DESIGN DATA			
Traffic	Average Daily		
Current 2013	Pass: 3254	Trucks: 1054	Total: 4308
Preventative Maintenance			

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	18088	1	1

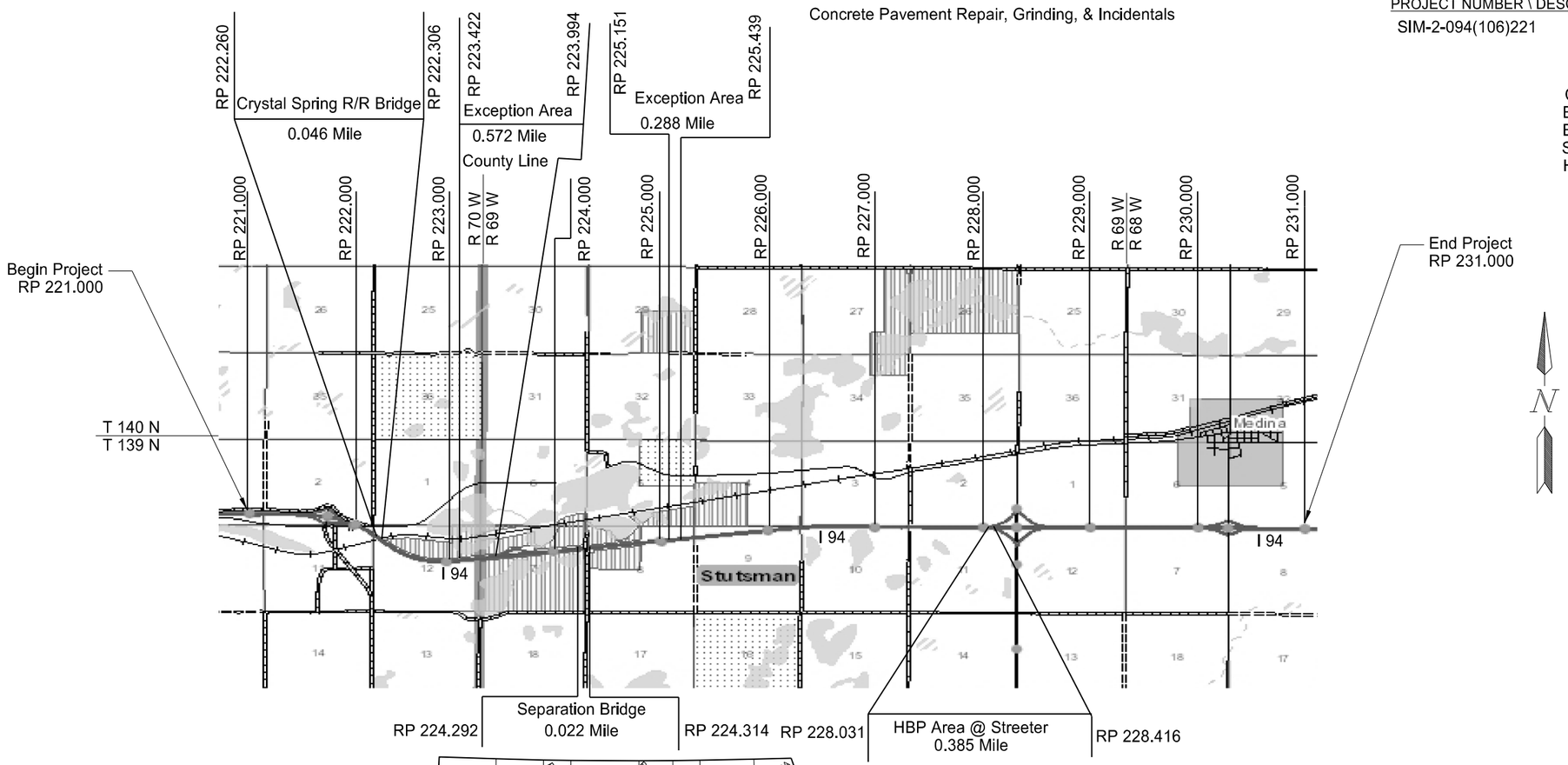
JOB # 5
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

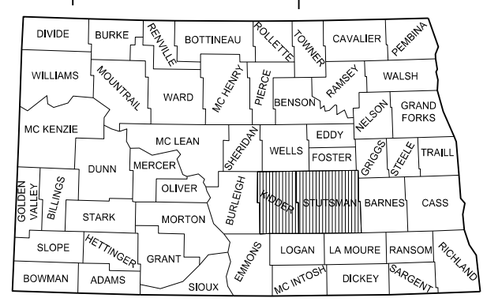
SIM-2-094(106)221
Stutman & Kidder County
Crystal Springs to 1 mile East Medina - EB
Concrete Pavement Repair, Grinding, & Incidentals

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

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
SIM-2-094(106)221	8.687	10.000

Exception Areas
Crystal Springs R/R Bridge = 0.046 Mile
Exception Area = 0.572 Mile
Exception Area = 0.288 Mile
Separation Bridge = 0.022 Mile
HBP Area @ Streeter = 0.385 Mile





STATE COUNTY MAP

DESIGNERS
Martin Avelino /s/
Dennis Rowell /s/

APPROVED DATE 1/12/2015
Jay Praska /s/
Valley City District Engineer
ND DEPARTMENT OF TRANSPORTATION

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

APPROVED DATE 1/12/2015
Daniel R Viau /s/
NDDOT - Valley City District

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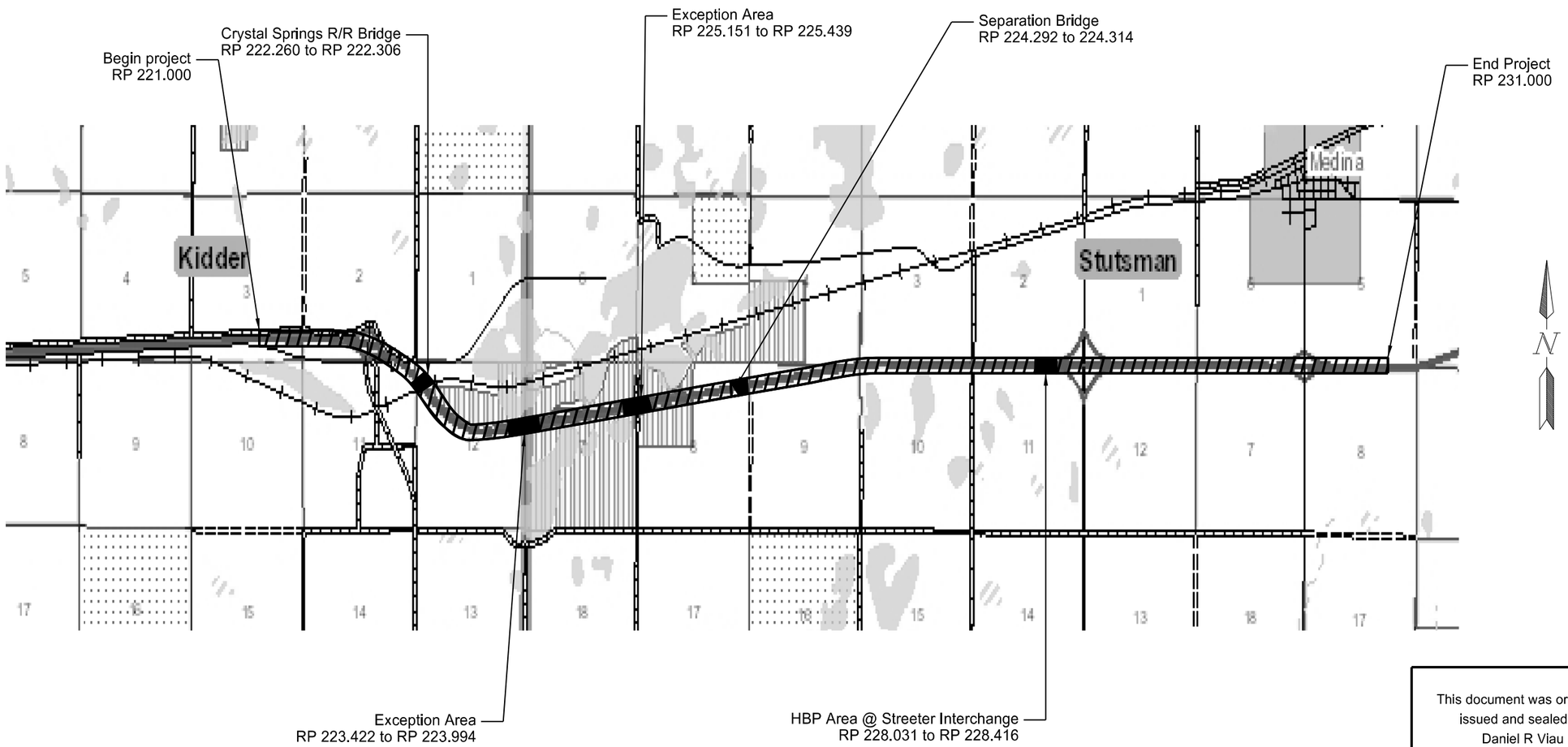
D-704-22	Construction Truck and Temporary Detour Layouts
D-704-27	Traffic Control Plan for Moving Operations
D-704-35	Sign Layout for One Lane Closure Interstate System
D-704-50	Portable Sign Support Assembly
D-762-2	Interstate Pavement Marking 4 Lane Divided Highway
D-762-4	Pavement Marking Details
D-762-6	Short Term Pavement Marking

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	4	1



Exception Areas

CRP & Grinding Areas

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Scope of Work
West Crystal Springs to East Medina

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	6	1

NOTES

105-P01 COORRINATION OF WORK: Concrete pavement Repair Project SIM-2-094(107)240 will also be constructed in 2015. The contractor should coordinate scheduling work activities, traffic control, etc. with the contractors on this adjacent project. Any costs associated with this coordination of work shall be the contractor's responsibility.

107-700 HAUL ROADS: The Engineer will not designate paved roads off the state system as haul roads.

107-710 HAUL ROADS: Before submitting a proposal, contact the appropriate State, County, Township, or City officials to determine if there are any roadways that will be designated as "no haul routes".

570-P01 CONCRETE PAVEMENT REPAIR: An additional 10% has been added to the quantities for "10IN-Concrete Pavement Repair-Full Depth-Dowelled", "Spall Repair-Partial Depth", and "Random PCC crack Cleaning & Sealing

570-P02 TRANSVERSE JOINTS CLEANING AND SEALING: Seal all transverse joints with silicone sealant as per Specification 826.02 B.1

570-P03 DOWELED CONTRACTION JOINT ASSEMBLY: The cost for the doweled contraction joint assemblies will be included in the price bid for 10" concrete pavement repair.

704-100 TRAFFIC CONTROL SUPERVISOR: Provide a Traffic Control Supervisor shall be provided on this project.

704-P01 TRAFFIC CONTROL DEVICES: The traffic control devices list has been developed using the following layouts on the Standard Drawing for traffic control:

D-704-5, Contractor sign as applicable
D-704-7, 8, 9, 10, 11, 13, and 14 are applicable
D-704-22, Layouts Type K & Type L for trucks hauling
D-704-27, For pavement marking operations.
D-704-35, one lane road closure on interstate

The quantities have been developed based on one 5 mile long one-lane closure. The required traffic control signs and devices are included in the "Traffic Control Devices List" and will be measured and paid at the Contract Unit Price for each device.

Additional devices required to accommodate the Contractor's operation shall be the Contractor's responsibility.

704-P02 TRAFFIC CONTROL: The portable traffic control used on this project will also be used on the adjacent, tied project SIM-2-094(090)231. These devices will only be paid for once on SIM-2-094(106)221 and will not be paid for again on the tied project. All costs to use the devices on the tied projects shall be included in the bid price bid for "Traffic Control Signs"

704-P03 MAINTENANCE & PROTECTION OF TRAFFIC FOR CONCRETE PAVEMENT REPAIRS: In full depth removal areas stackable vertical panels shall be spaced at 10 feet on centerline roadway until the concrete has been replaced. A minimum of two stackable vertical panels shall be used at each full depth removal area.

Type I Barricades shall be placed in front of each open area or as directed by the Engineer. The barricades shall not encroach onto the traffic lane.

The concrete pavement repairs must be completed for the entire length of one lane closure before starting any work in the adjacent lane.

If the Contractor is going to operate in a manner other than as herein provided, a complete traffic control layout and program shall be provided to the Engineer for review and approval prior to work being performed.

704-P04 TRAFFIC ROUTING DURING CONSTRUCTION: The Contractor shall provide one lane for traffic at all times. The Contractor's traffic shall be in the same direction as public traffic. Ramp traffic shall be maintained at all times during the pavement removal and replacement.

704-P05 CONSTRUCTION TRAFFIC: The Contractor's construction traffic required for concrete pavement repair shall be limited to access at interchanges only. Construction traffic will not be permitted to access from one roadway to the other roadway through the median.

762-P01 PERMANENT STRIPING: The Contractor shall groove over existing centerline striping to install new Preformed Patterned Pavement Mk 4IN Line – Grooved centerline striping after grinding operations have been completed. If the Contractor's operation moves forward without permanent striping installed, it will be necessary to install temporary striping prior to moving the lane closure. This temporary striping will be paid for under the bid item "Short Term 4IN Line – Type NR."

All permanent striping shall be along the same alignment and offset as the temporary striping to ensure all temporary striping is obliterated. Any temporary striping remaining after the grooving operation for permanent striping has been completed shall be obliterated at the Contractor's expense. All labor, materials, and equipment used to install new centerline striping in this manner shall be included in the unit bid price for "Preformed Patterned Pvmt Mk 4IN Line – Grooved."

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ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	8	1

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
103	0100	CONTRACT BOND	L SUM	0.57	0.57
216	0100	WATER	M GAL	217	217
302	0120	AGGREGATE BASE COURSE CL 5	TON	200	200
570	0210	PCC PAVEMENT GRINDING	SY	152,891	152,891
570	0710	10IN CONC PVMT REPAIR-FULL DEPTH-DOWELED	SY	750.9	750.9
570	0950	1/2IN TRANSVERSE PCC JOINT CLEAN & SEALING	LF	116,255	116,255
570	0965	LONGITUDINAL PCC JOINT CLEANING & SEALING	LF	136,530	136,530
570	0966	RANDOM PCC CRACK CLEANING & SEALING	LF	2,996	2,996
570	1512	SPALL REPAIR-PARTIAL DEPTH	SF	1,415	1,415
702	0100	MOBILIZATION	L SUM	0.57	0.57
704	0100	FLAGGING	MHR	500	500
704	1000	TRAFFIC CONTROL SIGNS	UNIT	1,582	1,582
704	1050	TYPE I BARRICADE	EA	40	40
704	1052	TYPE III BARRICADE	EA	29	29
704	1060	DELINEATOR DRUMS	EA	65	65
704	1067	TUBULAR MARKERS	EA	240	240
704	1080	STACKABLE VERTICAL PANELS	EA	80	80
704	1087	SEQUENCING ARROW PANEL-TYPE C	EA	1	1
762	0430	SHORT TERM 4IN LINE-TYPE NR	LF	116,350	116,350
762	0434	SHORT TERM 8IN LINE-TYPE NR	LF	2,450	2,450
762	1104	PVMT MK PAINTED 4IN LINE	LF	103,648	103,648
762	1305	PREFORMED PATTERNED PVMT MK 4IN LINE-GROOVED	LF	13,200	13,200

BASIS OF ESTIMATE

Material

Water @ 25 MGal/Mile
8.687 Miles x 25 MGal/Mile = 217 MGal
Estimated 25 MGal/Mile for dust control

Aggr Base Course Cl 5

200 Tons of Aggr base Course Cl 5 has been added for under full depth repairs

Permanent Pavement Marking

Preformed Patterned Pvmt Mk 4" Line – Grooved – Center line
RP 221.000 to RP 231.000 = 10 Miles
10 Miles x 1320 LF/Mile = 13,200 LF

4" Yellow Edge Line
RP 221.000 to RP 231.000 = 10 Miles
10 Miles x 5280 LF/Mile = 52,800 LF

4" White Edge Line
RP 221.000 to RP 231.000 = 10 Miles
10 Miles x 5280 LF/Mile = 52800 LF
Minus 2,450 LF 8" Line = 50,350 LF

8" White Channel Lane = 2,450 LF

Short Term Pavement Marking

Short Term 4" Line - Type NR – Center line
10 Miles x1,320 LF/Mile = 13,200 LF

Short Term 8" Line – Type NR
8" White Channel Line = 2,450 LF

4" Yellow Edge Line
10 Miles x 5280 LF/Mile = 52,800 LF

4" White Edge Line
10 Miles x 5280 LF/Mile = 52800 LF
Minus 2,450 LF 8" Line = 50,350 LF

PCC Pavement Grinding

Lengths = 8.687 Miles
24' width plus a 3' feather pass on the Lt & Rt shoulders
Total width = 30'
8.687 Miles x 5280 LF/Mile x 30 LF = 1,376,021 SF / 9 = 152,891 SY

Longitudinal Joints

Lengths = 8.687 Miles
8.687Miles x 5280 LF/Mile = 45,867 LF x 3 = 137,601 LF
Minus 1071 LF (Joint Repair) = 136,530 LF

Transverse Joints

Lengths = 8.687 Miles
8.687Miles x 5280 LF/Mile = 45,867 LF
45,867 LF / 15 LF Spacing = 3,058 Joints
3,058 Joints x 38.5 LF = 117,733 LF
117,733 LF – 1478 LF (Joint repair) = 116,255 LF

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	1

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
221																
.189	D										2	X	3	6		
.189	P														36	
.252	D	6	X	12	8.0	36	20		12	24						
.367	D										2	X	2	4		
.374	D										2	X	2	4		
.540	P										2	X	2	4		
.572	P										2	X	2	4		
.585	P										2	X	4	8		
.585	D										2	X	2	4		
.589	D	6	X	12	8.0	36	20		12	24						
.589	D	6	X	12	8.0	36	20		12	24						
.591	D	6	X	12	8.0	36	20		12	24						
.591	D										2	X	2	4		
.670	D										2	X	2	4		
.670	D										2	X	4	8		
.670	P										2	X	2	4		
.706	P	6	X	12	8.0	36	20		12	24						
.709	D	6	X	12	8.0	36	20		12	24						
.719	P										2	X	2	4		
.746	D														14	
.775	P	6	X	12	8.0	36	20		12	24						
.783	P										2	X	4	8		
.783	D										2	X	4	8		
.796	D										2	X	2	4		
.809	P														45	
.822	P														12	
.839	P										2	X	3	6		
.853	D										2	X	2	4		
.855	P														45	
.863	D										2	X	2	4		
.863	P														30	
.899	D										2	X	2	4		
.929	P										2	X	2	4		
.929	P										2	X	6	12		
.936	P										2	X	2	4		
.939	P										2	X	2	4		
.940	P										2	X	2	4		
.942	P										2	X	8	16		
.945	D										2	X	2	4		

* Items are for information purposes only. No extra payment will be made for these items.
Include costs of these items in contract unit price for "10 In Concrete Pavement Repair - Full Depth - Doweled"

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Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	2

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
221 Cont.																
.949	D										2	X	2	4		
.955	P										2	X	2	4		
.957	P										2	X	2	4		
.957	D										2	X	2	4		
.962	D										2	X	2	4		
.965	D										2	X	2	4		
.970	D										2	X	2	4		
.982	D										2	X	2	4		
.987	P										2	X	4	8		
.987	D										2	X	2	4		
.990	P										2	X	2	4		
.990	D										2	X	2	4		
.995	P										2	X	2	4		
.999	D/P	13	X	24	34.7	74	40		26	48						
SUBTOTAL					90.7	326.0	180.0		110.0	216.0				200.0	182.0	Subtotal for Mile 221

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Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	3

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
222																
.010	P										2	X	4	8		
.014	P														15	
.018	D														12	
.029	D										2	X	2	4		
.049	D										2	X	2	4		
.063	P	6	X	12	8.0	36	20		12	24						
.063	P	6	X	12	8.0	36	20		12	24						
.067	D										2	X	2	4		
.107	P										2	X	4	8		
.121	P														15	
.125	D	6	X	12	8.0	36	20		12	24						
.144	D										2	X	2	4		
.145	P														15	
.172	D	6	X	12	8.0	36	20		12	24						
.172	P														10	
.175	P														15	
.193	P										2	X	2	4		
.193	P														30	
.203	P														15	
.229	P										2	X	2	4		
.246	D														12	
.315	P										2	X	2	4		
.315	D										2	X	2	4		
.327	P										2	X	2	4		
.368	P	6	X	12	8.0	36	20		12	24						
.390	D	6	X	12	8.0	36	20		12	24						
.390	P										2	X	2	4		
.490	P														10	
.642	D										2	X	4	8		
.646	P										2	X	2	4		
.726	D	8	X	12	10.7	40	20		16	24						
.726	P														8	
.755	D										2	X	2	4		
.787	P										2	X	2	4		
.809	D										2	X	2	4		
.824	D										2	X	2	4		
.838	D	14	X	12	18.7	52	20		28	24						
.839	P														15	
.845	D										2	X	3	6		

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Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	4

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
222 Cont.																
.846	P	6	X	12	8.0	36	20		12	24						
.847	D										2	X	2	4		
.866	D	6	X	12	8.0	36	20		12	24						
.934	P														15	
.950	D	6	X	12	8.0	36	20		12	24						
.990	P										2	X	2	4		
SUBTOTAL					101.3	416.0	220.0		152.0	264.0				98.0	187.0	Subtotal for Mile 222
223																
.029	D										2	X	2	4		
.073	P														15	
.368	P														8	
.424	D														8	
.426	D														75	
.998	P														8	
SUBTOTAL														4.0	114.0	Subtotal for Mile 223

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Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	5

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
224																
.010	P														15	
.099	P														30	
.240	P										2	X	2	4		
.256	P														23	
.266	D										2	X	3	6		
.271	D										2	X	2	4		
.300	D										2	X	2	4		
.300	D										2	X	6	12		
.303	D										2	X	2	4		
.308	D														12	
.310	D										2	X	2	4		
.310	D										2	X	4	8		
.311	P										2	X	2	4		
.311	P										2	X	2	4		
.512	D										2	X	2	4		
.547	P										2	X	2	4		
.549	D										2	X	2	4		
.565	D										2	X	2	4		
.580	P														16	
.633	P														15	
.701	P														15	
.829	P										2	X	2	4		
.842	D														12	
.868	P										2	X	2	4		
.891	P										2	X	2	4		
.992	D										2	X	2	4		
SUBTOTAL														86.0	138.0	Subtotal for Mile 224

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Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	6

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
225																
.123	D										2	X	2	4		
.152	D														8	
.439	D										2	X	4	8		
.478	P														14	
.556	D										2	X	2	4		
.572	P										2	X	2	4		
.572	D										2	X	2	4		
.612	P										2	X	2	4		
.638	P										2	X	2	4		
.726	P														12	
.732	P										2	X	2	4		
.732	P														10	
.744	D										2	X	2	4		
.869	P										2	X	2	4		
.915	P										2	X	2	4		
.969	D										2	X	2	4		
.982	P										2	X	2	4		
SUBTOTAL														56.0	44.0	Subtotal for Mile 225

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Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	7

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
226																
.015	P														15	
.043	P										2	X	2	4		
.050	P										2	X	2	4		
.071	P										2	X	2	4		
.071	D										2	X	2	4		
.071	P														15	
.117	P										2	X	2	4		
.117	D										2	X	2	4		
.137	D														12	
.163	P										2	X	2	4		
.184	P										2	X	2	4		
.217	P										2	X	2	4		
.219	P										2	X	2	4		
.248	P										2	X	2	4		
.248	D										2	X	2	4		
.355	D										2	X	2	4		
.360	P										2	X	2	4		
.371	P										2	X	2	4		
.394	D										2	X	2	4		
.394	P										2	X	2	4		
.491	P														30	
.496	P										2	X	2	4		
.498	P														15	
.537	P										2	X	2	4		
.557	D										2	X	2	4		
.559	P										2	X	2	4		
.631	P	6	X	12	8.0	36	20		12	24						
.631	P	6	X	12	8.0	36	20		12	24						
.690	P										2	X	2	4		
.700	D										2	X	2	4		
.700	P										2	X	2	4		
.704	D										2	X	2	4		
.714	D										2	X	2	4		
.726	P										2	X	2	4		
.765	D										2	X	2	4		
.795	D										2	X	2	4		
.801	P	6	X	12	8.0	36	20		12	24						
.819	D										2	X	2	4		
.821	P														15	

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Concrete Repair Data Tables

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
226 Cont.																
.827	P										2	X	2	4		
.836	D														12	
.852	D										2	X	2	4		
.900	P										2	X	2	4		
.975	P										2	X	2	4		
.979	D														12	
.985	D										2	X	2	4		
.999	P										2	X	2	4		
SUBTOTAL					24.0	108.0	60.0		36.0	72.0				144.0	126.0	Subtotal for Mile 226

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Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	9

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
227																
.003	D										2	X	2	4		
.004	D	6	X	12	8.0	36	20		12	24						
.201	D														12	
.308	D										2	X	2	4		
.395	P										2	X	2	4		
.416	D										2	X	4	8		
.456	D										2	X	2	4		
.476	D														13	
.548	P										2	X	2	4		
.833	P										2	X	2	4		
.833	P										2	X	2	4		
.838	D	6	X	12	8.0	36	20		12	24						
.844	P														8	
.850	P														8	
.851	D														12	
.863	P	45	X	12	60.0	114	20	24	90	24						
.871	D														12	
.883	D	6	X	12	8.0	36	20		12	24						
.883	D	6	X	12	8.0	36	20		12	24						
.891	D														8	
.900	P														15	
.913	D														8	
.917	P	12	X	12	16.0	48	20		24	24						
.927	D	6	X	12	8.0	36	20		12	24						
.943	D	40	X	12	53.3	104	20	24	80	24					12	
.948	P										2	X	2	4		
.948	P										2	X	4	8		
.958	P										2	X	3	6		
.958	D														6	
.960	P										2	X	2	4		
.965	P										2	X	2	4		
.989	D														18	
SUBTOTAL					169.3	446.0	160.0	48.0	254.0	192.0				62.0	132.0	Subtotal for Mile 227

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Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	10

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
228																
.002	D										2	X	2	4		
.004	D										2	X	2	4		
.004	D										2	X	2	4		
.007	D										2	X	2	4		
.010	D										2	X	2	4		
.010	D										2	X	2	4		
.015	D										2	X	2	4		
.025	D	20	X	12	26.7	64	20	12	40	24						
.030	D														6	
.417	P	6	X	12	8.0	36	20		12	24						
.417	D	15	X	12	20.0	54	20		30	24						
.420	P										2	X	2	4		
.423	D	6	X	12	8.0	36	20		12	24						
.423	D										2	X	4	8		
.429	P														12	
.432	D	6	X	12	8.0	36	20		12	24						
.432	D										2	X	2	4		
.432	P										2	X	2	4		
.435	D	6	X	12	8.0	36	20		12	24						
.441	P										2	X	2	4		
.441	D										2	X	2	4		
.444	D										2	X	2	4		
.444	P										2	X	2	4		
.447	D	13	X	12	17.3	50	20		26	24						
.449	P										2	X	2	4		
.450	D										2	X	2	4		
.452	D										2	X	2	4		
.454	D										2	X	4	8		
.456	D										2	X	4	8		
.459	D										2	X	4	8		
.462	D	10	X	12	13.3	44	20		20	24						
.470	D														12	
.472	D														12	
.475	P														12	
.475	D														16	
.480	D										2	X	2	4		
.482	D	6	X	12	8.0	36	20		12	24						
.482	P														12	
.486	D										2	X	4	8		

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Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	11

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
228 Cont.																
.490	D										2	X	4	8		
.491	D										2	X	2	4		
.491	D										2	X	2	4		
.495	D										2	X	2	4		
.498	D										2	X	8	16		
.500	D														8	
.501	D										2	X	2	4		
.502	P														14	
.506	D														20	
.514	P										2	X	2	4		
.518	P														15	
.522	P														8	
.543	D										2	X	2	4		
.549	D										2	X	2	4		
.552	D	8	X	12	10.7	40	20		16	24						
.555	D										2	X	4	8		
.558	D										2	X	4	8		
.567	D										2	X	4	8		
.570	D	6	X	12	8.0	36	20		12	24						
.573	D										2	X	2	4		
.579	D														12	
.588	D										2	X	2	4		
.603	D										2	X	2	4		
.612	D														15	
.620	D	6	X	12	8.0	36	20		12	24						
.620	D														25	
.632	D														8	
.641	D										2	X	2	4		
.647	D										2	X	2	4		
.647	D														15	
.650	P														14	
.659	D	6	X	12	8.0	36	20		12	24						
.663	D	6	X	12	8.0	36	20		12	24						
.668	D	6	X	12	8.0	36	20		12	24						
.669	D										2	X	2	4		
.672	D														12	
.680	D	6	X	12	8.0	36	20		12	24						
.694	D										2	X	2	4		
.704	D														12	

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Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	12

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
228 Cont.																
.712	D										2	X	2	4		
.718	D										2	X	2	4		
.724	P														15	
.726	D										2	X	2	4		
.733	D										2	X	2	4		
.742	D										2	X	2	4		
.744	D														12	
.745	D										2	X	2	4		
.748	P														18	
.761	D														12	
.768	D														12	
.777	D														12	
.791	D	6	X	12	8.0	36	20		12	24						
.796	D										2	X	2	4		
.816	P														18	
.824	D														12	
.829	P														15	
.850	D														6	
.871	D	6	X	12	8.0	36	20		12	24						
.900	P														15	
.913	D														12	
.918	D										2	X	4	8		
.919	D														12	
.922	D														12	
.934	D										2	X	2	4		Rebar
.940	D														12	
.948	D														12	
.966	D										2	X	2	4		
.980	P										2	X	2	4		
.987	D														12	
SUBTOTAL					**192.0**	**720.0**	**360.0**	**12.0**	**288.0**	**432.0**				**264.0**	**479.0**	**Subtotal for Mile 228**

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Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	13

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
229																
.025	D										2	X	2	4		
.040	D										2	X	2	4		
.062	D										2	X	2	4		
.062	D														12	
.114	D										2	X	2	4		
.187	D														25	
.243	D														6	
.253	D														12	
.282	D										2	X	2	4		
.288	D										2	X	2	4		
.309	D										2	X	2	4		
.332	D										2	X	2	4		
.335	D										2	X	2	4		
.366	D														12	
.382	D	6	X	12	8.0	36	20		12	24						
.382	P	6	X	12	8.0	36	20		12	24						
.408	P										2	X	2	4		
.408	D										2	X	2	4		
.428	D										2	X	2	4		
.469	D														12	
.485	D										2	X	2	4		
.531	D														12	
.536	D										2	X	2	4		
.546	D										2	X	2	4		
.578	D														8	
.584	D										2	X	4	8		
.592	D														12	
.593	P										2	X	2	4		
.593	D										2	X	2	4		
.596	D										2	X	4	8		
.599	D										2	X	2	4		
.599	D														6	
.614	P										2	X	2	4		
.617	D										2	X	2	4		
.617	P										2	X	2	4		
.619	P										2	X	2	4		Rebar
.620	D														6	
.637	D														12	
.643	D														12	

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Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	14

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
229 Cont.																
.645	D														12	
.655	D														12	
.674	P										2	X	2	4		
.679	D														12	
.680	D										2	X	2	4		
.687	D														12	
.691	P										2	X	2	4		Rebar
.698	P										2	X	2	4		Rebar
.703	D	6	X	12	8.0	36	20		12	24						
.713	D										2	X	2	4		
.713	D														6	
.714	D														12	
.738	D										2	X	2	4		
.741	D														12	
.743	D										2	X	2	4		
.746	D										2	X	2	4		
.752	D										2	X	4	8		
.767	D														12	
.802	D														6	
.819	D										2	X	2	4		
.825	D										2	X	4	8		
.860	P										2	X	2	4		
.860	D										2	X	2	4		
.890	D														12	
.909	D														12	
.949	P										2	X	2	4		
.952	P														12	
.982	D										2	X	2	4		
.988	P														12	
SUBTOTAL					24.0	108.0	60.0		36.0	72.0				172.0	291.0	Subtotal for Mile 229

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Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	11	15

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
230																
.021	D										2	X	2	4		
.026	D										2	X	4	8		
.122	D														18	
.161	D														12	
.166	D										2	X	4	8		
.166	D														12	
.176	D														12	
.181	P														232	
.235	P														111	
.240	D														15	
.252	D														30	
.264	P														132	
.282	D	13	X	12	17.3	50	20		26	24						
.290	D	18	X	12	24.0	60	20		36	24						
.295	D														13	
.300	P														50	
.314	D														12	
.319	D														12	
.340	D														14	
.350	D										2	X	2	4		Rebar
.375	P														18	
.396	P														18	
.411	P										2	X	2	4		
.414	P										2	X	2	4		
.439	D										2	X	2	4		
.441	D										2	X	4	8		
.471	D														12	
.503	D										2	X	4	8		
.516	D										2	X	2	4		
.516	P														13	
.521	P										2	X	2	4		
.521	D										2	X	2	4		
.521	D										2	X	2	4		
.530	D										2	X	2	4		
.537	D										2	X	2	4		
.539	D										2	X	4	8		
.542	D										2	X	2	4		
.542	D														24	
.545	D										2	X	4	8		

* Items are for information purposes only. No extra payment will be made for these items.
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Concrete Repair Data Tables

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
230 Cont.																
.545	D														15	
.551	D										2	X	2	4		
.561	D										2	X	2	4		
.563	D										2	X	2	4		
.566	D										2	X	2	4		
.594	D														12	
.605	D										2	X	2	4		
.608	D										2	X	2	4		
.610	D										2	X	2	4		
.625	P	6	X	12	8.0	36	20		12	24						
.625	P														12	
.633	P														12	
.641	D										2	X	2	4		
.647	D										2	X	2	4		
.647	D										2	X	2	4		
.651	P														12	
.675	D														14	
.708	D														12	
.720	D														20	
.738	P														15	
.744	D														12	
.755	D										2	X	2	4		
.766	D	12	X	12	16.0	48	20		24	24						
.766	P														18	
.770	D	6	X	12	8.0	36	20									
.773	D														6	
.775	D														6	
.782	P														15	
.791	D										2	X	2	4		
.800	P										2	X	2	4		
.823	D														12	
.826	D														15	
.835	D														13	
.860	P														18	
.870	P										2	X	2	4		
.908	P										2	X	2	4		
.920	D										2	X	2	4		
.948	D										2	X	2	4		
.949	D										2	X	2	4		

* Items are for information purposes only. No extra payment will be made for these items.
Include costs of these items in contract unit price for "10 In Concrete Pavement Repair - Full Depth - Doweled"

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Concrete Repair Data Tables

RP	LANE	FULL DEPTH REPAIR									SPALL REPAIR				RANDOM CRACK REPAIR	COMMENTS
		DIMENSIONS			AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	DIMENSIONS			AREA		
		LENGTH	X	WIDTH							LENGTH	X	WIDTH			
RP	LANE	FT	X	FT	SY	LF	EA	LF	LF	LF	FT	X	FT	SF	LF	COMMENTS
230 Cont.																
.952	D														12	
.966	P										2	X	2	4		
.968	P										2	X	2	4		
.972	P														12	
.973	D														8	
.975	D										2	X	2	4		
.995	D	6	X	12	8.0	36	20									
.997	D										2	X	4	8		
.997	P										2	X	2	4		
.999	P										2	X	4	8		
SUBTOTAL					81.3	266.0	120.0		98.0	96.0				200.0	1031.0	Subtotal for Mile 230

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* Items are for information purposes only. No extra payment will be made for these items.
Include costs of these items in contract unit price for "10 In Concrete Pavement Repair - Full Depth - Doweled"

Concrete Repair Data Tables

SUBTOTAL FROM RP	FULL DEPTH REPAIR						SPALL REPAIR	RANDOM CRACK REPAIR
	AREA SF / 9	* SAWCUT	* DOWEL BARS	* DOWEL CONTRACTION JOINT ASSEMBLY	* Longitudinal Joint Seal	* Transverse Joint Seal	AREA	
	SY	LF	EA	LF	LF	LF	SF	LF
221	90.7	326.0	180	0	110	216	200	182
222	101.3	416.0	220	0	152	264	98	187
223	0.0	0.0	0	0	0	0	4	114
224	0.0	0.0	0	0	0	0	86	138
225	0.0	0.0	0	0	0	0	56	44
226	24.0	108.0	60	0	36	72	144	126
227	169.3	446.0	160	48	254	192	62	132
228	192.0	720.0	360	12	288	432	264	479
229	24.0	108.0	60	0	36	72	172	291
230	81.3	266.0	120	0	98	96	200	1031
TOTAL	682.7	2390	1160	60	974	1344	1286	2724
TOTAL *10%	750.9	2629	1276	66	1071	1478	1415	2996

* Items are for information purposes only. No extra payment will be made for these items.
Include costs of these items in contract unit price for "10 In Concrete Pavement Repair - Full Depth - Doweled"

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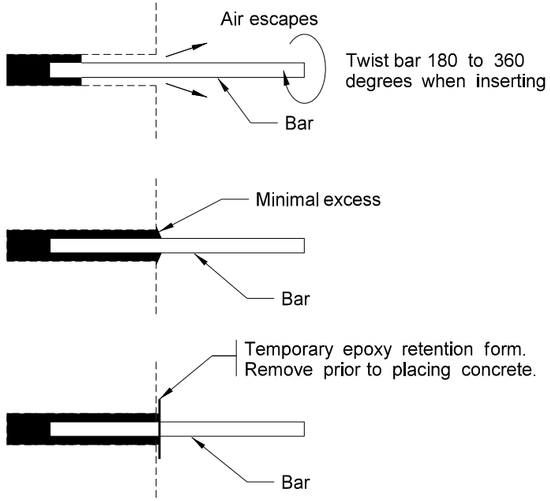
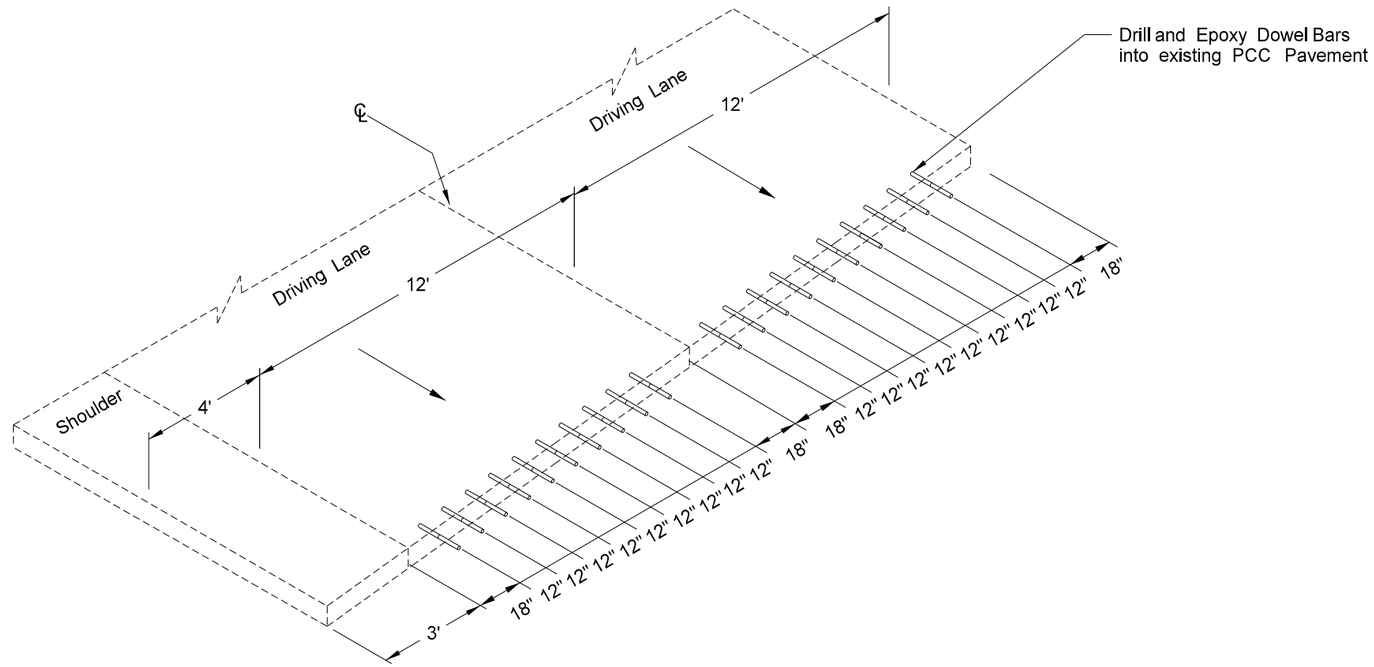
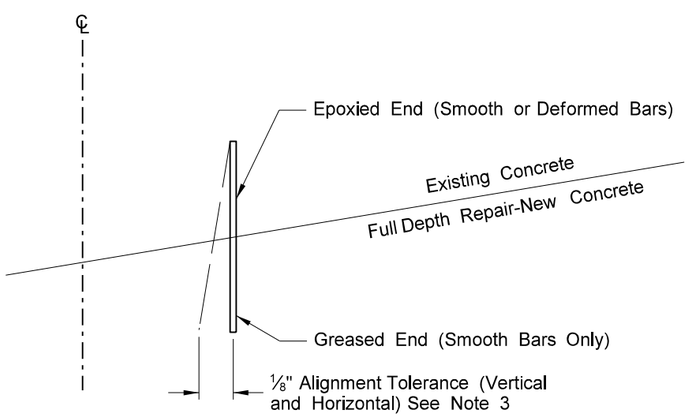
Concrete Repair Data Tables

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	20	1



Bar and Epoxy Installation
(Smooth or Deformed Bars)





Bar Alignment Tolerance

NOTES:

1. Use 10 bars spaced at 12" C to C for full depth repairs.
2. Place dowel bars at the vertical midpoint of the existing PCC pavement.
3. Align deformed bars parallel to the roadway surface and perpendicular to the joint face.

   Align smooth bars and dowel bar assemblies parallel to the roadway centerline and pavement surface.

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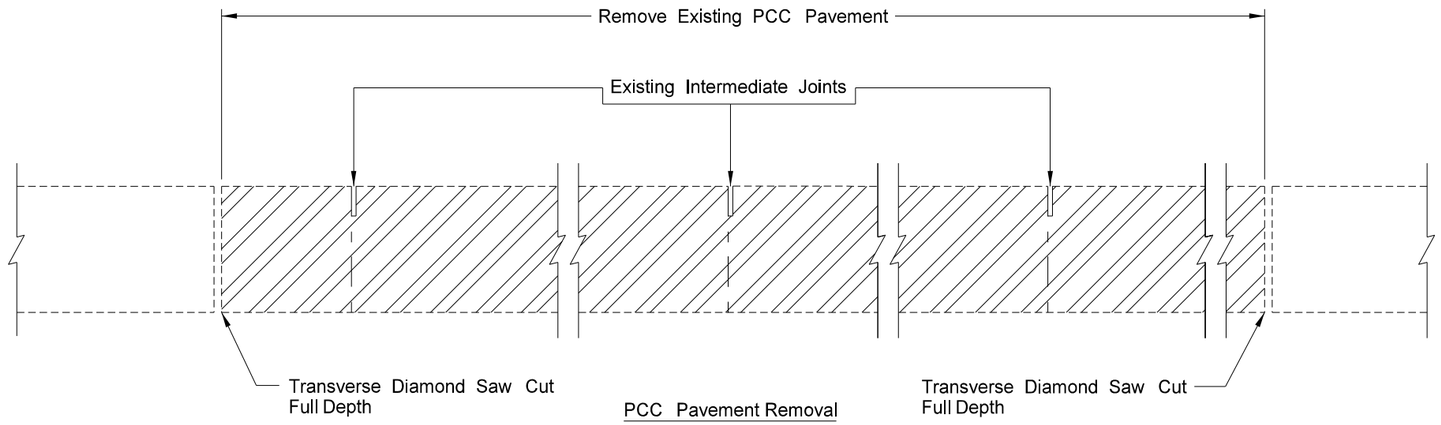
Dowel Bar Placement - Full Depth Repairs
Concrete Pavement Repair (Skewed Joints)
Concrete Pavement Repair
I 94 RP 221 EB

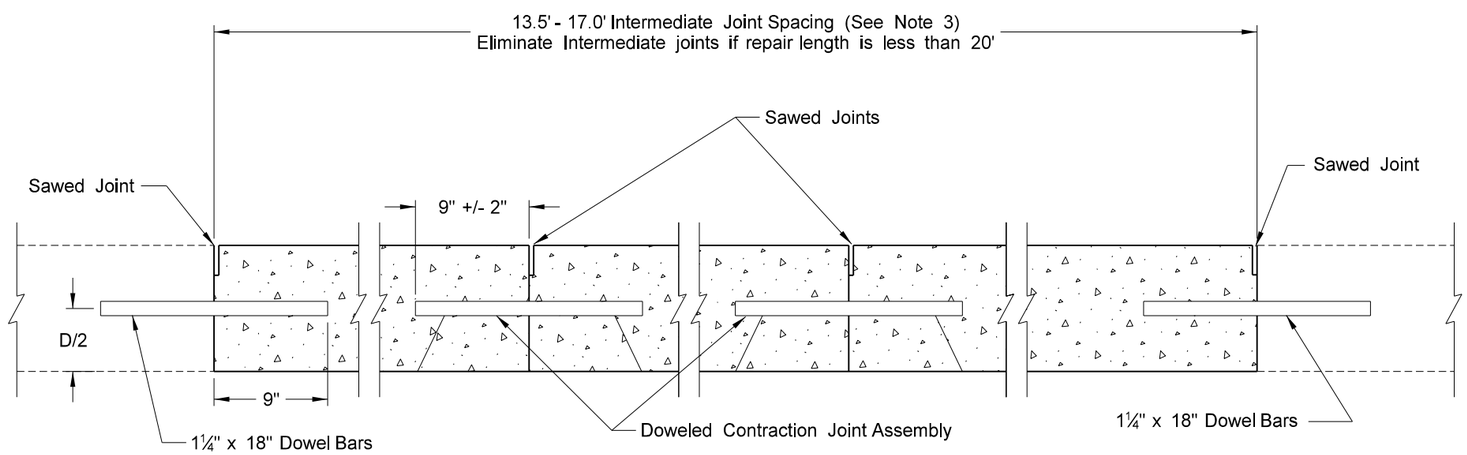
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	20	2



PCC Pavement Removal

Notes:

1. Variables: D = Pavement Depth
2. Space joints 13.5' to 17.0'. Where repair length does not allow even spacing of this length, use a minimum 10 foot spacing.
3. In repair areas which are not the entire roadway width, place joints to match the existing pavement wherever possible.



PCC Pavement Replacement

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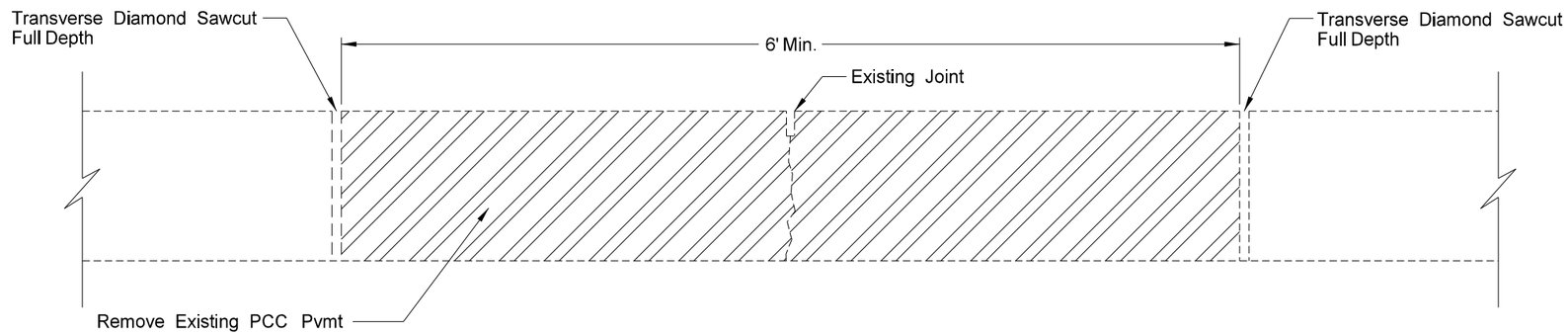
Concrete Pavement Repair
Full-Depth, Non-Reinforced PCC Pavement
(Longitudinal Length One Panel or More)

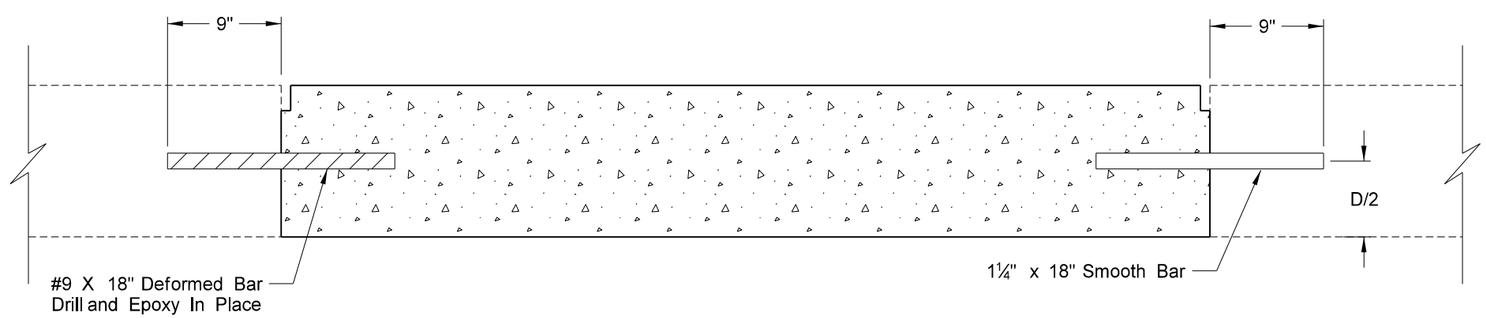
Project Description

I 94 RP 221

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	20	3



FULL DEPTH PAVEMENT REMOVAL



FULL DEPTH PAVEMENT REPLACEMENT

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.

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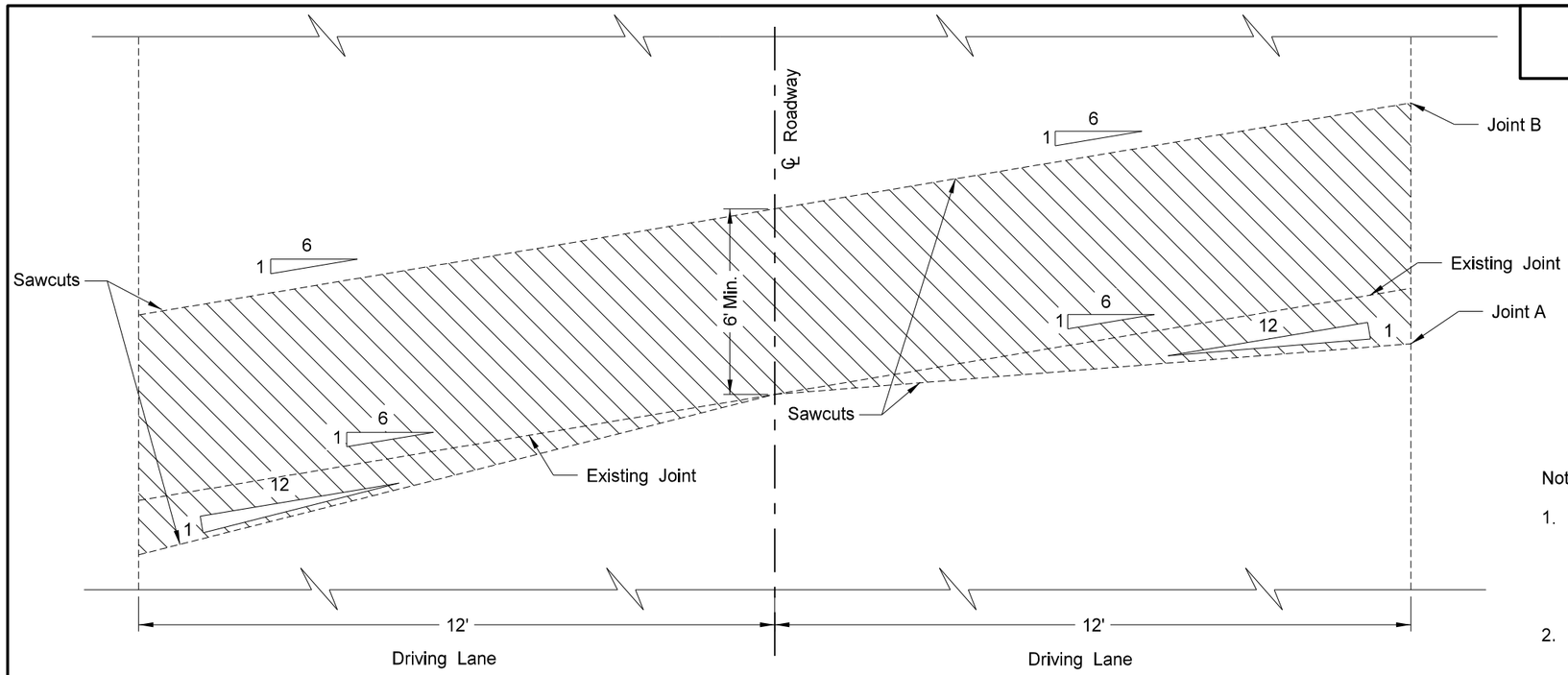
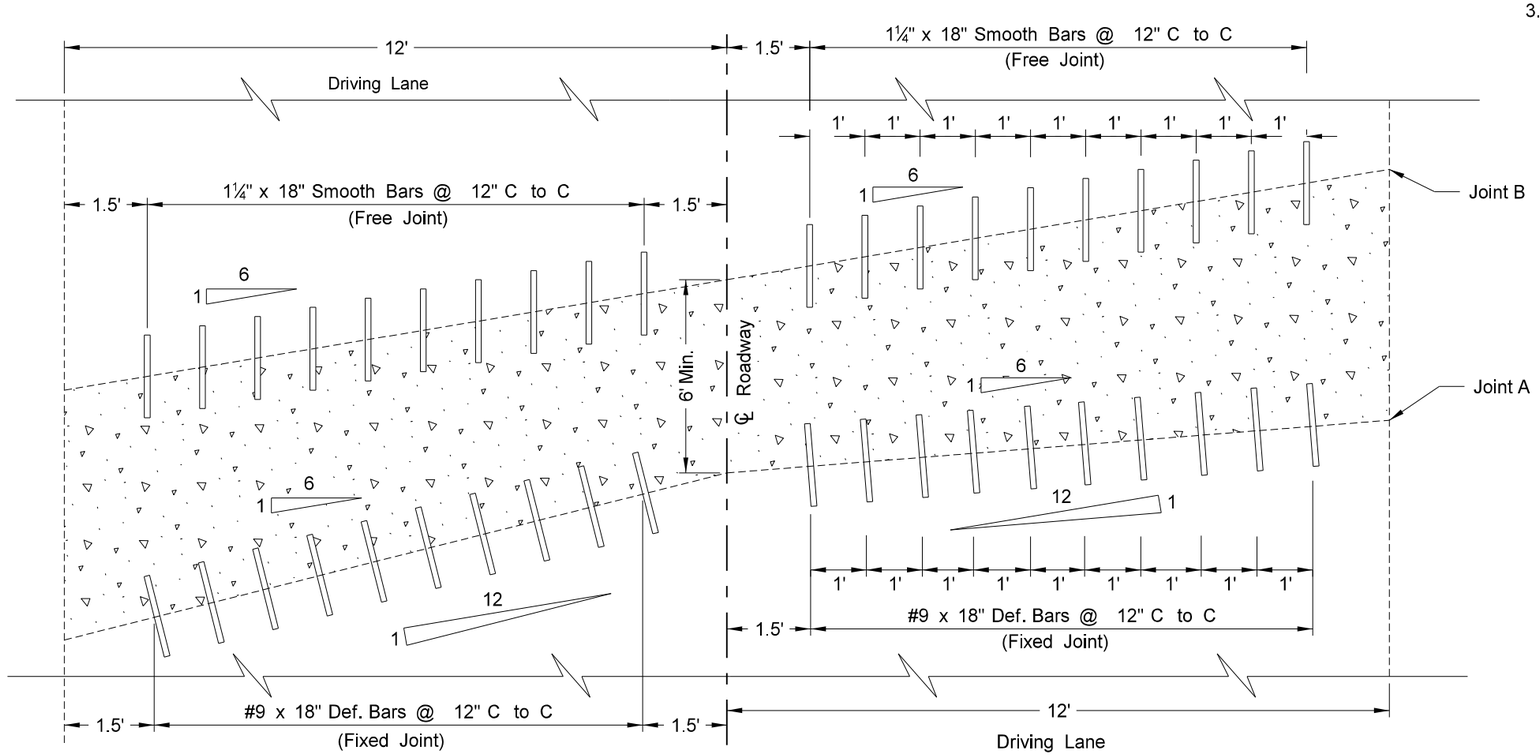
Concrete Pavement Repair
Full-Depth, Non-Reinforced PCC Pavement
(Longitudinal Length Less Than One Panel)

Project Description

Project Location

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	20	4





Notes:

1. Joint A (fixed joint) shall be the new joint with the shortest distance to the next transverse joint or working random crack. Make the saw cut at a 1 to 6 skew, or up to a maximum of a 1 to 12 skew, referenced off the 1 to 6 skewed transverse joints. Place deformed bars perpendicular to the face of the saw cut.

2. Joint B (free joint) shall be the new joint with the greatest distance to the next transverse joint or working random crack. Place the smooth bars within the tolerances shown on the "Dowel Bar Placement - Full Depth Repair" detail sheet.

3. If the distance is equal for both repair joints, place the free joint (joint B) on the approach side of the repair.

PCC Removal

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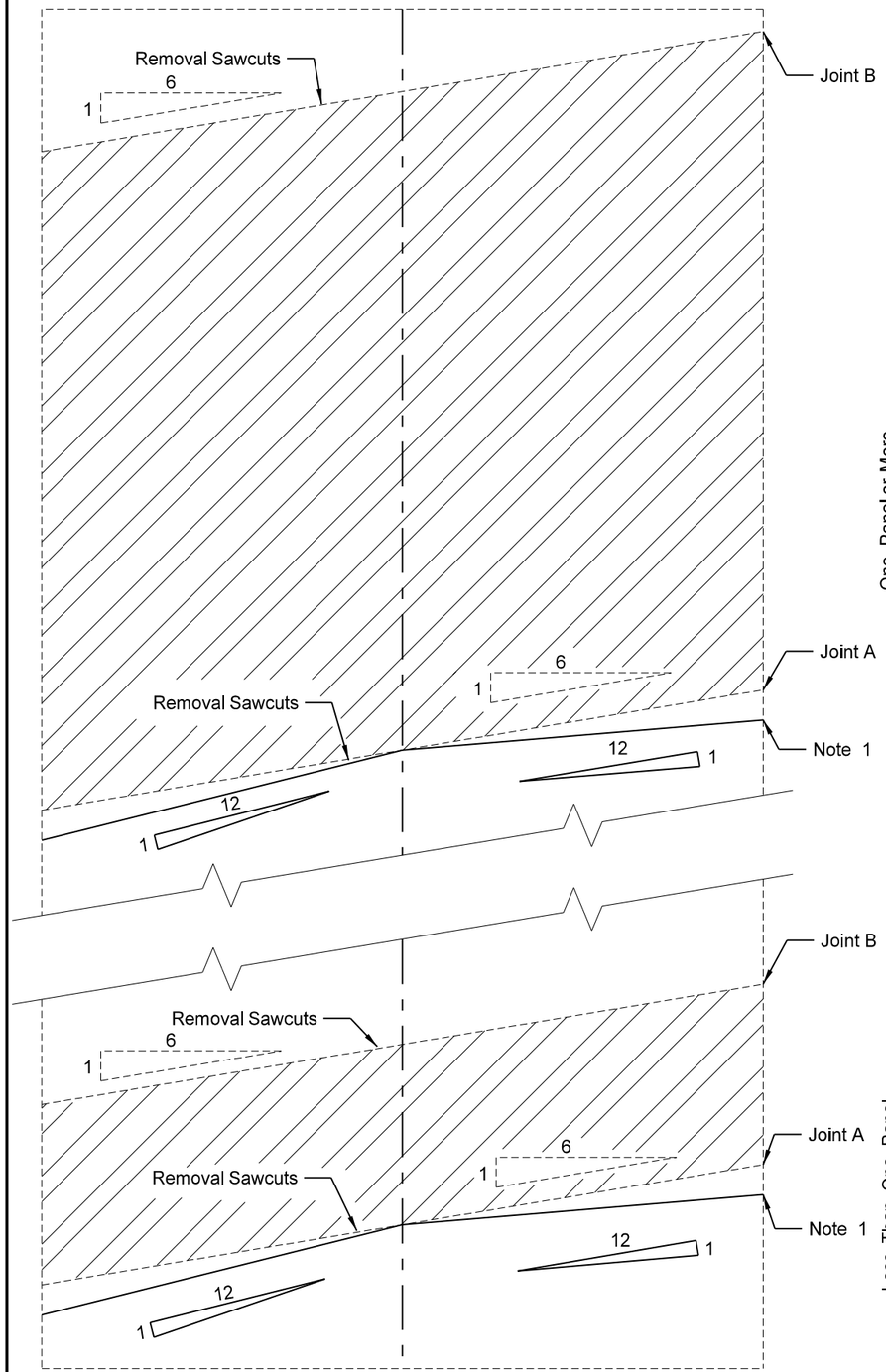
Concrete Pavement Repair
Full-Depth, Non-Reinforced PCC Pavement
(Longitudinal Length Less Than One Panel)

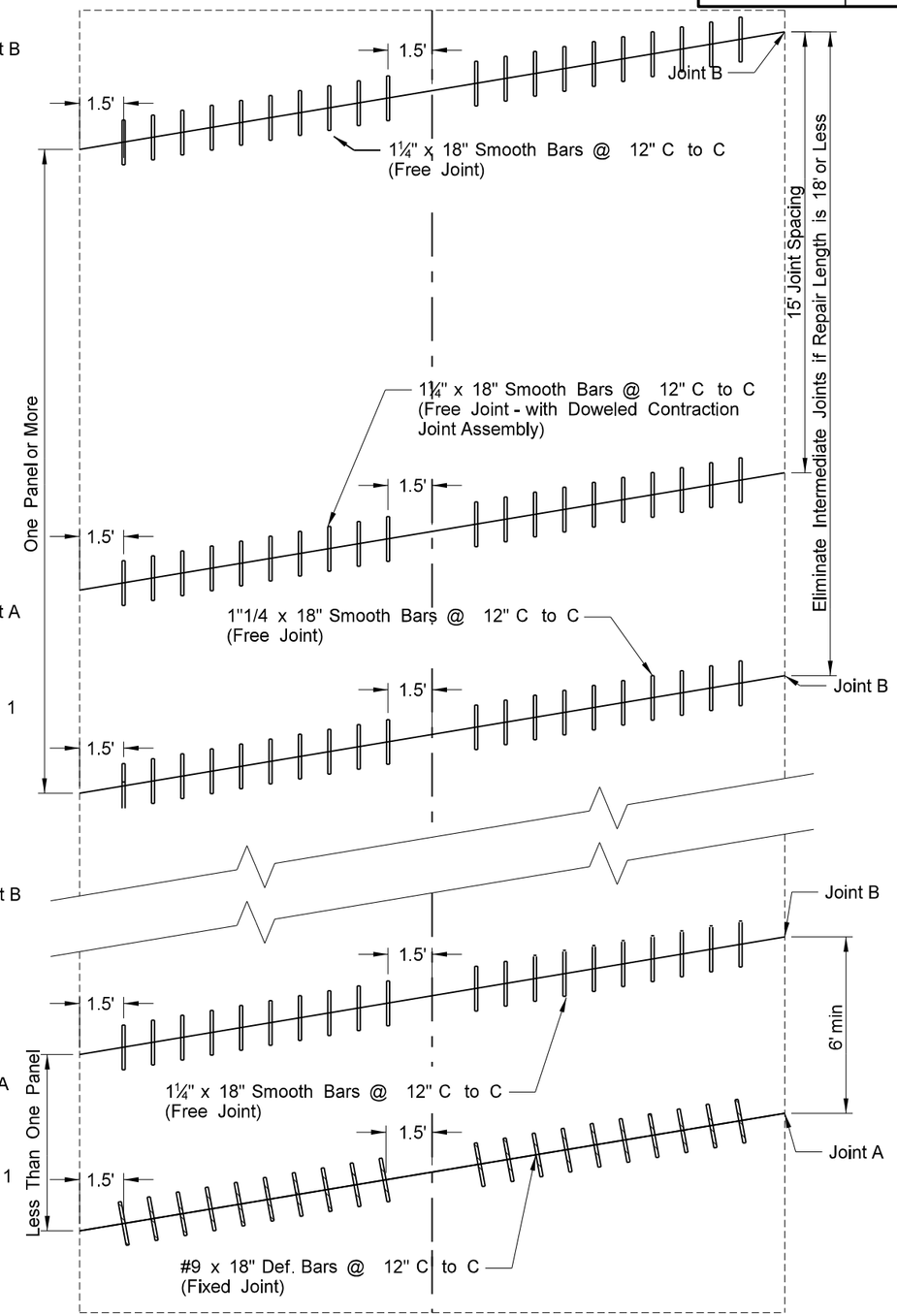
Project Description

Project Location

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	20	5



Removal



Proposed

PCC Removal

Notes:

1. Joint A (Fixed Joint) shall be the new joint with the shortest distance to the next transverse joint or working random crack. The saw cut may be made at a 1:6 skew, or up to a maximum 1:12 skew referenced off the 1:6 skewed transverse joint. The deformed bars shall be placed perpendicular to the face of the saw cut.
2. Joint B (Free Joint) shall be the new joint with the greatest distance to the next transverse joint or working random crack. The smooth bars shall be installed 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, the free joint (joint B) shall be placed on the approach side of the repair.
4. If greater than one panel in length, a Doweled Contraction Joint Assembly shall be installed at transverse contraction joints.
5. In repair areas which are not the entire roadway width, joints shall be placed to match the existing pavement wherever possible.
6. The joints at the beginning and end of a full depth repair section can be either a Joint B or Joint A depending on the existing joint.

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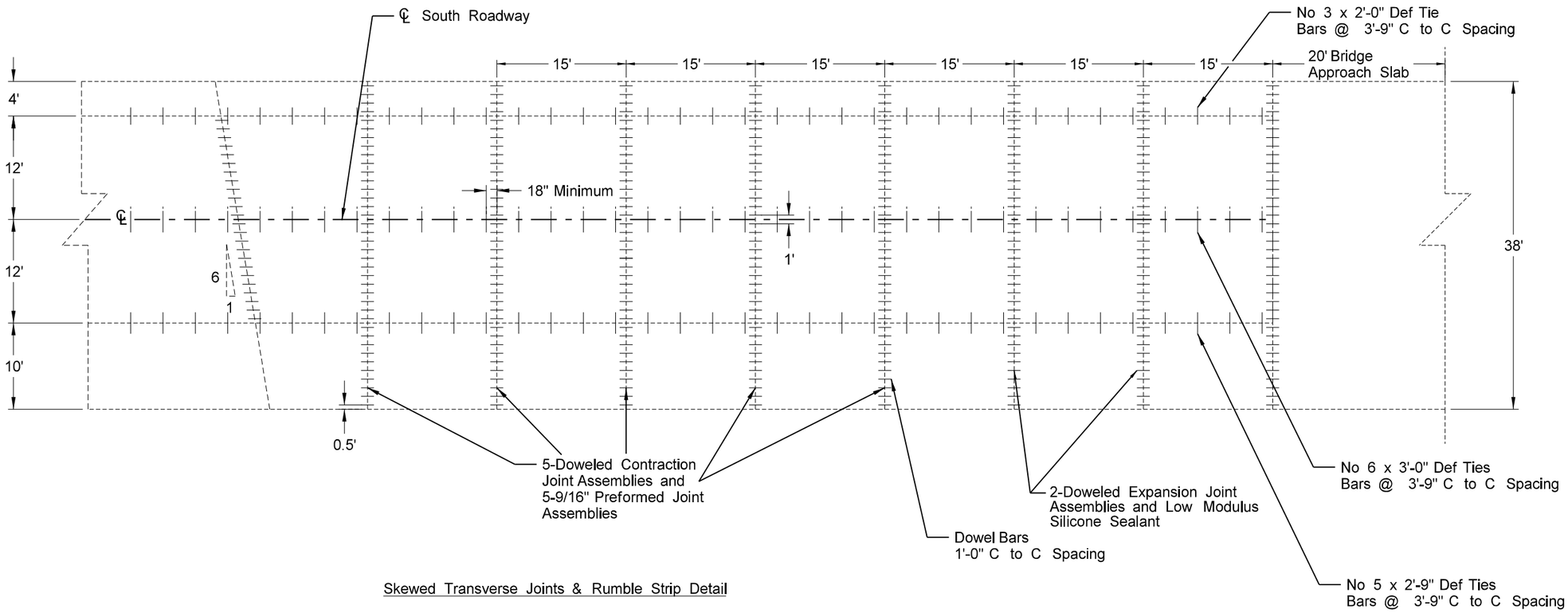
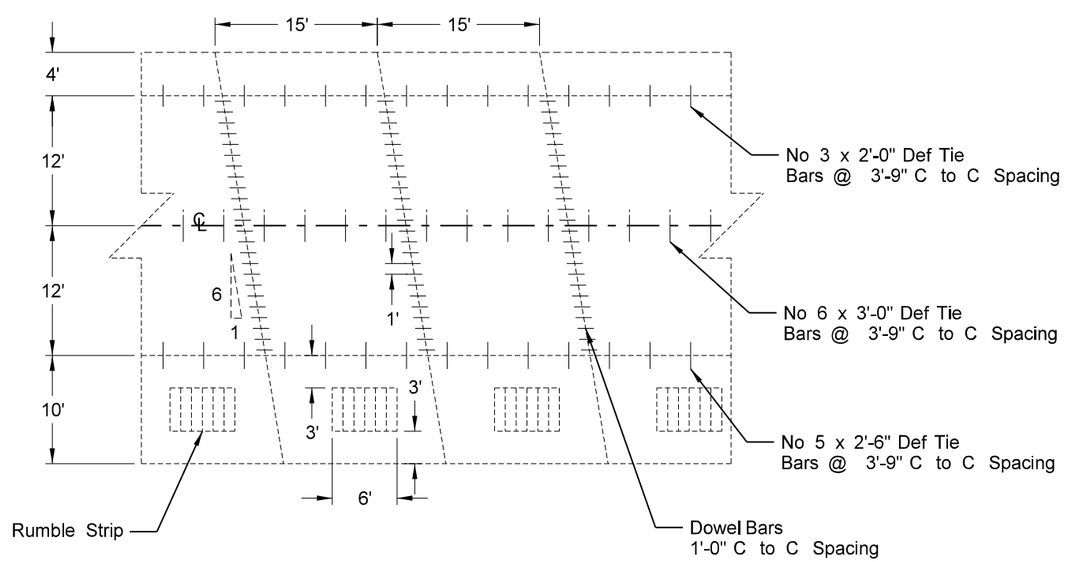
Removal of Concrete & Dowel bar Placement Full-Depth Repair
I 94 RP 221 Eastbound

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	20	6

J Bolt and Doweled Expansion and Contraction Joint Locations



Skewed Transverse Joints & Rumble Strip Detail



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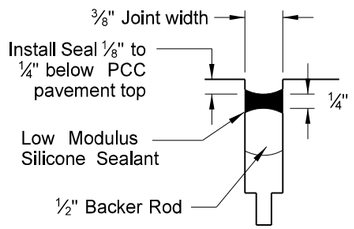
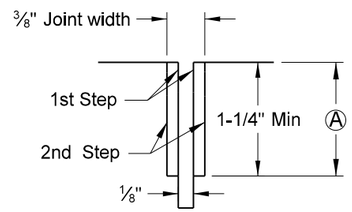
Existing Pavement Joints

I 94 RP 221 Eastbound

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	20	7

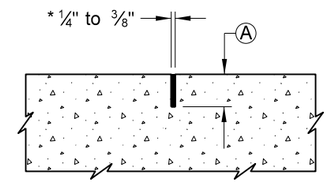


TRANSVERSE JOINT SEAL

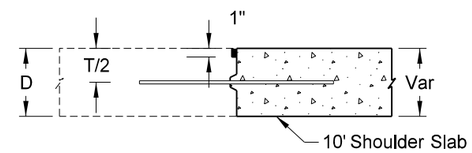


TRANSVERSE JOINT SAWING

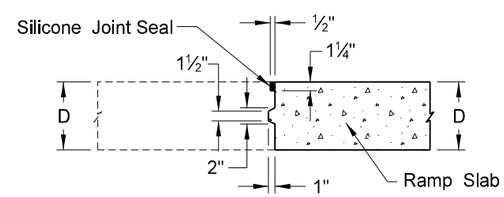
SILICONE SEAL



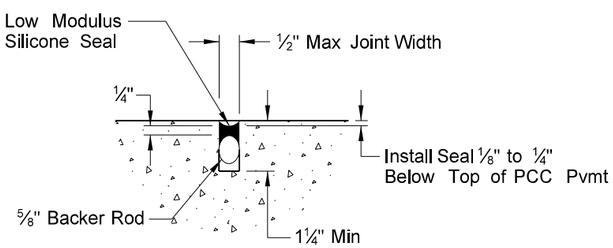
SAWED, TIED LONGITUDINAL JOINTS
(Mainline and ramps)



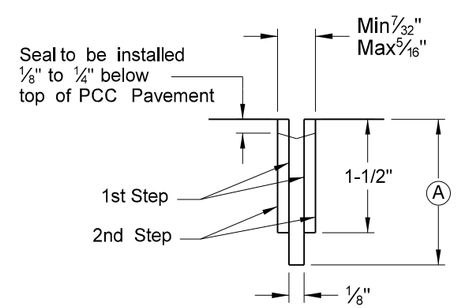
LONGITUDINAL CONSTRUCTION JOINT
(at 10' Shoulder - Keyed & Tied)



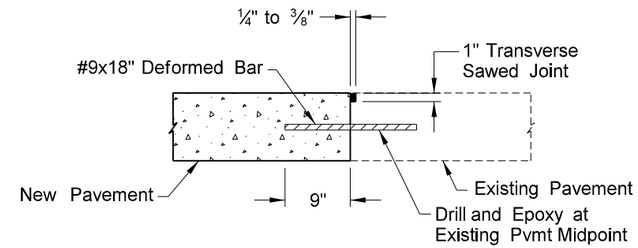
LONGITUDINAL CONSTRUCTION JOINT
(at Ramps - Keyed)



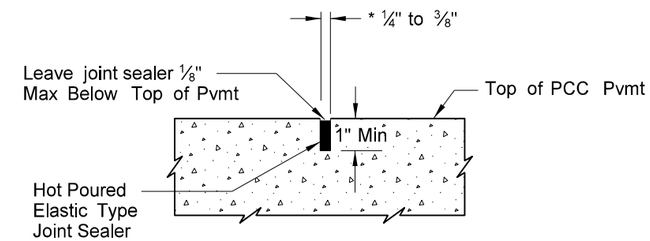
LONGITUDINAL JOINT SILICONE SEAL
(Non-Tied Joint)



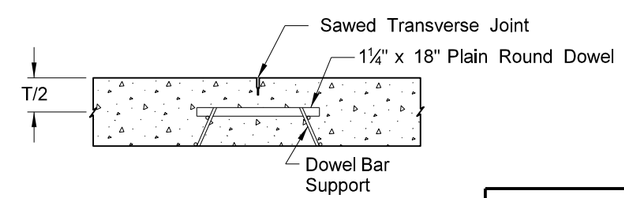
SAWED TRANSVERSE JOINT



DEFORMED BAR INSTALLATION
(Spaced at 2'-0" C to C)



(Applies to all Sawed and Tied Joints)
JOINT SEALER DETAIL



DOWELED TRANSVERSE JOINT

D = Depth of Pvmt

A = One-Third thickness of PCC Pavement

*Width requirement for top 1" only, bottom portion of sawcut may be narrower.

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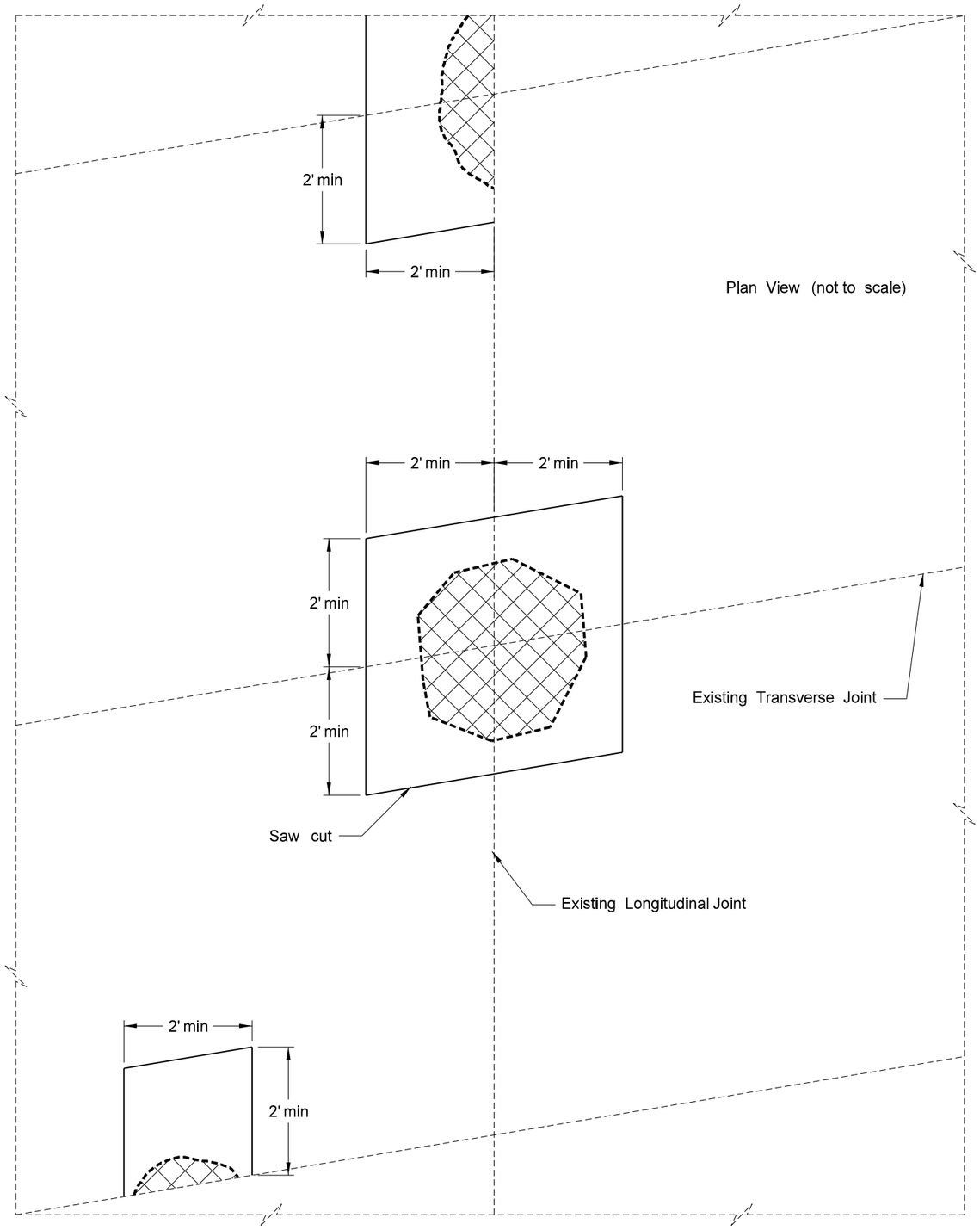
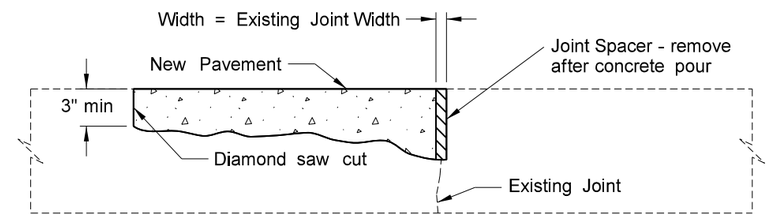
Joint Details for Repairs
(1 Panel or More in Length)
Concrete Pavement Repair
I 94 RP 221 Eastbound

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	20	8

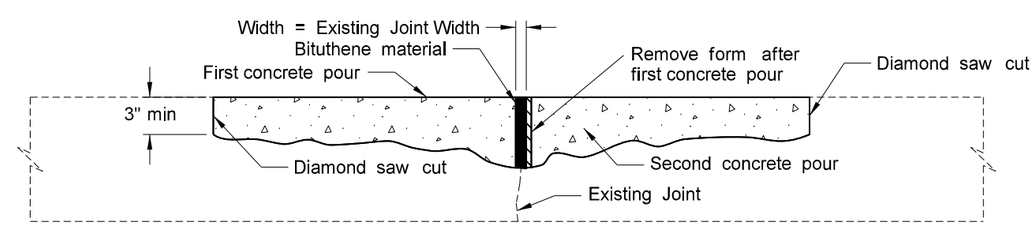


Spall Repair



Cross Section - "Repair Area on One Side of Transverse Joint"

Note:
Place a spacer material on the transverse joint face to maintain the joint during repair. The spacer material shall have the capability of maintaining a width equal to that of the existing joint and being easily removed after the pour. A bituthene waterproofing material may be used for this purpose. It shall be a minimum of 260 mil (approximately ¼") thick or equal to the width of the existing joint, whichever is greater. Cut it to fit over the entire face of the existing joint to provide for expansion and prevent water from entering the existing joint throught the sides or bottom. Press it into place to conform to the face of the existing joint.



Cross Section - "Repair on Both Sides of Transverse Joint"

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Spall

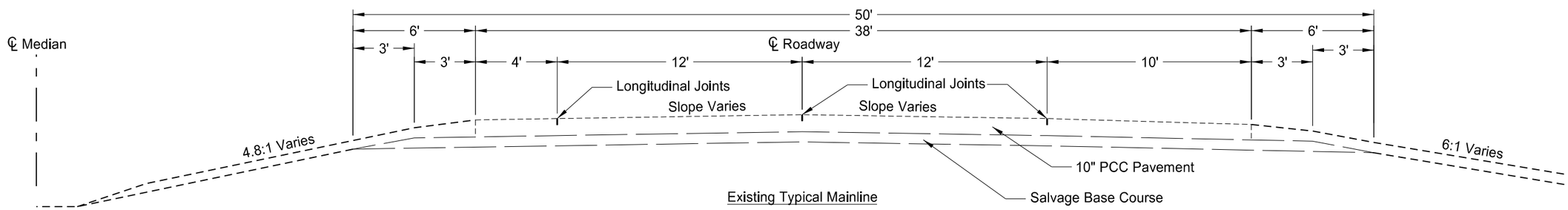
Concrete Removal Area

Spall Repair Detail

Concrete Pavement Repair

I 94 RP 221 EB

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	30	1



Existing Typical Mainline

PR 221.000 to 231.000
Minus Exception Areas
Eastbound roadway

Curve section same as Tangent,
except for Superelevation.

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Existing Typical Sections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
D3-36	36"x6"	STREET NAME SIGN (Sign and installation only)		6	
G20-1-60	**60"x24"**	**ROAD WORK NEXT __ MILES**	**2**	**34**	**68**
G20-1b-60	60"x24"	WORK IN PROGRESS/ NO WORK IN PROGRESS (Sign and installation only)		26	
G20-2-48	**48"x24"**	**END ROAD WORK**	**2**	**19**	**38**
G20-4-36	36"x18"	PILOT CAR FOLLOW ME (Mounted to back of pilot car)		18	
G20-10-108	**108"x48"**	**CONTRACTOR SIGN**	**1**	**64**	**64**
G20-50a-72	72"x36"	ROAD WORK NEXT __ MILES RT & LT ARROWS		37	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW		30	
G20-55-96	**96"x48"**	**SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT**	**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 ARROW RIGHT or LEFT		23	
M5-1-21	21"x15"	ARROW AHD AND RT or LT(Mounted on route marker post)		7	
M5-2-21	21"x15"	ARROW AHD UP & RT or LT (Mounted on route marker post)		7	
M6-1-21	21"x15"	ARROW RT or LT (Mounted on route marker post)		7	
M6-2-21	21"x15"	ARROW UP & RT or LT (Mounted on route marker post)		7	
M6-3-21	21"x15"	ARROW AHD (Mounted on route marker post)		7	
R1-1-48	48"x48"	STOP		32	
R1-1a-18	**18"x18"**	**STOP and SLOW PADDLE Back to Back**	**6**	**5**	**30**
R1-2-60	**60"x60"**	**YIELD**	**3**	**29**	**87**
R2-1-48	**48"x60"**	**SPEED LIMIT __**	**6**	**39**	**234**
R2-1a-24	**24"x18"**	**MINIMUM FEE $80 (Mounted on Speed Limit post)**	**4**	**10**	**40**
R3-7-48	48"x48"	LEFT or RIGHT LANE MUST TURN LEFT or RIGHT		35	
R4-1-48	**48"x60"**	**DO NOT PASS**	**4**	**39**	**156**
R4-7-48	48"x60"	KEEP RIGHT SYMBOL		39	
R5-1-48	48"x48"	DO NOT ENTER		35	
R6-1-36	36"x12"	ONE WAY RIGHT or LEFT		13	
R7-1-12	12"x18"	NO PARKING		11	
R10-6-24	24"x36"	STOP HERE ON RED		16	
R11-2-48	48"x30"	ROAD CLOSED		28	
R11-2a-48	48"x30"	STREET CLOSED		28	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY		31	
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY		31	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC		31	
W1-3-48	48"x48"	RIGHT or LEFT SHARP REVERSE CURVE ARROW		35	
W1-4-48	48"x48"	RIGHT or LEFT REVERSE CURVE ARROW		35	
W1-4b-48	48"x48"	DOUBLE RIGHT or LEFT REVERSE CURVE ARROW		35	
W1-6-48	48"x24"	LARGE ARROW		26	
W3-1-48	48"x48"	STOP AHEAD SYMBOL		35	
W3-3-48	48"x48"	SIGNAL AHEAD SYMBOL		35	
W3-4-48	48"x48"	BE PREPARED TO STOP		35	
W3-5-48	**48"x48"**	**SPEED REDUCTION AHEAD**	**4**	**35**	**140**
W4-2-48	**48"x48"**	**RIGHT or LEFT LANE TRANSITION SYMBOL**	**4**	**35**	**140**
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 SYMBOL		35	
W8-1-48	48"x48"	BUMP		35	
W8-3-48	48"x48"	PAVEMENT ENDS		35	
W8-7-48	48"x48"	LOOSE GRAVEL		35	
W8-9a-48	48"x48"	SHOULDER DROP-OFF		35	
W8-11-48	48"x48"	UNEVEN LANES		35	
W8-12-48	48"x48"	NO CENTER STRIPE		35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY		35	
W8-54-48	**48"x48"**	**TRUCKS ENTERING AHEAD or __ FT.**	**2**	**35**	**70**
W8-55-48	48"x48"	TRUCKS CROSSING AHEAD or __ FT.		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 SYMBOL		35	
W13-1-24	24"x24"	__ MPH ADVISORY SPEED PLATE (Mounted on warning sign post)		11	
W13-4-48	**48"x60"**	**RAMP ARROW**	**3**	**39**	**117**
W14-3-48	48"x36"	NO PASSING ZONE		23	
W20-1-48	**48"x48"**	**ROAD WORK AHEAD or _FT or _ MILE**	**2**	**35**	**70**
W20-2-48	48"x48"	DETOUR AHEAD or __ FT		35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or __ FT.		35	
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or __ FT.		35	
W20-5-48	48"x48"	RIGHT or LEFT LANE CLOSED AHEAD or __ FT.		35	
W20-7a-48	**48"x48"**	**FLAGGING SYMBOL**	**6**	**35**	**210**
W20-7k-24	24"x18"	__ FEET (Mounted on warning sign post)		10	
W20-8-48	48"x48"	STREET CLOSED		35	
W20-51-48	48"x48"	EQUIPMENT WORKING		35	
W20-52-54	54"x12"	NEXT __ MILES (Mounted on warning sign post)		12	
W21-1a-48	48"x48"	WORKERS SYMBOL		35	
W21-2-48	48"x48"	FRESH OIL		35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT		35	

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

SPECIAL SIGNS

SPEC & CODE

704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS**	**1582**

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	**FLAGGING**	**MHR**	**500**
704-1041	ATTENUATION DEVICE-TYPE B-55	EACH	
704-1043	ATTENUATION DEVICE-TYPE B-65	EACH	
704-1044	ATTENUATION DEVICE-TYPE B-70	EACH	
704-1050	**TYPE I BARRICADES**	**EACH**	**40**
704-1051	TYPE II BARRICADES	EACH	
704-1052	**TYPE III BARRICADES**	**EACH**	**29**
704-1060	**DELINEATOR DRUMS**	**EACH**	**65**
704-1065	TRAFFIC CONES	EACH	
704-1067	**TUBULAR MARKERS**	**EACH**	**240**
704-1070	DELINEATOR	EACH	
704-1072	FLEXIBLE DELINEATORS	EACH	
704-1081	**VERTICAL PANELS - BACK TO BACK**	**EACH**	**80**
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**
704-1088	SEQUENCING ARROW PANEL - TYPE C - CROSSOVER	EACH	
704-1095	TYPE B FLASHERS	EACH	
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**	**116350**
762-1500	OBLITERATION OF PVMT MK	SF	
772-2110	FLASHING BEACON - POST MOUNTED	EACH	

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

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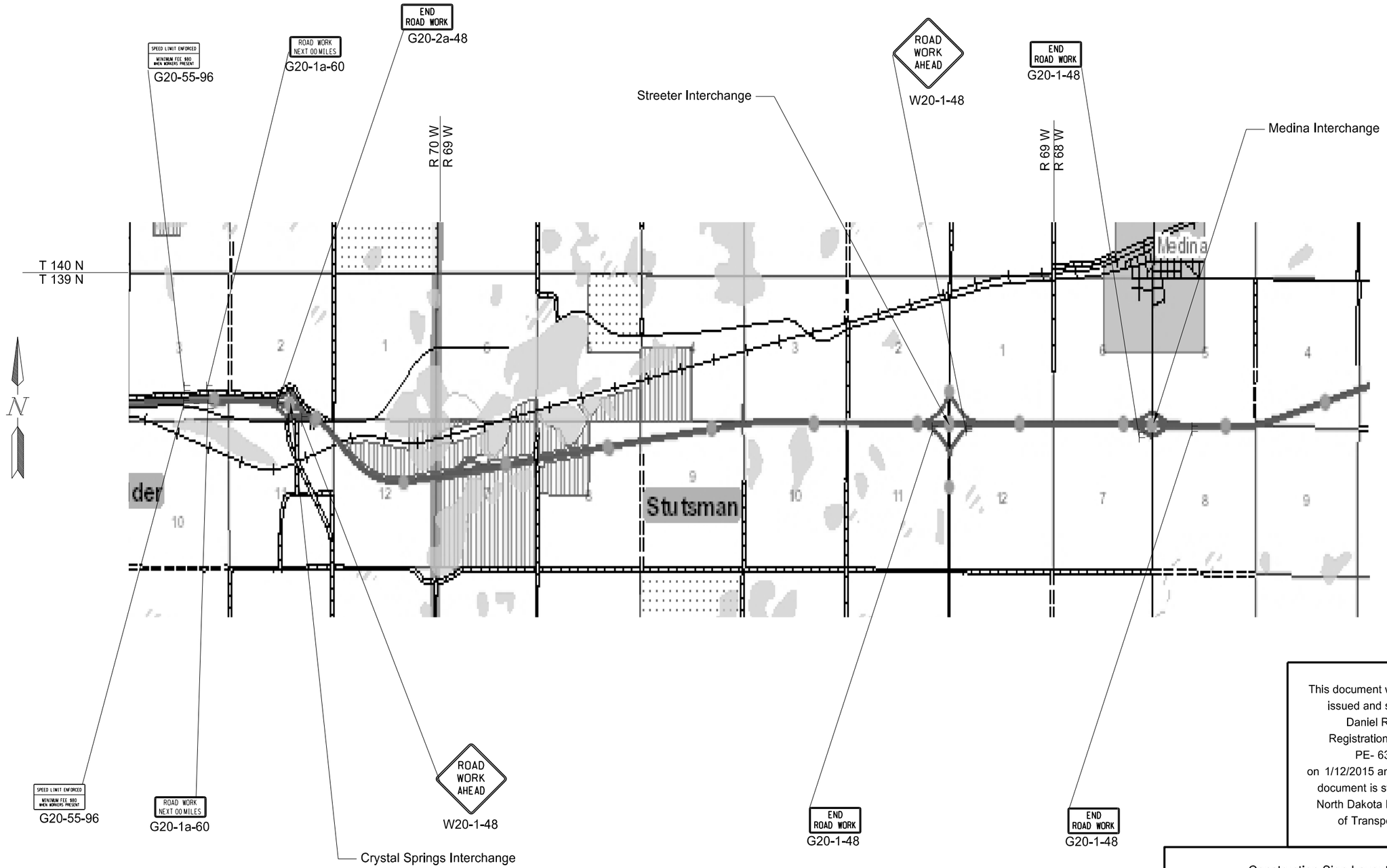
Traffic Control Devices List

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SIM-2-094(106)221	100	2



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Construction Sign Layout
Crystal Springs to East Medina

NDDOT ABBREVIATIONS

D-101-1

?	This is a special text character used in the labeling of existing features. It indicates a feature that has an unknown characteristic, potentially based on: lack of description, location accuracy or purpose.
Abn	abandoned
Abut	abutment
Ac	acres
Adj	adjusted
Aggr	aggregate
Ahd	ahead
ARV	air release valve
Align	alignment
Al	alley
Alt	alternate
Alum	aluminum
ADA	Americans with Disabilities Act
A	ampere
&	and
Appr	approach
Approx	approximate
ACP	asbestos cement pipe
Asph	asphalt
AC	asphalt cement
Assmd	assumed
@	at
Atten	attenuation
ATR	automatic traffic recorder
Ave	Avenue
Avg	average
ADT	average daily traffic
Az	azimuth
Bk	back
BF	back face
Bs	backsight
Balc	balcony
B Wire	barbed wire
Barr	barricade
Btry	battery
Brg	bearing
BI	beehive inlet
Beg	begin
BM	bench mark
Bkwy	bikeway
Bit	bituminous
Blk	block
Bd Ft	board feet
BH	bore hole
BS	both sides
Bot	bottom
Blvd	Boulevard
Bndry	boundary
BC	brass cap
Brkwy	breakaway
Br	bridge
Bldg	building
BV	butterfly valve
Byp	bypass
C Gdrl	cable guardrail
Calc	calculate
Cd	candela
CIP	cast iron pipe
CB	catch basin
CRS	cationic rapid setting
C Gd	cattle guard
C To C	center to center
CI or ℄	centerline
Cm	centimeter
Ch	chain
Chnlk	chain-link
Ch Blk	channel block
Ch Ch	channel change
Chk	check
Chsld	chiseled
Cir	circle
Cl	class
Cl	clay
Cl F	clay fill
Cl Hvy	clay heavy
Cl Lm	clay loam
Clnt	clean-out
Clr	clear
Cl&gr	clearing & grubbing
Co S	coal slack
Comb.	combination
Coml	commercial
Compr	compression
CADD	computer aided drafting & design
Conc	concrete
Cond	conductor
Const	construction
Cont	continuous
CSB	continuous split barrel sample
Contr	contraction
Contr	contractor
CP	control point
Coord	coordinate
Cor	corner
Corr	corrected
CAES	corrugated aluminum end section
CAP	corrugated aluminum pipe
CMES	corrugated metal end section
CMP	corrugated metal pipe
CPVCP	corrugated poly-vinyl chloride pipe
CSES	corrugated steel end section
CSP	corrugated steel pipe
C	coulomb
Co	County
Crse	course
C Gr	course gravel
CS	course sand
Ct	Court
Xarm	cross arm
Xbuck	cross buck
Xsec	cross sections
Xing	crossing
Xrd	Crossroad
Crn	crown
CF	cubic feet
M3	cubic meter
M3/s	cubic meters per second
CY	cubic yard
Cy/mi	cubic yards per mile
Culv	culvert
C&G	curb & gutter
CI	curb inlet
CR	curb ramp
CS	curve to spiral
C	cut
Dd Ld	dead load
Defl	deflection
Defm	deformed
Deg or D	degree
Dlnt	delineate
Dlntr	delineator
Depr	depression
Desc	description
Det	detail
DWP	detectable warning panel
Dtr	detour
Dia	diameter
Dir	direction
Dist	distance
DM	disturbed material
DB	ditch block
DG	ditch grade
Dbl	double
Dn	down
Dwg	drawing
Dr	drive
Drwy	driveway
DI	drop inlet
D	dry density
Ea	each
Esmt	easement
E	East
EB	Eastbound
Elast	elastomeric
EL	electric locker
E Mtr	electric meter
Elec	electric/al
EDM	electronic distance meter
Elev or El	elevation
Ellipt	elliptical
Emb	embankment
Emuls	emulsion/emulsified
ES	end section
Engr	engineer
ESS	environmental sensor station
Eq	equal
Eq	equation
Evgr	evergreen
Exc	excavation
Exst	existing
Exp	expansion
Expy	Expressway
E	external of curve
Extru	extruded
FOS	factor of safety
F	Fahrenheit
FS	far side
F	farad
Fed	Federal
FP	feed point
Ft	feet/foot
Fn	fence
Fn P	fence post
FO	fiber optic
FB	field book
FD	field drive
F	fill
FAA	fine aggregate angularity
FS	fine sand
FH	fire hydrant
Fl	flange
Flrd	flared
FES	flared end section
F Bcn	flashing beacon
FA	flight auger sample
FL	flow line
Ftg	footing
FM	force main
Fs	foresight
Fnd	found
Fdn	foundation
Frac	fractional
Frwy	freeway
Frt	front
FF	front face
F Disp	fuel dispenser

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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NDDOT ABBREVIATIONS

D-101-2

FFP	fuel filler pipes
FLS	fuel leak sensor
Furn	furnish/ed
Gal	gallon
Galv	galvanized
Gar	garage
Gs L	gas line
G Reg	gas line regulator
GMV	gas main valve
G Mtr	gas meter
GSV	gas service valve
GVP	gas vent pipe
GV	gate valve
Ga	gauge
Geod	geodetic
GIS	Geographical Information System
G	giga
GPS	Global Positioning System
Gov	government
Grd	graded/grade
Gr	gravel
Grnd	ground
GWM	ground water monitor
Gdrl	guardrail
Gtr	gutter
H Plg	H piling
Hdwl	headwall
Ha	hectare
Ht	height
HI	height of instrument
Hel	helical
H	henry
Hz	hertz
HDPE	high density polyethylene
HM	high mast
HP	high pressure
HPS	high pressure sodium
Hwy	highway
Hor	horizontal
HBP	hot bituminous pavement
Hr	hour(s)
Hyd	hydrant
Ph	hydrogen ion content
Id	identification
In or "	inch
Incl	inclinometer tube
IMH	inlet manhole
ID	inside diameter
Inst	instrument
Intchg	interchange
Intmdt	intermediate
Intscn	intersection
Inv	invert
IM	iron monument
I Pn	Iron Pin

IP	iron Pipe
Jt	joint
J	joule
Jct	junction
K	kelvin
Kn	kilo newton
Kpa	kilo pascal
Kg	kilogram
Kg/m3	kilogram per cubic meter
Km	kilometer
K	Kip(s)
LS	Land Surveyor (licensed)
LSIT	Land Surveyor In Training
Ln	lane
Lg	large
Lat	latitude
Lt	left
L	length of curve
Lens	lenses
Lvl	level
LB	level book
Lvlng	leveling
Lht	light
LP	light pole
Ltg	lighting
Lig Co	lignite coal
Lig Sl	lignite slack
LF	linear foot
Liq	liquid
LL	liquid limit
L	litre
Lm	loam
Loc	location
LC	long chord
Long.	longitude
Lp	loop
LD	loop detector
Lm	lumen
Lum	luminaire
L Sum	lump sum
Lx	lux
ML	main line
M Hr	man hour
MH	manhole
Mkd	marked
Mkr	marker
Mkg	marking
MA	mast arm
Matl	material
Max	maximum
MC	meander corner
Meas	measure
Mdn	median
MD	median drain
MC	medium curing

M	mega
Mer	meridian
M	meter
M/s	meters per second
M	mid ordinate of curve
Mi	mile
MM	mile marker
MP	mile post
Ml	milliliter
Mm	millimeter
Mm/hr	millimeters per hour
Min	minimum
Misc	miscellaneous
Mon	monument
Mnd	mound
Mtbl	mountable
Mtd	mounted
Mtg	mounting
Mk	muck
Mun	municipal
N	nano
NGS	National Geodetic Survey
NS	near side
Neop	neoprene
Ntwk	network
N	newton
N	North
NE	North East
NW	North West
NB	Northbound
No. or #	number
Obsc	obscure(d)
Obsn	observation
Ocpd	occupied
Ocpy	occupy
Off Loc	office location
O/s	offset
OC	on center
C	one dimensional consolidation
OC	organic content
Orig	original
O To O	out to out
OD	outside diameter
OH	overhead
PMT	pad mounted transformer
Pg	pages
Pntd	painted
Pr	pair
Pnl	panel
Pk	park
PK	Parker-Kalon nail
Pa	pascal
PSD	passing sight distance
Pvmt	pavement
Ped	pedestal

Ped	pedestrian
PPP	pedestrian pushbutton post
Pen.	penetration
Perf	perforated
Per.	perimeter
PL	pipeline
Pl	place
P&P	plan & profile
PL	plastic limit
Pl	plate
Pt	point
PCC	point of compound curve
PC	point of curve
PI	point of intersection
PRC	point of reverse curvature
PT	point of tangent
POC	point on curve
POT	point on tangent
PE	polyethylene
PVC	polyvinyl chloride
PCC	Portland Cement concrete
Lb or #	pounds
PP	power pole
Preempt	preemption
Prefab	prefabricated
Prfmd	preformed
Prep	preperation
Press.	pressure
PRV	pressure relief valve
Prestr	prestressed
Pvt	private
PD	private drive
Prod.	production/produce
Prog	programmed
Prop.	property
Prop Ln	property line
Ppsd	proposed
PB	pull box

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NDDOT ABBREVIATIONS

D-101-3

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

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

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

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Line Styles

- Limits of Const Transition Line
- Bale Check
- Rock Check
- Sight Distance Triangle Line
- Small Hidden Object
- Dimension Leader
- Existing Ground
- Existing Topsoil (Cross Section View)
- Large Hidden Object
- Edge Drain
- D — Geotextile Fabric Type D
- E — Existing Electrical
- FO — Existing Fiber Optic Line
- FO — Existing TV Fiber Optic
- G — Existing Gas Pipe
- Geo — Geogrid
- OH — Existing Overhead Utility Line
- P — Existing Power
- PL — Existing Fuel Pipeline
- PL — Existing Undefined Above Ground Pipe Line
- R — Geotextile Fabric Type R
- R — Geotextile Fabric Type R1
- REMOVE — Remove Line
- RR — Geotextile Fabric Type RR
- S — Geotextile Fabric Type S
- S — Floating Silt Curtain
- T — Existing Telephone Line
- TV — Existing TV Line
- Void — Existing Assumed Ground (Not Surveyed)
- Void — Tentative Ground Line
- W — Existing Water or Steam Line
- Existing Under Drain
- Under Drain
- Wall
- Existing Slotted Drain
- Existing Cemetary Boundary
- 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
- Wetland Mitigation
- Existing Box Culvert Bridge
- Existing Concrete Surface
- Existing Drainage Structure
- Easement
- Existing Concrete
- Existing Easement
- Existing Gravel Surface
- Existing Aggregate (Cross Section View)
- Existing Curb and Gutter (Cross Section View)
- Existing Riprap
- Existing Underground Vault or Lift Station
- Tangent Line
- Hidden Object
- Existing Dirt Surface
- Existing Conduit
- Topsoil Profile
- Existing Conductor
- Conductor
- Fiber Optic
- Existing Loop Detector
- Subgrade, Subcut or Ditch Grade
- Existing Asphalt Surface
- Existing Asphalt (Cross Section View)
- Existing Reinforcement Rebar
- Existing Tie Point Line
- Existing State or International Line
- Existing Quarter Section Line
- Existing County
- Existing Section Line
- Existing Township
- Existing Railroad Centerline
- Centerline
- Existing Centerline
- Supplemental Contour
- Right of Way
- Existing Right of Way
- Existing Right of Way Railroad
- Failure Line
- Existing Conditions
- Existing Ground (Details)
- Existing Sixteenth Section Line
- Existing Right of Way Not State Owned
- Phantom Object
- Centerline Main
- Existing Guardrail Cable
- Existing Guardrail Metal
- Existing Edge of Water
- Excavation Limits
- Existing Government Lot Line
- Existing Adjacent Block Lines
- Existing Adjacent Lot Lines
- Existing Adjacent Property Line
- Existing Adjacent Subdivision Lines

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D-101-21

Line Styles

- Subgrade Reinforcement
- Existing Down Guy Wire Down Guy
- Existing Fence
- Existing Railroad
- Existing Sanitary Sewer
- Existing Sanitary Force Main
- Existing Storm Drain
- Existing Storm Drain Force Main
- Fence
- Silt Fence
- Existing Field Line
- Exst Flow
- Flow
- Existing Culvert
- Existing Curb
- Existing Valley Gutter
- Existing Driveway Gutter
- Existing Curb and Gutter
- Existing Mountable Curb and Gutter
- Existing Double Micro Loop Detector
- Micro Loop Detector Double
- Existing Overhead Sign Structure
- Existing Micro Loop Detector
- Micro Loop Detector
- Existing Overhead Sign Structure Cantilever
- Existing Railroad Switch
- Overhead Sign Structure Cantilever
- 24 Inch Pipe
- Reinforced Concrete Pipe
- Signal Head with Mast Arm
- Existing Signal Head with Mast Arm
- Tie Bar at Random Spacing
- 3-Cable w Posts
- Existing 3-Cable w Posts
- Site Boundary
- Fiber Rolls
- Doweled Joint
- Tie Bar 30 Inch 4 Foot Center to Center
- Tie Bar 18 Inch 3 Foot Center to Center
- Existing Berm, Dike, Pit, or Earth Dam
- Existing Ditch Block
- Depression Contours
- Existing City Corporate Limits or Reservation Boundary
- Gravel Pit - Borrow Area
- Existing Tree Boundary
- Tree Row
- Existing Brush or Shrub Boundary
- Existing Retaining Wall
- Existing Planter or Wall
- Retaining Wall (Plan View)
- Sheet Piling
- W-Beam w Posts
- Existing W-Beam Guardrail with Posts
- Exst Wet Area-Vegetation Break
- Existing Wetland Delineated

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Symbols

D-101-30

- North Arrow (Half Scale)
- Truck Mounted Attenuator
- Type I Barricade
- Type II Barricade
- Type III Barricade
- Catch Basin
- Cairn or Stone Circle
- Video Detection Camera
- Storm Drain Cap or Stub
- Corrugated Metal End Section 18 Inch
- Corrugated Metal End Section 24 Inch
- Corrugated Metal End Section 30 Inch
- Corrugated Metal End Section 36 Inch
- Corrugated Metal End Section 42 Inch
- Corrugated Metal End Section 48 Inch
- Concrete Foundation
- Ground Connection Conductor
- Neutral Connection Conductor
- Phase 1 Connection Conductor
- Phase 2 Connection Conductor
- Traffic Cone
- Signal Controller
- Pad Mounted Signal Controller
- Alignment Data Point
- Emergency Vehicle Detector
- Attenuation Device
- Diamond Grade Delineator Type A
- Diamond Grade Delineator Type B
- Diamond Grade Delineator Type C
- Diamond Grade Delineator Type D
- Diamond Grade Delineator Type E
- Flexible Delineator
- Flexible Delineator Type A
- Flexible Delineator Type B
- Flexible Delineator Type C
- Flexible Delineator Type D
- Flexible Delineator Type E
- Delineator Type A
- Delineator Type A Reset
- Delineator Type B
- Delineator Type B Reset
- Delineator Type C
- Delineator Type D
- Delineator Type E
- Delineator Drums
- Spot Elevation
- Existing Access Control Arrow
- Existing Artifact
- Existing Flashing Beacon
- Existing Benchmark
- Existing Railroad Battery Box
- Existing Bush or Shrub
- Existing Gas Cap or Stub
- Existing Sanitary Cap or Stub
- Existing Storm Drain Cap or Stub
- Existing Water Cap or Stub
- Existing Sanitary Cleanout
- Existing Concrete Foundation
- Existing Traffic Signal Controller
- Existing Pad Mounted Signal Controller
- Existing Sixteenth Section Corner
- Existing Quarter Section Corner
- Existing Section Corner
- Existing Railroad Crossbuck
- Existing Satellite Dish
- Existing Fuel Dispensers
- Existing Flexible Delineator Type A
- Existing Flexible Delineator Type B
- Existing Flexible Delineator Type C
- Existing Flexible Delineator Type D
- Existing Flexible Delineator Type E
- Existing Delineator Type A
- Existing Delineator Type B
- Existing Delineator Type C
- Existing Delineator Type D
- Existing Delineator Type E
- Existing EFB Misc
- Existing Flashing Beacon
- Existing Pipe Mounted Flasher
- Existing Pad Mounted Feed Point
- Existing Pipe Mounted Feed Point with Pad
- Existing Pole Mounted Feed Point
- Existing Railroad Frog
- Existing Snow Gate 18
- Existing Snow Gate 28
- Existing Snow Gate 40
- Existing Headwall
- Existing Pedestrian Head with Number
- Existing Signal Head
- Existing Sprinkler Head
- Existing Fire Hydrant
- Existing Catch Basin Drop Inlet
- Existing Curb Inlet
- Existing Manhole Inlet
- Existing Junction Box

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Symbols

D-101-31

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

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Symbols

D-101-32

- Pad Mounted Feed Point
- Pipe Mounted Feed Point with Pad
- Pole Mounted Feed Point
- Headwall
- Double Headwall with Vegitation Barrier
- Single Headwall with Vegitation Barrier
- Pole Mounted Head
- Sprinkler Head
- Fire Hydrant
- Inlet Type 1
- Inlet Type 2
- Double Inlet Type 2
- Inlet Grate Type 2
- Junction Box
- High Mast Light Standard 10 Luminaire
- High Mast Light Standard 3 Luminaire
- High Mast Light Standard 4 Luminaire
- High Mast Light Standard 5 Luminaire
- High Mast Light Standard 6 Luminaire
- High Mast Light Standard 7 Luminaire
- High Mast Light Standard 8 Luminaire
- High Mast Light Standard 9 Luminaire
- Relocate Light Standard
- Overhead Sign Structure Load Center
- Light Standard 100 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 150 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 175 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 200 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 250 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 310 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 35 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 400 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 50 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 70 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 700 Watt High Pressure Sodium Vapor Luminaire
- Manhole
- Manhole 48 Inch
- Sanitary Force Main Manhole
- Sanitary Sewer Manhole
- Storm Drain Manhole
- Storm Drain Manhole with Inlet
- Reset Mile Post
- Mile Post Type A
- Mile Post Type B
- Mile Post Type C
- Right of Way Marker
- Tubular Marker
- Alignment Monument
- Iron Pin Reference Monument
- Object Marker Type I
- Object Marker Type II
- Object Marker Type III
- Caution Mode Arrow Panel
- Back to Back Vertical Panel Sign
- Double Direction Arrow Panel
- Left Directional Arrow Panel
- Right Directional Arrow Panel
- Sequencing Arrow Panel
- Truck Mounted Arrow Panel
- Power Pole
- Wood Pole
- Pedestrian Push Button Post
- Property Corner
- Pull Box
- Intelligent Transportation Pull Box
- Sanitary Pump
- Storm Drain Pump
- Reinforced Pavement
- Reinforced Concrete End Section 15 Inch
- Reinforced Concrete End Section 18 Inch
- Reinforced Concrete End Section 24 Inch
- Reinforced Concrete End Section 30 Inch
- Reinforced Concrete End Section 36 Inch
- Reinforced Concrete End Section 42 Inch
- Reinforced Concrete End Section 48 Inch
- Reinforced Concrete End Section 54 Inch
- Reset Right of Way Marker
- Reset USGS Marker
- Right of Way Markers
- Riser 30 Inch
- CSB — Continuous Split Barrel Sample
- FA — Flight Auger Sample
- SB — Split Barrel Sample
- T — Thinwall Tube Sample
- Highway Sign
- SNOW GATE 18 FT
- SNOW GATE 28 FT
- SNOW GATE 40 FT
- N — Standard Penetration Test
- Transformer
- Incl — Inclinometer Tube
- Underdrain Cleanout
- Excavation Unit
- Water Valve

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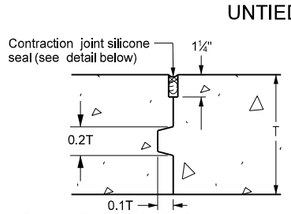
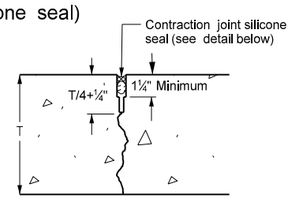
LONGITUDINAL JOINT DETAILS

D-550-2

UNTIED JOINTS (silicone seal)

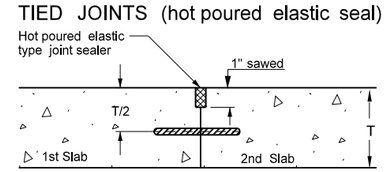


Sawed longitudinal joint with keyway



Sawed longitudinal joint without keyway

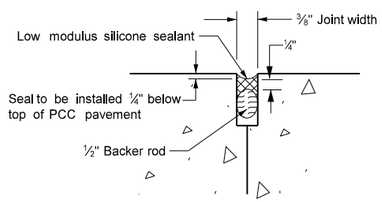
TIED JOINTS (hot poured elastic seal)



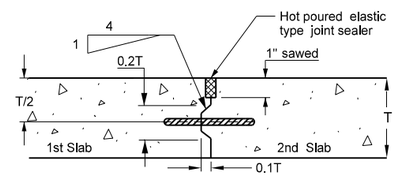
Longitudinal construction joint (tied butt joint)

Notes:

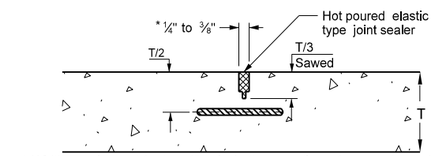
1. The hot poured elastic type joint sealer shall be in accordance with Section 826.02A.2 of the Standard Specifications.
2. The longitudinal joint and seal shall be included in the price bid for the P.C.C. pavement.
3. Tie bars shall not be placed within 18 inches of a transverse skewed joint.
4. Where tie bars are installed bent and later straightened, Grade 40 steel shall be used.
5. Tie bar spacing can be increased up to 10% to facilitate construction.
6. Tie Bars shall be 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 silicone seal



Longitudinal construction joint (tied keyed joint)

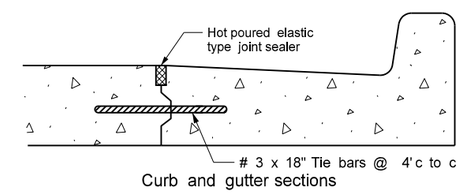


* Width requirement for top 1" only, bottom portion of saw cut may be narrower

Sawed longitudinal joint

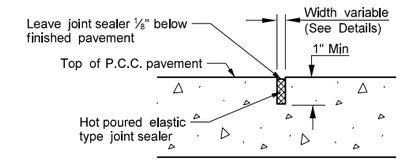
TIEBAR SPACINGS (In)

DIST TO FREE EDGE (FT) / BAR LENGTH	BAR SIZE	# 3 BAR										# 4 BAR												# 5 BAR												# 6 BAR												
	GRADE STEEL	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	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	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	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	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										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										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										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										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											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											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

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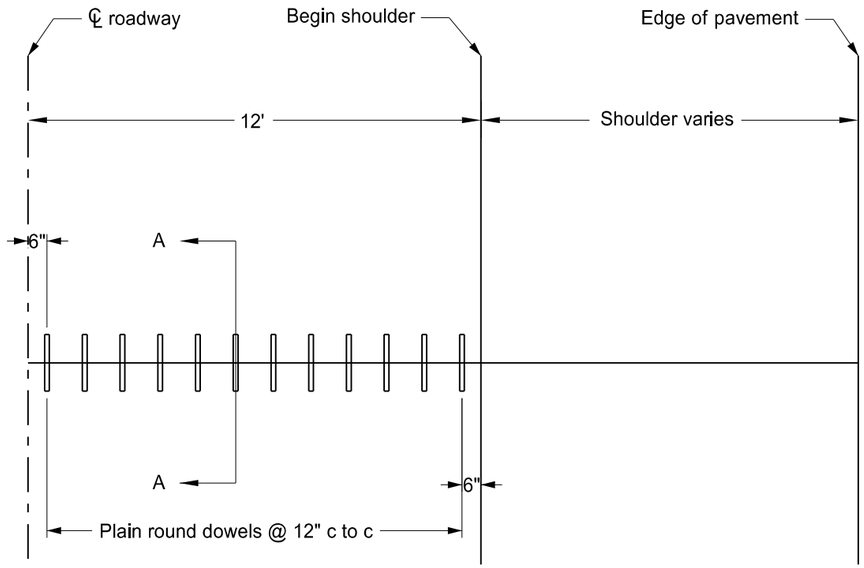
TRANSVERSE CONTRACTION JOINT DETAILS

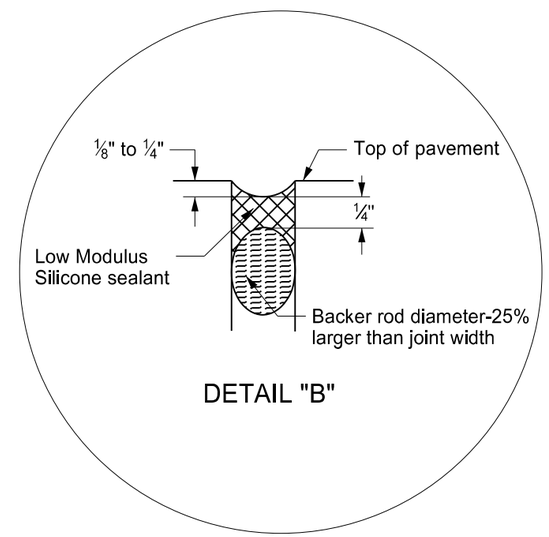
D-550-3



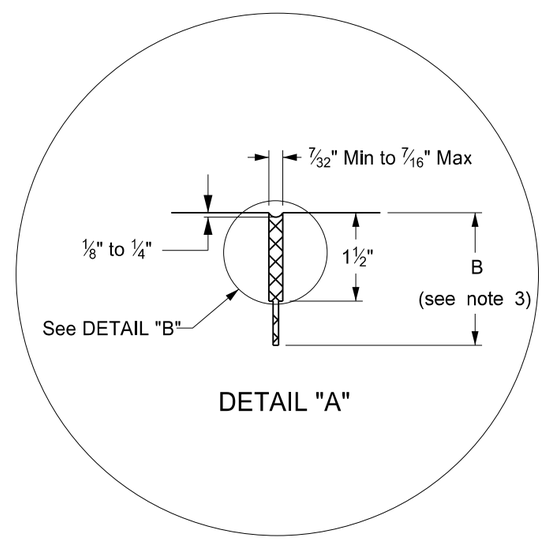
CONTRACTION JOINT DOWEL ASSEMBLY
(1/2 roadway shown)

Notes

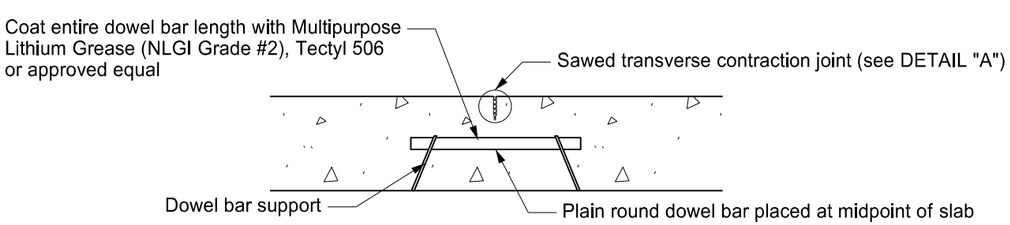
1. The joint seal details apply to both doweled and non-doweled (plain) transverse joints.
2. T = Thickness of pavement.
3. B = T/4 + ¼" for AE or YE for non-dowelled concrete pavement or
   B = T/3 for high early or dowelled concrete pavement



DETAIL "B"



DETAIL "A"



SECTION A-A

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-2010	
REVISIONS	
DATE	CHANGE
6/23/2014	Removed dowel size reference

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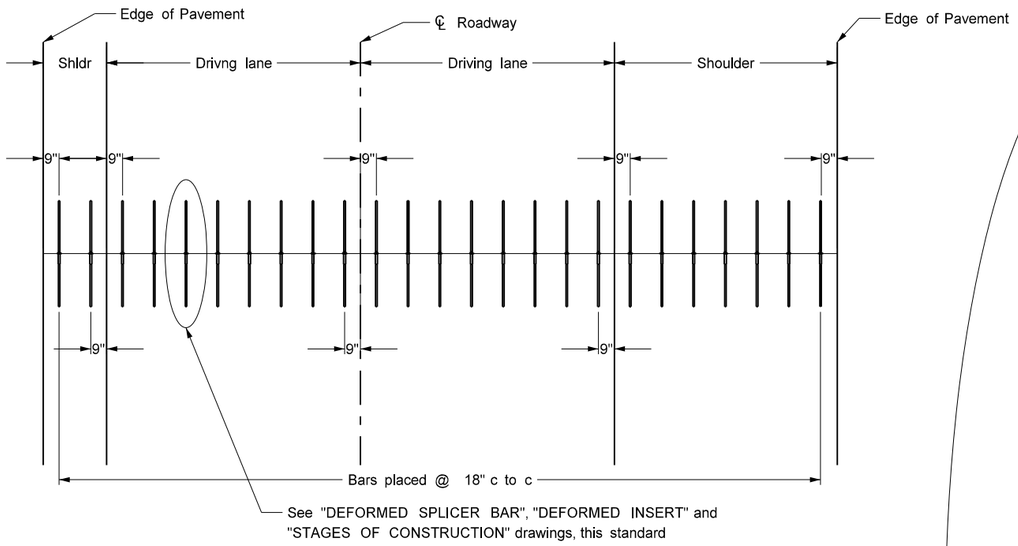
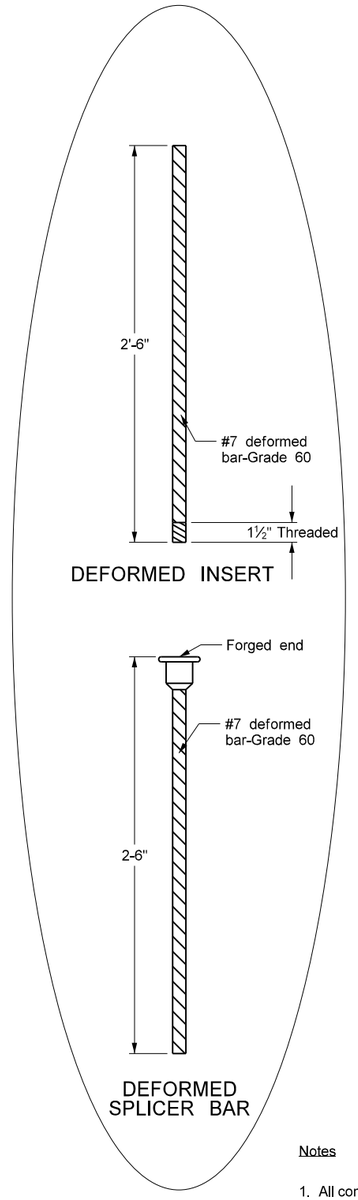
TRANSVERSE CONSTRUCTION JOINT

D-550-5

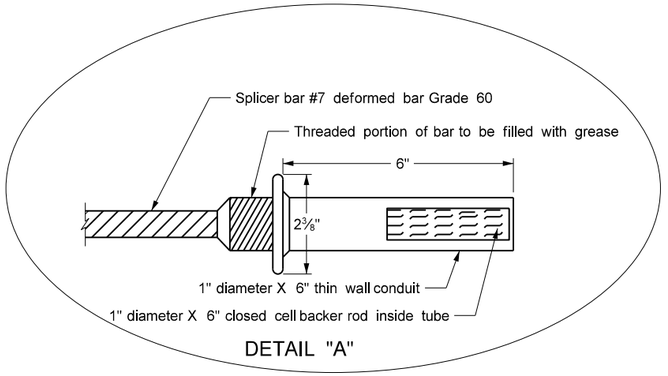


PLAN VIEW

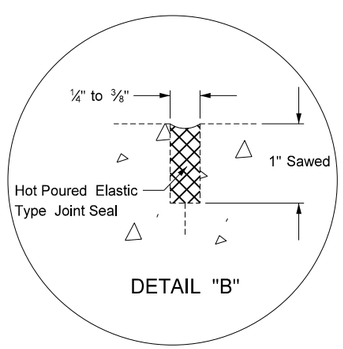


DEFORMED INSERT

DEFORMED SPLICER BAR

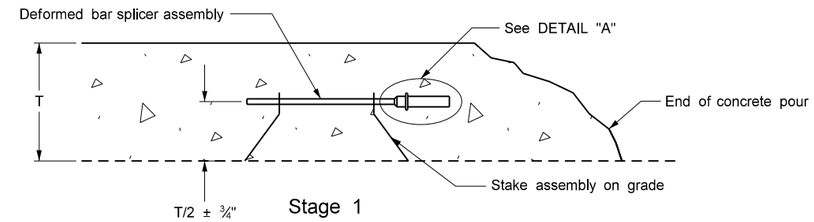


DETAIL "A"

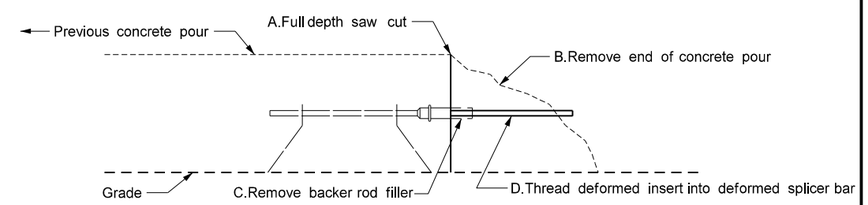


DETAIL "B"

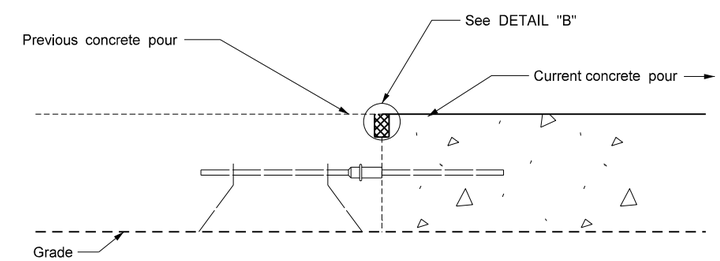
STAGES OF CONSTRUCTION



Stage 1



Stage 2



Stage 3

Notes

1. All construction joints shall be sawed and sealed.
2. The cost for all transverse construction joints shall be included in the price bid for P.C.C. pavement.
3. The contractor shall not saturate the subgrade during the sawing operation.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-2010	
REVISIONS	
DATE	CHANGE

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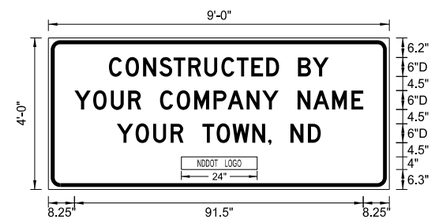
CONSTRUCTION SIGN DETAIL

D-704-5

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

SYMBOL	X	Y	WID	HT	ANGLE
	42.1	6.2	24	4	0

STATION(S): AREA: 36.0 Sq.Ft.



Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

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

Notes:

1. Sign shall be placed a distance of ½A following the End Road Work (G20-2a-48) sign. There shall be a maximum of 2 signs per project.
2. Sign shall be post mounted.
3. Sign required on rural projects with a 30 day or longer duration and it is not required on seal coat projects or other short duration projects.
4. Sign shall not be placed in urban areas or within city limits.

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

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

8-22-12

REVISIONS

DATE	CHANGE
7-18-14	Revise sheeting to type IV

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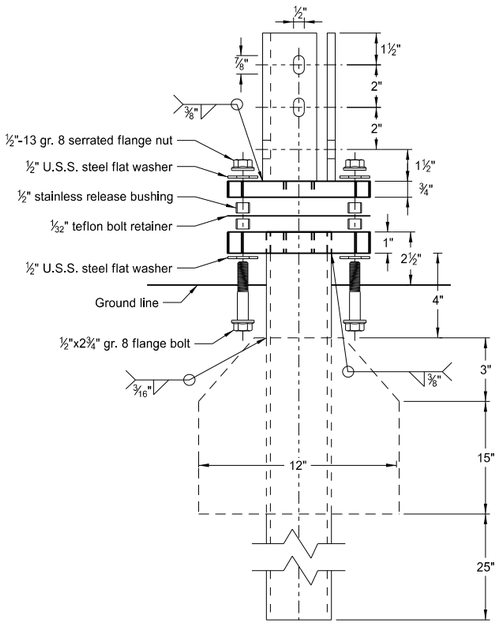
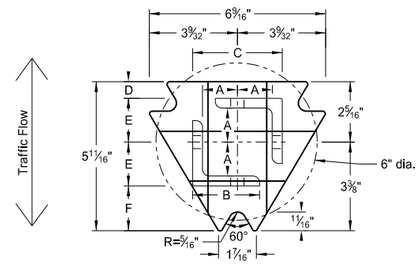
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

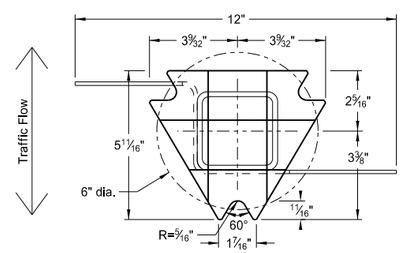
Perforated Tube



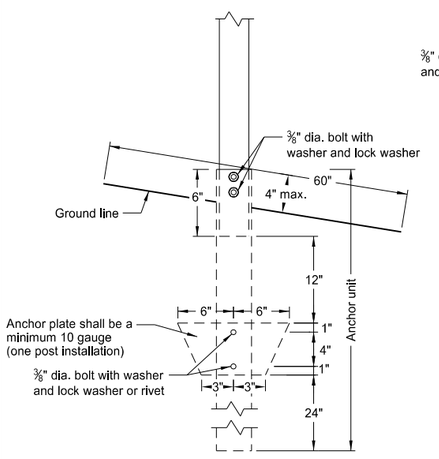
Multi-Directional
Slip Base Assembly



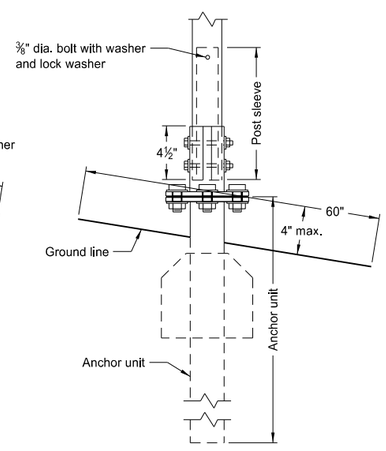
Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2½"x2½"x⅜" ASTM A36 structural angle



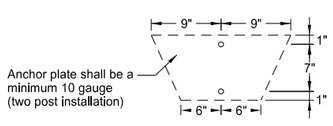
Bottom Soil Stub
Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50

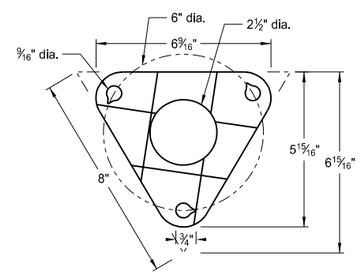


Anchor Unit and Post Assembly



Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly





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

Notes:

1. Slip base bolts shall be torqued as specified by the manufacturer.
2. Anchor shall have a yield strength of 43.9 KSI and tensile strength of 59.3 KSI.
3. The 4" vertical clearance is required for the anchor or breakaway base. The 4"x60" measurement shall be made above and below post location and also back and ahead of the post.
4. When used in concrete sidewalk, anchor shall be same except without the wings.
5. Four post signs shall have over 7' between the first and the fourth posts.

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	2 3/16	10	Yes	

(A) The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak.

(B) The 2 3/16"x10 ga. may be inserted into 2½"x10 ga. for additional wind load.

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
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.785

Top Post Receiver Data Table

Square Post Sizes (B)	A	B	C	D	E	F
2 3/16"x10 ga.	1 9/64"	2½"	3 1/32"	25/32"	1 33/64"	1⅞"
2½"x10 ga.	1 9/32"	2½"	3 5/16"	⅝"	1 21/32"	1¾"

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

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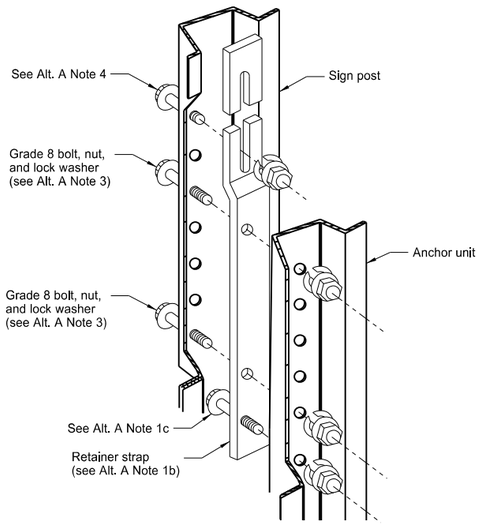
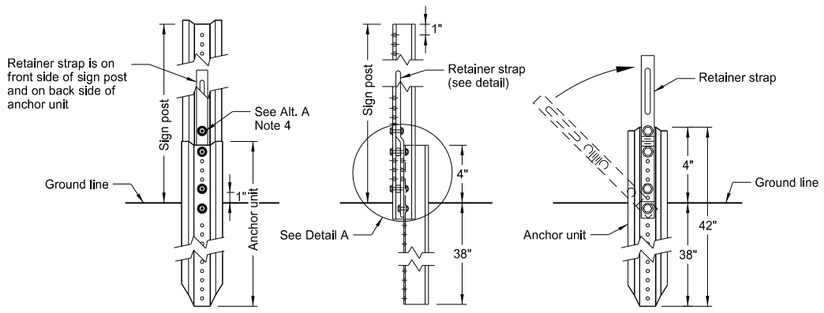
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

U-Channel Post



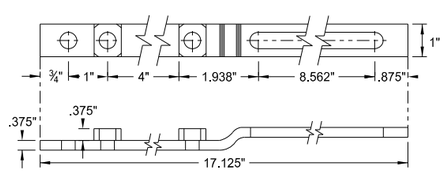
Detail A



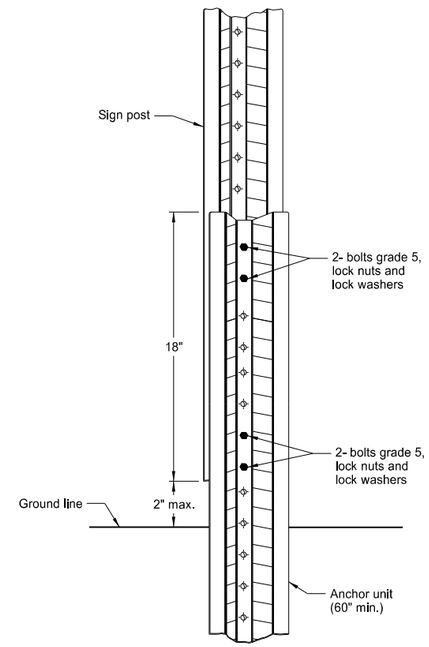
Front View | Side View | Back View

Breakaway U-Channel Detail
Alternate A

A maximum of 2 posts shall be installed within 7'.

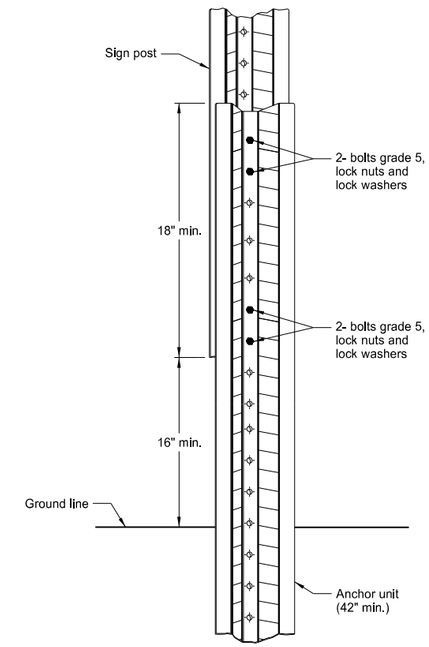


Retainer Strap Detail



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

A maximum of 3 posts shall be installed within 7'.



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

A maximum of 3 posts shall be installed within 7'.

Alternate A Steps of Installation:

1. a) Drive anchor unit to within 12" of ground level.
   b) Proper assembly established by lining up the bottom hole of retainer strap with the 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. The base post, strap and sign post shall be properly nested. Proper nesting occurs when all flat surfaces of the base post, strap, and sign post at the bolts have full contact across the entire width.

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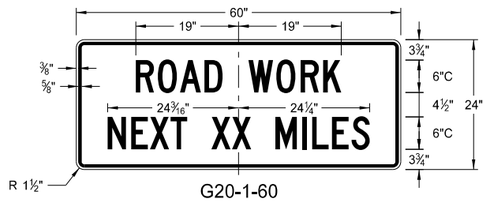
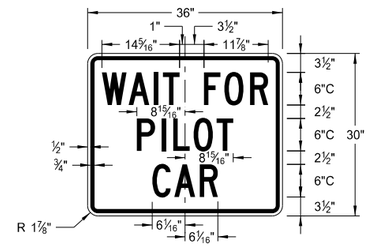
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



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



G20-4b-36
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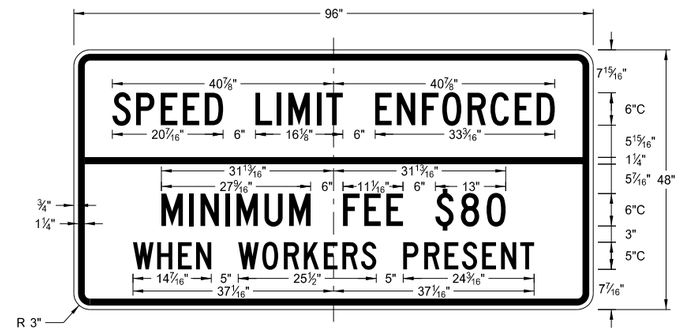
Background; orange



G20-55-96
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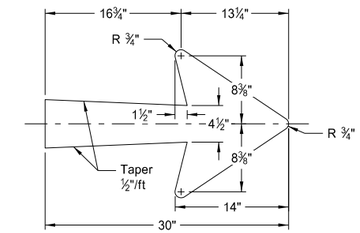
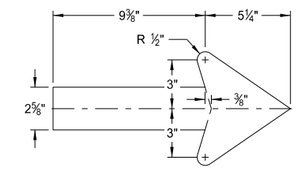
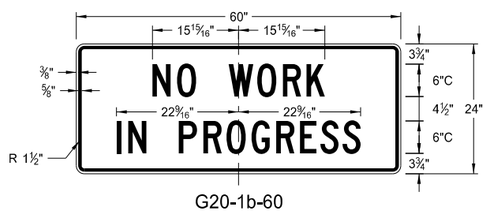


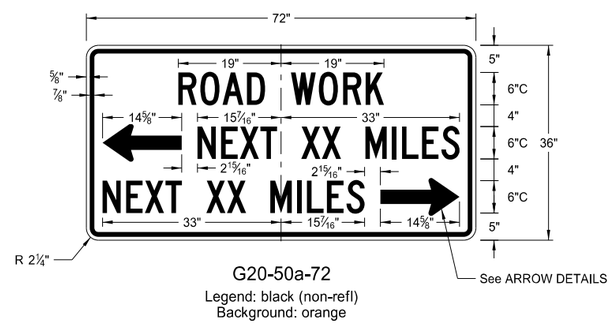
E5-1-48



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



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



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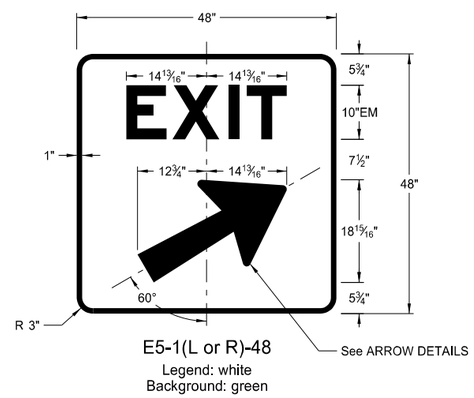
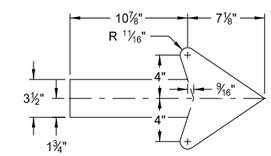
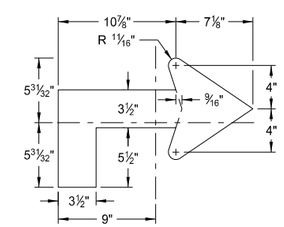
Background: orange



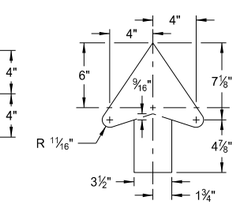
E5-1(L or R)-48
Legend: white
Background: green



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

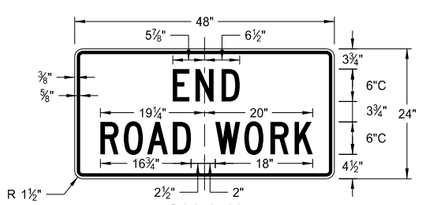


M4-9(L or R)-30
Advanced Right or Left



M4-9-30
Straight

ARROW DETAILS



G20-2-48
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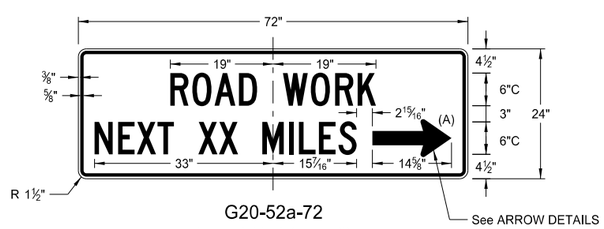
Background: orange



G20-52a-72
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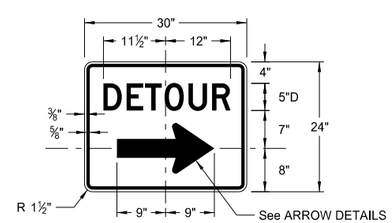
Background: orange



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

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	
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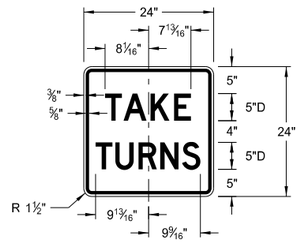
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



R1-50-24
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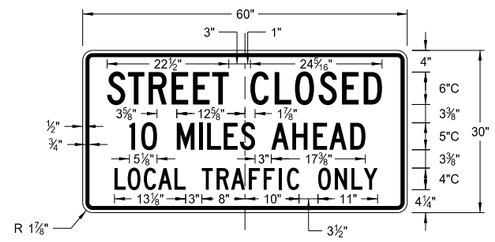
Background: white



R11-3c-60
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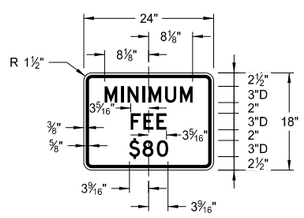
Background: white



R2-1a-24
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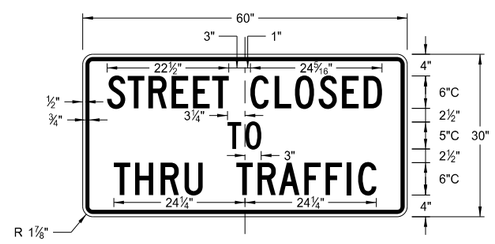
Background: white



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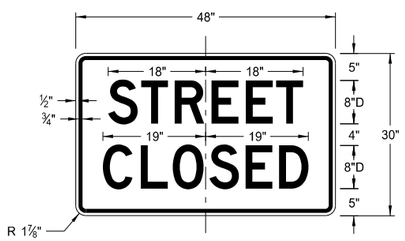

R11-2a-48
Legend: black (non-refl)
Background: white

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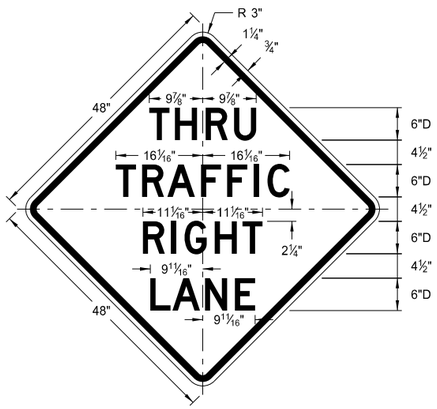
D-704-11

CONSTRUCTION SIGN DETAILS
WARNING SIGNS



W5-8-48
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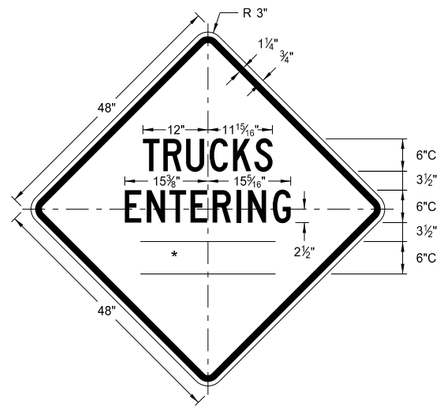
Background: orange



W8-54-48
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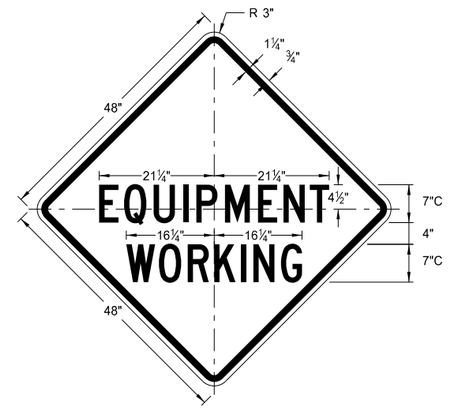

W20-51-48
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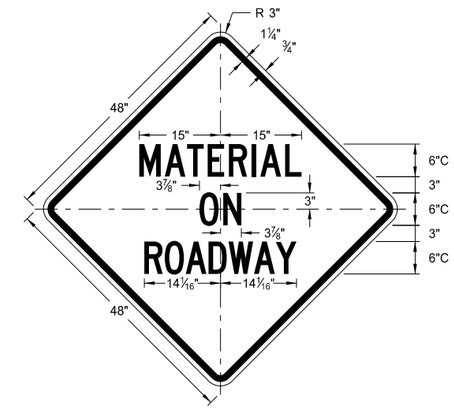
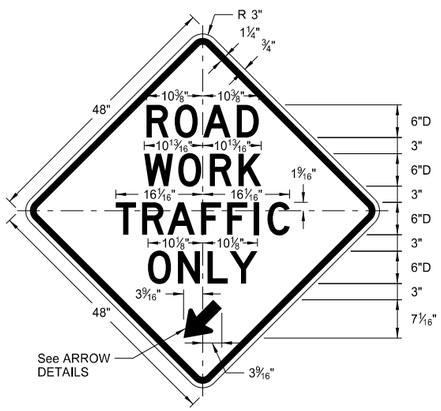
Background: orange



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

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

* DISTANCE MESSAGES



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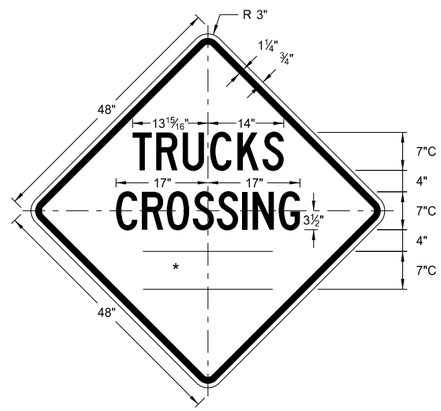
Background: orange



W8-55-48
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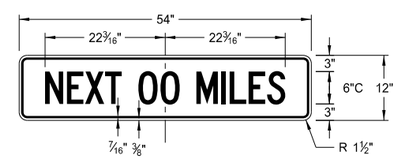
Background: orange



W20-52-54
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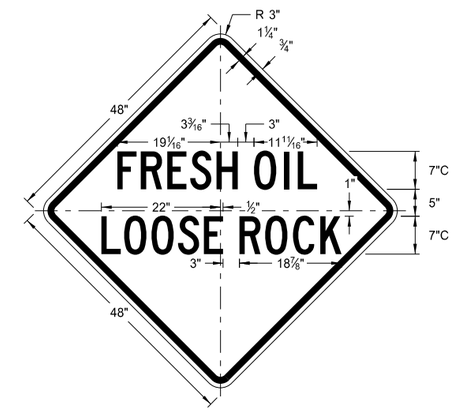
Background: orange



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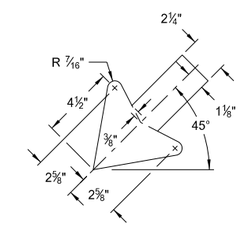
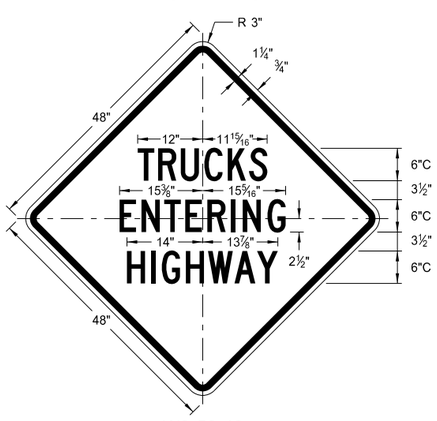
Background: orange



W5-9-48

ARROW DETAILS



W8-53-48
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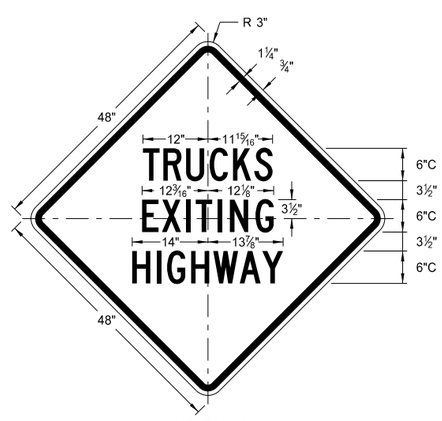

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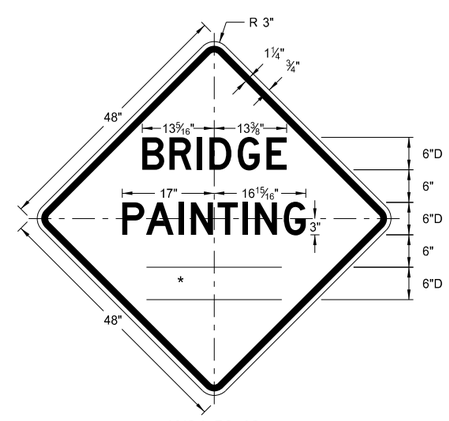
Background: orange



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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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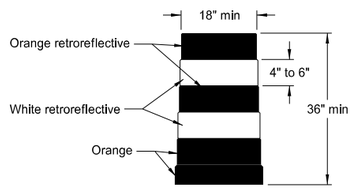
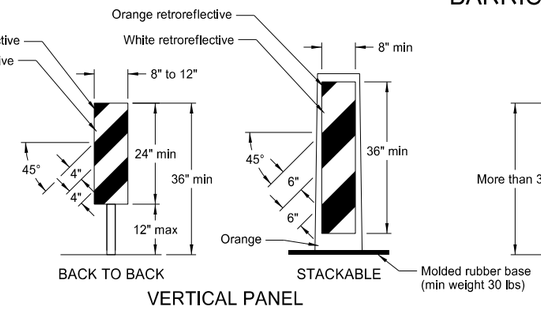
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



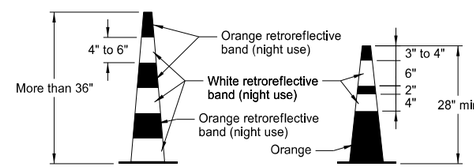
DELINEATOR DRUM

The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectorized spaces between the horizontal orange and white stripes shall not exceed 3" wide. Stripes shall not be placed on ribs or indentations in the drum. Drums shall have closed tops that will not allow collection of construction debris or other debris. Ballast shall not be placed on the top of a drum.



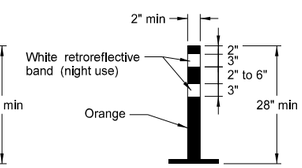
VERTICAL PANEL

Markings for vertical panels shall be alternating orange and white retroreflective stripes, sloping downward in the direction vehicular traffic is to pass. Retroreflective sheeting shall be placed on both sides of panel and shall have 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, a stripe width of 6 inches shall be used.



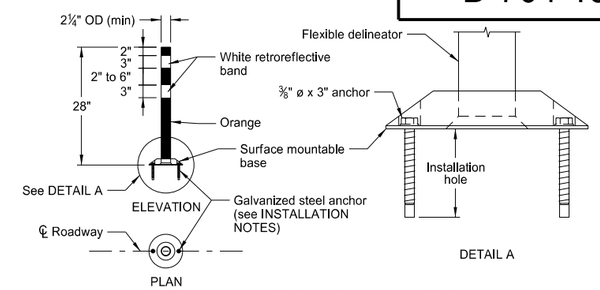
TRAFFIC CONE

Retroreflectorization of cones more than 36" in height shall be provided by alternating orange and white retroreflective stripes. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectorized space between the orange and white stripes shall not exceed 3" wide.



TUBULAR MARKER

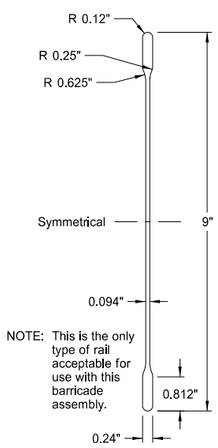
Retroreflectorization of tubular markers more than 42" in height shall be provided by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

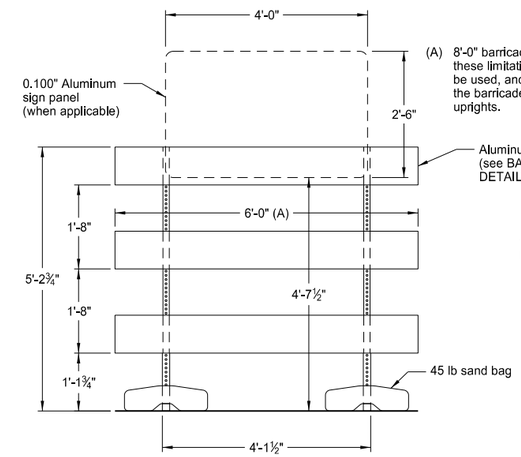
INSTALLATION NOTES:

1. Drill installation holes to diameter and depth as 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, the contractor may use an 8" x 8" butyl pad or hot melt butyl. Butyl shall be removed as close as possible to pavement surface.



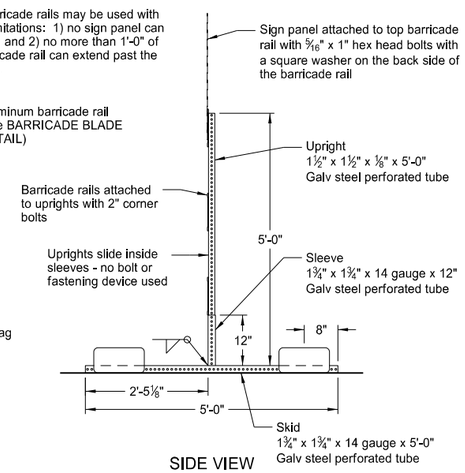
NOTE: This is the only type of rail acceptable for use with this barricade assembly.

BARRICADE BLADE DETAIL



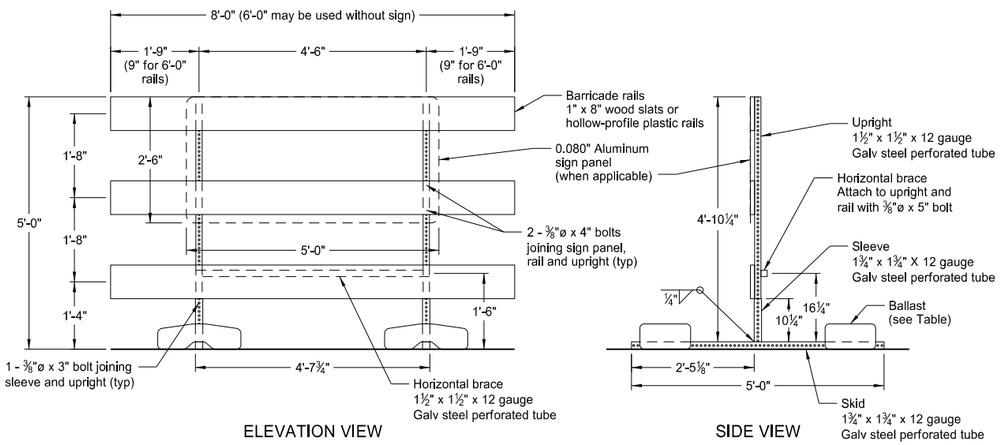
(A) 8'-0" barricade rails may be used with these limitations: 1) no sign panel can be used, and 2) no more than 1'-0" of the barricade rail can extend past the uprights.

ELEVATION VIEW



SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Aluminum Barricade Rails)

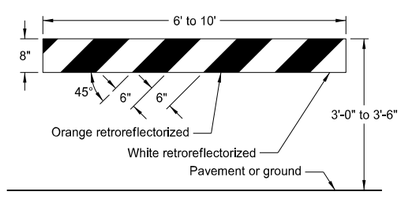


ELEVATION VIEW

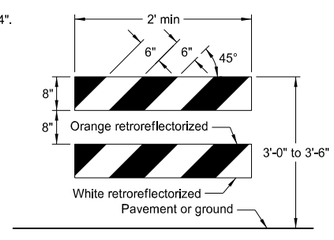
SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Wood or Plastic Rails)

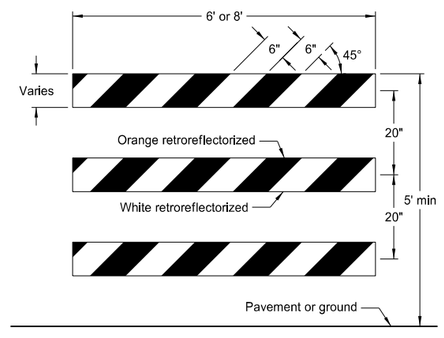
NOTE: Markings for barricades shall be alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Retroreflective sheeting shall be placed on both sides of the rails and shall have a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the barricade length is less than 36", the rail stripe width shall be 4".



TYPE I BARRICADE

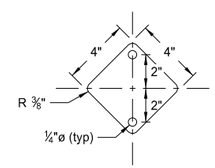


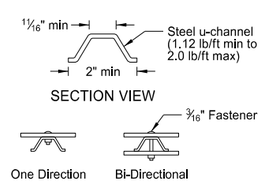
TYPE II BARRICADE

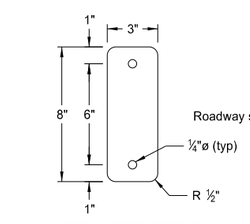


TYPE III BARRICADE

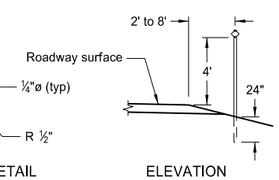
BARRICADE RAIL DETAILS







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: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
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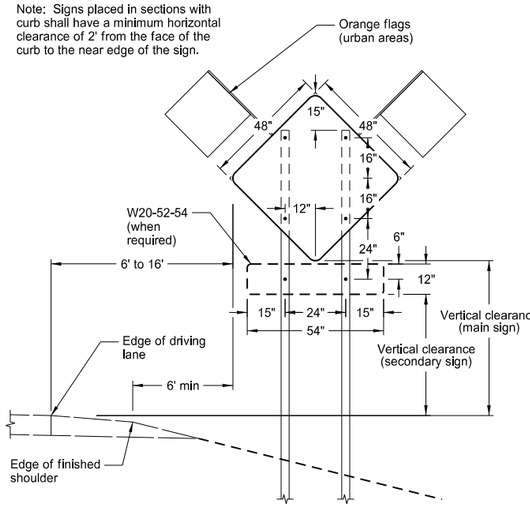
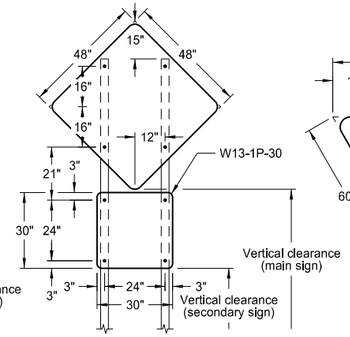
CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

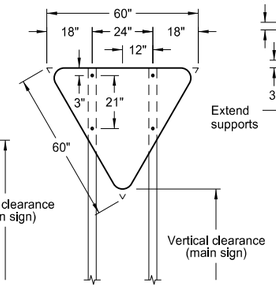
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



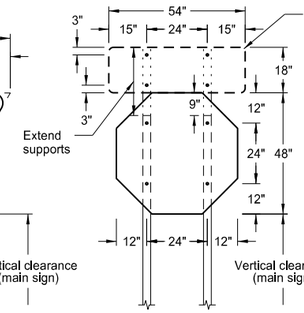
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



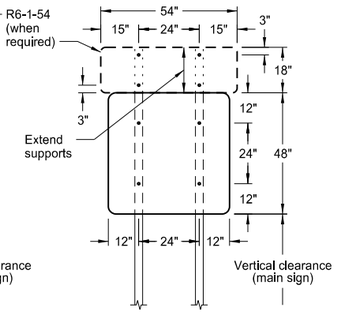
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



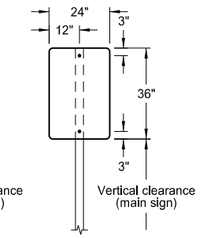
R1-2-60 - YIELD SIGN



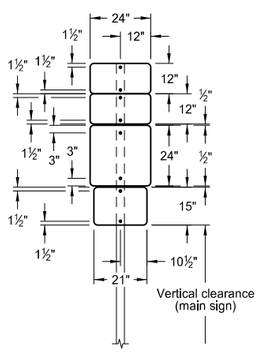
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



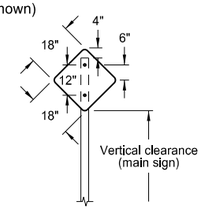
48" x 48" SIGN
(with R6-1-54 sign as required)



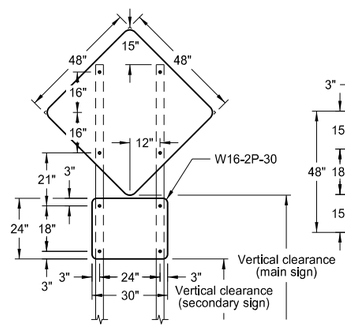
24" x 36" SIGN



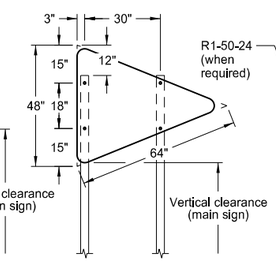
24" x 24"
ROUTE MARKER
ASSEMBLY



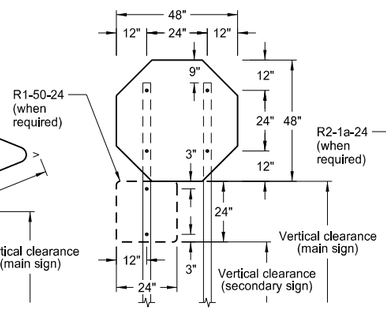
18" x 18"
DIAMOND SIGN



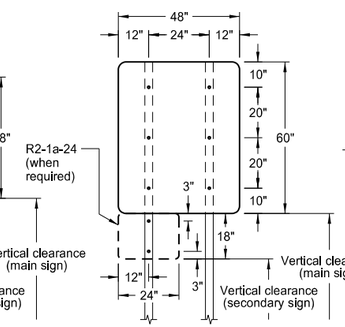
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



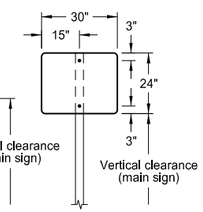
W14-3-64 - PENNANT SIGN



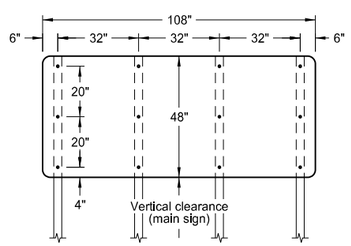
R1-1-48 - STOP SIGN
(with R1-50-24 sign as required)



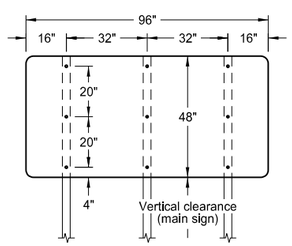
48" x 48" SIGN
(with R2-1a-24 sign as required)



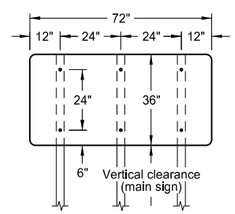
30" x 24" SIGN



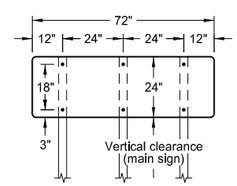
108" x 48" SIGN



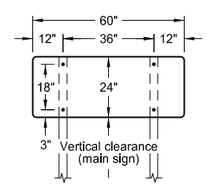
96" x 48" SIGN



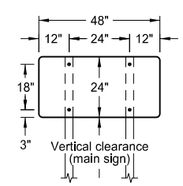
72" x 36" SIGN



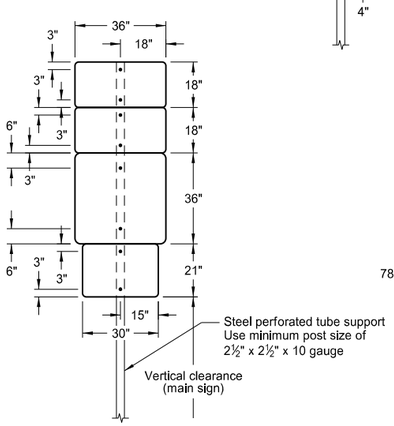
72" x 24" SIGN



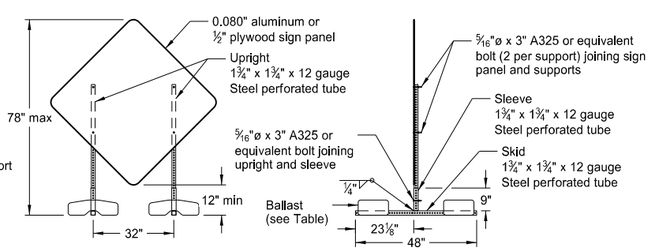
60" x 24" SIGN



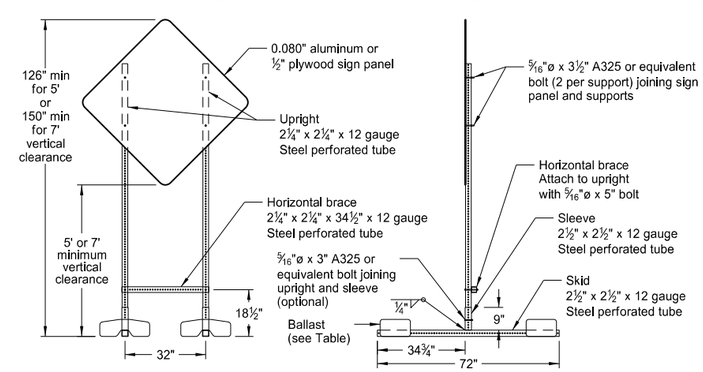
48" x 24" SIGN



36" x 36"
ROUTE MARKER
ASSEMBLY



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

1. Sign Supports: Supports shall be galvanized or painted. 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, the minimum post size for assemblies containing a secondary sign is 3.0 lb/ft. Post sizes are based on a wind speed of 55 MPH.

   Signs over 50 square feet should be installed on 2½" x 2½" perforated tube supports as a minimum.

   Guy wires shall not be attached to sign supports. Wind beams may be attached to u-posts behind the sign panels.

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

3. Alternate Messages: The signs that have alternate messages may have these alternate messages placed on a reflectorized plate (without a border) and installed and removed as required. (i.e. "Left" and "Right" message on a 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 as stated above.

   Large signs having an area exceeding 50 square feet shall have a minimum clearance of 7'-0" from the ground at the post.

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

   When portable signs are used for 5 days or less, low-mounting height (minimum 12" vertical clearance) sign supports may be used 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. The R9-8 through R9-11a series, W1-6 through W1-8 series, M4-10, and E5-1 may be used for longer than 5 days.

   Signs mounted to the portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT Details shall have 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

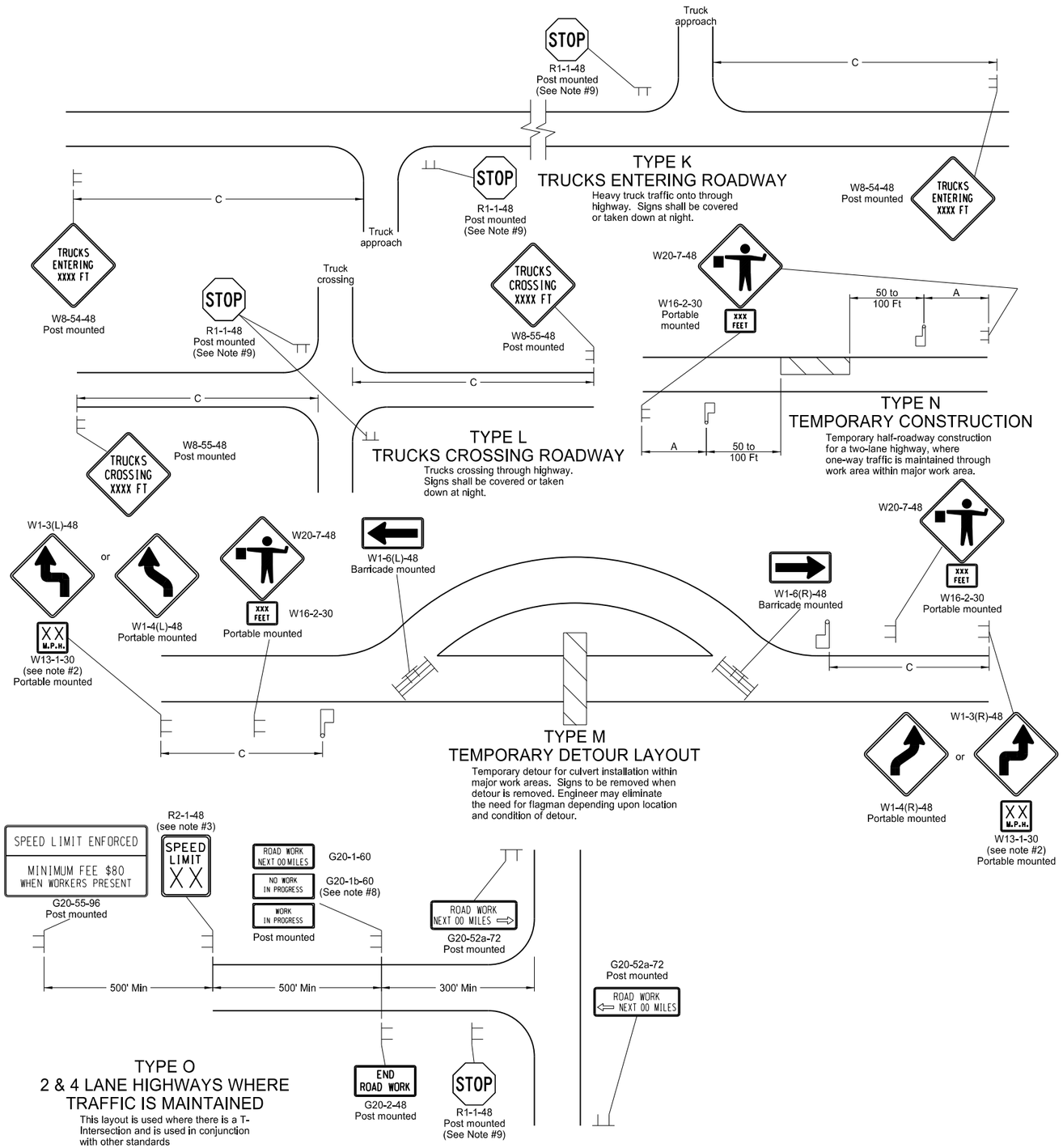
Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-13	
REVISIONS	
DATE	CHANGE
11-14-13	Revised Note 6.

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 11/14/13 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

D-704-22



Notes

1. Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies.
2. Where necessary, safe speed to be determined by the Engineer.
3. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at ½ B.
4. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
5. Existing speed limit signs within a reduced speed zone shall be covered.
6. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
7. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
8. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
9. If existing stop sign is in place, a 48" stop sign is not required.
10. G20-55-96 sign is not required if this standard is part of other traffic control layouts with this sign or the work is less than 15 days.

KEY

Type III barricade — Work area

Sign — Flagger

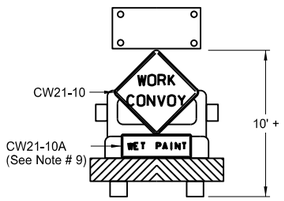
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway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

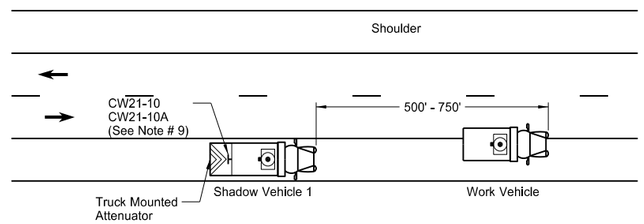
This document was originally issued and sealed by Roger Weigel Registration Number PE- 2930, on 09/27/13 and the original document is stored at the North Dakota Department of Transportation

TRAFFIC CONTROL PLAN FOR MOVING OPERATIONS

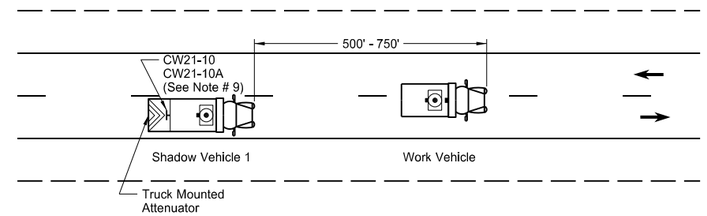
D-704-27



Typical Shadow Vehicle 1
Two-Way Roaday



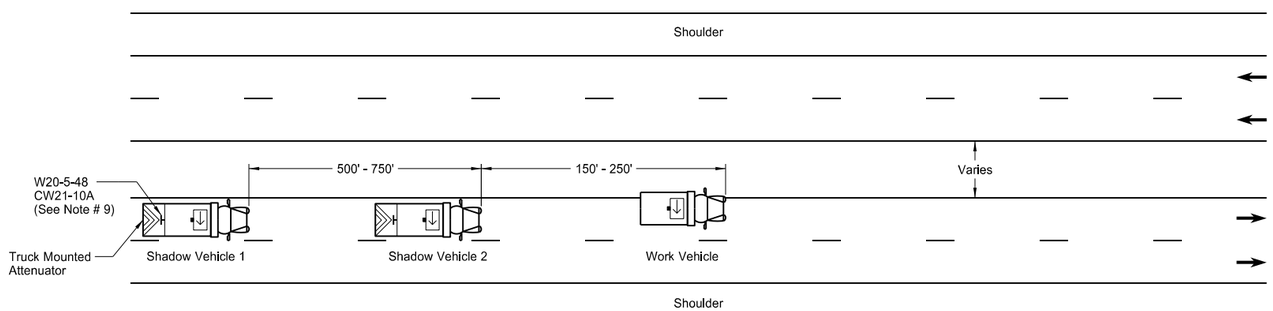
Two-Way Roadway with Paved Shoulders



Two-Way Roadway without Paved Shoulders

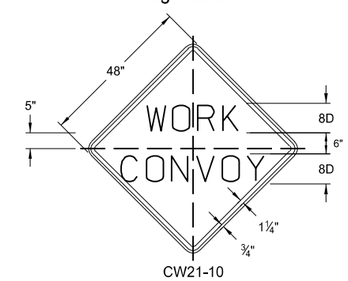
Notes

1. If the contractor chooses to place more vehicles in the convoy than are shown, these vehicles shall have the truck mounted attenuator and shall be at the contractor's expense.
2. Shadow and work vehicles shall display yellow rotating beacons or strobe lights unless otherwise stated elsewhere in the plans.
3. Flashing arrow panels shall be Type B or Type C. The panel operation shall be controlled from inside the vehicle.
4. Each vehicle shall have two-way electronic communication capability.
5. When work convoys must change lanes, shadow vehicle 1 should change lanes first to shadow other convoy vehicles.
6. Vehicle spacing between the shadow vehicle 1 and shadow vehicle 2 will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the trail vehicle in time to slow down and/or change lanes as they approach the shadow vehicle.
7. Sign Colors
   Letters = Black
   Border = Black
   Background = Orange
8. Shadow vehicle 2 may be used as the paint tender vehicle.
9. Sign CW21-10A shall only be used during a painting operation.
10. On two lane - two way roadways, the work and shadow vehicles should pull over periodically to allow motor vehicle traffic to pass.

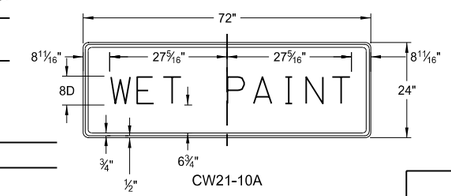


Undivided Multi-Lane Roadway

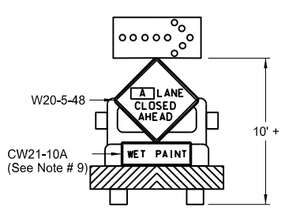
Sign Details



CW21-10

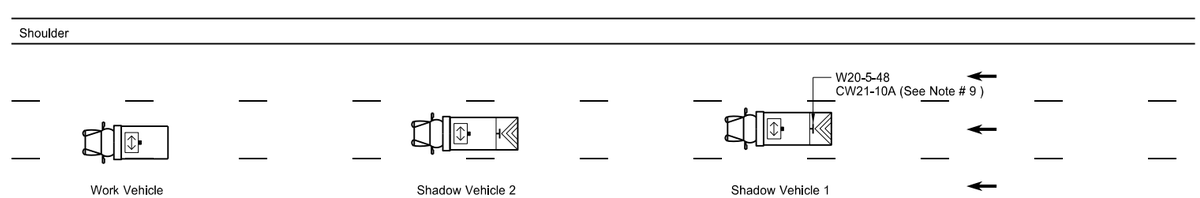


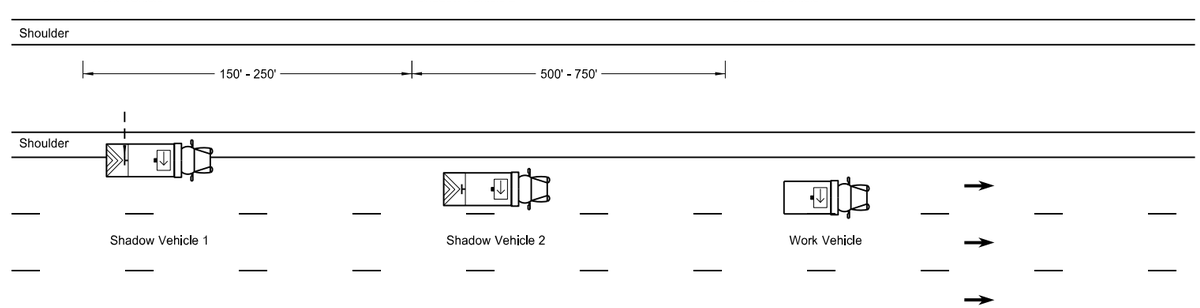
CW21-10A



Typical Shadow Vehicle 1 & 2
Multi-Lane Highways

A = Left Right Center





Divided Multi-Lane Highway

KEY

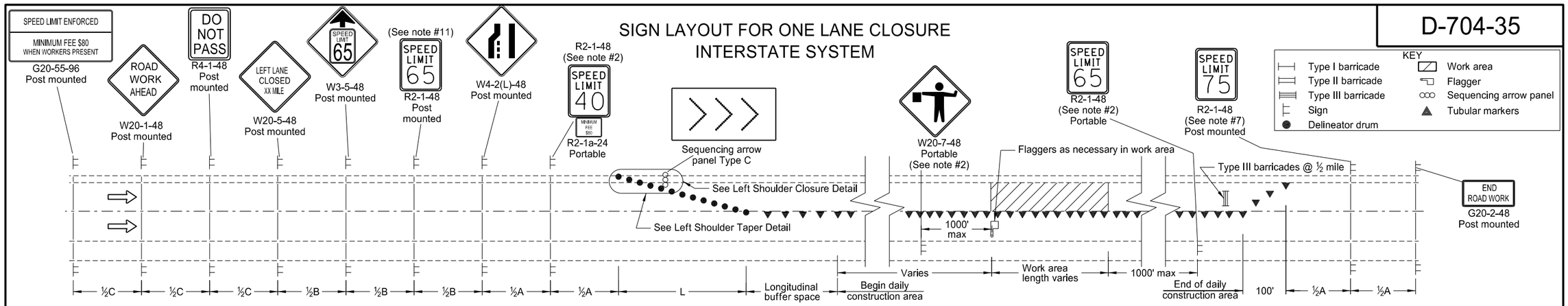
- Sign
- Truck mounted attenuator
- Flashing arrow panels:
  - Right directional
  - Left directional
  - Double arrow directional
  - Caution Mode

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
6-18-14	Removed shadow vehicle 2 on two lane roadways

This document was originally issued and sealed by Roger Weigel Registration Number PE- 2930, on 06/18/14 and the original document is stored at the North Dakota Department of Transportation

SIGN LAYOUT FOR ONE LANE CLOSURE
INTERSTATE SYSTEM

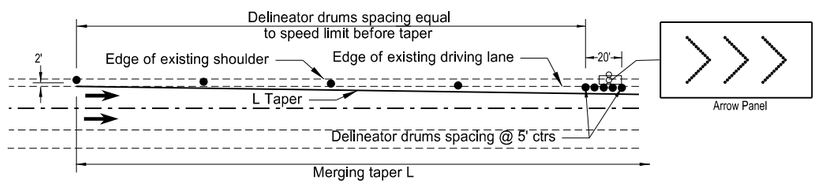
D-704-35



KEY

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

LEFT LANE CLOSED
WORKERS IN WORK AREA



LEFT SHOULDER TAPER DETAIL

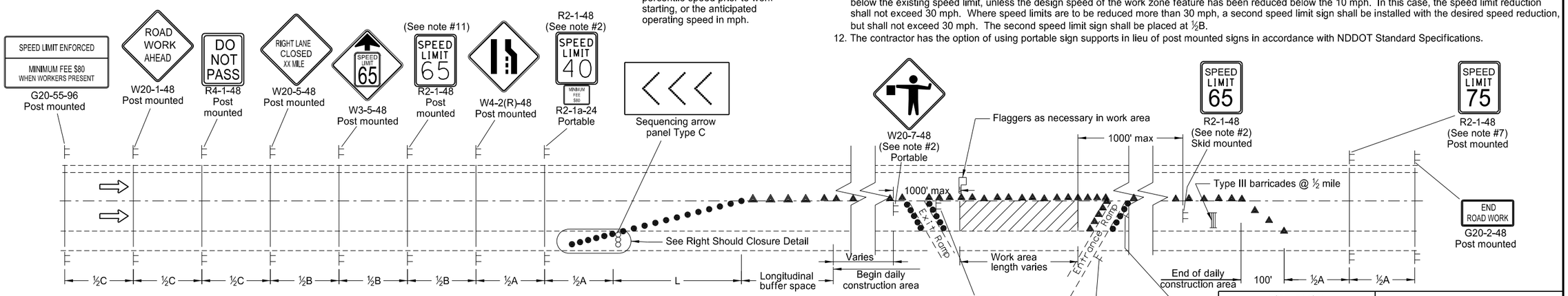
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min (ft)		
	A	B	C
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance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

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

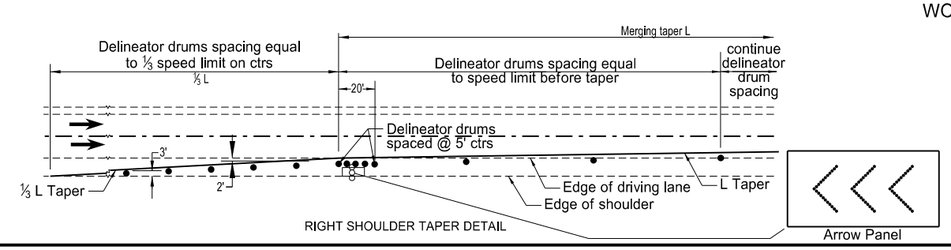
*Posted speed, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.

Notes:

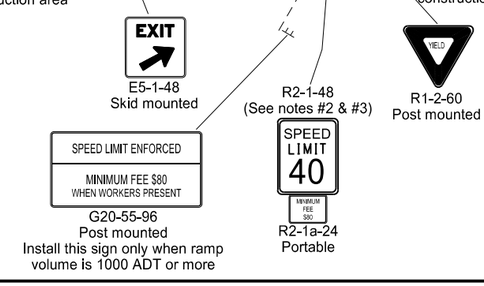
1. Advance signs for flagging shall be installed when flaggers are flagging.
2. The advanced flagger sign and the speed limit signs shall be moved as the work area moves through the construction zone. When the work area is not visible from the flagger, the flagger station shall be placed so the work area is visible. The 65 mph speed limit and the 40 mph speed limit sign shall be spaced at ½A in advance of the flagger sign. The 65 mph speed limit sign shall also be moved. Upon completion of the work day or when workers are not present, the 65 mph speed limit, 40 mph speed limit, and the Minimum Fee $80 signs shall be covered or removed.
3. RAMPS: When the work area encompasses an entrance ramp, the ramp shall be controlled by installing a 40 mph speed limit sign and covering any existing yield sign. Install new yield sign as necessary. When the main line 40 mph speed zone is moved past the ramp, the ramp speed limit sign shall be removed.
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. Delineator drums, used for tapering traffic shall be spaced at the dimension "S". Tubular markers used for tangents shall be spaced at 2 times dimension "S".
6. Sequencing arrow panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface.
   Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater).
7. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
8. Existing speed limit signs within a reduced speed zone shall be covered.
9. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
10. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
11. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 mph. Where speed limits are to be reduced more than 30 mph, a second speed limit sign shall be installed with the desired speed reduction, but shall not exceed 30 mph. The second speed limit sign shall be placed at ½B.
12. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Specifications.



RIGHT LANE CLOSED
WORKERS IN WORK AREA



RIGHT SHOULDER TAPER DETAIL

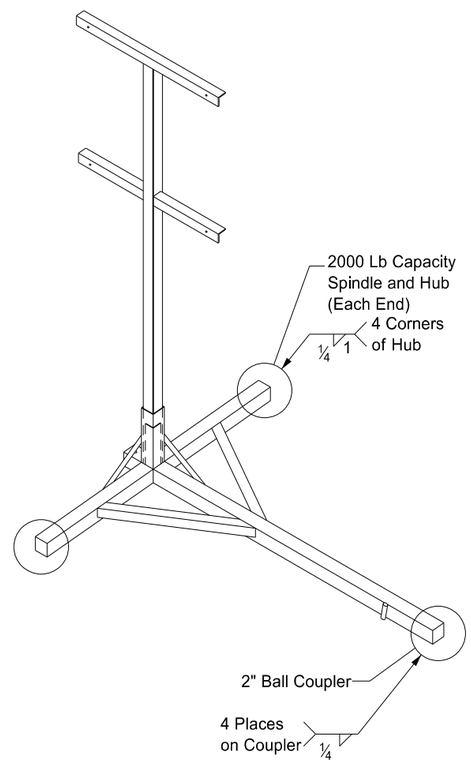


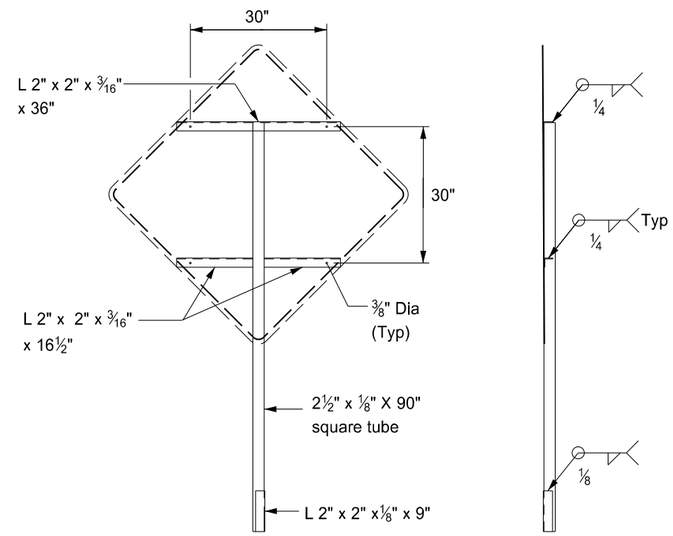
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-7-2012	
REVISIONS	
DATE	CHANGE
6/23/2014	Revised Note 12

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 6/23/14 and the original document is stored at the North Dakota Department of Transportation

PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50

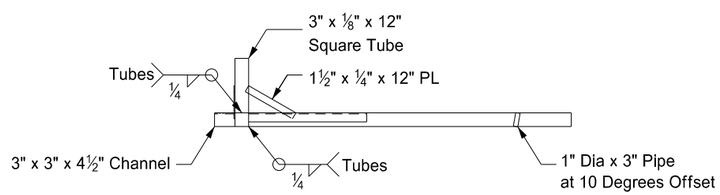




FRONT

RIGHT

SIGN SUPPORT



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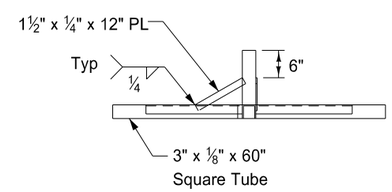

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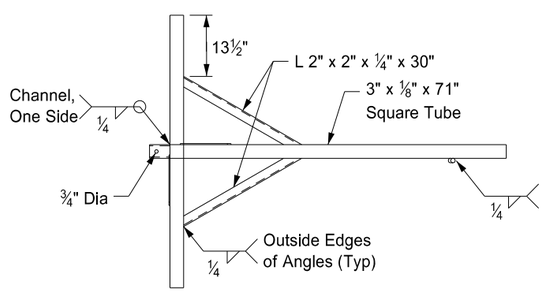

TOP

TRAILER

Notes:

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

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

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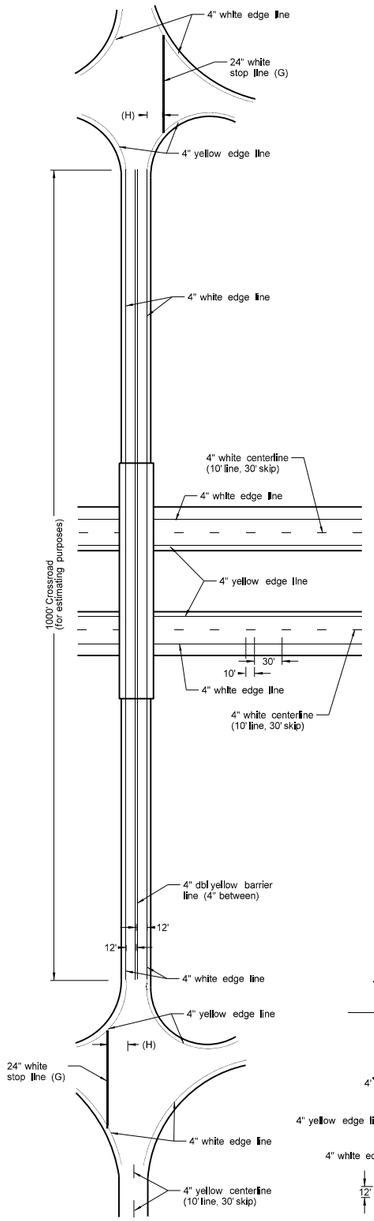
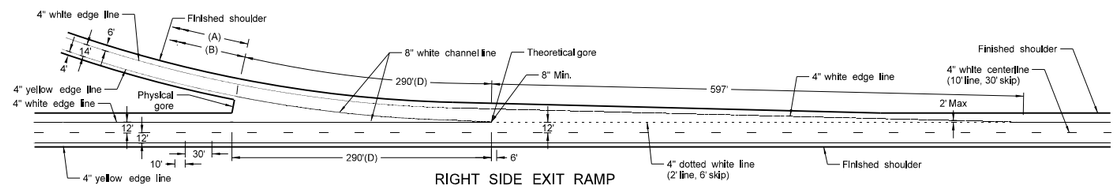
INTERSTATE PAVEMENT MARKING
4 LANE DIVIDED HIGHWAY

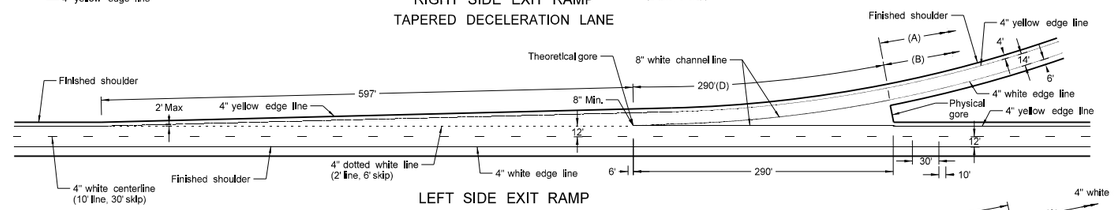
D-762-2



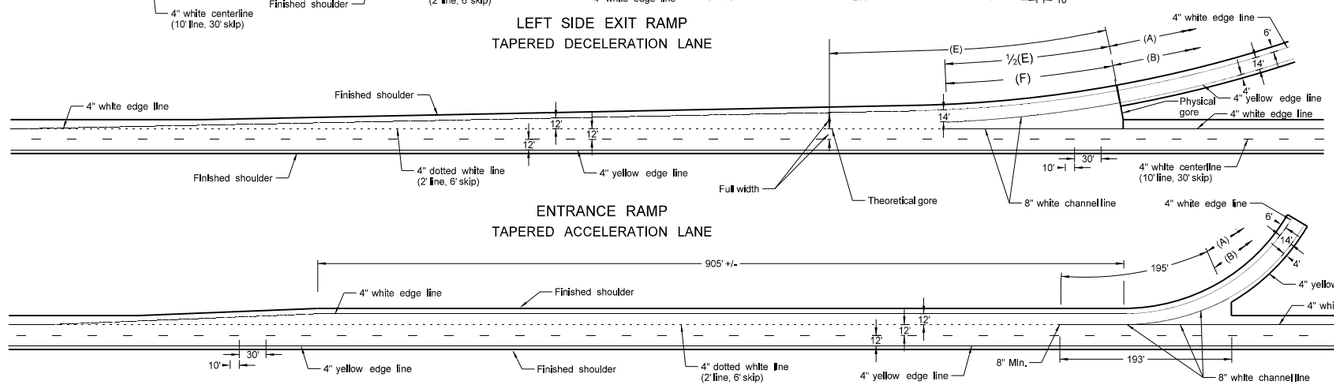
CROSS-ROAD & STRUCTURE
The engineer in the field shall determine the length to be striped.



RIGHT SIDE EXIT RAMP
TAPERED DECELERATION LANE

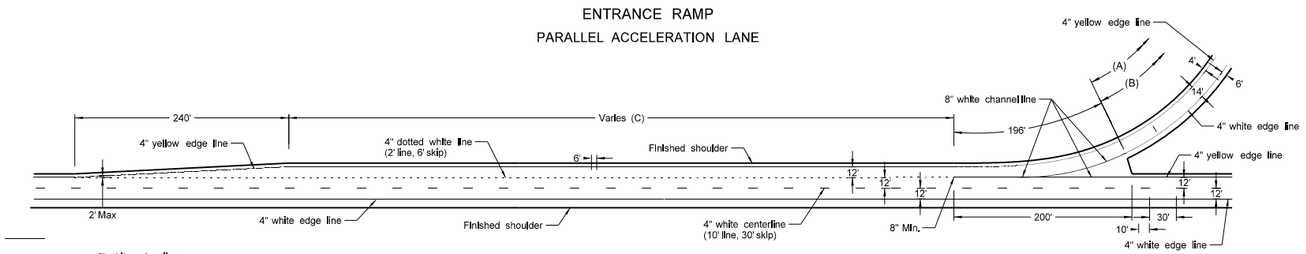


LEFT SIDE EXIT RAMP
TAPERED DECELERATION LANE

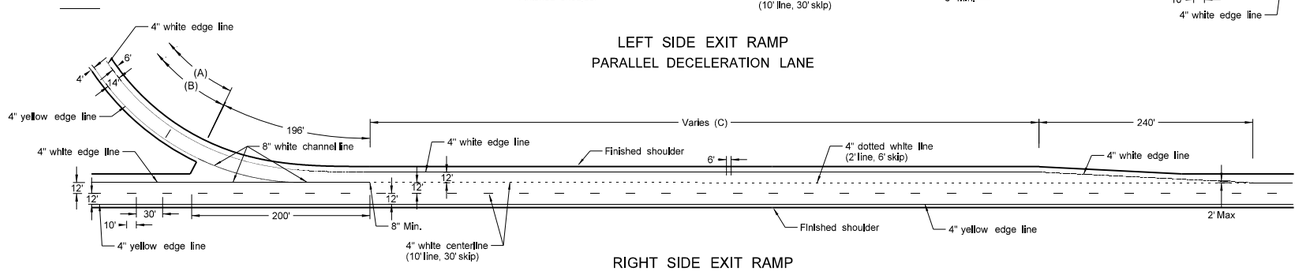


ENTRANCE RAMP
TAPERED ACCELERATION LANE

ENTRANCE RAMP
PARALLEL ACCELERATION LANE



LEFT SIDE EXIT RAMP
PARALLEL DECELERATION LANE



RIGHT SIDE EXIT RAMP
PARALLEL DECELERATION LANE

NOTE:

(A) 4" White edge line
(B) 4" Yellow edge line
(C) Assume "varies" to equal 790' for purpose of estimate. The pavement marking shall begin at the beginning of the taper and end at the 8" line.
(D) Beginning of physical gore to theoretical gore.
(E) If the distace is less than 350' then extend the 8" channel line to the theoretical gore, otherwise use 195'.
(F) 195' was used for estimating purposes.
(G) Not required when crossroad approaches have gravel surface.
(H) 4' minimum, 15' maximum from the nearest edge of the Intersection traveled way.

BASIS OF ESTIMATE

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

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

8-3-11

REVISIONS

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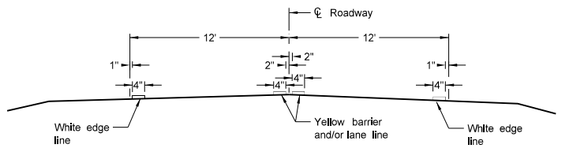
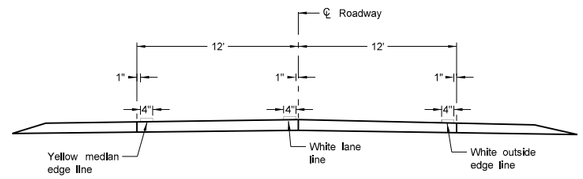
PAVEMENT MARKING

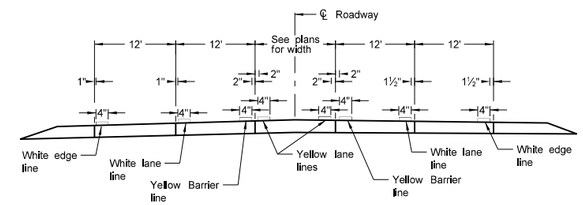
D-762-4



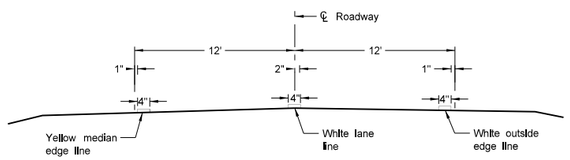
Two Lane Two Way
RURAL ROADWAY



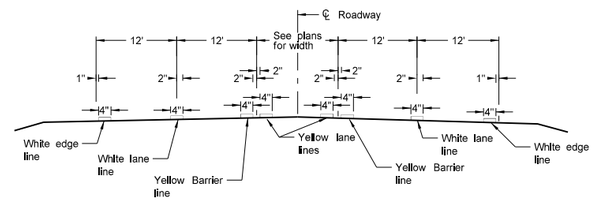
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



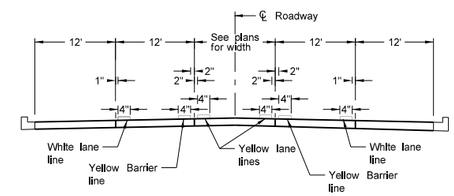
RURAL FIVE LANE ROADWAY
Concrete Section



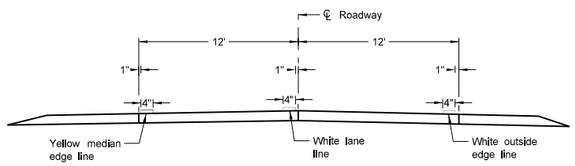
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



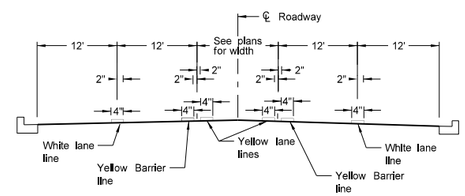
RURAL FIVE LANE ROADWAY
Asphalt Section



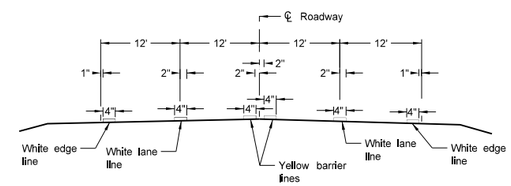
URBAN FIVE LANE SECTION
Concrete Section



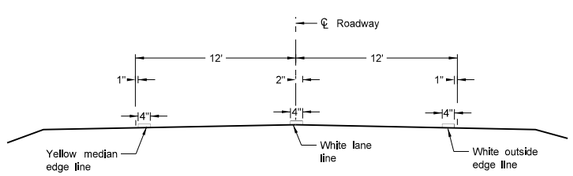
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



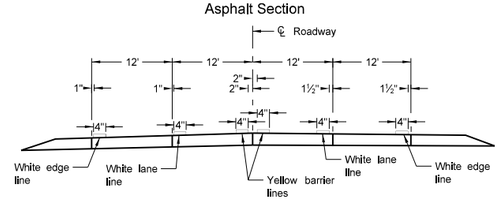
URBAN FIVE LANE SECTION
Asphalt Section



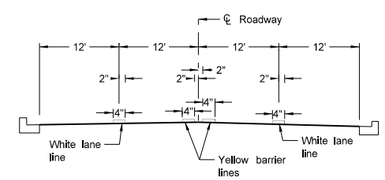
RURAL FOUR LANE ROADWAY
Asphalt Section



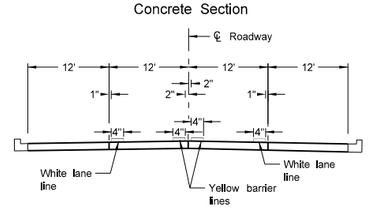
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



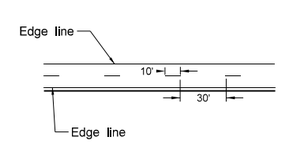
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

NOTES:

1. Edge lines shall be continued through private drives and field drives and broken for intersections.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
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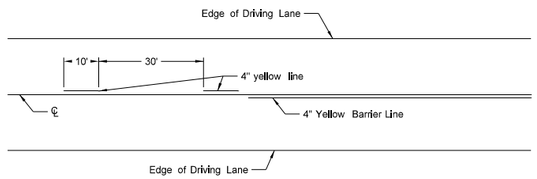
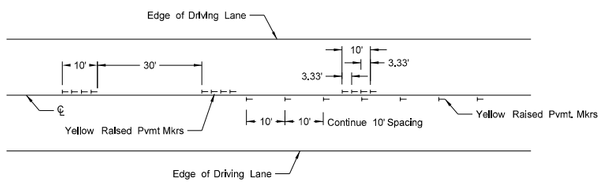
SHORT-TERM PAVEMENT MARKING

D-762-6

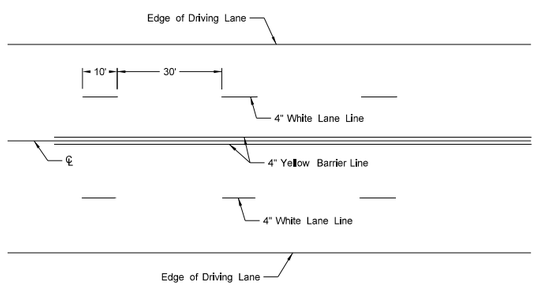


Painted or Tape Lines

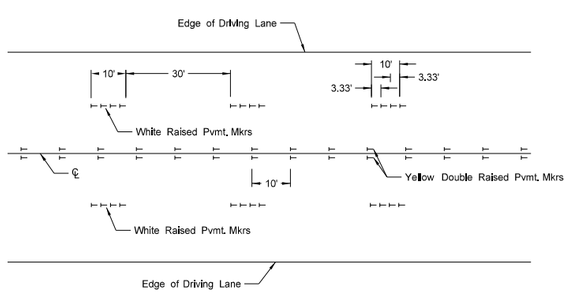


Raised Pavement Markers

TWO-LANE TWO-WAY ROADWAY

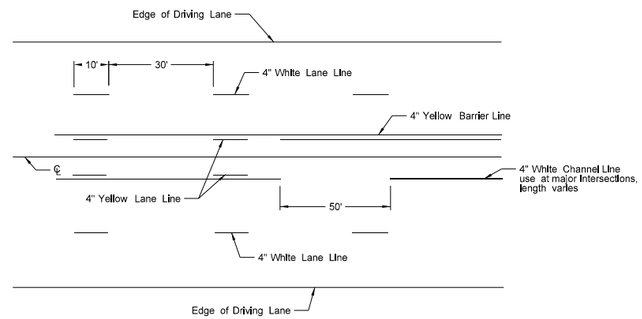


Painted or Tape Lines



Raised Pavement Markers

FOUR LANE ROADWAY



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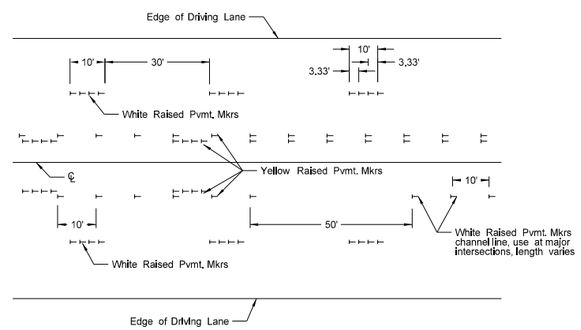
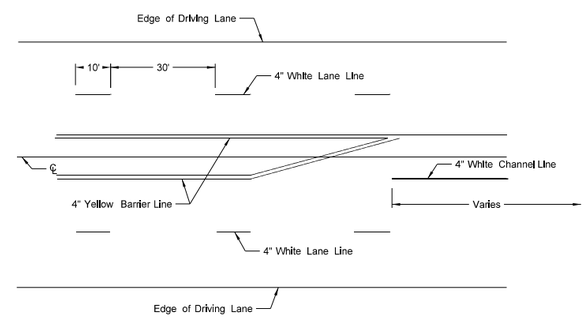
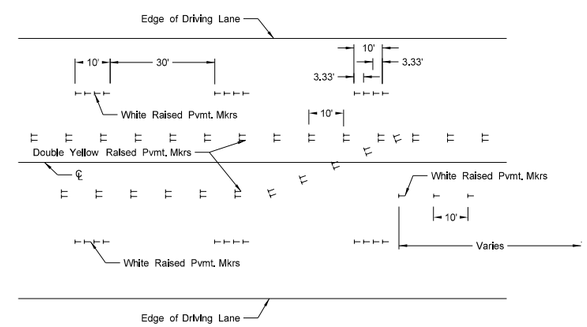


Raised Pavement Markers

FIVE LANE ROADWAY TWO WAY LEFT TURN



Painted or Tape Lines



Raised Pavement Markers

FIVE LANE ROADWAY WITH MARKED ISLANDS

NOTES:

1. Two-lane two-way roadways shall have no passing zones placed as shown. No passing zone signs may be placed in lieu of short term no passing zone pavement markings. These signs will be allowed to remain in place for three days, at which time the short term no passing zone pavement marking shall be placed.

2. Short term center line stripe (paint) on top lift shall be carefully placed with exact spacing so that the permanent stripe will match when applied.

3. Raised markers and tape markings shall be removed after permanent pavement marking has been installed. Removed markings shall become the property of the contractor.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
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