

NDDOT ABBREVIATIONS

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

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D-20-2

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

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

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NDDOT UTILITY COMPANY ABBREVIATIONS

702COM 702 Communications
 ACCENT Accent Communications
 AGASSIZ WU Agassiz Water Users Incorporated
 All 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
 BASIN ELEC Basin Electric Cooperative Incorporated
 BEK TEL Bek Communications Cooperative
 BELLE PL Belle Fourche Pipeline Company
 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 PWR ELEC Central Power Electric Cooperative
 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
 FALK MNG Falkirk Mining Company
 G FKS-TRL WD Grand Forks-trail 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
 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 WRD McKenzie County Water Resource District
 MCKNZ ELEC McKenzie Electric Cooperative
 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
 MRE LBTY TEL Moore & Liberty Telephone
 MOR-GRAN-SOU ELEC Mor-gran-sou Electric Cooperative
 MOUNT-WILLI ELEC Mountrail-williams Electric Cooperative
 MUNICIPAL City Of '.....'
 MUNICIPAL City Water And Sewer
 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
 OTTR TL PWR Otter Tail Power Company
 P L E M Prairielands Energy Marketing
 POLAR COM Polar Communications
 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
 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
 STUT RWU Stutsman Rural Water Users
 T M C Turtle Mountain Communications
 TCI TCI of North Dakota
 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
 USW COMM U.S. West Communications
 VRNDRY ELEC Verendrye Electric Cooperative
 W RIV TEL West River Telephone Incorporated
 WEB W. E. B. Water Development Association
 WILLI RWA Williams Rural Water Association
 WILSTN BAS PL Williston Basin Interstate Pipeline Company
 WLSH RWD Walsh Water Rural Water District
 WOLVRTN TEL Wolverton Telephone
 XLENER Xcel Energy
 YSVR Yellowstone Valley Railroad

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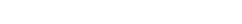
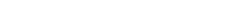
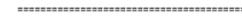
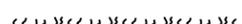
Line Styles

.....	Limits of Const Transition Line	—— 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
—— Geo —— Geo ——	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 v v 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
—— ——— PL ——	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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Line Styles

	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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Symbols

	Existing Light Standard		Existing Manhole with Valve Water		Existing Telephone Pole		Existing Undefined Manhole
	Existing High Mast Light Standard 10 Luminaire		Existing Water Manhole		Existing Wood Pole		Existing Undefined Pull Box
	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		Existing Monument Found		Existing Pull Box		Existing Gas Pipe Vent
	Existing Overhead Sign Structure Load Center		Existing Monument set		Existing Intelligent Transportation Pull Box		Existing Sanitary Pipe Vent
	Existing Luminaire		Existing RW Property Monument Found		Existing Water Pump		Existing Storm Drain Pipe Vent
	Existing Light Standard Luminaire		Existing RW Property Monument set		Existing Slotted Reinforced Concrete Pipe		Existing Water Pipe Vent
	Existing Federal Mailbox		Existing Object Marker Type I		Existing RR Profile Spot		Existing Weather Station
	Existing Private Mailbox		Existing Object Marker Type II		Existing Fuel Leak Sensors		Existing Ground Water Well Bore Hole
	Existing Meander Section Corner		Existing Object Marker Type III		Existing Highway Sign		Existing Windmill or Tower
	Existing Meter		Existing Electrical Pedestal		Existing Miscellaneous Spot		Existing Witness Corner
	Existing Electrical Manhole		Existing Telephone Pedestal		Existing Lighting Standard Pole		Flashing Beacon
	Existing Gas Manhole		Existing Fiber Optic Telephone Pedestal		Existing Traffic Signal Standard		Flagger
	Existing Sanitary Manhole		Existing TV Pedestal		Existing Transformer		Pipe Mounted Flasher
	Existing Sanitary Force Main Manhole		Existing Fiber Optic TV Pedestal		Existing Large Evergreen Tree		Sanitary Force Main with Valve
	Existing Sanitary Manhole with Valve		Existing Fuel Filler Pipes		Existing Small Evergreen Tree		
	Existing Storm Drain Manhole		Existing Traverse PI Aerial Panel		Existing Large Tree		
	Existing Force Main Storm Drain Manhole		Existing Pole		Existing Small Tree		
	Existing Force Main Storm Drain Manhole with Valve		Existing Power Pole		Existing Tree Trunk		
	Existing Telephone Manhole		Existing Power Pole with Transformer		Existing Pad Mounted Traffic Signal Control Box		

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Symbols

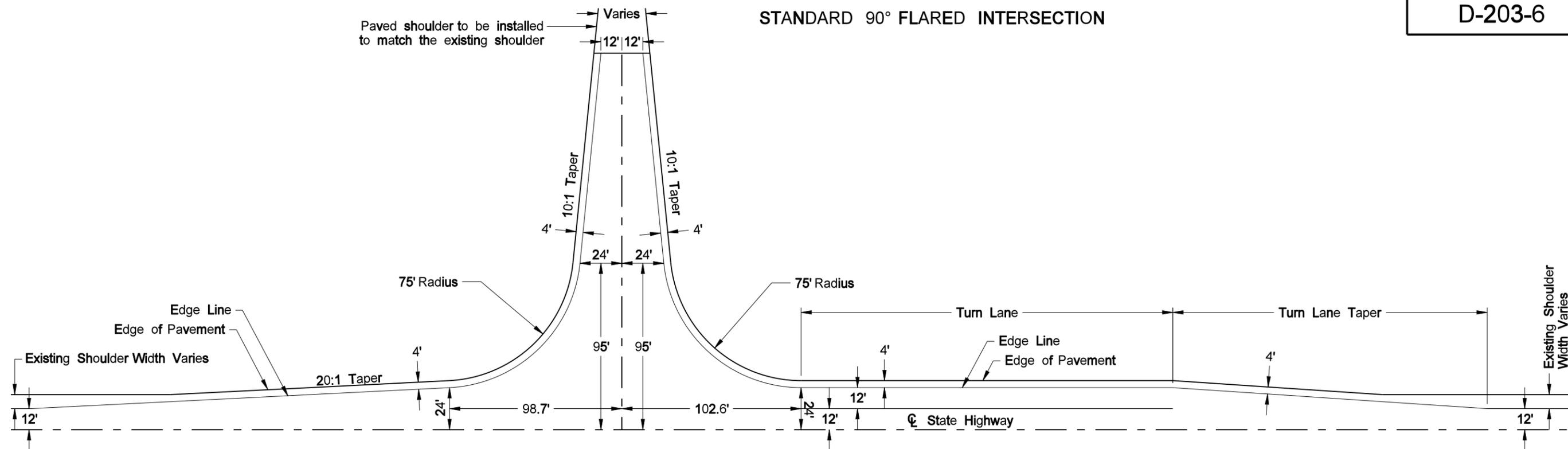
D-20-32

 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  Concrete Monument to Be Set  RW Property Monument to Be Set	 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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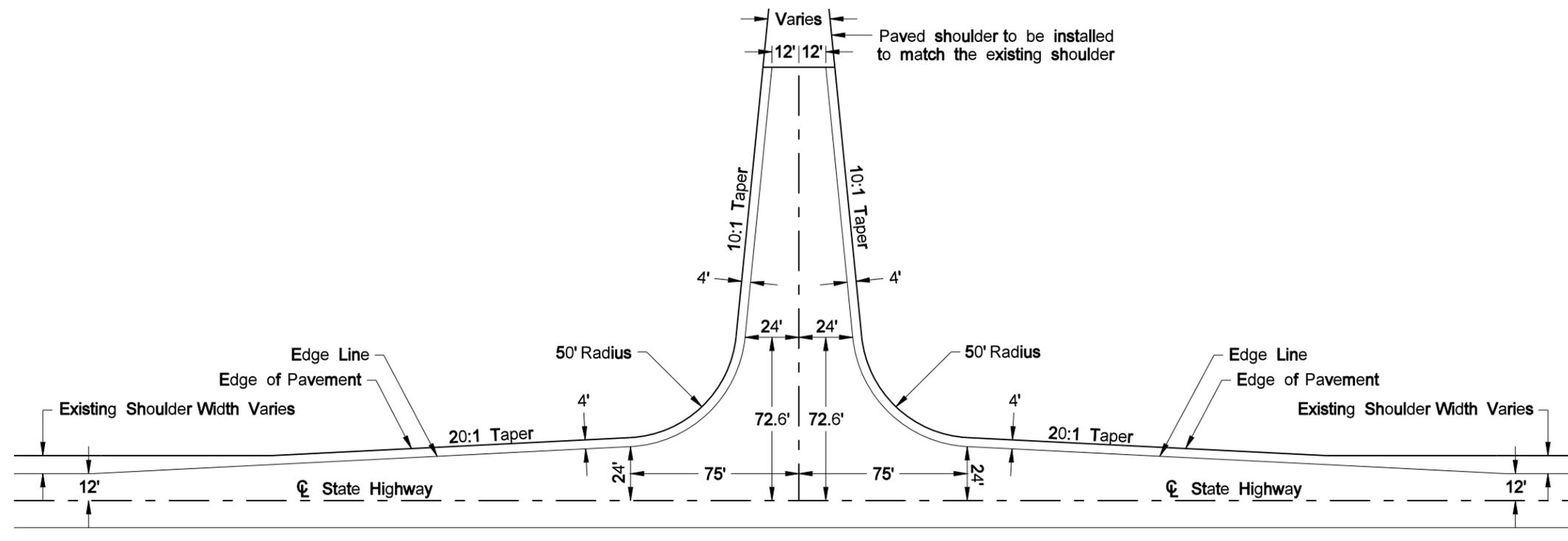
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STANDARD 90° FLARED INTERSECTION



Type B
90° Flared Intersection with Turn Lane



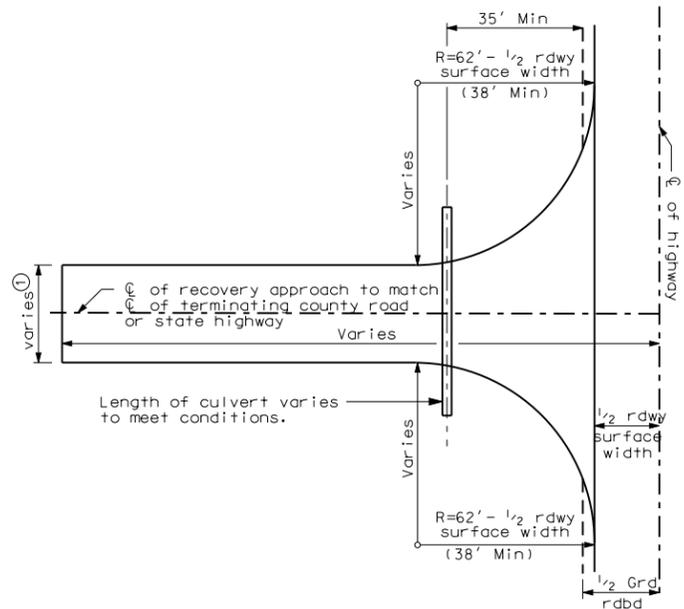
Type A
90° Flared Intersection

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5-19-09	
REVISIONS	
DATE	CHANGE

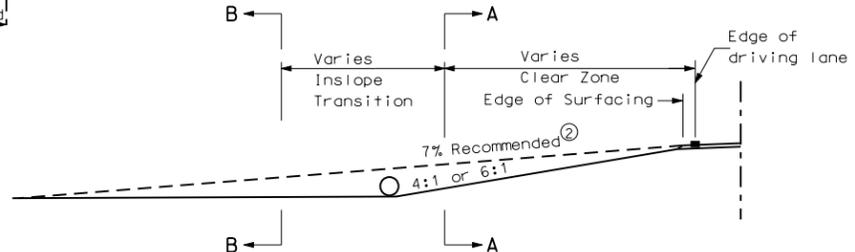
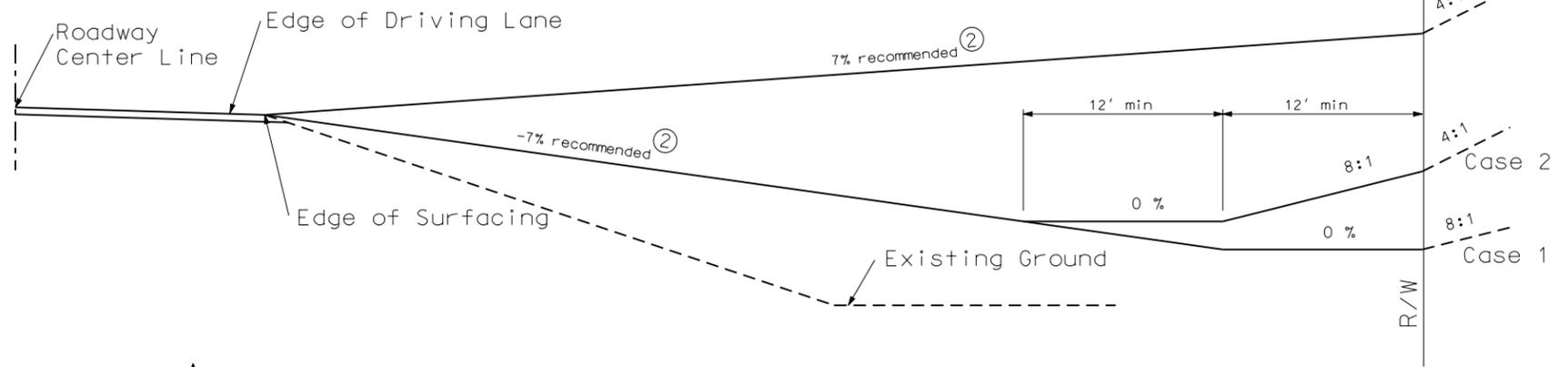
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RECOVERY APPROACHES AT T-INTERSECTIONS

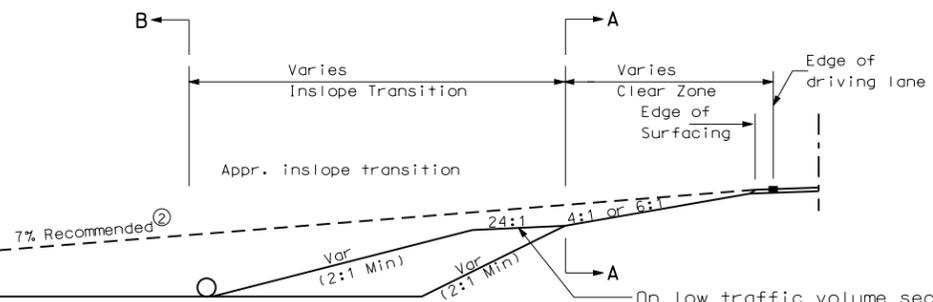
D-203-7



PLAN VIEW RECOVERY APPROACH

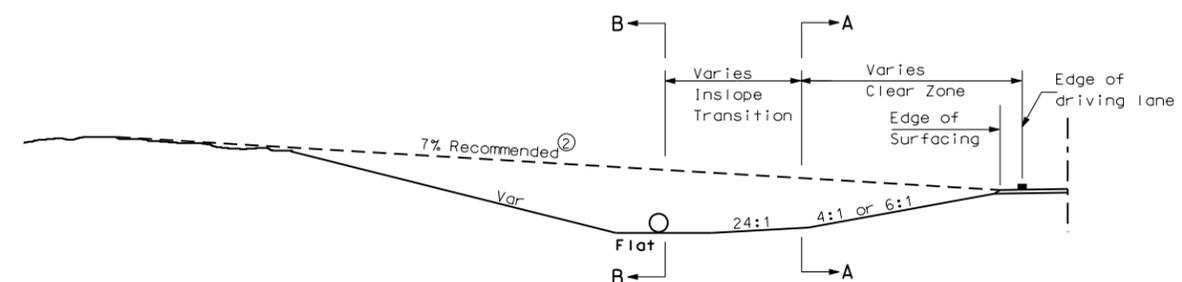


RECOVERY APPROACH GRADE ON FILL SECTION 12 FEET OR LESS

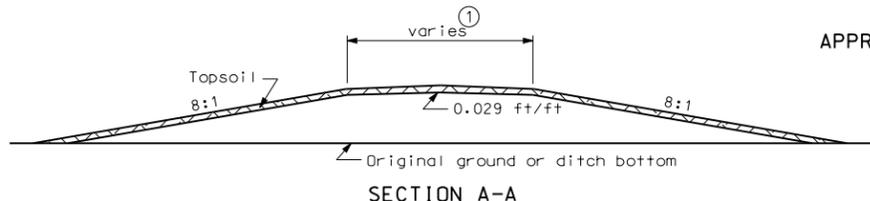


RECOVERY APPROACH GRADE ON FILL SECTION OVER 12 FEET

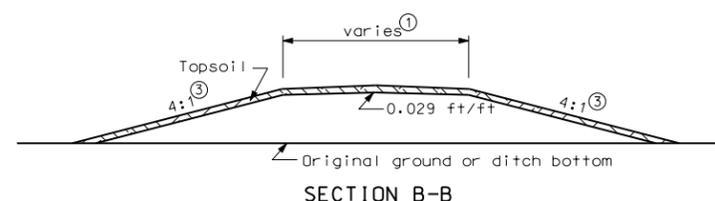
On low traffic volume secondary projects the secondary slope is omitted and the inslope is steepened beyond the 24' line on fill sections over 8' in height.



APPROACH GRADE ON CUT SECTION



SECTION A-A



SECTION B-B

- Case 1. Ties into existing back slope and within existing right of way. Existing Back Slope is 8:1 or flatter.
- Case 2. Ties into existing back slope and within existing right of way. Existing Back Slope is 4:1 or flatter.
- Case 3. Ties into existing back slope and within existing right of way. Existing Back Slope is 4:1 or flatter.

FOOT NOTES

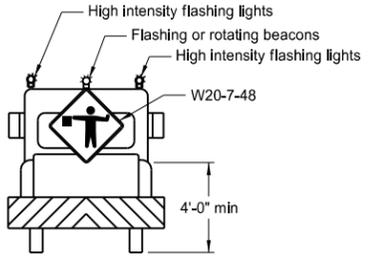
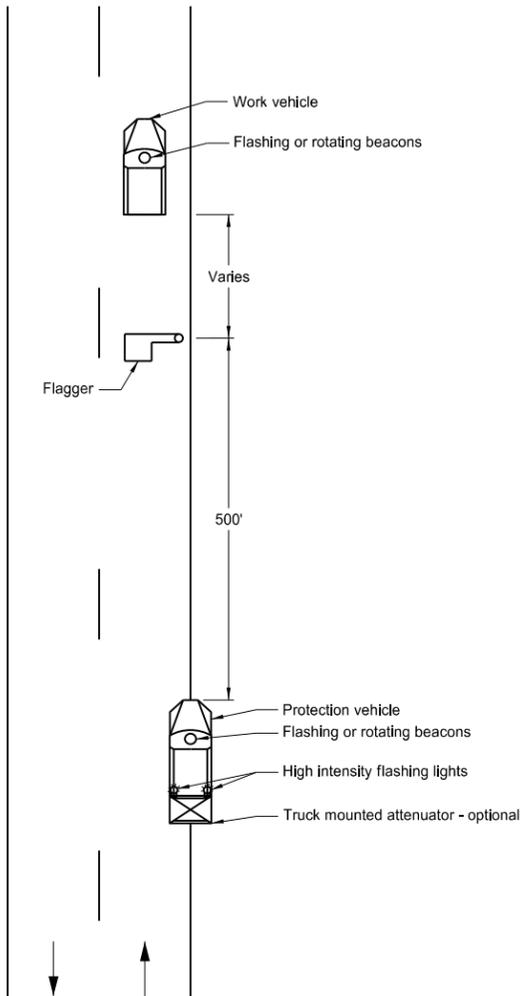
- ① width of recovery approach to match width of terminating county road or state highway
- ② 10% Max
- ③ 3:1 Slope - 20' to 30' fill
2:1 Slope on fills over 30'

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
06-03-03	
REVISIONS	
DATE	CHANGE
12-01-04	PE Stamp added

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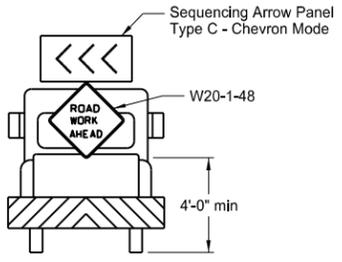
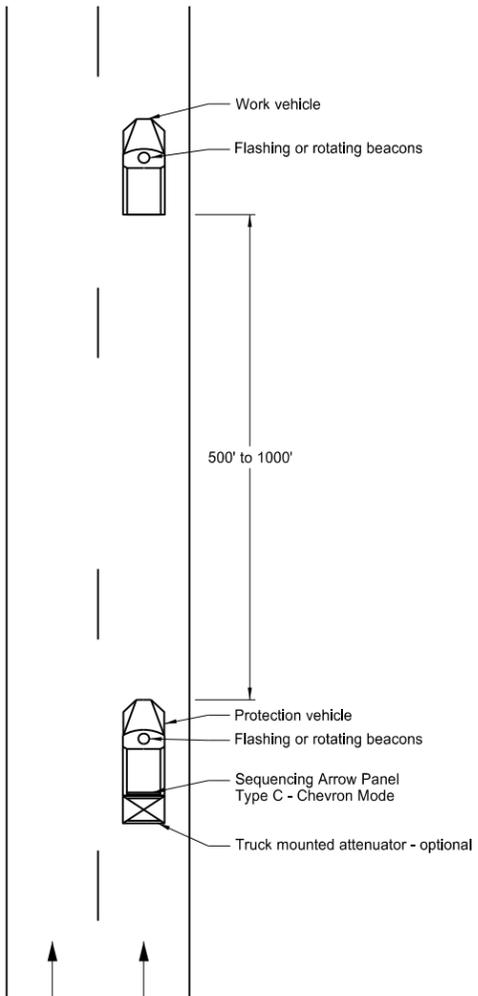
TRAFFIC CONTROL FOR CORING OF HOT BITUMINOUS PAVEMENT

Two Lane, Two Way Roadways



Typical Protection Vehicle

Multilane Roadways



Typical Protection Vehicle

- Notes:
1. The working vehicle shall display a 360 degree rotating, flashing, oscillating or strobe light.
 2. The shadow vehicle shall display a 360 degree rotating, flashing, oscillating or strobe light. The shadow vehicle for Multilane Roadway shall also have a sequencing arrow panel Type C operated in the chevron mode.
 3. This application is for use during daylight hours and in areas of good visibility only.
 4. Two lane, two way roadway, a flagger shall be used to protect the work area and warn oncoming traffic.

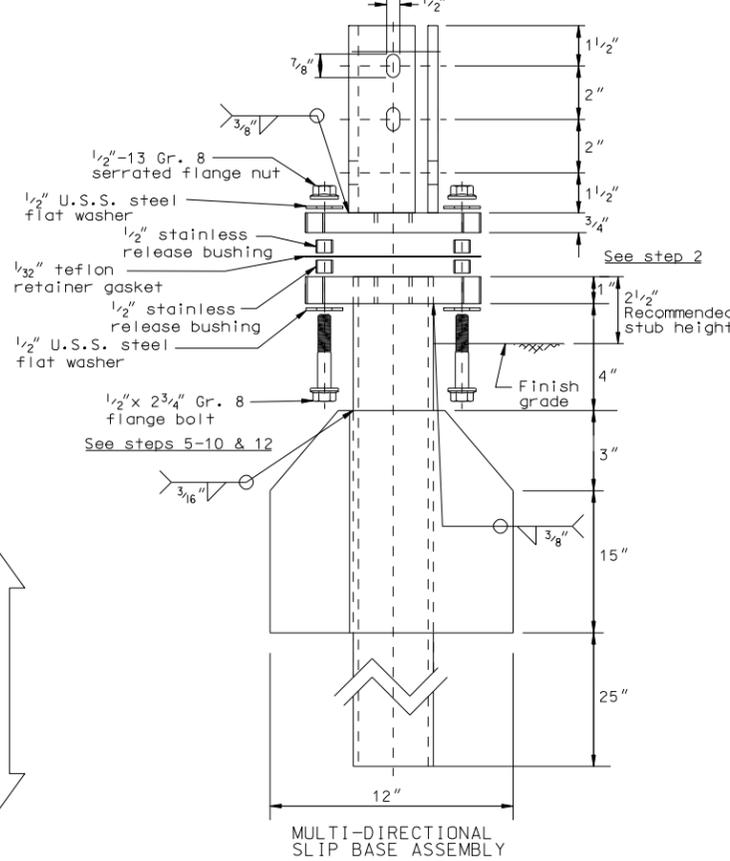
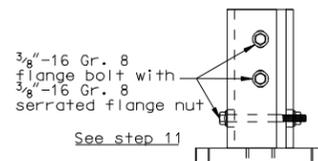
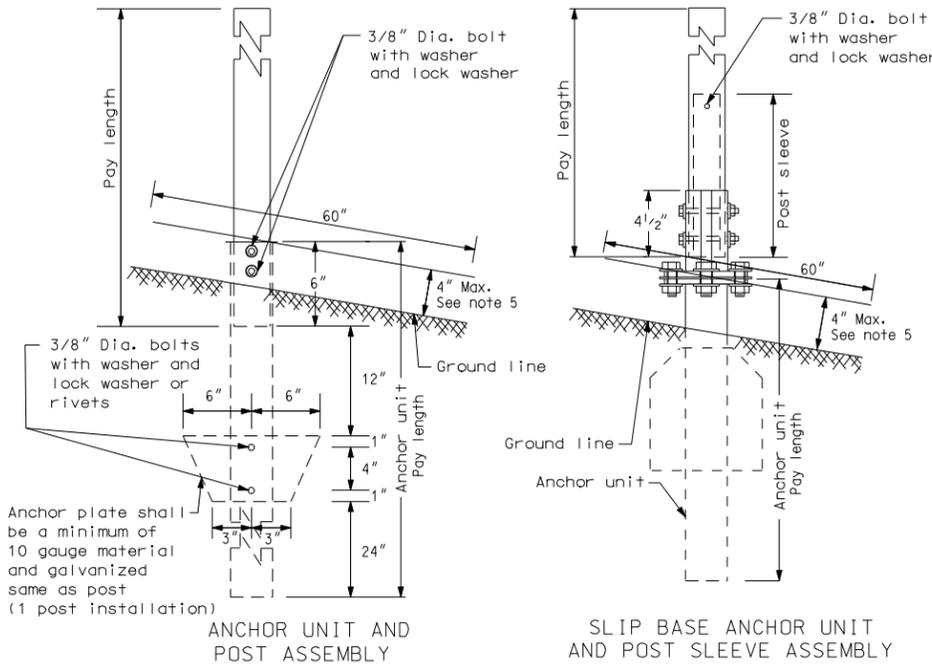
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9-25-12	
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DATE	CHANGE

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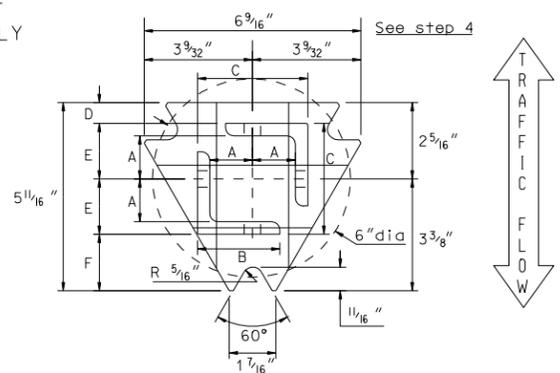
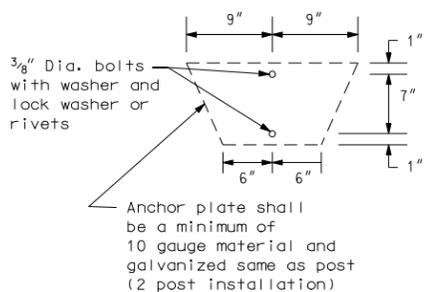
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

PERFORATED TUBE



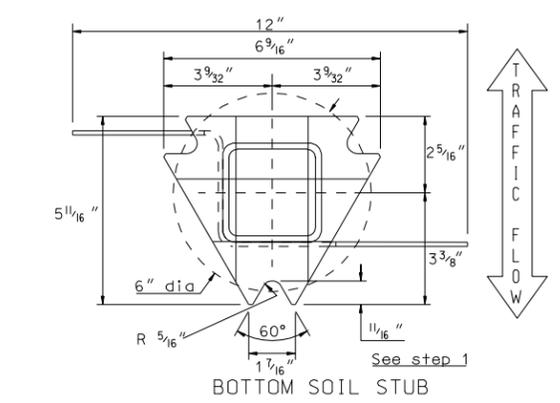
- Notes
1. Slip base bolts shall be torqued as specified by the manufacturer.
 2. The 2 3/16 inch size 10 gauge is shown as 2.19 inch size on the plans. The 2 1/2 inch size 10 gauge is shown as 2.51 inch size on the plans.
 3. Anchor for 2 inch, 2 1/4 inch, and 2 1/2 inch posts.
 4. Anchor material shall be 7 gauge H.R.P.O. Commercial quality ASTM A569 and 3 inch x 3 inch x 7 gauge ASTM A500 Grade B. Anchor shall have a yield strength of 43.9 KSI and tensile strength of 59.3 KSI. Anchor shall be hot dipped galvanized per ASTM A123/A153. All tolerances on anchor unit and slip base bottom assembly are ± 0.005 unless otherwise noted.
 5. 4 inch vertical clearance of anchor or breakaway base. The 4 inch x 60 inch measurement shall be made above and below post location and also back and ahead of post.
 6. When used in concrete sidewalk, anchor shall be the same except without the wings.
 7. Four post signs shall have over 8 feet between the first and fourth posts.



TOP POST RECEIVER
Materials: Plate - ASTM A572 grade 50
Angle receiver - 2 1/2 inch x 2 1/2 inch x 3/8 inch ASTM A36 structural angle

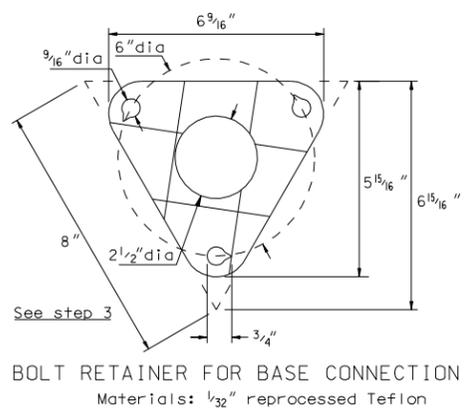
TOP POST RECEIVER DATA TABLE						
Square Post Sizes	A	B	C	D	E	F
2 3/16 inch x 10 Ga. Square Post	1 3/64 inch	2 1/2 inch	3 1/32 inch	2 5/32 inch	1 3/64 inch	1 7/8 inch
2 1/2 inch x 10 Ga. Square Post	1 3/32 inch	2 1/2 inch	3 5/16 inch	5/8 inch	1 2/32 inch	1 3/4 inch

2 3/16 inch x 10 gauge may be inserted into 2 1/2 inch x 10 gauge for additional wind load.



BOTTOM SOIL STUB
Materials: Tube - 3 inch x 3 inch x 7 gauge ASTM A500 Gr B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A 569
Plate - ASTM A572 grade 50

MULTI-DIRECTIONAL SLIP BASE ASSEMBLY	
STEP	INSTALLATION PROCEDURE
1.	Install bottom soil anchor stub plumb and squared up with road, with point of plate facing oncoming traffic.
2.	Depth of imbedment to leave 2 1/2 inch from grade to top of anchor plate.
3.	Place teflon bolt retainer gasket on top of bottom plate (make sure that notches in holes are pointing counter clockwise).
4.	Place top post receiver on to retainer gasket, properly indexed so that angle receivers are squared up with road.
5.	Slide 1 each 1/2 inch flat washer on to 1 each inverted 1/2 inch - 13 gr. 8 flange bolt, followed by 1 each stainless steel release bushing.
6.	Insert above bolt with washer and bushing up through notched points of top and bottom plates, passing through hole in gasket.
7.	Slide second bushing down on to above bolt until it rests on top of gasket followed by second washer.
8.	Complete by threading 1/2 inch - 13 gr. 8 serrated flange nut snugly down against top of washer.
9.	Repeat steps 5,6,7 & 8 at the two remaining notched triangle points.
10.	Insert sign post into angle receivers on top half until post(s) bottom out. *NOTE: Where higher wind load is desired, insert the next size smaller square post inside bottom of main upright post (Minimum of 48 inch, not to exceed beyond bottom edge of sign).
11.	Secure posts into receivers using 3 each 3/8 inch - 16 gr. 8 flange bolts and 3 each 3/8 inch - 16 serrated flange nuts in receiver slots (top 2 bolts should be parallel to highway) do not tighten nuts until all bolts are in place.
12.	After all sub-assembly hardware is tightened, then torque the three 1/2 inch - 13 nuts to 42 ft-lbs, in a circular pattern until all bolt assemblies reach the required torque. *NOTE: On multi-leg installations, be sure that all anchors are squared and lined up with each other.



BOLT RETAINER FOR BASE CONNECTION
Materials: 1/32 inch reprocessed Teflon

Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. 4	Cross Sect. Area In. 2	Section Modulus In. 3
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/8 x 2 3/8	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
4 x 4	0.250	1/4	6.600	3.040	1.940	1.050

Number of Posts	Telescoping Perforated Tube					
	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			B	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	10			Yes	
2	2 1/4	12	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 3/8	10	Yes	

B - The 2 1/2 inch, 12 gauge posts do not need breakaway bases when placed in standard soils, but require a shim as specified by the manufacturer. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.

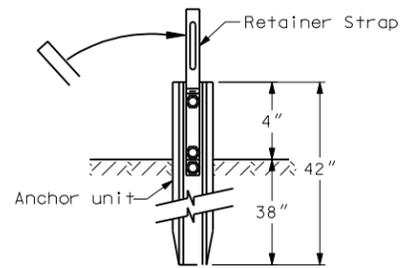
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-21-02	
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DATE	CHANGE
12-01-04	PE stamp added

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BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

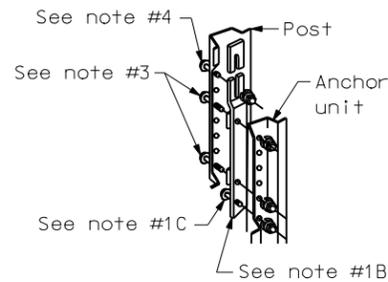
FLANGED CHANNEL



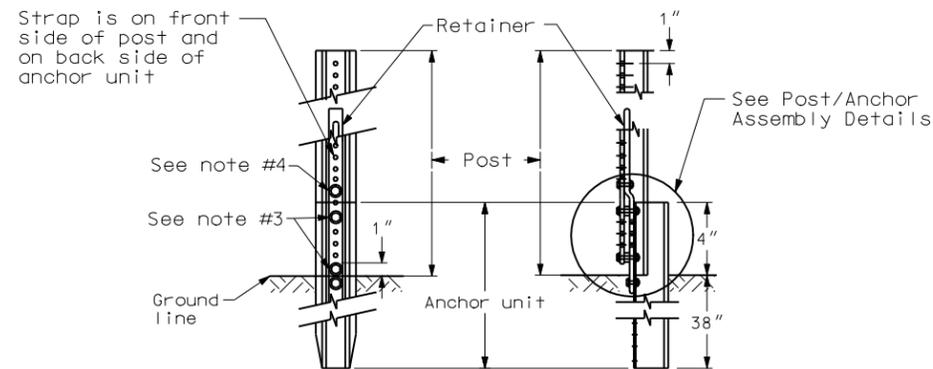
Anchor Unit & Strap Assembly Detail

STEPS OF INSTALLATION

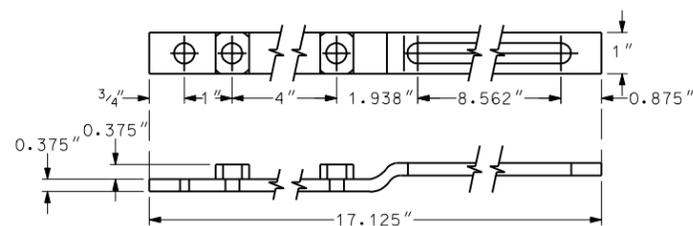
1. A) Drive anchor unit to within 12" of ground level.
B) Proper assembly established by lining up the top 3/4" slot of retainer spacer strap with top hole of anchor unit.
C) Assemble strap to back of anchor unit using 3/8"-16 UNC x 2.0" long bolt, lock washer and nut.
D) Rotate strap 90° to left.
2. A) Drive anchor unit to 4" dimension.
B) Rotate strap to vertical position.
3. A) Place 3/8"-16 UNC x 2" bolt, lock washer & nut in bottom of sign post to facilitate alignment of sign post with proper hole in anchor unit (this coincides with the bottom 3/4" slot in the strap).
B) Alternately tighten two connector bolts.
4. A) Complete assembly by tightening 3/8"-16 UNC x 2" long retainer bolt (this fastens sign post to retainer spacer strap).
5. The base post, strap & 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.



Post/Anchor Assembly Details



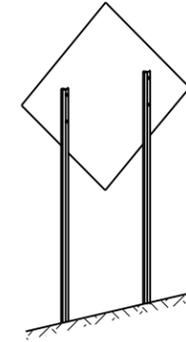
Front View Side View Sign Post Assembly Detail



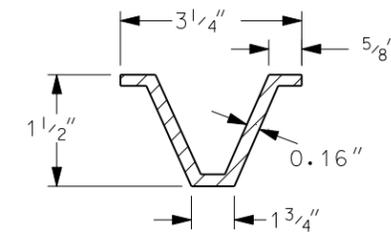
Retainer/Spacer Strap Detail

CHANNEL SIZE IN.	WALL THICKNESS IN.	WEIGHT PER FOOT LBS.	MOMENT OF INERTIA IN. 4	CROSS SECT. AREA IN. SQ.	SECTION MODULUS IN. 3
1.516 x 3.125"	.116	2.00	.179	.590	.225
1.532 x 3.125"	.124	2.25	.201	.648	.254
1.562 x 3.125"	.132	2.50	.233	.748	.289
1.578 x 3.125"	.140	2.75	.271	.819	.329
1.750 x 3.500"	.150	3.00	.372	.918	.403
1.750 x 3.500"	.175	4.00	.500	1.190	.560

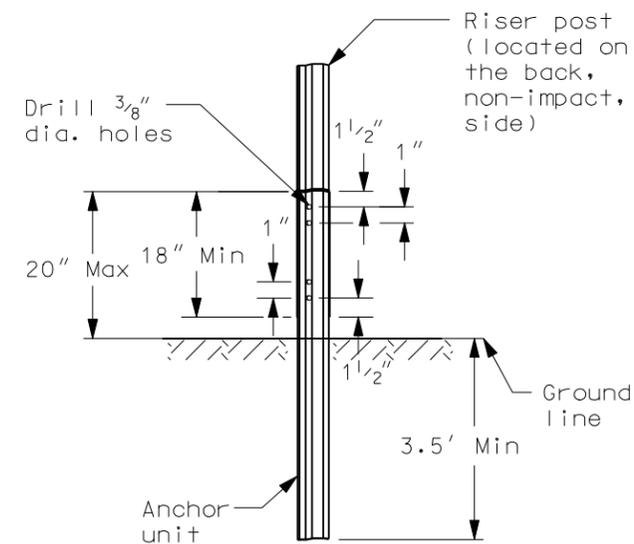
3 LB/FT U POSTS



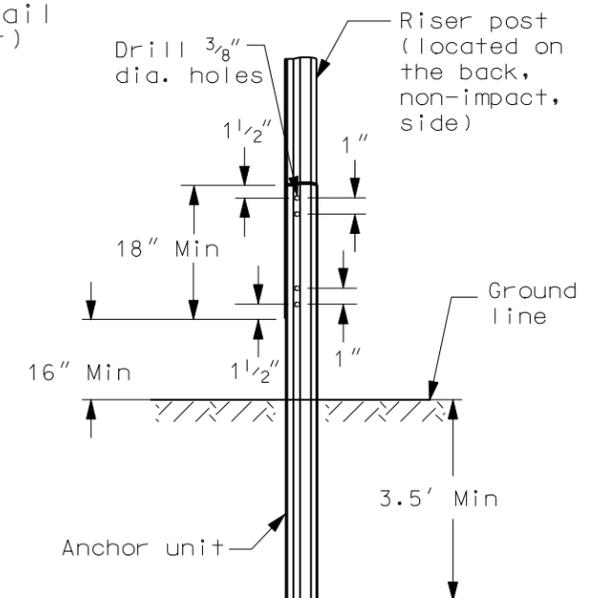
Typical Installation



U-Post Detail (3 lb/ft)



U-Channel Splice Option 1



U-Channel Splice Option 2

Notes

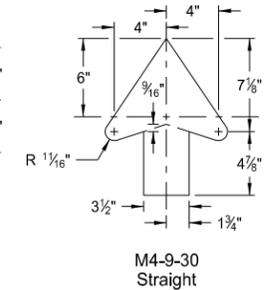
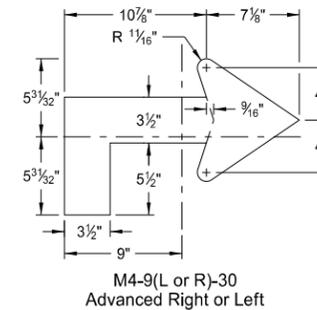
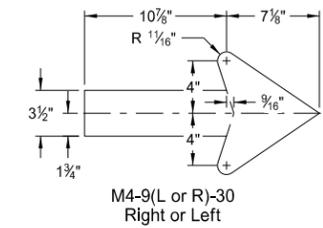
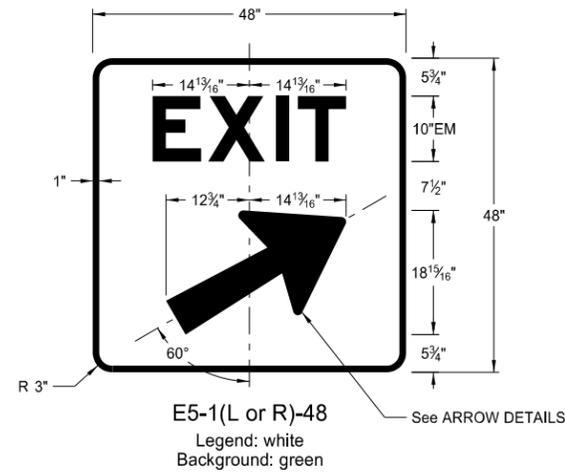
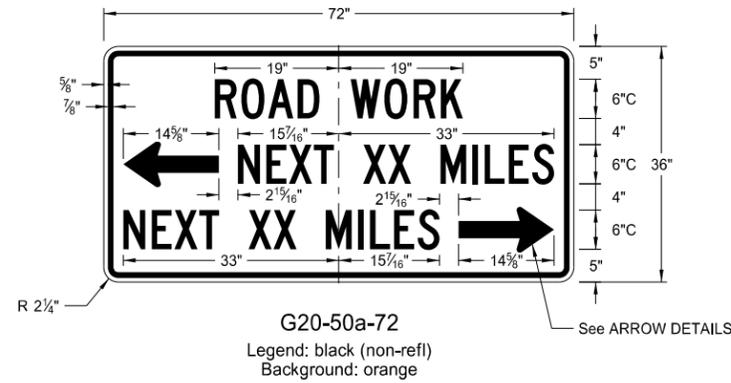
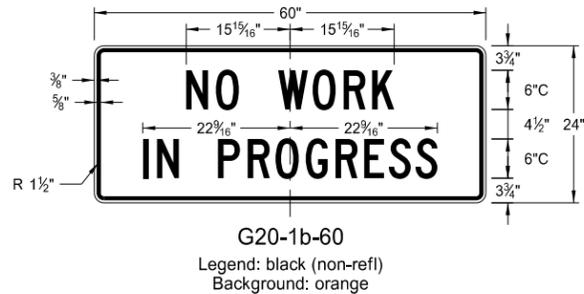
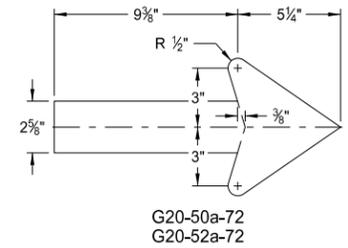
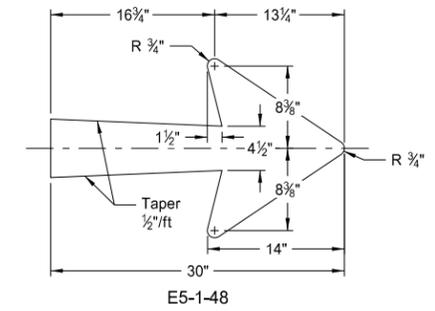
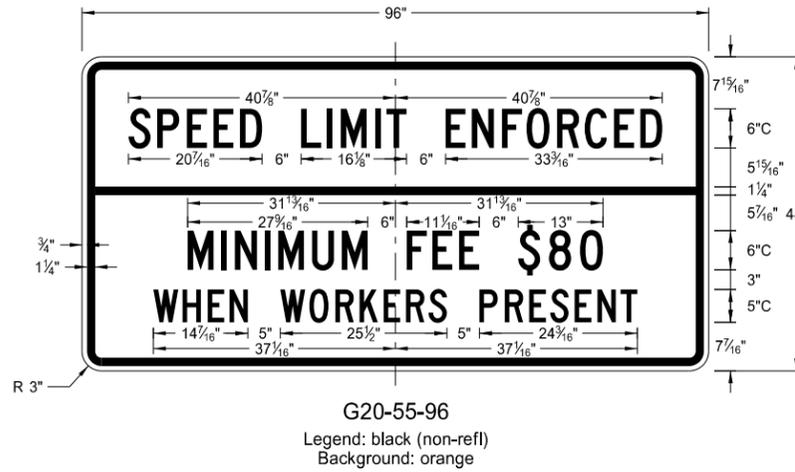
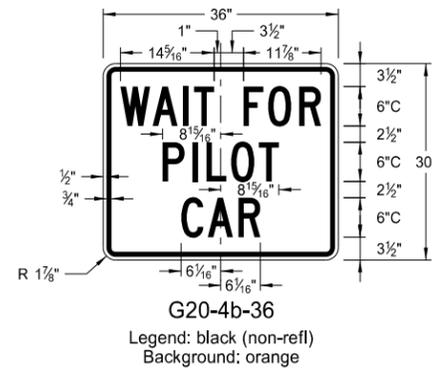
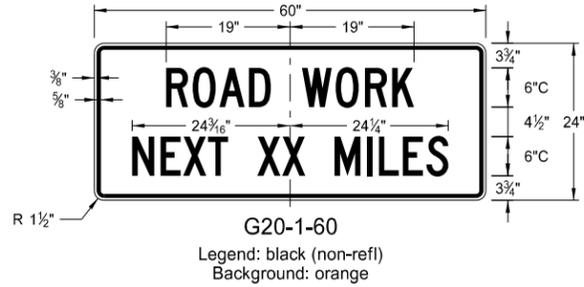
1. Use 3 lb/ft riser anchor units and risers
2. Driven riser posts shall be at least 7' long and embedded at least 3.5'.
3. A splice shall overlap a minimum of 18".
4. Use 4 bolts 5/16" diameter with washers and nuts. Two at top and two at bottom of splice.
5. Anchor unit for guy wires shall be no more than 4" above ground and embedded at least 3.5'.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-28-93	
REVISIONS	
DATE	CHANGE
03-07-01	Revised U-post details
11-21-02	Deleted perforated tube
05-08-03	Revised U-Channel splice
12-01-04	PE stamp added
06-29-05	Revised flanged channel note

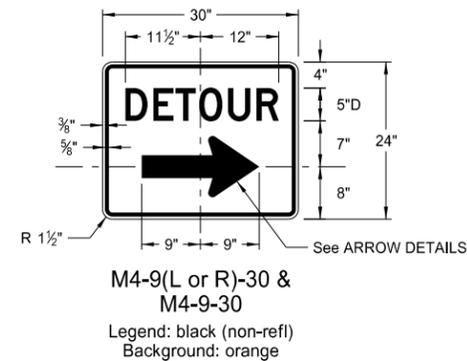
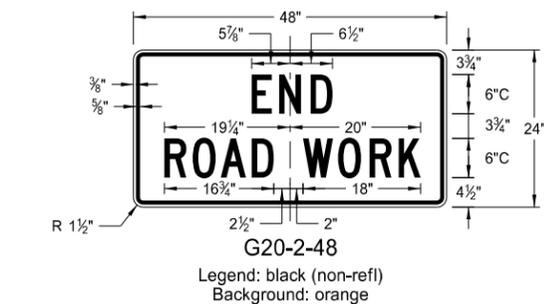
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CONSTRUCTION SIGN DETAILS
 TERMINAL AND GUIDE SIGNS

D-704-9



ARROW DETAILS



NOTES:

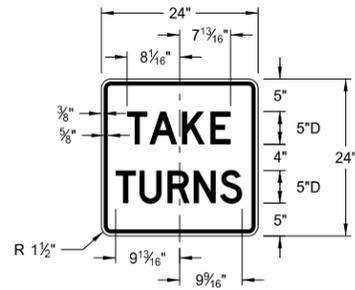
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

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

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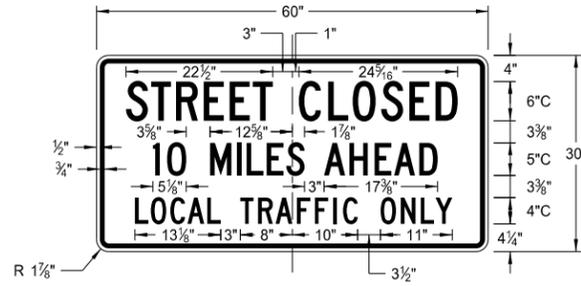
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS

D-704-10



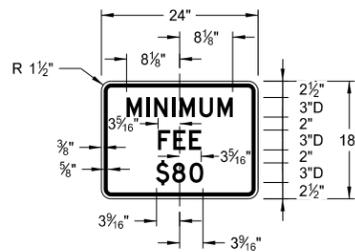
R1-50-24

Legend: black (non-refl)
Background: white



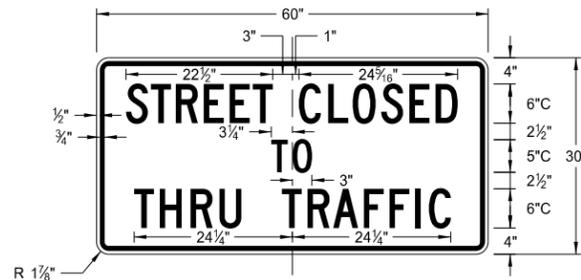
R11-3c-60

Legend: black (non-refl)
Background: white



R2-1a-24

Legend: black (non-refl)
Background: white



R11-4a-60

Legend: black (non-refl)
Background: white



R11-2a-48

Legend: black (non-refl)
Background: white

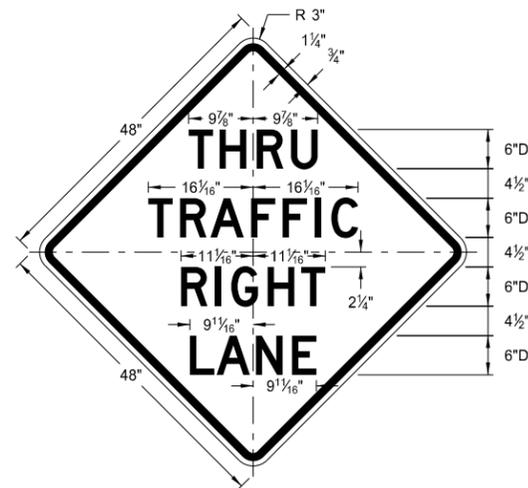
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE

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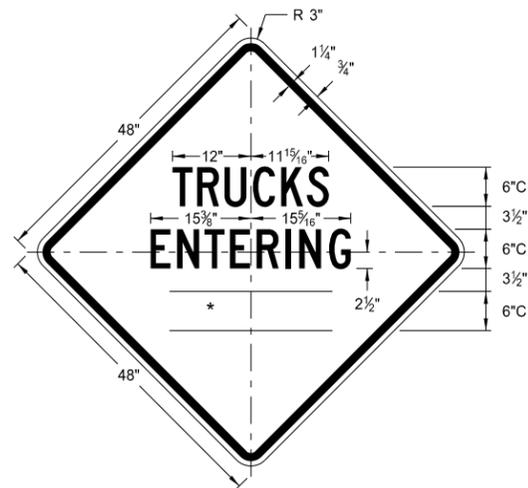
CONSTRUCTION SIGN DETAILS
WARNING SIGNS

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

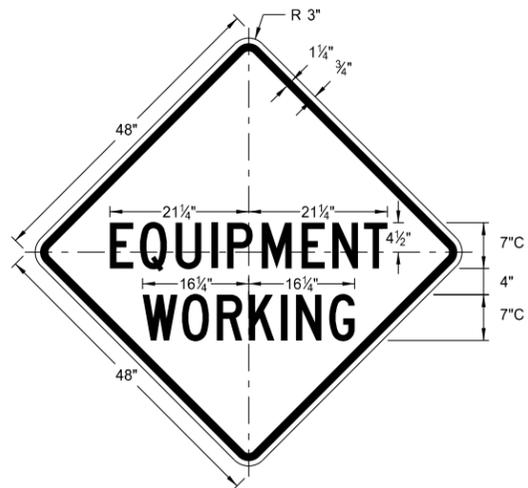
* DISTANCE MESSAGES



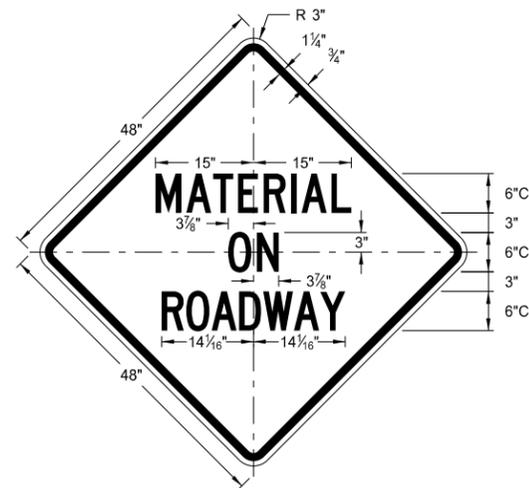
W5-8-48
Legend: black (non-refl)
Background: orange



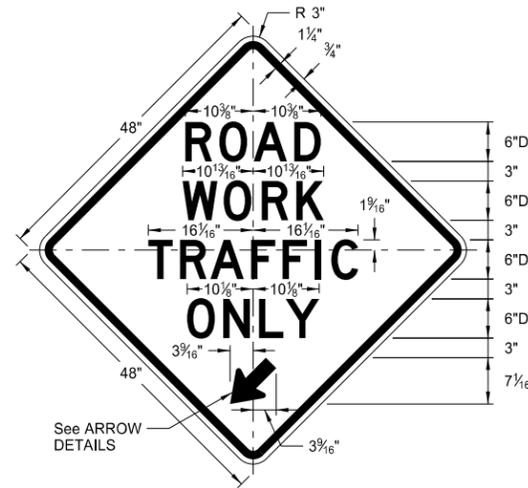
W8-54-48
Legend: black (non-refl)
Background: orange



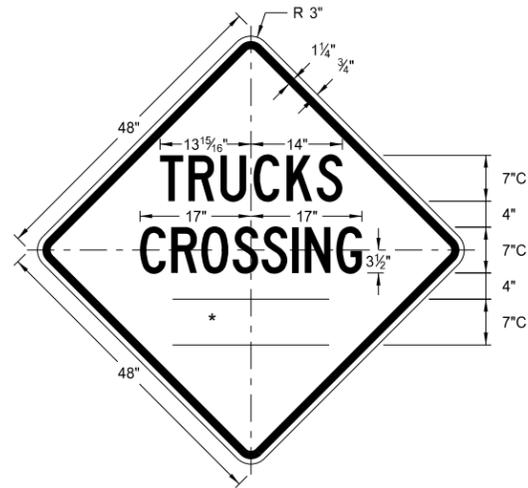
W20-51-48
Legend: black (non-refl)
Background: orange



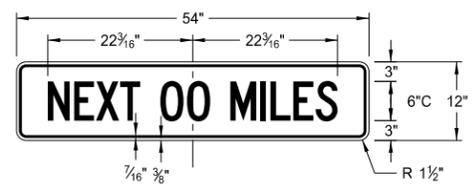
W21-51-48
Legend: black (non-refl)
Background: orange



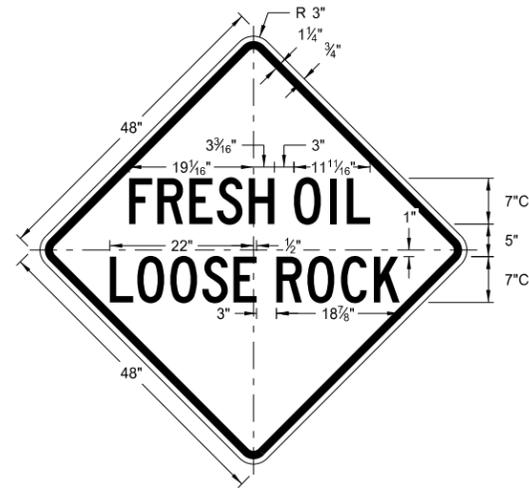
W5-9-48
Legend: black (non-refl)
Background: orange



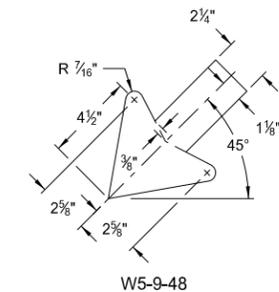
W8-55-48
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Background: orange



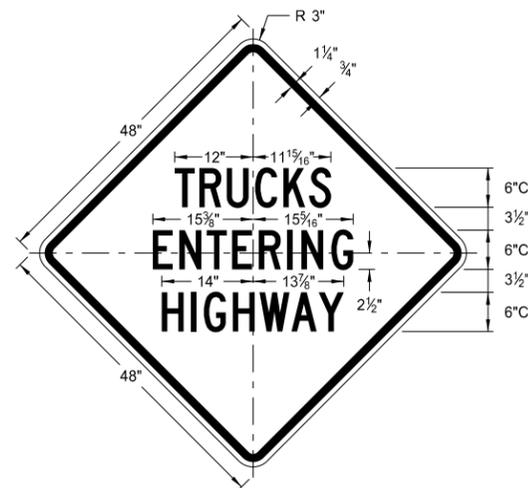
W20-52-54
Legend: black (non-refl)
Background: orange



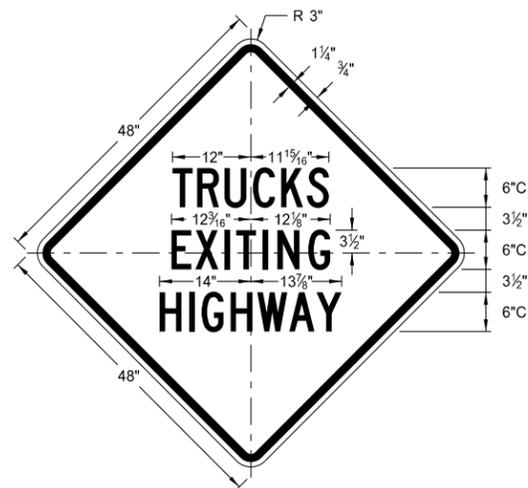
W22-8-48
Legend: black (non-refl)
Background: orange



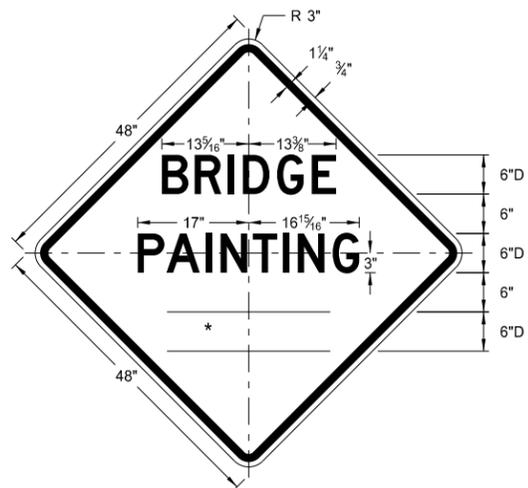
ARROW DETAILS



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



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



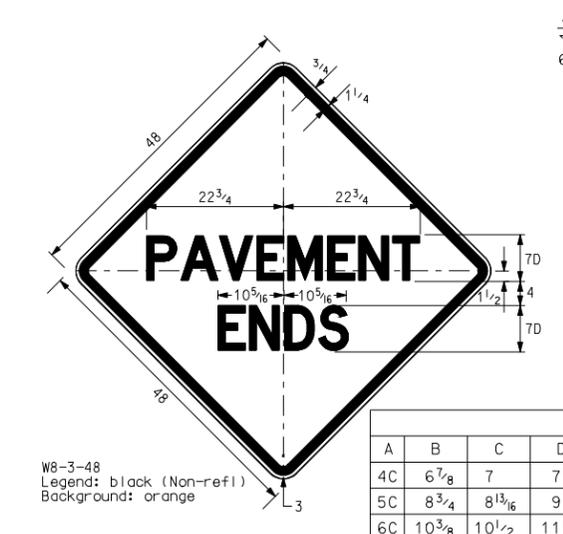
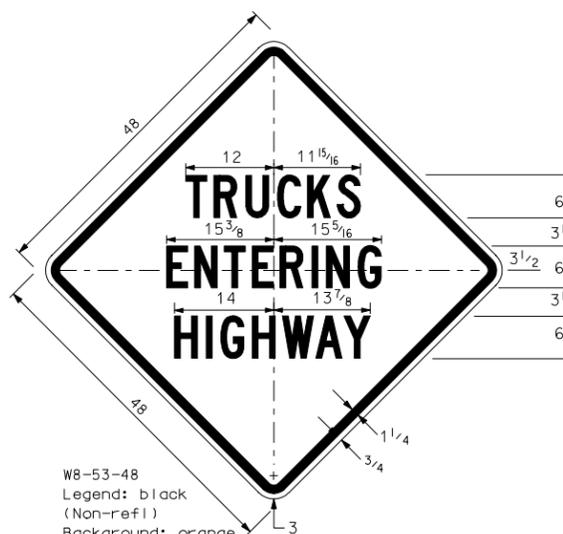
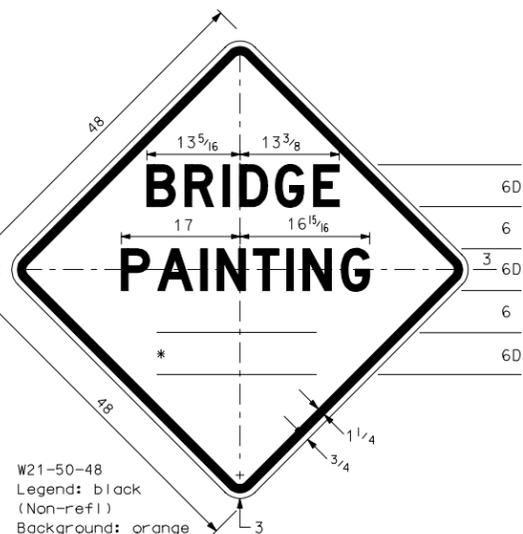
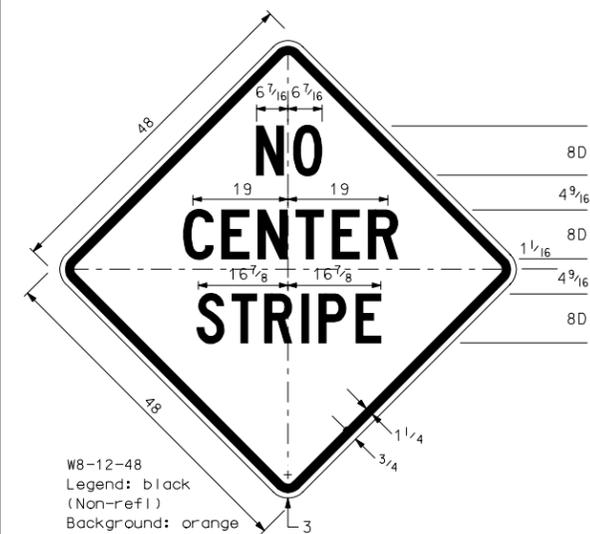
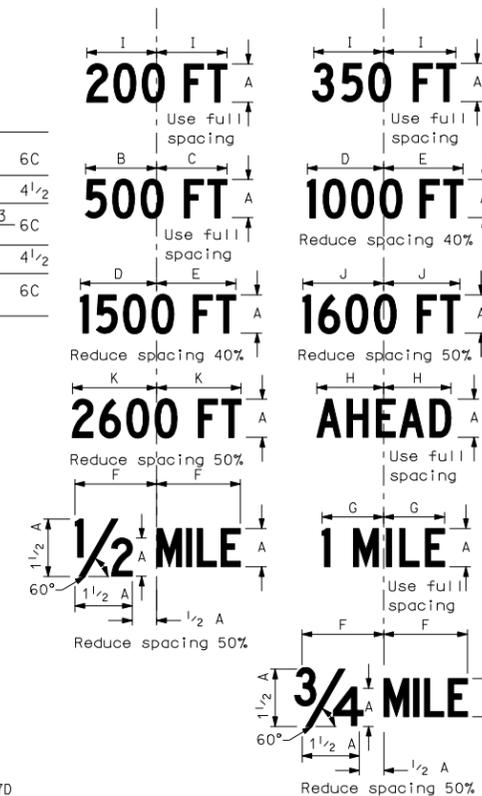
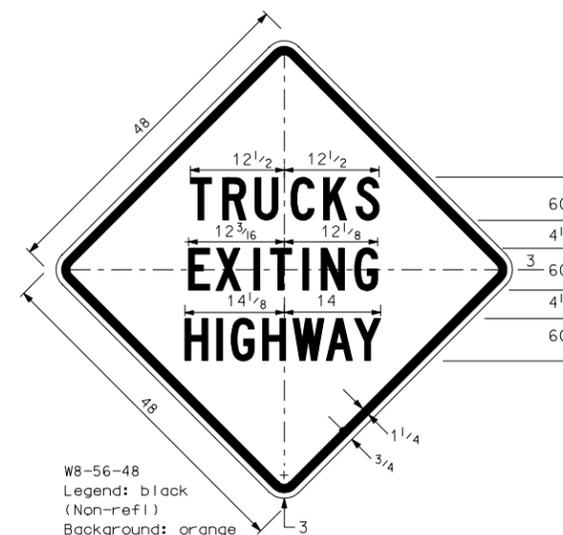
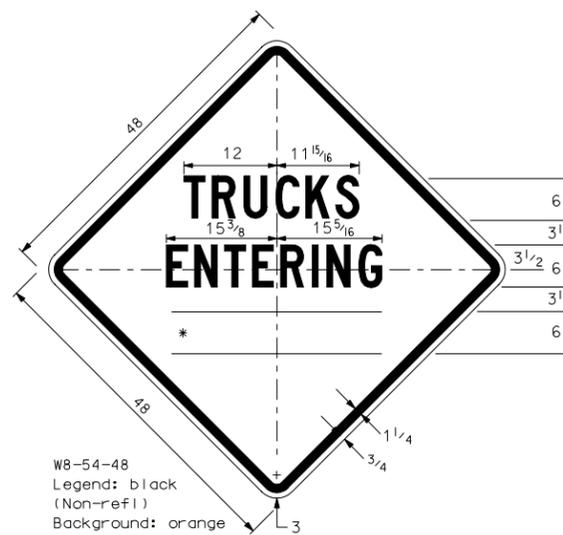
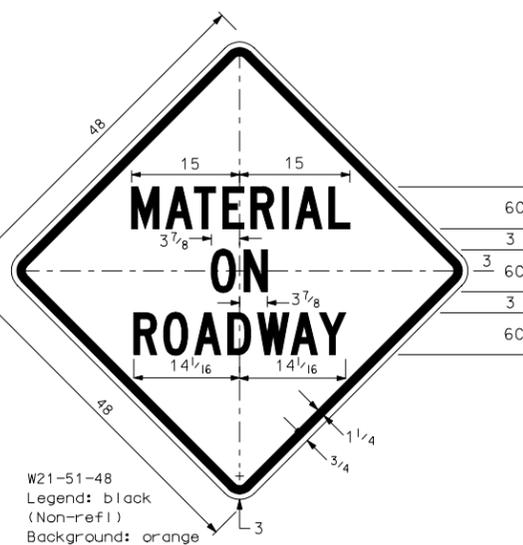
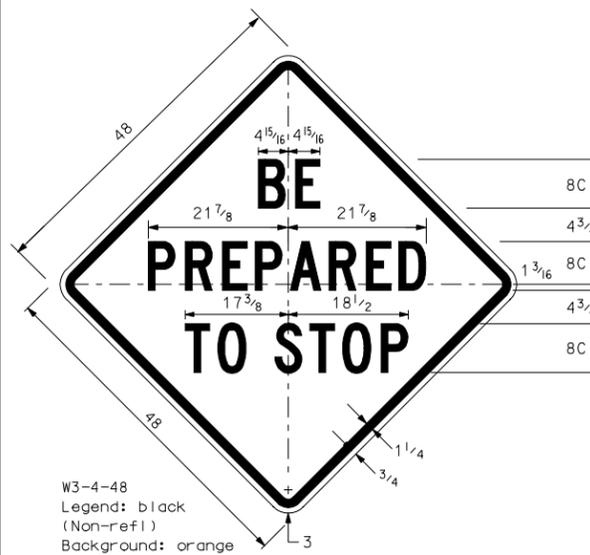
W21-50-48
Legend: black (non-refl)
Background: orange

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

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CONSTRUCTION SIGN DETAIL

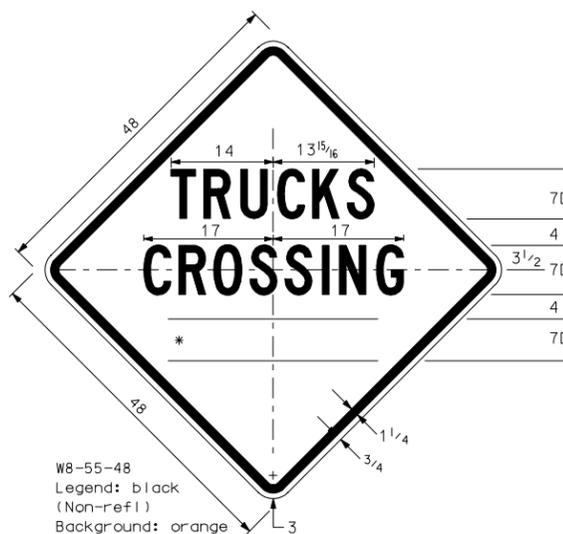
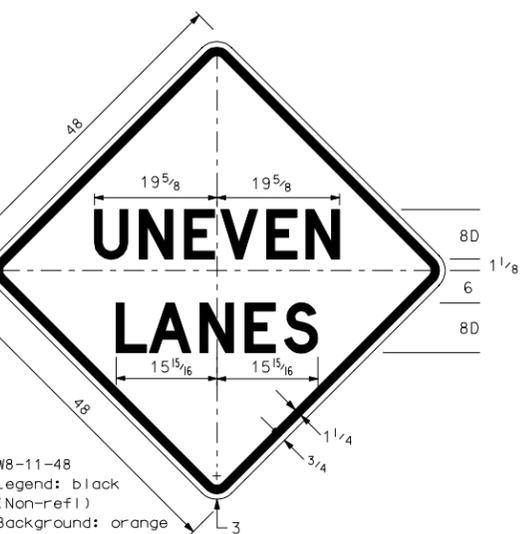
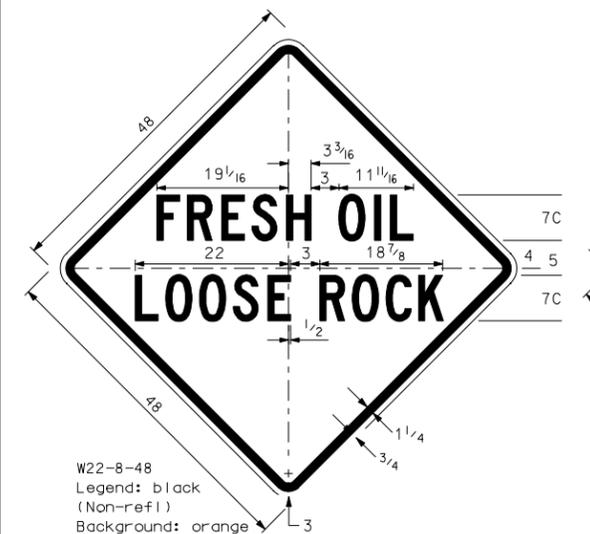
D-704-12



* DIMENSIONS (INCHES)

	A	B	C	D	E	F	G	H	I	J	K
4C	6 7/8	7	7 1/2	8	8 5/16	6 1/16	7	8 5/16	9 1/8	9 3/4	
5C	8 3/4	8 13/16	9 3/8	10	10 7/16	7 5/8	8 3/4	10 1/16	11 1/16	12 3/16	
6C	10 3/8	10 1/2	11 1/4	12	12 1/2	9 1/8	10 1/2	12 1/2	13 3/4	14 5/8	
7C	12	12 3/16	13 1/8	14	14 9/16	10 5/8	12 1/4	14 9/16	15	15 5/8	
8C	13 3/4	14	15	16	16 5/8	12 1/8	14	16 3/4	18 1/4	19 1/2	
4D	8 1/8	8 5/8	8 1/2	9	9	7 3/16	8 1/16	9 3/4	10 3/4	11 3/8	
5D	10 3/16	10 13/16	11 5/8	11 1/4	11 1/4	9 1/2	10 7/8	12 1/8	13 1/4	14 1/4	
6D	12 3/16	12 15/16	13 3/4	13 1/2	13 1/2	11 13/16	13 1/8	14 9/16	14 7/8	15 1/2	
7D	14 1/4	15 1/8	14 7/8	15 3/4	15 3/4	13 1/16	15 1/2	15 1/8	15 1/2	16 7/8	
8D	16 1/4	17 1/4	17	18	18	14 3/8	17 7/16	19 1/4	17 3/4	19 5/16	

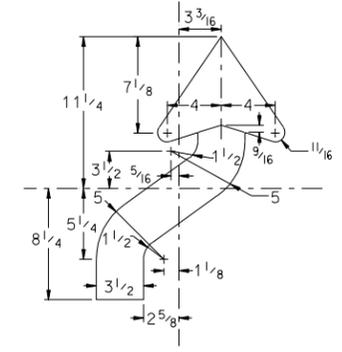
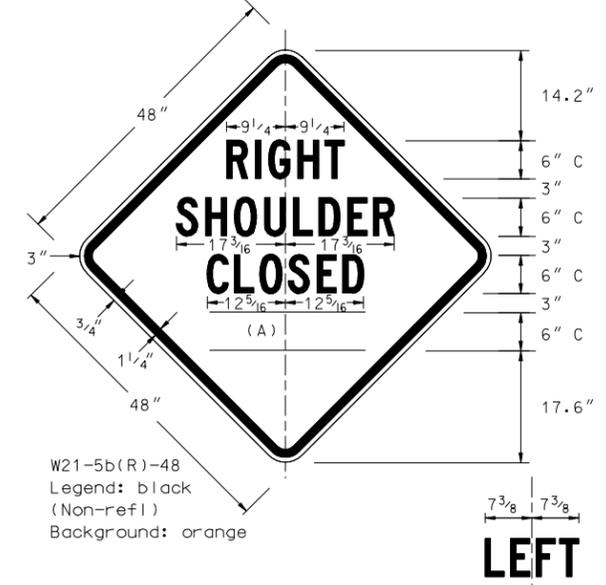
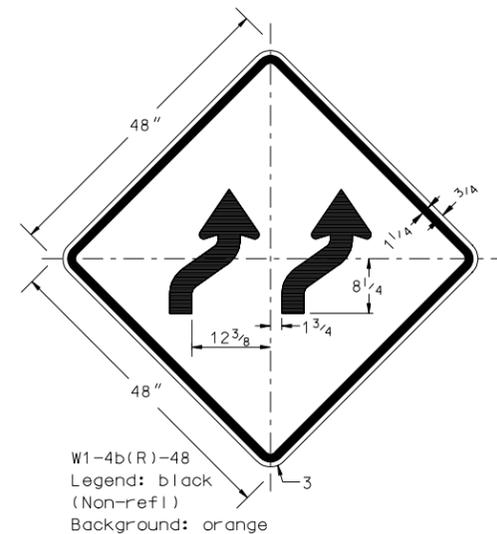
Standard signs that are shown in the construction sign and barricade location details shall be fabricated in the shape, color, and dimensions as shown in the standard signs layout booklet.



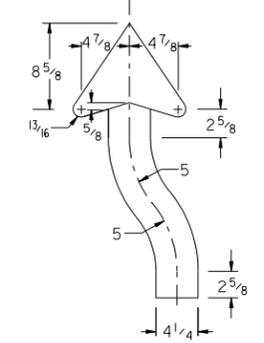
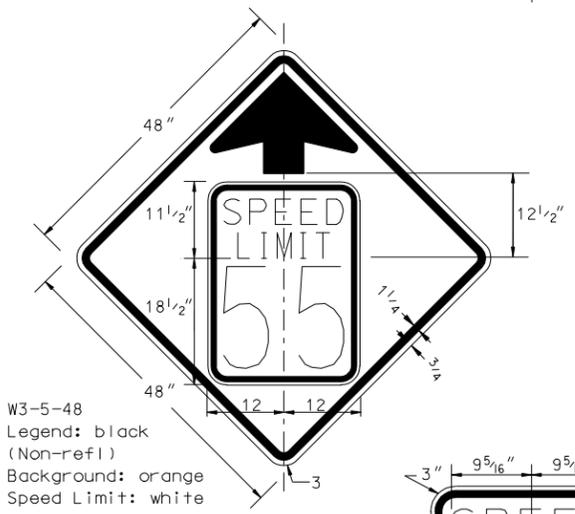
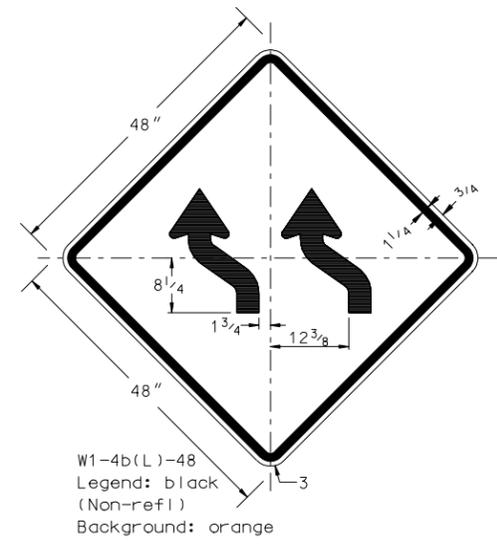
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
12-01-88	Uneven pavement
05-01-92	General revisions
01-24-95	W8-12-48
02-03-95	W8-11-48
06-15-95	General revisions
05-19-98	Added 3/4 mile
05-26-99	Added W8-56-48
08-05-04	Deleted slow paddle added W8-3-48
12-01-04	PE stamp added
07-11-05	Changed W20-7b to W3-4, Revised W8-11 and W8-12

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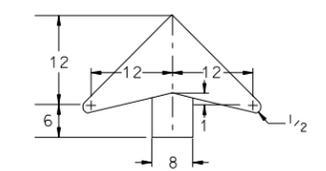
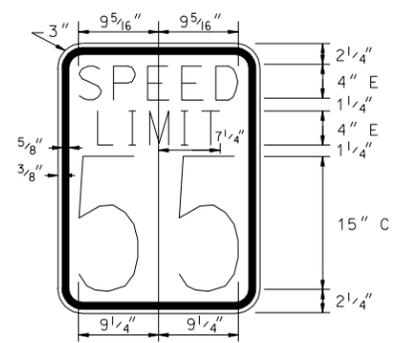
CONSTRUCTION SIGN DETAIL



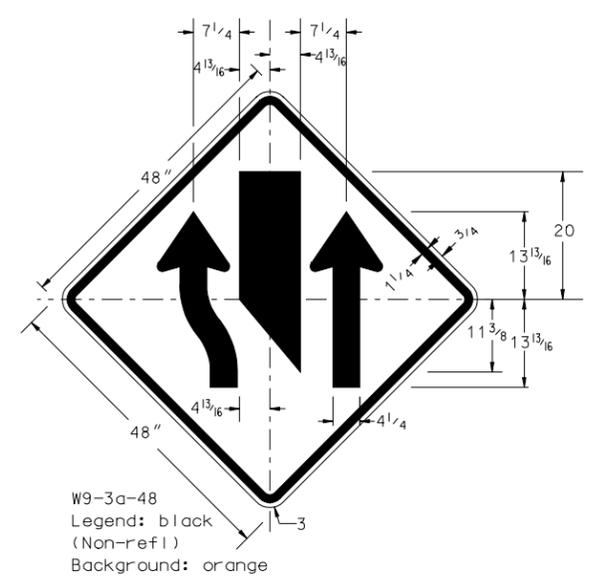
Arrow detail for sign M1-4b(R or L)-48



Arrow detail for sign M9-3a-48



Arrow detail for sign W3-5-48

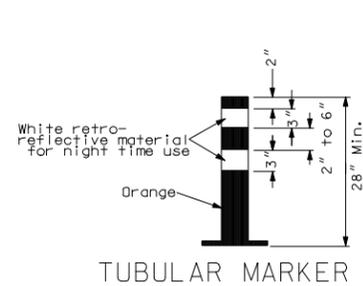


(A) See table on standard D-704-12 for messages and dimensions.

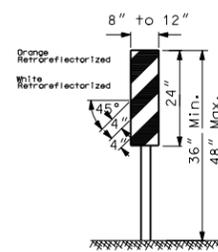
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-12-02	
REVISIONS	
DATE	CHANGE
04-01-04	Added W21-5b-48
08-06-04	General revisions
12-01-04	PE stamp added
06-14-05	Added W3-5-48

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BARRICADE DETAILS AND CHANNELIZING DEVICES

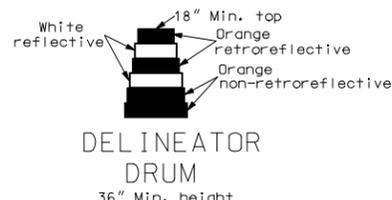


TUBULAR MARKER



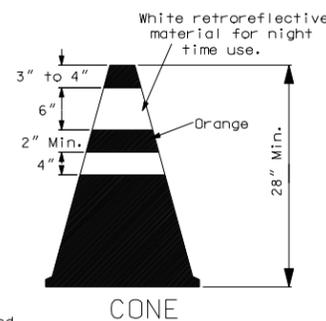
VERTICAL PANEL

(Retro-reflective sheeting shall be placed on both sides)
NOTE: Vertical panels used on the expressways or other high speed roadways shall be 12" by 24"

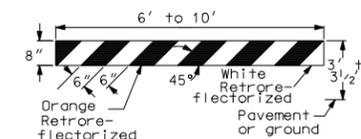


DELINEATOR DRUM
36" Min. height

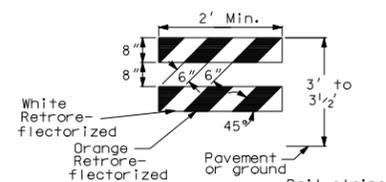
The markings on drums shall be orange and white stripes 4 to 6 inches wide. There shall be at least two orange and two white stripes. Where drums have ribs or indentations, there shall be no retro-reflective sheeting in this area. This space shall be no more than 2 inches wide. The drum surface shall be prepared as recommended by the sheeting manufacturer before retro-reflective sheeting is applied.



CONE

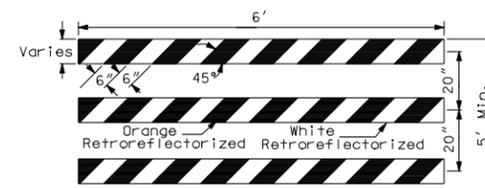


TYPE I BARRICADE



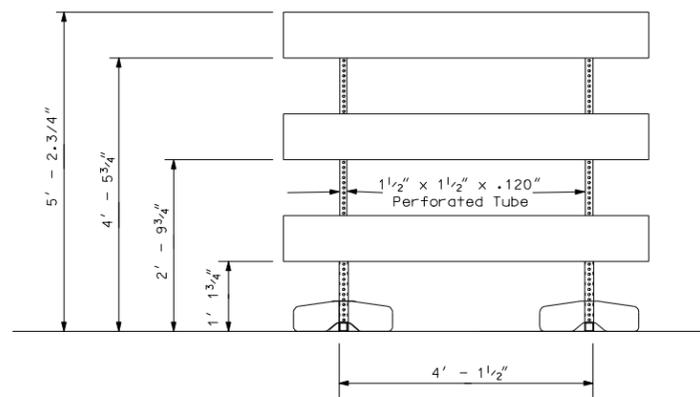
TYPE II BARRICADE

Rail stripe width shall be 4" if barricade length is less than 36".

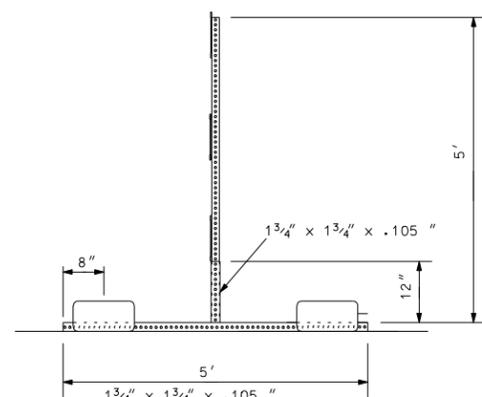


TYPE III BARRICADE

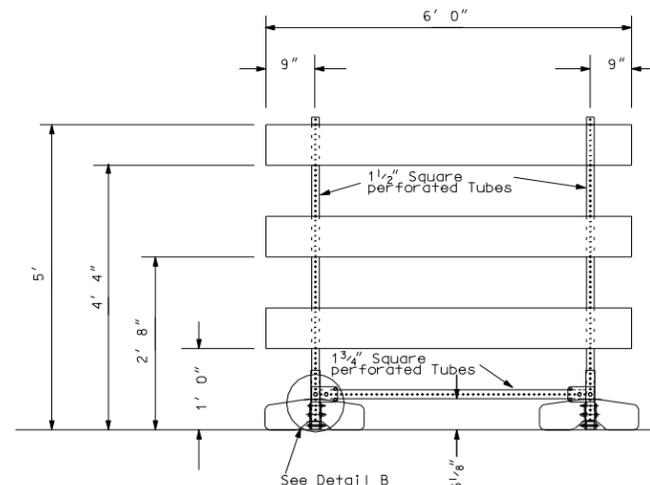
BARRICADES:
Number of retro-reflective rail faces:
Type I - 2 (One each direction)
Type II - 4 (Two each direction)
Type III - 6 (Three in each direction)



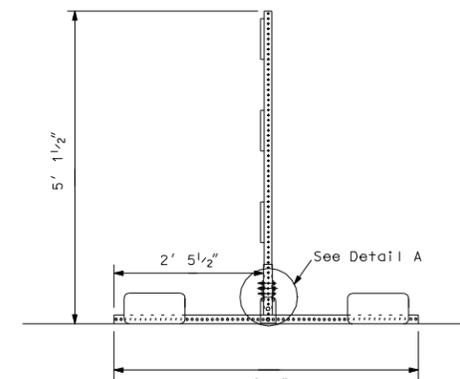
FRONT VIEW



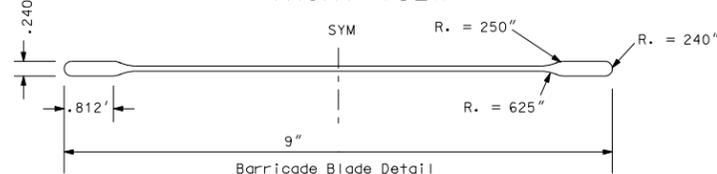
END VIEW



See Detail B

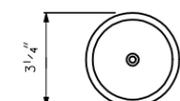


See Detail A



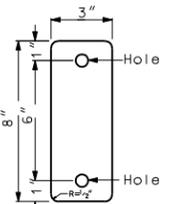
Ballast = 45lb sandbag at the end of each leg.
Barricade blade fastened to vertical supports with 2" corner bolts.
Vertical portion of leg is welded to horizontal portion on all four sides.
Masts slide inside vertical portion of legs. No bolts or fastenings devices used.

BARRICADE ASSEMBLY DETAIL
(Use when aluminum blade as detailed above)



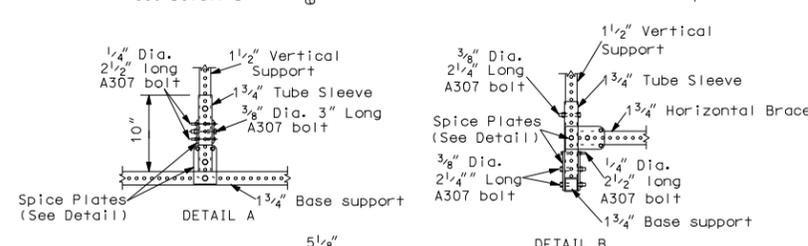
ACRYLIC PLASTIC REFLECTOR

Delineator reflector shall meet the requirements of section 894



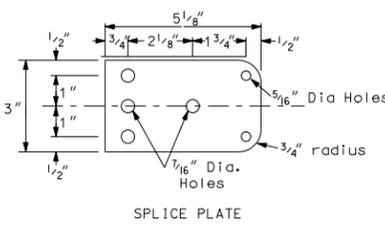
DELINEATOR REFLECTOR

3"x8"-18 Gauge galvanized steel sheet or 0.080" aluminum plate with white retro-reflective sheeting (Type 3A or 3B) as specified in section 894 of the Standard Specifications.



DETAIL A

DETAIL B



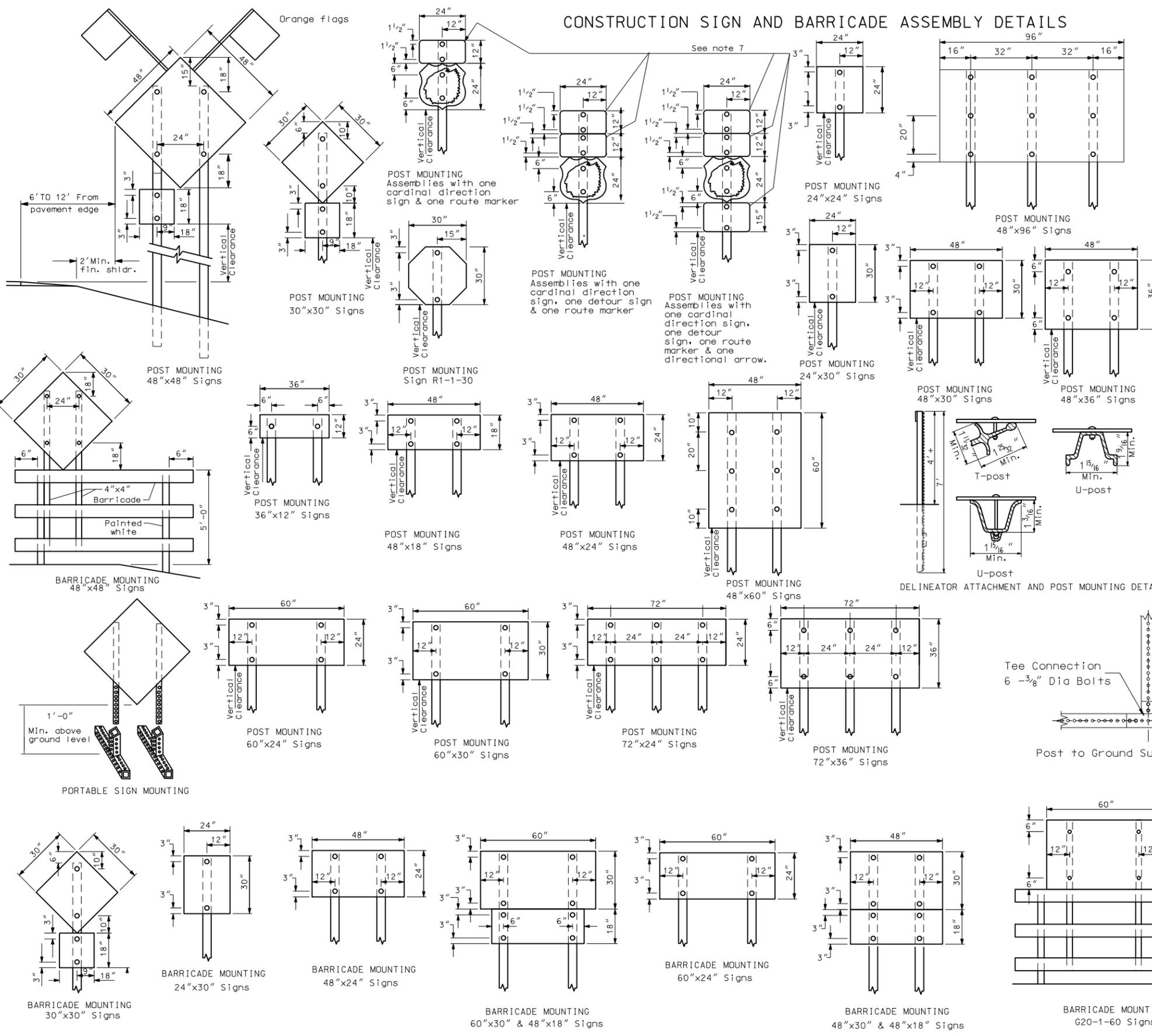
SPLICE PLATE

BARRICADE ASSEMBLY DETAIL
(Use when Plastic I-Beam w/ 1.1/2" Hollow Core Flanges or 1" x 8" x 72" wood boards.)

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
08-03-87	Type sheeting
10-01-87	Delineator drum note
06-08-88	Barricade type III
06-01-92	General revision
06-10-93	General revision
09-23-93	Vertical panel
06-09-95	Reflective sheeting
03-01-02	Barricade type III assembly details
04-01-02	Type III barricade
12-01-04	PE stamp added
06-29-05	Revised Type II barricade stripe

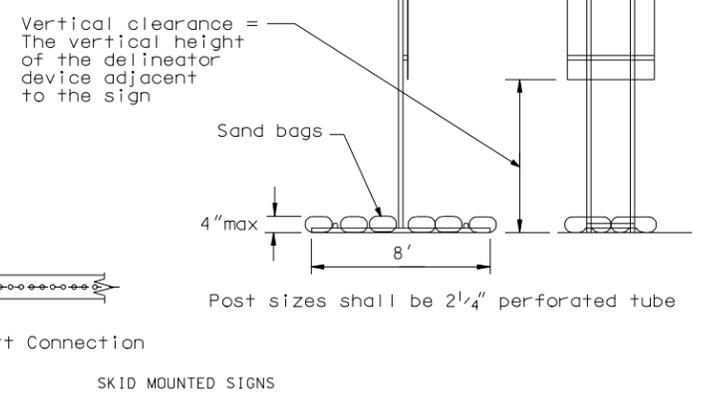
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CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS



NOTES:

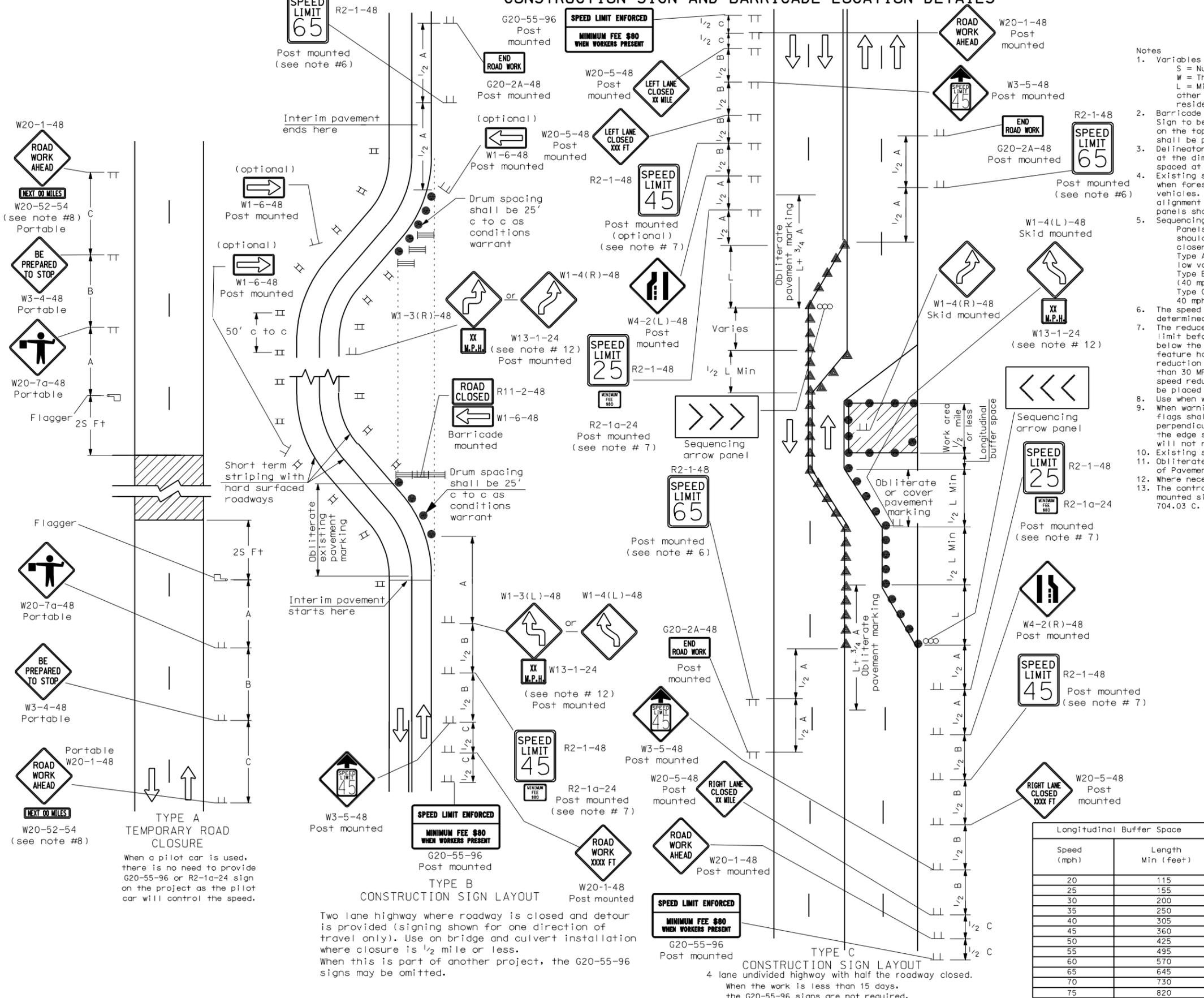
1. Barricade and Sign Supports: Wooden supports shall be painted white. Steel supports shall be galvanized or painted.
2. Barricade Mounting Signs: The bottom of the sign shall be flush with the top of the top rail. Wood sign posts shall be 4"x4" min. SFS or equivalent steel posts. All barricades and barricade mounted signs shall be assembled with 3/8" bolts.
3. Sign Supports: Sign supports shall be 4"x4" min. SFS or equivalent steel post. The anchor for steel supports shall have a stub height of 4" or less. Wood posts more than 4"x4" shall be breakaway. Sign supports shall be imbedded to a sufficient depth so that signs will remain plumb throughout duration of project. It is suggested that wood posts have a min. depth of embedment of 5' and steel posts be imbedded a min. 3'-6". Material: All signs shall be 0.100" aluminum, 12 gauge steel, 1/2" plywood or other approved material. Holes: All holes to be punched round for 3/8" bolts.
4. Alternate Messages: The signs that have alternate messages may have these alternate messages placed on a reflectorized plate without a border and this plate installed and removed as required.
5. Advance Warning Flashing or Sequencing Arrow Panels: The minimum mounting height shall be 7 feet above the roadway to the bottom of the panel, except on vehicle mounted panels which shall be as high as practicable.
6. Delineator Posts: Typical fence post sections are shown in Attachment Details. Other types of metal fence posts may be substituted upon approval of the engineer. These substituted posts shall have reflectors attached similar to the ones shown.
7. Route Marker Auxiliary Signs: The route marker auxiliary signs such as the cardinal direction and directional arrows shall have background colors the same as the route marker they are used with (Interstate route markers, blue background, US and State route markers, white background, Interstate Business loop and spur, green background, and County route markers, blue background).
8. Vertical Clearance: Post mounted signs placed in rural areas shall have a vertical clearance of at least 5 feet measured from the bottom of the sign to the near edge of the driving lane. In business, commercial and residential districts where parking and/or pedestrian movement is likely to occur or where other obstructions to view, the distance between the bottom of the sign to the near edge of the driving lane shall be at least 7 feet. The height to the bottom of secondary signs mounted below another sign may be 1 foot less than the appropriate height specified. Large signs having an area exceeding 50 square feet that are installed on multiple breakaway posts shall be mounted a minimum of 7 feet above the ground.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
08-01-88	Sign assembly
05-01-92	Sign assembly
03-30-93	Sign supports note
07-04-96	Sign height
08-15-96	Note 8
07-10-97	Note revision
01-31-98	Note & portable sign
10-01-99	Skid mounted sign
02-07-03	Vertical clearance note
11-30-04	Third post added to some signs
12-01-04	PE stamp added

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CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS



- 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 S²/60 for urban, residential, and other streets with speeds of 40 mph or less.
 - Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on roadway shall be placed on skid mounted assemblies.
 - Delineator drums, barricades or cones used for tapering traffic shall be spaced at the dimension "S". Delineator drums or cones used for tangents shall be spaced at 2 times dimension "S".
 - Existing striping shall be removed as required. Delineators will only be used when foreslope is 1V:4H or better and roadway alignment is visible to approaching vehicles. Vertical panels shall be used where roadways has steep slopes and alignment is not visible to approaching vehicles. Delineators and vertical panels shall be installed back to back.
 - Sequencing Arrow Panels
 - Panel should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface.
 - Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph and 750 ADT or less).
 - Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less).
 - Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 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 1/2 B.
 - Use when work area is 1 mile or longer.
 - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 - Existing speed limit signs within a reduced speed zone shall be covered.
 - Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
 - 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 sign as shown on the standard drawings as specified in section 704.03 c.

ADVANCE WARNING SIGN SPACING

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

KEY

—	Type I barricade	▨	Work area
—	Type II barricade	□	Flagger
—	Type III barricade	○	Sequencing arrow panel
—	Sign	II	Type A delineator or vertical panels back to back
●	Delineator drum		
▲	Cones		

Longitudinal Buffer Space

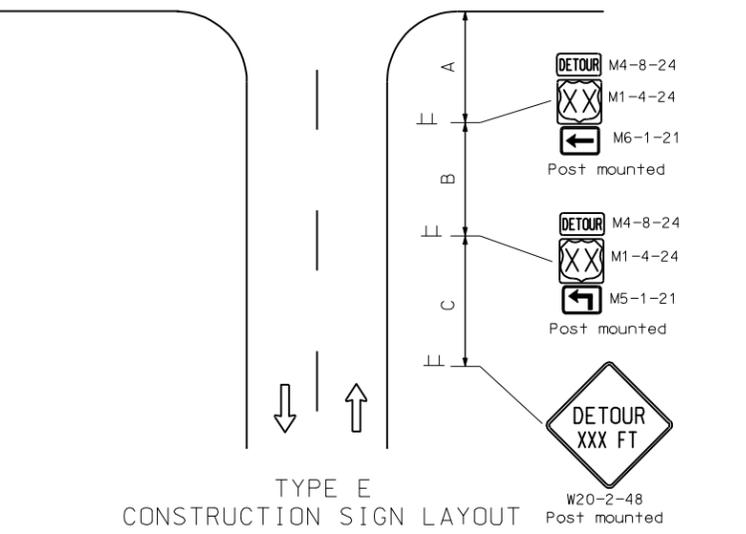
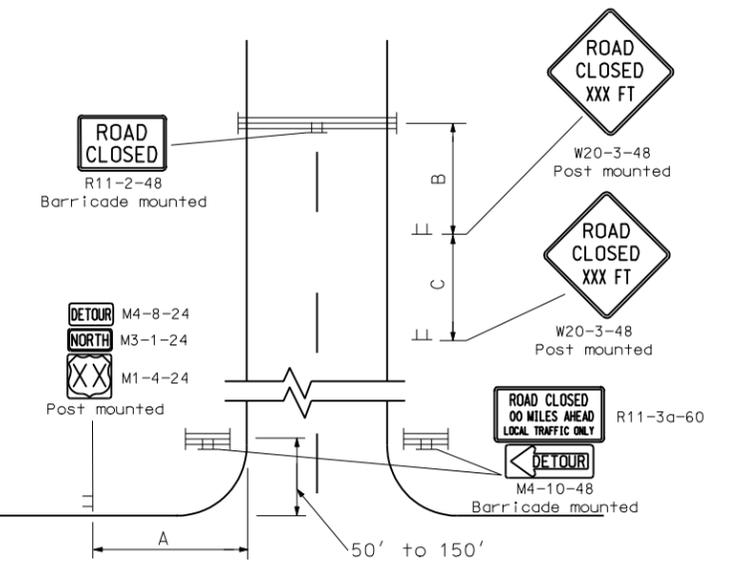
Speed (mph)	Length Min (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 10-1-86

DATE	CHANGE
01-05-01	Revised note 3
07-19-02	Reversed End Road Work & Speed Signs
07-25-03	Revised R2-1, R2-1a and W20-1
04-01-04	Change Fee Sign, Warning & Buffer Spacing
12-18-03	Relocated reverse curve PE stamp added
12-01-04	Revised W4-2, Replaced R2-5a with W3-5, Rev. Adv.
06-29-05	Warning Table, Rev. Note 7, Changed W20-7b to W3-4
07-05-05	

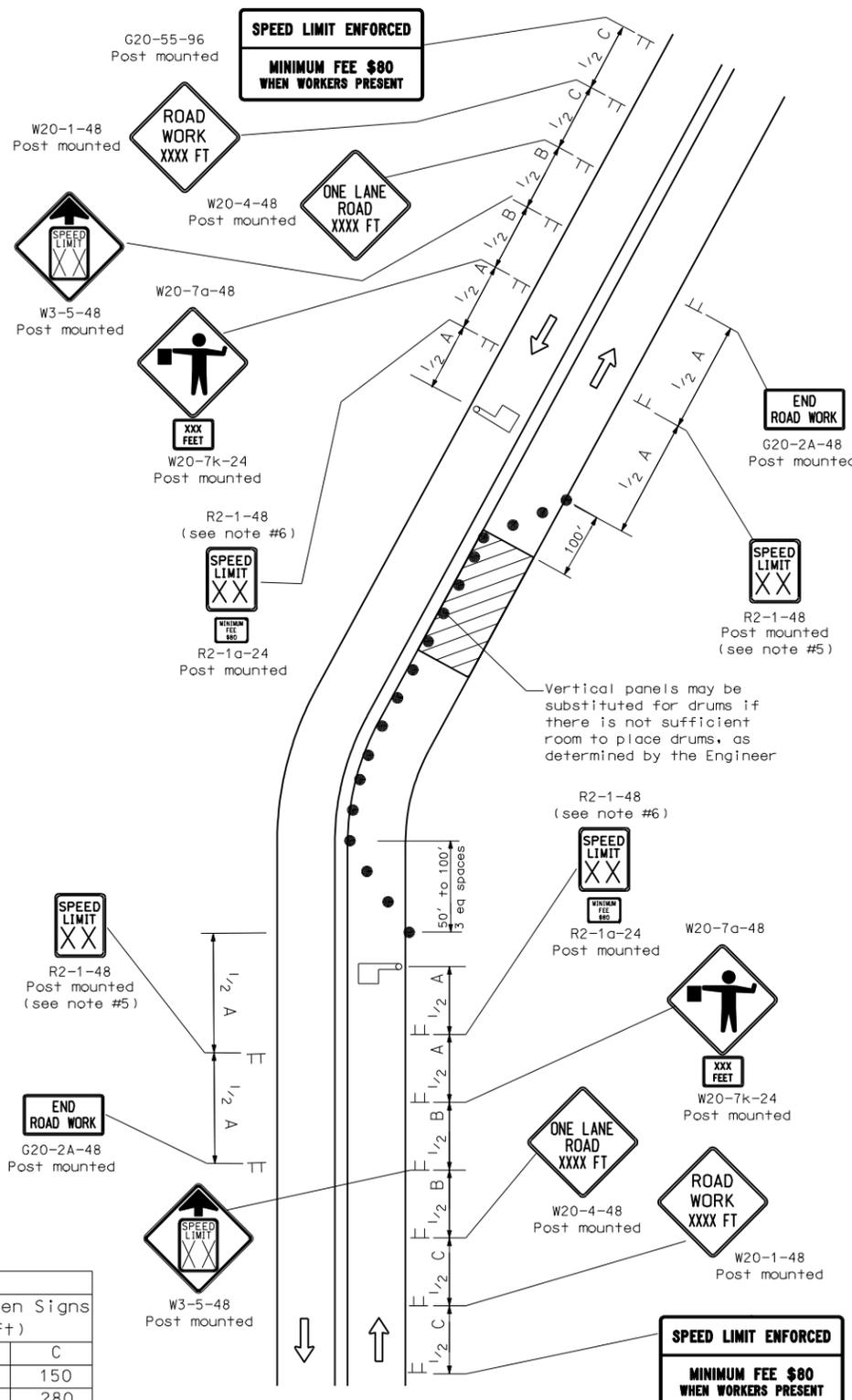
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CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS



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.

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



Two lane highway with one lane closed. Flagger is at a point where it is visible to approaching traffic.

- 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 S²/60 for urban, residential, and other streets with speeds of 40 mph or less.
 - Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be 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".
 - Sequencing Arrow Panels
 Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface. Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph and 750 ADT or less). Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less). Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 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 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.
 - Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
 - 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 sign as shown on the standard drawings as specified in section 704.03 C.
 - G20-55-96 or R2-1a-24 sign are not required when a pilot car operation is used.

KEY

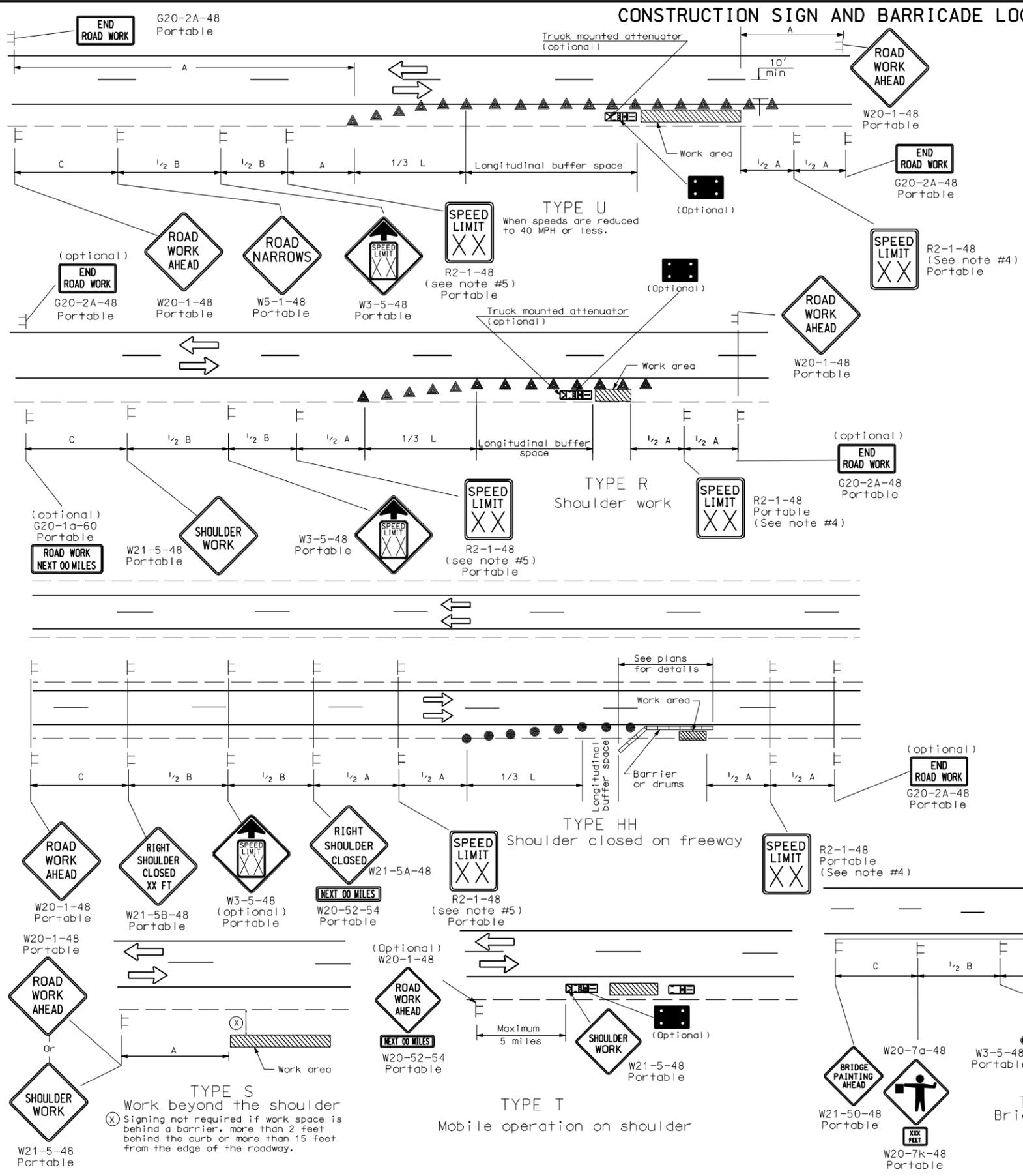
- Delineator Drum
- ┌ Type A Delineator
- └ Sign
- ▲ Cone
- ▮ Type I Barricade
- ▮ Type II Barricade
- ▮ Type III Barricade
- └ Flagger
- ∞ Sequencing Arrow Panel
- ▨ Work/Hazard Area

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
07-19-02	Reversed End Road Work & Speed Limit Signs
07-25-03	Revised R2-1a and W20-1
01-16-04	Revised type F
04-01-04	Revised fee sign & warning sign spacing. Rev. note 6, add note 12
12-01-04	PE stamp added
06-29-05	Added W3-5 to type F, Rev. Adv. Warning Table, Rev. Note 6
04-05-06	Showed signing for opposite direction
02-16-07	Added W3-5-48 to opposite direction of Type F layout

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CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

- 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, or cones used for tapering traffic shall be spaced at dimension "S". Delineator drums, or cones 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 and 750 ADT or less).
 Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less).
 Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 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 $1/2 B$.
 - 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 sign as shown on the standard drawings as specified in section 704.03 C.



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

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

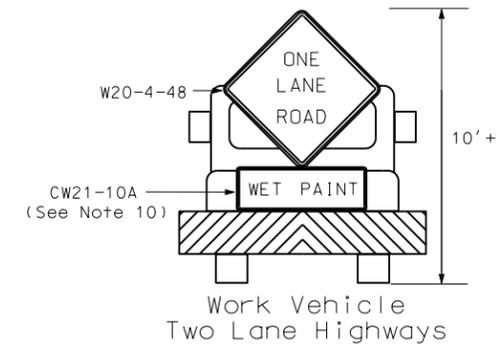
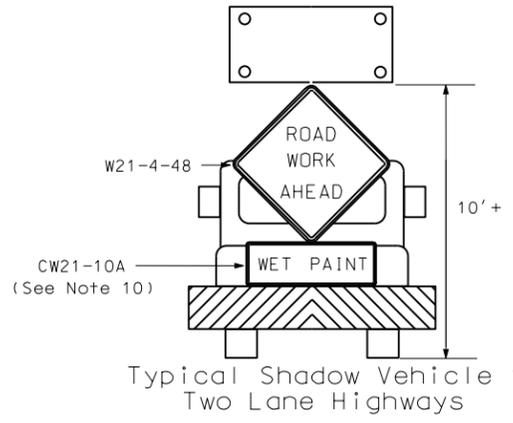
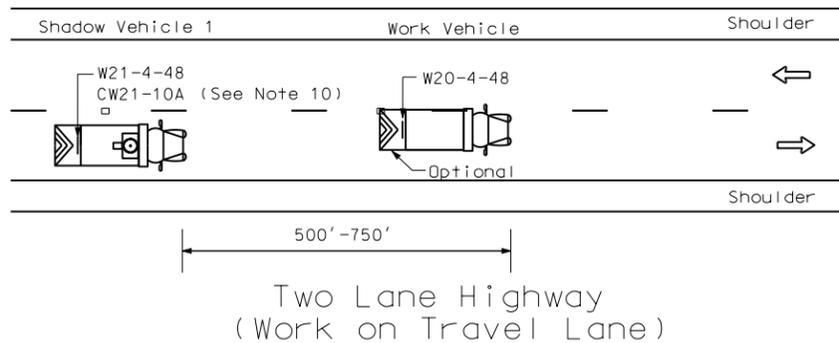
KEY

- Type I barricade
- Type II barricade
- Type III barricade
- Sign
- Delineator drum
- Cones
- Work area
- Flagger
- Sequencing arrow panel
- Type A delineator or vertical panels back to back

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 10-1-86	
DATE	CHANGE
10-01-99	General revisions
10-04-99	Type HH barrier
11-15-99	Add taper width & note
03-15-01	Revised note 2
07-19-02	Reversed End Road Work & Speed Limit signs
07-25-03	Revised R2-1a and W20-1
04-01-04	Removed fee sign & rev warning & buffer spacing rev note 5
12-01-04	PE Stamp added
06-29-05	Replaced R2-5a with W3-5 Rev. Adv. Warning Table, Rev. Note 5

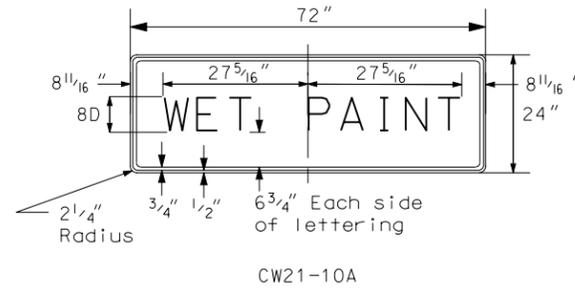
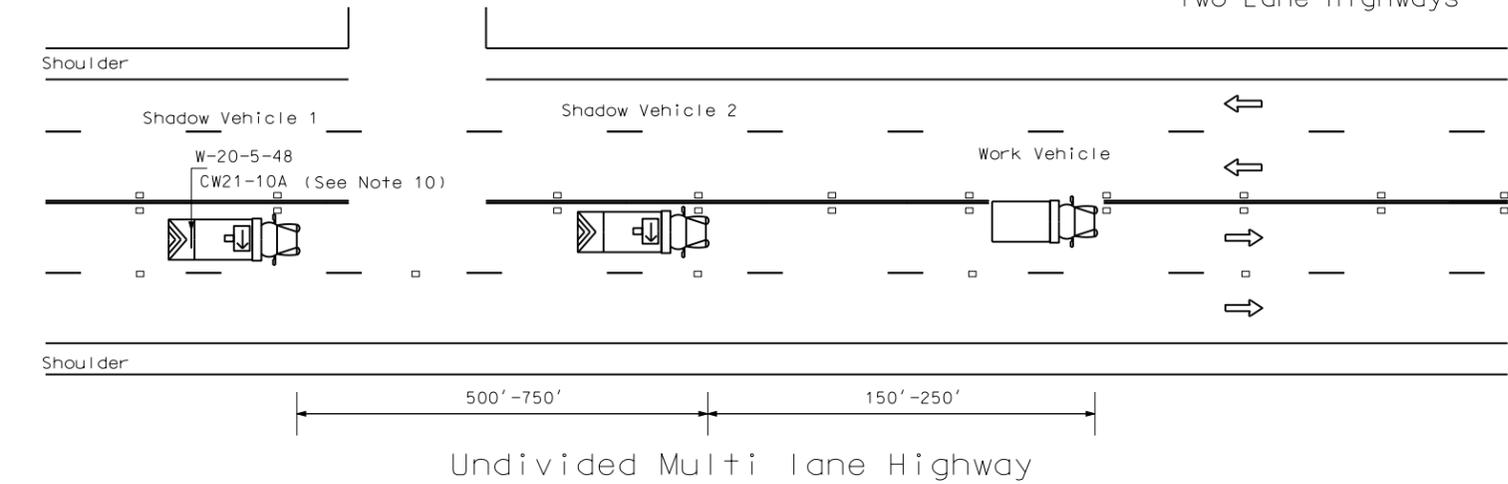
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TRAFFIC CONTROL FOR MOBILE OPERATIONS



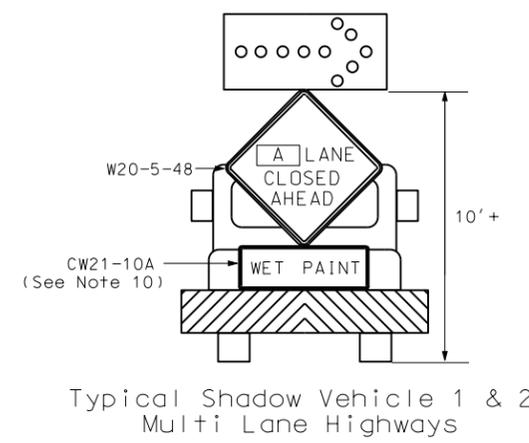
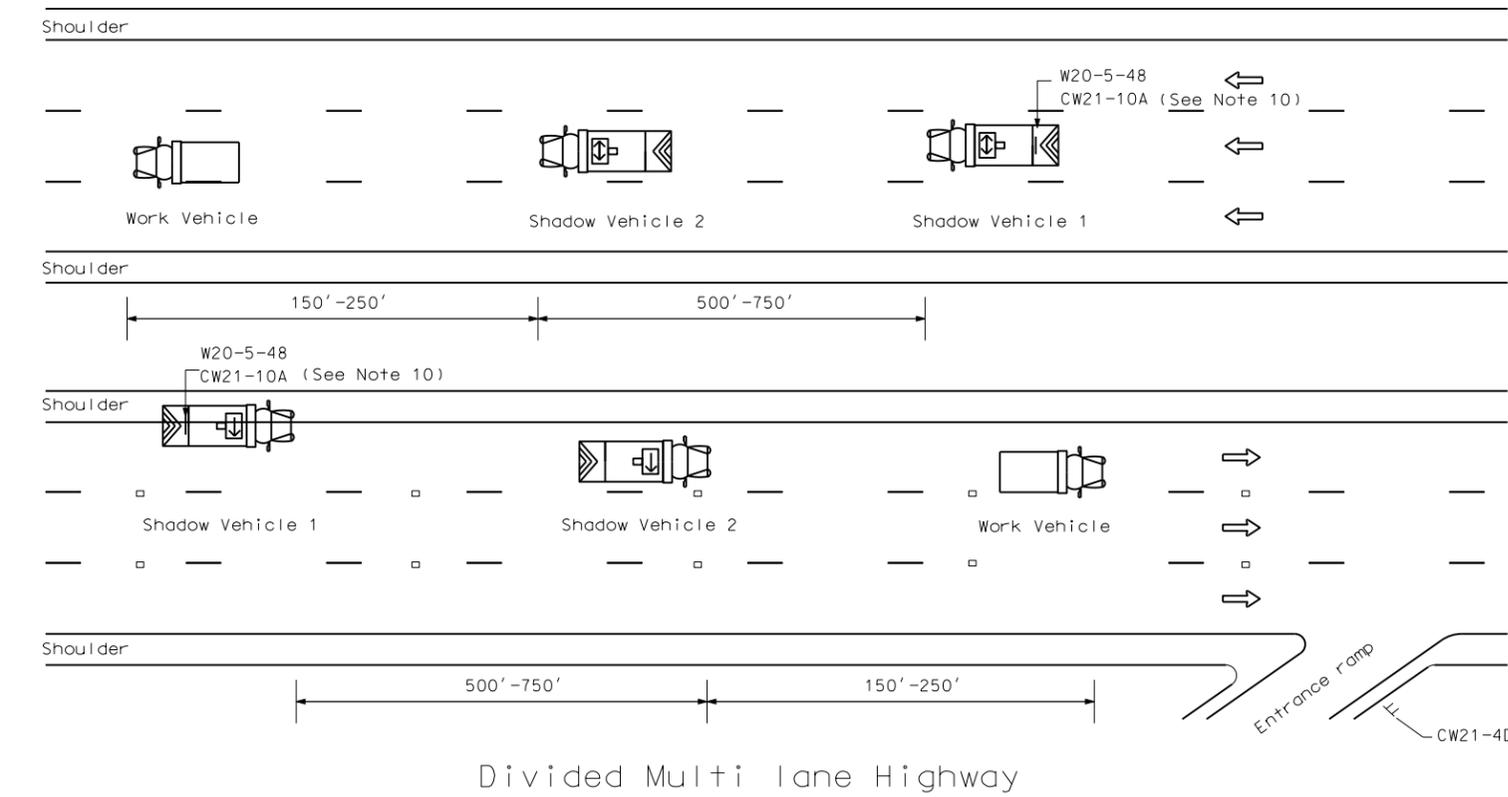
- Notes
1. If the contractor chooses to place more vehicles in the convoy than are shown, these vehicles shall have the truck mounted attenuator and shall be at the contractor's expense.
 2. All traffic control devices shall be in accordance with the "Manual on Uniform Traffic Control Devices" (MUTCD),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

Sign Details



KEY

A = [Left] [Right] [Center]	
	Truck mounted attenuator
	Flashing arrow panels:
	Right directional
	Left directional
	Double arrow directional
	Caution Mode

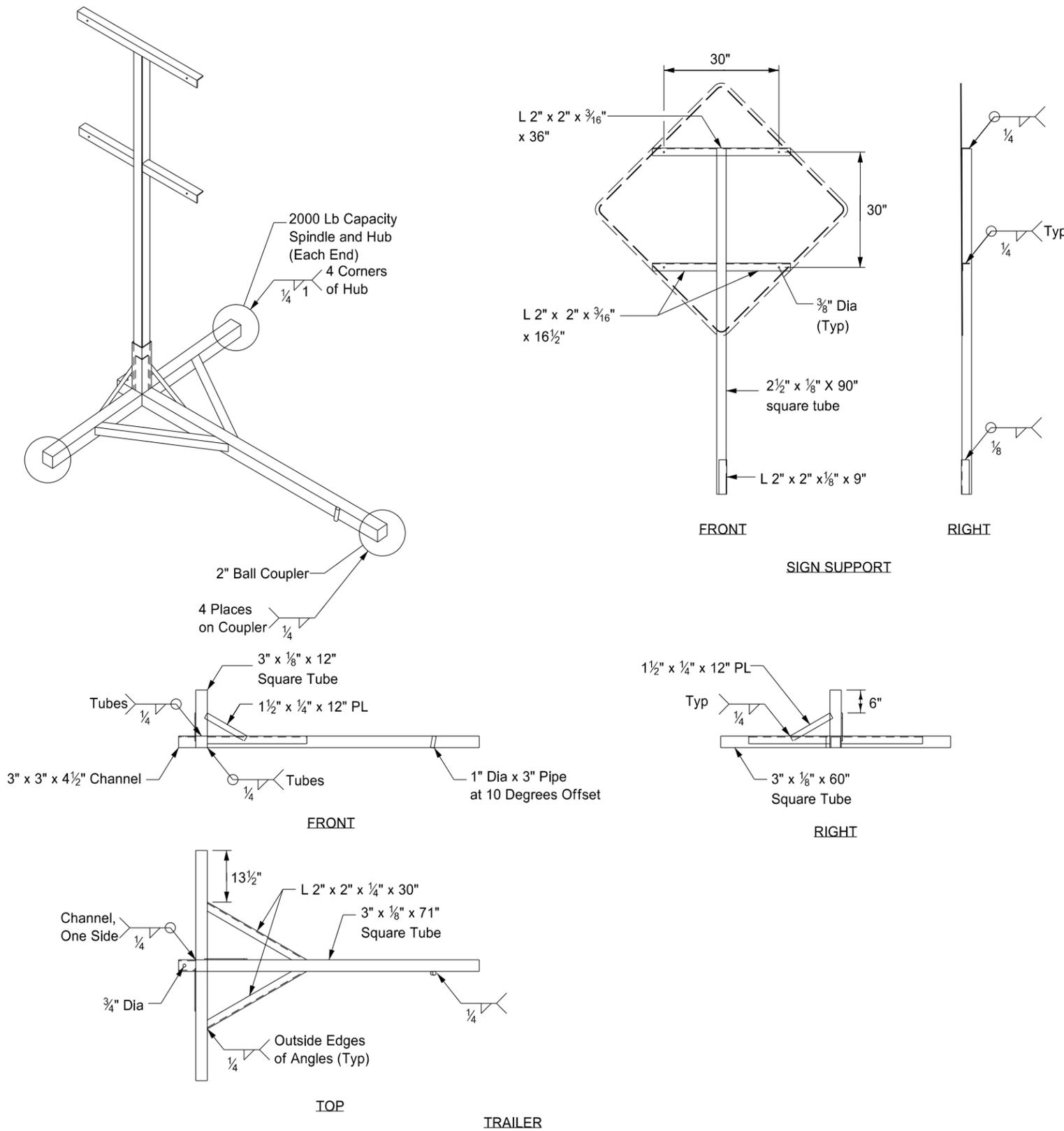


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
01-22-92	
REVISIONS	
DATE	CHANGE
02-24-93	General
06-21-95	Remove arrow panels
06-04-99	W21-4-48 sign
10-01-99	General revisions
07-25-00	General revisions
05-24-02	Major revisions
12-01-04	PE Stamp added

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PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



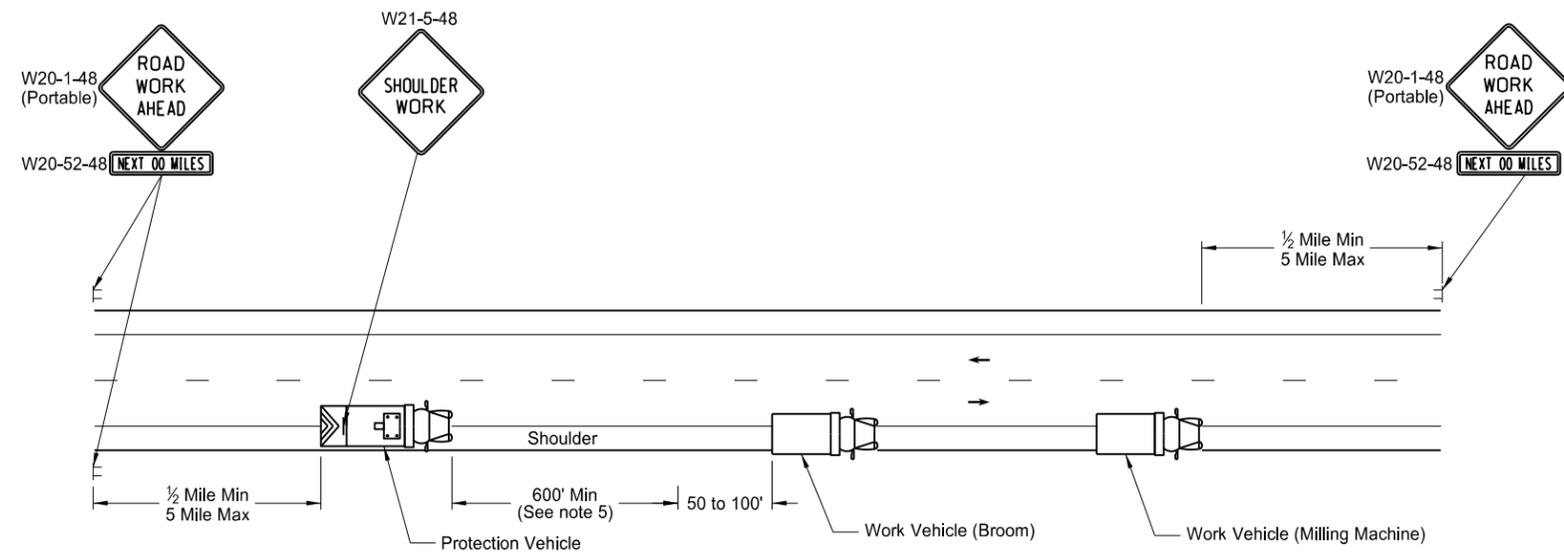
Notes:

- 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.

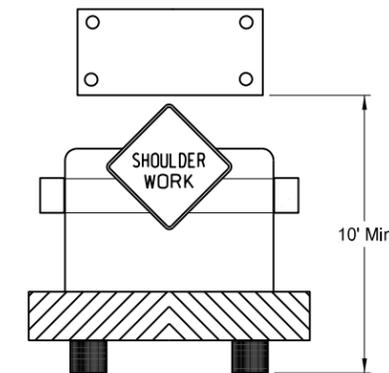
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 11/23/10 and the original document is stored at the North Dakota Department of Transportation.

MOBILE OPERATION
Grinding Shoulder Rumble Strips



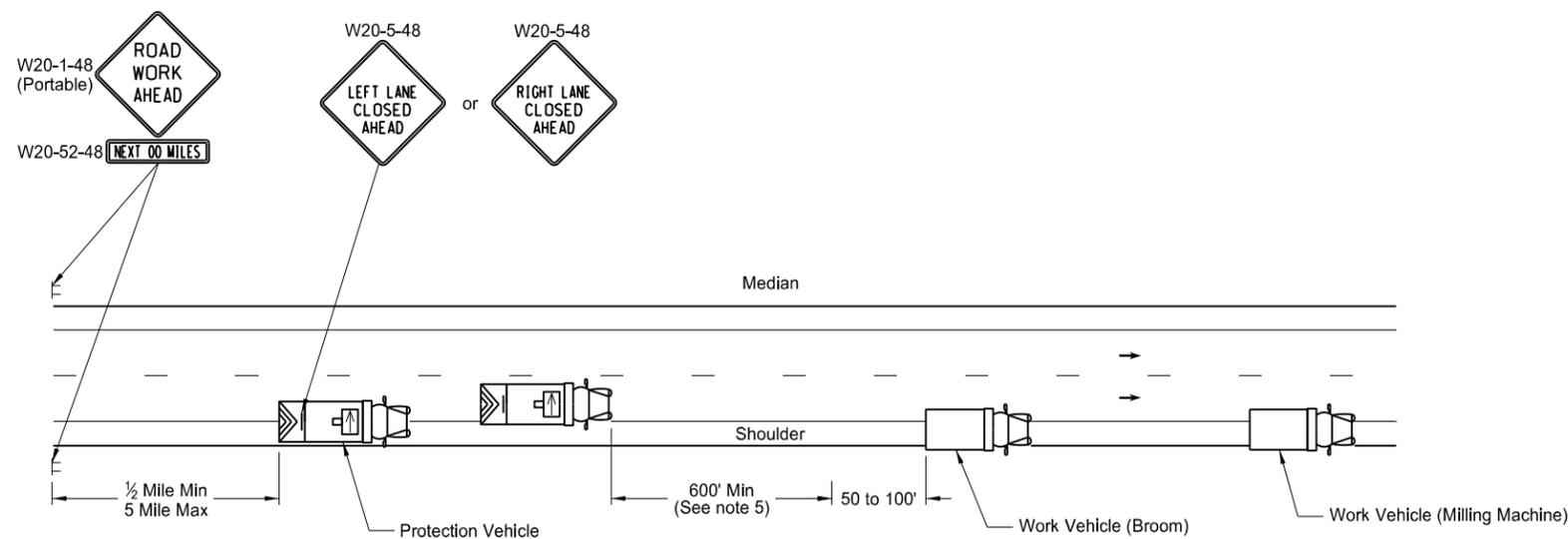
TWO LANE - TWO WAY ROADWAY



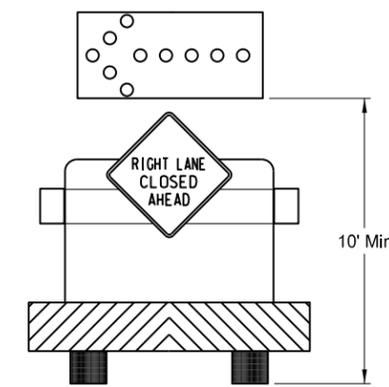
TWO LANE - TWO WAY ROADWAY
Typical Protection Vehicle with
Flashing Arrow Panel In Caution Mode

Notes:

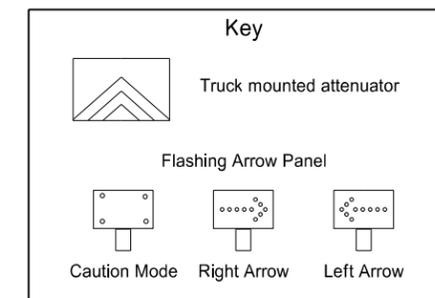
1. If the contractor chooses to place more vehicles in the convoy than are shown, these vehicles shall have the truck mounted attenuator and shall be at the contractors expense.
2. Vehicles shall have a rotating, flashing, oscillating or strobe lights.
3. Flashing arrow panels shall be Type B or Type C. The panel operation shall be controlled from inside the vehicle.
4. Each vehicle shall have two - way electronic communication capability.
5. Vehicle spacing between the protection vehicle and work vehicle will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the protection vehicle in time to slow down and safely pass the work vehicles.
6. ROAD WORK AHEAD SIGN: Advance Road Work Ahead signs shall be moved as the work area moves through the construction zone.
7. Next XX Miles sign required when the distance from Road Work Ahead sign to the work location is two miles or greater.



INTERSTATE & 4 LANE DIVIDED HIGHWAY



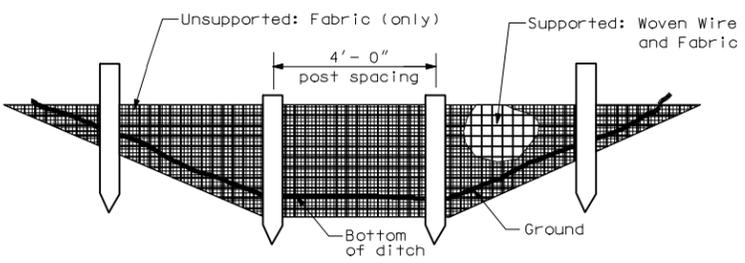
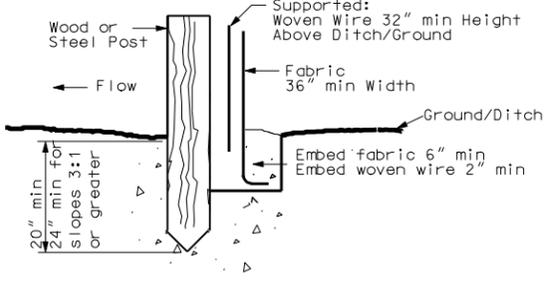
INTERSTATE & 4 LANE DIVIDED HIGHWAY
Typical Protection Vehicle with Flashing Arrow
Panel In Flashing Arrow Mode



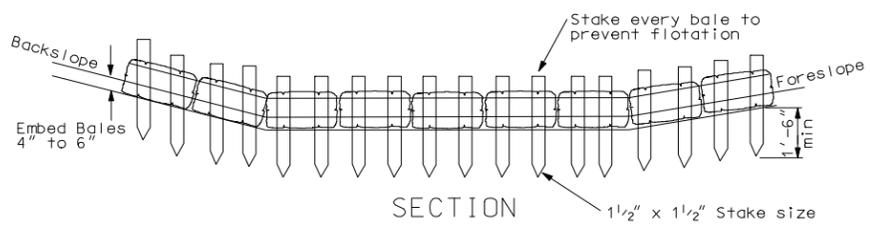
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-15-12	
REVISIONS	
DATE	CHANGE

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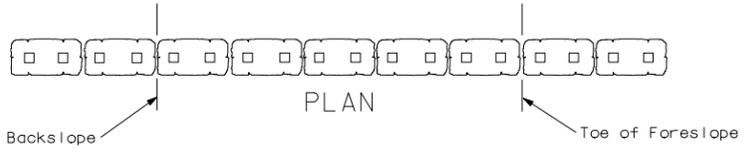
EROSION AND SILTATION CONTROLS



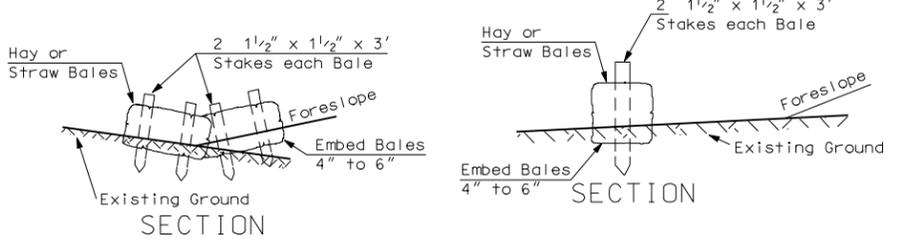
SILT FENCE
Supported and Unsupported



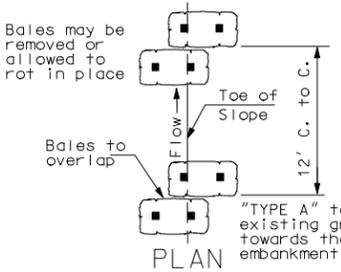
SECTION



"TYPE A"

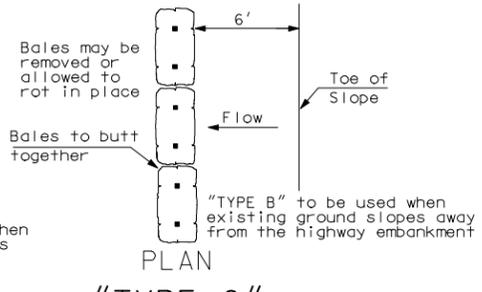


SECTION



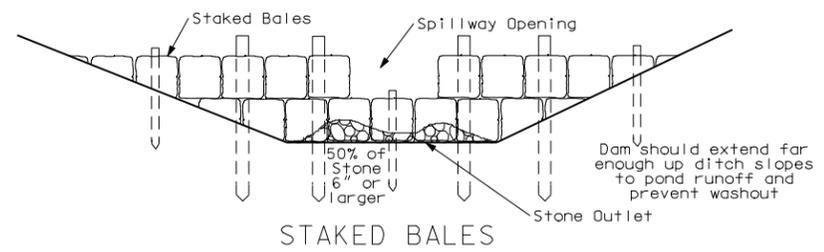
PLAN

"TYPE B"
BALED HAY OR STRAW EROSION CHECKS

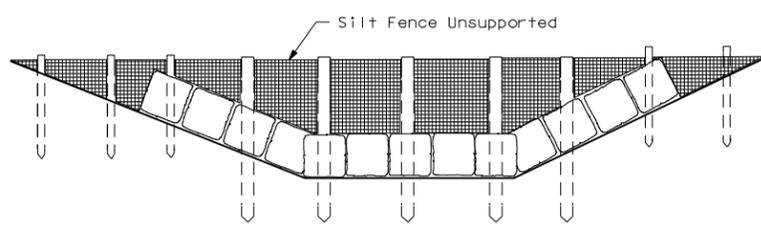


PLAN

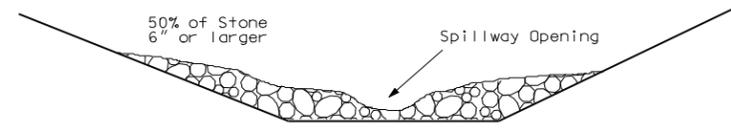
"TYPE C"



STAKED BALES

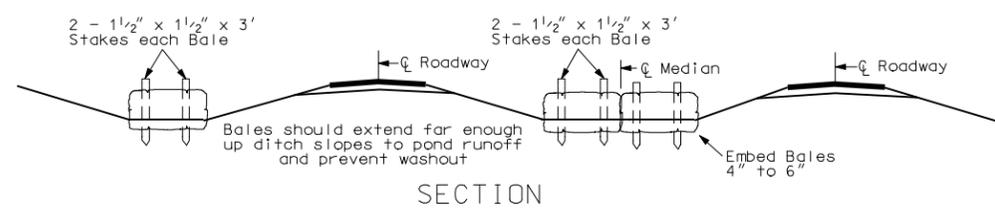


FENCE-BACKED BALES



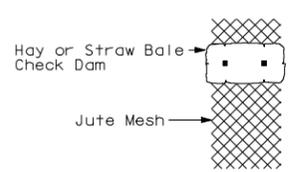
GRADED STONE

DITCH EROSION DAMS

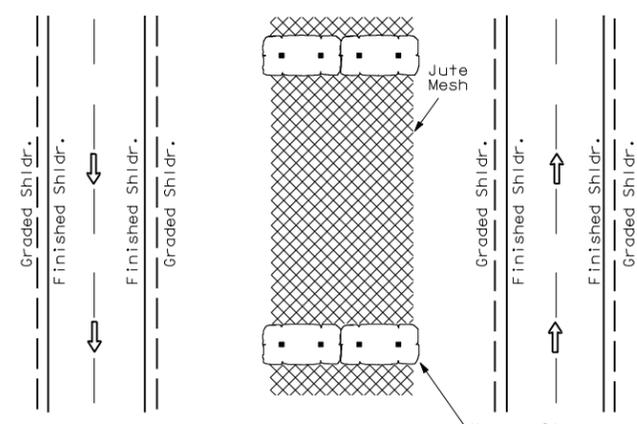


SECTION

MEDIAN OR DITCH PROTECTION AT STREAM CROSSING



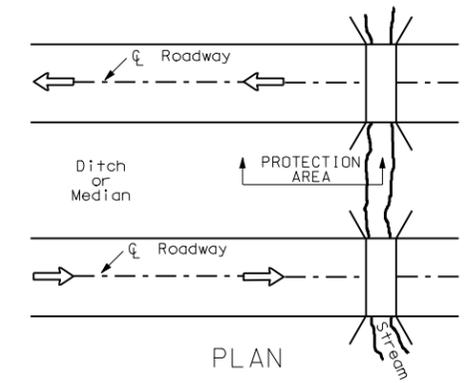
ROADSIDE DITCH



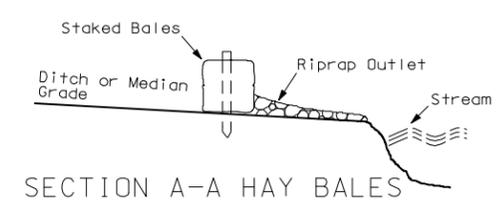
PLAN

MEDIAN DITCH

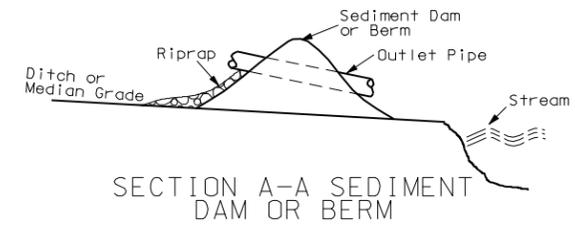
STONE, JUTE, MESH, OR SOD
DITCH & MEDIAN EROSION CONTROL



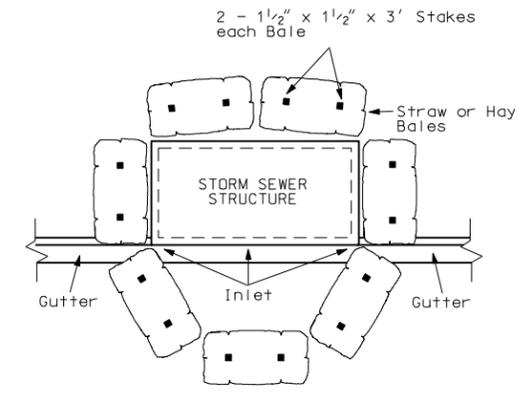
PLAN



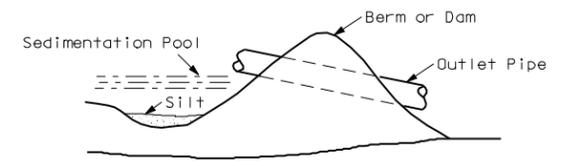
SECTION A-A HAY BALES



SECTION A-A SEDIMENT DAM OR BERM



STORM SEWER INLET
EROSION & SILTATION
BARRIER



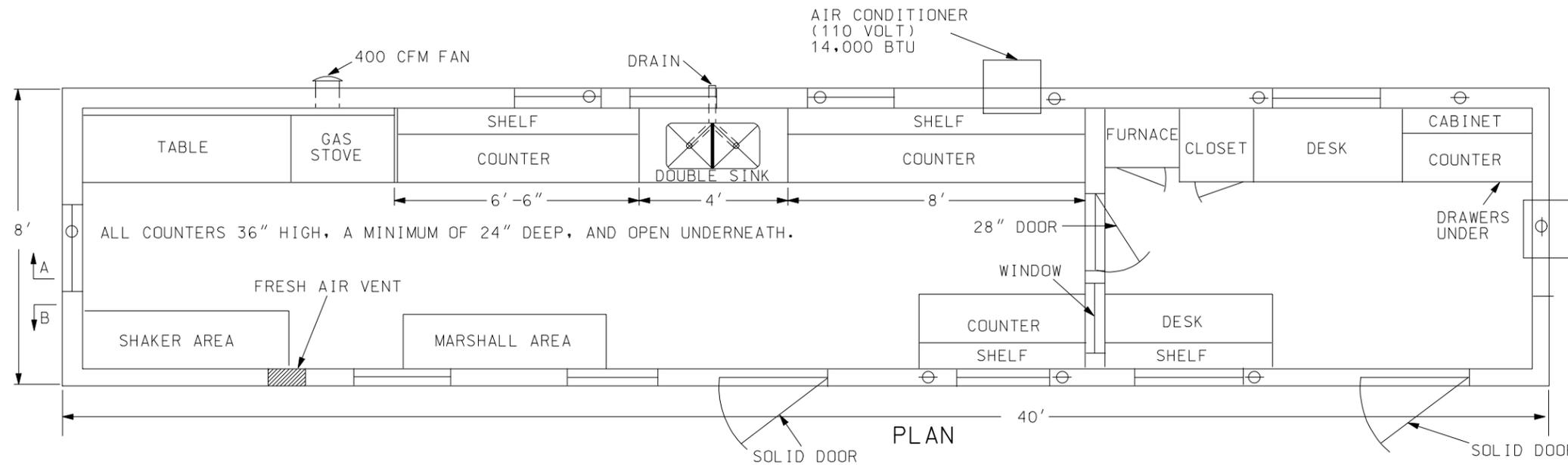
SMALL SEDIMENT DAM OR BERM

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
09-04-92	Ditch check
09-16-92	Sediment cont. fencing
01-31-95	General revisions
10-09-02	Sediment fence
01-24-04	Silt fence
02-06-04	Rev silt fence details
12-01-04	PE Stamp added

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TYPE C FIELD LABORATORY

D-706-1



AIR CONDITIONER (110 VOLT) 8,000 BTU

NOTES:

There shall be a minimum of 6 exterior ventilated casement or double hung windows. The minimum total area of opening shall be 34 square feet. The number, size, and location of windows may be adjusted to fit conditions. Suggested locations are shown on drawing.

The sink shall be double compartment stainless steel. Each compartment shall be a minimum of 16"x14"x10" deep. The sink shall be drained to an outside wasteline. A trap is not required. Water service lines shall be copper or plastic having a diameter of 1/2 inch.

The lab shall be equipped with an exhaust fan capable of removing inside air at a rate of 400 CFM.

The fresh air vent shall be hinged to open or close manually.

24" x 48" table shall be provided capable of holding a 200 lb. masonry saw. The table shall have a minimum clearance of 36" overhead.

The water supply tank shall have a capacity of 500 gallons.

Steps shall be provided for each of two entrance doors. Steps for each area shall be made of, or covered with, a material providing for a non-slip surface. They shall be heavy duty steps that are capable of withstanding heavy loadings and extensive use.

The pressure tank on the pump shall be 20 gallon capacity.

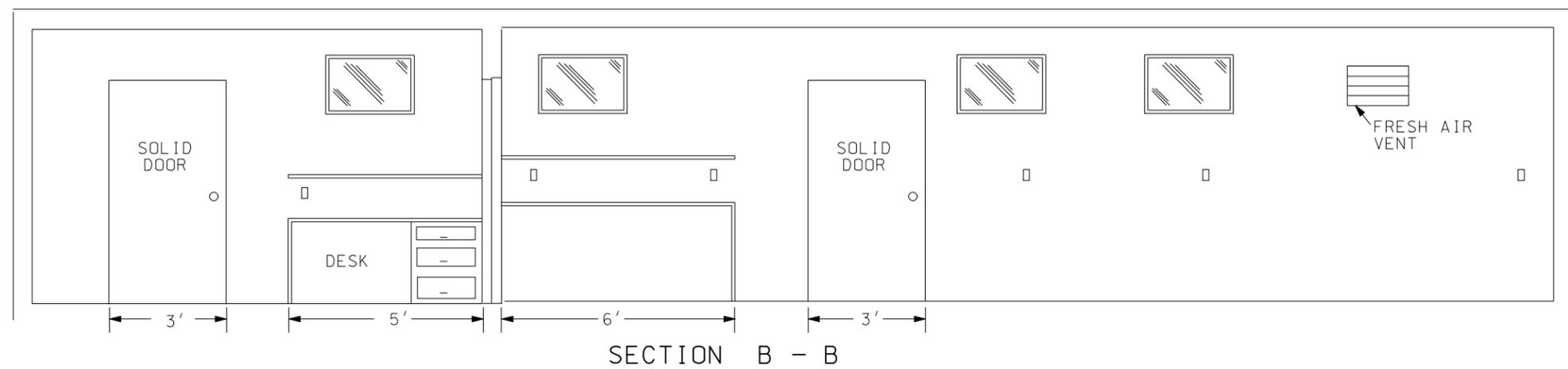
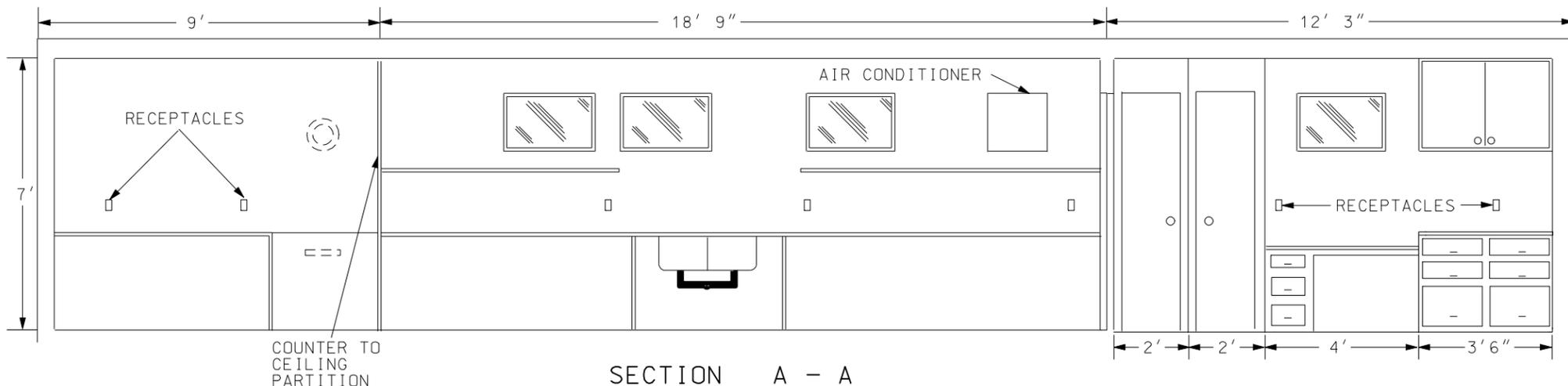
Locks, latches, and hinges for main doors shall be heavy duty type to withstand the intense use in service.

The wall between the office and the work area shall be properly insulated to prevent the transmission of heat & noise.

The floor beneath the marshall area shall be heavily reinforced.

The lab shall be equipped with steel cable tie downs and ground anchors at each corner of the lab.

Electrical service entrance shall be wired for 100 amps, and have separate circuits for air conditioners. Convenience outlets shall have a minimum spacing of 4 feet in counter areas.

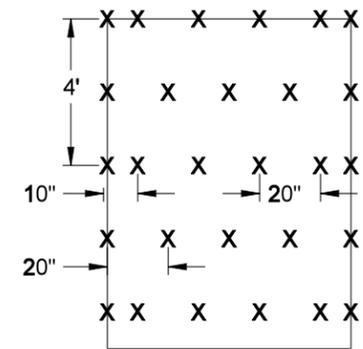
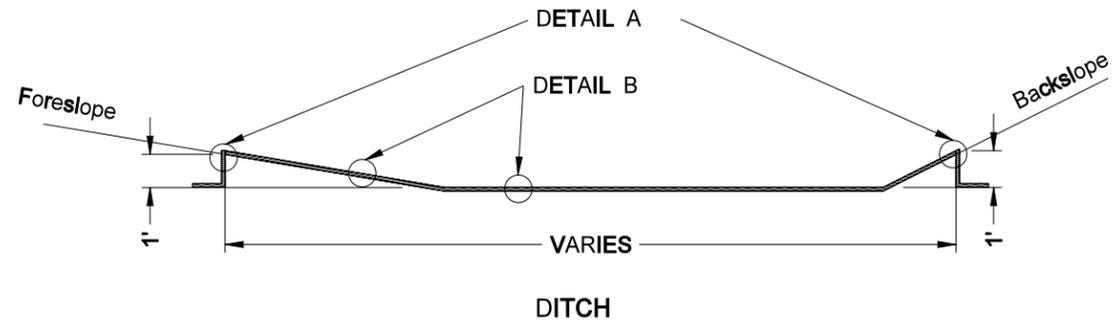


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
05-05-88	Drawing and notes
06-20-03	General revisions
12-01-04	PE Stamp added

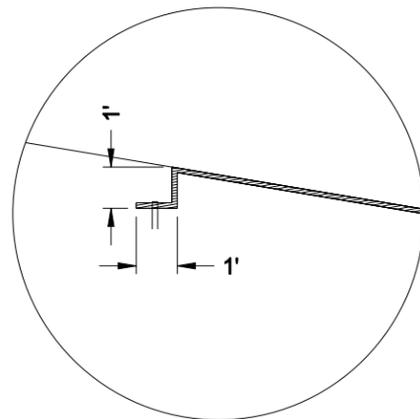
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EROSION AND SILTATION CONTROL BLANKET INSTALLATION

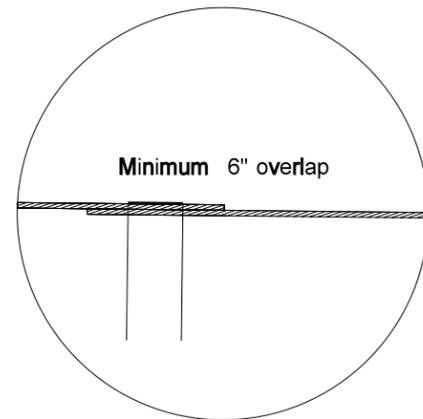
D-708-5



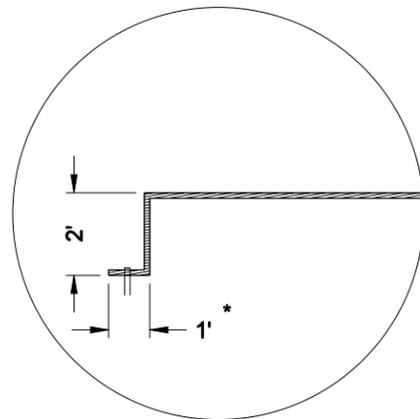
STAPLE PATTERN: 3.8 staples per square yard using 8-inch 11 gauge wire "u" staples.



DETAIL A

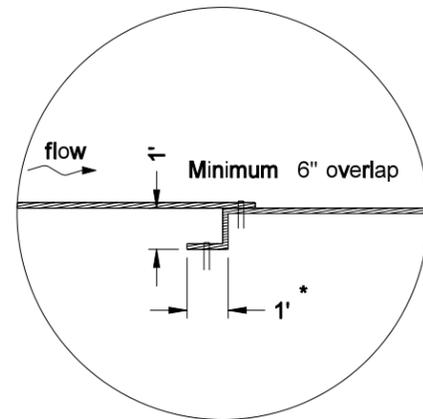


DETAIL B

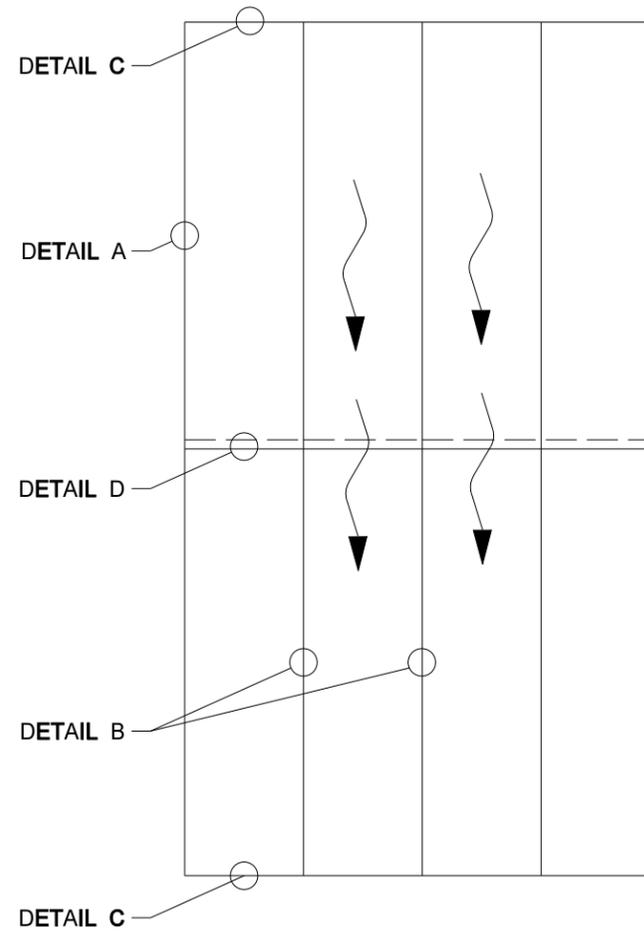


DETAIL C

* This tie may be placed ahead or back.

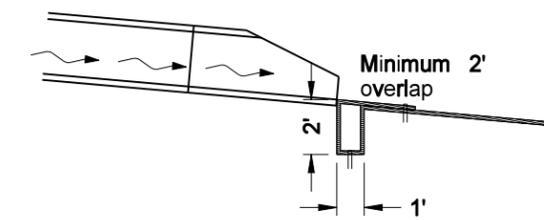


DETAIL D

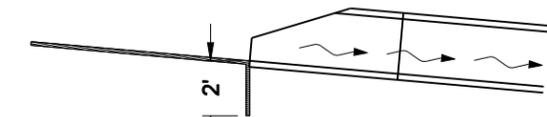


BLANKET LAYOUT

Note: Beginning and ending of erosion control blanket areas shall be installed as DETAIL C.



PIPE OUTLETS



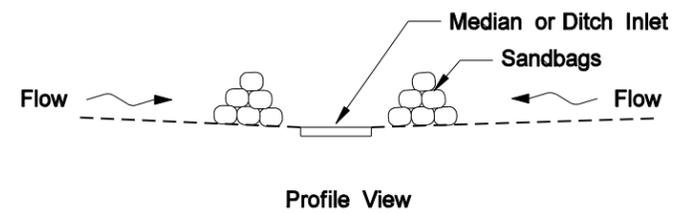
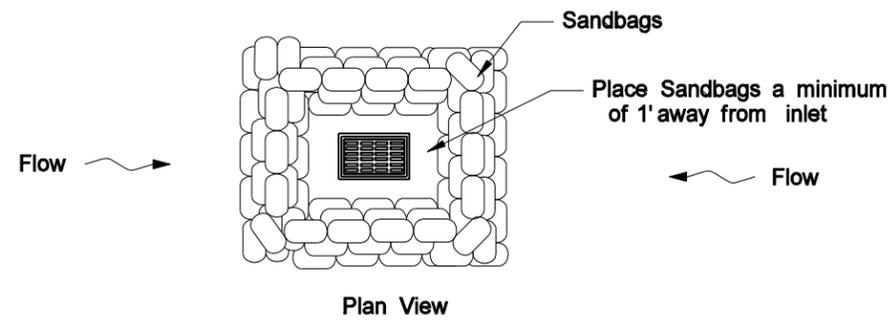
PIPE INLETS
INSTALLATION AT PIPE ENDS

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-13-06	
REVISIONS	
DATE	CHANGE

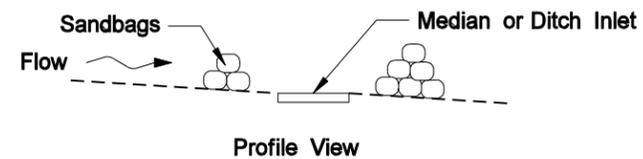
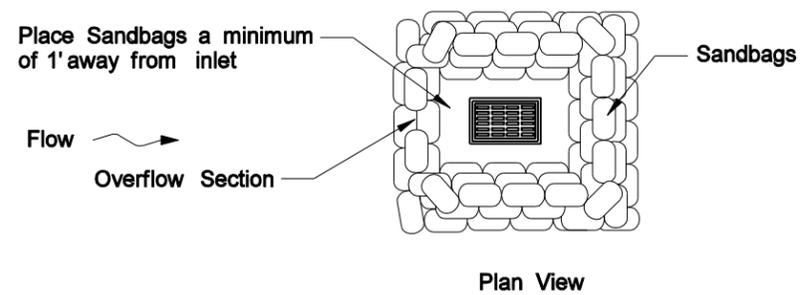
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EROSION CONTROL
MEDIAN OR DITCH INLET PROTECTION

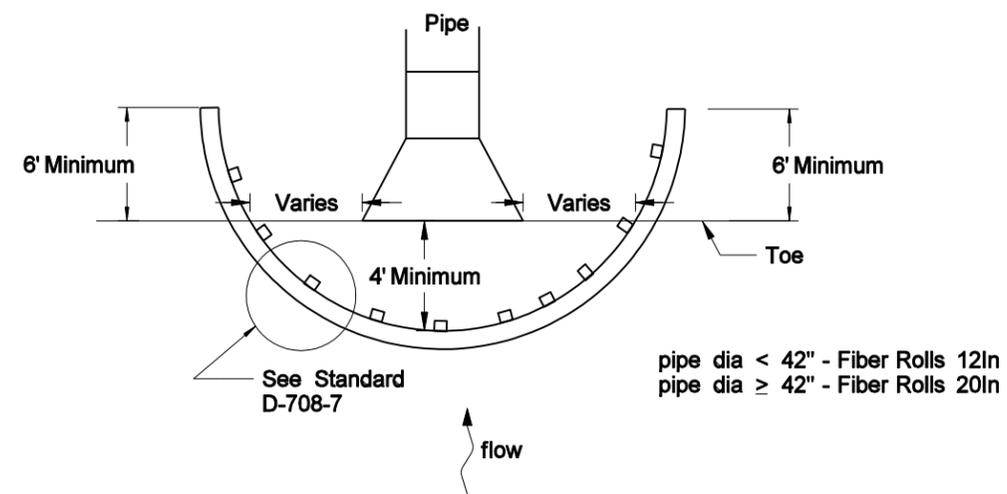
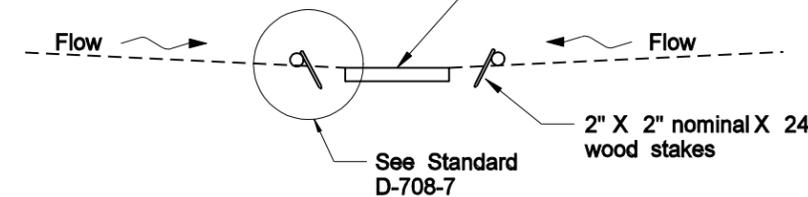
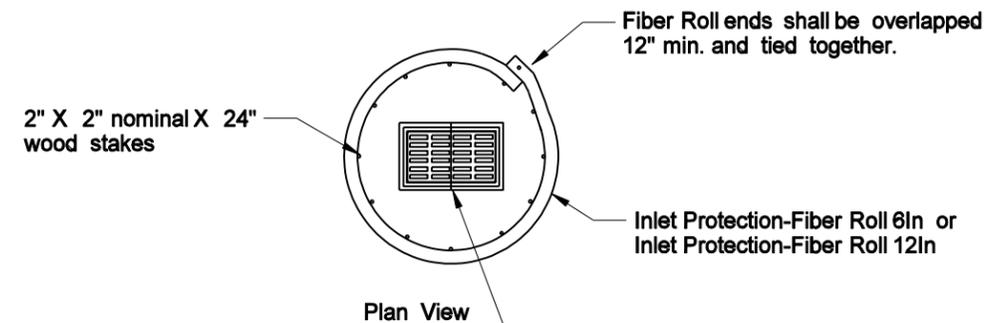
D-708-6



SANDBAG PROTECTION
LOW POINT



SANDBAG PROTECTION
ON SLOPE



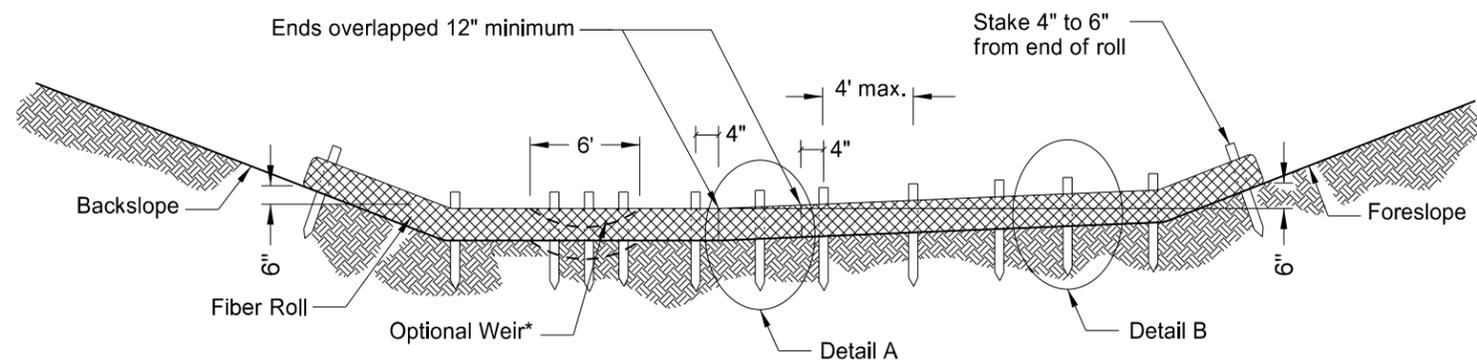
FIBER ROLL PROTECTION
INLET OF PIPE END

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-13-06	
REVISIONS	
DATE	CHANGE

12-14-07	Added 12" Fiber roll overlap, option of butting fiber roll ends removed.
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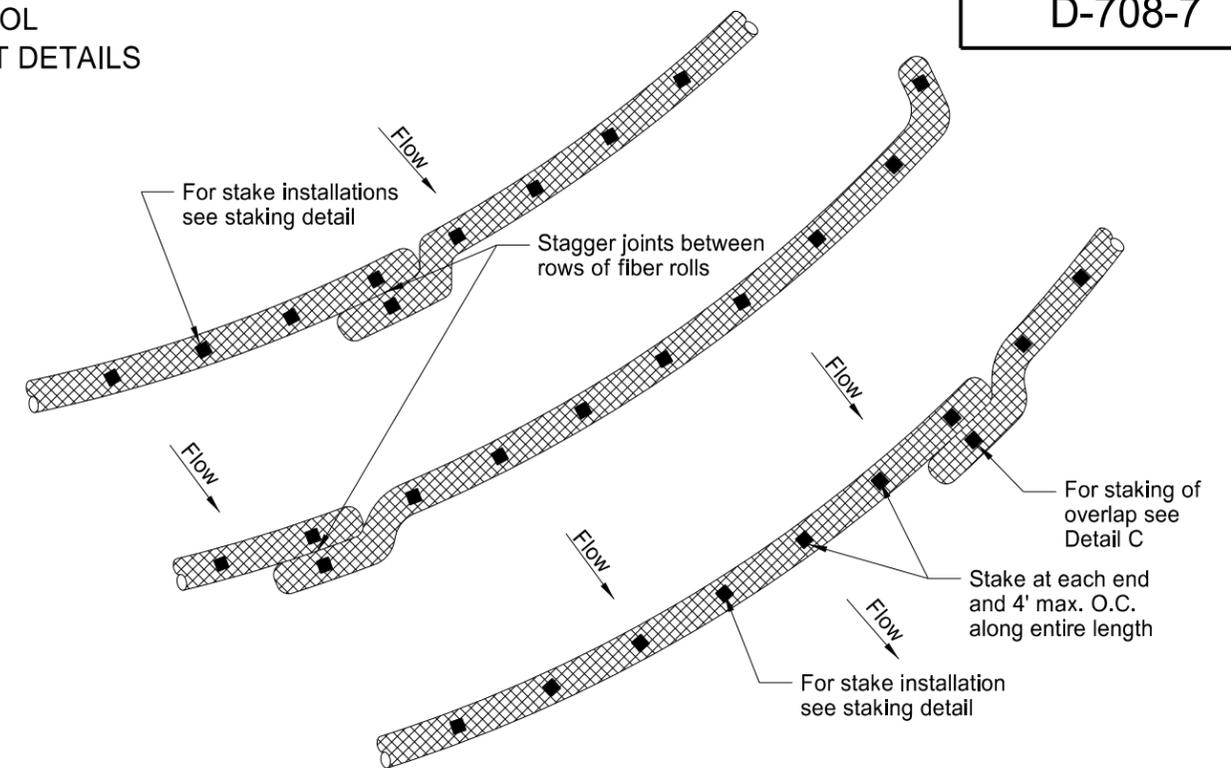
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EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

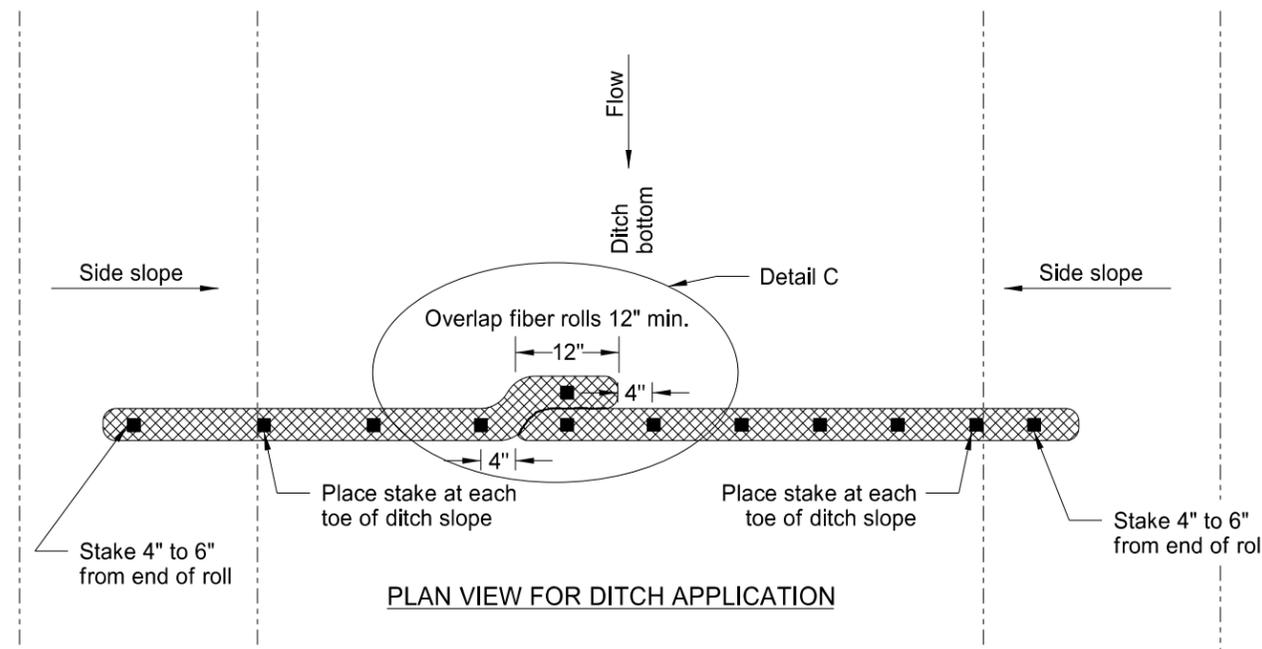


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

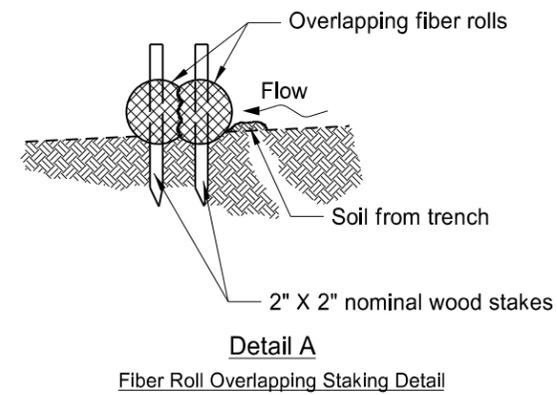
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



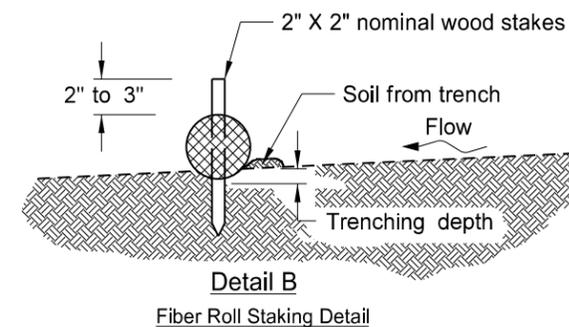
PLAN VIEW FOR SLOPE APPLICATION



PLAN VIEW FOR DITCH APPLICATION



Detail A
Fiber Roll Overlapping Staking Detail



Detail B
Fiber Roll Staking Detail

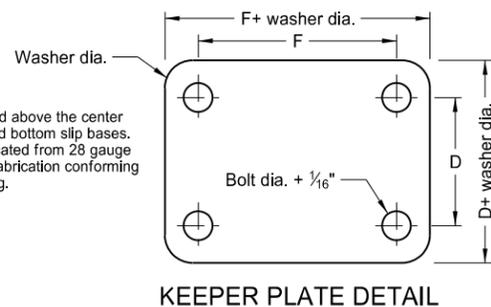
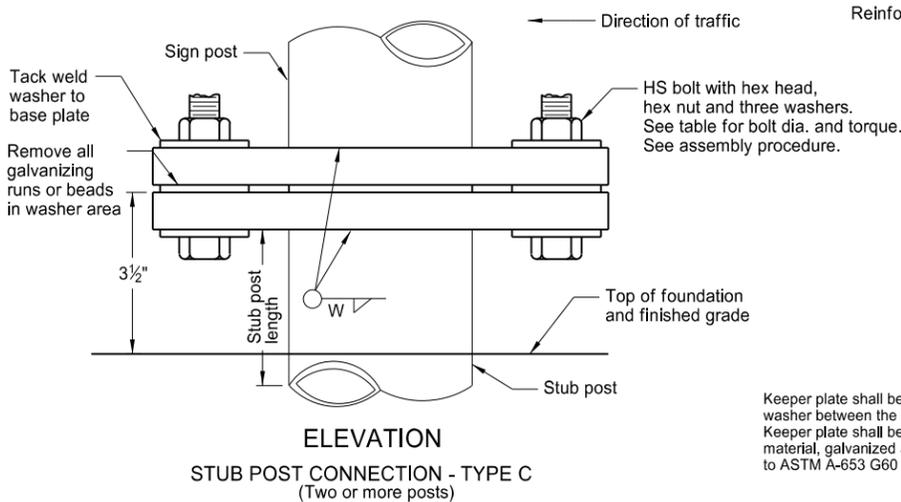
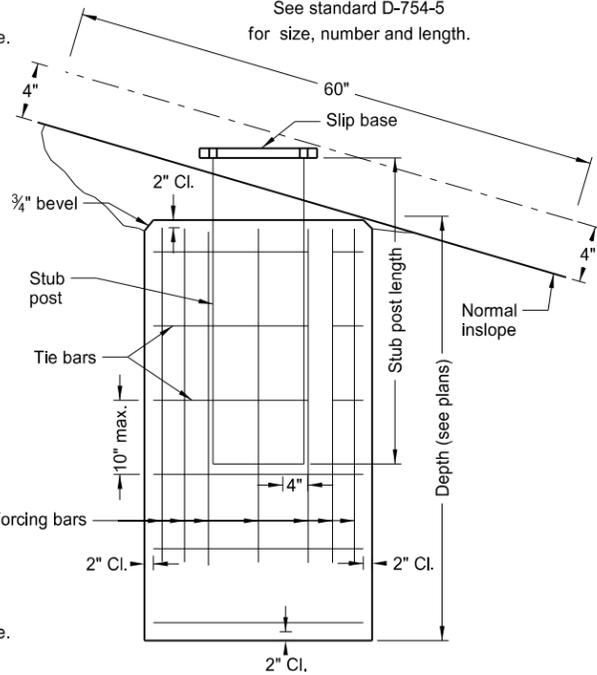
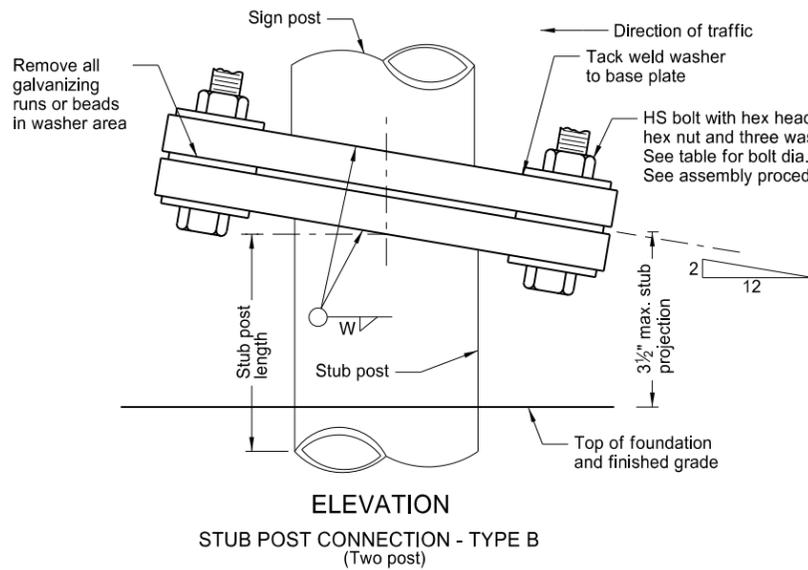
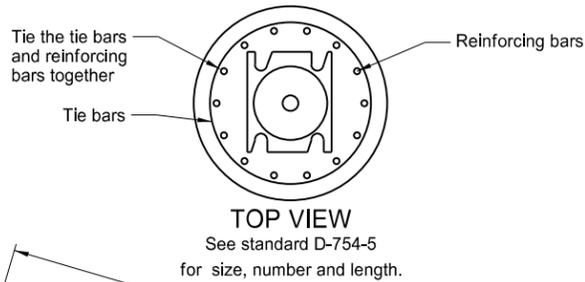
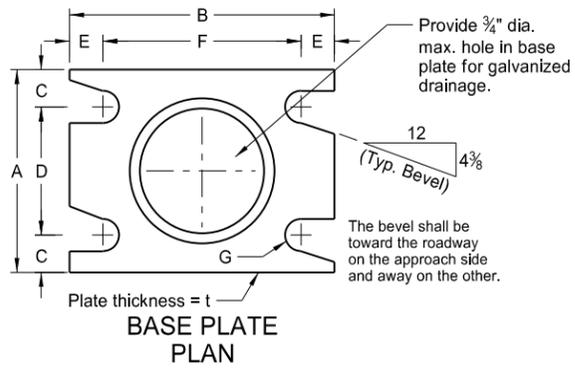
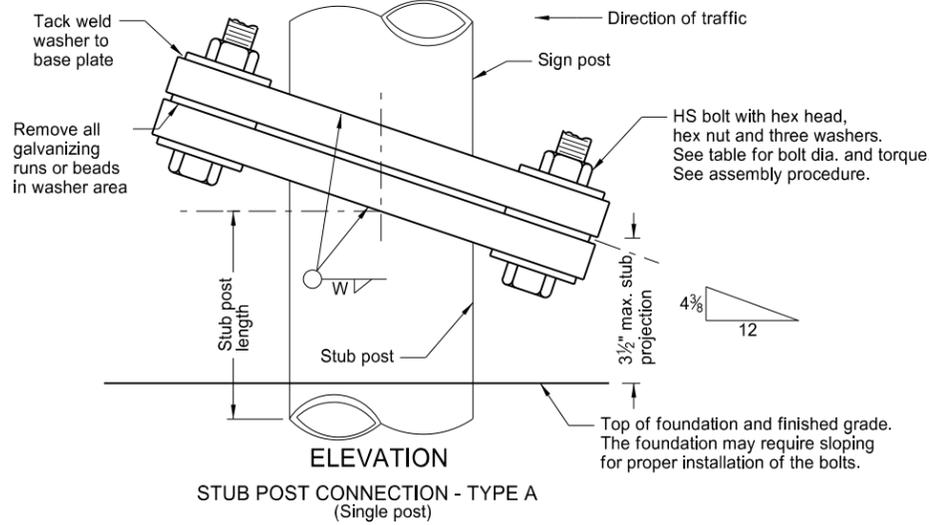
FIBER ROLL DIAMETER	NOMINAL STAKE SIZE	MINIMUM STAKE LENGTH	MINIMUM TRENCH DEPTH	MAXIMUM TRENCH DEPTH
6"	2" x 2"	18"	2"	2"
12"	2" x 2"	24"	2"	3"
20"	2" x 2"	36"	3"	5"

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.

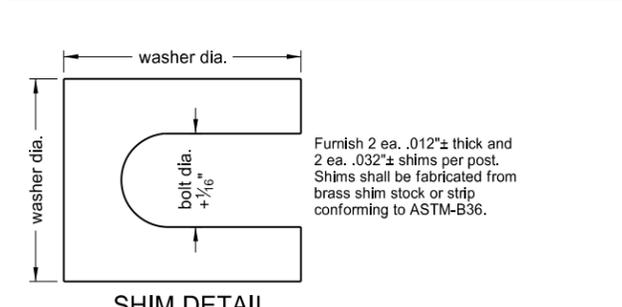
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**BREAK-AWAY BASE AND FOUNDATION DETAILS
STUB POST CONNECTION (PIPE)**



ROUND METAL POSTS							
DIMENSIONS				PROPERTIES			
NOMINAL DIAMETER IN.	OUTSIDE DIAMETER IN.	INSIDE DIAMETER IN.	WALL THICKNESS IN.	WEIGHT PER FOOT POUND	MOMENT OF INERTIA IN ⁴	CROSS SECTIONAL AREA IN ²	SECTION DIAMETER IN.
STEEL POSTS							
3 1/2	4.000	3.548	.226	9.11	4.788	2.680	2.394
4	4.500	4.026	.237	10.79	7.233	3.174	3.215
5	5.563	5.047	.258	14.62	15.16	4.300	5.449
6	6.625	6.065	.280	18.97	28.14	5.581	8.495
8	8.625	8.071	.277	24.70	63.35	7.265	14.69
10	10.750	10.192	.279	31.20	125.9	9.178	23.42
12	12.750	12.090	.330	43.77	248.5	12.88	38.98
12	12.750	12.000	.375	49.56	279.3	14.58	43.81
ALUMINUM POSTS							
3 1/2	4.000	3.548	.226	3.151	4.788	2.680	2.394
4	4.500	4.026	.237	3.733	7.232	3.174	3.214
5	5.563	5.047	.258	5.057	15.16	4.300	5.451
6	6.625	6.065	.280	6.564	28.14	5.581	8.496
8	8.625	8.071	.277	8.543	63.35	7.265	14.69
10	10.750	10.192	.279	10.79	125.8	9.178	23.41
10	10.750	10.136	.307	11.84	137.4	10.072	25.57
10	10.750	10.020	.365	14.00	160.7	11.908	29.90
12	12.750	12.090	.330	15.14	248.5	12.88	38.98
12	12.750	12.000	.375	17.14	279.3	14.579	43.81
12	12.750	11.750	.500	22.63	361.5	19.242	56.71

BASE DATA TABLE												
NOMINAL PIPE SIZE DIAMETER	BOLT SIZE (DIAMETER X LENGTH)	TORQUE SIZE	A	B	C	D	E	F	G	t	W	STUB POST LENGTH
STEEL												
3 1/2"	1/2"x2 1/2"	12	5 1/2"	8 3/8"	1 3/16"	3 7/8"	1 3/16"	6 3/4"	9/32"	3/4"	3/8"	1'-6"
4"	5/8"x2 3/4"	29	5 1/2"	8 3/4"	1"	3 1/2"	1"	6 3/4"	1 1/32"	1"	7/16"	1'-6"
5"	3/4"x3 1/2"	46	6 1/2"	10"	1 1/8"	4 1/4"	1 1/8"	7 3/4"	1 3/32"	1"	7/16"	2'-0"
6"	1"x4 1/4"	61	7 1/2"	11 3/4"	1 3/8"	4 3/4"	1 3/8"	9"	1 1/32"	1 1/4"	7/16"	2'-0"
8"	1"x4 1/4"	61	9 1/2"	13 1/4"	1 3/8"	6 3/4"	1 3/8"	10 1/2"	1 1/32"	1 1/4"	7/16"	2'-6"
10"	1"x4 1/4"	61	11 3/4"	15 1/4"	1 3/8"	9"	1 3/8"	12 1/2"	1 1/32"	1 1/4"	1/2"	3'-0"
12"	1 1/4"x5"	135	13 3/4"	18"	1 5/8"	10 1/2"	1 5/8"	14 3/4"	2 1/32"	1 1/2"	1/2"	3'-0"
ALUMINUM												
3 1/2"	1/2"x2 1/2"	12	5 1/2"	8 3/8"	1 3/16"	3 7/8"	1 3/16"	6 3/4"	9/32"	3/4"	3/8"	1'-6"
4"	5/8"x2 3/4"	29	5 1/2"	8 3/4"	1"	3 1/2"	1"	6 3/4"	1 1/32"	1"	7/16"	1'-6"
5"	3/4"x3 1/2"	46	6 1/2"	10"	1 1/8"	4 1/4"	1 1/8"	7 3/4"	1 3/32"	1"	1/2"	2'-0"
6"	1"x4 1/4"	61	7 1/2"	11 3/4"	1 3/8"	4 3/4"	1 3/8"	9"	1 1/32"	1 1/4"	1/2"	2'-0"
8"	1"x4 1/4"	61	9 1/2"	13 1/4"	1 3/8"	6 3/4"	1 3/8"	10 1/2"	1 1/32"	1 1/4"	1/2"	2'-6"
10"	1"x4 3/4"	61	11 3/4"	15 1/4"	1 3/8"	9"	1 3/8"	12 1/2"	1 1/32"	1 1/4"	7/16"	3'-0"
12"	1 1/4"x5 1/2"	135	13 3/4"	18"	1 5/8"	10 1/4"	1 5/8"	14 3/4"	2 1/32"	1 3/4"	1 1/16"	3'-0"



Notes:
Keeper Plate - A keeper plate shall be used.

Aluminum Base Plate Washers - When the base plate is fabricated from aluminum, the washers shown as tack welded to base shall be aluminum.

Fuse Joint Cuts - Steel posts may be cut after galvanizing and cut surface treated with an approved method meeting ASTM A780 or the cut may be galvanized after fabrication. Aluminum posts will not require treatment.

Vertical clearance of breakaway base - The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.

Foundation data obtained from standard D-754-5. Foundation shall be formed 6" into ground. Forms shall be removed.

ASSEMBLY PROCEDURE

- Assemble post to stub with bolts and with one flat washer between base plates and keeper plate.
- Shim as required to plumb post.
- Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and shims and to clean bolt threads, then loosen.
- Retighten bolts in a systematic order to prescribed torque. (see table)
- Loosen each bolt and apply thread locking liquid resin. The liquid locking resin shall conform to ASTM D5363-03 (2008). The thread locker shall secure the entire assembly from vibration, pressure and corrosion. The thread locker shall fill the gaps between the thread and the mating surface to form solid one part assemblies.
- Retighten each bolt to prescribed torque in the same order as initial retightening.

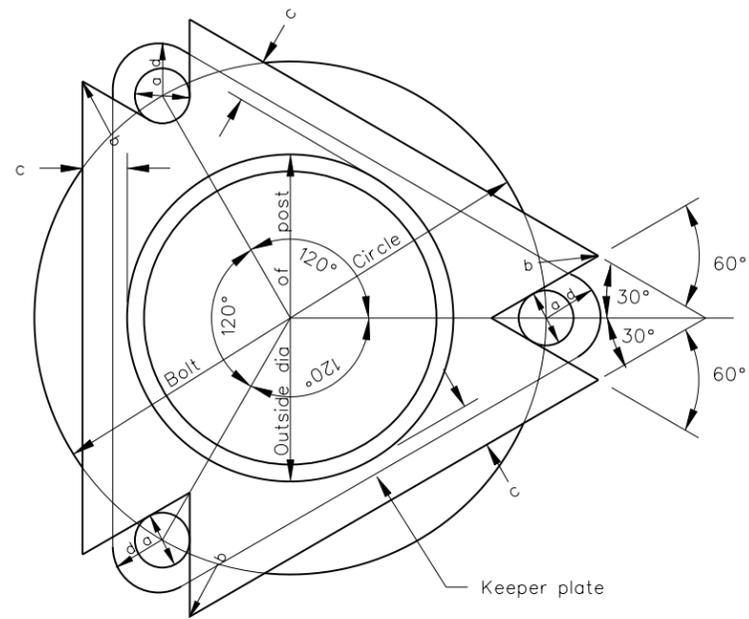
FOUNDATION DIAMETER	POST SIZE
1'-4"	3 1/2"x4"
1'-9"	5"
1'-9"	6"
2'-0"	8"
2'-4"	10"
2'-6"	12"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
REVISIONS	
DATE	CHANGE

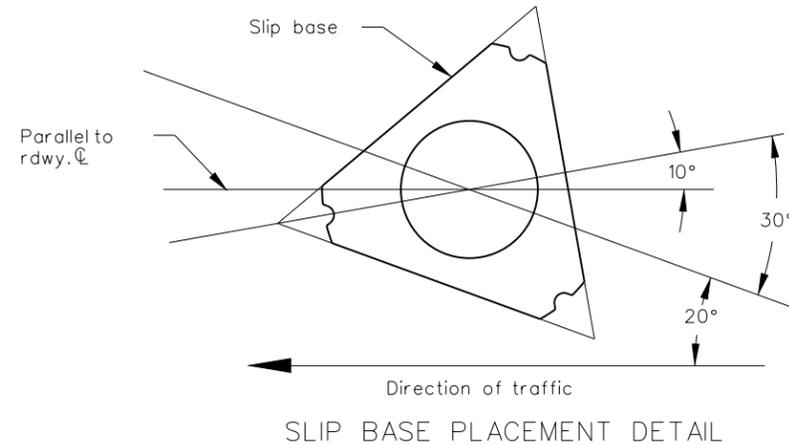
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MULTI-DIRECTIONAL BREAK AWAY BASE

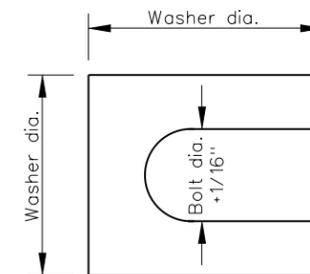
D-754-4



PLAN



SLIP BASE PLACEMENT DETAIL



Furnish 2 ea. .012"± thick and 2 ea. .032"± thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM-B36.

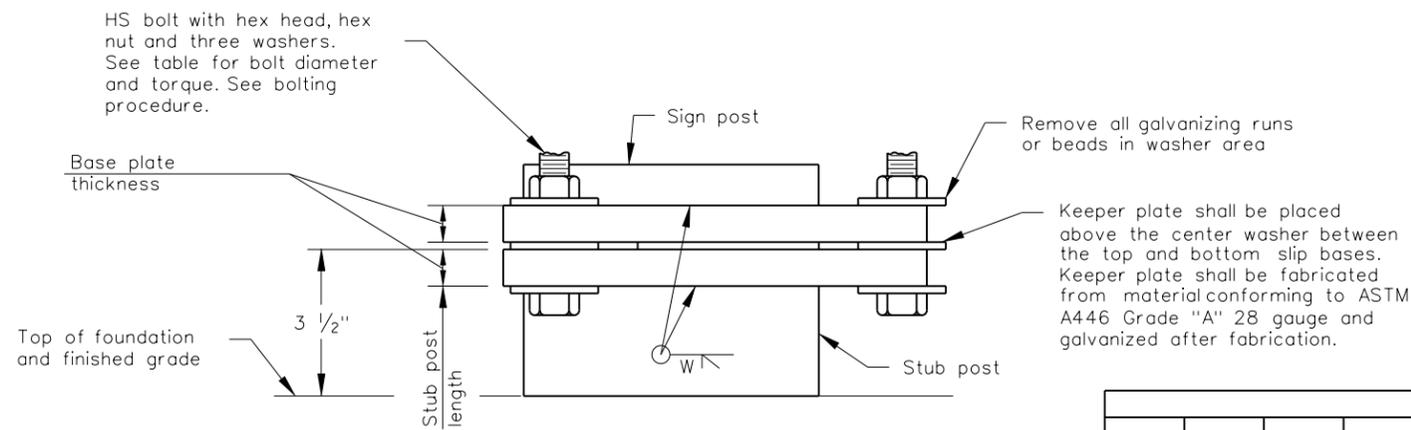
SHIM DETAIL

NOTES:

Foundations shall be similar to those shown on the break away and foundation details except for the type of slip base, in lieu of stub post shown, the anchor bolt connection shown on the break away and foundation details may be used.

Assembly Procedure

1. Assemble post to stub with bolts and with one flat washer between base plates and keeper plate.
2. Shim as required to plumb post.
3. Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and shims and to clean bolt threads, then loosen.
4. Retighten bolts in a systematic order to prescribed torque. (see table)
5. Loosen each bolt and apply thread locking liquid resin. The liquid locking resin shall be "Loctite" manufactured by Loctite Corporation or equal. The thread locker shall secure the entire assembly from vibration, pressure and corrosion. The thread locker shall fill the gaps between the thread and the mating surface to form solid one part assemblies.
6. Retighten each bolt to prescribed torque in the same order as initial retightening.



ELEVATION
MULTI. DIRECTION SIGN POST
TYPE D

MULTI-DIRECTIONAL SLIP BASE											
NOMINAL POST DIA.	OUTSIDE POST DIA.	BOLT CIRCLE	a Radius	b Radius	c Radius	BOLT SIZE	BASE PLATE THICKNESS	w	BASE BOLT TORQUE Ft. lbs.	d Radius	STUB POST LENGTH
STEEL											
3 1/2"	4"	7"	1 1/16"	1/8"	1 1/8"	1" x 4"	1 1/4"	5/16"	55	1 1/8"	1'-6"
4"	4.5"	7 1/2"	1 1/16"	1/8"	1 1/8"	1" x 4 1/2"	1 1/2"	3/8"	98	1 1/8"	1'-6"
5"	5.563"	9 1/2"	1 5/16"	1/8"	1 1/8"	1 1/4" x 5"	1 1/2"	3/8"	167	1 3/8"	2'-0"
ALUMINUM											
3 1/2"	4"	7"	13/16"	1/8"	7/8"	3/4" x 3 1/2"	1"	5/16"	43	7/8"	1'-6"
4"	4.5"	7 1/2"	13/16"	1/8"	3/4"	3/4" x 4"	1 1/4"	5/16"	76	7/8"	1'-6"
5"	5.563"	9 1/2"	1 1/16"	1/8"	1 1/8"	1" x 4"	1 1/4"	5/16"	98	1 1/8"	2'-0"
6"	6.625"	10 1/4"	1 1/16"	1/8"	3/4"	1" x 4 1/2"	1 1/2"	3/8"	134	1 1/8"	2'-0"
8"	8.625"	12 1/2"	1 5/16"	1/8"	3/4"	1 1/4" x 5"	1 1/2"	1/2"	189	1 3/8"	2'-6"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-15-94	
REVISIONS	
DATE	CHANGE
06-20-95	Notes
08-14-95	Stub post dimension
03-07-01	Layout revision
03-05-03	Welding symbol
08-09-04	Revised elevation view
12-01-04	PE Stamp added

This document was originally issued and sealed by
MARK S. GAYDOS
Registration Number
PE- 4518 ,
on 12/01/04 and the original document is stored at the
North Dakota Department
of Transportation

FOUNDATION DATA FOR STEEL SUPPORTS

D-754-5

FOUNDATION DIAMETER	FOUNDATION		REINFORCING BARS			TIE BARS	
	DEPTH	VOLUME CU YDS	NO.	SIZE	LENGTH OF EACH	NO.	SIZE
ONE POST							
1'4"	4'6"	0.23	6	4	4'2"	6	3
1'4"	5'0"	0.26	6	4	4'8"	7	3
1'4"	5'6"	0.28	6	4	5'2"	8	3
1'4"	6'0"	0.31	6	4	5'8"	8	3
1'4"	6'6"	0.34	6	4	6'2"	9	3
1'4"	7'0"	0.36	6	4	6'8"	9	3
1'4"	7'6"	0.39	6	4	7'2"	10	3
1'4"	8'0"	0.41	6	4	7'8"	11	3
1'4"	8'6"	0.44	6	4	8'2"	11	3
1'4"	9'0"	0.47	6	4	8'8"	12	3
1'4"	9'6"	0.49	6	4	9'2"	12	3
1'4"	10'0"	0.52	6	4	9'8"	13	3
1'4"	10'6"	0.54	6	4	10'2"	14	3
1'4"	11'0"	0.57	6	4	10'8"	14	3
1'4"	11'6"	0.59	6	4	11'2"	15	3
1'4"	12'0"	0.62	6	4	11'8"	15	3

FOUNDATION DIAMETER	FOUNDATION		REINFORCING BARS			TIE BARS	
	DEPTH	VOLUME CU YDS	NO.	SIZE	LENGTH OF EACH	NO.	SIZE
ONE POST							
1'9"	4'6"	0.40	10	4	4'2"	6	3
1'9"	5'0"	0.45	10	4	4'8"	7	3
1'9"	5'6"	0.49	10	4	5'2"	8	3
1'9"	6'0"	0.53	10	4	5'8"	8	3
1'9"	6'6"	0.58	10	4	6'2"	9	3
1'9"	7'0"	0.62	10	4	6'8"	9	3
1'9"	7'6"	0.67	10	4	7'2"	10	3
1'9"	8'0"	0.71	10	4	7'8"	11	3
1'9"	8'6"	0.76	10	4	8'2"	11	3
1'9"	9'0"	0.80	10	4	8'8"	12	3
1'9"	9'6"	0.85	10	4	9'2"	12	3
1'9"	10'0"	0.89	10	4	9'8"	13	3
1'9"	10'6"	0.94	10	4	10'2"	14	3
1'9"	11'0"	0.98	10	4	10'8"	14	3
1'9"	11'6"	1.02	10	4	11'2"	15	3
1'9"	12'0"	1.07	10	4	11'8"	15	3
1'9"	12'6"	1.11	10	4	12'2"	16	3
1'9"	13'0"	1.16	10	4	12'8"	17	3
1'9"	13'6"	1.20	10	4	13'2"	17	3
1'9"	14'0"	1.25	10	4	13'8"	18	3
1'9"	14'6"	1.29	10	4	14'2"	18	3
1'9"	15'0"	1.34	10	4	14'8"	19	3
1'9"	15'6"	1.38	10	4	15'2"	20	3
1'9"	16'0"	1.43	10	4	15'8"	20	3

FOUNDATION DIAMETER	FOUNDATION		REINFORCING BARS			TIE BARS	
	DEPTH	VOLUME CU YDS	NO.	SIZE	LENGTH OF EACH	NO.	SIZE
TWO POSTS							
1'4"	4'6"	0.46	12	4	4'2"	12	3
1'4"	5'0"	0.52	12	4	4'8"	14	3
1'4"	5'6"	0.56	12	4	5'2"	16	3
1'4"	6'0"	0.62	12	4	5'8"	16	3
1'4"	6'6"	0.68	12	4	6'2"	18	3
1'4"	7'0"	0.72	12	4	6'8"	18	3
1'4"	7'6"	0.78	12	4	7'2"	20	3
1'4"	8'0"	0.82	12	4	7'8"	22	3
1'4"	8'6"	0.88	12	4	8'2"	22	3
1'4"	9'0"	0.94	12	4	8'8"	24	3
1'4"	9'6"	0.98	12	4	9'2"	24	3
1'4"	10'0"	1.02	12	4	9'8"	26	3
1'4"	10'6"	1.08	12	4	10'2"	28	3
1'4"	11'0"	1.14	12	4	10'8"	28	3
1'4"	11'6"	1.18	12	4	11'2"	30	3
1'4"	12'0"	1.24	12	4	11'8"	30	3

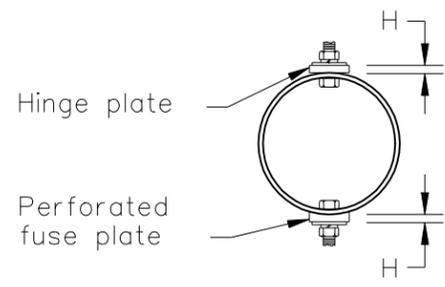
FOUNDATION DIAMETER	FOUNDATION		REINFORCING BARS			TIE BARS	
	DEPTH	VOLUME CU YDS	NO.	SIZE	LENGTH OF EACH	NO.	SIZE
TWO POSTS							
1'9"	4'6"	0.80	10	4	4'2"	12	3
1'9"	5'0"	0.90	10	4	4'8"	14	3
1'9"	5'6"	0.98	10	4	5'2"	16	3
1'9"	6'0"	1.06	10	4	5'8"	16	3
1'9"	6'6"	1.16	10	4	6'2"	18	3
1'9"	7'0"	1.22	10	4	6'8"	18	3
1'9"	7'6"	1.34	10	4	7'2"	20	3
1'9"	8'0"	1.42	10	4	7'8"	22	3
1'9"	8'6"	1.52	10	4	8'2"	22	3
1'9"	9'0"	1.60	10	4	8'8"	24	3
1'9"	9'6"	1.70	10	4	9'2"	24	3
1'9"	10'0"	1.78	10	4	9'8"	26	3
1'9"	10'6"	1.88	10	4	10'2"	28	3
1'9"	11'0"	1.96	10	4	10'8"	28	3
1'9"	11'6"	2.04	10	4	11'2"	30	3
1'9"	12'0"	2.14	10	4	11'8"	30	3
1'9"	12'6"	2.22	10	4	12'2"	32	3
1'9"	13'0"	2.32	10	4	12'8"	34	3
1'9"	13'6"	2.40	10	4	13'2"	34	3
1'9"	14'0"	2.50	10	4	13'8"	36	3
1'9"	14'6"	2.58	10	4	14'2"	36	3
1'9"	15'0"	2.68	10	4	14'8"	38	3
1'9"	15'6"	2.78	10	4	15'2"	40	3
1'9"	16'0"	2.86	10	4	15'8"	40	3

FOUNDATION DIAMETER	FOUNDATION		REINFORCING BARS			TIE BARS	
	DEPTH	VOLUME CU YDS	NO.	SIZE	LENGTH OF EACH	NO.	SIZE
TWO POSTS							
2'0"	4'6"	1.05	24	5	4'2"	12	3
2'0"	5'0"	1.16	24	5	4'8"	14	3
2'0"	5'6"	1.28	24	5	5'2"	16	3
2'0"	6'0"	1.40	24	5	5'8"	16	3
2'0"	6'6"	1.51	24	5	6'2"	18	3
2'0"	7'0"	1.63	24	5	6'8"	18	3
2'0"	7'6"	1.75	24	5	7'2"	20	3
2'0"	8'0"	1.86	24	5	7'8"	22	3
2'0"	8'6"	1.98	24	5	8'2"	22	3
2'0"	9'0"	2.09	24	5	8'8"	24	3
2'0"	9'6"	2.21	24	5	9'2"	24	3
2'0"	10'0"	2.32	24	5	9'8"	26	3
2'0"	10'6"	2.44	24	5	10'2"	28	3
2'0"	11'0"	2.56	24	5	10'8"	28	3
2'0"	11'6"	2.68	24	5	11'2"	30	3
2'0"	12'0"	2.79	24	5	11'8"	30	3
2'0"	12'6"	2.91	24	5	12'2"	32	3
2'0"	13'0"	3.03	24	5	12'8"	34	3
2'0"	13'6"	3.14	24	5	13'2"	34	3
2'0"	14'0"	3.26	24	5	13'8"	36	3
2'0"	14'6"	3.37	24	5	14'2"	36	3
2'0"	15'0"	3.49	24	5	14'8"	38	3
2'0"	15'6"	3.61	24	5	15'2"	40	3
2'0"	16'0"	3.72	24	5	15'8"	40	3
2'0"	16'6"	3.84	24	5	16'2"	42	3
2'0"	17'0"	3.96	24	5	16'8"	42	3
2'0"	17'6"	4.07	24	5	17'2"	44	3
2'0"	18'0"	4.19	24	5	17'8"	46	3
2'0"	18'6"	4.31	24	5	18'2"	46	3
2'0"	19'0"	4.42	24	5	18'8"	48	3
2'0"	19'6"	4.54	24	5	19'2"	48	3
2'0"	20'0"	4.65	24	5	19'8"	50	3
2'0"	20'6"	4.77	24	5	20'2"	52	3
2'0"	21'0"	4.89	24	5	20'8"	52	3
2'0"	21'6"	5.00	24	5	21'2"	54	3
2'0"	22'0"	5.12	24	5	21'8"	54	3
2'0"	22'6"	5.25	24	5	22'2"	56	3
2'0"	23'0"	5.35	24	5	22'8"	58	3
2'0"	23'6"	5.47	24	5	23'2"	58	3
2'0"	24'0"	5.59	24	5	23'8"	60	3

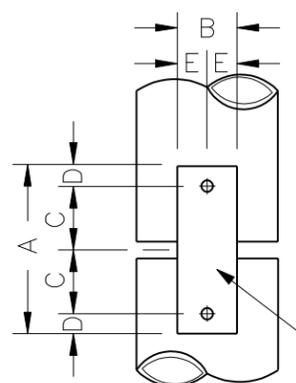
FOUNDATION DIAMETER	FOUNDATION		REINFORCING BARS			TIE BARS	
	DEPTH	VOLUME CU YDS	NO.	SIZE	LENGTH OF EACH	NO.	SIZE
TWO POSTS							
2'4"	4'6"	1.43	28	5	4'2"	12	3
2'4"	5'0"	1.58	28	5	4'8"	14	3
2'4"	5'6"	1.74	28	5	5'2"	16	3
2'4"	6'0"	1.90	28	5	5'8"	16	3
2'4"	6'6"	2.06	28	5	6'2"	18	3
2'4"	7'0"	2.22	28	5	6'8"	18	3
2'4"	7'6"	2.38	28	5	7'2"	20	3
2'4"	8'0"	2.53	28	5	7'8"	22	3
2'4"	8'6"	2.69	28	5	8'2"	22	3
2'4"	9'0"	2.85	28	5	8'8"	24	3
2'4"	9'6"	3.01	28	5	9'2"	24	3
2'4"	10'0"	3.17	28	5	9'8"	26	3
2'4"	10'6"	3.33	28	5	10'2"	28	3
2'4"	11'0"	3.48	28	5	10'8"	28	3
2'4"	11'6"	3.64	28	5	11'2"	30	3
2'4"	12'0"	3.80	28	5	11'8"	30	3
2'4"	12'6"	3.96	28	5	12'2"	32	3
2'4"	13'0"	4.12	28	5	12'8"	34	3
2'4"	13'6"	4.28	28	5	13'2"	34	3
2'4"	14'0"	4.43	28	5	13'8"	36	3
2'4"	14'6"	4.59	28	5	14'2"	36	3
2'4"	15'0"	4.75	28	5	14'8"	38	3
2'4"	15'6"	4.91	28	5	15'2"	40	3
2'4"	16'0"	5.07	28	5	15'8"	40	3
2'4"	16'6"	5.23	28	5	16'2"	42	3
2'4"	17'0"	5.38	28	5	16'8"	42	3
2'4"	17'6"	5.54	28	5	17'2"	44	3
2'4"	18'0"	5.70	28	5	17'8"	46	3
2'4"	18'6"	5.86	28	5	18'2"	46	3
2'4"	19'0"	6.02	28	5	18'8"	48	3
2'4"	19'6"	6.18	28	5	19'2"	48	3
2'4"	20'0"	6.33	28	5	19'8"	50	3
2'4"	20'6"	6.49	28	5	20'2"	52	3
2'4"	21'0"	6.65	28	5	20'8"	52	3
2'4"	21'6"	6.81	28	5	21'2"	54	3
2'4"	22'0"	6.97	28	5	21'8"	54	3
2'4"	22'6"	7.13	28	5	22'2"	56	3
2'4"	23'0"	7.29	28	5	22'8"	58	3
2'4"	23'6"	7.44	28	5	23'2"	58	3
2'4"	24'0"	7.60	28	5	23'8"	60	3
2'4"	24'6"	7.76	28	5	24'2"	60	3
2'4"	25'0"	7.92	28	5	24'8"	62	3
2'4"	25'6"	8.08	28	5	25'2"	64	3
2'4"	26'0"	8.24	28	5	25'8"	64	3
2'4"	26'6"	8.39	28	5	26'2"	66	3
2'4"	27'0"	8.55	28	5	26'8"	66	3

FOUNDATION DIAMETER	FOUNDATION		REINFORCING BARS			TIE BARS	
	DEPTH	VOLUME CU YDS	NO.	SIZE	LENGTH OF EACH	NO.	SIZE
TWO POSTS							
2'6"	4'6"	1.64	28	6	4'2"	12	3
2'6"	5'0"	1.82					

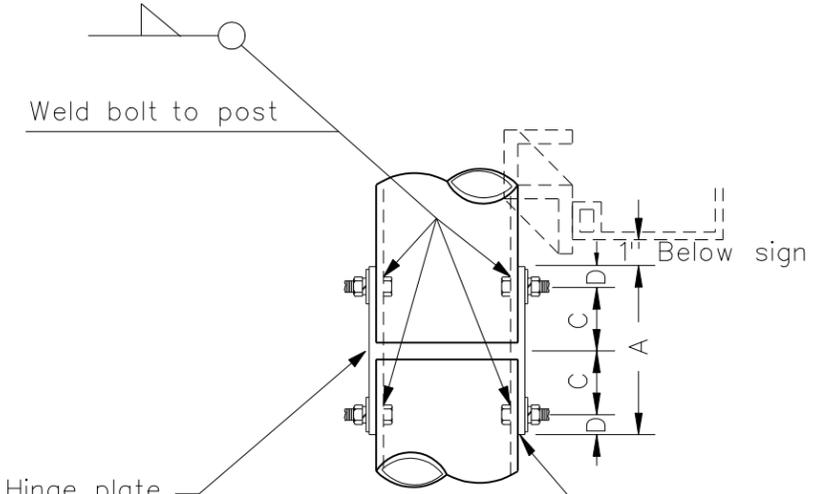
HINGE PLATE DETAILS
PERFORATED FUSE PLATE DETAILS



TOP VIEW



BACK VIEW

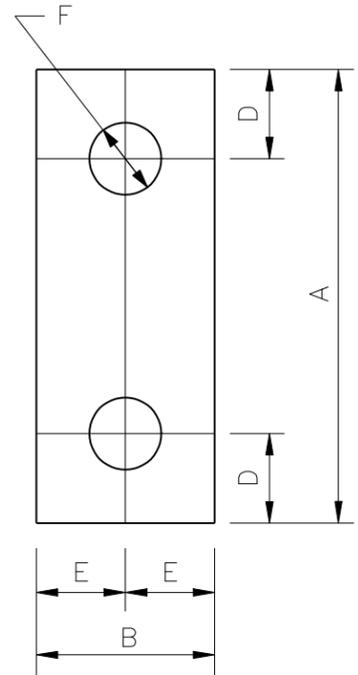


Hinge plate thickness = H

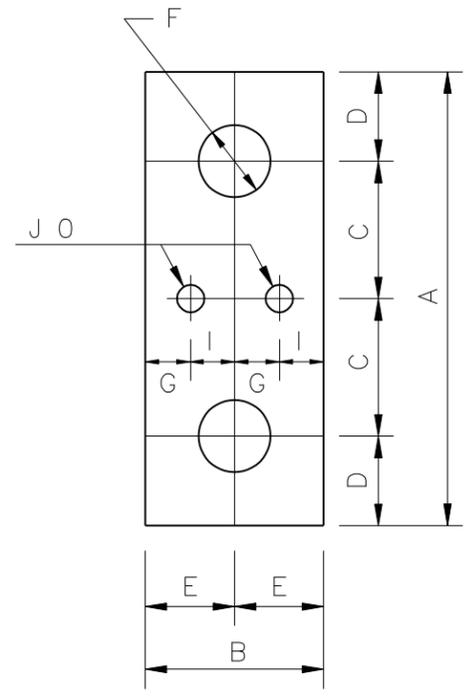
Perforated fuse plate thickness = H

Direction of traffic
BACK VIEW

HINGE PLATE DETAIL
ALUMINUM OR STEEL POSTS
FOR 2 OR MORE POST SIGNS



HINGE PLATE



PERFORATED FUSE PLATE

NOTES:

Assembly Procedure

1. Assemble hinge plate to post with bolts and with one flat washer and lock washer under nut.
2. Tighten all bolts the maximum possible with 12" to 15" wrench.

DIMENSION NOM. PIPE SIZE	FUSE AND HINGE PLATE DATA										
	BOLT SIZE	A	B	C	D	E	F	G	H	I	J
3 1/2"	1/2" ϕ x 1-1/2"	5"	1-3/4"	1-11/16"	13/16"	7/8"	9/16"	15/32"	1/4"	13/32"	7/16"
4"	5/8" ϕ x 1-1/2"	5-3/4"	2"	1-7/8"	1"	1"	11/16"	17/32"	3/8"	15/32"	9/16"
5"	5/8" ϕ x 1-3/4"	5-3/4"	2"	1-7/8"	1"	1"	11/16"	9/16"	1/2"	7/16"	5/8"
6"	3/4" ϕ x 2-1/4"	6-1/4"	2-1/4"	2"	1-1/8"	1-1/8"	13/16"	5/8"	1/2"	1/2"	5/8"
8"	1" ϕ x 2-1/2"	7-1/4"	2-3/4"	2-1/4"	1-3/8"	1-3/8"	1-1/16"	7/8"	1/2"	1/2"	7/16"
10"	1-1/4" ϕ x 2-3/4"	8-1/4"	3-1/4"	2-1/2"	1-5/8"	1-5/8"	1-5/16"	5/8"	1/2"	11/16"	3/4"
12"	1-1/4" ϕ x 3"	8-1/4"	3-1/4"	2-1/2"	1-5/8"	1-5/8"	1-5/16"	1"	1/2"	5/8"	1/2"

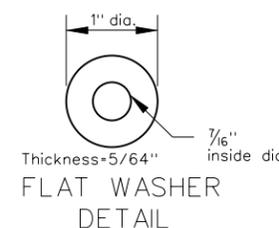
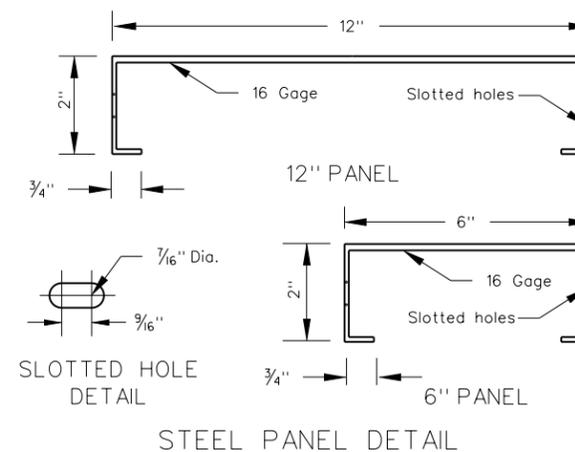
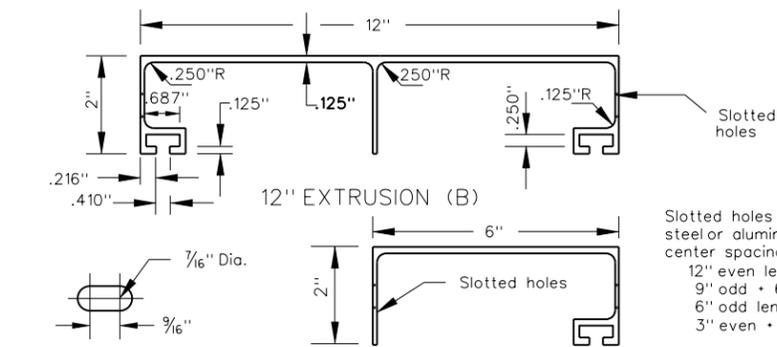
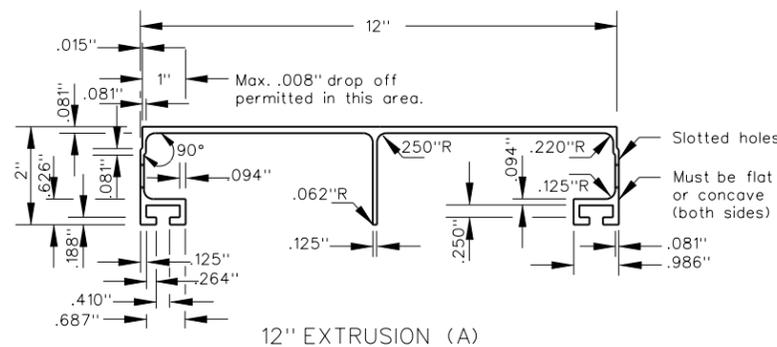
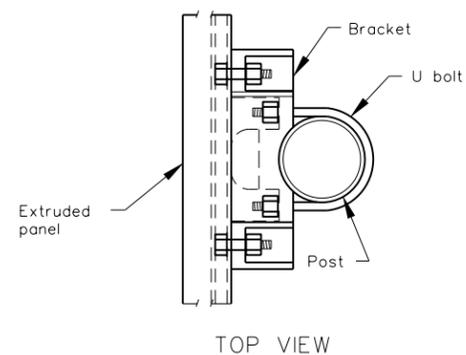
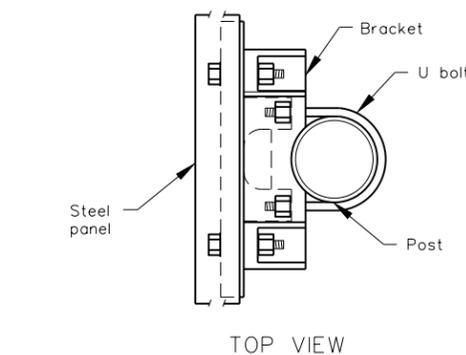
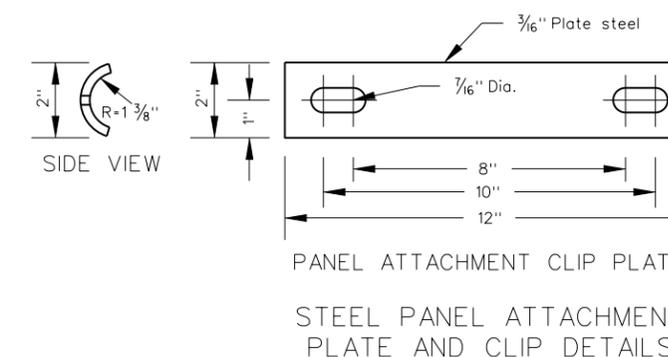
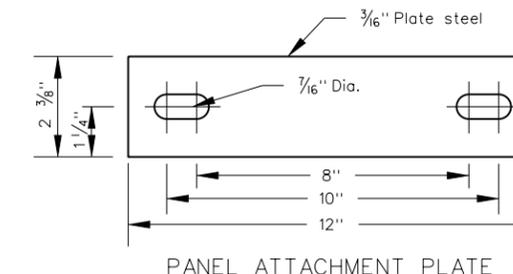
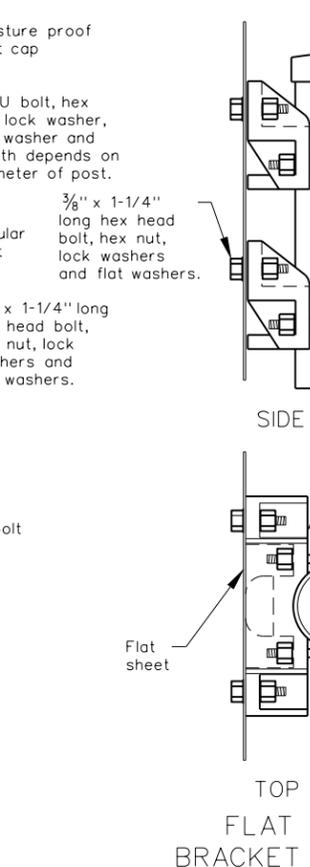
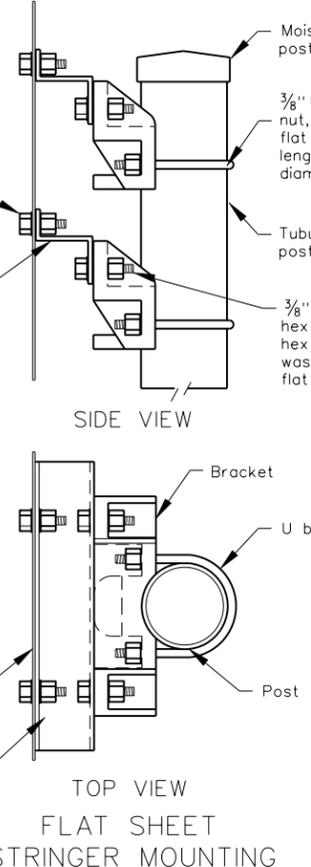
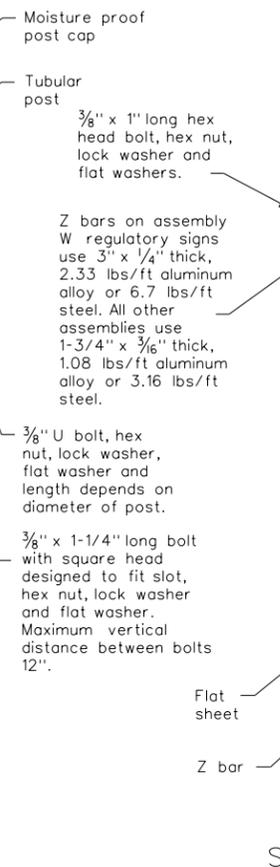
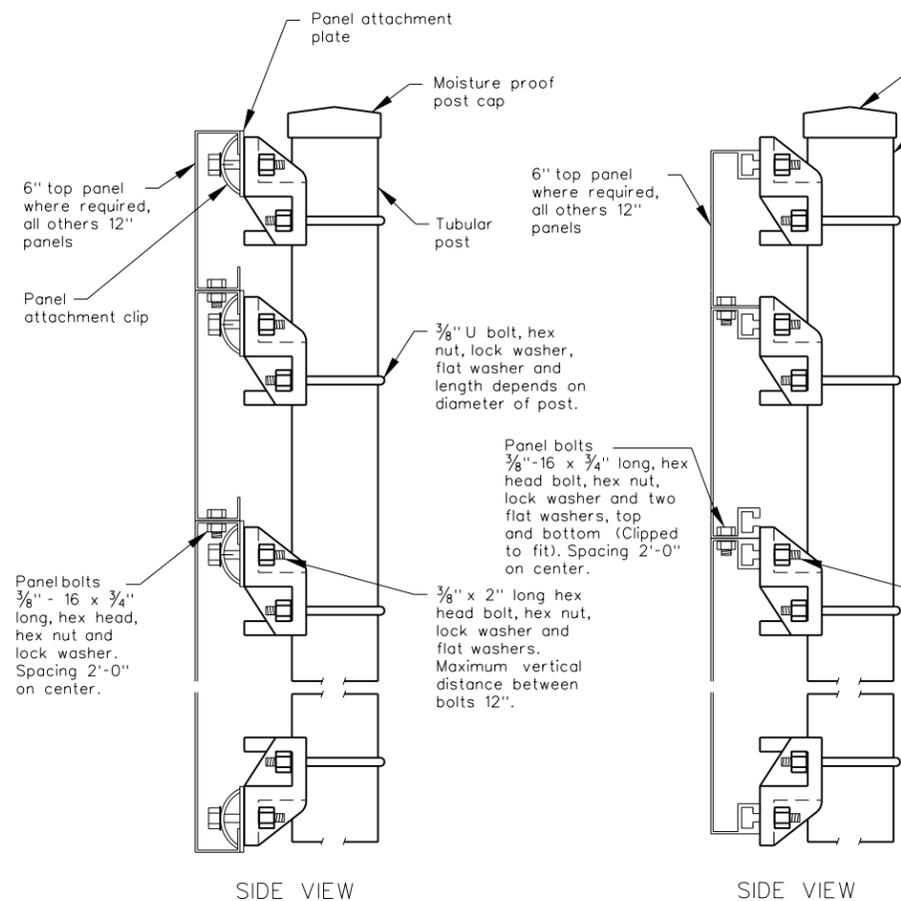
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-15-94	
REVISIONS	
DATE	CHANGE
06-20-95	Notes
03-07-01	Layout revisions
10-12-01	Weld bolt to post
03-25-04	Removed locktite & added lock washer
12-01-04	PE Stamp added

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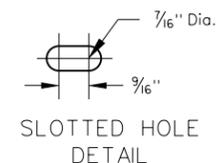
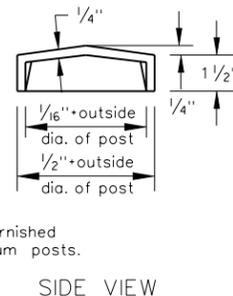
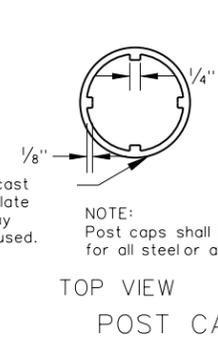
MOUNTING, POST CAP AND PANEL DETAILS

NOTE:

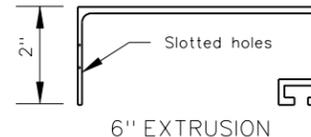
Mounting Bracket: See Std. D-754-8 for details.



Note: In lieu of cast post cap a 1/8" plate welded all the way around may be used.



ALUMINUM PANEL DETAIL



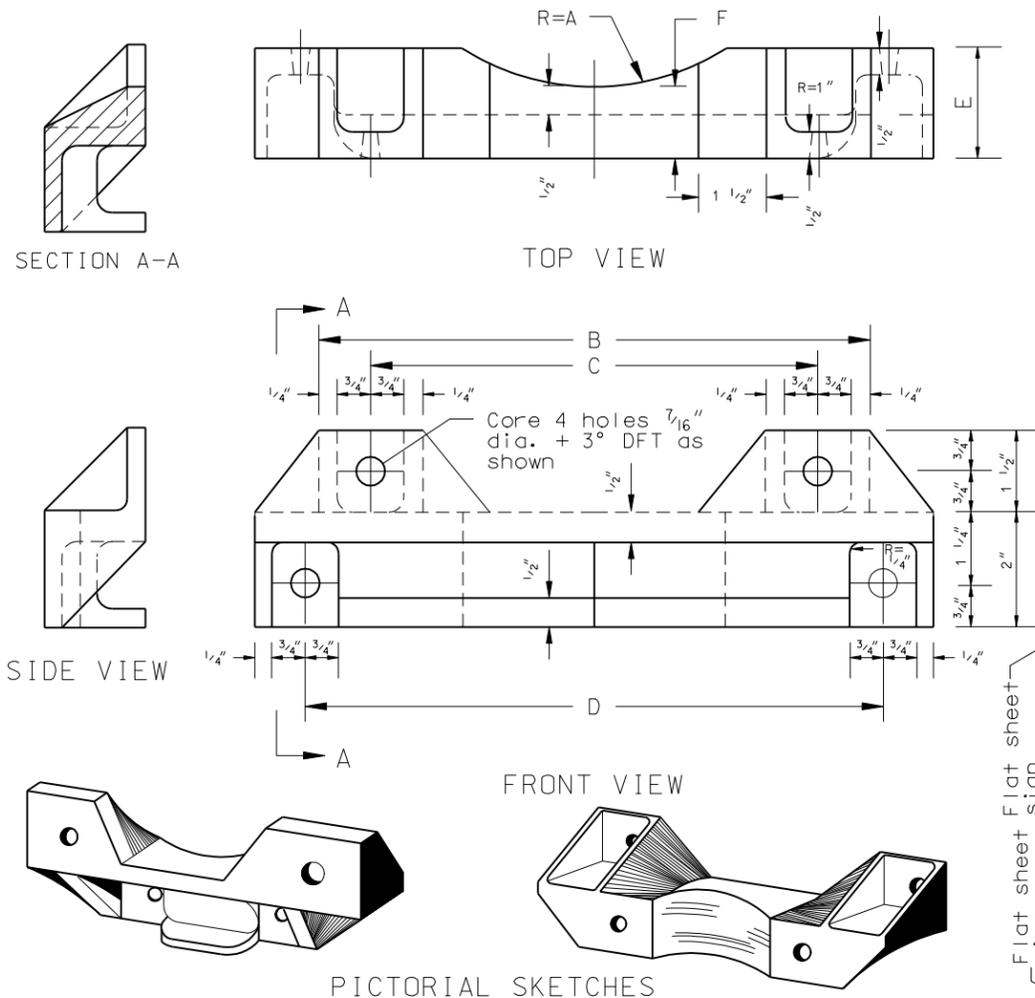
Slotted holes shall be punched in the steel or aluminum panels at 1'-0" on center spacing from end as listed below:
 12" even length panels 4'-0" etc.
 9" odd + 6" length panels 5'-6" etc.
 6" odd length panels 5'-0" etc.
 3" even + 6" length panels 4'-6" etc.

Wall thickness = .078" unless specified otherwise.
 All inside and outside corners = .031" radius unless specified otherwise.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-15-94	
REVISIONS	
DATE	CHANGE
02-29-00	Flat washers
03-12-01	Layout revision
12-01-04	PE Stamp added

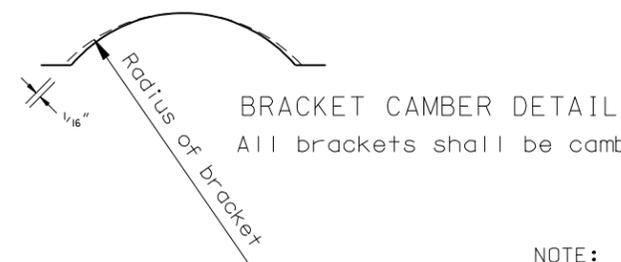
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ATTACHMENT BRACKETS
FOR STANDARD STEEL PIPE (GALV.) POSTS
AND ALUMINUM TUBULAR POSTS



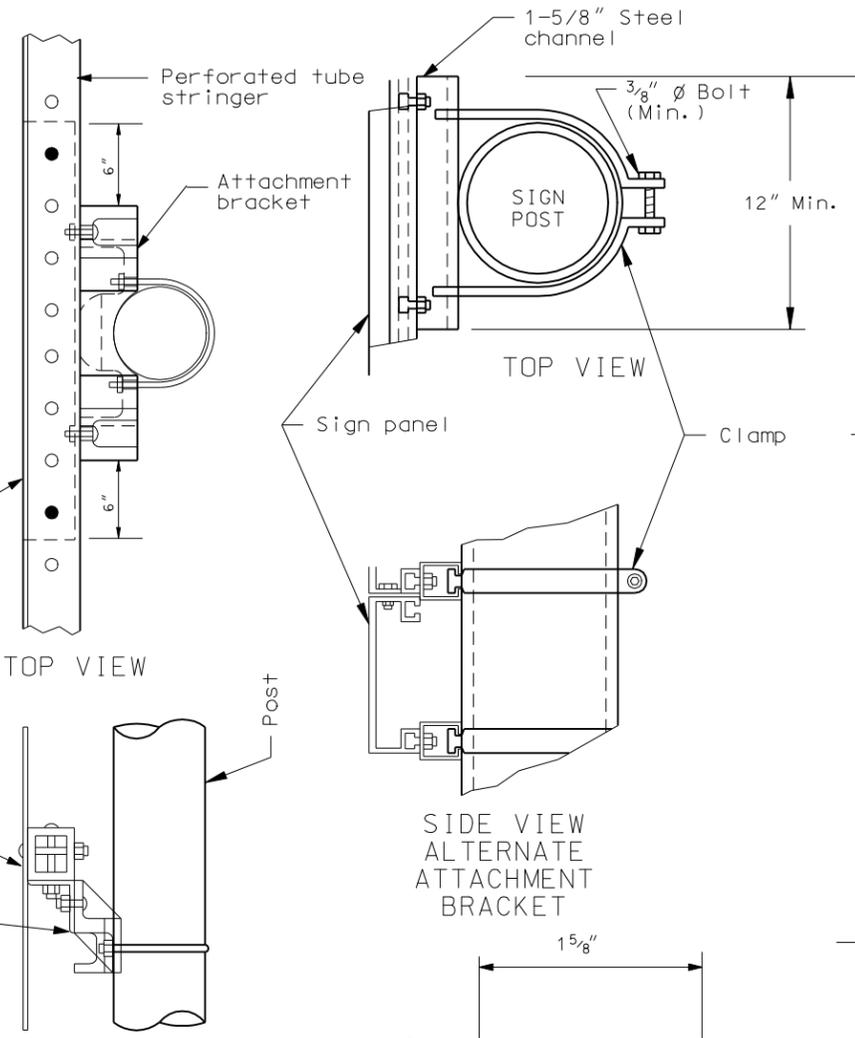
PICTORIAL SKETCHES

NOTE:
All brackets shall be galvanized steel or aluminum alloy SG 70-T6.
Where tube and bracket come in contact to be smooth and flat.



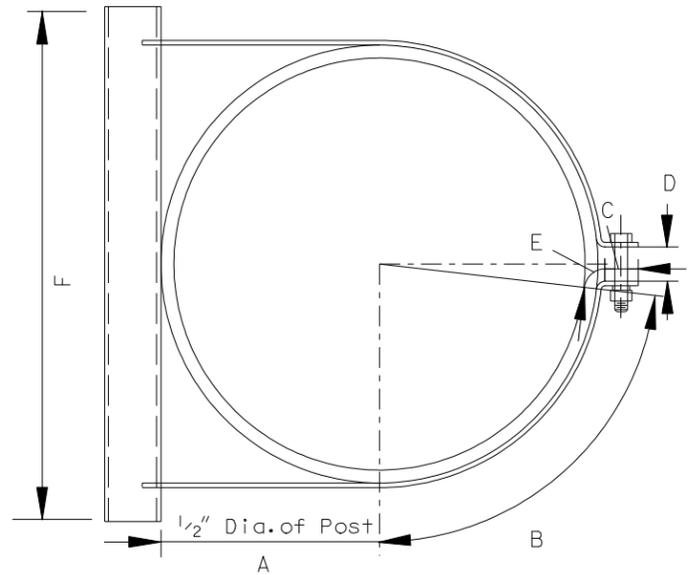
BRACKET CAMBER DETAIL
All brackets shall be cambered as shown

1/4" Angle shall be same size as perforated tube stringer



SIDE VIEW ATTACHMENT BRACKET
For Flat Sheet Sign to Pipe Post Detail

POST SIZE	A	B	C	D	E	F
3 1/2	2	3	1	1	5/16	12
4	2.25	3 3/16	1	1	5/16	12
5	2.78	5 1/8	1	1	5/16	12
6	3.31	7 7/16	1	1	5/16	12
8	4.31	13 1/16	1	1	11/32	12
10	5.37	20 3/4	1	1	3/8	14
12	6.37	29 5/8	1	1	3/8	15

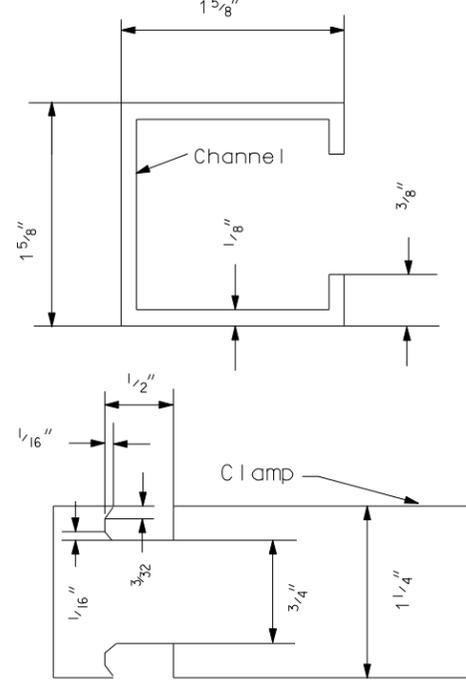


ALTERNATE ATTACHMENT BRACKET DETAILS

N.D. TUBE	DIMENSIONS					
	A	B	C	D	E	F
3-1/2"	2-1/4"	10"	8"	4-3/8"	2-1/8"	1-9/16"
4"	2-1/4"	10"	8"	4-7/8"	2-1/8"	1-3/8"
5"	2-25/32"	10"	8"	5-15/16"	2-1/8"	1-3/8"
6"	3-5/16"	10"	8"	7"	2-1/8"	1-1/4"
8"	4-5/16"	12"	10"	9"	2-1/8"	1-1/4"
10"	5-3/8"	12"	10"	11-1/8"	2-1/8"	1-1/4"
12"	6-3/8"	12"	10"	13-1/8"	2-1/2"	1-1/4"

NOTE:
In lieu of the cast aluminum attachment brackets for standard pipe posts when used with extruded aluminum sign panels, the attachment method shown hereon may be used. Each Alternate Attachment Brackets have the required length provided and shall be manufactured to these requirements.
Cost of providing this type of attachment shall be included in the price bid for panel for signs.
The attachment clamp may be used with Flat Sheet sign and stringers.

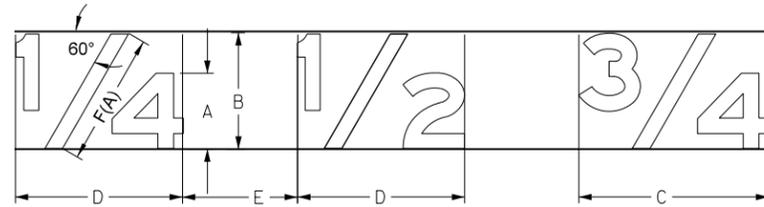
Post Size	Gauge (min.) - Clamp
3-1/2" - 4"	11
5" - 12"	10



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-15-94	
REVISIONS	
DATE	CHANGE
12-01-04	PE Stamp added
04-24-06	Details for Alternate Bracket

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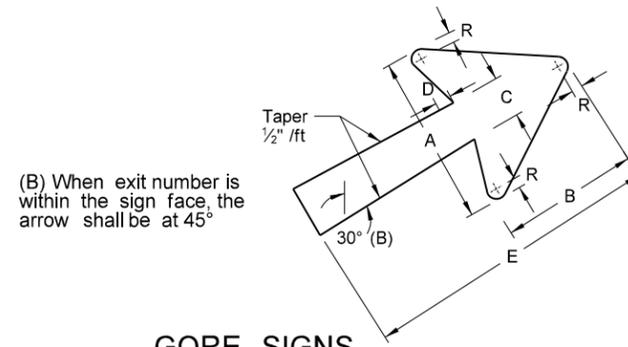
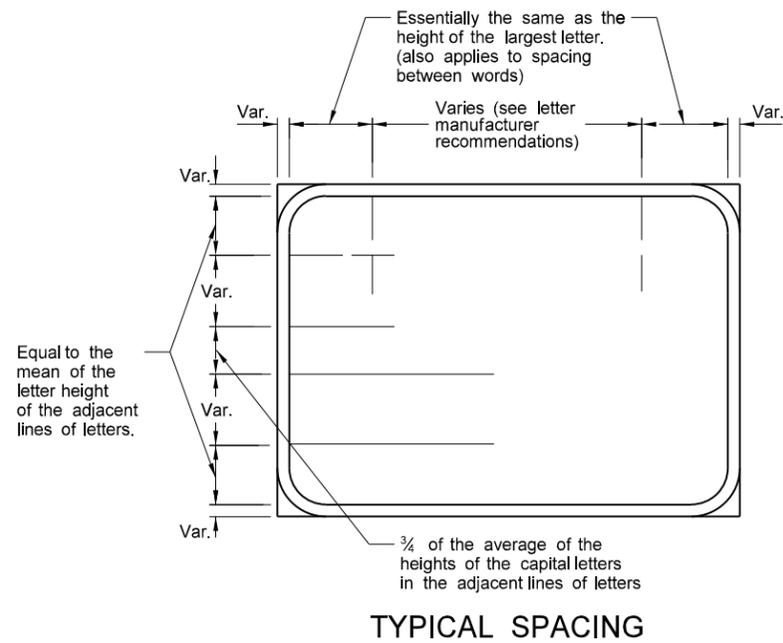
LETTER AND ARROW DETAILS FOR VARIABLE LENGTH SIGNS



SIZE OF THE FRACTION IS DETERMINED AS FOLLOWS:

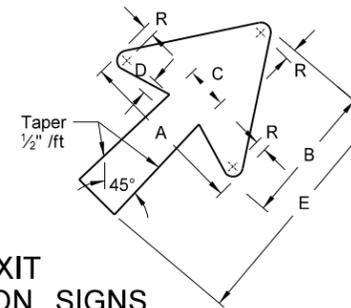
SYMBOL	TITLE	RATIO TO HEIGHT OF CAPITAL OR UPPER CASE
A	Letter height	1.0 of capital or upper case
B	Fraction height	1.5 X A
C	Fraction width	2.5 X A
D	Fraction width	2 X A
E	Space to next character	1 to 1.5 X A
F(A)	Length of diagonal	1.75 X A

(A) Diagonal stroke of fraction is to be centered optically.



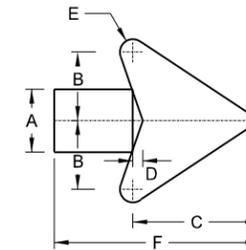
GORE SIGNS

"EXIT" LETTER SIZE (Upper Case)	A	B	C	D	E	R
8"	15 1/8"	11 1/16"	3 3/4"	1 5/16"	25"	13 1/16"
10" - 13 1/3"	18 1/4"	14"	4 1/2"	1 1/2"	30"	3/4"



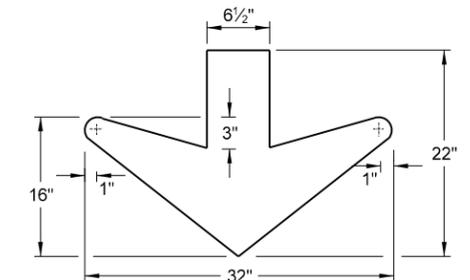
EXIT DIRECTION SIGNS

LETTER SIZE (Upper Case)	A	B	C	D	E	R
8"	15 1/8"	11 1/16"	3 3/4"	1 5/16"	17"	13 1/16"
10" - 13 1/3"	18 1/4"	14"	4 1/2"	1 1/2"	20"	3/4"
16" - 20"	22 1/4"	17"	5 3/8"	1 3/4"	25"	1"



DISTANCE AND DESTINATION SIGNS

LETTER SIZE (Upper Case)	A	B	C	D	E	F
6"	2 3/4"	3"	5 1/16"	7/16"	9/16"	9"
8"	3 1/2"	4"	7 1/8"	9/16"	1 1/16"	12"
12"	5 1/4"	6"	10 5/8"	1 3/16"	1 1/16"	18"

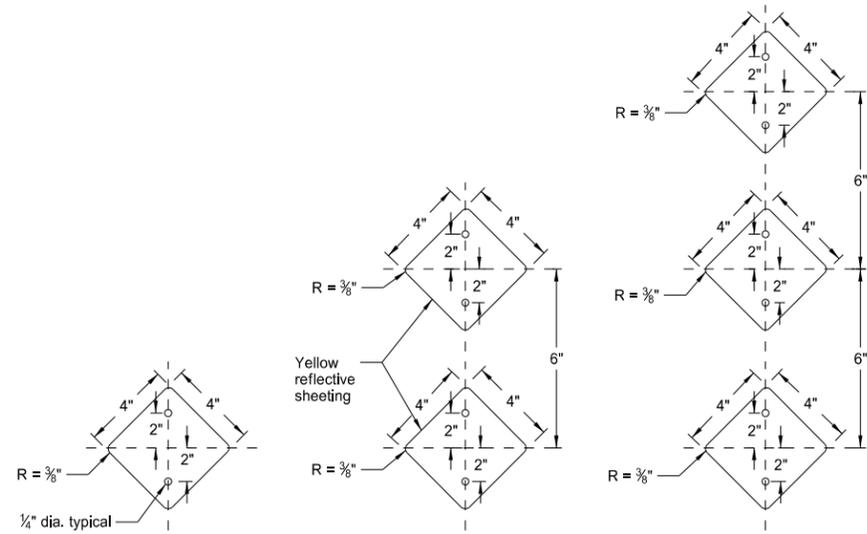


DOWN ARROW

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-3-11	
REVISIONS	
DATE	CHANGE

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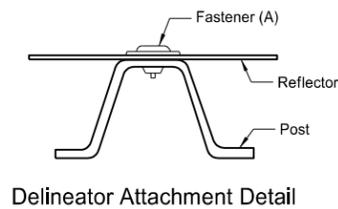
REFLECTORIZED DELINEATORS



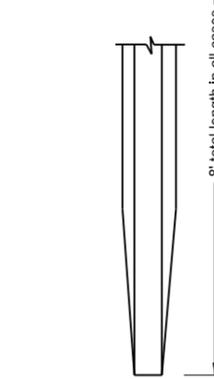
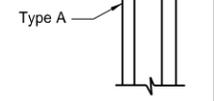
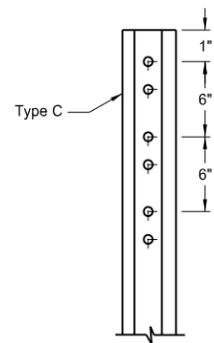
Main line
One reflector
(Type A delineator)

Ramps
Two reflectors
(Type B delineator)

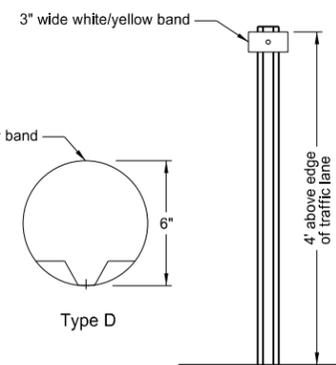
Narrow Bridges
Three reflectors
(Type C delineator)



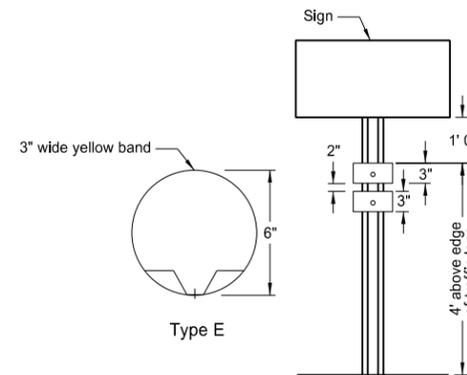
Delineator Attachment Detail



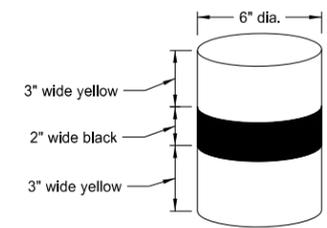
U-type Post



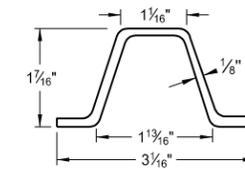
Median
One reflector
(Type D delineator)



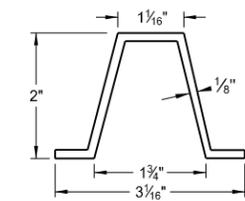
Median
One or Two reflectors
(Type E delineator)



Alternate Type E



Steel Post Detail
Approx. 2.0 lbs/ft



Aluminum Post Detail
Approx. 0.88 lbs/ft

Delineator Details
Type A, B, and C

Installation: Posts are to be installed along the right shoulder line unless shown otherwise on the plans.

Reflectors: Reflector shall be the same color as the adjacent pavement marking.

Spacing: Delineator spacing along main line tangents and curves with radius greater than 11500' (less than 0° 30') shall be at 528' centers. Curves with a radius less than 11500' but greater than 1200' the spacing shall be at 264' centers. With curves less than 1200' use spacing (S) = 3√R-50

Material: Reflective material shall be ASTM Type IX.

Type E

Type E: Two yellow bands with a 2" spacing between bands.

Alternate Type E: One unit band consisting of two yellow stripes separated by a 2" black stripe.

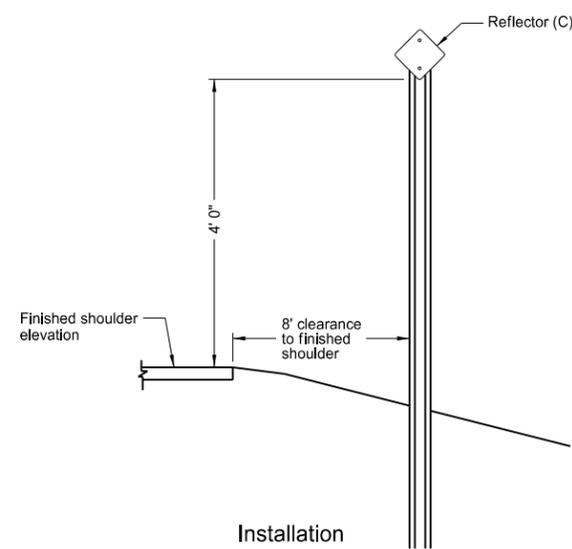
Material: Reflective material shall be Type IX.

(A) The fastener shall be 3/8" dia. with flat washer having a min. outside dia. of 1 3/16". Fasteners shall be tension pin type or other non-rust vandal resistant fastener.

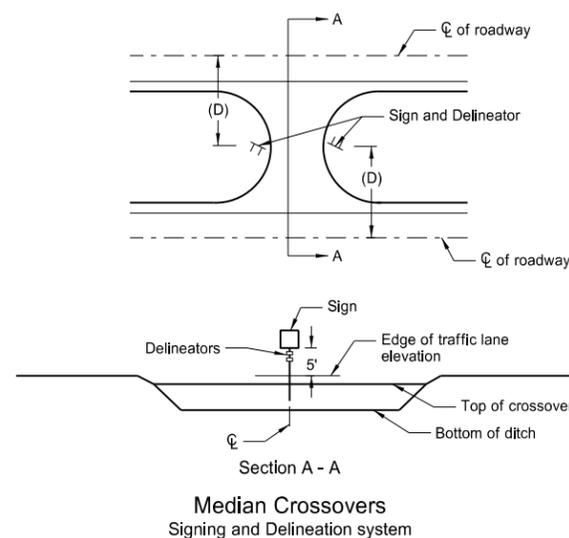
(B) The contractor may drill only those holes required to attach the number of reflectors on that post, or drill all the posts the same so that any number of reflectors may be added.

(C) Reflector to be mounted facing traffic at an angle of 93° away from oncoming traffic.

(D) The median width may vary. The sign and delineator assembly shall be placed in the median crossover an equal distance from each roadway.



Installation



Section A - A
Median Crossovers
Signing and Delineation system

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE

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NOTES:

1. Curbed Roadways: The clearance from the face of the curb should be 3' except where right of way or sidewalk width is limited, a minimum clearance of 2' shall be provided. The horizontal clearance may need to be increased to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.

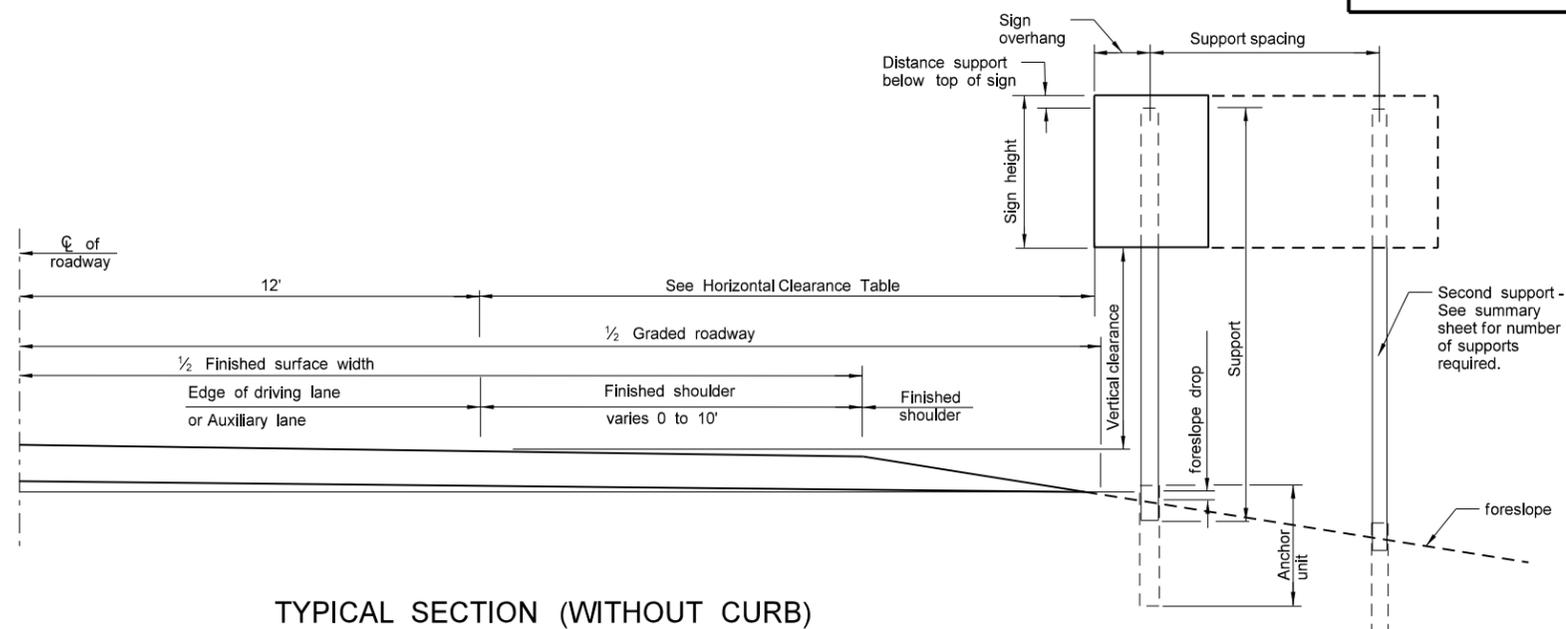
2. Minimum Vertical clearance: Signs installed at the side of the road in rural districts shall be at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least 7'.

Directional signs on expressways and freeways shall be installed with a minimum height of 7'. If the secondary sign is mounted below another sign, the major sign shall be installed at least 8' and the secondary sign shall be installed at least 5' above the edge of the driving lane. All route signs, warning signs, and regulatory signs on expressways and freeways shall be at least 7' above the edge of the driving lane. Where signs are placed at least 30 feet or more from the edge of the traveled way, the height to the bottom of such sign shall be 5' above the edge of the driving lane.

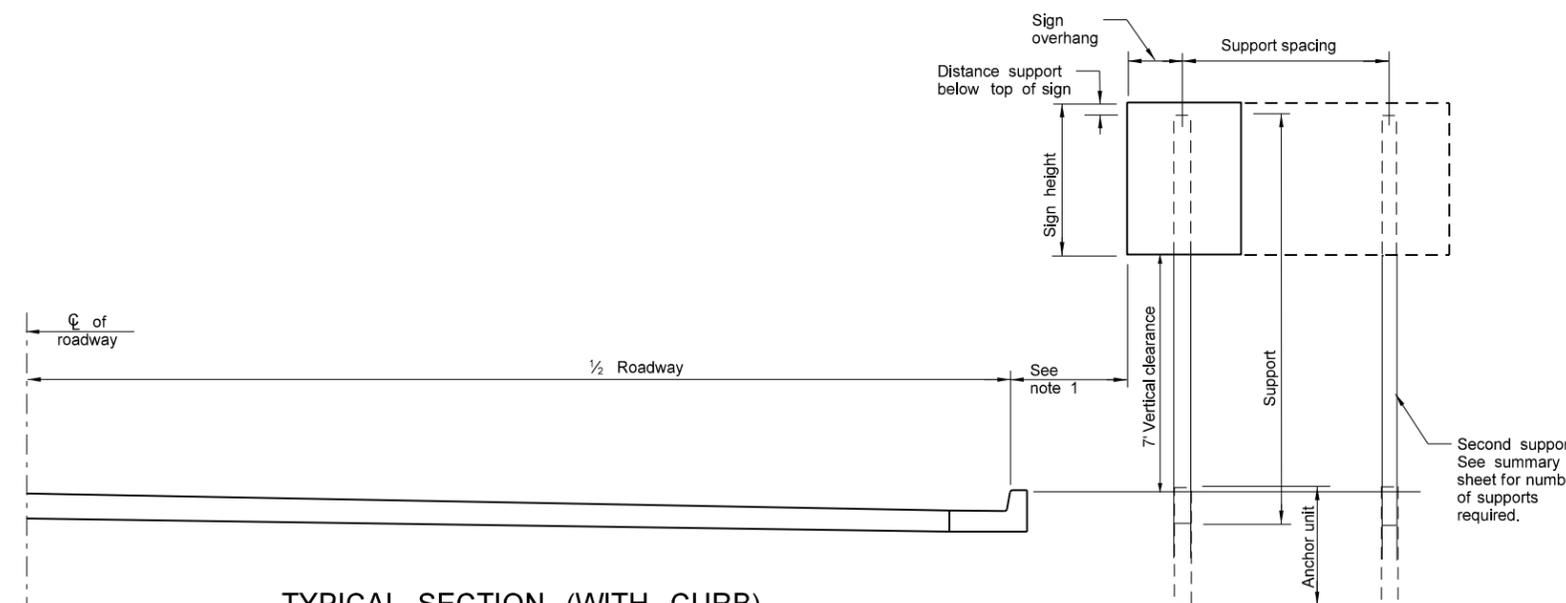
The vertical clearance shall have a maximum height of 6" above the vertical clearance specified above.

HORIZONTAL CLEARANCE TABLE	
SHOULDER WIDTH ft	OFFSET ft
0 to 2	16
>2 to 4	18
>4 to 6	20
>6 to 8	22
>8 to 10	24

ASSEMBLY DETAILS

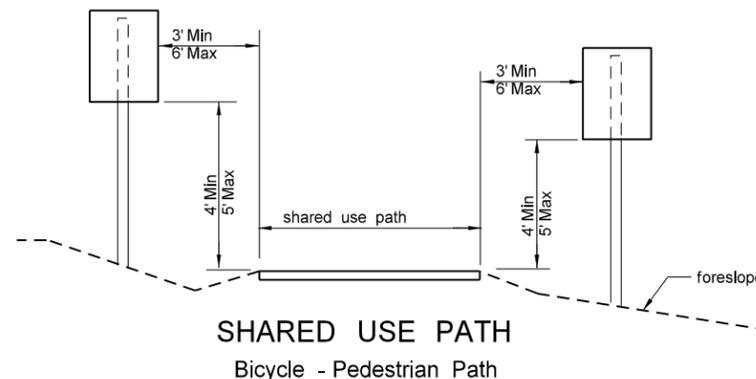


TYPICAL SECTION (WITHOUT CURB)



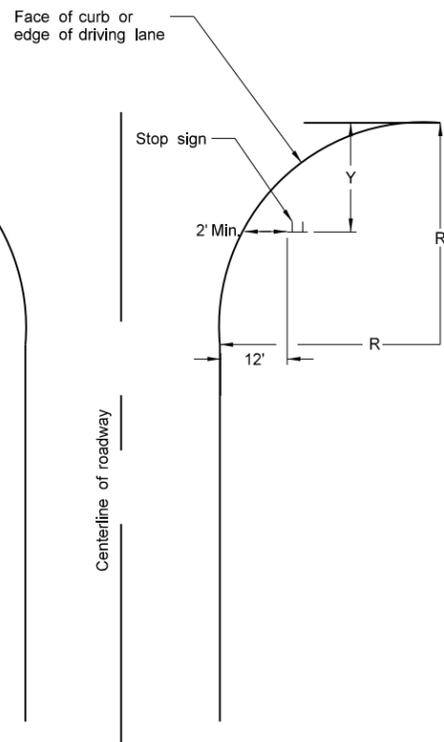
TYPICAL SECTION (WITH CURB)

Residential or Business District



SHARED USE PATH

Bicycle - Pedestrian Path



STOP SIGN LOCATION WIDE THROAT INTERSECTION

Note: This layout is to be used for the placement of "Stop" signs.

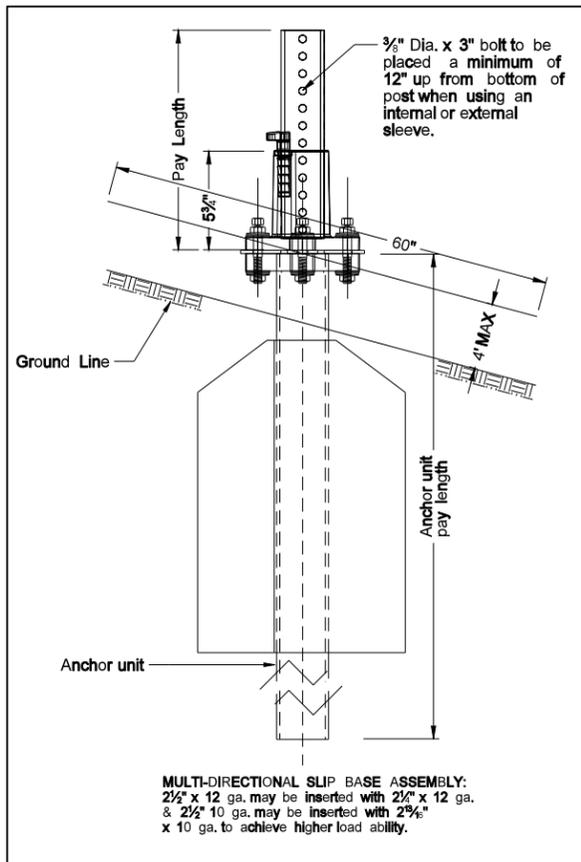
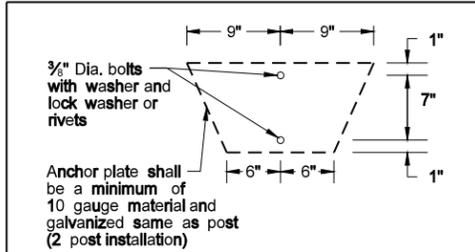
R=Radius	Y-Max	Y-Min
40'	50'	15'
45'	50'	18'
50'	50'	21'
55'	50'	25'
60'	50'	28'
65'	50'	32'
70'	50'	35'
75'	50'	39'
80'	50'	43'

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

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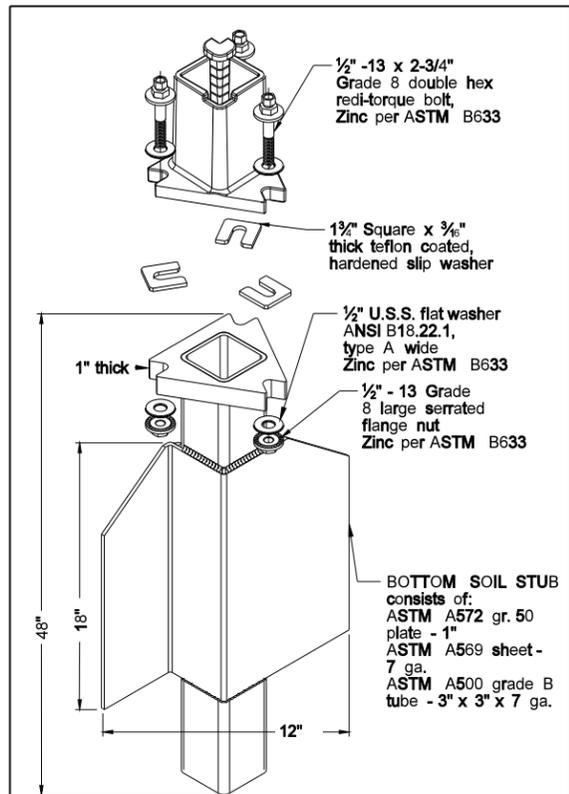
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/2	12
1	2 1/2	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes	7	7
1	2 1/2	12	2 1/2(D)	12	Yes	7	7
1	2 1/2	12	2 1/2	12	Yes	7	7
2	2 1/2	10			Yes	7	7
2	2 1/2	12	2 1/2(D)	12	Yes	7	7
2	2 1/2	12	2 1/2	12	Yes	7	7
3 & 4	2 1/2	12			Yes	7	7
3 & 4	2 1/2	10			Yes	7	7
3 & 4	2 1/2	12	2 1/2	12	Yes	7	7
3 & 4	2 1/2	12	2 1/2(D)	12	Yes	7	7
3 & 4	2 1/2	10	2 1/2	10	Yes	7	7

(B) - The 2 1/2", 12 gauge posts do not need breakaway bases when placed in standard soils, but require a shim as specified by the manufacturer. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
 (C) - 3" anchor unit
 (D) - 2 1/2" x 12 ga. x 18" minimum length external sleeve required.

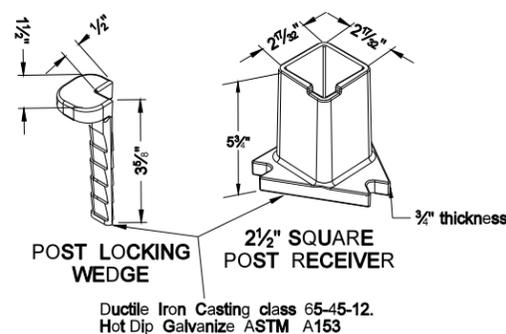


MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:
 2 1/2" x 12 ga. may be inserted with 2 1/2" x 12 ga. & 2 1/2" 10 ga. may be inserted with 2 3/8" x 10 ga. to achieve higher load ability.

Mounting Details Perforated Tube

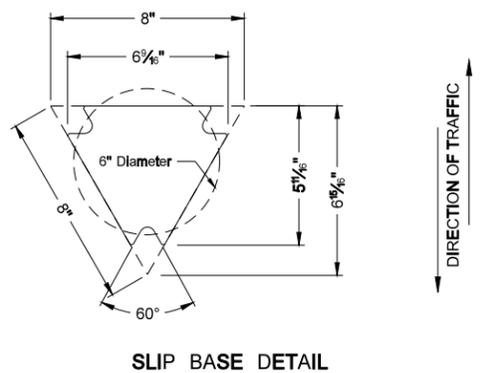


SLIP BASE FOR 2 1/2" POST



2 1/2" SQUARE POST RECEIVER

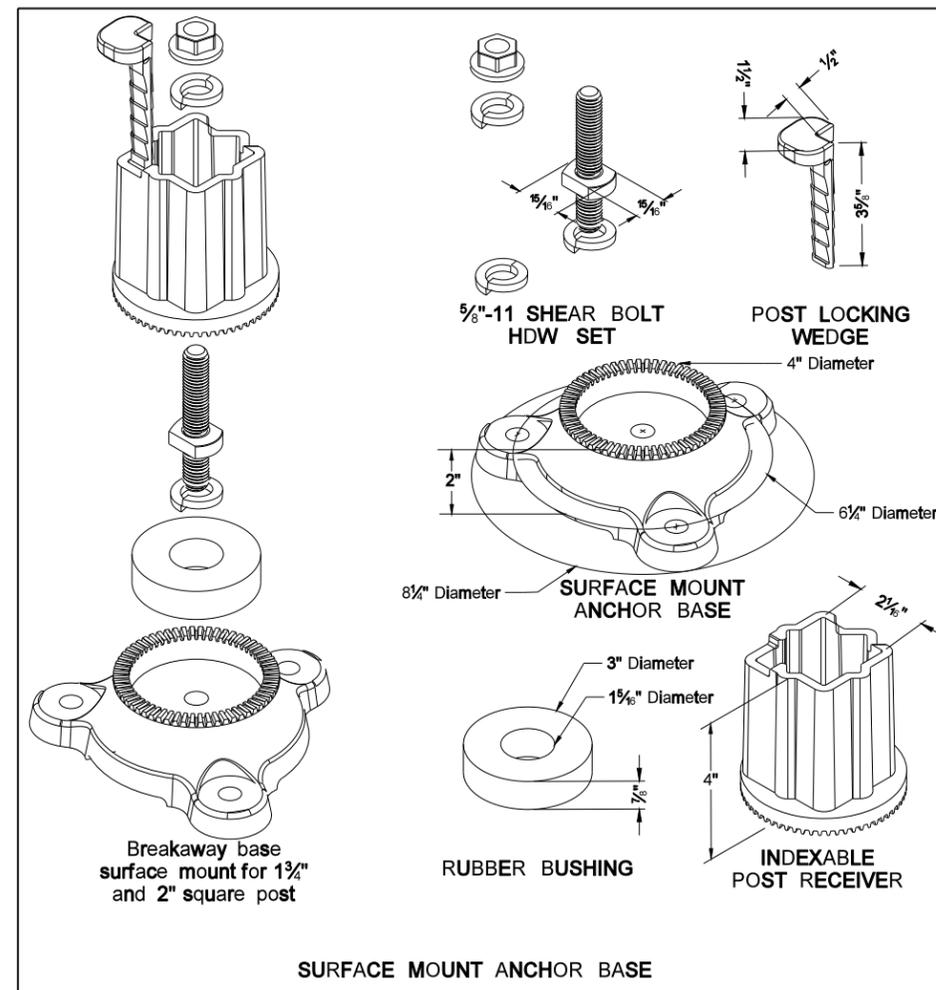
Ductile Iron Casting class 65-45-12. Hot Dip Galvanize ASTM A153



SLIP BASE DETAIL

Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness in.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. Area In. ²	Section Modulus In. ³
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/2 x 2 1/2	0.105	12	2.773	0.561	0.695	0.499
2 3/8 x 2 3/8	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	0.783

The 2 3/8" size 10 gauge is shown as 2.19" size on the plans; The 2 1/2" size is shown as 2.51" size on the plans.



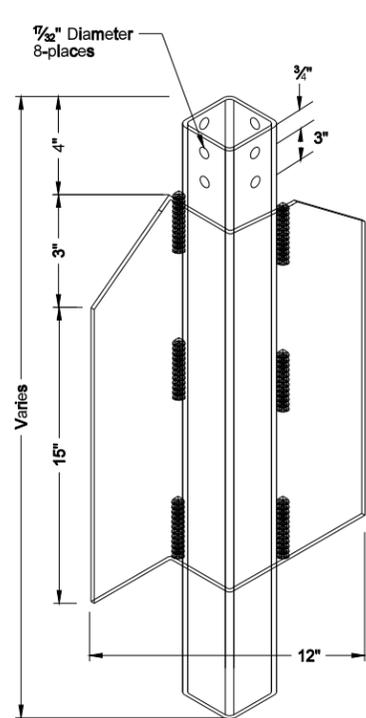
SURFACE MOUNT ANCHOR BASE

NOTE:

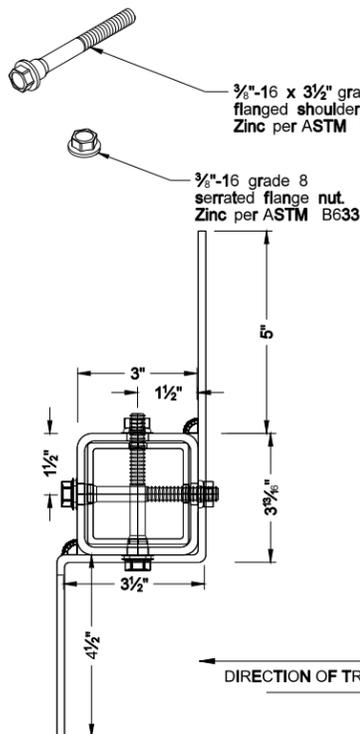
- 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.
- Anchor material shall be 7 gauge H.R.P.O. Commercial quality ASTM A569 and 3" x 3" x 7" gauge ASTM A500 grade B. Anchor shall have a yield strength 43.9 KSI and tensile strength of 59.3 KSI. Anchor shall be hot dipped galvanized per ASTM A123/153. All tolerances on anchor unit and slip base bottom assembly are +/- 0.005" unless otherwise noted.
- When used in concrete sidewalk, anchor shall be the same concept without the wings.
- Four post signs shall have over 8" between the first and fourth posts.
- Installation procedures as per manufacturers recommendation.
- Concrete fasteners for surface mount breakaway base shall be a minimum 1/2" diameter x 4" grade 8.

SHOULDER BOLT

Shimming agent to reduce tolerance between 3" anchor unit and 2 1/2" post. (standard 3/8" diameter grade 8 bolt may be used with proper shim)



3" ANCHOR UNIT



DIRECTION OF TRAFFIC

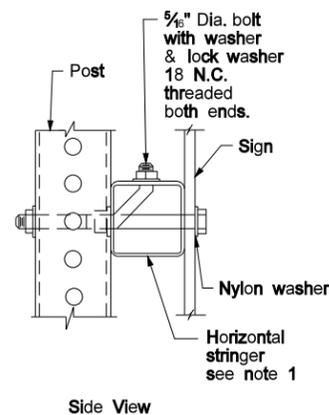
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE

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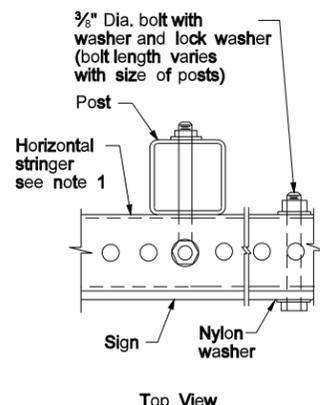
Mounting Details Perforated Tube

Note:

- Horizontal stringers - In lieu of perforated tubes, the contractor may substitute z bar stringers. The z bar stringers shall be 1 1/2" x 3/16" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel.
- Metal washers used on sign face shall have a minimum outside diameter of 5/8" ± 1/16" and 10 gauge thickness.
- No Parking Signs: All no parking signs with directional arrows shall be placed at a 30 to 45 degree angle with the line of traffic flow. No parking signs required at the above angles may have the support turned to the correct angle. If the no parking sign is placed with another sign that has to be placed at a 90 degree angle with the line of traffic flow, the detailed angle strap should be used to mount the no parking sign. Flat washers and lock washers shall be used with all nylon washers. Material used for the attachment strap shall be included in the price bid for "Flat sheet for signs."
- In lieu of using the bent bolt to attach the post to the stringer, the contractor may choose to punch the sign backing and place the bolt through the sign, the stringer and the post.
- 4" vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.

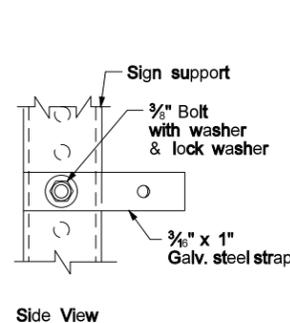


Side View

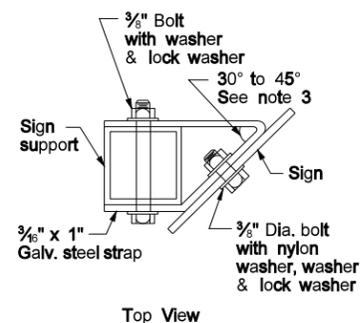


Top View

STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)

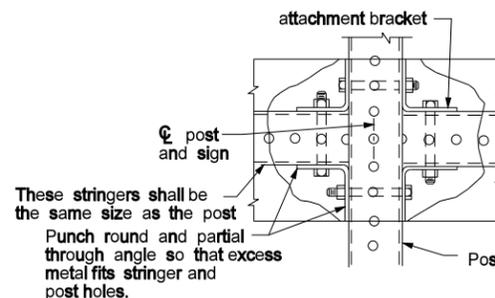


Side View



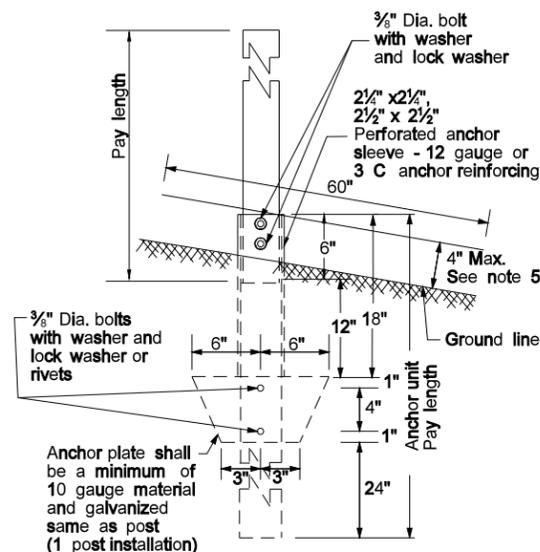
Top View

STRAP DETAIL

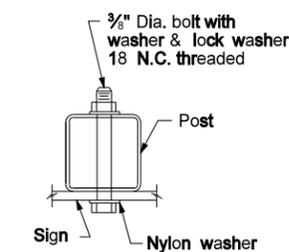
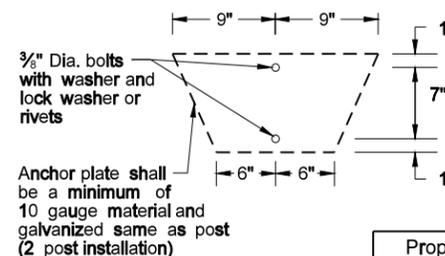


These stringers shall be the same size as the post. Punch round and partial through angle so that excess metal fits stringer and post holes.

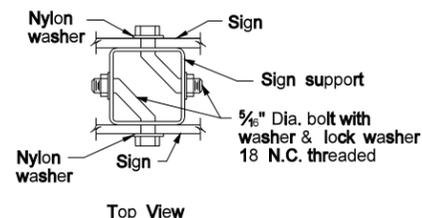
STREET NAME SIGNS
AND ONE WAY SIGNS
SINGLE POST ASSEMBLY
ONE STRINGER OR
BACK TO BACK MOUNTING



ANCHOR UNIT AND
POST ASSEMBLY



BOLT MOUNTING



Top View

BACK TO BACK
MOUNTING

Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. area In. ²	Section Modulus In. ³
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/8 x 2 3/8	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	0.783

The 2 1/4" size 10 gauge is shown as 2.19" size on the plans.
The 2 1/2" size is shown as 2.51" size on the plans.

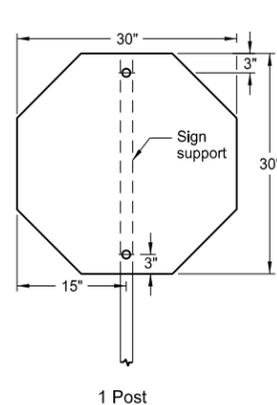
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/2	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2 1/2(D)	12	Yes		7
1	2 1/2	12	2 1/4	12	Yes		7
2	2 1/2	10			Yes		7
2	2 1/4	12	2 1/2(D)	12	Yes		7
2	2 1/2	12	2 1/4	12	Yes		7
3 & 4	2 1/2	12			Yes		7
3 & 4	2 1/2	10			Yes		7
3 & 4	2 1/2	12	2 1/4	12	Yes		7
3 & 4	2 1/4	12	2 1/2(D)	12	Yes		7
3 & 4	2 1/2	10	2 3/8	10	Yes		7

(B) - The 2 1/2", 12 gauge posts do not need breakaway bases when placed in standard soils, but require a shim as specified by the manufacturer. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2 1/2" x 12 ga. x 18" minimum length external sleeve required.

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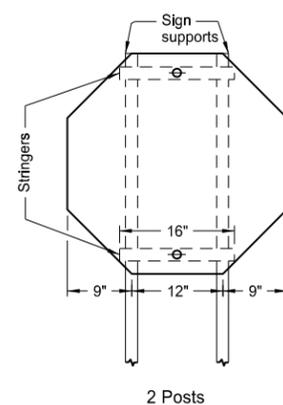
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS

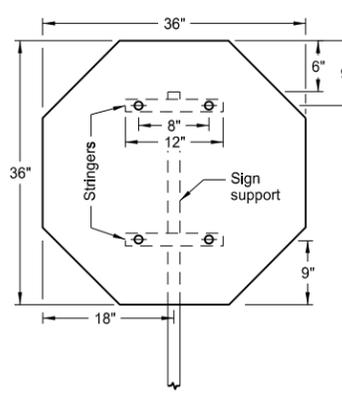


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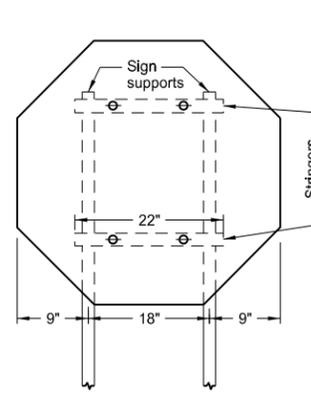
Assembly No. 1



2 Posts

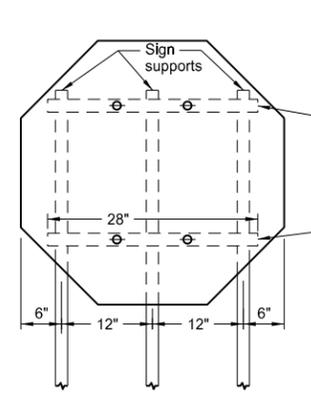


1 Post



2 Posts

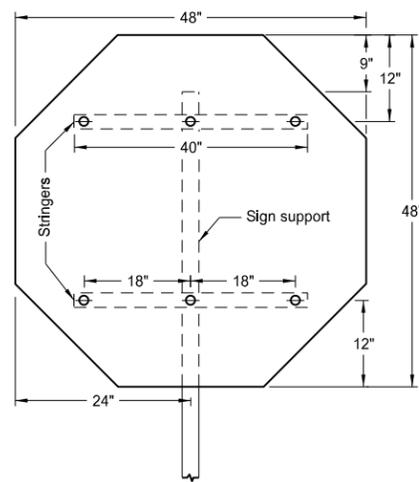
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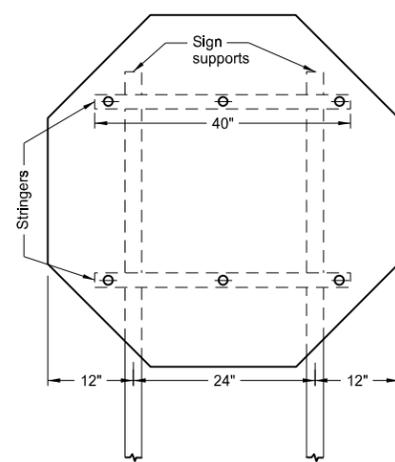
3 Posts

Notes:

1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1½" x 1½".
4. All holes shall be punched round for ⅜" bolt.

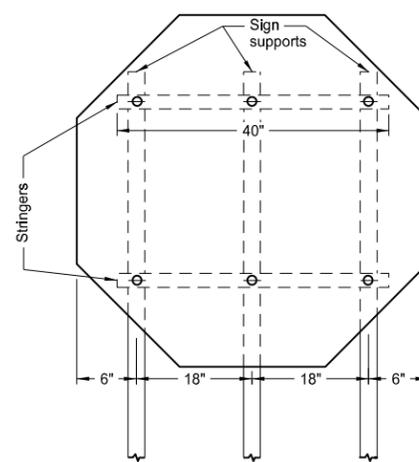


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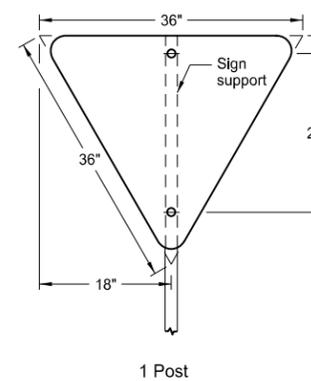


2 Posts

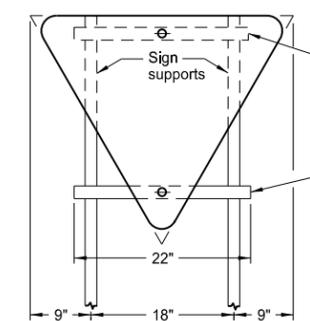
Assembly No. 3



3 Posts

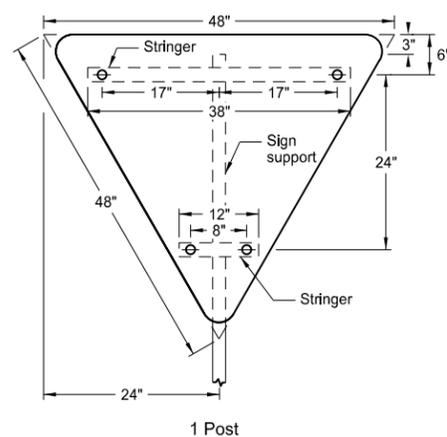


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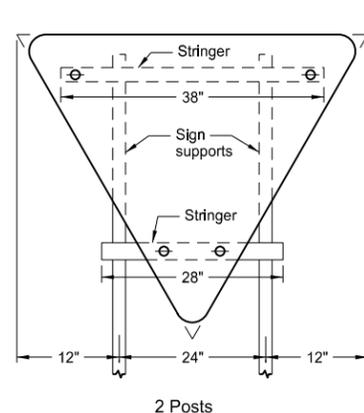


2 Posts

Assembly No. 4

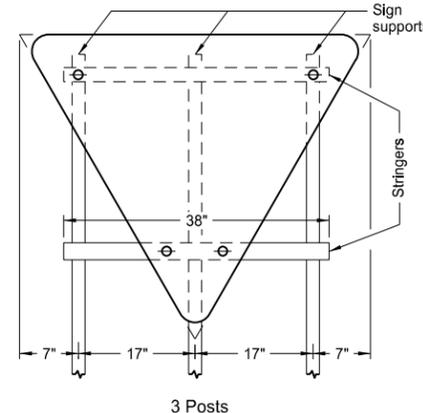


1 Post



2 Posts

Assembly No. 5

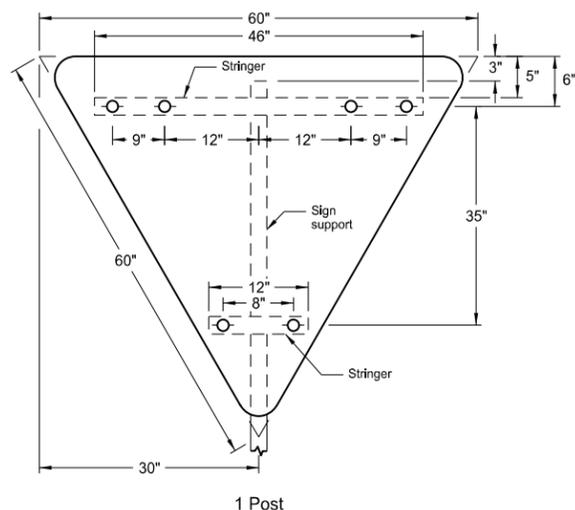


3 Posts

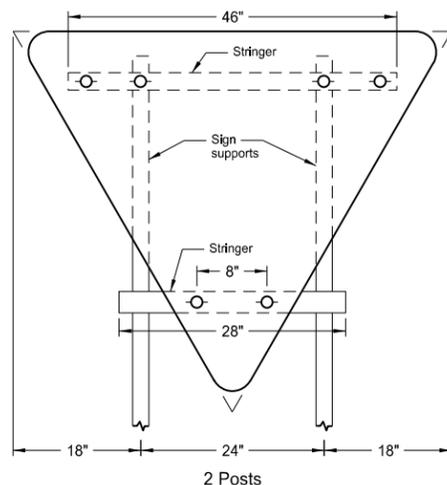
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DATE	CHANGE

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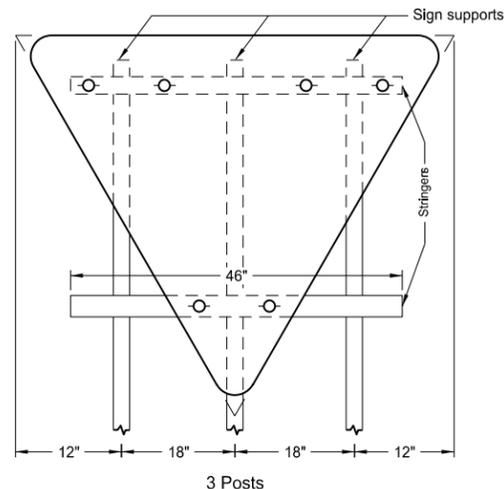
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



1 Post



2 Posts

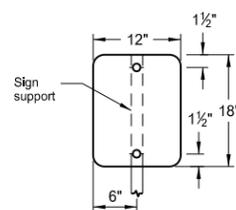


3 Posts

Assembly No. 6

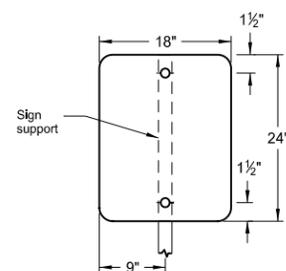
Notes:

1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1½" x 1½".
4. All holes shall be punched round for ⅜" bolt.



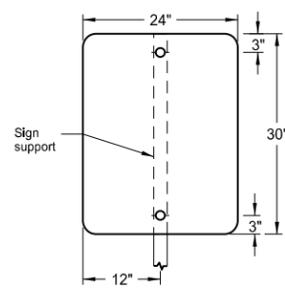
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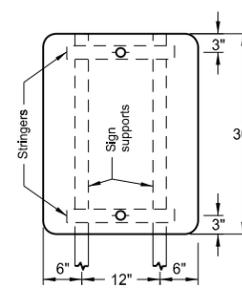
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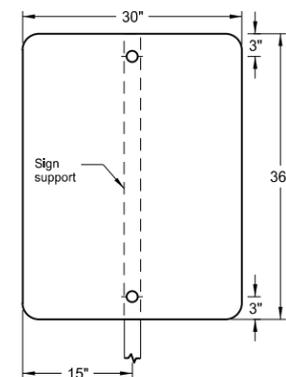


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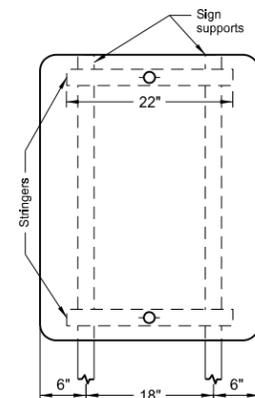
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2 Posts

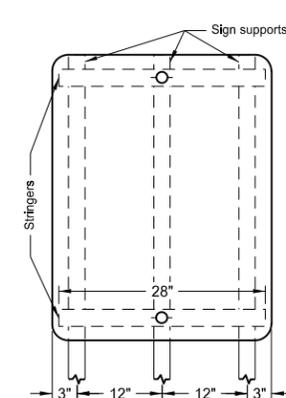


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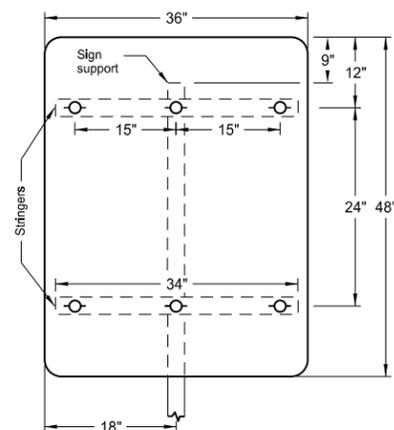


2 Posts

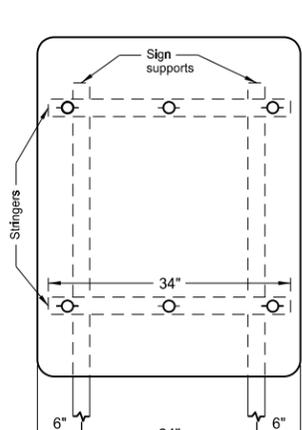
Assembly No. 10



3 Posts

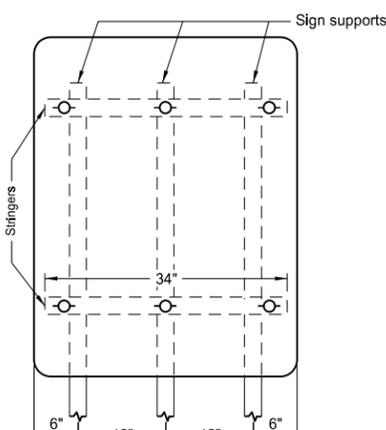


1 Post



2 Posts

Assembly No. 11

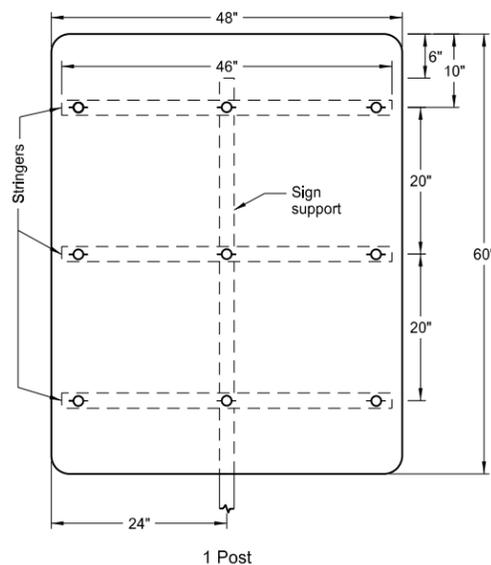


3 Posts

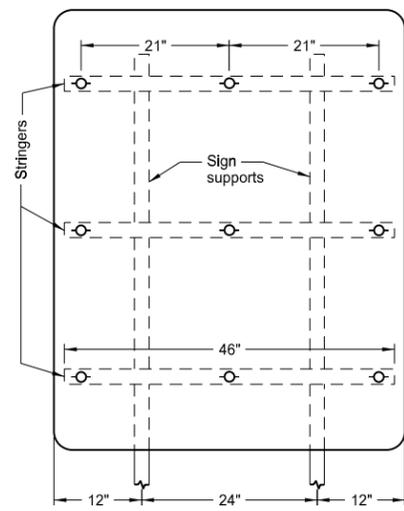
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS

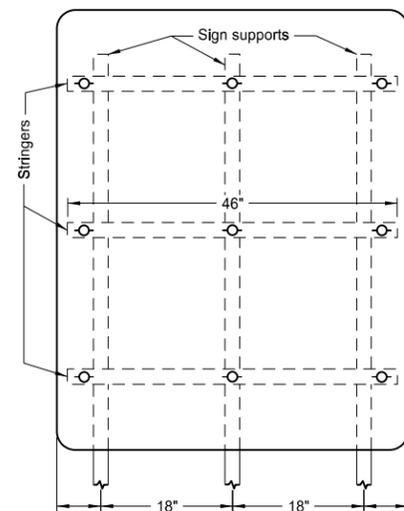


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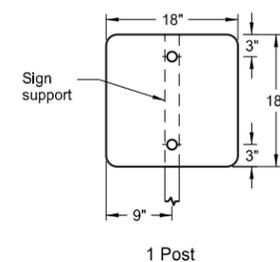


2 Posts

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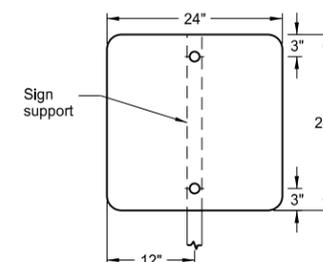


3 Posts



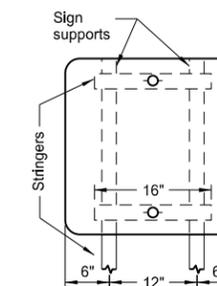
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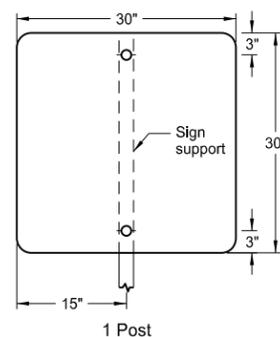


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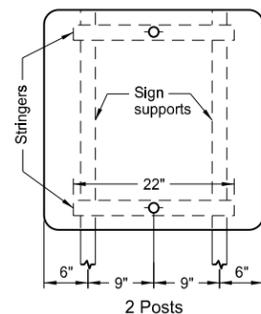


2 Posts

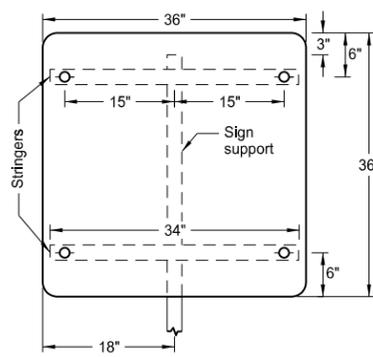


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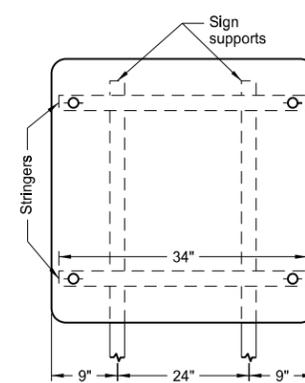
Assembly No. 15



2 Posts

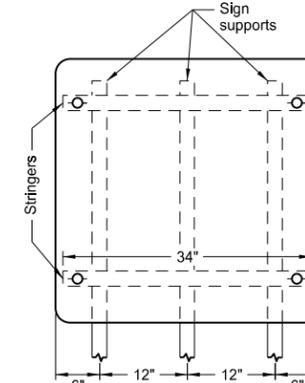


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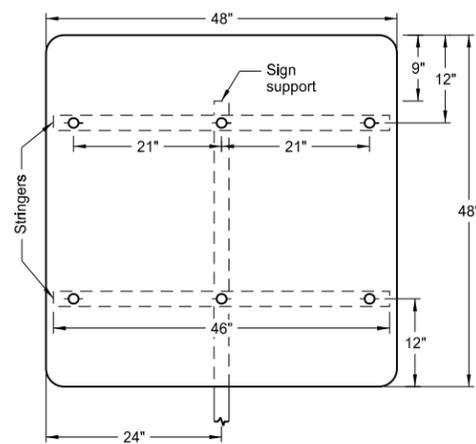


2 Posts

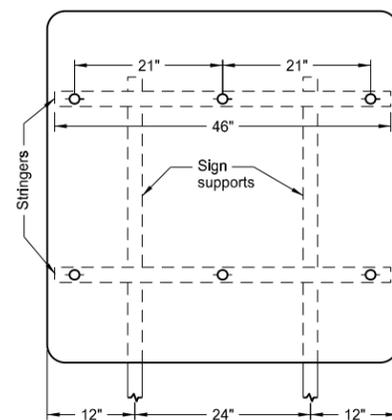
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3 Posts

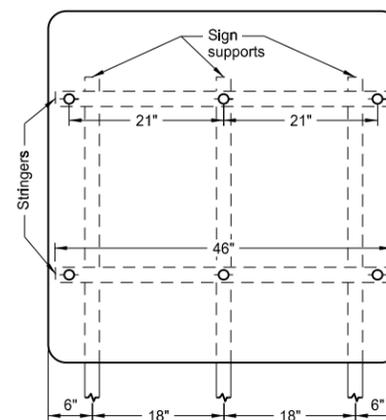


1 Post



2 Posts

Assembly No. 17



3 Posts

Notes:

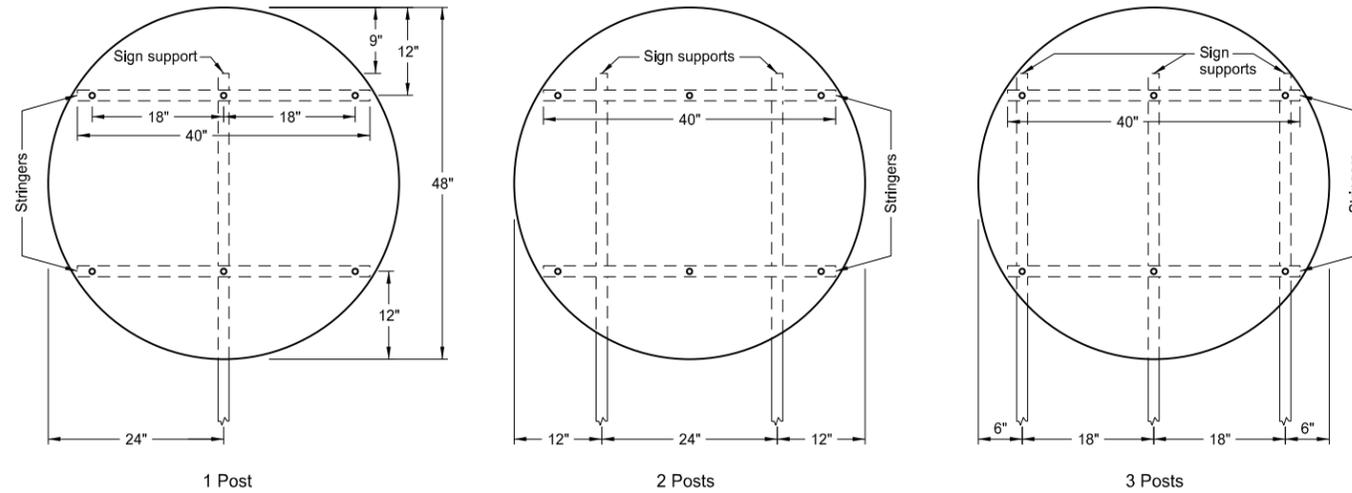
1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1 1/2" x 1 1/2".
4. All holes shall be punched round for 3/8" bolt.

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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
REGULATORY, WARNING AND GUIDE SIGNS

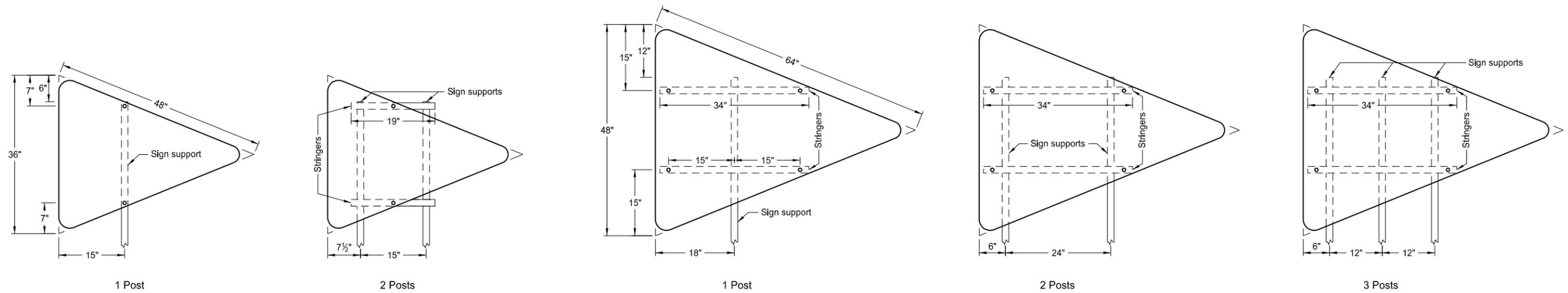
D-754-41



ASSEMBLY NO. 64

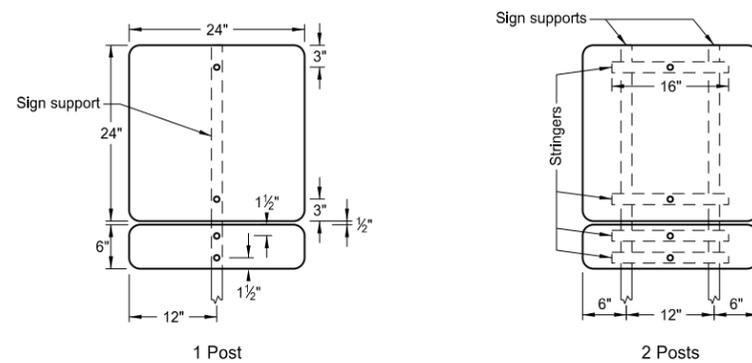
Notes:

1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1½"x1½".
3. All holes shall be punched round for ⅜" bolt.



ASSEMBLY NO. 65

ASSEMBLY NO. 66



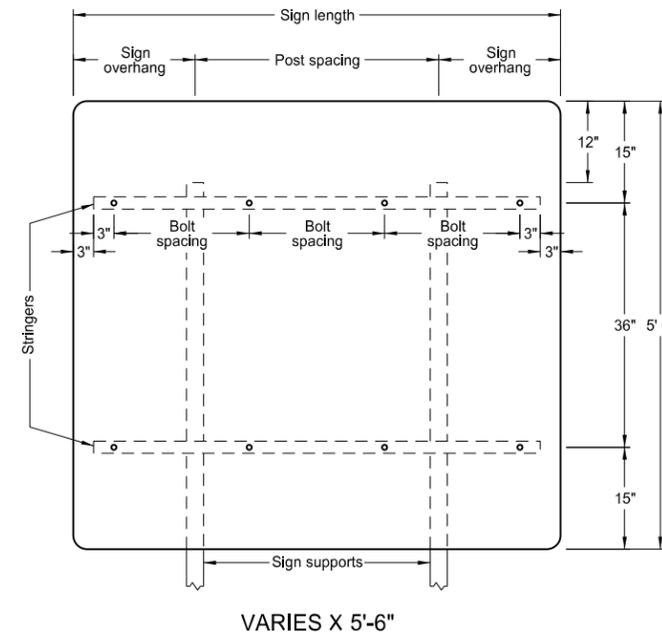
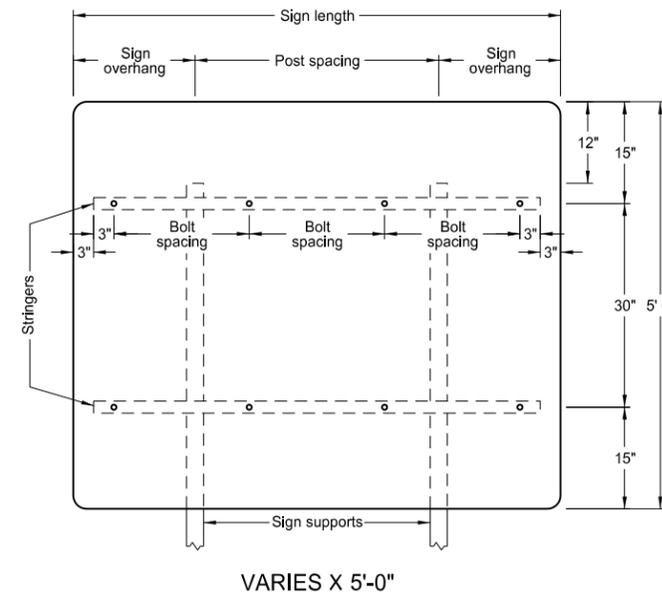
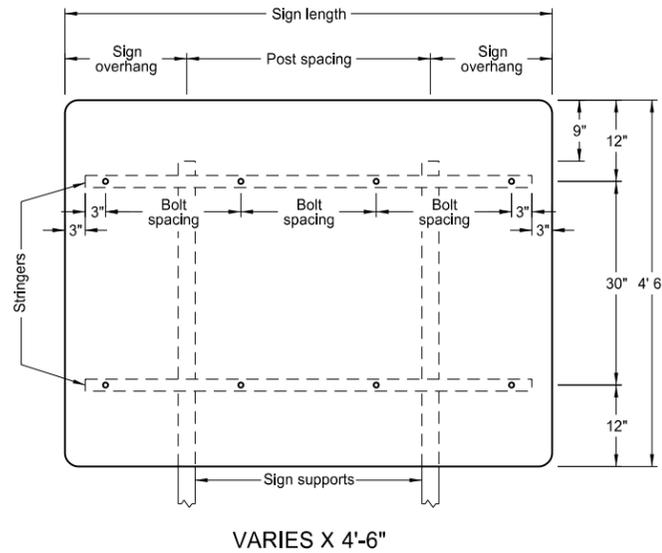
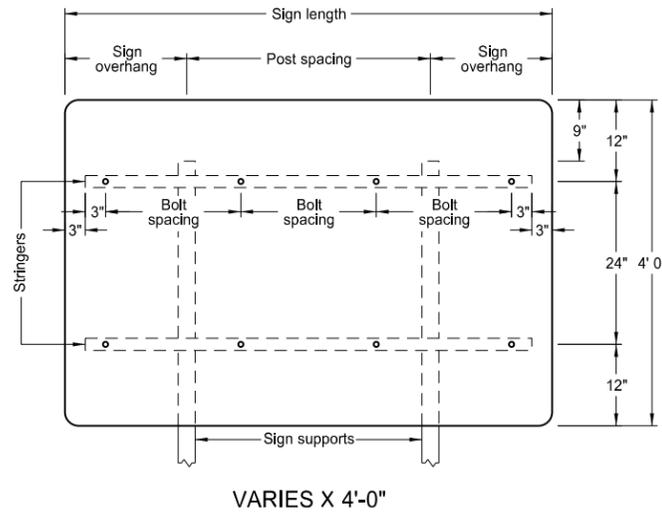
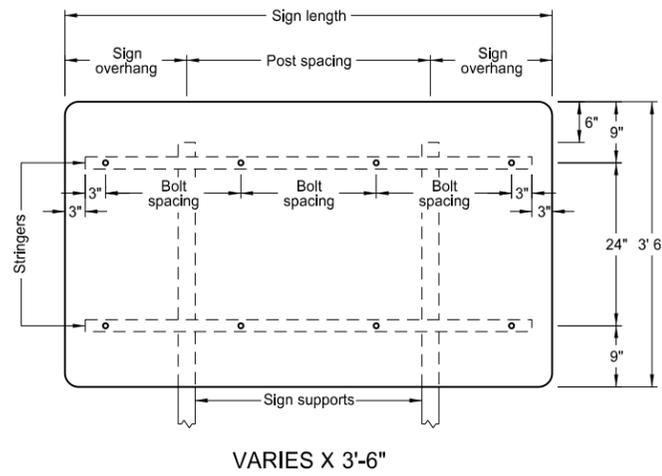
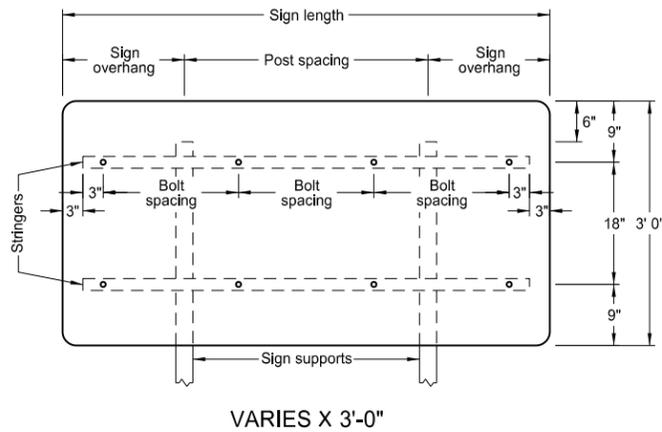
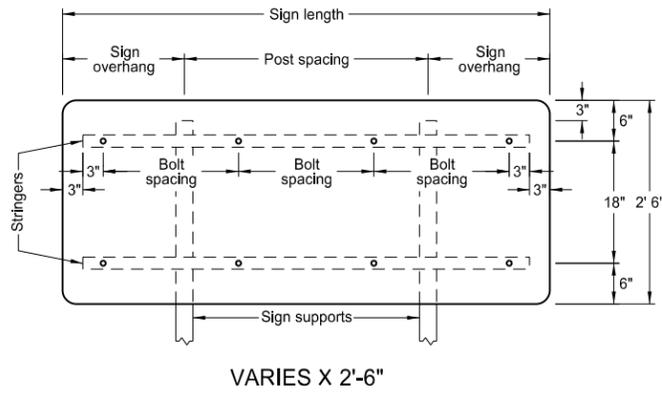
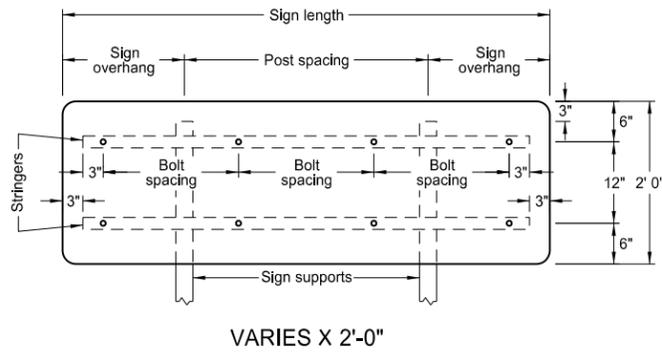
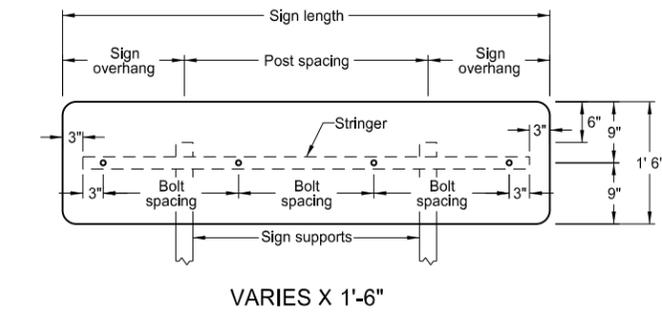
ASSEMBLY NO. 67

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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS

D-754-48



2 POSTS			
Sign Length	Sign Overhang	Post Spacing	Bolt Spacing
4'-0"	1'-0"	2'-0"	18"
4'-6"	1'-3"	2'-0"	21"
5'-0"	1'-0"	3'-0"	24"
5'-6"	1'-3"	3'-0"	18"
6'-0"	1'-6"	3'-0"	20"
6'-6"	1'-3"	4'-0"	22"
7'-0"	1'-6"	4'-0"	24"
7'-6"	1'-9"	4'-0"	2'-20" & 2'-19"
8'-0"	2'-0"	4'-0"	21"
8'-6"	1'-9"	5'-0"	2'-22" & 2'-23"
9'-0"	2'-0"	5'-0"	24"
9'-6"	1'-9"	6'-0"	4'-20" & 1'-22"
10'-0"	2'-0"	6'-0"	2'-21" & 3'-22"
10'-6"	2'-3"	6'-0"	4'-23" & 1'-22"
11'-0"	2'-6"	6'-0"	24"
11'-6"	2'-9"	6'-0"	21"
12'-0"	2'-0"	8'-0"	22"
12'-6"	2'-3"	8'-0"	23"
13'-0"	2'-6"	8'-0"	24"
13'-6"	2'-9"	8'-0"	3'-22" & 4'-21"
14'-0"	3'-0"	8'-0"	2'-23" & 5'-22"
14'-6"	3'-3"	8'-0"	6'-23" & 1'-24"
15'-0"	3'-6"	8'-0"	24"
15'-6"	2'-9"	10'-0"	6'-22" & 2'-21"
16'-0"	3'-0"	10'-0"	4'-23" & 4'-22"
16'-6"	3'-3"	10'-0"	6'-23" & 2'-24"
17'-0"	3'-6"	10'-0"	24"
17'-6"	3'-9"	10'-0"	22"
18'-0"	3'-0"	12'-0"	6'-23" & 3'-22"
18'-6"	3'-3"	12'-0"	6'-23" & 3'-24"
19'-0"	3'-6"	12'-0"	24"
19'-6"	3'-9"	12'-0"	8'-22" & 2'-23"
20'-0"	4'-0"	12'-0"	8'-23" & 2'-22"

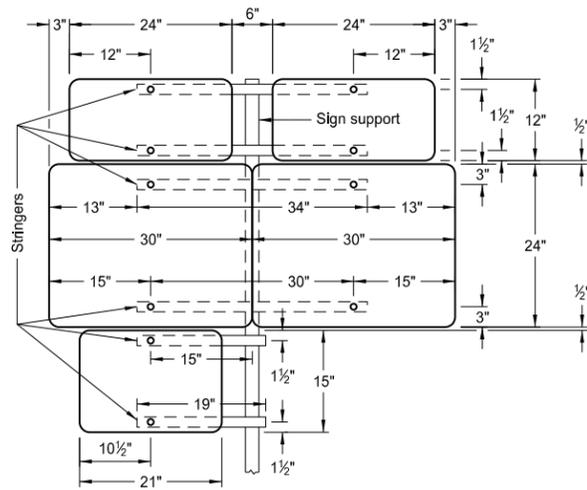
- Notes:
- The minimum sign backing material thickness shall be 0.100 inch.
 - Perforated square tube stringer shall be 1½" x 1½".
 - All holes shall be punched round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE

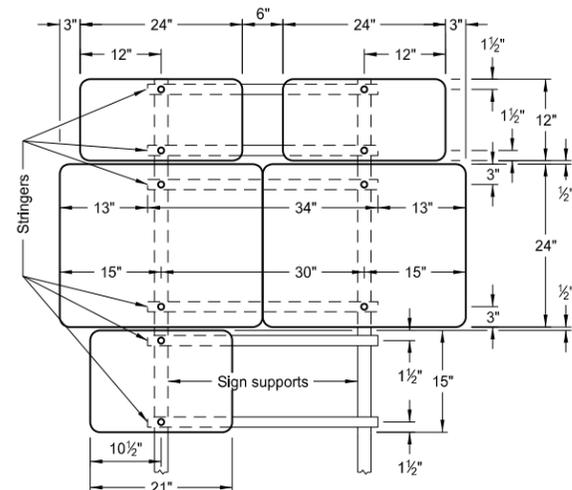
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Roger Weigel,
Registration Number
PE-2930,
on 9/25/2012 and the original document is stored at the North Dakota Department of Transportation

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

D-754-55

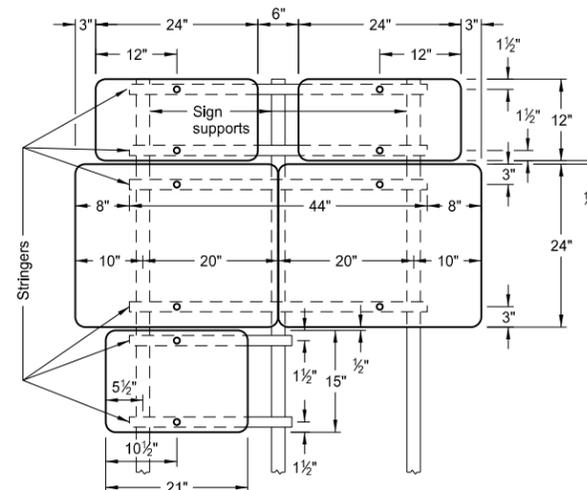


1 Post



2 Posts

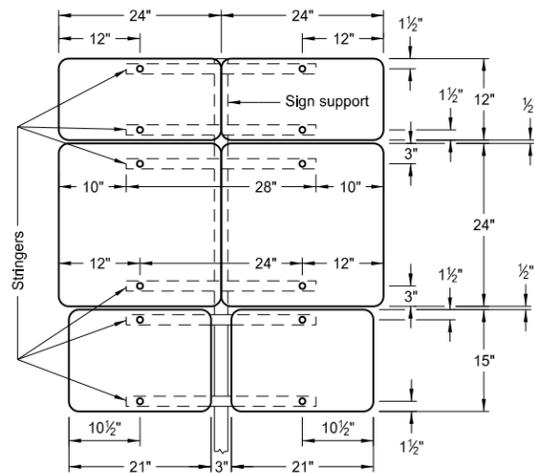
ASSEMBLY 386



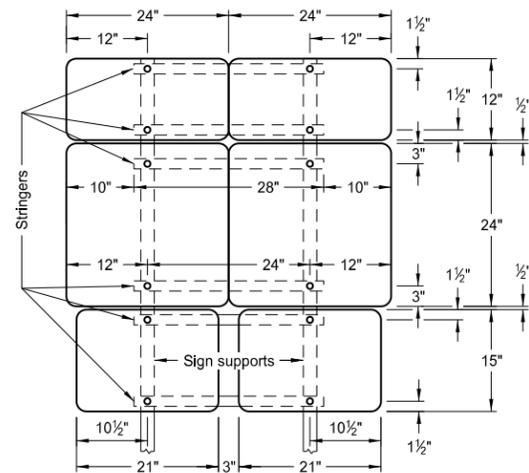
3 Posts

Notes:

1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1 1/2"x1 1/2".
3. All holes shall be punched round for 3/8" bolt.

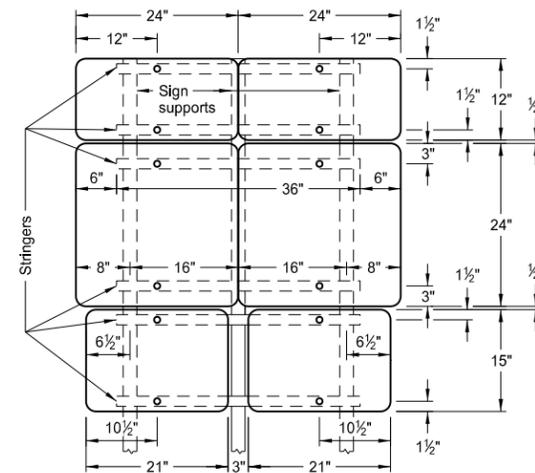


1 Post

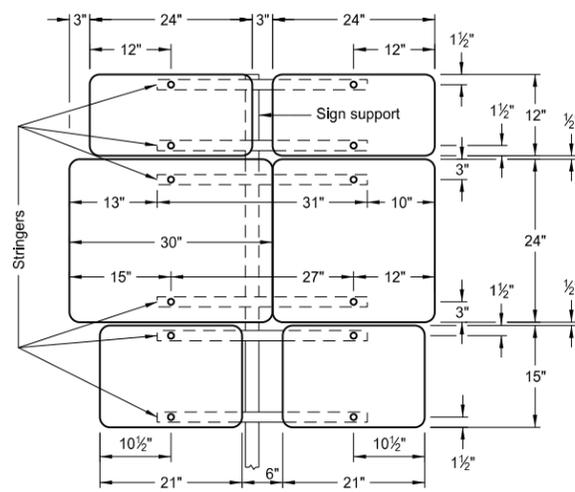


2 Posts

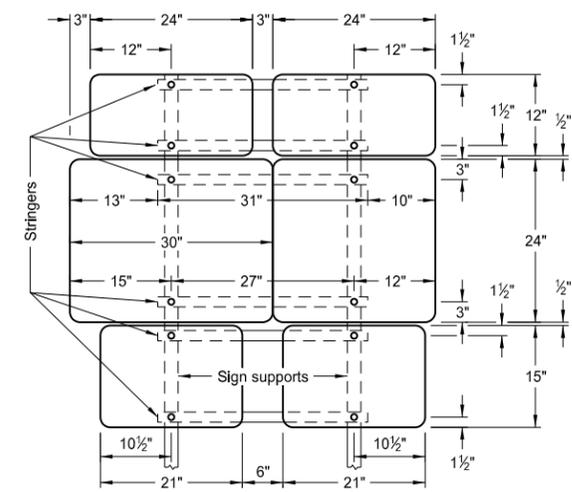
ASSEMBLY 387



3 Posts

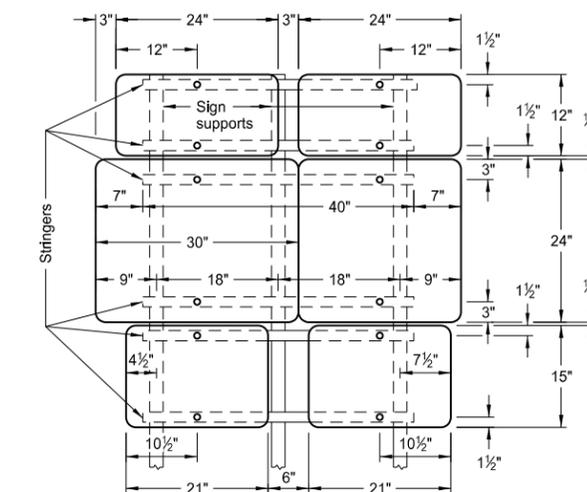


1 Post



2 Posts

ASSEMBLY 388



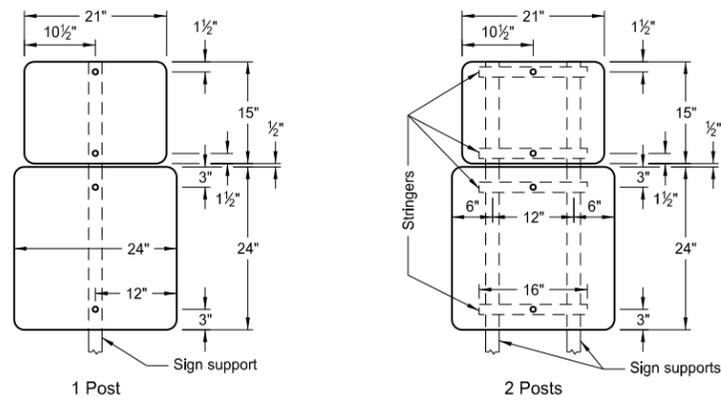
3 Posts

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE

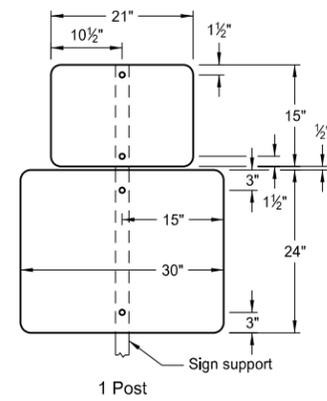
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

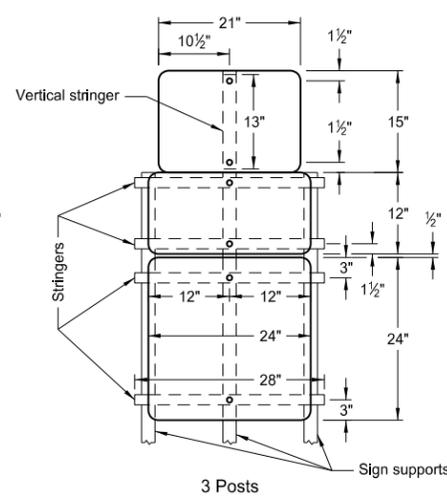
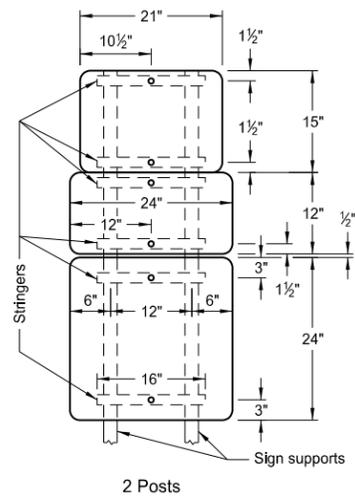
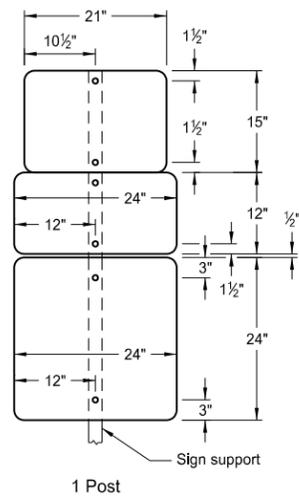
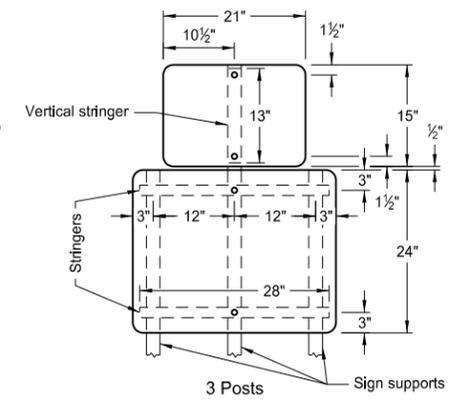
D-754-57



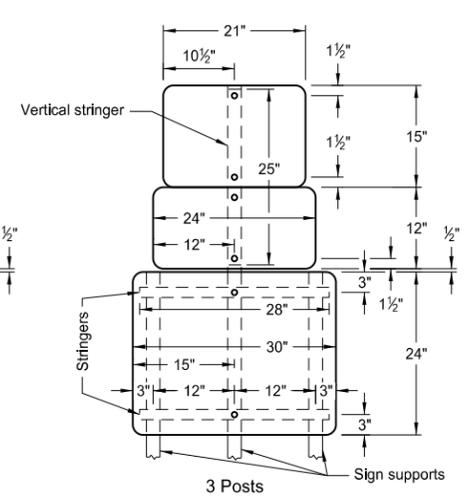
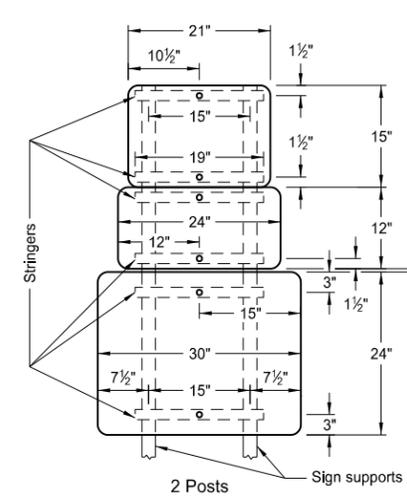
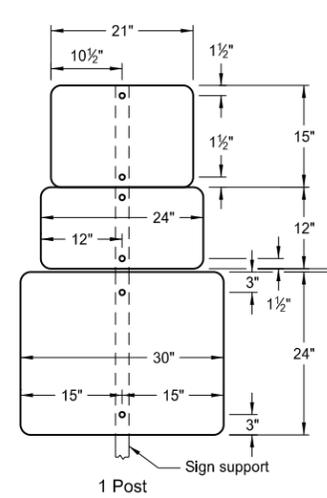
ASSEMBLY 391



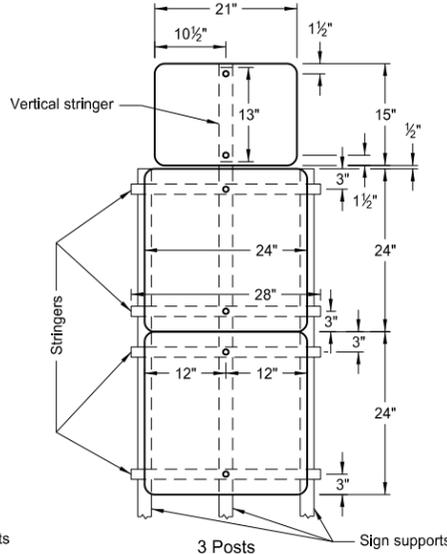
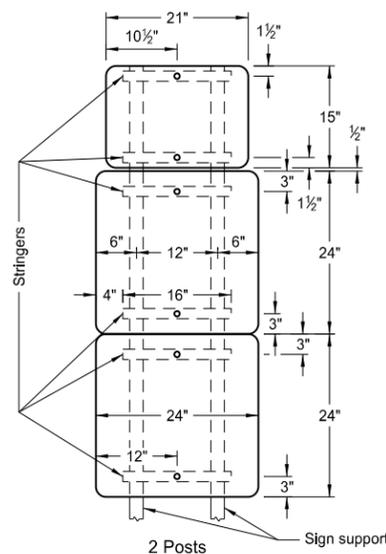
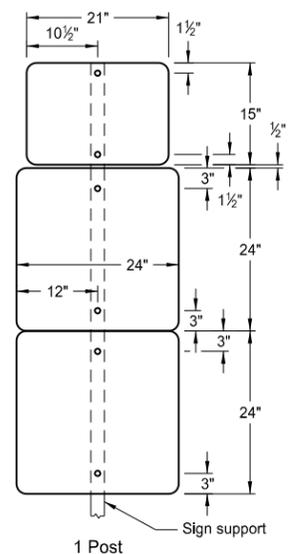
ASSEMBLY 392



ASSEMBLY 393



ASSEMBLY 394



ASSEMBLY 395

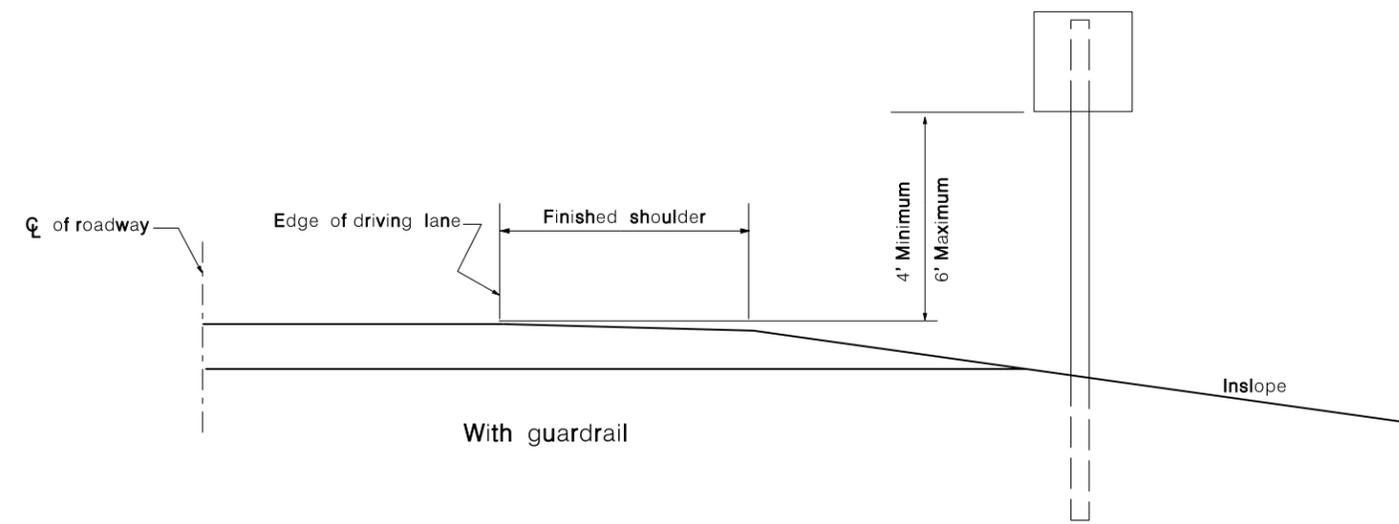
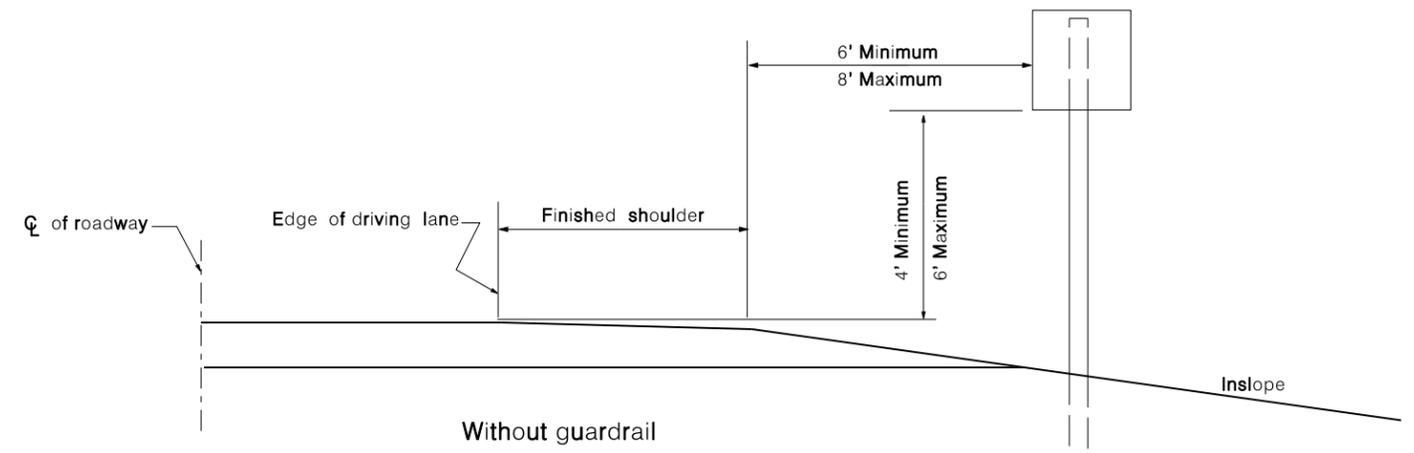
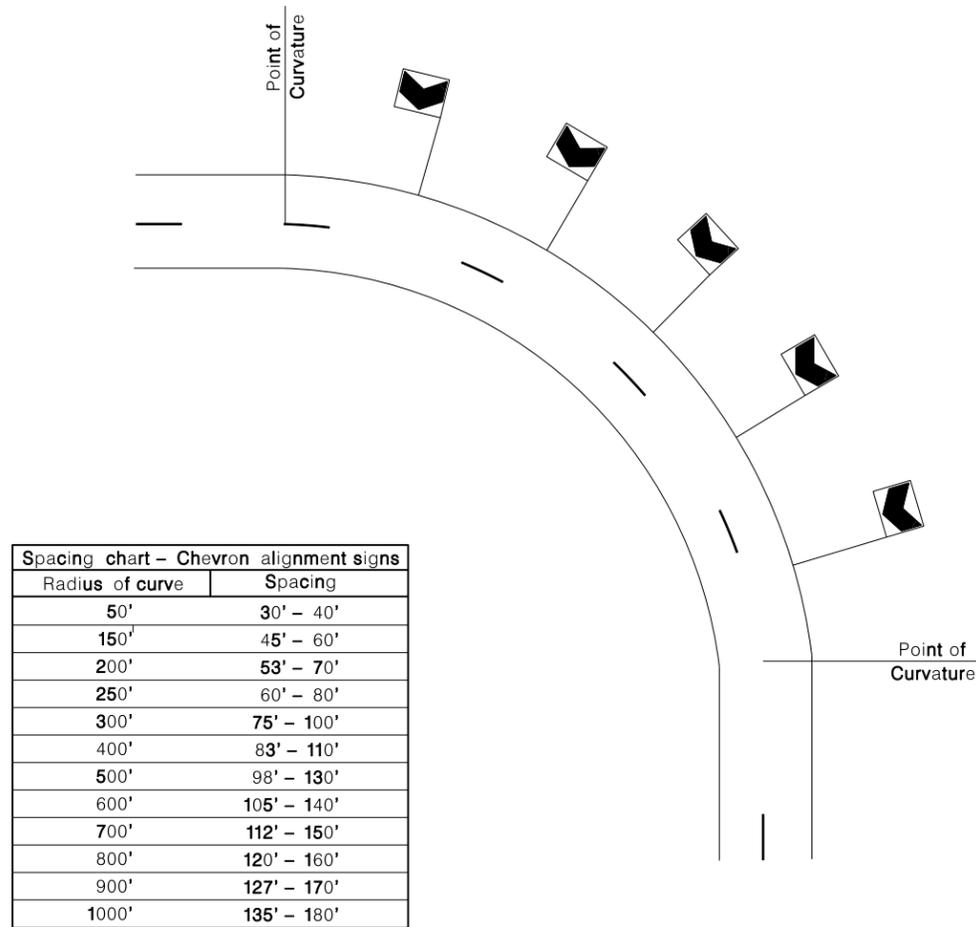
- Notes:
1. The minimum sign backing material thickness shall be 0.100 inch.
 2. Perforated square tube stringer shall be 1 1/2"x1 1/2".
 3. All holes shall be punched round for 3/8" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE

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CHEVRON INSTALLATION DETAILS
W 1-8

D-754-79



Engineering judgement & consideration of other factors such as approach speed, visibility, grade, etc. may temper the above spacing values to assure that two devices are in view of the motorist at all times.

NOTES:

ALIGNMENT: Chevrons shall be situated in line with and at right angles to approaching traffic. They shall be placed so motorists always have two in view, until the roadway alignment no longer requires them. Chevrons shall not be placed on the tangent section.

SPACING PROCEDURE:
Locate the first chevron one space into the curve from the point of curvature. (Required spacing taken from spacing chart). Repeat procedure for other direction of travel and adjust equally the spacing of intermediate signs. (for delineation in both directions). If delineation is required in only one direction, the last sign may be located one full space or any part of a space in advance of the end of the curve.

MATERIAL: All chevron sign face sheeting shall be type 3A.

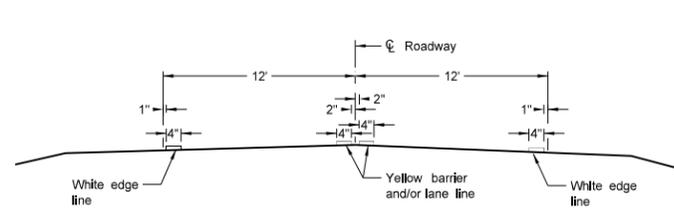
GENERAL: Chevrons shall not be attached to existing or proposed delineators or arrow boards.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
05-01-92	General revisions
06-23-03	Layout revisions
12-01-04	PE Stamp added

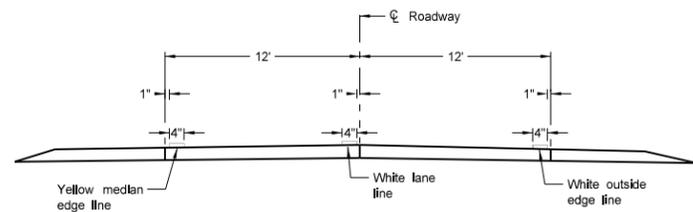
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MARK S. GAYDOS
Registration Number
PE- 4518 ,
on 12/01/04 and the original document is stored at the
North Dakota Department
of Transportation

PAVEMENT MARKING

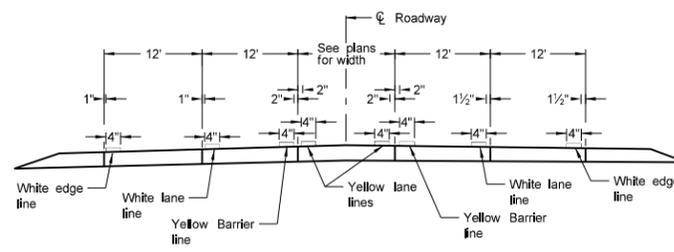
D-762-4



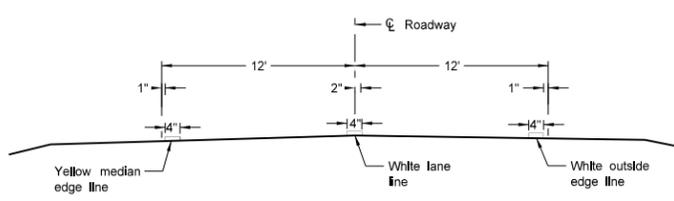
Two Lane Two Way
RURAL ROADWAY



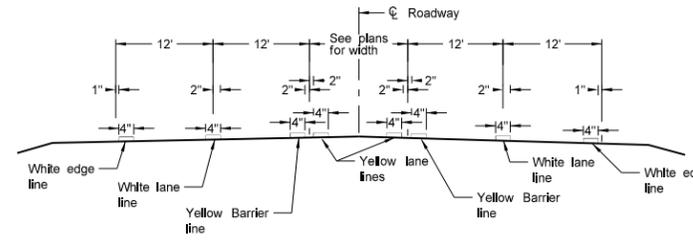
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



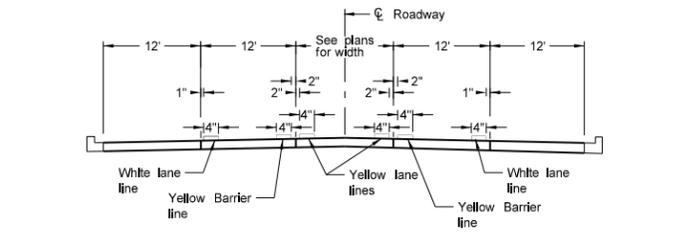
RURAL FIVE LANE ROADWAY
Concrete Section



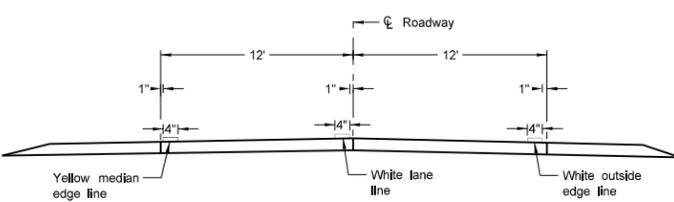
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



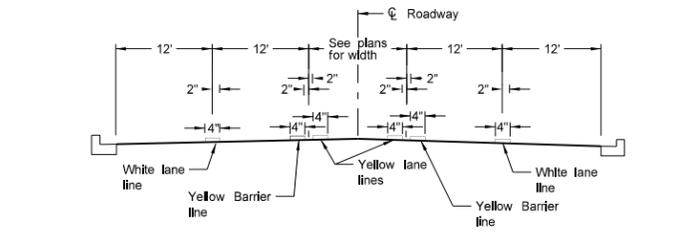
RURAL FIVE LANE ROADWAY
Asphalt Section



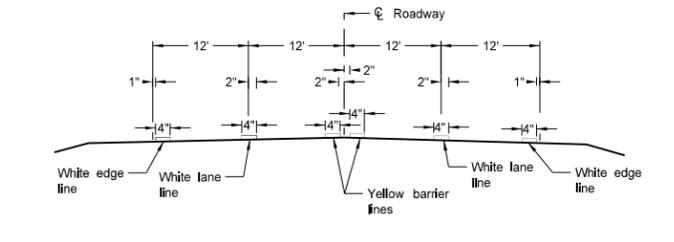
URBAN FIVE LANE SECTION
Concrete Section



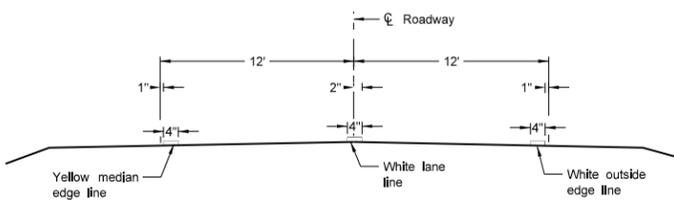
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



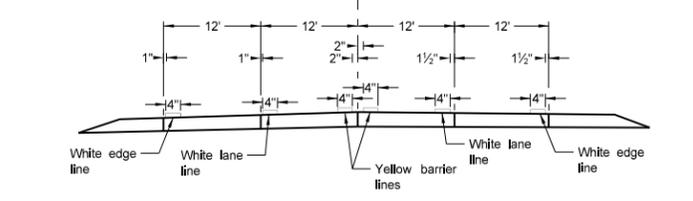
URBAN FIVE LANE SECTION
Asphalt Section



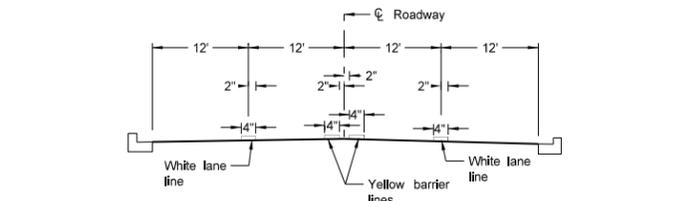
RURAL FOUR LANE ROADWAY
Asphalt Section



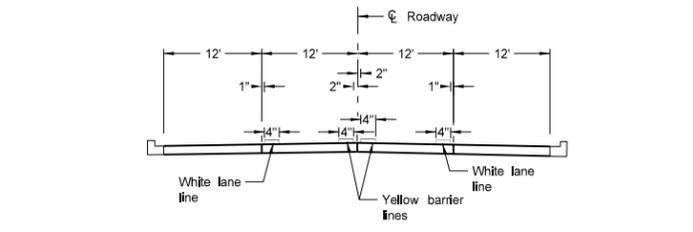
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



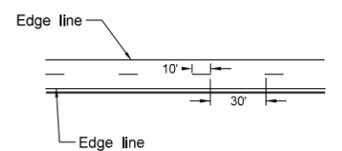
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



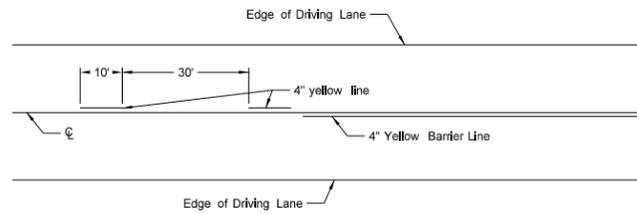
CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

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

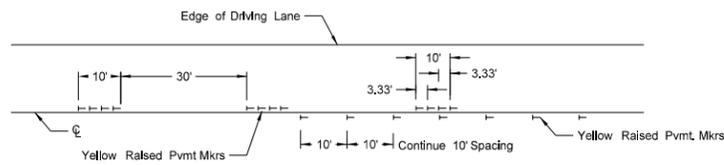
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

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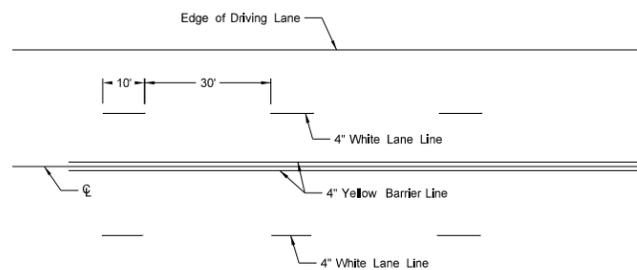
SHORT-TERM PAVEMENT MARKING



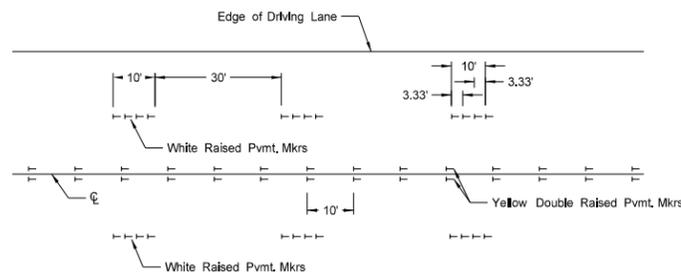
Painted or Tape Lines



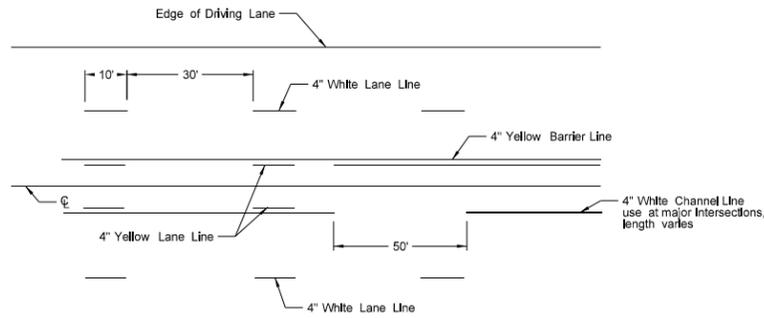
Raised Pavement Markers
TWO-LANE TWO-WAY ROADWAY



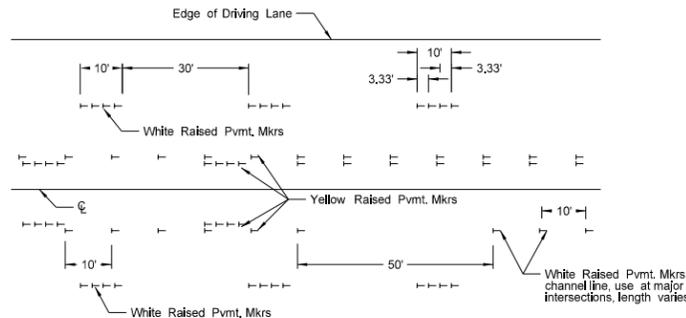
Painted or Tape Lines



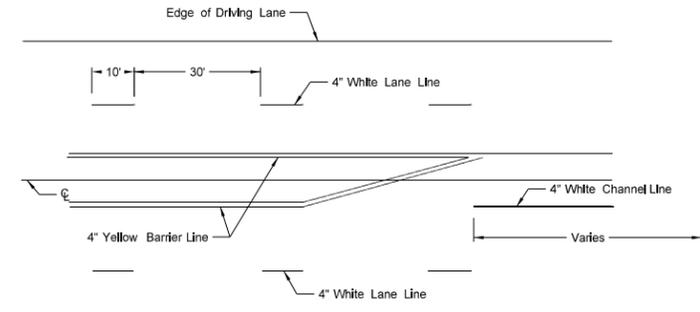
Raised Pavement Markers
FOUR LANE ROADWAY



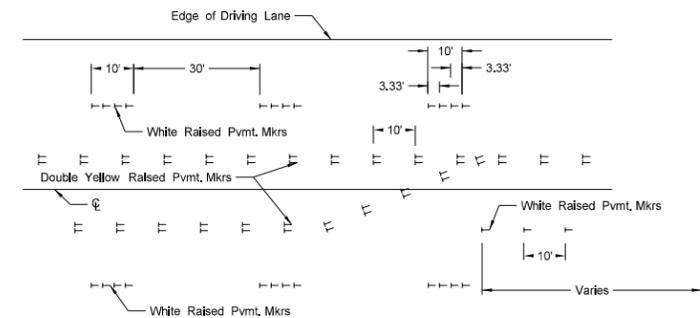
Painted or Tape Lines



Raised Pavement Markers
FIVE LANE ROADWAY TWO WAY LEFT TURN



Painted or Tape Lines



Raised Pavement Markers
FIVE LANE ROADWAY WITH MARKED ISLANDS

NOTES:

- Two-lane two-way roadways shall have no passing zones placed as shown. No passing zone signs may be placed in lieu of short term no passing zone pavement markings. These signs will be allowed to remain in place for three days, at which time the short term no passing zone pavement marking shall be placed.
- Short term center line stripe (paint) on top lift shall be carefully placed with exact spacing so that the permanent stripe will match when applied.
- Raised markers and tape markings shall be removed after permanent pavement marking has been installed. Removed markings shall become the property of the contractor.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

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