

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	SS-1-999(047)	23418	1	1

**NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION**

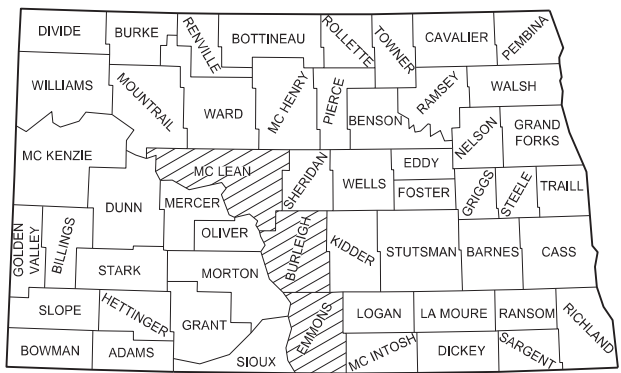
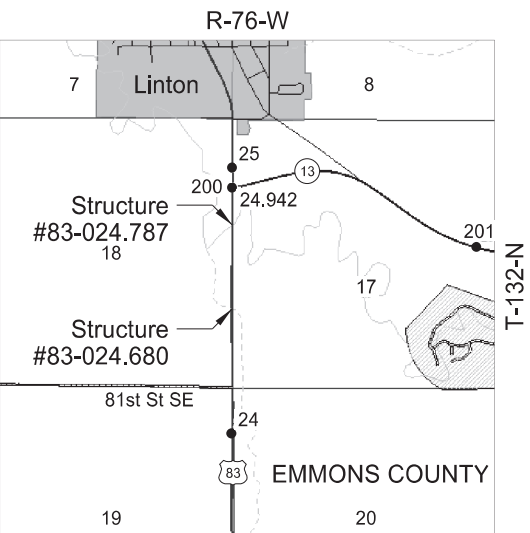
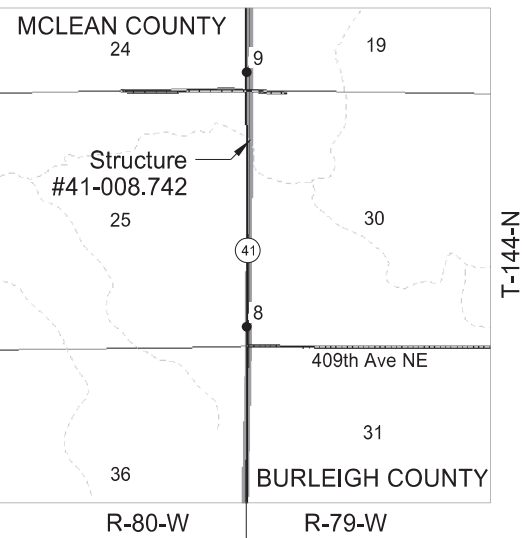
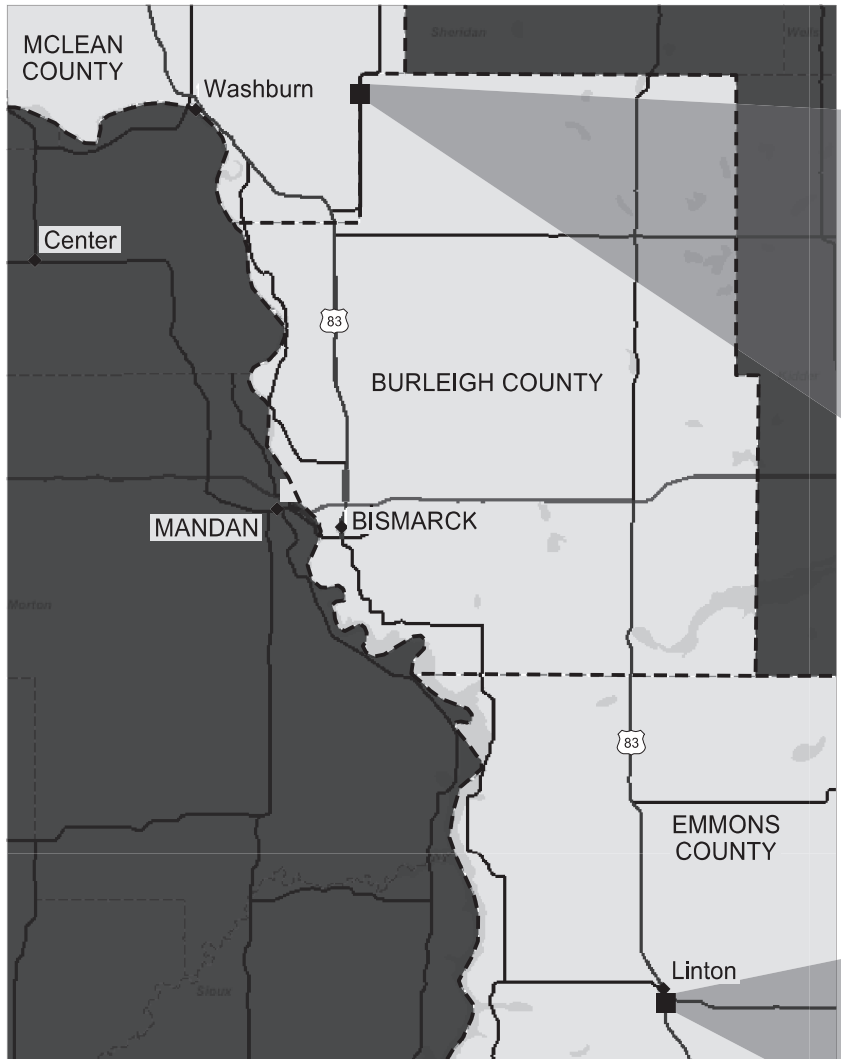
SS-1-999(047)

McLean, Burleigh, and Emmons County
Various Structures - District 1 (Bismarck District)

Bridge Deck Overlay, Spall Repairs, Rail Retrofit, and Guardrail

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

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
SS-1-999(047)	Varies	Varies



STATE COUNTY MAP

DESIGNER Matthew Henderson, PE
DESIGNER Mary Boechler, PE Andrew Hellman, EIT
DESIGNER Sawyer Kenney, EIT Sam Boulton, EIT

ND DEPARTMENT OF TRANSPORTATION
OFFICE OF PROJECT DEVELOPMENT
Ketterling, Jonathan
07/05/23
Jonathan Ketterling

Ulteig Engineers, Inc.

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PLAN SECTIONS

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D-764-10	Thrie Beam Transition To Double Box Beam Retrofit
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SPECIAL PROVISIONS

Number	Description
PSP 52(23)	Permits and Environmental Considerations
SSP 2	Federal Migratory Bird Treaty Act
SSP 10	E-Ticketing
SP 440(22)	Commercial Grade Hot Mix Asphalt

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NOTES

202-P01 REMOVAL OF OBJECT MARKERS: Include the cost of removing object markers at Station 1864+27.5 and Station 1865+02.5 into the project cost.

704-200 PRECAST CONCRETE MEDIAN BARRIERS – STATE FURNISHED:

Obtain 42 barriers for use at Bridge 41-008.742 from Sterling Maintenance Yard (31346 27th Ave NE, Sterling, ND 58572). Return barriers to Sterling.

Obtain 91 barriers for use at Bridges 83-024.787 & 83-024.680 from Sterling Maintenance Yard (31346 27th Ave NE, Sterling, ND 58572). Return barriers to Sterling.

Install any missing markers on the barriers before traffic use. Include the cost of the markers in the contract unit price for "Precast Concrete Median Barrier – State Furnished".

Some 4 inch x 4 inch boards are available at the return location. Provide any additional 4 inch x 4 inch boards necessary to stack barriers. The boards will become property of the Department. Include the cost for boards in the contract unit price for "Precast Concrete Median Barrier - State Furnished".

704-P01 LANE CLOSURE - SIGNAL CONTROL/FLAGGING CONTROL: Install the signal controlled lane closure on Standard D-704-16.

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 a traffic signal system in the contract unit price for "Lane Closure – Signal Control/Flagging Control".

704-P02 TRAFFIC CONTROL DEVICES: The traffic control devices list has been developed using the traffic control layout sheets and the list below:

- D-704-16, Sign layout for Lane Closure on a Two Lane Road Using Traffic Control Signals

704-P03 OBLITERATION OF CENTERLINE PAVEMENT MARKINGS: Masking of centerline pavement marking designated for obliteration is allowed. Choose to remove or mask marking as specified in Section 704.04 N, "Obliteration of Pavement Markings".

762-050 PAVEMENT MARKING: If the Engineer and Contractor agree, plan quantity will be used as the measurement for payment for pavement marking items.

764-P01 REMOVE W-BEAM GUARDRAIL & POSTS: Remove the existing w-beam guardrail, posts, end treatment, & transition at the locations shown in the plans.

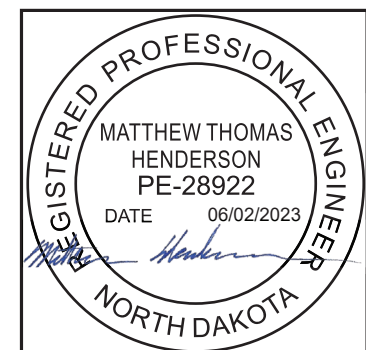
Deliver all salvageable w-beam guardrail, posts, end treatment, & transition to one of the following three NDDOT Maintenance Storage Yards in Underwood, Bismarck, or Linton, and neatly stack them at a location designated by the engineer. The addresses of the NDDOT Maintenance Storage Yards are:

UNDERWOOD NDDOT
337 Old US Hwy 83
Underwood, ND 58576

BISMARCK NDDOT
218 Airport Road
Bismarck, ND 58552

LINTON NDDOT
8051 8th Ave SE
Linton, ND 58552

Include the costs for removal and disposal of all unsalvageable materials, and delivery of all salvageable materials in the contract unit price bid for "Remove W-Beam Guardrail & Posts" and "Remove End Treatment & Transition."



ENVIRONMENTAL NOTES

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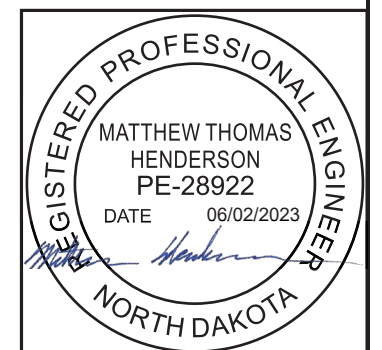
ENVIRONMENTAL NOTES (EN): The North Dakota Department of Transportation has made environmental commitments to secure approval of this project. The following environmental notes are requirements to comply with these commitments:

EN-5 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).



Estimated Quantities

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SPEC	CODE	ITEM DESCRIPTION	UNIT	Mainline	TOTAL
103	0100	CONTRACT BOND	L SUM	1	1
202	0021	REMOVE AGGREGATE BASE & SURFACING	TON	112	112
302	0120	AGGREGATE BASE COURSE CL 5	TON	302	302
411	0105	MILLING PAVEMENT SURFACE	SY	1045	1045
430	0500	COMMERCIAL GRADE HOT MIX ASPHALT	TON	184	184
550	0210	PCC PAVEMENT GRINDING	SY	769	769
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	1244	1244
624	3001	DOUBLE BOX BEAM RAIL RETROFIT-FREE STANDING	LF	149	149
650	0704	OVERLAY CONCRETE	CY	49.6	49.6
650	0707	DECK CONCRETE	CY	14.9	14.9
650	0710	CLASS 1-H REMOVAL	SY	1019	1019
650	0711	CLASS 2-H REMOVAL	SY	215	215
650	0712	CLASS 3-H REMOVAL	SY	55	55
702	0100	MOBILIZATION	L SUM	1	1
704	1000	TRAFFIC CONTROL SIGNS	UNIT	1527	1527
704	1018	LANE CLOSURE-SIGNAL CONTROL/FLAGGING CONTROL	EA	2	2
704	1039	ATTENUATION DEVICE-TYPE B-45	EA	4	4
704	1043	ATTENUATION DEVICE-TYPE B-65	EA	2	2
704	1052	TYPE III BARRICADE	EA	6	6
704	1060	DELINEATOR DRUMS	EA	27	27
704	1500	OBLITERATION OF PAVEMENT MARKING	SF	945	945
704	3510	PRECAST CONCRETE MED BARRIER-STATE FURNISHED	EA	133	133
762	0113	EPOXY PVMT MK 4IN LINE	LF	3947	3947
762	0420	SHORT TERM 4IN LINE-TYPE R	LF	6358	6358
762	0426	SHORT TERM 24IN LINE-TYPE R	LF	48	48
762	1104	PVMT MK PAINTED 4IN LINE	LF	1668	1668
764	0131	W-BEAM GUARDRAIL	LF	358	358
764	0145	W-BEAM GUARDRAIL END TERMINAL	EA	4	4
764	0150	REMOVE & RESET GUARDRAIL	LF	615	615
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS	LF	438	438
764	2081	REMOVE END TREATMENT & TRANSITION	EA	4	4
930	8644	SILICONE SEALANT	LF	66	66
930	9612	SPALL REPAIR	SF	22	22

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ESTMATED QUANTIES FOR BRIDGE TRANSTIONS SURFACING

Spec	Code	Bid item	UNIT	Structure #0041-008.742				Structure #0083-024.787				Structure #0083-024.680				Total
				North		South		North		South		North		South		
				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	
411	105	MILLING	SY	30	166.7	30	166.7	32	177.8	32	177.8	32	177.8	32	177.8	1044.5
430	500	COMMERCIAL GRADE HOT MIX ASPHALT @ 2 TON/CY	TON	30	13.9	30	13.9	32	19.8	32	19.8	32	19.8	32	19.8	107.0
*	*	TACK COAT @ 0.05 Gal/SY	GAL	30	9.4	30	9.4	32	13.4	32	13.4	32	13.4	32	13.4	72.2
*	*	PG 58S-28 ASPHALT CEMENT @ 6%	TON	30	0.8	30	0.8	32	1.2	32	1.2	32	1.2	32	1.2	6.4

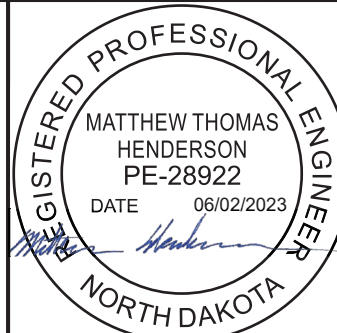
* Not a pay item. Included in the contract unit price bid for 430 0500 Commercial Grade Hot Mix Asphalt.

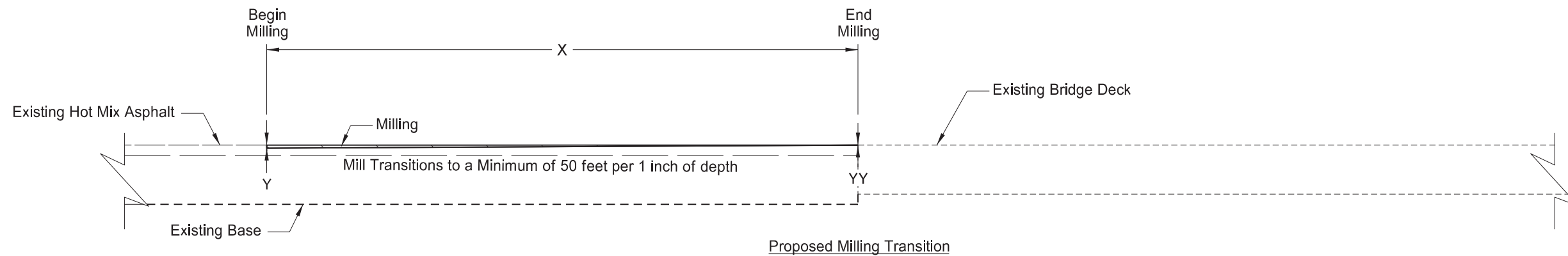
ESTIMATED QUANTITIES FOR GUARDRAIL EMBANKMENT SURFACING

Spec	Code	Bid Item	UNIT	Structure #0041-008.742				Structure #0083-024.787				Structure #0083-024.680				Total
				Begin Bridge		End Bridge		Begin Bridge		End Bridge		Begin Bridge		End Bridge		
				RT	LT	RT	LT	RT	LT	RT	LT	RT	LT	RT	LT	
202	0021	REMOVE AGGREGATE BASE & SURFACING	TON	-	-	-	-	16.0	13.8	13.6	12.6	16.3	12.3	15.2	12.6	112.4
		ASSUME 6" AGGREGATE SURFACING EXISTING @ 1.875 Ton/CY														
302	0120	AGGREGATE BASE COURSE CL 5	TON	81.5	22.6	22.2	84.1	12.9	11.2	11.1	10.3	13.1	10.1	12.2	10.3	301.6
*	*	TACK COAT @ 0.05 Gal/SY	GAL	9.4	2.0	1.9	9.7	1.3	1.0	1.0	0.9	1.3	1.2	0.9	0.9	31.4
*	*	PRIME COAT @ 0.25 Gal/SY	GAL	46.8	9.9	9.5	48.7	6.4	5.1	5.0	4.4	6.6	4.2	5.9	4.4	156.9
430	0500	COMMERCIAL GRADE HOT MIX ASPHALT @ 2 Ton/CY	TON	22.4	5.1	5.0	23.3	3.2	2.6	2.6	2.3	3.3	2.2	3.0	2.3	77.2
*	*	PG 58S-28 ASPHALT CEMENT @ 6%	TON	1.3	0.3	0.3	1.4	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.1	4.6

* Not a pay item. Included in the contract unit price bid for 430 0500 Commercial Grade Hot Mix Asphalt.

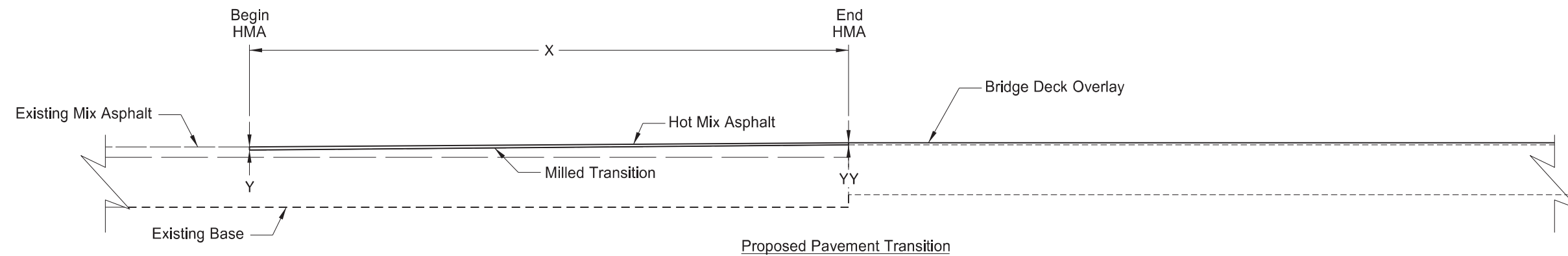
See Section 130, Standard Drawing D-764-22, and Standard Drawing D-764-48 for details.

<p>Basis of Estimate</p> <p>Removals & Surfacing</p> <p>Various Structures - District 1 (Bismarck District)</p>	
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Milling Transitions

Location	X	Begin Milling Station	Y	YY	End Milling Station
Bridge 41-008.742	50 ft	1863+77.5	1.5 in	0.5 in	1864+27.5
Bridge 41-008.742	50 ft	1865+52.5	1.5 in	0.5 in	1865+02.5
Bridge 83-024.680	50 ft	2860+92.5	2.0 in	3.0 in	2861+42.5
Bridge 83-024.680	50 ft	2863+07.5	2.0 in	3.0 in	2862+57.5
Bridge 83-024.787	50 ft	2855+31.5	2.0 in	3.0 in	2855+81.5
Bridge 83-024.787	50 ft	2856+82.5	2.0 in	3.0 in	2857+32.5



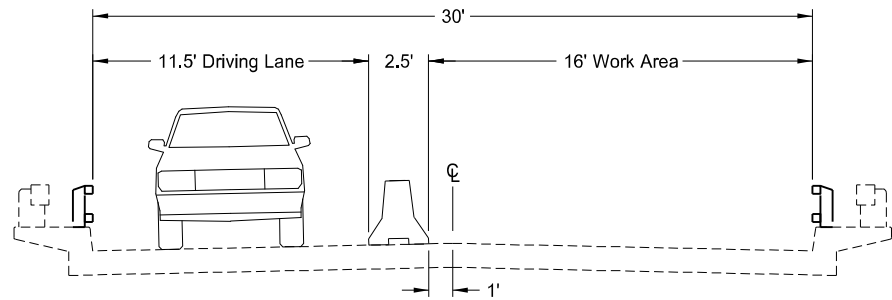
Paving Transitions

Location	X	Begin Milling Station	Y	YY	End Milling Station
Bridge 41-008.742	50 ft	1863+77.5	1.5 in	1.5 in	1864+27.5
Bridge 41-008.742	50 ft	1865+52.5	1.5 in	1.5 in	1865+02.5
Bridge 83-024.680	50 ft	2860+92.5	2.0 in	2.0 in	2861+42.5
Bridge 83-024.680	50 ft	2863+07.5	2.0 in	2.0 in	2862+57.5
Bridge 83-024.787	50 ft	2855+31.5	2.0 in	2.0 in	2855+81.5
Bridge 83-024.787	50 ft	2856+82.5	2.0 in	2.0 in	2857+32.5

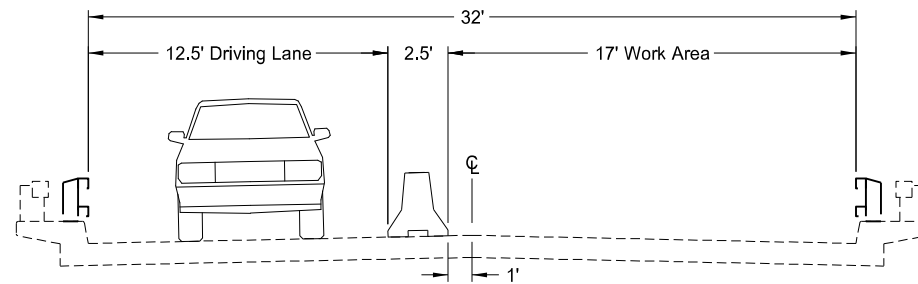
Drawing is not to scale

<p>Milling and Paving Transitions</p> <p>ND Hwy 41, ND Hwy 83</p> <p>Various Structures - District 1 (Bismarck District)</p>	
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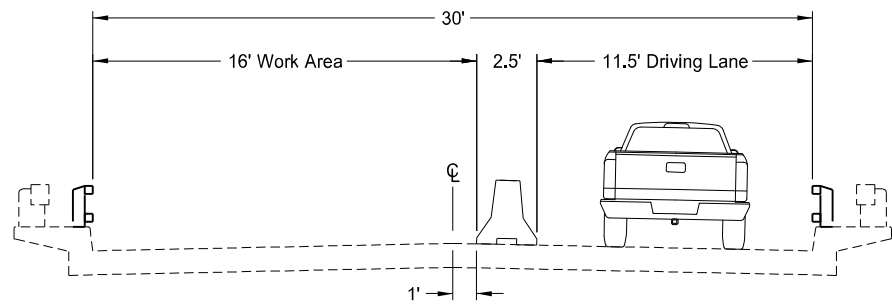
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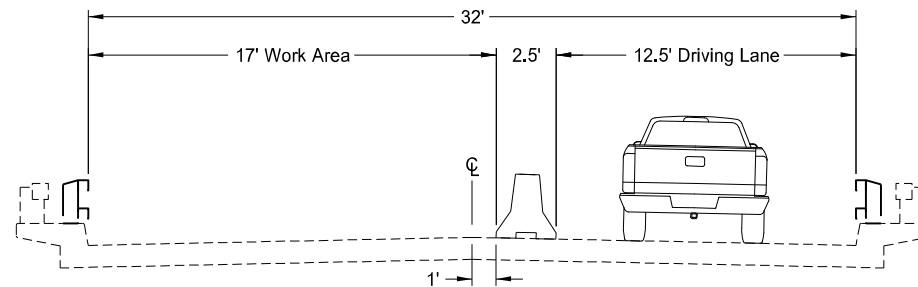
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Structure #83-024.680 - Phase 1
Structure #83-024.787 - Phase 1



Structure #41-008.742 - Phase 2

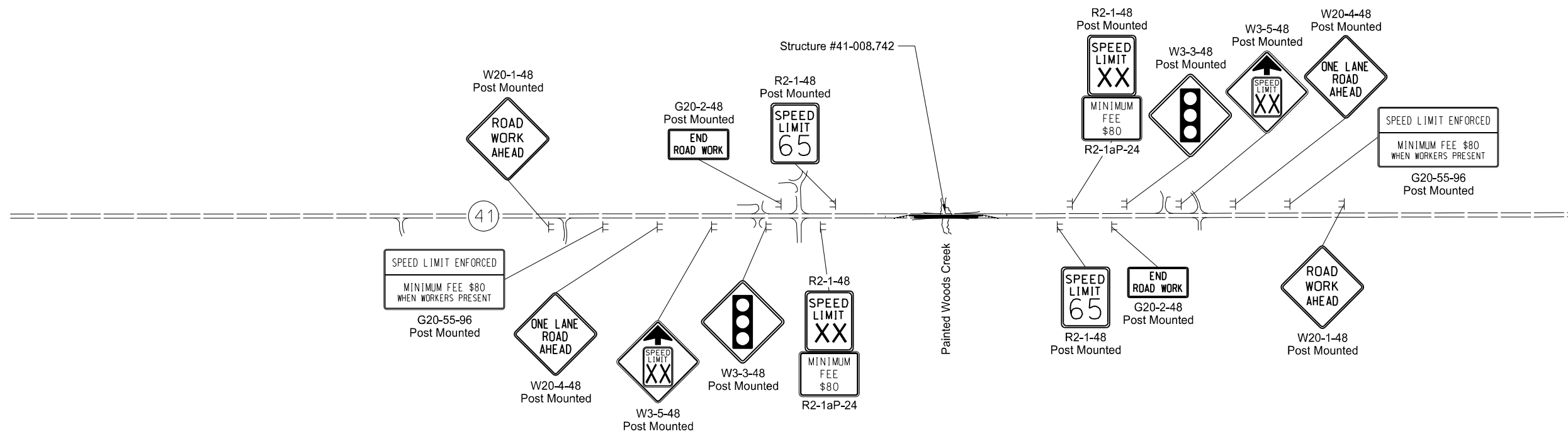
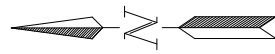


Structure #83-024.680 - Phase 2
Structure #83-024.787 - Phase 2

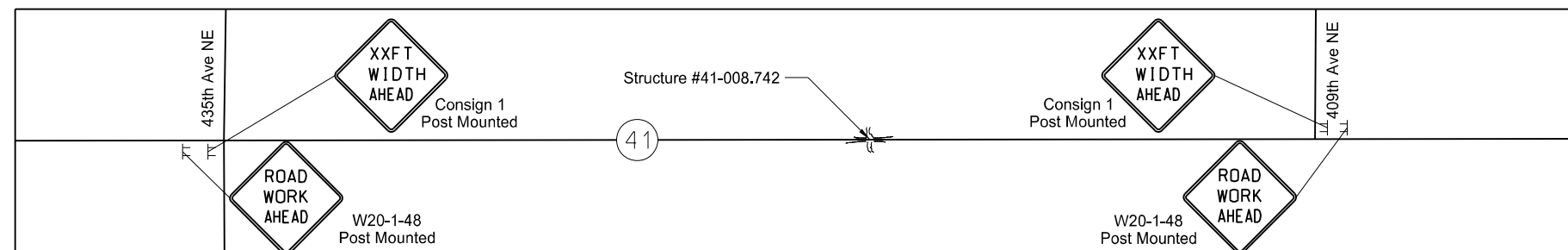
Work Zone Traffic Control
Typical Sections
ND Hwy 41, US Hwy 83
Various Structures - District 1
(Bismarck District)



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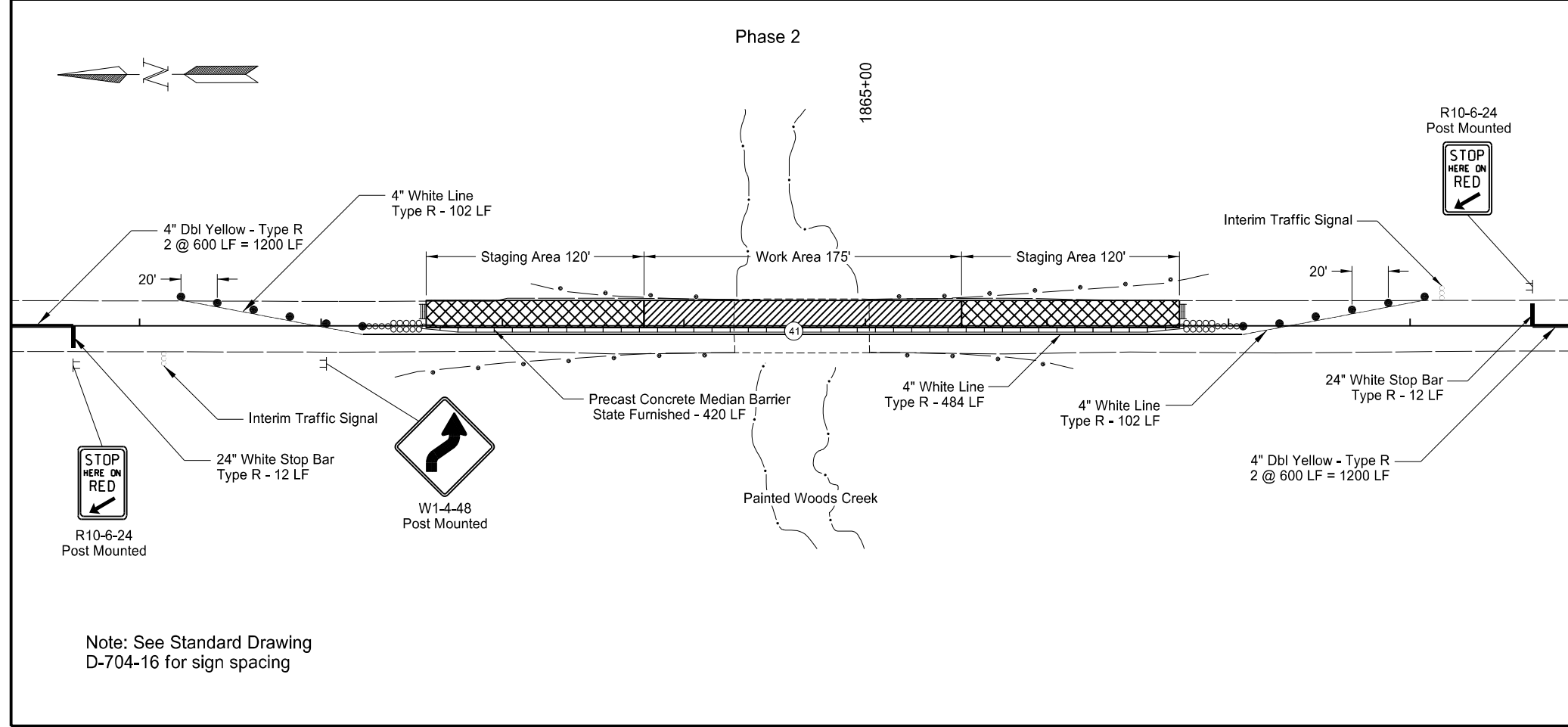
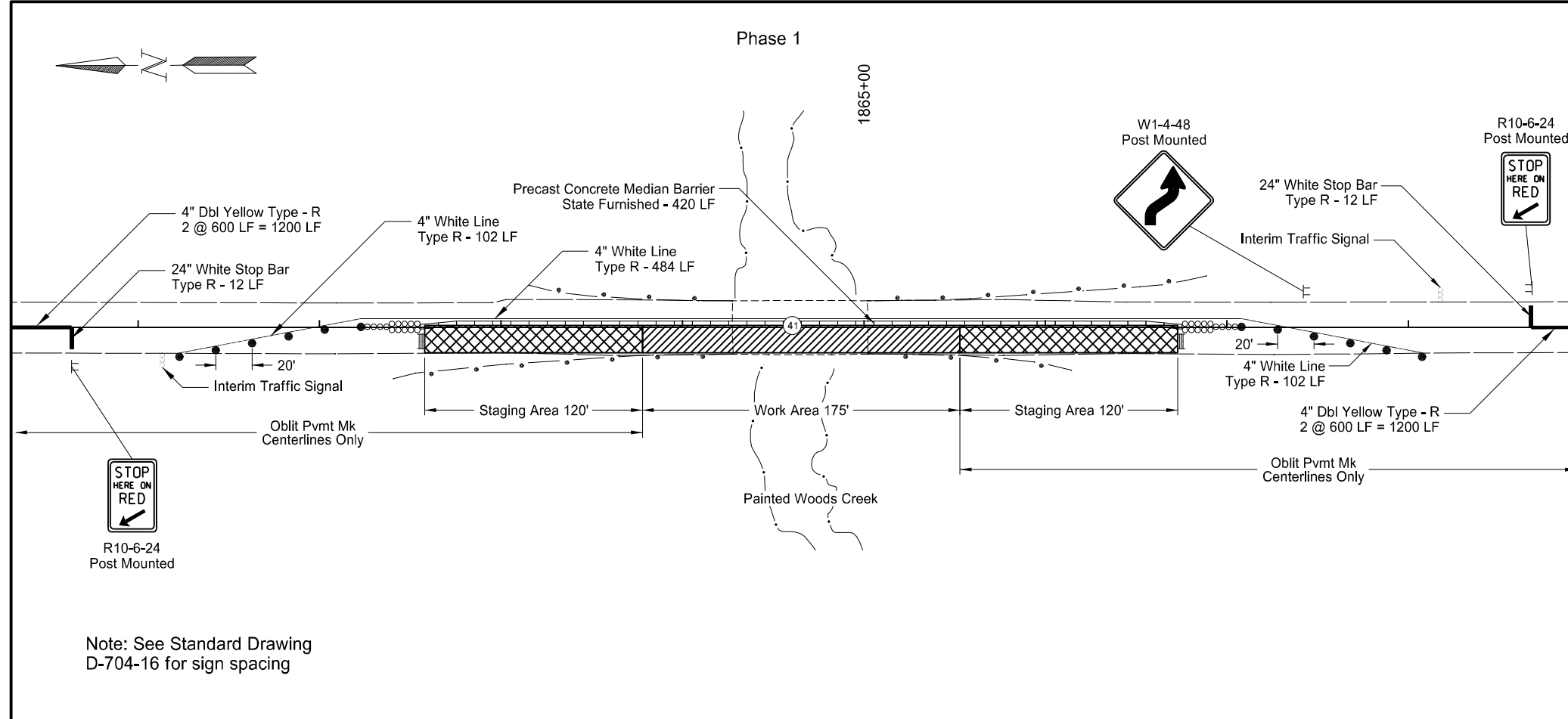


Note: See Standard Drawing
D-704-16 for sign spacing



<p>Work Zone Traffic Control Sign Layout ND Hwy 41 Various Structures - District 1 (Bismarck District)</p>	
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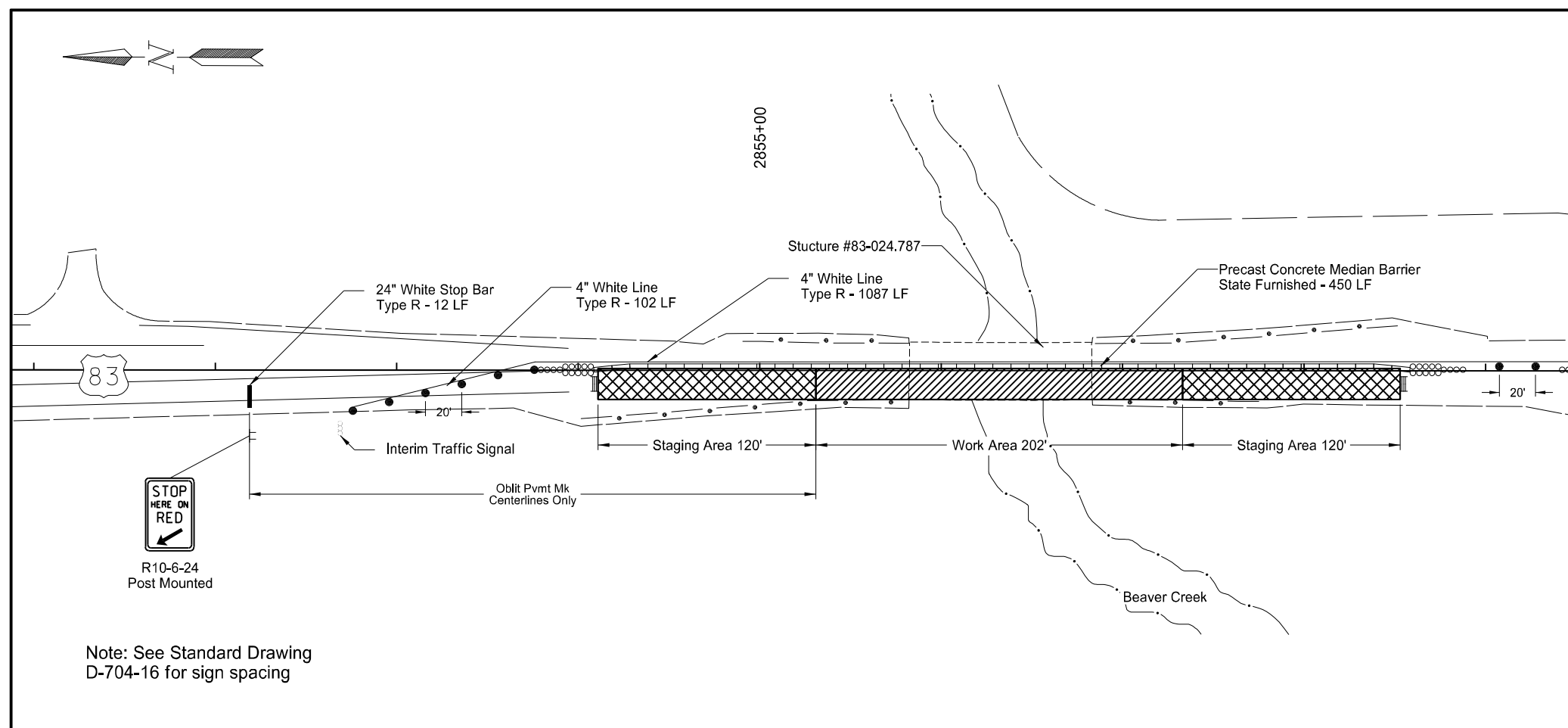


- Legend**
- Work Area
 - Staging Area
 - Type-III Barricade
 - Precast Concrete Median Barrier
 - Attenuation Device
 - Delineator Drum
 - Sign Post
 - Interim Traffic Signal

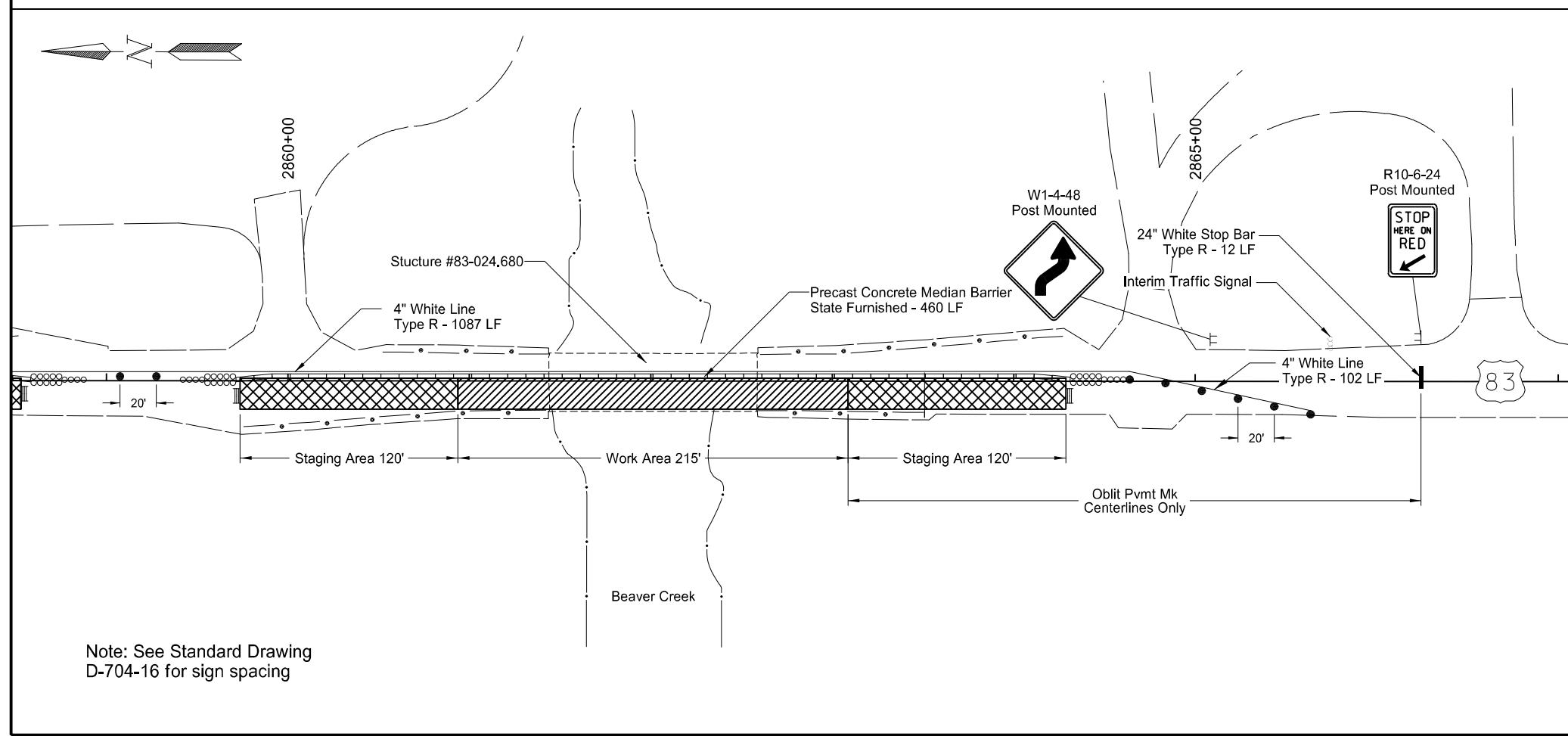
Work Zone Traffic Control
Phase 1 & Phase 2
ND Hwy 41
Various Structures - District 1
(Bismarck District)



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Note: See Standard Drawing D-704-16 for sign spacing

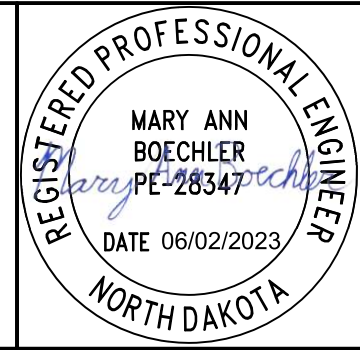


Note: See Standard Drawing D-704-16 for sign spacing

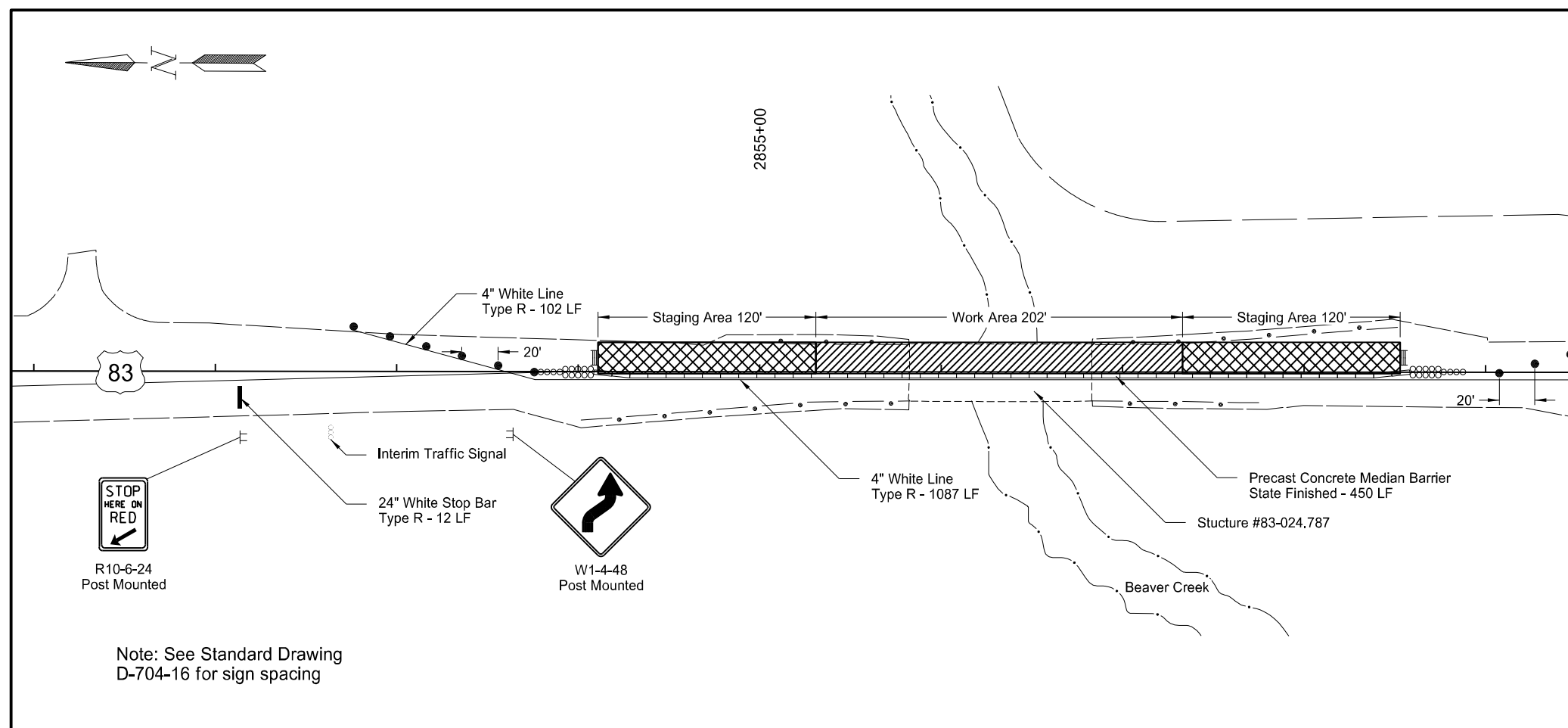
Legend

	Work Area
	Staging Area
	Type-III Barricade
	Precast Concrete Median Barrier
	Attenuation Device
	Delineator Drum
	Sign Post
	Interim Traffic Signal

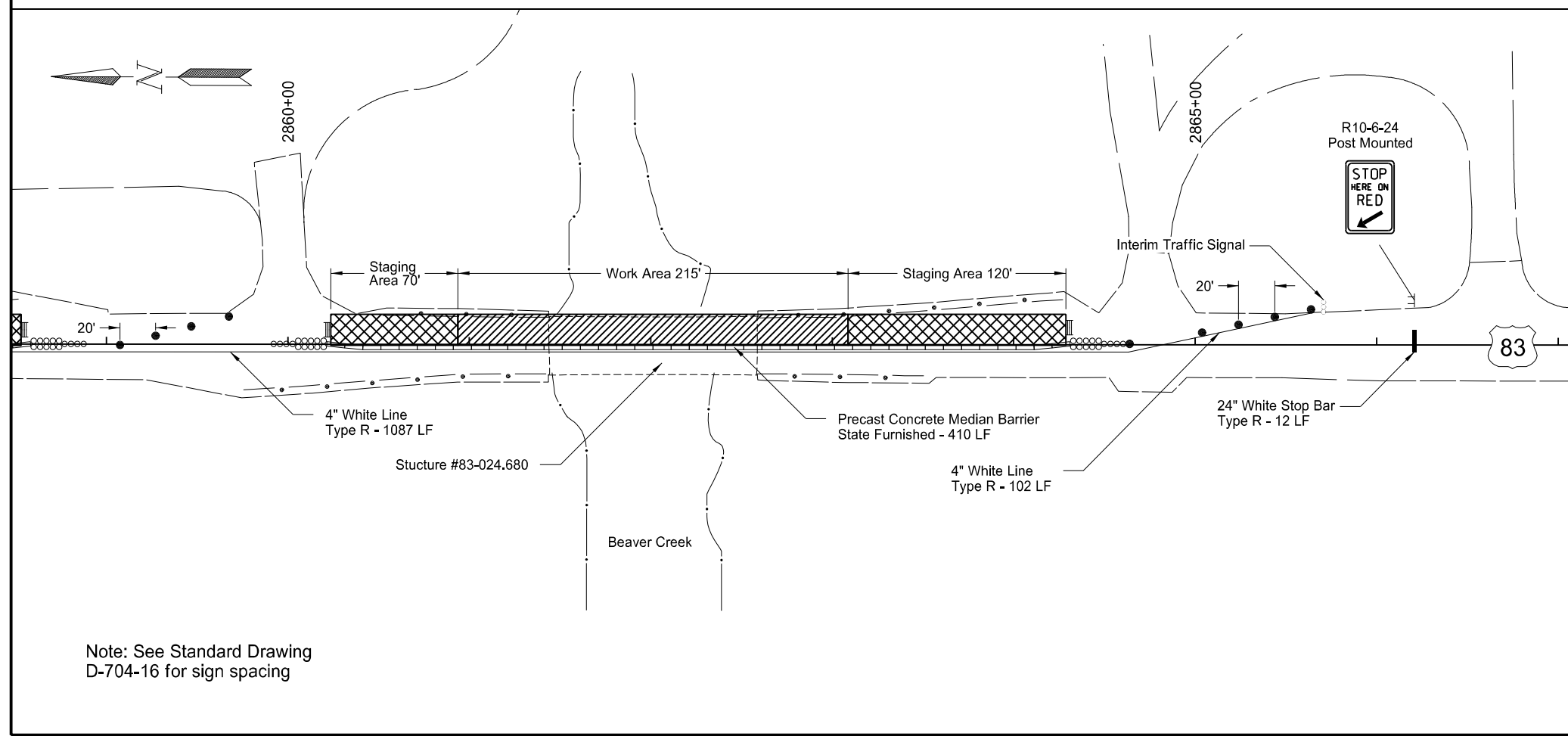
Work Zone Traffic Control
Phase 1
US Hwy 83
Various Structures - District 1
(Bismarck District)



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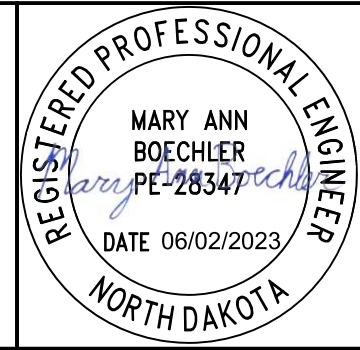
Note: See Standard Drawing D-704-16 for sign spacing



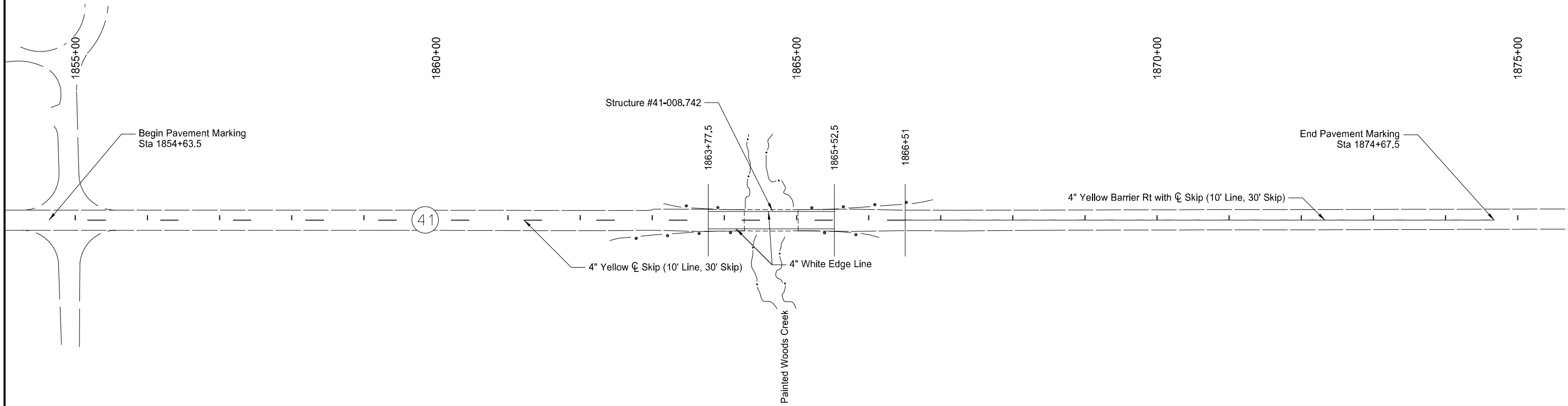
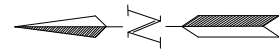
Note: See Standard Drawing D-704-16 for sign spacing

- Legend**
- Work Area
 - Staging Area
 - Type-III Barricade
 - Precast Concrete Median Barrier
 - Attenuation Device
 - Delineator Drum
 - Sign Post
 - Interim Traffic Signal

Work Zone Traffic Control
Phase 2
US Hwy 83
Various Structures - District 1
(Bismarck District)



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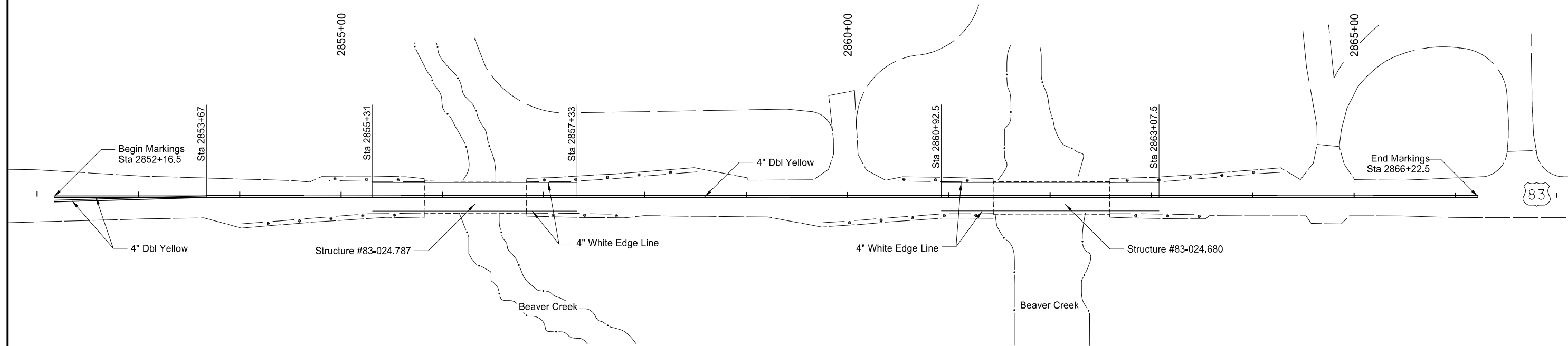
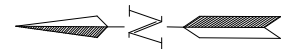


SPEC CODE	BID ITEM	QTY	UNIT
762 1104	PVMT MK PAINTED 4IN LINE		
	Sta 1863+77.5 to 1865+52.5 - White Edge Line Lt	175	LF
	Sta 1863+77.5 to 1865+52.5 - White Edge Line Rt	175	LF
	Sta 1854+63.5 to Sta 1866+51 - Yellow \varnothing Skip	297	LF
	Sta 1866+51 to Sta 1874+67.5 - Yellow Barrier Rt with \varnothing Skip	1021	LF

Pavement Marking Layout
 ND Hwy 41
 Various Structures - District 1
 (Bismarck District)

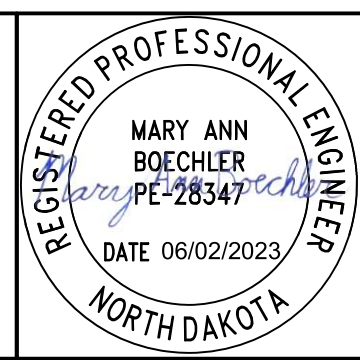


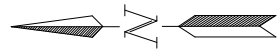
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-1-999(047)	120	2



SPEC	CODE	BID ITEM	QTY	UNIT
762	0113	EPOXY PVMT MK 4IN LINE		
		Sta 2852+16.5 to Sta 2853+67 - Yellow \bar{C} Dbl Barrier (x2)	602	LF
		Sta 2853+67 to Sta 2866+22.5 - Yellow \bar{C} Dbl Barrier	2511	LF
		Sta 2855+31 to Sta 2857+33 - White Edge Line Lt	202	LF
		Sta 2855+31 to Sta 2857+33 - White Edge Line Rt	202	LF
		Sta 2860+92.5 to Sta 2863+07.5 - White Edge Line Lt	215	LF
		Sta 2860+92.5 to Sta 2863+07.5 - White Edge Line Rt	215	LF

Pavement Marking Layout
 US Hwy 83
 Various Structures - District 1
 (Bismarck District)

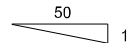




23 USC § 407 Documents
NDDOT Reserves All Objections

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ND	SS-1-999(047)	130	1

Remove existing area of gravel surfacing. Follow Standard Drawing D-764-48 to create guardrail embankment area with surfacing of 6" aggregate base course C15 and 2" HMA.



(D)

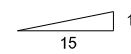
Finished Shoulder

ND Hwy 41

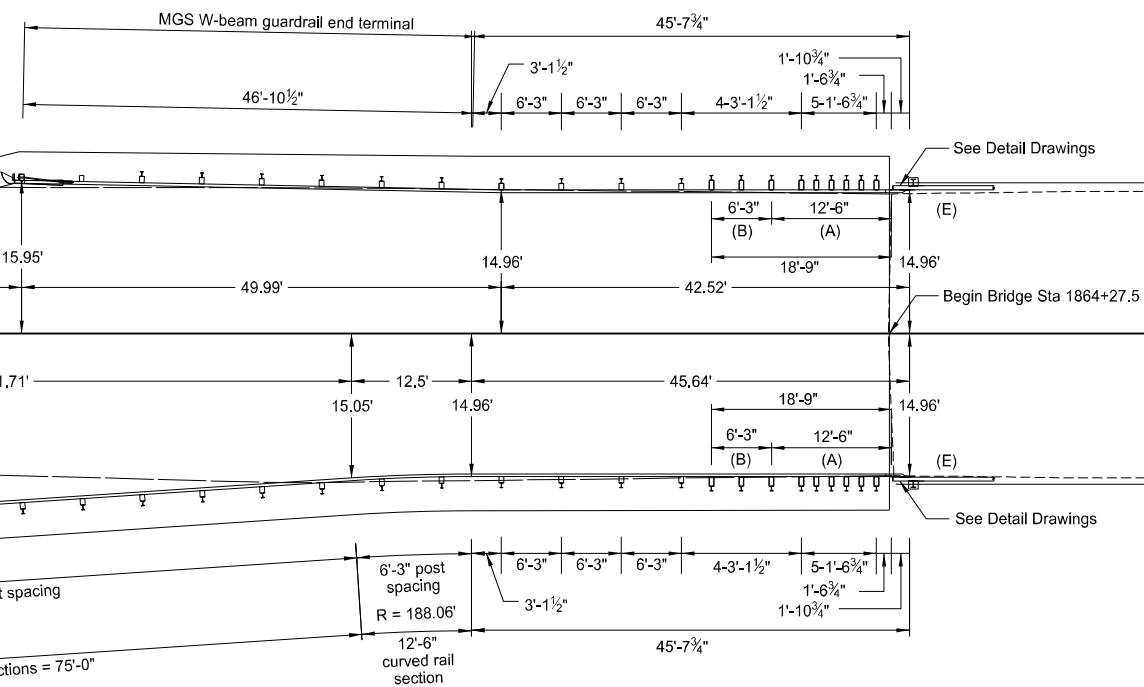
Finished Shoulder

Remove existing area of gravel surfacing. Follow Standard Drawing D-764-48 to create guardrail embankment area with surfacing of 6" aggregate base course C15 and 2" HMA.

(C)



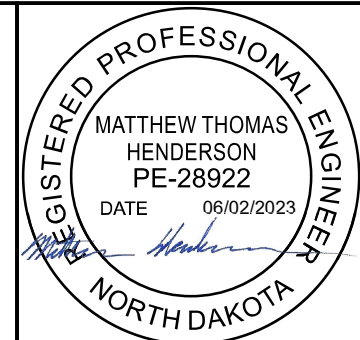
- (A) Thrie beam rail section (double thickness)
- (B) Symmetrical W-beam to thrie beam transition
- (C) Install a MGS FLEAT end terminal at this location. See Standard D-764-38. Instead of the CRT wood posts at posts 3 through 8 shown on D-764-38 install:
 Posts 3 through 6:
 Steel posts, per the manufacturer's recommendation, with 8" routed timber blocks.
 Posts 7 and 8:
 Standard steel line posts with 8" routed wood blocks. See plan details.
- (D) Install either a MASH SKT or a MASH SoftStop Terminal at this location.
 If a MASH SKT is installed, install the end terminal as shown above. See Standard D-764-51. Instead of the CRT wood posts at posts 3 through 8 shown on D-764-51 install:
 Posts 3 through 8:
 Standard steel line posts with 8" routed wood blocks. See plan details.
 If a MASH SoftStop is installed, install it with the offset as shown on Standard D-764-50. Additional guardrail embankment required is at the contractor's expense.
- (E) Remove 2 object markers at Station 1864+27.5, both sides of bridge

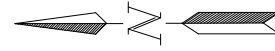


Thrie/MGS W-Beam Guardrail Layout
At Beginning of Bridge

Painted Woods Creek Bridge
RP 008.742

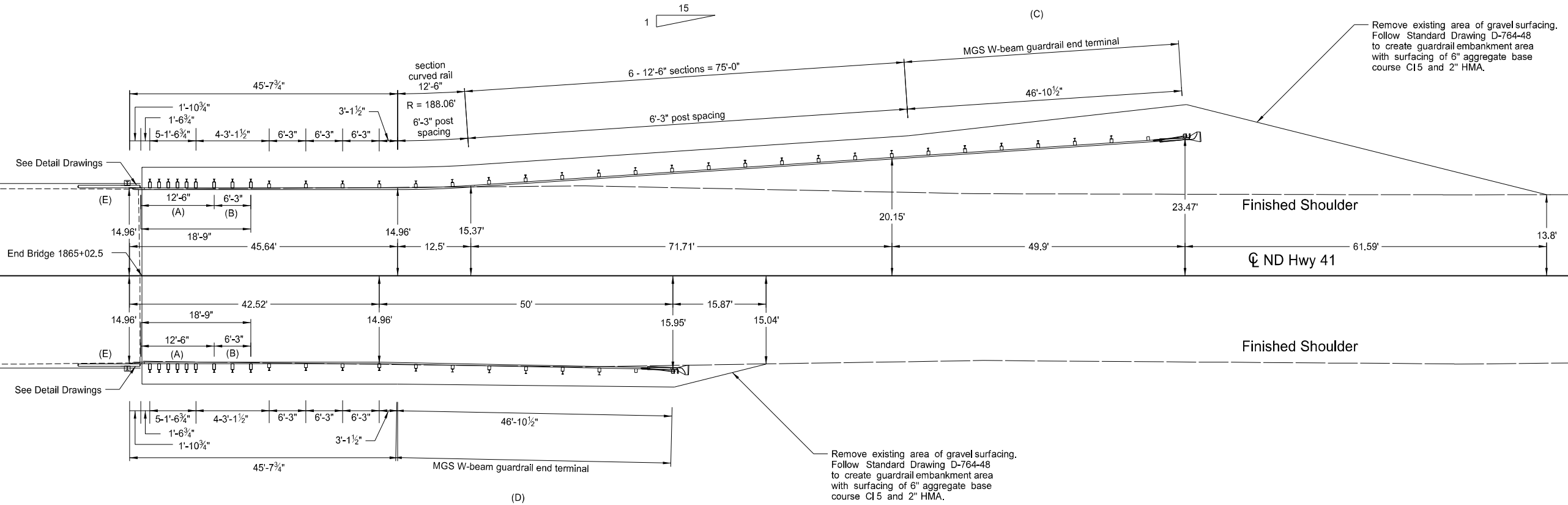
ND Hwy 41





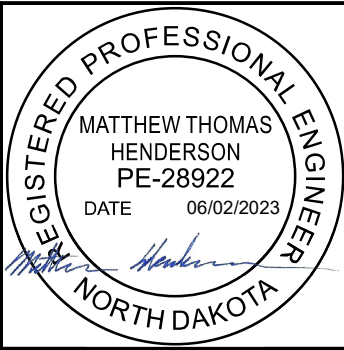
23 USC § 407 Documents
 NDDOT Reserves All Objections

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- (A) Thrie beam rail section (double thickness)
- (B) Symmetrical W-beam to thrie beam transition
- (C) Install a MGS FLEAT end terminal at this location. See Standard D-764-38. Instead of the CRT wood posts at posts 3 through 8 shown on D-764-38 install:
 Posts 3 through 6:
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 Posts 7 and 8:
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- (D) Install either a MASH SKT or a MASH SoftStop Terminal at this location.
 If a MASH SKT is installed, install the end terminal as shown above. See Standard D-764-51. Instead of the CRT wood posts at posts 3 through 8 shown on D-764-51 install:
 Posts 3 through 8:
 Standard steel line posts with 8" routed wood blocks. See plan details.
 If a MASH SoftStop is installed, install it with the offset as shown on Standard D-764-50. Additional guardrail embankment required is at the contractor's expense.
- (E) Remove 2 object markers at Station 1865+02.5, both sides of bridge

Thrie/MGS W-Beam Guardrail Layout
 At End of Bridge
 Painted Woods Creek Bridge
 RP 008.742
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	ND	SS-1-999(047)	130	3

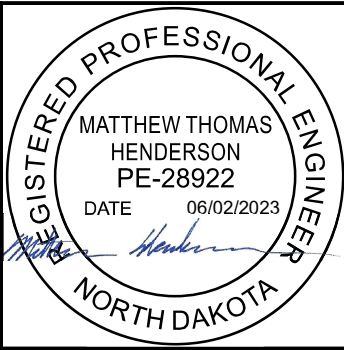
MGS W-BEAM GUARDRAIL SUMMARY OF QUANTITIES																
THRIE/MGS W-BEAM GUARDRAIL AT BRIDGE ENDS																
LOCATION	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
	5/8" Ø x 10" LONG GUARD- RAIL BOLT	W6 x 9 x 6'-0" POST	6" x 8" x 14" ROUTED TIMBER BLOCK	5/8" Ø x 1 1/4" LONG GUARD- RAIL BOLT	12'-6" STRAIGHT W-BEAM RAIL SECTION	12'-6" CURVED W-BEAM RAIL SECTION	REFL- ECTOR- IZED PLATES	W6 x 9 x 6'-6" POST	HSS12 x 6 x 1/4 x 1'-9 1/8" STEEL BLOCK	HSS12 x 6 x 1/4 x 1'-2" STEEL BLOCK	5/8" Ø x 14" LONG GUARD- RAIL BOLT	6'-3" W-THRIE BEAM TRANS- ITION SECTION	12'-6" DOUBLE THRIE BEAM SECTION	2'-6" THRIE BEAM TERM- INAL CON- NECTOR	7/8" Ø x 3/4" LONG BOLT	5/8" Ø x 2" LONG POST BOLT
	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH
Sta 1862+96.61 to 1864+29.60 Rt	18	20	18	160	8	1	7	7	7	2	1	1	1	1	5	2
Sta 1863+83.96 to 1864+29.60 Lt	4	6	4	48	2		3	7	7	2	1	1	1	1	5	2
Sta 1865+00.39 to 1865+46.04 Rt	4	6	4	48	2		3	7	7	2	1	1	1	1	5	2
Sta 1865+00.39 to 1866+33.38 Lt	18	20	18	160	8	1	7	7	7	2	1	1	1	1	5	2
TOTAL	44	52	44	416	20	2	20	28	28	8	4	4	4	4	20	8

SPEC CODE BID ITEM	QTY	UNIT
764 0131 W-BEAM GUARDRAIL		
Sta 1862+96.61 to 1864+29.60 Rt	133.2	LF
Sta 1863+83.96 to 1864+29.60 Lt	45.6	LF
Sta 1865+00.39 to 1865+46.04 Rt	45.6	LF
Sta 1865+00.39 to 1866+33.38 Lt	133.2	LF
764 0145 W-BEAM GUARDRAIL END TERMINAL		
Sta 1862+46.74 to 1862+96.63 Rt	1	LF
Sta 1863+33.97 to 1863+83.96 Lt	1	LF
Sta 1865+46.04 to 1865+96.03 Rt	1	LF
Sta 1866+33.37 to 1866+83.25 Lt	1	LF

SPEC CODE BID ITEM	QTY	UNIT
764 0151 REMOVE W-BEAM GUARDRAIL & POSTS		
Sta 1862+90.48 to 1864+29.60 Rt	135.5	LF
Sta 1863+46.32 to 1864+29.60 Lt	83.3	LF
Sta 1865+00.39 to 1865+73.50 Rt	83.3	LF
Sta 1865+00.39 to 1866+49.68 Lt	135.5	LF
764 2081 REMOVE END TREATMENT & TRANSITION		
Sta 1862+40.48 to 1862+90.48 Rt	1	LF
Sta 1863+14.40 to 1863+46.32 Lt	1	LF
Sta 1865+73.50 to 1866+15.89 Rt	1	LF
Sta 1866+49.68 to 1866+90.07 Lt	1	LF

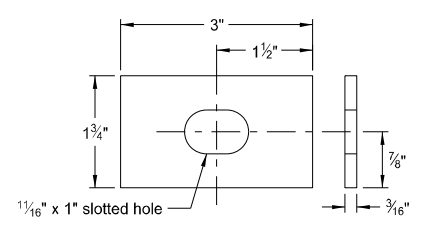
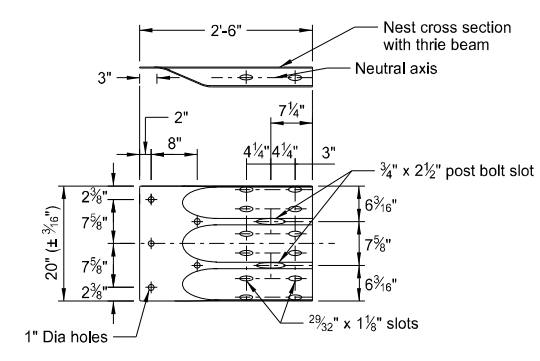
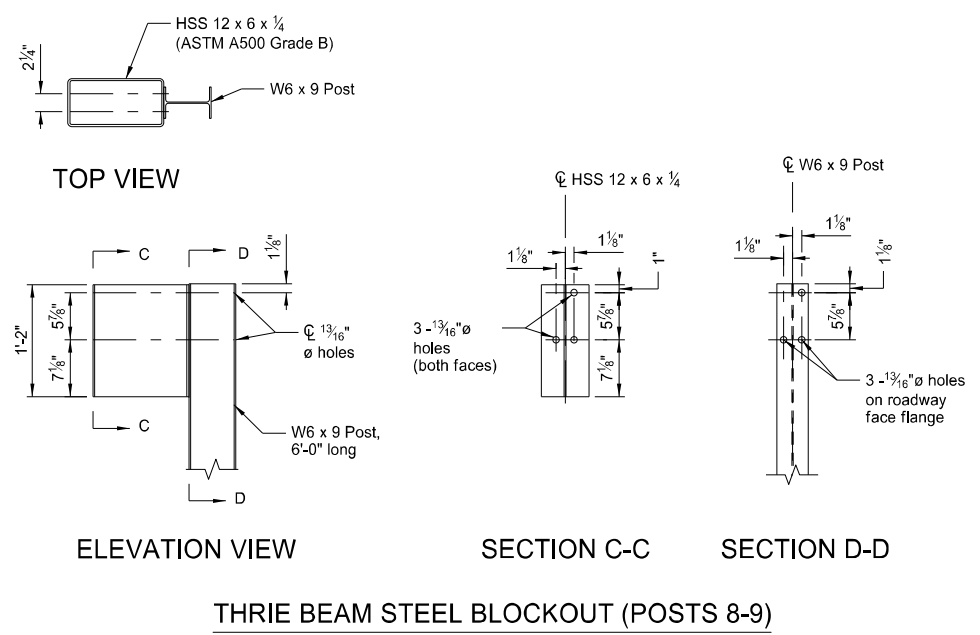
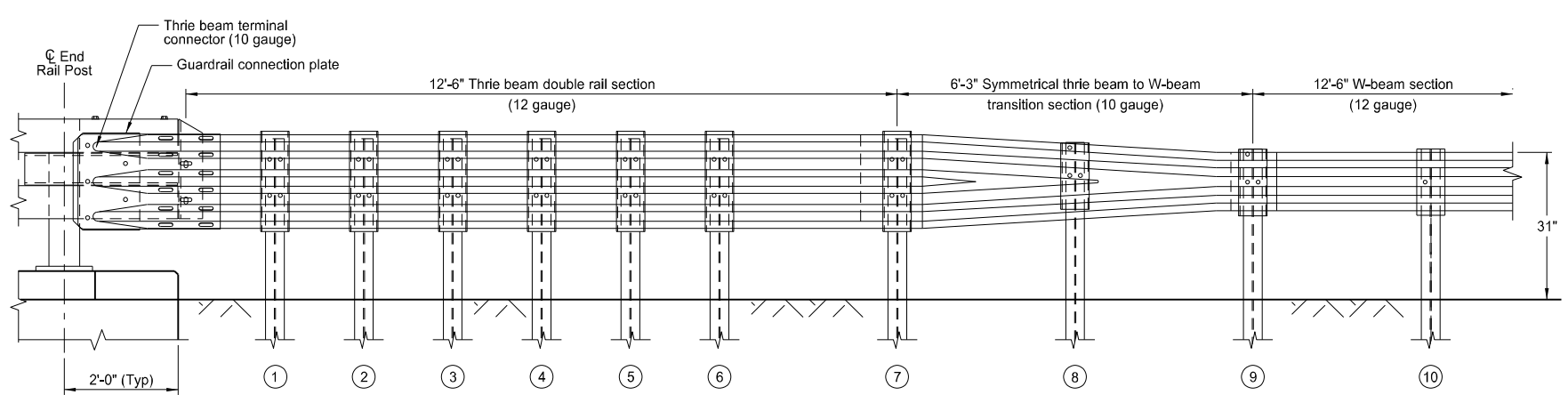
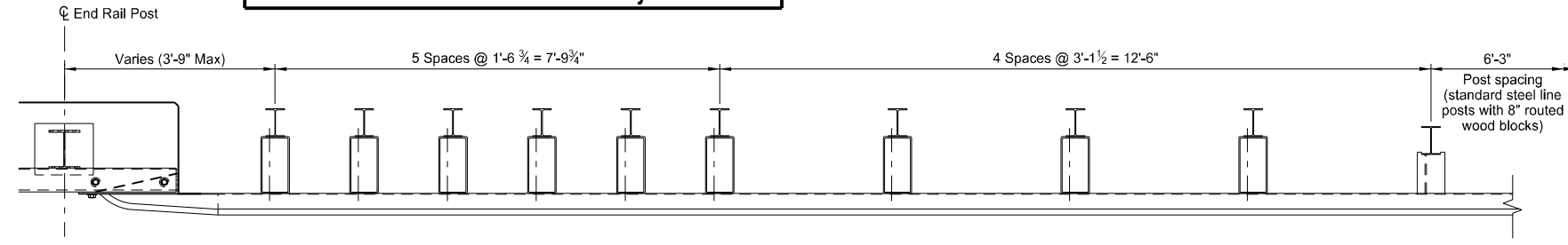
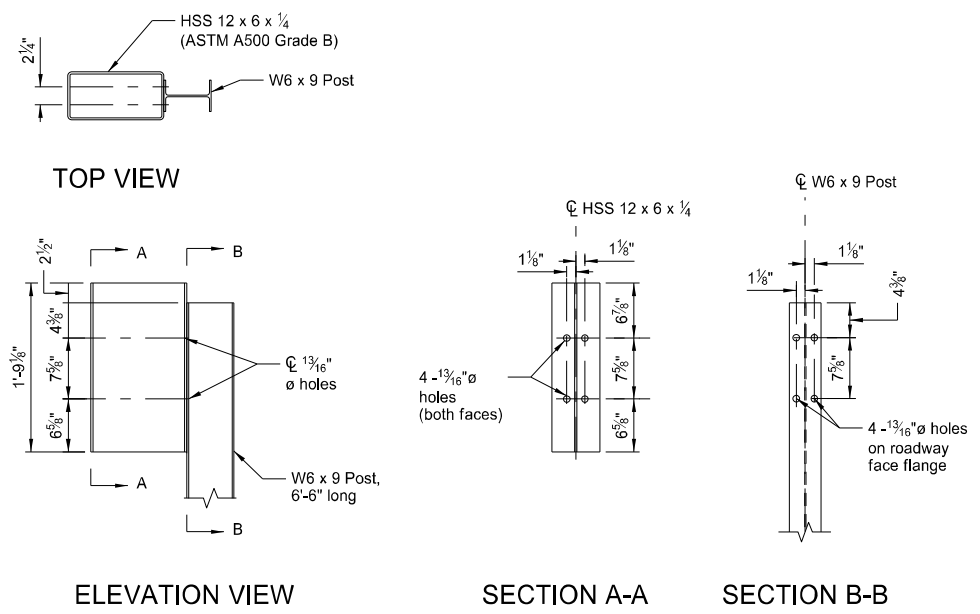
(A) Include these items in the contract unit price bid for "W-Beam Guardrail".

Thrie/MGS W-Beam Guardrail Quantities
Painted Woods Creek Bridge
RP 008.742
ND Hwy 41

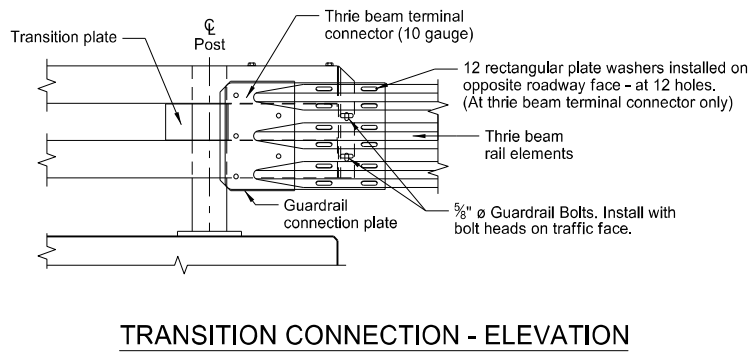
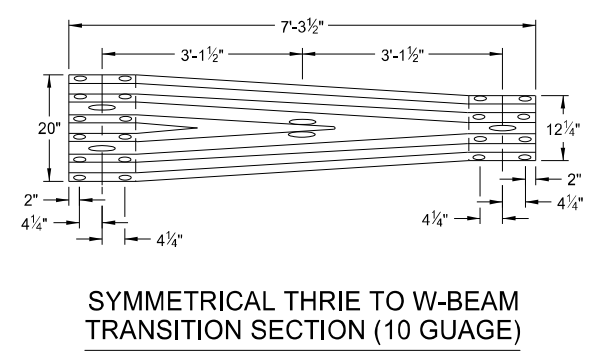
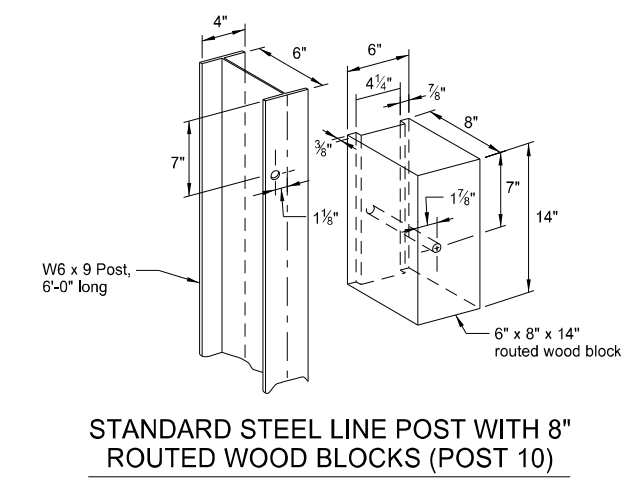


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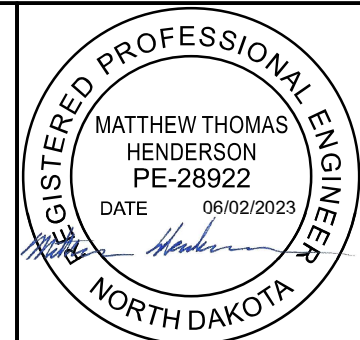
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-1-999(047)	130	4



TRANSITION POST AND BLOCKOUT SIZING		
POST NO.	POST SIZE	BLOCKOUT SIZE
1-7	W6 x 9 x 6'-6" long	HSS 12 x 6 x 1/4 x 1'-9 1/8" long
8-9	W6 x 9 x 6'-0" long	HSS 12 x 6 x 1/4 x 1'-2" long
10	W6 x 9 x 6'-0" long	6" x 8" x 14" routed wood

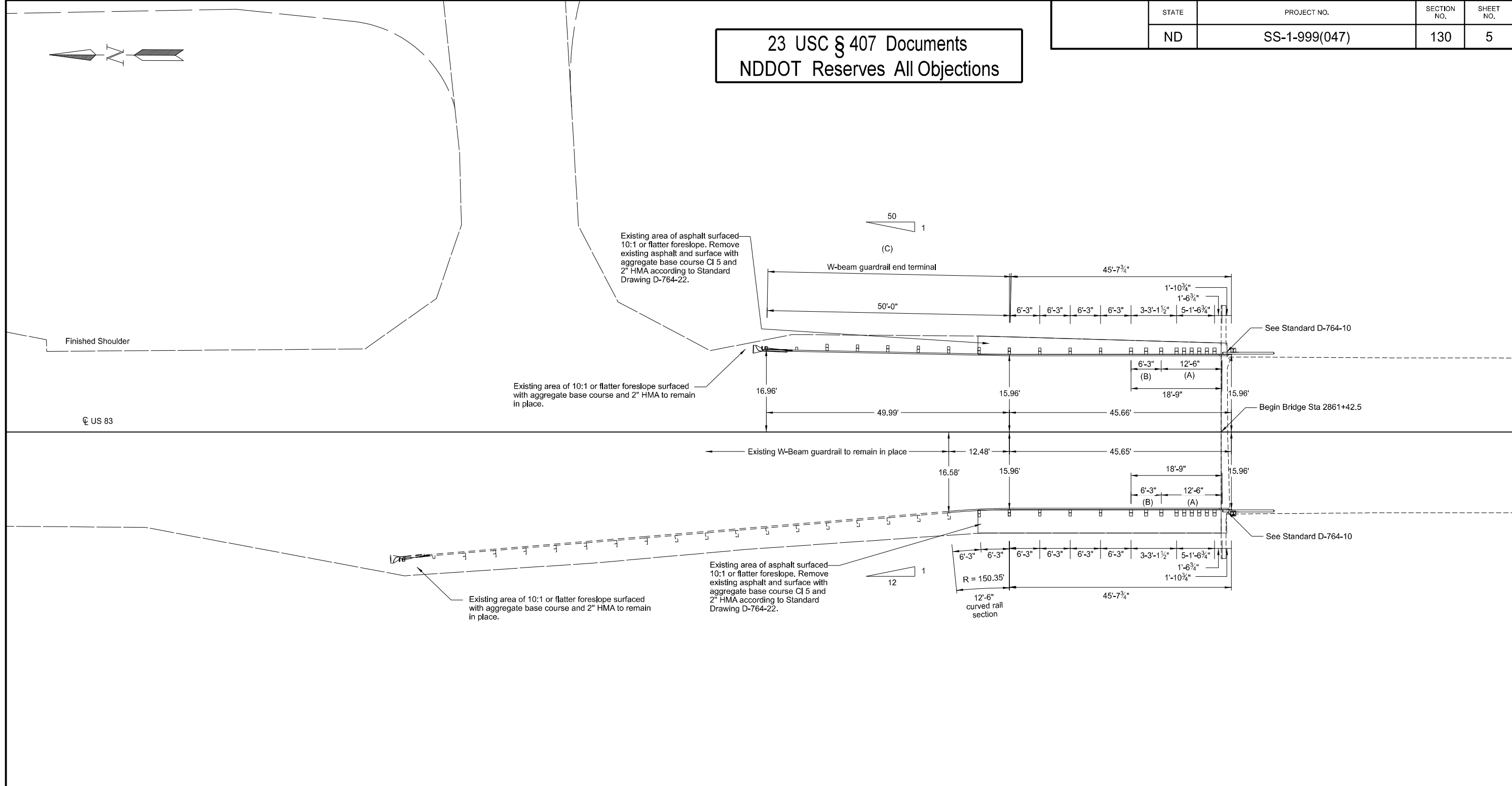


Thrie/MGS W-Beam Transition to Double Box Beam Retrofit Detail
 Painted Woods Creek Bridge
 RP 008.742
 ND Hwy 41



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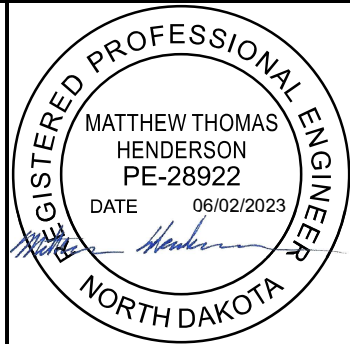
- (A) Thrie beam rail section (double thickness)
- (B) Symmetrical W-Thrie beam transition section (double thickness)
- (C) Reset existing SKT end terminal at this location.

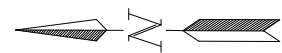
SPEC	CODE	BID ITEM	QTY	UNIT
764	0150	REMOVE & RESET GUARDRAIL		
		Sta 2860+48.96 to 2861+44.61 Lt	95.7	LF
		Sta 2860+86.49 to 2861+44.61 Lt	58.1	LF

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

Beaver Creek Bridge
 RP 024.680

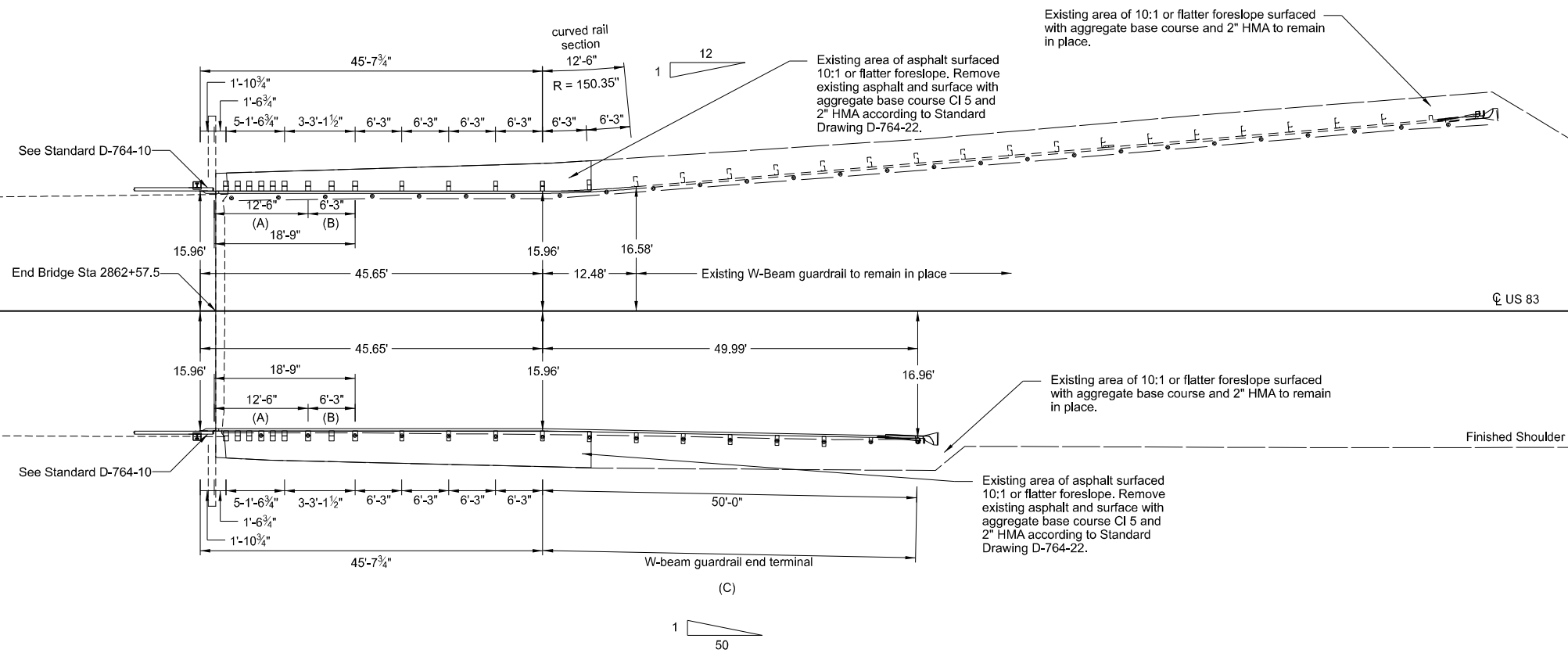
US Hwy 83





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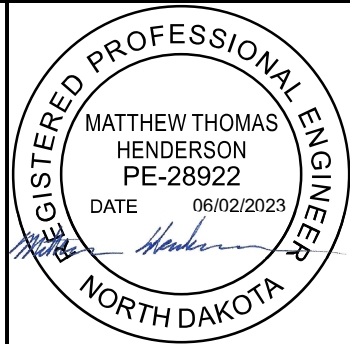
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-1-999(047)	130	6

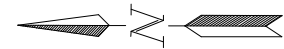


- (A) Thrie beam rail section (double thickness)
- (B) Symmetrical W-Thrie beam transition section (double thickness)
- (C) Reset existing SKT end terminal at this location.

SPEC	CODE	BID ITEM	QTY	UNIT
764	0150	REMOVE & RESET GUARDRAIL		
		Sta 2862+55.40 to 2863+13.52 Lt	95.7	LF
		Sta 2862+55.40 to 2863+51.03 Rt	58.1	LF

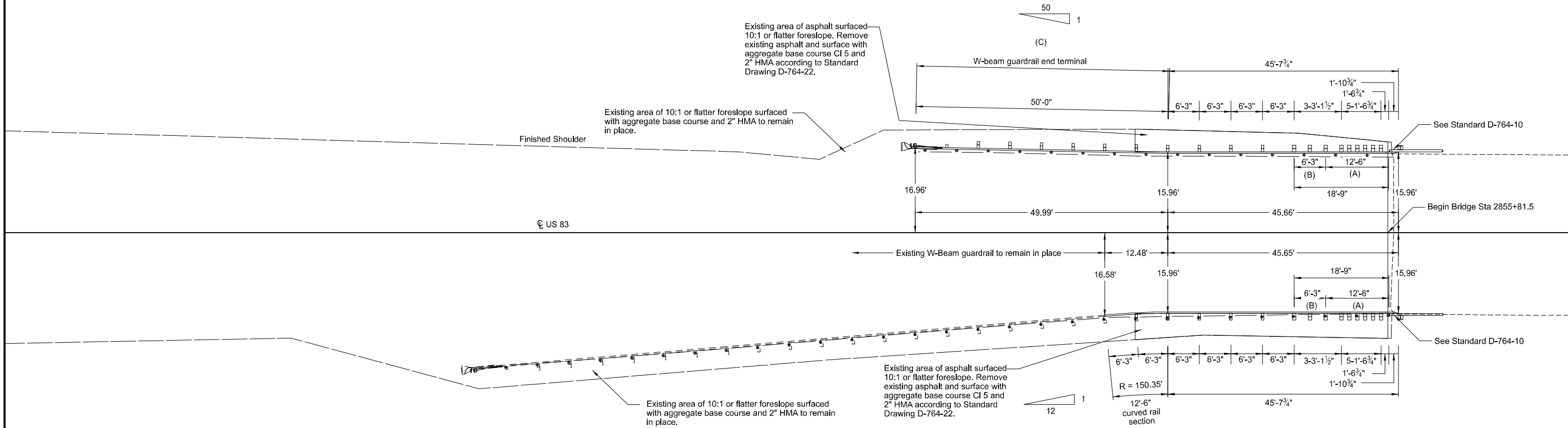
Thrie/MGS W-Beam Guardrail Layout
 At End of Bridge
 Beaver Creek Bridge
 RP 024.680
 US Hwy 83





23 USC § 407 Documents
 NDDOT Reserves All Objections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-1-999(047)	130	7



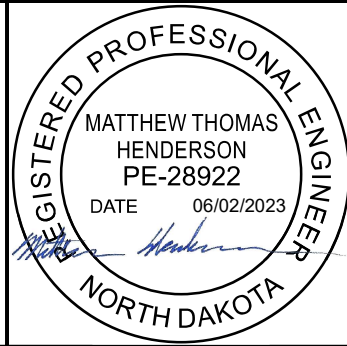
- (A) Thrie beam rail section (double thickness)
- (B) Symmetrical W-Thrie beam transition section (double thickness)
- (C) Reset existing SKT end terminal at this location.

SPEC	CODE	BID ITEM	QTY	UNIT
764	0150	REMOVE & RESET GUARDRAIL		
		Sta 2854+87.93 to 2855+83.57 Lt	95.7	LF
		Sta 2855+25.45 to 2855+83.57 Rt	58.1	LF

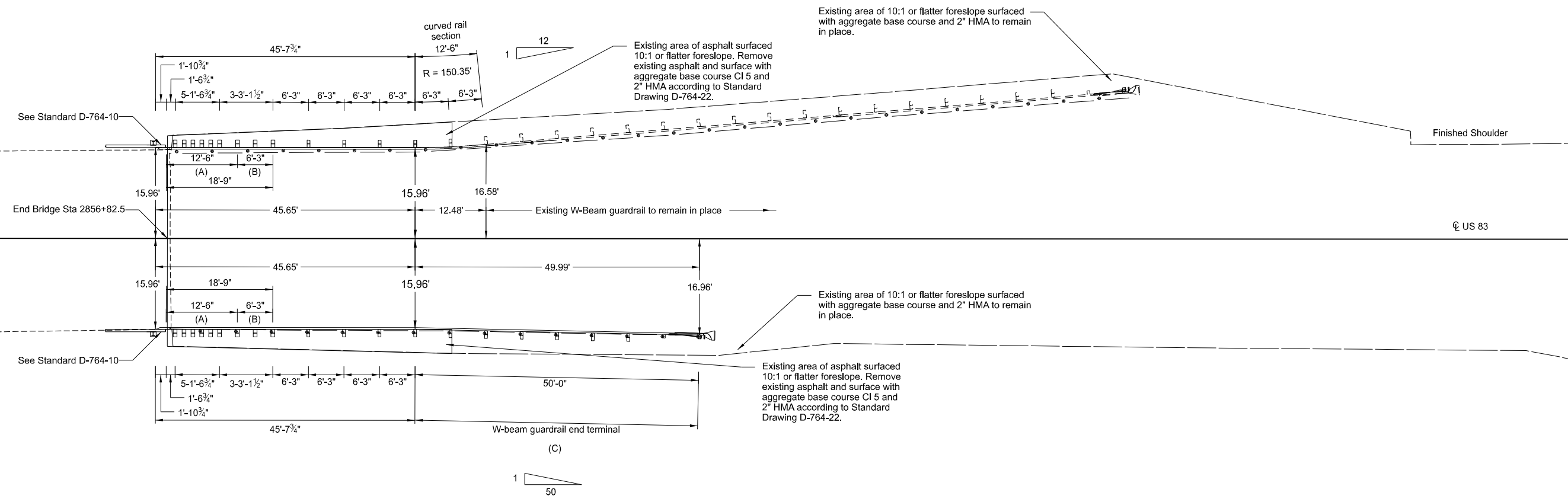
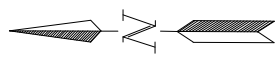
Thrie/MGS W-Beam Guardrail Layout
 At Beginning of Bridge

Beaver Creek Bridge
 RP 024.787

US Hwy 83



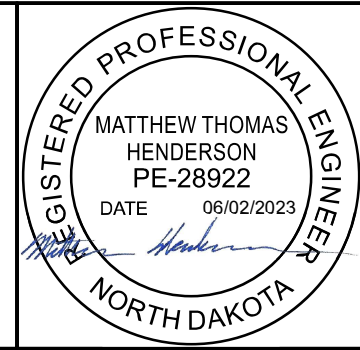
23 USC § 407 Documents
 NDDOT Reserves All Objections



SPEC	CODE	BID ITEM	QTY	UNIT
764	0150	REMOVE & RESET GUARDRAIL		
		Sta 2856+80.36 to 2857+75.99 Rt	95.7	LF
		Sta 2856+80.36 to 2857+38.48 Lt	58.1	LF

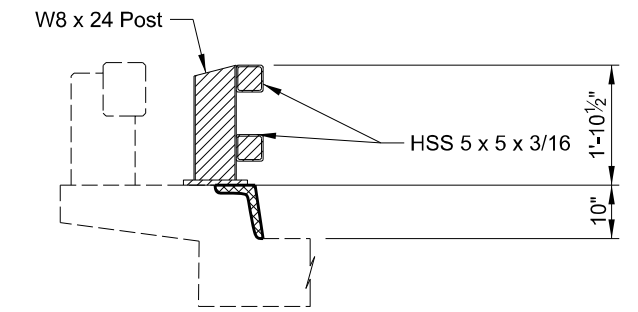
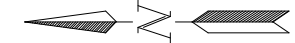
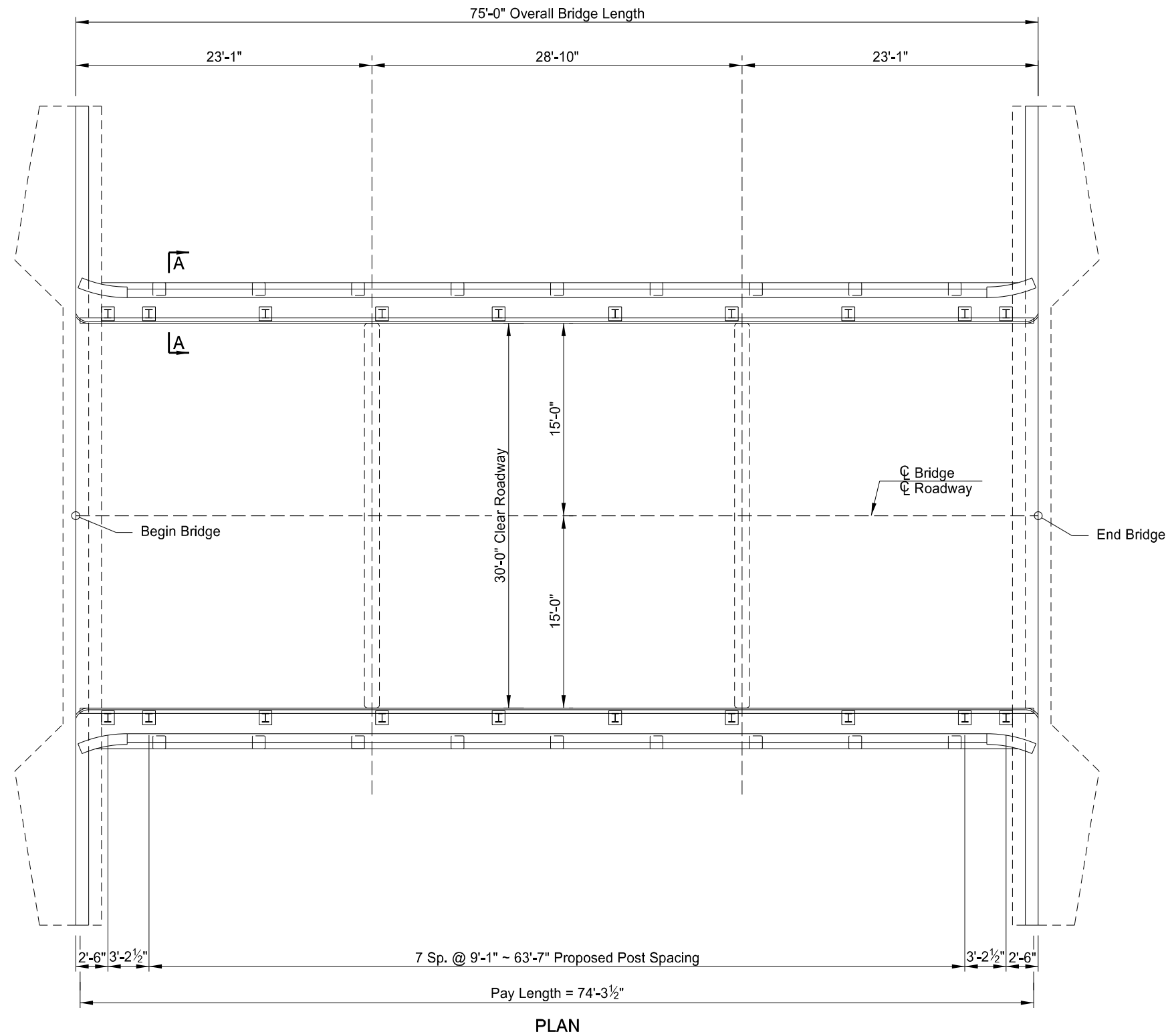
- (A) Thrie beam rail section (double thickness)
- (B) Symmetrical W-Thrie beam transition section (double thickness)
- (C) Reset existing SKT end terminal at this location.

Thrie/MGS W-Beam Guardrail Layout
 At End of Bridge
 Beaver Creek Bridge
 RP 024.787
 US Hwy 83



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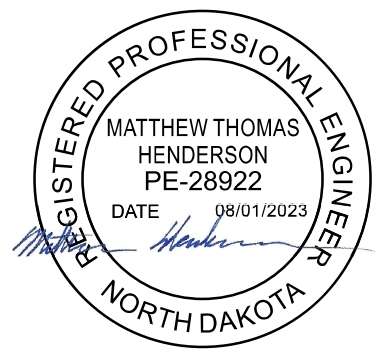
(SPALL REPAIR AND RAIL REMOVAL)

SECTION A-A

- Hatched area indicates existing double box beam steel rail retrofit to be removed. Include the removal of the existing rail retrofit in the contract unit price for "Double Box Beam Rail Retrofit - Free Standing."
- Hatched area indicates curb spall.

BRIDGE BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	316
624	3001	DOUBLE BOX BEAM RAIL RETROFIT-FREE STANDING	LF	149
650	0704	OVERLAY CONCRETE	CY	12.2
650	0707	DECK CONCRETE	CY	4.2
650	0710	CLASS 1-H REMOVAL	SY	250
650	0711	CLASS 2-H REMOVAL	SY	61
650	0712	CLASS 3-H REMOVAL	SY	16
930	9612	SPALL REPAIR	SF	10



PAINTED WOODS CREEK

BRIDGE LAYOUT

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

Thorenson, Jason R.

08/21/23

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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NOTES

100 SCOPE OF WORK: This project consists of removing the existing bridge rail, placing a concrete deck overlay, curb spall repair, and double box beam rail retrofit.

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

After the solution has cured, apply a silicone sealant meeting the requirements of Section 826.02.B.1 along the interface of the overlay and curbs. Include the cost of the silicone sealant in the price bid for the penetrating water repellent.

650 OVERLAY CONCRETE: Use cement that meets the requirements of AASHTO M240, Type IL(MS).

An additional ¼" depth of overlay concrete was included in the overlay concrete quantities to account for the irregular surface profile from milling.

The Engineer will measure overlay concrete based on the mobile mixer count and the yield box. The Engineer will determine the quantity of concrete placed by taking counter readings from the mixer before and after each placement and multiplying the readings by the meter count determined by the yield test.

The Engineer will deduct waste concrete from the measured quantity. The Contractor and Engineer will agree upon the amount of waste, including the material used in the yield test, at the end of each day.

Use a mix design that has the weights per cubic yard shown in the below table.

Cement	600 lbs
Coarse aggregate (Size 5)	1700 lbs
Fine aggregate	1425 lbs
Water	230 lbs
Air entrainment admixture	5%-8%
Mid-range water reducer	Manufacturer dosage

930 SPALL REPAIR: The curb has spalling as shown in the plans. Actual limits of repair should be determined by the Engineer in the field.

Remove all unsound concrete and replace it with new concrete material. Use a 15-pound maximum size chipping hammer on any unsound concrete. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Remove enough concrete in unsound areas to get behind periphery of outer reinforcing a minimum of 1".

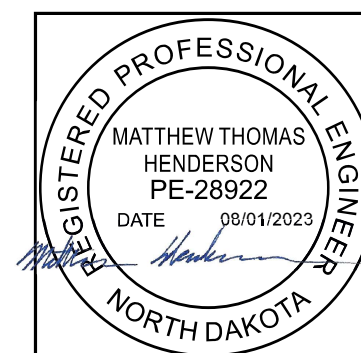
Sand blast clean the existing concrete and exposed reinforcing steel. Clean the existing concrete surface by high pressure water blasting. After the surface has dried and just before the patching material is placed, coat the surface with an epoxy bonding agent as recommended by the manufacturer.

Use a two component, polymer-modified, cementitious repair mortar material that is specifically intended for patching concrete and contains a corrosion inhibitor. This patching material may be SikaTop 123 Plus (Sika Corporation), Duraltop Gel (Euclid Chemical Company), MasterEmaco N 400 (BASF Corporation), or an approved equal repair mortar. Cure the material as recommended by the manufacturer.

930 CRACK SEALING: After the penetrating water repellent has been applied and is dry, the Engineer will perform a visual inspection of the bridge deck overlay to determine the need for crack sealing. Mark and seal all visible cracks appearing on the top surface 0.007" or greater in width at its widest segment or as directed by the Engineer.

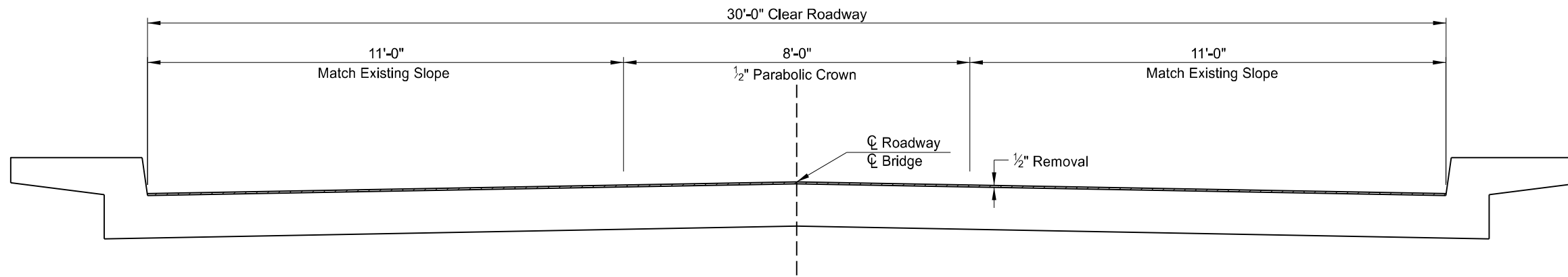
Immediately before applying the sealer, clean the cracks by removing all dust and debris with compressed air. Seal the cracks with a two-part epoxy in accordance with the manufacturer's recommendations. Chase cracks with a sealant applicator to limits of crack, including those portions that are narrower 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 the costs for crack sealing the deck overlay in the price bid for overlay concrete.

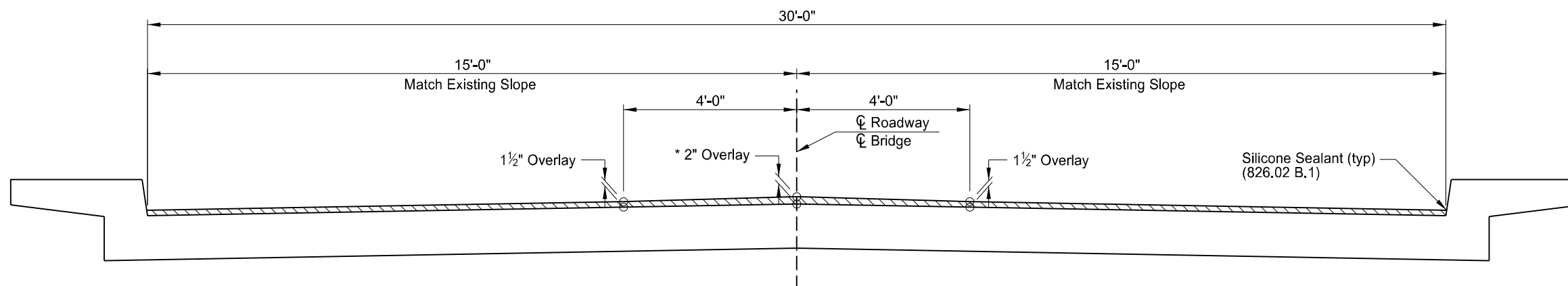


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NDDOT Reserves All Objections

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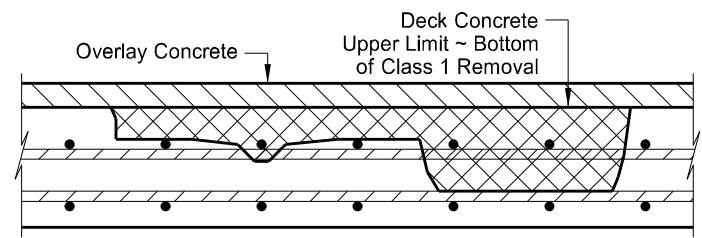


(SHOWING REMOVAL)
TYPICAL DECK SECTION



* 2" assumed to establish normal crown.

(SHOWING OVERLAY)
TYPICAL DECK SECTION



(DECK CONCRETE)
BRIDGE DECK SECTION



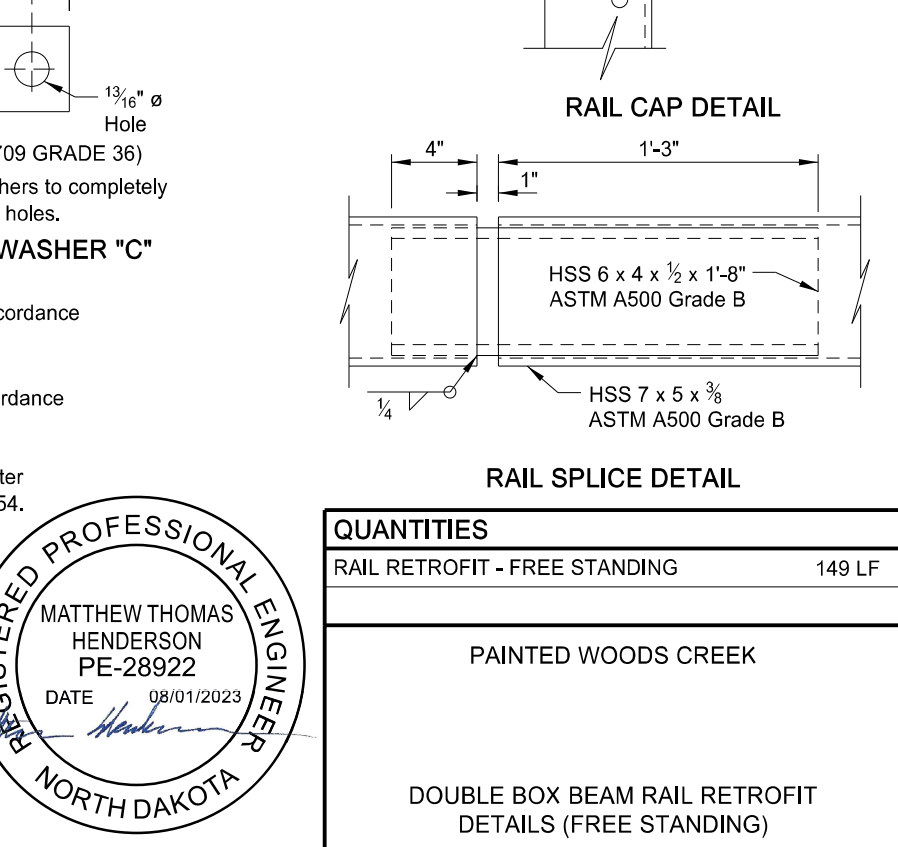
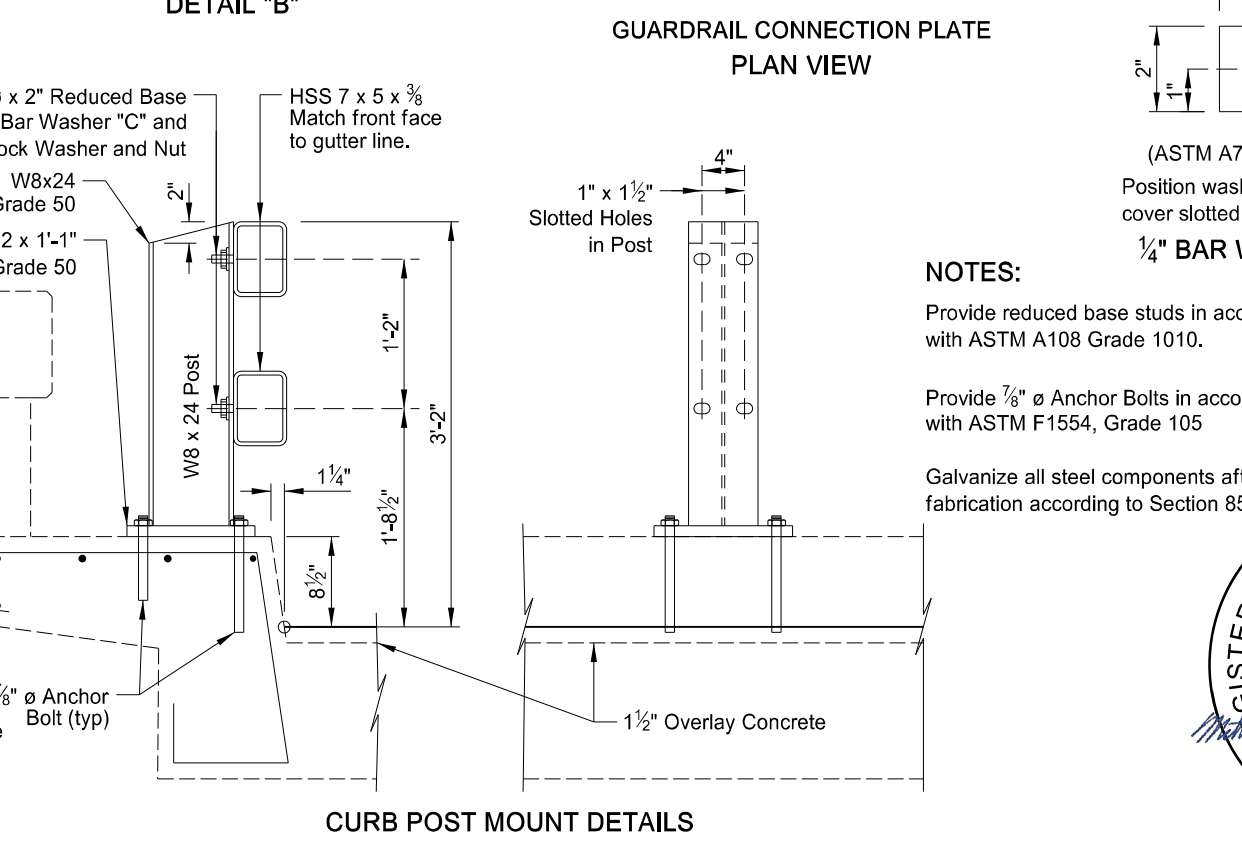
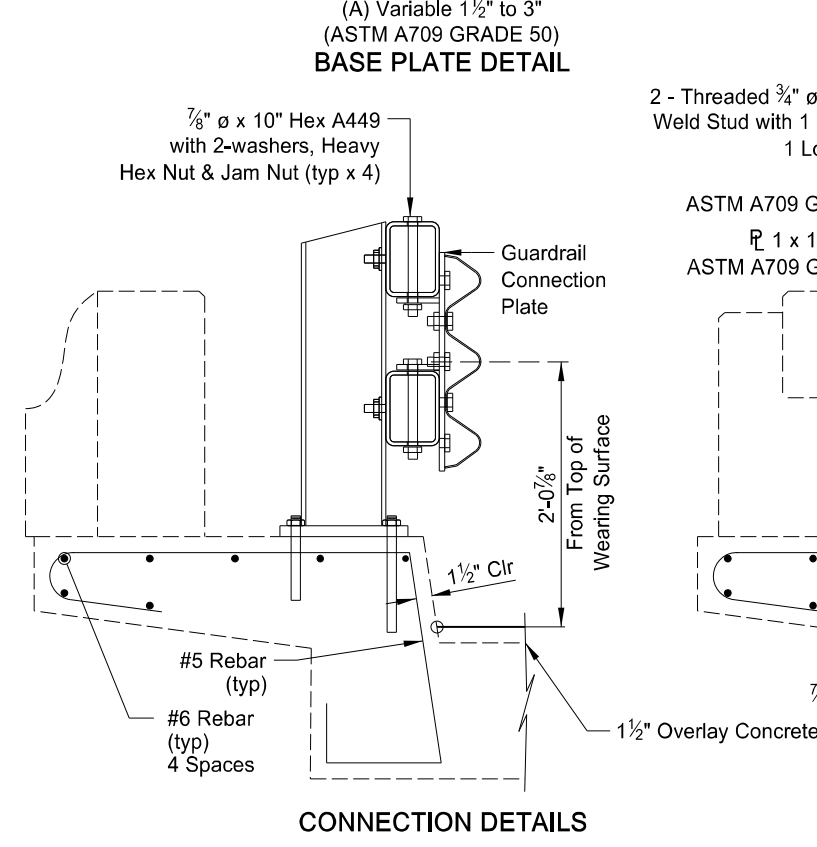
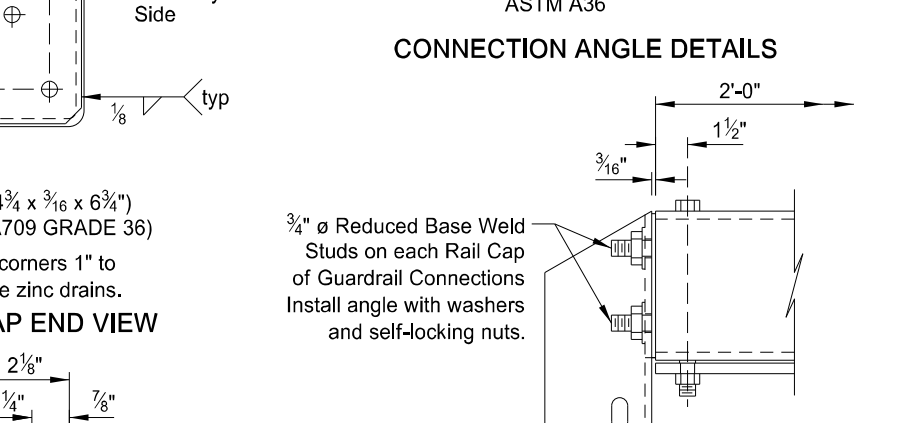
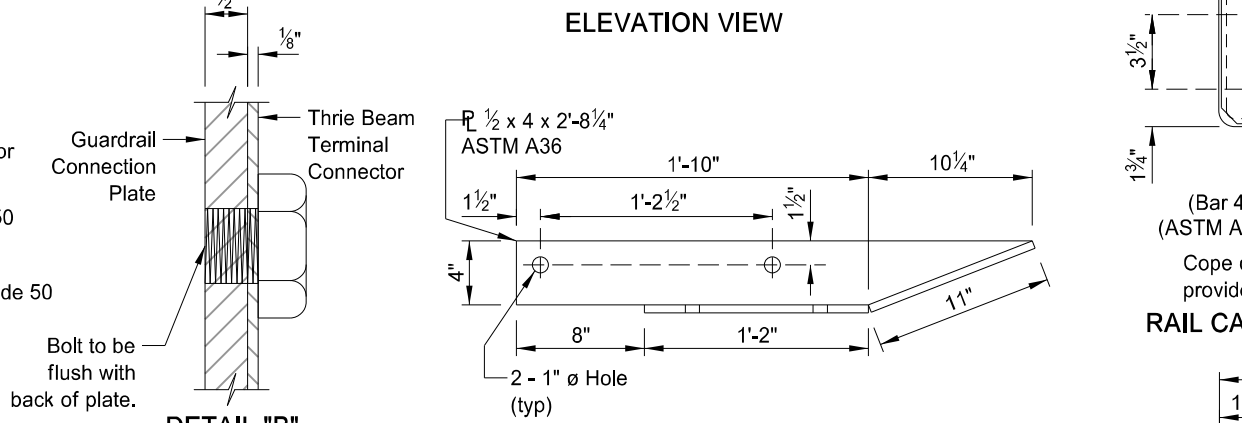
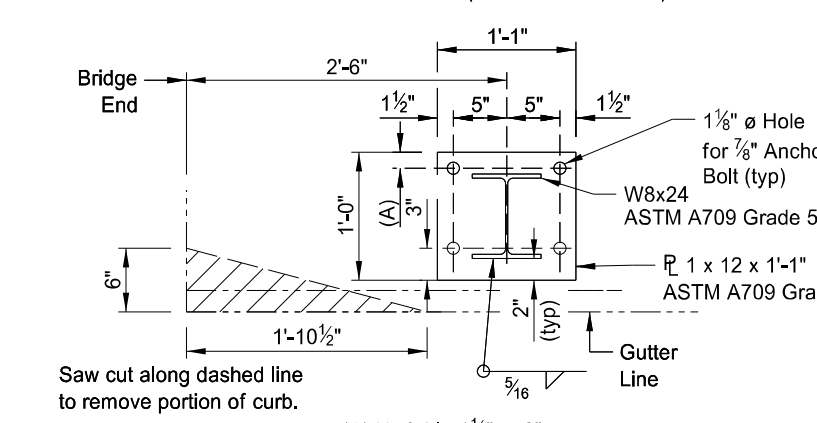
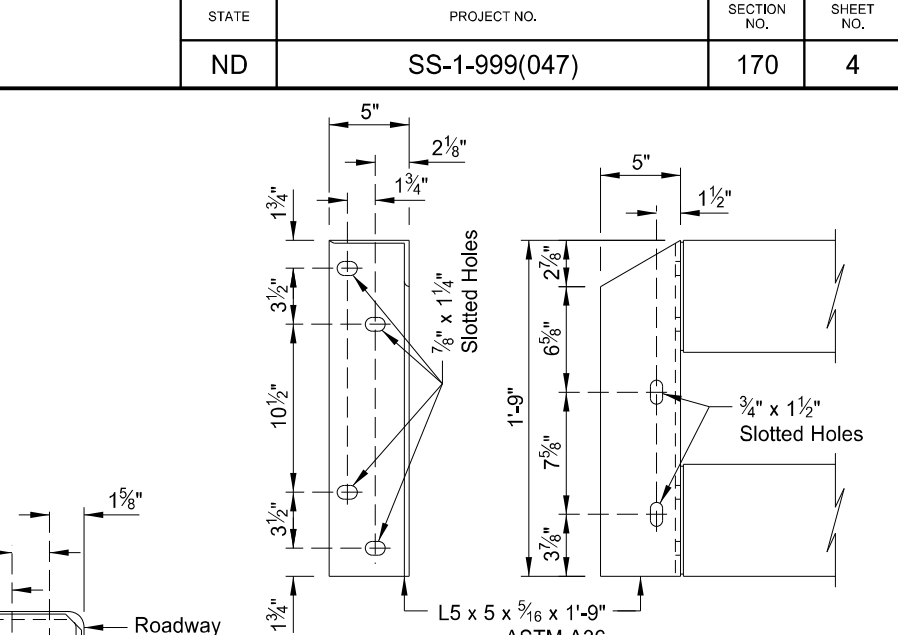
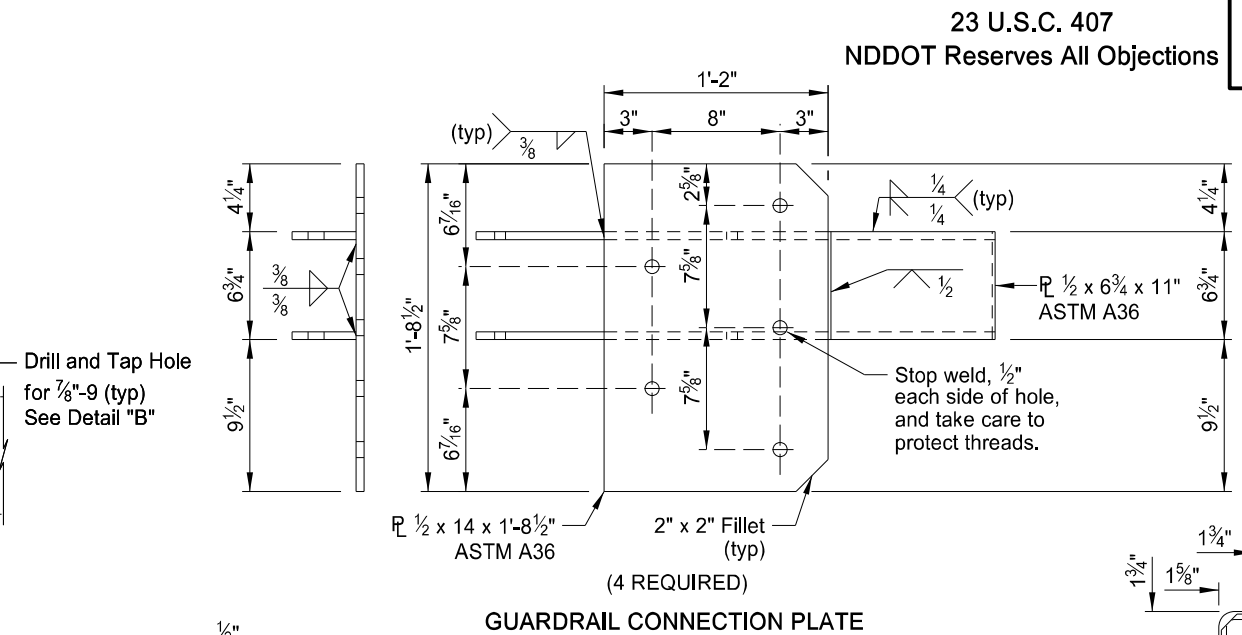
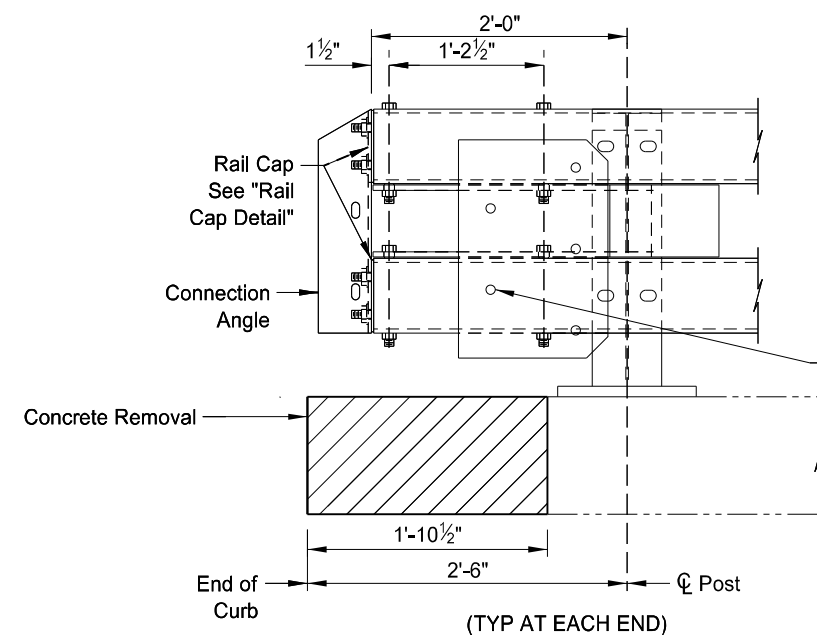
QUANTITIES	
OVERLAY CONCRETE	12.2 CY
DECK CONCRETE	4.2 CY
CLASS 1-H REMOVAL	250 SY
CLASS 2-H REMOVAL	61 SY
CLASS 3-H REMOVAL	16 SY

PAINTED WOODS CREEK

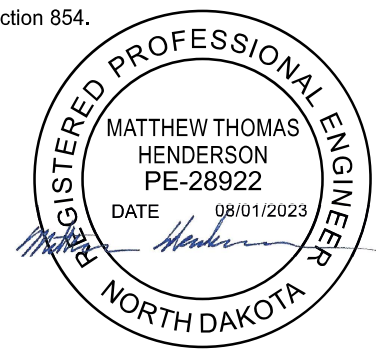
DECK OVERLAY DETAILS

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

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-1-999(047)	170	4



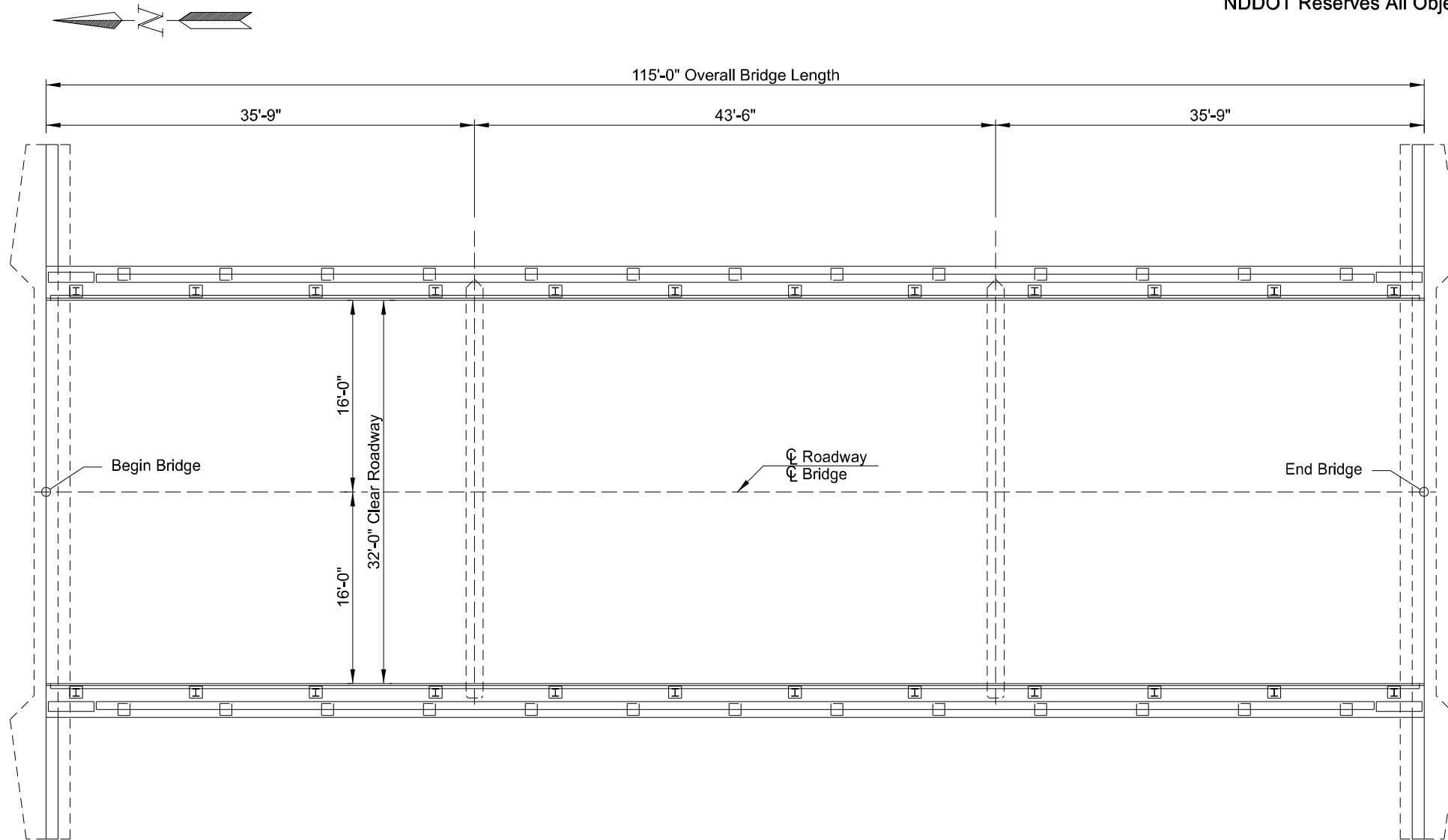
- NOTES:**
- Provide reduced base studs in accordance with ASTM A108 Grade 1010.
 - Provide 7/8" ϕ Anchor Bolts in accordance with ASTM F1554, Grade 105
 - Galvanize all steel components after fabrication according to Section 854.



QUANTITIES	
RAIL RETROFIT - FREE STANDING	149 LF
PAINTED WOODS CREEK	
DOUBLE BOX BEAM RAIL RETROFIT DETAILS (FREE STANDING)	

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

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-1-999(047)	170	5



PLAN

BRIDGE BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
550	0210	PCC PAVEMENT GRINDING	SY	409
602	1250	PENETRATING WATER REPELLENT	SY	503
650	0704	OVERLAY CONCRETE	CY	19.9
650	0707	DECK CONCRETE	CY	5.7
650	0710	CLASS 1-H REMOVAL	SY	409
650	0711	CLASS 2-H REMOVAL	SY	82
650	0712	CLASS 3-H REMOVAL	SY	21



BEAVER CREEK BRIDGE SOUTH OF LINTON	
BRIDGE LAYOUT	
ND DEPARTMENT OF TRANSPORTATION BRIDGE DIVISION	
Thorenson, Jason R.	08/21/23

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-1-999(047)	170	6

NOTES

- 100 SCOPE OF WORK: This project consists of removing an asphalt overlay and placing a concrete deck overlay.
- 550 PCC PAVEMENT GRINDING: The bridge deck has been overlaid by ±2 inches of bituminous pavement. Remove the bituminous pavement from the concrete surface by milling or diamond grinding. Do not damage the surface of the bridge deck when removing the bituminous pavement. Use a milling machine that meets the requirements of Section 156.03. Plan quantity of "PCC Pavement Grinding" will be paid no matter how many passes it takes to remove all the bituminous pavement from the bridge deck.
- 602 PENETRATING WATER REPELLENT TREATMENT: Apply the penetrating water repellent solution to the top of deck and to the front face and top of curbs. Apply penetrating water repellent solution prior to sealing any bridge deck overlay cracks. Do not apply pavement marking or allow traffic until solution has completely penetrated and the entire driving surface is dry.

After the solution has cured, apply a silicone sealant meeting the requirements of Section 826.02.B.1 along the interface of the overlay and curbs. Include the cost of the silicone sealant in the price bid for the penetrating water repellent.

- 650 OVERLAY CONCRETE: Use cement that meets the requirements of AASHTO M240, Type IL(MS).

An additional ¼" depth of overlay concrete was included in the overlay concrete quantities to account for the irregular surface profile from milling.

The Engineer will measure overlay concrete based on the mobile mixer count and the yield box. The Engineer will determine the quantity of concrete placed by taking counter readings from the mixer before and after each placement and multiplying the readings by the meter count determined by the yield test.

The Engineer will deduct waste concrete from the measured quantity. The Contractor and Engineer will agree upon the amount of waste, including the materials used in the yield test, at the end of each day.

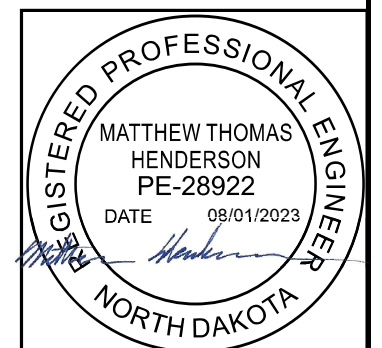
Use a mix design that has the weights per cubic yard shown in the below table.

Cement	600 lbs
Coarse aggregate (Size 5)	1700 lbs
Fine aggregate	1425 lbs
Water	230 lbs
Air entrainment admixture	5%-8%
Mid-range water reducer	Manufacturer dosage

- 930 CRACK SEALING: After penetrating repellent has been applied and is dry, the Engineer will perform a visual inspection of the bridge deck overlay to determine the need for crack sealing. Mark and seal all visible cracks appearing on the top surface 0.007" or greater in width at its widest segment or as directed by the Engineer.

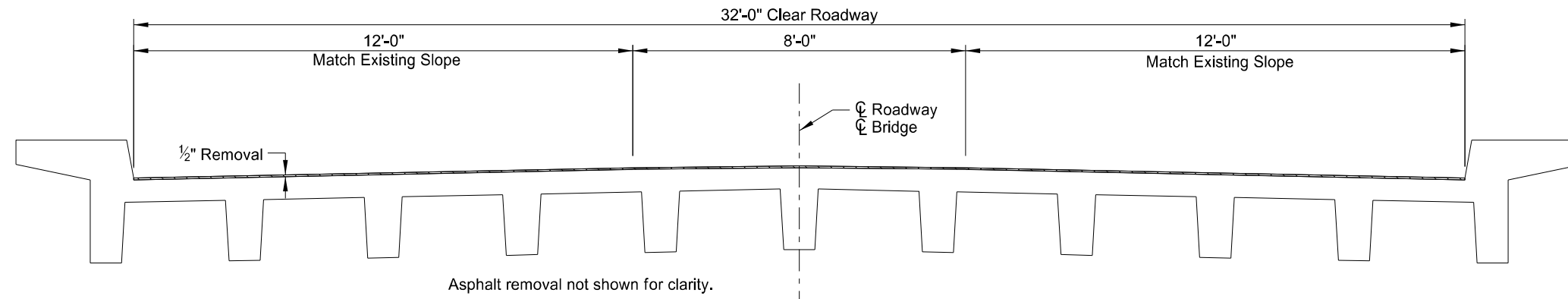
Immediately before applying the sealer, clean the cracks by removing all dust and debris with compressed air. Seal the cracks with a two-part epoxy in accordance with the manufacturer's recommendations. Chase cracks with a sealant applicator to limits of crack, including those portions that are narrower 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 the costs for crack sealing the deck overlay in the price bid for overlay concrete.

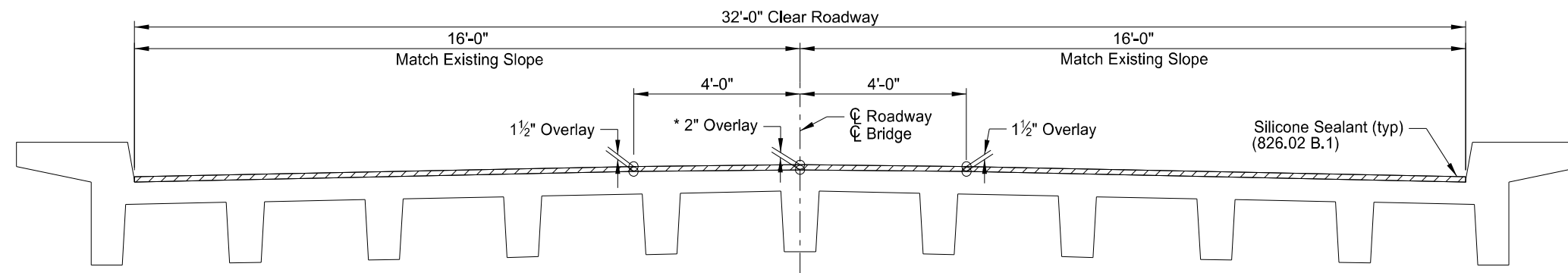


23 U.S.C. 407
NDDOT Reserves All Objections

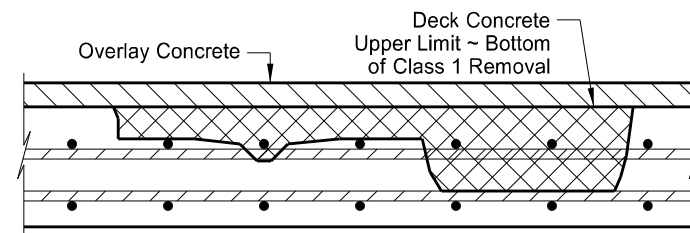
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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(SHOWING REMOVAL)
TYPICAL DECK SECTION



(SHOWING OVERLAY)
TYPICAL DECK SECTION



(DECK CONCRETE)
BRIDGE DECK SECTION



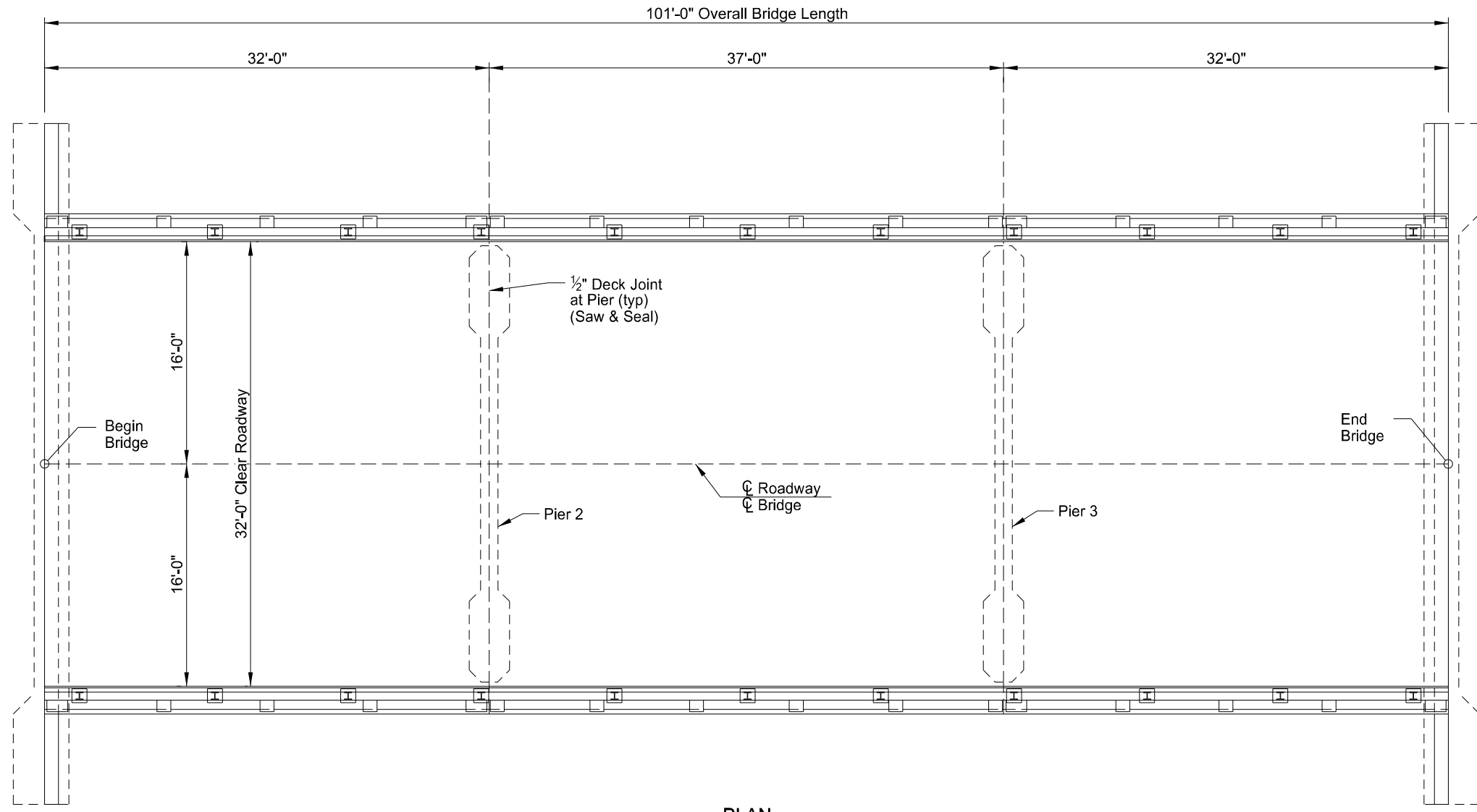
QUANTITIES	
OVERLAY CONCRETE	19.9 CY
DECK CONCRETE	5.7 CY
CLASS 1-H REMOVAL	409 SY
CLASS 2-H REMOVAL	82 SY
CLASS 3-H REMOVAL	21 SY

BEAVER CREEK BRIDGE
SOUTH OF LINTON

DECK OVERLAY DETAILS

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

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-1-999(047)	170	8



PLAN

BRIDGE BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
550	0210	PCC PAVEMENT GRINDING	SY	360
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	425
650	0704	OVERLAY CONCRETE	CY	17.5
650	0707	DECK CONCRETE	CY	5.0
650	0710	CLASS 1-H REMOVAL	SY	360
650	0711	CLASS 2-H REMOVAL	SY	72
650	0712	CLASS 3-H REMOVAL	SY	18
930	8644	SILICONE SEALANT	LF	66
930	9612	SPALL REPAIR	SF	12



BEAVER CREEK
IN LINTON

BRIDGE LAYOUT

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

Thorenson, Jason R.
08/21/23

Jason Thorenson

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-1-999(047)	170	9

NOTES

100 SCOPE OF WORK: This project consists of removing an asphalt overlay, placing a concrete deck overlay, deck spall repair, curb spall repair, pier spall repair, and girder patching.

550 PCC PAVEMENT GRINDING: The bridge deck has been overlaid with ±2 inches of bituminous pavement. Remove the bituminous pavement from the concrete surface by milling or diamond grinding. Do not damage the surface of the bridge deck when removing the bituminous pavement. Use a milling machine that meets the requirements of Section 156.03. Plan quantity "PCC Pavement Grinding" will be paid no matter how many passes it takes to remove all the bituminous pavement from the bridge deck.

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

After the solution has cured, apply a silicone sealant meeting the requirements of Section 826.02.B.1 along the interface of the overlay and curbs. Include the cost of the silicone sealant in the price bid for the penetrating water repellent.

650 OVERLAY CONCRETE: Use cement that meets the requirements of AASHTO M240, Type IL(MS).

An additional ¼" depth of overlay concrete was included in the overlay concrete quantities to account for the irregular surface profile from milling.

The Engineer will measure overlay concrete based on the mobile mixer count and the yield box. The Engineer will determine the quantity of concrete placed by taking counter readings from the mixer before and after each placement and multiplying the readings by the meter count determined by the yield test.

The Engineer will deduct waste concrete from the measured quantity. The Contractor and Engineer will agree upon the amount of waste, including the material used in the yield test, at the end of each day.

Use a mix design that has the weights per cubic yard shown in the below table.

Cement	600 lbs
Coarse aggregate (Size 5)	1700 lbs
Fine aggregate	1425 lbs
Water	230 lbs
Air entrainment admixture	5%-8%
Mid-range water reducer	Manufacturer dosage

930 SPALL REPAIR: The deck, curb, piers, and girder have spalling as shown in the elevation and section views. Actual limits of repair should be determined by the Engineer in the field.

Remove all unsound concrete and replace it with new concrete material. Use a 15-pound maximum size chipping hammer on any unsound concrete. Provide sharp, neat lines at least 1 inch deep at the edges of the repair areas. Produce these sharp, neat lines by saw cutting or other means approved by the Engineer. Remove enough concrete in unsound areas to get behind periphery of outer reinforcement a minimum of 1".

Sand blast clean the existing concrete and exposed reinforcing steel. Clean the existing concrete surface by high pressure water blasting. After the surface has dried and just before the patching material is placed, coat the surface with an epoxy bonding agent as recommended by the manufacturer.

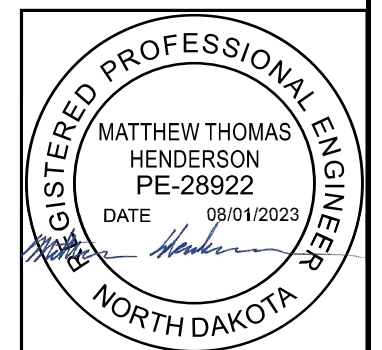
Use a two component, polymer-modified, cementitious repair mortar material that is specifically intended for patching concrete. This patching material may be SikaTop 123 Plus (Sika Corporation), Duraltop Gel (Euclid Chemical Company), MasterEmaco N 400 (BASF Corporation), or an approved equal repair mortar. Cure the material as recommended by the manufacturer.

930 SILICONE SEALANT: After the overlay concrete is cured, the deck joints at the piers shall be saw cut to a depth of 1". The joints shall be cleaned of all foreign material before the silicone sealant is installed. A low modulus (Type 5) silicone sealant shall be used. The silicone sealant shall extend 6" up the face of the curb. All materials, labor and equipment required to saw cut the joints and place the silicone sealant shall be included in the bid item "Silicone Sealant."

930 CRACK SEALING: After the penetrating water repellent has been applied and is dry, the Engineer will perform a visual inspection of the bridge deck, curb, pier column, and pier cap repair to determine the need for crack sealing. Mark and seal all visible cracks appearing on the top surface 0.007" or greater in width at its widest segment or as directed by the Engineer.

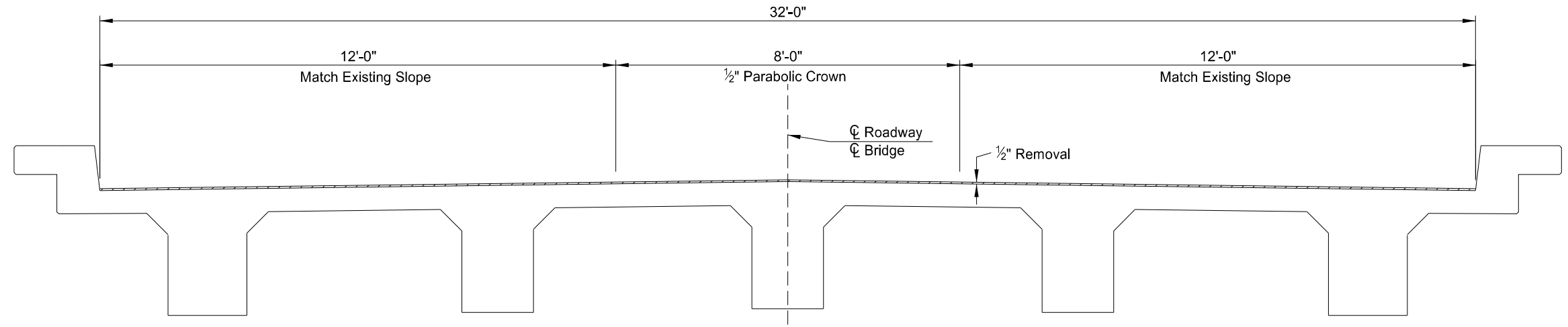
Immediately before applying the sealer, clean the cracks by removing all dust and debris with compressed air. Seal the cracks with a two-part epoxy in accordance with the manufacturer's recommendations. Chase crack with the sealant application to limits of crack, including those portions that are narrower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



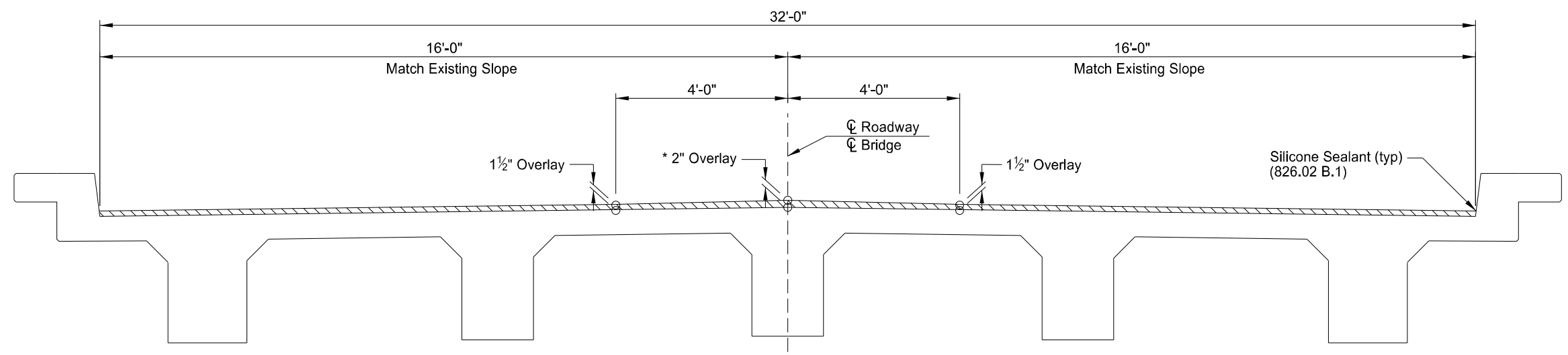
23 U.S.C. 407
NDDOT Reserves All Objections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-1-999(047)	170	10



Asphalt removal not shown for clarity.
(SHOWING REMOVAL)

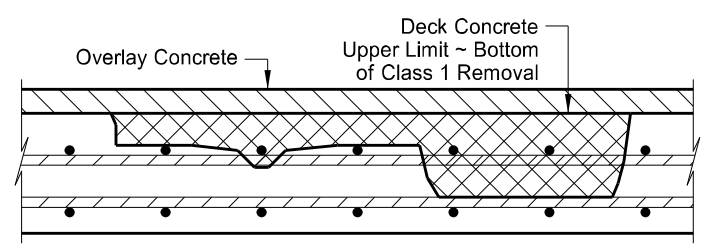
TYPICAL DECK SECTION



* 2" assumed to establish normal crown.

(SHOWING OVERLAY)

TYPICAL DECK SECTION



(DECK CONCRETE)

BRIDGE DECK SECTION



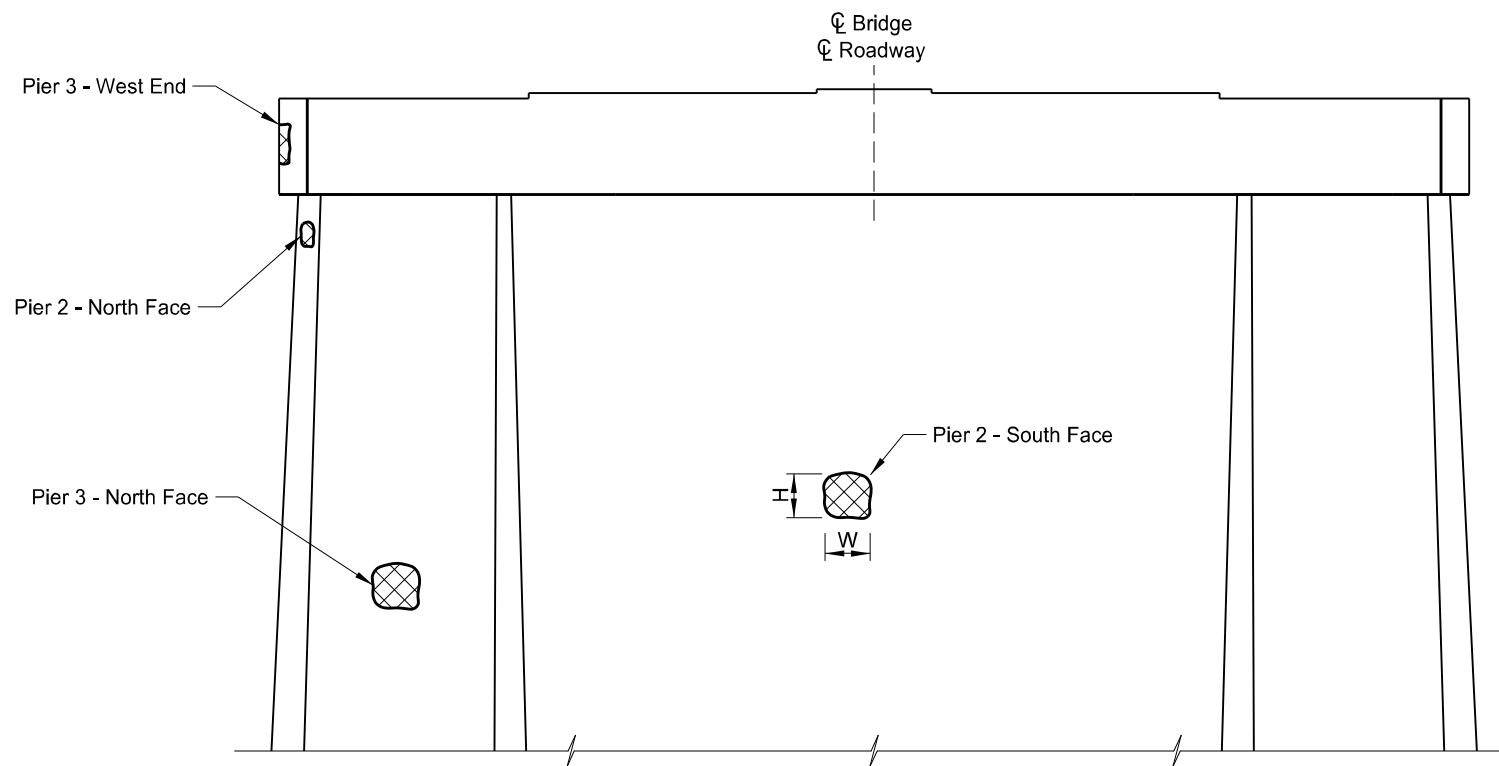
QUANTITIES	
OVERLAY CONCRETE	17.5 CY
DECK CONCRETE	5.0 CY
CLASS 1-H REMOVAL	360 SY
CLASS 2-H REMOVAL	72 SY
CLASS 3-H REMOVAL	18 SY

BEAVER CREEK
IN LINTON

DECK OVERLAY DETAILS

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

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-1-999(047)	170	11



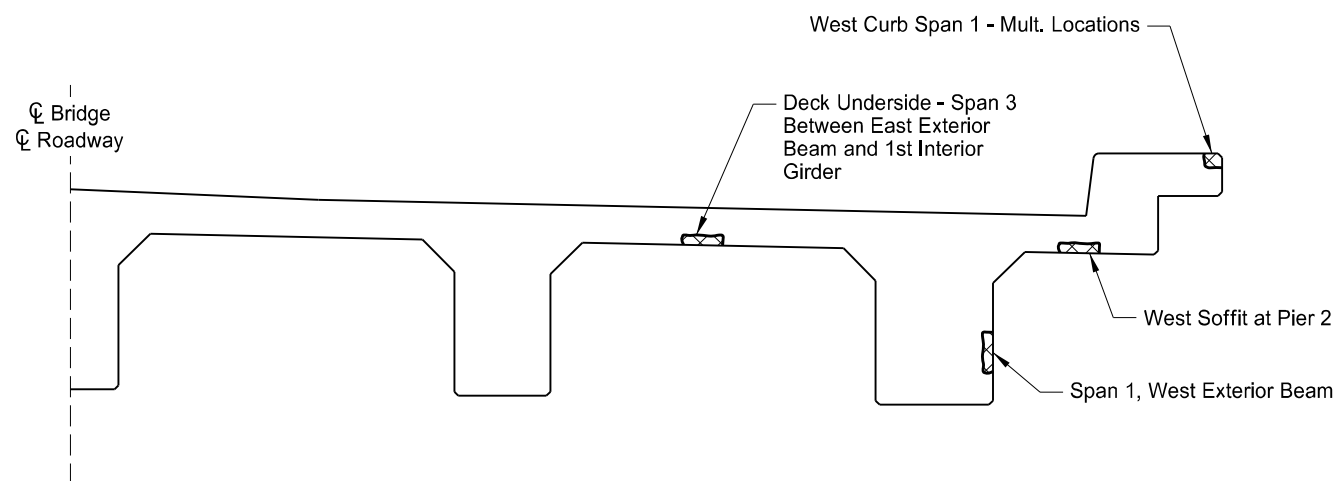
TYPICAL PIER ELEVATION - FACING NORTH

PIER SPALL REPAIRS			
PIER	FACE	W	H
2	SOUTH	6"	6"
2	NORTH	1'-0"	1'-0"
3	NORTH	1'-0"	1'-0"
3	WEST END	1'-0"	6"

DECK AND CURB SPALL REPAIRS		
LOCATION	L	W
WEST CURB SPAN 1 AT ABUTMENT	3'-0"	1'-0"
WEST CURB SPAN 1	2'-0"	1'-0"
DECK UNDERSIDE SPAN 3	5"	5"
WEST SOFFIT AT PIER 2	1'-0"	2'-0"

GIRDER SPALL REPAIR				
SPAN	BEAM	LOCATION	L	H
1	WEST EXTERIOR	AT PIER 2	2'-0"	1'-0"

 Indicates spall repair area.



TYPICAL DECK AND GIRDER CROSS SECTION



QUANTITIES	
SPALL REPAIR	12 SF
BEAVER CREEK IN LINTON	
SPALL REPAIRS AND GIRDER PATCHING	

NDDOT ABBREVIATIONS

D-101-1

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

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

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

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

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

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
04-23-18	General Revisions
05-20-18	General Revisions
12-10-20	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	performed		
Intmdt	intermediate	Mtd	mounted	Prep	preparation		
Intscn	intersection	Mtg	mounting	Press.	pressure		
Inv	invert	Mk	muck	PRV	pressure relief valve		
IP	iron pipe			Prestr	prestressed		
				Pvt	private		
				PD	private drive		
Jt	joint	Neop	neoprene	Prod.	production/produce		
Jct	junction	Ntwk	network	Prog	programmed		
		N	North	Prop.	property		
		NE	North East	Prop Ln	property line		
		NW	North West	Ppsd	proposed		
		NB	Northbound	PB	pull box		
		No. or #	number				

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
08-03-15	General Revisions
04-23-18	General Revisions
12-18-20	General Revisions
08-16-22	General Revisions



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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NDDOT ABBREVIATIONS

D-101-4

MEASUREMENTS

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

T tesla
 T/mi tons per mile
 V volt
 W watt
 Wb weber

SURVEY DESCRIPTIONS

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

SOIL TYPES

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

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

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

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LINE STYLES

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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

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

Proposed Topography

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

Existing Utilities

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

Proposed Utilities

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

Traffic Utilities

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

Sign Structures

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

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LINE STYLES

D-101-21

Right Of Way

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

Boundary Control

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

Cross Sections and Typical

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

Geotechnical

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

Countours

- Depression Contours
- Supplemental Contour

Profile

- Subgrade, Subcut or Ditch Grade
- Topsoil Profile

Striping

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

Pavement Joints

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

Bridge Details

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

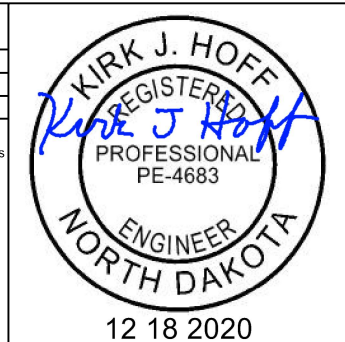
Erosion Control

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

Environmental

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

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SYMBOLS



North Arrow (Half Scale)



Alignment Data Point



Alignment Monument



Spot Elevation



Existing Miscellaneous Spot



Existing Access Control Arrow



Existing Benchmark



Reset USGS Marker



Iron Monument Found



Iron Pin R/W Monument



Property Corner



Iron Pin Reference Monument



Right of Way Marker (Exst, Ppsd, Reset)



Existing Federal Reference Corner



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



Existing Witness Corner



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



Existing Traverse PI Aerial Panel



Existing Reference Marker Point NGS



Existing EFB Misc



Existing Bush or Shrub



Existing Large Evergreen Tree



Existing Small Evergreen Tree



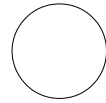
Existing Large Tree



Existing Small Tree



Existing Tree Trunk



Cairn or Stone Circle



Existing Artifact



Existing Satellite Dish



Existing Weather Station



Existing Windmill or Tower



Reinforced Pavement



Continuous Split Barrel Sample



Flight Auger Sample



Split Barrel Sample



Thinwall Tube Sample



Standard Penetration Test



Inclinometer Tube



Excavation Unit



Existing Ground Water Well Bore Hole

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12-18-20	General Revisions

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SYMBOLS

















































































D-101-31

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

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SYMBOLS

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

D-101-33

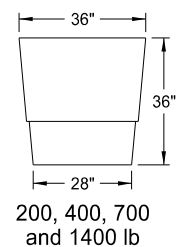
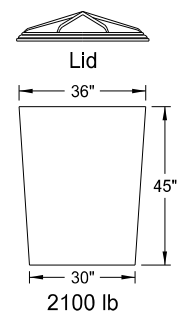
			Existing Manhole (Electrical, Gas, Telephone)							Cap or Stub Exst Gas, Exst Sanitary, Exst Storm Drain, Ppsd Storm Drain, Exst Water
			Water Manhole (Exst, Exst with Valve)							
			Sanitary Sewer Manhole (Exst, Ppsd, Exst with Valve)							Existing Pedestal Electrical, Telephone, Fiber Optic Telephone, 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)							
			Inlet Mountable Curb (Type A, Type B)							Existing Utility Marker
			Inlet Saddle Base (Type 1, Type 2)							Existing Meter
			Inlet Special (Catch Basin, Type 1, Type A)							Existing Fuel Dispensers
			Inlet (Tee, Type 1, Type 2, Type 2 Double)							Existing Fuel Filler Pipes
			Median Drain							Existing Fuel Leak Sensors
			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



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

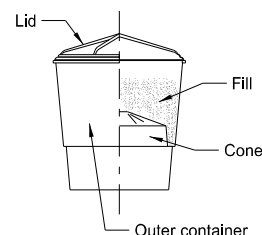
ATTENUATION DEVICE



Outer Containers

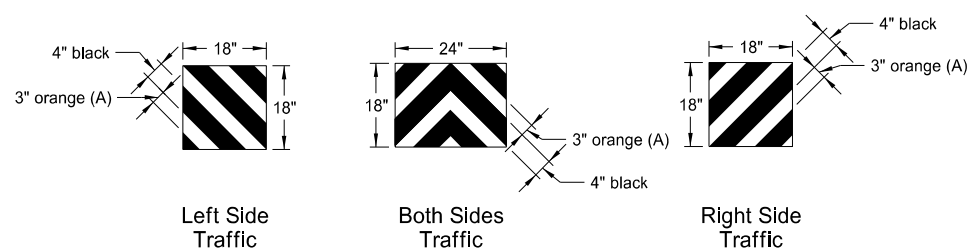


Cones



Typical Assembly

Typical Module Construction Detail

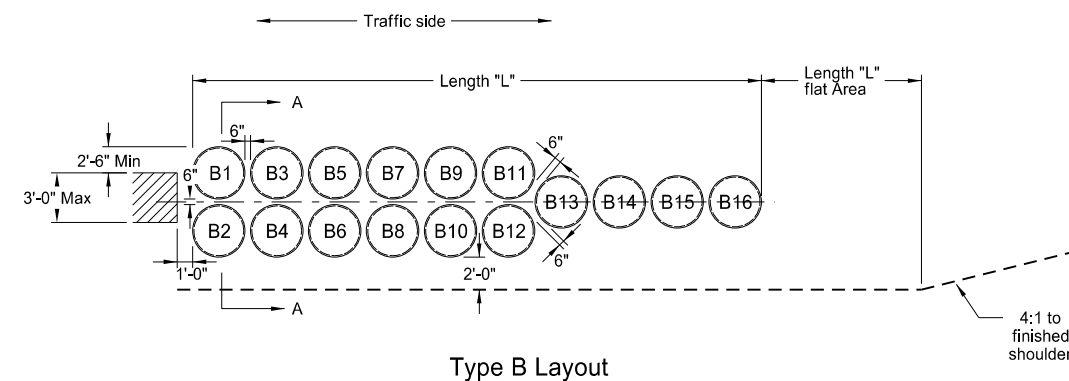


Reflective Sheet Detail

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.

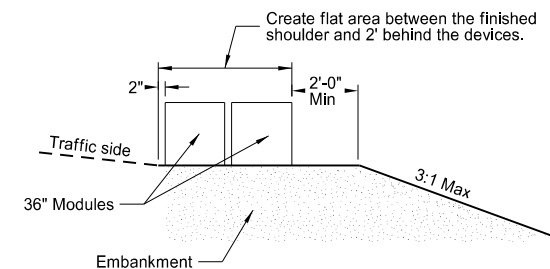
(A) Use 3" orange sheeting for temporary installations, and 3" yellow sheeting for permanent installations.

	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.

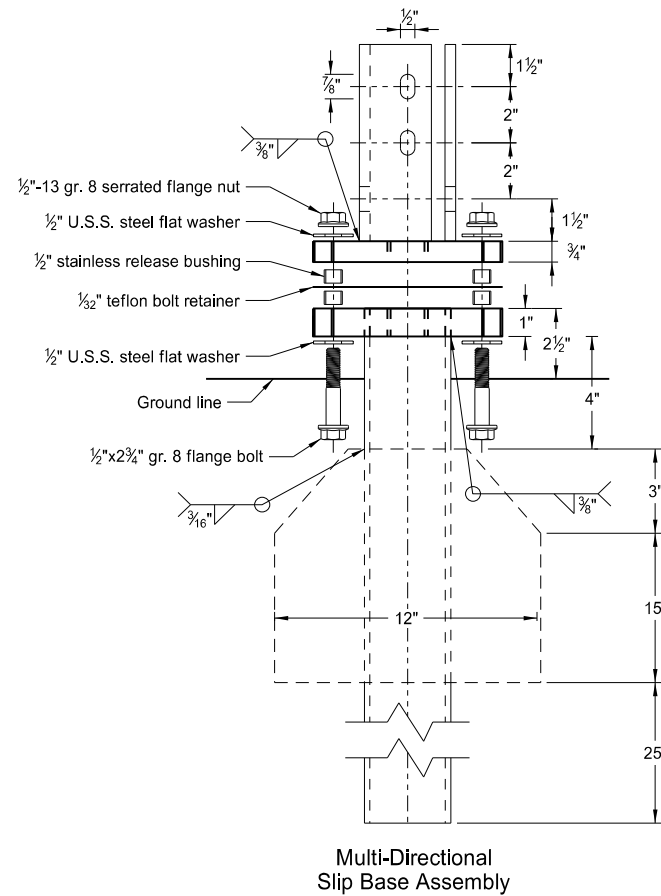
 - Provide three components for 2, 4, or 7 cubic foot module containers:
 - A 14 C.F., yellow outer container.
 - A black lid securely locking over the top lip of the container.
 - A variable cone-shaped supporting insert capable of supporting 200, 400, or 700 pounds of sand mass to allow for three sizes 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

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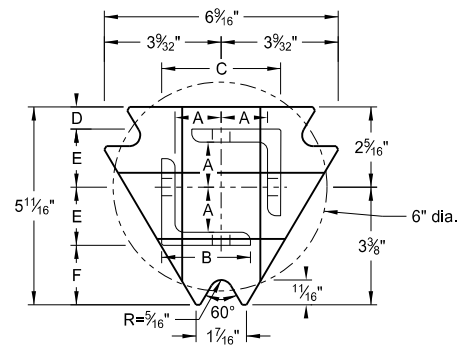
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

Perforated Tube



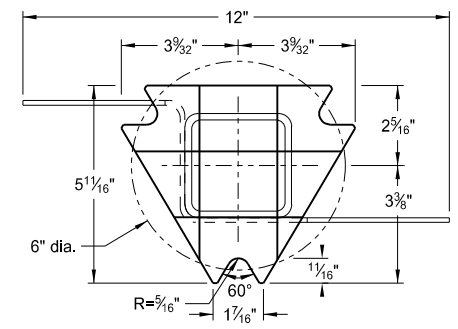
Multi-Directional Slip Base Assembly

Traffic Flow

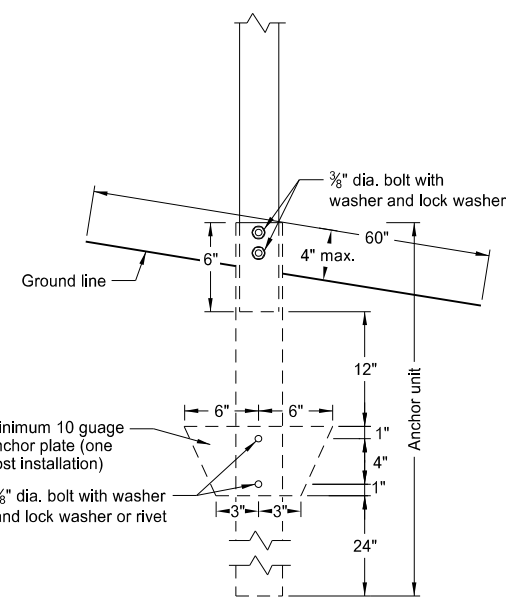


Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2 1/2" x 2 1/2" x 3/8" ASTM A36 structural angle

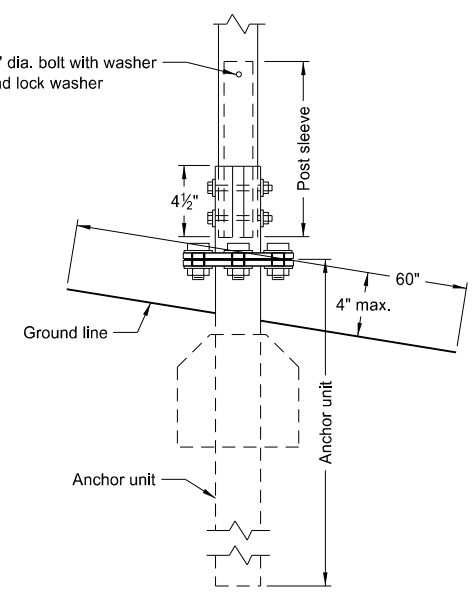
Traffic Flow



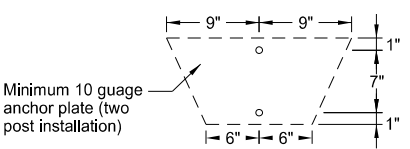
Bottom Soil Stub
Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50



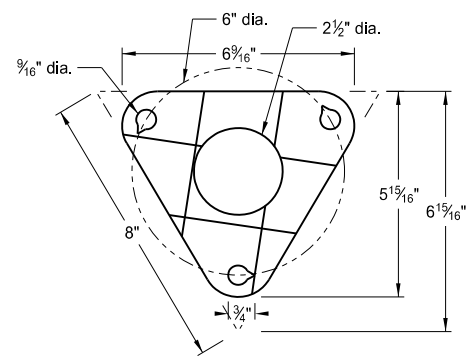
Anchor Unit and Post Assembly



Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly



Minimum 10 gauge anchor plate (two post installation)



Bolt Retainer for Base Connection
Bolt Retainer- 1/2" Reprocessed Teflon

Notes:

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

Telescoping Perforated Tube

Number of Posts	Post Size in.	Wall Thickness Gauge	Sleeve Size in.	Wall Thickness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2 1/4
1	2 1/4	12			No	2 1/2
1	2 1/2	12			(A)	3
1	2 1/2	10			Yes	
1	2 1/2	12	2	12	Yes	
1	2 1/2	12	2 1/4	12	Yes	
2	2	12			No	2 1/4
2	2 1/4	12			No	2 1/2
2	2 1/2	12			Yes	
2	2 1/2	12			Yes	
2	2 1/4	10	2	12	Yes	
2	2 1/2	12	2 1/4	12	Yes	
3 & 4	2 1/2	12			Yes	
3 & 4	2 1/2	10			Yes	
3 & 4	2 1/2	12	2 1/4	12	Yes	
3 & 4	2 1/4	12	2	12	Yes	
3 & 4	2 1/2	10	2 3/16	10	Yes	

Properties of Telescoping Perforated Tube

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

Top Post Receiver Data Table

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

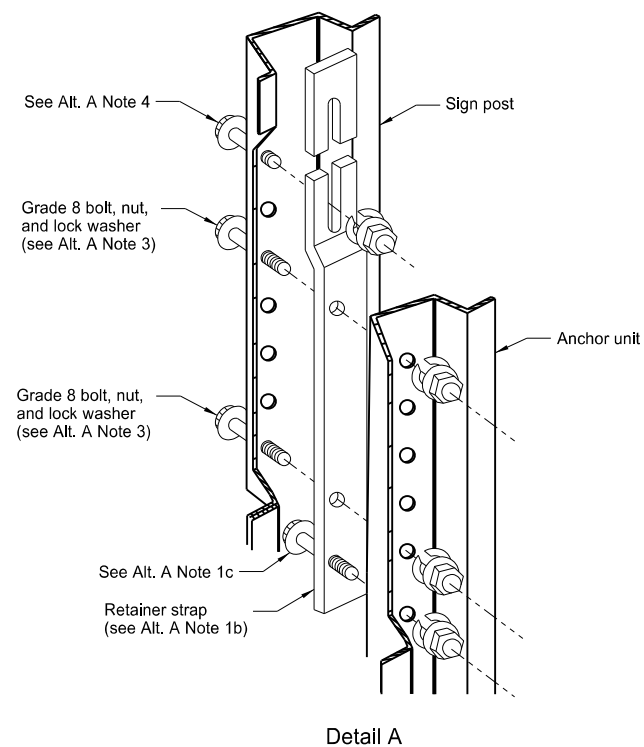
(A) Use breakaway base when support is placed in weak soils. Engineer determines if soils are weak.

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

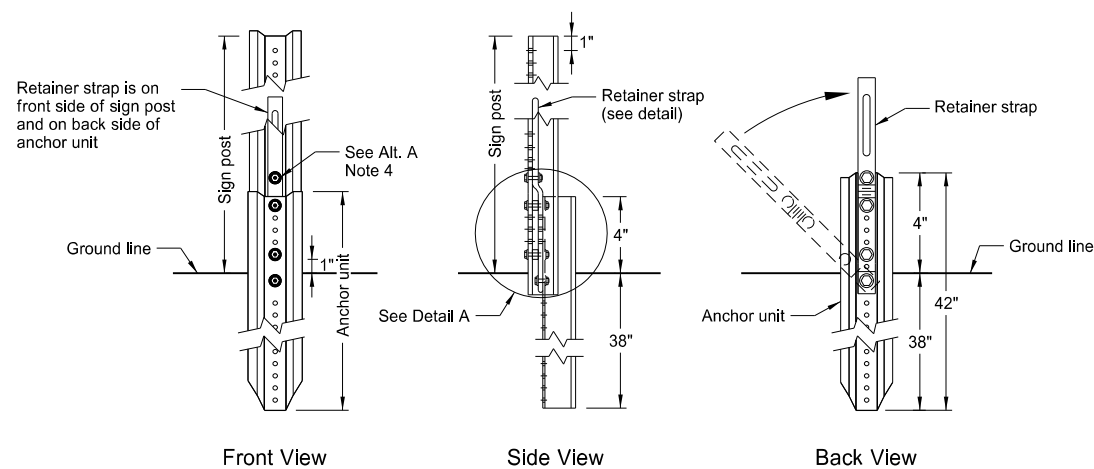
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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U-Channel Post



Detail A



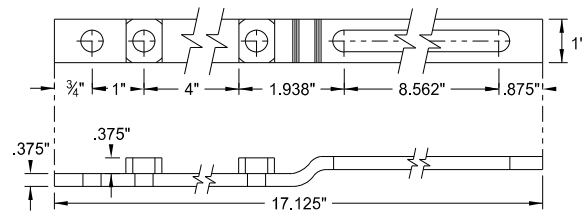
Front View

Side View

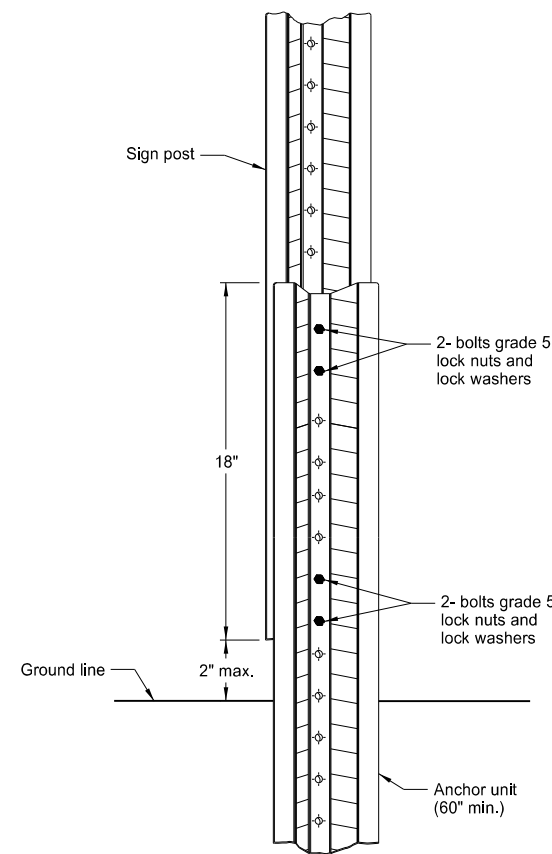
Back View

Breakaway U-Channel Detail Alternate A

Install a maximum of 2 posts within 7'.

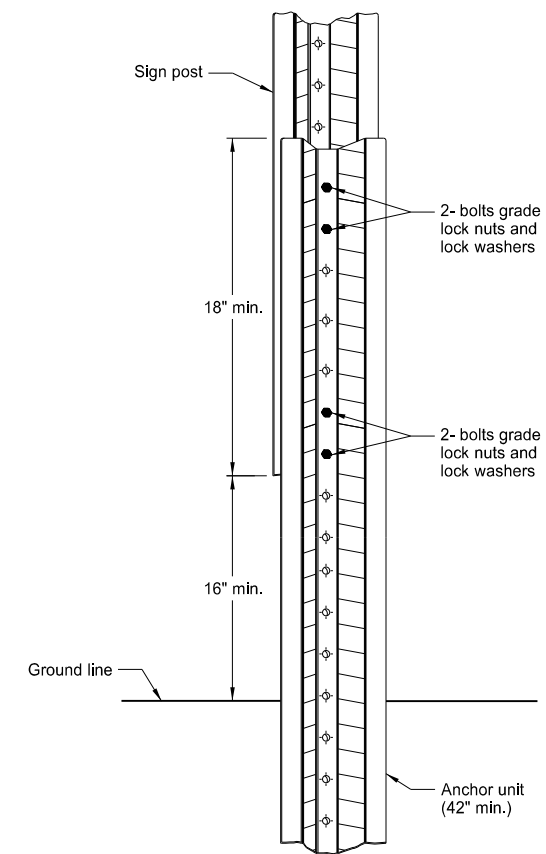


Retainer Strap Detail



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:

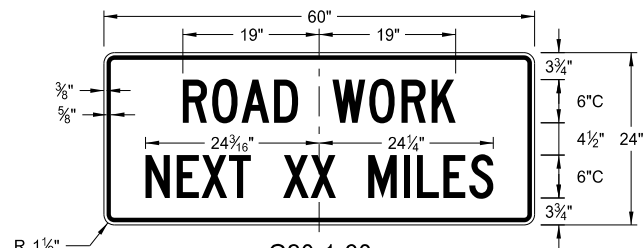
1. a) Drive anchor unit to within 12" of ground level.
b) Establish proper assembly by lining up bottom hole of retainer strap with 6th hole from the top of the anchor unit.
c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
d) Rotate strap 90° to left.
2. a) Drive anchor 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

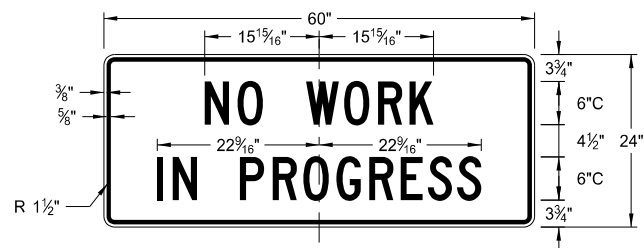
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CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS

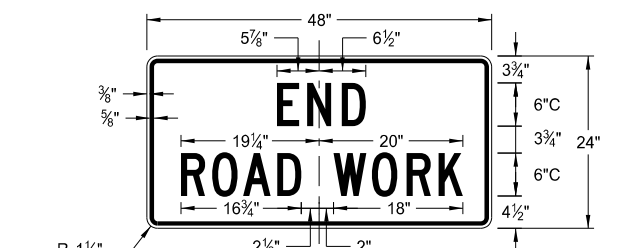
D-704-9



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



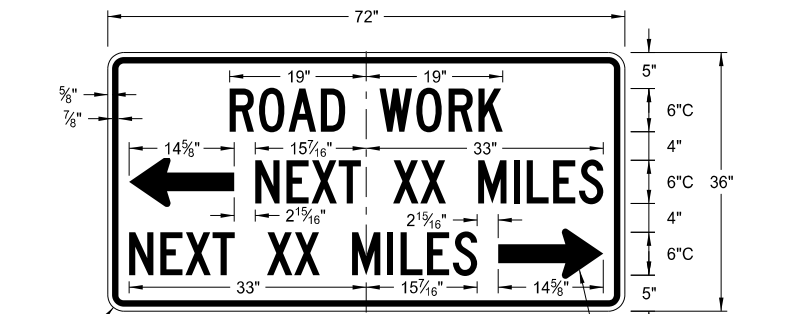
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Background: orange



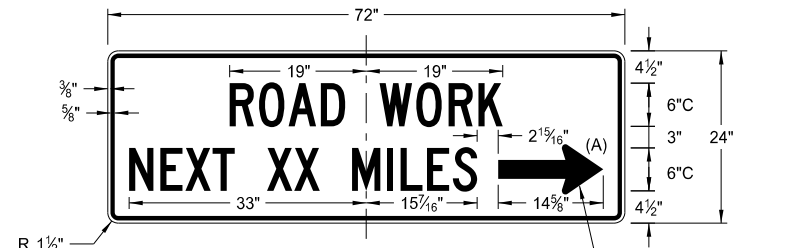
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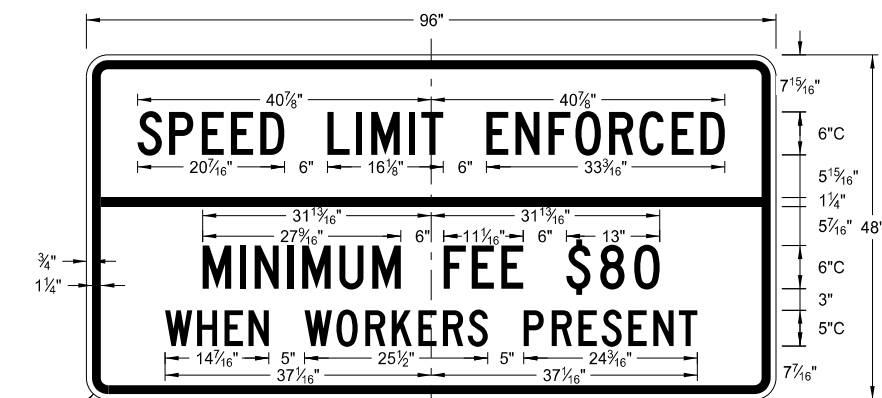
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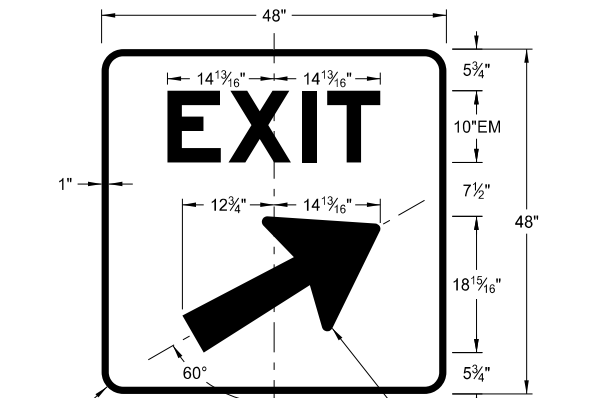
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Background: orange



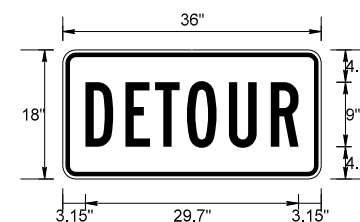
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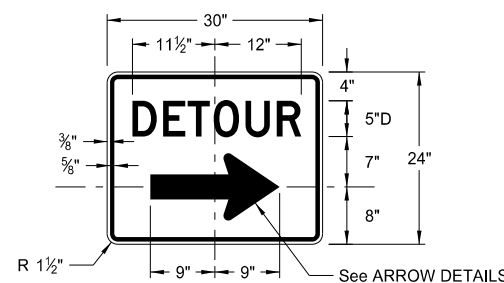
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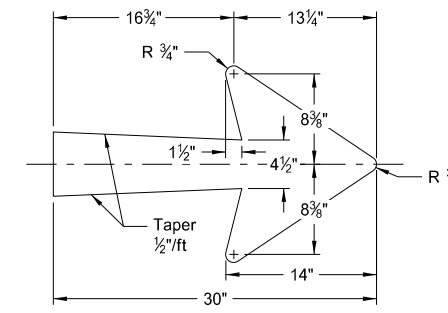
E5-1(L or R)-48
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Background: green (orange optional)



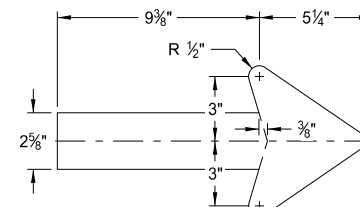
M4-8-36
Legend: black (non-refl)
Background: orange



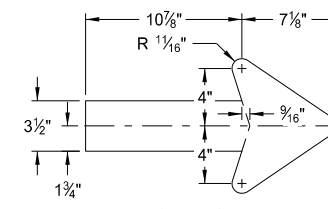
M4-9(L or R)-30 & M4-9-30
Legend: black (non-refl)
Background: orange



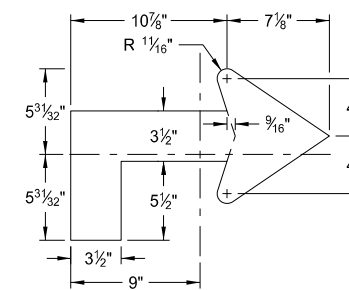
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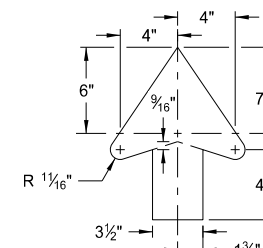
G20-50a-72
G20-52a-72



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:

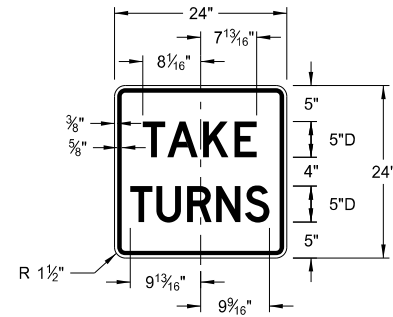
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

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

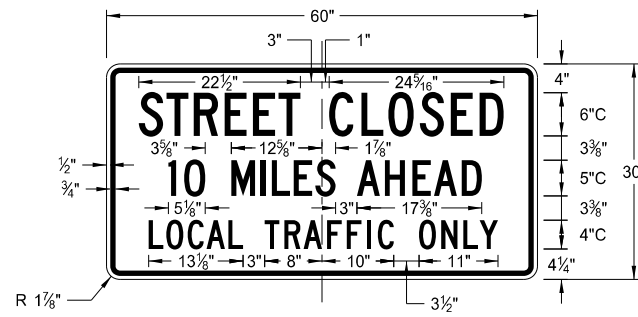
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CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS

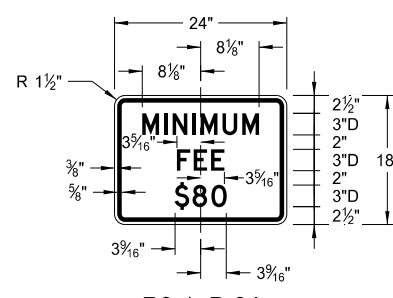
D-704-10



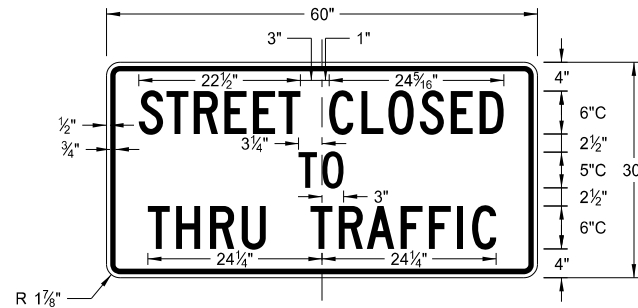
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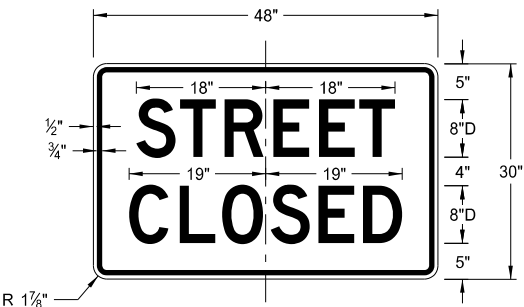
R11-3c-60
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R2-1aP-24
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Background: white



R11-4a-60
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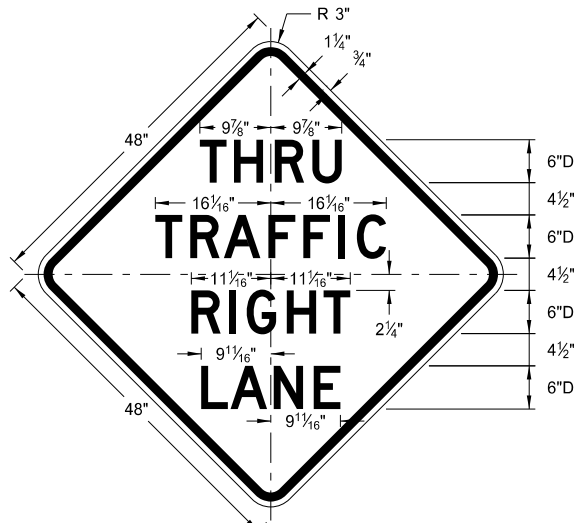


R11-2a-48
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NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Revised sign number
10-03-19	New Design Engineer PE Stamp

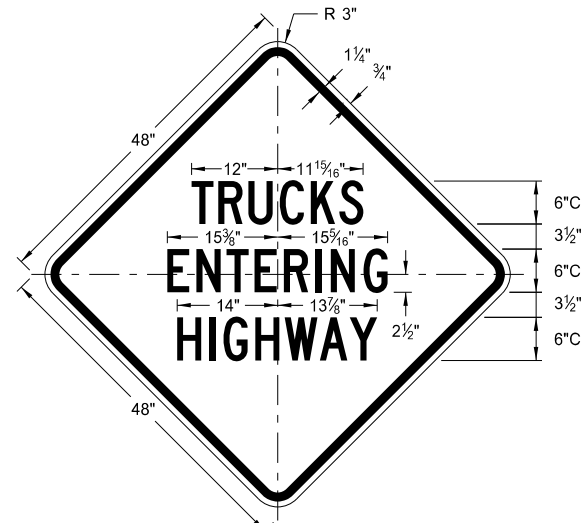
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CONSTRUCTION SIGN DETAILS
WARNING SIGNS



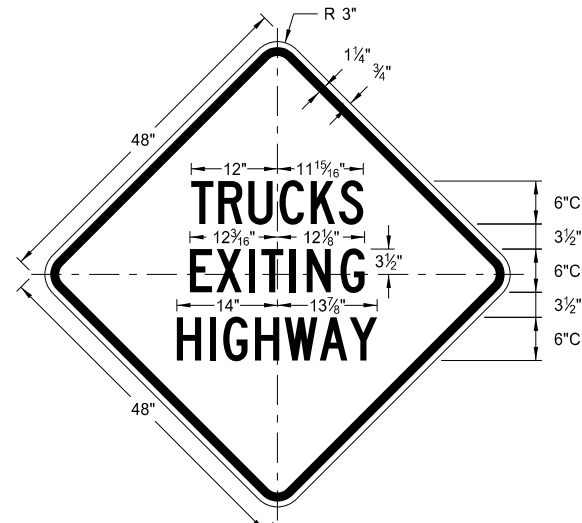
W5-8-48

Legend: black (non-refl)
Background: orange



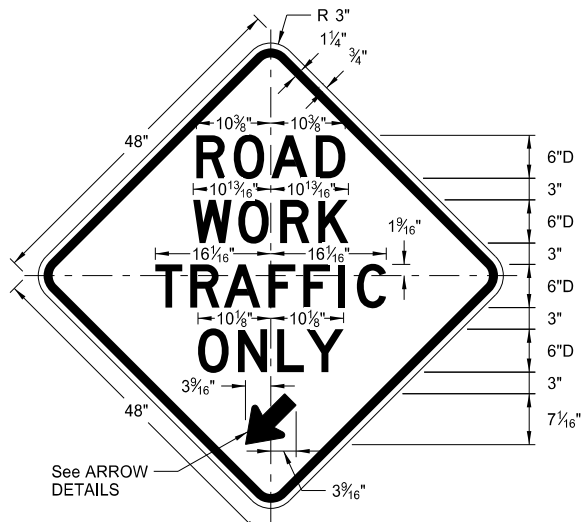
W8-53-48

Legend: black (non-refl)
Background: orange



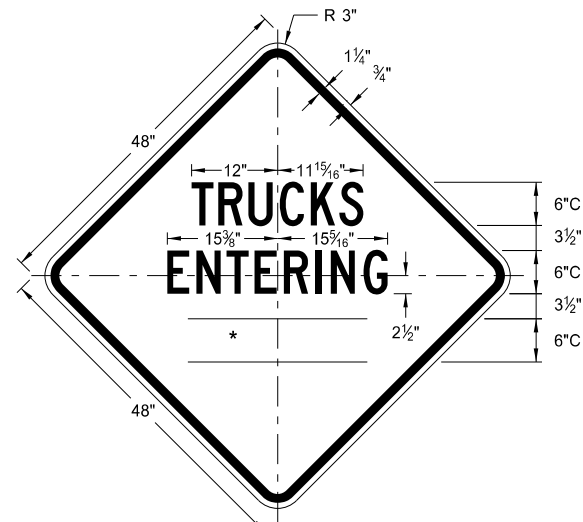
W8-56-48

Legend: black (non-refl)
Background: orange



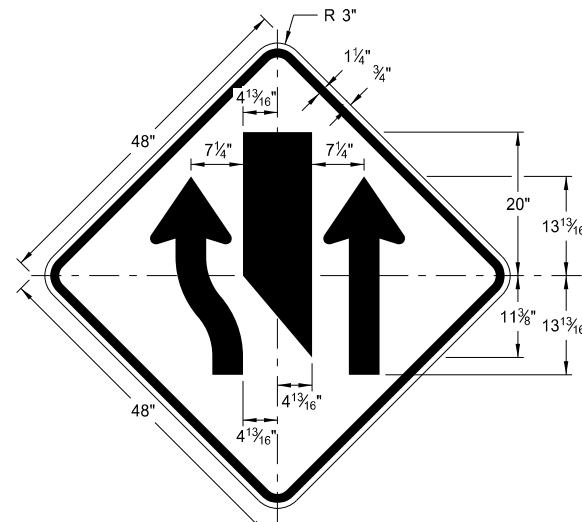
W5-9-48

Legend: black (non-refl)
Background: orange



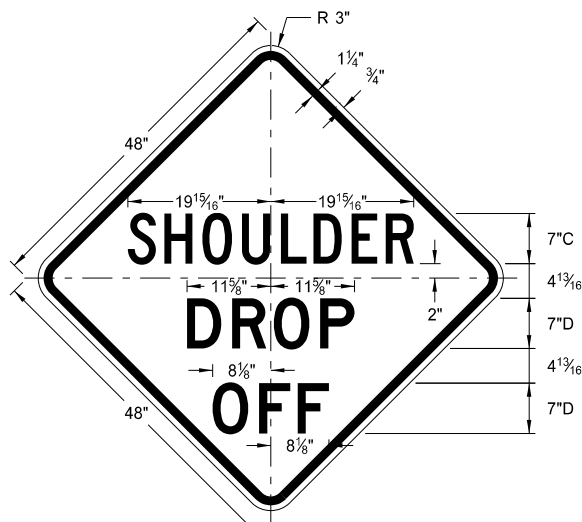
W8-54-48

Legend: black (non-refl)
Background: orange



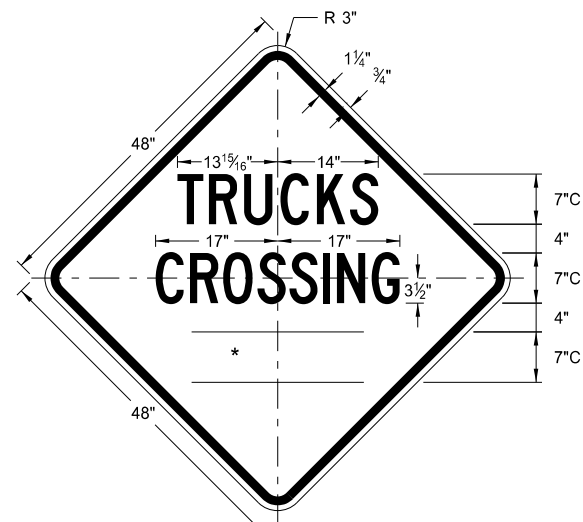
W9-3a-48

Legend: black (non-refl)
Background: orange



W8-9a-48

Legend: black (non-refl)
Background: orange

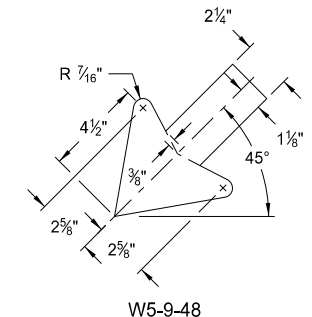


W8-55-48

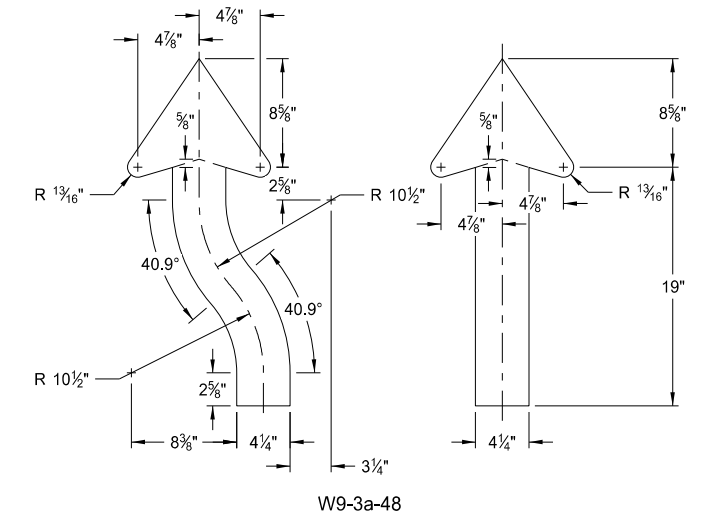
Legend: black (non-refl)
Background: orange

WORD	LETTER SPACING
AHEAD	Standard
200 FT	Standard
350 FT	Standard
500 FT	Standard
1000 FT	Reduce 40%
1500 FT	Reduce 40%
1/2 MILE	Reduce 50%
1 MILE	Standard

* DISTANCE MESSAGES



W5-9-48



W9-3a-48

ARROW DETAILS

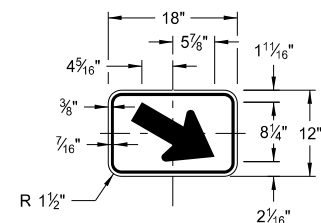
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Updated sign number
5-31-18	Revised sign and arrow details
10-03-19	New Design Engineer PE Stamp

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

CONSTRUCTION SIGN DETAILS
WARNING SIGNS

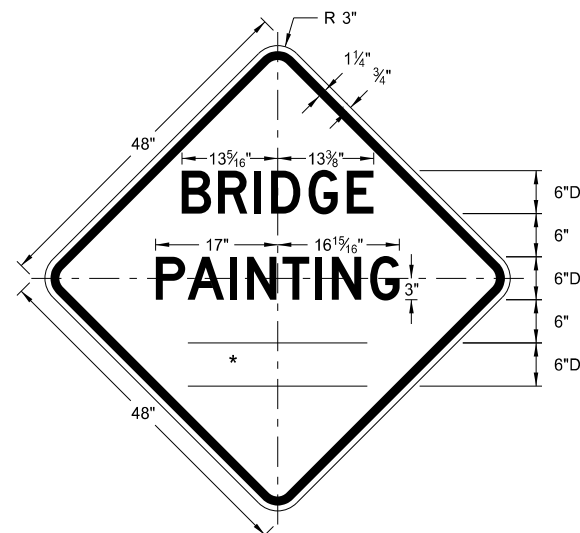
WORD	LETTER SPACING
AHEAD	Standard
200 FT	Standard
350 FT	Standard
500 FT	Standard
1000 FT	Reduce 40%
1500 FT	Reduce 40%
½ MILE	Reduce 50%
1 MILE	Standard

* DISTANCE MESSAGES



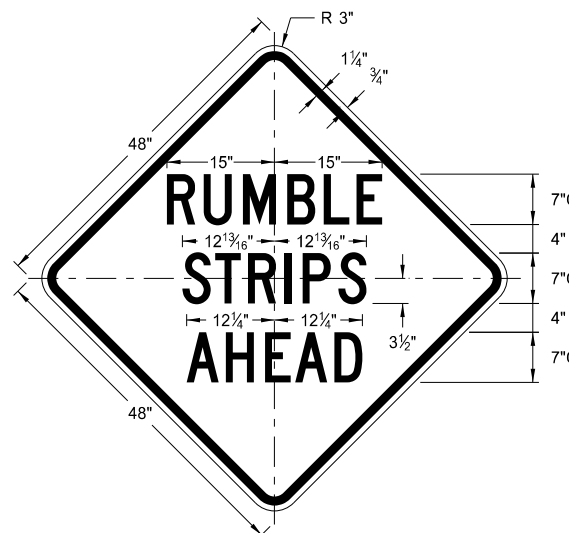
W16-7aP-18

Legend: black (non-refl)
Background: orange



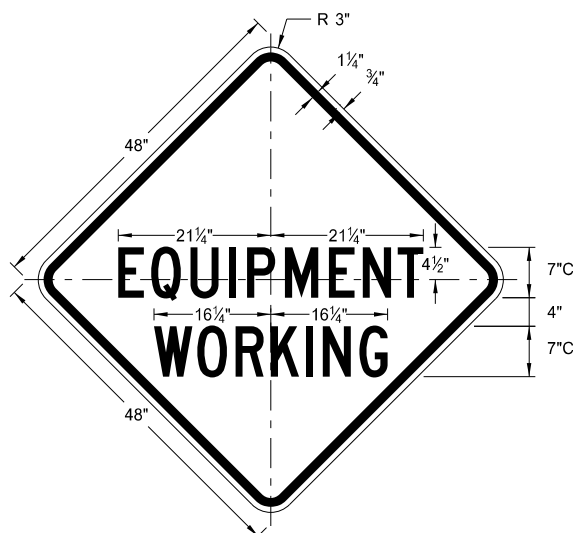
W21-50-48

Legend: black (non-refl)
Background: orange



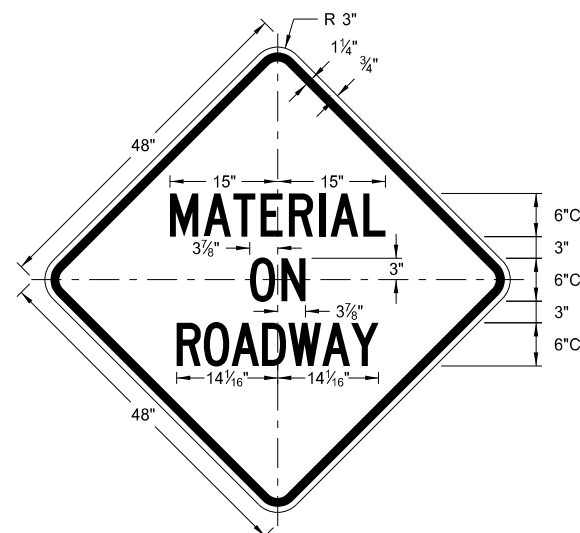
W21-53-48

Legend: black (non-refl)
Background: orange



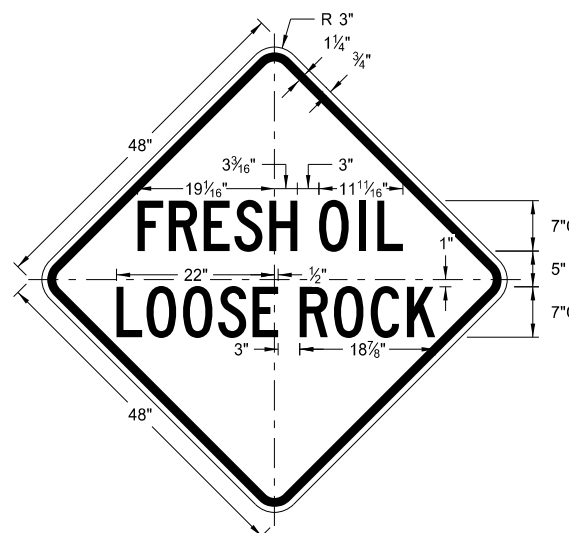
W20-51-48

Legend: black (non-refl)
Background: orange



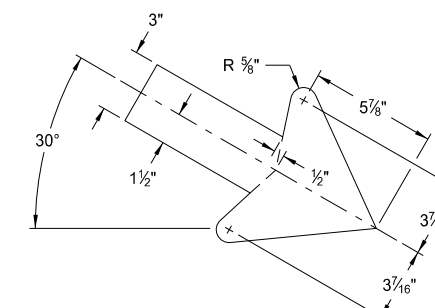
W21-51-48

Legend: black (non-refl)
Background: orange



W22-8-48

Legend: black (non-refl)
Background: orange

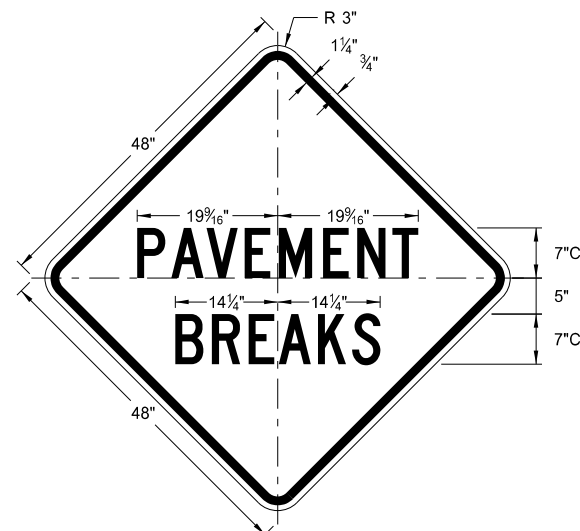


W16-7aP-18



W20-52P-54

Legend: black (non-refl)
Background: orange



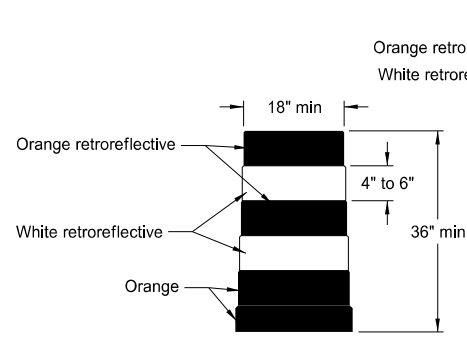
W21-52-48

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.

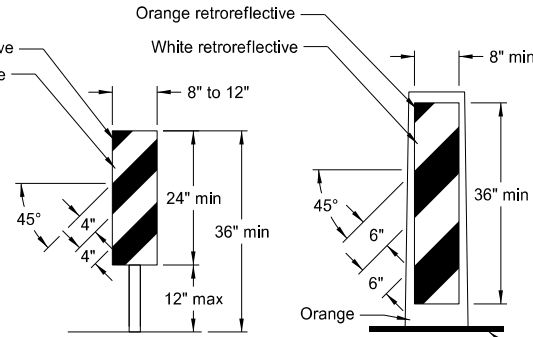
This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

BARRICADE AND CHANNELIZING DEVICE DETAILS



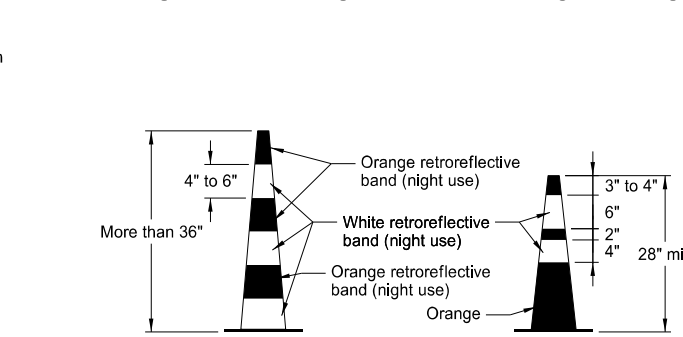
DELINEATOR DRUM

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



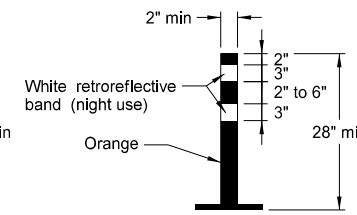
BACK TO BACK VERTICAL PANEL

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



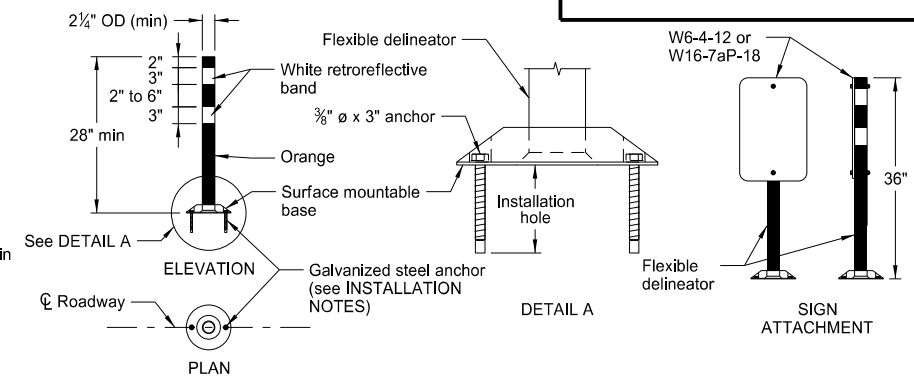
TRAFFIC CONE

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



TUBULAR MARKER

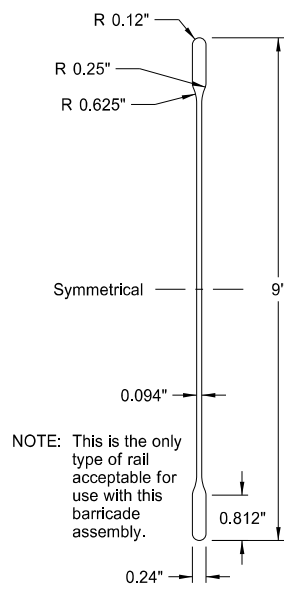
Provide retroreflectORIZATION of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

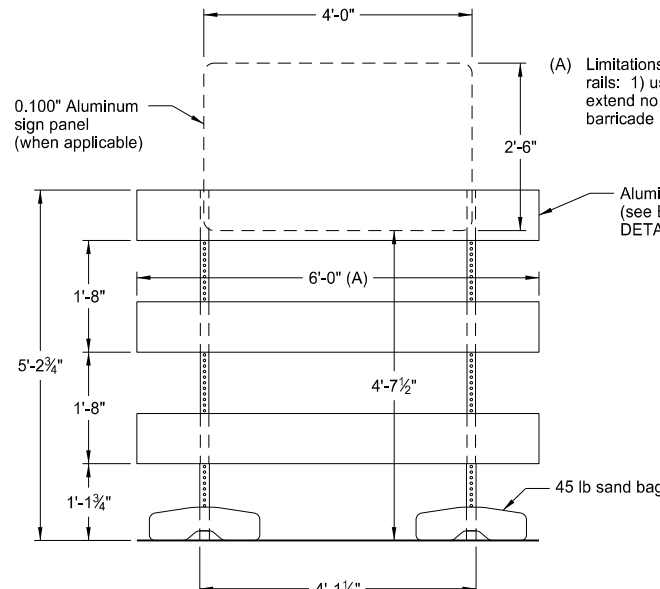
INSTALLATION NOTES:

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



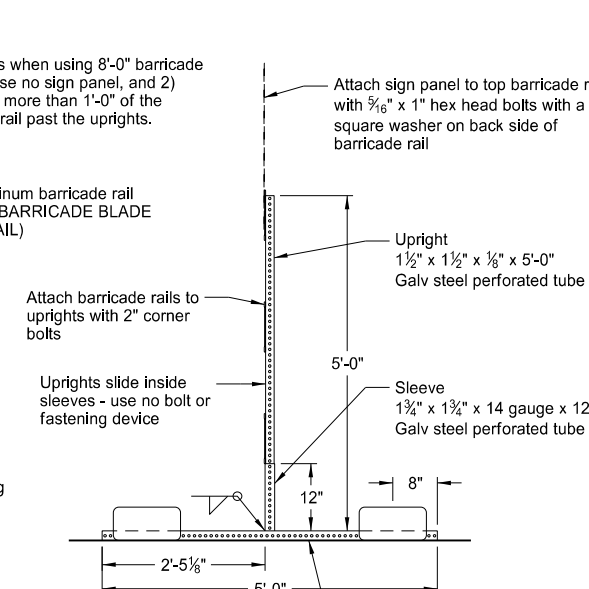
BARRICADE BLADE DETAIL

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

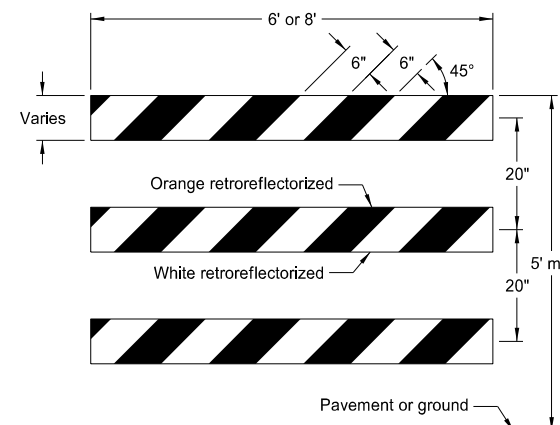


ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)



SIDE VIEW

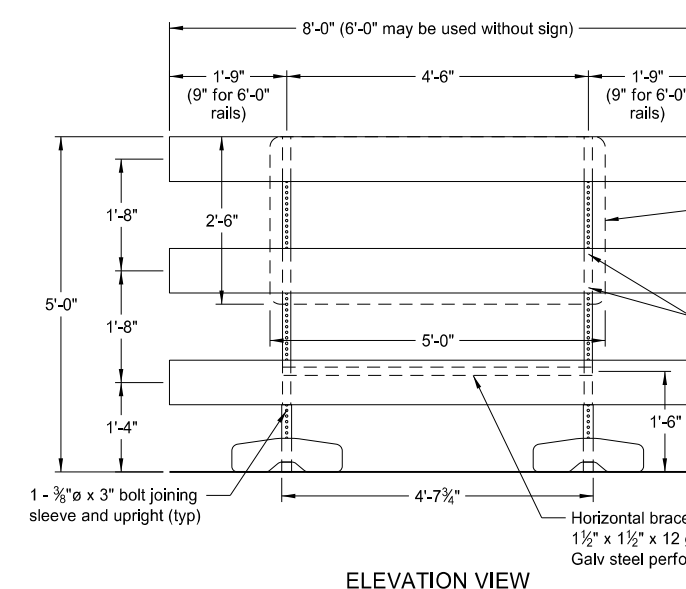


TYPE I BARRICADE

TYPE II BARRICADE

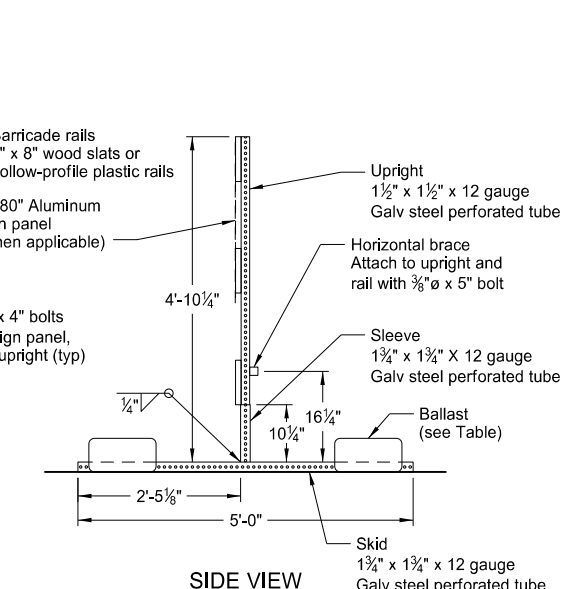
TYPE III BARRICADE

BARRICADE RAIL DETAILS

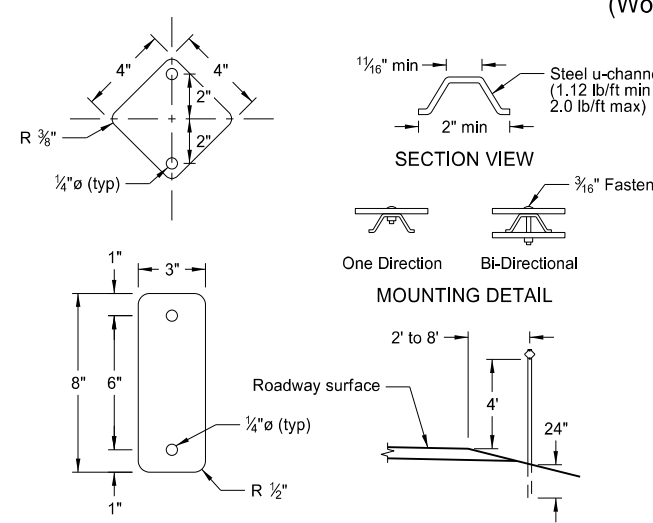


ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)



SIDE VIEW



REFLECTOR DETAIL

ELEVATION

DELINEATORS

MINIMUM BALLAST (For each side of barricade support)

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

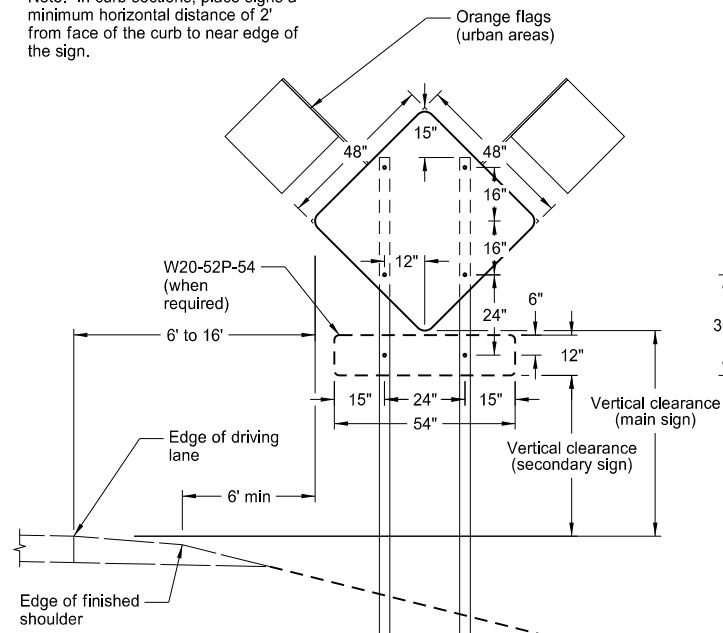
Note: Number of sandbags based on a wind speed of 55 MPH. Sandbags assumed to be placed at or near the ends of the skids.

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

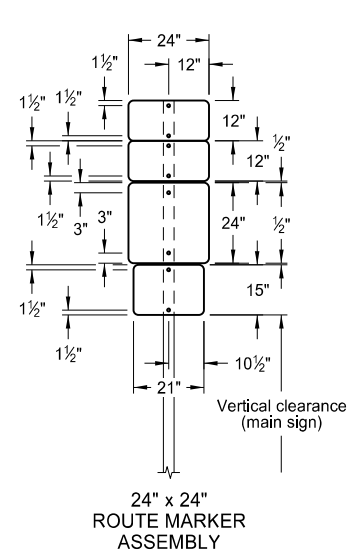
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

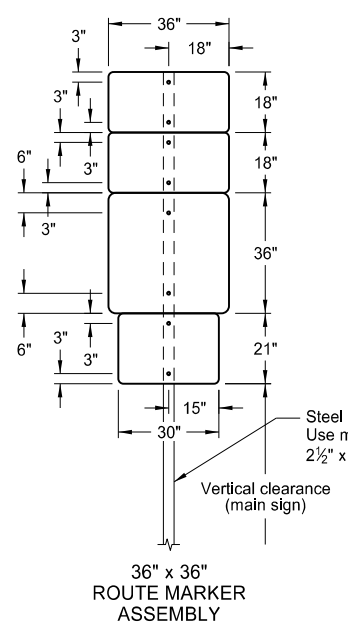
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



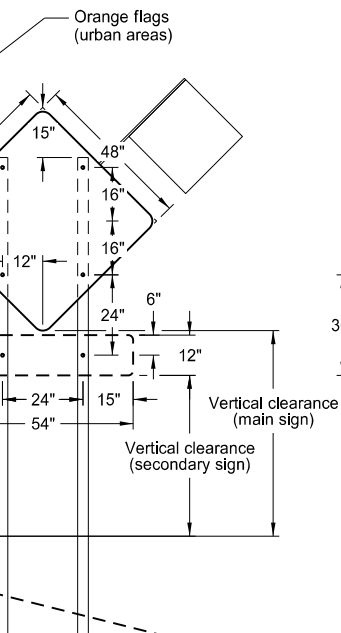
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



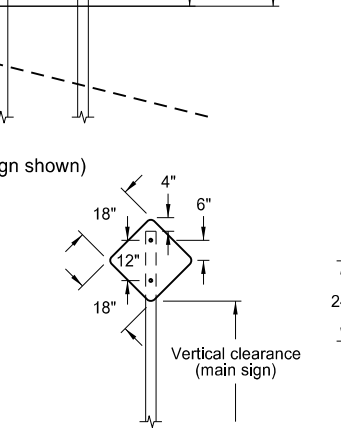
24" x 24" ROUTE MARKER ASSEMBLY



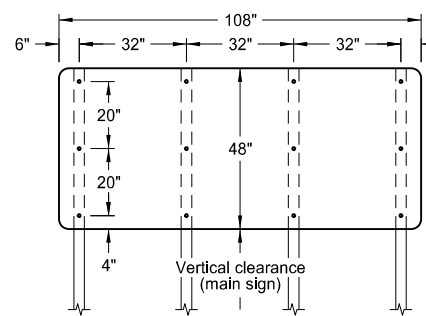
36" x 36" ROUTE MARKER ASSEMBLY



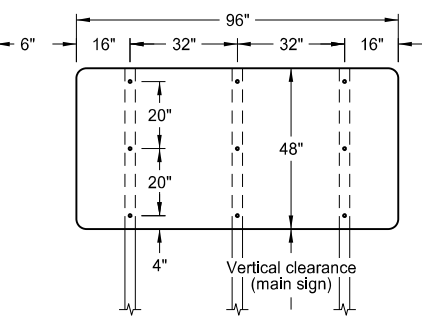
18" x 18" DIAMOND SIGN



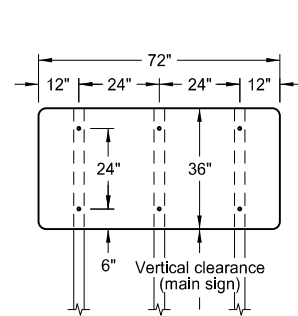
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



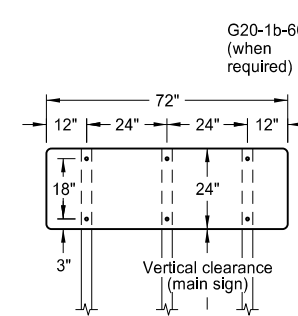
108" x 48" SIGN



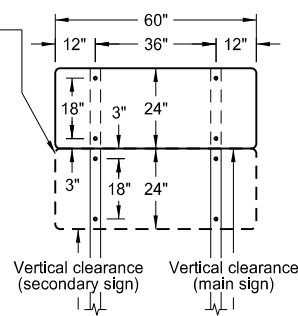
96" x 48" SIGN



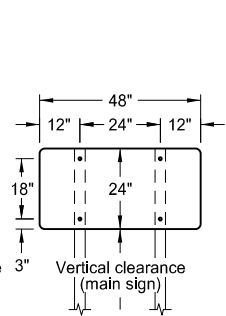
72" x 36" SIGN



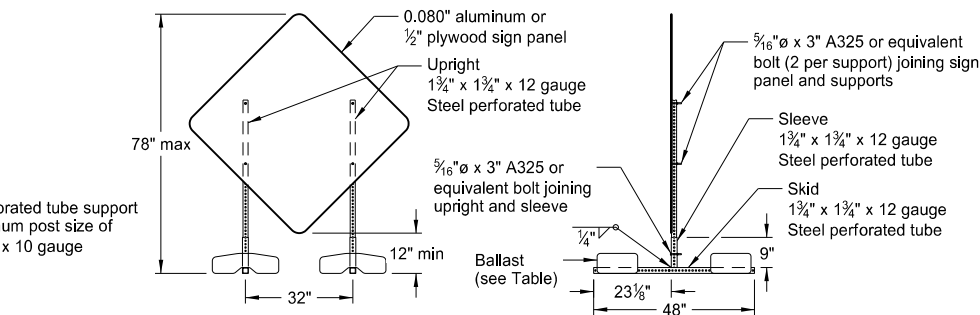
72" x 24" SIGN



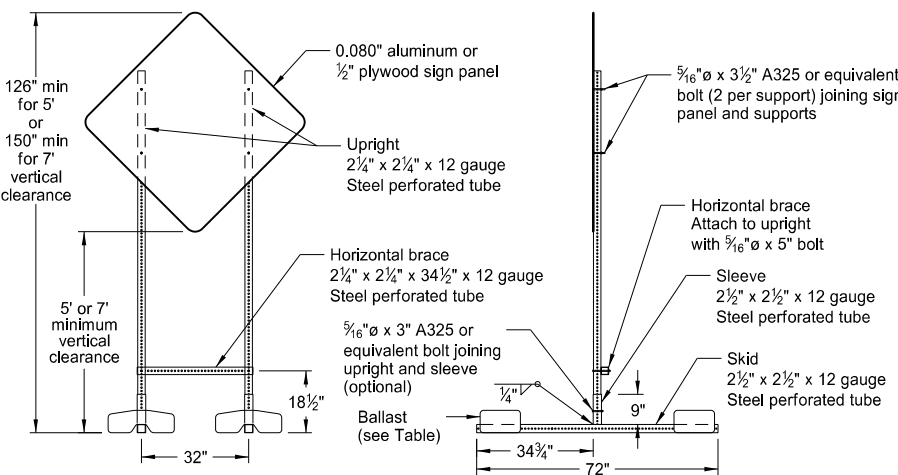
60" x 24" SIGN



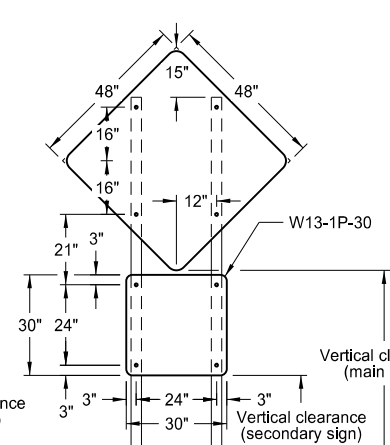
48" x 24" SIGN



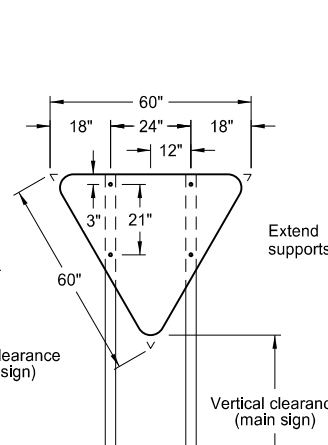
PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



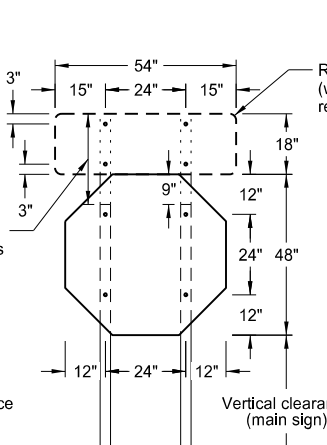
PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT



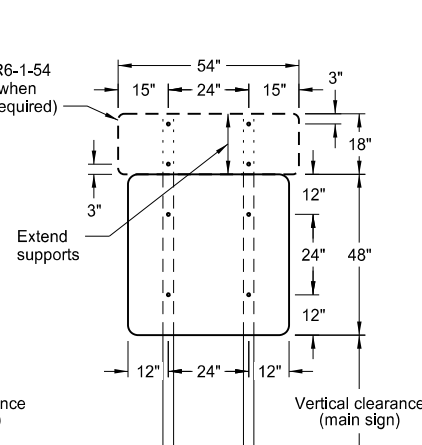
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



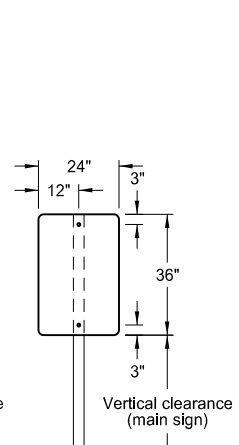
R1-2-60 - YIELD SIGN



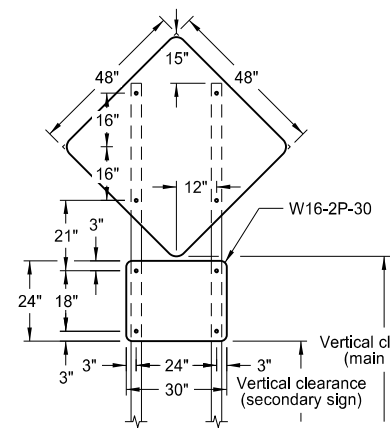
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



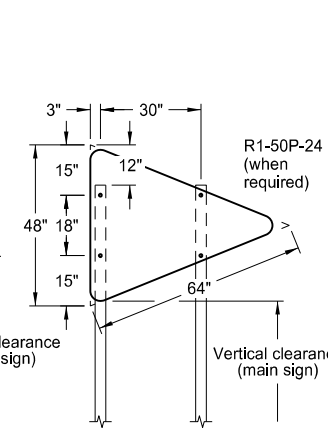
48" x 48" SIGN
(with R6-1-54 sign as required)



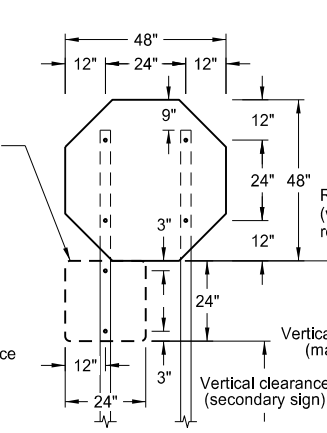
24" x 36" SIGN



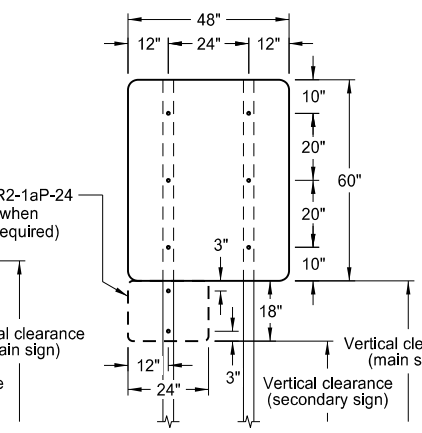
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



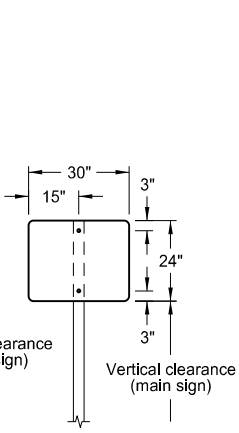
W14-3-64 - PENNANT SIGN



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

- 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.

- 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 breakdowns, 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

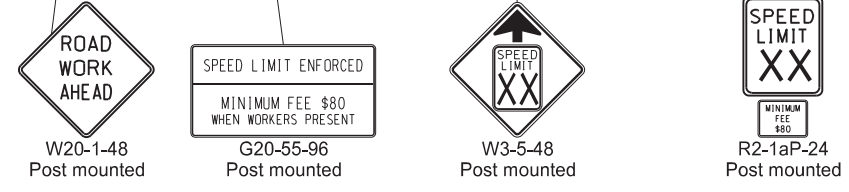
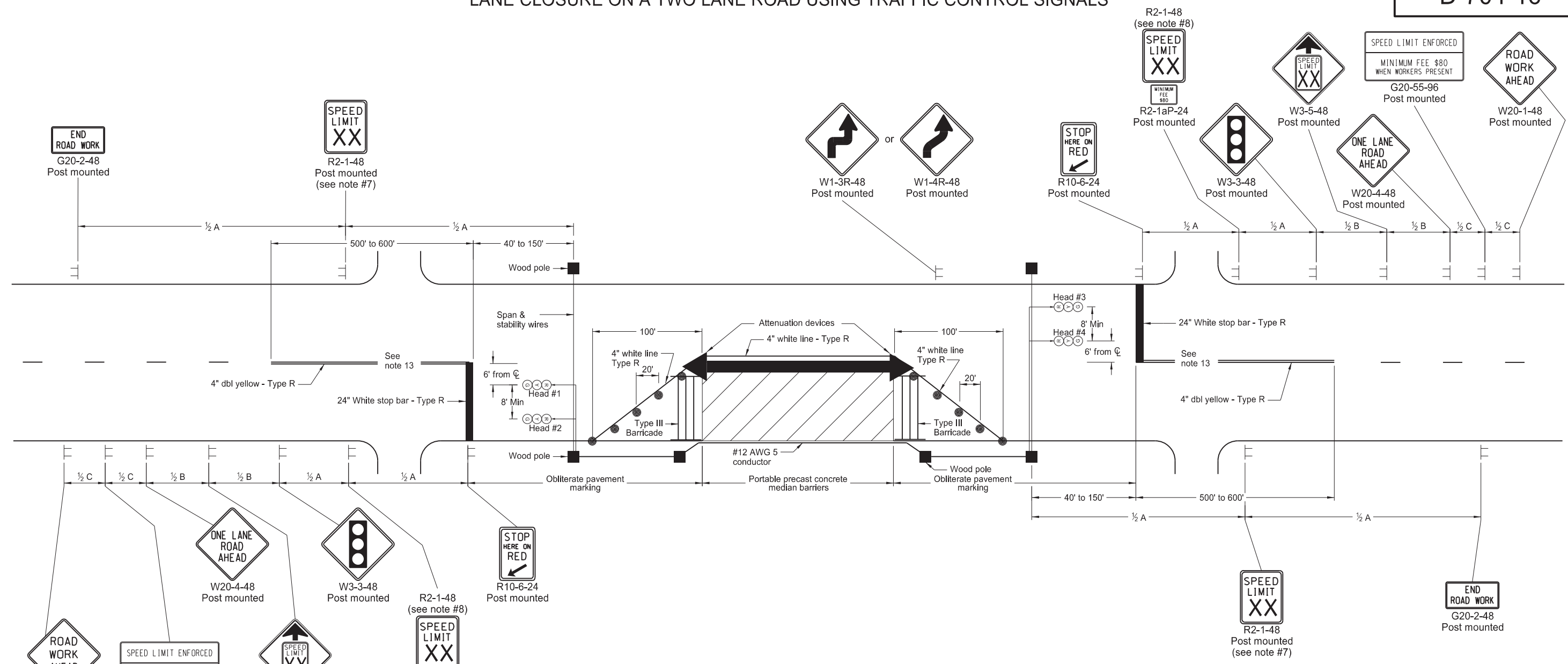
Note: The number of sandbags are based on a wind speed of 55 MPH. Place sandbags at or near the ends of skids.

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



KEY	
	Work Area
	Type III Barricade
	Sign
	Delineator Drum
	Wood Pole

- 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. 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.
 - Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - Continue double yellow centerline thru private drives.
 - Sign G20-55-96 is not required 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.

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

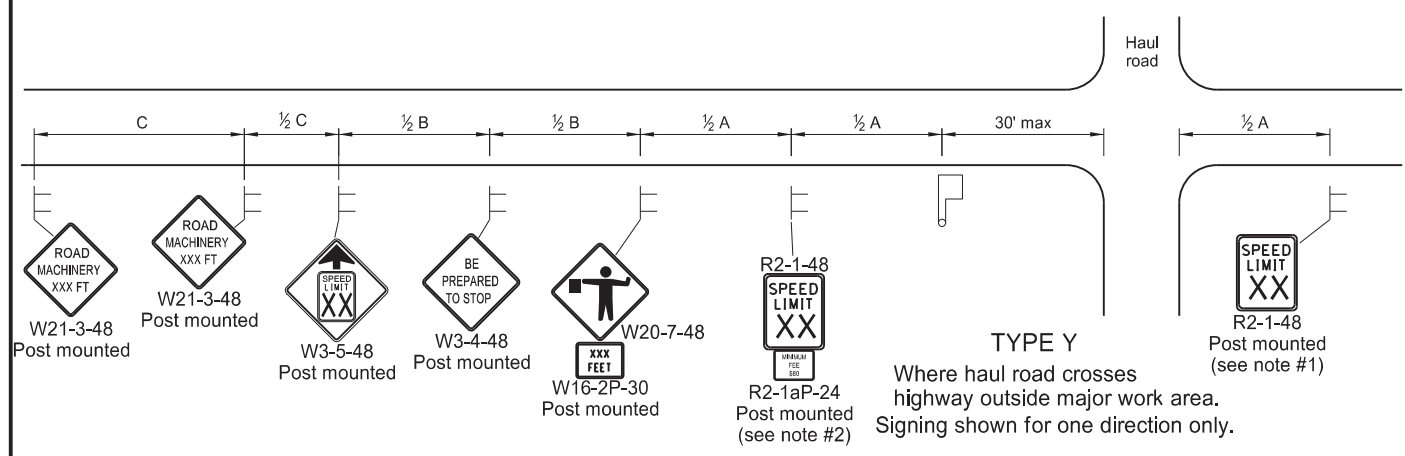
SUGGESTED TIMING AND SIGNAL SEQUENCE						
Heads 1 & 2	Green	Yellow	Red			
			Green	Yellow	Red	
Heads 3 & 4						
Time	18.0	4.5	22.5	18.0	4.5	22.5
Cycle = 90 seconds						
Percent of Cycle	20	5	25	20	5	25

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 & pvtmt 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

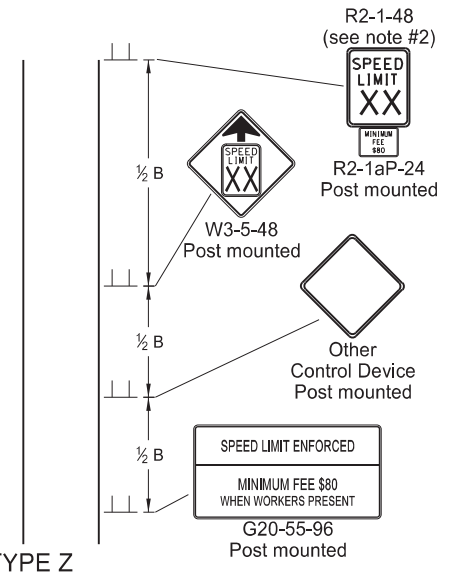


11/29/22

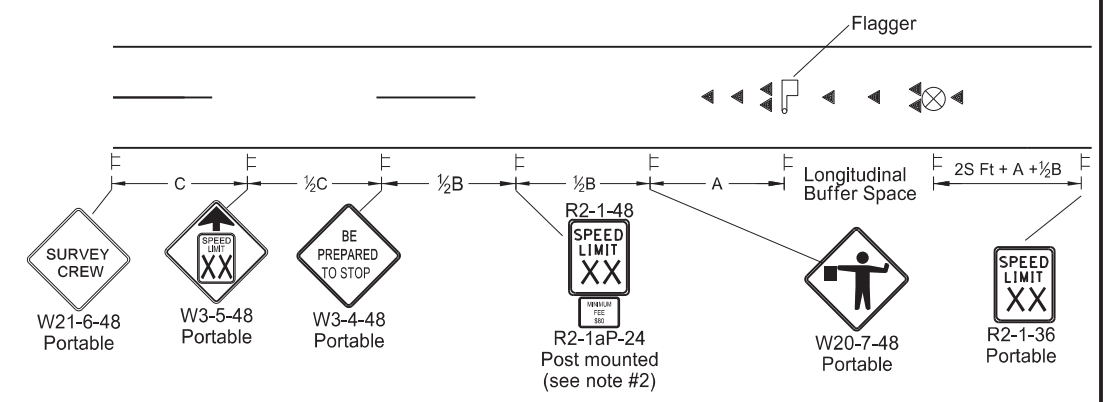
MISCELLANEOUS SIGN LAYOUTS



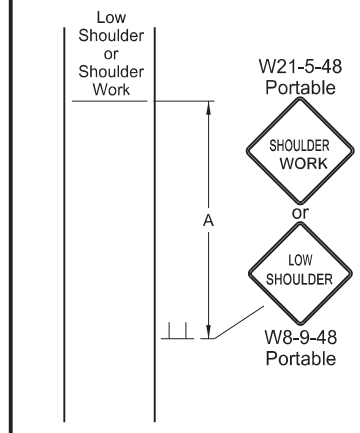
TYPE Y
Where haul road crosses highway outside major work area. Signing shown for one direction only.



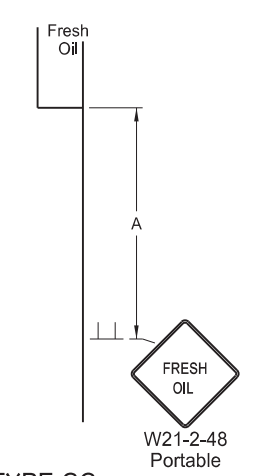
TYPE Z
Where speed zone is needed. Signing shown for one direction only.



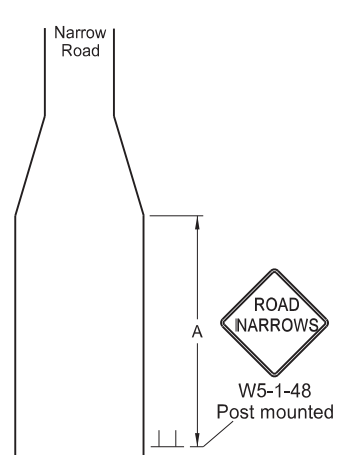
TYPE AA
Where survey crew is used. Signing shown for one direction only.



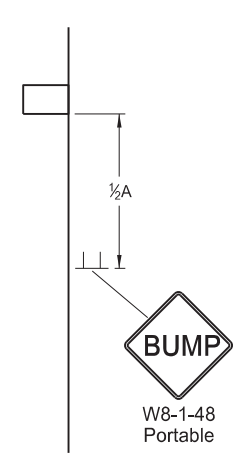
TYPE BB
Within major work area where sign conditions exist



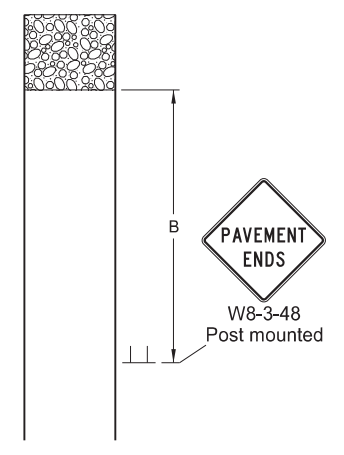
TYPE CC
Where sign conditions exist



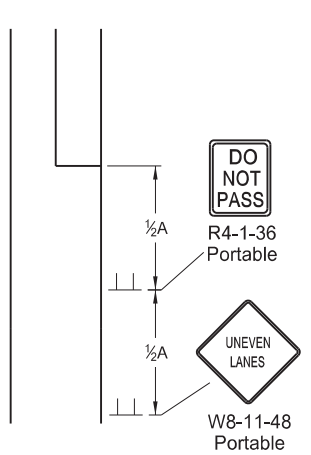
TYPE DD
Where sign conditions exist



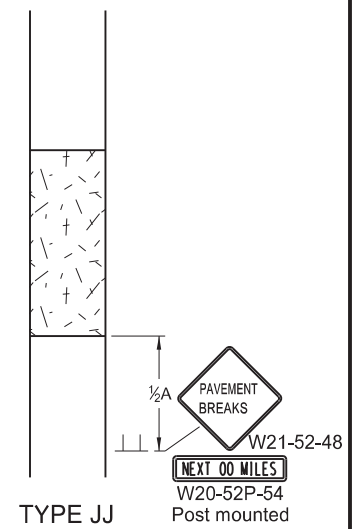
TYPE EE
Where sign conditions exist



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



TYPE GG
Where elevation difference exists between lanes

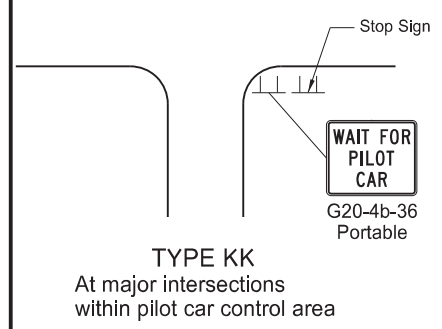


TYPE JJ
For break in pavement. Install signs when conditions exist and remove when not applicable. Signing shown for one direction only.

KEY

- ☐ Flagger
- ☐ Sign
- ▲ Cones
- ⊗ Survey Equipment

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



TYPE KK
At major intersections within pilot car control area

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

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

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

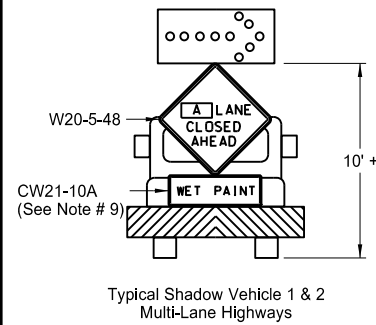
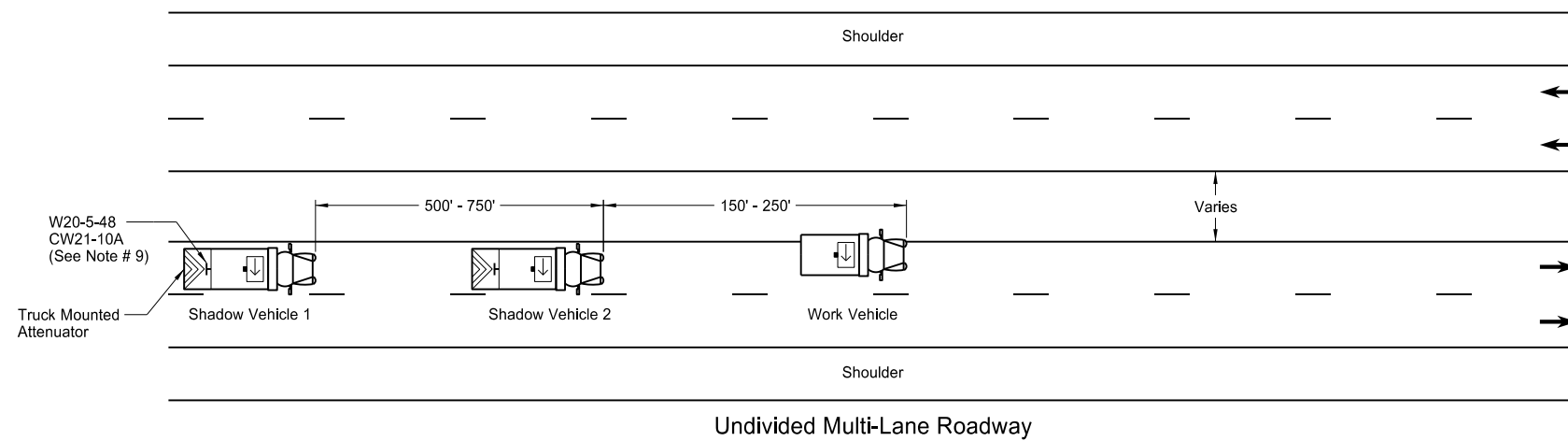
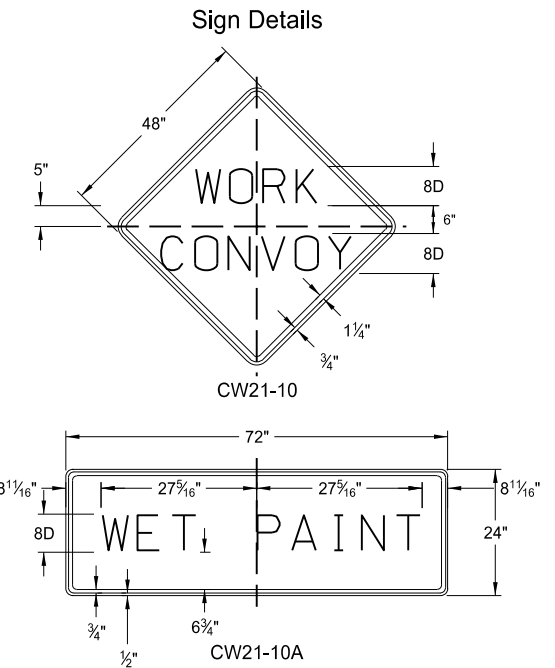
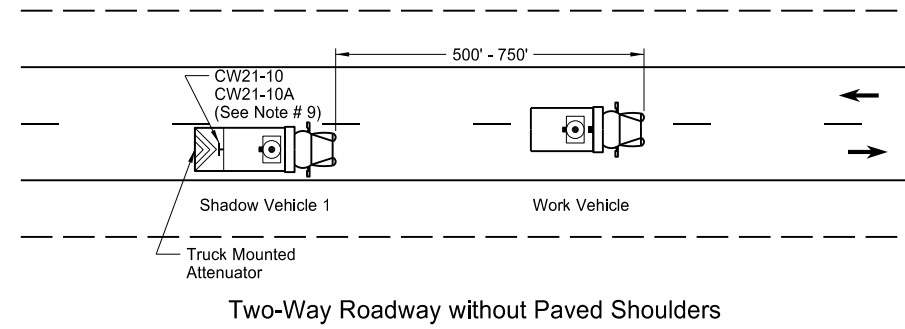
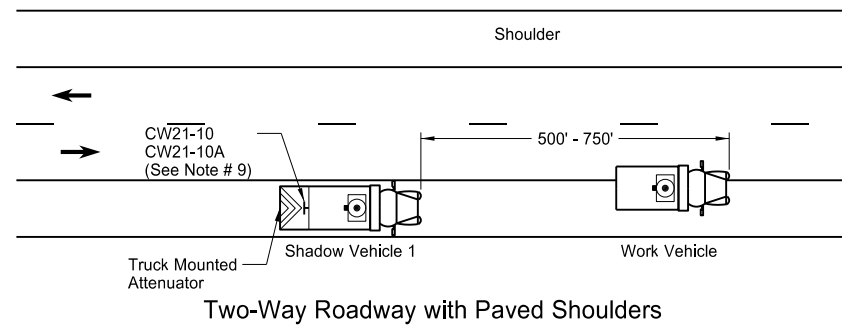
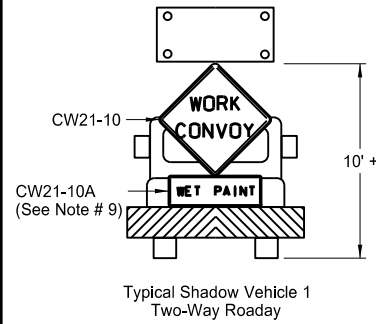
* Posted speed, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
8-17-17	Added speed limit signs. Updated notes & sign numbers.
11-01-19	Revised note 5 & sign numbers.
2-23-23	Revised distance & removed signs.

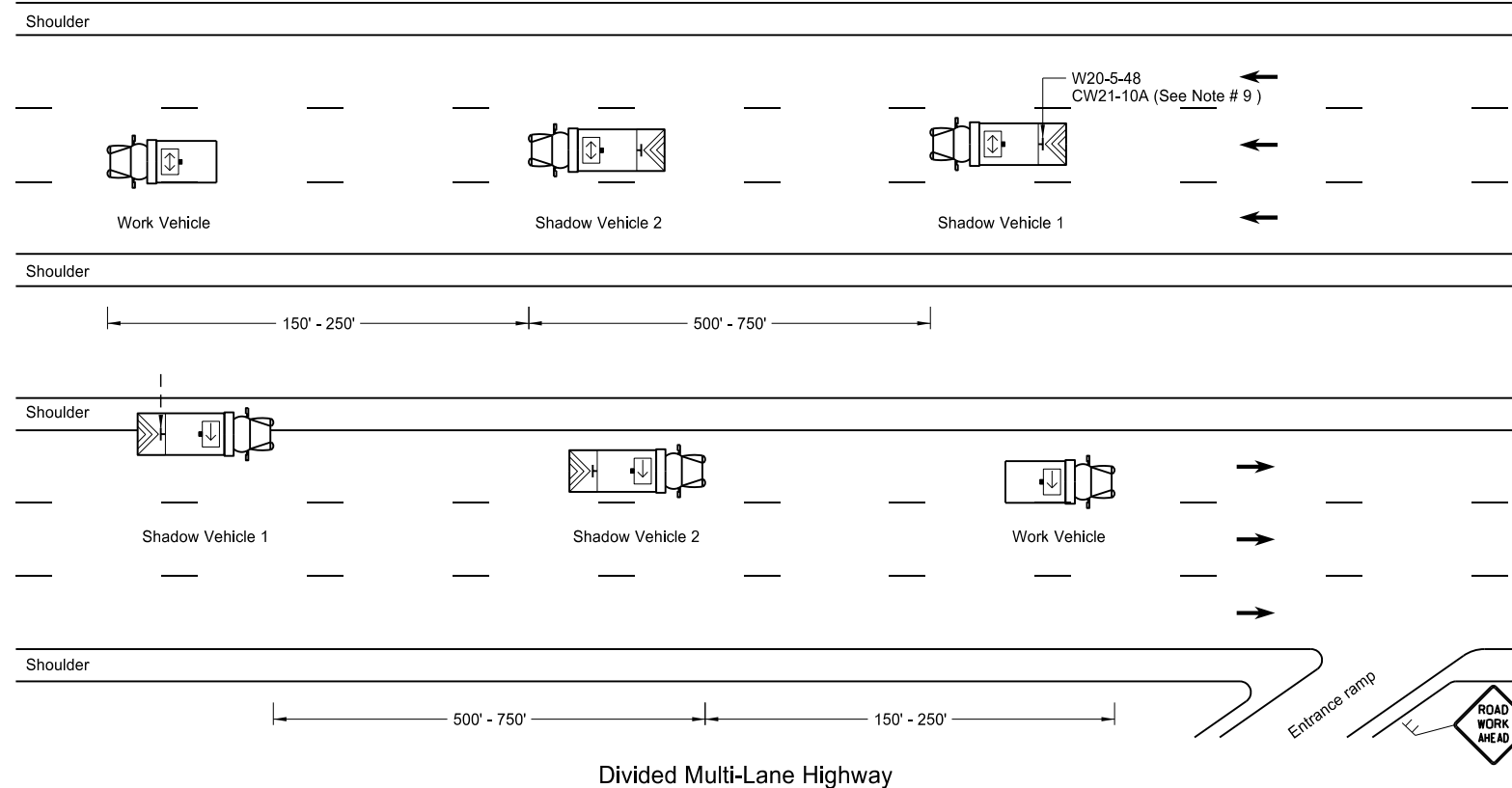


02/23/23

MOBILE OPERATION
(PAVEMENT MARKING)

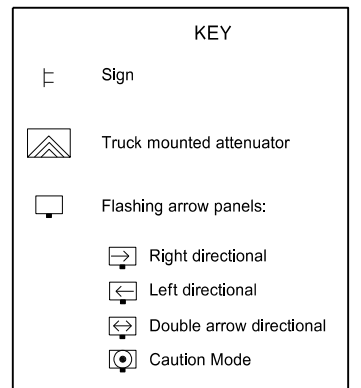


A = Left Right Center



Notes

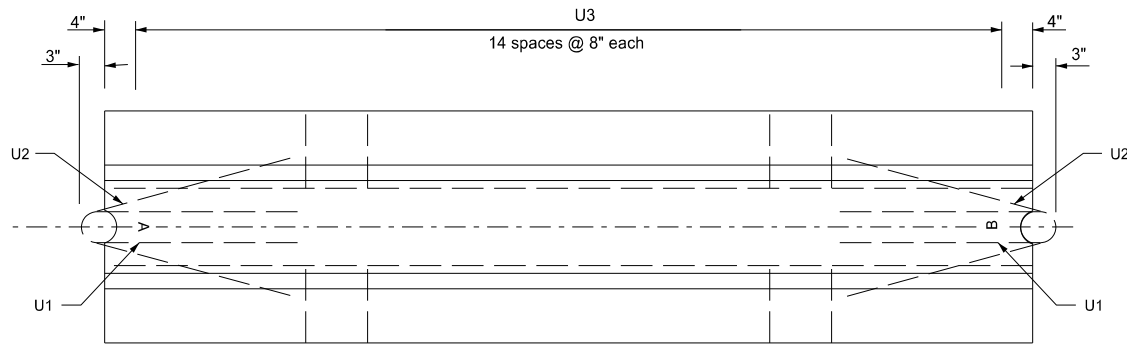
1. Use additional vehicles you choose to be in the convoy with truck mounted attenuators, at your own expense.
2. Display yellow rotating beacons or strobe lights on shadow and work vehicles, unless otherwise stated in the plans.
3. Use Type B or Type C flashing arrow panels controlled from inside the 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.



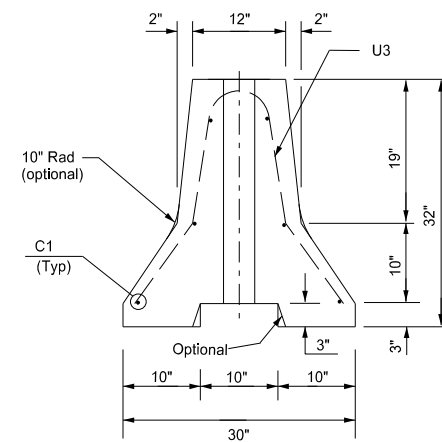
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
6-18-14	Removed shadow vehicle 2 on two lane roadways
9-27-17	Updated to active voice
11-08-19	Changed Standard Heading

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Registration Number
PE- 4683,
on 11/08/19 and the original document is stored at the North Dakota Department of Transportation

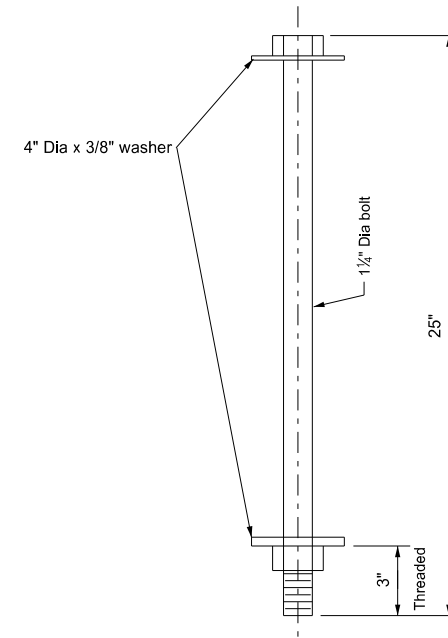
PORTABLE PRECAST CONCRETE MEDIAN BARRIER
(TEMPORARY USAGE)



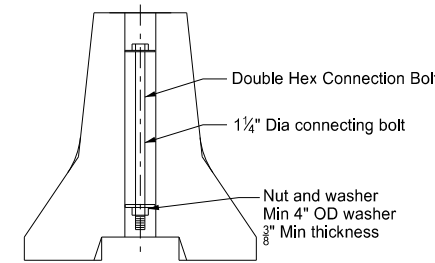
Plan View



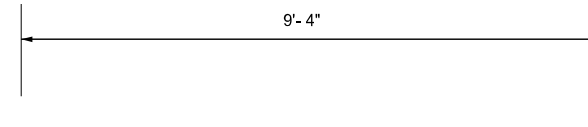
End View



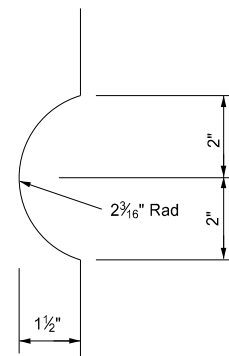
Connecting Bolt Detail
(One per 10 Ft section)



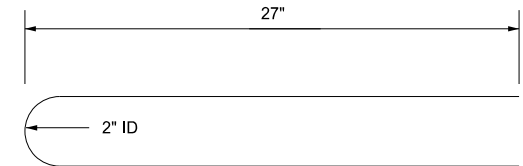
Bolt Connection Detail



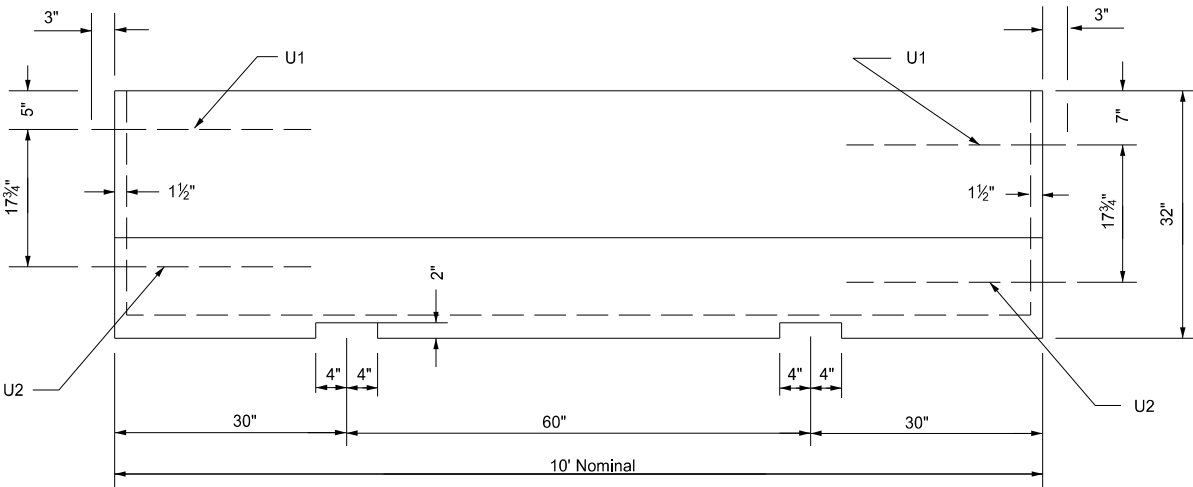
C1 Bar Detail



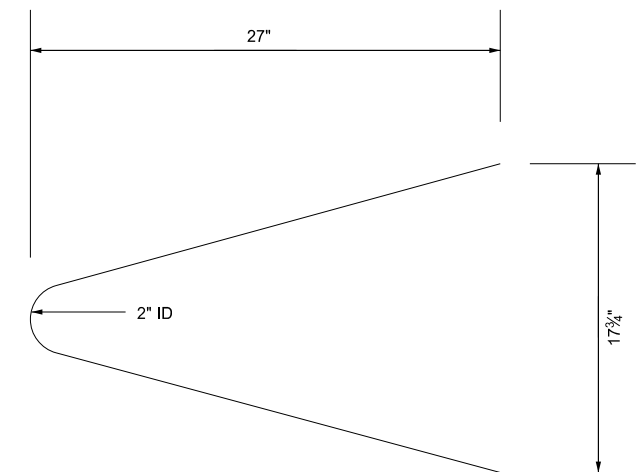
Dap Detail



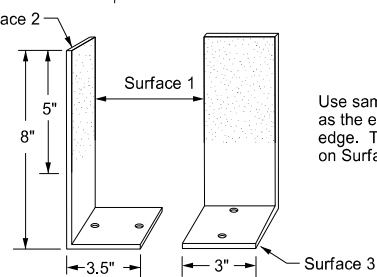
U1 Bar Detail



Side View



U2 Bar Detail



Barrier Marker Detail

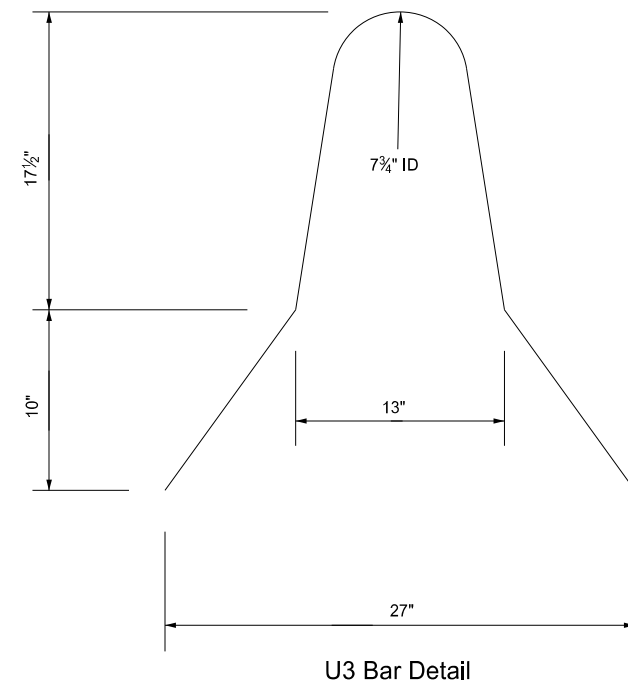
Use same color reflective faces as the edge line along barrier edge. Two way reflective on Surface 1 & 2.

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



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.

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

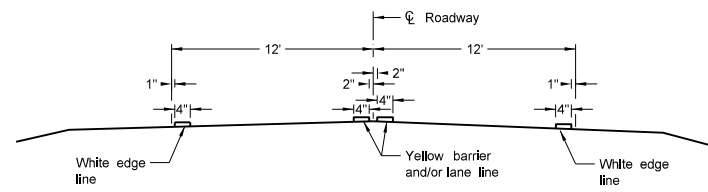
Property	Result	ASTM Test Method
Thickness (min)	.090"	—
Tensile strength (min psi) @ yield	5,500	D638
Impact strength @ -20°F (ft-lbs/in of notch)	3.2	D256 Method A
Impact strength @ 73°F (ft-lbs/in of notch)	14.0	D256 Method A
Flexural strength, PSI 1/4" @ 73°F	8,000	D790
Flexural modulus, PSI 1/4"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

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

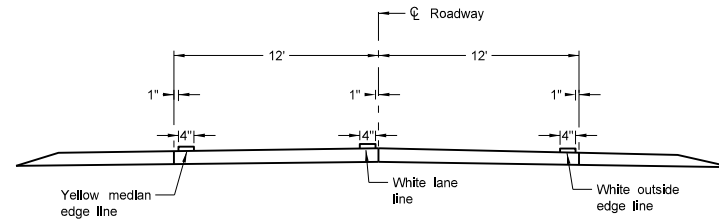
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PAVEMENT MARKING

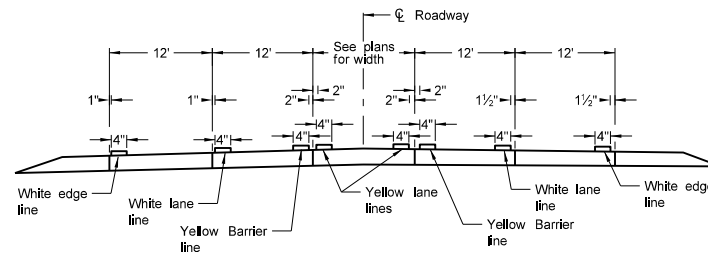
D-762-4



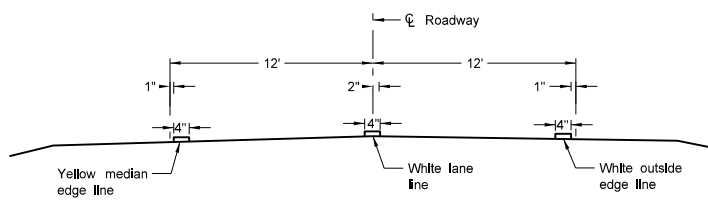
Two Lane Two Way
RURAL ROADWAY



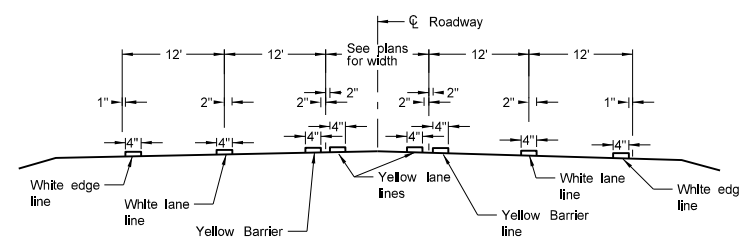
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



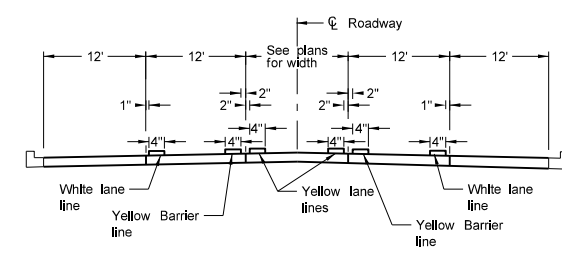
RURAL FIVE LANE ROADWAY
Concrete Section



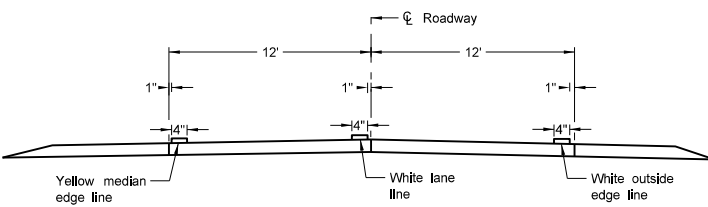
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



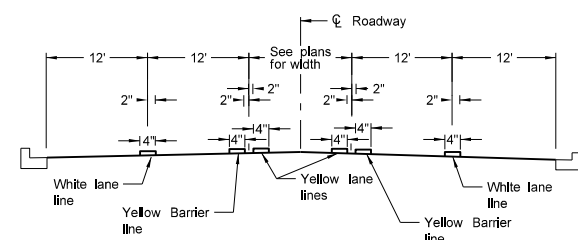
RURAL FIVE LANE ROADWAY
Asphalt Section



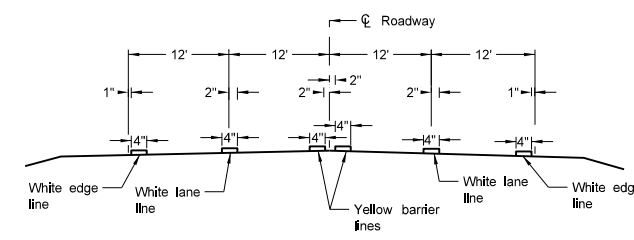
URBAN FIVE LANE SECTION
Concrete Section



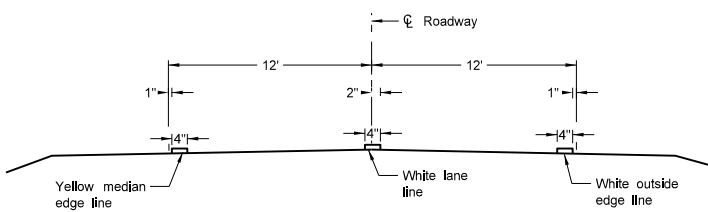
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



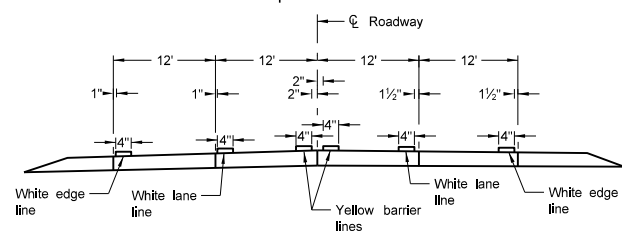
URBAN FIVE LANE SECTION
Asphalt Section



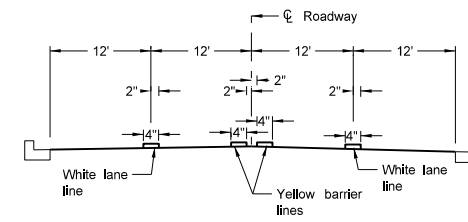
RURAL FOUR LANE ROADWAY
Asphalt Section



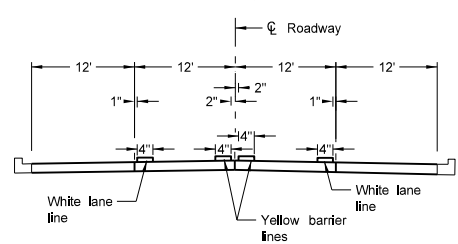
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



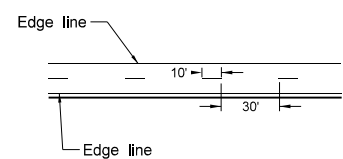
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



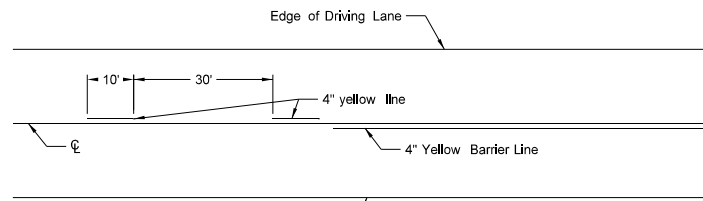
CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

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

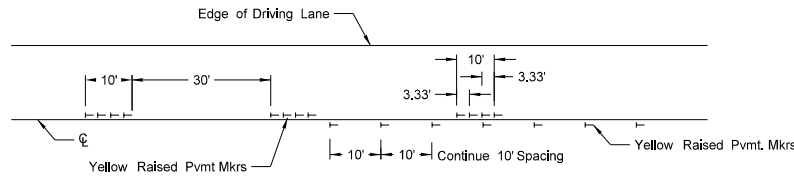
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp.

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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

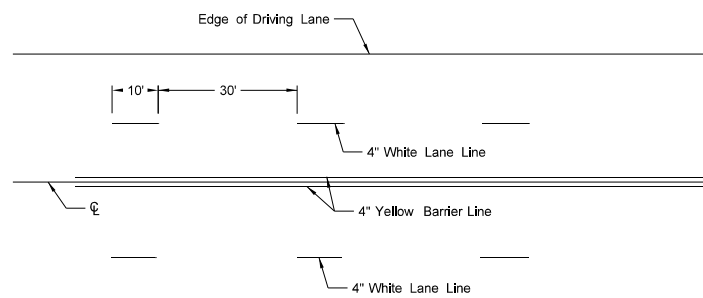


Painted or Tape Lines

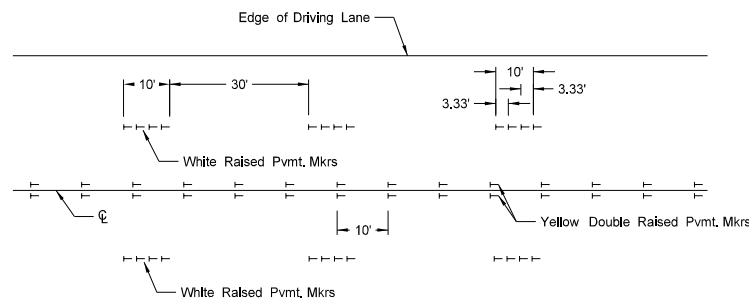


Raised Pavement Markers

TWO-LANE TWO-WAY ROADWAY

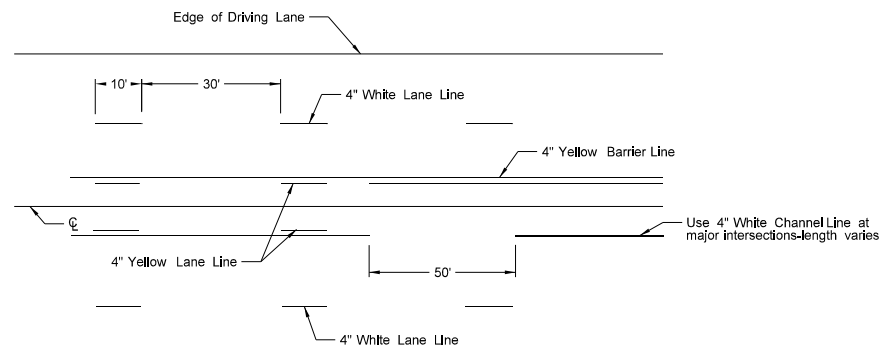


Painted or Tape Lines

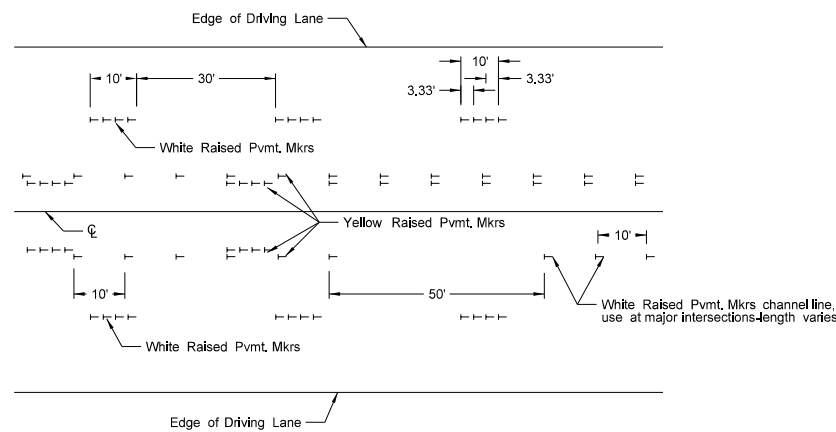


Raised Pavement Markers

FOUR LANE ROADWAY

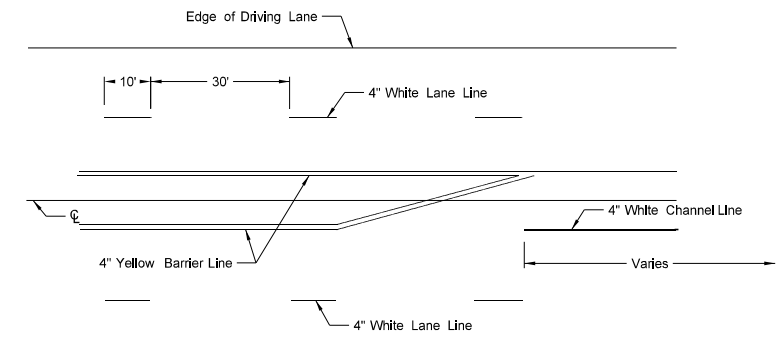


Painted or Tape Lines

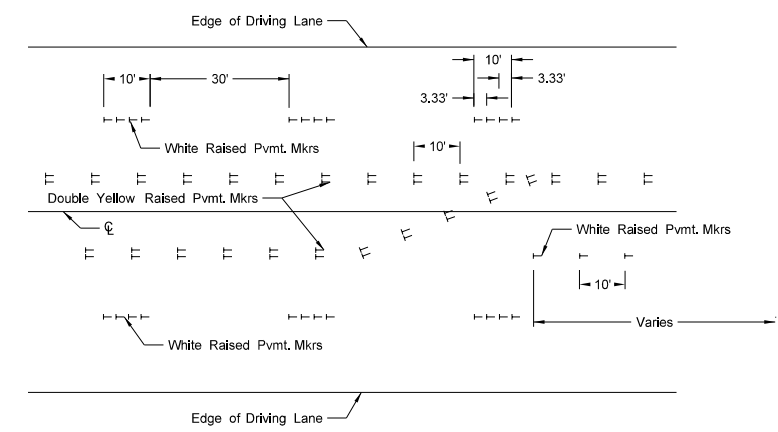


Raised Pavement Markers

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.

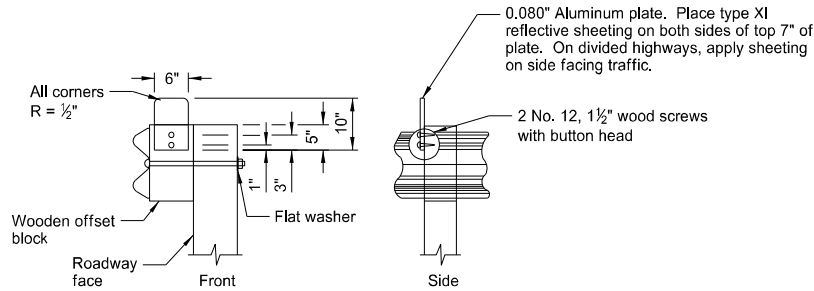
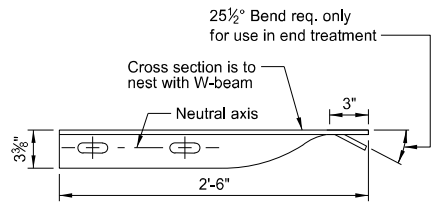
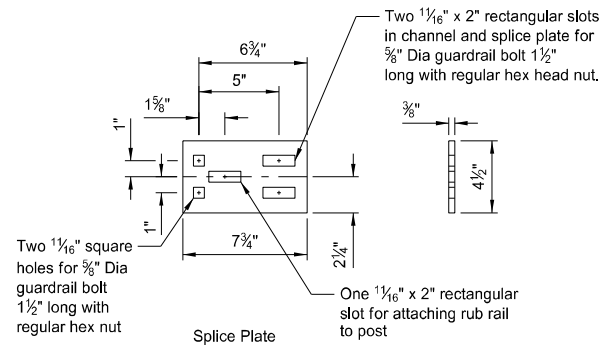
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
3-29-16	Re-numbered to be D-762-11 (previously was D-762-6)
10-17-17	Updated to active voice.
8-27-19	New Design Engineer PE Stamp.

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

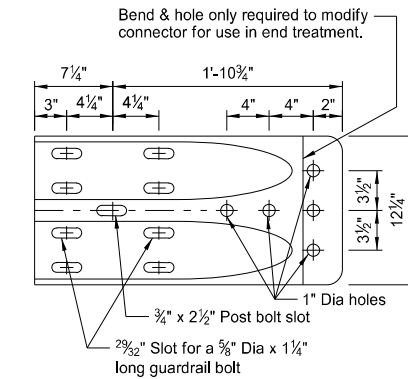
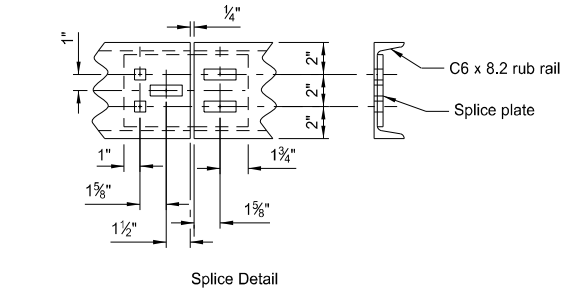
W-BEAM GUARDRAIL GENERAL DETAILS

NOTES:

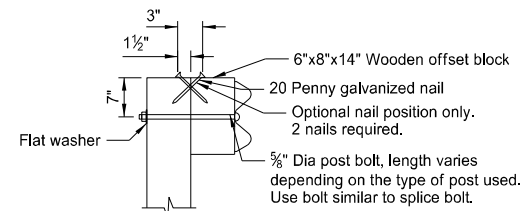
- Place reflector plates at the first post and spaced at 25' centers on guardrail less than 250' in length and at 50' centers for guardrail over 250' in length. Use reflector the same color as the pavement marking adjacent to that reflector unless noted otherwise on the plans.
- Dispose of excess earth from excavations for guard posts as directed by the engineer. Replace bituminous material where guardrail is installed after mat is placed. Include cost of excavation and replacing of bituminous material in the price bid for other items.
- Place Object Marker within the vertical edges of the Impact Plate. Use type XI retroreflective sheeting meeting the requirements of Section 894.02.E of the standard specifications. Apply sheeting to 0.100 Aluminum sheeting meeting the requirements Section 894.01.A. Attach the Object Marker to the Impact Head Plate with non-rust rivets or some other non-rust attachment device. Slope stripes downward toward the roadway side.
- Guardrail installation height tolerance = $- \frac{1}{4}"$, $+ 1"$.
- Standard W-Beam rail post bolt slot spacing is 6'-3". Post bolt slot spacing of 3'-1 1/2" is acceptable.



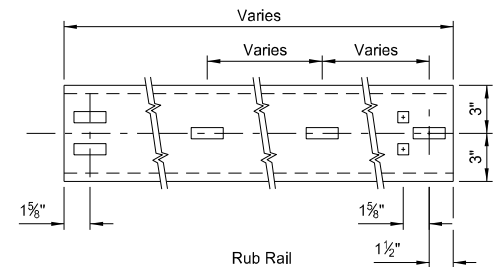
REFLECTORIZED PLATE DETAIL
Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.



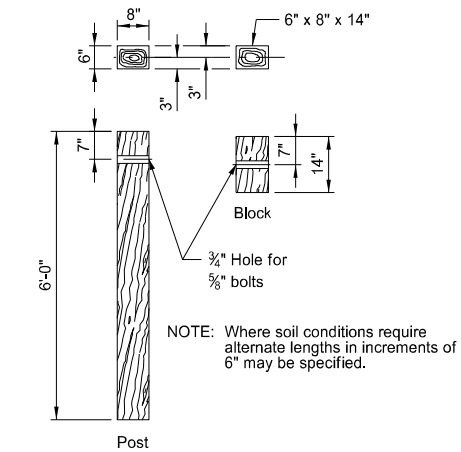
W BEAM TERMINAL CONNECTOR



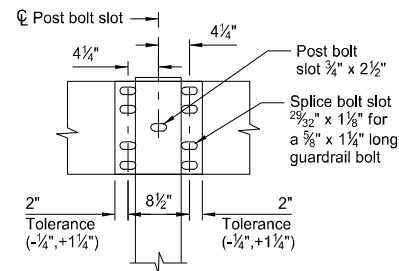
TYPICAL POST ATTACHMENT DETAIL



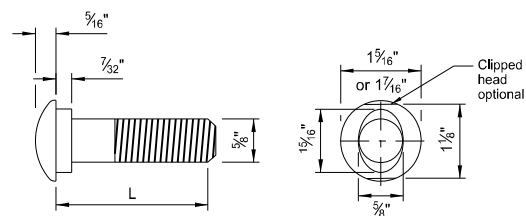
C6x8 RUB RAIL AND SPLICE PLATE



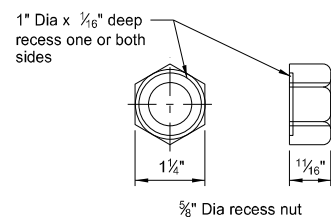
6"x8" TIMBER POST & BLOCK



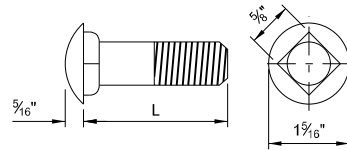
SPLICE DETAIL



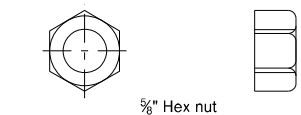
5/8" Diameter Guardrail Bolt	
L	Thread Length
1 1/4"	Full length thread
2"	1 1/4" Min thread length
9 1/2"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length



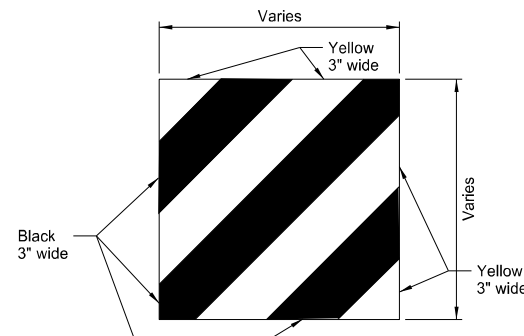
5/8" GUARDRAIL BOLT & RECESS NUT



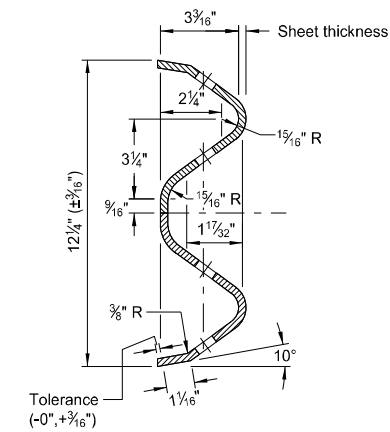
5/8" Diameter Carriage Bolt	
L	Thread Length
1 1/2"	Full length thread
3"	1 1/2" Min thread length
11"	1 3/4" Min thread length
13"	1 3/4" Min thread length



5/8" CARRIAGE BOLT & NUT



IMPACT HEAD OBJECT MARKER

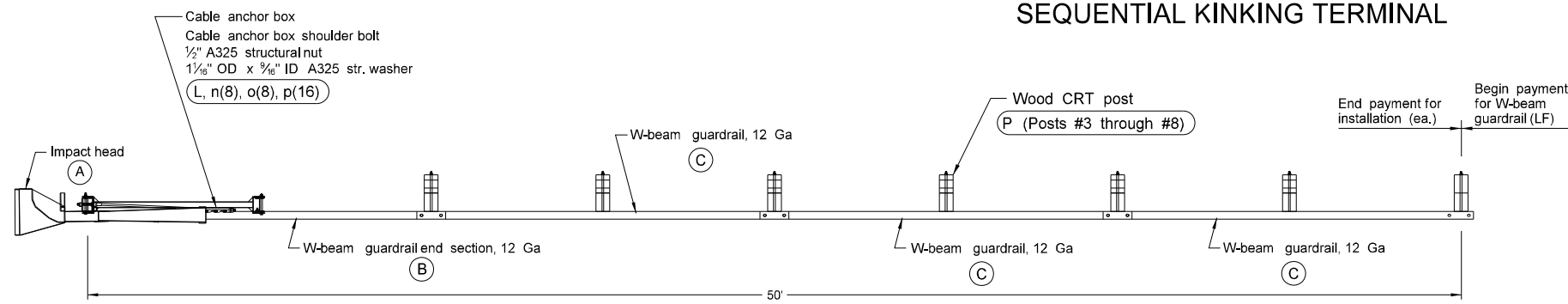


W-BEAM CROSS SECTION

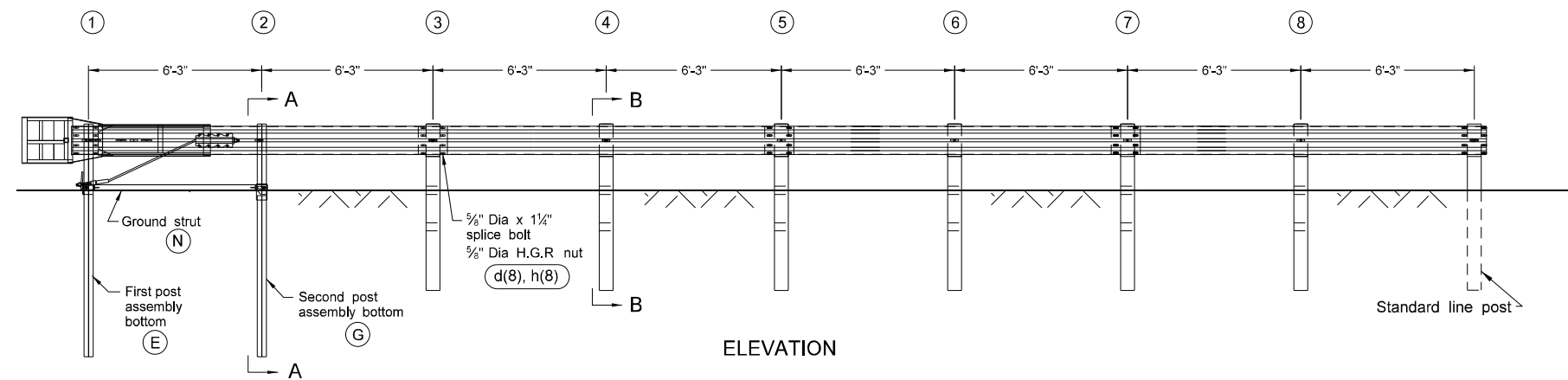
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE
10-25-19	Updated notes to active voice and added Note 5.
12-02-20	Updated clipped head to optional

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

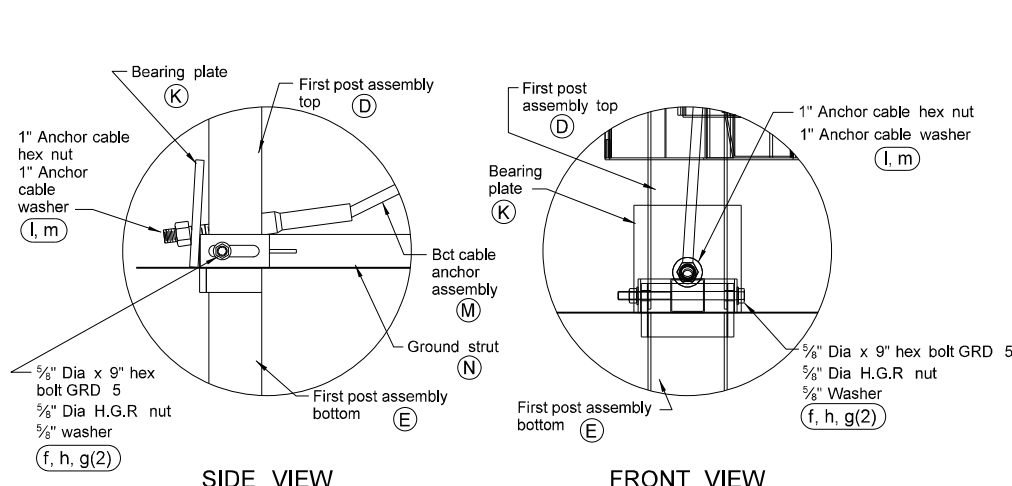
SEQUENTIAL KINKING TERMINAL



PLAN



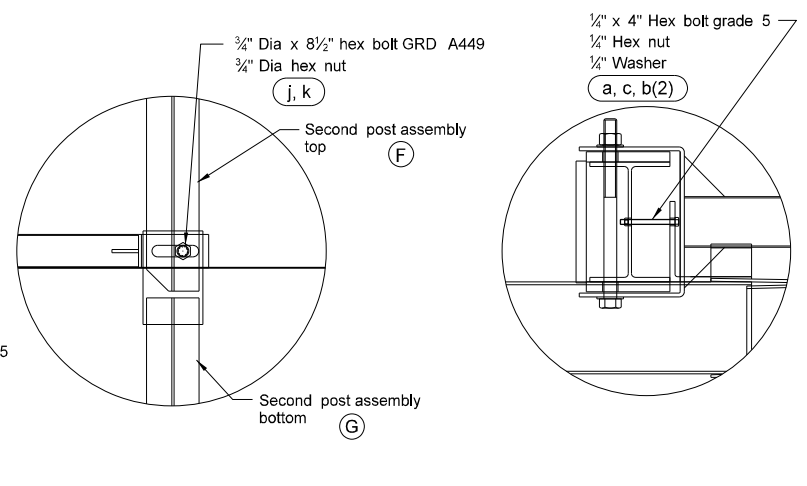
ELEVATION



SIDE VIEW

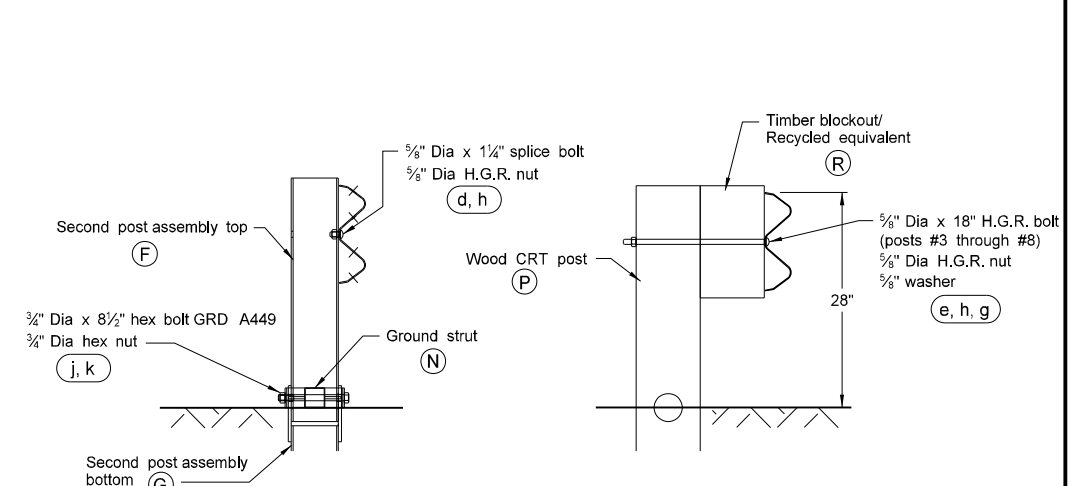
FRONT VIEW

POST #1 CONNECTION DETAILS



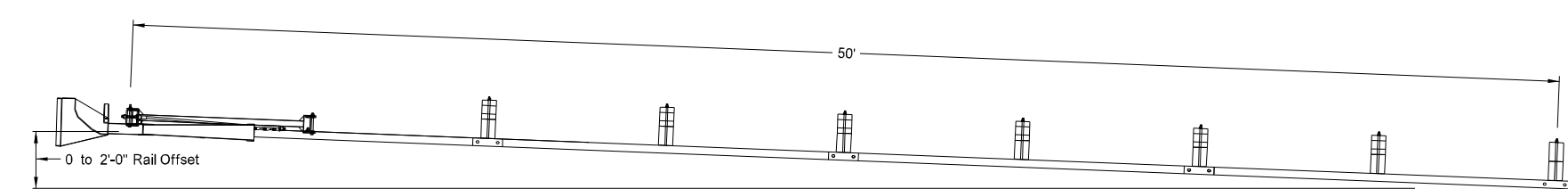
SIDE VIEW DETAIL OF POST #2

IMPACT HEAD CONNECTION DETAIL



SECTION A-A
Post #2

SECTION B-B
Posts #3 through #8



FLARED INSTALLATION
25:1 maximum flare rate

GENERAL NOTES:

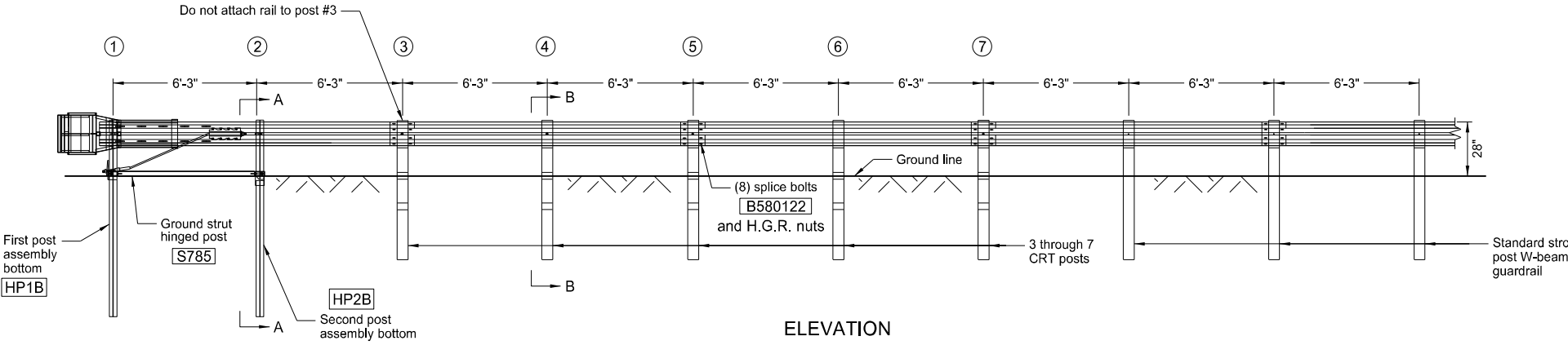
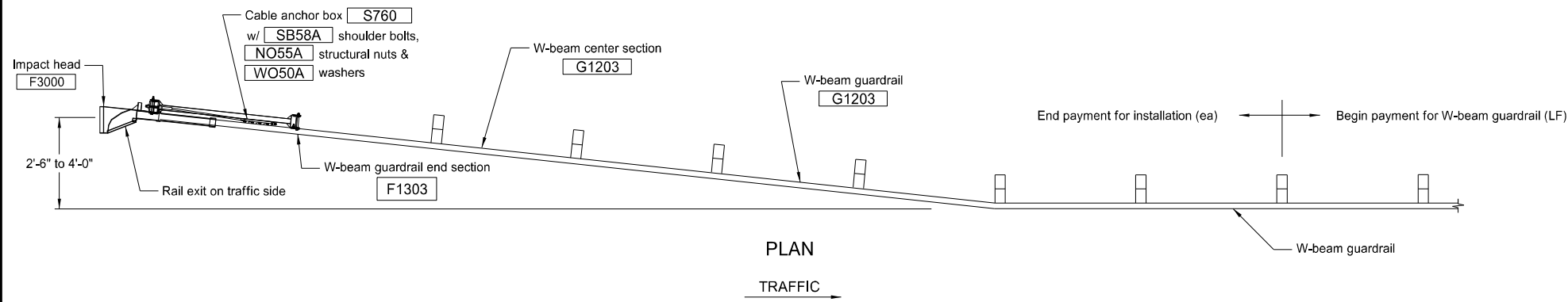
1. Use breakaway posts with the SKT.
2. Use galvanized bolts, nuts, cable assemblies, cable anchors, and bearing plates.
3. Flare the SKT at a rate of up to 25:1 to prevent shoulder encroachment by the impact head.
4. Grade site as needed to prevent lower sections of the posts from protruding more than 4" above ground (measured along a 5' cord).
5. Drive 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 satisfactorily to prevent settlement.
6. When rock is encountered during excavation, use a 10" diameter post hole, 20" into the rock surface, if approved by the engineer. Place granular material in the bottom of the hole, approximately 2 1/2" deep to provide drainage. Field cut posts 1 & 2 to length, place in the hole, and backfill with adequately compacted material excavated from the hole.
7. Place the breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent the cable from twisting when tightening nuts.
8. "Toe nail" the wood blockouts on post #3 through post #8 with two 20 penny galvanized nails in each rectangular post, to prevent them from turning when the wood shrinks.

BILL OF MATERIALS		
ITEM	QTY	
A	1	IMPACT HEAD
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga
C	3	W-BEAM GUARDRAIL, 12 Ga
D	1	FIRST POST ASSEMBLY TOP
E	1	FIRST POST ASSEMBLY BOTTOM
F	1	SECOND POST ASSEMBLY TOP
G	1	SECOND POST ASSEMBLY BOTTOM
K	1	BEARING PLATE
L	1	CABLE ANCHOR BOX
M	1	BCT CABLE ANCHOR ASSEMBLY
N	1	GROUND STRUT HINGED POST
P	6	WOOD CRT POST
R	6	TIMBER BLOCKOUT/RCY EQUIVALENT
HARDWARE		
a	2	1/4 " x 4" HEX BOLT Grade 5
b	4	1/2" WASHER
c	2	1/4" HEX NUT
d	25	5/8" Dia X 1 1/4" SPLICE BOLT, POST #2
e	6	5/8" Dia X 18" H.G.R. BOLT (POSTS 3 THRU 8)
f	1	5/8" Dia X 9" HEX BOLT GRD 5
g	8	5/8" WASHER
h	32	5/8" Dia H.G.R. NUT
j	1	3/4" Dia X 8 1/2" HEX BOLT GRD A449
k	1	3/4" Dia HEX NUT
l	2	1" ANCHOR CABLE HEX NUT
m	2	1" ANCHOR CABLE WASHER
n	8	GROUND STRUT HINGED POST
o	8	1/2" A325 STRUCTURAL NUT
p	16	1 1/8" OD X 5/8" ID A325 STR. WASHER

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.

FLARED ENERGY ABSORBING TERMINAL

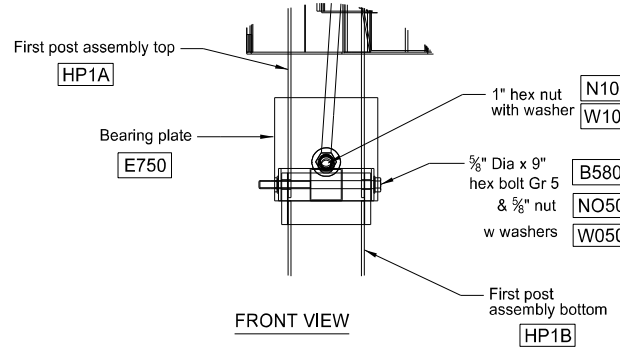
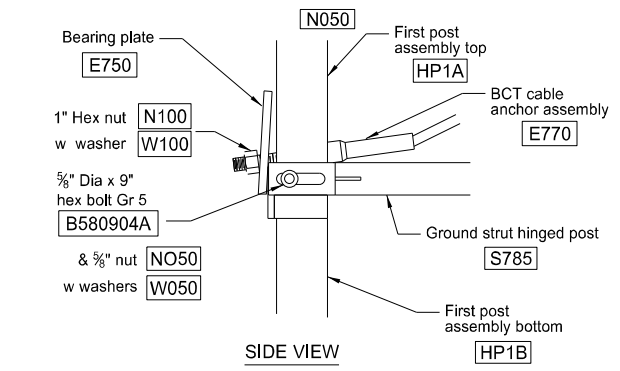
D-764-6



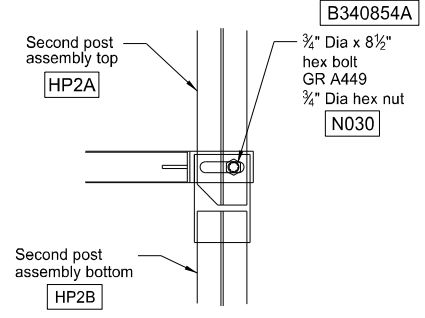
ITEM #	QTY	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA
G1203	2	W-BEAM GUARDRAIL, 12 GA
HP1A	1	FIRST POST ASSEMBLY TOP
HP1B	1	FIRST POST ASSEMBLY BOTTOM
HP2A	1	SECOND POST ASSEMBLY TOP
HP2B	1	SECOND POST ASSEMBLY BOTTOM
P671	5	WOOD CRT POST
P675	5	TIMBER BLOCKOUT OR RECYCLED EQUIVALENT
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
S785	1	GROUND STRUT HINGED POST
HARDWARE		
B140404	2	1/4" Dia x 4" HEX BOLT
W014	4	1/4" WASHER
N014	2	1/4" HEX NUT
B580122	17	5/8" Dia x 1 1/4" SPLICE BOLT
B581802	4	5/8" Dia x 10" H.G.R. BOLT (POSTS 3 THRU 6)
B580904A	1	5/8" Dia x 9" HEX BOLT GR 5
W050	5	5/8" WASHER
N050	22	5/8" Dia H.G.R. NUT
B340854A	1	3/4" Dia x 8 1/2" HEX BOLT GR A449
N030	1	3/4" Dia HEX NUT
N100	2	1" ANCHOR CABLE HEX NUT
W100	2	1" ANCHOR CABLE WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N055A	8	1/2" A325 STRUCTURAL NUT
W050A	16	1 1/16" OD x 3/16" ID A325 STR. WASHER

GENERAL NOTES

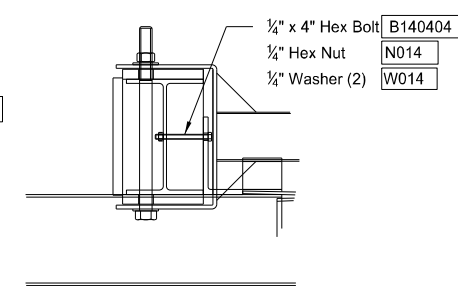
- Use wood posts with the Flared Energy Absorbing Terminal except posts #1 and #2.
- Use galvanized bolts, nuts, cable assemblies, cable anchors, and bearing plates.
- Grade site as needed to prevent lower sections of the posts from protruding more than 4 inches above the ground (measured along a 60 inch cord).
- Drive the lower section without the upper post attached. If the post is placed in a drilled hole, compact the backfill material satisfactorily to prevent settlement.
- When rock is encountered during excavation, use a 12" diameter post hole 20" into the rock surface, if approved by the Engineer. Place granular material in the bottom of hole approximately 2 1/2" deep to provide drainage. Field cut soil tubes to length, place in hole, and back fill with adequately compacted material excavated from hole.
- Place the 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 with two 20 penny galvanized nails in each post to prevent them from turning when the wood shrinks.
- 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, flare the Flared Energy Absorbing Terminal at the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, turn the Flared Energy Absorbing Terminal parallel to the roadway.



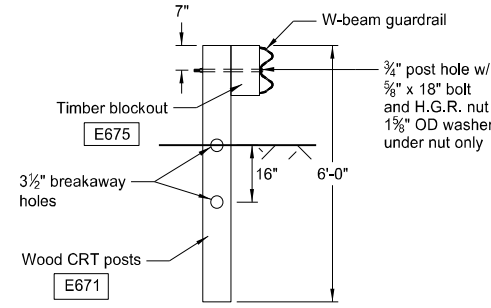
POST #1 CONNECTION DETAILS



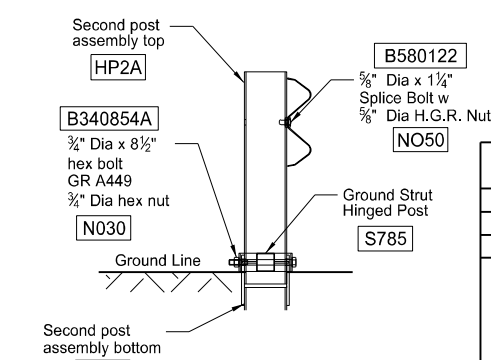
SIDE VIEW DETAIL OF POST #2



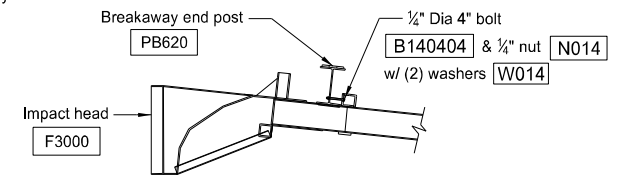
IMPACT HEAD CONNECTION DETAIL



SECTION B-B
POST 3 THRU 7



SECTION A-A
at Post #2



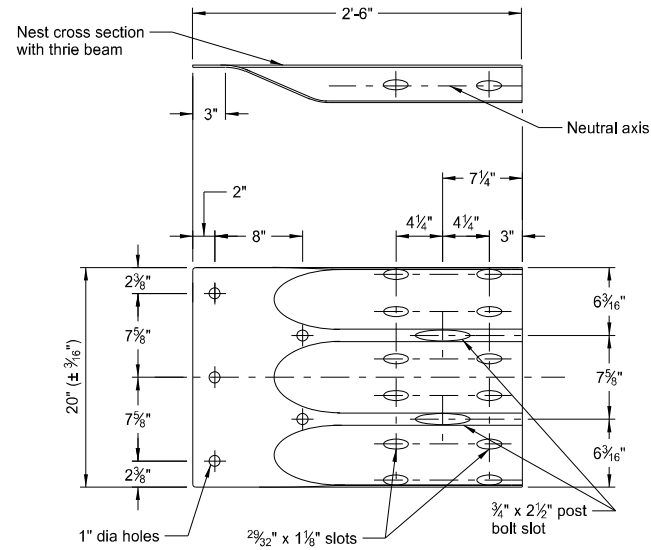
IMPACT HEAD CONNECTING DETAIL

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE
12-02-20	Update notes to active voice.

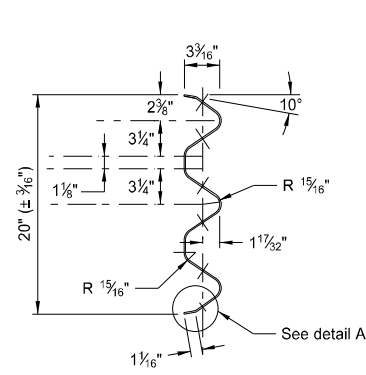


THRIE BEAM TRANSITION TO DOUBLE BOX BEAM RETROFIT

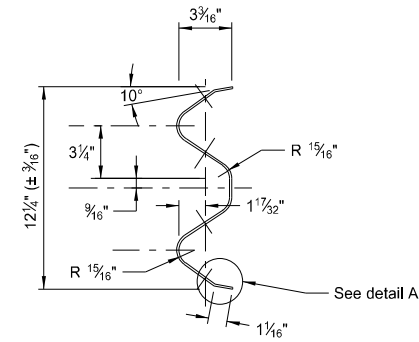
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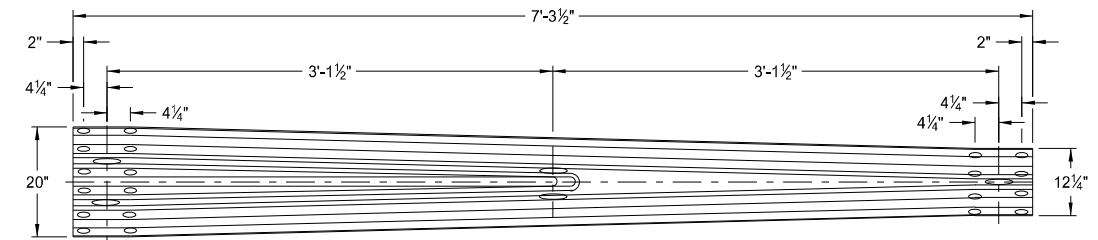
THRIE BEAM TERMINAL CONNECTOR



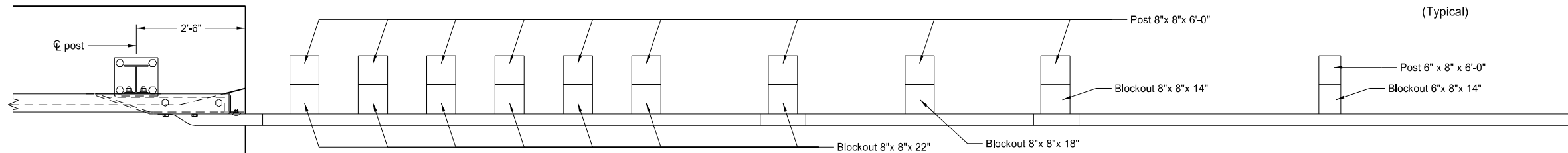
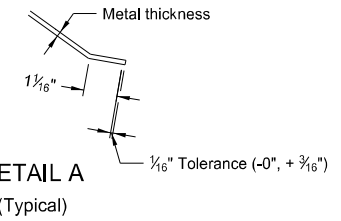
THRIE BEAM END VIEW



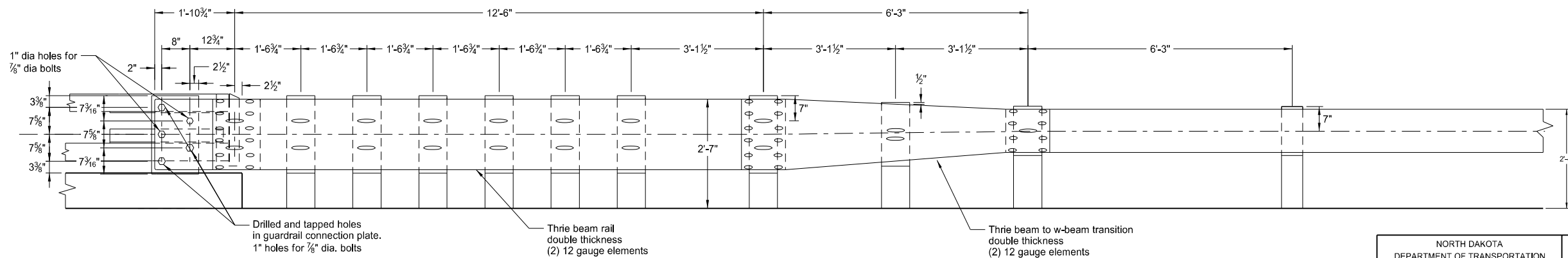
W-BEAM END VIEW



THRIE BEAM TO W-BEAM TRANSITION SECTION



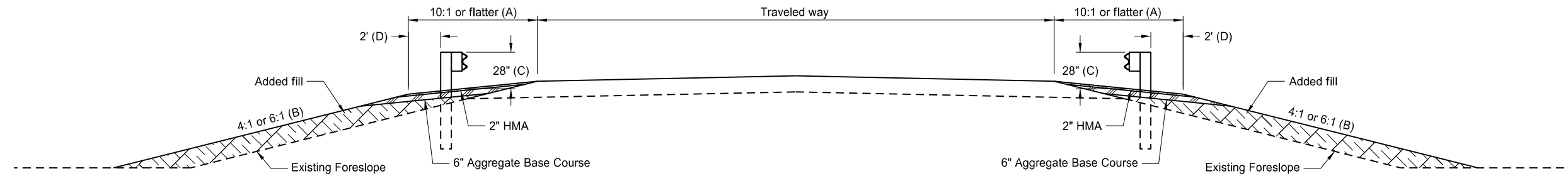
PLAN



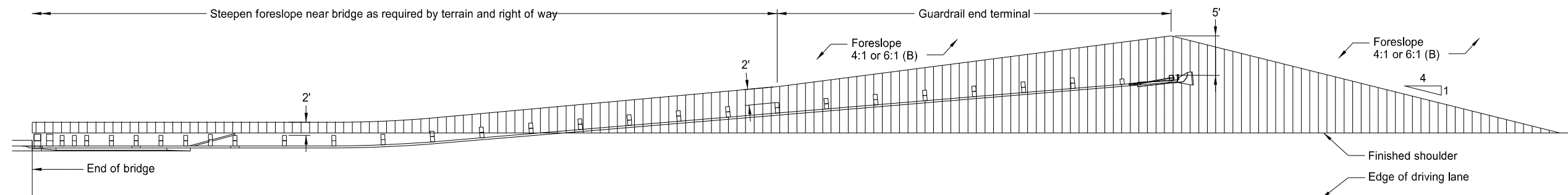
ELEVATION

NORTH DAKOTA	
DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE
12/02/20	Updated text to active voice.

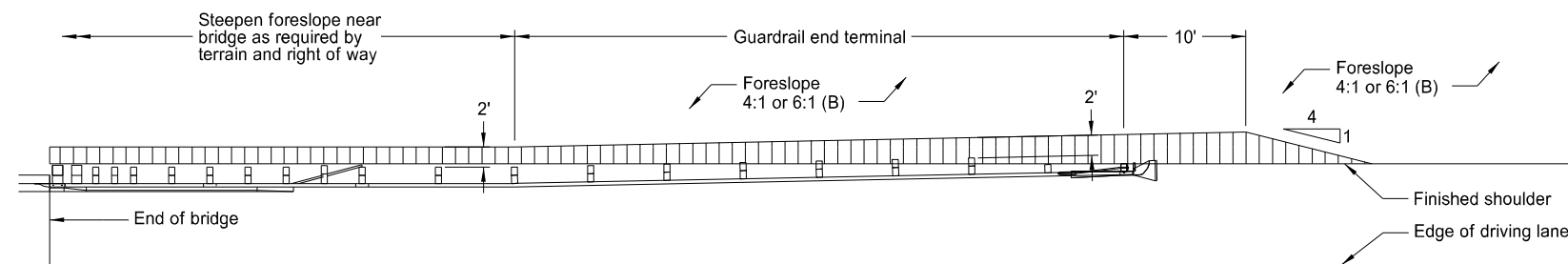
TYPICAL GRADING AT BRIDGE ENDS
WITH W-BEAM GUARDRAIL



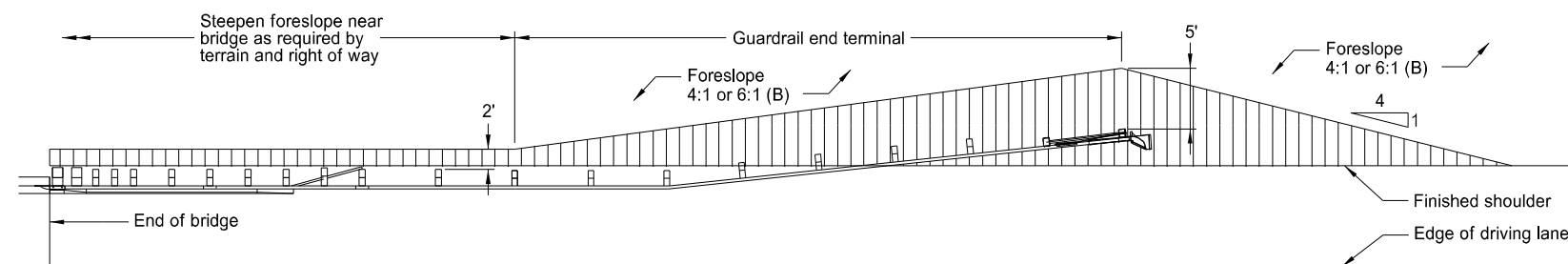
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

- (A) Use slope flatter than 10:1 when necessary 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) Dimension at end terminals vary per Plan Layouts shown on this sheet.

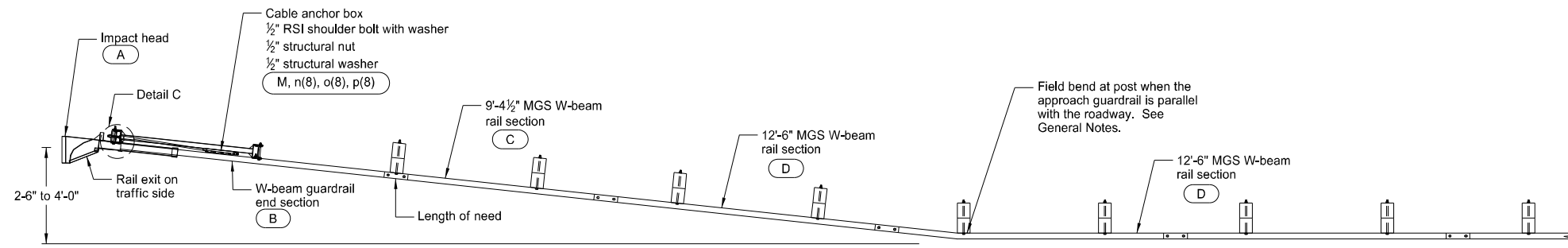
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.



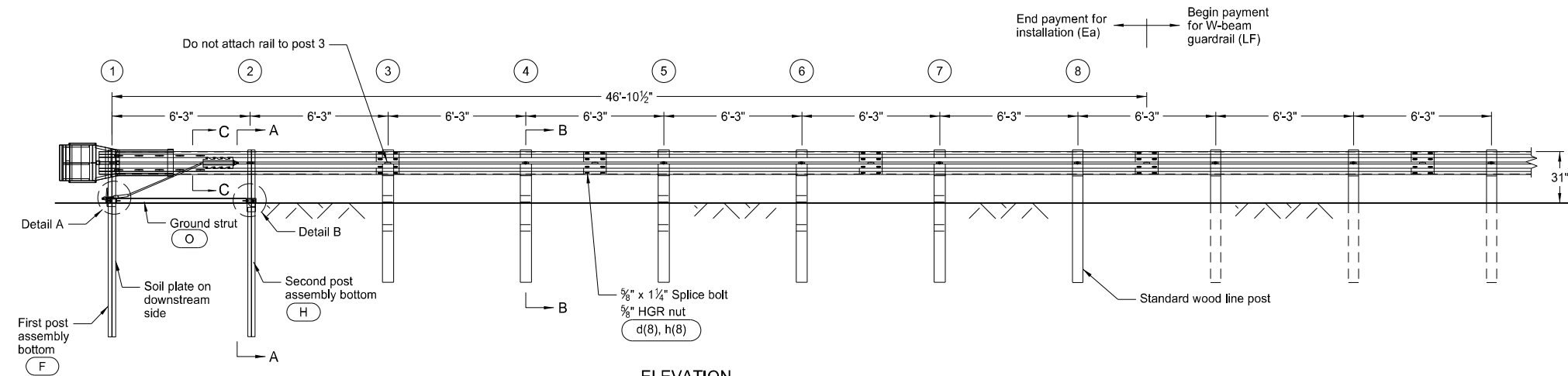
12 02 2020

MGS FLARED ENERGY ABSORBING TERMINAL - WOOD POST

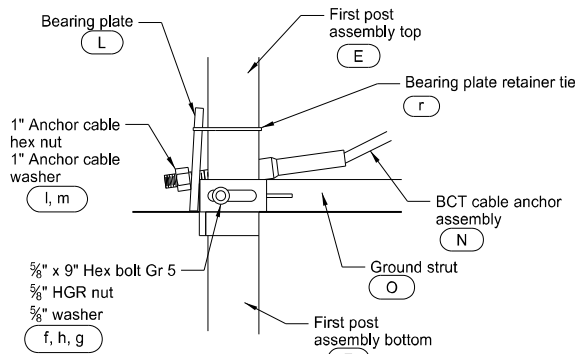
D-764-38



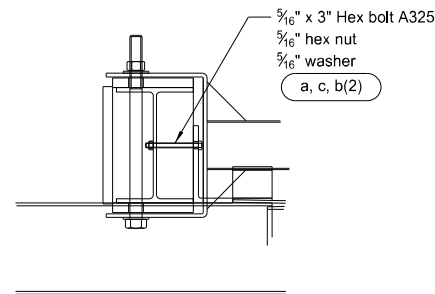
PLAN



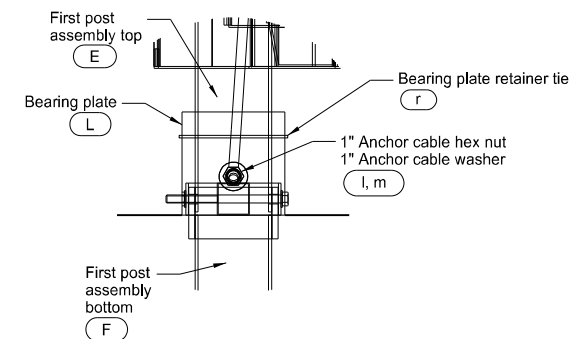
ELEVATION



SIDE VIEW

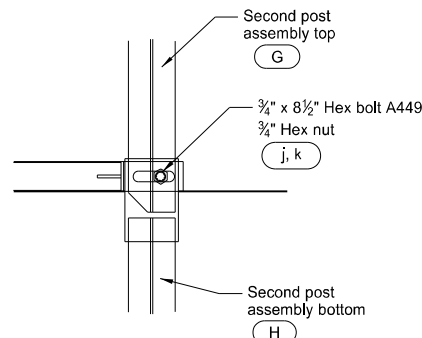


DETAIL C
Post 1 (Impact Head connection)

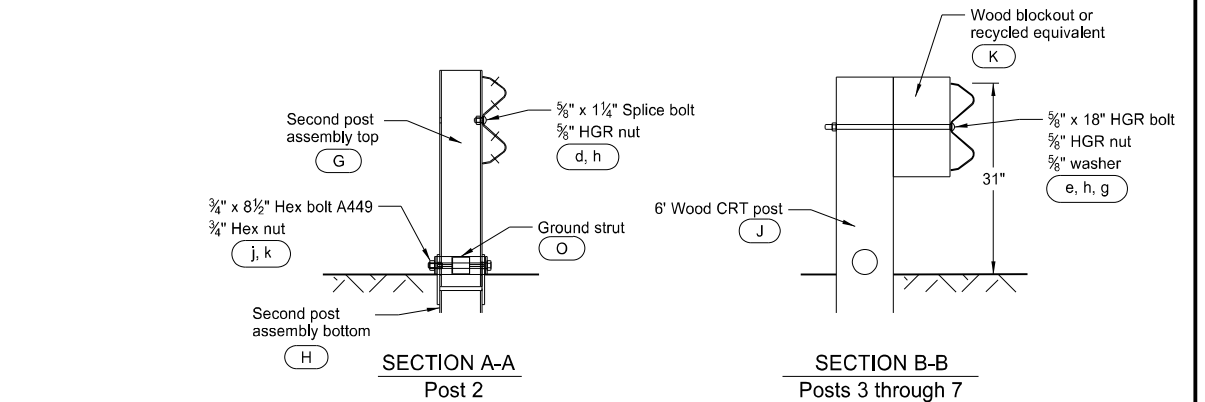


FRONT VIEW

DETAIL A
Post 1

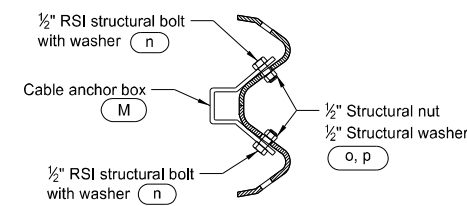


DETAIL B
Post 2



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	5/16" WASHER	7
h	N050	5/8" Dia HGR NUT	39
j	B340854A	3/4" Dia x 8 1/2" HEX BOLT GRD A449	1
k	N030	3/4" Dia HEX NUT	1
l	N100	1" ANCHOR CABLE HEX NUT	2
m	W100	1" ANCHOR CABLE WASHER	2
n	SB12A	1/2" RSI SHOULDER BOLT WITH WASHER	8
o	N012A	1/2" STRUCTURAL NUT	8
p	W012A	1/2" STRUCTURAL WASHER	8
r	CT-100ST	BEARING PLATE RETAINER TIE	1

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

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
7-14-17

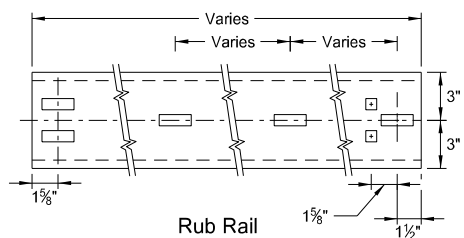
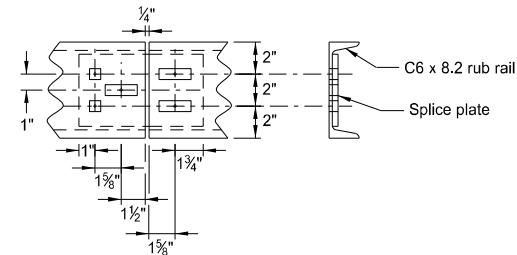
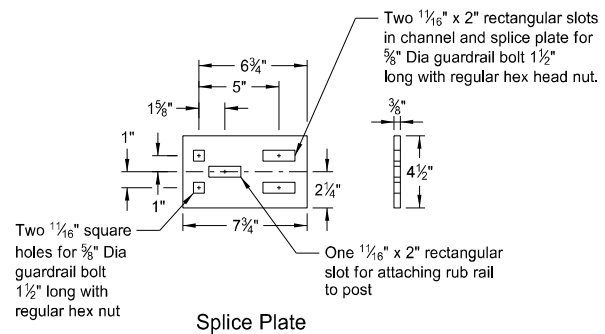
REVISIONS
DATE CHANGE
12-02-20 Updated notes to active voice.



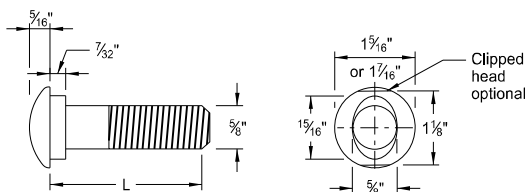
12 02 2020

MGS W-BEAM GUARDRAIL GENERAL DETAILS

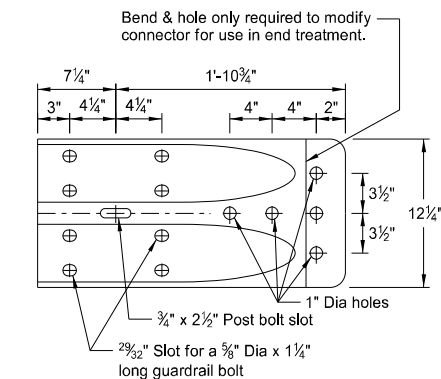
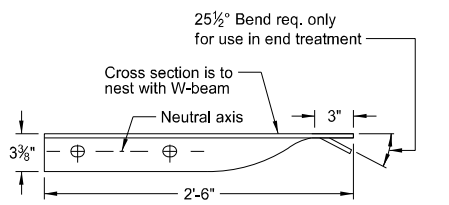
D-764-40



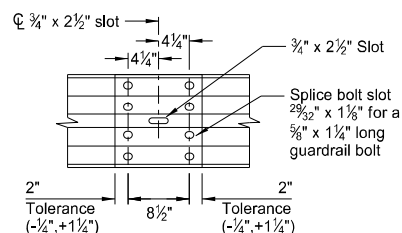
C6x8.2 RUB RAIL AND SPLICE PLATE



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

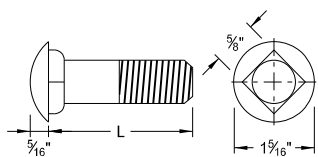


W BEAM TERMINAL CONNECTOR

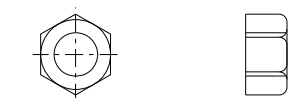


SPLICE DETAIL

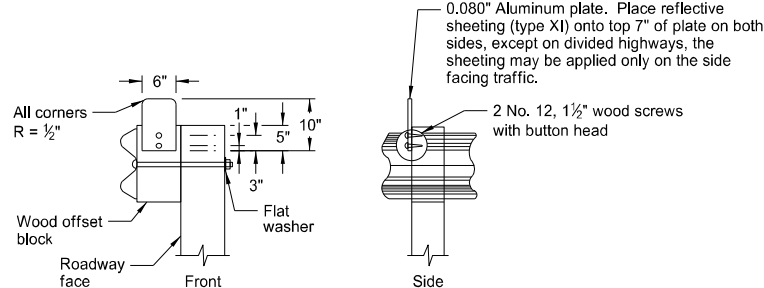
NOTE: Do not install center bolt in the 3/4" x 2 1/2" slot at mid span splices.



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

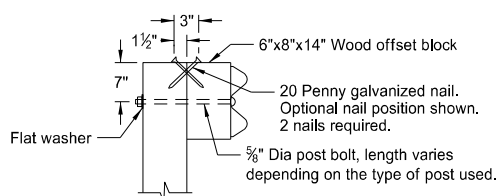


5/8" CARRIAGE BOLT & NUT

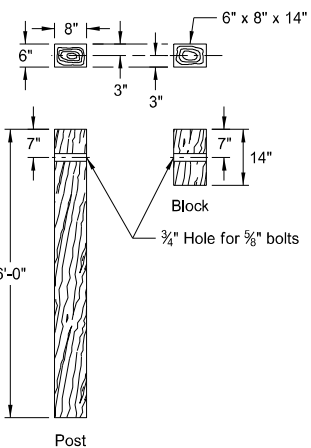


REFLECTORIZED PLATE DETAIL

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

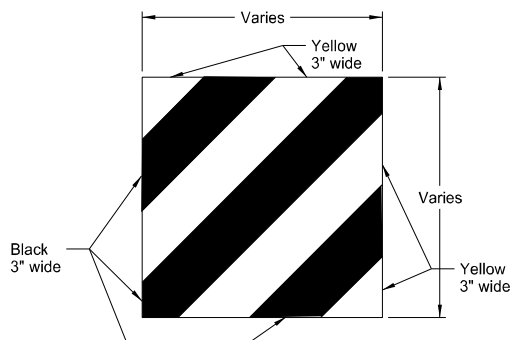


TYPICAL WOOD POST ATTACHMENT DETAIL

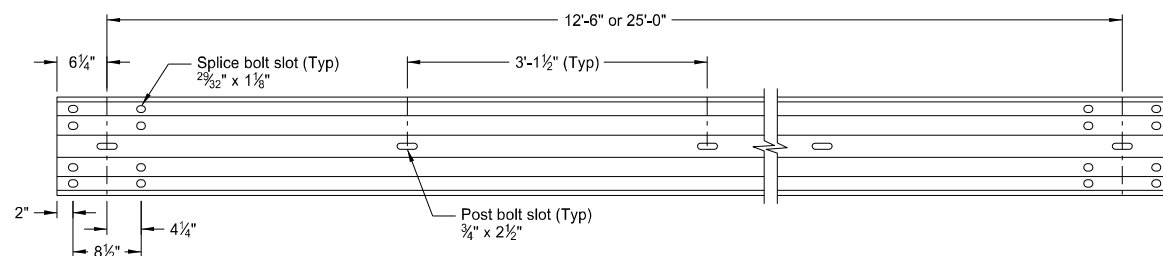


6" x 8" WOOD POST & BLOCK

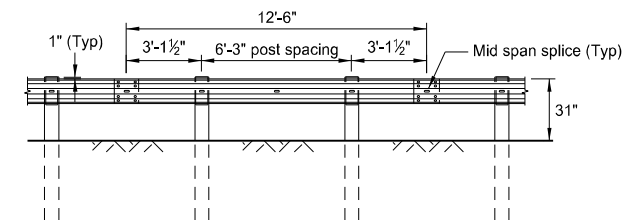
NOTE: Where soil conditions require, alternate lengths may be specified, in 6" increments.



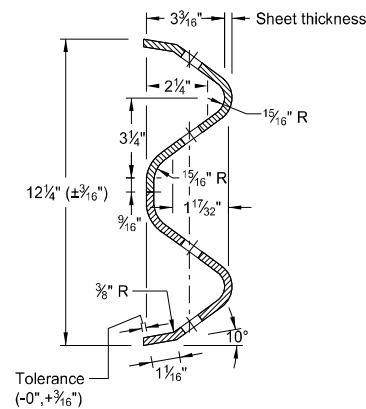
IMPACT HEAD OBJECT MARKER



STANDARD MGS GUARDRAIL PANEL



STANDARD MGS GUARDRAIL SYSTEM

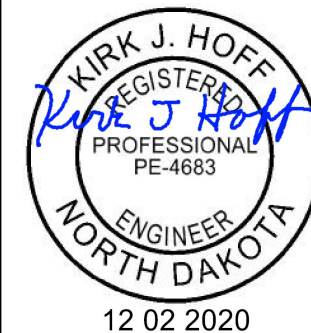


W-BEAM CROSS SECTION

NOTES:

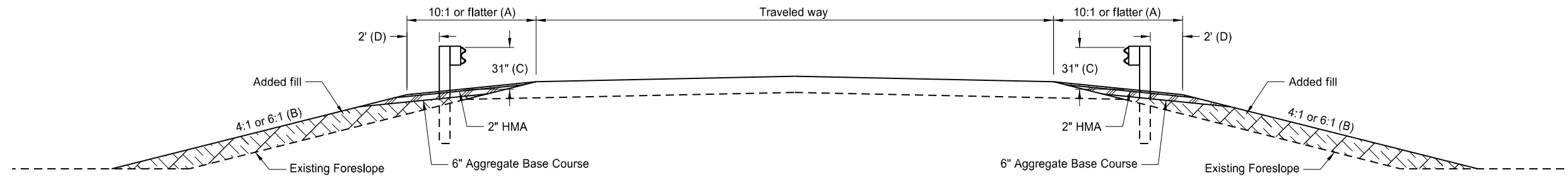
1. Begin reflector plates at the first post and space at 25' centers on guardrail less than 250' length and at 50' centers for guardrail over 250' length. Provide the reflector the same color as the pavement marking adjacent to it unless noted otherwise on the plans.
2. Replacing bituminous material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

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7-14-17	
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12-02-20	Updated clipped head to optional

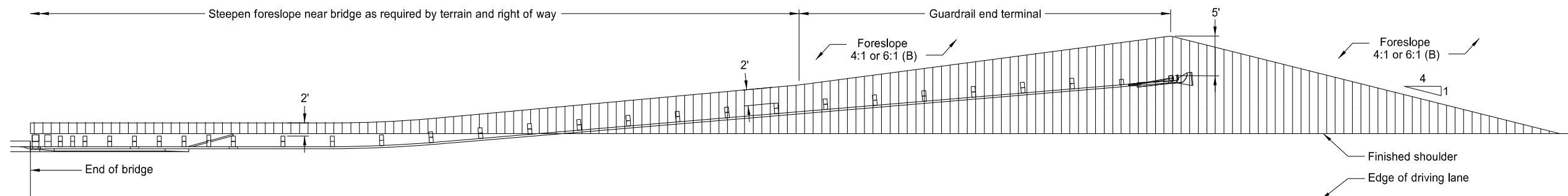


TYPICAL GRADING AT BRIDGE ENDS
WITH MGS W-BEAM GUARDRAIL

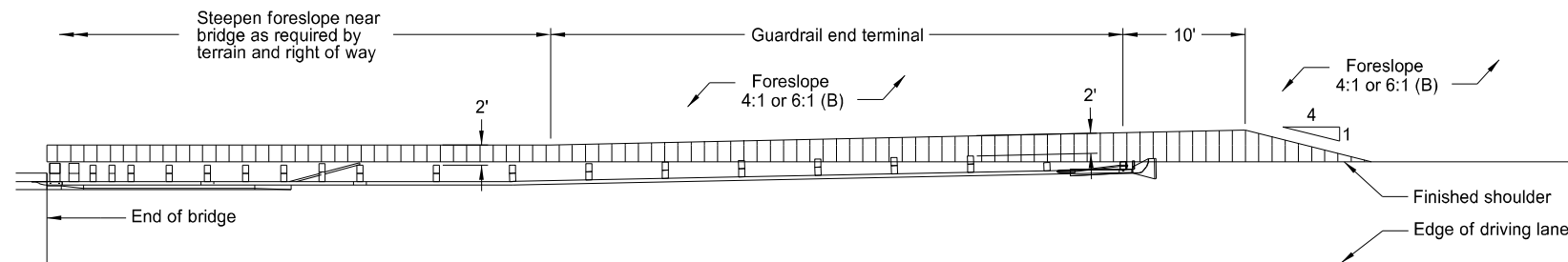
D-764-48



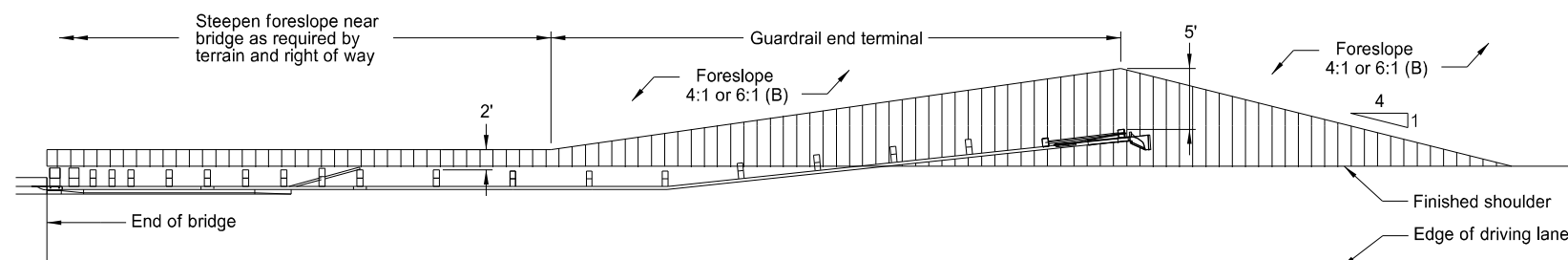
TYPICAL SECTION



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.

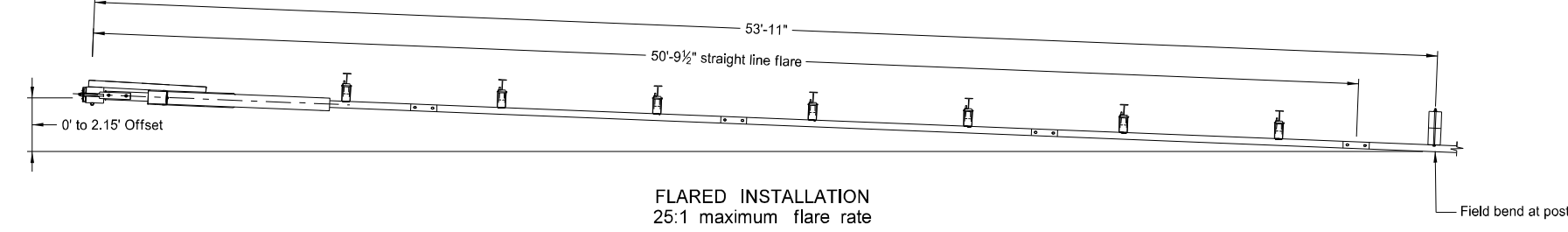
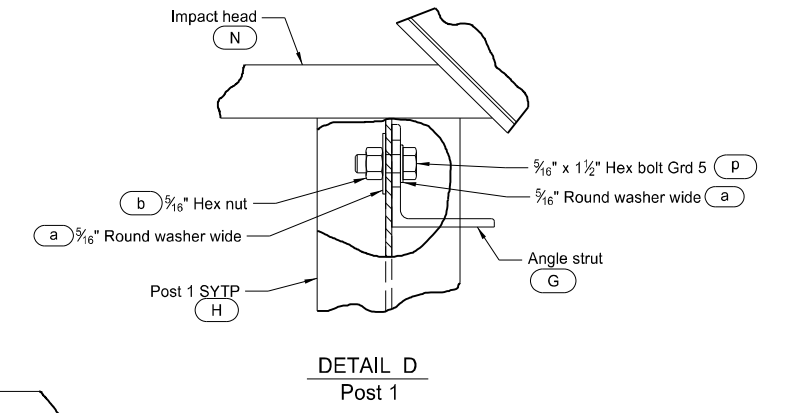
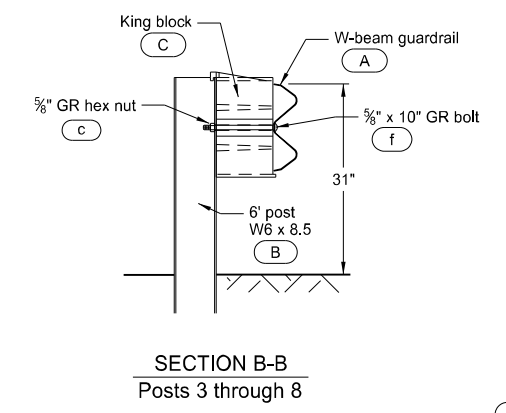
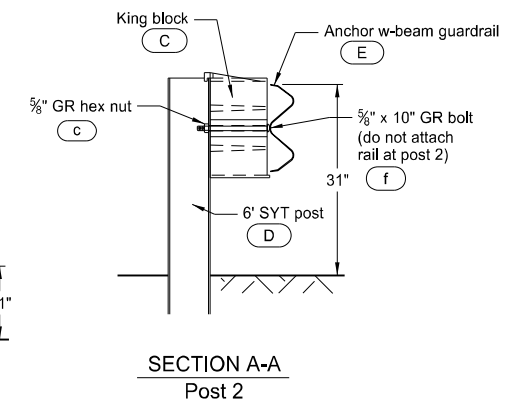
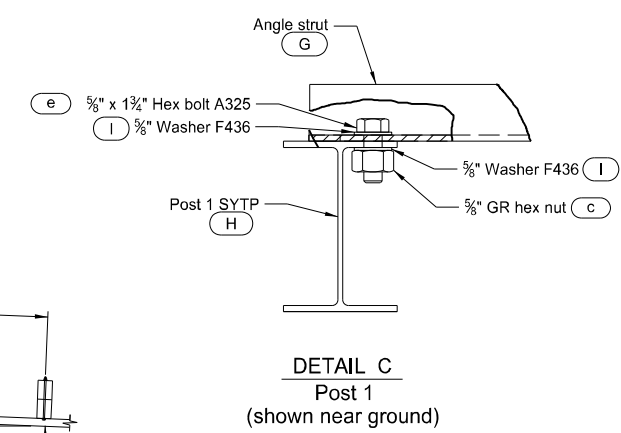
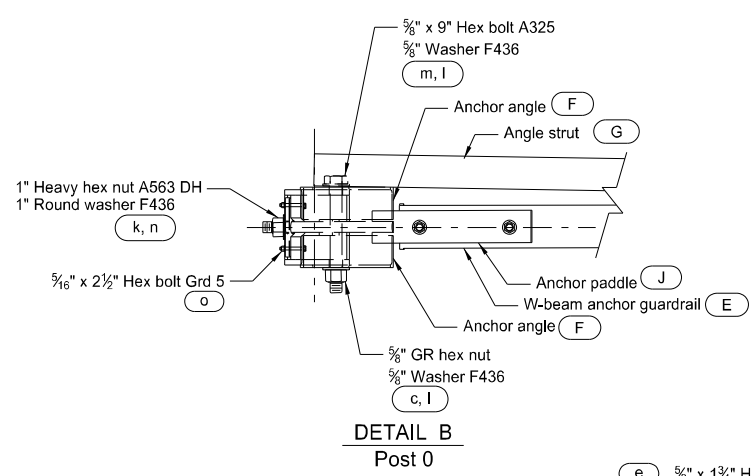
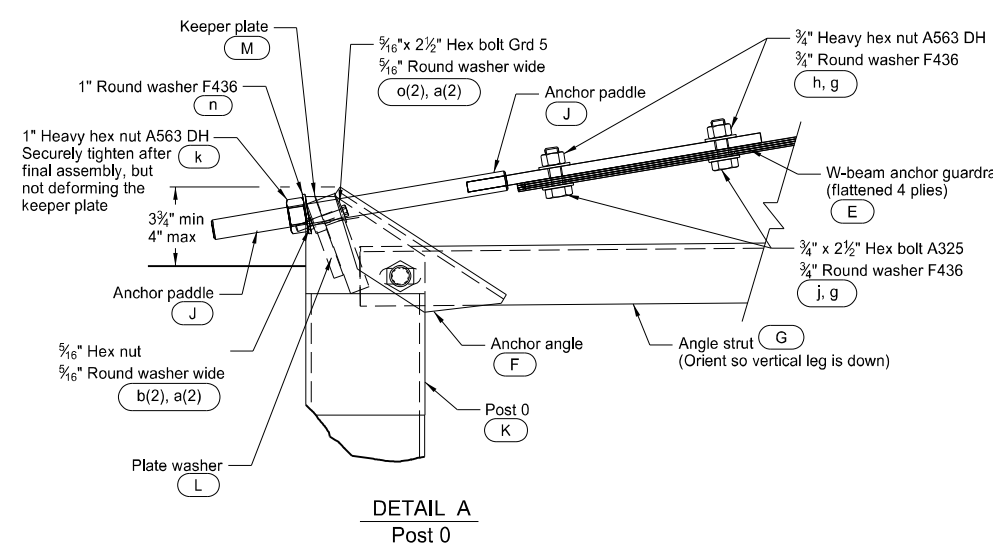
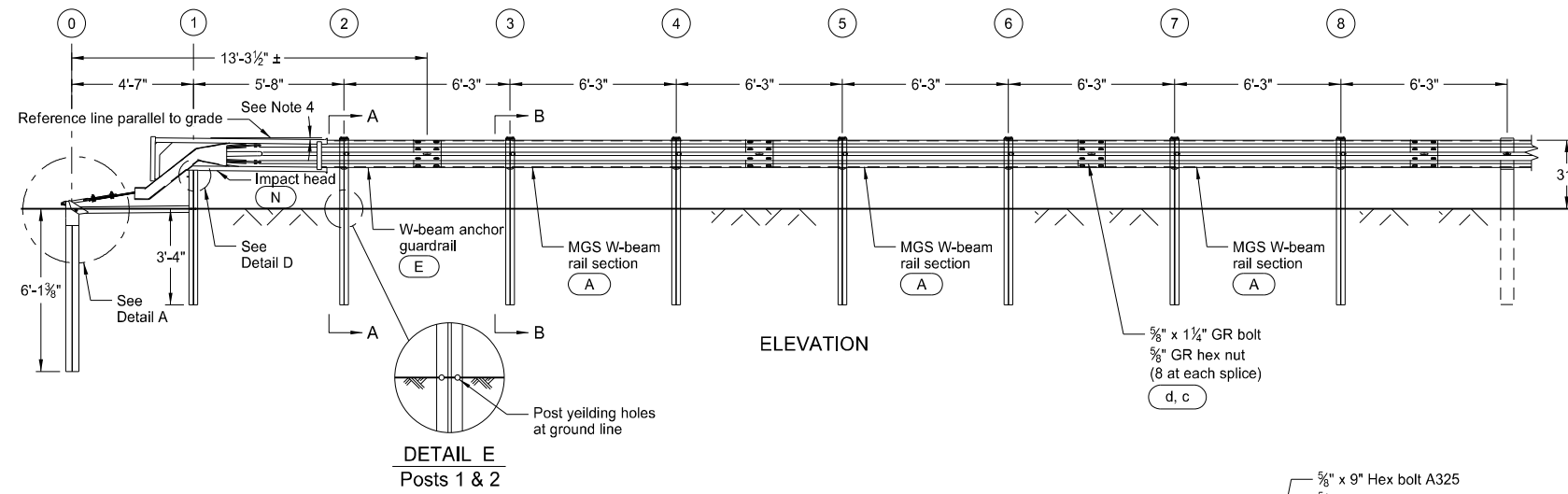
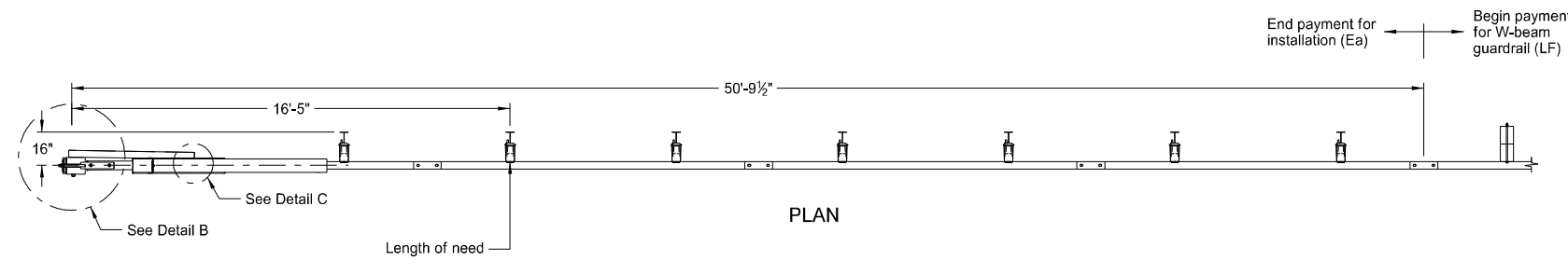
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DATE	CHANGE
12/02/20	Updated notes to active voice.



12 02 2020

MASH SOFTSTOP END TERMINAL - STEEL POST

D-764-50



- GENERAL NOTES:
- Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
 - Flare the SoftStop at a rate of 25:1 or flatter.
 - Do not curve the guardrail within the SoftStop under any circumstances.
 - If necessary, install the SoftStop impact head parallel to the grade line or with an upward tilt. See softstop assembly manual for specific details.

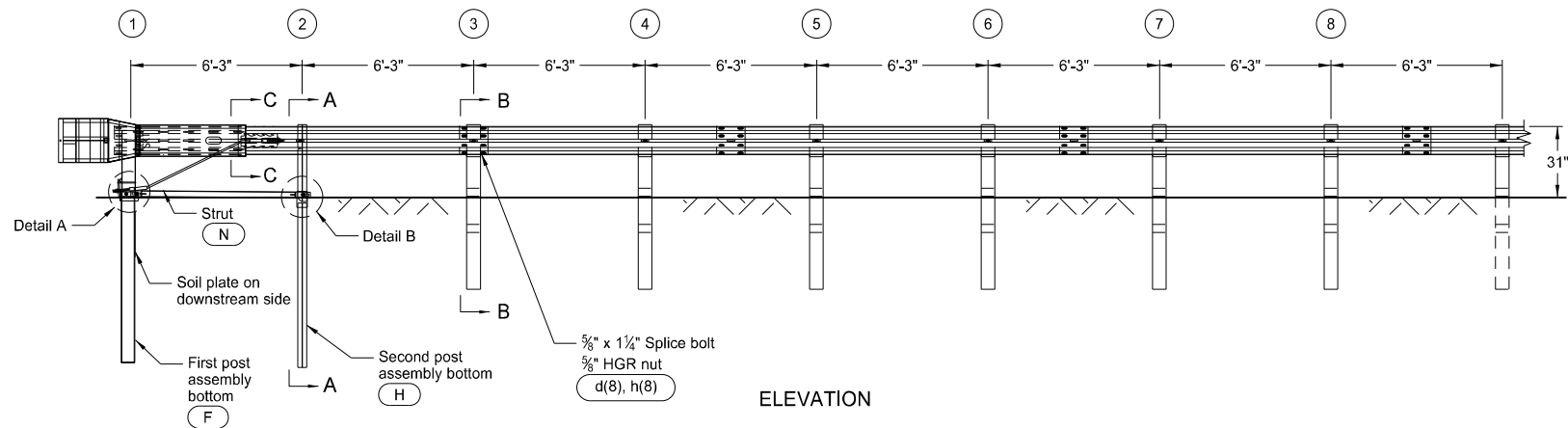
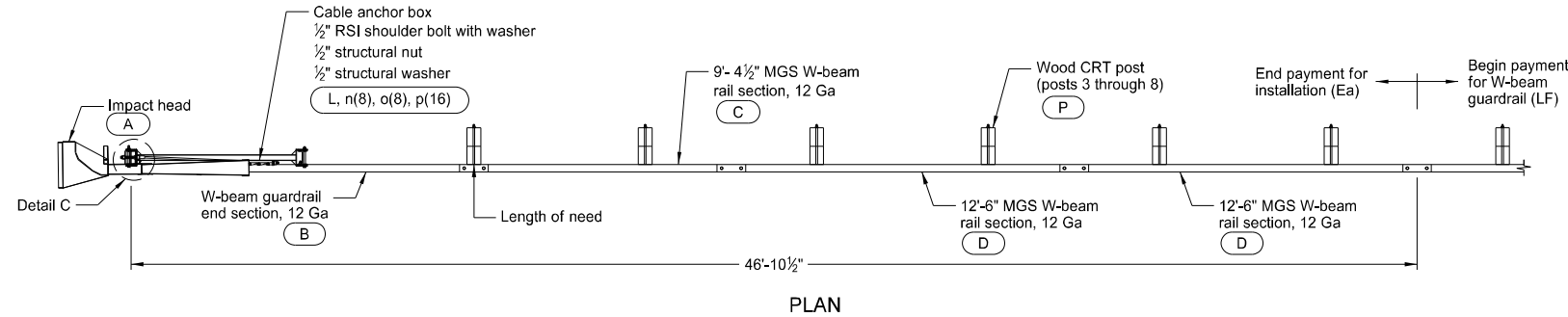
ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	000011	12 / 12'-6" / 3'-1 1/2" / S MGS W-BEAM RAIL SECTION	3
B	000533	6'-0" STEEL POST W6 x 8.5	6
C	006777	KING BLOCK 4" X 7 1/2" X 1'-2"	7
D	015000	6'-0" SYT POST / 8.5 / 31" GR HT	1
E	015200	SFST - ANCHOR GUARDRAIL 12'-6"	1
F	015201	SFST - ANCHOR ANGLE	2
G	015202	SFST - ANGLE STRUT	1
H	015203	SFST - POST #1 SYTP	1
J	015204	SFST - ANCHOR PADDLE	1
K	015205	SFST - POST #0	1
L	015206	SFST - PLATE WASHER	1
M	015207	SFST - KEEPER PLATE	1
N	015208	SFST - IMPACT HEAD	1
HARDWARE			
a	003240	5/16" ROUND WASHER WIDE	6
b	003245	5/16" HEX NUT	3
c	003340	5/8" GR HEX NUT	41
d	003360	5/8" x 1 1/4" GR BOLT	32
e	003391	5/8" x 1 3/4" HEX BOLT A325	1
f	003500	5/8" x 10" GR BOLT A307	7
g	003701	3/4" ROUND WASHER F436	4
h	003704	3/4" HVY HEX NUT A563 DH	2
j	003717	3/4" x 2 1/2" HEX BOLT A325	2
k	003908	1" HVY HEX NUT A563 DH	1
l	004372	5/8" WASHER F436	4
m	004489	5/8" x 9" HEX BOLT A325	1
n	004902	1" ROUND WASHER F436	1
o	105285	5/16" x 2 1/2" HEX BOLT GRD 5	2
p	105286	5/16" x 1 1/2" HEX BOLT GRD 5	1

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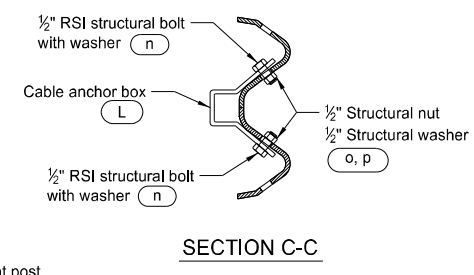
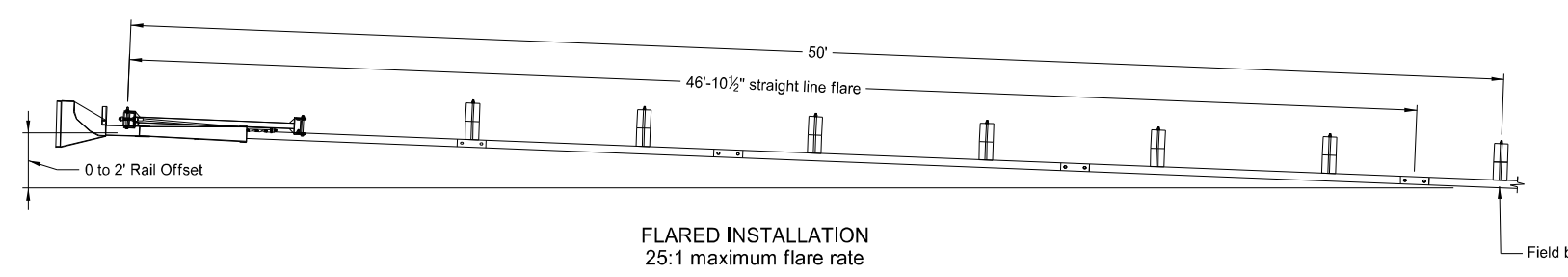
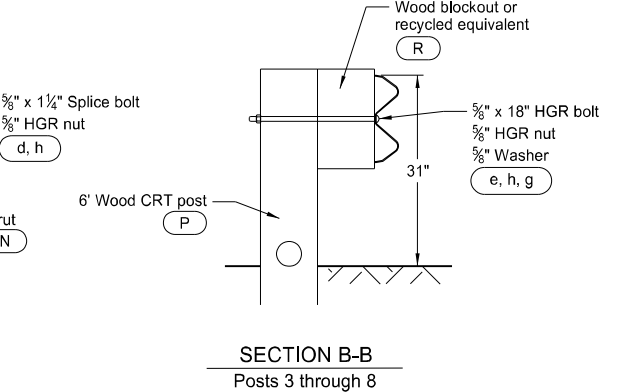
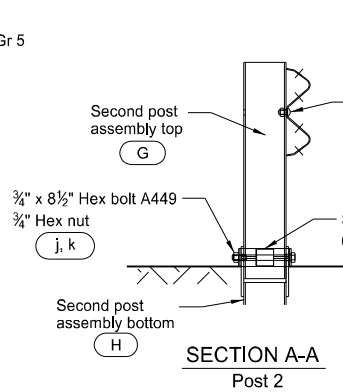
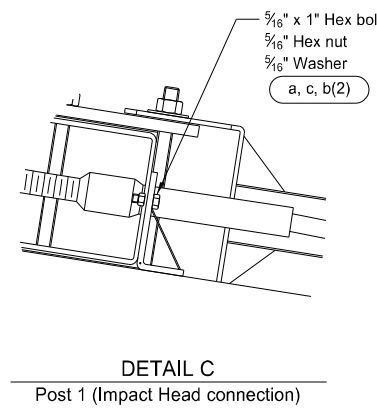
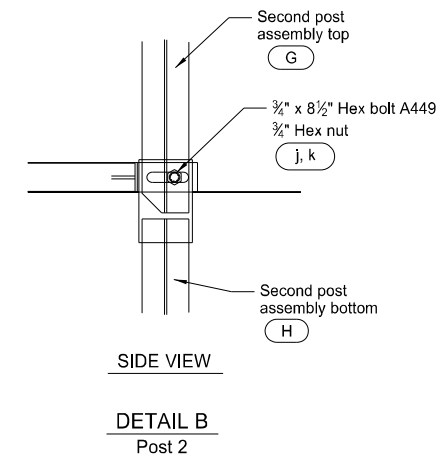
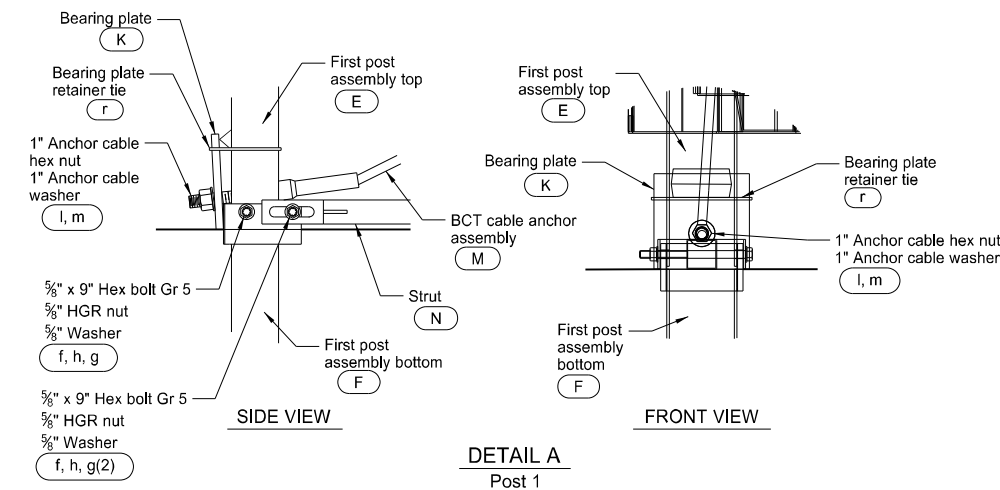
MASH SEQUENTIAL KINKING TERMINAL - WOOD POST

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 1/2" 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



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