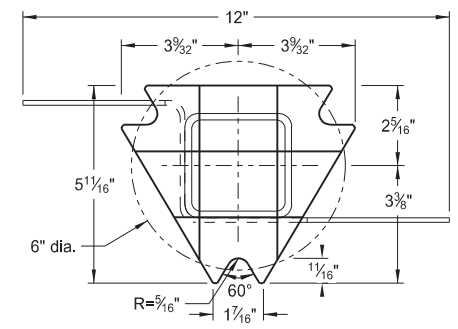
Multi-Directional Slip Base Assembly

Traffic Flow

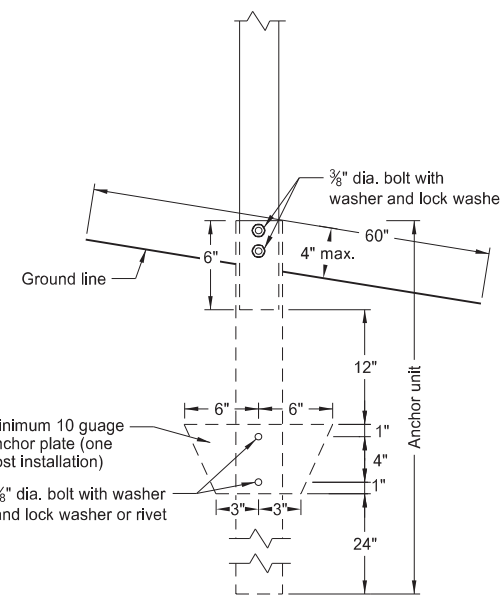


Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2 1/2" x 2 1/2" x 3/8" ASTM A36 structural angle

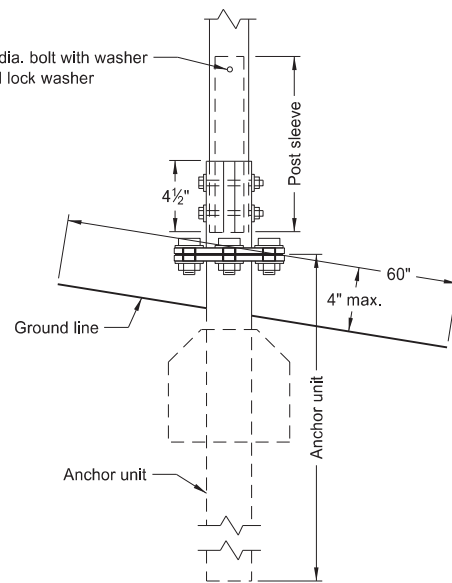
Traffic Flow



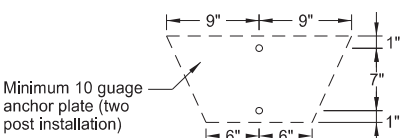
Bottom Soil Stub
Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50



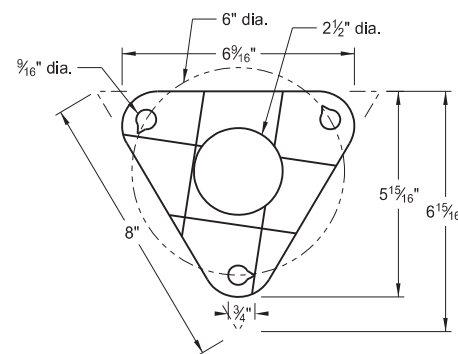
Anchor Unit and Post Assembly



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 - 1/32" Reprocessed Teflon

Notes:

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

Telescoping Perforated Tube

Number of Posts	Post Size in.	Wall 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 3 3/64"	1 7/8"
2 1/2" x 10 ga.	1 3/32"	2 1/2"	3 5/16"	5/8"	1 2 1/32"	1 3/4"

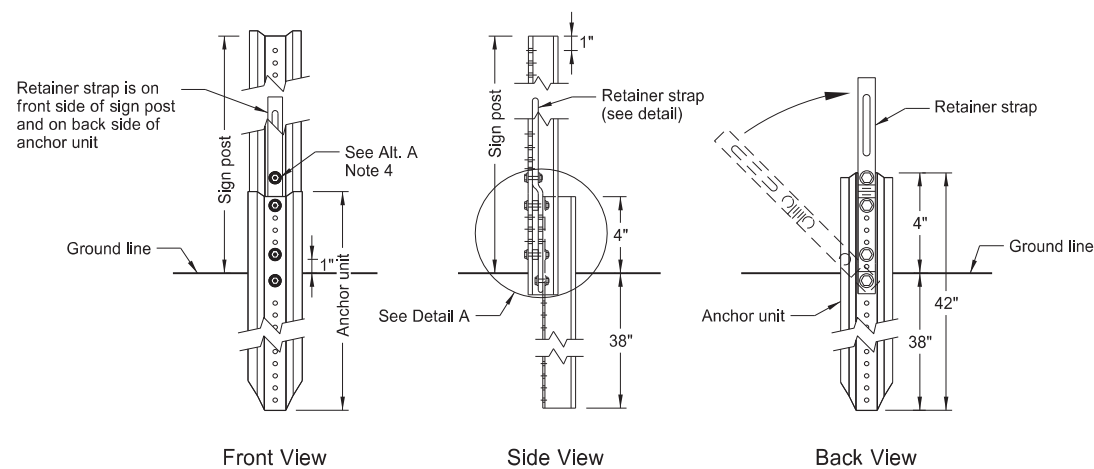
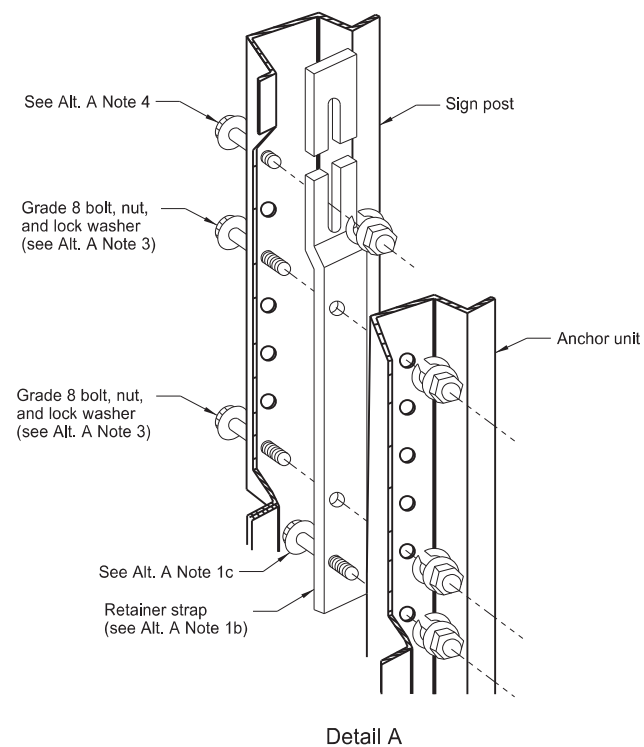
(A) Use breakaway base when support is placed in weak soils. Engineer determines if soils are weak.

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

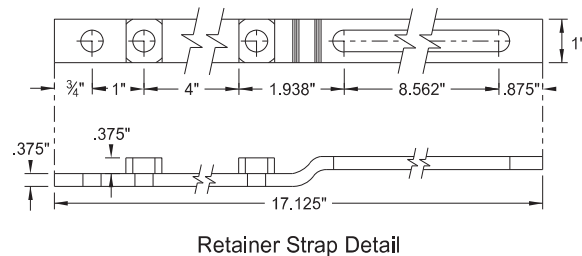
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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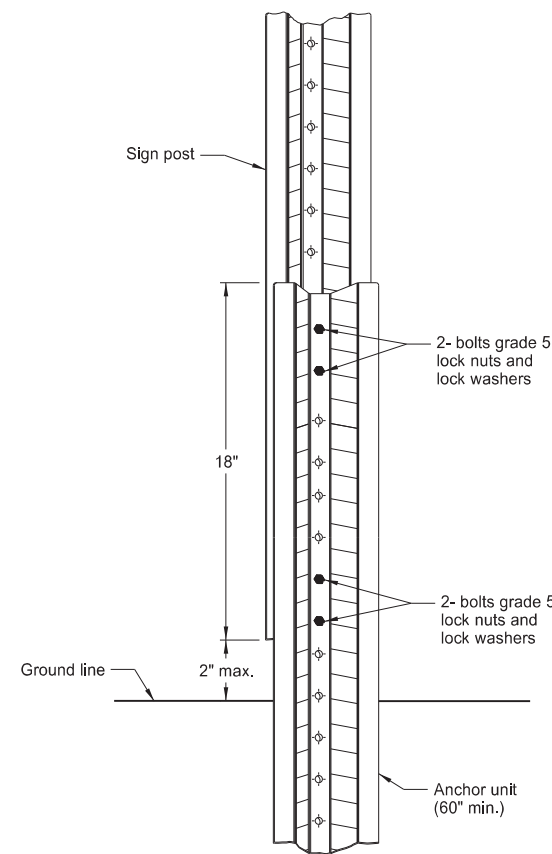
U-Channel Post



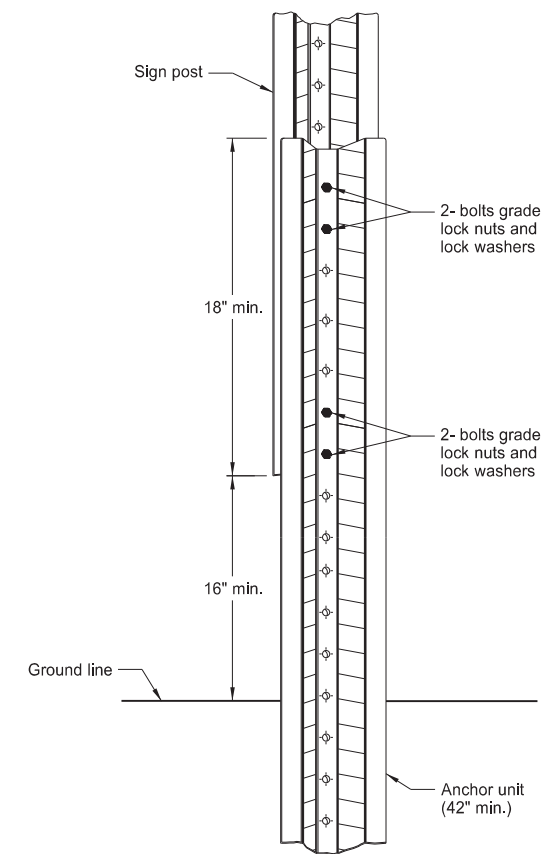
Breakaway U-Channel Detail Alternate A
Install a maximum of 2 posts within 7'.



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

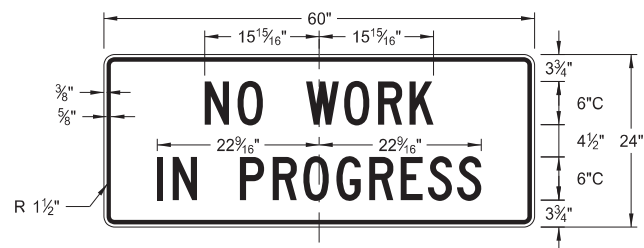
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CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS

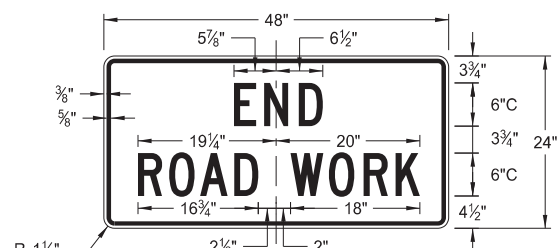
D-704-9



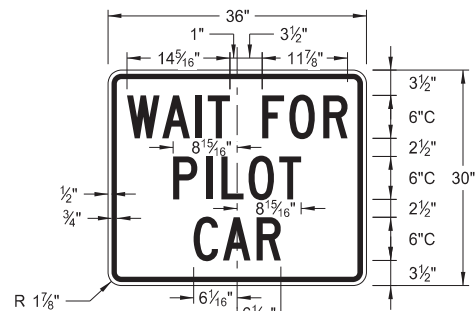
G20-1-60
Legend: black (non-refl)
Background: orange



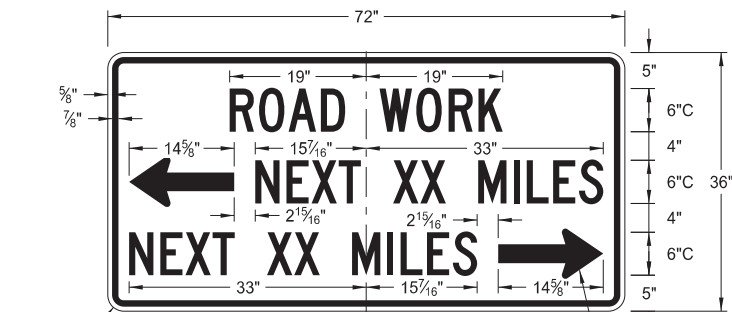
G20-1b-60
Legend: black (non-refl)
Background: orange



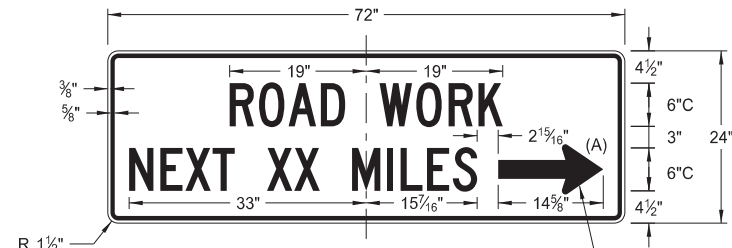
G20-2-48
Legend: black (non-refl)
Background: orange



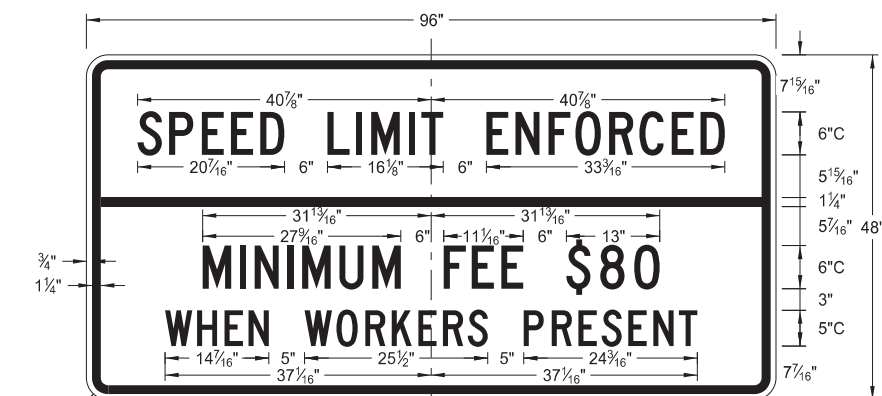
G20-4b-36
Legend: black (non-refl)
Background: orange



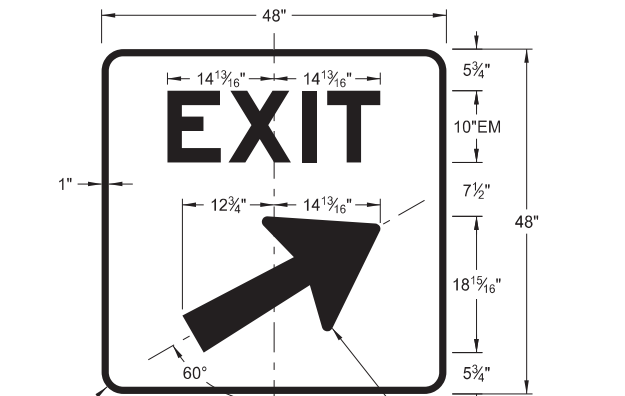
G20-50a-72
Legend: black (non-refl)
Background: orange



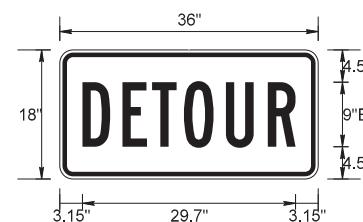
G20-52a-72
Legend: black (non-refl)
Background: orange



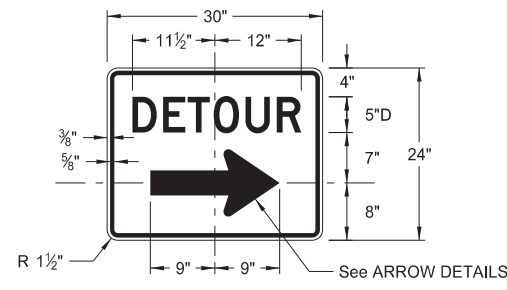
G20-55-96
Legend: black (non-refl)
Background: orange



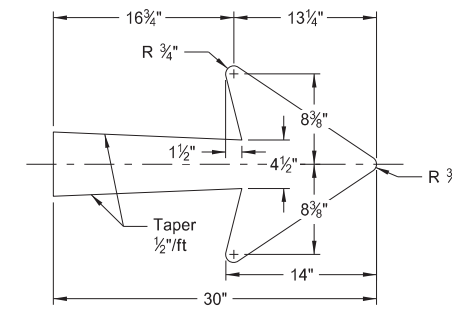
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



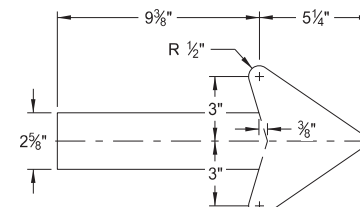
M4-8-36
Legend: black (non-refl)
Background: orange



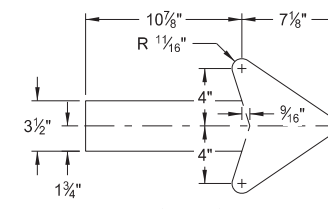
M4-9(L or R)-30 & M4-9-30
Legend: black (non-refl)
Background: orange



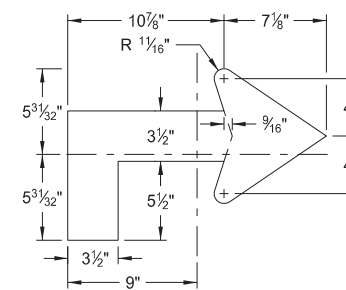
E5-1-48



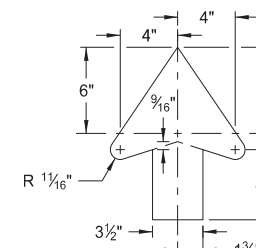
G20-50a-72
G20-52a-72



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

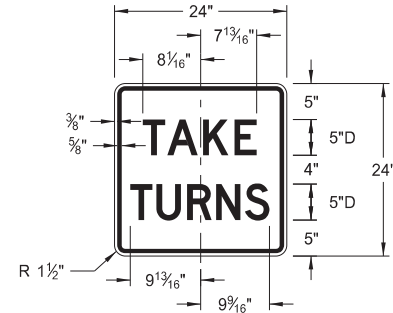
NOTES:

(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

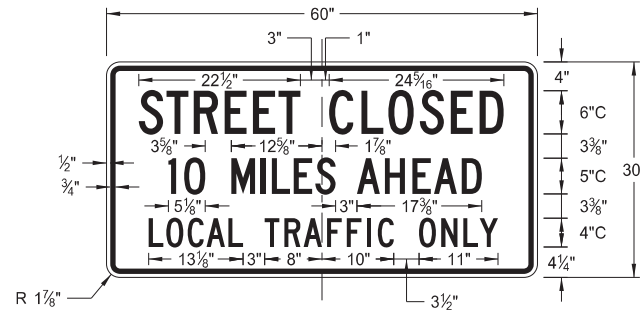
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CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



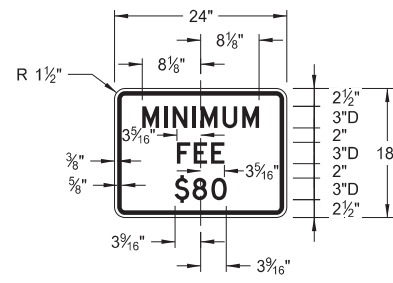
R1-50P-24

Legend: black (non-refl)
Background: white



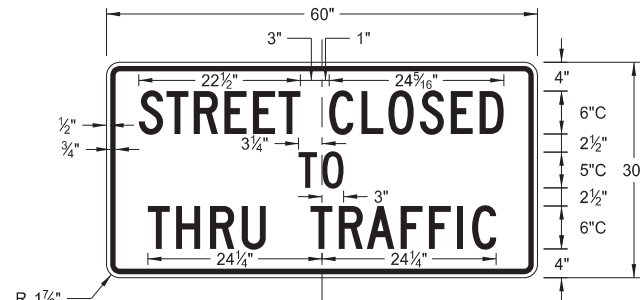
R11-3c-60

Legend: black (non-refl)
Background: white



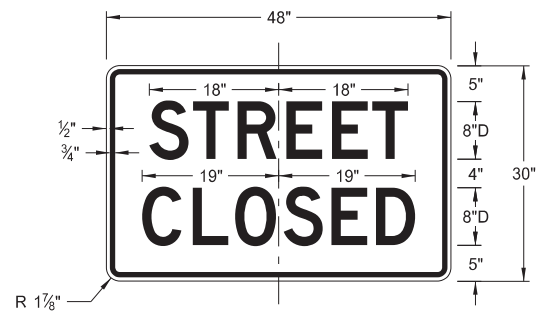
R2-1aP-24

Legend: black (non-refl)
Background: white



R11-4a-60

Legend: black (non-refl)
Background: white



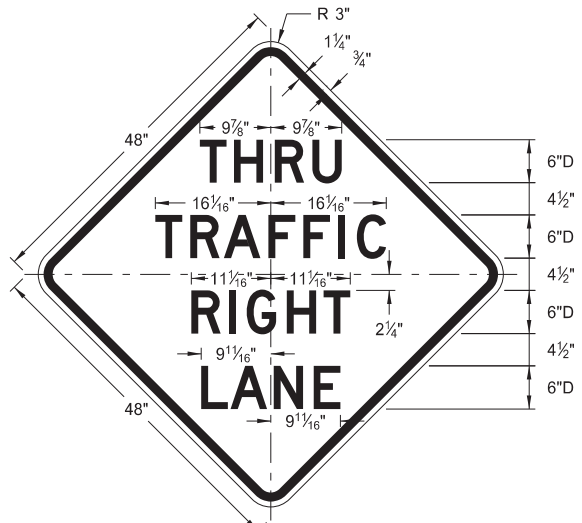
R11-2a-48

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

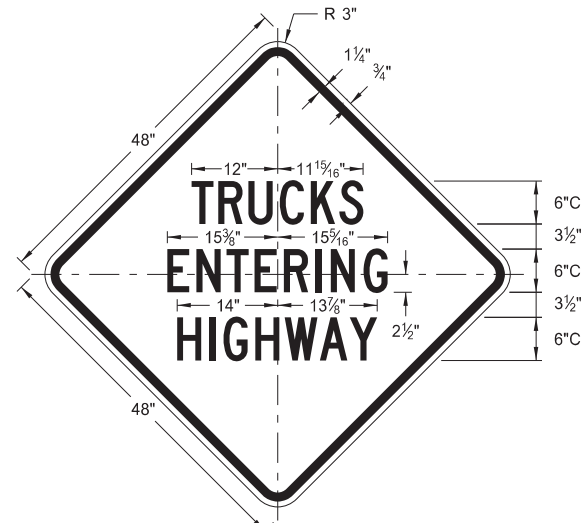
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CONSTRUCTION SIGN DETAILS
WARNING SIGNS



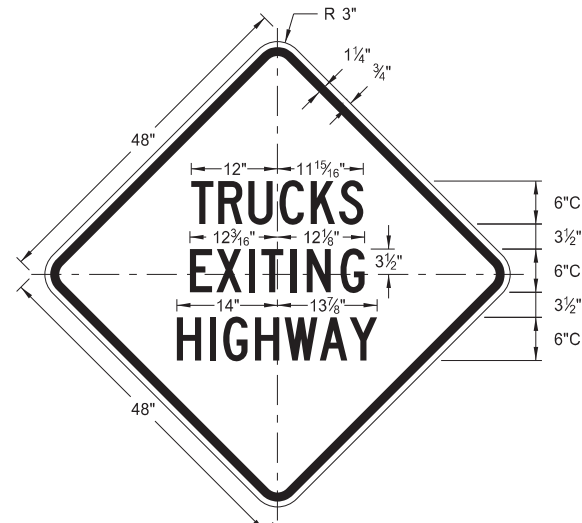
W5-8-48

Legend: black (non-refl)
Background: orange



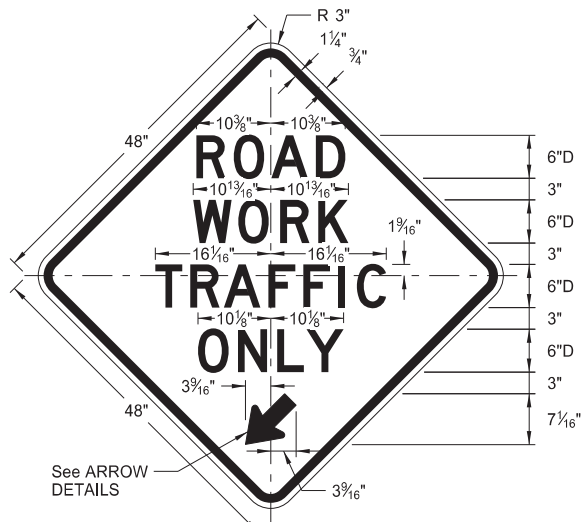
W8-53-48

Legend: black (non-refl)
Background: orange



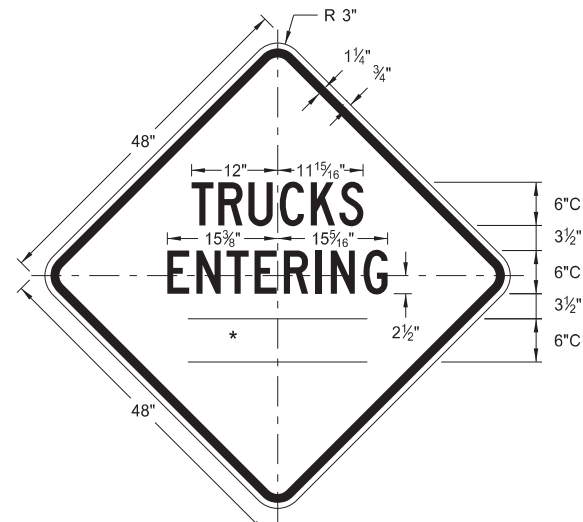
W8-56-48

Legend: black (non-refl)
Background: orange



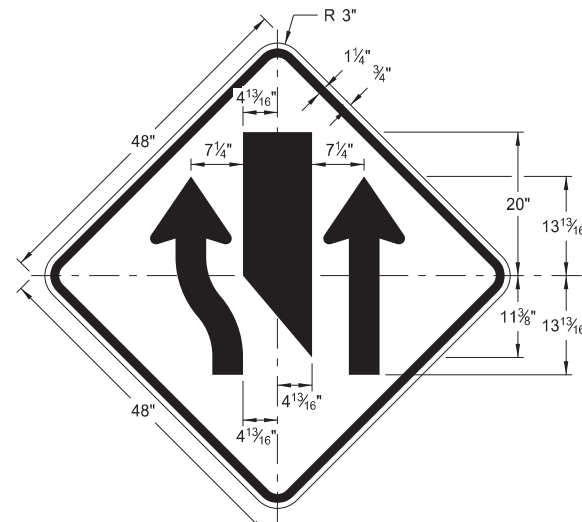
W5-9-48

Legend: black (non-refl)
Background: orange



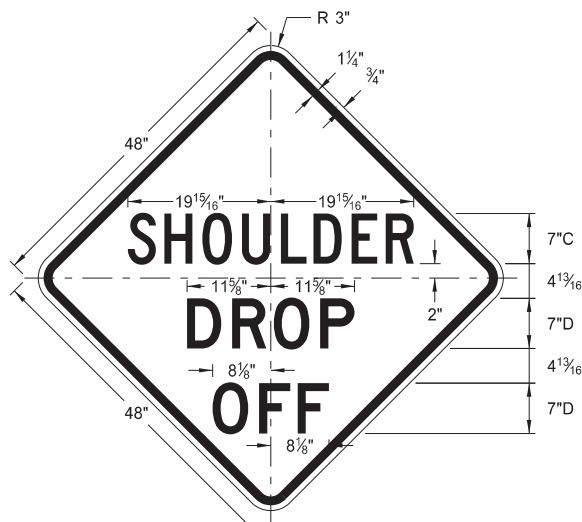
W8-54-48

Legend: black (non-refl)
Background: orange



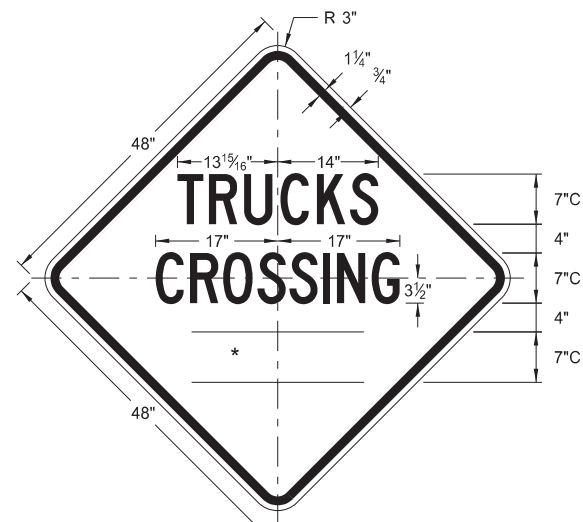
W9-3a-48

Legend: black (non-refl)
Background: orange



W8-9a-48

Legend: black (non-refl)
Background: orange

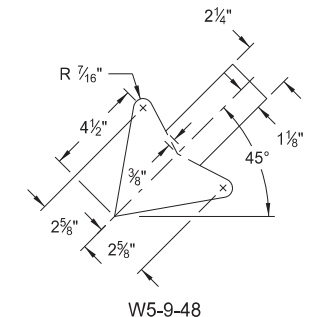


W8-55-48

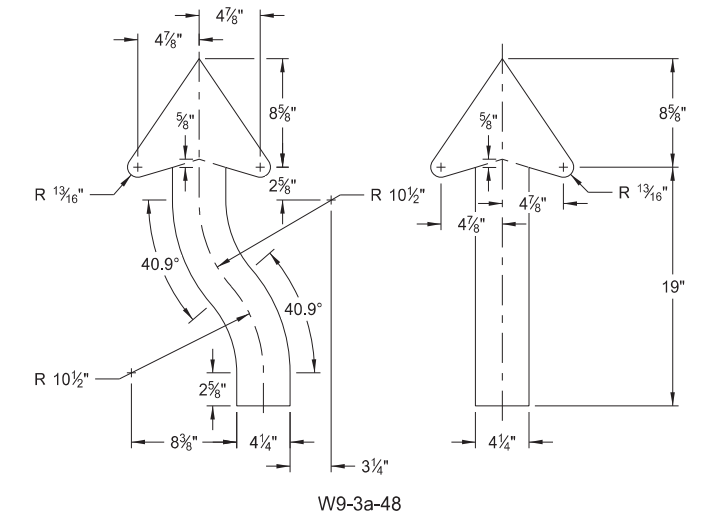
Legend: black (non-refl)
Background: orange

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

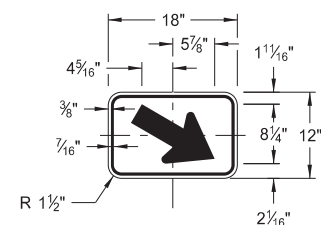
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Updated sign number
5-31-18	Revised sign and arrow details
10-03-19	New Design Engineer PE Stamp

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CONSTRUCTION SIGN DETAILS
WARNING SIGNS

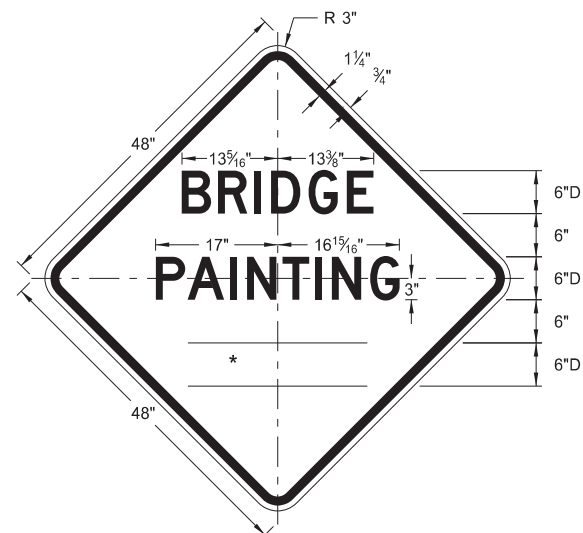
WORD	LETTER SPACING
AHEAD	Standard
200 FT	Standard
350 FT	Standard
500 FT	Standard
1000 FT	Reduce 40%
1500 FT	Reduce 40%
½ MILE	Reduce 50%
1 MILE	Standard

* DISTANCE MESSAGES



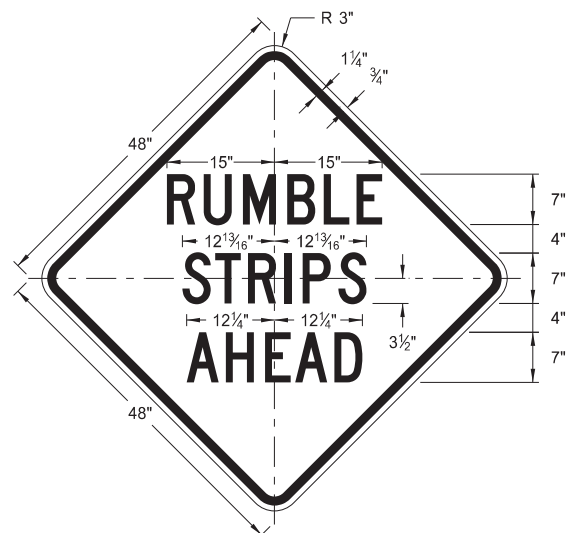
W16-7aP-18

Legend: black (non-refl)
Background: orange



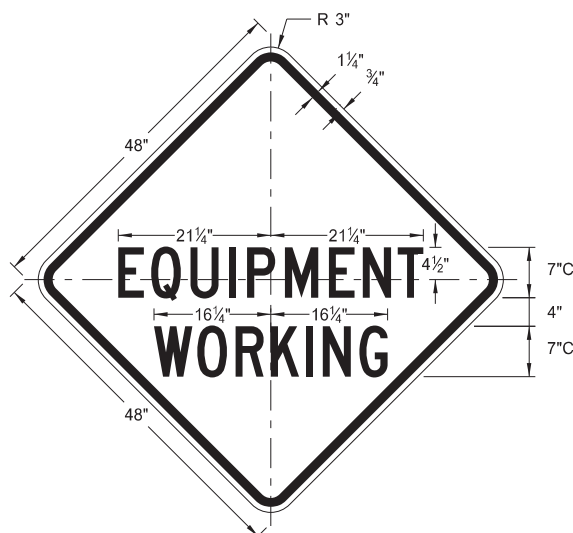
W21-50-48

Legend: black (non-refl)
Background: orange



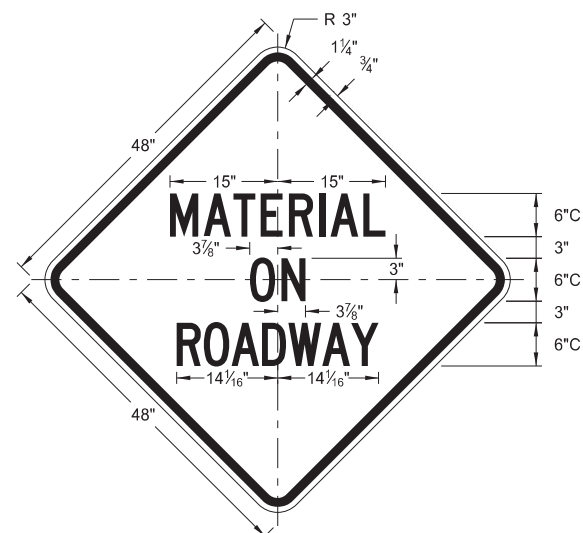
W21-53-48

Legend: black (non-refl)
Background: orange



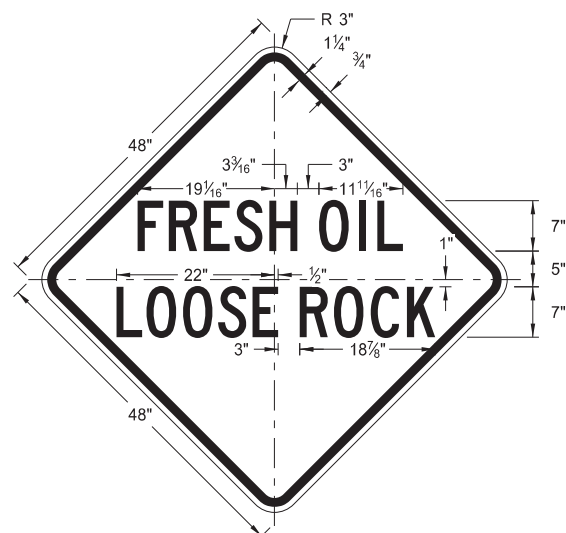
W20-51-48

Legend: black (non-refl)
Background: orange



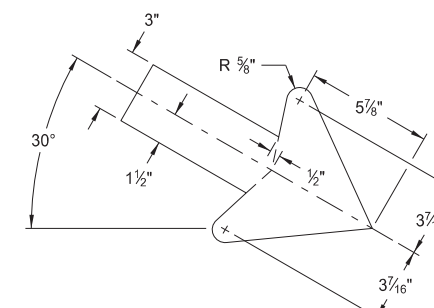
W21-51-48

Legend: black (non-refl)
Background: orange

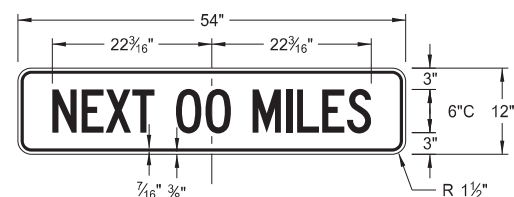


W22-8-48

Legend: black (non-refl)
Background: orange

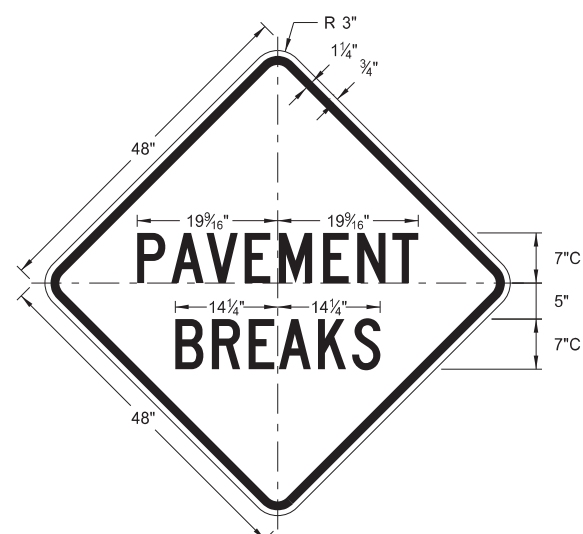


W16-7aP-18



W20-52P-54

Legend: black (non-refl)
Background: orange



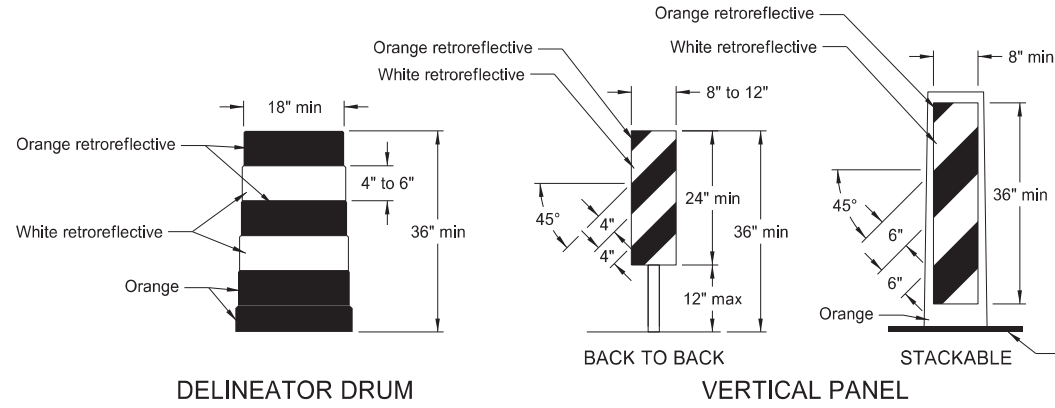
W21-52-48

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.

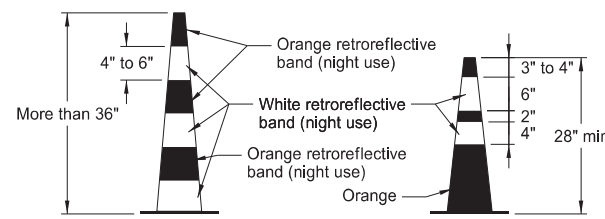
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BARRICADE AND CHANNELIZING DEVICE DETAILS

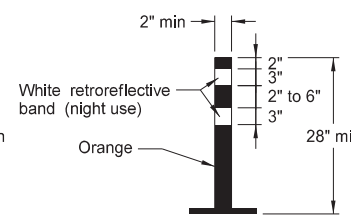


DELINEATOR DRUM

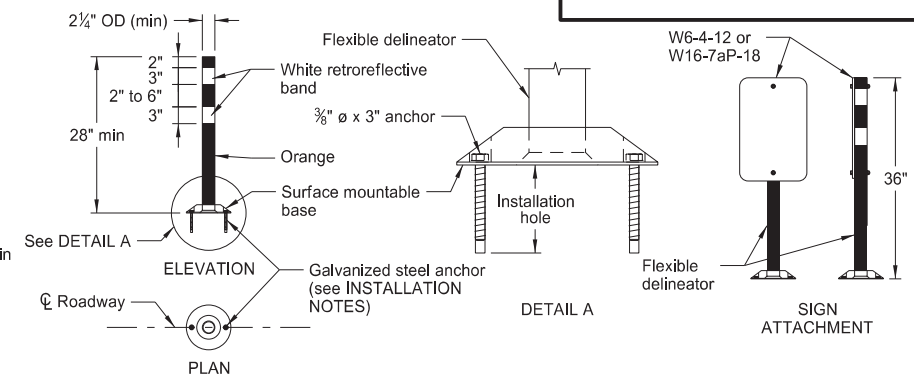
VERTICAL PANEL



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.

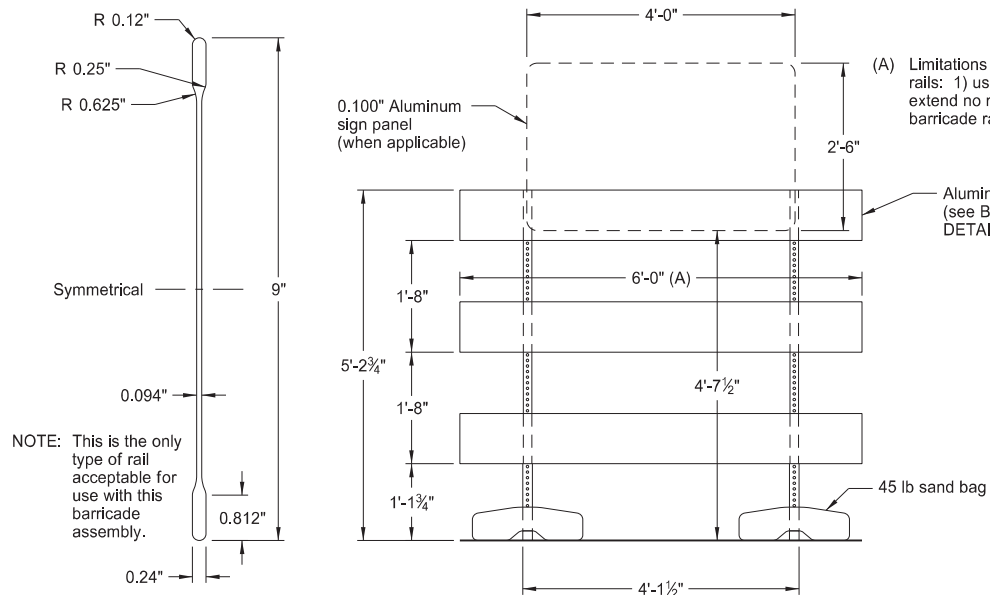
Provide alternating orange and white retroreflective stripes, sloping downward in direction vehicular traffic is to pass. Place retroreflective sheeting on both sides of panel with a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective 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:

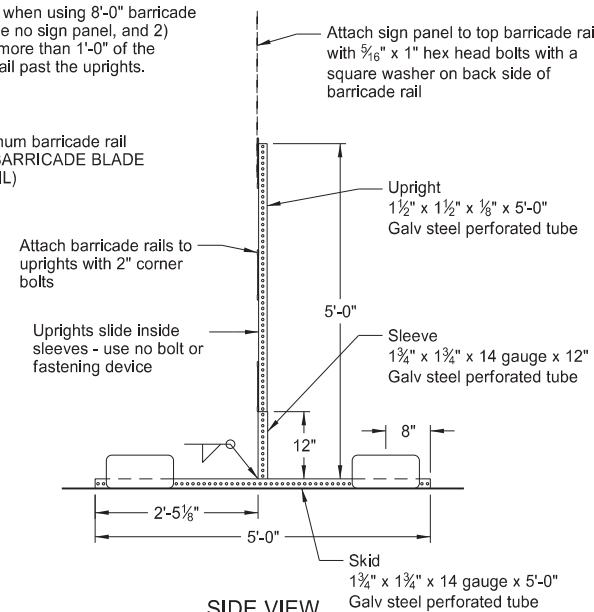
1. Drill installation holes to diameter and depth required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, use an 8" x 8" butyl pad or hot melt butyl. Remove butyl as close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



BARRICADE BLADE DETAIL

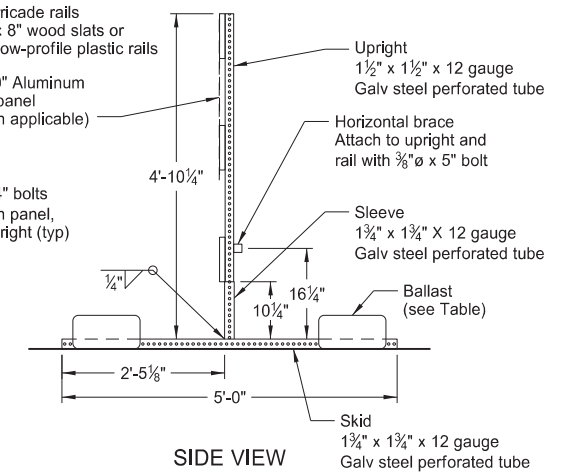
ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)



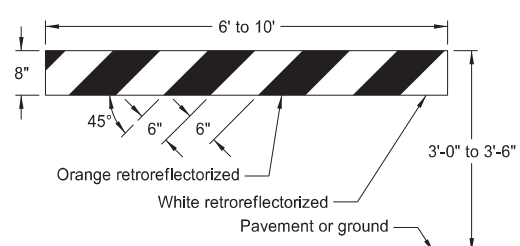
ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

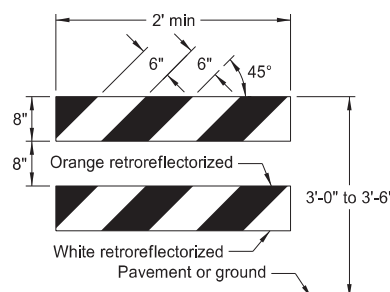


SIDE VIEW

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".

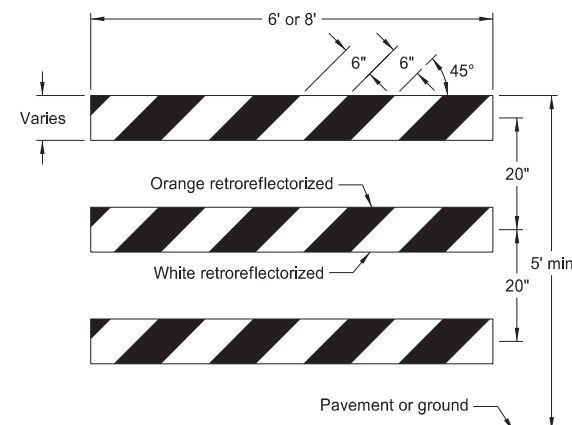


TYPE I BARRICADE

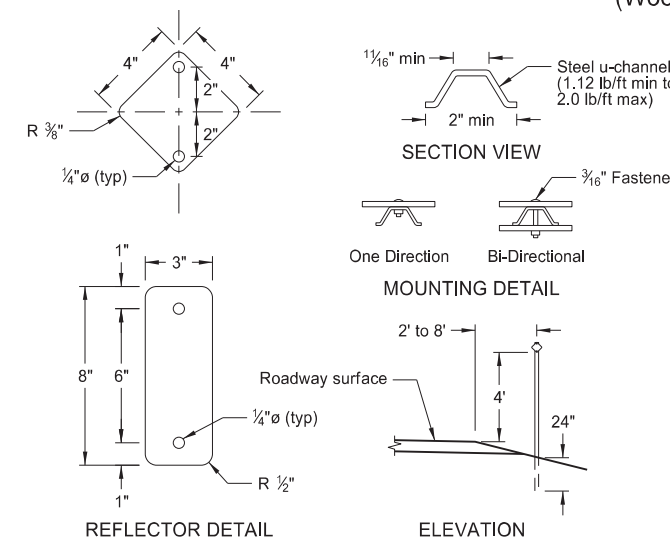


TYPE II BARRICADE

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

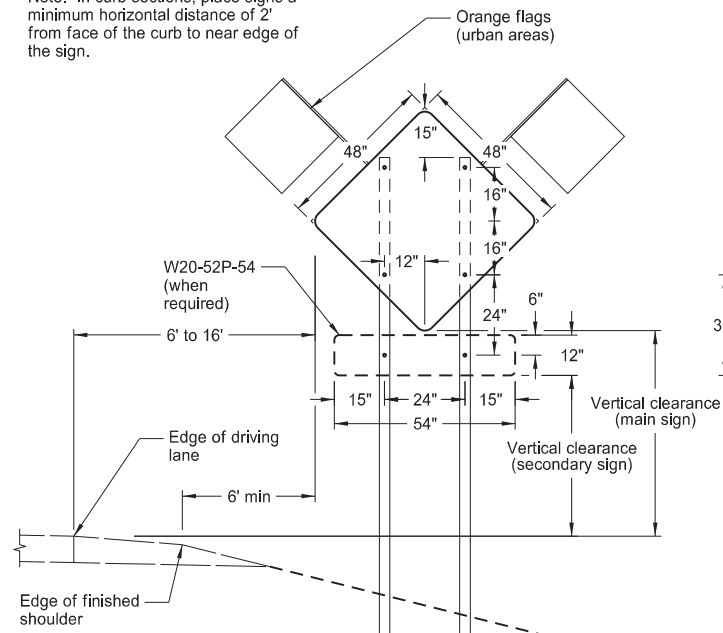
Note: Number of sandbags based on a wind speed of 55 MPH. Sandbags assumed to be placed at or near the ends of the skids.

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

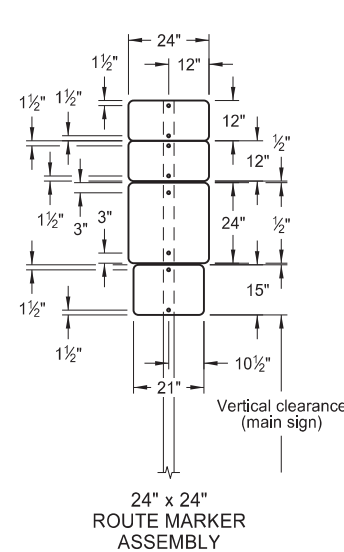
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

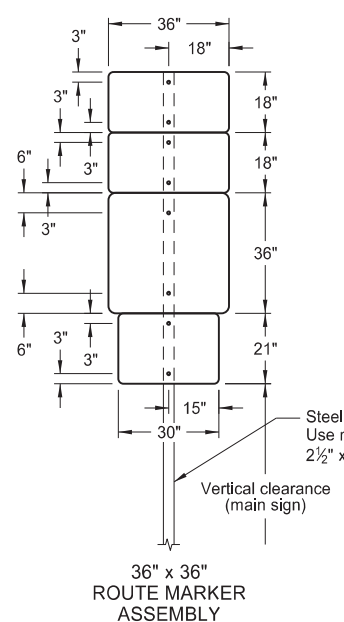
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



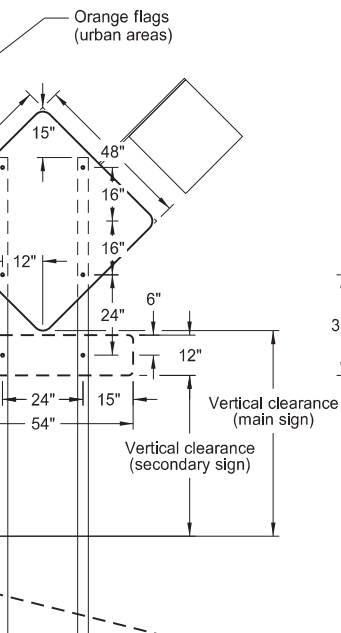
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



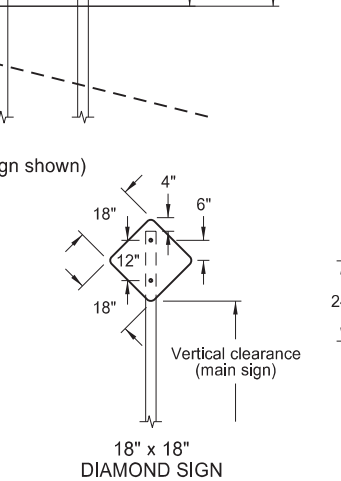
24" x 24" ROUTE MARKER ASSEMBLY



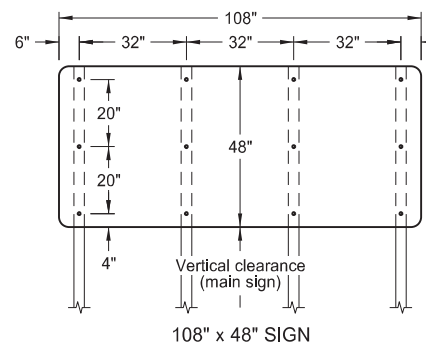
36" x 36" ROUTE MARKER ASSEMBLY



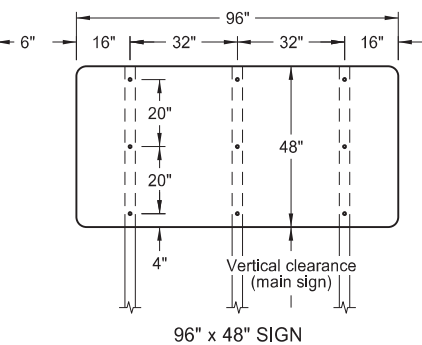
18" x 18" DIAMOND SIGN



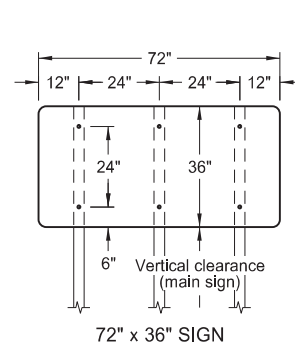
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



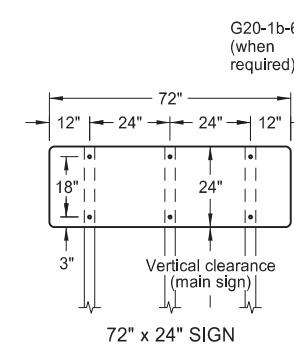
108" x 48" SIGN



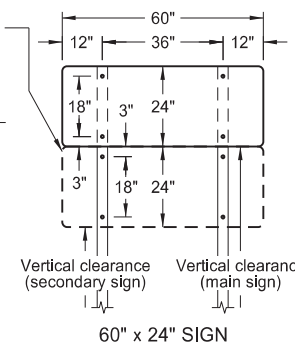
96" x 48" SIGN



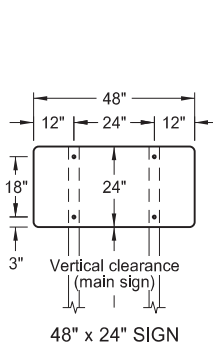
72" x 36" SIGN



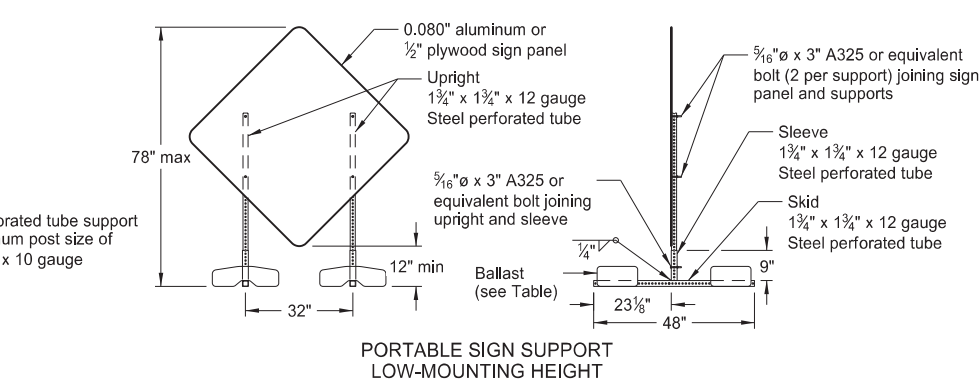
72" x 24" SIGN



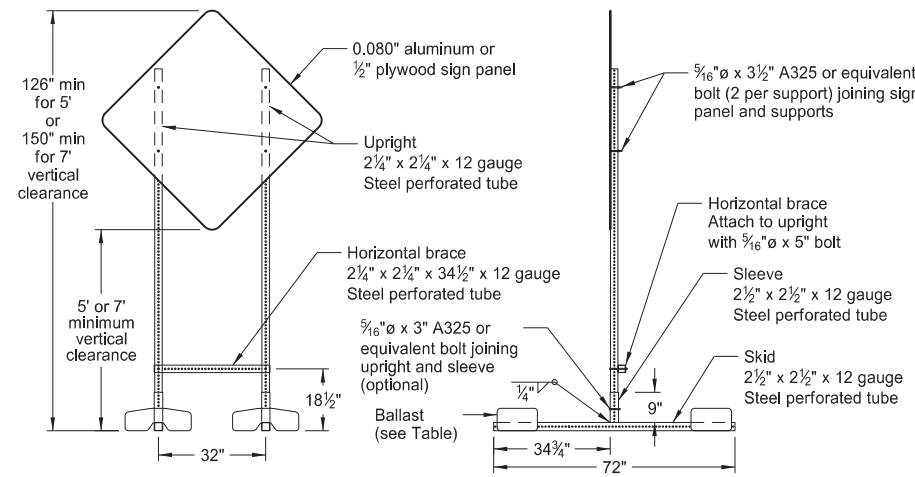
60" x 24" SIGN



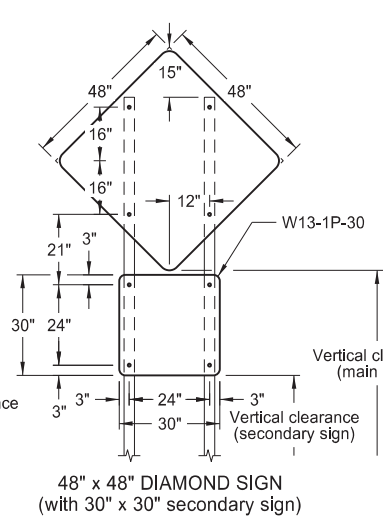
48" x 24" SIGN



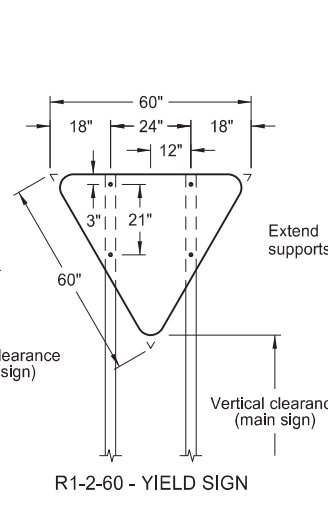
PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



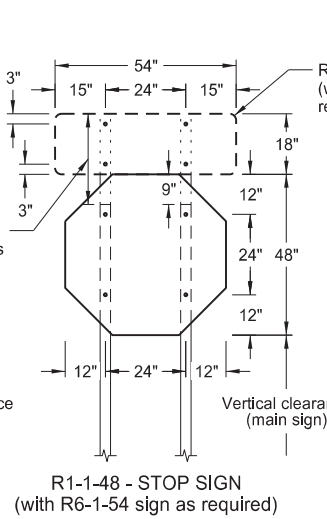
PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT



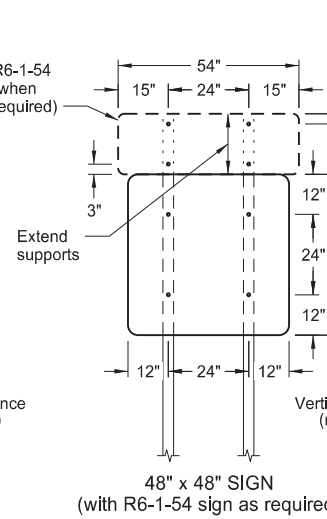
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



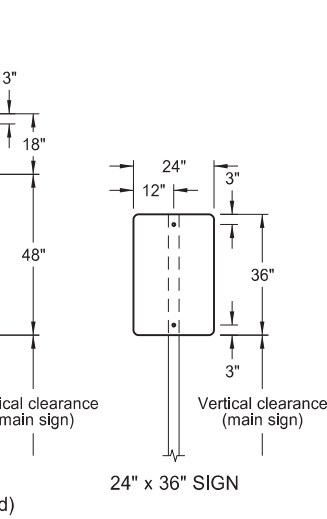
R1-2-60 - YIELD SIGN



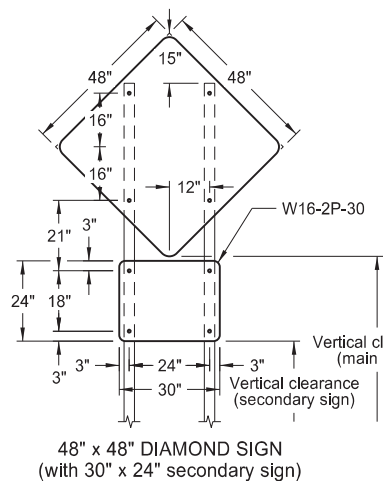
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



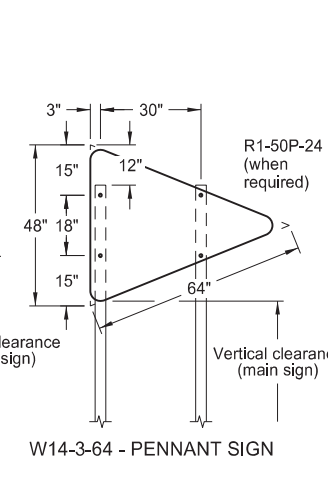
48" x 48" SIGN
(with R6-1-54 sign as required)



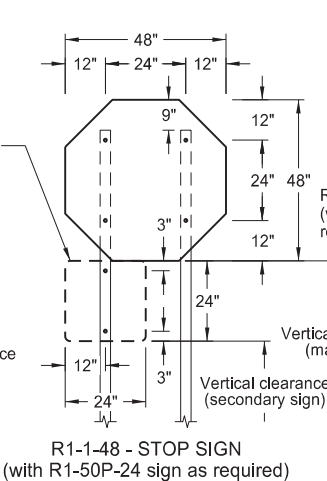
24" x 36" SIGN



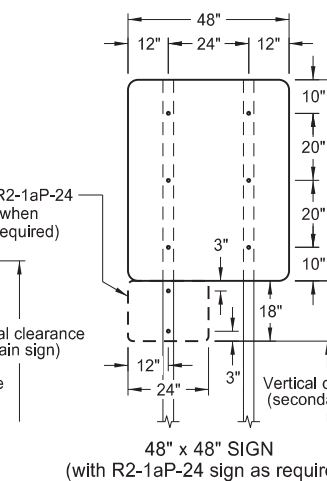
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



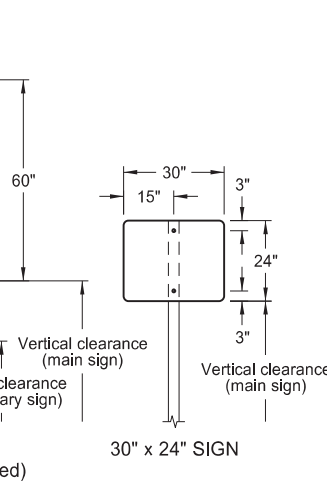
W14-3-64 - PENNANT SIGN



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



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



30" x 24" SIGN

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

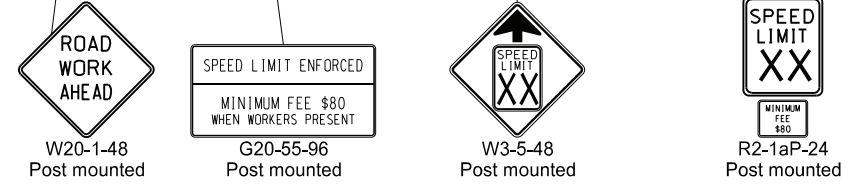
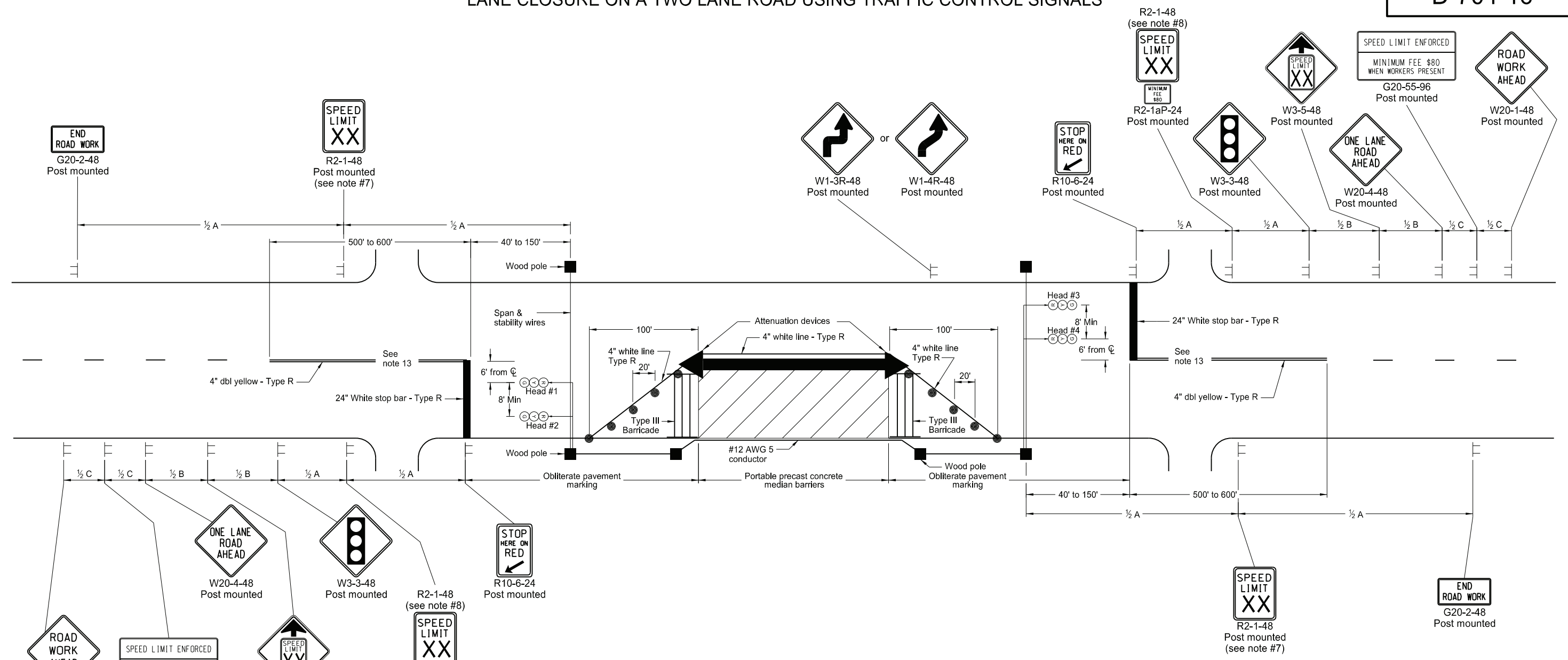
Note: The number of sandbags are based on a wind speed of 55 MPH. Place sandbags at or near the ends of skids.

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

LANE CLOSURE ON A TWO LANE ROAD USING TRAFFIC CONTROL SIGNALS

D-704-16



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

	Green			Yellow			Red		
	Heads 1 & 2	Heads 3 & 4	Time	Heads 1 & 2	Heads 3 & 4	Time	Heads 1 & 2	Heads 3 & 4	Time
Cycle = 90 seconds	18.0	4.5	22.5	18.0	4.5	22.5	18.0	4.5	22.5
Percent of Cycle	20	5	25	20	5	25	20	5	25

- Notes:**
- Span conductor overhead between poles except on bridges, where it may alternately be attached and supported by the bridge structure. When conductor is supported by the bridge structure, attach conductor to avoid interference with bridge construction. Attach conductor on either side of bridge as determined by field personnel.
 - Locate controller on a wood pole in the cable run between signal heads for through traffic movements.
 - The timing schedule is suggested trial setting. Check signals in operation frequently to obtain the most efficient timing schedule.
 - Place wood poles a minimum of 16 feet from edge of driving lane. Provide a minimum 16 to 19 feet clearance from the center line of the roadway to the bottom of traffic signal heads suspended over the roadway.
 - Place traffic signal heads with 12 inch red, yellow and green lenses and 5 inch louvered backplates.
 - See standard drawing "Span Wire Mounted Traffic Signals" for interim traffic construction details.
 - 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.
 - Sign G20-55-96 is not required if this 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.
 - As an option, use solar powered signals instead of wood pole signal system.

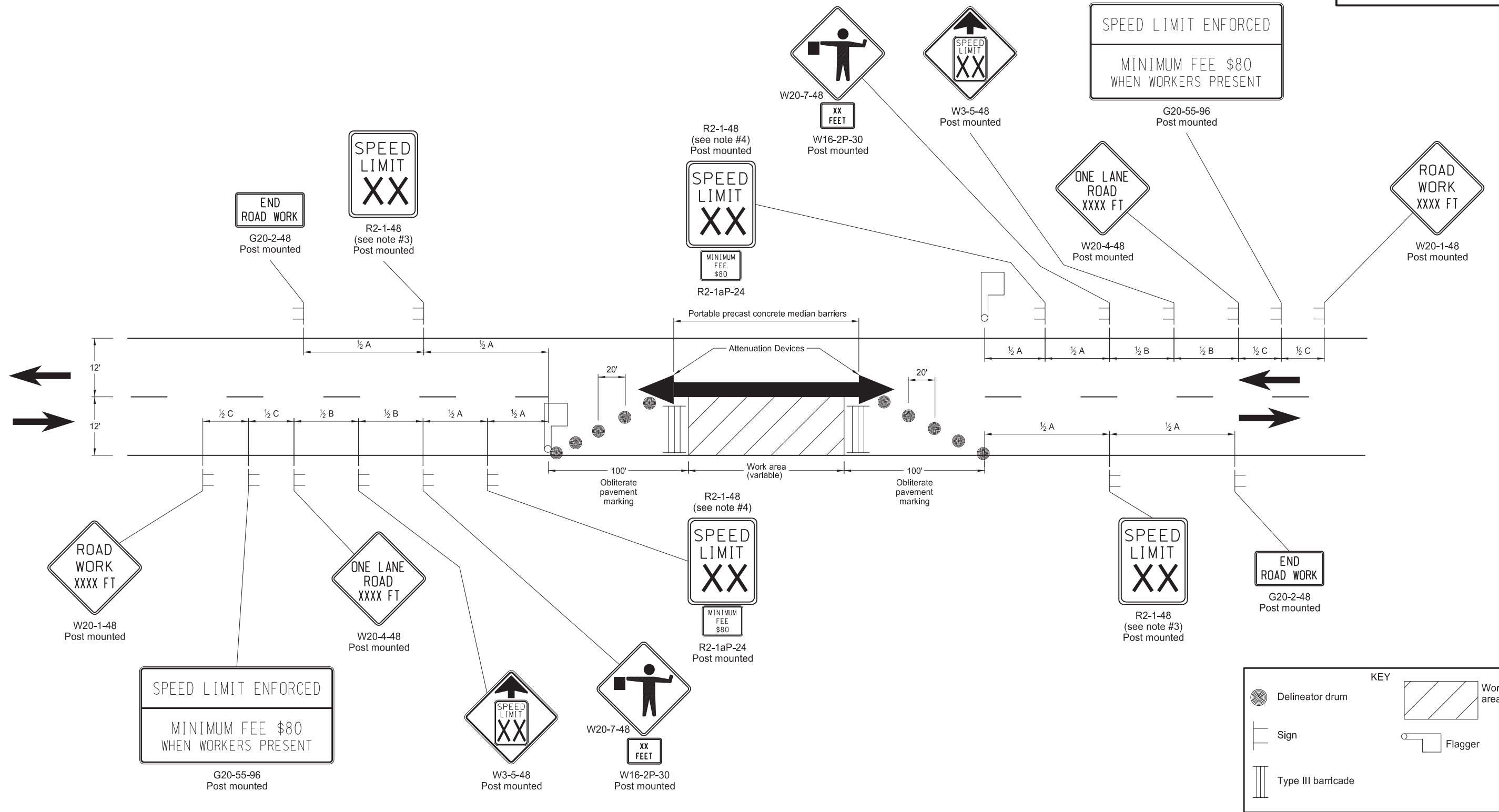
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
11-20-15	Revised Note 6 & Renumbered Minimum Fee plaque.
08-17-17	Revised notes & added note.
11-01-19	Revised sign #s & p/mt mk type.
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work.
11-29-22	Removed Dollars At Work.
08-31-23	Corrected Note 14 grammar.



08/31/23

SIGN LAYOUT FOR ONE LANE CLOSURE TWO LANE ROADWAY

D-704-17



Notes:

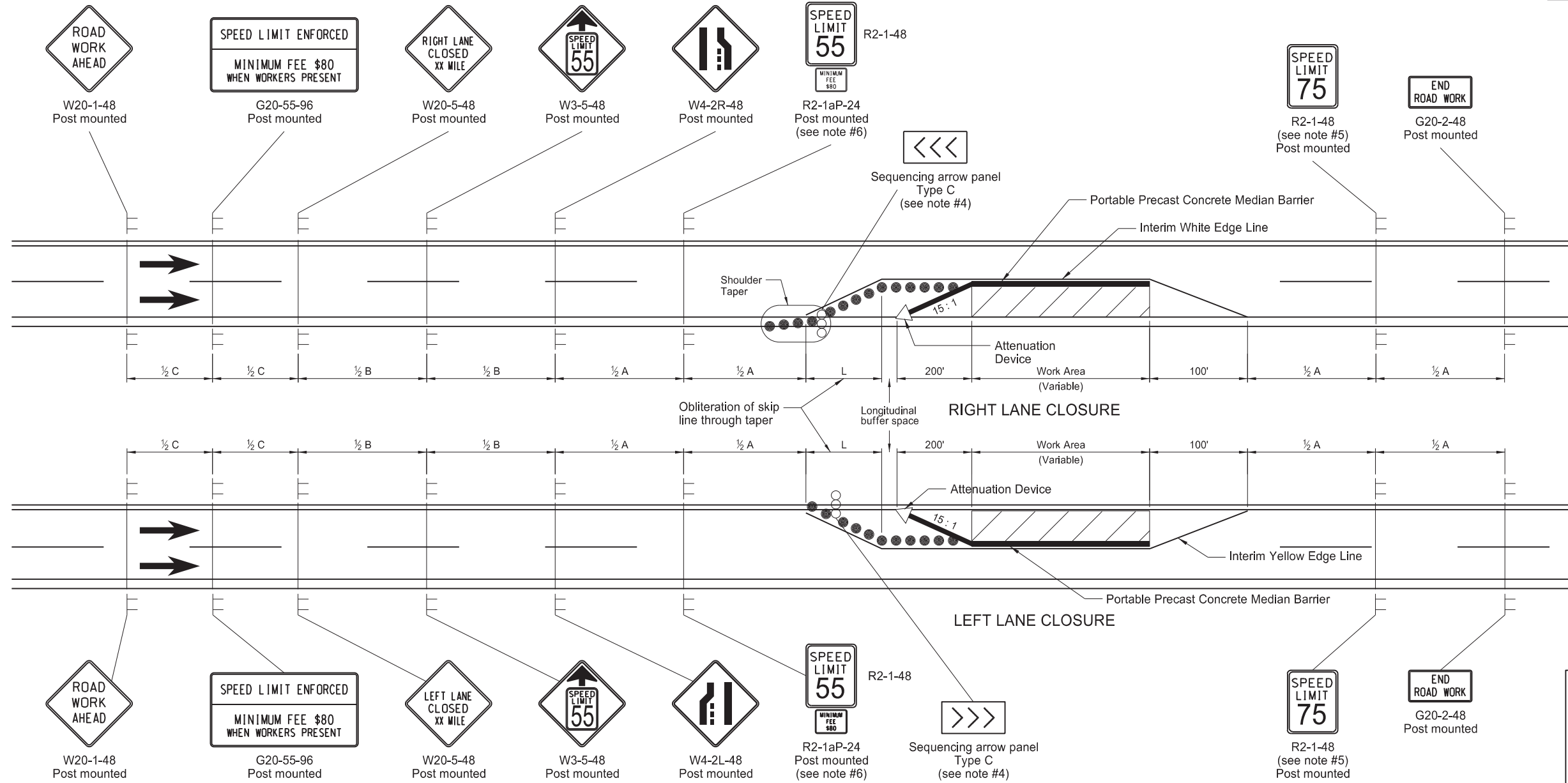
1. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
2. Remove existing striping as required. Use back to back delineators when inslope is 4:1 or flatter and roadway alignment is visible to approaching vehicles. Place back to back vertical panels when roadways have steep slopes and alignment is not visible to approaching traffic.
3. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
4. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 MPH.) Place the second speed limit sign at 1/2 B.
5. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
6. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
7. Cover existing speed limit signs within a reduced speed zone.
8. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or if work is less than 15 days.
9. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
08-17-17	Note update & sign numbers
11-01-19	Removed signs & revised note
12-08-21	Switched order of Road Work XXXX and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work

KIRK J. HOFF
 REGISTERED
 PROFESSIONAL
 PE-4683
 ENGINEER
 NORTH DAKOTA
 11/29/22

SIGN LAYOUT FOR INTERSTATE SYSTEM ONE LANE CLOSURE



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

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

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

- Notes:
- Variables
 S = Numerical value of posted speed limit, off-peak 85th percentile speed prior to work starting, or anticipated operating speed in MPH.
 W = The width of offset in feet.
 L = Minimum taper length in feet. $S \times W$ for freeways, expressways, and roads with speeds of 45 mph or greater, or $W \times S^2 / 60$ for urban, residential, and streets with speeds of 40 mph or less.
 - Place barricades on moveable assemblies and signs on portable assemblies when located on the roadway.
 - Space delineator drums used for tapering traffic and on tangent at 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 the roadway surface. See Shoulder Closure Standard Drawing. Use Type C on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater).
 - 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 the Standard D-704-14.
 - Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or if work is less than 15 days.
 - Reduce speed limit further, if location and conditions dictate.

KEY

- Delineator Drum
- Sign
- Attenuation Device
- Sequencing Arrow Panel
- Work Area

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
01-13-16	Changed to Interim yellow edge line
03-15-16	Removed Do Not Pass signs & updated notes
08-17-17	Updated notes & sign numbers
11-01-19	Note, sign #, & pmt oblit change
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work



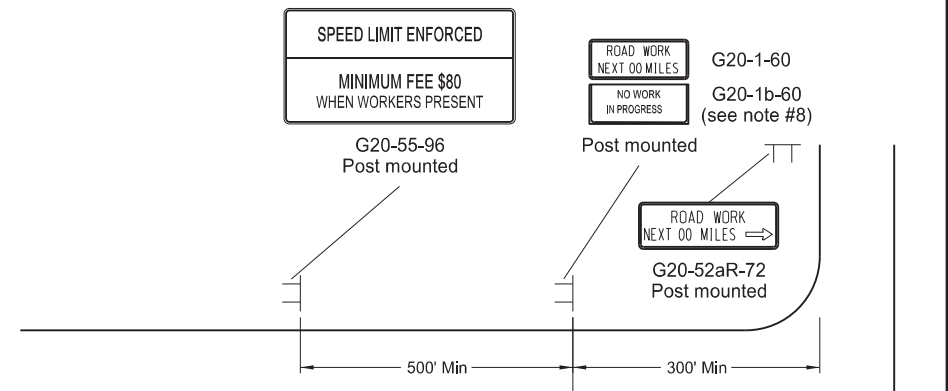
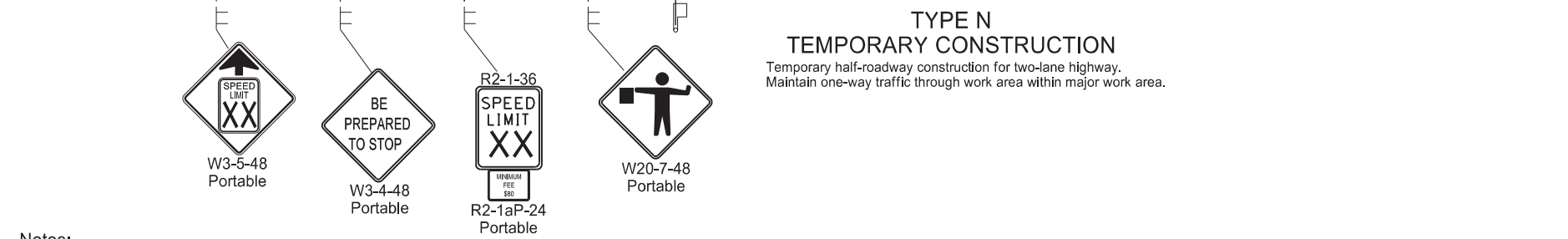
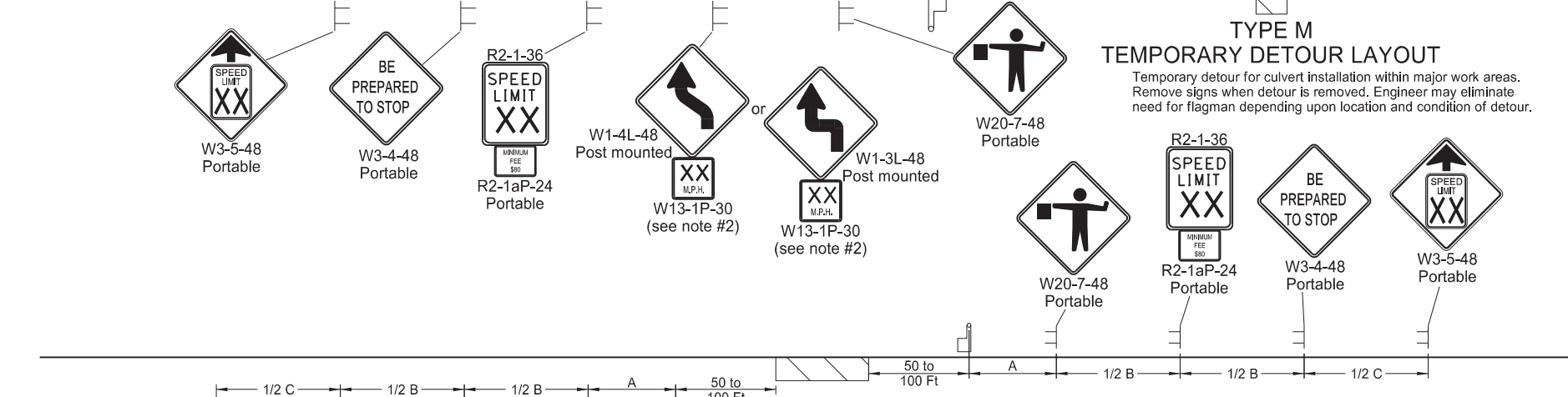
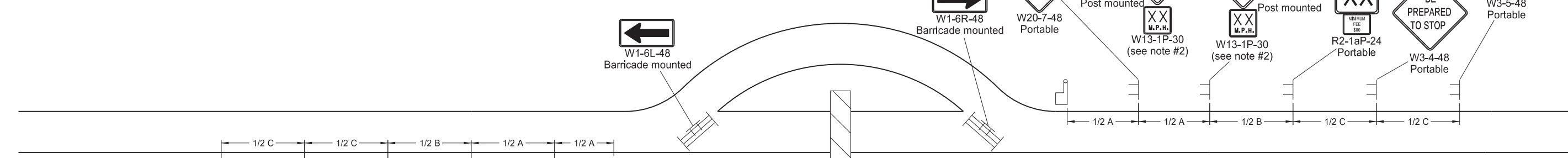
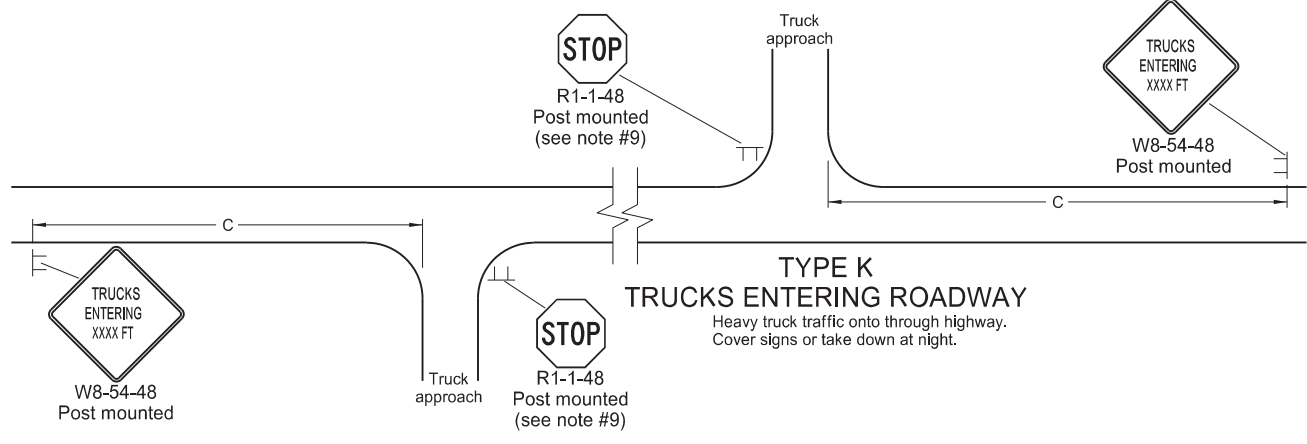
11/29/22

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.

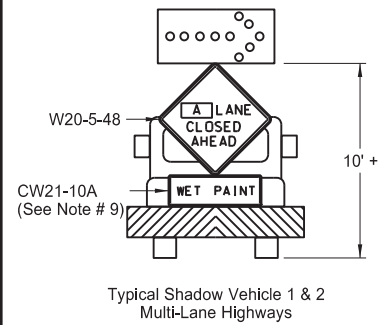
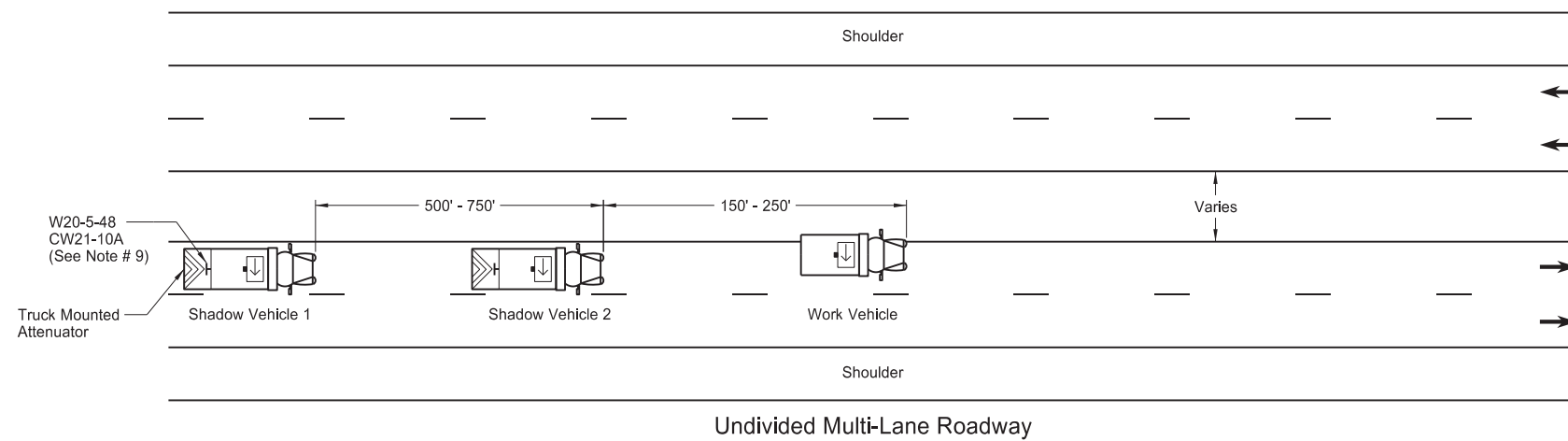
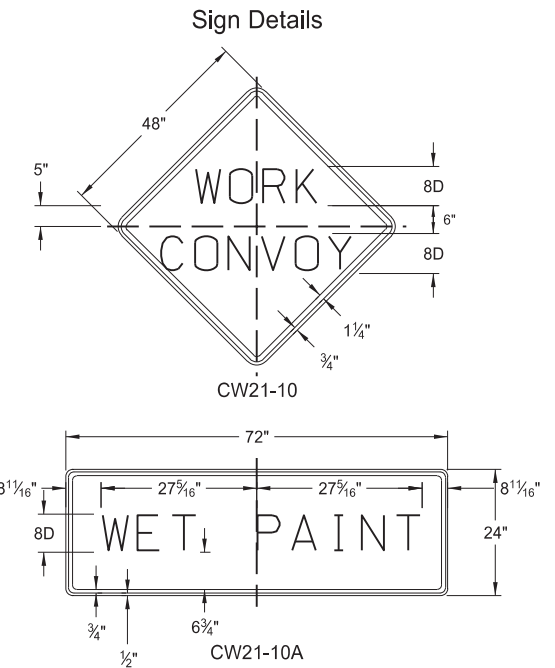
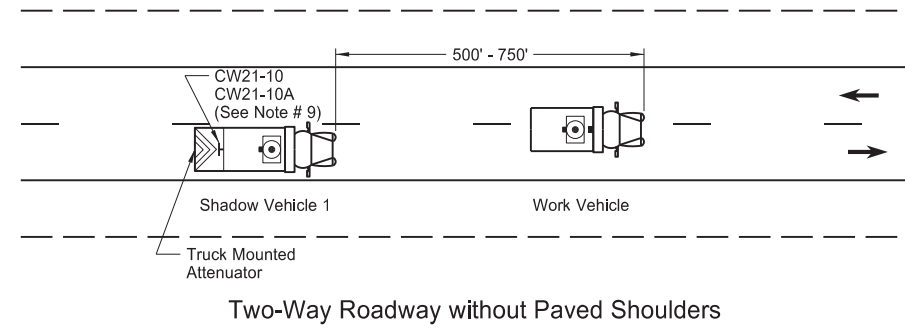
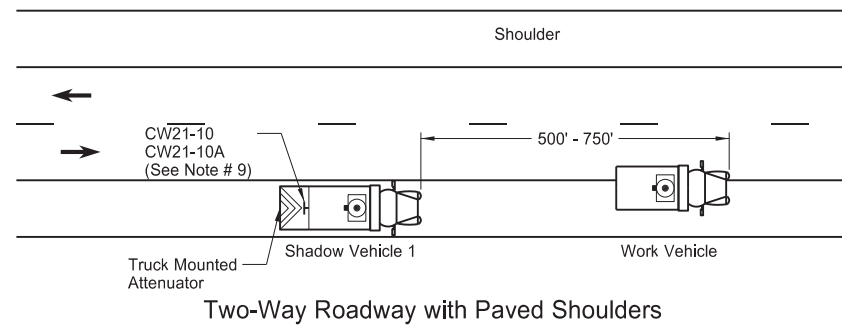
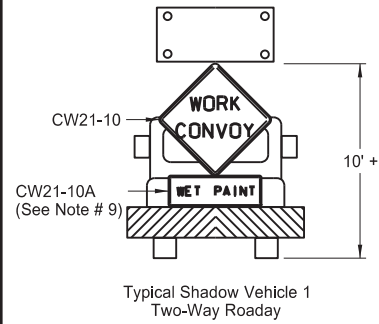
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60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

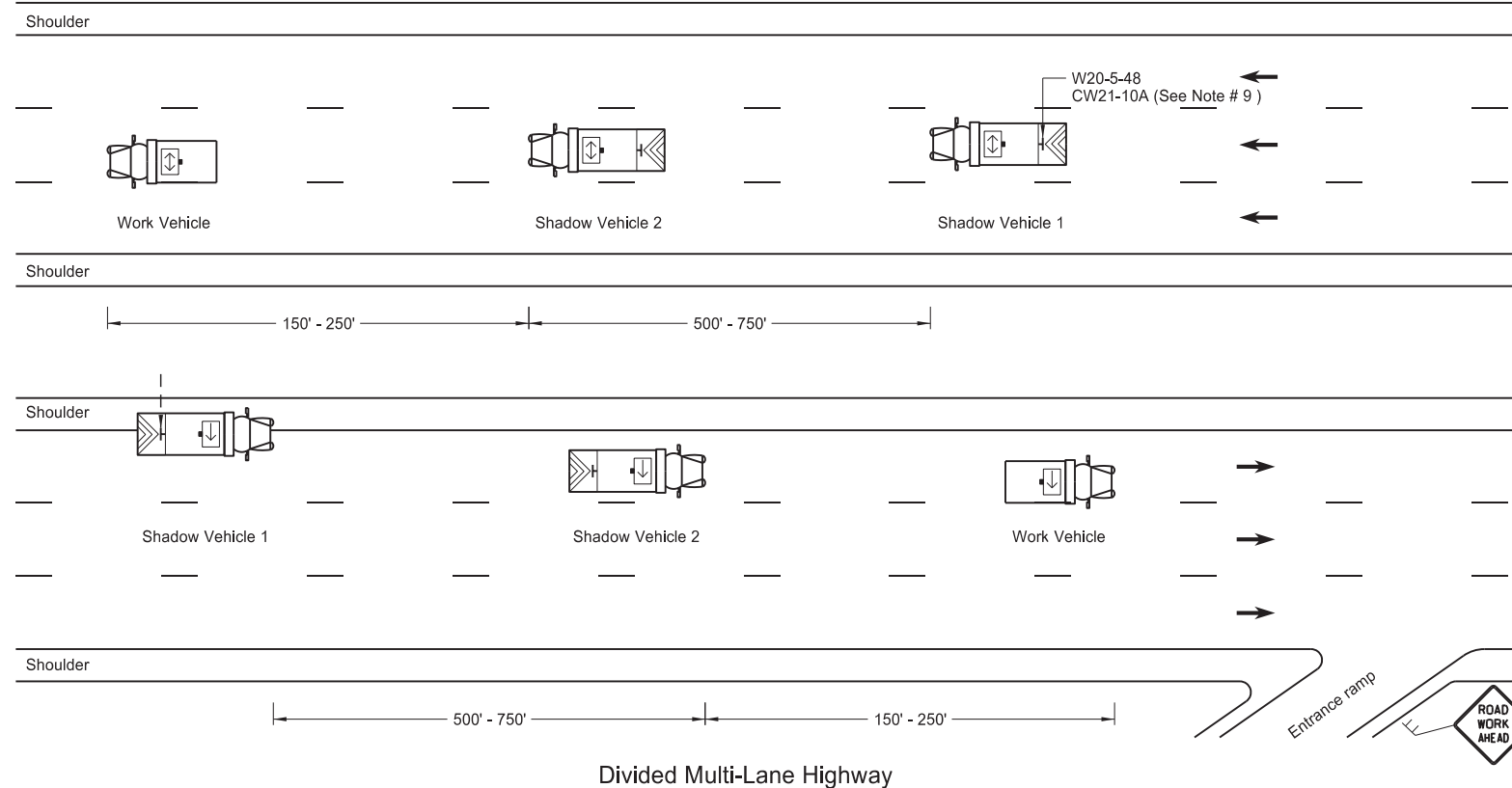


11/29/22

MOBILE OPERATION
(PAVEMENT MARKING)

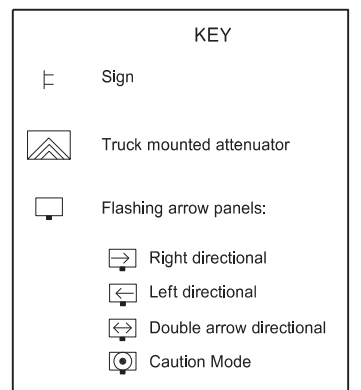


A = Left Right Center



Notes

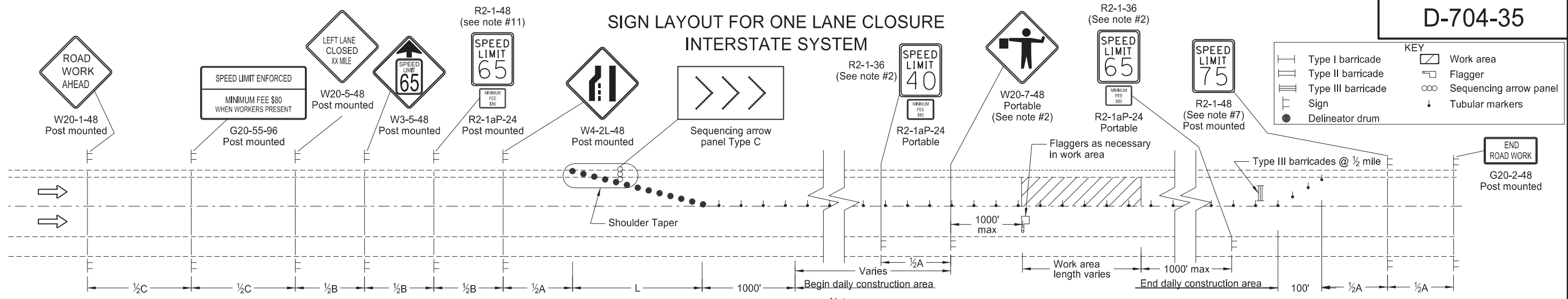
1. Use additional vehicles you choose to be in the convoy with truck mounted attenuators, at your own expense.
2. Display yellow rotating beacons or strobe lights on shadow and work vehicles, unless otherwise stated in the plans.
3. Use Type B or Type C flashing arrow panels controlled from inside the vehicle.
4. Provide each vehicle with two-way electronic communication capability.
5. Move shadow vehicle 1 first to shadow other convoy vehicles when convoy changes lane.
6. 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.
7. Sign Colors
Letters = Black
Border = Black
Background = Orange
8. As an option, use shadow vehicle 2 the paint tender vehicle.
9. Use sign CW21-10A only during painting operation.
10. 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
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of Transportation

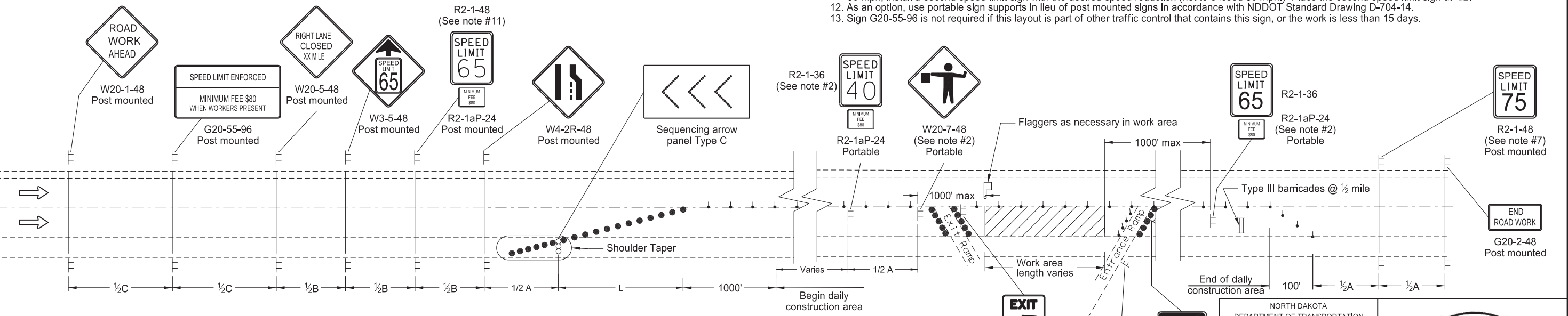
SIGN LAYOUT FOR ONE LANE CLOSURE INTERSTATE SYSTEM



LEFT LANE CLOSED
WORKERS IN WORK AREA

- Notes:
1. Install advance signs for flagging when flaggers are flagging.
 2. Move the advanced flagger sign and the speed limit signs as the work area moves through the construction zone. When the work area is not visible from the flagger, move the flagger station so the work area is visible. Space the 40 mph speed limit sign at 1/2A in advance of the flagger sign and move the 65 mph speed limit sign. Cover or remove the 40 mph speed limit and Minimum Fee \$80 signs and the 65 mph speed limit sign upon completion of the work day or when workers are not present.
 3. RAMP: When the work area encompasses an entrance ramp, install a 40 mph speed limit sign on the ramp and cover any existing yield sign. Install new yield sign as necessary. Remove the ramp speed limit sign when the main line 40 mph speed zone is moved past the ramp.
 4. Variables:
 S=Numerical value of speed limit or 85th percentile
 W=The width of taper.
 L=Minimum length of taper, or SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater, or WxSxS/60 for urban, residential, and other streets with speeds of 40 mph or less.
 5. Space delineator drums for tapering traffic at the dimension "S". Space tubular markers used for tangents at 2 times dimension "S".
 6. 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 the roadway surface.
 Use Type C on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater).
 7. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
 8. Cover existing speed limit signs within a reduced speed zone.
 9. Upon approval, the Engineer will measure obliterated or covered pavement marking as Obliteration of Pavement Marking.
 10. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the diamond sign, and at such a distance above the edge that the flag does not touch the sign when limp.
 11. Determine the reduced speed limit dependent on the in place speed limit before construction. When speed limits are to be reduced more than 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 1/2B.
 12. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 13. 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.

ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min (ft)		
	A	B	C
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



RIGHT LANE CLOSED
WORKERS IN WORK AREA

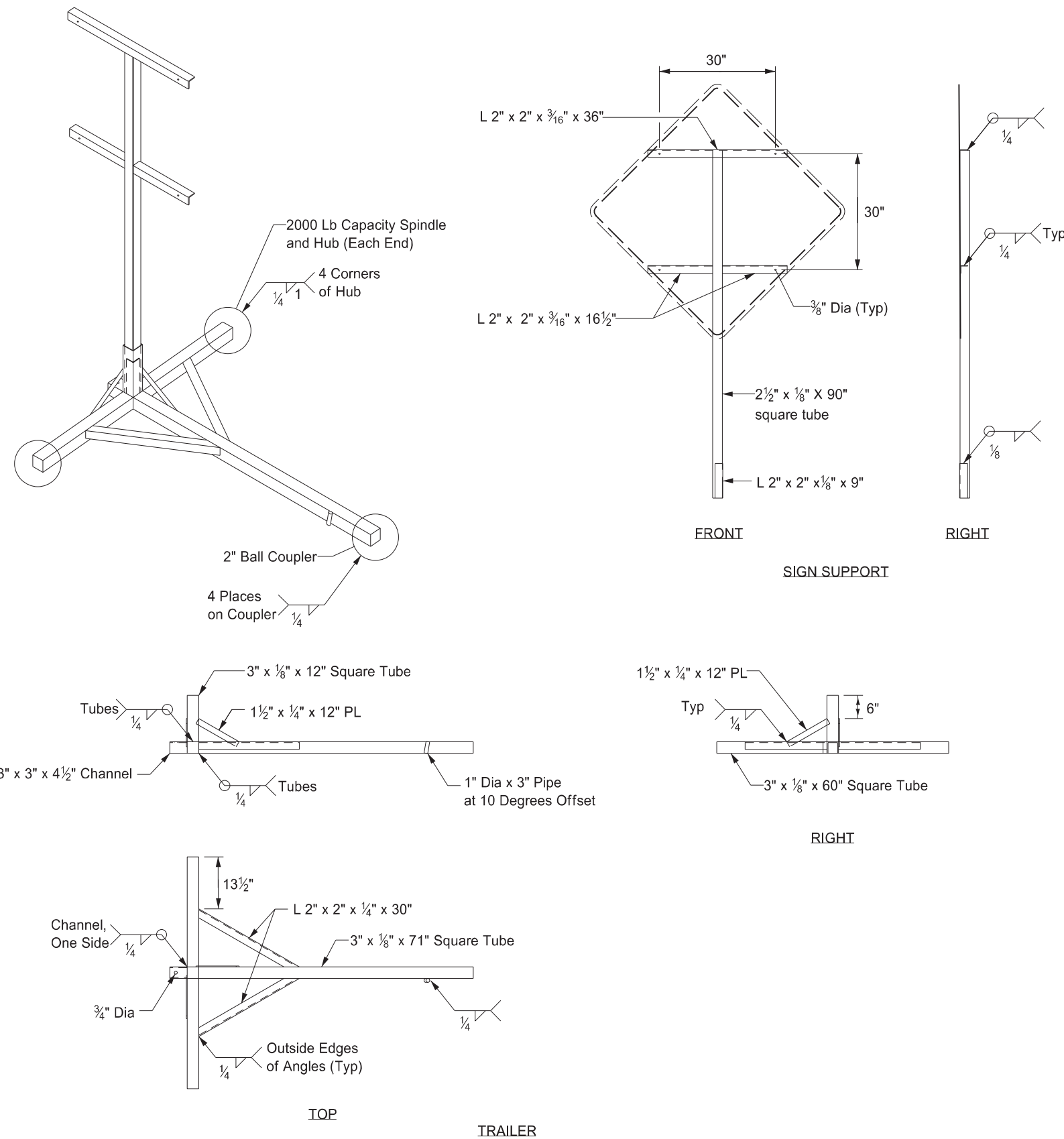
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-7-2012	
REVISIONS	
DATE	CHANGE
06-23-14	Revised Note 12
03-15-16	Removed Do Not Pass signs & updated notes
08-17-17	Moved speed signs & added note
10-17-17	Corrected spelling of "shoulder"
11-01-19	Revised tubular Mkrs symbols
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced, added Dollars At Work, & removed table
11-29-22	Removed Dollars At Work



11/29/22

PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



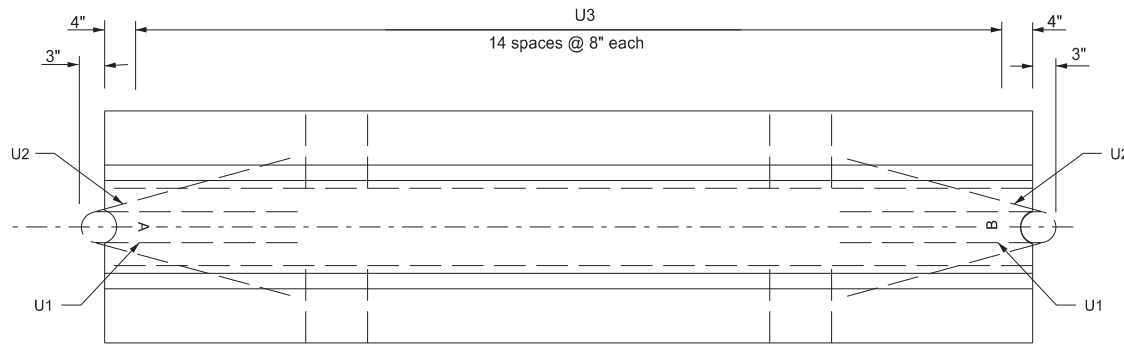
Notes:

- 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.

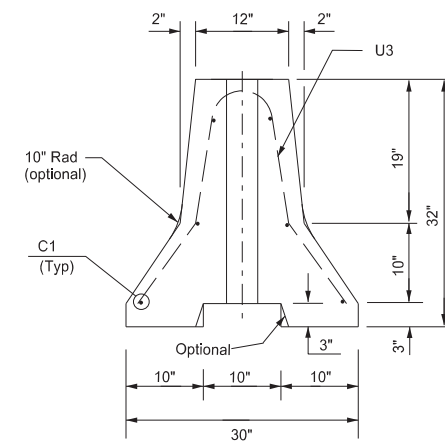
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE
12/02/2020	Updated Note to active voice.

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

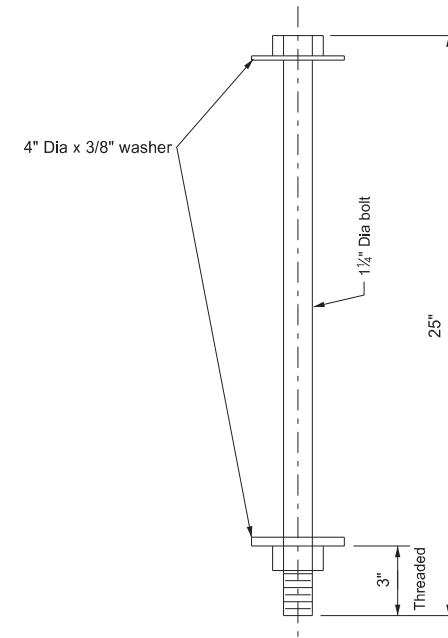
PORTABLE PRECAST CONCRETE MEDIAN BARRIER
(TEMPORARY USAGE)



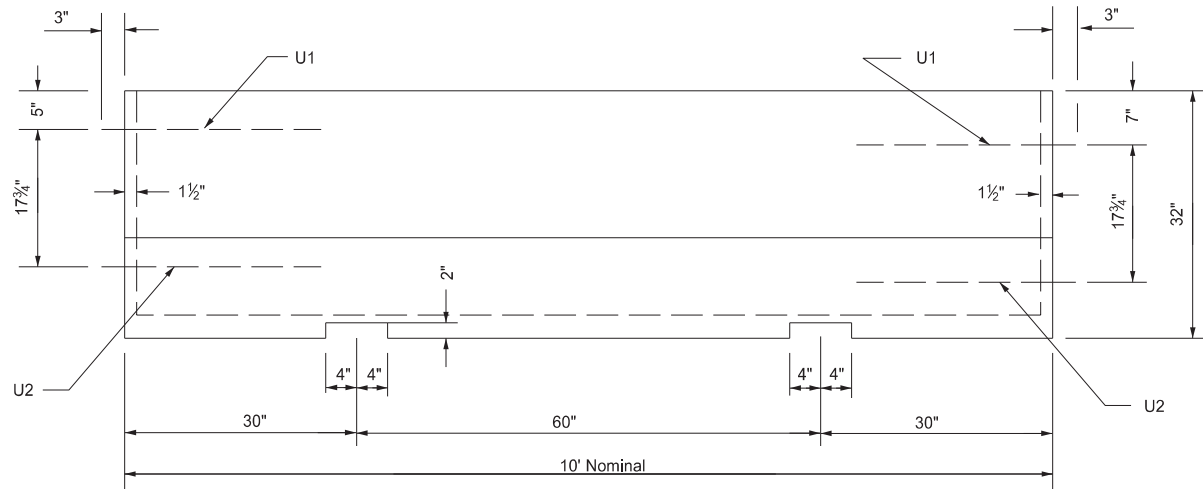
Plan View



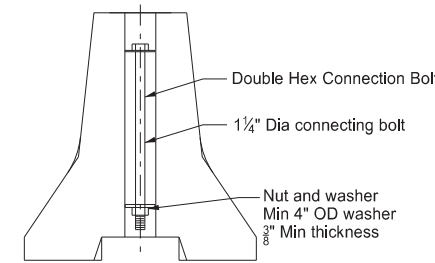
End View



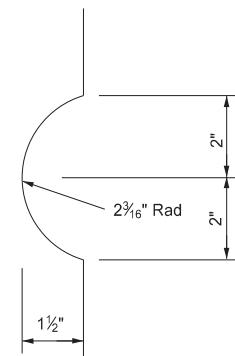
Connecting Bolt Detail
(One per 10 Ft section)



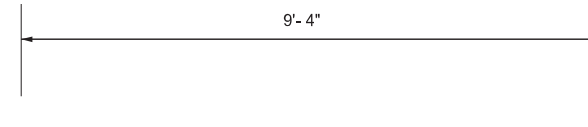
Side View



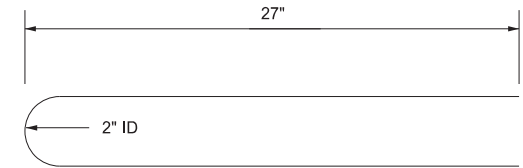
Bolt Connection Detail



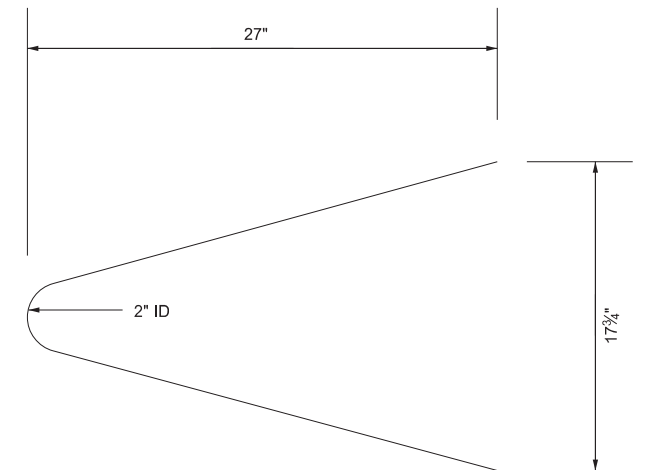
Dap Detail



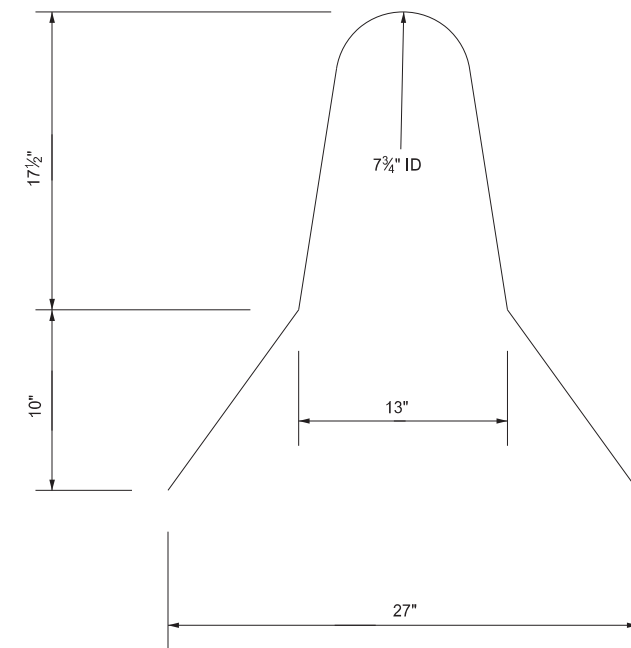
C1 Bar Detail



U1 Bar Detail



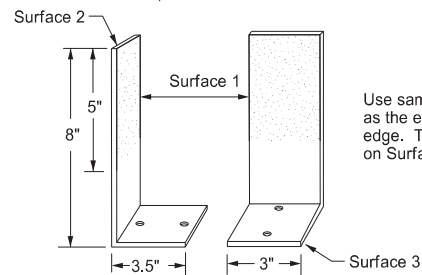
U2 Bar Detail



U3 Bar Detail

Notes:

- Galvanize all exposed hardware as per ASTM A153, except for the loop inserts.
- Use AAE-3 Concrete.
- Provide steel in accordance with Section 612 of NDDOT Standard Specifications.
- Imprint barrier ends A and B as shown with 4 inch letters. Field match A end with B end.
- Place barrier markers at the center of the barrier at 20' centers.
- Connect barrier sections with 1 1/4" Dia A-307 double hex connecting bolt. Maintain bottom nut and washer connection for duration of barrier installation.
- Place barrier to minimize openings between individual sections.



Barrier Marker Detail

Use same color reflective faces as the edge line along barrier edge. Two way reflective on Surface 1 & 2.

Reflective Tape
Use retroreflective, acrylic microprism material with acrylic backing, 3" wide, providing the following minimum optical performance with an observation angle of 0.1° measured in candlepower for the reflector:

Entrance Angle	Specific Intensity
Yellow - 4"	136
White - 4"	200

Adhesive
Use factory applied solid butyl rubber 1/8" thick, 2" wide on 2 1/4" wide release paper on surface 3 to temporarily mount markers to portable concrete barrier.

Bar List				
Mark	Size	No.	Length	Shape
C1	4	6	9'- 4"	Straight
U1	4	2	4'- 8"	Bent
U2	4	2	4'- 10 1/4"	Bent
U3	4	15	5'- 4"	Bent

Marker Body
Use high impact, weatherable engineering thermo-plastic material conforming to the following:

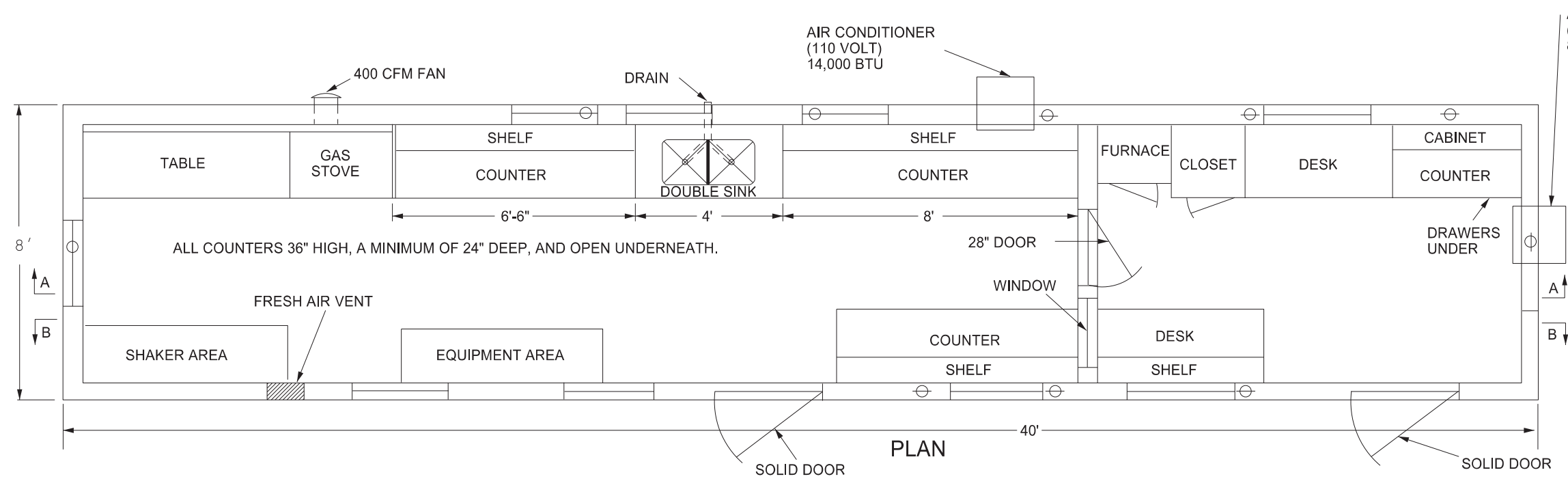
Property	Result	ASTM Test Method
Thickness (min)	.090"	—
Tensile strength (min psi) @ yield	5,500	D638
Impact strength @ -20°F (ft-lbs/in of notch)	3.2	D256 Method A
Impact strength @ 73°F (ft-lbs/in of notch)	14.0	D256 Method A
Flexural strength, PSI 1/4" @ 73°F	8,000	D790
Flexural modulus, PSI 1/4" @ 73°F	300,000	D790
Elongation @ yield	30%	D638

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-20-12	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
11-01-19	New Design Engr PE Stamp

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

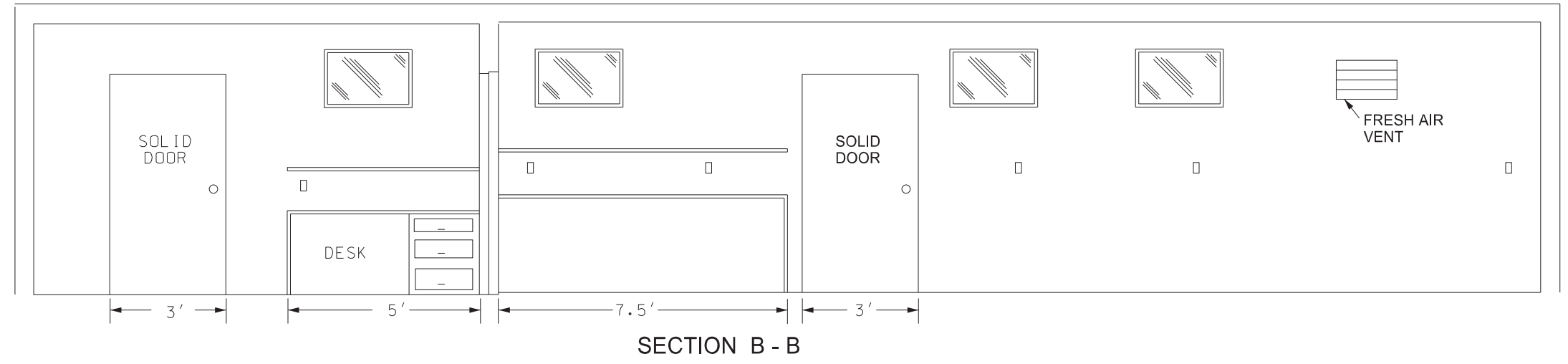
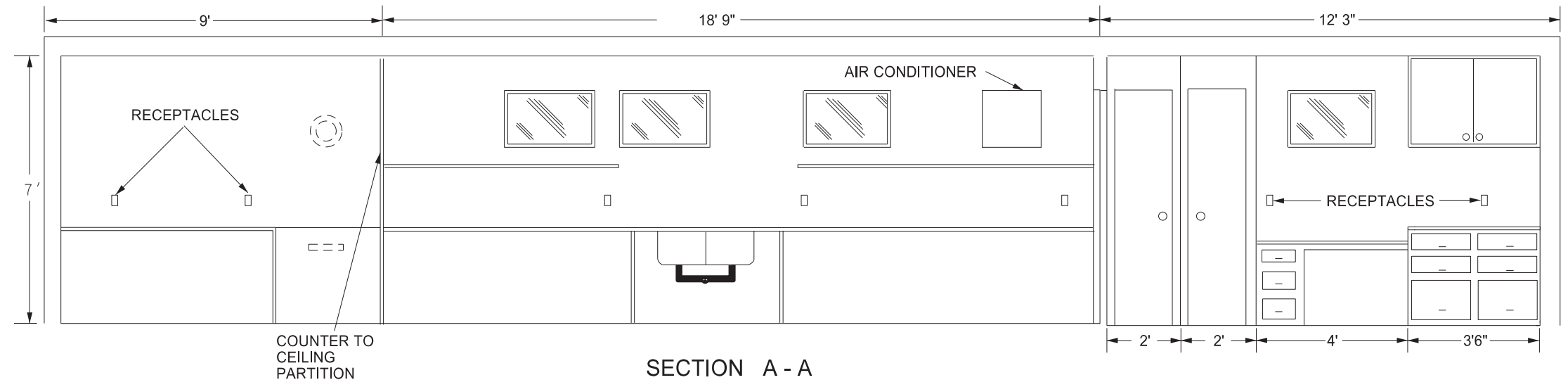
BITUMINOUS LABORATORY

D-706-1



AIR CONDITIONER
(110 VOLT)
8,000 BTU

- 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.

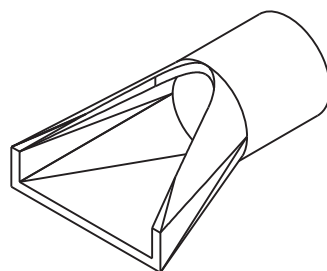


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
07-30-14	Changed standard's title and revised notes.
01-11-16	Revised notes.
08-27-19	New Design Engineer PE Stamp

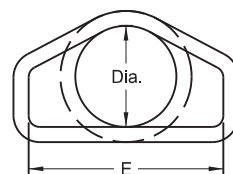
This document was originally issued and sealed by
Kirk J Hoff,
 Registration Number
PE- 4683,
 on **08/27/19** and the original document is stored at the North Dakota Department of Transportation

REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS
(Round Pipe)

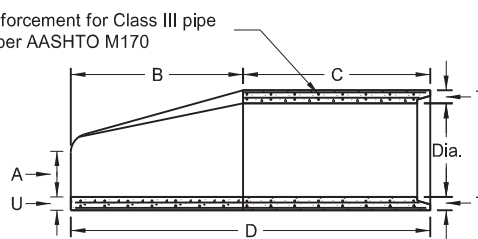
FLARED END SECTION						
TERMINAL DIMENSIONS						
DIA	A	B	C	D	E	U
12	0'-4"	2'-0"	4'-0 ⁷ / ₈ "	6'-0 ⁷ / ₈ "	2'-0"	2"
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2 ¹ / ₄ "
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2 ¹ / ₂ "
21	0'-9"	3'-0"	3'-1"	6'-1"	3'-6"	2 ¹ / ₂ "
24	0'-9 ¹ / ₂ "	3'-7 ¹ / ₂ "	2'-6"	6'-1 ¹ / ₂ "	4'-0"	3"
27	0'-10 ¹ / ₂ "	4'-0"	2'-1 ¹ / ₂ "	6'-1 ¹ / ₂ "	4'-6"	3 ¹ / ₂ "
30	1'-0"	4'-6"	1'-7 ¹ / ₄ "	6'-1 ³ / ₄ "	5'-0"	3 ¹ / ₂ "
36	1'-3"	5'-3"	2'-9"	8'-0"	6'-0"	4"
42	1'-9"	5'-3"	2'-9"	8'-0"	6'-6"	4 ¹ / ₂ "
48	2'-0"	6'-0"	2'-0"	8'-0"	7'-0"	5"
54	2'-3"	5'-5"	2'-9 ¹ / ₄ "	8'-2 ¹ / ₄ "	7'-6"	5 ¹ / ₂ "
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	5"
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	5 ¹ / ₂ "
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	6"
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	6 ¹ / ₂ "
84	3'-0"	7'-6 ¹ / ₂ "	1'-9"	9'-3 ¹ / ₂ "	10'-0"	6 ¹ / ₂ "
90	3'-5"	7'-3 ¹ / ₂ "	2'-0"	9'-3 ¹ / ₂ "	11'-0"	6 ¹ / ₂ "



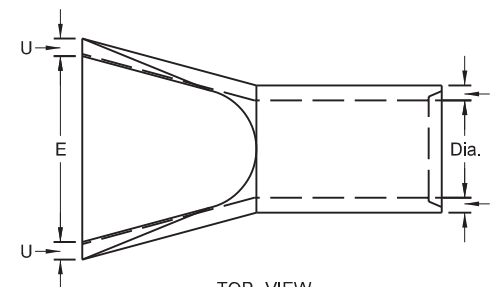
PERSPECTIVE



END VIEW



SIDE VIEW



TOP VIEW

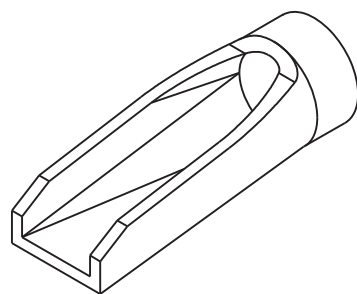
NOTES:

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

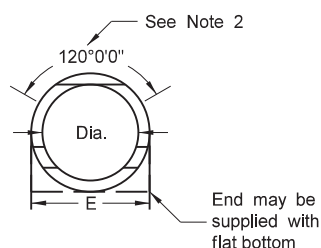
REINFORCED CONCRETE PIPE - FLARED END SECTION

Reinforcement to be equivalent to Class III RCP

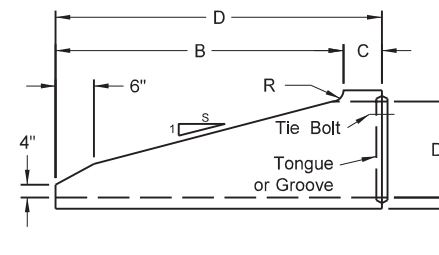
TRAVERSABLE END SECTION						
DIA	B	C	D	E	R	S
15"	4'	9"	4'-9"	1'-7 ¹ / ₂ "	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	3"	6
24"	6'	1'	7'	2'-6"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3 ¹ / ₂ "	4
36"	7'-3"	15"	8'-6"	3'-8"	3"	4



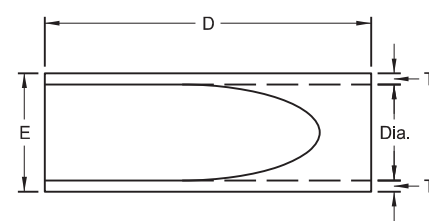
PERSPECTIVE



END VIEW



SIDE VIEW



TOP VIEW

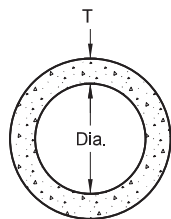
NOTES (Traversable End Section):

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

REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION

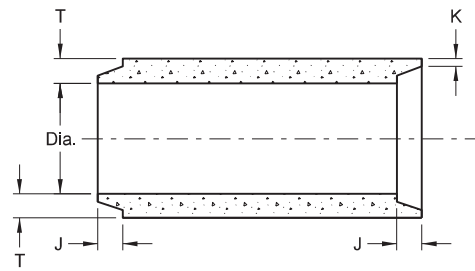
Reinforcement to be equivalent to Class III RCP

All Classifications of Round Concrete Pipe						
Internal Dia. of pipe in Inches	Cross-Sectional Water Area	Weight per Lin. Foot of pipe Std. Wall	Joint J Groove Min./Max.	Joint K Tongue Min.	Minimum Wall Thickness (T)	
Dia	Sq. ft.	Lbs.	In.	In.	In.	
12	0.79	92	1 ¹ / ₈ -2 ³ / ₈	3/4	2	
15	1.23	127	1 ¹ / ₈ -2 ³ / ₈	7/8	2 ¹ / ₄	
18	1.77	168	1 ¹ / ₈ -2 ⁷ / ₈	1	2 ¹ / ₂	
21	2.40	214	1 ¹ / ₈ -3 ¹ / ₈	1 ¹ / ₈	2 ³ / ₄	
24	3.14	265	2 ³ / ₈ -3 ¹ / ₈	1 ¹ / ₂	3	
27	3.98	322	2 ³ / ₈ -4	1 ¹ / ₄	3 ¹ / ₄	
30	4.91	384	3 ¹ / ₄ -4 ¹ / ₄	1 ¹ / ₄	3 ¹ / ₂	
33	5.94	452	3 ¹ / ₄ -4 ¹ / ₄	1 ¹ / ₂	3 ³ / ₄	
36	7.07	524	3 ¹ / ₄ -4 ¹ / ₄	1 ¹ / ₂	4	
42	9.62	685	3 ¹ / ₄ -4 ¹ / ₄	1 ³ / ₄	4 ¹ / ₂	
48	12.57	885	3 ¹ / ₄ -4 ¹ / ₄	1 ¹ / ₂	5	
54	15.90	1070	4 ¹ / ₈ -5 ¹ / ₄	2	5 ¹ / ₂	
60	19.63	1296	4 ¹ / ₈ -5 ¹ / ₂	2 ¹ / ₄	6	
66	23.76	1542	5-6	2 ³ / ₈	6 ¹ / ₂	
72	28.27	1810	5 ¹ / ₈ -6 ³ / ₄	2 ³ / ₈	7	
78	33.18	2098	6 ¹ / ₄ -7 ¹ / ₄	2 ³ / ₈	7 ¹ / ₂	
84	38.48	2410	5 ¹ / ₈ -7 ¹ / ₄	3 ¹ / ₈	8	
90	44.18	2793	6 ¹ / ₄ -8 ¹ / ₂	3 ¹ / ₈	8 ¹ / ₂	
96	50.27	3092	7-8 ¹ / ₄	3 ¹ / ₂	9	
102	56.75	3466	7-8 ¹ / ₄	3 ¹ / ₂	9 ¹ / ₂	
108	63.62	3864	7 ¹ / ₄ -8 ¹ / ₂	3 ³ / ₄	10	

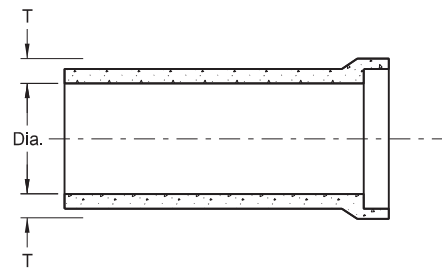


END VIEW

CIRCULAR PIPE

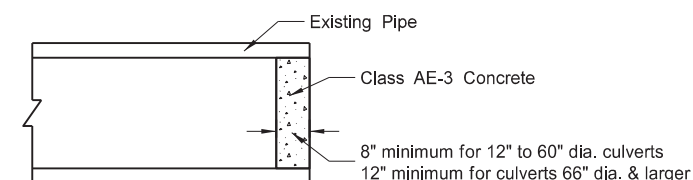


TONGUE & GROOVE JOINT



BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE



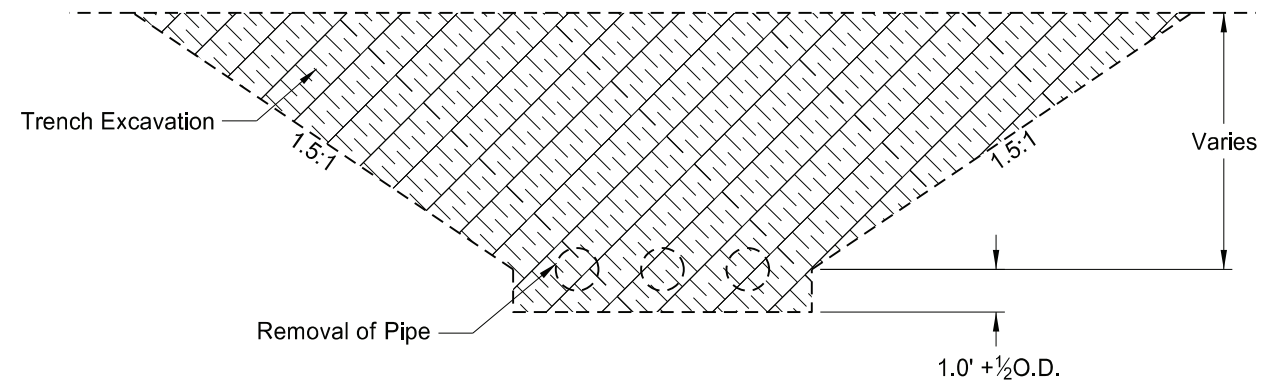
CONCRETE PIPE PLUG

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

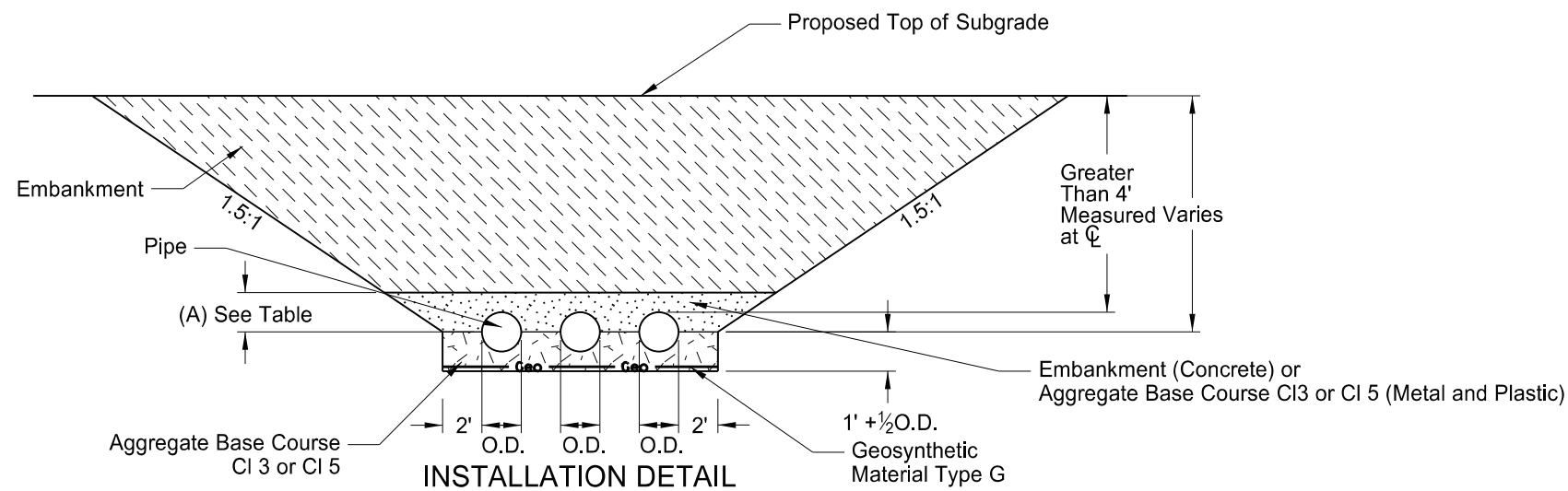
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-12-14	
REVISIONS	
DATE	CHANGE
01-21-15	Revised Note 5
11-21-16	Revised End Section Dimensions
09-18-19	Updated Perspective View Details

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

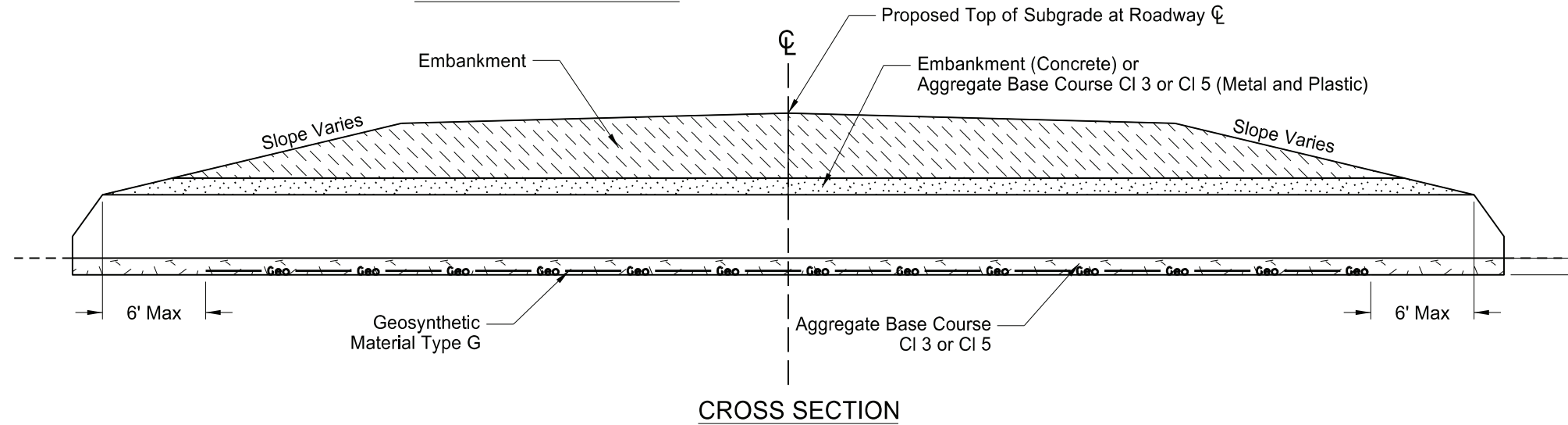
TRANSVERSE MAINLINE PIPE INSTALLATION DETAIL
 MULTIPLE PIPES MORE THAN 4 FEET BELOW TOP OF SUBGRADE



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 Items

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

NOTES:

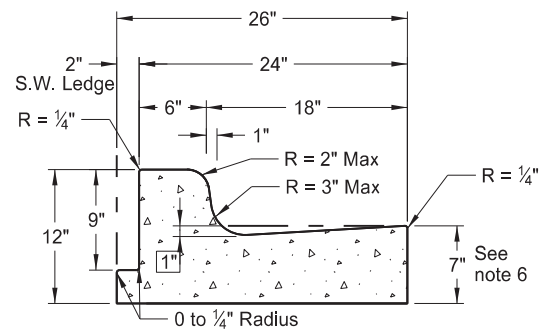
- 1) This drawing applies to new/replaced mainline and paved intersection roadways (including ramps). It does not include pipes in approaches.
- 2) Embankment may be either Borrow Excavation or Common Excavation - Type A.

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

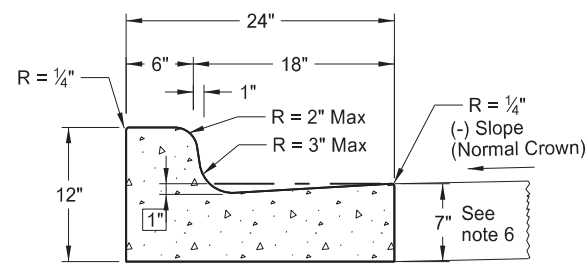
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-4-14	
REVISIONS	
DATE	CHANGE
3-3-14	Spelling
1-21-14	Nomenclature
9-18-15	Title Rewording
12-10-15	Added Plastic Pipe
5-27-20	Replaced R1 Fabric with Geogrid Changed bedding depth and embankment requirements



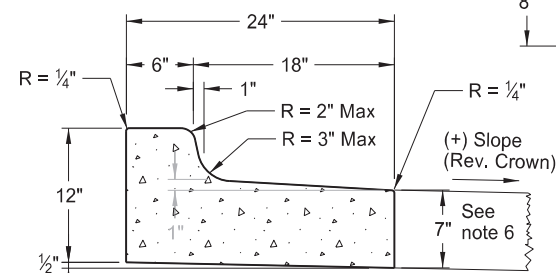
Curb & Gutter and Valley Gutter



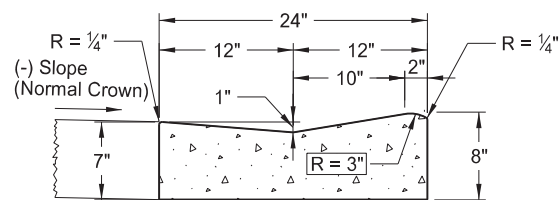
Curb & Gutter Type 1 (Sec. A & B)
Adjacent to Concrete Sidewalk,
Median, or Parking Lot.
(Sec. A shown. See Sec B for
additional details.)



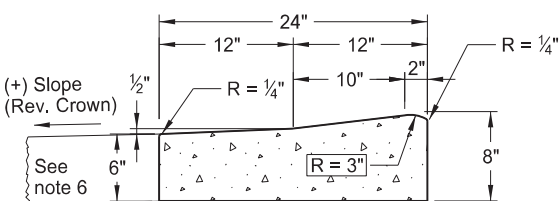
Curb & Gutter Type 1 (Sec. A)



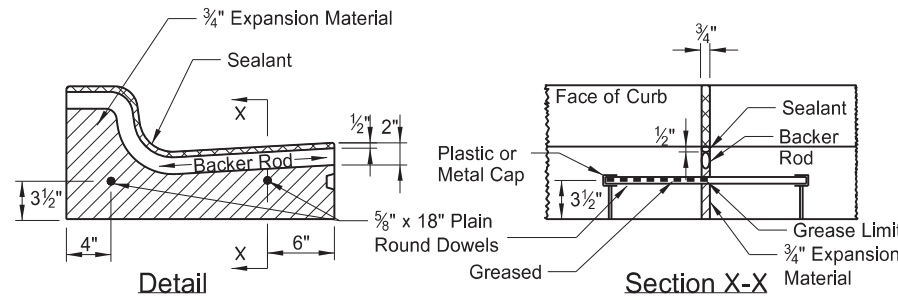
Curb & Gutter Type 1 (Sec. B)



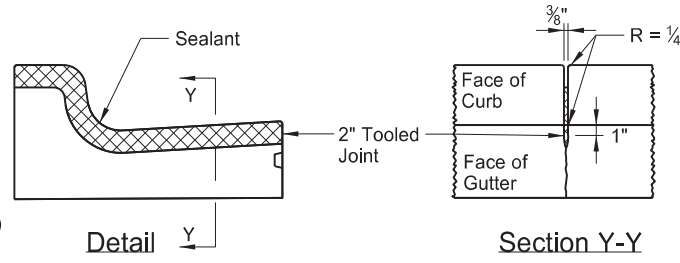
Mountable Curb & Gutter Type 1 (Sec. A)



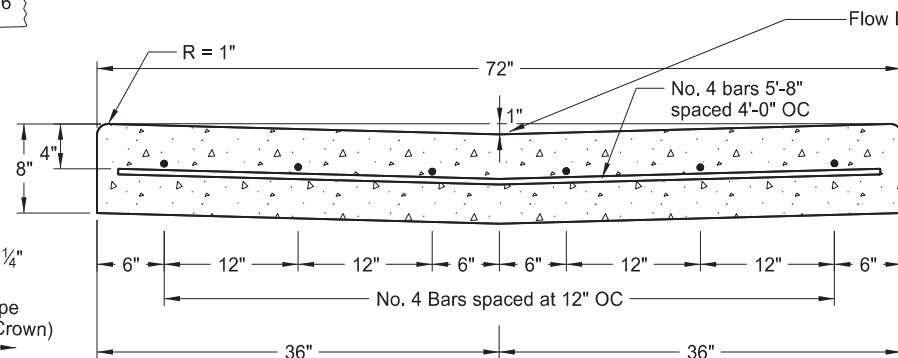
Mountable Curb & Gutter Type 1 (Sec. B)



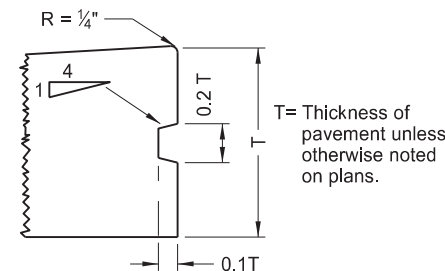
Isolation Joint



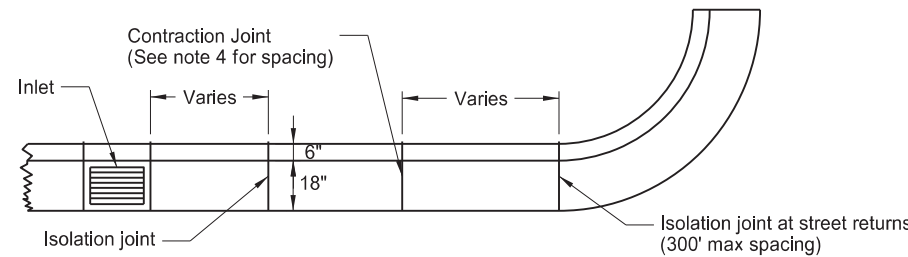
Contraction Joint
(10' Max Spacing)



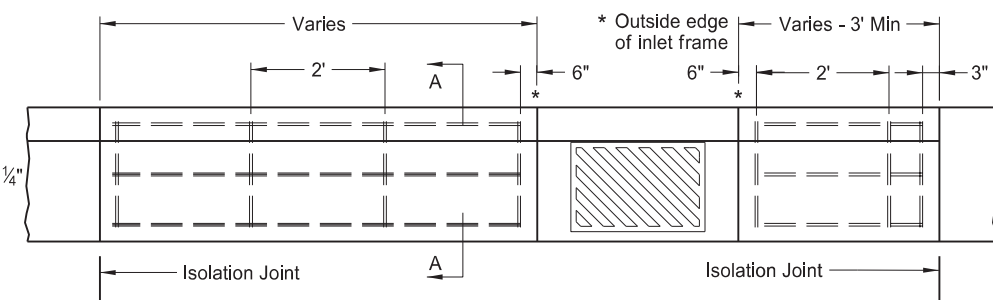
72" Concrete Valley Gutter Detail



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

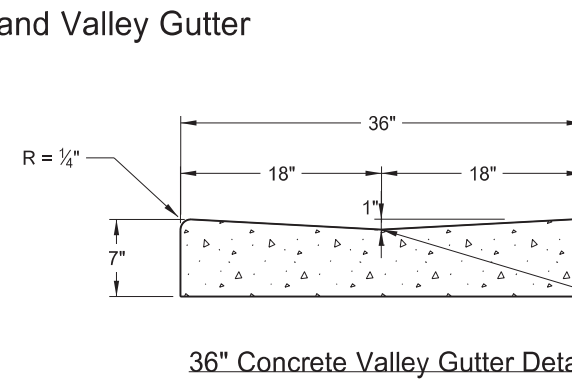


Joint Location Detail

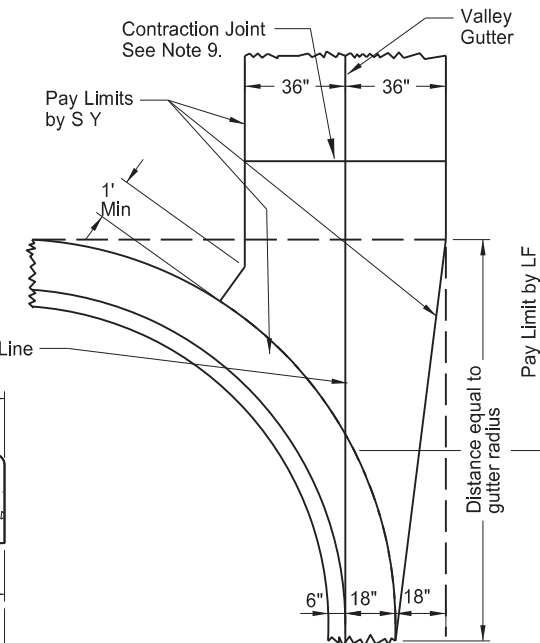


Curb & Gutter Reinforcing at Inlets

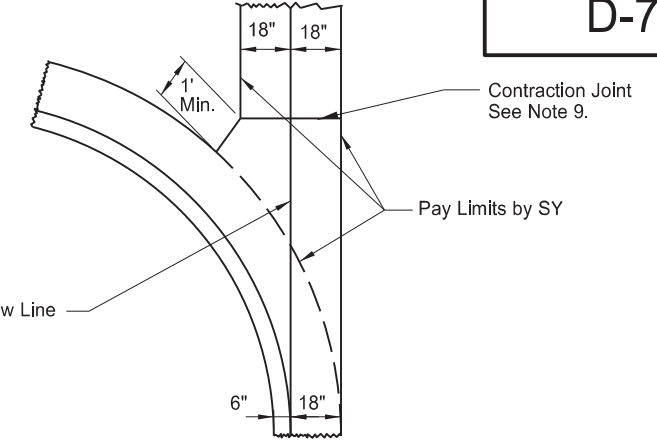
NOTE: Use #4 deformed reinforcing bars without splices. Include all costs for reinforcing bars at inlet locations (even inlets located on radii) in the price bid for "Curb and Gutter - Type 1." Extend reinforcement to the second joint (rebar placed through the first joint) in cases where the 3' min. 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.

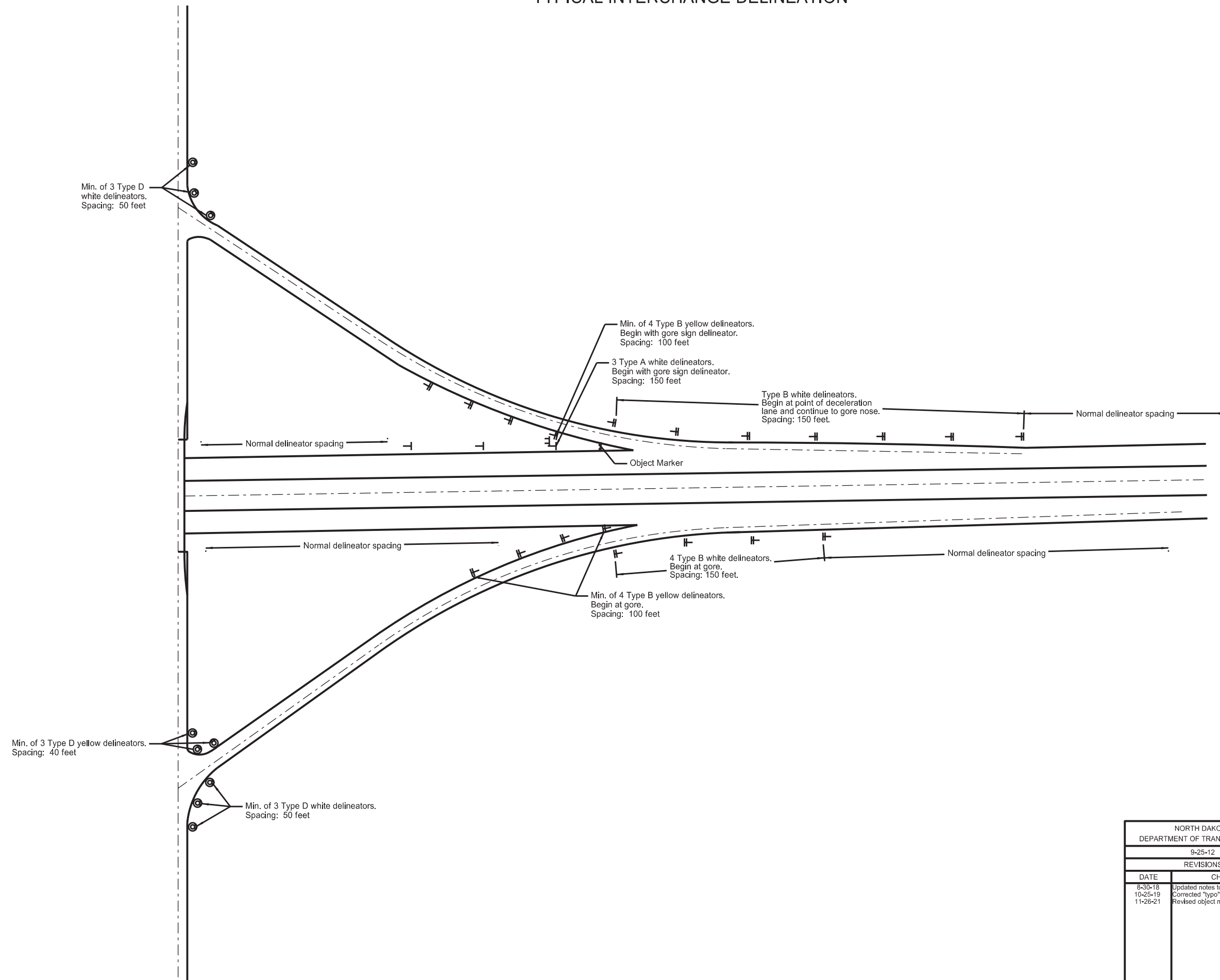
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-7-2013	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
08-27-19	New Design Engr PE Stamp.

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

TYPICAL INTERCHANGE DELINEATION

D-754-22A

Interstate mainline delineator spacing:
528' on tangent and curves less than 0°30'
264' on curves 0°30' and greater.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
10-25-19	Corrected "typo" in exit ramp layout.
11-26-21	Revised object marker designation.



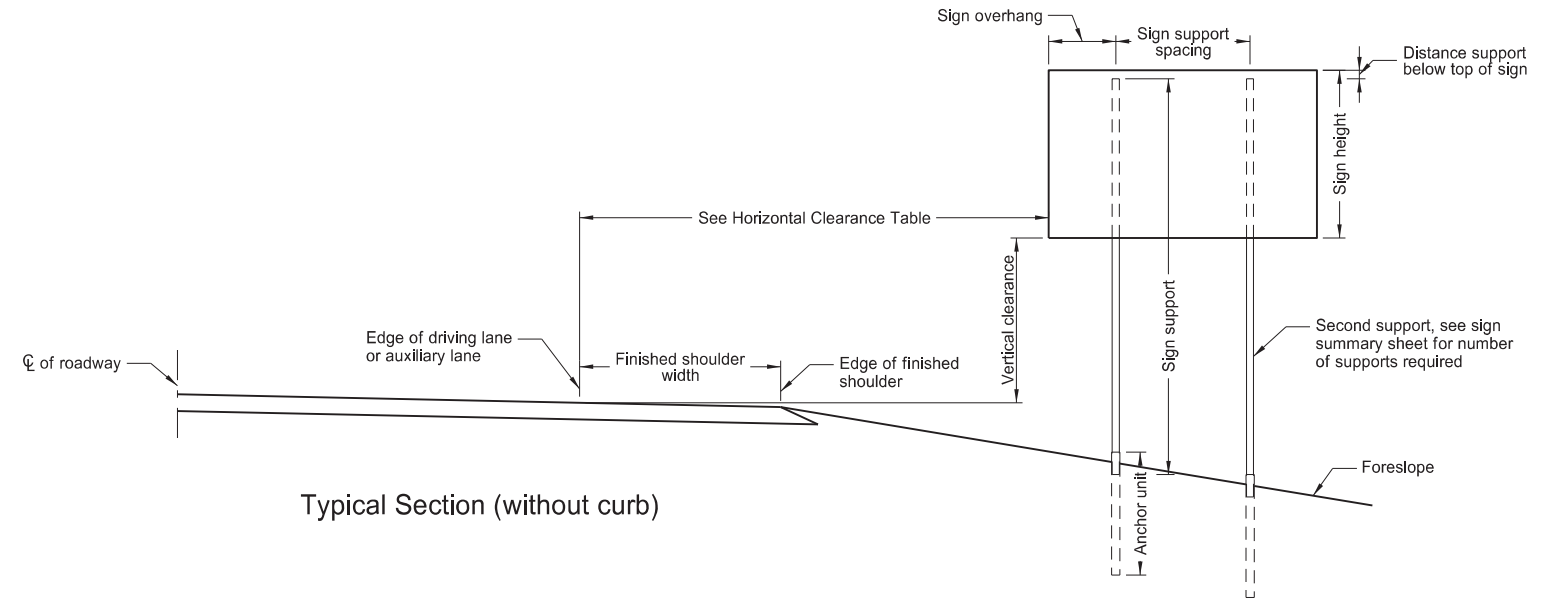
11/26/21

PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

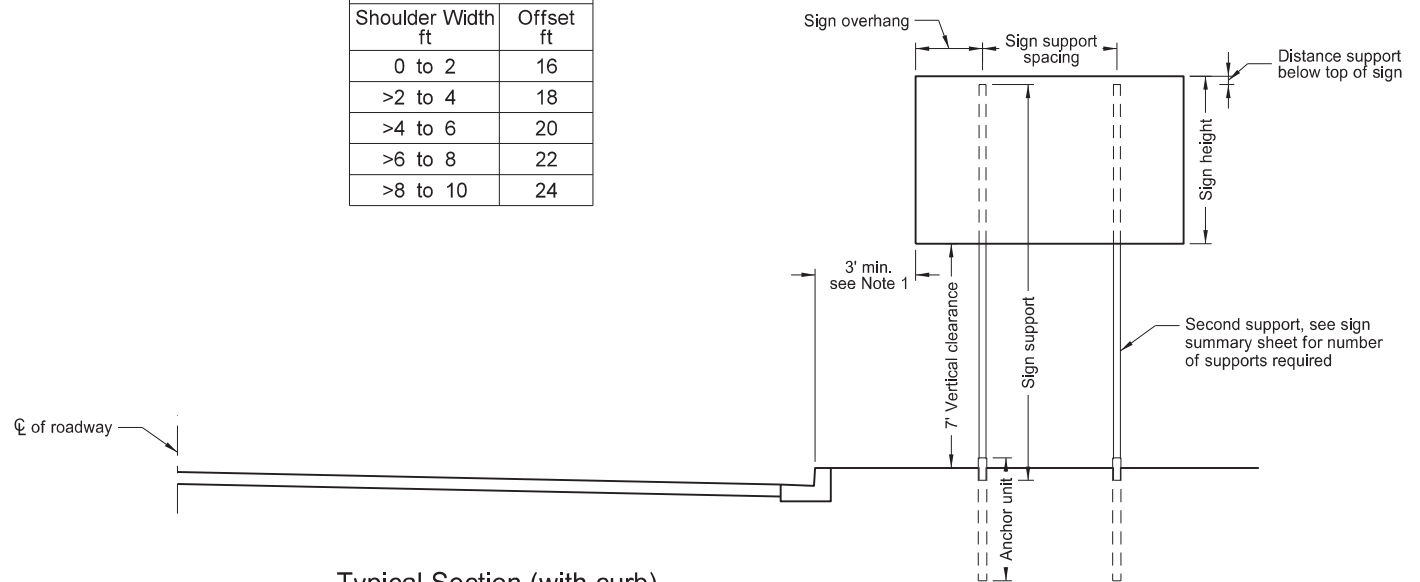
Notes:

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'.

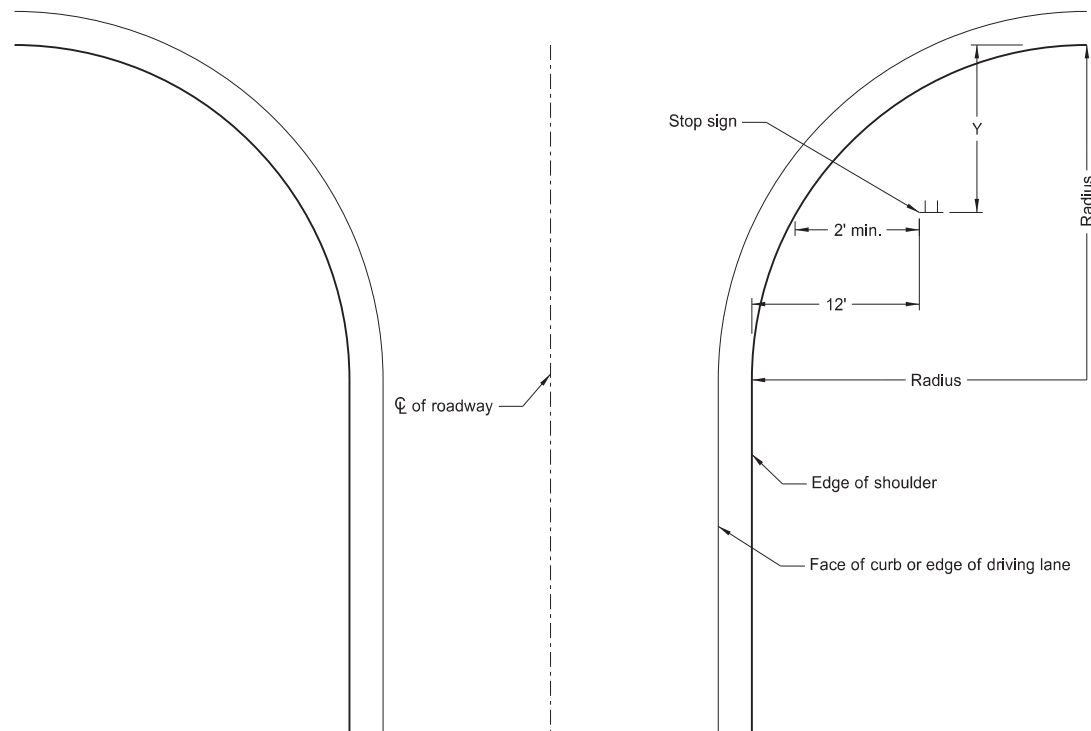


Typical Section (without curb)

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



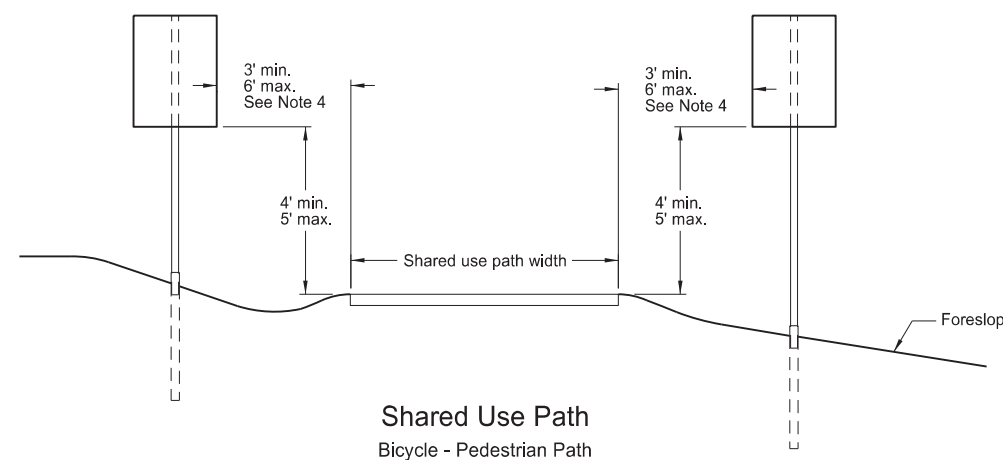
Typical Section (with curb)
Residential or Business District



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



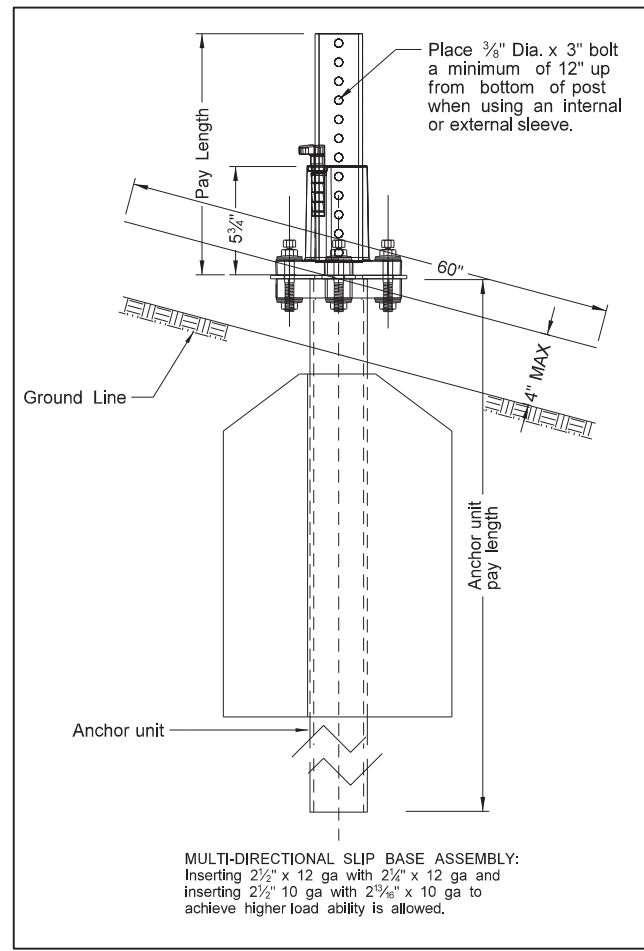
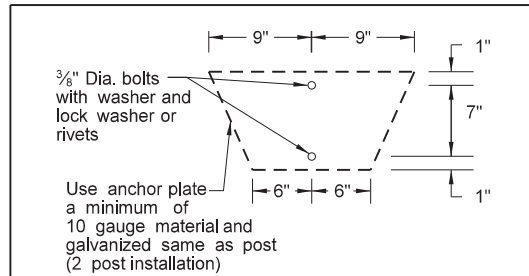
Shared Use Path
Bicycle - Pedestrian Path

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

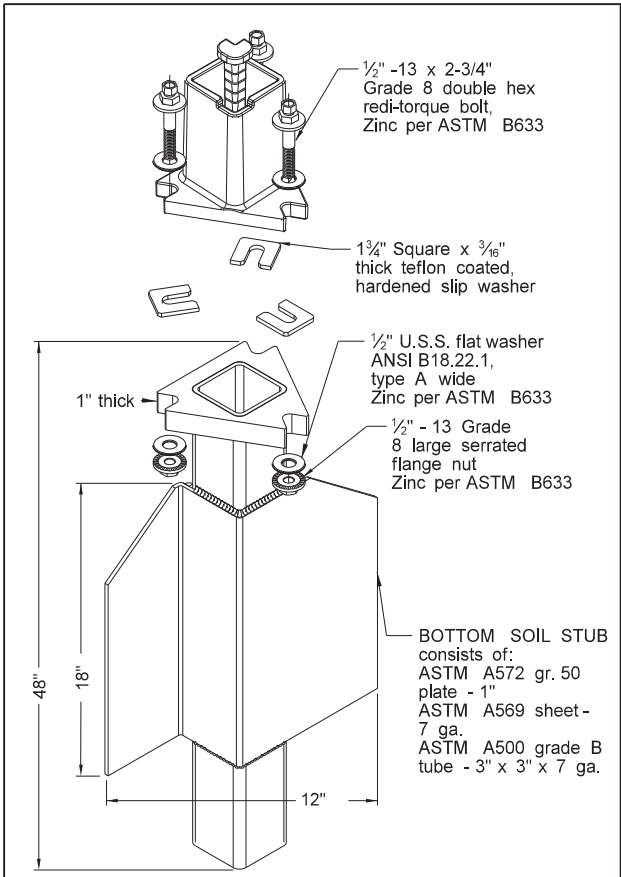
Telescoping Perforated Tube							
Number of Posts	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2 1/2(D)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



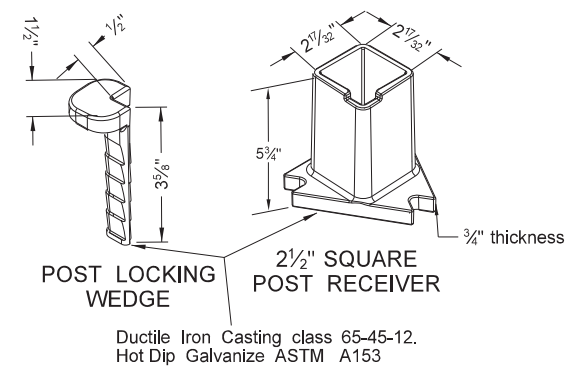
MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:
 Inserting 2 1/2" x 12 ga with 2 1/4" x 12 ga and inserting 2 1/2" 10 ga with 2 3/8" x 10 ga to achieve higher load ability is allowed.

Mounting Details Perforated Tube

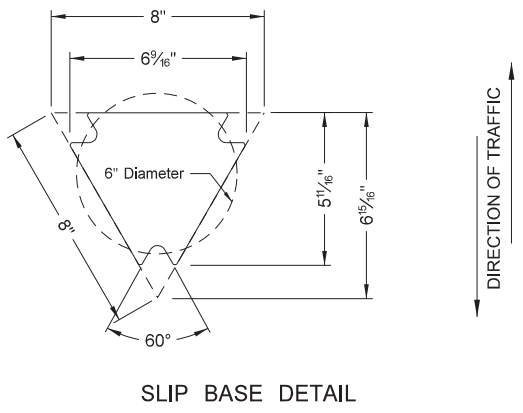


BOTTOM SOIL STUB consists of:
 ASTM A572 gr. 50 plate - 1"
 ASTM A569 sheet - 7 ga.
 ASTM A500 grade B tube - 3" x 3" x 7 ga.

SLIP BASE FOR 2 1/2" POST



SLIP BASE DETAIL

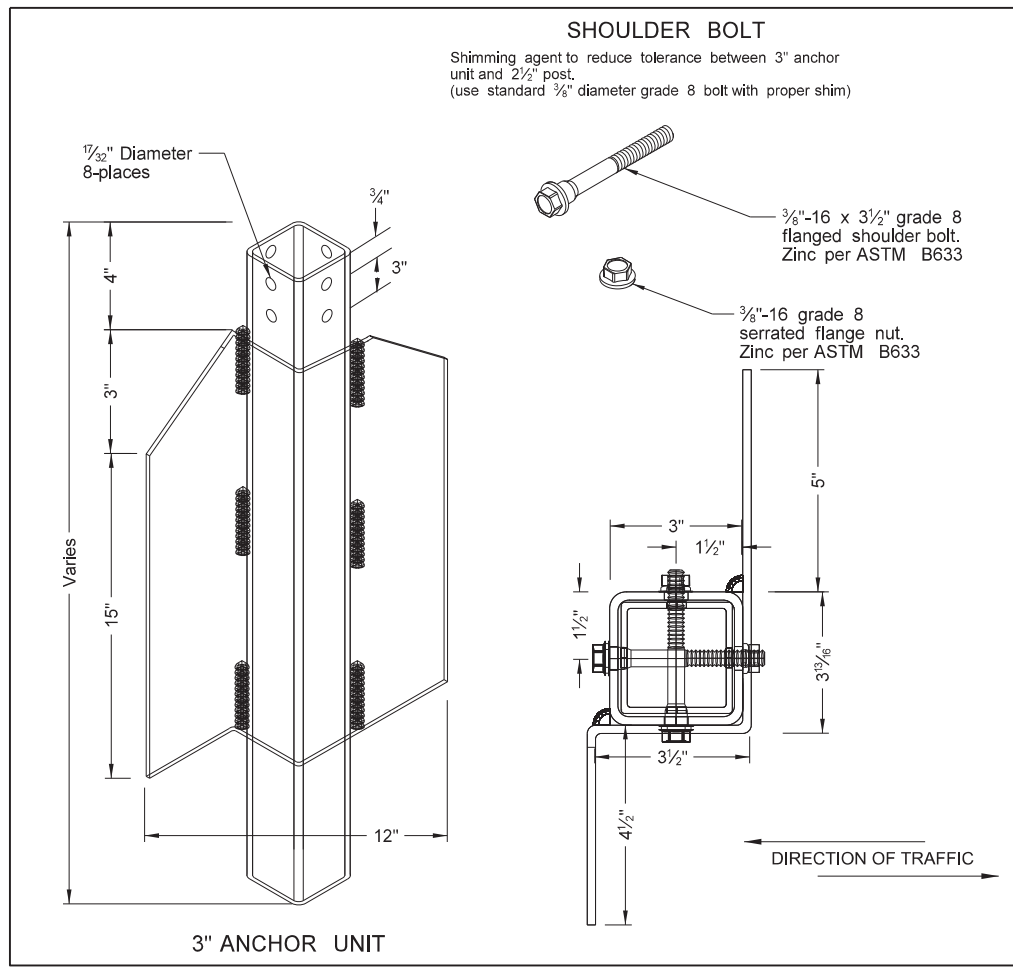


Properties of Telescoping Perforated Tubes

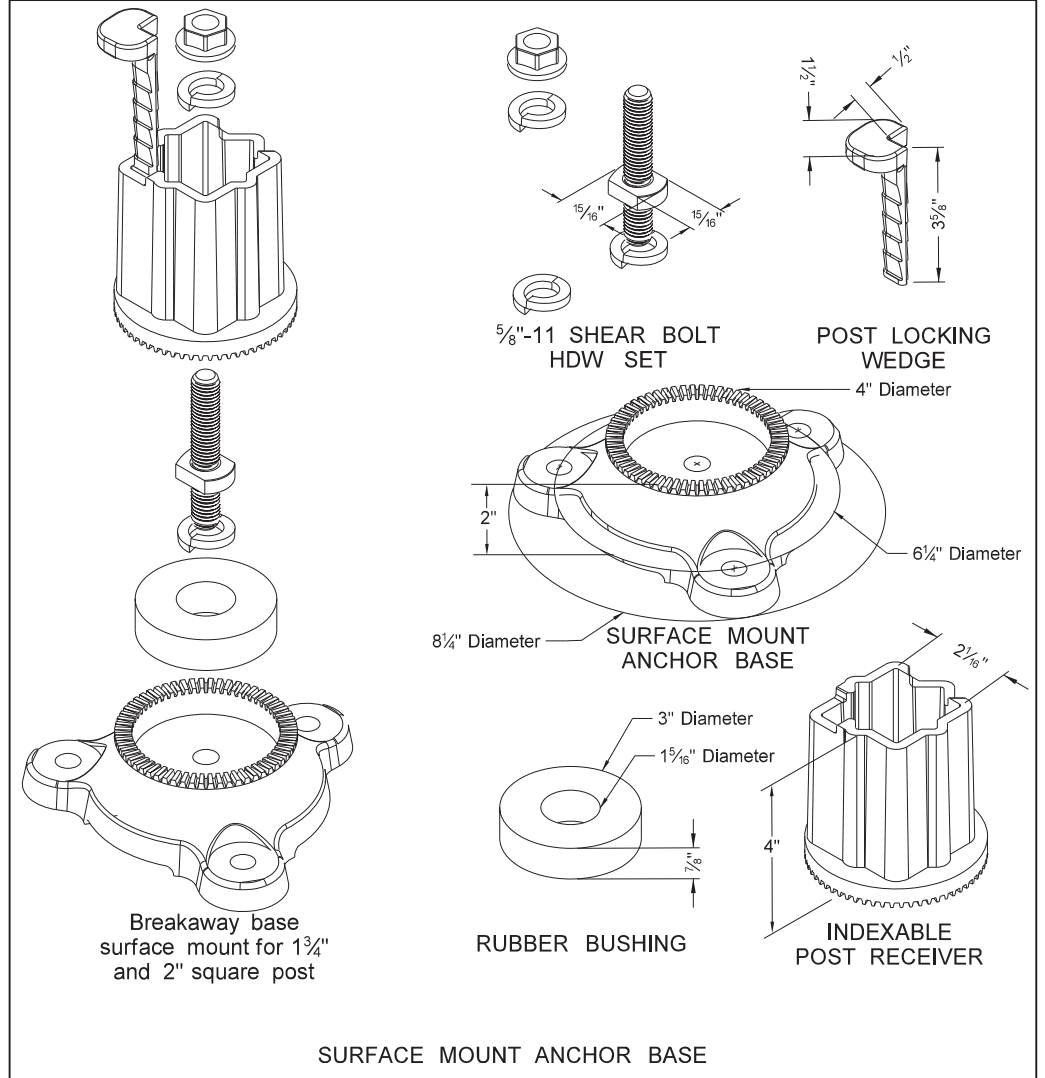
Tube Size In.	Wall Thickness in.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. Area In. ²	Section Modulus In. ³
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/8 x 2 3/8	0.135	10	3.432	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.



3" ANCHOR UNIT

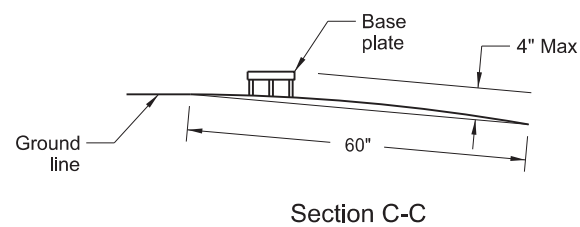
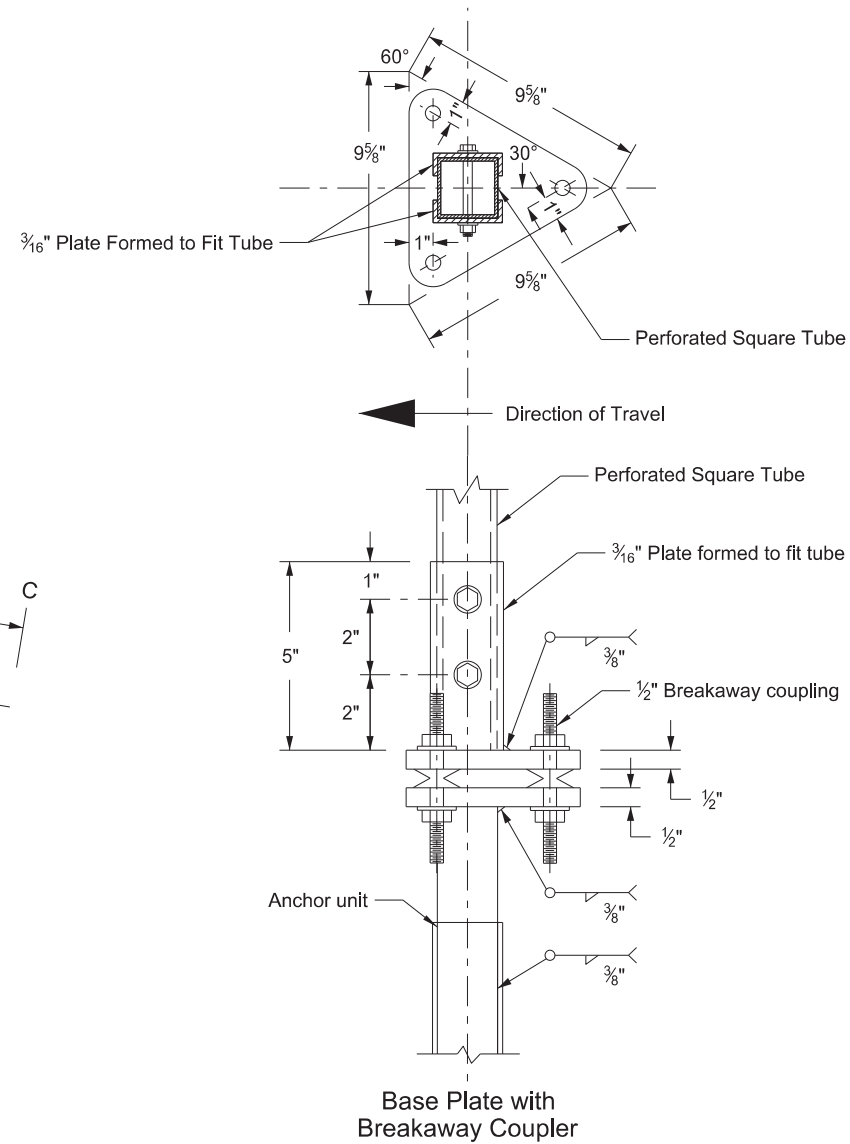
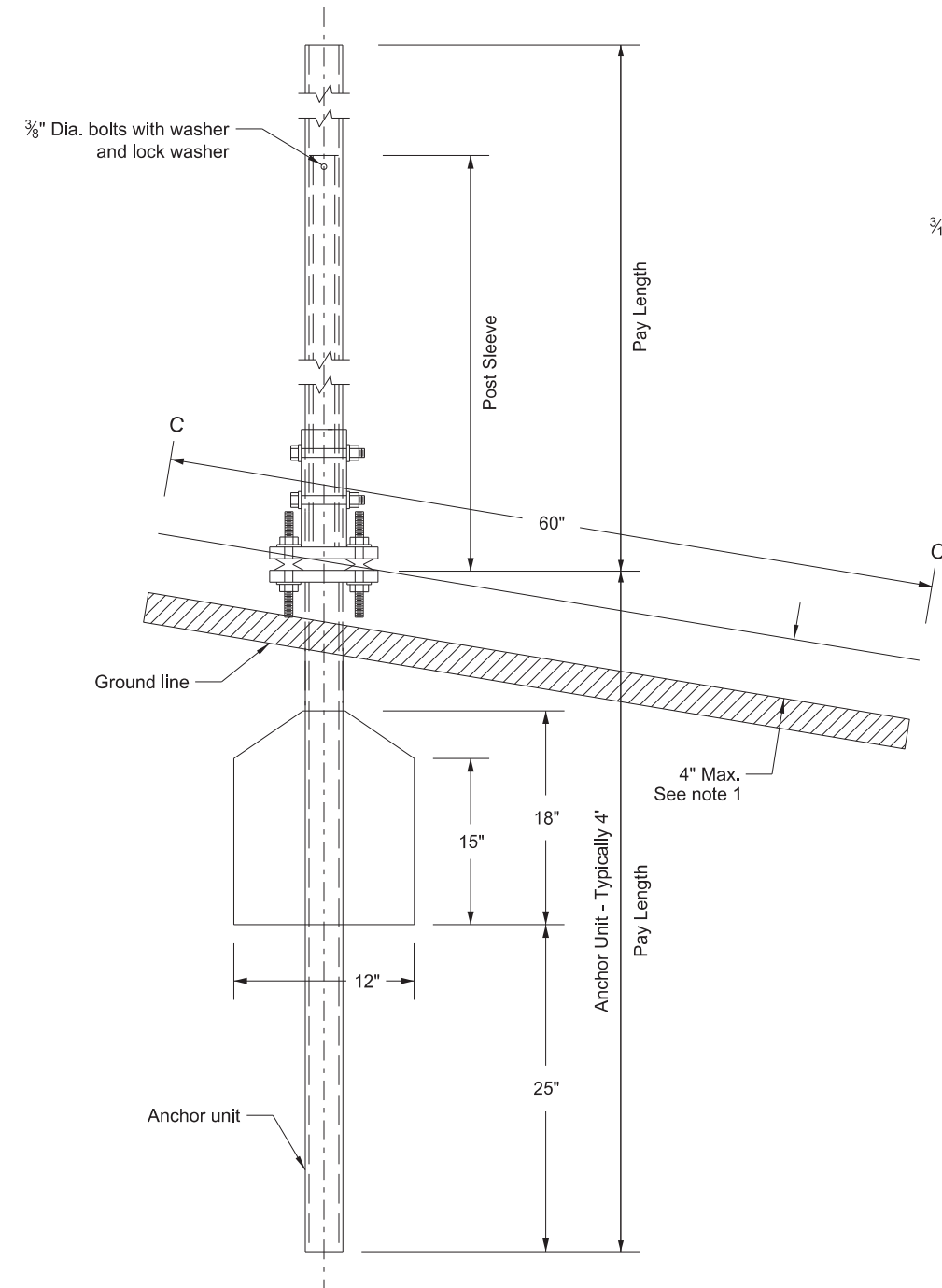


SURFACE MOUNT ANCHOR BASE

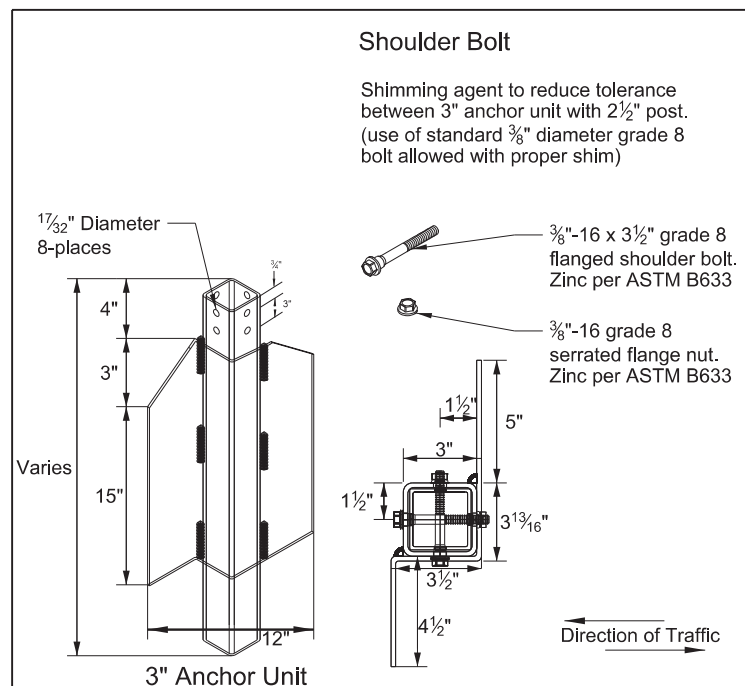
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice & corrected max height of base.
8-29-19	New Design Engineer PE Stamp.

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

Breakaway Coupler System for Perforated Tubes



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

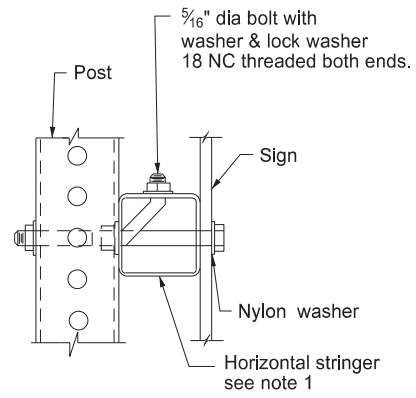
(B) - 2 1/2" 12 gauge posts do not need breakaway bases unless support is placed in boggy, wet, or loose soil areas.

(C) - 3" anchor unit

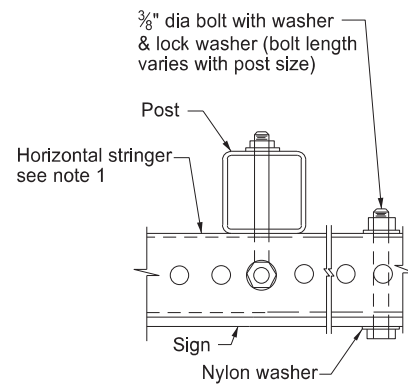
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engr PE Stamp.

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

Mounting Details Perforated Tube

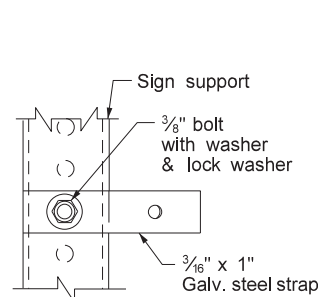


Side View

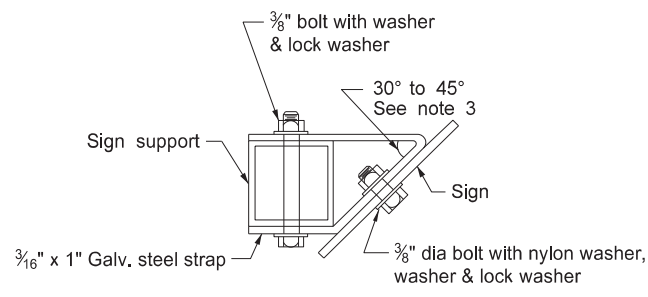


Top View

STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)

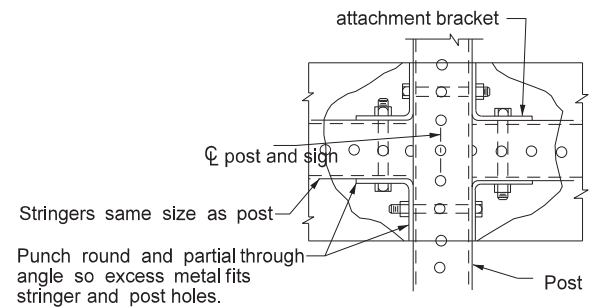


Side View



Top View

STRAP DETAIL

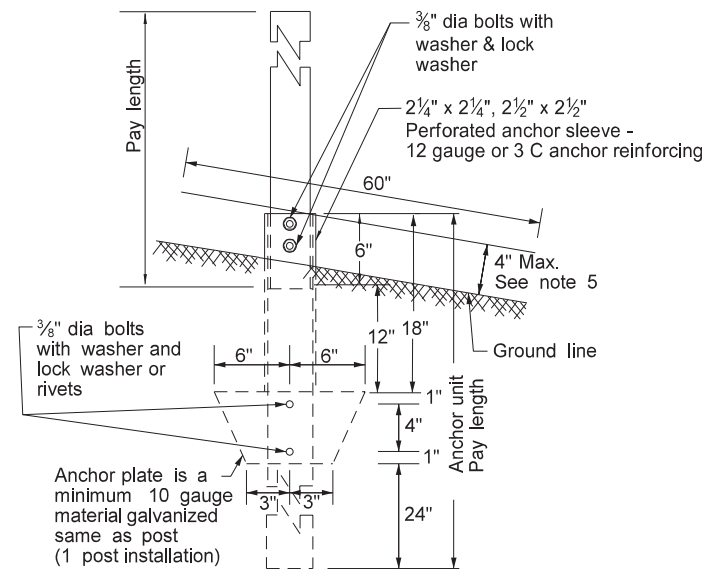


Punch round and partial through angle so excess metal fits stringer and post holes.

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

Note:

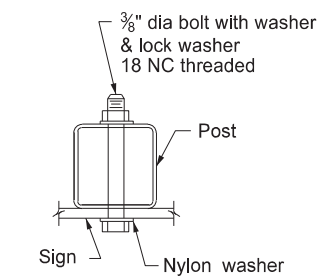
- Horizontal stringers - Use perforated tubes or 1 3/4" x 3/16" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel z bar stringers.
- Use minimum outside diameter 1 5/16" ± 1/16" and 10 gauge thick metal washers on sign face.
- Place No Parking signs with directional arrows at a 30 to 45 degree angle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



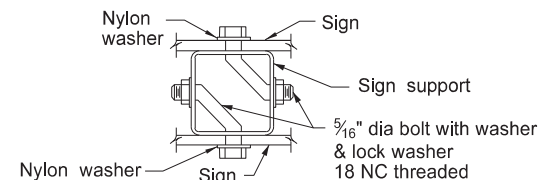
ANCHOR UNIT AND POST ASSEMBLY

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.

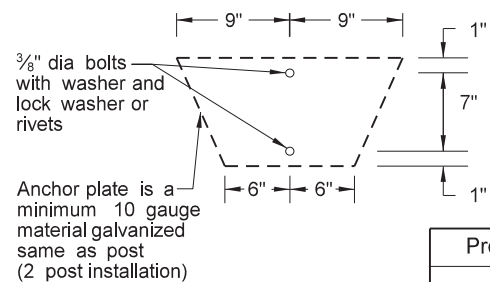


BOLT MOUNTING



Top View

BACK TO BACK MOUNTING



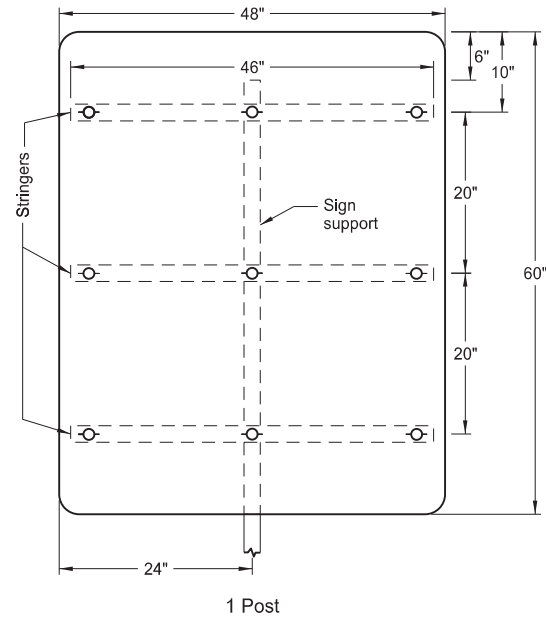
Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. area In. ²	Section Modulus In. ³
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/4 x 2 1/4	0.105	12	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.

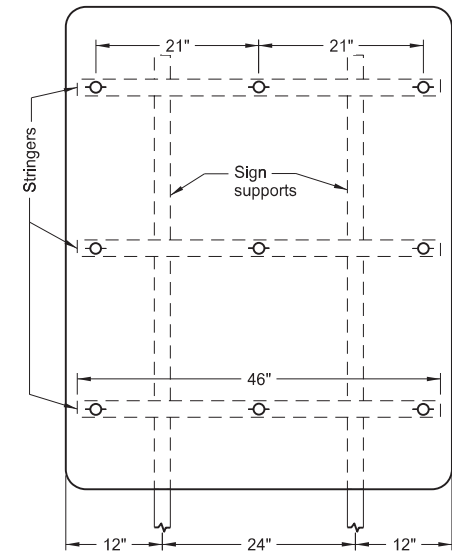
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
7-8-14	Revised Note 3.
8-30-18	Updated notes to active voice.
8-30-19	New Design Engr PE Stamp.

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

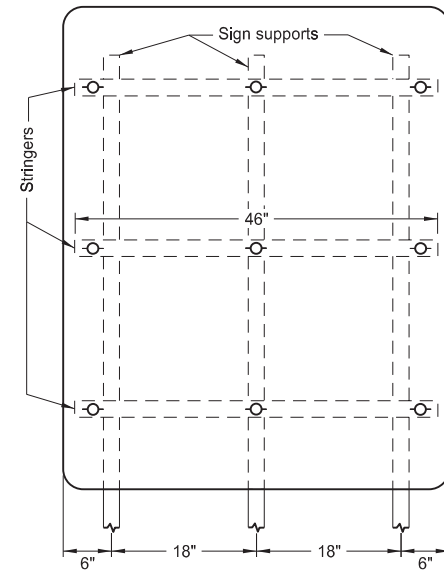


1 Post

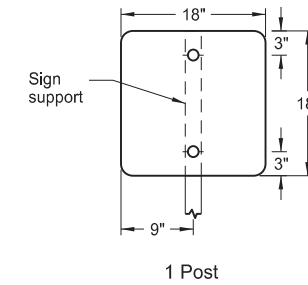


2 Posts

Assembly No. 12

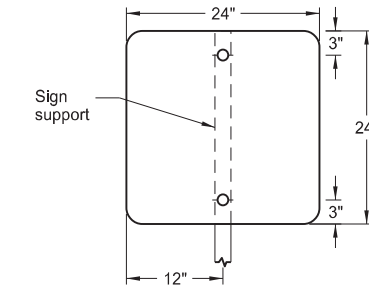


3 Posts



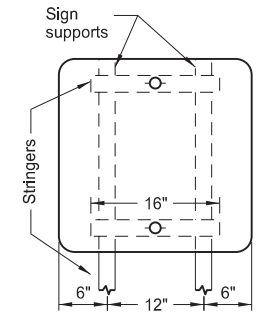
1 Post

Assembly No. 13

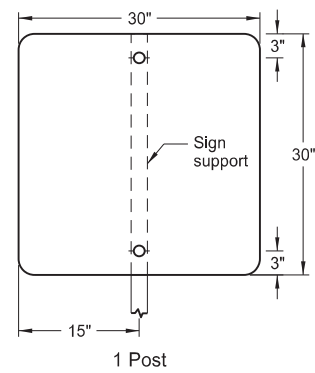


1 Post

Assembly No. 14

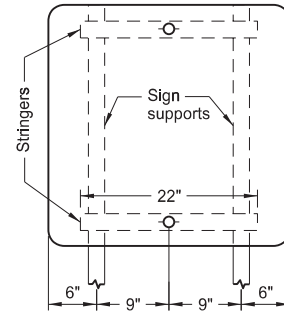


2 Posts

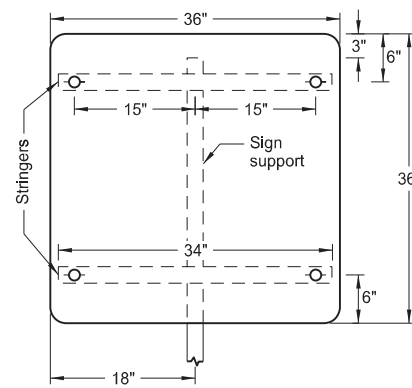


1 Post

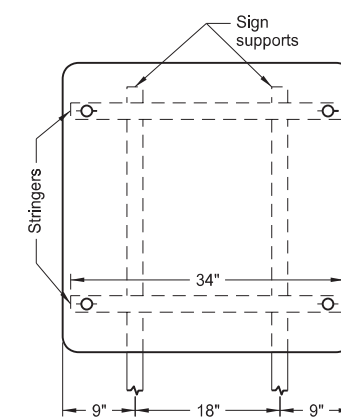
Assembly No. 15



2 Posts

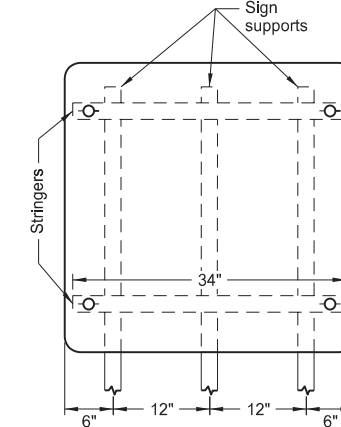


1 Post



2 Posts

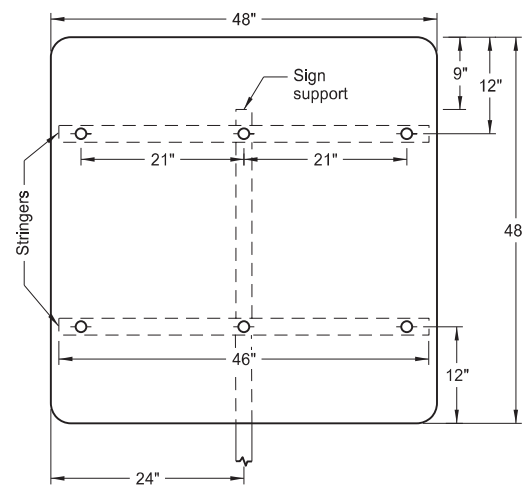
Assembly No. 16



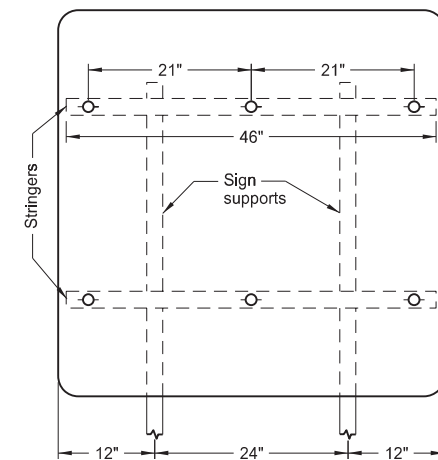
3 Posts

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.

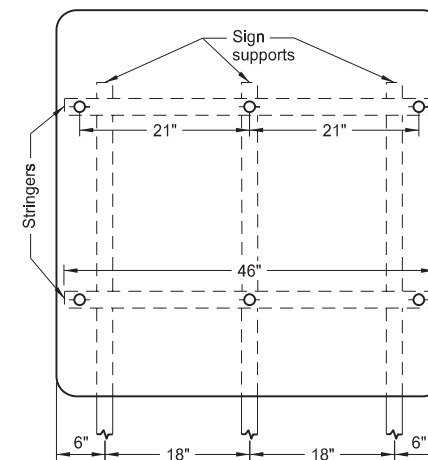


1 Post



2 Posts

Assembly No. 17



3 Posts

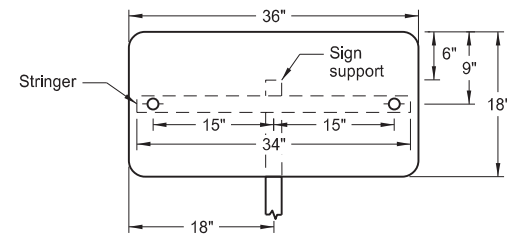
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated to active voice & changed Assembly 16 post spacing.
8-30-19	New Design Engineer PE Stamp.

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

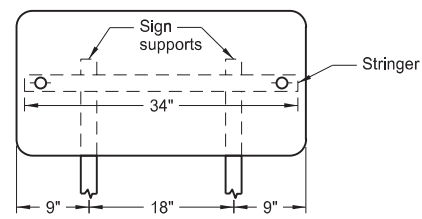
Notes:

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.

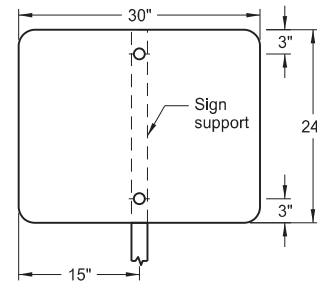


1 Post

Assembly No. 31

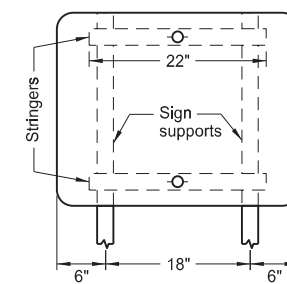


2 Posts

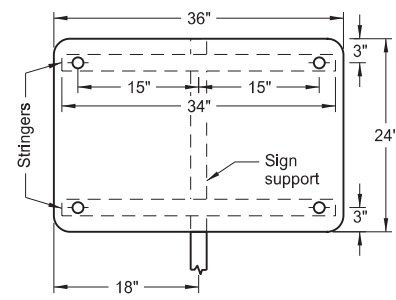


1 Post

Assembly No. 32

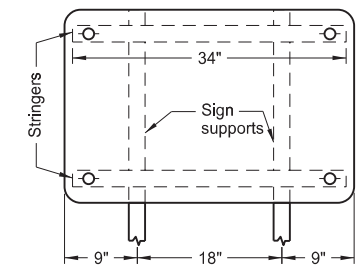


2 Posts

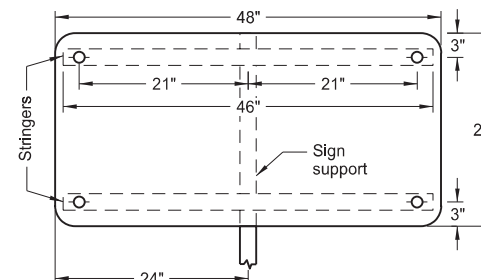


1 Post

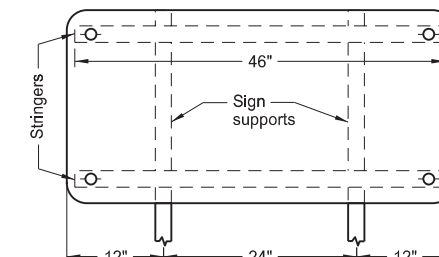
Assembly No. 33



2 Posts

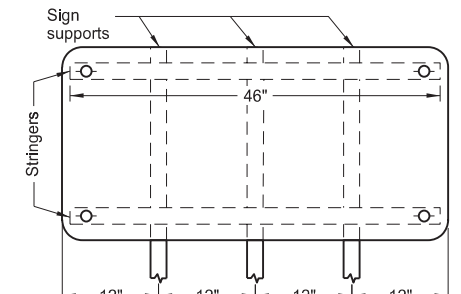


1 Post

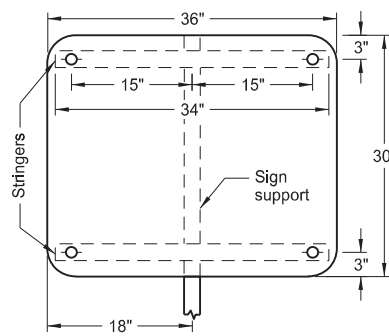


2 Posts

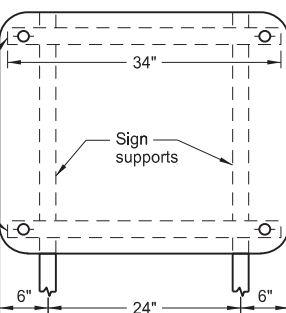
Assembly No. 34



3 Posts

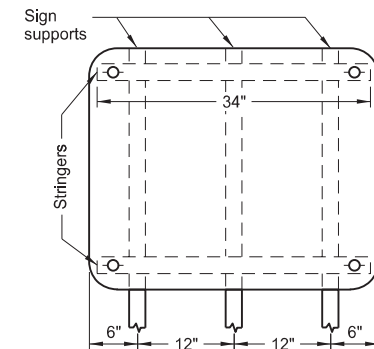


1 Post

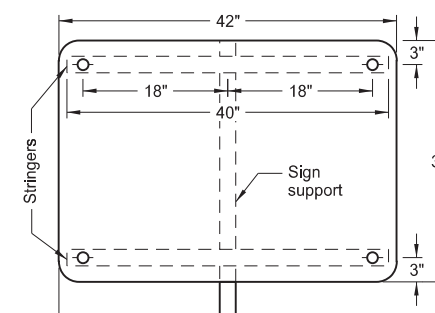


2 Posts

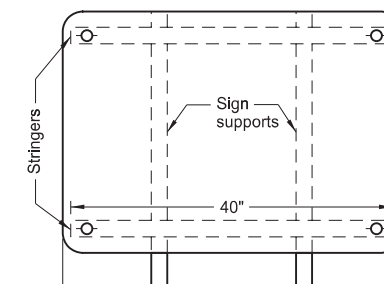
Assembly No. 35



3 Posts

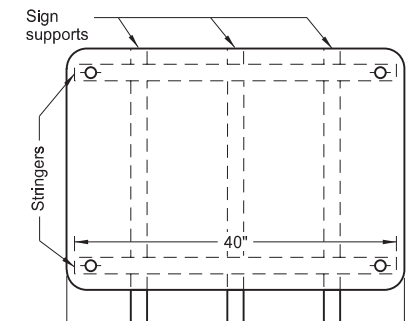


1 Post

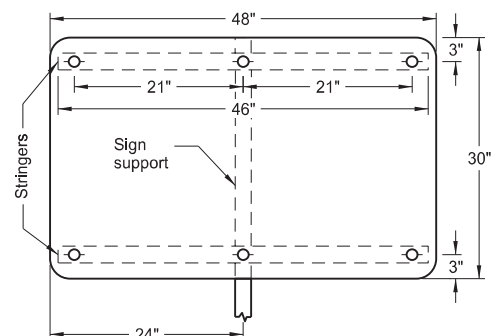


2 Posts

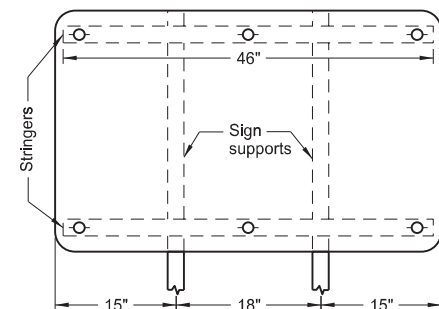
Assembly No. 36



3 Posts

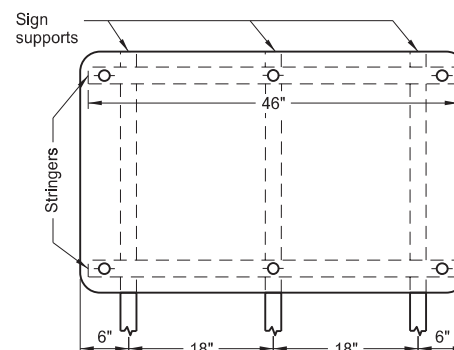


1 Post



2 Posts

Assembly No. 37

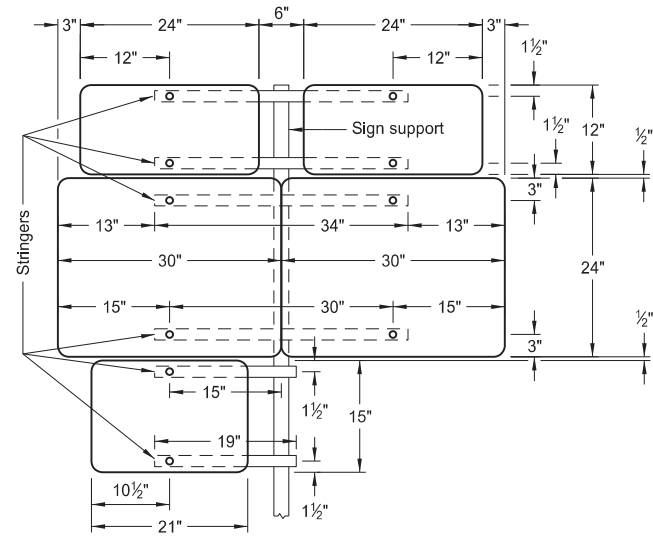


3 Posts

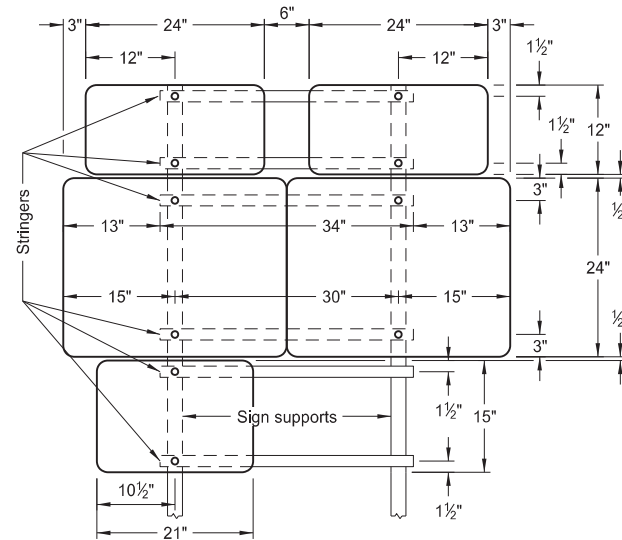
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

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 - ROUTE MARKER SIGNS

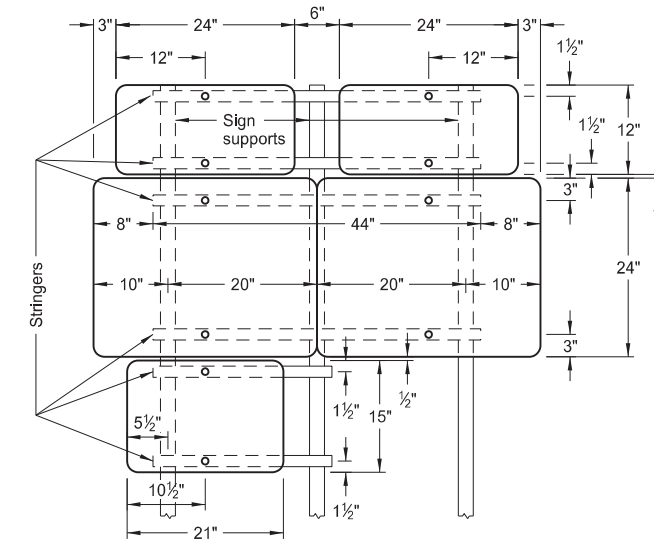


1 Post



2 Posts

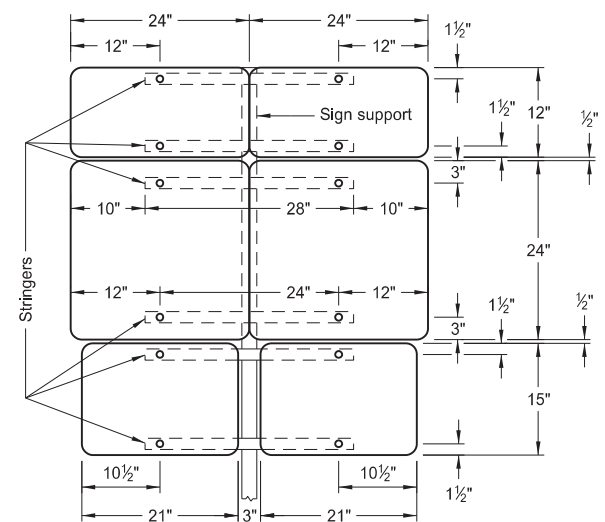
ASSEMBLY 386



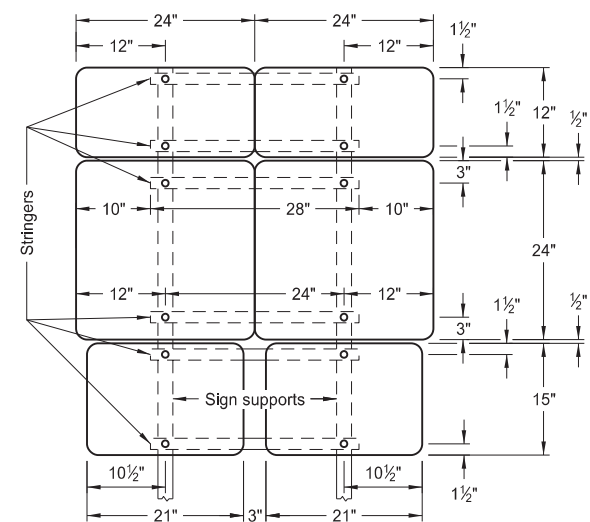
3 Posts

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.

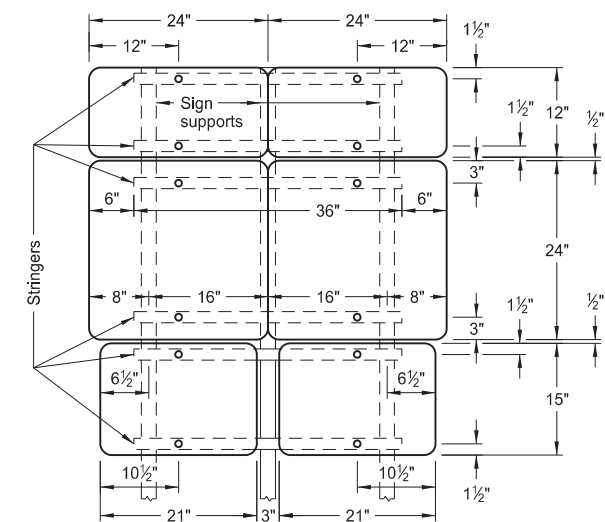


1 Post

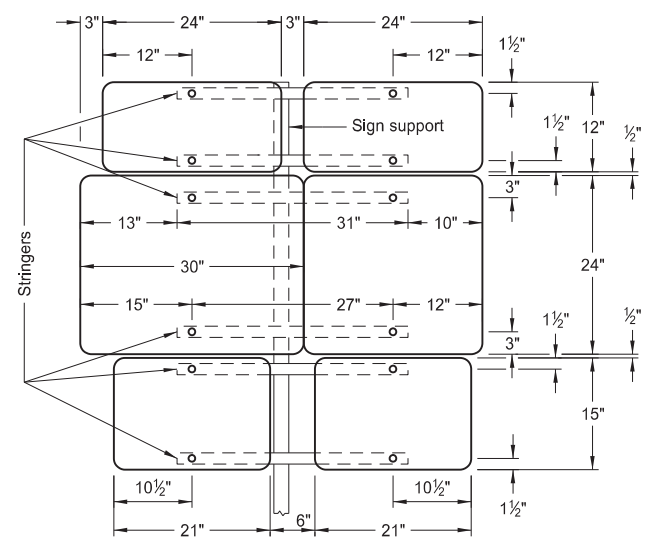


2 Posts

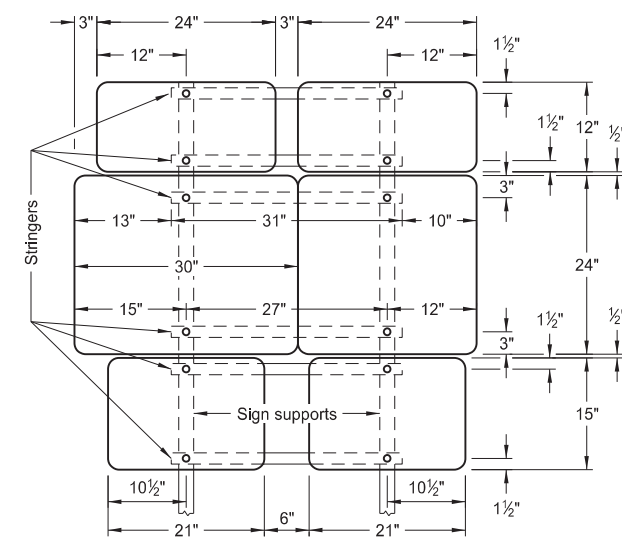
ASSEMBLY 387



3 Posts

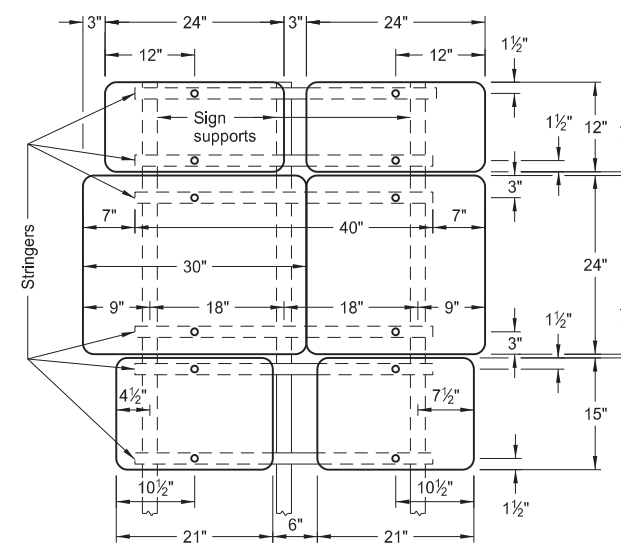


1 Post



2 Posts

ASSEMBLY 388



3 Posts

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

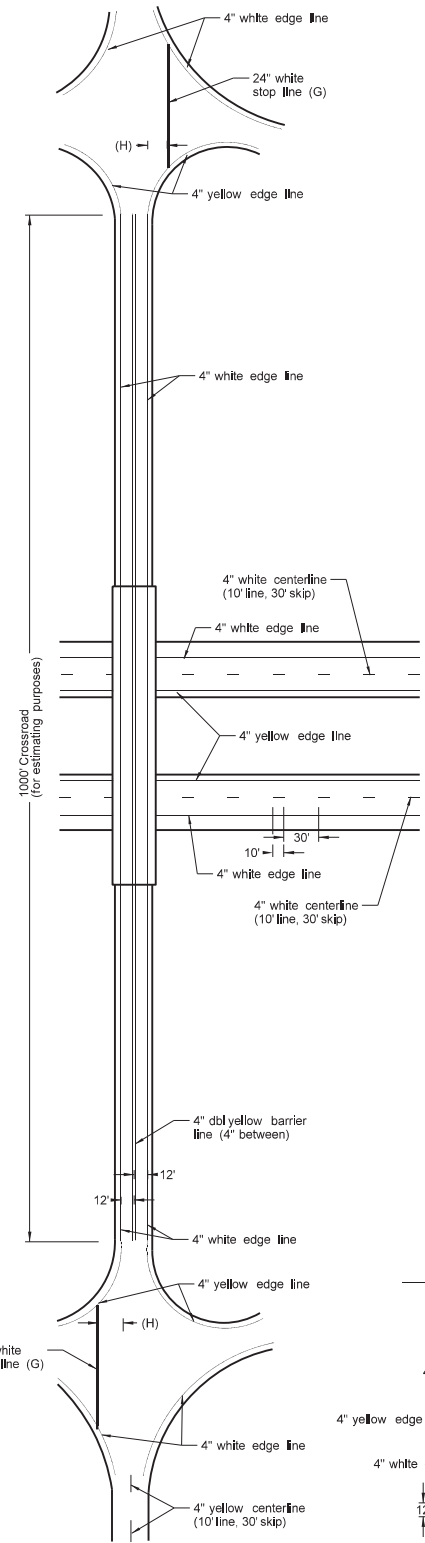
This document was originally issued and sealed by
 Kirk J Hoff,
 Registration Number
 PE- 4683,
 on 9/04/19 and the original document is stored at the
 North Dakota Department
 of Transportation

INTERSTATE PAVEMENT MARKING 4 LANE DIVIDED HIGHWAY

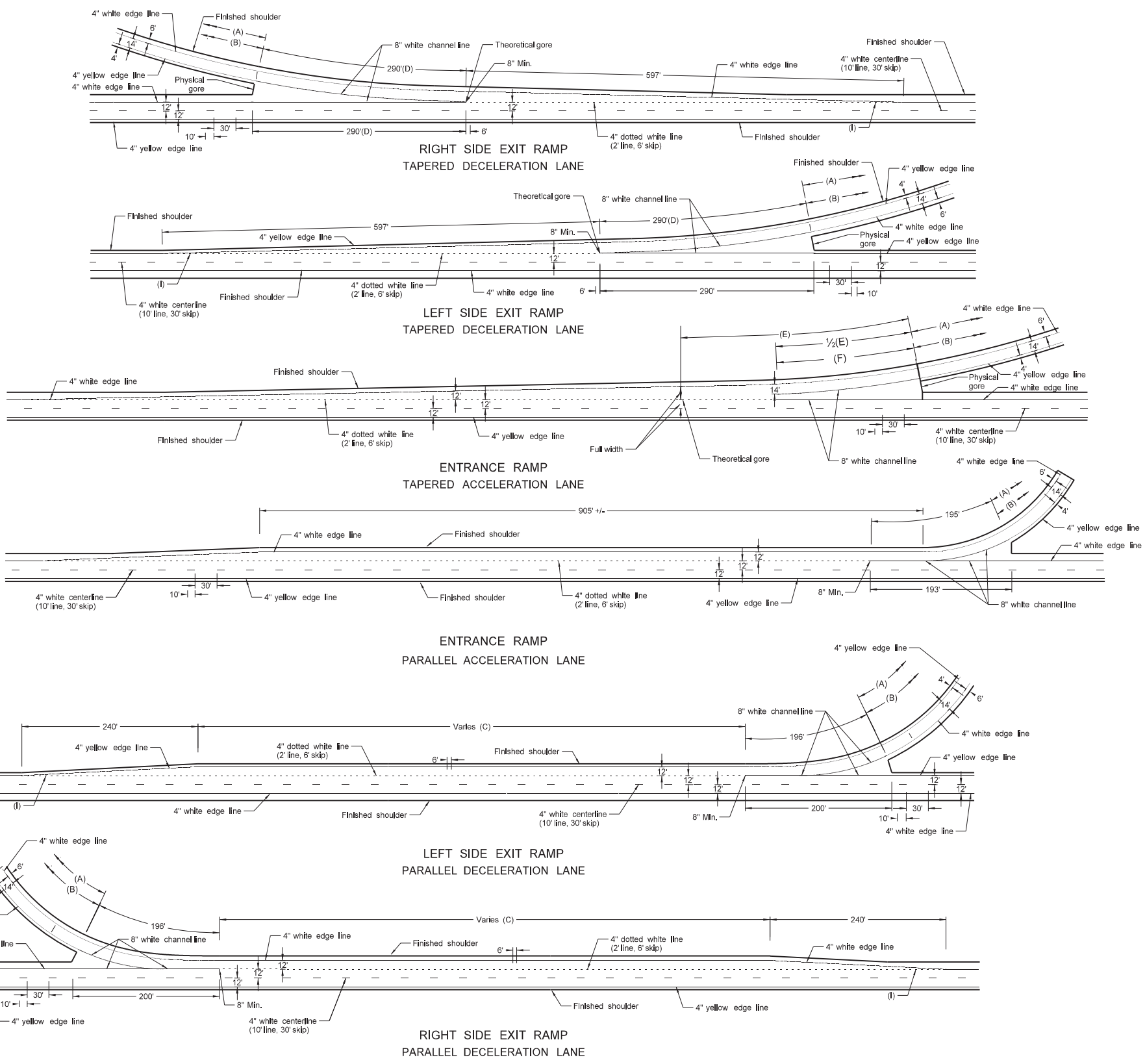
D-762-2

NOTE:

- (A) 4" White edge line
- (B) 4" Yellow edge line
- (C) Assume "varies" equals 790' for purpose of estimate. Place pavement marking from beginning of taper to the 8" line.
- (D) Beginning of physical gore to theoretical gore.
- (E) If the distance is less than 350' extend the 8" channel line to the theoretical gore, otherwise use 195'.
- (F) Use 195' for estimating purposes.
- (G) Not required for gravel surface crossroad approaches.
- (H) 4' minimum, 15' maximum from nearest edge of intersection traveled way.
- (I) Extend dotted line until it touches the edgeline.



CROSS-ROAD & STRUCTURE
Engineer will determine length striped.



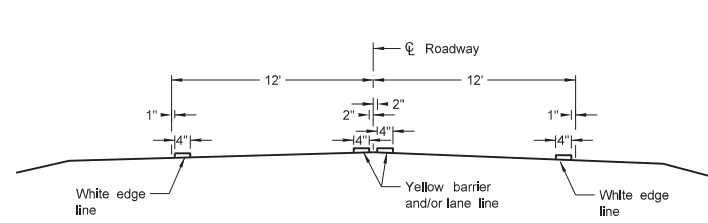
BASIS OF ESTIMATE		
LOCATION	ITEM	
Right or Left Side Exit Ramp TAPERED	8" White channel line	580 LF
	24" White stop line	60 LF
	4" White dotted line	148 LF
	4" White edge line	1115 LF
	4" Yellow edge line	1075 LF
Entrance Ramp TAPERED	8" White channel line	390 LF
	4" White dotted line	258 LF
	4" White edge line	1270 LF
	4" Yellow edge line	1075 LF
Right or Left Side Exit Ramp PARALLEL	8" White channel line	396 LF
	24" White stop line	60 LF
	4" White dotted line (C)	258 LF
	4" White edge line	1115 LF
	4" Yellow edge line	1075 LF
Entrance Ramp PARALLEL	8" White channel line	388 LF
	4" White dotted line	283 LF
	4" White edge line	1275 LF
	4" Yellow edge line	1075 LF
Main Line (Both Roadways)	4" White line, 10' line, 30' skip	2840 LF/M
	4" White edge line	10,560 LF/M
	4" Yellow edge line	10,560 LF/M
Cross Road	4" White edge line	2000 LF
	4" Dotted yellow barrier line (4" between)	2000 LF

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-3-11	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice
10-25-19	Replaced 2" Max dim with Note (I)
11-05-21	Revised labels

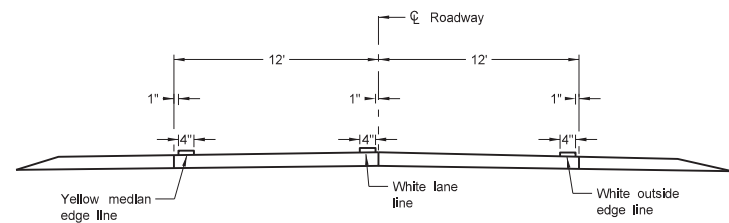


PAVEMENT MARKING

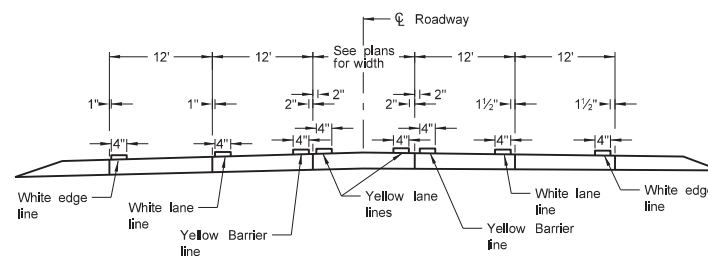
D-762-4



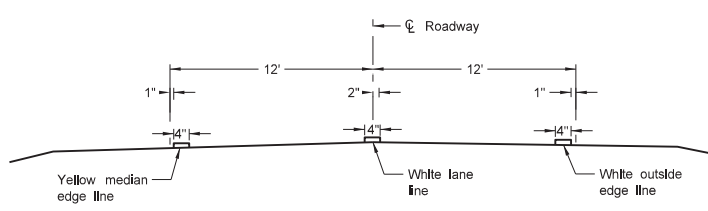
Two Lane Two Way
RURAL ROADWAY



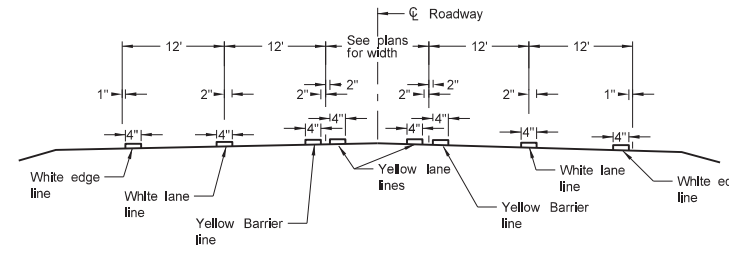
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



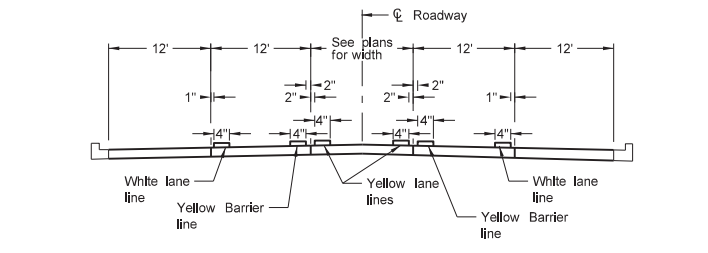
RURAL FIVE LANE ROADWAY
Concrete Section



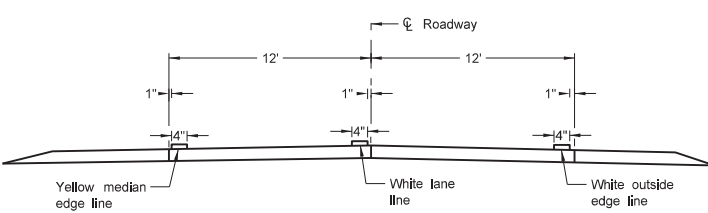
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



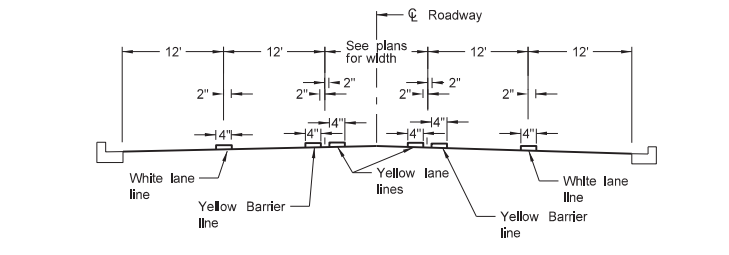
RURAL FIVE LANE ROADWAY
Asphalt Section



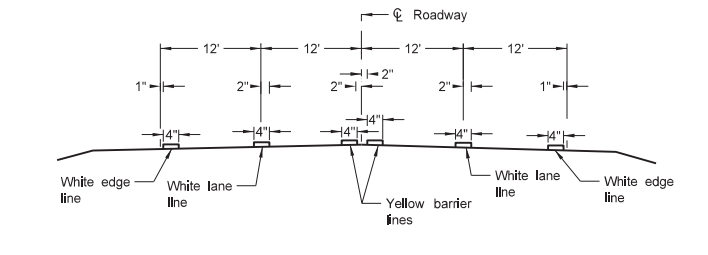
URBAN FIVE LANE SECTION
Concrete Section



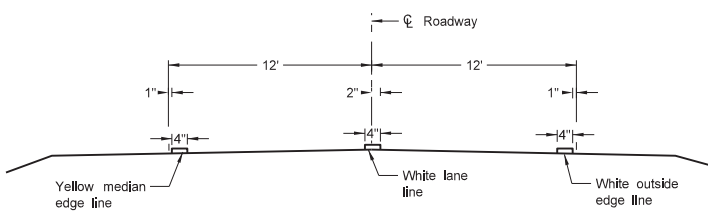
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



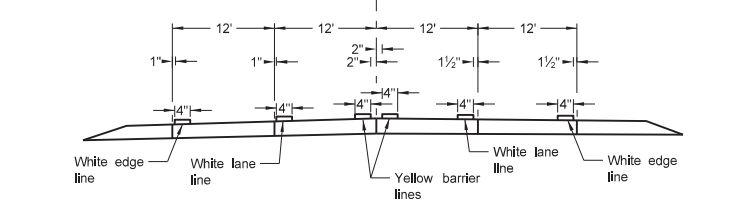
URBAN FIVE LANE SECTION
Asphalt Section



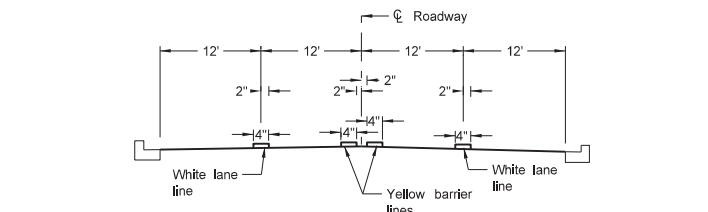
RURAL FOUR LANE ROADWAY
Asphalt Section



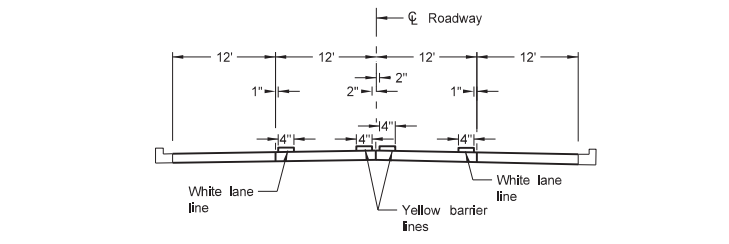
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



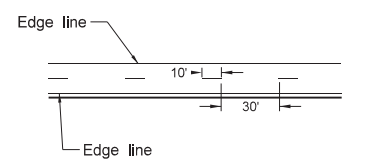
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



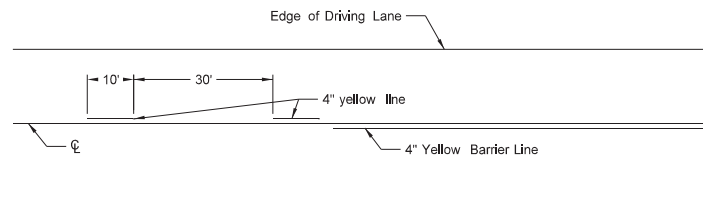
CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

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

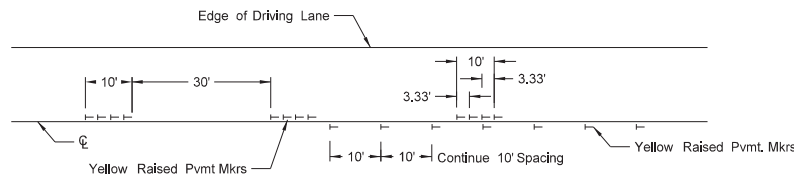
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp.

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

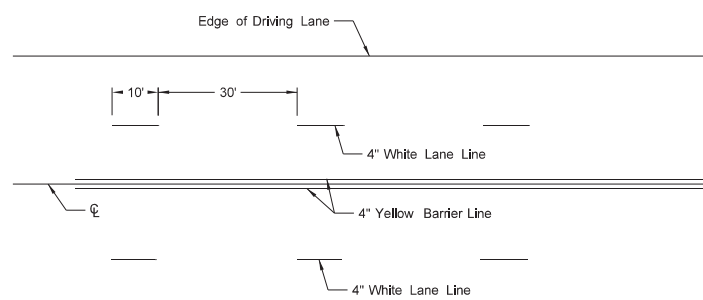


Painted or Tape Lines

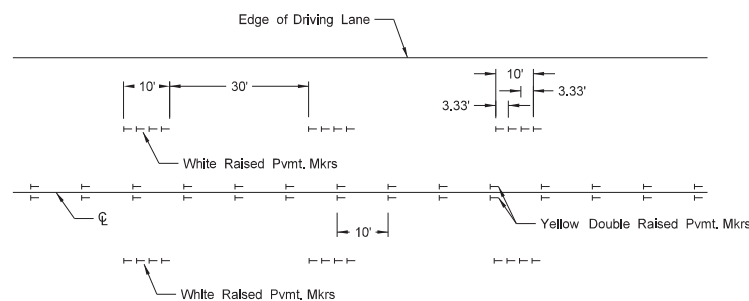


Raised Pavement Markers

TWO-LANE TWO-WAY ROADWAY

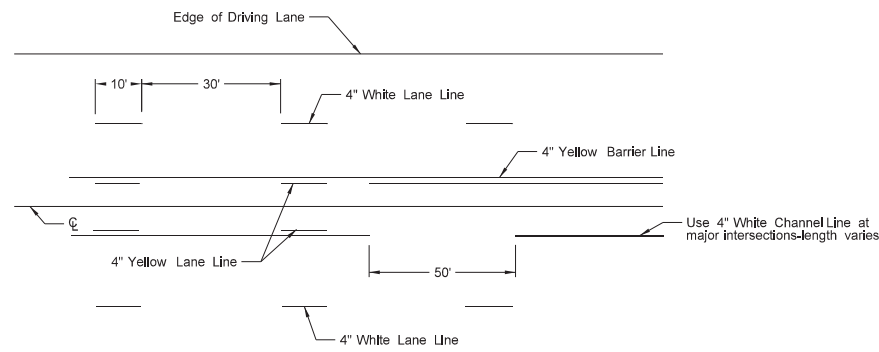


Painted or Tape Lines

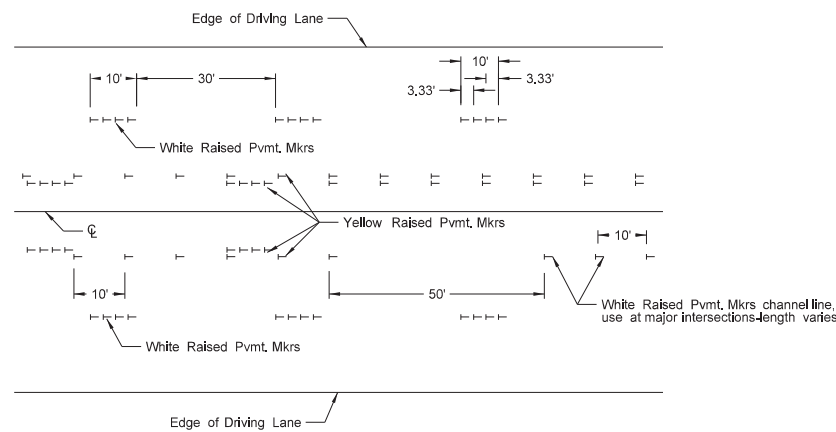


Raised Pavement Markers

FOUR LANE ROADWAY

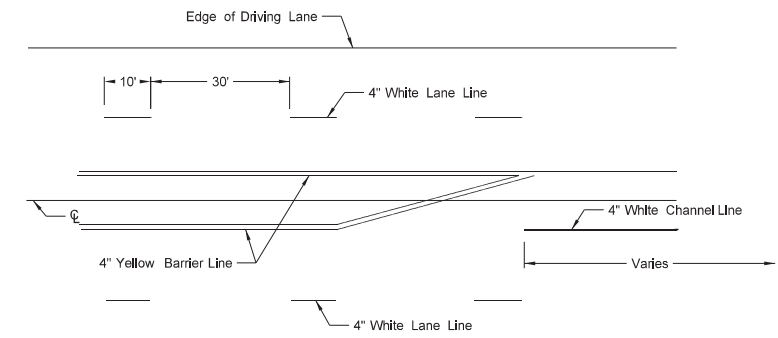


Painted or Tape Lines

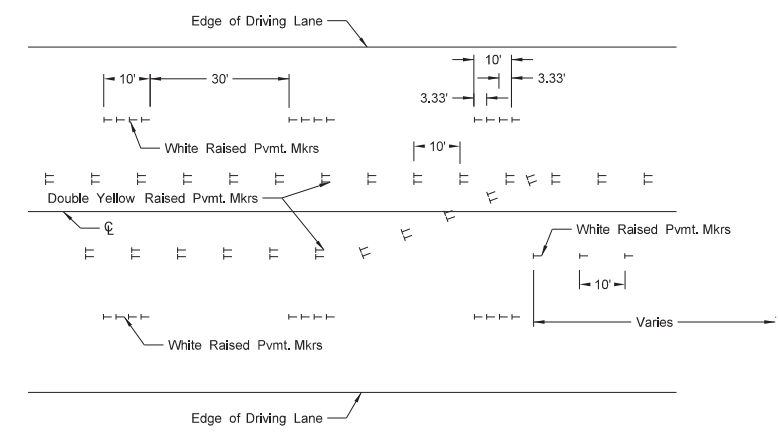


Raised Pavement Markers

FIVE LANE ROADWAY TWO WAY LEFT TURN



Painted or Tape Lines



Raised Pavement Markers

FIVE LANE ROADWAY WITH MARKED ISLANDS

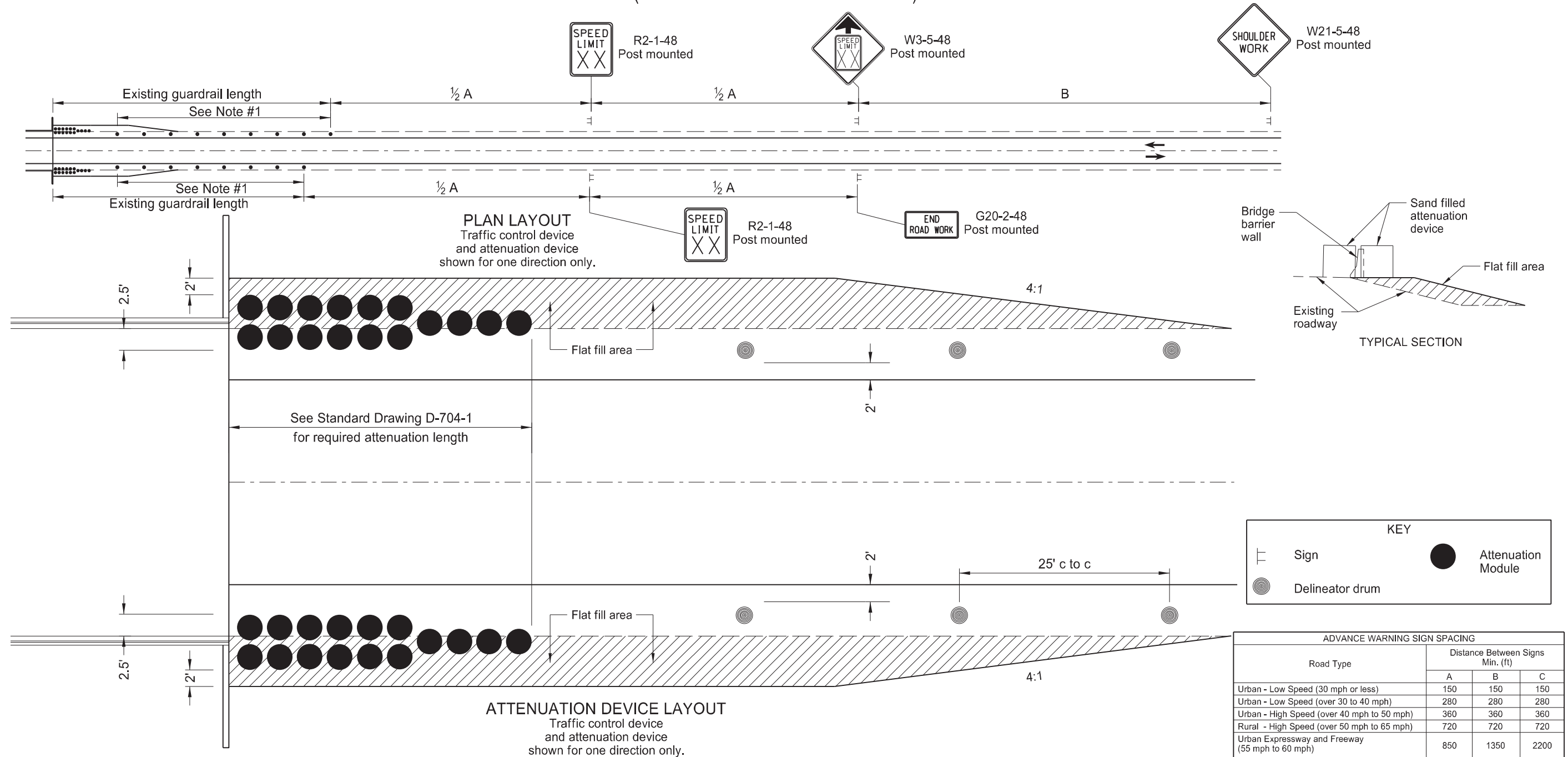
NOTES:

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

SHORT TERM END TREATMENT FOR BRIDGES
(ATTENUATION DEVICE METHOD)



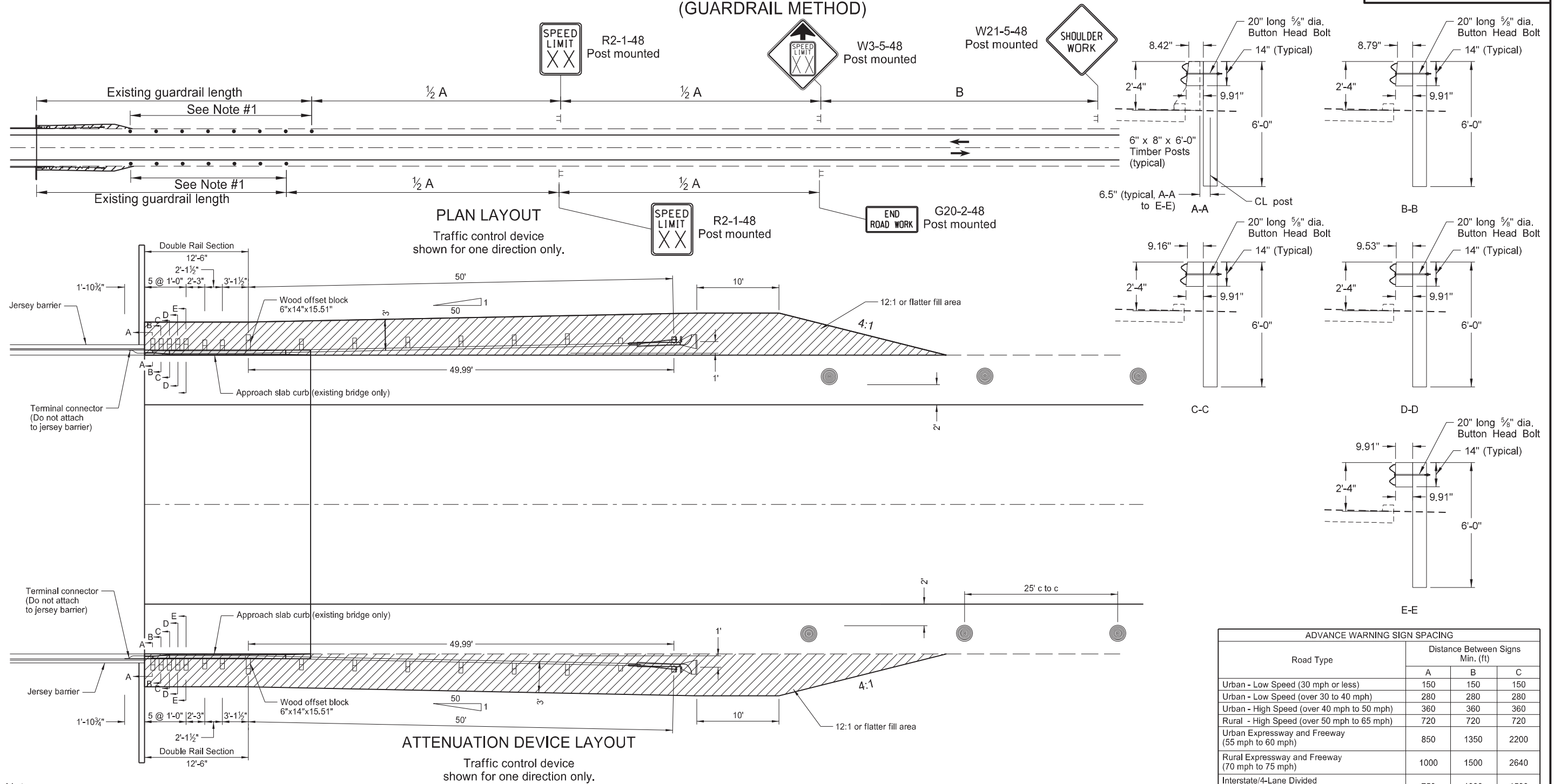
Notes

- When the shoulder width is less than 3', use vertical panels placed as far from the driving lane as possible on the finished shoulder. When there is no shoulder, place vertical panels as near as possible to the driving lane on the foreslope of the shoulder.
- When the bridge is within the construction zone signing, eliminate the reduced speed ahead sign.
- Determine the reduced speed limit dependent on the in place speed limit before construction. Where total speed reduction exceed 30 mph, reduce the speed limit in two stages with each reduction not exceeding 30 mph. Place the second speed limit sign at 1/2 B.
- Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
- Cover existing speed limit signs within a reduced speed zone.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.

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

SHORT TERM END TREATMENT FOR BRIDGES
(GUARDRAIL METHOD)



Notes

1. If the shoulder width is less than 3', use vertical panels placed as far from the driving lane as possible and still be on the finished shoulder. When there is no shoulder, place vertical panels as near as possible to the driving lane on the foreslope of the shoulder.
2. If the bridge is within construction zone signing, eliminate the reduced speed ahead sign.
3. Determine the reduced speed limit dependent on the in place speed limit before construction. Where total speed reduction exceed 30 mph, reduce the speed limit in two stages with each reduction not exceeding 30 mph. Place the second speed limit sign at 1/2 B.
4. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
5. Cover existing speed limit signs within a reduced speed zone.

KEY

	Sign
	Delineator drum

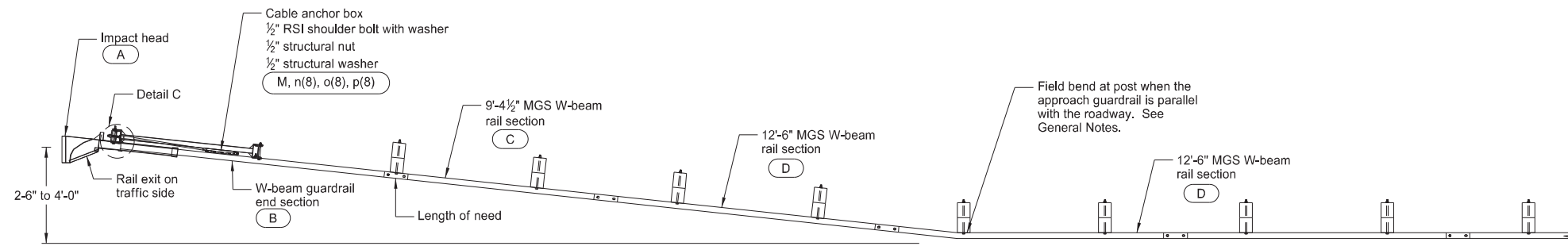
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.

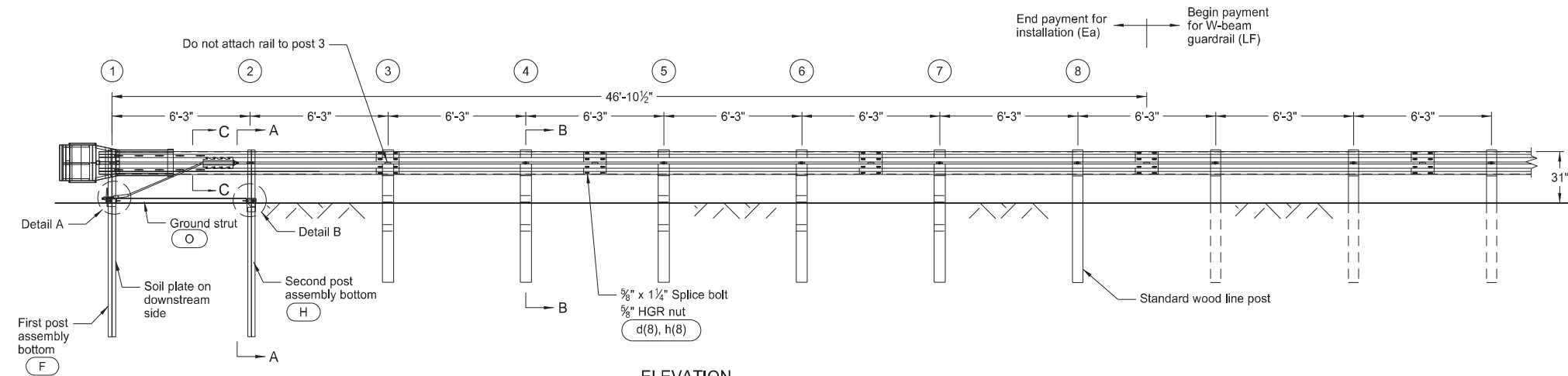


MGS FLARED ENERGY ABSORBING TERMINAL - WOOD POST

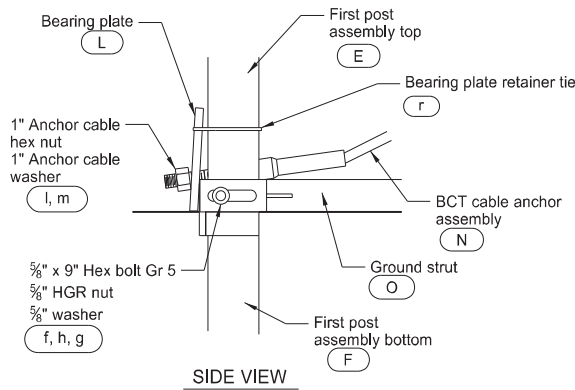
D-764-38



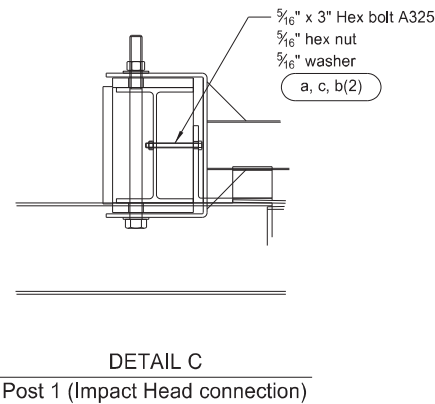
PLAN



ELEVATION

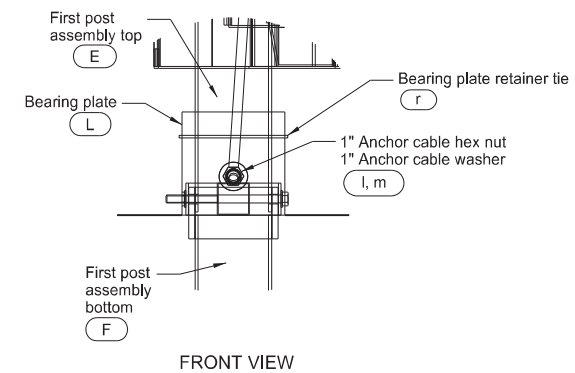


SIDE VIEW



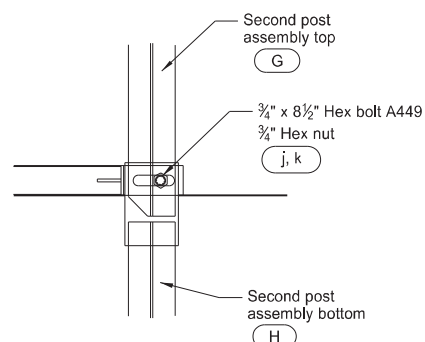
DETAIL C

Post 1 (Impact Head connection)

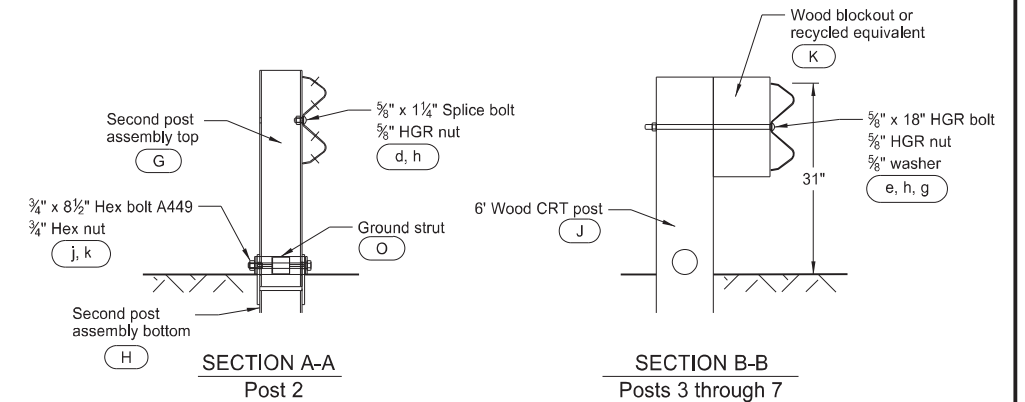


FRONT VIEW

DETAIL A
Post 1

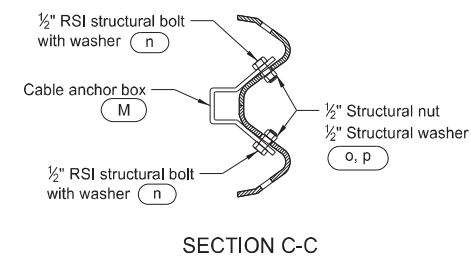


DETAIL B
Post 2



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

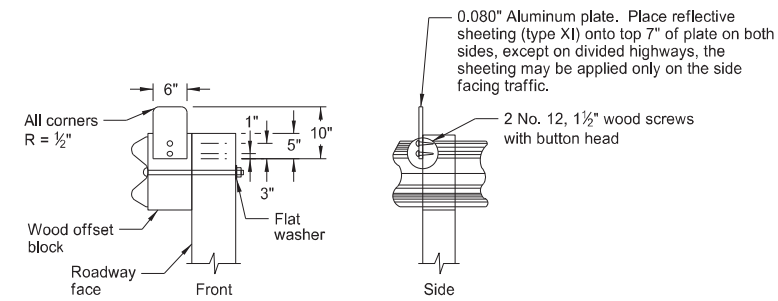
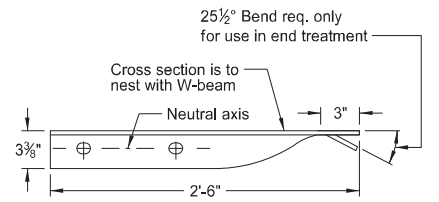
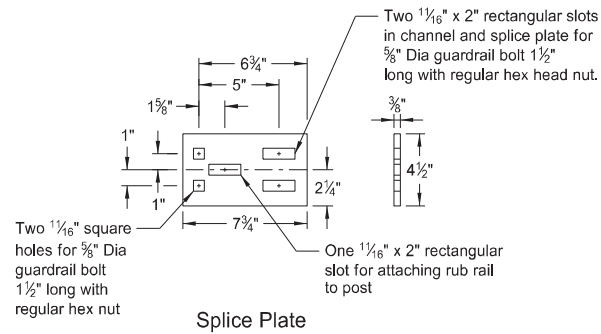
REVISIONS
DATE CHANGE
12-02-20 Updated notes to active voice.



MGS W-BEAM GUARDRAIL GENERAL DETAILS

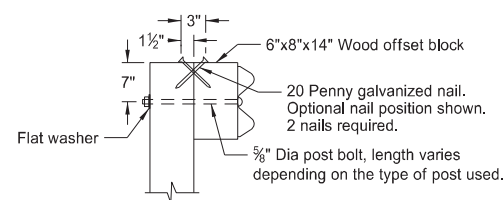
NOTES:

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".

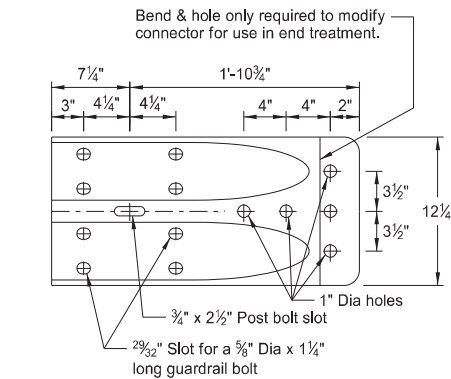


REFLECTORIZED PLATE DETAIL

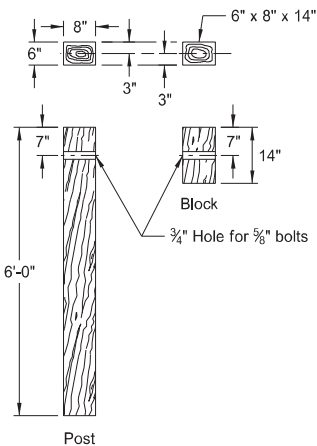
NOTE: Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.



TYPICAL WOOD POST ATTACHMENT DETAIL

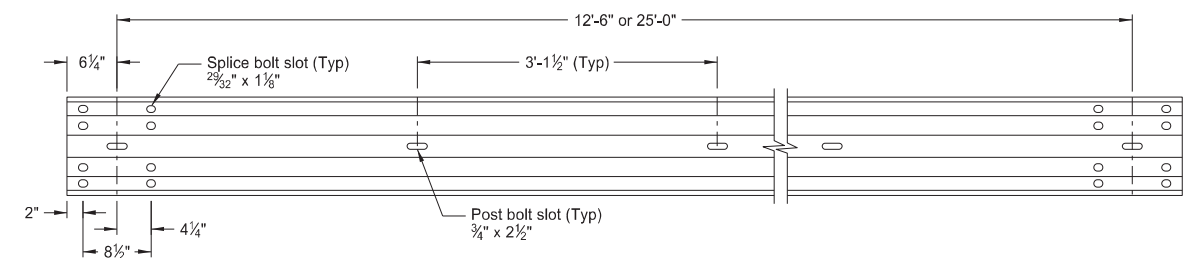


W BEAM TERMINAL CONNECTOR

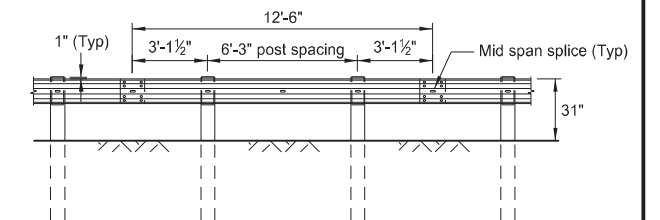


6" x 8" WOOD POST & BLOCK

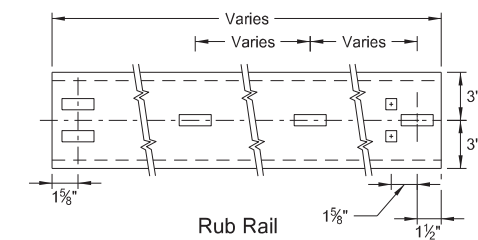
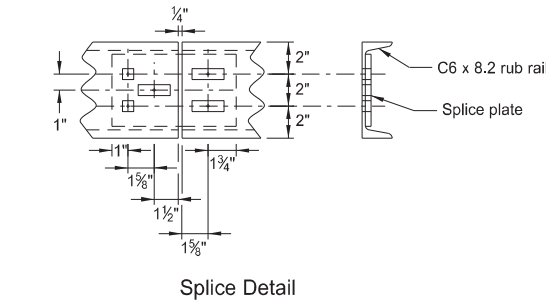
NOTE: Where soil conditions require, alternate lengths may be specified, in 6" increments.



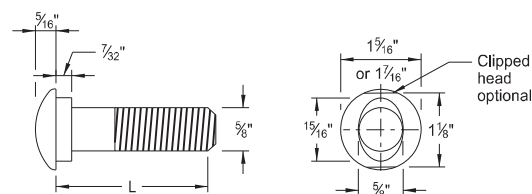
STANDARD MGS GUARDRAIL PANEL



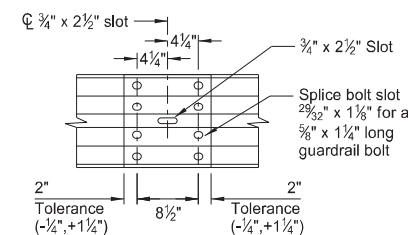
STANDARD MGS GUARDRAIL SYSTEM



C6x8.2 RUB RAIL AND SPLICE PLATE

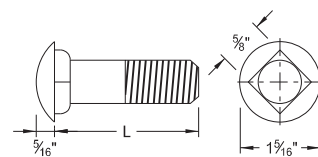


5/8" Diameter Guardrail Bolt	
L	Thread Length
1 1/4"	Full length thread
2"	1 3/4" Min thread length
9 1/2"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length

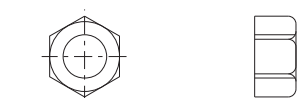


SPLICE DETAIL

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

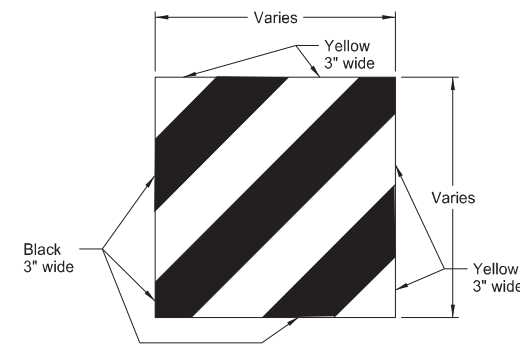


5/8" Diameter Carriage Bolt	
L	Thread Length
1 1/2"	Full length thread
3"	1 1/2" Min thread length
11"	1 3/4" Min thread length
13"	1 3/4" Min thread length

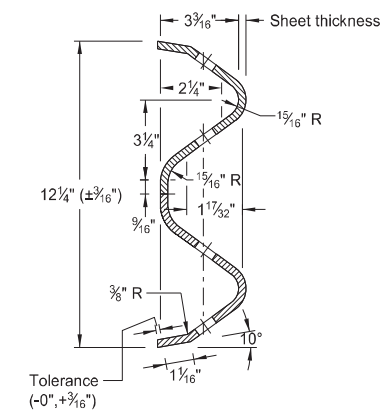


5/8" DIA HEX NUT

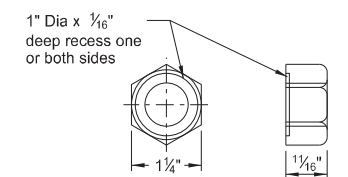
5/8" CARRIAGE BOLT & NUT



IMPACT HEAD OBJECT MARKER



W-BEAM CROSS SECTION



5/8" DIA RECESS NUT

5/8" GUARDRAIL BOLT & RECESS NUT

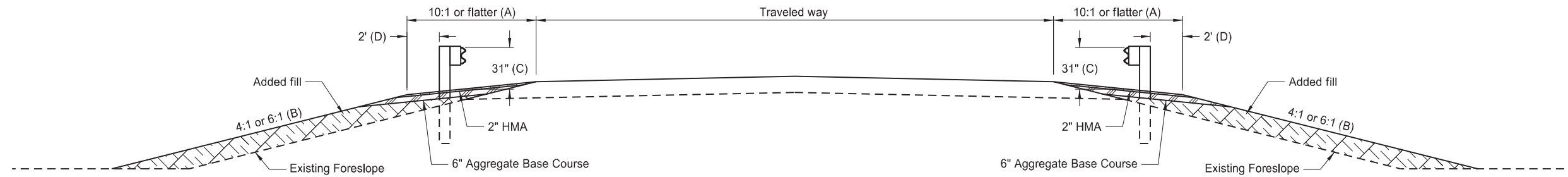
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12-02-20	Updated clipped head to optional



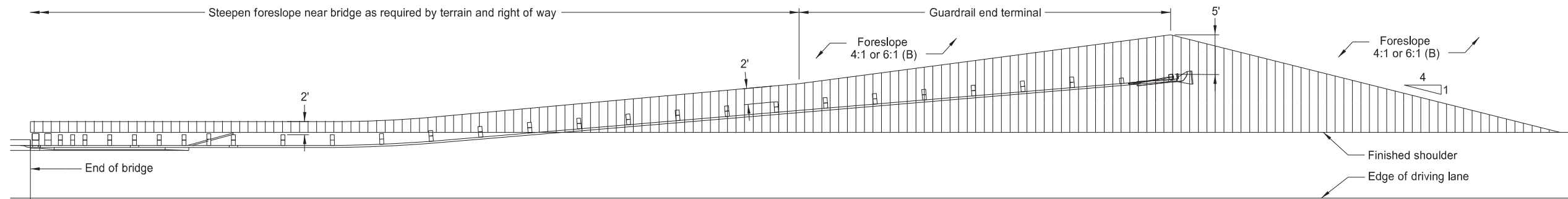
12 02 2020

TYPICAL GRADING AT BRIDGE ENDS
WITH MGS W-BEAM GUARDRAIL

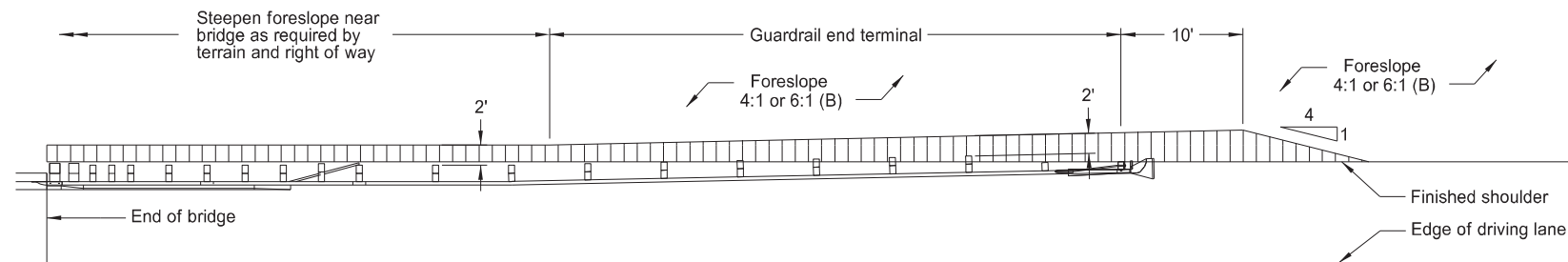
D-764-48



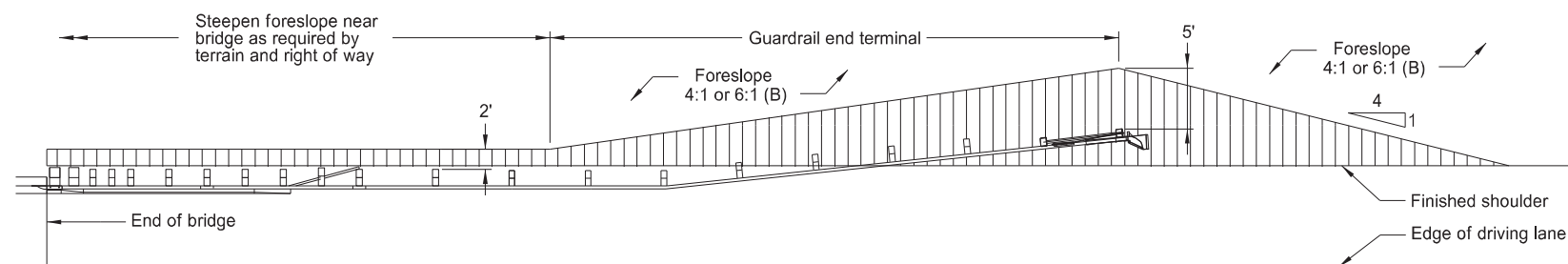
TYPICAL SECTION



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.

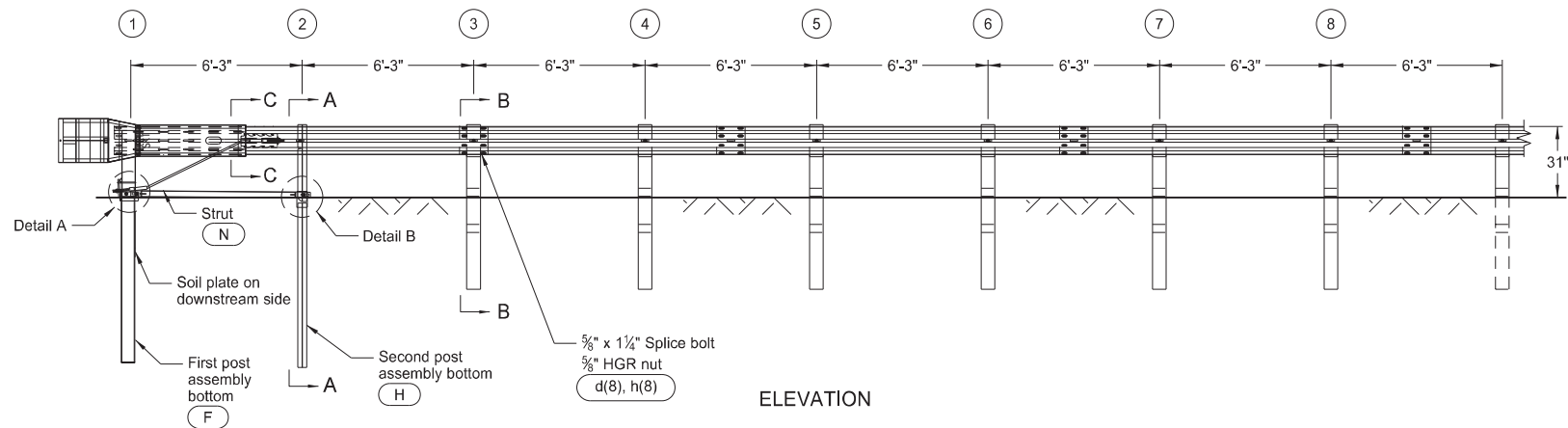
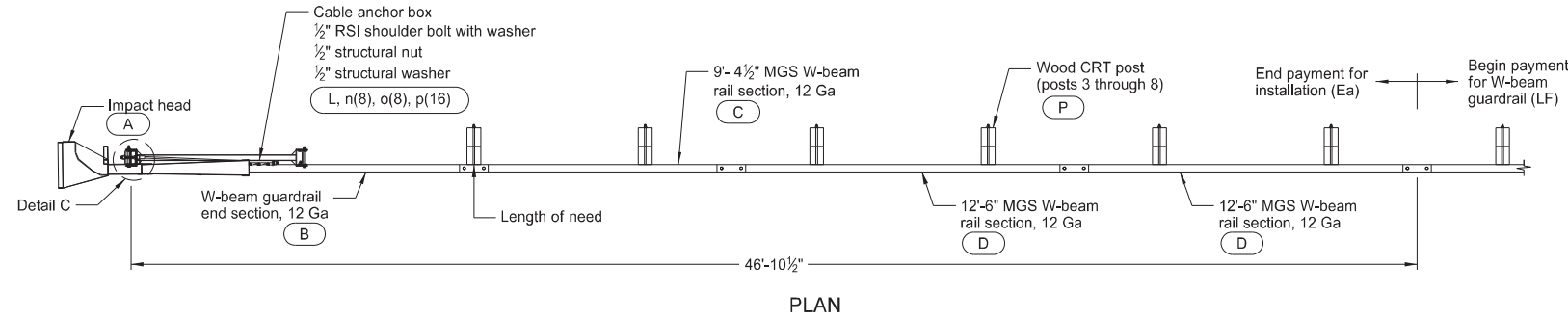
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12/02/20	Updated notes to active voice.



12 02 2020

MASH SEQUENTIAL KINKING TERMINAL - WOOD POST

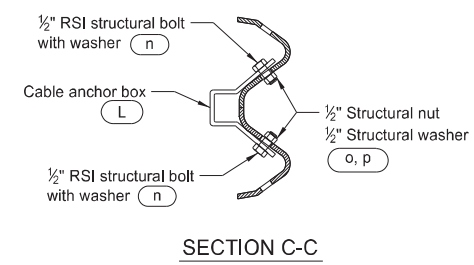
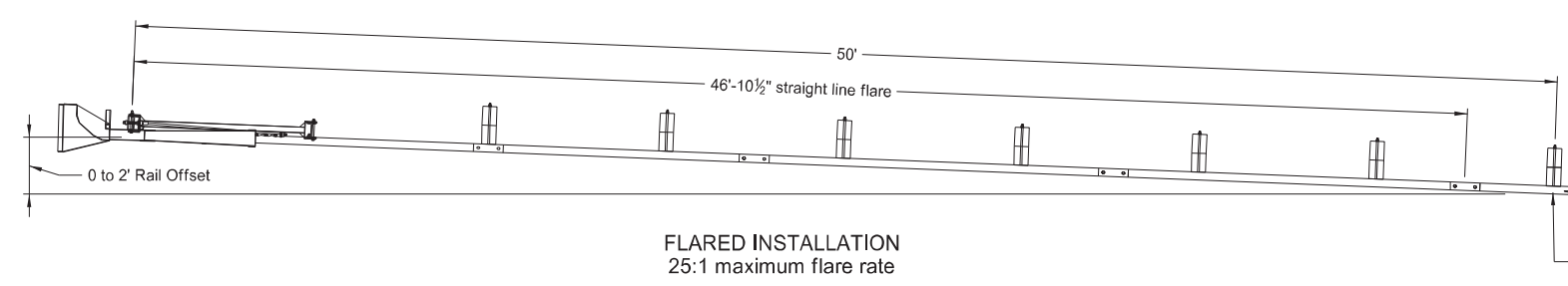
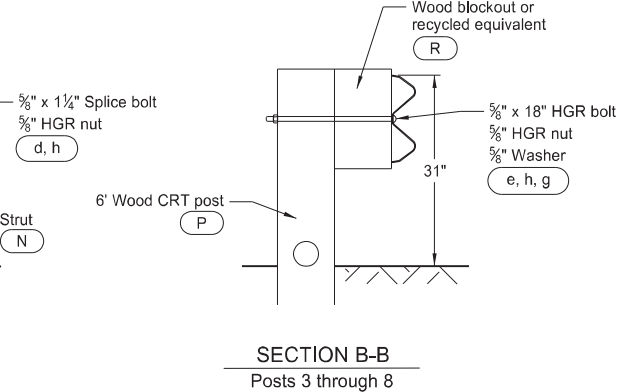
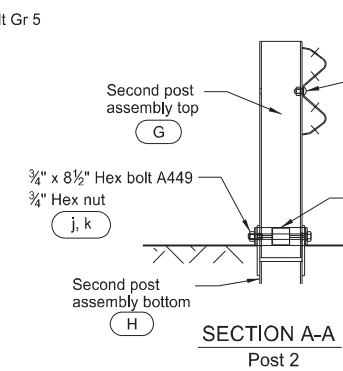
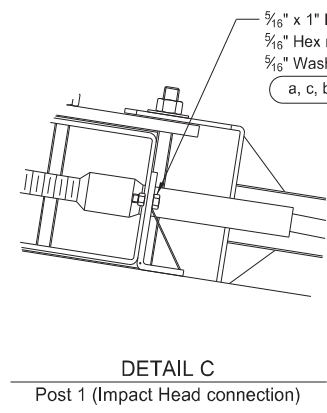
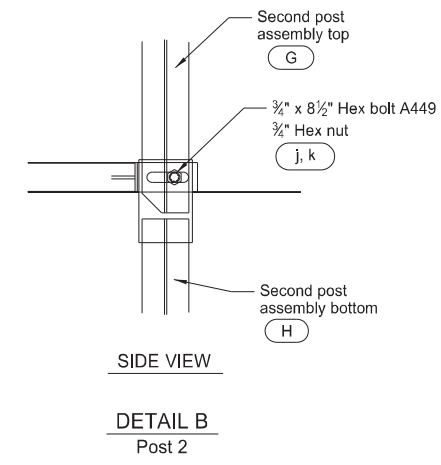
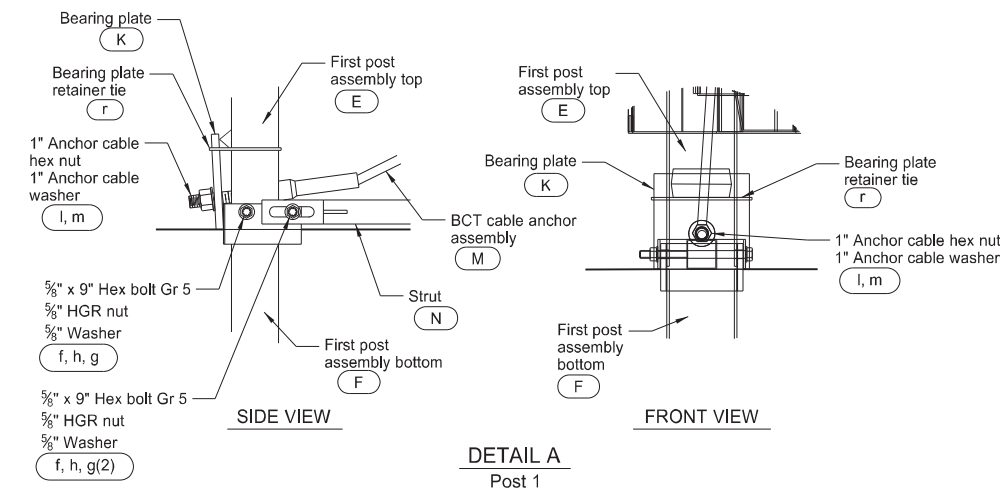
D-764-51



GENERAL NOTES:

- Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
- Flare the MSKT at a rate of up to 25:1, as needed to prevent the impact head from encroaching on the shoulder.
- Site grade as necessary to ensure the lower sections of posts do not protrude more than 4" above the ground (measured along a 5' cord).
- 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 breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent the cable from twisting when tightening nuts.
- "Toe nail" the wood blockouts to the rectangular wood posts at post 3 through post 8 with two 20 penny galvanized nails to prevent them from turning when the wood warps.

ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	MS3000	IMPACT HEAD	1
B	SF1303	W-BEAM GUARDRAIL END SECTION, 12 Ga	1
C	G12025	9'-4 1/2" MGS W-BEAM RAIL SECTION, 12 Ga	1
D	G1203A	12'-6" MGS W-BEAM RAIL SECTION, 12 Ga	2
E	MTPHP1A	FIRST POST ASSEMBLY TOP (6" X 6" X 1/8" Tube)	1
F	MTPHP1B	FIRST POST ASSEMBLY BOTTOM (6" W6X15)	1
G	UHP2A	SECOND POST ASSEMBLY TOP	1
H	HP2B	SECOND POST ASSEMBLY BOTTOM	1
K	E750	BEARING PLATE	1
L	S760	CABLE ANCHOR BOX	1
M	E770	BCT CABLE ANCHOR ASSEMBLY	1
N	MS785	STRUT	1
P	UP671	6" WOOD CRT POST	6
R	P675	WOOD BLOCKOUT OR RECYCLED EQUIVALENT	6
HARDWARE			
a	B5160104A	5/16" x 1" HEX BOLT GR 5	2
b	W0516	5/16" WASHER	4
c	N0516	5/16" HEX NUT	2
d	B580122	5/8" Dia x 1 1/4" SPLICE BOLT	33
e	B581802	5/8" Dia x 18" HGR BOLT (POSTS 3 THRU 8)	6
f	B580904A	5/8" x 9" HEX BOLT GR 5	2
g	W050	5/8" WASHER	9
h	N050	5/8" Dia HGR NUT	35
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

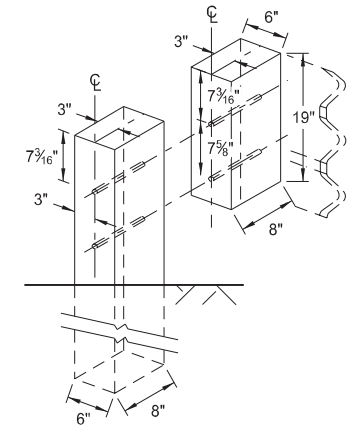
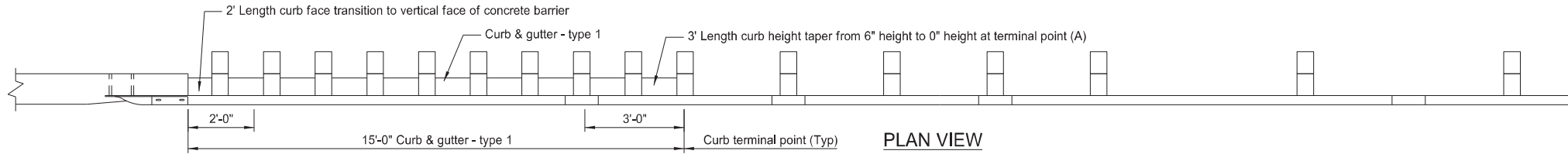


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.

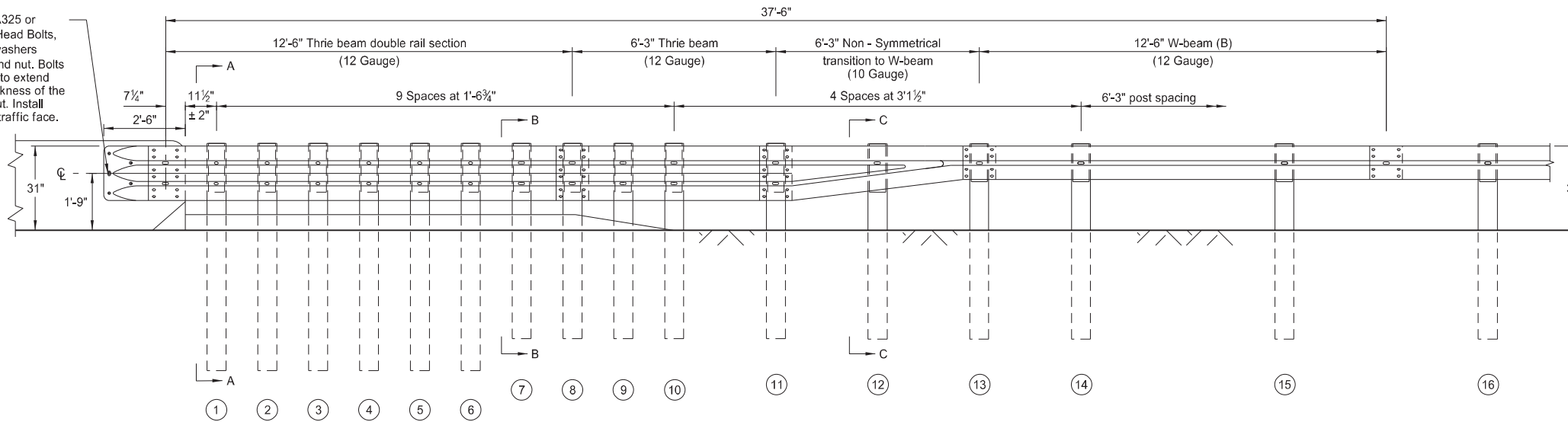


MGS W-BEAM TRANSITION WITH APPROACH CURB TO CONCRETE SINGLE SLOPE OR JERSEY BARRIER

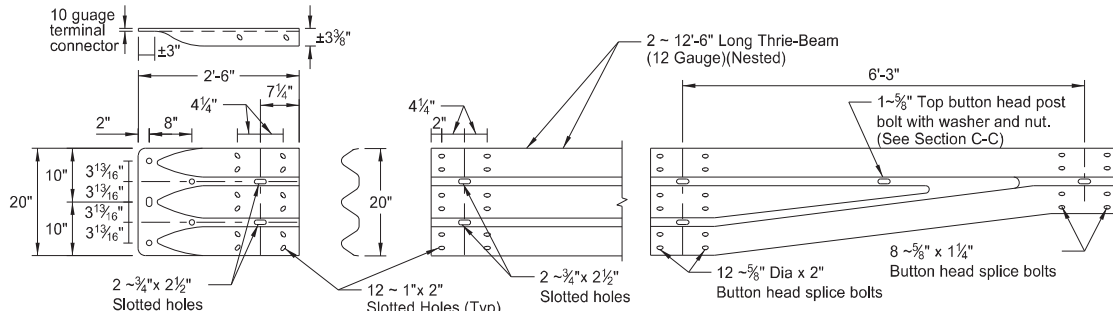
D-764-60



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.

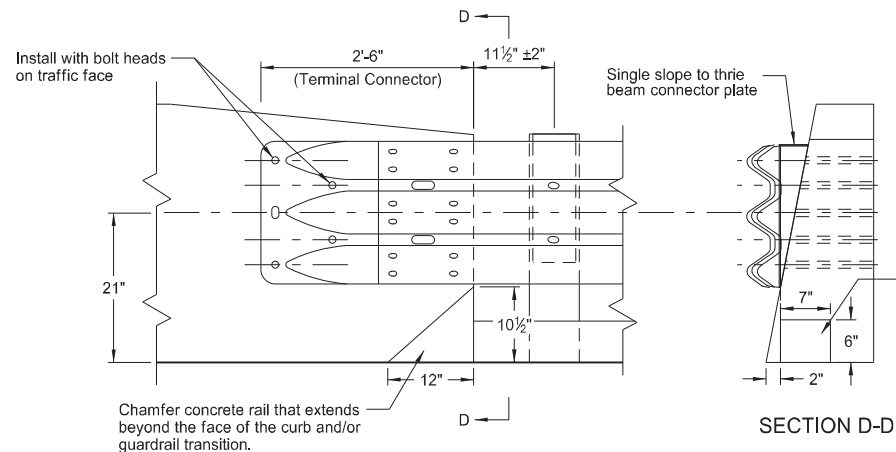
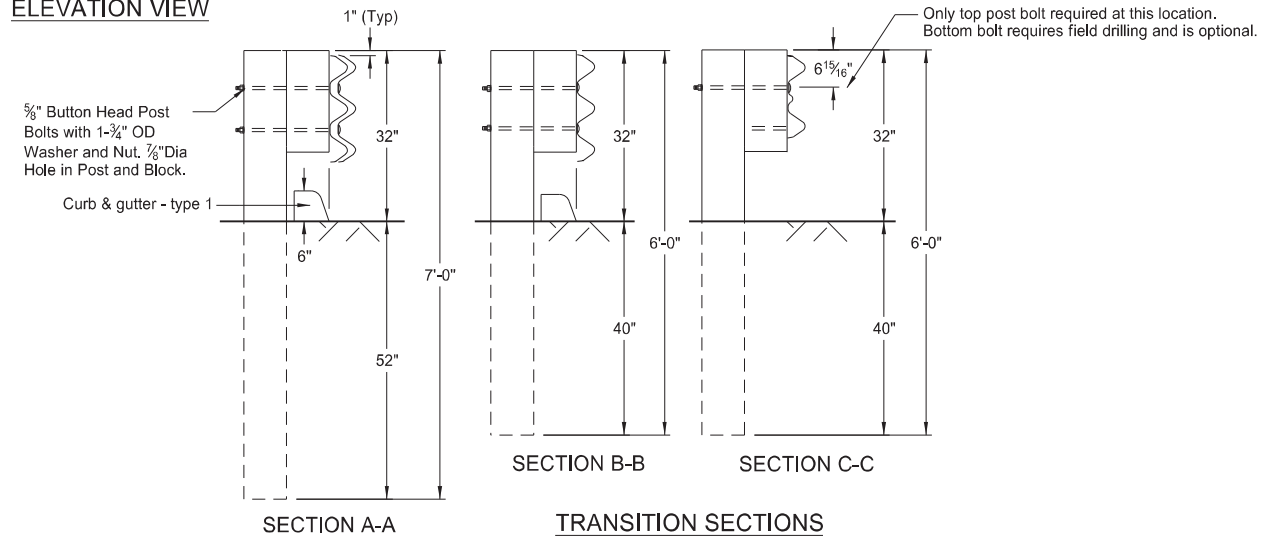


TRANSITION POST AND TIMBER BLOCKOUT SIZING		
POST NO.	POST SIZE	BLOCKOUT SIZE
1-6	6" X 8" X 7'-0" long	6" X 8" X 19"
7-12	6" X 8" X 6'-0" long	6" X 8" X 19"
13-16	6" X 8" X 6'-0" long	6" X 8" X 14"

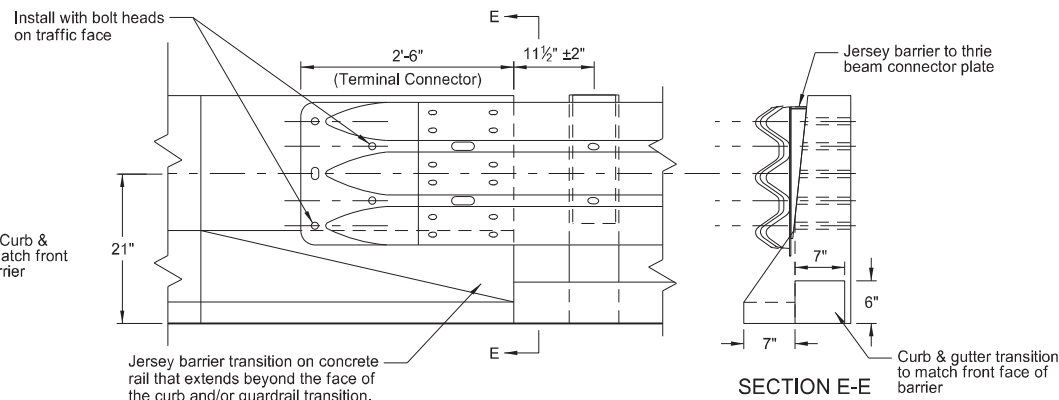


NON - SYMMETRICAL TRANSITION TO W-BEAM (10 GAUGE)

ELEVATION VIEW



CONNECTION TO CONCRETE SINGLE SLOPE BRIDGE RAIL AND TRAFFIC BARRIERS



CONNECTION TO CONCRETE JERSEY BARRIER BRIDGE RAIL AND TRAFFIC BARRIERS

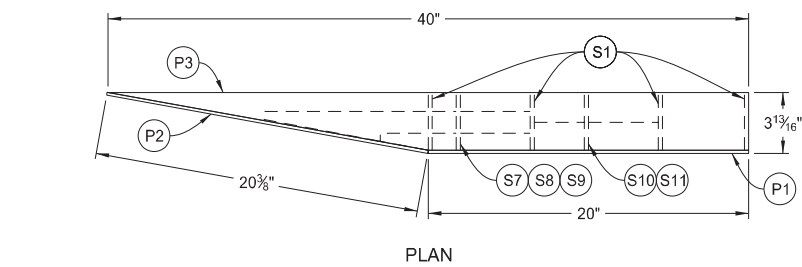
- (A) Where curb is required to continue past 15' length, taper the curb down to 3" height at the terminal point shown above, instead of 0" height. Use 3" height curb between posts 10 and 16.
- (B) Install 12'-6" length W-beam double rail section at location where curb extends past 15' length.

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12-02-20	Updated notes to active voice.

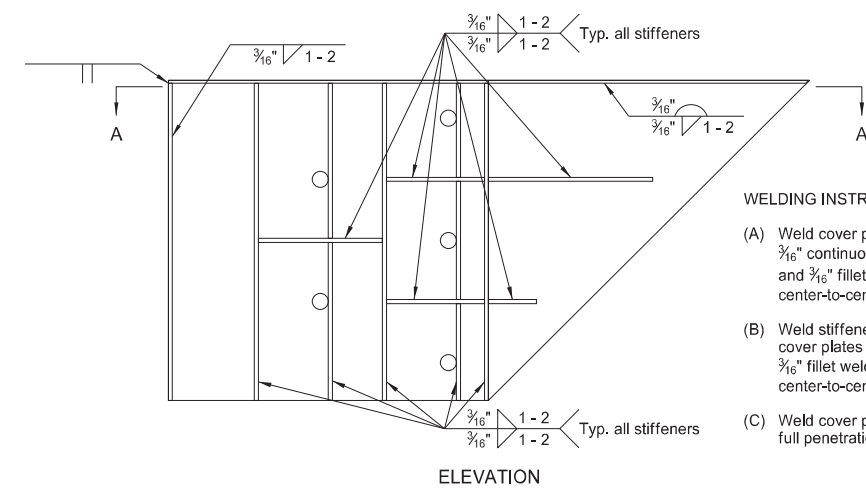
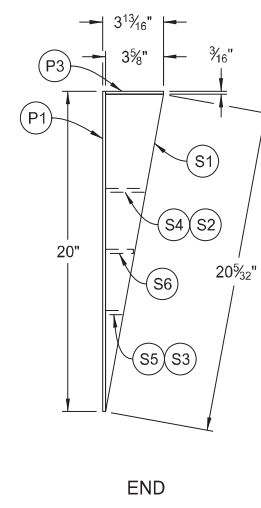
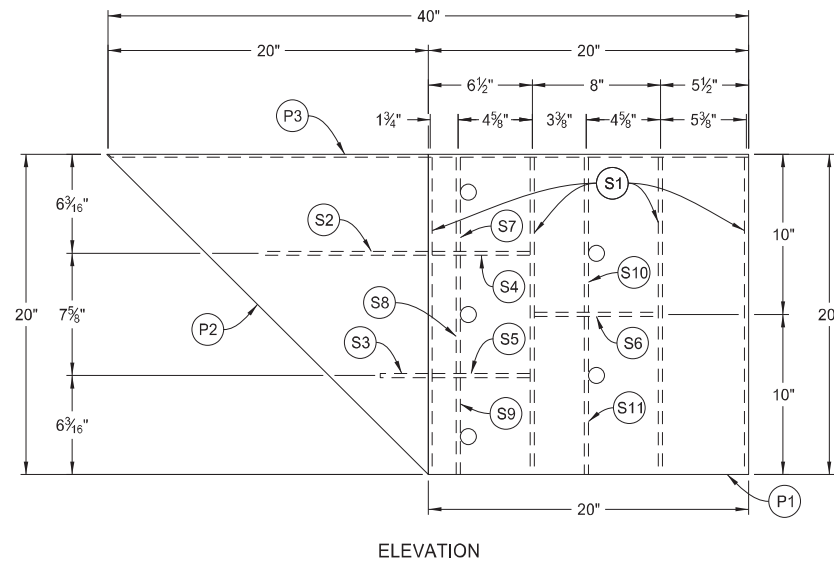
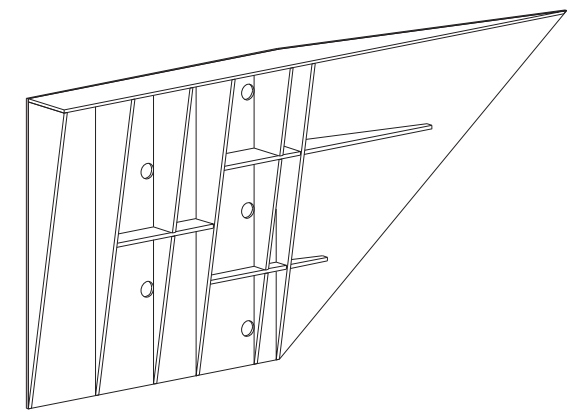
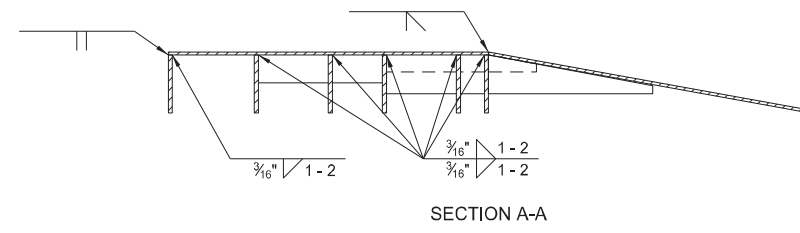


12 02 2020

SINGLE SLOPE TO THRIE BEAM CONNECTOR PLATE DETAILS



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

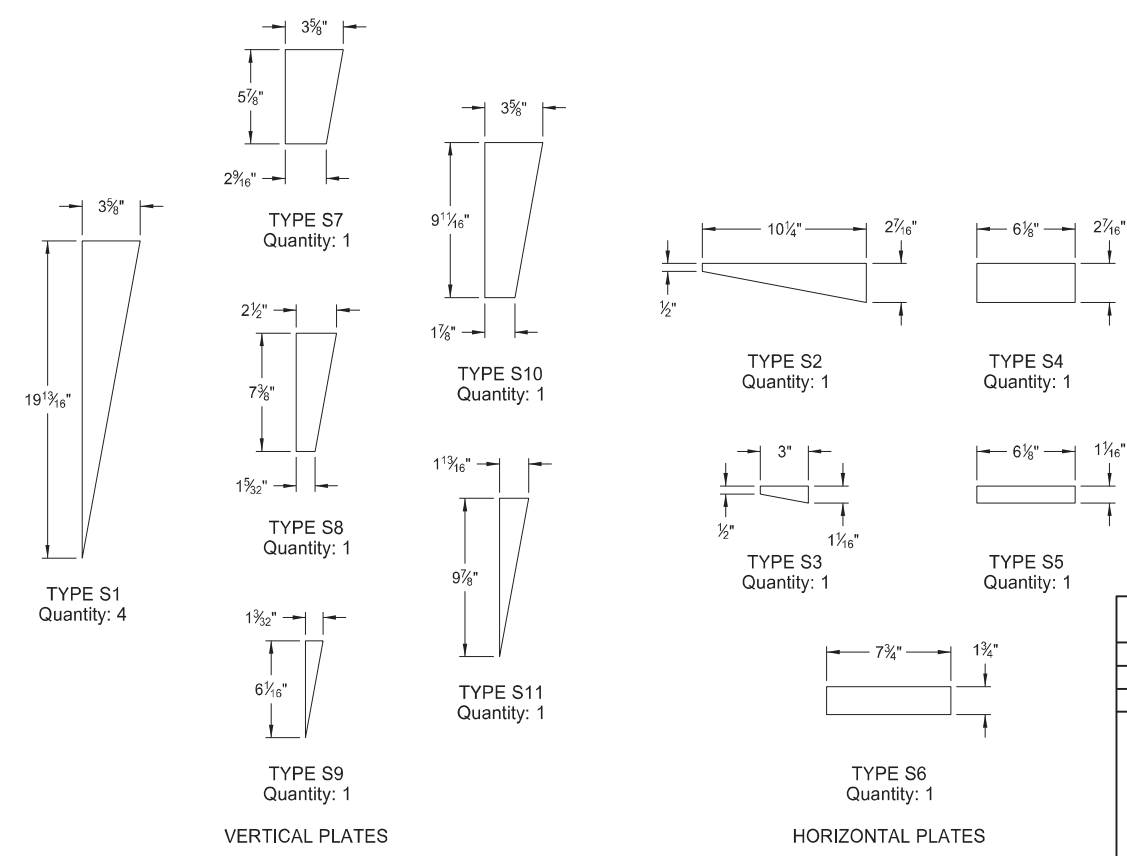
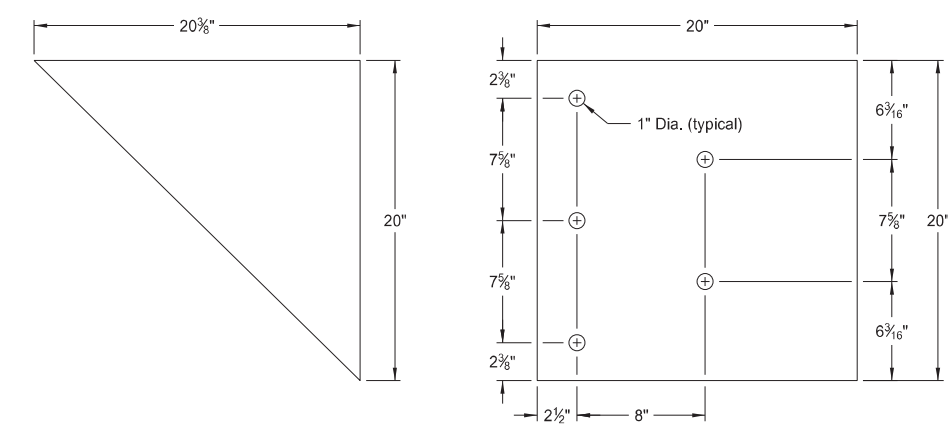
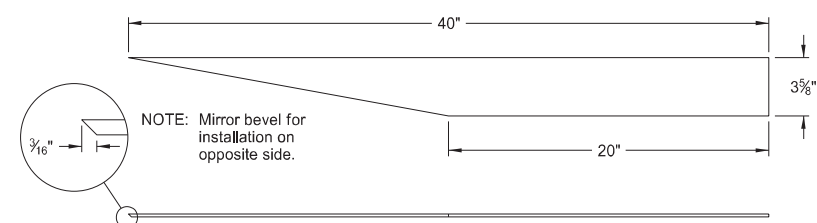


WELDING INSTRUCTIONS:

- (A) Weld cover plate P3 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 full penetration groove weld.

ASSEMBLY DETAIL
(Front View)

WELDING DETAIL
(Back View)

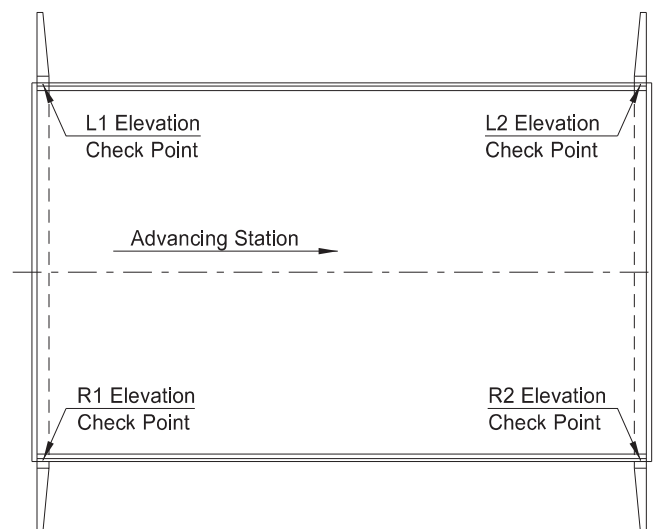


NOTES:

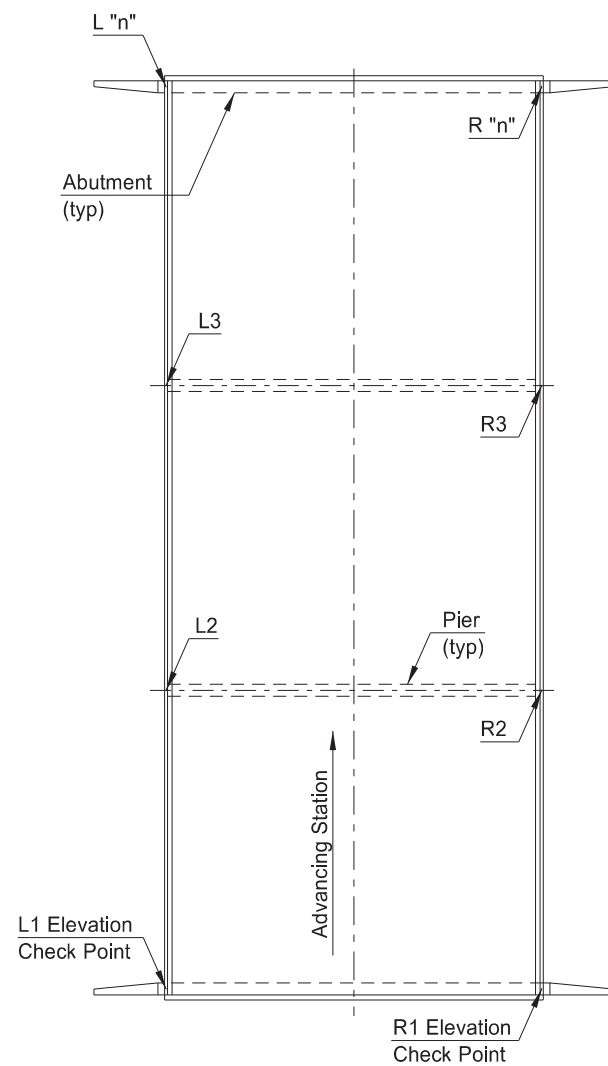
1. Fabricate cover plates P1, P2, and P3 from $\frac{3}{16}$ " thick ASTM A36 Grade structural steel.
2. Fabricate stiffener plates from $\frac{1}{4}$ " thick ASTM A36 Grade structural steel.
3. Galvanize connector plate in accordance with AASHTO M111.

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12 02 2020

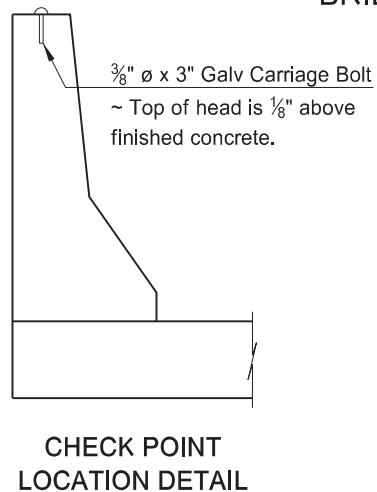


GENERAL LAYOUT FOR SINGLE SPAN

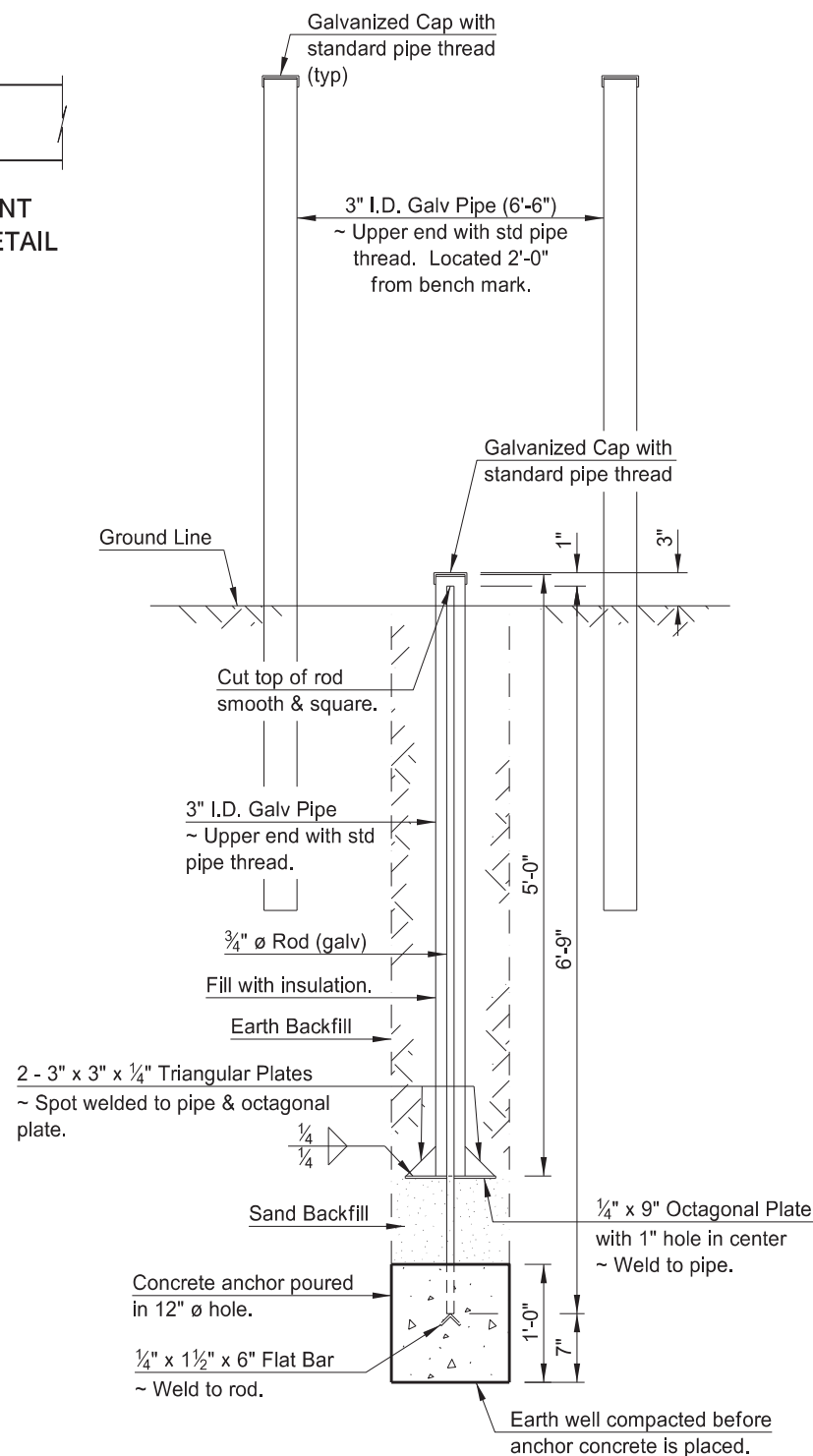


GENERAL LAYOUT FOR MULTIPLE SPAN

BRIDGE BENCH MARKS



CHECK POINT LOCATION DETAIL



BENCH MARK DETAIL

NOTES:

Elevation check points shall consist of 3/8" diameter x 3" galvanized carriage bolts (or equal) set in the concrete barrier at the points indicated on the General Layout sketches. The top of the bolt head shall project above the finished concrete 1/8". Elevation check points shall be placed on each barrier over each unit of the substructure for each bridge at a structural location.

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

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

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

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

METHOD OF MEASUREMENT:

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

BASIS OF PAYMENT:

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

GALVANIZING:

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

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09/14/11	
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DATE	CHANGE
09/03/19	UPDATED SIGNATURE

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