DESIGN DATA				
Traffic	Average Daily			
Current 2023	Pass: 873	Trucks: 737	Total: 1,610	
Preventive Maintenance				

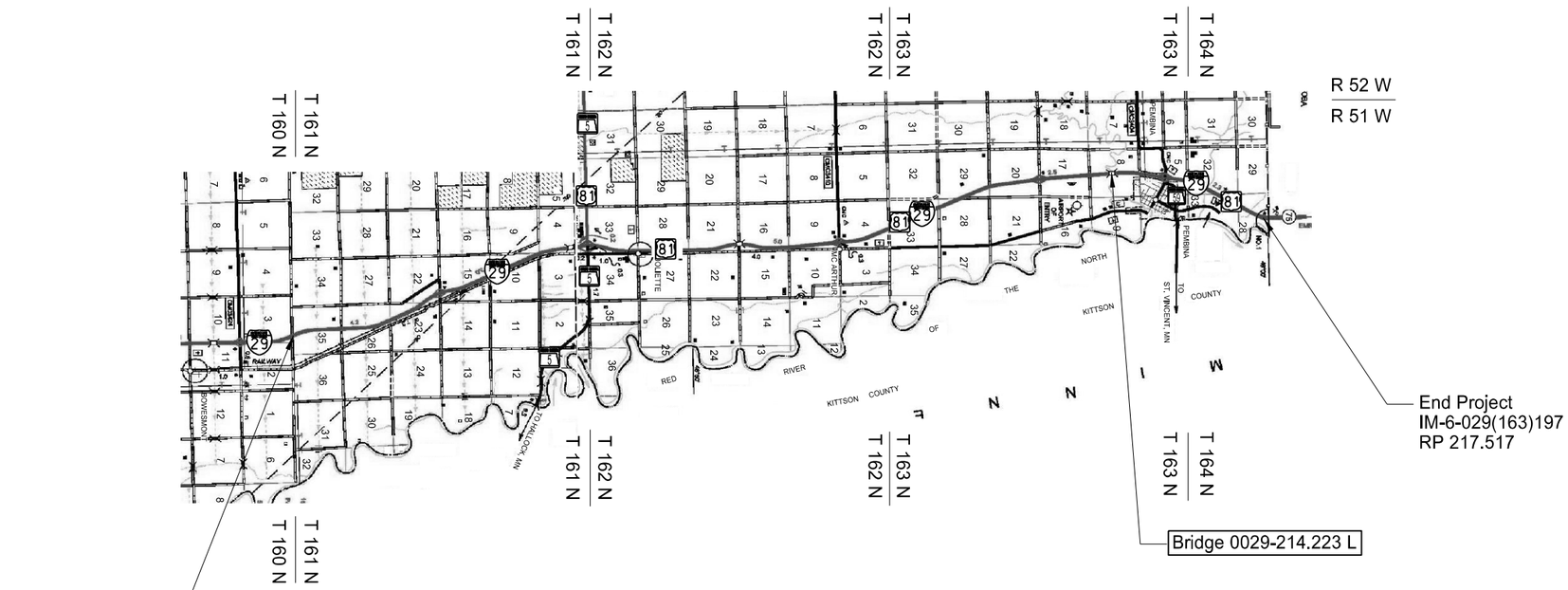
STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	23476	1	1

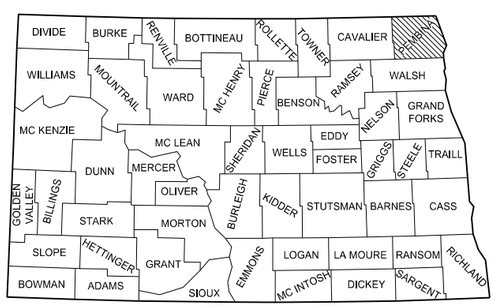
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

IM-6-029(163)197
Pembina County
N Bowesmont to Canadian Line - NB
Concrete Pavement Repair, Milling and HMA

GOVERNING SPECIFICATIONS	Date Published and Adopted by the North Dakota Department of Transportation
Standard Specifications	07/01/2024
Supplemental Specifications	NONE

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
IM-6-029(163)197	20.437	20.437





STATE COUNTY MAP

DESIGNER
Lynnette Steyn
DESIGNER
DESIGNER

ND DEPARTMENT OF TRANSPORTATION
GRAND FORKS DISTRICT

02/11/25

GRAND FORKS DISTRICT

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	2	1

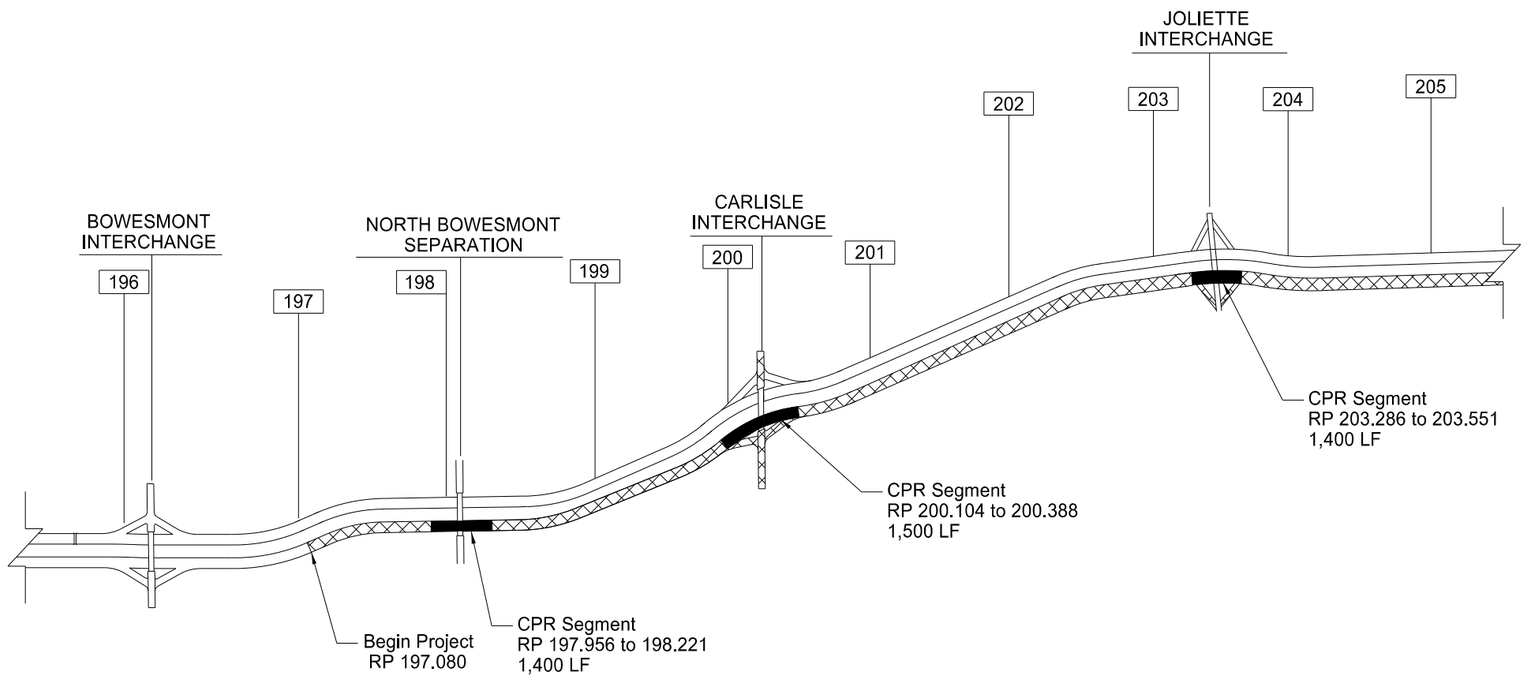
TABLE OF CONTENTS

PLAN SECTIONS

LIST OF STANDARD DRAWINGS

SPECIAL PROVISIONS

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	4	1



2" Mill and 2" RAP - Superpave FAA 45

Concrete Pavement Repair and PCC Grinding

Scope of Work

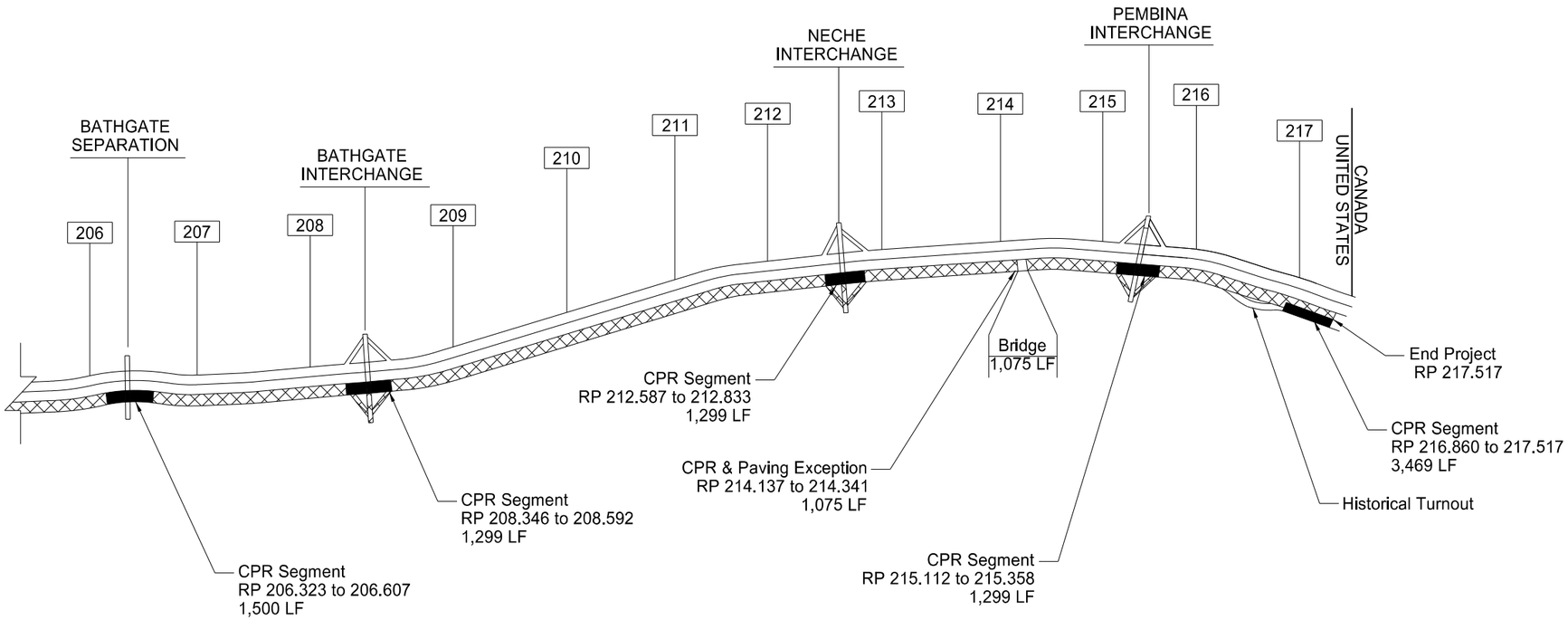
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

2/10/2025 12:40:32 PM lsteyn R:\project\60029197.163\District\Sheets\004SW_Scope\004SW_001_Scope of Work.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	4	2



2" Mill and 2" RAP - Superpave FAA 45

Concrete Pavement Repair and PCC Grinding

Scope of Work

Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

2/10/2025 12:40:32 PM lsteyn R:\project\60029197.163\District\Sheets\004SW_Scope\004SW_001_Scope of Work.dgn

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	6	1

NOTES

100-P01 CONTACTS: Provide a detailed work activity schedule of this project to the following US Border officials: Chief Christopher Misson, Affairs Liaison – Ports of Entry, 10980 Hwy 29, Pembina, ND 58271, Phone: (701) 825-5800 Ext: 5851, Fax: (701) 825-5980

105-P02 The Engineer will establish centerline if requested by the Contractor. No additional horizontal control will be provided.

107-300 CONSTRUCTION TRAFFIC ACCESS: Access areas within the right of way only at interchanges. The Engineer may allow temporary access at other locations.

To obtain temporary access, provide an access plan containing the following information:

- A traffic control plan;
- A traffic impact analysis;
- A safety analysis;
- A COA; and
- An environmental impact analysis.

To be considered for approval, the following minimum conditions must be met in the access plan:

- Construction traffic will not be allowed to cross the interstate median, or lanes of traffic being used by the public at grade.
- The access plan must show that there will be methods in place, at all times, to prevent public traffic from using the access.
- A plan to restore the area disturbed by the access, including right of way fences, to pre-existing or better condition.

All work necessary to provide the access plan, comply with the plan, and to restore the area to its pre-existing condition must be completed at no additional cost to the Department.

108-100 WEEKLY PLANNING & REPORTING MEETING: A weekly planning and reporting meeting is required.

230-P01 SHOULDER PREPARATION: Apply herbicide to existing paved shoulder prior to fog seal, as shown in Section 30. Remove all weeds and grass from the paved shoulder before applying fog seal. Tilling, discing, and reshaping of the foreslope will not be required.

302-P01 AGGREGATE BASE COURSE CL 5: Aggregate Base Course Cl 5 has been provided in the quantities to fill in around the radii of the interchange ramps. This material will be required when sloughs are steeper than 4:1.

411-P01 TEMPORARY ASPHALT WEDGES: Place temporary asphalt wedges at the beginning and ends of this project and intersecting routes to allow smooth passage of vehicles at these milled locations. Place wedges at these milled areas prior to the traffic being allowed back on the milled roadway section. Millings may be used instead of asphalt for all wedges. Include all costs associated with labor, materials, and equipment for the installation, maintenance, and removal of the wedges in the contract price bid for “MILLING PAVEMENT SURFACE”.

430-200 FOG SEAL: Apply a fog seal at a rate of 0.05 Gal/SY to the final surface of the hot mix asphalt if the ND T 113 “Lightweight Pieces in Virgin Aggregate” test results exceeds 3.0% during mix design or production of the hot mix asphalt. Apply the fog seal behind the finish roller before the mat temperature drops below 130 degrees Fahrenheit. Use the same emulsion material as the Tack Coat. Apply the fog seal at no additional cost to the Department.

430-P01 RECYCLED ASPHALT PAVEMENT (RAP): RAP may be incorporated into mix at a rate between 10 and 15 percent of the mix, by weight. Obtain the recycled material from the I-29 mainline travel lanes and inside (median) shoulder on this project. The Engineer will not approve recycled material taken from the I-29 driving lane shoulder, interchange ramps, or interchange crossroads.

430-P02 HMA RAMPS, CROSSROADS AND INTERSECTING ROUTES: Construct the pavement to minimize joints. Place longitudinal joints at the centerline of the road, crossroads, or ramps. Where multiple lanes exist, place the joint between the lanes. Place a uniform joint where routes intersect. Construct each lane with an adjoining shoulder and/or radius using a hot seam and roll the entire mat in a manner such that compaction is uniform and the seam is not visible.

570-P01 CONCRETE PAVEMENT REPAIR: An additional 25% has been added to the quantities for “DOWELED CONTRACTION JOINT ASSEMBLY,” “CONCRETE PAVEMENT REPAIR-FULL DEPTH-DOWELED,” and “SPALL REPAIR-PARTIAL DEPTH” to be used as directed by the Engineer.

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

704-P01 TRAFFIC CONTROL FOR MILLING, HMA OVERLAY, AND CONCRETE PAVEMENT REPAIR: Provide traffic control consisting of a temporary lane closure and flagging.

The maximum work zone length is limited to 10 miles. A total of two sequential 10-mile work zones is required to complete this project.

Traffic control device quantities are based on a 10-mile work zone and the list below.

1. Standard D-704-15,Type A (Crossroads);
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;

Place vertical panels on the roadway centerline adjacent to full depth repair areas. Place panels every 10 feet and use a minimum of two panels at each full depth repair area.

Place Type I barricades in front of each full depth removal area. Position barricades so that they do not encroach into the traffic lane.

Quantities of Type I barricades and vertical panels are based on 6 full depth repair locations and 2 vertical panels per location. The Department will pay for additional barricades and panels at the contract unit price for the devices.

704-P02 TRAFFIC CONTROL FOR CONCRETE PAVEMENT REPAIR, MILLING & HMA AT PEMBINA BORDER CROSSING (RP 215.634 TO 217.388): See Section 100, Sheets 2 & 6-13 for quantities and an overview of construction phasing plan for concrete pavement repairs, milling & HMA to be completed at the Pembina Border Crossing. Traffic control quantities will be provided for this segment in addition to the traffic control quantities noted in 704-P01.

704-P03 MAINTAIN ACCESS FOR CONCRETE PAVEMENT REPAIR, MILLING & HMA: To minimize interference with traffic operations, maintaining access at the Historical Turnout, Commercial Truck Bypass, and Duty Free entrance during concrete pavement repair, milling, and paving operations will be required. See Section 100, Sheets 7, 10, and 11 for traffic control phasing and locations.

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	6	2

NOTES

706-P01 BITUMINOUS LABORATORY: Provide cellular internet service with Wi-Fi capabilities. Also provide a cell phone signal booster that allows for the reliable use of cellular voice and data services throughout the lab. Include all costs for installation and monthly fees for the cellular internet service and cellular signal booster in the contract price for “BITUMINOUS LABORATORY”.

706-P02 FIELD OFFICE: Provide a field office which meets the following requirements:

1. Be completely insulated and weather tight.
2. Minimum total area of 450 square feet.
3. Indoor bathroom facilities and supplies with weekly cleaning services.
4. Hookups for heat, electricity, sewer, and potable water.
5. Have a dependable source of electricity for power and lights with a minimum of 6 electrical outlets spaced throughout the building and light fixtures spaced to uniformly light the entire interior (lumens required 110 foot-candles).
6. Minimum counter space of 40 square feet.
7. Be wired for DSL Broadband internet with wireless Wi-Fi and have the capability to allow for hard wiring the computer. Include the cost of the installation and monthly fees.
8. A heating and cooling system that is capable of maintaining the temperature between 65º F and 78º F year around.
9. A minimum of 3 desks and 3 desk chairs, 3 extra chairs, a drawer file cabinet with at least two drawers, one table minimum of 2.5 feet x 5 feet.
10. Photocopy/Printer with scanning capabilities capable of 11x17 photocopies and toner to last the duration of the project. Other features to include digital copying and scanning. Copier/printer machine with operating software compatible with that used by the NDDOT.

Place the field office on the project, or as close to the project as possible. The Contractor is responsible for payment of the following:

-Rental fees;
-Heating;
-Electrical;
-Sewer, and
-Potable water.

Make the field office available for occupancy one week before the start of the project. The Engineer will approve the location and the condition of the office. Do not remove the field office until the Engineer releases the field office.

The Engineer is responsible for the following items:

-Supplying paper.

All requirements of the Field Office are subject to approval by the Engineer. Include the costs for the field office in the contract unit price bid for “FIELD OFFICE”.

Schedule for Payments:

-25% when set up on site.
-50% when 30% of the work is complete.
-75% when 60% of the work is complete.
-100% when project is complete.

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

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 09/11/25
NORTH DAKOTA

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	8	1

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
103	0100	CONTRACT BOND	L SUM	0.75	0.75
109	1000	E-TICKETING	L SUM	0.95	0.95
230	0125	SHOULDER PREPARATION	MILE	21.389	21.389
302	0120	AGGREGATE BASE COURSE CL 5	TON	200	200
401	0050	TACK COAT	GAL	30,681	30,681
401	0070	FOG SEAL	GAL	3,706	3,706
411	0105	MILLING PAVEMENT SURFACE	SY	408,869	408,869
430	0145	RAP - SUPERPAVE FAA 45	TON	44,682	44,682
430	0400	HMA INTELLIGENT COMPACTION	L SUM	1	1
430	0425	PAVER MOUNTED THERMAL PROFILER	L SUM	1	1
430	1000	CORED SAMPLE	EA	216	216
430	5818	PG 58H-34 ASPHALT CEMENT	TON	2,337	2,337
570	0210	PCC PAVEMENT GRINDING	SY	8,611	8,611
570	0240	DOWELED CONTRACTION JOINT ASSEMBLY	LF	334	334
570	0709	11IN CONCRETE PAVEMENT REPAIR-FULL DEPTH-DOWELED	SY	632	632
570	0710	10IN CONCRETE PAVEMENT REPAIR-FULL DEPTH-DOWELED	SY	265	265
570	1512	SPALL REPAIR-PARTIAL DEPTH	SF	693	693
702	0100	MOBILIZATION	L SUM	0.75	0.75
704	0100	FLAGGING	MHR	1,464	1,464
704	1000	TRAFFIC CONTROL SIGNS	UNIT	6,125	6,125
704	1050	TYPE I BARRICADE	EA	45	45
704	1052	TYPE III BARRICADE	EA	27	27
704	1060	DELINEATOR DRUMS	EA	181	181
704	1067	TUBULAR MARKERS	EA	690	690
704	1080	STACKABLE VERTICAL PANELS	EA	110	110
704	1087	SEQUENCING ARROW PANEL-TYPE C	EA	3	3
706	0400	FIELD OFFICE	EA	0.75	0.75
706	0500	AGGREGATE LABORATORY	EA	0.75	0.75
706	0550	BITUMINOUS LABORATORY	EA	0.75	0.75
706	0600	CONTRACTOR'S LABORATORY	EA	0.75	0.75
760	0025	SINUSOIDAL RUMBLE STRIP - ASPHALT SHOULDER	MILE	35.753	35.753
762	0432	SHORT TERM 6IN LINE-TYPE NR	LF	62,162	62,162
762	1106	PVMT MK PAINTED 6IN LINE	LF	263,271	263,271

ESTIMATE NUMBER: 24446 ESTIMATE TYPE: FINAL FINALIZED: Y RUN DATE: 01/15/2025 TIME: 12:44:39

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	8	2

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
762	1112	PVMT MK PAINTED 12IN LINE	LF	7,042	7,042
762	1124	PVMT MK PAINTED 24IN LINE	LF	352	352

ESTIMATE NUMBER: 24446 ESTIMATE TYPE: FINAL FINALIZED: Y RUN DATE: 01/15/2025 TIME: 12:44:39

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	10	1

BASIS OF ESTIMATE

Design Calculations			
Description	**Unit**	**Width**	**Quantity**
Typical Section 1: 5.080 Miles			
Milling Pavement Surface *(34 FT X 5,280 LF/Mi. ÷ 9 SF/SY = 19,947 SY/Mi.)*	SY	34'	101,331
RAP - Superpave FAA 45 *(5.5043 SF X 5,280 LF/Mi. X 2 Ton/CY ÷ 27 CF/CY = 2,153 Ton/Mi.)*	Ton	34'	10,938
PG 58H-34 Asphalt Cement @ 5.2% *(2,153 Tons/Mi. X 0.052 = 112 Ton/Mi.)*	Ton	34'	569
Tack Coat @ 0.075 Gal/SY *(34 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.075 Gal/SY = 1,496 Gal/Mi.)*	Gal	34'	7,600
Fog Seal @ 0.05 Gal/SY *(6 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.05 Gal/SY = 176 Gal/Mi.)*	Gal	6' RT	895
Shoulder Preparation *(1 Mi/Mi)*	Mi	--	5.080
Typical Section 2: 1.372 Miles			
Milling Pavement Surface *(33.1 FT X 5,280 LF/Mi. ÷ 9 SF/SY = 19,419 SY/Mi.)*	SY	33.1'	26,643
RAP - Superpave FAA 45 *(5.4194 SF X 5,280 LF/Mi. X 2 Ton/CY ÷ 27 CF/CY = 2,120 Ton/Mi.)*	Ton	33.1'	2,909
PG 58H-34 Asphalt Cement @ 5.2% *(2,120 Tons/Mi. X 0.052 = 111 Ton/Mi.)*	Ton	33.1'	153
Tack Coat @ 0.075 Gal/SY *(33.1 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.075 Gal/SY = 1,457 Gal/Mi.)*	Gal	33.1'	1,999
Fog Seal @ 0.05 Gal/SY *(6 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.05 Gal/SY = 176 Gal/Mi.)*	Gal	6' RT	242
Shoulder Preparation *(1 Mi/Mi)*	Mi	--	1.372
Typical Section 3: 1.586 Miles			
Milling Pavement Surface *(34.1 FT X 5,280 LF/Mi. ÷ 9 SF/SY = 20,006 SY/Mi.)*	SY	34.1'	31,730
RAP - Superpave FAA 45 *(5.5027 SF X 5,280 LF/Mi. X 2 Ton/CY ÷ 27 CF/CY = 2,153 Ton/Mi.)*	Ton	34.1'	3,415
PG 58H-34 Asphalt Cement @ 5.2% *(2,153 Tons/Mi. X 0.052 = 112 Ton/Mi.)*	Ton	34.1'	178
Tack Coat @ 0.075 Gal/SY *(34.1 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.075 Gal/SY = 1,501 Gal/Mi.)*	Gal	34.1'	2,381
Fog Seal @ 0.05 Gal/SY *(6 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.05 Gal/SY = 176 Gal/Mi.)*	Gal	6' RT	280
Shoulder Preparation *(1 Mi/Mi)*	Mi	--	1.586

Design Calculations			
Description	**Unit**	**Width**	**Quantity**
Typical Section 4: 7.155 Miles			
Milling Pavement Surface *(32.9 FT X 5,280 LF/Mi. ÷ 9 SF/SY = 19,302 SY/Mi.)*	SY	32.9'	138,106
RAP - Superpave FAA 45 *(5.4075 SF X 5,280 LF/Mi. X 2 Ton/CY ÷ 27 CF/CY = 2,115 Ton/Mi.)*	Ton	32.9'	15,133
PG 58H-34 Asphalt Cement @ 5.2% *(2,115 Tons/Mi. X 0.052 = 110 Ton/Mi.)*	Ton	32.9'	788
Tack Coat @ 0.075 Gal/SY *(32.9 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.075 Gal/SY = 1,448 Gal/Mi.)*	Gal	32.9'	10,361
Fog Seal @ 0.05 Gal/SY *(6 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.05 Gal/SY = 176 Gal/Mi.)*	Gal	6' RT	1,260
Shoulder Preparation *(1 Mi/Mi)*	Mi	--	7.155
Typical Section 5: 1.011 Miles			
Milling Pavement Surface *(32.9 FT X 5,280 LF/Mi. ÷ 9 SF/SY = 19,302 SY/Mi.)*	SY	32.9'	19,515
RAP - Superpave FAA 45 *(5.3930 SF X 5,280 LF/Mi. X 2 Ton/CY ÷ 27 CF/CY = 2,110 Ton/Mi.)*	Ton	32.9'	2,134
PG 58H-34 Asphalt Cement @ 5.2% *(2,110 Tons/Mi. X 0.052 = 110 Ton/Mi.)*	Ton	32.9'	112
Tack Coat @ 0.075 Gal/SY *(32.9 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.075 Gal/SY = 1,448 Gal/Mi.)*	Gal	32.9'	1,464
Fog Seal @ 0.05 Gal/SY *(6 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.05 Gal/SY = 176 Gal/Mi.)*	Gal	6' RT	178
Shoulder Preparation *(1 Mi/Mi)*	Mi	--	1.011
Typical Section 6: 1.082 Miles			
Milling Pavement Surface *(32.7 FT X 5,280 LF/Mi. ÷ 9 SF/SY = 19,184 SY/Mi.)*	SY	32.7'	20,758
RAP - Superpave FAA 45 *(5.3897 SF X 5,280 LF/Mi. X 2 Ton/CY ÷ 27 CF/CY = 2,108 Ton/Mi.)*	Ton	32.7'	2,281
PG 58H-34 Asphalt Cement @ 5.2% *(2,108 Tons/Mi. X 0.052 = 110 Ton/Mi.)*	Ton	32.7'	120
Tack Coat @ 0.075 Gal/SY *(32.7 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.075 Gal/SY = 1,439 Gal/Mi.)*	Gal	32.7'	1,557
Fog Seal @ 0.05 Gal/SY *(6 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.05 Gal/SY = 176 Gal/Mi.)*	Gal	6' RT	191
Shoulder Preparation *(1 Mi/Mi)*	Mi	--	1.082

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	10	2

BASIS OF ESTIMATE

Design Calculations			
Description	**Unit**	**Width**	**Quantity**
Typical Section 7: 0.371 Miles			
Milling Pavement Surface *(32.7 FT X 5,280 LF/Mi. ÷ 9 SF/SY = 19,184 SY/Mi.)*	SY	32.7'	7,118
RAP - Superpave FAA 45 *(5.3889 SF X 5,280 LF/Mi. X 2 Ton/CY ÷ 27 CF/CY = 2,108 Ton/Mi.)*	Ton	32.7'	783
PG 58H-34 Asphalt Cement @ 5.2% *(2,108 Tons/Mi. X 0.052 = 110 Ton/Mi.)*	Ton	32.7'	41
Tack Coat @ 0.075 Gal/SY *(32.7 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.075 Gal/SY = 1,439 Gal/Mi.)*	Gal	32.7'	534
Fog Seal @ 0.05 Gal/SY *(6 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.05 Gal/SY = 176 Gal/Mi.)*	Gal	6' RT	66
Shoulder Preparation *(1 Mi/Mi)*	Mi	--	0.371
Typical Section 8: 1.003 Miles			
Fog Seal @ 0.05 Gal/SY (Asphalt Shoulders) *(11 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.05 Gal/SY = 323 Gal/Mi.)*	Gal	3' LT 8' RT	324
Shoulder Preparation *(2 Mi/Mi)*	Mi	--	2.006
Typical Section 9: 0.833 Miles			
Fog Seal @ 0.05 Gal/SY (Asphalt Shoulders) *(11 FT X 5,280 LF/Mi. ÷ 9 SF/SY X 0.05 Gal/SY = 323 Gal/Mi.)*	Gal	3' LT 8' RT	270
Shoulder Preparation *(2 Mi/Mi)*	Mi	--	1.666

HMA Cored Samples				
Specification	**Basis of Estimate**	**Quantity**	**Quantity** (1 per mile)	**Unit**
430.04 I.2.b(1), "General" *(Repairs-Section 20 Sheet 6)*	1 Core per Lift x 2 Lifts x 2 Lanes x 2 Locations	8	N/A	EA
SP 436(24) B.1, "Mat Density" *(Mainline & Border Section)*	38,509 Mainline Tons ÷ 900 Ton/Sublot x 2 EA/Lot	86	N/A	EA
SSP 4 Longitudinal Joint Density *(Mainline & Border Section)*	153,865 LF ÷ 1,000 FT/Sublot x 1 EA/Sublot	96	N/A	EA
SP 436(24) B.1, "Mat Density" *(Ramps & Crossroads)*	6,120 Mainline Tons ÷ 900 Ton/Sublot x 2 EA/Sublot	14	N/A	EA
SSP 4 Longitudinal Joint Density *(Ramps & Crossroads)*	11,849 LF ÷ 1,000 FT/Sublot x 1 EA/Sublot	12	N/A	EA
430.04 I.2.b(2) "Pavement Thickness Determination Cores"		N/A	18	EA
		216	**18**	**EA**

Additional Design Calculations			
Description	**Unit**	**Basis**	**Quantity**
Ramp Tapers, Ramps and Crossroads			
Milling Pavement Surface	SY	Section 90 Sheets 1-6	55,025
RAP Superpave FAA 45	Ton		6,120
PG 58H-34 Asphalt Cement @ 5.2%	Ton		323
Tack Coat @ 0.075 Gal/SY	Gal		4,136
Aggregate Base Course CL 5	Ton		200
Repairs: Sec. 20 Sheet 6			
Milling Pavement Surface	SY	Sec. 90 Sheet 6	267
RAP Superpave FAA 45	Ton		38
PG 58H-34 Asphalt Cement @ 5.2%	Ton		3
Tack Coat @ 0.075 Gal/SY	Gal		20
Pembina River Bridge (RP 214.223): Sec. 90 Sheet 7			
Milling Pavement Surface	SY	Sec. 90 Sheet 7	134
RAP Superpave FAA 45	Ton		15
PG 58H-34 Asphalt Cement @ 5.2%	Ton		1
Tack Coat @ 0.075 Gal/SY	Gal		10
Border Section (RP 216.775-217.218): Sec. 90 Sheets 8-9			
Milling Pavement Surface	SY	Sec. 90 Sheets 8-9	8,242
RAP Superpave FAA 45	Ton		916
PG 58H-34 Asphalt Cement @ 5.2%	Ton		49
Tack Coat @ 0.075 Gal/SY	Gal		619

PCC Pavement Grinding					
Location	**Begin RP**	**End RP**	**Length (FT)**	**Width (FT)**	**Area (SY)**
Interchange 208 Driving Lane	208.421	208.497	400	15	667
Auxiliary Right Lane	216.860	217.349	2,582	13	3,730
Auxiliary Left Lane	216.860	217.104	1,289	12	1,719
Driving & Passing Lane	217.218	217.388	898	25	2,495
Total Grinding Area					**8,611**

*Grinding will be performed on roadway portions described in the table above. A Transitional 1' feathering pass will be required along the Passing Lane and Auxiliary Right Lane shoulder.

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	10	3

BASIS OF ESTIMATE

Estimated Milled Material Quantities Accepted for Use in RAP-Superpave FAA 45			
Milled Material	**Milled Area (SF)**	**Length (Mi)**	**Tons (1.875 Ton/CY)**
Typical Section 1	4.8373	5.080	9,011
Typical Section 2	4.7524	1.372	2,391
Typical Section 3	4.8357	1.586	2,813
Typical Section 4	4.7405	7.155	12,437
Typical Section 5	4.7260	1.011	1,752
Typical Section 6	4.7227	1.082	1,874
Typical Section 7	4.7219	0.371	643
Border Section (Section 90, Sheets 8 & 9)	8,242 SY		859
Total Milled Material Accepted for Use in RAP-Superpave FAA 45 (Less 10% for losses)			**28,602**
Estimated Milled Material Quantities Not Accepted for Use in RAP-Superpave FAA 45 *See Note 430-P01 (Outside Shoulder, Ramps and Crossroads)*			
Milled Material	**Milled Area (SF)**	**Length (Mi)**	**Tons (1.875 Ton/CY)**
Typical Section 1 (4' Width)	0.667	5.080	1,243
Typical Section 2 (4' Width)	0.667	1.372	336
Typical Section 3 (4' Width)	0.667	1.586	388
Typical Section 4 (4' Width)	0.667	7.155	1,750
Typical Section 5 (4' Width)	0.667	1.011	248
Typical Section 6 (4' Width)	0.667	1.082	265
Typical Section 7 (4' Width)	0.667	0.371	91
Additional Quantities	**Square Yards**		**Tons (1.875 Ton/CY)**
Ramp Tapers, Ramps & Crossroads	55,025		5,732
Total Milled Material Not Accepted for Use in RAP-Superpave FAA 45 (Less 10% for losses)			**9,048**

Estimated Required & Remaining Milled Material Quantities		
	% RAP by Mix Design	
	10% Min	15% Max
Milled Material required for production of RAP - Superpave FAA 45 *(44,682 tons RAP-Superpave FAA 45)*	**4,469**	**6,703**
Milled Material to become Property of Contractor	**33,181**	**30,947**

Estimated Flagging Hours		
Operation	**Basis**	**Flagging**
Milling Pavement (Mainline)	10 Days x 12 Hrs/Day x 3 Flaggers	360 MHR
HMA (Mainline)	10 Days x 12 Hrs/Day x 4 Flaggers	480 MHR
Ramps/Crossroads (Milling & Paving)	8 Days x 12 Hrs/Day x 4 Flaggers	384 MHR
Concrete Pavement Repair	10 Days x 12 Hrs/Day x 2 Flaggers	240 MHR
Total Flagging Hours		**1,464 MHR**

Sinusoidal Rumble Strips - Asphalt Shoulder		
Location	Basis	Quantity
RP 197.080 to RP 217.218 (Asphalt Segments Only) *Exclusion areas per Table 760-01 are deducted from total length.*		
Sinusoidal Rumble Strips - Asphalt Shoulder	2 Mi/Mi	35.753

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	10	4

BASIS OF ESTIMATE

Temporary Pavement Marking		
Location	Basis	Quantity
RP 197.080 to RP 216.775 (HMA Segments) (17.859 Mi) *(2 Applications)*		
Short Term 6IN Line-Type NR White Skip Line *(10' Line, 30' Skip)*	1,320 LF/Mi	47,148 LF
RP 216.775 to RP 217.218 (HMA Segment) (0.443 Mi) *(2 Applications)*		
Short Term 6IN Line-Type NR White Skip Line *(10' Line, 30' Skip)*	2,640 LF/Mi	2,340 LF
RP 197.080 to RP 217.136 (Concrete Segments) (1.836 Mi) *(1 Application)*		
Short Term 6IN Line-Type NR White Skip Line *(10' Line, 30' Skip)*	1,320 LF/Mi	2,424 LF
RP 217.136 to RP 217.274 (Concrete) (0.138 Mi) *(1 Application)*		
Short Term 6IN Line-Type NR White Skip Line *(10' Line, 30' Skip)*	2,640 LF/Mi	365 LF
RP 217.274 to RP 217.409 (Concrete) (0.135 Mi) *(1 Application)*		
Short Term 6IN Line-Type NR White Skip Line *(10' Line, 30' Skip)*	2,640 LF/Mi	357 LF
Crossroads *(2 Applications)*		
Short Term 6IN Line-Type NR Yellow Double Barrier	10,560 LF/Mi	9,528 LF

Permanent Pavement Marking		
Location	Basis	Quantity
RP 197.080 to RP 216.775 (19.695 Mi)		
PVMT MK Painted 6IN White Skip Line *(10' Line, 30' Skip)*	1,320 LF/Mi	25,998 LF
PVMT MK Painted 6IN White Edge Line	5,280 LF/Mi	94,053 LF
PVMT MK Painted 6IN Yellow Edge Line	5,280 LF/Mi	103,990 LF
RP 216.775 to RP 217.136 (0.361 Mi)		
PVMT MK Painted 6IN White Skip Line *(10' Line, 30' Skip)*	2,640 LF/Mi	954 LF
PVMT MK Painted 6IN Yellow Edge Line	5,280 LF/Mi	1,907 LF
RP 216.797 to RP 218.863 (0.066 Mi)		
PVMT MK Painted 12IN Dotted White Extension Line *(3' Line, 9' Skip)*	1,320 LF/Mi	88 LF
RP 217.136 to RP 217.274 (0.138 Mi)		
PVMT MK Painted 6IN White Skip Line *(10' Line, 30' Skip)*	2,640 LF/Mi	365 LF
PVMT MK Painted 6IN Yellow Edge Line	5,280 LF/Mi	729 LF
RP 217.274 to RP 217.409 (0.135 Mi)		
PVMT MK Painted 6IN White Skip Line *(10' Line, 30' Skip)*	2,640 LF/Mi	357 LF

Additional Permanent Pavement Marking Quantities

See Standard Drawing D-762-02

	Interchange	12" White Channel Line	24" White Stop Line	6" White Dotted Line *(2' Line, 6' Skip)*	6" White Edge Line	6" Yellow Edge Line	6" Yellow Double Barrier Line
Exit Ramps	Carlisle (200)	568 LF	66 LF	116 LF	945 LF	970 LF	--
	Joliette (203)	572 LF	72 LF	144 LF	1,413 LF	1,423 LF	--
	Bathgate (208)	556 LF	66 LF	130 LF	848 LF	841 LF	--
	Neche (212)	540 LF	70 LF	186 LF	834 LF	812 LF	--
	Pembina (215)	468 LF	78 LF	168 LF	860 LF	867 LF	
Entrance Ramps	Carlisle (200)	574 LF	--	124 LF	1,120 LF	1,078 LF	--
	Joliette (203)	564 LF	--	180 LF	1,530 LF	1,520 LF	--
	Bathgate (208)	644 LF	--	144 LF	878 LF	871 LF	--
	Neche (212)	728 LF	--	168 LF	889 LF	869 LF	--
	Pembina (215)	720 LF	--	160 LF	927 LF	933 LF	--
Cross-roads	Carlisle (200)	--	--	--	2,540 LF	--	2,540 LF
	Joliette (203)	--	--	--	--	--	--
	Bathgate (208)	--	--	--	1,112 LF	--	1,112 LF
	Neche (212)	--	--	--	1,112 LF	--	1,112 LF
	Pembina (215)	--	--	--	--	--	--
Historical Turnout		1,020 LF	--	124 LF	2,090 LF	1,228 LF	--
Totals		**6,954 LF**	**352 LF**	**1,644 LF**	**17,098 LF**	**11,412 LF**	**4,764 LF**

Total 6IN Pavement Marking		
	White	Yellow
Short Term 6IN Line - Type NR	52,634 LF	9,528 LF
PVMT MK Painted 6IN Line	140,469 LF	122,802 LF
Additional Pavement Marking Totals		
	White	Yellow
PVMT MK Painted 12IN Line	7,042 LF	--
PVMT MK Painted 24IN Line	352 LF	--

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	11	1

I-29 Concrete Pavement Repair Locations

Location		*Spall			*Full Depth								Notes / Locations
		Dimensions		SF	Dimensions			SY	*Basket (LF)	Bar Type			
**Station	Lane	L (ft)	W (ft)		L (ft)	W (ft)	D (in.)			Dowel	Deformed	Tie	
Sta 0+00 = RP 197.956 (N Bowesmont Separation)													CPR Segment (Separation 198)
5+29	CL	2.0	2.0	4.0									
6+78	DL	2.0	2.0	4.0									
Sta 0+00 = RP 200.104 (Carlisle Interchange)													CPR Segment (Interchange 200)
12+96	PL	2.0	2.0	4.0									
13+16	PL	2.0	2.0	4.0									
13+33	PL	2.0	2.0	4.0									
13+41	PL	2.0	2.0	4.0									
Sta 0+00 = RP 203.286 (Joliette Interchange)													CPR Segment (Interchange 203)
5+29	DL	2.0	2.0	4.0									
5+31	DL	3.0	4.0	12.0									
13+47	DL	2.0	3.0	6.0									
Sta 0+00 = RP 206.323 (Bathgate Separation)													CPR Segment (Separation 206)
0+10	PL	2.0	2.0	4.0									
0+33	PL	2.0	2.0	4.0									
0+97	DL	2.0	2.0	4.0									
6+79	PL	2.0	2.0	4.0									
Sta 0+00 = RP 208.346 (Bathgate Interchange)													CPR Segment (Interchange 208)
4+51	DL				19.0	14.0	10.0	29.6	11	12	12		
4+83	DL				17.0	14.0	10.0	26.4	11	12	12		
5+25	DL	5.0	2.0	10.0									
7+76	DL				7.0	14.0	10.0	10.9		12	12		
Sta 0+00 = RP 212.587 (Neche Interchange)													CPR Segment (Interchange 212)
9+46	PL	2.0	2.0	4.0									
9+49	DL	2.0	2.0	4.0									
11+00	DL	2.0	2.0	4.0									
12+73	DL				6.0	14.0	10.0	9.3	11		24		
Sta 0+00 = RP 215.112 (Pembina Interchange)													CPR Segment (Interchange 215)
5+94	DL	2.0	2.0	4.0									
5+79	DL	2.0	2.0	4.0									
6+02	DL	2.0	2.0	4.0									
6+98	DL	2.0	2.0	4.0									
				100.0	**Total 10 IN**			**76.3**	**33**	**36**	**60**	**0**	

*Note: Spall repairs, Full Depth Repairs, and Doweled Contraction Joint Assemblies (Baskets) are Pay Items.
Tie Bars, Smooth Dowels and Deformed Dowels are incidental to "Concrete Pavement Repair-Full Depth Doweled".

**Stations increase from South to North.

Data Tables

Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	11	2

I-29 Concrete Pavement Repair Locations

Location		*Spall			*Full Depth								Notes / Locations
		Dimensions		SF	Dimensions			SY	*Basket (LF)	Bar Type			
**Station	Lane	L (ft)	W (ft)		L (ft)	W (ft)	D (in.)			Dowel	Deformed	Tie	
Sta 0+00 = RP 216.860 (Border Area)													
0+12	Aux RT	2.0	2.0	4.0									
0+70	Aux LT/RT	2.0	2.0	4.0									
1+91	Aux LT	2.0	2.0	4.0									
2+04	Aux RT	2.0	2.0	4.0									
2+37	Aux RT	2.0	2.0	4.0									
2+73	Aux RT	4.0	2.0	8.0									
3+97	Aux LT	2.0	2.0	4.0									
5+01	Aux LT	2.0	2.0	4.0									
5+13	Aux LT	2.0	2.0	4.0									
7+10	Aux LT	2.0	2.0	4.0									
8+24	Aux RT	2.0	2.0	4.0									
8+68	Aux RT	2.0	3.0	6.0									
8+81	Aux RT	2.0	2.0	4.0									
9+95	Aux RT	2.0	2.0	4.0									
11+20	Aux LT				168.0	12.0	11.0	224.0	81	20		44	
12+56	Aux RT				6.0	6.0	11.0	4.0		4	6	2	
12+56	Aux RT/SH				34.0	22.6	11.0	85.4	9	20		18	
12+88	Aux RT				6.0	6.0	11.0	4.0		4	6		
14+13	Aux RT	2.0	2.0	4.0									
18+21	DL/PL/SH				41.0	28.0	10.0	127.6	54	40		22	Sawcut & remove bituminous & concrete 11 ft South of concrete and include with FD repair
20+74	DL/PL	2.0	2.0	4.0									
20+87	DL/PL	2.0	2.0	4.0									
21+02	CL	2.0	2.0	4.0									
21+02	DL	2.0	2.0	4.0									
21+83	CL	2.0	2.0	4.0									
22+10	CL	2.0	2.0	4.0									
22+47	Aux LT/SH	2.0	2.0	4.0									
22+79	CL	2.0	2.0	4.0									
22+79	Aux LT	2.0	2.0	4.0									
22+99	CL	2.0	2.0	4.0									
23+17	CL	2.0	2.0	4.0									
				110.0	Total 10 IN			127.6	144	88	12	86	
					Total 11 IN			317.4					

*Note: Spall repairs, Full Depth Repairs, and Doweled Contraction Joint Assemblies (Baskets) are Pay Items.
Tie Bars, Smooth Dowels and Deformed Dowels are incidental to "Concrete Pavement Repair-Full Depth Doweled".

**Stations increase from South to North.

Data Tables

Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	11	3

I-29 Concrete Pavement Repair Locations

Location		*Spall			*Full Depth								Notes / Locations
		Dimensions		SF	Dimensions			SY	*Basket (LF)	Bar Type			
**Station	Lane	L (ft)	W (ft)		L (ft)	W (ft)	D (in.)			Dowel	Deformed	Tie	
Sta 0+00 = RP 216.860 (Border Area)													
23+27	PL	2.0	2.0	4.0									
23+27	CL	2.0	2.0	4.0									
23+45	DL				6.0	6.0	10.0	4.0		4	6		
23+45	CL	2.0	2.0	4.0									
23+63	CL	2.0	2.0	4.0									
23+82	CL	2.0	2.0	4.0									
23+82	DL	2.0	2.0	4.0									
24+15	Aux RT/Gore				168.0	10.0	11.0	186.7	84	16		45	
24+46	CL	2.0	2.0	4.0									
25+03	DL	2.0	2.0	4.0									
25+86	PL	2.0	2.0	4.0									
25+86	CL	2.0	2.0	4.0									
25+86	DL	2.0	2.0	4.0									
25+99	DL				6.0	6.0	10.0	4.0	3	4	6		
25+99	PL	2.0	2.0	4.0									
26+12	PL	2.0	2.0	4.0									
26+12	CL	2.0	2.0	4.0									
26+25	CL	2.0	2.0	4.0									
26+76	Aux LT	2.0	2.0	4.0									
26+76	PL	2.0	2.0	4.0									
26+76	PL	2.0	2.0	4.0									
26+87	PL	2.0	4.0	8.0									
26+87	CL	2.0	2.0	4.0									
27+08	PL	3.0	2.0	6.0									
27+19	PL	2.0	3.0	6.0									
27+32	CL	2.0	2.0	4.0									
27+43	PL	2.0	2.0	4.0									
27+43	CL	2.0	2.0	4.0									
27+58	PL	2.0	2.0	4.0									
27+58	CL	2.0	2.0	4.0									
27+74	PL				6.0	6.0	10.0	4.0	3	4	6		
27+74	DL	2.0	2.0	4.0									
27+87	PL	2.0	2.0	4.0									
27+87	CL	2.0	2.0	4.0									
				344.0	Total 10 IN			8.0	90	28	18	45	
					Total 11 IN			186.7					

*Note: Spall repairs, Full Depth Repairs, and Doweled Contraction Joint Assemblies (Baskets) are Pay Items.
Tie Bars, Smooth Dowels and Deformed Dowels are incidental to "Concrete Pavement Repair-Full Depth Doweled".

**Stations increase from South to North.

Item Description	*Spall	*Full Depth					
	SF	SY	SY + 25%	*Basket (LF)	Bar Type		
					Dowel	Deformed	Tie
Full Depth 10 IN Totals		212	265	93	88	78	22
Full Depth 11 IN Totals		505	632	174	64	12	109
Spall Totals	554						
Spall Totals + 25%	693						
Totals		717	897	267	152	90	131
Totals + 25%				334	190	113	164

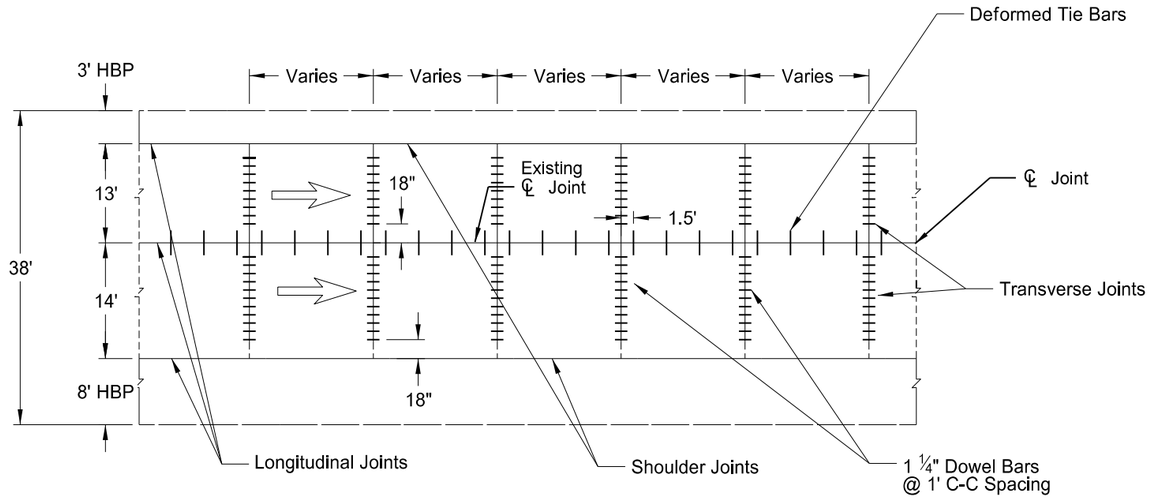
Data Tables

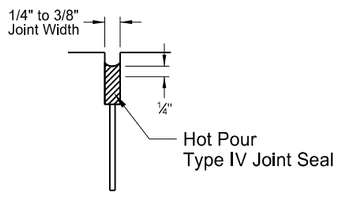
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

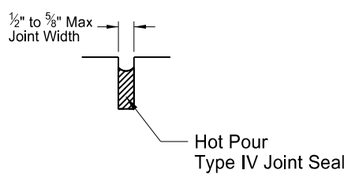
REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	20	1

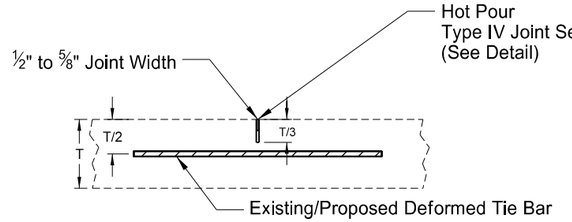




Proposed
Transverse Joint Detail



Proposed
Longitudinal Joint Detail



Proposed Longitudinal Joint Seal
(All Sawed and Tied Joints)

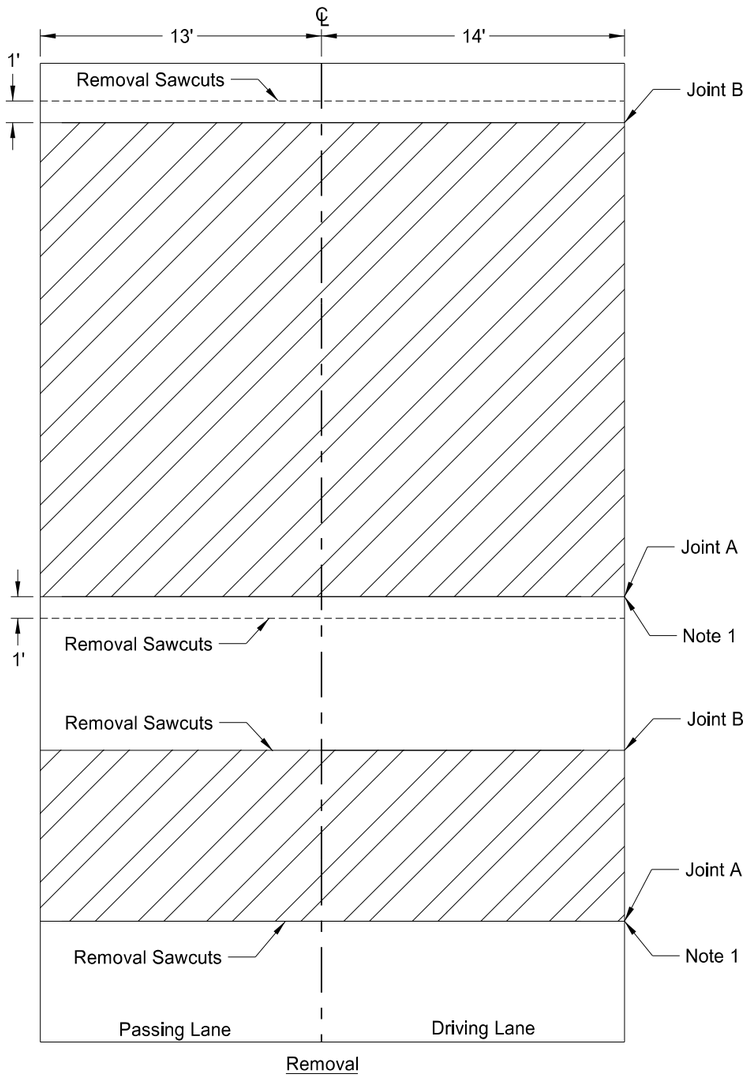
Proposed PCC Pavement Joint Details
Straight Joints

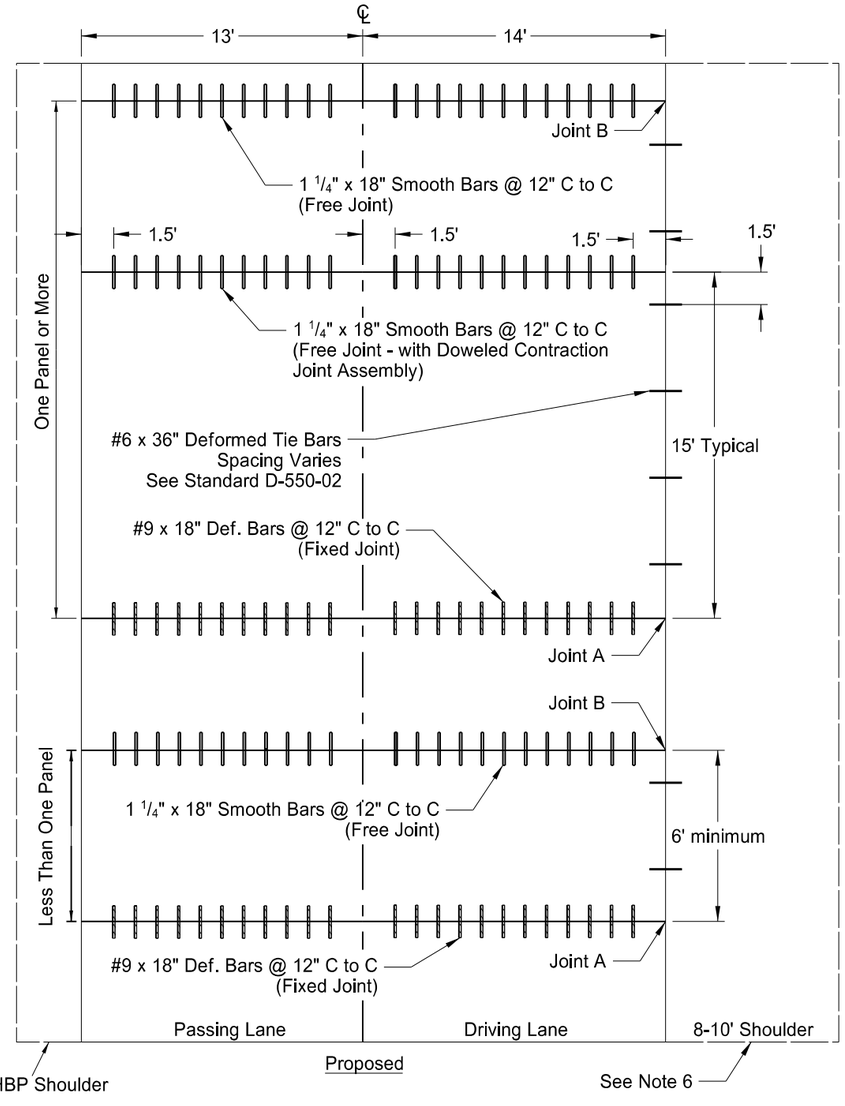
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	20	2





PCC Removal

Notes:

1. Provide a Fixed Joint (Joint A) when the new joint is the shortest distance to the next transverse joint or working random crack. Saw cut perpendicular to the Centerline. Place deformed bars parallel to the centerline on the face of the saw cut.

2. Provide a Free Joint (Joint B) when the new joint is the greatest distance to the next transverse joint or working random crack. Install smooth bars within the tolerances shown on the "Dowel Bar Placement - Full Depth Repair" detail sheet.

3. When the distance to the next transverse joint or working random crack is equal for both new joints, place the free joint (Joint B) on the approach side of the repair.

4. Install a Doweled Contraction Joint Assembly at the transverse contraction joint if the distance is greater than one panel in length.

5. The joints at the beginning and end of a full depth repair section can be either a Free Joint or Fixed Joint depending on the existing joint.

6. Deformed tie bars required only for concrete shoulders. Asphalt shoulders do not need deformed tie bars.

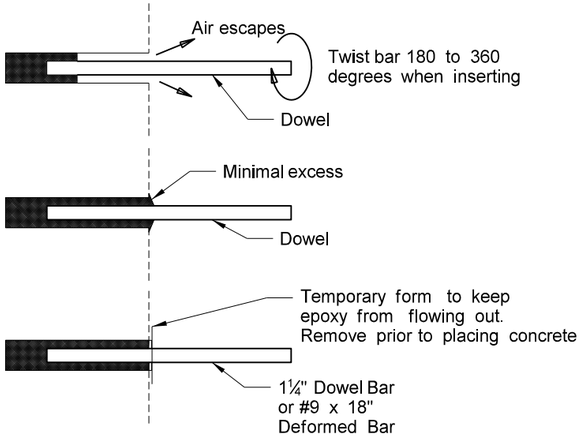
Removal of Concrete & Dowel Bar Placement - Full Depth Repair Straight Joints

Concrete Pavement Repair, Milling & HMA

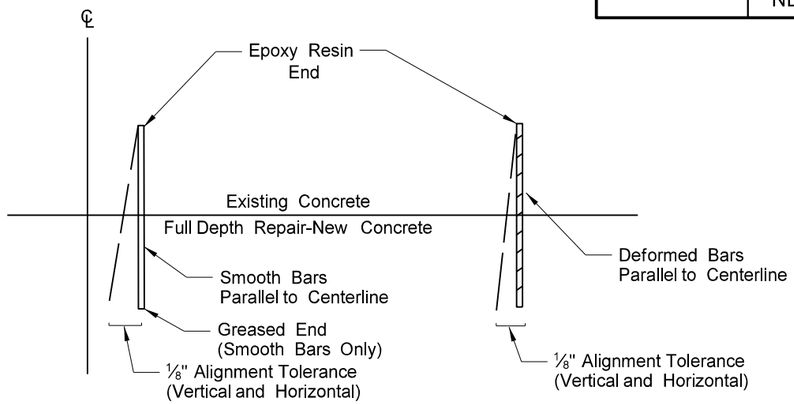
N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

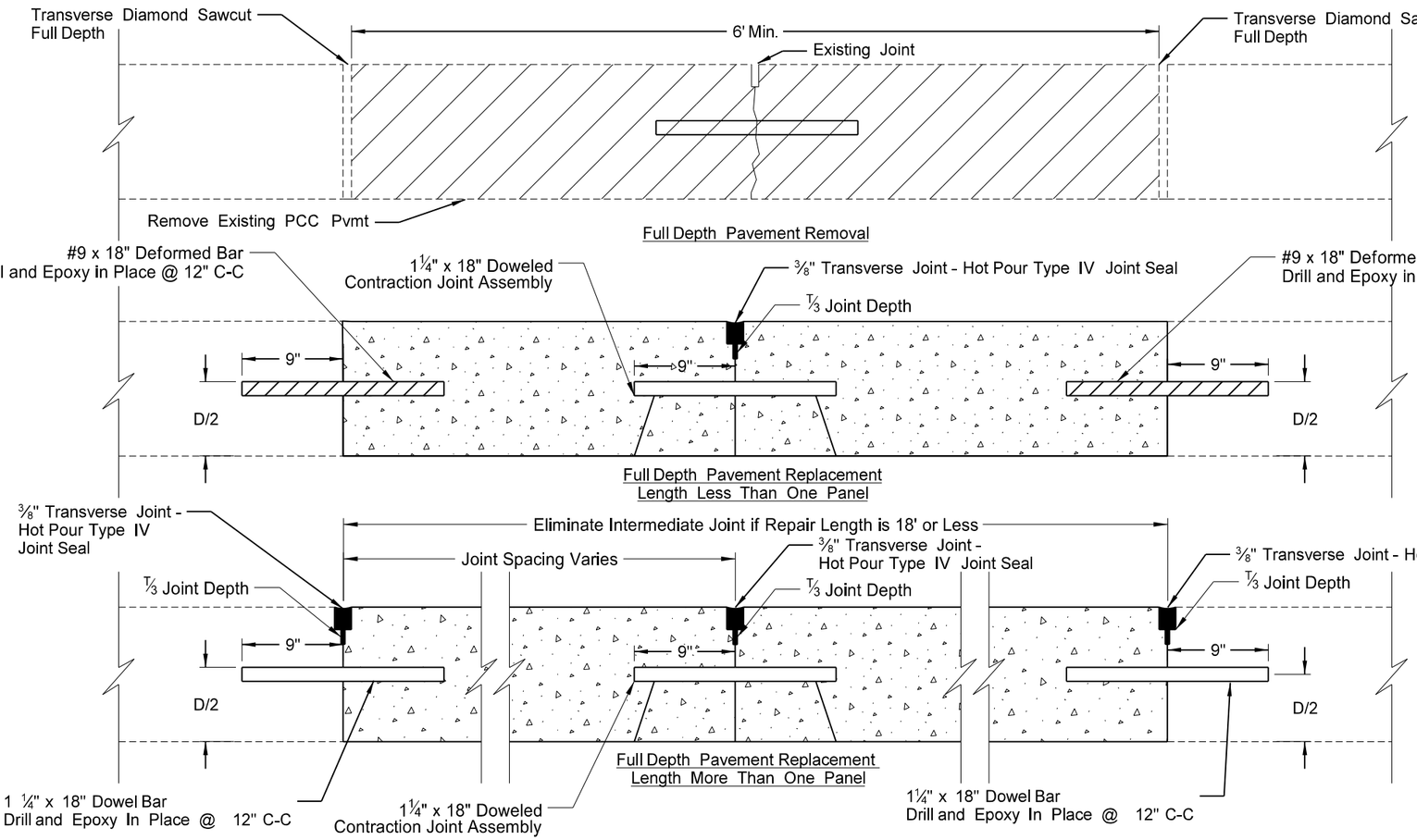
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	20	3



Dowel & Epoxy Installation
(Smooth or Deformed Bars)



Dowel Alignment Tolerance



Notes:

1. Variables:
   D = Depth of Pavement
2. Removal and replacement also applies to full depth repairs at cracks.
3. Place smooth dowel bars in repair joint which is farthest away from the next transverse joint or working random crack. If distance is equal for both repair joints, place smooth dowels on approach side of patch.
4. Space Dowel / Deformed Bars, or Baskets @ 12" C-C and 18" from longitudinal joints; total of 10 bars per 12' lane.
5. Grease the exposed end of 1¼" x 18" smooth bar.
6. Use 1-1/2" Dowel Bars for 11" Pavement.

Concrete Pavement Repair - Full Depth
Non-Reinforced PCC Pavement Doweled

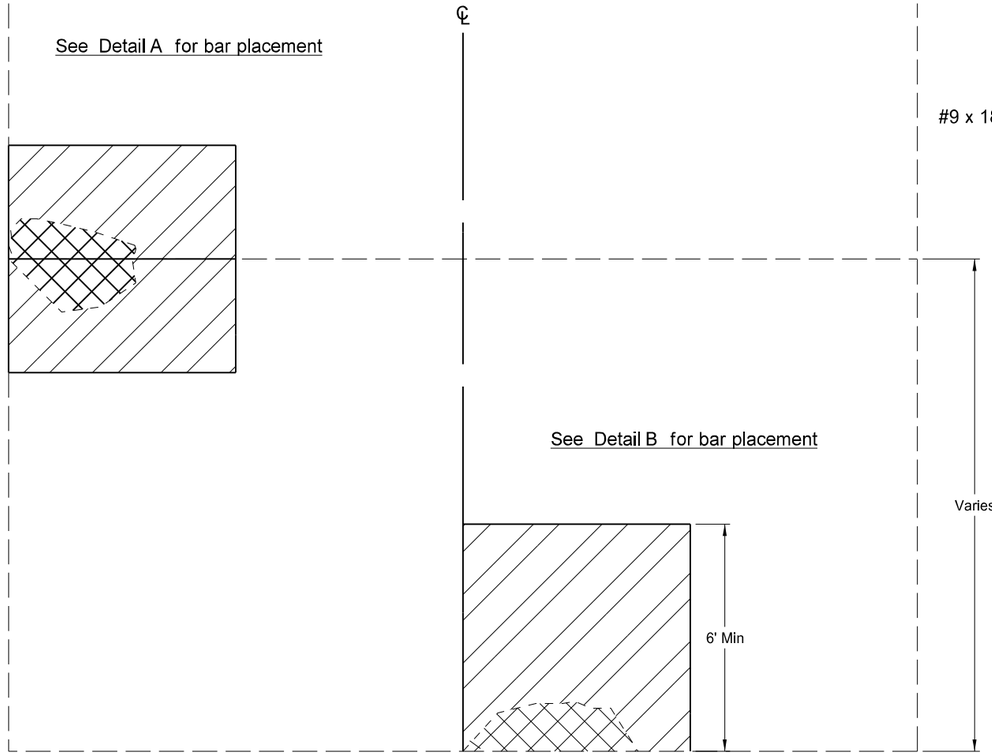
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

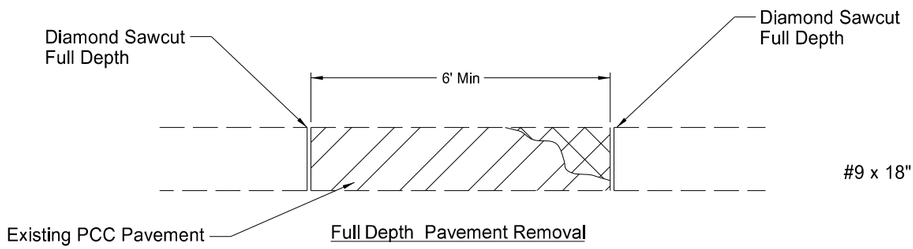
REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/13/2025 3:39:53 PM lsteyn R:\project\60029197.163\District\Sheets\020GD_GenDetails\020GD_003_DFDR.dgn

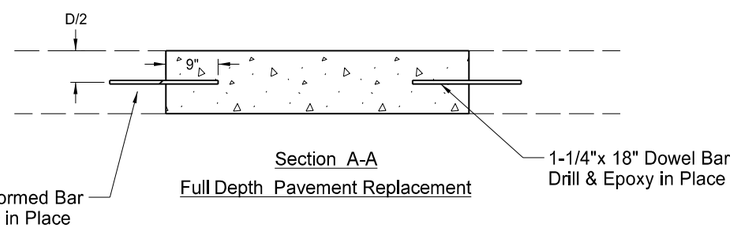
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	20	4



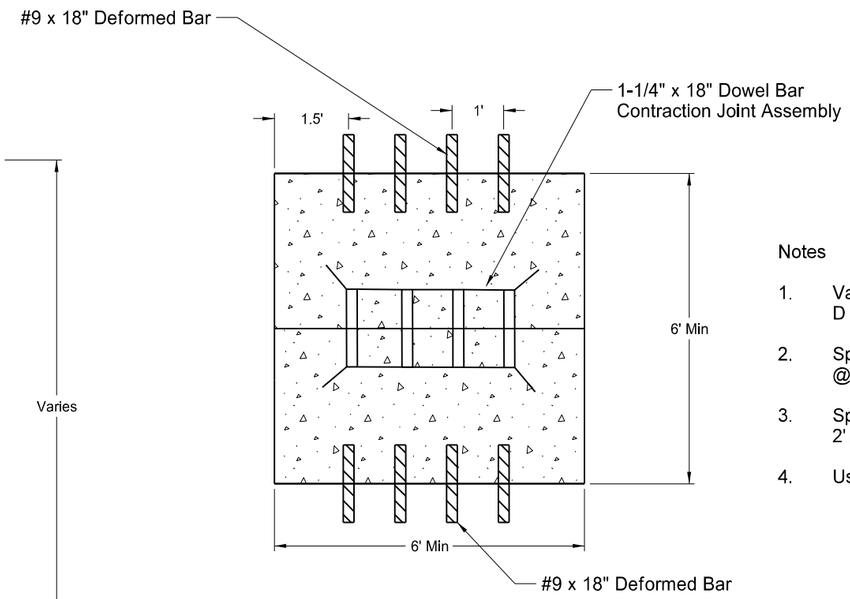
Full Depth Repairs
Removal Areas



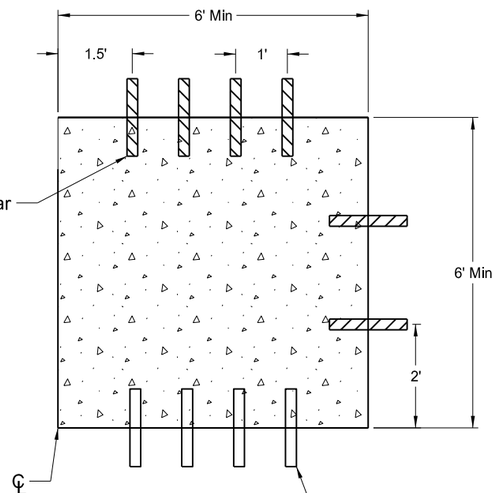
Full Depth Pavement Removal



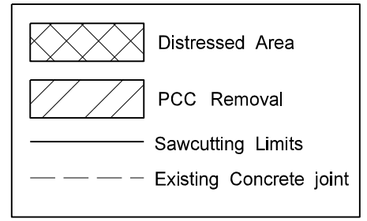
Full Depth Pavement Replacement



Detail A
Bar Placement



Detail B
Bar Placement



Notes

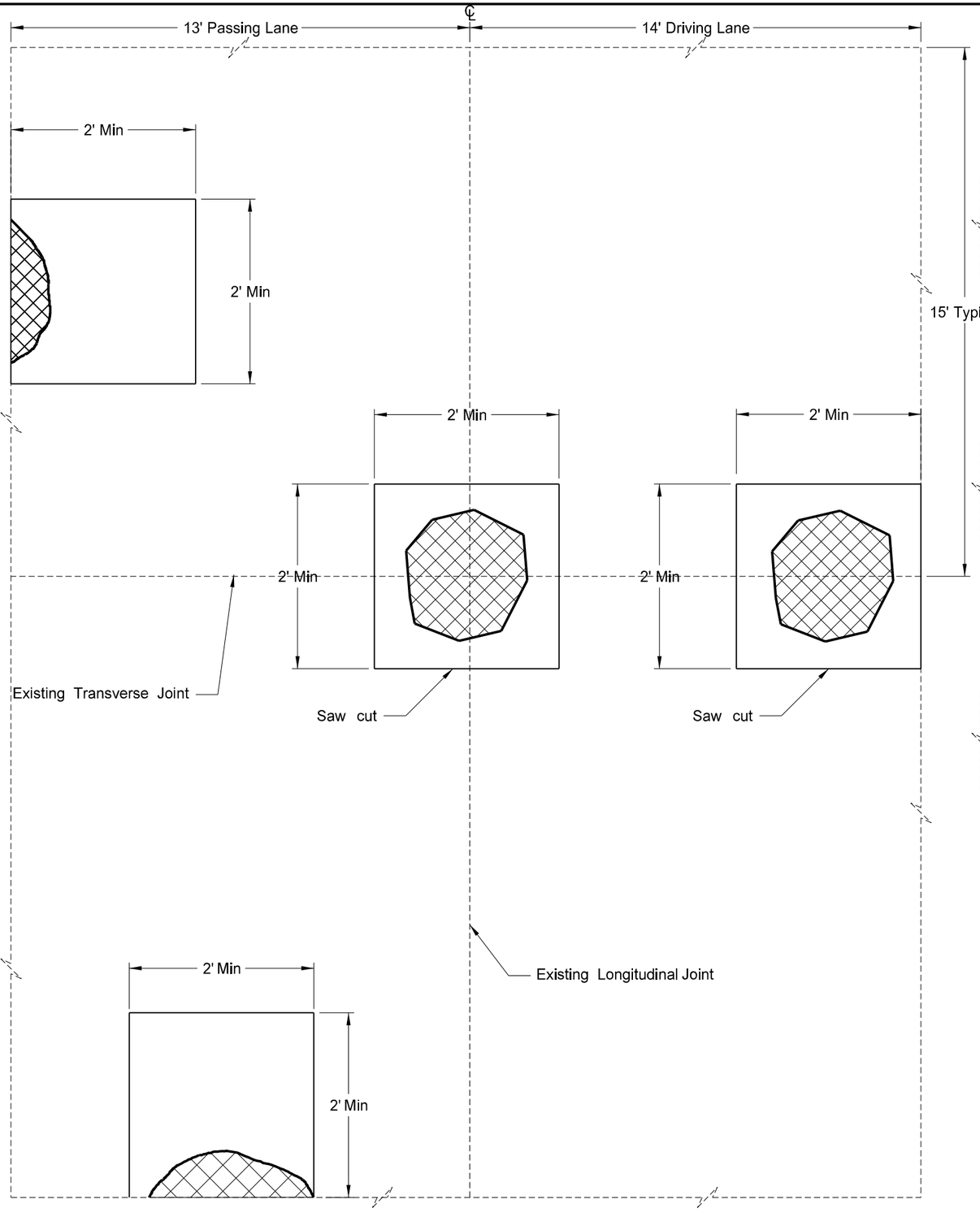
1. Variables
   D = Depth of Pavement
2. Space Dowel/Deformed Bars, or Baskets @ 12" C-C and 18" from longitudinal joints.
3. Space Deformed Bars along construction joint 2' from transverse joint and 2' C-C.
4. Use 1-1/2" Dowels for 11" Pavement.

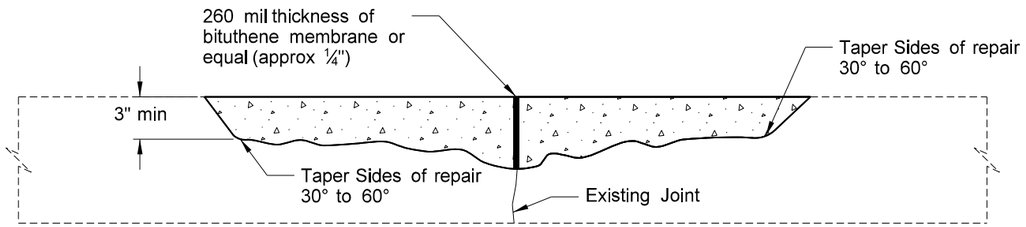
CPR Segments
Spall Repair Detail
Straight Joints

Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

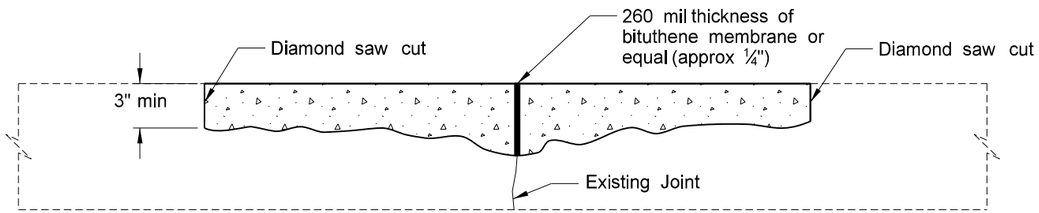
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	20	5





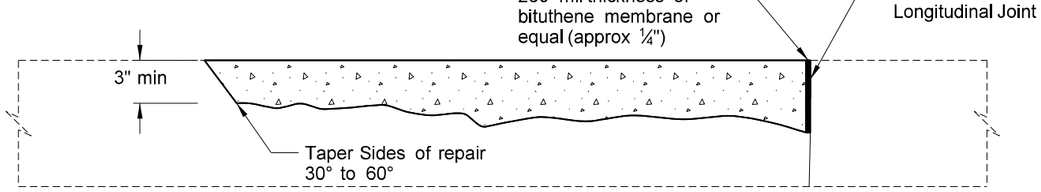
Cross Section - Repair Area

Milling



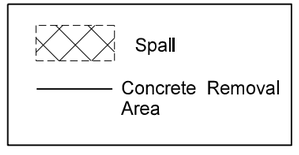
Cross Section - Repair Area

Chipping



Cross Section - Repair Area

Milling



Plan View (not to scale)

CPR Segments
Spall Repair Detail
Straight Joints

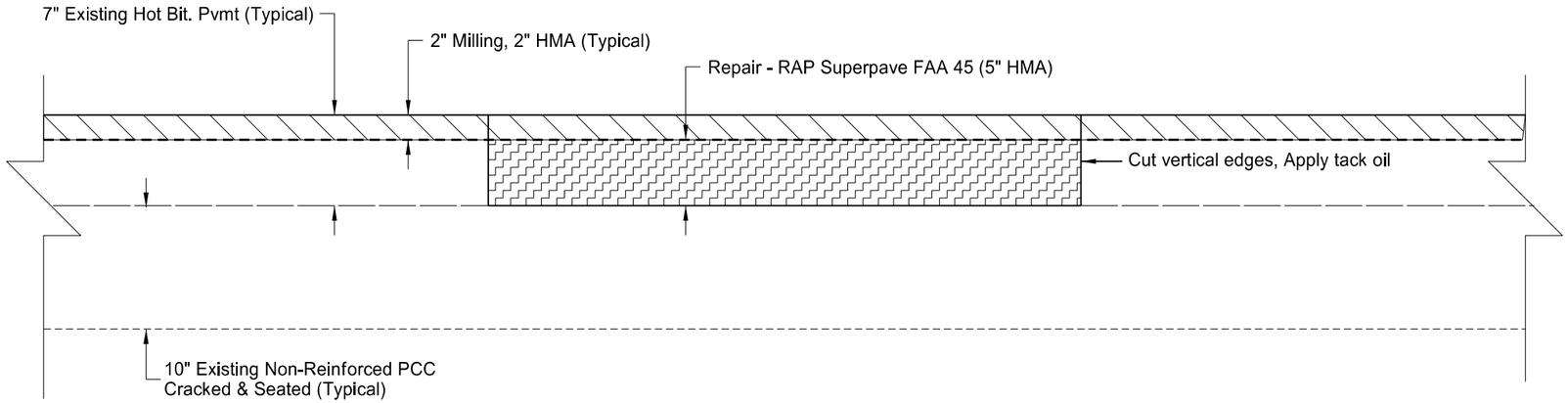
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/13/2025 3:53:16 PM lsteyn R:\project\60029197.163\District\Sheets\020GD_GenDetails\020GD_005_DspallRepair.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	20	6



1. The exact locations, lengths and widths to be patched will be determined by the Engineer in the field.
2. Broken or unstable bituminous surfacing will be removed and replaced according to Section 430.04 G.
3. The repair must meet specified density. The requirements of Section 430.04 I.2 apply.
4. RAP Superpave FAA 45 must be paved and compacted in two equal lifts of 2.5".
5. Include all costs to perform al work for this repair in the prices bid for "MILLING PAVEMENT SURFACE", "RAP SUPERPAVE FAA 45", "PG 58H-34 ASPHALT CEMENT", "CORED SAMPLE", and "TACK COAT". Quantities have been included in each of the respective bid items.

Basis of Estimate						
Location	**Length (LF)**	**Width (LF)**	**Milling Pavement Surface (SY)**	**RAP Superpave FAA 45 (Ton) 5" Typical**	**PG 58H-34 Asphalt Cement (Ton)**	**Tack Coat (Gal)**
RP 212.833-212.837	20	24	107	15	1	8
RP 215.358-215.364	30	24	160	23	2	12
Totals			**267**	**38**	**3**	**20**

Repair - RAP Superpave FAA 45

Typical Milling Pavement Surface & HMA

Repair Detail

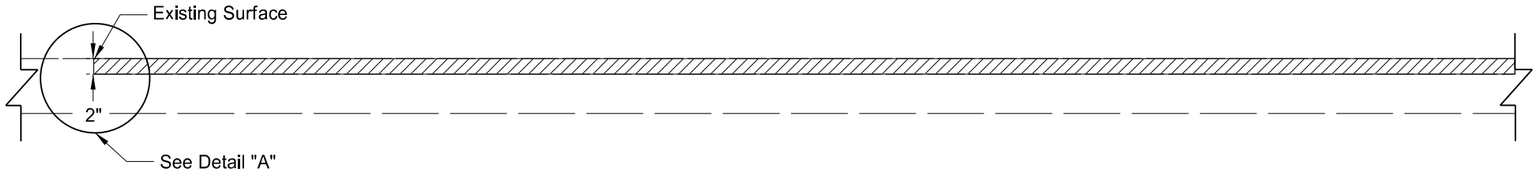
Concrete Pavement Repair, Milling & HMA

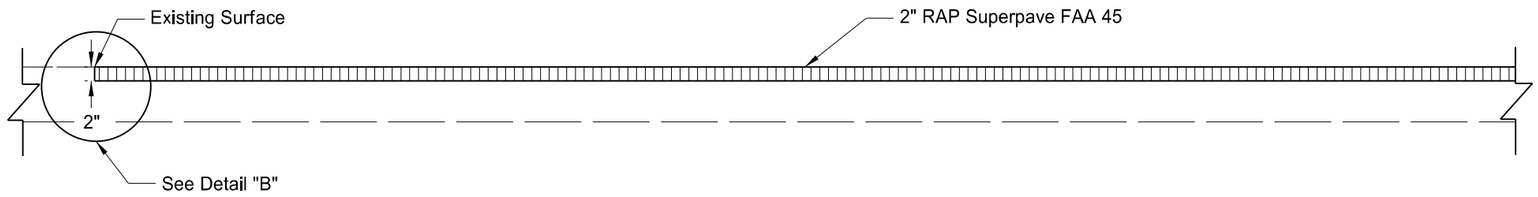
N Bowesmont to Canadian Line - NB

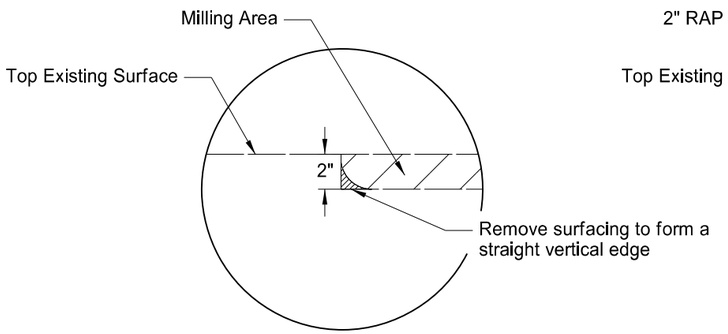
REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/13/2025 3:57:39 PM lsteyn R:\project\60029197.163\District\Sheets\020GD_GenDetails\020GD_006_Repairs Detail.dgn

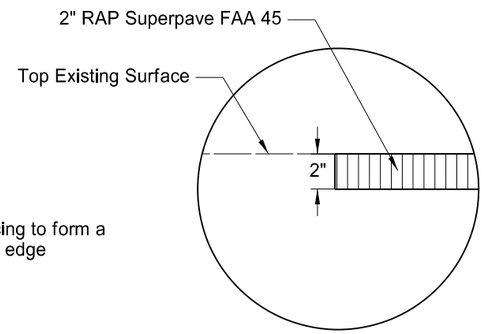
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	20	7







Detail A



Detail B

Milling & HMA Details

Beginning & End of Project

Bridge Ends:
- Interchange 200
- Interchange 208
- Interchange 212
- Pembina River Bridge

Concrete Segment Ends:
- Separation 198
- Interchange 200
- Interchange 203
- Separation 206
- Interchange 208
- Interchange 212
- Interchange 215

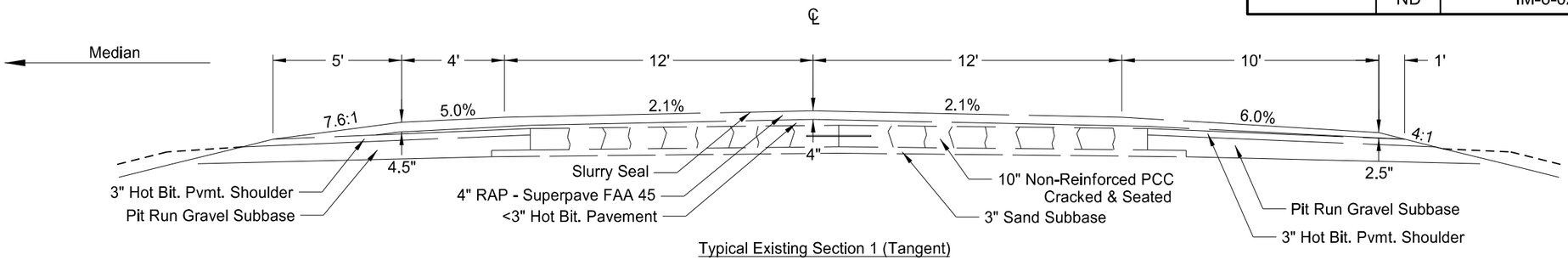
Milling & Paving Transitions

Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

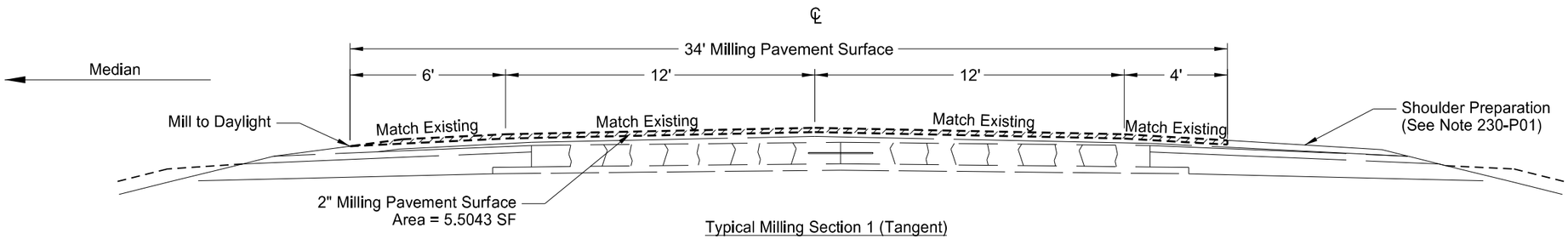
REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	30	1



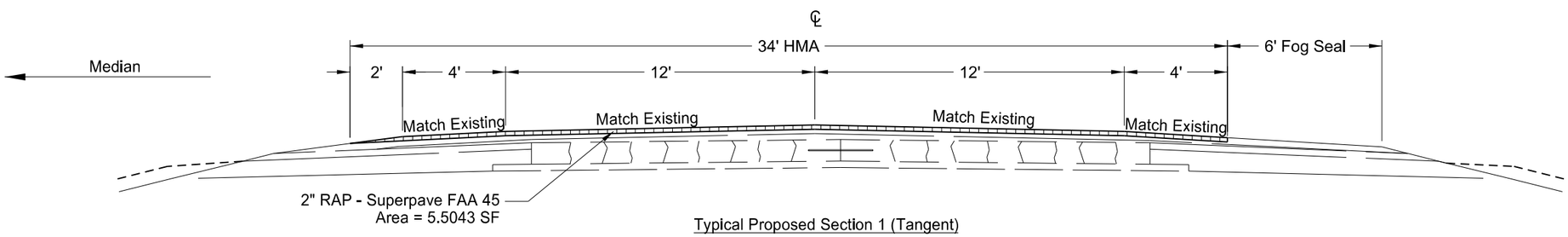
Typical Existing Section 1 (Tangent)

RP 197.080 to RP 197.200	RP 200.462 to RP 200.506
RP 197.620 to RP 197.956	RP 200.831 to RP 202.350
RP 198.221 to RP 198.521	RP 202.687 to RP 203.239
RP 198.976 to RP 199.510	RP 203.800 to RP 203.854
RP 199.806 to RP 199.859	RP 204.200 to RP 205.768



Typical Milling Section 1 (Tangent)

RP 197.080 to RP 197.200	RP 200.462 to RP 200.506
RP 197.620 to RP 197.956	RP 200.831 to RP 202.350
RP 198.221 to RP 198.521	RP 202.687 to RP 203.239
RP 198.976 to RP 199.510	RP 203.800 to RP 203.854
RP 199.806 to RP 199.859	RP 204.200 to RP 205.768



Typical Proposed Section 1 (Tangent)

RP 197.080 to RP 197.200	RP 200.462 to RP 200.506
RP 197.620 to RP 197.956	RP 200.831 to RP 202.350
RP 198.221 to RP 198.521	RP 202.687 to RP 203.239
RP 198.976 to RP 199.510	RP 203.800 to RP 203.854
RP 199.806 to RP 199.859	RP 204.200 to RP 205.768

Typical Section 1

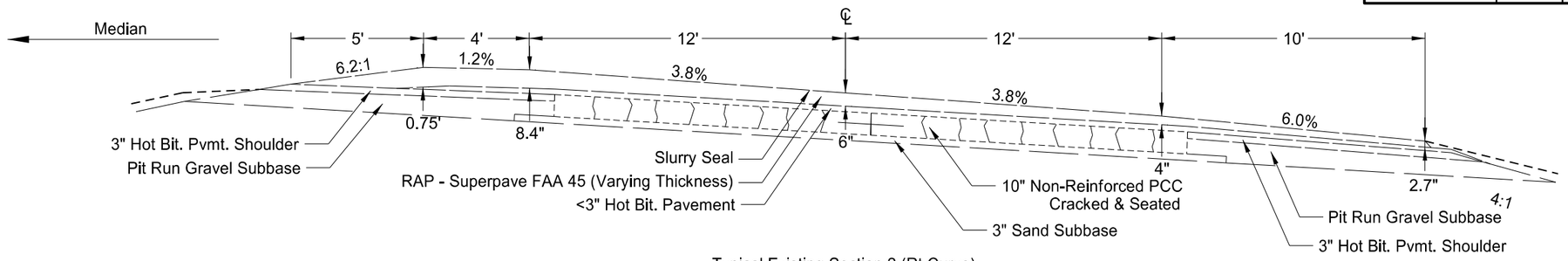
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

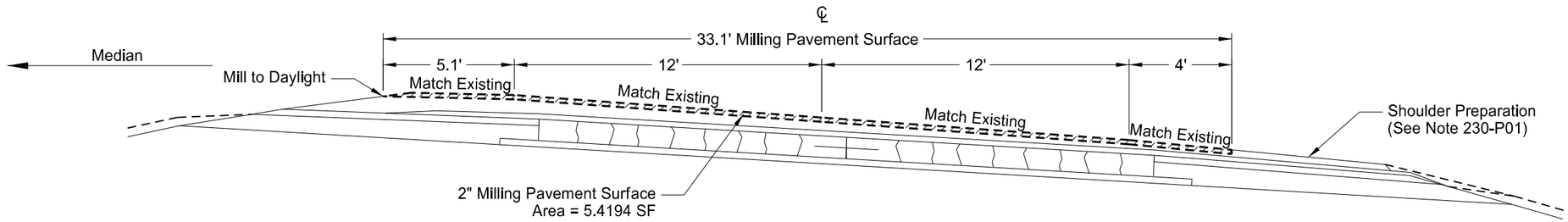
2/10/2025 1:00:26 PM lsteyn R:\project\60029197.163\District\Sheets\030TP_Typical Sections\030TP_001_Typical Sections.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	30	2



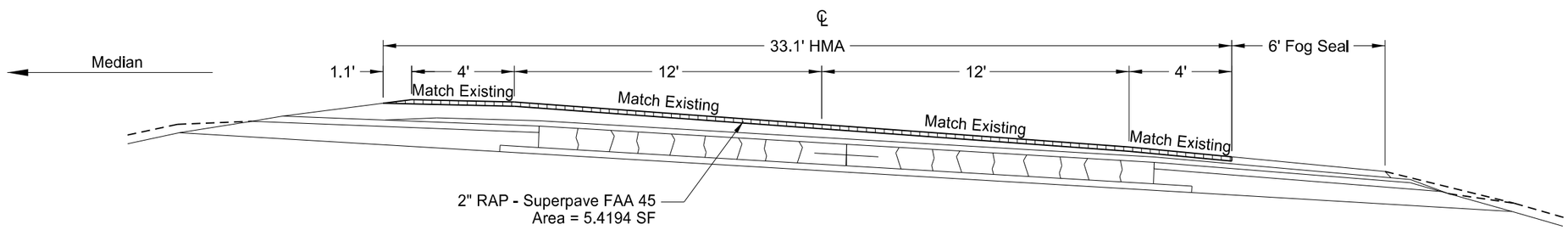
Typical Existing Section 2 (Rt Curve)

RP 197.200 to RP 197.620 RP 202.350 to RP 202.687
RP 199.859 to RP 200.104 RP 203.239 to RP 203.286
RP 200.388 to RP 200.462 RP 203.551 to RP 203.800



Typical Milling Section 2 (Rt Curve)

RP 197.200 to RP 197.620 RP 202.350 to RP 202.687
RP 199.859 to RP 200.104 RP 203.239 to RP 203.286
RP 200.388 to RP 200.462 RP 203.551 to RP 203.800



Typical Proposed Section 2 (Rt Curve)

RP 197.200 to RP 197.620 RP 202.350 to RP 202.687
RP 199.859 to RP 200.104 RP 203.239 to RP 203.286
RP 200.388 to RP 200.462 RP 203.551 to RP 203.800

Typical Section 2
Rt Curve

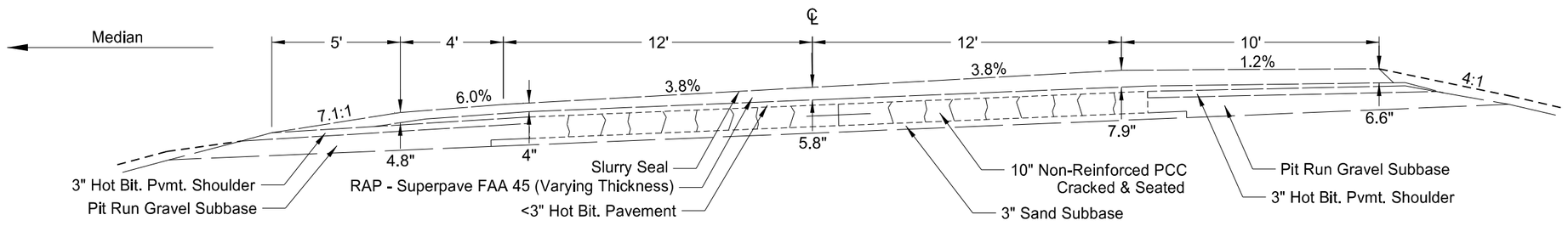
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

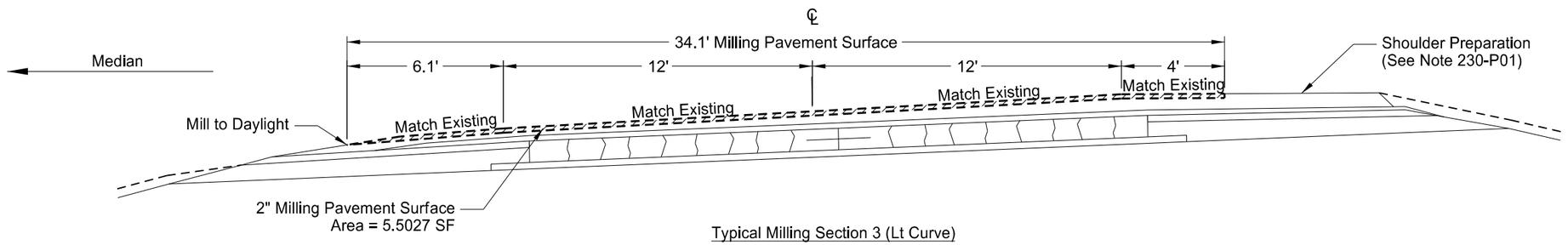
2/10/2025 1:00:27 PM lsteyn R:\project\60029197.163\District\Sheets\030TP_Typical Sections\030TP_001_Typical Sections.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	30	3



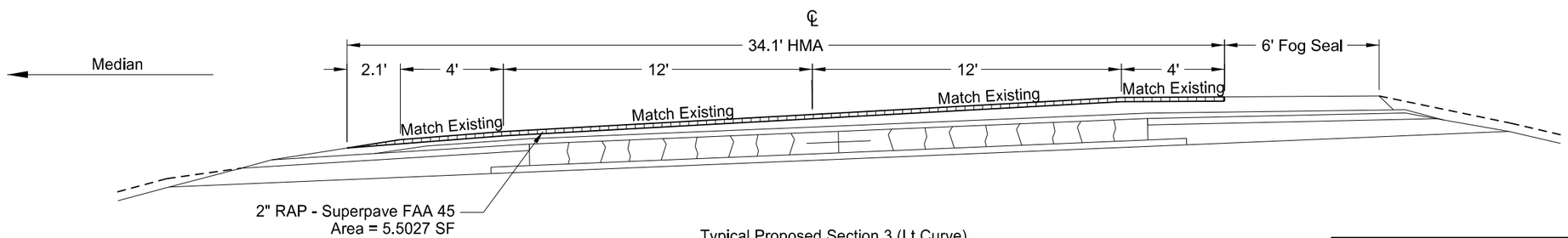
Typical Existing Section 3 (Lt Curve)

RP 198.521 to RP 198.976 RP 203.854 to RP 204.200
RP 199.510 to RP 199.806 RP 205.768 to RP 205.932
RP 200.506 to RP 200.831



Typical Milling Section 3 (Lt Curve)

RP 198.521 to RP 198.976 RP 203.854 to RP 204.200
RP 199.510 to RP 199.806 RP 205.768 to RP 205.932
RP 200.506 to RP 200.831



Typical Proposed Section 3 (Lt Curve)

RP 198.521 to RP 198.976 RP 203.854 to RP 204.200
RP 199.510 to RP 199.806 RP 205.768 to RP 205.932
RP 200.506 to RP 200.831

Typical Section 3
Lt Curve

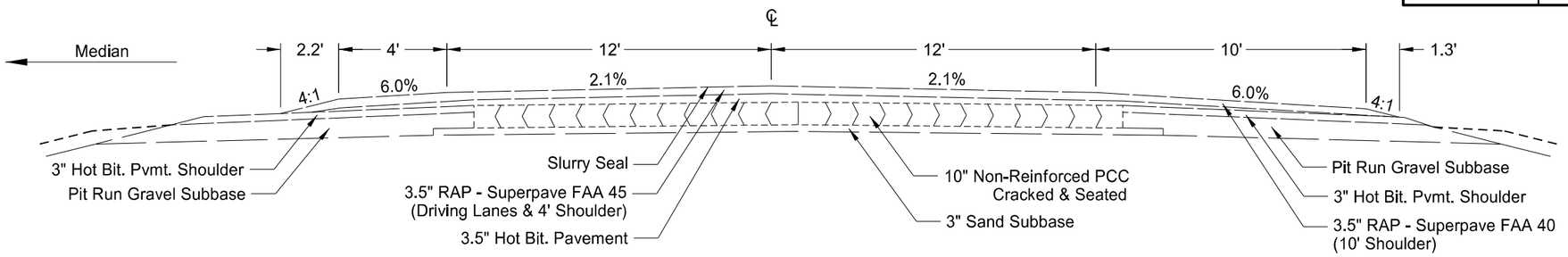
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

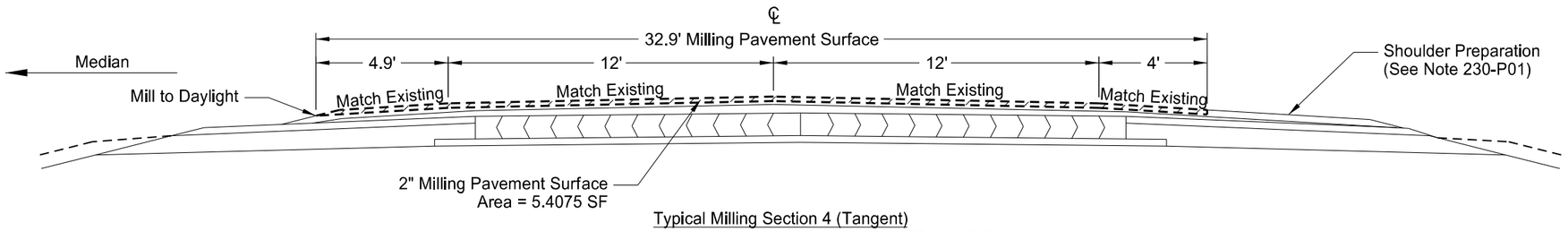
2/10/2025 1:00:27 PM lsteyn R:\project\60029197.163\District\Sheets\030TP_Typical Sections\030TP_001_Typical Sections.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	30	4



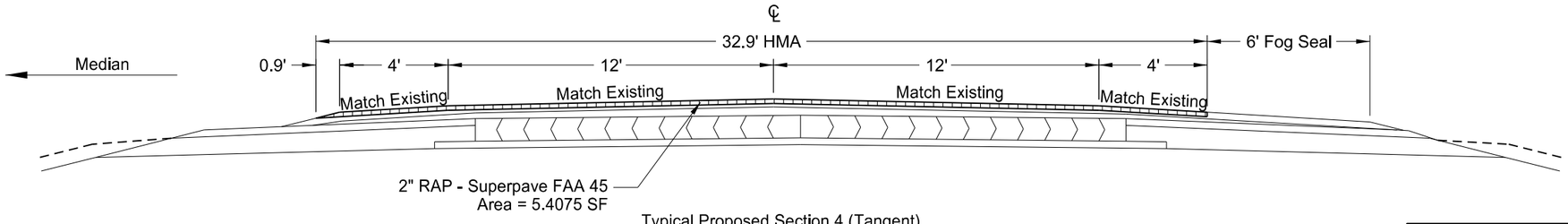
Typical Existing Section 4 (Tangent)

RP 206.116 to RP 206.159	RP 211.876 to RP 212.587
RP 206.760 to RP 206.797	RP 212.833 to RP 214.137
RP 207.100 to RP 207.375	RP 214.341 to RP 214.351
RP 207.532 to RP 208.346	RP 214.722 to RP 215.112
RP 208.592 to RP 208.740	RP 215.358 to RP 215.581
RP 209.107 to RP 211.530	RP 216.000 to RP 216.775



Typical Milling Section 4 (Tangent)

RP 206.116 to RP 206.159	RP 211.876 to RP 212.587
RP 206.760 to RP 206.797	RP 212.833 to RP 214.137
RP 207.100 to RP 207.375	RP 214.341 to RP 214.351
RP 207.532 to RP 208.346	RP 214.722 to RP 215.112
RP 208.592 to RP 208.740	RP 215.358 to RP 215.581
RP 209.107 to RP 211.530	RP 216.000 to RP 216.775



Typical Proposed Section 4 (Tangent)

RP 206.116 to RP 206.159	RP 211.876 to RP 212.587
RP 206.760 to RP 206.797	RP 212.833 to RP 214.137
RP 207.100 to RP 207.375	RP 214.341 to RP 214.351
RP 207.532 to RP 208.346	RP 214.722 to RP 215.112
RP 208.592 to RP 208.740	RP 215.358 to RP 215.581
RP 209.107 to RP 211.530	RP 216.000 to RP 216.775

Typical Section 4

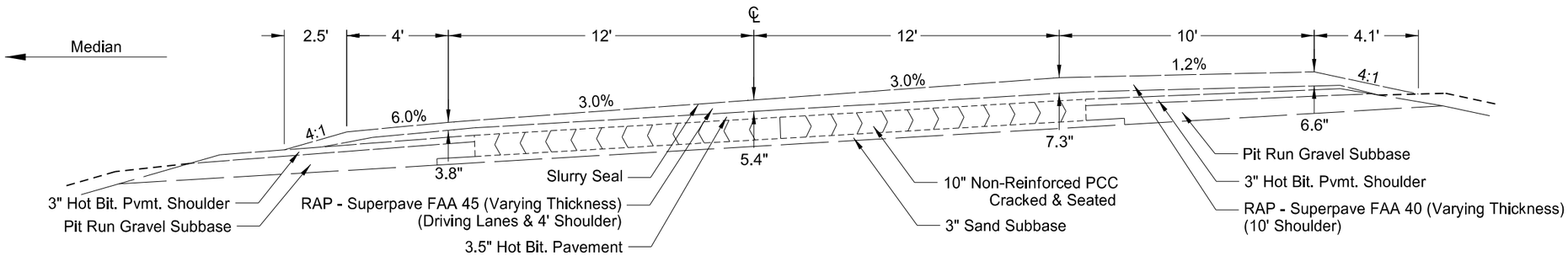
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

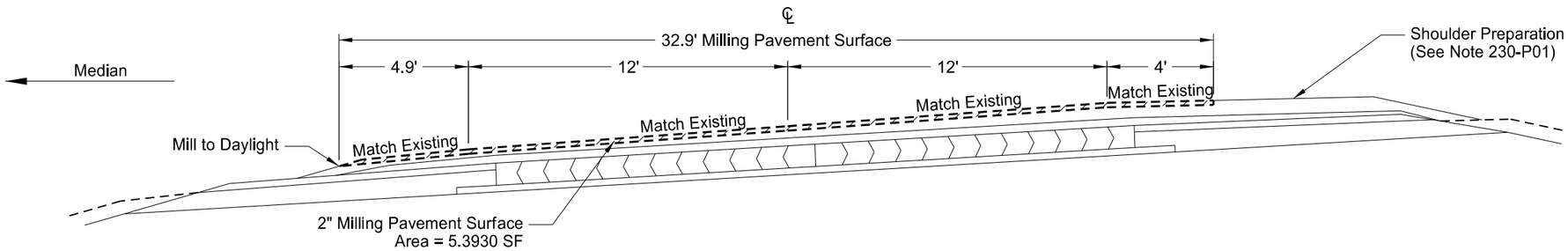
2/10/2025 1:00:27 PM lsteyn R:\project\60029197.163\District\Sheets\030TP_Typical Sections\030TP_001_Typical Sections.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	30	5



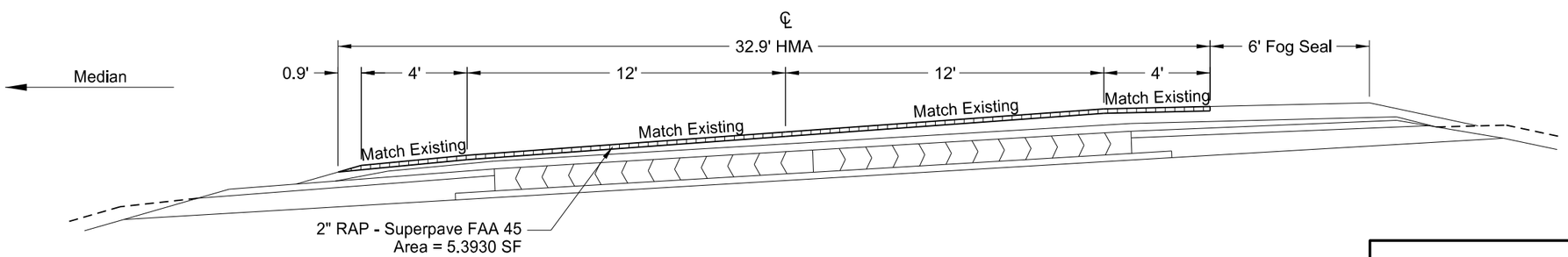
Typical Existing Section 5 (Lt Curve)

RP 205.932 to RP 206.116 RP 207.375 to RP 207.532
RP 206.797 to RP 207.100 RP 208.740 to RP 209.107



Typical Milling Section 5 (Lt Curve)

RP 205.932 to RP 206.116 RP 207.375 to RP 207.532
RP 206.797 to RP 207.100 RP 208.740 to RP 209.107



Typical Proposed Section 5 (Lt Curve)

RP 205.932 to RP 206.116 RP 207.375 to RP 207.532
RP 206.797 to RP 207.100 RP 208.740 to RP 209.107

Typical Section 5
Lt Curve

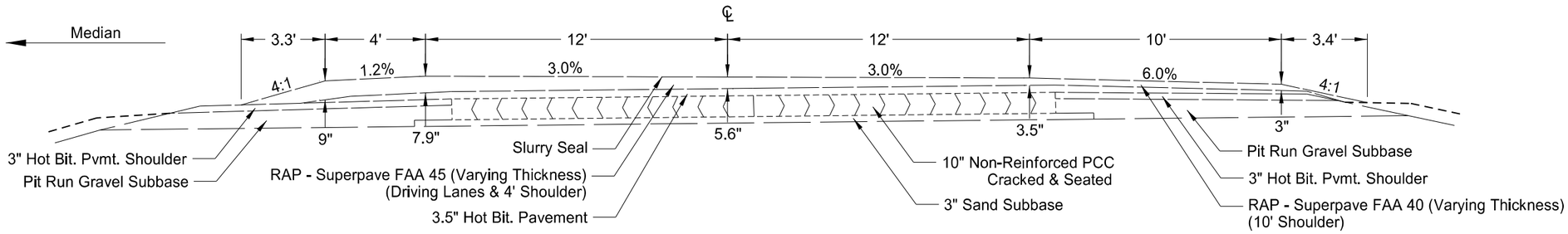
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

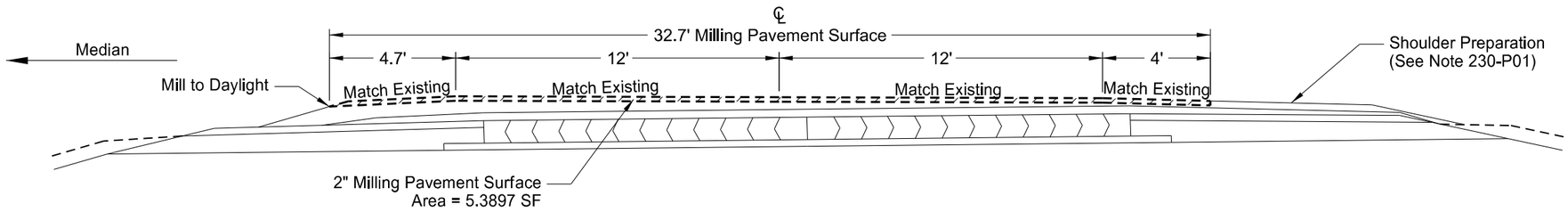
2/10/2025 1:00:27 PM lsteyn R:\project\60029197.163\District\Sheets\030TP_Typical Sections\030TP_001_Typical Sections.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	30	6



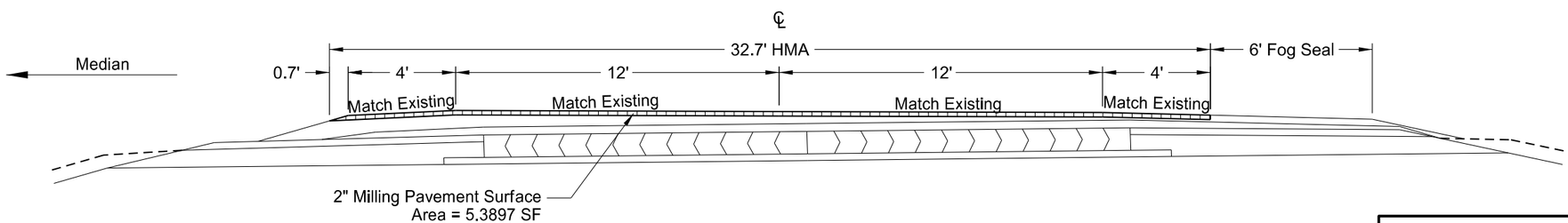
Typical Existing Section 6 (Rt Curve)

RP 206.159 to RP 206.323 RP 211.530 to RP 211.876
RP 206.607 to RP 206.760 RP 215.581 to RP 216.000



Typical Milling Section 6 (Rt Curve)

RP 206.159 to RP 206.323 RP 211.530 to RP 211.876
RP 206.607 to RP 206.760 RP 215.581 to RP 216.000



Typical Proposed Section 6 (Rt Curve)

RP 206.159 to RP 206.323 RP 211.530 to RP 211.876
RP 206.607 to RP 206.760 RP 215.581 to RP 216.000

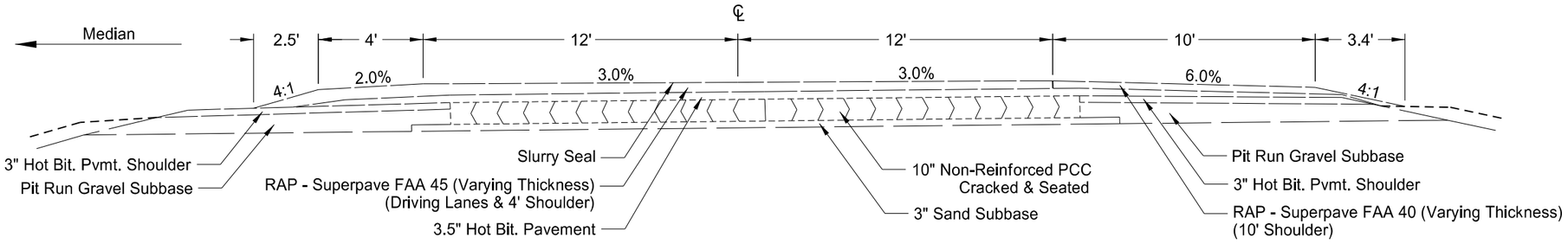
Typical Section 6
Rt Curve

Concrete Pavement Repair, Milling & HMA

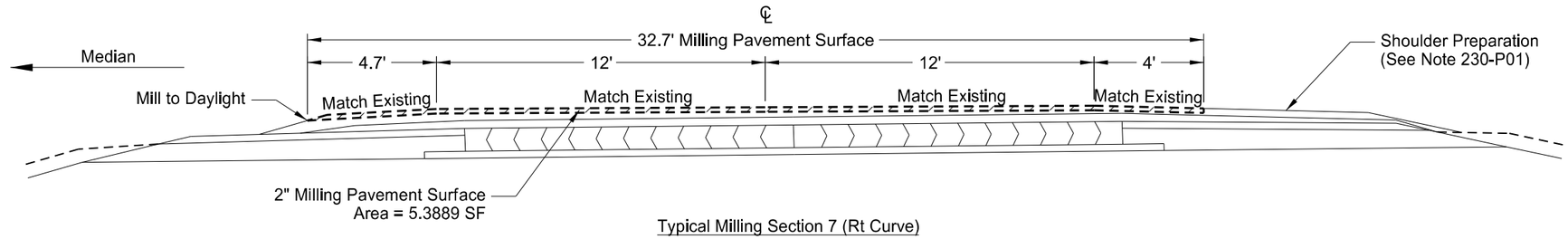
N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

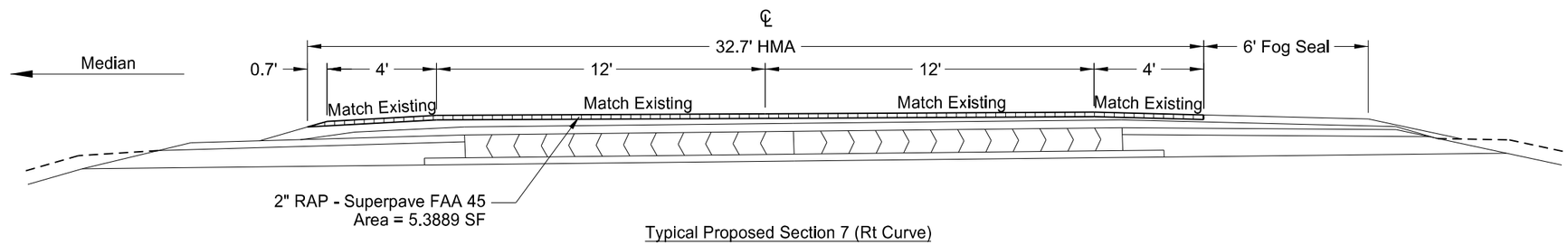
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	30	7



Typical Existing Section 7 (Rt Curve)
RP 214.351 to RP 214.722



Typical Milling Section 7 (Rt Curve)
RP 214.351 to RP 214.722



Typical Proposed Section 7 (Rt Curve)
RP 214.351 to RP 214.722

Typical Section 7
Rt Curve

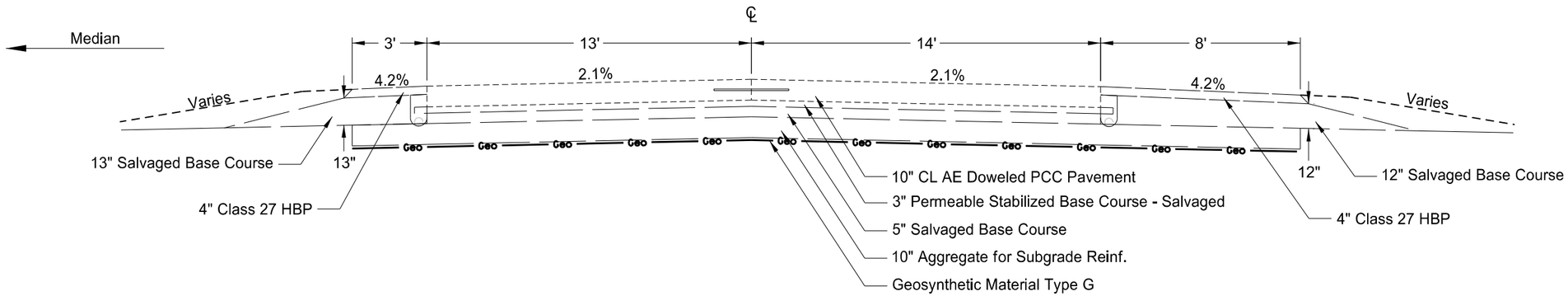
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

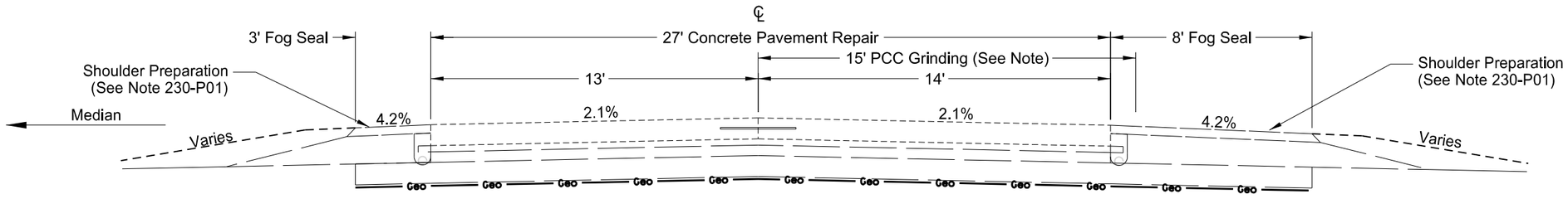
2/10/2025 1:00:28 PM lsteyn R:\project\60029197.163\District\Sheets\030TP_Typical Sections\030TP_001_Typical Sections.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	30	8



Typical Existing Section 8

RP 197.956 to RP 198.221 (N Bowesmont Separation)
RP 208.346 to RP 208.592 (Bathgate Interchange)
RP 212.587 to RP 212.833 (Neche Interchange)
RP 215.112 to RP 215.358 (Pembina Interchange)



Note: PCC Grinding in Driving Lane only from RP 208.421 to RP 208.497.
See PCC Pavement Grinding Table in Section 10, Sheet 2 for other locations.

Typical Proposed Section 8

RP 197.956 to RP 198.221 (N Bowesmont Separation)
RP 208.346 to RP 208.592 (Bathgate Interchange)
RP 212.587 to RP 212.833 (Neche Interchange)
RP 215.112 to RP 215.358 (Pembina Interchange)

Typical Section 8

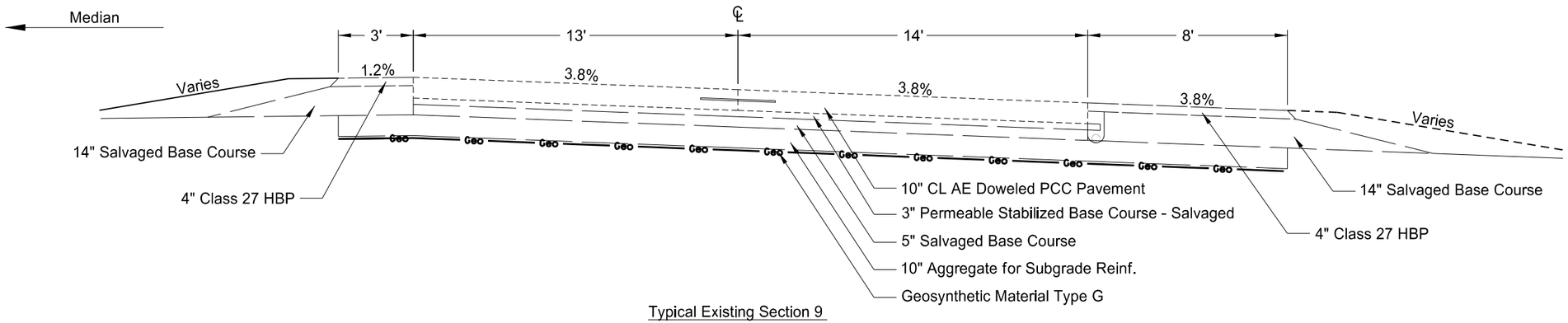
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

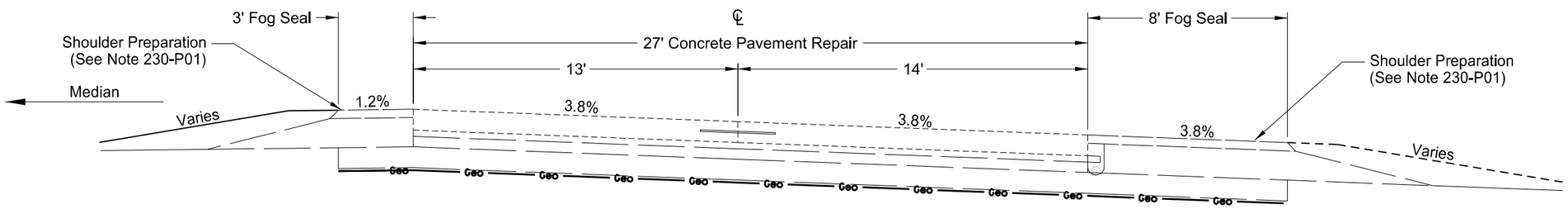
2/10/2025 1:00:28 PM lsteyn R:\project\60029197.163\District\Sheets\030TP_Typical Sections\030TP_001_Typical Sections.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	30	9



Typical Existing Section 9

RP 200.104 to RP 200.388 (Carlisle Interchange)
RP 203.286 to RP 203.551 (Joliette Interchange)
RP 206.323 to RP 206.607 (Bathgate Separation)



Typical Proposed Section 9

RP 200.104 to RP 200.388 (Carlisle Interchange)
RP 203.286 to RP 203.551 (Joliette Interchange)
RP 206.323 to RP 206.607 (Bathgate Separation)

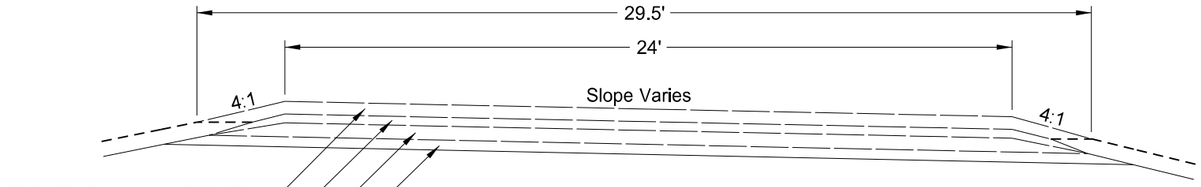
Typical Section 9

Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

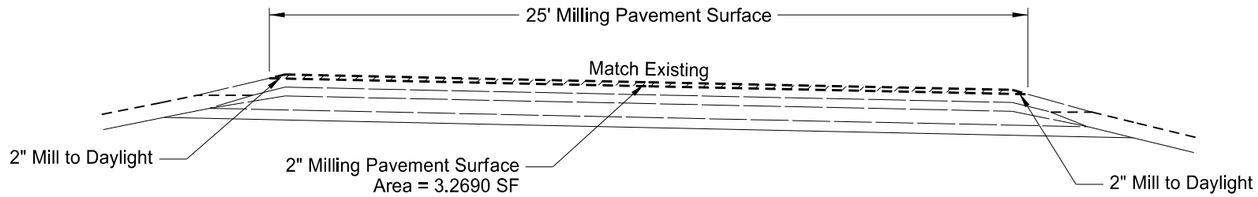
REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	30	10



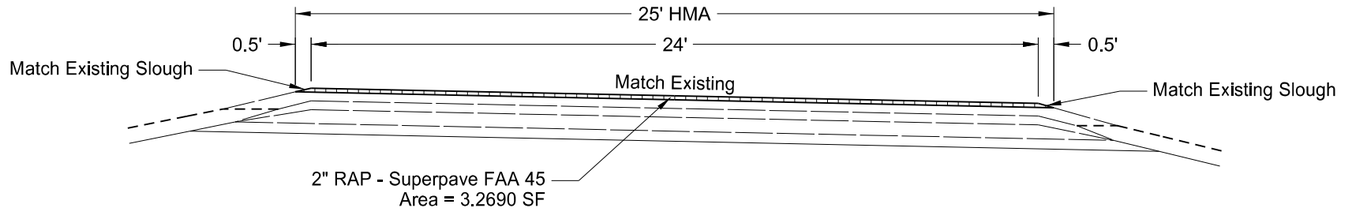
Typical Existing Section (Ramps)

Carlisle Interchange	(Exit 200)
Joliette Interchange	(Exit 203)
Bathgate Interchange	(Exit 208)
Neche Interchange	(Exit 212)
Pembina Interchange	(Exit 215)



Typical Milling Section (Ramps)

Carlisle Interchange	(Exit 200)
Joliette Interchange	(Exit 203)
Bathgate Interchange	(Exit 208)
Neche Interchange	(Exit 212)
Pembina Interchange	(Exit 215)



Typical Milling Section (Ramps)

Carlisle Interchange	(Exit 200)
Joliette Interchange	(Exit 203)
Bathgate Interchange	(Exit 208)
Neche Interchange	(Exit 212)
Pembina Interchange	(Exit 215)

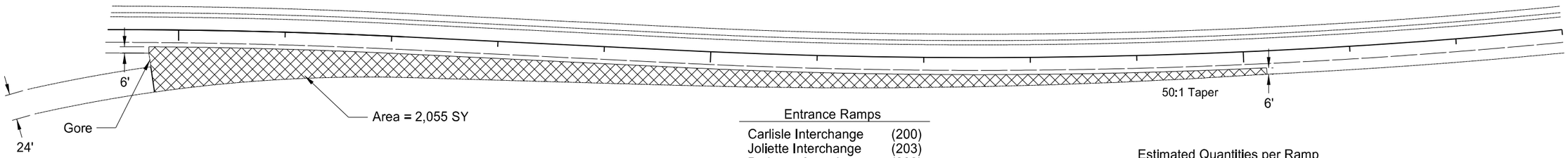
Typical Section
Ramps

Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 02/10/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	90	1

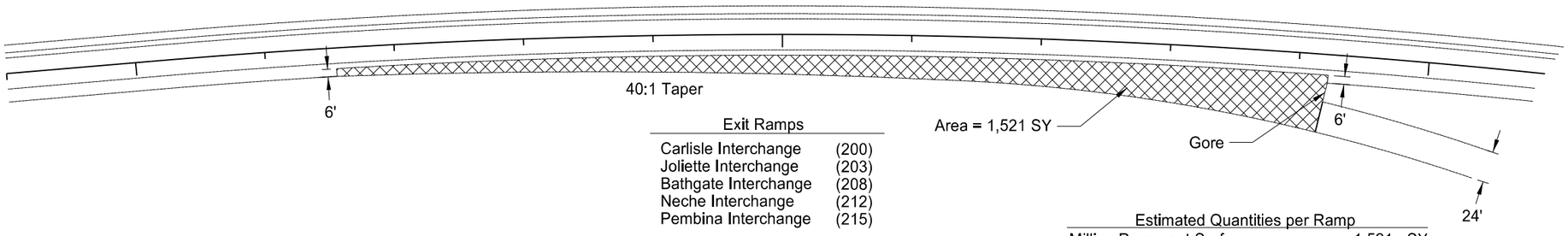


Entrance Ramps

Carlisle Interchange	(200)
Joliette Interchange	(203)
Bathgate Interchange	(208)
Neche Interchange	(212)
Pembina Interchange	(215)

Estimated Quantities per Ramp

Milling Pavement Surface	2,055	SY
RAP-Superpave FAA 45 @ 2 Tons/CY	229	Ton
PG 58H-34 Asphalt Cement @ 5.2%	12	Ton
Tack Coat @ 0.075 Gallons/SY	155	Gal



Exit Ramps

Carlisle Interchange	(200)
Joliette Interchange	(203)
Bathgate Interchange	(208)
Neche Interchange	(212)
Pembina Interchange	(215)

Estimated Quantities per Ramp

Milling Pavement Surface	1,521	SY
RAP-Superpave FAA 45 @ 2 Tons/CY	169	Ton
PG 58H-34 Asphalt Cement @ 5.2%	9	Ton
Tack Coat @ 0.075 Gallons/SY	114	Gal

2" Milling & 2" HMA (Additional Quantity)

Milling & Paving Layout
Entrance/Exit Ramp Tapers

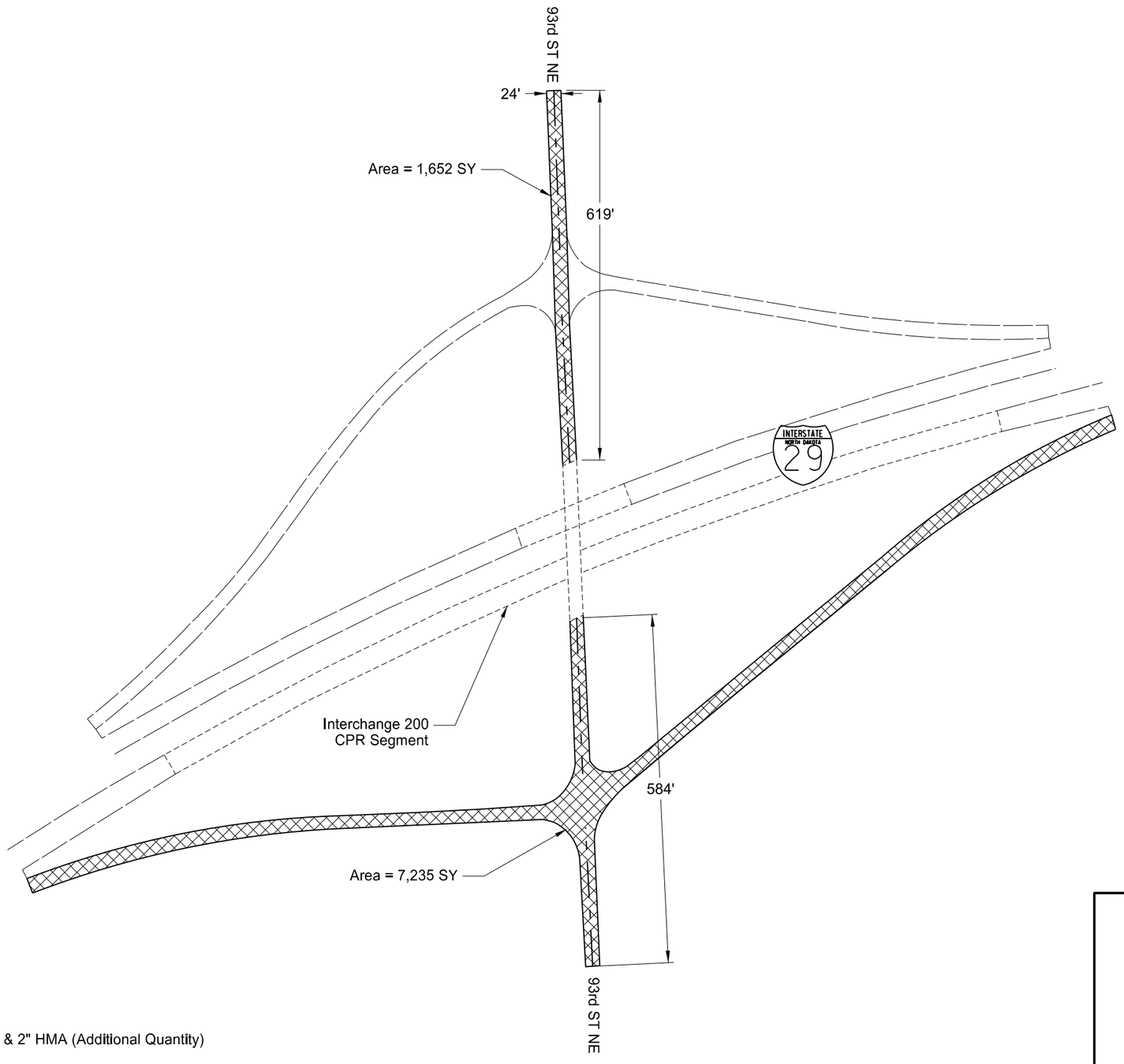
Concrete Pavement Repair, Mill & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/13/2025 4:54:28 PM lsteyn R:\project\60029197.163\District\Sheets\090PL_Paving Lot\090PL_001_Ramp Tapers.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	90	2



Estimated Quantities

Milling Pavement Surface	8,887	SY
RAP - Superpave FAA 45 @ 2 Tons/CY	988	Ton
PG 58H-34 Asphalt Cement @ 5.2%	52	Ton
Tack @ 0.075 Gal/SY	667	Gal

Milling & Paving Layout
Carlisle Interchange Ramps
(200)

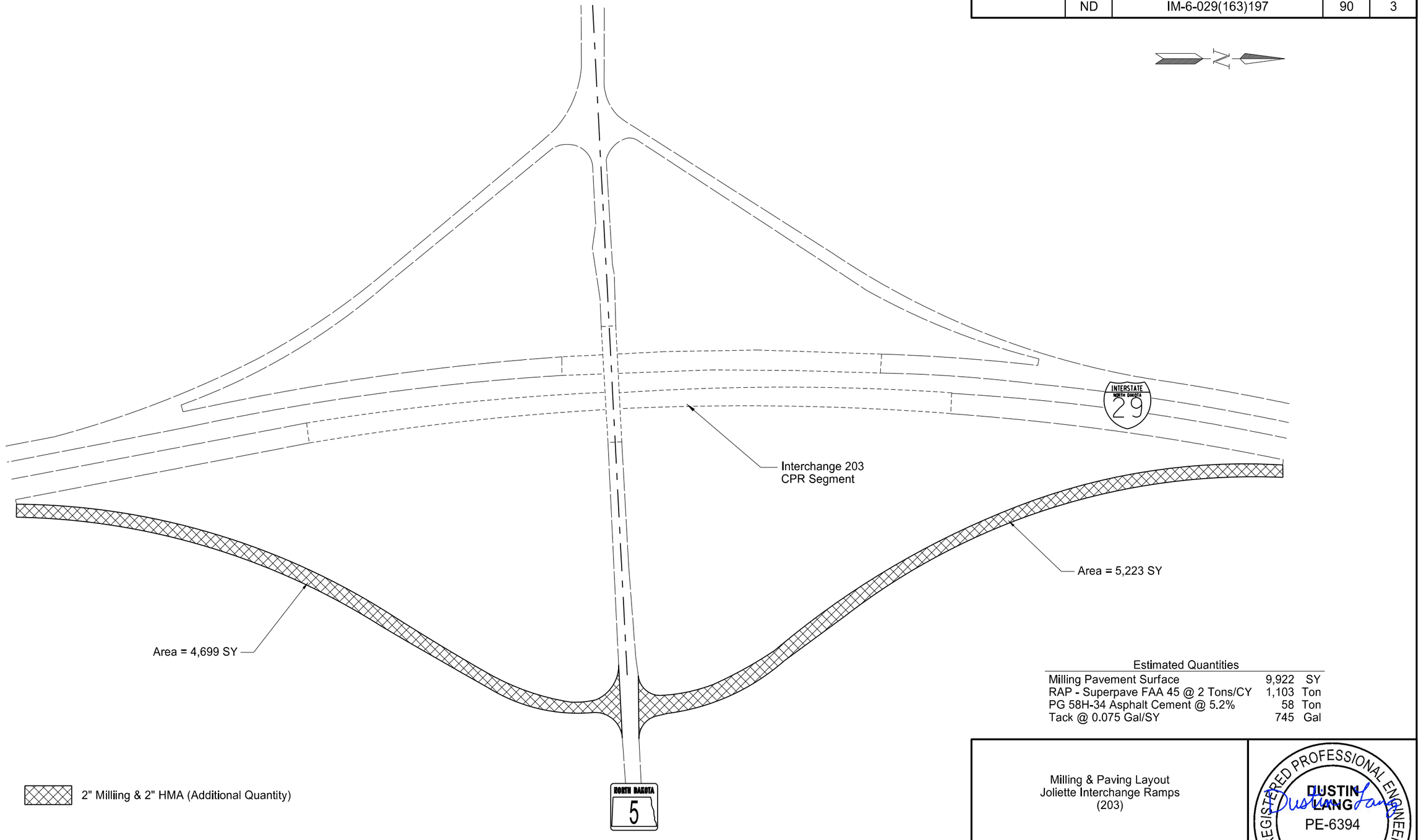
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/14/2025 8:16:56 AM lsteyn R:\project\60029197.163\District\Sheets\090PL_Paving Lot\090PL_002_Carlisle Interchange.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	90	3



Estimated Quantities

Milling Pavement Surface	9,922	SY
RAP - Superpave FAA 45 @ 2 Tons/CY	1,103	Ton
PG 58H-34 Asphalt Cement @ 5.2%	58	Ton
Tack @ 0.075 Gal/SY	745	Gal

Milling & Paving Layout
Joliette Interchange Ramps
(203)

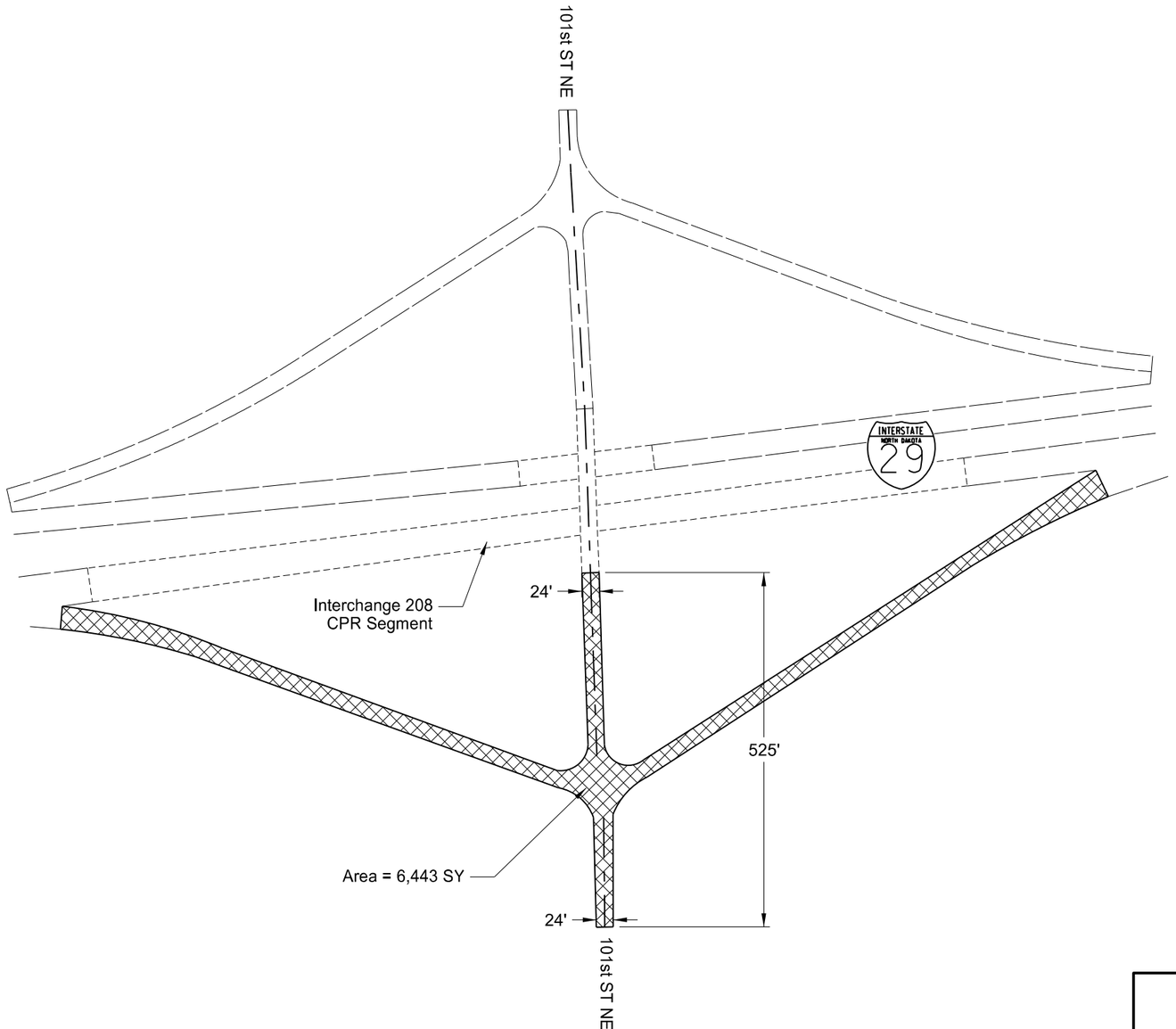
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/14/2025 9:33:55 AM lsteyn R:\project\60029197.163\District\Sheets\090PL_Paving Lot\090PL_003_Joliette Interchange.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	90	4



2" Milling & 2" HMA (Additional Quantity)

Estimated Quantities

Milling Pavement Surface	6,443	SY
RAP - FAA 45 @ 2 Tons/CY	716	Ton
PG 58H-34 Asphalt Cement @ 5.2%	38	Ton
Tack @ 0.075 Gal/SY	484	Gal

Milling & Paving Layout
Bathgate Interchange Ramps
(208)

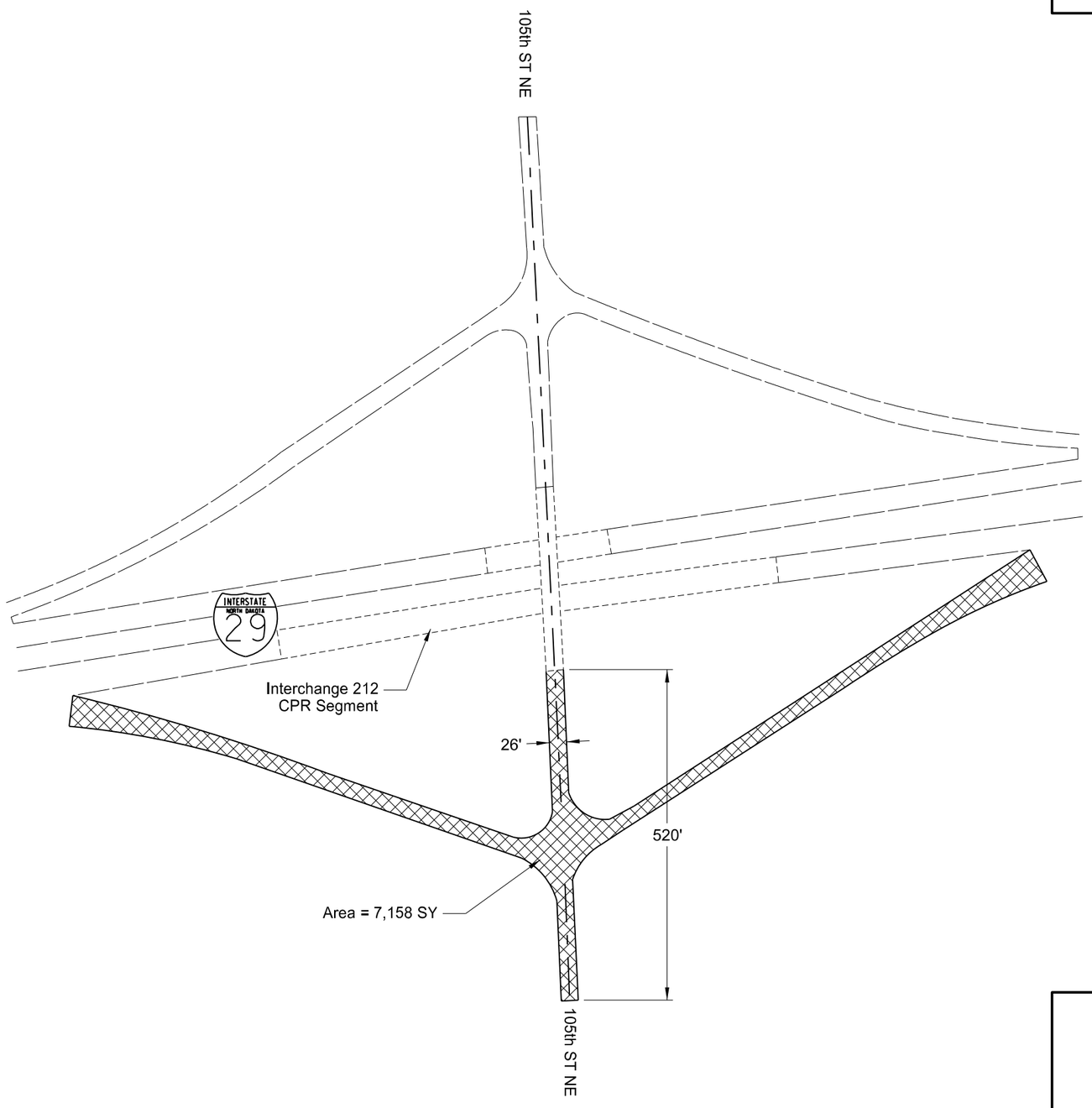
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/13/2025 4:51:06 PM lsteyn R:\project\60029197.163\District\Sheets\090PL_Paving Lot\090PL_004_Bathgate Interchange.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	90	5



2" Milling & 2" HMA (Additional Quantity)

Estimated Quantities

Milling Pavement Surface	7,158	SY
RAP - FAA 45 @ 2 Tons/CY	796	Ton
PG 58H-34 Asphalt Cement @ 5.2%	42	Ton
Tack @ 0.075 Gal/SY	539	Gal

Milling & Paving Layout
Neche Interchange Ramps
(212)

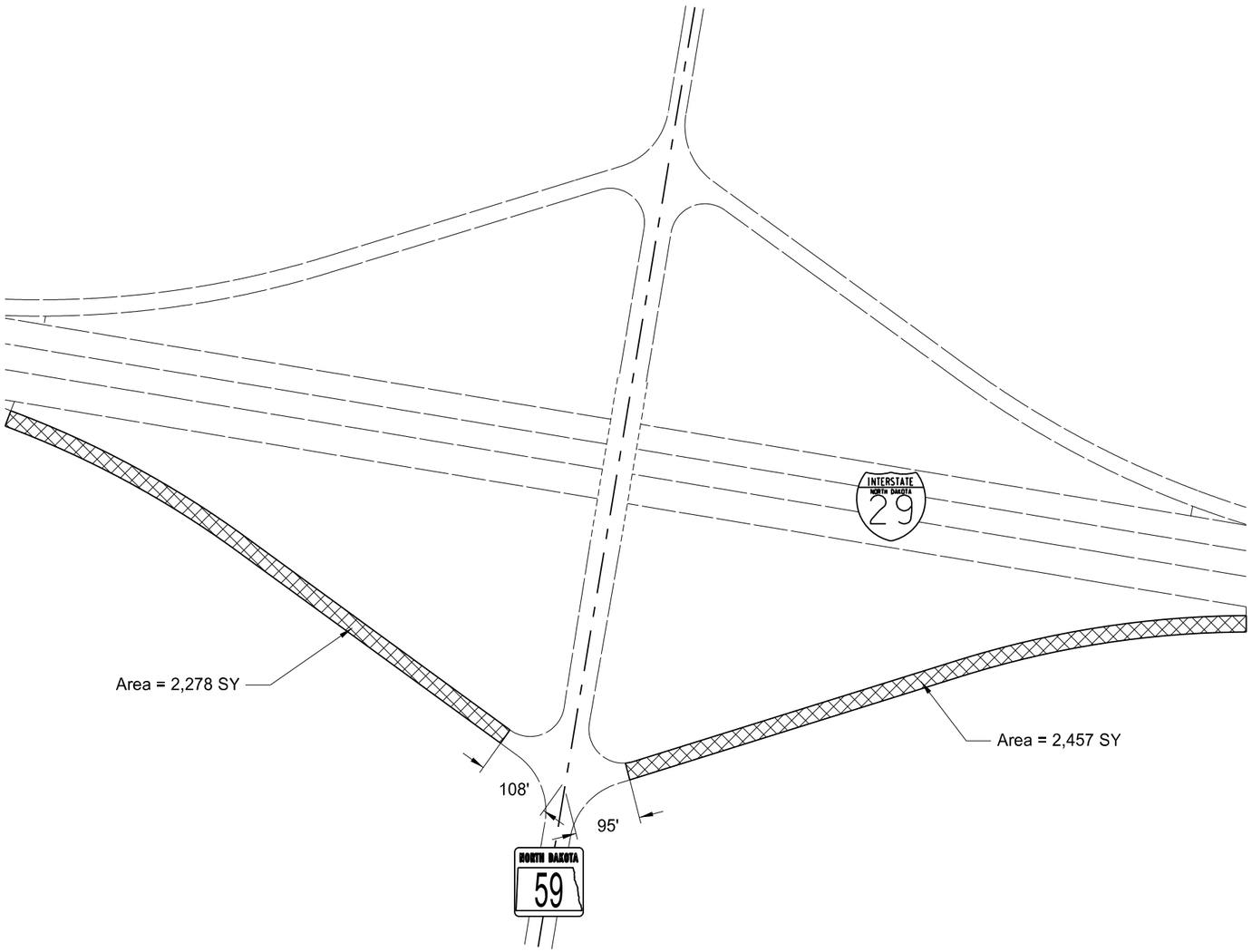
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/14/2025 9:43:09 AM lsteyn R:\project\60029197.163\District\Sheets\090PL_Paving Lot\090PL_005_Neche Interchange.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	90	6



2" Milling & 2" HMA (Additional Quantity)

Estimated Quantities

Milling Pavement Surface	4,735	SY
RAP - FAA 45 @ 2 Tons/CY	527	Ton
PG 58H-34 Asphalt Cement @ 5.2%	28	Ton
Tack @ 0.075 Gal/SY	356	Gal

Milling & Paving Layout
Pembina Interchange Ramps
(215)

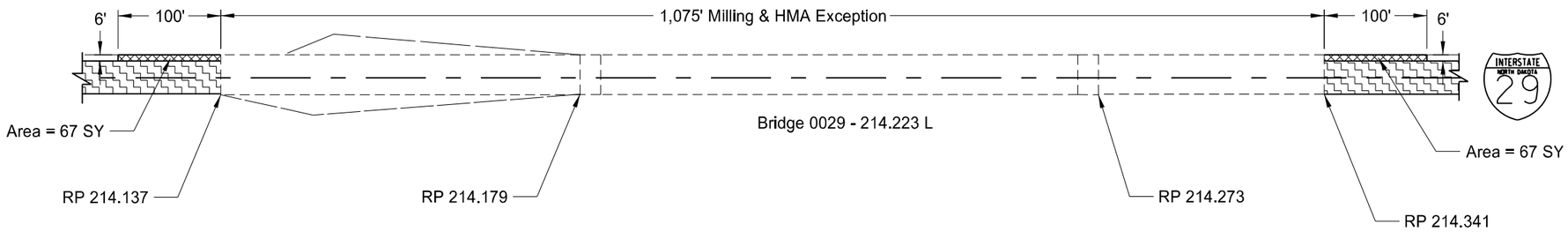
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/14/2025 10:15:26 AM lsteyn R:\project\60029197.163\District\Sheets\090PL_Paving Lot\090PL_006_Pembina interchange.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	90	7



Estimated Quantities

Milling Pavement Surface	134 SY
RAP - Superpave FAA 45 @ 2 Tons/CY	15 Ton
PG 58H-34 Asphalt Cement @ 5.2%	1 Ton
Tack @ 0.075 Gal/SY	10 Gal

2" Milling & 2" HMA (Additional Quantity)

Milling & HMA (Typical Section 4)

Milling & Paving Layout
Pembina River Bridge

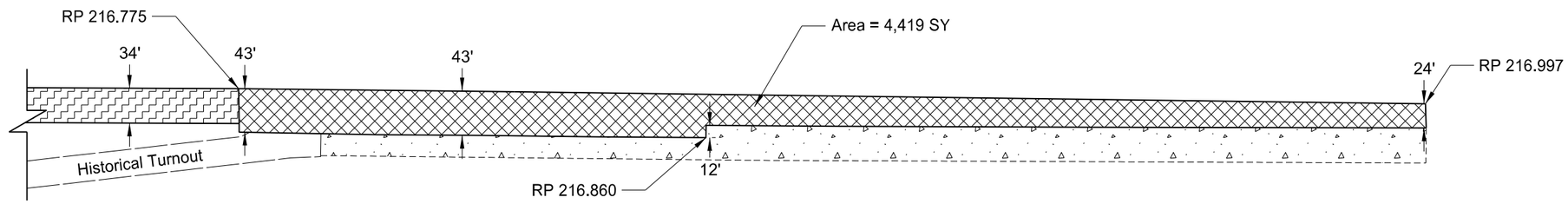
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/14/2025 10:17:54 AM lsteyn R:\project\60029197.163\District\Sheets\090PL_Paving Lot\090PL_007_Pembina River bridge.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	90	8



2" Milling & 2" HMA (Additional Quantity)

Milling & HMA (Typical Section 4)

Existing PCC Pavement

Estimated Quantities

Milling Pavement Surface	4,419 SY
RAP - Superpave FAA 45 @ 2 tons/CY	491 Ton
PG 58H-34 Asphalt Cement @ 5.2%	26 Ton
Tack Coat @ 0.075 Gallons/SY	332 Gal

Milling & Paving Layout
RP 216.775 to 216.997 Asphalt Section

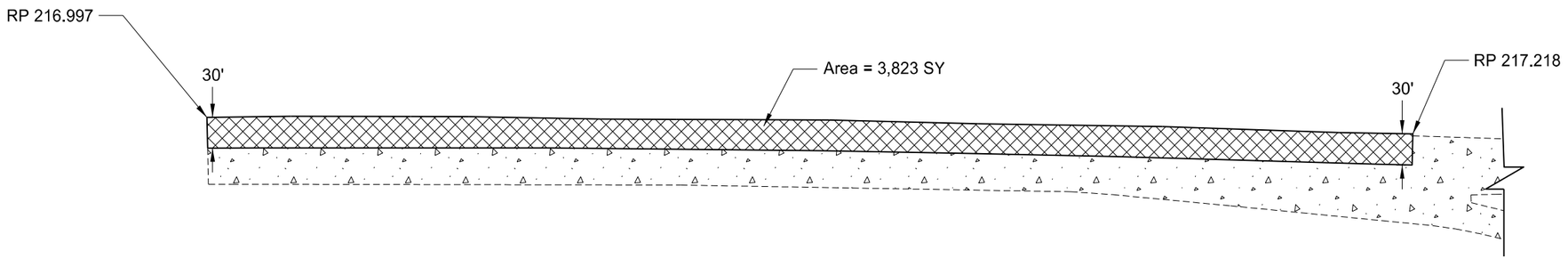
Concrete Pavement Repair, Mill & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/14/2025 10:22:30 AM lsteyn R:\project\60029197.163\District\Sheets\090PL_Paving Lot\090PL_008_Border Mill and Pave.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	90	9



Estimated Quantities

Milling Pavement Surface	3,823 SY
RAP - Superpave FAA 45 @ 2 tons/CY	425 Ton
PG 58H-34 Asphalt Cement @ 5.2%	23 Ton
Tack Coat @ 0.075 Gallons/SY	287 Gal

2" Milling & 2" HMA (Additional Quantity)

Existing PCC Pavement

Milling & Paving Layout
RP 216.997 to 217.218 Asphalt Section

Concrete Pavement Repair, Mill & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/14/2025 10:22:31 AM lsteyn R:\project\60029197.163\District\Sheets\090PL_Paving Lot\090PL_008_Border Mill and Pave.dgn

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
E5-1-48	**48"x48"**	**EXIT GORE**	**3**	**35**	**105**
G20-1-60	**60"x24"**	**ROAD WORK NEXT __ MILES**	**7**	**28**	**196**
G20-1b-60	60"x24"	NO WORK IN PROGRESS (Sign and installation only)		18	
G20-2-48	**48"x24"**	**END ROAD WORK**	**5**	**26**	**130**
G20-4-36	36"x18"	PILOT CAR FOLLOW ME (Mounted to back of pilot car)		18	
G20-10-108	108"x48"	CONTRACTOR SIGN		70	
G20-50a-72	72"x36"	ROAD WORK NEXT __ MILES RT & LT ARROWS		43	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW		36	
G20-55-96	**96"x48"**	**SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT**	**2**	**59**	**118**
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)		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 (INSIDE ARROW) RIGHT or LEFT (Mounted on barricade)		7	
M5-1-21	21"x15"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)		7	
M5-1-30	30"x21"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)		9	
M6-1-21	21"x15"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)		7	
M6-1-30	30"x21"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)		9	
M6-3-21	21"x15"	DIRECTIONAL ARROW UP (Mounted on route marker post)		7	
R1-1-48	**48"x48"**	**STOP**	**3**	**32**	**96**
R1-2-60	**60"x60"**	**YIELD**	**3**	**29**	**87**
R2-1-36	**36"x48"**	**SPEED LIMIT __ (Portable only)**	**17**	**30**	**510**
R2-1-48	**48"x60"**	**SPEED LIMIT __**	**4**	**39**	**156**
R2-1aP-24	**24"x18"**	**MINIMUM FEE $80 (Mounted on Speed Limit post)**	**13**	**10**	**130**
R3-2-48	48"x48"	NO LEFT TURN		35	
R4-1-48	**48"x60"**	**DO NOT PASS**	**2**	**39**	**78**
R4-7-48	48"x60"	KEEP RIGHT		39	
R5-1-48	48"x48"	DO NOT ENTER		35	
R6-1-54	54"x18"	ONE WAY RIGHT or LEFT (Mounted on STOP or DO NOT ENTER post)		14	
R7-1-12	12"x18"	NO PARKING ANY TIME		11	
R10-6-24	24"x36"	STOP HERE ON RED		16	
R11-2-48	48"x30"	ROAD CLOSED (Mounted on barricade)		12	
R11-2a-48	48"x30"	STREET CLOSED (Mounted on barricade)		12	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC (Mounted on barricade)		15	
W1-3-48	48"x48"	REVERSE TURN RIGHT or LEFT		35	
W1-4-48	**48"x48"**	**REVERSE CURVE RIGHT or LEFT**	**2**	**35**	**70**
W1-4b-48	48"x48"	TWO LANE REVERSE CURVE RIGHT or LEFT		35	
W1-6-48	48"x24"	ONE DIRECTION LARGE ARROW		26	
W3-1-48	48"x48"	STOP AHEAD		35	
W3-3-48	48"x48"	SIGNAL AHEAD		35	
W3-4-48	**48"x48"**	**BE PREPARED TO STOP**	**6**	**35**	**210**
W3-5-48	**48"x48"**	**SPEED REDUCTION AHEAD**	**8**	**35**	**280**
W4-2-48	**48"x48"**	**LANE ENDS RIGHT or LEFT**	**2**	**35**	**70**
W5-1-48	48"x48"	ROAD NARROWS		35	
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE		35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW		35	
W6-3-48	48"x48"	TWO WAY TRAFFIC		35	
W8-1-48	**48"x48"**	**BUMP**	**10**	**35**	**350**
W8-3-48	48"x48"	PAVEMENT ENDS		35	
W8-7-48	48"x48"	LOOSE GRAVEL		35	
W8-11-48	**48"x48"**	**UNEVEN LANES**	**2**	**35**	**70**
W8-12-48	48"x48"	NO CENTER LINE		35	
W8-17-48	48"x48"	SHOULDER DROP-OFF SYMBOL		35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY		35	
W8-54-48	**48"x48"**	**TRUCKS ENTERING AHEAD or __ FT or _ MILE**	**2**	**35**	**70**
W8-55-48	**48"x48"**	**TRUCKS CROSSING AHEAD or __ FT or _ MILE**	**2**	**35**	**70**
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY		35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL		35	
W12-2-48	48"x48"	LOW CLEARANCE		35	
W13-1P-30	30"x30"	__ MPH ADVISORY SPEED PLAQUE (Mounted on warning sign post)		14	
W14-3-64	64"x48"	NO PASSING ZONE		28	
W16-2P-30	30"x24"	__ FEET PLAQUE (Mounted on warning sign post)		10	
W20-1-48	**48"x48"**	**ROAD WORK AHEAD or _FT or _ MILE**	**34**	**35**	**1190**
W20-2-48	48"x48"	DETOUR AHEAD or __ FT or _ MILE		35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or __ FT or _ MILE		35	
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or __ FT or _ MILE		35	
W20-5-48	**48"x48"**	**RIGHT or CENTER or LEFT LANE CLOSED AHEAD or __ FT or _ MILE**	**2**	**35**	**70**
W20-7-48	**48"x48"**	**FLAGGER**	**7**	**35**	**245**
W20-8-18	**18"x18"**	**STOP - SLOW PADDLE Back to Back**	**6**	**5**	**30**
W20-52P-54	54"x12"	NEXT __ MILES (Mounted on warning sign post)		12	
W21-1-48	48"x48"	WORKERS		35	
W21-2-48	**48"x48"**	**FRESH OIL**	**1**	**35**	**35**
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT or _ MILE		35	
W21-5-48	48"x48"	SHOULDER WORK		35	
W21-5a-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED		35	
W21-5b-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT or _ MILE		35	
W21-6-48	48"x48"	SURVEY CREW		35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT		35	
W21-51-48	48"x48"	MATERIAL ON ROADWAY		35	
W21-52-48	48"x48"	PAVEMENT BREAKS		35	
W21-53-48	48"x48"	RUMBLE STRIPS AHEAD		35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK		35	
W24-1-48	**48"x48"**	**DOUBLE REVERSE CURVE**	**1**	**35**	**35**

SPECIAL SIGNS

W5-4-48	**48"x48"**	**RAMP NARROWS**	**15**	**35**	**525**
W13-4-36	**36"X30"**	**ON RAMP**	**20**	**18**	**360**

SPEC & CODE

704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS**	**5286**

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	**FLAGGING**	**MHR**	**1464**
704-1048	PORTABLE RUMBLE STRIPS	EACH	
704-1050	**TYPE I BARRICADES**	**EACH**	**30**
704-1052	**TYPE III BARRICADES**	**EACH**	**22**
704-1060	**DELINEATOR DRUMS**	**EACH**	**76**
704-1065	TRAFFIC CONES	EACH	
704-1067	**TUBULAR MARKERS**	**EACH**	**608**
704-1070	DELINEATOR	EACH	
704-1072	FLEXIBLE DELINEATORS	EACH	
704-1080	**STACKABLE VERTICAL PANELS**	**EACH**	**80**
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**	**1**
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	
762-0432	**SHORT TERM 6IN LINE- TYPE NR**	**LF**	**62162**

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

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

Traffic Control Devices List

Concrete Pavement Repair,Milling & HMA
N. Bowesmont to Canadian Line - NB

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	100	2

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
E5-1-48	**48"x48"**	**EXIT GORE**	**2**	**35**	**70**
G20-1-60	60"x24"	ROAD WORK NEXT __ MILES		28	
G20-1b-60	60"x24"	NO WORK IN PROGRESS (Sign and installation only)		18	
G20-2-48	48"x24"	END ROAD WORK		26	
G20-4-36	36"x18"	PILOT CAR FOLLOW ME (Mounted to back of pilot car)		18	
G20-10-108	108"x48"	CONTRACTOR SIGN		70	
G20-50a-72	72"x36"	ROAD WORK NEXT __ MILES RT & LT ARROWS		43	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW		36	
G20-55-96	96"x48"	SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT		59	
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 (INSIDE ARROW) RIGHT or LEFT (Mounted on barricade)		7	
M5-1-21	21"x15"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)		7	
M5-1-30	30"x21"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)		9	
M6-1-21	21"x15"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)		7	
M6-1-30	30"x21"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)		9	
M6-3-21	21"x15"	DIRECTIONAL ARROW UP (Mounted on route marker post)		7	
R1-1-48	48"x48"	STOP		32	
R1-2-60	**60"x60"**	**YIELD**	**1**	**29**	**29**
R2-1-36	**36"x48"**	**SPEED LIMIT __ (Portable only)**	**6**	**30**	**180**
R2-1-48	48"x60"	SPEED LIMIT __		39	
R2-1aP-24	**24"x18"**	**MINIMUM FEE $80 (Mounted on Speed Limit post)**	**6**	**10**	**60**
R3-2-48	48"x48"	NO LEFT TURN		35	
R4-1-48	48"x60"	DO NOT PASS		39	
R4-7-48	48"x60"	KEEP RIGHT		39	
R5-1-48	48"x48"	DO NOT ENTER		35	
R6-1-54	54"x18"	ONE WAY RIGHT or LEFT (Mounted on STOP or DO NOT ENTER post)		14	
R7-1-12	12"x18"	NO PARKING ANY TIME		11	
R10-6-24	24"x36"	STOP HERE ON RED		16	
R11-2-48	48"x30"	ROAD CLOSED (Mounted on barricade)		12	
R11-2a-48	48"x30"	STREET CLOSED (Mounted on barricade)		12	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC (Mounted on barricade)		15	
W1-3-48	48"x48"	REVERSE TURN RIGHT or LEFT		35	
W1-4-48	48"x48"	REVERSE CURVE RIGHT or LEFT		35	
W1-4b-48	48"x48"	TWO LANE REVERSE CURVE RIGHT or LEFT		35	
W1-6-48	48"x24"	ONE DIRECTION LARGE ARROW		26	
W3-1-48	48"x48"	STOP AHEAD		35	
W3-3-48	48"x48"	SIGNAL AHEAD		35	
W3-4-48	48"x48"	BE PREPARED TO STOP		35	
W3-5-48	**48"x48"**	**SPEED REDUCTION AHEAD**	**2**	**35**	**70**
W4-2-48	**48"x48"**	**LANE ENDS RIGHT or LEFT**	**2**	**35**	**70**
W5-1-48	48"x48"	ROAD NARROWS		35	
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE		35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW		35	
W6-3-48	48"x48"	TWO WAY TRAFFIC		35	
W8-1-48	48"x48"	BUMP		35	
W8-3-48	48"x48"	PAVEMENT ENDS		35	
W8-7-48	48"x48"	LOOSE GRAVEL		35	
W8-11-48	48"x48"	UNEVEN LANES		35	
W8-12-48	48"x48"	NO CENTER LINE		35	
W8-17-48	48"x48"	SHOULDER DROP-OFF SYMBOL		35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY		35	
W8-54-48	48"x48"	TRUCKS ENTERING AHEAD or __ FT or _ MILE		35	
W8-55-48	48"x48"	TRUCKS CROSSING AHEAD or __ FT or _ MILE		35	
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY		35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL		35	
W12-2-48	48"x48"	LOW CLEARANCE		35	
W13-1P-30	30"x30"	__ MPH ADVISORY SPEED PLAQUE (Mounted on warning sign post)		14	
W14-3-64	64"x48"	NO PASSING ZONE		28	
W16-2P-30	30"x24"	__ FEET PLAQUE (Mounted on warning sign post)		10	
W20-1-48	**48"x48"**	**ROAD WORK AHEAD or _FT or _ MILE**	**2**	**35**	**70**
W20-2-48	48"x48"	DETOUR AHEAD or __ FT or _ MILE		35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or __ FT or _ MILE		35	
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or __ FT or _ MILE		35	
W20-5-48	**48"x48"**	**RIGHT or CENTER or LEFT LANE CLOSED AHEAD or __ FT or _ MILE**	**2**	**35**	**70**
W20-7-48	**48"x48"**	**FLAGGER**	**2**	**35**	**70**
W20-8-18	**18"x18"**	**STOP - SLOW PADDLE Back to Back**	**2**	**5**	**10**
W20-52P-54	54"x12"	NEXT __ MILES (Mounted on warning sign post)		12	
W21-1-48	48"x48"	WORKERS		35	
W21-2-48	48"x48"	FRESH OIL		35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT or _ MILE		35	
W21-5-48	48"x48"	SHOULDER WORK		35	
W21-5a-48	**48"x48"**	**RIGHT or LEFT SHOULDER CLOSED**	**2**	**35**	**70**
W21-5b-48	**48"x48"**	**RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT or _ MILE**	**2**	**35**	**70**
W21-6-48	48"x48"	SURVEY CREW		35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT		35	
W21-51-48	48"x48"	MATERIAL ON ROADWAY		35	
W21-52-48	48"x48"	PAVEMENT BREAKS		35	
W21-53-48	48"x48"	RUMBLE STRIPS AHEAD		35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK		35	

SPECIAL SIGNS

SPEC & CODE

704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS**	**839**

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	FLAGGING	MHR	
704-1048	PORTABLE RUMBLE STRIPS	EACH	
704-1050	**TYPE I BARRICADES**	**EACH**	**15**
704-1052	**TYPE III BARRICADES**	**EACH**	**5**
704-1060	**DELINEATOR DRUMS**	**EACH**	**105**
704-1065	TRAFFIC CONES	EACH	
704-1067	**TUBULAR MARKERS**	**EACH**	**82**
704-1070	DELINEATOR	EACH	
704-1072	FLEXIBLE DELINEATORS	EACH	
704-1080	**STACKABLE VERTICAL PANELS**	**EACH**	**30**
704-1081	VERTICAL PANELS - BACK TO BACK	EACH	
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH	
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH	
704-1087	**SEQUENCING ARROW PANEL - TYPE C**	**EACH**	**2**
704-1500	OBLITERATION OF PVMT MK	SF	
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF	
704-3510	PRECAST CONCRETE MED BARRIER - STATE FURNISHED	EACH	
762-0200	RAISED PAVEMENT MARKERS	EACH	
762-0420	SHORT TERM 4IN LINE - TYPE R	LF	
762-0430	SHORT TERM 4IN LINE - TYPE NR	LF	

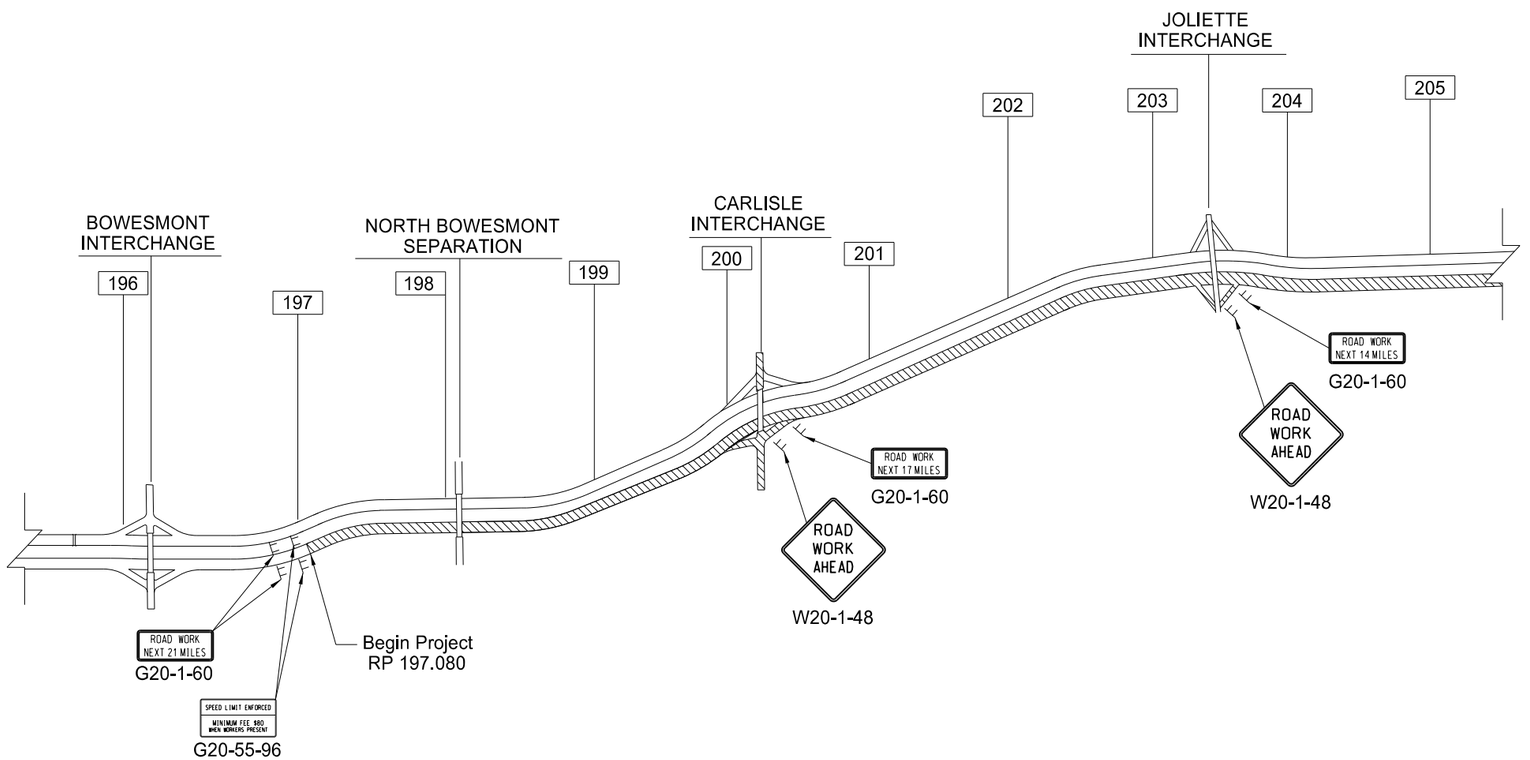
NOTE:
If additional signs are required, units will be calculated using the formula from Section III-18.06 of the Design Manual.
http://www.dot.nd.gov/

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

Traffic Control Devices List

Pembina Border Crossing Phases
Concrete Pavement Repair,Milling & HMA
N. Bowesmont to Canadian Line - NB

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	100	3



Work Zone

Work Zone Traffic Control

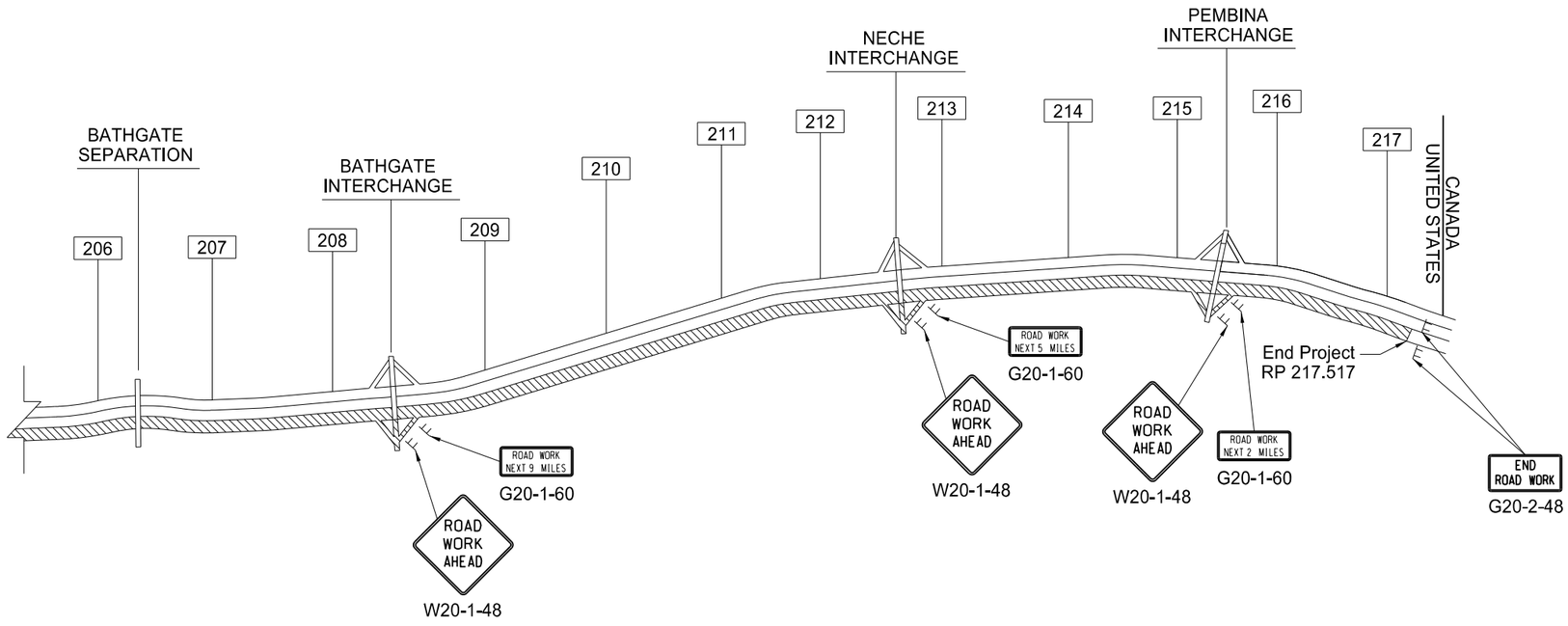
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/14/2025 10:40:31 AM lsteyn R:\project\60029197.163\District\Sheets\100WZ_ConSign\100WZ_003_Consign.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	100	4



Work Zone

Work Zone Traffic Control

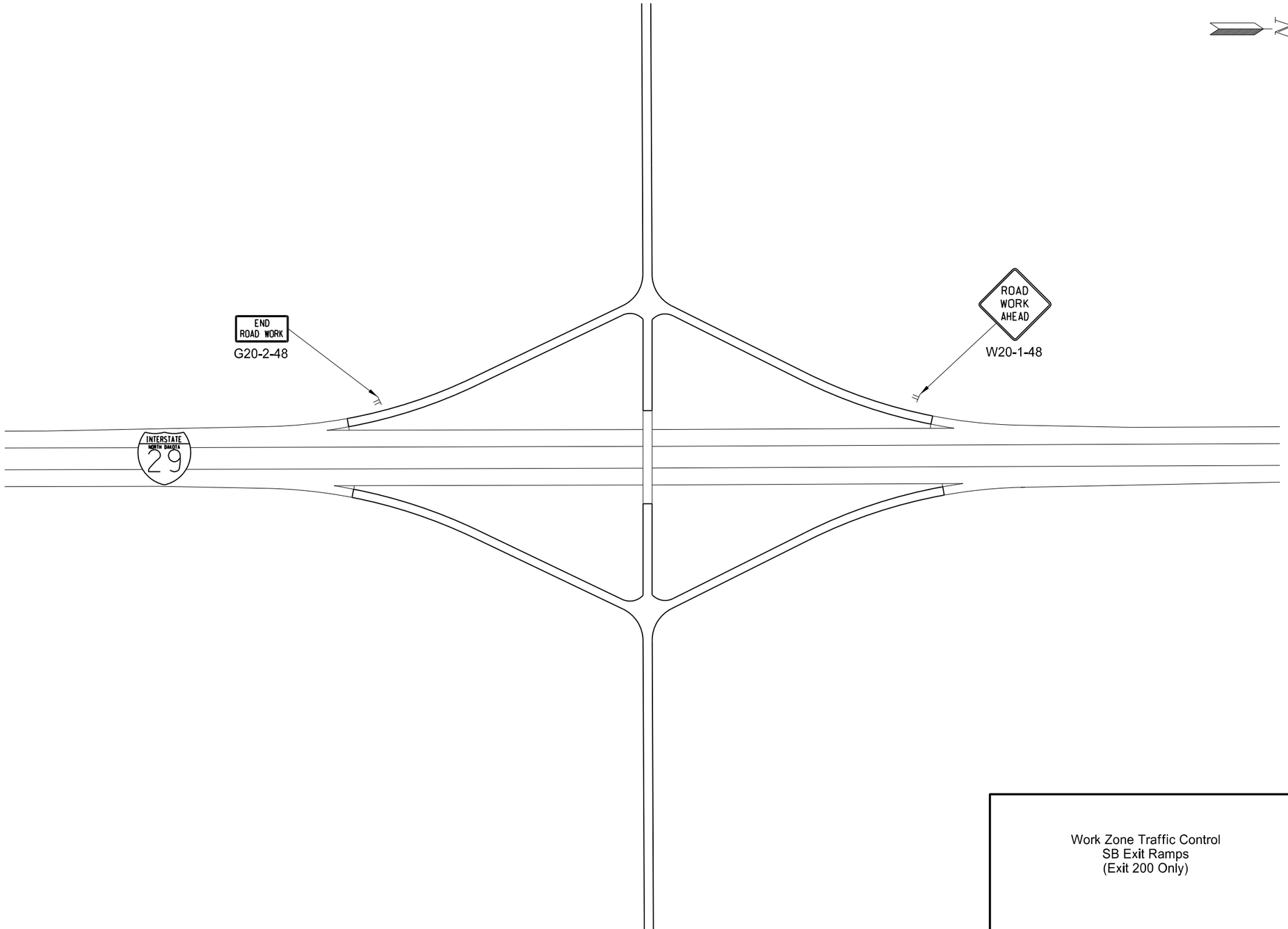
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/14/2025 10:48:03 AM lsteyn R:\project\60029197.163\District\Sheets\100WZ_ConSign\100WZ_004_Consign.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	100	5



Work Zone Traffic Control
SB Exit Ramps
(Exit 200 Only)

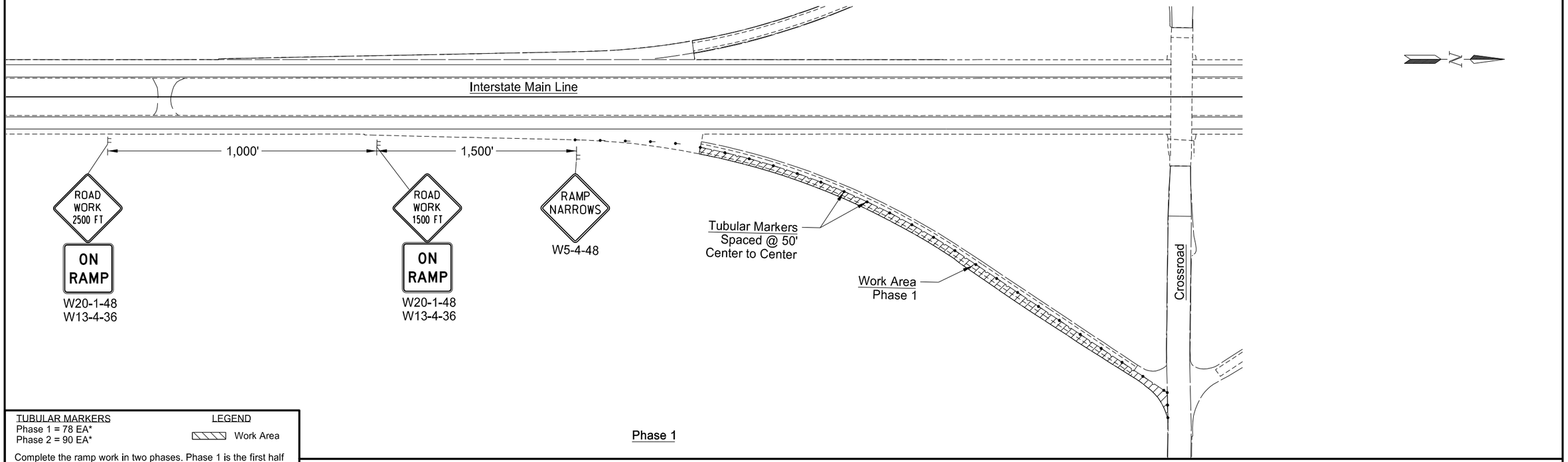
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/14/2025 2:38:14 PM lsteyn R:\project\60029197.163\District\Sheets\100WZ_ConSign\100WZ_005_WZTCRamps.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	100	6



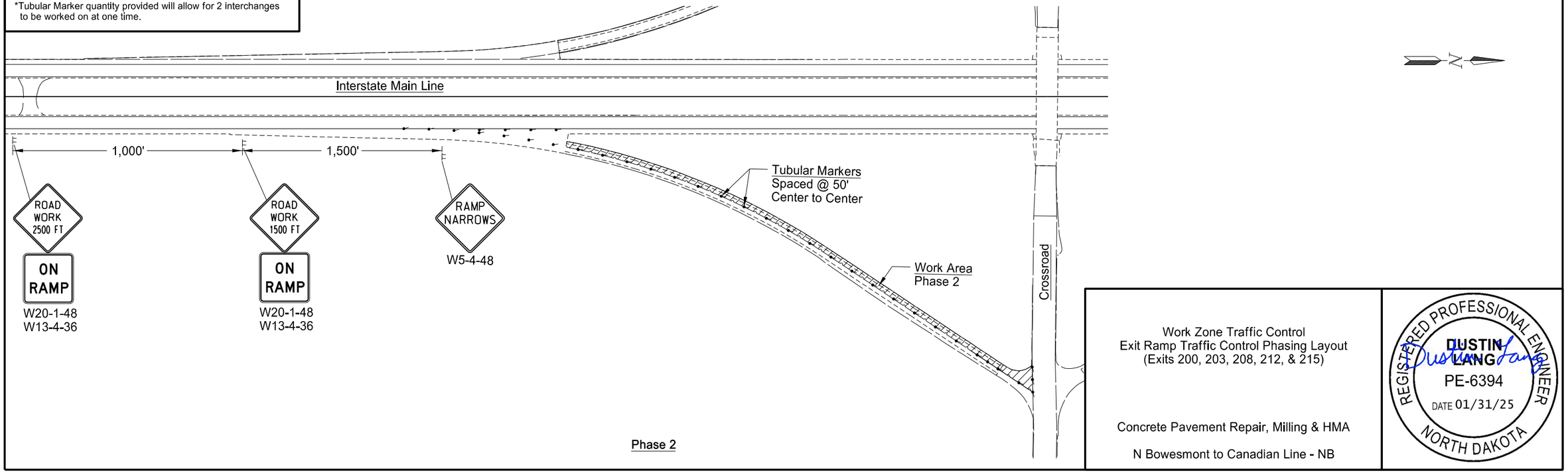
Phase 1

TUBULAR MARKERS
Phase 1 = 78 EA*
Phase 2 = 90 EA*

LEGEND
Work Area

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

*Tubular Marker quantity provided will allow for 2 interchanges to be worked on at one time.



Phase 2

Work Zone Traffic Control
Exit Ramp Traffic Control Phasing Layout
(Exits 200, 203, 208, 212, & 215)

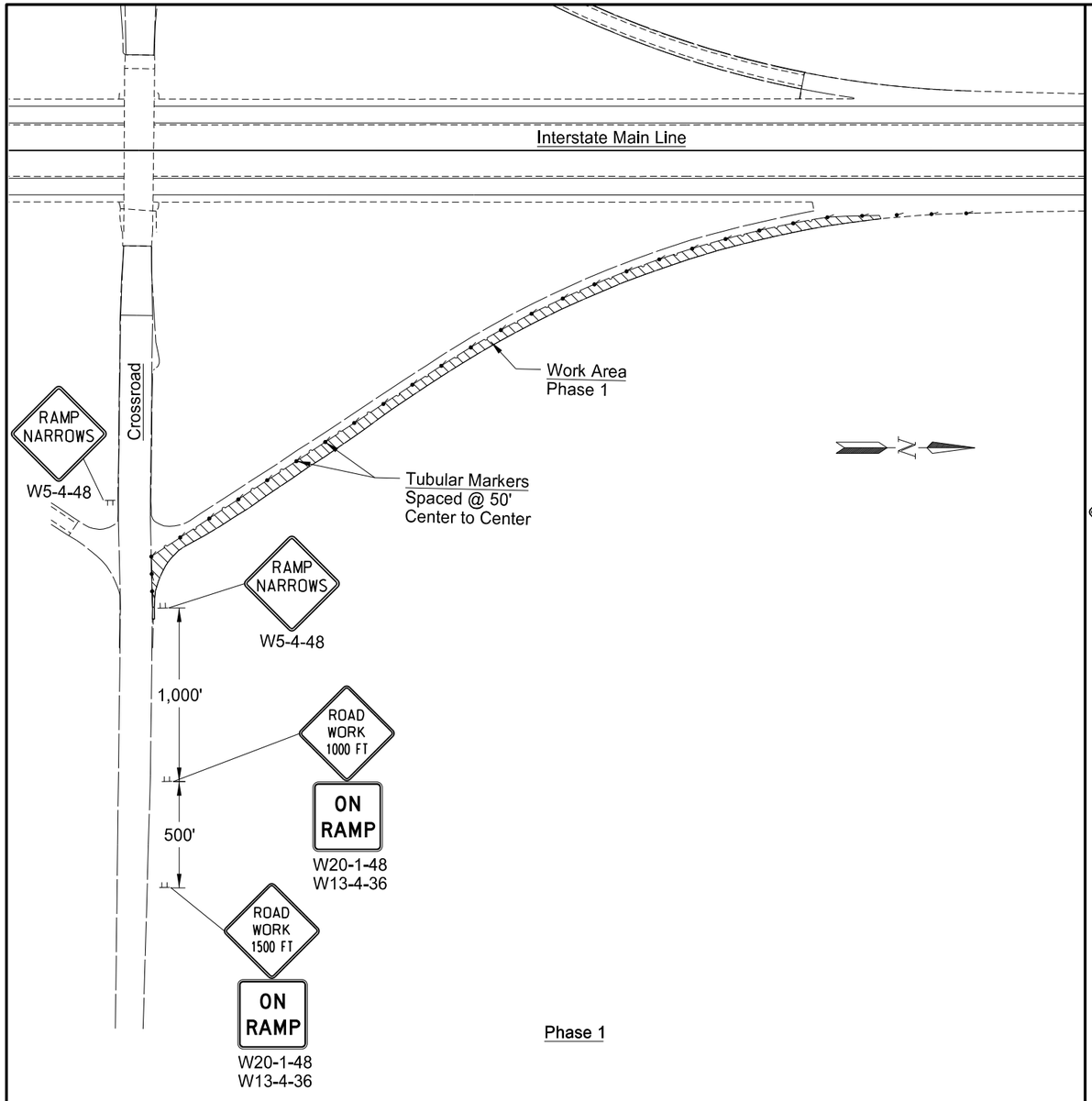
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

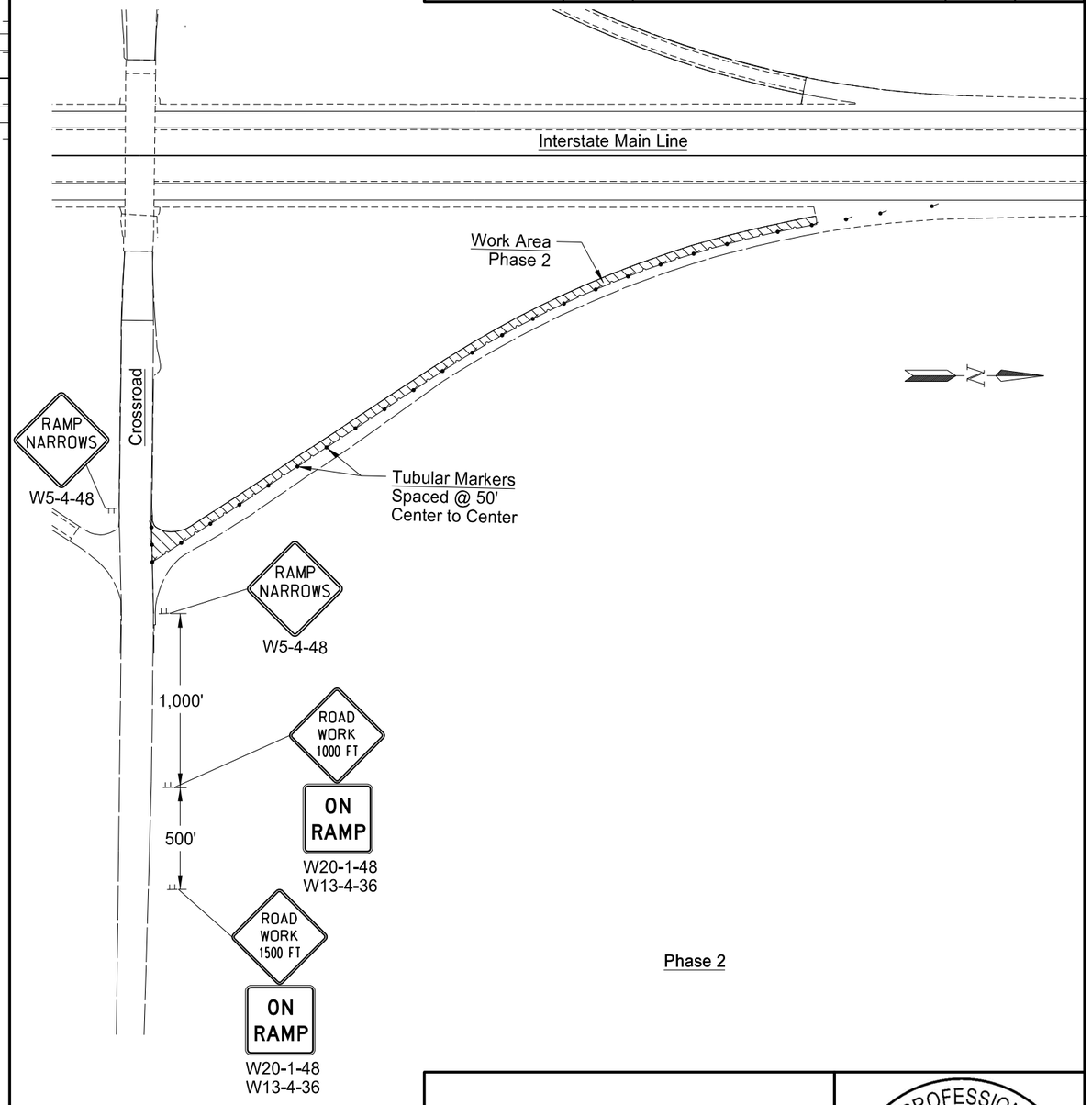
REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/14/2025 3:48:08 PM lsteyn R:\project\60029197.163\District\Sheets\100WZ_ConSign\100WZ_006_WZTC_Exit_Ramp_TC_Phasing.dgn

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(163)197	100	7



Phase 1



Phase 2

TUBULAR MARKERS
Phase 1 = 72 EA*
Phase 2 = 68 EA*

LEGEND
Work Area

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

*Tubular Marker quantity provided will allow for 2 interchanges to be worked on at one time.

Work Zone Traffic Control
Entrance Ramp Traffic Control Phasing Layouts
(Exits 200, 203, 208, 212, & 215)

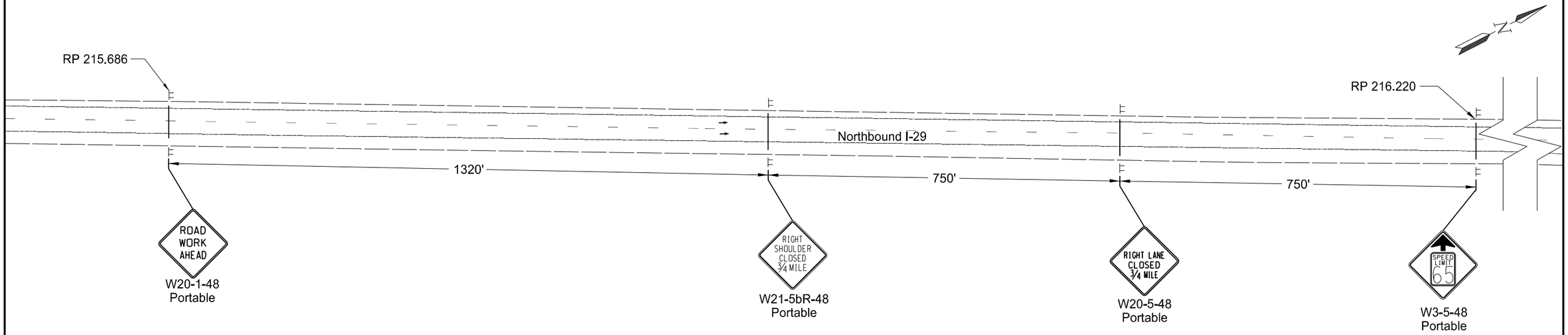
Concrete Pavement Repair, Milling & HMA

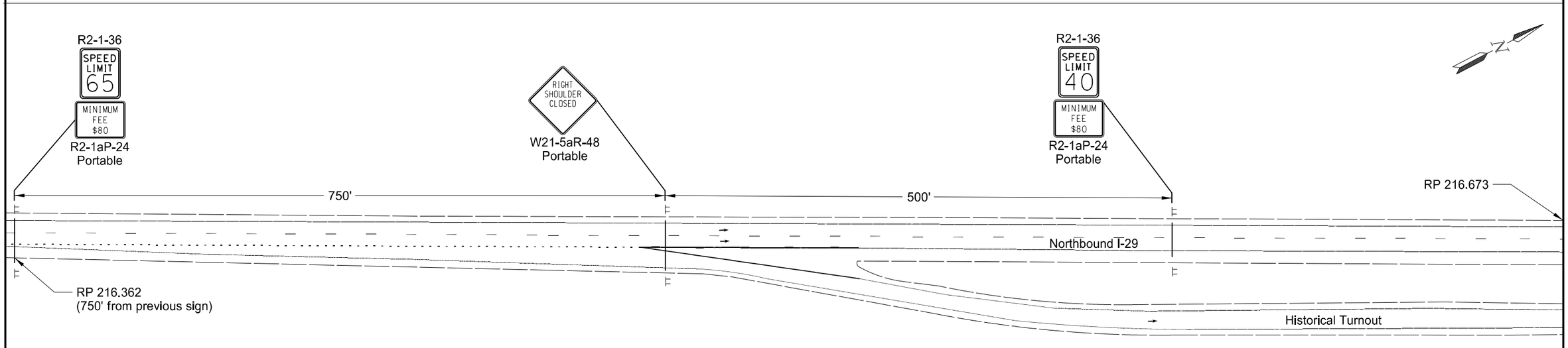
N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/14/2025 3:50:02 PM lsteyn R:\project\60029197.163\District\Sheets\100WZ_ConSign\100WZ_007_WZTC_Entrance_Ramp_TC_Phasing.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	100	8





- Sign
- Tubular Marker
- Delineator Drum
- Type III Barricade
- Flagger
- Work Area

Work Zone Traffic Control
Pembina Border Crossing, Phase 1
Concrete Pavement Repair

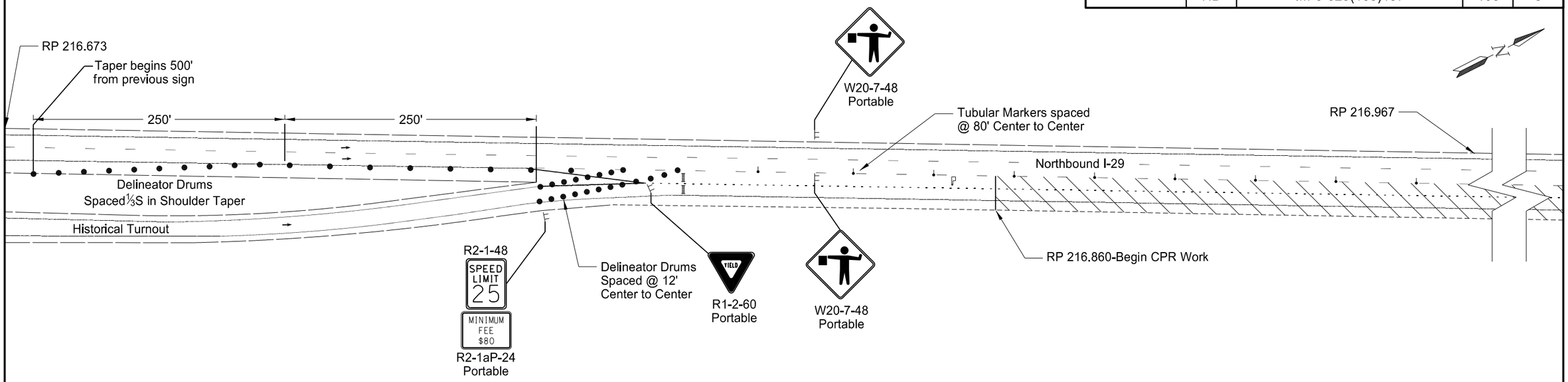
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/15/2025 12:21:46 PM lsteyn R:\project\60029197.163\District\Sheets\100WZ_ConSign\100WZ_008_WZTC at border.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	100	9



Sign
Tubular Marker
Delineator Drum
Type III Barricade
Flagger
Work Area

Work Zone Traffic Control
Pembina Border Crossing, Phase 1
Concrete Pavement Repair

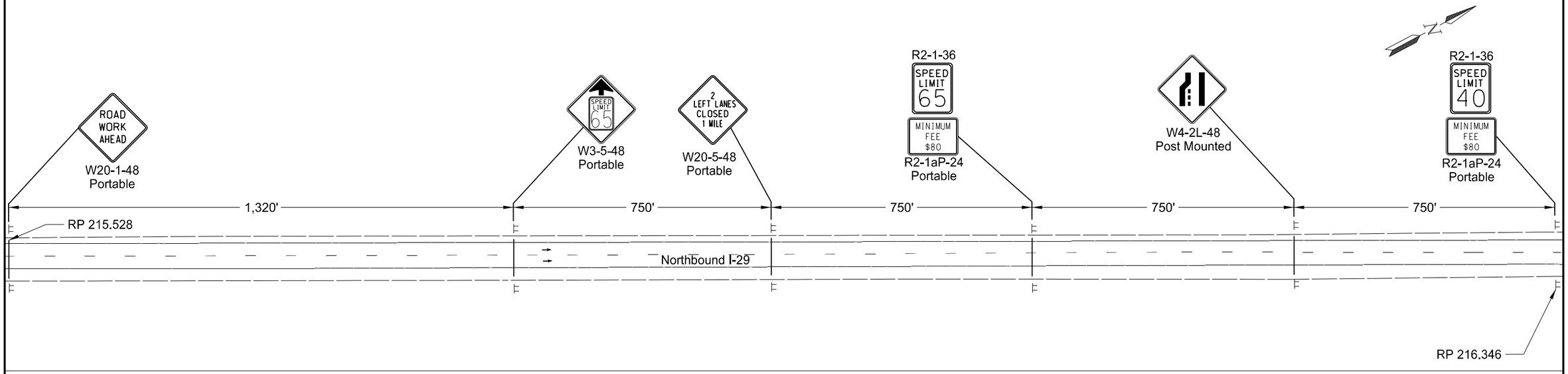
Concrete Pavement Repair, Milling & HMA

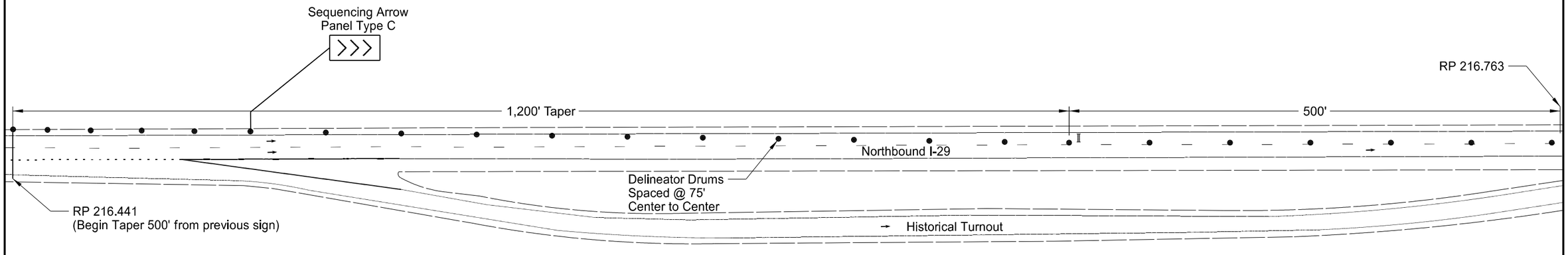
N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/15/2025 12:21:46 PM lsteyn R:\project\60029197.163\District\Sheets\100WZ_ConSign\100WZ_008_WZTC at border.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	100	10





- Sign
- Tubular Marker
- Delineator Drum
- Type III Barricade
- Flagger
- Work Area

Work Zone Traffic Control
Pembina Border Crossing, Phase 2
Concrete Pavement Repair

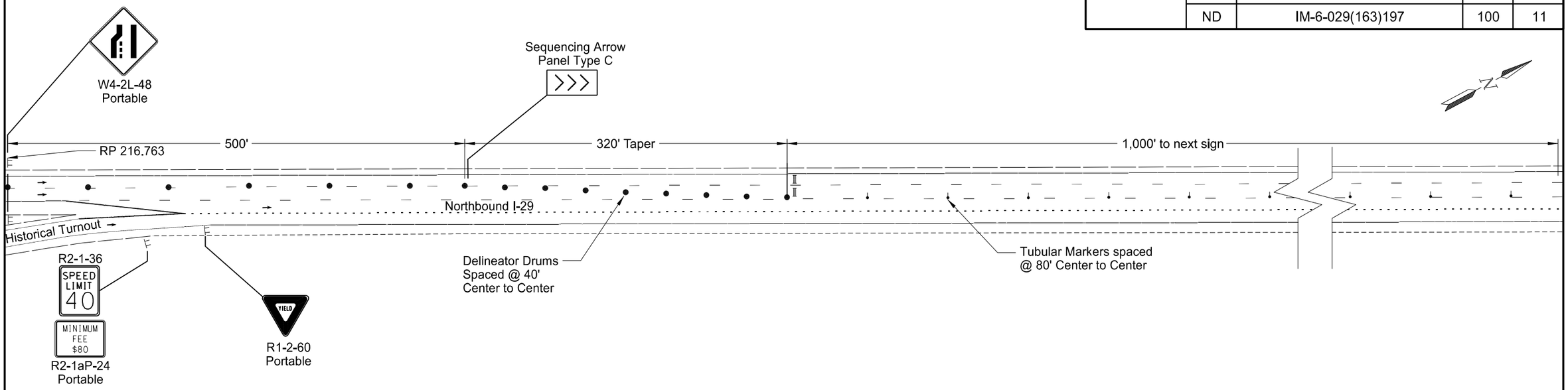
Concrete Pavement Repair, Milling & HMA

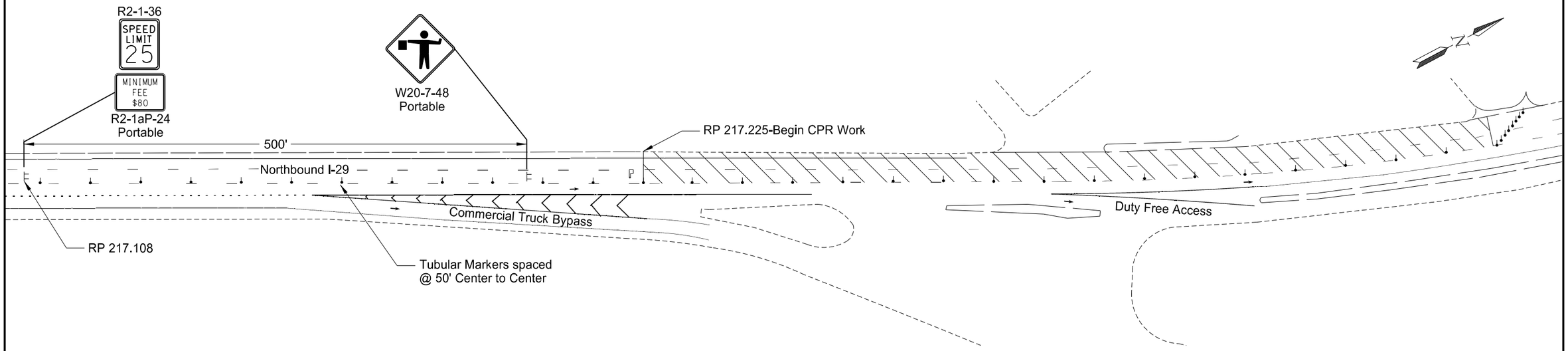
N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/15/2025 12:21:47 PM lsteyn R:\project\60029197.163\District\Sheets\100WZ_ConSign\100WZ_008_WZTC at border.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	100	11





- Sign
- Tubular Marker
- Delineator Drum
- Type III Barricade
- Flagger
- Work Area

Work Zone Traffic Control
Pembina Border Crossing, Phase 2
Concrete Pavement Repair

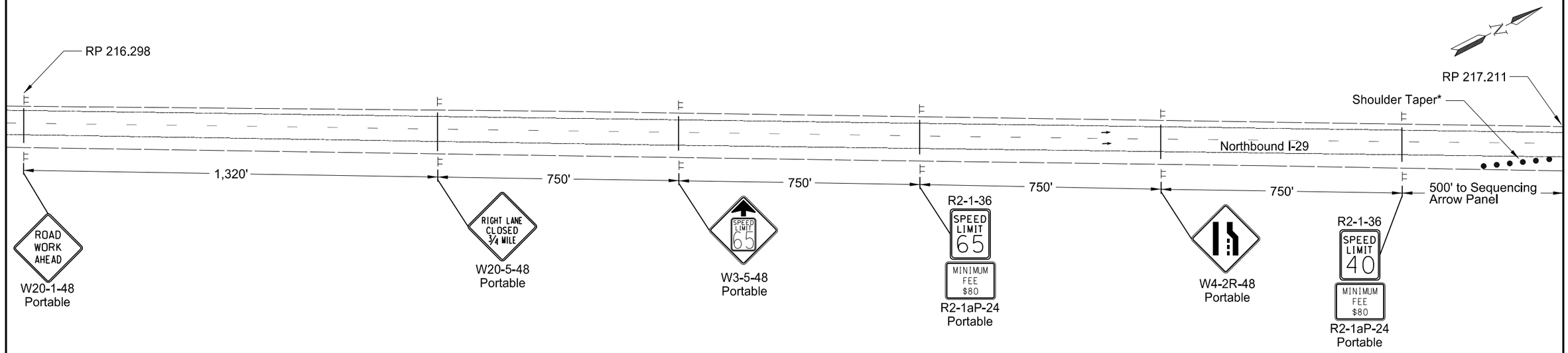
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

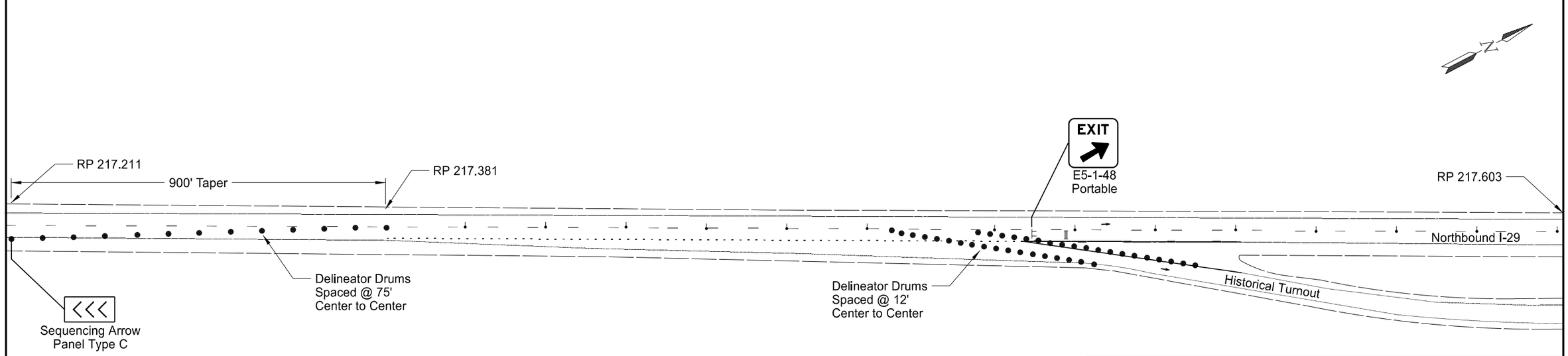
REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/15/2025 12:21:47 PM lsteyn R:\project\60029197.163\District\Sheets\100WZ_ConSign\100WZ_008_WZTC at border.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	100	12



*Delineator Drums in Shoulder Taper Spaced 25' Center to Center (1/3S)



Sign
Tubular Marker
Delineator Drum
Type III Barricade
Flagger
Work Area

Work Zone Traffic Control
Pembina Border Crossing, Phase 1
Mill & HMA

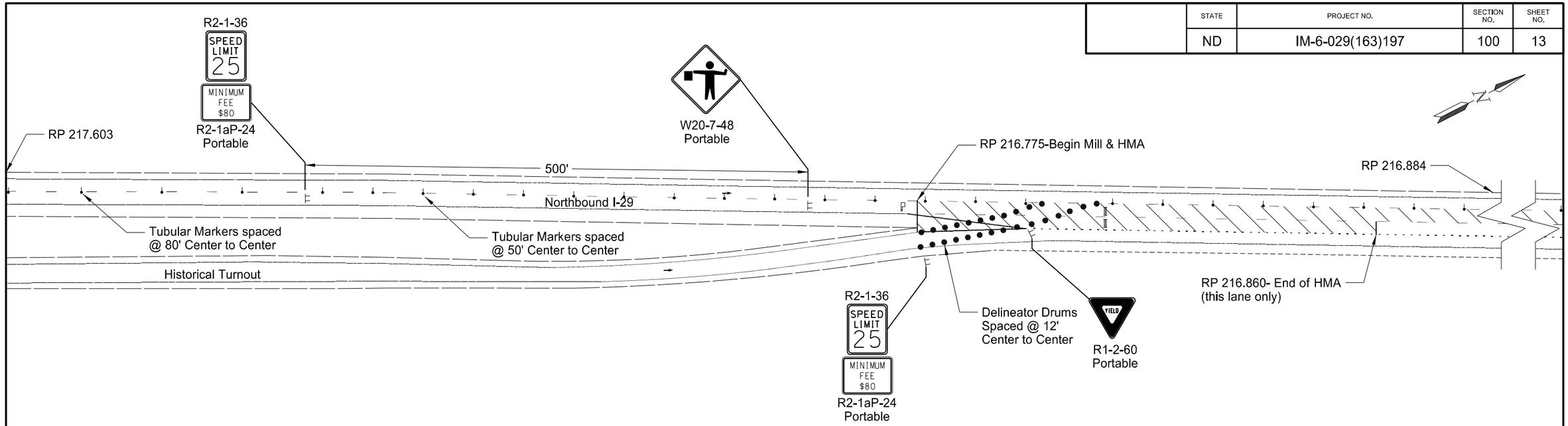
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/15/2025 12:21:47 PM lsteyn R:\project\60029197.163\District\Sheets\100WZ_ConSign\100WZ_008_WZTC at border.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	100	13



- Sign
- Tubular Marker
- Delineator Drum
- Type III Barricade
- Flagger
- Work Area

Work Zone Traffic Control
Pembina Border Crossing, Phase 1
Mill & HMA

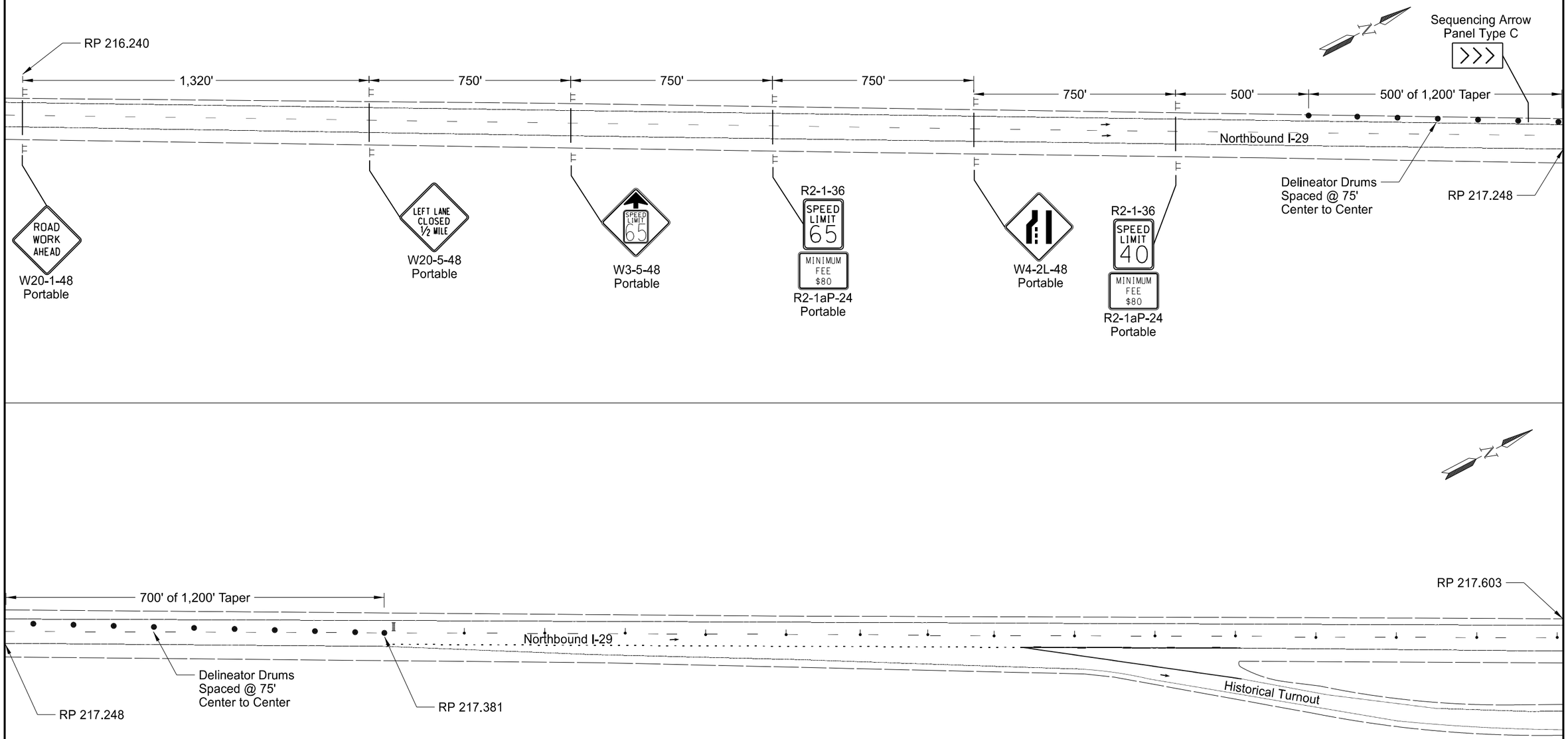
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/15/2025 12:21:47 PM lsteyn R:\project\60029197.163\District\Sheets\100WZ_ConSign\100WZ_008_WZTC at border.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	100	14



- Sign
- Tubular Marker
- Delineator Drum
- Type III Barricade
- Flagger
- Work Area

Work Zone Traffic Control
Pembina Border Crossing, Phase 2
Mill & HMA

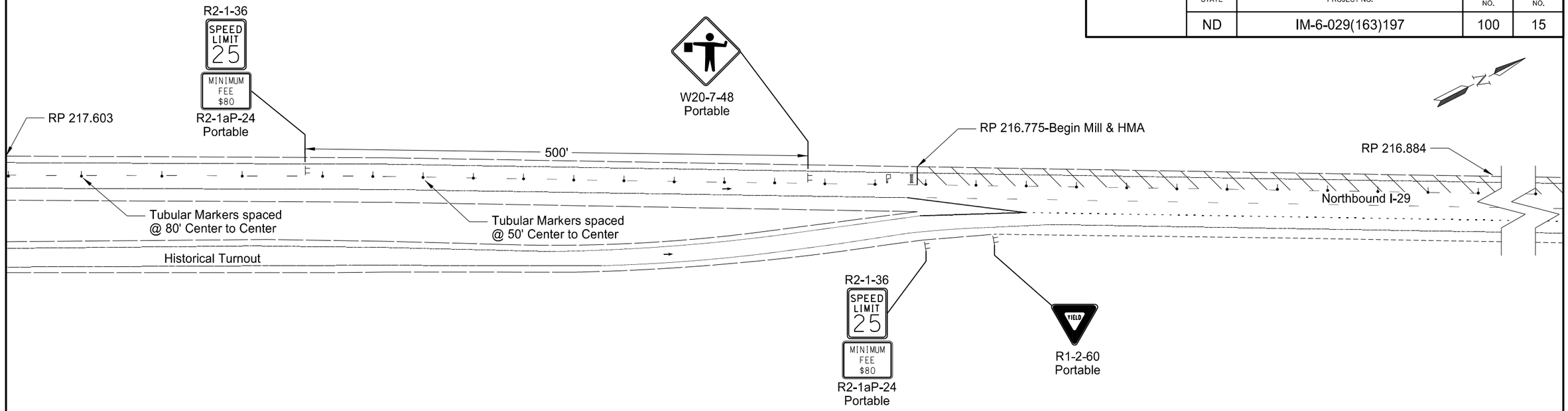
Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/15/2025 12:21:48 PM lsteyn R:\project\60029197.163\District\Sheets\100WZ_ConSign\100WZ_008_WZTC at border.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-6-029(163)197	100	15



- Sign
- Tubular Marker
- Delineator Drum
- Type III Barricade
- Flagger
- Work Area

Work Zone Traffic Control
Pembina Border Crossing, Phase 2
Mill & HMA

Concrete Pavement Repair, Milling & HMA

N Bowesmont to Canadian Line - NB

REGISTERED PROFESSIONAL ENGINEER
DUSTIN LANG
PE-6394
DATE 01/31/25
NORTH DAKOTA

1/15/2025 12:21:48 PM lsteyn R:\project\60029197.163\District\Sheets\100WZ_ConSign\100WZ_008_WZTC at border.dgn

NDDOT ABBREVIATIONS

D-101-1

?	This is a special text character used in the labeling of existing features. It indicates a feature that has an unknown characteristic, potentially based on: lack of description, location accuracy or purpose.
Abn	abandoned
Abut	abutment
Adj	adjusted
Aggr	aggregate
Ahd	ahead
ARV	air release valve
Align	alignment
Al	alley
Alt	alternate
Alum	aluminum
ADA	Americans with Disabilities Act
&	and
Appr	approach
Approx	approximate
ACP	asbestos cement pipe
Asph	asphalt
AC	asphalt cement
Assmd	assumed
@	at
Atten	attenuation
ATR	automatic traffic recorder
Ave	Avenue
Avg	average
ADT	average daily traffic
Bk	back
BF	back face
Balc	balcony
B Wire	barbed wire
Barr	barricade
Btry	battery
BI	beehive inlet
Beg	begin
BG	below grade
BM	bench mark
Bkwy	bikeway
Bit	bituminous
Blk	block
BH	bore hole
Bot	bottom
Blvd	Boulevard
Bndry	boundary
Brkwy	breakaway
Br	bridge
Bldg	building
Bus.	business
BV	butterfly valve
Byp	bypass
C Gdrl	cable guardrail
Calc	calculate
CIP	cast iron pipe
CB	catch basin
CRS	cationic rapid setting
C Gd	cattle guard
C To C	center to center
CL or ℄	centerline
Ch	chain
Chnlk	chain-link
Ch Blk	channel block
Ch Ch	channel change
Chk	check
Chsld	chiseled
Cir	circle
Cl	class
Clnt	clean-out
Clr	clear
Cl&gr	clearing & grubbing
Comb.	combination
Coml	commercial
Compr	compression
CADD	computer aided drafting & design
Conc	concrete
CECB	concrete erosion control blanket
Cond	conductor
Const	construction
Cont	continuous
CSB	continuous split barrel sample
Contr	contraction
Contr	contractor
CP	control point
Coord	coordinate
Cor	corner
Corr	corrected
CAES	corrugated aluminum end section
CAP	corrugated aluminum pipe
CMES	corrugated metal end section
CMP	corrugated metal pipe
CPVCP	corrugated poly-vinyl chloride pipe
CSES	corrugated steel end section
CSFES	corrugated steel flared end section
CSP	corrugated steel pipe
CSTES	corrugated steel traversable end section
Co	County
Crse	course
Ct	Court
Xarm	cross arm
Xbuck	cross buck
Xsec	cross sections
Xing	crossing
Xrd	crossroad
Crn	crown
Culv	culvert
C&G	curb & gutter
CI	curb inlet
CR	curb ramp
C	cut
Dd Ld	dead load
Defl	deflection
Defm	deformed
Dlnt	delineate
Dlntr	delineator
Depr	depression
Desc	description
Det	detail
DWP	detectable warning panel
Dtr	detour
Dia or ø	diameter
Dir	direction
Dist	distance
DM	disturbed material
DB	ditch block
DG	ditch grade
Dbl	double
Dn	down
Dwg	drawing
Dr	drive
Drwy	driveway
DI	drop inlet
D	dry density
Ea	each
Esmt	easement
E	East
EB	Eastbound
Elast	elastomeric
EL	electric locker
E Mtr	electric meter
Elec	electric/al
EDM	electronic distance meter
Elev or El	elevation
Ellipt	elliptical
Emb	embankment
Emuls	emulsion/emulsified
ES	end section
Engr	engineer
ESS	environmental sensor station
Eq	equal
Evgr	evergreen
Exc	excavation
Exst	existing
Exp	expansion
Expy	Expressway
E	external of curve
Extru	extruded
FOS	factor of safety
Fed	Federal
FP	feed point
Fn	fence
Fn P	fence post
FO	fiber optic
FD	field drive
F	fill
FAA	fine aggregate angularity
FH	fire hydrant
Fl	flange
Flrd	flared
FES	flared end section
F Bcn	flashing beacon
FA	flight auger sample
FL	flow line
Ftg	footing
FM	force main
Fnd	found
Fdn	foundation
Frac	fractional
Frwy	freeway
Frt	front
FF	front face
F Disp	fuel dispenser
FFP	fuel filler pipes
FLS	fuel leak sensor
Furn	furnish/ed

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
04-23-18	General Revisions
09-20-18	General Revisions
12-18-20	General Revisions
08-16-22	General Revisions

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

NDDOT ABBREVIATIONS

D-101-2

Galv	galvanized
Gar	garage
Gs L	gas line
G Reg	gas line regulator
GMV	gas main valve
G Mtr	gas meter
GSV	gas service valve
GVP	gas vent pipe
GV	gate valve
Ga	gauge
Gov	government
Grd	graded/grade
Grnd	ground
GWM	ground water monitor
Gdrl	guardrail
Gtr	gutter
H Plg	H piling
Hdwl	headwall
Ht	height
Hel	helical
HDPE	high density polyethylene
HM	high mast
HP	high pressure
HPS	high pressure sodium
HTCG	high tension cable guardrail
Hwy	highway
Hor	horizontal
HBP	hot bituminous pavement
HMA	hot mix asphalt
Hyd	hydrant
Ph	hydrogen ion content
Id	identification
Incl	inclinometer tube
IMH	inlet manhole
ID	inside diameter
Inst	instrument
Intchg	interchange
Intmdt	intermediate
Intscn	intersection
Inv	invert
IP	iron pipe
Jt	joint
Jct	junction

Ln	lane
Lg	large
Lat	latitude
Lt	left
Lens	lenses
Lvl	level
Lvlng	leveling
Lht	light
LP	light pole
Ltg	lighting
Liq	liquid
LL	liquid limit
Loc	location
Long.	longitude
Lp	loop
LD	loop detector
Lum	luminaire
Mb	mailbox
ML	main line
MH	manhole
Mkd	marked
Mkr	marker
Mkg	marking
MA	mast arm
Matl	material
Max	maximum
MC	meander corner
Meas	measure
Mdn	median
MD	median drain
MC	medium curing
MGS	Midwest Guardrail System
MM	mile marker
MP	mile post
Min	minimum
Misc	miscellaneous
Mon	monument
Mnd	mound
Mtbl	mountable
Mtd	mounted
Mtg	mounting
Mk	muck
Neop	neoprene
Ntwk	network
N	North
NE	North East
NW	North West
NB	Northbound
No. or #	number

Obsc	obscure(d)
Ocpd	occupied
Ocpy	occupy
O/s	offset
OC	on center
C	one dimensional consolidation
OC	organic content
Orig	original
O To O	out to out
OD	outside diameter
OH	overhead
PMT	pad mounted transformer
Pg	pages
Pntd	painted
Pr	pair
Pnl	panel
Pk	park
PSD	passing sight distance
Pvmt	pavement
Ped	pedestal
Ped	pedestrian
PPP	pedestrian pushbutton post
Pen.	penetration
Perf	perforated
Per.	perimeter
Perm	permanent
PL	pipeline
Pl	place
P&P	plan & profile
PL	plastic limit
Pl or ℄	plate
Pt	point
PE	polyethylene
PVC	polyvinyl chloride
PCC	Portland Cement concrete
PP	power pole
Preempt	preemption
Prefab	prefabricated
Prfmd or Pref	preformed
Prep	preperation
Press.	pressure
PRV	pressure relief valve
Prestr	prestressed
Pvt	private
PD	private drive
Prod.	production/produce
Prog	programmed
Prop.	property
Prop Ln	property line
Ppsd	proposed
PB	pull box

Qty	quantity
Qtr	quarter
Rad or R	radius
RR	railroad
Rlwy	railway
Rsd	raised
RC	rapid curing
Rec	record
Rcy	recycle
RAP	recycled asphalt pavement
RPCC	recycled portland cement concrete
Ref	reference
R Mkr	reference marker
RM	reference monument
RP	reference point
Refl	reflectorized
RCB	reinforced concrete box
RCES	reinforced concrete end section
RCFES	reinforced concrete flared end section
RCP	reinforced concrete pipe
RCPS	reinforced concrete pipe sewer
RCTES	reinforced concrete traversable end section
Reinf	reinforcement
Res	reservation
Res	residence
Ret	retaining
Rev	reverse
Rt	right
R/W	right of way
Riv	river
Rd	road
Rdbd	road bed
Rdwy	roadway
RWIS	roadway weather information system
Rk	rock
Rt	route

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

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

Salv	salvage(d)
San	sanitary sewer line
Sec	section
SL	section line
Sep	separation
Seq	sequence
Serv	service
Sht	sheet
Shtng	sheeting
Shldr	shoulder
Sw or Sdwk	sidewalk
SD	sight distance
SN	sign number
Sig	signal
Sgl	single
SRCP	slotted reinforced concrete pipe
SC	slow curing
SS	slow setting
Sm	small
S	South
SE	South East
SW	South West
SB	Southbound
Sp	spaces
Spcl	special
SA	special assembly
SP	special provisions
G	specific gravity
Spk	spike
SB	split barrel sample
SH	sprinkler head
SV	sprinkler valve
Sq	square
Stk	stake
Std	standard
N	standard penetration test
Std Specs	standard specifications
Stm L	steam line
SEC	steel encased concrete
SMA	stone matrix asphalt
SSD	stopping sight distance
SD	storm drain
St	street
SPP	structural plate pipe
SPPA	structural plate pipe arch
Str	structure
Subd	subdivision
Sub	subgrade
Sub Prep	subgrade preperation
Ss	subsoil
SS	supplement specification
Supp	supplemental
Surf	surfacing
Surv	survey
Sym	symmetrical

Tel	telephone
Tel B	Telephone Booth
Tel P	telephone pole
Tv	television
Temp	temperature
Temp	temporary
TBM	temporary bench mark
T	thinwall tube sample
Ts	topsoil
Traf	traffic
TSCB	traffic signal control box
Tr	trail
Transf	transformer
Trans	transition
TT	transmission tower
TES	traversable end section
Trans	transverse
Trtd	treated
Trmt	treatment
Qc	triaxial compression
TERO	tribal employment rights ordinance
Tpl	triple
Typ	typical
Qu	unconfined compressive strength
Ugrnd	underground
Util	utility
VG	valley gutter
Vap	vapor
Vert	vertical
VCP	vitrified clay pipe
Vol	volume
VSFS	vehicle speed feedback sign
Wkwy	walkway
W	water content
WGV	water gate valve
WL	water line
WM	water main
WMV	water main valve
W Mtr	water meter
WSV	water service valve
WW	water well
Wrng	wearing
WIM	weigh in motion
W	west
WB	westbound
Wrng	wiring
W/	with
W/o	without
WC	witness corner

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

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

08/16/22

NDDOT ABBREVIATIONS

MEASUREMENTS

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

SURVEY DESCRIPTIONS

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

SOIL TYPES

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

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
07-01-14

REVISIONS

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

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

NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
04-23-18	General Revisions
09-20-18	General Revisions
12-18-20	General Revisions
08-16-22	General Revisions

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

08/16/22

LINE STYLES

D-101-20

Existing Topography

- Existing Ground Void
- Existing Cemetary Boundary
- Existing Box Culvert Bridge
- Existing Concrete Surface
- Existing Drainage Structure
- Existing Gravel Surface
- Existing Riprap
- Existing Dirt Surface
- Existing Asphalt Surface
- Existing Tie Point Line
- Existing Railroad Centerline
- Existing Guardrail Cable
- Existing Guardrail Metal
- Existing Edge of Water
- Existing Fence
- Existing Railroad
- Existing Field Line
- Exst Flow
- Existing Curb
- Existing Valley Gutter
- Existing Driveway Gutter
- Existing Curb and Gutter
- Existing Mountable Curb and Gutter
- Existing 3-Cable w Posts
- Site Boundary
- Existing Berm, Dike, Pit, or Earth Dam
- Existing Ditch Block
- Existing Tree Boundary
- Existing Brush or Shrub Boundary
- Existing Retaining Wall
- Existing Planter or Wall
- Existing W-Beam Guardrail with Posts
- Existing Railroad Switch
- Gravel Pit - Borrow Area
- Existing Wet Area-Vegetation Break
- Existing High Tension Cable Guardrail
- Existing High Tension Cable Guardrail with Posts

Proposed Topography

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

Existing Utilities

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

Proposed Utilities

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

Traffic Utilities

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

Sign Structures

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

07-01-14

REVISIONS

DATE	CHANGE
09-23-16 12-18-20	Added and Revised Items, Organized by Functional Groups General Revisions

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

Kirk J Hoff

12 18 2020

LINE STYLES

D-101-21

Right Of Way

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

Boundary Control

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

Cross Sections and Typicals

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

Geotechnical

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

Countours

- Depression Contours
- Supplemental Contour

Profile

- Subgrade, Subcut or Ditch Grade
- Topsoil Profile

Striping

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

Pavement Joints

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

Bridge Details

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

Erosion Control

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

Environmental

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

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

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

12 18 2020

SYMBOLS

D-101-30

North Arrow (Half Scale)

Alignment Data Point

Alignment Monument

Spot Elevation

Existing Miscellaneous Spot

Existing Access Control Arrow

Existing Benchmark

Reset USGS Marker

Iron Monument Found

Iron Pin R/W Monument

Property Corner

Iron Pin Reference Monument

Right of Way Marker (Exst, Ppsd, Reset)

Existing Federal Reference Corner

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

Existing Witness Corner

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

Existing Traverse PI Aerial Panel

Existing Reference Marker Point NGS

Existing EFB Misc

Existing Bush or Shrub

Existing Large Evergreen Tree

Existing Small Evergreen Tree

Existing Large Tree

Existing Small Tree

Existing Tree Trunk

Cairn or Stone Circle

Existing Artifact

Existing Satellite Dish

Existing Weather Station

Existing Windmill or Tower

Reinforced Pavement

CSB Continuous Split Barrel Sample

FA Flight Auger Sample

SB Split Barrel Sample

T Thinwall Tube Sample

N Standard Penetration Test

Incl Inclinometer Tube

Excavation Unit

Existing Ground Water Well Bore Hole

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

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

Kirk J Hoff

12 18 2020

SYMBOLS

D-101-31

- Flexible Delineator
- Flexible Delineator Type A (Exst, Ppsd)
- Flexible Delineator Type B (Exst, Ppsd)
- Flexible Delineator Type C (Exst, Ppsd)
- Flexible Delineator Type D (Exst, Ppsd)
- Flexible Delineator Type E (Exst, Ppsd)
- Delineator Type A (Exst, Ppsd, Diamond Grade-Reset)
- Delineator Type B (Exst, Ppsd, Diamond Grade-Reset)
- Delineator Type C (Exst, Ppsd, Diamond Grade)
- Delineator Type D (Exst, Ppsd, Diamond Grade)
- Delineator Type E (Exst, Ppsd, Diamond Grade)
- Barricade (Type I, Type II, Type III}
- Arrow Panel (Caution Mode, Double Direction, Left Directional, Right Directional, Sequencing, Truck Mounted)
- Attenuation Device
- Truck Mounted Attenuator
- Delineator Drums
- Flagger
- Tubular Marker
- Traffic Cone
- Back to Back Vertical Panel Sign

- Highway Sign (Exst, Ppsd)
- Mile Post Type A (Exst-Ppsd-Reset)
- Mile Post Type B (Exst, Ppsd)
- Mile Post Type C (Exst, Ppsd)
- Object Marker Type I (Exst, Ppsd)
- Object Marker Type II (Exst, Ppsd)
- Object Marker Type III (Exst, Ppsd)
- Existing Reference Marker
- Road Closure Gate 18 Ft (Exst, Ppsd)
- Road Closure Gate 28 Ft (Exst, Ppsd)
- Road Closure Gate 40 Ft (Exst, Ppsd)
- Existing Railroad Battery Box
- Existing RR Profile Spot
- Existing Railroad Crossbuck
- Existing Railroad Frog
- Existing Mailbox (Private, Federal)

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

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

Kirk J Hoff

12 18 2020

SYMBOLS

D-101-32

- Existing Luminaire
- Luminaire LED
- Existing Light Standard Luminaire
- Relocate Light Standard
- Light Standard Light LED Luminaire
- Light Standard 35 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 50 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 70 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 100 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 150 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 200 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 250 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 310 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 400 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 700 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire
- Emergency Vehicle Detector
- Video Detection Camera

- High Mast Light Standard 3 Luminaire (Exst, Ppsd)
- High Mast Light Standard 4 Luminaire (Exst, Ppsd)
- High Mast Light Standard 5 Luminaire (Exst, Ppsd)
- High Mast Light Standard 6 Luminaire (Exst, Ppsd)
- High Mast Light Standard 7 Luminaire (Exst, Ppsd)
- High Mast Light Standard 8 Luminaire (Exst, Ppsd)
- High Mast Light Standard 9 Luminaire (Exst, Ppsd)
- High Mast Light Standard 10 Luminaire (Exst, Ppsd)
- Overhead Sign Structure Load Center (Exst, Ppsd)
- Traffic Signal Controller (Exst, Ppsd)
- Pad Mounted Traffic Signal Controller (Exst, Ppsd)
- Flashing Beacon (Exst, Ppsd)
- Concrete Foundation (Exst, Ppsd)
- Pipe Mounted Flasher (Exst, Ppsd)
- Pad Mounted Feed Point (Exst, Ppsd)
- Pipe Mounted Feed Point with Pad (Exst, Ppsd)
- Pole Mounted Feed Point (Exst, Ppsd)
- Junction Box (Exst, Ppsd)
- Existing Pedestrian Head with Number
- Existing Signal Head
- Pole Mounted Head
- Existing Lighting Standard Pole

- Existing Traffic Signal Standard
- Pull Box (Exst-Ppsd-Undefined)
- Intelligent Transportation Pull Box (Exst, Ppsd)
- Transformer (Exst, Ppsd)
- Power Pole (Exst-Ppsd-with Transformer)
- Wood Pole (Exst, Ppsd)
- Pedestrian Push Button Post (Exst, Ppsd)
- Existing Pole
- Existing Telephone Pole
- Existing Post
- Connection Conductor (Ground, Neutral, Phase 1, Phase 2)

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

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

12 18 2020

SYMBOLS

D-101-33

Existing Manhole (Electrical, Gas, Telephone)

Water Manhole (Exst, Exst with Valve)

Sanitary Sewer Manhole (Exst, Ppsd, Exst with Valve)

Sanitary Force Main Manhole (Exst, Ppsd, Exst with Valve)

Storm Drain Manhole (Exst, Ppsd, Exst with Inlet, Ppsd with Inlet)

Force Main Storm Drain Manhole (Exst, Exst with Valve)

Manhole (Ppsd, Ppsd 48 Inch, Exst Undefined)

Existing Water Appurtenance

Sprinkler Head (Exst, Ppsd)

Fire Hydrant (Exst, Ppsd)

Cleanout (Exst Sanitary, Underdrain)

Existing Catch Basin Inlet (Round, Square)

Existing Curb Inlet (Round, Square)

Existing Slotted Reinforced Concrete Pipe

Catch Basin (Riser 30 Inch, Beehive, Type A)

Inlet Mountable Curb (Type A, Type B)

Inlet Saddle Base (Type 1, Type 2)

Inlet Special (Catch Basin, Type 1, Type A)

Inlet (Tee, Type 1, Type 2, Type 2 Double)

Median Drain

Headwall (Exst, Ppsd, Ppsd Single with Vegitation Barrier, Ppsd Double with Vegitation Barrier)

Cap or Stub
Exst Gas, Exst Sanitary, Exst Storm Drain, Ppsd Storm Drain, Exst Water

Existing Pedestal
Electrical, Telephone, Fiber Optic Telephone, TV, Fiber Optic TV, Undefined

Existing Pipe Vent
Gas, Fuel, Sanitary, Storm Drain, Water, Undefined

Valve
Exst Gas, Exst Water, Ppsd Water, Exst Undefined

Pump
Sanitary, Storm Drain, Exst Water

Corrugated Metal End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)

Reinforced Concrete End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)

Existing Utility Marker

Existing Meter

Existing Fuel Dispensers

Existing Fuel Filler Pipes

Existing Fuel Leak Sensors

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

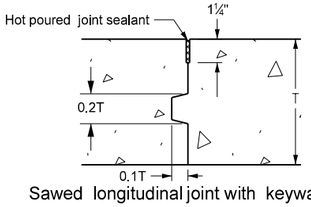
KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

12 18 2020

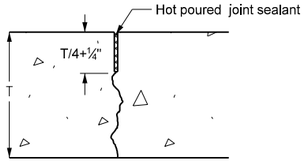
LONGITUDINAL JOINT DETAILS

D-550-2

UNTIED JOINTS

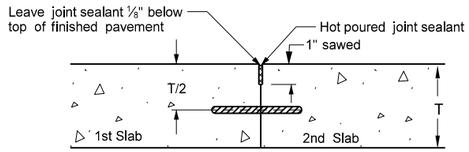


Sawed longitudinal joint with keyway



Sawed longitudinal joint without keyway

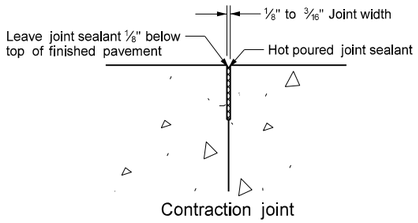
TIED JOINTS



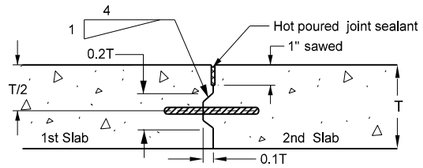
Longitudinal construction joint (tied butt joint)

Notes:

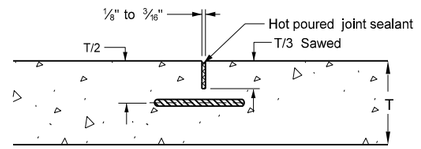
1. Provide hot poured joint sealant meeting the requirements of Section 826.02A.2 of the Standard Specifications.
2. Include all costs of the longitudinal joint and seal in the price bid for the PCC pavement.
3. Do not place tie bars within 18 inches of a transverse skewed joint.
4. Use Grade 40 steel for tie bars installed bent and later straightened.
5. Increase the tie bar spacing up to 10%, when necessary to facilitate construction.
6. Place tie Bars at a 48 inch maximum spacing.
7. A "Warp" joint is a sawed joint or a construction joint with a keyway.
8. A "Butt joint" is a construction joint with no keyway.



Contraction joint



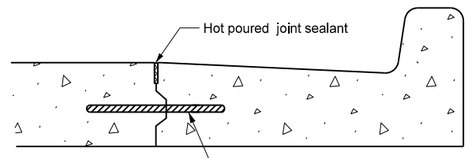
Longitudinal construction joint (tied keyed joint)



Sawed longitudinal joint

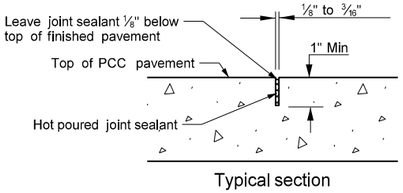
TIEBAR SPACINGS (In)

BAR SIZE / GRADE STEEL / BAR LENGTH / DIST TO FREE EDGE (FT) / JOINT TYPE / PVMT THICKNESS		# 3 BAR										# 4 BAR												# 5 BAR												# 6 BAR											
		GRADE 40				GRADE 60						GRADE 40					GRADE 60							GRADE 40						GRADE 60						GRADE 40						GRADE 60					
		24"				30"						24"					36"							30"						42"						36"						48"					
		4	6	8	10	4	6	8	10	12	14	8	10	12	14	16	8	10	12	14	16	22	24	10	12	14	16	22	24	10	12	14	16	22	24	10	12	14	16	19	22	24	10	12	14	16	19	22	24
6"	WARP		48	39			48	48				48					48																															
	BUTT		37	27			48	42				48					48																															
8"	WARP	48	39	29	24	48	48	44	35	29	25	48	42	35	30	26	48	48	48	45	39	28	26	48	48	47	41	30	27	48	48	48	48	45	41	48	48	48	48	48	43	39	48	48	48	48	48	48	48
	BUTT	42	27			48	42	31	25			37	29	24			48	44	37	32	27			46	39	33	29			48	48	48	43	32	29	48	48	48	48	35	30	27	48	48	48	48	48	45	41
8½"	WARP	48	37	28		48	48	42	33	28	24	48	39	33	28	24	48	48	48	42	37	27	24	48	48	44	38	28	25	48	48	48	48	42	38	48	48	48	48	47	40	37	48	48	48	48	48	48	48
	BUTT	39	26			44	39	29				35	27				48	42	35	29	26			44	36	31	27			48	48	47	41	30	27	48	48	45	39	33	28	26	48	48	48	48	48	42	39
9"	WARP	48	35	26		48	48	39	31	26		47	37	31	26		48	48	47	40	35	25		48	48	42	36	26	24	48	48	48	48	40	36	48	48	48	48	44	38	35	48	48	48	48	48	48	48
	BUTT	37	24			48	37	27				33	26				48	40	33	28	25			41	34	29	25			48	48	44	39	28	25	48	48	42	37	31	26	24	48	48	48	48	47	40	37
9½"	WARP	48	33	25		48	48	37	30	25		44	35	29	25		48	48	44	38	33	24		48	46	39	34	25		48	48	48	48	38	34	48	48	48	48	42	36	33	48	48	48	48	48	48	48
	BUTT	35				48	35	26				31	25				47	37	31	27				39	32	27	25			48	48	42	37	27	24	48	47	40	35	29	25		48	48	48	48	44	38	35
10"	WARP	47	31			48	47	35	28			42	34	28	24		48	48	42	36	31			48	44	37	33	24		48	48	48	48	36	33	48	48	48	48	40	34	31	48	48	48	48	48	48	47
	BUTT	33				48	33	25				29	24				45	36	29	25				37	31	26	24			48	46	40	35	25		48	45	38	33	28	24		48	48	48	48	42	36	33
10½"	WARP	45	30			48	45	34	27			40	32	26			48	48	40	34	30			48	42	36	31			48	48	48	47	34	31	48	48	48	48	45	38	33	30	48	48	48	48	48	48	45
	BUTT	32				48	32	24				28					42	34	28	24				35	29	25				48	44	38	33	24		48	42	36	32	27			48	48	48	48	40	34	31
11"	WARP	43	28			48	43	32	26			38	31	25			48	46	38	33	28			48	40	34	30			48	48	48	45	32	30	48	48	48	43	36	31	28	48	48	48	48	48	47	43
	BUTT	30				46	30					27					40	32	27					34	28	24				48	42	36	32			48	40	35	30	25			48	48	48	46	38	33	30
11½"	WARP	41	27			48	41	31	24			36	29	24			48	44	36	31	27			46	38	32	28			48	48	48	43	31	28	48	48	47	41	34	30	27	48	48	48	48	48	45	41
	BUTT	29				44	29					25					39	31	25					32	27					48	40	35	30			46	39	33	29	24			48	48	48	44	37	31	29
12"	WARP	39	26			48	39	29				35	28				48	42	35	30	26			44	36	31	28			48	48	47	41	30	27	48	48	45	40	33	28	26	48	48	48	48	48	43	39
	BUTT	27				42	27					25					37	30	25					31	25					46	39	33	29			45	37	32	28				48	48	48	42	35	30	27
12½"	WARP	38	25			48	38	28				33	27				48	40	33	29	25			42	35	30	26			48	48	45	39	28	26	48	48	43	38	32	27	25	48	48	48	48	48	41	38
	BUTT	27				40	27					25					35	28						29	25					44	37	32	27			42	35	30	27				48	48	45	40	34	29	26
13"	WARP	36	24			48	36	27				32	26				48	39	32	27	24			40	33	29	25			48	48	43	38	27	25	48	48	41	36	30	26	24	48	48	48	48	46	40	36
	BUTT	25				38	25					24					34	27						28						42	35	30	27			41	34	29	25				48	48	44	38	32	28	25
13½"	WARP	35				48	35	26				31	25				47	37	31	26				39	32	28	24			48	48	42	36	26	24	48	47	40	35	29	25		48	48	48	48	44	38	35
	BUTT	25				37	25					24					33	26						27						41	34	29	25			39	33	28	25				48	48	42	37	31	27	24
14"	WARP	34				48	34	25				30	24				45	36	30	25				37	31	27				48	47	40	35	25		48	45	38	34	28	24		48	48	48	48	43	37	34
	BUTT	24				35	24					23					32	25						26						39	33	28	25			38	32	27	24				48	47	40	35	30	26	
14½"	WARP	32				48	32	24				29					43	35	29	25				36	30	26				48	45	39	34	24		48	43	37	32	27			48	48	48	48	41	35	32
	BUTT					34						22					30	25						25						38	32	27	24			36	30	26					48	46	39	34	29	25	
15"	WARP	31				47	31					28					42	33	28	24				35	29	25				48	44	37	33	24		48	42	36	31	26			48	48	48	47	40	34	31
	BUTT					33						21					29							25						37	31	26				35	29	25					48	44	38	33	28	24	



Curb and gutter sections

JOINT SEALER DETAILS



Typical section

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-15-2010

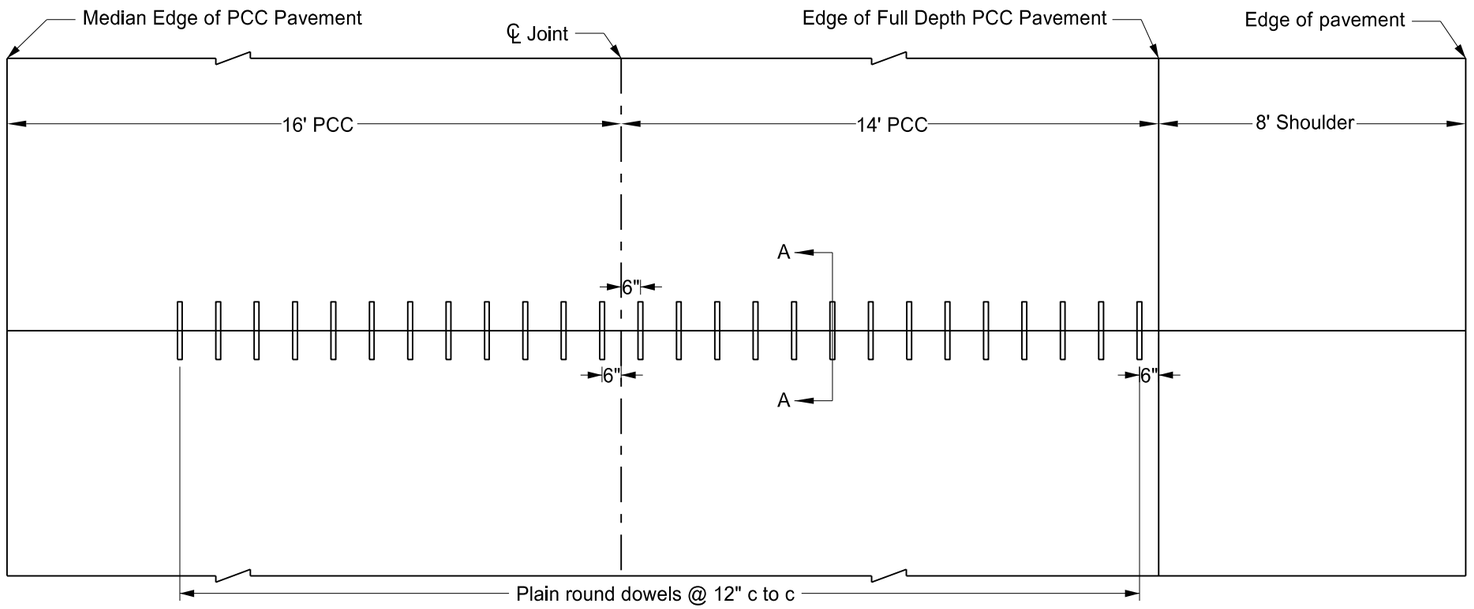
REVISIONS

DATE	CHANGE
10/23/2012	Expanded Tie Bar Table
03/16/2016	Updated Jt Details & notes
10/25/2019	Corrected "Typo" in Note 3

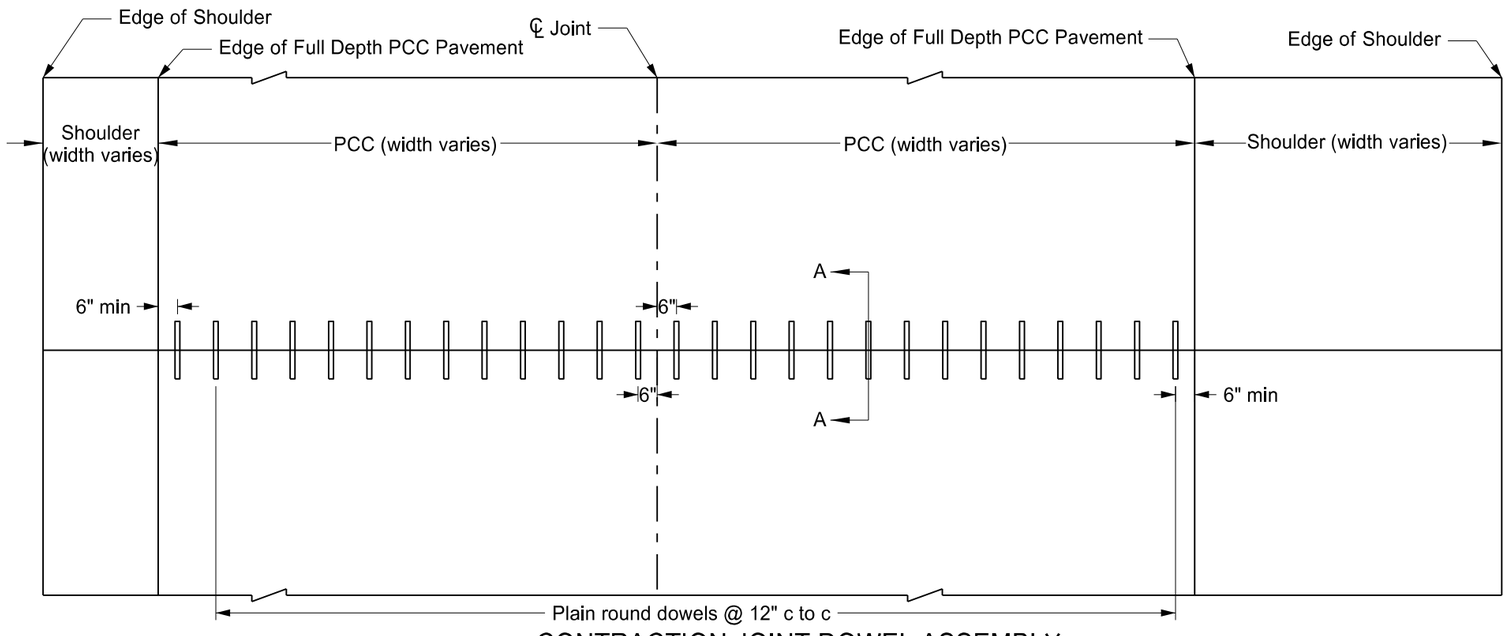
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/25/19 and the original document is stored at the North Dakota Department of Transportation

TRANSVERSE CONTRACTION JOINT DETAILS

D-550-3



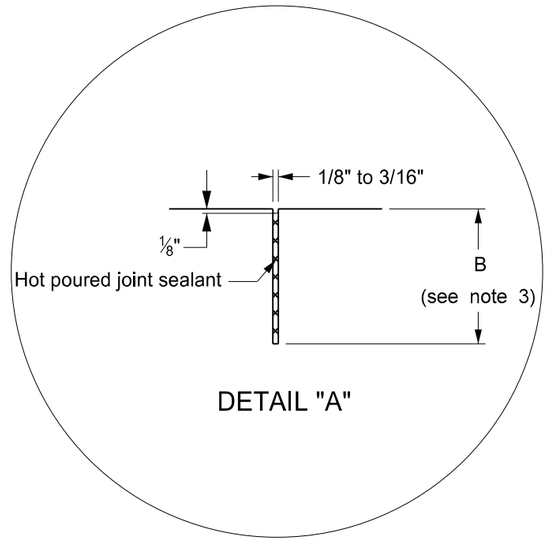
CONTRACTION JOINT DOWEL ASSEMBLY
INTERSTATE



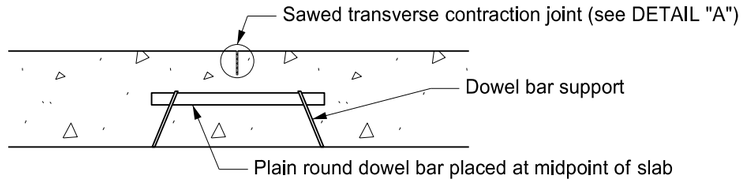
CONTRACTION JOINT DOWEL ASSEMBLY
NON-INTERSTATE

Notes

1. The joint seal details apply to both doweled and non-doweled (plain) transverse joints.
2. T = Thickness of pavement.
3. B = T/4 + ¼" for AE or YE for non-dowelled concrete pavement or
   B = T/3 for AAE or dowelled concrete pavement



DETAIL "A"



SECTION A-A

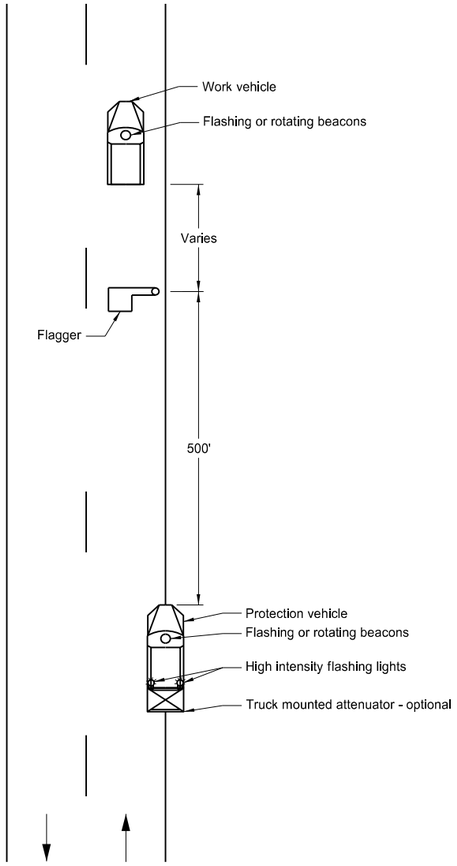
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-10	
REVISIONS	
DATE	CHANGE
6/23/2014	Removed dowel size reference
3/16/2016	Revised Joint Details and notes
10/25/2019	Expanded Details for clarity

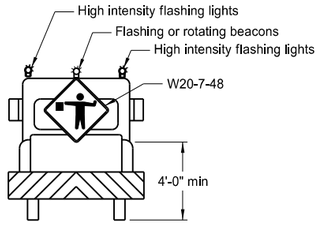
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/25/19 and the original document is stored at the North Dakota Department of Transportation

TRAFFIC CONTROL FOR CORING OF HOT BITUMINOUS PAVEMENT

D-704-2

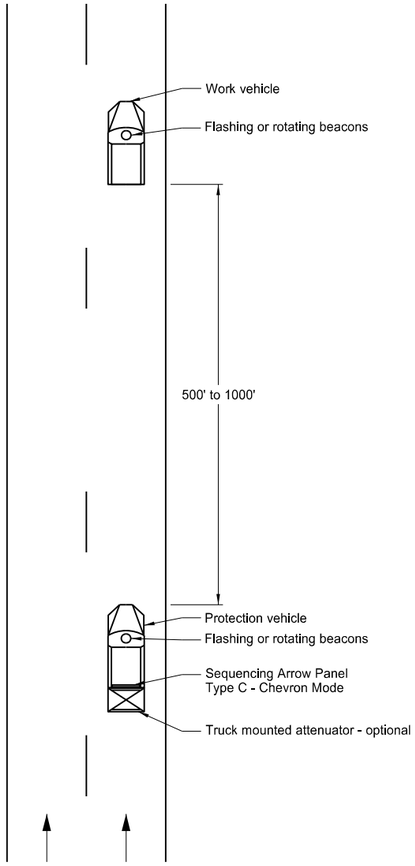
Two Lane, Two Way Roadways

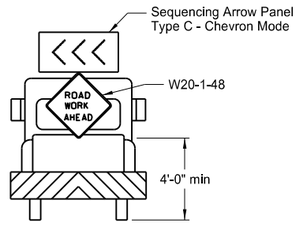




Typical Protection Vehicle

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.

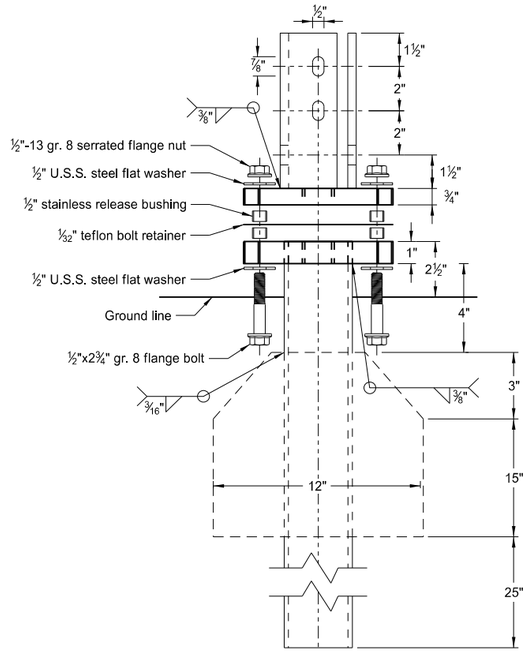
4. Use flagger to protect the work area and warn oncoming traffic for two lane, two way roadway.

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

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

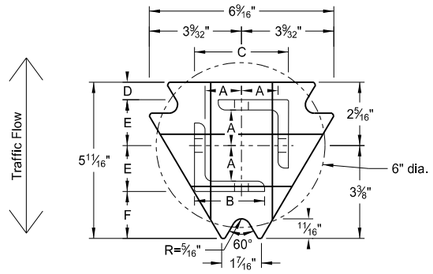
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

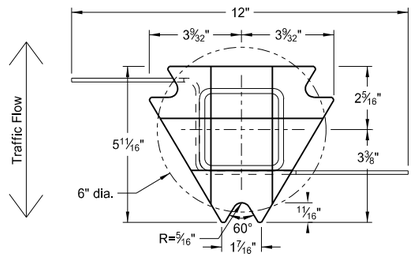


Multi-Directional
Slip Base Assembly

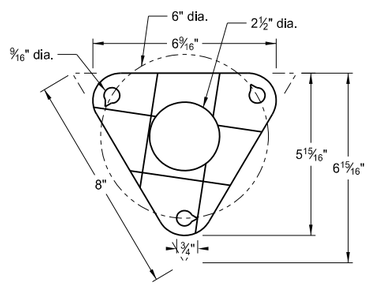
Perforated Tube



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



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



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

Notes:

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

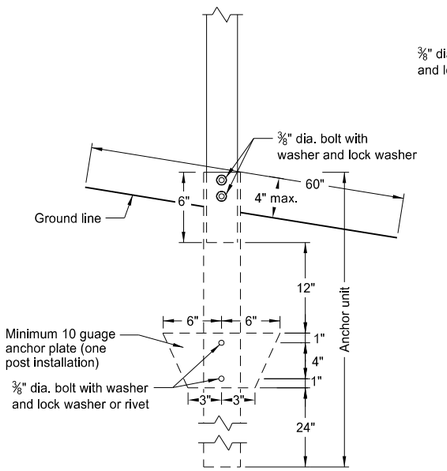
Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thick-ness Gauge	Sleeve Size in.	Wall Thick-ness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2¼
1	2¼	12			No	2½
1	2½	12			(A)	3
1	2½	10			Yes	
1	2¼	12	2	12	Yes	
1	2½	12	2¼	12	Yes	
2	2	12			No	2¼
2	2¼	12			No	2½
2	2½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

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

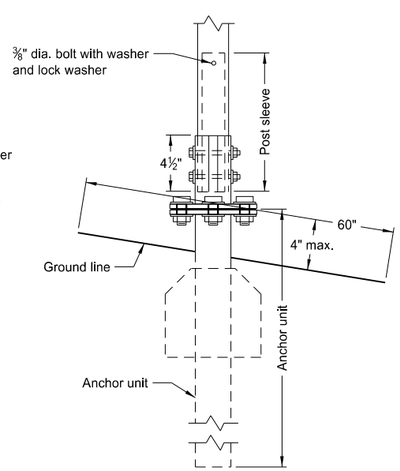
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2³/16"x10 ga.	1⁹/64"	2½"	3¹/32"	2⁵/32"	1³³/64"	1⅞"
2½"x10 ga.	1⁹/32"	2½"	3⁵/16"	⅝"	1²¹/32"	1¾"

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

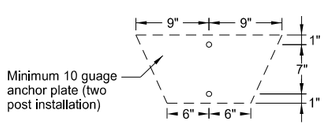
(B) For additional wind load, insert the 2³/16"x10 ga. into 2½"x10 ga.



Anchor Unit and Post Assembly



Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly



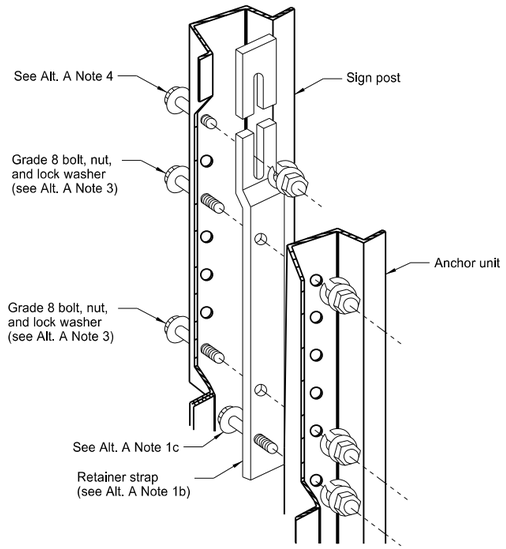
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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

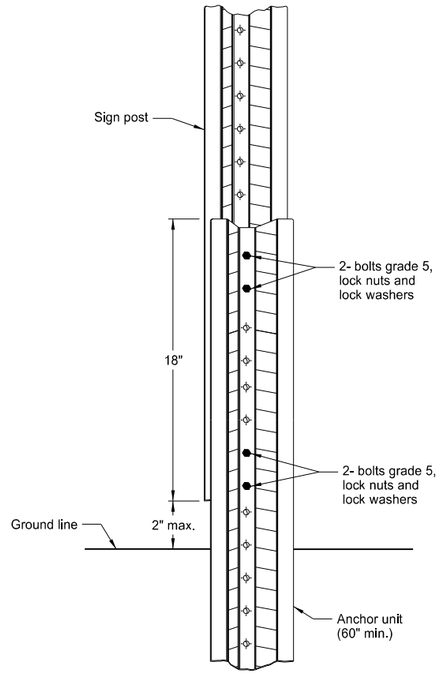
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

U-Channel Post

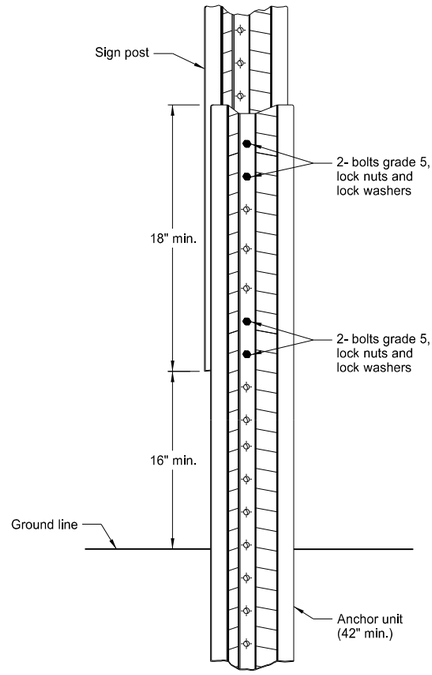


Detail A



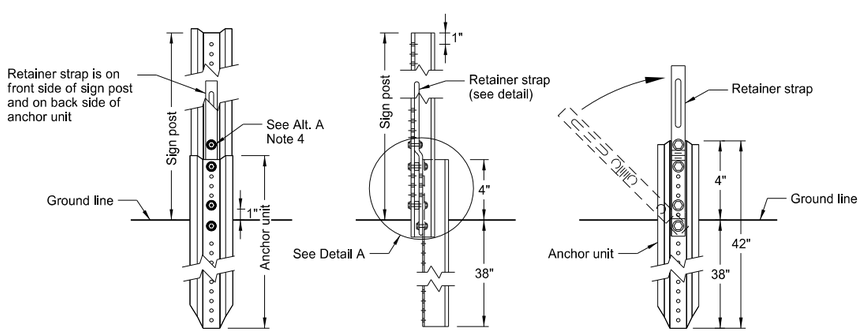
Breakaway U-Channel Splice Detail
Alternate B
(2.5 and 3 lb/ft)

Install a maximum of 3 posts within 7'.



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

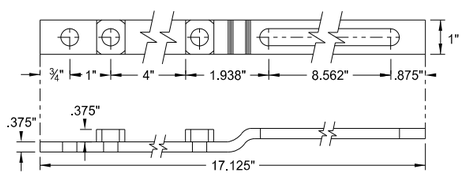
Install a maximum of 3 posts within 7'.



Front View Side View Back View

Breakaway U-Channel Detail
Alternate A

Install a maximum of 2 posts within 7'.



Retainer Strap Detail

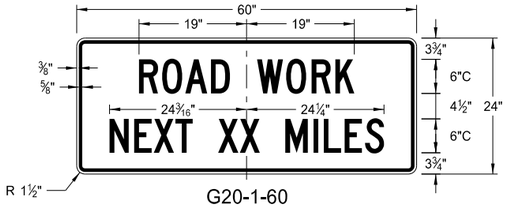
Alternate A Steps of Installation:

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

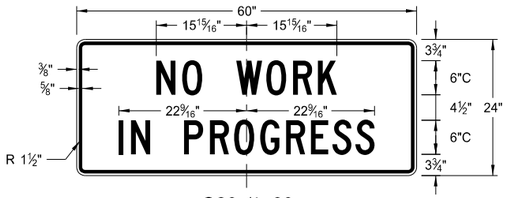
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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

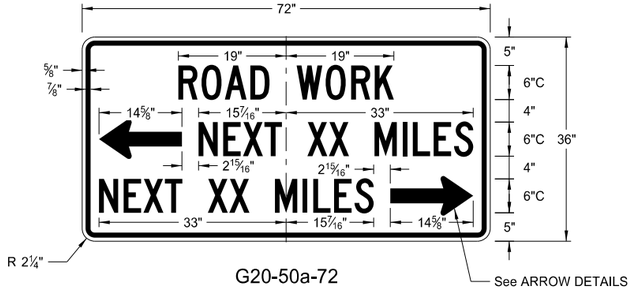
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



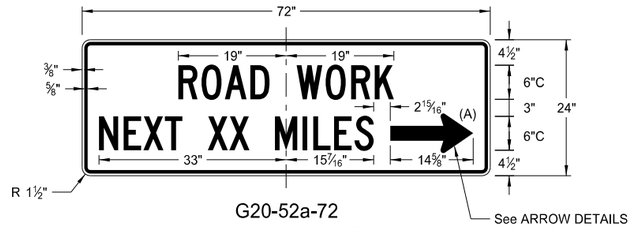
G20-1-60
Legend: black (non-refl)
Background: orange



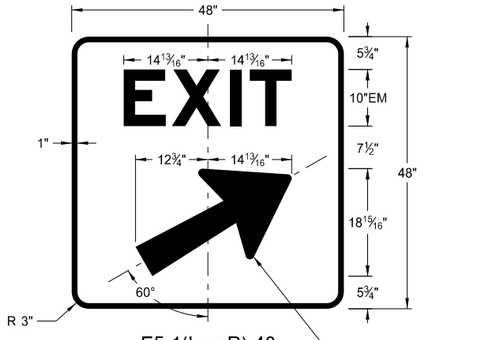
G20-1b-60
Legend: black (non-refl)
Background: orange



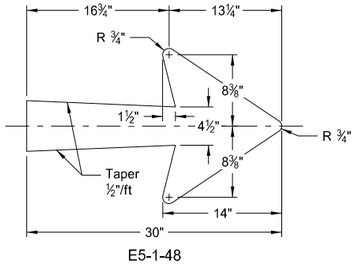
G20-50a-72
Legend: black (non-refl)
Background: orange



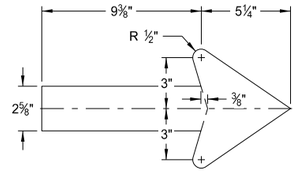
G20-52a-72
Legend: black (non-refl)
Background: orange



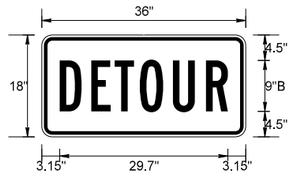
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



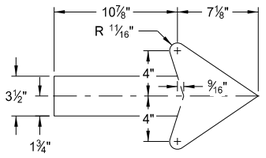
E5-1-48



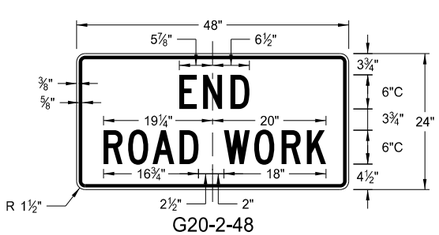
G20-50a-72
G20-52a-72



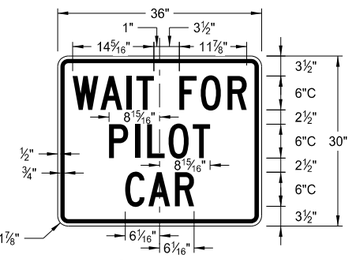
M4-8-36
Legend: black (non-refl)
Background: orange



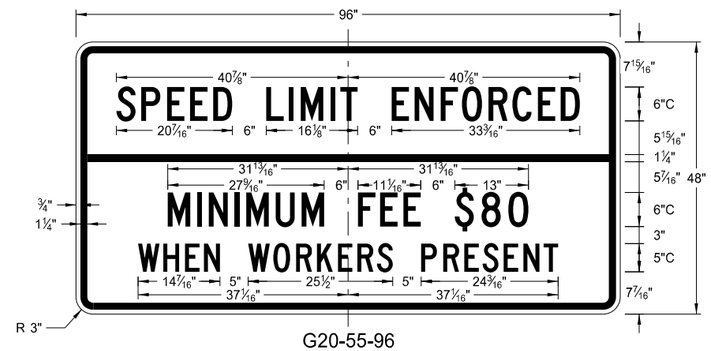
M4-9(L or R)-30
Right or Left



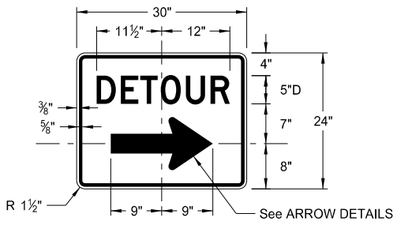
G20-2-48
Legend: black (non-refl)
Background: orange



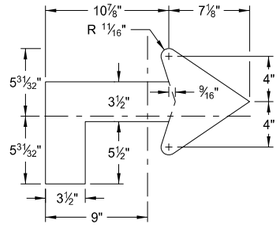
G20-4b-36
Legend: black (non-refl)
Background: orange



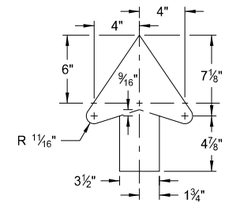
G20-55-96
Legend: black (non-refl)
Background: orange



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



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



M4-9-30
Straight

ARROW DETAILS

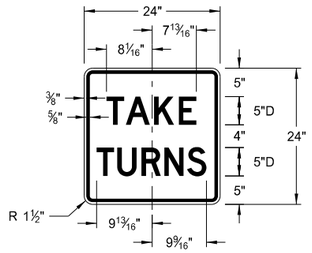
NOTES:

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

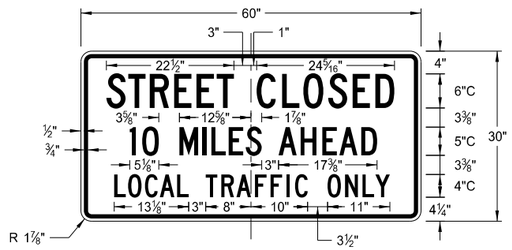
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Added sign & background color
10-03-19	New Design Engineer PE Stamp

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

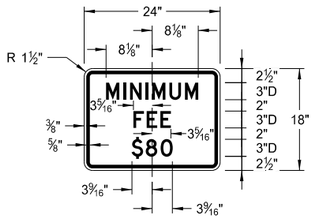
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



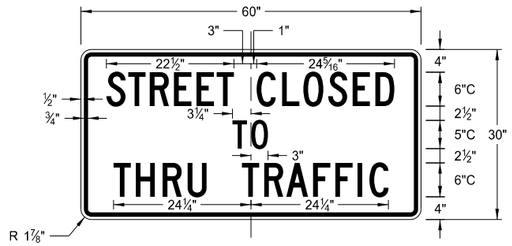
R1-50P-24
Legend: black (non-refl)
Background: white



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



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



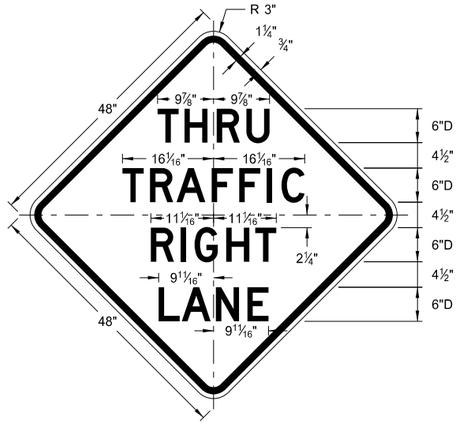
R11-4a-60
Legend: black (non-refl)
Background: white

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

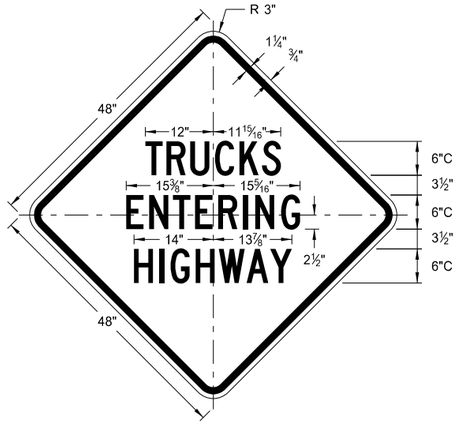
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Revised sign number
10-03-19	New Design Engineer PE Stamp

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

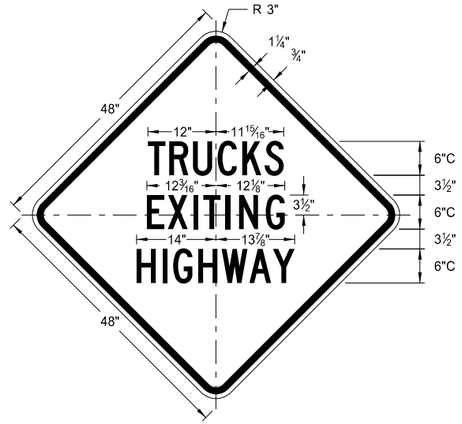
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



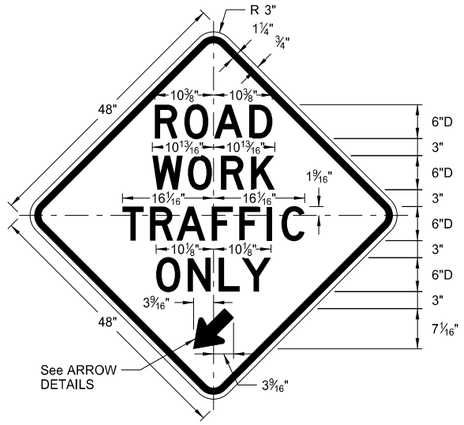
W5-8-48
Legend: black (non-refl)
Background: orange



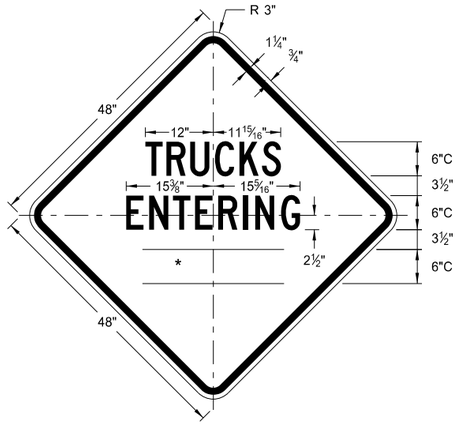
W8-53-48
Legend: black (non-refl)
Background: orange



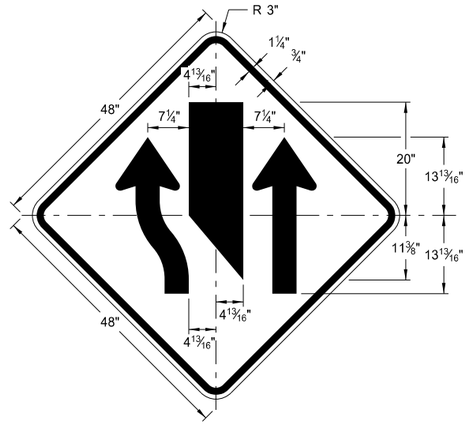
W8-56-48
Legend: black (non-refl)
Background: orange



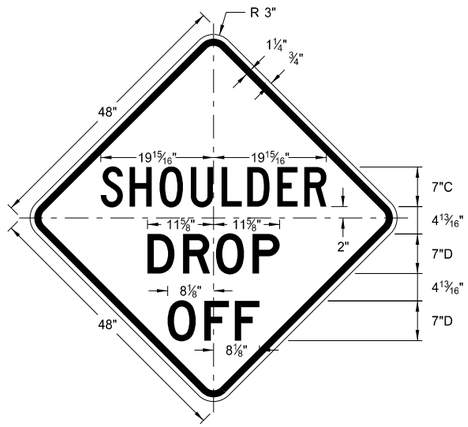
W5-9-48
Legend: black (non-refl)
Background: orange



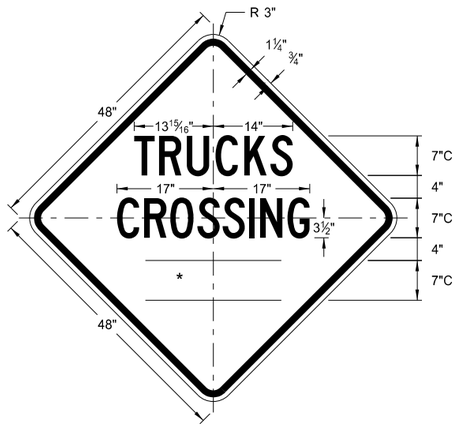
W8-54-48
Legend: black (non-refl)
Background: orange



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



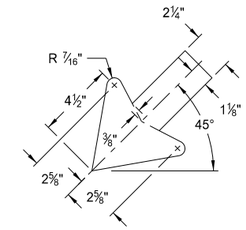
W8-9a-48
Legend: black (non-refl)
Background: orange



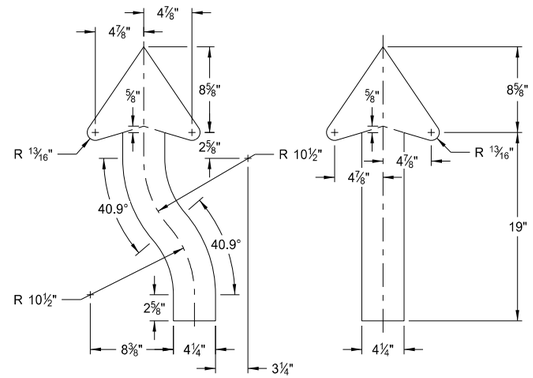
W8-55-48
Legend: black (non-refl)
Background: orange

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

* DISTANCE MESSAGES



W5-9-48



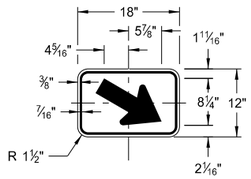
W9-3a-48

ARROW DETAILS

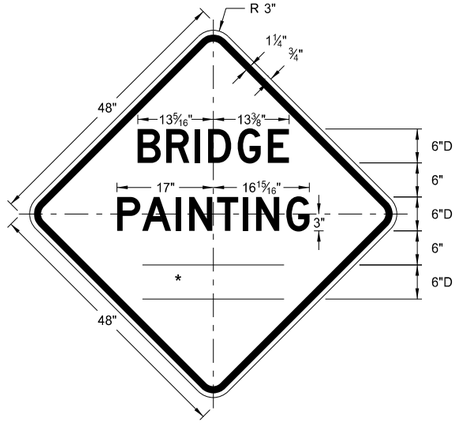
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Updated sign number
5-31-18	Revised sign and arrow details
10-03-19	New Design Engineer PE Stamp

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

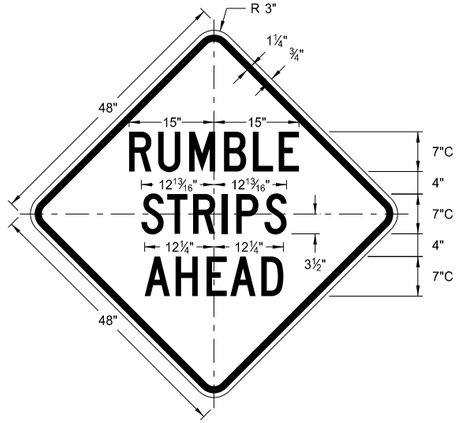
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



W16-7aP-18
Legend: black (non-refl)
Background: orange



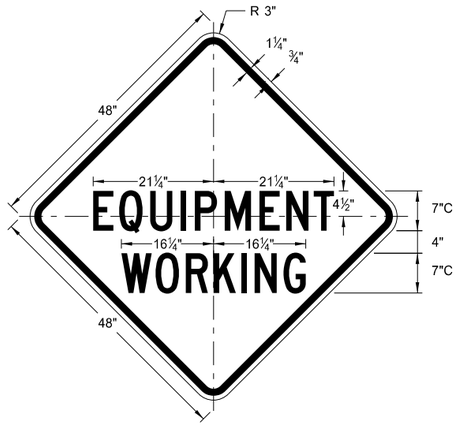
W21-50-48
Legend: black (non-refl)
Background: orange



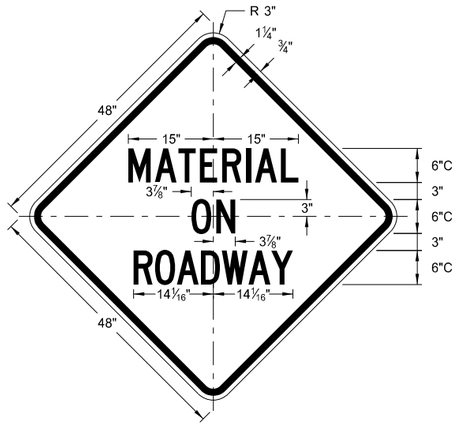
W21-53-48
Legend: black (non-refl)
Background: orange

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

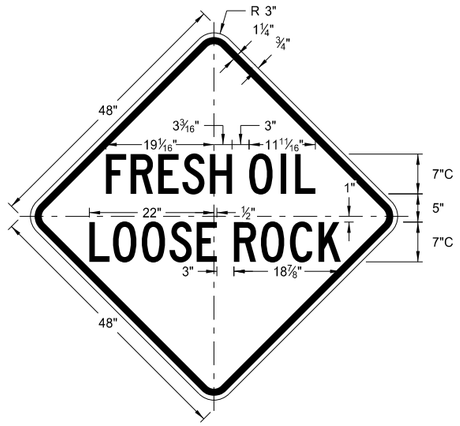
* DISTANCE MESSAGES



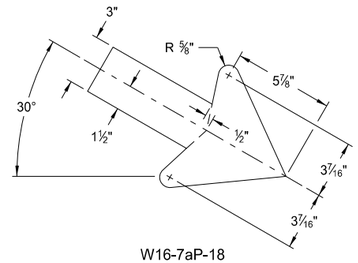
W20-51-48
Legend: black (non-refl)
Background: orange



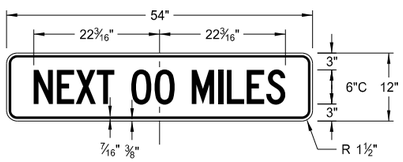
W21-51-48
Legend: black (non-refl)
Background: orange



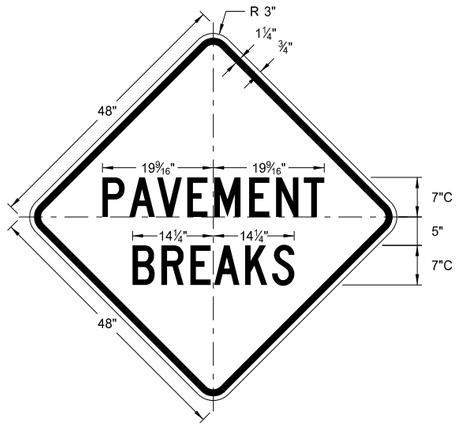
W22-8-48
Legend: black (non-refl)
Background: orange



W16-7aP-18



W20-52P-54
Legend: black (non-refl)
Background: orange



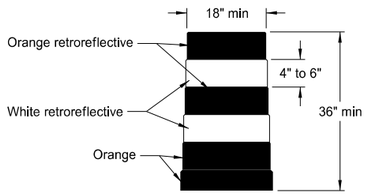
W21-52-48
Legend: black (non-refl)
Background: orange

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

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

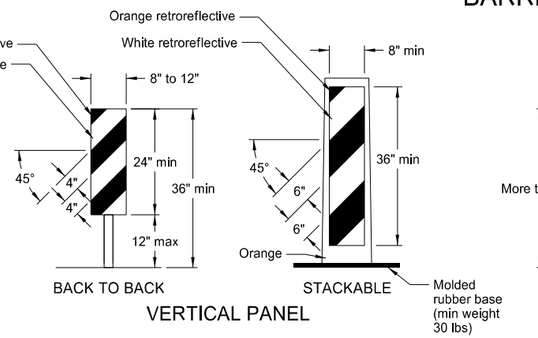
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



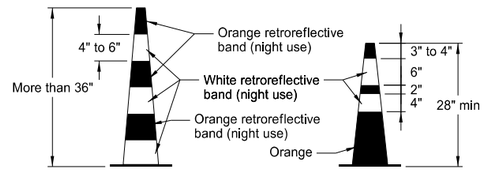
DELINEATOR DRUM

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



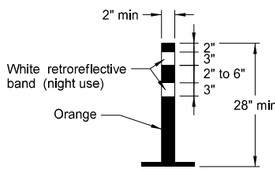
VERTICAL PANEL

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



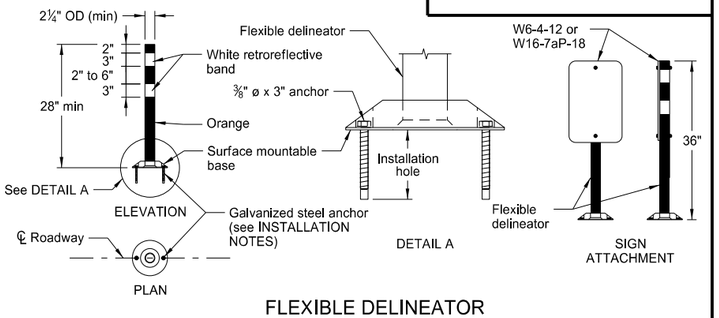
TRAFFIC CONE

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



TUBULAR MARKER

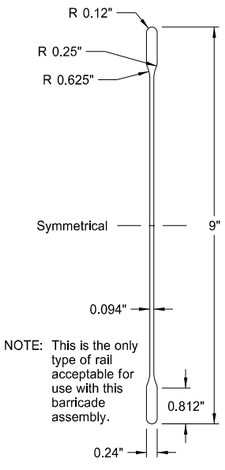
Provide retroreflectorization of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

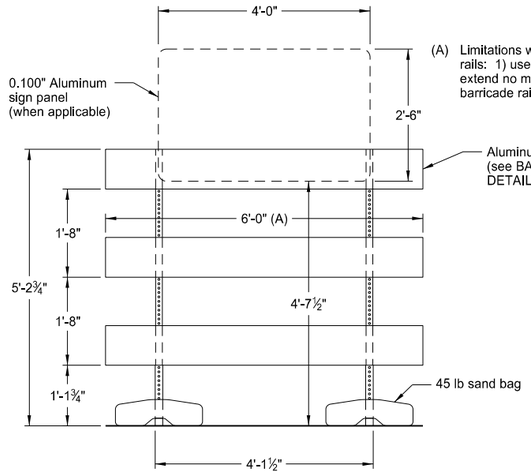
INSTALLATION NOTES:

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



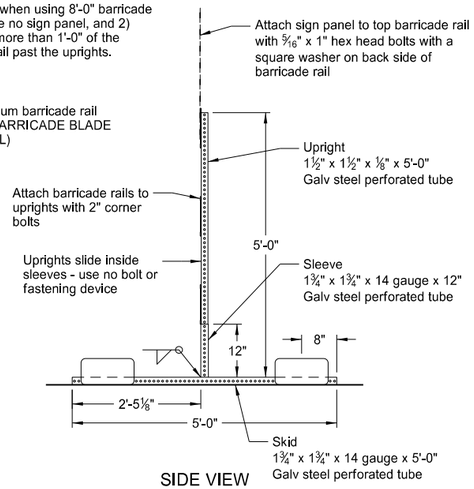
NOTE: This is the only type of rail acceptable for use with this barricade assembly.

BARRICADE BLADE DETAIL



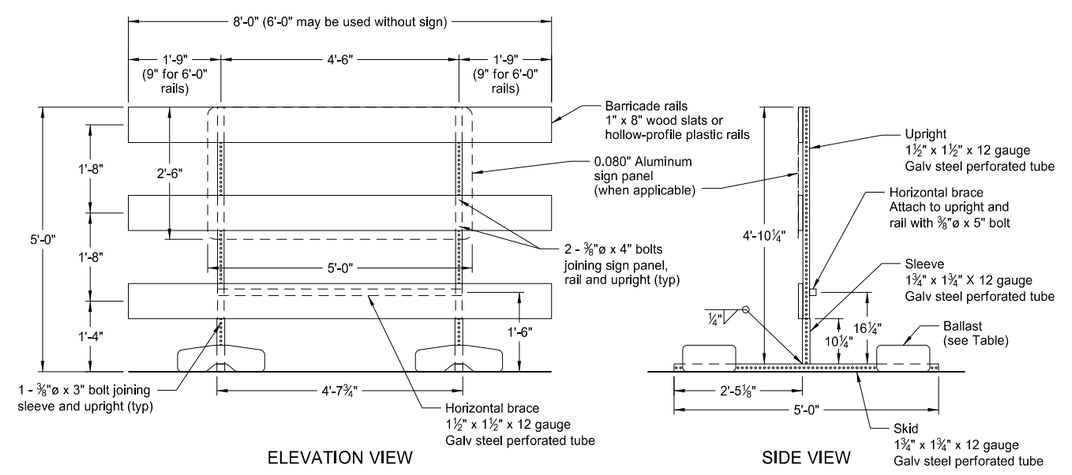
(A) Limitations when using 8'-0" barricade rails: 1) use no sign panel, and 2) extend no more than 1'-0" of the barricade rail past the uprights.

ELEVATION VIEW



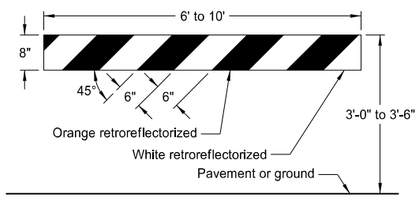
SIDE VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

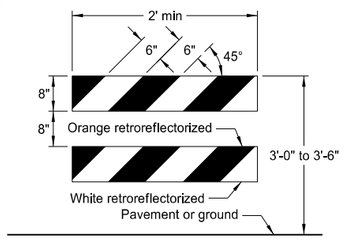


BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

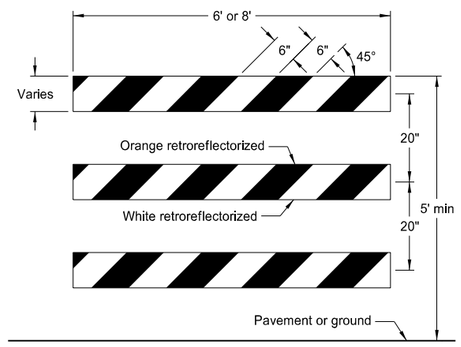
NOTE: For barricade markings use alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Place retroreflective sheeting on both sides of the rails with a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the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



TYPE I BARRICADE

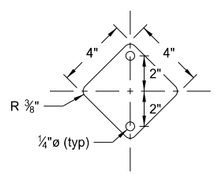


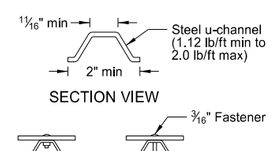
TYPE II BARRICADE

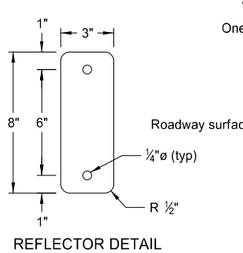


TYPE III BARRICADE

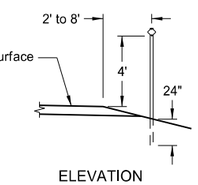
BARRICADE RAIL DETAILS







REFLECTOR DETAIL



ELEVATION

DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

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

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

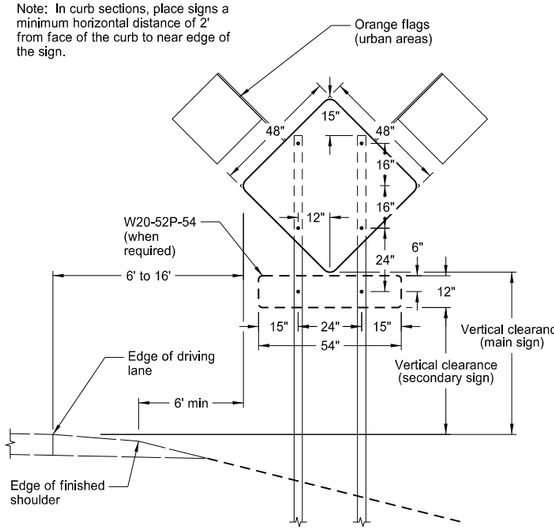
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
9-27-17 11-01-19	Updated to active voice Revised details for Flexible Delineator

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

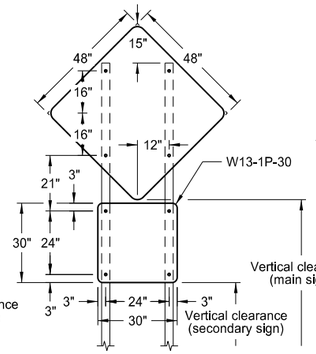
CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

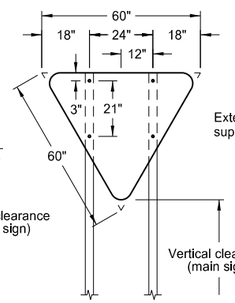
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



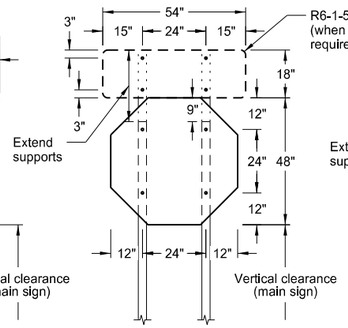
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



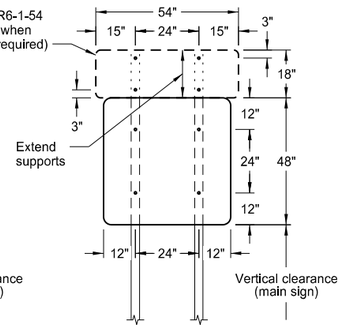
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



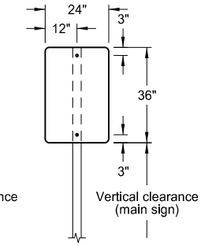
R1-2-60 - YIELD SIGN



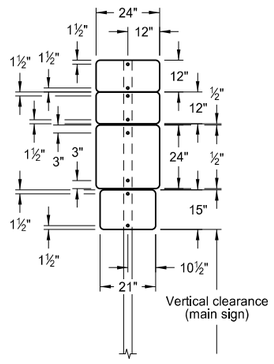
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



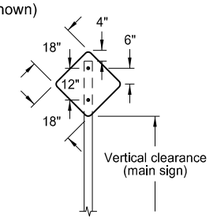
48" x 48" SIGN
(with R6-1-54 sign as required)



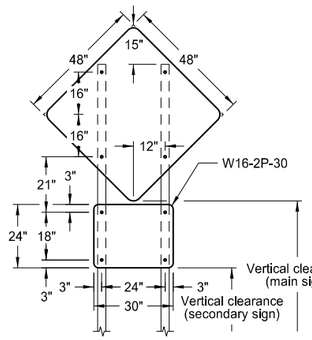
24" x 36" SIGN



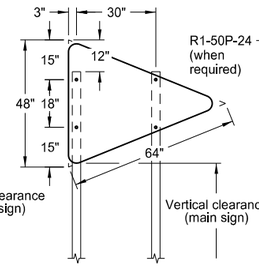
24" x 24"
ROUTE MARKER
ASSEMBLY



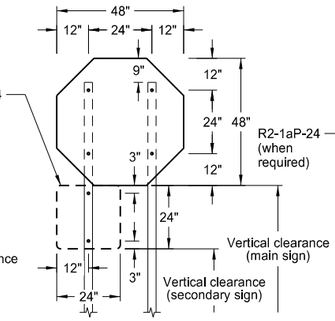
18" x 18"
DIAMOND SIGN



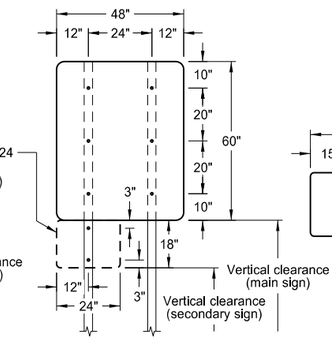
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



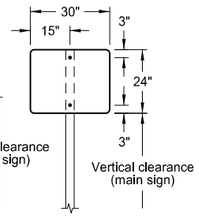
W14-3-64 - PENNANT SIGN



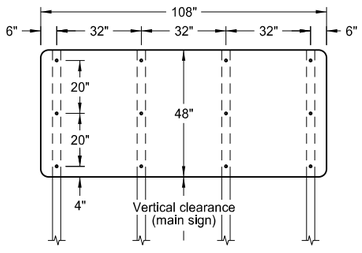
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



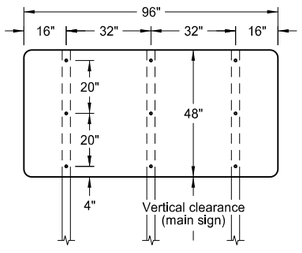
48" x 48" SIGN
(with R2-1aP-24 sign as required)



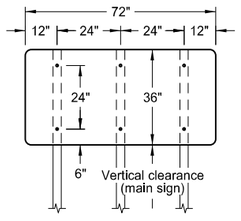
30" x 24" SIGN



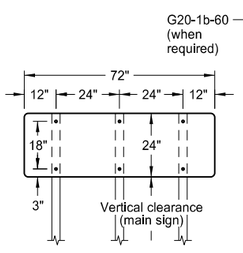
108" x 48" SIGN



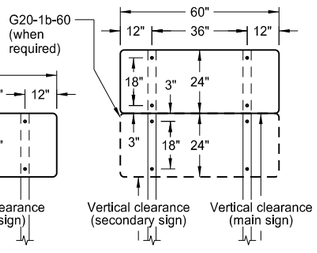
96" x 48" SIGN



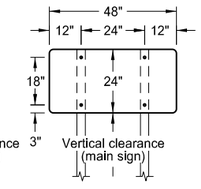
72" x 36" SIGN



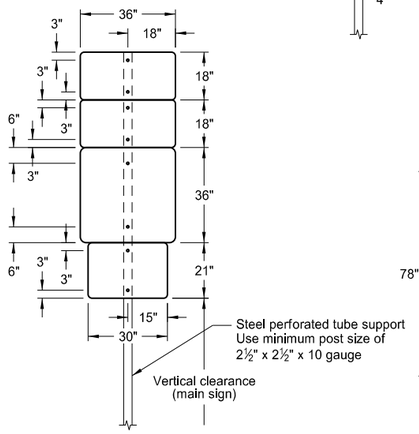
72" x 24" SIGN



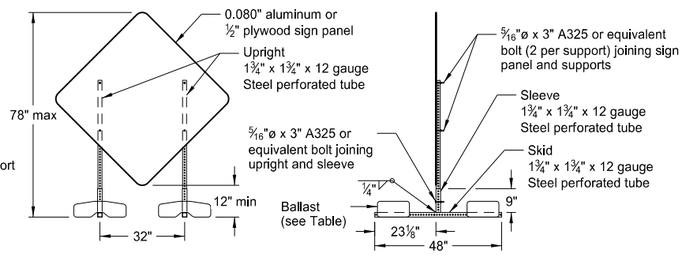
60" x 24" SIGN



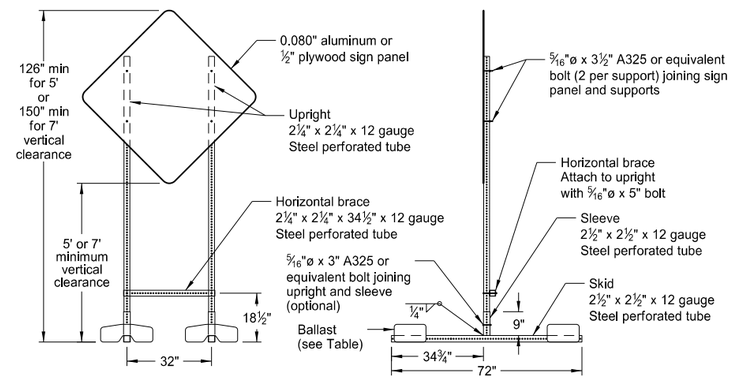
48" x 24" SIGN



36" x 36"
ROUTE MARKER
ASSEMBLY



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

MINIMUM BALLAST
(For each side of sign support base)

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

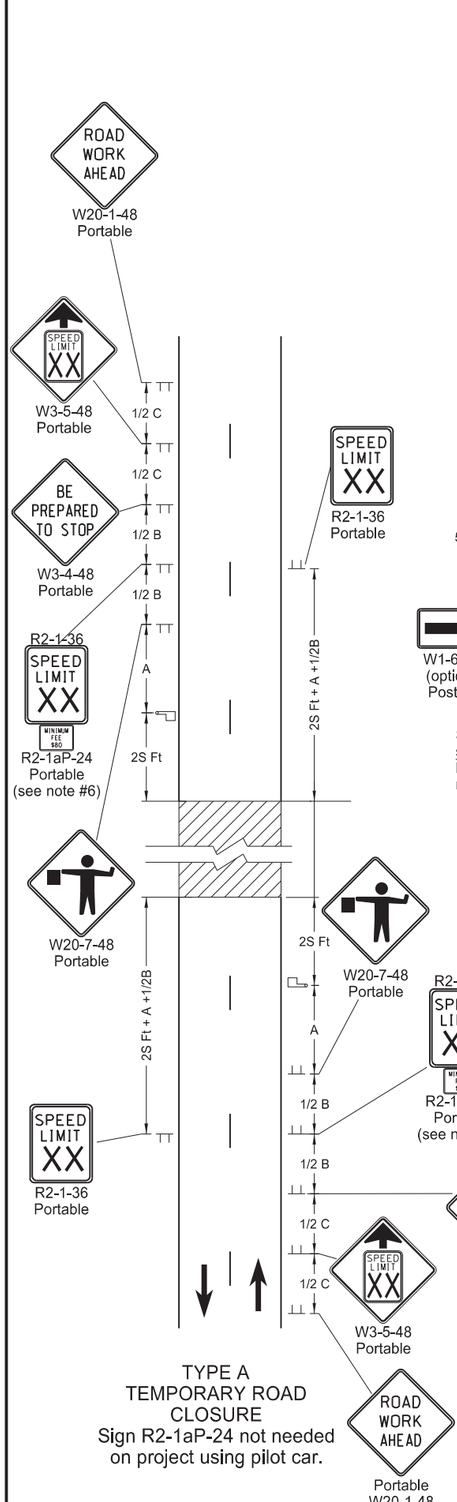
Note: The number of sandbags are based on a wind speed of 55 MPH. Place sandbags at or near the ends of skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-13	
REVISIONS	
DATE	CHANGE
11-14-13	Revised Note 6
9-27-17	Updated to active voice
11-01-19	Revised 60"x24" sign detail

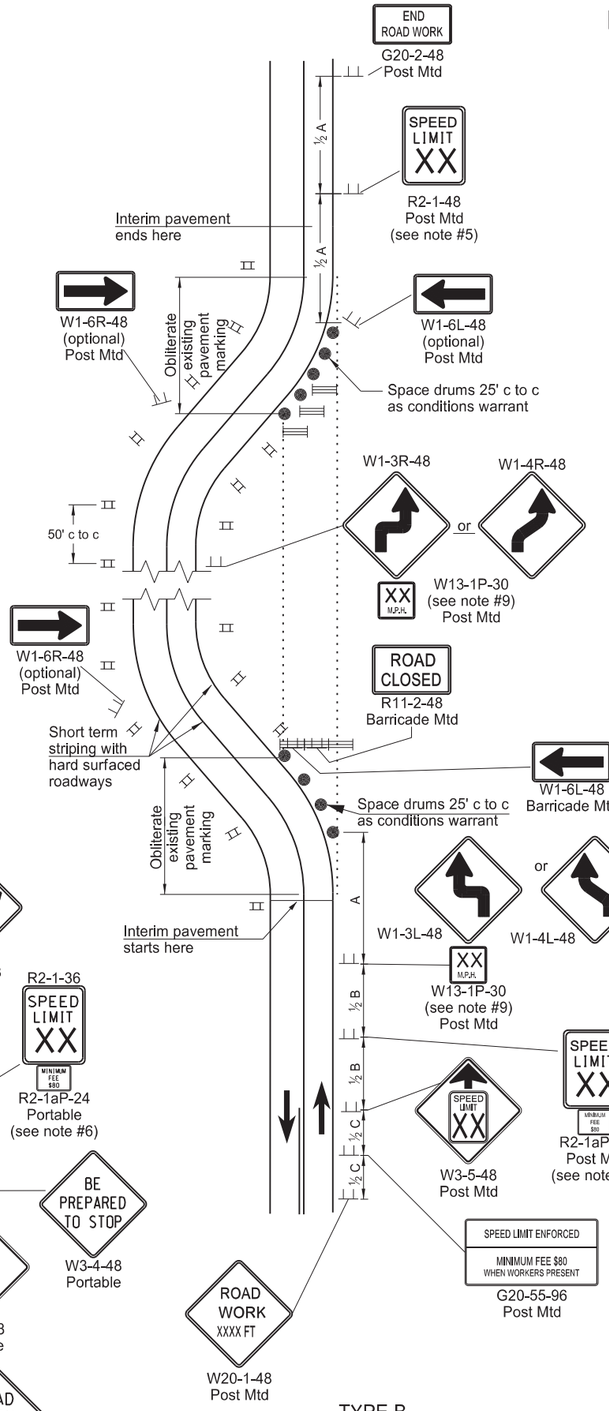
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

ROAD CLOSURE LAYOUTS

D-704-15

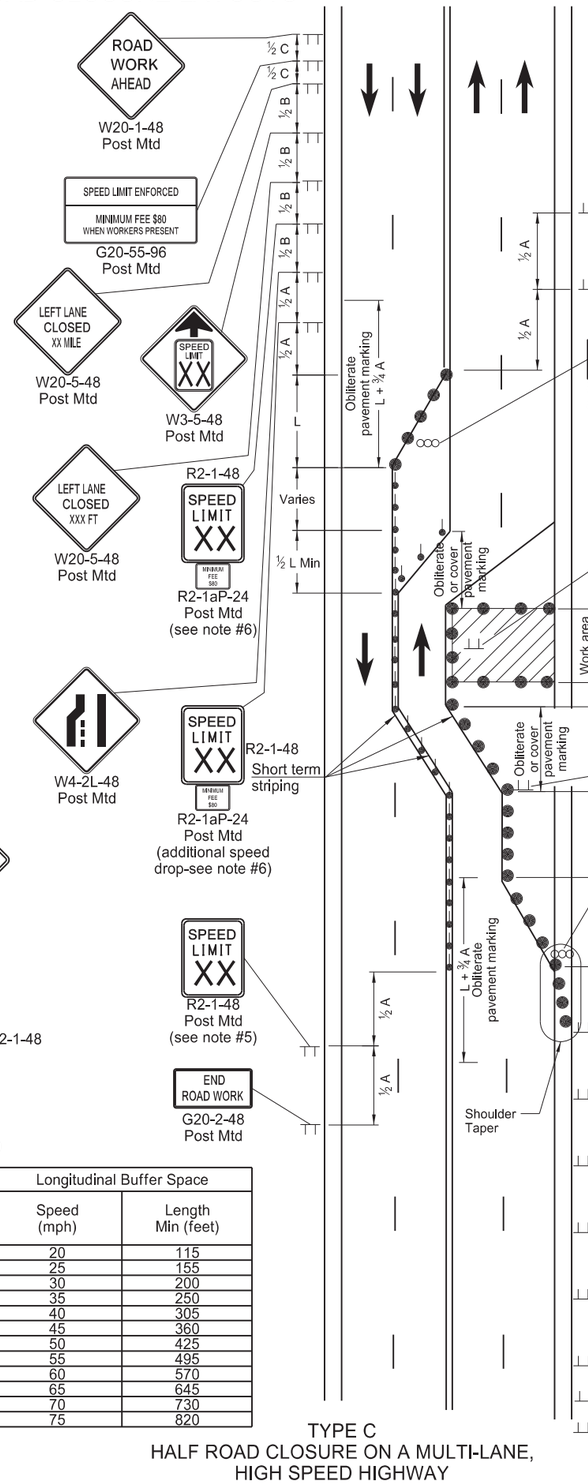


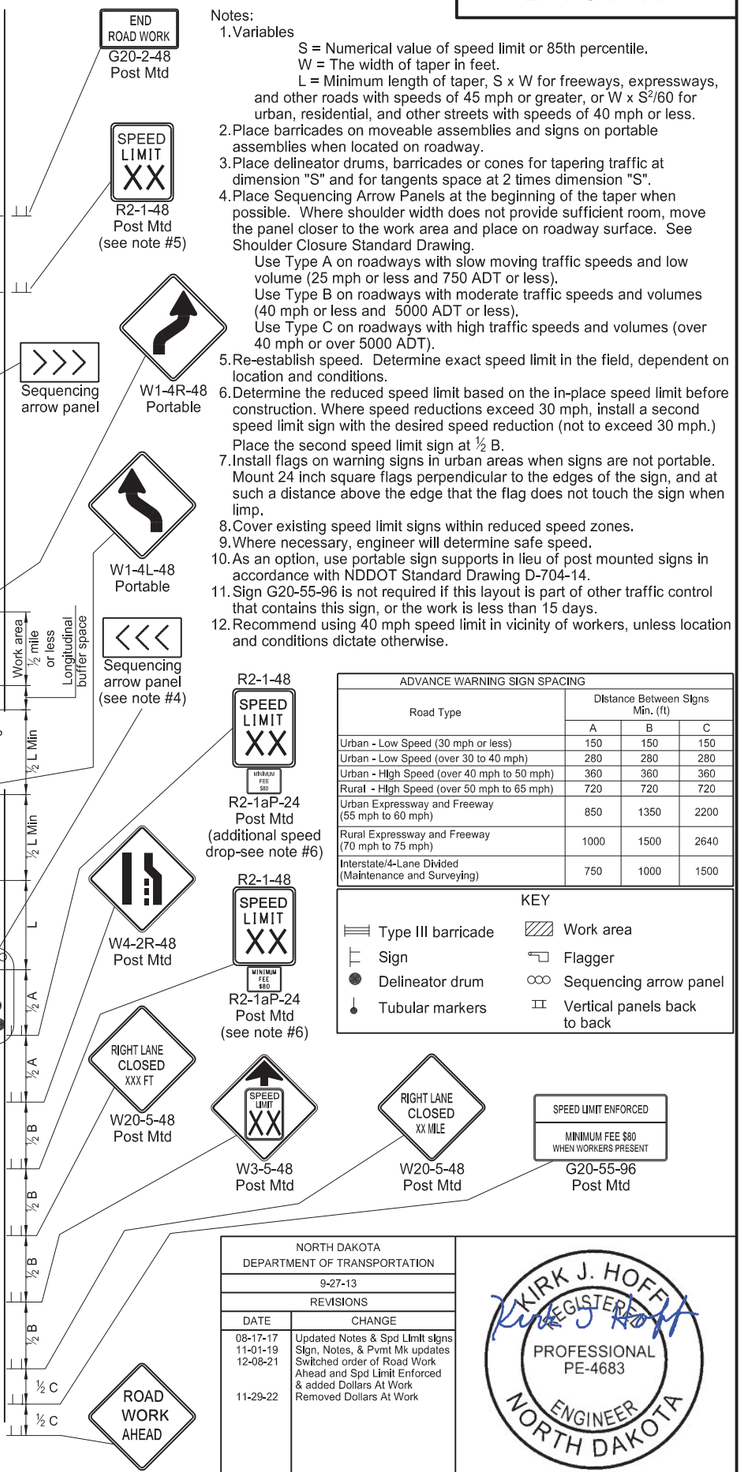
TYPE A
TEMPORARY ROAD CLOSURE
Sign R2-1aP-24 not needed on project using pilot car.



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

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





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

Notes:
1. Variables
   S = Numerical value of speed limit or 85th percentile.
   W = The width of taper in feet.
   L = Minimum length of taper, S x W for freeways, expressways, and other roads with speeds of 45 mph or greater, or W x S^2/60 for urban, residential, and other streets with speeds of 40 mph or less.
2. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
3. Place delineator drums, barricades or cones for tapering traffic at dimension "S" and for tangents space at 2 times dimension "S".
4. Place Sequencing Arrow Panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on roadway surface. See Shoulder Closure Standard Drawing.
   Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
   Use Type B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
   Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
5. Re-establish speed. Determine exact speed limit in the field, dependent on location and conditions.
6. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½ B.
7. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
8. Cover existing speed limit signs within reduced speed zones.
9. Where necessary, engineer will determine safe speed.
10. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
11. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.
12. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

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

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

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

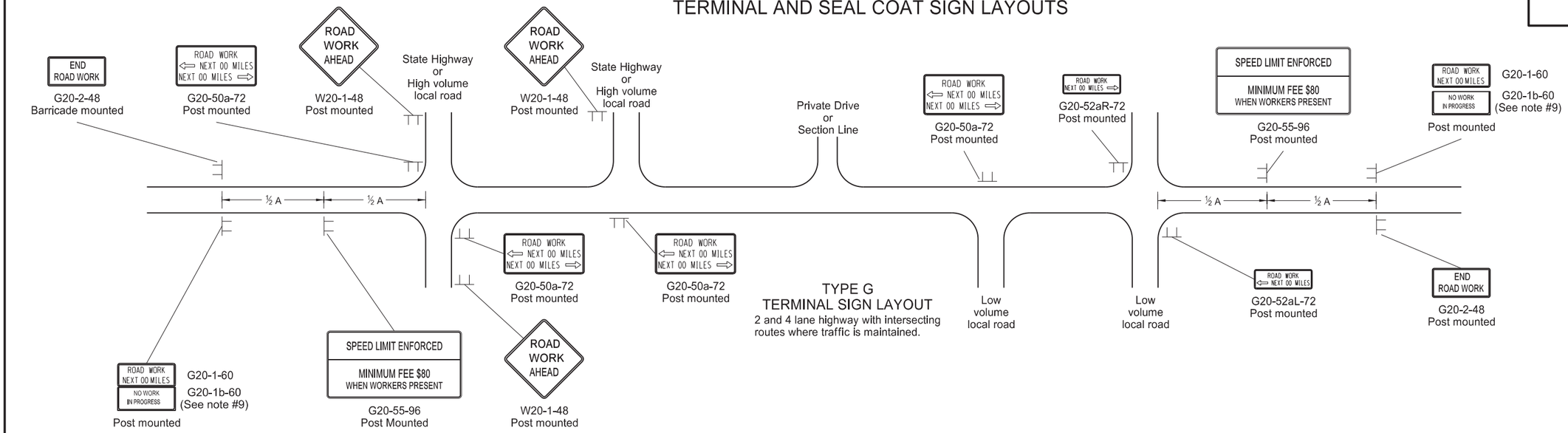
DATE	CHANGE
08-17-17	Updated Notes & Spd Limit signs
11-01-19	Sign, Notes, & Pvmt Mk updates
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work

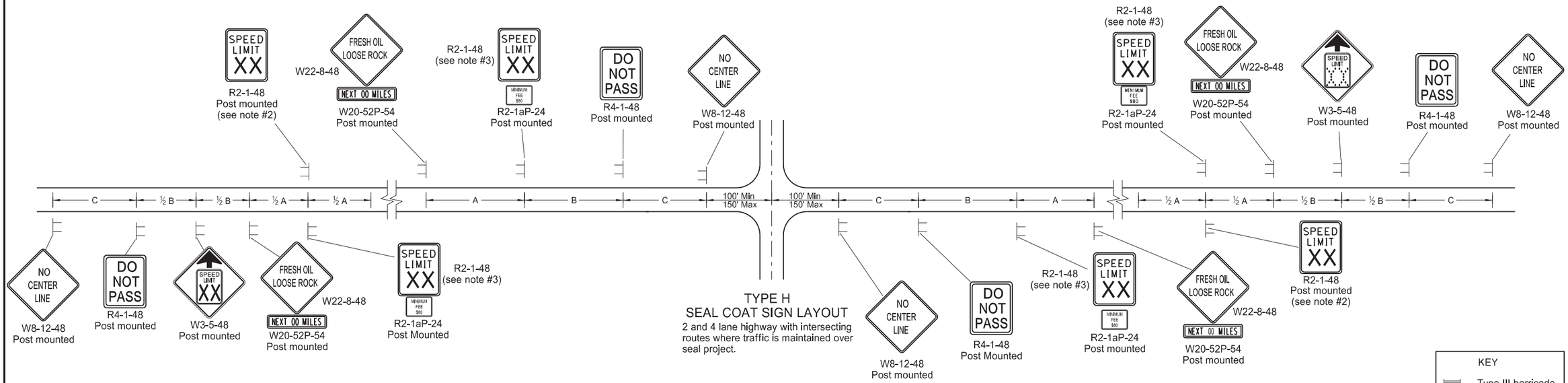
KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

11/29/22

TERMINAL AND SEAL COAT SIGN LAYOUTS

D-704-20





Notes:

1. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
2. Determine the exact speed limit in the field, based on location and conditions.
3. Determine the reduced speed limit based on the in place speed limit before construction. Where speed limit reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 MPH.) Place the second speed limit sign at ½ B.
4. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
5. Cover existing speed limit signs within a reduced speed zone.
6. On seal coat projects, place signs R2-1-48, R2-1aP-24, R4-1-48, W22-8-48 and W20-52P-54 after all important intersections and at five mile intervals. Place sign W8-12-48 after all important intersections and at 2 mile intervals until short term center line pavement marking is placed.
7. As an option, use portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Drawing D-704-14.
8. Cover or remove speed limit signs from layout Type H when loose aggregate is removed.
9. Install sign G20-1b-60 when work is suspended for winter.
10. Use other traffic control layouts in immediate work areas. Place sign R2-1aP-24 below speed limit signs in reduced speed limit work areas.
11. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.
12. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

DATE	CHANGE
08-17-17	Updated notes & sign numbers
11-01-19	Updated note & sign
12-08-21	Switched order of Road Work and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work

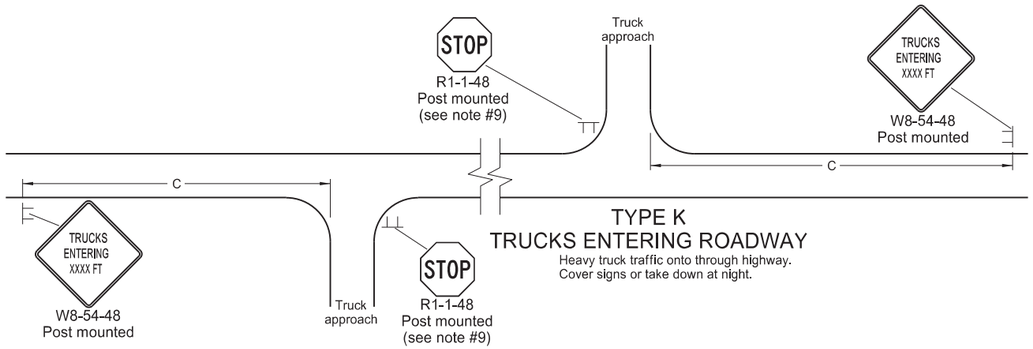
KIRK J. HOFF REGISTERED PROFESSIONAL PE-4683 ENGINEER NORTH DAKOTA

11/29/22

CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

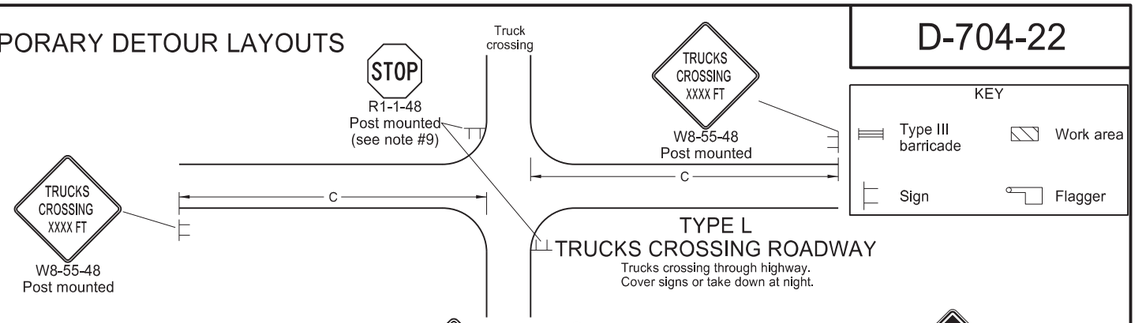
D-704-22

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



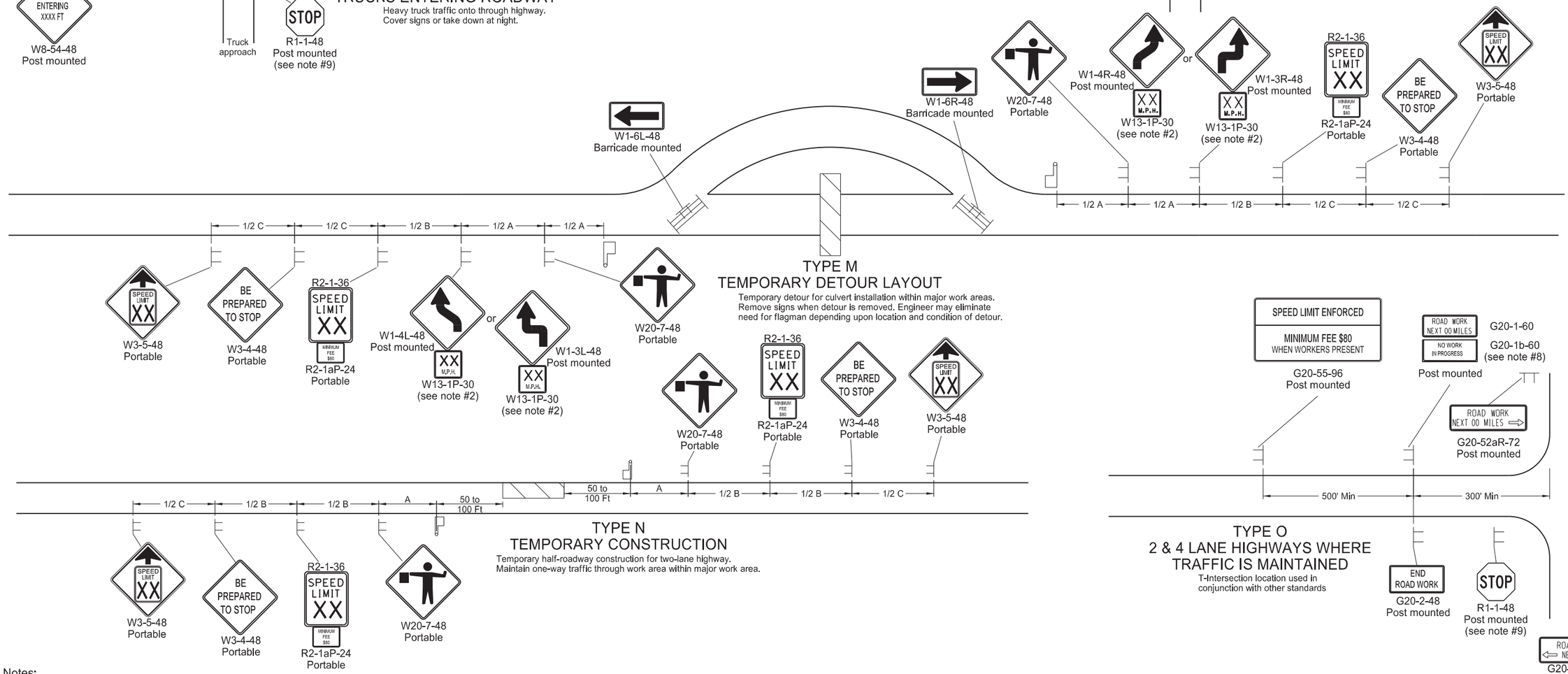
TYPE K
TRUCKS ENTERING ROADWAY

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



TYPE L
TRUCKS CROSSING ROADWAY

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



TYPE M
TEMPORARY DETOUR LAYOUT

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

TYPE N
TEMPORARY CONSTRUCTION

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

TYPE O
2 & 4 LANE HIGHWAYS WHERE TRAFFIC IS MAINTAINED

T-Intersection location used in conjunction with other standards

Notes:

1. Place barricades on a moveable assemblies and signs on portable assemblies when located on roadway.
2. Where necessary, safe speed to be determined by the Engineer.
3. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½ B.
4. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
5. Cover existing speed limit signs within a reduced speed zone.
6. Covered (when approved by engineer) or obliterated pavement marking measured as Obliteration of Pavement Marking.
7. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
8. Install sign G20-1b-60 when work is suspended for winter.
9. If existing stop sign is in place, a 48" stop sign is not required.
10. Sign G20-55-96 is not required if layout is part of other traffic control that contains this sign, or if work is less than 15 days.
11. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

ADVANCE WARNING SIGN SPACING

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

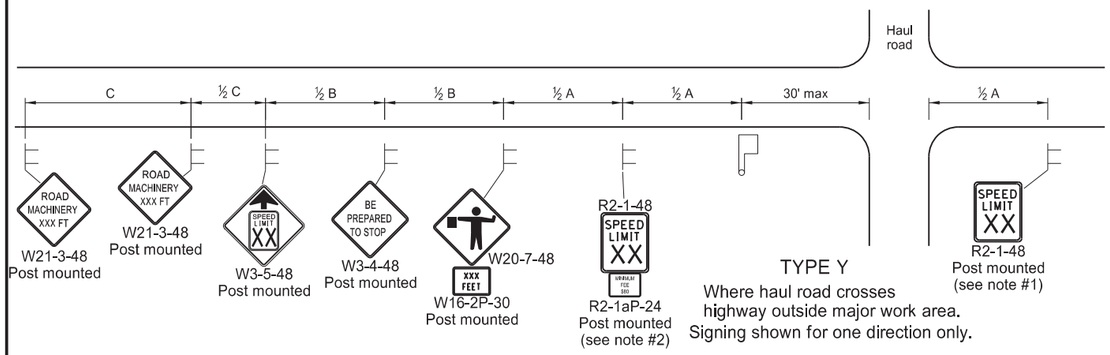
DATE	CHANGE
08-17-17	Update notes & sign numbers
11-01-19	Revised sign numbers & note 7
12-09-21	Added Speed Limit Enforced and Dollars At Work signs
11-29-22	Removed Dollars At Work

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

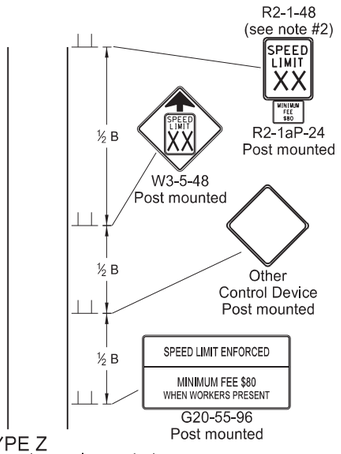
11/29/22

MISCELLANEOUS SIGN LAYOUTS

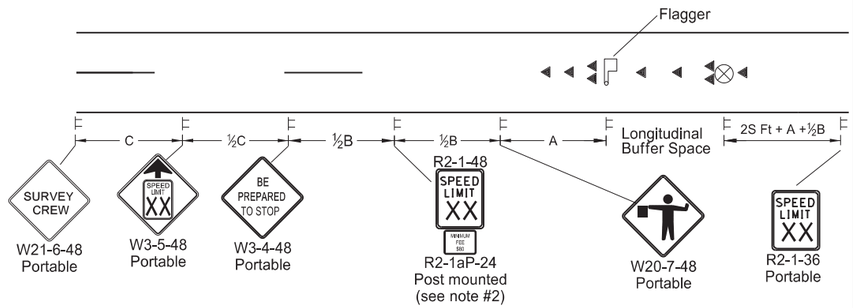
D-704-26



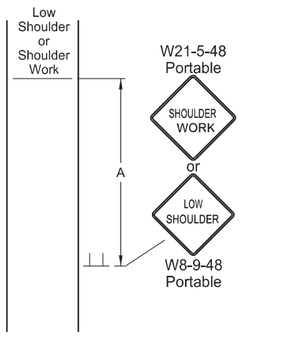
TYPE Y
Where haul road crosses highway outside major work area.
Signing shown for one direction only.



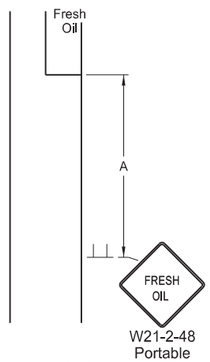
TYPE Z
Where speed zone is needed
Signing shown for one direction only.



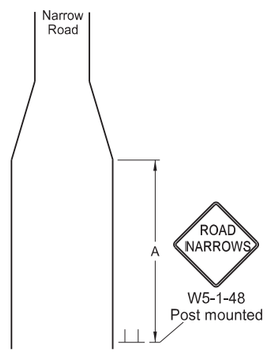
TYPE AA
Where survey crew is used
Signing shown for one direction only.



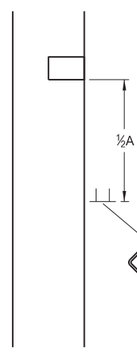
TYPE BB
Within major work area where sign conditions exist



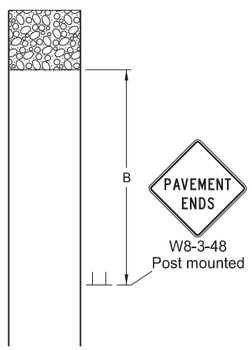
TYPE CC
Where sign conditions exist



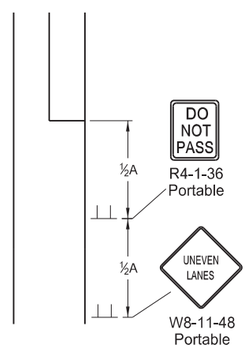
TYPE DD
Where sign conditions exist



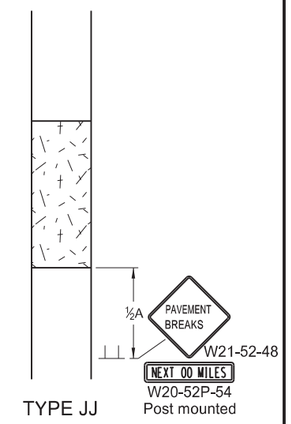
TYPE EE
Where sign conditions exist



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



TYPE GG
Where elevation difference exists between lanes

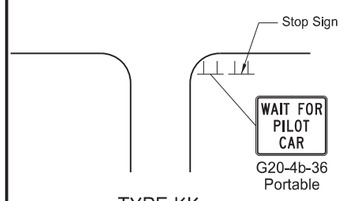


TYPE JJ
For break in pavement.
Install signs when conditions exist and remove when not applicable.
Signing shown for one direction only.

KEY

Flagger	Sign
Cones	Survey Equipment

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



TYPE KK
At major intersections within pilot car control area

Notes
1. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
2. Determine reduced speed limit based on in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at 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 Drawing D-704-14.
6. Sign G20-55-96 is not required if this standard is part of other traffic control layouts, or work is less than 15 days.
7. When pilot car operation is used, place sign G20-4b-36 "Wait For Pilot Car" at major intersections within pilot car control area.
8. Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
9. Layouts shown for one direction only.

ADVANCE WARNING SIGN SPACING

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

Longitudinal Buffer Space

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

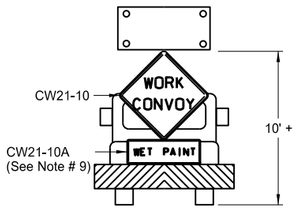
REVISIONS

DATE	CHANGE
8-17-17	Added speed limit signs. Updated notes & sign numbers.
11-01-19	Revised note 5 & sign numbers.
2-23-23	Revised distance & removed signs.

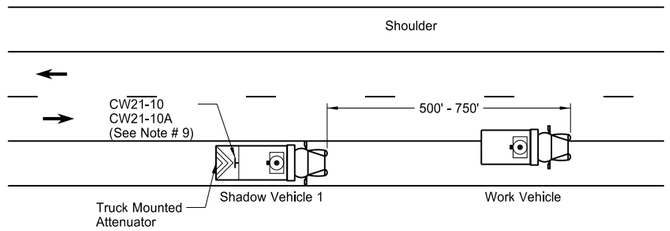
KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

02/23/23

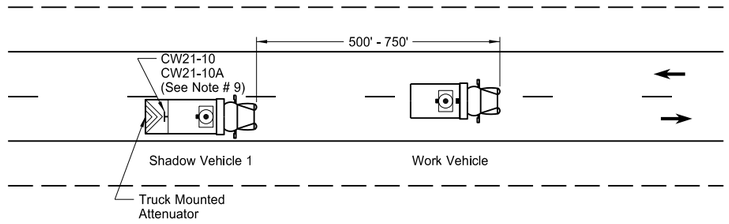
MOBILE OPERATION
(PAVEMENT MARKING)



Typical Shadow Vehicle 1
Two-Way Roaday

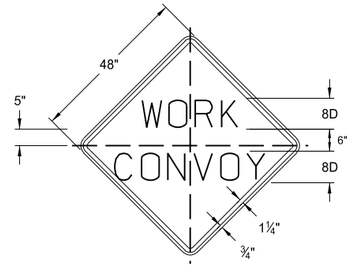


Two-Way Roadway with Paved Shoulders

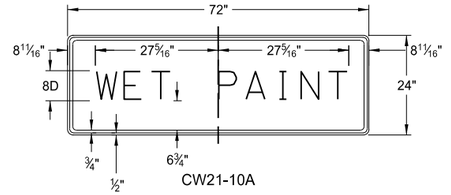


Two-Way Roadway without Paved Shoulders

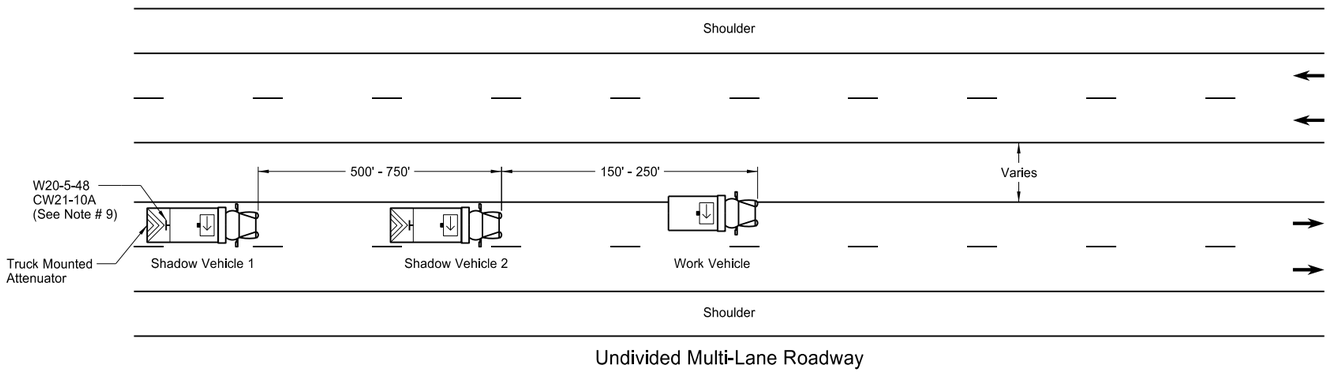
Sign Details



CW21-10

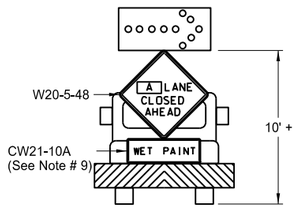


CW21-10A



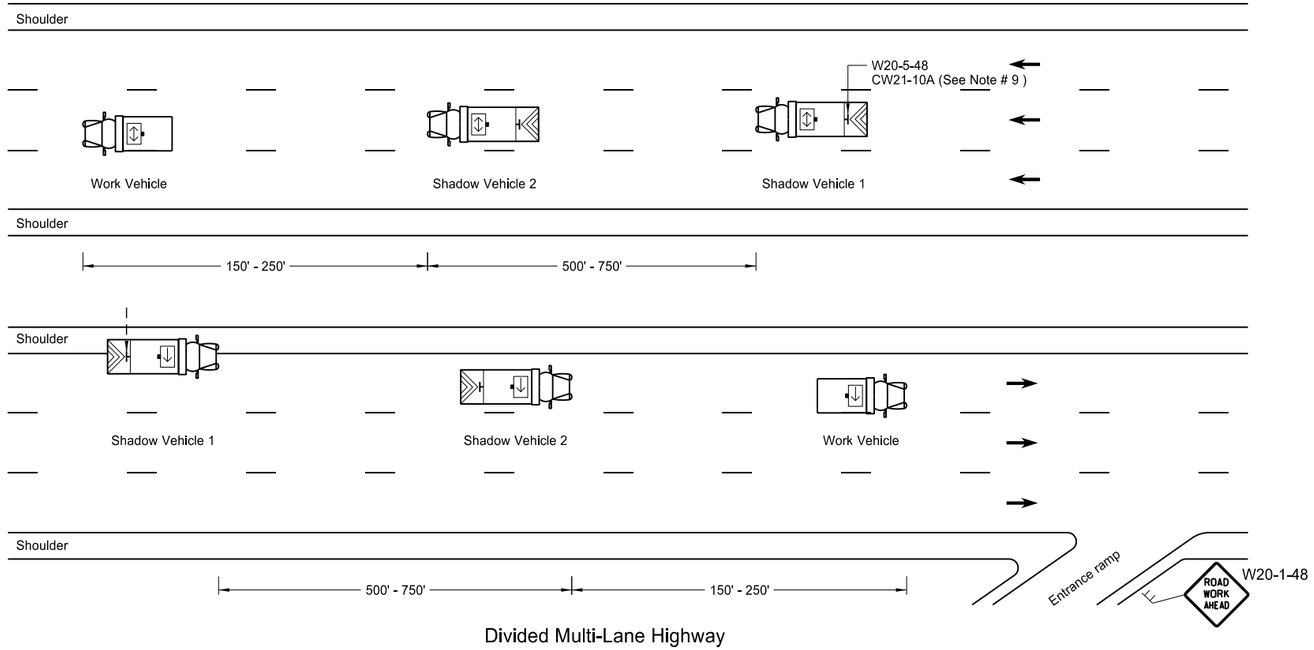
Undivided Multi-Lane Roadway

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

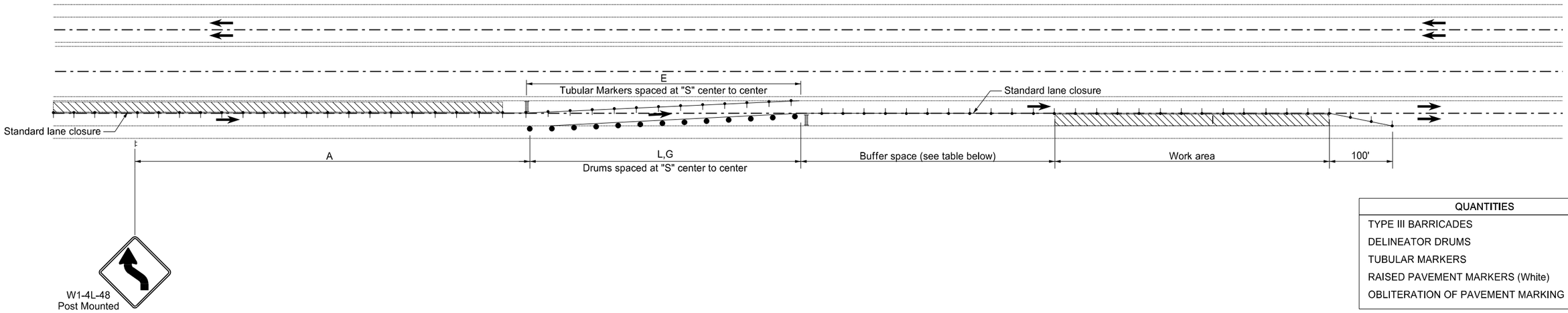
- Sign
- Truck mounted attenuator
- Flashing arrow panels:
  - Right directional
  - Left directional
  - Double arrow directional
  - Caution Mode

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
11-08-19	Changed Standard Heading

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

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	13 Each
TUBULAR MARKERS	13 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 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 Drawing D-704-14.
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

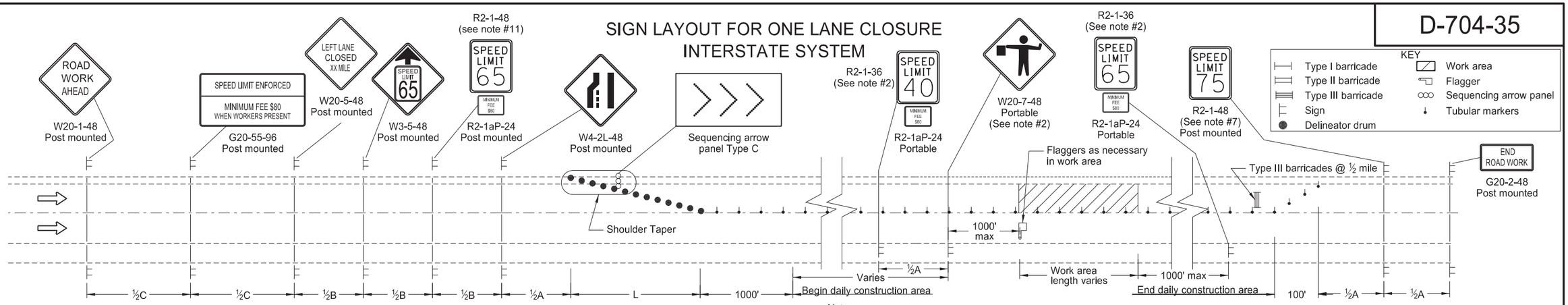
REVISIONS

DATE	CHANGE
9-27-17	Updated to active voice
11-01-19	Clarified work zone

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

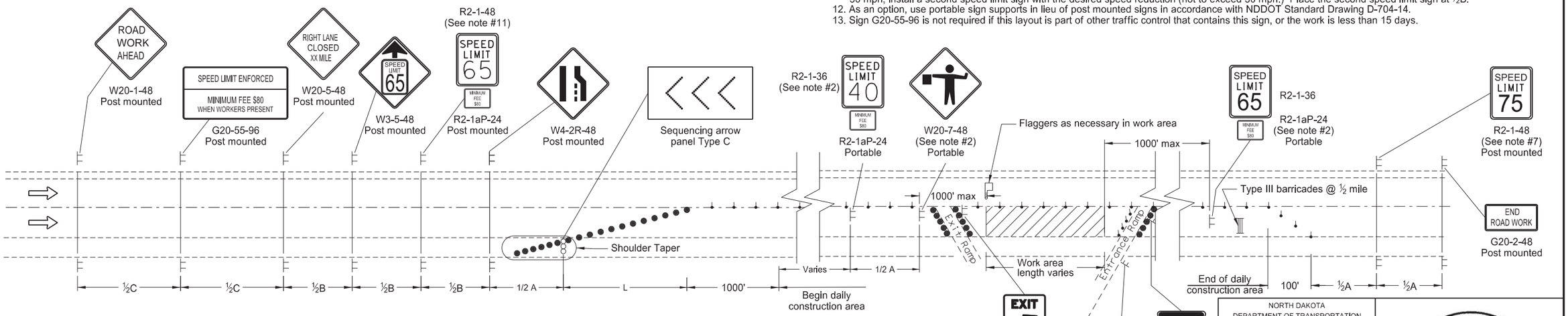
D-704-35

SIGN LAYOUT FOR ONE LANE CLOSURE INTERSTATE SYSTEM



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



RIGHT LANE CLOSED
WORKERS IN WORK AREA

Notes:

1. Install advance signs for flagging when flaggers are flagging.
2. Move the advanced flagger sign and the speed limit signs as the work area moves through the construction zone. When the work area is not visible from the flagger, move the flagger station so the work area is visible. Space the 40 mph speed limit sign at 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 Drawing D-704-14.
13. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

9-7-2012

REVISIONS

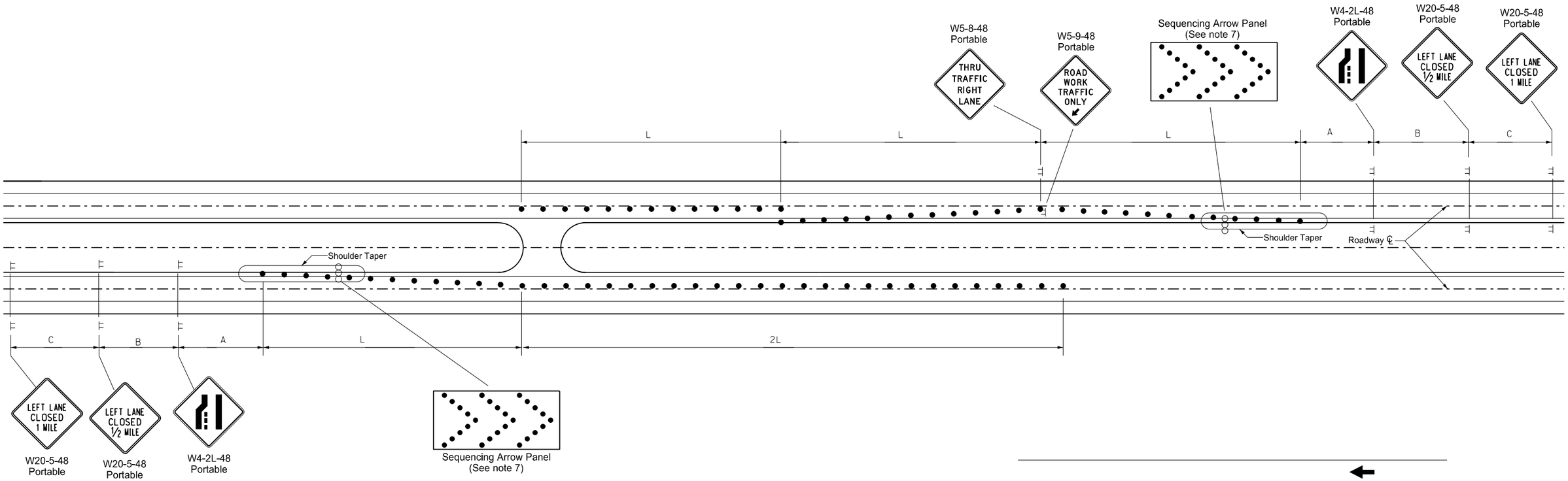
DATE	CHANGE
06-23-14	Revised Note 12
03-15-16	Removed Do Not Pass signs & updated notes
08-17-17	Moved speed signs & added note
10-17-17	Corrected spelling of "shoulder"
11-01-19	Revised tubular Mrkrs symbols
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced, added Dollars At Work, &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

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

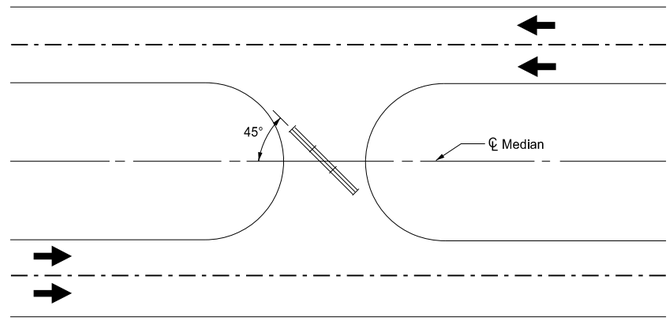
11/29/22

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS
CONSTRUCTION TRAFFIC MEDIAN CROSSING

D-704-49



Notes:
1. Include all costs for construction signing and devices in other items.
2. Remove construction signs and channelizing devices daily and barricade median access during nonworking hours.
3. Provide a minimum distance of one mile between the work area and the crossover. Use interchange access when the distance between work area and interchange is less than two miles.
4. Do not allow construction traffic to decelerate until they are well into crossover lane.
5. 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 speed of 40 mph or less
6. Space delineator drums, barricades or cones used for tapering traffic at dimension "S".
7. Sequencing Arrow Panels:
   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 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 and over 5000 ADT).



BARRICADE LOCATION DETAIL

Install barricades at 45 degrees away from approaching traffic when median access is not in use.

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
- Sign
- Delineator Drum
- Sequencing Arrow Panel
- Type III Barricade

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
11-19-12

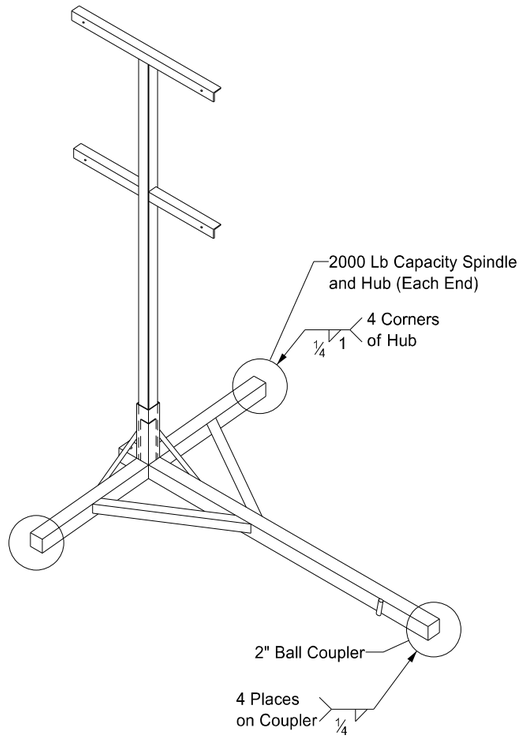
REVISIONS

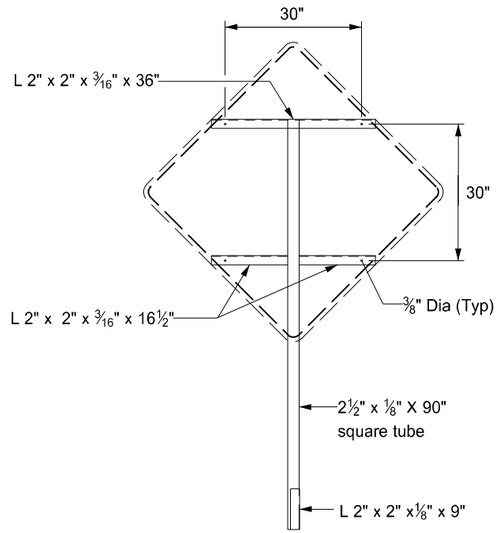
DATE	CHANGE
06-24-14	Changed W5-9-48 to portable mounted.
09-06-19	Update Notes to active voice & New Design Engr PE Stamp.
11-01-19	Identified Shoulder Taper.

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

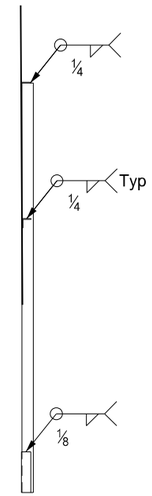
PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50





FRONT

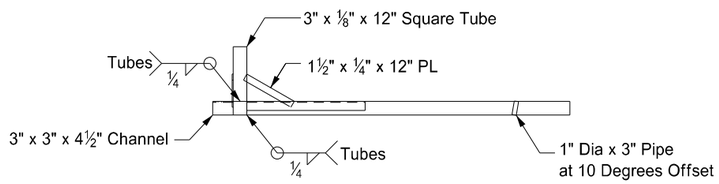


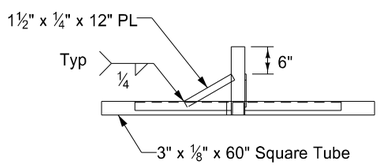
RIGHT

SIGN SUPPORT

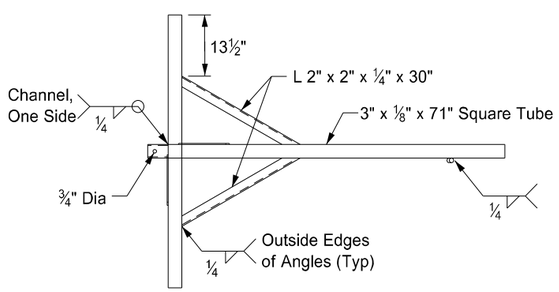
Notes:

1. Maximum 250 pound weight of assembly.
2. Use a 14" wheel and tire.
3. Use no automotive and equipment axle assemblies for trailer-mounted sign supports.
4. Other NCHRP 350 or MASH crash tested assemblies are acceptable.





RIGHT



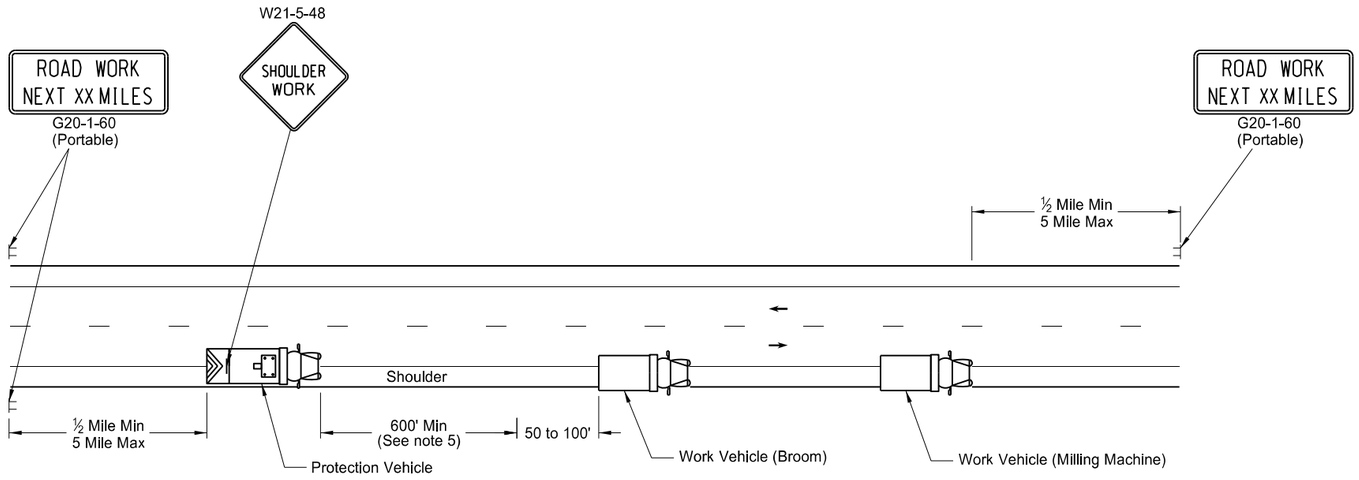
TOP

TRAILER

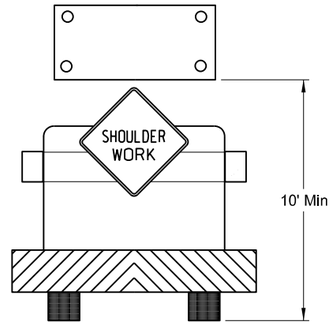
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE
12/02/2020	Updated Note to active voice.

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

MOBILE OPERATION
Grinding Shoulder Rumble Strips



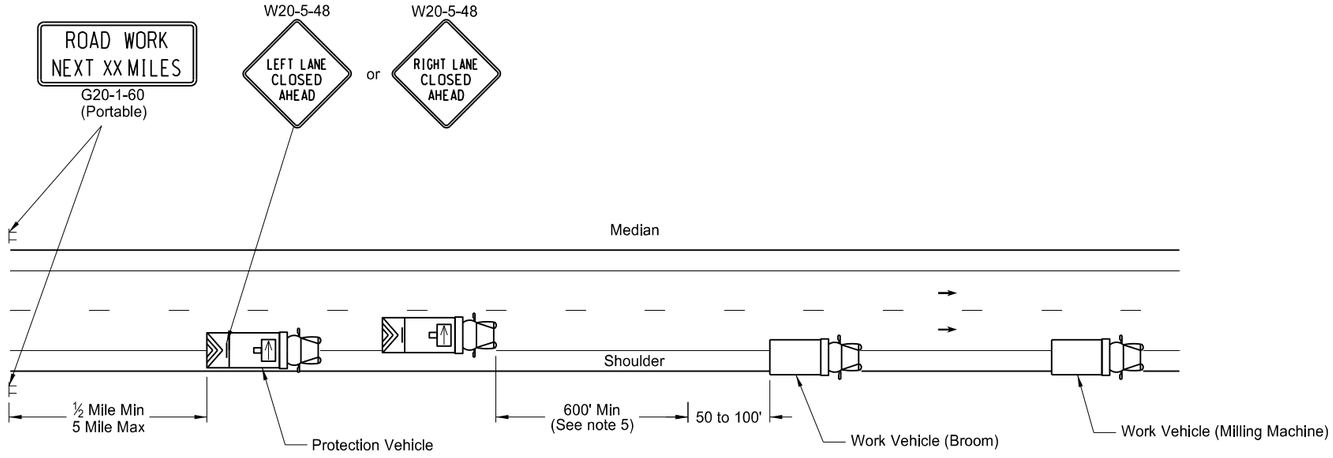
TWO LANE - TWO WAY ROADWAY



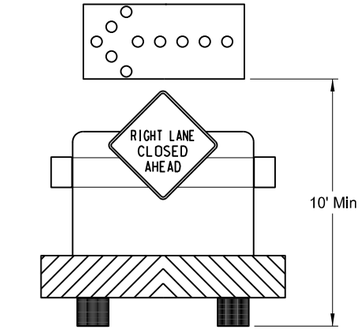
TWO LANE - TWO WAY ROADWAY

Typical Protection Vehicle with
Flashing Arrow Panel In Caution Mode

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

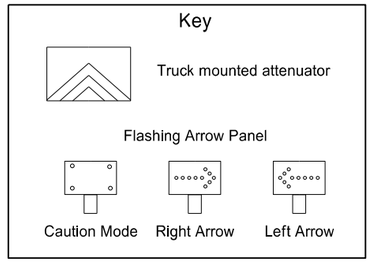


INTERSTATE & 4 LANE DIVIDED HIGHWAY



INTERSTATE & 4 LANE DIVIDED HIGHWAY

Typical Protection Vehicle with Flashing Arrow
Panel In Flashing Arrow Mode

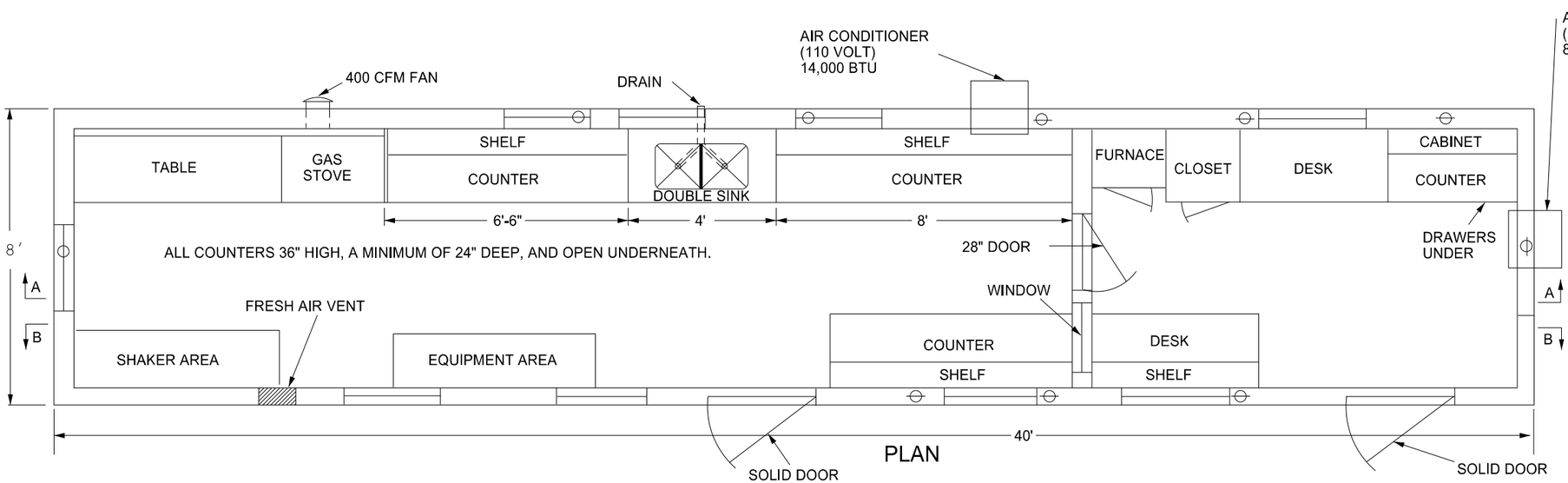


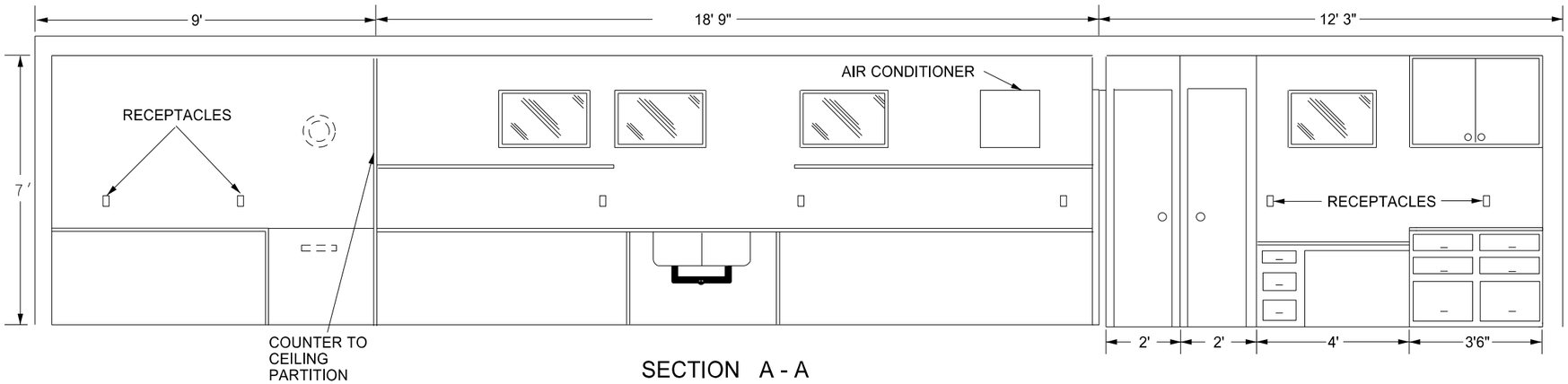
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-15-12	
REVISIONS	
DATE	CHANGE
8-17-17	Updated notes & signs
10-03-19	New Design Engineer PE Stamp

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

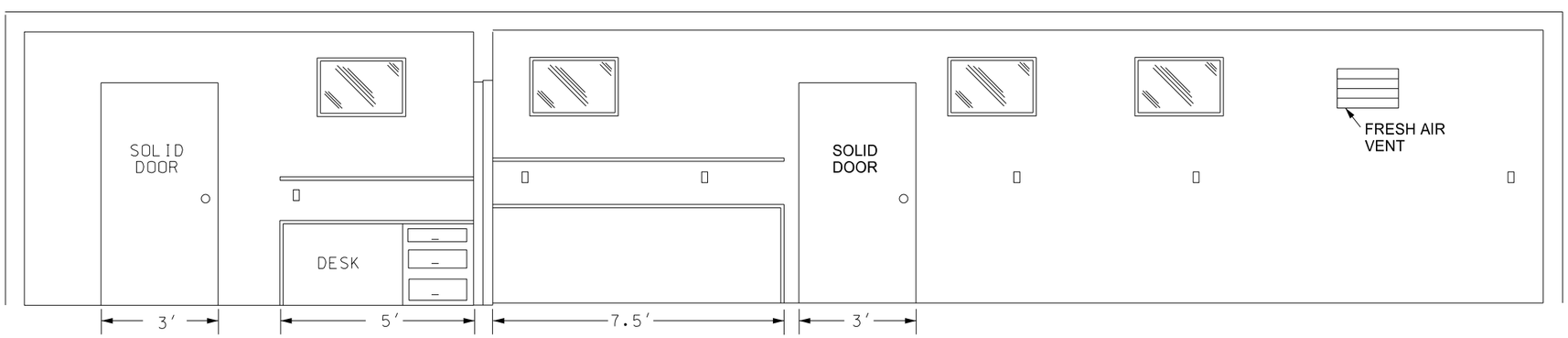
BITUMINOUS LABORATORY

D-706-1





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.
08-27-19	New Design Engineer PE Stamp

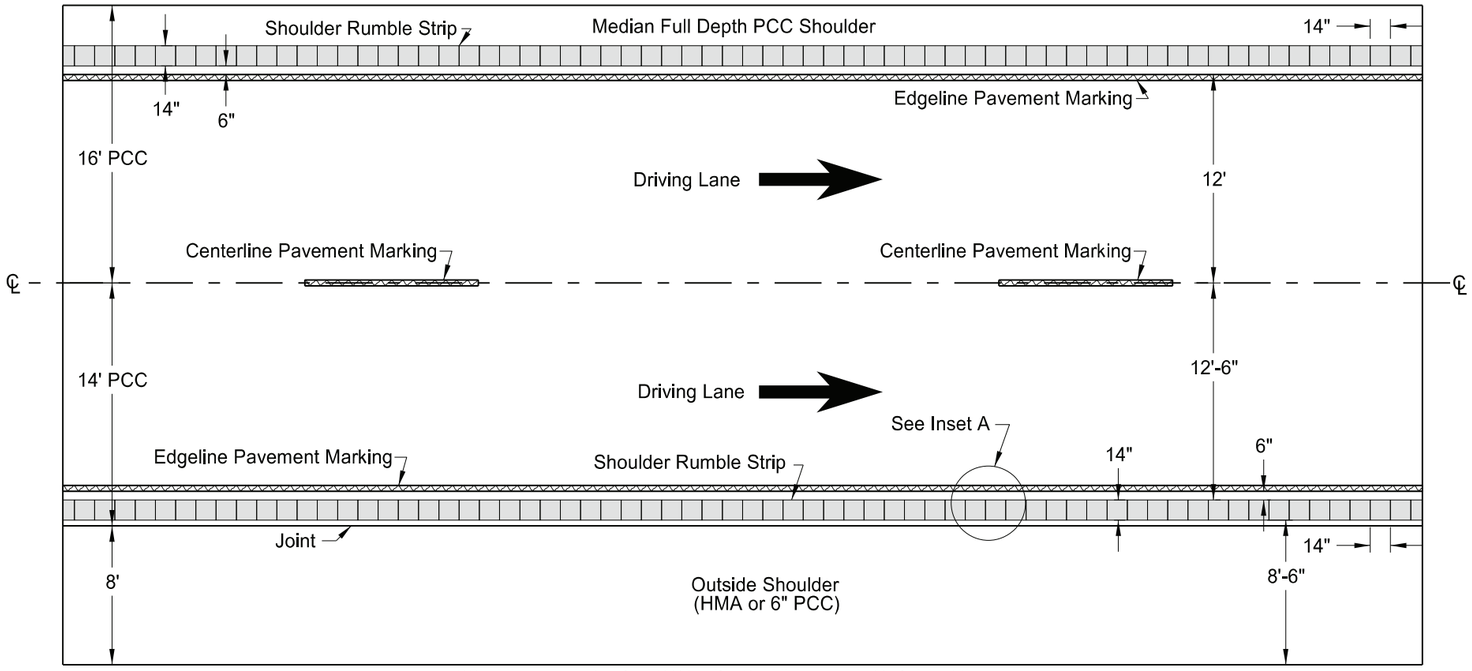
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 08/27/19 and the original document is stored at the North Dakota Department of Transportation

RUMBLE STRIPS
INTERSTATE HIGHWAYS

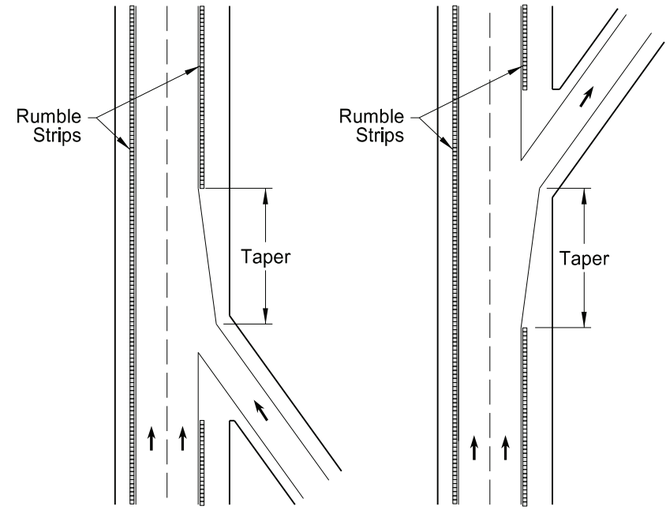
D-760-1

NOTES:

1) Discontinue rumble strips through ramps and tapers.

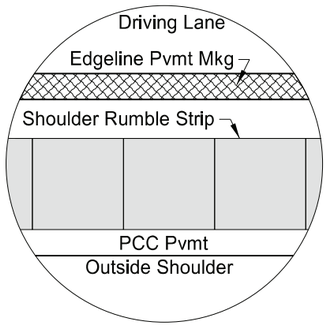


30' Wide Full Depth PCC with 8' Wide HMA Outside Shoulder

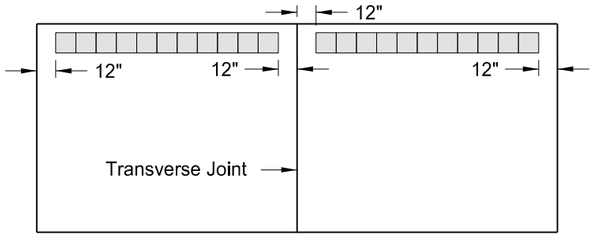


Entrance Ramp

Exit Ramp

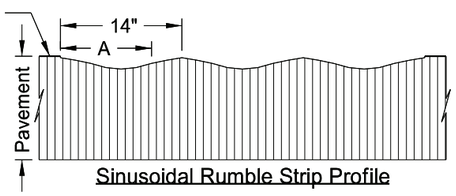


Inset A - Shoulder Rumble Strip
(Layout for opposite shoulder reversed)



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

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



Sinusoidal Rumble Strip Profile

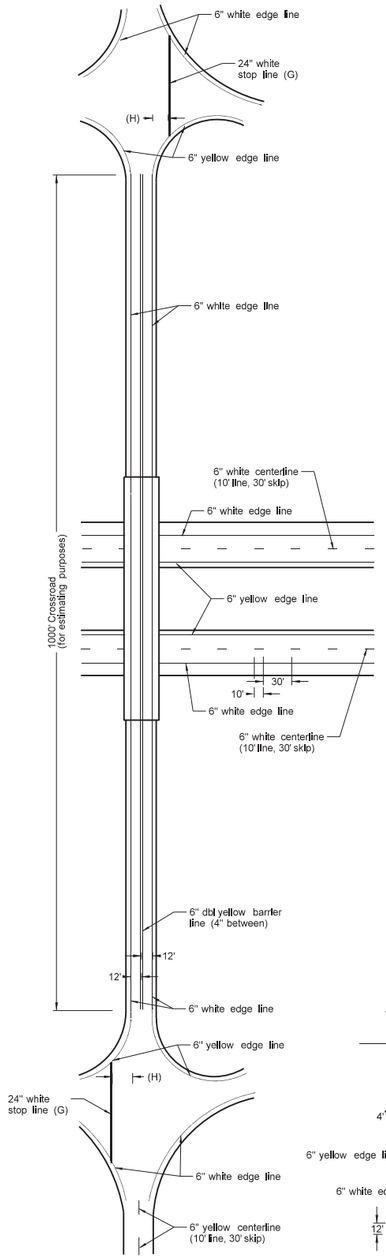
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-29-09	
REVISIONS	
DATE	CHANGE
2-25-10	Note 4 was added.
9-08-11	Revised Notes and D-760-1.
8-30-18	Revised drawings for clarity.
10-25-19	Added missing dimensions.
11-16-21	Added rumbles to end of taper.
5-26-23	Rumble strips made sinusoidal.

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

05/26/23

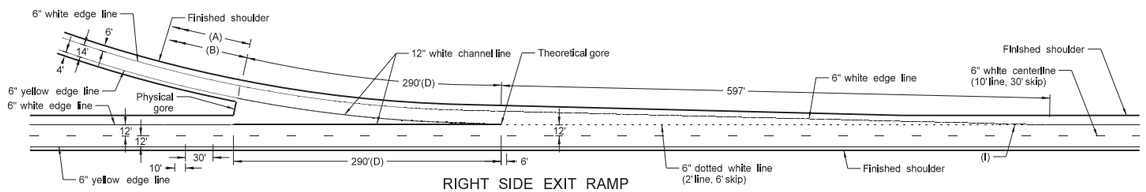
INTERSTATE PAVEMENT MARKING
4 LANE DIVIDED HIGHWAY

D-762-2

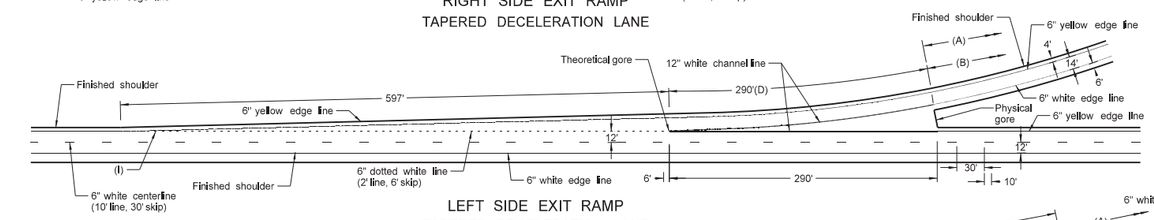


CROSS-ROAD & STRUCTURE

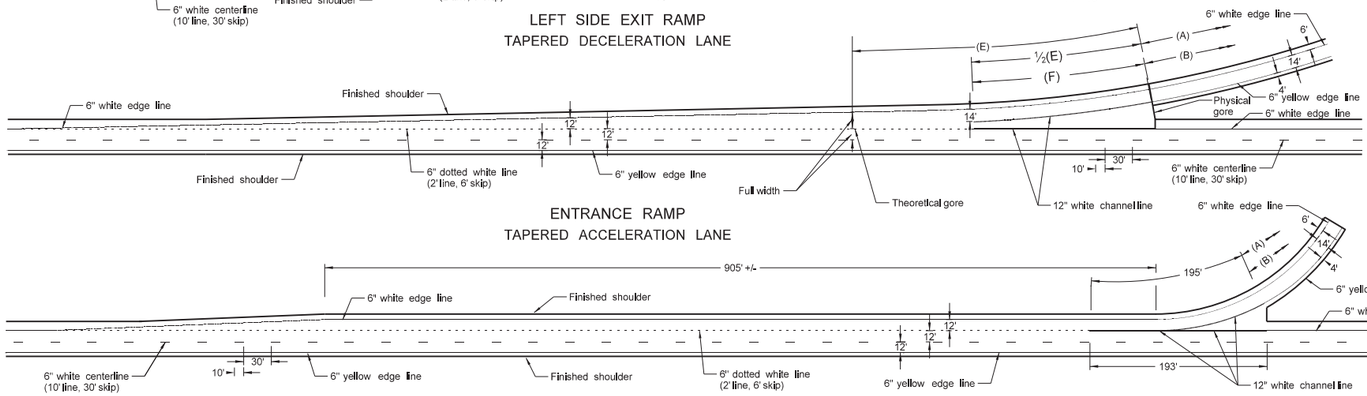
Engineer will determine length striped.



RIGHT SIDE EXIT RAMP
TAPERED DECELERATION LANE

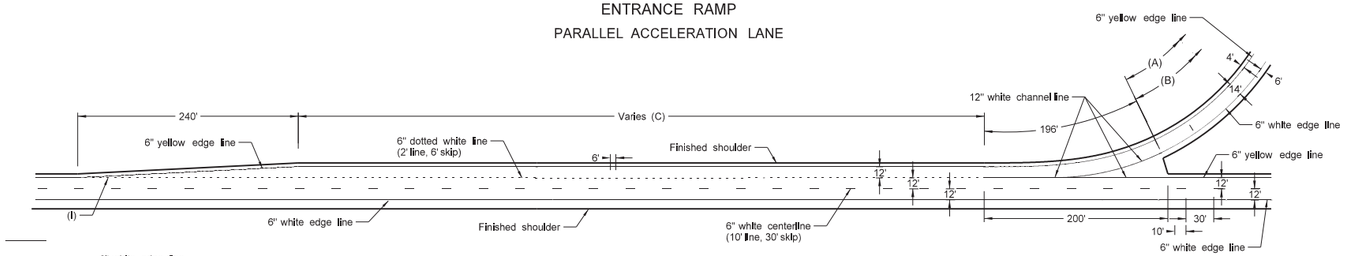


LEFT SIDE EXIT RAMP
TAPERED DECELERATION LANE

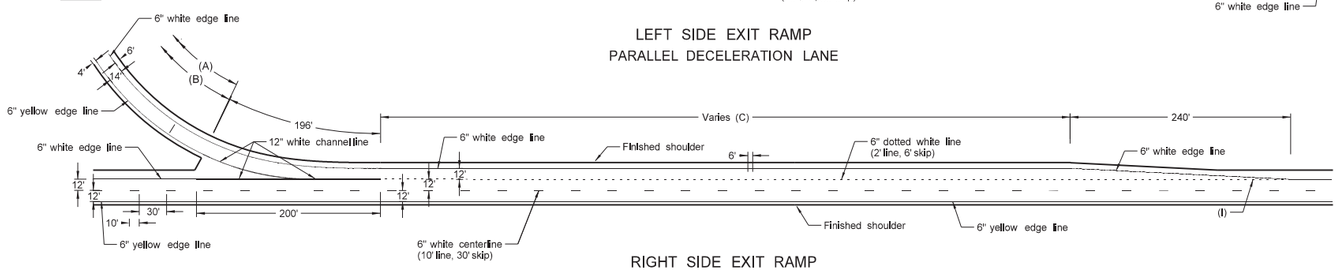


ENTRANCE RAMP
TAPERED ACCELERATION LANE

ENTRANCE RAMP
PARALLEL ACCELERATION LANE



LEFT SIDE EXIT RAMP
PARALLEL DECELERATION LANE



RIGHT SIDE EXIT RAMP
PARALLEL DECELERATION LANE

NOTE:

(A) Normal width white edge line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph.

Use 4 or 6 inch wide pavement marking for all other roadways with speed limits ≤ 40 mph.

(B) Normal width yellow edge line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph.

Use 4 or 6 inch wide pavement marking for all other roadways with speed limits ≤ 40 mph.

(C) Assume "varies" equals 790' for purpose of estimate. Place pavement marking from beginning of taper to the 12" line.
(D) Beginning of physical gore to theoretical gore.
(E) If the distace is less than 350' extend the 12" channel line to the theoretical gore, otherwise use 195'.
(F) Use 195' for estimating purposes.
(G) Not required for gravel surface crossroad approaches.
(H) 4' minimum, 15' maximum from nearest edge of intersection traveled way.
(I) Extend dotted line until it touches the edgeline.

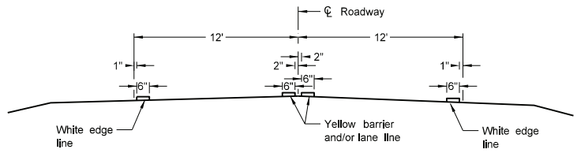
BASIS OF ESTIMATE		
LOCATION	ITEM	
Right or Left Side Exit Ramp TAPERED	12" White channel line	580 LF
	24" White stop line	60 LF
	6" White dotted line	148 LF
	6" White edge line	1115 LF
	6" Yellow edge line	1075 LF
Entrance Ramp TAPERED	12" White channel line	390 LF
	6" White dotted line	258 LF
	6" White edge line	1270 LF
	6" Yellow edge line	1075 LF
Right or Left Side Exit Ramp PARALLEL	12" White channel line	396 LF
	24" White stop line	60 LF
	6" White dotted line (C)	258 LF
	6" White edge line	1115 LF
	6" Yellow edge line	1075 LF
Entrance Ramp PARALLEL	12" White channel line	388 LF
	6" White dotted line	283 LF
	6" White edge line	1275 LF
	6" Yellow edge line	1075 LF
Main Line (Both Roadways)	6" White lane line, 10' line, 30' skip	2640 LF/MI
	6" White edge line	10,560 LF/MI
	6" Yellow edge line	10,560 LF/MI
Cross Road	6" White edge line	2000 LF
	6" 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
10-25-19	Replaced 2' Max dim with Note (I)
11-05-21	Revised labels
11-22-23	Revised pvmt marking widths
1-17-24	Revised wide pvmt marking width

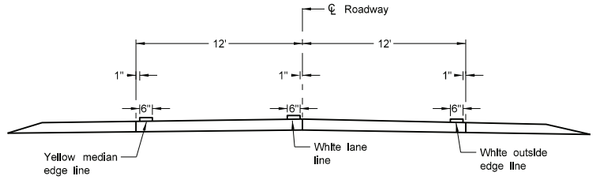
KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
01/17/24
ENGINEER
NORTH DAKOTA

PAVEMENT MARKING

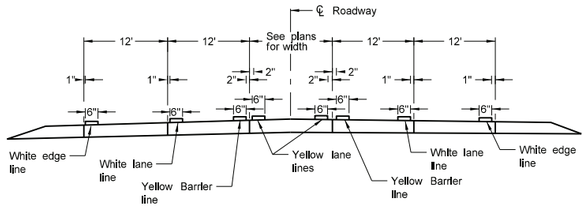
D-762-4



Two Lane Two Way
RURAL ROADWAY



Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



RURAL FIVE LANE ROADWAY
Concrete Section

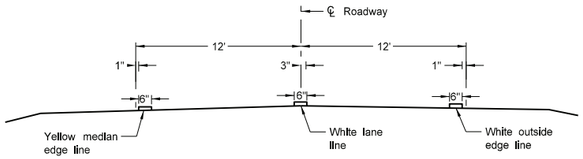
NOTES:

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

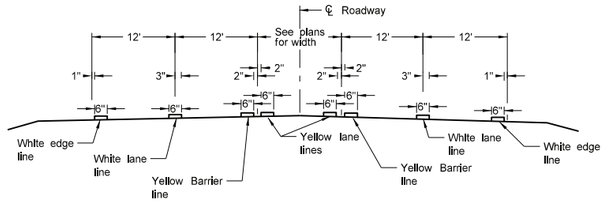
   For section lines, county roads, and street approaches, stripe the radii and edge lines of the paved surface within the right of way except where curb and gutter is present.

2. Normal width line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph,

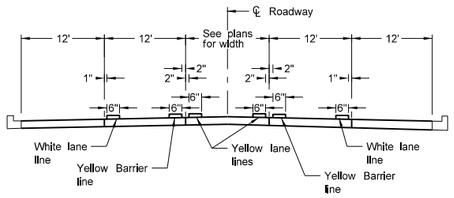
3. Use 4 or 6 inch wide pavement marking for all other roadways with speed limits < 40 mph.



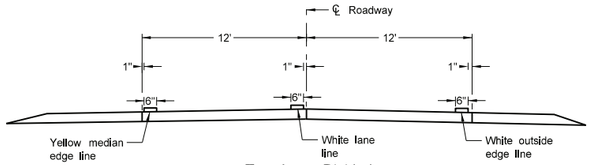
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



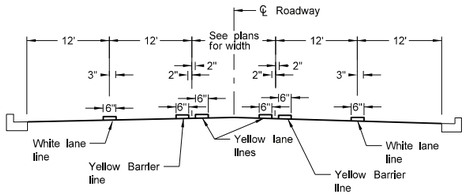
RURAL FIVE LANE ROADWAY
Asphalt Section



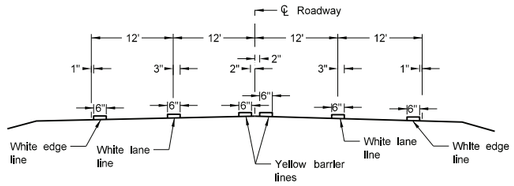
URBAN FIVE LANE SECTION
Concrete Section



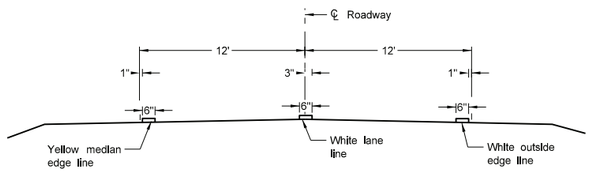
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Concrete Section



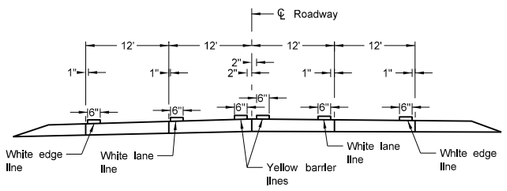
URBAN FIVE LANE SECTION
Asphalt Section



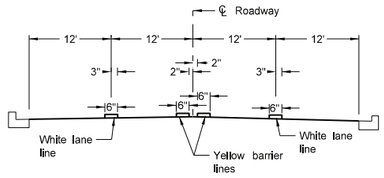
RURAL FOUR LANE ROADWAY
Asphalt Section



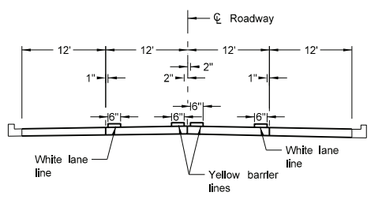
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



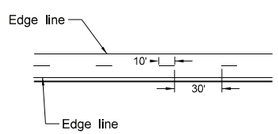
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



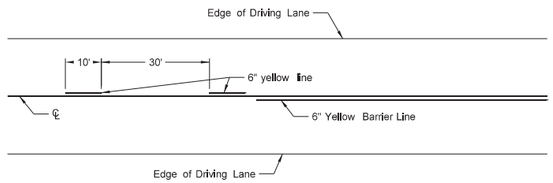
CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp.
11-22-23	Revised pavement marking widths.
07-09-24	Modified Note 1.

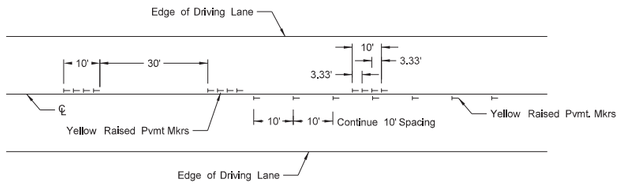
KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
07/09/24
ENGINEER
NORTH DAKOTA

SHORT-TERM PAVEMENT MARKING

D-762-11

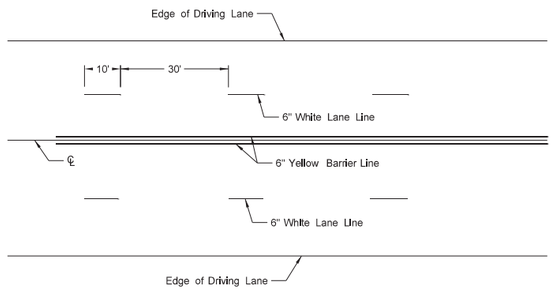


Painted or Tape Lines

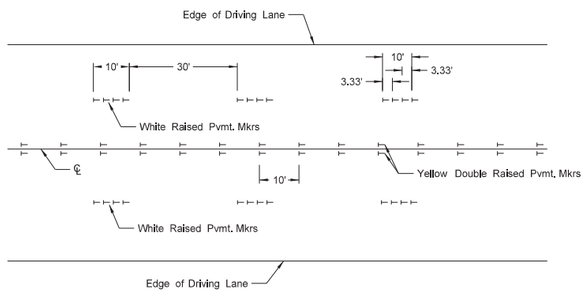


Raised Pavement Markers

TWO-LANE TWO-WAY ROADWAY

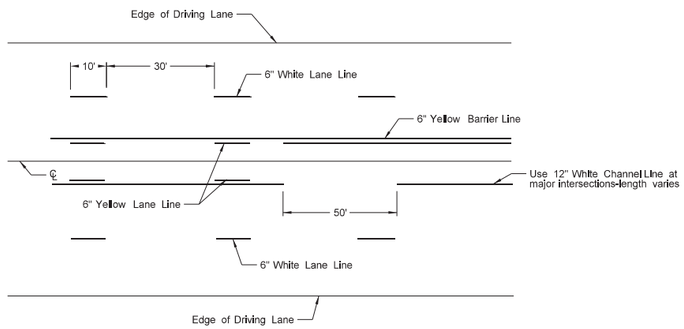


Painted or Tape Lines

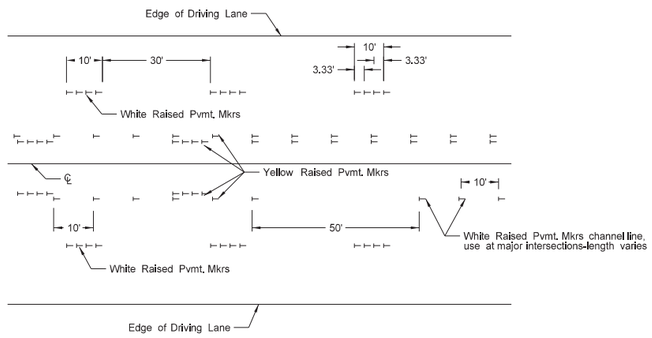


Raised Pavement Markers

FOUR LANE ROADWAY

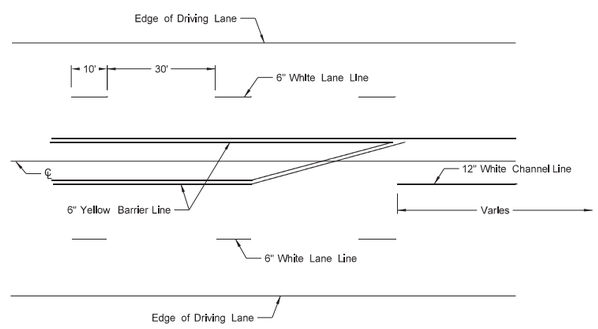


Painted or Tape Lines

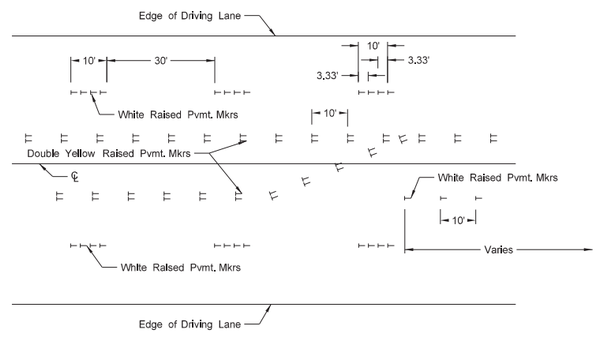


Raised Pavement Markers

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.
4. Normal width line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph.
5. Use 4 or 6 inch wide pavement marking for all other roadways with speed limits ≤ 40 mph.
6. Wide lines - 8 inches wide if 4 inch normal width lines are used and 12 inches wide if 6 inch normal width lines are used.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
3-29-16	Re-numbered to be D-762-11 (previously was D-762-6)
10-17-17	Updated to active voice.
8-27-19	New Design Engineer PE Stamp.
11-22-23	Revised pavement marking widths.
1-17-24	Revised wide pvmt marking width.

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
01/17/24
ENGINEER
NORTH DAKOTA