

STATE COUNTY MAP

JOB# 1 BILLINGS COUNTY NORTH DAKOTA

FEDERAL AID PROJECT
SC-0400(002)
CMC 0427 & CMC 0408
CHIP SEAL COAT AND INCIDENTALS
2 miles north and 3 miles east of South Fairfield

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	SC-0400(002)	20777	1	1

GOVERNING SPECIFICATIONS

Standard Specifications for Road and Bridge Construction adopted by the North Dakota Department of Transportation October 2014; Standard Drawings currently in effect; and other Contract Provisions submitted herein.

PROJECT LENGTH

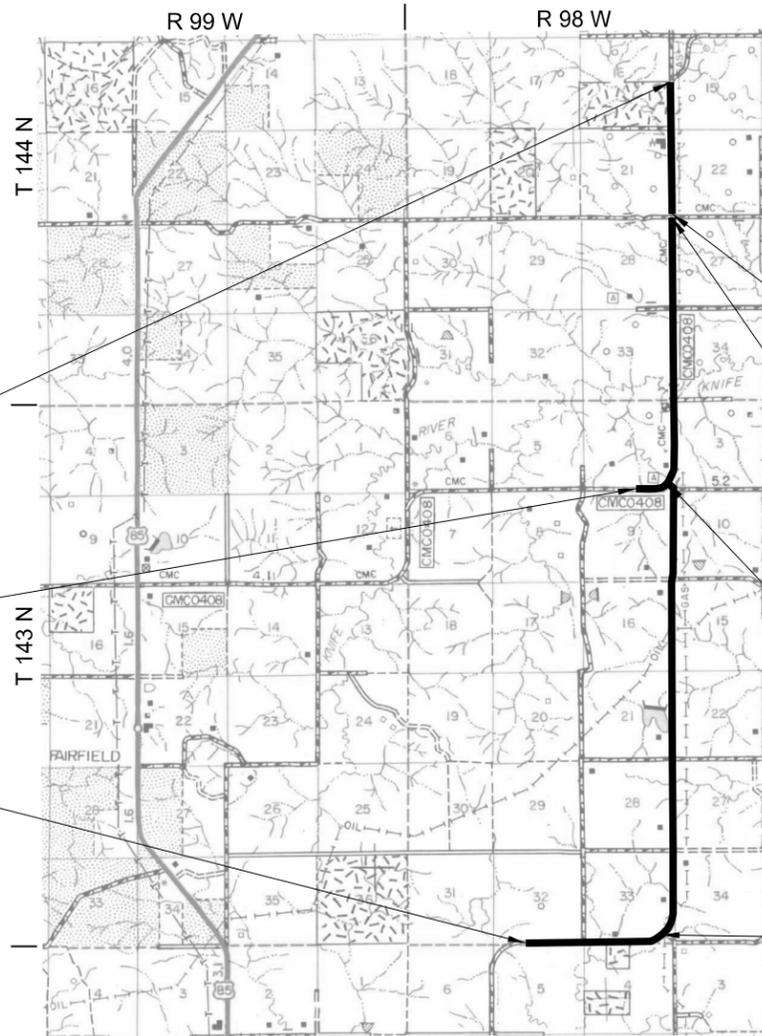
Project	Gross Miles	Net Miles
CMC 0427	4.998	4.998
CMC 0408	3.139	3.139
NON PARTICIPATING SITE 1	1.816	1.816
NON PARTICIPATING SITE 2	1.483	1.483
TOTAL	11.436	11.436

This project consists of approximately 11.436 miles of chip seal located in Billings County, North Dakota.

DESIGN DATA

Traffic ~ SC-0400(002)		Average Daily			Est. 30th Max. Hr.
		Passenger	Trucks	Total	
Current Traffic	2014	45	110	155	-
Forecast Traffic	2034	60	145	205	-

Clear Zone Distance: 14 Feet
 Design Speed: 45 MPH
 Minimum Sight Dist. for Stopping: 360 Feet



END NON PARTICIPATING SITE 2:
 Sta 78+50. A point 7850 feet north of the Southeast Corner of Section 21, Township 144 N, Range 98 W of the 5th P.M., Billings County, North Dakota

BEGIN CMC 0408:
 Sta 350+50. A point 1097 feet west of the Northwest Corner of Section 10, Township 143 N, Range 98 W of the 5th P.M., Billings County, North Dakota

BEGIN NON PARTICIPATING SITE 1:
 Sta 263+15. A point 4418 feet west of the Southeast Corner of Section 32, Township 143 N, Range 98 W of the 5th P.M., Billings County, North Dakota

BEGIN NON PARTICIPATING SITE 2:
 Sta 0+20. A point 20 feet north of the Southeast Corner of Section 21, Township 144 N, Range 98 W of the 5th P.M., Billings County, North Dakota

END CMC 0408:
 Sta 516+25. A point 25 feet south of the Southeast Corner of Section 21, Township 144 N, Range 98 W of the 5th P.M., Billings County, North Dakota

END CMC 0427:
 Sta 622+94. A point 230 feet west and 195 feet north of the Northwest Corner of Section 10, Township 143 N, Range 98 W of the 5th P.M., Billings County, North Dakota

**END NON PARTICIPATING SITE 1
 BEGIN CMC 0427:**
 Sta 359+03. A point 180 feet west and 304 feet north of the Southeast Corner of Section 33, Township 143 N, Range 98 W of the 5th P.M., Billings County, North Dakota

SURVEY FIELD BOOK:	
DESIGNERS	
	Andrew Krebs, PE
	Jordan Woroniecki, EI

Any questions regarding these plans can be directed to:
 Andrew Krebs, P.E.
 Kadmas, Lee & Jackson
 P.O. Box 290
 Dickinson, ND 58602-0290
 (701) 483-1284 Phone

This document was originally issued and sealed by Andrew J. Krebs Registration Number PE-7876, on January 15, 2015, and the original document is stored at K LJ, Dickinson, ND 58601

CERTIFICATION
 I HEREBY CERTIFY THAT THESE 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 NORTH DAKOTA.
 Andrew J. Krebs /s/
 ANDREW J. KREBS, P.E.
 KADRMAS, LEE & JACKSON, INC.
 DATE 1/15/2015 REGISTRATION NUMBER PE-7876



P.O. BOX 290
 DICKINSON, ND 58602-0290
 (701) 483-1284, FAX (701) 483-2795
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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SC-0400(002)	2	1

TABLE OF CONTENTS

<u>SECTION NO.</u>	<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	1	Title Sheet
2	1	Table of Contents & List of Standard Drawings
6	1	Plan Notes
8	1	Summary of Quantities
10	1	Basis of Estimate
30	1	Typical Sections
100	1-5	Work Zone Traffic Control

LIST OF STANDARD DRAWINGS

<u>STANDARD NO.</u>	<u>DESCRIPTION</u>
D-704-7	Breakaway Systems for Construction Zone Signs – Perforated Tube
D-704-8	Breakaway Systems for Construction Zone Signs – U-Channel Post
D-704-9	Construction Sign Details – Terminal and Guide Signs
D-704-10	Construction Sign Details – Regulatory Signs
D-704-11	Construction Sign Details – Warning Signs
D-704-14	Construction Sign Punching and Mounting Details
D-704-15	Road Closure Layouts
D-704-20	Terminal and Seal Coat Sign Layouts
D-704-22	Construction Truck and Temporary Detour Layouts
D-704-27	Traffic Control Plan for Moving Operations
D-704-50	Portable Sign Support Assembly
D-762-4	Pavement Marking



PLAN NOTES

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SC-0400(002)	6	1

GENERAL NOTES

100-P01 COORDINATION OF PROJECTS: Billings County will be completing any necessary patching on the existing armor coat prior to the chip seal. The project will be ready for chip sealing by July 20th, 2015. Billings County will also be adding additional gravel prior to the application of PASS-CR on Non Participating Site 2. Notify Billings County a minimum of three weeks prior to chip sealing. The contact is Jeff Iverson at (701) 290-9581.

401-P01 FOG SEAL COAT: Apply Fog oil within 3 calendar days after final sweeping. Complete the final sweeping within 1-5 calendar days after completion of the seal coat operation. The maintenance period will end 5 days after the application of the fog coat.

420-P01 PASS-CR: Following initial sweeping of the existing aggregate surfacing, apply water to pre wet the surface the afternoon before applying PASS-CR. Keep the surface damp just ahead of the distributor as PASS-CR is applied. Apply water as needed per PASS-CR manufacturer's recommendation.

420-P02 APPROACHES: Seal approaches as shown on the proposed typical sections. Approximately 8 major and 9 minor approaches are on this project. Quantities for 210 SY on each major approach and 64 SY on each minor approach for the chip and fog seals have been provided for this item. Include all costs in the unit price bid for the corresponding items.

420-P03 COVER COAT MATERIAL CL 41-M: Replace the gradation for CL 41-M as specified in Section 816.03 of the Standard Specifications with the following gradation:

Sieve Size	Percent Passing
3/4"	100
1/2"	50-80
3/8"	20-55
No. 4	0-12
No. 10	0-2

420-P04 ARMOR COAT PATCHING: Billings County will be digging up areas of the existing armor coat for repairs and leveling them out with gravel. Prior to chip sealing apply PASS-CR and COVER COAT MATERIAL CL 41-M over these areas as directed by the Engineer. Allow PASS-CR to cure for a minimum of 12 hours prior to placing the seal coat. 3,500 Gal of PASS-CR and 100 Ton of COVER COAT MATERIAL CL 41-M have been included in the Summary of Quantities. Include all associated costs for applying patch seals in the unit price bid for "PASS-CR" and "COVER COAT MATERIAL CL 41-M".

704-P01 TRAFFIC CONTROL: Traffic Control for seal coat operations consists of flagging and a pilot car. Traffic Control Devices shall comply with the following Standard Drawings:

- D-704-15, Type A: For Flagging with Pilot Car.
- D-704-20, Type G and H: For Chip Seal Coat Operations.
- D-704-22, Type K: For Chip Stockpile Locations.
- D-704-27: For striping operations.
- D-704-7, 8, 9, 10, 11, 14, and 50 are applicable.
- Traffic Control Layouts are in Section 100 of the plans.

Traffic control devices will be paid for the maximum required number of each type of device at one time between all the different jobs on the project.

704-P02 FLAGGERS: Equip flaggers with radio communications when visible contact is not possible for directing the safety of the traveling motorists. This is not needed if a pilot car is being used.

762-P01 PVMT MK PAINTED 4IN LINE: Continue painted edge lines through private drives and break for the 8 major approaches. Only white edge line pavement marking will be applied.

Pavement markings will not be measured for payment unless changes are made in the field. Payment for PVMT MK PAINTED 4IN LINE will be at plan quantity.

818-P01 PASS-CR SPECIFICATIONS: Supply PASS-CR (Polymer Asphalt Surface Sealer) that meets the following specifications:

Test on Emulsion	Method	Specification
Viscosity @122° F (SFS)	ASTM D244	50 - 400
Residue, w%, minimum.	ASTM D244	65
pH	ASTM E70	2.0-5.0
Sieve, w%, max.	ASTM D244	0.1
Oil distillate, w%, max.	ASTM D244	0.5
Test on Residue		
Viscosity @ 140°F, (P), maximum.	ASTM D2171	5000
Penetration @ 39.2°F, minimum.	ASTM D5	40
Elastic Recovery on residue by distillation, %, minimum.	AASHTO T59	45
Test on Latex:		
Specific Gravity (minimum)	ASTM 1475	1.08
Tensile strength, die C dumbbell, psi, minimum	ASTM D412	500
Swelling in rejuvenating agent, % maximum; 48 hours exposure @ 104 °F	ASTM D471 Modified	40% intact film
Test on rejuvenating agent:		
Flash point, COC, °F	ASTM D92	380 Min
Hot Mix Recycling Agent Classification	ASTM D4552	
Viscosity, 140F cst		50-175
Asphaltenes		1.0 Max

PASS-CR will be accepted on certifications.

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SC-0400(002)
CMC 0427 & CMC 0408

Plan Notes

Billings County, ND

DRWN. BY JMW	CHKD. BY AK	PROJECT NO. 3314107
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SUMMARY OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SC-0400(002)	8	1

Spec	Code	Description	Unit	CMC 0427	CMC 0408	Non-Participating Site 1	Non-Participating Site 2	Total Quantities
103	0100	CONTRACT BOND	LSUM	0.36	0.25	0.13	0.26	1
216	0100	WATER	MGAL	25	16	9	61	111
401	0070	FOG SEAL	GAL	5,038	3,152	1,822	1,505	11,517
420	0108	PASS-CR	GAL	500	3,000	0	15,078	18,578
420	0111	CRS2P EMULSIFIED ASPHALT	GAL	33,262	20,794	12,017	9,979	76,052
420	0125	COVER COAT MATERIAL CL 41	TON	1,164	728	421	350	2,663
420	0127	COVER COAT MATERIAL CL 41-M	TON	15	85	0	350	450
702	0100	MOBILIZATION	LSUM	0.36	0.25	0.13	0.26	1
704	1000	TRAFFIC CONTROL SIGNS	UNIT	1,731	783	771	424	3,709
762	1104	PVMT MK PAINTED 4IN LINE	LF	52,382	32,990	19,096	15,660	120,128

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SC-0400(002)		
CMC 0427 & CMC 0408		
	Summary of Quantities Billings County, ND	
	<small>DRWN. BY</small> JMW	<small>CHKD. BY</small> AK

BASIS OF ESTIMATE

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SC-0400(002)	10	1

BASIS OF ESTIMATE										
Description	Unit	CMC 0427		CMC 0408		Non-Participating Site 1		Non-Participating Site 2		Totals
		4.998 Miles		3.139 Miles		1.816 Miles		1.483 Miles		
		Quantity Per Mile	Width (FT)	Quantity Per Mile	Width (FT)	Quantity Per Mile	Width (FT)	Quantity Per Mile	Width (FT)	
Water	MGAL	5		5		5		35		102
Fog Seal (0.05 Gal/SY)	Gal	997	34	997	34	997	34	997	34	11,402
PASS-CR (0.50 Gal/SY)	Gal							9,973	34	14,790
CRS2P Emulsified Asphalt (0.40 Gal/SY)	Gal	6,571	28	6,571	28	6,571	28	6,571	28	75,146
Cover Coat Material CI 41 (28 lb/SY)	Ton	230	28	230	28	230	28	230	28	2,630
Cover Coat Material CI 41-M (28 lb/SY)	Ton							230	28	341

APPROACH BASIS OF ESTIMATE						
Description	Unit	CMC 0427	CMC 0408	Non-Participating Site 1	Non-Participating Site 2	Totals
		Major Approach	Major Approach	Major Approach	Minor Approach	
		5	2	1	9	
		Quantity Per Approach	Quantity Per Approach	Quantity Per Approach	Quantity Per Approach	
Water	MGAL				1	9
Fog Seal (0.05 Gal/SY)	Gal	11	11	11	3	115
PASS-CR (0.50 Gal/SY)	Gal				32	288
CRS2P Emulsified Asphalt (0.40 Gal/SY)	Gal	84	84	84	26	906
Cover Coat Material CI 41 (28 lb/SY)	Ton	3	3	3	1	33
Cover Coat Material CI 41-M (28 lb/SY)	Ton				1	9

Water
 5 MGAL/Mile for Dust Control
 30 MGAL/Mile for Pre Wetting existing Aggregate Surfacing

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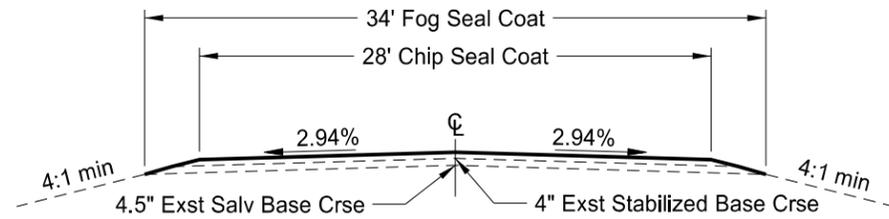
SC-0400(002)
CMC 0427 & CMC 0408

Basis of Estimate

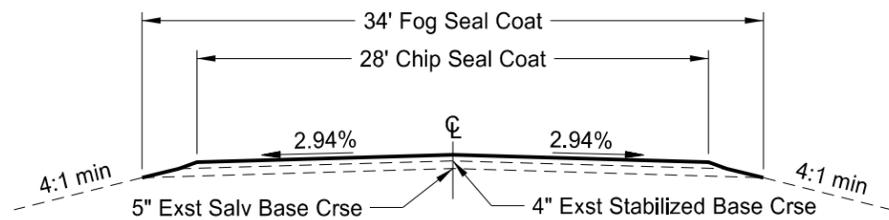
Billings County, ND

DRWN. BY JMW	CHKD. BY AK	PROJECT NO. 3314107
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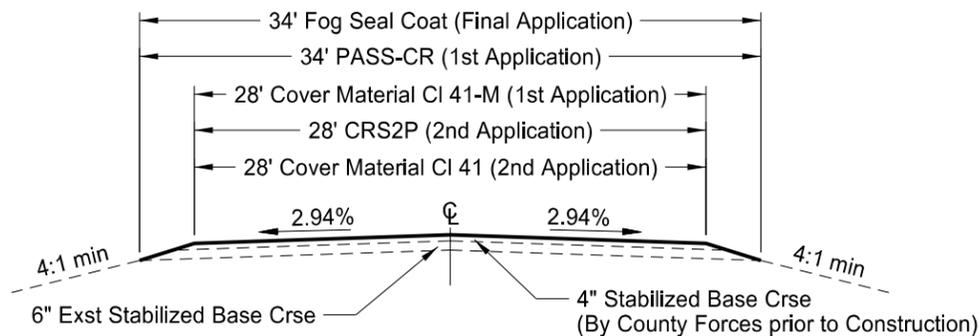
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	ND	SC-0400(002)	30	1



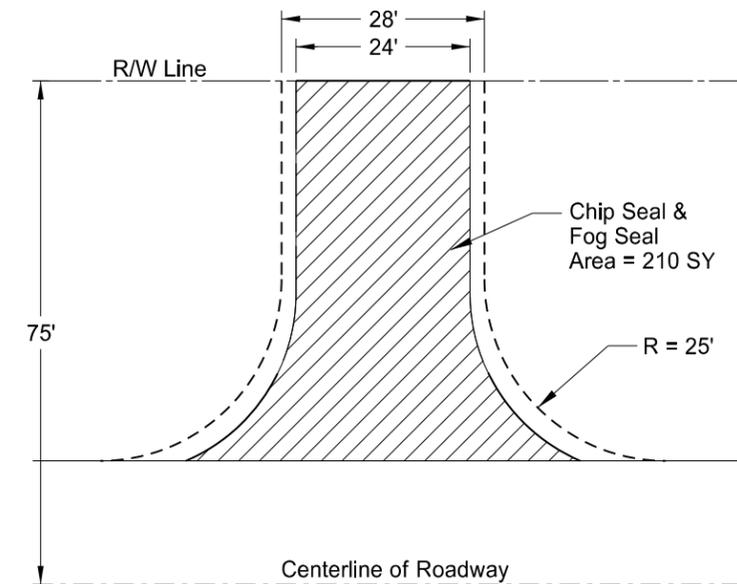
Proposed Typical Section 1
 Non-Participating Site 1
 Sta 263+15 to 359+03
 CMC 0427
 Sta 359+03 to 622+94



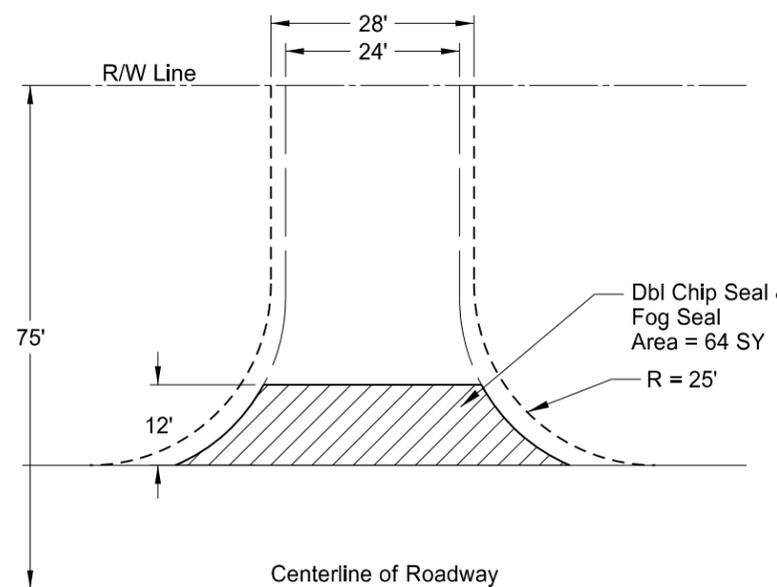
Proposed Typical Section 2
 CMC 0408
 Sta 350+50 to 516+25



Proposed Typical Section 3
 Non Participating Site 2
 Sta 0+20 to 78+50



Proposed Major Approach
 Non Part Site 1- Sta 307+25 Lt
 CMC 0427 - Sta 359+74 Rt
 Sta 462+00 Lt, Sta 567+50 Rt
 Sta 620+00 Rt, Sta 622+94 Cl
 CMC 0408 - Sta 463+75 Rt & Lt



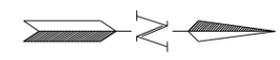
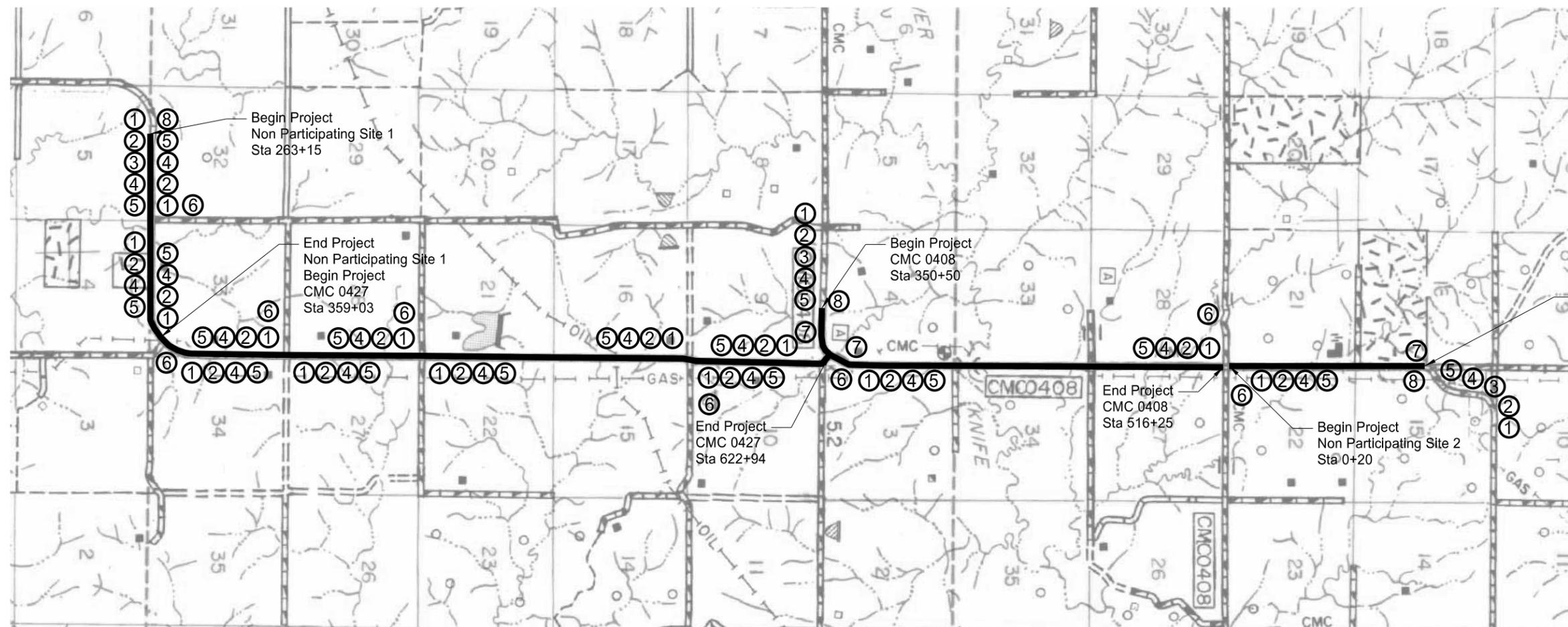
Proposed Minor Approach
 Non Part Site 2 - Sta 17+90 Rt & Lt,
 Sta 26+35 Rt, Sta 28+38 Lt,
 Sta 39+70 Lt, Sta 48+38 Rt,
 Sta 52+70 Rt & Lt, Sta 70+30 Rt

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SC-0400(002)	
CMC 0427 & CMC 0408	
Proposed Typical Sections	
Billings County, ND	
	<small>DRWN. BY</small> JMW <small>CHKD. BY</small> AK <small>PROJECT NO.</small> 3314107

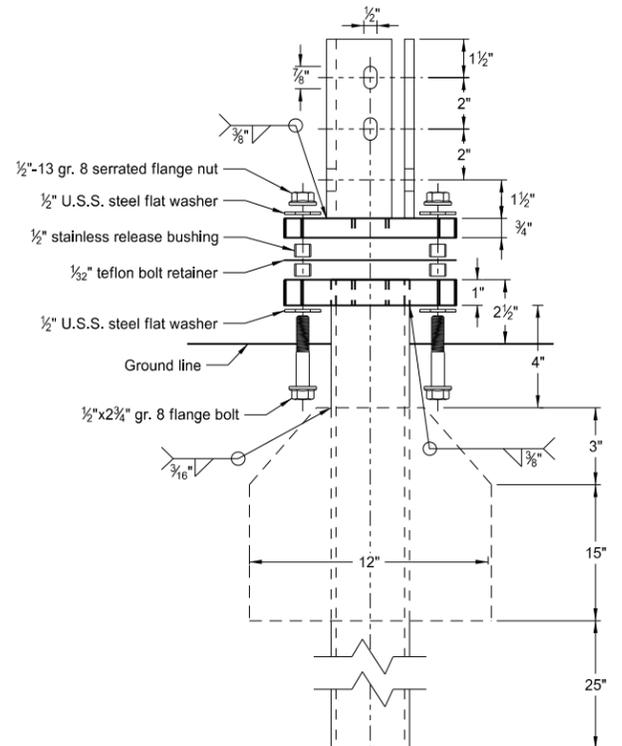
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SC-0400(002)	100	5

- | | | | |
|---|------------|--|---------------|
| ① | W8-12-48 | No Centerline Stripe | Post Mounting |
| ② | R4-1-48 | Do Not Pass | Post Mounting |
| ③ | W3-5-48 | Speed Reduction Ahead | Post Mounting |
| ④ | W22-8-48 | Fresh Oil Loose Rock | Post Mounting |
| | W20-52-54 | Next XX Miles | |
| ⑤ | R2-1-48 | (35 MPH) | Post Mounting |
| | R2-1a-24 | Minimum Fee \$80 | |
| ⑥ | G20-50a-72 | Road Work Next __ Miles Rt & Lt Arrows | Post Mounting |
| ⑦ | G20-52a-72 | Road Work Next __ Miles Rt or Lt Arrow | Post Mounting |
| ⑧ | G20-2-48 | End Road Work | Post Mounting |



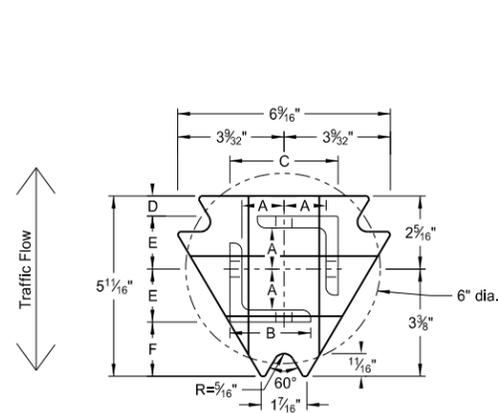
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SC-0400(002)	
CMC 0427 & CMC 0408	
	Work Zone Traffic Control
	Billings County, ND
DRAWN BY JMW	CHECKED BY AK
PROJECT NO. 3314107	

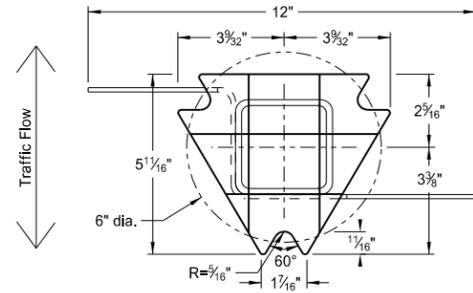


Multi-Directional Slip Base Assembly

Perforated Tube



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

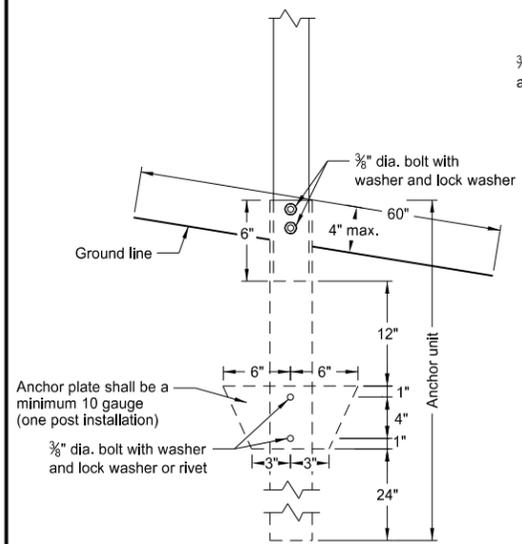
Notes:

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.

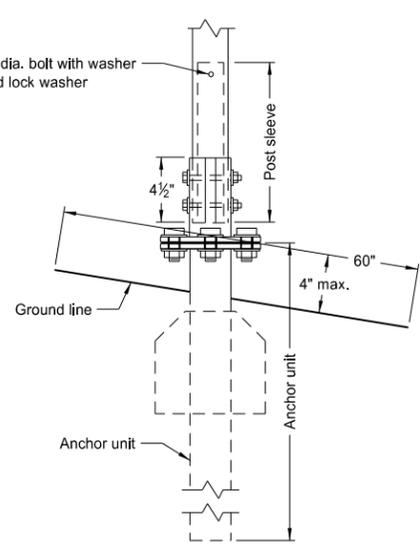
Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thickness Gauge	Sleeve Size in.	Wall Thickness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2 1/4
1	2 1/4	12			No	2 1/2
1	2 1/2	12			(A)	3
1	2 1/2	10			Yes	
1	2 1/4	12	2	12	Yes	
1	2 1/2	12	2 1/4	12	Yes	
2	2	12			No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

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

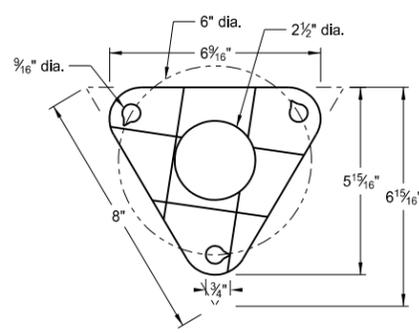
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2 3/16" x 10 ga.	1 9/64"	2 1/2"	3 1/32"	2 5/32"	1 33/64"	1 1/8"
2 1/2" x 10 ga.	1 9/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"



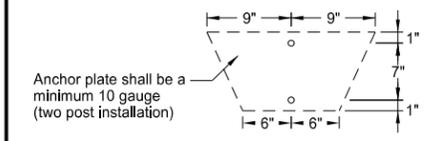
Anchor Unit and Post Assembly



Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly



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

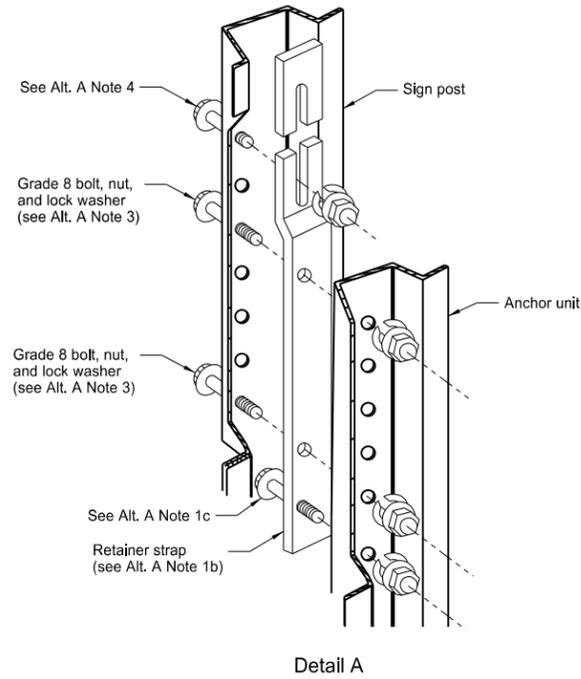


Anchor plate shall be a minimum 10 gauge (two post installation)

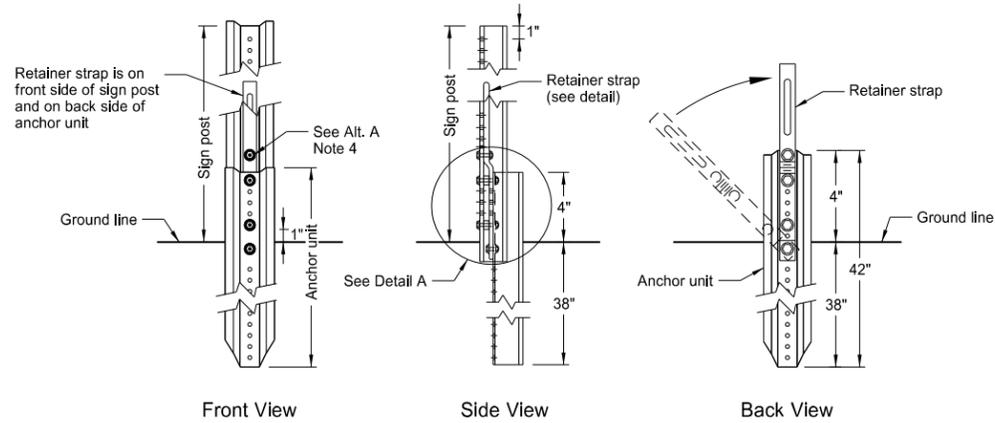
- (A) The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak.
(B) The 2 3/16" x 10 ga. may be inserted into 2 1/2" x 10 ga. for additional wind load.

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2-28-14		
REVISIONS		
DATE	CHANGE	

U-Channel Post



Detail A



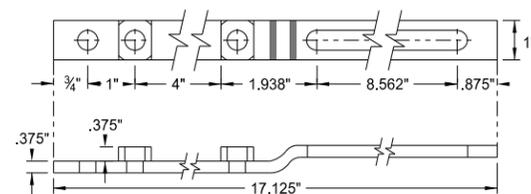
Front View

Side View

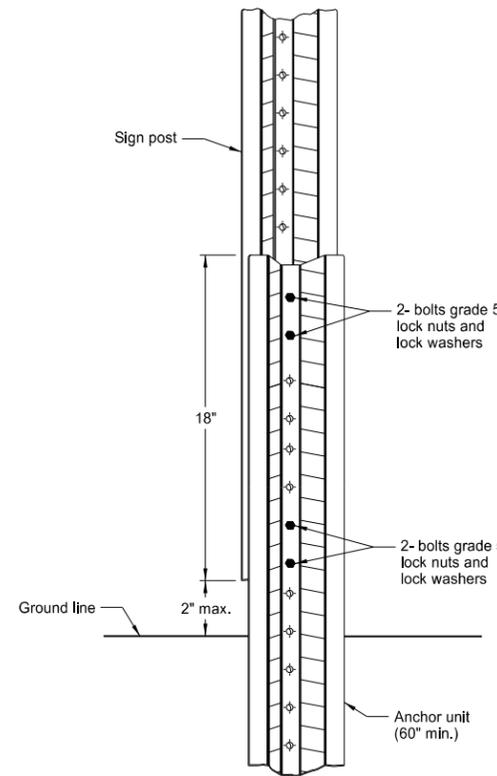
Back View

Breakaway U-Channel Detail Alternate A

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

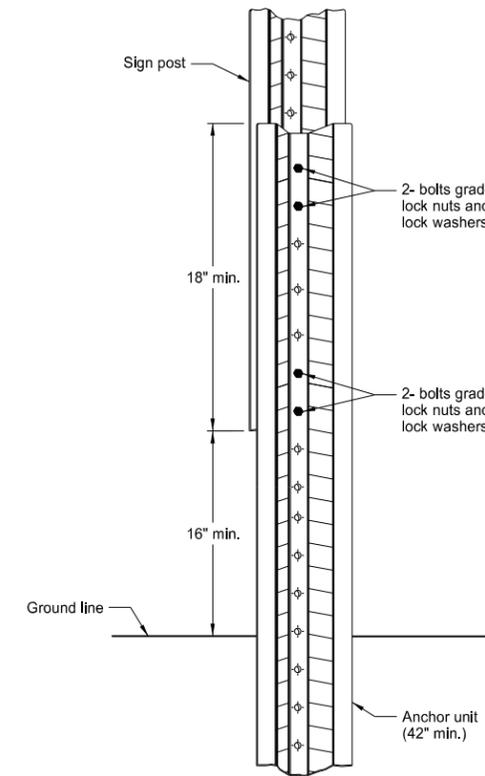


Retainer Strap Detail



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:

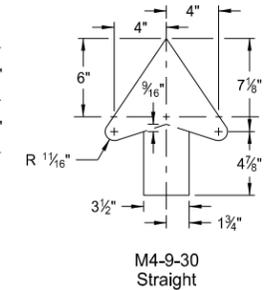
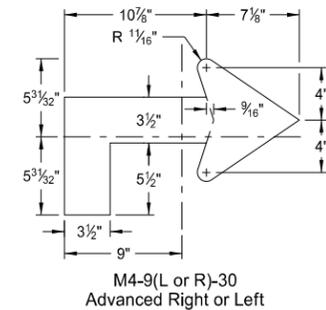
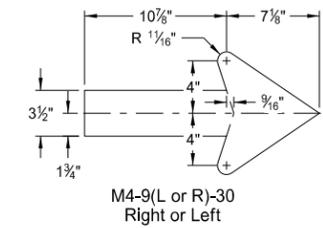
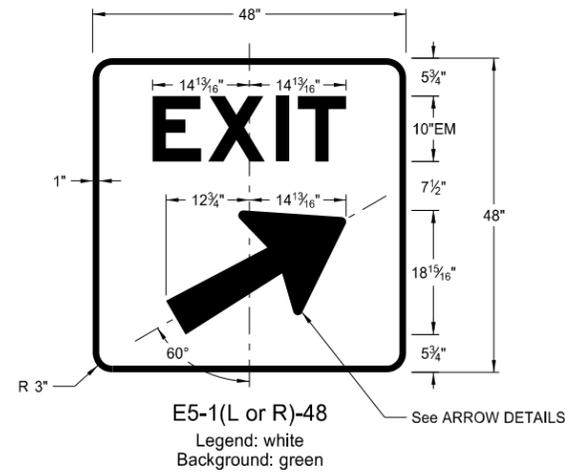
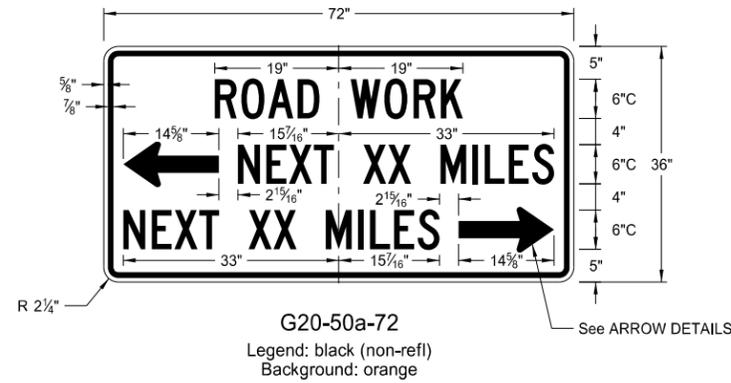
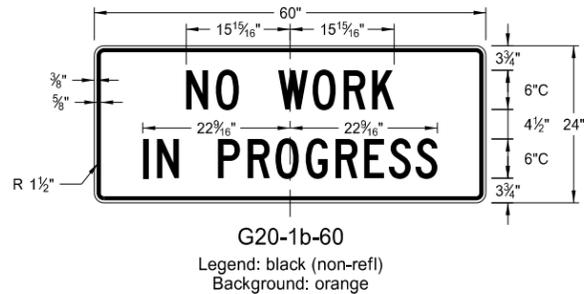
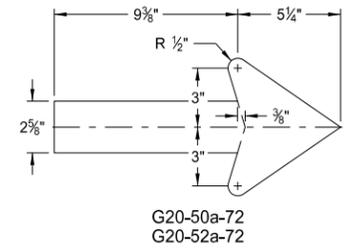
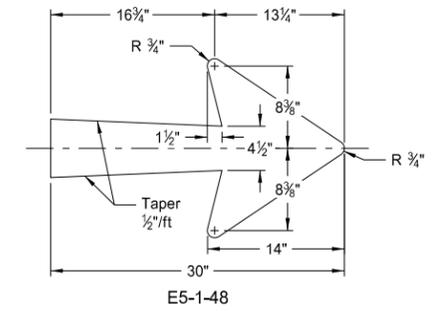
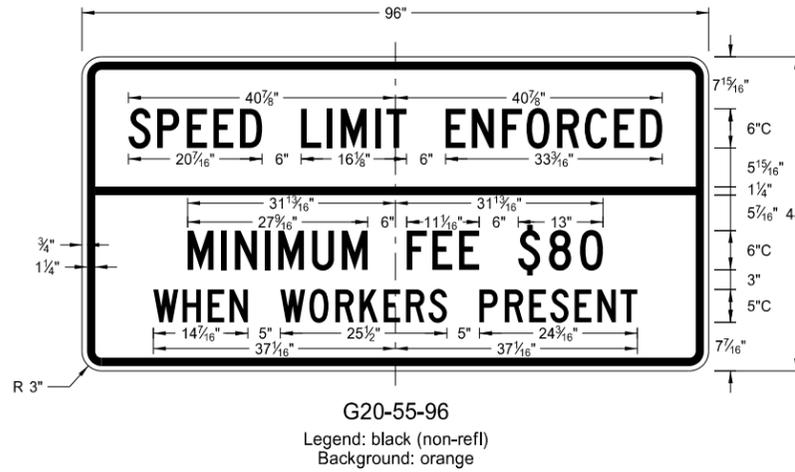
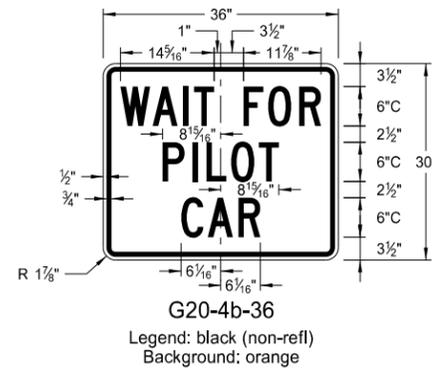
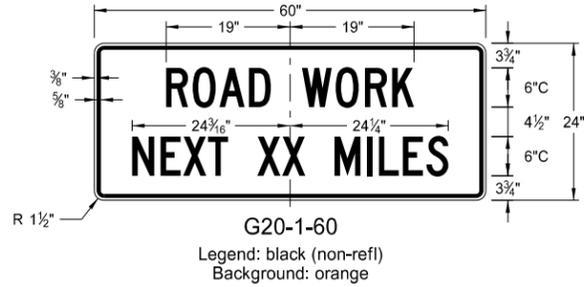
1. a) Drive anchor unit to within 12" of ground level.
b) Proper assembly established by lining up the bottom hole of retainer strap with the 6th hole from the top of the anchor unit.
c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
d) Rotate strap 90° to left.
2. a)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

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

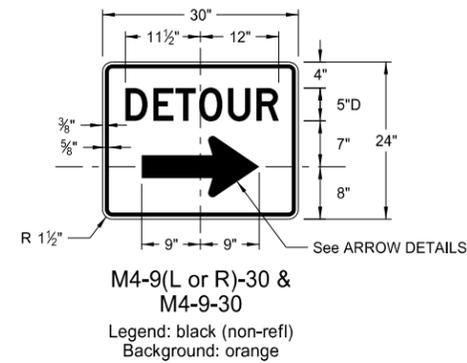
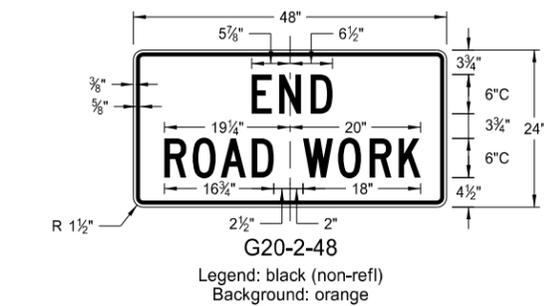
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CONSTRUCTION SIGN DETAILS
 TERMINAL AND GUIDE SIGNS

D-704-9



ARROW DETAILS



NOTES:

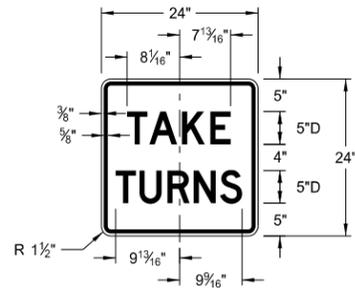
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE

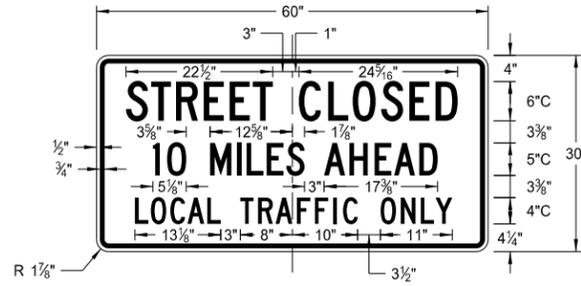
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 of Transportation

CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS

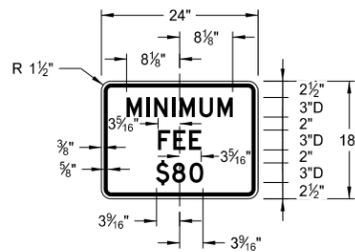
D-704-10



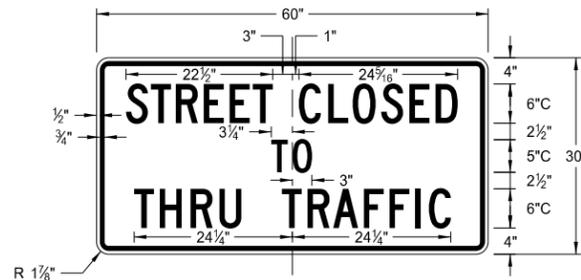
R1-50-24
Legend: black (non-refl)
Background: white



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



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



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



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

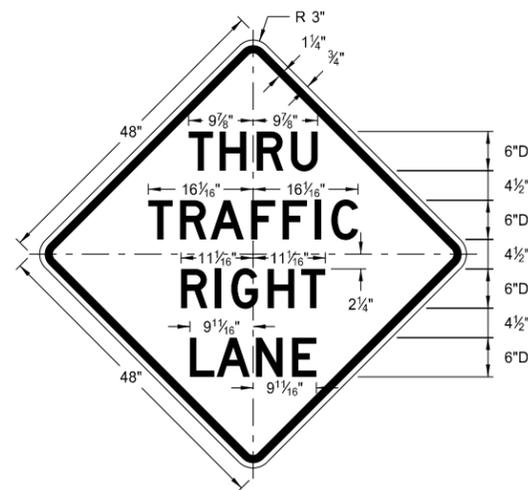
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8-13-13	
REVISIONS	
DATE	CHANGE

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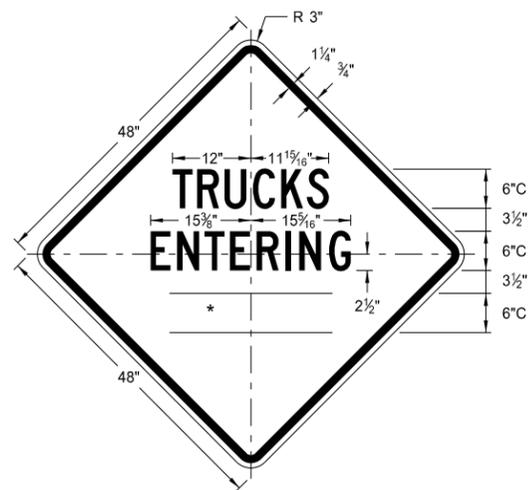
CONSTRUCTION SIGN DETAILS
WARNING SIGNS

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

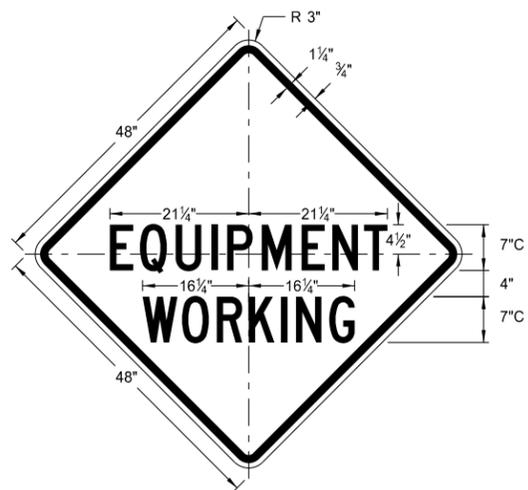
* DISTANCE MESSAGES



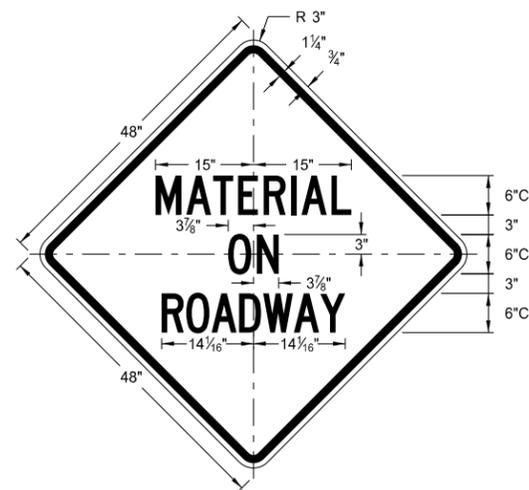
W5-8-48
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Background: orange



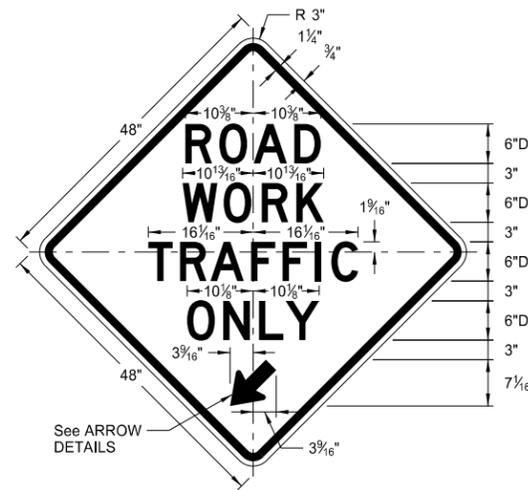
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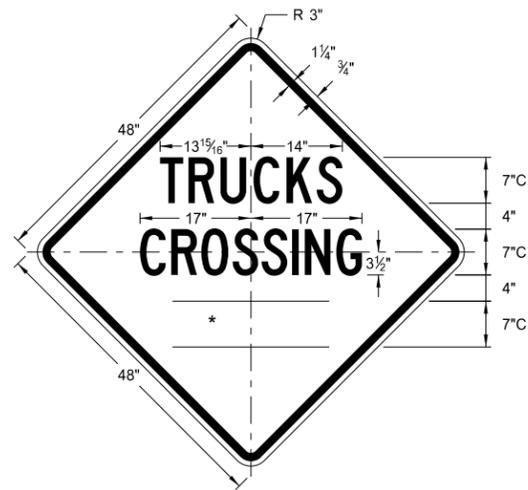
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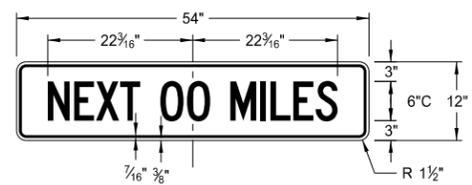
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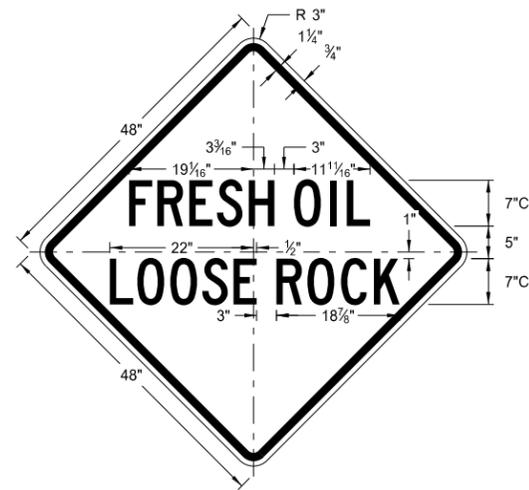
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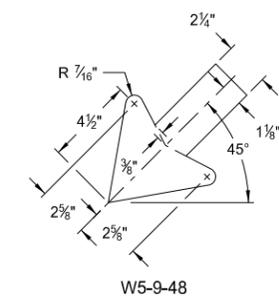
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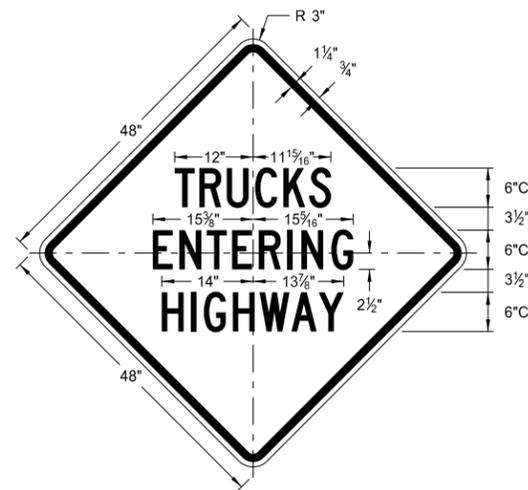
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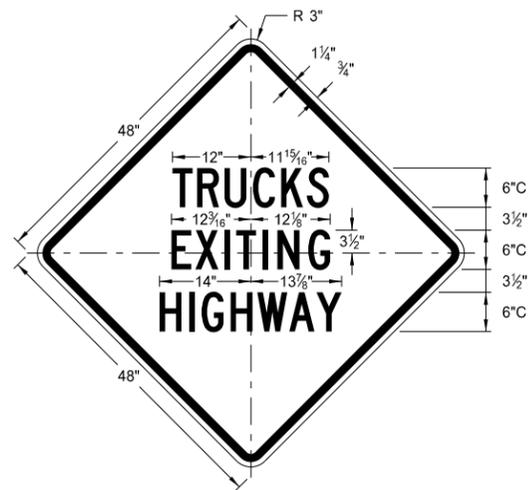
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Background: orange



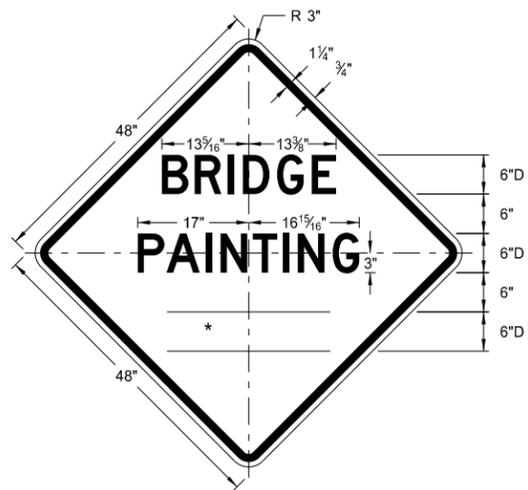
W5-9-48
ARROW DETAILS



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



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



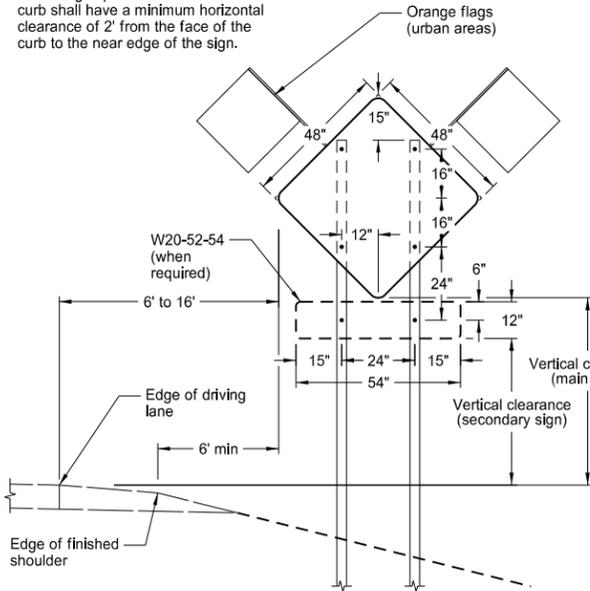
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Background: orange

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
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DATE	CHANGE

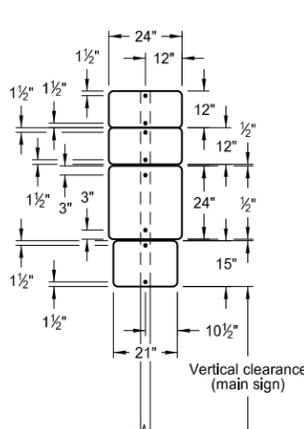
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CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

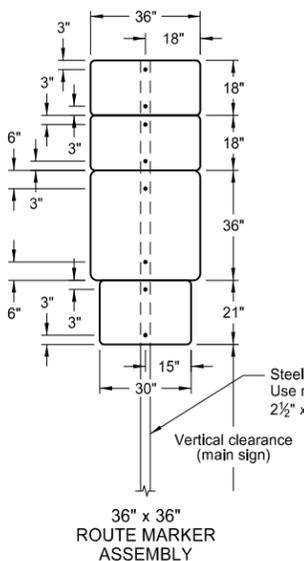
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



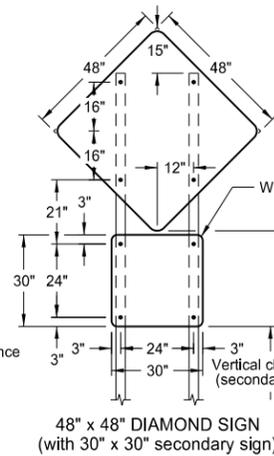
TYPICAL SECTION (48" x 48" diamond warning sign shown)



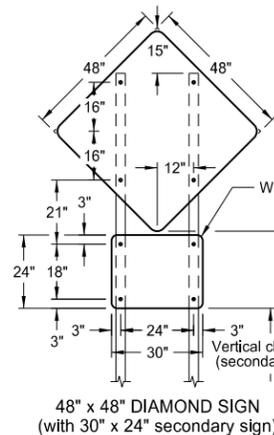
24" x 24" ROUTE MARKER ASSEMBLY



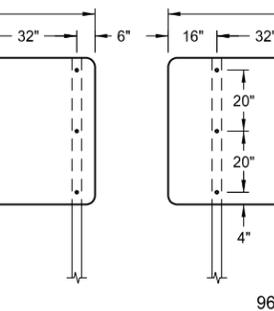
36" x 36" ROUTE MARKER ASSEMBLY



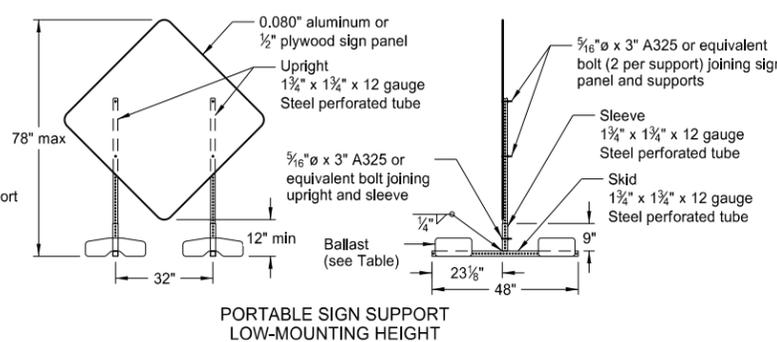
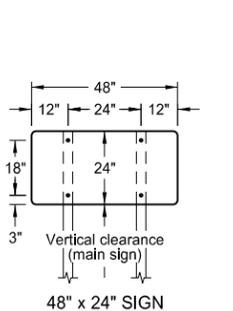
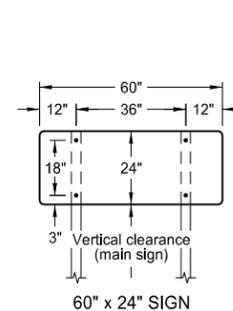
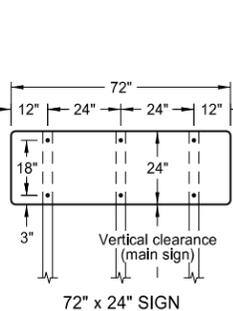
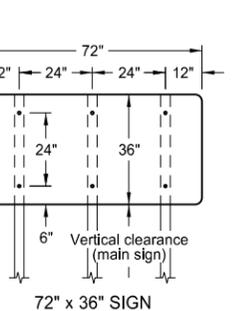
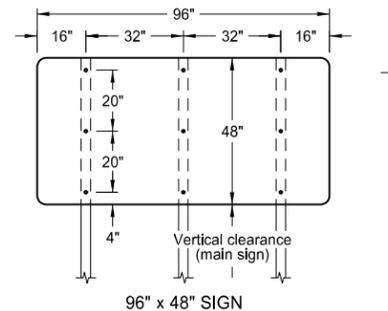
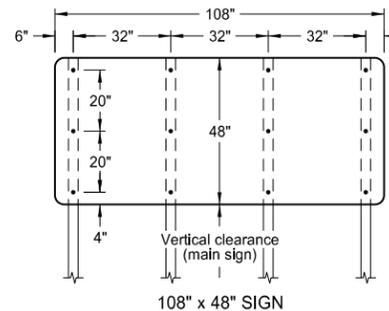
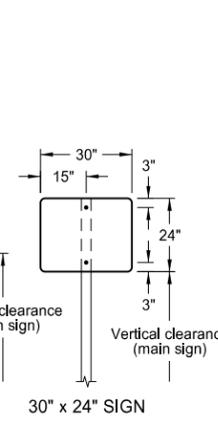
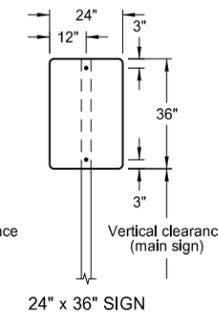
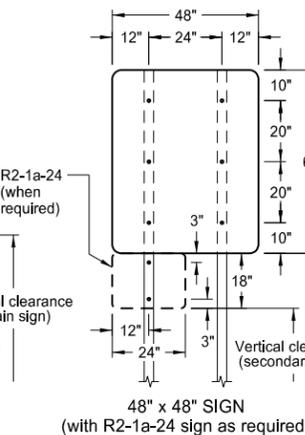
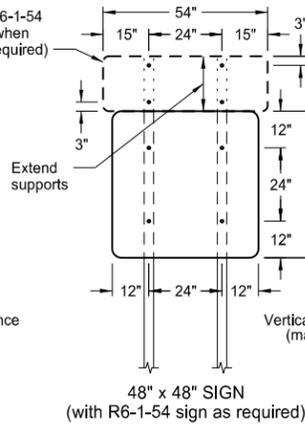
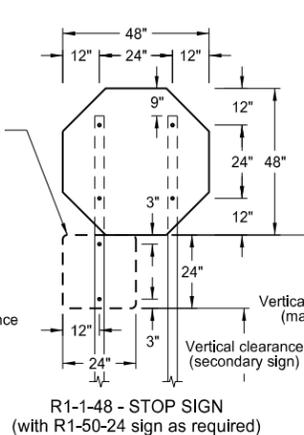
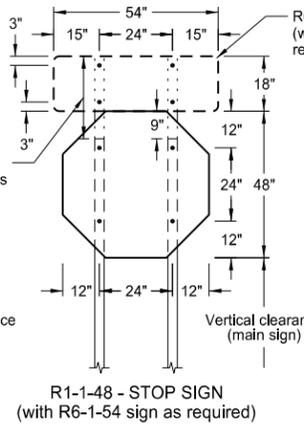
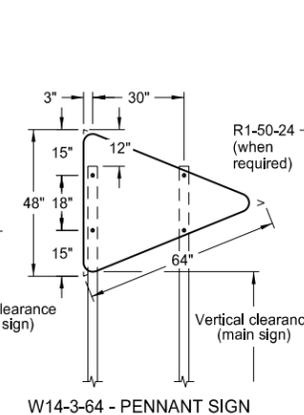
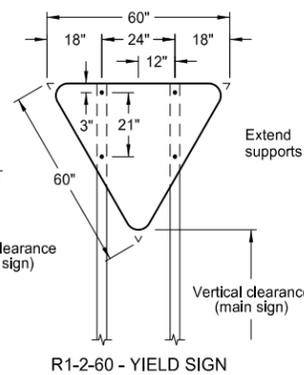
48" x 48" DIAMOND SIGN (with 30" x 30" secondary sign)



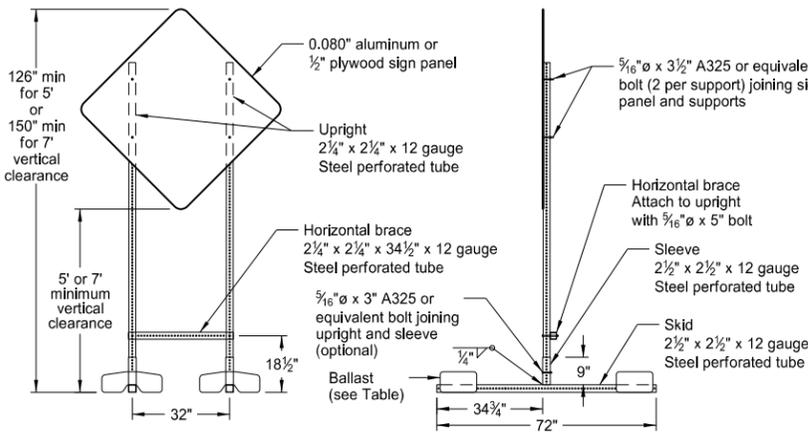
18" x 18" DIAMOND SIGN



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



PORTABLE SIGN SUPPORT LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT HIGH-MOUNTING HEIGHT

- NOTES:
- 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 2 1/2" x 2 1/2" 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.
 - Sign Panels: Provide sign panels made of 0.100" aluminum, 1/2" plywood, or other approved material, except where noted. All holes to be punched round for 3/8" bolts.
 - 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)
 - Route Marker Auxiliary Signs: Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:
Interstate - white legend on blue background
Interstate Business Loop - white legend on green background
US and State - black legend on white background
County - yellow legend on blue background
 - Vertical Clearance: Install signs with a vertical clearance of 5'-0" (see TYPICAL SECTION.) In areas where parking or pedestrian movements are likely or the view of the sign may be obstructed, install signs with a vertical clearance of 7'-0" from the top of the curb or from the near edge of the driving lane in absence of a curb.
The vertical clearance to secondary signs is 1'-0" less than the vertical clearance 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.
 - 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 unforeseen circumstances, such as equipment breakdown, rain, subgrade failures, etc., will not accrue towards the 5 day period. The R9-8 through R9-11a series, W1-5 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	
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11-14-13	Revised Note 6.

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ROAD CLOSURE LAYOUTS

Notes

- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of taper.
 - L = Minimum length of taper, or $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2/60$ for urban, residential, and other streets with speeds of 40 mph or less.
- Barricades placed on roadway shall be on a moveable assembly. Signs placed on roadway shall be placed on skid mounted assemblies.
- Delineator drums, barricades or cones used for tapering traffic shall be spaced at the dimension "S". Delineator drums or cones used for tangents shall be spaced at 2 times dimension "S".
- Sequencing Arrow Panels
 - 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. See Shoulder Closure Standard Drawing.
 - Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
 - Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
 - Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- 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 $\frac{1}{2}$ B.
- Use when work area is 1 mile or longer.
- 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.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
- G20-55-96 sign is not required if this standard is part of other traffic control layouts, or the work is less than 15 days.

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

KEY

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

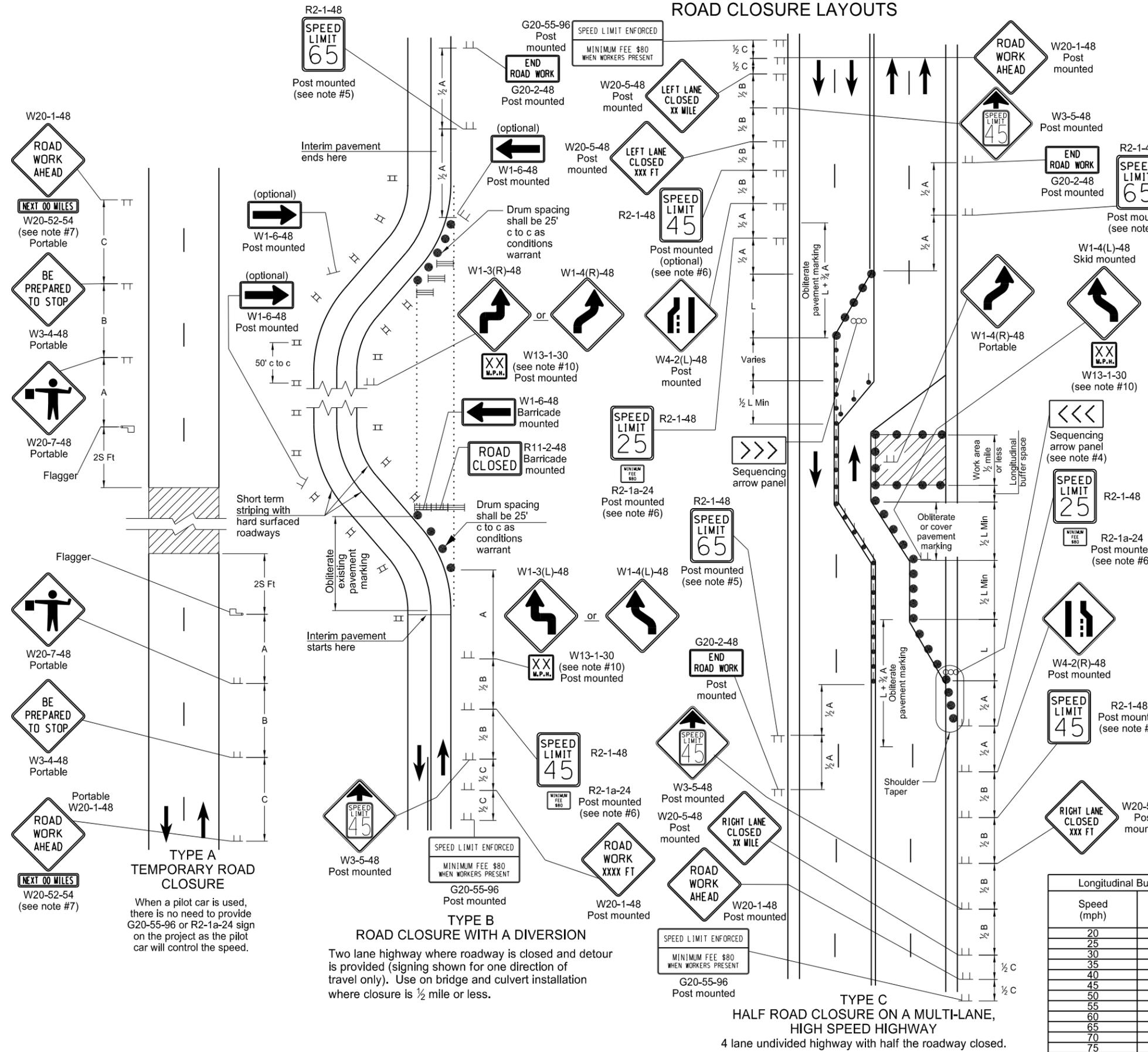
Longitudinal Buffer Space

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

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
9-27-13

REVISIONS	
DATE	CHANGE

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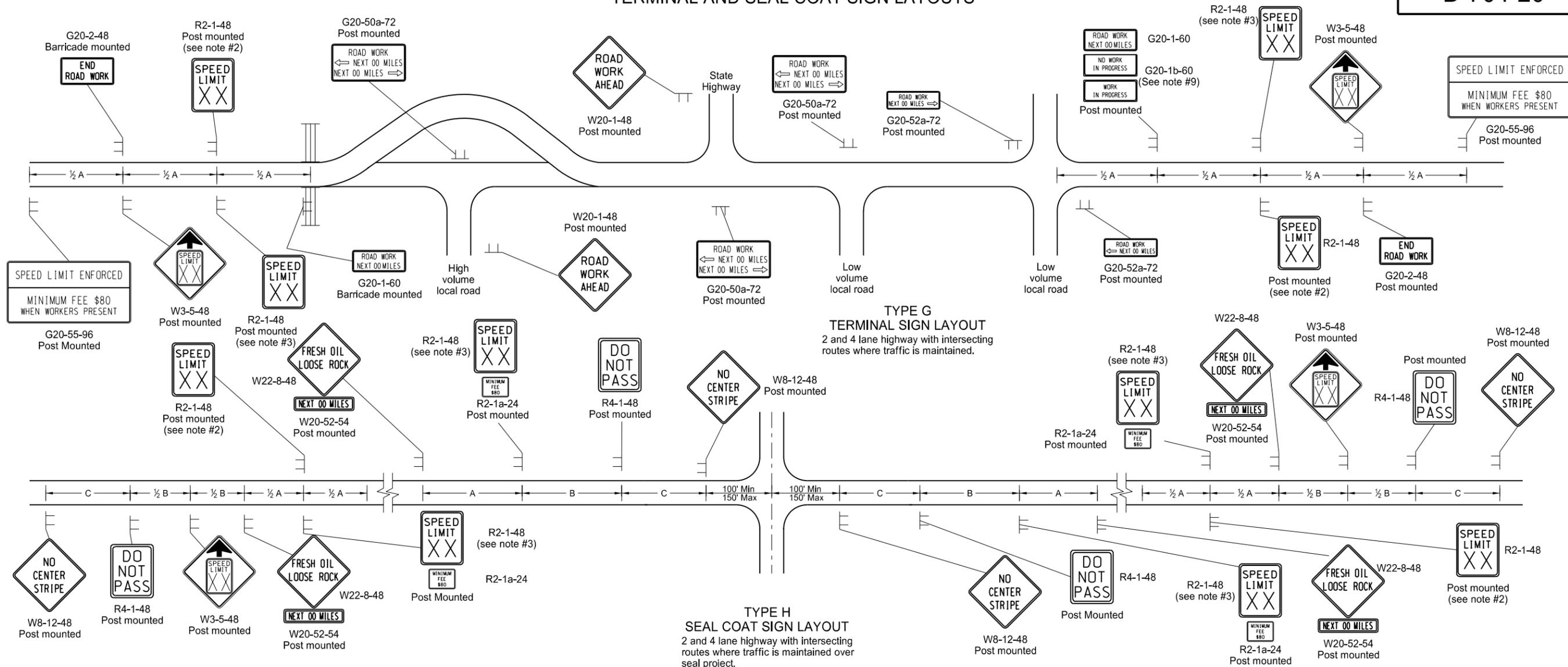
TYPE A TEMPORARY ROAD CLOSURE
When a pilot car is used, there is no need to provide G20-55-96 or R2-1a-24 sign on the project as the pilot car will control the speed.

TYPE B ROAD CLOSURE WITH A DIVERSION
Two lane highway where roadway is closed and detour is provided (signing shown for one direction of travel only). Use on bridge and culvert installation where closure is $\frac{1}{2}$ mile or less.

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

TERMINAL AND SEAL COAT SIGN LAYOUTS

D-704-20



1. Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies.
2. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
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 1/2 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. On seal projects, signs R2-1-48, R2-1a-24, R4-1-48, W22-8-48 and W20-52-54 shall be placed just after all important intersections and at five mile intervals thereafter. Sign W8-12-48 shall be placed just after all important intersections and at 2 mile intervals thereafter until the short term center line pavement marking is in place. No short term pavement markings are placed when traffic volumes are 750 ADT or less.
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. Type H construction sign traffic control shall have the speed limit signs covered or removed once the loose aggregate has been removed.
9. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
10. Other traffic control layouts will be required in the immediate work areas. If the speed limit is reduced in the work area, speed limit signs shall have the R2-1a-24 sign placed below.
11. G20-55-96 sign is not required if work is less than 15 days.

KEY

Type III barricade
 Sign

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

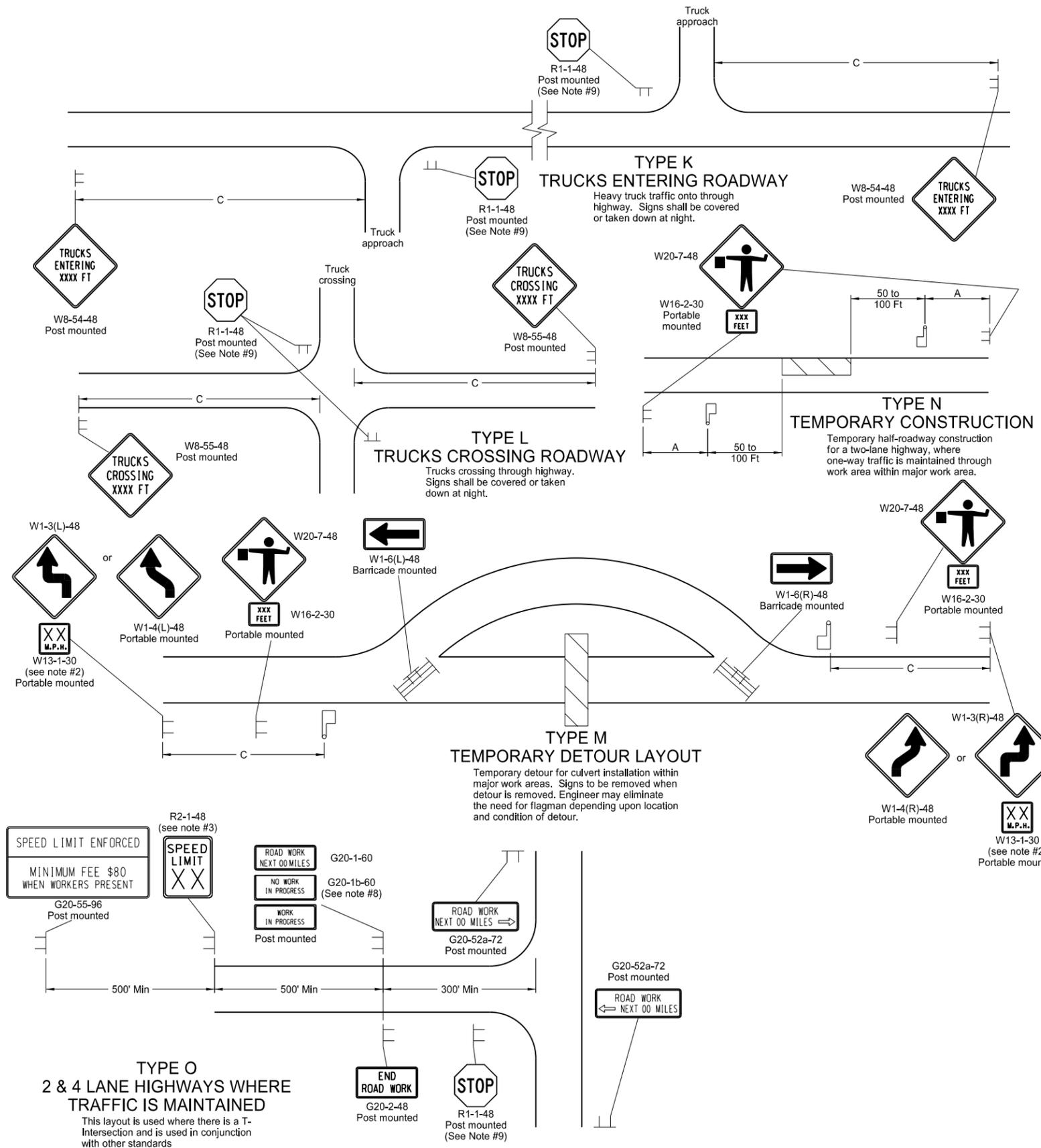
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
9-27-13

REVISIONS	
DATE	CHANGE

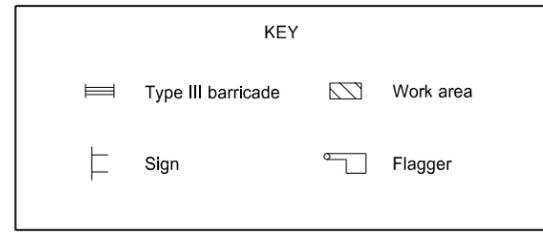
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CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

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. Where necessary, safe speed to be determined by the Engineer.
 2. 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 1/2 B.
 3. 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.
 4. Existing speed limit signs within a reduced speed zone shall be covered. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
 5. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
 6. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
 7. If existing stop sign is in place, a 48" stop sign is not required.
 8. 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.



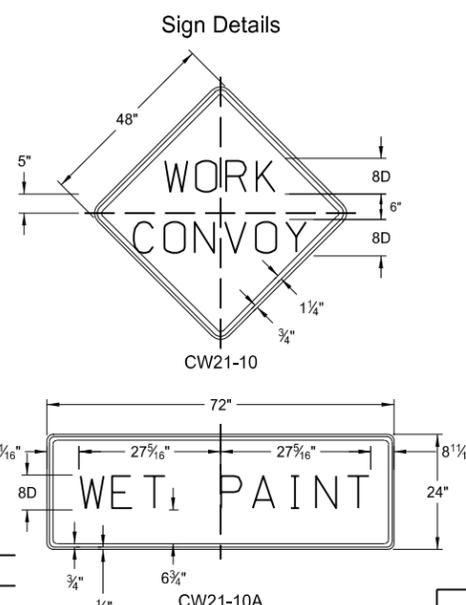
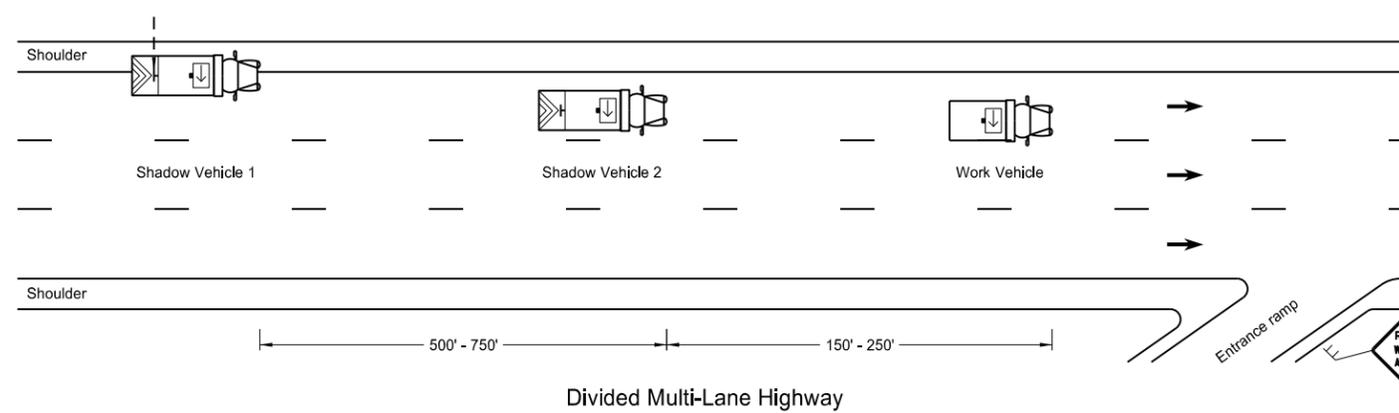
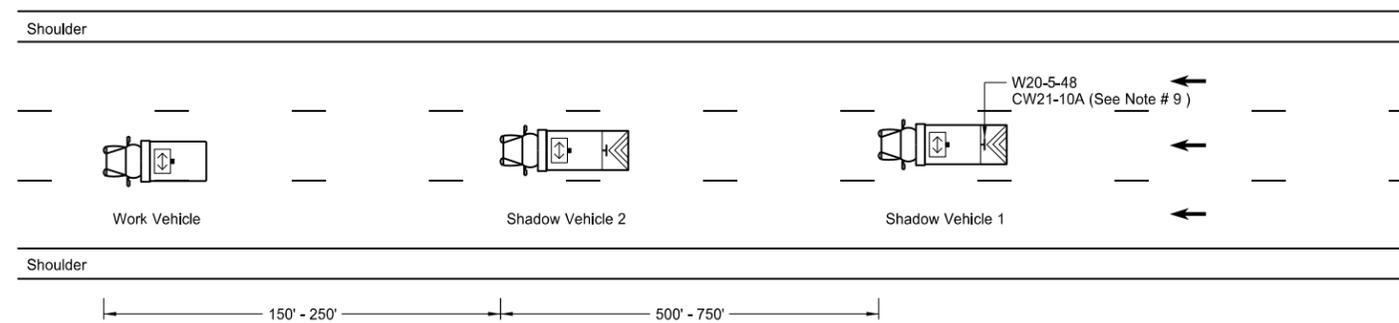
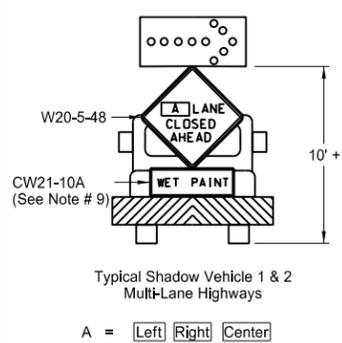
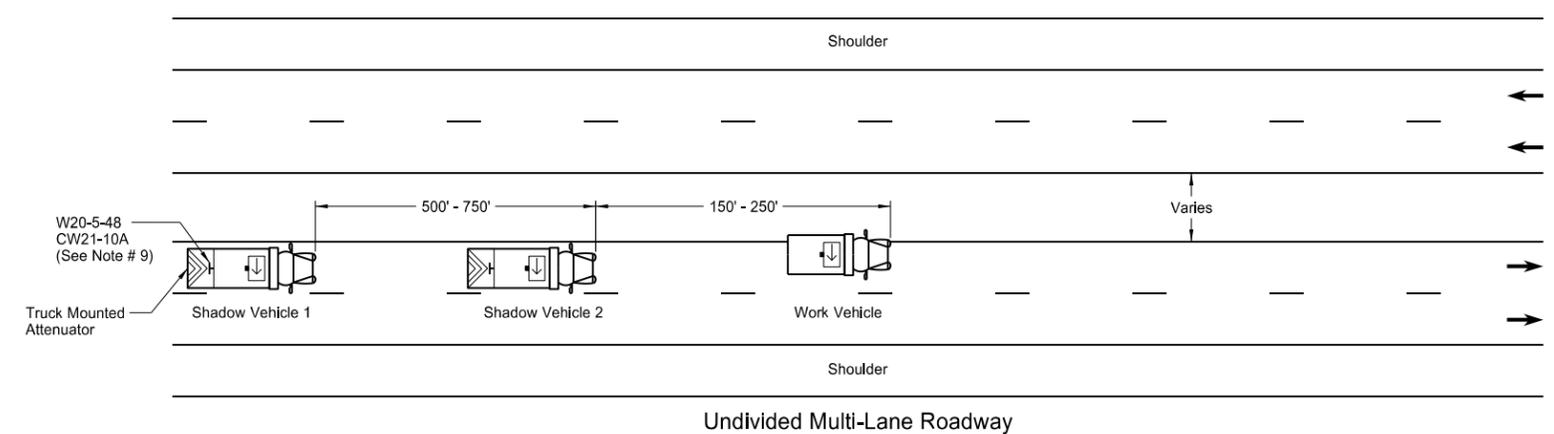
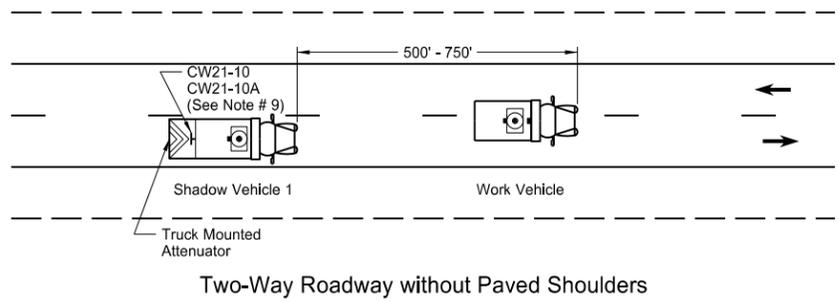
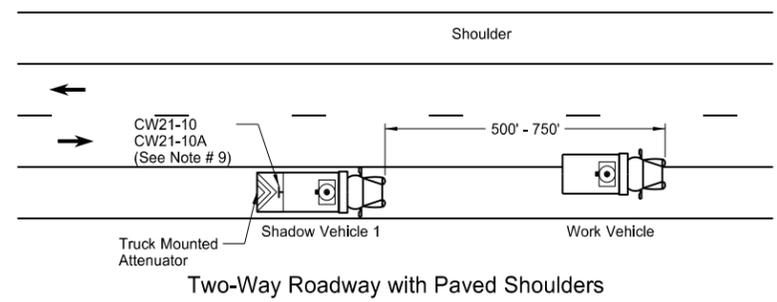
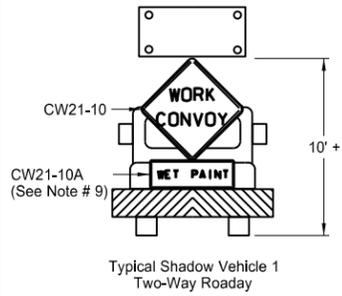
Road Type	ADVANCE WARNING SIGN SPACING		
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NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 9-27-13	
REVISIONS	
DATE	CHANGE

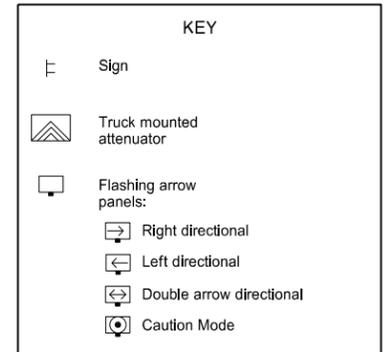
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TRAFFIC CONTROL PLAN FOR MOVING OPERATIONS

D-704-27



- Notes
- 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.
 - Shadow and work vehicles shall display yellow rotating beacons or strobe lights unless otherwise stated elsewhere in the plans.
 - Flashing arrow panels shall be Type B or Type C. The panel operation shall be controlled from inside the vehicle.
 - Each vehicle shall have two-way electronic communication capability.
 - When work convoys must change lanes, shadow vehicle 1 should change lanes first to shadow other convoy vehicles.
 - 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.
 - Sign Colors
Letters = Black
Border = Black
Background = Orange
 - Shadow vehicle 2 may be used as the paint tender vehicle.
 - Sign CW21-10A shall only be used during a painting operation.
 - On two lane - two way roadways, the work and shadow vehicles should pull over periodically to allow motor vehicle traffic to pass.

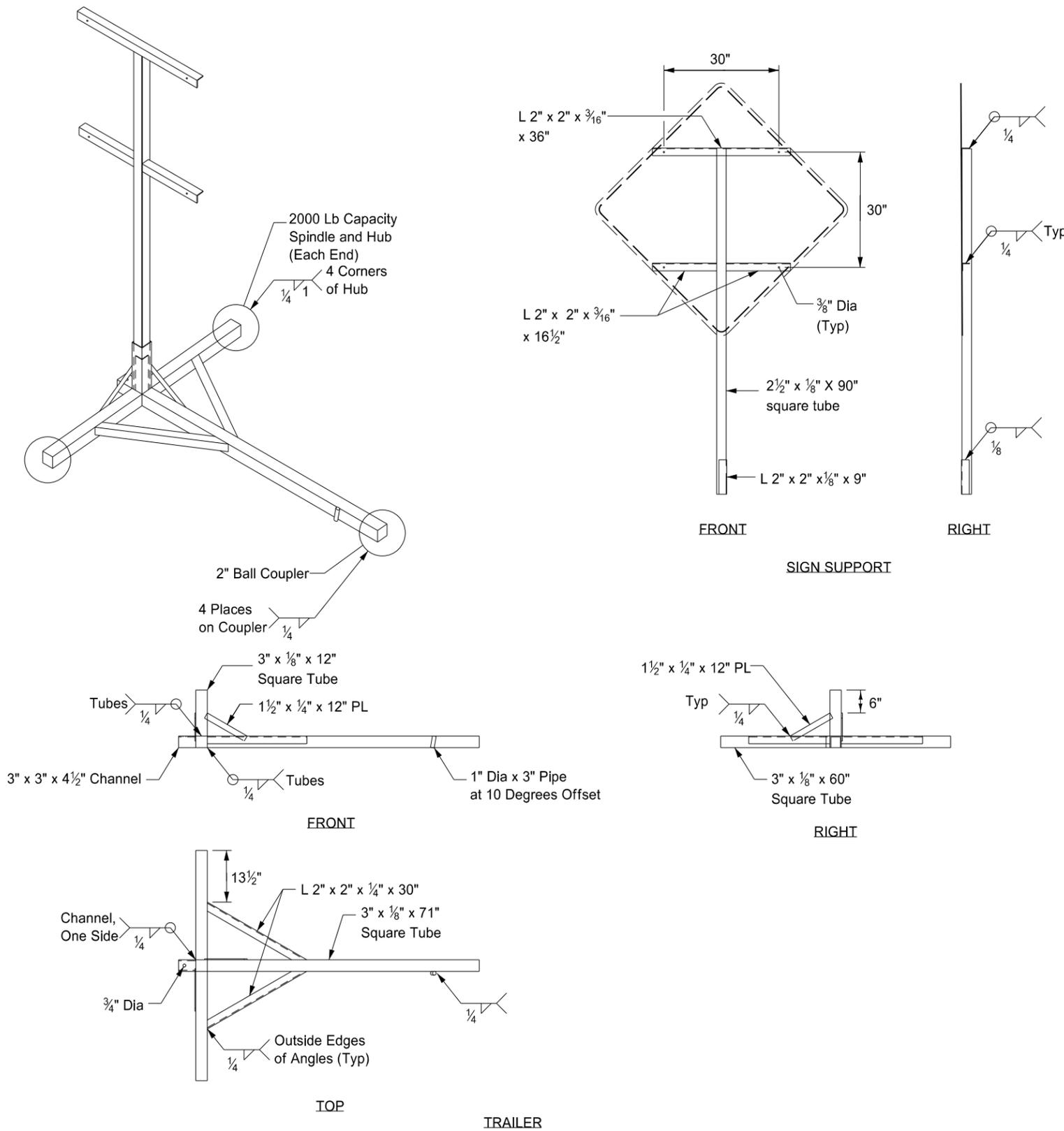


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
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6-18-14	Removed shadow vehicle 2 on two lane roadways

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PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



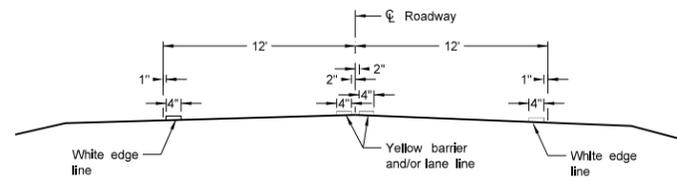
Notes:

- 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.

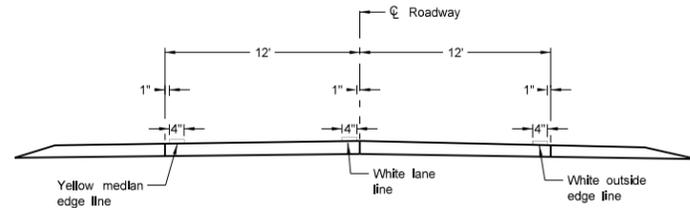
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11-23-10	
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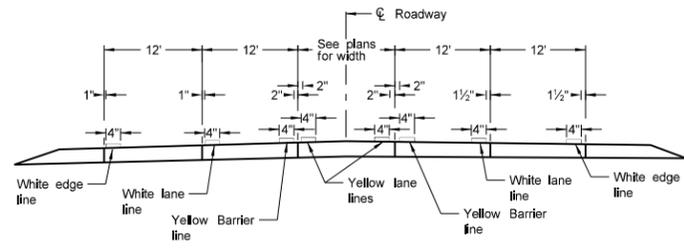
PAVEMENT MARKING



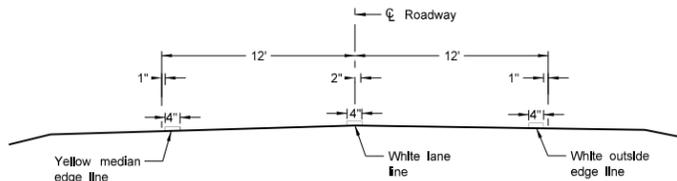
Two Lane Two Way
RURAL ROADWAY



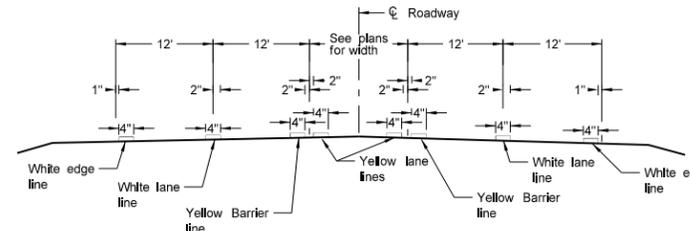
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



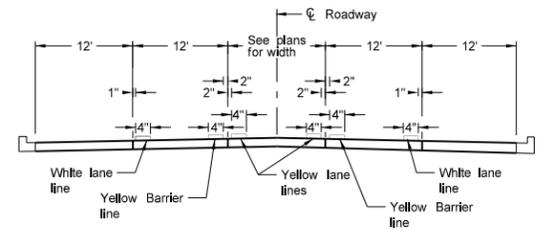
RURAL FIVE LANE ROADWAY
Concrete Section



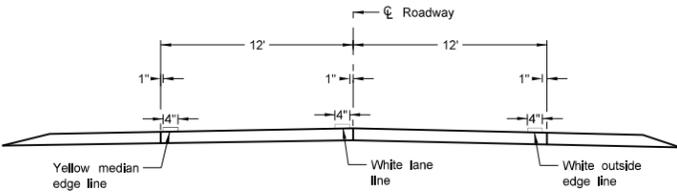
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



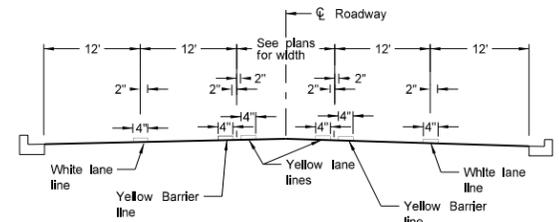
RURAL FIVE LANE ROADWAY
Asphalt Section



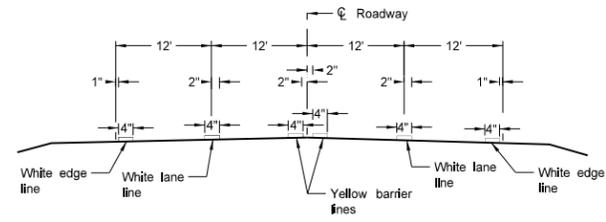
URBAN FIVE LANE SECTION
Concrete Section



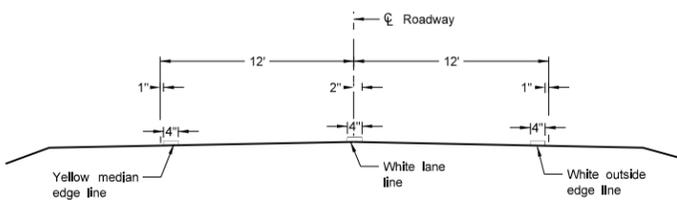
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



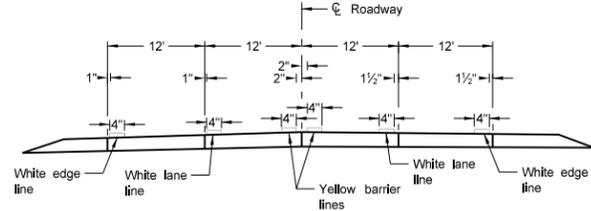
URBAN FIVE LANE SECTION
Asphalt Section



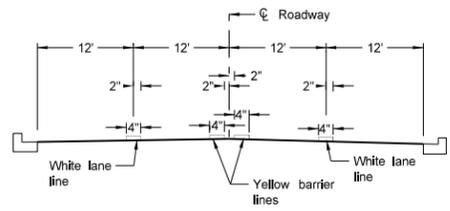
RURAL FOUR LANE ROADWAY
Asphalt Section



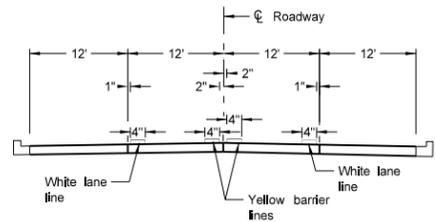
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



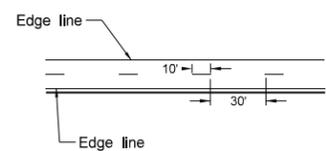
RURAL FOUR LANE ROADWAY
Concrete Section



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	
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