

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	Dlnt	delineate	FP	feed point
BF	back face	Co S	coal slack	Dlnt	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	DWPP	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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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

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

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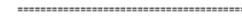
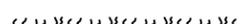
Line Styles

.....	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

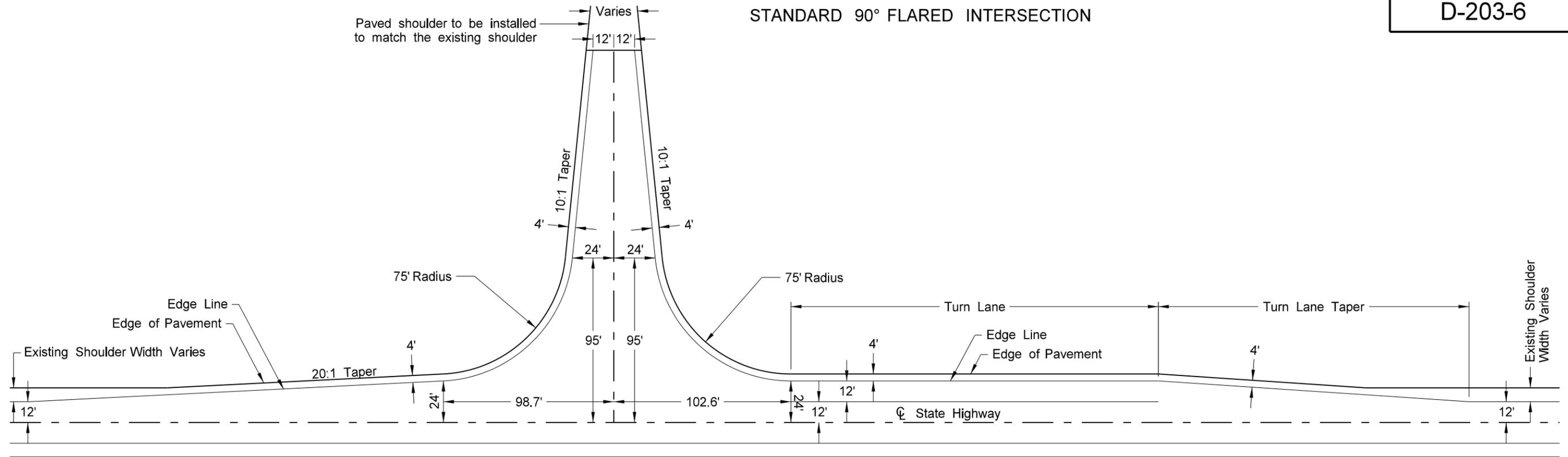
D-20-32

 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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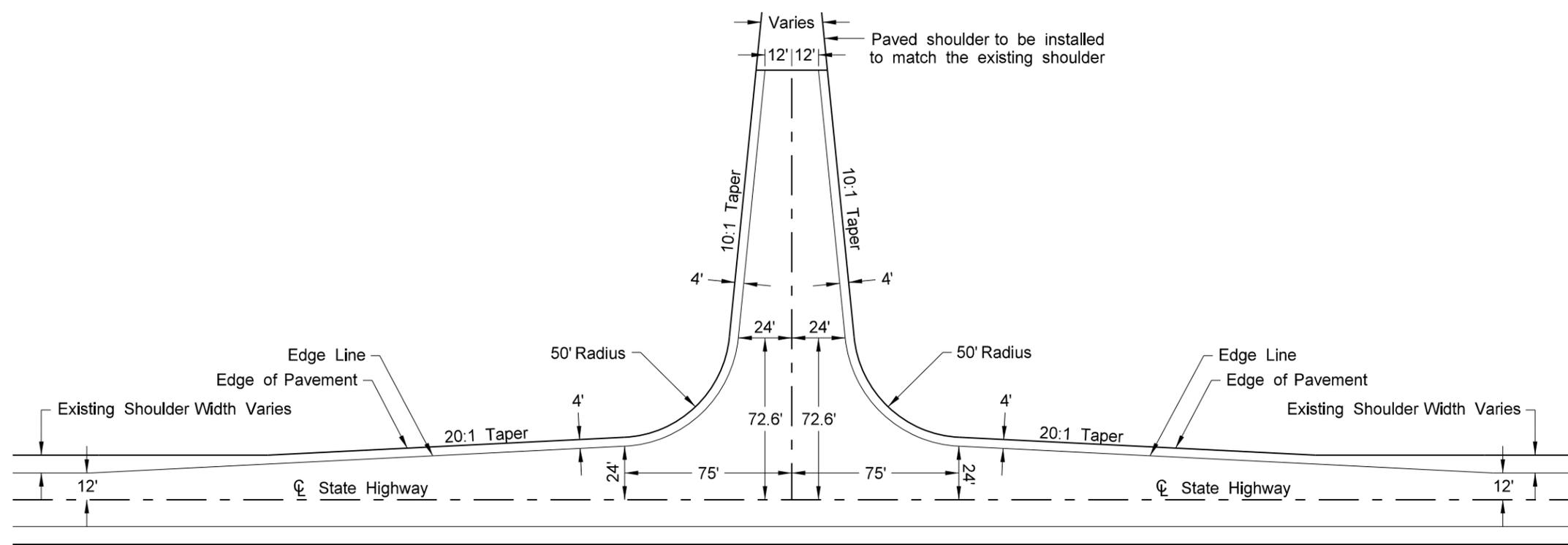
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STANDARD 90° FLARED INTERSECTION



Type B
90° Flared Intersection with Turn Lane

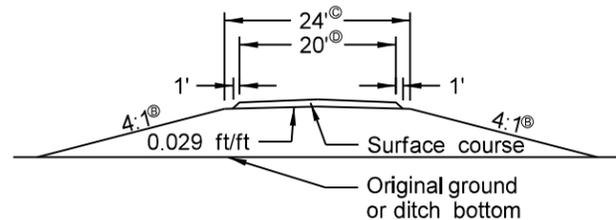
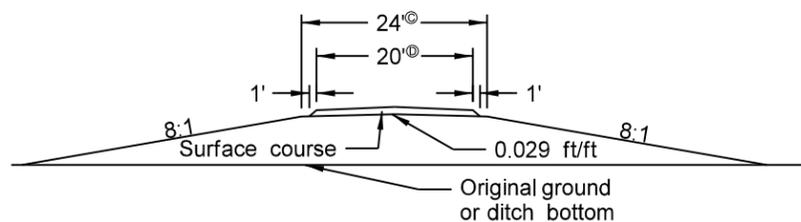
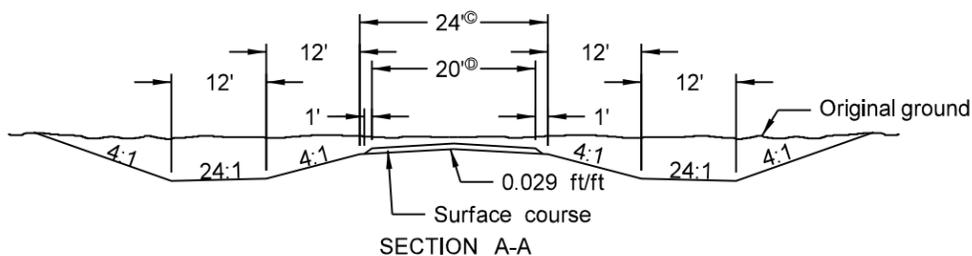
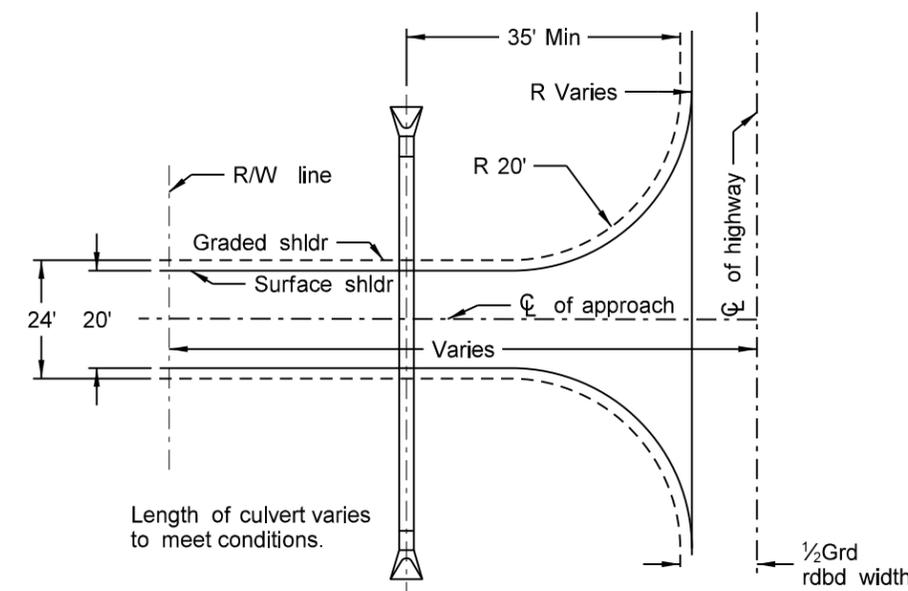
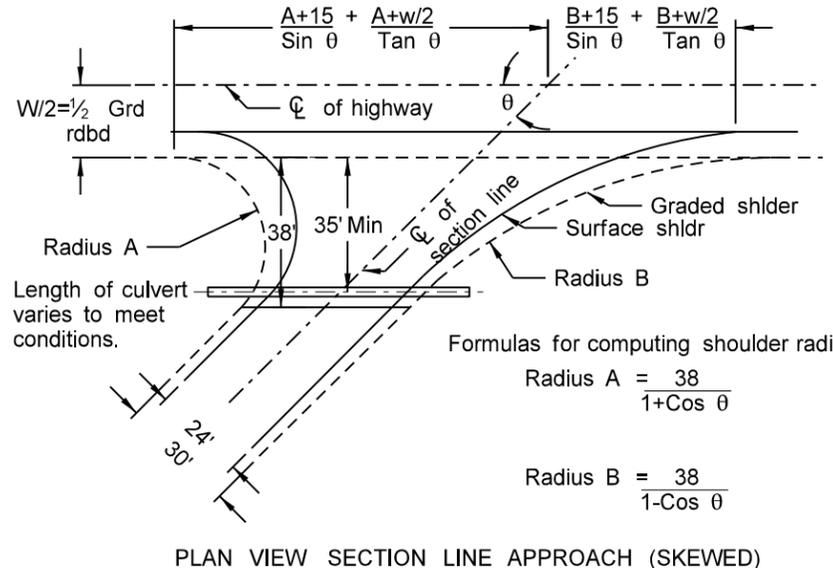
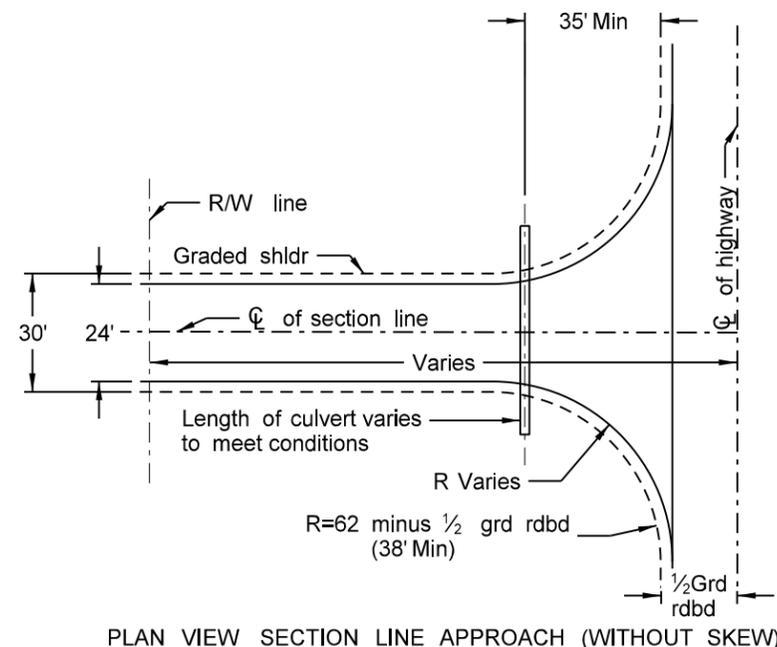


Type A
90° Flared Intersection

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5-19-09	
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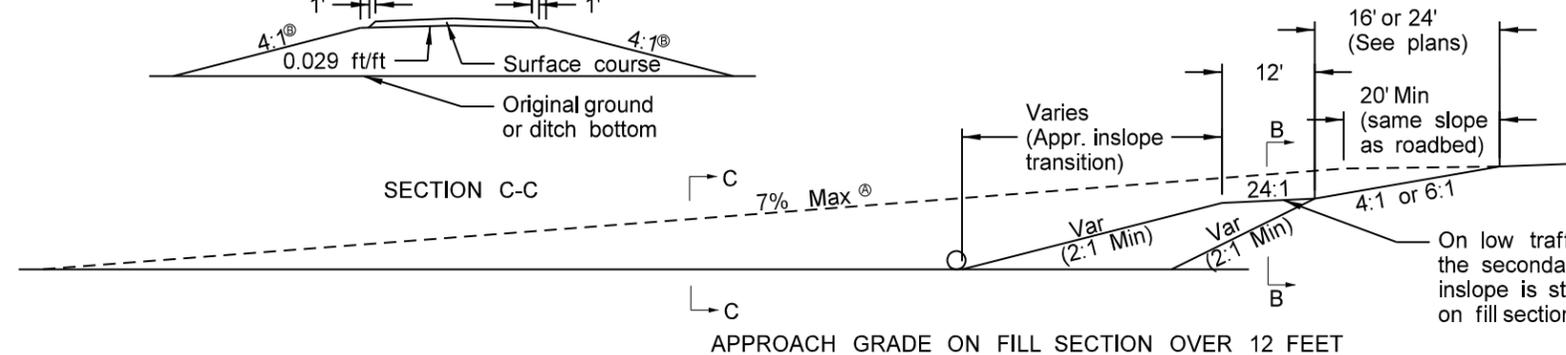
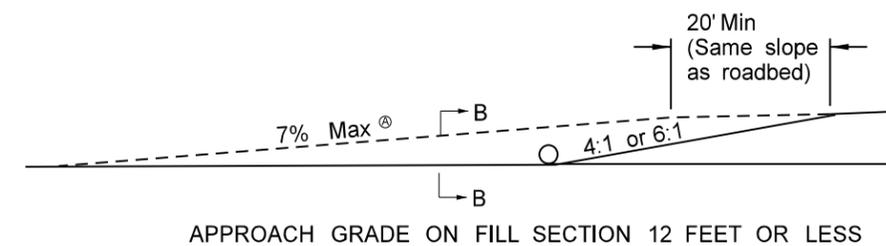
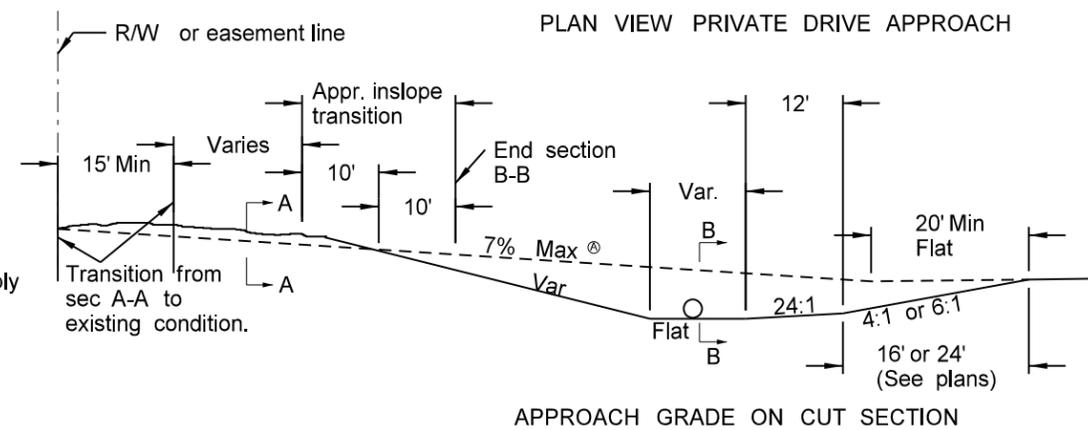
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SECTION LINE & PRIVATE DRIVE APPROACHES
(RURAL)



- NOTES:
1. Dimensions shown for surfacing are for aggregate surface course or bituminous surface constructed with grading contract.
 2. Approach grades and typical sections apply to both private drives and section line approaches.
 3. Pipes shall be installed per Manufacturer's recommendations. Deflection testing may be performed at the discretion of the Engineer.

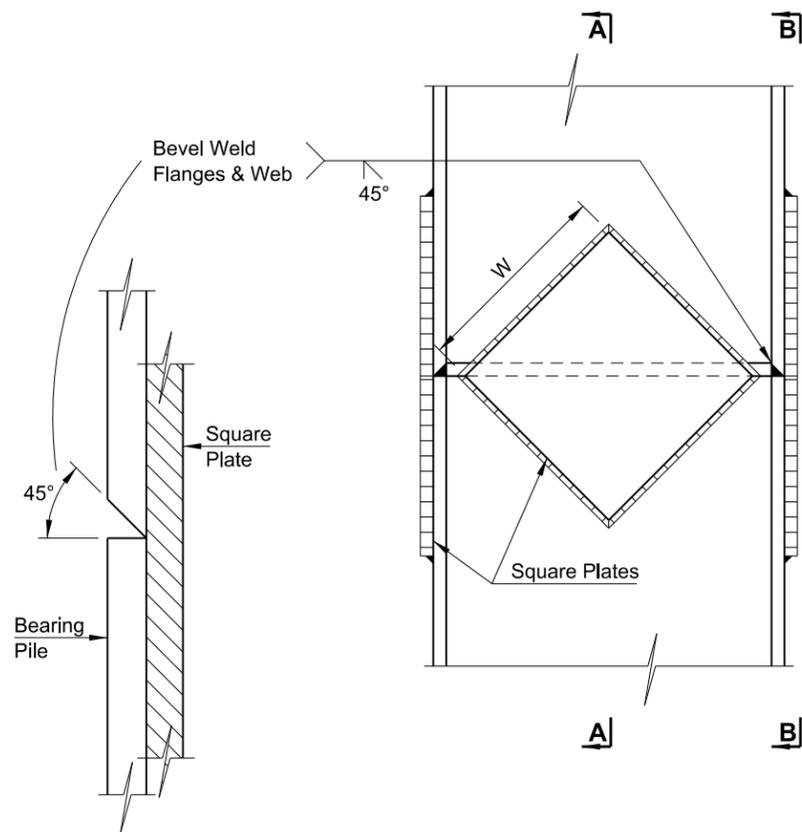
- FOOT NOTES
- (A) 10% Max on field drives
 - (B) 3:1 Slope - 20' to 30' fill
 - 2:1 Slope on fills over 30'
 - (C) 30' on sec. line approaches
 - (D) 24' on sec line approaches



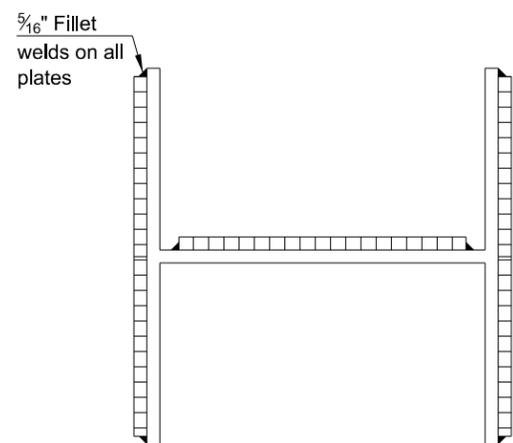
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
06-03-03	Revised roadway crown
12-01-04	PE Stamp added
04-05-06	General revisions
12-08-08	Format revisions/added Note 3

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PILE SPLICE DETAILS

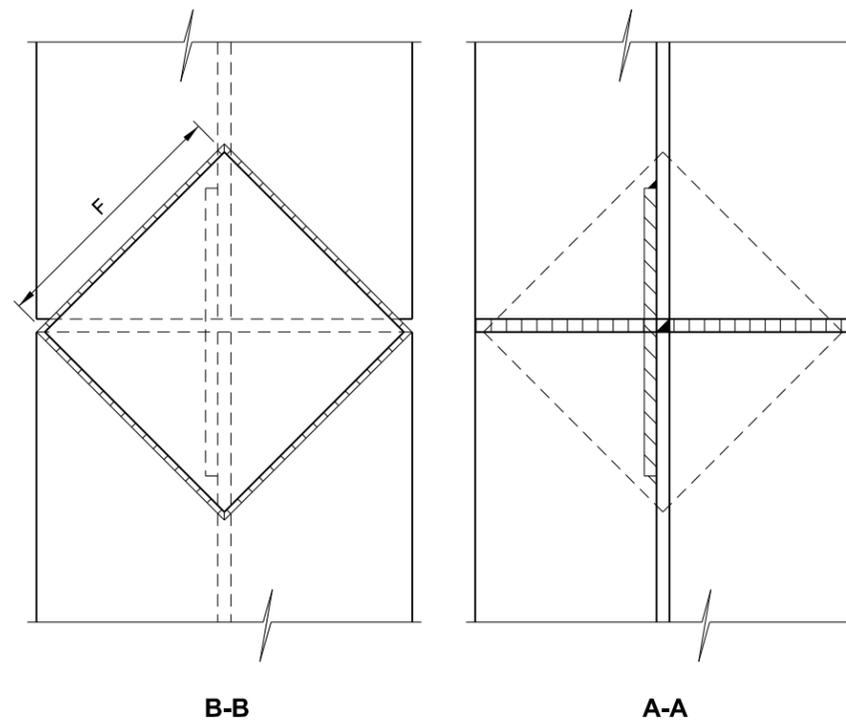


ENLARGED VIEW

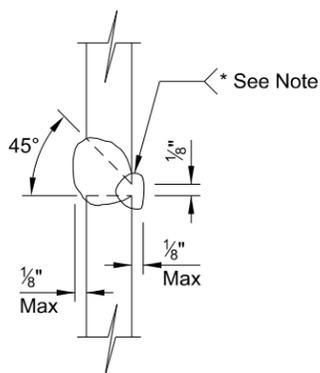


PILE	8"	10"	12"	14"
"F" FLANGE	5"	6 1/2"	8"	10"
"W" WEB	4"	5 1/2"	6 1/2"	8"

H-PILE SPLICE DETAIL



Flame scarf inside of both flanges and one side of web of upper section.



ALTERNATE H-PILE SPLICE DETAIL

NOTES:

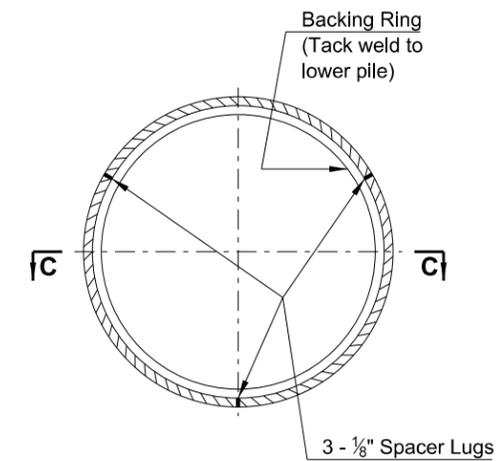
Steel H-Pile may be spliced with complete penetration groove welds in both flanges and web in lieu of using the reinforcing plates.

AWS classification E70XX Low Hydrogen Electrodes shall be used.

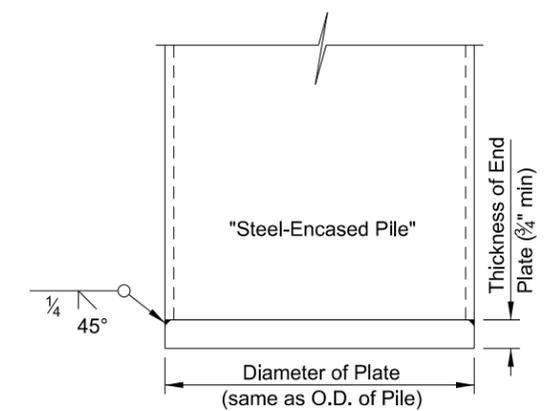
* Welds made without the use of backing material shall have the root gouged to sound metal and welded from the second side.

All welding shall conform to the current AASHTO/AWS D1.5 Bridge Welding Code.

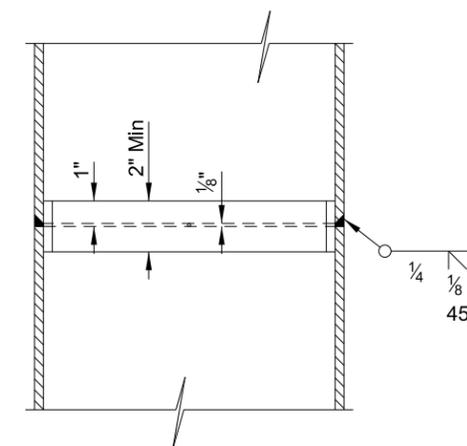
The thickness of the steel square plates shall at a minimum be as thick as the flanges and web of the pile being spliced.



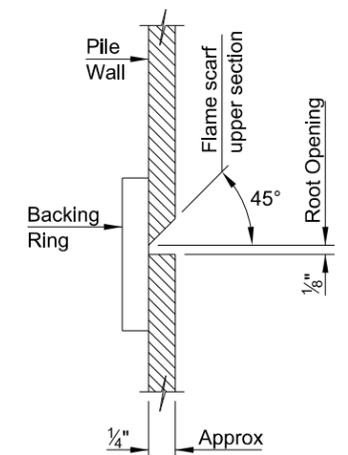
Backing Ring may be made from pile cut-offs or other material of a like quality.



END PLATE DETAIL



STEEL-ENCASED CONCRETE PILE SPLICE DETAIL

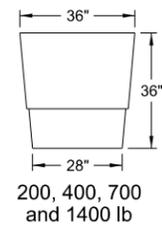
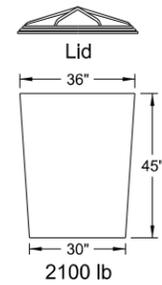


ENLARGED VIEW

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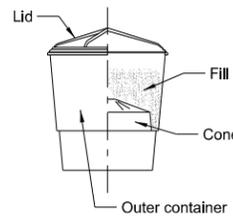
ATTENUATION DEVICE



Outer Containers

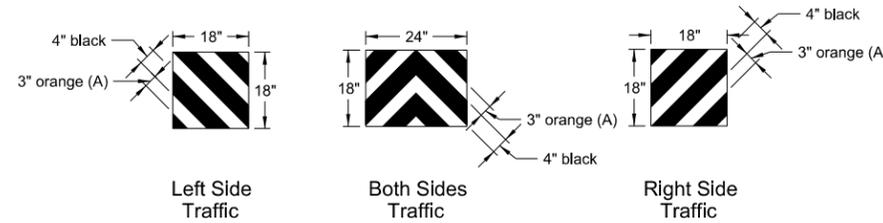


Cones



Typical Assembly

Typical Module Construction Detail

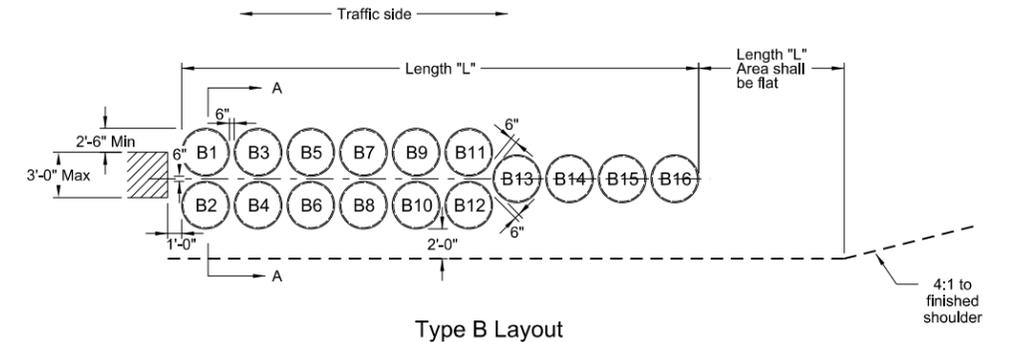


Reflective Sheet Detail

Note:
The last attenuation device facing traffic shall have a reflective sheet, following the details above, directly applied to the outer container. The sheet may also be applied to a metallic sheet and attached to the container with approved fasteners. The reflective sheeting shall be Type III C as specified in NDDOT Standard Specifications.

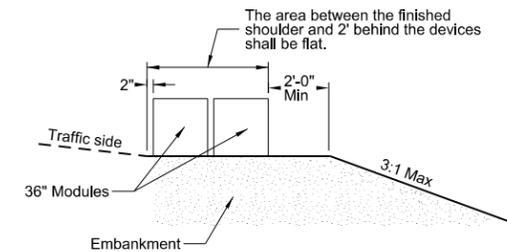
(A) 3" orange sheeting shall be used for temporary installations, and 3" yellow sheeting shall be used for permanent installations.

	Fill Chart				
	Module Weights (LBS)				
Distance from top edge	200	400	700	1400	2100
	8 1/2"	5"	4"	3"	0"



Type B Layout

Note:
When attenuation devices are placed at piers offset from roadway, they shall be angled 10 degrees towards traffic.



Section A-A (Type B Layout)

Type B Attenuation Device												
Module Number	Dash Number											
	75	70	65	60	55	50	45	40	35	30	25	
Module Weights (LBS)												
B1	2100											
B2	2100											
B3	2100	2100	2100	2100	2100	2100	2100	2100	2100			
B4	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100		
B5	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B6	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B7	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B8	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B9	700	700	700	700	700	700	700	700	700	700	700	700
B10	700	700	700	700	700	700	700	700	700	700	700	700
B11	700	700	700	700	700	700	700	700	700	700	700	700
B12	700	700	700	700	700	700	700	700	700	700	700	700
B13	700	700	700	700	700	700	700	700	700	700	700	700
B14	400	400	400	400	400	400	400	400	400	400	400	400
B15	400	400	400	400	400	400	400	400	400	400	400	400
B16	200	200	200	200	200	200	200	200	200	200	200	200
Length (L)	34.2'	30.7'	30.7'	30.7'	30.7'	30.7'	30.7'	30.7'	30.7'	27.2'	27.2'	
Module Weights (LBS)	Replacement Module											
2100	1	1	1	1	1	1	1	1	1	1	1	
1400	1	1	1	1	1	1	1	1	1	1	1	1
700	2	2	2	2	2	2	2	2	2	2	2	2
400	1	1	1	1	1	1	1	1	1	1	1	1
200	2	2	2	1	1	1	1	1	1	1	1	1

Notes:

- Materials
 - A) Modules shall be manufactured from a frangible polyethylene material which will shatter upon impact.
 - B) Modules shall be filled with class 43 aggregate meeting the requirements for aggregate according to NDDOT Standard Specifications. The fill unit weight shall be at least 100 pounds per cubic foot. Fill left over winter shall have a moisture content of 2% or less.
- Modules
 - The modules shall be provided in two sizes to contain volumes of either 2, 4, 7, 14, or 21 cubic feet as a minimum.
 - A) The module for the 2, 4 or 7 cubic foot container shall consist of three components:
 - 1) A 14 C.F., yellow outer container.
 - 2) A black lid which locks securely over the top lip of the container.
 - 3) A cone-shaped supporting insert. The insert shall be varied to allow for the three sizes of modules and capable of supporting 200, 400, or 700 pounds of sand mass. The cone inserts shall be placed inside the 14 cubic foot container.
 - B) The module for the 21 cubic foot container shall consist of two components:
 - 1) A 36" height X 36" width yellow outer container.
 - 2) A black lid which locks securely over the top of the container.
- For temporary use: The modules shall be Energite or Fitch attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, Traffix barrels manufactured by Traffix Devices, Inc. of San Clemente, CA, or an approved equal. The attenuation devices may be placed on pallets to facilitate maintenance. Pallets shall have a maximum thickness of 1/8".
- For permanent use: Barrel Attenuation Device installations, the outer sand container portion of the modules shall consist of a one-piece container with separate detachable lid. The modules which meet these requirements are Energite attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, Traffix barrels manufactured by Traffix Devices, Inc. of San Clemente, CA, or an approved equal. Modules having outer sand containers assembled from multiple pieces shall not be accepted for permanent installations.
- The Typical Module Construction Detail and Type B Layout are based on the Energite Crash Cushion manufactured by Energy Absorption. The manufacturer of other sand filled attenuation modules shall provide any necessary layouts and details required which differ from those shown here.

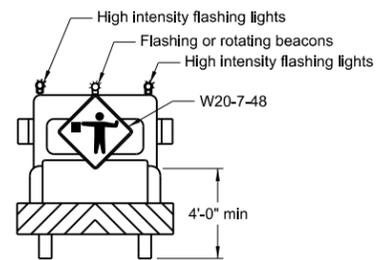
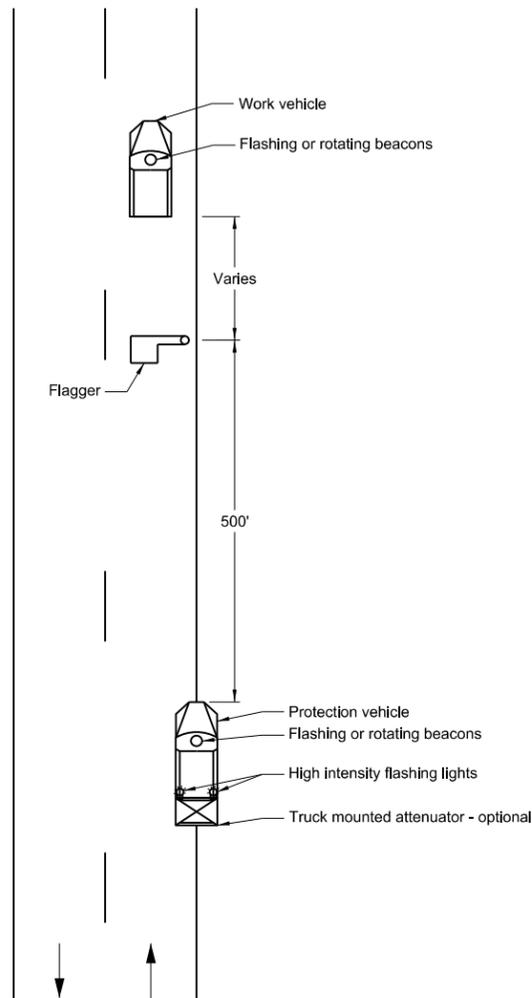
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TRAFFIC CONTROL FOR CORING OF HOT BITUMINOUS PAVEMENT

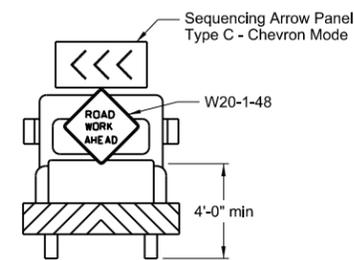
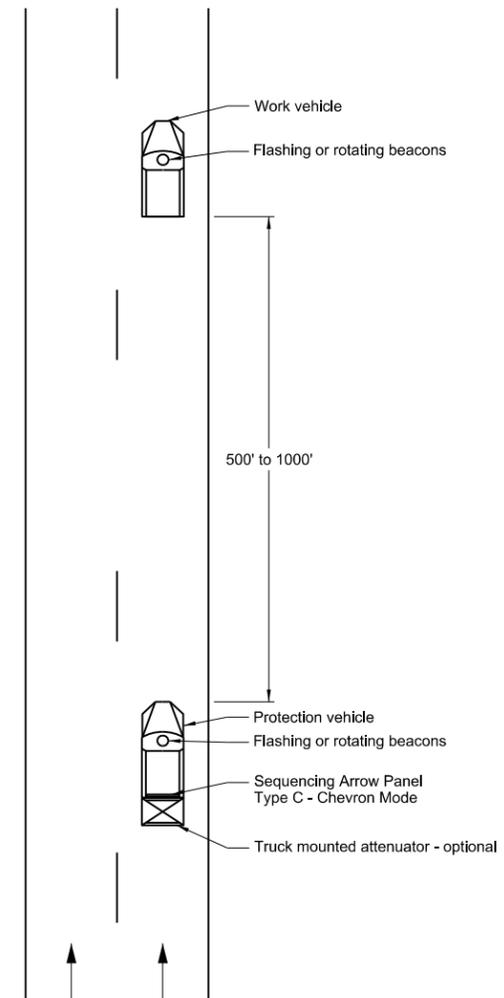
D-704-2

Two Lane, Two Way Roadways



Typical Protection Vehicle

Multilane Roadways



Typical Protection Vehicle

Notes:

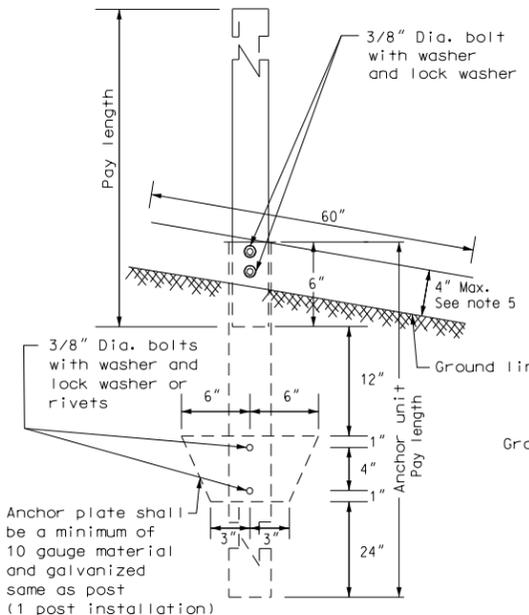
1. The working vehicle shall display a 360 degree rotating, flashing, oscillating or strobe light.
2. The shadow vehicle shall display a 360 degree rotating, flashing, oscillating or strobe light. The shadow vehicle for Multilane Roadway shall also have a sequencing arrow panel Type C operated in the 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.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
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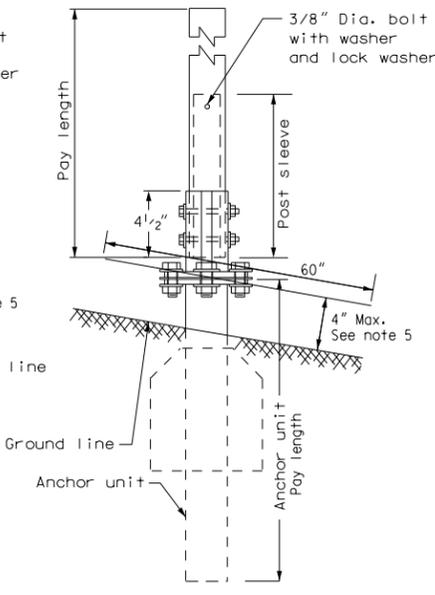
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BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

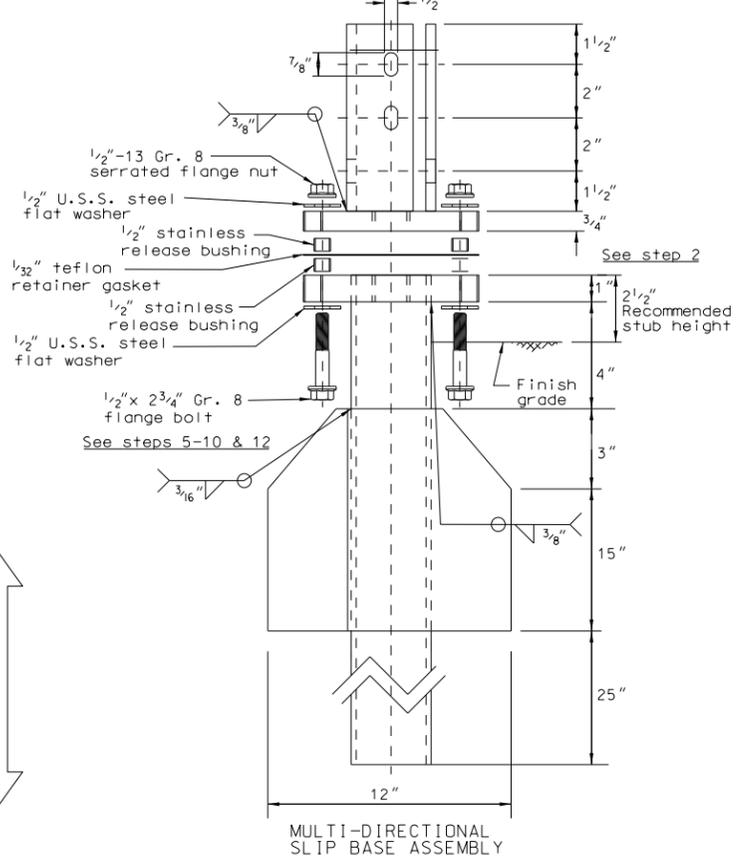
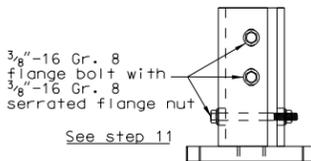
PERFORATED TUBE



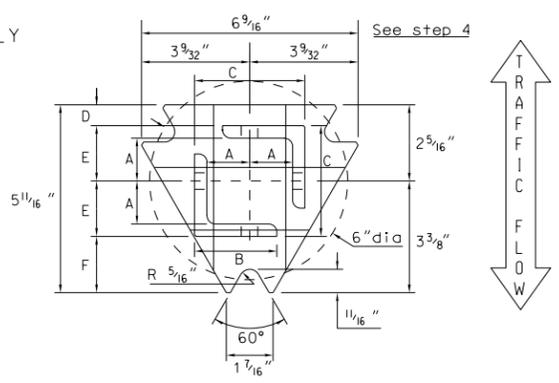
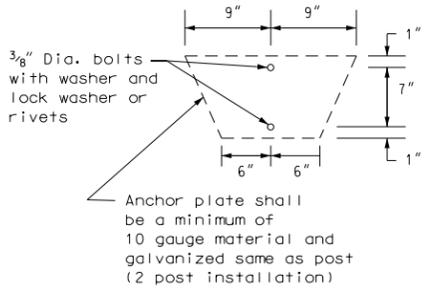
ANCHOR UNIT AND POST ASSEMBLY



SLIP BASE ANCHOR UNIT AND POST SLEEVE ASSEMBLY



MULTI-DIRECTIONAL SLIP BASE ASSEMBLY

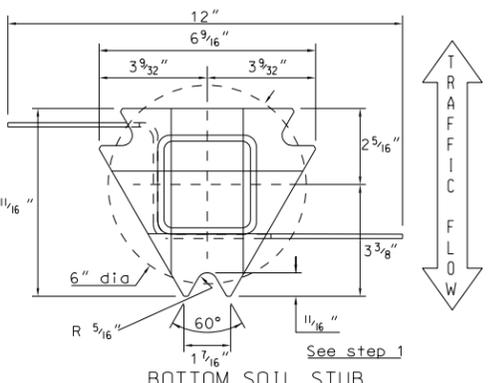


TOP POST RECEIVER

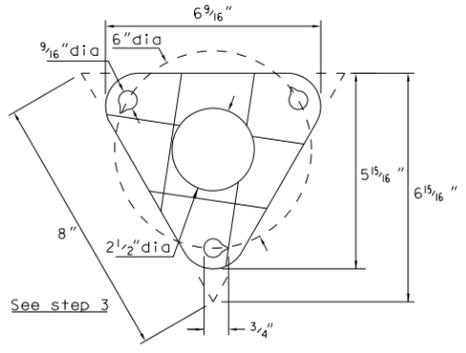
Materials: Plate - ASTM A572 grade 50
 Angle receiver - 2 1/2" x 2 1/2" x 3/8" ASTM A36 structural angle

TOP POST RECEIVER DATA TABLE						
Square Post Sizes	A	B	C	D	E	F
2 3/16" x 10 Ga. Square Post	1 9/64"	2 1/2"	3 1/32"	2 3/32"	1 33/64"	1 7/8"
2 1/2" x 10 Ga. Square Post	1 9/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"

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



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



BOLT RETAINER FOR BASE CONNECTION
 Materials: 1/2" reprocessed Teflon

- Notes
- Slip base bolts shall be torqued as specified by the manufacturer.
 - The 2 3/16" size 10 gauge is shown as 2.19" size on the plans. The 2 1/2" size 10 gauge is shown as 2.51" size on the plans.
 - Anchor for 2", 2 1/4", and 2 1/2" posts.
 - 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 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.
 - 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.
 - When used in concrete sidewalk, anchor shall be the same except without the wings.
 - Four post signs shall have over 8' between the first and fourth posts.

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", 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.

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" 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" flat washer on to 1 each inverted 1/2"-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"-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", not to exceed beyond bottom edge of sign).
11.	Secure posts into receivers using 3 each 3/8"-16 gr. 8 flange bolts and 3 each 3/8"-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"-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.

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

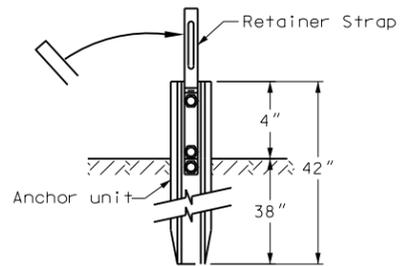
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-21-02	
REVISIONS	
DATE	CHANGE
12-01-04	PE stamp added

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BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

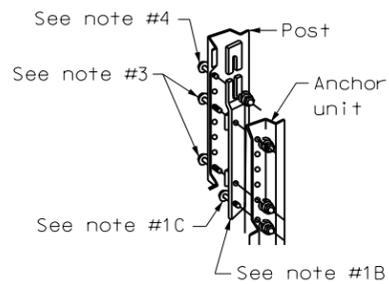
FLANGED CHANNEL



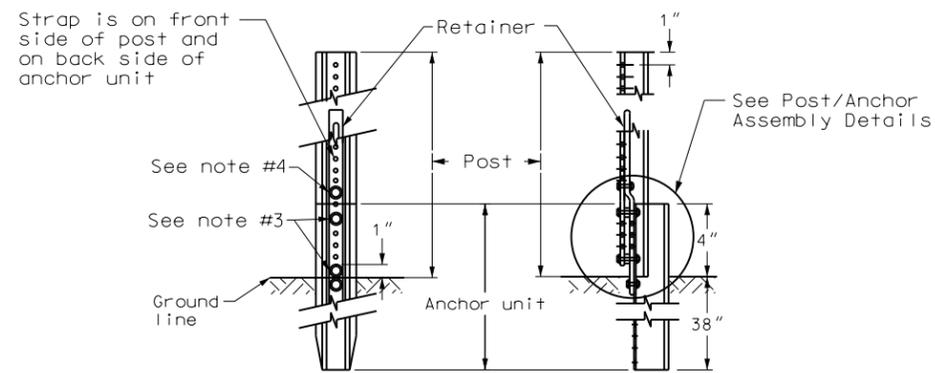
Anchor Unit & Strap Assembly Detail

STEPS OF INSTALLATION

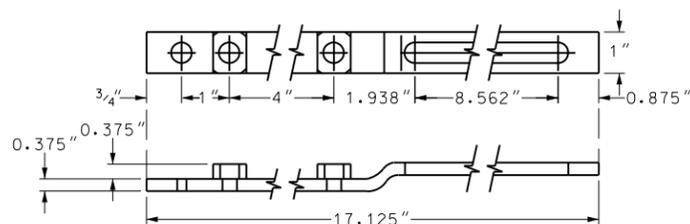
1. A) Drive anchor unit to within 12" of ground level.
B) Proper assembly established by lining up the top 3/4" slot of retainer spacer strap with top hole of anchor unit.
C) Assemble strap to back of anchor unit using 3/8"-16 UNC x 2.0" long bolt, lock washer and nut.
D) Rotate strap 90° to left.
2. 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



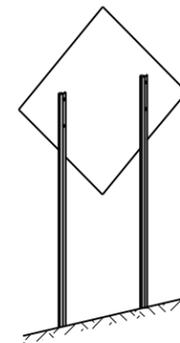
Front View Side View Sign Post Assembly Detail



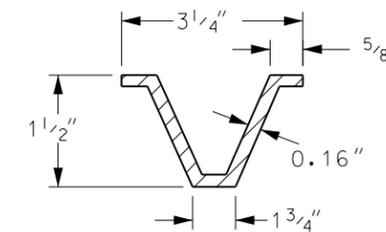
Retainer/Spacer Strap Detail

CHANNEL SIZE IN.	WALL THICKNESS IN.	WEIGHT PER FOOT LBS.	MOMENT OF INERTIA IN. 4	CROSS SECT. AREA IN. 2	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



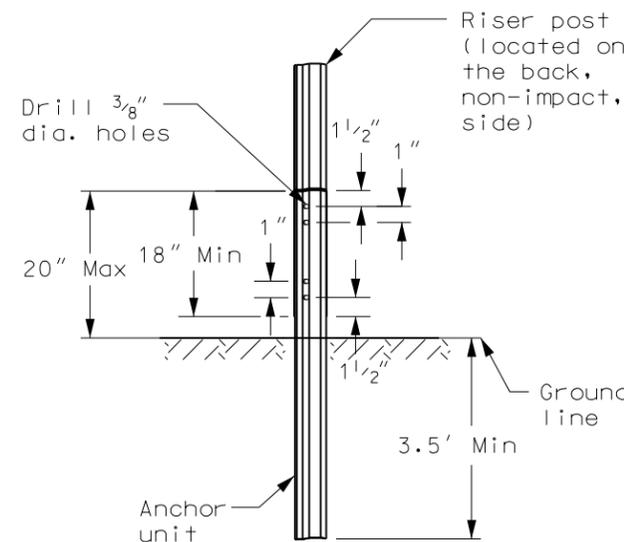
Typical Installation



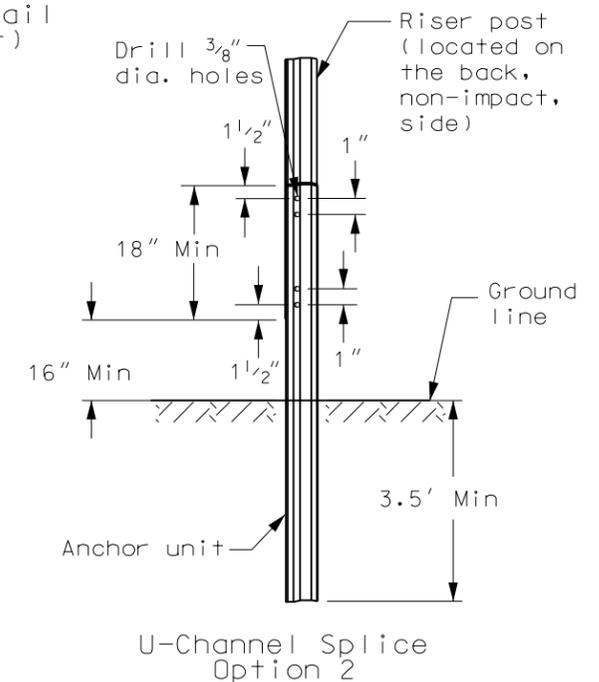
U-Post Detail (3 lb/ft)

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'.



U-Channel Splice Option 1



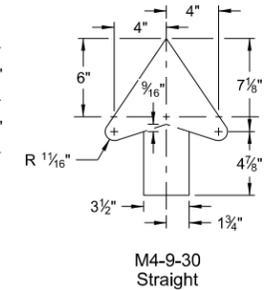
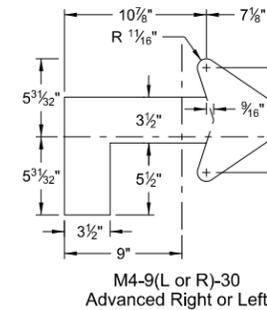
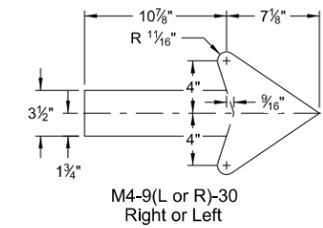
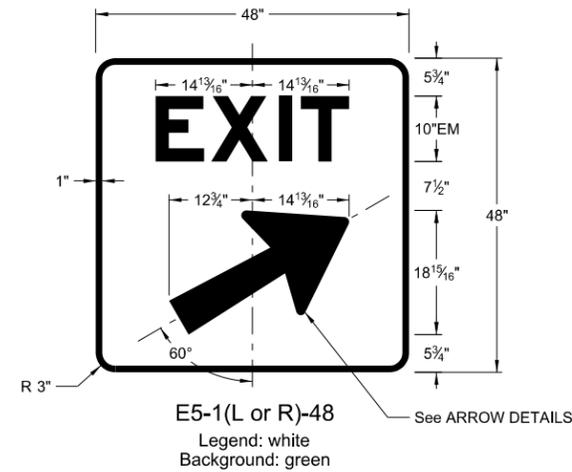
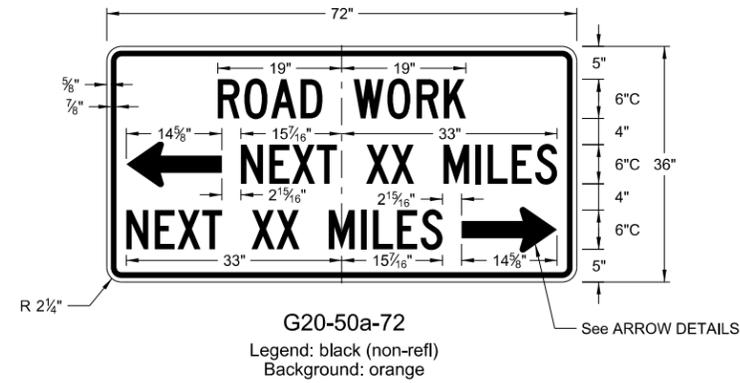
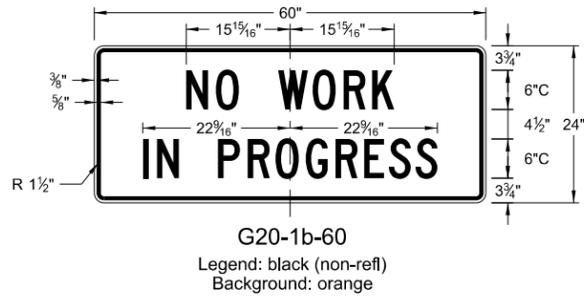
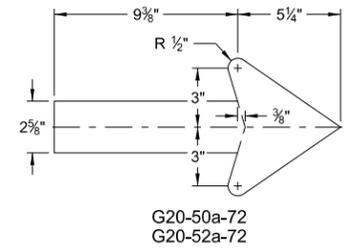
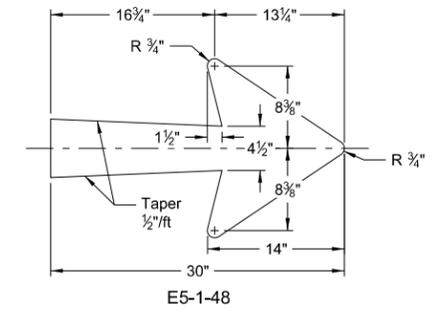
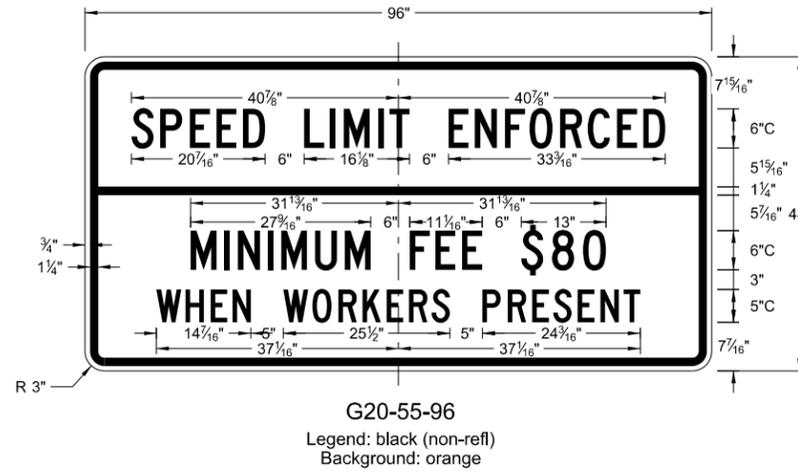
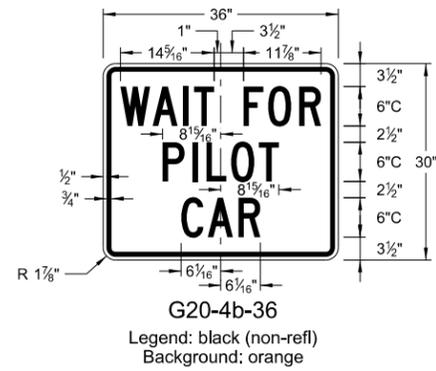
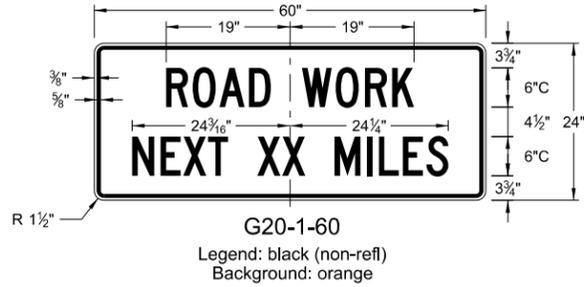
U-Channel Splice Option 2

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

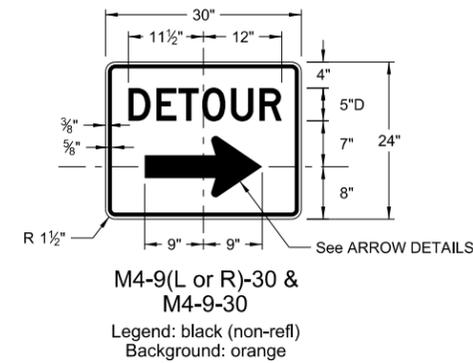
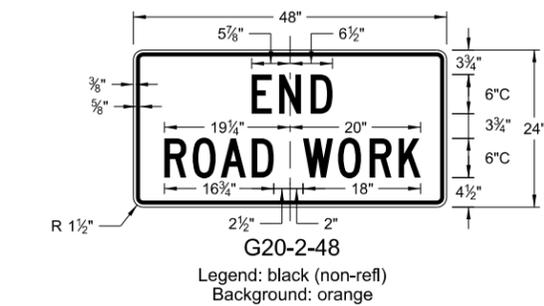
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CONSTRUCTION SIGN DETAILS
 TERMINAL AND GUIDE SIGNS

D-704-9



ARROW DETAILS



NOTES:

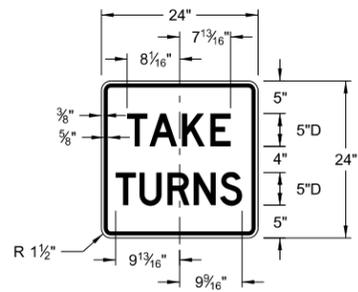
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

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

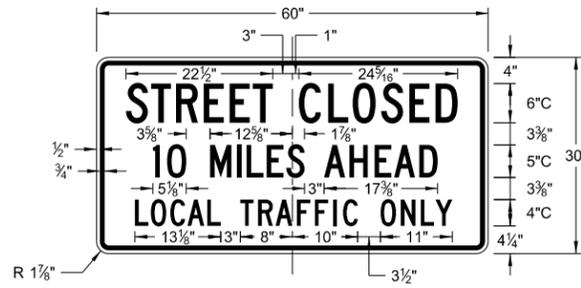
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CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS

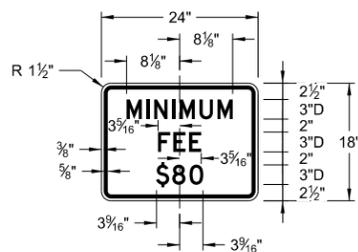
D-704-10



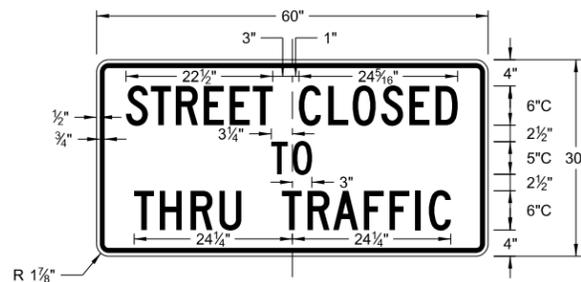
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R2-1a-24
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R11-4a-60
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R11-2a-48
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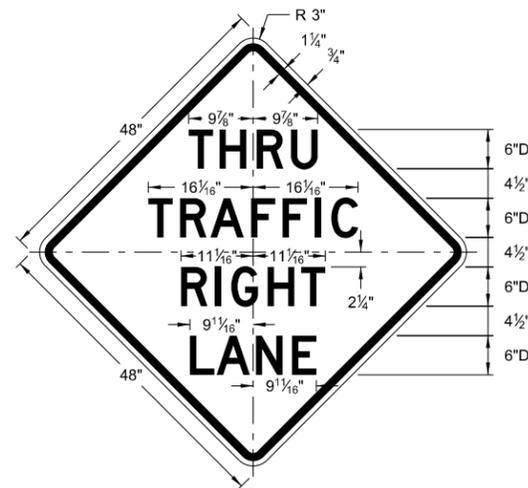
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE

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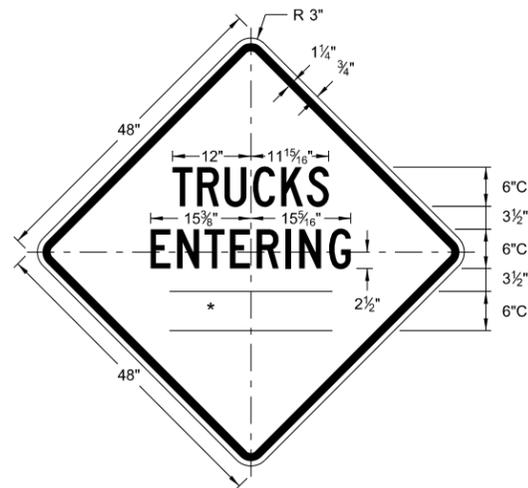
CONSTRUCTION SIGN DETAILS
WARNING SIGNS

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

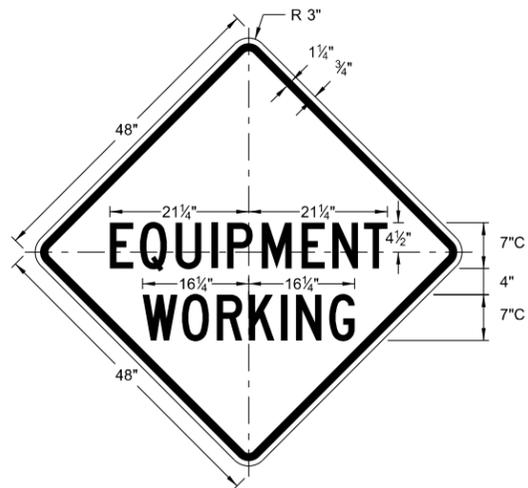
* DISTANCE MESSAGES



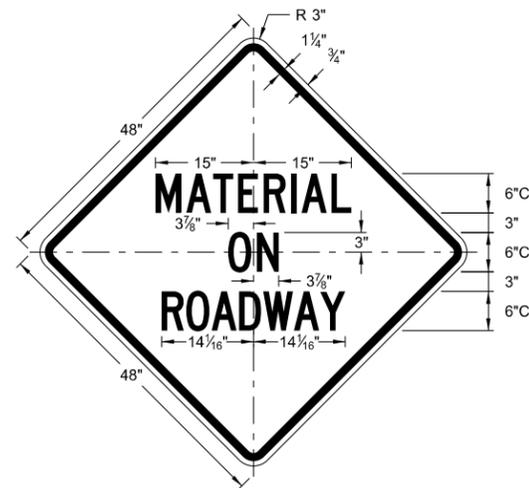
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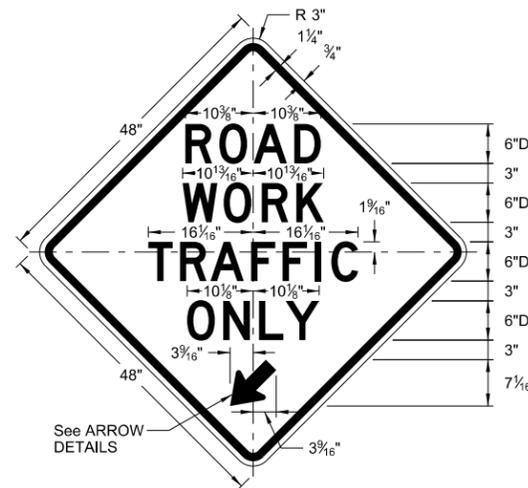
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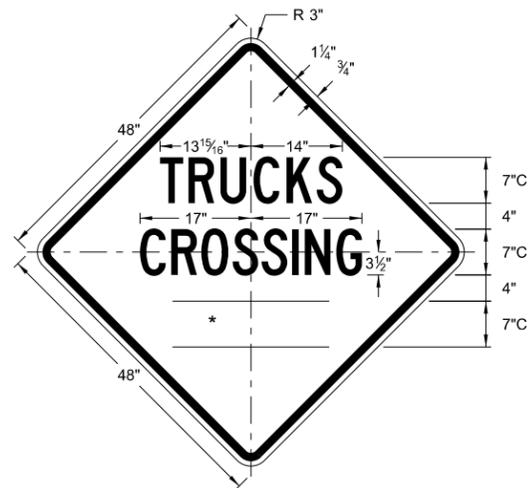
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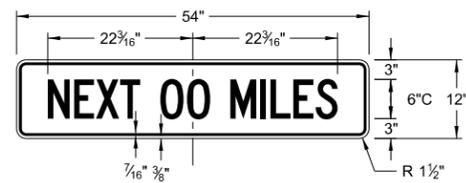
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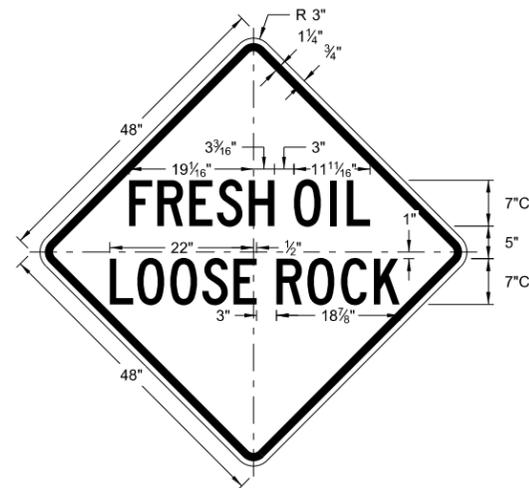
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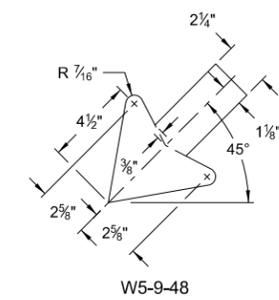
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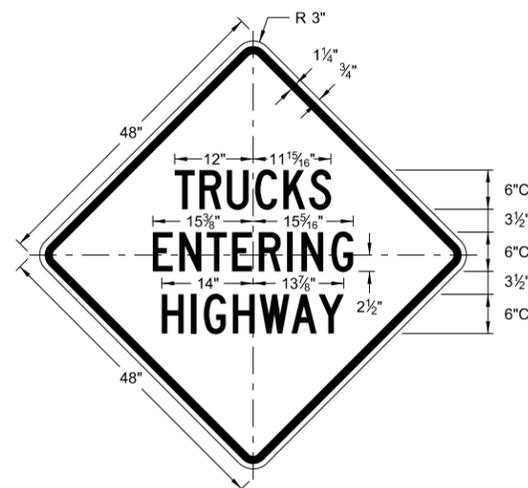
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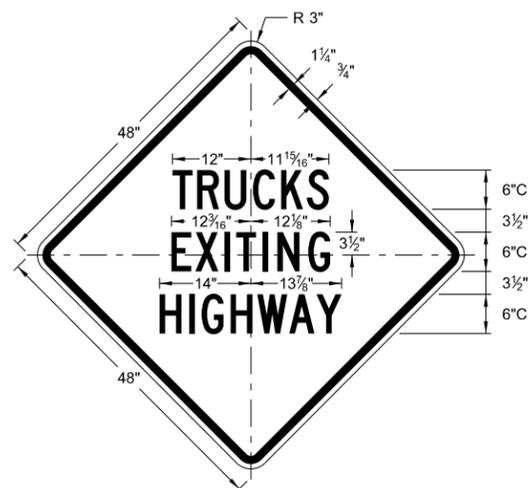
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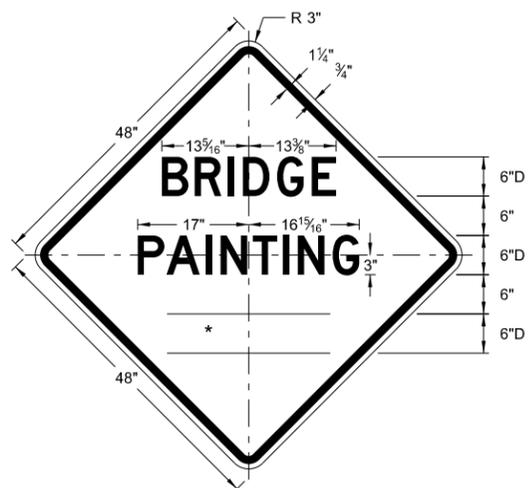
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ARROW DETAILS



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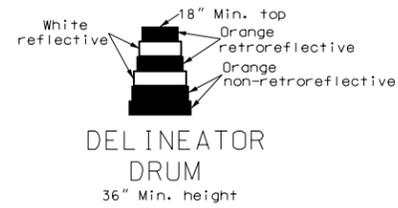
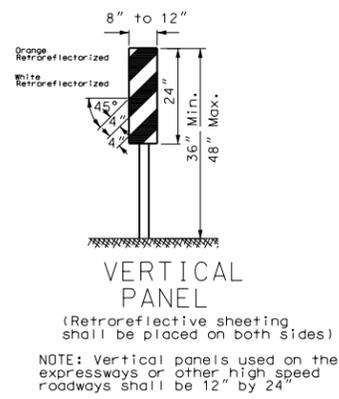
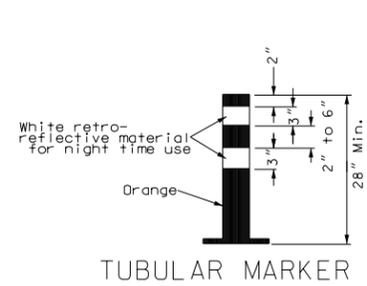


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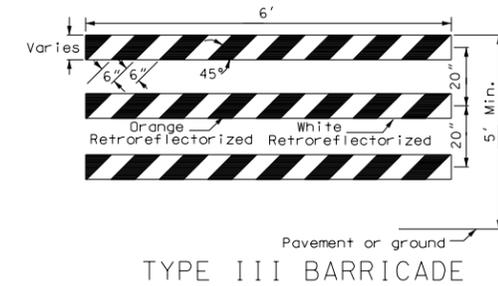
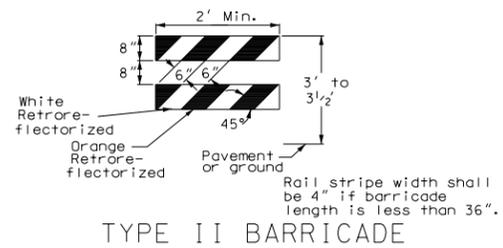
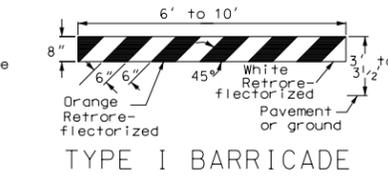
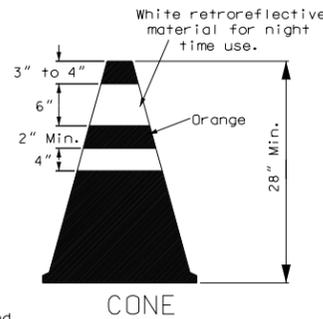
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8-13-13	
REVISIONS	
DATE	CHANGE

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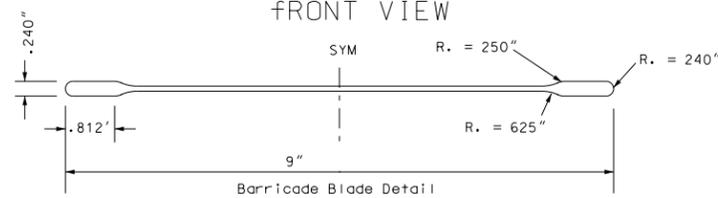
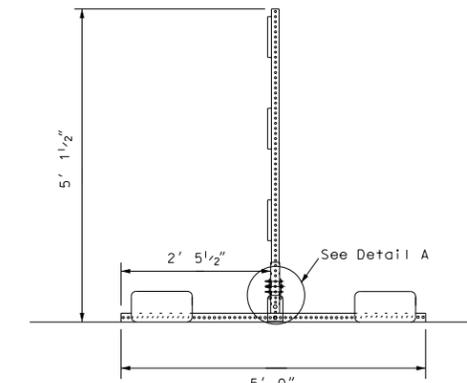
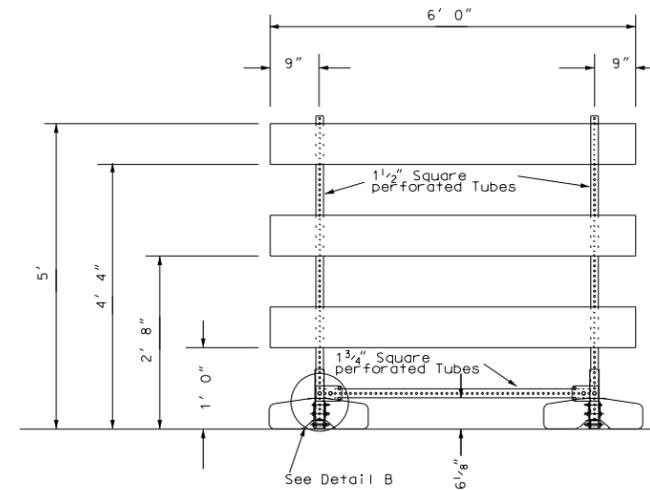
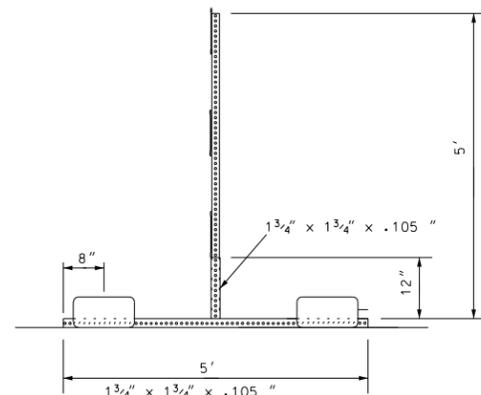
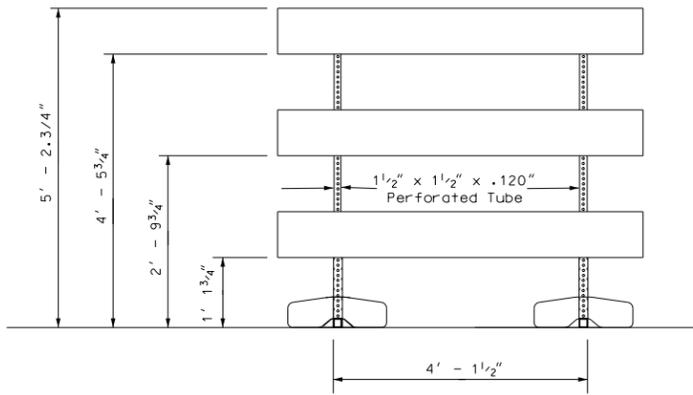
BARRICADE DETAILS AND CHANNELIZING DEVICES



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 retroreflective 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.



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

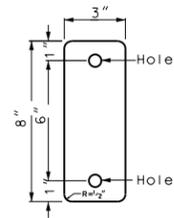


Ballast = 45lb sandbag at the end of each leg.
Barricade blade fastened to vertical supports with 2" corner bolts.
Vertical portion of leg is welded to horizontal portion on all four sides.
Masts slide inside vertical portion of legs. No bolts or fastenings devices used.

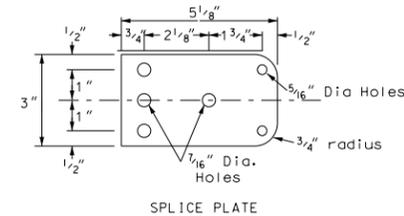
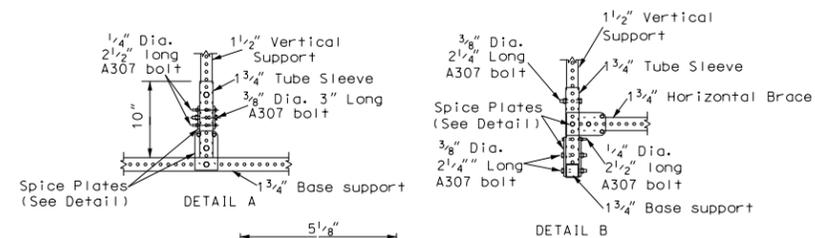
BARRICADE ASSEMBLY DETAIL
(Use when aluminum blade as detailed above)



Delineator reflector shall meet the requirements of section 894



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



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

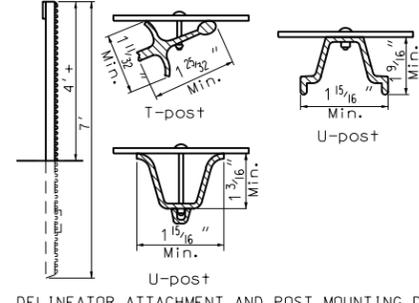
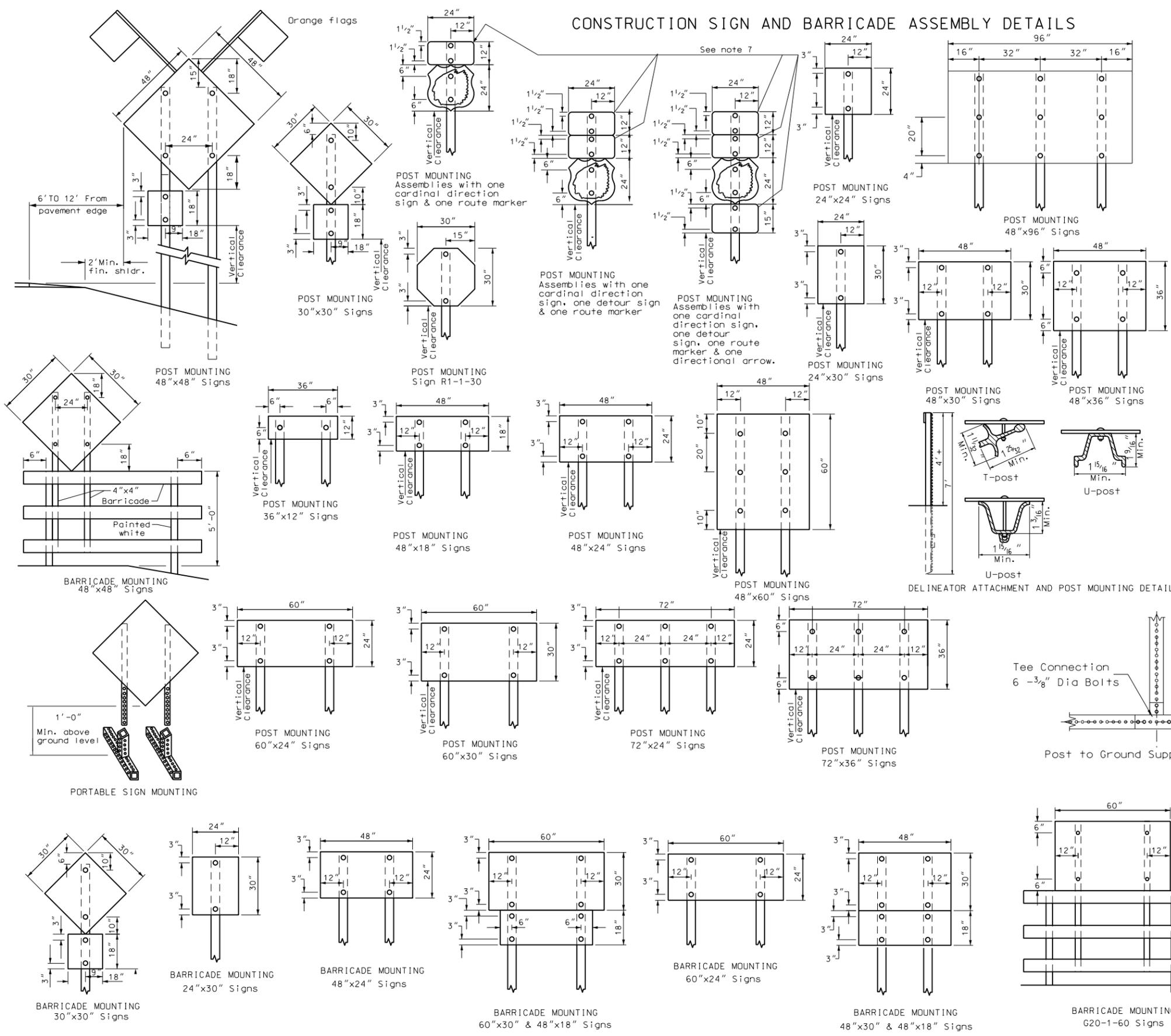
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
08-03-87	Type sheeting
10-01-87	Delineator drum note
06-08-88	Barricade type III
06-01-92	General revision
06-10-93	General revision
09-23-93	Vertical panel
06-09-95	Reflective sheeting
03-01-02	Barricade type III assembly details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

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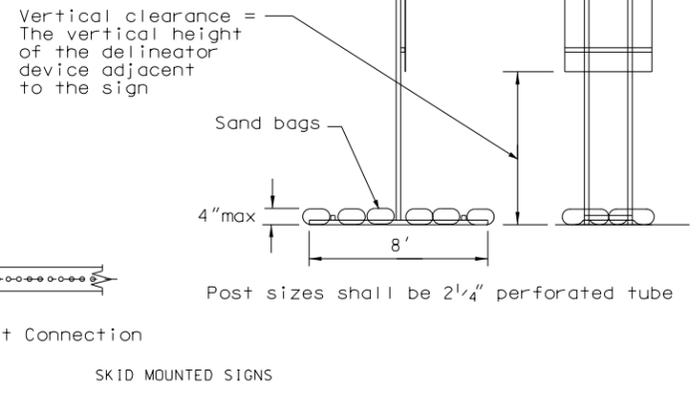
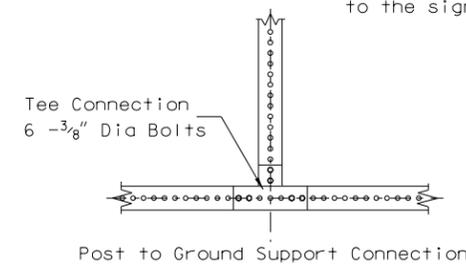
CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS

NOTES:

- Barricade and Sign Supports: Wooden supports shall be painted white. Steel supports shall be galvanized or painted.
- 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.
- 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 embedded 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.
- 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.
- 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.
- 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.
- 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).
- 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 roadway. 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.



DELINEATOR ATTACHMENT AND POST MOUNTING DETAILS

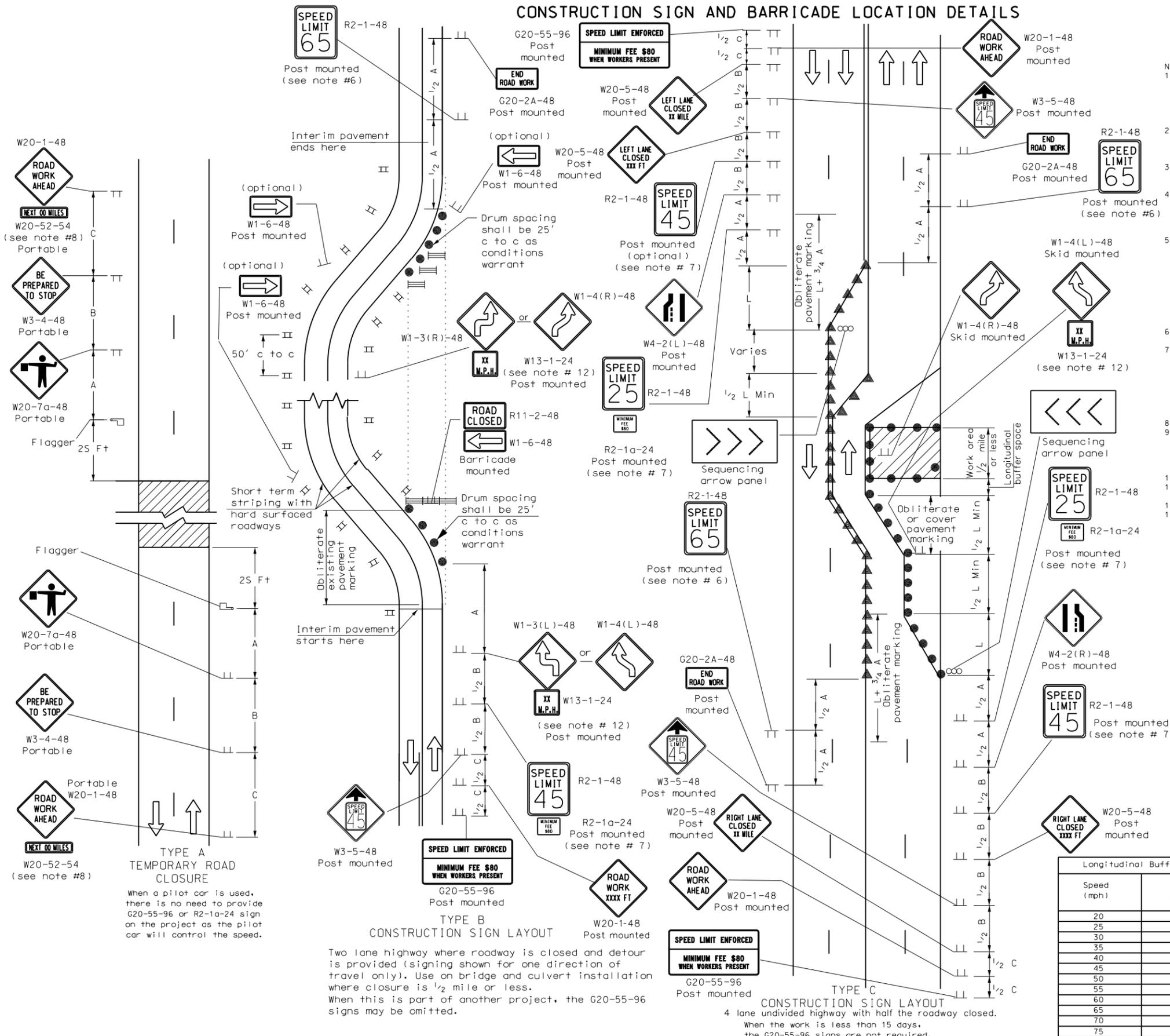


SKID MOUNTED SIGNS

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
03-04-96	Sign height
08-15-96	Note 8
07-10-97	Note revision
07-31-98	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 movable 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.
 - Delinators drums, barricades or cones used for tapering traffic shall be spaced at the dimension "S". Delinators drums or cones used for tangents shall be spaced at 2 times dimension "S".
 - Existing striping shall be removed as required. Delinators 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. Delinators 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.

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	○ Delinators
● Delinators	— Type A delinators or vertical panels back to back
▲ Cones	

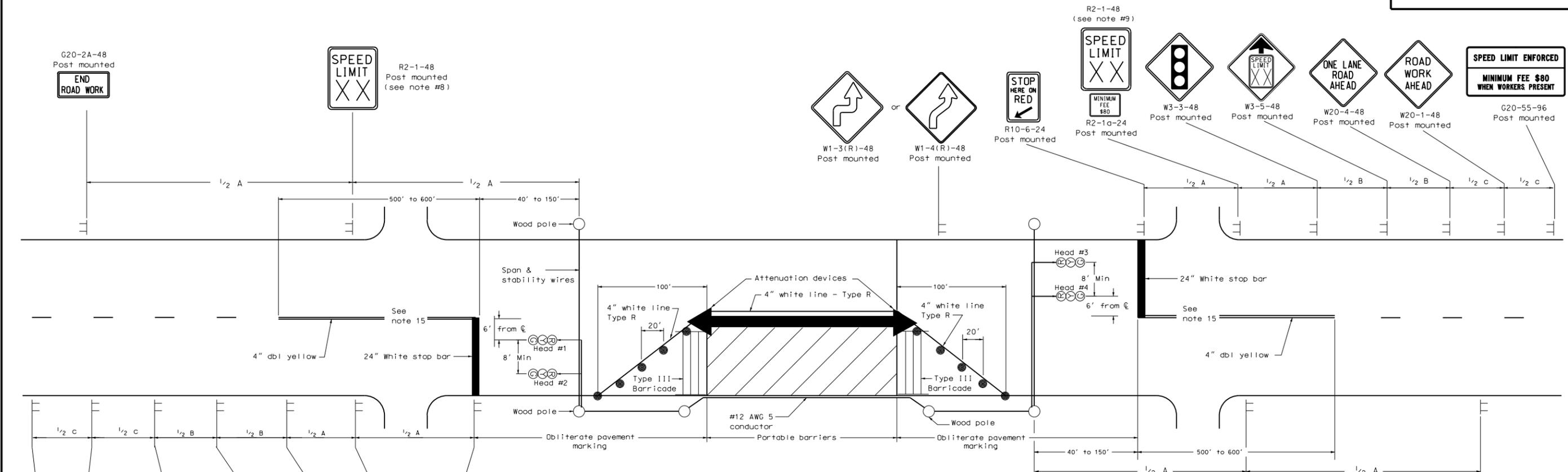
Speed (mph)	Length Min (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
01-05-01	Revised note 3
07-19-02	Revised 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	PE stamp added
06-29-05	Revised W4-2, Replaced R2-5a with W3-5, Rev. Adv. Warning Table, Rev. Note 7, Changed W20-7b to W3-4
07-05-05	

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TYPICAL CONSTRUCTION SIGNAL LAYOUT

D-704-16



Notes

- Conductor is to be overhead span between poles except on bridge where it is to be attached and supported by the bridge structure in such a way as not to interfere with bridge construction. Conductor is shown attached to side of bridge. It may be installed on either side of the bridge as determined by field personnel.
- The controller may be located on any of the wood poles in the cable run between the signal heads for through traffic movements.
- The timing schedule is suggested trial setting. Frequent checks of signals in operation shall be made to obtain the most efficient timing schedule.
- The wood poles shall be placed a minimum of 16 feet from the edge of the driving lane. The wood poles shall be of sufficient length to provide a minimum of 16 to 19 feet clearance from the center line of the roadway to the bottom of traffic signal heads suspended over the roadway.
- Traffic signal heads shall have 12 inch red, yellow and green lenses. The signal heads shall have 5 inch louvered backplates.
- For interim traffic construction detail see standard drawing D-772-6.
- Delineator drums used for tapering traffic shall be spaced at 20 ft. center to center.
- 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.
- Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be as specified in the plans.
- Existing speed limit signs within a reduced speed zone shall be covered.
- 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.
- 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.
- Double yellow centerline shall continue thru private drives.
- G20-55-96 sign is not required if this standard is part of other traffic control layouts, or the work is less than 15 days.

SPEED LIMIT ENFORCED
MINIMUM FEE \$80
WHEN WORKERS PRESENT

KEY

- Work Area
- Type III Barricade
- Sign
- Delineator Drum

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

SUGGESTED TIMING AND SIGNAL SEQUENCE						
Heads 1 & 2	Green	Yellow	Red			Red
	Green	Yellow	Red	Yellow	Red	
Time	18.0	4.5	22.5	18.0	4.5	22.5
Cycle = 90 seconds						
Percent of Cycle	20	5	25	20	5	25

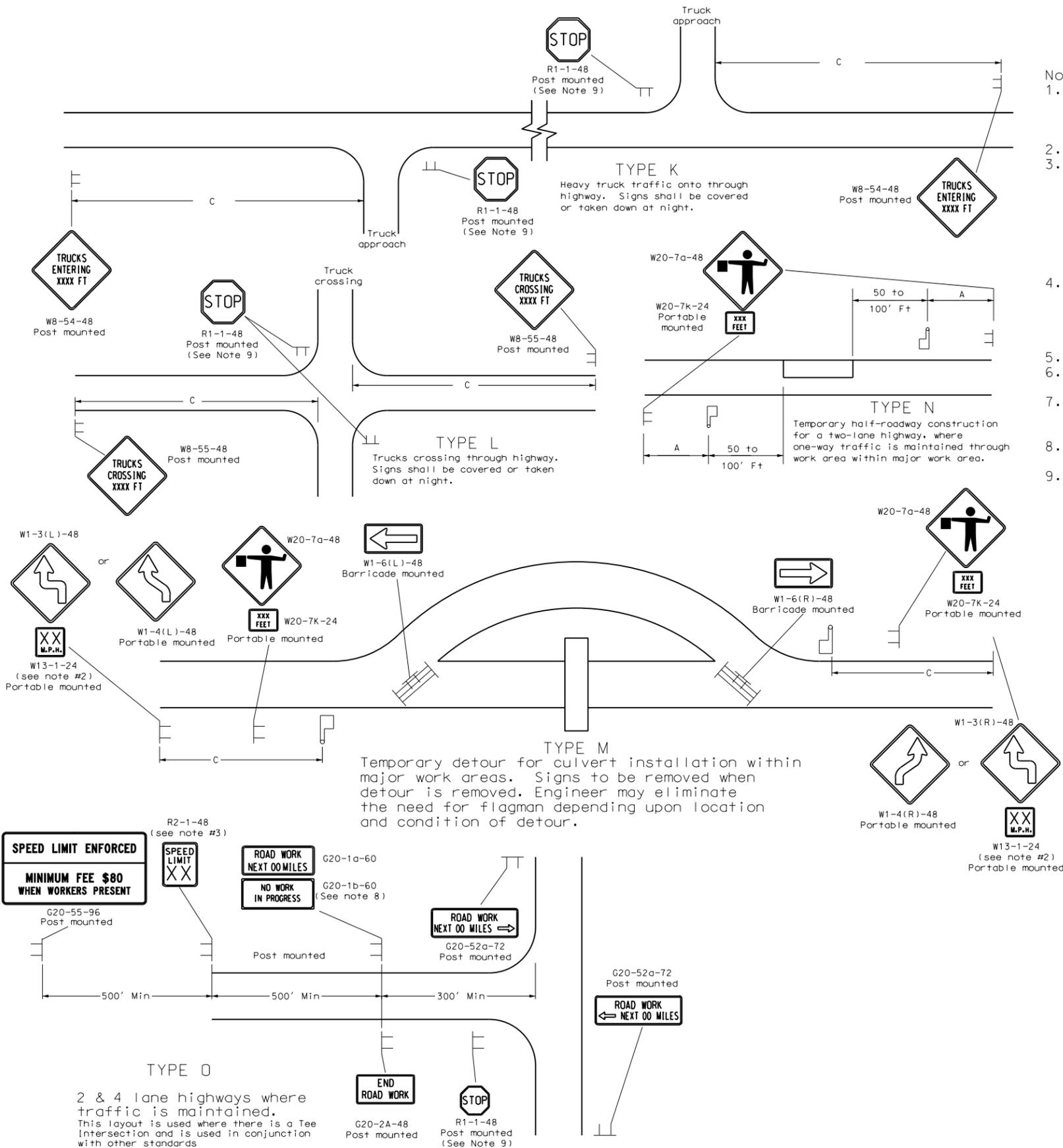
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
03-01-88	
REVISIONS	
DATE	CHANGE
05-01-00	Note 6
01-05-01	Revised note 7
07-19-02	Reversed End Road Work & speed limit signs
07-25-03	Revised R2-1a and W20-1
04-01-04	Rev. fee sign & Warning sign spacing, add note 16
	Revised note 9
12-01-04	PE Stamp added
02-16-05	Added W1-3(R)-48
06-29-05	Replaced R2-5a with W3-5, Rev. Adv. Warning Table, Rev. Note 9

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CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

Notes

1. Barricade shown to be placed on roadway shall be on a moveable assembly. Sign shown to be placed on the roadway shall be placed on skid mounted assemblies.
2. Where necessary, safe speed to be determined by the Engineer.
3. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
4. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
5. Existing speed limit signs within a reduced speed zone shall be covered.
6. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
7. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
8. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
9. If existing stop sign is in place, a 48" stop sign is not required.



KEY

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

ADVANCE WARNING SIGN SPACING

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

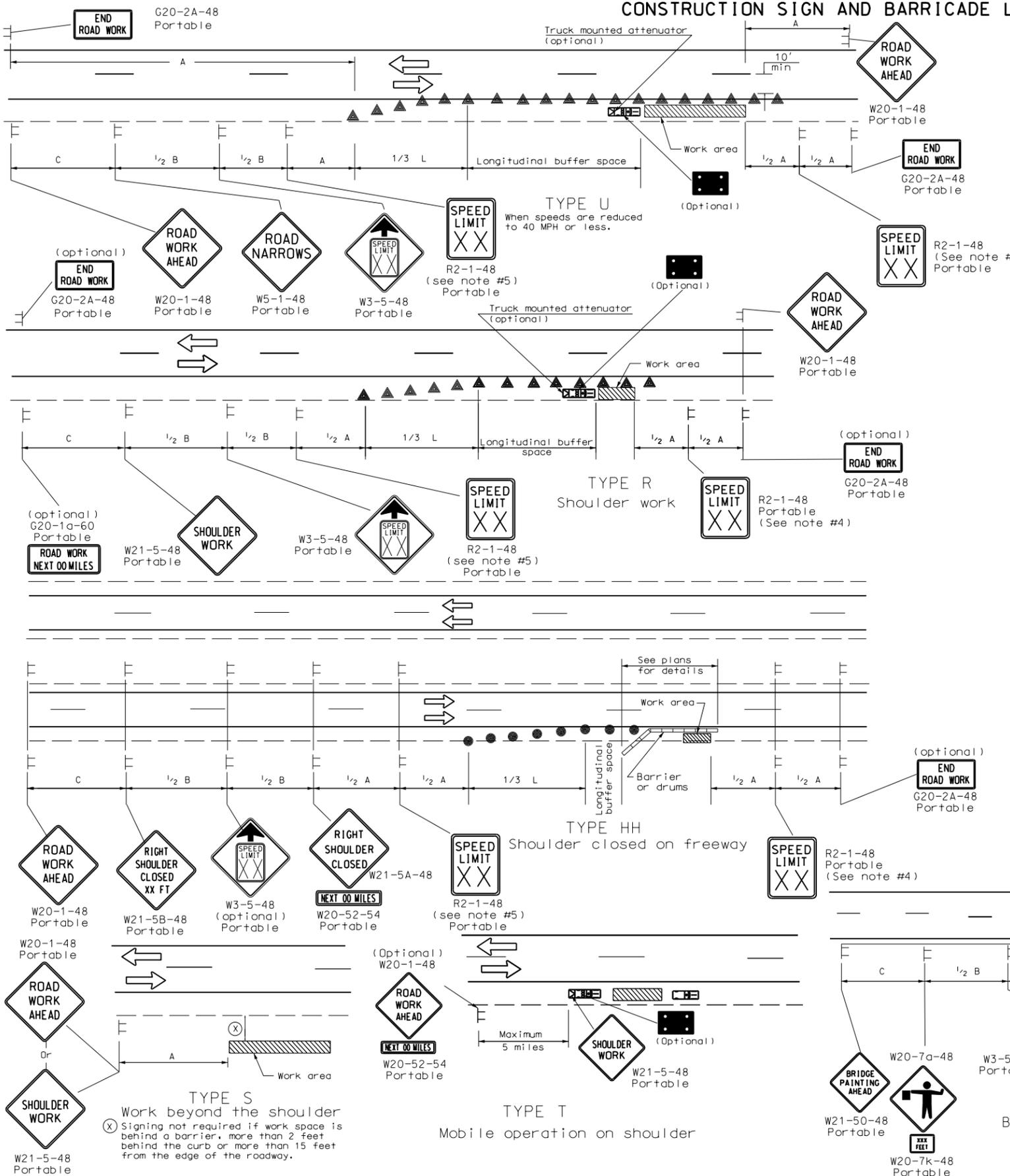
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
10-1-86

REVISIONS	
DATE	CHANGE
09-30-93	General revisions
06-21-95	General revisions
08-15-96	Revise flag note
10-01-99	General revisions
02-02-00	W8-55-48 Deleted Work In Progress Sign
10-17-02	Revised R2-1a
07-25-03	Revised fee sign & warning sign spacing.
04-01-04	Revised note 3
12-01-04	PE stamp added
02-14-05	Added note 9 and revised stop sign size
06-29-05	Rev. Adv. Warning Table, Rev. Note 3

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CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

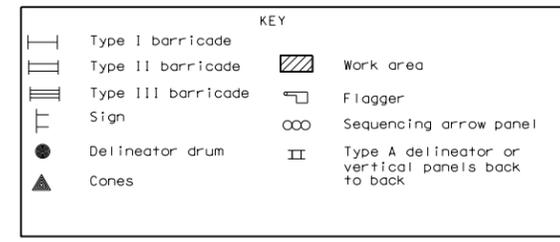
D-704-24



- Notes
- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of the taper.
 - L = Minimum length of taper, or $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2 / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
 - Delineator drums, 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.

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



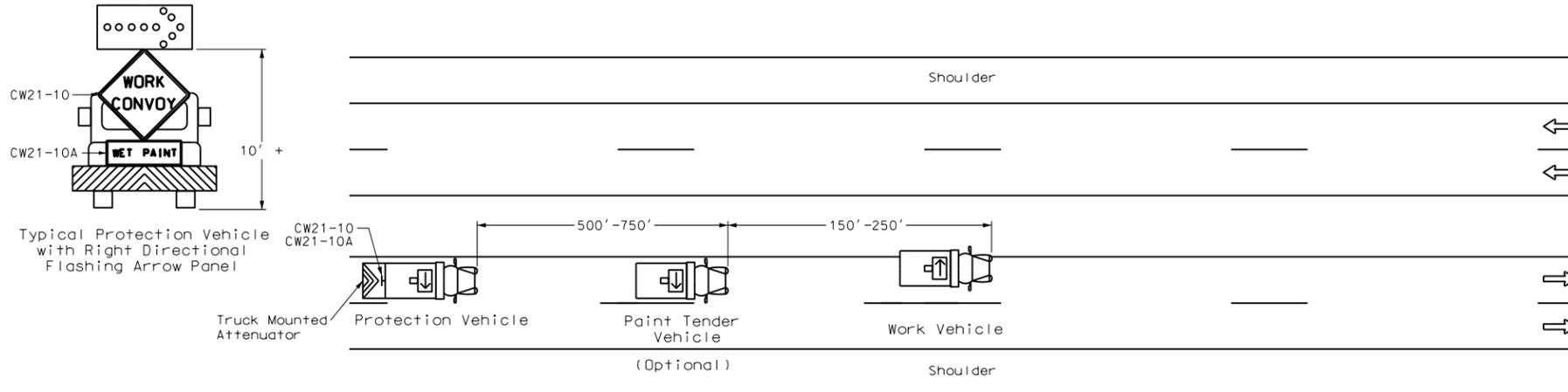
10-1-86	
DATE	CHANGE
10-01-99	General revisions
10-04-99	Type HH barrier
11-15-99	Add taper width & note
03-15-01	Revised note 2
07-19-02	Reversed End Road Work & Speed Limit signs
07-25-03	Revised R2-1a and W20-1
04-01-04	Removed fee sign & rev warning & buffer spacing rev note 5
12-01-04	PE Stamp added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

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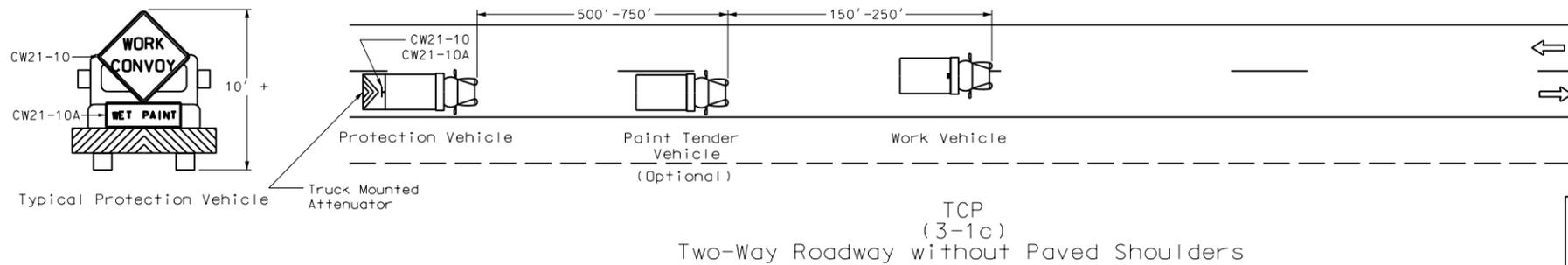
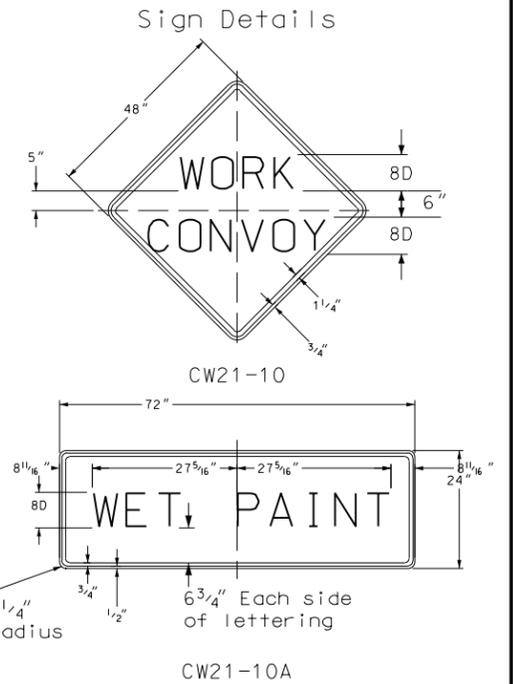
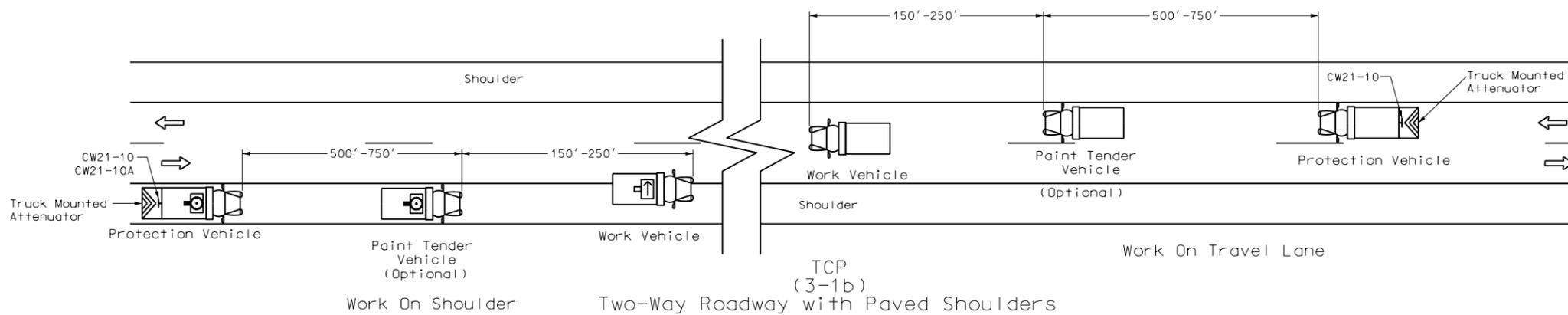
TRAFFIC CONTROL PLAN FOR MOVING OPERATIONS ON CONVENTIONAL HIGHWAYS (Pavement Marking)

D-704-27

- 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. The use of yellow rotating beacons or strobe lights on vehicles is required unless otherwise stated elsewhere in the plans.
 4. Flashing arrow panels shall be Type B or Type C. 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 protection vehicle should change lanes first to shadow other convoy vehicles.
 7. Vehicle spacing between the protection vehicle and paint tender 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/or change lanes as they approach the trail vehicle.
 8. Sign Colors
Letters = Black
Border = Black
Background = Orange



TCP
(3-1a)
Undivided Multi Lane Roadway



TCP
(3-1c)
Two-Way Roadway without Paved Shoulders

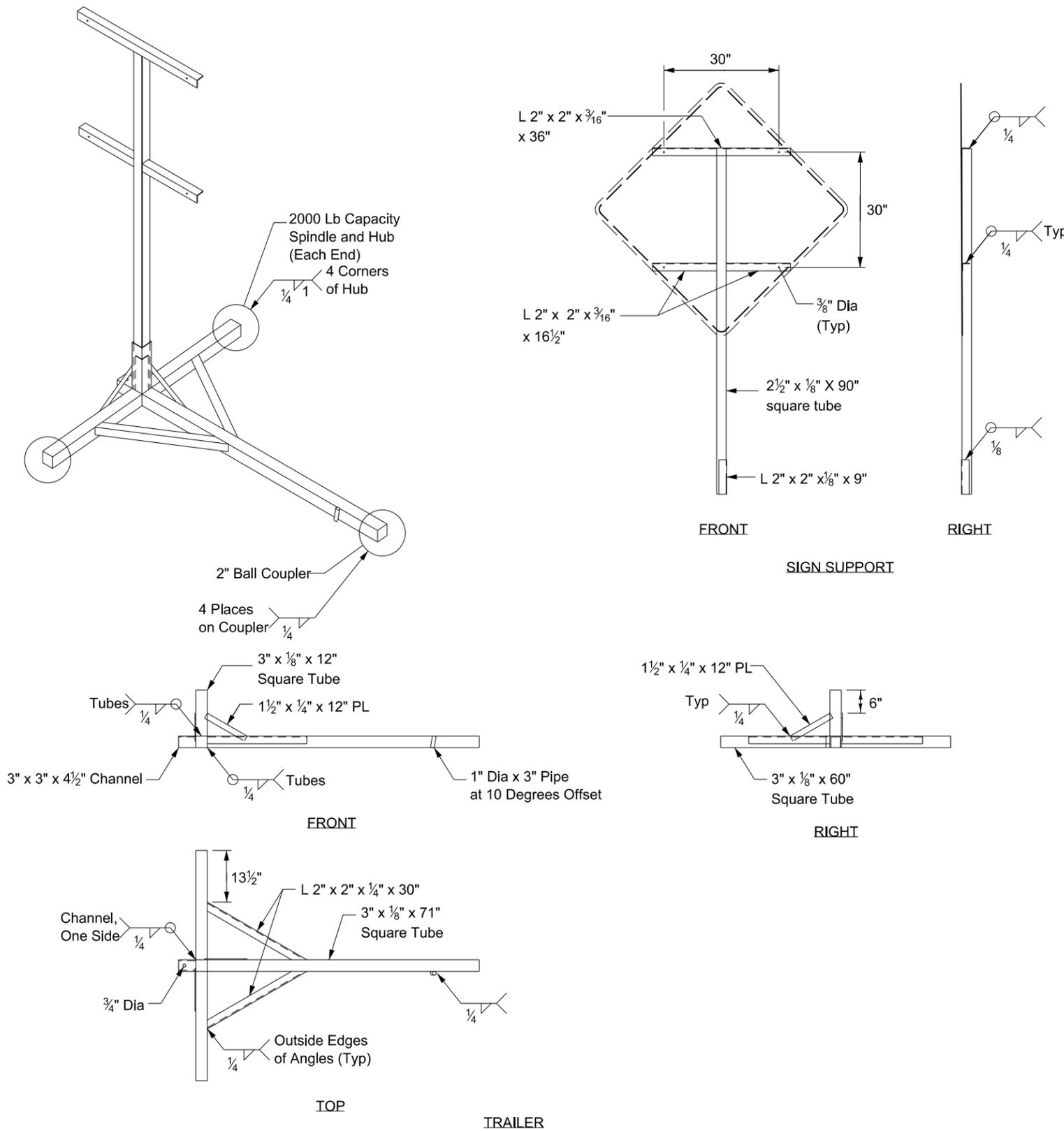
KEY	
	Truck mounted attenuator
	Flashing arrow panels:
	Right directional
	Left directional
	Double arrow directional
	Caution Mode

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
01-22-92	
REVISIONS	
DATE	CHANGE
02-24-93	General
03-15-95	General
06-21-95	Remove caution mode
10-01-99	General Revisions
07-25-00	General Revisions
12-01-04	PE Stamp added

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PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



Notes:

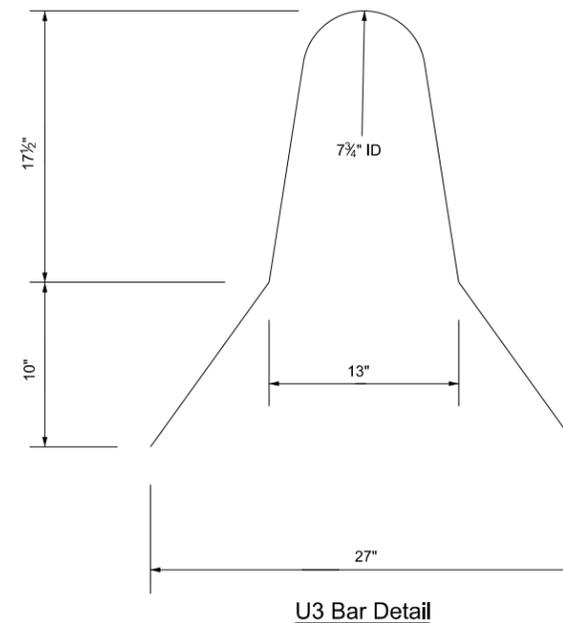
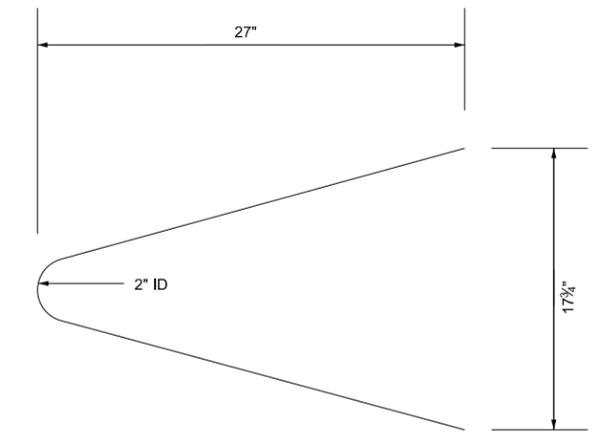
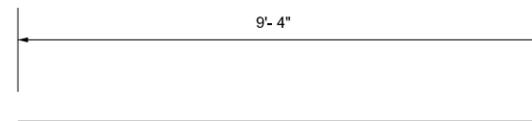
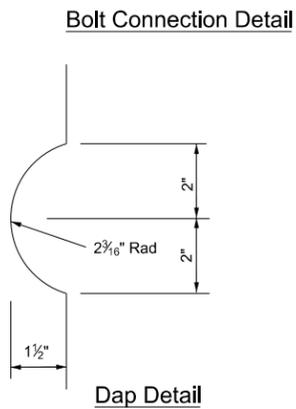
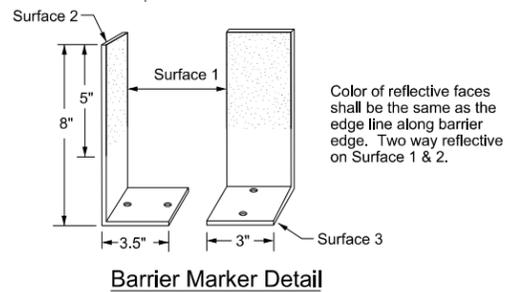
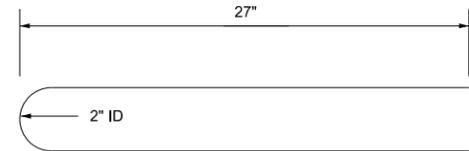
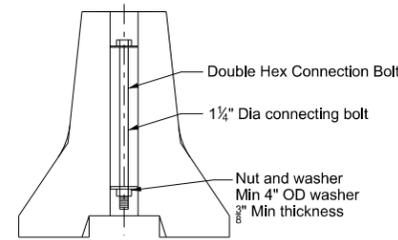
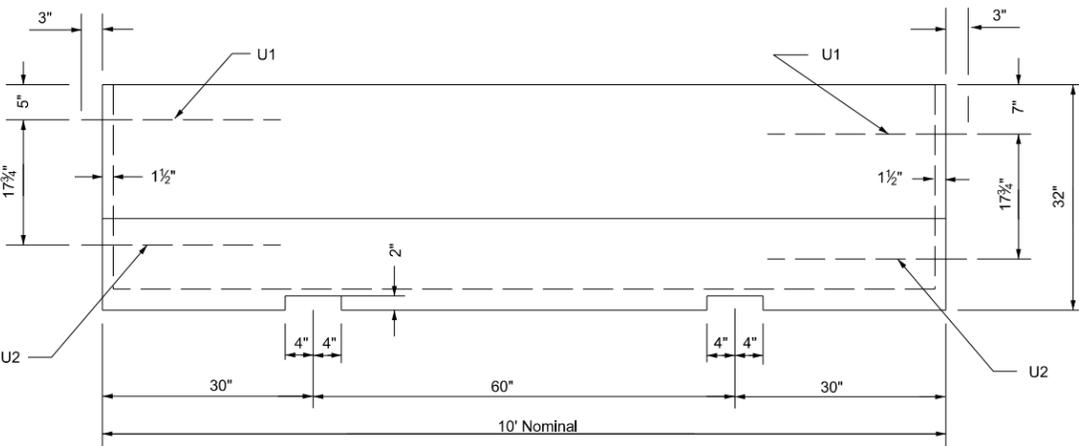
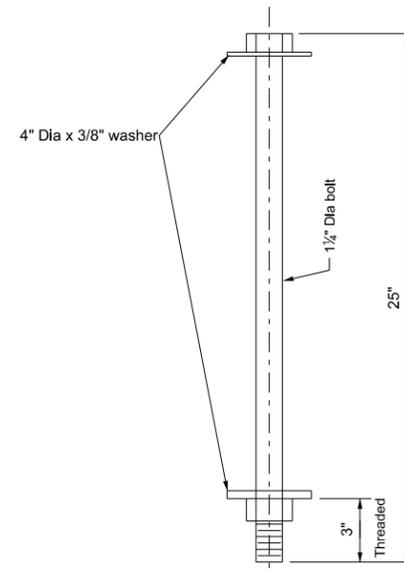
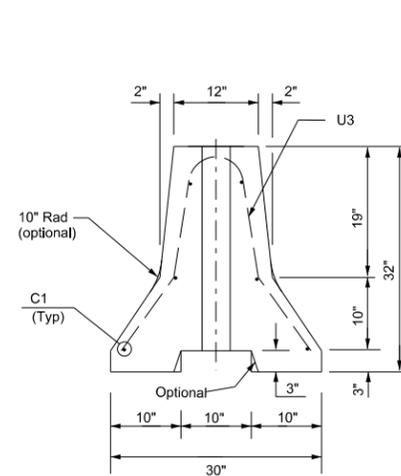
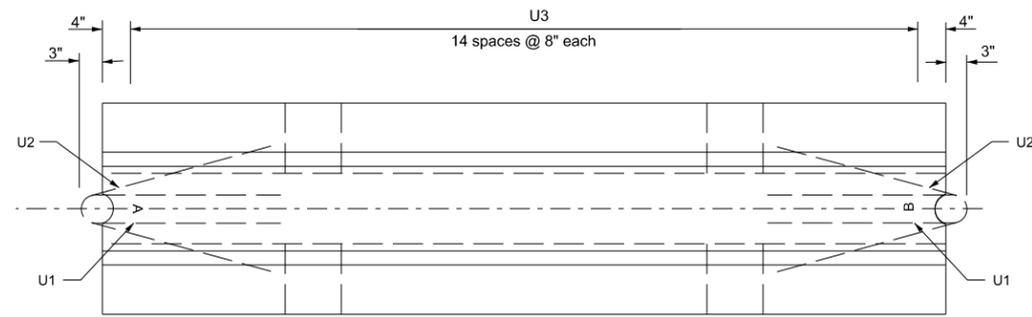
- ① The maximum weight of the assembly is 250 pounds.
- ② Use a 14" wheel and tire.
- ③ Automotive and equipment axle assemblies may not be used for trailer-mounted sign supports.
- ④ Other NCHRP 350 crash tested assemblies are acceptable.

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

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PORTABLE PRECAST CONCRETE MEDIAN BARRIER (TEMPORARY USAGE)

D-704-51



Notes:

1. All exposed hardware shall be galvanized as per ASTM A153, except for the loop inserts.
2. Concrete shall be Class AAE-3.
3. All steel shall conform to Section 612 of the NDDOT Standard Specifications.
4. Barrier ends shall be imprinted A and B as shown with 4 inch letters. Field placement shall match the A end with the B end.
5. Barrier markers shall be placed at the center of the barrier at 20' centers.
6. Barrier sections shall be connected together with the 1 1/4" Dia A-307 double hex connecting bolt. The bottom nut and washer connection shall be maintained by the contractor for the duration of the barrier installation.
7. Barrier shall be placed such that openings between individual sections shall be kept to a minimum.

Reflective Tape
The reflector shall be a retroreflective, acrylic microprism material with acrylic backing, 3" wide, providing the following minimum optical performance with an observation angle of 0.1' measured in candlepower:

Entrance Angle	Specific Intensity
Yellow - 4"	136
White - 4"	200

Adhesive
Markers shall be temporarily mounted to the portable concrete barrier with factory applied solid butyl rubber 1/8" thick, 2" wide on 2 1/4" wide release paper on surface 3.

Bar List				
Mark	Size	No.	Length	Shape
C1	4	6	9'- 4"	Straight
U1	4	2	4'- 8"	Bent
U2	4	2	4'- 10 1/4"	Bent
U3	4	15	5'- 4"	Bent

Marker Body
The marker shall be made of a high impact, weatherable engineering thermo-plastic material which conforms to the following:

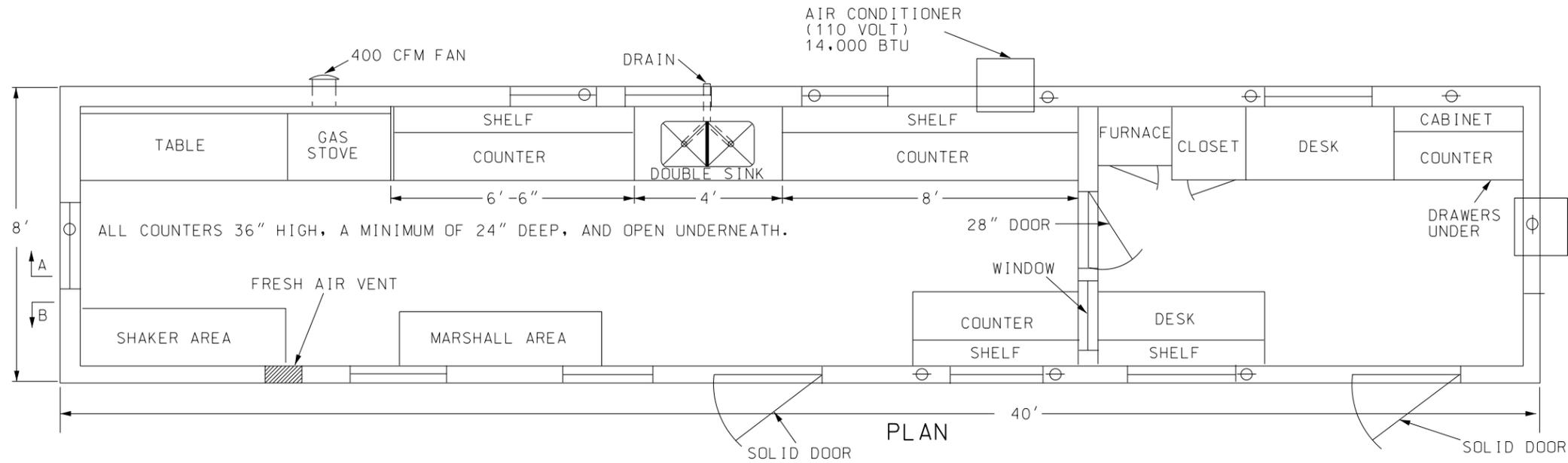
Property	Result	ASTM Test Method
Thickness (min)	.090"	—
Tensile strength (min psi) @ yield	5,500	D638
Impact strength @ -20°F (ft-lbs/in of notch)	3.2	D256 Method A
Impact strength @ 73°F (ft-lbs/in of notch)	14.0	D256 Method A
Flexural strength, PSI 1/4" @ 73°F	8,000	D790
Flexural modulus, PSI 1/4" @ 73°F	300,000	D790
Elongation @ yield	30%	D638

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-20-12	
REVISIONS	
DATE	CHANGE

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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.

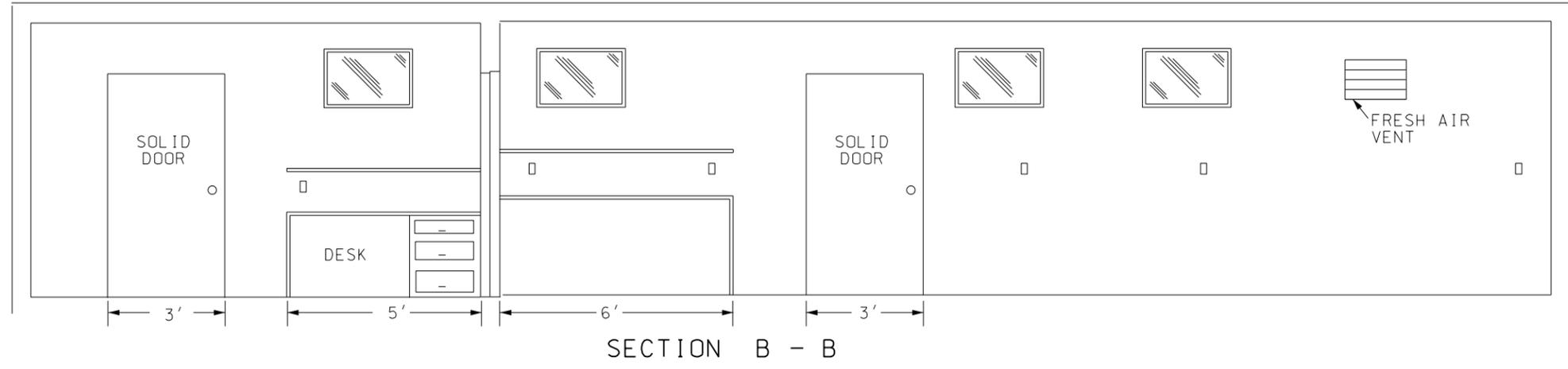
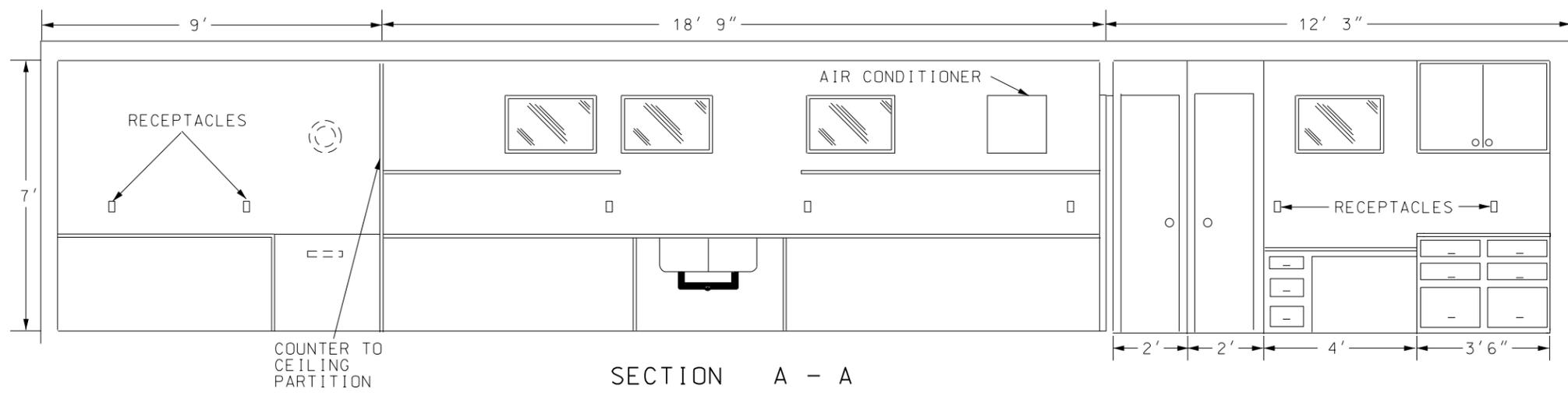
Locks, latches, and hinges for main doors shall be heavy duty type to withstand the intense use in service.

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.

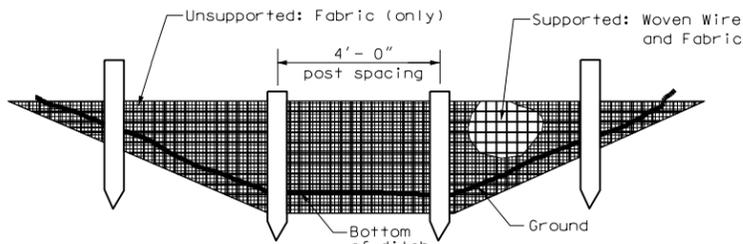
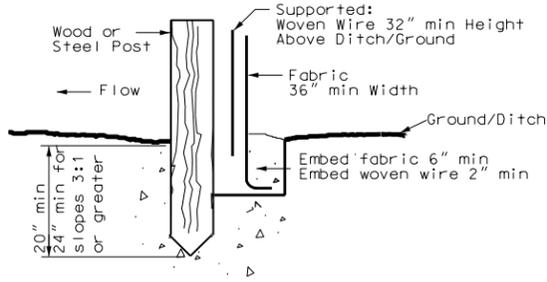
Electrical service entrance shall be wired for 100 amps. and have separate circuits for air conditioners. Convenience outlets shall have a minimum spacing of 4 feet in counter areas.



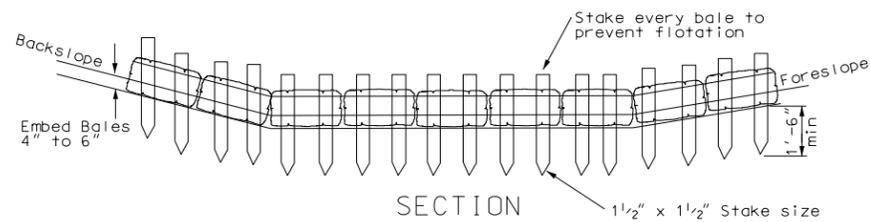
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
05-05-88	Drawing and notes
06-20-03	General revisions
12-01-04	PE Stamp added

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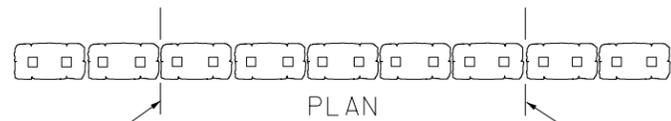
EROSION AND SILTATION CONTROLS



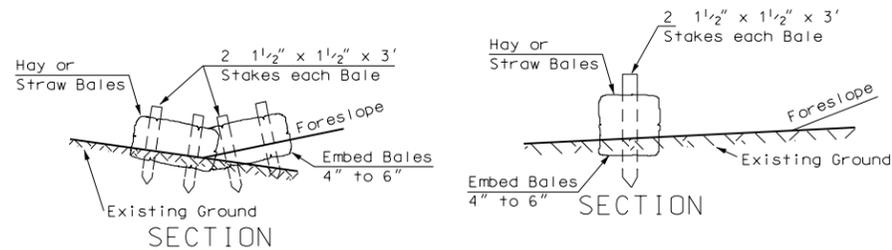
SILT FENCE
Supported and Unsupported



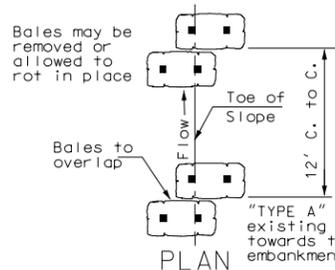
SECTION



"TYPE A"

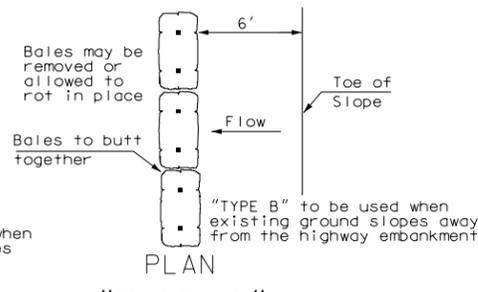


SECTION



PLAN

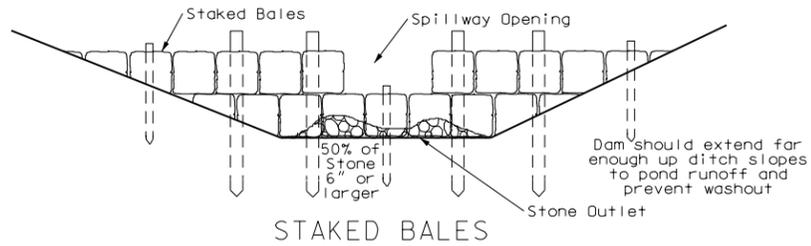
"TYPE B"



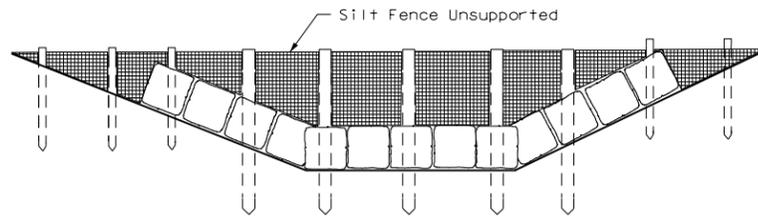
PLAN

"TYPE C"

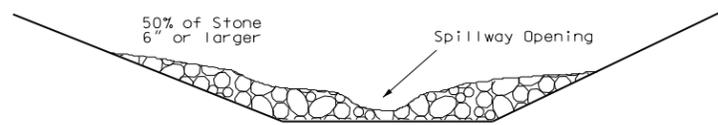
BALED HAY OR STRAW EROSION CHECKS



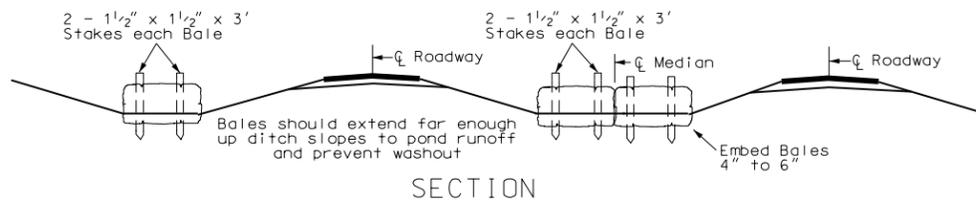
STAKED BALES



FENCE-BACKED BALES

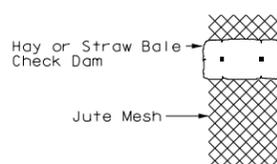


GRADED STONE
DITCH EROSION DAMS

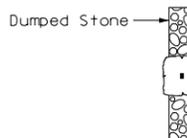


SECTION

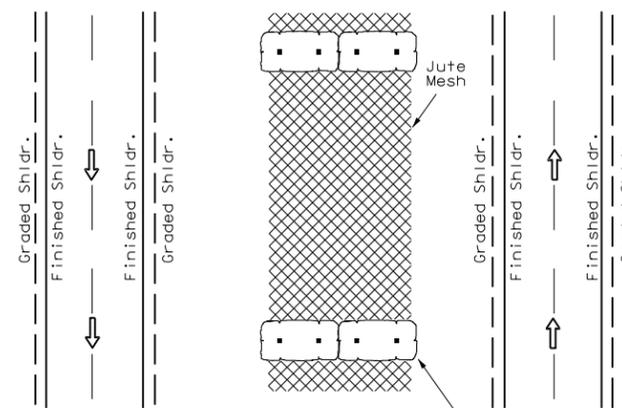
MEDIAN OR DITCH PROTECTION
AT STREAM CROSSING



Hay or Straw Bale Check Dam

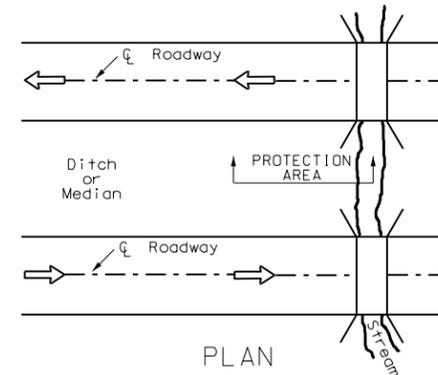


ROADSIDE DITCH

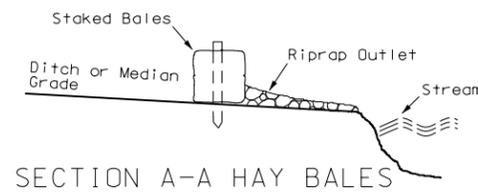


PLAN

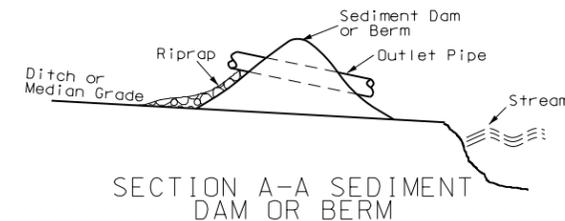
STONE, JUTE, MESH, OR SOD
DITCH & MEDIAN EROSION CONTROL



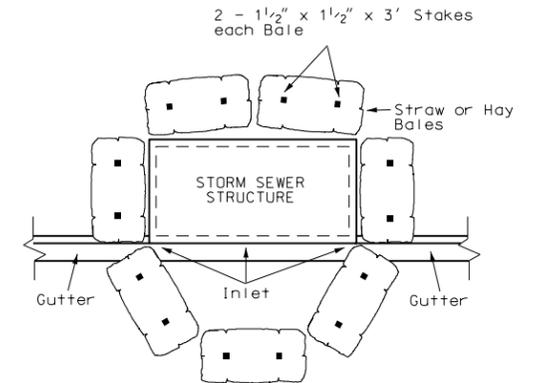
PLAN



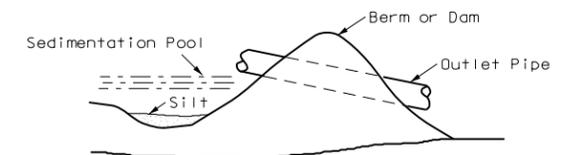
SECTION A-A HAY BALES



SECTION A-A SEDIMENT
DAM OR BERM



STORM SEWER INLET
EROSION & SILTATION
BARRIER



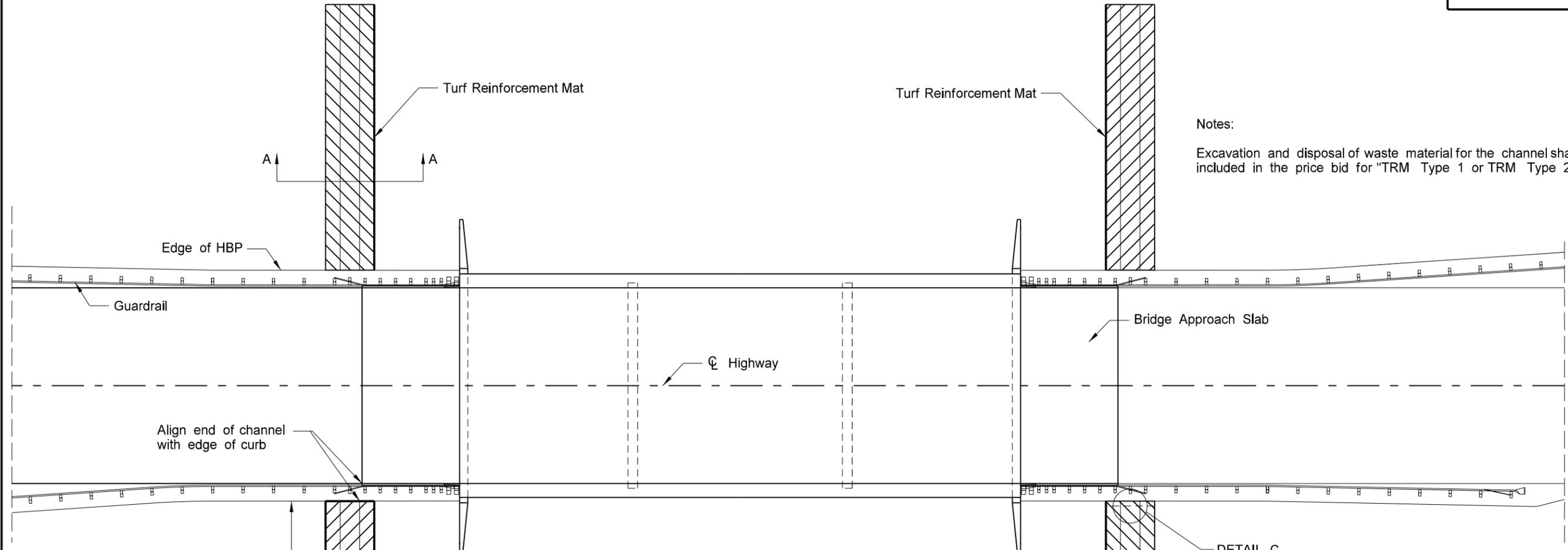
SMALL SEDIMENT DAM OR BERM

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

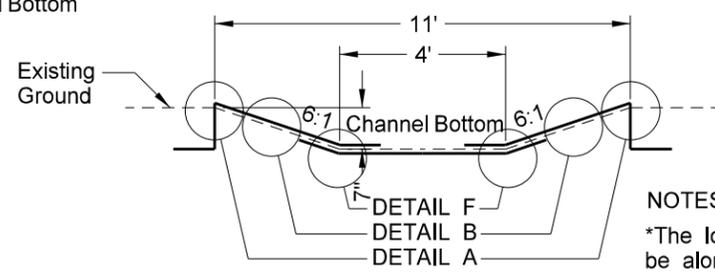
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BRIDGE APPROACH SLAB DRAINAGE DETAIL

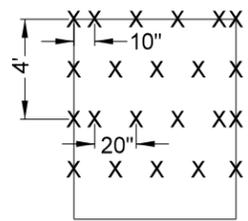
D-708-4



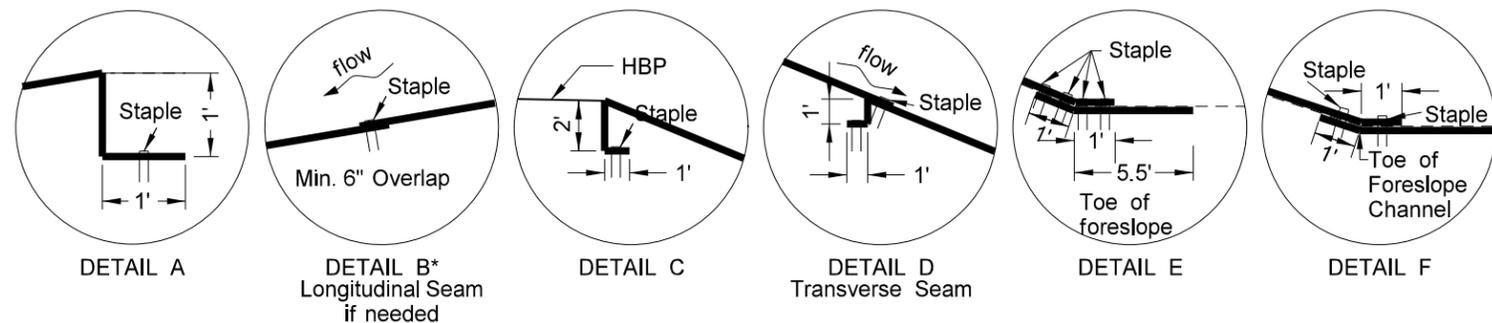
Notes:
Excavation and disposal of waste material for the channel shall be included in the price bid for "TRM Type 1 or TRM Type 2".



NOTES:
*The longitudinal seams shall not be along the channel bottom.
*Top seam must be minimum 0.5' above the channel bottom.



STAPLE PATTERN: 3.8 staples per square yard.



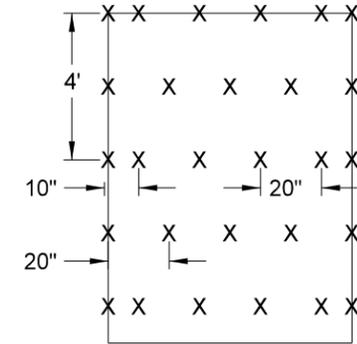
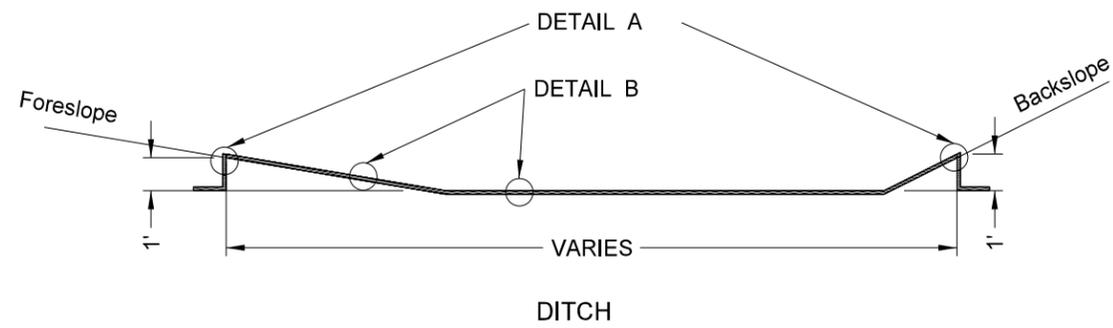
DETAIL C
DETAIL D
DETAIL E

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

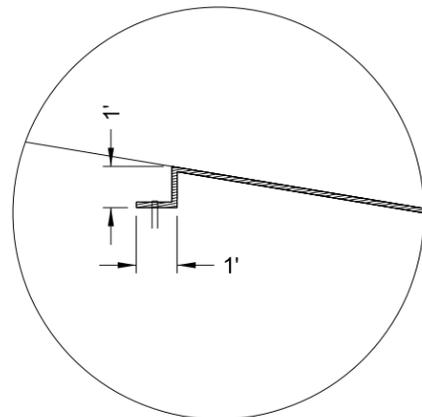
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EROSION AND SILTATION CONTROL
BLANKET INSTALLATION

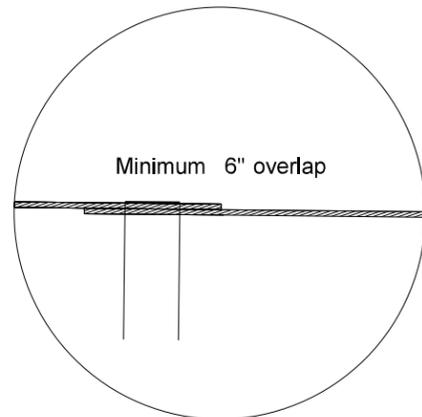
D-708-5



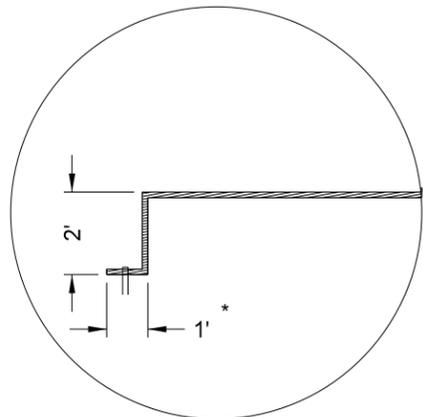
STAPLE PATTERN: 3.8 staples per square yard using 8-inch 11 gauge wire "u" staples.



DETAIL A

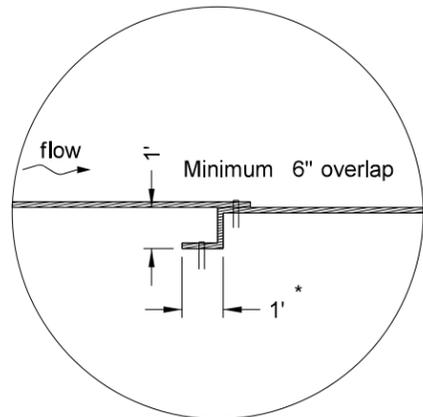


DETAIL B

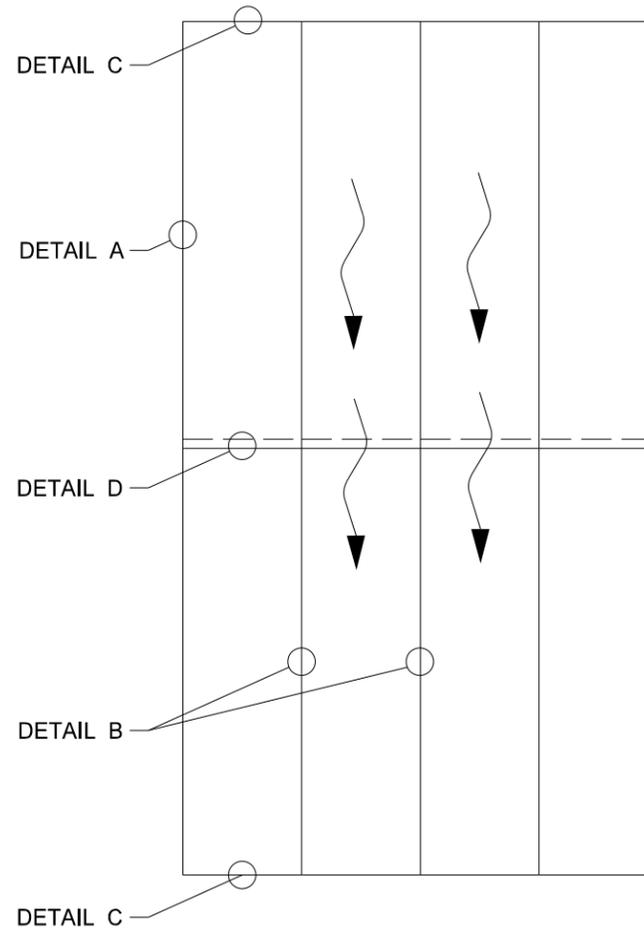


DETAIL C

* This tie may be placed ahead or back.

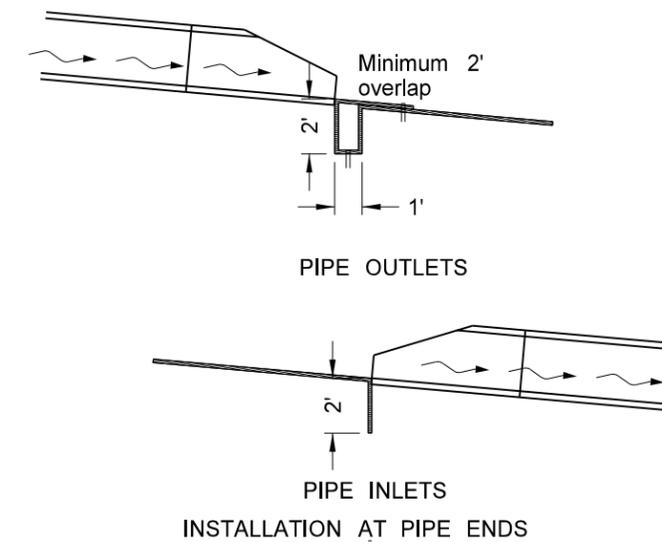


DETAIL D



BLANKET LAYOUT

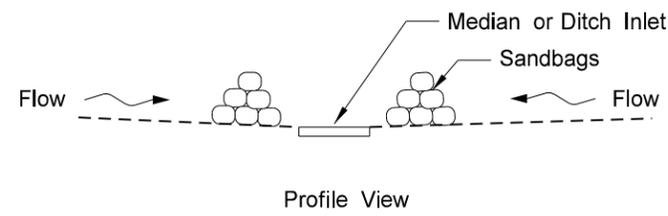
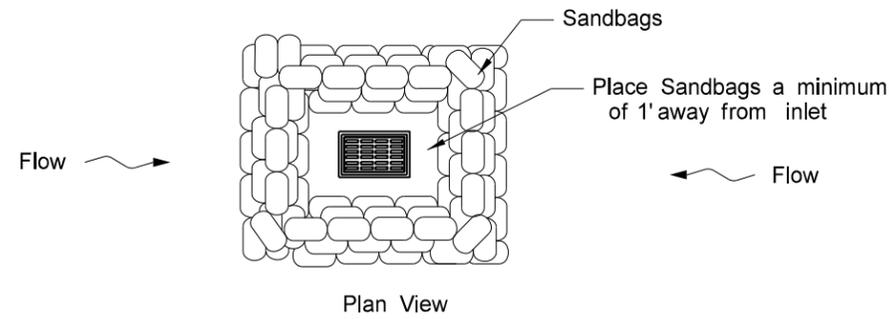
Note: Beginning and ending of erosion control blanket areas shall be installed as DETAIL C.



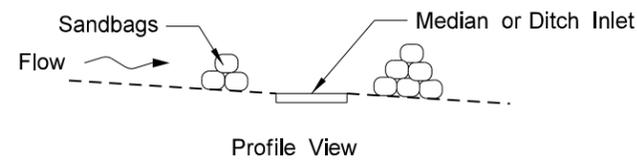
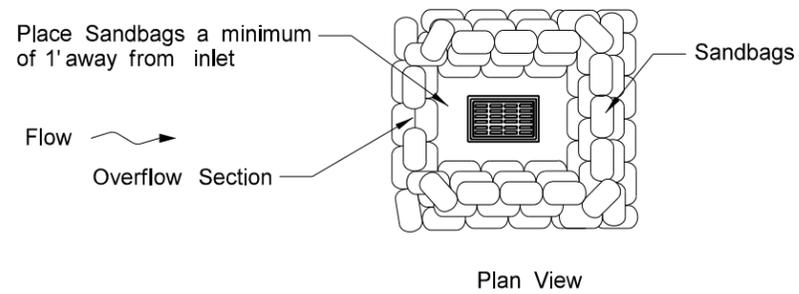
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-13-06	
REVISIONS	
DATE	CHANGE

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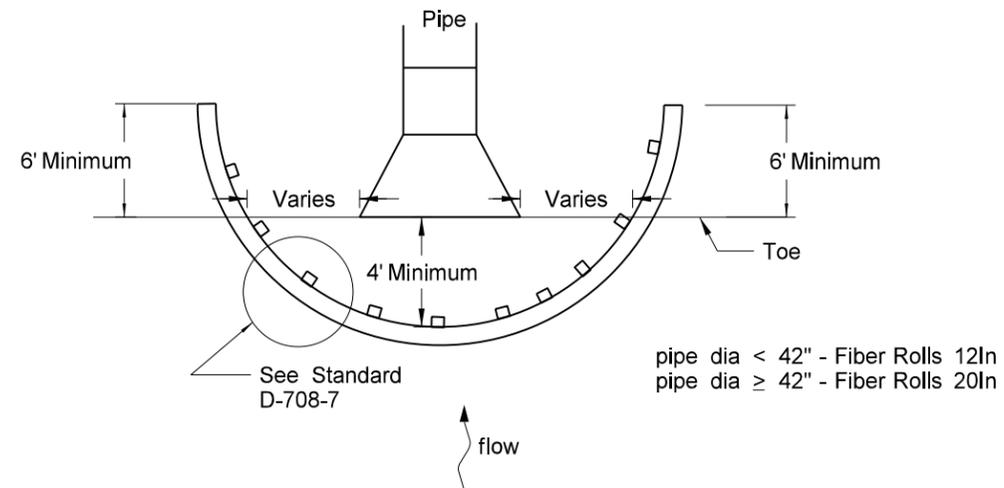
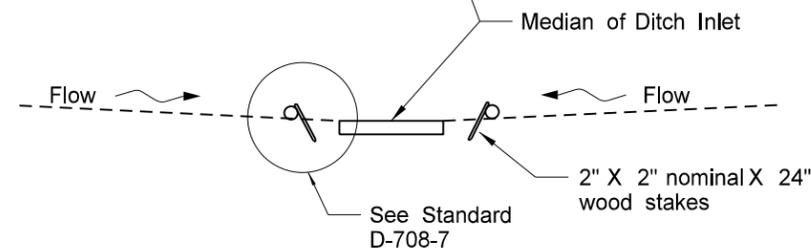
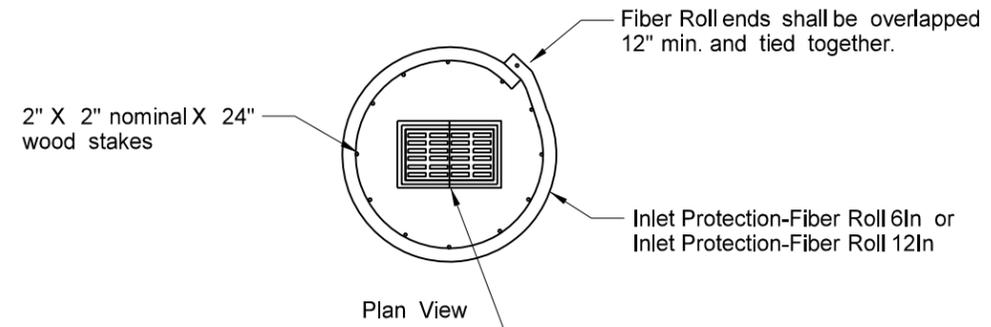
EROSION CONTROL
MEDIAN OR DITCH INLET PROTECTION



SANDBAG PROTECTION
LOW POINT



SANDBAG PROTECTION
ON SLOPE



FIBER ROLL PROTECTION
INLET OF PIPE END

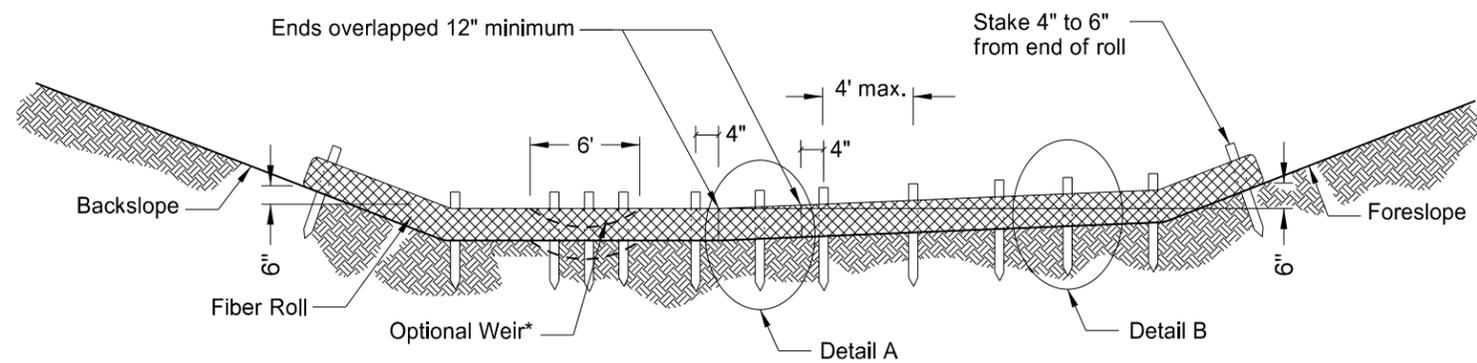
pipe dia < 42" - Fiber Rolls 12In
pipe dia ≥ 42" - Fiber Rolls 20In

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.
----------	--------------------------------------------------------------------------

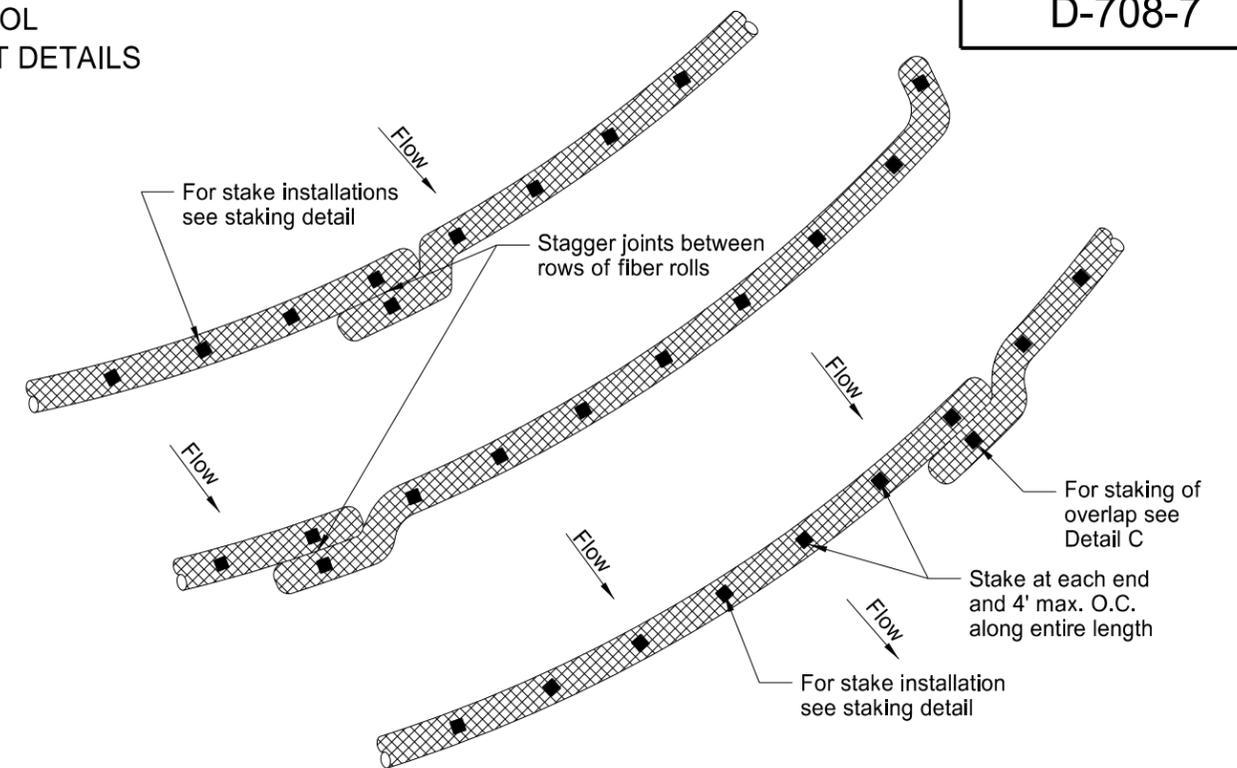
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EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

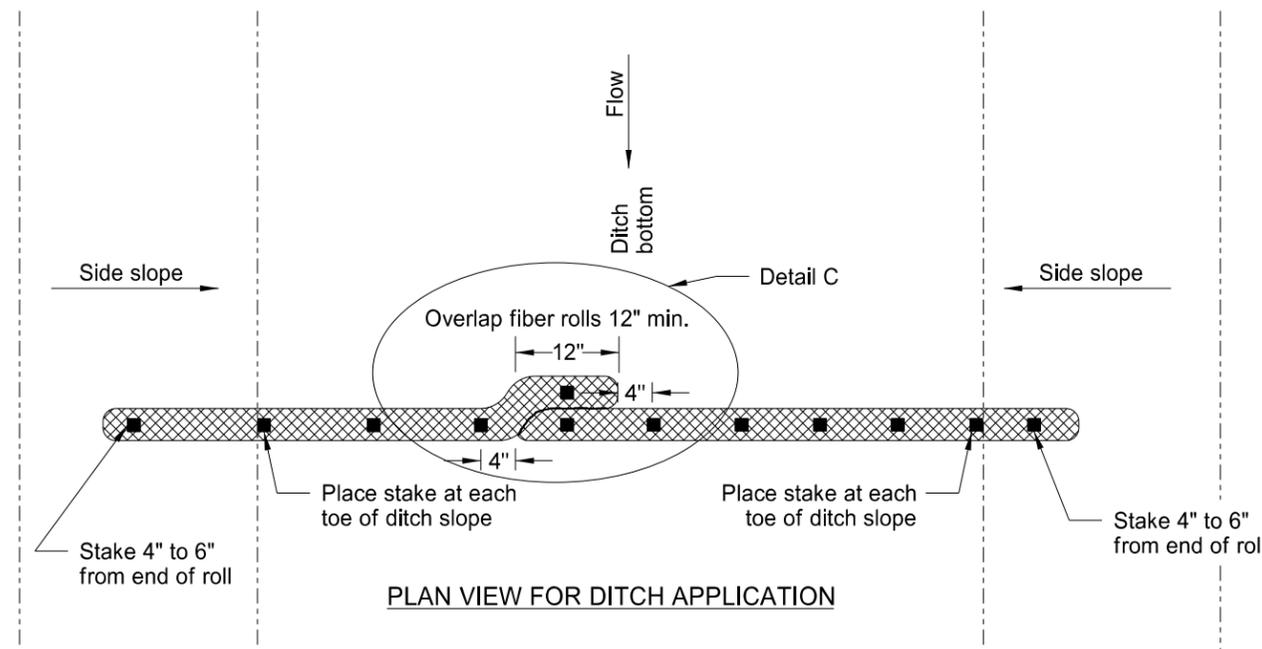


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

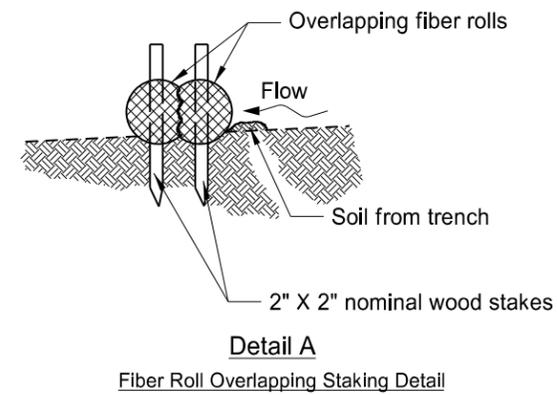
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



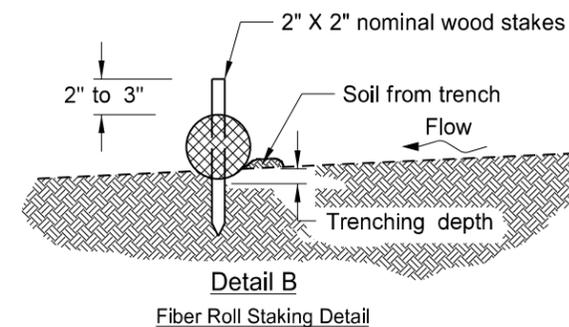
PLAN VIEW FOR SLOPE APPLICATION



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"

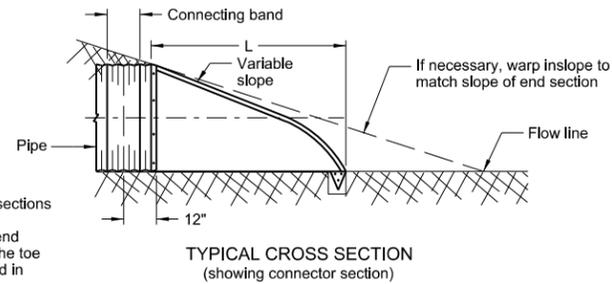
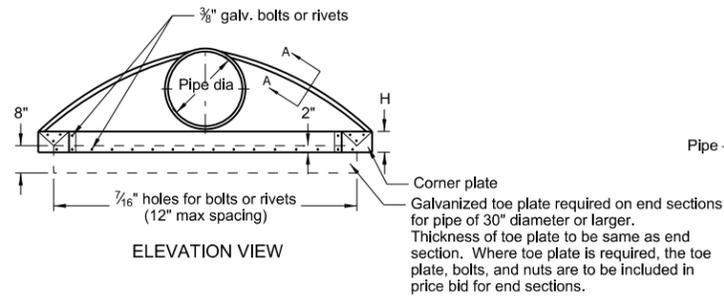
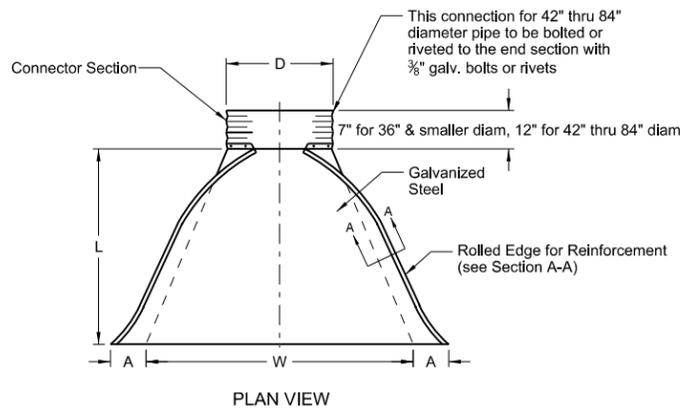
NOTE: Runoff must not be allowed to run under or around roll.

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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ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

D-714-4



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

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

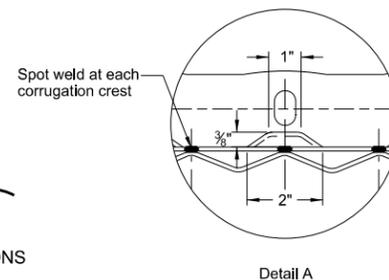
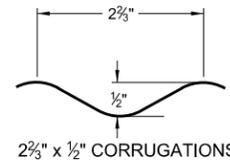
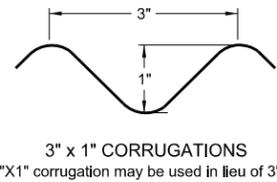
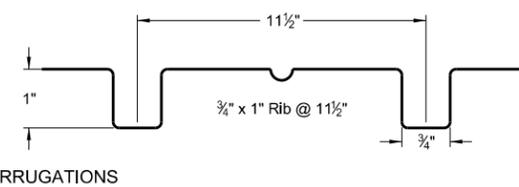
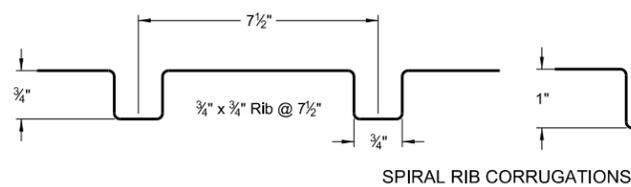
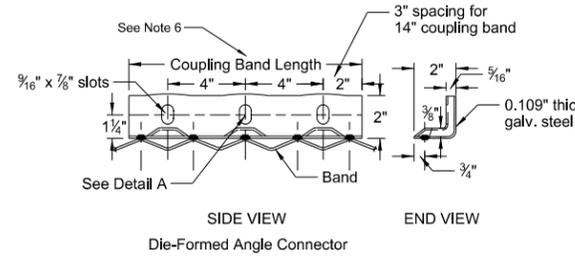
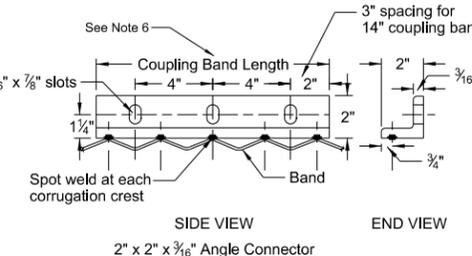
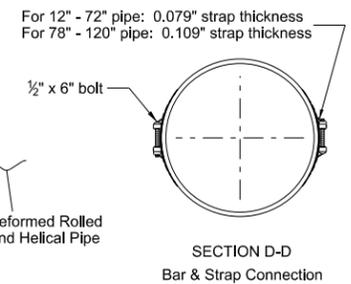
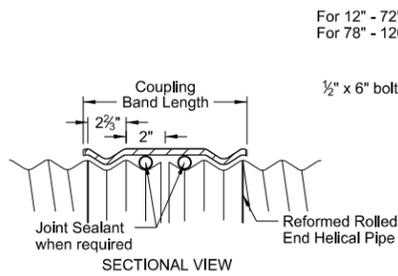
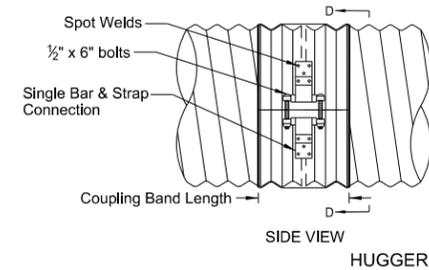
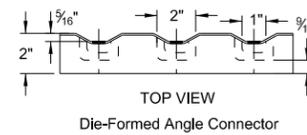
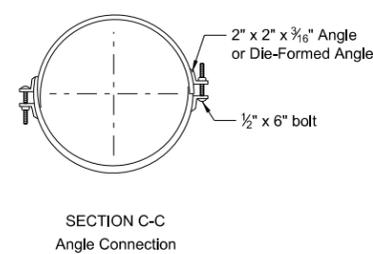
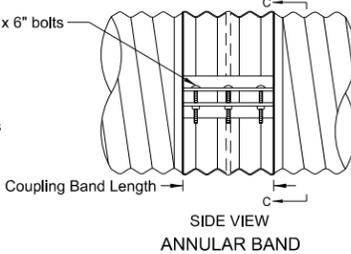
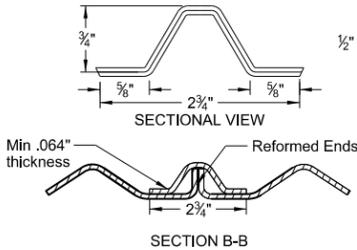
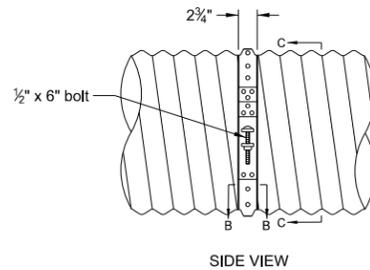
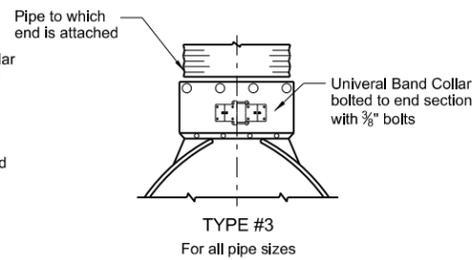
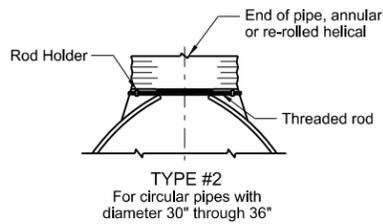
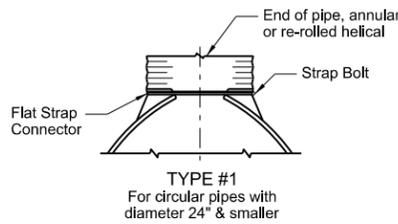
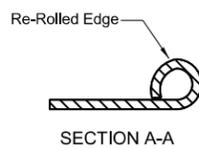
Splices to be the lap riveted type.

Multiple panel bodies shall have lap seams which are to be tightly joined with 3/8" dia. galv. bolts or rivets. Nuts to be torqued to 25 foot-lbs ±.

NOTES:

1. Pipes and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
2. Top edge of all end sections to have rolled edges for reinforcement (see Section A-A). The reinforced edges are to be supplemented with 2" x 2" x 3/16" galv. angle for 60" through 72" dia. and 2 1/2" x 2 1/4" galv. angle for 78" and 84" dia.. Angles to be attached by galv. 3/8" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
3. Elongated pipes shall be factory preformed so that the vertical diameter shall be 5% greater and the horizontal diameter 5% less than a circular pipe.
4. Coupling bands shall be two-piece for pipes larger than 36" as shown in Section C-C & D-D details. For pipes 36" and smaller, a one-piece band is acceptable.
5. 1/2" x 8" bolts may be used as a substitute for the 1/2" x 6" bolts shown in the details.
6. Coupling bands wider than 14" may be used if a minimum of four 1/2" bolts with maximum spacing of 5 1/2" are used for the connection.
7. Length of spot welds shall be minimum 1/2".

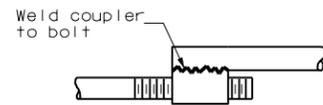
COUPLING BAND DIMENSIONS				
COUPLING TYPE	CORRUGATION PITCH x DEPTH	PIPE SIZE	COUPLING BAND LENGTH	MIN. BAND THICKNESS
Hat Band	2 3/8" x 1/2"	12" - 48"	2 3/4"	.064"
Annular Band	2 3/8" x 1/2"	12" - 72"	12"	.052"
		78" - 84"	12"	.079"
Hugger Band	2 3/8" x 1/2" Rerolled End	12" - 72"	10 1/2"	.052"
		78" - 84"	10 1/2"	.079"
		48" - 120"	10 1/2"	.052"
	3" x 1" Rerolled End	48" - 120"	10 1/2"	.052"
	5" x 1" Rerolled End	48" - 120"	12"	.064"



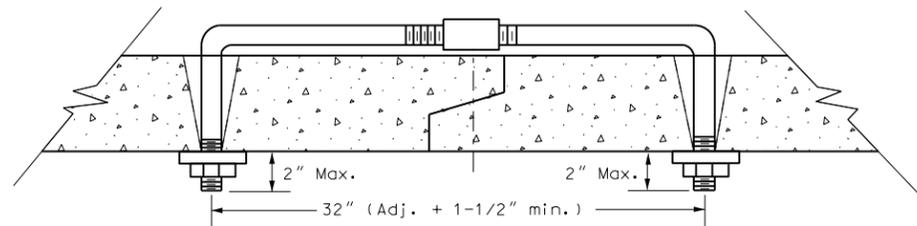
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
08-06-13	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674 , on 08/06/2013 and the original document is stored at the North Dakota Department of Transportation

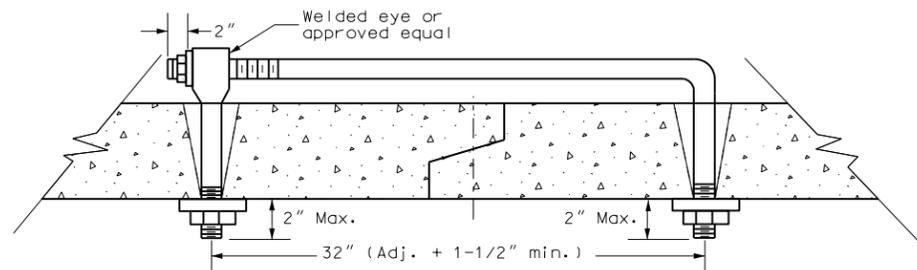
CONCRETE PIPE TIES



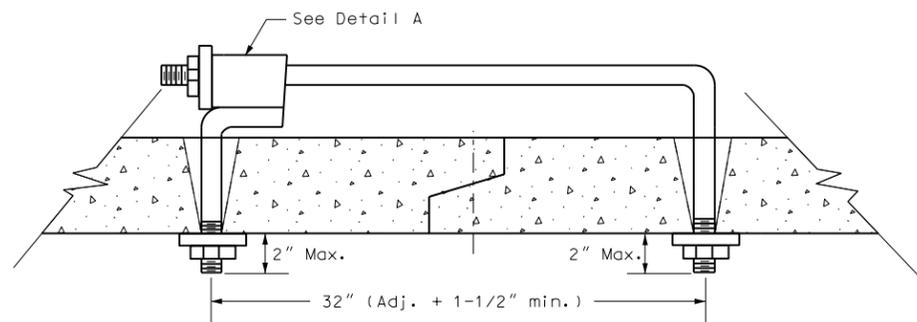
TOP VIEW



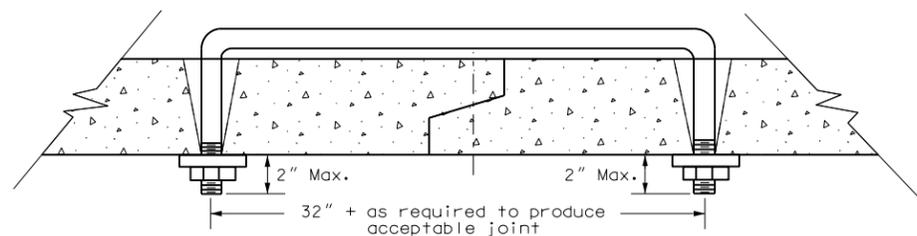
ADJUSTABLE TIE



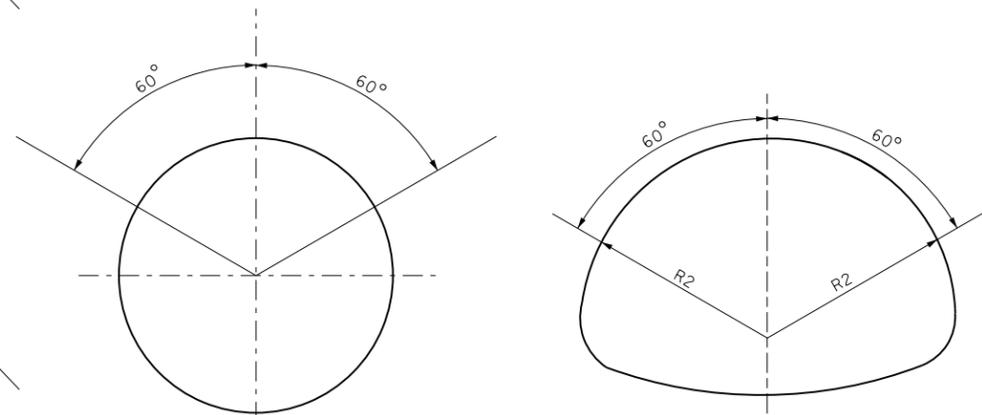
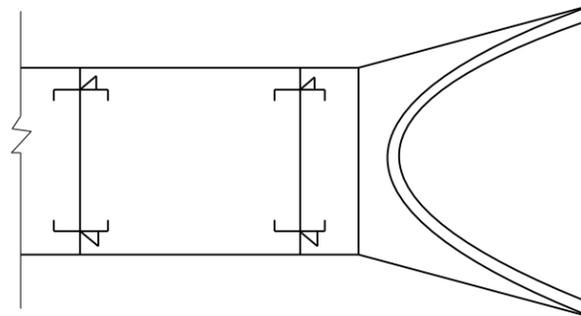
EYE BOLT TIE



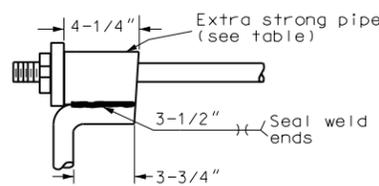
WELDED PIPE TIE



U BOLT TIE

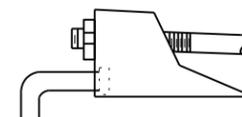


PLACEMENT OF HOLES



DETAIL A

Thread Dia.	E.S. Pipe I.D.
5/8"	3/4"
3/4"	1"
1"	1-1/4"



OPTIONAL CANOPY TIE

REQUIRED SIZE OF TIE BOLTS					
Pipe Size (Inches)	Thread Dia.	Pipe Size (Inches)	Thread Dia.	Pipe Size (Inches)	Thread Dia.
12	5/8" (See note 2)	30	3/4"	72	1"
15		33		78	
18		36		84	
21		42		90	
24		48		96	
27		54		102	
		60		108	
	66	120			
				132	

NOTES:

1. Pipe size listed is inside diameter of round pipe or equivalent diameter of pipe arch.
2. Nuts and washers are not required on inside of 21" diameter pipe or less.
3. Ties to be used only to hold pipe sections together, not for pulling sections tight.
4. Tie bolts shall be painted after fabrication with one coat of zinc chromate iron oxide paint. Threaded portion of rods do not have to be painted.
5. Holes in pipe to accommodate the tie bolts can be precast or drilled. Tapered holes will be permitted when precast. When existing pipe are extended or salvaged and relayed, the contractor will be required to drill the necessary holes.
6. The contractor has the option of selecting the type of tie bolt to be used. The type selected shall be approved by the engineer.
7. The cost of precasting or drilling the required holes and furnishing and installing the tie bolts shall be included in the price bid for reinforced concrete pipe culverts.
8. All concrete pipe joints will be tied including the end section joints. Tie bolts are not required on storm sewer pipe unless specifically noted in the plans.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 10-1-86	
REVISIONS	
DATE	CHANGE
12-09-94	Notes
06-26-03	Layout revisions
12-01-04	PE Stamp added

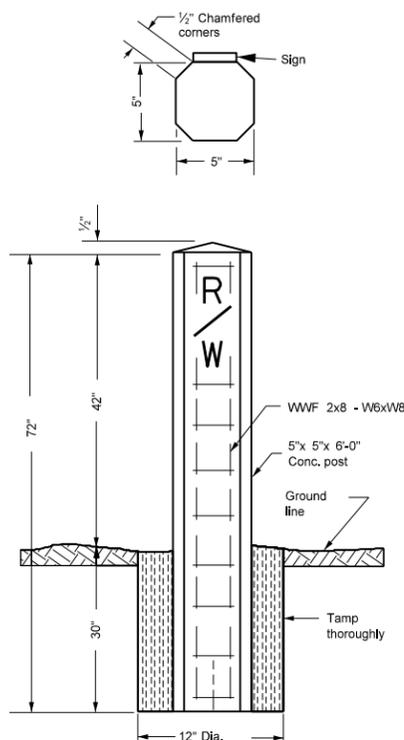
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STANDARD MONUMENTS AND RIGHT OF WAY MARKERS

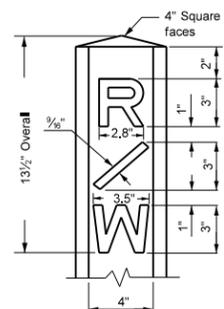
NOTES

The construction and installation of precast concrete alignment monuments and right of way markers (witness posts) shall conform to Section 720 of the Standard Specifications. The markers shall be placed on the right of way line 12" from the iron pin as shown in the details. All markers shall be installed with the letter side facing the project. A 3" x 9" sign (see details on this sheet) will be attached to the back side of the markers.

IRON MONUMENTS (PINS):
Iron pins (1" x 24") will be furnished and placed by the NDDOT (or surveying consultant personnel working on highway projects) on the Right of Way line at section lines, right of way breaks, curve points, and near the mid point of each mile. The iron pins will also be placed on the centerline alignment curve points and POT's (see diagram below). The pins at the mid point can be eliminated if the curve points or right of way breaks are in the immediate vicinity.

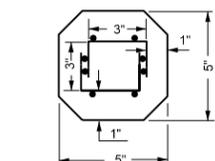


MARKER DETAIL
CONCRETE RIGHT OF WAY MARKER DETAILS

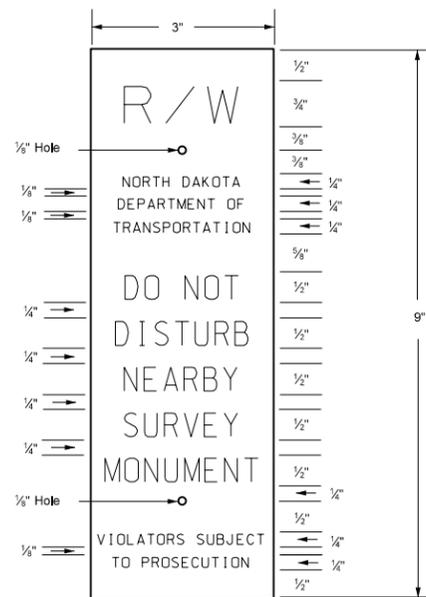


MARKING DETAIL

Incised letters (1/4" min.)
3" high on one side.
Series "F" letters.

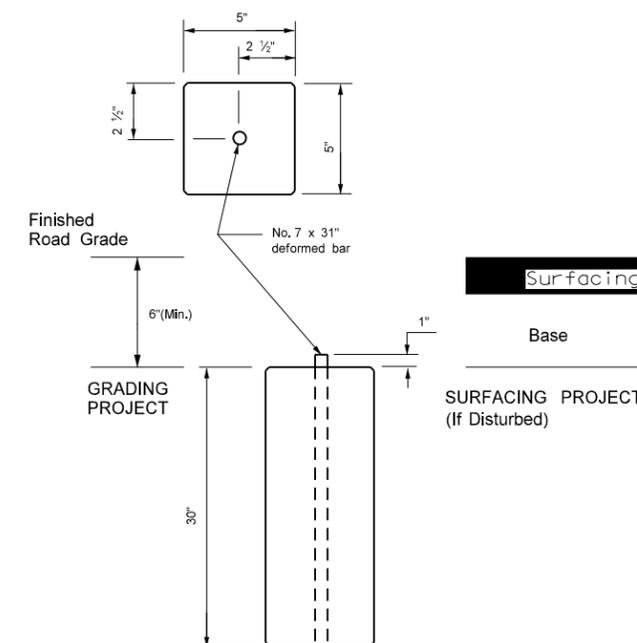


REINFORCING DETAIL

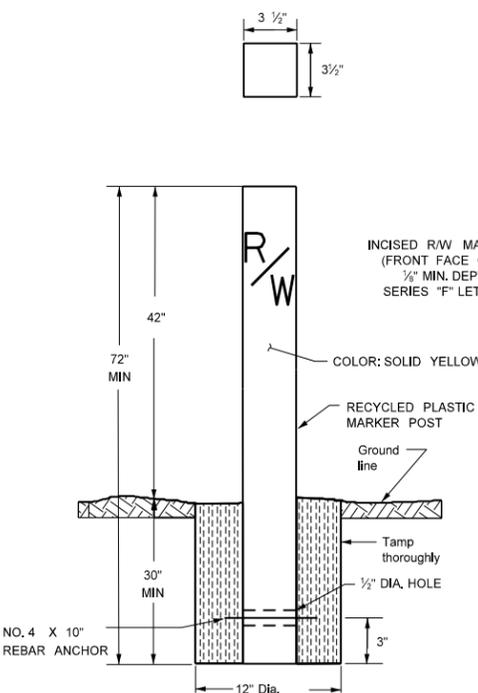


SIGN DETAIL

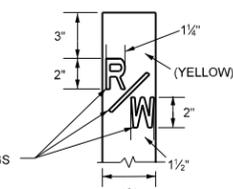
Black letters on orange background, 40 Gauge stamped aluminum plate. Baked enamel finish. Silk screen graphics. One color print. Sign shall be attached by drilling two holes in the face of the post (side facing the private owner, away from the Department of Transportation right of way). Put inserts into the holes and mount the sign with #4 vandal proof screws. Sign shall be installed 2" from top of post.



PRECAST CONCRETE ALIGNMENT MONUMENT

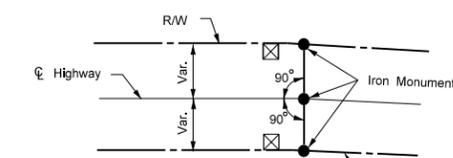


MARKER DETAIL
RECYCLED PLASTIC RIGHT OF WAY MARKER DETAILS

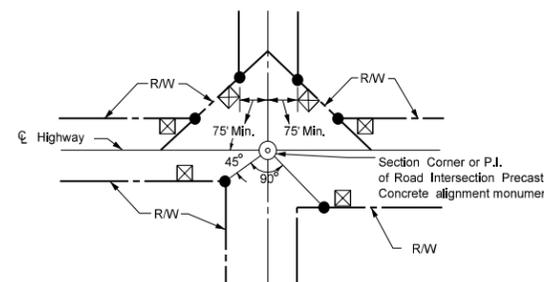


MARKING DETAIL

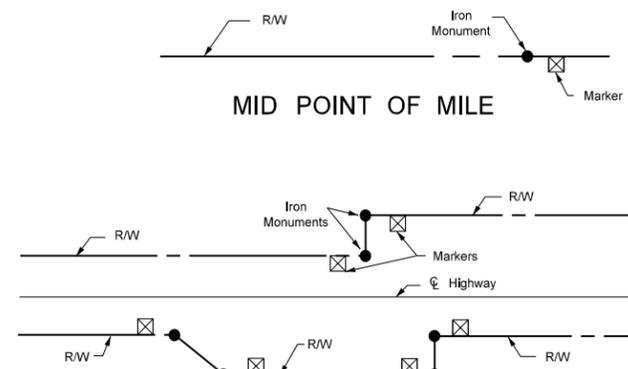
INCISED R/W MARKINGS (FRONT FACE ONLY)
1/2" MIN. DEPTH
SERIES "F" LETTERS



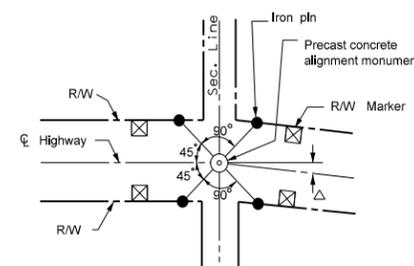
CURVE POINTS (PC, PT, TS, SC, CS, ST, etc.)



FLARED R/W BREAKS



MARKERS AT R/W BREAKS



SECTION CORNERS, QUARTER CORNERS, SECTION LINE CROSSINGS, & P.I's

KEY

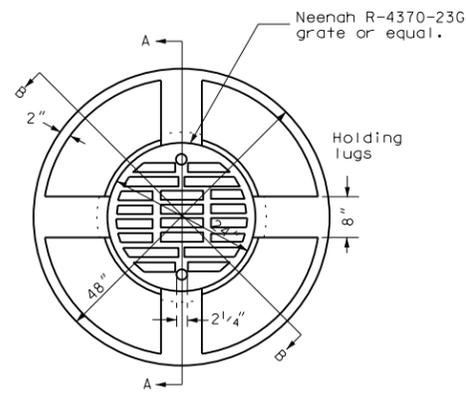
- Iron Monument (pin)
- ⊠ R/W Marker (witness post)
- ⊙ Precast Concrete Alignment Monument

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
12-16-87	Note change
05-01-90	Steel post note
09-03-96	Sign detail
08-05-98	Revised notes
10-26-98	General revisions
12-23-98	Note Revisions
12-05-00	Add plastic R/W marker, Rev. note
02-18-03	Revised notes
12-01-04	PE Stamp added
11-28-05	Revised monument to pin
02-14-07	Added "witness posts"
08-06-07	Removed beveled edges on plastic r/w markers

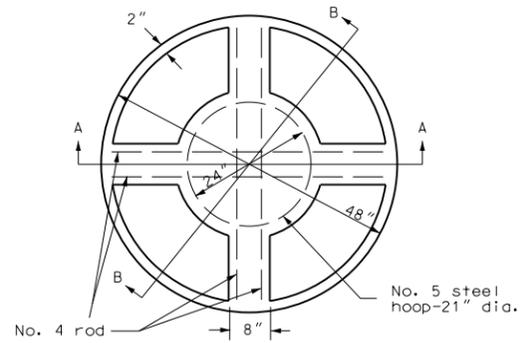
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PRECAST CONCRETE MEDIAN DRAIN

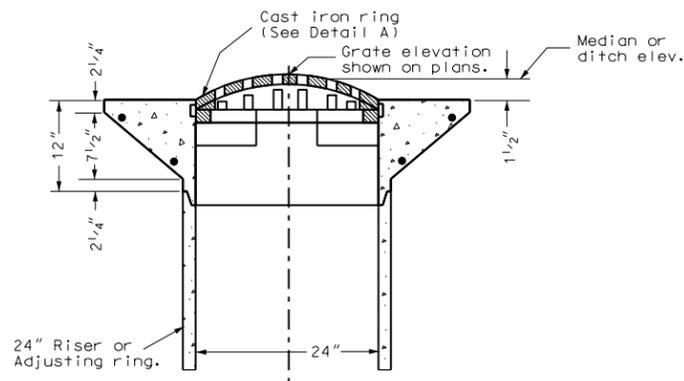
D-722-7



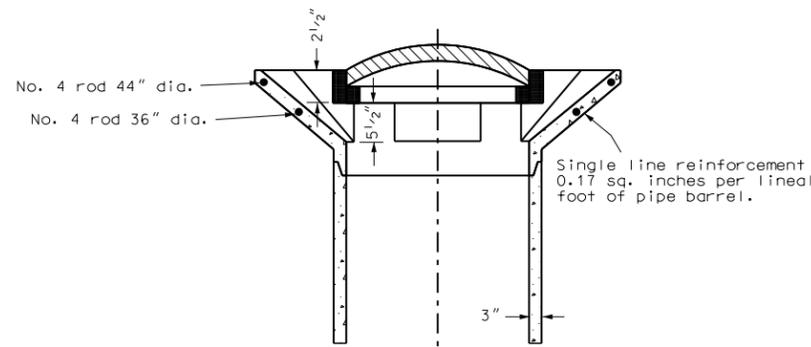
PLAN VIEW



PLAN VIEW

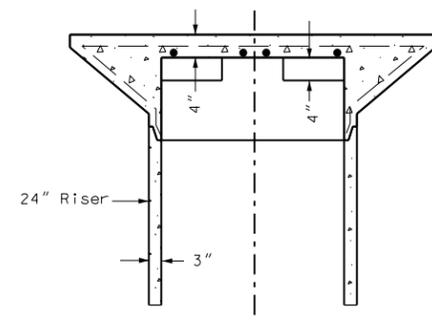


SECTION A-A

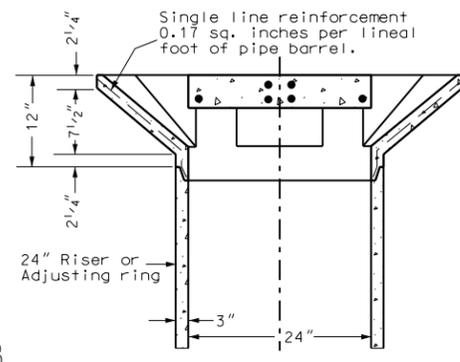


TYPE A

SECTION B-B

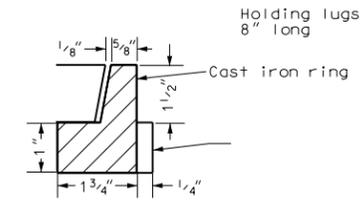


SECTION A-A

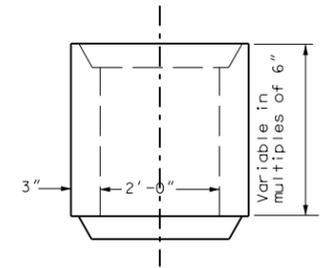


TYPE B

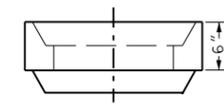
SECTION B-B



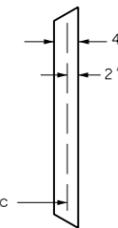
DETAIL A



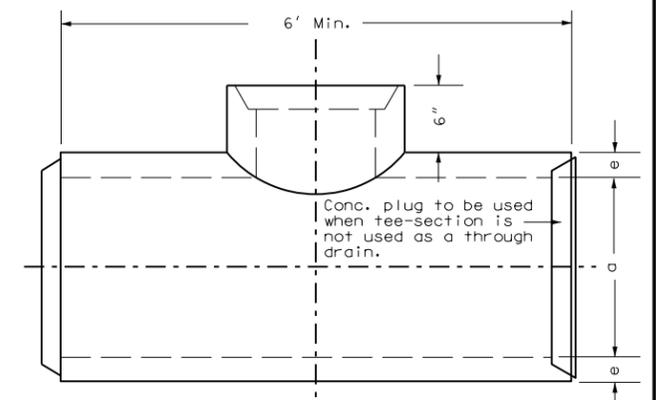
RISER SECTION



ADJUSTING RING

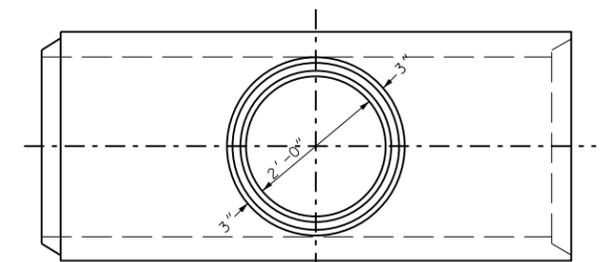


CONC. PLUG



SIDE VIEW

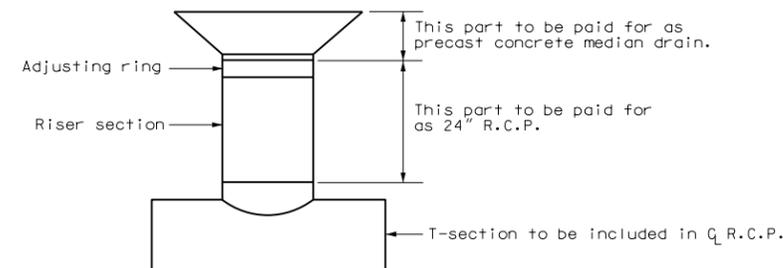
a = Diameter of drainage pipe
e = Wall thickness of drainage pipe



PLAN VIEW

Reinforcement in above sections shall be in accordance with Standard Specifications.

T - SECTION

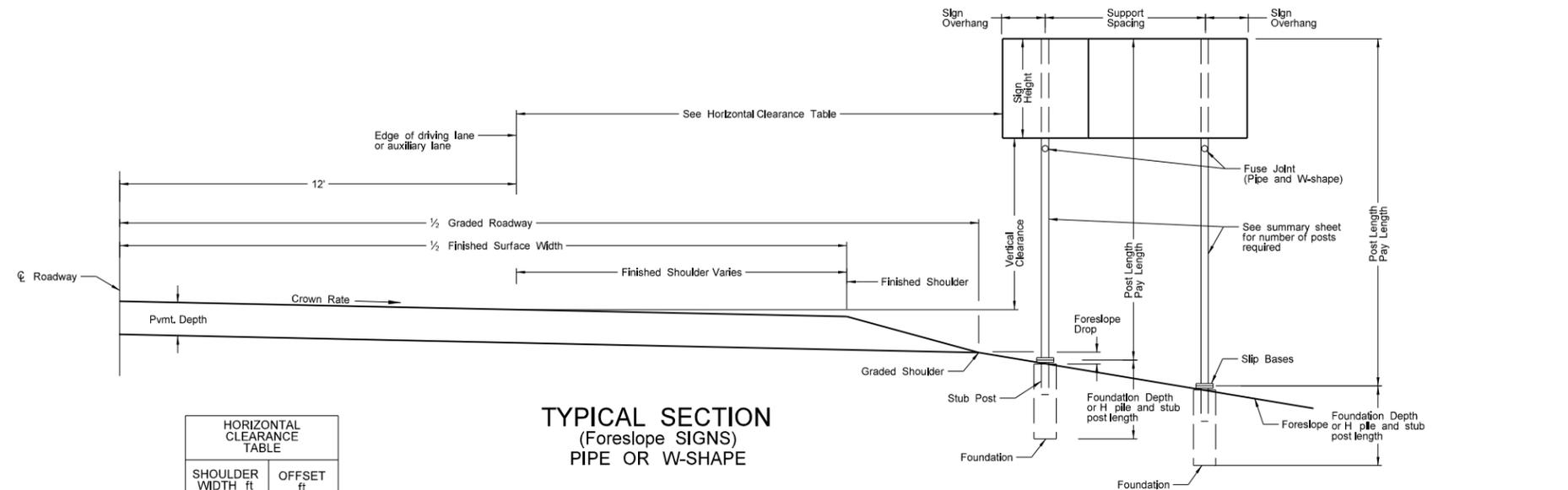


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
06-26-03	Layout revision
12-01-04	PE Stamp added

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PIPE OR W-SHAPE ASSEMBLY DETAILS

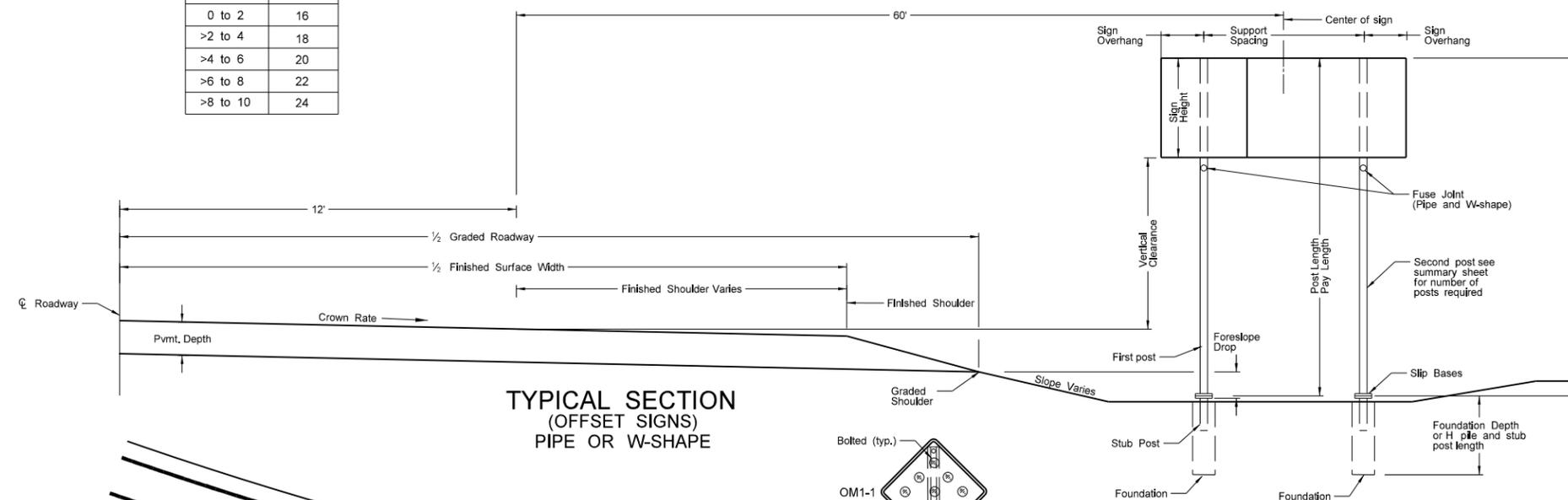
D-754-1



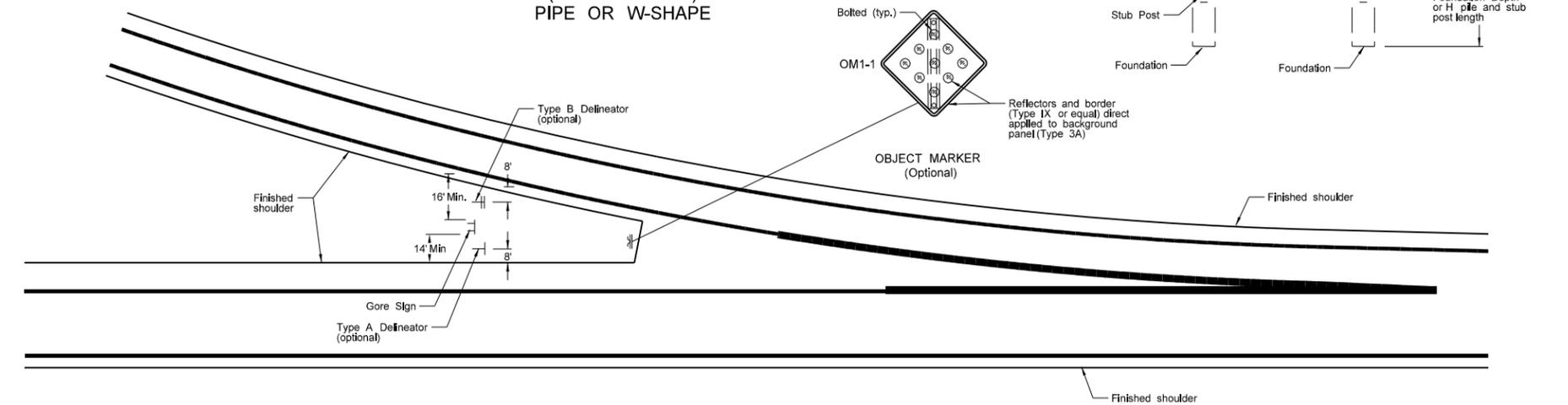
HORIZONTAL CLEARANCE TABLE

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

TYPICAL SECTION (FORESLOPE SIGNS) PIPE OR W-SHAPE



TYPICAL SECTION (OFFSET SIGNS) PIPE OR W-SHAPE



EXIT RAMP GORE SIGN PLACEMENT

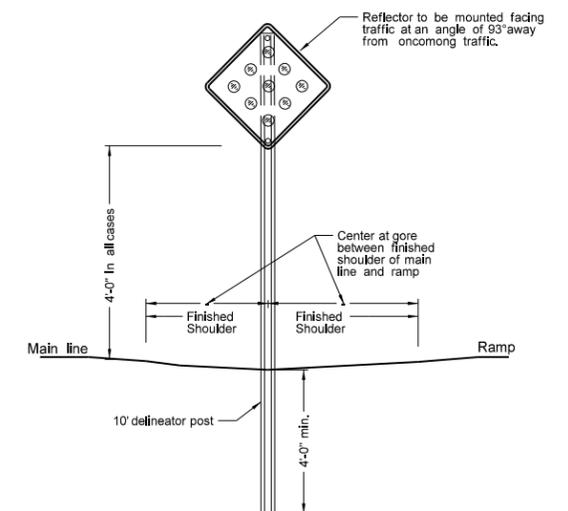
NOTES:

MINIMUM VERTICAL CLEARANCE:
 Signs installed at the side of the road in rural districts shall be at least 5 feet measured from the bottom of the sign to the edge of driving lane, or Auxiliary Lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least 7 feet.

Directional signs on expressways and freeways shall be installed with a minimum height of 7 feet. If secondary sign is mounted below another sign, the major sign shall be installed at least 8 feet and the secondary sign shall be installed at least 5 feet above the edge of driving lane. All route signs, warning signs, and regulatory signs on expressways and freeways shall be at least 7 feet above the edge of 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 feet above the edge of driving lane.

Signs may be placed a maximum of 6" above the vertical clearance specified above.



OBJECT MARKER INSTALLATION
 (Posts shall conform to section 894.06 of Standard Specifications.)

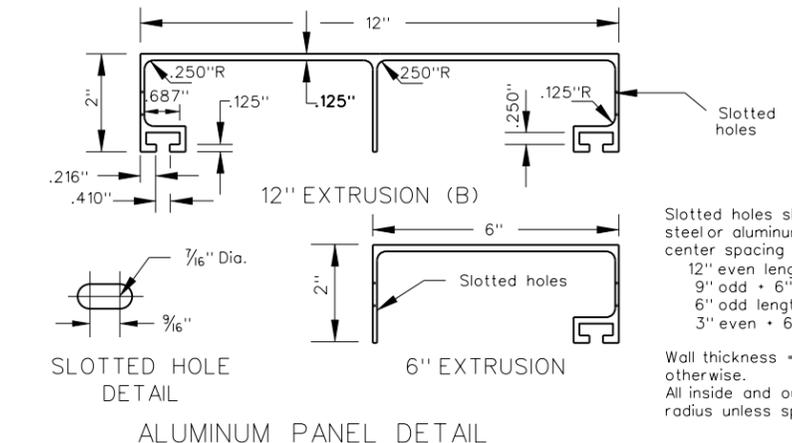
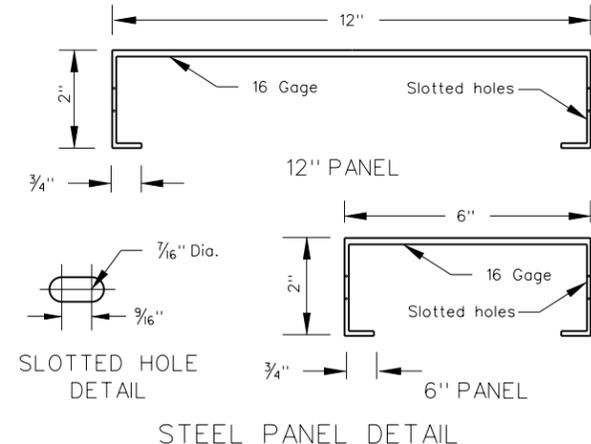
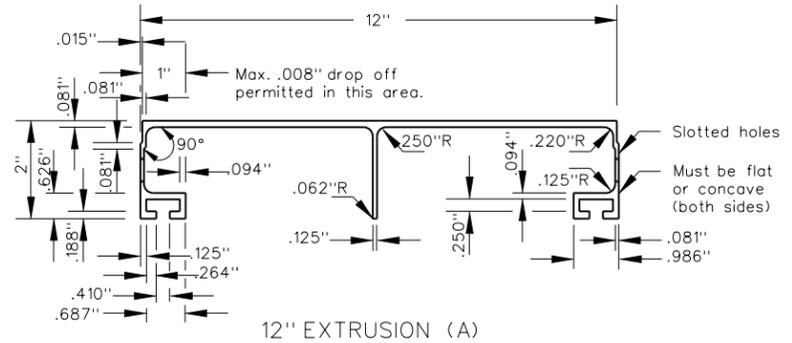
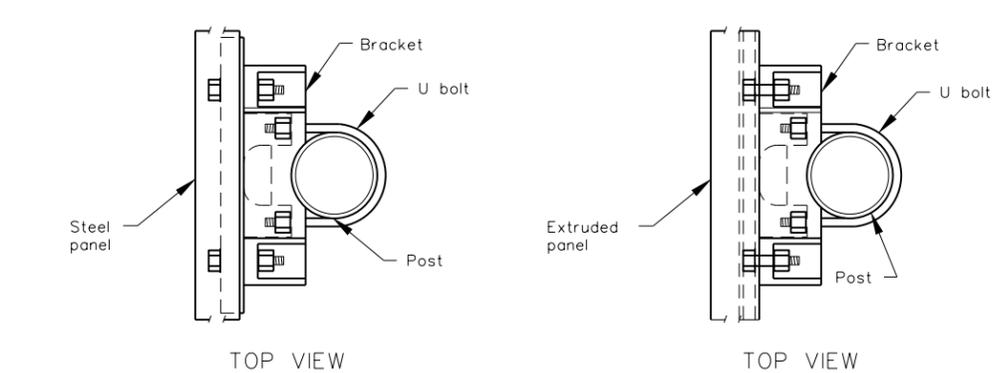
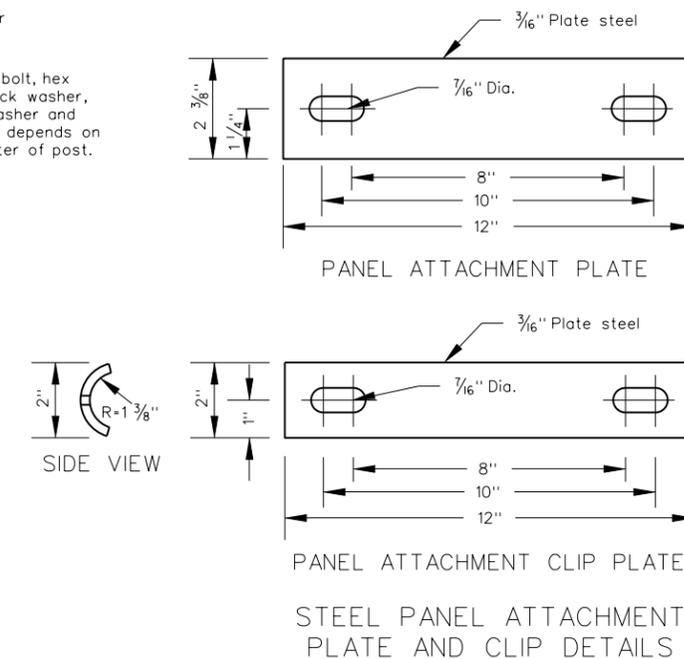
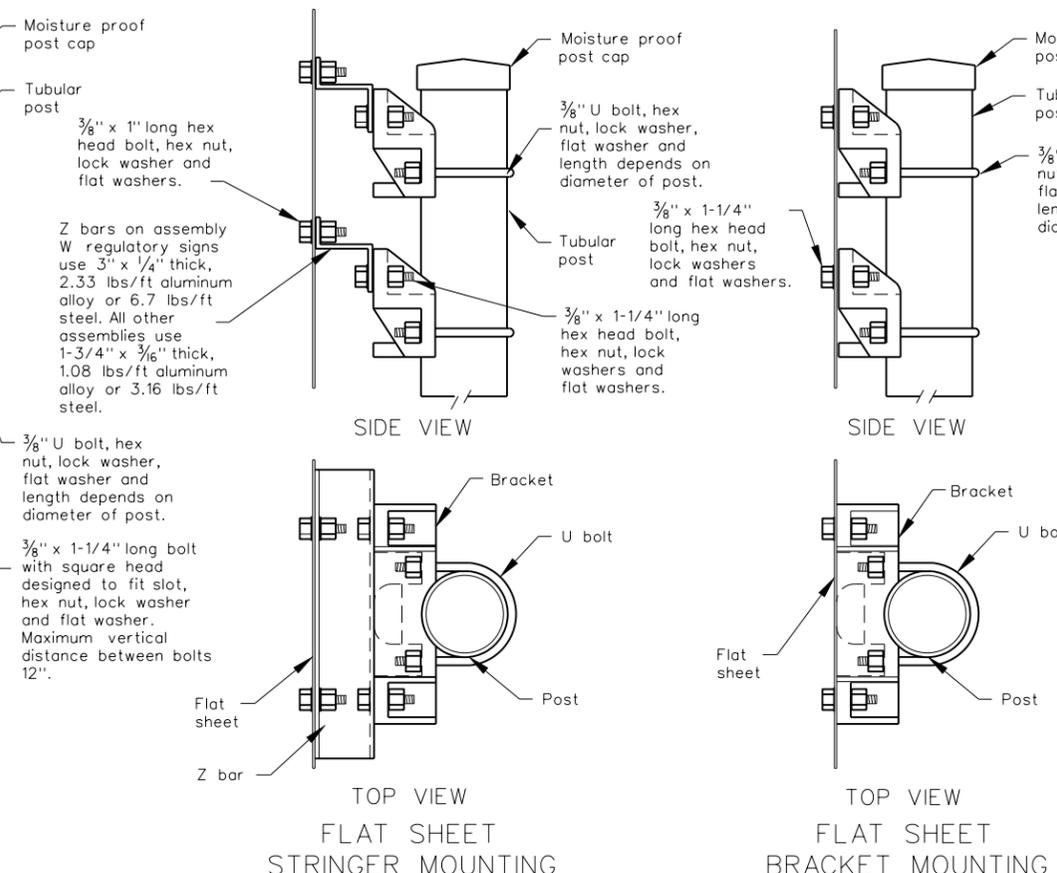
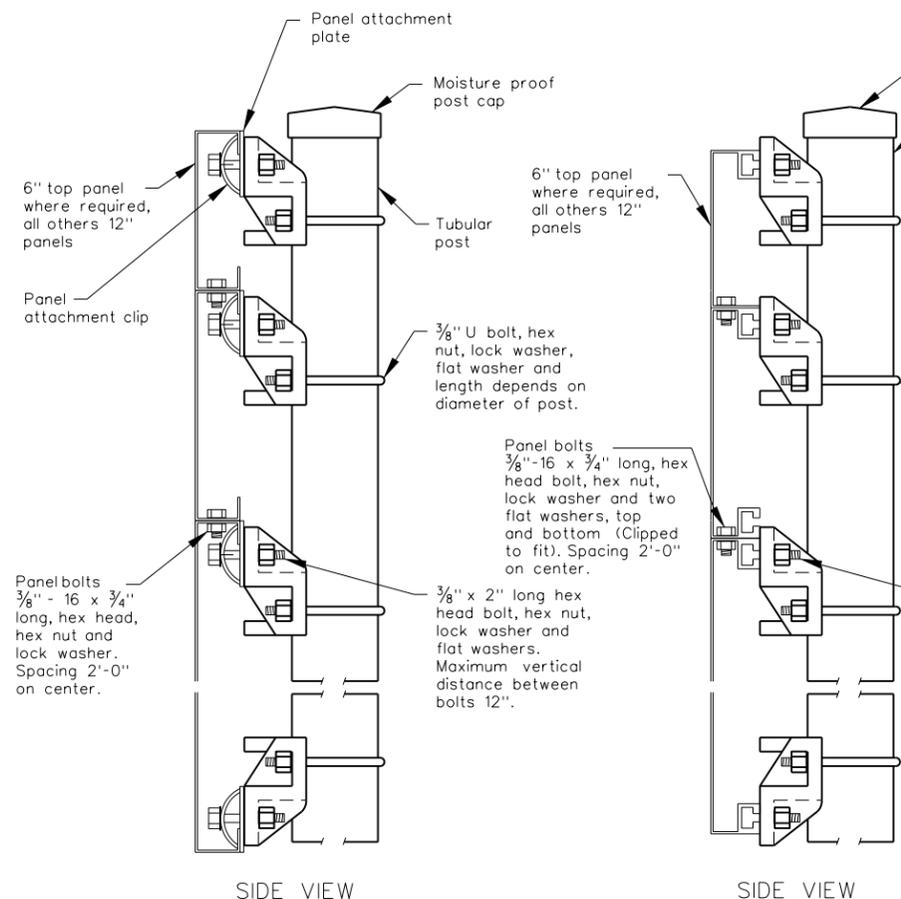
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

MOUNTING, POST CAP AND PANEL DETAILS

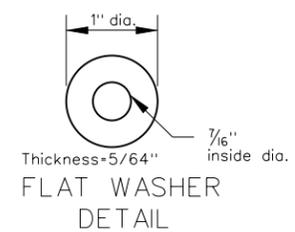
NOTE:

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

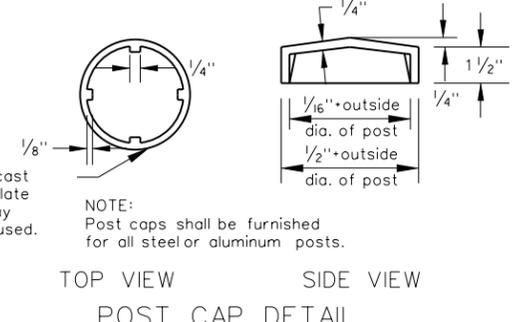


Slotted holes shall be punched in the steel or aluminum panels at 1'-0" on center spacing from end as listed below:
12" even length panels 4'-0" etc.
9" odd + 6" length panels 5'-6" etc.
6" odd length panels 5'-0" etc.
3" even + 6" length panels 4'-6" etc.

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



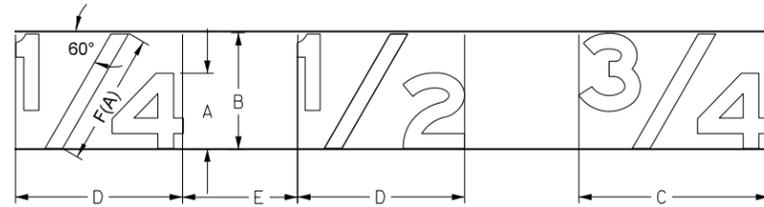
Note: In lieu of cast post cap a 1/8" plate welded all the way around may be used.



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

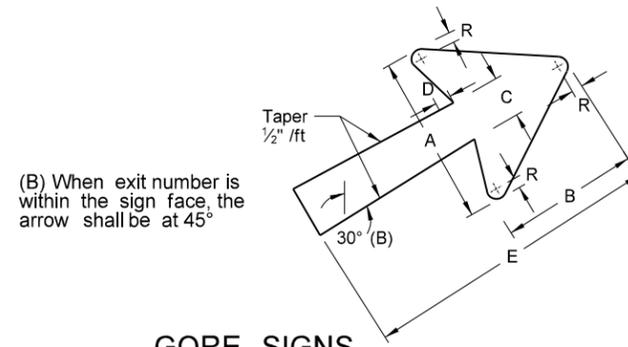
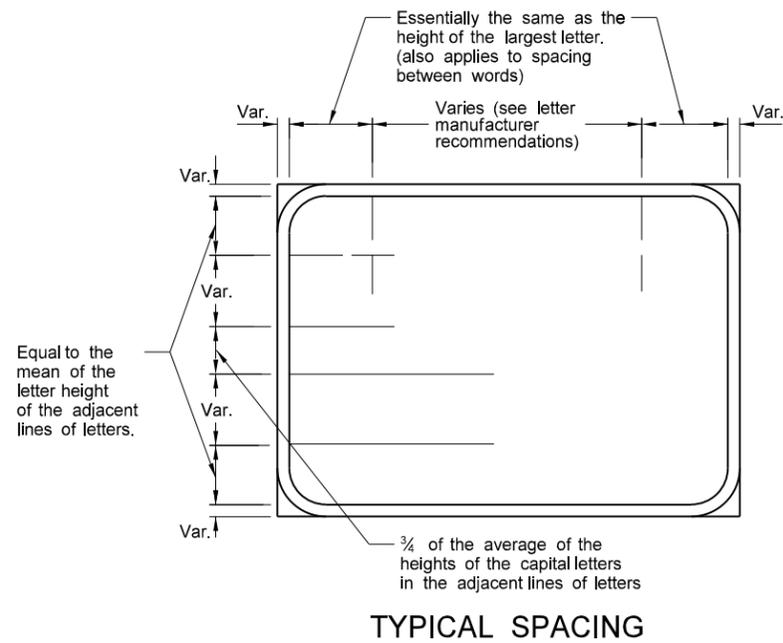
LETTER AND ARROW DETAILS FOR VARIABLE LENGTH SIGNS



SIZE OF THE FRACTION IS DETERMINED AS FOLLOWS:

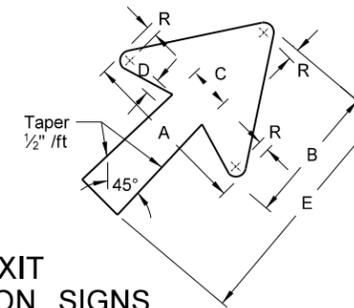
SYMBOL	TITLE	RATIO TO HEIGHT OF CAPITAL OR UPPER CASE
A	Letter height	1.0 of capital or upper case
B	Fraction height	1.5 X A
C	Fraction width	2.5 X A
D	Fraction width	2 X A
E	Space to next character	1 to 1.5 X A
F(A)	Length of diagonal	1.75 X A

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



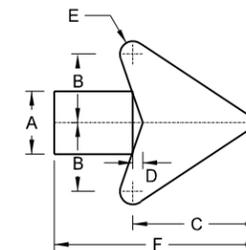
GORE SIGNS

"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"



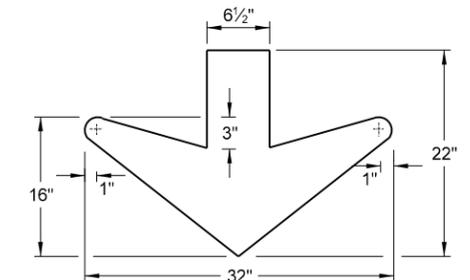
EXIT DIRECTION SIGNS

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"

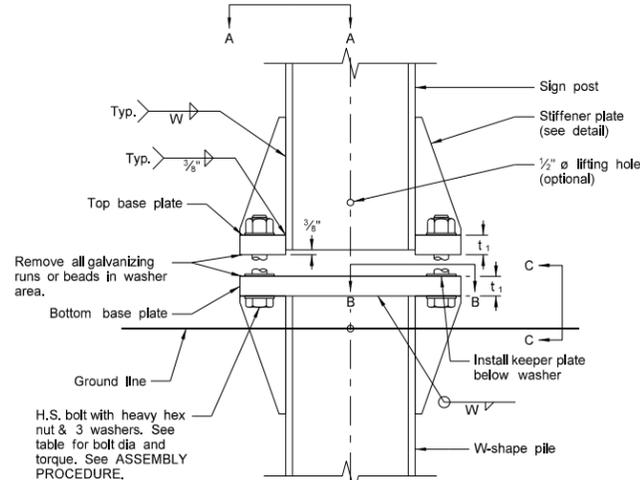


DOWN ARROW

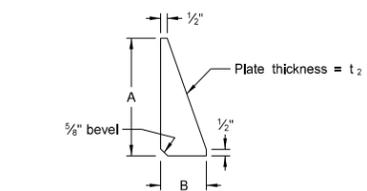
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-3-11	
REVISIONS	
DATE	CHANGE

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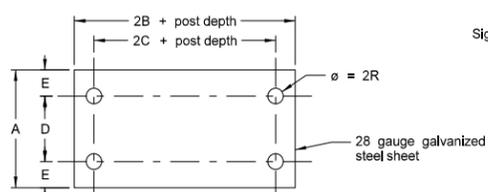
STRUCTURAL DETAILS
W-SHAPE SUPPORTS



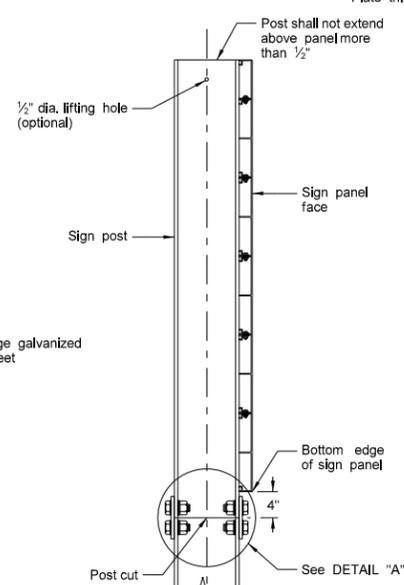
SIGN POST ELEVATION



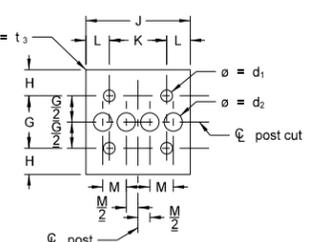
STIFFENER PLATE DETAIL



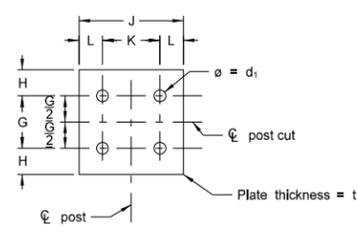
KEEPER PLATE



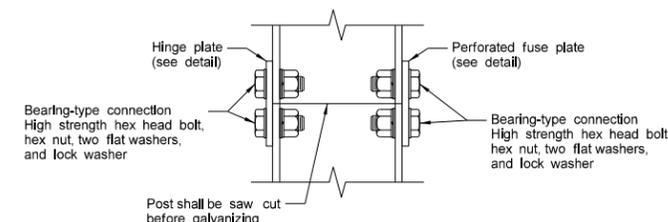
FUSE JOINT
(SIDE VIEW)



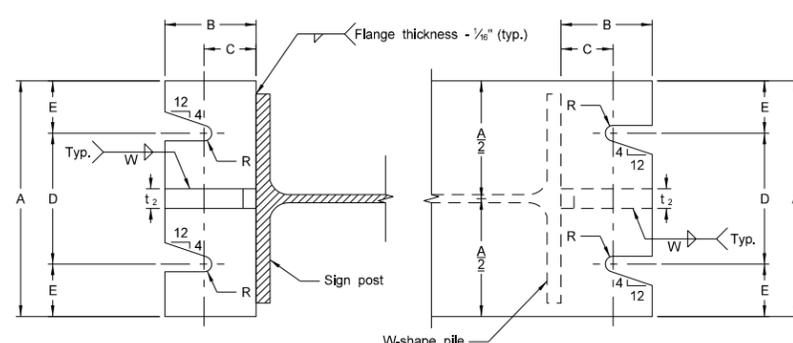
PERFORATED FUSE
PLATE DETAIL



HINGE PLATE
DETAIL



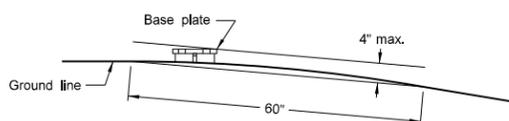
DETAIL "A"



SECTION A-A

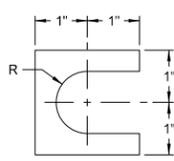
SECTION B-B

Sections shown are for installations on right shoulder and in gore. Installations on the left shoulder shall have the plate slot bevels reversed.



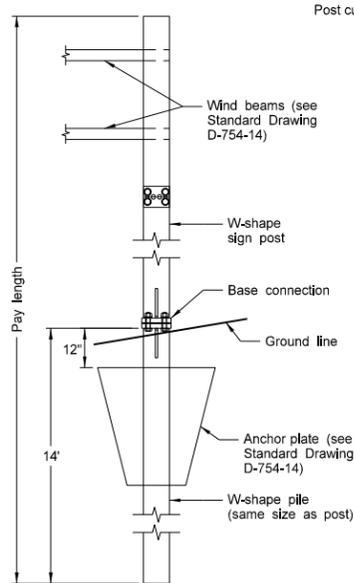
SECTION C-C

Maximum projection of base plate shall not extend above a line, 4" parallel to any chord, which is perpendicular to (or aligned radially to) the center line of the highway and has the chord's end points on the ground surface on opposite sides of the stub post.

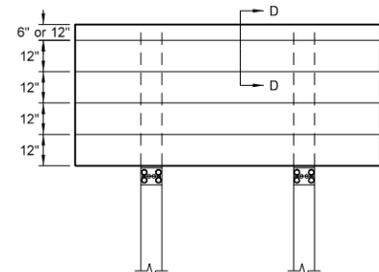


SHIM DETAIL

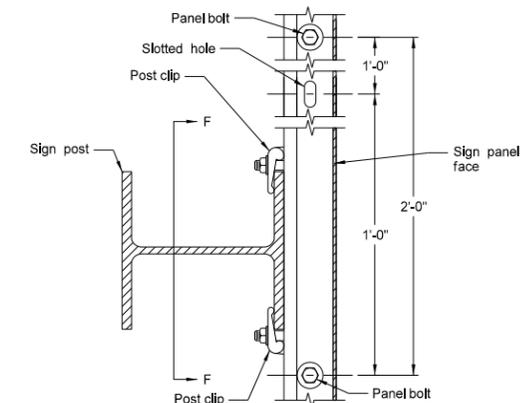
Furnish 2 - .012± thick and 2 - .032± thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.



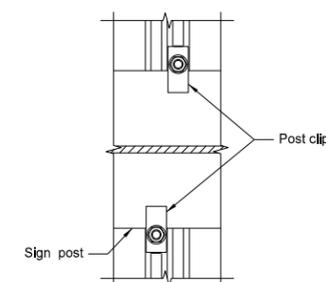
SIGN SUPPORT DETAIL



TYPICAL PANEL MOUNTING

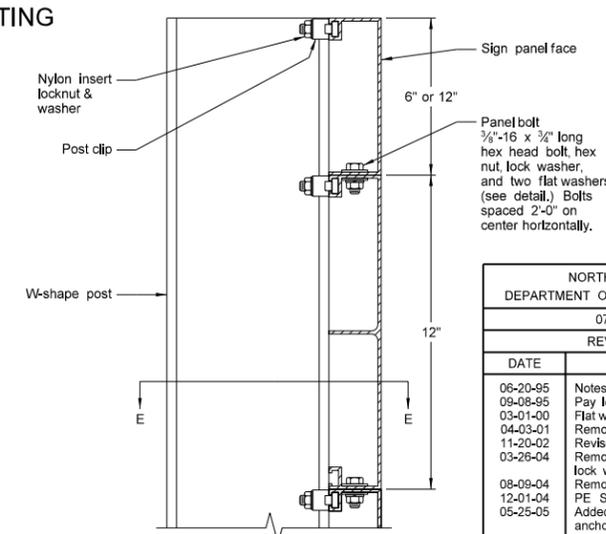


SECTION E-E

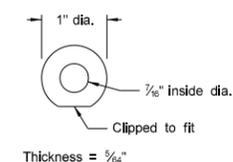


SECTION F-F

Note: Post clips shall be installed on both sides of each post at each panel joint as indicated.



SECTION D-D



FLAT WASHER DETAIL

NOTES:

Structural steel shall conform to Section 894.05 B.6 of the Standard Specifications. High strength bolts shall conform to ASTM A-325.

Refer to "Sign Summary" sheet for specific data on each individual sign installation.

Perforated fuse plate shall be installed on side of post facing traffic.

All posts shall be saw cut. Plates may be sheared or flame cut using a mechanically guided cutting torch in accordance with Section 754.03 E.6.b of the Standard Specifications. Edge preparation shall be in accordance with Section 754.03 E.6.c of the Standard Specifications.

ASSEMBLY PROCEDURE:

1. Assemble base plates together with bolts and with one flat washer between top base plate and the keeper plate.
2. Shim as required to plumb post.
3. Tighten all base connection bolts the maximum possible with 12" to 15" wrench to bed washers and shims and to clean bolt threads.
4. Loosen each bolt in turn and retighten in a systematic order to the prescribed torque (see table.)
5. Assemble perforated fuse and hinge plates to post with bolts and with one flat washer and lock washer under nut. Tighten all bolts the maximum possible with a 12" to 15" wrench to bed washers and shims and to clean bolt threads. Loosen, and retighten bolts in a systematic order.

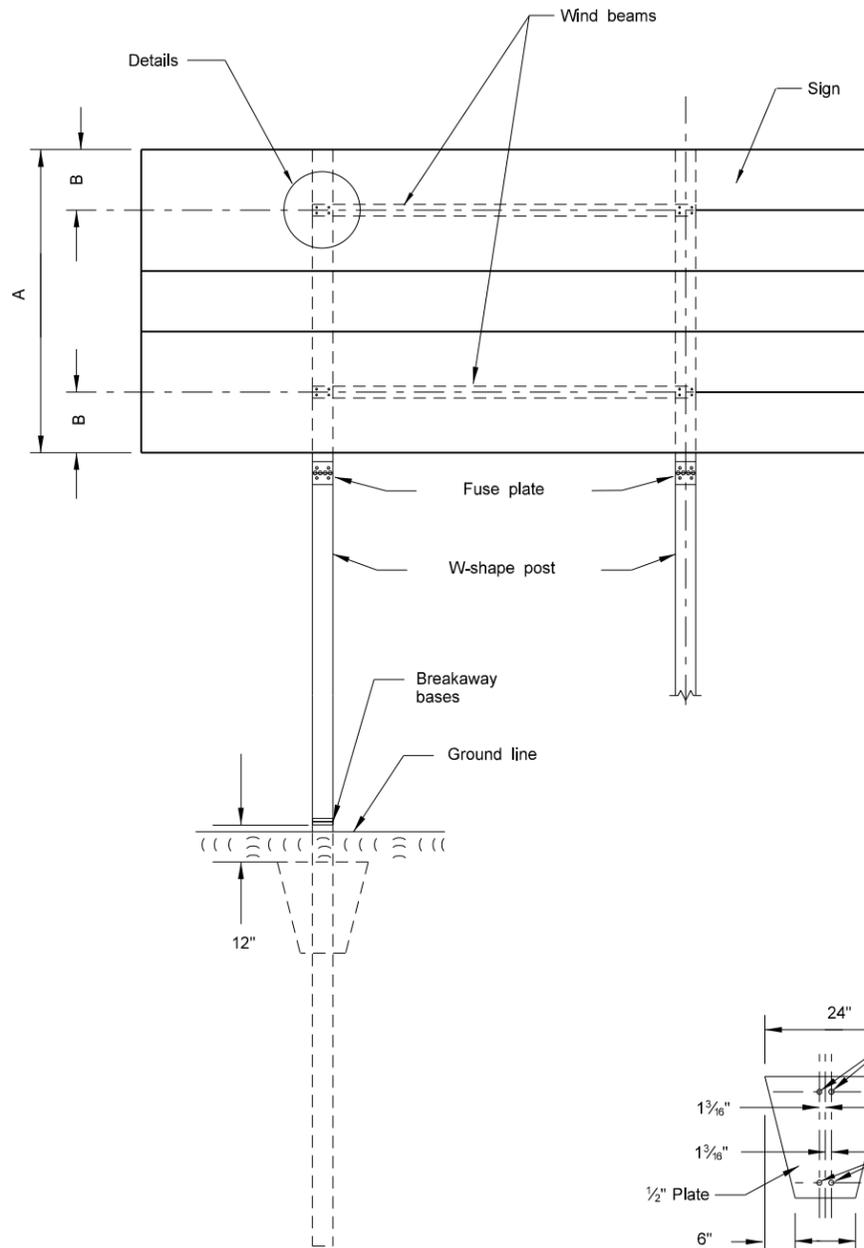
W-SHAPE POST AND PILE SIZE	BOLT SIZE AND TORQUE	BASE CONNECTION DIMENSIONS										FUSE AND HINGE PLATE DIMENSIONS										BOLT DIA.
		A	B	C	D	E	t ₁	t ₂	W	R	G	H	J	K	L	M	d ₁	d ₂	t ₃			
W4x13	3/4" ø x 3 1/2" Torque = 600 in-lb	6"	2 1/2"	1 1/2"	3 1/2"	1 1/4"	1"	1/2"	1/4"	13/32"	2"	1 1/4"	4"	2 1/4"	7/8"	1"	1 1/16"	3/4"	3/8"	5/8"		
W5x16	3/4" ø x 3 1/2" Torque = 600 in-lb	6"	2 1/2"	1 1/2"	3 1/2"	1 1/4"	1"	1/2"	1/4"	13/32"	2 1/2"	1 1/4"	5"	2 3/4"	1 1/8"	1 1/8"	13/16"	7/8"	3/8"	3/4"		
W6x20	7/8" ø x 4 1/4" Torque = 800 in-lb	8"	3"	1 3/4"	4"	2"	1 1/4"	1/2"	1/4"	15/32"	2 1/2"	1 1/4"	6"	3 1/2"	1 1/4"	1 3/8"	13/16"	1 1/8"	3/8"	3/4"		
W8x24	7/8" ø x 4 1/4" Torque = 800 in-lb	8"	3"	1 3/4"	4"	2"	1 1/4"	1/2"	1/4"	15/32"	2 1/2"	1 1/2"	6 1/2"	3 1/2"	1 1/2"	1 1/2"	15/16"	1 1/4"	1/2"	7/8"		
W8x28	1" ø x 5" Torque = 1000 in-lb	8"	3"	2"	4"	2"	1 1/2"	3/4"	5/16"	17/32"	2 1/2"	1 1/2"	6 1/2"	3 1/2"	1 1/2"	1 5/8"	1 1/16"	1 1/8"	1/2"	1"		
W8x31	1 1/8" ø x 5" Torque = 1200 in-lb	9"	3 1/2"	2"	5"	2"	1 1/2"	3/4"	5/16"	19/32"	3"	1 3/4"	8"	5 1/2"	1 1/4"	2"	1 1/16"	1 1/2"	1/2"	1"		
W10x39	1 1/8" ø x 5" Torque = 1200 in-lb	9"	3 1/2"	2"	5"	2"	1 1/2"	3/4"	5/16"	19/32"	3"	1 3/4"	8"	5 1/2"	1 1/4"	1 7/8"	1 3/16"	1 3/8"	1/2"	1 1/8"		

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 07-15-94	
REVISIONS	
DATE	CHANGE
06-20-95	Notes
09-08-95	Pay length
03-01-00	Flat washers
04-03-01	Remove splice plate
11-20-02	Revised note
03-26-04	Removed lock tile and added lock washer
08-09-04	Removed stub post
12-01-04	PE Stamp added
05-25-05	Added wind beams and anchor plates
04-23-07	Revised details and notes

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WIND BEAMS AND ANCHOR PLATES
FOR W-SHAPE SUPPORTS

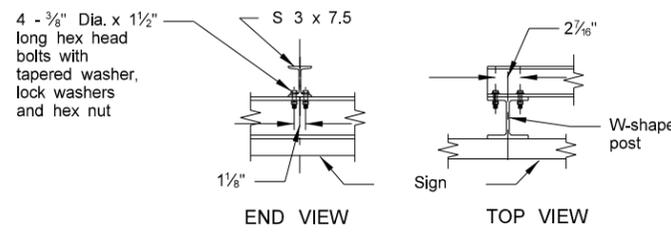
D-754-14



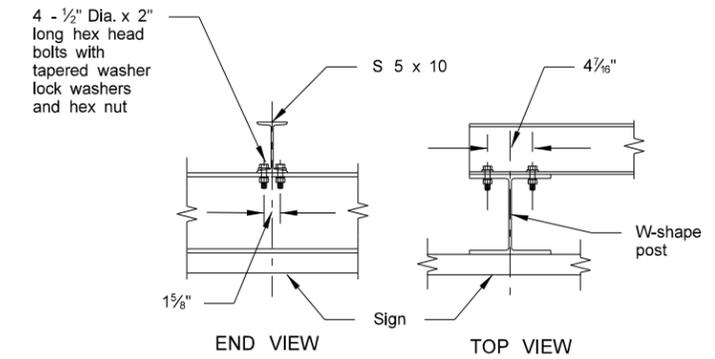
The B distance is calculated by the following formula, $b=A/4$.

The wind beam shall conform to section 894.05 B.6.

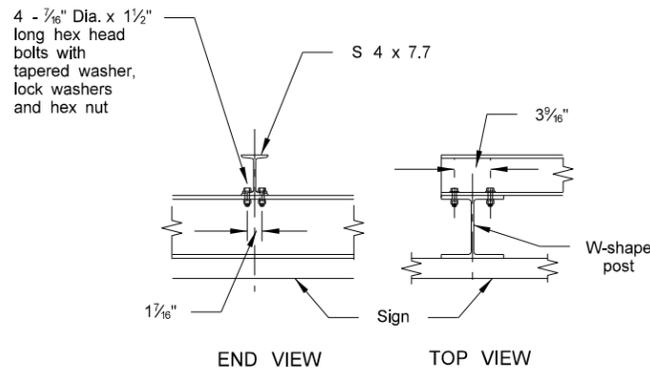
The bolts shall conform to requirements of ASTM A-307 and galvanized according to AASHTO M-232.



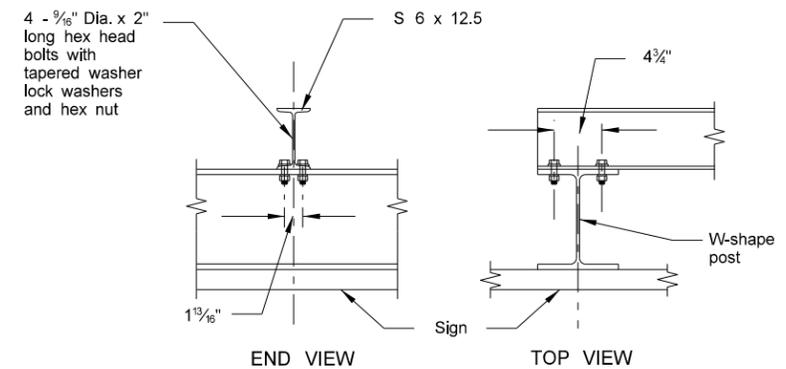
DETAIL
W4-13 or W5-16



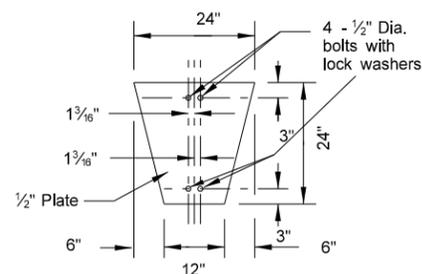
DETAIL
W8-31



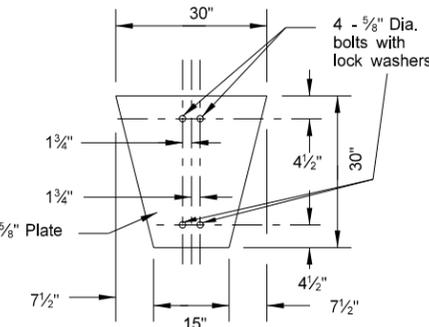
DETAIL
W6-20, W8-24 & W8-28



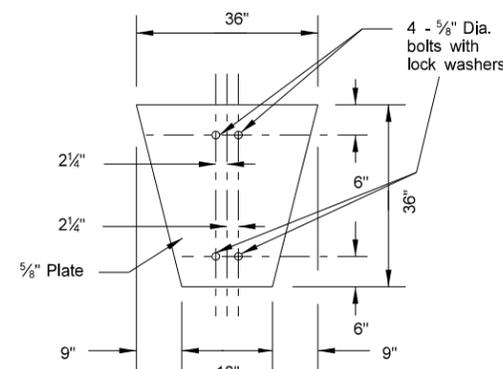
DETAIL
W10-39



W4-13
& W5-16



W6-20, W8-24
& W8-28



W8-31 & W10-39

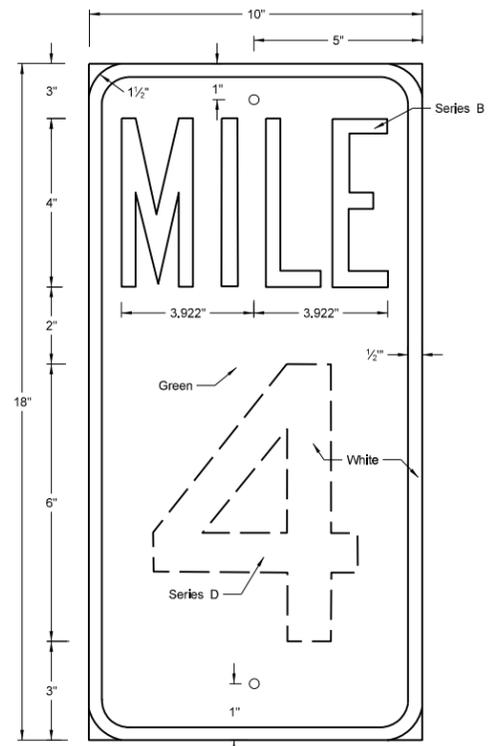
ANCHOR PLATE DETAIL

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-25-05	
REVISIONS	
DATE	CHANGE
06-29-05	Revised bolt requirements
04-23-07	General revisions

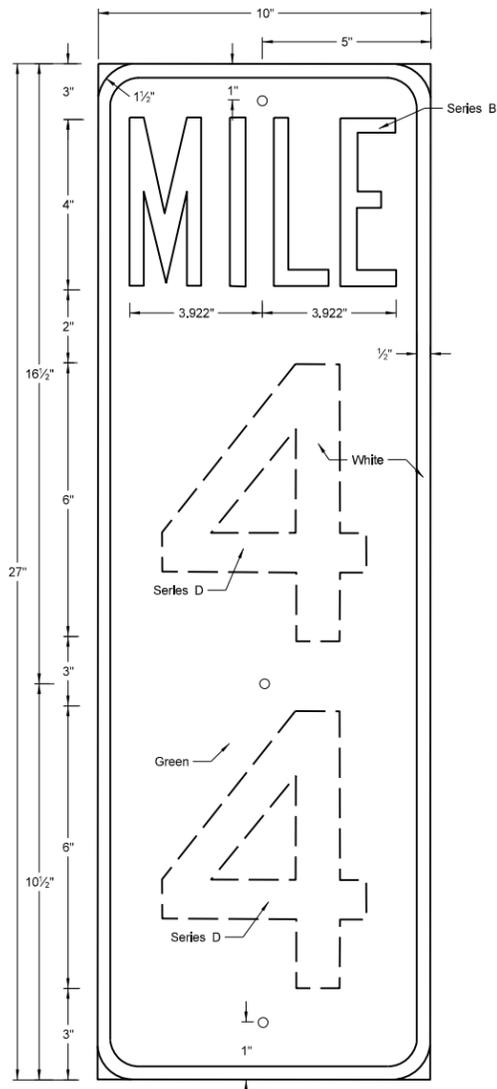
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MARK S. GAYDOS
Registration Number
PE- 4518 ,
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North Dakota Department
of Transportation

(CONVENTIONAL USE) REFERENCE MARKERS

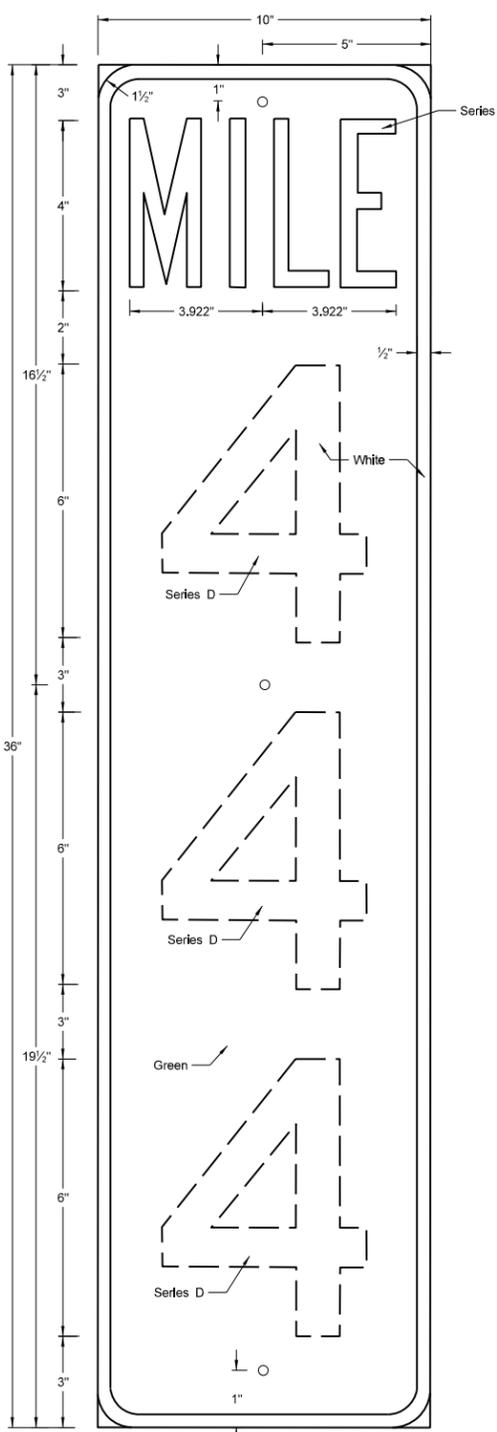
D-754-19



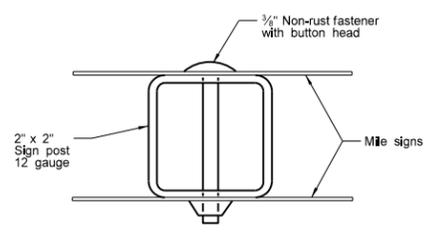
TYPE A
Area = 1.25 S.F.



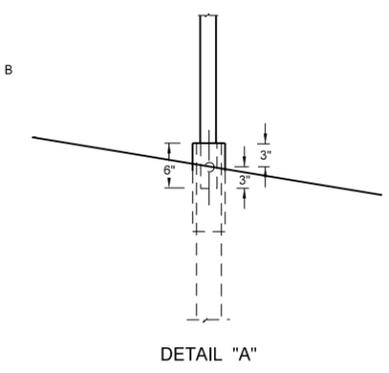
TYPE B
Area = 1.88 S.F.



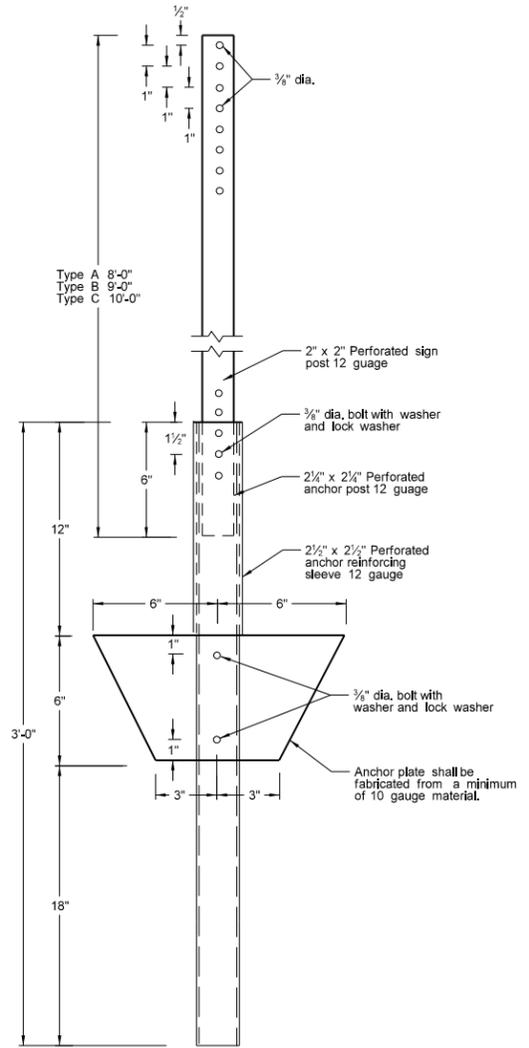
TYPE C
Area = 2.50 S.F.



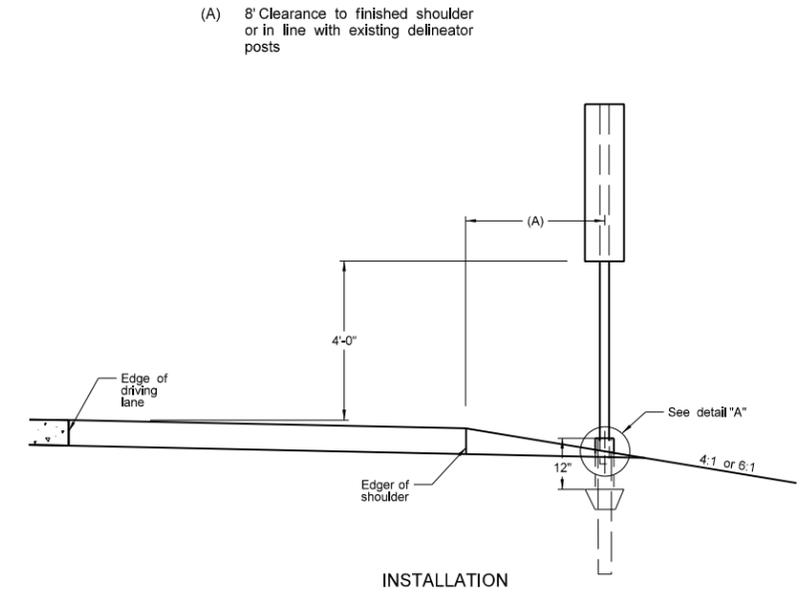
ASSEMBLY DETAIL
(back to back)



DETAIL "A"



POST AND ANCHOR PLATE DETAIL



INSTALLATION

NOTES:
 Installation: Posts shall be installed along right shoulder.
 Sign: Backing shall be fabricated of 0.080 aluminum. Sheeting shall conform to section 894.01 of the Standard Specifications.
 Posts: Posts shall conform to section 894.05 of the Standard Specifications.
 Fasteners: The signs shall be attached to the post by tension pin type fastener or other suitable vandal resistant non-rust fastener.
 Reflective Sheeting: Sheeting shall conform to section 894.02 (Type IIIA) of the Standard Specifications.
 Numbers: Numbers shall be of the series shown and may be screened or applied copy. Screening and reflective sheeting for applied copy shall conform to section 754 & 894 of the Standard Specifications.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
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.

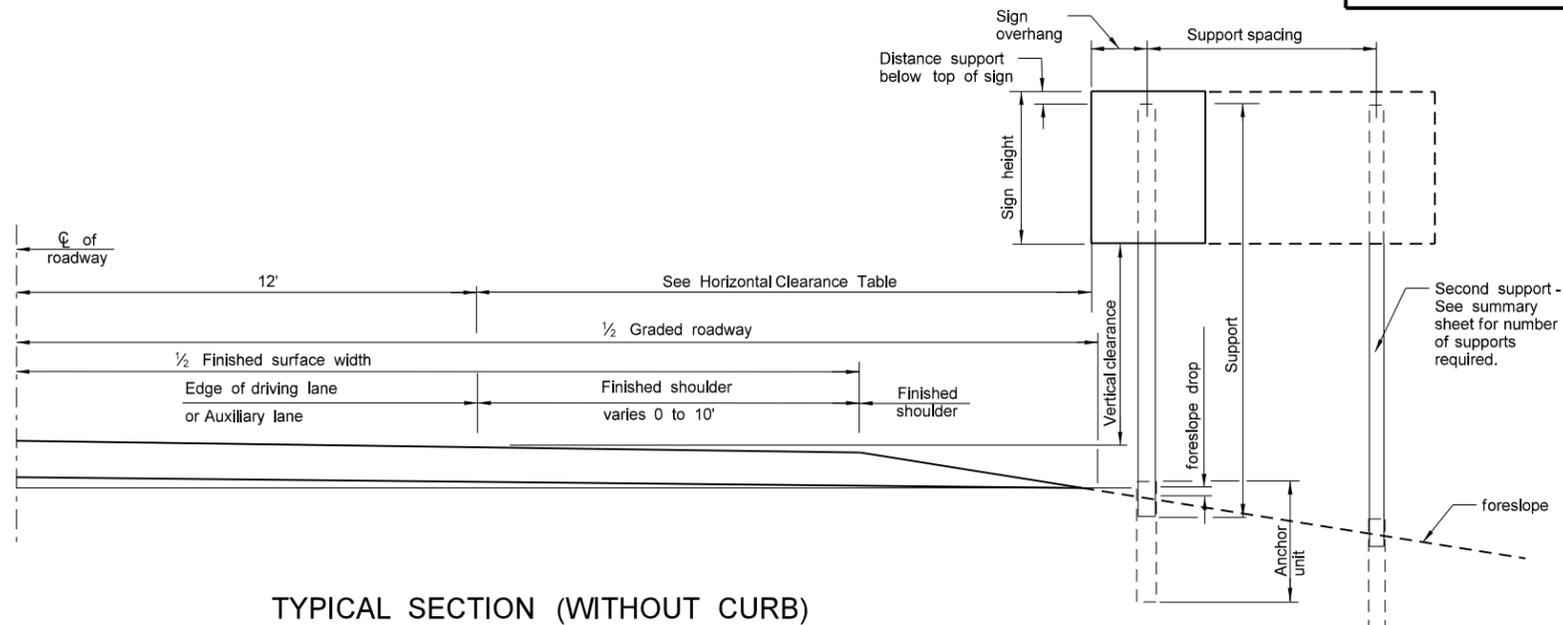
2. Minimum Vertical clearance: Signs installed at the side of the road in rural districts shall be at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least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

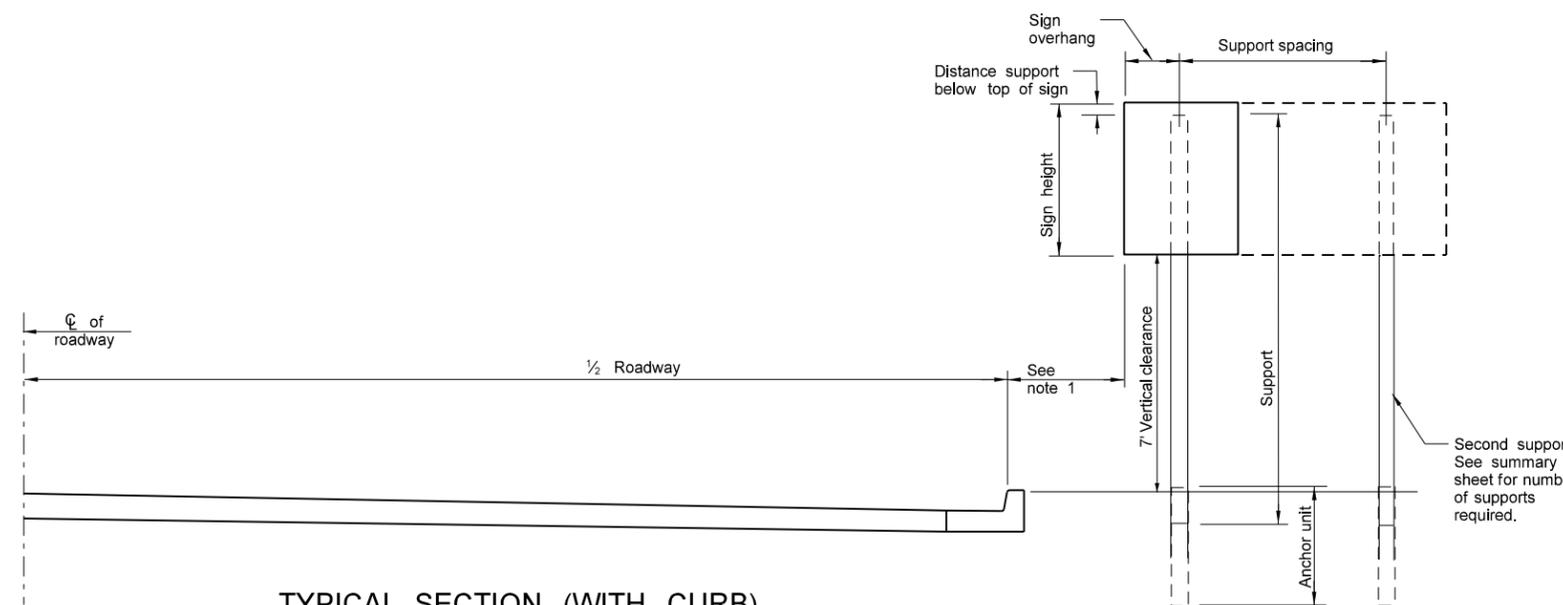
The vertical clearance shall have a maximum height of 6" above the vertical clearance specified above.

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

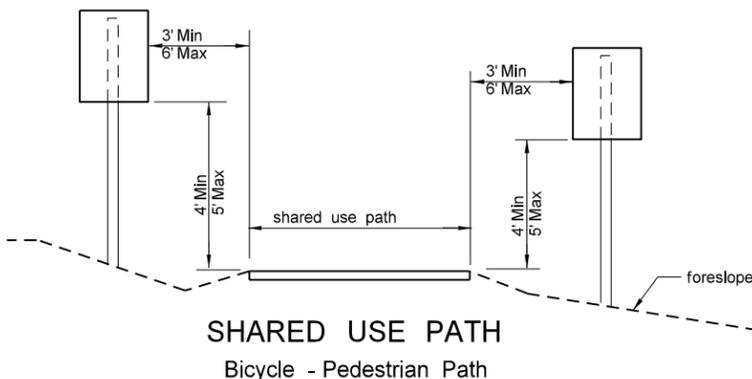


TYPICAL SECTION (WITHOUT CURB)



TYPICAL SECTION (WITH CURB)

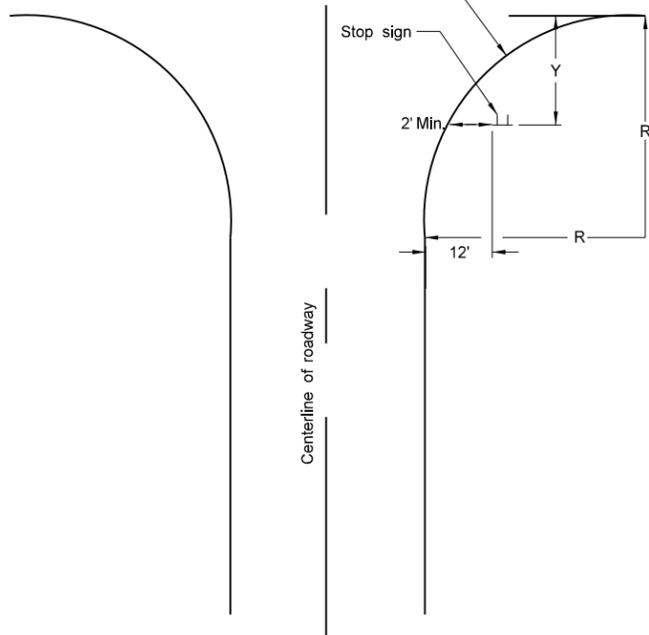
Residential or Business District



SHARED USE PATH

Bicycle - Pedestrian Path

Face of curb or edge of driving lane



STOP SIGN LOCATION WIDE THROAT INTERSECTION

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

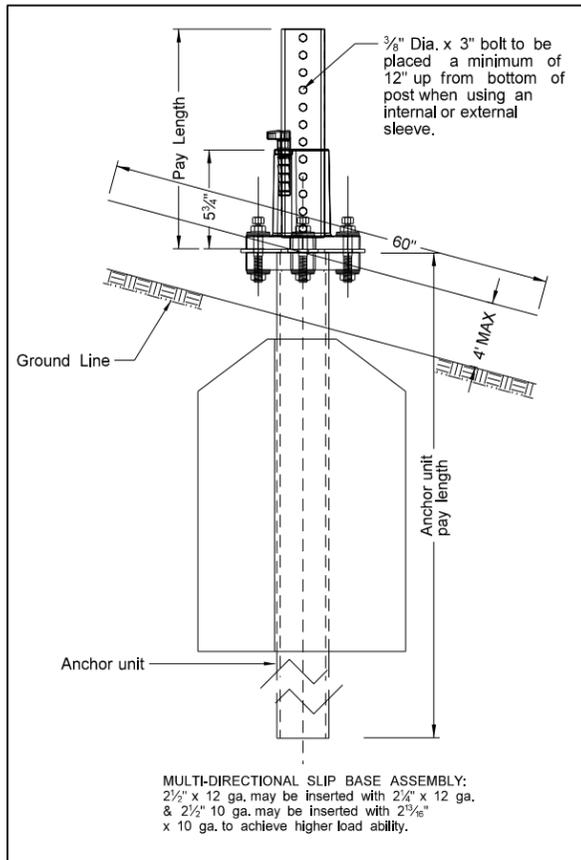
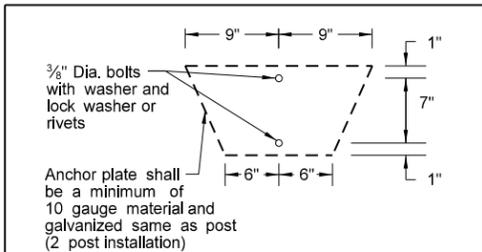
R=Radius	Y-Max	Y-Min
40'	50'	15'
45'	50'	18'
50'	50'	21'
55'	50'	25'
60'	50'	28'
65'	50'	32'
70'	50'	35'
75'	50'	39'
80'	50'	43'

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

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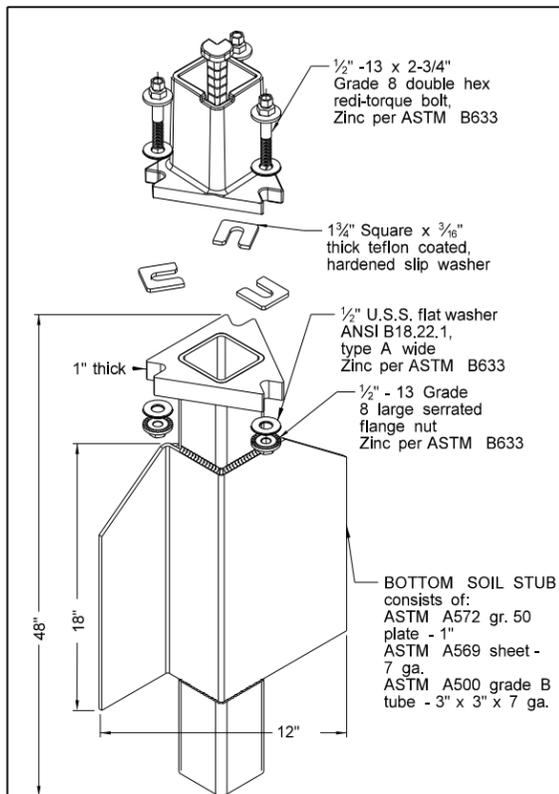
Telescoping Perforated Tube							
Number of Posts	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2 1/2(D)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

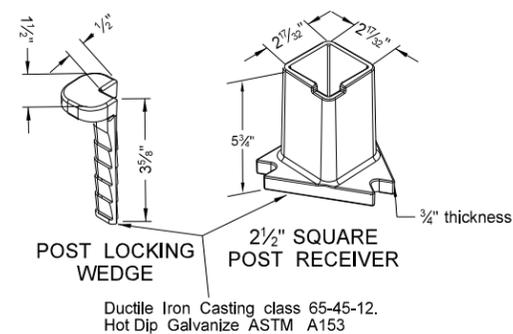


MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:
 2 1/2" x 12 ga. may be inserted with 2 1/4" x 12 ga. & 2 1/2" x 10 ga. may be inserted with 2 1/8" x 10 ga. to achieve higher load ability.

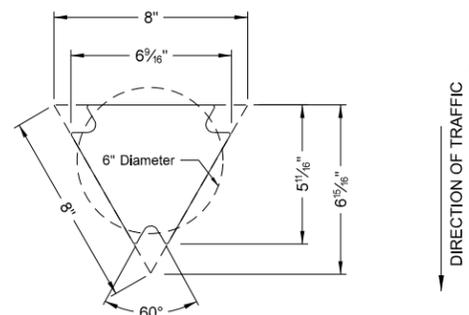
Mounting Details Perforated Tube



SLIP BASE FOR 2 1/2" POST



2 1/2" SQUARE POST RECEIVER



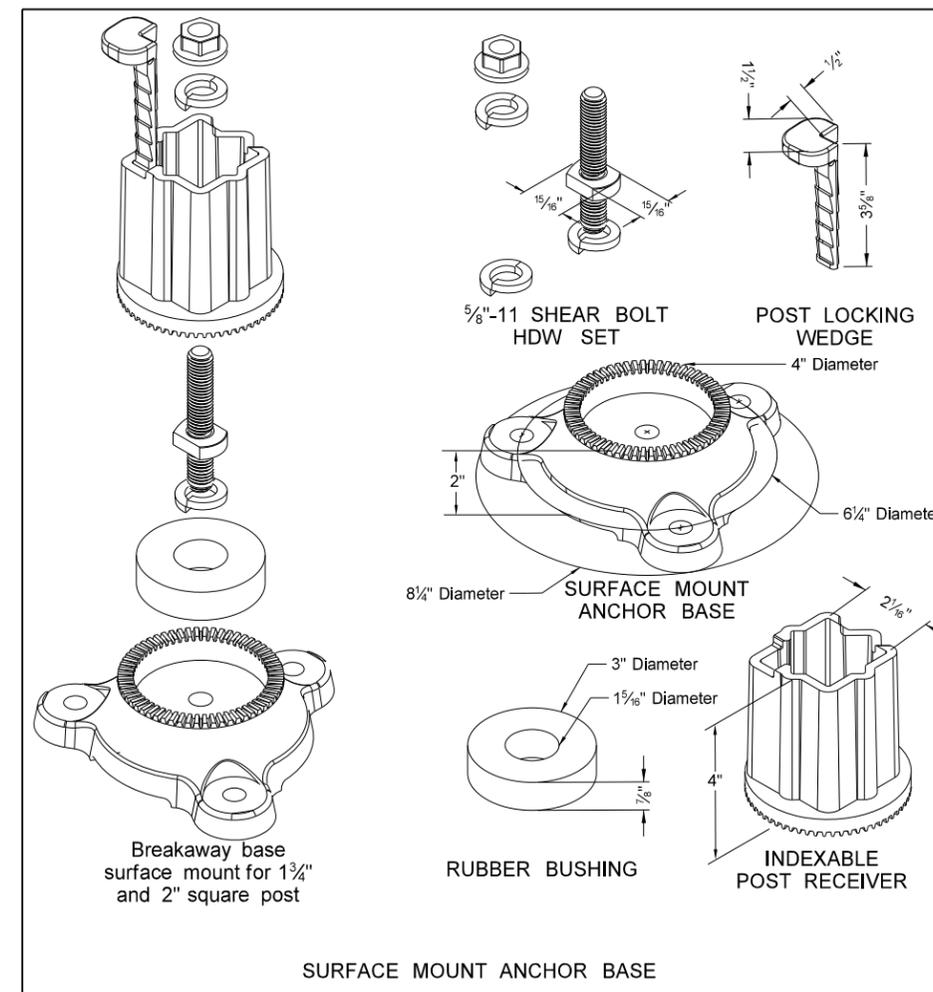
SLIP BASE DETAIL

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 1/4 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

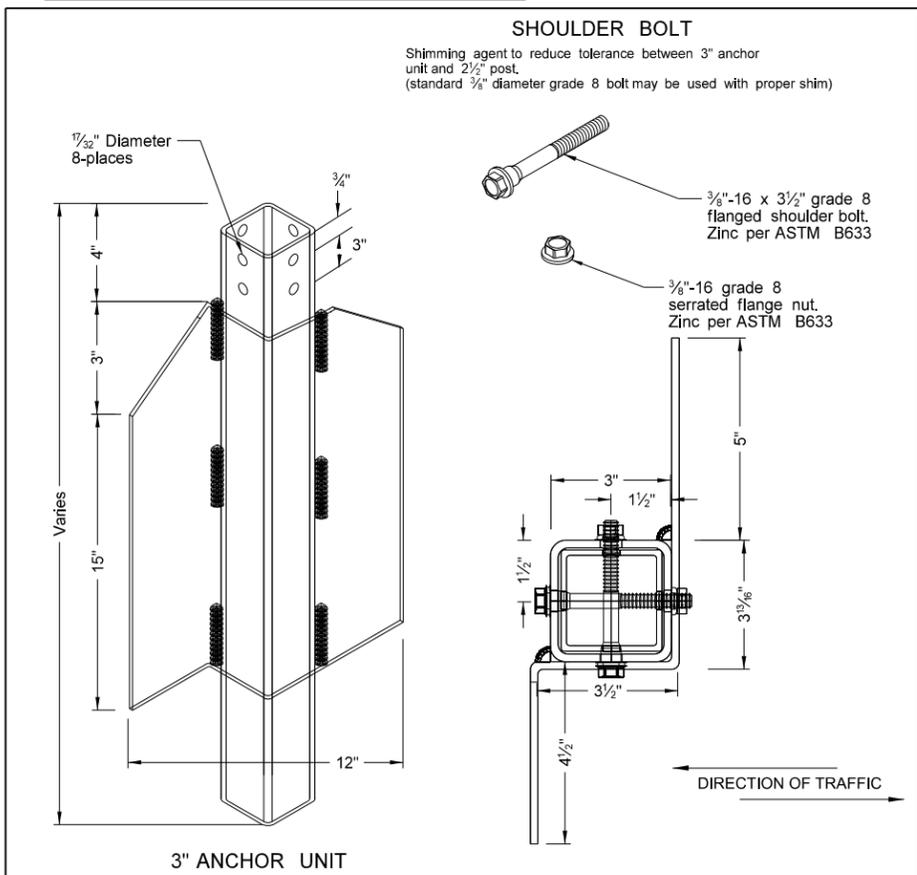
The 2 3/8" size 10 gauge is shown as 2.19" size on the plans;
 The 2 1/2" size is shown as 2.51" size on the plans.

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.



SURFACE MOUNT ANCHOR BASE



3" ANCHOR UNIT

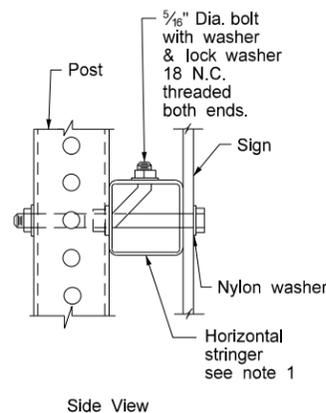
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE

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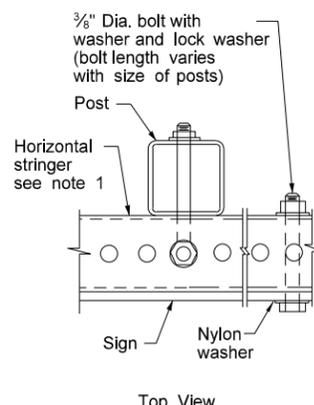
Mounting Details Perforated Tube

Note:

- Horizontal stringers - In lieu of perforated tubes, the contractor may substitute z bar stringers. The z bar stringers shall be 1 3/4" 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 15/16" ± 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.

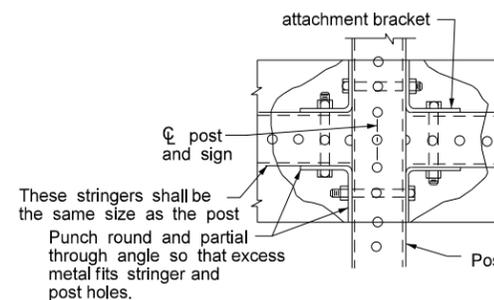


Side View



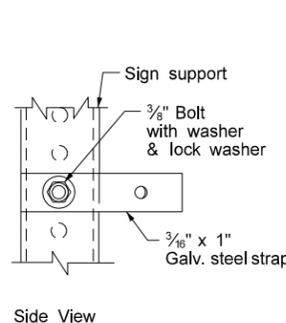
Top View

STRINGER MOUNTING (WITH STRINGER IN FRONT OF POST)

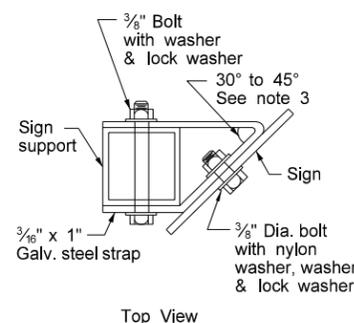


These stringers shall be the same size as the post. Punch round and partial through angle so that excess metal fits stringer and post holes.

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

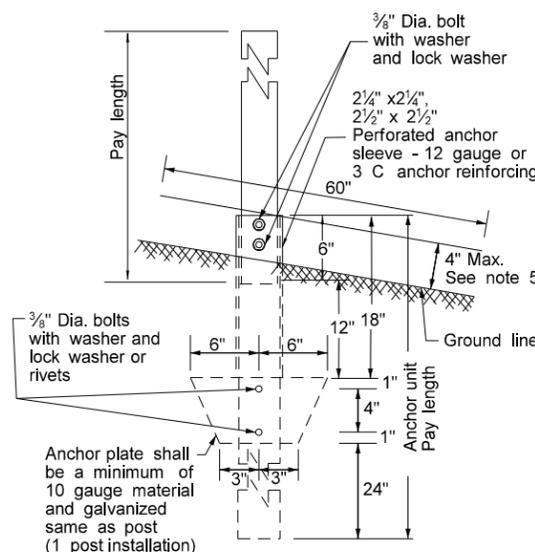


Side View



Top View

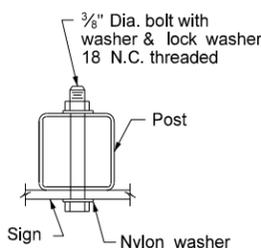
STRAP DETAIL



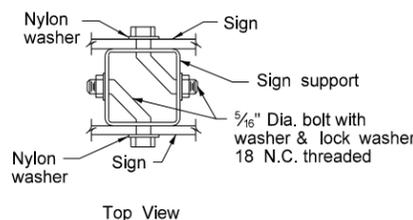
ANCHOR UNIT AND POST ASSEMBLY

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 1/4	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 3/16	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.

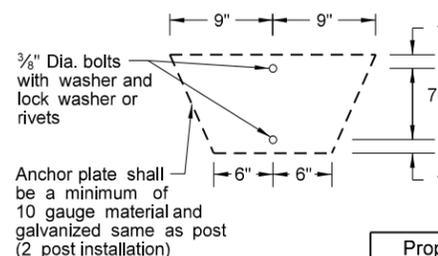


BOLT MOUNTING



Top View

BACK TO BACK MOUNTING



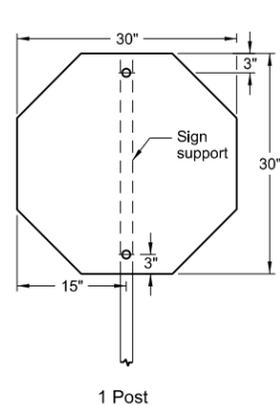
Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. area In. ²	Section Modulus In. ³
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2 1/2 x 2 1/2	0.105	12	3.141	0.804	0.803	0.643
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.783

The 2 3/16" 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.

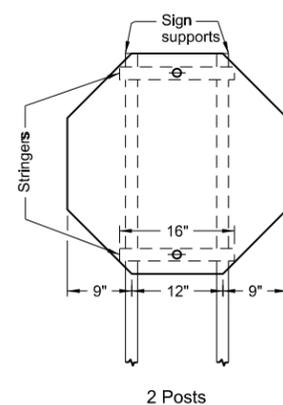
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
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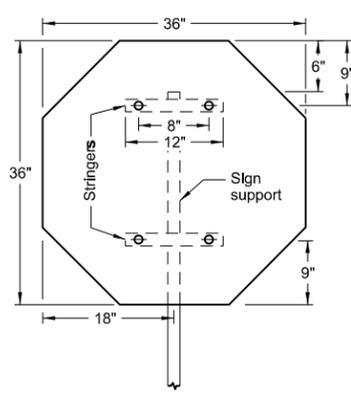
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



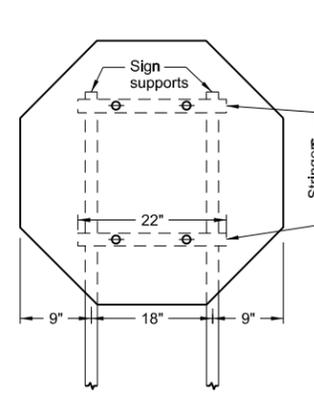
1 Post



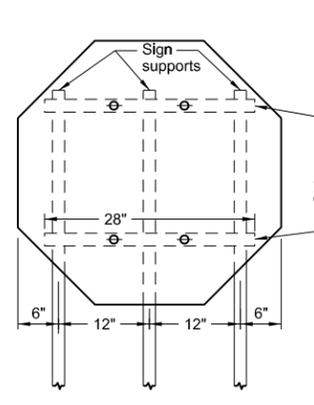
2 Posts



1 Post



2 Posts



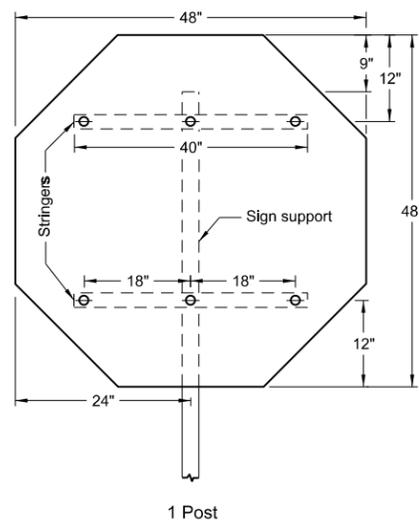
3 Posts

Assembly No. 1

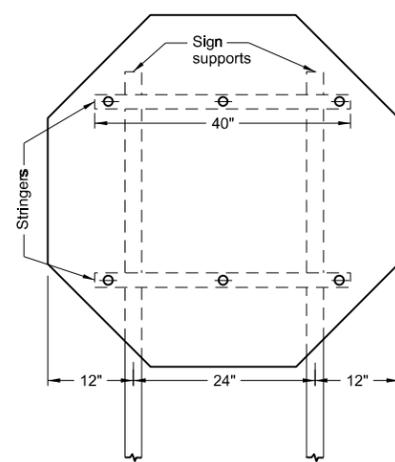
Assembly No. 2

Notes:

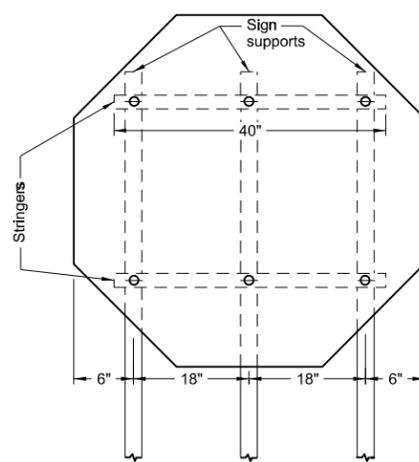
1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1/2" x 1 1/2".
4. All holes shall be punched round for 3/8" bolt.



1 Post

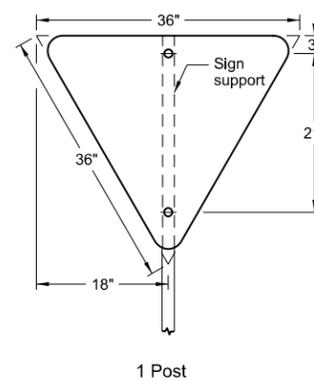


2 Posts

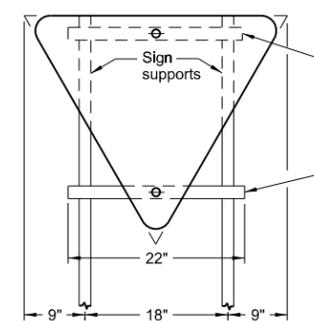


3 Posts

Assembly No. 3

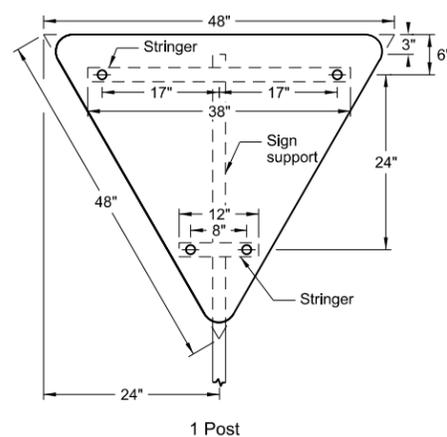


1 Post

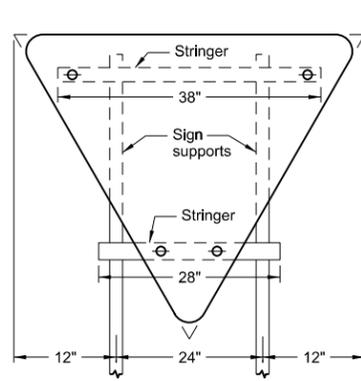


2 Posts

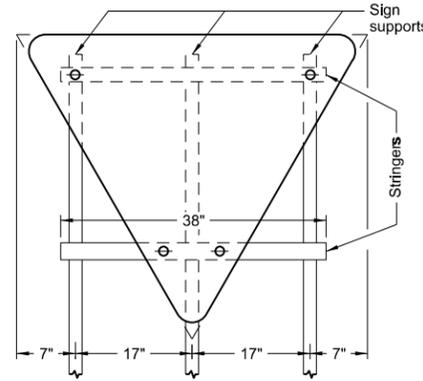
Assembly No. 4



1 Post



2 Posts



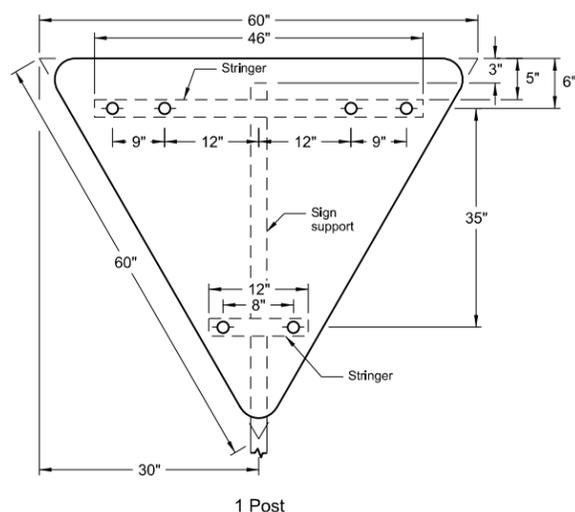
3 Posts

Assembly No. 5

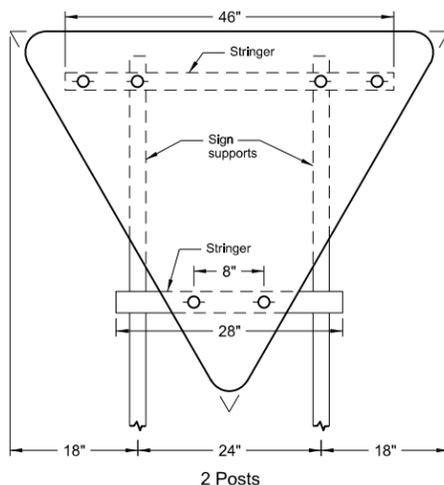
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12-1-10	
REVISIONS	
DATE	CHANGE

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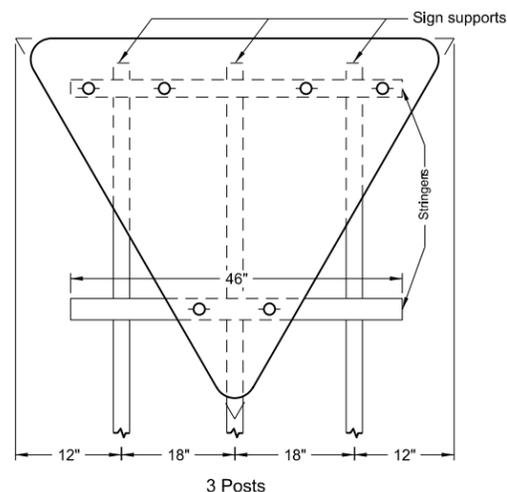
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



1 Post



2 Posts

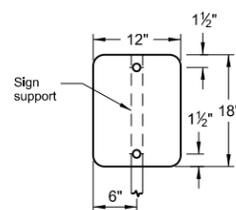


3 Posts

Assembly No. 6

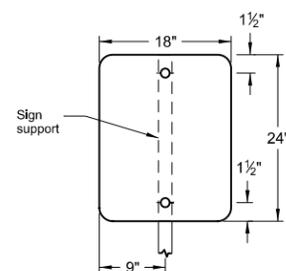
Notes:

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 1/2" x 1 1/2".
4. All holes shall be punched round for 3/8" bolt.



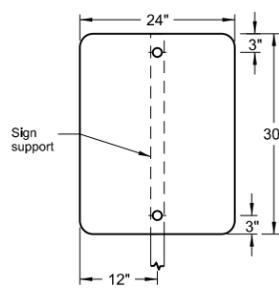
1 Post

Assembly No. 7



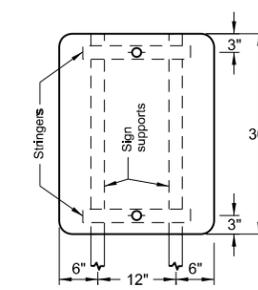
1 Post

Assembly No. 8

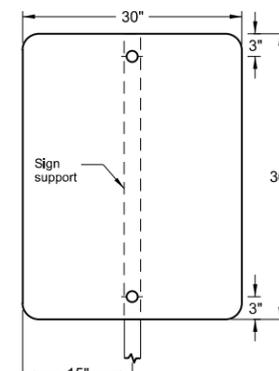


1 Post

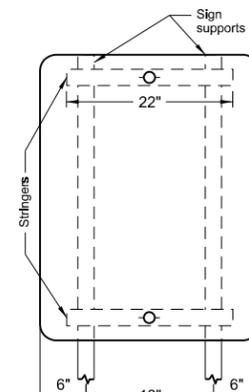
Assembly No. 9



2 Posts

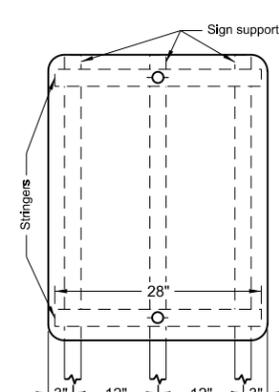


1 Post

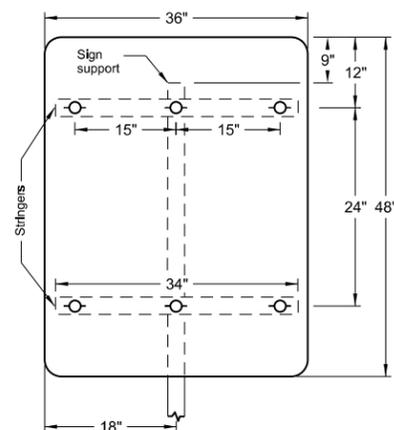


2 Posts

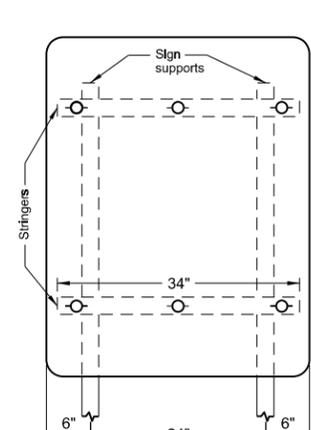
Assembly No. 10



3 Posts

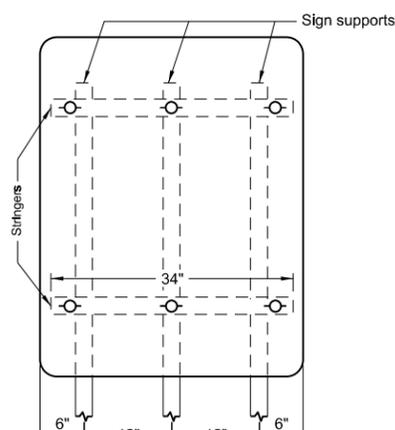


1 Post



2 Posts

Assembly No. 11

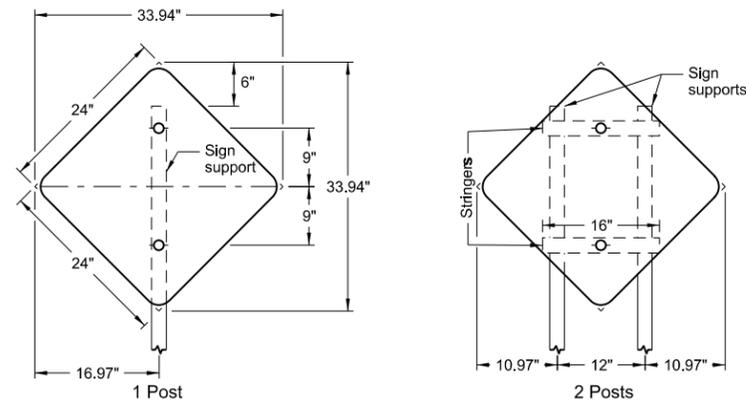


3 Posts

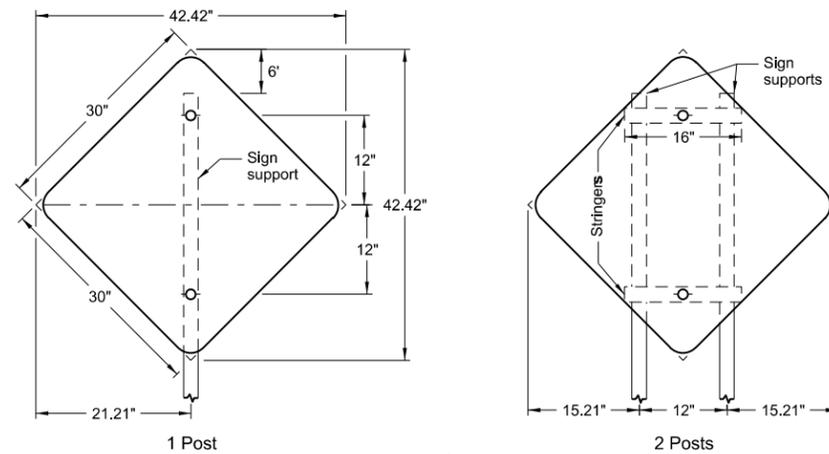
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12-1-10	
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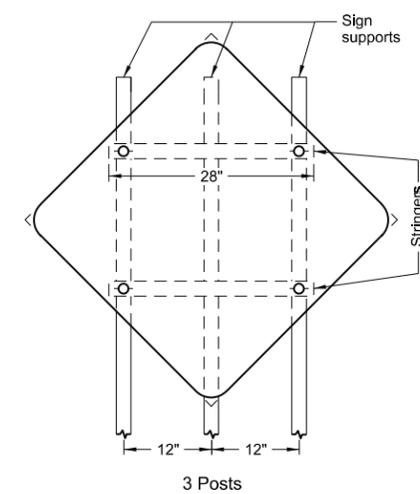
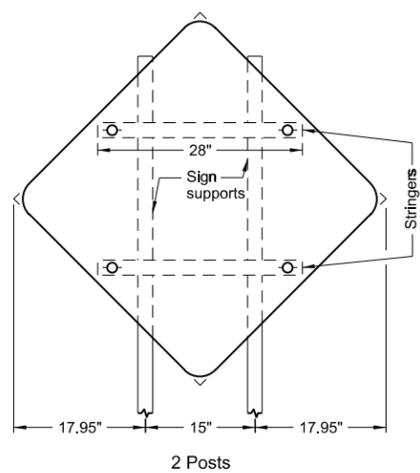
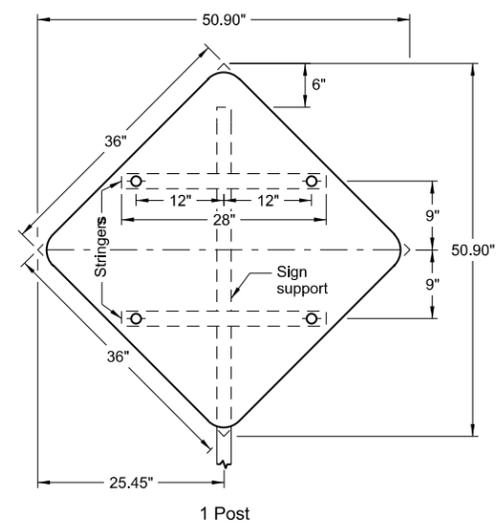
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



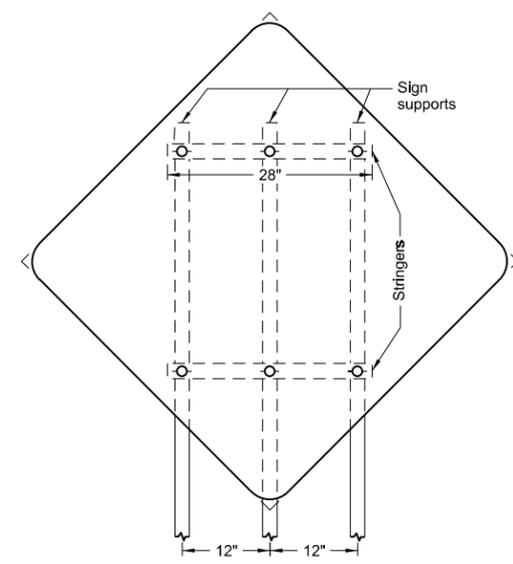
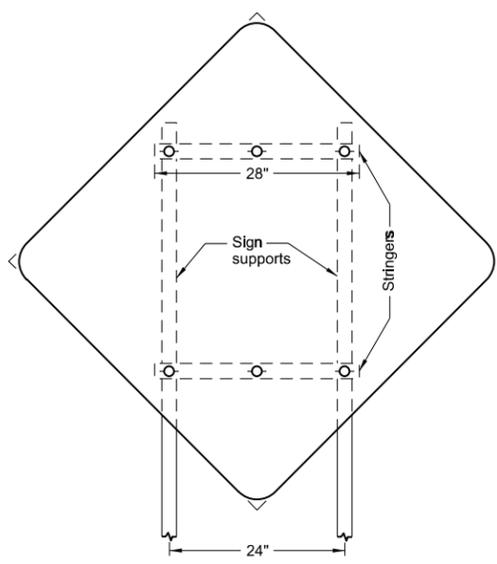
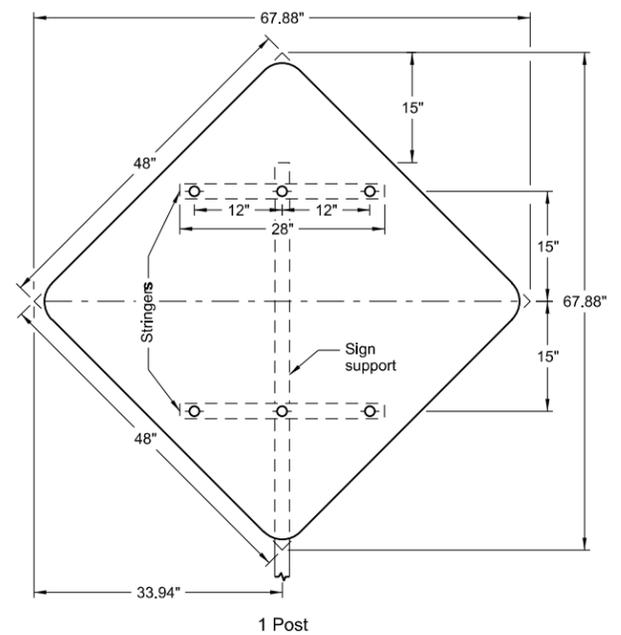
Assembly No. 18



Assembly No. 19



Assembly No. 20



Assembly No. 21

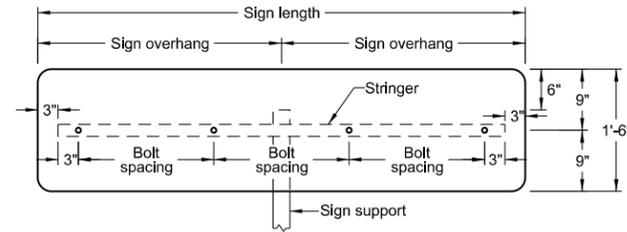
- Notes:
1. See Standard D-754-25 for mounting details.
 2. The minimum sign backing material thickness shall be 0.100 inch.
 3. Perforated square tube stringer shall be 1/2" x 1 1/2".
 4. All holes shall be punched round for 3/8" bolt.

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

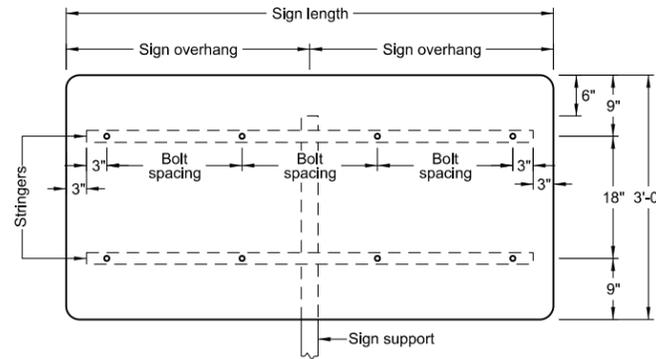
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**SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
FOR VARIABLE LENGTH SIGNS**

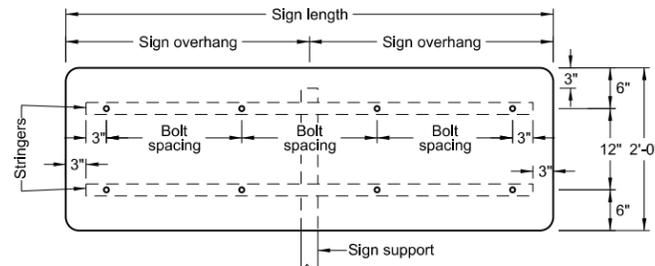
D-754-47



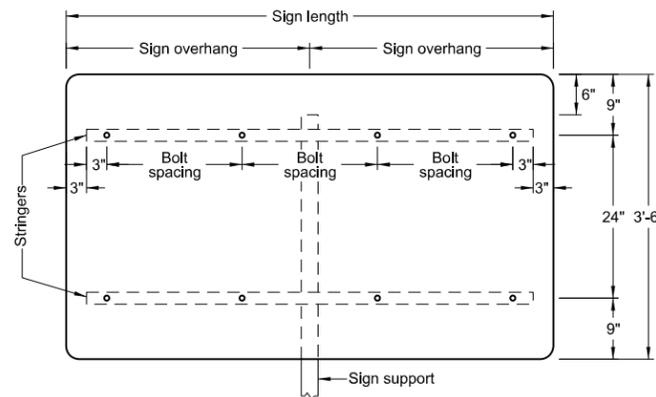
VARIES X 1'-6"



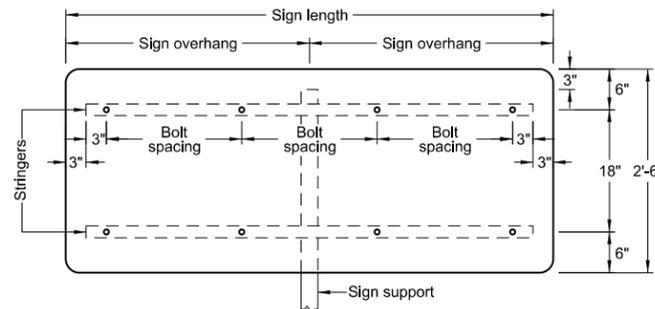
VARIES X 3'-0"



VARIES X 2'-0"



VARIES X 3'-6"



VARIES X 2'-6"

1 POST		
Sign Length	Sign Overhang	Bolt Spacing
4'-0"	2'-0"	18"
4'-6"	2'-3"	21"
5'-0"	2'-6"	24"
5'-6"	2'-9"	18"
6'-0"	3'-0"	20"
6'-6"	3'-3"	22"
7'-0"	3'-6"	24"
7'-6"	3'-9"	2-20" & 2-19"
8'-0"	4'-0"	21"
8'-6"	4'-3"	2-22" & 2-23"
9'-0"	4'-6"	24"
9'-6"	4'-9"	4-20" & 1-22"
10'-0"	5'-0"	2-21" & 3-22"
10'-6"	5'-3"	4-23" & 1-22"
11'-0"	5'-6"	24"
11'-6"	5'-9"	21"
12'-0"	6'-0"	22"

Notes:

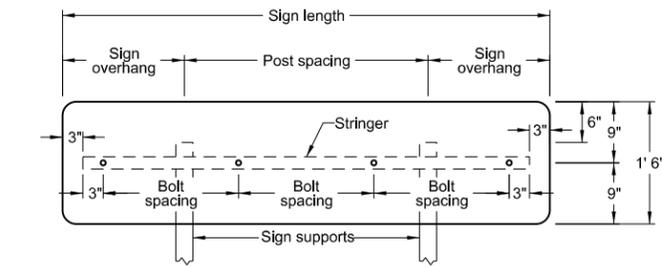
1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1/2" x 1 1/2".
3. All holes shall be punched round for 3/8" bolt.
4. Single stringer and single post signs shall have stringers attached to the post using the special stringer angle, shown on the "Mounting Details Perforated Tube" standard drawing.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
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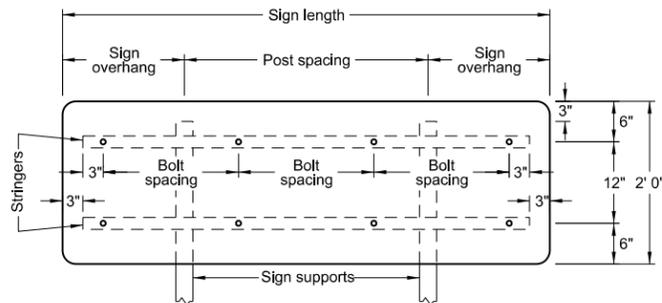
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS

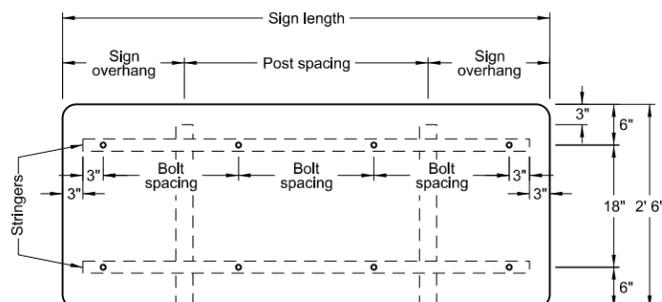
D-754-48



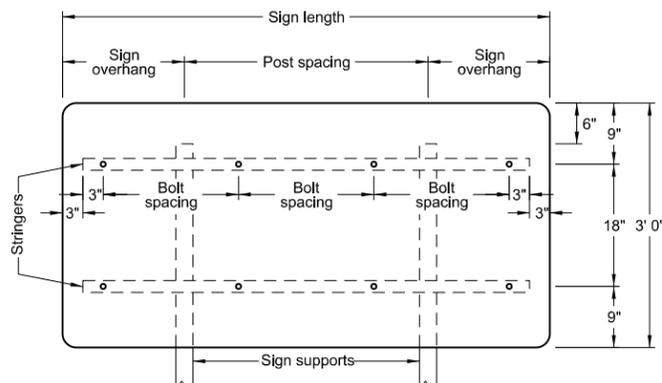
VARIES X 1'-6"



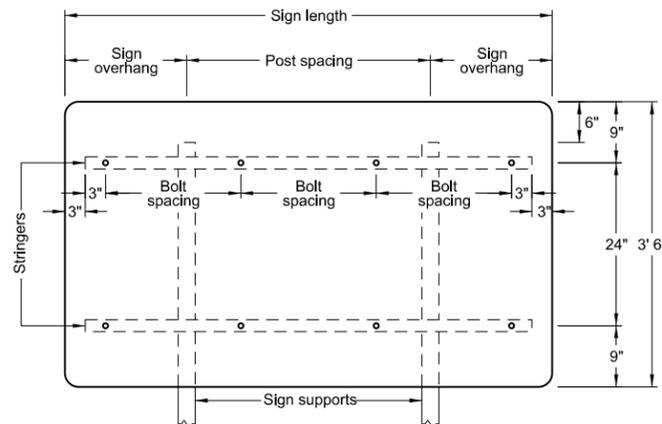
VARIES X 2'-0"



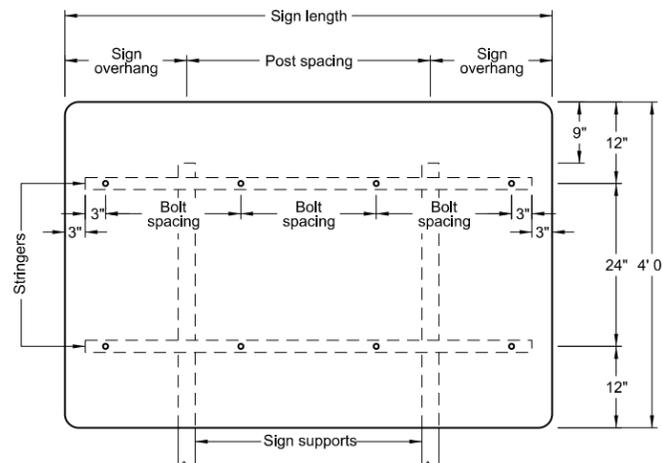
VARIES X 2'-6"



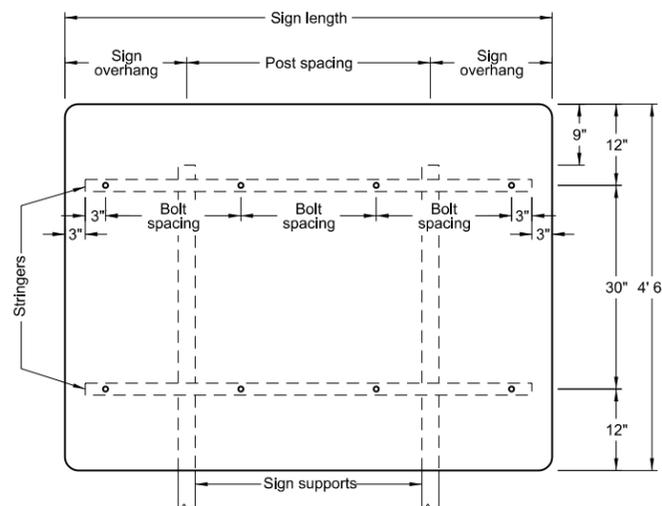
VARIES X 3'-0"



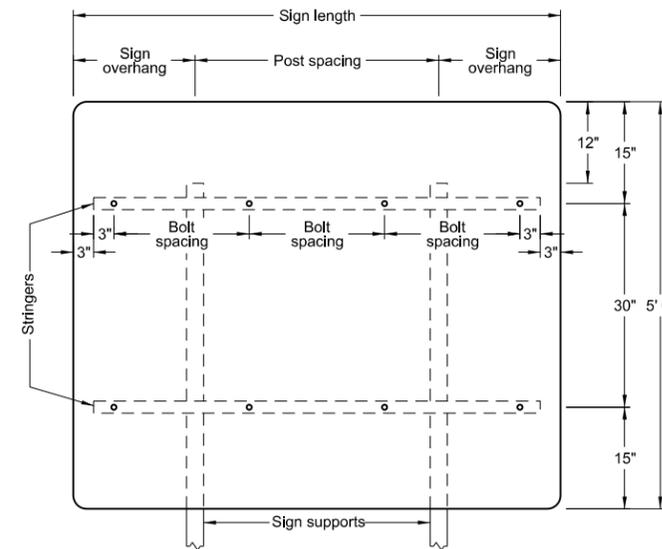
VARIES X 3'-6"



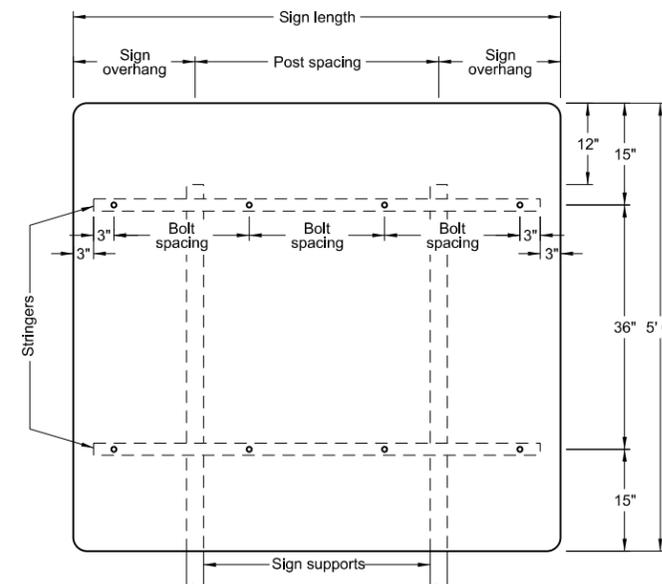
VARIES X 4'-0"



VARIES X 4'-6"



VARIES X 5'-0"



VARIES X 5'-6"

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"

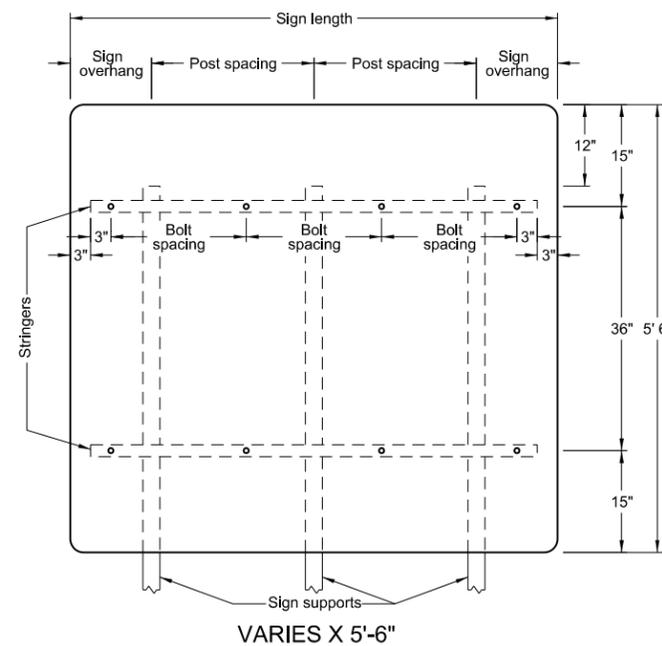
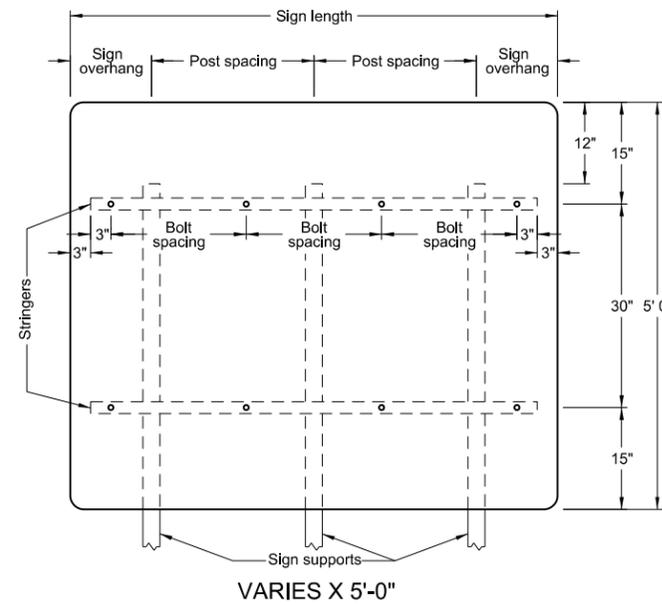
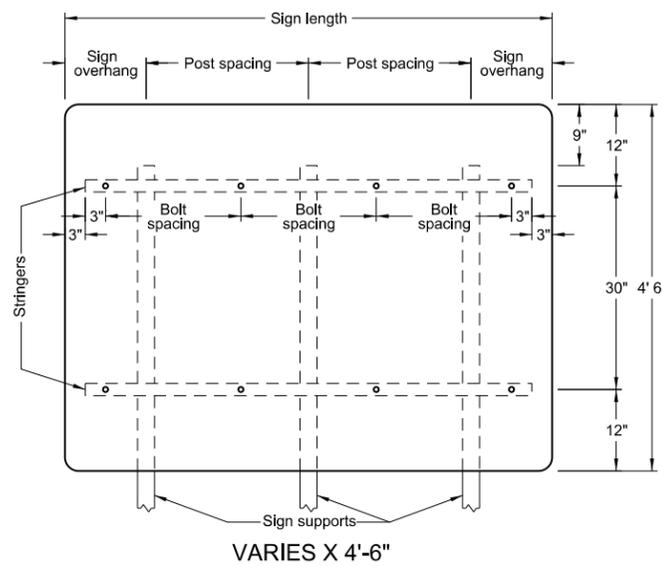
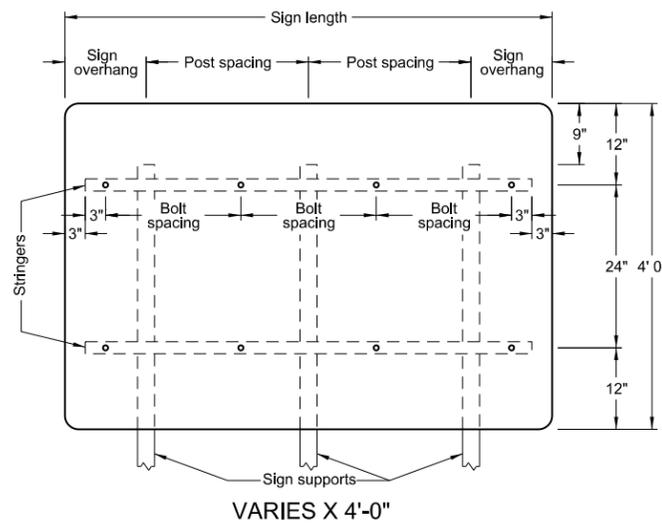
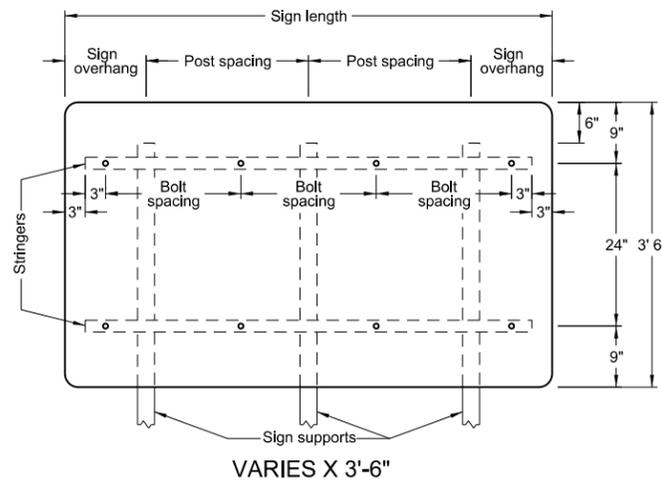
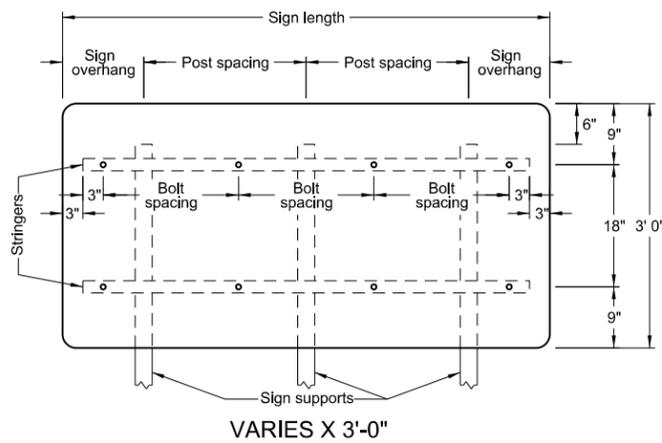
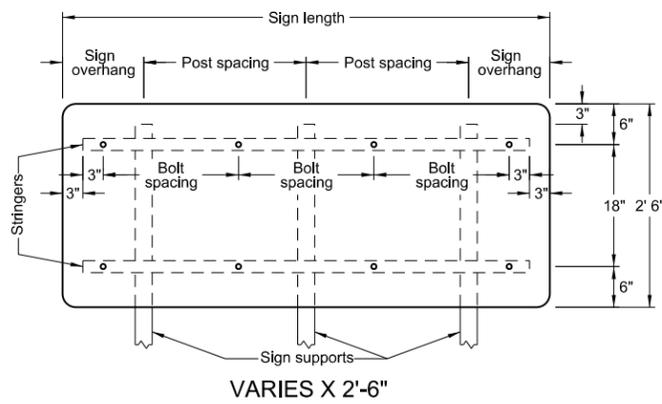
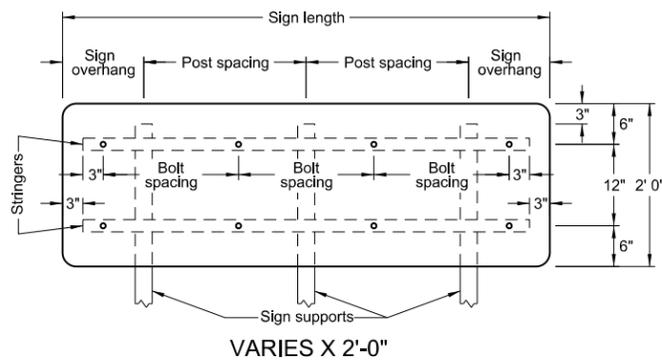
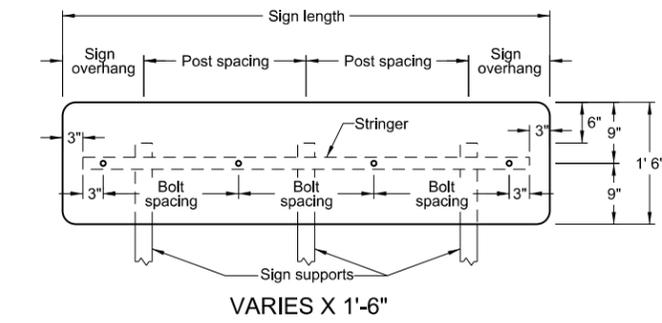
Notes:

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

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

This document was originally issued and sealed by
Roger Weigel,
Registration Number
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS



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

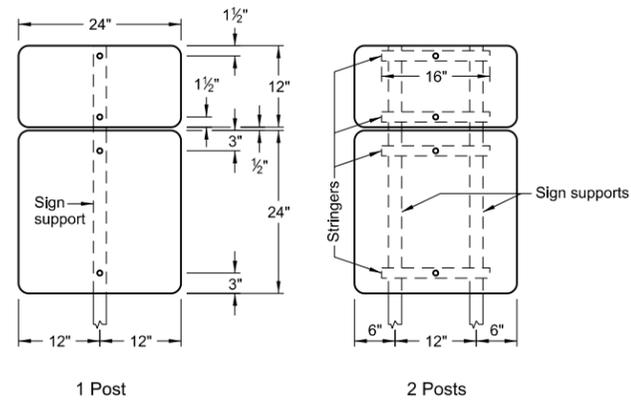
- Notes:
- The minimum sign backing material thickness shall be 0.100 inch.
 - Perforated square tube stringer shall be 1/2" x 1 1/2".
 - All holes shall be punched round for 3/8" bolt.

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

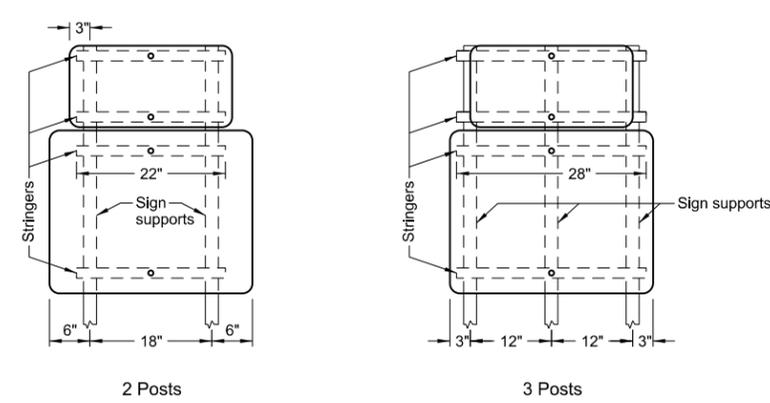
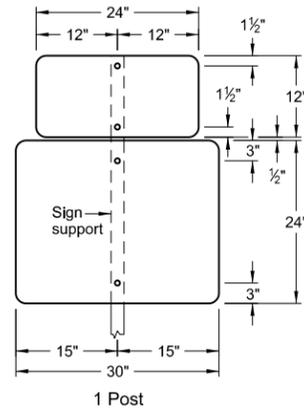
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

D-754-51



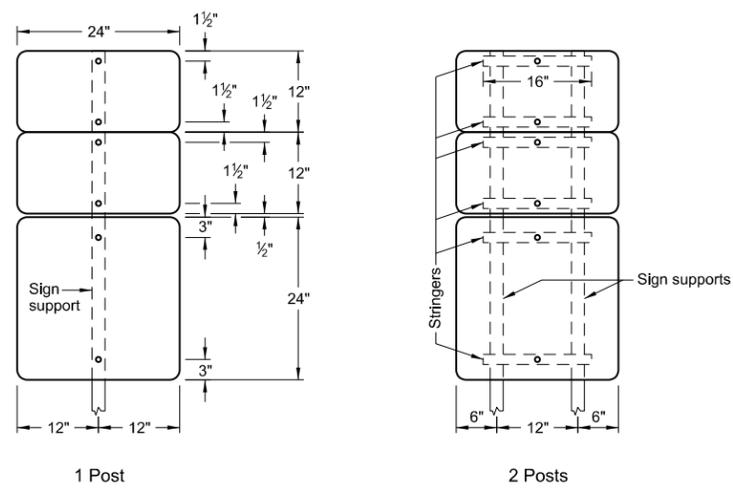
ASSEMBLY NO. 371



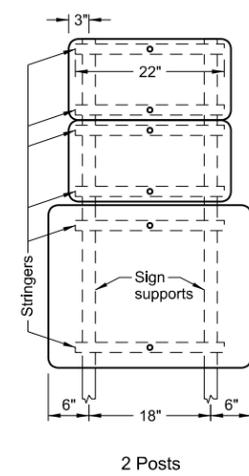
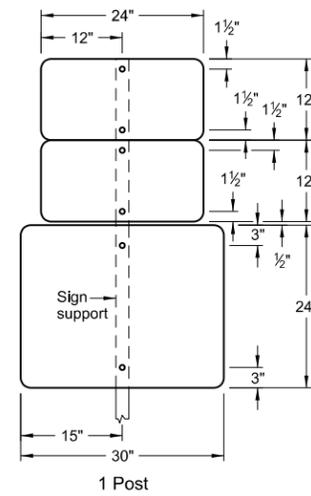
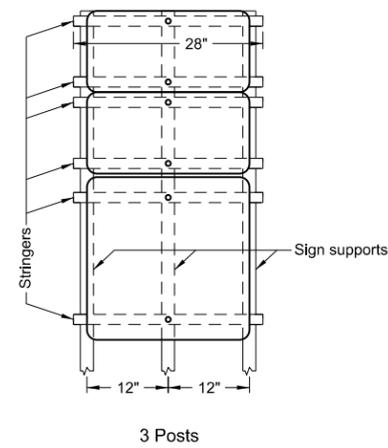
ASSEMBLY NO. 372

Notes:

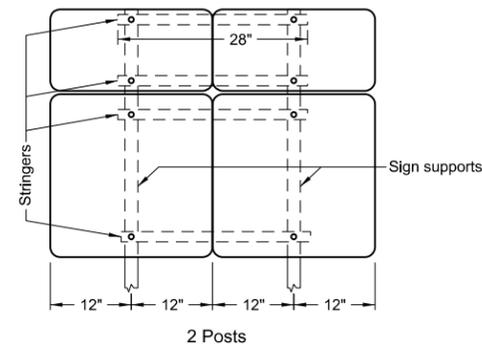
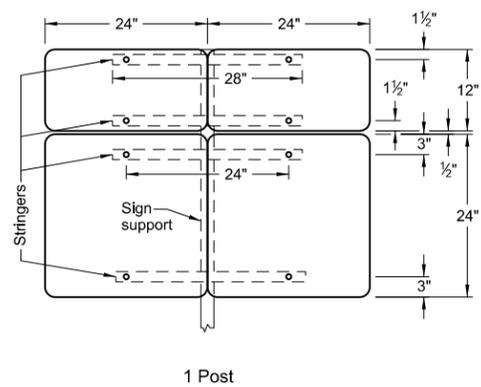
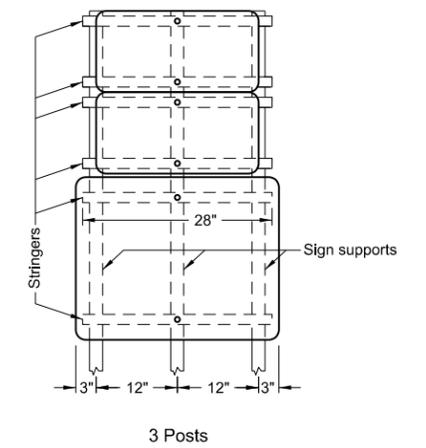
1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1/2"x1 1/2".
3. All holes shall be punched round for 3/8" bolt.



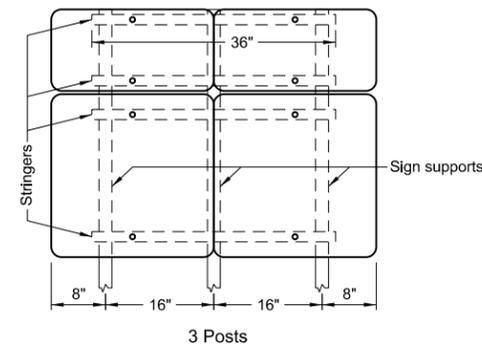
ASSEMBLY NO. 373



ASSEMBLY NO. 374



ASSEMBLY NO. 375

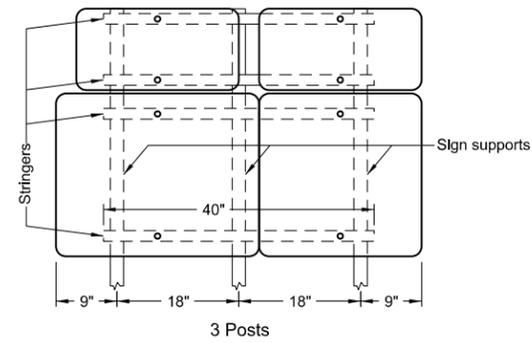
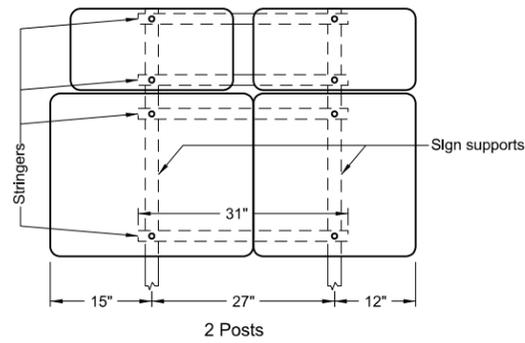
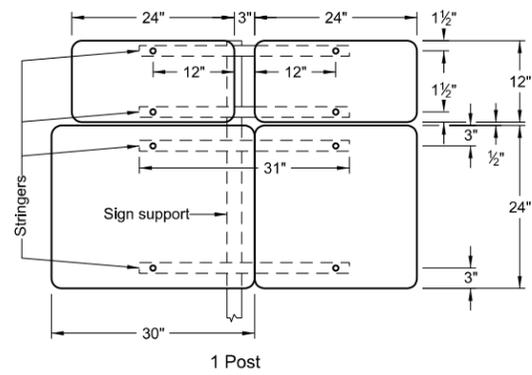


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE

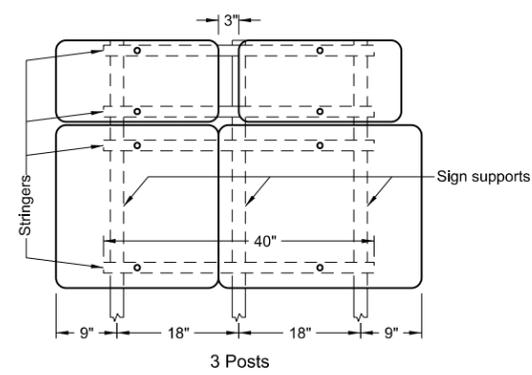
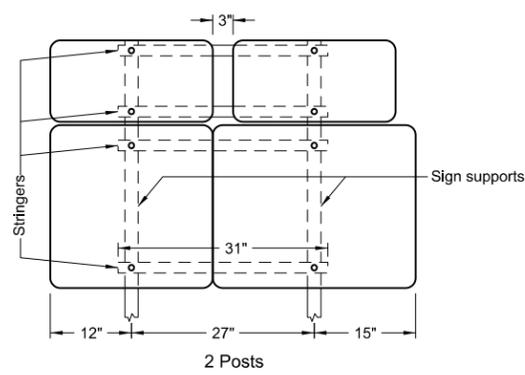
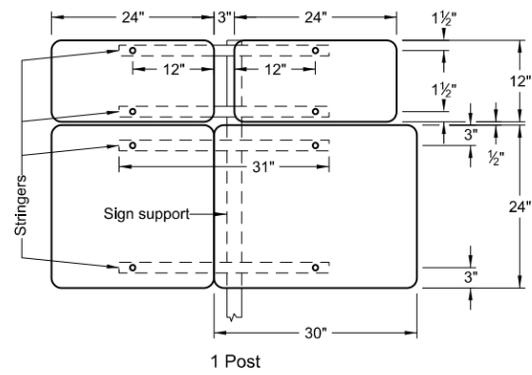
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

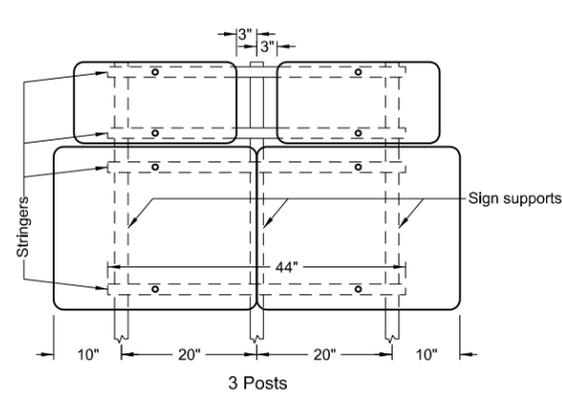
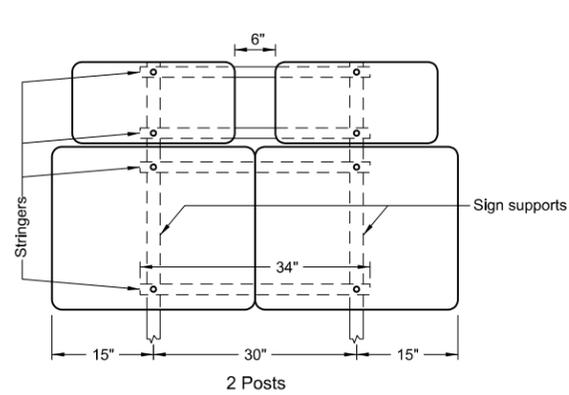
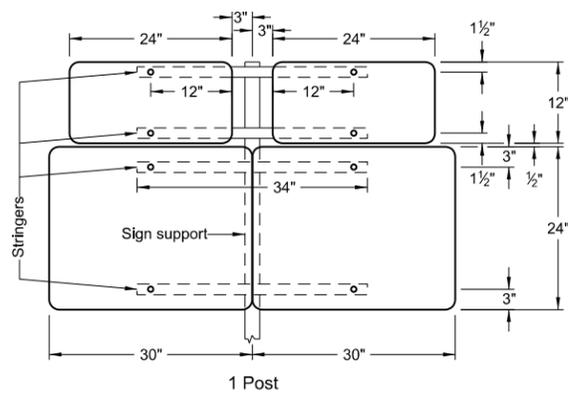
D-754-52



ASSEMBLY NO. 376



ASSEMBLY NO. 377



ASSEMBLY NO. 378

Notes:

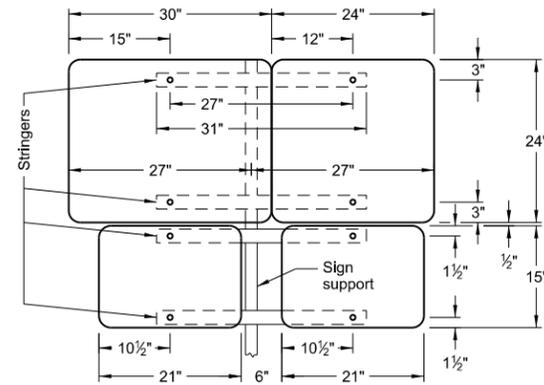
1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1/2"x1 1/2".
3. All holes shall be punched round for 3/8" bolt.

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

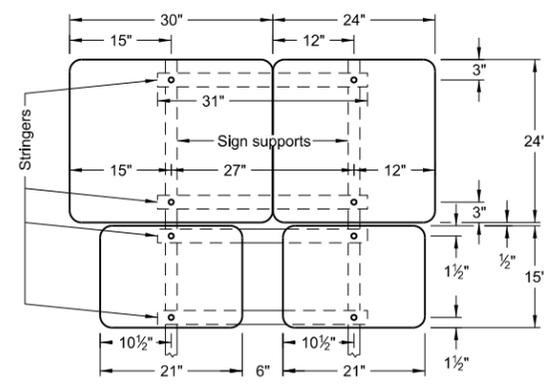
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

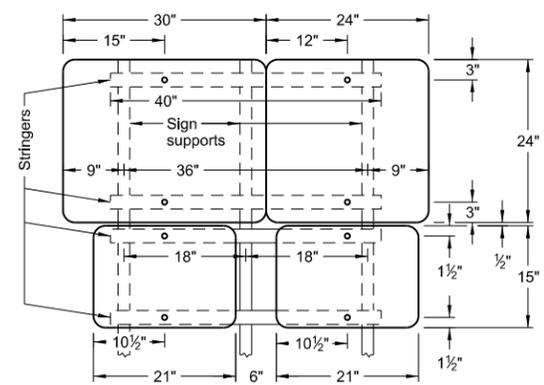
D-754-61



1 Post

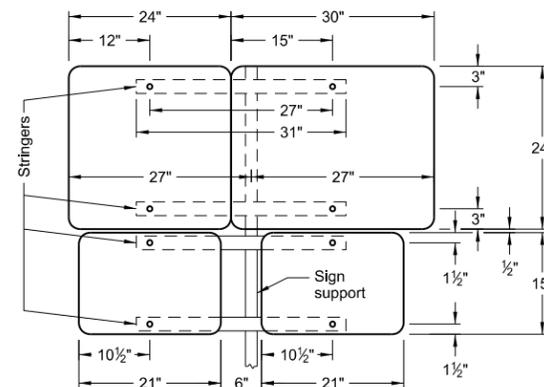


2 Posts

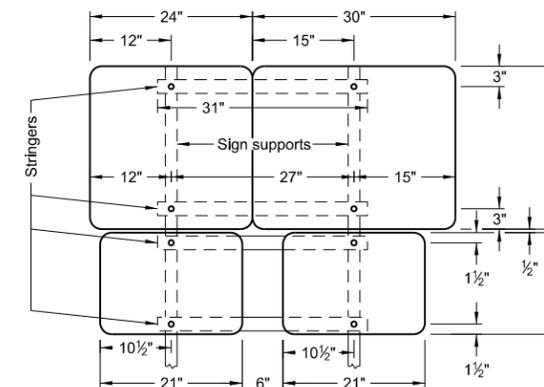


3 Posts

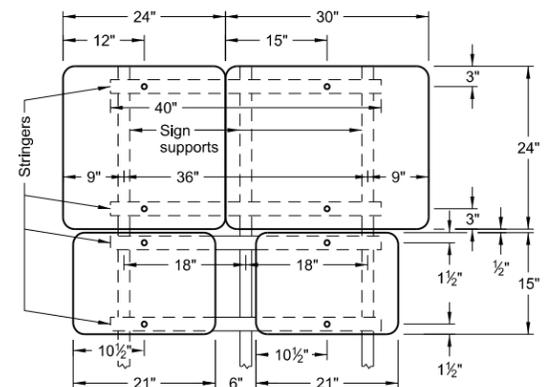
ASSEMBLY 406



1 Post

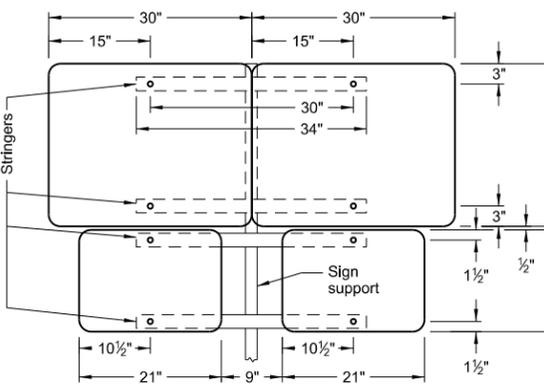


2 Posts

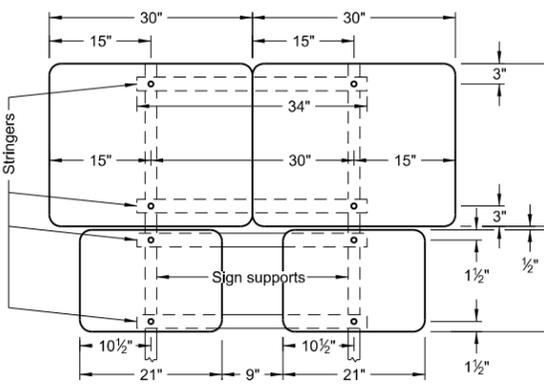


3 Posts

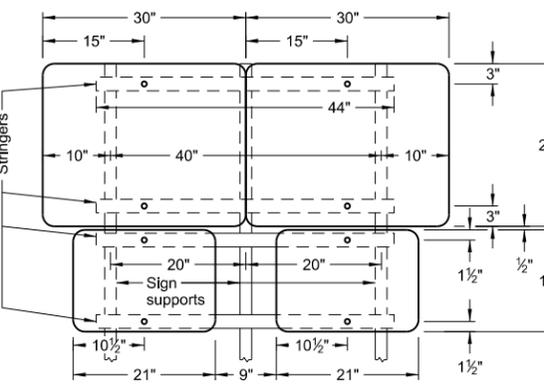
ASSEMBLY 407



1 Post



2 Posts



3 Posts

ASSEMBLY 408

Notes:

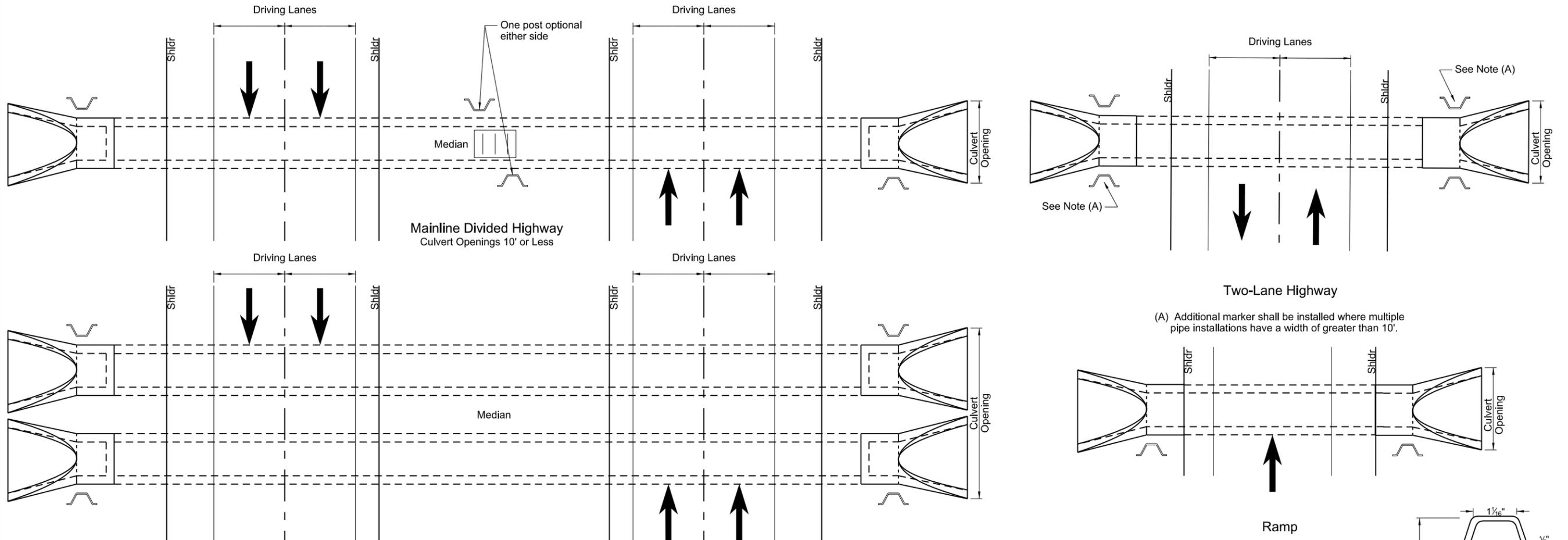
1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1/2"x1 1/2".
3. All holes shall be punched round for 3/8" bolt.

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

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OBJECT MARKERS - CULVERTS

D-754-83



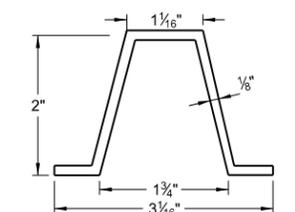
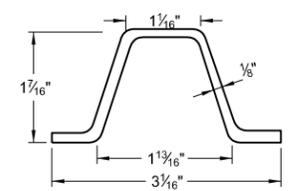
(A) Additional marker shall be installed where multiple pipe installations have a width of greater than 10'.

Post Location

Mainline Divided Highway
Culvert Openings Greater than 10'
Multiple Installations

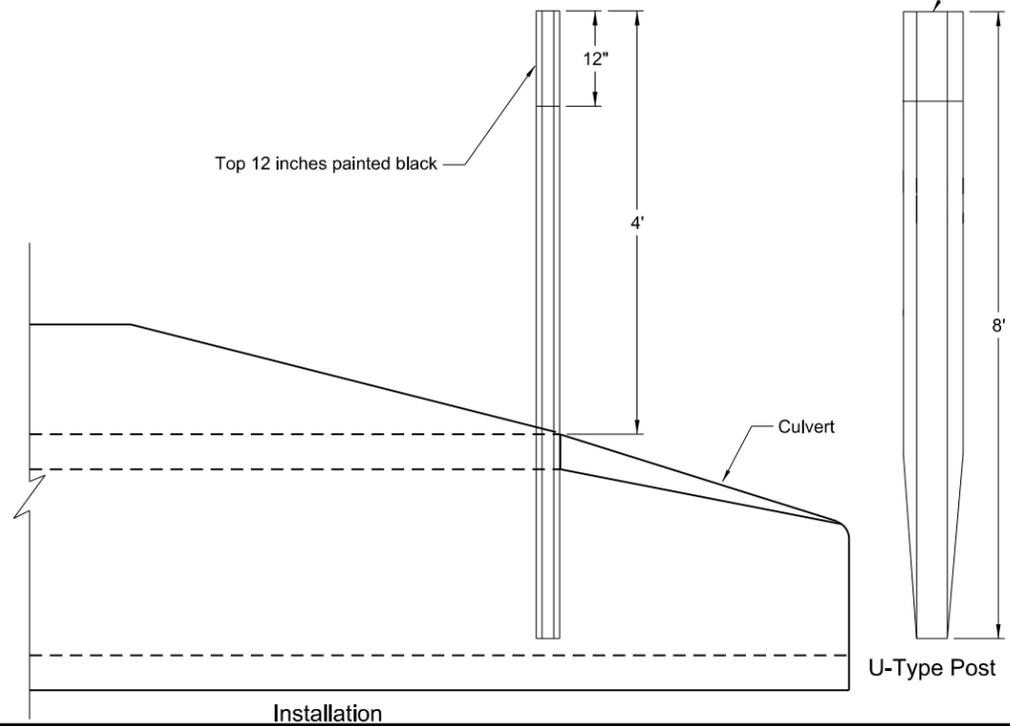
Top 12 inches painted black

Top 12 inches painted black



Notes:

- Installation:** Construction requirements shall meet 754.03E.2. Each end of culverts crossing the roadway within the right-of-way shall be marked with a post as shown. Posts are to be installed in front of the culvert in the direction of travel along the side of the culvert and one foot from the culvert opening unless shown otherwise on the plans.
- Posts:** Posts shall conform to section 894.06A of the Standard Specifications with the exception that the post may or may not have holes drilled.
- Basis of Payment:** The quantity will be measured by the number of object markers each installed. All costs for furnishing and installing the markers shall be included in the price bid for the item "Object Markers - Culverts".

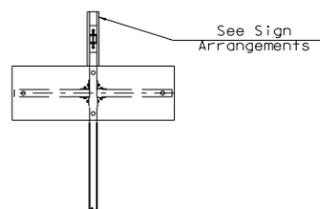


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 8-05-13	
REVISIONS	
DATE	CHANGE

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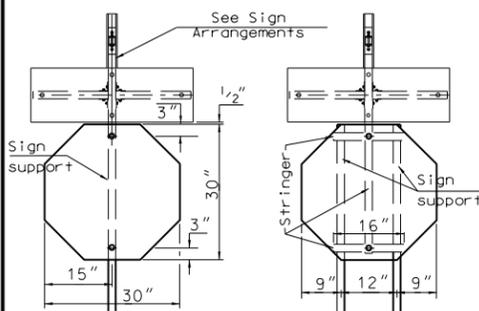
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR STREET NAME SIGNS AND 911 SIGNING

Note: See Standard Drawing D-754-86 for 911 support information and sign layout details.



1 Post

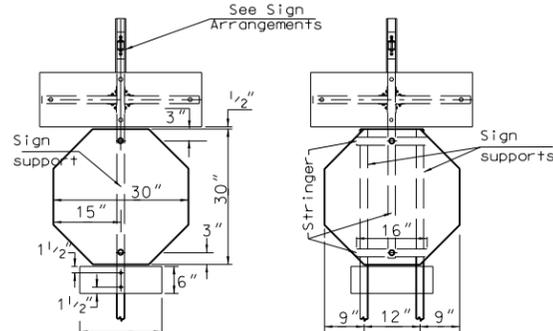
SPECIAL ASSEMBLY 1 (A,B,C,D or E)



1 Post

2 Posts

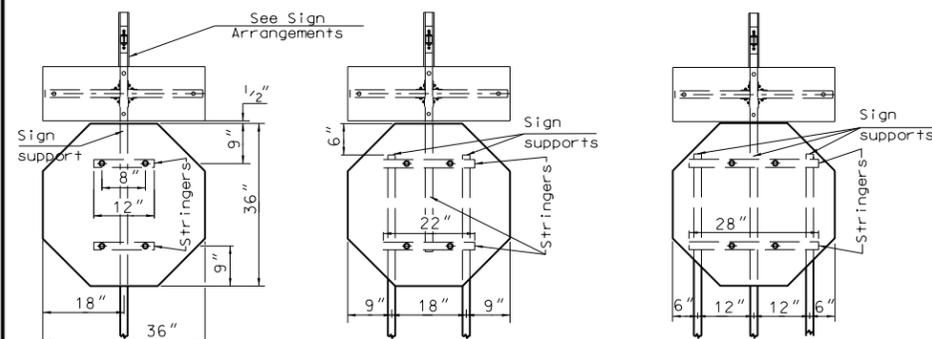
SPECIAL ASSEMBLY 2 (A,B,C,D or E)



1 Post

2 Posts

SPECIAL ASSEMBLY 3 (A,B,C,D or E)

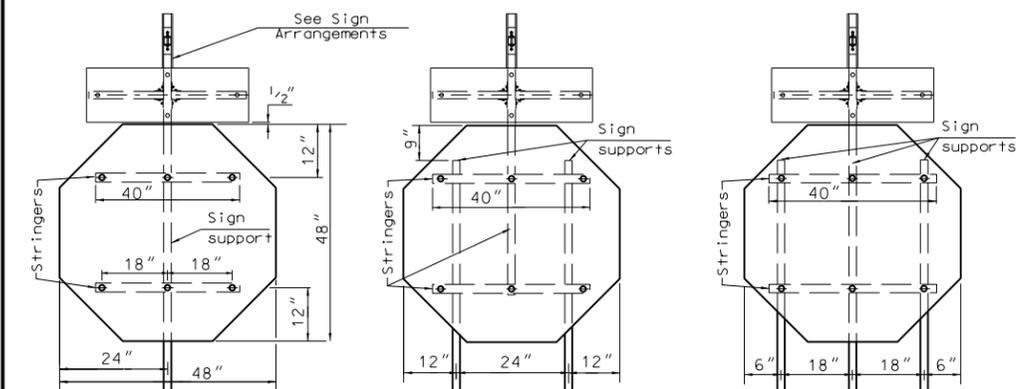


1 Post

2 Posts

3 Posts

SPECIAL ASSEMBLY 4 (A,B,C,D or E)

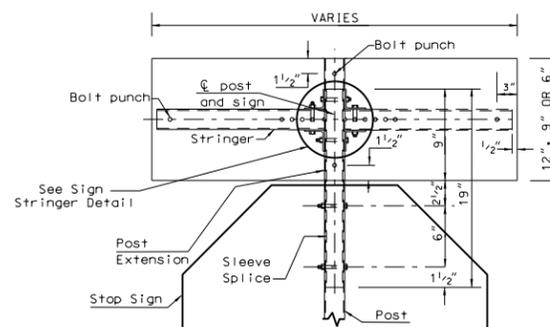


1 Post

2 Posts

3 Posts

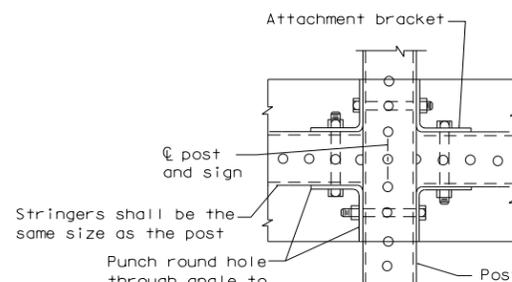
SPECIAL ASSEMBLY 5 (A,B,C,D or E)



FRONT VIEW

SLEEVE SPLICE DETAIL

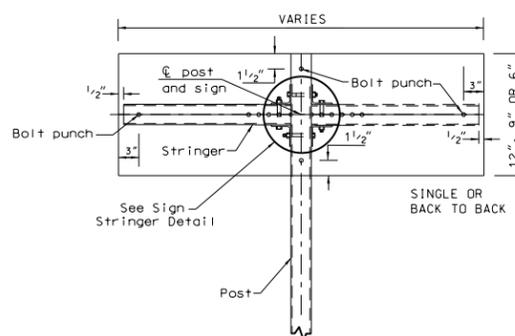
Note: The splice method may be used upon approval of the engineer.



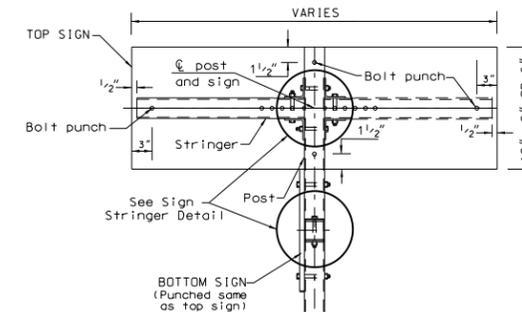
SIGN STRINGER DETAIL

Stringers shall be the same size as the post.
Punch round hole through angle to fit stringer and post holes.

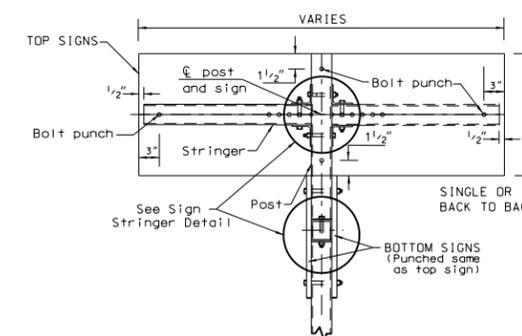
SIGN ARRANGEMENTS



DETAIL A or B



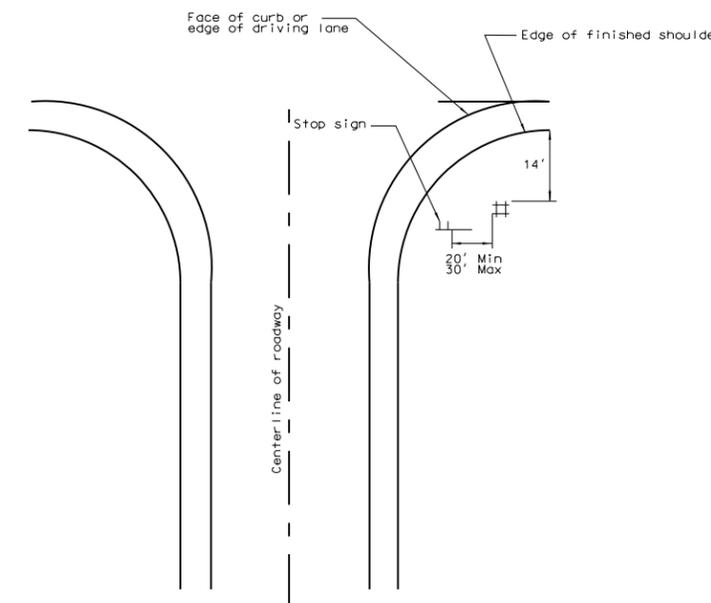
DETAIL C



DETAIL D or E

DETAIL

- A - Single sign
- B - Back to back
- C - Single sign, each direction
- D - Single sign one direction, back to back other direction
- E - Back to Back, both directions



INTERSECTION LAYOUT

Note: This layout is to be used for street name signs or 911 signs that are used with Special Assembly 1 only.

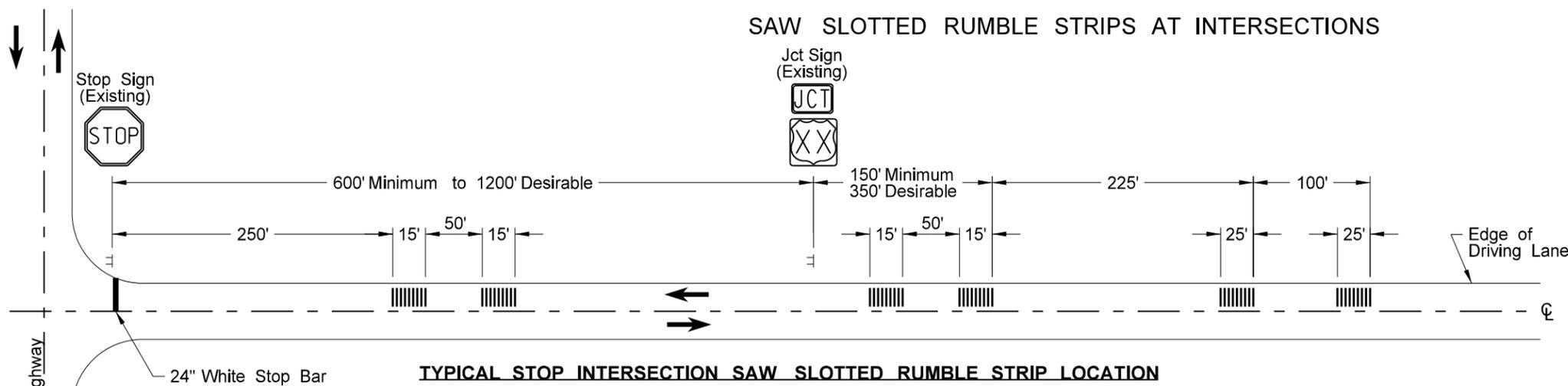
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-10-08	
REVISIONS	
DATE	CHANGE

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PE- 2930 ,
on 07/10/08 and the original document is stored at the
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of Transportation

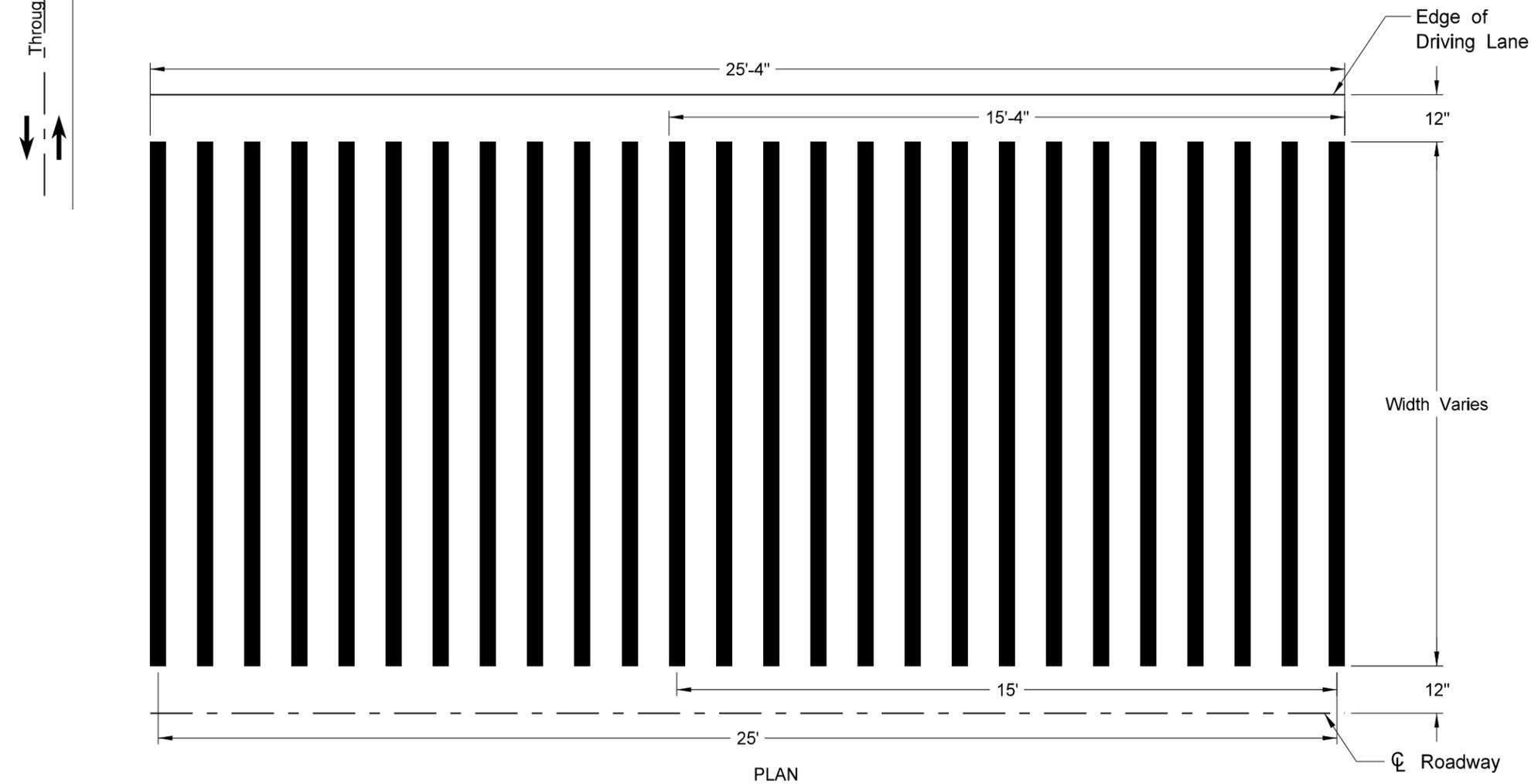
SAW SLOTTED RUMBLE STRIPS AT INTERSECTIONS

Notes:

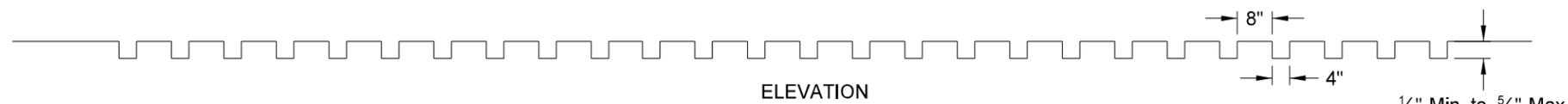
1) Discontinue saw slotted rumble strips near Automated Traffic Recorders (ATR), Weigh In Motion (WIM), and Roadway Weather Information Systems (RWIS). Saw slotted rumble strips shall discontinue 10' before and after any ATR or RWIS system. Saw slotted rumble strips shall be discontinued 300' before and 100' after in the direction of travel for any Weigh In Motion equipment.



TYPICAL STOP INTERSECTION SAW SLOTTED RUMBLE STRIP LOCATION



PLAN



ELEVATION

SAW SLOTTED RUMBLE STRIP DETAIL

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-29-09	
REVISIONS	
DATE	CHANGE
2-22-10	Saw Slotted width revised.
2-25-10	Note 7 was added.
9-8-11	Revised Notes and D-760-5.

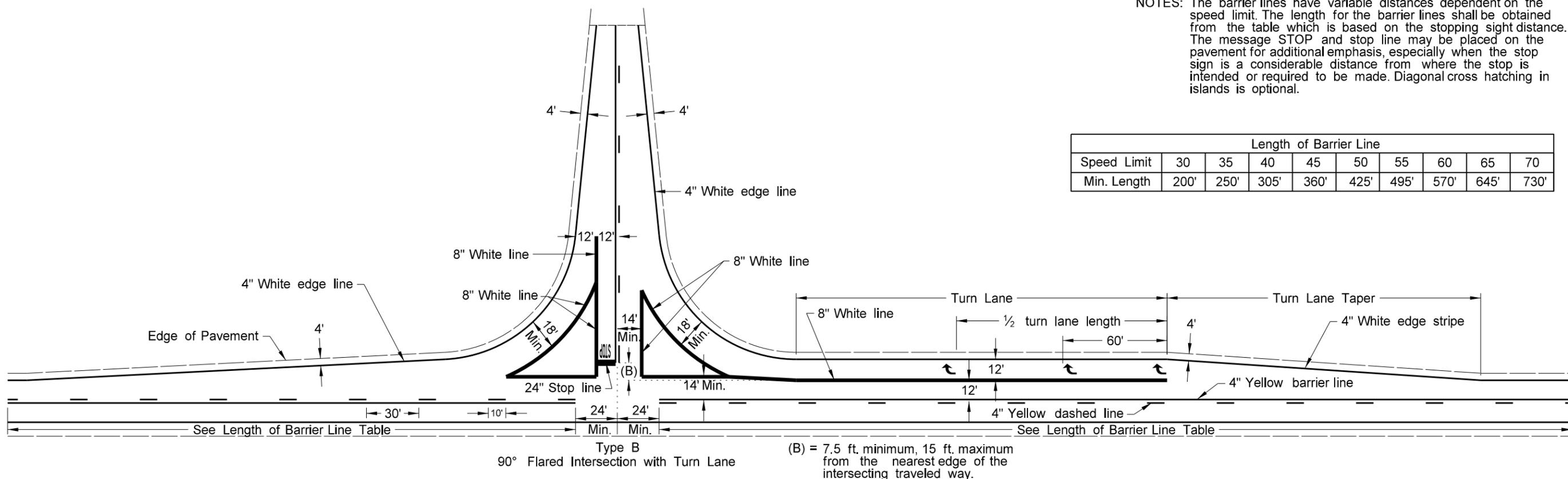
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PAVEMENT MARKING FOR STANDARD 90° FLARED INTERSECTION

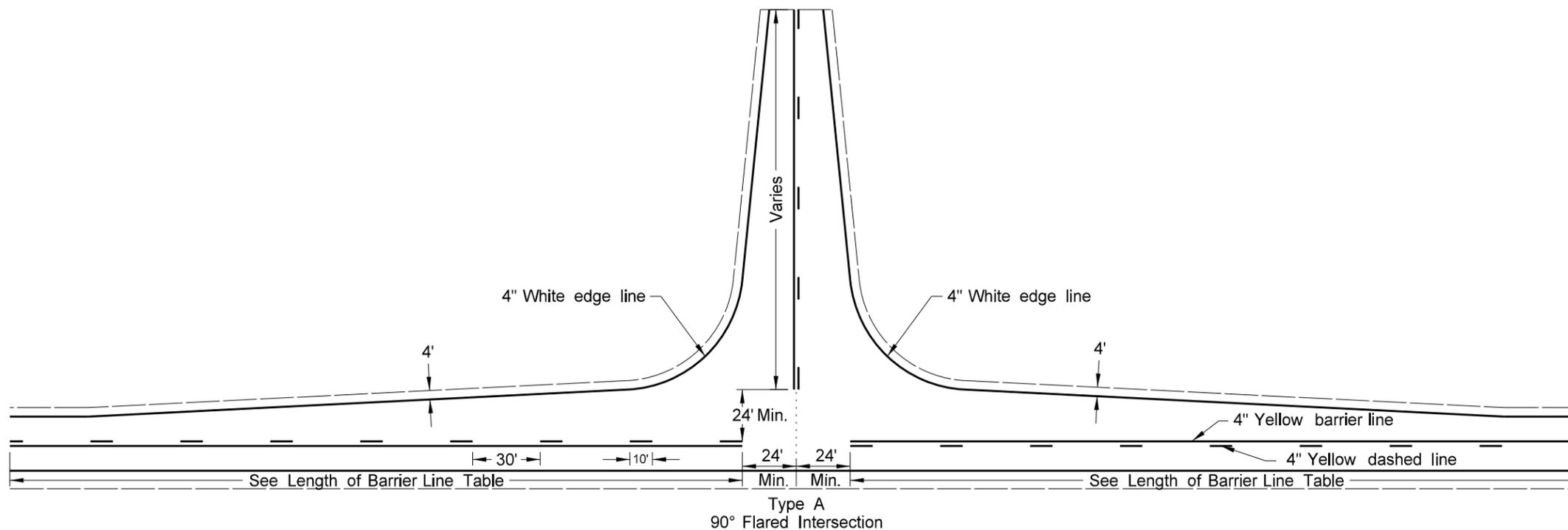
D-762-3

NOTES: The barrier lines have variable distances dependent on the speed limit. The length for the barrier lines shall be obtained from the table which is based on the stopping sight distance. The message STOP and stop line may be placed on the pavement for additional emphasis, especially when the stop sign is a considerable distance from where the stop is intended or required to be made. Diagonal cross hatching in islands is optional.

Length of Barrier Line									
Speed Limit	30	35	40	45	50	55	60	65	70
Min. Length	200'	250'	305'	360'	425'	495'	570'	645'	730'



- Legend
- 4" Line
 - 8" Line
 - 24" Line

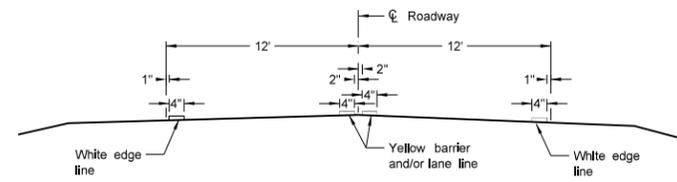


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
6-9-09	
REVISIONS	
DATE	CHANGE
9-24-09	Barrier Stripe Correction
9-21-11	Revised Turn Lane Markings

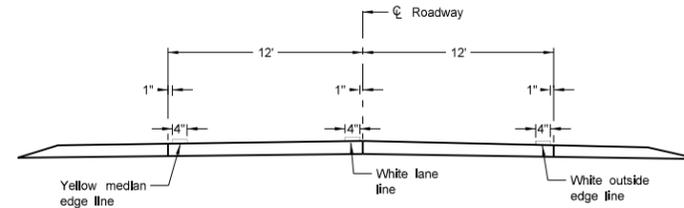
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 of Transportation

PAVEMENT MARKING

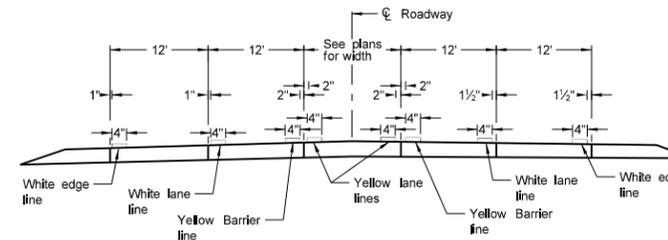
D-762-4



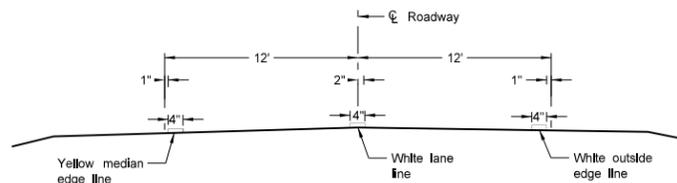
Two Lane Two Way
RURAL ROADWAY



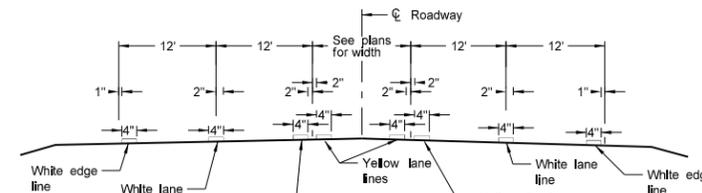
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



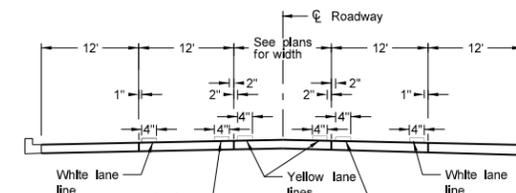
RURAL FIVE LANE ROADWAY
Concrete Section



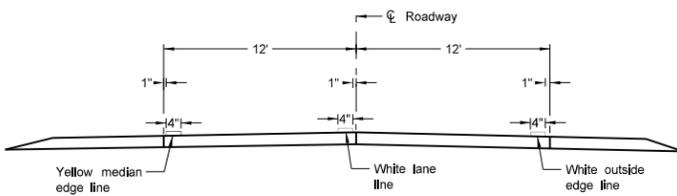
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



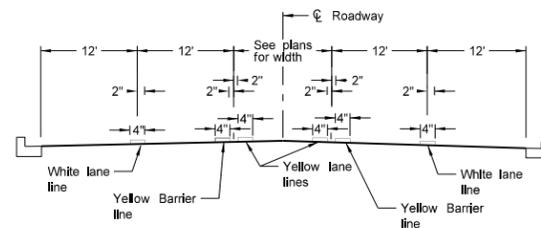
RURAL FIVE LANE ROADWAY
Asphalt Section



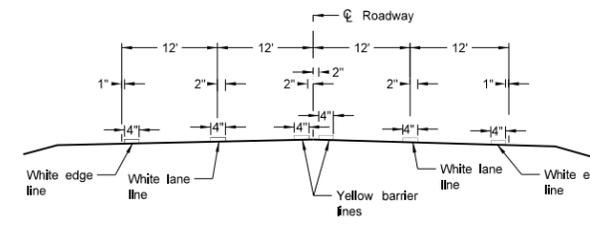
URBAN FIVE LANE SECTION
Concrete Section



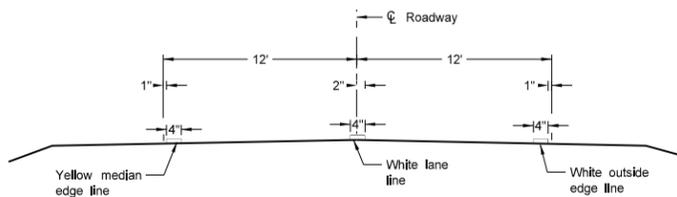
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



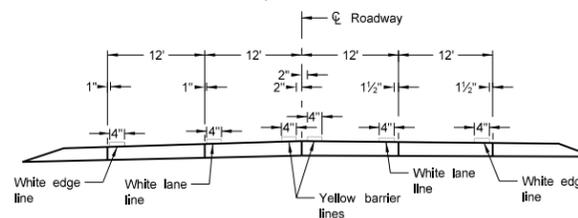
URBAN FIVE LANE SECTION
Asphalt Section



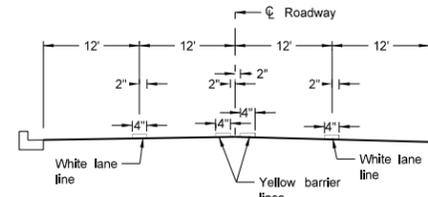
RURAL FOUR LANE ROADWAY
Asphalt Section



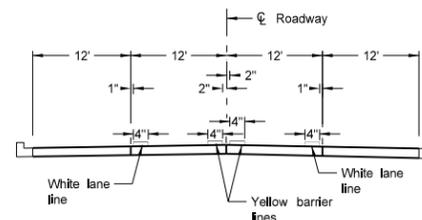
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



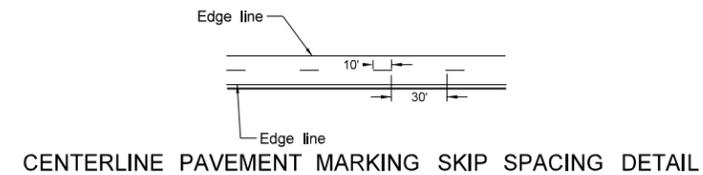
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

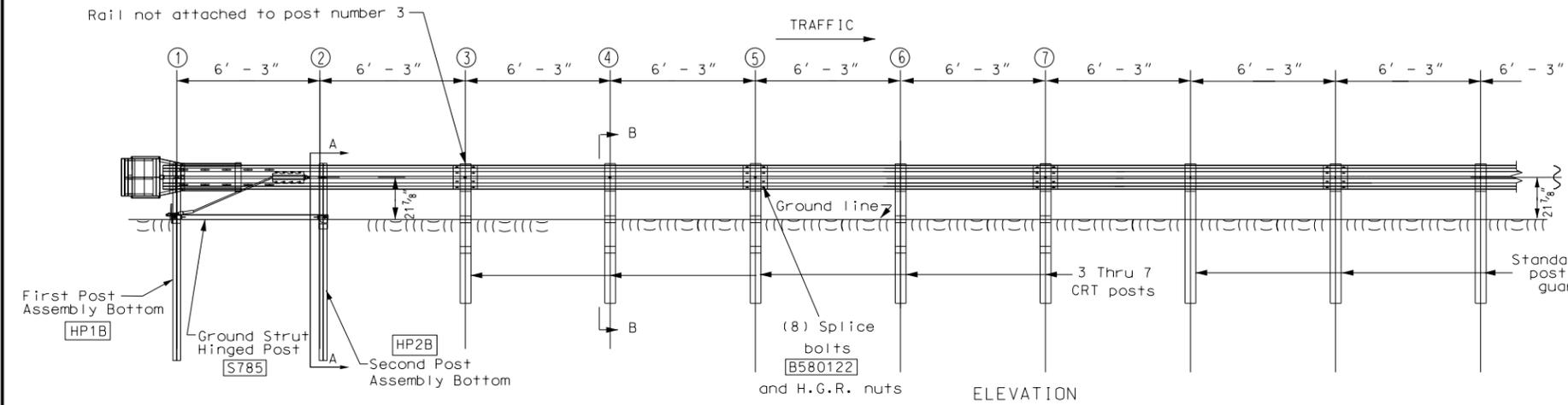
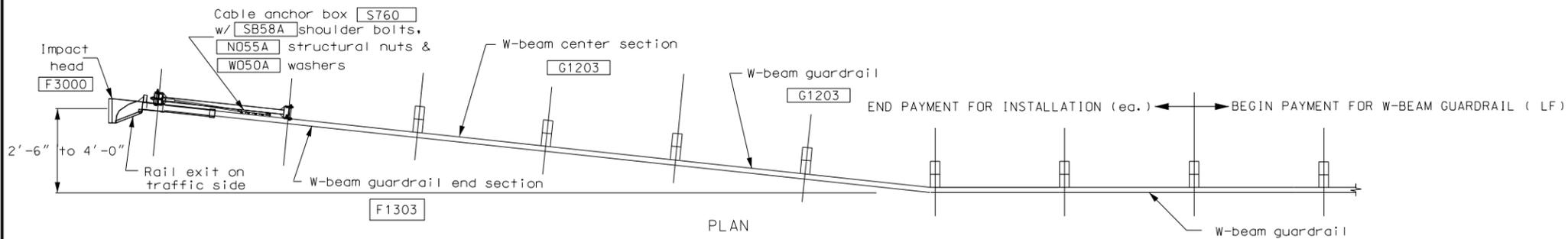
NOTES:
1. Edge lines shall be continued through private drives and field drives and broken for intersections.

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

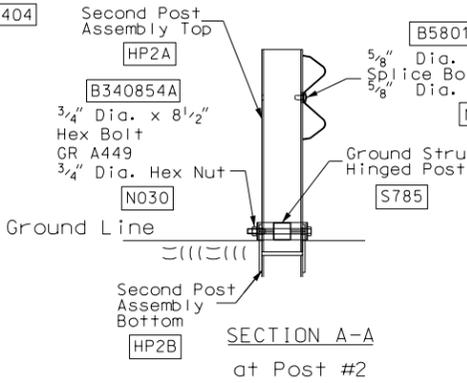
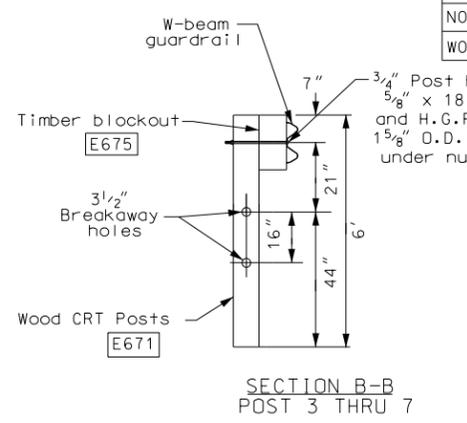
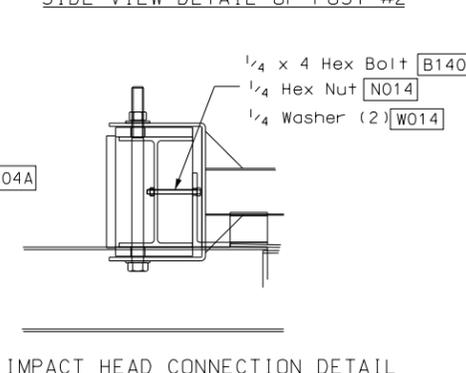
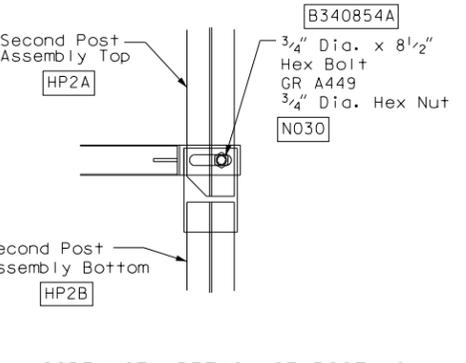
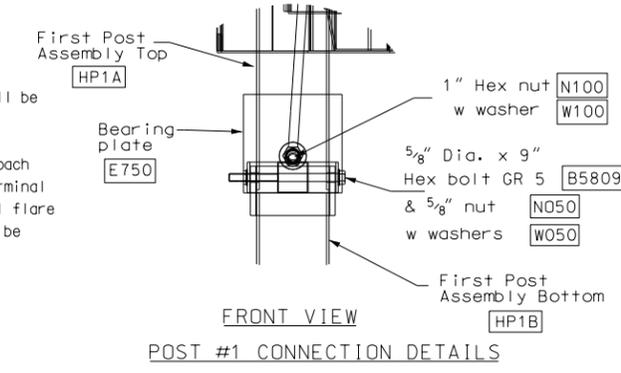
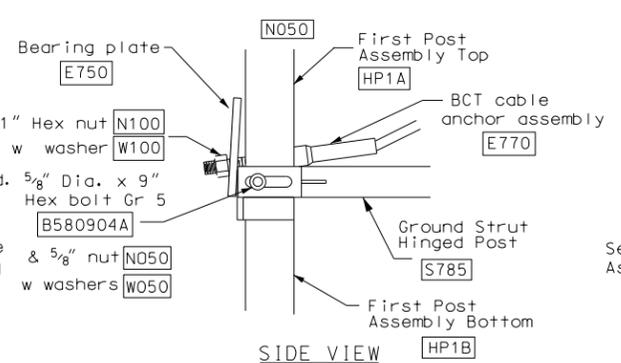
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

FLARED ENERGY ABSORBING TERMINAL FOR STEEL BREAKAWAY SYSTEM

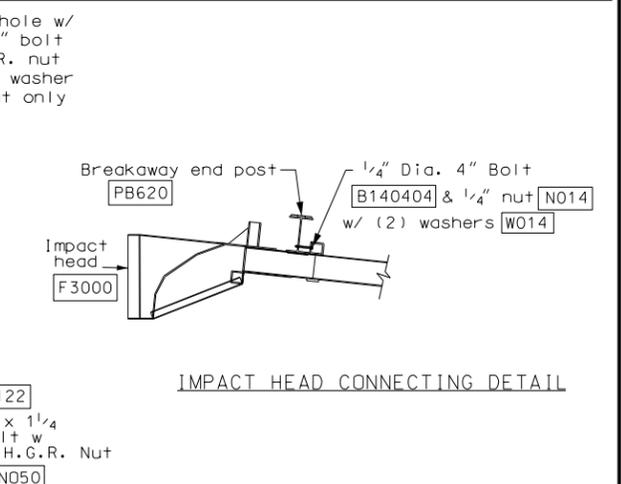
D-764-2C



- GENERAL NOTES**
- Wood posts are required with the Flared Energy Absorbing Terminal except post 1 and 2.
 - All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
 - The lower sections of the posts shall not protrude more than 4 inches above the ground (measured along a 60 inch cord). Site grading may be necessary to meet this requirement.
 - Lower post sections shall not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactory compacted to prevent settlement.
 - When rock is encountered during excavation, a 12" diameter post hole 20" deep may be used if approved by the Engineer. Granular material will be placed in the bottom of the hole approximately 2 1/2" deep to provide drainage. The soil tubes shall be field cut to length, placed in the hole and back filled with adequately compacted material excavated from the hole.
 - The breakaway cable assembly shall be taut. A locking device (vice grips or channel lock pliers) should be used to prevent cable from twisting when tightening nuts.
 - The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when wood shrinks. The nail shall be 20 penny and galvanized.
 - The Flared Energy Absorbing Terminal shall be flared only when the approach guardrail is parallel with the roadway. When the approach guardrail is flared at 16:1 to 10:1, the Flared Energy Absorbing Terminal shall have only the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, the Flared Energy Absorbing Terminal shall be turned parallel to the roadway.



ITEM #	QTY	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA.
G1203	2	W-BEAM GUARDRAIL, 12 GA.
HP1A	1	FIRST POST ASSEMBLY TOP
HP1B	1	FIRST POST ASSEMBLY BOTTOM
HP2A	1	SECOND POST ASSEMBLY TOP
HP2B	1	SECOND POST ASSEMBLY BOTTOM
P671	5	WOOD CRT POST
P675	5	TIMBER BLOCKOUT OR RECYCLED EQUIV.
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
S785	1	GROUND STRUT HINGED POST
HARDWARE (ALL DIMENSIONS IN INCHES)		
B140404	2	1/4 Dia. x 4 HEX BOLT
W014	4	1/4 WASHER
N014	2	1/4 HEX NUT
B580122	17	5/8 Dia. x 1 1/4 SPLICE BOLT
B581802	4	5/8" Dia. x 10" H.G.R. BOLT (POSTS 3 THRU 6)
B580904A	1	5/8 Dia. x 9 HEX BOLT GR 5
W050	5	5/8 WASHER
N050	22	5/8 Dia. H.G.R. NUT
B340854A	1	3/4 Dia. x 8 1/2 HEX BOLT GR A449
N030	1	3/4 Dia. HEX NUT
N100	2	1 ANCHOR CABLE HEX NUT
W100	2	1 ANCHOR CABLE WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N055A	8	1/2 A325 STRUCTURAL NUT
W050A	16	1 1/16 OD x 3/16 ID A325 STR. WASHER

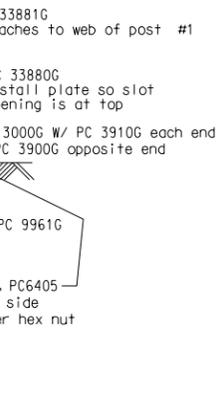
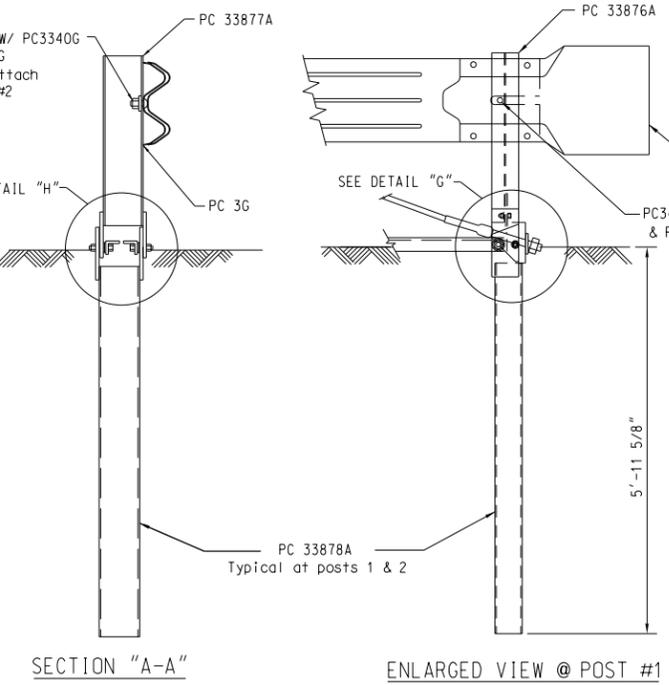
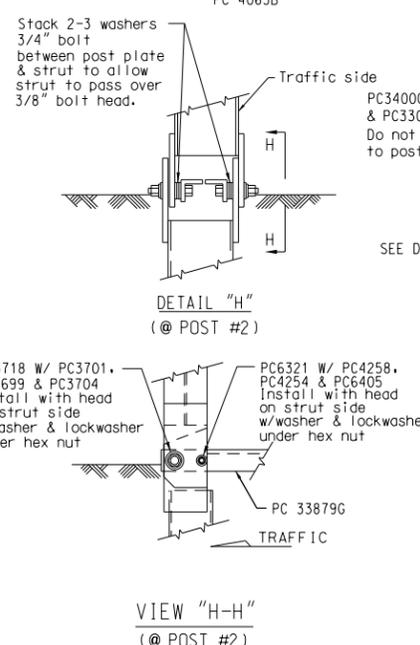
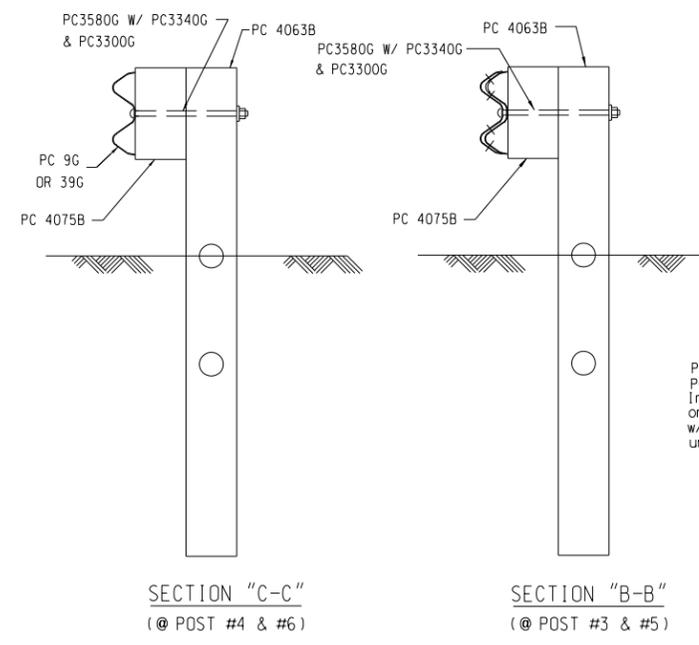
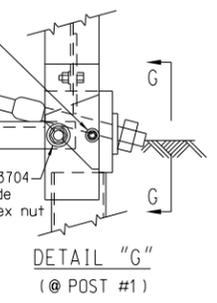
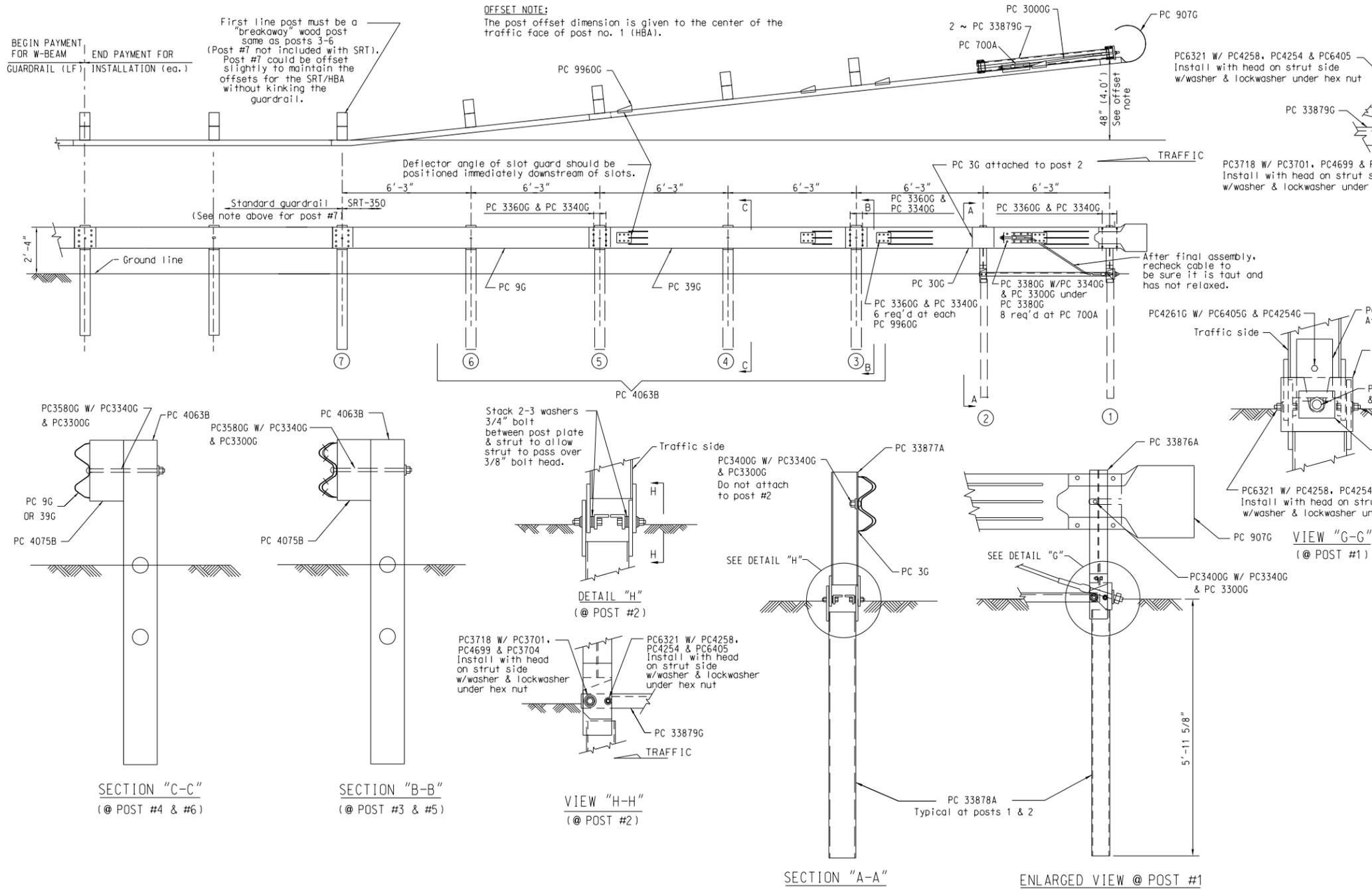


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09-01-98	
REVISIONS	
DATE	CHANGE
12-21-00	Flared energy absorbing terminal note
06-29-01	Added steel breakaway post
04-16-02	Adjusted post spacing and eliminated one post
12-01-04	PE Stamp added
05-03-05	Revised posts 1 & 2.
04-05-06	Revised notes
01-04-07	Changed CRT post & blackout Qty. to 5 and added 7 to section B-B
09-12-07	General revisions
	Rev. dimension to center of guardrail to 21 1/8"

This document was originally issued and sealed by Mark S Gaydos, Registration Number PE-4518, on 09/12/07 and the original document is stored at the North Dakota Department of Transportation

SLOTTED RAIL TERMINAL 6 POST SYSTEM

D-764-2H



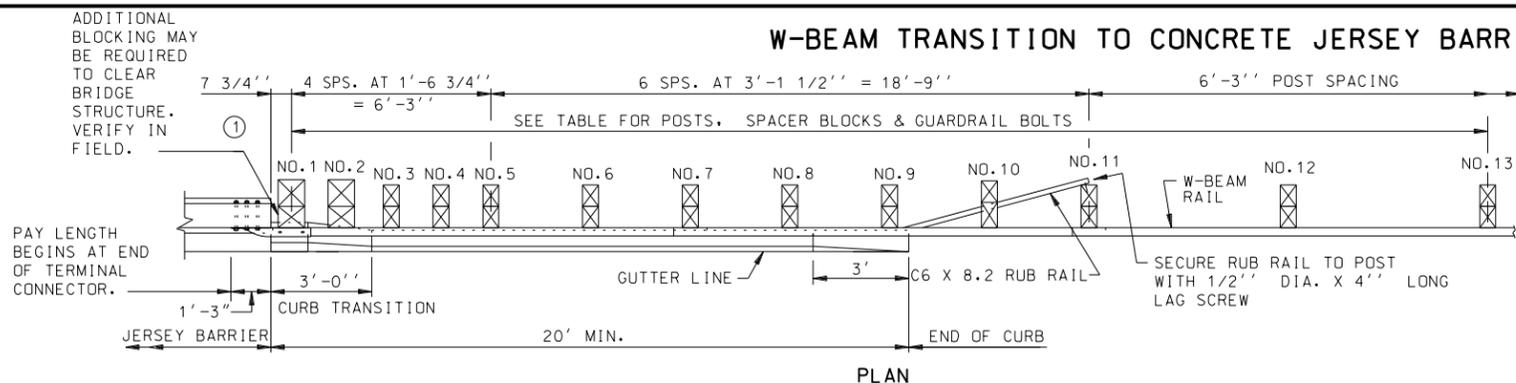
BILL OF MATERIAL		
PC	QTY	DESCRIPTION
3G	1	12/12"/BACKUP (GUARDRAIL)
9G	1	12/12'6"/6'3/S (GUARDRAIL)
30G	1	12/12'6/S SRT-1 (GUARDRAIL)
39G	1	12/12'6/S SRT-2 (GUARDRAIL)
700A	1	CABLE ANCHOR BRACKET
907G	1	12/BUFFER/ROLLED (TERMINAL)
3000G	1	3/4 x 6'6" CABLE
3300G	14	5/8" WASHER
3340G	58	5/8" HEX NUT
3360G	44	5/8"Ø x 1 1/4" SPLICE BOLT
3380G	8	5/8"Ø x 1 1/2" HEX HD BOLT
3400G	2	5/8"Ø x 2" POST BOLT
3580G	4	5/8"Ø x 18" POST BOLT
3701G	10	3/4" WASHER
3704G	4	3/4" HEX NUT
3718G	4	3/4"Ø x 3" HEX HD BOLT (A325)
3900G	1	1" WASHER
3910G	2	1" HEX NUT
4063B	4	6' POST 6" x 8"
4075B	4	14" BLOCK 6" x 8"
4254G	5	3/8" WASHER
4258G	4	3/8" LOCKWASHER
4261G	1	3/8"Ø x 1 1/2" HEX HD BOLT (GR 5)
4699G	4	3/4" LOCKWASHER
6321G	4	3/8"Ø x 2" HEX HD BOLT (GR 5)
6405G	5	3/8" HEX NUT
9960G	4	SLOT GUARD
9961G	1	3/8" x 3" x 4" PLATE WASHER
33876A	1	HBA POST 1 TOP (W6 x 8.5)
33877A	1	HBA POST 2 TOP (W6 x 8.5)
33878A	2	HBA POST 1 & 2 BOT (TS 6 x 4)
33879G	2	ANGLE STRUT 2" x 2" x 3/8"
33880G	1	1" x 6" x 8" BEARING PLATE
33881G	1	CABLE WEB PL 4" x 1/4" x 6 1/2"

- GENERAL NOTES:**
1. Wood posts are required with the slotted rail terminal except posts 1 and 2.
 2. All bolts, nuts, cable assemblies, cable anchors, bearing plates, slot guards, struts, nails, pipes soil tubes and soil plates shall be galvanized.
 3. The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent cable from twisting when tightening nuts.
 4. The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when wood shrinks. The 2 nails required per blockout shall be 20 penny and galvanized.
 5. For curb installation, the curb must end prior to post number 7. Where the curb is extended beyond post number 7, the flared SRT can not be used. A straight end treatment shall be used at the end of the straight guardrail that is placed at the face of the curb.
 6. For details not shown, see the manufacturer's installation manual.
 7. Minimum length of rail, including end terminal, in advance of fixed objects shall be 175 feet when the slotted rail terminal is used as the end terminal.

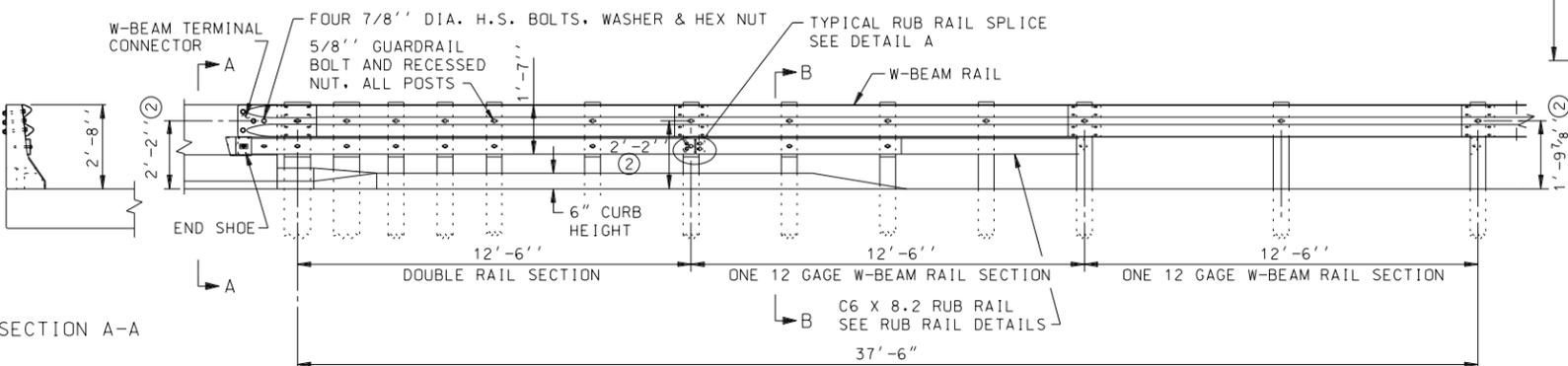
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09-03-99	
REVISIONS	
DATE	CHANGE
03-15-01	Major revision
06-29-01	Breakaway post added
12-06-02	Added note 7
04-23-03	Revised note 7
12-01-04	PE Stamp added
09-12-07	Revised guardrail height from 27" to 28"

This document was originally issued and sealed by
Mark S Gaydos,
 Registration Number
PE- 4518 ,
 on **09/12/07** and the original document is stored at the
 North Dakota Department
 of Transportation

W-BEAM TRANSITION TO CONCRETE JERSEY BARRIER WITH APPROACH CURB

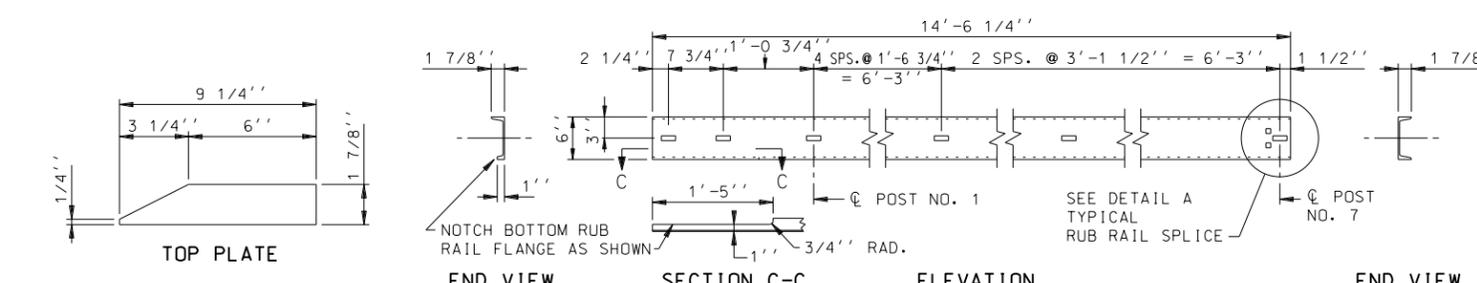


PLAN



SECTION A-A

ELEVATION GENERAL ASSEMBLY DETAILS



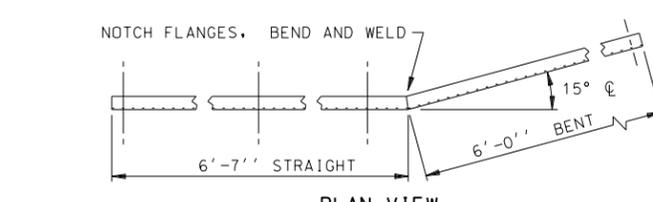
TOP PLATE

END SHOE PLATE DETAILS (1/4" PLATE)

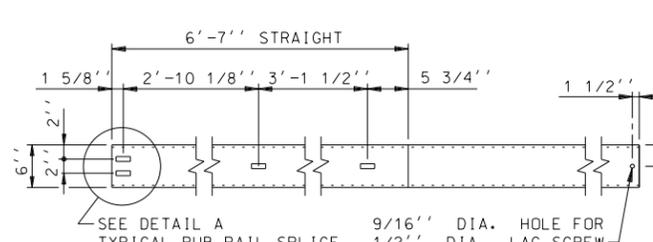
FRONT PLATE

BOTTOM PLATE

END SHOE PLATE DETAILS (1/4" PLATE)

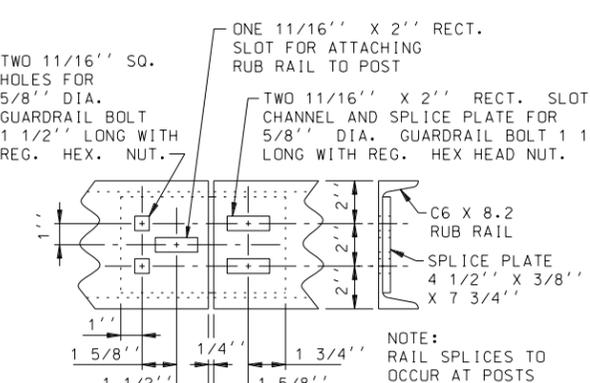


PLAN VIEW



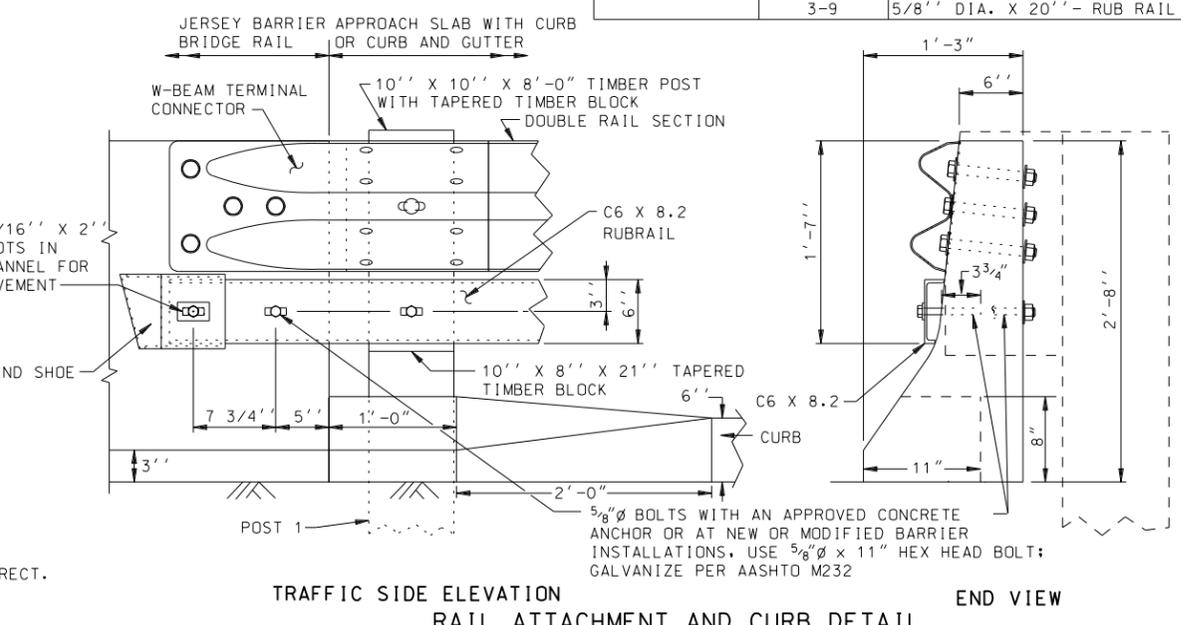
ELEVATION

RUB RAIL BENT SECTION



DETAIL A

TYPICAL RUB RAIL SPLICE



TRAFFIC SIDE ELEVATION

RAIL ATTACHMENT AND CURB DETAIL

END VIEW

NOTES:

C6 X 8.2 RUB RAIL AND STRUCTURAL STEEL SHALL BE AASHTO M270M GRADE 250, AND SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH AASHTO M111.

ALL SLOTTED HOLES ARE 11/16" X 2".

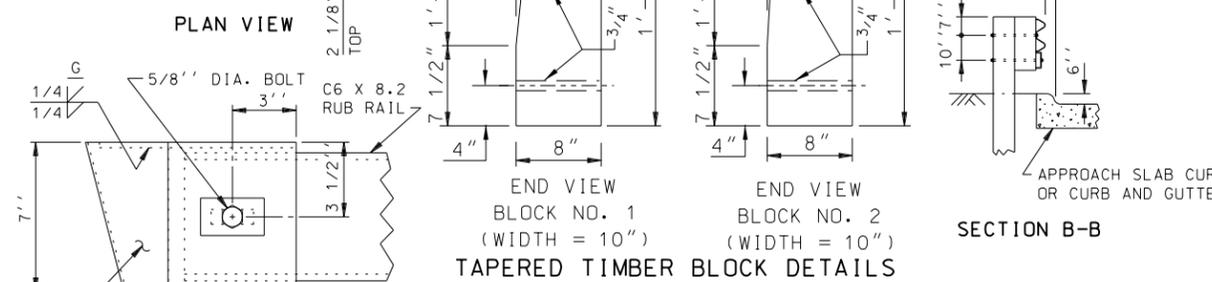
ALL SQUARE HOLES ARE 11/16".

GALVANIZE ALL HARDWARE IN ACCORDANCE WITH AASHTO M232.

ALL POSTS AND BLOCKS FOR THE W-BEAM GUARDRAIL SHALL BE TIMBER.

- ① ADDITIONAL BLOCKING MAY BE REQUIRED AT POST NO. 1.
- ② HEIGHT IS 2'-2" FROM 0' TO 12'-6" FROM BRIDGE. HEIGHT TAPERS FROM 2'-2" TO 1'-9 7/8" BETWEEN 12'-6" TO 37'-6" FROM BRIDGE.

POST, TIMBER BLOCK & BOLT TABLE		
DESCRIPTION	POST NO.	SIZE
POST	1 & 2	10' X 10' X 8'-0" MIN. LONG
	3-5	6' X 8' X 7'-0" MIN. LONG
	6-13	6' X 8' X 6'-0" MIN. LONG
SPACER BLOCK	1-2	10' X 8' X 21" TAPERED BLOCK
	3-9	6' X 8' X 21"
	10	6' X 9 3/4" X 14"
	11-13	6' X 8' X 14"
GUARDRAIL BOLT & RECESSED NUT	1 & 2 & 10	5/8" DIA. X 20" - GUARDRAIL
	3-9, 11-13	5/8" DIA. X 18" - GUARDRAIL
	1-2	5/8" DIA. X 22" - RUB RAIL
	3-9	5/8" DIA. X 20" - RUB RAIL



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-19-02	
REVISIONS	
DATE	CHANGE
02-07-03	Rev rail attachment
12-05-04	PE Stamp added
07-05-06	General revisions
08-24-06	Revised table
09-12-07	Rev. dimension to center of guardrail to 1'-9 7/8"

This document was originally issued and sealed by Mark S Gaydos, Registration Number PE-4518, on 09/12/07 and the original document is stored at the North Dakota Department of Transportation

GUARDRAIL AT BRIDGE ENDS
65 MPH DESIGN SPEED

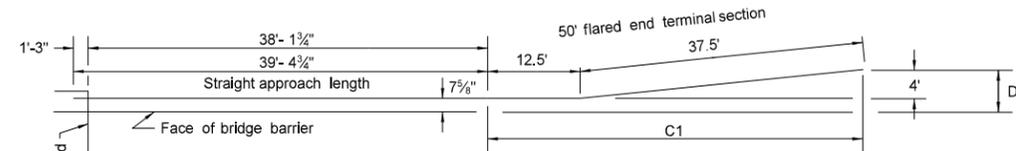
D-764-8A

LENGTH OF NEED TABLE 65 MPH DESIGN SPEED

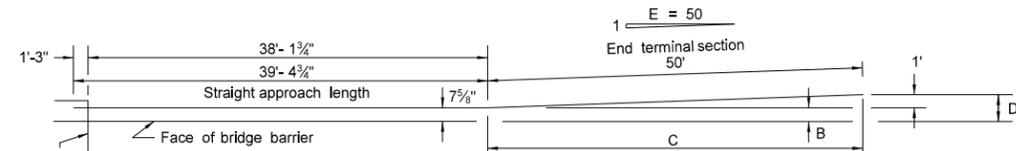
DESIGN TRAFFIC VOLUME	CLEAR ROADWAY WIDTH OF BRIDGE	STRAIGHT APPROACH LENGTH	APPROACH SIDE							OPPOSITE SIDE																
			A	B	C	D	C1	D1	E	TOTAL W-BEAM LENGTH	A	B	C	D	C1	D1	E	TOTAL W-BEAM LENGTH								
																			③	③	③	③	③	③	③	③
																			FT	FT	FT	FT	FT	FT	FT	FT
UNDER 750 ADT	48	39.4	12.49	1.05	49.89	4.38			15	51.9	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4								
	46	39.4	24.96	1.88	49.89	5.21			15	64.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4								
	44	39.4	24.96	1.88	49.89	5.21			15	64.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4								
	42	39.4	37.43	2.71	49.89	6.04			15	76.9	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4								
	40	39.4	49.91	3.55	49.89	6.87			15	89.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4								
	38	39.4	49.91	3.55	49.89	6.87			15	89.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4								
	36	39.4	62.38	4.38	49.89	7.70			15	101.9	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4								
	34	39.4	74.85	5.21	49.89	8.53			15	114.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4								
	32	39.4	74.85	5.21	49.89	8.53			15	114.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4								
	30	39.4	87.32	6.04	49.89	9.37			15	126.9	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4								
	28	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38				15	51.9							
	26	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38				15	51.9							
	24	39.4	112.27	7.70	49.89	11.03			15	151.9	12.49	1.05	49.89	4.38				15	51.9							
	750 - 1500 ADT	48	39.4	49.91	3.55	49.89	6.87			15	89.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4							
		46	39.4	62.38	4.38	49.89	7.70			15	101.9	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4							
		44	39.4	62.38	4.38	49.89	7.70			15	101.9	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4							
		42	39.4	74.85	5.21	49.89	8.53			15	114.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4							
		40	39.4	74.85	5.21	49.89	8.53			15	114.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4							
		38	39.4	87.32	6.04	49.89	9.37			15	126.9	12.49	1.05	49.89	4.38			15	51.9							
		36	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9							
		34	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9							
		32	39.4	112.27	7.70	49.89	11.03			15	151.9	24.96	1.88	49.89	5.21			15	64.4							
		30	39.4	112.27	7.70	49.89	11.03			15	151.9	24.96	1.88	49.89	5.21			15	64.4							
		28	39.4	124.74	8.53	49.89	11.86			15	164.4	37.43	2.71	49.89	6.04			15	76.9							
26		39.4	124.74	8.53	49.89	11.86			15	164.4	37.43	2.71	49.89	6.04			15	76.9								
24	39.4	137.21	9.37	49.89	12.69			15	176.9	49.91	3.55	49.89	6.87			15	89.4									
1500 - 2000 ADT	48	39.4	74.85	5.21	49.89	8.53			15	114.4	12.49	1.05	49.89	4.38			15	51.9								
	46	39.4	87.32	6.04	49.89	9.37			15	126.9	12.49	1.05	49.89	4.38			15	51.9								
	44	39.4	87.32	6.04	49.89	9.37			15	126.9	12.49	1.05	49.89	4.38			15	51.9								
	42	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9								
	40	39.4	99.80	6.87	49.89	10.20			15	139.4	24.96	1.88	49.89	5.21			15	64.4								
	38	39.4	112.27	7.70	49.89	11.03			15	151.9	24.96	1.88	49.89	5.21			15	64.4								
	36	39.4	112.27	7.70	49.89	11.03			15	151.9	37.43	2.71	49.89	6.04			15	76.9								
	34	39.4	124.74	8.53	49.89	11.86			15	164.4	49.91	3.55	49.89	6.87			15	89.4								
	32	39.4	124.74	8.53	49.89	11.86			15	164.4	49.91	3.55	49.89	6.87			15	89.4								
	30	39.4	137.21	9.37	49.89	12.69			15	176.9	62.38	4.38	49.89	7.70			15	101.9								
	28	39.4	137.21	9.37	49.89	12.69			15	176.9	62.38	4.38	49.89	7.70			15	101.9								
	26	39.4	149.69	10.20	49.89	13.52			15	189.4	74.85	5.21	49.89	8.53			15	114.4								
24	39.4	149.69	10.20	49.89	13.52			15	189.4	74.85	5.21	49.89	8.53			15	114.4									
2000 - 6000 ADT	48	39.4	87.32	6.04	49.89	9.37			15	126.9	12.49	1.05	49.89	4.38			15	51.9								
	46	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9								
	44	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9								
	42	39.4	112.27	7.70	49.89	11.03			15	151.9	24.96	1.88	49.89	5.21			15	64.4								
	40	39.4	112.27	7.70	49.89	11.03			15	151.9	37.43	2.71	49.89	6.04			15	76.9								
	38	39.4	124.74	8.53	49.89	11.86			15	164.4	37.43	2.71	49.89	6.04			15	76.9								
	36	39.4	124.74	8.53	49.89	11.86			15	164.4	49.91	3.55	49.89	6.87			15	89.4								
	34	39.4	137.21	9.37	49.89	12.69			15	176.9	49.91	3.55	49.89	6.87			15	89.4								
	32	39.4	149.69	10.20	49.89	13.52			15	189.4	62.38	4.38	49.89	7.70			15	101.9								
	30	39.4	149.69	10.20	49.89	13.52			15	189.4	62.38	4.38	49.89	7.70			15	101.9								
	28	39.4	162.16	11.03	49.89	14.36			15	201.9	74.85	5.21	49.89	8.53			15	114.4								
	26	39.4	162.16	11.03	49.89	14.36			15	201.9	74.85	5.21	49.89	8.53			15	114.4								
24	39.4	174.63	11.86	49.89	15.19			15	214.4	87.32	6.04	49.89	9.37			15	126.9									
OVER 6000 ADT	48	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9								
	46	39.4	112.27	7.70	49.89	11.03			15	151.9	24.96	1.88	49.89	5.21			15	64.4								
	44	39.4	112.27	7.70	49.89	11.03			15	151.9	37.43	2.71	49.89	6.04			15	76.9								
	42	39.4	124.74	8.53	49.89	11.86			15	164.4	37.43	2.71	49.89	6.04			15	76.9								
	40	39.4	124.74	8.53	49.89	11.86			15	164.4	49.91	3.55	49.89	6.87			15	89.4								
	38	39.4	137.21	9.37	49.89	12.69			15	176.9	49.91	3.55	49.89	6.87			15	89.4								
	36	39.4	149.69	10.20	49.89	13.52			15	189.4	62.38	4.38	49.89	7.70			15	101.9								
	34	39.4	149.69	10.20	49.89	13.52			15	189.4	62.38	4.38	49.89	7.70			15	101.9								
	32	39.4	162.16	11.03	49.89	14.36			15	201.9	74.85	5.21	49.89	8.53			15	114.4								
	30	39.4	162.16	11.03	49.89	14.36			15	201.9	74.85	5.21	49.89	8.53			15	114.4								
	28	39.4	174.63	11.86	49.89	15.19			15	214.4	87.32	6.04	49.89	9.37			15	126.9								
	26	39.4	174.63	11.86	49.89	15.19			15	214.4	99.80	6.87	49.89	10.20			15	139.4								
24	39.4	187.10	12.69	49.89	16.02			15	226.9	99.80	6.87	49.89	10.20			15	139.4									

DESIGN SPEED	F	G	H	R
65	0.42	12.49	3.33	187.78

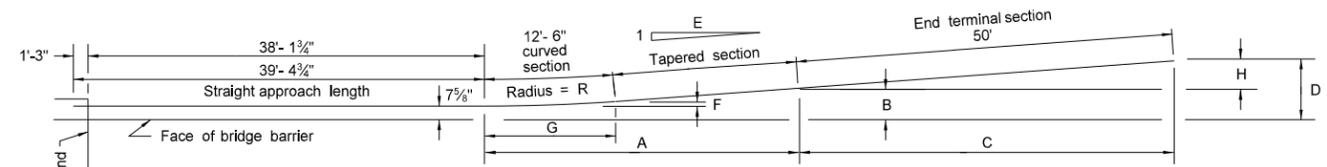
NOTES:
On divided highways use distance from roadway centerline to bridge rail x 2 and use this as clear roadway width of the bridge to determine guardrail length.
The contractor shall use wood posts for W-beam guardrail.



W-BEAM GUARDRAIL DIMENSION LAYOUT WITH FLARED END TERMINAL



W-BEAM GUARDRAIL DIMENSION LAYOUT WITH 50:1 TAPERED END TERMINAL



W-BEAM GUARDRAIL DIMENSION LAYOUT WITH TAPERED SECTION AND NONFLARED END TERMINAL

- ① Does not include end terminal section
- ② The 39.4' straight approach length is for use with the transition shown on Standard Drawing D-764-3.
For the transition shown on Standard Drawing D-764-3A, revise straight approach length to 45.65'.
- ③ Dimensions "B", "D" and "D1" include the 7 7/8" (0.64') offset from the lower face of jersey barrier to the rear face of the W-beam guardrail.
For installations using the transition shown on Standard Drawing D-764-3A, subtract 0.64' from the dimensions "B", "D" and "D1", to obtain offset from face of guardrail connection plate.

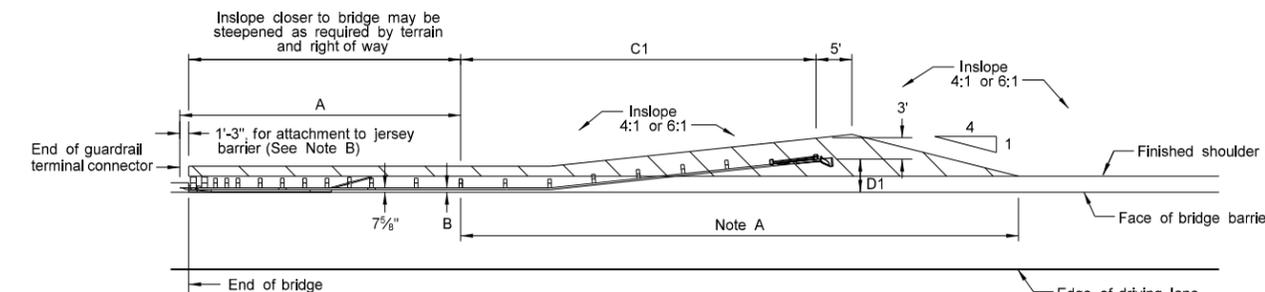
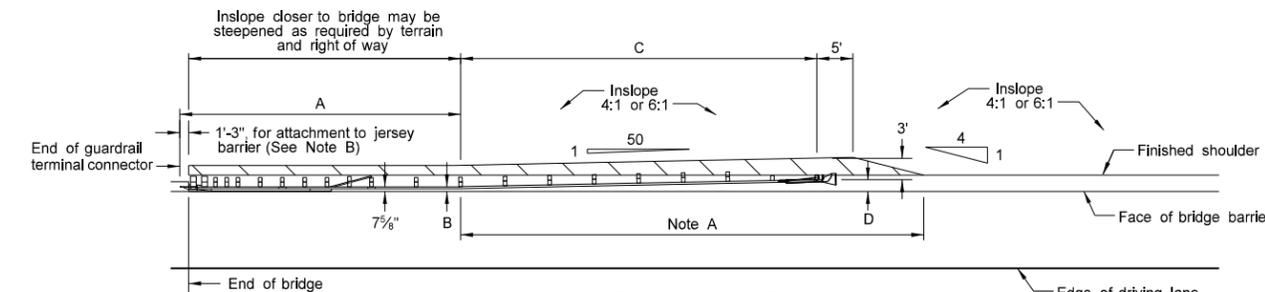
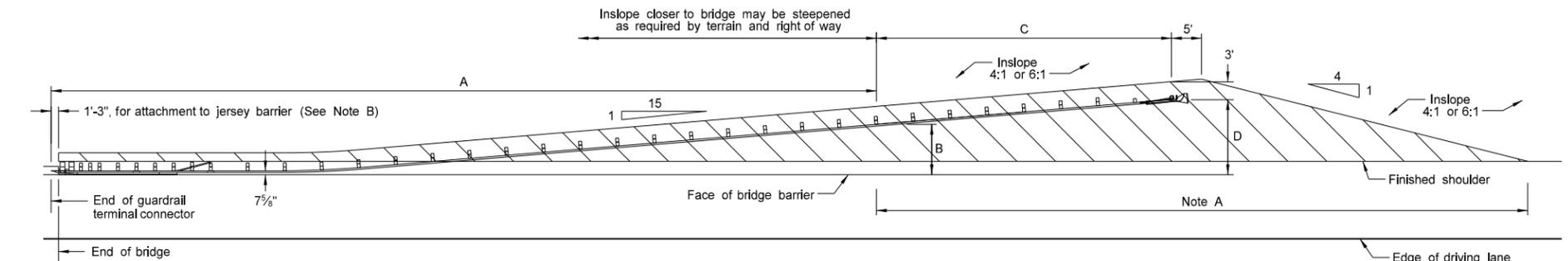
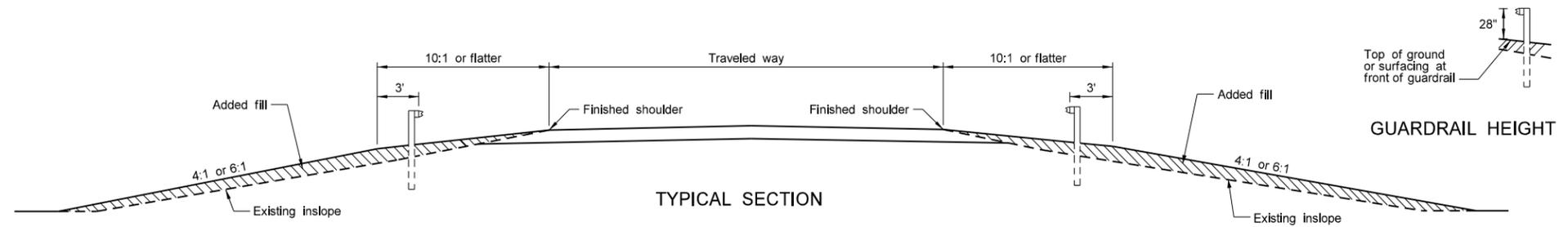
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09-01-88	
REVISIONS	
DATE	CHANGE
12-21-00	Revised flared end treatment
08-09-01	Revised note
07-05-02	Values in column C
12-18-02	Revised table
01-29-03	Revised table
12-01-04	PE Stamp added
01-04-07	Revised tables and layouts
02-16-07	Added notes ② and ③.
07-31-07	Revised length of need table
	Revised note ②

This document was originally issued and sealed by **MARK S GAYDOS** Registration Number **PE- 4518**, on **07/31/07** and the original document is stored at the North Dakota Department of Transportation

TYPICAL GRADING AT BRIDGE ENDS
WITH FLARED W-BEAM GUARDRAIL
65 MPH DESIGN SPEED

GUARDRAIL EMBANKMENT DIMENSION TABLE

DESIGN TRAFFIC VOLUME	CLEAR ROADWAY WIDTH OF BRIDGE	APPROACH SIDE						OPPOSITE SIDE					
		STRAIGHT AND FLARED GUARDRAIL		END TREATMENT TERMINAL NON-FLARED		END TREATMENT TERMINAL FLARED		STRAIGHT AND FLARED GUARDRAIL		END TREATMENT TERMINAL NON-FLARED		END TREATMENT TERMINAL FLARED	
		①	②	②	②	C1	D1	①	②	②	②	C1	D1
		FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT
UNDER 750 ADT	48	51.9	1.1	49.9	4.4			38.2	0.6	50.0	1.6	49.8	4.6
	46	64.4	1.9	49.9	5.2			38.2	0.6	50.0	1.6	49.8	4.6
	44	64.4	1.9	49.9	5.2			38.2	0.6	50.0	1.6	49.8	4.6
	42	76.8	2.7	49.9	6.0			38.2	0.6	50.0	1.6	49.8	4.6
	40	89.3	3.6	49.9	6.9			38.2	0.6	50.0	1.6	49.8	4.6
	38	89.3	3.6	49.9	6.9			38.2	0.6	50.0	1.6	49.8	4.6
	36	101.8	4.4	49.9	7.7			38.2	0.6	50.0	1.6	49.8	4.6
	34	114.3	5.2	49.9	8.5			38.2	0.6	50.0	1.6	49.8	4.6
	32	114.3	5.2	49.9	8.5			38.2	0.6	50.0	1.6	49.8	4.6
	30	126.7	6.0	49.9	9.4			38.2	0.6	50.0	1.6	49.8	4.6
	28	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	26	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
24	151.7	7.7	49.9	11.0			63.1	1.1	49.9	4.4			
750 - 1500 ADT	48	89.3	3.6	49.9	6.9			38.2	0.6	50.0	1.6	49.8	4.6
	46	101.8	4.4	49.9	7.7			38.2	0.6	50.0	1.6	49.8	4.6
	44	101.8	4.4	49.9	7.7			38.2	0.6	50.0	1.6	49.8	4.6
	42	114.3	5.2	49.9	8.5			38.2	0.6	50.0	1.6	49.8	4.6
	40	114.3	5.2	49.9	8.5			38.2	0.6	50.0	1.6	49.8	4.6
	38	126.7	6.0	49.9	9.4			63.1	1.1	49.9	4.4		
	36	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	34	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	32	151.7	7.7	49.9	11.0			75.6	1.9	49.9	5.2		
	30	151.7	7.7	49.9	11.0			75.6	1.9	49.9	5.2		
	28	164.1	8.5	49.9	11.9			88.1	2.7	49.9	6.0		
	26	164.1	8.5	49.9	11.9			88.1	2.7	49.9	6.0		
24	176.6	9.4	49.9	12.7			100.6	3.6	49.9	6.9			
1500 - 2000 ADT	48	114.3	5.2	49.9	8.5			63.1	1.1	49.9	4.4		
	46	126.7	6.0	49.9	9.4			63.1	1.1	49.9	4.4		
	44	126.7	6.0	49.9	9.4			63.1	1.1	49.9	4.4		
	42	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	40	139.2	6.9	49.9	10.2			75.6	1.9	49.9	5.2		
	38	151.7	7.7	49.9	11.0			75.6	1.9	49.9	5.2		
	36	151.7	7.7	49.9	11.0			88.1	2.7	49.9	6.0		
	34	164.1	8.5	49.9	11.9			100.6	3.6	49.9	6.9		
	32	164.1	8.5	49.9	11.9			100.6	3.6	49.9	6.9		
	30	176.6	9.4	49.9	12.7			113.0	4.4	49.9	7.7		
	28	176.6	9.4	49.9	12.7			113.0	4.4	49.9	7.7		
	26	189.1	10.2	49.9	13.5			125.5	5.2	49.9	8.5		
24	189.1	10.2	49.9	13.5			125.5	5.2	49.9	8.5			
2000 - 6000 ADT	48	126.7	6.0	49.9	9.4			63.1	1.1	49.9	4.4		
	46	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	44	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	42	151.7	7.7	49.9	11.0			75.6	1.9	49.9	5.2		
	40	151.7	7.7	49.9	11.0			88.1	2.7	49.9	6.0		
	38	164.1	8.5	49.9	11.9			88.1	2.7	49.9	6.0		
	36	164.1	8.5	49.9	11.9			100.6	3.6	49.9	6.9		
	34	176.6	9.4	49.9	12.7			100.6	3.6	49.9	6.9		
	32	189.1	10.2	49.9	13.5			113.0	4.4	49.9	7.7		
	30	189.1	10.2	49.9	13.5			113.0	4.4	49.9	7.7		
	28	201.6	11.0	49.9	14.4			125.5	5.2	49.9	8.5		
	26	201.6	11.0	49.9	14.4			125.5	5.2	49.9	8.5		
24	214.0	11.9	49.9	15.2			138.0	6.0	49.9	9.4			
OVER 6000 ADT	48	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	46	151.7	7.7	49.9	11.0			75.6	1.9	49.9	5.2		
	44	151.7	7.7	49.9	11.0			88.1	2.7	49.9	6.0		
	42	164.1	8.5	49.9	11.9			88.1	2.7	49.9	6.0		
	40	164.1	8.5	49.9	11.9			100.6	3.6	49.9	6.9		
	38	176.6	9.4	49.9	12.7			100.6	3.6	49.9	6.9		
	36	189.1	10.2	49.9	13.5			113.0	4.4	49.9	7.7		
	34	189.1	10.2	49.9	13.5			113.0	4.4	49.9	7.7		
	32	201.6	11.0	49.9	14.4			125.5	5.2	49.9	8.5		
	30	201.6	11.0	49.9	14.4			125.5	5.2	49.9	8.5		
	28	214.0	11.9	49.9	15.2			138.0	6.0	49.9	9.4		
	26	214.0	11.9	49.9	15.2			150.4	6.9	49.9	10.2		
24	226.5	12.7	49.9	16.0			150.4	6.9	49.9	10.2			



Note A: This area may have to be placed at flatter than 10:1 to provide the proper guardrail height.

Note B: For guardrail installed in accordance with Standard Drawing D-764-3A, the three beam terminal connector installation location must be determined from the bridge railing plans.

NOTES:

The design traffic volumes (ADT) shall be as shown on title sheet under traffic forecast.

Where normal inslope is 4:1, the added fill shall be 4:1. Where normal inslope is 6:1, the added fill shall be 6:1.

① The values shown for dimension "A" are applicable for W-beam guardrail installations attached to jersey barrier as shown on Standard Drawing D-764-3.

When the guardrail installation is in accordance with Standard Drawing D-764-3A, dimension "A" shall be revised by adding 6.3' to the tabulated value.

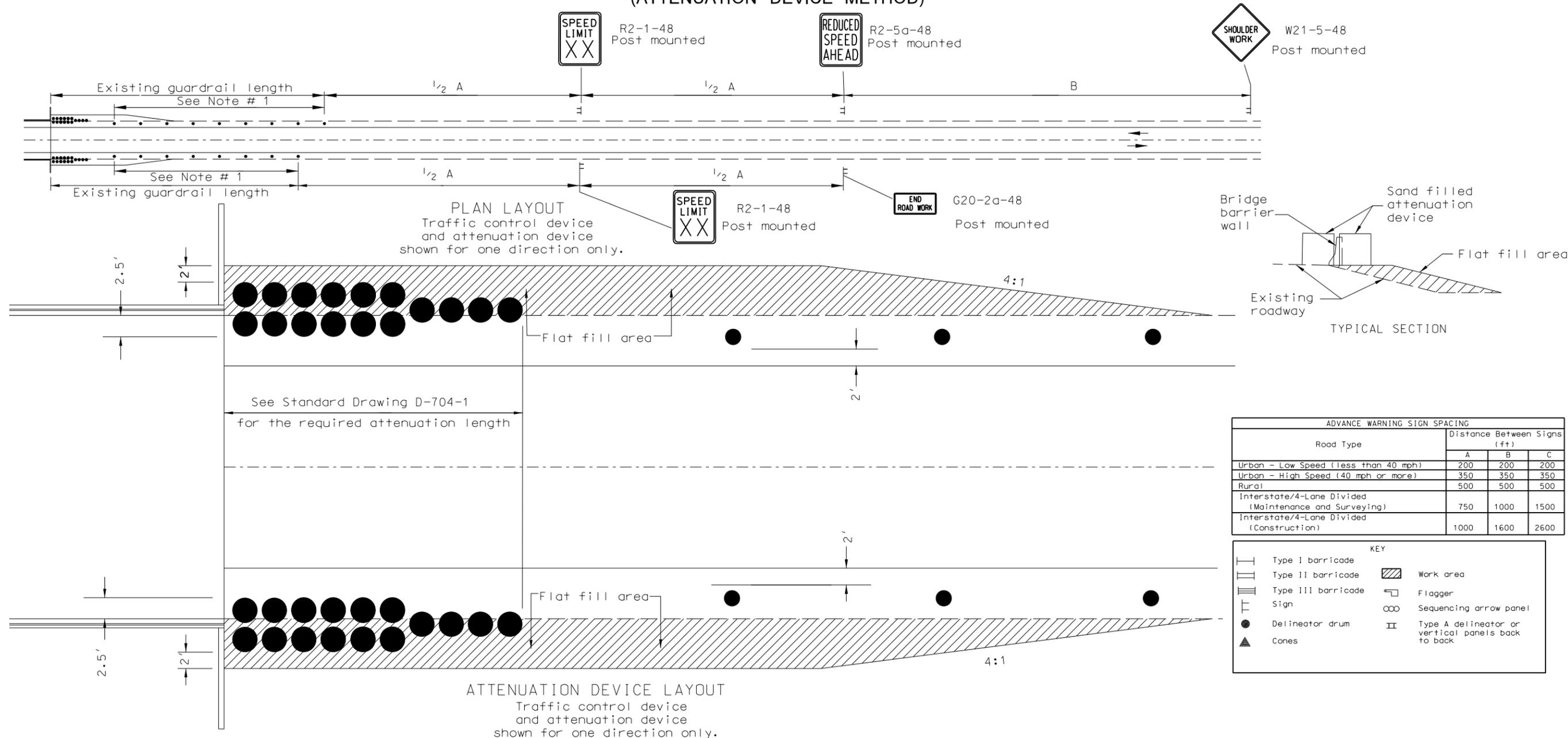
② The values shown for dimensions "B", "D" and "D1" are applicable for W-beam guardrail installations attached to jersey barrier as shown on Standard Drawing D-764-3.

When the guardrail installation is in accordance with Standard Drawing D-764-3A, dimensions "B", "D", and "D1" shall be revised by subtracting 0.6' from the tabulated value.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09-01-98	
REVISIONS	
DATE	CHANGE
10-29-98	Offset dimensions
12-21-00	Revise flared end treatment
04-02-02	Revised table
12-06-02	Revised table
12-01-04	PE Stamp added
01-04-07	Revised table and layouts
02-16-07	Added notes ①, ②, B, revised table and layouts
09-13-07	Revised guardrail height from 27" to 28"

This document was originally issued and sealed by Mark S Gaydos, Registration Number PE- 4518, on 09/13/07 and the original document is stored at the North Dakota Department of Transportation

SHORT TERM END TREATMENT FOR BRIDGES
(ATTENUATION DEVICE METHOD)



Road Type	Distance Between Signs (ft)		
	A	B	C
Urban - Low Speed (less than 40 mph)	200	200	200
Urban - High Speed (40 mph or more)	350	350	350
Rural	500	500	500
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500
Interstate/4-Lane Divided (Construction)	1000	1600	2600

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

Note

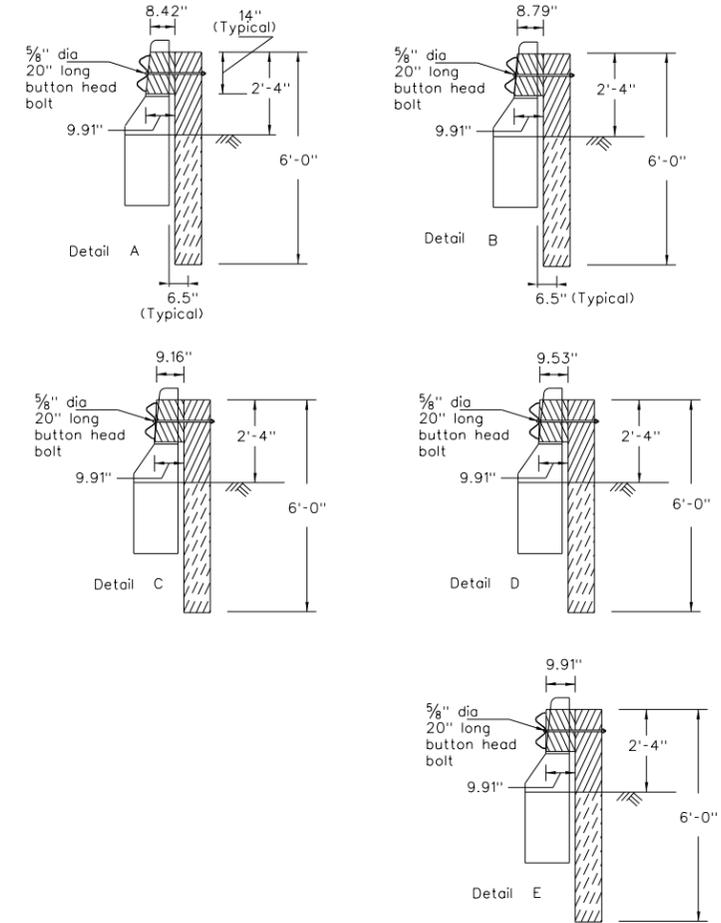
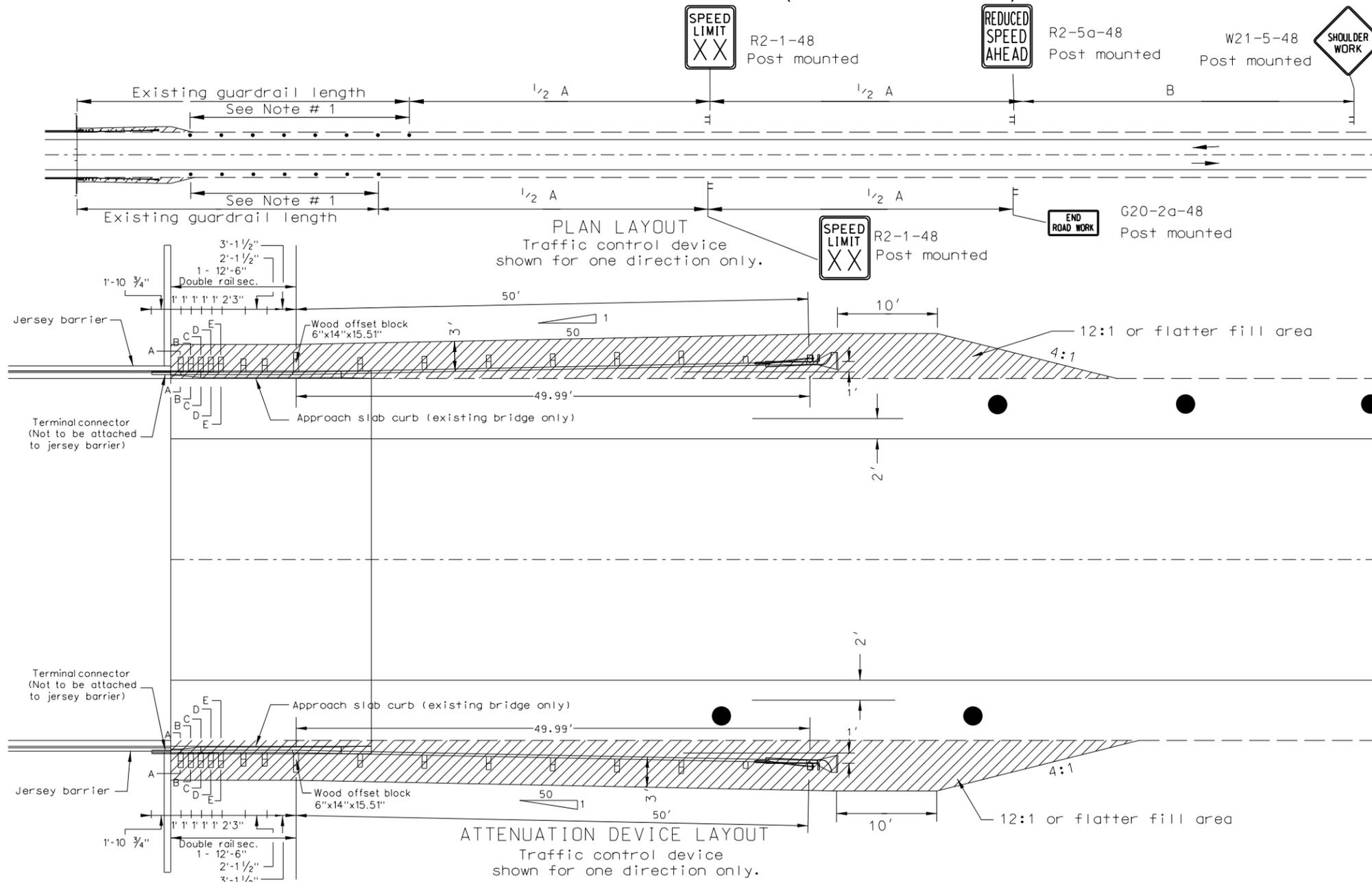
- If the shoulder width is less than 3', the vertical panels shall be used and placed as far from the driving lane as possible and still be on the finished shoulder. When there is no shoulder, the vertical panels shall be placed as near as possible to the driving lane on the in slope of the shoulder.
- If the bridge is within construction zone signing, the reduced speed ahead sign can be eliminated.
- 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 20 mph. Where speed limits are to be reduced more than 20 mph, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 20 mph. The second speed limit sign shall be placed at 1/2 B.
- 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 20 mph. Where speed limits are to be reduced more than 20 mph, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 20 mph. The second speed limit sign shall be placed at 1/2 B.
- Existing speed limit signs within a reduced speed zone shall be covered.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
01-22-04	
REVISIONS	
DATE	CHANGE
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

SHORT TERM END TREATMENT FOR BRIDGES (GUARDRAIL METHOD)

D-764-30



ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs (ft)		
	A	B	C
Urban - Low Speed (less than 40 mph)	200	200	200
Urban - High Speed (40 mph or more)	350	350	350
Rural	500	500	500
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500
Interstate/4-Lane Divided (Construction)	1000	1600	2600

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

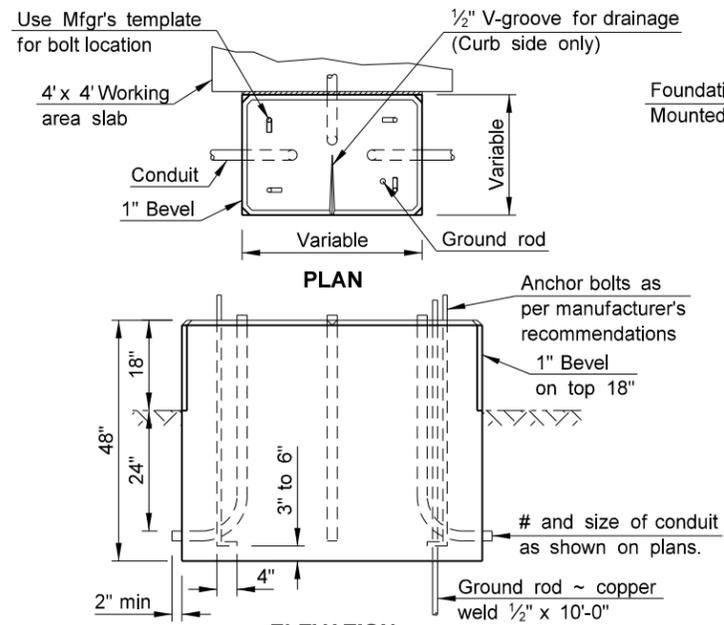
Note

- If the shoulder width is less than 3', the vertical panels shall be used and placed as far from the driving lane as possible and still be on the finished shoulder. When there is no shoulder, the vertical panels shall be placed as near as possible to the driving lane on the inslope of the shoulder.
- If the bridge is within construction zone signing, the reduced speed ahead sign can be eliminated.
- 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 20 mph. Where speed limits are to be reduced more than 20 mph, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 20 mph. The second speed limit sign shall be placed at 1/2 B.
- 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 20 mph. Where speed limits are to be reduced more than 20 mph, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 20 mph. The second speed limit sign shall be placed at 1/2 B.
- Existing speed limit signs within a reduced speed zone shall be covered.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
01-22-04	
REVISIONS	
DATE	CHANGE
12-01-04	PE Stamp added

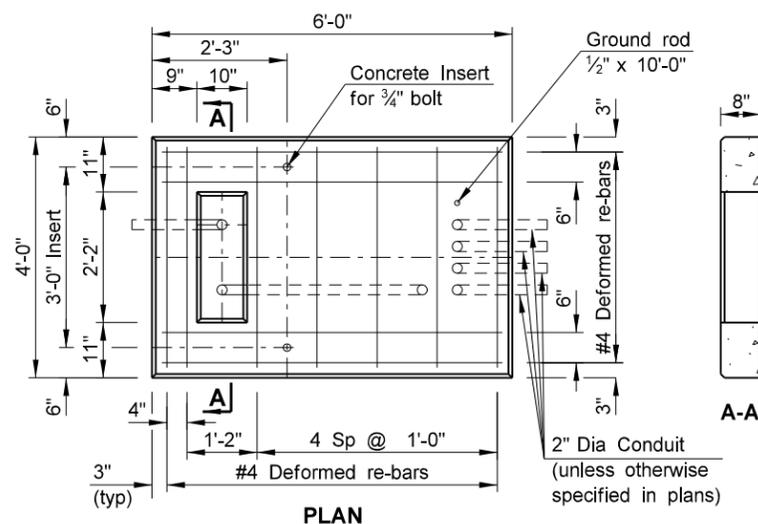
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**CONCRETE FOUNDATIONS
(TRAFFIC SIGNALS & HIGHWAY LIGHTING)**

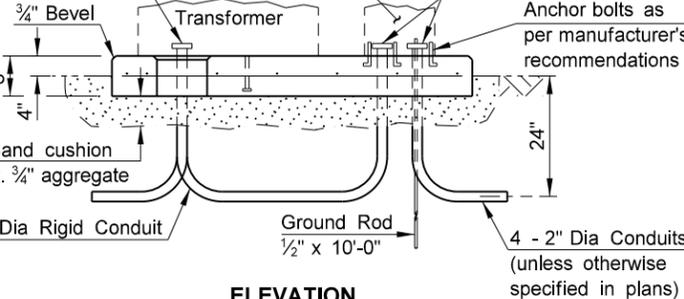


CONTROLLER CABINET FOUNDATION PAD MOUNT

The Controller Cabinet Foundation shall be bid as Concrete Foundation - Traffic Signals.

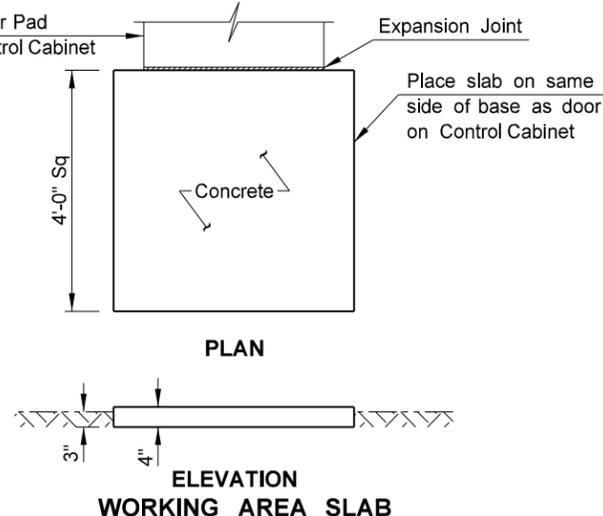


TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

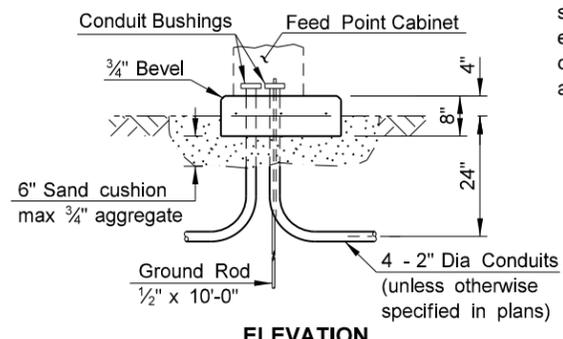
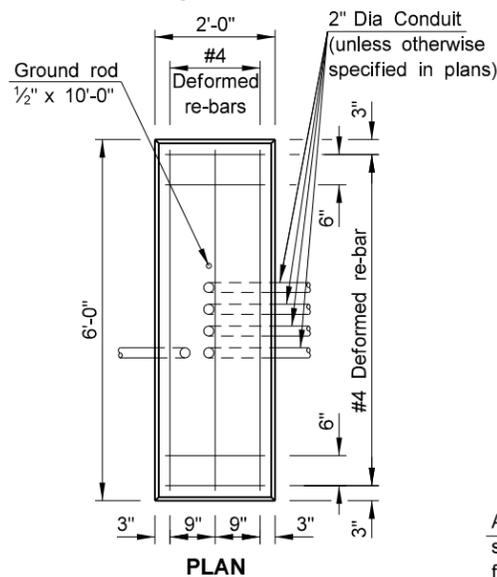


TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

The Transformer & Feed Point Cabinet Foundation Pad Mount shall be bid as Concrete Foundation ~ Feed Point ~ Type A.

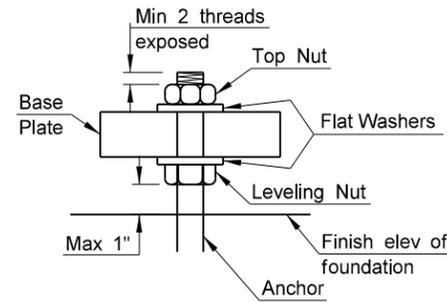


The Working Area Slab shall be installed where shown on the plans and shall not be bid separately but shall be included in the price bid for Concrete Foundation - Traffic Signals.

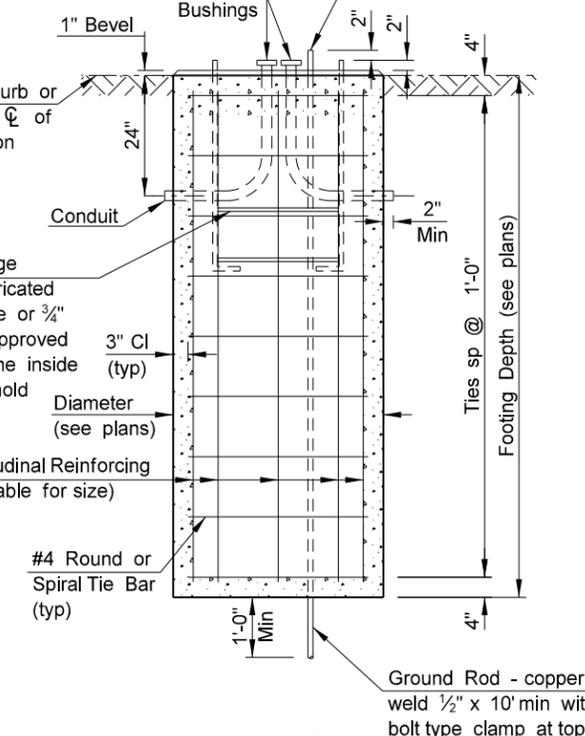
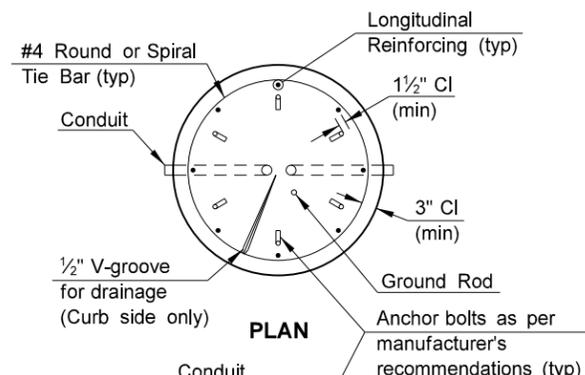


FEED POINT CABINET FOUNDATION PAD MOUNT

The Feed Point Cabinet Foundation Pad Mount shall be bid as Concrete Foundation ~ Feed Point ~ Type B.



ANCHOR BOLT DETAIL



LIGHT & SIGNAL STANDARD FOUNDATION

NOTES:

LIGHT & SIGNAL STANDARD FOUNDATIONS:
See plans for conduit size, number of bends and correct position for each foundation. When conduit does not continue beyond the foundation, conduit with a 105° bend and bushings on both ends may be substituted for the 90° bends shown. See plans for correct size & location of foundations. The grade and exact location shall be established by the Engineer in the field. All reinforcing shall be Grade 60. Tie bars shall have a minimum of a 12" lap. Reinforcing may be omitted for Type I, II, V, VI & VII signal standard foundations if the anchor bolts extend to within 3" to 6" above the bottom of the foundation. A minimum of 6 anchor bolts shall be used for cantilevered structures.

CONTROLLER CABINET FOUNDATION PAD MOUNT FOUNDATION: See plans for the number of 90° bends per foundation and correct positioning. The foundation for Pad Mounted Controller Cabinet shall be of sufficient size so that there is a minimum of 3" of clearance from the outside edge of cabinet to the outside edge of the foundation on any side. The contractor shall ensure a water-tight seal between the controller cabinet and the foundation by caulking, except for V-groove.

WORKING AREA SLAB: The materials and preparation of this slab shall be as approved by the Engineer in the field.

TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNTED: The foundation shall have a wood float finish. All conduits shown shall be installed. Conduit that is not used at this time shall be plugged with an expandable plug.

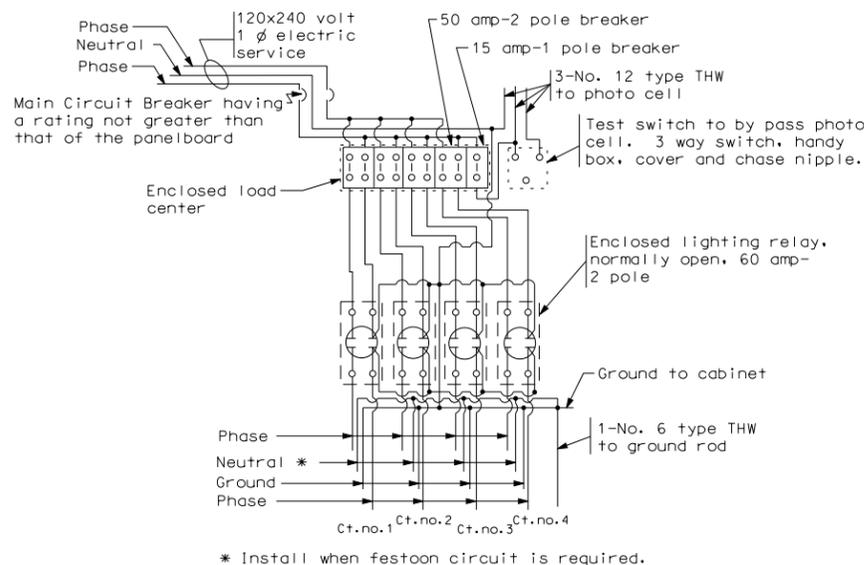
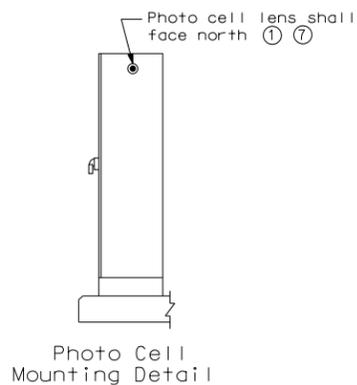
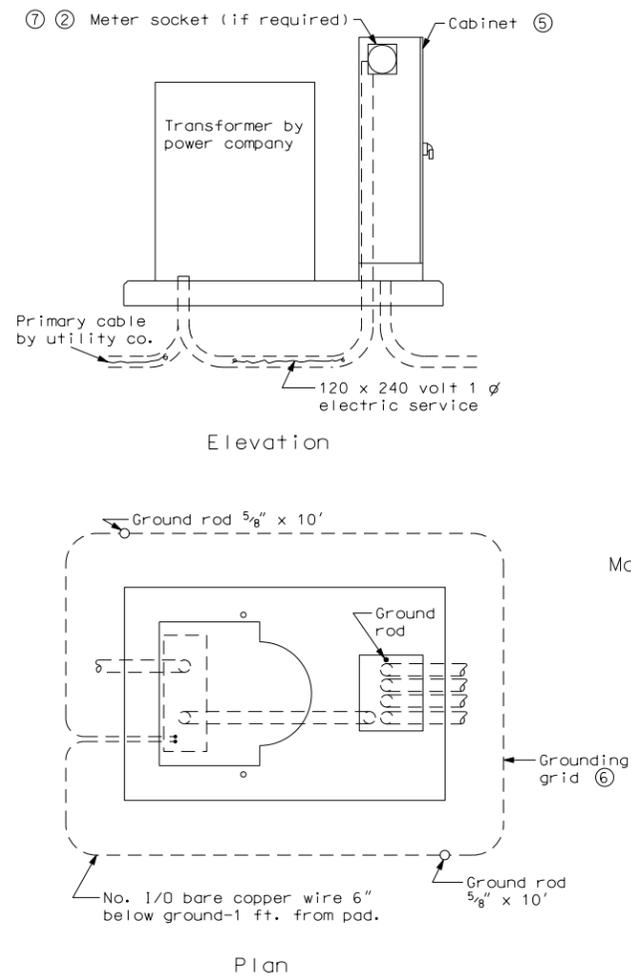
FEED POINT CABINET FOUNDATION PAD MOUNTED: The foundation shall have a wood float finish. All conduits shown shall be installed. Conduit that is not used at this time shall be plugged with an expandable plug.

LIGHT & SIGNAL FOUNDATION TABLE	
FOOTING DEPTH (ft)	LONGITUDINAL REINFORCING
≤ 12	8 - #5
13 - 14	8 - #6
15 - 16	8 - #7
17 - 19	8 - #8

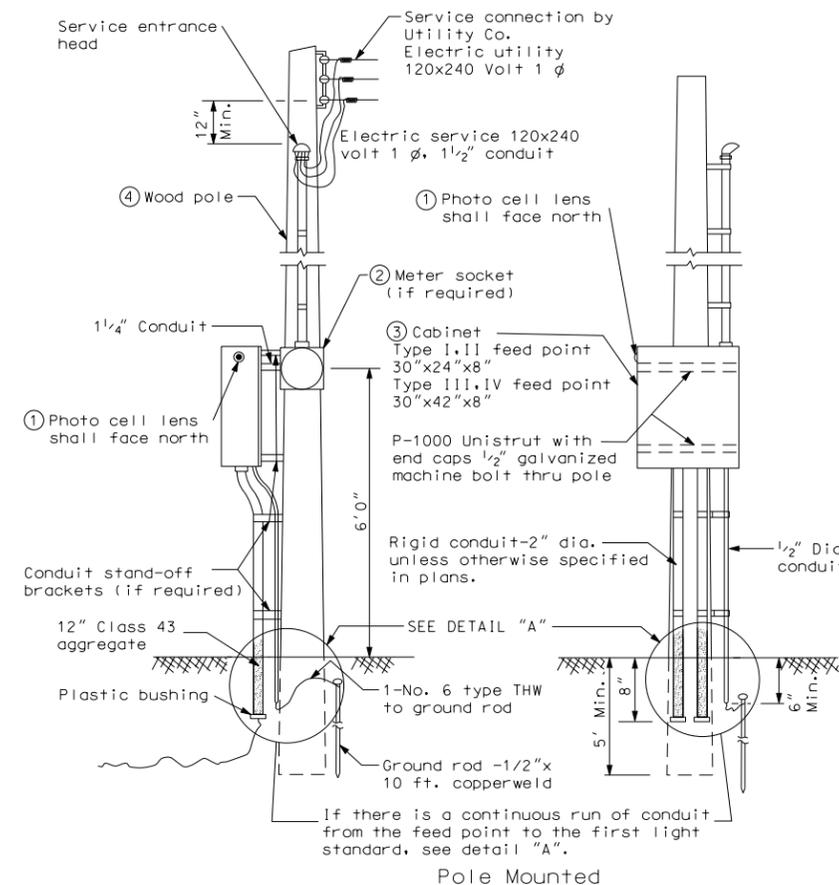
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6-15-10	
REVISIONS	
DATE	CHANGE

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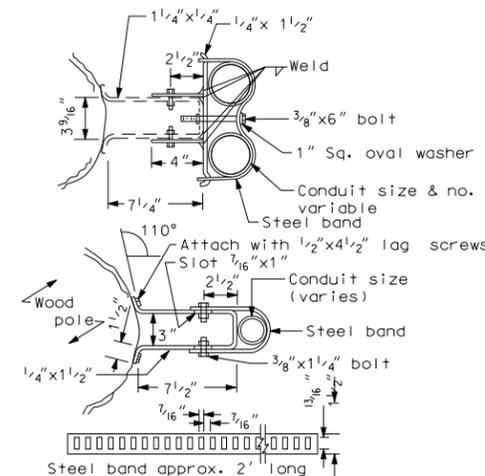
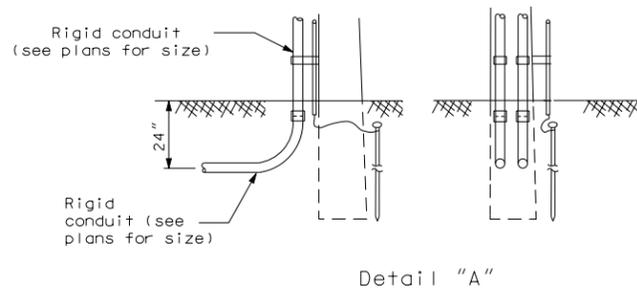
**FEED POINTS
(ROADWAY LIGHTING)**



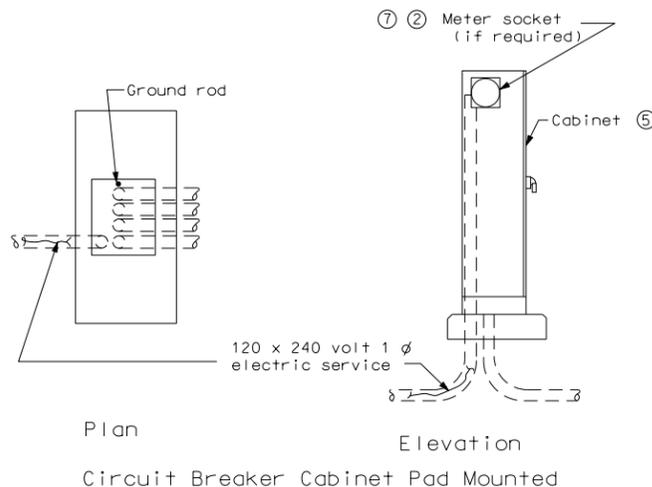
Type 1 feed point is similar to type IV except only one electrical circuit, one 50 amp-2 pole breaker and one lighting relay, normally open, shall be installed. Type II feed point is similar to type IV except only two electrical circuit, two 50 amp-2 pole breaker and two lighting relays, normally open, shall be installed. Type III feed point is similar to type IV except only three electrical circuits, three 50 amp-2 pole breakers and three lighting relays, normally open, shall be installed.



- NOTES:**
- PHOTO CELL: The electrical contractor shall furnish and install the photoelectric cell.
 - METER SOCKET: The contractor shall install the meter socket and trim if the meter is required by local utility company. Meter to be furnished and installed by utility company.
 - CABINET: Cabinet shall be N.E.M.A. 12 rating with lock drip shield and 1/2" plywood backing, stainless steel hardware. Paint plywood with 2 coats of oil base gray. Cabinet shall be shop coated with one coat of primer & have two coats of exterior gray enamel.
 - WOOD POLE: Minimum 20 ft. Class VII full length penta pressure treated wood pole. (if required, see layout sheets)
 - CABINET: Cabinet shall be 56" high x 26" wide x 14" deep. Minimum 12 ga. steel with provisions for padlock. Cabinet shall be weatherproof. Cabinet shall have one shop coat of primer and two field coats of exterior dark green enamel.
 - GROUNDING GRID: The grounding grid shall have a ground resistance not to exceed 25 ohms. This shall be obtained by one or more 5/8"x10' copperweld ground rods in parallel or series at two corners. Minimum distance between ground unit assemblies shall be 6'0".
 - METER LOCATION: The meter (if required) shall not be mounted on the same side of the cabinet as the photo-cell is mounted.



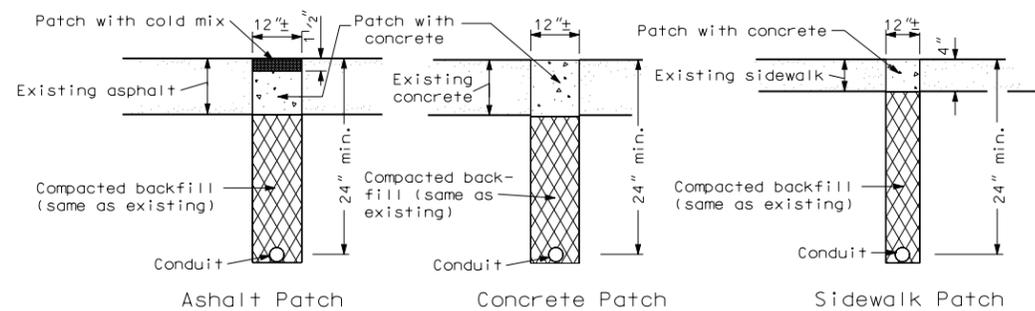
The conduit standoff brackets may be omitted if not required by the local utility company.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
01-28-91	Cabinet note
03-20-91	Conduit
09-01-92	Feed point
06-19-03	Minor revisions
12-01-04	PE Stamp added

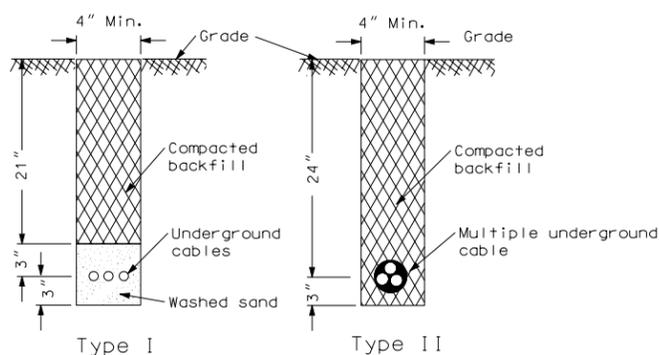
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LIGHTING AND SIGNAL DETAILS



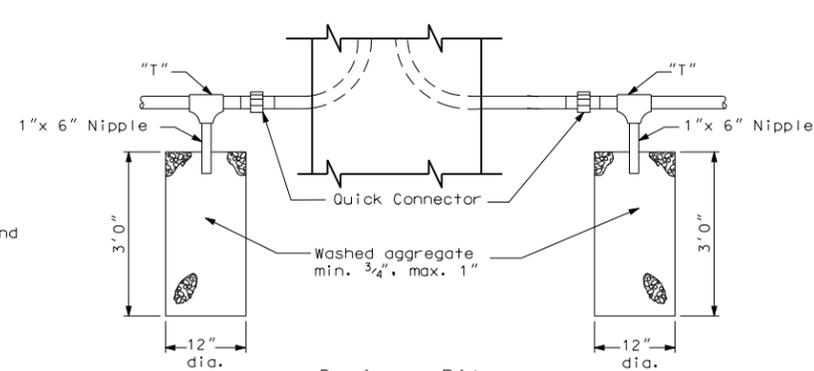
Surface Patch Details

Note:
Patches: All trenches shall be saw-cut. The replacement concrete shall be P.C.C. pavement and the coarse aggregate gradation, maximum size and method of curing shall be as approved by the Engineer. The cost shall be included in the price bid for Conduit.
Immediately prior to pouring replacement concrete, all surfaces shall be painted with an approved epoxy compound.



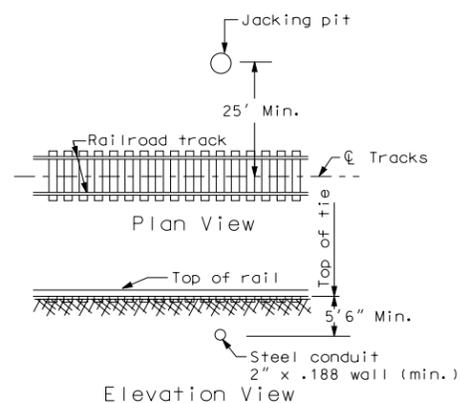
Cable Trench

The entire area which is disturbed by the trenching shall be sodded, or as directed by the Engineer. The cost shall be included in the price bid for "Cable Trench."

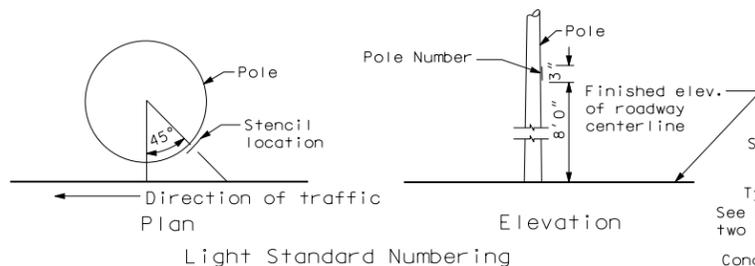


Drainage Pit

Drainage pits shall be installed in both ends of the conduit runs. Except where conduit slopes enough for drainage to one end. (To be used for Traffic Signal Conduit Runs Only)

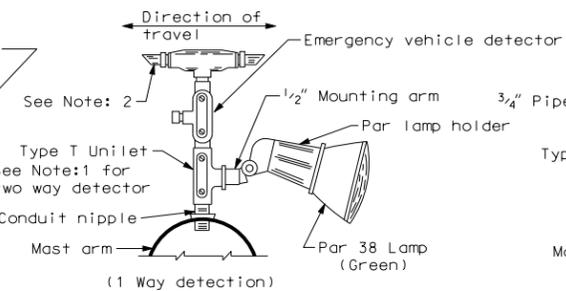


Railroad Track Conduit Placement



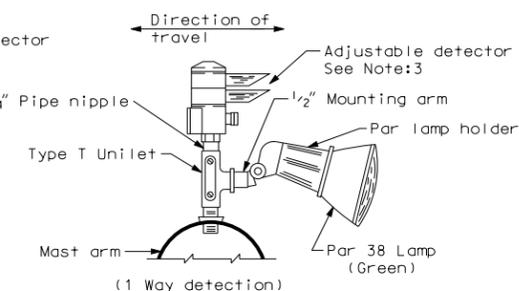
Light Standard Numbering

Note:
Pole Numbering: The contractor shall stencil on each light standard the pole number in black paint on the roadway side of the pole, or adhesive coated plastic such as Scotch cal. Manufactured by 3M as approved by the Engineer. See layout sheets for pole numbers.



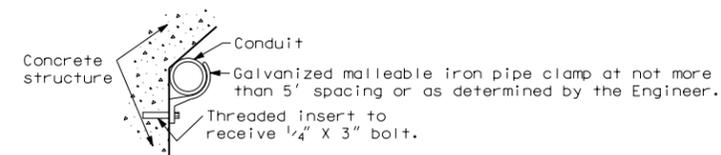
Emergency Vehicle Detector Detail (Location as shown in plans)

Notes:
1. Two-way Detector shall have Type X Unilet with two Par lamp holders and lamps (one in each direction).
2. One-way Detector shall have the unused end plugged with metal pipe plug.

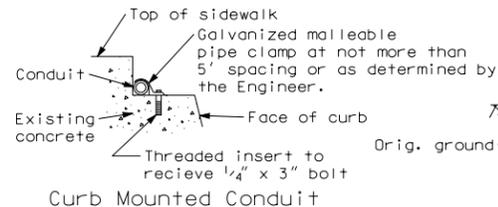


Alternate Emergency Vehicle Detector Detail (Adjustable) (Location as shown in plans)

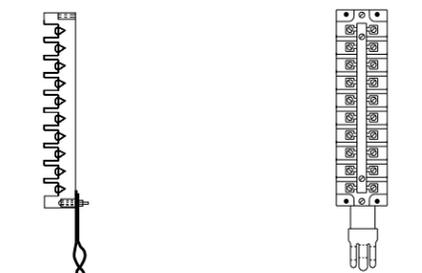
Notes:
3. Two-way Detector shall have the detector lens rotated to face the direction of travel, and shall have Type X Unilet with two Par lamp holders and lamps (one in each direction).



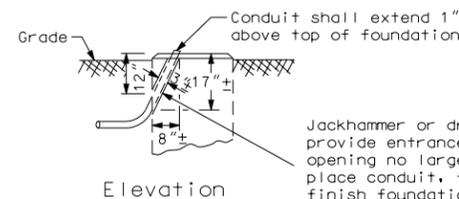
Bridge Mounted Conduit Hanger



Curb Mounted Conduit



Terminal Block (Rigid Mounted)



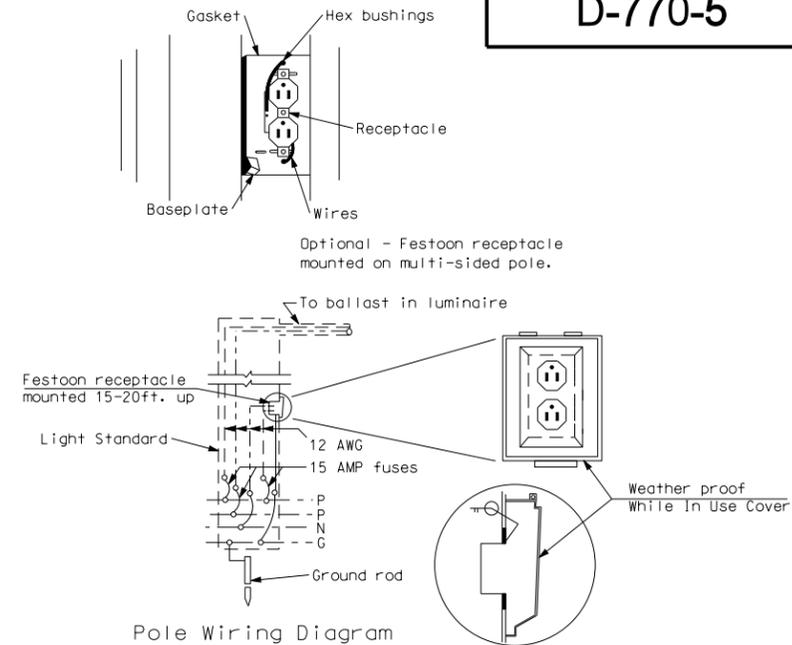
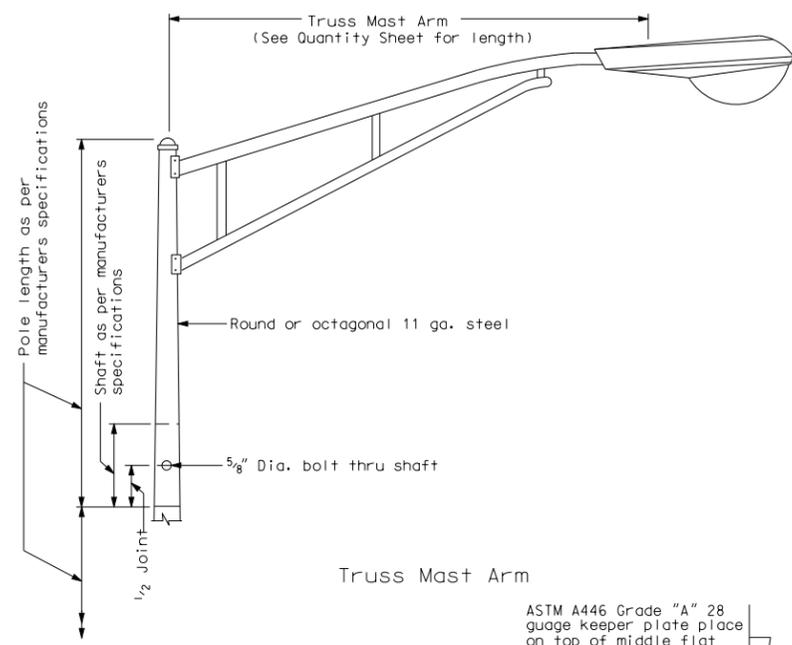
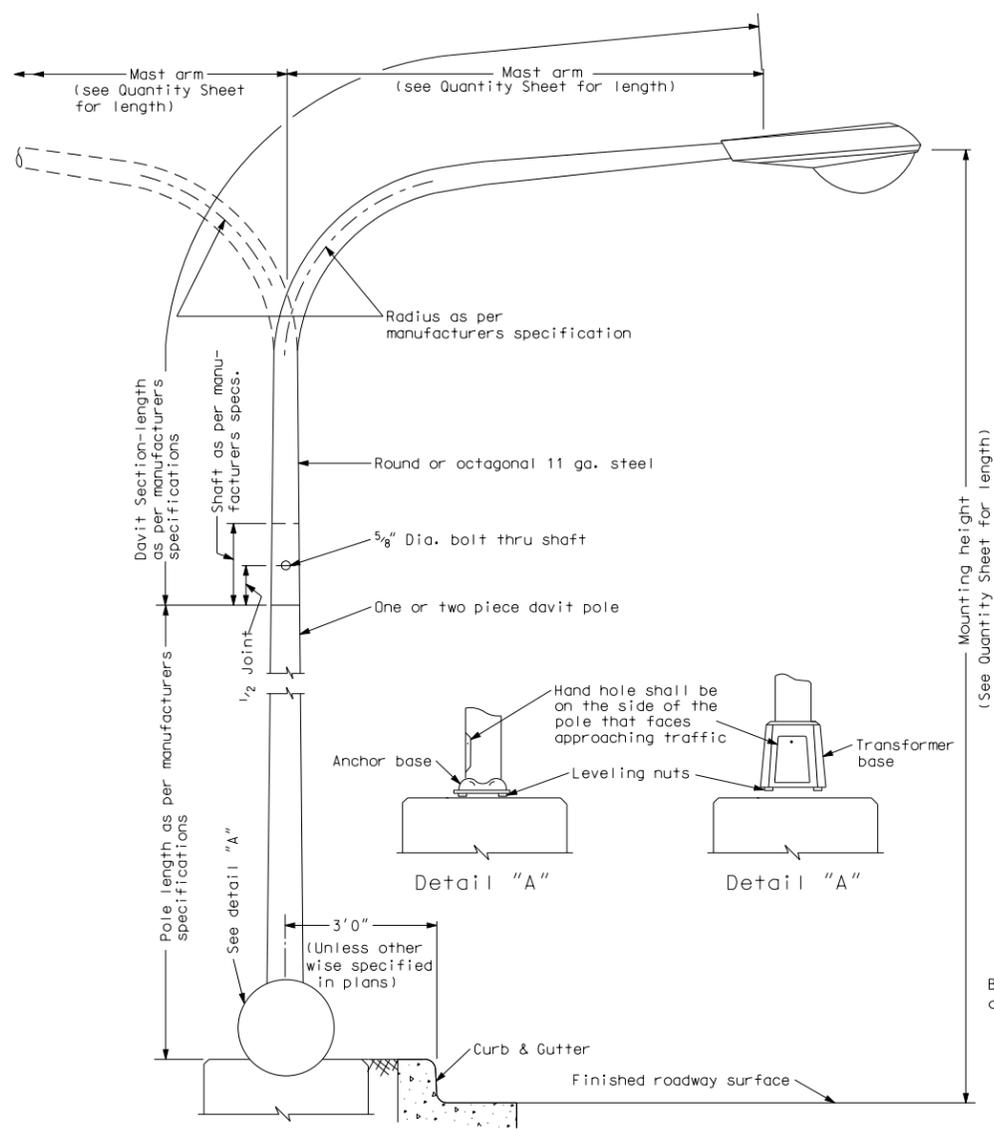
Revise Concrete Foundation

Jackhammer or drill material out to provide entrance for conduit. Make opening no larger than necessary, place conduit, fill with concrete and finish foundation to original appearance.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
11-07-90	Track clearance
06-19-03	Minor revisions
12-01-04	PE Stamp added

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LIGHT STANDARD DETAILS



Receptacle Mounting Detail
 Receptacle shall be mounted on the side of the pole that faces the street side.
 (Festoon Receptacle shall be installed only when specified in the plans.)

NOTES:
Light Standard Locations: The offset distance shall have a minimum offset from the curb face of 3 feet to a maximum offset outside the clear zone. Light standards that are placed in urban areas and the where speeds are less than 30 mph, may be placed at 3 feet. Where speeds are 30 mph or more, light standards shall be placed at least 16 feet from the driving lane. All light standards shall be breakaway if they are within the clear zone.

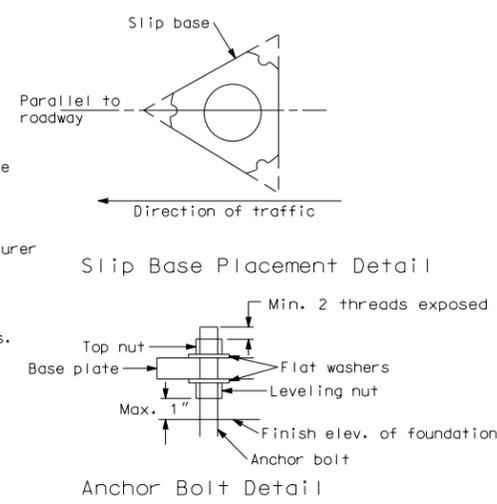
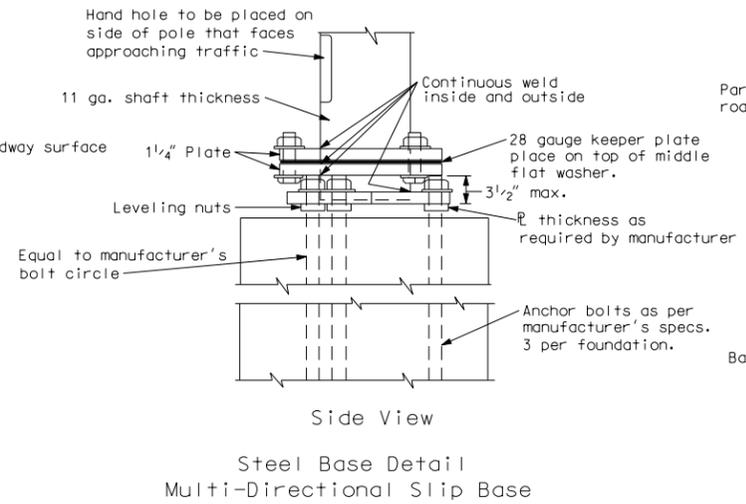
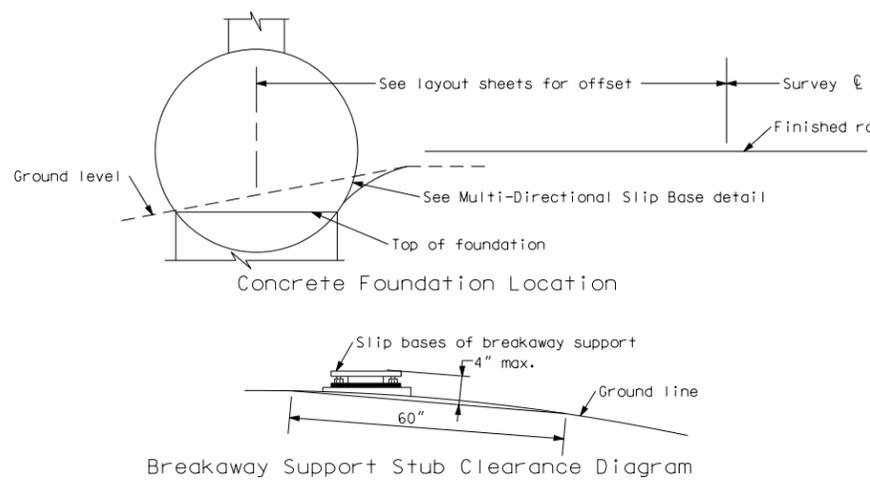
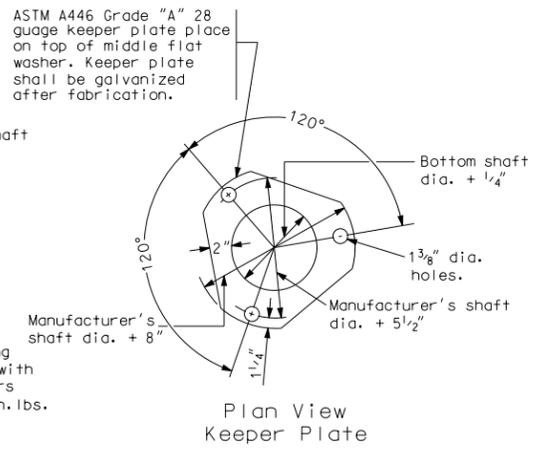
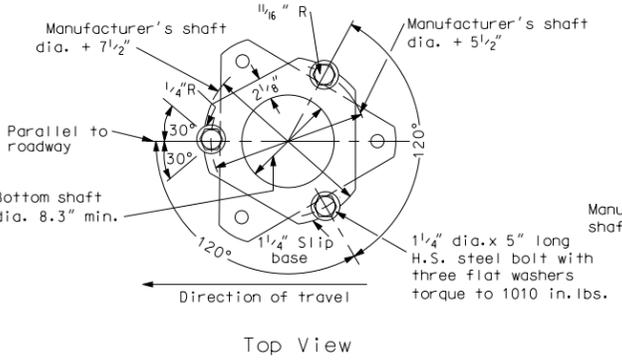
Steel Standards: Marred or scratched areas shall be touched up after erection.

Mast Arm: See quantity sheet for length.

Luminaire: Shall be internal ballast-constant wattage 120 x 240 voltage. See layout sheets for type of luminaire, wattage, I.E.S. distribution, and operating system.

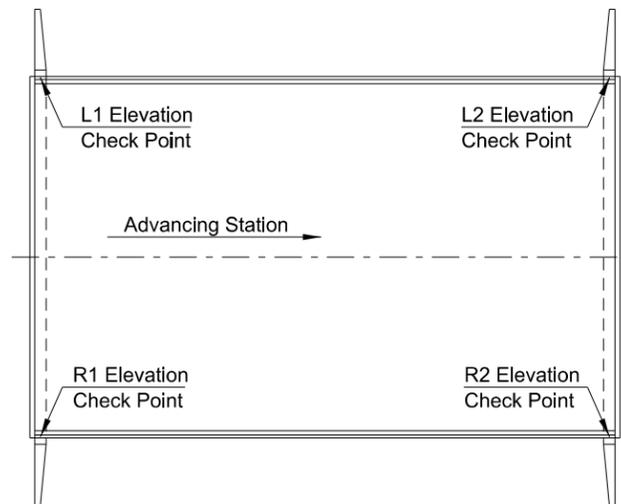
Fusing: Fusing in base, see specifications.

- Slip Base Bolt Torque Procedure:**
1. Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and to clean bolt threads, then loosen.
 2. Retighten bolts with a systematic order to prescribed torque.
 3. Loosen each bolt and retighten to prescribed torque in same order as initial retightening.
 4. Burr threads of junction with nut using center punch to prevent nut loosening.

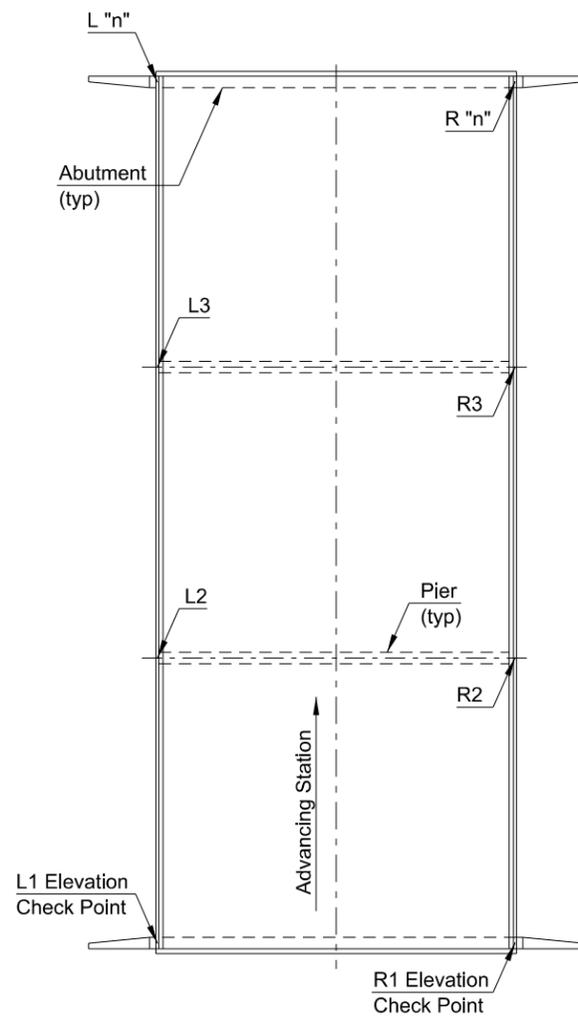


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
11-13-02	Location note added
08-21-03	Rev. festoon receptacle
12-01-04	PE Stamp added

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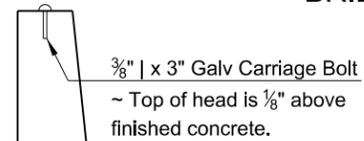


GENERAL LAYOUT FOR SINGLE SPAN

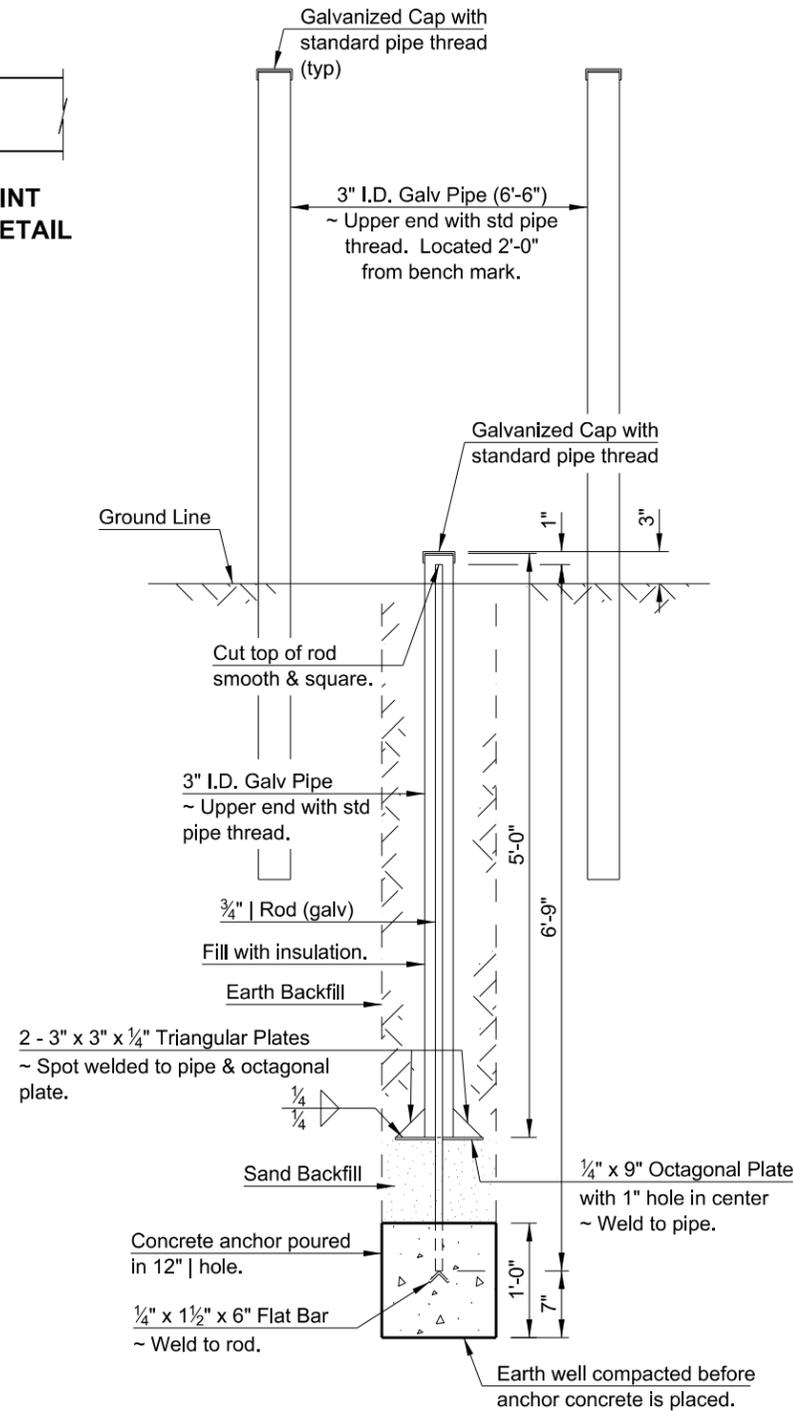


GENERAL LAYOUT FOR MULTIPLE SPAN

BRIDGE BENCH MARKS



CHECK POINT LOCATION DETAIL



BENCH MARK DETAIL

NOTES:

Elevation check points shall consist of 3/8" x 3" galvanized carriage bolts (or equal) set in the concrete barrier at the points indicated on the General Layout sketches. The top of the bolt shall project above the finished concrete 1/8". Elevation check points shall be placed on each barrier over each unit of the substructure for each bridge at a structural location.

Two bench marks as detailed hereon shall be set at diagonal opposite positions away from the structure location and at least 300 feet from the nearest point on the bridge or bridges (if more than one at a location). These bench marks shall be constructed as detailed on this sheet and located near the Highway Right of Way lines. The two pipes shall extend 4'-0" above ground and be painted with two coats of white paint suitable for galvanized steel surfaces.

The Project Engineer shall run a set of levels determining the elevation of each check point on the structure and the two bench marks immediately after the completion of the bridge. Bench Mark #1 can be listed as having elevation 1000 or the actual surveyed elevation. This information shall be recorded on SFN 13420 and submitted to the Bridge Engineer with adequate information locating each check point and bench mark.

All metal parts are to be hot dip galvanized after punching, shearing, welding and fabrication.

Threads of cap and pipe are not to be galvanized. At the time of installation these threads are to be coated with synthetic grease with teflon and cap screwed to a snug fit.

METHOD OF MEASUREMENT:

Each set of Bridge Bench Marks consisting of two bench marks and the required number of elevation check points shall be considered as one unit for bidding purposes and the quantity to be paid for shall be the number of sets of bridge bench marks which have been installed complete in place and accepted by the Engineer.

BASIS OF PAYMENT:

Bridge Bench Marks shall be paid for at the contract price bid for each set of Bridge Bench Marks, which price shall be full compensation for all excavation, backfill and clean-up, and for furnishing, hauling and placing all elevation check points, galvanized pipe, caps, rods, sand backfill, concrete, rock equipment, tools and incidentals, including galvanizing and greasing, necessary to complete this item.

GALVANIZING:

After fabrication the complete assembly shall be hot-dip galvanized.

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09/14/11	
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