DESIGN DATA (RP 221.188 to RP 228.321 - EB)				
Traffic	Average Daily			
Current 2017	Pass: 2,525	Trucks: 1,085	Total: 3,610	
Forecast 2037	Pass: 3,410	Trucks: 1,465	Total: 4,875	

DESIGN DATA (RP 228.321 to RP 240.065 - EB)				
Traffic	Average Daily			
Current 2017	Pass: 2,850	Trucks: 1,165	Total: 4,015	
Forecast 2037	Pass: 3,850	Trucks: 1,575	Total: 5,425	

Clear Zone Dist. 20'	Design Speed: 75
Minimum Sight Dist. for Stopping:	Bridges:
Full Control of Access, No Point of Access Other Than at Interchange Ramps	
Pavement Design Life 20 (years)	
Design Accumulated One-way Flexible ESALs: 10,043,765	

JOB # 15
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

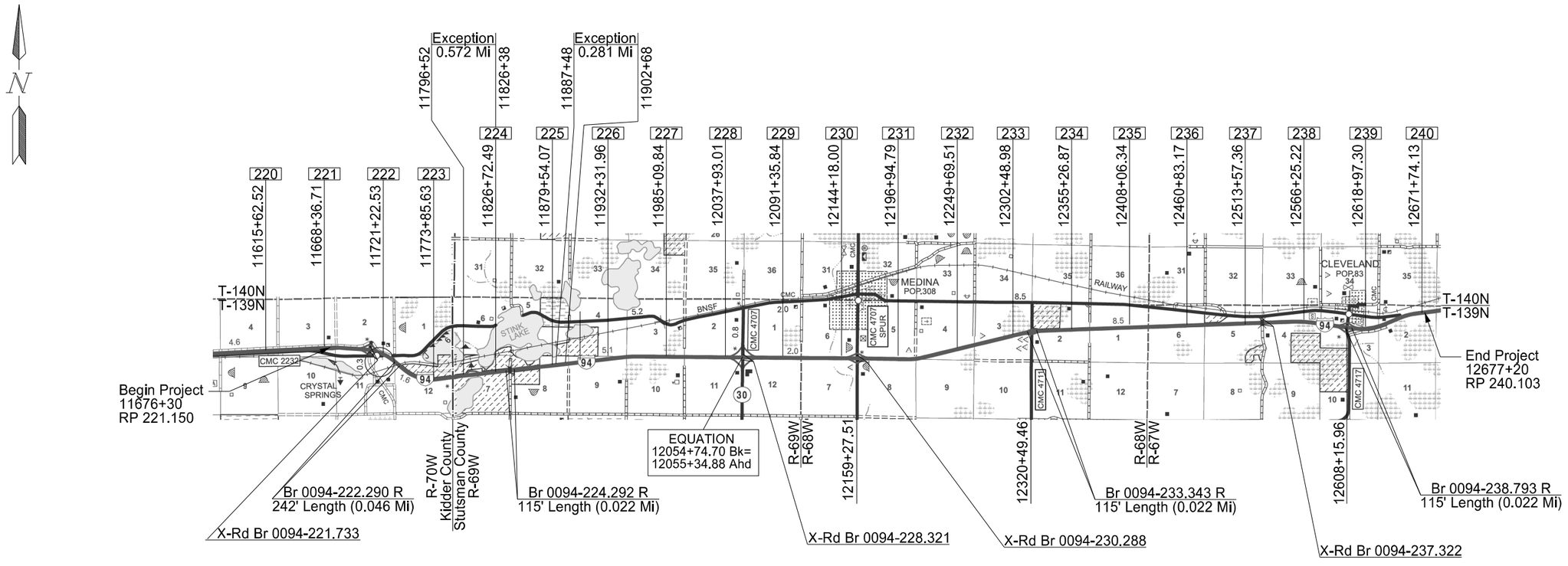
IM-2-094(156)221
Kidder and Stutsman Counties
Crystal Springs to Cleveland - EB
Crack & Seat and HMA Overlay, Bridge Deck Overlay

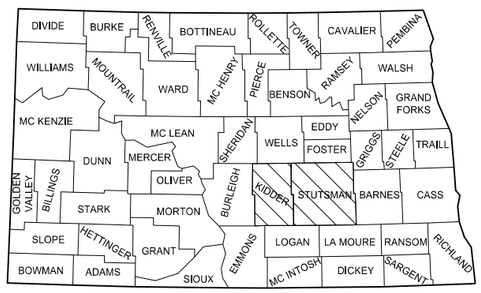
	STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	22065	1	1

GOVERNING SPECIFICATIONS:
2014 Standard Specifications adopted by the North Dakota Department of Transportation and the Supplemental Specifications effective on the date the project is advertised.

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
IM-2-094(156)221\Crack & Seat & HMA Overlay	17.988	18.953

0.853 miles deducted for Exceptions.
0.112 miles deducted for bridges.





STATE COUNTY MAP

DESIGNERS

Sara Cahlin /s/

APPROVED DATE 3-28-2018

Roger Weigel /s/
OFFICE OF PROJECT DEVELOPMENT
ND DEPARTMENT OF TRANSPORTATION

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

APPROVED DATE 3-28-18

James Douglas Rath
NDDOT DESIGN DIVISION

This document was originally issued and sealed by James Douglas Rath, Registration Number PE- 4288, on 3-28-18 and the original document is stored at the North Dakota Department of Transportation

3/28/2018 9:18:05 AM scahlin R:\project\20094221.156\design\Sheets\SMA\001TS_001_Title Sheet.dgn

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PLAN SECTIONS

SPECIAL PROVISIONS

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LIST OF STANDARD DRAWINGS

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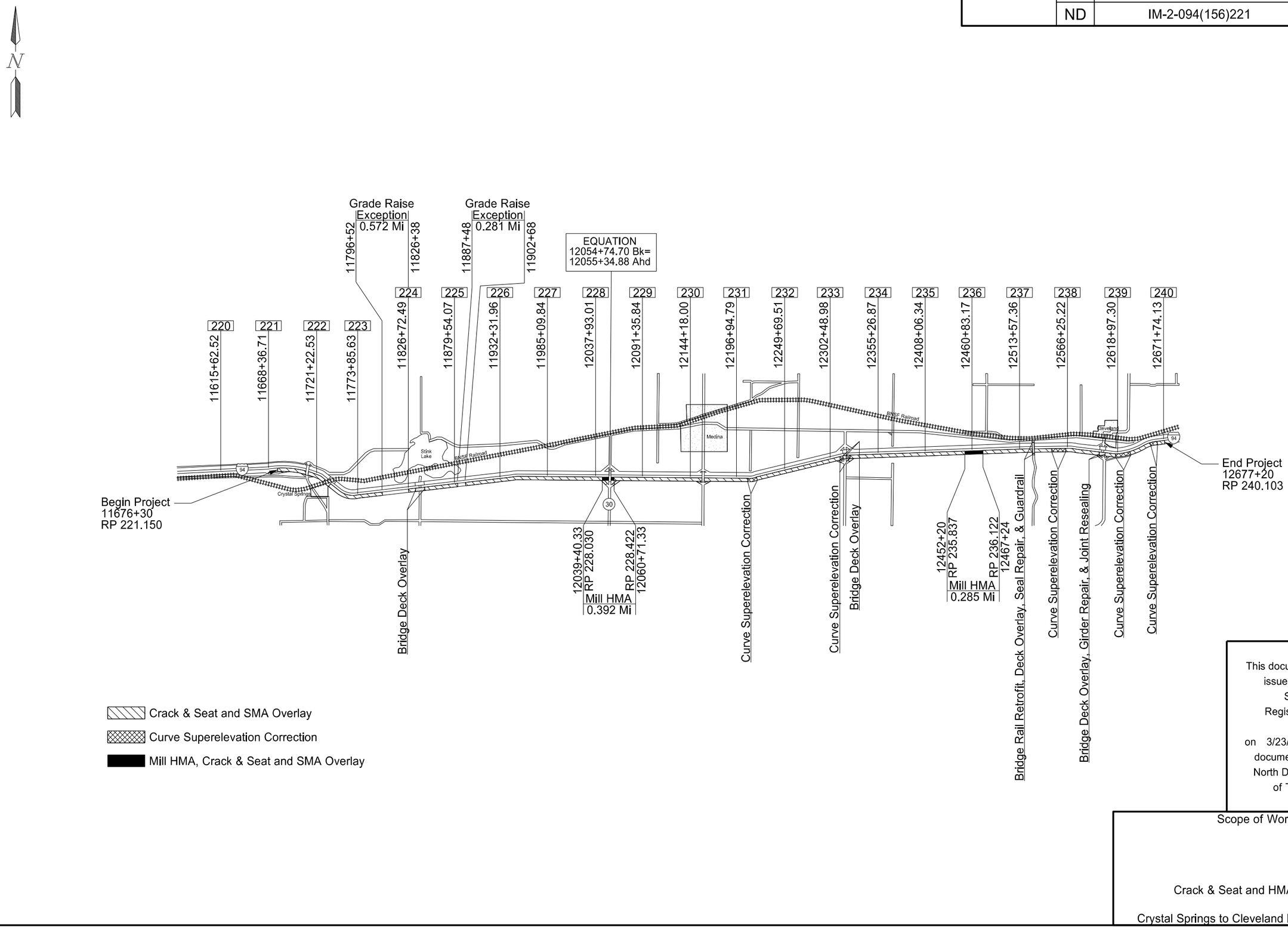

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Scope of Work

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	6	1

NOTES

GENERAL NOTES

107-P01 PHASING: Place the first lift of Superpave FAA 45 in both lanes and shoulders in an area before placing the final lift of SMA.

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

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

230-P01 RESHAPE INSLOPE: Remove the existing embankment adjacent to the concrete shoulder and use in the embankment for curve widening.

260-P01 REMOVE SILT FENCE SUPPORTED: Remove the approximately 1000 LF of existing silt fence supported on the property north of RP 225.000. Reset the right of way fence after work is complete. Include all costs to reset the right of way fence in the bid item, “Remove Silt Fence Supported.”

0.92 acres of Class 2 seeding has been provided for use at the discretion of the Engineer.

261-P01 PERMANENT FIBER ROLLS: If fiber rolls are to remain on the project, use fiber rolls that are composed of netting that meets either of the following:

- Plastic or natural fiber photodegradable netting that has a life expectancy between 12 to 24 months. If the photodegradable netting is plastic, the netting color must be either clear or green. Black plastic netting will not be allowed.
- 100 percent biodegradable jute netting that has a life expectancy between 6 to 12 months.

262-P01 REMOVE FLOTATION SILT CURTAIN: Remove flotation silt curtain adhering to the south right of way fence at approximately RP 223.422.

401-P01 FOG SEAL: Fog seal after final rolling with a minimum mat temperature of 125° F.

411-P01 MAINLINE MILLING: The last paragraph of Section 411.04 “Construction Requirements” only applies to the ramps and crossroad paving; the 5 day limit will not apply to the milling operations on I-94.

411-P02 SALVAGED MILLIINGS: The milled material shall remain property of NDDOT. Stockpile at the NDDOT Medina Section stockpile site located at 3682 55th Ave SE, Medina, ND 58467. At least 72 hours prior to hauling material, coordinate with the Engineer and determine where to stockpile the milled material. Use a pay-loader when pushing up the material on the stockpile. Maximum particle size shall not exceed 1-1/2”. Include all costs for removal, hauling, and stockpiling of milled material in the contract unit price for “Milling Pavement Surface.”

430-P01 SUPERPAVE FAA 45: Taper the HMA to 3” at the edge of the 10’ shoulder at Sta. 11706+87.95 to 11707+15.95, Sta. 12054+38.12 to 12055+47.88, & Sta. 12530+24.94 to 12530+66.52.

430-P02 CENTERLINE LONGITUDINAL JOINT: Construct joints in a manner to provide a continuous bond between the old and new surfaces. When constructing longitudinal joints adjacent to existing HMA Pavements; overlap the existing pavement 1 inch to 1.5 inches. The initial longitudinal roller pass will be on the un-compacted hot mat 6 inches to 1 foot from the joint. The successive roller pass will compact the overlapped material and the 6 inch to 1 foot material simultaneously.

430-P03 SUPERPAVE FAA 45: Place material in first lift at a depth of 2.7” at centerline.

704-100 TRAFFIC CONTROL SUPERVISOR: Provide a Traffic Control Supervisor.

704-255 TRAFFIC CONTROL FOR SHOULDER DROP-OFF: If the shoulder and adjacent driving lane are not even at the end of the day, the following criteria will apply:

Place the following sign assembly at the locations listed below.

Sign Assembly: Sign No. W8-9a-48 "Shoulder Drop Off" and supplemental plate Sign No. W20-52-54 to identify the distance.

Locations:

- In advance of the drop off;
- Spaced at each mile from the advance sign; and
- At major intersections (CMC routes, state and US highways, and Interstate Ramps).

If the difference in elevation between the shoulder and the driving lane is 2" or greater, construct a slough on the driving lane that is 4:1 or flatter.

If the difference in elevation between the shoulder and driving lane is less than 2", no slough is required.

Sign assemblies will be measured and paid for according to Section 704 "Temporary Traffic Control".

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NOTES

704-P01 TRAFFIC CONTROL: For estimating purposes, the traffic control device list is based on two 6-mile work zones, 2 interchanges and the following list:

1. Standard D-704-15, Type A
2. Standard D-704-22, Types K and L;
3. Standard D-704-26, Types CC, EE, and GG;
4. Standard D-704-34A; and
5. Standard D-704-35.

Two work zones are allowed but must be separated by a three mile gap. The gap is considered the distance between the sign reestablishing the normal speed limit after the first work zone and the reduced speed ahead sign for second lane closure.

704-P02 TRAFFIC CONTROL: Provide traffic control consisting of a temporary lane closure and flagging.

The maximum work zone length is limited to one day's production.

One day's production is defined as the length of roadway that can be paved in a single day.

If all or portions of the lane closure are removed and uneven lanes exist, provide traffic control as specified in Section 704.04 O, "Traffic Control for Uneven Pavement".

Complete work in a manner such that lane closures can safely be removed if no work is to take place for more than 3 consecutive days. Remove lane closures if no work is to take place for more than 3 consecutive days.

The Department will pay for all necessary deployed devices, regardless of the number and length of the lane closures.

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

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NOTES

SECTION 130

764-P01 BARREL ATTENUATION DEVICE BASES: Install the barrel attenuation devices on extended concrete slabs. This work consists of the installation of a concrete slab adjacent to the existing slab that extends the slabs at 2 locations and both widens and extends the length of the existing slab at 2 locations. Remove the existing paint markings on the concrete barrel attenuation device bases by sandblasting. Paint the specified mass (weight) of aggregate, and the perimeter, for each module in the array.

Include all costs to construct concrete slab extensions and install the new barrel arrays for each of the existing attenuation device in the contract unit price bid for the item “Barrel Attenuation Device – Type B-75.”

764-P02 REMOVE BARREL ATTENUATION DEVICE: Remove the existing barrel attenuation devices at the median pier locations shown in the plans. Each of these devices consists of fourteen plastic sand filled drums with lids.

Deliver the plastic drums, lids, and internal plastic sand cones to the NDDOT Maintenance Storage Yard in Medina, and neatly stack them at a location designated by the engineer. The address of the NDDOT Maintenance Storage Yard is:

MEDINA NDDOT
3682 55th Ave SE
Medina ND 58467-9998

Include all costs for removal and disposal of sand, and delivery of the drums, lids and cones in the contract unit price bid for “Remove Barrel Attenuation Device.”

764-P03 RESET W-BEAM GUARDRAIL END TERMINAL: Remove and reset a total of 4 W-beam guardrail end terminals at the Streeter Interchange Crossroad, RP 228.321.

The existing end terminals are Flared Energy Absorbing Terminals (FLEATs) manufactured by Road Systems, Inc. of Big Spring, Texas. These devices were originally installed in the year 1997. A portion of each of the existing FLEAT end terminals has 4’-2” post spacings. Retain the existing post spacings when the end terminals are reset.

Each of the existing end terminals were installed with timber breakaway posts set in steel foundation tubes at the first two post locations. Do not reset these timber breakaway posts. Modify each of the reset end terminals to have steel breakaway posts at the first two post locations, in accordance with the manufacturers’ recommendations. Include all costs for the steel breakaway posts, associated steel foundation posts, and any other hardware necessary to modify the end terminals as described above in the contract unit price bid for “Reset W-Beam Guardrail End Terminal.”

764-P04 REMOVE END TREATMENT & TRANSITION: Deliver the removed end treatment and transition materials which are not reset by the contractor to the NDDOT Maintenance Storage Yard in Medina, and neatly stack them at a location designated by the engineer. The address of the NDDOT Maintenance Storage Yard is:

MEDINA NDDOT
3682 55th Ave SE
Medina ND 58467-9998

Include all costs for delivery and stacking of the removed end treatment and transition materials in the contract unit price bid for the item "Remove End Treatment and Transition."

764-P05 REMOVED W-BEAM GUARDRAIL MATERIALS: Deliver the undamaged straight rail sections, blocks, posts, and hardware removed to the NDDOT Maintenance Storage Yard in Medina, and neatly stack them at a location designed by the Engineer. The address of the NDDOT Maintenance Storage Yard is:

MEDINA NDDOT
3682 55th Ave SE
Medina ND 58467-9998

Include all costs for delivery of the removed guardrail materials in the contract unit prices bid for the items "Remove W-Beam Guardrail & Posts.”

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	8	1

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
103	0100	CONTRACT BOND	L SUM	1	1
202	0132	REMOVAL OF BITUMINOUS SURFACING	SY	5,218	5,218
202	0169	REMOVAL OF END SECTION-ALL TYPES & SIZES	EA	20	20
202	0230	REMOVAL OF INLETS	EA	8	8
203	0109	TOPSOIL	CY	3,660	3,660
203	0140	BORROW-EXCAVATION	CY	5,894	5,894
216	0100	WATER	M GAL	570	570
251	0200	SEEDING CLASS II	ACRE	12.3	12.3
251	2000	TEMPORARY COVER CROP	ACRE	11.4	11.4
253	0101	STRAW MULCH	ACRE	22.7	22.7
255	0102	ECB TYPE 2	SY	6,756	6,756
260	0201	REMOVE SILT FENCE SUPPORTED	LF	1,000	1,000
261	0112	FIBER ROLLS 12IN	LF	3,916	3,916
262	0101	REMOVE FLOTATION SILT CURTAIN	LF	15	15
302	0120	AGGREGATE BASE COURSE CL 5	TON	2,472	2,472
401	0050	TACK COAT	GAL	51,200	51,200
401	0070	FOG SEAL	GAL	5,832	5,832
411	0100	MILLING PAVEMENT SURFACE	TON	10,227	10,227
430	0045	SUPERPAVE FAA 45	TON	66,471	66,471
430	0200	HOT MIX ASPHALT - STONE MATRIX ASPHALT	TON	48,095	48,095
430	1000	CORED SAMPLE	EA	419	419
430	5806	PG 58H-28 ASPHALT CEMENT	TON	4,583	4,583
430	5818	PG 58H-34 ASPHALT CEMENT	TON	2,886.6	2,886.6
550	0968	PCC PAVEMENT CRACKING & SEATING	SY	426,108	426,108
602	0130	CLASS AAE-3 CONCRETE	CY	3.7	3.7
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	2,098	2,098
616	5890	STRUCTURAL STEEL	L SUM	1	1
624	3001	DOUBLE BOX BEAM RAIL RETROFIT-FREE STANDING	LF	422.6	422.6
624	3005	CONNECTION PLATE MODIFICATION	EA	4	4
650	0704	OVERLAY CONCRETE	CY	139	139
650	0720	CLASS 1 REMOVAL	SY	2,098	2,098
650	0721	CLASS 2 REMOVAL	SY	419	419
650	0722	CLASS 2-A REMOVAL	LF	756	756

ESTIMATE NUMBER: 18589 RUN DATE: 03/28/2018 TIME: 07:16:36

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	8	2

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
650	0723	CLASS 3 REMOVAL	SY	106	106
650	0724	CLASS 4 REMOVAL	SY	21	21
702	0100	MOBILIZATION	L SUM	1	1
704	0100	FLAGGING	MHR	1,250	1,250
704	1000	TRAFFIC CONTROL SIGNS	UNIT	5,424	5,424
704	1048	PORTABLE RUMBLE STRIPS	EA	4	4
704	1052	TYPE III BARRICADE	EA	30	30
704	1060	DELINEATOR DRUMS	EA	284	284
704	1067	TUBULAR MARKERS	EA	684	684
704	1087	SEQUENCING ARROW PANEL-TYPE C	EA	2	2
704	1185	PILOT CAR	HR	250	250
706	0550	BITUMINOUS LABORATORY	EA	1	1
706	0600	CONTRACTOR'S LABORATORY	EA	1	1
714	0310	PIPE CONC REINF 18IN CL III	LF	68	68
714	0615	PIPE CONC REINF 24IN CL III	LF	4	4
714	3013	END SECT-TRAVERSABLE REINF. CONC.18IN	EA	18	18
714	3023	END SECT-TRAVERSABLE REINF. CONC.24IN	EA	2	2
748	0141	CURB & GUTTER-TYPE 1 SPECIAL	LF	15	15
754	0206	STEEL GALV POSTS-TELESCOPING PERFORATED TUBE	LF	13	13
754	0210	GALV STEEL POST-STANDARD PIPE	LF	38	38
754	0592	RESET SIGN PANEL	EA	3	3
754	1100	CLASS AE CONCRETE-SIGN FOUNDATIONS	CY	0.3	0.3
762	0113	EPOXY PVMT MK 4IN LINE	LF	225,162	225,162
762	0430	SHORT TERM 4IN LINE-TYPE NR	LF	64,448	64,448
762	1104	PVMT MK PAINTED 4IN LINE	LF	89,546	89,546
762	1124	PVMT MK PAINTED 24IN LINE	LF	461	461
764	0131	W-BEAM GUARDRAIL	LF	1,876	1,876
764	0145	W-BEAM GUARDRAIL END TERMINAL	EA	12	12
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS	LF	2,829	2,829
764	1010	RESET 3-CABLE GUARDRAIL	LF	475	475
764	1050	RESET W-BEAM GUARDRAIL	LF	1,585	1,585
764	1059	RESET W-BEAM GUARDRAIL END TERMINAL	EA	7	7
764	1495	ADJUST GUARDRAIL	LF	325	325

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	8	3

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
764	2020	REMOVE 3-CABLE GUARDRAIL & POSTS	LF	475	475
764	2081	REMOVE END TREATMENT & TRANSITION	EA	15	15
764	2090	REMOVE BARREL ATTENUATION DEVICE	EA	4	4
764	8071	BARREL ATTENUATION DEVICE-TYPE B-75	EA	4	4
930	8644	SILICONE SEALANT	LF	132	132
930	9610	DECK SPALL REPAIR	SF	174	174
930	9695	GIRDER REPAIR	L SUM	1	1

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		Stations		Stations	
		Sta. 11676+30 to 11735+30 Sta. 11738+52 to 11798+52 Sta. 11824+38 to 11841+64 Sta. 11843+19 to 11889+48 Sta. 11900+68 to 12029+58.27		Sta. 12029+58.27 to 12054+74.70 Sta. 12055+34.88 to 12319+54 Sta. 12321+48 to 12607+30 Sta. 12609+24 to 12677+20.00	
		Tangent		Tangent	
Materials	Unit	Width (ft)	Quantity per Station	Width (ft)	Quantity per Station
PCC Pavement Cracking & Seating	SY	38	422.22	38	422.22
Tack Coat @ 0.05 Gal/SY (1st Lift)	Gal	40.9	22.72	40.5	22.5
Tack Coat @ 0.05 Gal/SY (2nd Lift)	Gal	39.5	21.93	39.2	21.78
Hot Mix Asphalt - Stone Matrix Asphalt @ 2 Ton/CY	Ton	38	47.82	38	47.89
Superpave FAA 45 @ 2 Ton/CY	Ton	38	56.05	38	55.92
PG 58H-34 Asphalt Cement @ 6.0% (Top 2" Lift)	Ton	38	2.87	38	2.87
PG 58H-28 Asphalt Cement @ 6.0% (Bottom Lift)	Ton	38	3.36	38	3.36

		Interchanges				
		Crystal	Streeter	Medina	Halfway Lake	Cleveland
Materials	Unit	Quantity	Quantity	Quantity	Quantity	Quantity
Milling Pavement Surface	TON	1279	2160	1094	922	1093
PCC Pavement Cracking & Seating	SY	4260	6845	4383	3184	4390
Tack Coat @ 0.05 Gal/SY	Gal	758	1309	704	564	711
Fog Seal @ 0.10 Gal/SY	Gal	1090	1944	985	830	983
Superpave FAA 45 @ 2 Ton/CY	Ton	1279	2160	1094	922	1093
PG 58H-28 Asphalt Cement @ 6.0%	Ton	77	130	66	55	66

		Guardrail								
		Crystal Springs	BN Railroad Separation	Minor Road Separation	Streeter		Medina	Halfway Lake	West Cleveland	Cleveland
		Mainline	Mainline	Mainline	Mainline	Crossroad	Mainline	Mainline	Crossroad	Mainline
Materials	Unit	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity
Removal of Bituminous Surfacing	SY	400	460	696	315	355	1320	916		756
Tack Coat @ 0.05 Gal/SY	Gal	20	23	34	16	13	66	46	11	38
Superpave FAA 45 @ 2 Ton/CY	Ton	44	52	87	35	40	147	89	23	84
PG 58H-28 Asphalt Cement @ 6.0%	Ton	2.64	3.12	5.22	2.1	2.4	8.82	5.34	1.38	5.04
Aggregate Base CL 5 @ 1.875 Ton/CY	Ton	82	96	162	65	71	275	165	44	158
Embankment	CY	-	-	-	57	190	-	462	930	1005
Seeding CL II	Acre	-	-	-	0.3	0.7	-	0.2	0.7	0.35
Topsoil	CY	-	-	-	192	570	-	85	480	190

HBP Cored Samples							
	A	B	C	D			
Specification Section	Distance (Ft)÷2000	Lanes	Lifts	Sublots (A × B × C)	Quantity (D × 2)	Quantity (1 per mile)	Unit
430.04 I.2.b(1), "General"	50	2	2	200	400	N/A	EA
430.04 I.2.b(2), "Pavement Thickness Determination Cores"					N/A	19	EA
				Total	400	19	EA

Location	Quantity of Millings TON
Mainline - 228.0304 to 228.4226	1,433
Mainline - 235.837 to 236.122	2,147
Crystal Springs	1,279
Streeter	2,160
Medina	1,094
Halfway Lake	922
Cleveland	1,093

Permanent Pavement Marking		
Location - Type	Basis	Quantity
Centerline – Epoxy Pvmt MK 4IN Line	Centerline Skips 1,320 LF/mile	25,018 LF
Edge Lines – Epoxy Pvmt MK 4 IN Line	10,560 LF/mile	200,144 LF
Crystal Springs Interchange		
Centerline – Pvmt MK Painted 4IN Line	Barrier Stripe	2,010 LF
Edge Lines – Pvmt MK Painted 4IN Line	10,560 LF/mile	12,832 LF
Pvmt MK Painted 24 IN Line		90 LF
Streeter Interchange		
Centerline – Pvmt MK Painted 4IN Line	Barrier Stripe	5,832 LF
Edge Lines – Pvmt MK Painted 4IN Line	10,560 LF/mile	24,962 LF
Pvmt MK Painted 24 IN Line		66 LF
Medina Interchange		
Centerline – Pvmt MK Painted 4IN Line	Barrier Stripe	2,660 LF
Edge Lines – Pvmt MK Painted 4IN Line	10,560 LF/mile	12,551 LF
Pvmt MK Painted 24 IN Line		105 LF
Halfway Lake Interchange		
Centerline – Pvmt MK Painted 4IN Line	Barrier Stripe	1,530 LF
Edge Lines – Pvmt MK Painted 4IN Line	10,560 LF/mile	11,297 LF
Pvmt MK Painted 24 IN Line		115 LF
Cleveland Interchange		
Centerline – Pvmt MK Painted 4IN Line	Barrier Stripe	2,380 LF
Edge Lines – Pvmt MK Painted 4IN Line	10,560 LF/mile	13,492 LF
Pvmt MK Painted 24 IN Line		85 LF

Short Term 4 IN Line-Type NR		
Location	Basis	Quantity
Centerline – Top of 1st Lift	Centerline Skips 1,320 LF/mile	25,018 LF
Centerline – Top of 2nd Lift	Centerline Skips 1,320 LF/mile	25,018 LF
Crystal Springs Crossroad	Barrier Stripe	2,010 LF
Streeter Crossroad	Barrier Stripe	5,832 LF
Medina Crossroad	Barrier Stripe	2,660 LF
Halfway Lake Crossroad	Barrier Stripe	1,530 LF
Cleveland Crossroad	Barrier Stripe	2,380 LF

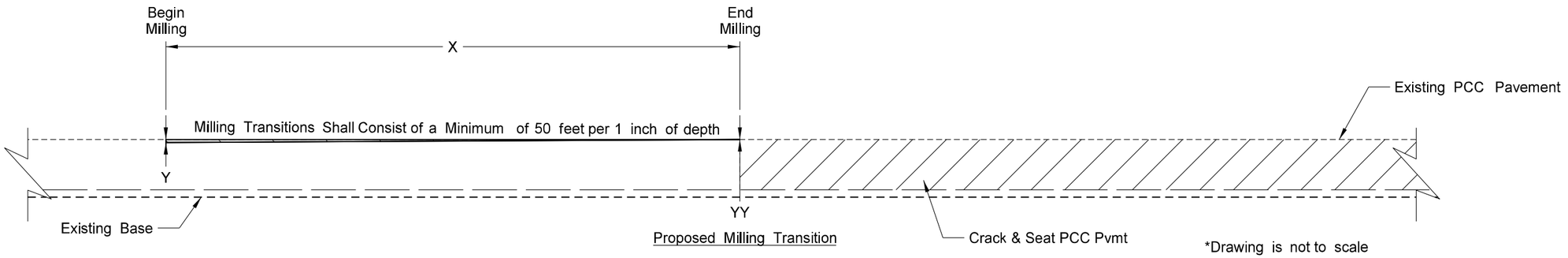
This document was originally issued and sealed by Sara A. Cahlin, Registration Number PE- 8397, on 3/23/18 and the original document is stored at the North Dakota Department of Transportation

Basis of Estimate

Crack & Seat and HMA Overlay

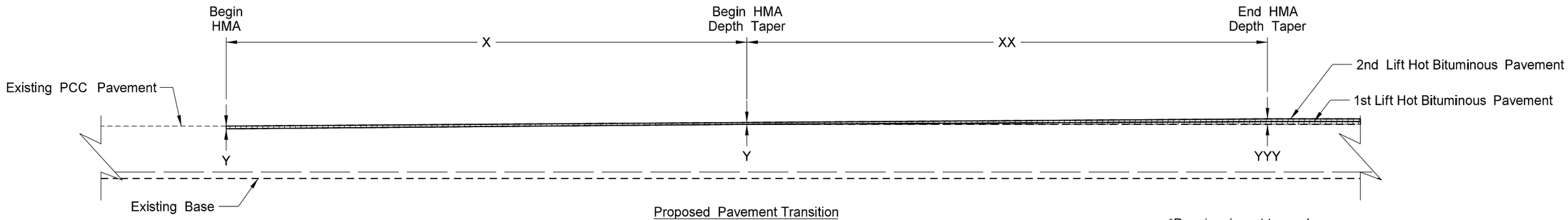
Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	20	1



Proposed Milling Transition

*Drawing is not to scale



Proposed Pavement Transition

*Drawing is not to scale

Milling and Paving Transitions

Location	X	Begin Milling/Paving Station	Y	YY	End Milling Station	XX	YYY	End HMA Depth Taper Station	Mill (Ton)	Tack (Gal)	HMA (Ton)	AC (Ton)
Beginning of Project	100 ft	11676+30	2.0 in	0 in	11677+30	100 ft	4.0 in	11678+30	23.5	61.4	122.8	7.37
Crystal Springs Rest Area SER	100 ft	-2+00	2.0 in	0 in	-1+00	100 ft	4.0 in	0+00	15.5	40.0	62.0	3.72
RR Bridge 94-222.290 R	100 ft	11735+30	2.0 in	0 in	11734+30	100 ft	4.0 in	11733+30	23.5	61.4	122.8	7.37
RR Bridge 94-222.290 R	100 ft	11738+52	2.0 in	0 in	11739+52	100 ft	4.0 in	11740+52	23.5	61.4	122.8	7.37
Start Exception	100 ft	11798+52	2.0 in	0 in	11797+52	100 ft	4.0 in	11796+52	23.5	61.4	122.8	7.37
End Exception	100 ft	11824+38	2.0 in	0 in	11825+38	100 ft	4.0 in	11826+38	23.5	61.4	122.8	7.37
Bridge 94-224.292 R	100 ft	11841+64	2.0 in	0 in	11840+64	100 ft	4.0 in	11839+64	23.5	61.4	122.8	7.37
Bridge 94-224.292 R	100 ft	11843+19	2.0 in	0 in	11844+19	100 ft	4.0 in	11845+19	23.5	61.4	122.8	7.37
Start Exception	100 ft	11889+48	2.0 in	0 in	11888+48	100 ft	4.0 in	11887+48	23.5	61.4	122.8	7.37
End Exception	100 ft	11900+68	2.0 in	0 in	11901+68	100 ft	4.0 in	11902+68	23.5	61.4	122.8	7.37
Bridge 94-233.343 R	100 ft	12319+54	2.0 in	0 in	12318+54	100 ft	4.0 in	12317+54	23.5	61.4	122.8	7.37
Bridge 94-233.343 R	100 ft	12321+48	2.0 in	0 in	12322+48	100 ft	4.0 in	12323+48	23.5	61.4	122.8	7.37
Bridge 94-238.793 R	100 ft	12607+30	2.0 in	0 in	12606+30	100 ft	4.0 in	12605+30	23.5	61.4	122.8	7.37
Bridge 94-238.793 R	100 ft	12609+24	2.0 in	0 in	12610+24	100 ft	4.0 in	12611+24	23.5	61.4	122.8	7.37
End of Project	100 ft	12677+20	2.0 in	0 in	12676+20	100 ft	4.0 in	12675+20	23.5	61.4	122.8	7.37

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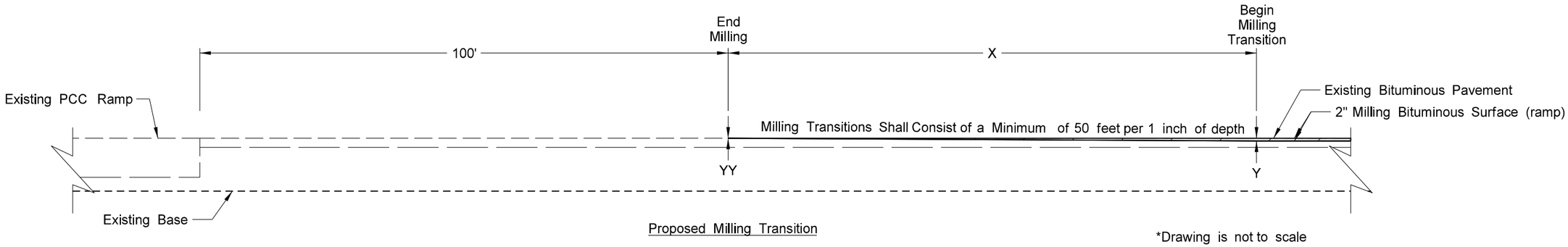
Mainline Milling and Paving End Transitions

Crack & Seat and HMA Overlay

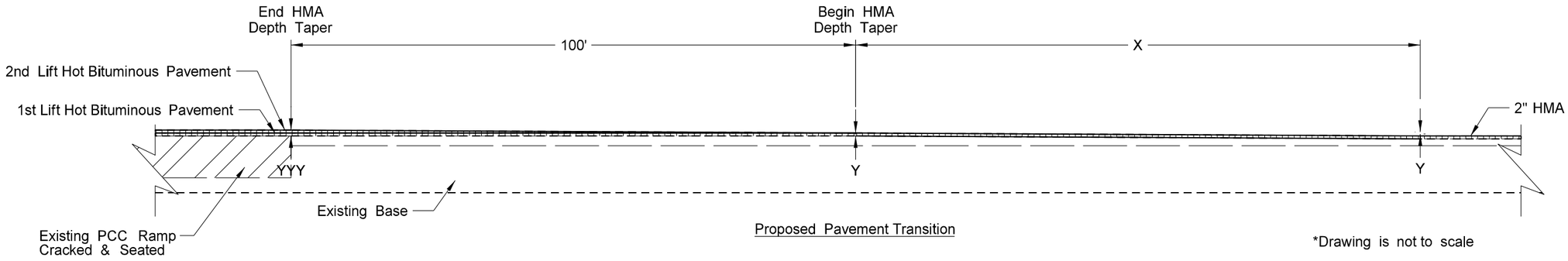
Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	20	2



Proposed Milling Transition

*Drawing is not to scale



Proposed Pavement Transition

*Drawing is not to scale

Milling and Paving Transitions

Location	X	Begin Milling Transition Station	Y	YY	End Milling Transition Station	XX	YYY	End HMA Depth Taper Station	Mill (Ton)	Tack (Gal)	HMA (Ton)	AC (Ton)
Crystal Springs Interchange												
SW Ramp	100 ft	10+83.53	2.0 in	0 in	9+83.53	100 ft	4.0 in	8+83.53	15.5	40.0	62.0	3.72
SE Ramp	100 ft	8+74.64	2.0 in	0 in	9+74.64	100 ft	4.0 in	10+74.64	15.5	40.0	62.0	3.72
Streeter Interchange												
SW Ramp	100 ft	19+29.5	2.0 in	0 in	18+29.5	100 ft	4.0 in	17+29.5	15.5	40.0	62.0	3.72
SE Ramp	100 ft	28+81.1	2.0 in	0 in	29+81.1	100 ft	4.0 in	30+81.1	15.5	40.0	62.0	3.72
Medina Interchange												
SW Ramp	100 ft	8+89	2.0 in	0 in	7+89	100 ft	4.0 in	6+89	15.5	40.0	62.0	3.72
SE Ramp	100 ft	3+67	2.0 in	0 in	4+67	100 ft	4.0 in	5+67	15.5	40.0	62.0	3.72
Halfway Lake Interchange												
SW Ramp	100 ft	6+17.6	2.0 in	0 in	5+17.6	100 ft	4.0 in	4+17.6	15.5	40.0	62.0	3.72
SE Ramp	100 ft	12+68.96	2.0 in	0 in	13+68.96	100 ft	4.0 in	14+68.96	15.5	40.0	62.0	3.72
Cleveland Interchange												
SW Ramp	100 ft	15+56.95	2.0 in	0 in	14+56.95	100 ft	4.0 in	13+56.95	15.5	40.0	62.0	3.72
SE Ramp	100 ft	23+23.09	2.0 in	0 in	24+23.09	100 ft	4.0 in	25+23.09	15.5	40.0	62.0	3.72

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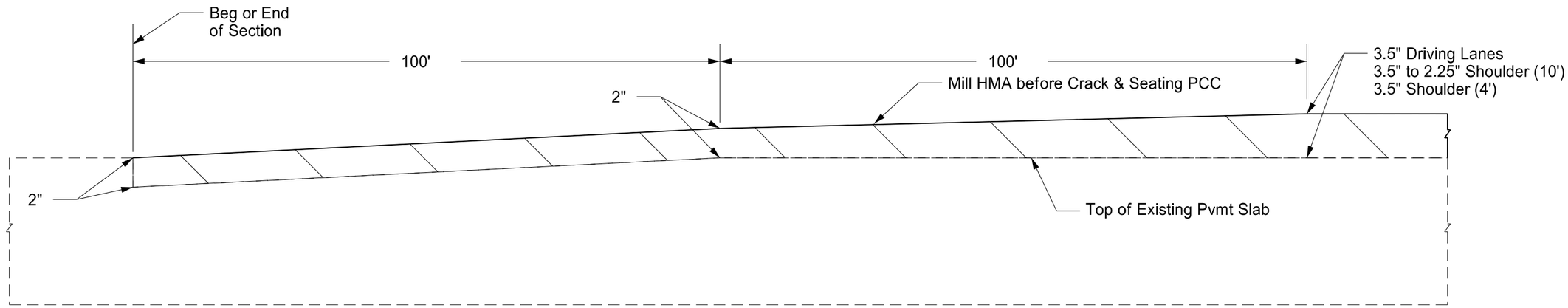
EB Ramp Milling and Paving Transitions

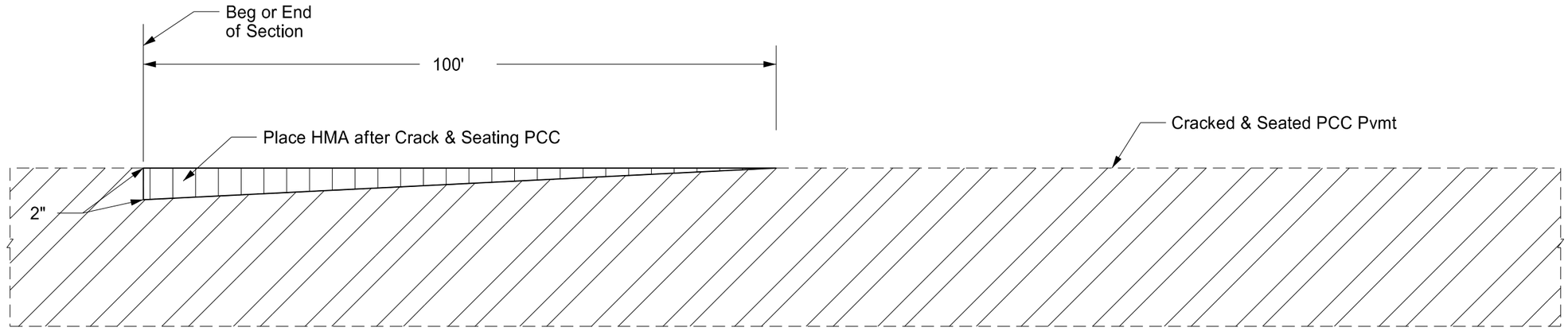
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	20	3



MILLING DETAIL



PAVING DETAIL

Additional Quantities for Eastbound Mainline west of Streeter Interchange

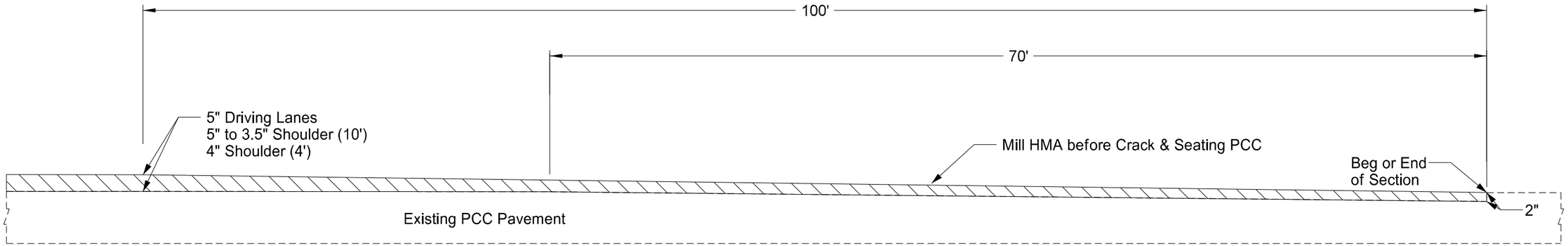
PAVING QUANTITIES	Beg Repair Sta 12039+60.32 to End Repair Sta 12060+53.37
Milling Pavement Surface	1,570 Ton
Tack Coat	49 Gal
Superpave FAA 45	54.3 Ton
PG 58H-28 Asphalt Cement	3.26 Ton

Mainline HMA Milling Near Streeter Interchange

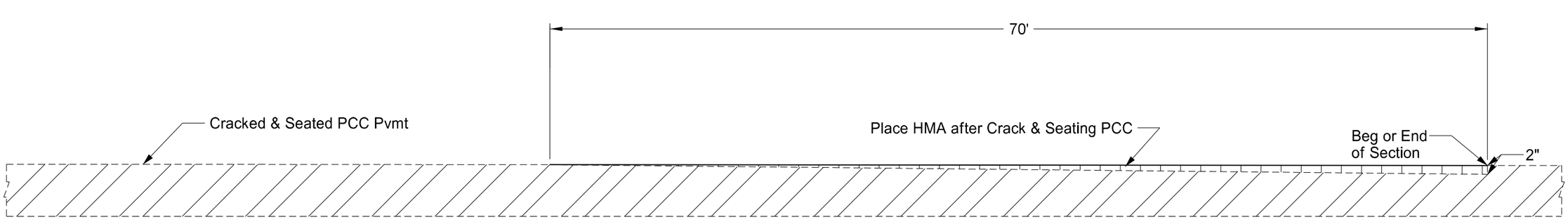
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	20	4



Milling Detail



HMA Detail

Additional Quantities for Eastbound Mainline west of Cleveland Interchange

PAVING QUANTITIES	Beg Repair Sta 12452+20 to End Repair Sta 12467+24
Milling Pavement Surface	1,609 Ton
Tack Coat	42 Gal
Superpave FAA 45	33.5 Ton
PG 58H-28 Asphalt Cement	2.0 Ton

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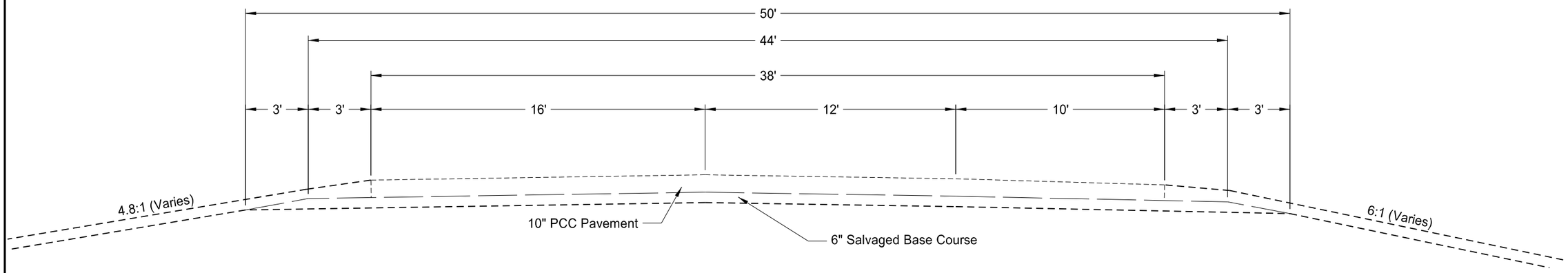
Mainline HMA Milling Near RP 236

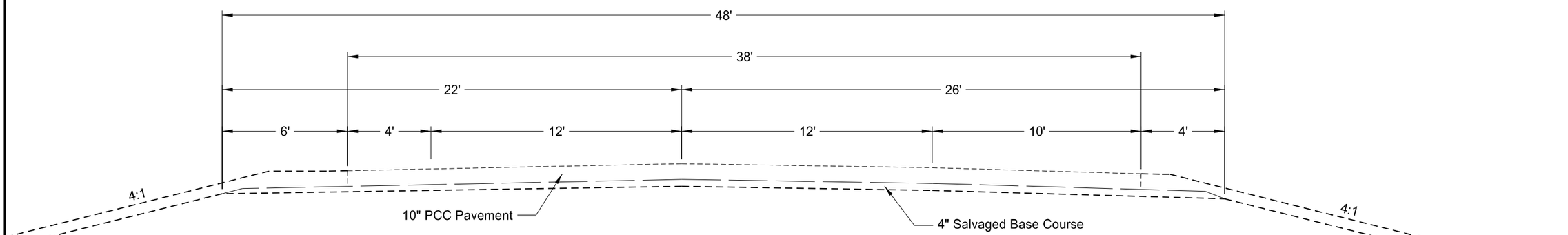
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	30	1



Existing Typical Section
RP 221.188 to 227.842



Existing Typical Section
RP 227.842 to 228.0304
RP 228.4226 to 235.837
RP 236.122 to 240.065

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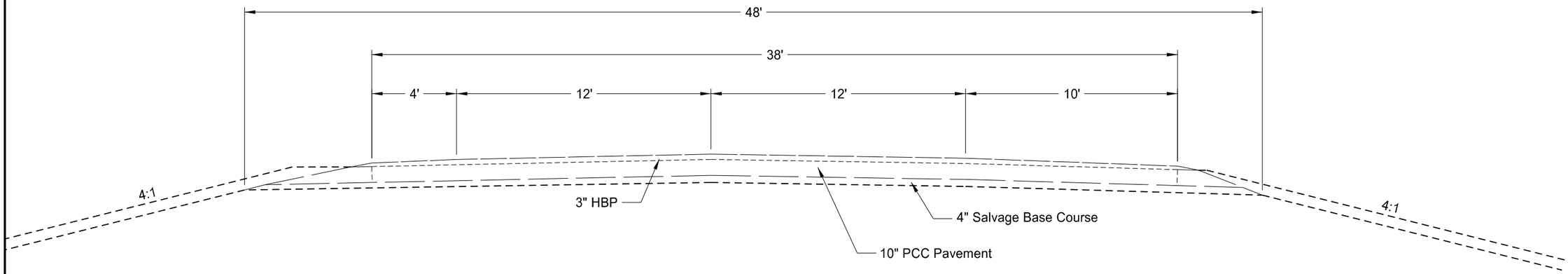
Existing Typical Section

Mainline I-94

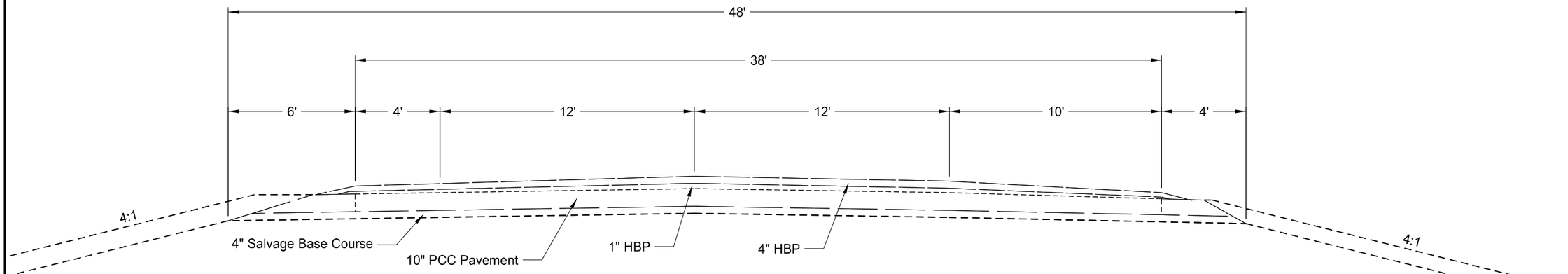
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	30	2



Existing Typical Section
RP 228.0304 to RP 228.4226



Existing Typical Section
RP 235.837 to 236.122

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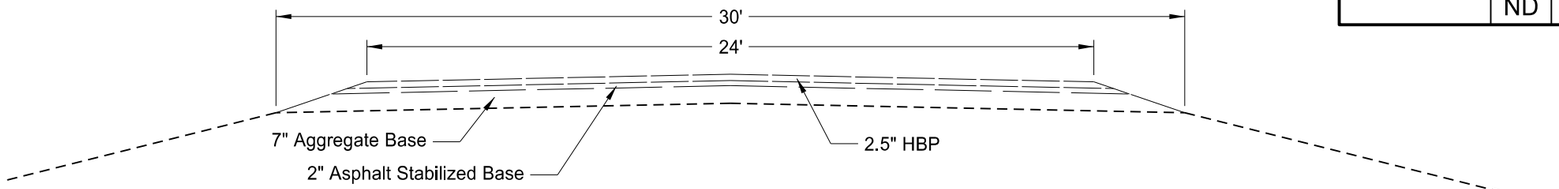
Existing Typical Section

Crack & Seat and HMA Overlay

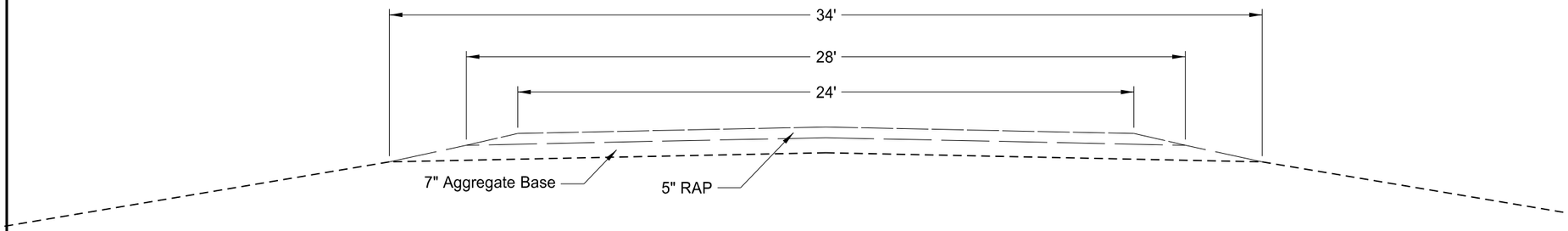
Crystal Springs to Cleveland Interchange - EB

3/23/2018 1:35:19 PM sbaehurst R:\project\20094221.156\design\Sheets\SMA\030TP_002_Existing Typical.dgn

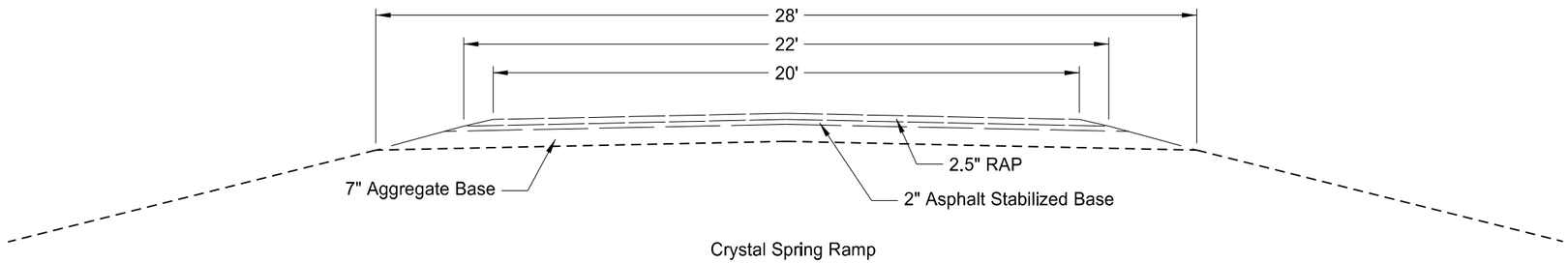
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	30	3



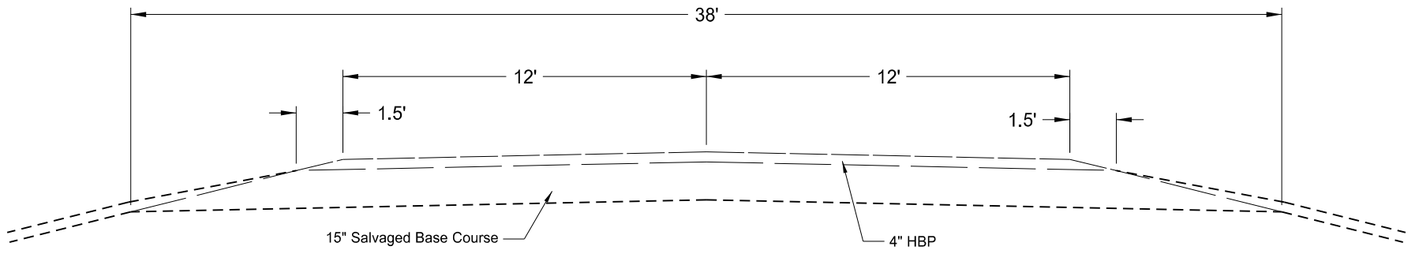
Crystal Springs Interchange
Crossroad



Crystal Spring Ramp
Reconstructed Area



Crystal Spring Ramp



Medina Interchange
NE & SE Ramps

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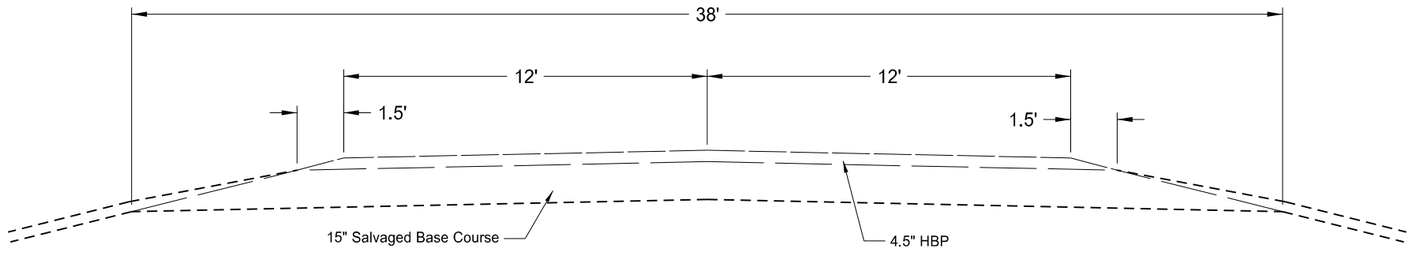
Existing Typical Section

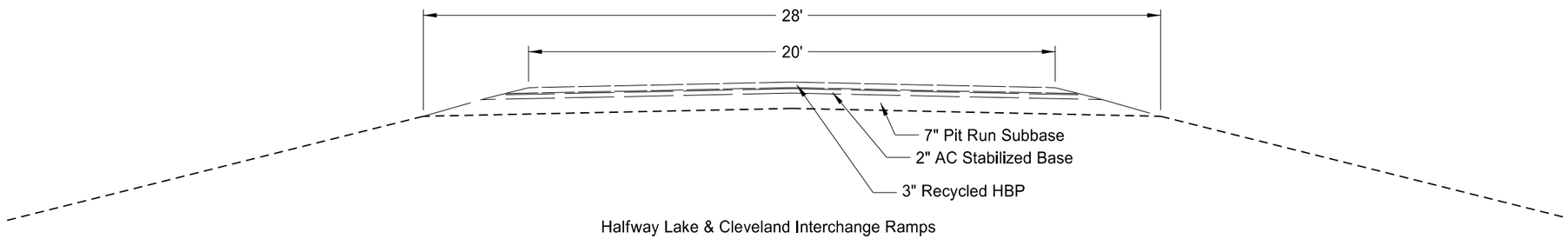
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

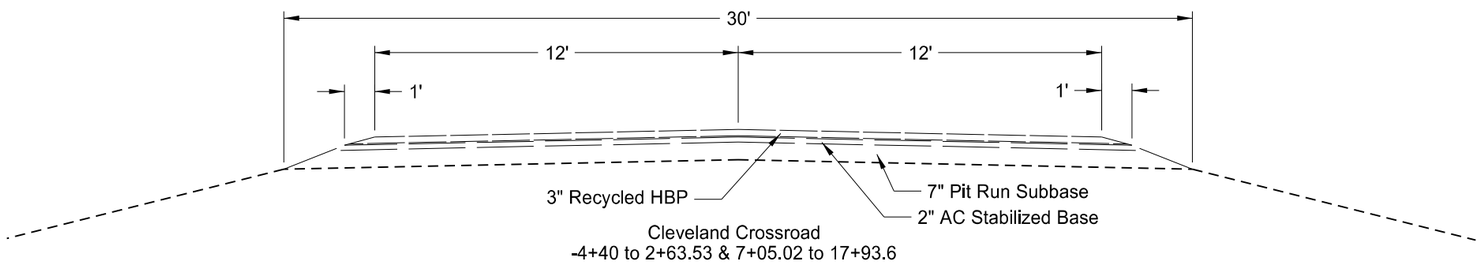
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	30	4



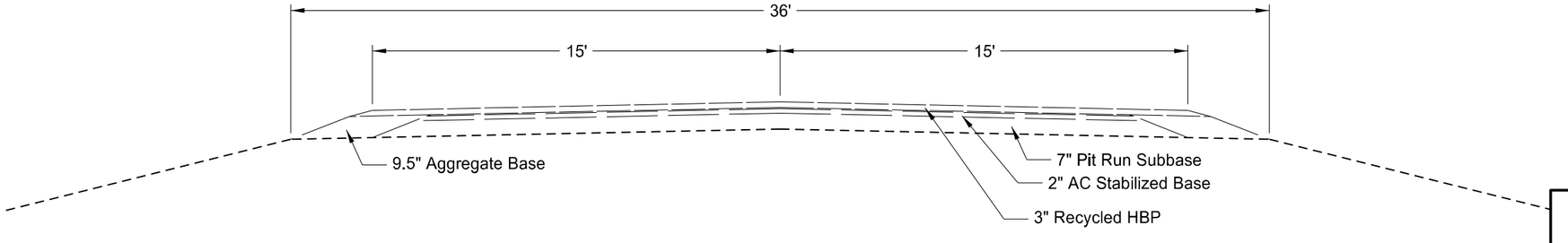
Medina Interchange
NW & SW Ramps



Halfway Lake & Cleveland Interchange Ramps



Cleveland Crossroad
-4+40 to 2+63.53 & 7+05.02 to 17+93.6
-4+40 to 1+84.29 & 6+36.47 to 17+93.6



Cleveland Crossroad
2+63.53 to 6+60.37
2+39.63 to 6+36.47

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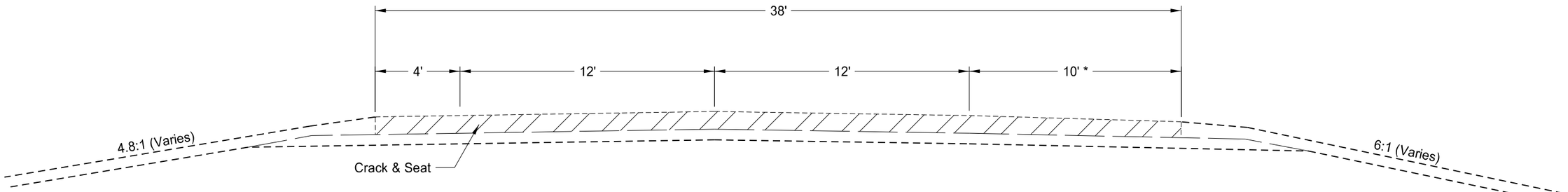
Existing Typical Section

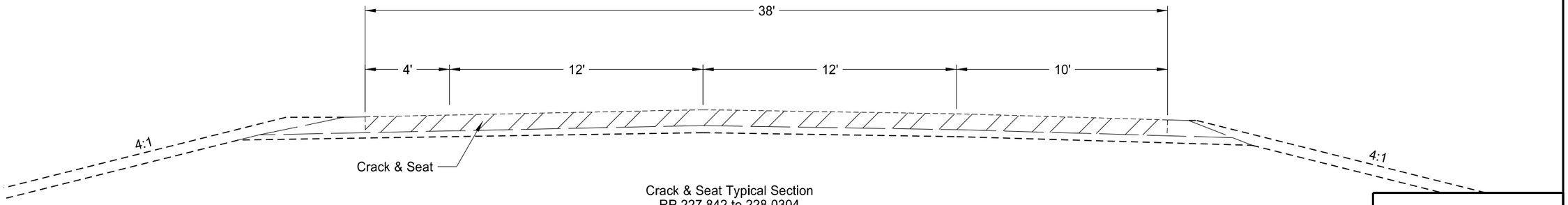
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	30	5



Crack & Seat Typical Section
RP 221.188 to 227.842



Crack & Seat Typical Section
RP 227.842 to 228.0304
RP 228.4226 to 235.837
RP 236.122 to 240.065

*Note: Do not crack and seat the 10' shoulder from Sta. 11705+87.95 to Sta. 11708+15.95.

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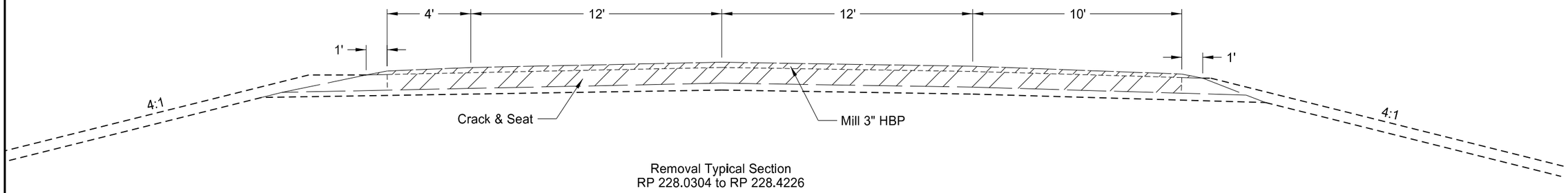
Crack & Seat Typical Section

Mainline I-94

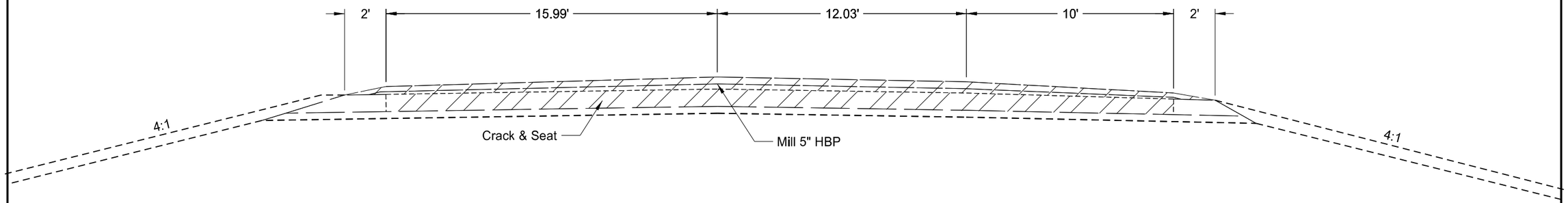
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	30	6



Removal Typical Section
RP 228.0304 to RP 228.4226



Removal Typical Section
RP 235.837 to 236.122

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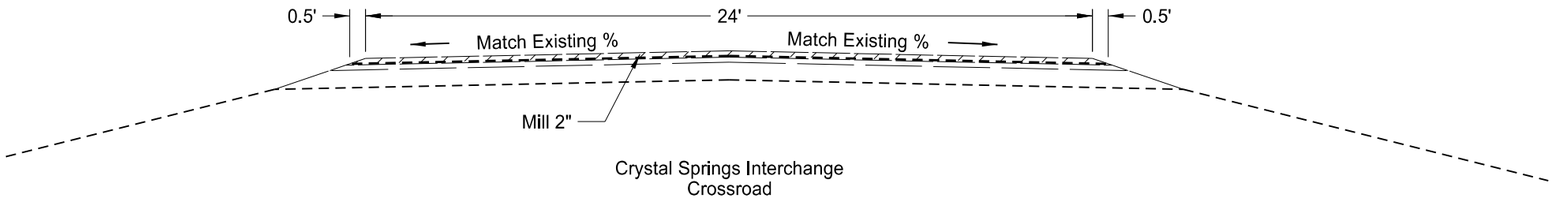
Removal Typical Section

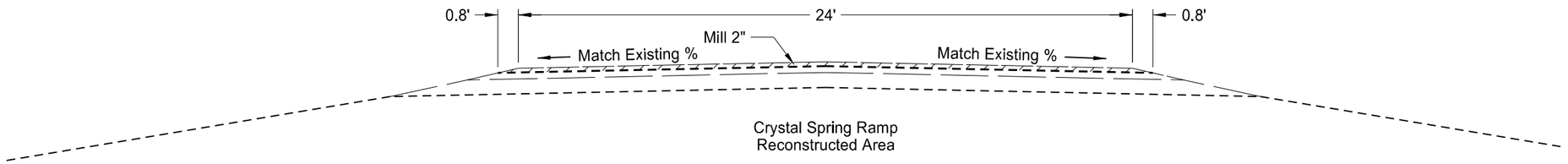
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

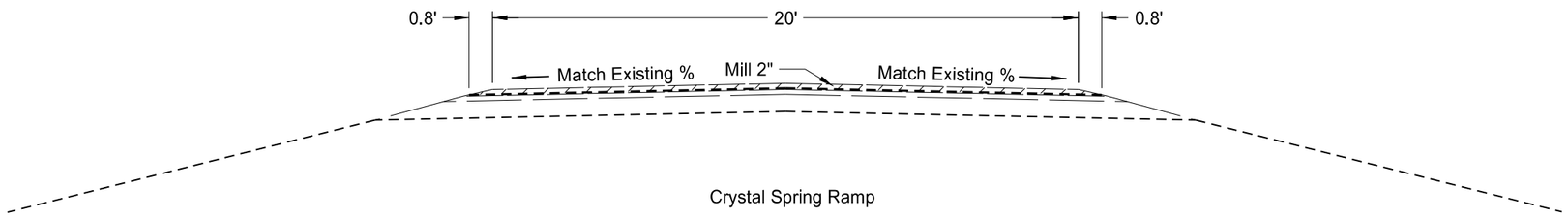
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	30	7



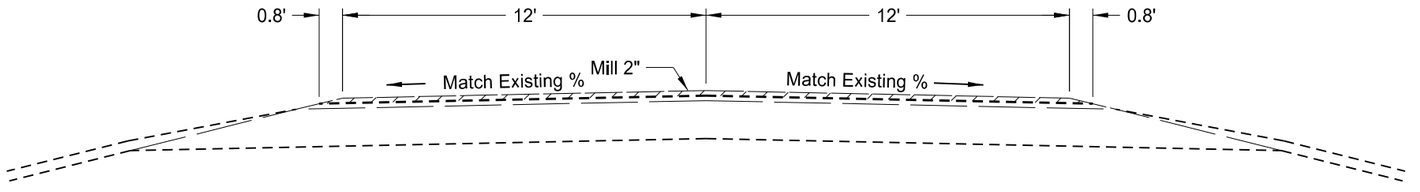
Crystal Springs Interchange
Crossroad



Crystal Spring Ramp
Reconstructed Area



Crystal Spring Ramp



Medina Interchange
NE & SE Ramps

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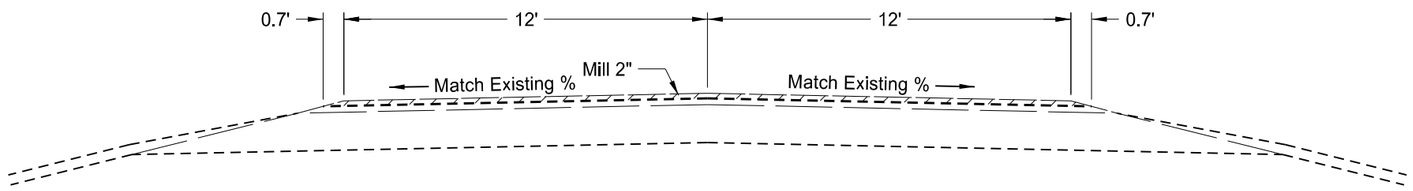
Removal Typical Section

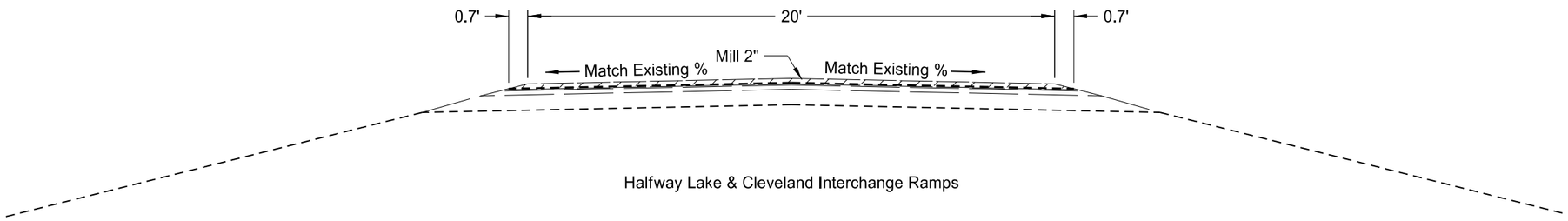
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

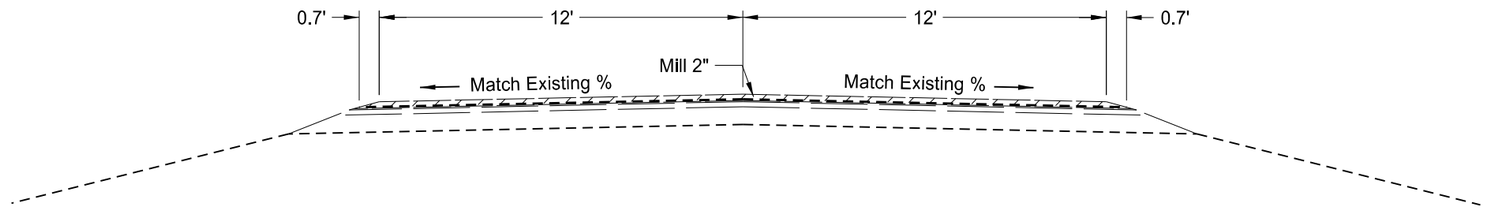
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	30	8



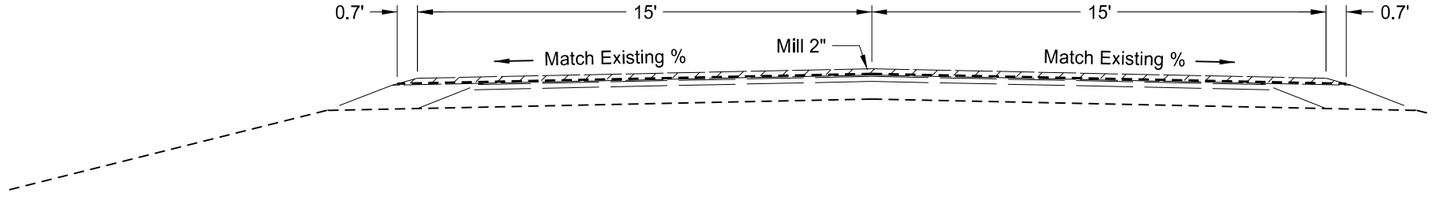
Medina Interchange
NW & SW Ramps



Halfway Lake & Cleveland Interchange Ramps



Cleveland Crossroad
-4+40 to 2+63.53 & 7+05.02 to 17+93.6
-4+40 to 1+84.29 & 6+36.47 to 17+93.6



Cleveland Crossroad
2+63.53 to 6+60.37
2+39.63 to 6+36.47

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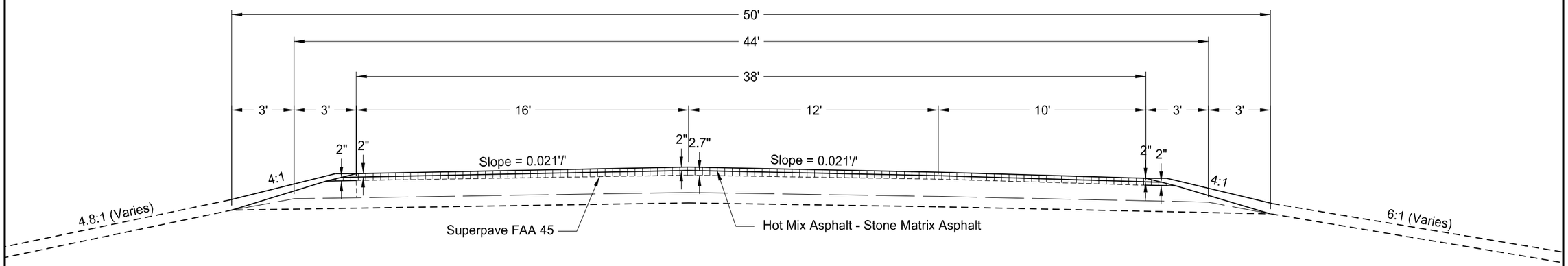
Removal Typical Section

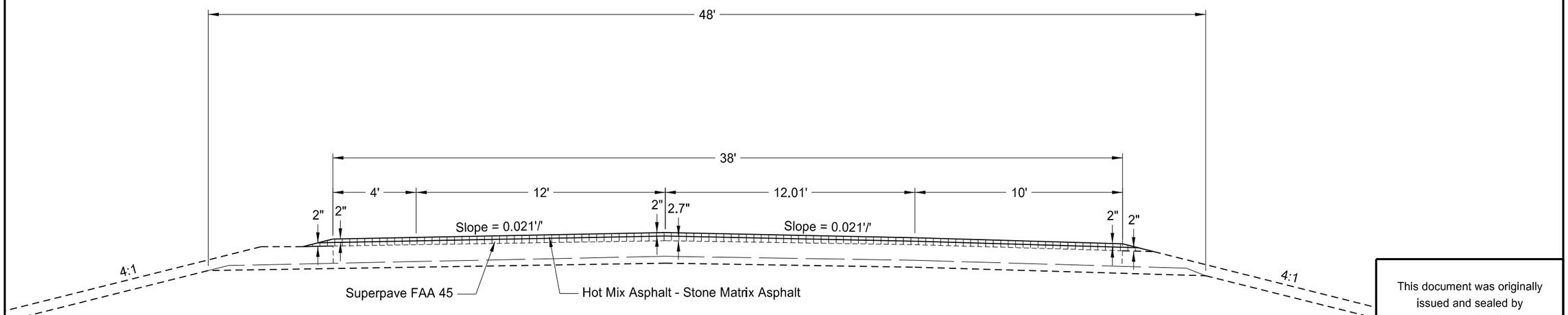
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	30	9



Typical Section
RP 221.188 to 227.842



Typical Section
RP 227.842 to 240.065

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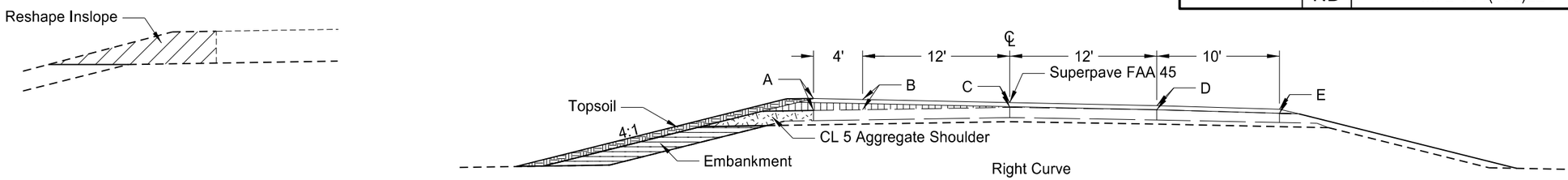
Proposed Typical Section

Mainline I-94

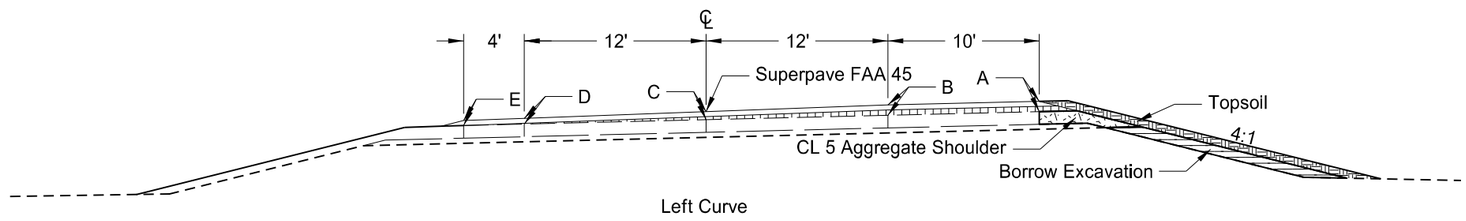
Crack & Seat and SMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	30	10



		Left Curve														Right Curve												
		Superelevation (%)				Total Depth of HMA					Additional Quantities					Superelevation (%)				Total Depth of HMA					Additional Quantities						
	Curve	Existing Slope		Proposed Slope		A	B	C	D	E	Borrow	Tack	Area	FAA 45	AC*	Existing Slope		Proposed Slope		A	B	C	D	E	Borrow	Tack	Area	FAA 45	AC*	Topsoil	CL 5
Location	Direction	Left	Right	Left	Right	(in)	(in)	(in)	(in)	(in)	(CY)	(gal)	(sf)	(ton)	(ton)	Left	Right	Left	Right	(in)	(in)	(in)	(in)	(in)	(CY)	(gal)	(sf)	(ton)	(ton)	(CY)	(TON)
PC-141' Sta 12203+25.84		-1.6	-1.6	-2.1	-2.1	4	4	4.7	4	4		3.5	-	2.3	0.1																
PC-78' Sta 12203+88.84		-1.6	0.0	-2.1	0.0	4	4	4.7	4.7	4.7		16.5	0.9888	19.2	1.2																
PC Sta 12204+66.84		-1.6	+1.6	-2.5	+2.5	4	4.4	5.7	7	7		12.4	5.6552	20.2	1.2																
PC+39' Sta 12205+05.84	Left	-2.4	+2.4	-3.7	+3.7	4	4.6	6.4	8.2	8.2		454.6	8.2948	852.2	51.1																
PT-39' Sta 12218+92.86		-2.4	+2.4	-3.7	+3.7	4	4.6	6.4	8.2	8.2	2325	12.4	8.2948	20.2	1.2															932	503
PT Sta 12219+31.86		-1.6	+1.6	-2.5	+2.5	4	4.4	5.7	7	7		16.5	5.6552	19.2	1.2																
PT+78' Sta 12220+09.86		-1.6	0.0	-2.1	0.0	4	4	4.7	4.7	4.7		3.5	0.9888	2.3	0.1																
PT+141' Sta 12220+72.86		-1.6	-1.6	-2.1	-2.1	4	4	4.7	4	4			-																		
PC-107' Sta 12557+24.34																-1.6	-1.6	-2.1	-2.1	4	4	4.7	4	4		5.1	-	8.2	0.5		
PC-44' Sta 12557+87.34																-1.6	-1.6	0.0	-2.1	8.4	7	4.7	4	4		7.6	3.5290	14.6	0.9		
PC Sta 12558+31.34																-1.6	-1.6	+1.4	-2.1	10.1	8.7	4.7	4	4		4.9	5.4123	10.2	0.6		
PC+22' Sta 12558+53.34	Right															-1.6	-1.6	+2.1	-2.1	11.8	10	4.7	4	4	830	513.2	7.1091	1,034.9	62.1	564	851
PT-22' Sta 12578+18.64																-1.6	-1.6	+2.1	-2.1	11.8	10	4.7	4	4		4.9	7.1091	10.2	0.6		
PT Sta 12578+40.64																-1.6	-1.6	+1.4	-2.1	10.1	8.7	4.7	4	4		7.6	5.4123	14.6	0.9		
PT+44' Sta 12578+84.64																-1.6	-1.6	0.0	-2.1	8.4	7	4.7	4	4		5.1	3.5290	8.2	0.5		
PT+107' Sta 12579+47.64																-1.6	-1.6	-2.1	-2.1	4	4	4.7	4	4			-				
PC-141' Sta 12611+84.6		-1.6	-1.6	-2.1	-2.1	4	4	4.7	4	4		3.5	-	2.3	0.1																
PC-78' Sta 12612+47.6		-1.6	0.0	-2.1	0.0	4	4	4.7	4.7	4.7		16.5	0.9888	19.2	1.2																
PC Sta 12613+25.6		-1.6	+1.6	-2.5	+2.5	4	4.4	5.7	7	7		12.4	5.6552	20.2	1.2																
PC+39' Sta 12613+64.6	Left	-2.4	+2.4	-3.7	+3.7	4	4.6	6.4	8.2	8.2		983.4	8.2948	1,843.5	110.6																
PT-39' Sta 12643+64.97		-2.4	+2.4	-3.7	+3.7	4	4.6	6.4	8.2	8.2	0	12.4	8.2948	20.2	1.2															0	0
PT Sta 12644+03.97		-1.6	+1.6	-2.5	+2.5	4	4.4	5.7	7	7		16.5	5.6552	19.2	1.2																
PT+78' Sta 12644+81.97		-1.6	0.0	-2.1	0.0	4	4	4.7	4.7	4.7		3.5	0.9888	2.3	0.1																
PT+141' Sta 12645+44.97		-1.6	-1.6	-2.1	-2.1	4	4	4.7	4	4			-																		
PC-141' Sta 12656+46.75																-1.6	-1.6	-2.1	-2.1	4	4	4.7	4	4		2.4	-	1.5	0.1		
PC-78' Sta 12657+09.75																0.0	-1.6	0.0	-2.1	4.7	4.7	4.7	4	4		10.6	0.6388	12.3	0.7		
PC Sta 12657+87.75																+1.6	-1.6	+2.5	-2.5	7.2	6.8	5.5	4	4		8.0	3.6253	12.2	0.7		
PC+39' Sta 12658+26.75	Right															+2.4	-2.4	+3.7	-3.7	8.2	7.6	5.8	4	4	0	324.6	4.8003	532.8	32.0	0	0
PT-39' Sta 12673+25.17																+2.4	-2.4	+3.7	-3.7	8.2	7.6	5.8	4	4		8.0	4.8003	12.2	0.7		
PT Sta 12673+64.17																+1.6	-1.6	+2.5	-2.5	7.2	6.8	5.5	4	4		10.6	3.6253	12.3	0.7		
PT+78' Sta 12674+42.17																0.0	-1.6	0.0	-2.1	4.7	4.7	4.7	4	4		2.4	0.6388	1.5	0.1		
PT+141' Sta 12676+05.17																-1.6	-1.6	-2.1	-2.1	4	4	4.7	4	4			-				
TOTALS												1,567.6		2,862.5	171.7											1,544.5		2,950.3	177.0		



*AC is PG 58H-28

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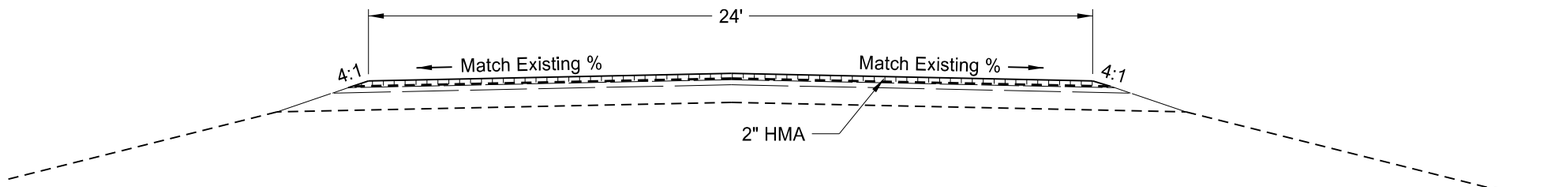
Note: The "Total Depth of HMA" columns represent the depth of HMA required to correct the superelevation on the curves.
The "Additional Quantities" columns represent the HMA required to adjust the superelevation (in addition to the basis of estimate overlay.)

Proposed Curve Superelevation Correction Typical Sections

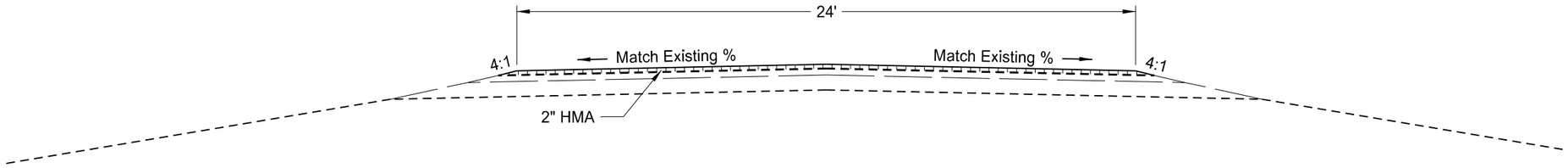
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

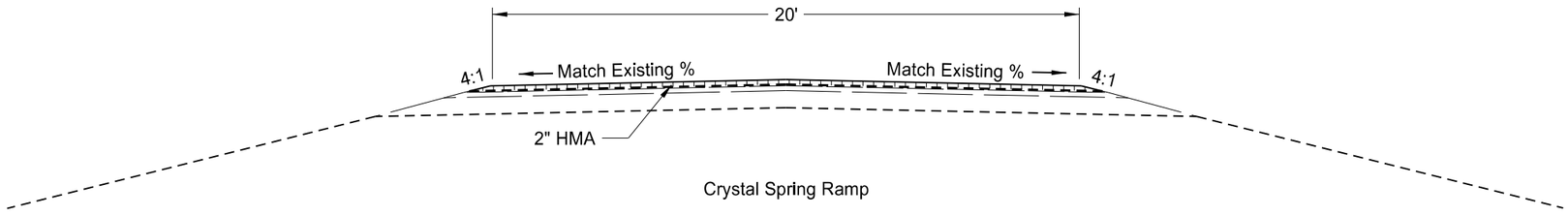
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	30	11



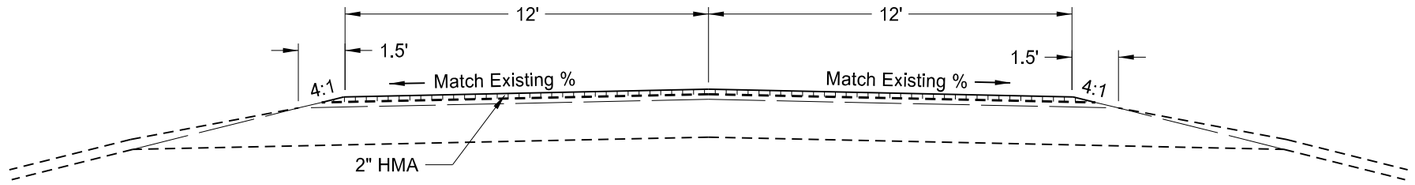
Crystal Springs Interchange
Crossroad



Crystal Spring Ramp
Reconstructed Area



Crystal Spring Ramp



Medina Interchange
NE & SE Ramps

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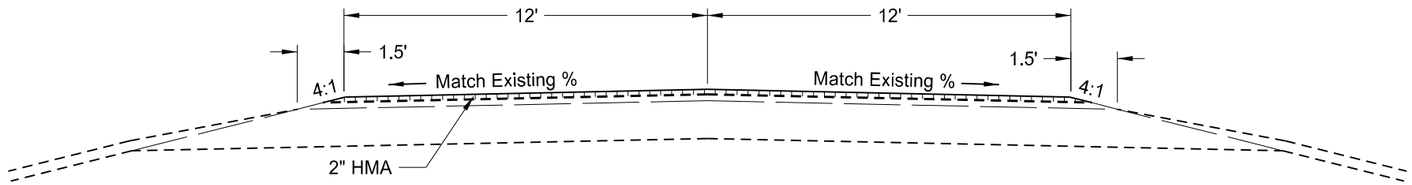
Proposed Ramp Typical Sections

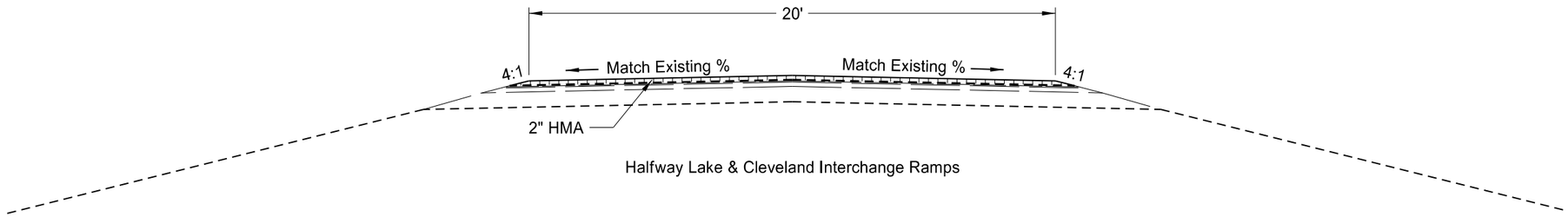
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

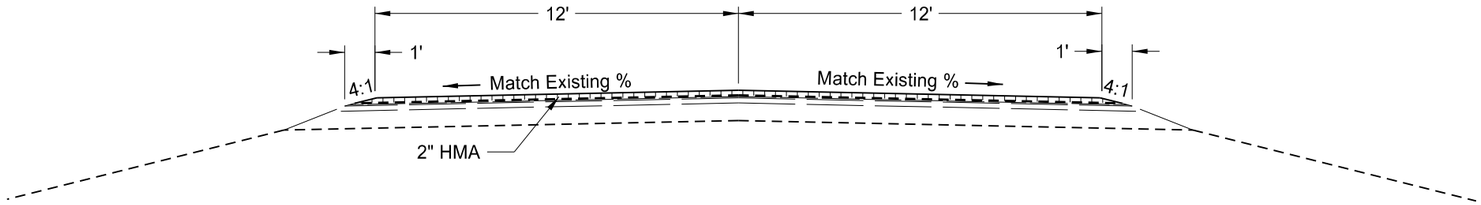
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	30	12



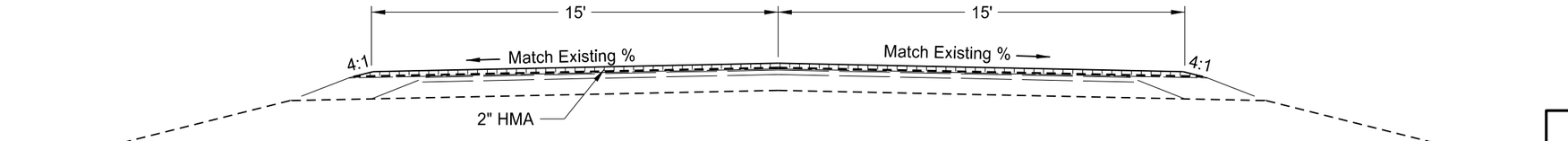
Medina Interchange
NW & SW Ramps



Halfway Lake & Cleveland Interchange Ramps



Cleveland Crossroad
-4+40 to 2+63.53 & 7+05.02 to 17+93.6
-4+40 to 1+84.29 & 6+36.47 to 17+93.6



Cleveland Crossroad
2+63.53 to 6+60.37
2+39.63 to 6+36.47

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Proposed Typical Ramp Sections

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	51	1

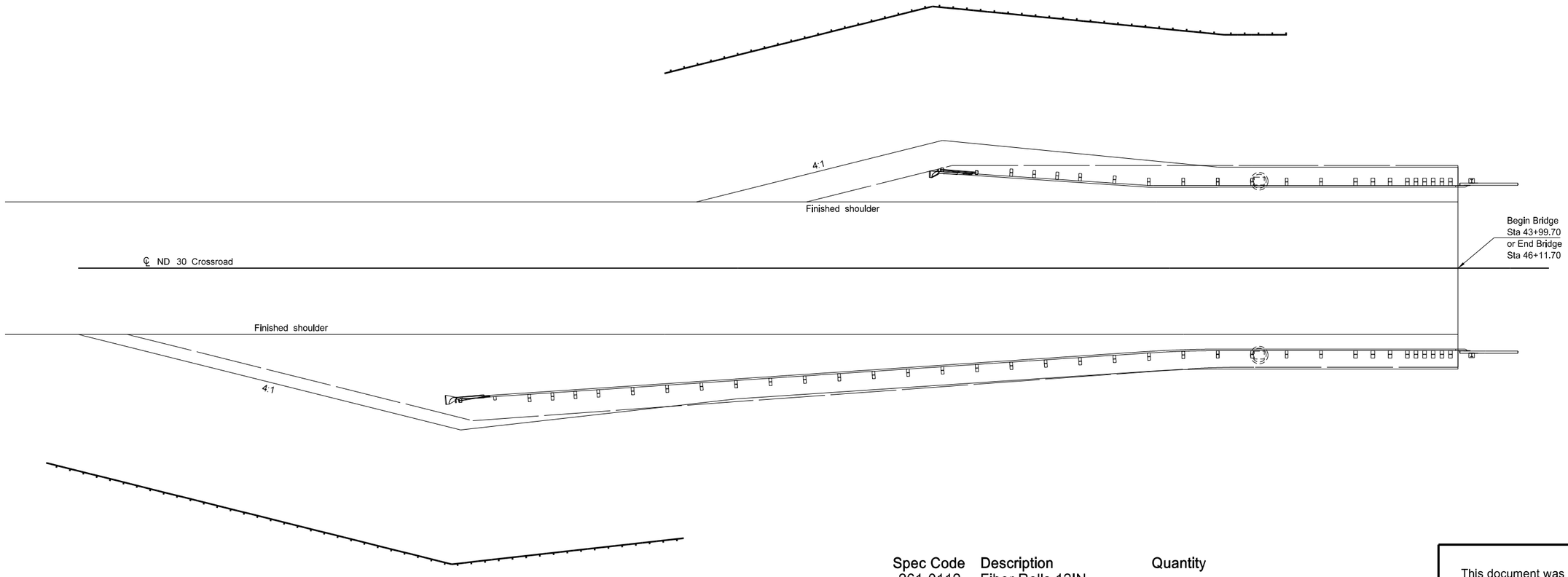
Reference Point	Approx. Station	Description	Remove	Install	Install	Embankment
221.624	11701+34	18" X 72' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
221.765	11708+79	24" X 76' RCP - 2 FES	1-24" FES	24" X 2' RCP	1-24" RCTES	5 CY
223.242	11786+64	18" X 72' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
224.569	11803+90	18" X 112' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
226.291	11947+66	18" X 90' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
226.575	11962+65	18" X 72' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
227.37	12004+64	18" X 74' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
227.844	12079+86	18" X 66' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
228.905	12086+27	18" X 78' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
229.388	12111+84	24" X 66' RCP - 2 FES	1-24" FES	24" X 2' RCP	1-24" RCTES	5 CY
231.613	12229+27	18" X 66' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
231.992	12249+26	18" X 66' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
232.371	12269+27	18" X 66' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
233.772	12343+22	18" X 66' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
235.192	12418+18	18" X 66' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
236.122	12467+26	18" X 72' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
238.044	12568+56	18" X 84' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
238.564	12595+98	18" X 86' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY
239.041	12621+13	18" X 98' RCP - 2 FES	1-18" FES	18" X 4' RCP	1-18" RCTES	5 CY

Allowable Pipe List

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	76	1



Spec Code	Description	Quantity
261-0112	Fiber Rolls 12IN	
	South Approach	
	Left	114 LF
	Right	118 LF
	North Approach	
	Left	118 LF
	Right	114 LF
	Total	464 LF

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Temporary Erosion Control
Streeter Interchange Crossroad-RP 228.321
Both Ends of Bridge

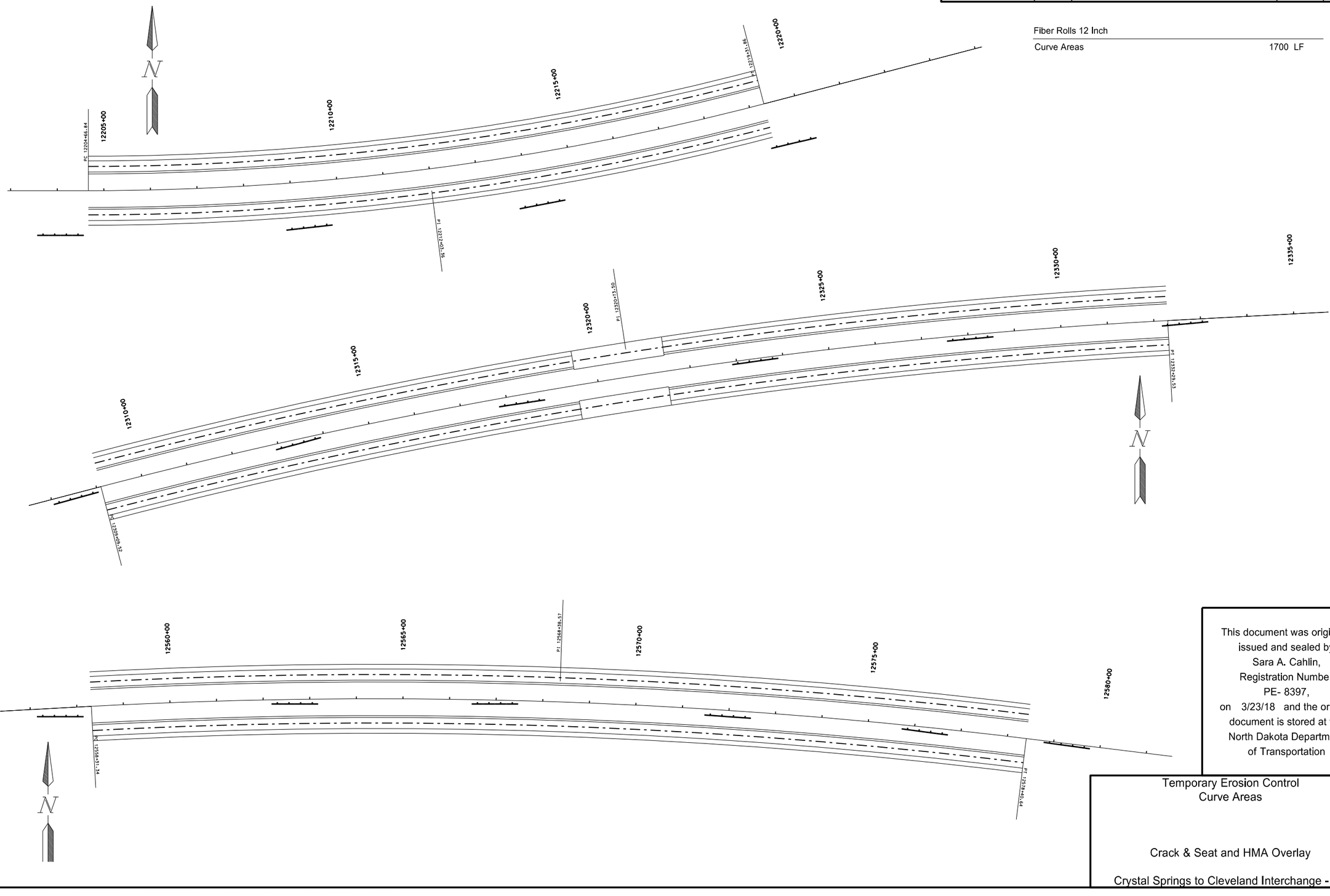
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	76	2

Fiber Rolls 12 Inch

Curve Areas	1700 LF



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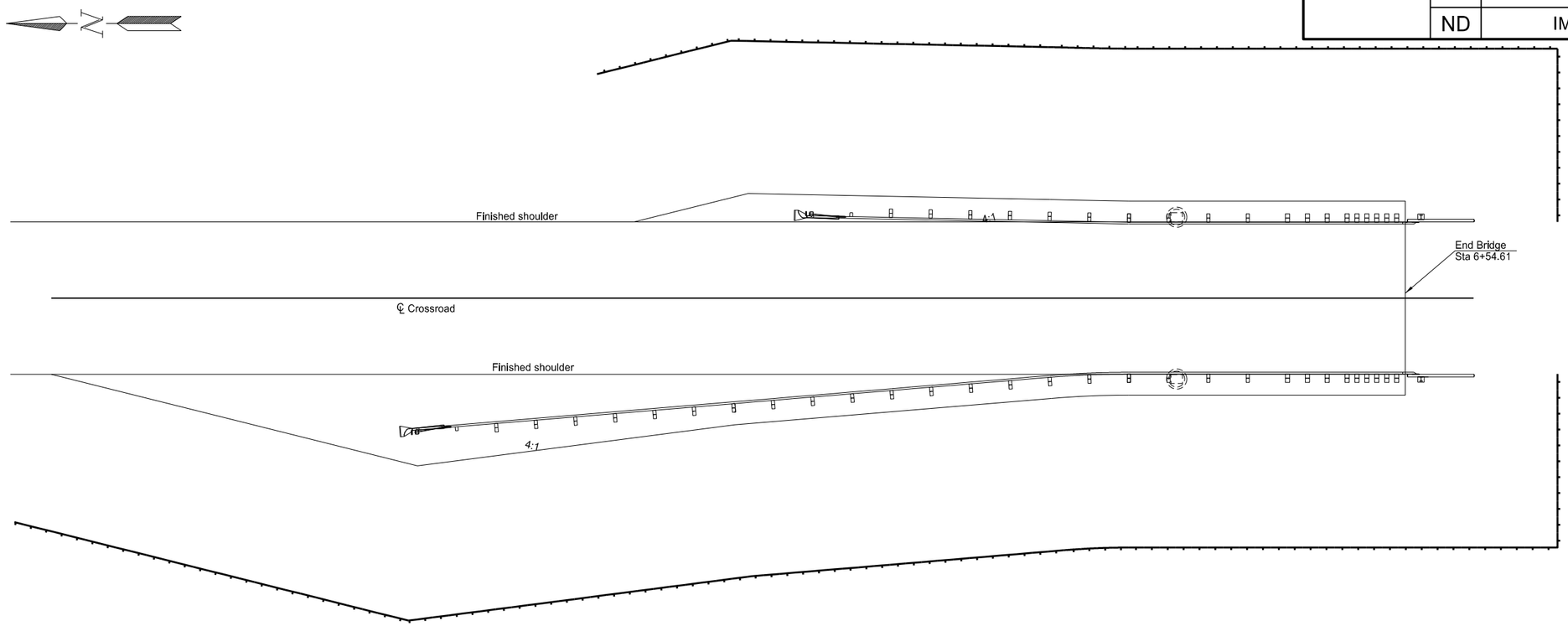
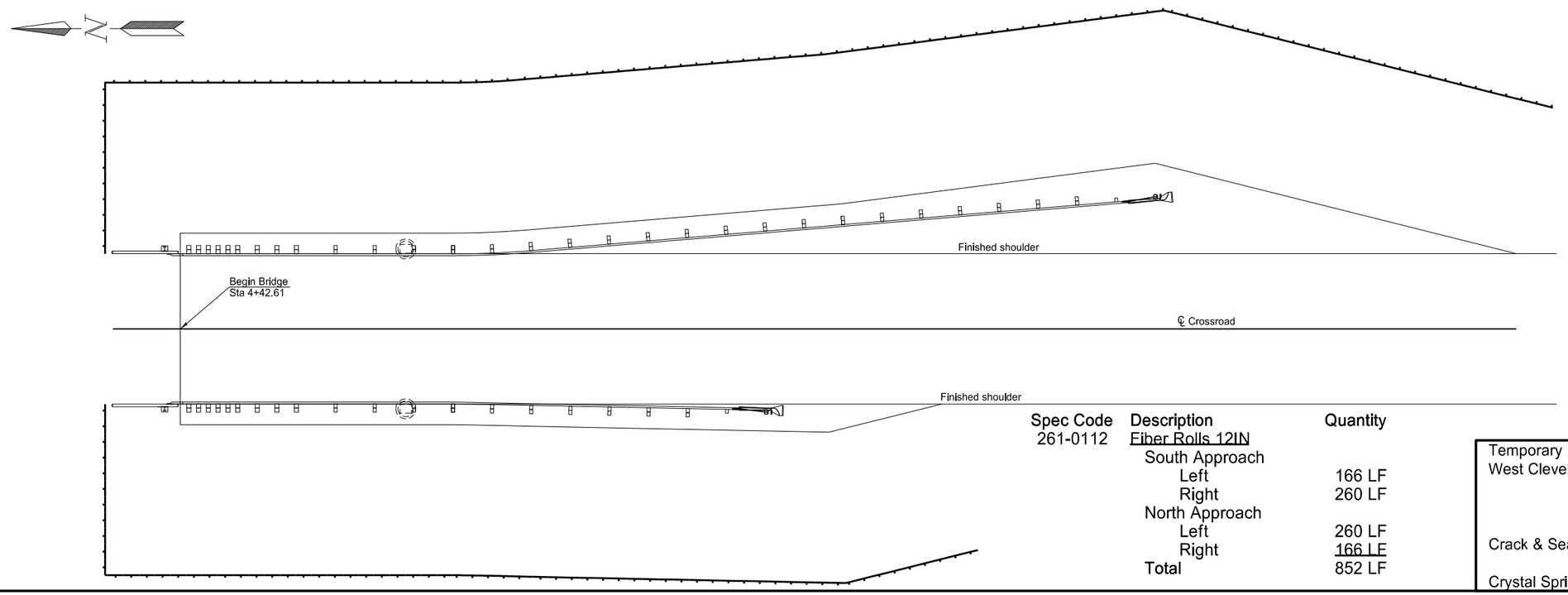
Temporary Erosion Control
Curve Areas

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	76	3





Spec Code	Description	Quantity
261-0112	Fiber Rolls 12IN	
	South Approach	
	Left	166 LF
	Right	260 LF
	North Approach	
	Left	260 LF
	Right	166 LF
	Total	852 LF

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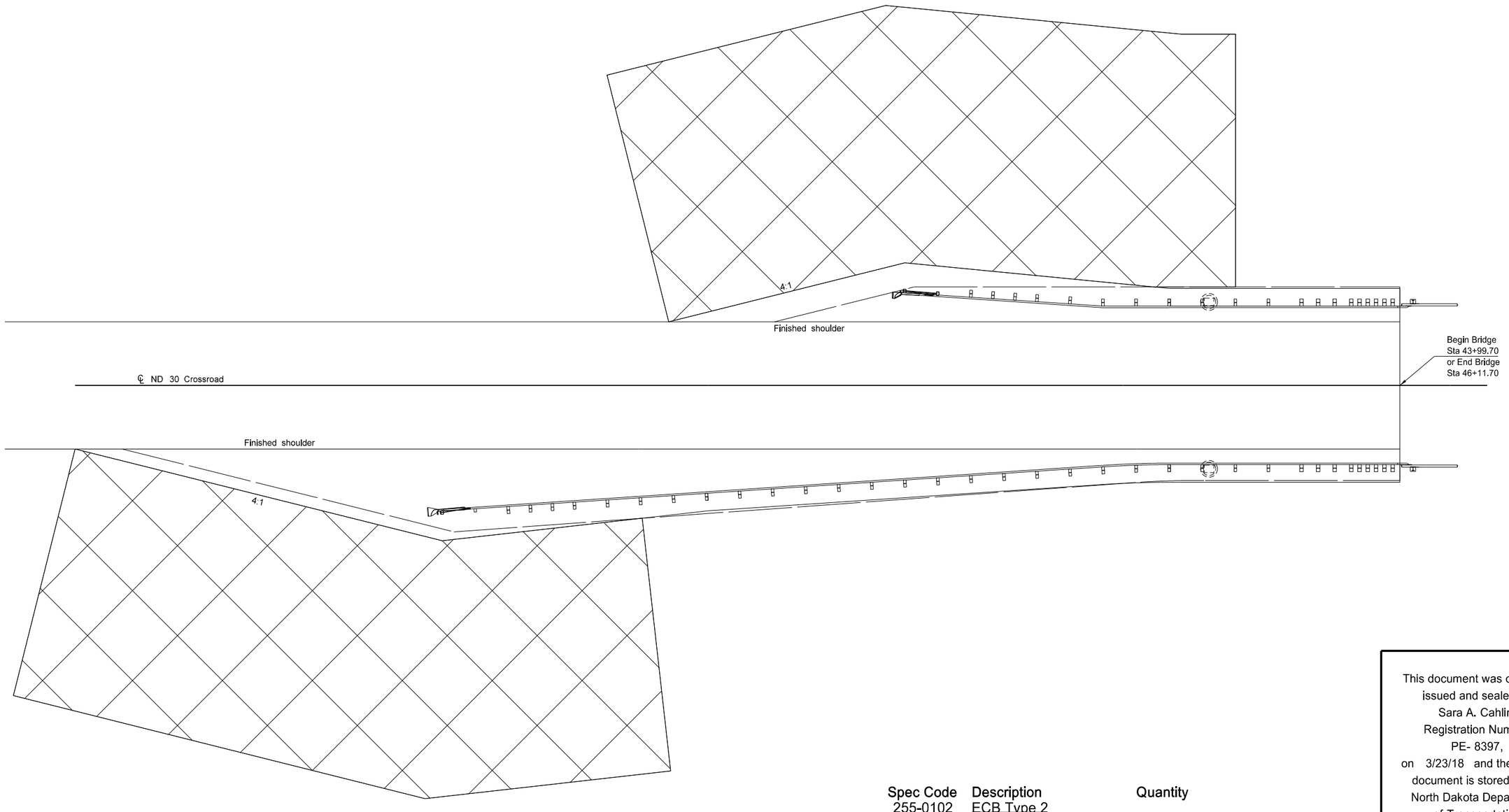
Temporary Erosion Control
West Cleveland Separation Cross Road-RP 237.322

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	77	1



ECB Type 2

Spec Code	Description	Quantity
255-0102	ECB Type 2	
	South Approach	
	Left	610 LF
	Right	630 LF
	North Approach	
	Left	630 LF
	Right	610 LF
	Total	2,480 LF

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Permanent Erosion Control
Streeter Interchange Crossroad-RP 228.321
Both Ends of Bridge

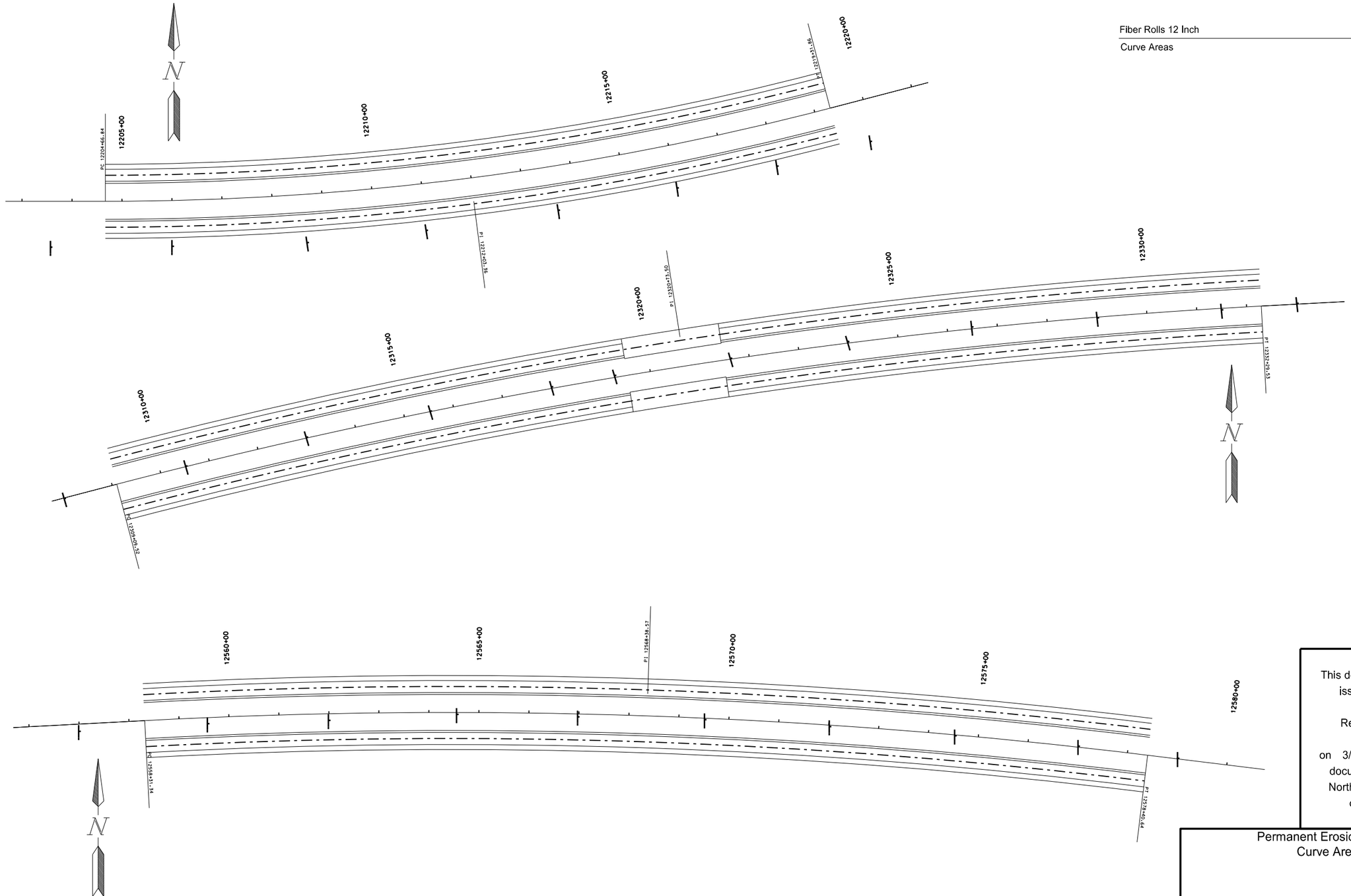
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	77	2

Fiber Rolls 12 Inch

Curve Areas	900 LF



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Permanent Erosion Control
Curve Areas

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

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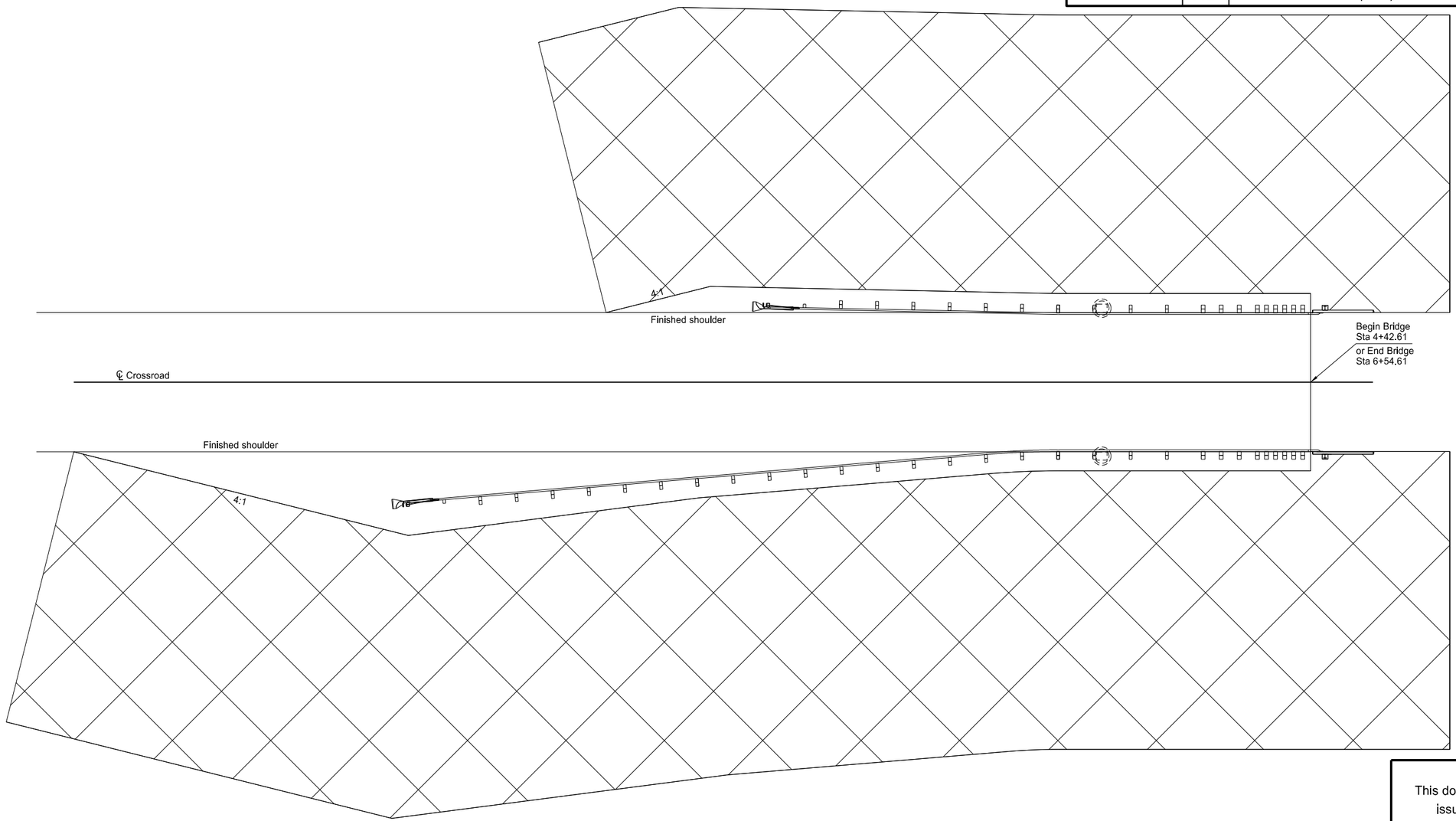
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	77	3



ECB Type 2

Spec Code	Description	Quantity
255-0102	ECB Type 2	
	South Approach	
	Left	819 SY
	Right	1,319 SY
	North Approach	
	Left	1,319 SY
	Right	819 SY
	Total	4,276 SY

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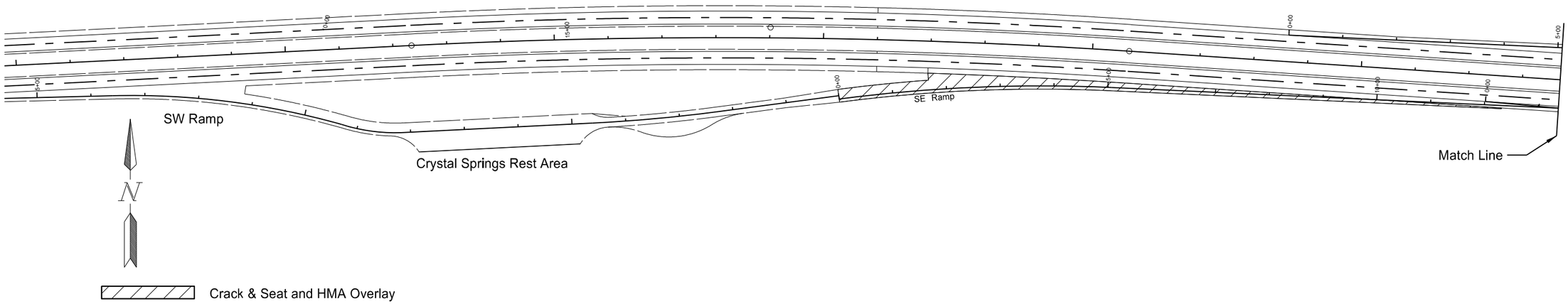
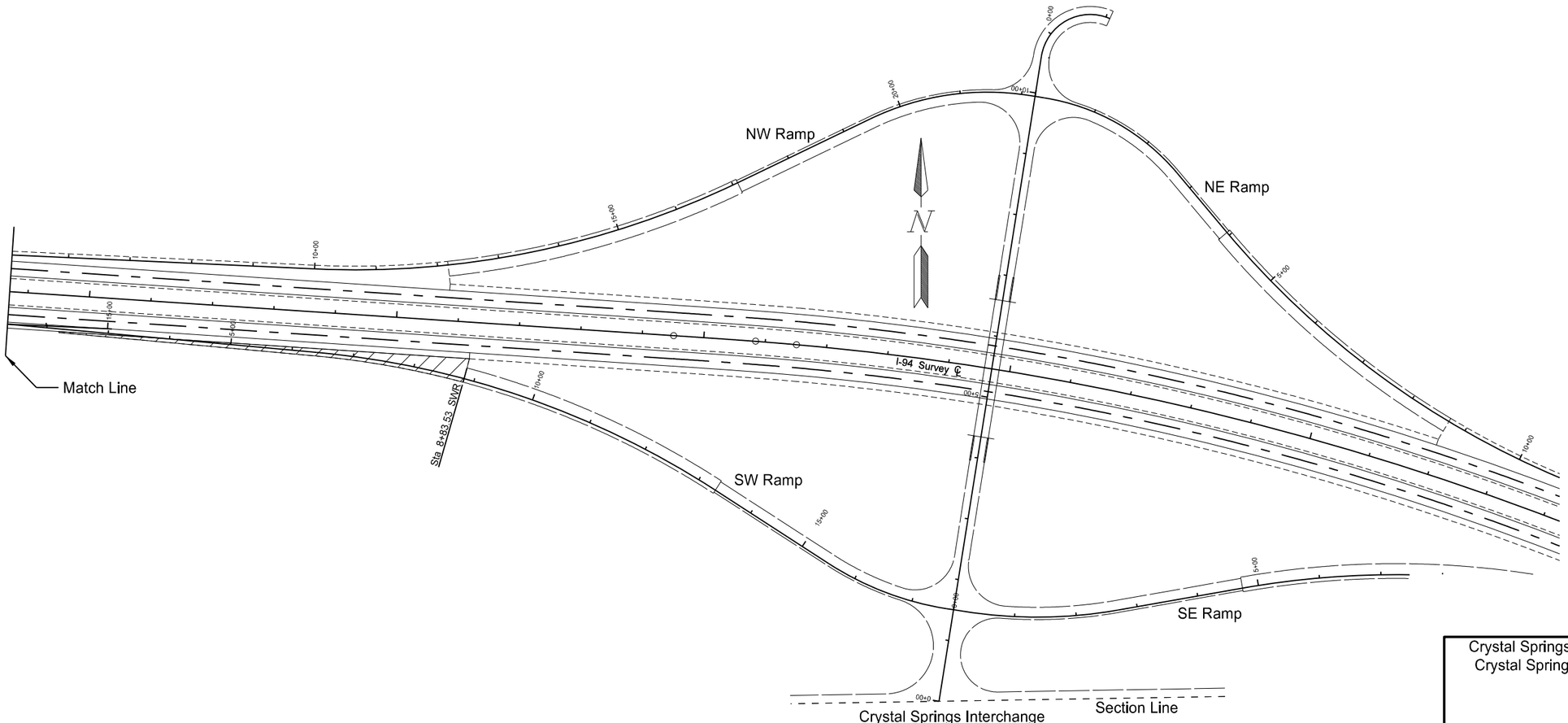
Permanent Erosion Control
West Cleveland Separation Cross Road-RP 237.322

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	90	1





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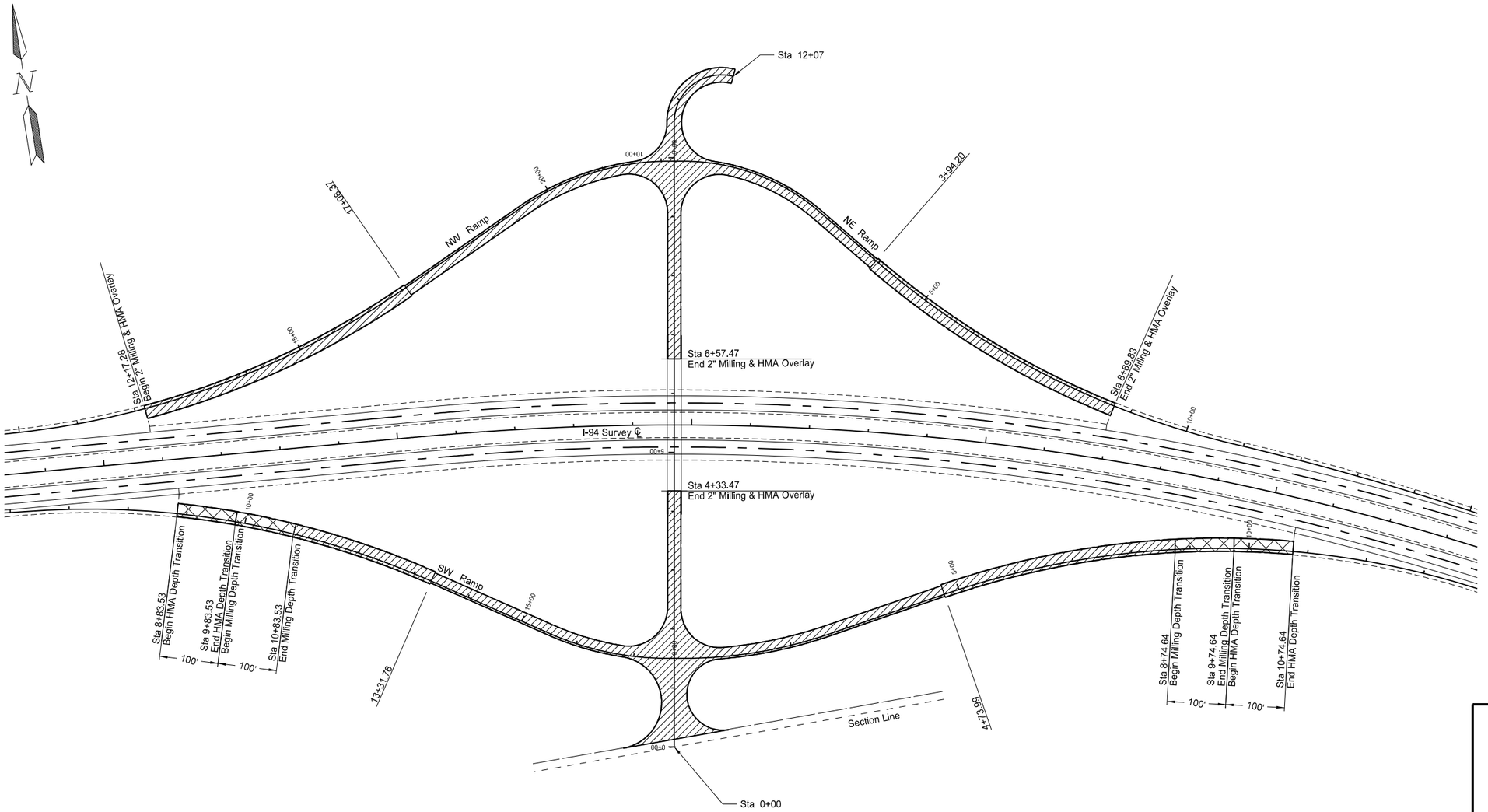
Crystal Springs Rest Area SE Ramp Layout and Crystal Springs Interchange SW Ramp Layout

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	90	2



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Crystal Springs Interchange Layout

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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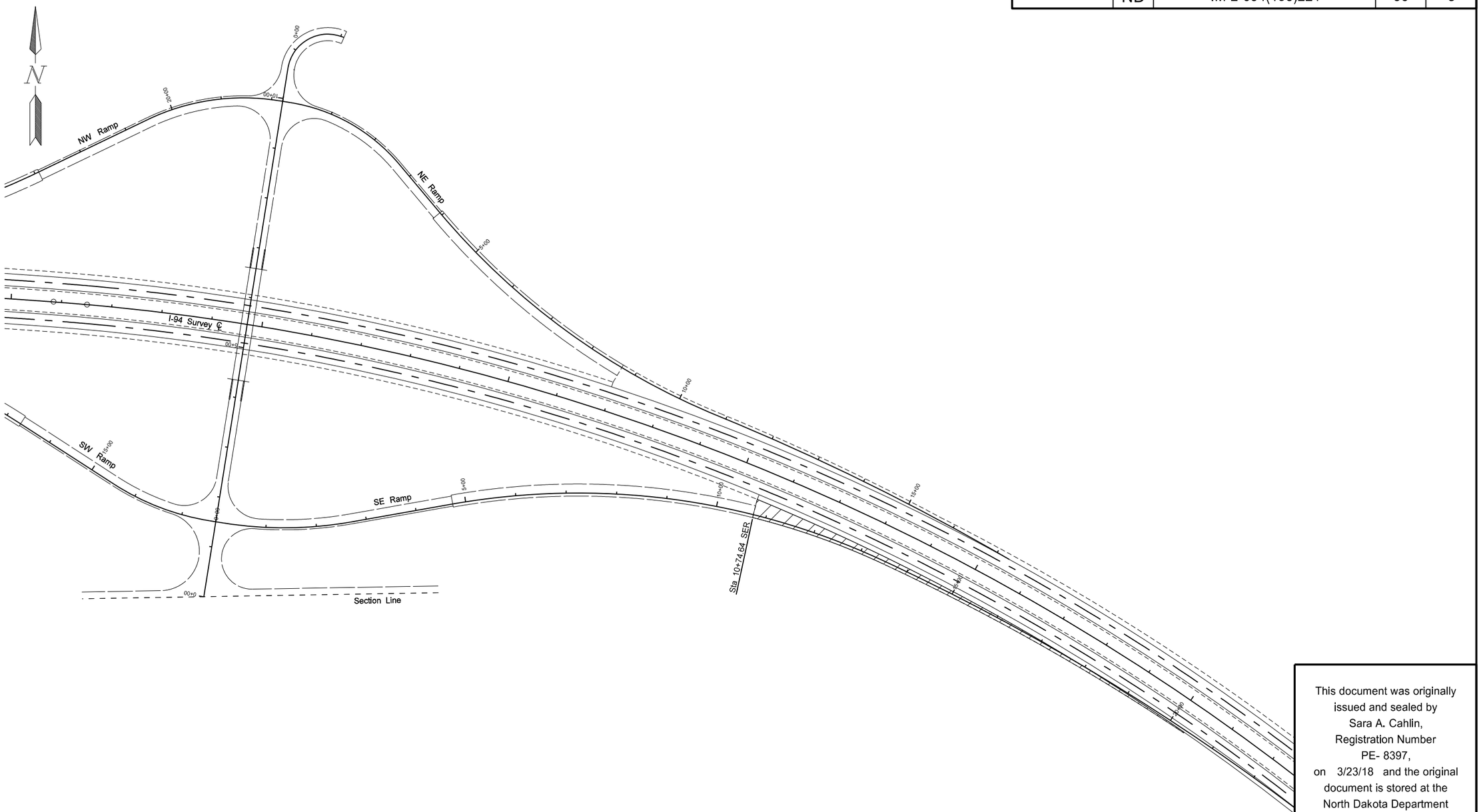

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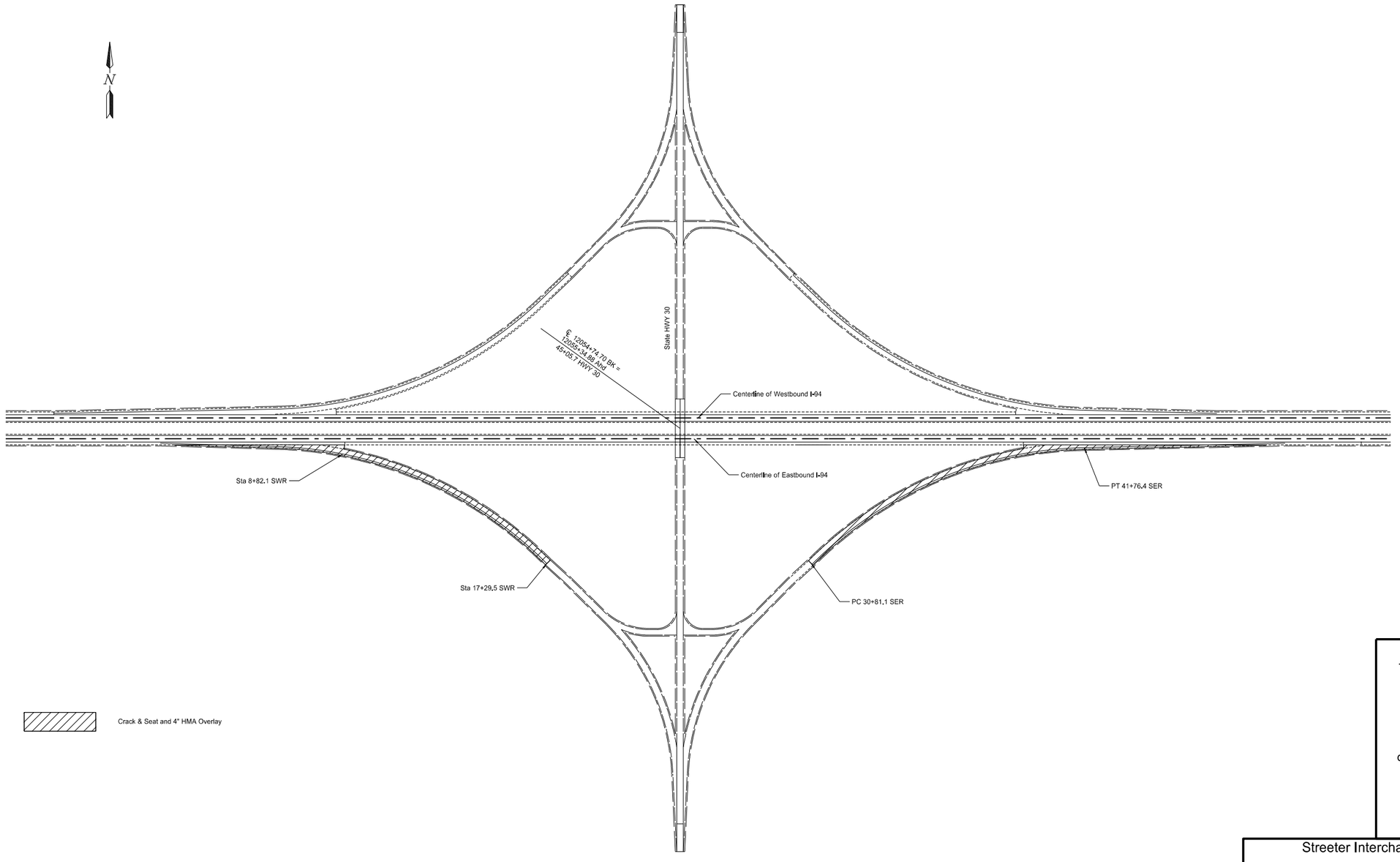
Crystal Springs SE Ramp Layout

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	90	4



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Streeter Interchange Ramps Layout

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

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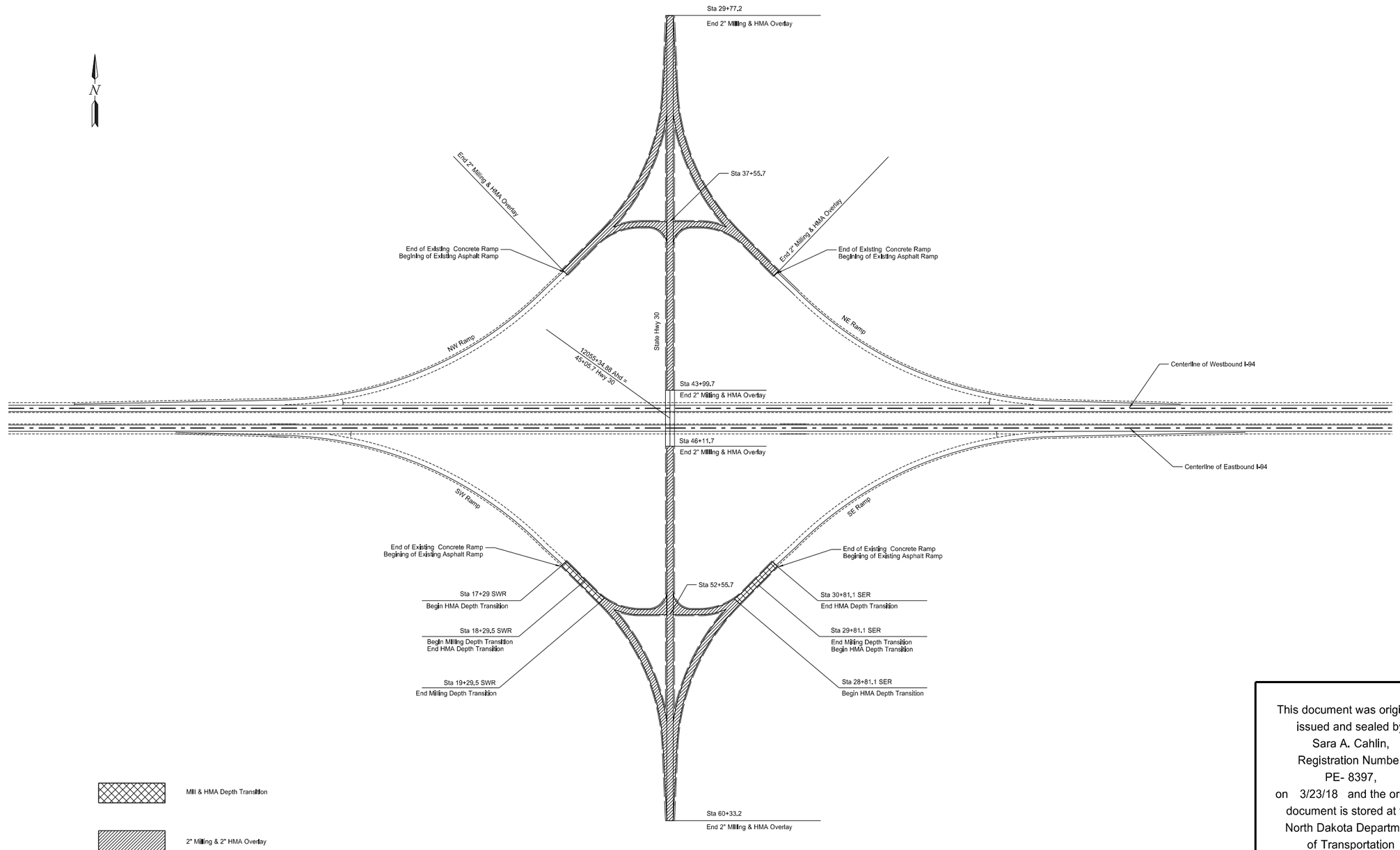
	ND	IM-2-094(156)221	90	5



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Streeter Interchange Layout

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

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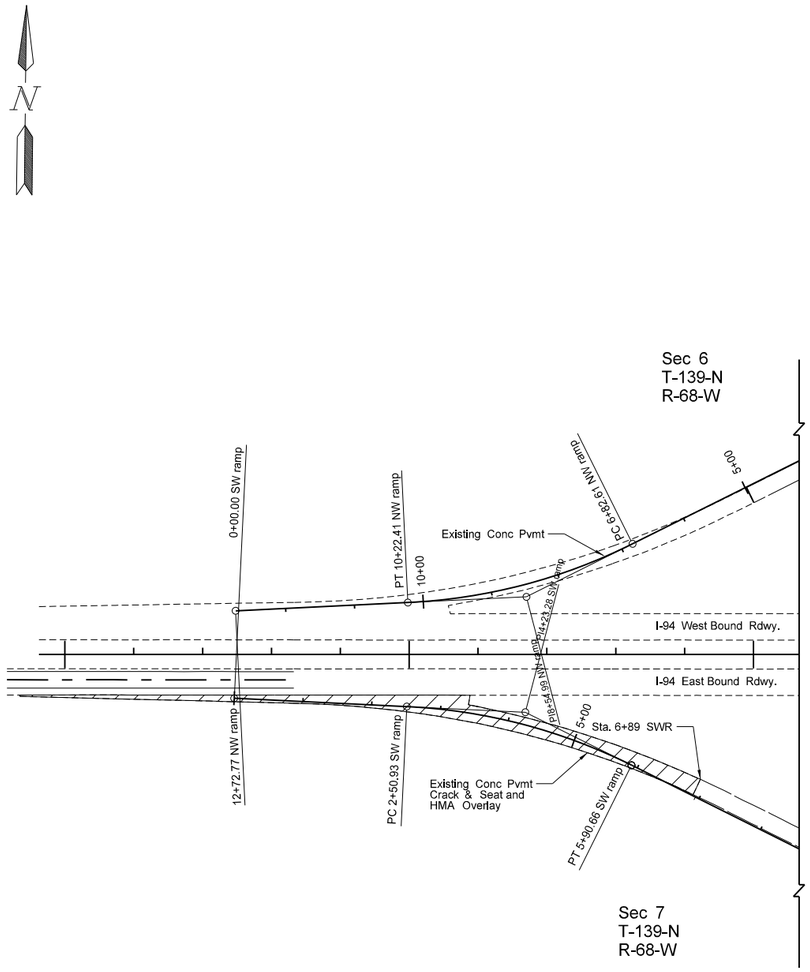
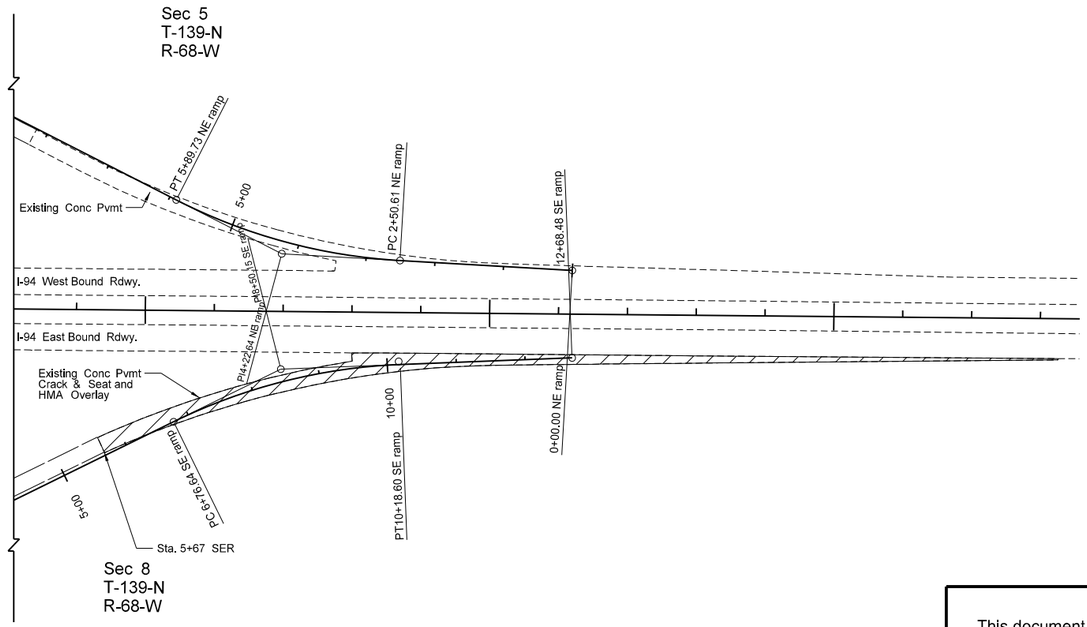
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	90	6





Crack & Seat and 4" HMA Overlay

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Medina InterchangeRamp Layout Layout

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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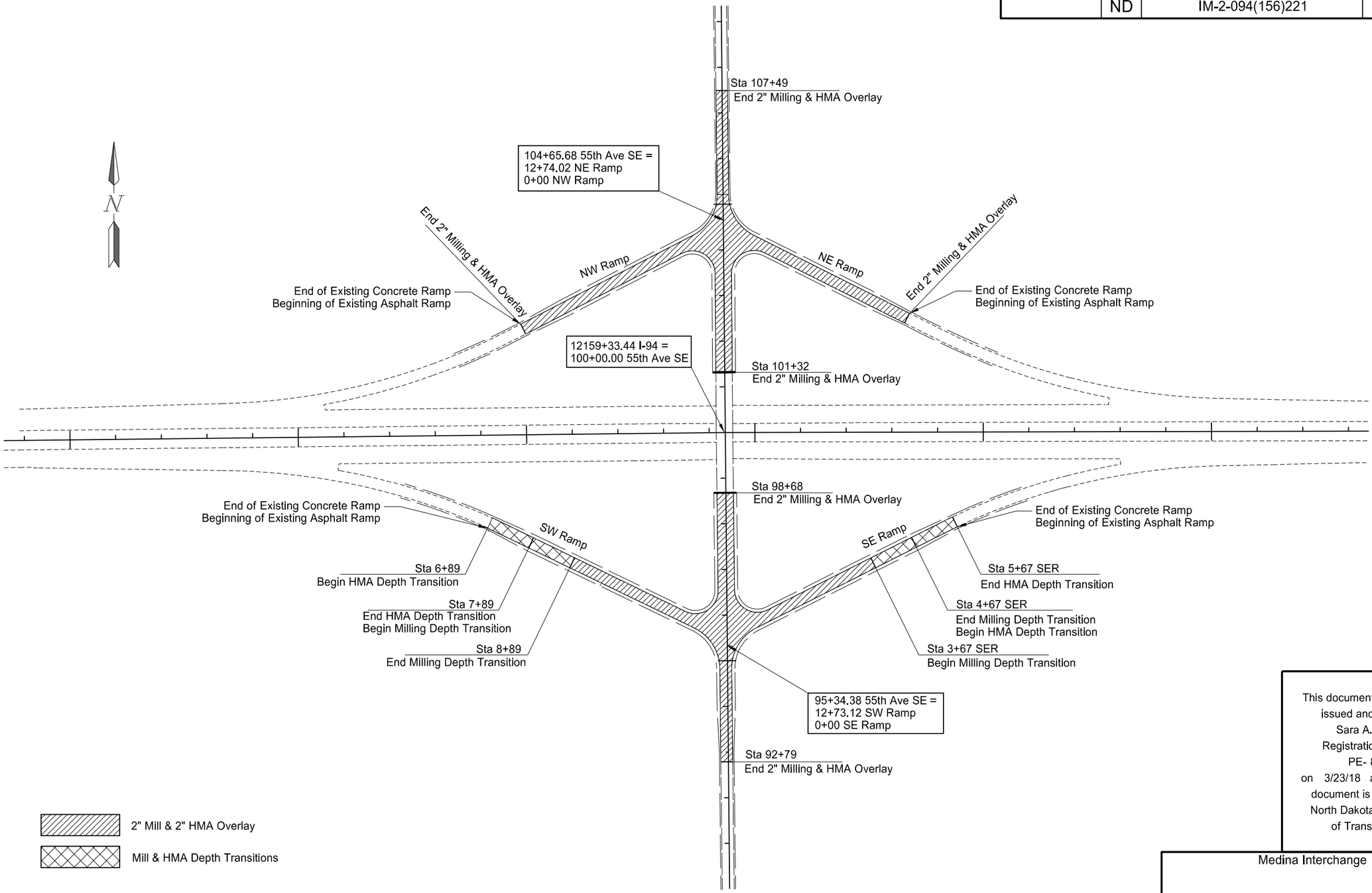

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Medina Interchange

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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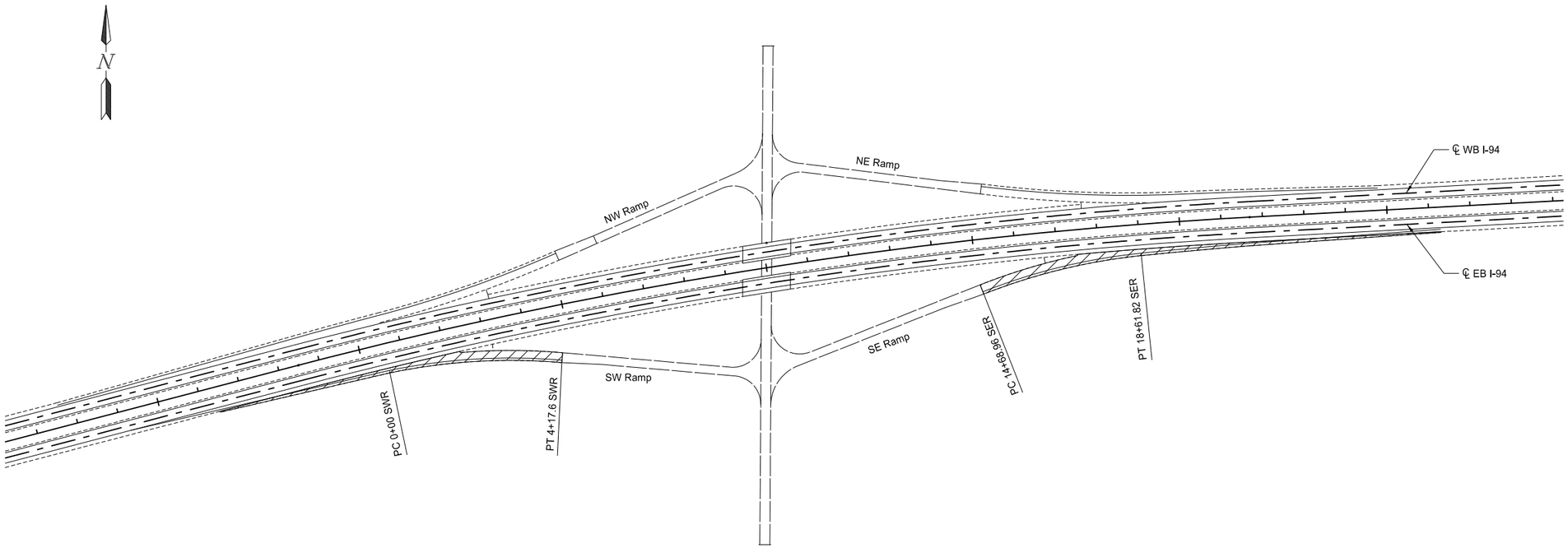

Crack & Seat and HMA Overlay

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Halfway Lake Interchange Ramps Layout

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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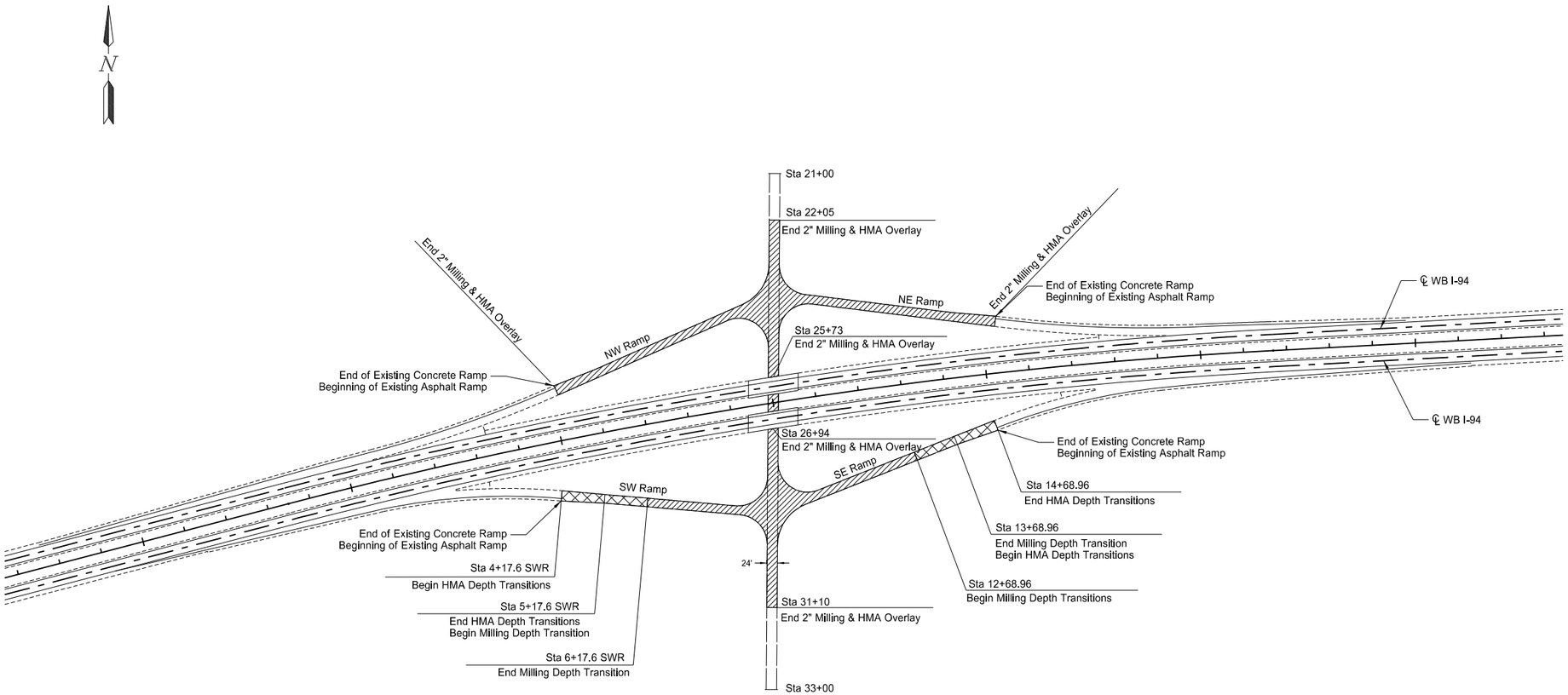

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Halfway Lake Interchange

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

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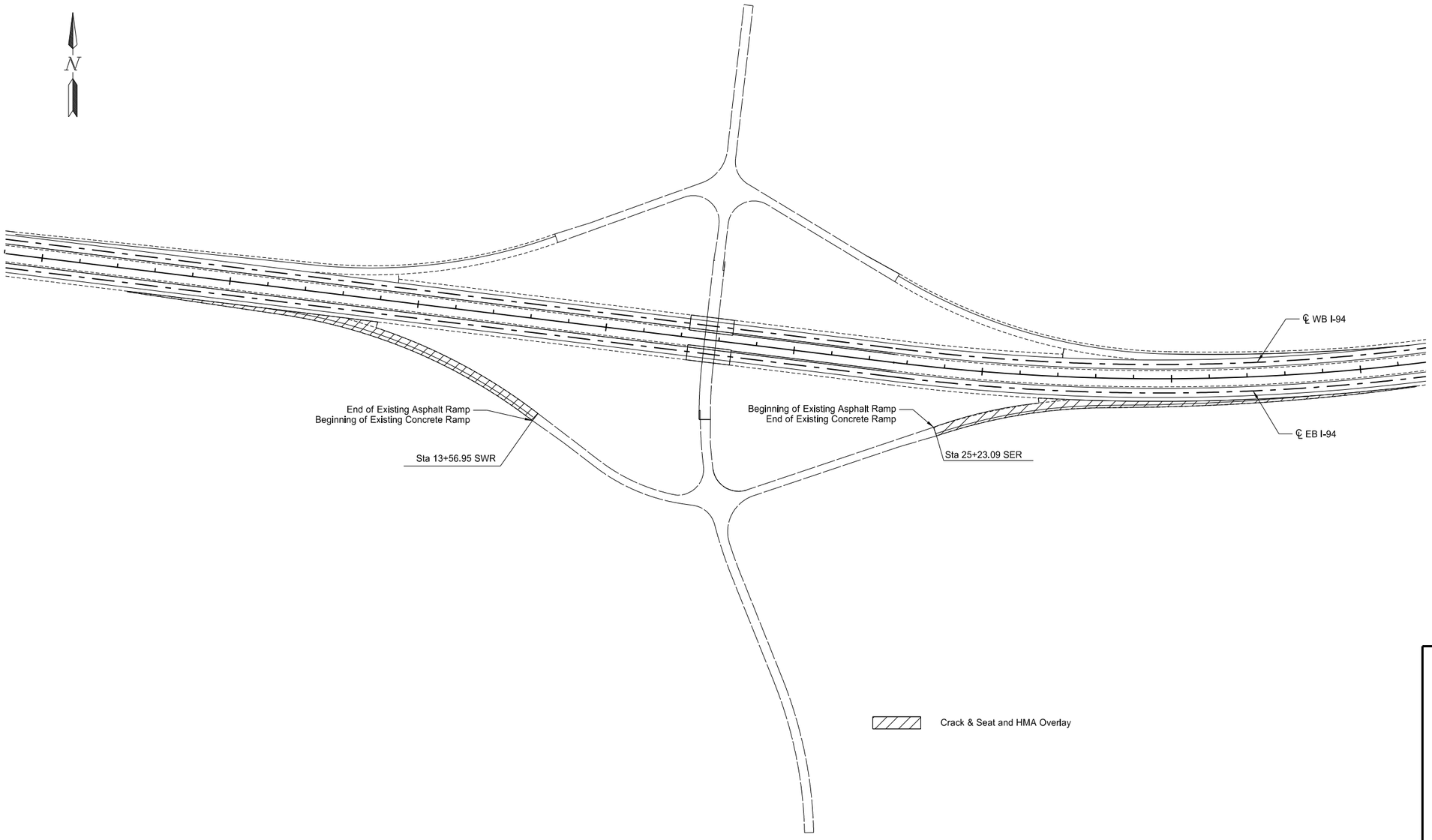

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Cleveland Interchange Ramps Layout

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

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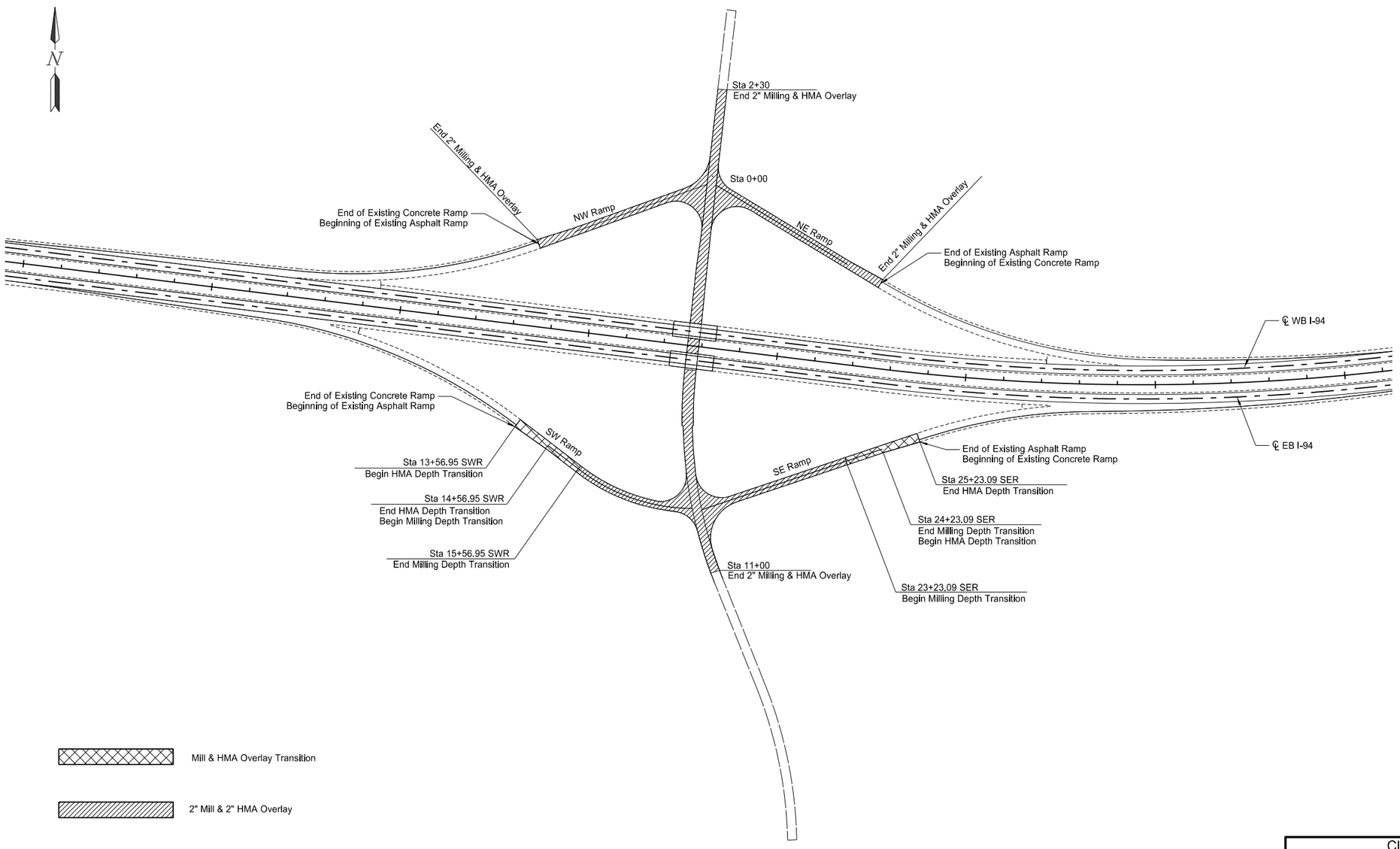

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Cleveland Interchange

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
D3-36	36"x6"	STREET NAME SIGN (Sign and installation only)		6	
E5-1-48	**48"x48"**	**EXIT ARROW**	**2**	**35**	**70**
G20-1-60	**60"x24"**	**ROAD WORK NEXT __ MILES**	**6**	**34**	**204**
G20-1b-60	60"x24"	WORK IN PROGRESS/ NO WORK IN PROGRESS (Sign and installation only)		26	
G20-2-48	**48"x24"**	**END ROAD WORK**	**10**	**19**	**190**
G20-4-36	**36"x18"**	**PILOT CAR FOLLOW ME (Mounted to back of pilot car)**	**2**	**18**	**36**
G20-10-108	**108"x48"**	**CONTRACTOR SIGN**	**2**	**64**	**128**
G20-50a-72	72"x36"	ROAD WORK NEXT __ MILES RT & LT ARROWS		37	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW		30	
G20-55-96	**96"x48"**	**SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT**	**8**	**59**	**472**
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)		10	
M1-4-24	24"x24"	U.S. ROUTE MARKER (Post and installation only)		10	
M1-5-24	24"x24"	STATE ROUTE MARKER (Post and installation only)		10	
M3-1-24	24"x12"	NORTH (Mounted on route marker post)		7	
M3-2-24	24"x12"	EAST (Mounted on route marker post)		7	
M3-3-24	24"x12"	SOUTH (Mounted on route marker post)		7	
M3-4-24	24"x12"	WEST (Mounted on route marker post)		7	
M4-8-24	24"x12"	DETOUR (Mounted on route marker post)		7	
M4-9-30	30"x24"	DETOUR ARROW RIGHT or LEFT/AHD AND RT or LT		15	
M4-10-48	48"x18"	DETOUR ARROW RIGHT or LEFT		23	
M5-1-21	21"x15"	ARROW AHD AND RT or LT(Mounted on route marker post)		7	
M5-2-21	21"x15"	ARROW AHD UP & RT or LT (Mounted on route marker post)		7	
M6-1-21	21"x15"	ARROW RT or LT (Mounted on route marker post)		7	
M6-2-21	21"x15"	ARROW UP & RT or LT (Mounted on route marker post)		7	
M6-3-21	21"x15"	ARROW AHD (Mounted on route marker post)		7	
R1-1-48	**48"x48"**	**STOP**	**4**	**32**	**128**
R1-1a-18	**18"x18"**	**STOP and SLOW PADDLE Back to Back**	**6**	**5**	**30**
R1-2-60	**60"x60"**	**YIELD**	**7**	**29**	**203**
R2-1-48	**48"x60"**	**SPEED LIMIT __**	**25**	**39**	**975**
R2-1a-24	**24"x18"**	**MINIMUM FEE $80 (Mounted on Speed Limit post)**	**12**	**10**	**120**
R3-7-48	48"x48"	LEFT or RIGHT LANE MUST TURN LEFT or RIGHT		35	
R4-1-48	**48"x60"**	**DO NOT PASS**	**2**	**39**	**78**
R4-7-48	48"x60"	KEEP RIGHT SYMBOL		39	
R5-1-48	48"x48"	DO NOT ENTER		35	
R6-1-36	36"x12"	ONE WAY RIGHT or LEFT		13	
R7-1-12	12"x18"	NO PARKING		11	
R10-6-24	24"x36"	STOP HERE ON RED		16	
R11-2-48	48"x30"	ROAD CLOSED		28	
R11-2a-48	48"x30"	STREET CLOSED		28	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY		31	
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY		31	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC		31	
W1-3-48	48"x48"	RIGHT or LEFT SHARP REVERSE CURVE ARROW		35	
W1-4-48	48"x48"	RIGHT or LEFT REVERSE CURVE ARROW		35	
W1-4b-48	48"x48"	DOUBLE RIGHT or LEFT REVERSE CURVE ARROW		35	
W1-6-48	48"x24"	LARGE ARROW		26	
W3-1-48	48"x48"	STOP AHEAD SYMBOL		35	
W3-3-48	48"x48"	SIGNAL AHEAD SYMBOL		35	
W3-4-48	**48"x48"**	**BE PREPARED TO STOP**	**2**	**35**	**70**
W3-5-48	**48"x48"**	**SPEED REDUCTION AHEAD**	**8**	**35**	**280**
W4-2-48	**48"x48"**	**RIGHT or LEFT LANE TRANSITION SYMBOL**	**8**	**35**	**280**
W5-1-48	**48"x48"**	**ROAD NARROWS**	**8**	**35**	**280**
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE		35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW		35	
W6-3-48	48"x48"	TWO WAY TRAFFIC SYMBOL		35	
W8-1-48	**48"x48"**	**BUMP**	**18**	**35**	**630**
W8-3-48	48"x48"	PAVEMENT ENDS		35	
W8-7-48	48"x48"	LOOSE GRAVEL		35	
W8-9a-48	**48"x48"**	**SHOULDER DROP-OFF**	**1**	**35**	**35**
W8-11-48	**48"x48"**	**UNEVEN LANES**	**3**	**35**	**105**
W8-12-48	48"x48"	NO CENTER STRIPE		35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY		35	
W8-54-48	**48"x48"**	**TRUCKS ENTERING AHEAD or __ FT.**	**2**	**35**	**70**
W8-55-48	**48"x48"**	**TRUCKS CROSSING AHEAD or __ FT.**	**2**	**35**	**70**
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY		35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL		35	
W12-2-48	48"x48"	LOW CLEARANCE SYMBOL		35	
W13-1-24	24"x24"	__ MPH ADVISORY SPEED PLATE (Mounted on warning sign post)		11	
W13-4-48	48"x60"	RAMP ARROW		39	
W14-3-48	48"x36"	NO PASSING ZONE		23	
W20-1-48	**48"x48"**	**ROAD WORK AHEAD or _FT or _ MILE**	**10**	**35**	**350**
W20-2-48	48"x48"	DETOUR AHEAD or __ FT		35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or __ FT.		35	
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or __ FT.		35	
W20-5-48	**48"x48"**	**RIGHT or LEFT LANE CLOSED AHEAD or __ FT.**	**8**	**35**	**280**
W20-7a-48	**48"x48"**	**FLAGGING SYMBOL**	**5**	**35**	**175**
W20-7k-24	24"x18"	__ FEET (Mounted on warning sign post)		10	
W20-8-48	48"x48"	STREET CLOSED		35	
W20-51-48	48"x48"	EQUIPMENT WORKING		35	
W20-52-54	**54"x12"**	**NEXT __ MILES (Mounted on warning sign post)**	**5**	**12**	**60**
W21-1a-48	48"x48"	WORKERS SYMBOL		35	
W21-2-48	**48"x48"**	**FRESH OIL**	**1**	**35**	**35**

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT		35	
W21-5-48	48"x48"	SHOULDER WORK		35	
W21-5a-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED		35	
W21-5b-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT.		35	
W21-6a-48	48"x48"	SURVEY CREW AHEAD		35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT.		35	
W21-51-48	48"x48"	MATERIAL ON ROADWAY		35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK		35	
	24"x24"	TAKE TURNS (6" D letters) (Mounted on stop sign post)		11	

SPECIAL SIGNS

	48"x48"	**Consign 1**	**2**	**35**	**70**

SPEC & CODE

704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS**	**5424**

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	**FLAGGING**	**MHR**	**1250**
704-1039	ATTENUATION DEVICE-TYPE B-45	EACH	
704-1041	ATTENUATION DEVICE-TYPE B-55	EACH	
704-1043	ATTENUATION DEVICE-TYPE B-65	EACH	
704-1044	ATTENUATION DEVICE-TYPE B-70	EACH	
704-1045	ATTENUATION DEVICE-TYPE B-75	EACH	
704-1048	**PORTABLE RUMBLE STRIPS**	**EACH**	**4**
704-1050	TYPE I BARRICADES	EACH	
704-1051	TYPE II BARRICADES	EACH	
704-1052	**TYPE III BARRICADES**	**EACH**	**30**
704-1060	**DELINEATOR DRUMS**	**EACH**	**284**
704-1065	TRAFFIC CONES	EACH	
704-1067	**TUBULAR MARKERS**	**EACH**	**684**
704-1070	DELINEATOR	EACH	
704-1072	FLEXIBLE DELINEATORS	EACH	
704-1081	VERTICAL PANELS - BACK TO BACK	EACH	
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH	
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH	
704-1087	**SEQUENCING ARROW PANEL - TYPE C**	**EACH**	**2**
704-1088	SEQUENCING ARROW PANEL - TYPE C - CROSSOVER	EACH	
704-1095	TYPE B FLASHERS	EACH	
704-1185	**PILOT CAR**	**HR**	**250**
704-1500	OBLITERATION OF PVMT MK	SF	
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF	
704-3510	PRECAST CONCRETE MED BARRIER - STATE FURNISHED	EACH	
762-0200	RAISED PAVEMENT MARKERS	EACH	
762-0420	SHORT TERM 4IN LINE - TYPE R	LF	
762-0430	**SHORT TERM 4IN LINE - TYPE NR**	**LF**	**64448**
772-2110	FLASHING BEACON - POST MOUNTED	EACH	

NOTE:
If additional signs are required, units will be calculated using the formula from Section III-19.06 of the Design Manual.
http://www.dot.nd.gov/

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Traffic Control Devices List

Crack & Seat and SMA Overlay

Crystal Springs to Cleveland - EB

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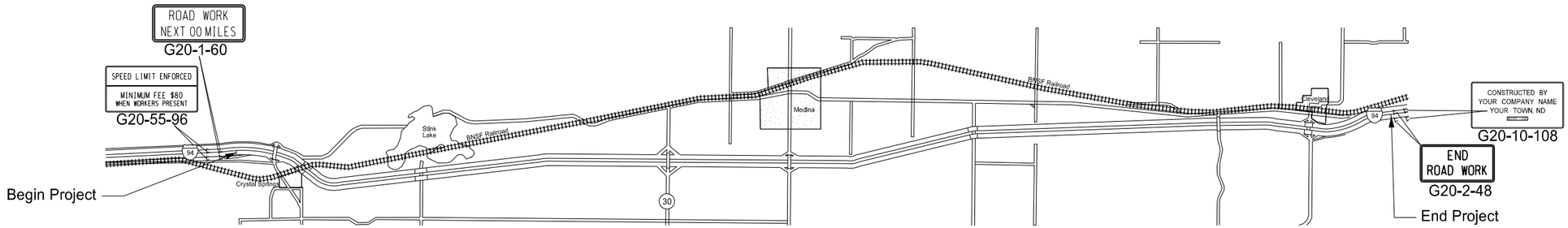
	ND	IM-2-094(156)221	100	2

N



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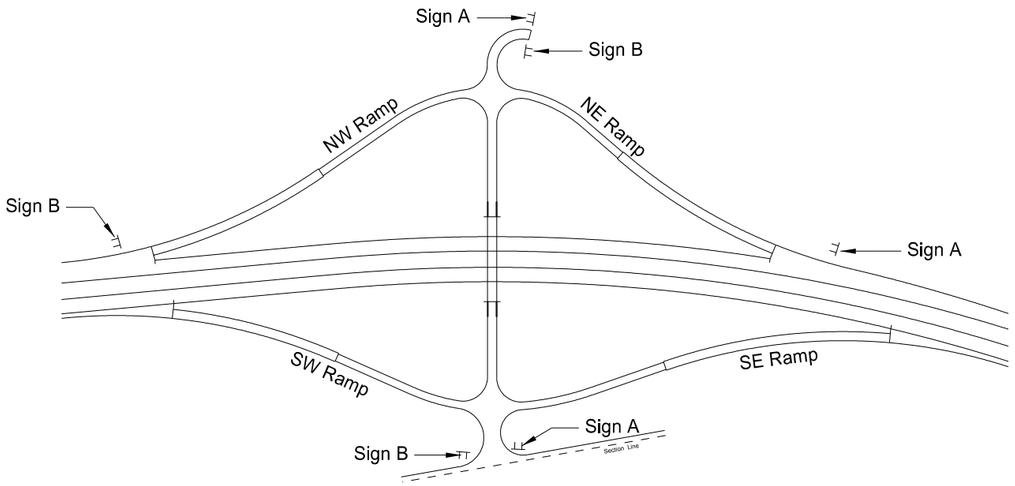
Construction Sign Layout

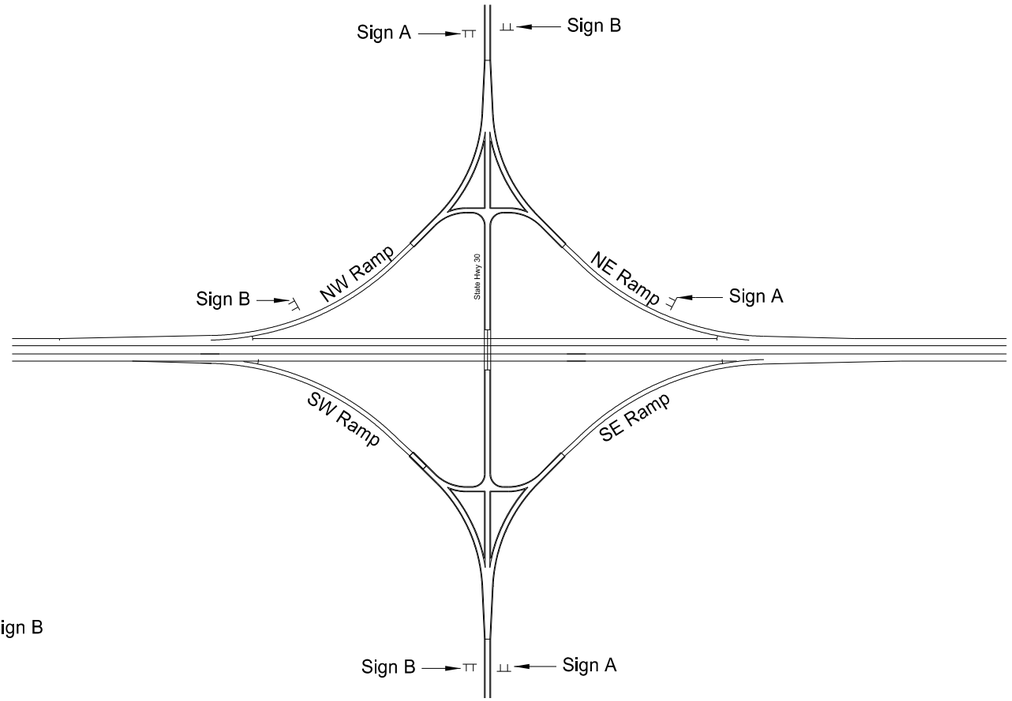
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

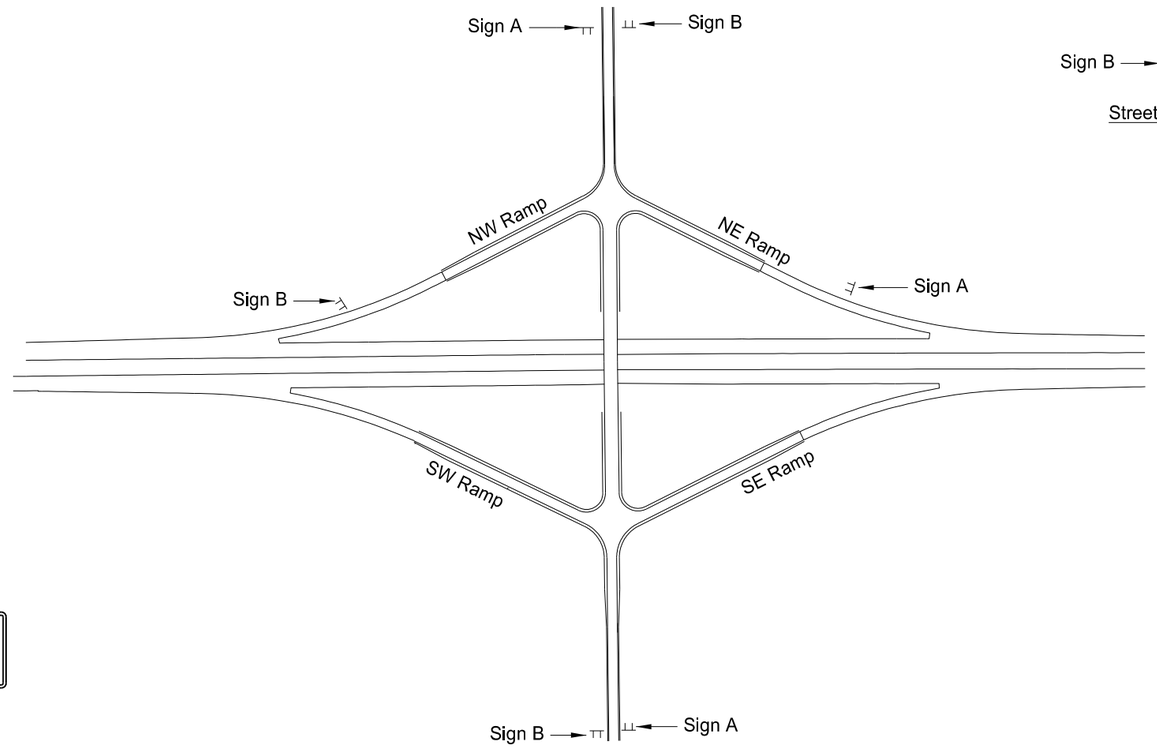
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	100	3



Crystal Springs Interchange

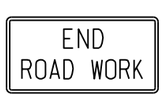


Streeter Interchange



Medina Interchange

Sign A



Sign B

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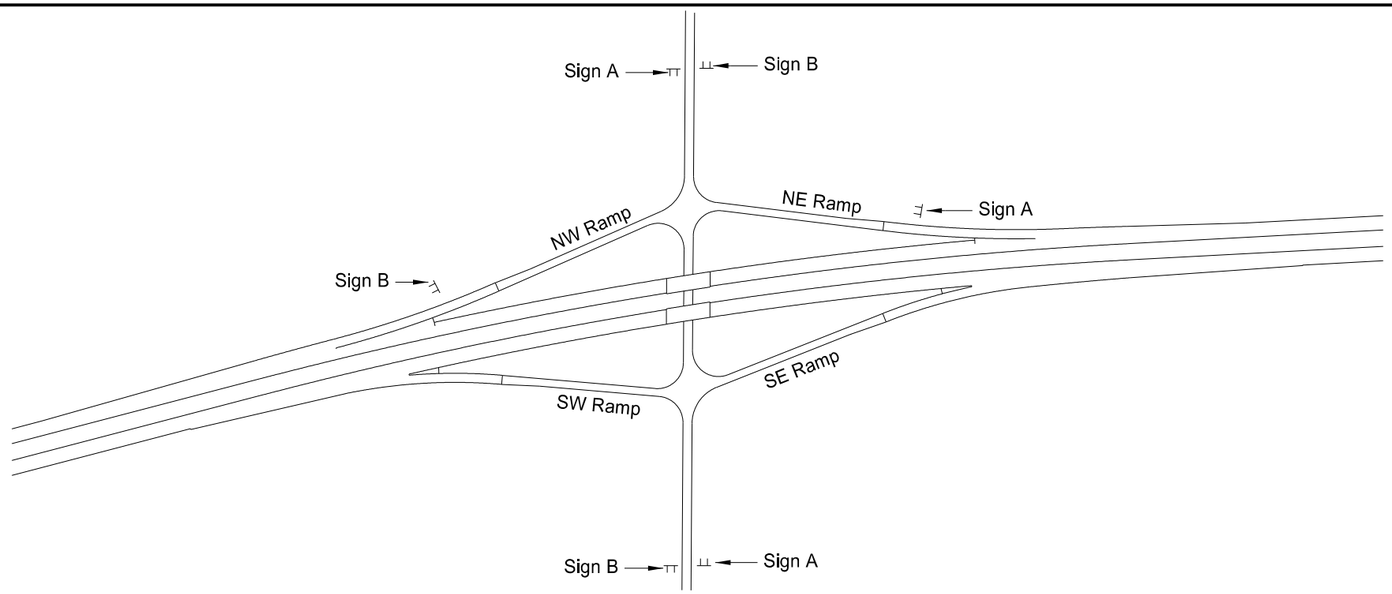
Construction Sign Layout

Interchanges

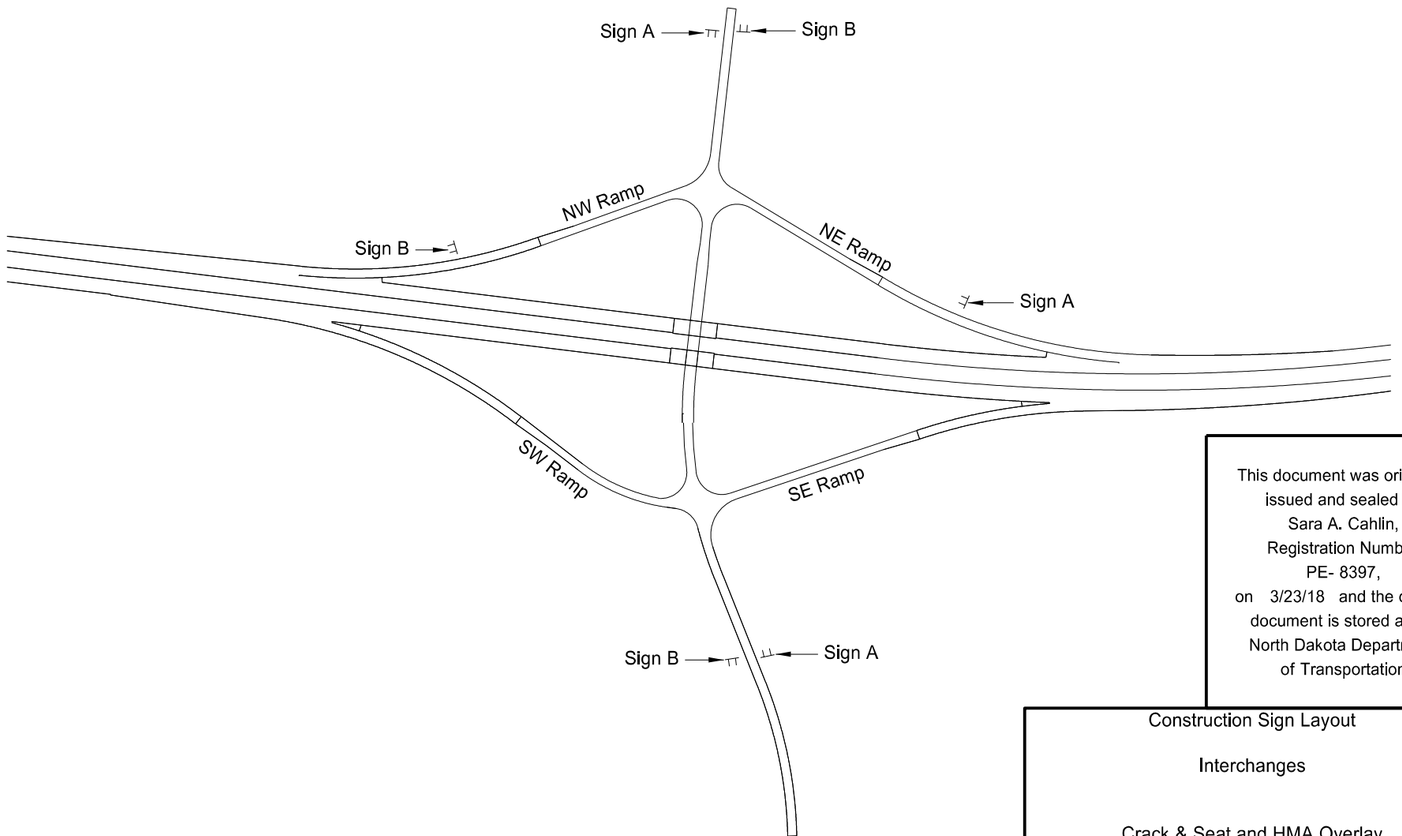
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	100	4

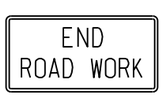


Halfway Lake Interchange



Cleveland Interchange

Sign A



Sign B

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Construction Sign Layout

Interchanges

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

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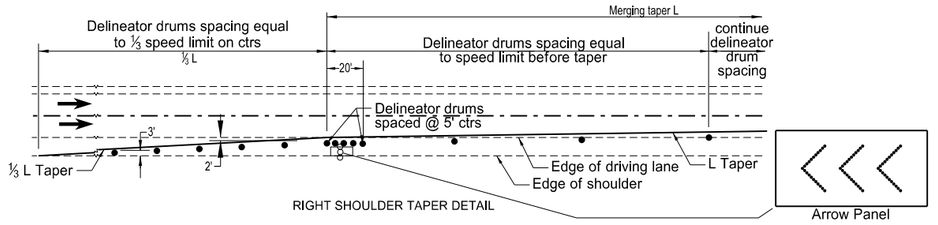
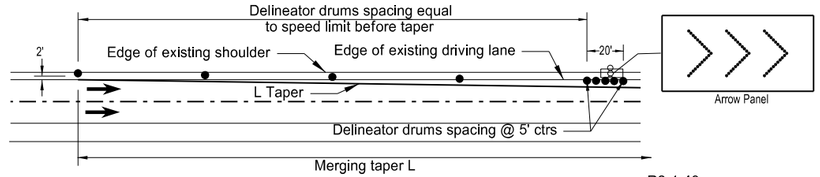
SIGN LAYOUT FOR ONE LANE CLOSURE
INTERSTATE SYSTEM

Notes:
1. Install advance signs for flagging when flaggers are flagging.
2. Move the portable rumble strips, rumble strips ahead sign, advanced flagger sign, and the speed limit signs as the work area moves through the construction zone. When the work area is not visible from the flagger, move the flagger station so the work area is visible. Cover or remove the rumble strips ahead sign, 40 mph speed limit and Minimum Fee $80 signs and the 65 mph speed limit sign upon completion of the work day or when workers are not present. Remove the portable rumble strips upon completion of the work day.
3. RAMPS: When the work area encompasses an entrance ramp, install a 40 mph speed limit sign on the ramp and cover any existing yield sign. Install new yield sign as necessary. Remove the ramp speed limit sign when the main line 40 mph speed zone is moved past the ramp.
4. Variables:
   S=Numerical value of speed limit or 85th percentile
   W=The width of taper.
   L=Minimum length of taper, or SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater, or
   WxSxS/60 for urban, residential, and other streets with speeds of 40 mph or less.
5. Space delineator drums for tapering traffic at the dimension "S". Space tubular markers used for tangents at 2 times dimension "S".
6. Place sequencing arrow panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface.
   Use Type C on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater).
7. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
8. Cover existing speed limit signs within a reduced speed zone.
9. Upon approval, the Engineer will measure obliterated or covered pavement marking as Obliteration of Pavement Marking.
10. Install flags when warning signs are used in urban areas and the signs are not portable. Mount 24 inch square flags perpendicular to the edges of the diamond sign, and at such a distance above the edge that the flag does not touch the sign when limp. Rural areas will not require flags.
11. Determine the reduced speed limit dependent on the in place speed limit before construction. Do not exceed a speed limit reduction of 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. When speed limits are to be reduced more than 30 mph, install a second speed limit sign so no single speed reduction exceeds 30 mph. Place the second speed limit sign at ½B.
12. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Specifications.
13. For a stationary operation, maximum distance is 1000'. For a moving operation, maximum distance is 3000'.

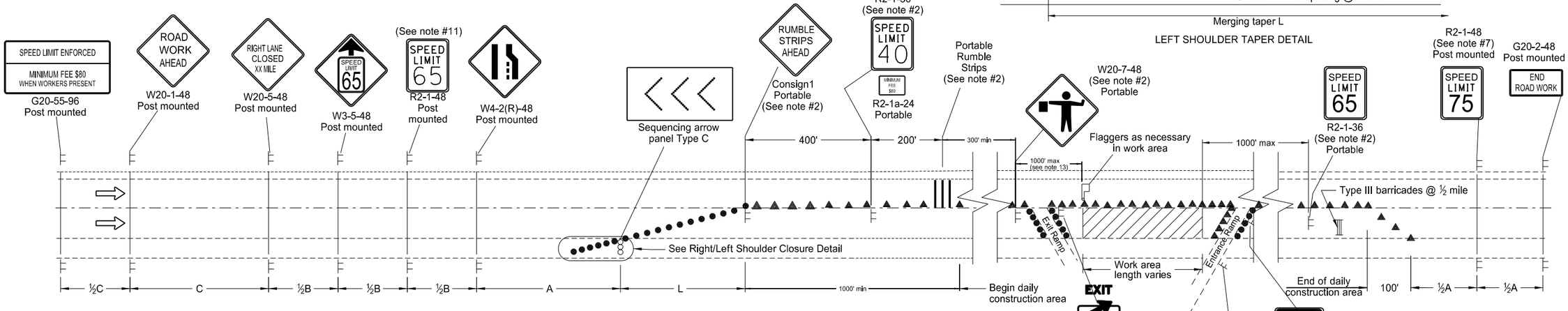
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min (ft)		
	A	B	C
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance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

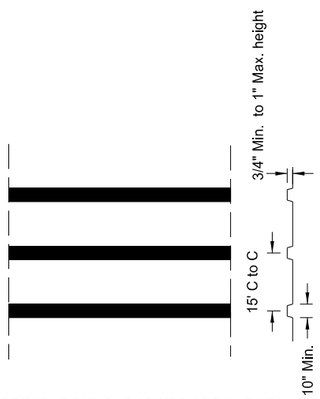
KEY
- Type I barricade
- Type II barricade
- Type III barricade
- Sign
- Delineator drum
- Work area
- Flagger
- Sequencing arrow panel
- Tubular markers



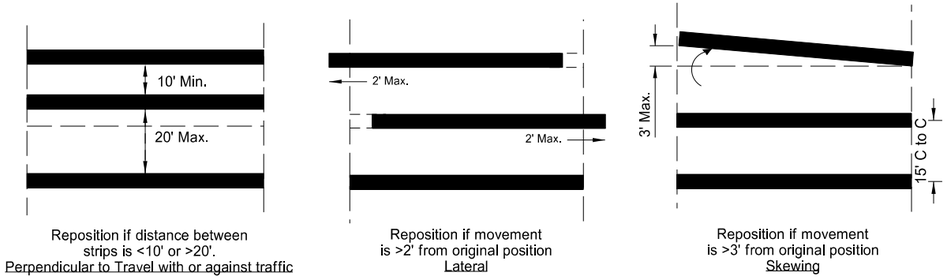


LEFT SHOULDER TAPER DETAIL





PORTABLE RUMBLE STRIPS ARRAY DETAIL



PORTABLE RUMBLE STRIPS ARRAY - TYPES OF MOVEMENT AND MAXIMUM ALLOWANCES

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PORTABLE RUMBLE STRIPS

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

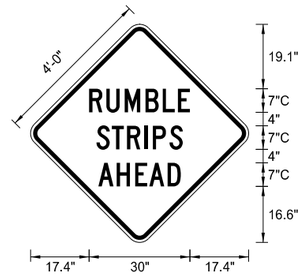
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	100	6

SIGN NUMBER	Consign 1
WIDTH x HEIGHT	4'-0" x 4'-0"
BORDER WIDTH	1.25" (inset 0.75")
CORNER RADIUS	3"
MOUNTING	Ground
BACKGROUND	TYPE: XI Reflective
	COLOR: Fluorescent Orange
LEGEND/BORDER	TYPE: Non-reflective
	COLOR: Black

SYMBOL	X	Y	WID	HT	ANGLE

STATION(S):
Various Locations

AREA: 16 Sq.Ft.



Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

PANEL STYLE: ND_Misc_Warning.sil

LETTER POSITION (X)																			LENGTH	SIZE	SERIES
R	U	M	B	L	E														30	7	C 2000
17.4	22.5	28	34.1	39.2	43.8																
S	T	R	I	P	S														25.6	7	C 2000
19.6	24.1	28.7	33.8	36.3	41.3																
A	H	E	A	D															24.5	7	C 2000
20.1	25.6	31.1	35.3	40.7																	

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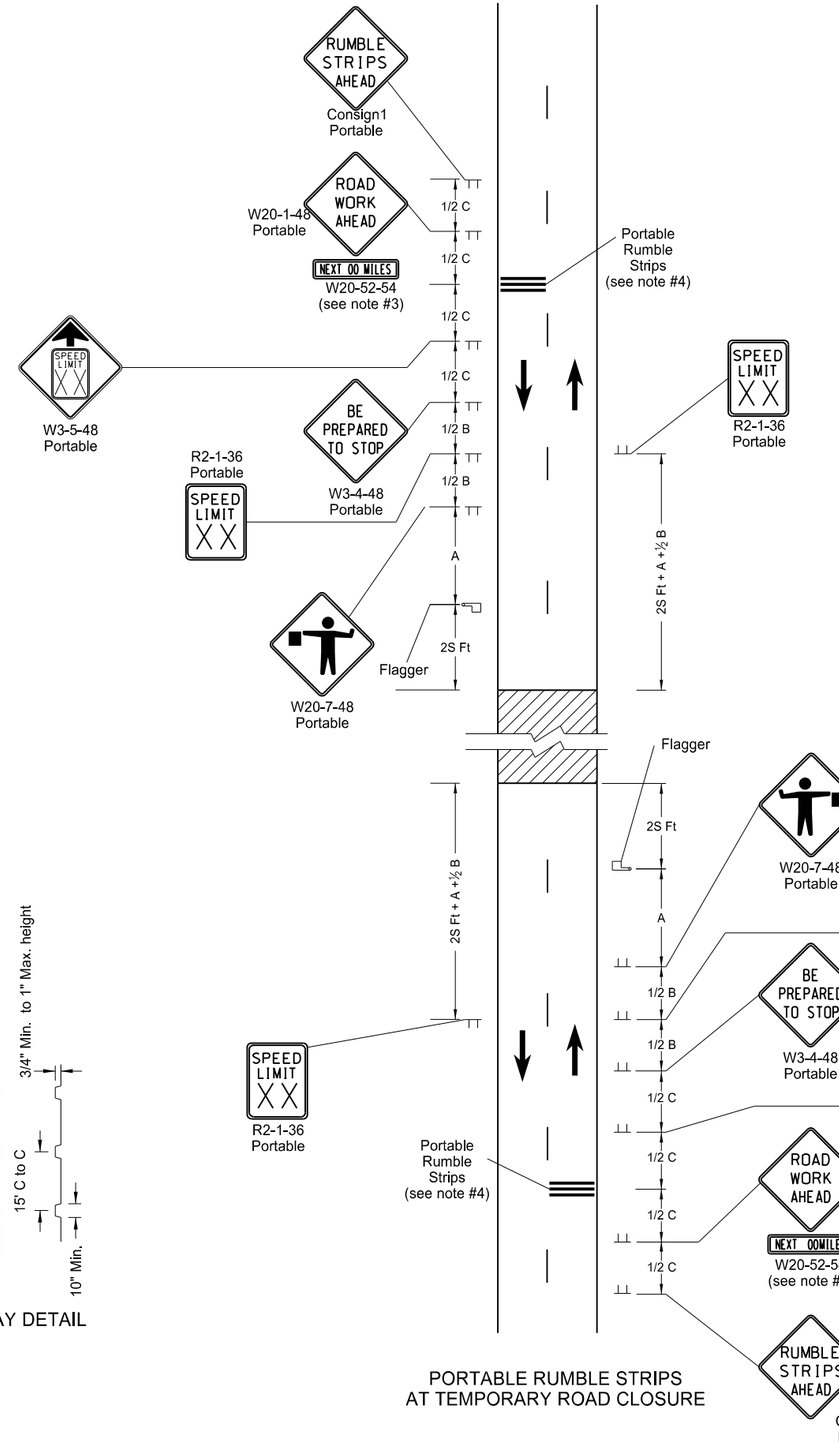
Construction Sign Detail

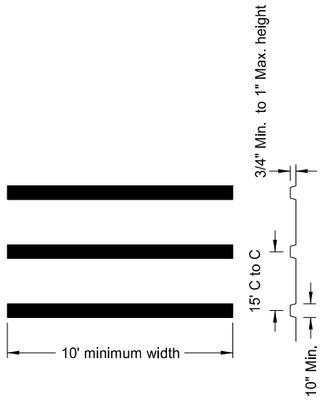
Crack & Seat and HMA Overlay

Crystal Springs to Cleveland Interchange - EB

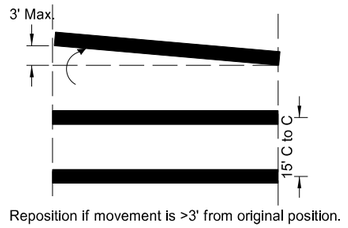
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	100	7



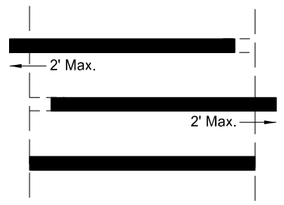
PORTABLE RUMBLE STRIPS AT TEMPORARY ROAD CLOSURE



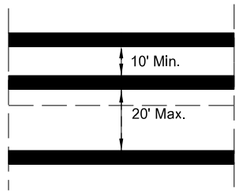
PORTABLE RUMBLE STRIPS ARRAY DETAIL



Reposition if movement is >3' from original position.
Skewing



Reposition if movement is >2' from original position.
Lateral



Reposition if distance between strips is <10' or >20'.
Perpendicular to Travel with or against traffic

PORTABLE RUMBLE STRIPS ARRAY TYPES OF MOVEMENT AND MAXIMUM ALLOWANCES

Drawing not to scale.

Notes:
1. Number of devices were calculated using 40 mph. Speed determined in the field based on location and conditions.
2. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
3. Use sign W20-52-54 when work area is 1 mile or longer.
4. Rumble strips are not used on a non paved surface or in a pre-construction speed zone of 25 mph or less.

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

KEY
- Work area
- Flagger
- Sign

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

Portable Rumble Strips

Crack & Seat and HMA Overlay

Crystal Springs to Cleveland

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	N.D.	IM-2-094(156)221	110	1

Station / RP	Sign No.	Assembly No.	Flat Sheet For Signs IV SF	Flat Sheet For Signs XI SF	Sign Support Length 1st LF	2nd LF	3rd LF	4th LF	Vert Clear-ance FT	Support Size	Max Post Len LF	Sleeve Length 1st LF	2nd LF	3rd LF	4th LF	Sleeve Size	Anchor EA	Anchor LF	Anchor Size	Reset Sign Panel EA	Reset Sign Support EA	Break-Away EA	Comments
12090+80 Rt					13.3				7.0	2.25 x 2.25 12 ga	14.0	4.4				2 x 2 12 ga	1	4	3 x 3 7 ga	1		1	
Sub Total			0.0	0.0		**Total**	13.3										**Total**	4		1	0	1	
Grand Total			**0.0**	**0.0**		**Total**	**13.3**										**Total**	**4**	**0**	**1**	**0**	**1**	

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Sign Summary
Perforated Tube

CRYSTAL SPRINGS TO CLEVELAND INT - EB

I-94

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
N.D.	IM-2-094(156)221	110	2

Station / RP	Sign / Assembly No.	Flat Sheet For Signs IV SF	Flat Sheet For Signs XI SF	Panel For Signs IV SF	Panel For Signs XI SF	Overlay Panel IV SF	Overlay Panel XI SF	Vert Clear-ance FT	Galv Steel Sheet Standard Pipe 1st	Galv Steel Sheet Standard Pipe 2nd	Size	Galv Steel Post W-Shape Posts 1st LF	Galv Steel Post W-Shape Posts 2nd LF	Galv Steel Post W-Shape Posts 3rd LF	Max Post Len LF	Post Space FT	Revise Fuse Joint EA	Std Pipe Fdn Dia FT	Std Pipe Fdn Dep FT	Std Pipe Fdn Vol CY	W-Shape Pile LF	Remove Sign Fdns Conc Fdn	Remove Sign Fdns W-Shape Pile	Reset Sign Panel EA	Reset Sign Support EA	Stub Post EA	Multi Dir Base EA	Comments
12086+39 Rt								7.0	13.5		3.5				17.4			1.3	5.5	0.3				1				
12182+71 Rt								7.0	13.5		4.0				16.2									1				
Sub Total								**Total**	27.0			**Total**	0.0							0.3	0	0	0	2	0	0	0	
Grand Total								**Total**	**27.0**			**Total**		**0.0**						**0.3**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	

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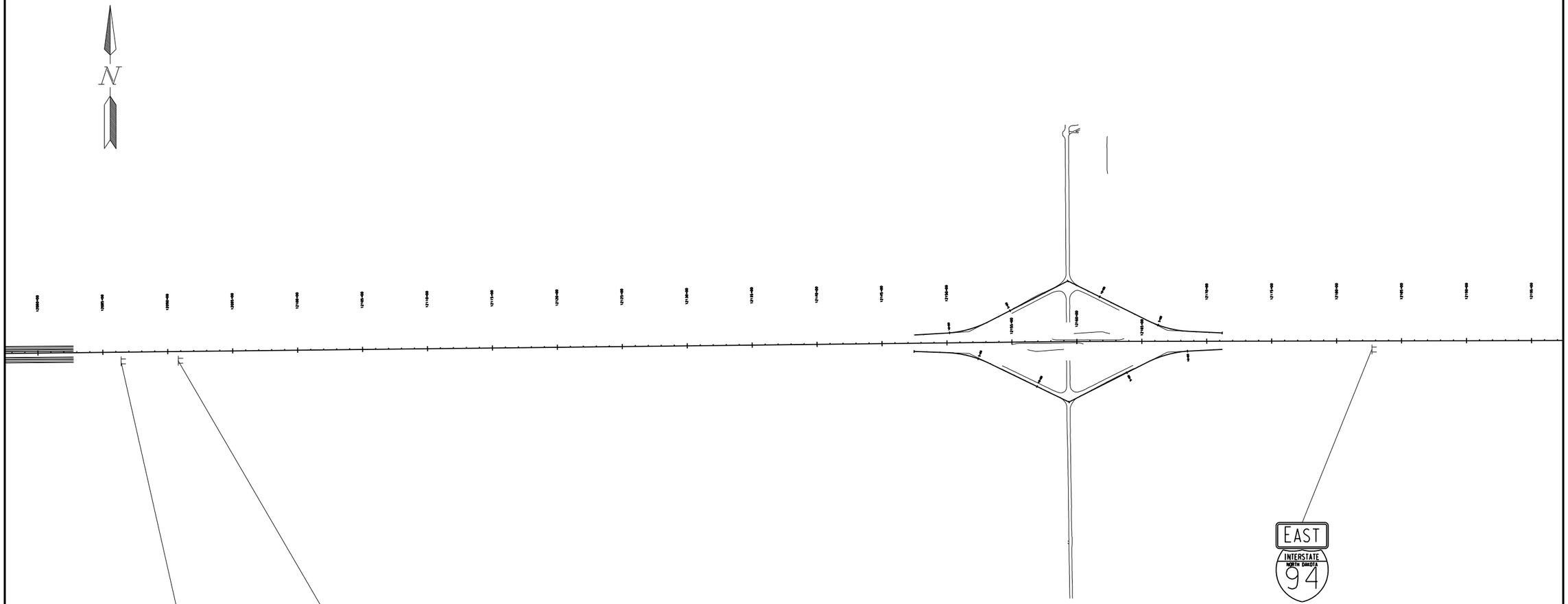
Sign Summary
Round Steel Pipe & W-Shape

CRYSTAL SPRINGS TO CLEVELAND INT - EB

I-94

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	110	3



Sta 12086+39 Rt
Reset sign on
new support
and foundation

Sta 12090+80 Rt
Reset sign on
new support

Sta 12182+71 Rt
Reset sign on
new support on
existing foundation

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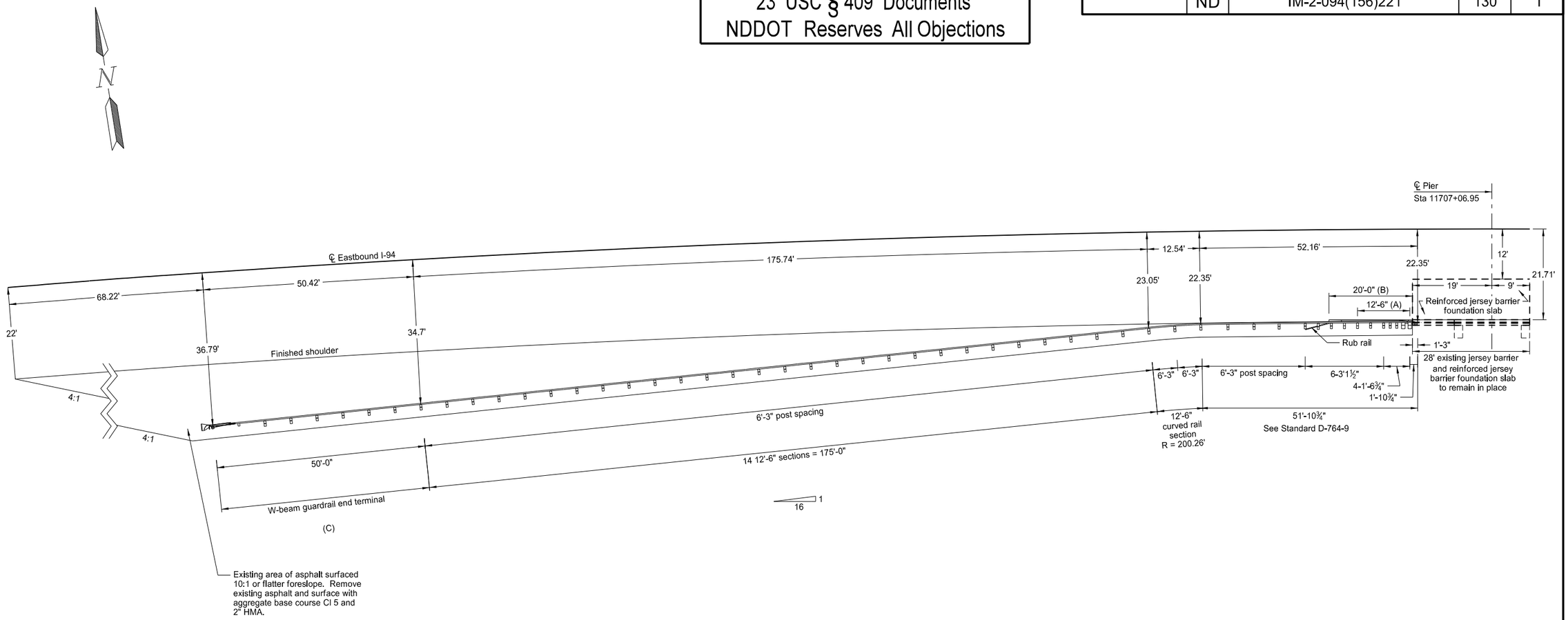
Sign Layout

CRYSTAL SPRINGS TO CLEVELAND INT - EB
Sta 12080+00 to Sta 12195+00

I-94

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	130	1

23 USC § 409 Documents
NDDOT Reserves All Objections



SPEC	CODE	BID ITEM	QTY	UNIT
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS		
		Sta 11704+48.68 to 11706+89.12 Rt	239.4	LF
764	1050	RESET W-BEAM GUARDRAIL		
		Sta 11704+48.68 to 11706+89.12 Rt	239.4	LF
764	1059	RESET W-BEAM GUARDRAIL END TERMINAL		
		Sta 11703+98.26 to 11704+48.68 Rt	1	EA
764	2081	REMOVE END TREATMENT & TRANSITION		
		Sta 11703+98.26 to 11704+48.68 Rt	1	EA

(A) Double rail section.

(B) Existing curb & gutter, with height transitions as shown in D-764-9, to remain in place.

(C) Reset existing Slotted Rail Terminal at this location. See Standard D-764-7.

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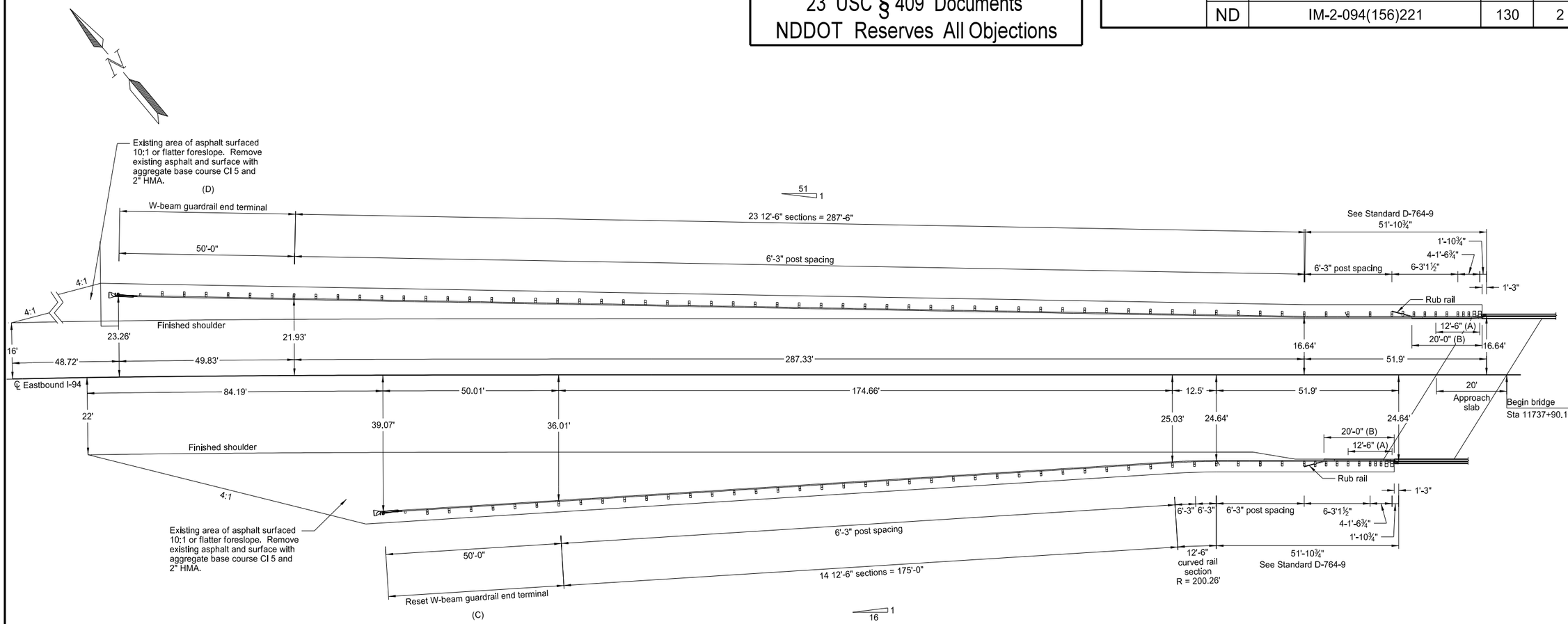
Jersey Barrier and W-Beam Guardrail Layout

Outside Pier Protection

Crystal Springs Interchange
RP 221.733
Eastbound I-94

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	130	2



SPEC	CODE	BID ITEM	QTY	UNIT
764	0145	W-BEAM GUARDRAIL END TERMINAL		
		Sta 11733+95.29 to 11734+45.12 Rt Mdn	1	EA
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS		
		Sta 11735+20.29 to 11737+59.35 Rt	239.4	LF
		Sta 11734+45.12 to 11737+84.35 Rt Mdn	339.4	LF
		Total	578.8	LF
764	1050	RESET W-BEAM GUARDRAIL		
		Sta 11735+20.29 to 11737+59.35 Rt	239.4	LF
		Sta 11734+45.12 to 11737+84.35 Rt Mdn	339.4	LF
		Total	578.8	LF
764	1059	RESET W-BEAM GUARDRAIL END TERMINAL		
		Sta 11734+70.28 to 11735+20.29 Rt	1	EA
764	2081	REMOVE END TREATMENT & TRANSITION		
		Sta 11734+70.28 to 11735+20.29 Rt	1	EA
		Sta 11733+95.29 to 11734+45.12 Rt Mdn	1	EA
		Total	2	EA

(A) Double rail section

(B) Existing curb & gutter, with height transitions as shown in D-764-9, to remain in place.

(C) Reset existing Slotted Rail Terminal at this location. See Standard D-764-7.

(D) Install a Sequential Kinking Terminal at this location. See Standard D-764-5.

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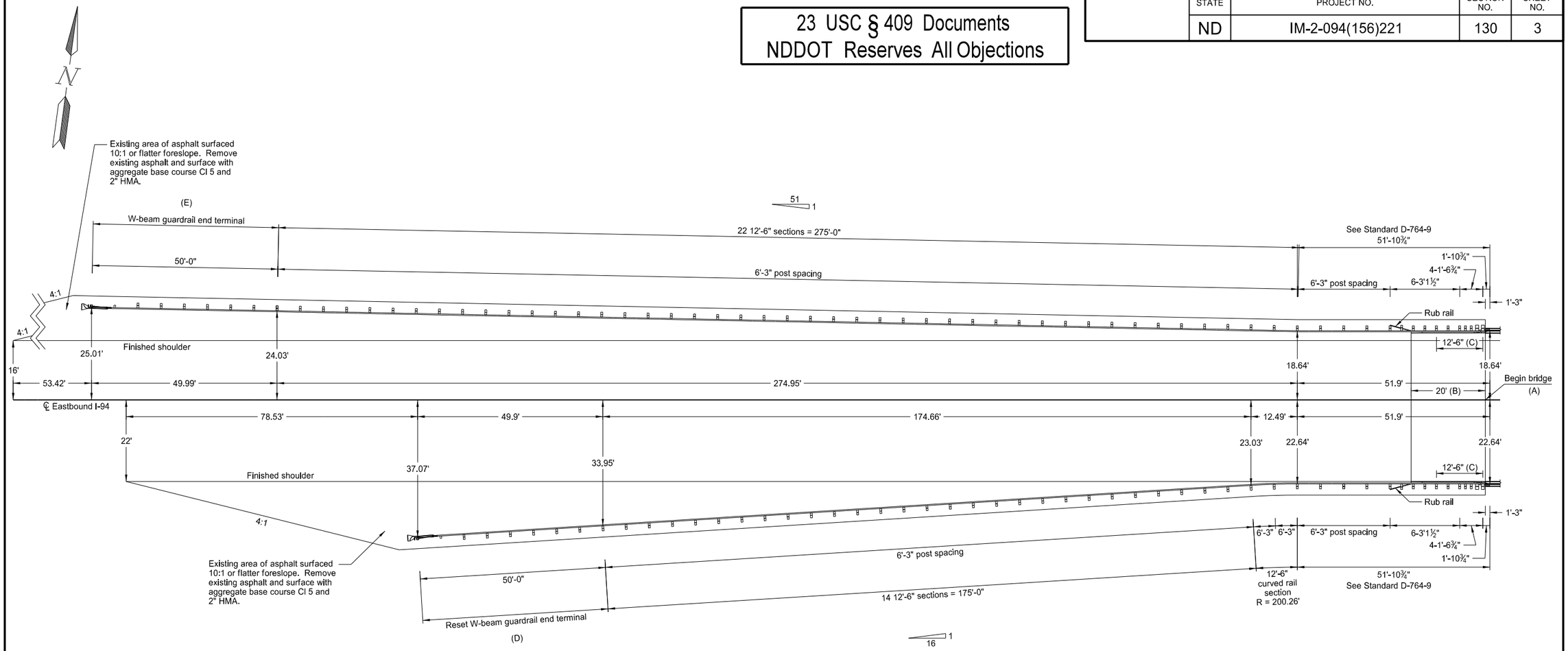
W-Beam Guardrail Layout

BN Railroad Separation
RP 222.290
Eastbound Roadway

I-94

23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	130	3



SPEC	CODE	BID ITEM	QTY	UNIT
764	0145	W-BEAM GUARDRAIL END TERMINAL		
		Sta 11838+96.16 to 11839+46.15 Rt Mdn	1	EA
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS		
		Sta 11840+33.95 to 11842+73.00 Rt	239.4	LF
		Sta 11839+46.15 to 11842+73.00 Rt Mdn	326.9	LF
		Total	566.3	LF
764	1050	RESET W-BEAM GUARDRAIL		
		Sta 11840+33.95 to 11842+73.00 Rt	239.4	LF
		Sta 11839+46.15 to 11842+73.00 Rt Mdn	326.9	LF
		Total	566.3	LF
764	1059	RESET W-BEAM GUARDRAIL END TERMINAL		
		Sta 11839+84.05 to 11840+33.95 Rt	1	EA
764	2081	REMOVE END TREATMENT & TRANSITION		
		Sta 11839+84.05 to 11840+33.95 Rt	1	EA
		Sta 11838+96.16 to 11839+46.15 Rt Mdn	1	EA
		Total	2	EA

(A) Sta 11842+71.75

(B) Existing approach slab with curb & gutter installed at the ends of the bridge jersey barrier, to remain in place. The curb & gutter has height transitions as shown on Standard D-764-9.

(C) Double rail section

(D) Reset existing Slotted Rail Terminal end terminal at this location. See Standard D-764-7.

(E) Install a Sequential Kinking Terminal at this location. See Standard D-764-5.

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W-Beam Guardrail Layout

Minor Road Separation
RP 224.292
Eastbound Roadway

I-94

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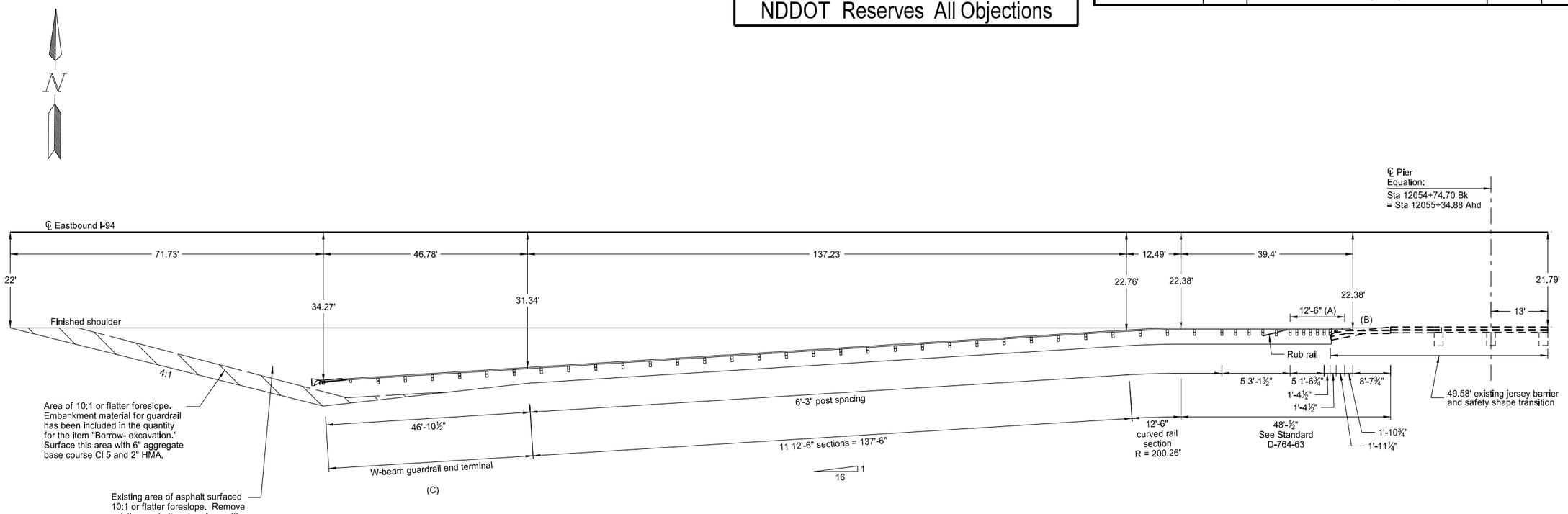
23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	130	4



(A) Double rail section

(B) Installation of the guardrail onto the existing safety shape transition requires drilling new bolt holes through the concrete. See Standard D-764-63.

(C) Install an MGS FLEAT end terminal at this location. See Standard D-764-38.

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Jersey Barrier and MGS W-Beam Guardrail Layout

Outside Pier Protection

Streeter Interchange
RP 228.321
Eastbound I-94

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	130	5

MGS W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

MGS W-BEAM GUARDRAIL AT OBSTRUCTIONS WITH EXISTING SAFETY SHAPE TRANSITIONS

LOCATION	(A) TERM-INAL CONNEC-TOR EACH	(A) 6" ID STD PIPE 12" LONG EACH	(A) 5/8" Ø x 2" LONG GUARD-RAIL BOLT EACH	(A) 7/8"Ø x 10" LONG HEX HEAD BOLT EACH	(A) 5/8" Ø x 18" LONG GUARD-RAIL BOLT EACH	(A) 6"x 8" x 14" WOOD OFF-SET BLOCK EACH	(A) 6"x 8" x 6' TIMBER POST EACH	(A) 5/8" Ø x 1 1/4" LONG GUARD-RAIL BOLT EACH	(A) 12'-6" DOUBLE RAIL SECTION EACH	(A) 12'-6" STRAIGHT RAIL SECTION EACH	(A) 12'-6" CURVED RAIL SECTION EACH	(A) 1/2" Ø x 4" LONG LAG SCREW EACH	(A) 6" x 8" x 7'-0" TIMBER POSTS EACH	(A) 6" x 8" x 23" WOOD OFFSET BLOCK EACH	(A) 5'-3" RUBRAIL SECTION EACH	(A) 15'-7 1/4" RUBRAIL SECTION EACH	(A) 5/8" Ø x 1 ½" LONG HEX HEAD BOLT EACH	(A) 5/8" Ø x 20" LONG GUARD-RAIL BOLT EACH	(A) REFL-ECTOR-IZED PLATES EACH	(A) 5/8" Ø x 20" LONG GUARD-RAIL BOLT EACH	(A) 7" x 7" x ½" RUBRAIL ANCHOR PLATE EACH	(A) 7 3/4" x 4 1/2" x x 3/8" RUBRAIL SPLICE PLATE EACH	(A) 12" x 12 1/2" x 5/8" PLATE EACH	(A) 6"x 9 3/4" x 14" WOOD OFF-SET BLOCK EACH	(A) 5/8" Ø x 20" LONG GUARD-RAIL BOLT EACH
Sta 12052+53.94 to 12054+43.06 Rt	1	1	1	7	36	29	33	128	1	13	1	1	4	7	1	1	4	7	11	1	1	1	1	1	1	1
TOTAL	1	1	1	7	36	29	33	128	1	13	1	4	4	7	1	1	4	7	11	1	1	1	1	1	1	1

SPEC	CODE	BID ITEM	QTY	UNIT
764	0131	W-BEAM GUARDRAIL		
		Sta 12052+53.94 to 12054+43.06 Rt	189.4	LF
764	0145	W-BEAM GUARDRAIL END TERMINAL		
		Sta 12052+07.16 to 12052+53.94 Rt	1	Ea
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS		
		Sta 12052+67.58 to 12054+44.20 Rt	176.9	LF
764	2081	REMOVE END TREATMENT & TRANSITION		
		Sta 12052+17.69 to 12052+67.58 Rt	1	Ea

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

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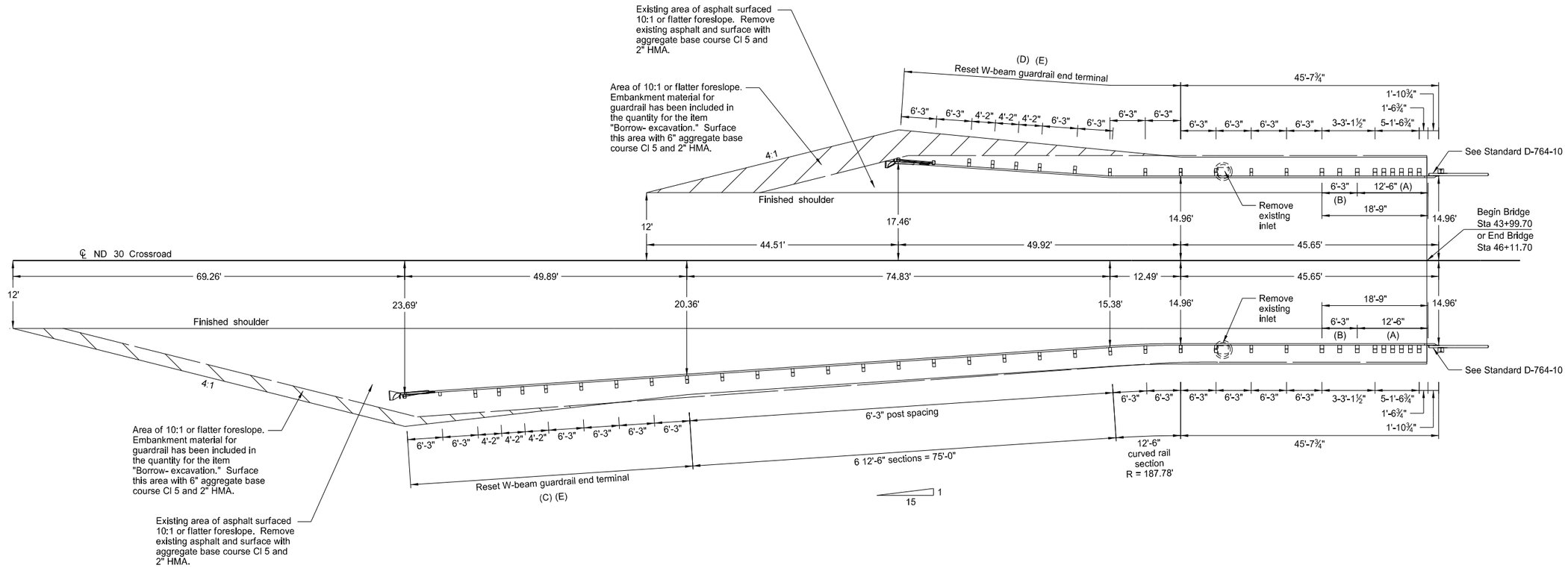
MGS W-Beam Guardrail Quantities

Outside Pier Protection

Streeter Interchange
RP 228.321
Eastbound I-94

23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	130	6



(A) Thrie beam rail section (double thickness)

(B) W-Thrie beam transition section (double thickness)

(C) Reset existing FLEAT end terminal at this location. See Standard D-764-6.

(D) Reset existing FLEAT end terminal with a 2'-6" flare at this location. See Standard D-764-6.

(E) Reset the W-beam guardrail end terminals with the post spacing shown above. Replace the first two posts of the end terminals with steel breakaway posts.

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

Streeter Interchange Crossroad
RP 228.321

I-94

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	130	7

W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

THRIE/W-BEAM GUARDRAIL AT BRIDGE ENDS

LOCATION	(A) 5/8" Ø x 18" LONG GUARD-RAIL BOLT	(A) 6" x 8" x 6'-0" TIMBER POST	(A) 6" x 8" x 14" TIMBER BLOCK	(A) 5/8" Ø x 1 1/4" LONG GUARD-RAIL BOLT	(A) 12'- 6" STRAIGHT W-BEAM RAIL SECTION	(A) 12'- 6" CURVED W-BEAM RAIL SECTION	(A) REFL-ECTOR-IZED PLATES	(A) 8"x 8" x 6' WOOD POST	(A) 8"x 8" x 22" WOOD OFF-SET BLOCK	(A) 8"x 8" x 18" WOOD OFF-SET BLOCK	(A) 8"x 8" x 14" WOOD OFF-SET BLOCK	(A) 6'-3" DOUBLE W-THRIE BEAM TRANS-ITION SECTION	(A) 12'-6" DOUBLE THRIE BEAM SECTION	(A) 2'-6" THRIE BEAM TERM-INAL CON-NECTOR	(A) 7/8" Ø x VAR-IABLE LONG. BOLT	(A) 3/4" Ø x 2-1/2" LONG POST BOLT
	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH
Sta 43+43.66 to 44+01.80 Rt	23	6	6	56	2	1	9	9	7	1	1	1	1	1	5	2
Sta 43+81.15 to 44+01.80 Lt	17			32			5	9	7	1	1	1	1	1	5	2
Sta 46+09.60 to 46+30.25 Rt	17			32			5	9	7	1	1	1	1	1	5	2
Sta 46+09.60 to 46+67.74 Lt	23	6	6	56	2	1	9	9	7	1	1	1	1	1	5	2
TOTAL	80	12	12	176	4	2	28	36	28	4	4	4	4	4	20	8

SPEC	CODE	BID ITEM	QTY	UNIT
202	230	REMOVAL OF INLETS (B)		
		Sta 43+63.70 Rt	1	Ea
		Sta 43+63.70 Lt	1	Ea
		Sta 46+47.70 Rt	1	Ea
		Sta 46+47.70 Lt	1	Ea
		Total	4	Ea
764	0131	W-BEAM GUARDRAIL		
		Sta 43+43.66 to 44+01.80 Rt	58.1	Ea
		Sta 43+81.15 to 44+01.80 Lt	20.7	Ea
		Sta 46+09.60 to 46+30.25 Rt	20.7	Ea
		Sta 46+09.60 to 46+67.74 Lt	58.1	Ea
		Total	157.6	Ea
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS		
		Sta 42+75.17 to 44+01.87 Rt	126.9	LF
		Sta 43+12.47 to 44+01.87 Lt	39.4	LF
		Sta 46+09.53 to 46+48.93 Rt	39.4	LF
		Sta 46+09.53 to 47+36.23 Lt	126.9	LF
		Total	332.6	LF

SPEC	CODE	BID ITEM	QTY	UNIT
764	1050	RESET W-BEAM GUARDRAIL		
		Sta 42+68.83 to 43+43.66 Rt	75	LF
		Sta 43+56.15 to 43+81.15 Lt	25	LF
		Sta 46+30.25 to 46+55.25 Rt	25	LF
		Sta 46+67.74 to 47+42.57 Lt	75	LF
		Total	200	LF
764	1059	RESET W-BEAM GUARDRAIL END TERMINAL		
		Sta 42+18.94 to 42+68.83 Rt	1	Ea
		Sta 43+06.23 to 43+56.15 Lt	1	Ea
		Sta 46+55.25 to 47+05.17 Rt	1	Ea
		Sta 47+42.57 to 47+92.46 Lt	1	Ea
		Total	4	Ea
764	2081	REMOVE END TREATMENT & TRANSITION		
		Sta 42+25.30 to 42+75.17 Rt	1	Ea
		Sta 43+12.47 to 43+62.47 Lt	1	Ea
		Sta 46+48.93 to 46+98.93 Rt	1	Ea
		Sta 47+36.23 to 47+86.10 Lt	1	Ea
		Total	4	Ea

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

(B) Each pair of inlets consists of a 4' long 30" Riser and a 5' long 30" Riser, resting on a 6" thick concrete base, with inlet castings and grates.

Each inlet pair of inlets is connected with a 15" CMP and is drained by a 15" CMP.

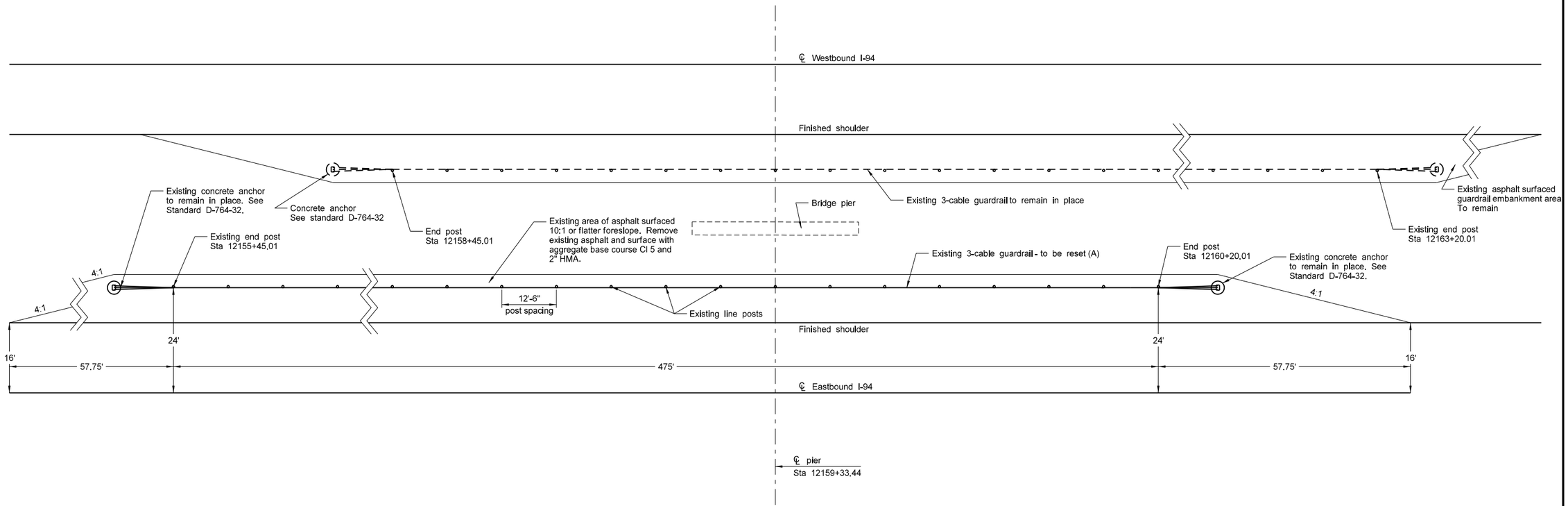
Thrie/W-Beam Guardrail Quantities

Streeter Interchange Crossroad
RP 228.321

I-94

23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	130	8



SPEC	CODE	BID ITEM	QTY	UNIT
764	1010	RESET 3-CABLE GUARDRAIL		
		Sta 12155+45.01 to 12160+20.01 Rt Mdn	475	LF
764	2020	REMOVE 3-CABLE GUARDRAIL & POSTS		
		Sta 12155+45.01 to 12160+20.01 Rt Mdn	475	LF

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3-Cable Guardrail Layout
Median Pier Protection

Medina Interchange
RP 230.288

I-94

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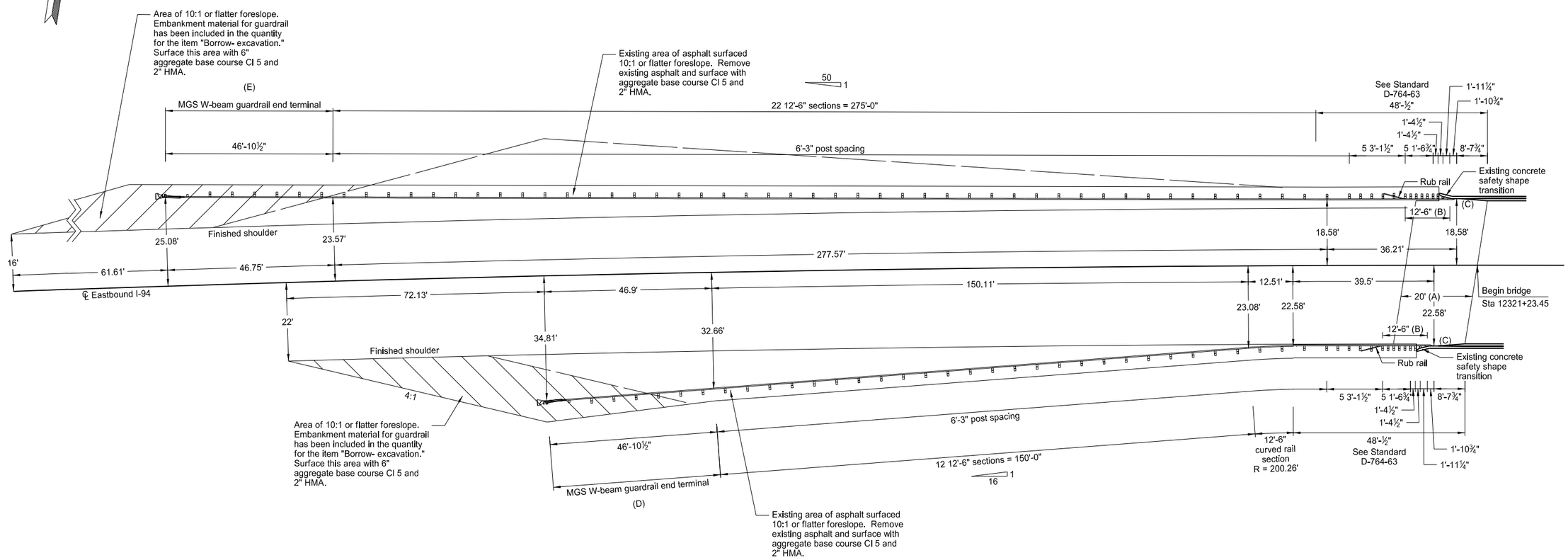
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	130	9



(A) Approach slab

(B) Double rail section

(C) Installation of the guardrail onto the existing safety shape transition requires drilling new bolt holes through the concrete. See Standard D-764-63.

(D) Install an MGS FLEAT end terminal at this location. See Standard D-764-38.

(E) Install either a SoftStop or a MASH SKT end terminal at this location. See Standards D-764-50 and D-764-51.

Any additional guardrail embankment required to install the SoftStop end terminal is at the contractor's expense.

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MGS W-Beam Guardrail Layout

Halfway Lake Interchange
RP 233.343
Eastbound Roadway

I-94

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	130	10

MGS W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

MGS W-BEAM GUARDRAIL AT BRIDGE ENDS WITH EXISTING SAFETY SHAPE TRANSITION

LOCATION	(A) TERM-INAL CONNEC-TOR EACH	(A) 6" ID STD PIPE 12" LONG EACH	(A) 5/8" Ø x 2" LONG GUARD-RAIL BOLT EACH	(A) 7/8"Ø x 10" LONG HEX HEAD BOLT EACH	(A) 5/8" Ø x 18" LONG GUARD-RAIL BOLT EACH	(A) 6"x 8" x 14" WOOD OFF-SET BLOCK EACH	(A) 6"x 8" x 6' TIMBER POST EACH	(A) 5/8" Ø x 1 1/4" LONG GUARD-RAIL BOLT EACH	(A) 12'-6" DOUBLE RAIL SECTION EACH	(A) 12'-6" STRAIGHT RAIL SECTION EACH	(A) 12'-6" CURVED RAIL SECTION EACH	(A) 1/2" Ø x 4" LONG LAG SCREW EACH	(A) 6" x 8" x 7'-0" TIMBER POSTS EACH	(A) 6" x 8" x 23" WOOD OFFSET BLOCK EACH	(A) 5'-3" RUBRAIL SECTION EACH	(A) 15'-7 1/4" RUBRAIL SECTION EACH	(A) 5/8" Ø x 1 ½" LONG HEX HEAD BOLT EACH	(A) 5/8" Ø x 20" LONG GUARD-RAIL BOLT EACH	(A) REFL-ECTOR-IZED PLATES EACH	(A) 5/8" Ø x 20" LONG GUARD-RAIL BOLT EACH	(A) 7" x 7" x ½" RUBRAIL ANCHOR PLATE EACH	(A) 7 3/4" x 4 1/2" x x 3/8" RUBRAIL SPLICE PLATE EACH	(A) 12" x 12 1/2" x 5/8" PLATE EACH	(A) 6"x 9 3/4" x 14" WOOD OFF-SET BLOCK EACH
Sta 12319+09.20 to 12321+11.32 Rt	1	1	1	7	38	31	35	136	1	14	1	1	4	7	1	1	4	7	7	1	1	1	1	1
Sta 12318+03.87 to 12321+17.65 Rt Mdn	1	1	1	7	56	49	53	208	1	24		1	4	7	1	1	4	7	9	1	1	1	1	1
TOTAL	2	2	2	14	94	80	88	344	2	38	1	4	8	14	2	2	8	14	16	2	2	2	2	2

SPEC	CODE	BID ITEM	QTY	UNIT
764	0131	W-BEAM GUARDRAIL		
		Sta 12319+09.20 to 12321+11.32 Rt	201.9	LF
		Sta 12318+03.87 to 12321+17.65 Rt Mdn	314.4	LF
		Total	516.3	LF
764	0145	W-BEAM GUARDRAIL END TERMINAL		
		Sta 12318+62.30 to 12319+09.20 Rt	1	Ea
		Sta 12317+57.12 to 12318+03.87 Rt Mdn	1	Ea
		Total	2	Ea
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS		
		Sta 12319+35.83 to 12321+12.45 Rt	176.9	LF
		Sta 12319+17.29 to 12321+18.85 Rt Mdn	201.9	LF
		Total	378.8	LF
764	2081	REMOVE END TREATMENT & TRANSITION		
		Sta 12318+85.94 to 12319+35.83 Rt	1	Ea
		Sta 12318+67.40 to 12319+17.29 Rt Mdn	1	Ea
		Total	2	Ea

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

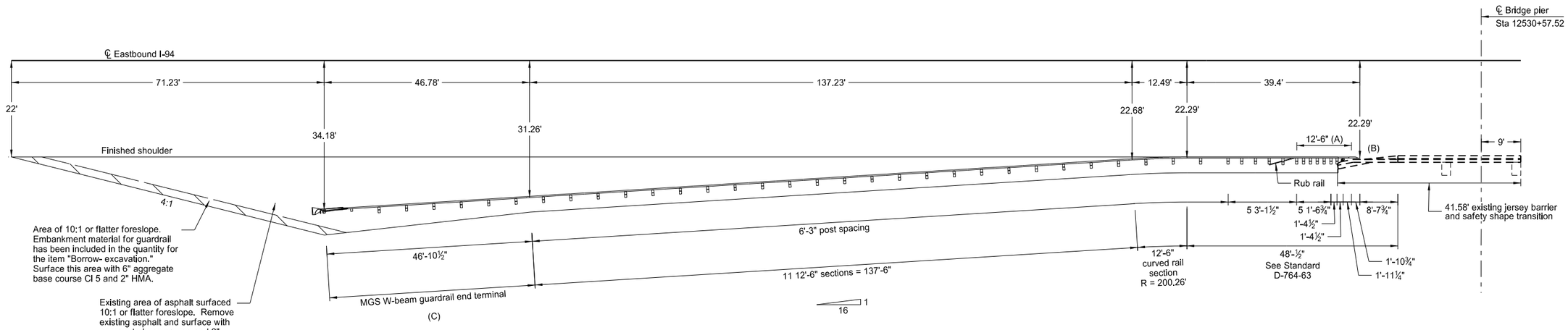
MGS W-Beam Guardrail Quantities

Halfway Lake Interchange
RP 233.343
Eastbound Roadway

I-94

23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	130	11



(A) Double rail section

(B) Installation of the guardrail onto the existing safety shape transition requires drilling new bolt holes through the concrete. See Standard D-764-63.

(C) Install an MGS FLEAT end terminal at this location. See Standard D-764-38.

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Jersey Barrier and MGS W-Beam Guardrail Layout

Outside Pier Protection

West Cleveland Separation
RP 237.322
Eastbound I-94

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	130	12

MGS W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

MGS W-BEAM GUARDRAIL AT OBSTRUCTIONS WITH EXISTING SAFETY SHAPE TRANSITIONS

LOCATION	(A) TERM-INAL CONNEC-TOR EACH	(A) 6" ID STD PIPE 12" LONG EACH	(A) 5/8" Ø x 2" LONG GUARD-RAIL BOLT EACH	(A) 7/8"Ø x 10" LONG HEX HEAD BOLT EACH	(A) 5/8" Ø x 18" LONG GUARD-RAIL BOLT EACH	(A) 6"x 8" x 14" WOOD OFF-SET BLOCK EACH	(A) 6"x 8" x 6' TIMBER POST EACH	(A) 5/8" Ø x 1 1/4" LONG GUARD-RAIL BOLT EACH	(A) 12'-6" DOUBLE RAIL SECTION EACH	(A) 12'-6" STRAIGHT RAIL SECTION EACH	(A) 12'-6" CURVED RAIL SECTION EACH	(A) 1/2" Ø x 4" LONG LAG SCREW EACH	(A) 6" x 8" x 7'-0" TIMBER POSTS EACH	(A) 6" x 8" x 23" WOOD OFFSET BLOCK EACH	(A) 5'-3" RUBRAIL SECTION EACH	(A) 15'-7 1/4" RUBRAIL SECTION EACH	(A) 5/8" Ø x 1 ½" LONG HEX HEAD BOLT EACH	(A) 5/8" Ø x 20" LONG GUARD-RAIL BOLT EACH	(A) REFL-ECTOR-IZED PLATES EACH	(A) 5/8" Ø x 20" LONG GUARD-RAIL BOLT EACH	(A) 7" x 7" x ½" RUBRAIL ANCHOR PLATE EACH	(A) 7 3/4" x 4 1/2" x x 3/8" RUBRAIL SPLICE PLATE EACH	(A) 12" x 12 1/2" x 5/8" PLATE EACH	(A) 6"x 9 3/4" x 14" WOOD OFF-SET BLOCK EACH	(A) 5/8" Ø x 20" LONG GUARD-RAIL BOLT EACH
Sta 12528+40.74 to 12530+29.86 Rt	1	1	1	7	36	29	33	128	1	13	1	1	4	7	1	1	4	7	11	1	1	1	1	1	1	1
TOTAL	1	1	1	7	36	29	33	128	1	13	1	4	4	7	1	1	4	7	11	1	1	1	1	1	1	1

SPEC	CODE	BID ITEM	QTY	UNIT
764	0131	W-BEAM GUARDRAIL		
		Sta 12528+40.74 to 12530+29.86 Rt	189.4	LF
764	0145	W-BEAM GUARDRAIL END TERMINAL		
		Sta 12527+93.96 to 12528+40.74 Rt	1	Ea
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS		
		Sta 12528+54.40 to 12530+31.02 Rt	176.9	LF
764	2081	REMOVE END TREATMENT & TRANSITION		
		Sta 12528+04.51 to 12528+54.40 Rt	1	Ea

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

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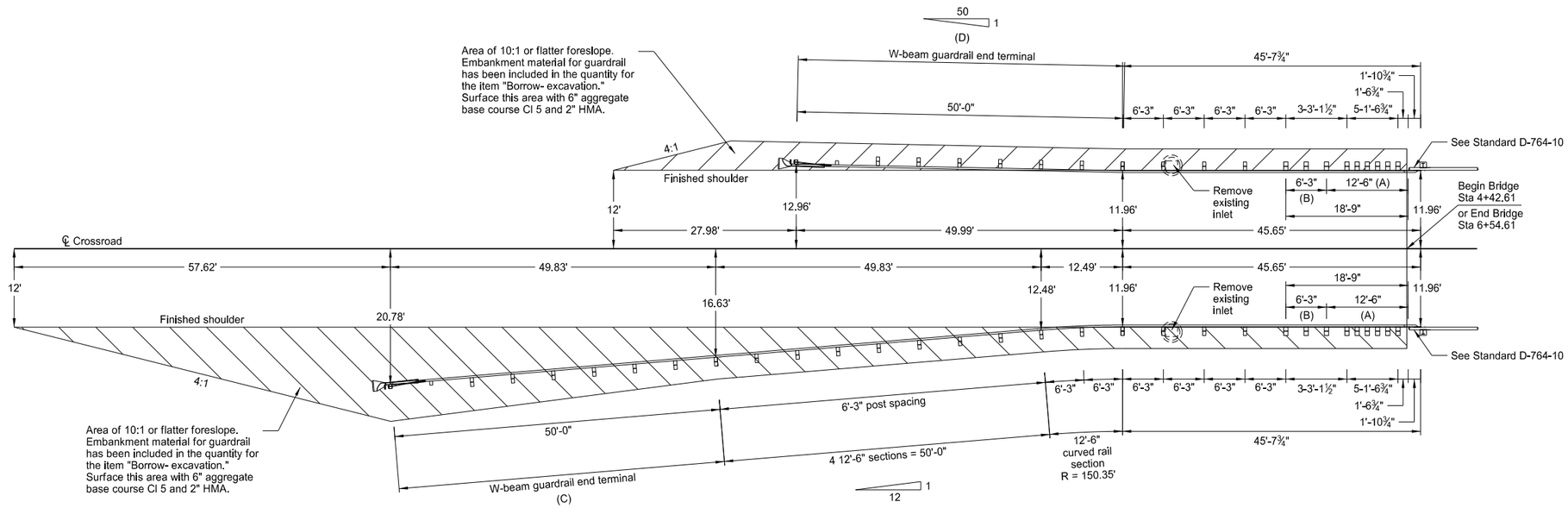
MGS W-Beam Guardrail Quantities

Outside Pier Protection

West Cleveland Separation
RP 237.322
Eastbound I-94

23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	130	13



(A) Thrie beam rail section (double thickness)

(B) W-Thrie beam transition section (double thickness)

(C) Install a FLEAT end terminal at this location.

(D) Install either a FLEAT or Sequential Kinking Terminal at this location.

If the FLEAT is installed, use the flare shown on Standard D-764-6. Any additional guardrail embankment required to install the FLEAT end terminal is at the contractor's expense.

If the Sequential Kinking Terminal is installed, use a 50:1 taper for this end terminal. See Standard D-764-5.

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

West Cleveland Separation Crossroad
RP 237.322

I-94

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	130	14

W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

THRIE/W-BEAM GUARDRAIL AT BRIDGE ENDS

LOCATION	(A) 5/8" Ø x 18" LONG GUARD-RAIL BOLT	(A) 6" x 8" x 6'-0" TIMBER POST	(A) 6" x 8" x 14" TIMBER BLOCK	(A) 5/8" Ø x 1 1/4" LONG GUARD-RAIL BOLT	(A) 12'- 6" STRAIGHT W-BEAM RAIL SECTION	(A) 12'- 6" CURVED W-BEAM RAIL SECTION	(A) REFL-ECTOR-IZED PLATES	(A) 8"x 8" x 6' WOOD POST	(A) 8"x 8" x 22" WOOD OFF-SET BLOCK	(A) 8"x 8" x 18" WOOD OFF-SET BLOCK	(A) 8"x 8" x 14" WOOD OFF-SET BLOCK	(A) 6'-3" DOUBLE W-THRIE BEAM TRANS-ITION SECTION	(A) 12'-6" DOUBLE THRIE BEAM SECTION	(A) 2'-6" THRIE BEAM TERM-INAL CON-NECTOR	(A) 7/8" Ø x VAR-IABLE LONG. BOLT	(A) 3/4" Ø x 2-1/2" LONG POST BOLT
	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH
Sta 3+36.74 to 4+44.71 Rt.	31	14	14	88	6	1	8	9	7	1	1	1	1	1	5	2
Sta 3+99.06 to 4+44.71 Lt.	21	4	4	48	2		5	9	7	1	1	1	1	1	5	2
Sta 6+52.51 to 6+98.16 Rt.	21	4	4	48	2		5	9	7	1	1	1	1	1	5	2
Sta 6+52.51 to 7+60.48 Lt.	31	14	14	88	6	1	8	9	7	1	1	1	1	1	5	2
TOTAL	104	36	36	272	16	2	26	36	28	4	4	4	4	4	20	8

SPEC	CODE	BID ITEM	QTY	UNIT
202	230	REMOVAL OF INLETS (B)		
		Sta 4+06.61 Rt	1	Ea
		Sta 4+06.61 Lt	1	Ea
		Sta 6+90.61 Rt	1	Ea
		Sta 6+90.61 Lt	1	Ea
		Total	4	Ea
764	0131	W-BEAM GUARDRAIL		
		Sta 3+36.74 to 4+44.71 Rt.	108.1	LF
		Sta 3+99.06 to 4+44.71 Lt.	45.6	LF
		Sta 6+52.51 to 6+98.16 Rt.	45.6	LF
		Sta 6+52.51 to 7+60.48 Lt.	108.1	LF
		Total	307.4	LF
764	0145	W-BEAM GUARDRAIL END TERMINAL		
		Sta 2+86.91 to 3+36.74 Rt.	1	Ea
		Sta 3+49.07 to 3+99.06 Lt.	1	Ea
		Sta 6+98.16 to 7+48.15 Rt.	1	Ea
		Sta 7+60.48 to 8+10.31 Lt.	1	Ea
		Total	4	Ea

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

(B) Each pair of inlets consists of a 4' long 30" Riser and a 5' long 30" Riser, resting on a 6" thick concrete base, with inlet castings and grates.

Each inlet pair of inlets is connected with a 15" CMP and is drained by a 15" CMP.

Thrie/W-Beam Guardrail Quantities

West Cleveland Separation Crossroad
RP 237.322

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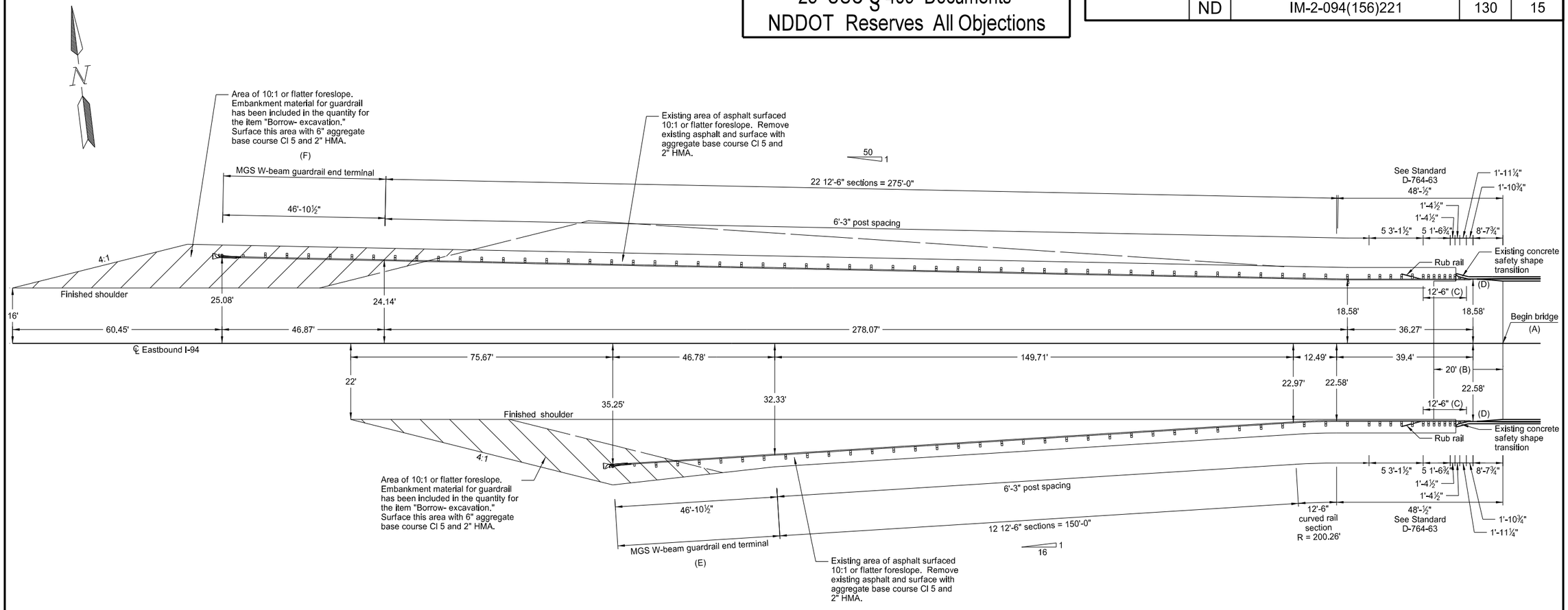
23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	130	15



(A) Sta 12608+69.76

(B) Approach slab

(C) Double rail section

(D) Installation of the guardrail onto the existing safety shape transition requires drilling new bolt holes through the concrete. See Standard D-764-63.

(E) Install an MGS FLEAT end terminal at this location. See Standard D-764-38.

(F) Install either a SoftStop or MASH SKT end terminal at this location. See Standards D-764-50 and D-764-51.

Any additional guardrail embankment required to install the SoftStop end terminal is at the contractor's expense.

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MGS W-Beam Guardrail Layout

Cleveland Interchange
RP 238.793
Eastbound Roadway

I-94

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	130	16

MGS W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

MGS W-BEAM GUARDRAIL AT BRIDGE ENDS WITH EXISTING SAFETY SHAPE TRANSITION

LOCATION	(A) TERM-INAL CONNEC-TOR EACH	(A) 6" ID STD PIPE 12" LONG EACH	(A) 5/8" Ø x 2" LONG GUARD-RAIL BOLT EACH	(A) 7/8"Ø x 10" LONG HEX HEAD BOLT EACH	(A) 5/8" Ø x 18" LONG GUARD-RAIL BOLT EACH	(A) 6"x 8" x 14" WOOD OFF-SET BLOCK EACH	(A) 6"x 8" x 6' TIMBER POST EACH	(A) 5/8" Ø x 1 1/4" LONG GUARD-RAIL BOLT EACH	(A) 12'-6" DOUBLE RAIL SECTION EACH	(A) 12'-6" STRAIGHT RAIL SECTION EACH	(A) 12'-6" CURVED RAIL SECTION EACH	(A) 1/2" Ø x 4" LONG LAG SCREW EACH	(A) 6" x 8" x 7'-0" TIMBER POSTS EACH	(A) 6" x 8" x 23" WOOD OFFSET BLOCK EACH	(A) 5'-3" RUBRAIL SECTION EACH	(A) 15'-7 1/4" RUBRAIL SECTION EACH	(A) 5/8" Ø x 1 ½" LONG HEX HEAD BOLT EACH	(A) 5/8" Ø x 20" LONG GUARD-RAIL BOLT EACH	(A) REFL-ECTOR-IZED PLATES EACH	(A) 5/8" Ø x 20" LONG GUARD-RAIL BOLT EACH	(A) 7" x 7" x ½" RUBRAIL ANCHOR PLATE EACH	(A) 7 3/4" x 4 1/2" x 3/8" RUBRAIL SPLICE PLATE EACH	(A) 12" x 12 1/2" x 5/8" PLATE EACH	(A) 6"x 9 3/4" x 14" WOOD OFF-SET BLOCK EACH
Sta 12606+59.51 to 12608+61.11 Rt	1	1	1	7	38	31	35	136	1	14	1	1	4	7	1	1	4	7	7	1	1	1	1	1
Sta 12605+46.77 to 12608+61.11 Rt Mdn	1	1	1	7	56	49	53	208	1	24		1	4	7	1	1	4	7	9	1	1	1	1	1
TOTAL	2	2	2	14	94	80	88	344	2	38	1	4	8	14	2	2	8	14	16	2	2	2	2	2

SPEC	CODE	BID ITEM	QTY	UNIT
764	0131	W-BEAM GUARDRAIL		
		Sta 12606+59.51 to 12608+61.11 Rt	201.9	LF
		Sta 12605+46.77 to 12608+61.11 Rt Mdn	314.4	LF
		Total	516.3	LF
764	0145	W-BEAM GUARDRAIL END TERMINAL		
		Sta 12606+12.73 to 12606+59.51 Rt	1	Ea
		Sta 12604+99.90 to 12605+46.77 Rt Mdn	1	Ea
		Total	2	Ea
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS		
		Sta 12606+85.64 to 12608+62.26 Rt	176.9	LF
		Sta 12606+60.70 to 12608+62.26 Rt Mdn	201.9	LF
		Total	378.8	LF
764	2081	REMOVE END TREATMENT & TRANSITION		
		Sta 12606+35.75 to 12606+85.64 Rt	1	Ea
		Sta 12606+10.81 to 12606+60.70 Rt Mdn	1	Ea
		Total	2	Ea

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

MGS W-Beam Guardrail Quantities

Cleveland Interchange
RP 238.793
Eastbound Roadway

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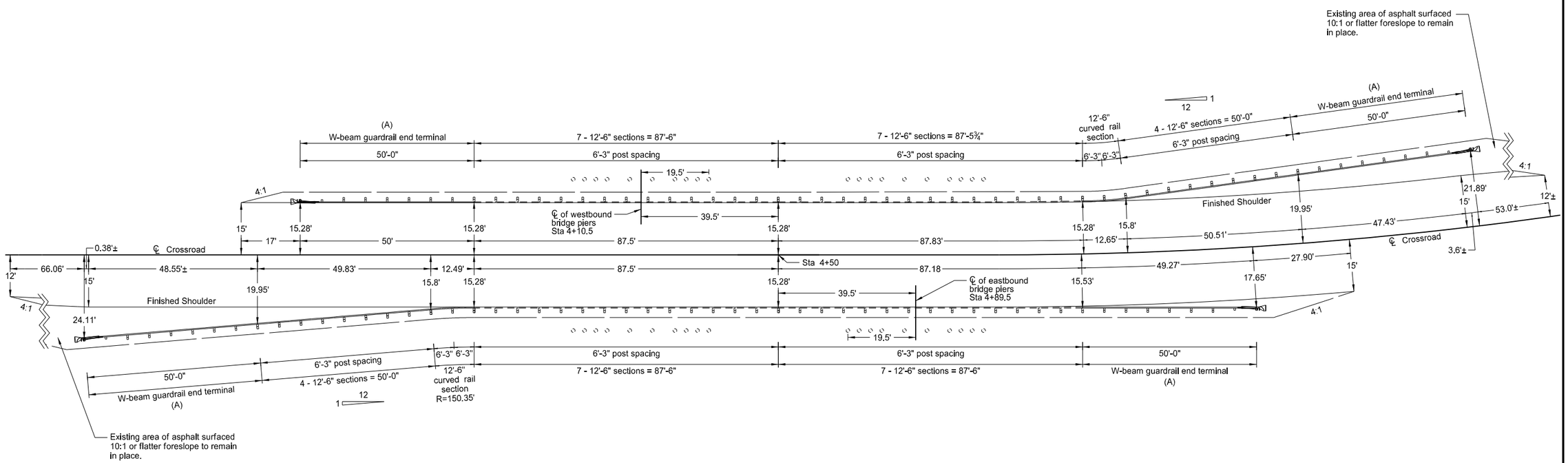
23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	130	17



SPEC	CODE	BID ITEM	QTY	UNIT
764	1495	ADJUST GUARDRAIL		
		Sta 2+51.25 to 3+62.50 Rt	112.5	LF
		Sta 3+12.50 to 3+62.50 Lt	50	LF
		Sta 5+37.18 to 5+86.45 Rt	50	LF
		Sta 5+37.83 to 6+52.02 Lt	112.5	LF
		Total	325	LF

(A) The existing end terminal at this location is a Slotted Rail Terminal. See Standard D-764-7.

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W-Beam Guardrail Layout

Cleveland Interchange Crossroad
RP 238.793

I-94

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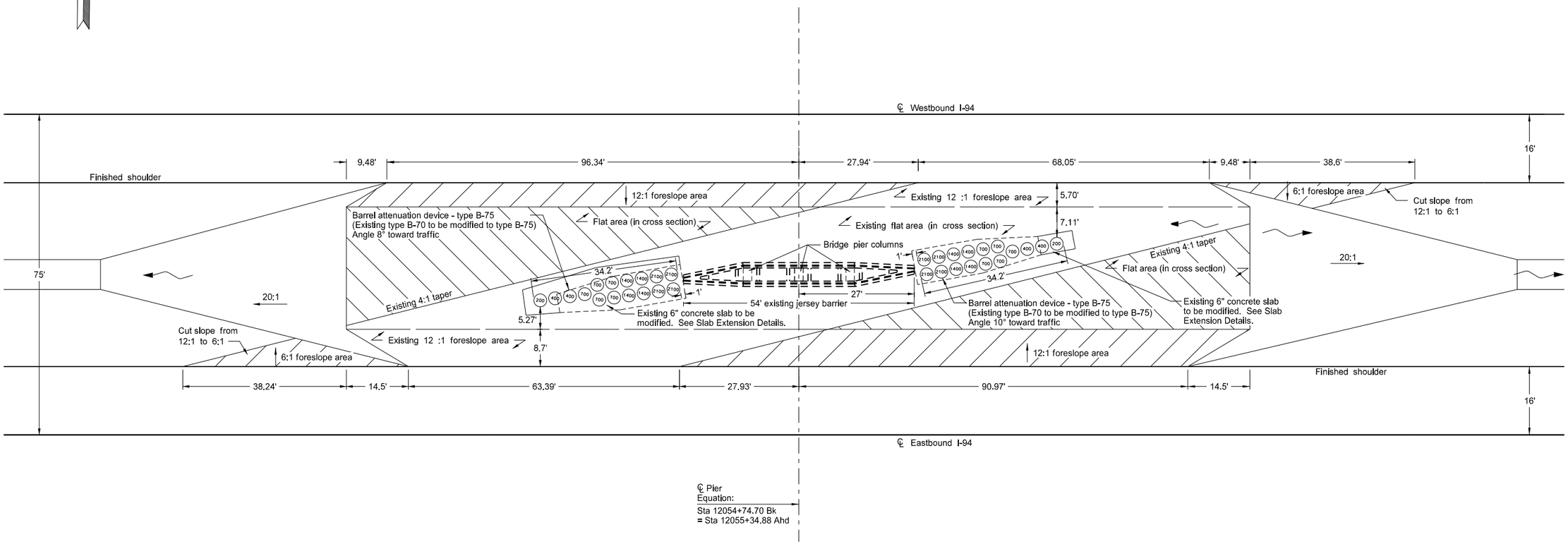
23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	130	18



SPEC	CODE	BID ITEM	QTY	UNIT
764	2090	REMOVE BARREL ATTENUATION DEVICE	2	EA
764	8071	BARREL ATTENUATION DEVICE - TYPE B-75	2	EA

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Notes:
1. Use Standard Drawing D-704-1 for the permanent installation of the barrel attenuation devices.

   Include the barrel attenuation device bases in the contract unit price bid for "Barrel attenuation device type B-75."
2. Embankment material has been included in the quantity for the item "Borrow- excavation."

Foreslope Reshaping and Attenuation Device Layout at Existing Jersey Barrier

Median Pier Protection

Streeter Interchange
RP 228.321
I-94

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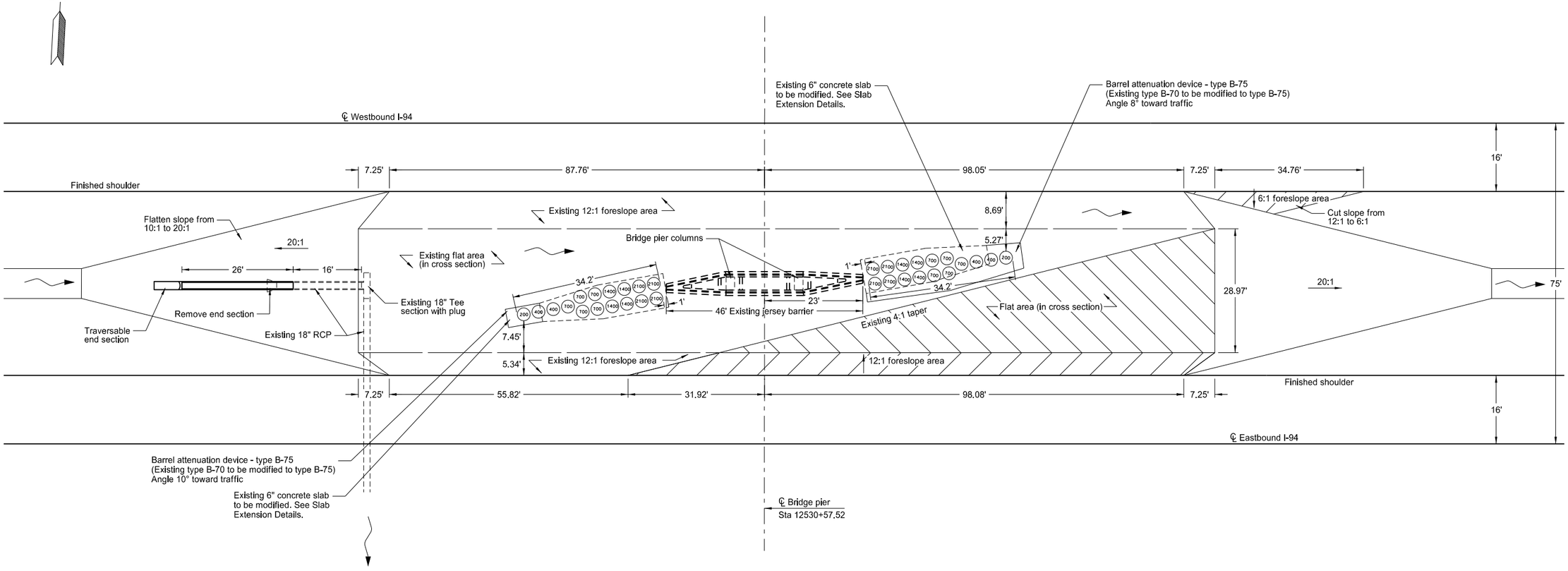
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	130	19

23 USC § 409 Documents
NDDOT Reserves All Objections



SPEC	CODE	BID ITEM	QTY	UNIT
202	0169	REMOVAL OF END SECTION - ALL TYPES & SIZES	1	EA
714	0310	PIPE CONC REINF18IN CL III	26	FT
714	3013	END SECT - TRAVERSABLE REINF. CONC. 18IN	1	EA

SPEC	CODE	BID ITEM	QTY	UNIT
764	2090	REMOVE BARREL ATTENUATION DEVICE	2	EA
764	8071	BARREL ATTENUATION DEVICE - TYPE B-75	2	EA

Notes:
1. Use Standard Drawing D-704-1 for the permanent installation of the barrel attenuation devices.

   Include the barrel attenuation device bases in the contract unit price bid for "Barrel attenuation device type B-75."
2. Embankment material has been included in the quantity for the item "Borrow- excavation."

This document was originally issued and sealed by Douglas A. Schumaker, Registration Number PE- 5047, on 3/23/18 and the original document is stored at the North Dakota Department of Transportation

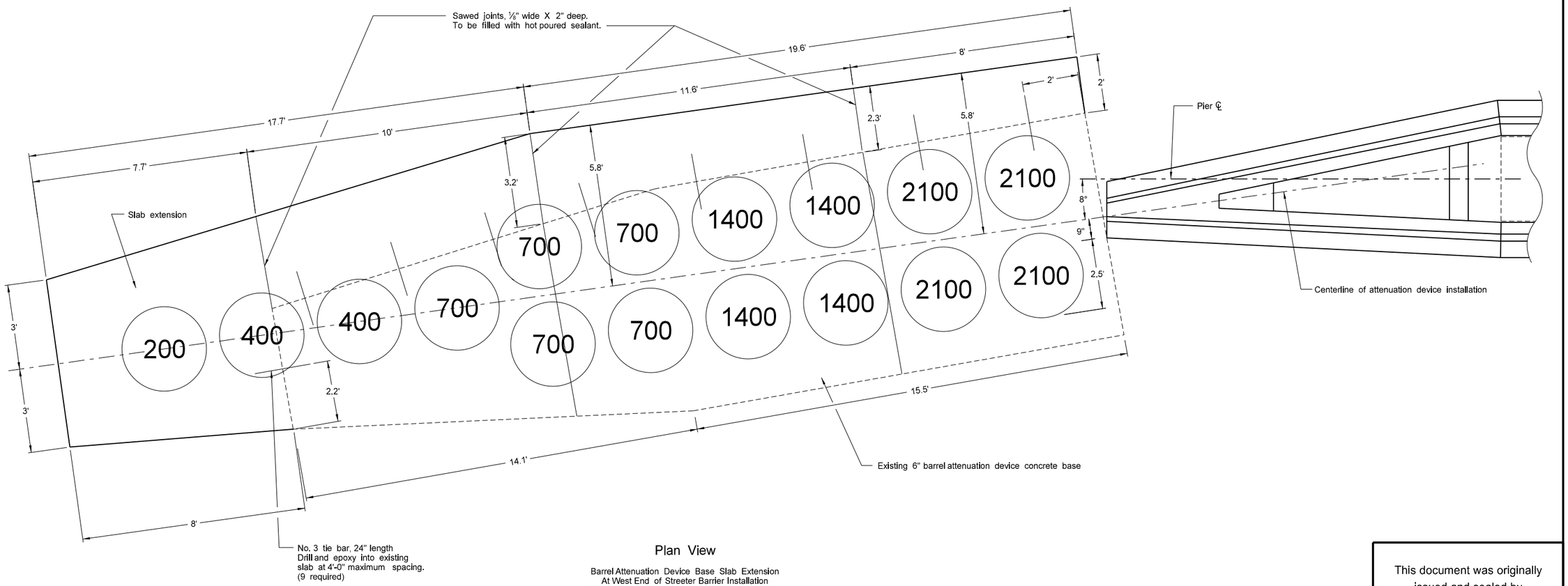
Foreslope Reshaping and Attenuation Device Layout at Existing Jersey Barrier

Median Pier Protection

West Cleveland Separation
RP 237.322
I-94

23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	130	20



Plan View

Barrel Attenuation Device Base Slab Extension
At West End of Streeter Barrier Installation
At East End of West Cleveland Barrier Installation
(2 required)

Area = 133.59 square feet.

Construct the slab extension using 2" of aggregate base and 6" of Class AE-3 concrete.

Remove the existing paint markings for attenuation device modules by sandblasting. Paint the perimeter of each module and the specified mass (weight) of Class 43 aggregate in each module on the slab for the new Type B-75 array configuration.

Include all materials, equipment and labor required to extend the concrete slab in the contract unit price bid for item "Barrel attenuation device type B-75."

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Barrel Attenuation Device Base Details
At Slab Extensions

Median Pier Protection

Streeter Interchange, RP 228.321
West Cleveland Separation, RP 237.322
I-94

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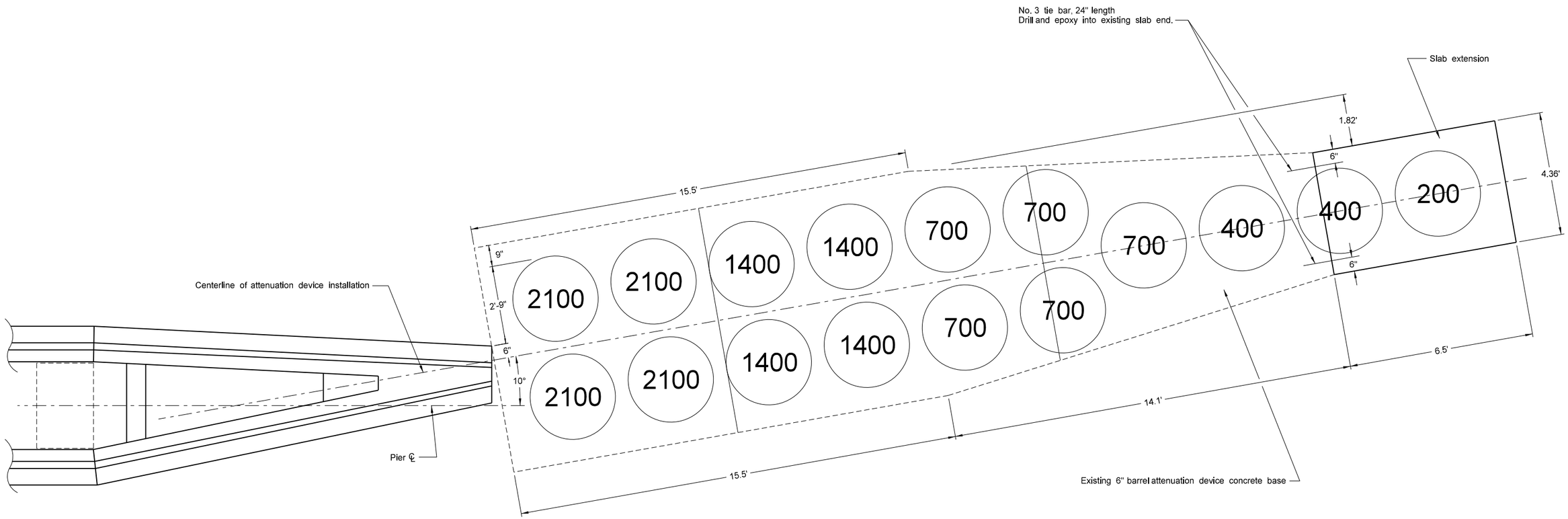
23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	130	21



Plan View

Barrel Attenuation Device Base Slab Extension
At East End of Streeter Barrier Installation
At West End of West Cleveland Barrier Installation
(2 required)

Area = 28.34 square feet.

Construct the slab extension using 2" of aggregate base and 6" of Class AE-3 concrete.

Remove the existing paint markings for attenuation device modules by sandblasting. Paint the perimeter of each module and the specified mass (weight) of Class 43 aggregate in each module on the slab for the new Type B-75 array configuration.

Include all materials, equipment and labor required to extend the concrete slab in the contract unit price bid for item "Barrel attenuation device type B-75."

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Barrel Attenuation Device Base Details
At Slab Extensions

Median Pier Protection

Streeter Interchange, RP 228.321
West Cleveland Separation, RP 237.322
I-94

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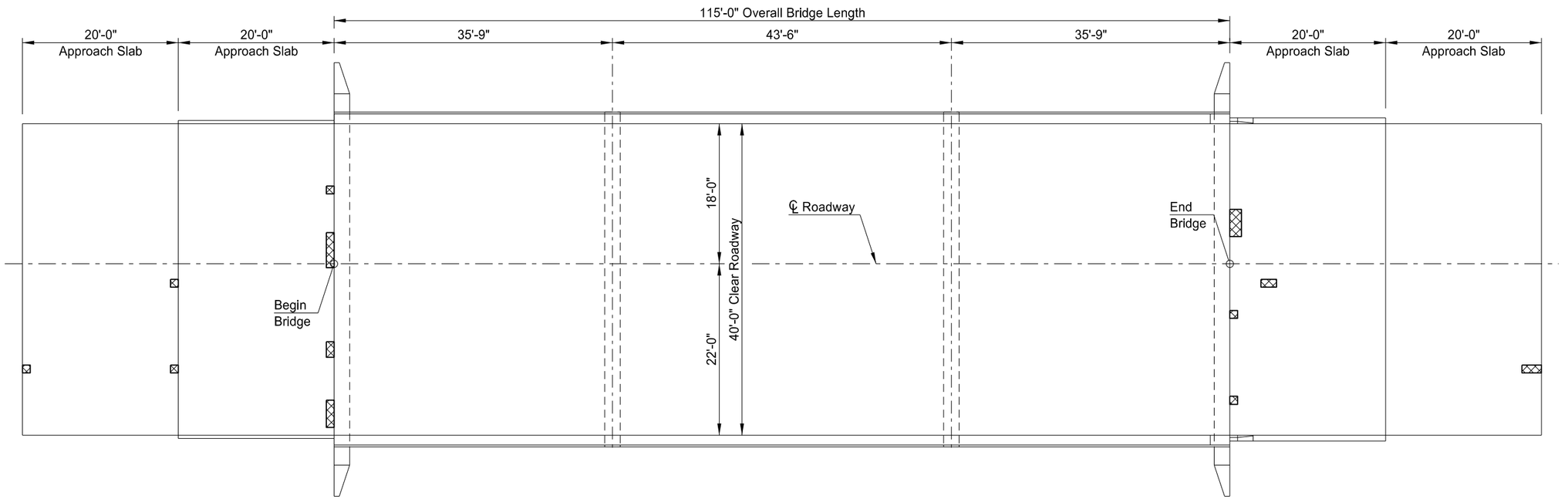
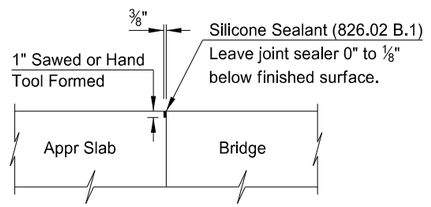
23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	170	1



PLAN

Indicates spall repair area.



JOINT DETAIL

NOTES:

100 SCOPE OF WORK: Work at this site consists of placing a deck overlay and repairing concrete spall areas on the approach slabs.

930 DECK SPALL REPAIR: The approach slabs have spall areas as shown at both ends of the bridge. Construct the deck spall repair as a Bridge Deck Overlay meeting Section 650 of the NDDOT Standard Specifications. Saw cut the perimeter of the repair area to a depth of 1". Remove concrete to a depth of 2½". The Engineer in the field will determine the actual limits of repair. Include all material, labor, and equipment required to remove the concrete and repair the deck spall area in the bid item "Deck Spall Repair."

BRIDGE BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
602	0130	CLASS AAE-3 CONCRETE	CY	0.9
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	511
650	0704	OVERLAY CONCRETE	CY	36.7
650	0720	CLASS 1 REMOVAL	SY	511
650	0721	CLASS 2 REMOVAL	SY	102
650	0722	CLASS 2-A REMOVAL	LF	184
650	0723	CLASS 3 REMOVAL	SY	26
650	0724	CLASS 4 REMOVAL	SY	5
930	9610	DECK SPALL REPAIR	SF	26

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NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

MINOR ROAD SPARATION

BRIDGE LAYOUT

PROJECT: IM-2-094(156)221

STUTSMAN COUNTY

3/26/18 (DATE) Jon Ketterling (BRIDGE ENGINEER)

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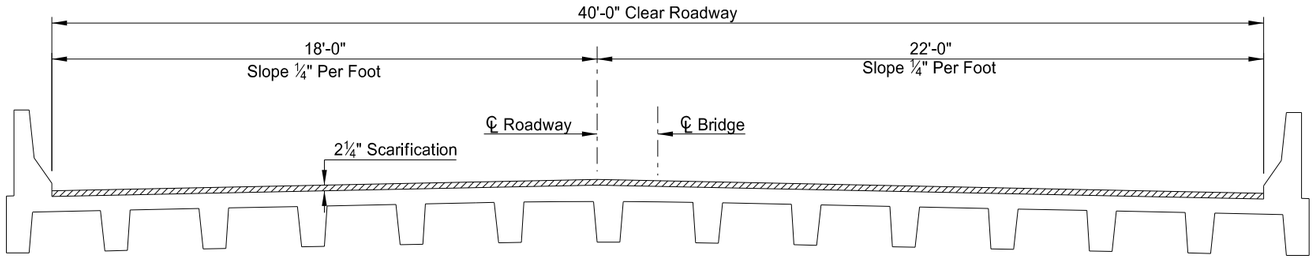
94-224.292R-1

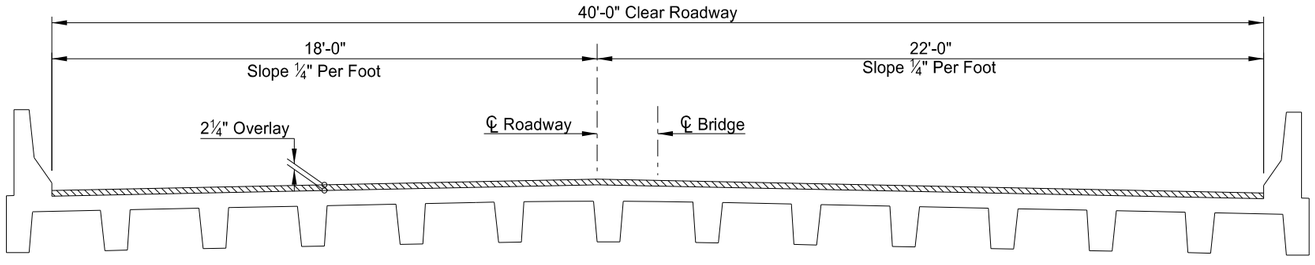
23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	170	2



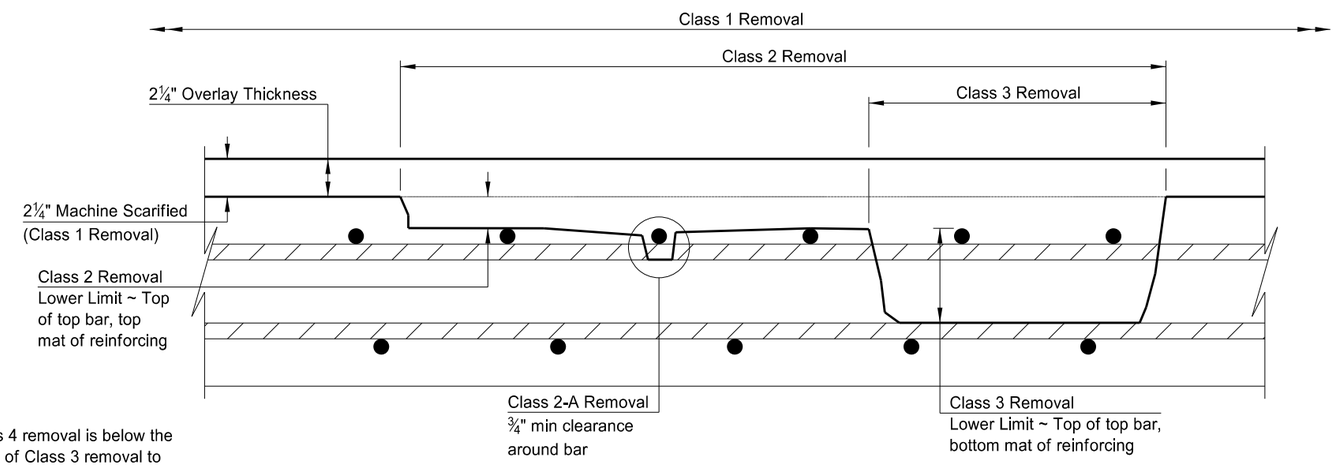
(SHOWING REMOVAL)

TYPICAL DECK SECTION



(SHOWING OVERLAY)

TYPICAL DECK SECTION



Class 4 removal is below the limits of Class 3 removal to full depth of deck.

(REMOVAL CLASSIFICATIONS)

BRIDGE DECK SECTION

NOTES:

602 PENETRATING WATER REPELLENT: Apply the penetrating water repellent solution according to Section 602.04 J with the modification that it will only be applied to the driving surface of the deck.

650 OVERLAY CONCRETE: Placement of overlay concrete after September 15 requires authorization from the Bridge Engineer.

650 CLASS 2-A REMOVAL: Class 2-A removal is paid for the top bar in the top mat of reinforcing only. If a bar that is identified for 2-A is in an area that becomes Class 3 or Class 4, it will not be paid for as 2-A removal.

650 SURFACE TOLERANCE: The Engineer will process a contract price adjustment for overlay concrete based on the surface tolerance measurements determined in Section 650.04 H, "Surface Tolerances." The amount of the contract price adjustment will be determined by multiplying the contract unit price for "Overlay Concrete" by the area, measured in square yards, that is out of tolerance and the appropriate Contract Price Reduction Factor in the table.

DEVIATION	CONTRACT PRICE REDUCATION FACTOR
>⅛ inch and ≤¼ inch	0.6%
>¼ inch and ≤½ inch	1.8%

650 LONGITUDINAL GROOVING: Do not run a metal tine transversely across the deck overlay surface immediately following the artificial grass drag as per 602.04 D. After the curing of the deck overlay is complete, cut in longitudinal grooves into the deck overlay using a mechanical cutting device. Perform any required surface correction grinding to the deck overlay prior to grooving it. Cut grooves that are⅛ inch in width (±1/64 inch) and ⅛ inch in depth (±1/64 inch). Space grooves at ¾ inch center to center. Stop the grooving 2 feet from the face of the barrier/curb and 6 inches from the beginning and end of the deck. Include the price for grooving in the bid item "Overlay Concrete."

QUANTITIES	
CLASS AAE-3 CONCRETE	0.9 CY
OVERLAY CONCRETE	36.7 CY
CLASS 1 REMOVAL	511 SY
CLASS 2 REMOVAL	102 SY
CLASS 2-A REMOVAL	184 LF
CLASS 3 REMOVAL	26 SY
CLASS 4 REMOVAL	5 SY

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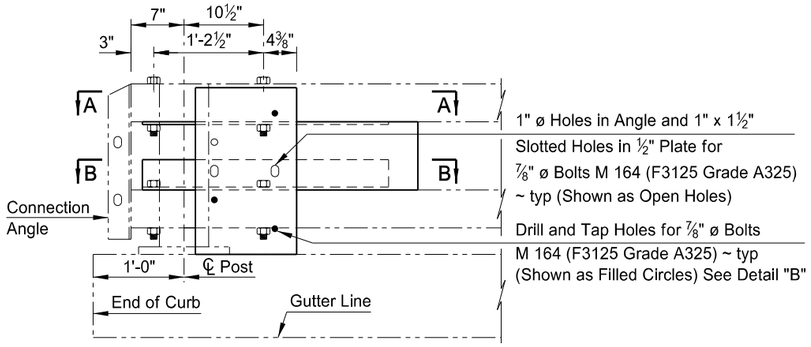
MINOR ROAD SPARATION

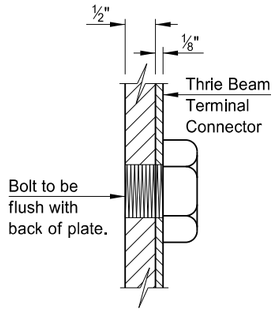
DECK OVERLAY DETAILS

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

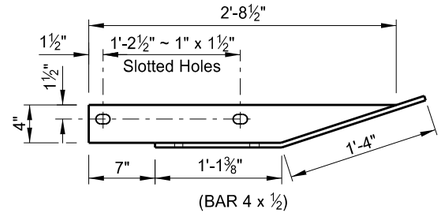
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	170	3



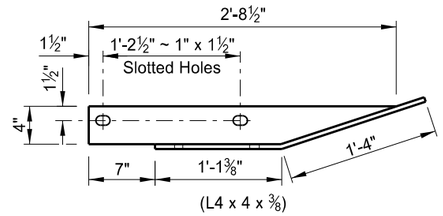
END POST CONNECTION DETAIL



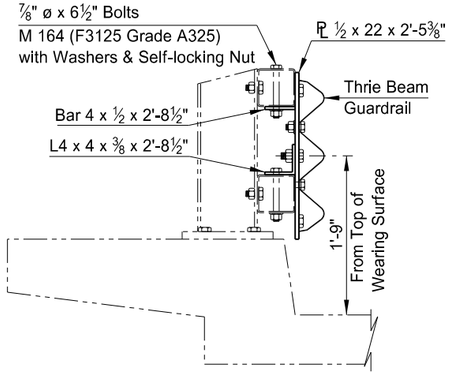
DETAIL "B"



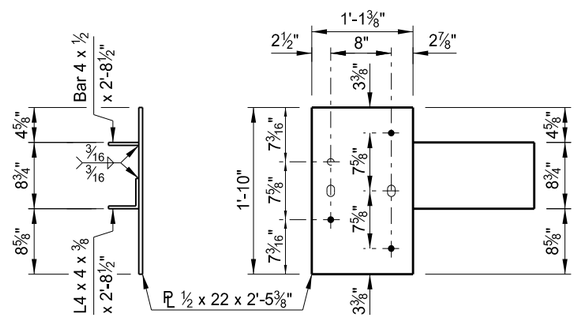
(BAR 4 x ½)
A-A



(L4 x 4 x ⅜)
B-B



THRIE BEAM CONNECTION DETAIL



GUARDRAIL CONNECTION PLATE DETAILS

NOTES:

Payment for the "Connection Plate Modification" includes compensation for furnishing and installing the guardrail connection plate, welded studs, and for removal and disposal of the existing connection plate.

Galvanize all components after fabrication according to Section 854. Galvanize field welds according to Section 854.02. Provide reduced base studs in accordance with ASTM A108.

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BRIDGE BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
624	3005	CONNECTION PLATE MODIFICATION	EA	4

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

I94/STREETER INTERCHANGE

CONNECTION PLATE MODIFICATION DETAILS

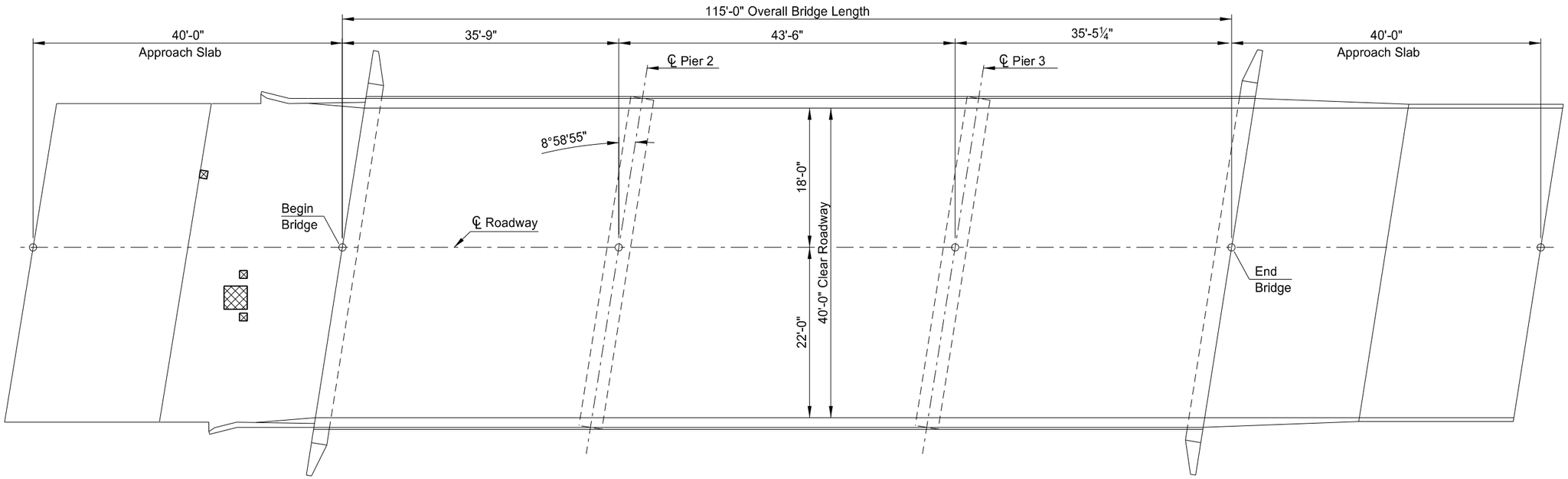
PROJECT: IM-2-094(156)221

STUTSMAN COUNTY

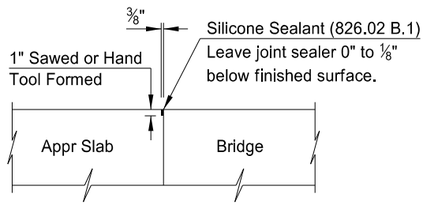
3/26/18 — DATE
Jon Ketterling — BRIDGE ENGINEER

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

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	170	4



PLAN



JOINT DETAIL

Indicates spall repair area.

NOTES:

100 SCOPE OF WORK: Work at this site consists of placing a deck overlay and repairing concrete spall areas on the approach slabs.

930 DECK SPALL REPAIR: The approach slab has spall areas as shown at the entrance end of the bridge. Construct the deck spall repair as a Bridge Deck Overlay meeting Section 650 of the NDDOT Standard Specifications. Saw cut the perimeter of the repair area to a depth of 1". Remove concrete to a depth of 2½". The Engineer in the field will determine the actual limits of repair. Include all material, labor, and equipment required to remove the concrete and repair the deck spall area in the bid item "Deck Spall Repair."

BRIDGE BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
602	0130	CLASS AAE-3 CONCRETE	CY	0.9
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	511
650	0704	OVERLAY CONCRETE	CY	36.7
650	0720	CLASS 1 REMOVAL	SY	511
650	0721	CLASS 2 REMOVAL	SY	102
650	0722	CLASS 2-A REMOVAL	LF	184
650	0723	CLASS 3 REMOVAL	SY	26
650	0724	CLASS 4 REMOVAL	SY	5
930	9610	DECK SPALL REPAIR	SF	12

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NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

HALFWAY LAKE

BRIDGE LAYOUT

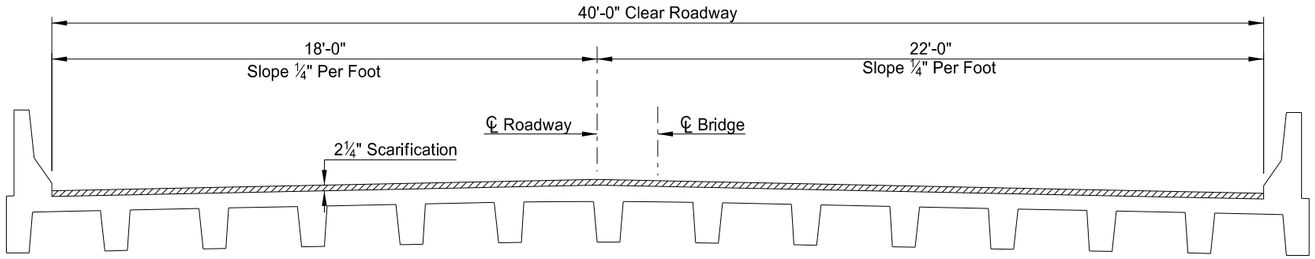
PROJECT: IM-2-094(156)221

STUTSMAN COUNTY

3/26/18 (DATE) Jon Ketterling (BRIDGE ENGINEER)

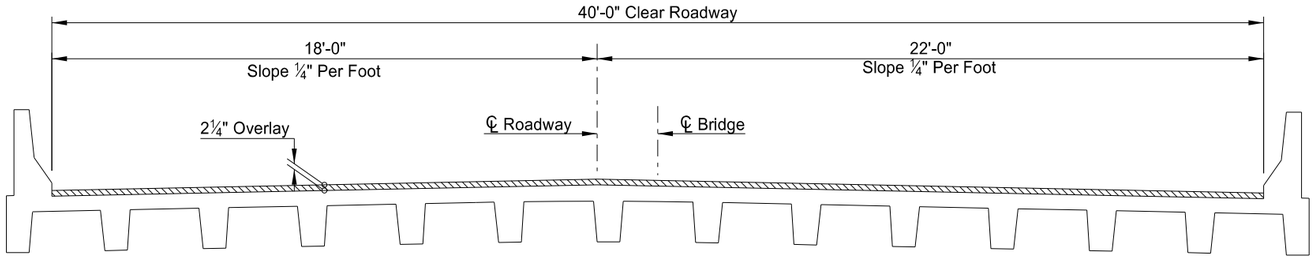
23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	170	5



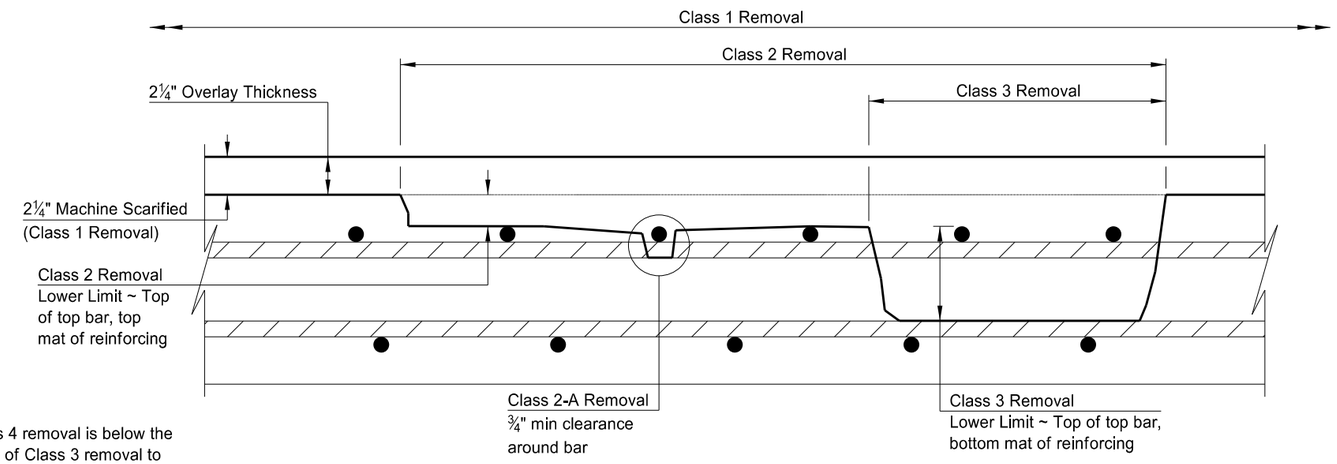
(SHOWING REMOVAL)

TYPICAL DECK SECTION



(SHOWING OVERLAY)

TYPICAL DECK SECTION



Class 4 removal is below the limits of Class 3 removal to full depth of deck.

(REMOVAL CLASSIFICATIONS)

BRIDGE DECK SECTION

NOTES:

602 PENETRATING WATER REPELLENT: Apply the penetrating water repellent solution according to Section 602.04 J with the modification that it will only be applied to the driving surface of the deck.

650 OVERLAY CONCRETE: Placement of overlay concrete after September 15 requires authorization from the Bridge Engineer.

650 CLASS 2-A REMOVAL: Class 2-A removal is paid for the top bar in the top mat of reinforcing only. If a bar that is identified for 2-A is in an area that becomes Class 3 or Class 4, it will not be paid for as 2-A removal.

650 SURFACE TOLERANCE: The Engineer will process a contract price adjustment for overlay concrete based on the surface tolerance measurements determined in Section 650.04 H, "Surface Tolerances." The amount of the contract price adjustment will be determined by multiplying the contract unit price for "Overlay Concrete" by the area, measured in square yards, that is out of tolerance and the appropriate Contract Price Reduction Factor in the table.

DEVIATION	CONTRACT PRICE REDUCATION FACTOR
>⅛ inch and ≤¼ inch	0.6%
>¼ inch and ≤½ inch	1.8%

650 LONGITUDINAL GROOVING: Do not run a metal tine transversely across the deck overlay surface immediately following the artificial grass drag as per 602.04 D. After the curing of the deck overlay is complete, cut in longitudinal grooves into the deck overlay using a mechanical cutting device. Perform any required surface correction grinding to the deck overlay prior to grooving it. Cut grooves that are⅛ inch in width (±1/64 inch) and ⅛ inch in depth (±1/64 inch). Space grooves at ¾ inch center to center. Stop the grooving 2 feet from the face of the barrier/curb and 6 inches from the beginning and end of the deck. Include the price for grooving in the bid item "Overlay Concrete."

QUANTITIES	
CLASS AAE-3 CONCRETE	0.9 CY
OVERLAY CONCRETE	36.7 CY
CLASS 1 REMOVAL	511 SY
CLASS 2 REMOVAL	102 SY
CLASS 2-A REMOVAL	184 LF
CLASS 3 REMOVAL	26 SY
CLASS 4 REMOVAL	5 SY

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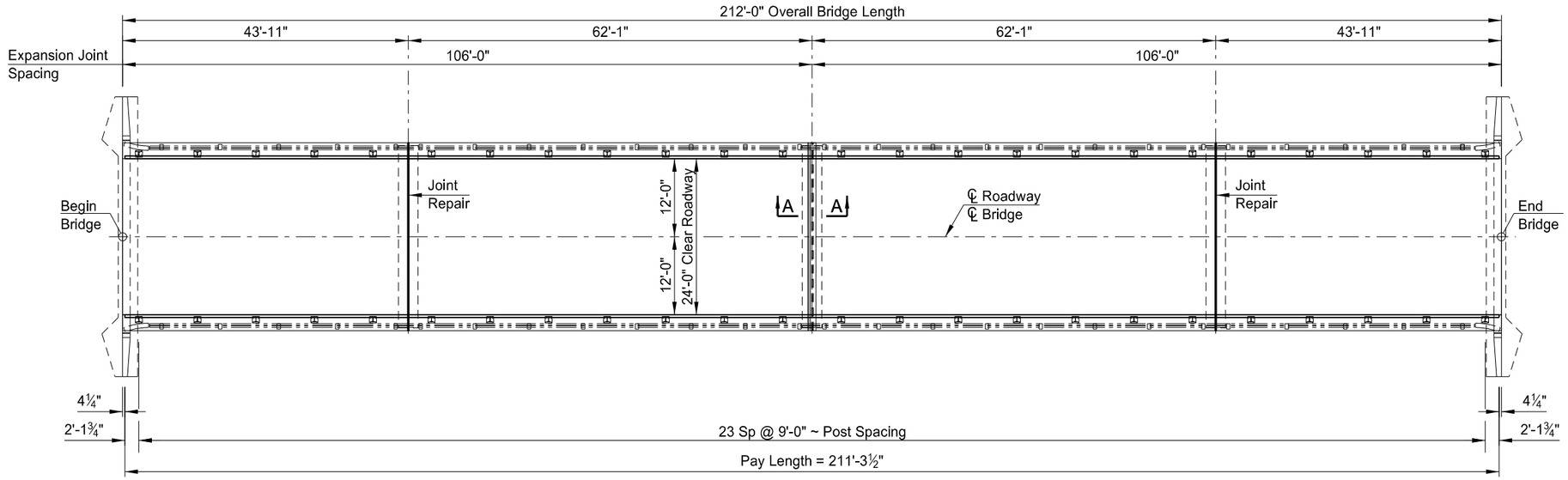
HALFWAY LAKE

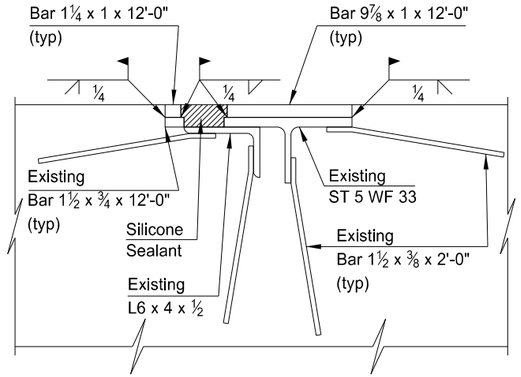
DECK OVERLAY DETAILS

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

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	170	6

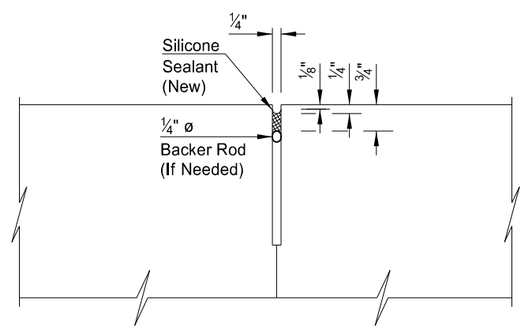


PLAN



(EXPANSION JOINT @ PIER 3)

A-A



(SHOWING JOINT @ PIER 2 & 4)

JOINT REPAIR DETAIL

NOTES:

100 SCOPE OF WORK: Work at this site consists of placing a deck overlay and resealing the joints at the piers, removing existing railing and posts, and installing a double box beam rail retrofit.

616 STRUCTURAL STEEL: At the expansion joint at Pier 3, weld new steel bars on top of existing bars and fill with silicone sealant. Use steel that meets AASHTO M 270 Grade 36. Use a low modulus (Type 5) silicone sealant. Clean the joint of all foreign material and sandblast before the new silicone sealant are installed. Include all materials, labor, and equipment required to weld the steel bars in place and install the silicone sealant in the price bid for "Structural Steel."

624 DOUBLE BOX BEAM RAIL RETROFIT: Remove the existing ornamental aluminum railing and cut existing anchor bolts flush with the top of the concrete. Include the cost to remove existing guardrail in the bid item "Double Box Beam Rail Retrofit - Free Standing."

930 SILICONE SEALANT: Replace the silicone sealant and backer rod in the joint at Piers 2 & 4. Clean the joint of all foreign material and sandblast before the new backer rod and silicone sealant are installed. Use a low modulus (Type 5) silicone sealant. Extend the silicone sealant and backer rod 6" up the face of the curb. Include all materials, labor, and equipment required to remove and replace the silicone sealant and backer rod in the bid item "Silicone Sealant."

BRIDGE BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
602	0130	CLASS AAE-3 CONCRETE	CY	1.0
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	565
616	5890	STRUCTURAL STEEL	L SUM	1
624	3001	DOUBLE BOX BEAM RAIL RETROFIT-FREE STANDING	LF	422.6
650	0704	OVERLAY CONCRETE	CY	28.9
650	0720	CLASS 1 REMOVAL	SY	565
650	0721	CLASS 2 REMOVAL	SY	113
650	0722	CLASS 2-A REMOVAL	LF	204
650	0723	CLASS 3 REMOVAL	SY	28
650	0724	CLASS 4 REMOVAL	SY	6
930	8644	SILICONE SEALANT	LF	50

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NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

I94/WEST CLEVELAND SEPARATION

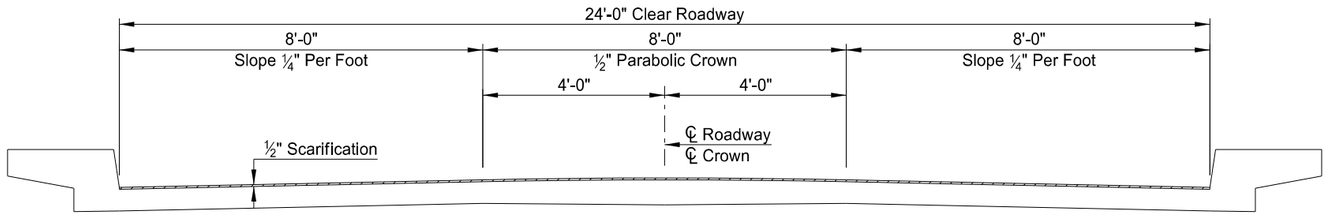
BRIDGE LAYOUT

PROJECT: IM-2-094(156)221

STUTSMAN COUNTY

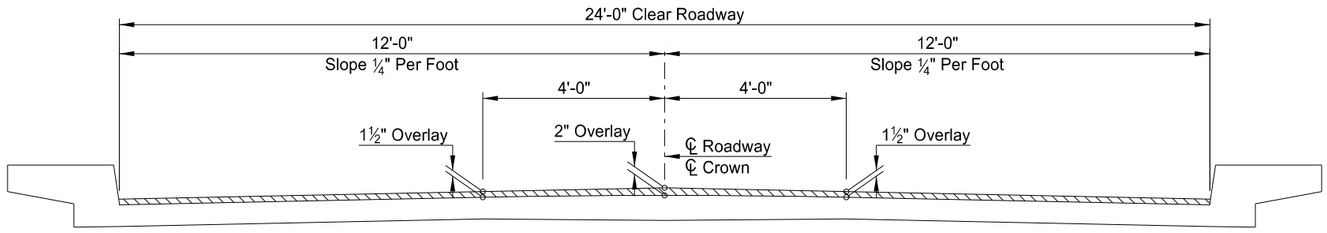
3/26/18 (DATE) Jon Ketterling (BRIDGE ENGINEER)

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	170	7



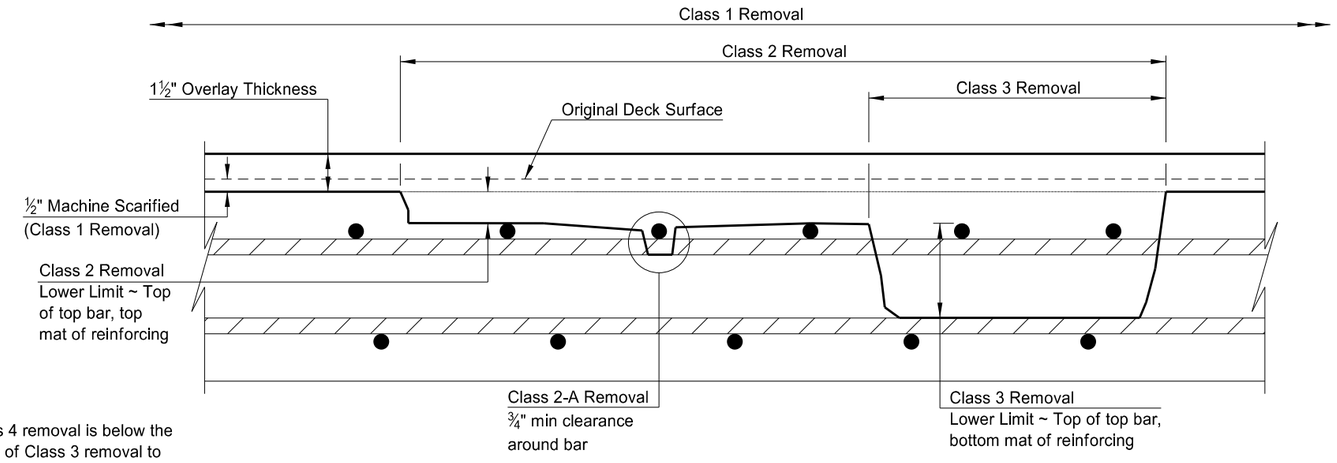
(SHOWING REMOVAL)

TYPICAL DECK SECTION



(SHOWING OVERLAY)

TYPICAL DECK SECTION



Class 4 removal is below the limits of Class 3 removal to full depth of deck.

(REMOVAL CLASSIFICATIONS)

BRIDGE DECK SECTION

NOTES:

602 PENETRATING WATER REPELLENT: Apply the penetrating water repellent solution according to Section 602.04 J with the modification that it will only be applied to the driving surface of the deck.

650 OVERLAY CONCRETE: Placement of overlay concrete after September 15 requires authorization from the Bridge Engineer.

650 CLASS 2-A REMOVAL: Class 2-A removal is paid for the top bar in the top mat of reinforcing only. If a bar that is identified for 2-A is in an area that becomes Class 3 or Class 4, it will not be paid for as 2-A removal.

650 SURFACE TOLERANCE: The Engineer will process a contract price adjustment for overlay concrete based on the surface tolerance measurements determined in Section 650.04 H, "Surface Tolerances." The amount of the contract price adjustment will be determined by multiplying the contract unit price for "Overlay Concrete" by the area, measured in square yards, that is out of tolerance and the appropriate Contract Price Reduction Factor in the table.

DEVIATION	CONTRACT PRICE REDUCATION FACTOR
>⅛ inch and ≤¼ inch	0.6%
>¼ inch and ≤½ inch	1.8%

650 LONGITUDINAL GROOVING: Do not run a metal tine transversely across the deck overlay surface immediately following the artificial grass drag as per 602.04 D. After the curing of the deck overlay is complete, cut in longitudinal grooves into the deck overlay using a mechanical cutting device. Perform any required surface correction grinding to the deck overlay prior to grooving it. Cut grooves that are⅛ inch in width (±1⁄64 inch) and ⅛ inch in depth (±1⁄64 inch). Space grooves at ¾ inch center to center. Stop the grooving 2 feet from the face of the barrier/curb and 6 inches from the beginning and end of the deck. Include the price for grooving in the bid item "Overlay Concrete."

QUANTITIES	
CLASS AAE-3 CONCRETE	1.0 CY
OVERLAY CONCRETE	28.9 CY
CLASS 1 REMOVAL	565 SY
CLASS 2 REMOVAL	113 SY
CLASS 2-A REMOVAL	204 LF
CLASS 3 REMOVAL	28 SY
CLASS 4 REMOVAL	6 SY

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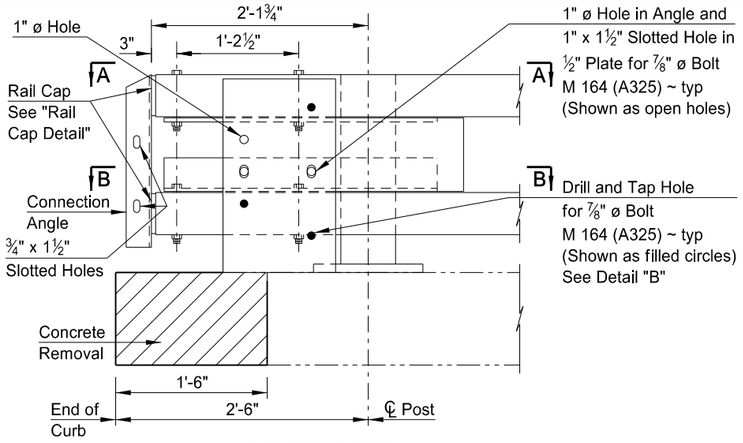
I94/WEST CLEVELAND SEPARATION

DECK OVERLAY DETAILS

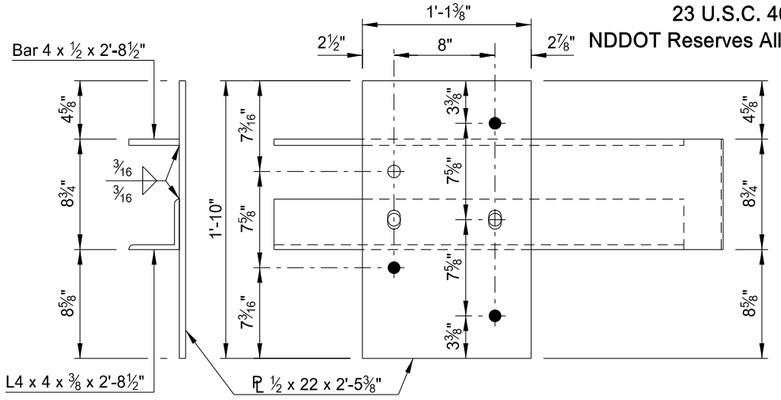
23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	170	8



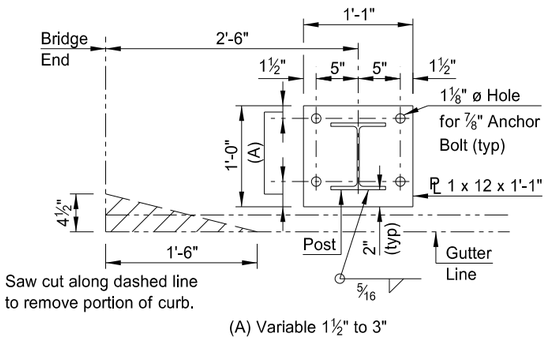
(TYP AT EACH END)

END POST CONNECTION DETAIL



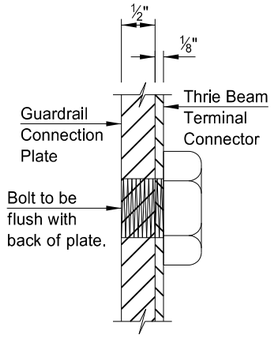
(4 REQUIRED)

GUARDRAIL CONNECTION PLATE DETAILS

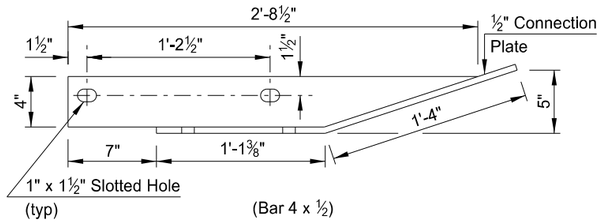


(A) Variable 1½" to 3"

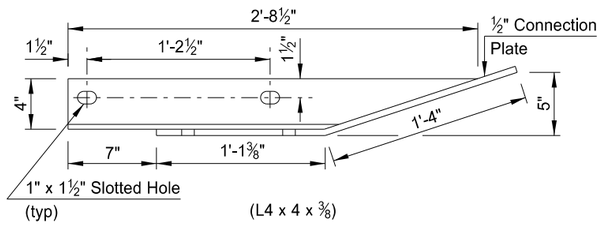
BASE PLATE DETAIL



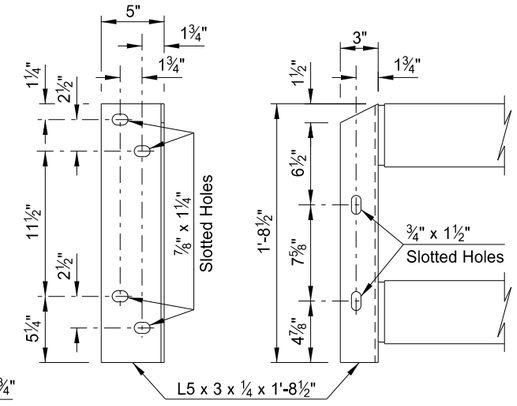
DETAIL "B"



A-A

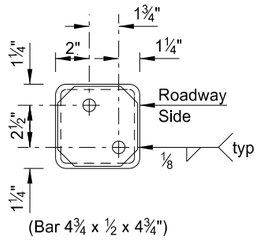


B-B



(4 REQUIRED)

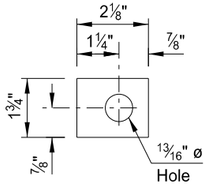
CONNECTION ANGLE DETAILS



(Bar 4¾ x ½ x 4¾")

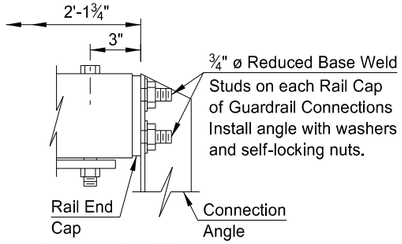
Cope corners 1" to
provide zinc drains.

RAIL CAP END VIEW

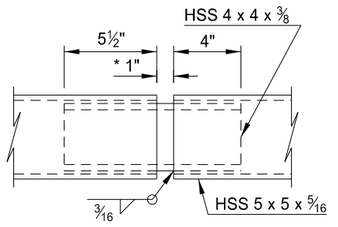


Position washers to completely
cover slotted holes.

¼" BAR WASHER "C"

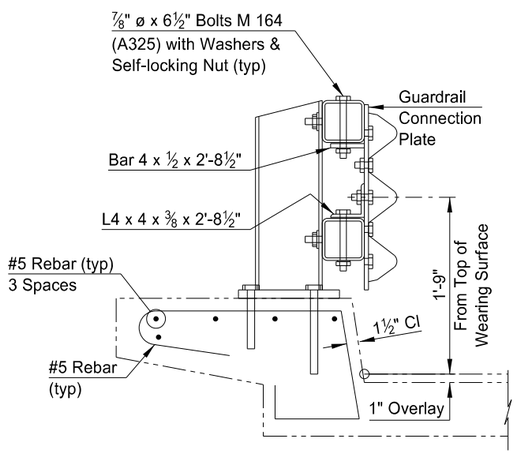


RAIL CAP DETAIL

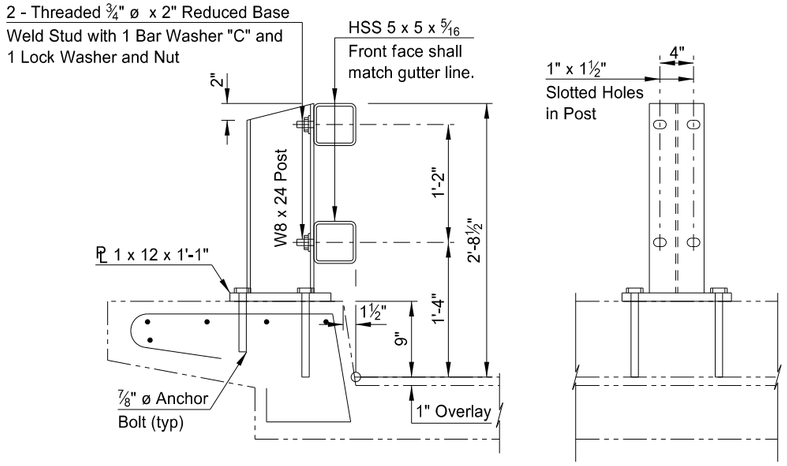


* 2" at expansion joints.

RAIL SPLICE DETAIL



CONNECTION DETAILS



CURB MOUNT POST DETAILS

NOTES:

Provide bolts and anchor bolts that meet the requirements of ASTM F1325 Grade A325

Provide reduced base studs in accordance with ASTM A108.

Galvanize all steel components after fabrication according to Section 854.

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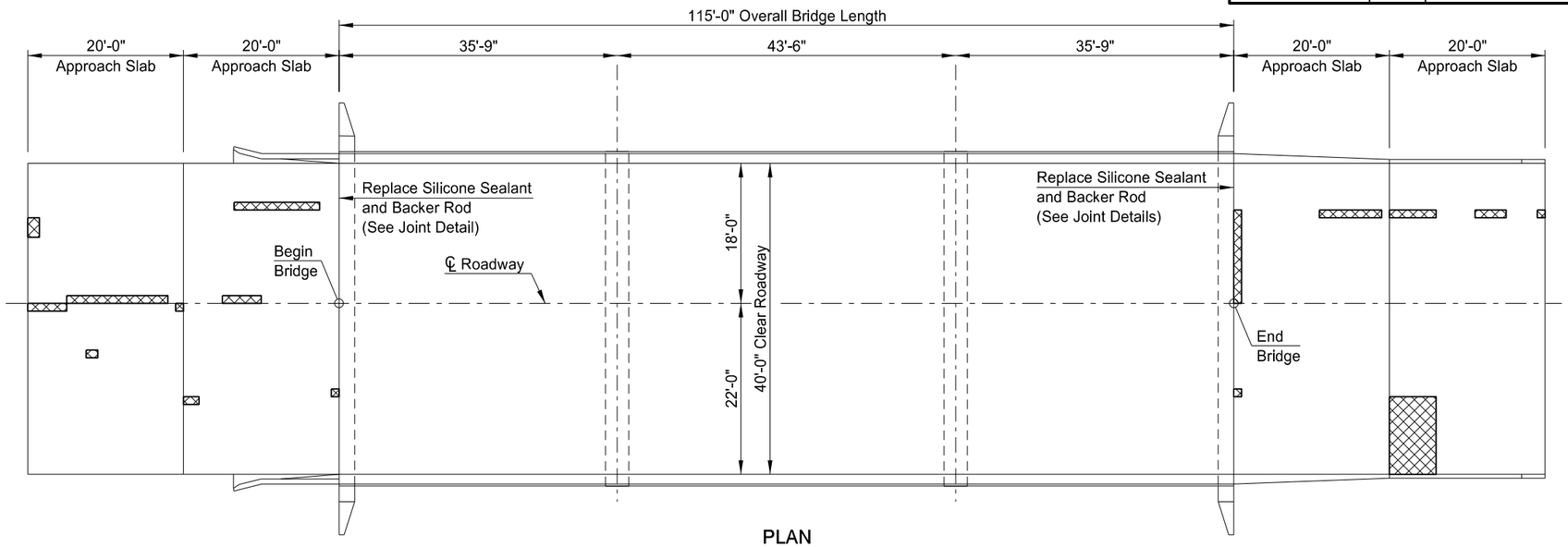
QUANTITIES	
RAIL RETROFIT - FREE STANDING	422.6 LF

I94/WEST CLEVELAND SEPARATION

DOUBLE BOX BEAM RAIL RETROFIT DETAILS (FREE STANDING)

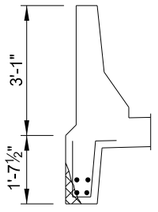
23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	IM-2-094(156)221	170	9

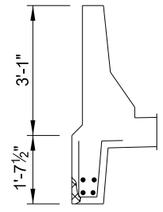


PLAN

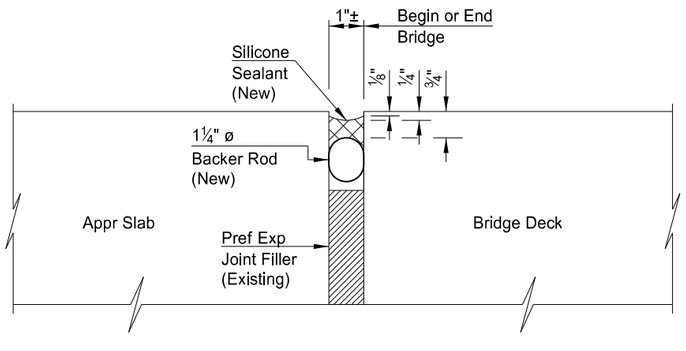
Indicates spall repair area.



(SHOWING SOUTH BEAM NEAR PIER 2)
BEAM SPALL DETAIL



(SHOWING SOUTH BEAM NEAR PIER 3)
BEAM SPALL DETAIL



JOINT DETAIL

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BRIDGE BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
602	0130	CLASS AAE-3 CONCRETE	CY	0.9
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	511
650	0704	OVERLAY CONCRETE	CY	36.7
650	0720	CLASS 1 REMOVAL	SY	511
650	0721	CLASS 2 REMOVAL	SY	102
650	0722	CLASS 2-A REMOVAL	LF	184
650	0723	CLASS 3 REMOVAL	SY	26
650	0724	CLASS 4 REMOVAL	SY	5
930	8644	SILICONE SEALANT	LF	82
930	9610	DECK SPALL REPAIR	SF	136
930	9694	GIRDER PATCHING	LSUM	1

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

CLEVELAND INTERCHANGE

BRIDGE LAYOUT

PROJECT: IM-2-094(156)221

STUTSMAN COUNTY

3/26/18 (DATE)
Jon Ketterling (BRIDGE ENGINEER)

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	170	10

NOTES

100 SCOPE OF WORK: Work at this site consists of a bridge deck overlay, repairing spall areas on the approach slabs, repairing spall areas on the south beam, and resealing the joints between the bridge & approach slabs.

602 PENETRATING WATER REPELLENT TREATMENT: Apply penetrating water repellent solution according to Section 602.04 J with the modification that it will only be applied to the driving surface of the deck.

650 OVERLAY CONCRETE: Place overlay concrete before September 15 unless authorized by the Bridge Engineer.

650 CLASS 2-A REMOVAL: Class 2-A removal is paid for the top bar in the top mat of reinforcing only. If a bar that is identified for 2-A is in an area that becomes Class 3 or Class 4, it will not be paid for as 2-A removal.

650 SURFACE TOLERANCE: The Engineer will process a contract price adjustment for overlay concrete based on the surface tolerance measurements determined in Section 650.04 H, “Surface Tolerances”. The amount of the contract price adjustment will be determined by multiplying the contract unit price for “Overlay Concrete” by the area, measured in square yards, that is out of tolerance and the appropriate Contract Price Reduction Factor in the table.

DEVIATION	CONTRACT PRICE REDUCTION FACTOR
> 1/8 inch and ≤ 1/4 inch	0.6%
> 1/4 inch and ≤ 1/2 inch	1.8%

650 LONGITUDINAL GROOVING: Do not run a metal tine transversely across the deck overlay surface immediately following the artificial grass drag as per 602.04 D. After the curing of the deck overlay is complete, cut in longitudinal grooves into the deck overlay using a mechanical cutting device. Perform any required surface correction grinding to the deck overlay prior to grooving it. Cut grooves that are 1/8 inch in width (±1/64 inch) and 1/8 inch in depth (±1/64 inch). Space grooves at 3/4 inch center to center. Stop the grooving 2 feet from the face of the barrier/curb and 6 inches from the beginning and end of the deck. Include the price for grooving in the bid item "Overlay Concrete."

930 SILICONE SEALANT: Replace the silicone sealant and backer rod in the joint between the approach slab and deck at both ends of the bridge. Clean the joint of all foreign material and sandblast before the new backer rod and silicone sealant are installed. Use a low modulus (Type 5) silicone sealant. Extend the silicone sealant and backer rod 6" up the face of the curb. Include all materials, labor, and equipment required to remove and replace the silicone sealant and backer rod in the bid item "Silicone Sealant."

930 DECK SPALL REPAIR: The approach slabs have spall areas at both ends of the bridge as shown. Construct the deck spall repair as a Bridge Deck Overlay meeting Section 650 of the NDDOT Standard Specifications. Saw cut the perimeter of the repair area to a depth of 1". Remove concrete to a depth of 2½". The Engineer in the field will determine the actual limits of the repair area. Include all material, labor, and equipment required to remove the concrete and repair the deck spall areas in the bid item "Deck Spall Repair."

930 GIRDER PATCHING: The south beam has 2 spall areas to be repaired. A 1' x 8' spall area is to the east of centerline of Pier 2. A 1’ x 5' spall area is to east of the centerline of Pier 3. The Engineer in the field will determine the actual limits of repair areas.

Use a 15 pound maximum size chipping hammer to remove any unsound concrete. The edges of the repair area will be sharp neat lines at least one inch deep. Produce these neat lines by saw cutting or other means approved by the Engineer. Do not damage the reinforcing steel during the removal process.

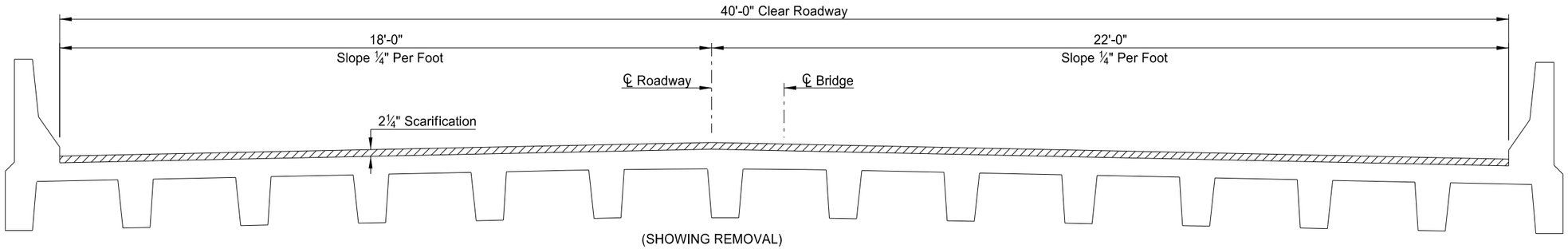
After all unsound concrete is removed, clean the existing surface by light sandblasting or high pressure water blasting. After the surface has dried and just before the patch material is placed, coat the surface with an epoxy bonding agent as recommended by the manufacturer.

Restore the beams to their original cross sections with a concrete material that is specifically intended for patching concrete. This material may be SikaTop 122 Repair Mortar (Sika Corporation), Duraltop Gel (Euclid Chemical Company), ThoRoc HB2 (BASF Corporation), or an approved equal. It is important to minimize the shrinkage in the patch material, therefore, take steps, including proper curing, as recommended by the manufacturer to minimize shrinkage.

Include all labor, equipment, and materials to remove loose concrete and to patch the damaged area on the beams as specified in the bid item “Girder Patching.”

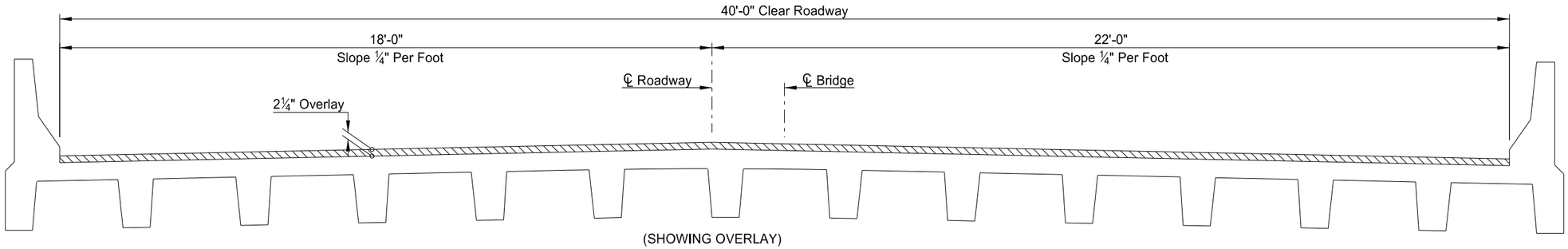
23 U.S.C. 409
NDDOT Reserves All Objections

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	IM-2-094(156)221	170	11



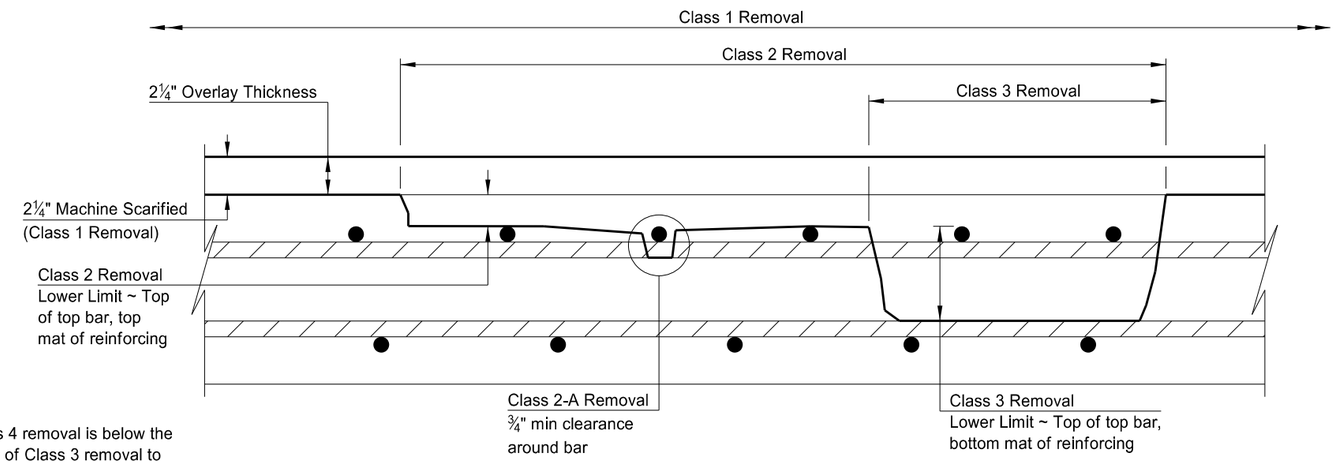
(SHOWING REMOVAL)

TYPICAL DECK SECTION



(SHOWING OVERLAY)

TYPICAL DECK SECTION



Class 4 removal is below the limits of Class 3 removal to full depth of deck.

(REMOVAL CLASSIFICATIONS)

BRIDGE DECK SECTION

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QUANTITIES	
CLASS AAE-3 CONCRETE	0.9 CY
OVERLAY CONCRETE	36.7 CY
CLASS 1 REMOVAL	511 SY
CLASS 2 REMOVAL	102 SY
CLASS 2-A REMOVAL	184 LF
CLASS 3 REMOVAL	26 SY
CLASS 4 REMOVAL	5 SY

CLEVELAND INTERCHANGE

DECK OVERLAY DETAILS

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
Ac	acres
Adj	adjusted
Aggr	aggregate
Ahd	ahead
ARV	air release valve
Align	alignment
Al	alley
Alt	alternate
Alum	aluminum
ADA	Americans with Disabilities Act
A	ampere
&	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
Az	azimuth
Bk	back
BF	back face
Bs	backsight
Balc	balcony
B Wire	barbed wire
Barr	barricade
Btry	battery
Brg	bearing
BI	beehive inlet
Beg	begin
BM	bench mark
Bkwy	bikeway
Bit	bituminous
Blk	block
Bd Ft	board feet
BH	bore hole
BS	both sides
Bot	bottom
Blvd	Boulevard
Bndry	boundary
BC	brass cap
Brkwy	breakaway
Br	bridge
Bldg	building
BV	butterfly valve
Byp	bypass
C Gdrl	cable guardrail
Calc	calculate
Cd	candela
CIP	cast iron pipe
CB	catch basin
CRS	cationic rapid setting
C Gd	cattle guard
C To C	center to center
Cl or ℄	centerline
Cm	centimeter
Ch	chain
Chnlk	chain-link
Ch Blk	channel block
Ch Ch	channel change
Chk	check
Chsld	chiseled
Cir	circle
Cl	class
Cl	clay
Cl F	clay fill
Cl Hvy	clay heavy
Cl Lm	clay loam
Clnt	clean-out
Clr	clear
Cl&gr	clearing & grubbing
Co S	coal slack
Comb.	combination
Coml	commercial
Compr	compression
CADD	computer aided drafting & design
Conc	concrete
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
CSP	corrugated steel pipe
C	coulomb
Co	County
Crse	course
C Gr	course gravel
CS	course sand
Ct	Court
Xarm	cross arm
Xbuck	cross buck
Xsec	cross sections
Xing	crossing
Xrd	Crossroad
Crn	crown
CF	cubic feet
M3	cubic meter
M3/s	cubic meters per second
CY	cubic yard
Cy/mi	cubic yards per mile
Culv	culvert
C&G	curb & gutter
CI	curb inlet
CR	curb ramp
CS	curve to spiral
C	cut
Dd Ld	dead load
Defl	deflection
Defm	deformed
Deg or D	degree
Dlnt	delineate
Dlntr	delineator
Depr	depression
Desc	description
Det	detail
DWP	detectable warning panel
Dtr	detour
Dia	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
Eq	equation
Evgr	evergreen
Exc	excavation
Exst	existing
Exp	expansion
Expy	Expressway
E	external of curve
Extru	extruded
FOS	factor of safety
F	Fahrenheit
FS	far side
F	farad
Fed	Federal
FP	feed point
Ft	feet/foot
Fn	fence
Fn P	fence post
FO	fiber optic
FB	field book
FD	field drive
F	fill
FAA	fine aggregate angularity
FS	fine sand
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
Fs	foresight
Fnd	found
Fdn	foundation
Frac	fractional
Frwy	freeway
Frt	front
FF	front face
F Disp	fuel dispenser

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE

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NDDOT ABBREVIATIONS

D-101-2

FFP	fuel filler pipes
FLS	fuel leak sensor
Furn	furnish/ed
Gal	gallon
Galv	galvanized
Gar	garage
Gs L	gas line
G Reg	gas line regulator
GMV	gas main valve
G Mtr	gas meter
GSV	gas service valve
GVP	gas vent pipe
GV	gate valve
Ga	gauge
Geod	geodetic
GIS	Geographical Information System
G	giga
GPS	Global Positioning System
Gov	government
Grd	graded/grade
Gr	gravel
Grnd	ground
GWM	ground water monitor
Gdrl	guardrail
Gtr	gutter
H Plg	H piling
Hdwl	headwall
Ha	hectare
Ht	height
HI	height of instrument
Hel	helical
H	henry
Hz	hertz
HDPE	high density polyethylene
HM	high mast
HP	high pressure
HPS	high pressure sodium
Hwy	highway
Hor	horizontal
HBP	hot bituminous pavement
HMA	hot mix asphalt
Hr	hour(s)
Hyd	hydrant
Ph	hydrogen ion content
Id	identification
In or "	inch
Incl	inclinometer tube
IMH	inlet manhole
ID	inside diameter
Inst	instrument
Intchg	interchange
Intmdt	intermediate
Intscn	intersection
Inv	invert
IM	iron monument
I Pn	Iron Pin
IP	iron Pipe
Jt	joint
J	joule
Jct	junction
K	kelvin
Kn	kilo newton
Kpa	kilo pascal
Kg	kilogram
Kg/m3	kilogram per cubic meter
Km	kilometer
K	Kip(s)
LS	Land Surveyor (licensed)
LSIT	Land Surveyor In Training
Ln	lane
Lg	large
Lat	latitude
Lt	left
L	length of curve
Lens	lenses
Lvl	level
LB	level book
Lvlng	leveling
Lht	light
LP	light pole
Ltg	lighting
Lig Co	lignite coal
Lig Sl	lignite slack
LF	linear foot
Liq	liquid
LL	liquid limit
L	litre
Lm	loam
Loc	location
LC	long chord
Long.	longitude
Lp	loop
LD	loop detector
Lm	lumen
Lum	luminaire
L Sum	lump sum
Lx	lux
ML	main line
M Hr	man hour
MH	manhole
Mkd	marked
Mkr	marker
Mkg	marking
MA	mast arm
Matl	material
Max	maximum
MC	meander corner
Meas	measure
Mdn	median
MD	median drain
MC	medium curing
M	mega
Mer	meridian
M	meter
M/s	meters per second
M	mid ordinate of curve
Mi	mile
MM	mile marker
MP	mile post
Ml	milliliter
Mm	millimeter
Mm/hr	millimeters per hour
Min	minimum
Misc	miscellaneous
Mon	monument
Mnd	mound
Mtbl	mountable
Mtd	mounted
Mtg	mounting
Mk	muck
Mun	municipal
N	nano
NGS	National Geodetic Survey
NS	near side
Neop	neoprene
Ntwk	network
N	newton
N	North
NE	North East
NW	North West
NB	Northbound
No. or #	number
Obsc	obscure(d)
Obsn	observation
Ocpd	occupied
Ocpy	occupy
Off Loc	office location
O/s	offset
OC	on center
C	one dimensional consolidation
OC	organic content
Orig	original
O To O	out to out
OD	outside diameter
OH	overhead
PMT	pad mounted transformer
Pg	pages
Pntd	painted
Pr	pair
Pnl	panel
Pk	park
PK	Parker-Kalon nail
Pa	pascal
PSD	passing sight distance
Pvmt	pavement
Ped	pedestal
Ped	pedestrian
PPP	pedestrian pushbutton post
Pen.	penetration
Perf	perforated
Per.	perimeter
PL	pipeline
Pl	place
P&P	plan & profile
PL	plastic limit
Pl	plate
Pt	point
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
PE	polyethylene
PVC	polyvinyl chloride
PCC	Portland Cement concrete
Lb or #	pounds
PP	power pole
Preempt	preemption
Prefab	prefabricated
Prfmd	preformed
Prep	preperation
Press.	pressure
PRV	pressure relief valve
Prestr	prestressed
Pvt	private
PD	private drive
Prod.	production/produce
Prog	programmed
Prop.	property
Prop Ln	property line
Ppsd	proposed
PB	pull box

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NDDOT ABBREVIATIONS

Qty	quantity
Qtr	quarter
Rad or R	radius
RR	railroad
Rlwy	railway
Rsd	raised
RTP	random traverse point
Rge or R	range
RC	rapid curing
Rec	record
Rcy	recycle
RAP	recycled asphalt pavement
RPCC	recycled portland cement concrete
Ref	reference
R Mkr	reference marker
RM	reference monument
Refl	reflectorized
RCB	reinforced concrete box
RCES	reinforced concrete end section
RCP	reinforced concrete pipe
RCPS	reinforced concrete pipe sewer
Reinf	reinforcement
Res	reservation
Ret	retaining
Rev	reverse
Rt	right
R/W	right of way
Riv	river
Rd	road
Rdbd	road bed
Rdwy	roadway
RWIS	roadway weather information system
Rk	rock
Rt	route
Salv	salvage(d)
Sd	sand
Sdy Cl	sandy clay
Sdy Cl Lm	sandy clay loam
Sdy Fl	sandy fill
Sdy Lm	sandy loam
San	sanitary sewer line
Sc	scoria
Sec	seconds
Sec	section
SL	section line
Sep	separation
Seq	sequence
Serv	service
Sh	shale
Sht	sheet
Shtng	sheeting
Shldr	shoulder
Sw	sidewalk
S	siemens
SD	sight distance
SN	sign number
Sig	signal
Si Cl	silt clay
Si Cl Lm	silty clay loam
Si Lm	silty loam
Sgl	single
SC	slow curing
SS	slow setting
Sm	small
S	South
SE	South East
SW	South West
SB	Southbound
Sp	spaces
Spcl	special
SA	special assembly
SP	special provisions
G	specific gravity
Spk	spike
SC	spiral to curve
ST	spiral to tangent
SB	split barrel sample
SH	sprinkler head
SV	sprinkler valve
Sq	square
SF	square feet
Km2	square kilometer
M2	square meter
SY	square yard
Stk	stake
Std	standard
N	standard penetration test
Std Specs	standard specifications
Sta	station
Sta Yd	station yards
Stm L	steam line
SEC	steel encased concrete
SMA	stone matrix asphalt
SSD	stopping sight distance
SD	storm drain
St	street
SPP	structural plate pipe
SPPA	structural plate pipe arch
Str	structure
Subd	subdivision
Sub	subgrade
Sub Prep	subgrade preperation
Ss	subsoil
SE	superelevation
SS	supplement specification
Supp	supplemental
Surf	surfacing
Surv	survey
Sym	symmetrical
SI	systems international
Tan	tangent
T	tangent (semi)
TS	tangent to spiral
Tel	telephone
Tel B	Telephone Booth
Tel P	telephone pole
Tv	television
Temp	temperature
Temp	temporary
TBM	temporary bench mark
T	tesla
T	thinwall tube sample
T/mi	tons per mile
Ts	topsoil
Twp or T	township
Traf	traffic
TSCB	traffic signal control box
Tr	trail
Transf	transformer
TB	transit book
Trans	transition
TT	transmission tower
Trans	transverse
Trav	traverse
TP	traverse point
Trtd	treated
Trmt	treatment
Qc	triaxial compression
TERO	tribal employment rights ordinance
Tpl	triple
TP	turning point
Typ	typical
Qu	unconfined compressive strength
Ugrnd	underground
USC&G	US Coast & Geodetic Survey
USGS	US Geologic Survey
Util	utility
VG	valley gutter
Vap	vapor
Vert	vertical
VC	vertical curve
VCP	vitrified clay pipe
V	volt
Vol	volume
Wkwy	walkway
W	water content
WGV	water gate valve
WL	water line
WM	water main
WMV	water main valve
W Mtr	water meter
WSV	water service valve
WW	water well
W	watt
Wrng	wearing
Wb	weber
WIM	weigh in motion
W	west
WB	westbound
Wrng	wiring
W/	with
W/o	without
WC	witness corner
WGS	world geodetic system
Z	zenith

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

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

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Line Styles

D-101-20

Existing Topography

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

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

Proposed Topography

- 3-Cable w Posts
- Flow
- Fence
- Remove Line
- Wall
- Retaining Wall (Plan View)
- W-Beam w 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 Typicals

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

Geotechnical

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

Countours

- Depression Contours
- Supplemental Contour

Profile

- Subgrade, Subcut or Ditch Grade
- Topsoil Profile

Striping

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

Pavement Joints

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

Bridge Details

- Hidden Object
- Small Hidden Object
- Large Hidden Object
- Phantom Object
- Centerline Main
- Centerline
- Existing Ground (Details)
- Existing Conditions
- Sheet Piling

Erosion Control

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

Environmental

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

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Symbols

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North Arrow (Half Scale)

Truck Mounted Attenuator

Type I Barricade

Type II Barricade

Type III Barricade

Catch Basin

Cairn or Stone Circle

Video Detection Camera

Storm Drain Cap or Stub

Corrugated Metal End Section 18 Inch

Corrugated Metal End Section 24 Inch

Corrugated Metal End Section 30 Inch

Corrugated Metal End Section 36 Inch

Corrugated Metal End Section 42 Inch

Corrugated Metal End Section 48 Inch

Concrete Foundation

Ground Connection Conductor

Neutral Connection Conductor

Phase 1 Connection Conductor

Phase 2 Connection Conductor

Traffic Cone

Signal Controller

Pad Mounted Signal Controller

Alignment Data Point

Emergency Vehicle Detector

Attenuation Device

Diamond Grade Delineator Type A

Diamond Grade Delineator Type B

Diamond Grade Delineator Type C

Diamond Grade Delineator Type D

Diamond Grade Delineator Type E

Flexible Delineator

Flexible Delineator Type A

Flexible Delineator Type B

Flexible Delineator Type C

Flexible Delineator Type D

Flexible Delineator Type E

Delineator Type A

Delineator Type A Reset

Delineator Type B

Delineator Type B Reset

Delineator Type C

Delineator Type D

Delineator Type E

Delineator Drums

Spot Elevation

Existing Access Control Arrow

Existing Artifact

Existing Flashing Beacon

Existing Benchmark

Existing Railroad Battery Box

Existing Bush or Shrub

Existing Gas Cap or Stub

Existing Sanitary Cap or Stub

Existing Storm Drain Cap or Stub

Existing Water Cap or Stub

Existing Sanitary Cleanout

Existing Concrete Foundation

Existing Traffic Signal Controller

Existing Pad Mounted Signal Controller

Existing Sixteenth Section Corner

Existing Quarter Section Corner

Existing Section Corner

Existing Railroad Crossbuck

Existing Satellite Dish

Existing Fuel Dispensers

Existing Flexible Delineator Type A

Existing Flexible Delineator Type B

Existing Flexible Delineator Type C

Existing Flexible Delineator Type D

Existing Flexible Delineator Type E

Existing Delineator Type A

Existing Delineator Type B

Existing Delineator Type C

Existing Delineator Type D

Existing Delineator Type E

Existing EFB Misc

Existing Flashing Beacon

Existing Pipe Mounted Flasher

Existing Pad Mounted Feed Point

Existing Pipe Mounted Feed Point with Pad

Existing Pole Mounted Feed Point

Existing Railroad Frog

Existing Snow Gate 18

Existing Snow Gate 28

Existing Snow Gate 40

Existing Headwall

Existing Pedestrian Head with Number

Existing Signal Head

Existing Sprinkler Head

Existing Fire Hydrant

Existing Catch Basin Drop Inlet

Existing Curb Inlet

Existing Manhole Inlet

Existing Junction Box

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Symbols

D-101-31

- Existing Light Standard
- Existing High Mast Light Standard 10 Luminaire
- Existing High Mast Light Standard 3 Luminaire
- Existing High Mast Light Standard 4 Luminaire
- Existing High Mast Light Standard 5 Luminaire
- Existing High Mast Light Standard 6 Luminaire
- Existing High Mast Light Standard 7 Luminaire
- Existing High Mast Light Standard 8 Luminaire
- Existing High Mast Light Standard 9 Luminaire
- Existing Overhead Sign Structure Load Center
- Existing Luminaire
- Existing Light Standard Luminaire
- Existing Federal Mailbox
- Existing Private Mailbox
- Existing Meander Section Corner
- Existing Meter
- Existing Electrical Manhole
- Existing Gas Manhole
- Existing Sanitary Manhole
- Existing Sanitary Force Main Manhole
- Existing Sanitary Manhole with Valve
- Existing Storm Drain Manhole
- Existing Force Main Storm Drain Manhole
- Existing Force Main Storm Drain Manhole with Valve
- Existing Telephone Manhole
- Existing Manhole with Valve Water
- Existing Water Manhole
- Existing Mile Post Type A
- Existing Mile Post Type B
- Existing Mile Post Type C
- Existing Reference Marker
- Existing RW Marker
- Existing Utility Marker
- Iron Monument Found
- Iron Pin R/W Monument
- Existing Object Marker Type I
- Existing Object Marker Type II
- Existing Object Marker Type III
- Existing Electrical Pedestal
- Existing Telephone Pedestal
- Existing Fiber Optic Telephone Pedestal
- Existing TV Pedestal
- Existing Fiber Optic TV Pedestal
- Existing Fuel Filler Pipes
- Existing Traverse PI Aerial Panel
- Existing Pole
- Existing Power Pole
- Existing Power Pole with Transformer
- Existing Telephone Pole
- Existing Wood Pole
- Existing Post
- Existing Pedestrian Push Button Post
- Existing Control Point CP
- Existing Control Point GPS-RTK
- Existing Control Point TRI
- Existing Reference Marker Point NGS
- Existing Pull Box
- Existing Intelligent Transportation Pull Box
- Existing Water Pump
- Existing Slotted Reinforced Concrete Pipe
- Existing RR Profile Spot
- Existing Fuel Leak Sensors
- Existing Highway Sign
- Existing Miscellaneous Spot
- Existing Lighting Standard Pole
- Existing Traffic Signal Standard
- Existing Transformer
- Existing Large Evergreen Tree
- Existing Small Evergreen Tree
- Existing Large Tree
- Existing Small Tree
- Existing Tree Trunk
- Existing Pad Mounted Traffic Signal Control Box
- Existing Undefined Manhole
- Existing Undefined Pull Box
- Existing Undefined Pedestal
- Existing Undefined Valve
- Existing Undefined Pipe Vent
- Existing Gas Valve
- Existing Water Valve
- Existing Fuel Pipe Vent
- Existing Gas Pipe Vent
- Existing Sanitary Pipe Vent
- Existing Storm Drain Pipe Vent
- Existing Water Pipe Vent
- Existing Weather Station
- Existing Ground Water Well Bore Hole
- Existing Windmill or Tower
- Existing Witness Corner
- Flashing Beacon
- Flagger
- Pipe Mounted Flasher
- Sanitary Force Main with Valve

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Symbols

D-101-32

- Pad Mounted Feed Point
- Pipe Mounted Feed Point with Pad
- Pole Mounted Feed Point
- Headwall
- Double Headwall with Vegitation Barrier
- Single Headwall with Vegitation Barrier
- Pole Mounted Head
- Sprinkler Head
- Fire Hydrant
- Inlet Type 1
- Inlet Type 2
- Double Inlet Type 2
- Inlet Grate Type 2
- Junction Box
- High Mast Light Standard 10 Luminaire
- High Mast Light Standard 3 Luminaire
- High Mast Light Standard 4 Luminaire
- High Mast Light Standard 5 Luminaire
- High Mast Light Standard 6 Luminaire
- High Mast Light Standard 7 Luminaire
- High Mast Light Standard 8 Luminaire
- High Mast Light Standard 9 Luminaire
- Relocate Light Standard
- Overhead Sign Structure Load Center
- Light Standard 100 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 150 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 175 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 35 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 400 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 700 Watt High Pressure Sodium Vapor Luminaire
- Manhole
- Manhole 48 Inch
- Sanitary Force Main Manhole
- Sanitary Sewer Manhole
- Storm Drain Manhole
- Storm Drain Manhole with Inlet
- Reset Mile Post
- Mile Post Type A
- Mile Post Type B
- Mile Post Type C
- Right of Way Marker
- Tubular Marker
- Alignment Monument
- Iron Pin Reference Monument
- Object Marker Type I
- Object Marker Type II
- Object Marker Type III
- Caution Mode Arrow Panel
- Back to Back Vertical Panel Sign
- Double Direction Arrow Panel
- Left Directional Arrow Panel
- Right Directional Arrow Panel
- Sequencing Arrow Panel
- Truck Mounted Arrow Panel
- Power Pole
- Wood Pole
- Pedestrian Push Button Post
- Property Corner
- Pull Box
- Intelligent Transportation Pull Box
- Sanitary Pump
- Storm Drain Pump
- Reinforced Pavement
- Reinforced Concrete End Section 15 Inch
- Reinforced Concrete End Section 18 Inch
- Reinforced Concrete End Section 24 Inch
- Reinforced Concrete End Section 30 Inch
- Reinforced Concrete End Section 36 Inch
- Reinforced Concrete End Section 42 Inch
- Reinforced Concrete End Section 48 Inch
- Reinforced Concrete End Section 54 Inch
- Reset Right of Way Marker
- Reset USGS Marker
- Right of Way Markers
- Riser 30 Inch
- Continuous Split Barrel Sample (CSB)
- Flight Auger Sample (FA)
- Split Barrel Sample (SB)
- Thinwall Tube Sample
- Highway Sign
- SNOW GATE 18 FT
- SNOW GATE 28 FT
- SNOW GATE 40 FT
- Standard Penetration Test (N)
- Transformer
- Inclinometer Tube (Incl)
- Underdrain Cleanout
- Excavation Unit
- Water Valve

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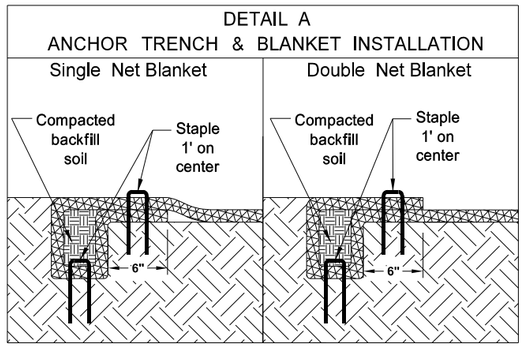
REVISIONS	
DATE	CHANGE

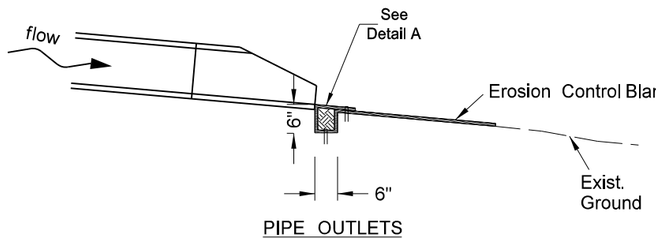
This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930 , on 07/01/14 and the original document is stored at the North Dakota Department of Transportation

D-255-2

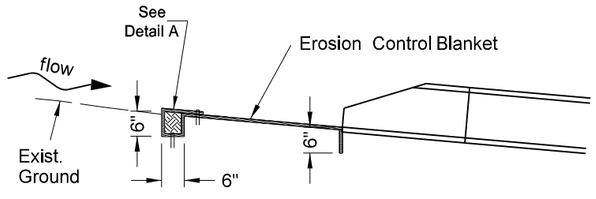
EROSION AND SILTATION CONTROL
EROSION CONTROL BLANKET INSTALLATION



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

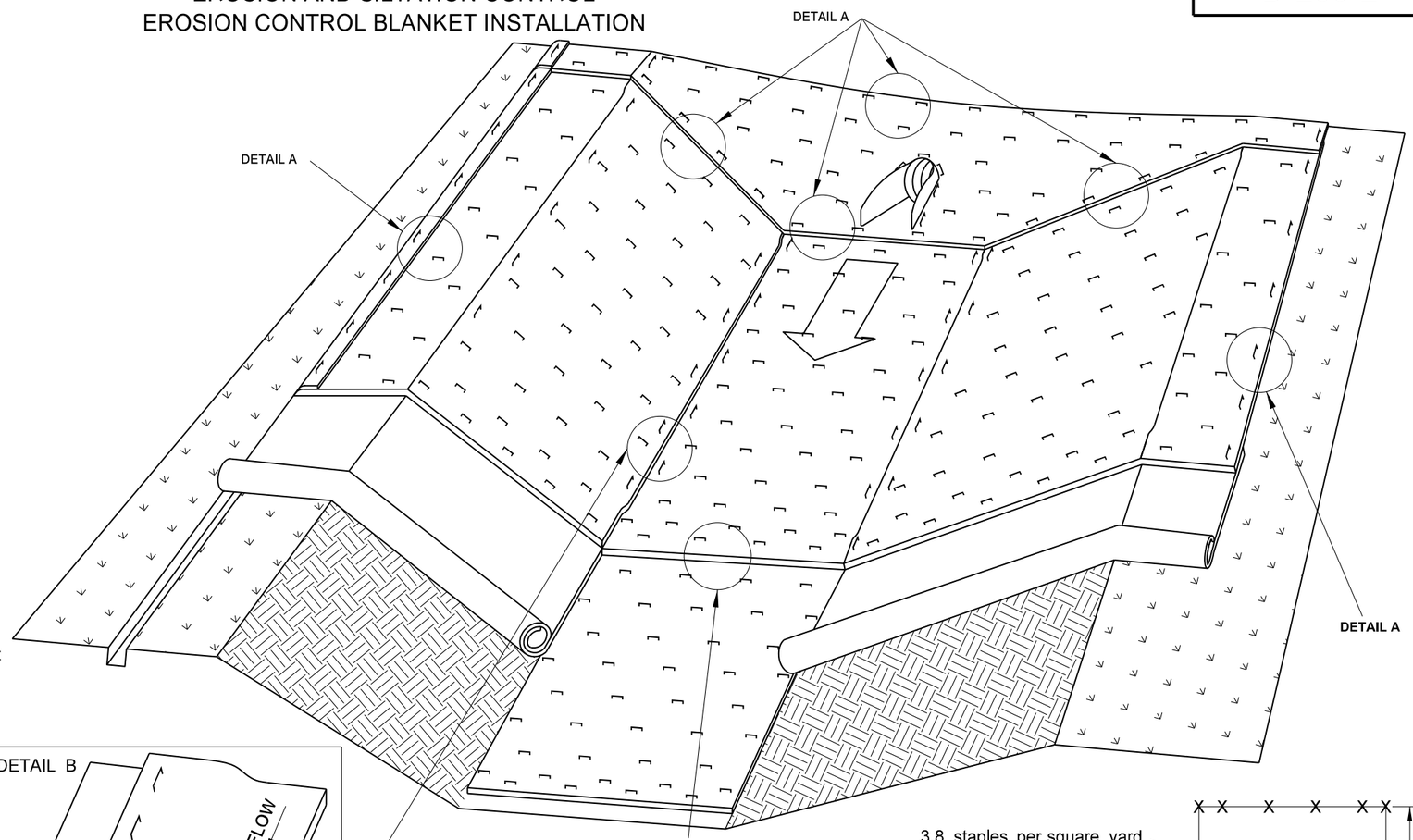


PIPE OUTLETS

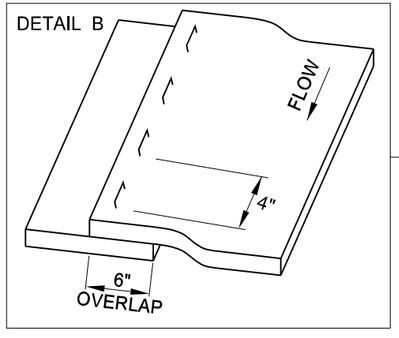


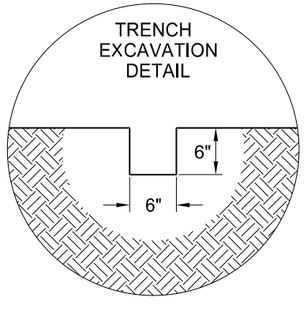
PIPE INLETS

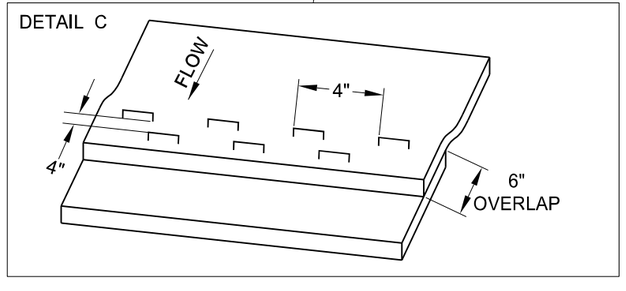
INSTALLATION AT PIPE ENDS



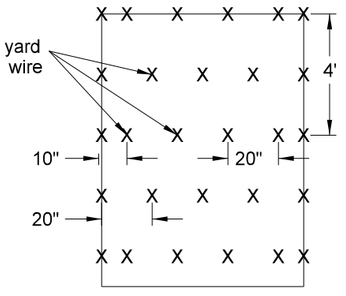
BLANKET LAYOUT
CHANNEL OR SLOPE INSTALLATION







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



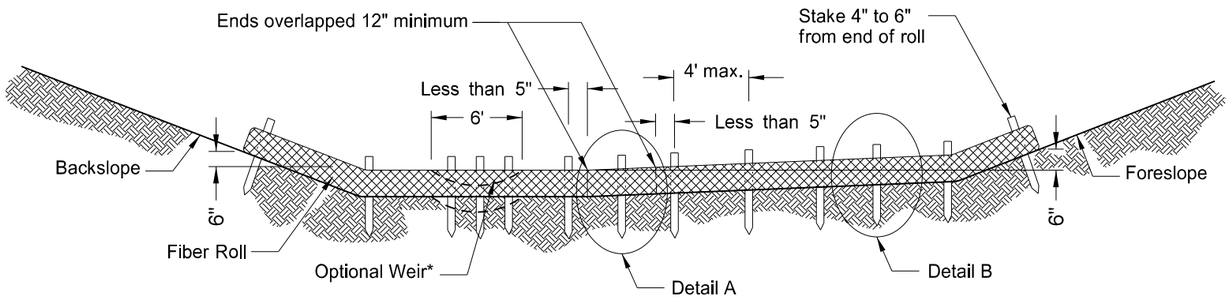
STAPLE PATTERN

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-709-5 to D-255-2.
07-27-15	Changed installation details such as trench depth and overlap dimensions.

This document was originally issued and sealed by Roger Weigel Registration Number PE- 2930 , on 07/27/15 and the original document is stored at the North Dakota Department of Transportation

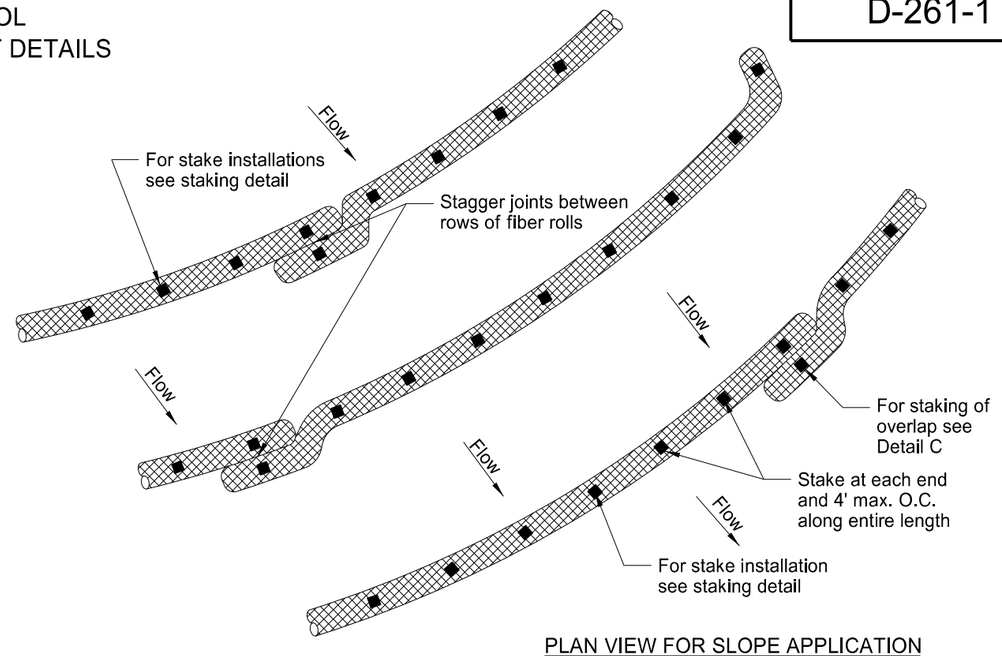
D-261-1

EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

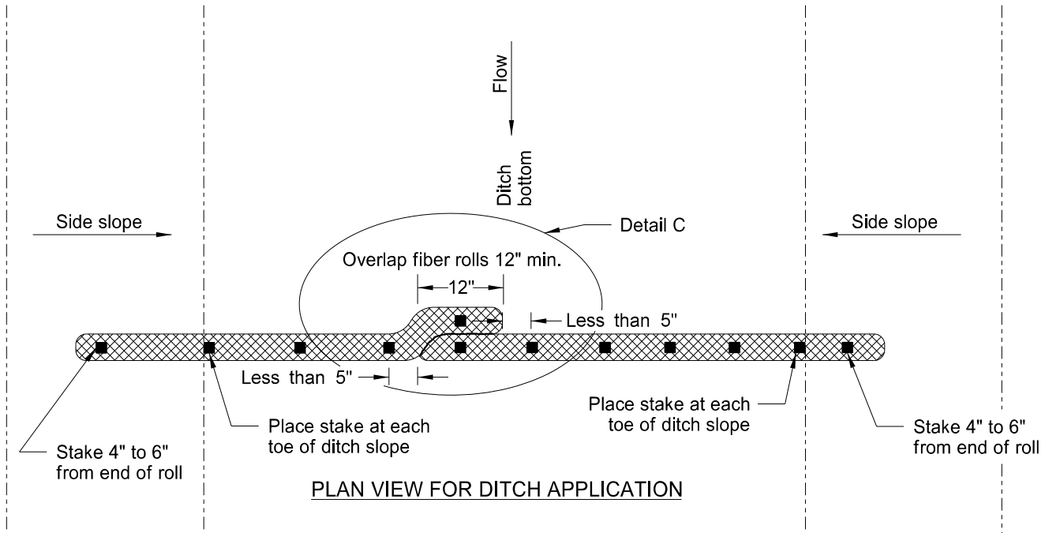


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

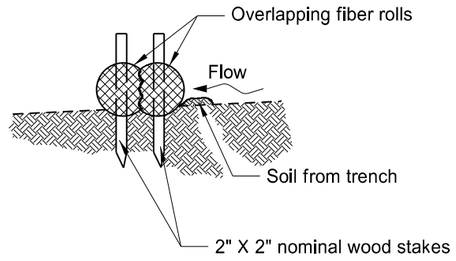
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



PLAN VIEW FOR SLOPE APPLICATION

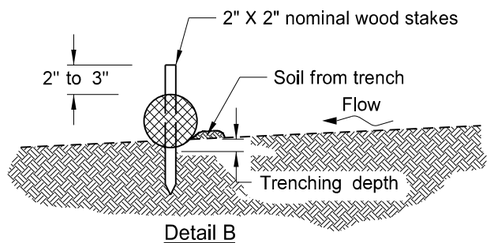


PLAN VIEW FOR DITCH APPLICATION



Detail A

Fiber Roll Overlapping Staking Detail



Detail B

Fiber Roll Staking Detail

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

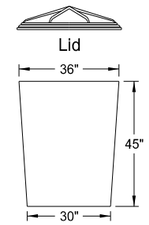
NOTE: Runoff must not be allowed to run under or around roll.

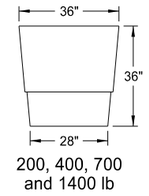
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-18-10	
REVISIONS	
DATE	CHANGE
06-10-13	Added plan view for ditch and slope application. Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.
06-26-14	Changed standard drawing number from D-708-7 to D-261-1

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 06/26/14 and the original document is stored at the North Dakota Department of Transportation

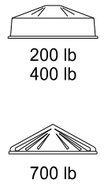
ATTENUATION DEVICE

D-704-1

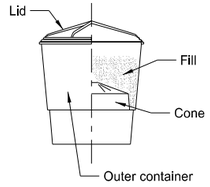




Outer Containers

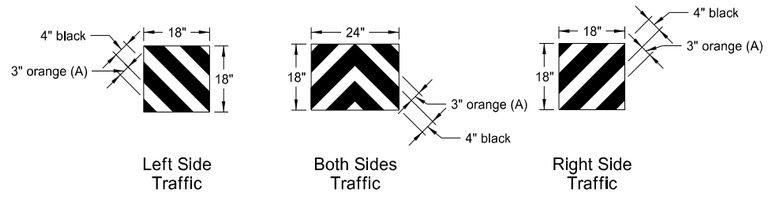


Cones



Typical Assembly

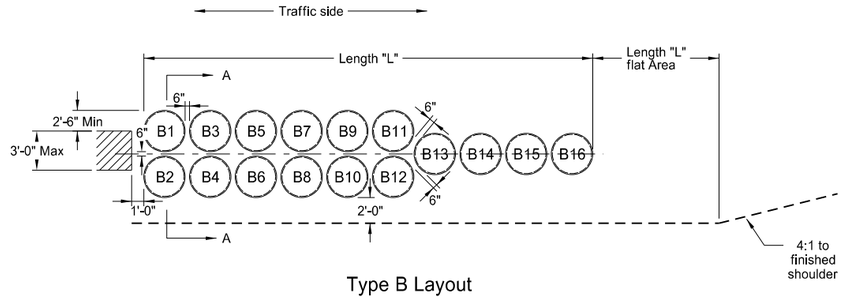
Typical Module
Construction Detail



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.

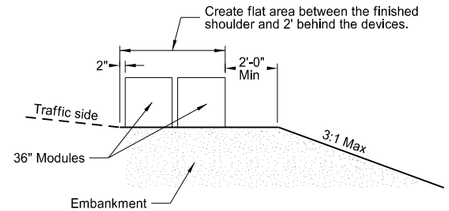
(A) Use 3" orange sheeting for temporary installations, and 3" yellow sheeting for permanent installations.



Type B Layout

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

Fill Chart					
	Module Weights (LBS)				
	200	400	700	1400	2100
Distance from top edge	8½"	5"	4"	3"	0"



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		
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:

1. Materials
   A) Use modules manufactured from frangible polyethylene material which shatters upon impact.
   B) 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.

2. Modules
   Provide modules in two sizes containing volumes of either 2, 4, 7, 14, or 21 cubic feet minimum.
   A) Provide three components for 2, 4, or 7 cubic foot module containers:
      1) A 14 C.F., yellow outer container.
      2) A black lid securely locking over the top lip of the container.
      3) 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.
   B) Provide two components for the 14 cubic foot module container:
      1) A 14 C.F., yellow outer container.
      2) A black lid securely locking over the top lip of the container.
   C) Provide two components for the 21 cubic foot module container:
      1) A 36" height X 36" width yellow outer container.
      2) A black lid which locks securely over the top of the container.

3. 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 3½" maximum thickness pallets to facilitate maintenance.

4. 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.

5. 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.

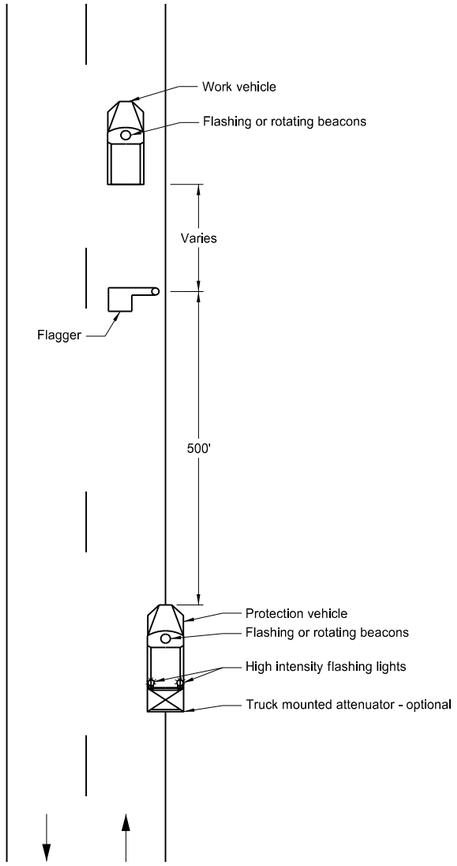
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
7-18-14	Revised sheeting in reflective sheet detail
9-27-17	Update to active voice

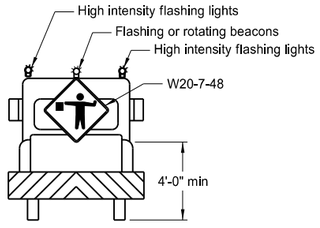
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 9/27/2017 and the original document is stored at the North Dakota Department of Transportation

TRAFFIC CONTROL FOR CORING OF HOT BITUMINOUS PAVEMENT

D-704-2

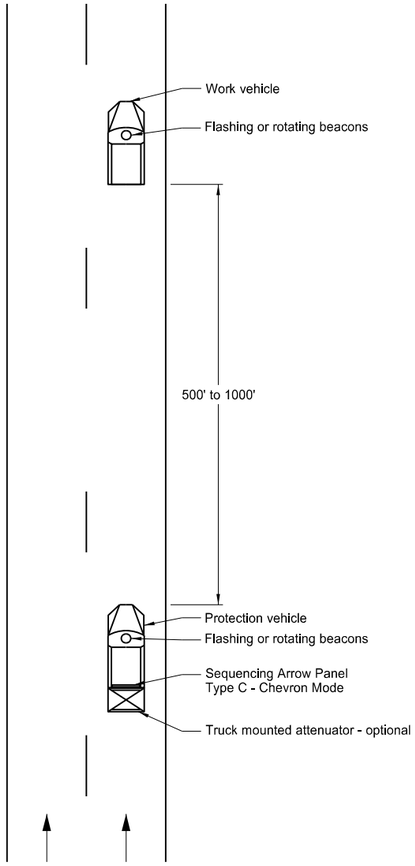
Two Lane, Two Way Roadways

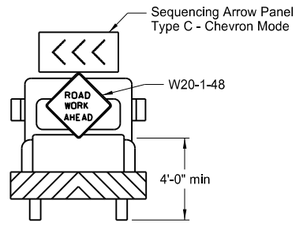




Typical Protection Vehicle

Multilane Roadways





Typical Protection Vehicle

Notes:

1. Display a 360 degree rotating, flashing, oscillating or strobe light on the working vehicle.

2. Display a 360 degree rotating, flashing, oscillating or strobe light on the shadow vehicle. Operate a sequencing arrow panel Type C in chevron mode on the shadow vehicle for Multilane Roadway.

3. Use these layouts during daylight hours and in areas of good visibility only.

4. Use flagger to protect the work area and warn oncoming traffic for two lane, two way roadway.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 9/27/2017 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN DETAIL

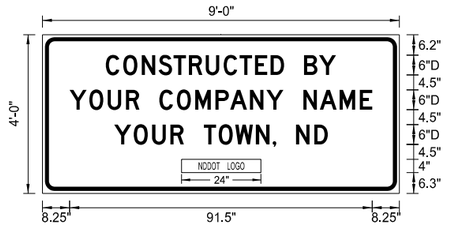
D-704-5

SIGN NUMBER	G20-10-108
WIDTH x HEIGHT	9'-0" x 4'-0"
BORDER WIDTH	1.25" (inset 0.75")
CORNER RADIUS	3"
MOUNTING	Ground
BACKGROUND	TYPE: IV Reflective
	COLOR: Fluorescent Orange
LEGEND/BORDER	TYPE: Non-Refl
	COLOR: Black

SYMBOL	X	Y	WID	HT	ANGLE
	42.1	6.2	24	4	0

STATION(S):

AREA: 36.0 Sq.Ft.



Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITION (X)																		LENGTH	SIZE	SERIES
C	O	N	S	T	R	U	C	T	E	D		B	Y					69.7	6	D 2000
19.2	24.5	30	35.1	39.7	44.3	49.4	54.8	59.7	64.3	69	73.1	79.1	83.7							
Y	O	U	R		C	O	M	P	A	N	Y		N	A	M	E		91.5	6	D 2000
8.3	14.2	19.8	25.3	29.4	35.4	40.7	46.2	52.4	56.8	62.8	67.8	72.9	78.9	83.9	89.9	96				
Y	O	U	R		T	O	W	N	,		N	D						64.6	6	D 2000
21.7	27.6	33.2	38.7	42.8	48.8	53.3	58.4	64.6	69.6	70.7	76.7	82.2								

Notes:

1. Post mount sign a distance of ½A following the End Road Work (G20-2a-48) sign (maximum 2 signs per project.)

2. Use sign on rural projects with a 30 day or longer duration (not required on seal coats or other short duration projects.)

3. Do not place sign in urban areas or within city limits.

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

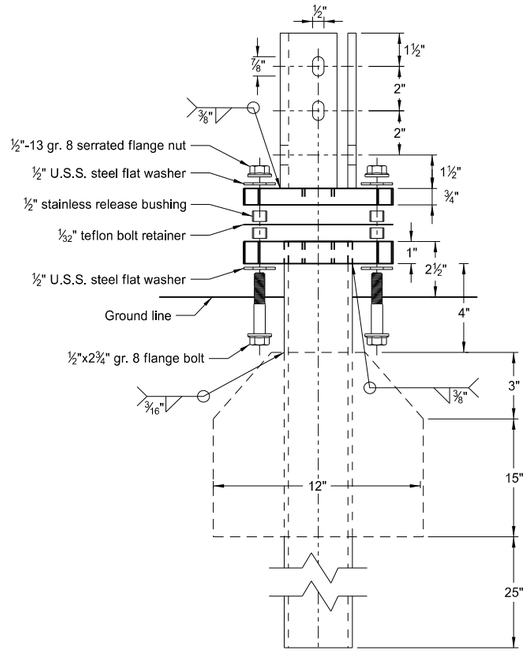
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
7-18-14	Revise sheeting to type IV
9-27-17	Updated to active voice

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 9/27/2017 and the original document is stored at the North Dakota Department of Transportation

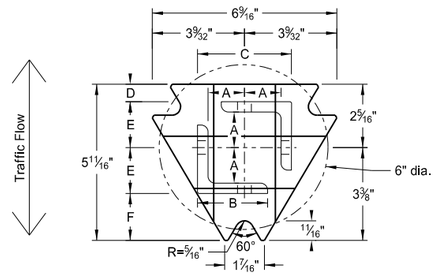
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

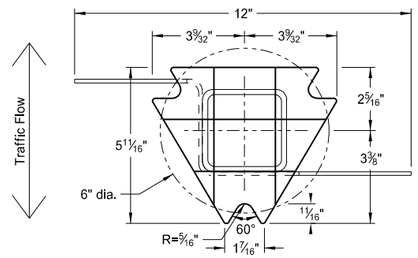
Perforated Tube



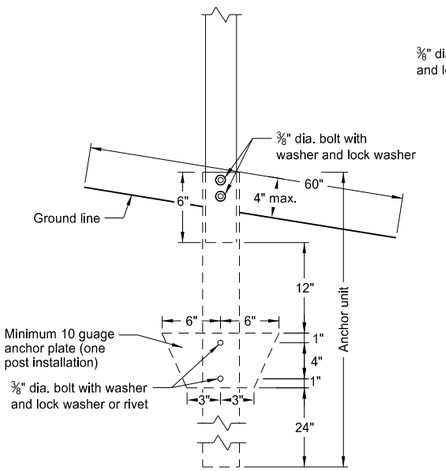
Multi-Directional
Slip Base Assembly



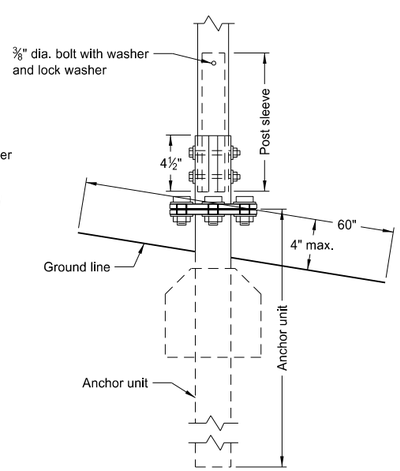
Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2½"x2½"x⅜" ASTM A36 structural angle



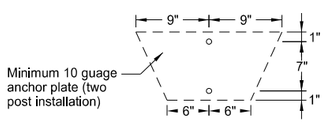
Bottom Soil Stub
Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50

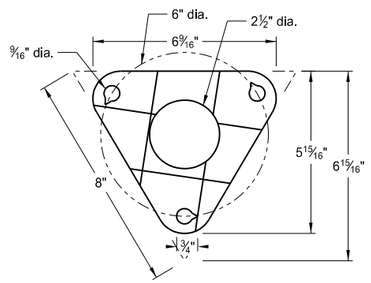


Anchor Unit and Post Assembly



Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly





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

Notes:

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

Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thick-ness Gauge	Sleeve Size in.	Wall Thick-ness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2¼
1	2¼	12			No	2½
1	2½	12			(A)	3
1	2½	10			Yes	
1	2¼	12	2	12	Yes	
1	2½	12	2¼	12	Yes	
2	2	12			No	2¼
2	2¼	12			No	2½
2	2½	12			Yes	
2	2½	12			Yes	
2	2¼	10	2	12	Yes	
2	2½	12	2¼	12	Yes	
3 & 4	2½	12			Yes	
3 & 4	2½	10			Yes	
3 & 4	2½	12	2¼	12	Yes	
3 & 4	2¼	12	2	12	Yes	
3 & 4	2½	10	2³/16	10	Yes	

Properties of Telescoping Perforated Tube						
Tube Size in.	Wall Thickness in.	U.S. Standard Gauge	Weight per Foot lbs.	Moment of Inertia in.⁴	Cross Sec. Area in.²	Section Modulus in.³
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2³/16 x 2³/16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.785

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

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice

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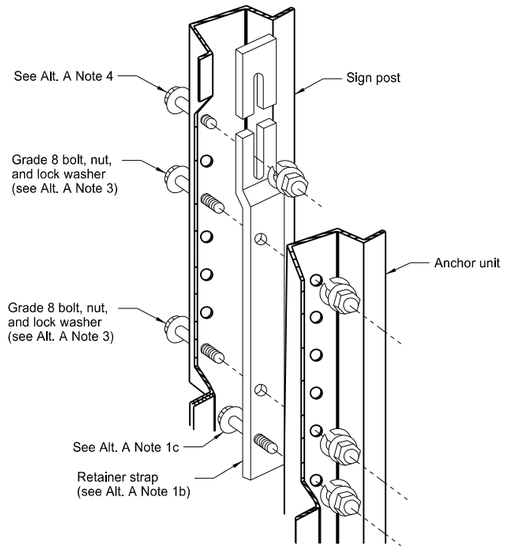
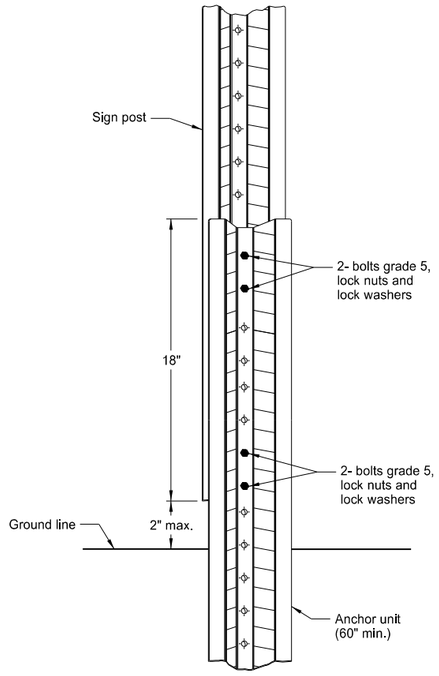
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

U-Channel Post

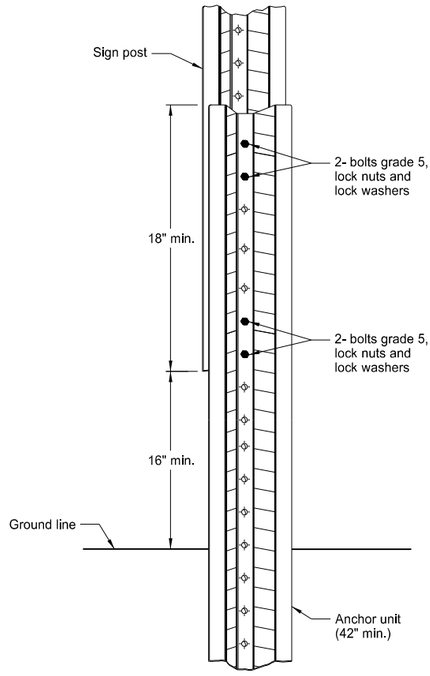


Detail A



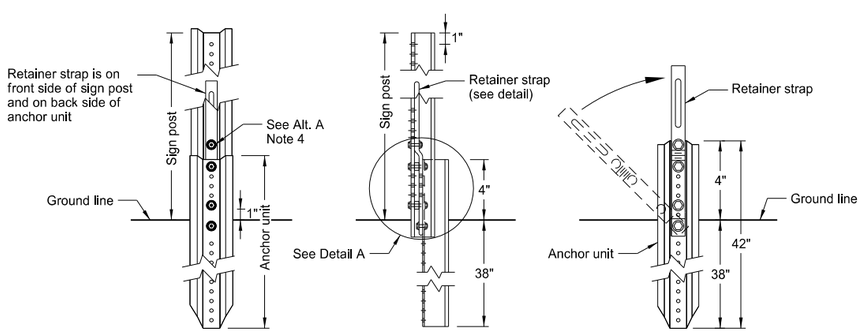
Breakaway U-Channel Splice Detail
Alternate B
(2.5 and 3 lb/ft)

Install a maximum of 3 posts within 7'.



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

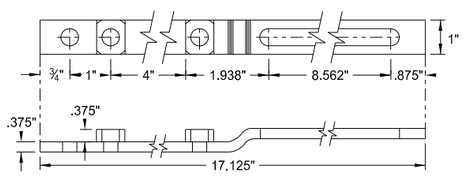
Install a maximum of 3 posts within 7'.



Front View Side View Back View

Breakaway U-Channel Detail
Alternate A

Install a maximum of 2 posts within 7'.



Retainer Strap Detail

Alternate A Steps of Installation:

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

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2-28-14	
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DATE	CHANGE
9-27-17	Updated to active voice

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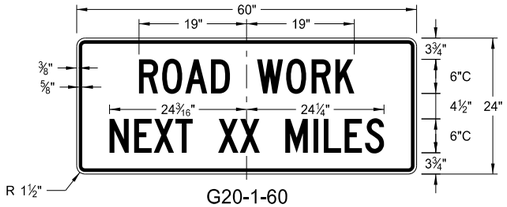
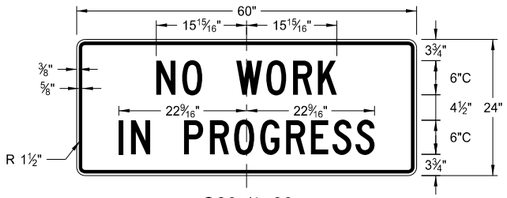
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



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



G20-1b-60
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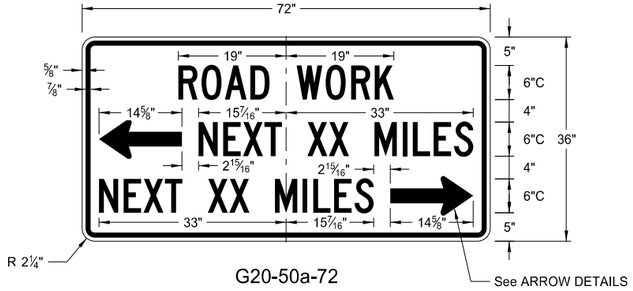
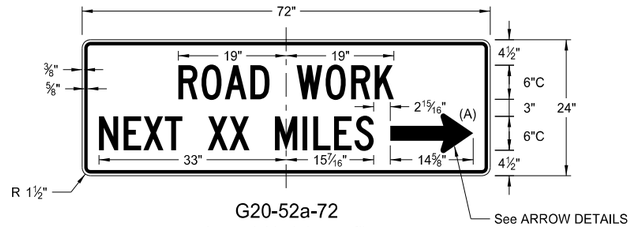


G20-50a-72
Legend: black (non-refl)
Background: orange



G20-52a-72
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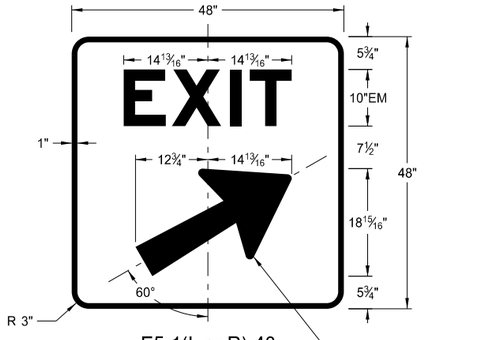
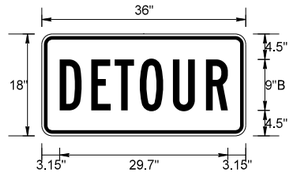
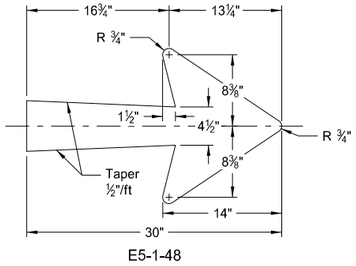


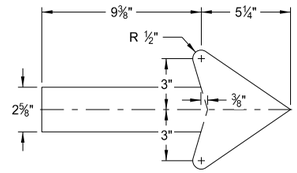
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



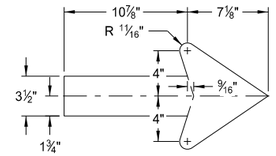
M4-8-36
Legend: black (non-refl)
Background: orange



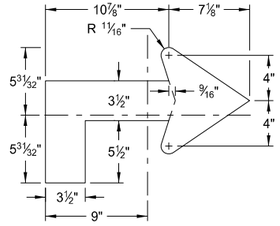
E5-1-48



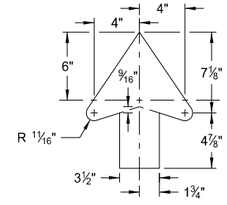
G20-50a-72
G20-52a-72



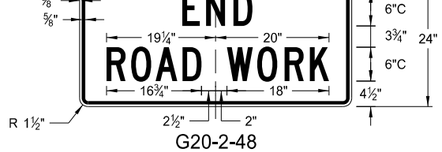
M4-9(L or R)-30
Right or Left



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

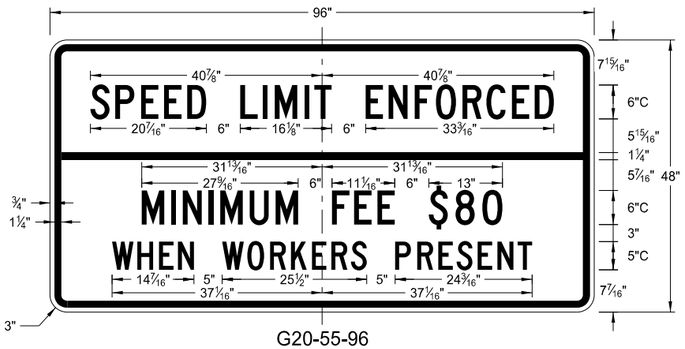


M4-9-30
Straight



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

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



G20-55-96
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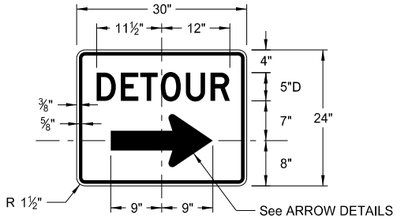
Background: orange



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

ARROW DETAILS

NOTES:

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Added sign & background color

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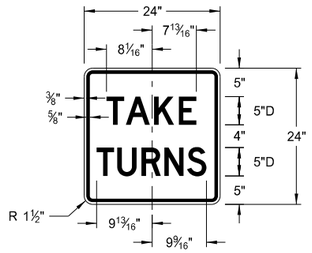
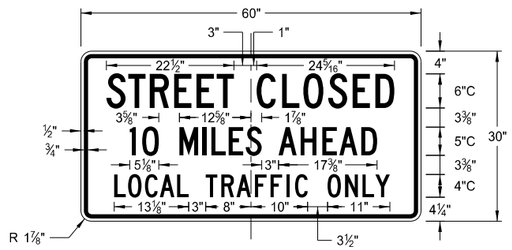
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



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



R11-3c-60
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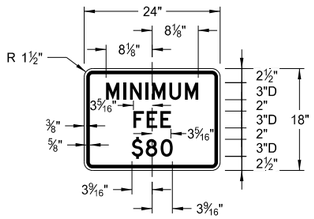
Background: white



R2-1aP-24
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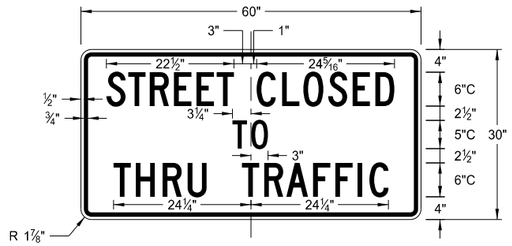
Background: white



R11-4a-60
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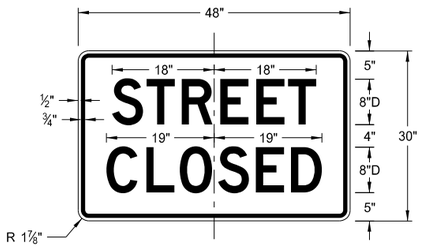
Background: white



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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Revised sign number

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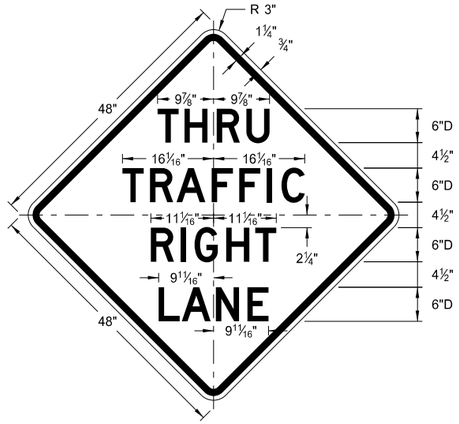
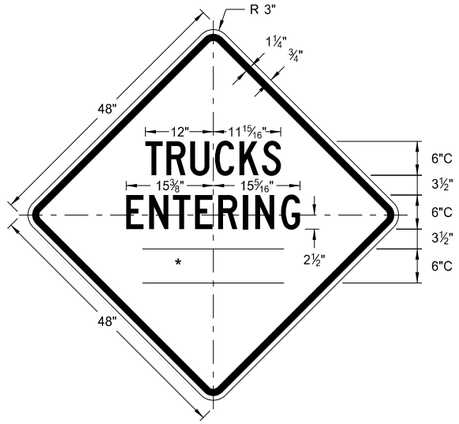
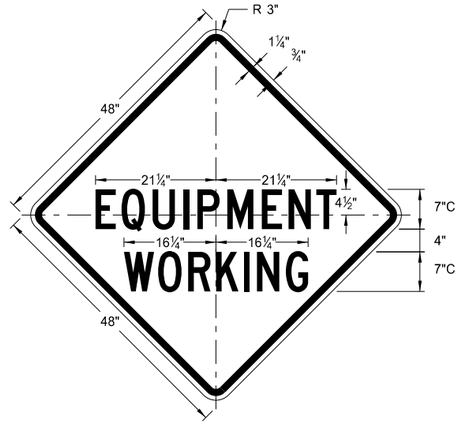
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



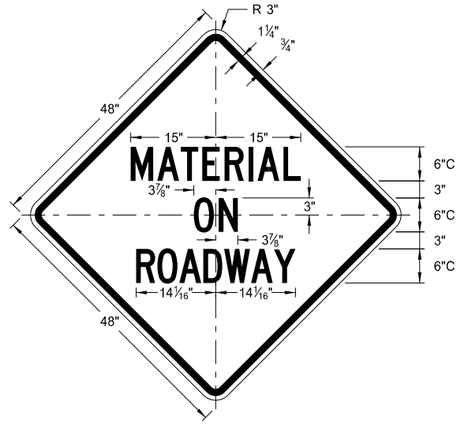
W5-8-48
Legend: black (non-refl)
Background: orange



W8-54-48
Legend: black (non-refl)
Background: orange



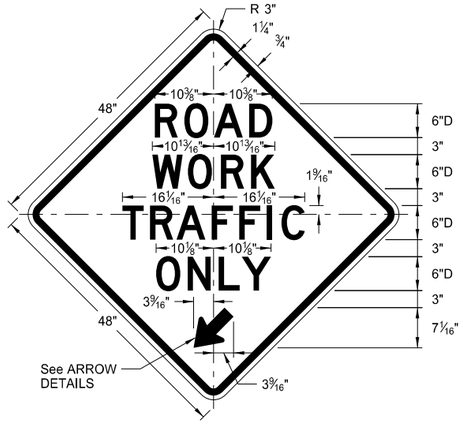
W20-51-48
Legend: black (non-refl)
Background: orange



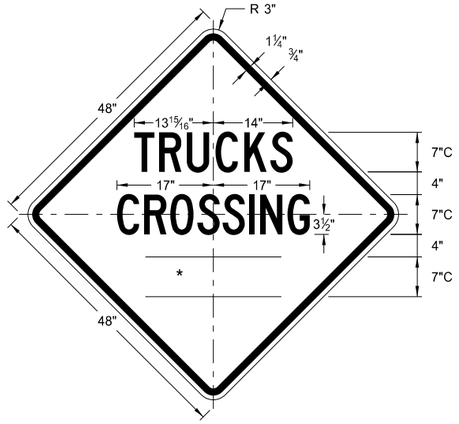
W21-51-48
Legend: black (non-refl)
Background: orange

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

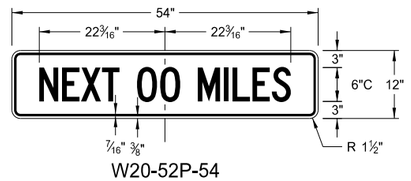
* DISTANCE MESSAGES



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



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



W20-52P-54
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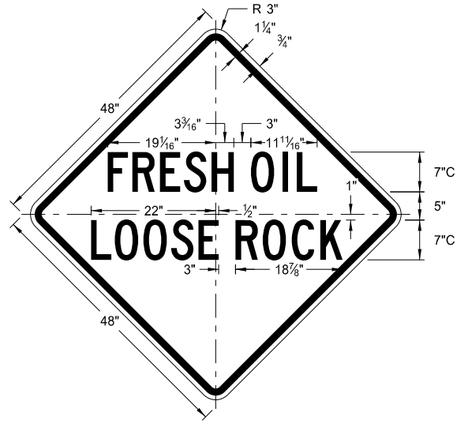
Background: orange



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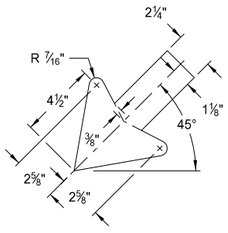
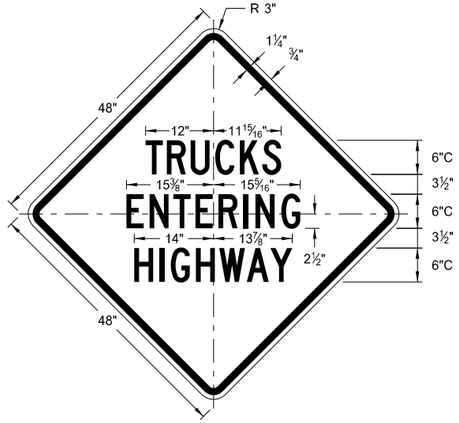


W5-9-48

ARROW DETAILS



W8-53-48
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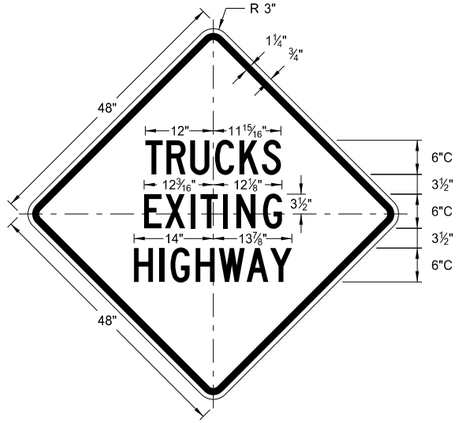
Background: orange



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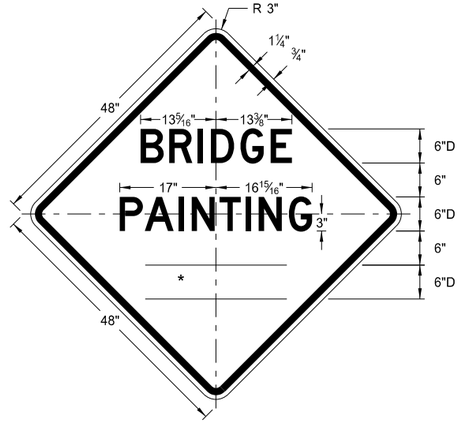

W21-50-48
Legend: black (non-refl)
Background: orange

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Updated sign number

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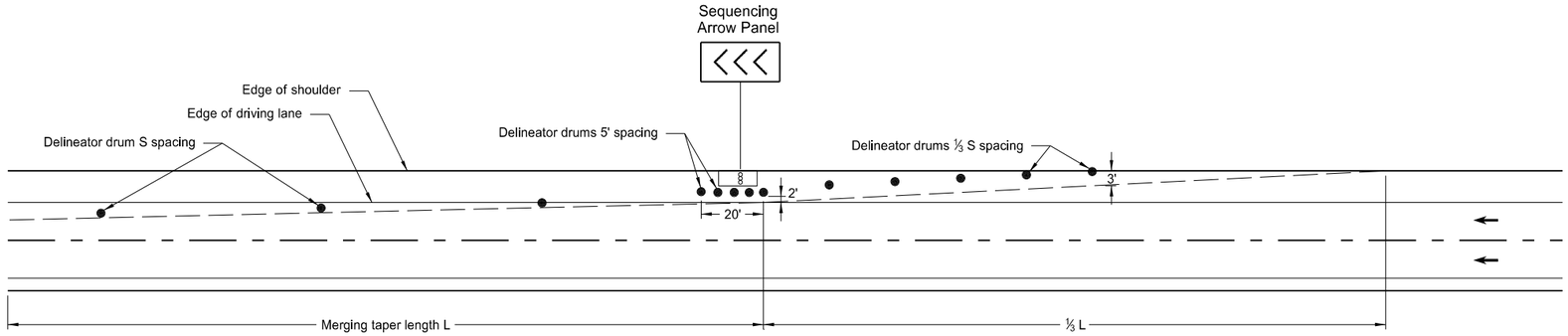
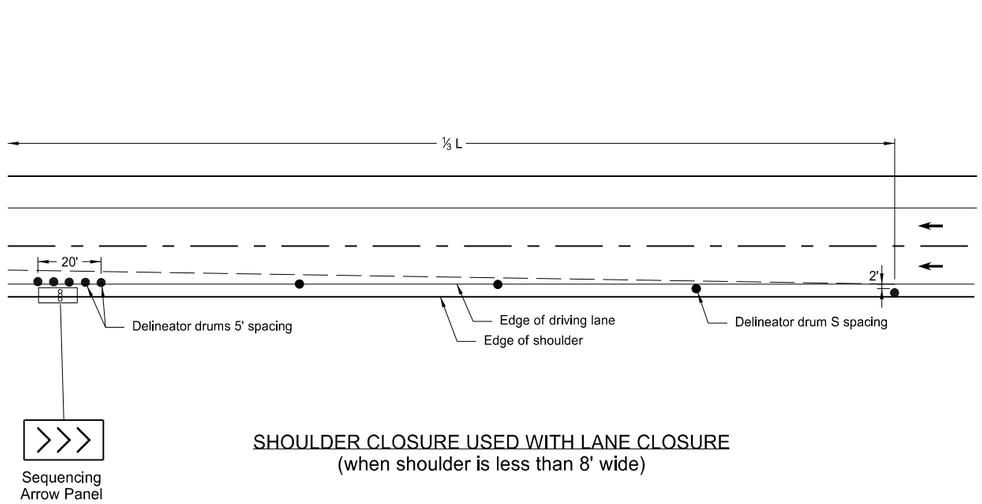
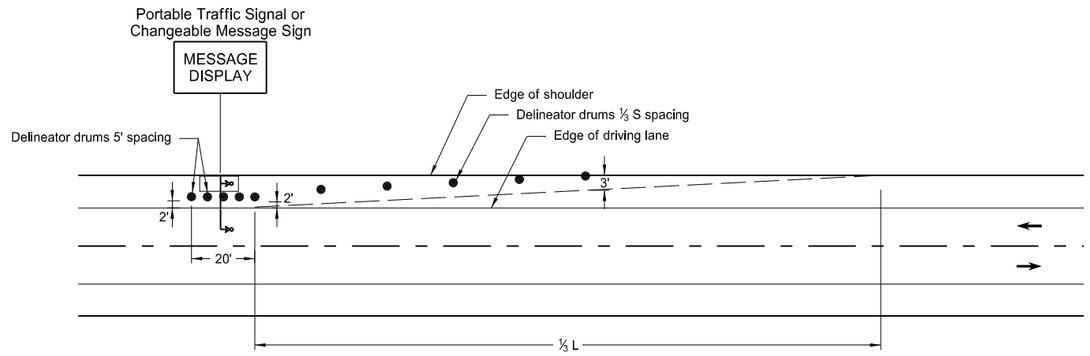
SHOULDER CLOSURE TAPERS



SHOULDER CLOSURE WITH LANE CLOSURE
(when shoulder is 8' or wider)



SHOULDER CLOSURE USED WITH LANE CLOSURE
(when shoulder is less than 8' wide)



PORTABLE TRAFFIC SIGNAL OR CHANGEABLE MESSAGE SIGN ON SHOULDER

KEY	
● Delineator Drum	∞ Sequencing Arrow Panel
◦ Message Display	Portable Traffic Signal

Notes:

1. S = Posted Speed Limit in mph
   W = Width of offset in feet
   L = Taper length in feet
   L = $WS^2/60$ (40mph or less)
   L = WS (45mph or more)
2. If a shoulder taper is used, use a length of approximately ⅓L. If a shoulder is used as a travel lane, use a normal merging or shifting taper.
3. When paved shoulders of 8 foot width or more are closed, use channelizing devices to close shoulder in advance, to delineate beginning of work space, and to direct vehicular traffic to remain within the traveled way.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice

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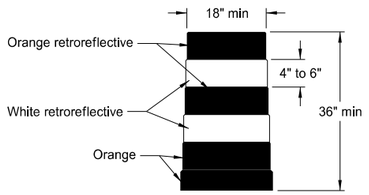
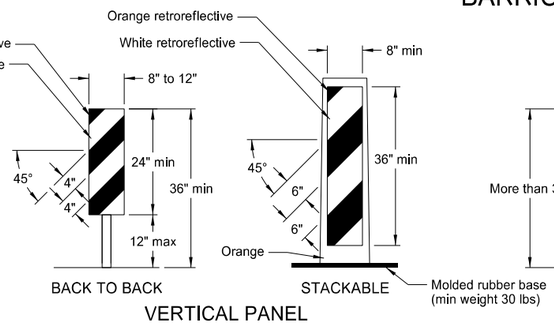
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



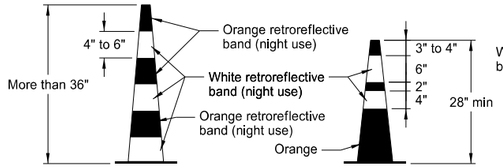
DELINEATOR DRUM

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



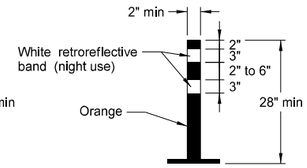
VERTICAL PANEL

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



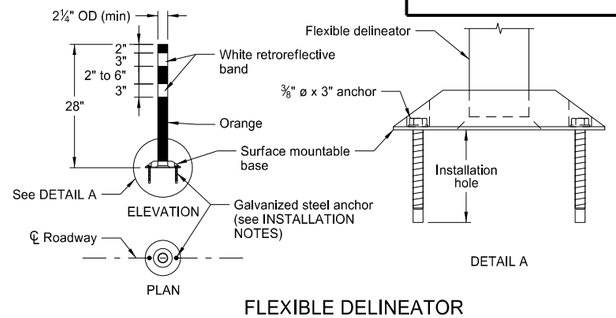
TRAFFIC CONE

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



TUBULAR MARKER

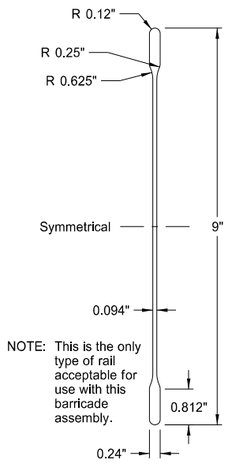
Provide retroreflectorization of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

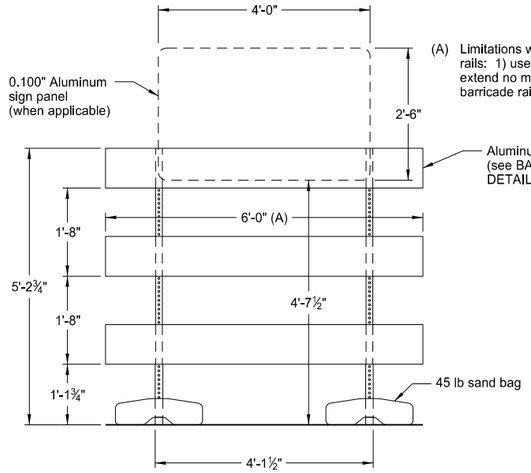
INSTALLATION NOTES:

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



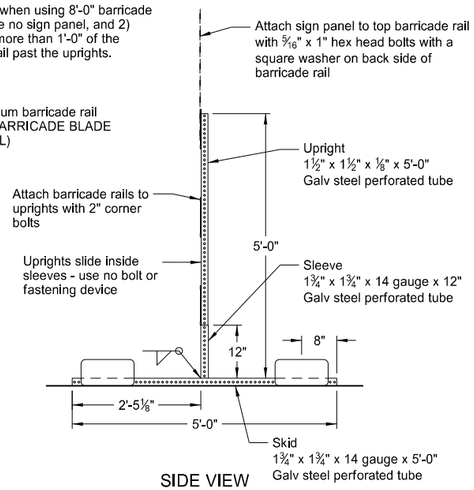
NOTE: This is the only type of rail acceptable for use with this barricade assembly.

BARRICADE BLADE DETAIL



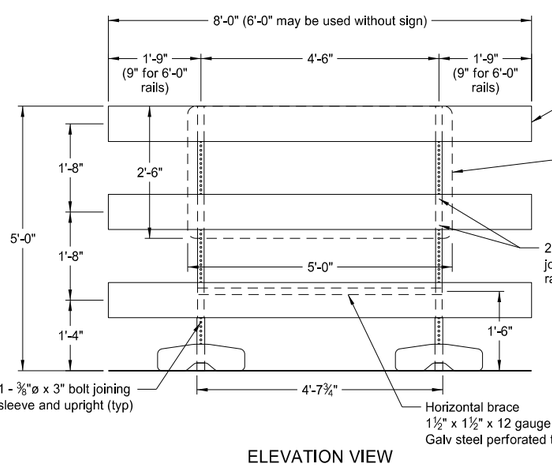
(A) Limitations when using 8'-0" barricade rails: 1) use no sign panel, and 2) extend no more than 1'-0" of the barricade rail past the uprights.

ELEVATION VIEW

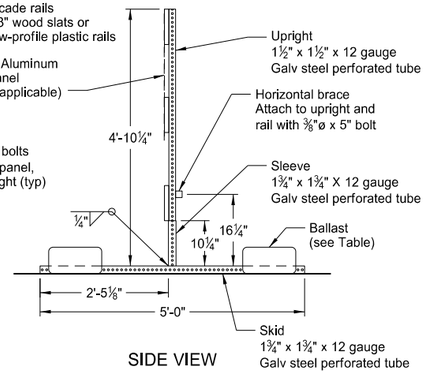


SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Aluminum Barricade Rails)



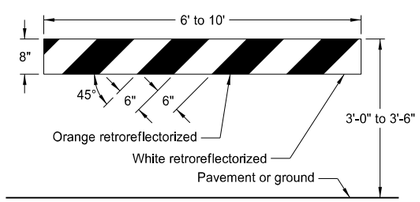
ELEVATION VIEW



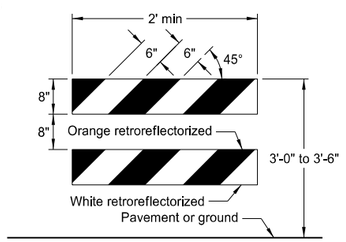
SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Wood or Plastic Rails)

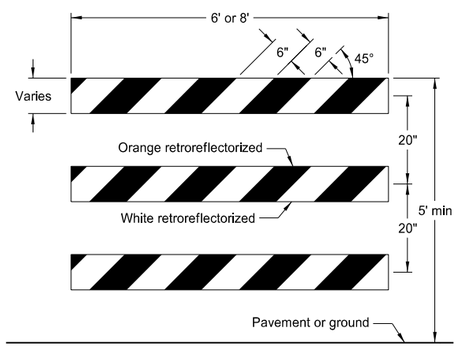
NOTE: For barricade markings use alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Place retroreflective sheeting on both sides of the rails with a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the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



TYPE I BARRICADE

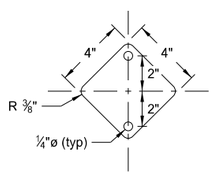


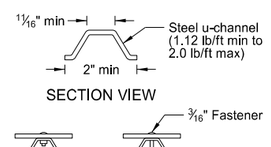
TYPE II BARRICADE

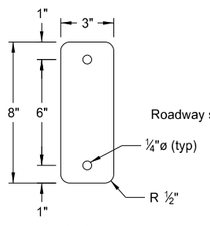


TYPE III BARRICADE

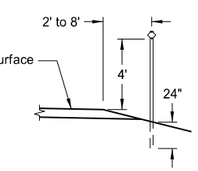
BARRICADE RAIL DETAILS







REFLECTOR DETAIL



ELEVATION

DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

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

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

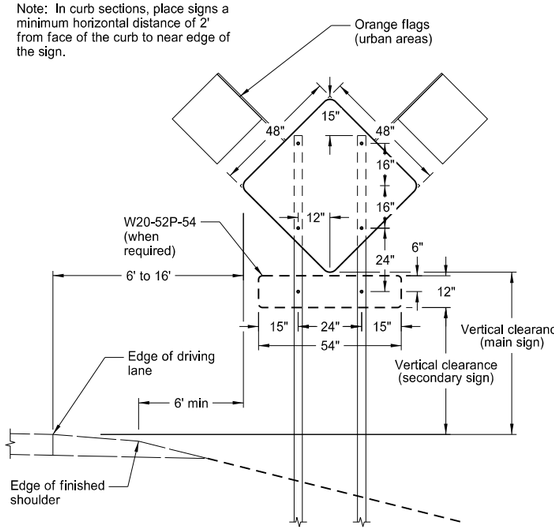
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 9/27/2017 and the original document is stored at the North Dakota Department of Transportation

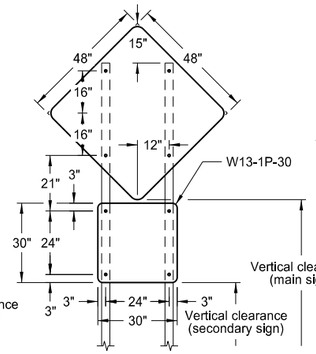
CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

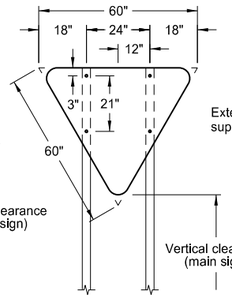
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



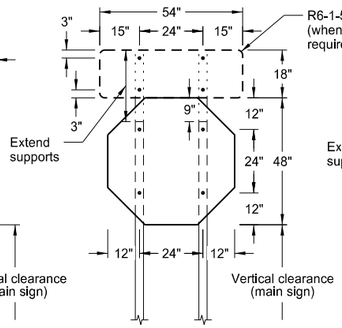
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



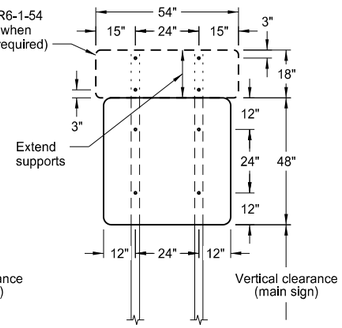
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



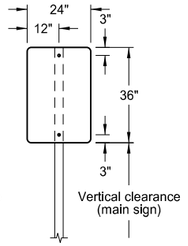
R1-2-60 - YIELD SIGN



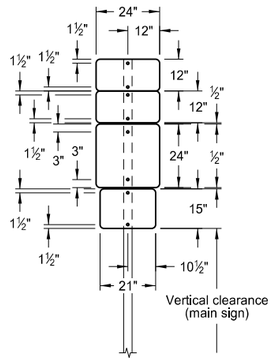
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



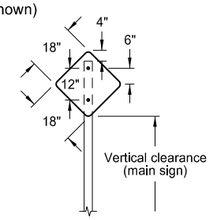
48" x 48" SIGN
(with R6-1-54 sign as required)



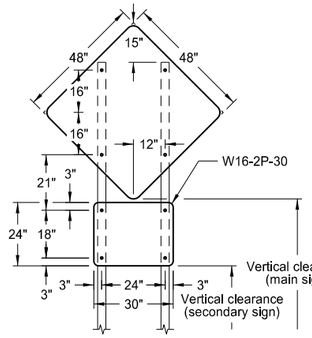
24" x 36" SIGN



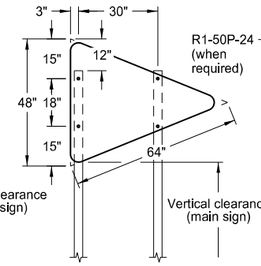
24" x 24"
ROUTE MARKER
ASSEMBLY



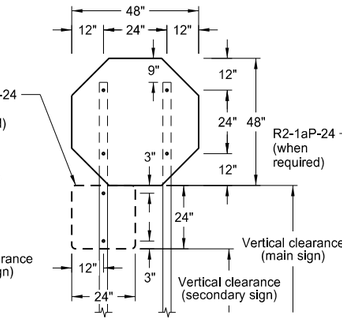
18" x 18"
DIAMOND SIGN



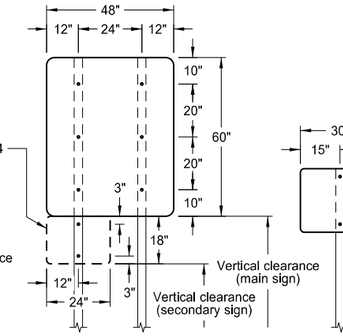
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



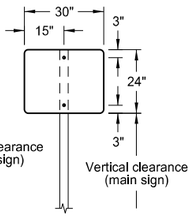
W14-3-64 - PENNANT SIGN



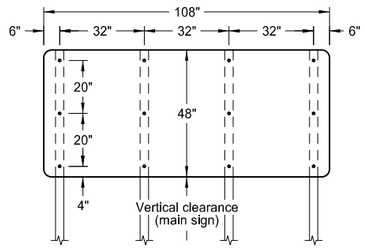
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



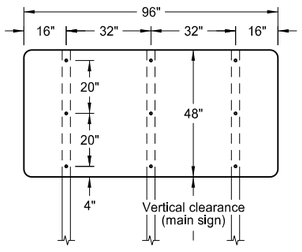
48" x 48" SIGN
(with R2-1aP-24 sign as required)



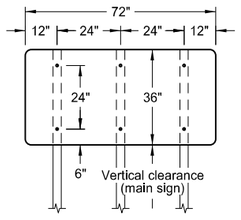
30" x 24" SIGN



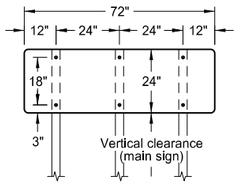
108" x 48" SIGN



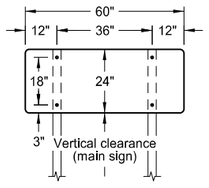
96" x 48" SIGN



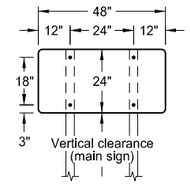
72" x 36" SIGN



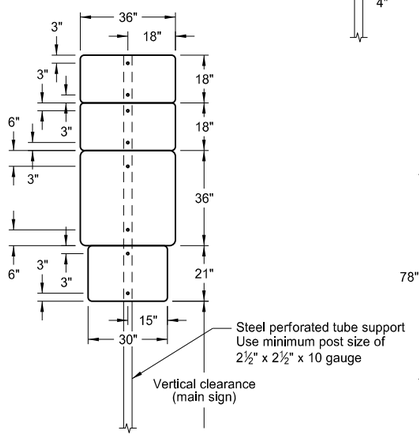
72" x 24" SIGN



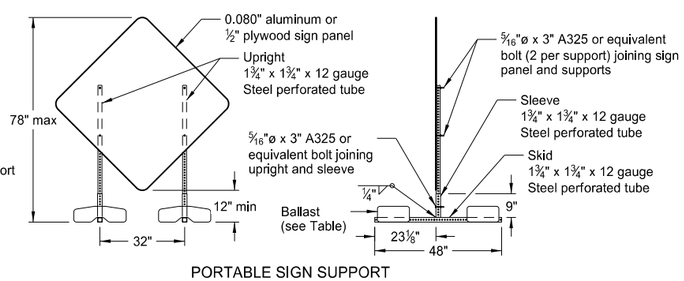
60" x 24" SIGN



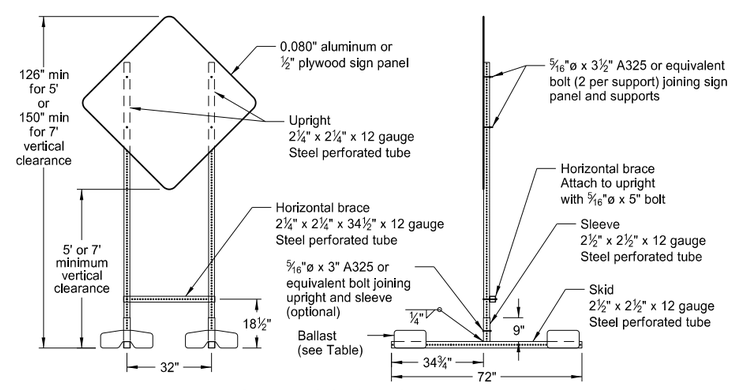
48" x 24" SIGN



36" x 36"
ROUTE MARKER
ASSEMBLY



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

MINIMUM BALLAST
(For each side of sign support base)

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

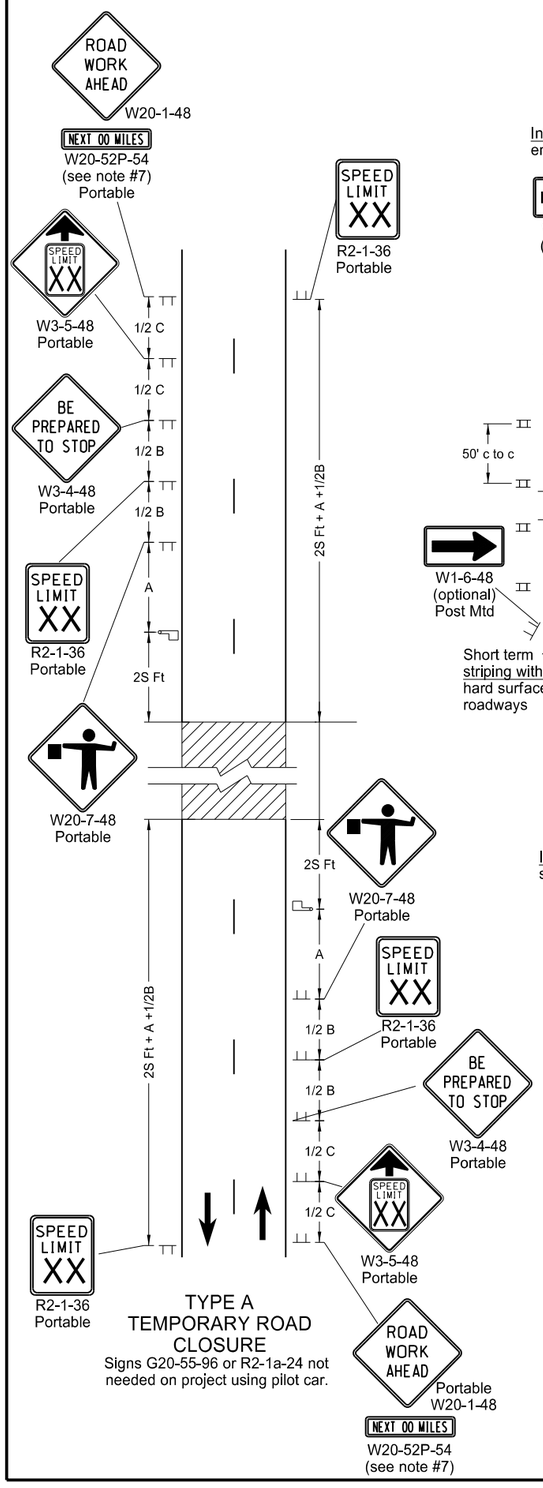
Note: The number of sandbags are based on a wind speed of 55 MPH. Place sandbags at or near the ends of skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-13	
REVISIONS	
DATE	CHANGE
11-14-13 9-27-17	Revised Note 6. Updated to active voice

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 9/27/2017 and the original document is stored at the North Dakota Department of Transportation

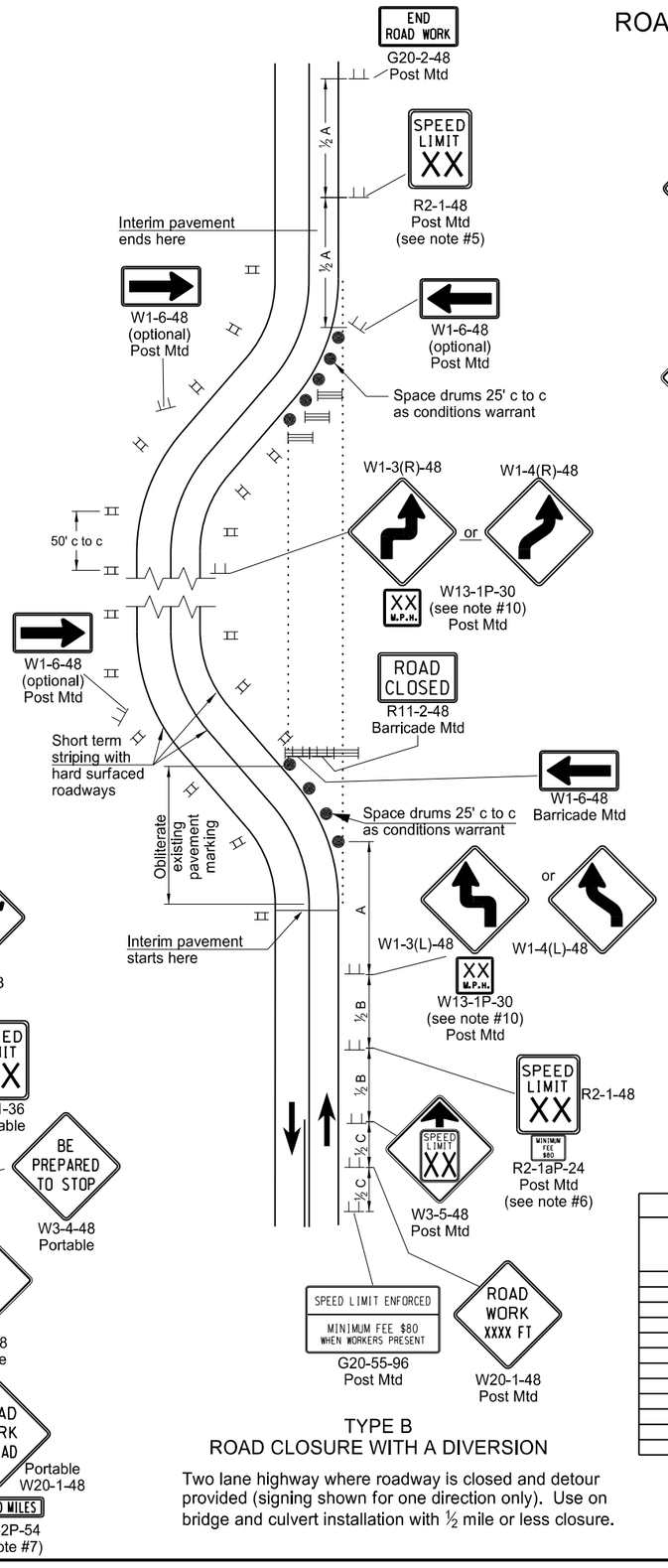
ROAD CLOSURE LAYOUTS

D-704-15



TYPE A
TEMPORARY ROAD CLOSURE

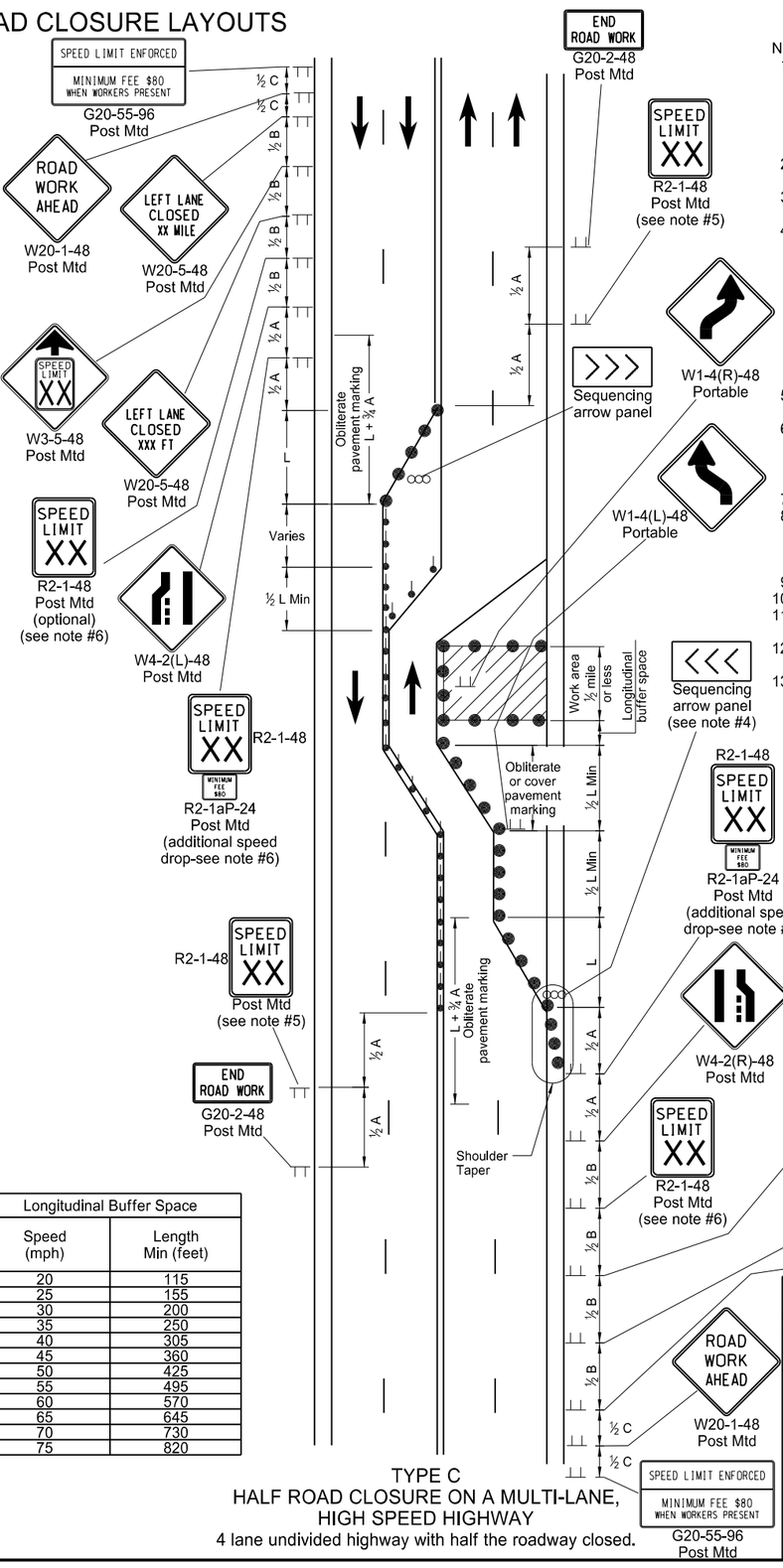
Signs G20-55-96 or R2-1a-24 not needed on project using pilot car.

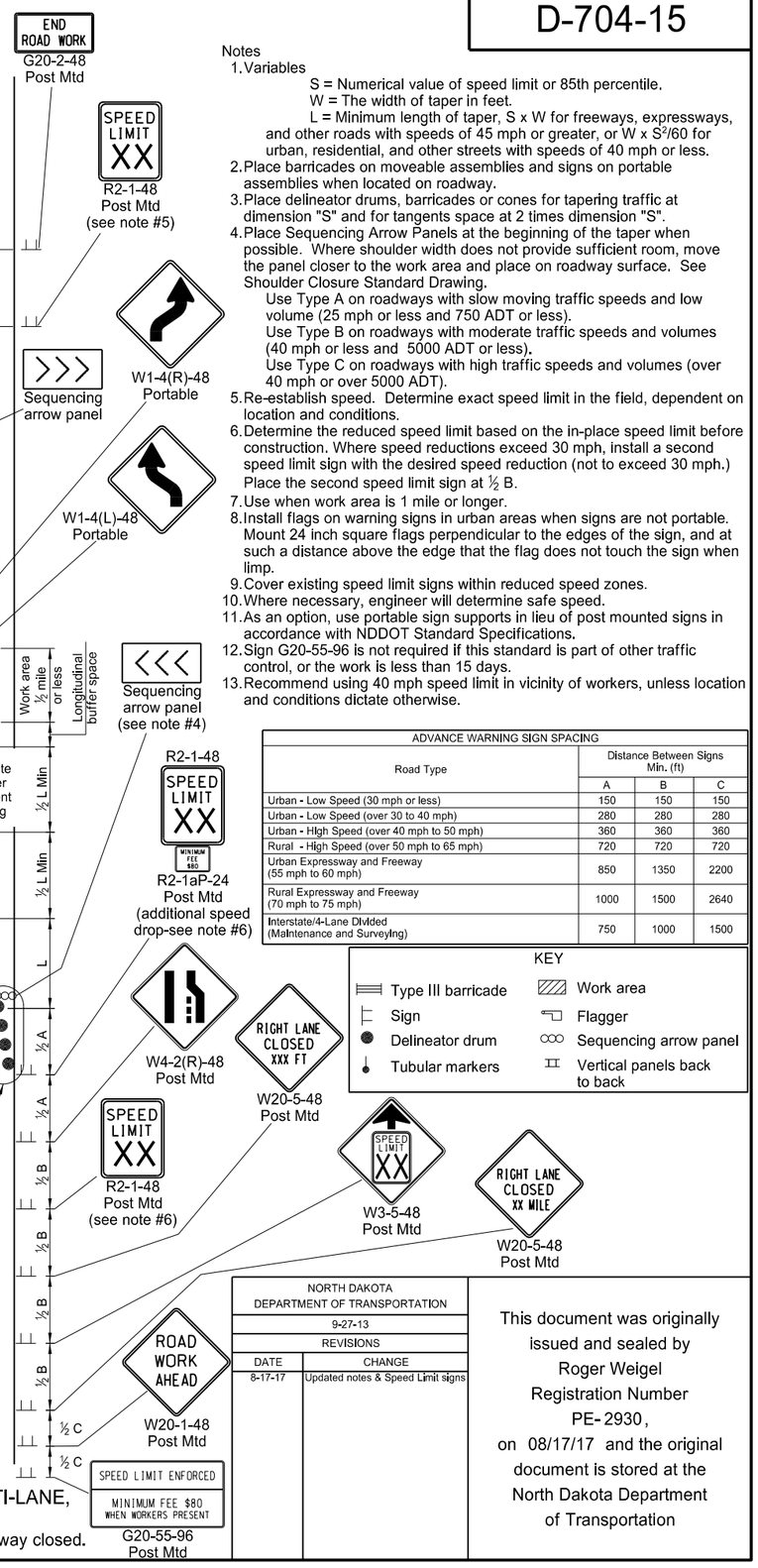


TYPE B
ROAD CLOSURE WITH A DIVERSION

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

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





TYPE C
HALF ROAD CLOSURE ON A MULTI-LANE, HIGH SPEED HIGHWAY

4 lane undivided highway with half the roadway closed.

Notes

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

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

KEY

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

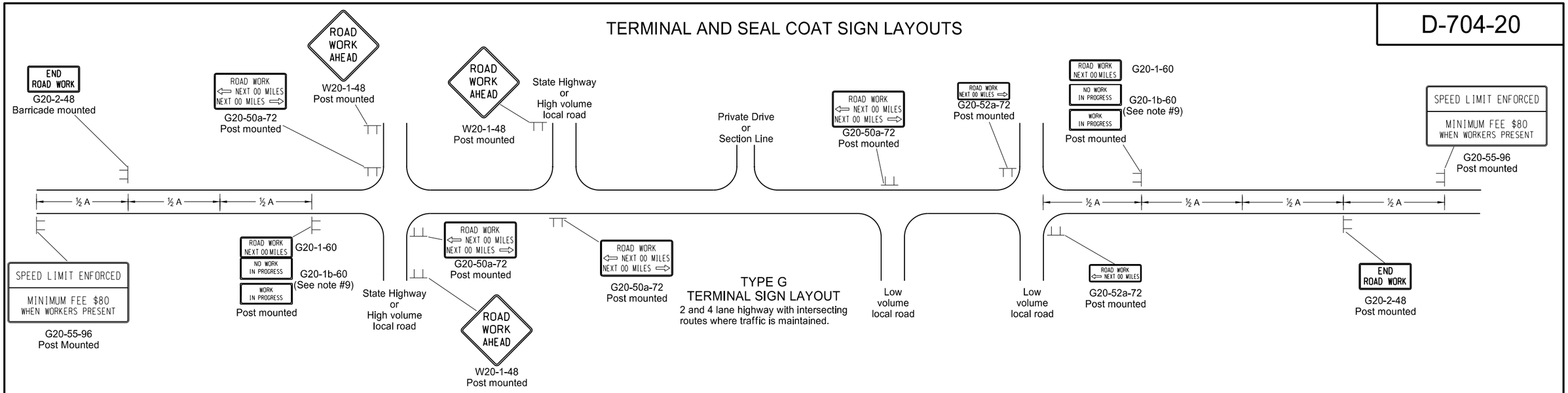
REVISIONS

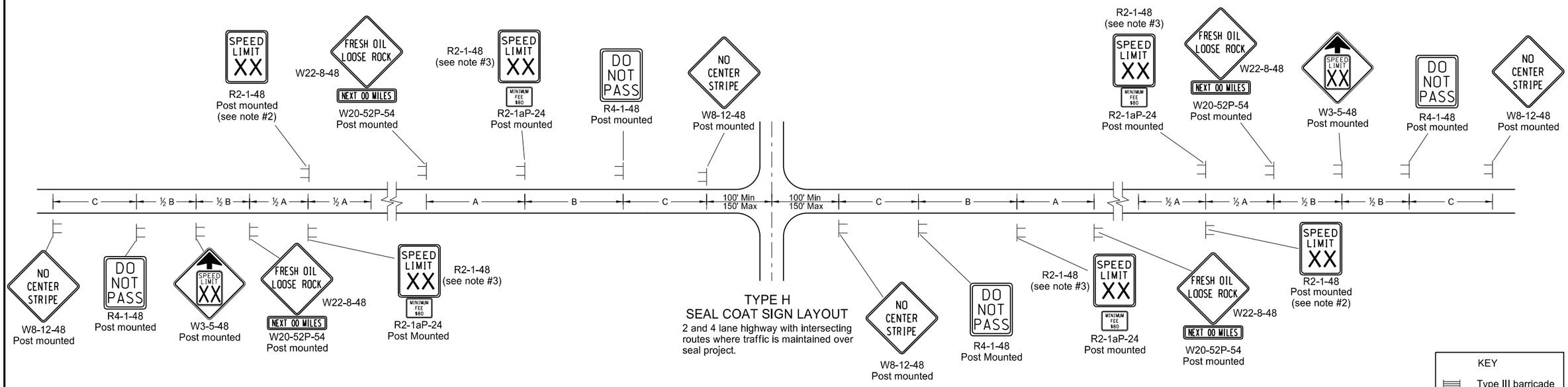
DATE	CHANGE
8-17-17	Updated notes & Speed Limit signs

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 08/17/17 and the original document is stored at the North Dakota Department of Transportation

TERMINAL AND SEAL COAT SIGN LAYOUTS

D-704-20





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

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

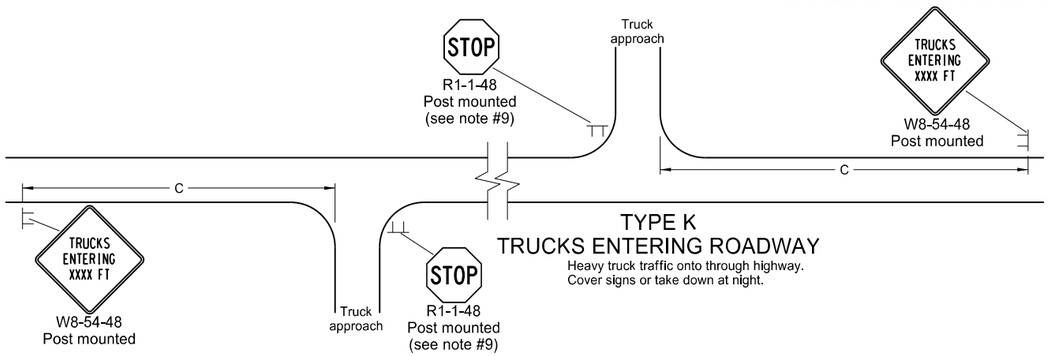
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
8-17-17	Updated notes & sign numbers

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 08/17/17 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

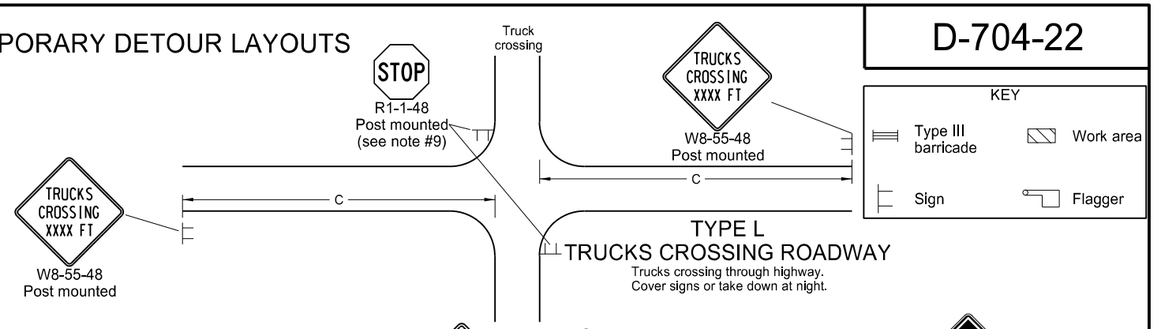
D-704-22

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



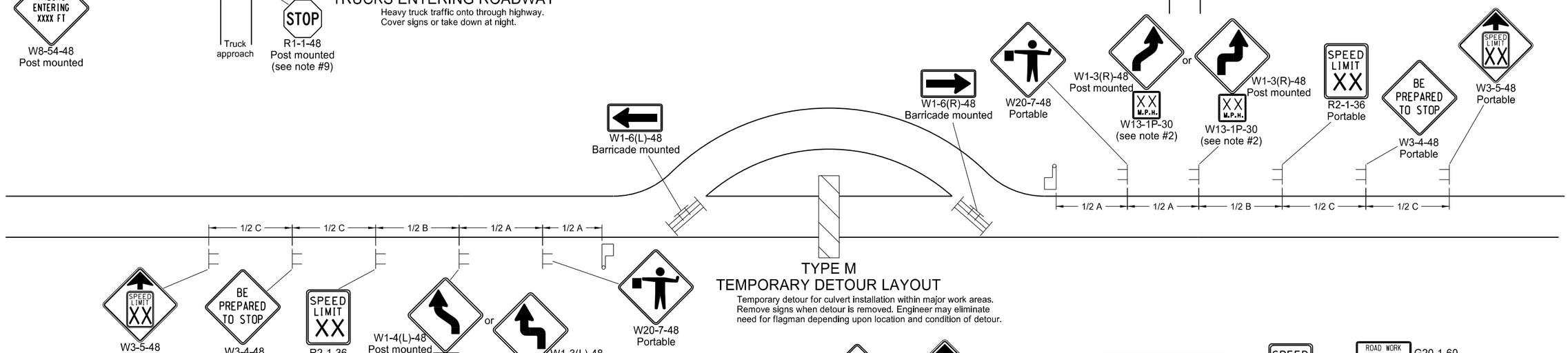
TYPE K
TRUCKS ENTERING ROADWAY

Heavy truck traffic onto through highway.
Cover signs or take down at night.



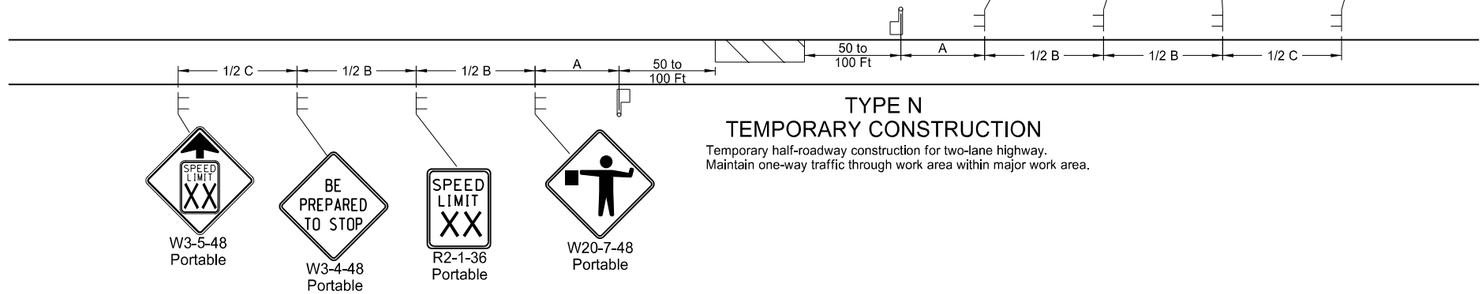
TYPE L
TRUCKS CROSSING ROADWAY

Trucks crossing through highway.
Cover signs or take down at night.



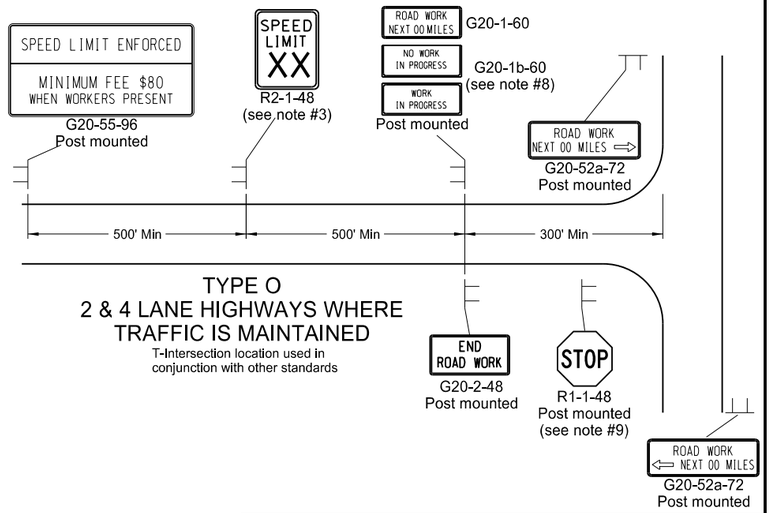
TYPE M
TEMPORARY DETOUR LAYOUT

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



TYPE N
TEMPORARY CONSTRUCTION

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



TYPE O
2 & 4 LANE HIGHWAYS WHERE TRAFFIC IS MAINTAINED

T-Intersection location used in conjunction with other standards

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

ADVANCE WARNING SIGN SPACING

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

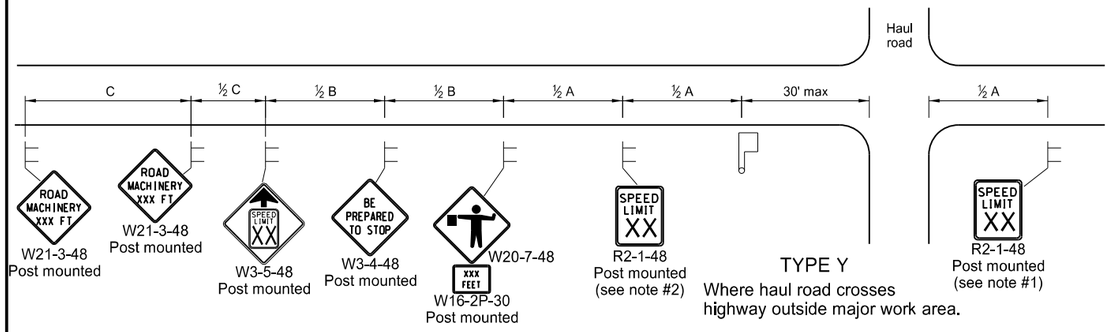
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
9-27-13
REVISIONS

DATE	CHANGE
8-17-17	Update notes & sign numbers

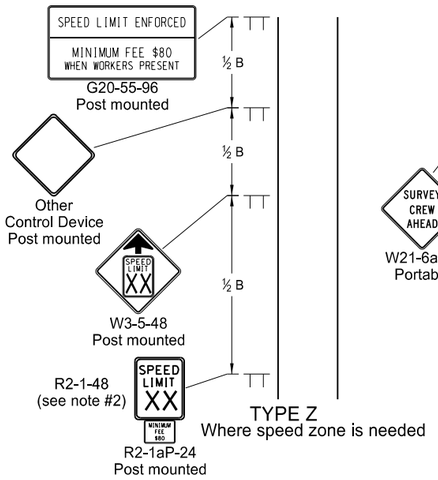
This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 08/17/17 and the original document is stored at the North Dakota Department of Transportation

MISCELLANEOUS SIGN LAYOUTS

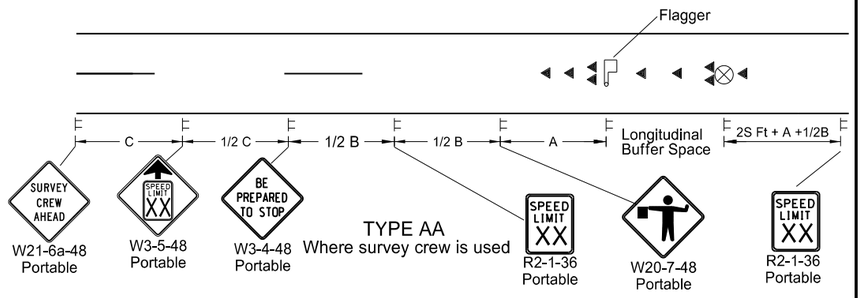
D-704-26



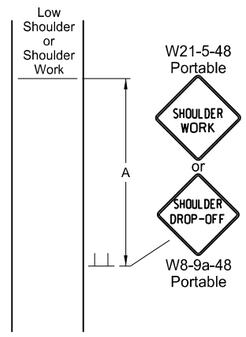
TYPE Y
Where haul road crosses highway outside major work area.



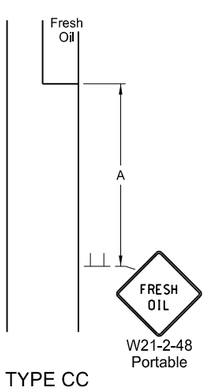
TYPE Z
Where speed zone is needed



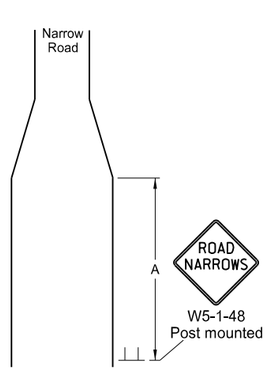
TYPE AA
Where survey crew is used

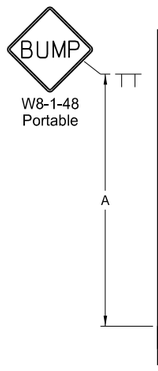


TYPE BB
Within major work area where sign conditions exist



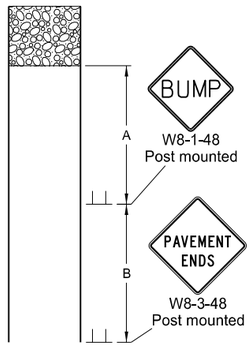
TYPE CC
Where sign conditions exist



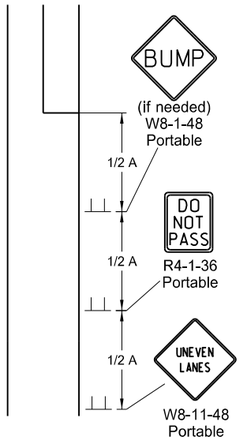


TYPE DD
Where sign conditions exist

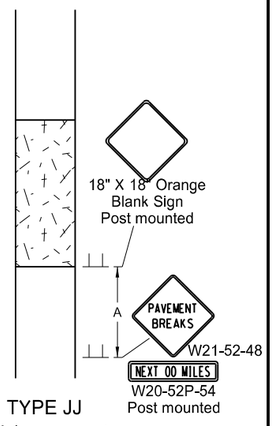
TYPE EE
Where sign conditions exist



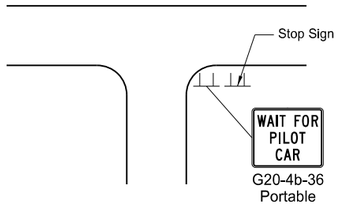
TYPE FF
Where sign conditions exist



TYPE GG
Where elevation difference exists between lanes



TYPE JJ
For break in pavement.
Install signs when conditions exist and remove when not applicable.



TYPE KK
At major intersections within pilot car control area

Notes
1. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
2. Determine reduced speed limit based on in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½B.
3. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
4. Cover existing speed limit signs within reduced speed zones.
5. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Specifications.
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.

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.

KEY

Sign Flagger Cones

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
8-17-17	Added speed limit signs. Updated notes & sign numbers

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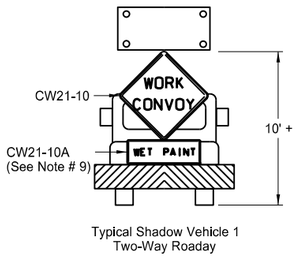
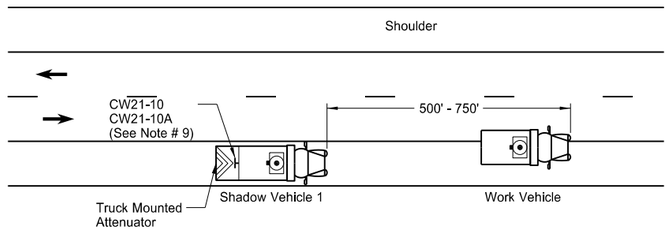
TRAFFIC CONTROL PLAN FOR MOVING OPERATIONS

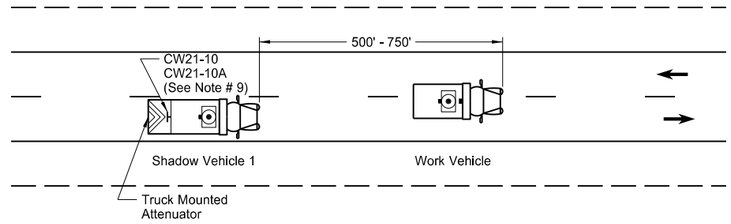
D-704-27



Typical Shadow Vehicle 1
Two-Way Roaday

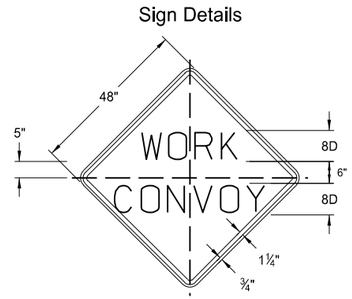


Two-Way Roadway with Paved Shoulders

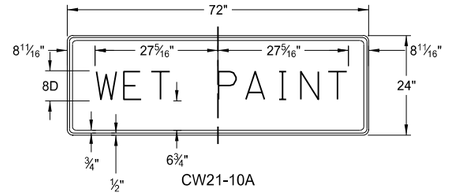


Two-Way Roadway without Paved Shoulders

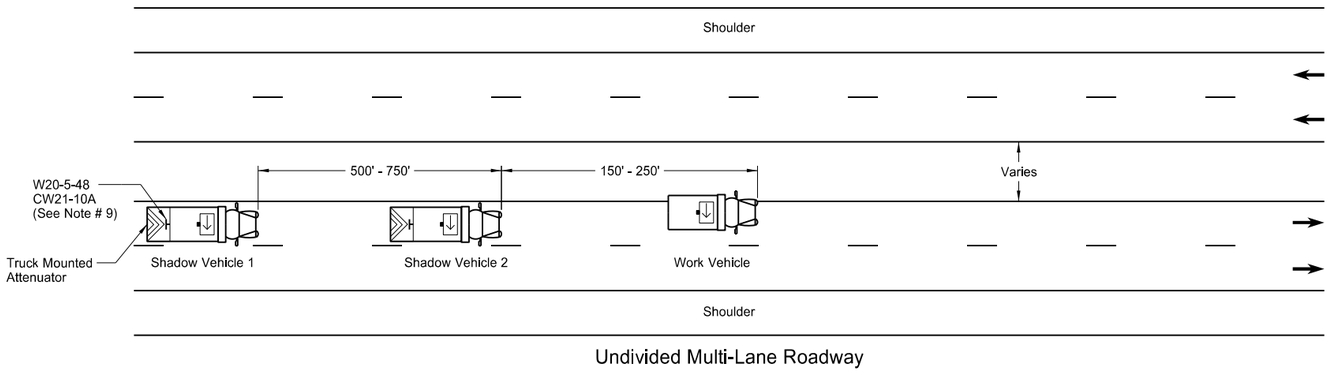
Sign Details



CW21-10

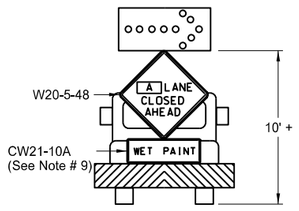


CW21-10A



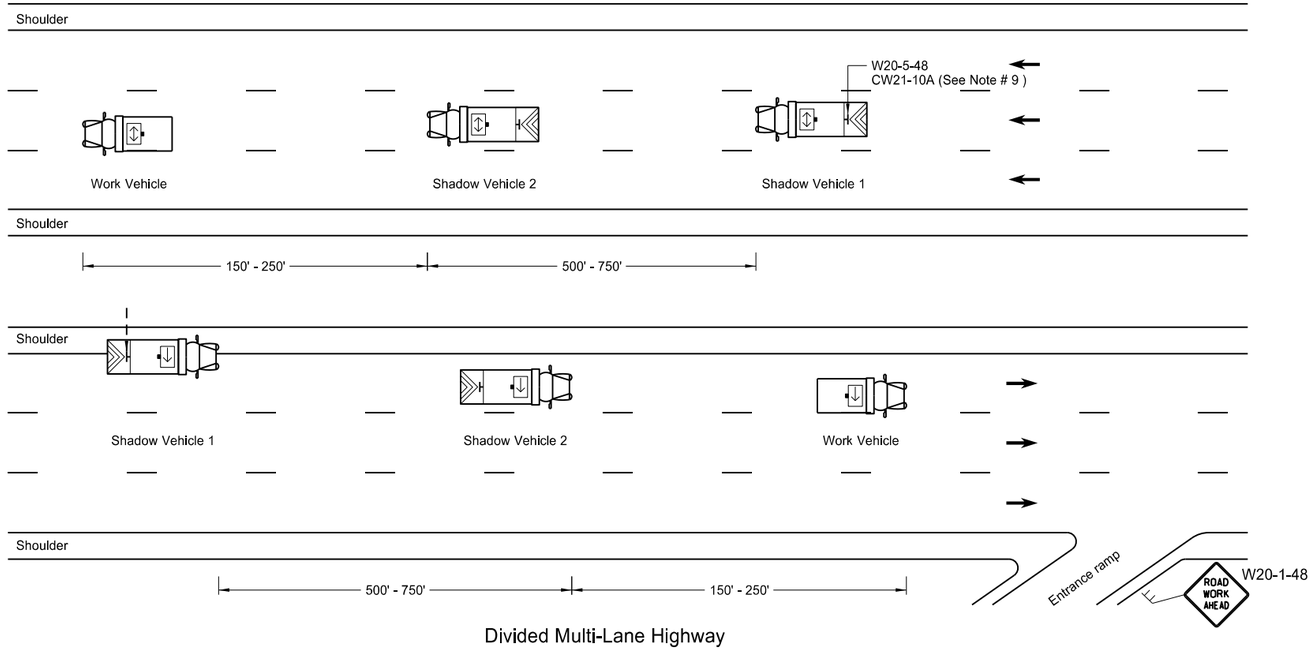
Undivided Multi-Lane Roadway

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 stobe 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.



Typical Shadow Vehicle 1 & 2
Multi-Lane Highways

A = Left Right Center



Divided Multi-Lane Highway

KEY

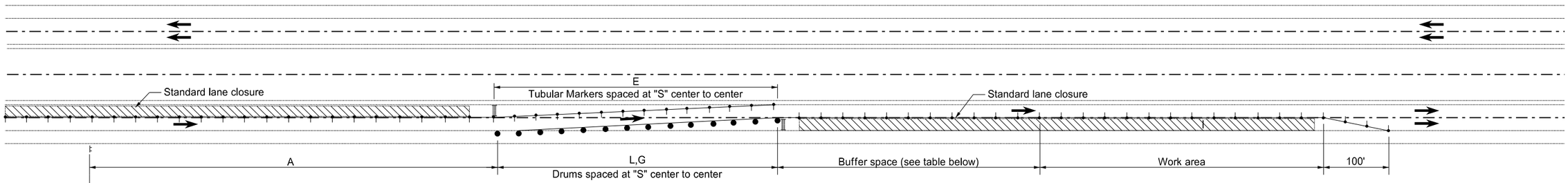
- Sign
- Truck mounted attenuator
- Flashing arrow panels:
  - Right directional
  - Left directional
  - Double arrow directional
  - Caution Mode

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

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 09/27/2017 and the original document is stored at the North Dakota Department of Transportation

TRAFFIC CONTROL SYSTEM
LANE SHIFT BETWEEN A LANE CLOSURE AND AN OPPOSITE LANE CLOSURE

D-704-34A



QUANTITIES	
TYPE III BARRICADES	2 Each
DELINEATOR DRUMS	14 Each
TUBULAR MARKERS	14 Each
RAISED PAVEMENT MARKERS (White)	Varies
OBLITERATION OF PAVEMENT MARKING	Varies

KEY

Work area	Delineator drum
Type III barricade	Tublar markers
Traffic Direction	Sign

LEGEND

E Obliteration of pavement marking (10' line, 30' skip centerline)
G Raised pavement markers (white) 5' ctrs.

Notes
1. Variables
   S = Numerical value of posted speed limit, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.
   W = Width of offset in feet.
   L = Taper length in feet. Speeds 40 mph or less $L=WS^2/60$. Speeds 45 mph or greater $L= WS$.
2. Place signs and barricade to be placed on roadway on moveable assemblies.
3. Cover existing speed limit signs within reduced speed zones.
4. Upon approval, the Engineer will measure obliterated or covered pavement marking as Obliteration of Pavement Marking.
5. As an option, use portable sign supports in lieu of post mounted sign in accordance with NDDOT Standard Specifications.
6. Place "Minimum Fee $80" signs below speed limit signs when placing traffic control devices to reduce speed.
7. When duration of work is 14 days or less, obliteration of pavement marking (10' line, 30' skip, centerline) and raised pavement markers are not required.

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.

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-26-2012

REVISIONS

DATE	CHANGE
9-27-17	Updated to active voice

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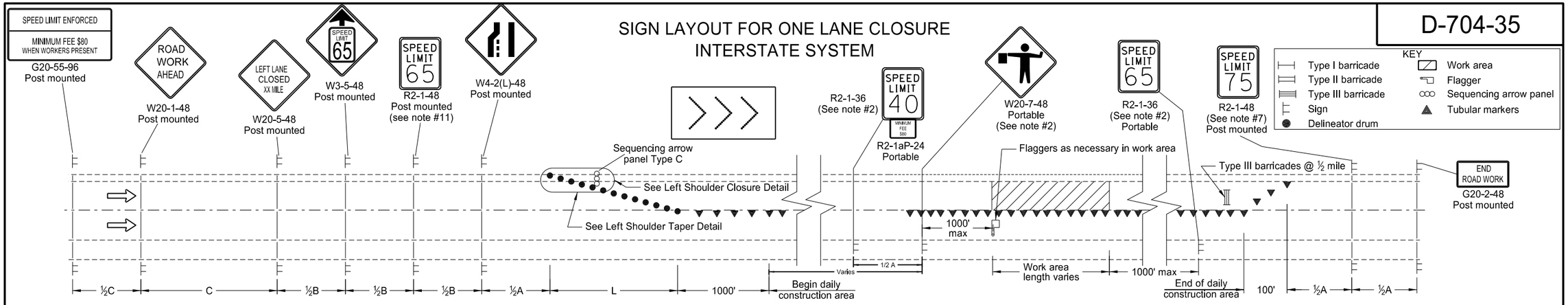
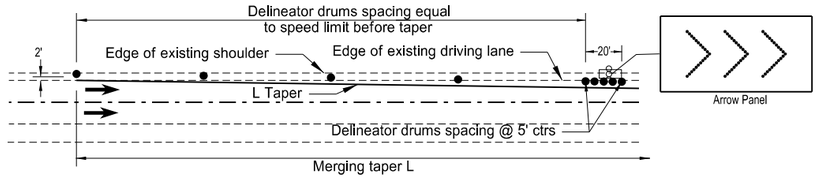
D-704-35

SIGN LAYOUT FOR ONE LANE CLOSURE
INTERSTATE SYSTEM



KEY

Type I barricade	Work area
Type II barricade	Flagger
Type III barricade	Sequencing arrow panel
Sign	Tubular markers
Delineator drum	



LEFT SHOULDER TAPER DETAIL

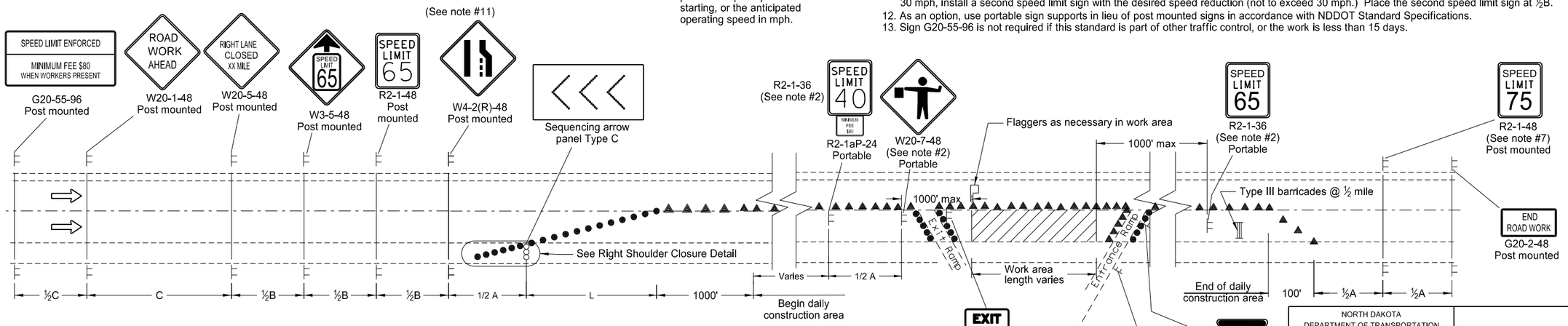
LEFT LANE CLOSED WORKERS IN WORK AREA

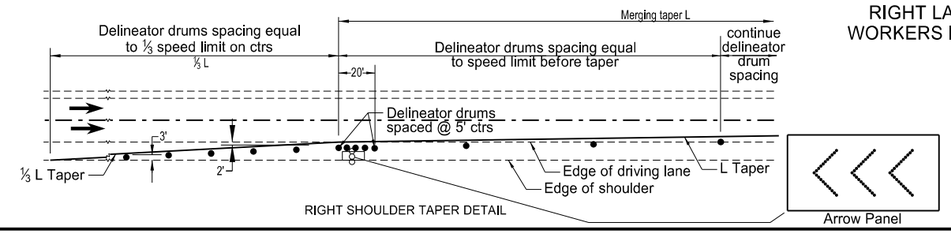
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min (ft)		
	A	B	C
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance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

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.

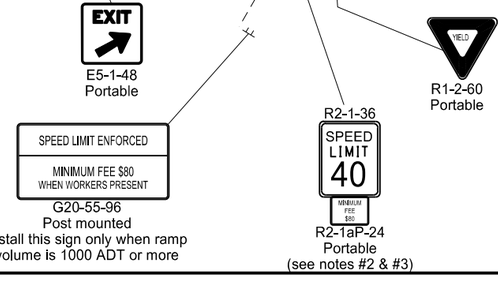
Notes:
1. Install advance signs for flagging when flaggers are flagging.
2. Move the advanced flagger sign and the speed limit signs as the work area moves through the construction zone. When the work area is not visible from the flagger, move the flagger station so the work area is visible. Space the 40 mph speed limit sign at ½A in advance of the flagger sign and move the 65 mph speed limit sign. Cover or remove the 40 mph speed limit and Minimum Fee $80 signs and the 65 mph speed limit sign upon completion of the work day or when workers are not present.
3. RAMPS: When the work area encompasses an entrance ramp, install a 40 mph speed limit sign on the ramp and cover any existing yield sign. Install new yield sign as necessary. Remove the ramp speed limit sign when the main line 40 mph speed zone is moved past the ramp.
4. Variables:
   S=Numerical value of speed limit or 85th percentile
   W=The width of taper.
   L=Minimum length of taper, or SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater, or
   WxSxS/60 for urban, residential, and other streets with speeds of 40 mph or less.
5. Space delineator drums for tapering traffic at the dimension "S". Space tubular markers used for tangents at 2 times dimension "S".
6. Place sequencing arrow panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface.
   Use Type C on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater).
7. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
8. Cover existing speed limit signs within a reduced speed zone.
9. Upon approval, the Engineer will measure obliterated or covered pavement marking as Obliteration of Pavement Marking.
10. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the diamond sign, and at such a distance above the edge that the flag does not touch the sign when limp.
11. Determine the reduced speed limit dependent on the in place speed limit before construction. When speed limits are to be reduced more than 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½B.
12. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Specifications.
13. Sign G20-55-96 is not required if this standard is part of other traffic control, or the work is less than 15 days.





RIGHT SHOULDER TAPER DETAIL

RIGHT LANE CLOSED WORKERS IN WORK AREA

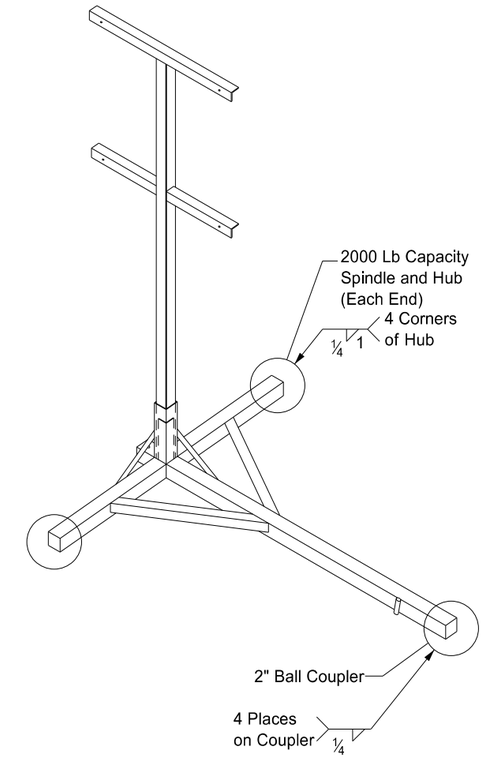


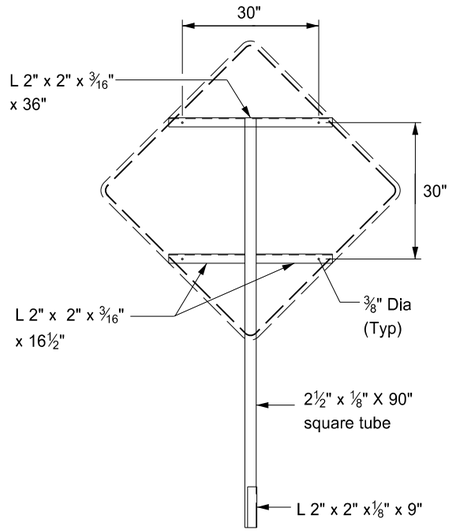
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-7-2012	
REVISIONS	
DATE	CHANGE
6/23/2014	Revised Note 12.
3/15/2016	Removed Do Not Pass signs and updated notes.
8/17/2017	Moved speed signs. Added note.
10/17/2017	Corrected spelling of "shoulder".

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

PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50





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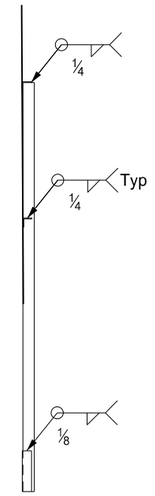
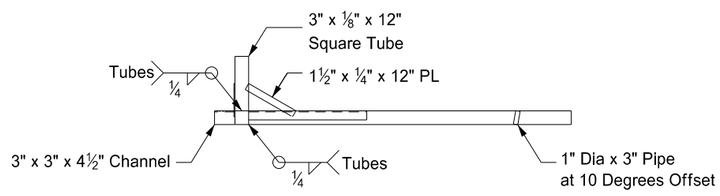
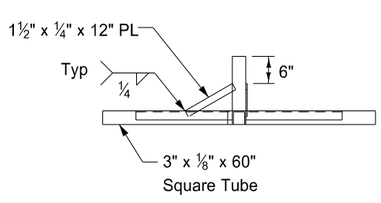


RIGHT

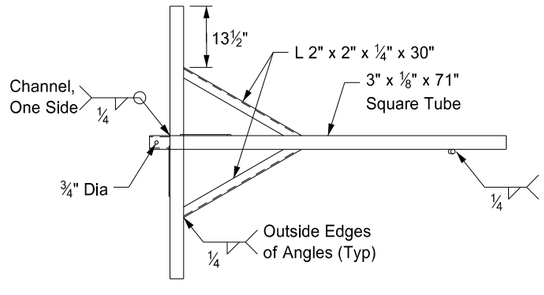
SIGN SUPPORT



FRONT



RIGHT



TOP

TRAILER

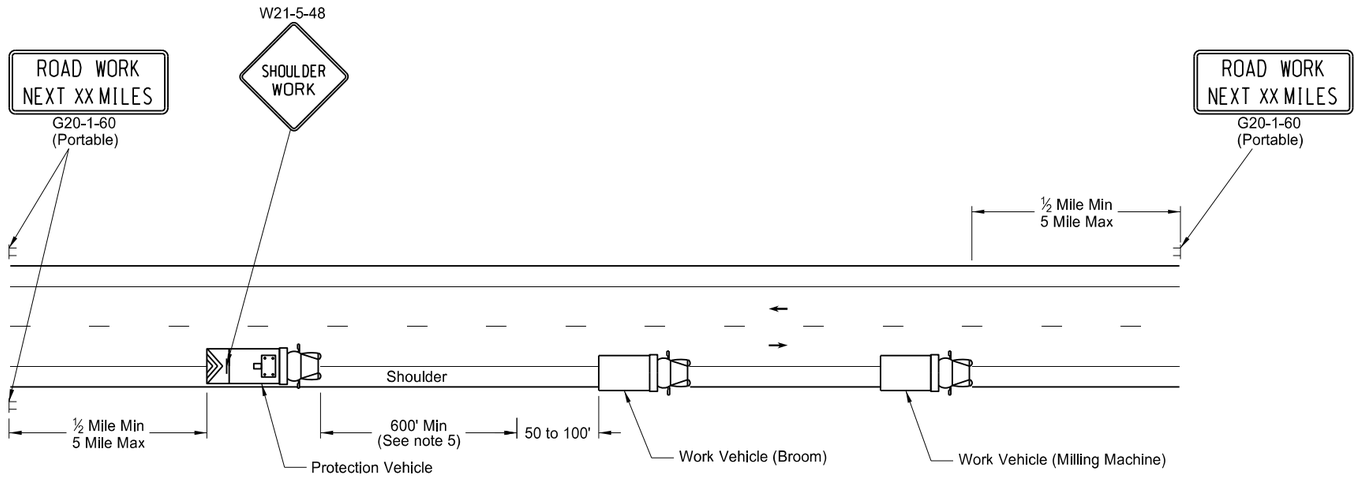
Notes:

1. The maximum weight of the assembly is 250 pounds.
2. Use a 14" wheel and tire.
3. Automotive and equipment axle assemblies may not be used for trailer-mounted sign supports.
4. Other NCHRP 350 crash tested assemblies are acceptable.

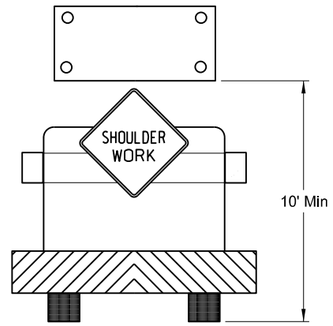
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel Registration Number PE- 2930 , on 11/23/10 and the original document is stored at the North Dakota Department of Transportation

MOBILE OPERATION
Grinding Shoulder Rumble Strips



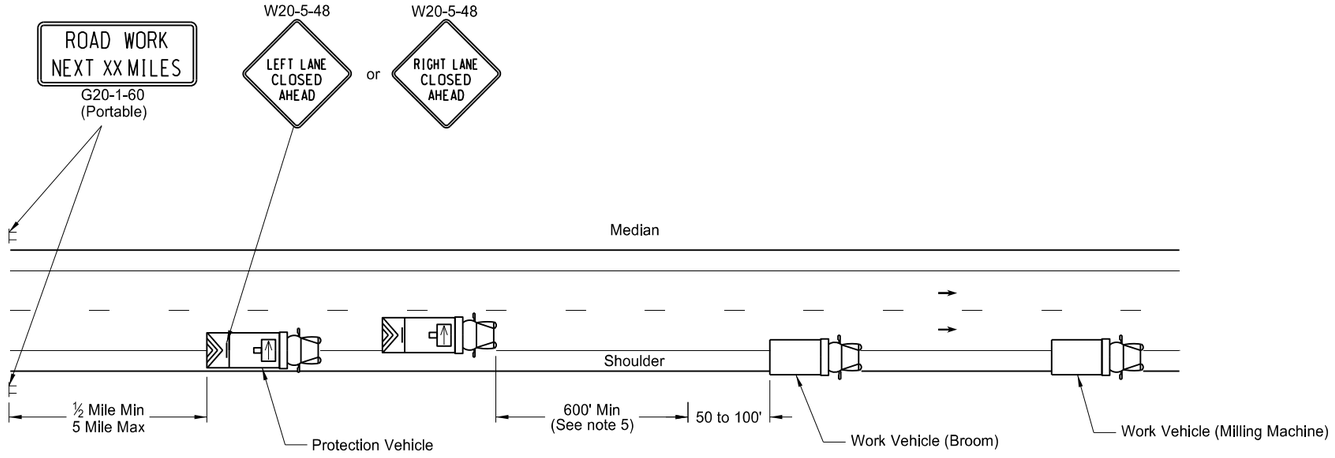
TWO LANE - TWO WAY ROADWAY



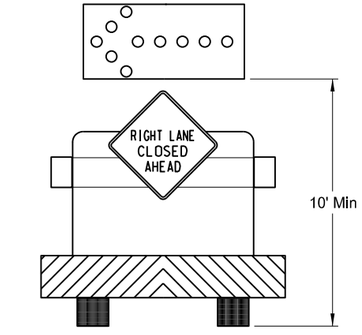
TWO LANE - TWO WAY ROADWAY

Typical Protection Vehicle with
Flashing Arrow Panel In Caution Mode

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

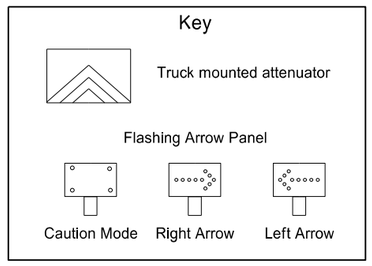


INTERSTATE & 4 LANE DIVIDED HIGHWAY



INTERSTATE & 4 LANE DIVIDED HIGHWAY

Typical Protection Vehicle with Flashing Arrow
Panel In Flashing Arrow Mode

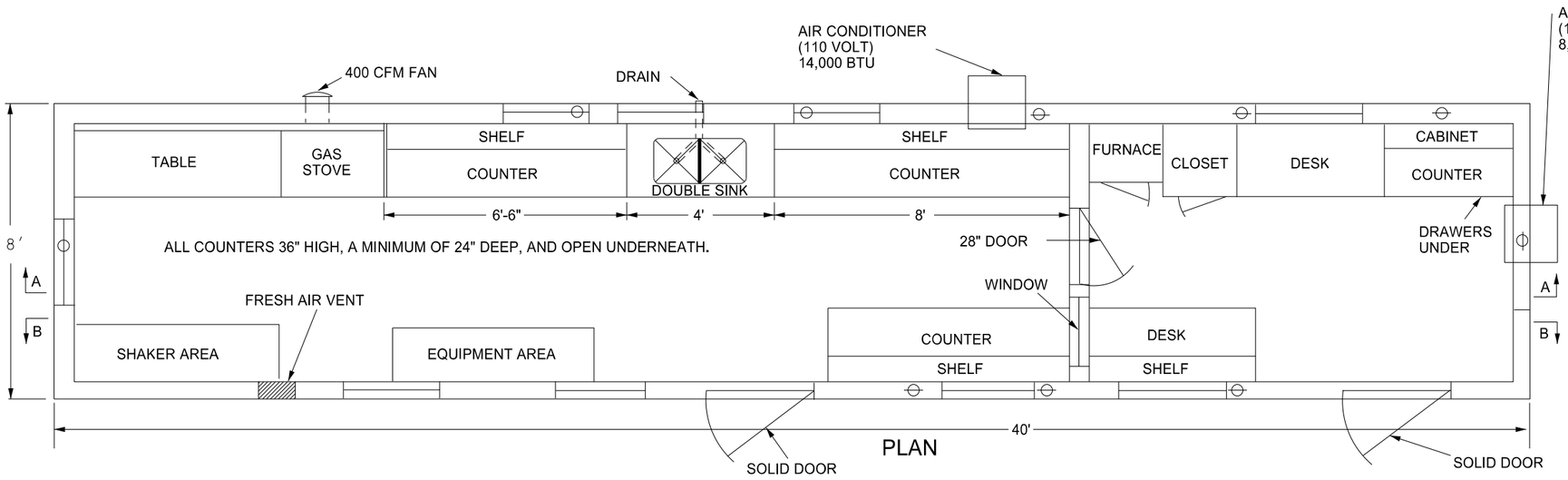


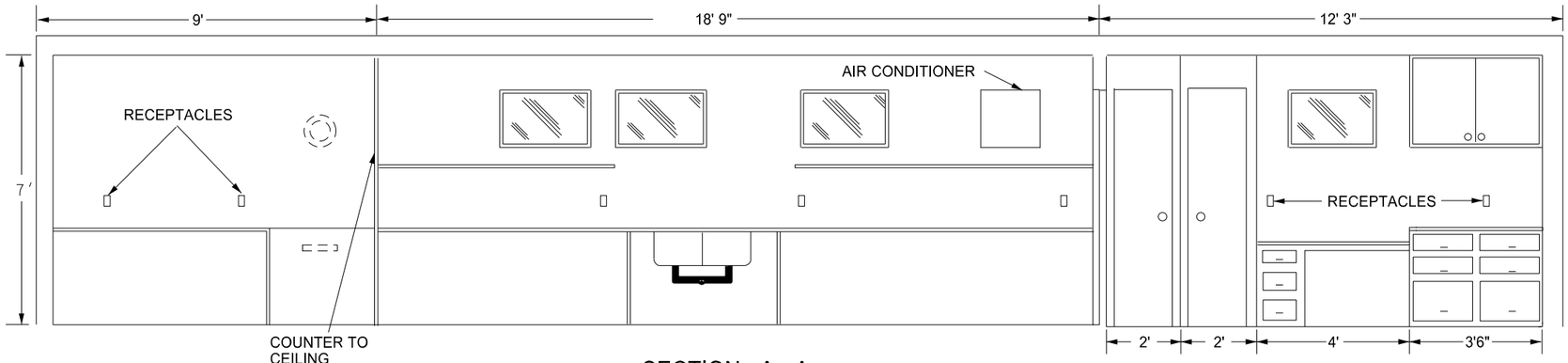
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-15-12	
REVISIONS	
DATE	CHANGE
8-17-17	Updated notes & signs

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 08/17/17 and the original document is stored at the North Dakota Department of Transportation

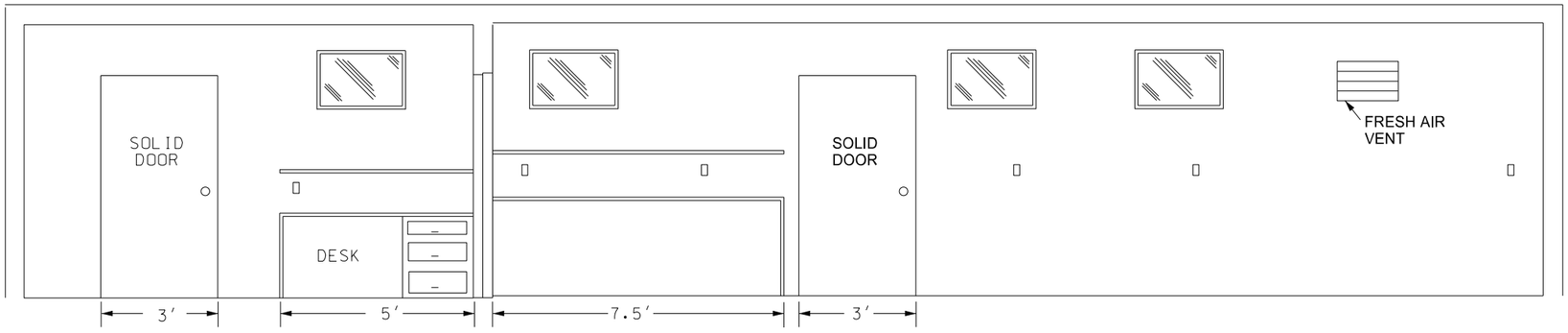
BITUMINOUS LABORATORY

D-706-1





SECTION A - A



SECTION B - B

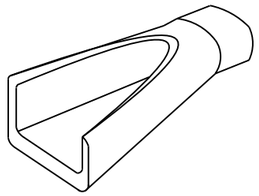
Provide a laboratory with the following:

1. A 1'x1' shelf at 36" above the regular countertop.
2. Double compartment stainless steel sink, with each compartment a minimum of 16"x14"x10" deep. Provide water service lines made of copper or plastic and a diameter of ½ inch.
3. An exhaust fan capable of removing inside air at a rate of 400 CFM.
4. Fresh air vent hinged to open or close manually.
5. 24" x 48" table capable of holding a 200 lb masonry saw with a minimum clearance of 36" above the table.
6. A water supply tank with a capacity of 500 gallons and a 20 gallon capacity pressure tank on the pump.
7. Heavy duty type locks, latches, and hinges for doors made to withstand the intense use in service.
8. A wall between the office and the work area properly insulated to prevent the transmission of heat and noise.
9. The steel cable tie downs and ground anchors at each corner of the lab.
10. Electrical service entrance wired for 100 amps and separate circuits for air conditioners. Space convenience outlets in counter areas a minimum of four feet apart.

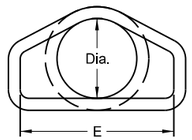
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
07-30-14	Changed standard's title and revised notes.
01-11-16	Revised notes.

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 01/11/16 and the original document is stored at the North Dakota Department of Transportation

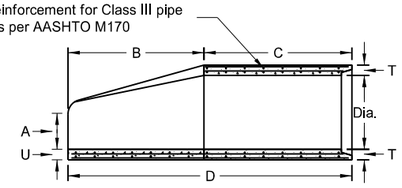
REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS
(Round Pipe)



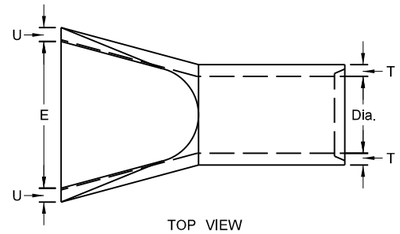
PERSPECTIVE



END VIEW



SIDE VIEW



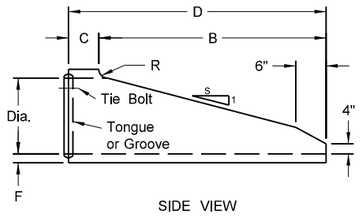
TOP VIEW

REINFORCED CONCRETE PIPE - FLARED END SECTION

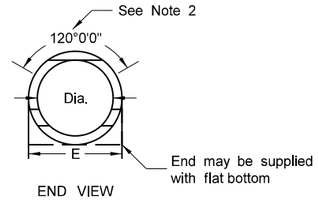
Reinforcement to be equivalent to Class III RCP

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

TRAVERSABLE END SECTION							
DIA	B	C	D	E	F	R	S
15"	4'	9"	4'-9"	1'-7½"	2¼"	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	2½"	3"	6
24"	6'	1'	7'	2'-6"	3"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3½"	3½"	4
36"	7'-3"	15"	8'-6"	3'-8"	4"	3"	4



SIDE VIEW



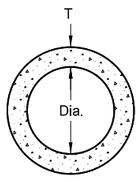
END VIEW

NOTES (Traversable End Section):

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

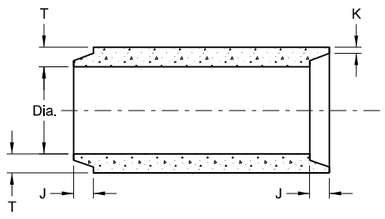
REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION

Reinforcement to be equivalent to Class III RCP

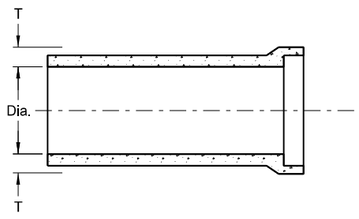


END VIEW

CIRCULAR PIPE

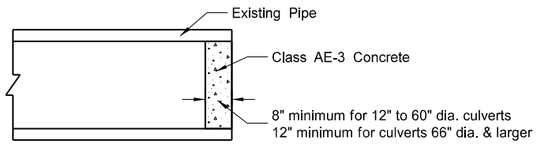


TONGUE & GROOVE JOINT



BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE



CONCRETE PIPE PLUG

All Classifications of Round Concrete Pipe					
Internal Dia of pipe in Inches	Cross-Sectional Water Area	Weight per lin. foot of Pipe Std. Wall	Joint J Groove End Min./Max.	Joint K Tongue End Min.	Minimum Wall Thickness (T)
Dia	Sq. ft.	Lbs.	In.	In.	In.
12	0.79	92	1⅛-2⅛	¾	2
15	1.23	127	1¾-2¾	⅞	2¼
18	1.77	168	1⅞-2⅛	1	2½
21	2.40	214	1⅞-3⅛	1⅛	2¾
24	3.14	265	2⅛-3¾	1⅛	3
27	3.98	322	2¾-4	1¼	3¼
30	4.91	384	3⅛-4¼	1¼	3½
33	5.94	452	3¼-4¼	1½	3¾
36	7.07	524	3½-4¼	1½	4
42	9.62	685	3⅝-4¾	1¾	4½
48	12.57	685	3⅝-4¾	1⅞	5
54	15.90	1070	4⅛-5¼	2	5½
60	19.63	1296	4½-5½	2¼	6
66	23.76	1542	5-6	2⅝	6½
72	28.27	1810	5⅝-6¾	2⅞	7
78	33.18	2098	6¼-7¼	2⅞	7½
84	38.48	2410	5⅝-7¾	3⅜	8
90	44.18	2793	6¾-8½	3⅛	8½
96	50.27	3092	7-8¼	3½	9
102	56.75	3466	7-8¼	3½	9½
108	63.62	3864	7¼-8½	3¾	10

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

NOTES:

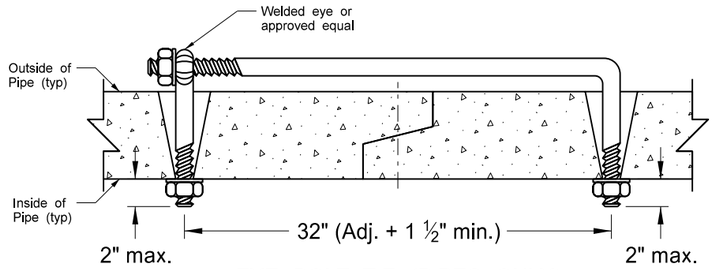
1. All reinforcing steel shall meet AASHTO M170 requirements.
2. All circular, longitudinal, and elliptical reinforcement shall be assembled and securely fastened in cage fashion so as to maintain reinforcement in exact shape and correct positions within the forms.
3. Laying length of pipe: 12" to 66"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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-12-14	
REVISIONS	
DATE	CHANGE
01-21-15	Revised Note 5
11-21-16	Revised End Section Dimensions

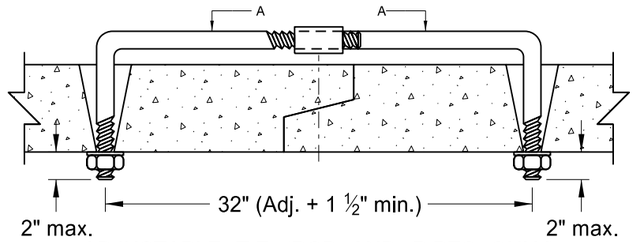
This document was originally issued and sealed by Jon Ketterling Registration Number PE-4684, on 11/21/16 and the original document is stored at the North Dakota Department of Transportation

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

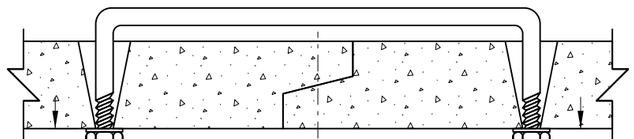
D-714-22



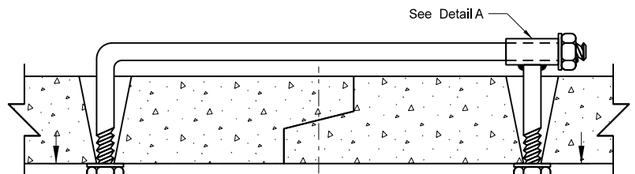
EYE BOLT TIE (PIPES ONLY)



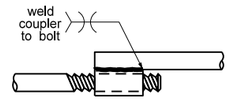
ADJUSTABLE TIE (RCB AND PIPES ONLY)



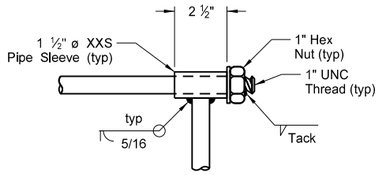
U BOLT TIE (RCB, PIPES, OR CATTLE PASSES)



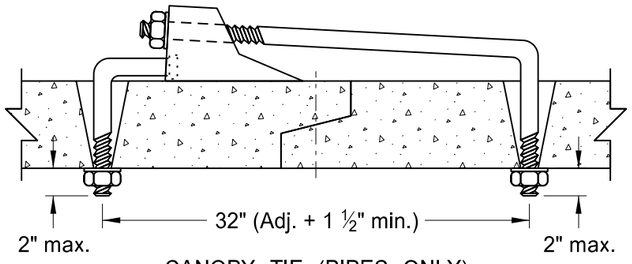
WELDED TIE (RCB AND PIPES ONLY)



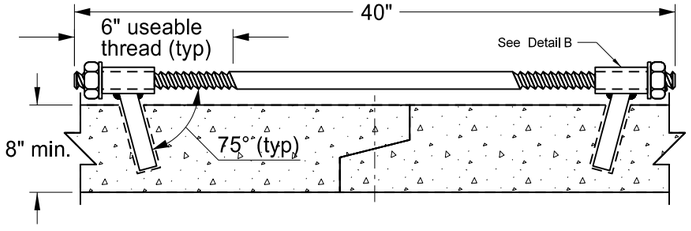
SECTION A-A



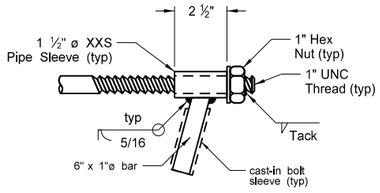
DETAIL A



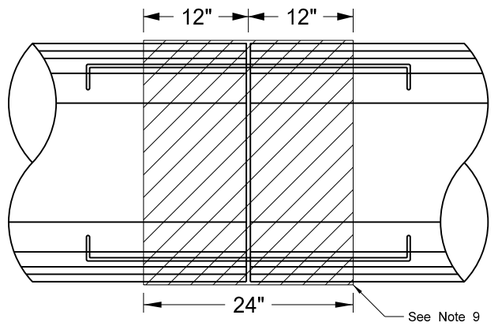
CANOPY TIE (PIPES ONLY)



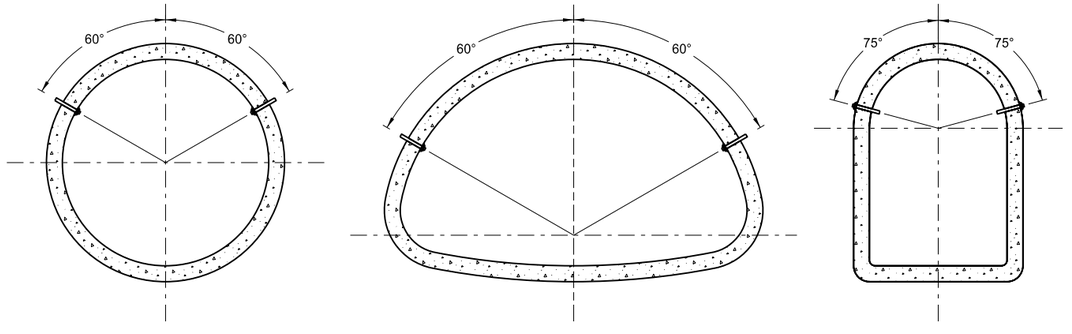
HIDDEN TIE (RCB ONLY)



DETAIL B



PLAN VIEW



END VIEW

REQUIRED SIZE OF TIE BOLTS		
Pipe Size	Thread ø	XXS Pipe Sleeve Inner ø
18" - 24"	⅝" See note 2	¾"
30" - 66"	¾"	1"
72" - 78"	1"	1 ¼"
RCB/Cattle Pass		

NOTES:

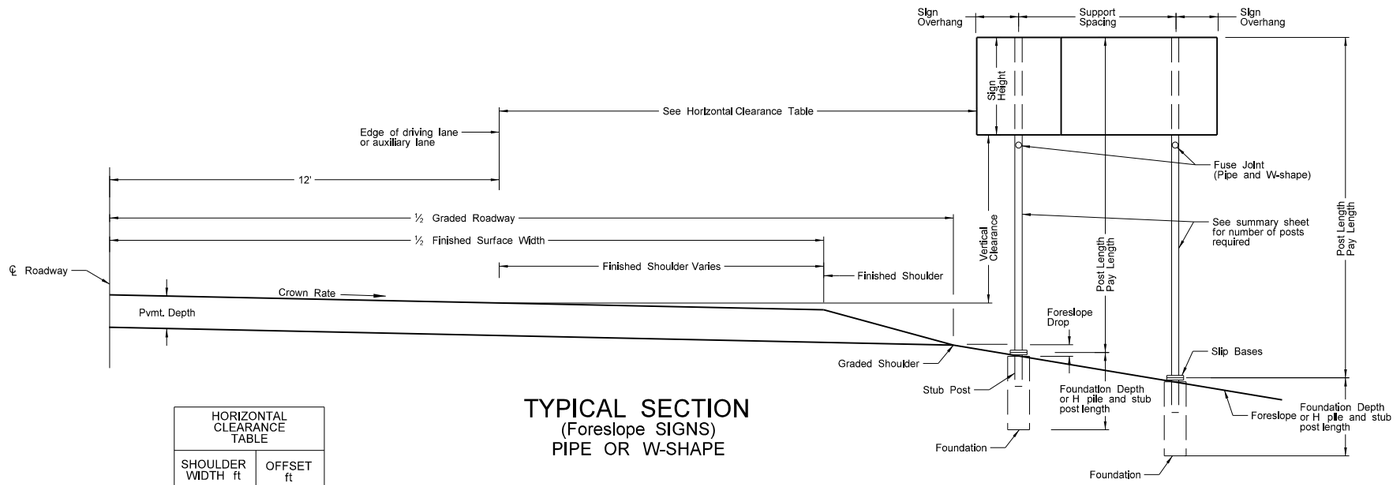
1. The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
2. Cattle Pass and Jacked and Bored pipes shall have pipe ties inserted from the inside of the pipes and grouted into place. Jacked and bored pipes with a diameter of 24" or less do not require pipe ties.
3. Nuts and washers are not required on Jacked and Bored pipes or pipes with a 24" diameter or less. Where nuts and washers are not used, the tie bars shall be inserted and grouted into place.
4. Ties are only for holding pipe or RCB sections together, not for pulling sections tight.
5. Tie bolt assembly shall be hot dip galvanized in accordance with AASHTO M232.
6. Holes in pipes to accommodate tie bolts can be precast or drilled. Tapered holes are permitted when precast. Holes shall have a diameter ¼" larger than the diameter of the thread. Holes in precast RCB's shall contain cast-in bolt sleeves with an inside diameter of 1 ¼".
7. The contractor has the option of selecting the type of tie bolt used from those shown.
8. The cost of precasting or drilling the required holes and furnishing and installing the tie bolts shall be included in the price bid for the appropriate conduit or RCB pay item.
9. All centerline and approach RCP culvert joints shall be tied. Storm drain systems shall have the first three joints including the end section of all free ends tied. Free ends are defined as any storm drain end which does not terminate at an inlet or manhole. Outfall culverts with end sections which drain adjacent ditches are examples of free ends.
10. Place joint wrap prior to installing ties. Overlap the joint by 12" in both directions.
11. Tie bolts shall conform to ASTM A 36. Nuts shall be be heavy hex and conform to ASTM A 563. Washers shall conform to ASTM F 436, Type 1. Welded pipe sleeves and cast-in bolt sleeves shall conform to ASTM A 53, Grade B.
12. RCB tie locations shall be as shown on the plans.

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

This document was originally issued and sealed by Jonathan David Ketterling, Registration Number PE-4684, on 6/6/2017 and the original document is stored at the North Dakota Department of Transportation

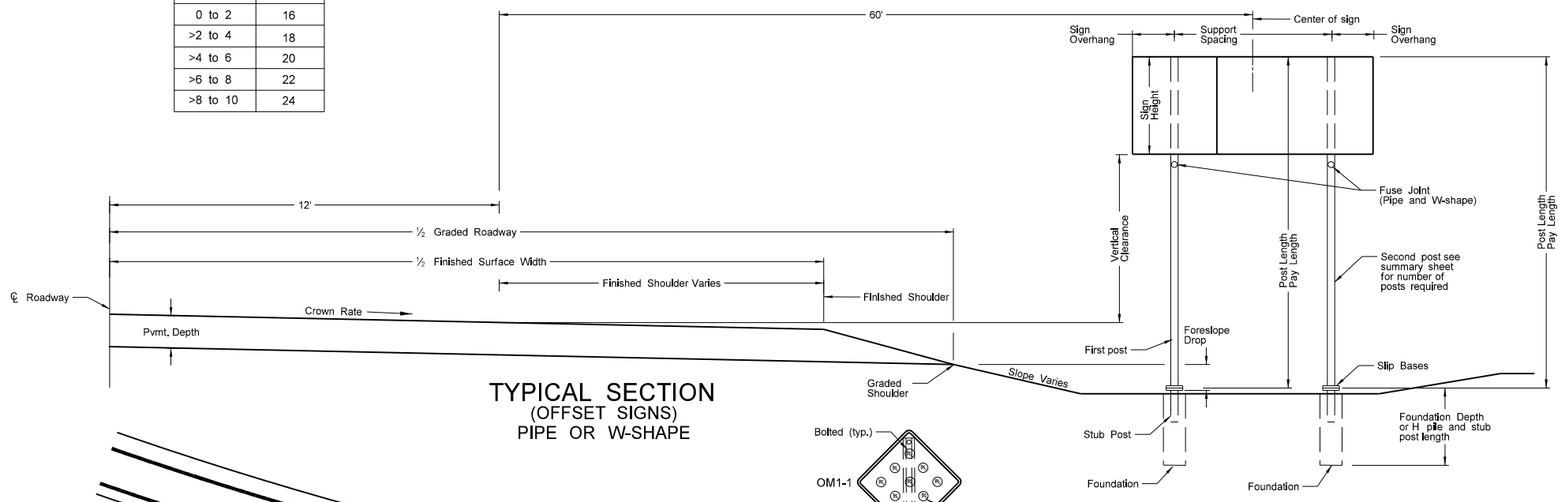
PIPE OR W-SHAPE ASSEMBLY DETAILS

D-754-1

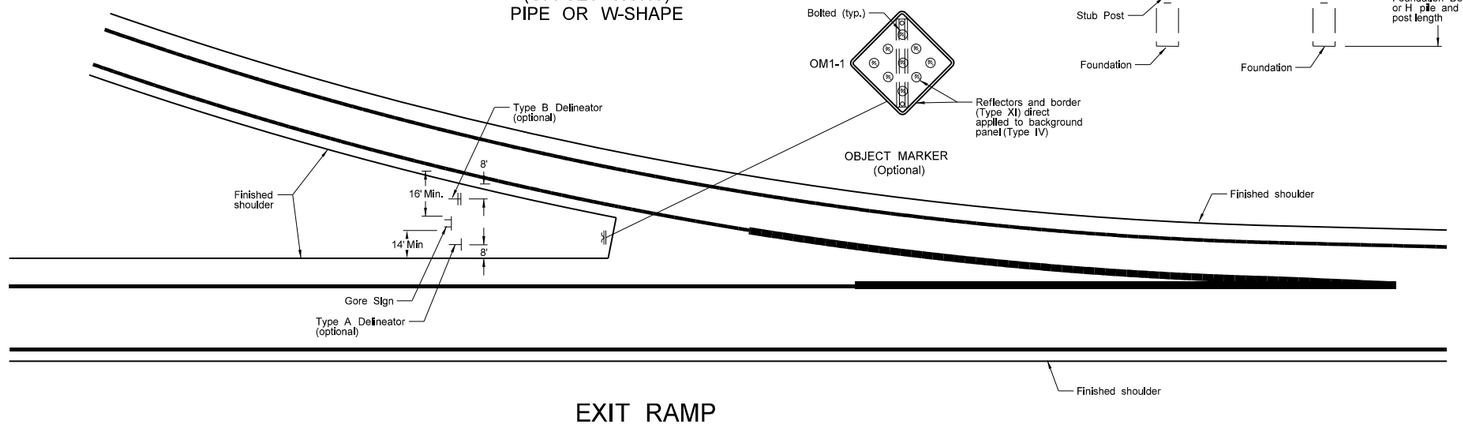


TYPICAL SECTION
(Foreslope SIGNS)
PIPE OR W-SHAPE

HORIZONTAL CLEARANCE TABLE	
SHOULDER WIDTH ft	OFFSET ft
0 to 2	16
>2 to 4	18
>4 to 6	20
>6 to 8	22
>8 to 10	24



TYPICAL SECTION
(OFFSET SIGNS)
PIPE OR W-SHAPE



OBJECT MARKER
(Optional)

EXIT RAMP
GORE SIGN PLACEMENT

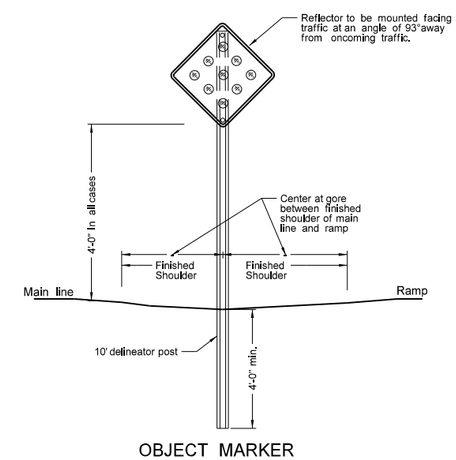
NOTES:

MINIMUM VERTICAL CLEARANCE:
Signs installed at the side of the road in rural districts shall be at least 5 feet measured from the bottom of the sign to the edge of driving lane, or Auxiliary Lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least 7 feet.

Signs on freeways, expressways, and multi-lane conventional roadways shall be installed with a minimum height of 7 feet.

Where signs are placed at least 30 feet or more from the edge of the traveled way, the height to the bottom of such sign shall be 5 feet above the edge of driving lane.

Signs may be placed a maximum of 6" above the vertical clearance specified above.



OBJECT MARKER
INSTALLATION
(Posts shall conform to section 894.04 A of Standard Specifications.)

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
7-18-14	Modify notes and update reflective sheeting for object marker. Add correct section number for object marker post.

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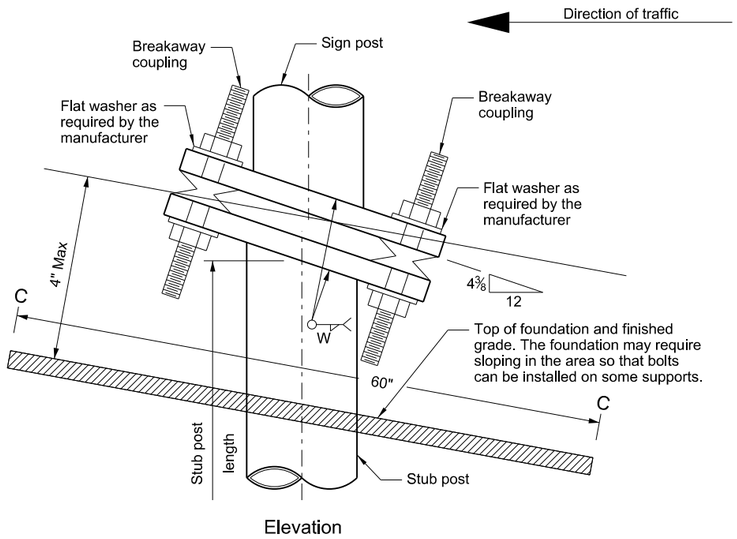
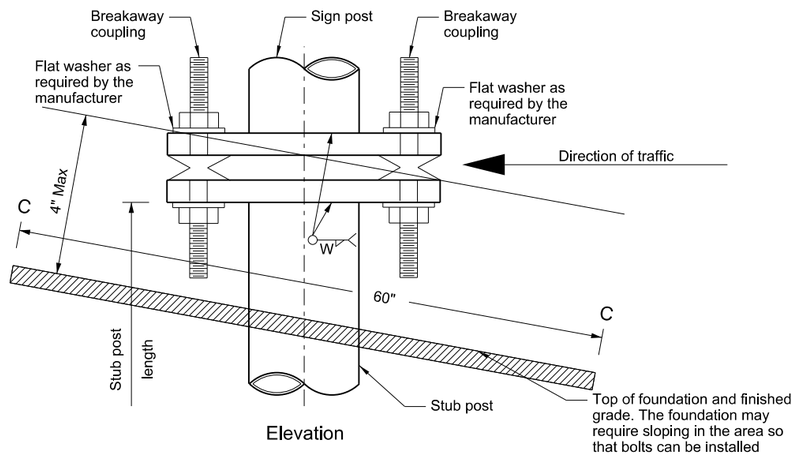
D-754-2



Elevation

Single Post Sign and Stub Post
Type A

Breakaway Coupler System for Standard Pipe Stub Post

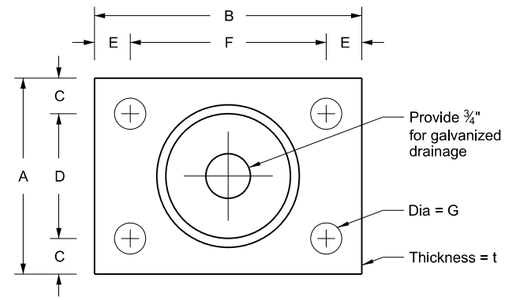


Elevation

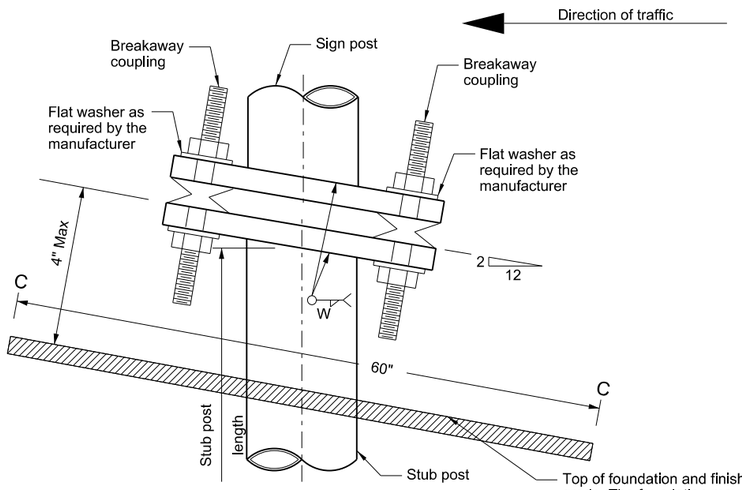
Two or More Post Sign and Stub Post
For two post signs with 8' or more post spacing and all three or more post signs
Type C

Notes:

1. In lieu of the breakaway base system on standards D-754-3 and D-754-4 the breakaway coupler system may be used. The breakaway coupler system shall be manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements as specified by DENT BREAKAWAY IND., INC. which meets the requirements of NCHRP Report 350.
2. Fuse Joint Cuts - Steel posts may be cut after galvanizing and cut surface treated in accordance with ASTM A780 or the cut may be galvanized after fabrication. Aluminum posts will need no treatment.
3. Shim as required to plumb post.
4. Tighten all bolts the maximum possible with 12" to 15" wrench.

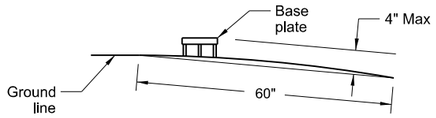


Plan Base Plate



Elevation

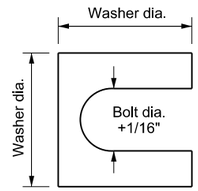
Two Post Sign and Stub Post
For signs with less than 8' post spacing
Type B



Section C - C

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

Dimension / Nom. Pipe Size	Base Table Data: Breakaway Coupling	A	B	C	D	E	F	G	t	W	Stub Post Length
Steel											
3½"	½" x 4½"	5½"	8⅜"	13/16"	3⅞"	13/16"	6¾"	9/16"	¾"	⅜"	1'-6"
4"	⅝" x 4½"	5½"	8¾"	1"	3½"	1"	6¾"	11/16"	¾"	⅜"	1'-6"
5"	¾" x 5¼"	6½"	10"	1⅛"	4¼"	1⅛"	7¾"	13/16"	1"	7/16"	2'-0"
6"	1" x 5¼"	7½"	11¾"	1⅜"	4¾"	1⅜"	9"	1 1/16"	1¼"	7/16"	2'-0"
8"	1" x 5¼"	9½"	13¼"	1⅜"	6¾"	1⅜"	10½"	1 1/16"	1¼"	7/16"	2'-6"
10"	1" x 5¼"	11¾"	15¼"	1⅜"	9"	1⅜"	12½"	1 1/16"	1¼"	½"	3'-0"
12"	1" x 7"	13¾"	18"	1⅝"	10 ½"	1⅝"	14¾"	1 1/16"	1½"	½"	3'-0"
Aluminum											
3½"	½" x 4½"	5½"	8⅜"	13/16"	3⅞"	13/16"	6¾"	9/16"	¾"	⅜"	1'-6"
4"	⅝" x 4½"	5½"	8¾"	1"	3½"	1"	6¾"	11/16"	1"	7/16"	1'-6"
5"	¾" x 5¼"	6½"	10"	1⅛"	4¼"	1⅛"	7¾"	13/16"	1"	½"	2'-0"
6"	1" x 5¼"	7½"	11¾"	1⅜"	4¾"	1⅜"	9"	1 1/16"	1¼"	½"	2'-0"
8"	1" x 5¼"	9½"	13¼"	1⅜"	6¾"	1⅜"	10½"	1 1/16"	1¼"	½"	2'-6"
10"	1" x 5¼"	11¾"	15¼"	1⅜"	9"	1⅜"	12½"	1 1/16"	1½"	7/16"	3'-0"
12"	1" x 7"	13¾"	18"	1⅝"	10¼"	1⅝"	14¾"	1 1/16"	1¾"	11/16"	3'-0"



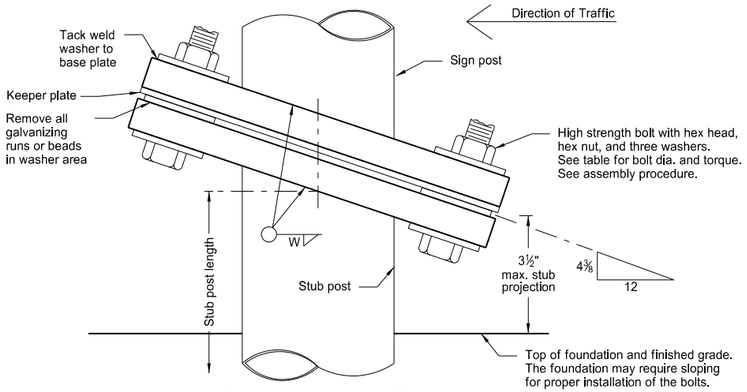
Shim Detail

Furnish 2 - .012"± thick and 2 - .032"± thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.

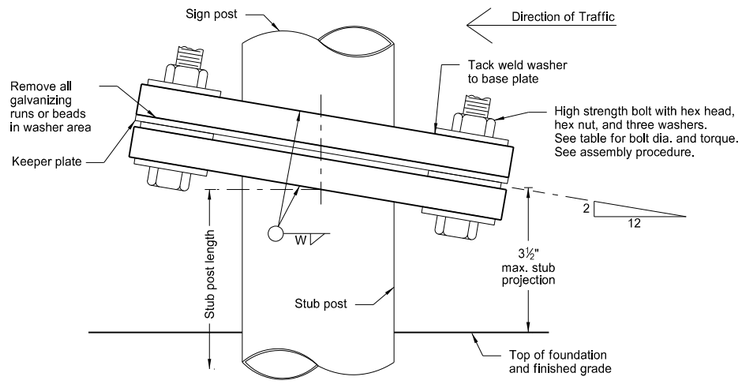
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 10/3/13 and the original document is stored at the North Dakota Department of Transportation

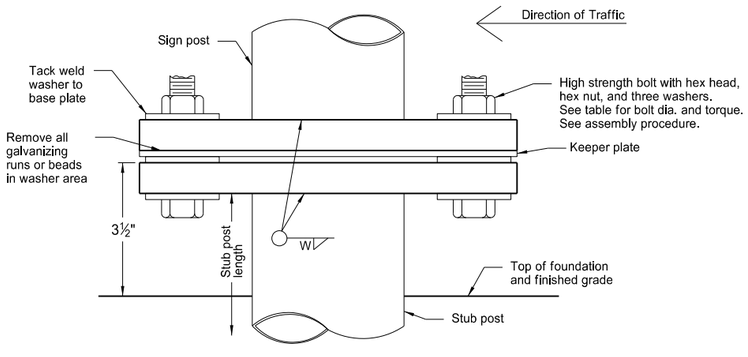
Breakaway System for Standard Pipe Stub Post



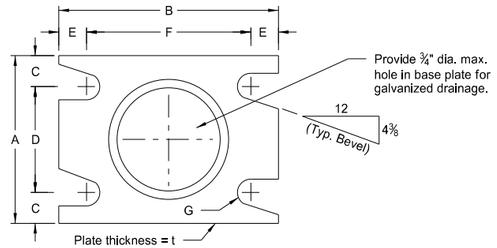
Stub Post Connection - Type A
Elevation View
(Single Post)



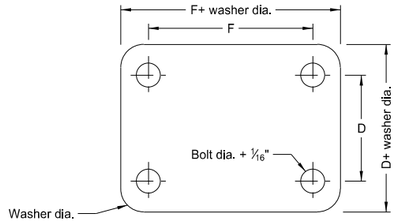
Stub Post Connection - Type B
Elevation View
(Two Posts)



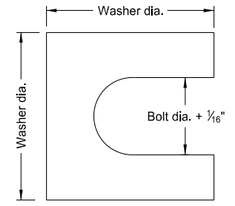
Stub Post Connection - Type C
Elevation View
(Two Posts)



Base Plate Plan View
The bevel shall be toward the roadway on the approach side and away on the other.



Keeper Plate Detail
Keeper plate shall be placed above the center washer between the top and bottom slip bases. Keeper plate shall be fabricated from 28 gauge material, galvanized after fabrication conforming to ASTM A653 G60 coating.



Shim Detail
Furnish 2 each ±.012" thick and 2 each ±.032" thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.

Notes:
When the base plate is fabricated in aluminum, the aluminum base plate washers shown shall be tack welded to the base as shown.

Use standard drawing D-754-6 for fuse plate, hinge plate, and foundation details.

Assembly Procedure:
1. Assemble post to stub with bolts and with one flat washer between base plates and keeper plate.
2. Shim as required.
3. Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and shims and to clean bolt threads, then loosen.
4. Retighten bolts in a systematic order to prescribed torque. (see table)
5. Loosen each bolt and apply thread locking liquid resin. The liquid locking resin shall conform to ASTM D5363-03 (2008). The thread locker shall secure the entire assembly from vibration, pressure and corrosion. The thread locker shall fill the gaps between the thread and the mating surface to form solid, one part assemblies.
6. Retighten each bolt to prescribed torque in the same order as initial retightening.

Base Data Table

Nominal Post Size dia.	Bolt Size (dia. x length)	Base Bolt Torque ft. lb.	A	B	C	D	E	F	G	t	W	Stub Post Length
Steel												
3½"	½"x2½"	12	5½"	8⅜"	13/16"	3⅞"	13/16"	6¾"	9/32"	¾"	⅜"	1'-6"
4"	⅝"x2¾"	29	5½"	8¾"	1"	3½"	1"	6¾"	11/32"	¾"	⅜"	1'-6"
5"	¾"x3½"	46	6½"	10"	1⅛"	4¼"	1⅛"	7¾"	13/32"	1"	7/16"	2'-0"
6"	1"x4¼"	61	7½"	11¾"	1⅜"	4¾"	1⅜"	9"	17/32"	1¼"	7/16"	2'-0"
Aluminum												
3½"	½"x2½"	12	5½"	8⅜"	13/16"	3⅞"	13/16"	6¾"	9/32"	¾"	⅜"	1'-6"
4"	⅝"x2¾"	29	5½"	8¾"	1"	3½"	1"	6¾"	11/32"	1"	7/16"	1'-6"
5"	¾"x3½"	46	6½"	10"	1⅛"	4¼"	1⅛"	7¾"	13/32"	1"	½"	2'-0"
6"	1"x4¼"	61	7½"	11¾"	1⅜"	4¾"	1⅜"	9"	17/32"	1¼"	½"	2'-0"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-21-11	
REVISIONS	
DATE	CHANGE
2-28-14	Removed lower post and foundation details.

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 5047, on 2/28/14 and the original document is stored at the North Dakota Department of Transportation

FOUNDATION DATA FOR STEEL SUPPORTS

D-754-5

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
1' - 4"	4' - 6"	0.23	0.47	4' - 2"	5	6	12	3	6	12
1' - 4"	5' - 0"	0.26	0.52	4' - 8"	5	6	12	3	7	14
1' - 4"	5' - 6"	0.28	0.57	5' - 2"	5	6	12	3	8	16
1' - 4"	6' - 0"	0.31	0.62	5' - 8"	5	6	12	3	8	16
1' - 4"	6' - 6"	0.34	0.67	6' - 2"	5	6	12	3	9	18
1' - 4"	7' - 0"	0.36	0.72	6' - 8"	5	6	12	3	9	18
1' - 4"	7' - 6"	0.39	0.78	7' - 2"	5	6	12	3	10	20
1' - 4"	8' - 0"	0.41	0.83	7' - 8"	5	6	12	3	11	22
1' - 4"	8' - 6"	0.44	0.88	8' - 2"	5	6	12	3	11	22
1' - 4"	9' - 0"	0.47	0.93	8' - 8"	5	6	12	3	12	24
1' - 4"	9' - 6"	0.49	0.98	9' - 2"	5	6	12	3	12	24
1' - 4"	10' - 0"	0.52	1.03	9' - 8"	5	6	12	3	13	26
1' - 4"	10' - 6"	0.54	1.09	10' - 2"	5	6	12	3	14	28
1' - 4"	11' - 0"	0.57	1.14	10' - 8"	5	6	12	3	14	28
1' - 4"	11' - 6"	0.59	1.19	11' - 2"	5	6	12	3	15	30
1' - 4"	12' - 0"	0.62	1.24	11' - 8"	5	6	12	3	15	30

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
1' - 9"	4' - 6"	0.40	0.80	4' - 2"	5	10	20	3	6	12
1' - 9"	5' - 0"	0.45	0.89	4' - 8"	5	10	20	3	7	14
1' - 9"	5' - 6"	0.49	0.98	5' - 2"	5	10	20	3	8	16
1' - 9"	6' - 0"	0.53	1.07	5' - 8"	5	10	20	3	8	16
1' - 9"	6' - 6"	0.58	1.16	6' - 2"	5	10	20	3	9	18
1' - 9"	7' - 0"	0.62	1.25	6' - 8"	5	10	20	3	9	18
1' - 9"	7' - 6"	0.67	1.34	7' - 2"	5	10	20	3	10	20
1' - 9"	8' - 0"	0.71	1.43	7' - 8"	5	10	20	3	11	22
1' - 9"	8' - 6"	0.76	1.51	8' - 2"	5	10	20	3	11	22
1' - 9"	9' - 0"	0.80	1.60	8' - 8"	5	10	20	3	12	24
1' - 9"	9' - 6"	0.85	1.69	9' - 2"	5	10	20	3	12	24
1' - 9"	10' - 0"	0.89	1.78	9' - 8"	5	10	20	3	13	26
1' - 9"	10' - 6"	0.94	1.87	10' - 2"	5	10	20	3	14	28
1' - 9"	11' - 0"	0.98	1.96	10' - 8"	5	10	20	3	14	28
1' - 9"	11' - 6"	1.02	2.05	11' - 2"	5	10	20	3	15	30
1' - 9"	12' - 0"	1.07	2.14	11' - 8"	5	10	20	3	15	30

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
2' - 0"	4' - 6"	0.52	1.05	4' - 2"	6	10	20	3	6	12
2' - 0"	5' - 0"	0.58	1.16	4' - 8"	6	10	20	3	7	14
2' - 0"	5' - 6"	0.64	1.28	5' - 2"	6	10	20	3	8	16
2' - 0"	6' - 0"	0.70	1.40	5' - 8"	6	10	20	3	8	16
2' - 0"	6' - 6"	0.76	1.51	6' - 2"	6	10	20	3	9	18
2' - 0"	7' - 0"	0.81	1.63	6' - 8"	6	10	20	3	9	18
2' - 0"	7' - 6"	0.87	1.75	7' - 2"	6	10	20	3	10	20
2' - 0"	8' - 0"	0.93	1.86	7' - 8"	6	10	20	3	11	22
2' - 0"	8' - 6"	0.99	1.98	8' - 2"	6	10	20	3	11	22
2' - 0"	9' - 0"	1.05	2.09	8' - 8"	6	10	20	3	12	24
2' - 0"	9' - 6"	1.11	2.21	9' - 2"	6	10	20	3	12	24
2' - 0"	10' - 0"	1.16	2.33	9' - 8"	6	10	20	3	13	26
2' - 0"	10' - 6"	1.22	2.44	10' - 2"	6	10	20	3	14	28
2' - 0"	11' - 0"	1.28	2.56	10' - 8"	6	10	20	3	14	28
2' - 0"	11' - 6"	1.34	2.68	11' - 2"	6	10	20	3	15	30
2' - 0"	12' - 0"	1.40	2.79	11' - 8"	6	10	20	3	15	30
2' - 0"	12' - 6"	1.45	2.91	12' - 2"	6	10	20	3	16	32
2' - 0"	13' - 0"	1.51	3.03	12' - 8"	6	10	20	3	17	34
2' - 0"	13' - 6"	1.57	3.14	13' - 2"	6	10	20	3	17	34
2' - 0"	14' - 0"	1.63	3.26	13' - 8"	6	10	20	3	18	36
2' - 0"	14' - 6"	1.69	3.37	14' - 2"	6	10	20	3	18	36
2' - 0"	15' - 0"	1.75	3.49	14' - 8"	6	10	20	3	19	38

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
2' - 4"	4' - 6"	0.71	1.43	4' - 2"	6	14	28	3	6	12
2' - 4"	5' - 0"	0.79	1.58	4' - 8"	6	14	28	3	7	14
2' - 4"	5' - 6"	0.87	1.74	5' - 2"	6	14	28	3	8	16
2' - 4"	6' - 0"	0.95	1.90	5' - 8"	6	14	28	3	8	16
2' - 4"	6' - 6"	1.03	2.06	6' - 2"	6	14	28	3	9	18
2' - 4"	7' - 0"	1.11	2.22	6' - 8"	6	14	28	3	9	18
2' - 4"	7' - 6"	1.19	2.38	7' - 2"	6	14	28	3	10	20
2' - 4"	8' - 0"	1.27	2.53	7' - 8"	6	14	28	3	11	22
2' - 4"	8' - 6"	1.35	2.69	8' - 2"	6	14	28	3	11	22
2' - 4"	9' - 0"	1.43	2.85	8' - 8"	6	14	28	3	12	24
2' - 4"	9' - 6"	1.50	3.01	9' - 2"	6	14	28	3	12	24
2' - 4"	10' - 0"	1.58	3.17	9' - 8"	6	14	28	3	13	26
2' - 4"	10' - 6"	1.66	3.33	10' - 2"	6	14	28	3	14	28
2' - 4"	11' - 0"	1.74	3.48	10' - 8"	6	14	28	3	14	28
2' - 4"	11' - 6"	1.82	3.64	11' - 2"	6	14	28	3	15	30
2' - 4"	12' - 0"	1.90	3.80	11' - 8"	6	14	28	3	15	30
2' - 4"	12' - 6"	1.98	3.96	12' - 2"	6	14	28	3	16	32
2' - 4"	13' - 0"	2.06	4.12	12' - 8"	6	14	28	3	17	34
2' - 4"	13' - 6"	2.14	4.28	13' - 2"	6	14	28	3	17	34
2' - 4"	14' - 0"	2.22	4.43	13' - 8"	6	14	28	3	18	36
2' - 4"	14' - 6"	2.30	4.59	14' - 2"	6	14	28	3	18	36
2' - 4"	15' - 0"	2.38	4.75	14' - 8"	6	14	28	3	19	38
2' - 4"	15' - 6"	2.45	4.91	15' - 2"	6	14	28	3	20	40
2' - 4"	16' - 0"	2.53	5.07	15' - 8"	6	14	28	3	20	40
2' - 4"	16' - 6"	2.61	5.23	16' - 2"	6	14	28	3	21	42
2' - 4"	17' - 0"	2.69	5.38	16' - 8"	6	14	28	3	21	42
2' - 4"	17' - 6"	2.77	5.54	17' - 2"	6	14	28	3	22	44
2' - 4"	18' - 0"	2.85	5.70	17' - 8"	6	14	28	3	23	46

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
2' - 6"	4' - 6"	0.82	1.64	4' - 2"	6	16	32	3	6	12
2' - 6"	5' - 0"	0.91	1.82	4' - 8"	6	16	32	3	7	14
2' - 6"	5' - 6"	1.00	2.00	5' - 2"	6	16	32	3	8	16
2' - 6"	6' - 0"	1.09	2.18	5' - 8"	6	16	32	3	8	16
2' - 6"	6' - 6"	1.18	2.36	6' - 2"	6	16	32	3	9	18
2' - 6"	7' - 0"	1.27	2.55	6' - 8"	6	16	32	3	9	18
2' - 6"	7' - 6"	1.36	2.73	7' - 2"	6	16	32	3	10	20
2' - 6"	8' - 0"	1.45	2.91	7' - 8"	6	16	32	3	11	22
2' - 6"	8' - 6"	1.55	3.09	8' - 2"	6	16	32	3	11	22
2' - 6"	9' - 0"	1.64	3.27	8' - 8"	6	16	32	3	12	24
2' - 6"	9' - 6"	1.73	3.45	9' - 2"	6	16	32	3	12	24
2' - 6"	10' - 0"	1.82	3.64	9' - 8"	6	16	32	3	13	26
2' - 6"	10' - 6"	1.91	3.82	10' - 2"	6	16	32	3	14	28
2' - 6"	11' - 0"	2.00	4.00	10' - 8"	6	16	32	3	14	28
2' - 6"	11' - 6"	2.09	4.18	11' - 2"	6	16	32	3	15	30
2' - 6"	12' - 0"	2.18	4.36	11' - 8"	6	16	32	3	15	30
2' - 6"	12' - 6"	2.27	4.55	12' - 2"	6	16	32	3	16	32
2' - 6"	13' - 0"	2.36	4.73	12' - 8"	6	16	32	3	17	34
2' - 6"	13' - 6"	2.45	4.91	13' - 2"	6	16	32	3	17	34
2' - 6"	14' - 0"	2.55	5.09	13' - 8"	6	16	32	3	18	36
2' - 6"	14' - 6"	2.64	5.27	14' - 2"	6	16	32	3	18	36
2' - 6"	15' - 0"	2.73	5.45	14' - 8"	6	16	32	3	19	38
2' - 6"	15' - 6"	2.82	5.64	15' - 2"	6	16	32	3	20	40
2' - 6"	16' - 0"	2.91	5.82	15' - 8"	6	16	32	3	20	40
2' - 6"	16' - 6"	3.00	6.00	16' - 2"	6	16	32	3	21	42
2' - 6"	17' - 0"	3.09	6.18	16' - 8"	6	16	32	3	21	42
2' - 6"	17' - 6"	3.18	6.36	17' - 2"	6	16	32	3	22	44
2' - 6"	18' - 0"	3.27	6.54	17' - 8"	6	16	32	3	23	46
2' - 6"	18' - 6"	3.36	6.73	18' - 2"	6	16	32	3	23	46
2' - 6"	19' - 0"	3.45	6.91	18' - 8"	6	16	32	3	24	48
2' - 6"	19' - 6"	3.55	7.09	19' - 2"	6	16	32	3	24	48
2' - 6"	20' - 0"	3.64	7.27	19' - 8"	6	16	32	3	25	50

NOTES:

1. All reinforcing steel shall be Grade 60 steel.

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

10-3-13

REVISIONS

DATE	CHANGE

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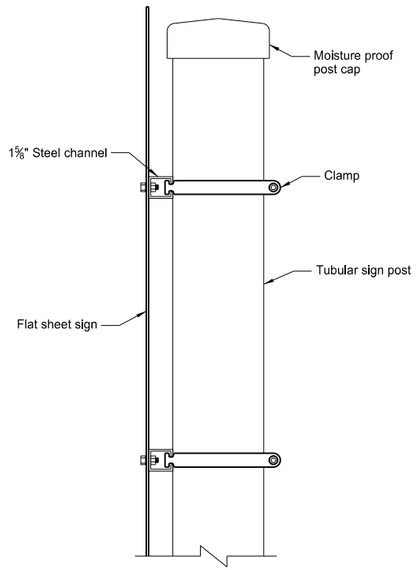
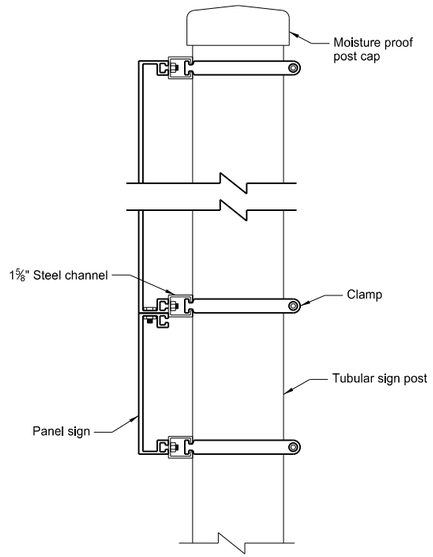
PIPE SUPPORT AND SIGN MOUNTING DETAILS

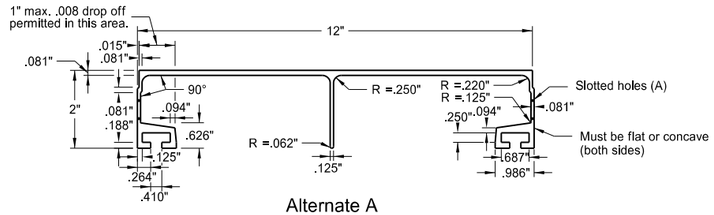
D-754-7



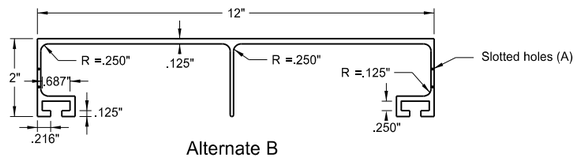
Side View



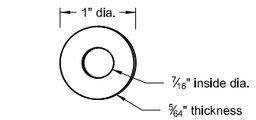
Side View



Alternate A
12" Extruded Panel



Alternate B
12" Extruded Panel



Flat Washer Detail

Slotted Hole Detail

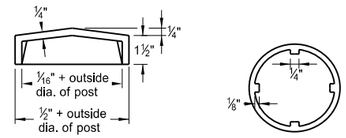
6" Extruded Panel

Aluminum Panel Details

(A) Slotted holes shall be punched in the aluminum panels at 1'-0" on center, spacing from end as listed below:

12" even length panels	4'-0" etc.
9" odd + 6" length panels	5'-6" etc.
6" odd length panels	5'-0" etc.
3" even + 6" length panels	4'-6" etc.

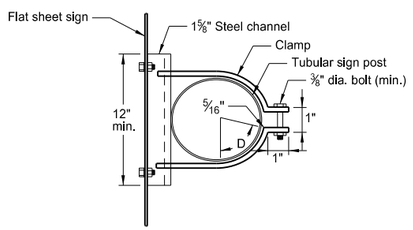
Wall thickness = .078" unless specified otherwise.
All inside and outside corners = .031" radius unless specified otherwise.



Side View Top View

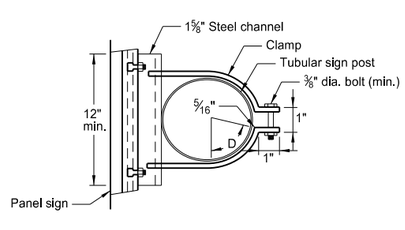
Post Cap Detail

Post caps shall be furnished for all steel or aluminum posts.
In place of post cap, a ⅛" plate welded all around may be used.



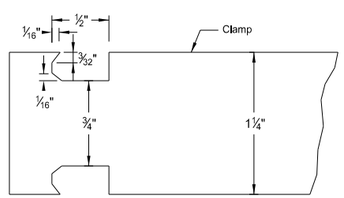
Top View

Flat Sheet Sign Clamp Mounting Details

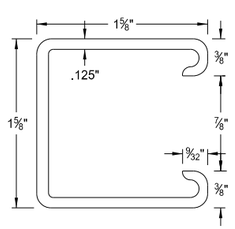


Top View

Panel Sign Clamp Mounting Details



Clamp Detail



Steel Channel Detail

Post Size dia.	Clamp Gauge min.
3½" to 5"	11
6" to 12"	10

Post Size dia. in.	D in.
3½	3
4	3 3⁄16
5	5⅛
6	7 7⁄16
8	13 1⁄16
10	20¾
12	29⅝

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-21-14	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 2/21/14 and the original document is stored at the North Dakota Department of Transportation

PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

Notes:

1. Curbed Roadways: The clearance from the face of the curb should be 3' except where right of way or sidewalk width is limited, a minimum clearance of 2' shall be provided. The horizontal clearance may need to be increased to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.

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

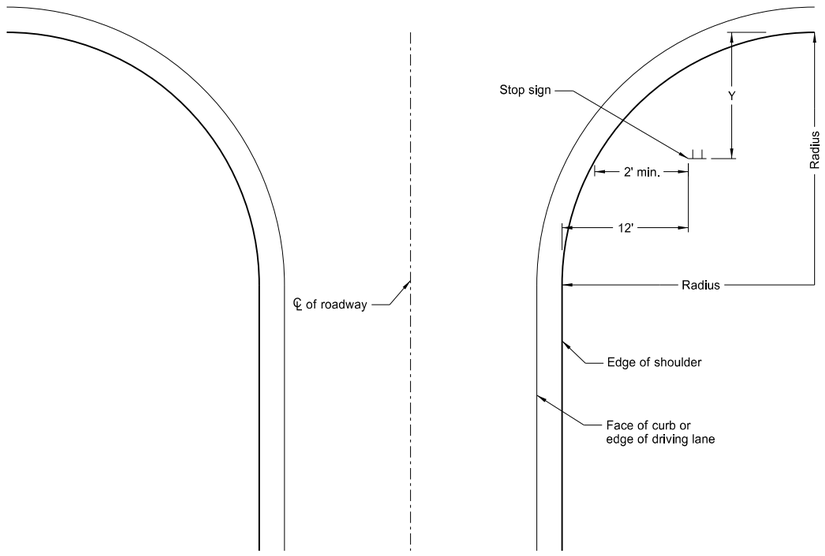
   Signs on expressways shall be installed with a minimum height of 7'.

   Adopt-a-highway signs installed on Freeways shall be at least 7' above the edge of the driving lane.

   The vertical clearance shall have a maximum height of 6" above the vertical clearance specified above.

3. Offset signs: Where signs are placed at least 30 feet or more from the edge of the traveled way, the height to the bottom of such sign shall be 5' above the edge of the driving lane.

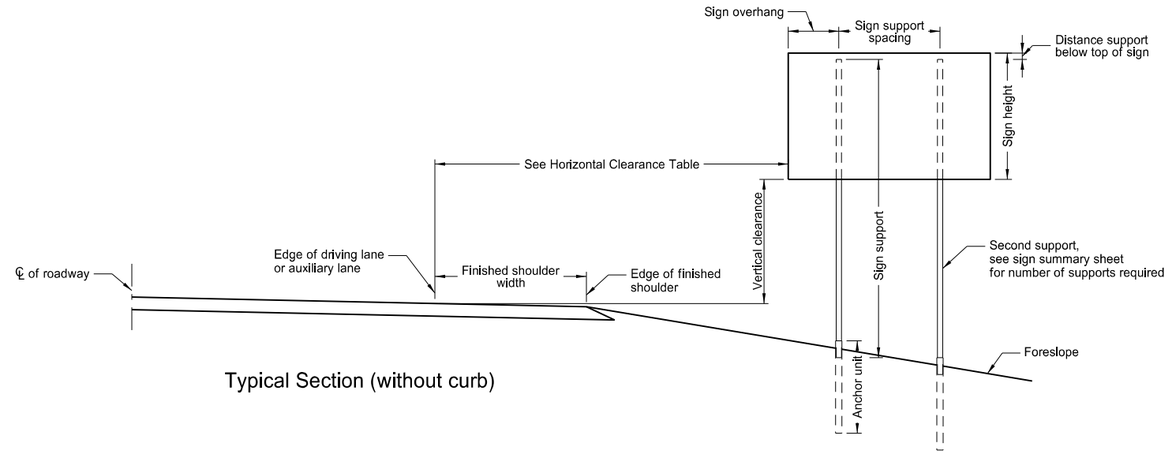
4. The clearance from edge of shared use path to edge of sign should be 3' except where width is limited, a minimum clearance of 2' shall be provided.



Stop Sign Location
Wide Throat Intersection

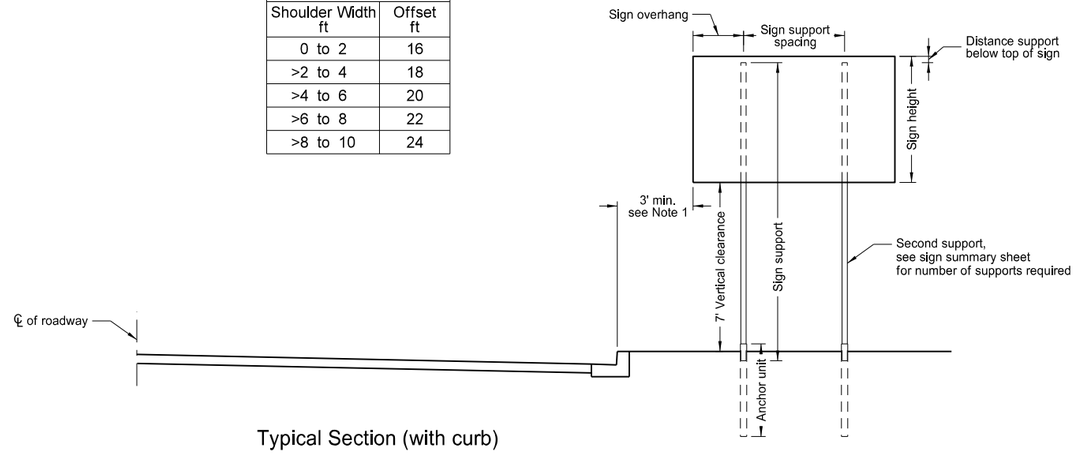
This layout is to be used for the placement of "Stop" signs.

Radius ft.	Y-max. ft.	Y-min. ft.
40	50	15
45	50	18
50	50	21
55	50	25
60	50	28
65	50	32
70	50	35
75	50	39
80	50	43



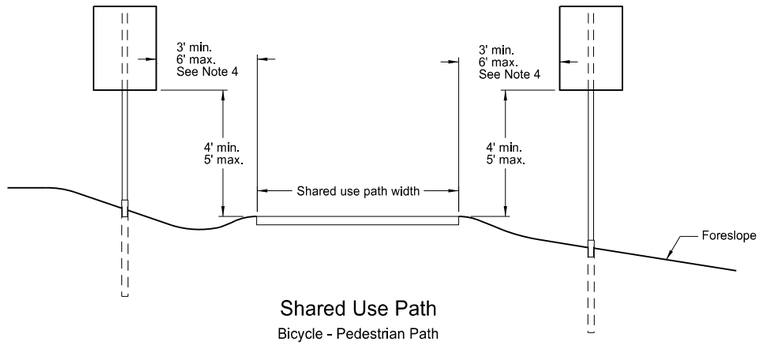
Typical Section (without curb)

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



Typical Section (with curb)

Residential or Business District



Shared Use Path

Bicycle - Pedestrian Path

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-8-14	Revised note 2, added note 4.

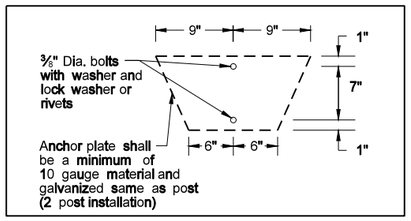
This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 7/8/14 and the original document is stored at the North Dakota Department of Transportation

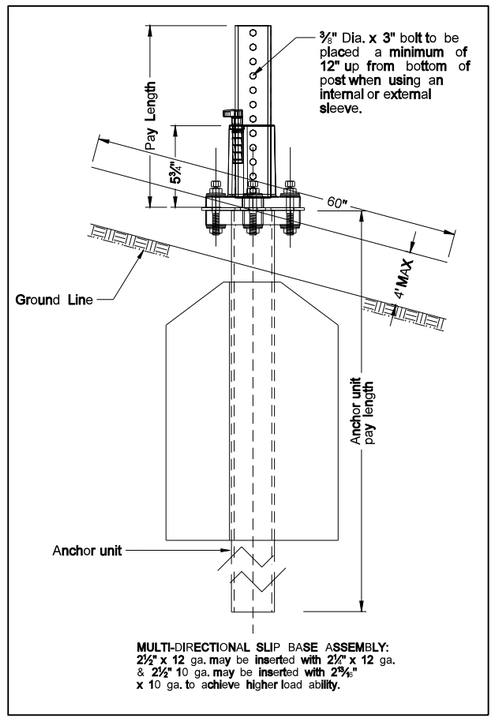
Mounting Details Perforated Tube

D-754-24

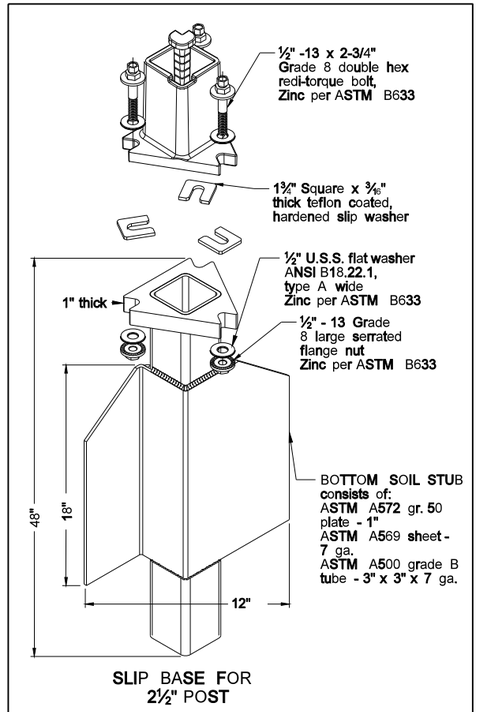
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2½	12
1	2½	12			No	2½	12
1	2½	12			(B)	3(C)	7
1	2½	10			Yes		7
1	2½	12	2⅛(D)	12	Yes		7
1	2½	12	2½	12	Yes		7
2	2½	10			Yes		7
2	2½	12	2⅛(D)	12	Yes		7
2	2½	12	2½	12	Yes		7
3 & 4	2½	12			Yes		7
3 & 4	2½	10			Yes		7
3 & 4	2½	12	2½	12	Yes		7
3 & 4	2½	12	2⅛(D)	12	Yes		7
3 & 4	2½	10	2⅜	10	Yes		7

(B) - The 2½", 12 gauge posts do not need breakaway bases when placed in standard soils, but require a shim as specified by the manufacturer. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2½" x 12 ga. x 18" minimum length external sleeve required.

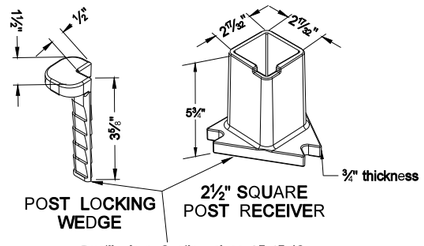




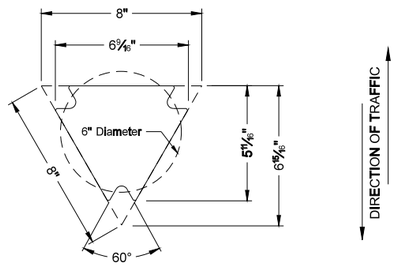
MULTI-DIRECTIONAL SLIP BASE ASSEMBLY: 2½" x 12 ga. may be inserted with 2½" x 12 ga. & 2½" 10 ga. may be inserted with 2⅜" x 10 ga. to achieve higher load ability.



SLIP BASE FOR 2½" POST



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



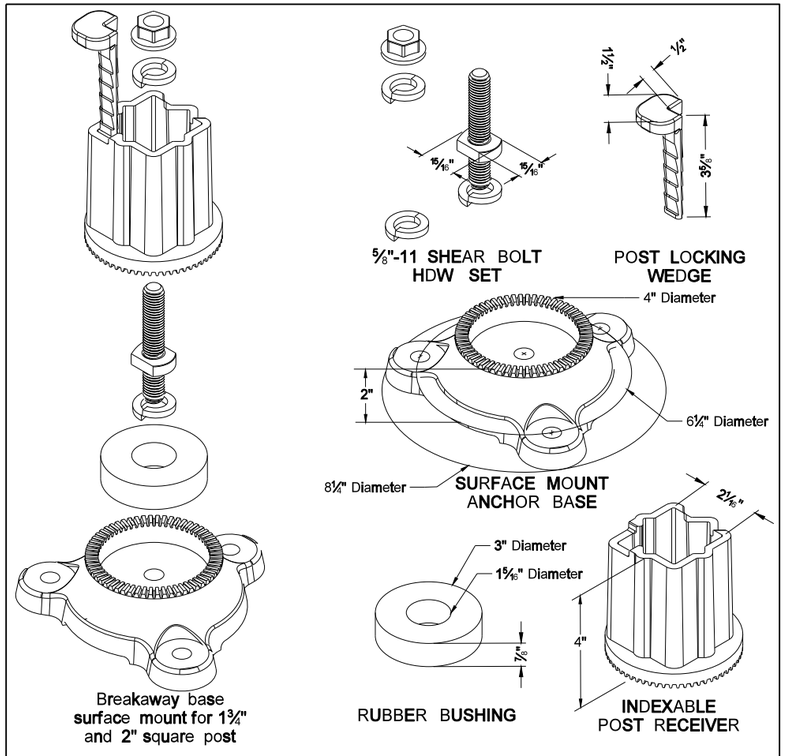
SLIP BASE DETAIL

Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness in.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia in.⁴	Cross Sect. Area in.²	Section Modulus in.³
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2⅜ x 2⅜	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.783

The 2 ⅜" size 10 gauge is shown as 2.19" size on the plans; The 2½" size is shown as 2.51" size on the plans.

NOTE:

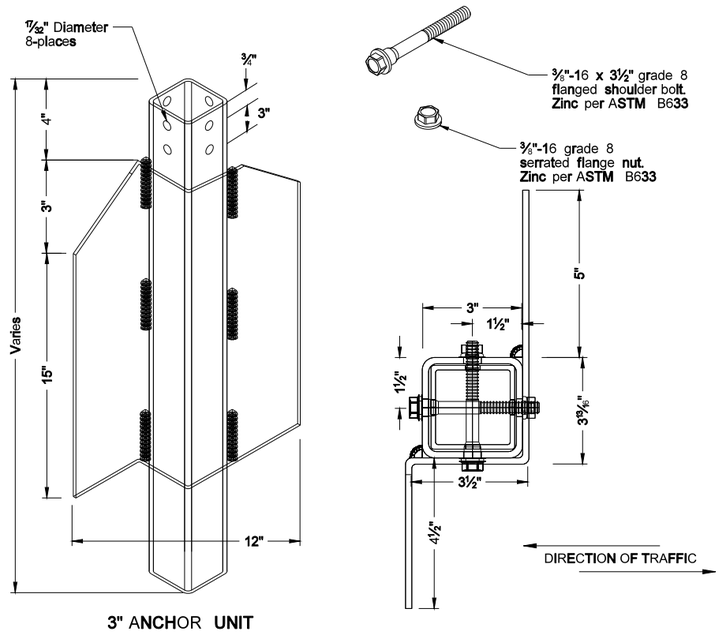
1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.
2. Anchor material shall be 7 guage H.R.P.O. Commmercial quality ASTM A569 and 3" x 3" x 7" guage ASTM A500 grade B. Anchor shall have a yield strength 43.9 KSI and tensile strength of 59.3 KSI. Anchor shall be hot dipped galvanized per ASTM A123/153. All tolerances on anchor unit and slip base bottom assembly are +/- 0.005" unless otherwise noted.
3. When used in concrete sidewalk, anchor shall be the same concept without the wings
4. Four post signs shall have over 8' between the first and fourth posts.
5. Installation procedures as per manufacturers recommendation.
6. Concrete fasteners for surface mount breakaway base shall be a minimum ½" diameter x 4" grade 8.



SURFACE MOUNT ANCHOR BASE

SHOULDER BOLT

Shimming agent to reduce tolerance between 3" anchor unit and 2½" post. (standard ⅝" diameter grade 8 bolt may be used with proper shim)



3" ANCHOR UNIT

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE

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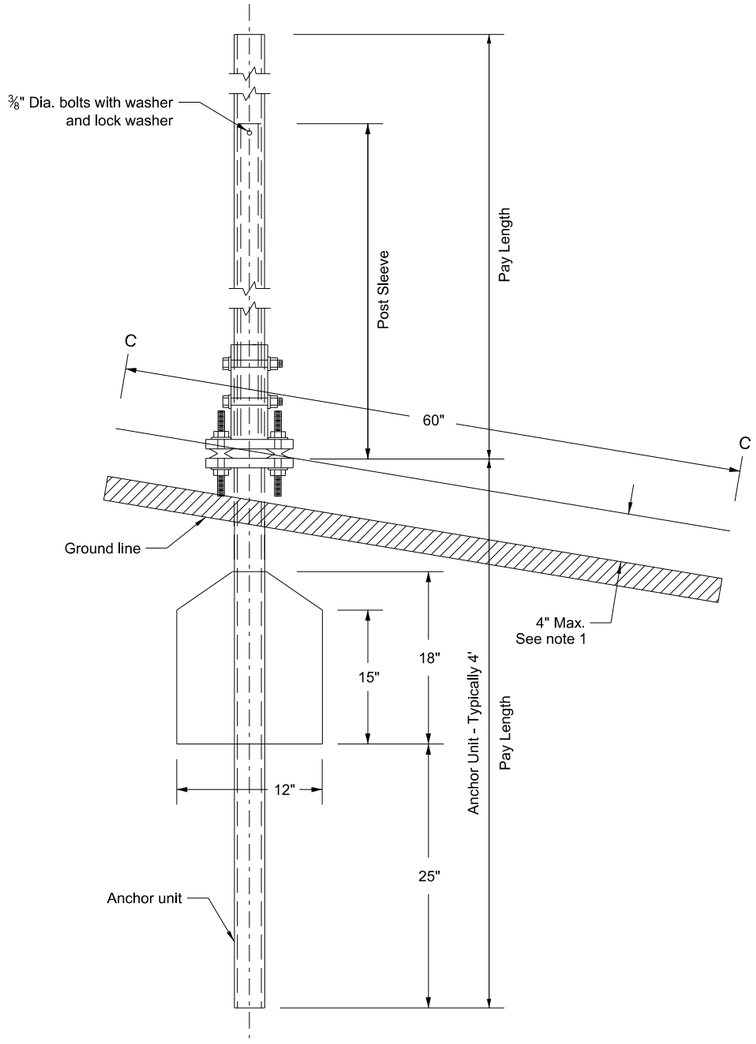
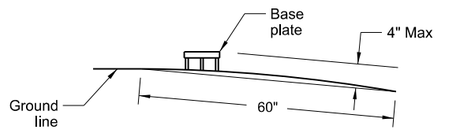
D-754-24A

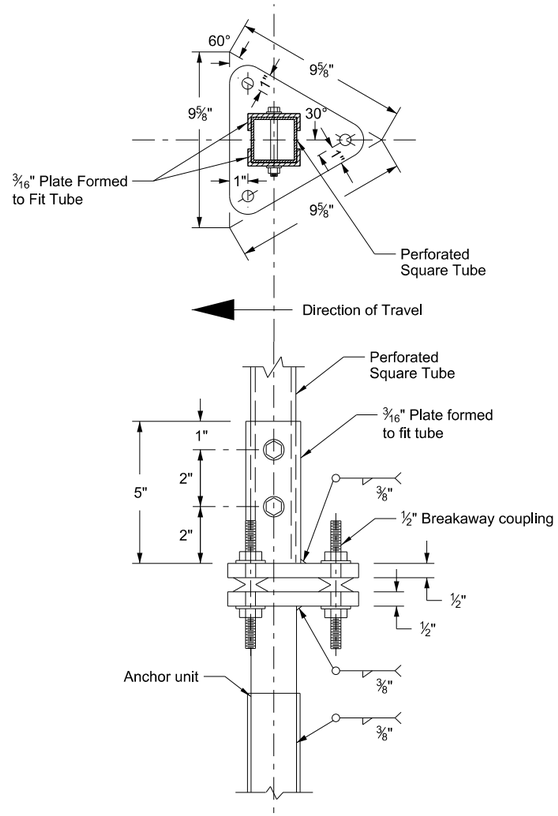
Breakaway Coupler System for Perforated Tubes



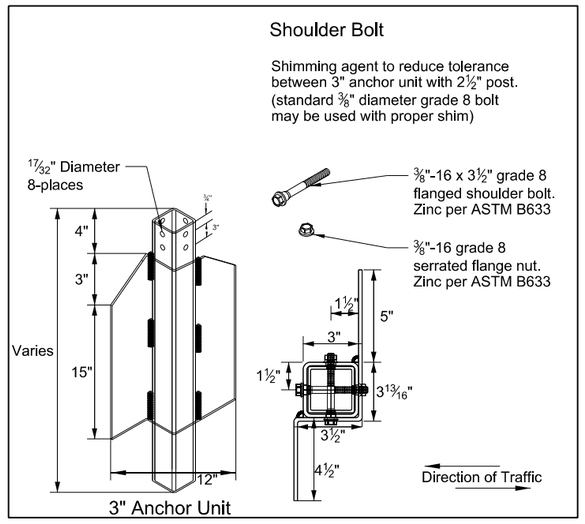


Section C-C

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



Base Plate with Breakaway Coupler



3" Anchor Unit

Notes:

1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.
2. Anchor unit shall be the same size as the post and shall have the same specification as the post.
3. Four post signs shall have over 8' between the first and fourth post.
4. In lieu of the breakaway base system on standard D-754-24 the breakaway coupling system may be used. The breakaway coupler system shall be manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements as specified by DENT BREAKAWAY IND., INC. which meets the test requirements of NCHRP Report 350.

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

(B) - The 2½" 12 gauge posts do not need breakaway bases when placed in standard soils. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.

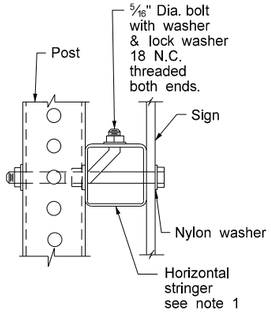
(C) - 3" anchor unit

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE

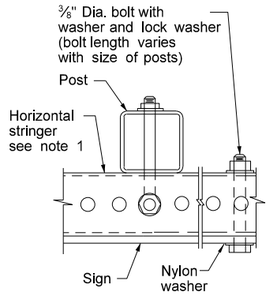
This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 10/3/13 and the original document is stored at the North Dakota Department of Transportation

Mounting Details Perforated Tube

D-754-25

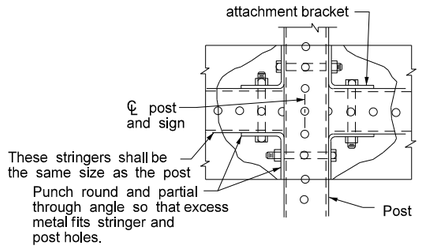


Side View



Top View

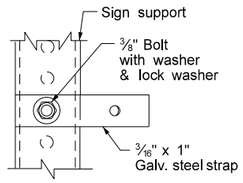
STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)



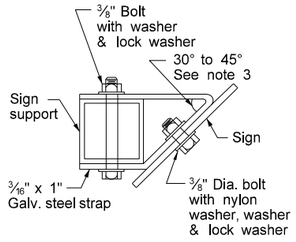
STREET NAME SIGNS
AND ONE WAY SIGNS
SINGLE POST ASSEMBLY
ONE STRINGER OR
BACK TO BACK MOUNTING

Note:

1. Horizontal stringers - In lieu of perforated tubes, the contractor may substitute z bar stringers. The z bar stringers shall be 1¾" x 3/16" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel.
2. Metal washers used on sign face shall have a minimum outside diameter of 15/16" ± 1/16" and 10 gauge thickness.
3. No Parking Signs: All no parking signs with directional arrows shall be placed at a 30 to 45 degree angle with the line of traffic flow. No parking signs required at the above angles may have the support turned to the correct angle. If the no parking sign is placed with another sign that has to be placed at a 90 degree angle with the line of traffic flow, the detailed angle strap should be used to mount the no parking sign. Flat washers and lock washers shall be used with all nylon washers.
4. In lieu of using the bent bolt to attach the post to the stringer, the contractor may choose to punch the sign backing and place the bolt through the sign, the stringer and the post.
5. 4" vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.

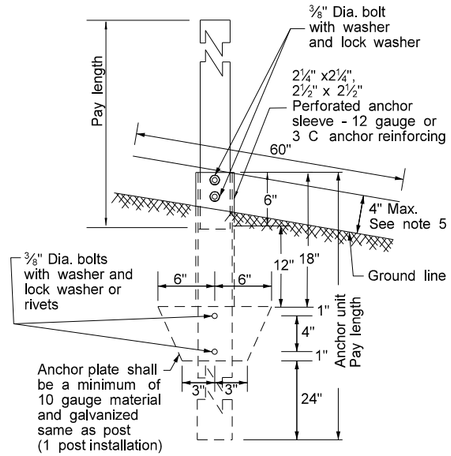


Side View



Top View

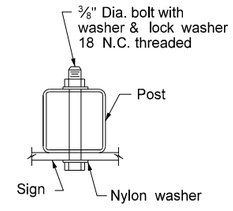
STRAP DETAIL



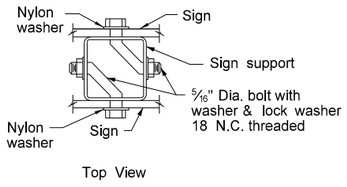
ANCHOR UNIT AND
POST ASSEMBLY

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

(B) - The 2½", 12 gauge posts do not need breakaway bases when placed in standard soils, but require a shim as specified by the manufacturer. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2½" x 12 ga. x 18" minimum length external sleeve required.

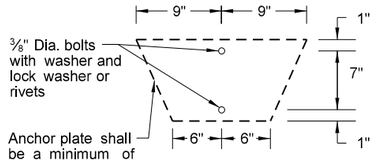


BOLT MOUNTING



Top View

BACK TO BACK
MOUNTING



Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia $In.^4$	Cross Sect. area $In.^2$	Section Modulus $In.^3$
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.783

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

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

8-6-09

REVISIONS

DATE	CHANGE
7-8-14	Revised Note 3

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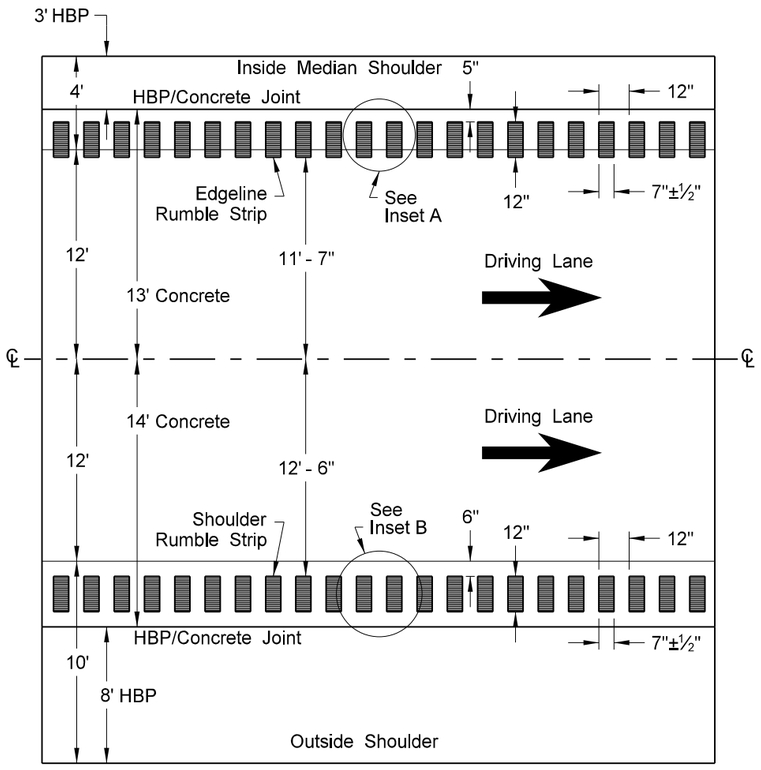
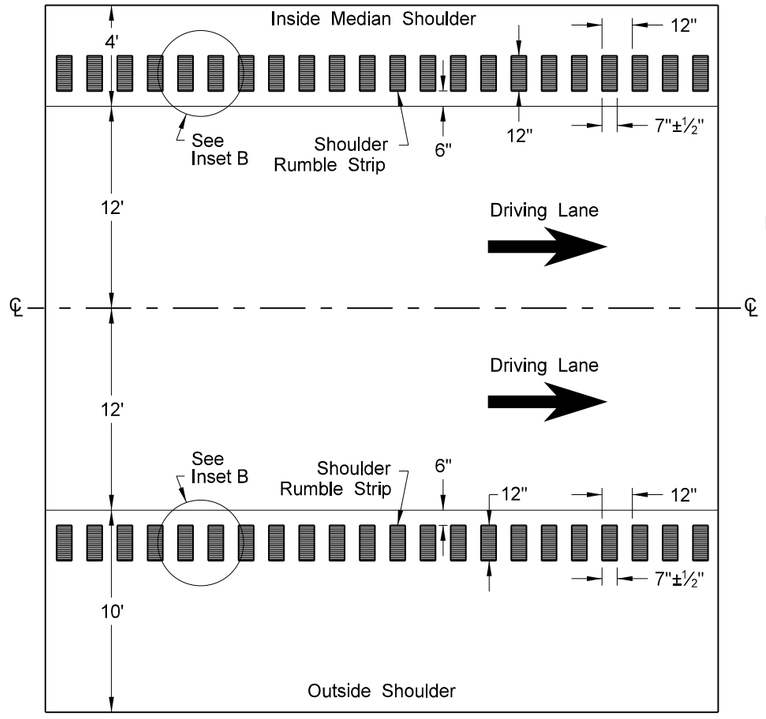
RUMBLE STRIPS
INTERSTATE HIGHWAYS



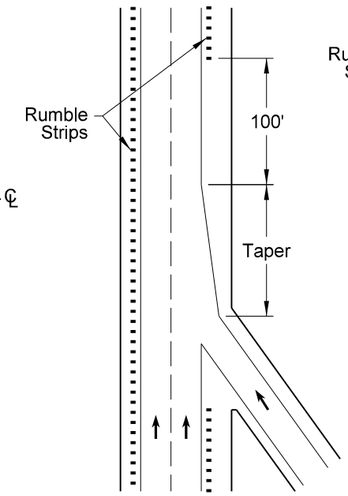
Interstate - 13' and 14' Concrete Width Mainline with Asphalt Shoulders



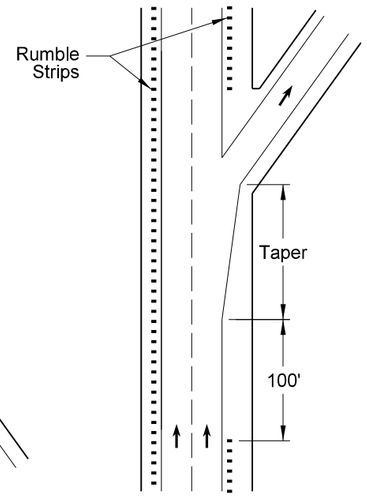
Interstate

NOTES:

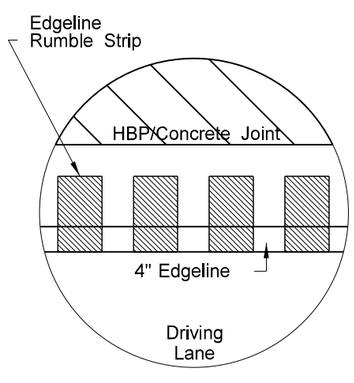
1) Discontinue rumble strips through ramps and 100' before and after ramp tapers as shown below.



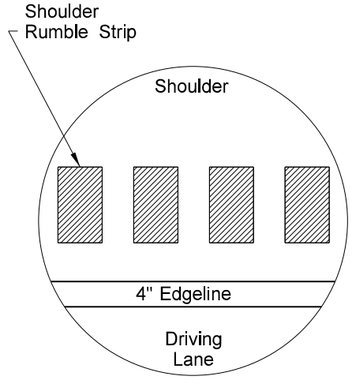
Entrance Ramp



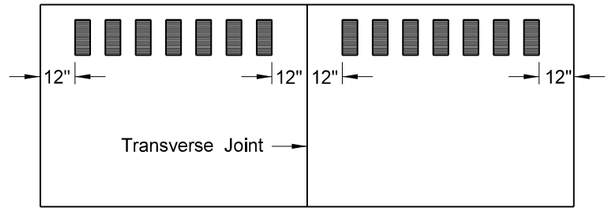
Exit Ramp



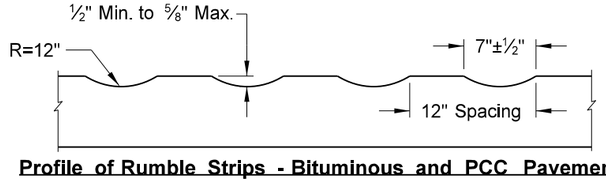
Inset A - Edgeline Rumble Strip



Inset B - Shoulder Rumble Strip



Discontinue rumble strip approx. 12" on both sides of PCC transverse joint



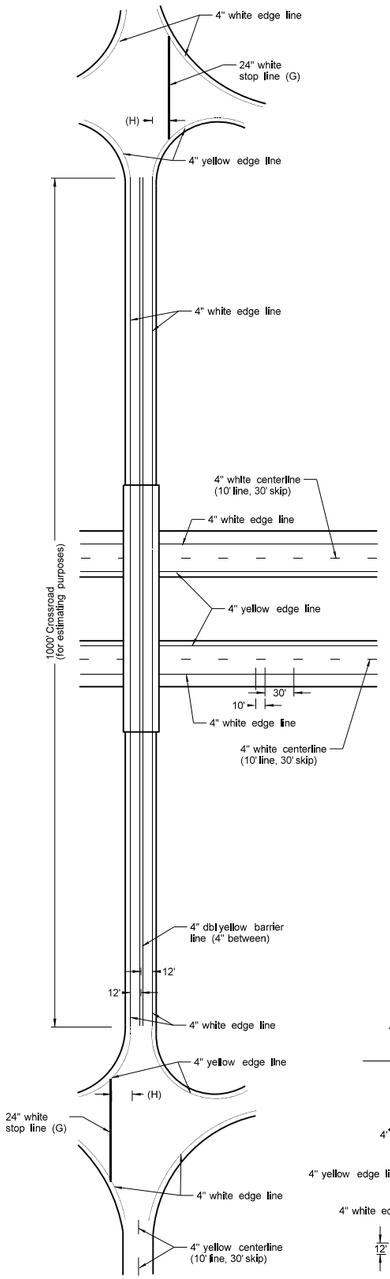
Profile of Rumble Strips - Bituminous and PCC Pavements

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-29-09	
REVISIONS	
DATE	CHANGE
2-25-10	Note 4 was added.
9-8-11	Revised Notes and D-760-1

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 9/8/11 and the original document is stored at the North Dakota Department of Transportation

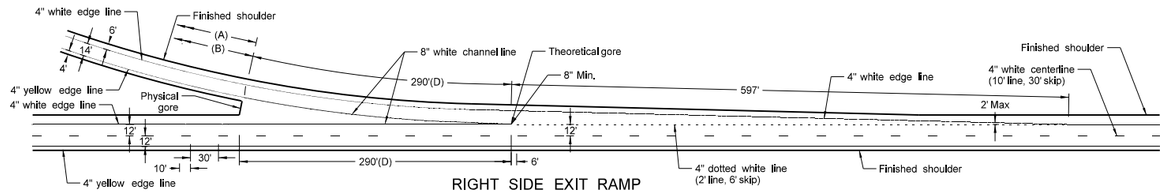
INTERSTATE PAVEMENT MARKING
4 LANE DIVIDED HIGHWAY

D-762-2



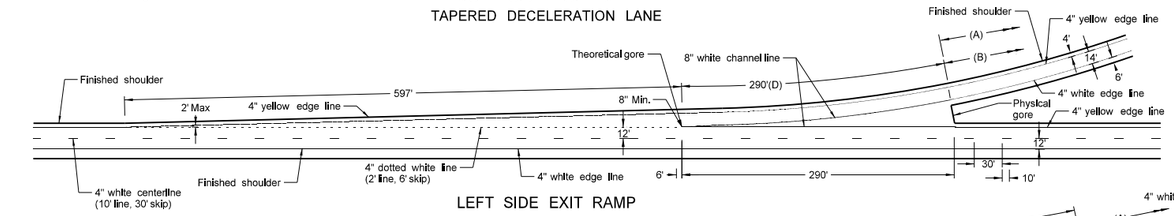
CROSS-ROAD & STRUCTURE

Engineer will determine length striped.



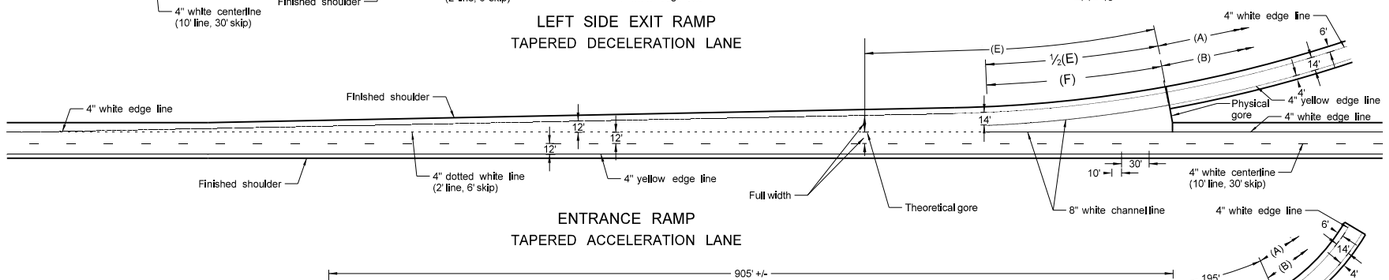
RIGHT SIDE EXIT RAMP

TAPERED DECELERATION LANE



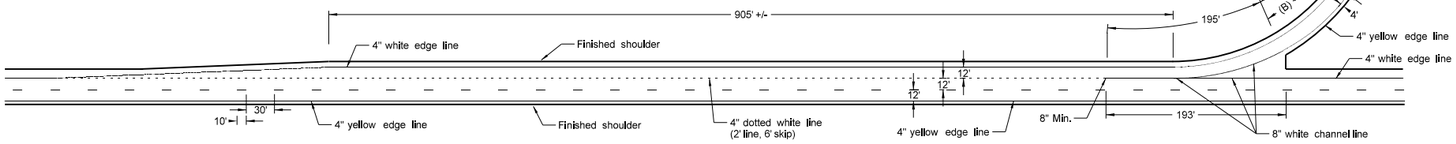
LEFT SIDE EXIT RAMP

TAPERED DECELERATION LANE



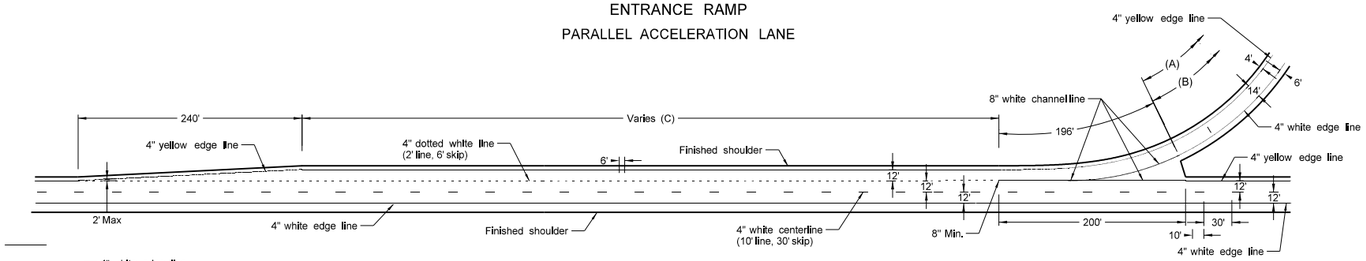
ENTRANCE RAMP

TAPERED ACCELERATION LANE



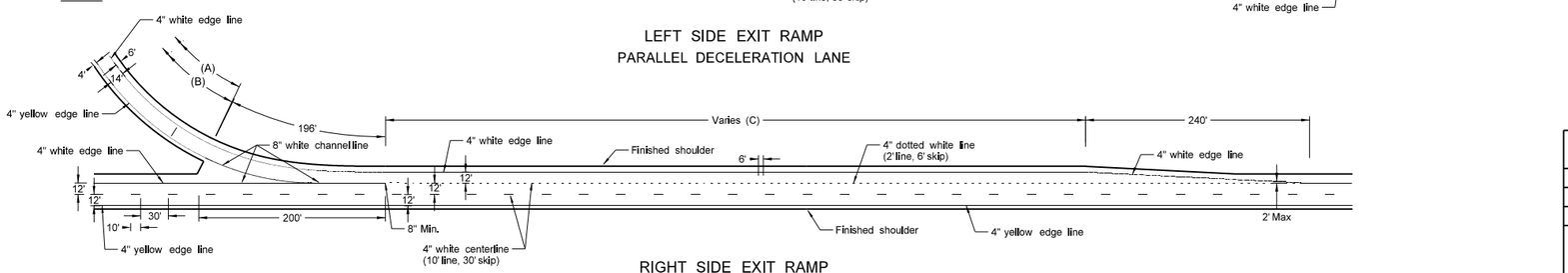
ENTRANCE RAMP

PARALLEL ACCELERATION LANE



LEFT SIDE EXIT RAMP

PARALLEL DECELERATION LANE



RIGHT SIDE EXIT RAMP

PARALLEL DECELERATION LANE

NOTE:

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

BASIS OF ESTIMATE		
LOCATION	ITEM	
Right or Left Side Exit Ramp TAPERED	8" White channel line	580 LF
	24" White stop line	60 LF
	4" White dotted line	148 LF
	4" White edge line	1115 LF
	4" Yellow edge line	1075 LF
Entrance Ramp TAPERED	8" White channel line	390 LF
	4" White dotted line	258 LF
	4" White edge line	1270 LF
	4" Yellow edge line	1075 LF
Right or Left Side Exit Ramp PARALLEL	8" White channel line	396 LF
	24" White stop line	60 LF
	4" White dotted line (C)	258 LF
	4" White edge line	1115 LF
	4" Yellow edge line	1075 LF
Entrance Ramp PARALLEL	8" White channel line	388 LF
	4" White dotted line	283 LF
	4" White edge line	1275 LF
	4" Yellow edge line	1075 LF
Main Line (Both Roadways)	4" White lane line, 10' line, 30' skip	2640 LF/MI
	4" White edge line	10,560 LF/MI
	4" Yellow edge line	10,560 LF/MI
Cross Road	4" White edge line	2000 LF
	4" Dbl yellow barrier line (4" between)	2000 LF

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-3-11	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.

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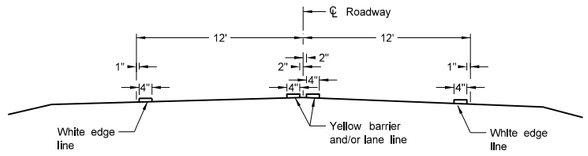
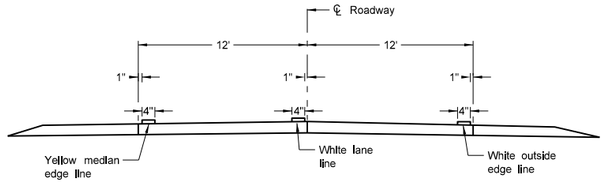
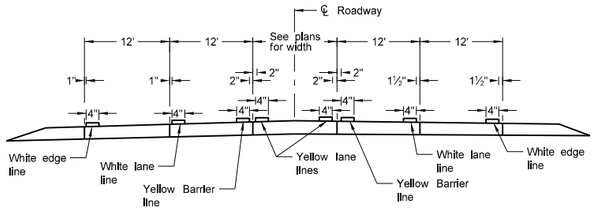


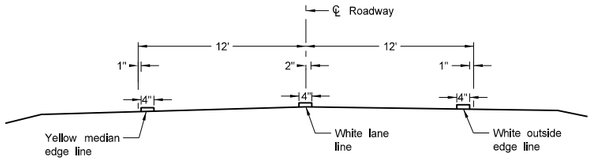
Two Lane Two Way
RURAL ROADWAY



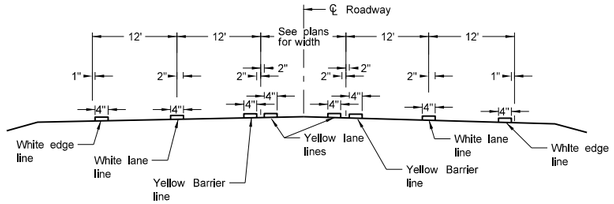
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



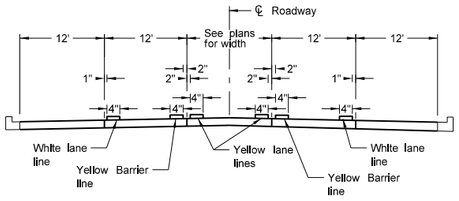
RURAL FIVE LANE ROADWAY
Concrete Section



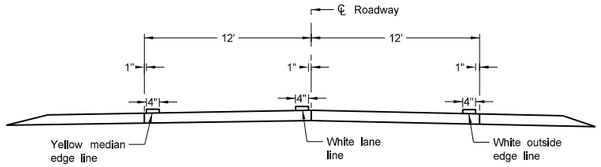
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



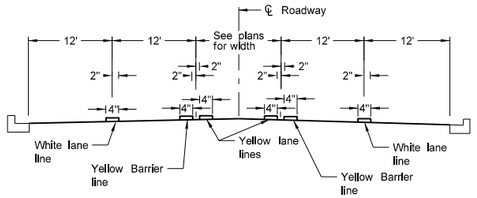
RURAL FIVE LANE ROADWAY
Asphalt Section



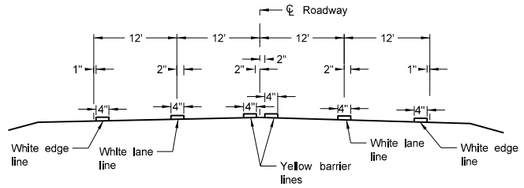
URBAN FIVE LANE SECTION
Concrete Section



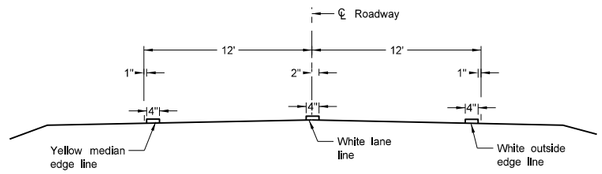
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



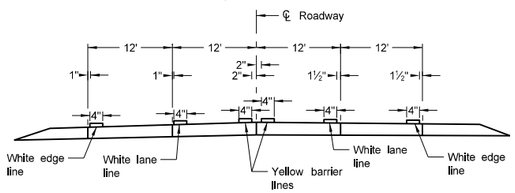
URBAN FIVE LANE SECTION
Asphalt Section



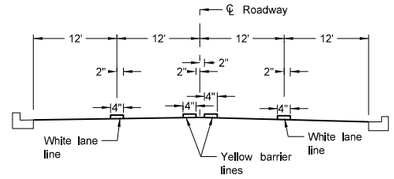
RURAL FOUR LANE ROADWAY
Asphalt Section



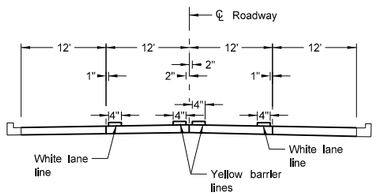
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



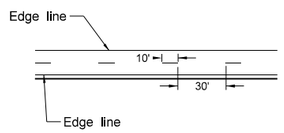
RURAL FOUR LANE ROADWAY
Concrete Section



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.

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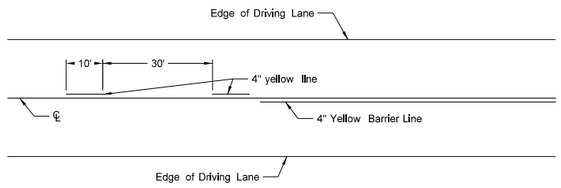
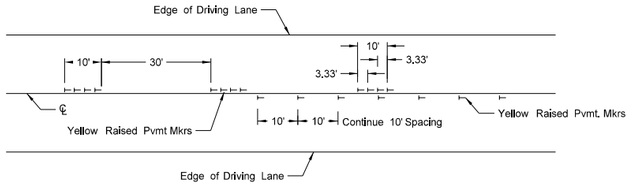
SHORT-TERM PAVEMENT MARKING

D-762-11

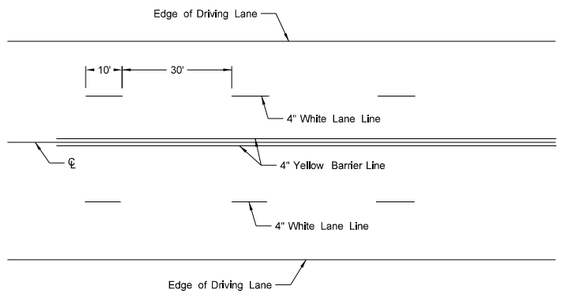


Painted or Tape Lines

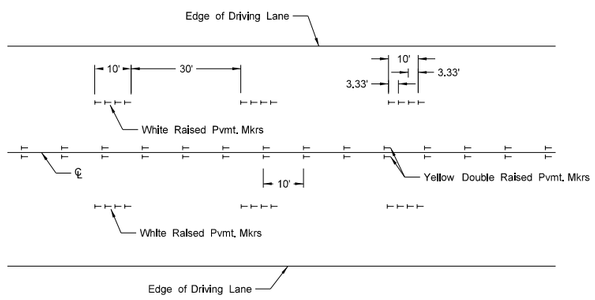


Raised Pavement Markers

TWO-LANE TWO-WAY ROADWAY

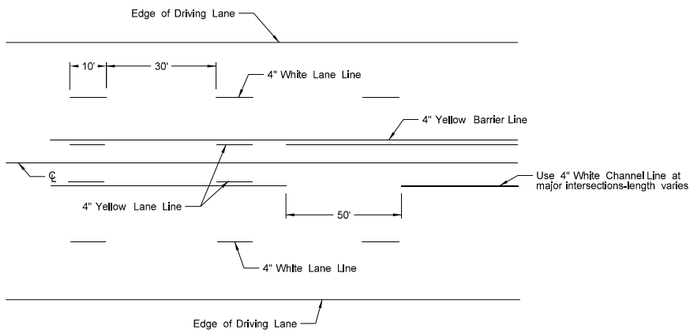


Painted or Tape Lines

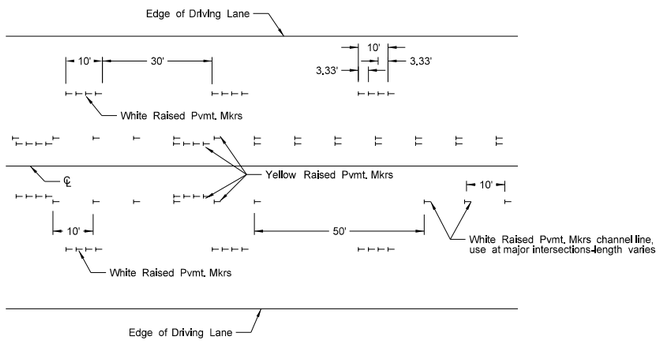


Raised Pavement Markers

FOUR LANE ROADWAY

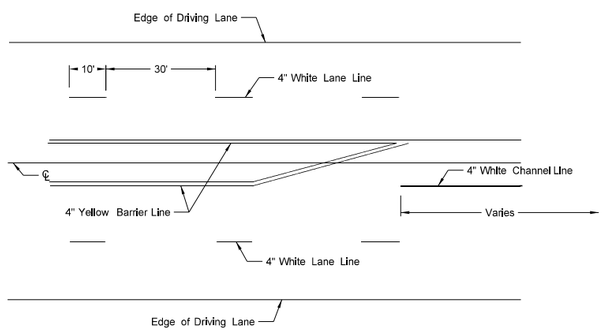


Painted or Tape Lines

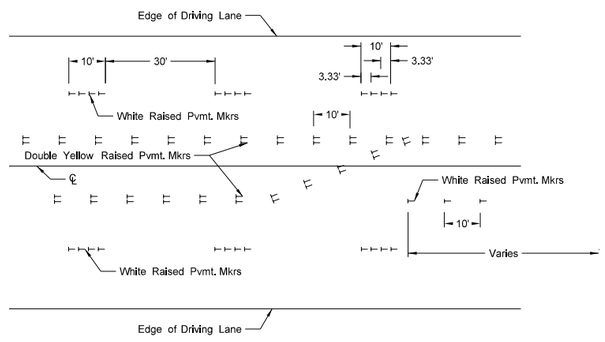


Raised Pavement Markers

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.

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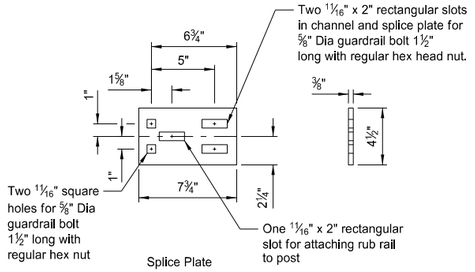
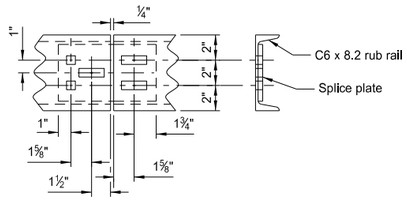
W-BEAM GUARDRAIL GENERAL DETAILS

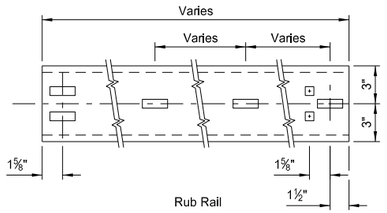
D-764-1



Splice Plate

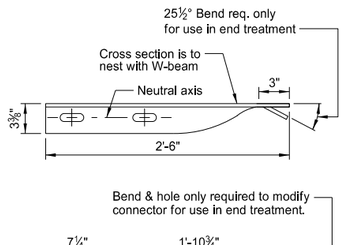


Splice Detail

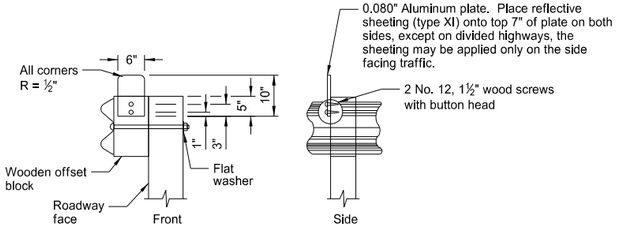


Rub Rail

C6x8 RUB RAIL AND SPLICE PLATE

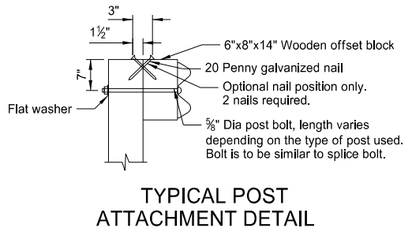


W BEAM TERMINAL CONNECTOR

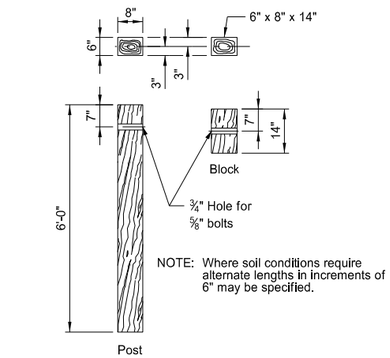


REFLECTORIZED PLATE DETAIL

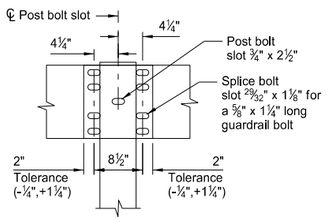
Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.



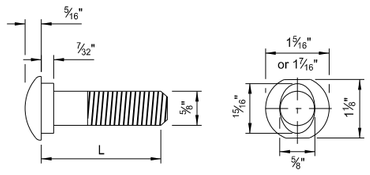
TYPICAL POST ATTACHMENT DETAIL



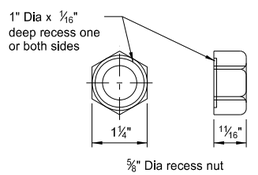
6"x8" TIMBER POST & BLOCK



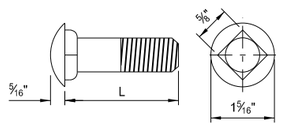
SPLICE DETAIL



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

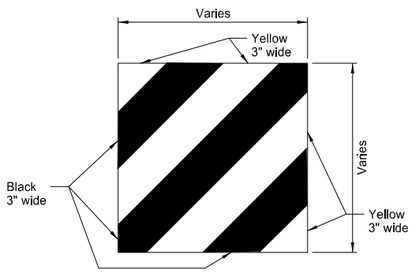


5/8" GUARDRAIL BOLT & RECESS NUT

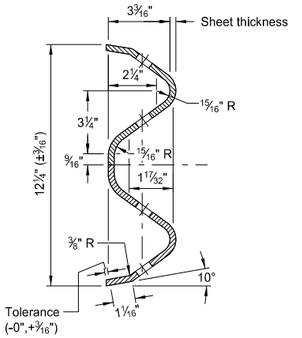


5/8" Diameter Carriage Bolt	
L	Thread Length
1 1/2"	Full length thread
3"	1 1/2" Min thread length
11"	1 3/4" Min thread length
13"	1 3/4" Min thread length

5/8" CARRIAGE BOLT & NUT



IMPACT HEAD OBJECT MARKER



W-BEAM CROSS SECTION

NOTES:

1. Reflectorized plates: Reflector plates shall begin at the first post and be spaced at 25' centers on guardrail less than 250' in length and at 50' centers for guardrail over 250' in length. The reflector shall be the same color as the pavement marking adjacent to that reflector unless noted otherwise on the plans.
2. Manner of replacing bituminous material at guardrail post: All excess earth from excavations for guard posts shall be disposed of 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. The Object Marker shall fit within the vertical edges of the Impact Plate. The retroreflective sheeting shall be type XI sheeting meeting the requirements of Section 894.02.B of the standard specifications. The sheeting shall be applied to 0.100 Aluminum sheeting meeting the requirements Section 894.01.A. The Object Marker shall attach to the Impact Head Plate with rivets or some other attachment device. The rivets or attachment device shall be non-rust. The stripes shall slope downward toward the roadway side.
4. Guardrail installation height tolerance = - 1/4" , + 1".

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE

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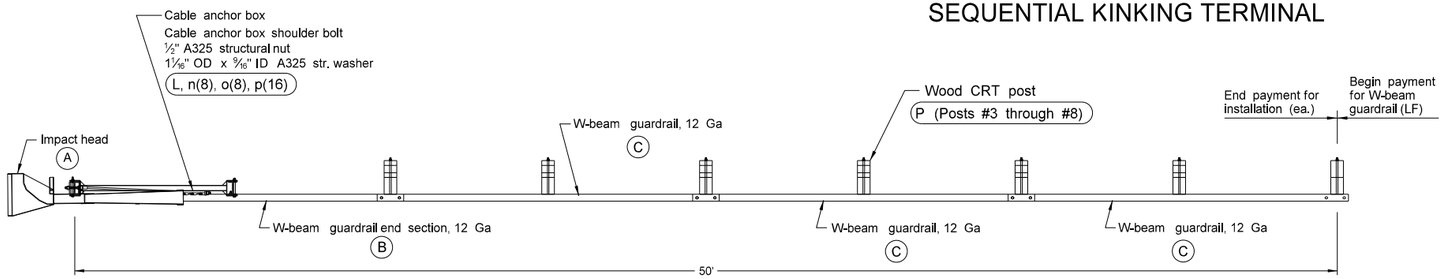
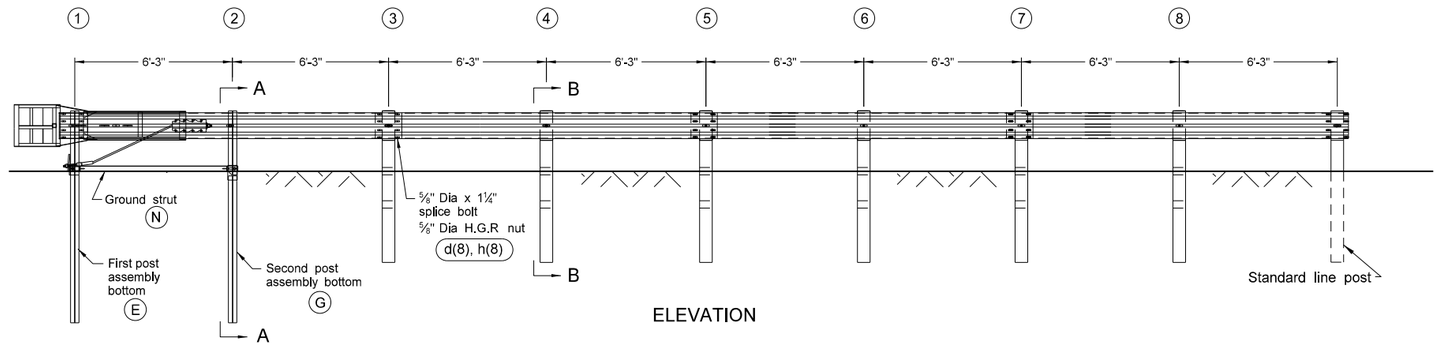
SEQUENTIAL KINKING TERMINAL

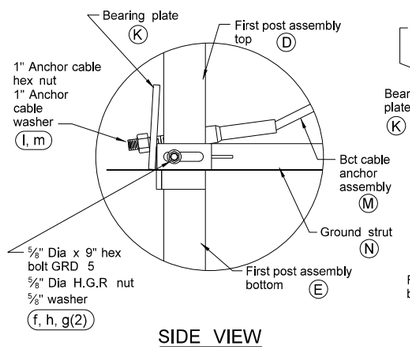
D-764-5



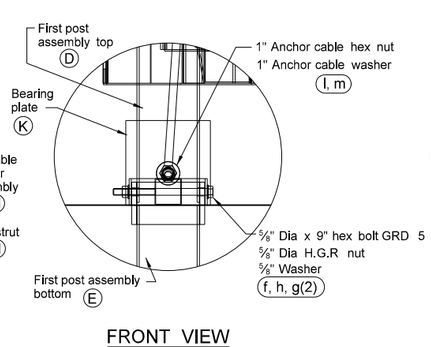
PLAN



ELEVATION

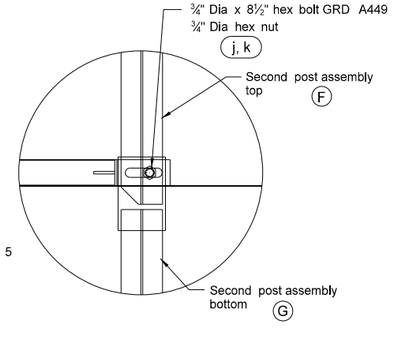


SIDE VIEW

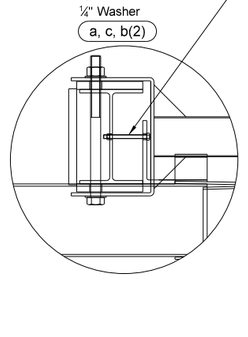


FRONT VIEW

POST #1 CONNECTION DETAILS



SIDE VIEW DETAIL OF POST #2

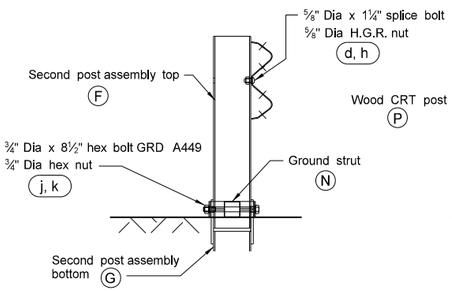


IMPACT HEAD CONNECTION DETAIL

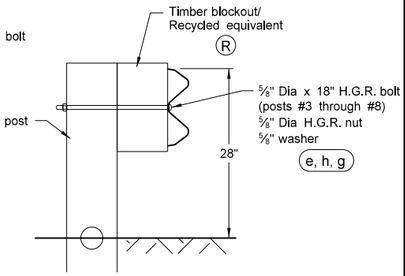
GENERAL NOTES:

1. Breakaway posts are required with the SKT.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The SKT can be flared at a rate of up to 25:1 to prevent the impact head from encroaching on the shoulder.
4. The lower sections of the posts shall not protrude more than 4" above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
5. The lower section of the hinged posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
6. When rock is encountered, a 10" diameter post hole, 20" into the rock surface may be used if approved by the engineer. Granular material will be placed in the bottom of the hole, approximately 2 1/2" deep to provide drainage. Posts 1 & 2 can be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
7. The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.
8. The wood blockouts on post #3 through post #8 should be "toe nailed" with two 20 penny galvanized nails into each rectangular post, to prevent them from turning when the wood shrinks.

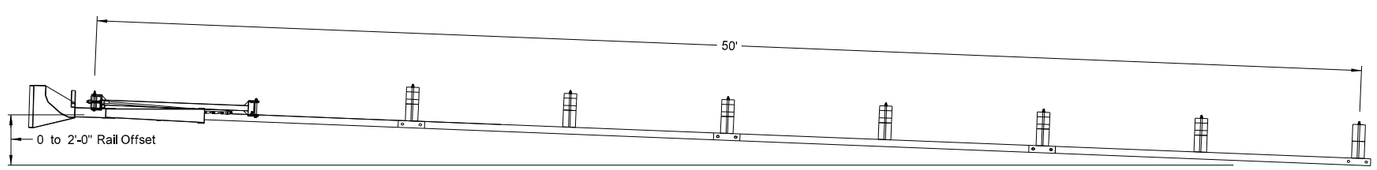
ITEM	QTY	BILL OF MATERIALS
A	1	IMPACT HEAD
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga
C	3	W-BEAM GUARDRAIL, 12 Ga
D	1	FIRST POST ASSEMBLY TOP
E	1	FIRST POST ASSEMBLY BOTTOM
F	1	SECOND POST ASSEMBLY TOP
G	1	SECOND POST ASSEMBLY BOTTOM
K	1	BEARING PLATE
L	1	CABLE ANCHOR BOX
M	1	BCT CABLE ANCHOR ASSEMBLY
N	1	GROUND STRUT HINGED POST
P	6	WOOD CRT POST
R	6	TIMBER BLOCKOUT/RCY EQUIVALENT
		HARDWARE
a	2	¼" x 4" HEX BOLT Grade 5
b	4	¼" WASHER
c	2	¼" HEX NUT
d	25	⅝" Dia x 1¼" SPLICE BOLT, POST #2
e	6	⅝" Dia x 18" H.G.R. BOLT (POSTS 3 THRU 8)
f	1	⅝" Dia x 9" HEX BOLT GRD 5
g	8	⅝" WASHER
h	32	⅝" Dia H.G.R NUT
j	1	¾" Dia x 8½" HEX BOLT GRD A449
k	1	¾" Dia HEX NUT
l	2	1" ANCHOR CABLE HEX NUT
m	2	1" ANCHOR CABLE WASHER
n	8	CABLE ANCHOR BOX SHOULDER BOLT
o	8	½" A325 STRUCTURAL NUT
p	16	1⅛" OD x ⅝" ID A325 STR. WASHER



SECTION A-A
Post #2



SECTION B-B
Posts #3 through #8



FLARED INSTALLATION
25:1 maximum flare rate

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE

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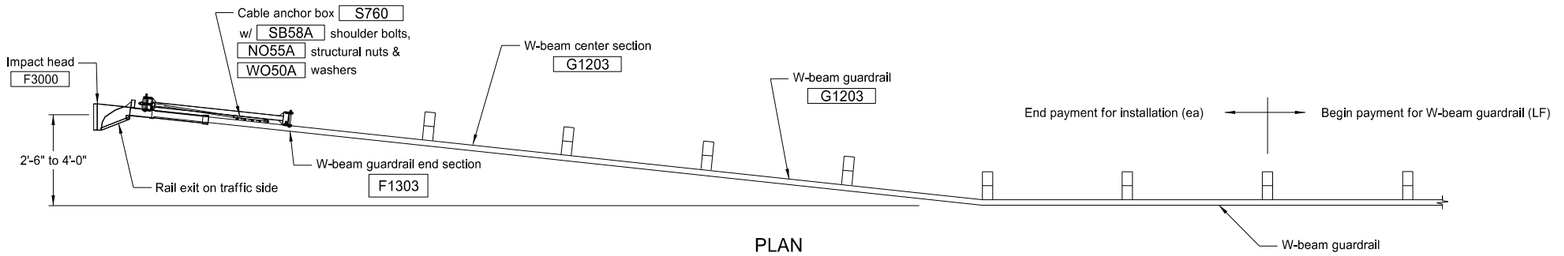
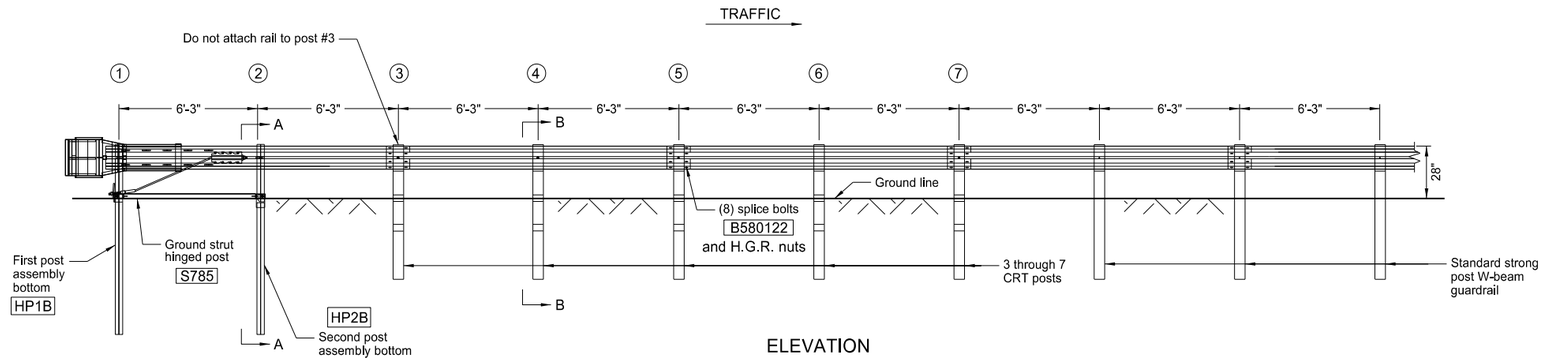
FLARED ENERGY ABSORBING TERMINAL

D-764-6



PLAN

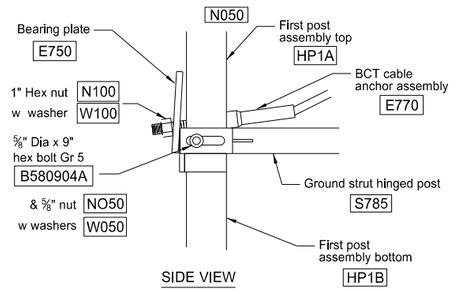


ELEVATION

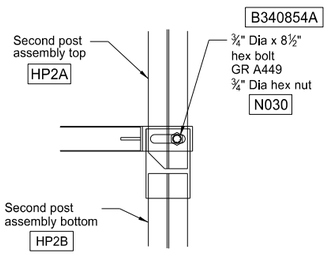
ITEM #	QTY	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA
G1203	2	W-BEAM GUARDRAIL, 12 GA
HP1A	1	FIRST POST ASSEMBLY TOP
HP1B	1	FIRST POST ASSEMBLY BOTTOM
HP2A	1	SECOND POST ASSEMBLY TOP
HP2B	1	SECOND POST ASSEMBLY BOTTOM
P671	5	WOOD CRT POST
P675	5	TIMBER BLOCKOUT 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 (ALL DIMENSIONS IN INCHES)
B140404	2	¼ Dia x 4 HEX BOLT
WO14	4	¼ WASHER
N014	2	¼ HEX NUT
B580122	17	⅝ Dia x 1¼ SPLICE BOLT
B581802	4	⅝ Dia x 10 H.G.R. BOLT (POSTS 3 THRU 6)
B580904A	1	⅝ Dia x 9 HEX BOLT GR 5
W050	5	⅝ WASHER
N050	22	⅝ Dia H.G.R. NUT
B340854A	1	¾ Dia x 8½ HEX BOLT GR A449
NO30	1	¾ 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	½ A325 STRUCTURAL NUT
W050A	16	1 1/16 OD x 9/16 ID A325 STR. WASHER

GENERAL NOTES

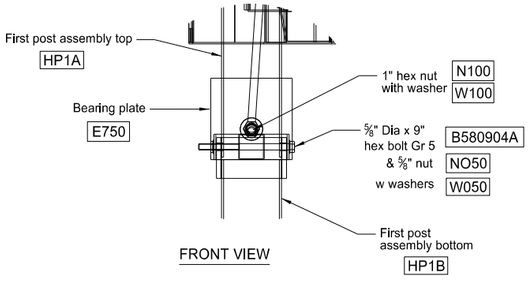
1. Wood posts are required with the Flared Energy Absorbing Terminal except posts #1 and #2.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The lower sections of the posts shall not protrude more than 4 inches above the ground (measured along a 60 inch cord). Site grading may be necessary to meet this requirement.
4. Lower post sections shall not be driven with the upper post attached. If the the post is placed in a drilled hole, the backfill material must be satisfactory compacted to prevent settlement.
5. When rock is encountered during excavation, a 12" diameter post hole 20" deep may be used if approved by the Engineer. Granular material will be placed in the bottom of the hole approximately 2½" deep to provide drainage. The soil tubes shall be field cut to length, placed in the hole and back filled with adequately compacted material excavated from the hole.
6. The breakaway cable assembly shall be taut. A locking device (vice grips or channel lock pliers) should be used to prevent cable from twisting when tightening nuts.
7. The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when wood shrinks. The nail shall be 20 penny and galvanized.
8. The Flared Energy Absorbing Terminal shall be flared only when the approach guardrail is parallel with the roadway. When the approach guardrail is flared at 16:1 to 10:1, the Flared Energy Absorbing Terminal shall have only the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, the Flared Energy Absorbing Terminal shall be turned parallel to the roadway.



SIDE VIEW

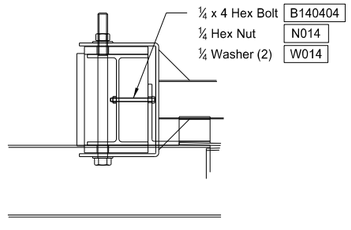


SIDE VIEW DETAIL OF POST #2

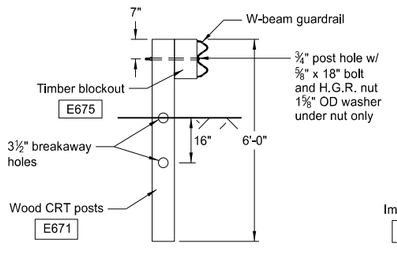


FRONT VIEW

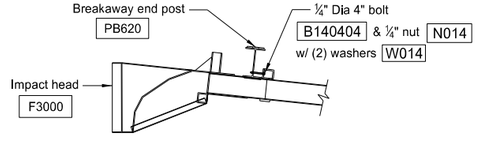
POST #1 CONNECTION DETAILS



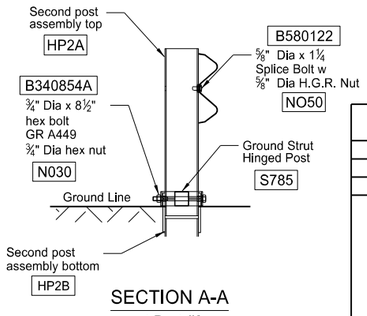
IMPACT HEAD CONNECTION DETAIL



SECTION B-B
POST 3 THRU 7



IMPACT HEAD CONNECTING DETAIL



SECTION A-A
at Post #2

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE

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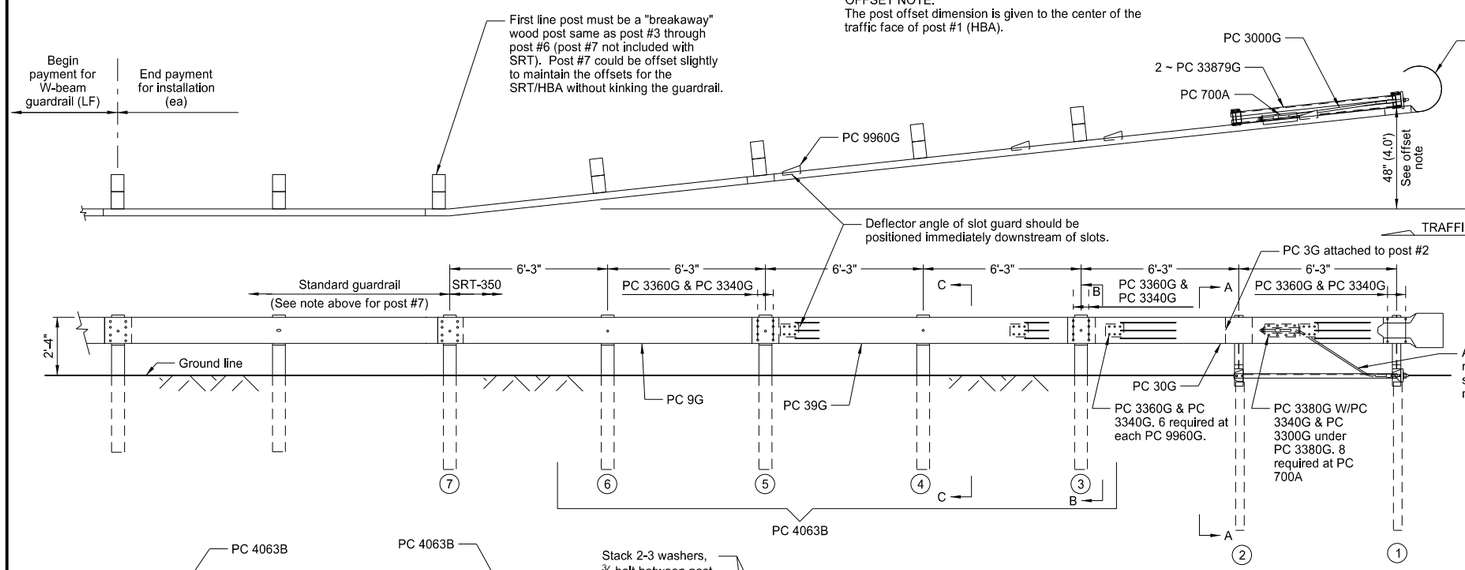
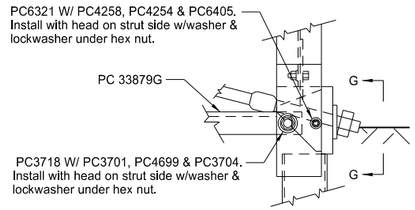
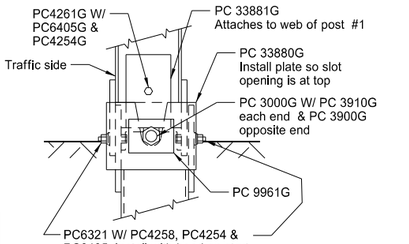
SLOTTED RAIL TERMINAL

D-764-7

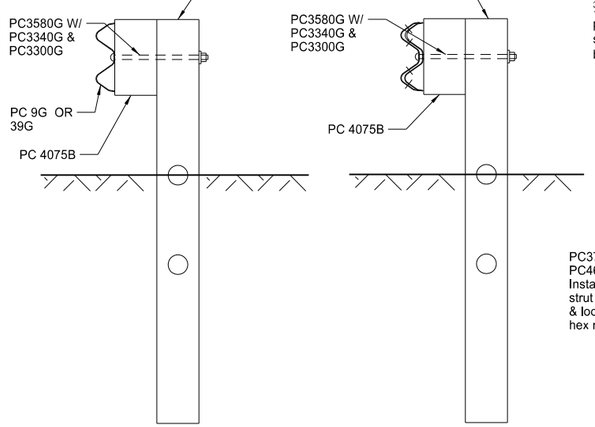




DETAIL "G"
(@ POST #1)

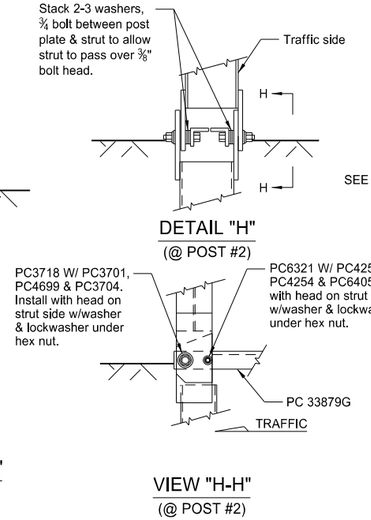


VIEW "G-G"
(@ POST #1)



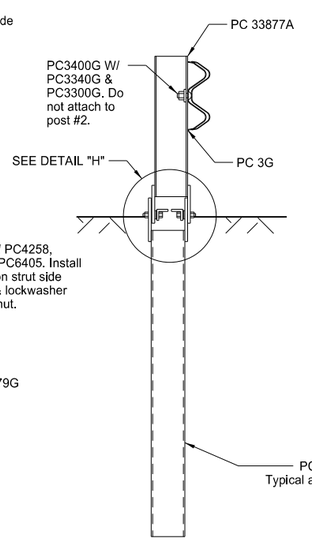
SECTION "C-C"
(@ POST #4 & #6)

SECTION "B-B"
(@ POST #3 & #5)

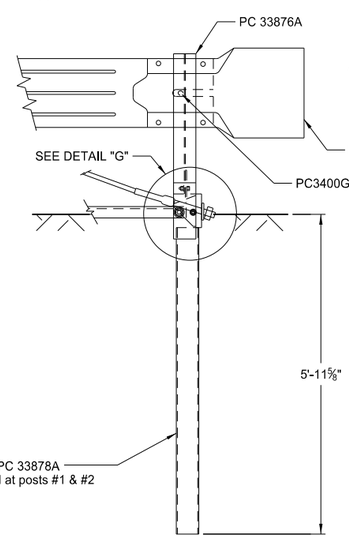


DETAIL "H"
(@ POST #2)

VIEW "H-H"
(@ POST #2)



SECTION "A-A"



ENLARGED VIEW @ POST #1

BILL OF MATERIAL		
PC	QTY	DESCRIPTION
3G	1	12/12"/BACKUP (GUARDRAIL)
9G	1	12/12'6/6'3/S (GUARDRAIL)
30G	1	12/12'6/S SRT-1 (GUARDRAIL)
39G	1	12/12'6/S SRT-2 (GUARDRAIL)
700A	1	CABLE ANCHOR BRACKET
907G	1	12/BUFFER/ROLLED (TERMINAL)
3000G	1	3/4 x 6'6" CABLE
3300G	14	5/8" WASHER
3340G	58	5/8" HEX NUT
3360G	44	5/8"ø x 1 1/4" SPLICE BOLT
3380G	8	5/8"ø x 1 1/2" HEX HD BOLT
3400G	2	5/8"ø x 2" POST BOLT
3580G	4	5/8"ø x 18" POST BOLT
3701G	10	3/4" WASHER
3704G	4	3/4" HEX NUT
3718G	4	3/4"ø x 3" HEX HD BOLT (A325)
3900G	1	1" WASHER
3910G	2	1" HEX NUT
4063B	4	6' POST 6" x 8"
4075B	4	14" BLOCK 6" x 8"
4254G	5	3/8" WASHER
4258G	4	3/8" LOCKWASHER
4261G	1	3/8"ø x 1 1/2" HEX HD BOLT (GR 5)
4699G	4	3/4" LOCKWASHER
6321G	4	3/8"ø x 2" HEX HD BOLT (GR 5)
6405G	5	3/8" HEX NUT
9960G	4	SLOT GUARD
9961G	1	3/8" x 3" x 4" PLATE WASHER
33876A	1	HBA POST 1 TOP (W6 x 8.5)
33877A	1	HBA POST 2 TOP (W6 x 8.5)
33878A	2	HBA POST 1 & 2 BOT (TS 6 x 4)
33879G	2	ANGLE STRUT 2" x 2" x 3/8"
33880G	1	1" x 6" x 8" BEARING PLATE
33881G	1	CABLE WEB PL 4" x 1/4" x 6 1/2"

GENERAL NOTES:

1. Wood posts are required with the slotted rail terminal except posts #1 and #2.
2. All bolts, nuts, cable assemblies, cable anchors, bearing plates, slot guards, struts, nails, pipes soil tubes and soil plates shall be galvanized.
3. The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent cable from twisting when tightening nuts.
4. The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when wood shrinks. The 2 nails required per blockout shall be 20 penny and galvanized.
5. For curb installation, the curb must end prior to post #7. Where the curb is extended beyond post #7, the flared SRT can not be used. A straight end treatment shall be used at the end of the straight guardrail that is placed at the face of the curb.
6. For details not shown, see the manufacturer's installation manual.
7. Minimum length of rail, including end terminal, in advance of fixed objects shall be 175 feet when the slotted rail terminal is used as the end terminal.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
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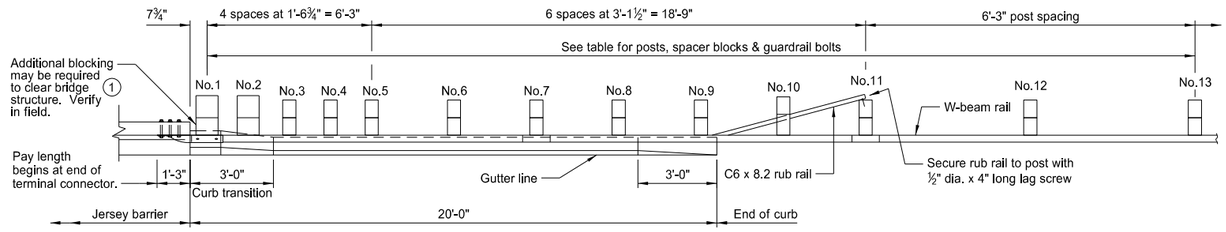
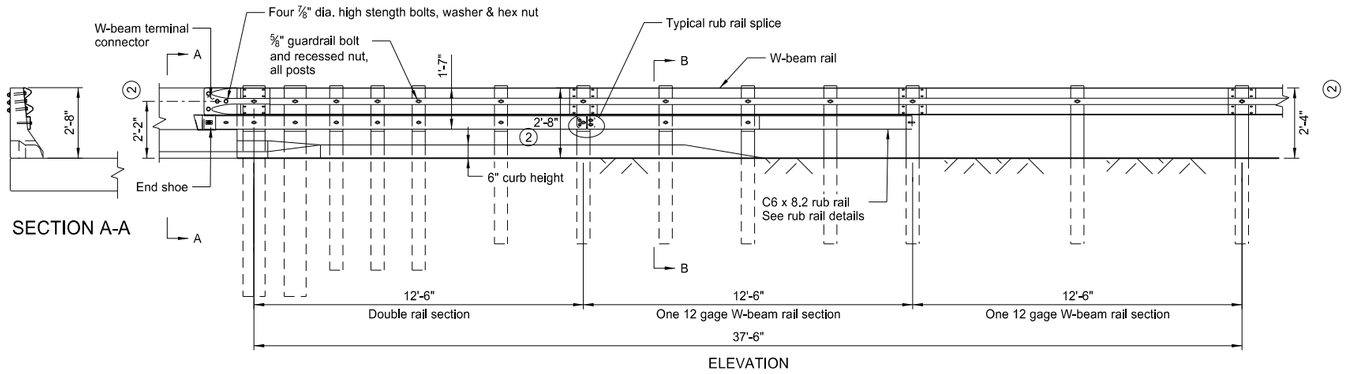
W-BEAM TRANSITION TO CONCRETE JERSEY BARRIER WITH APPROACH CURB

D-764-9



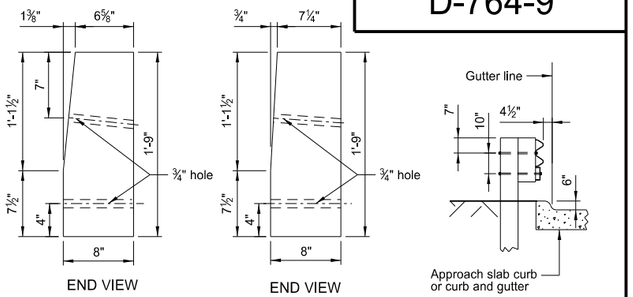
PLAN



SECTION A-A

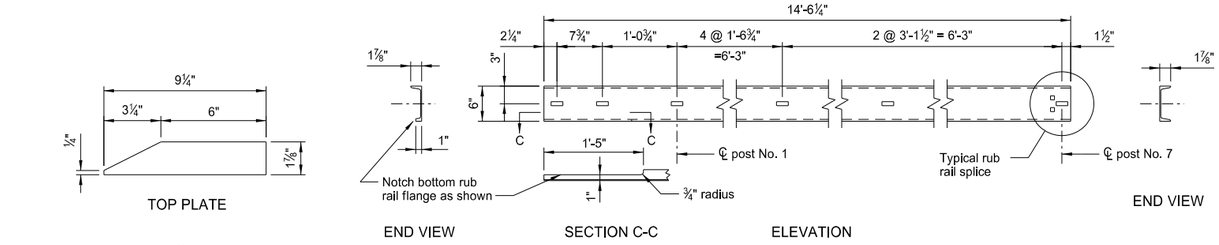
ELEVATION

GENERAL ASSEMBLY DETAILS

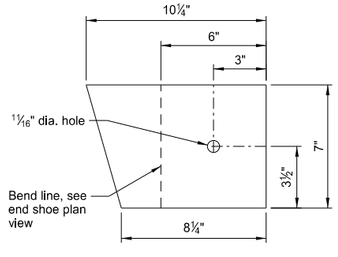


TAPERED TIMBER BLOCK DETAILS

POST, TIMBER BLOCK & BOLT TABLE		
DESCRIPTION	POST NO.	SIZE
Post	1 & 2	10" X 10" X 8'-0" min long
	3-5	6" X 8"X 7'-0" min long
	6-13	6" X 8"X 6'-0" min long
Spacer block	1-2	10" X 8" X 21" tapered block
	3-9	6" X 8" X 21"
	10	6" X 9 3/4" X 14"
	11-13	6" X 8" X 14"
Guardrail bolt & recessed nut	1 & 2 & 10	5/8" Dia X 20" - guardrail
	3-9,11-13	5/8" Dia X 18" - guardrail
	1-2	5/8" Dia X 22"- rub rail
	3-9	5/8" Dia X 20"- rub rail

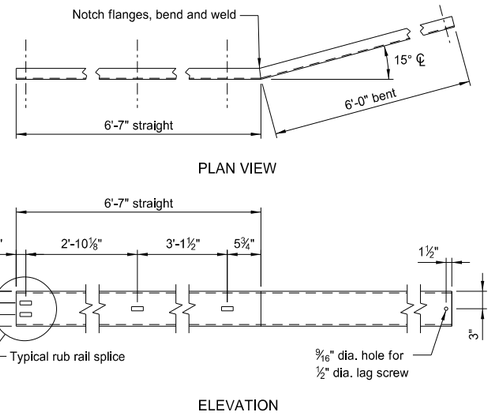


RUB RAIL STRAIGHT SECTION

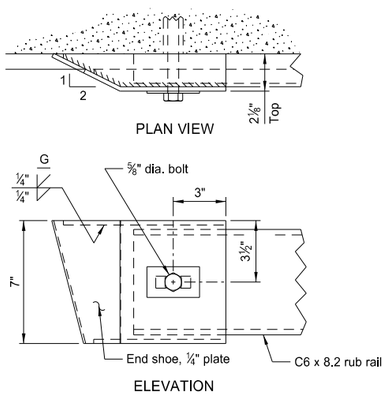


END SHOE PLATE DETAILS

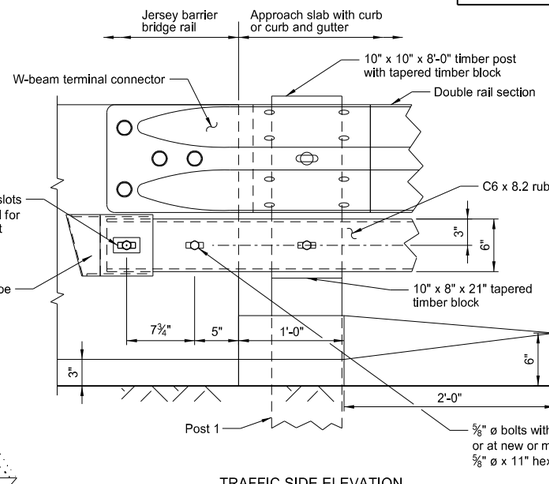
(¼" plate)

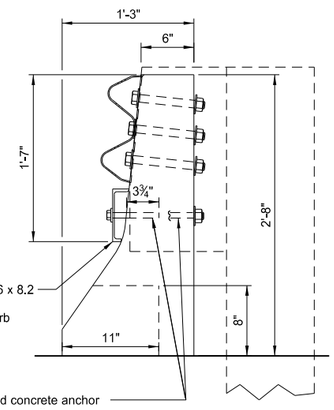


RUB RAIL BENT SECTION



RUB RAIL END SHOE ASSEMBLY





RAIL ATTACHMENT AND CURB DETAIL

(1) Additional blocking may be required at post No.1.

(2) Height is 2'-8" from 0' to 12'-6" from bridge. Height tapers from 2'-8" to 2'-4" between 12'-6" to 37'-6" from bridge.

NOTES:

C6 x 8.2 rub rail and structural steel shall be AASHTO 270M Grade 250, and shall be galvanized after fabrication in accordance with AASHTO M111.

All slotted holes are $^{1}\!/_{16}$" x 2".

All square holes are $^{1}\!/_{16}$".

Galvanize all hardware in accordance with AASHTO M232.

All posts and blocks for the W-beam guardrail shall be timber.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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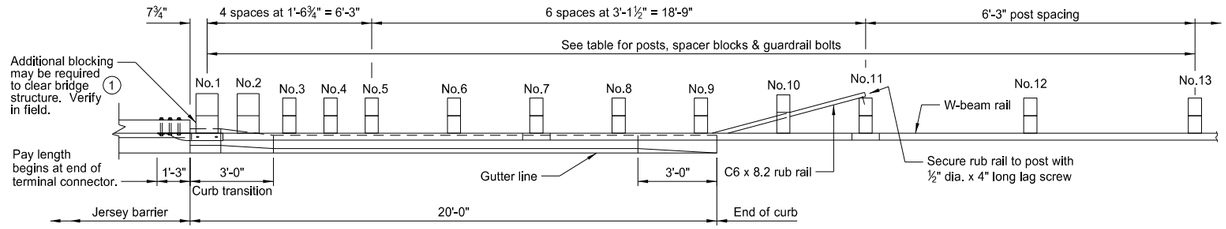
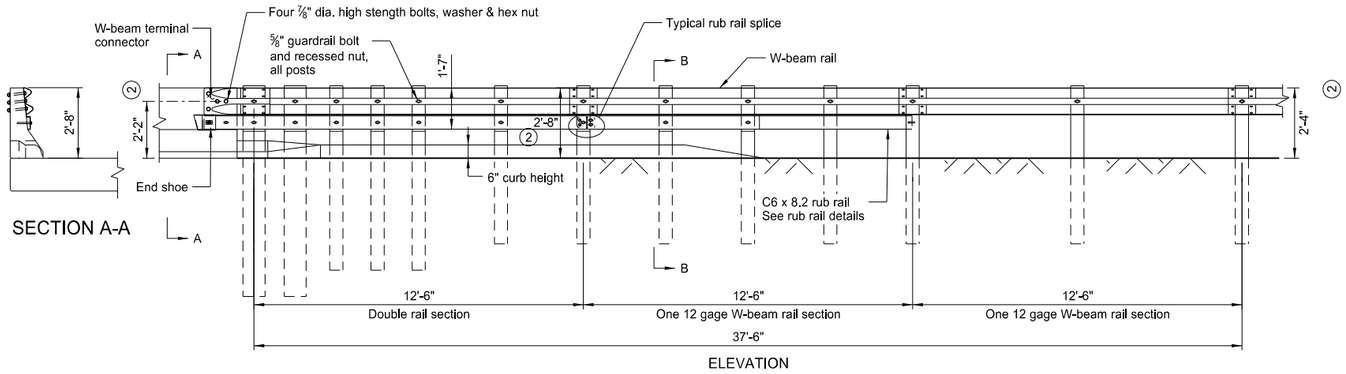
W-BEAM TRANSITION TO CONCRETE JERSEY BARRIER WITH APPROACH CURB

D-764-9

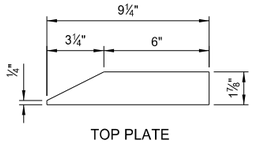


PLAN

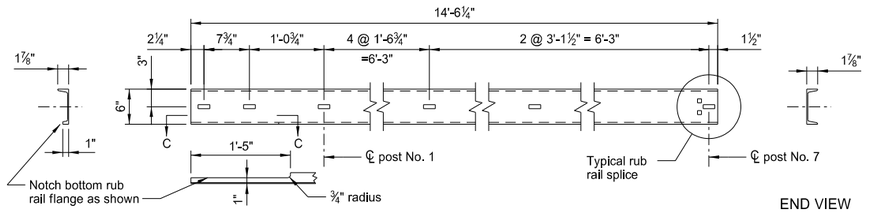


ELEVATION

GENERAL ASSEMBLY DETAILS



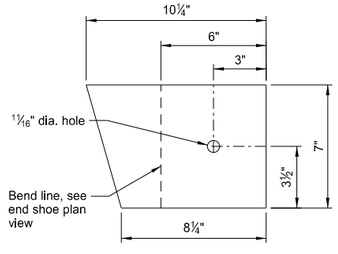
TOP PLATE



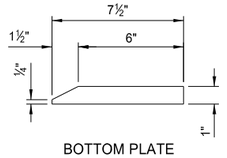
END VIEW SECTION C-C ELEVATION

END VIEW

RUB RAIL STRAIGHT SECTION



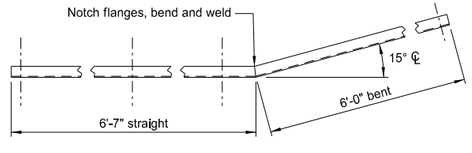
FRONT PLATE



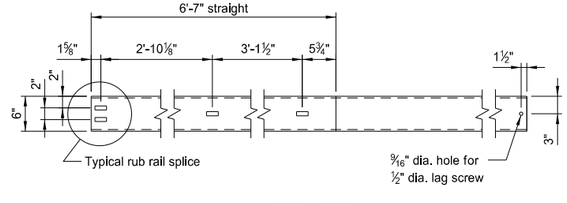
BOTTOM PLATE

END SHOE PLATE DETAILS

(¼" plate)

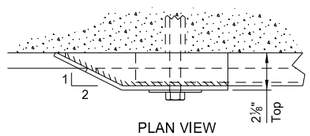


PLAN VIEW

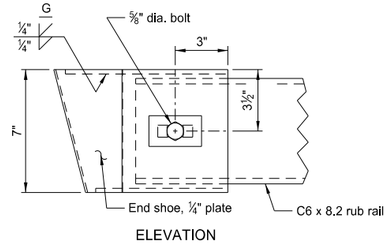


ELEVATION

RUB RAIL BENT SECTION

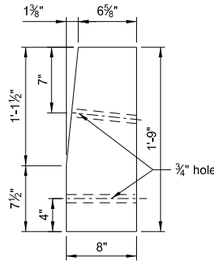


PLAN VIEW



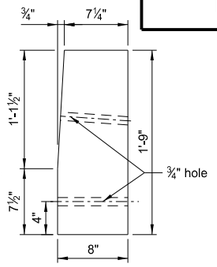
ELEVATION

RUB RAIL END SHOE ASSEMBLY



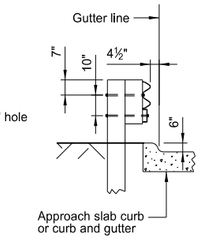
END VIEW

Block No. 1 (width = 10")



END VIEW

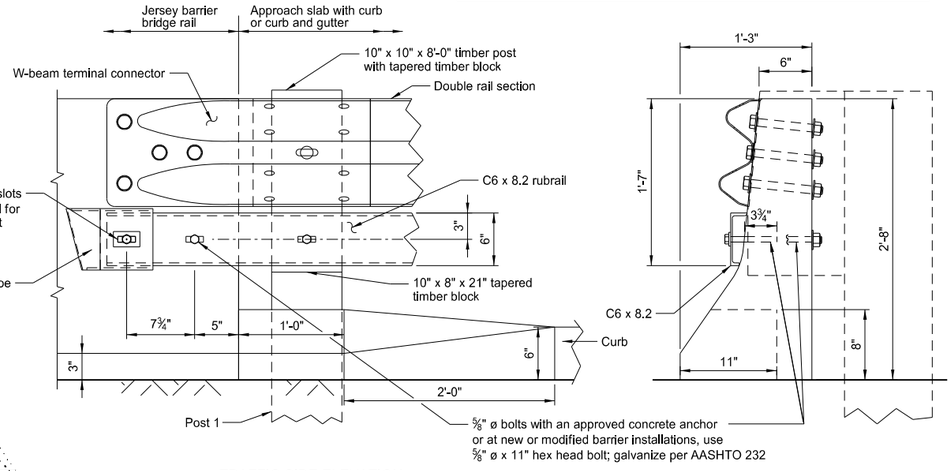
Block No. 2 (Width = 10")



SECTION B-B

TAPERED TIMBER BLOCK DETAILS

POST, TIMBER BLOCK & BOLT TABLE		
DESCRIPTION	POST NO.	SIZE
Post	1 & 2	10" X 10" X 8'-0" min long
	3-5	6" X 8"X 7'-0" min long
	6-13	6" X 8"X 6'-0" min long
Spacer block	1-2	10" X 8" X 21" tapered block
	3-9	6" X 8" X 21"
	10	6" X 9 3/4" X 14"
	11-13	6" X 8" X 14"
Guardrail bolt & recessed nut	1 & 2 & 10	5/8" Dia X 20" - guardrail
	3-9,11-13	5/8" Dia X 18" - guardrail
	1-2	5/8" Dia X 22"- rub rail
	3-9	5/8" Dia X 20"- rub rail



TRAFFIC SIDE ELEVATION

END VIEW

RAIL ATTACHMENT AND CURB DETAIL

(1) Additional blocking may be required at post No.1.

(2) Height is 2'-8" from 0' to 12'-6" from bridge. Height tapers from 2'-8" to 2'-4" between 12'-6" to 37'-6" from bridge.

NOTES:

C6 x 8.2 rub rail and structural steel shall be AASHTO 270M Grade 250, and shall be galvanized after fabrication in accordance with AASHTO M111.

All slotted holes are 1¹⁄₁₆" x 2".

All square holes are 1¹⁄₁₆".

Galvanize all hardware in accordance with AASHTO M232.

All posts and blocks for the W-beam guardrail shall be timber.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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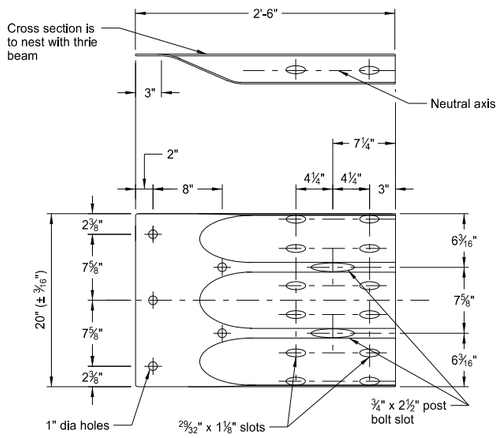
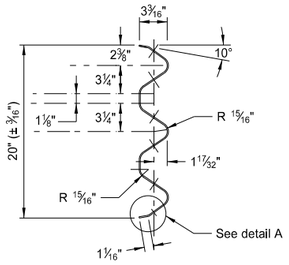
THRIE BEAM TRANSITION TO DOUBLE BOX BEAM RETROFIT

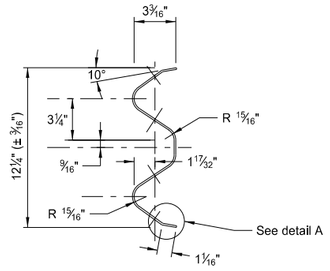
D-764-10



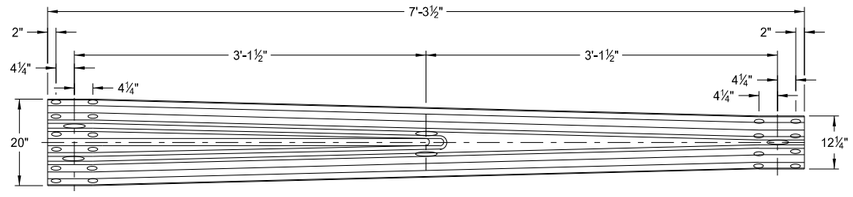
THRIE BEAM TERMINAL CONNECTOR



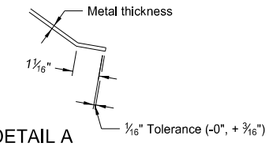
THRIE BEAM END VIEW



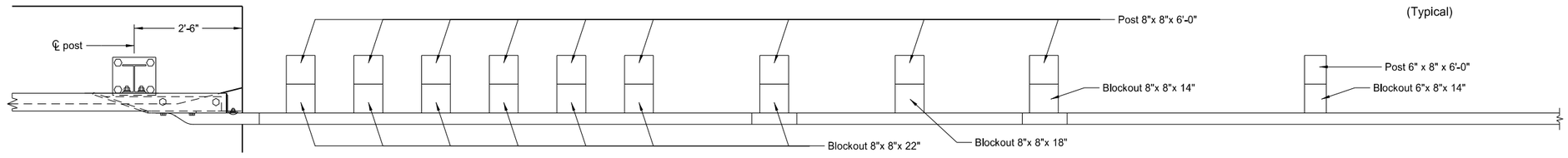
W-BEAM END VIEW



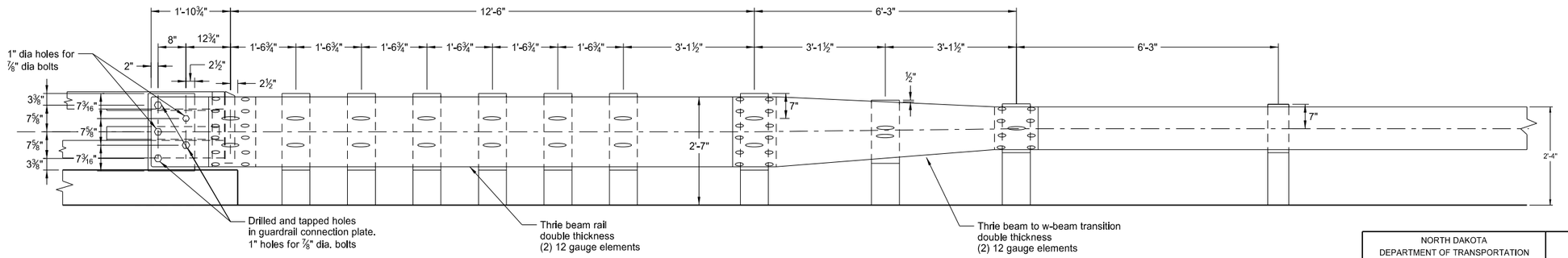
THRIE BEAM TO W-BEAM TRANSITION SECTION



DETAIL A
(Typical)



PLAN



ELEVATION

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
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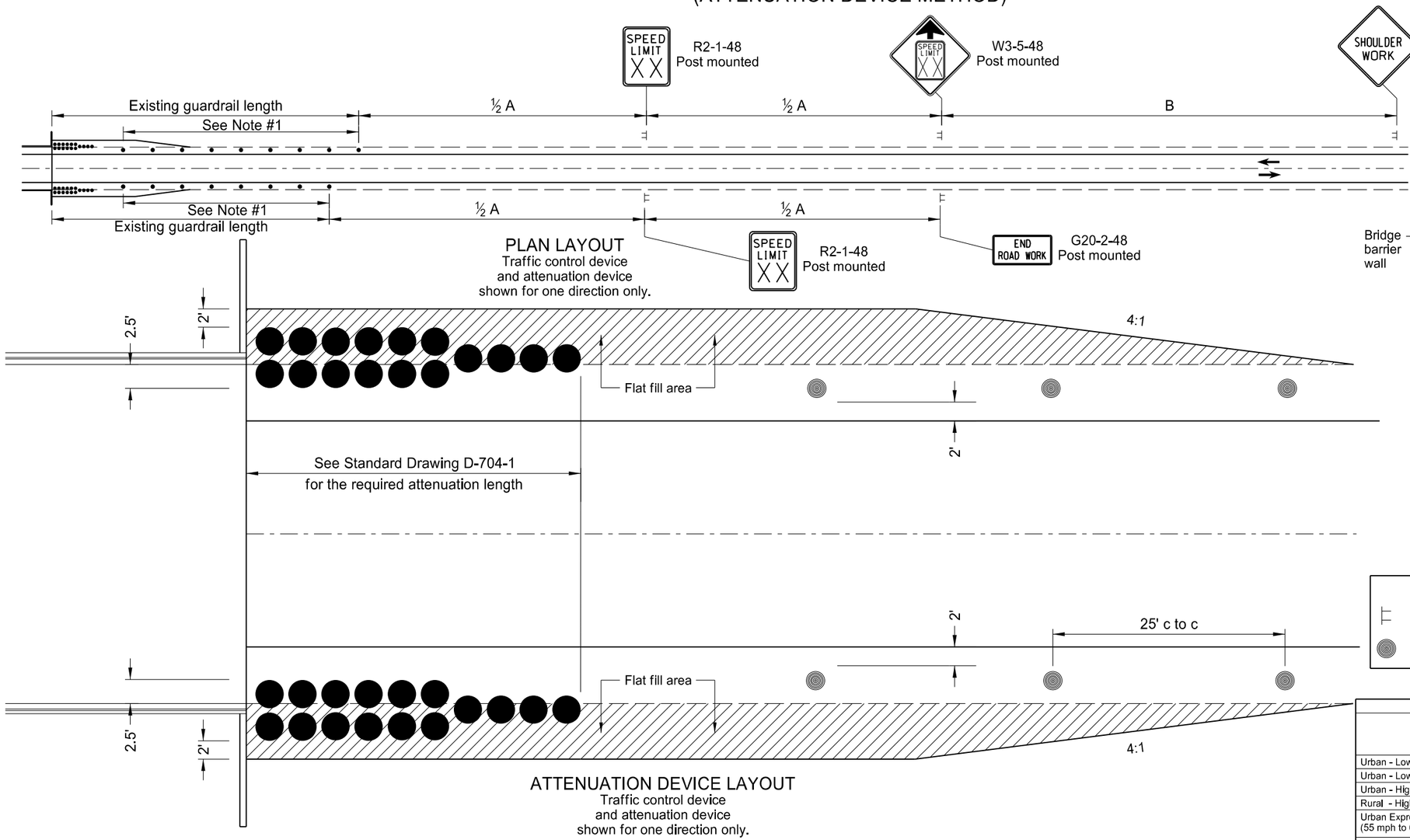
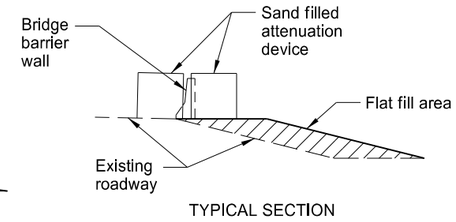
D-764-20

SHORT TERM END TREATMENT FOR BRIDGES
(ATTENUATION DEVICE METHOD)





KEY

- Sign
- Attenuation Module
- Delineator drum

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

Notes

1. If the shoulder width is less than 3', the vertical panels shall be used and placed as far from the driving lane as possible and still be on the finished shoulder. When there is no shoulder, the vertical panels shall be placed as near as possible to the driving lane on the foreslope of the shoulder.
2. If the bridge is within construction zone signing, the reduced speed ahead sign can be eliminated.
3. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 mph. Where speed limits are to be reduced more than 30 mph, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 mph. The second speed limit shall be placed at ½ B.
4. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
5. Existing speed limit signs within a reduced speed zone shall be covered.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE

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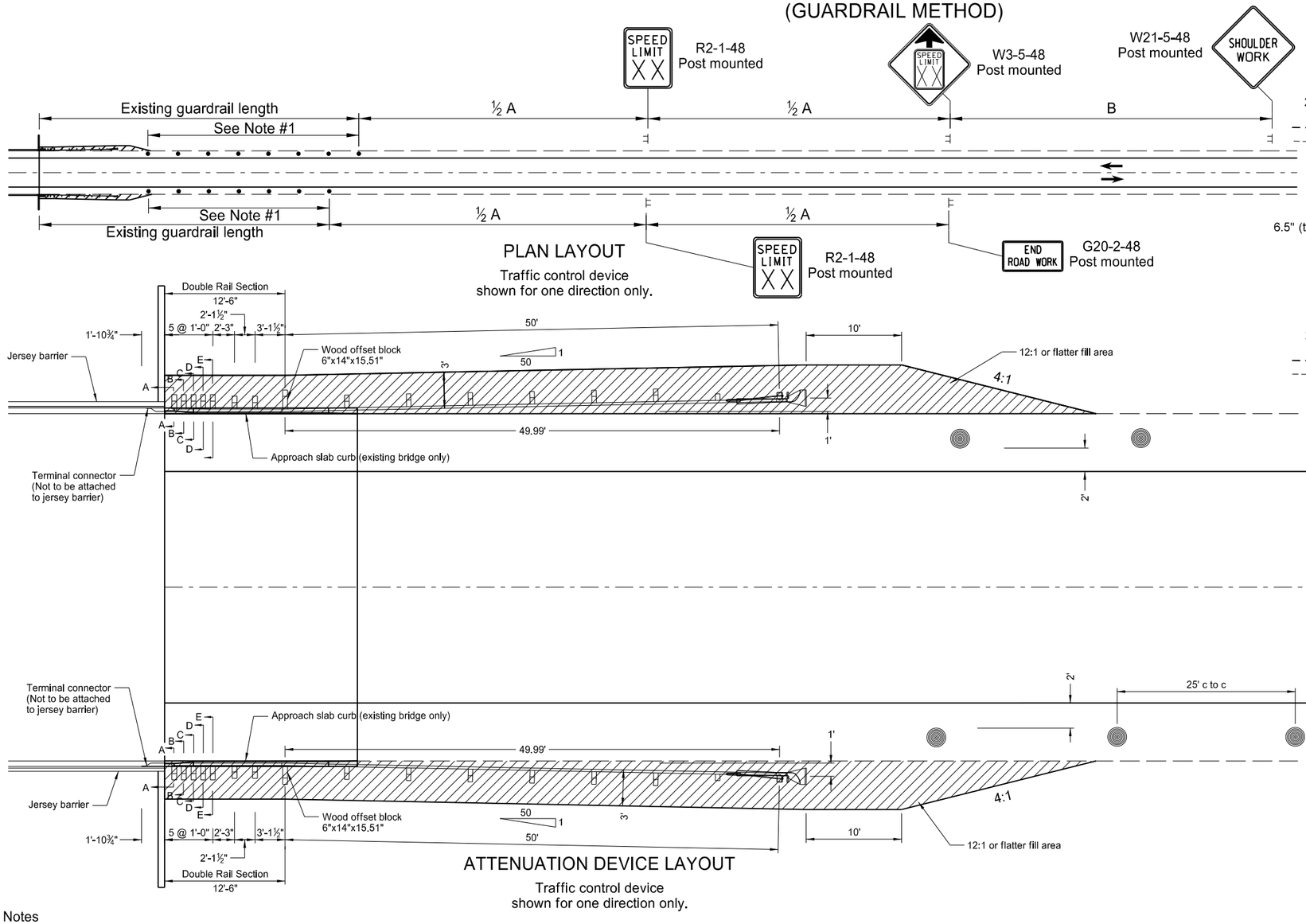
SHORT TERM END TREATMENT FOR BRIDGES (GUARDRAIL METHOD)

D-764-21

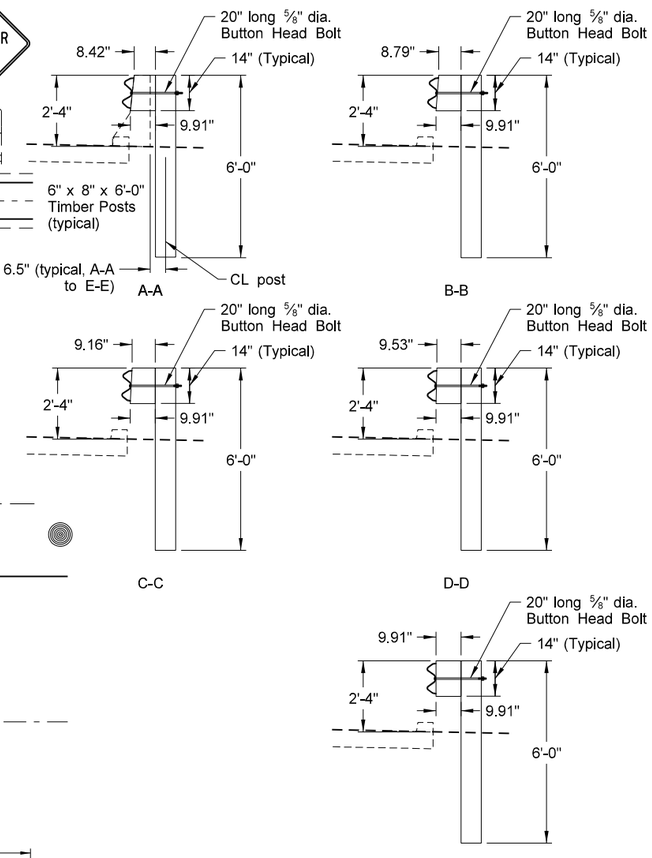


PLAN LAYOUT

Traffic control device shown for one direction only.

ATTENUATION DEVICE LAYOUT

Traffic control device 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

Notes

1. If the shoulder width is less than 3', vertical panels shall be used in place of delineator drums and placed as far from the driving lane as possible and still be on the finished shoulder. When there is no shoulder, the vertical panels shall be placed as near as possible to the driving lane on the foreslope of the shoulder.
2. If the bridge is within construction zone signing, the reduced speed ahead sign can be eliminated.
3. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 mph. Where speed limits are to be reduced more than 30 mph, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 mph. The second speed limit shall be placed at ½ B.
4. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
5. Existing speed limit signs within a reduced speed zone shall be covered.

KEY

Sign — Delineator drum

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE

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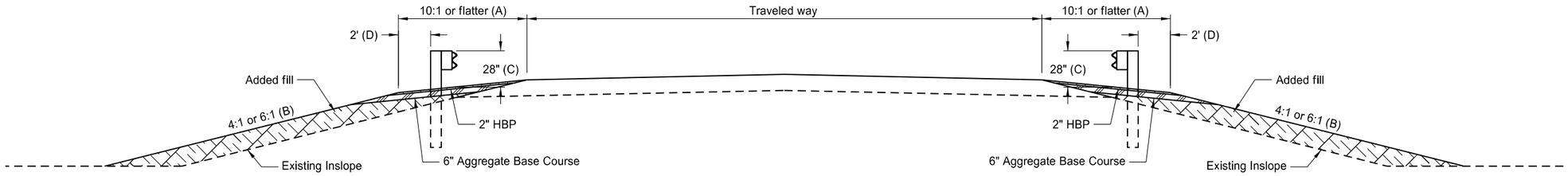
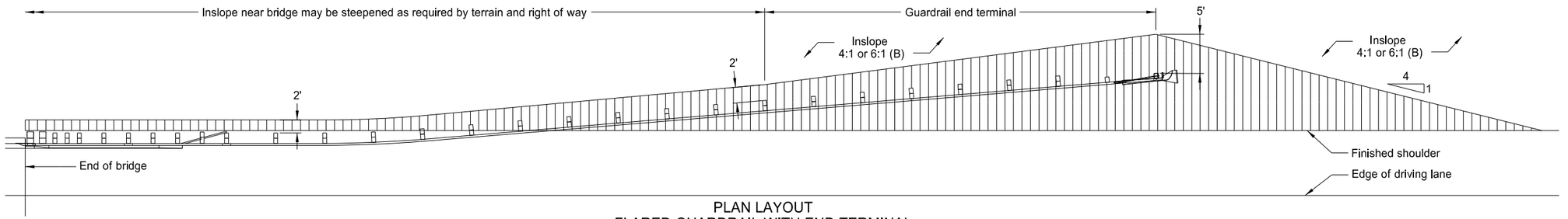
TYPICAL GRADING AT BRIDGE ENDS WITH W-BEAM GUARDRAIL

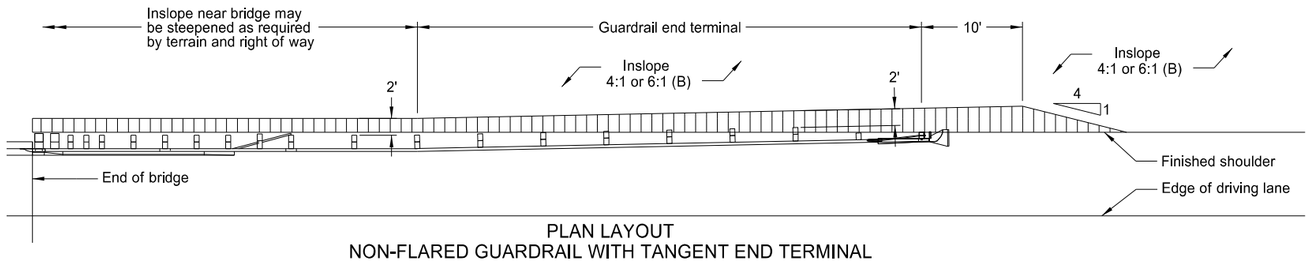
D-764-22



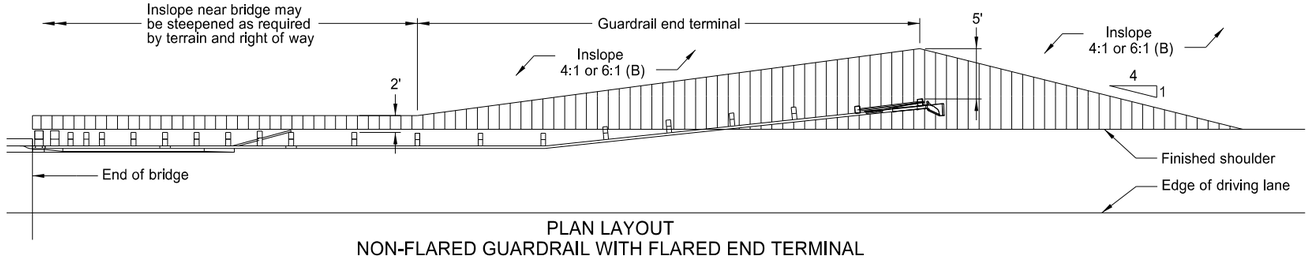
TYPICAL SECTION



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) Slope flatter than 10:1 may be required to provide proper guardrail height.

(B) Where normal inslope is 4:1 the added fill shall be 4:1. Where normal inslope is 6:1 the added fill shall be 6:1.

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

(D) Dimension at end terminals may vary per Plan Layouts shown on this sheet.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE

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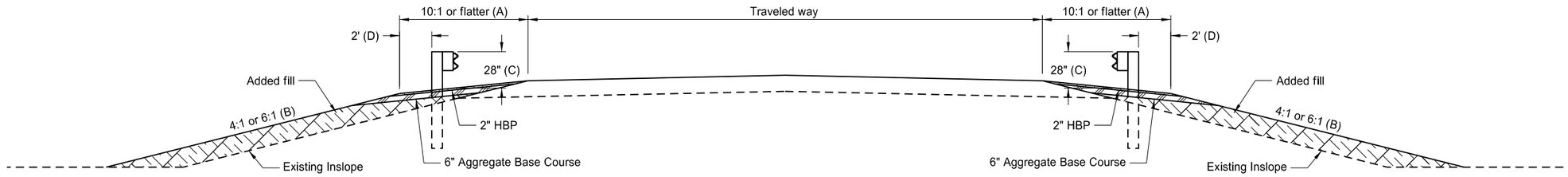
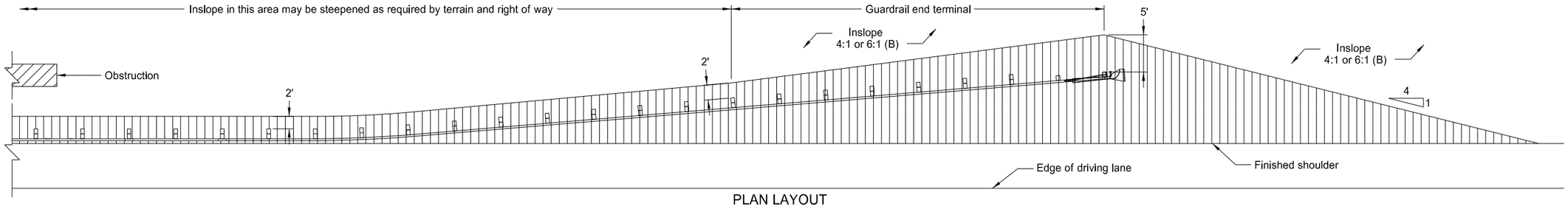
D-764-23

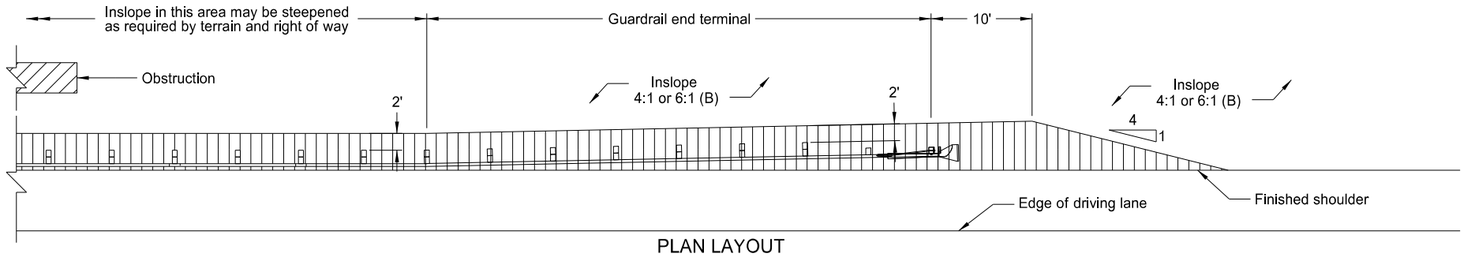
TYPICAL GRADING AT OBSTRUCTIONS WITH W-BEAM GUARDRAIL



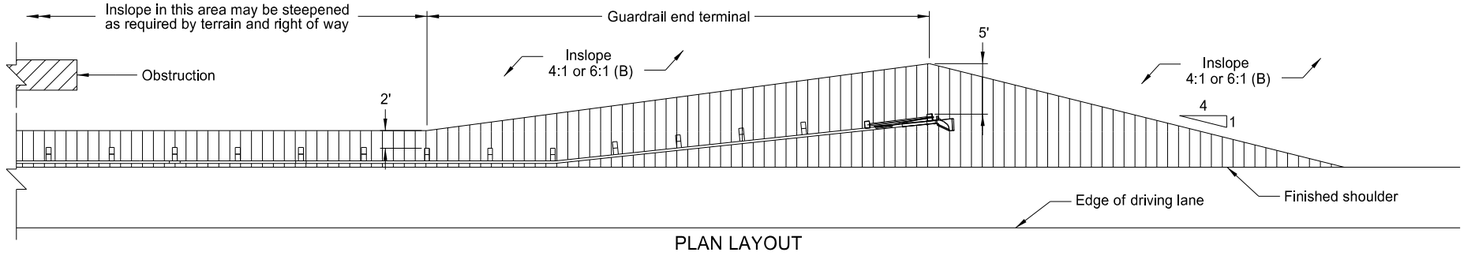
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL TANGENT END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

(A) Slope flatter than 10:1 may be required to provide proper guardrail height.

(B) Where normal inslope is 4:1 the added fill shall be 4:1. Where normal inslope is 6:1 the added fill shall be 6:1.

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

(D) Dimension at end terminals may vary per Plan Layouts shown on this sheet.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
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DATE	CHANGE

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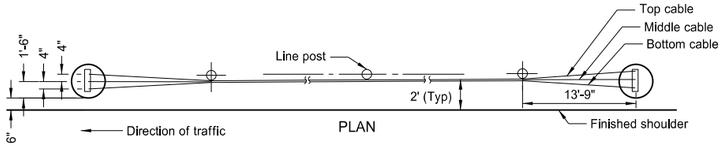
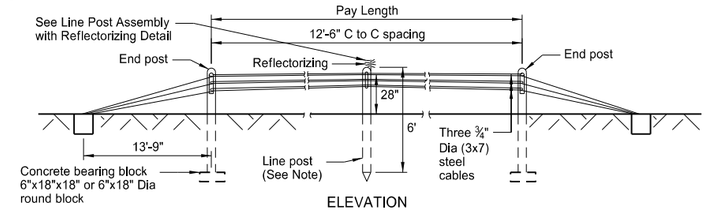
THREE CABLE GUARDRAIL

D-764-32

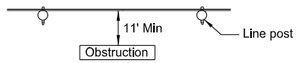


PLAN

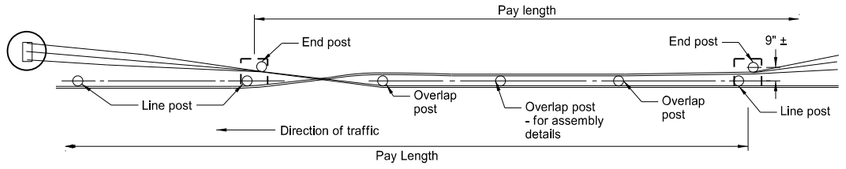


ELEVATION

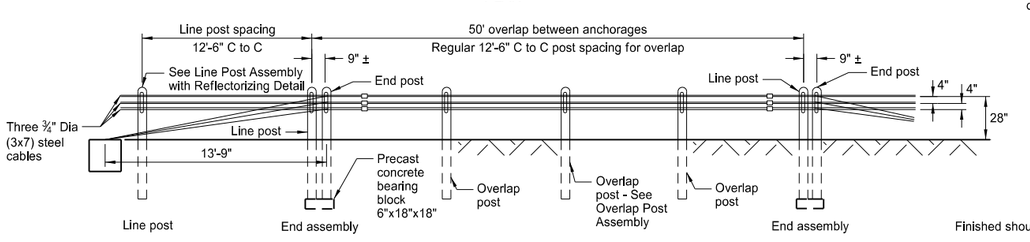
ASSEMBLY WITH END ANCHORAGES



Note: Line post may be pointed to facilitate driving, but the point shall be additional length (6'-0" plus point length).

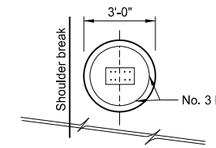


PLAN

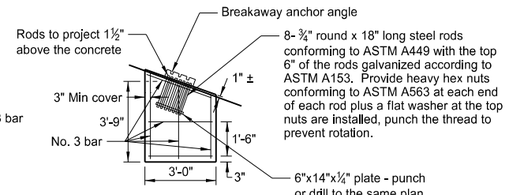


ELEVATION

ASSEMBLY WITH INTERMEDIATE ANCHORAGES



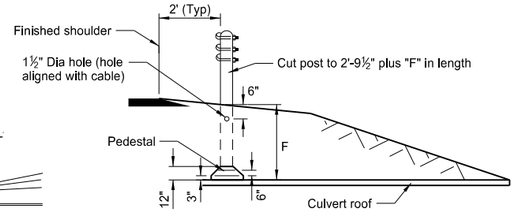
PLAN



ELEVATION

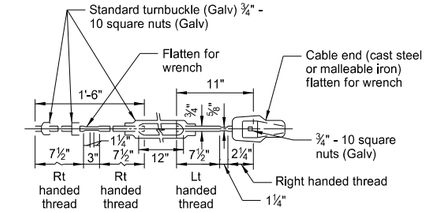
Foundation shall be class AE concrete and cast in place. The foundation shall be formed 6 inches into the ground and the top surface rubbed finished with the edges chamfered.

CONCRETE ANCHOR



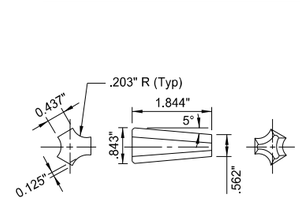
CONCRETE PEDESTAL AT CULVERTS
(WHERE REQUIRED)

Detail of concrete pedestal for posts to be used over culverts or footings when dimension "F" is less than 3'-8".

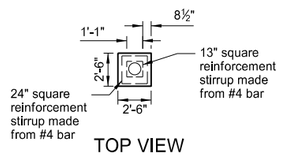


STEEL TURNBUCKLE CABLE END ASSEMBLY

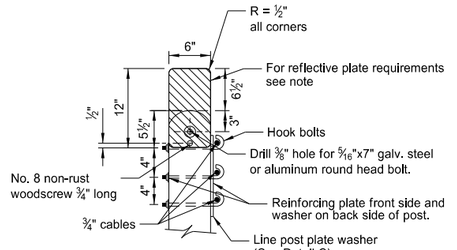
Minimum tensile strength - 25,000 lbs.



WEDGE DETAIL

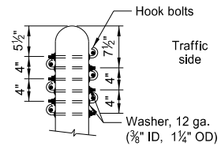


TOP VIEW PEDESTAL



Note: Drill holes on post same size as bolts.

LINE POST ASSEMBLY WITH REFLECTORIZING DETAIL



OVERLAP POST ASSEMBLY

Notes:

Reflectorized Plates: Reflector plates shall be on first and last posts. Spacing in - between at 25' centers on guardrail less than 250' in length and at 50' centers for guardrail over 250' in length. The reflector shall be the same color as the pavement marking adjacent to that reflector unless noted otherwise on the plans.

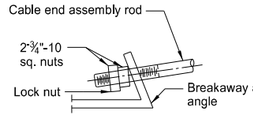
Intermediate anchors shall be equally spaced at intervals not to exceed 1000 ft. on tangents and the outside of horizontal curves. Do not use cable guardrail on the inside of curves sharper than 4°. On the inside of curves 4° or flatter, intermediate anchors shall be spaced at intervals not to exceed:

DEGREE OF CURVE (℄ MEASUREMENT)	DISTANCE BETWEEN INTERMEDIATE ANCHORS
4°	150 ft.
3°	175 ft.
2°	215 ft.
1°	300 ft.
30 minutes	430 ft.
15 minutes	600 ft.

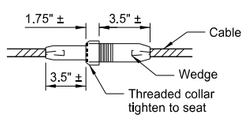
For intermediate curves, interpolate between values listed above.

The pay length shall be from end post to end post. The end posts, hardware, and blocks for the intermediate anchorage assembly shall be included in the price bid for "3-cable guardrail".

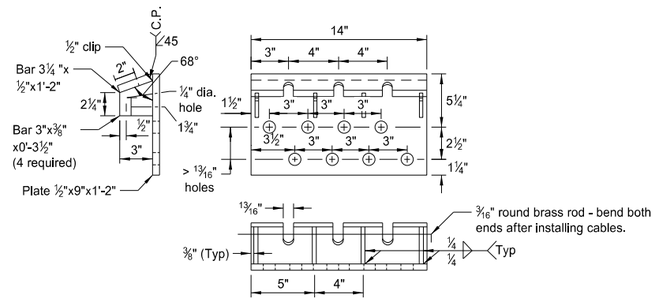
Wood posts shall be furnished and installed.



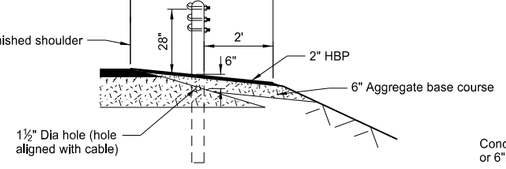
CABLE END ASSEMBLY ROD BREAKAWAY ANCHOR ANGLE CONN.



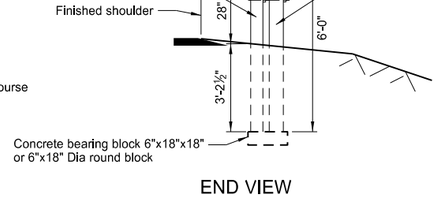
CABLE SPLICE ASSEMBLY



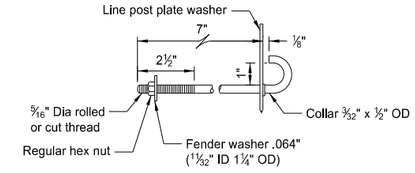
BREAKAWAY ANCHOR ANGLE



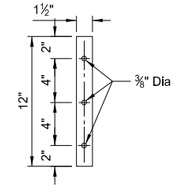
TYPICAL SECTION



END VIEW



HOOK BOLT



LINE POST PLATE WASHER ⅛"x1½"x12" DETAIL C

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE

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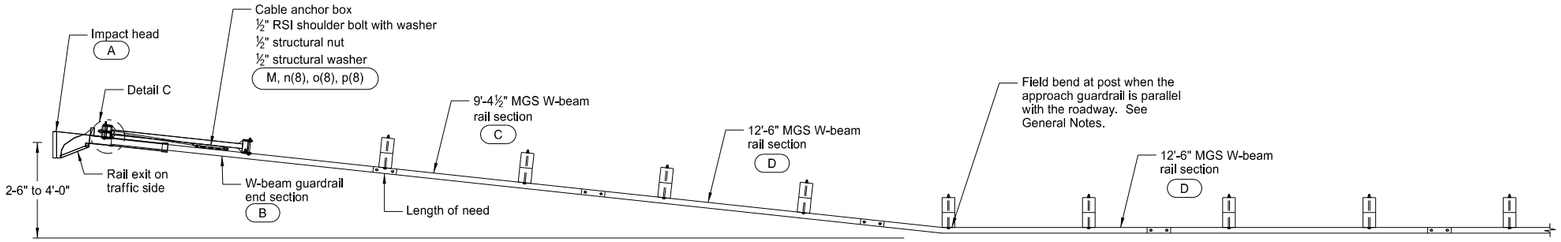
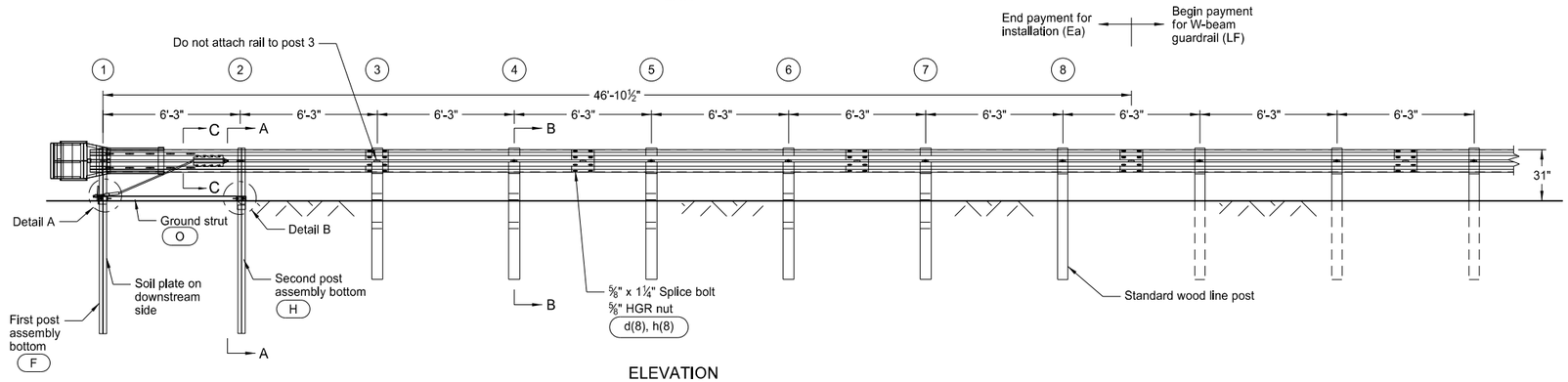
MGS FLARED ENERGY ABSORBING TERMINAL - WOOD POST

D-764-38



PLAN



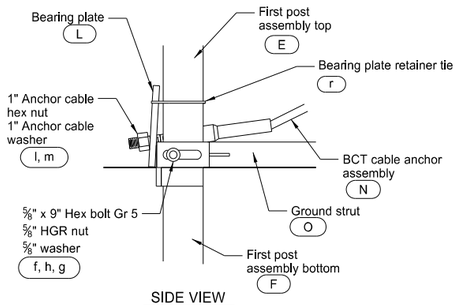
ELEVATION

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

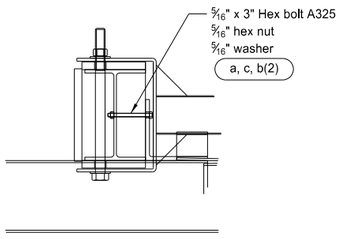
NOTE: Standard wood line post, block, and associated hardware not included in Bill of Materials Table.

GENERAL NOTES:

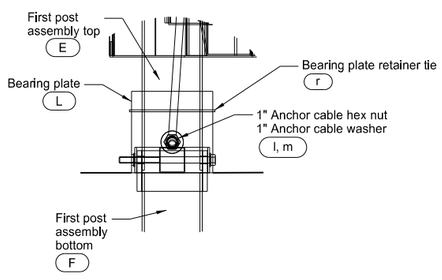
1. Wood posts are required with the Flared Energy Absorbing Terminal except posts 1 and 2.
2. Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
3. Flare the Flared Energy Absorbing Terminal when the approach guardrail is parallel with the roadway. When the approach guardrail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



SIDE VIEW

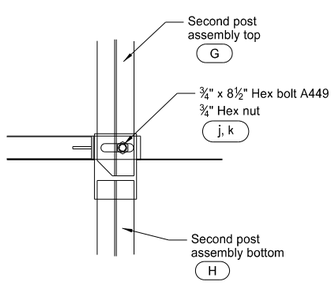


DETAIL C
Post 1 (Impact Head connection)

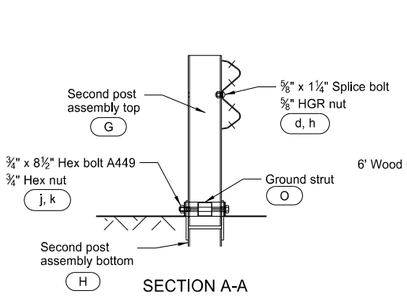


FRONT VIEW

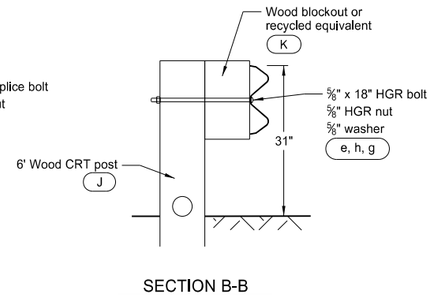
DETAIL A
Post 1



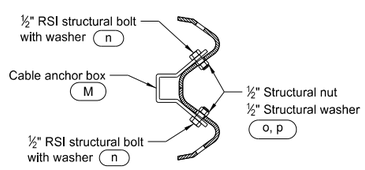
DETAIL B
Post 2



SECTION A-A
Post 2



SECTION B-B
Posts 3 through 7



SECTION C-C

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE

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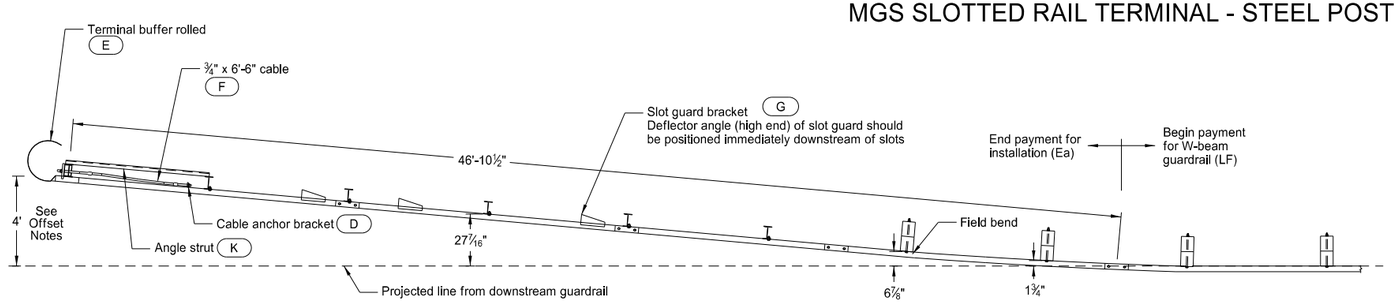
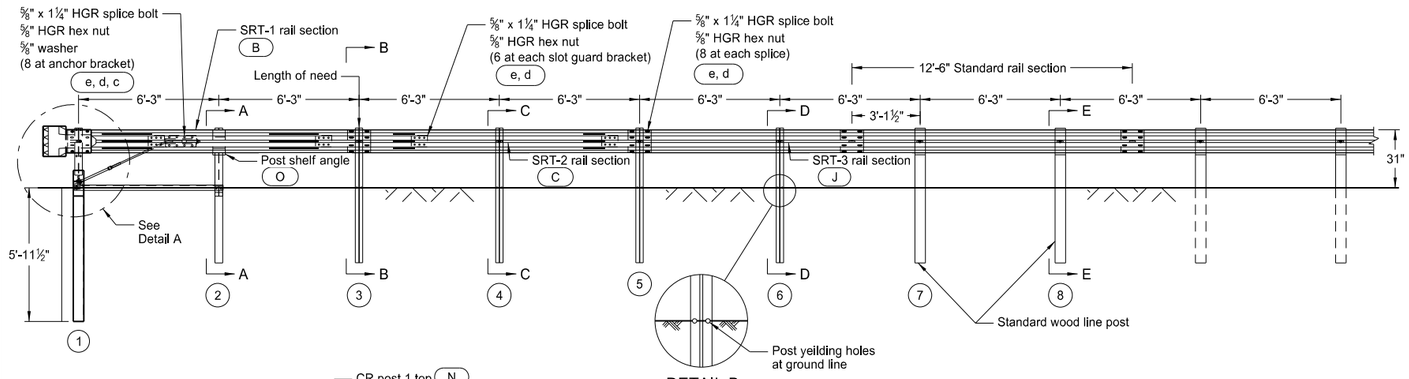
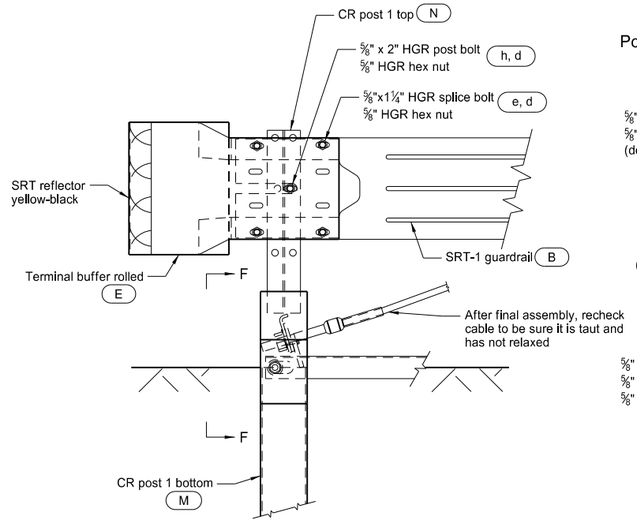
MGS SLOTTED RAIL TERMINAL - STEEL POST

D-764-39

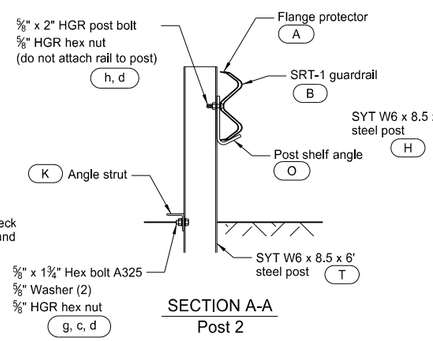




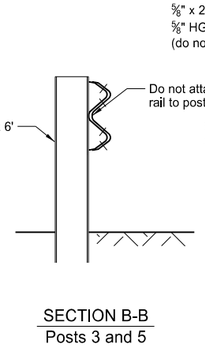
DETAIL B
Posts 3 through 6



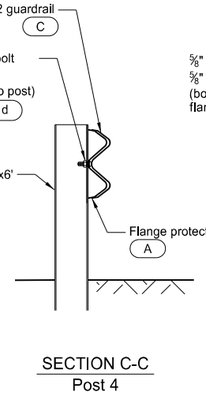
DETAIL A
Post 1



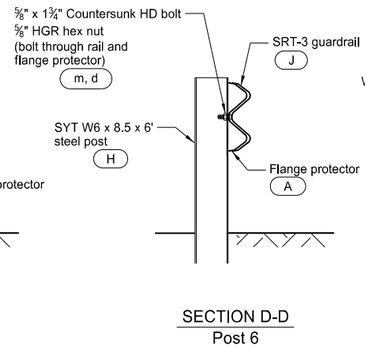
SECTION A-A
Post 2



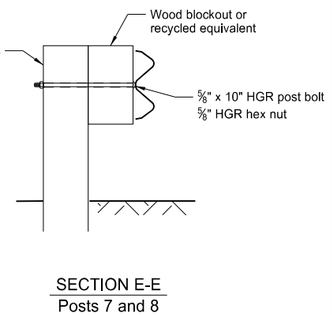
SECTION B-B
Posts 3 and 5



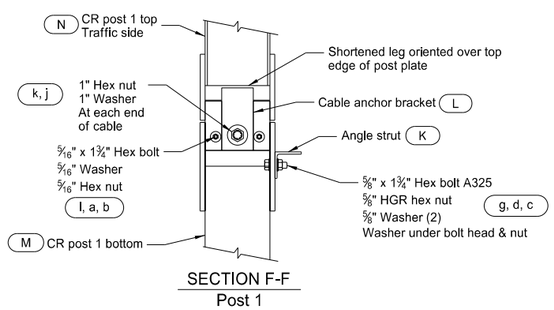
SECTION C-C
Post 4



SECTION D-D
Post 6



SECTION E-E
Posts 7 and 8



SECTION F-F
Post 1

GENERAL NOTES:

1. Galvanize all bolts, nuts, cable assemblies, cable anchors, bearing plates, slot guards, struts, nails, pipes soil tubes and soil plates.
2. The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent cable from twisting when tightening nuts.
3. For curb installation, the curb must end prior to post 7. Where the curb is extended beyond post 7, the flared Slotted Rail Terminal can not be used. Use a straight end treatment at the end of the straight guardrail that is placed at the face of the curb.
4. For details not shown, see the manufacturer's installation manual.
5. The Slotted Rail Terminal is only to be used as an end terminal when a minimum length of 175 feet, including the length of the end terminal, can be provided in advance of fixed objects.

OFFSET NOTES:

1. Post offset dimensions are given to the center of the traffic face of posts, except at posts 7 and 8 where dimensions are to the center of the traffic face of the blockouts.
2. Guardrail between posts 1-7 is on a straight line flare.
3. Install the Slotted Rail Terminal with a 4' flare for either a straight or flared guardrail installation.

ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	7G	12/6"/FLANGE PROTECTOR (POSTS 2, 4, 6)	3
B	30G	12/12'-6"/S SRT-1 RAIL SECTION	1
C	39G	12/12'-6"/S SRT-2 RAIL SECTION	1
D	700A	CABLE ANCHOR BRACKET	1
E	907G	TERMINAL BUFFER ROLLED	1
F	3000G	¾" x 6'-6" CABLE	1
G	9960G	SLOT GUARD BRACKET	4
H	15000G	SYT W6x8.5 6' STEEL POST	5
J	10967G	12/9'-4½"/3'-1½"/S SRT-3 RAIL SECTION	1
K	33875G	ANGLE STRUT 3" x 3" x ¼"	1
L	33909G	CABLE ANCHOR BRACKET (POST 1)	1
M	34052A	CR POST 1 BOTTOM W6x15	1
N	34053A	CR POST 1 TOP W6x8.5	1
O	34054G	POST SHELF ANGLE (POST 2)	1
HARDWARE			
a	3240G	⅝" WASHER	2
b	3245G	⅝" HEX NUT	2
c	3300G	⅝" WASHER	12
d	3340G	⅝" HGR HEX NUT	75
e	3360G	⅝" Dia x1¼" HGR SPLICE BOLT	60
f	3380G	⅝" Dia x 1½" HEX HD BOLT	8
g	3391G	⅝" Dia x 1¾" HEX BOLT A325 (AT STRUT)	2
h	3400G	⅝" Dia x 2" HGR POST BOLT (POSTS 1, 2 4)	4
j	3900G	1" WASHER (AT CABLE)	2
k	3910G	1" HEX NUT (AT CABLE)	2
l	4211G	⅝" Dia x 1¾" HEX BOLT (POST 1)	2
m	4419G	⅝" Dia x 1¾" COUNTERSUNK HD BOLT (POST 6)	1

NOTE: Standard rail section and standard wood line posts (including the blocks, and associated hardware) not included in Bill of Materials Table. All splice bolts (including associated nuts) are included in the Bill of Materials Table.

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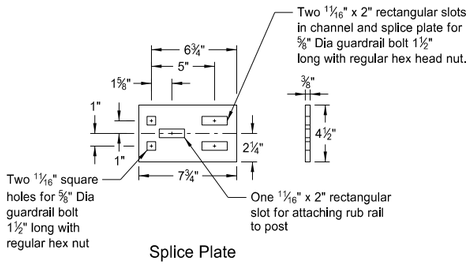
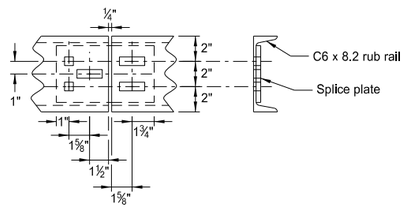
MGS W-BEAM GUARDRAIL GENERAL DETAILS

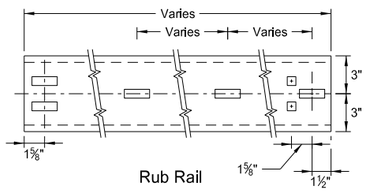
D-764-40



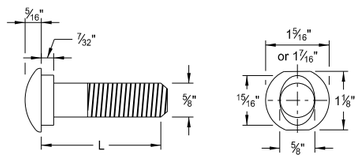
Splice Plate



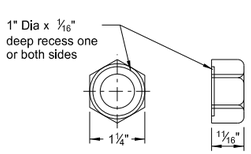
Splice Detail



C6x8.2 RUB RAIL AND SPLICE PLATE

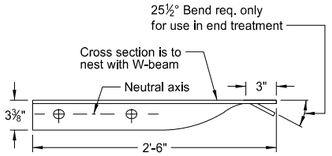


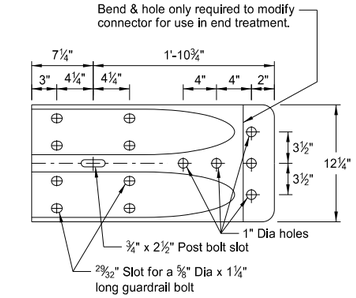
5/8" Diameter Guardrail Bolt	
L	Thread Length
1¼"	Full length thread
2"	1¾" Min thread length
9½"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length



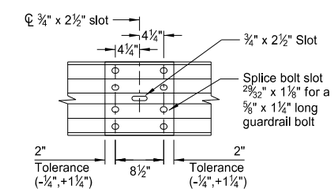
5/8" Dia recess nut

5/8" GUARDRAIL BOLT & RECESS NUT



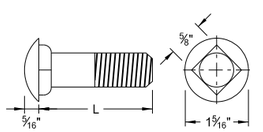


W BEAM TERMINAL CONNECTOR



SPLICE DETAIL

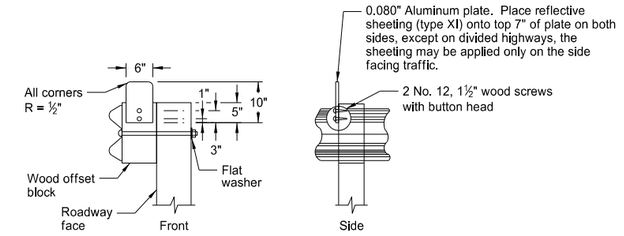
NOTE: Do not install center bolt in the ¾" x 2½" slot at mid span splices.



5/8" Diameter Carriage Bolt	
L	Thread Length
1½"	Full length thread
3"	1½" Min thread length
11"	1¾" Min thread length
13"	1¾" Min thread length

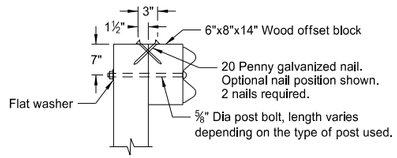
5/8" Dia hex nut

5/8" CARRIAGE BOLT & NUT

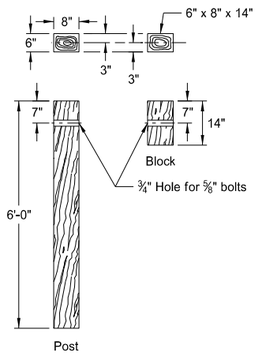


REFLECTORIZED PLATE DETAIL

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

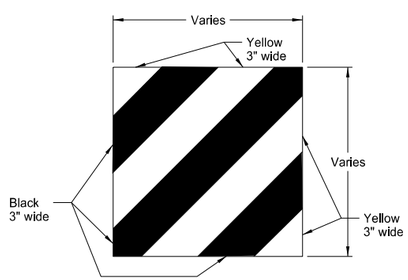


TYPICAL WOOD POST ATTACHMENT DETAIL

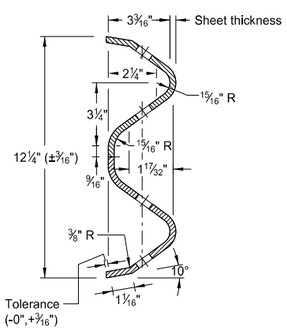


6" x 8" WOOD POST & BLOCK

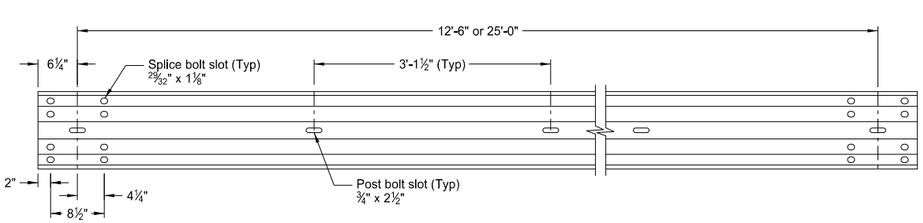
NOTE: Where soil conditions require, alternate lengths may be specified, in 6" increments.



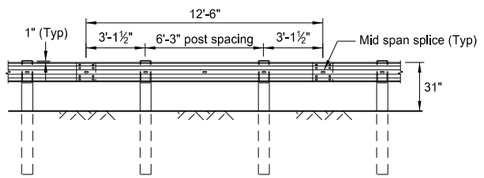
IMPACT HEAD OBJECT MARKER



W-BEAM CROSS SECTION



STANDARD MGS GUARDRAIL PANEL



STANDARD MGS GUARDRAIL SYSTEM

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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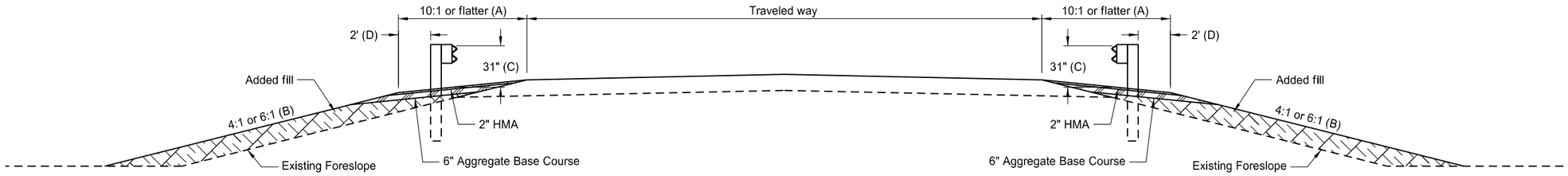
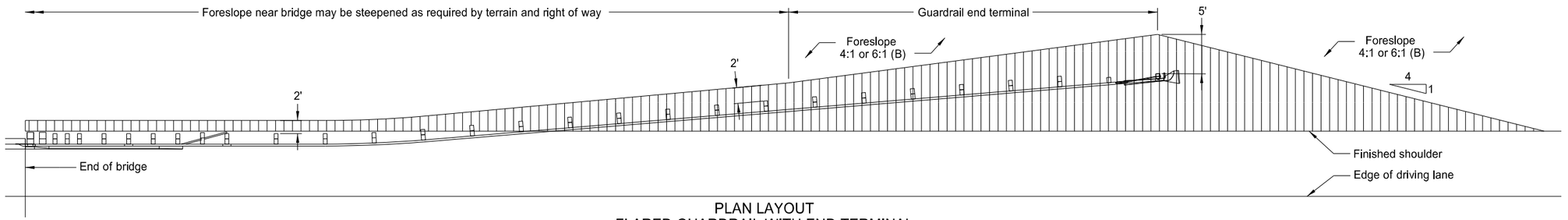
D-764-48

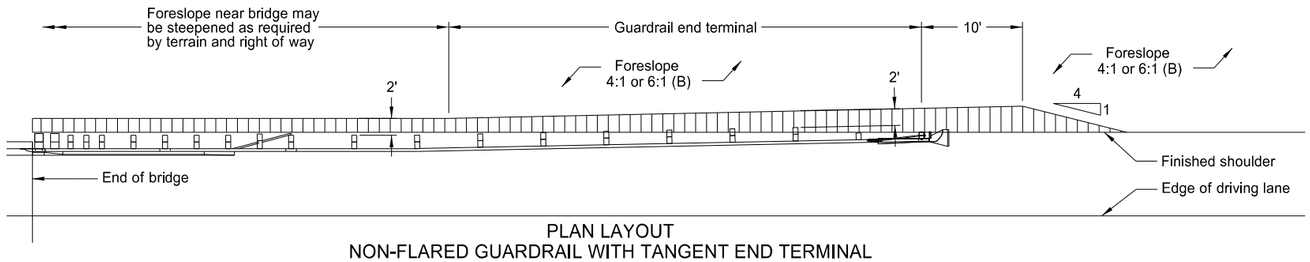
TYPICAL GRADING AT BRIDGE ENDS WITH MGS W-BEAM GUARDRAIL



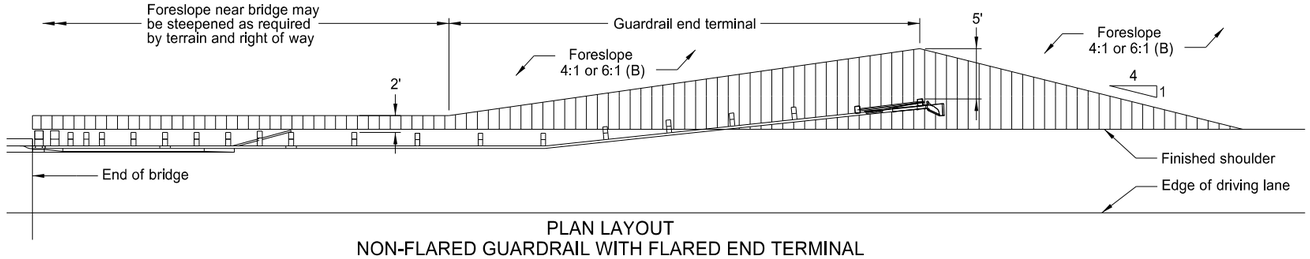
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

(A) Slope flatter than 10:1 may be required to provide proper guardrail height.

(B) Where normal foreslope is 4:1 the added fill shall be 4:1. Where normal foreslope is 6:1 the added fill shall be 6:1.

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

(D) Dimension at end terminals may vary per Plan Layouts shown on this sheet.

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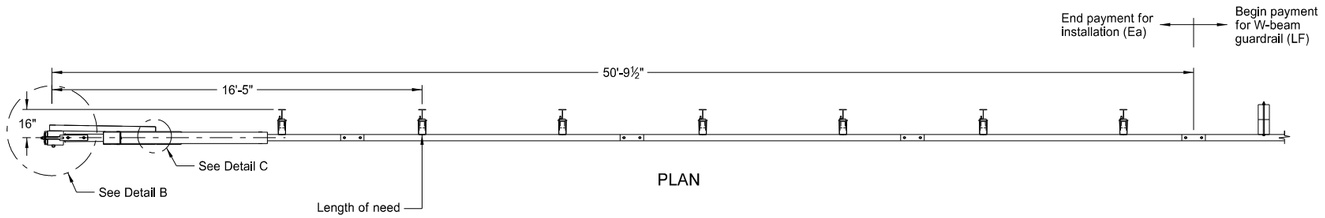
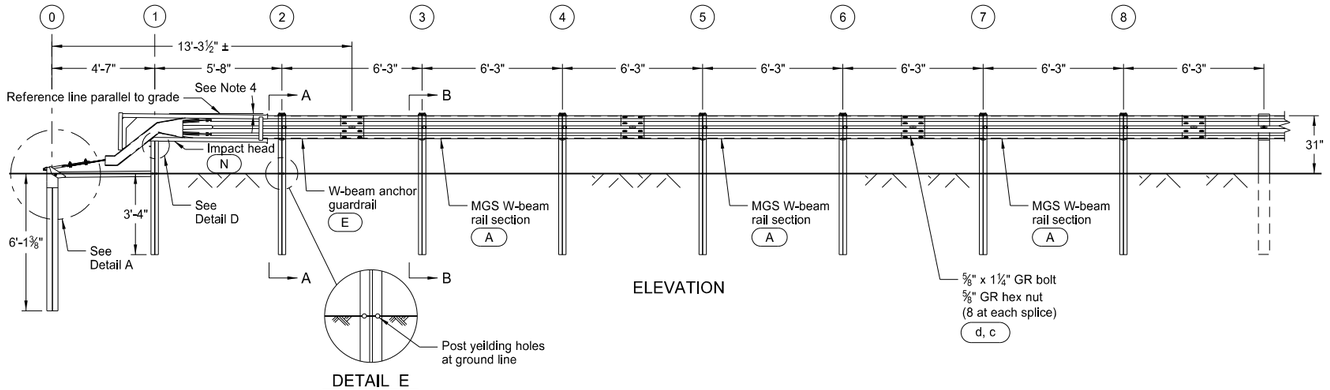
MASH SOFTSTOP END TERMINAL - STEEL POST

D-764-50



PLAN

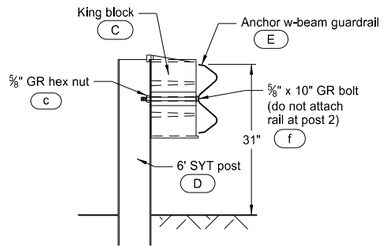


ELEVATION

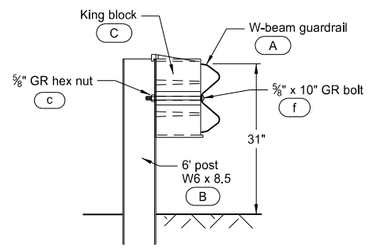
DETAIL E
Posts 1 & 2

GENERAL NOTES:

1. Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
2. The SoftStop can be flared at a rate of 25:1 or flatter.
3. Do not curve the guardrail within the SoftStop under any circumstances.
4 It is acceptable to install the SoftStop impact head parallel to the grade line or with an upward tilt. See softstop assembly manual for specific details.

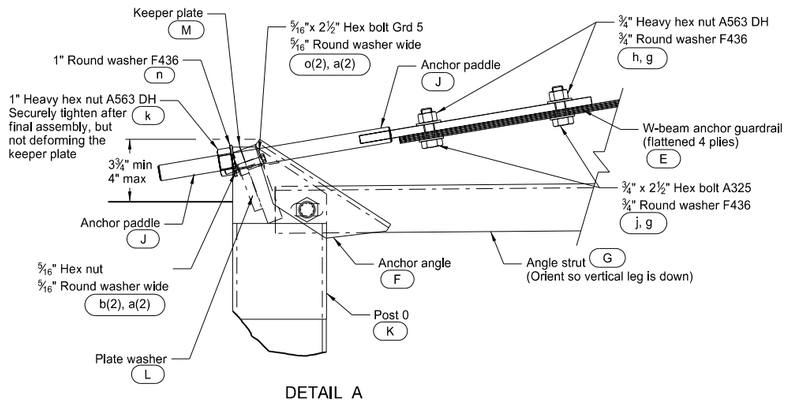


SECTION A-A
Post 2

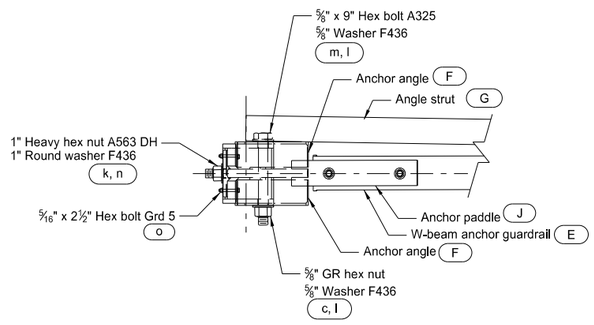


SECTION B-B
Posts 3 through 8

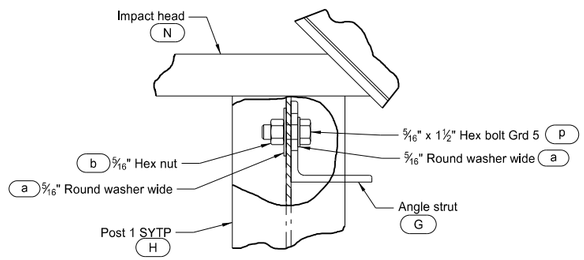
ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	000011	12 / 12'-6" / 3'-1½" / S MGS W-BEAM RAIL SECTION	3
B	000533	6'-0" STEEL POST W6 x 8.5	6
C	006777	KING BLOCK 4" X 7½" X 1'-2"	7
D	015000	6'-0" SYT POST / 8.5 / 31" GR HT	1
E	015200	SFST - ANCHOR GUARDRAIL 12'-6"	1
F	015201	SFST - ANCHOR ANGLE	2
G	015202	SFST - 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	⅝" GR HEX NUT	41
d	003360	⅝" x 1¼" GR BOLT	32
e	003391	⅝" x 1¾" HEX BOLT A325	1
f	003500	⅝" x 10" GR BOLT A307	7
g	003701	¾" ROUND WASHER F436	4
h	003704	¾" HVY HEX NUT A563 DH	2
j	003717	¾" x 2½" HEX BOLT A325	2
k	003908	1" HVY HEX NUT A563 DH	1
l	004372	⅝" WASHER F436	4
m	004489	⅝" x 9" HEX BOLT A325	1
n	004902	1" ROUND WASHER F436	1
o	105285	5/16" x 2½" HEX BOLT GRD 5	2
p	105286	5/16" x 1½" HEX BOLT GRD 5	1



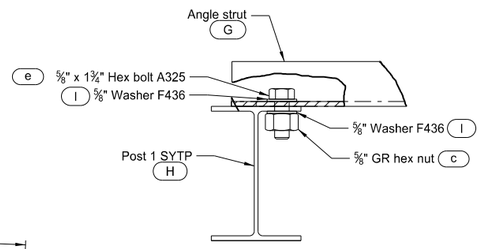
DETAIL A
Post 0



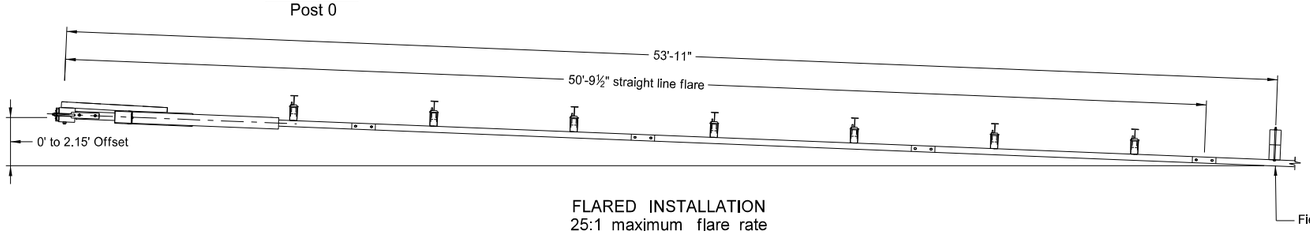
DETAIL B
Post 0



DETAIL D
Post 1



DETAIL C
Post 1
(shown near ground)



FLARED INSTALLATION
25:1 maximum flare rate

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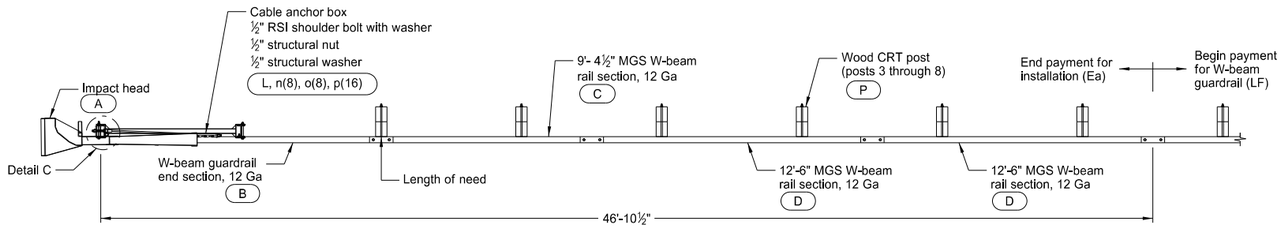
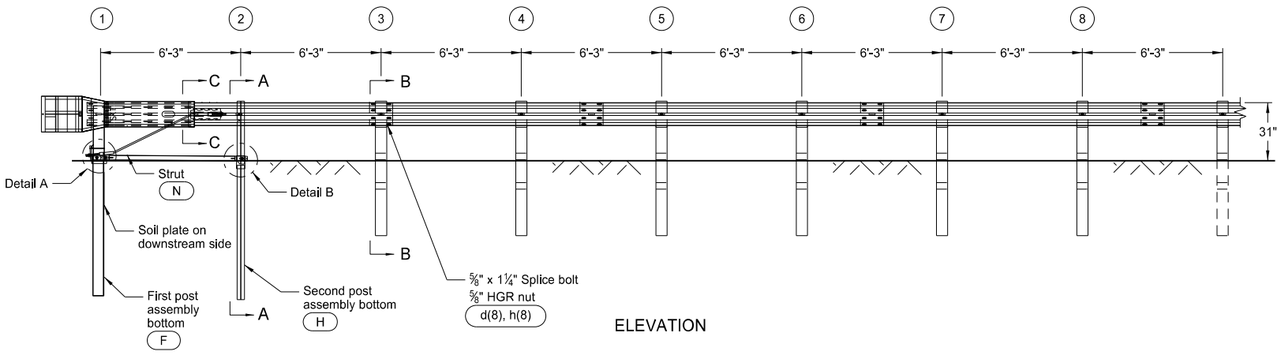
MASH SEQUENTIAL KINKING TERMINAL - WOOD POST

D-764-51



PLAN

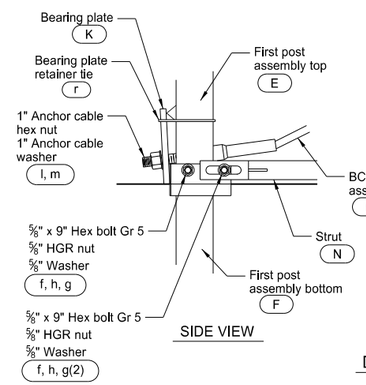


ELEVATION

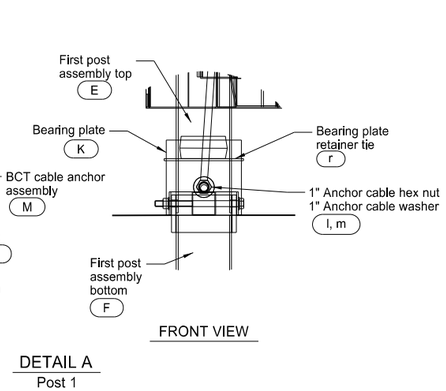
GENERAL NOTES:

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

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

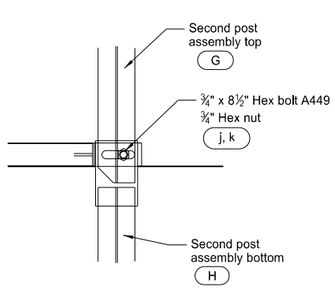


SIDE VIEW



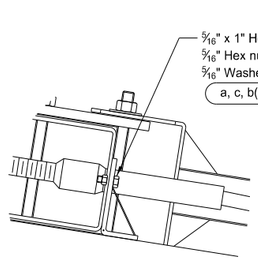
FRONT VIEW

DETAIL A
Post 1

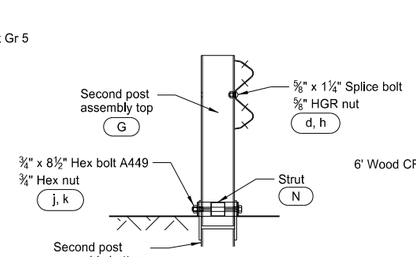


SIDE VIEW

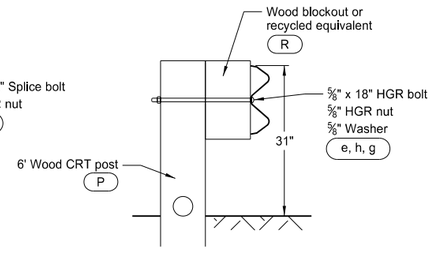
DETAIL B
Post 2



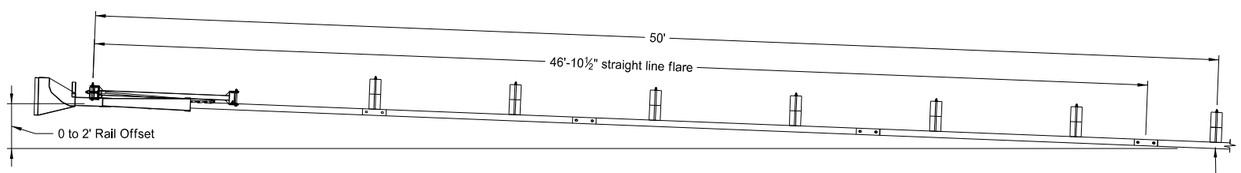
DETAIL C
Post 1 (Impact Head connection)



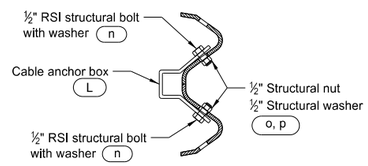
SECTION A-A
Post 2



SECTION B-B
Posts 3 through 8



FLARED INSTALLATION
25:1 maximum flare rate



SECTION C-C

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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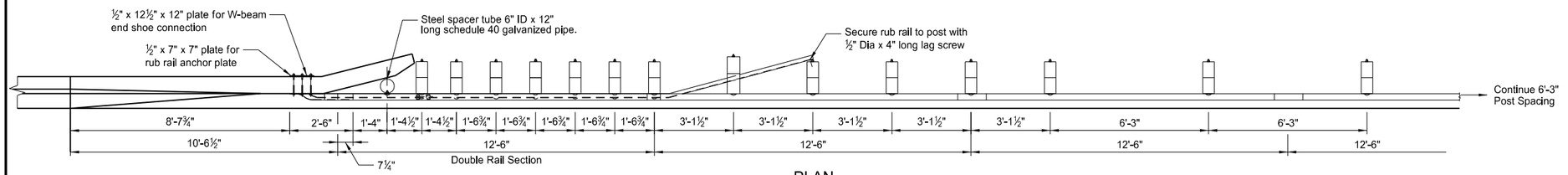
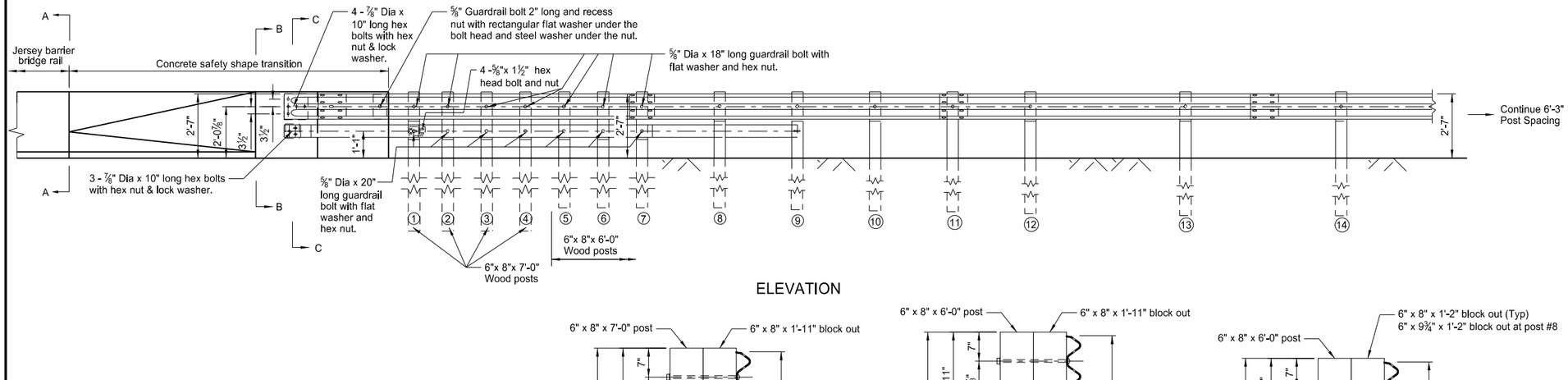
MGS W-BEAM TRANSITION TO CONCRETE SAFETY SHAPE TRANSITION

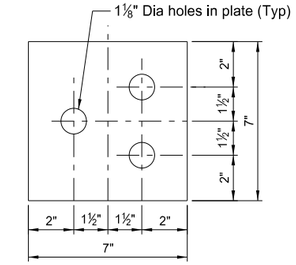
D-764-63



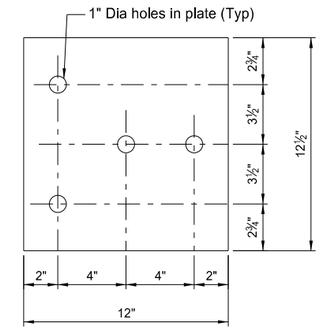
PLAN



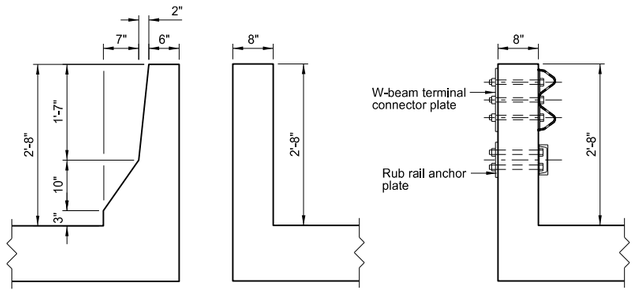
ELEVATION



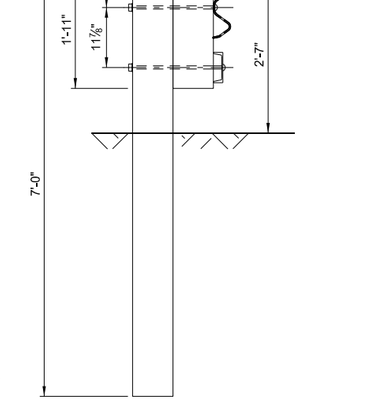
RUB RAIL ANCHOR PLATE
(7"x 7"x ½")



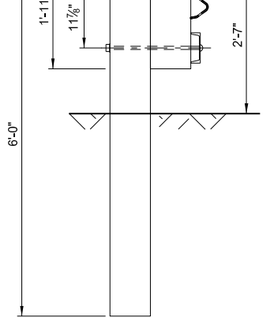
W-BEAM TERMINAL CONNECTOR PLATE
(12"x12½" x⅝")



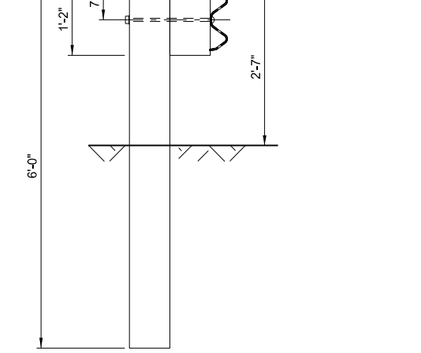
Note:
The bolt holes may require drilling through the concrete safety shape transition wall. If reinforcing steel is encountered when drilling holes, it shall be drilled through.



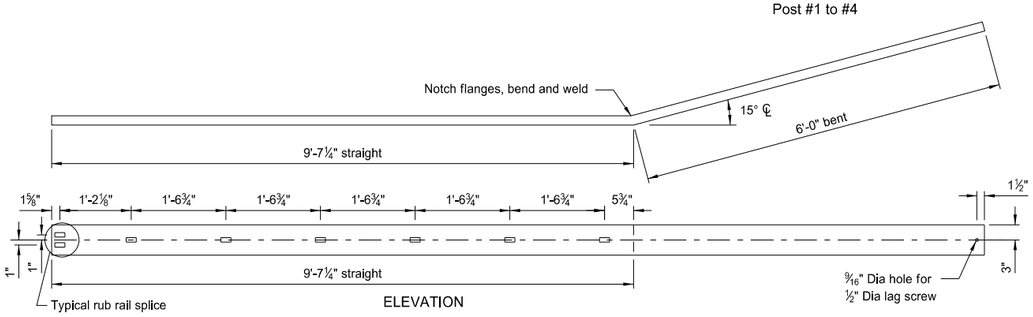
Detail
Post #1 to #4



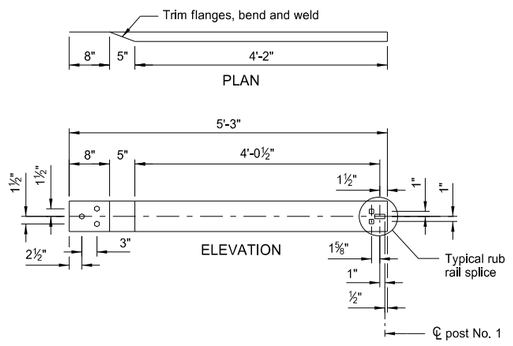
Detail
Post #5 to #7



Detail
Post #8 to #14



C6 x 8.2 RUB RAIL BENT SECTION



C6 x 8.2 RUB RAIL STRAIGHT SECTION

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