

DESIGN DATA			
Traffic	Average Daily		
Current 2016	Pass: 1,445	Trucks: 640	Total: 2,085
Forecast 2036	Pass: 1,955	Trucks: 830	Total: 2,785
Clear Zone Distance:	Design Speed: 65		
Minimum Sight Dist. for Stopping: 645	Bridges: ø		
Sight Dist. for No Passing Zone: 2285			
Pavement Design Life 20 (years)			
Design Accumulated One-way Flexible ESALs: 2,420,708			

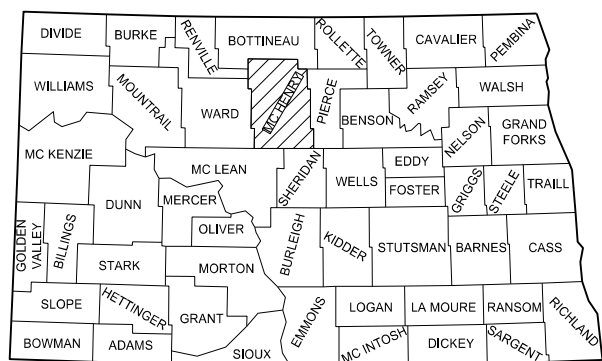
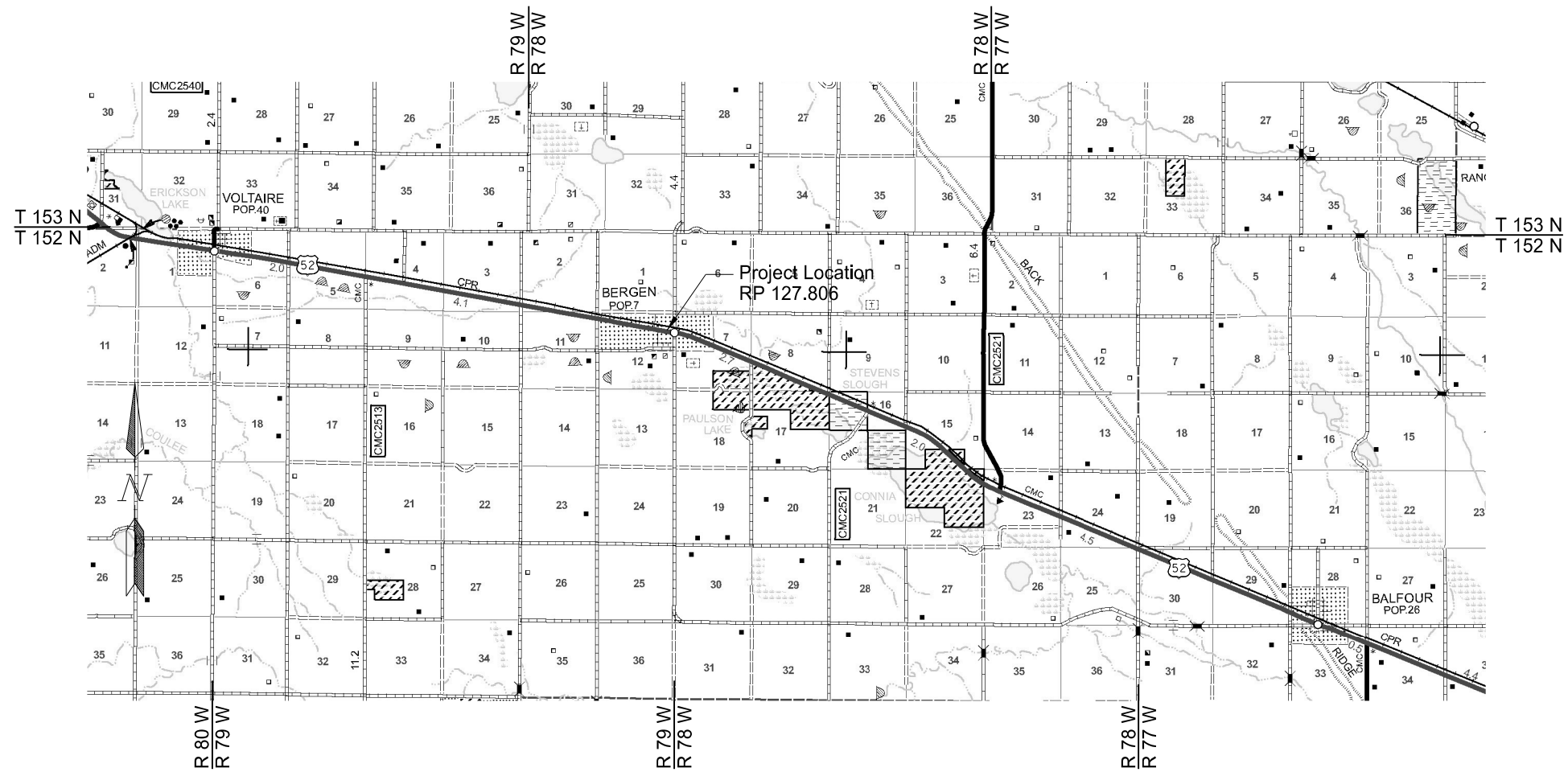
**JOB # 2**  
**NORTH DAKOTA**  
**DEPARTMENT OF TRANSPORTATION**

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	NH-4-052(081)127	21477	1	1

NH-4-052(081)127  
 McHenry County  
 US 52, 10 Mi W of Jct ND 53 Near Bergen  
 Pipe Lining

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

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
NH-4-052(081)127 \ Pipe Lining	0.001	0.001



**STATE COUNTY MAP**

**DESIGNERS**  
 Sara A. Cahlin /s/

APPROVED DATE 6/16/16  
 Roger Weigel /s/  
 OFFICE OF PROJECT DEVELOPMENT  
 ND DEPARTMENT OF TRANSPORTATION

I hereby certify that the attached plans were prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the state of ND.  
 APPROVED DATE 6/16/16  
 James Douglas Rath /s/  
 NDDOT DESIGN DIVISION

This document was originally issued and sealed by James Douglas Rath, Registration Number PE- 4288, on 6/16/16 and the original document is stored at the North Dakota Department of Transportation

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	ND	NH-4-052(081)127	2	1

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8	1	Quantities
20	1	General Details
30	1	Typical Sections
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100	1	Work Zone Traffic Control

**LIST OF STANDARD DRAWINGS**

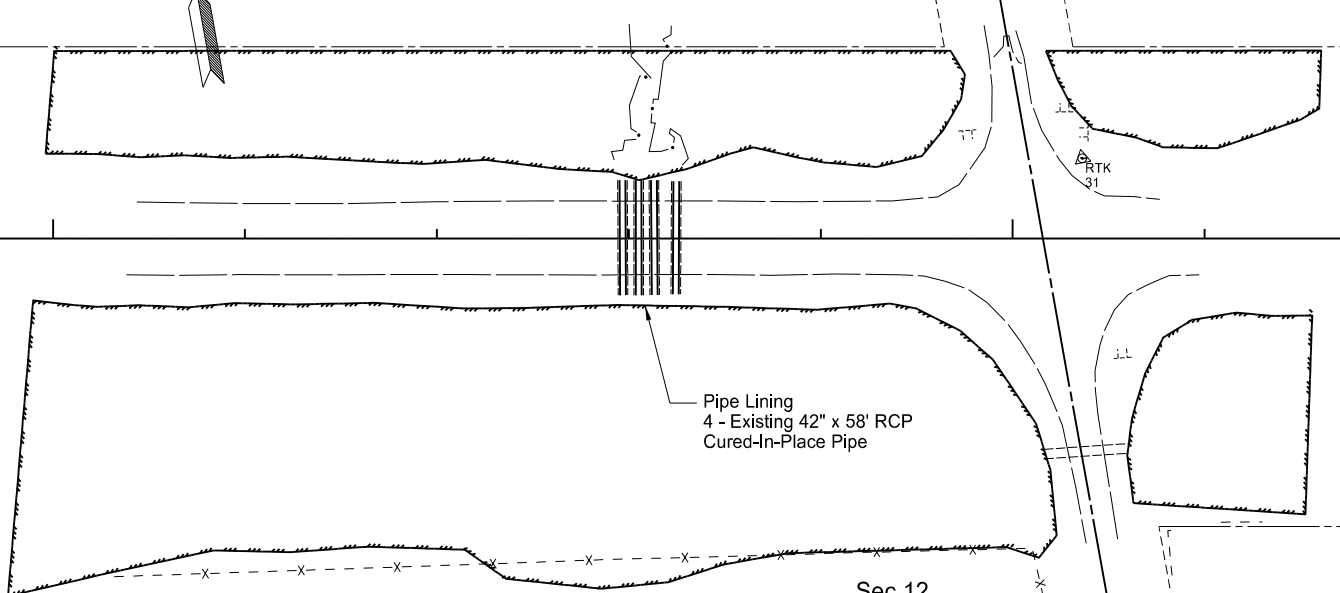
Number	Description
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D-101-10	NDDOT Utility Company and Organization Abbreviations
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D-101-30, 31, 32	Symbols
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D-704-8	Breakaway Systems For Construction Zone Signs - U-Channel Post
D-704-9	Construction Sign Details - Terminal And Guide Signs
D-704-10	Construction Sign Details - Regulatory Signs
D-704-11	Construction Sign Details - Warning Signs
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D-704-14	Construction Sign Punching And Mounting Details
D-704-19	Road Closure And Lane Closure On A Two Way Road Layouts
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**SPECIAL PROVISIONS**

Number	Description
SP 326(14)	Cured-in-Place Pipe
SP 5000(14)	Permits and Environmental Considerations

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	NH-4-052(081)127	4	1

6745+00 MCHENRY COUNTY 6750+00 Sec 7 T-152-N R-78-W 6755+00



Pipe Lining  
4 - Existing 42" x 58' RCP  
Cured-In-Place Pipe

6747+97 - C  
42" X 58' RCP (good)  
2 RCES (good)

6748+05 - C  
42" X 58' RCP (good)  
2 RCES (good)

6748+13 - C  
42" X 58' RCP (good)  
2 RCES (good)

6748+25 - C  
42" X 58' RCP (good)  
2 RCES (good)

CITY OF BERGEN

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Scope of Work

Pipe Lining

US 52, 10 Mi W of Jct ND 53 Near Bergen

**NOTES**

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	NH-4-052(081)127	6	1

**GENERAL NOTES**

704-P01 TRAFFIC CONTROL: Provide traffic control for the pipe lining consisting of a temporary lane closure, flagging, and shoulder closure. Provide additional devices at no cost to the Department:

- 1. D-704-19, layout F;
- 2. D-704-20, layout G;
- 3. D-704-24, layout S.

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**ENVIRONMENTAL NOTES**

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	NH-4-052(081)127	6	2

ENVIRONMENTAL NOTES (EN): The North Dakota Department of Transportation and the Federal Highway Administration has made environmental commitments to secure approval of this project. The following environmental notes are requirements to comply with these commitments:

EN-1 TEMPORARY WETLAND IMPACT: Temporary impact areas within wetlands and or other waters are incorporated into the plans for this project. Remove temporary fill placed and sedimentation in wetlands or other waters. Restore these wetlands to preconstruction contours.

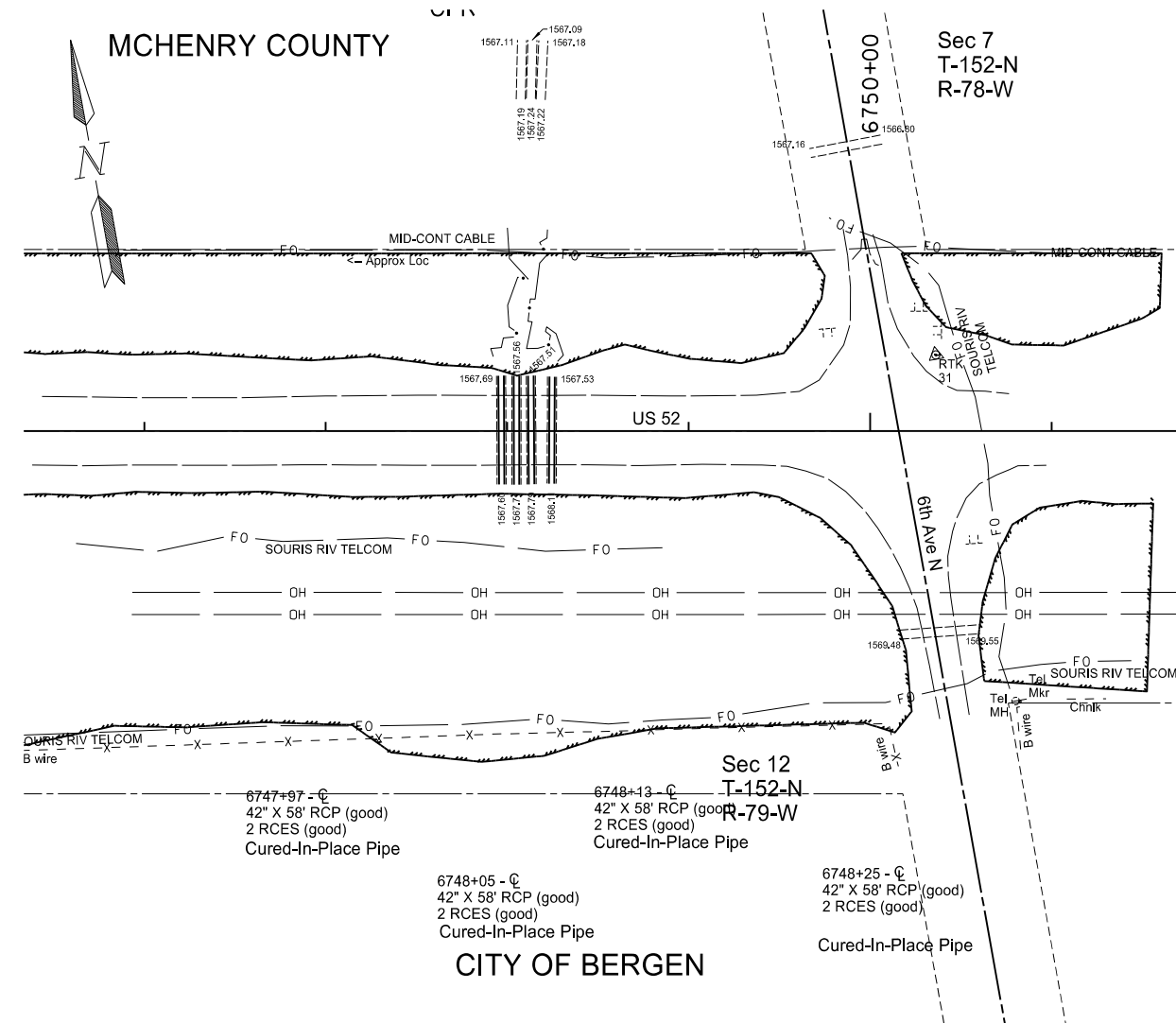
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# ESTIMATE OF QUANTITIES

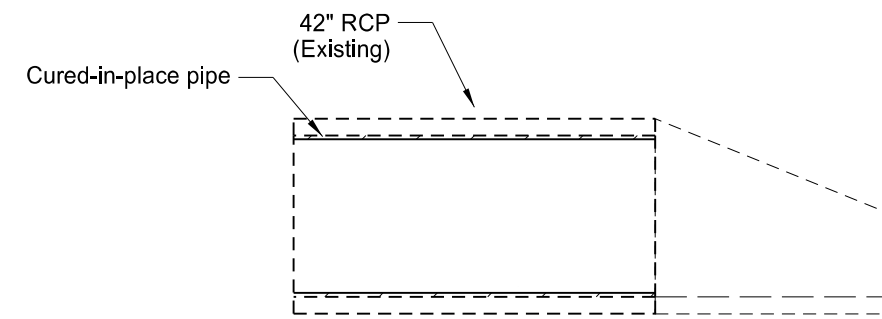
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
<b>ND</b>	NH-4-052(081)127	<b>8</b>	1

SPEC CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
-----	-----	-----	-----	-----
103	0100 CONTRACT BOND	L SUM	1	1
702	0100 MOBILIZATION	L SUM	1	1
704	0100 FLAGGING	MHR	250	250
704	1000 TRAFFIC CONTROL SIGNS	UNIT	780	780
704	1060 DELINEATOR DRUMS	EA	15	15
714	2542 CURED-IN-PLACE PIPE-42IN	LF	232	232
930	3639 POLYURETHANE FOAM - 90 LBS	GAL	200	200
990	0400 PIPE CLEANOUT	EA	4	4

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	NH-4-052(081)127	20	1



SPEC	CODE	BID ITEM	UNIT	QUANTITY
714	2542	CURED-IN-PLACE PIPE-42IN		
		6474+97	LF	58.0
		6748+05	LF	58.0
		6748+13	LF	58.0
		6748+25	LF	58.0
930	3639	POLYURETHANE FOAM - 90 LBS		
		6474+97	GAL	50.0
		6748+05	GAL	50.0
		6748+13	GAL	50.0
		6748+25	GAL	50.0



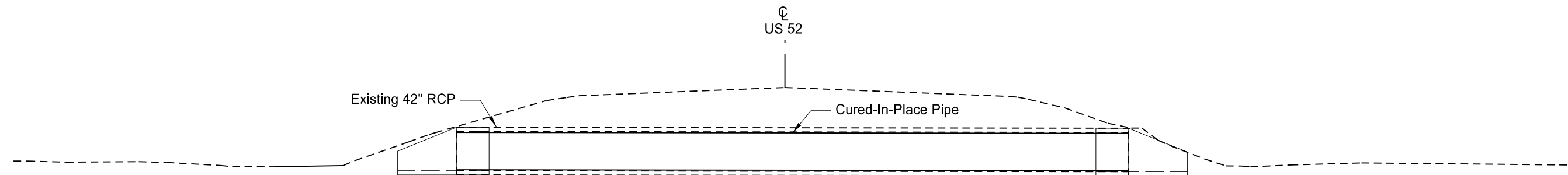
- 6747+97 - C  
42" X 58' RCP (good)  
2 RCES (good)  
Cured-In-Place Pipe
- 6748+05 - C  
42" X 58' RCP (good)  
2 RCES (good)  
Cured-In-Place Pipe
- 6748+13 - C  
42" X 58' RCP (good)  
2 RCES (good)  
Cured-In-Place Pipe
- 6748+25 - C  
42" X 58' RCP (good)  
2 RCES (good)  
Cured-In-Place Pipe

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Pipe Lining Detail  
  
Pipe Lining  
US 52, 10 Mi W of Jct ND 53 Near Bergen

NOTE: Horizontal and vertical joint separation was observed in the existing 42" RCP culverts.

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	NH-4-052(081)127	30	1



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Propose Typical Sections  
  
Pipe Lining  
US 52, 10 Mi W of Jct ND 53 Near Bergen



Wetland Impact Table																			
Wetland Number	Location	Wetland Feature	USACE Jurisdictional Wetlands <sup>1</sup> (JD)	Wetland Impacts Acre(s)				Wetland Mitigation											
				USACE/11990 Bank		11990 Bank		USFWS Bank		Onsite									
				Temp.	Perm.	Temp.	Perm.	EO 11990	USACE	USFWS	Location	Acre(s)	Location	Acre(s)	Location	Acre(s)	Mitigation Location; Ratio	Acre(s)	Constructed Site #
1a	Sec. 12, T152N, R79W	Slope	Yes	0.06	0			N	N	N									
1b	Sec. 12, T152N, R79W	Slope	Yes	0.07	0			N	N	N									
1c	Sec. 7, T152N, R79W	Slope	Yes	0	0			N	N	N									
1d	Sec. 7, T152N, R79W	Slope	Yes	0	0			N	N	N									
				<b>0.13</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>				<b>0</b>		<b>0.00</b>		<b>0.00</b>		<b>0.00</b>		<b>0.00</b>

<sup>1</sup> A wetland Jurisdictional Determination was issued by the USACE on 04/11/2016; NWO-2016-0397-BIS.

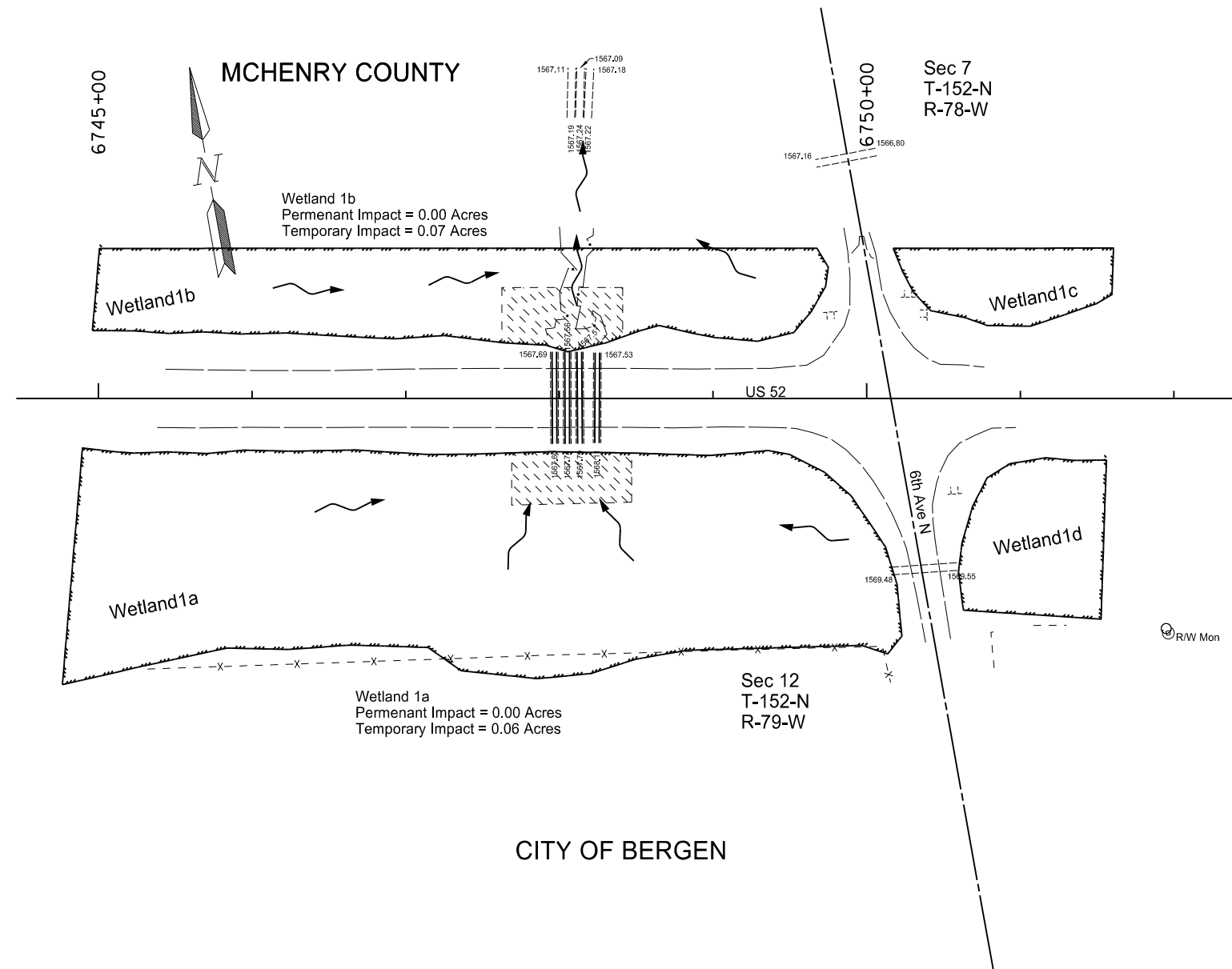
Impact Summary Table			
Permanent Impact Summary		Temporary Impacts and additional information	
Wetland Type	Total (Acres)	Wetland Type	Total (Acres/Lf)
Natural/JD	0	Temporary JD	0.13
Natural/Non-JD	0	Non-JD Temporary	0
Artificial/JD	0	Permanent JD > 0.10	0
Artificial /Non-JD	0	Permanent OW	0 ac/0 ft.
<b>Total</b>	<b>0.00</b>	<b>Temporary OW</b>	<b>0.00/0</b>

Mitigation Summary Table					
	Location	Onsite Acre(s)	11990 Bank Acre(s)	USACE/11990 Bank Acre(s)	USFWS Bank Acre(s)
USACE Only	NA	0		0	
EO 11990 Only	NA	0	0		
USACE/11990	NA	0		0	
USFWS	NA				0
<b>Total</b>		<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>

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Wetlands Mitigation and Environmental

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	NH-4-052(081)127	75	2



CITY OF BERGEN

 Temporary Wetland Impacts

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Wetland Impacts  
Pipe Lining  
US 52, 10 Mi W of Jct ND 53 Near Bergen



NDDOT ABBREVIATIONS

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

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

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NDDOT ABBREVIATIONS

D-101-2

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
08-03-15	General Revisions

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NDDOT ABBREVIATIONS

D-101-3

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
08-03-15	General Revisions

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

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

RED RIV TEL Red River Rural Telephone  
 RESVTN TEL Reservation Telephone  
 ROBRTS TEL Roberts Company Telephone  
 R-RIDER ELEC Roughrider Electric Coop  
 RRVW Red River Valley & Western Railroad  
 RSR ELEC R.S.R. Electric Cooperative  
 S E W U South East Water Users Incorporated  
 SCOTT CABLE Scott Cable Television Dickinson  
 SHERDN ELEC Sheridan Electric Cooperative  
 SHEYN VLY ELEC Sheyenne Valley Electric Cooperative  
 SKYTECH Skyland Technologies Incorporated  
 SLOPE ELEC Slope Electric Cooperative Incorporated  
 SOURIS RIV TELCOM Souris River Telecommunications  
 ST WAT COMM State Water Commission  
 STATE LN WATER State Line Water Cooperative  
 STER ENG Sterling Energy  
 STUT RWU Stutsman Rural Water Users  
 SW PL PRJ Southwest Pipeline Project  
 T M C Turtle Mountain Communications  
 TCI TCI of North Dakota  
 TESORO 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  
 WEB W. E. B. Water Development Association  
 WILLI RWA Williams Rural Water Association  
 WILSTN BAS PL Williston Basin Interstate Pipeline Company  
 WLSH RWD Walsh Water Rural Water District  
 WOLVRTN TEL Wolverton Telephone  
 XLENER Xcel Energy  
 YSVR Yellowstone Valley Railroad

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
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Line Styles

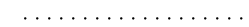





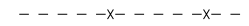
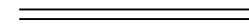
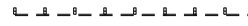
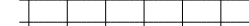

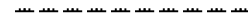
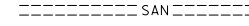

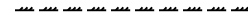
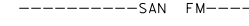
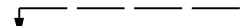
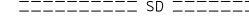
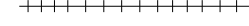

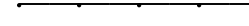
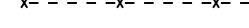
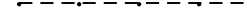


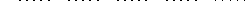





























.....	Limits of Const Transition Line	—— s —— s ——	Floating Silt Curtain	—— ——— ———	Existing Aggregate (Cross Section View)	- - - - -	Existing Centerline
.....	Bale Check	—— ——— T ——	Existing Telephone Line	—— ——— ———	Existing Curb and Gutter (Cross Section View)	- - - - -	Supplemental Contour
.....	Rock Check	—— ——— TV ——	Existing TV Line	—— ——— ———	Existing Riprap	—— - - - - -	Right of Way
.....	Sight Distance Triangle Line	Void — void — void — v	Existing Assumed Ground (Not Surveyed)	—— ——— ———	Existing Underground Vault or Lift Station	—— - - - - -	Existing Right of Way
- - - - -	Small Hidden Object	Void — void — void — v	Tentative Ground Line	—— ——— ———	Tangent Line	—— - - - - -	Existing Right of Way Railroad
- - - - -	Dimension Leader	—— ——— w ——	Existing Water or Steam Line	- - - - -	Hidden Object	- - - - -	Failure Line
- - - - -	Existing Ground	=====	Existing Under Drain	—— ——— ———	Existing Dirt Surface	- - - - -	Existing Conditions
- - - - -	Existing Topsoil (Cross Section View)	=====	Under Drain	—— ——— ———	Existing Conduit	- - - - -	Existing Ground (Details)
—— ——— ———	Large Hidden Object	=====	Wall	—— ——— ———	Topsoil Profile	—— - - - - -	Existing Sixteenth Section Line
—— ——— ———	Edge Drain	=====	Existing Slotted Drain	- - - - -	Existing Conductor	- - - - -	Existing Right of Way Not State Owned
—— D —— D ——	Geotextile Fabric Type D	—— + —— + ——	Existing Cemetary Boundary	- - - - -	Conductor	- - - - -	Phantom Object
—— ——— E ——	Existing Electrical	—— ——— ———	Centerline Pavement Marking	- - - - -	Fiber Optic	- - - - -	Centerline Main
—— ——— FO ——	Existing Fiber Optic Line	=====	Barrier with Centerline Pavement Marking	- - - - -	Existing Loop Detector	- . . . .	Existing Guardrail Cable
—— ——— FO ——	Existing TV Fiber Optic	=====	Barrier Pavement Marking	- - - - -	Subgrade, Subcut or Ditch Grade	— • — • — • — •	Existing Guardrail Metal
—— ——— G ——	Existing Gas Pipe	- - - - -	Stripe 4 IN Dotted Extension White	—— ——— ———	Existing Asphalt Surface	—— . —— . —— . —— . ——	Existing Edge of Water
—— ——— <b>Geo</b> —— <b>Geo</b> ——	Geogrid	- - - - -	Stripe 8 IN Dotted Extension White	—— ——— ———	Existing Asphalt (Cross Section View)	- - - - -	Excavation Limits
—— ——— OH ——	Existing Overhead Utility Line	- - - - -	Stripe 8 IN Lane Drop	—— ——— ———	Existing Reinforcement Rebar	—— . . . —— . . . —— . . . —— . . . ——	Existing Government Lot Line
—— ——— P ——	Existing Power	—— ——— v ——	Wetland Mitigation	—— ——— ———	Existing Tie Point Line	.....	Existing Adjacent Block Lines
—— ——— PL ——	Existing Fuel Pipeline	- - - - -	Existing Box Culvert Bridge	—— ——— ———	Existing State or International Line	.....	Existing Adjacent Lot Lines
—— ——— <b>PL</b> ——	Existing Undefined Above Ground Pipe Line	- - - - -	Existing Concrete Surface	—— ——— ———	Existing Quarter Section Line	.....	Existing Adjacent Property Line
—— ——— R —— R ——	Geotextile Fabric Type R	- - - - -	Existing Drainage Structure	—— ——— ———	Existing County	.....	Existing Adjacent Subdivision Lines
—— ——— R —— R ——	Geotextile Fabric Type R1	- - - - -	Easement	—— ——— ———	Existing Section Line	.....	
—— REMOVE —— REMOVE ——	Remove Line	- - - - -	Existing Concrete	—— ——— ———	Existing Township	.....	
—— ——— RR —— RR ——	Geotextile Fabric Type RR	- - - - -	Existing Easement	—— ——— ———	Existing Railroad Centerline	.....	
—— ——— S —— S ——	Geotextile Fabric Type S	—— ——— ———	Existing Gravel Surface	—— ——— ———	Centerline	.....	

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

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



















Symbols

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

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






























































































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

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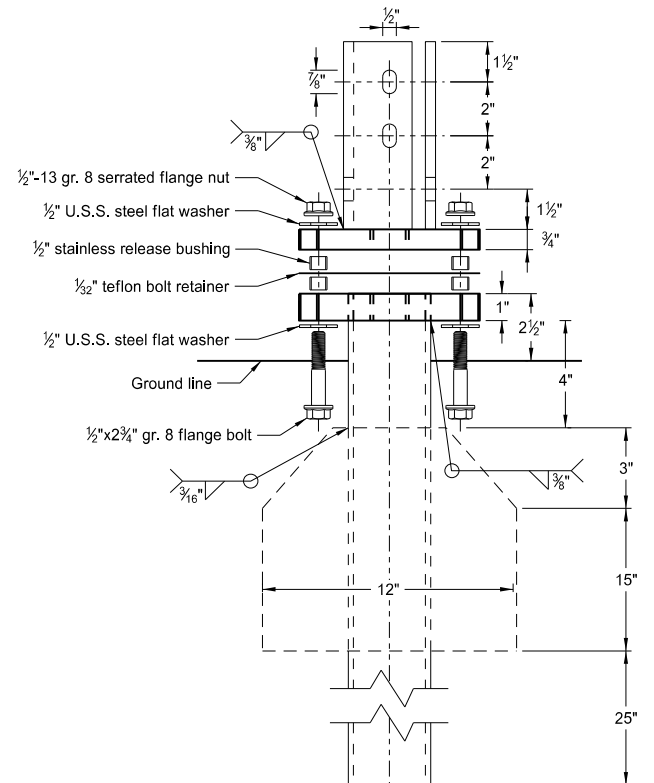
# Symbols

D-101-32

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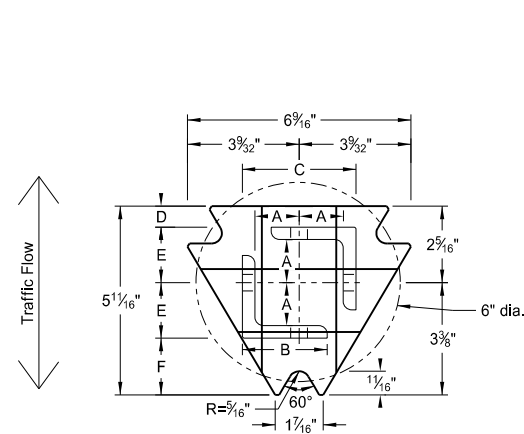
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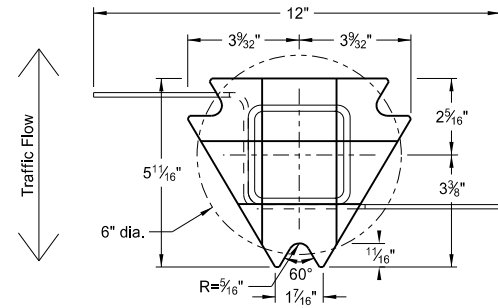


Multi-Directional Slip Base Assembly

Perforated Tube



Top Post Receiver  
Plate - ASTM A572 grade 50  
Angle Receiver - 2 1/2"x2 1/2"x3/8" ASTM A36 structural angle



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

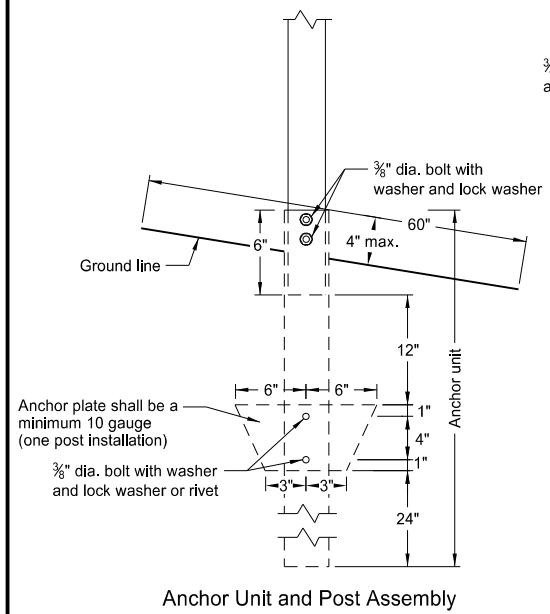
Notes:

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

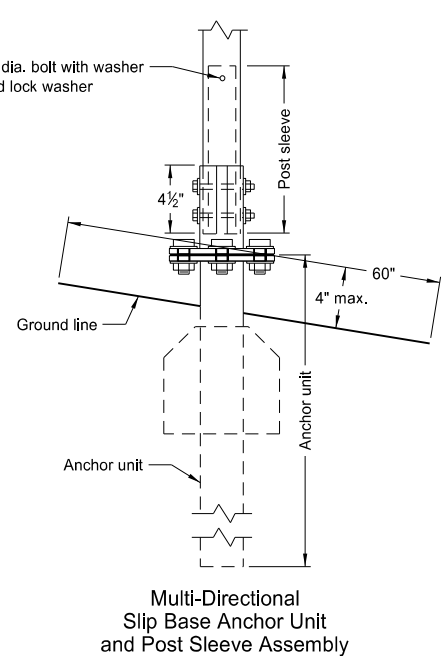
Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thickness Gauge	Sleeve Size in.	Wall Thickness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2 1/4
1	2 1/4	12			No	2 1/2
1	2 1/2	12			(A)	3
1	2 1/2	10			Yes	
1	2 1/4	12	2	12	Yes	
1	2 1/2	12	2 1/4	12	Yes	
2	2	12			No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

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

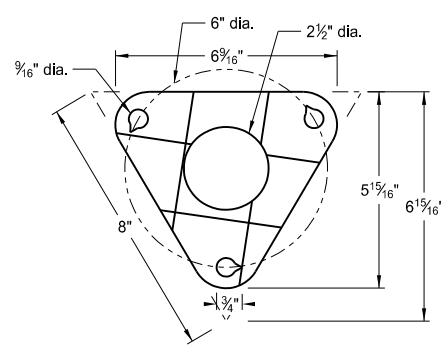
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2 3/16"x10 ga.	1 9/64"	2 1/2"	3 1/32"	2 5/32"	1 33/64"	1 1/8"
2 1/2"x10 ga.	1 9/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"



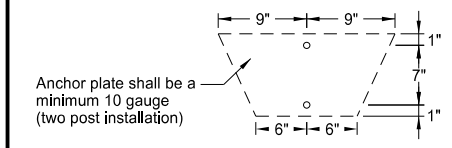
Anchor Unit and Post Assembly



Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly



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



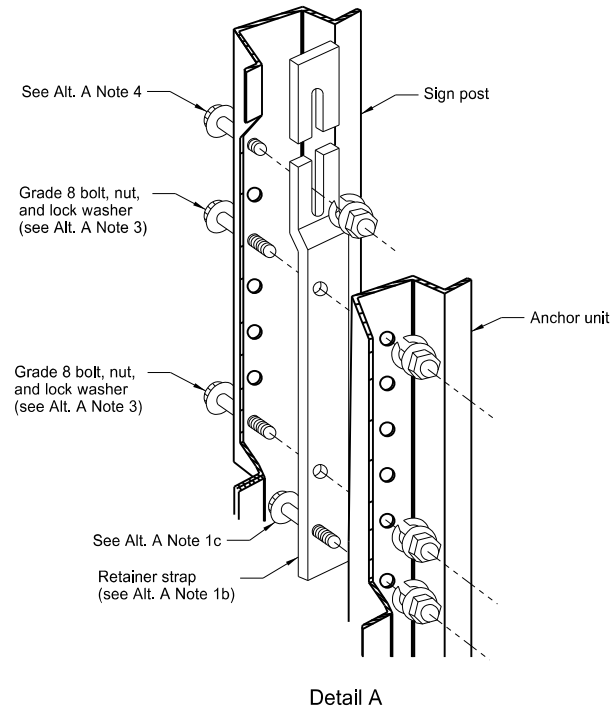
Anchor plate shall be a minimum 10 gauge (two post installation)

- (A) The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak.  
(B) The 2 3/16"x10 ga. may be inserted into 2 1/2"x10 ga. for additional wind load.

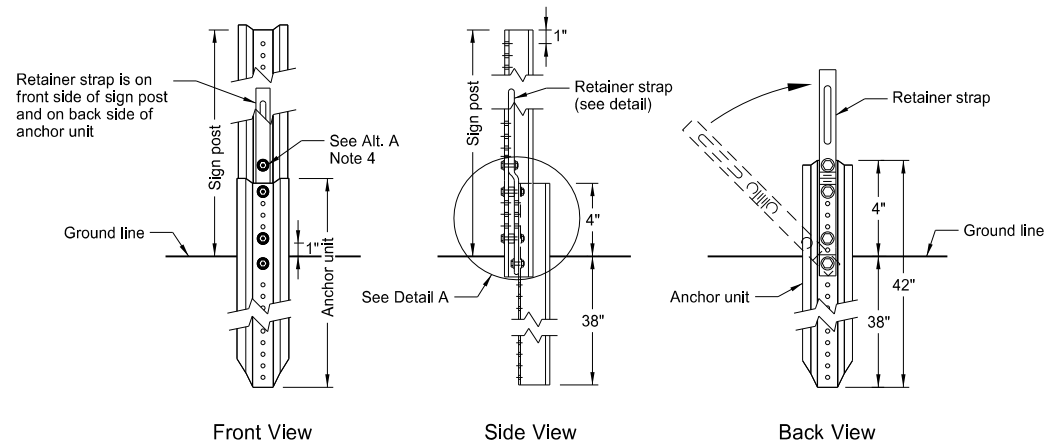
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U-Channel Post



Detail A



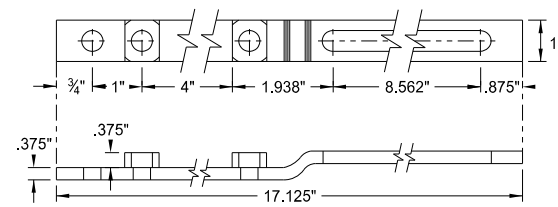
Front View

Side View

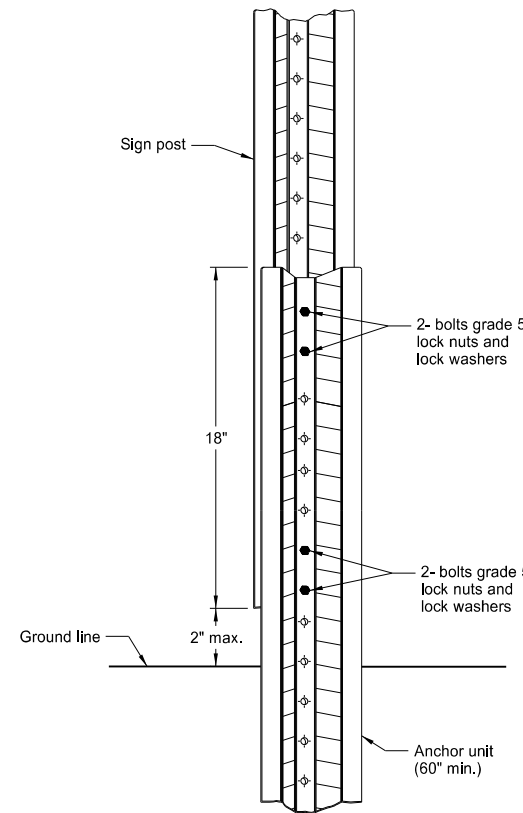
Back View

Breakaway U-Channel Detail Alternate A

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

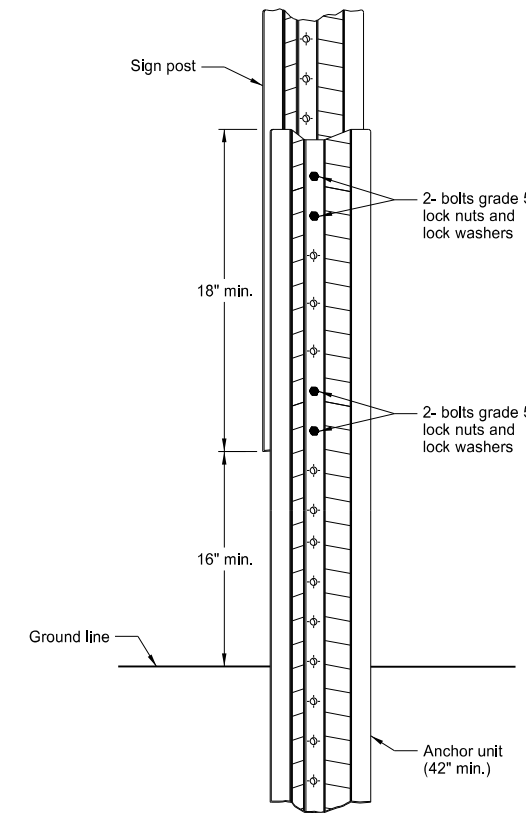


Retainer Strap Detail



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

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



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

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

Alternate A Steps of Installation:

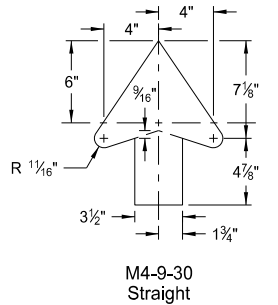
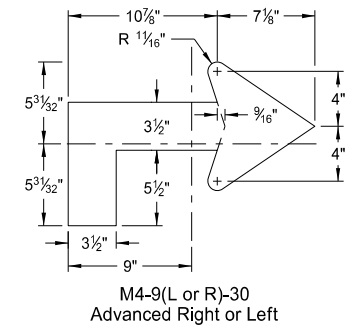
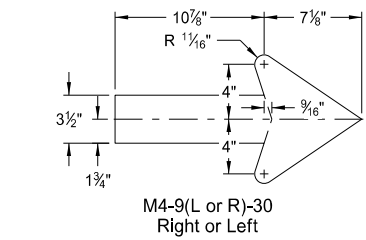
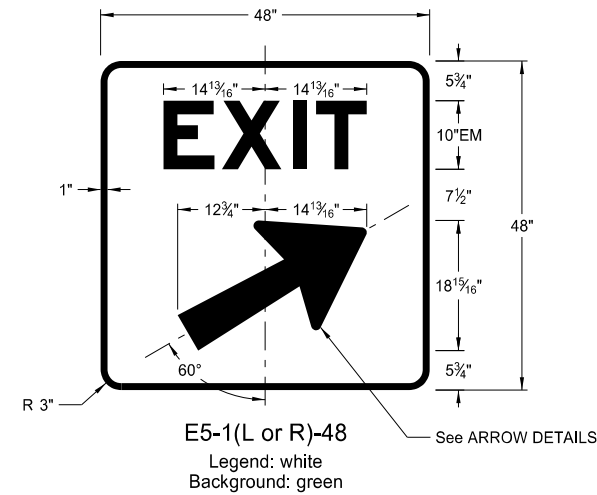
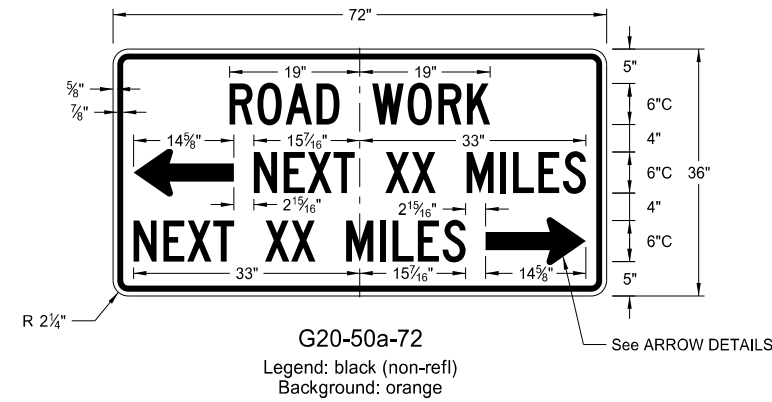
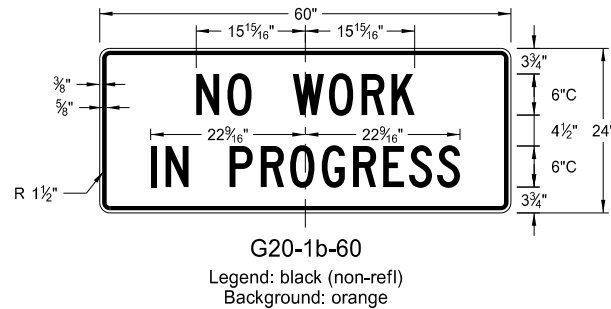
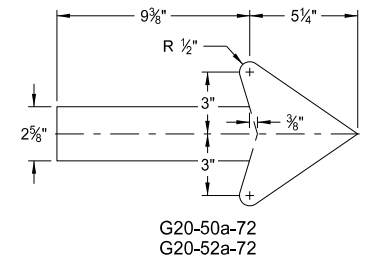
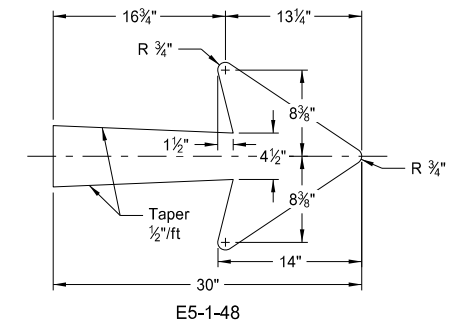
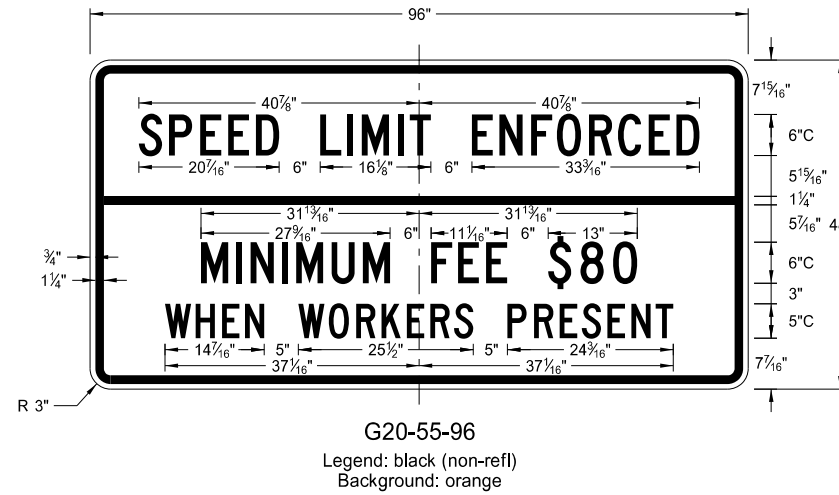
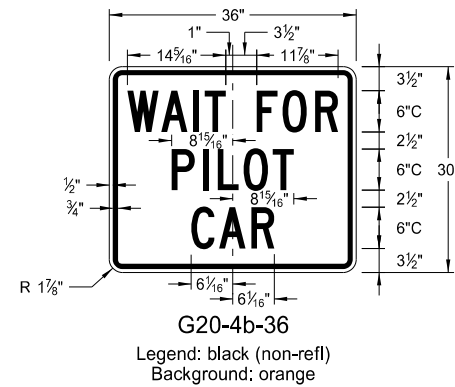
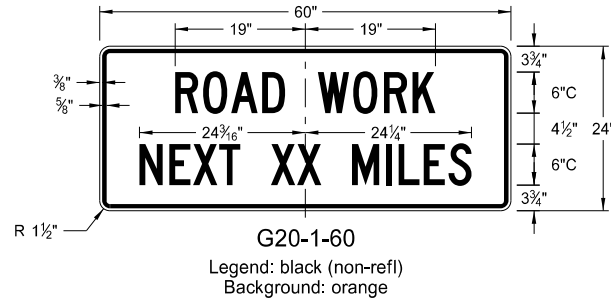
1. a) Drive anchor unit to within 12" of ground level.  
b) Proper assembly established by lining up the bottom hole of retainer strap with the 6th hole from the top of the anchor unit.  
c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.  
d) Rotate strap 90° to left.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

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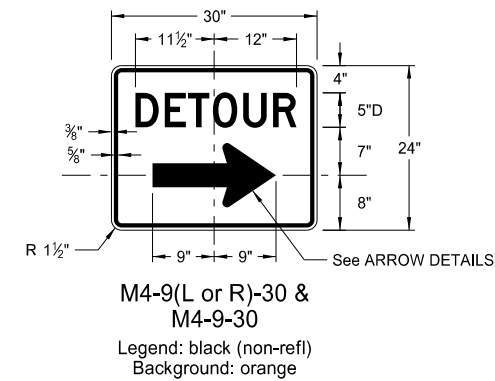
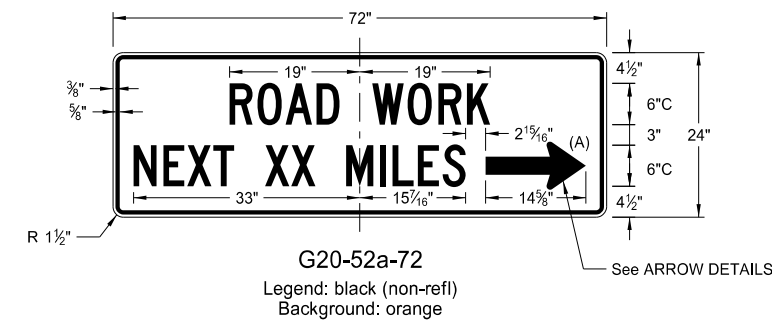
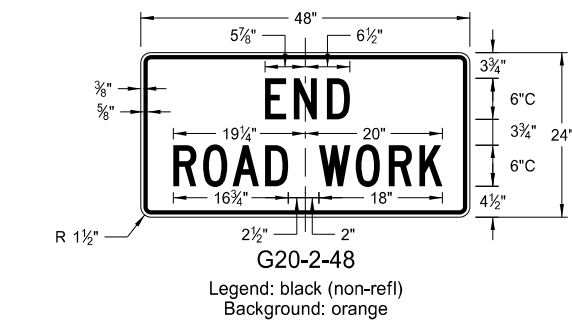
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CONSTRUCTION SIGN DETAILS  
 TERMINAL AND GUIDE SIGNS

D-704-9



ARROW DETAILS



NOTES:

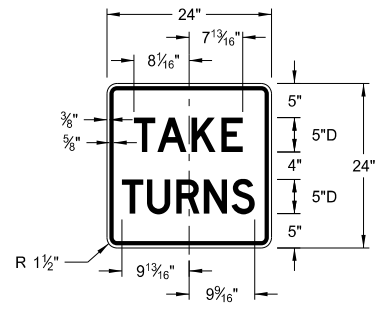
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

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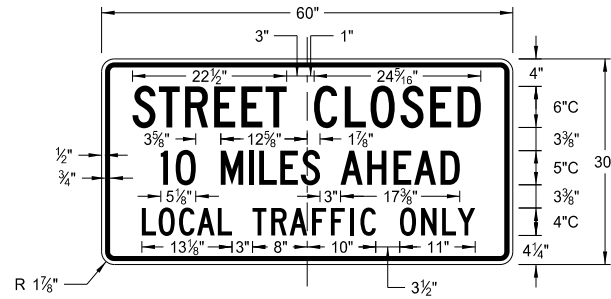
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CONSTRUCTION SIGN DETAILS  
REGULATORY SIGNS

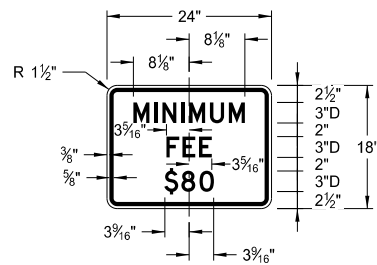
D-704-10



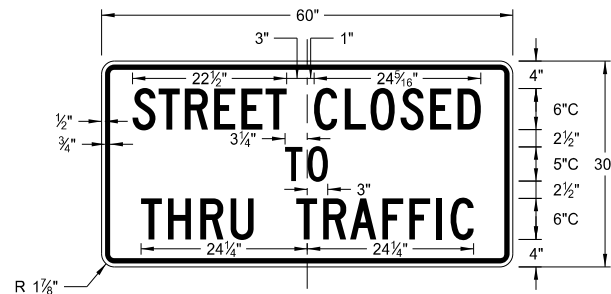
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Background: white



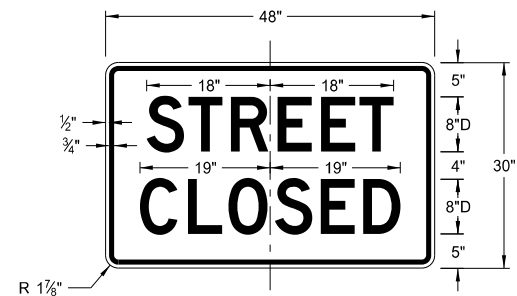
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R2-1a-24  
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R11-4a-60  
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R11-2a-48  
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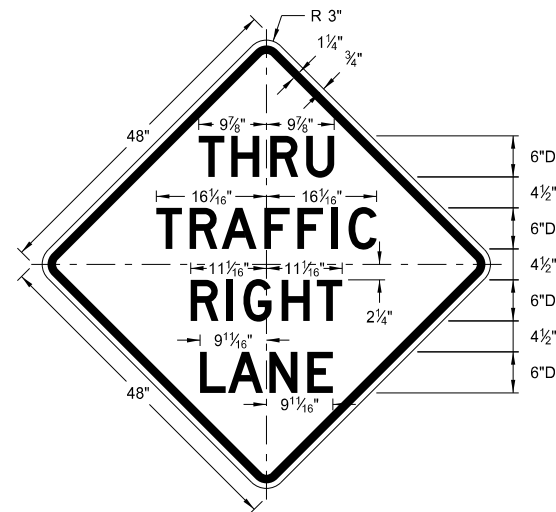
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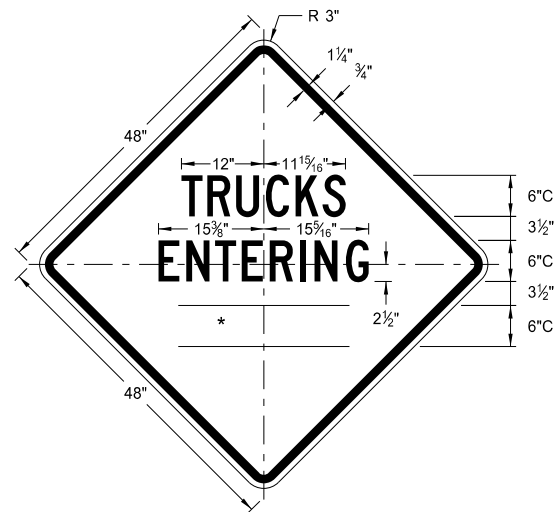
CONSTRUCTION SIGN DETAILS  
WARNING SIGNS

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

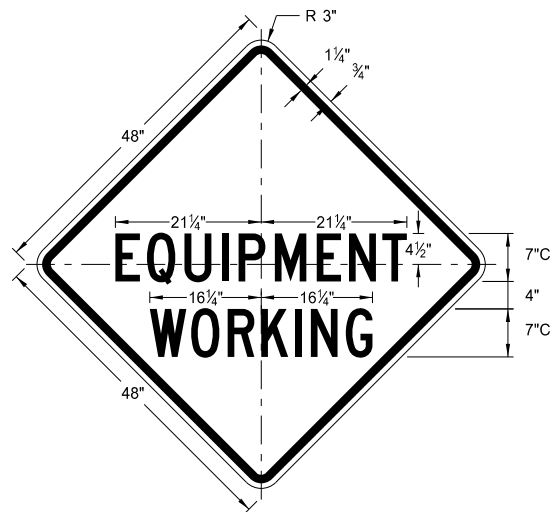
\* DISTANCE MESSAGES



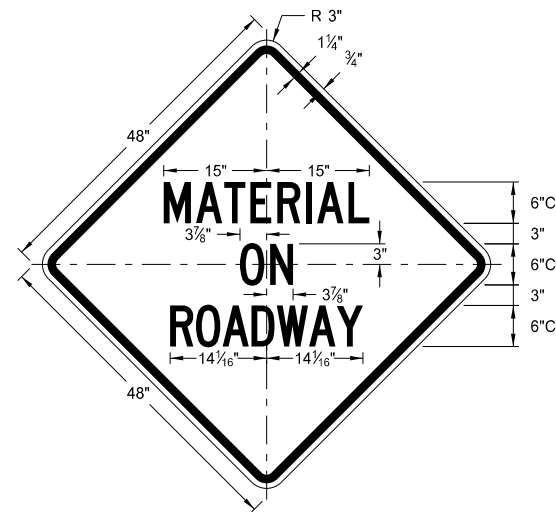
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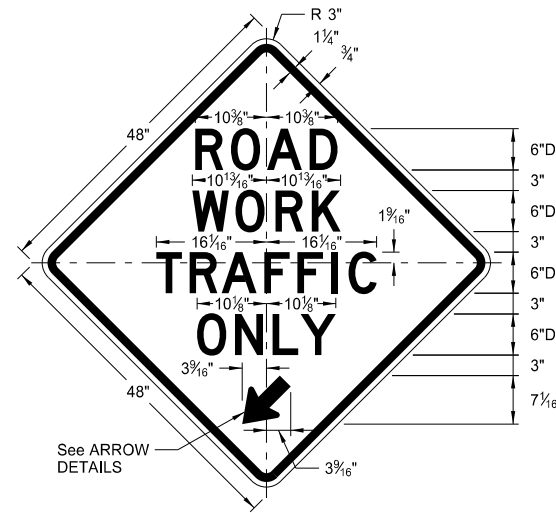
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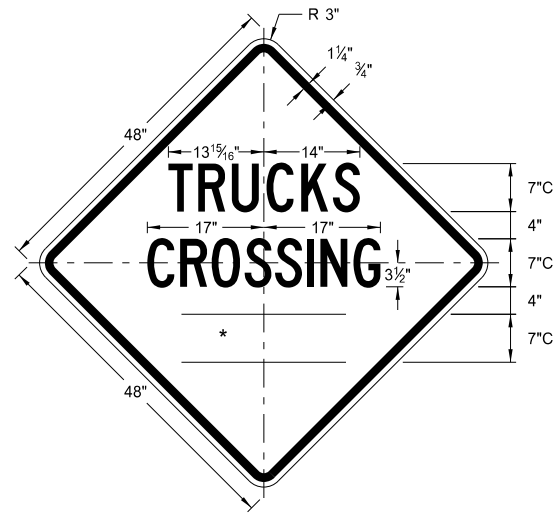
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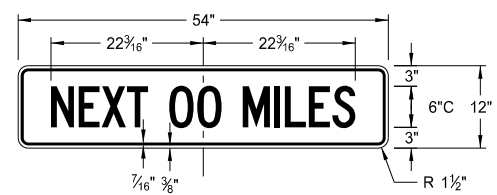
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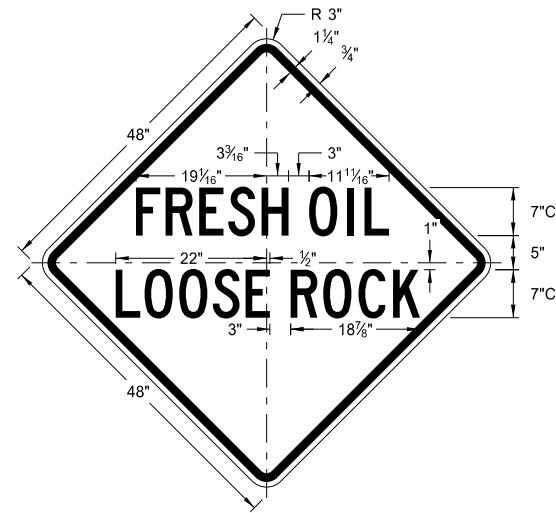
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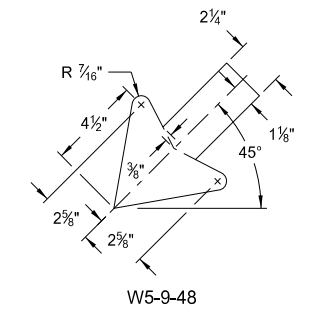
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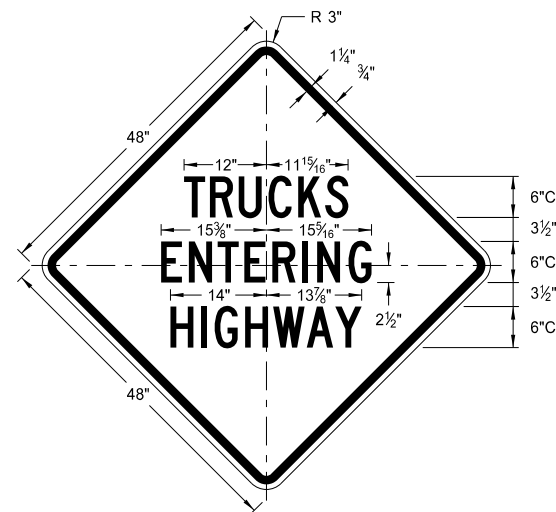
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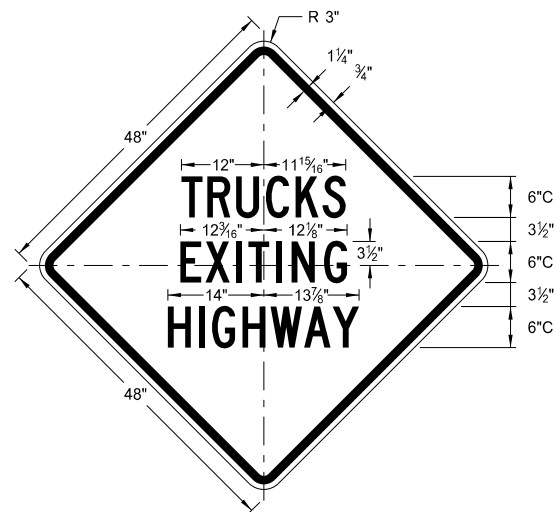
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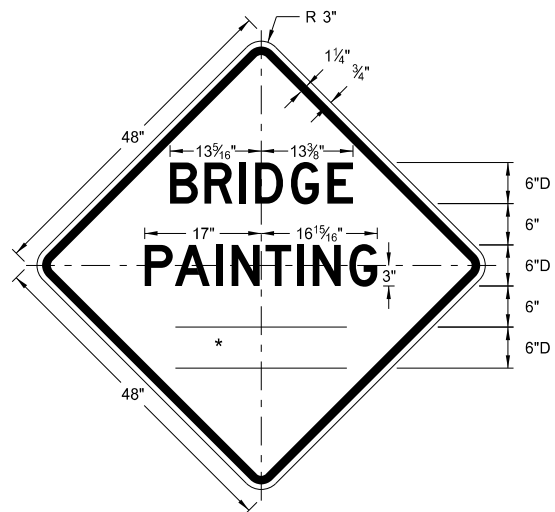
W5-9-48  
ARROW DETAILS



W8-53-48  
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W8-56-48  
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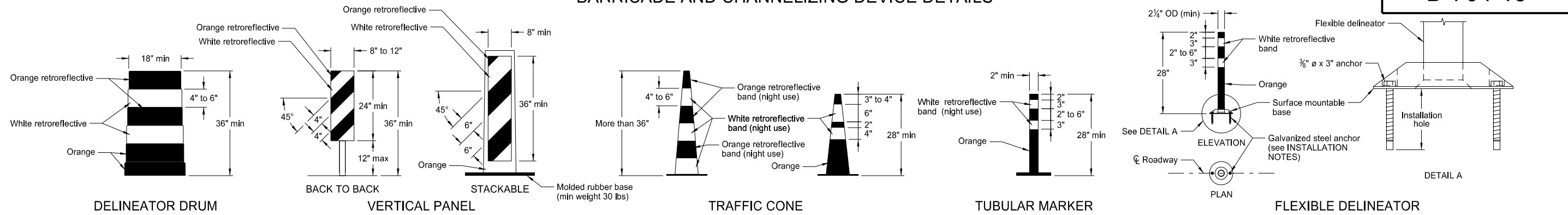


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BARRICADE AND CHANNELIZING DEVICE DETAILS



INSTALLATION NOTES:

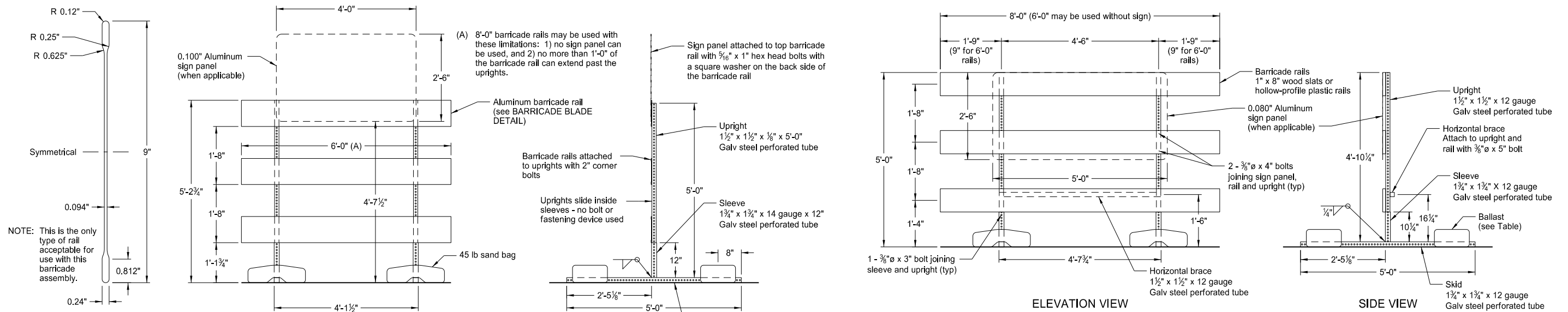
1. Drill installation holes to diameter and depth as required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, the contractor may use an 8" x 8" butyl pad or hot melt butyl.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

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

Markings for vertical panels shall be alternating orange and white retroreflective stripes, sloping downward in the direction vehicular traffic is to pass. Retroreflective sheeting shall be placed on both sides of panel and shall have a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective material on the vertical panel is 36 inches or more, a stripe width of 6 inches shall be used.

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

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



BARRICADE BLADE DETAIL

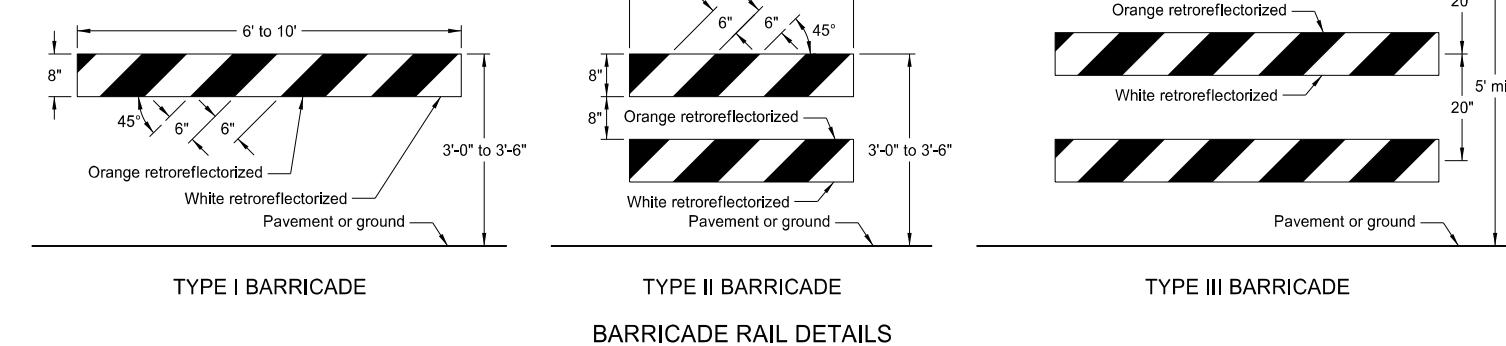
BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

SIDE VIEW

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

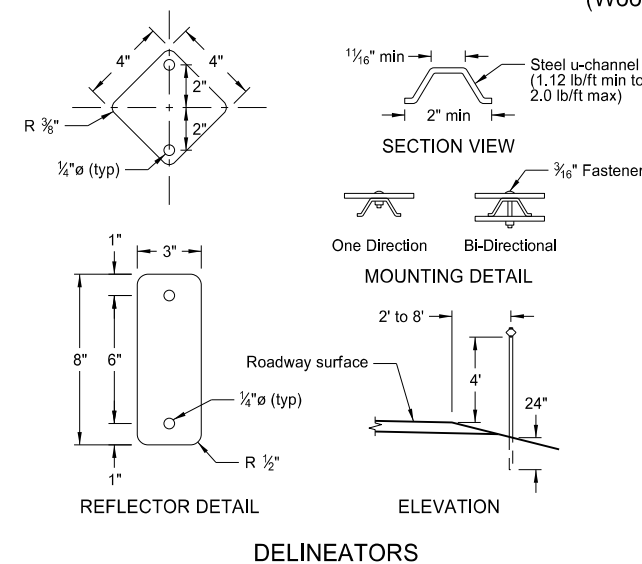


TYPE I BARRICADE

TYPE II BARRICADE

TYPE III BARRICADE

BARRICADE RAIL DETAILS



REFLECTOR DETAIL

DELINEATORS

MINIMUM BALLAST (For each side of barricade support)

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

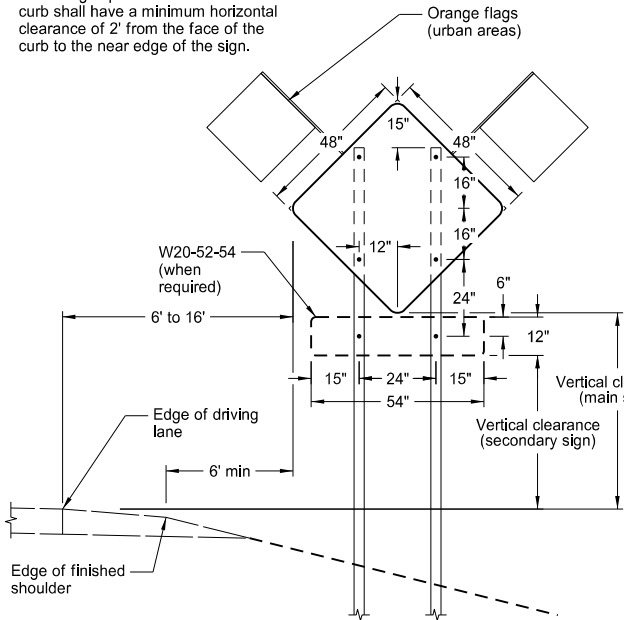
Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

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

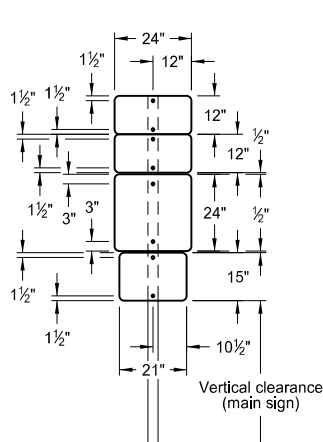
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CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

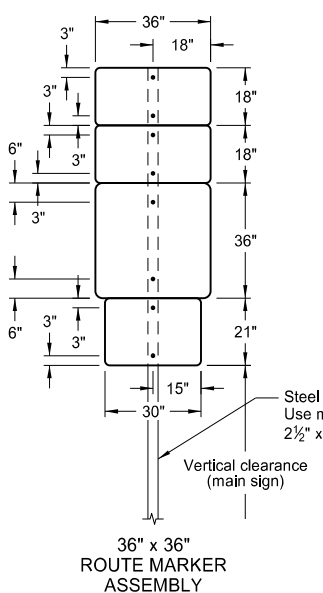
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



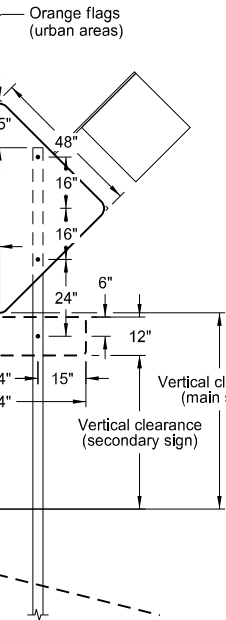
TYPICAL SECTION  
(48" x 48" diamond warning sign shown)



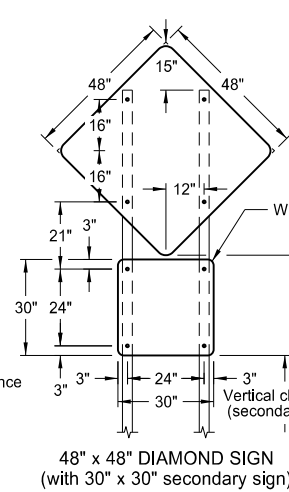
24" x 24" ROUTE MARKER ASSEMBLY



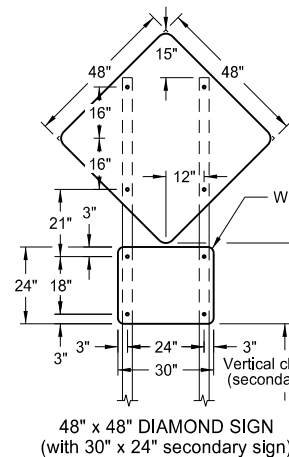
36" x 36" ROUTE MARKER ASSEMBLY



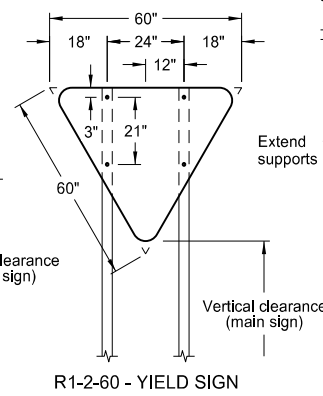
18" x 18" DIAMOND SIGN



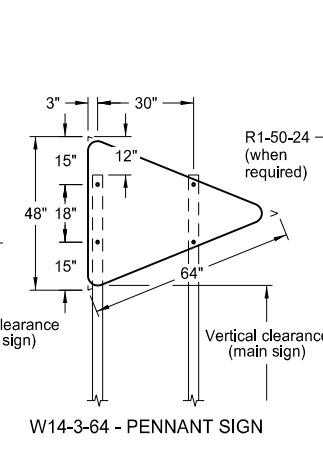
48" x 48" DIAMOND SIGN  
(with 30" x 30" secondary sign)



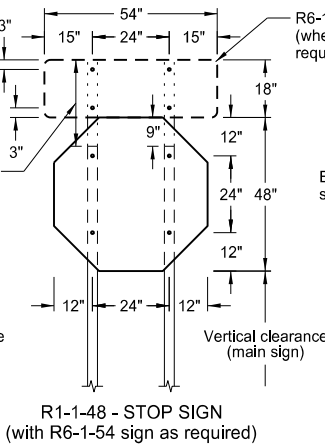
48" x 48" DIAMOND SIGN  
(with 30" x 24" secondary sign)



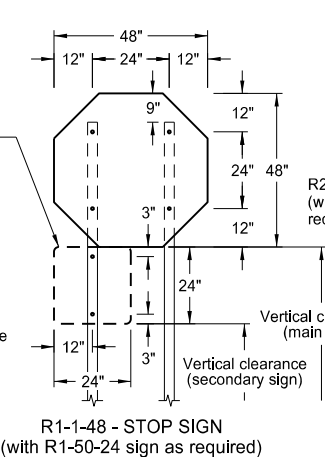
R1-2-60 - YIELD SIGN



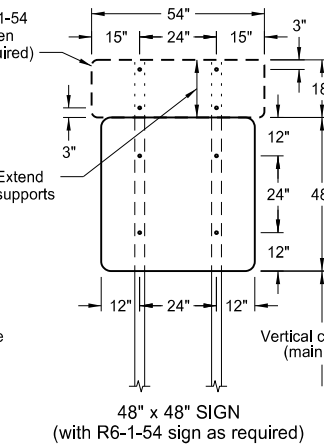
W14-3-64 - PENNANT SIGN



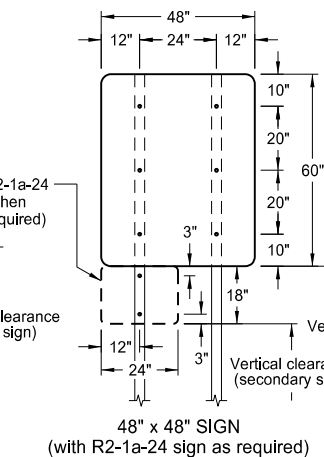
R1-1-48 - STOP SIGN  
(with R6-1-54 sign as required)



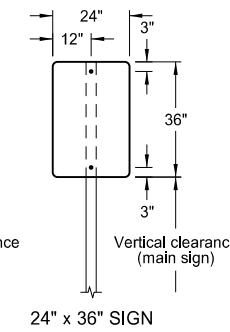
R1-1-48 - STOP SIGN  
(with R1-50-24 sign as required)



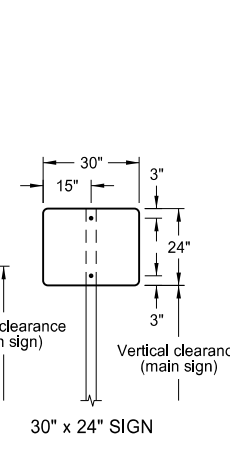
48" x 48" SIGN  
(with R6-1-54 sign as required)



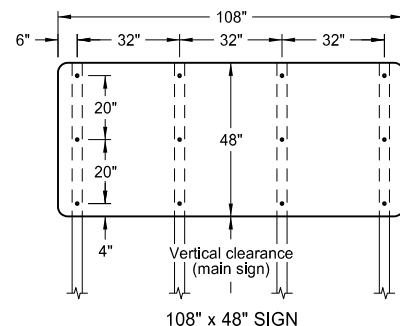
48" x 48" SIGN  
(with R2-1a-24 sign as required)



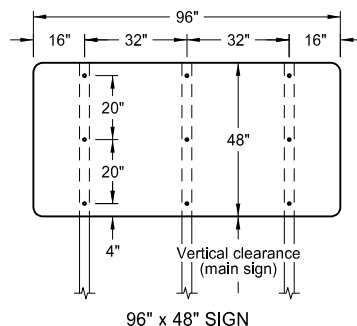
24" x 36" SIGN



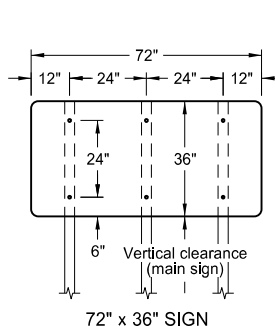
30" x 24" SIGN



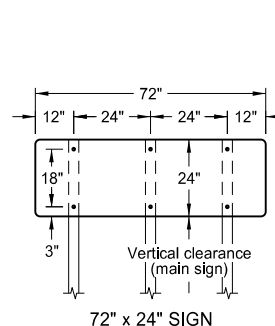
108" x 48" SIGN



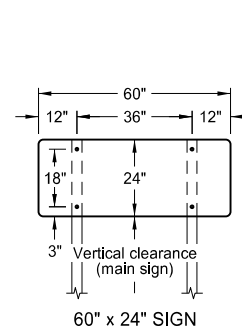
96" x 48" SIGN



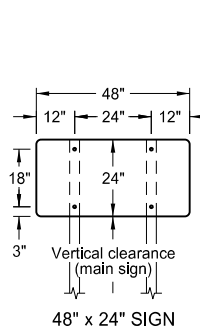
72" x 36" SIGN



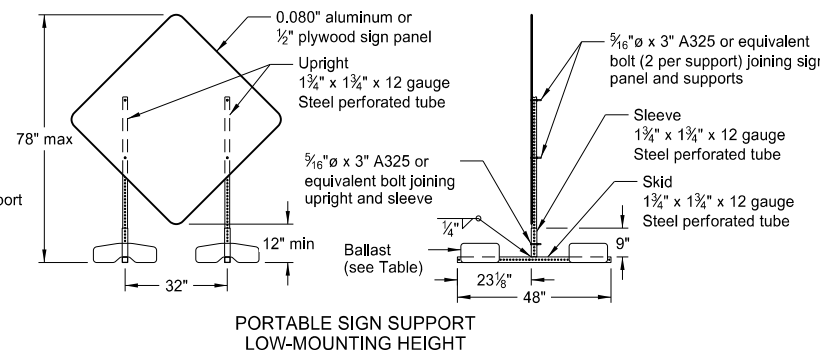
72" x 24" SIGN



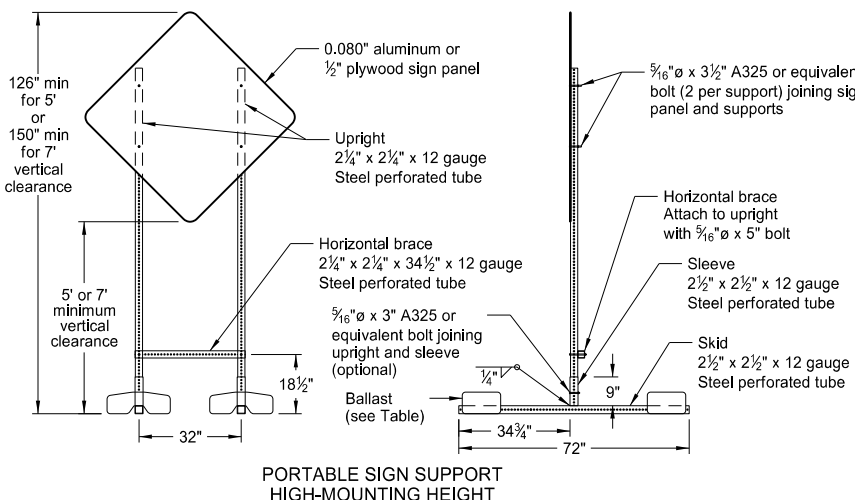
60" x 24" SIGN



48" x 24" SIGN



PORTABLE SIGN SUPPORT  
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT  
HIGH-MOUNTING HEIGHT

NOTES:

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

Signs over 50 square feet should be installed on 2 1/2" x 2 1/2" perforated tube supports as a minimum.

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

2. Sign Panels: Provide sign panels made of 0.100" aluminum, 1/2" plywood, or other approved material, except where noted. All holes to be punched round for 3/8" bolts.

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

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

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

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

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

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

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

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

Signs mounted to the portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT Details shall have a maximum surface area of 16 square feet.

MINIMUM BALLAST  
(For each side of sign support base)

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

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

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

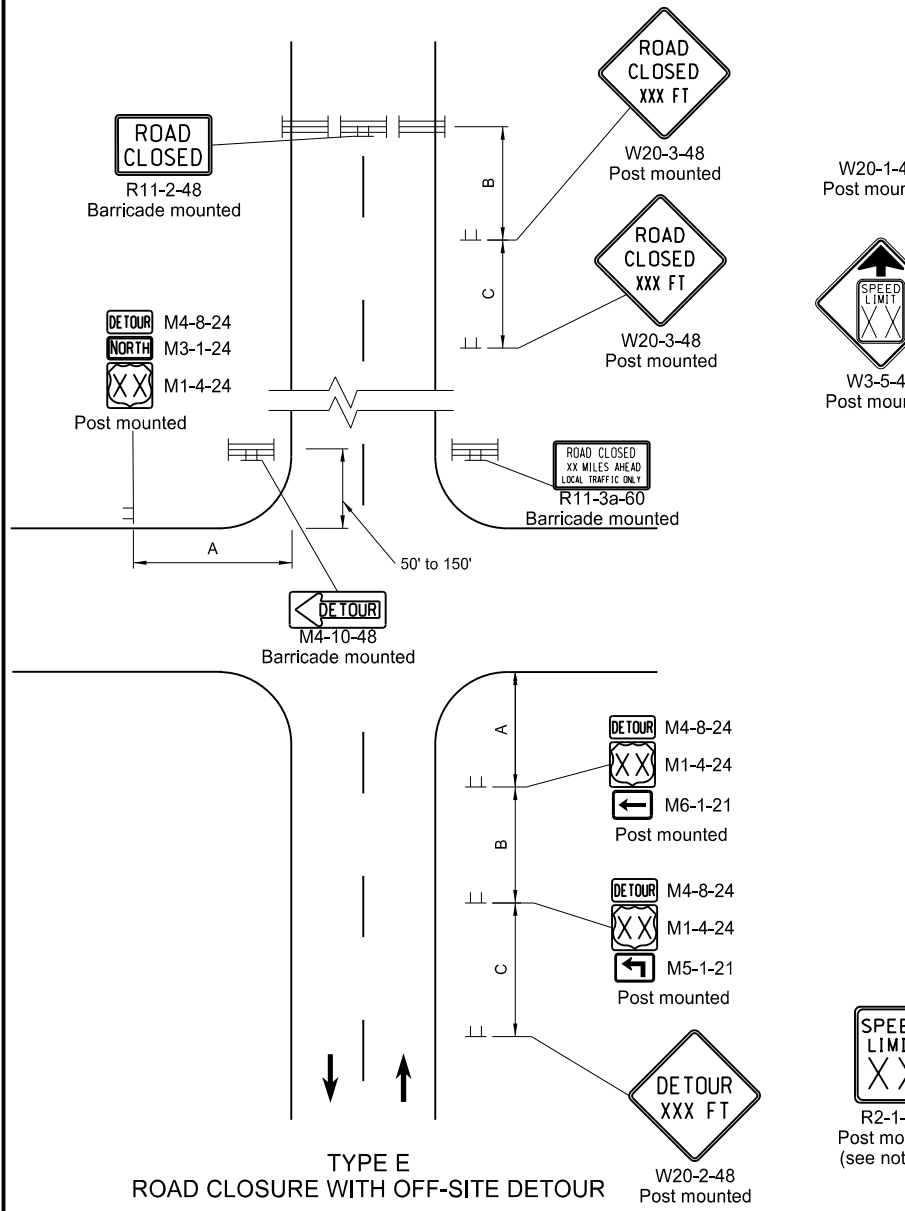
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# ROAD CLOSURE AND LANE CLOSURE ON A TWO WAY ROAD LAYOUTS

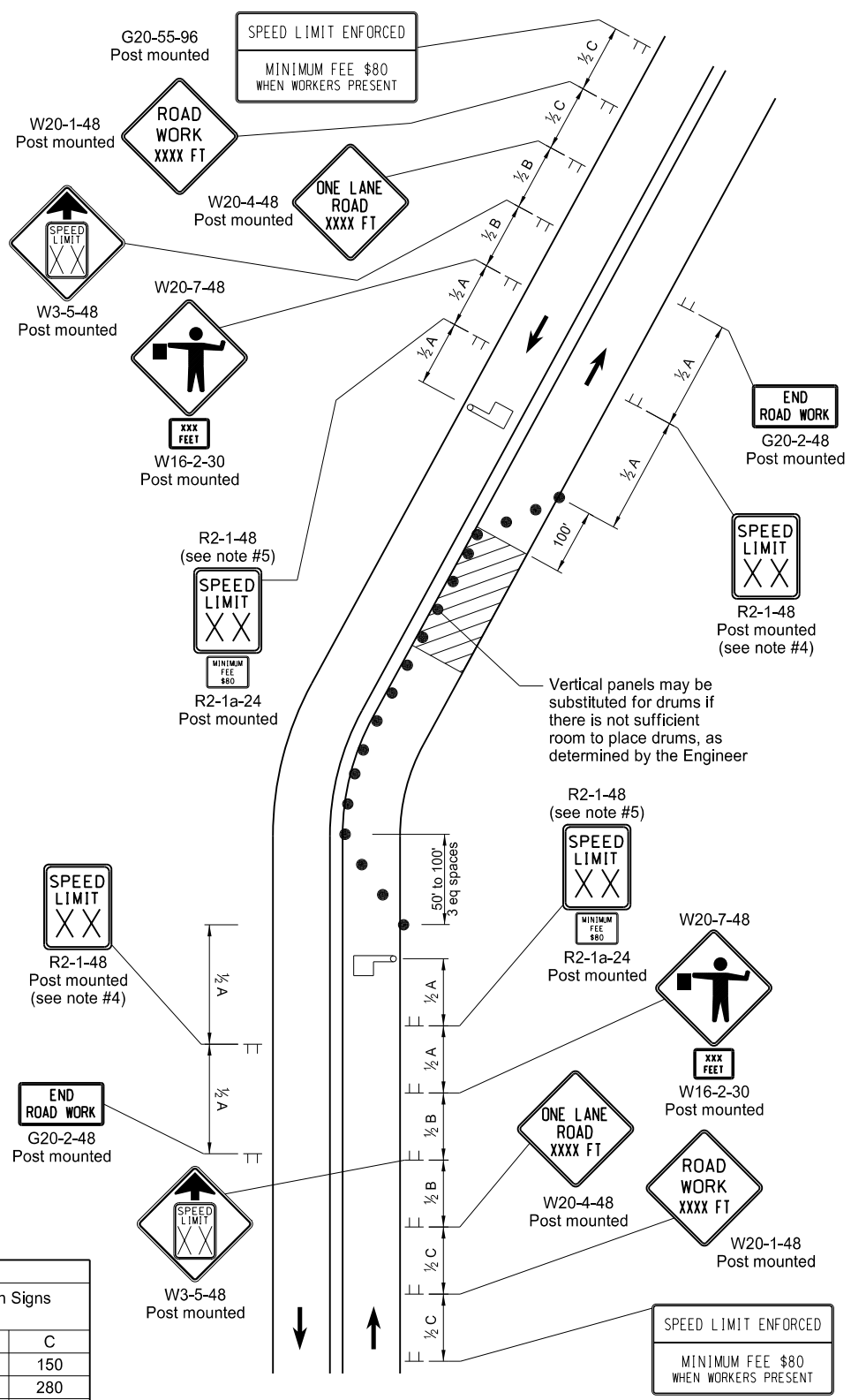
D-704-19

**Notes**

- Variables  
 S = Numerical value of speed limit or 85th percentile.  
 W = The width of taper  
 L = Minimum length of taper, or S x W for freeways, expressways, and all 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.
- Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies.
- Delineator drums used for tapering traffic shall be placed at 3 equal spaces. Delineator drums for tangents shall be spaced at 2 times dimension "S".
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
- G20-55-96 or R2-1a-24 sign are not required when a pilot car operation is used, if this standard is part of other traffic control layouts, or the 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.)
  - A "Do Not Stop on Tracks" sign (R8-8-24) should be placed near the cross buck in each direction while the lane closure is in the vicinity of the tracks.
  - A buffer space between the work zone and the lane closure transition should be extended upstream of the highway-rail grade crossing so a queue created by the flagging operation will not extend across the highway-rail grade crossing.
  - If the queuing of vehicles across active rail tracks cannot be avoided, a flagger shall be provided at the highway-rail grade crossing to prevent vehicles from stopping within the highway-rail grade crossing, even if automatic warning devices are in place.



**TYPE E  
ROAD CLOSURE WITH OFF-SITE DETOUR**  
Used where a road is closed beyond a detour point. Signing shown for one direction only. Sign not shown on detour shall be shown in plans and installed and maintained by the contractor.



**TYPE F  
LANE CLOSURE ON A TWO WAY ROAD USING FLAGGERS**  
Two lane highway with one lane closed. Flagger is at a point where it is visible to approaching traffic.

Road Type	ADVANCE WARNING SIGN SPACING		
	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**

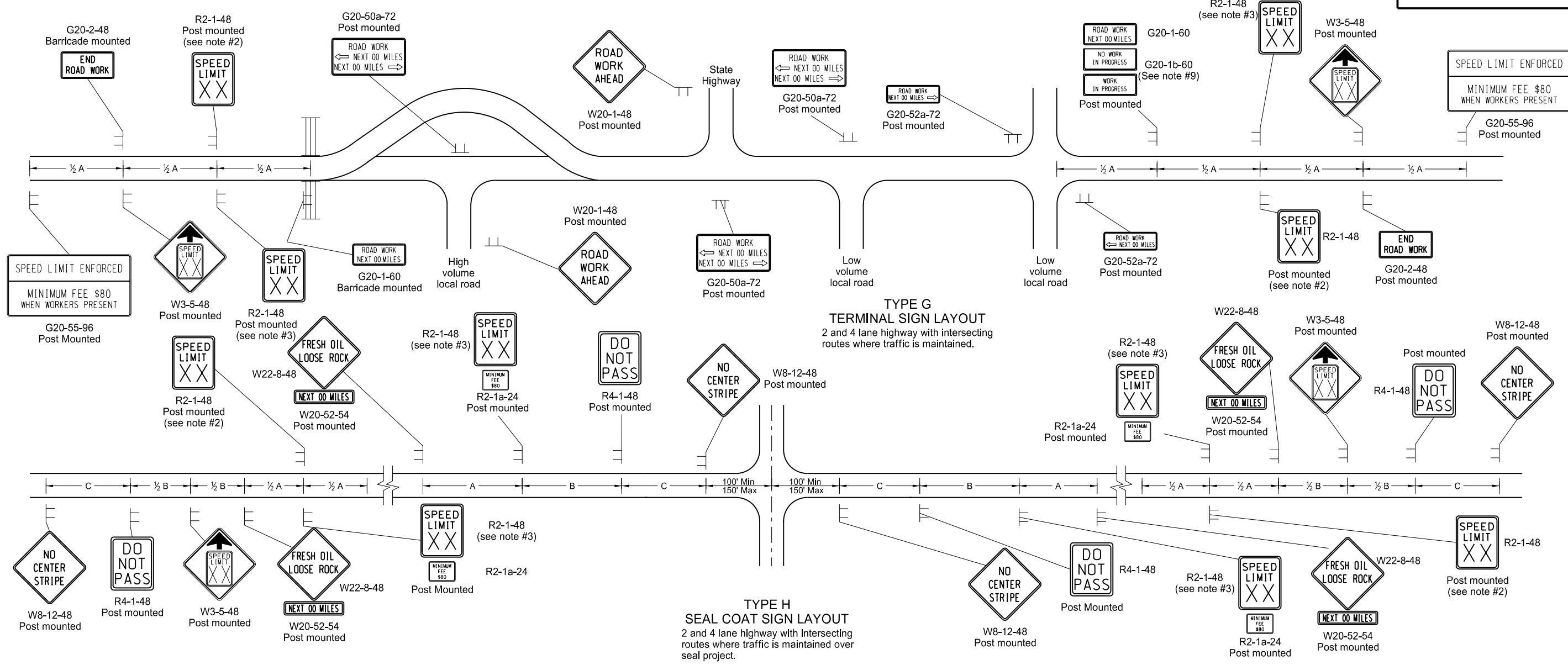
- Delineator Drum
- ▬ Sign
- ▬ Type III Barricade
- ▨ Work/Hazard Area
- ☞ Flagger

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
3-13-14	Revised Sign Cell "ROAD WORK XXX FT"

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**Roger Weigel**  
 Registration Number  
 PE-2930,  
 on 03/13/14 and the original document is stored at the  
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# TERMINAL AND SEAL COAT SIGN LAYOUTS

D-704-20



- Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies.
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 MPH below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 MPH. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- On seal projects, signs R2-1-48, R2-1a-24, R4-1-48, W22-8-48 and W20-52-54 shall be placed just after all important intersections and at five mile intervals thereafter. Sign W8-12-48 shall be placed just after all important intersections and at 2 mile intervals thereafter until the short term center line pavement marking is in place. No short term pavement markings are placed when traffic volumes are 750 ADT or less.
- The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
- Type H construction sign traffic control shall have the speed limit signs covered or removed once the loose aggregate has been removed.
- The contractor shall install the G20-1b-60 sign when work is suspended for winter.
- Other traffic control layouts will be required in the immediate work areas. If the speed limit is reduced in the work area, speed limit signs shall have the R2-1a-24 sign placed below.
- G20-55-96 sign is not required if work is less than 15 days.

**KEY**

≡ Type III barricade

⊥ Sign

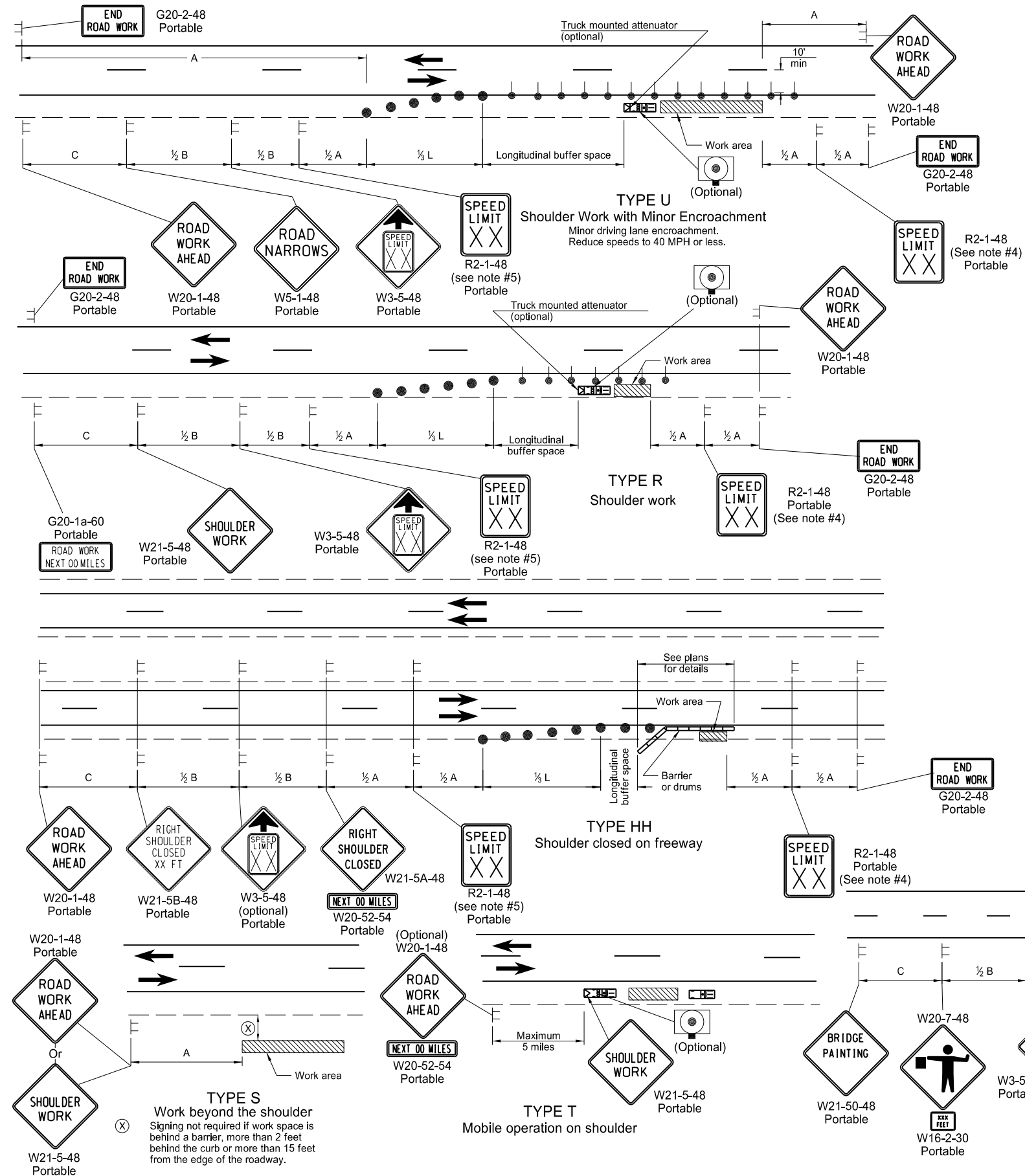
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
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# SHOULDER CLOSURES AND BRIDGE PAINTING LAYOUTS

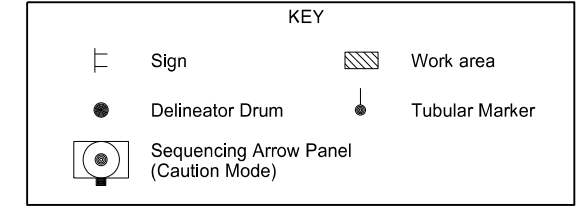
D-704-24



- Notes
- Variables  
S = Numerical value of speed limit or 85th percentile.  
W = The width of the taper.  
L = Minimum length of taper, or  $S \times W$  for freeways, expressways, and all other roads with speeds of 45 mph or greater, or  $W \times S^2 / 60$  for urban, residential, and other streets with speeds of 40 mph or less.
  - Delineator drums used for tapering traffic shall be spaced at dimension "S".  
Delineator drums or tubular markers used for tangents shall be spaced at 2 times "S".
  - Sequencing Arrow Panels  
Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).  
Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).  
Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
  - The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
  - The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at  $\frac{1}{2}B$ .
  - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
  - Existing speed limit signs within a reduced speed zone shall be covered.
  - The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.

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

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

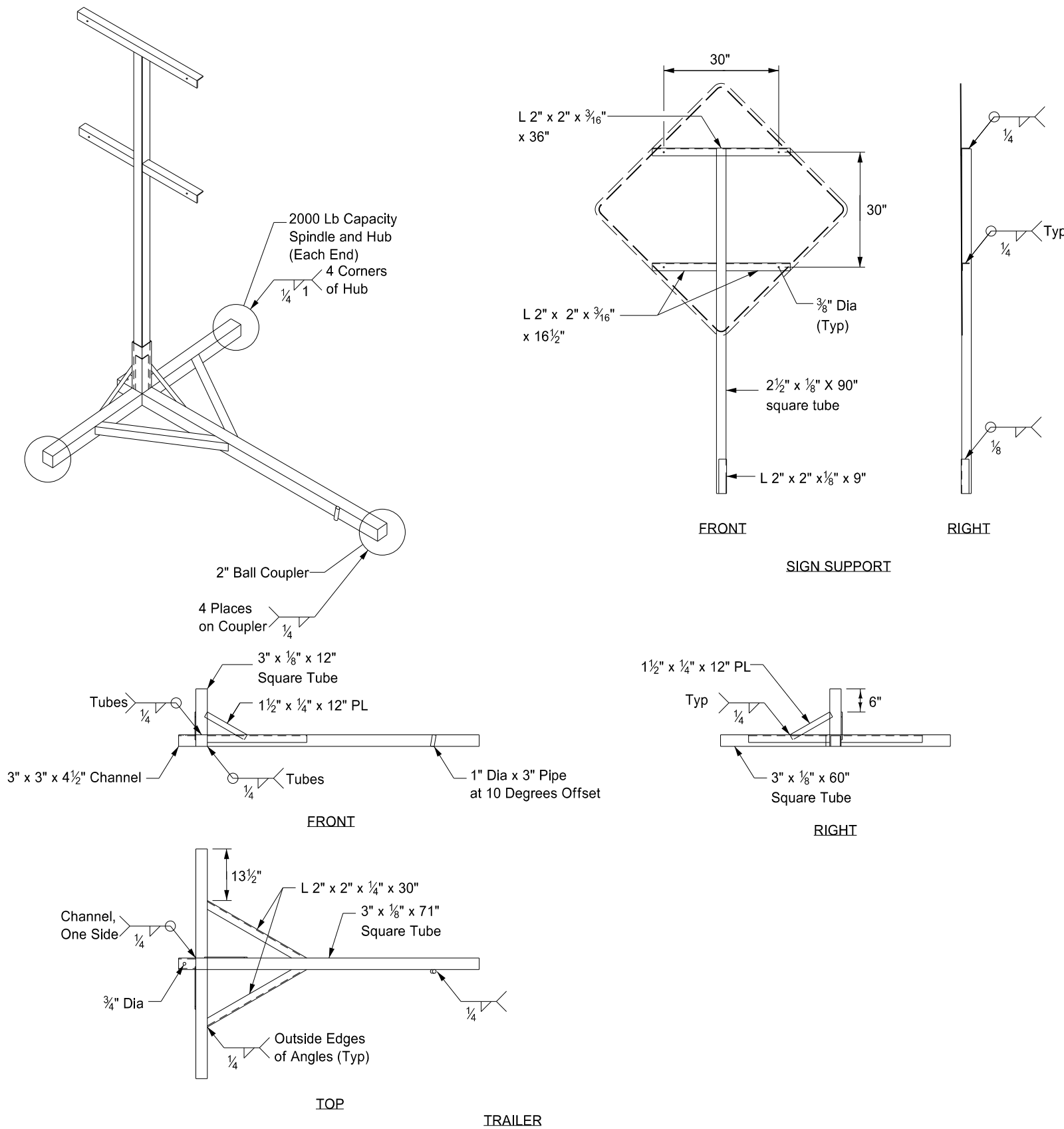


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
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DATE	CHANGE

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PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



Notes:

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

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

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