

DESIGN DATA				
Traffic	Average Daily			
Current 2022	Pass: Varies	Trucks: Varies	Total: Varies	
Preventive Maintenance				

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	H-2-999(067)	23584	1	1

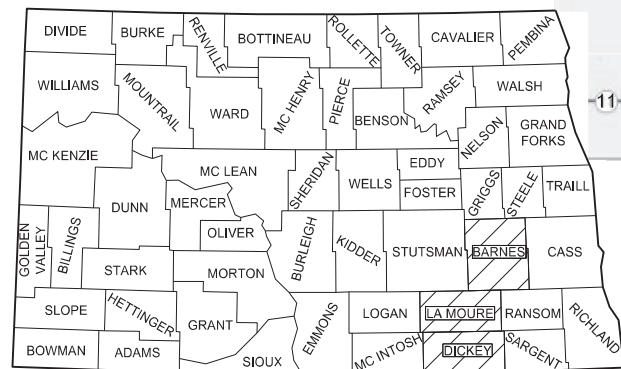
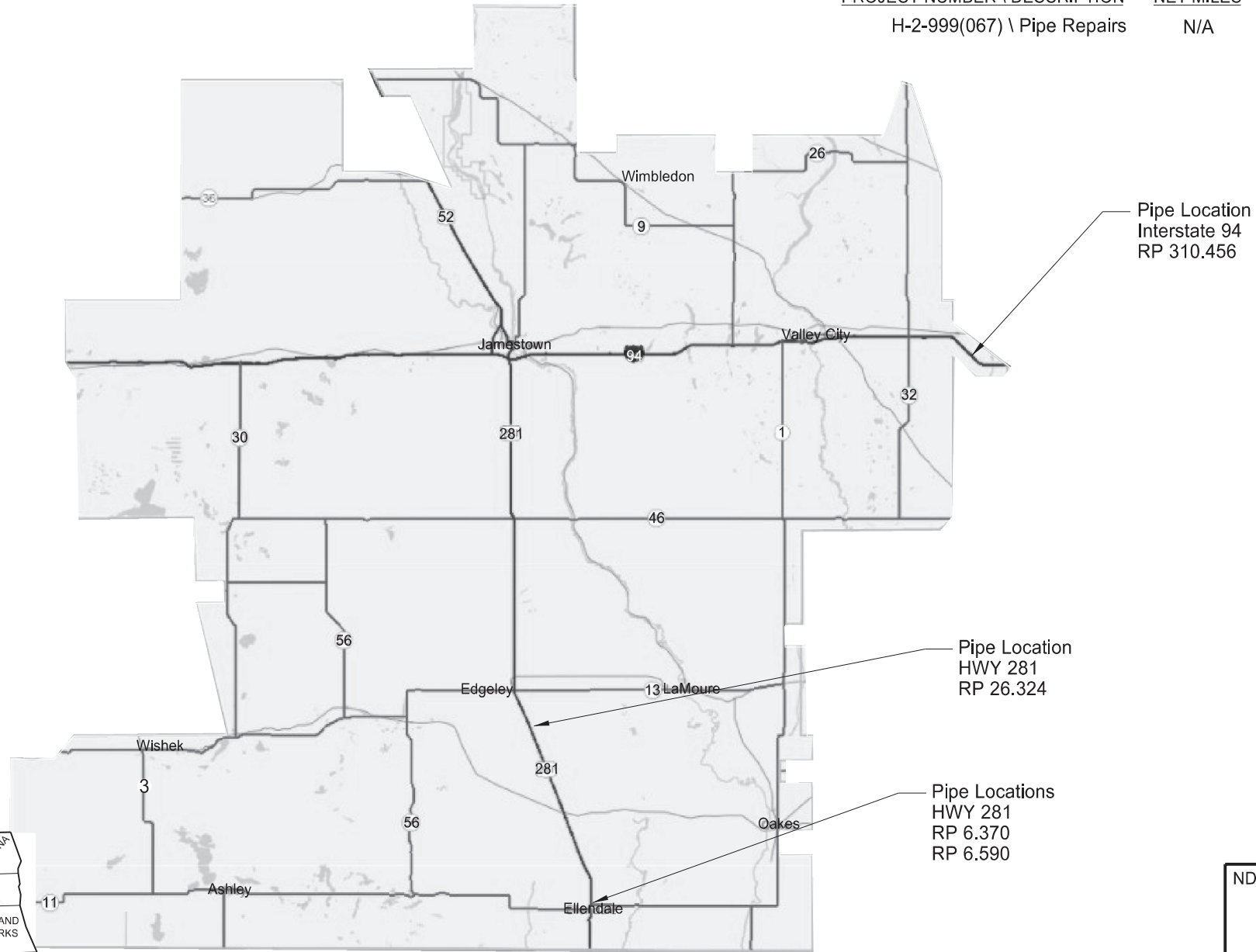
# NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

H-2-999(067)

Barnes, LaMoure, & Dickey County  
Pipe Repairs on Various Highways

GOVERNING SPECIFICATIONS	Date Published and Adopted by the North Dakota Department of Transportation
Standard Specifications	1/1/2020
Supplemental Specifications	NONE

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
H-2-999(067) \ Pipe Repairs	N/A	N/A



STATE COUNTY MAP

DESIGNER Taylor VanEaton
DESIGNER
DESIGNER

ND DEPARTMENT OF TRANSPORTATION  
VALLEY CITY DISTRICT

*Nathan A. Haaland*  
Haaland, Nathan A.  
04/22/22

NDDOT Valley City District

DATE  
04/22/22

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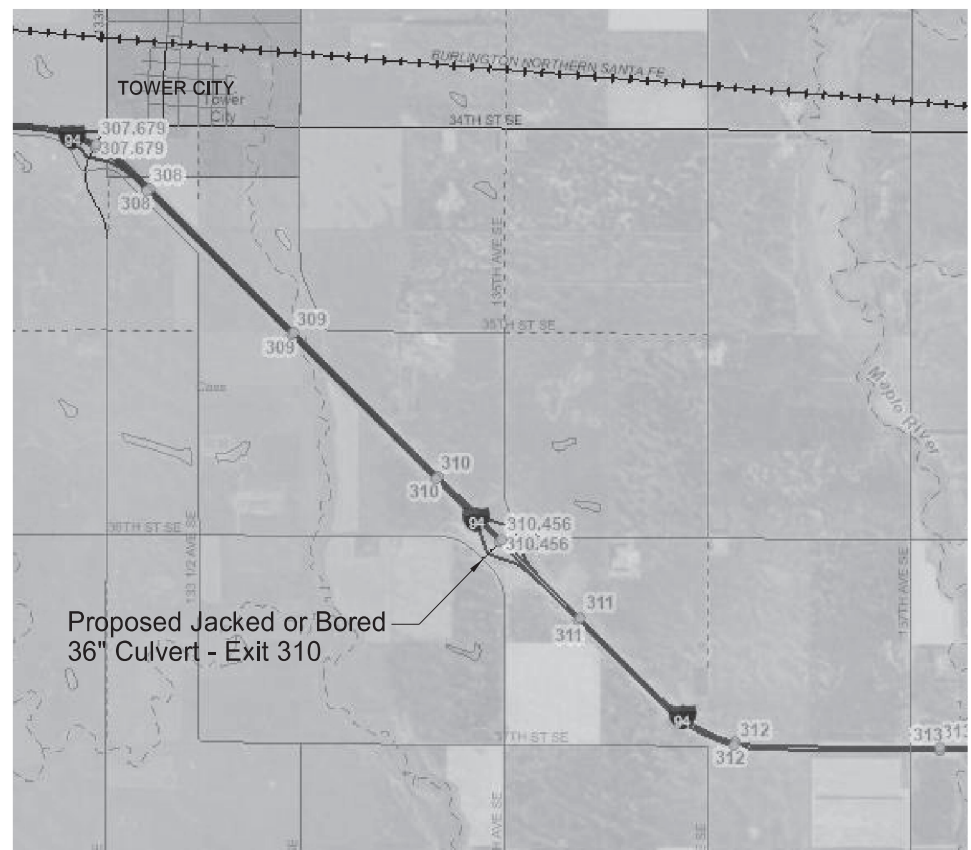
**LIST OF STANDARD DRAWINGS**

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D-714-22	Concrete Pipe, Cattle Pass, or Precast Concrete Box Culvert Ties
D-754-83	Object Markers - Culverts

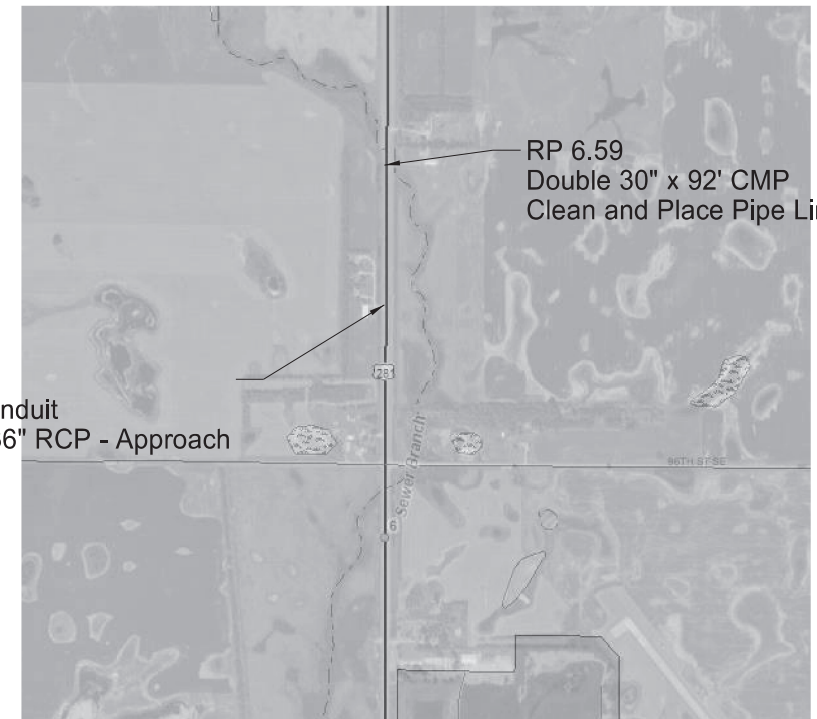
**SPECIAL PROVISIONS**

Number	Description
595(20)	Cured In Place Pipe (CIPP)
PSP 1	Permits and Environmental Considerations
SSP 1	Temporary Erosion and Sediment Best Management Practices

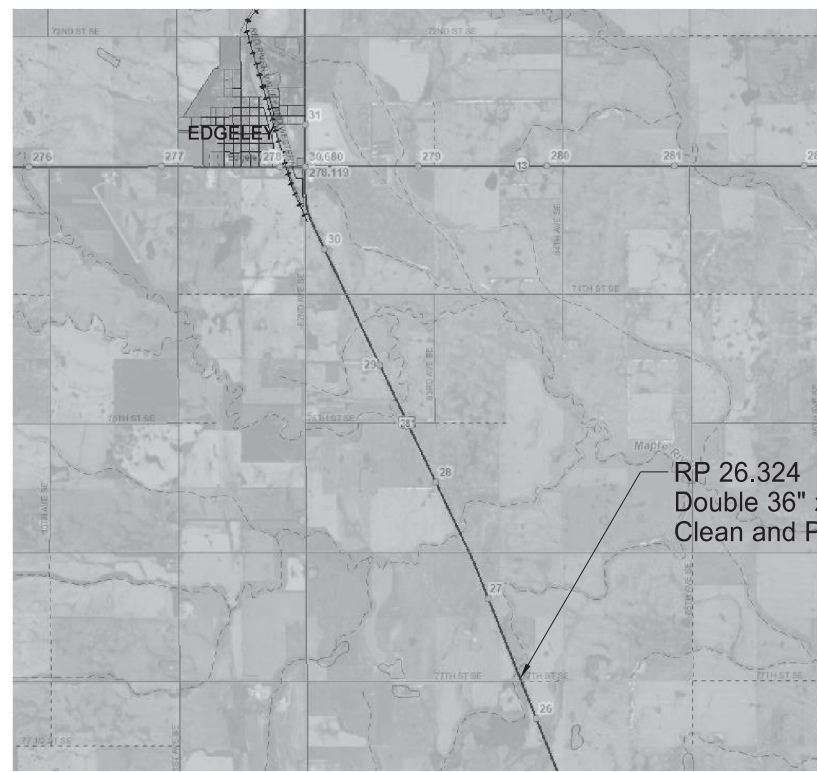
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I - 94



HWY 281



HWY 281



Scope of Work  
Pipe Repair on Various Hwy's

## NOTES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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107-P01 HAUL ROAD RESTORATION: Use Class 13 Aggregate for haul road restoration.

202-P01 REMOVAL OF PIPE ALL TYPES AND SIZES: Include the cost to excavate the approach pipe, the temporary removal and replacement of embankment and any fill material required to install the new approach pipe in the price bid for "Removal of Pipe All Types & Sizes".

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

1. Plastic or natural fiber photodegradable netting that has a life expectancy between 12 to 24 months. If the photodegradable netting is plastic, the netting color must be either clear or green. Black plastic netting will not be allowed.
2. 100 percent biodegradable jute netting that has a life expectancy between 6 to 12 months.

626-P01 COFFERDAM: Design, construct, operate, and remove temporary cofferdams. Construct upstream and downstream cofferdams to isolate the work areas.

Construct remaining cofferdams using one or more of the following materials or as approved by the Engineer.:

- Sandbags;
- Sheet piles;
- Water filled bladder;
- Impermeable containers; or
- Prefabricated dams.

Dewater the work areas. Operate the dewatering system within the work area to prevent any change in water quality of any adjacent water body. Before beginning dewatering of the work area, provide an inlet control system that limits sediment from entering the system and provide a stabilized discharge from the dewatering system.

Inlet control systems may include:

- Surface skimmers;
- Aggregate filled perforated containers; or
- Inlet filter sock.
- Stabilized discharges may include:
  - Dewatering basin;
  - Sediment bag; or
  - Filtering through vegetation.

Design and operate the discharge so that there is no visible sediment plume present in the water body and the discharge causes no additional erosion or sediment.

Do not discharge water directly to any adjacent water body.

A site is defined as one end of the pipes. Pay for cofferdams per site. Include all costs for labor, equipment, and material to install cofferdams, remove cofferdams in its entirety, dewater the work areas, and restore the areas to preconstruction contours in the price bid for "Cofferdam".

704-500 PORTABLE RUMBLE STRIPS (PRS): Use PRS made of rubber or engineered polymers.

Install PRS as part of the temporary traffic control when the following signs are also part of the required traffic control set up:

- "Be Prepared to Stop" (W3-4); and
- "Flagger" symbol (W20-7)

Install PRS that meet the following criteria:

- Have no adhesives or fasteners required for placement;
- Have a manufacture's speed rating that meets or exceeds the posted speed limit; and
- Each strip in the array must weigh a minimum of 100 pounds.

Use individual PRS constructed in one of the following manners:

- A single piece;
- Interlocking segments; or
- Two pieces hinged at the midpoint.

An installed array of PRS consists of a minimum of 3 individual strips.

Move rumble strips with the flagging operation. Do not place rumble strips on horizontal curves.

The Engineer will count and measure each array as one unit. Include the cost of providing, installing, maintaining, and relocating PRS in the unit price bid for "Portable Rumble Strips".

704-P01 TRAFFIC CONTROL: Provide traffic control consisting of a shoulder closure and flagging on highways.

The traffic control devices list has been developed using the following layouts on the Standard Drawing for traffic control.

1. Standard D-704-15, Type A
2. D-704-24, Type R, Shoulder Work.





**NOTES**

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	H-2-999(067)	6	2

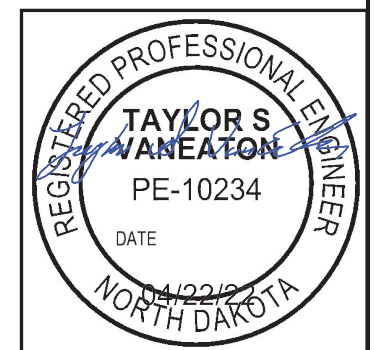
714-P01 END SECTION CORR STEEL 0.079IN 30IN, END SECTION CORR STEEL 0.079 IN 36 IN, & PIPE CONC REINF ARCH 58IN X 36IN CL III:

Remove, salvage, stockpile, and spread the existing topsoil within the work areas as specified in Section 203.04 B "Topsoil". After topsoil work is complete, mulch the area using Straw Mulch as specified in Section 253, and seed the area using Temporary Cover Crop and Class II Seed Mix as specified in Section 251. Include all costs associated with this work in the price bid for "End Section Corr Steel 0.079in 30in", "End Section Corr Steel 0.079 In 36 In" & "Pipe Conc Reinf Arch 58IN x 36IN CL III".

714-P02 JACKED OR BORED PIPE: Include temporary removal and replacement of embankment in the price bid for Pipe Conduit – Jacked or Bored. Use a maximum 2:1 slope beyond the existing pavement section (base, pavement, etc) for any temporary removal of embankment. Protect and stabilize the slope throughout the jacking or boring process.

Include all cost of temporary and permanent seeding, mulching, as well as stripping, stockpiling, and replacing the topsoil within the areas disturbed by installation of the pipe in the price bid for the "Pipe Conduit 36IN – Jacked or Bored".

990-P01 PIPE CLEANOUT: Remove and discharge silt and debris from each pipe to be cleaned. Dewater and remove the silt and debris using the method as specified per note 626-P01 "Cofferdam". Clean the pipe to re-establish drainage. Complete this work when the cofferdam is in place for each pipe. Include all costs for removing the silt and debris in the contact unit price for "Pipe Cleanout".



# ESTIMATE OF QUANTITIES

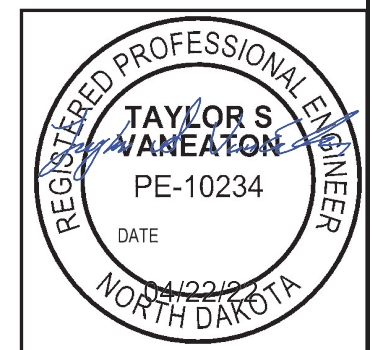
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
<b>ND</b>	H-2-999(067)	<b>8</b>	<b>1</b>

SPEC CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
-----	-----	-----	-----	-----
103	0100 CONTRACT BOND	L SUM	1	1
202	0174 REMOVAL OF PIPE ALL TYPES AND SIZES	LF	70	70
261	0112 FIBER ROLLS 12IN	LF	300	300
302	0100 SALVAGED BASE COURSE	TON	12	12
626	0100 COFFERDAM	EA	10	10
702	0100 MOBILIZATION	L SUM	1	1
704	0100 FLAGGING	MHR	200	200
704	1000 TRAFFIC CONTROL SIGNS	UNIT	677	677
704	1048 PORTABLE RUMBLE STRIPS	EA	4	4
704	1052 TYPE III BARRICADE	EA	2	2
704	1060 DELINEATOR DRUMS	EA	20	20
704	1067 TUBULAR MARKERS	EA	40	40
704	1080 STACKABLE VERTICAL PANELS	EA	15	15
714	2161 PIPE CONC REINF ARCH 58IN X 36IN CL III	LF	70	70
714	2530 CURED-IN-PLACE PIPE-30IN	LF	184	184
714	2536 CURED-IN-PLACE PIPE-36IN	LF	168	168
714	4124 PIPE CONDUIT 36IN-JACKED OR BORED	LF	100	100
714	5825 END SECT CORR STEEL .079IN 30IN	EA	4	4
714	5830 END SECT CORR STEEL .079IN 36IN	EA	4	4
754	0805 OBJECT MARKERS - CULVERTS	EA	2	2
930	3640 HIGH EXPANSION POLYURETHANE FOAM	GAL	141.81	141.81
990	0400 PIPE CLEANOUT	EA	2	2

## BASIS OF ESTIMATE

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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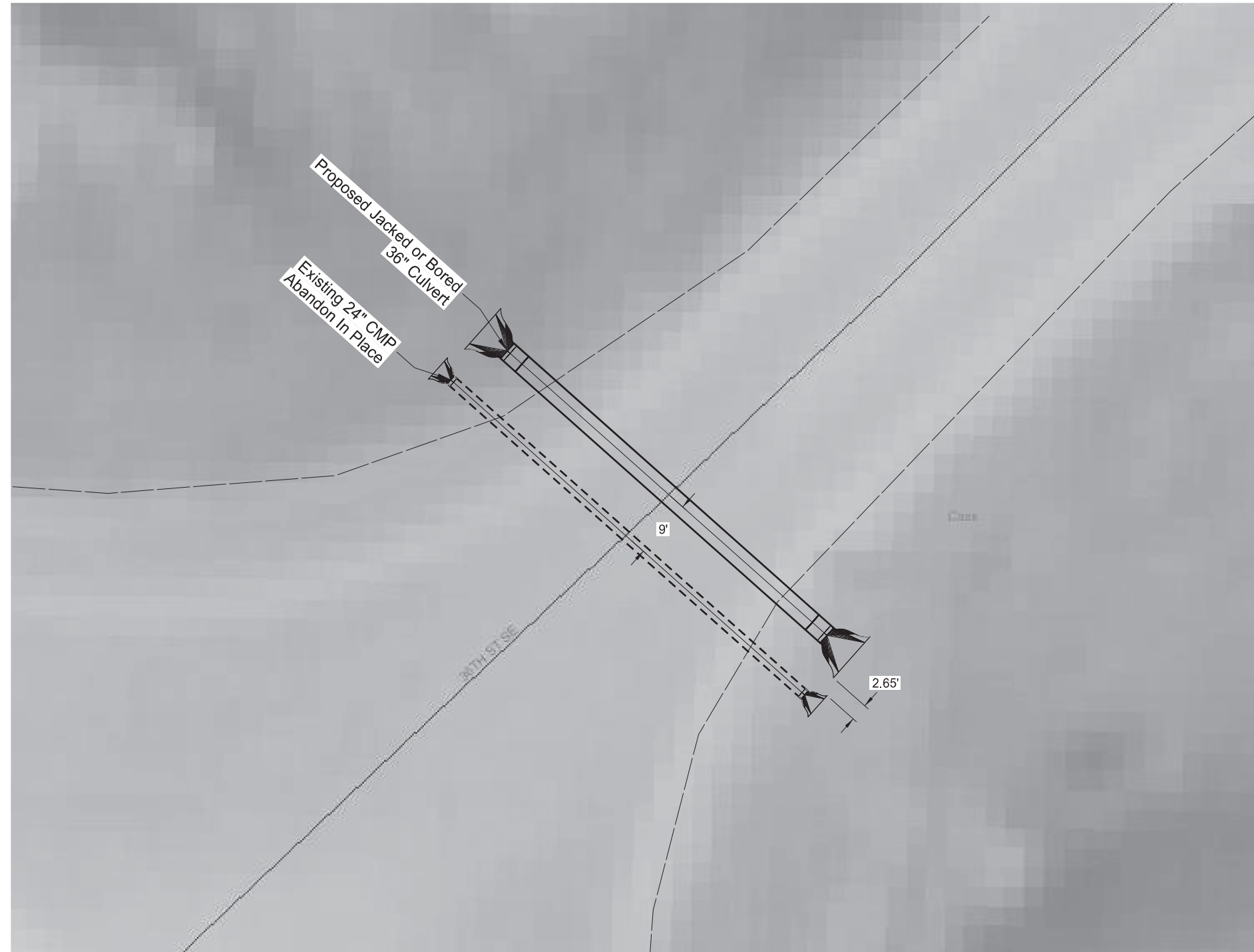
HWY	RP	SIZE (IN)	LENGTH (FT)	MATERIAL	LT INVERT ELEVATION	RT INVERT ELEVATION	CURED-IN-PLACE PIPE-30IN (LF)	CURED-IN-PLACE PIPE-36IN (LF)	END SECT CORR STEEL 0.079IN 30IN (LF)	END SECT CORR STEEL 0.079IN 36IN (LF)	PIPE CONC REINF ARCH 58IN X 36IN CL III	PIPE CONDUIT 36IN - JACKED OR BORED	REMOVAL OF PIPE ALL TYPES AND SIZES (LF)	FIBER ROLLS 12IN (LF)	PIPE CLEANOUT (EA)	COFFERDAM (EA)	TOTAL VOID VOLUME (CF)	HIGH EXPANSION POLYURETHANE FOAM @ 20X EXPANSION (GAL)	NOTES
281	6.370	58" x 36"	35 x 2	RCP							70		70	80					replace existing pipes in approach.
281	6.590	30	92 x 2	metal	1446.9	1446.9	184		4					80	1	4	133.69	50.00	2 pipes
281	26.324	36	84 x 2	metal	1529	1528.8		168		4				80	1	4	169.65	63.45	2 pipes
94	310.456	36	100	J or B								100		60		2			Abandon existing pipe
<b>Totals:</b>							184	168	4	4	70	100	70	300	2	10	303.34	113.45	25% Resin added to plan quantity for Unknown Voids
																		141.81	





	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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SPEC	CODE	BID ITEM	QTY	UNIT
714	4124	PIPE CONDUIT 36IN - JACKED OR BORED		
		Exit 310	100	LF
754	0805	OBJECT MARKERS - CULVERTS		
		Culvert Ends	2	EA



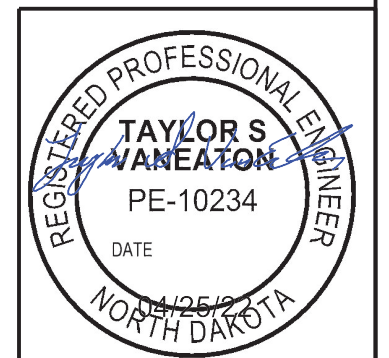
Jacking/Boring Detail  
36th St SE  
I 94 Exit 310



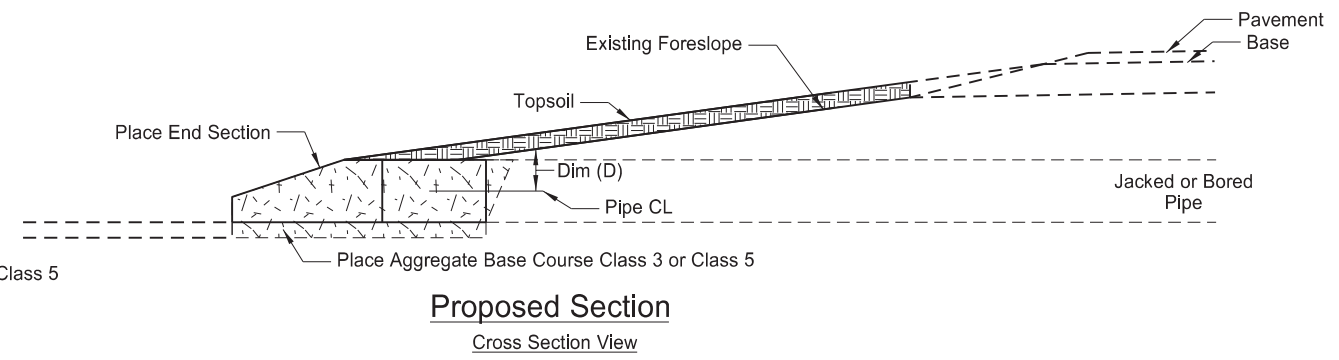
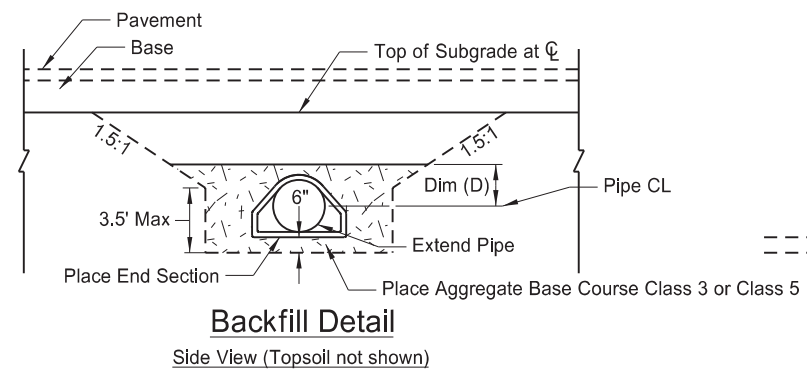


	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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SPEC	CODE	BID ITEM	QTY	UNIT
202	0174	REMOVAL OF PIPE ALL TYPES AND SIZES		
		RP 6.37	70	LF
302	0100	SALVAGED BASE COURSE		
		RP 6.37	12	TON
714	2161	PIPE CONC REINF ARCH 58IN X 36IN CL III		
		RP 6.37	70	LF



Pipe Detail
RP 6.37
HWY 281



Pipe Materials	Dim (A) <= 4 Feet	Backfill Dimension
	Material (B)	Dim (D)
Concrete	Embank or Aggr	0.5 O.D.
Metal	Embank or Aggr	0.5 O.D.+1 Foot

Pipe Materials	Dim (A) > 4 Feet	Backfill Dimension
	Material (B)	Dim (D)
Concrete	Embankment	0.5 O.D.
Metal	Embankment	0.5 O.D.+1 Foot

Pay Items  
1) Pipe\*

\*Included in Pipe Pay Item  
1) Pipe  
2) Aggregate Base Course Class 3 or Class 5

NOTES:  
1. Aggregate may be either Class 3 or Class 5 Aggregate Base Course.



Pipe Backfill Detail  
Jack/Bore Pipe  
I 94  
Exit 310

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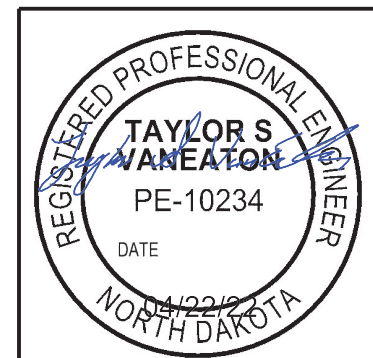
Hwy	RP	Begin Offset	End Offset	Pipe Installation (Pay Item)			Allowable Material	Required Diameter	Steel Pipe Coatings	Steel Pipe Corrugations or Spiral Ribs	Steel Pipe Minimum Thickness	Geosynthetic Material - Type G (Pay Item)	(*) End Sections		Applicable Backfill
				In	Bid Item	LF							Begin EA	End EA	
94	310.456	600 Rt	600 Rt	36	Jack or Bored Pipe Conduit	100	Reinforced Concrete Pipe - Class III (barrel length = 100 LF)	36					TES	TES	Section 20 Sheet 3
							Smooth Walled Steel Pipe	36			0.469				
281	6.37	70 Lt	70 Lt	58 x 36 Arch	Pipe Conc. Reinf. CL III	35	Reinforced Concrete Pipe - Class III (barrel length = 35 LF)	58 x 36 Arch					TES	TES	Specification 714.04 A
281	6.37	70 Lt	70 Lt	58 x 36 Arch	Pipe Conc. Reinf. CL III	35	Reinforced Concrete Pipe - Class III (barrel length = 35 LF)	58 x 36 Arch					TES	TES	Specification 714.04 A

Corrugations: 2 = 2-2/3"x1/2"  
3 = 3"x1"  
5 = 5"x1"

Coatings: Z = Zinc  
A = Aluminum  
P = Polymeric (over Zinc or Aluminum)

Spiral Ribs: 3/4 = 3/4"x3/4"@7-1/2"  
1 = 3/4"x1"@11-1/2"

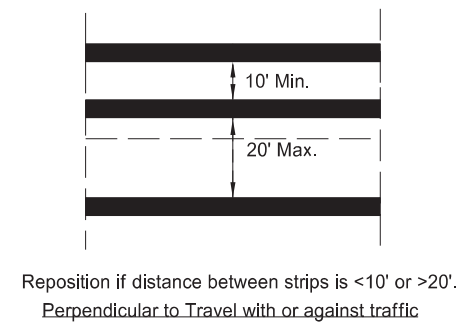
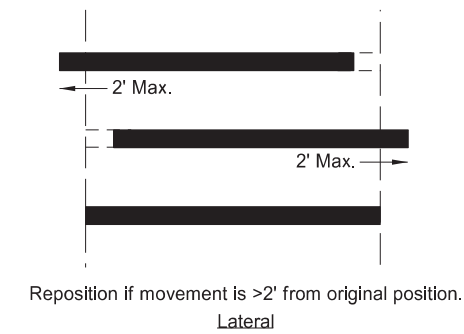
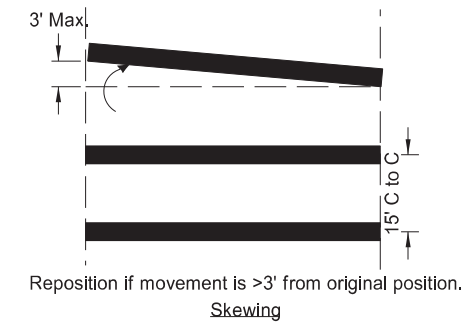
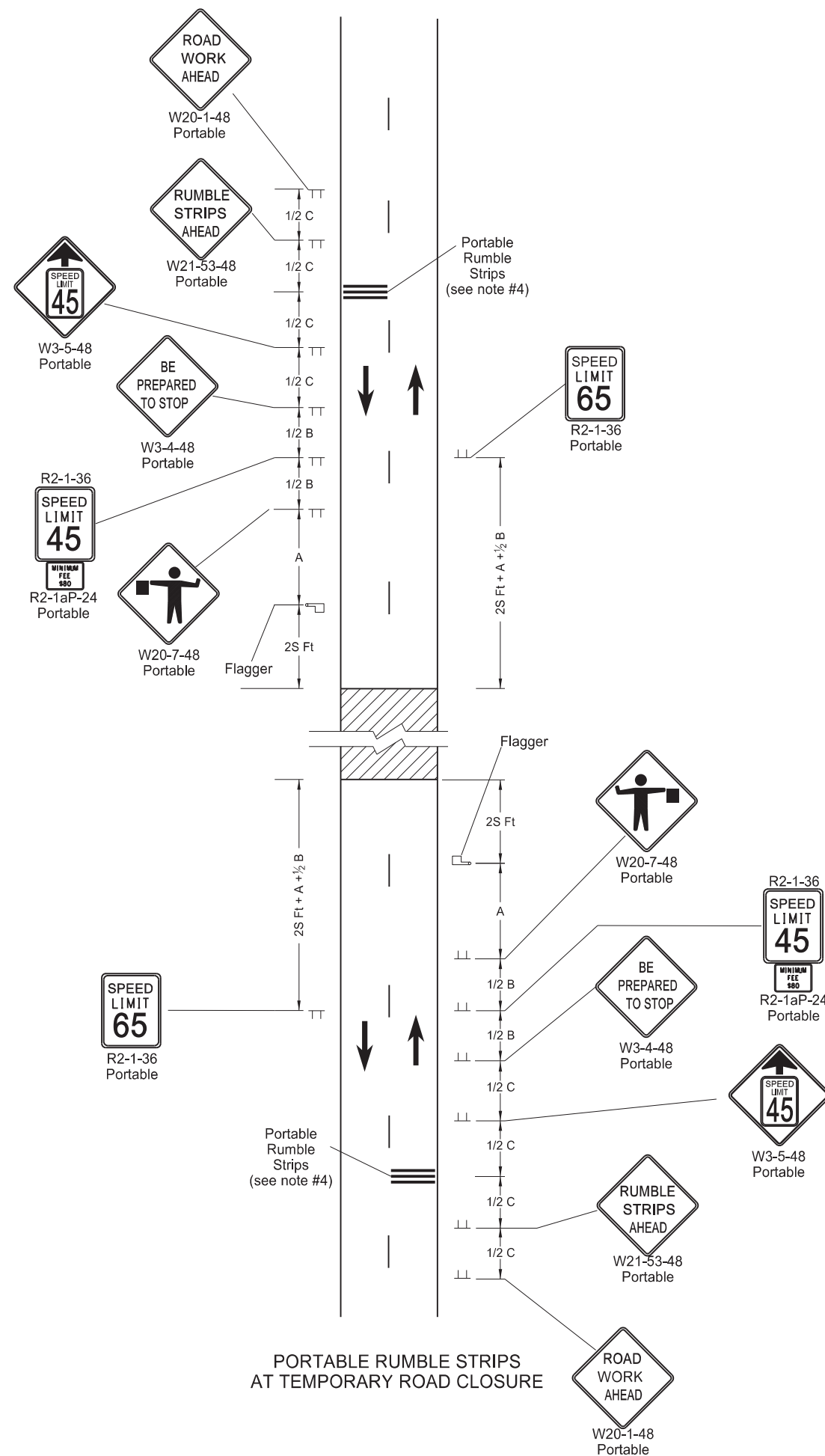
(\*) End sections are measured and paid for separately for pipe extensions.  
FES = Flared End Section  
TES = Traversable End Section



Allowable Pipe List



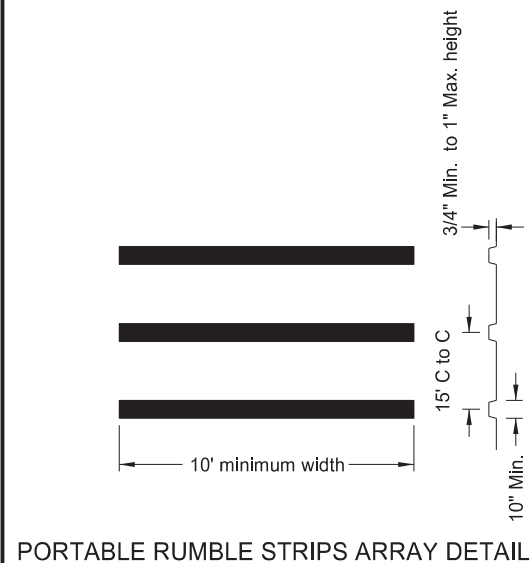
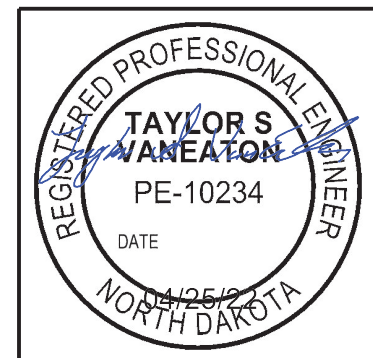




**PORTABLE RUMBLE STRIPS ARRAY  
TYPES OF MOVEMENT AND MAXIMUM ALLOWANCES**

- Notes:
1. Number of devices were calculated using 40 mph. Speed determined in the field based on location and conditions.
  2. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
  3. Sign R2-1aP-24 is not required when pilot car operation is used.
  4. Rumble strips are not used on a non paved surface or in a pre-construction speed zone of 25 mph or less.

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



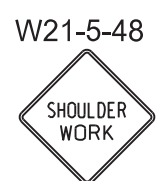
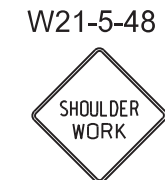
**PORTABLE RUMBLE STRIPS  
AT TEMPORARY ROAD CLOSURE**

KEY	
	Work area
	Flagger
	Sign
S = Numerical value of speed limit or 85th percentile.	

**TWO-LANE PORTABLE RUMBLE STRIPS**

Pipe Repairs

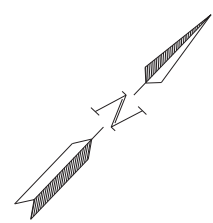
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Stackable Vertical Panels  
Spaced @ 25'

Stackable Vertical Panels  
Spaced @ 25'

36th St SE



Work Zone Traffic Control  
Jack/Bore Pipe  
I 94  
Exit 310

NDDOT ABBREVIATIONS

D-101-1

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

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

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

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

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

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

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

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



NDDOT ABBREVIATIONS

Galv	galvanized	Ln	lane	Obsc	obscure(d)	Qty	quantity
Gar	garage	Lg	large	Ocpd	occupied	Qtr	quarter
Gs L	gas line	Lat	latitude	Ocpy	occupy		
G Reg	gas line regulator	Lt	left	O/s	offset		
GMV	gas main valve	Lens	lenses	OC	on center	Rad or R	radius
G Mtr	gas meter	Lvl	level	C	one dimensional consolidation	RR	railroad
GSV	gas service valve	LvIng	leveling	OC	organic content	Rlwy	railway
GVP	gas vent pipe	Lht	light	Orig	original	Rsd	raised
GV	gate valve	LP	light pole	O To O	out to out	RC	rapid curing
Ga	gauge	Ltg	lighting	OD	outside diameter	Rec	record
Gov	government	Liq	liquid	OH	overhead	Rcy	recycle
Grd	graded/grade	LL	liquid limit			RAP	recycled asphalt pavement
Grnd	ground	Loc	location			RPCC	recycled portland cement concrete
GWM	ground water monitor	Long.	longitude	PMT	pad mounted transformer	Ref	reference
Gdrl	guardrail	Lp	loop	Pg	pages	R Mkr	reference marker
Gtr	gutter	LD	loop detector	Pntd	painted	RM	reference monument
		Lum	luminaire	Pr	pair	RP	reference point
				Pnl	panel	Refl	reflectorized
H Plg	H piling			Pk	park	RCB	reinforced concrete box
Hdwl	headwall	Mb	mailbox	PSD	passing sight distance	RCES	reinforced concrete end section
Ht	height	ML	main line	Pvmt	pavement	RCFES	reinforced concrete flared end section
Hel	helical	MH	manhole	Ped	pedestal	RCP	reinforced concrete pipe
HDPE	high density polyethylene	Mkd	marked	Ped	pedestrian	RCPS	reinforced concrete pipe sewer
HM	high mast	Mkr	marker	PPP	pedestrian pushbutton post	RCTES	reinforced concrete traversable end section
HP	high pressure	Mkg	marking	Pen.	penetration	Reinf	reinforcement
HPS	high pressure sodium	MA	mast arm	Perf	perforated	Res	reservation
Hwy	highway	Matl	material	Per.	perimeter	Res	residence
Hor	horizontal	Max	maximum	Perm	permanent	Ret	retaining
HBP	hot bituminous pavement	MC	meander corner	PL	pipeline	Rev	reverse
HMA	hot mix asphalt	Meas	measure	PI	place	Rt	right
Hyd	hydrant	Mdn	median	P&P	plan & profile	R/W	right of way
Ph	hydrogen ion content	MD	median drain	PL	plastic limit	Riv	river
		MC	medium curing	PI or P <sub>L</sub>	plate	Rd	road
		MGS	Midwest Guardrail System	Pt	point	Rdbd	road bed
Id	identification	MM	mile marker	PE	polyethylene	Rdwy	roadway
Incl	inclinometer tube	MP	mile post	PVC	polyvinyl chloride	RWIS	roadway weather information system
IMH	inlet manhole	Min	minimum	PCC	Portland Cement concrete	Rk	rock
ID	inside diameter	Misc	miscellaneous	PP	power pole	Rt	route
Inst	instrument	Mon	monument	Preempt	preemption		
Intchg	interchange	Mnd	mound	Prefab	prefabricated		
Intmdt	intermediate	Mtbl	mountable	Prfmd or Pref	performed		
Intscn	intersection	Mtd	mounted	Prep	preparation		
Inv	invert	Mtg	mounting	Press.	pressure		
IP	iron pipe	Mk	muck	PRV	pressure relief valve		
				Prestr	prestressed		
				Pvt	private		
				PD	private drive		
Jt	joint			Prod.	production/produce		
Jct	junction			Prog	programmed		
		Neop	neoprene	Prop.	property		
		Ntwk	network	Prop Ln	property line		
		N	North	Ppsd	proposed		
		NE	North East	PB	pull box		
		NW	North West				
		NB	Northbound				
		No. or #	number				

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



NDDOT ABBREVIATIONS

D-101-3

Salv	salvage(d)	Tel	telephone
San	sanitary sewer line	Tel B	Telephone Booth
Sec	section	Tel P	telephone pole
SL	section line	Tv	television
Sep	separation	Temp	temperature
Seq	sequence	Temp	temporary
Serv	service	TBM	temporary bench mark
Sht	sheet	T	thinwall tube sample
Shtng	sheeting	Ts	topsoil
Shldr	shoulder	Traf	traffic
Sw or Sdwk	sidewalk	TSCB	traffic signal control box
SD	sight distance	Tr	trail
SN	sign number	Transf	transformer
Sig	signal	Trans	transition
Sgl	single	TT	transmission tower
SRCP	slotted reinforced concrete pipe	TES	traversable end section
SC	slow curing	Trans	transverse
SS	slow setting	Trtd	treated
Sm	small	Trmt	treatment
S	South	Qc	triaxial compression
SE	South East	TERO	tribal employment rights ordinance
SW	South West	Tpl	triple
SB	Southbound	Typ	typical
Sp	spaces		
Spcl	special	Qu	unconfined compressive strength
SA	special assembly	Ugrnd	underground
SP	special provisions	Util	utility
G	specific gravity		
Spk	spike	VG	valley gutter
SB	split barrel sample	Vap	vapor
SH	sprinkler head	Vert	vertical
SV	sprinkler valve	VCP	vitrified clay pipe
Sq	square	Vol	volume
Stk	stake		
Std	standard	Wkwy	walkway
N	standard penetration test	W	water content
Std Specs	standard specifications	WGV	water gate valve
Stm L	steam line	WL	water line
SEC	steel encased concrete	WM	water main
SMA	stone matrix asphalt	WMV	water main valve
SSD	stopping sight distance	W Mtr	water meter
SD	storm drain	WSV	water service valve
St	street	WW	water well
SPP	structural plate pipe	Wrng	wearing
SPPA	structural plate pipe arch	WIM	weigh in motion
Str	structure	W	west
Subd	subdivision	WB	westbound
Sub	subgrade	Wrng	wiring
Sub Prep	subgrade preparation	W/	with
Ss	subsoil	W/o	without
SS	supplement specification	WC	witness corner
Supp	supplemental		
Surf	surfacing		
Surv	survey		
Sym	symmetrical		

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MEASUREMENTS

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

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

SURVEY DESCRIPTIONS

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

SOIL TYPES

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

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

702COM 702 Communications  
 ACCENT Accent Communications  
 AGASSIZ WU Agassiz Water Users Incorporated  
 AGC Associated General Contractors of America  
 ALL PL Alliance Pipeline  
 ALL SEAS WU All Seasons Water Users Association  
 AMOCO PI Amoco Pipeline Company  
 AMRDA HESS Amerada Hess Corporation  
 AT&T AT&T Corporation  
 B PAW Bear Paw Energy Incorporated  
 BAKER ELEC Baker Electric  
 BASIN ELEC Basin Electric Cooperative Incorporated  
 BEK TEL Bek Communications Cooperative  
 BELLE PL Belle Fourche Pipeline Company  
 BLM Bureau of Land Management  
 BNSF Burlington Northern Santa Fe Railway  
 BOEING Boeing  
 BRNS RWD Barnes Rural Water District  
 BURK-DIV ELEC Burke-Divide Electric Cooperative  
 BURL WU Burleigh Water Users  
 CABLE ONE Cable One  
 CABLE SERV Cable Services  
 CAP ELEC Capital Electric Cooperative Incorporated  
 CASS CO ELEC Cass County Electric Cooperative  
 CASS RWU Cass Rural Water Users Incorporated  
 CAV ELEC Cavalier Rural Electric Cooperative  
 CBLCOM Cablecom Of Fargo  
 CENEX PL Cenex Pipeline  
 CENT PL WATER DIST Central Pipe Line Water District  
 CENT PWR ELEC Central Power Electric Cooperative  
 CENTURYLINK CenturyLink  
 COE Corps of Engineers  
 CONS TEL Consolidated Telephone  
 CONT RES Continental Resource Inc  
 CPR Canadian Pacific Railway  
 D O E Department Of Energy  
 DAK CARR Dakota Carrier Network  
 DAK CENT TEL Dakota Central Telephone  
 DAK RWD Dakota Rural Water District  
 DGC Dakota Gasification Company  
 DICKEY R NET Dickey Rural Networks  
 DICKEY RWU Dickey Rural Water Users Association  
 DICKEY TEL Dickey Telephone  
 DNRR Dakota Northern Railroad  
 DOME PL Dome Pipeline Company  
 DVELEC Dakota Valley Electric Cooperative  
 DVMW Dakota, Missouri Valley & Western  
 ENBRDG Enbridge Pipelines Incorporated  
 ENVENTIS Enventis Telephone  
 FALK MNG Falkirk Mining Company  
 FHWA Federal Highway Administration  
 G FKS-TRL WD Grand Forks-traill Water District  
 GETTY TRD & TRAN Getty Trading & Transportation  
 GLDN W ELEC Golden West Electric Cooperative  
 GRGS CO TEL Griggs County Telephone  
 GTR RAMSEY WD Greater Ramsey Water District

GT PLNS NAT GAS Great Plains Natural Gas Company  
 HALS TEL Halstad Telephone Company  
 IDEA1 Idea1  
 INT-COMM TEL Inter-Community Telephone Company  
 KANEB PL Kaneb Pipeline Company  
 KEM ELEC Kem Electric Cooperative Incorporated  
 KOCH GATH SYS Koch Gathering Systems Incorporated  
 LKHD PL Lakehead Pipeline Company  
 LNGDN RWU Langdon Rural Water Users Incorporated  
 LWR YELL R ELEC Lower Yellowstone Rural Electric  
 MCKNZ CON McKenzie Consolidated Telcom  
 MCKNZ ELEC McKenzie Electric Cooperative  
 MCKNZ WRD McKenzie County Water Resource District  
 MCLEOD McLeod USA  
 MCLN ELEC McLean Electric Cooperative  
 MCLN-SHRDN R WAT McLean-Sheridan Rural Water  
 MDU Montana-dakota Utilities  
 MIDCO MidContinent Communications  
 MIDSTATE TEL Midstate Telephone Company  
 MINOT CABLE Minot Cable Television  
 MINOT TEL Minot Telephone Company  
 MISS VALL COMM Missouri Valley Communications  
 MISS W W S Missouri West Water System  
 MNKOTA PWR Minnkota Power  
 MOR-GRAN-SOU ELEC Mor-gran-sou Electric Cooperative  
 MOUNT-WILLI ELEC Mountrail-williams Electric Cooperative  
 MRE LBTY TEL Moore & Liberty Telephone  
 MUNICIPAL City Water And Sewer  
 MUNICIPAL City Of '.....'  
 N CENT ELEC North Central Electric Cooperative  
 N VALL W DIST North Valley Water District  
 ND PKS & REC North Dakota Parks And Recreation  
 ND TEL North Dakota Telephone Company  
 NDDOT North Dakota Department of Transportation  
 NDSU SOIL SCI DEPT NDSU Soil Science Department  
 NEMONT TEL Nemont Telephone  
 NODAK R ELEC Nodak Rural Electric Cooperative  
 NOON FRMS TEL Noonan Farmers Telephone Company  
 NPR Northern Plains Railroad  
 NSP Northern States Power  
 NTH PRAIR RW Northern Prairie Rural Water Association  
 NTHN BRDR PL Northern Border Pipeline  
 NTHN PLNS ELEC Northern Plains Electric Cooperative Incorporated  
 NTHWSTRN REF Northwestern Refinery Company  
 NW COMM Northwest Communication Cooperation  
 NWRWD Northwest Rural Water District  
 ONEOK Oneok gas  
 OSHA Occupational Safety and Health Administration  
 OTTR TL PWR Otter Tail Power Company  
 P L E M Prairielands Energy Marketing  
 POLAR COM Polar Communications  
 PVT ELEC Private Electric  
 QWEST Qwest Communications  
 R&T W SUPPLY R & T Water Supply Association

RED RIV COMM Red River Rural Communications  
 RESVTN TEL Reservation Telephone  
 ROBRTS TEL Roberts Company Telephone  
 R-RIDER ELEC Roughrider Electric Cooperative  
 RRVW Red River Valley & Western Railroad  
 S CENT REG WD South Central Regional Water District  
 S E W U South East Water Users Incorporated  
 SCOTT CABLE Scott Cable Television Dickinson  
 SHERDN ELEC Sheridan Electric Cooperative  
 SHEYN VLY ELEC Sheyenne Valley Electric Cooperative  
 SKYTECH Skyland Technologies Incorporated  
 SLOPE ELEC Slope Electric Cooperative Incorporated  
 SOURIS RIV TELCOM Souris River Telecommunications  
 ST WAT COMM State Water Commission  
 STATE LN WATER State Line Water Cooperative  
 STER ENG Sterling Energy  
 STUT RWU Stutsman Rural Water Users  
 SW PL PRJ Southwest Pipeline Project  
 T M C Turtle Mountain Communications  
 TCI TCI of North Dakota  
 TESORO GHG PLNS PL Tesoro High Plains Pipeline  
 TRI-CNTY WU Tri-County Water Users Incorporated  
 TRL CO RWU Traill County Rural Water Users  
 UNTD TEL United Telephone  
 UPPR SOUR WUA Upper Souris Water Users Association  
 US SPRINT U.S. Sprint  
 USAF MSL CABLE U.S.A.F. Missile Cable  
 USFWS US Fish and Wildlife Service  
 USW COMM U.S. West Communications  
 VRNDRY ELEC Verendrye Electric Cooperative  
 W RIV TEL West River Telephone Incorporated  
 WAPA Western Area Power Administration  
 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

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## Existing Topography

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

## Proposed Topography

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

## Existing Utilities

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

## Proposed Utilities

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

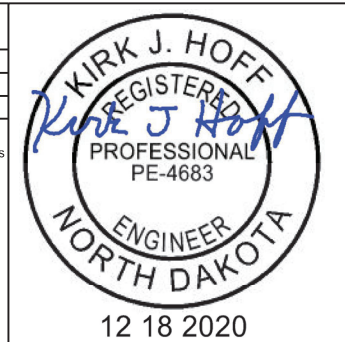
## Traffic Utilities

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

## Sign Structures

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

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# LINE STYLES

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### Right Of Way

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

### Boundary Control

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

### Cross Sections and Typical

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

### Geotechnical

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

### Countours

- Depression Contours
- Supplemental Contour

### Profile

- Subgrade, Subcut or Ditch Grade
- Topsoil Profile

### Striping

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

### Pavement Joints

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

### Bridge Details

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

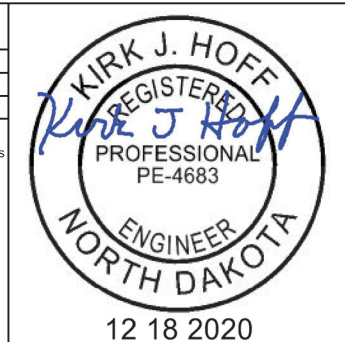
### Erosion Control

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

### Environmental

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

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SYMBOLS



North Arrow (Half Scale)



Alignment Data Point



Alignment Monument



Spot Elevation



Existing Miscellaneous Spot



Existing Access Control Arrow



Existing Benchmark



Reset USGS Marker



Iron Monument Found



Iron Pin R/W Monument



Property Corner



Iron Pin Reference Monument



Right of Way Marker (Exst, Ppsd, Reset)



Existing Federal Reference Corner



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



Existing Witness Corner



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



Existing Traverse PI Aerial Panel



Existing Reference Marker Point NGS



Existing EFB Misc



Existing Bush or Shrub



Existing Large Evergreen Tree



Existing Small Evergreen Tree



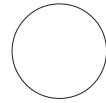
Existing Large Tree



Existing Small Tree



Existing Tree Trunk



Cairn or Stone Circle



Existing Artifact



Existing Satellite Dish



Existing Weather Station



Existing Windmill or Tower



Reinforced Pavement



Continuous Split Barrel Sample



Flight Auger Sample



Split Barrel Sample



Thinwall Tube Sample



Standard Penetration Test



Inclinometer Tube



Excavation Unit



Existing Ground Water Well Bore Hole

















































































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Professional Engineer Seal for Kirk J. Hoff, North Dakota, PE-4683, dated 12 18 2020.



# SYMBOLS

D-101-32

 Existing Luminaire  Luminaire LED  Existing Light Standard Luminaire  Relocate Light Standard  Light Standard Light LED Luminaire  Light Standard 35 Watt High Pressure Sodium Vapor Luminaire  Light Standard 50 Watt High Pressure Sodium Vapor Luminaire  Light Standard 70 Watt High Pressure Sodium Vapor Luminaire  Light Standard 100 Watt High Pressure Sodium Vapor Luminaire  Light Standard 150 Watt High Pressure Sodium Vapor Luminaire  Light Standard 200 Watt High Pressure Sodium Vapor Luminaire  Light Standard 250 Watt High Pressure Sodium Vapor Luminaire  Light Standard 310 Watt High Pressure Sodium Vapor Luminaire  Light Standard 400 Watt High Pressure Sodium Vapor Luminaire  Light Standard 700 Watt High Pressure Sodium Vapor Luminaire  Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire  Emergency Vehicle Detector  Video Detection Camera	  High Mast Light Standard 3 Luminaire (Exst, Ppsd)   High Mast Light Standard 4 Luminaire (Exst, Ppsd)   High Mast Light Standard 5 Luminaire (Exst, Ppsd)   High Mast Light Standard 6 Luminaire (Exst, Ppsd)   High Mast Light Standard 7 Luminaire (Exst, Ppsd)   High Mast Light Standard 8 Luminaire (Exst, Ppsd)   High Mast Light Standard 9 Luminaire (Exst, Ppsd)   High Mast Light Standard 10 Luminaire (Exst, Ppsd)   Overhead Sign Structure Load Center (Exst, Ppsd)   Traffic Signal Controller (Exst, Ppsd)   Pad Mounted Traffic Signal Controller (Exst, Ppsd)   Flashing Beacon (Exst, Ppsd)   Concrete Foundation (Exst, Ppsd)   Pipe Mounted Flasher (Exst, Ppsd)   Pad Mounted Feed Point (Exst, Ppsd)   Pipe Mounted Feed Point with Pad (Exst, Ppsd)   Pole Mounted Feed Point (Exst, Ppsd)   Junction Box (Exst, Ppsd)  Existing Pedestrian Head with Number  Existing Signal Head  Pole Mounted Head  Existing Lighting Standard Pole	 Existing Traffic Signal Standard    Pull Box (Exst-Ppsd-Undefined)   Intelligent Transportation Pull Box (Exst, Ppsd)   Transformer (Exst, Ppsd)    Power Pole (Exst-Ppsd-with Transformer)   Wood Pole (Exst, Ppsd)   Pedestrian Push Button Post (Exst, Ppsd)  Existing Pole  Existing Telephone Pole  Existing Post     Connection Conductor (Ground, Neutral, Phase 1, Phase 2)
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NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions



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

12 18 2020

# SYMBOLS

D-101-33

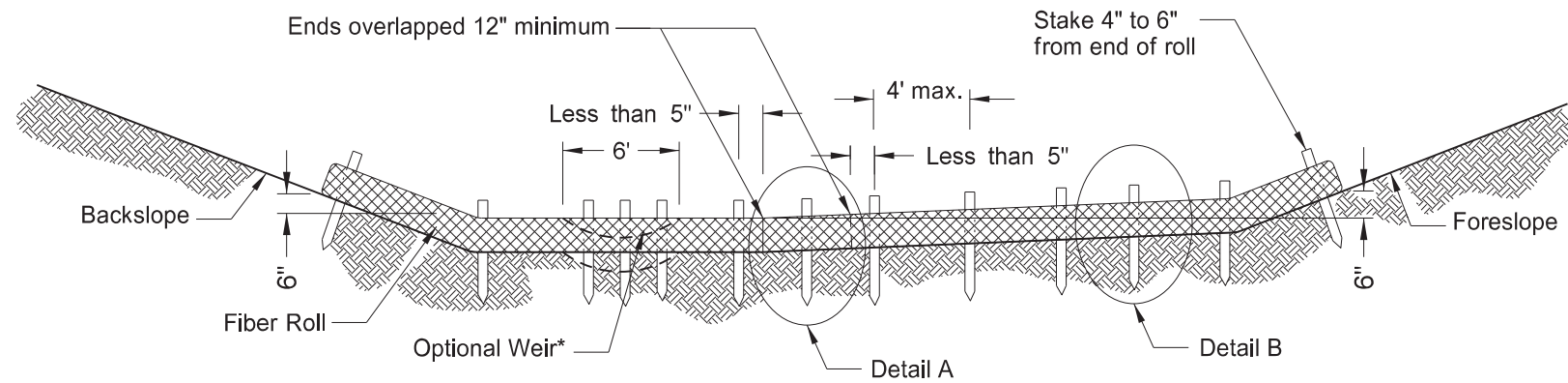
			Existing Manhole (Electrical, Gas, Telephone)		Cap or Stub Exst Gas, Exst Sanitary, Exst Storm Drain, Ppsd Storm Drain, Exst Water
			Water Manhole (Exst, Exst with Valve)		
			Sanitary Sewer Manhole (Exst, Ppsd, Exst with Valve)		Existing Pedestal Electrical, Telephone, Fiber Optic Telephone, TV, Fiber Optic TV, Undefined
			Sanitary Force Main Manhole (Exst, Ppsd, Exst with Valve)		
			Storm Drain Manhole (Exst, Ppsd, Exst with Inlet, Ppsd with Inlet)		Existing Pipe Vent Gas, Fuel, Sanitary, Storm Drain, Water, Undefined
			Force Main Storm Drain Manhole (Exst, Exst with Valve)		
			Manhole (Ppsd, Ppsd 48 Inch, Exst Undefined)		Valve Exst Gas, Exst Water, Ppsd Water, Exst Undefined
			Existing Water Appurtenance		
			Sprinkler Head (Exst, Ppsd)		Pump Sanitary, Storm Drain, Exst Water
			Fire Hydrant (Exst, Ppsd)		
			Cleanout (Exst Sanitary, Underdrain)		Corrugated Metal End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)
			Existing Catch Basin Inlet (Round, Square)		Reinforced Concrete End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)
			Existing Curb Inlet (Round, Square)		
			Existing Slotted Reinforced Concrete Pipe		
			Catch Basin (Riser 30 Inch, Beehive, Type A)		Existing Utility Marker
			Inlet Mountable Curb (Type A, Type B)		Existing Meter
			Inlet Saddle Base (Type 1, Type 2)		Existing Fuel Dispensers
			Inlet Special (Catch Basin, Type 1, Type A)		Existing Fuel Filler Pipes
			Inlet (Tee, Type 1, Type 2, Type 2 Double)		Existing Fuel Leak Sensors
			Median Drain		
			Headwall (Exst, Ppsd, Ppsd Single with Vegetation Barrier, Ppsd Double with Vegetation Barrier)		

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

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

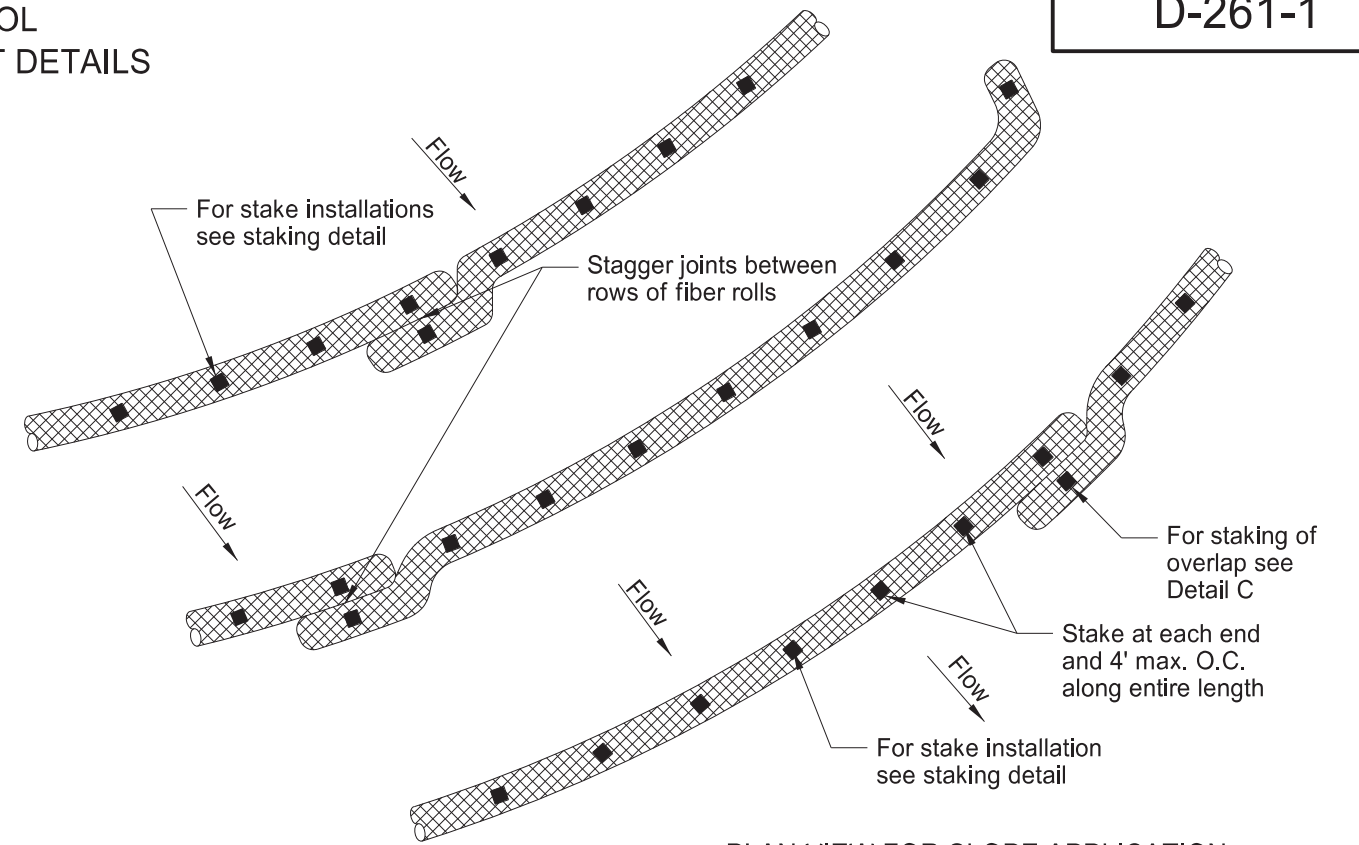


EROSION CONTROL  
FIBER ROLL PLACEMENT DETAILS

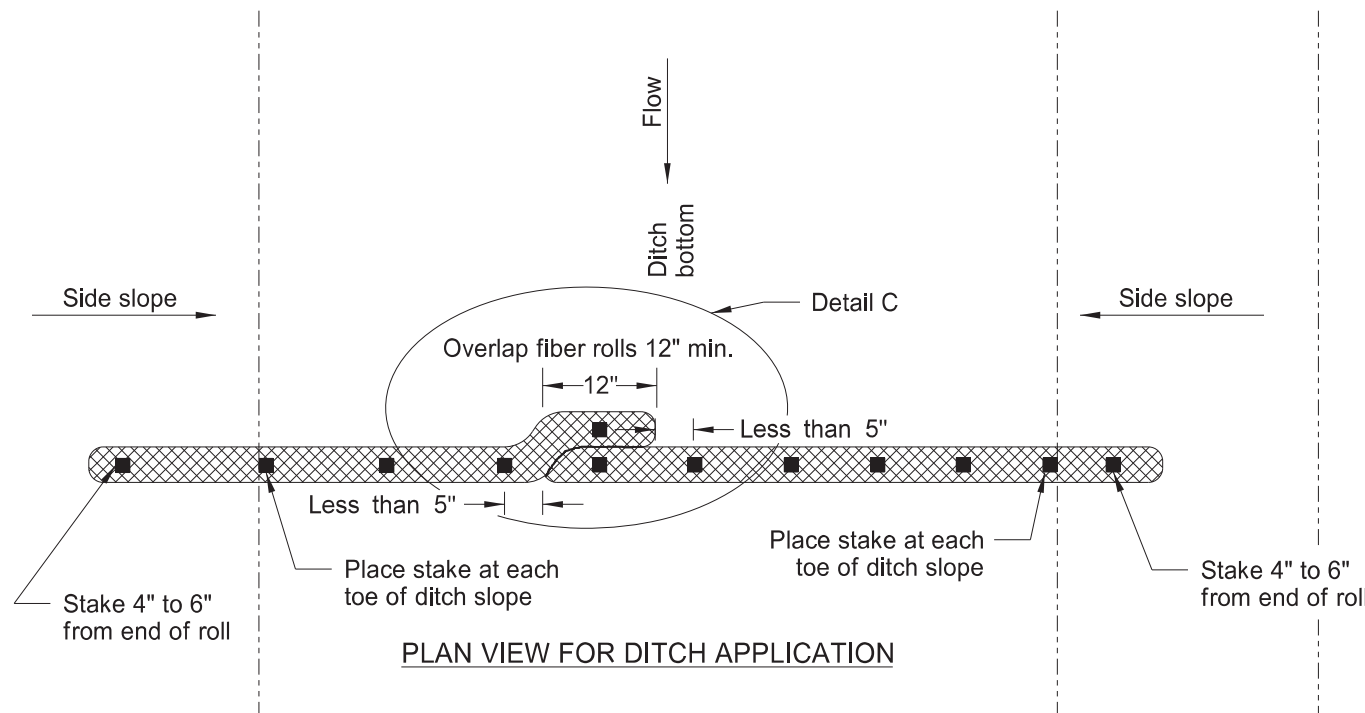


\*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back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

12 OR 20 INCH FIBER ROLL - DITCH BOTTOM

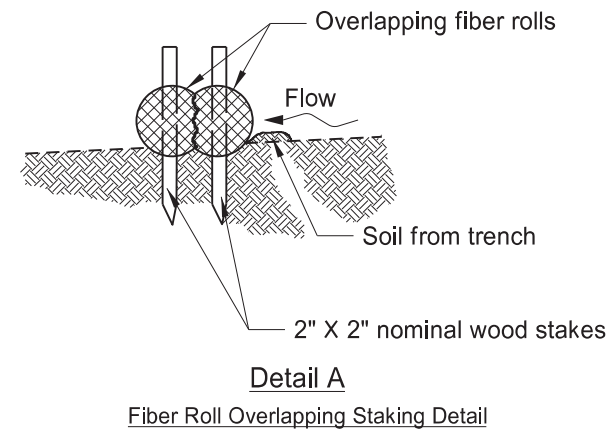


PLAN VIEW FOR SLOPE APPLICATION

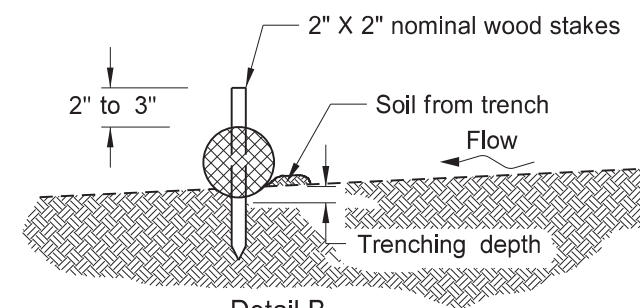


PLAN VIEW FOR DITCH APPLICATION

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



Detail A  
Fiber Roll Overlapping Staking Detail



Detail B  
Fiber Roll Staking Detail

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-18-10	
REVISIONS	
DATE	CHANGE
06-10-13	Added plan view for ditch and slope application. Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.
06-26-14	Changed standard drawing number from D-708-7 to D-261-1.
08-27-19	New Design Engineer PE Stamp

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

CONSTRUCTION SIGN DETAILS  
PROJECT FUNDING SIGN

D-704-6

SIGN NUMBER	I2-5-96	STATION(S):	AREA: 32.0 Sq.Ft.		
WIDTH X HEIGHT	8'-0" x 4'-0"				
BORDER WIDTH	1.25" (inset 0.75")				
CORNER RADIUS	3"				
MOUNTING	Ground				
BACKGROUND	TYPE: XI Reflective COLOR: White				
LEGEND/BORDER	TYPE: Non-reflective COLOR: Black				
SYMBOL	X	Y	WID	HT	ANGLE
ND_CIRCLE_LOGO	6	22.8	18	18	0
	44.2	4.2	7.5	8.6	0

Dimensions are in inches,tenths      Letter locations are panel edge to lower left corner

PANEL STYLE: ND\_Reg\_48\_Large,ssj

LETTER POSITION (X)												LENGTH	SIZE	SERIES			
Y	O	U	R	H	I	G	H	W	A	Y							
33.5	38.1	42.8	47.5	55.4	60.1	62.1	66.7	70.9	75.8	80					50.3	6	C 2000
27.4	31.8	36.5	40.4	43.9	48.5	52.6	60.5	64.7	72.2	77.5	82.3	86.6			62.6	6	C 2000
35.5	38.1	41.2	44.3	47.4	50.1	55.3	57.9								25	4	C 2000

(A)

FUNDING SOURCE MESSAGE VARIATIONS
FEDERAL
STATE
FEDERAL - STATE
FEDERAL - LOCAL
FEDERAL - STATE - LOCAL
STATE - LOCAL

Use a horizontal spacing of 3" between words and hyphens. Center message horizontally in sign panel.

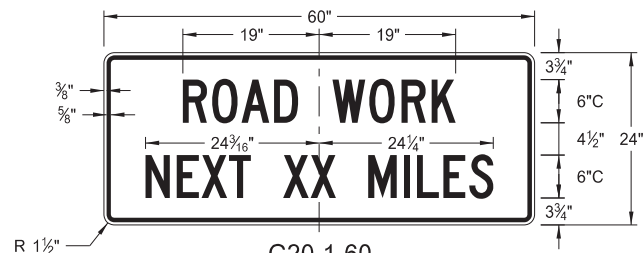
- Notes:
- 1) Contact the Communications Division of the NDDOT to obtain a copy of the image for the NDDOT Logo.
  - 2) Contact Project Engineer for funding source message.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-08-21	
REVISIONS	
DATE	CHANGE

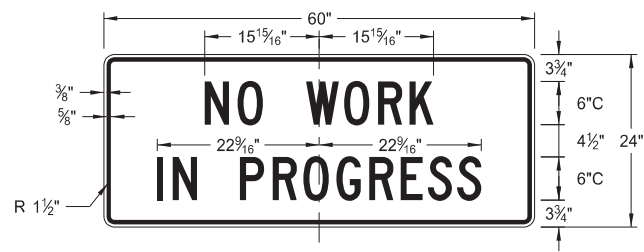
12/08/21

CONSTRUCTION SIGN DETAILS  
 TERMINAL AND GUIDE SIGNS

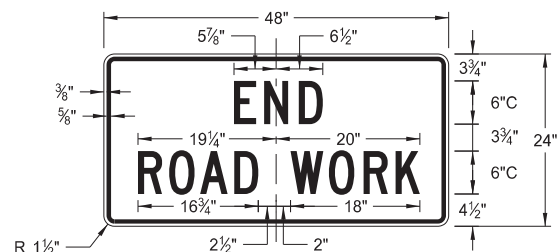
D-704-9



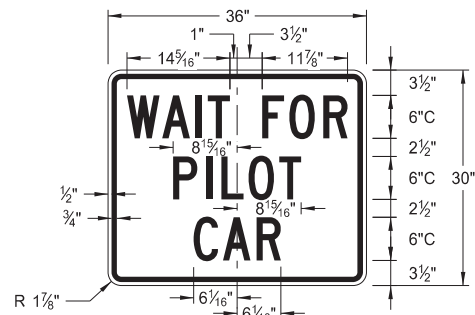
G20-1-60  
 Legend: black (non-refl)  
 Background: orange



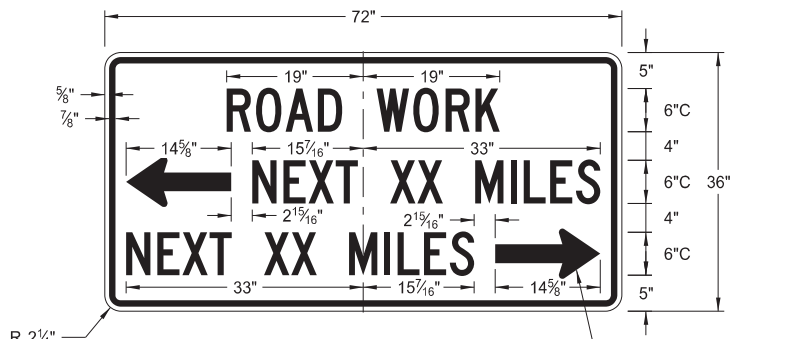
G20-1b-60  
 Legend: black (non-refl)  
 Background: orange



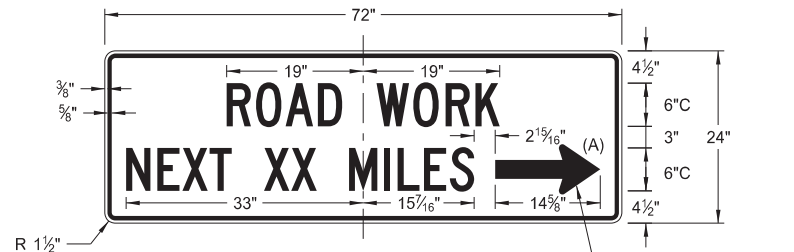
G20-2-48  
 Legend: black (non-refl)  
 Background: orange



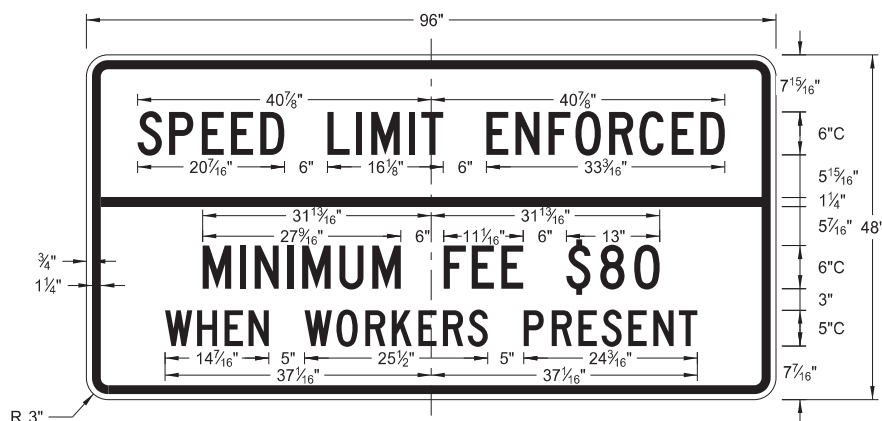
G20-4b-36  
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 Background: orange



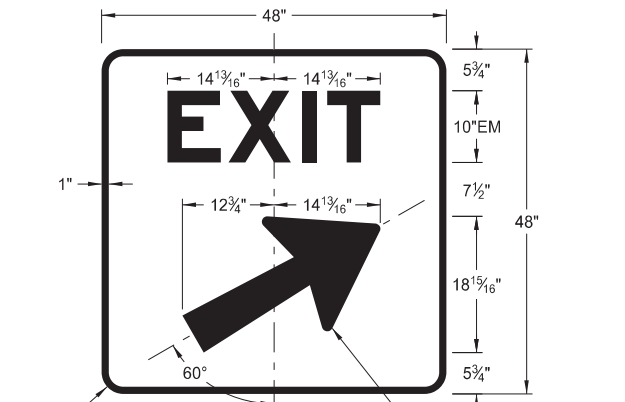
G20-50a-72  
 Legend: black (non-refl)  
 Background: orange



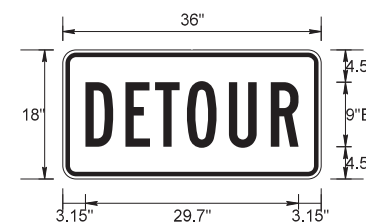
G20-52a-72  
 Legend: black (non-refl)  
 Background: orange



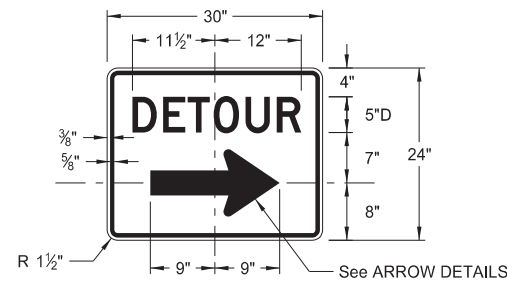
G20-55-96  
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 Background: orange



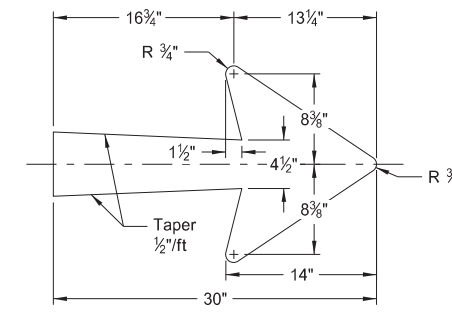
E5-1(L or R)-48  
 Legend: white  
 Background: green (orange optional)



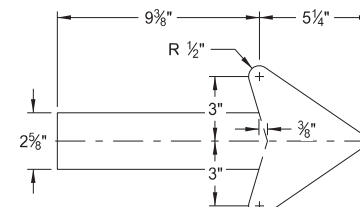
M4-8-36  
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 Background: orange



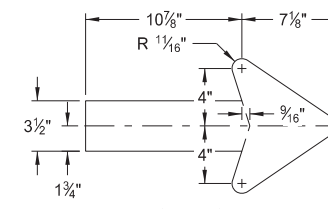
M4-9(L or R)-30 &  
 M4-9-30  
 Legend: black (non-refl)  
 Background: orange



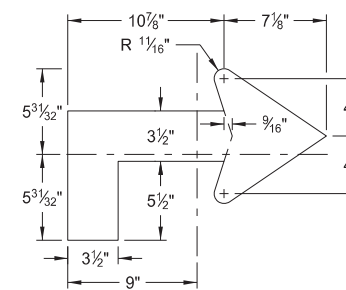
E5-1-48



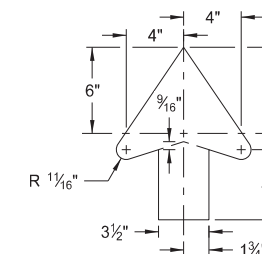
G20-50a-72  
 G20-52a-72



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



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



M4-9-30  
 Straight

ARROW DETAILS

NOTES:

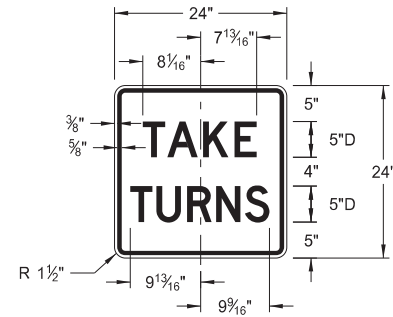
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

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

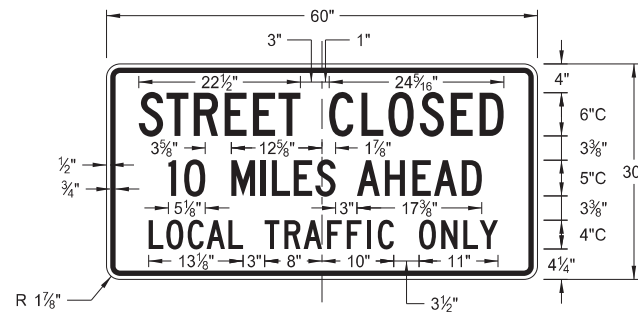
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 PE- 4683,  
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CONSTRUCTION SIGN DETAILS  
REGULATORY SIGNS

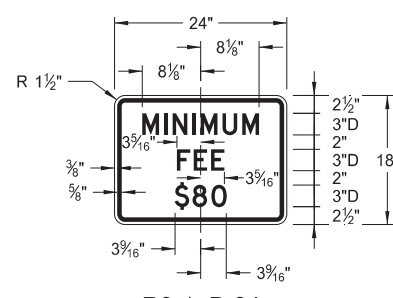
D-704-10



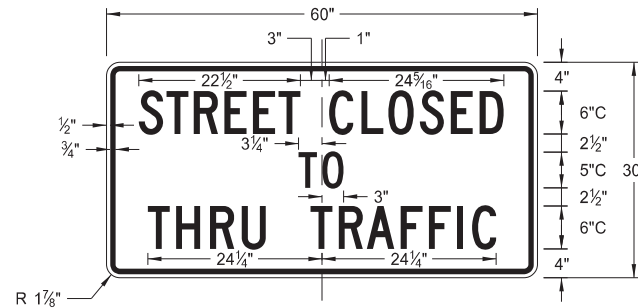
R1-50P-24  
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Background: white



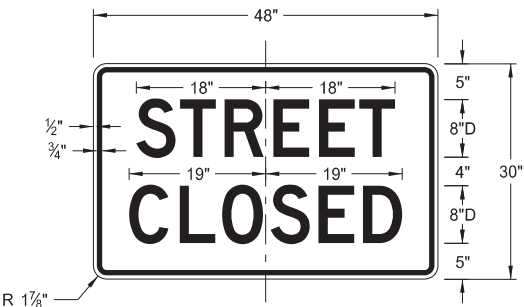
R11-3c-60  
Legend: black (non-refl)  
Background: white



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



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

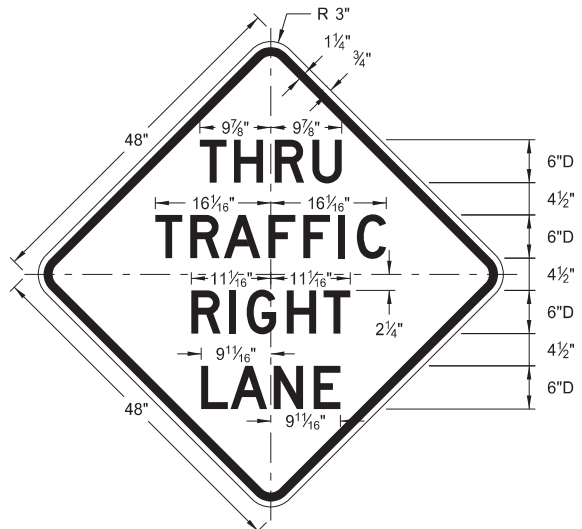


R11-2a-48  
Legend: black (non-refl)  
Background: white

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

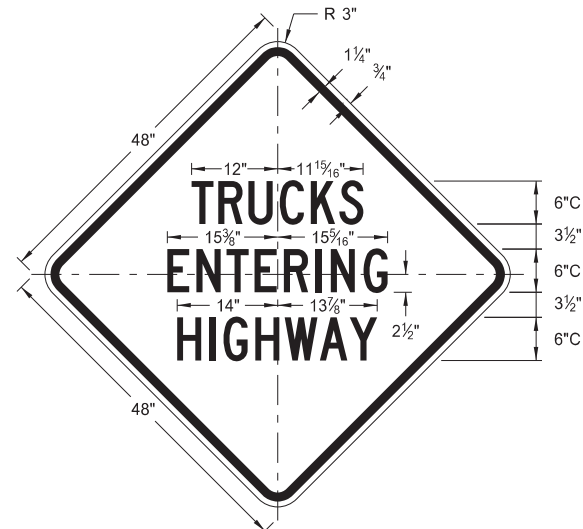
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CONSTRUCTION SIGN DETAILS  
WARNING SIGNS



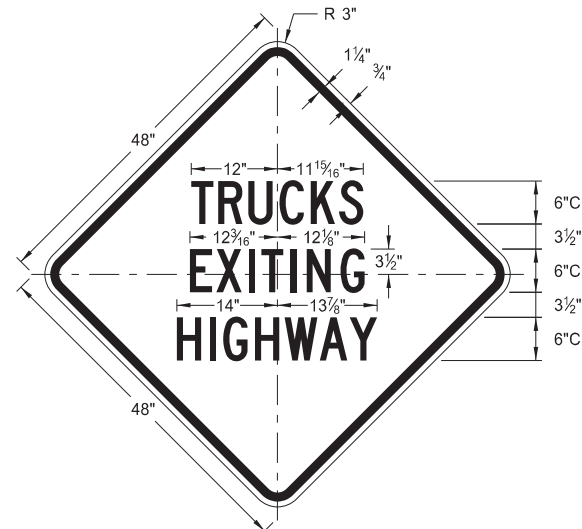
W5-8-48

Legend: black (non-refl)  
Background: orange



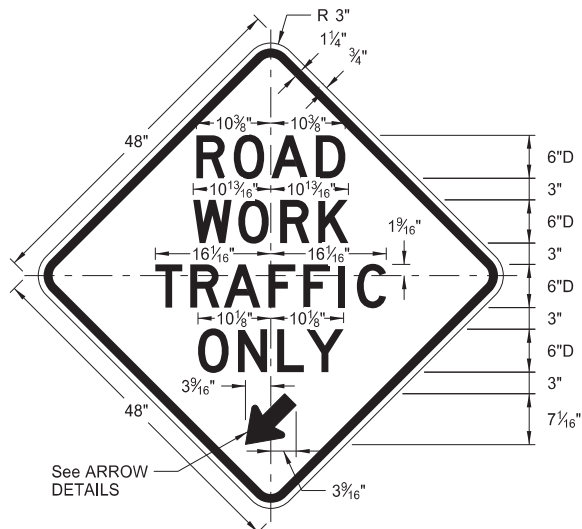
W8-53-48

Legend: black (non-refl)  
Background: orange



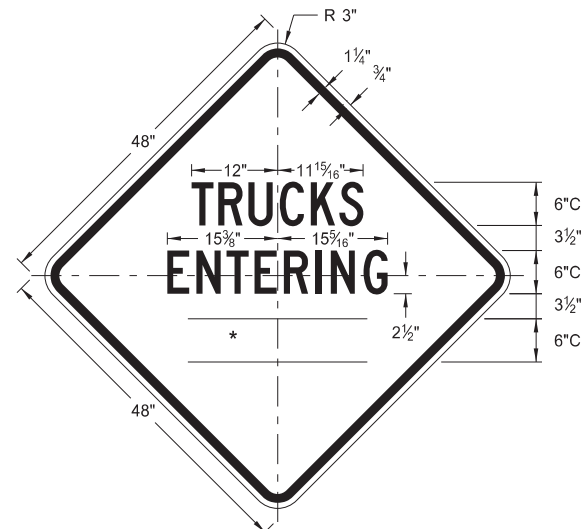
W8-56-48

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Background: orange



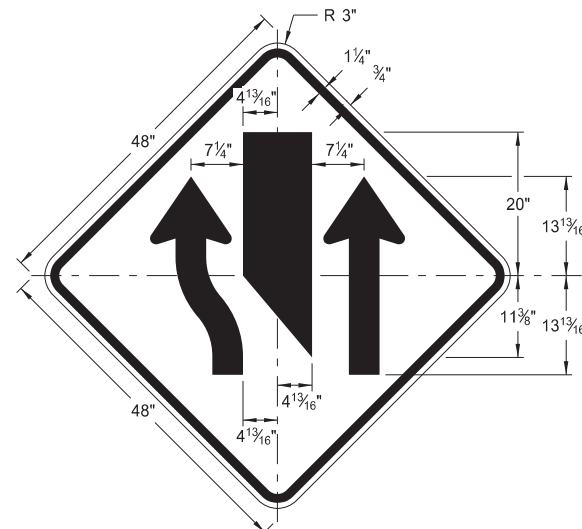
W5-9-48

Legend: black (non-refl)  
Background: orange



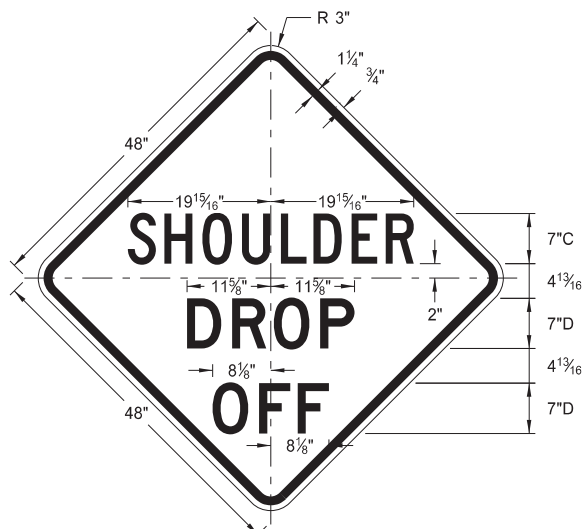
W8-54-48

Legend: black (non-refl)  
Background: orange



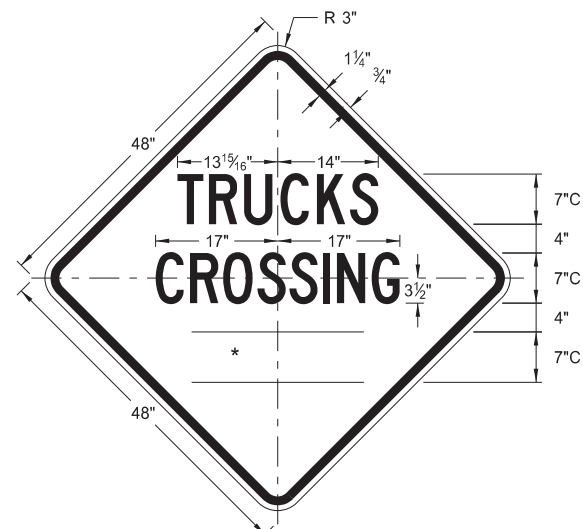
W9-3a-48

Legend: black (non-refl)  
Background: orange



W8-9a-48

Legend: black (non-refl)  
Background: orange

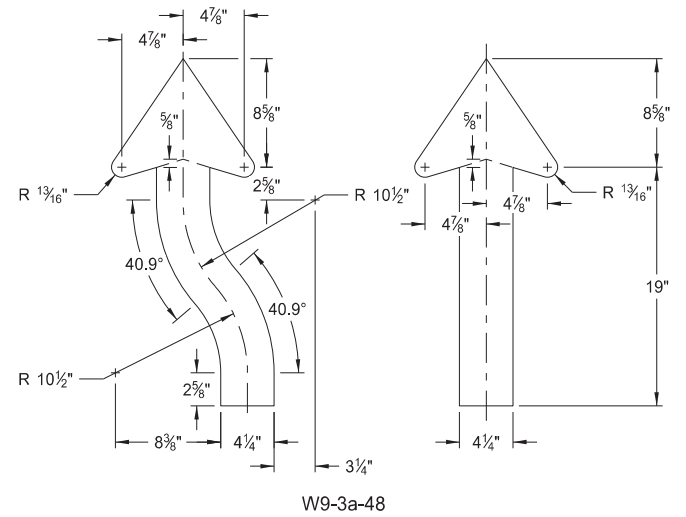
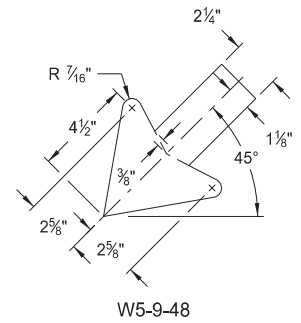


W8-55-48

Legend: black (non-refl)  
Background: orange

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

\* DISTANCE MESSAGES



ARROW DETAILS

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

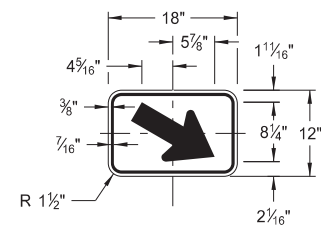
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CONSTRUCTION SIGN DETAILS  
WARNING SIGNS

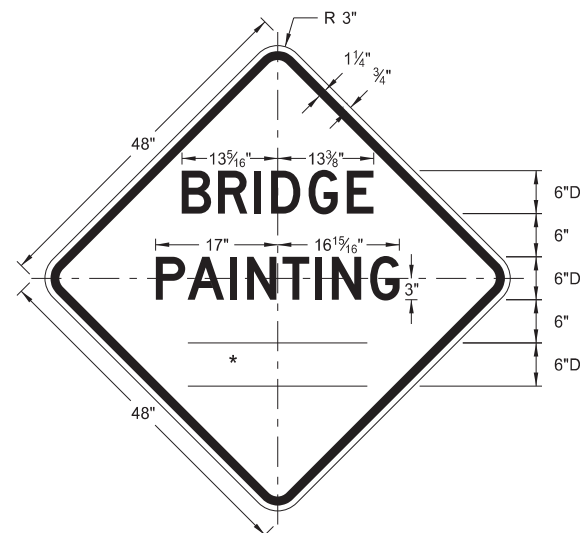
WORD	LETTER SPACING
AHEAD	Standard
200 FT	Standard
350 FT	Standard
500 FT	Standard
1000 FT	Reduce 40%
1500 FT	Reduce 40%
½ MILE	Reduce 50%
1 MILE	Standard

\* DISTANCE MESSAGES



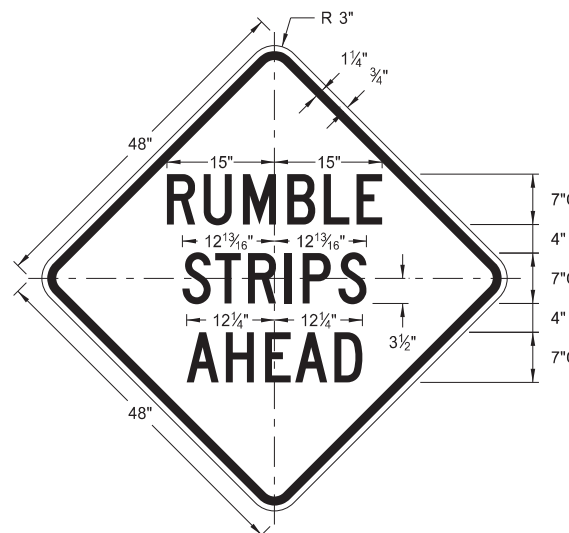
W16-7aP-18

Legend: black (non-refl)  
Background: orange



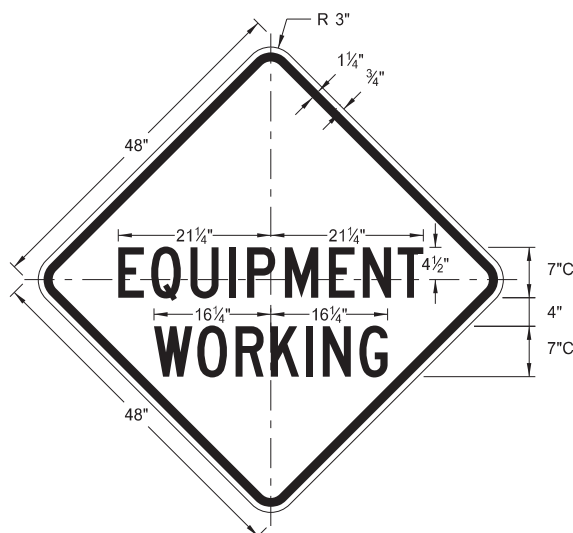
W21-50-48

Legend: black (non-refl)  
Background: orange



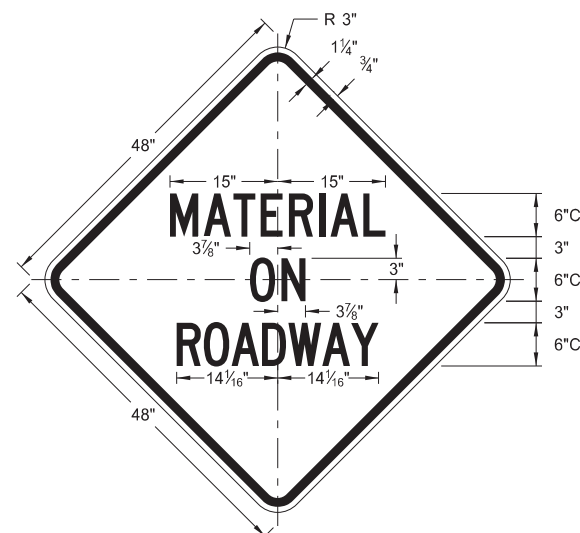
W21-53-48

Legend: black (non-refl)  
Background: orange



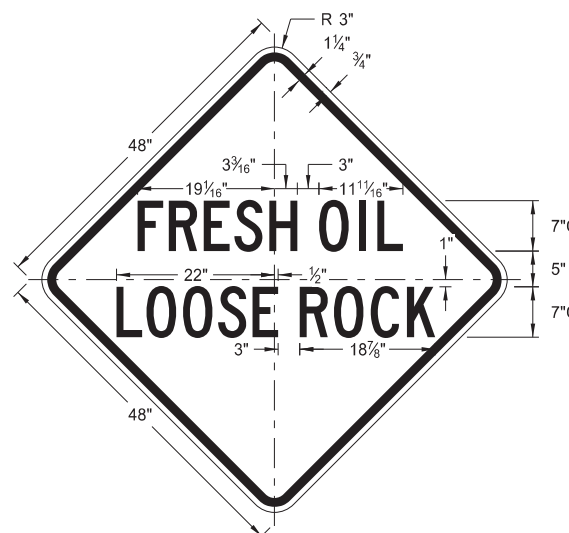
W20-51-48

Legend: black (non-refl)  
Background: orange



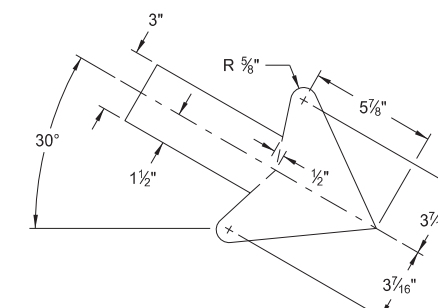
W21-51-48

Legend: black (non-refl)  
Background: orange

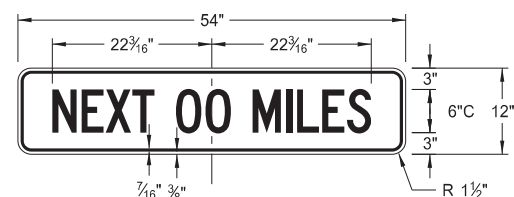


W22-8-48

Legend: black (non-refl)  
Background: orange

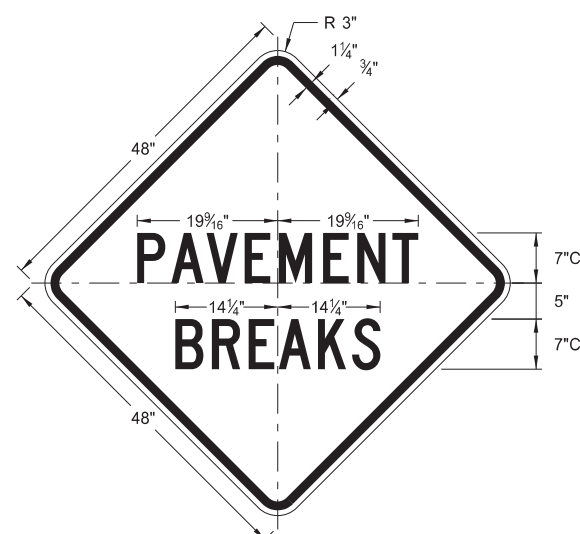


W16-7aP-18



W20-52P-54

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Background: orange



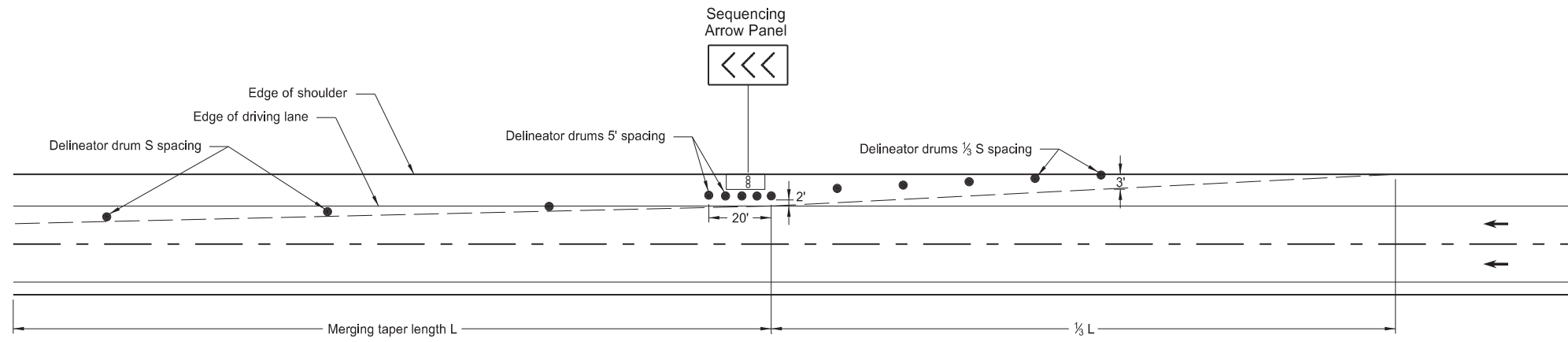
W21-52-48

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Background: orange

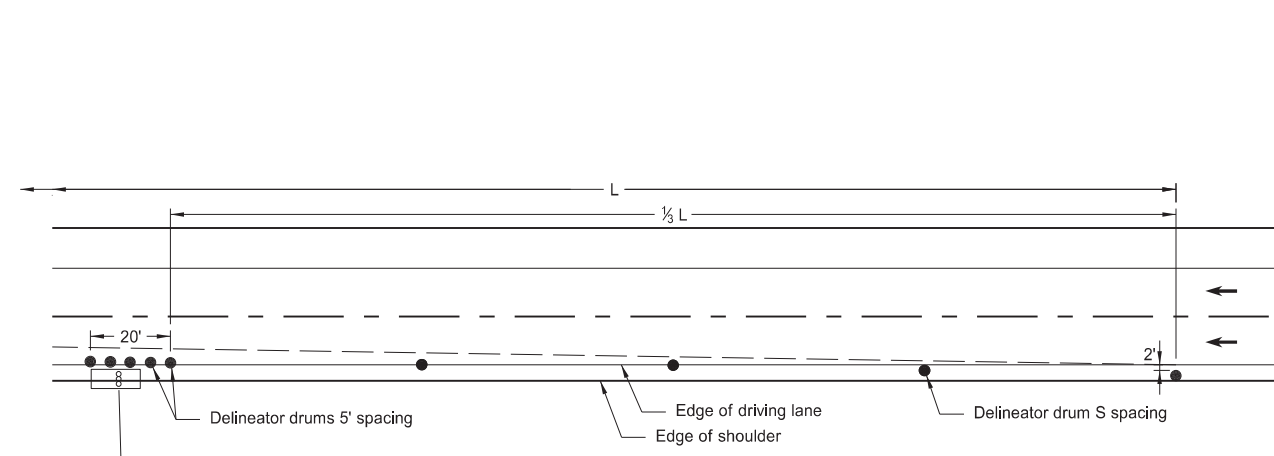
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
5-31-18	
REVISIONS	
DATE	CHANGE
11-01-19	Added details for sign W16-7aP-18.

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PE- 4683,  
on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

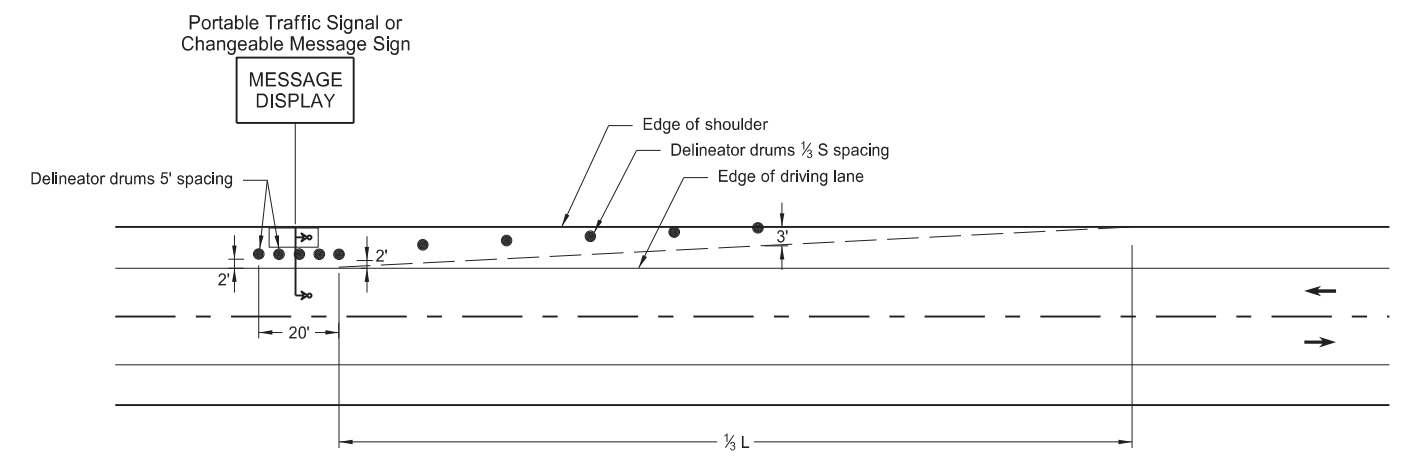
SHOULDER CLOSURE TAPERS



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



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



PORTABLE TRAFFIC SIGNAL OR CHANGEABLE MESSAGE SIGN ON SHOULDER

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

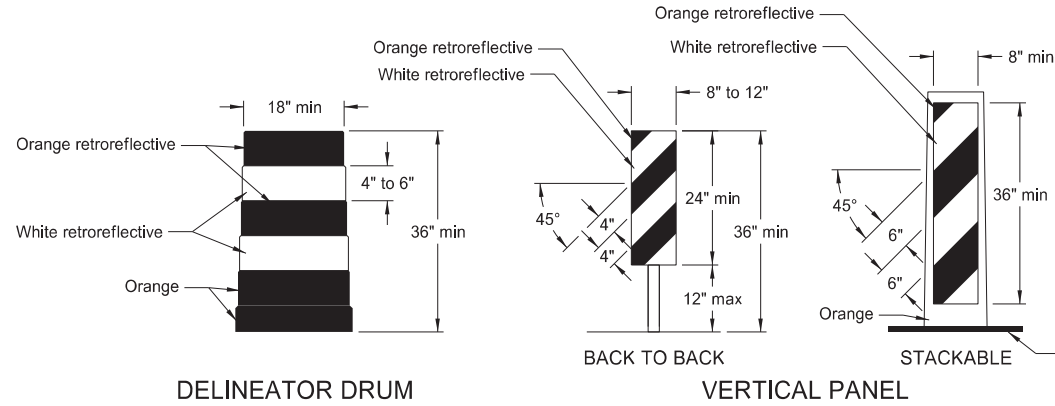
Notes:

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-25-19	Added L dimension to detail

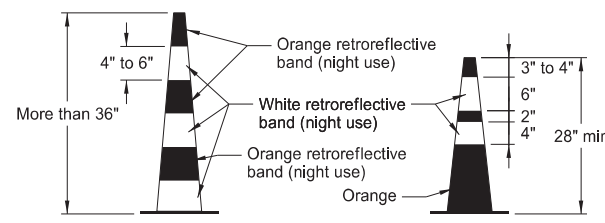
This document was originally issued and sealed by  
Kirk J Hoff,  
Registration Number  
PE- 4683,  
on 10/25/19 and the original document is stored at the North Dakota Department of Transportation

BARRICADE AND CHANNELIZING DEVICE DETAILS

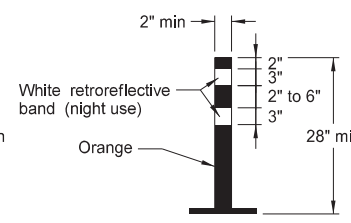


DELINEATOR DRUM

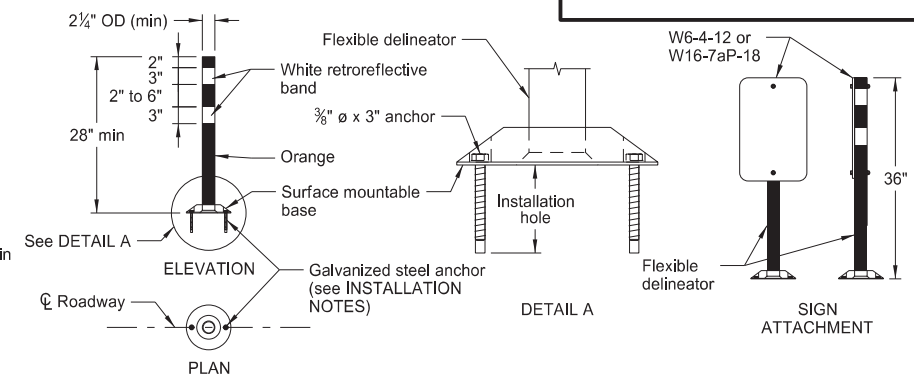
VERTICAL PANEL



TRAFFIC CONE



TUBULAR MARKER



FLEXIBLE DELINEATOR

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

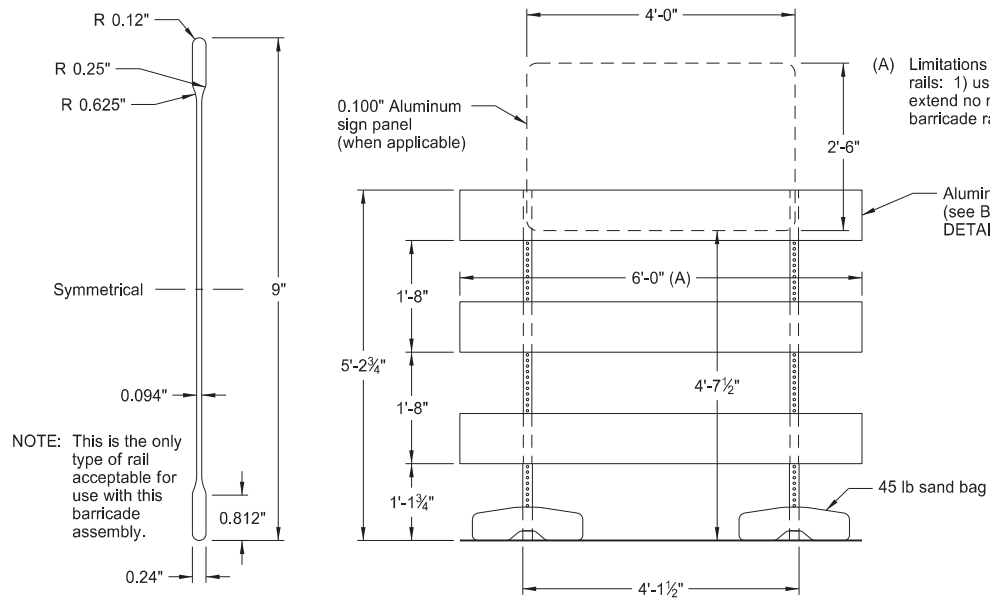
Provide alternating orange and white retroreflective stripes, sloping downward in direction vehicular traffic is to pass. Place retroreflective sheeting on both sides of panel with a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective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

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

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

INSTALLATION NOTES:

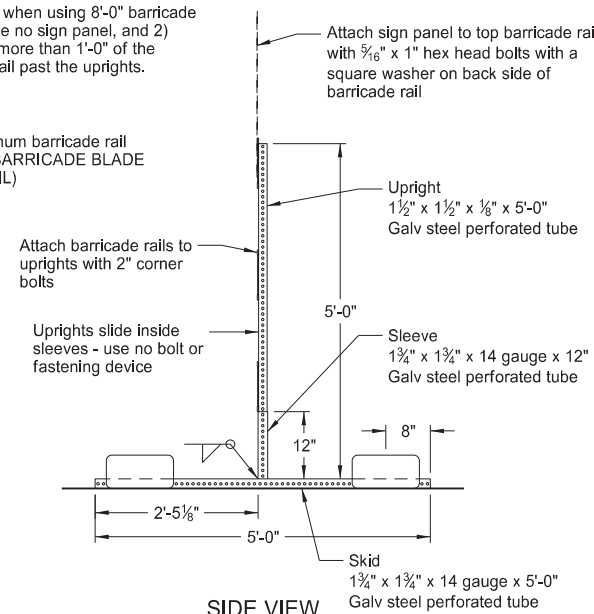
1. Drill installation holes to diameter and depth required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, use an 8" x 8" butyl pad or hot melt butyl. Remove butyl as close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



BARRICADE BLADE DETAIL

ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

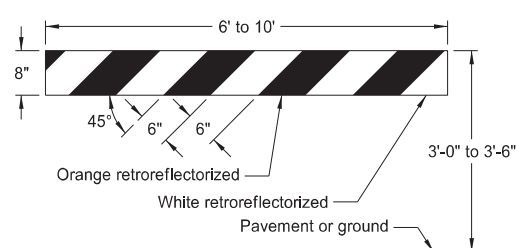


ELEVATION VIEW

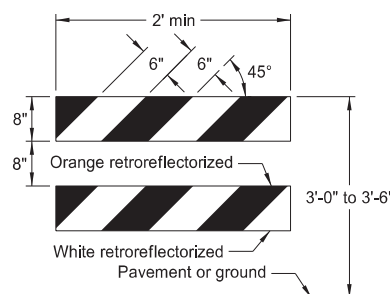
BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

SIDE VIEW

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

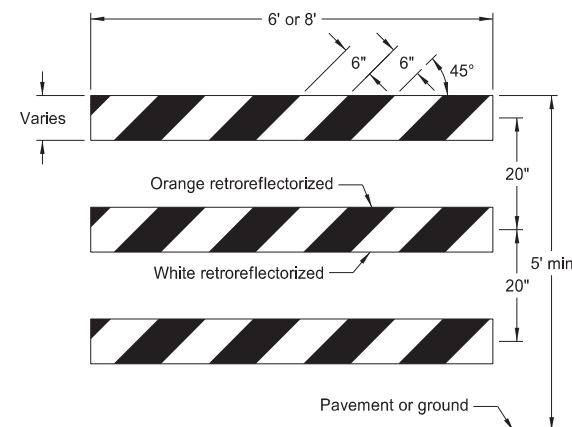


TYPE I BARRICADE

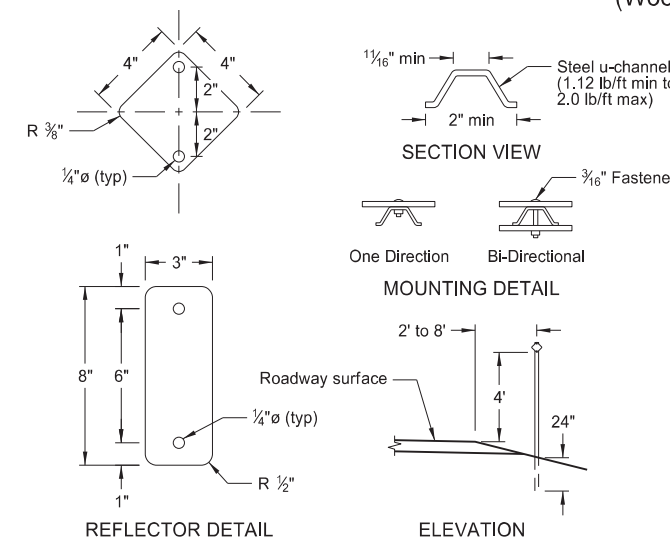


TYPE II BARRICADE

BARRICADE RAIL DETAILS



TYPE III BARRICADE



REFLECTOR DETAIL

ELEVATION

DELINEATORS

MINIMUM BALLAST (For each side of barricade support)

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

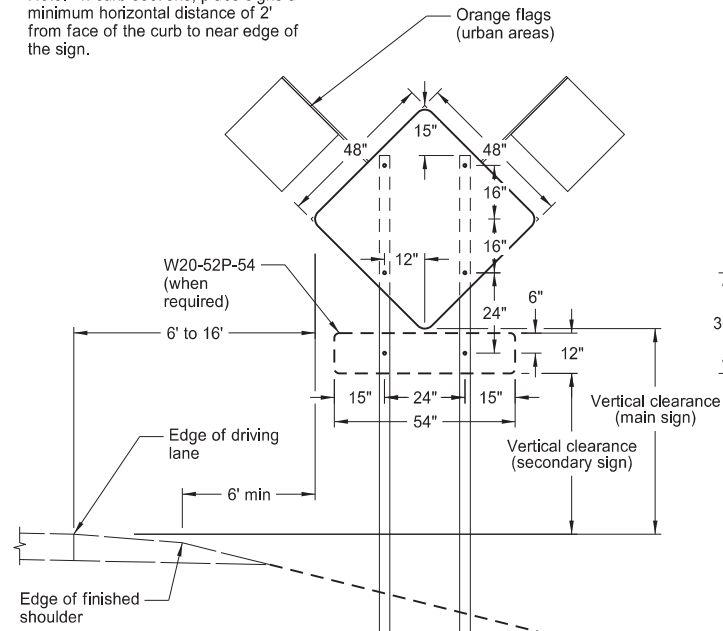
Note: Number of sandbags based on a wind speed of 55 MPH. Sandbags assumed to be placed at or near the ends of the skids.

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

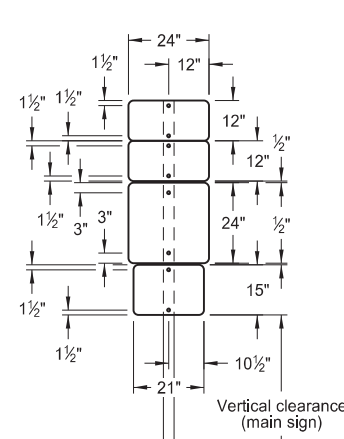
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

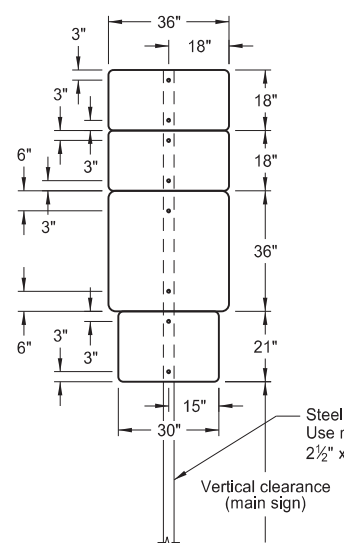
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



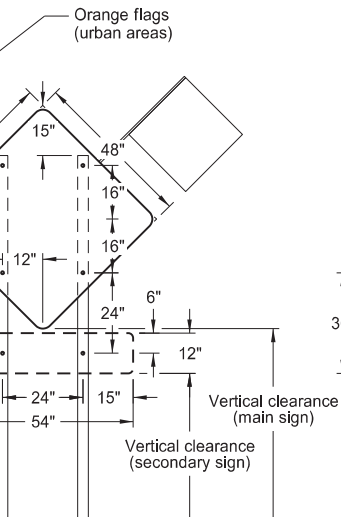
TYPICAL SECTION  
(48" x 48" diamond warning sign shown)



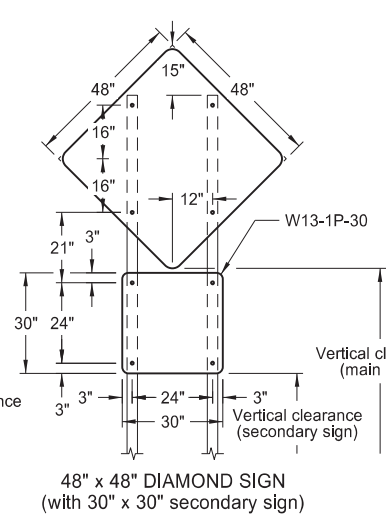
24" x 24" ROUTE MARKER ASSEMBLY



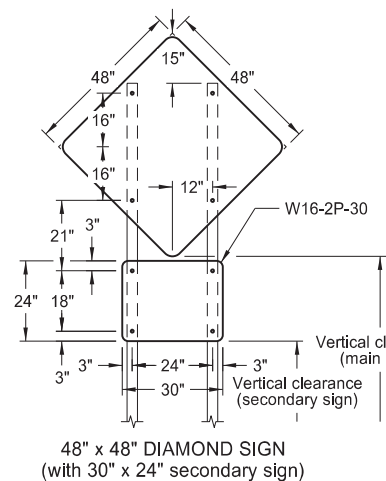
36" x 36" ROUTE MARKER ASSEMBLY



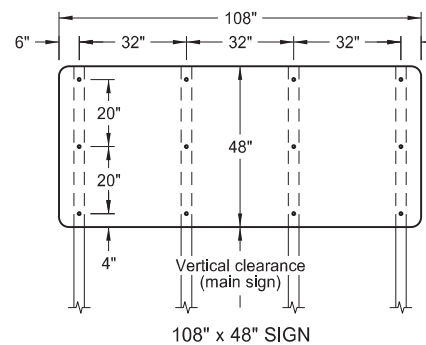
18" x 18" DIAMOND SIGN



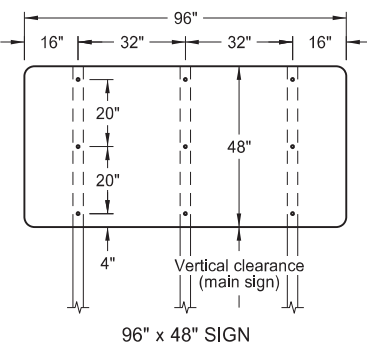
48" x 48" DIAMOND SIGN  
(with 30" x 30" secondary sign)



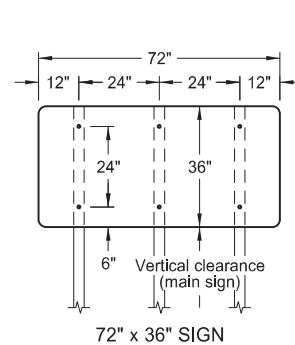
48" x 48" DIAMOND SIGN  
(with 30" x 24" secondary sign)



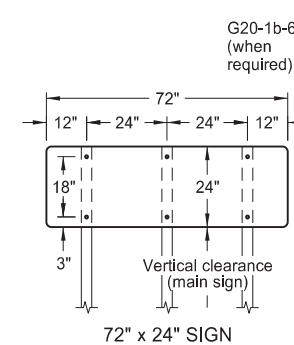
108" x 48" SIGN



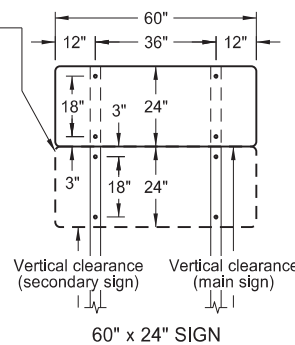
96" x 48" SIGN



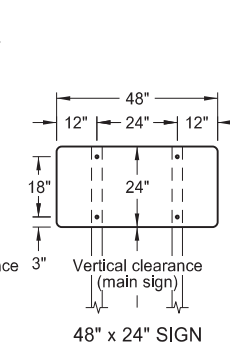
72" x 36" SIGN



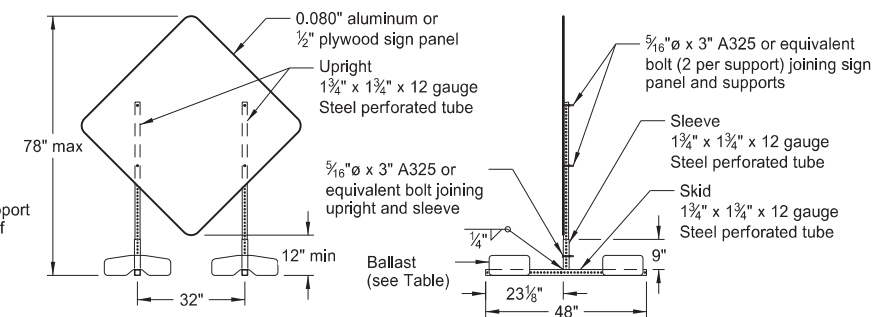
72" x 24" SIGN



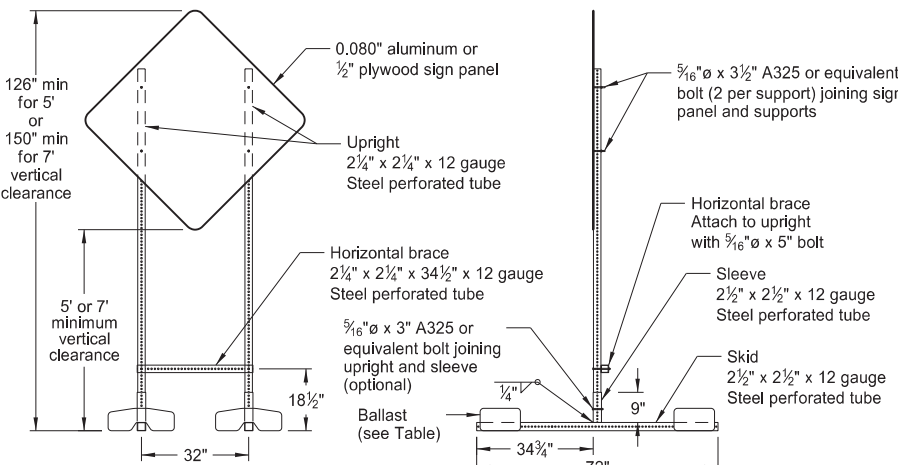
60" x 24" SIGN



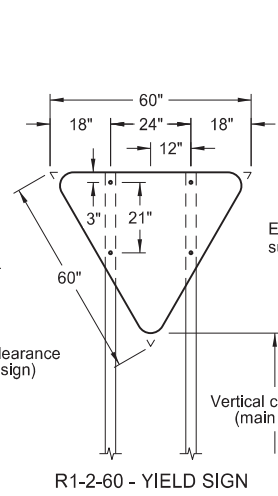
48" x 24" SIGN



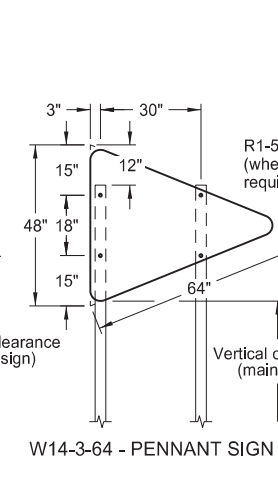
PORTABLE SIGN SUPPORT  
LOW-MOUNTING HEIGHT



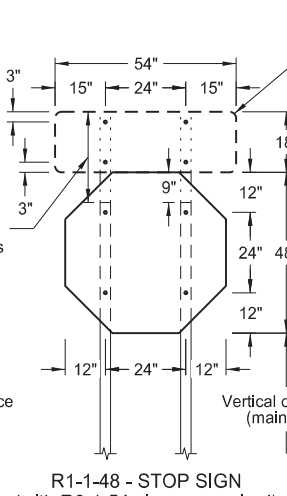
PORTABLE SIGN SUPPORT  
HIGH-MOUNTING HEIGHT



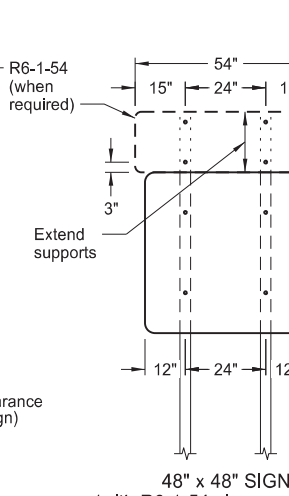
R1-2-60 - YIELD SIGN



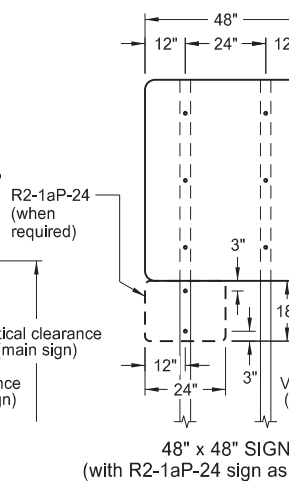
R1-1-48 - STOP SIGN  
(with R1-50P-24 sign as required)



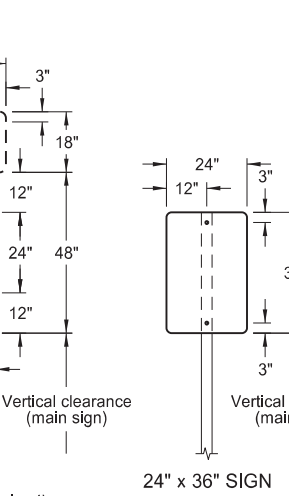
R1-1-48 - STOP SIGN  
(with R6-1-54 sign as required)



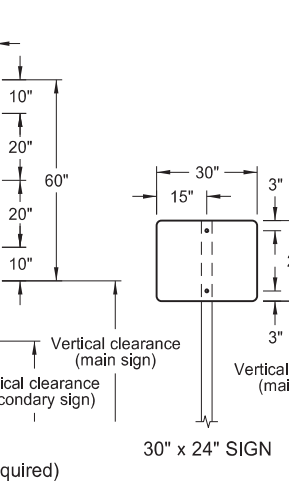
48" x 48" SIGN  
(with R6-1-54 sign as required)



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



24" x 36" SIGN



30" x 24" SIGN

NOTES:

- Sign Supports: Galvanize or paint supports. Minimum post sizes are 2.5 lb/ft u-channel or 2" x 2" x 12 gauge steel perforated tube, except where noted. When installing signs on u-channel, minimum post size for assemblies containing a secondary sign is 3.0 lb/ft. Post sizes based on a wind speed of 55 MPH.  
  
Place signs over 50 square feet on 2 1/2" x 2 1/2" perforated tube supports as a minimum.  
  
Do not attach guy wires to sign supports. Attach wind beams behind sign panels when used with u-posts.
- Sign Panels: Provide sign panels made of 0.100" aluminum, 1/2" plywood, or other approved material, except where noted. Punch all holes round for 5/16" bolts.
- Alternate Messages: Install and remove alternate message signs on reflectorized plate (without borders) as required. (i.e. "Left" and "Right" message on lane closure sign)
- Route Marker Auxiliary Signs: Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:

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

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

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

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

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

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

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

MINIMUM BALLAST  
(For each side of sign support base)

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

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

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

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



ROAD CLOSURE LAYOUTS

Notes:  
1. Variables

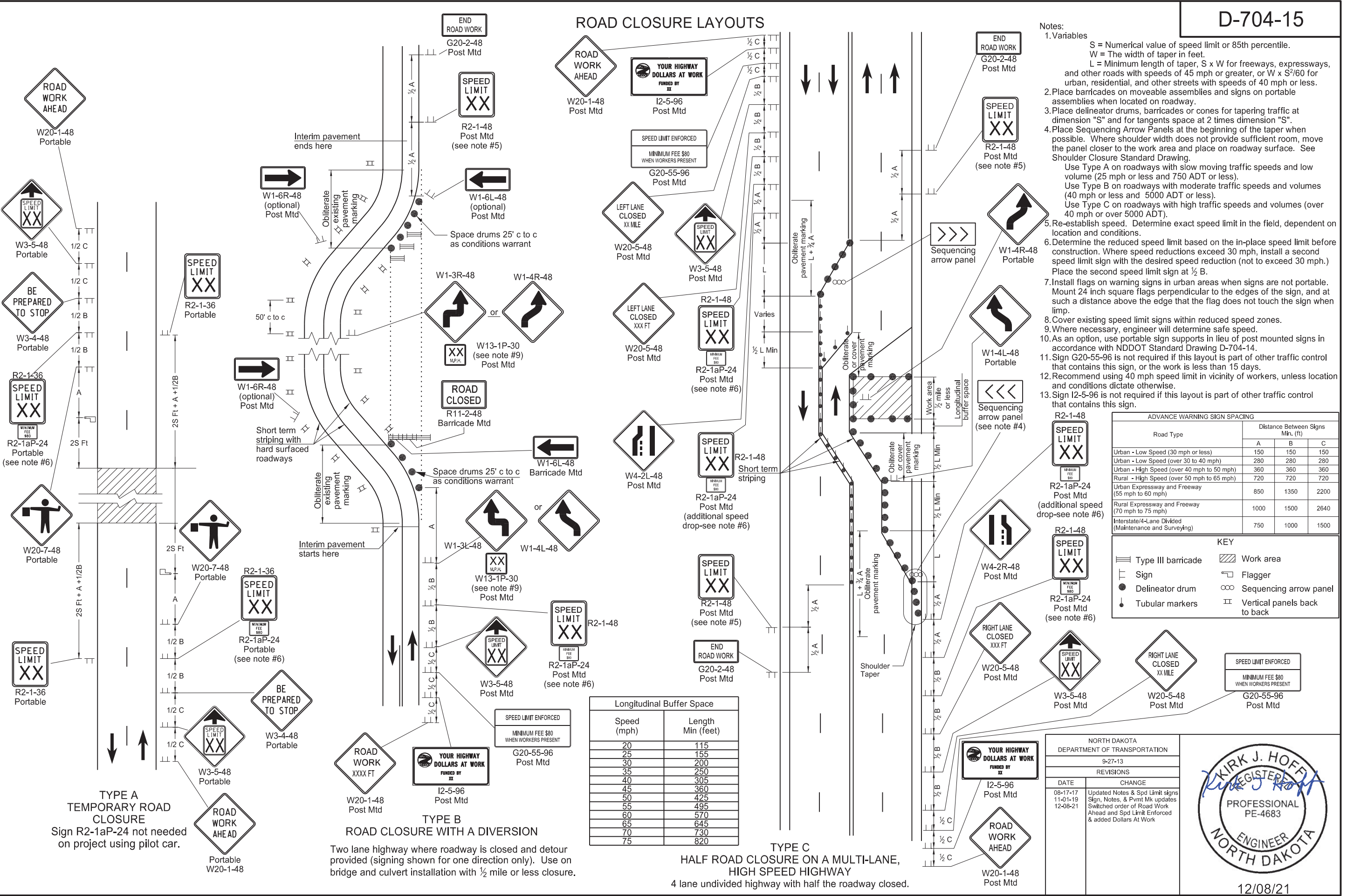
- S = Numerical value of speed limit or 85th percentile.
- W = The width of taper in feet.
- L = Minimum length of taper, S x W for freeways, expressways, and other roads with speeds of 45 mph or greater, or W x S<sup>2</sup>/60 for urban, residential, and other streets with speeds of 40 mph or less.
- 2. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
- 3. Place delineator drums, barricades or cones for tapering traffic at dimension "S" and for tangents space at 2 times dimension "S".
- 4. Place Sequencing Arrow Panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on roadway surface. See Shoulder Closure Standard Drawing.
- Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
- Use Type B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
- Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
- 5. Re-establish speed. Determine exact speed limit in the field, dependent on location and conditions.
- 6. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at 1/2 B.
- 7. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
- 8. Cover existing speed limit signs within reduced speed zones.
- 9. Where necessary, engineer will determine safe speed.
- 10. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
- 11. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.
- 12. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
- 13. Sign I2-5-96 is not required if this layout is part of other traffic control that contains this sign.

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

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



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

**TYPE B**  
ROAD CLOSURE WITH A DIVERSION  
Two lane highway where roadway is closed and detour provided (signing shown for one direction only). Use on bridge and culvert installation with 1/2 mile or less closure.

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
08-17-17	Updated Notes & Spd Limit signs
11-01-19	Sign, Notes, & Permit Mkt updates
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work

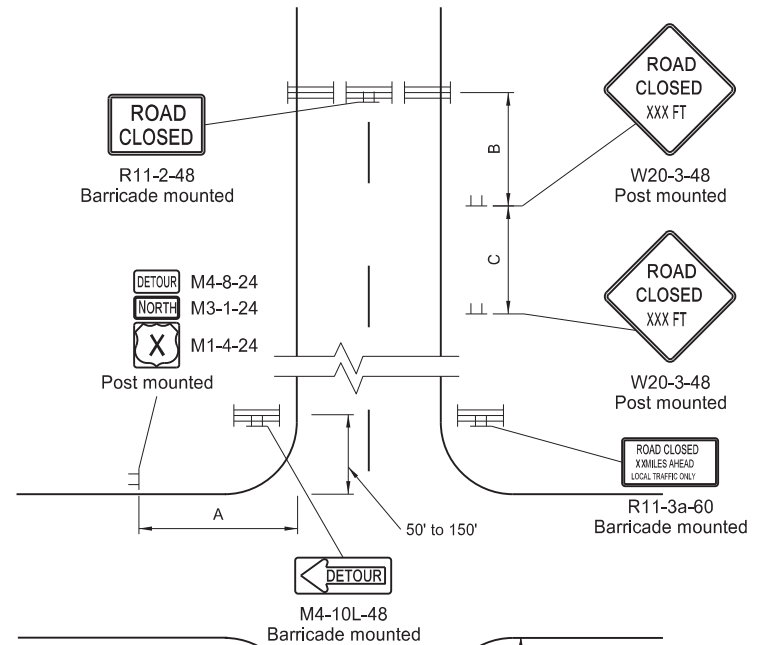




ROAD CLOSURE AND LANE CLOSURE ON A TWO WAY ROAD LAYOUTS

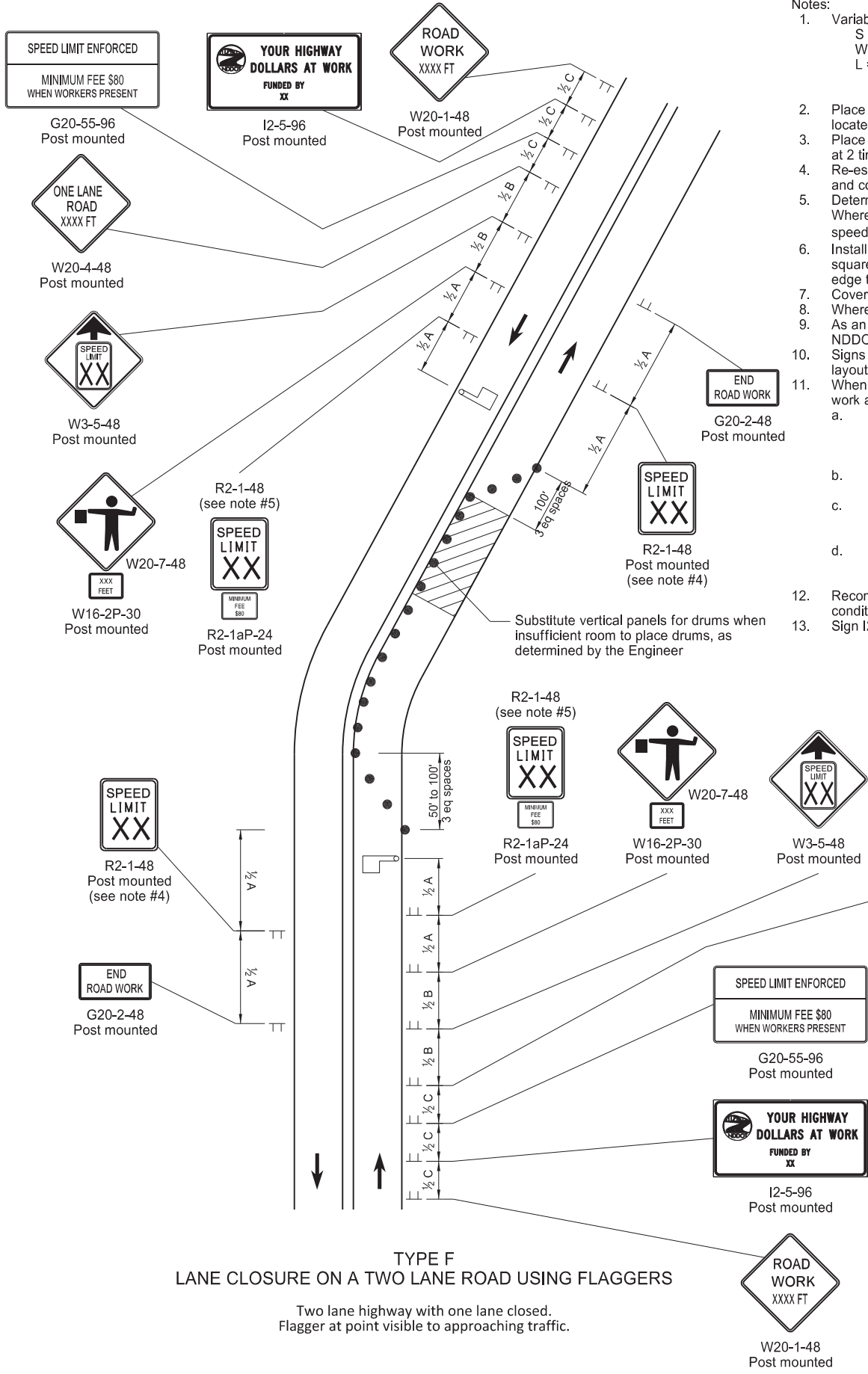
Notes:

- Variables
  - S = Numerical value of speed limit or 85th percentile.
  - W = The width of taper in feet
  - L = Minimum length of taper in feet. S x W for freeways, expressways, and roads with speeds of 45 mph or greater, or W x S<sup>2</sup>/60 for urban, residential, and streets with speeds of 40 mph or less.
- Place barricades on moveable assemblies and signs on portable assemblies when located on the roadway.
- Place delineator drums for tapering traffic at 3 equal spaces and for tangents space them at 2 times dimension "S".
- Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
- Determine the reduced speed limit based on the in place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place second speed limit sign at 1/2B.
- Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
- Cover existing speed limit signs within a reduced speed zone.
- Where necessary, safe speed to be determined by the Engineer.
- As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
- Signs G20-55-96 or R2-1aP-24 are not required when pilot car operation is used, if this layout is part of other traffic control that contains this sign, or if work is less than 15 days.
- When highway-rail grade crossings exist either within or in the vicinity of the roadway work activities:
  - Extra care shall be taken to minimize the probability of conditions being created, either by lane restrictions, flagging or other operations, where vehicles might be stopped within the highway-rail grade crossing (considered as being 15 feet on either side of the closest and farthest rail.) Place "Do Not Stop on Tracks" sign (R8-8-24) near cross buck in each direction while lane closure is near tracks.
  - Extend buffer space between work zone and lane closure transition upstream of the highway-rail grade crossing to prevent flagging queue from extending across highway-rail grade crossing.
  - If queuing extends across highway-rail crossing, provide flagger at crossing to prevent vehicles from stopping within the crossing (even when automatic warning devices are in place.)
- Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
- Sign I2-5-96 is not required if this layout is part of other traffic control that contains this sign.



TYPE E  
ROAD CLOSURE WITH OFF-SITE DETOUR

Road closed beyond detour point. Signage shown for one direction only. Install and maintain signs shown in plans.



TYPE F  
LANE CLOSURE ON A TWO LANE ROAD USING FLAGGERS

Two lane highway with one lane closed. Flagger at point visible to approaching traffic.

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

KEY

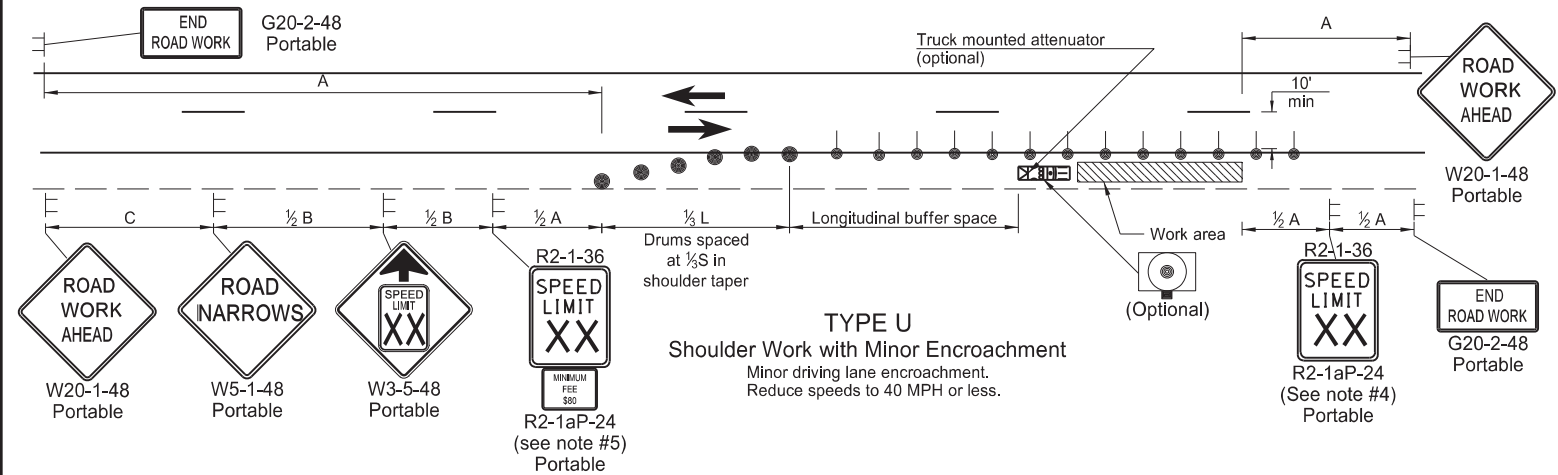
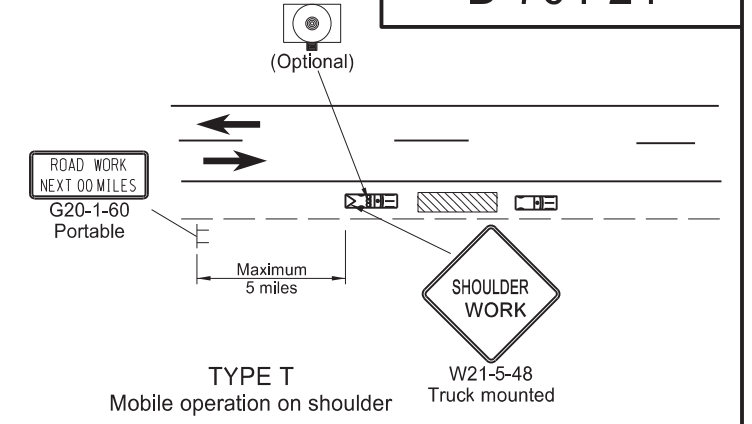
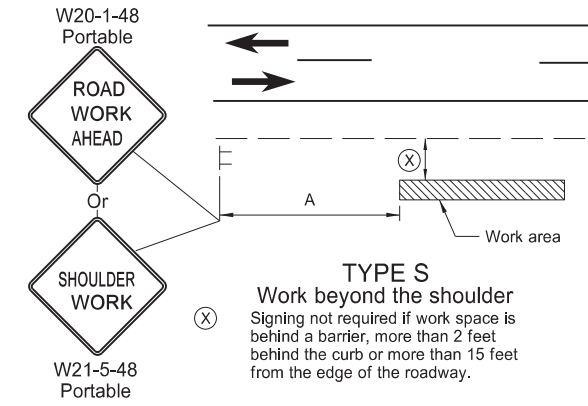
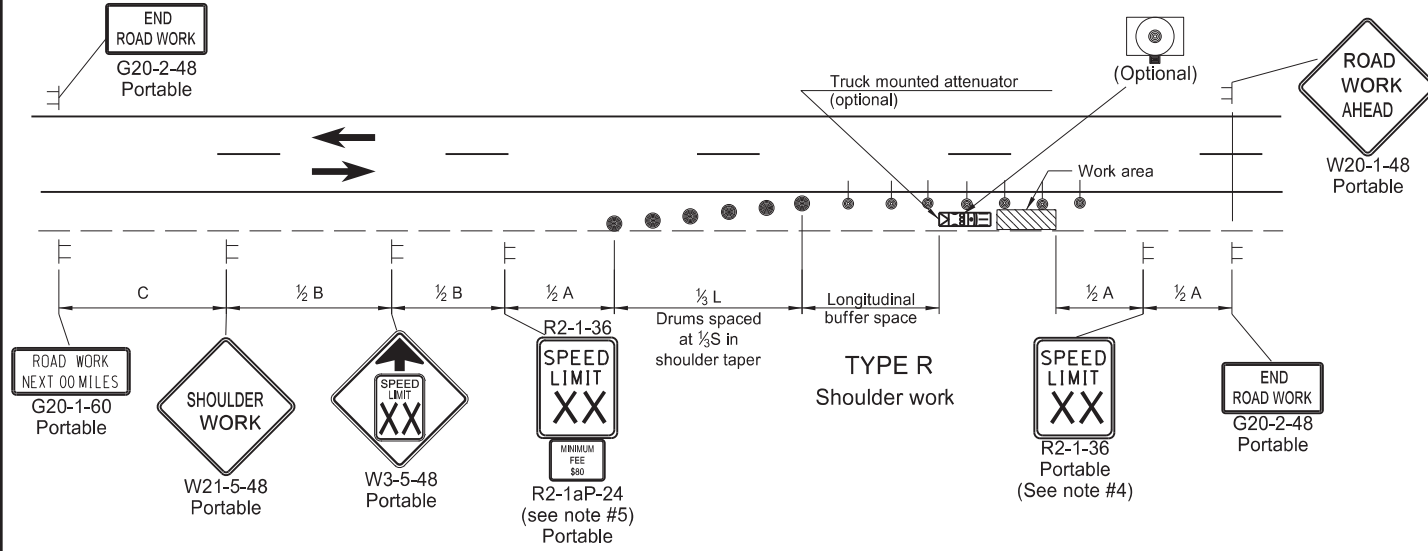
- Delineator Drum
- Type III Barricade
- Flagger
- Sign
- Work/Hazard Area

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
03-13-14	Revised Sign Call "ROAD WORK XXX FT"
08-17-17	Update notes & sign numbers
11-01-19	Revised signs, sign #s, & notes
12-08-21	Switched order of Road Work XXX and Spd Limit Enforced & added Dollars At Work

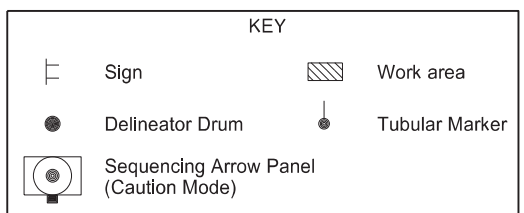
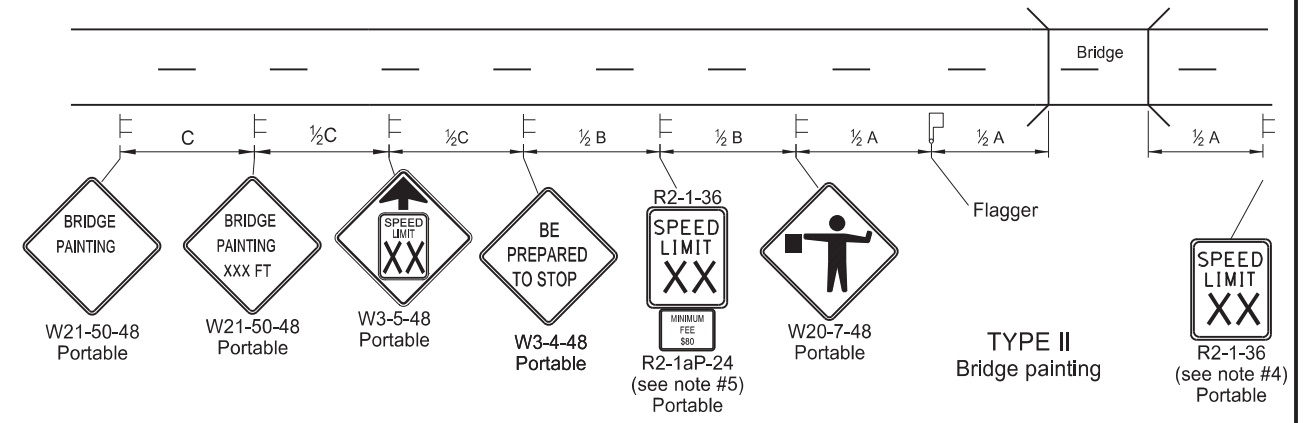
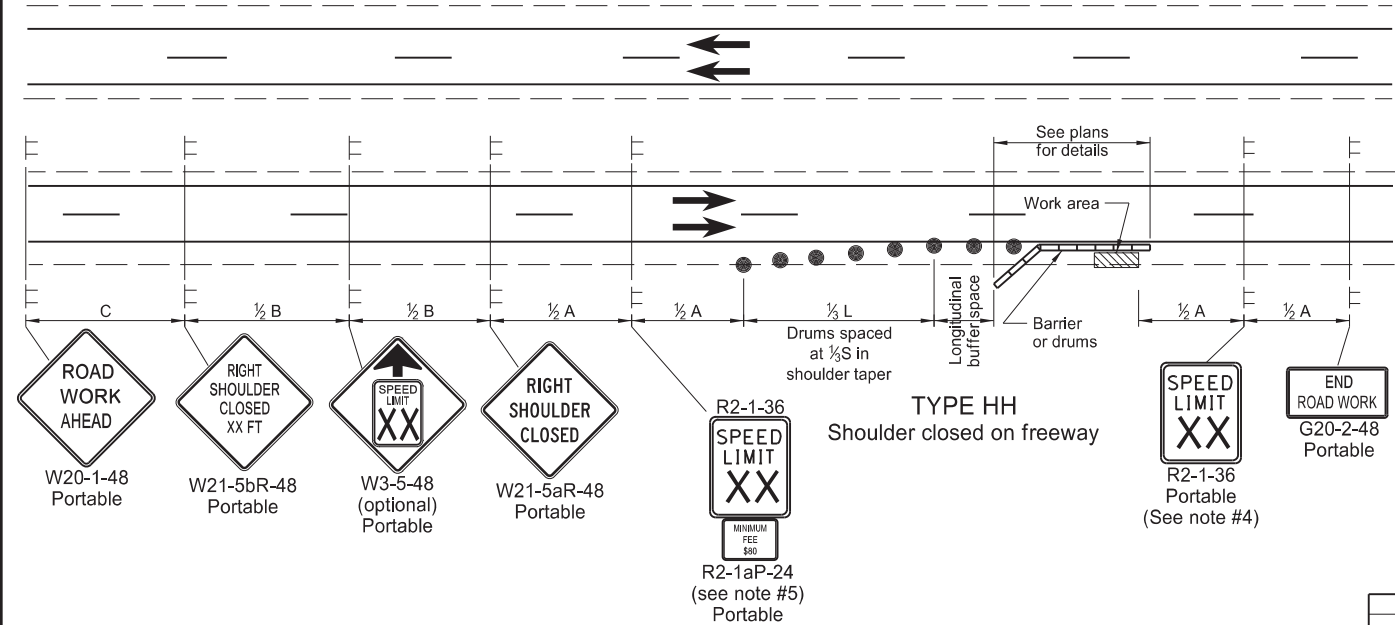


12/08/21

SHOULDER CLOSURES AND BRIDGE PAINTING LAYOUTS



- Notes
- Variables
    - S = Numerical value of speed limit or 85th percentile.
    - W = The width of the taper in feet.
    - L = Minimum length of taper,  $S \times W$  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.
  - Space delineator drums for tapering traffic at dimension "S". Space delineator drums or tubular markers for tangents at 2 times "S".
  - Sequencing Arrow Panels
    - Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
    - Use Type B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
    - Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
  - Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
  - Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at 1/2 B.
  - Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
  - Cover existing speed limit signs within a reduced speed zone.
  - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
  - Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.



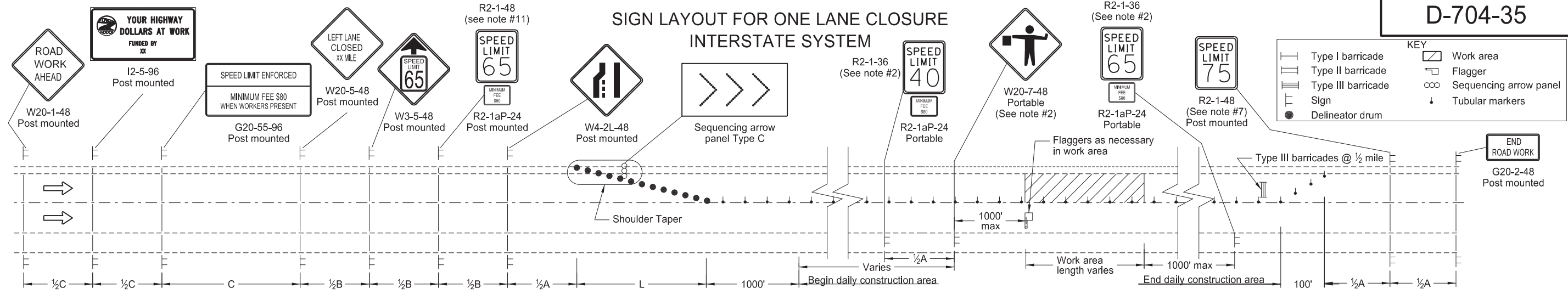
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
8-17-17 11-01-19	Updated notes & revised signs Revised drum spacing & signs nos.

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

SIGN LAYOUT FOR ONE LANE CLOSURE  
INTERSTATE SYSTEM



**KEY**

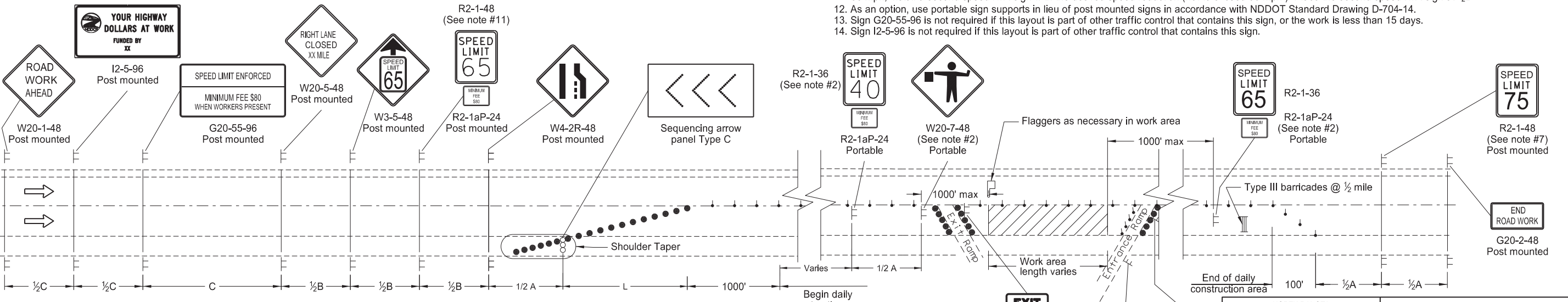
- Type I barricade
- Type II barricade
- Type III barricade
- Sign
- Delineator drum
- Work area
- Flagger
- Sequencing arrow panel
- Tubular markers

LEFT LANE CLOSED  
WORKERS IN WORK AREA

- Notes:**
- Install advance signs for flagging when flaggers are flagging.
  - Move the advanced flagger sign and the speed limit signs as the work area moves through the construction zone. When the work area is not visible from the flagger, move the flagger station so the work area is visible. Space the 40 mph speed limit sign at 1/2 A in advance of the flagger sign and move the 65 mph speed limit sign. Cover or remove the 40 mph speed limit and Minimum Fee \$80 signs and the 65 mph speed limit sign upon completion of the work day or when workers are not present.
  - RAMPS:** When the work area encompasses an entrance ramp, install a 40 mph speed limit sign on the ramp and cover any existing yield sign. Install new yield sign as necessary. Remove the ramp speed limit sign when the main line 40 mph speed zone is moved past the ramp.
  - 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.
  - Space delineator drums for tapering traffic at the dimension "S". Space tubular markers used for tangents at 2 times dimension "S".
  - Place sequencing arrow panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface.  
 Use Type C on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater).
  - Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
  - Cover existing speed limit signs within a reduced speed zone.
  - Upon approval, the Engineer will measure obliterated or covered pavement marking as Obliteration of Pavement Marking.
  - Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the diamond sign, and at such a distance above the edge that the flag does not touch the sign when limp.
  - Determine the reduced speed limit dependent on the in place speed limit before construction. When speed limits are to be reduced more than 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at 1/2 B.
  - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
  - Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.
  - Sign I2-5-96 is not required if this layout is part of other traffic control that contains this sign.

**ADVANCE WARNING SIGN SPACING**

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



RIGHT LANE CLOSED  
WORKERS IN WORK AREA

**REVISIONS**

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

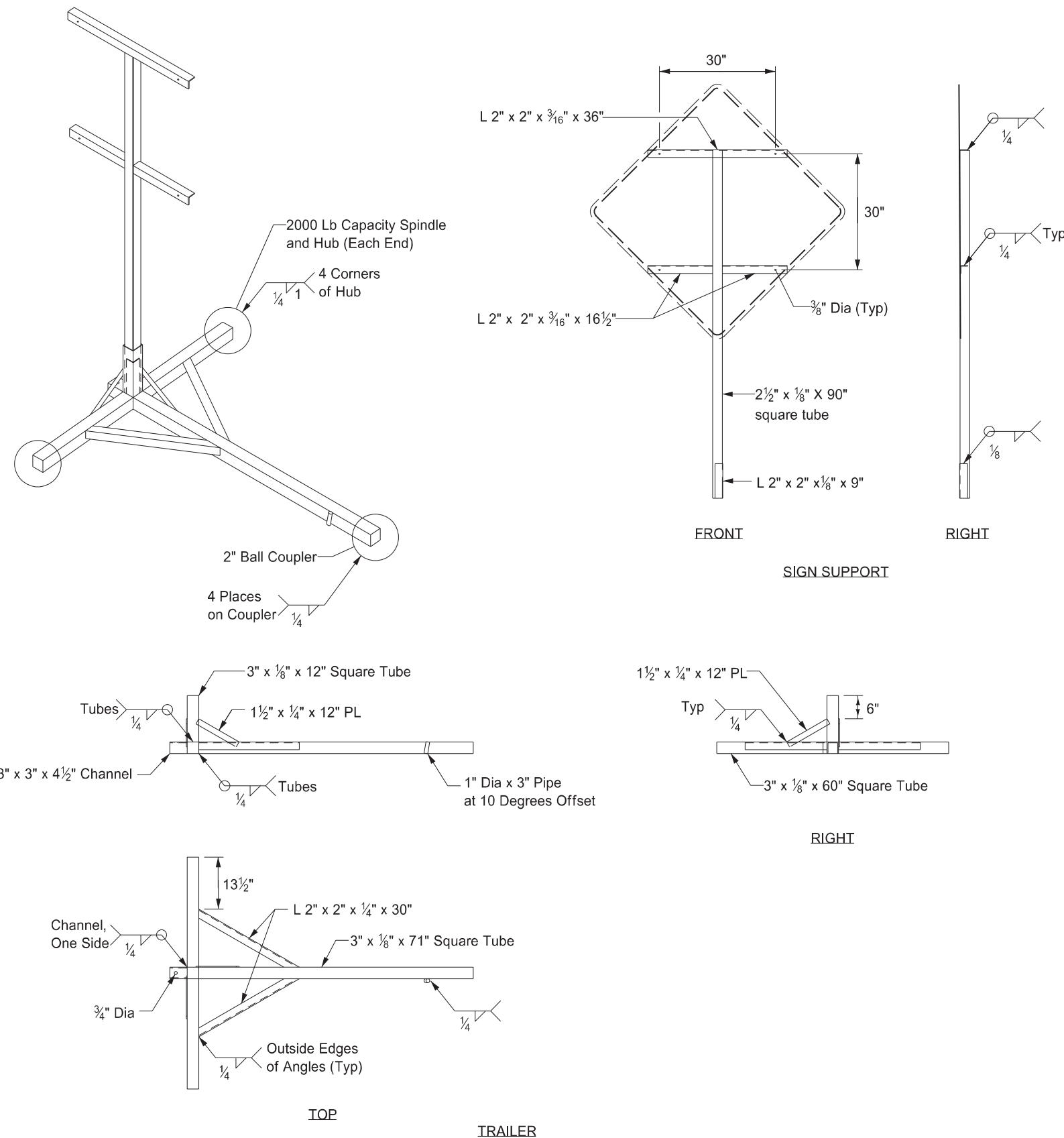
**KIRK J. HOFF**  
REGISTERED  
PROFESSIONAL  
PE-4683  
ENGINEER  
NORTH DAKOTA

12/08/21



PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



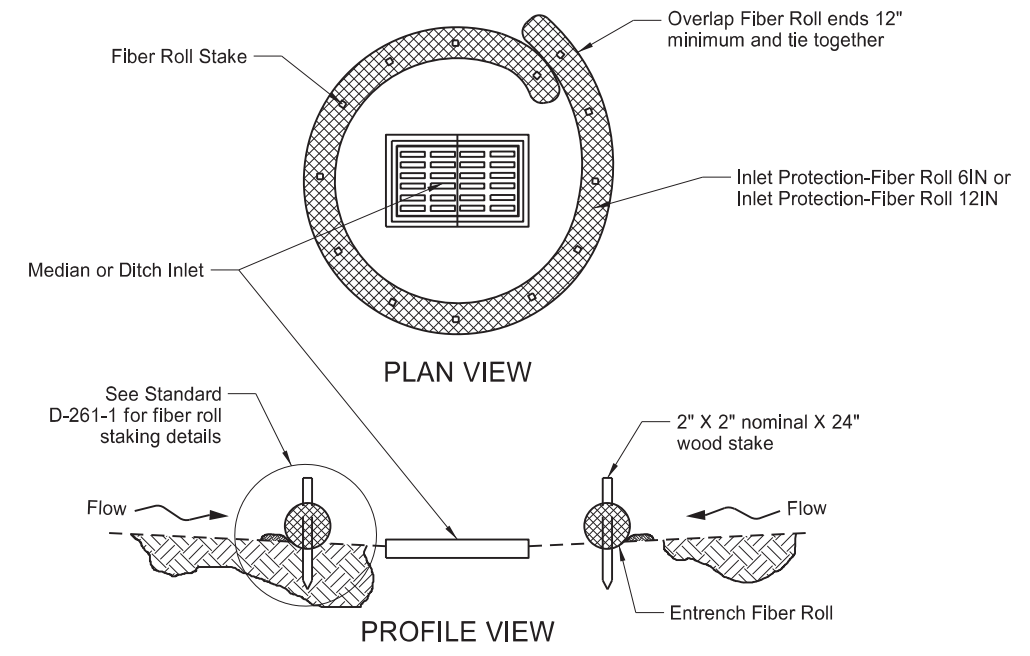
Notes:

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

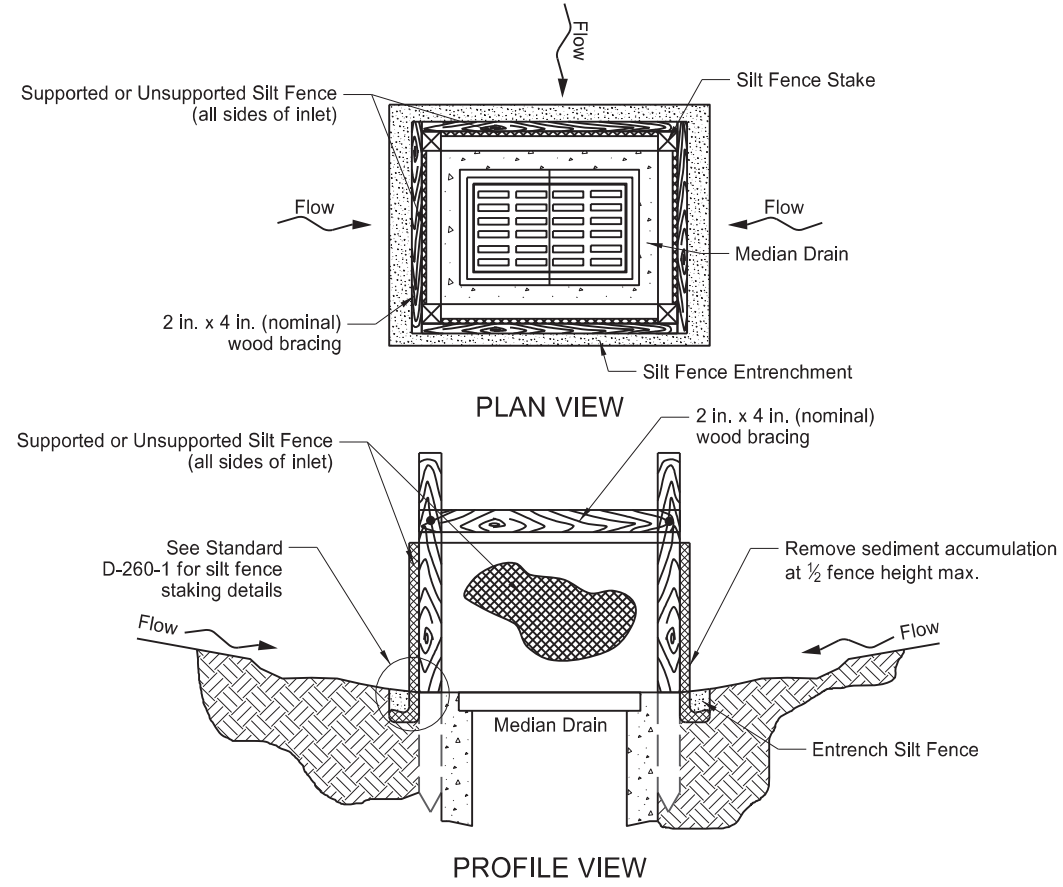
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE
12/02/2020	Updated Note to active voice.

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

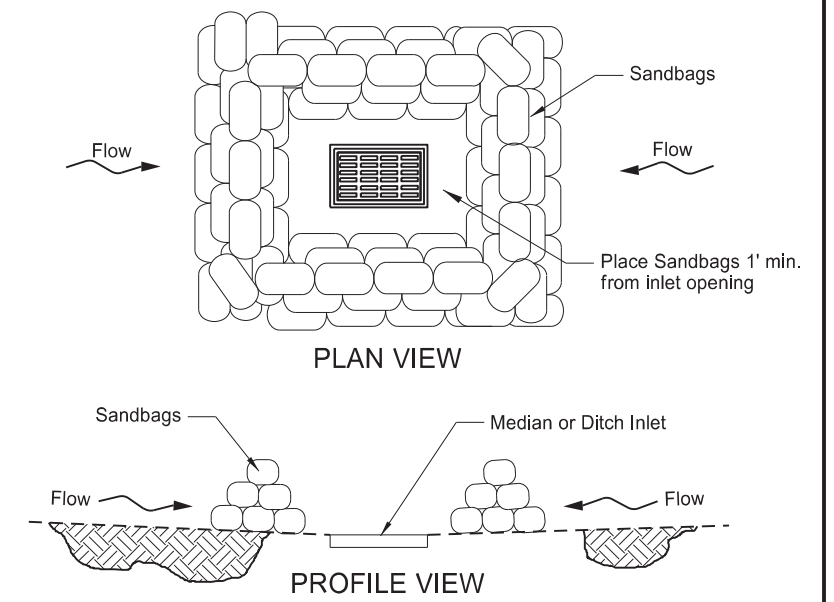
EROSION AND SILTATION CONTROLS  
MEDIAN OR DITCH INLET PROTECTION



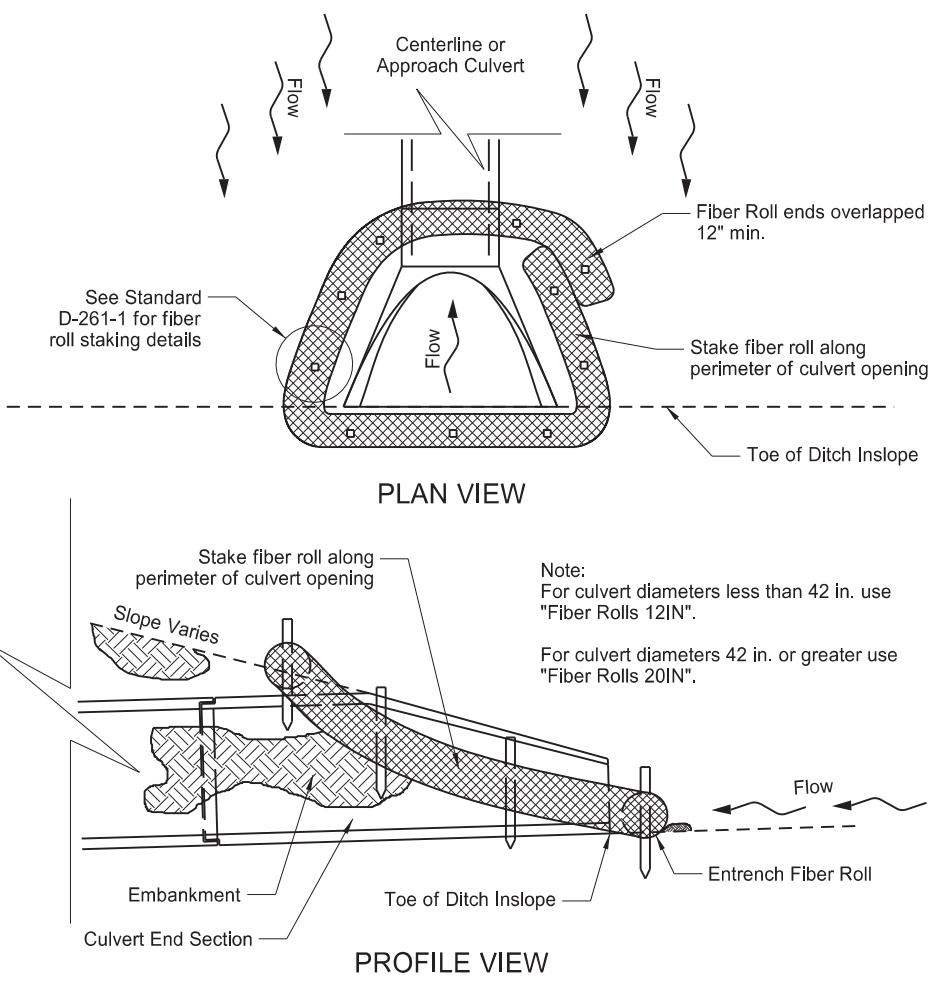
FIBER ROLL PROTECTION (MEDIAN OR DITCH INLET)



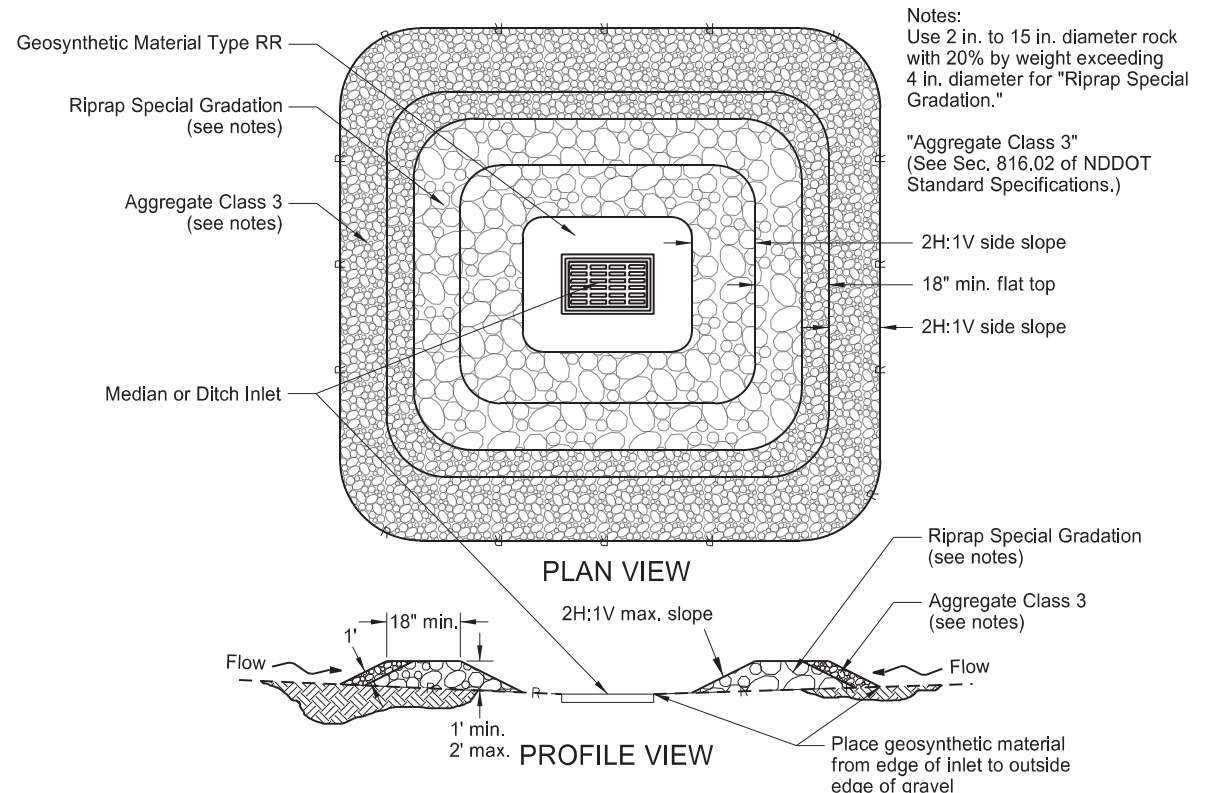
SILT FENCE PROTECTION (MEDIAN OR DITCH INLET)



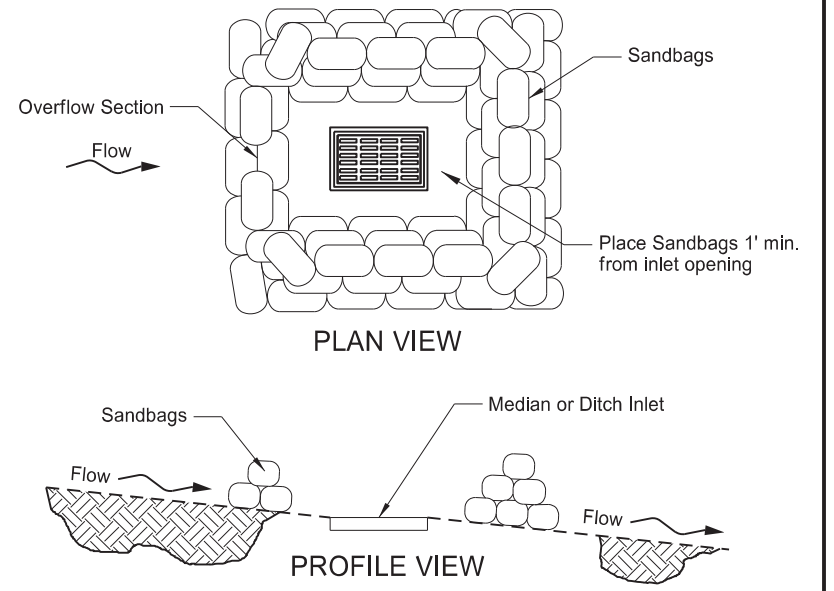
SANDBAG PROTECTION (LOW POINT)



FIBER ROLL PROTECTION (INLET OF CULVERT)



GRAVEL INLET PROTECTION (MEDIAN OR DITCH INLET)



SANDBAG PROTECTION (ON SLOPE)

Notes:  
 Use 2 in. to 15 in. diameter rock with 20% by weight exceeding 4 in. diameter for "Riprap Special Gradation."  
 "Aggregate Class 3" (See Sec. 816.02 of NDDOT Standard Specifications.)

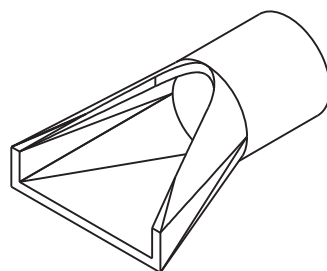
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Updated reference to standard drawing number for fiber roll staking details.
10-01-14	Updated reference to standard drawing number for silt fence.
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by  
 Kirk J Hoff,  
 Registration Number PE-4683,  
 on 8-27-19 and the original document is stored at the North Dakota Department of Transportation

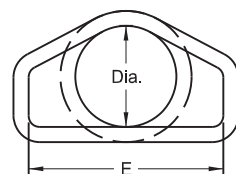


REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS  
(Round Pipe)

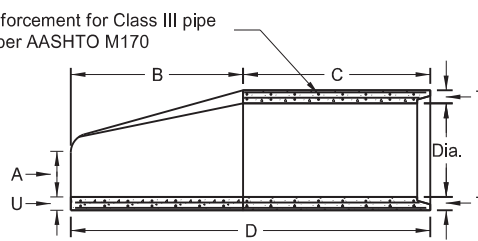
FLARED END SECTION						
TERMINAL DIMENSIONS						
DIA	A	B	C	D	E	U
12	0'-4"	2'-0"	4'-0 <sup>7</sup> / <sub>8</sub> "	6'-0 <sup>7</sup> / <sub>8</sub> "	2'-0"	2"
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2 <sup>1</sup> / <sub>4</sub> "
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2 <sup>1</sup> / <sub>2</sub> "
21	0'-9"	3'-0"	3'-1"	6'-1"	3'-6"	2 <sup>1</sup> / <sub>2</sub> "
24	0'-9 <sup>1</sup> / <sub>2</sub> "	3'-7 <sup>1</sup> / <sub>2</sub> "	2'-6"	6'-1 <sup>1</sup> / <sub>2</sub> "	4'-0"	3"
27	0'-10 <sup>1</sup> / <sub>2</sub> "	4'-0"	2'-1 <sup>1</sup> / <sub>2</sub> "	6'-1 <sup>1</sup> / <sub>2</sub> "	4'-6"	3 <sup>1</sup> / <sub>2</sub> "
30	1'-0"	4'-6"	1'-7 <sup>1</sup> / <sub>4</sub> "	6'-1 <sup>3</sup> / <sub>4</sub> "	5'-0"	3 <sup>1</sup> / <sub>2</sub> "
36	1'-3"	5'-3"	2'-9"	8'-0"	6'-0"	4"
42	1'-9"	5'-3"	2'-9"	8'-0"	6'-6"	4 <sup>1</sup> / <sub>2</sub> "
48	2'-0"	6'-0"	2'-0"	8'-0"	7'-0"	5"
54	2'-3"	5'-5"	2'-9 <sup>1</sup> / <sub>4</sub> "	8'-2 <sup>1</sup> / <sub>4</sub> "	7'-6"	5 <sup>1</sup> / <sub>2</sub> "
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	5"
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	5 <sup>1</sup> / <sub>2</sub> "
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	6"
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	6 <sup>1</sup> / <sub>2</sub> "
84	3'-0"	7'-6 <sup>1</sup> / <sub>2</sub> "	1'-9"	9'-3 <sup>1</sup> / <sub>2</sub> "	10'-0"	6 <sup>1</sup> / <sub>2</sub> "
90	3'-5"	7'-3 <sup>1</sup> / <sub>2</sub> "	2'-0"	9'-3 <sup>1</sup> / <sub>2</sub> "	11'-0"	6 <sup>1</sup> / <sub>2</sub> "



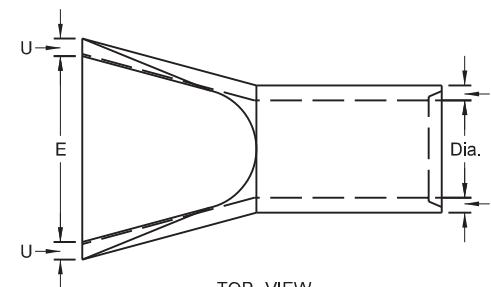
PERSPECTIVE



END VIEW



SIDE VIEW



TOP VIEW

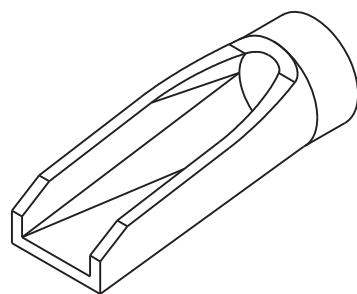
REINFORCED CONCRETE PIPE - FLARED END SECTION  
Reinforcement to be equivalent to Class III RCP

Standard Reinforcement for Class III pipe reinforced as per AASHTO M170

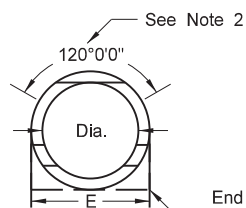
NOTES:

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

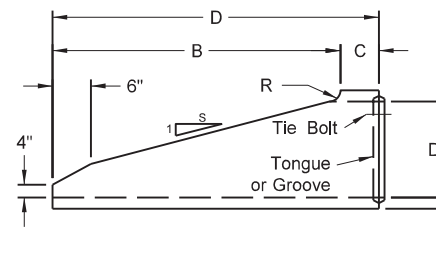
TRAVERSABLE END SECTION						
DIA	B	C	D	E	R	S
15"	4'	9"	4'-9"	1'-7 <sup>1</sup> / <sub>2</sub> "	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	3"	6
24"	6'	1'	7'	2'-6"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3 <sup>1</sup> / <sub>2</sub> "	4
36"	7'-3"	15"	8'-6"	3'-8"	3"	4



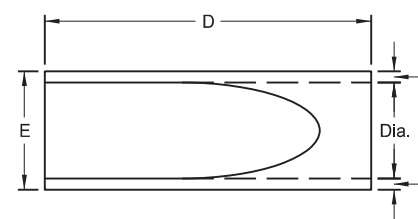
PERSPECTIVE



END VIEW



SIDE VIEW



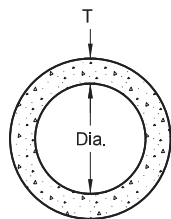
TOP VIEW

REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION  
Reinforcement to be equivalent to Class III RCP

NOTES (Traversable End Section):

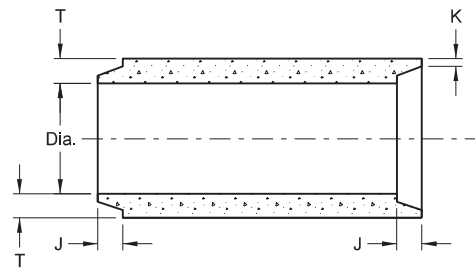
- Manufactured in accordance with applicable portions of ASTM C76/AASHTO M170.
- Reinforcement per Class III RCP with double reinforcement in the upper 120° of the full barrel portion.

All Classifications of Round Concrete Pipe						
Internal Dia. of pipe in Inches	Cross-Sectional Water Area	Weight per Lin. Foot of pipe Std. Wall	Joint J Groove End Min./Max.	Joint K Tongue End Min.	Minimum Wall Thickness (T)	
Dia	Sq. ft.	Lbs.	In.	In.	In.	
12	0.79	92	1 <sup>1</sup> / <sub>8</sub> -2 <sup>3</sup> / <sub>8</sub>	3/4	2	
15	1.23	127	1 <sup>3</sup> / <sub>8</sub> -2 <sup>1</sup> / <sub>4</sub>	7/8	2 <sup>1</sup> / <sub>4</sub>	
18	1.77	168	1 <sup>7</sup> / <sub>8</sub> -2 <sup>7</sup> / <sub>8</sub>	1	2 <sup>1</sup> / <sub>2</sub>	
21	2.40	214	1 <sup>7</sup> / <sub>8</sub> -3 <sup>1</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	
24	3.14	265	2 <sup>3</sup> / <sub>4</sub> -3 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>2</sub>	3	
27	3.98	322	2 <sup>3</sup> / <sub>4</sub> -4	1 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	
30	4.91	384	3 <sup>1</sup> / <sub>4</sub> -4 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>	
33	5.94	452	3 <sup>1</sup> / <sub>4</sub> -4 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	
36	7.07	524	3 <sup>1</sup> / <sub>4</sub> -4 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>2</sub>	4	
42	9.62	685	3 <sup>3</sup> / <sub>4</sub> -4 <sup>3</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>2</sub>	
48	12.57	885	3 <sup>3</sup> / <sub>4</sub> -4 <sup>3</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>4</sub>	5	
54	15.90	1070	4 <sup>1</sup> / <sub>8</sub> -5 <sup>1</sup> / <sub>4</sub>	2	5 <sup>1</sup> / <sub>2</sub>	
60	19.63	1296	4 <sup>1</sup> / <sub>2</sub> -5 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>4</sub>	6	
66	23.76	1542	5-6	2 <sup>3</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>2</sub>	
72	28.27	1810	5 <sup>5</sup> / <sub>8</sub> -6 <sup>3</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>8</sub>	7	
78	33.18	2098	6 <sup>1</sup> / <sub>4</sub> -7 <sup>1</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>8</sub>	7 <sup>1</sup> / <sub>2</sub>	
84	38.48	2410	5 <sup>5</sup> / <sub>8</sub> -7 <sup>1</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>8</sub>	8	
90	44.18	2793	6 <sup>3</sup> / <sub>4</sub> -8 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>8</sub>	8 <sup>1</sup> / <sub>2</sub>	
96	50.27	3092	7-8 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>2</sub>	9	
102	56.75	3466	7-8 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>2</sub>	9 <sup>1</sup> / <sub>2</sub>	
108	63.62	3864	7 <sup>1</sup> / <sub>4</sub> -8 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	10	

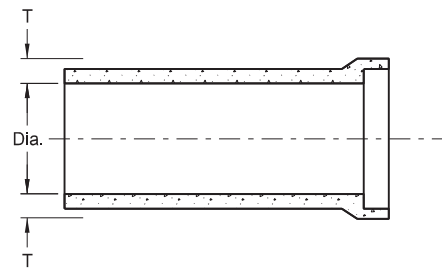


END VIEW

CIRCULAR PIPE

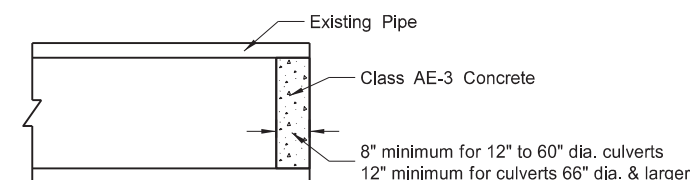


TONGUE & GROOVE JOINT



BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE



CONCRETE PIPE PLUG

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

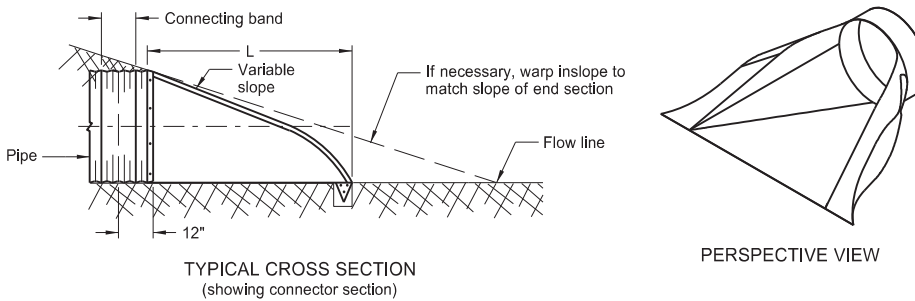
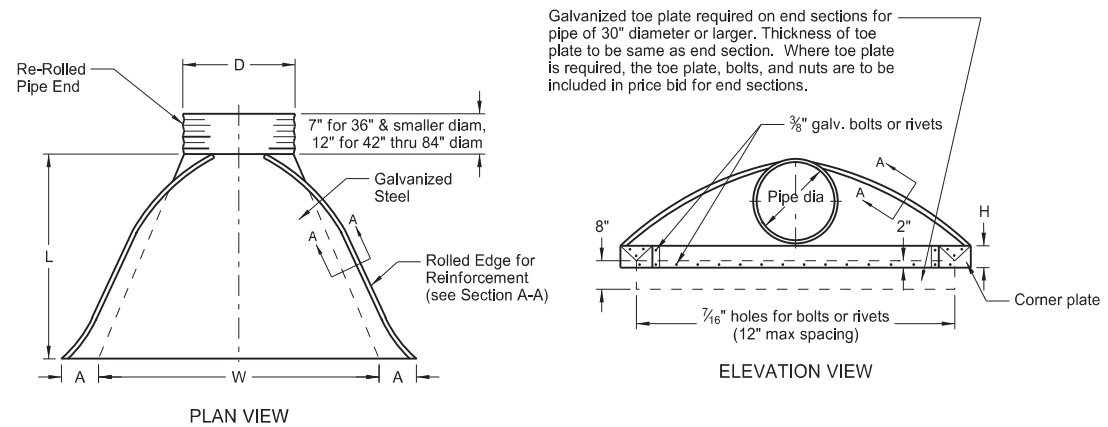
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-12-14	
REVISIONS	
DATE	CHANGE
01-21-15	Revised Note 5
11-21-16	Revised End Section Dimensions
09-18-19	Updated Perspective View Details

This document was originally issued and sealed by  
Jon Ketterling  
Registration Number PE-4684,  
on 9/18/19 and the original document is stored at the North Dakota Department of Transportation



# ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

D-714-4



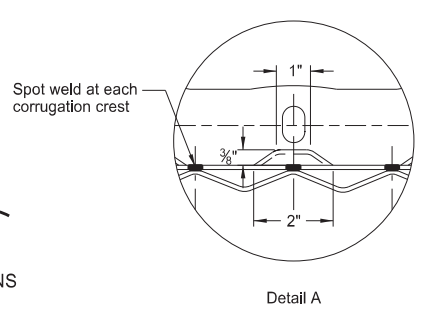
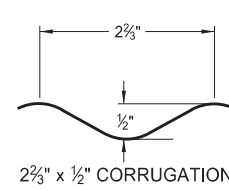
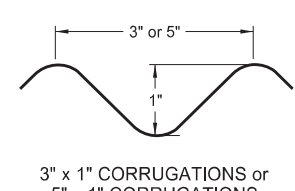
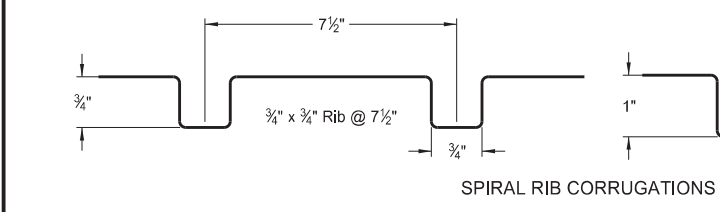
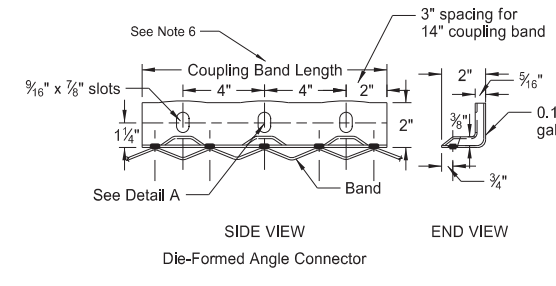
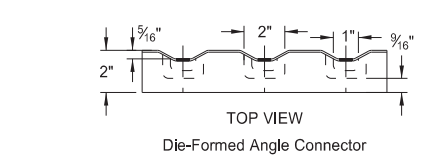
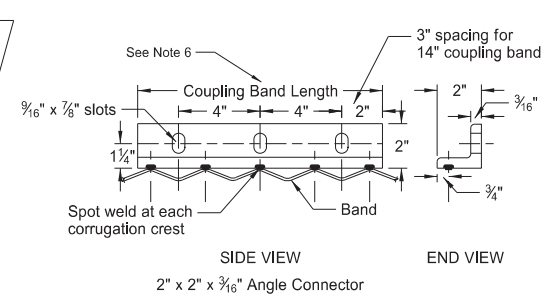
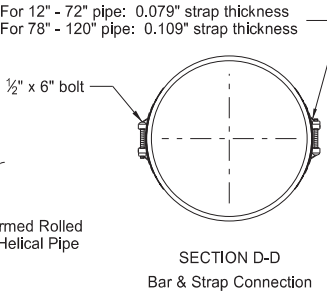
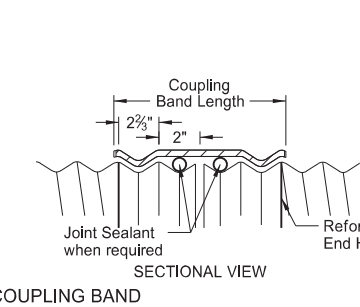
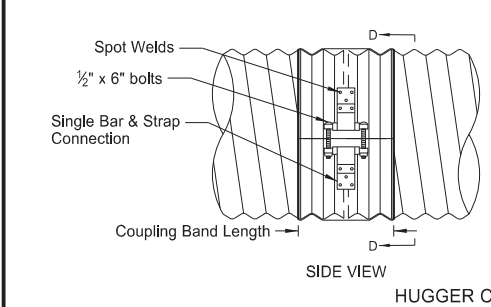
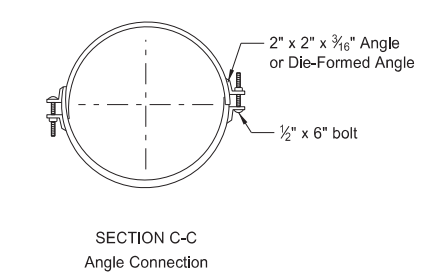
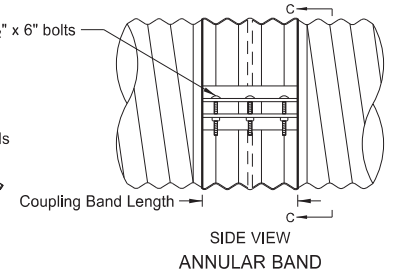
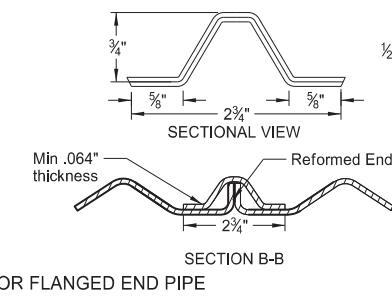
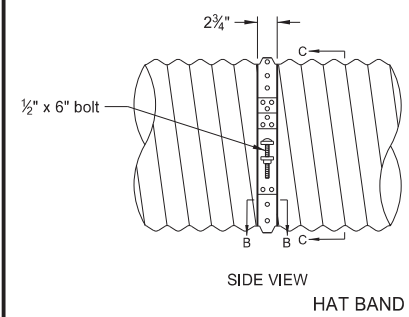
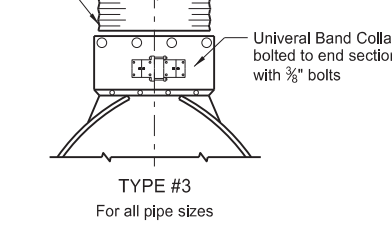
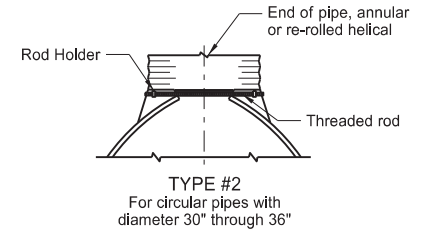
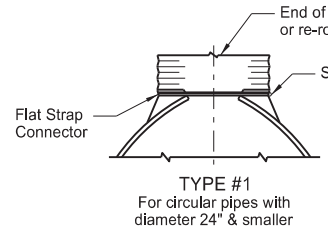
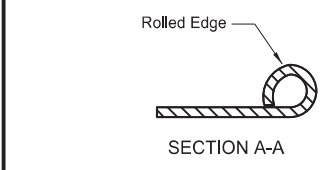
PIPE DIA.	GALV. THICK.	END SECTION DIMENSIONS					APPROX. SLOPE	BODY PIECE
		A	B	H	L	W		
15	0.064	7	8	6	26	30	2½:1	1
18	0.064	8	10	6	31	36	2½:1	1
24	0.064	10	13	6	41	48	2½:1	1
30	0.079	12	16	8	51	60	2½:1	1 or 2
36	0.079	14	19	9	60	72	2½:1	2
42	0.109	16	22	11	69	84	2½:1	2
48	0.109	18	27	12	78	90	2½:1	2
54	0.109	18	30	12	84	102	2:1	2
* 60	0.109	18	33	12	87	114	1½:1	3
* 66	0.109	18	36	12	87	120	1½:1	3
* 72	0.109	18	39	12	87	126	1 1/3 :1	3
* 78	0.109	18	42	12	87	132	1½:1	3
* 84	0.109	18	45	12	87	138	1 1/6 :1	3

- These sizes have 0.109" sides and 0.138" center panels.
  - Pipe diameter is equal to dimension "D" of end section.
- Manufacturers tolerances of above dimensions will be allowed.
- Splices to be the lap riveted type.

Multiple panel bodies shall have lap seams which are to be tightly joined with ¾" dia. galv. bolts or rivets. Nuts to be torqued to 25 foot-lbs ±.

- NOTES:
1. Pipes and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
  2. Top edge of all end sections to have rolled edges for reinforcement (see Section A-A). The reinforced edges are to be supplemented with 2" x 2" x ¼" galv. angle for 60" through 72" dia. and 2½" x 2½" x ¼" galv. angle for 78" and 84" dia.. Angles to be attached by galv. ¾" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
  3. Elongated pipes shall be factory preformed so that the vertical diameter shall be 5% greater and the horizontal diameter 5% less than a circular pipe.
  4. Coupling bands shall be two-piece for pipes larger than 36" as shown in Section C-C & D-D details. For pipes 36" and smaller, a one-piece band is acceptable.
  5. ½" x 8" bolts may be used as a substitute for the ½" x 6" bolts shown in the details.
  6. Coupling bands wider than 14" may be used if a minimum of four ½" bolts with maximum spacing of 5½" are used for the connection.
  7. Length of spot welds shall be minimum ½".

COUPLING BAND DIMENSIONS				
COUPLING TYPE	CORRUGATION PITCH x DEPTH	PIPE SIZE	COUPLING BAND LENGTH	MIN. BAND THICKNESS
Hat Band	2⅔" x ½"	12" - 48"	2¾"	.064"
		78" - 84"	12"	.079"
Annular Band	2⅔" x ½"	48" - 120"	14"	.052"
		12" - 72"	12"	.079"
Hugger Band	2⅔" x ½" Rerolled End	12" - 72"	10½"	.052"
		78" - 84"	10½"	.079"
	3" x 1" Rerolled End	48" - 120"	10½"	.052"
		5" x 1" Rerolled End	48" - 120"	12"



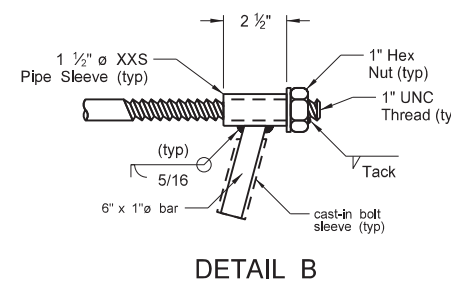
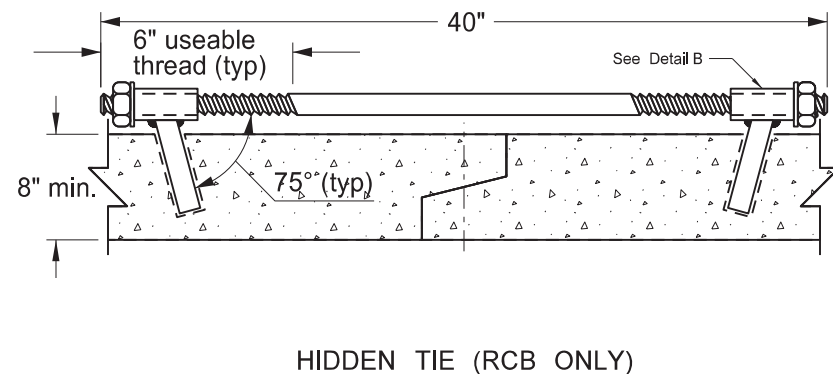
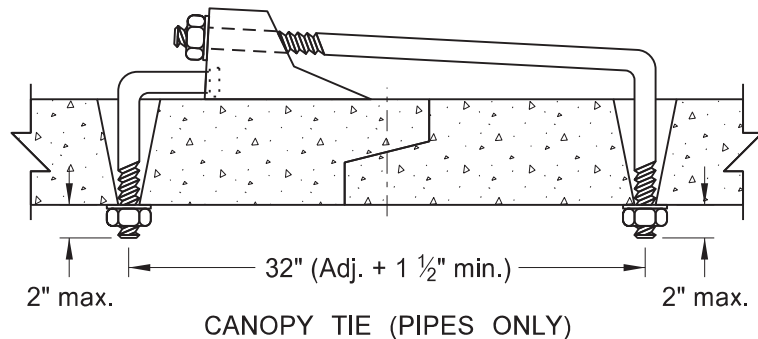
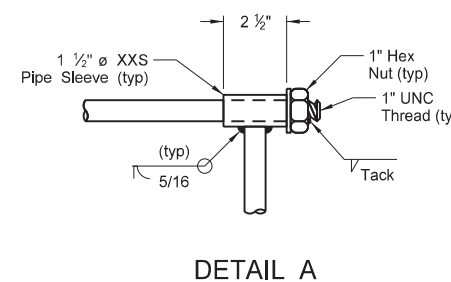
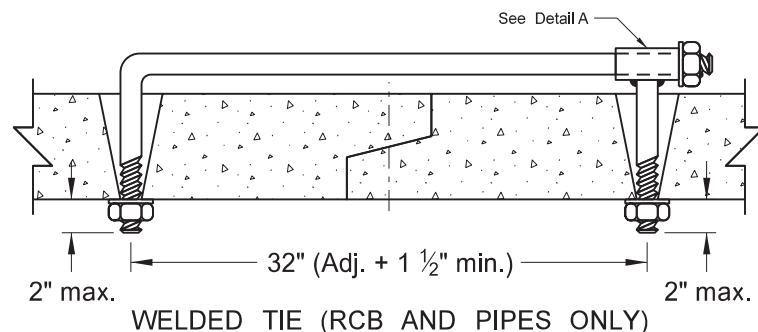
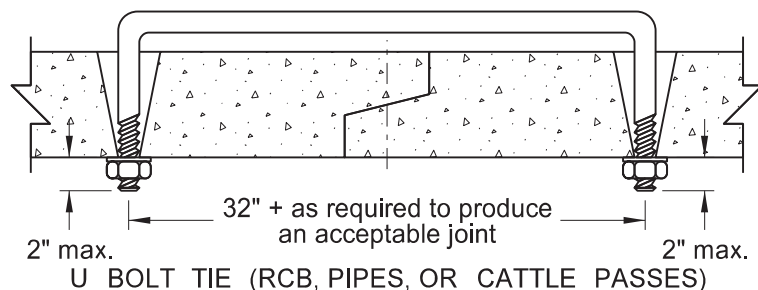
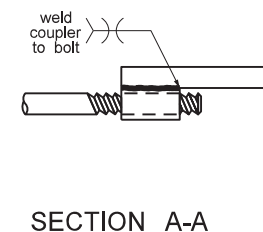
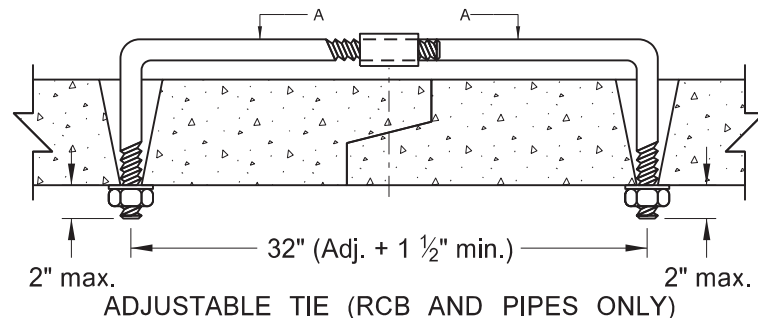
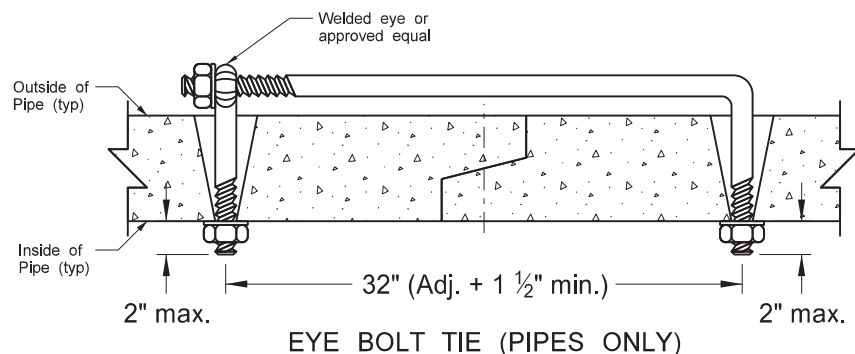
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
08-16-13	
REVISIONS	
DATE	CHANGE
01-07-14	End Section Plan View
02-27-14	3" x 1" Corrugation Detail
09-18-19	Added Perspective View Detail

This document was originally issued and sealed by  
**Jon Kettering**  
 Registration Number  
**PE-4684**,  
 on 9/18/19 and the original document is stored at the  
 North Dakota Department  
 of Transportation

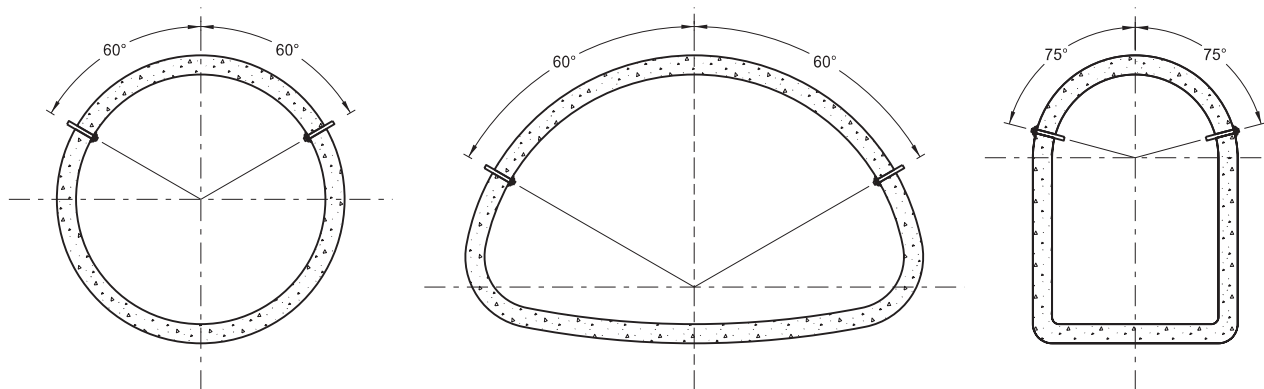
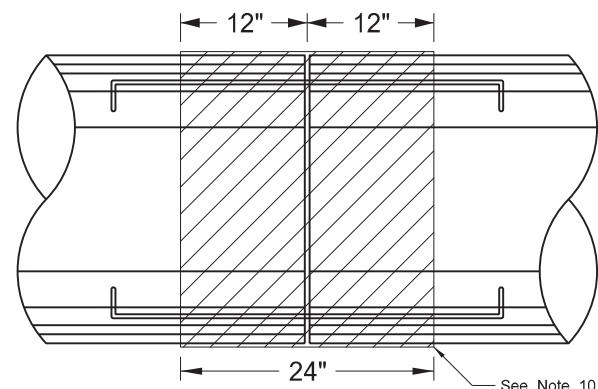


# CONCRETE PIPE, CATTLE PASS, OR PRECAST CONCRETE BOX CULVERT TIES

REQUIRED SIZE OF TIE BOLTS		
Pipe Size	Thread $\phi$	XXS Pipe Sleeve Inner $\phi$
18" - 24"	$\frac{5}{8}$ " See note 3	$\frac{3}{4}$ "
30" - 66"	$\frac{3}{4}$ "	1"
72" - 120"	1"	1 $\frac{1}{4}$ "
RCB/Cattle Pass		



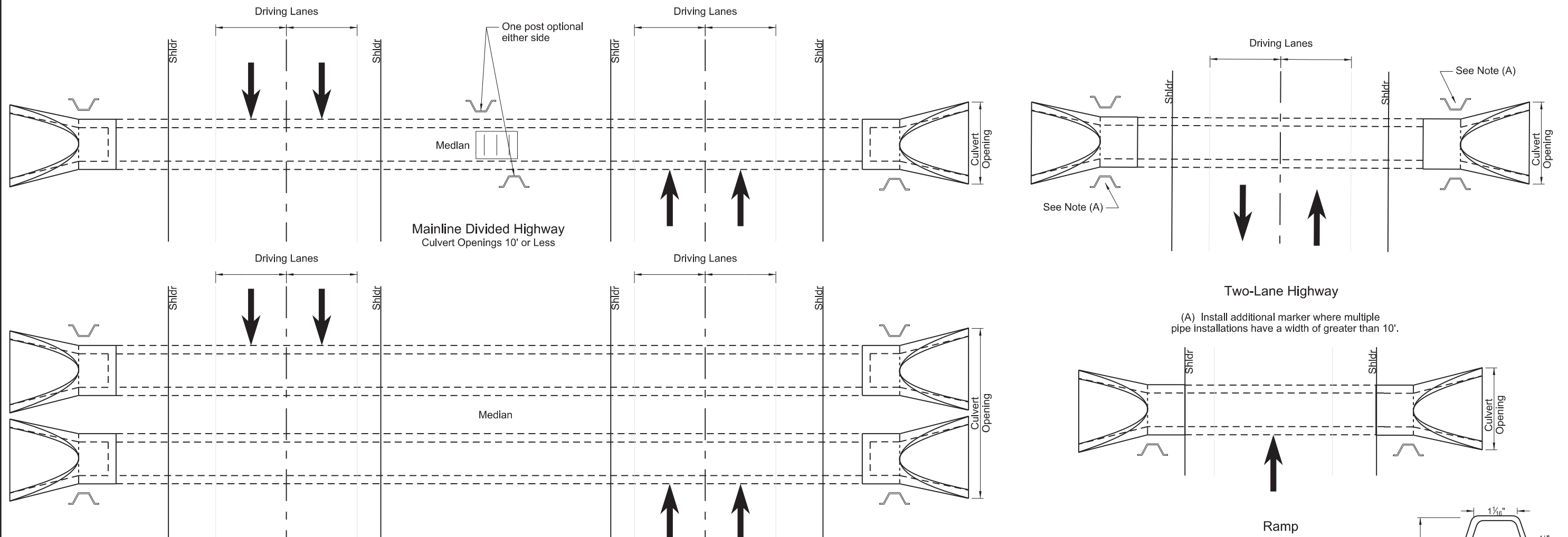
- NOTES:
- The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
  - Insert pipe ties from the inside of the pipes and grout in place for Cattle Pass and Jacked and Bored pipes. Jacked and bored pipes with a diameter of 24" or less do not require pipe ties.
  - Nuts and washers are not required on Jacked and Bored pipes or pipes with a 24" diameter or less. Insert and grout tie bars into place where nuts and washers are not used.
  - Do not use pipe ties to pull the pipe or RCB sections tight. The ties are only for holding sections together.
  - Use only tie bolt assemblies that have been hot dip galvanized in accordance with ASTM A 153.
  - Holes in pipes to accommodate tie bolts can be precast or drilled. Tapered holes are permitted when precast. Use holes that have a diameter  $\frac{1}{4}$ " larger than the diameter of the thread. In precast RCB's, use holes that contain cast-in bolt sleeves with an inside diameter of 1  $\frac{1}{4}$ ".
  - Select the type of tie bolt used from those shown.
  - Include the cost of precasting or drilling the required holes and furnishing and installing the tie bolts in the price bid for the appropriate conduit or RCB pay item.
  - Tie all centerline and approach RCP culvert joints. Tie the first three joints including the end section of all free ends of storm drain systems. Free ends are defined as any storm drain end which does not terminate at an inlet or manhole. Outfall culverts with end sections which drain adjacent ditches are examples of free ends.
  - Place joint wrap prior to installing ties. Firmly secure the wrap around the full perimeter. For concrete pipes, overlap the joint by 12" in both directions. For box culverts, use a waterproof membrane that meets ASTM C877 (Type III). Provide a membrane that is a minimum of 12" wide and center it at the joint. Provide a minimum overlap of 2.5" at the seams.
  - Use tie bolts that conform to ASTM A 36. Use heavy hex nuts that conform to ASTM A 563. Use washers that conform to ASTM F 436, Type 1. Use welded pipe sleeves and cast-in bolt sleeves that conform to ASTM A 53, Grade B.
  - Tie RCB's at locations shown on the plans.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
3-18-14	
REVISIONS	
DATE	CHANGE
7-21-15	Note 8
6-5-17	Notes 2-11, Table, Title, Labels
8-11-21	Notes 2-12, Table, Label



OBJECT MARKERS - CULVERTS



(A) Install additional marker where multiple pipe installations have a width of greater than 10'.

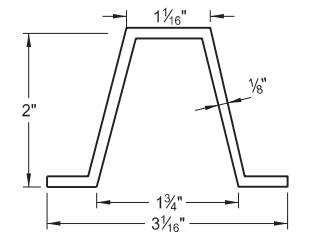
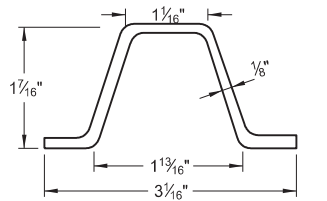
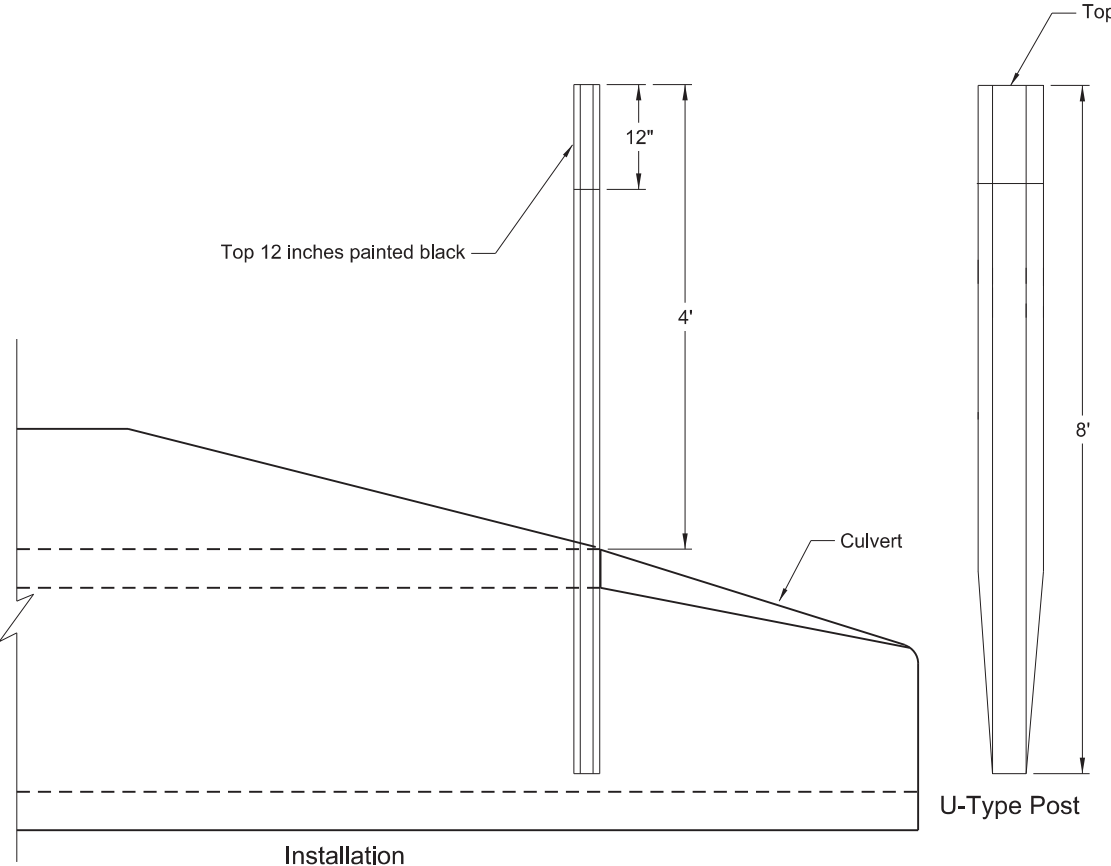
Post Location

Mainline Divided Highway  
Culvert Openings Greater than 10'  
Multiple Installations

Notes:

Mark each end of culverts crossing the roadway within the right-of-way with a post. Install posts in front of culvert in direction of travel along the side of culvert and one foot from culvert opening unless shown otherwise in plans.

Top 12 inches painted black



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-05-13	
REVISIONS	
DATE	CHANGE
7-7-14	Revised Notes
8-30-18	Updated notes to active voice.
9-05-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 9/05/19 and the original document is stored at the North Dakota Department of Transportation

Installation