

D-101-1

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

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 09/20/18 and the original document is stored at the North Dakota Department of Transportation

NDDOT ABBREVIATIONS

D-101-2

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
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08-03-15 04-23-18	General Revisions General Revisions

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NDDOT ABBREVIATIONS

D-101-3

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

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

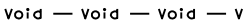


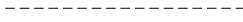
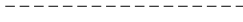

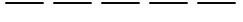
















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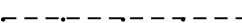
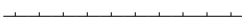


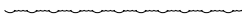
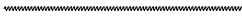
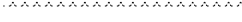

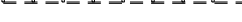



702COM	702 Communications	GT PLNS NAT GAS	Great Plains Natural Gas Company	RED RIV TEL	Red River Rural Telephone
ACCENT	Accent Communications	HALS TEL	Halstad Telephone Company	RESVTN TEL	Reservation Telephone
AGASSIZ WU	Agassiz Water Users Incorporated	IDEA1	Idea1	ROBRTS TEL	Roberts Company Telephone
AGC	Associated General Contractors of America	INT-COMM TEL	Inter-Community Telephone Company	R-RIDER ELEC	Roughrider Electric Cooperative
All PI	Alliance Pipeline	KANEB PL	Kaneb Pipeline Company	RRVW	Red River Valley & Western Railroad
ALL SEAS WU	All Seasons Water Users Association	KEM ELEC	Kem Electric Cooperative Incorporated	S CENT REG WD	South Central Regional Water District
AMOCO PI	Amoco Pipeline Company	KOCH GATH SYS	Koch Gathering Systems Incorporated	S E W U	South East Water Users Incorporated
AMRDA HESS	Amerada Hess Corporation	LKHD PL	Lakehead Pipeline Company	SCOTT CABLE	Scott Cable Television Dickinson
AT&T	AT&T Corporation	LNGDN RWU	Langdon Rural Water Users Incorporated	SHERDN ELEC	Sheridan Electric Cooperative
B PAW	Bear Paw Energy Incorporated	LWR YELL R ELEC	Lower Yellowstone Rural Electric	SHEYN VLY ELEC	Sheyenne Valley Electric Cooperative
BAKER ELEC	Baker Electric	MCKNZ CON	McKenzie Consolidated Telcom	SKYTECH	Skyland Technologies Incorporated
BASIN ELEC	Basin Electric Cooperative Incorporated	MCKNZ ELEC	McKenzie Electric Cooperative	SLOPE ELEC	Slope Electric Cooperative Incorporated
BEK TEL	Bek Communications Cooperative	MCKNZ WRD	McKenzie County Water Resource District	SOURIS RIV TELCOM	Souris River Telecommunications
BELLE PL	Belle Fourche Pipeline Company	MCLEOD	McLeod USA	ST WAT COMM	State Water Commission
BLM	Bureau of Land Management	MCLN ELEC	McLean Electric Cooperative	STATE LN WATER	State Line Water Cooperative
BNSF	Burlington Northern Santa Fe Railway	MCLN-SHRDN R WAT	McLean-Sheridan Rural Water	STER ENG	Sterling Energy
BOEING	Boeing	MDU	Montana-dakota Utilities	STUT RWU	Stutsman Rural Water Users
BRNS RWD	Barnes Rural Water District	MID-CONT CABLE	Mid-Continent Cable	SW PL PRJ	Southwest Pipeline Project
BURK-DIV ELEC	Burke-Divide Electric Cooperative	MIDSTATE TEL	Midstate Telephone Company	T M C	Turtle Mountain Communications
BURL WU	Burleigh Water Users	MINOT CABLE	Minot Cable Television	TCI	TCI of North Dakota
Cable One	Cable One	MINOT TEL	Minot Telephone Company	TESORO HGH PLNS PL	Tesoro High Plains Pipeline
CABLE SERV	Cable Services	MISS VALL COMM	Missouri Valley Communications	TRI-CNTY WU	Tri-County Water Users Incorporated
CAP ELEC	Capital Electric Cooperative Incorporat	MISS W W S	Missouri West Water System	TRL CO RWU	Traill County Rural Water Users
CASS CO ELEC	Cass County Electric Cooperative	MNKOTA PWR	Minnkota Power	UNTD TEL	United Telephone
CASS RWU	Cass Rural Water Users Incorporated	MOR-GRAN-SOU ELEC	Mor-gran-sou Electric Cooperative	UPPR SOUR WUA	Upper Souris Water Users Association
CAV ELEC	Cavalier Rural Electric Cooperative	MOUNT-WILLI ELEC	Mountrail-williams Electric Cooperative	US SPRINT	U.S. Sprint
CBLCOM	Cablecom Of Fargo	MRE LBTY TEL	Moore & Liberty Telephone	USAF MSL CABLE	U.S.A.F. Missile Cable
CENEX PL	Cenex Pipeline	MUNICIPAL	City Water And Sewer	USFWS	US Fish and Wildlife Service
CENT PL WATER DIST	Central Pipe Line Water District	MUNICIPAL	City Of '.....'	USW COMM	U.S. West Communications
CENT PWR ELEC	Central Power Electric Cooperative	N CENT ELEC	North Central Electric Cooperative	VRNDRY ELEC	Verendrye Electric Cooperative
COE	Corps of Engineers	N VALL W DIST	North Valley Water District	W RIV TEL	West River Telephone Incorporated
CONS TEL	Consolidated Telephone	ND PKS & REC	North Dakota Parks And Recreation	WEB	W. E. B. Water Development Association
CONT RES	Continental Resource Inc	ND TEL	North Dakota Telephone Company	WILLI RWA	Williams Rural Water Association
CPR	Canadian Pacific Railway	NDDOT	North Dakota Department of Transportation	WILSTN BAS PL	Williston Basin Interstate Pipeline Company
D O E	Department Of Energy	NDSU SOIL SCI DEPT	NDSU Soil Science Department	WLSH RWD	Walsh Water Rural Water District
DAK CARR	Dakota Carrier Network	NEMONT TEL	Nemont Telephone	WOLVRTN TEL	Wolverton Telephone
DAK CENT TEL	Dakota Central Telephone	NODAK R ELEC	Nodak Rural Electric Cooperative	XLENER	Xcel Energy
DAK RWD	Dakota Rural Water District	NOON FRMS TEL	Noonan Farmers Telephone Company	YSVR	Yellowstone Valley Railroad
DGC	Dakota Gasification Company	NPR	Northern Plains Railroad		
DICKEY R NET	Dickey Rural Networks	NSP	Northern States Power		
DICKEY RWU	Dickey Rural Water Users Association	NTH PRAIR RW	Northern Prairie Rural Water Association		
DICKEY TEL	Dickey Telephone	NTHN BRDR PL	Northern Border Pipeline		
DNRR	Dakota Northern Railroad	NTHN PLNS ELEC	Northern Plains Electric Cooperative Incorporated		
DOME PL	Dome Pipeline Company	NTHWSTRN REF	Northwestern Refinery Company		
DVELEC	Dakota Valley Electric Cooperative	NW COMM	Northwest Communication Cooperation		
DVMW	Dakota, Missouri Valley & Western	NWRWD	Northwest Rural Water District		
ENBRDG	Enbridge Pipelines Incorporated	ONEOK	Oneok gas		
ENVENTIS	Enventis Telephone	OSHA	Occupational Safety and Health Administration		
FALK MNG	Falkirk Mining Company	OTTR TL PWR	Otter Tail Power Company		
FHWA	Federal Highway Administration	P L E M	Prairielands Energy Marketing		
G FKS-TRL WD	Grand Forks-trail Water District	POLAR COM	Polar Communications		
GETTY TRD & TRAN	Getty Trading & Transportation	PVT ELEC	Private Electric		
GLDN W ELEC	Golden West Electric Cooperative	QWEST	Qwest Communications		
GRGS CO TEL	Griggs County Telephone	R&T W SUPPLY	R & T Water Supply Association		
GTR RAMSEY WD	Greater Ramsey Water District				

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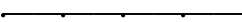

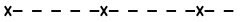

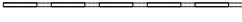


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Existing Topography









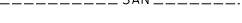
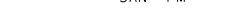












	Existing Ground Void
	Existing Cemetary Boundary
	Existing Box Culvert Bridge
	Existing Concrete Surface
	Existing Drainage Structure
	Existing Gravel Surface
	Existing Riprap
	Existing Dirt Surface
	Existing Asphalt Surface
	Existing Tie Point Line
	Existing Railroad Centerline
	Existing Guardrail Cable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

	Existing 3-Cable w Posts
	Site Boundary
	Existing Berm, Dike, Pit, or Earth Dam
	Existing Ditch Block
	Existing Tree Boundary
	Existing Brush or Shrub Boundary
	Existing Retaining Wall
	Existing Planter or Wall
	Existing W-Beam Guardrail with Posts
	Existing Railroad Switch
	Gravel Pit - Borrow Area
	Existing Wet Area-Vegetation Break

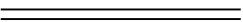


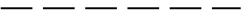
Proposed Topography

	3-Cable w Posts
	Flow
	Fence
	Remove Line
	Wall
	Retaining Wall (Plan View)
	W-Beam w Posts

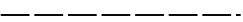
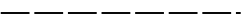







Existing Utilities

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




Proposed Utilities

	24 Inch Pipe
	Reinforced Concrete Pipe
	Under Drain
	Edge Drain

Traffic Utilities

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

Sign Structures

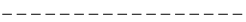
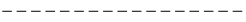




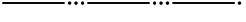






	Existing Overhead Sign Structure
	Existing Overhead Sign Structure Cantilever
	Overhead Sign Structure Cantilever

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09-23-16	Added and Revised Items, Organized by Functional Groups

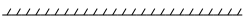





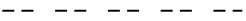


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Line Styles

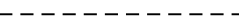
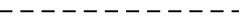
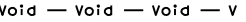
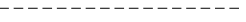




Right Of Way

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







Boundary Control

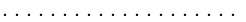

	Existing City Corporate Limits or Reservation Boundary
	Existing State or International Line
	Existing Township
	Existing County
	Existing Section Line
	Existing Quarter Section Line
	Existing Sixteenth Section Line
	Existing Centerline
	Tangent Line

Cross Sections and Typicals



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

Geotechnical

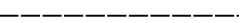
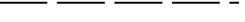
	D	Geotextile Fabric Type D
	Geo	Geogrid
	R	Geotextile Fabric Type R
	R	Geotextile Fabric Type R1
	RR	Geotextile Fabric Type RR
	S	Geotextile Fabric Type S

	Subgrade Reinforcement
	Failure Line


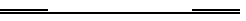

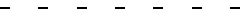


Countours

	Depression Contours
	Supplemental Contour


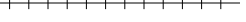


Profile

	Subgrade, Subcut or Ditch Grade
	Topsoil Profile










Striping

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

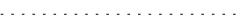



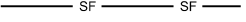

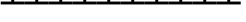
Pavement Joints

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





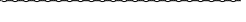
Bridge Details

	Hidden Object
	Small Hidden Object
	Large Hidden Object
	Phantom Object
	Centerline Main
	Centerline
	Existing Ground (Details)
	Existing Conditions
	Sheet Piling

Erosion Control

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

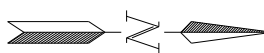






























































































Environmental

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
09-23-16	Added and Revised Items, Organized by Functional Groups





















































































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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	<table><tr><th colspan="2">NORTH DAKOTA DEPARTMENT OF TRANSPORTATION</th></tr><tr><th colspan="2">07-01-14</th></tr><tr><th colspan="2">REVISIONS</th></tr><tr><th>DATE</th><th>CHANGE</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> <div>This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930 , on 07/01/14 and the original document is stored at the North Dakota Department of Transportation</div>		NORTH DAKOTA DEPARTMENT OF TRANSPORTATION		07-01-14		REVISIONS		DATE	CHANGE						
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION																					
07-01-14																					
REVISIONS																					
DATE	CHANGE																				
	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																

Symbols

D-101-31

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

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Symbols



Pad Mounted Feed Point



Pipe Mounted Feed Point with Pad



Pole Mounted Feed Point



Headwall



Double Headwall with Vegetation Barrier



Single Headwall with Vegetation Barrier



Pole Mounted Head



Sprinkler Head



Fire Hydrant



Inlet Type 1



Inlet Type 2



Double Inlet Type 2



Inlet Grate Type 2



Junction Box



High Mast Light Standard 10 Luminaire



High Mast Light Standard 3 Luminaire



High Mast Light Standard 4 Luminaire



High Mast Light Standard 5 Luminaire



High Mast Light Standard 6 Luminaire



High Mast Light Standard 7 Luminaire



High Mast Light Standard 8 Luminaire



High Mast Light Standard 9 Luminaire



Relocate Light Standard



Overhead Sign Structure Load Center



Light Standard 100 Watt High Pressure Sodium Vapor Luminaire



Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire



Light Standard 150 Watt High Pressure Sodium Vapor Luminaire



Light Standard 175 Watt High Pressure Sodium Vapor Luminaire



Light Standard 200 Watt High Pressure Sodium Vapor Luminaire



Light Standard 250 Watt High Pressure Sodium Vapor Luminaire



Light Standard 310 Watt High Pressure Sodium Vapor Luminaire



Light Standard 35 Watt High Pressure Sodium Vapor Luminaire



Light Standard 400 Watt High Pressure Sodium Vapor Luminaire



Light Standard 50 Watt High Pressure Sodium Vapor Luminaire



Light Standard 70 Watt High Pressure Sodium Vapor Luminaire



Light Standard 700 Watt High Pressure Sodium Vapor Luminaire



Manhole



Manhole 48 Inch



Sanitary Force Main Manhole



Sanitary Sewer Manhole



Storm Drain Manhole



Storm Drain Manhole with Inlet



Reset Mile Post



Mile Post Type A



Mile Post Type B



Mile Post Type C



Right of Way Marker



Tubular Marker



Alignment Monument



Iron Pin Reference Monument



Object Marker Type I



Object Marker Type II



Object Marker Type III



Caution Mode Arrow Panel



Back to Back Vertical Panel Sign



Double Direction Arrow Panel



Left Directional Arrow Panel



Right Directional Arrow Panel



Sequencing Arrow Panel



Truck Mounted Arrow Panel



Power Pole



Wood Pole



Pedestrian Push Button Post



Property Corner



Pull Box



Intelligent Transportation Pull Box



Sanitary Pump



Storm Drain Pump



Reinforced Pavement



Reinforced Concrete End Section 15 Inch



Reinforced Concrete End Section 18 Inch



Reinforced Concrete End Section 24 Inch



Reinforced Concrete End Section 30 Inch



Reinforced Concrete End Section 36 Inch



Reinforced Concrete End Section 42 Inch



Reinforced Concrete End Section 48 Inch



Reinforced Concrete End Section 54 Inch



Reset Right of Way Marker



Reset USGS Marker



Right of Way Markers



Riser 30 Inch



Continuous Split Barrel Sample



Flight Auger Sample



Split Barrel Sample



Thinwall Tube Sample



Highway Sign



SNOW GATE 18 FT



SNOW GATE 28 FT



SNOW GATE 40 FT



Standard Penetration Test



Transformer



Inclinometer Tube



Underdrain Cleanout



Excavation Unit



Water Valve

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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Cross Section Legend

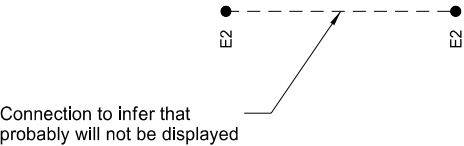
Description	Longitudinal Parallel to Roadway	Transverse Perpendicular to Roadway*
Cable Line	● CBL1	● CBL2
Conduit Line	● CDU1	● CDU2
Electric Line	● E1	● E2
Fiber Optic Line	● F1	● F2
Gas Main Line	● GM1	● GM2
Gas Service Line	● GS1	● GS2
Gas Transmission Line	● GT1	● GT2
Fuel Pipeline	● PL1	● PL2
Sanitary Sewer Force Main	● SSF1	● SSF2
Sanitary Sewer	● SS1	● SS2
Steam Line	● STE1	● STE2
Storm Drain (Assumed Depth)	● SD1	● SD2
Telephone Line	● T1	● T2
TV Line	● TV1	● TV2
Water Main Line	● WM1	● WM2
Water Service Line	● WS1	● WS2

Description	Longitudinal Parallel to Roadway	Transverse Perpendicular to Roadway*
Overhead Power Transmission Line	OHT1 ↑	OHT2 ↑
Overhead Line	OH1 ↑	OH2 ↑



When storm drain invert elevations are NOT used to draw pipe, they will appear as shown to the left. When invert elevations are used to draw pipe, they will be a cross section similar to the graphics shown below.

* Usually the transverse utilities are shown on a cross section with 2 or more symbols. The utility runs from one symbol to the other, but the connection may not be shown.



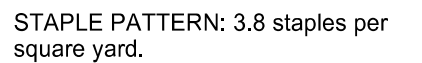
On the right side of most cross sections there is a earthwork table. The following example (values not related to project) details the earthwork table layout.

Cut Area	CA: 34.34 SF
Fill Area	FA: 0.017 SF
Cut Volume	CV: 64.44 CY
Fill Volume	FV: 0.031 CY
Mass Ordinate	MO: 65.13 CY

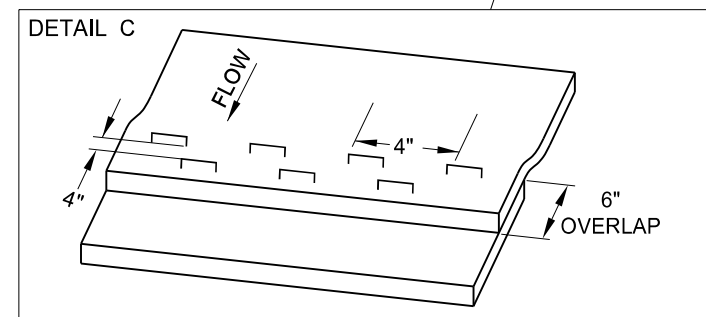
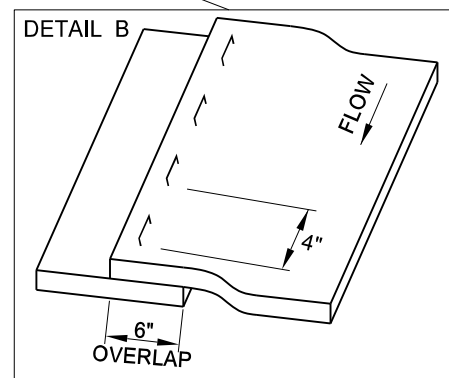
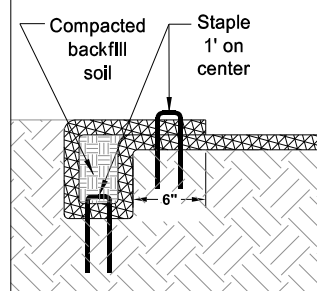
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-20-18	
REVISIONS	
DATE	CHANGE

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D-255-1



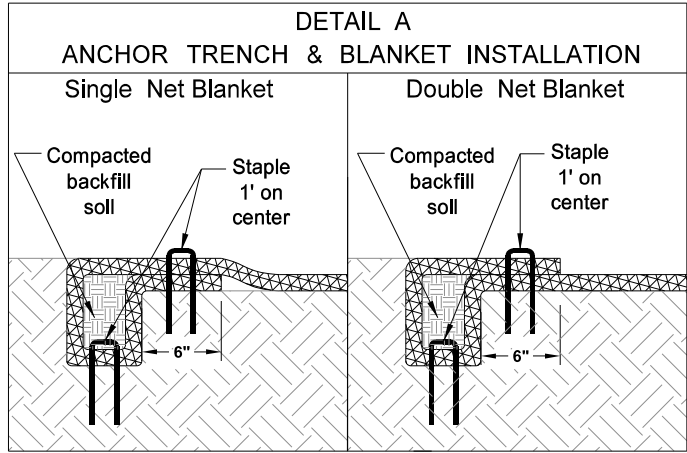
DETAIL A
ANCHOR TRENCH
&
TRM INSTALLATION



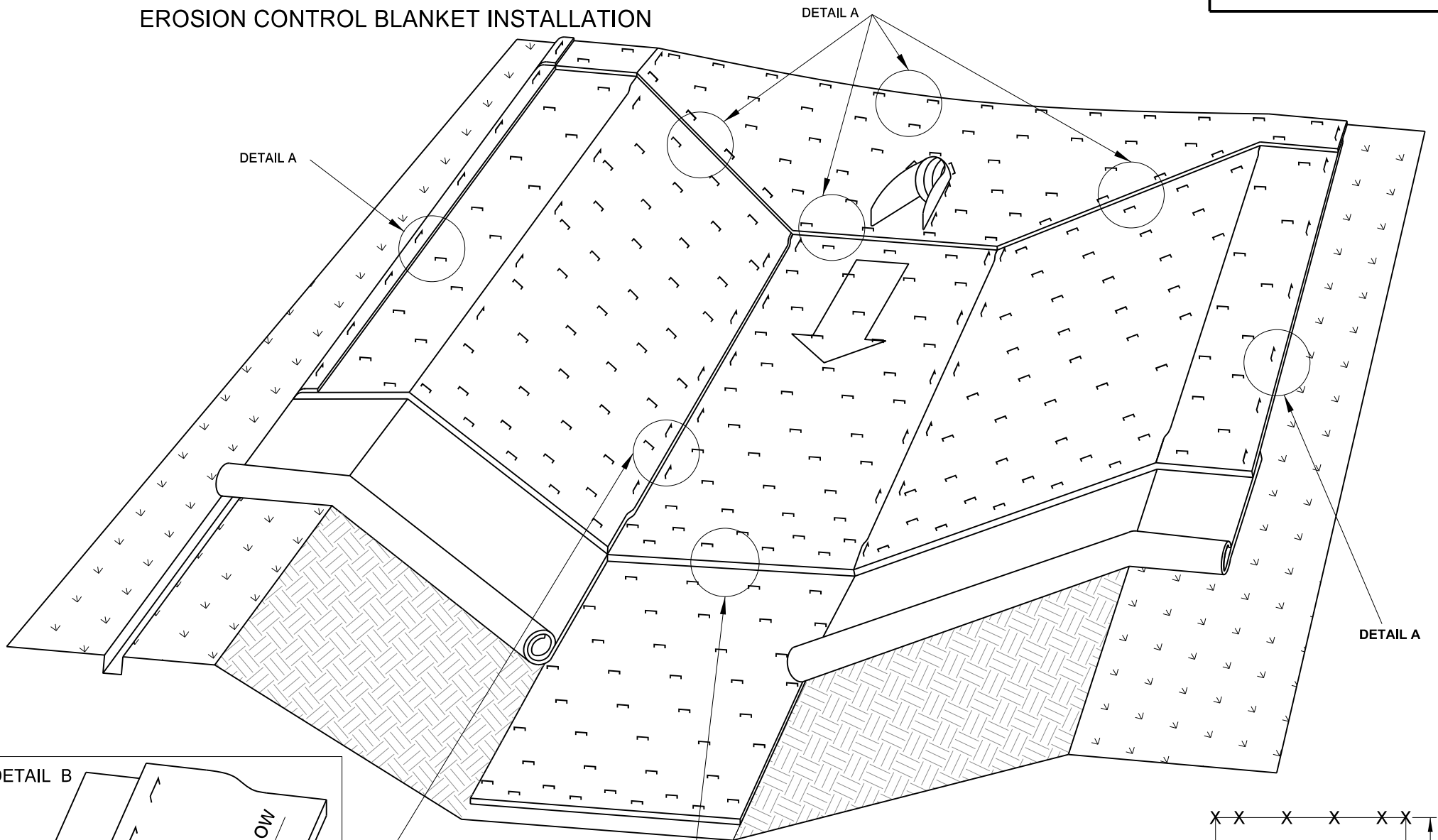
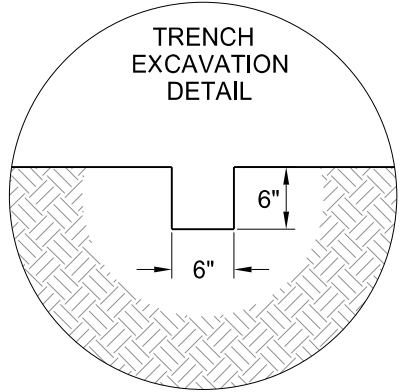
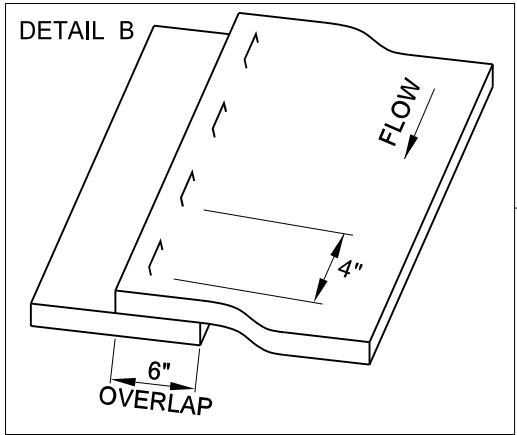
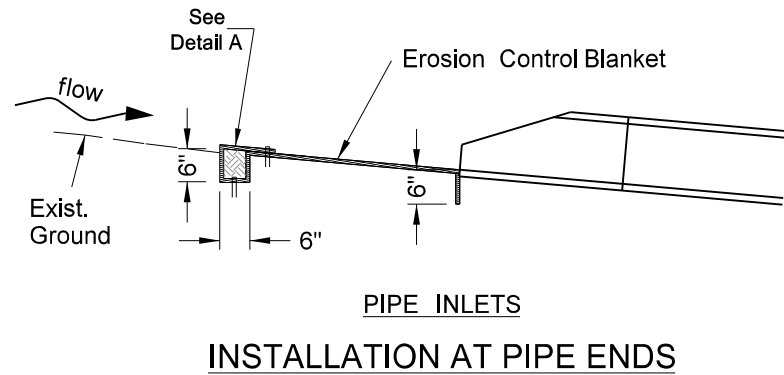
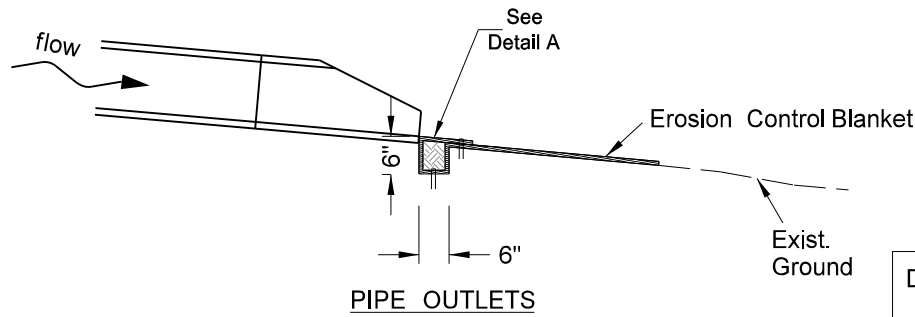
NORTH DAKOTA	
DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-4 to D-255-1.
07-27-15	Changed installation details.
08-27-19	New Design Engineer PE Stamp.

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EROSION AND SILTATION CONTROL
EROSION CONTROL BLANKET INSTALLATION

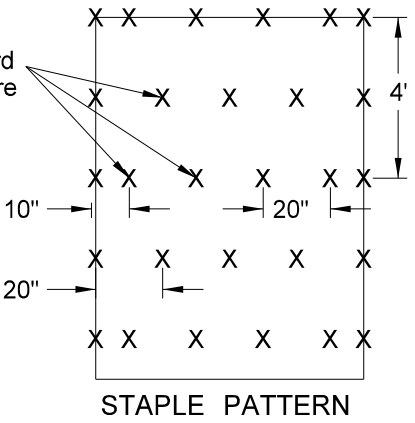


NOTE:
If a Single Net Blanket is used the side with the netting should be on the top once the blanket is installed.



BLANKET LAYOUT
CHANNEL OR SLOPE INSTALLATION

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



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-S to D-255-2.
07-27-15	Changed installation details such as trench depth and overlap dimensions.
08-27-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
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STANDARD SLOPE PROTECTION UNDER BRIDGES

D-258-1

NOTES:

The toe wall shall be placed before concrete is placed on the slope.

All inside panels shall be 5'-6" square. All outside panels shall be adjustable from 5'-0" minimum to 8'-0" maximum.

All transverse joints shall be 1/2" deep grooved joints sealed with concrete joint sealer. All longitudinal joints shall be construction joints with 1/2" deep grooves sealed with concrete joint sealer. All cracks that may have developed before the project has been accepted shall also be sealed with concrete joint sealer. An elastomeric joint sealant which meets ASTM C-920, CI 25, can be used in lieu of the sealants allowed in 826.02 of the ND Standard Specifications.

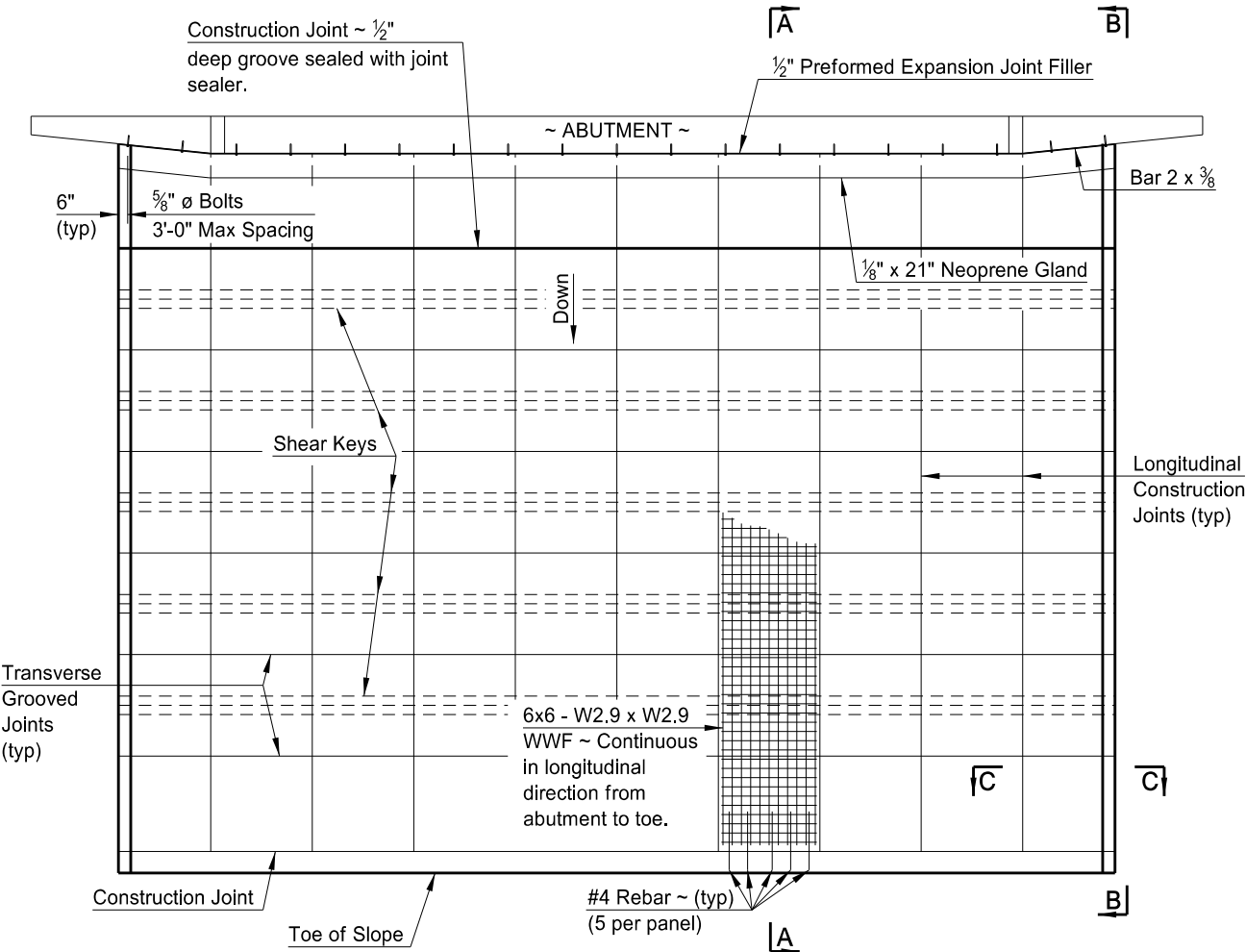
Wherever parts of a structure, such as piers, etc. are contacted by the slope protection, preformed expansion joint filler shall be installed between the contact areas as shown.

Shear keys shall be placed in every panel on the slope, as shown.

The welded wire fabric (WWF) shall be supplied in sheets. When it is necessary to make the WWF continuous, a lap splice at least 8" long shall be used.

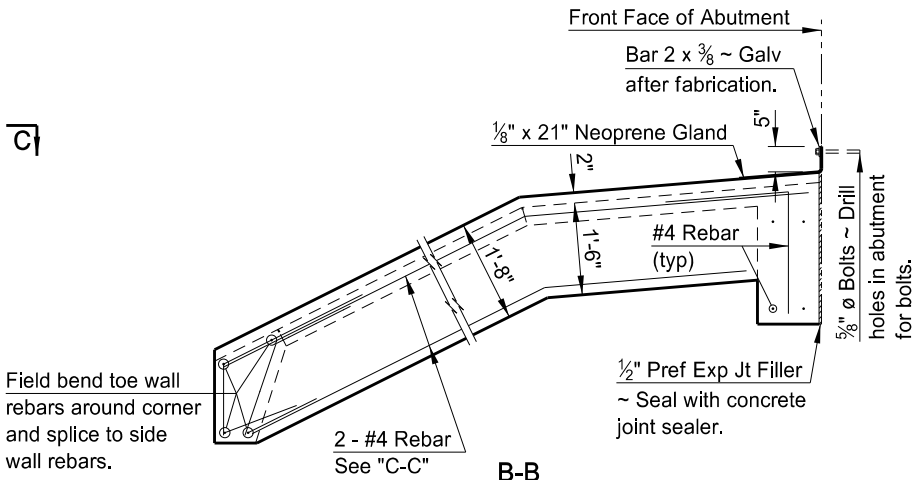
Several shorter bars may be substituted for the continuous Bar 2 x 3/8. If the substitution is made, the space from the end of the bar to the first hole shall not be more than 6 inches.

The bolts to hold the neoprene gland in place shall be installed into the abutment by a mechanical or chemically bonded method.



SLOPE PROTECTION LAYOUT

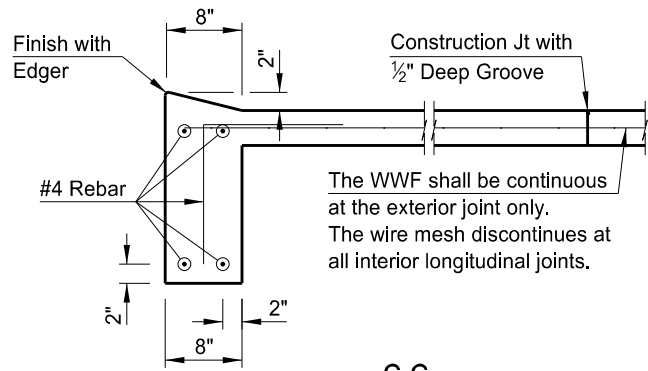
SKewed SLOPE PROTECTION LAYOUT



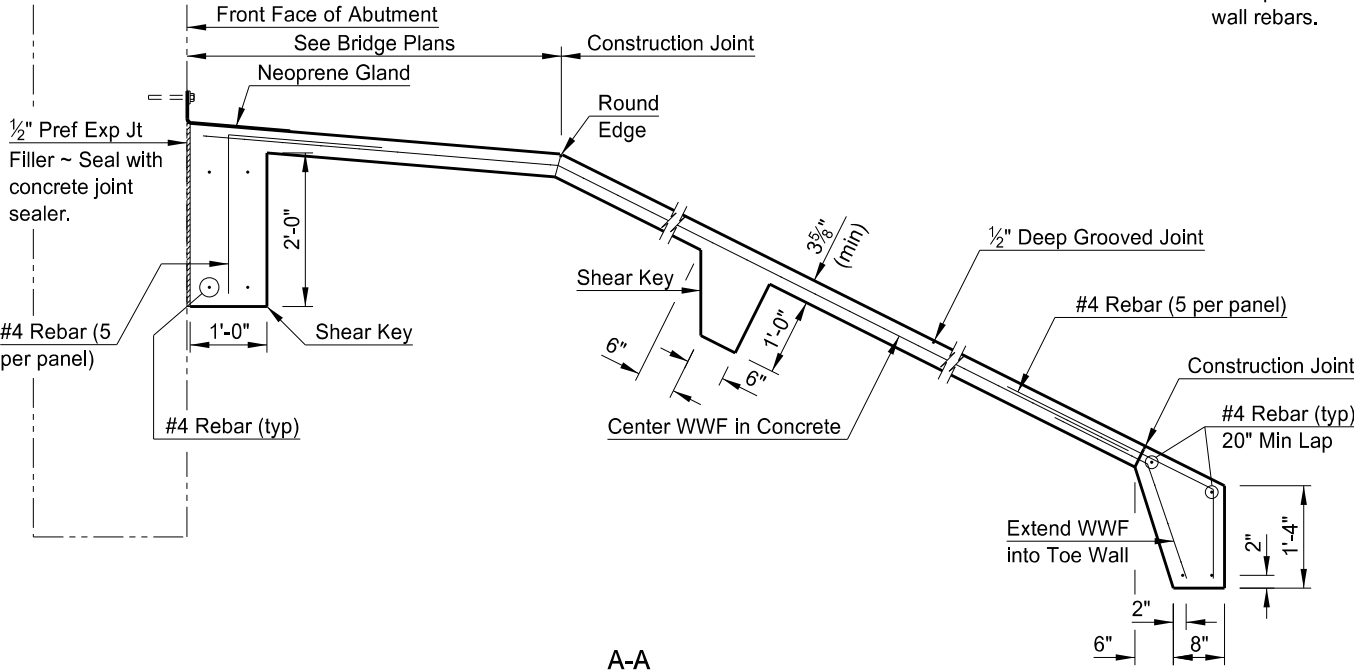
B-B

#4 SHEAR KEY BENT BAR DETAIL

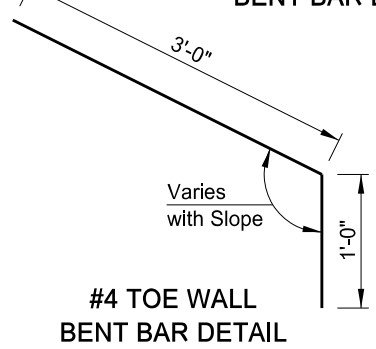
#4 SIDE WALL BENT BAR DETAIL



C-C



A-A

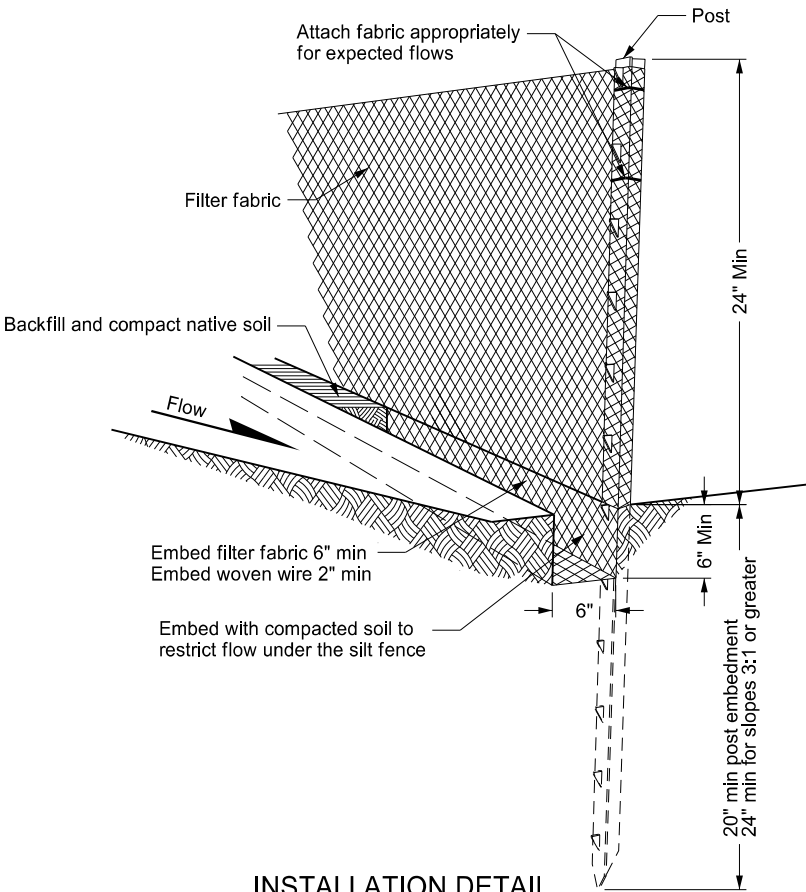


#4 TOE WALL BENT BAR DETAIL

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07/10/14	
REVISIONS	
DATE	CHANGE
07/10/14	CHANGED FROM D-708-1
09/03/19	UPDATED SIGNATURES

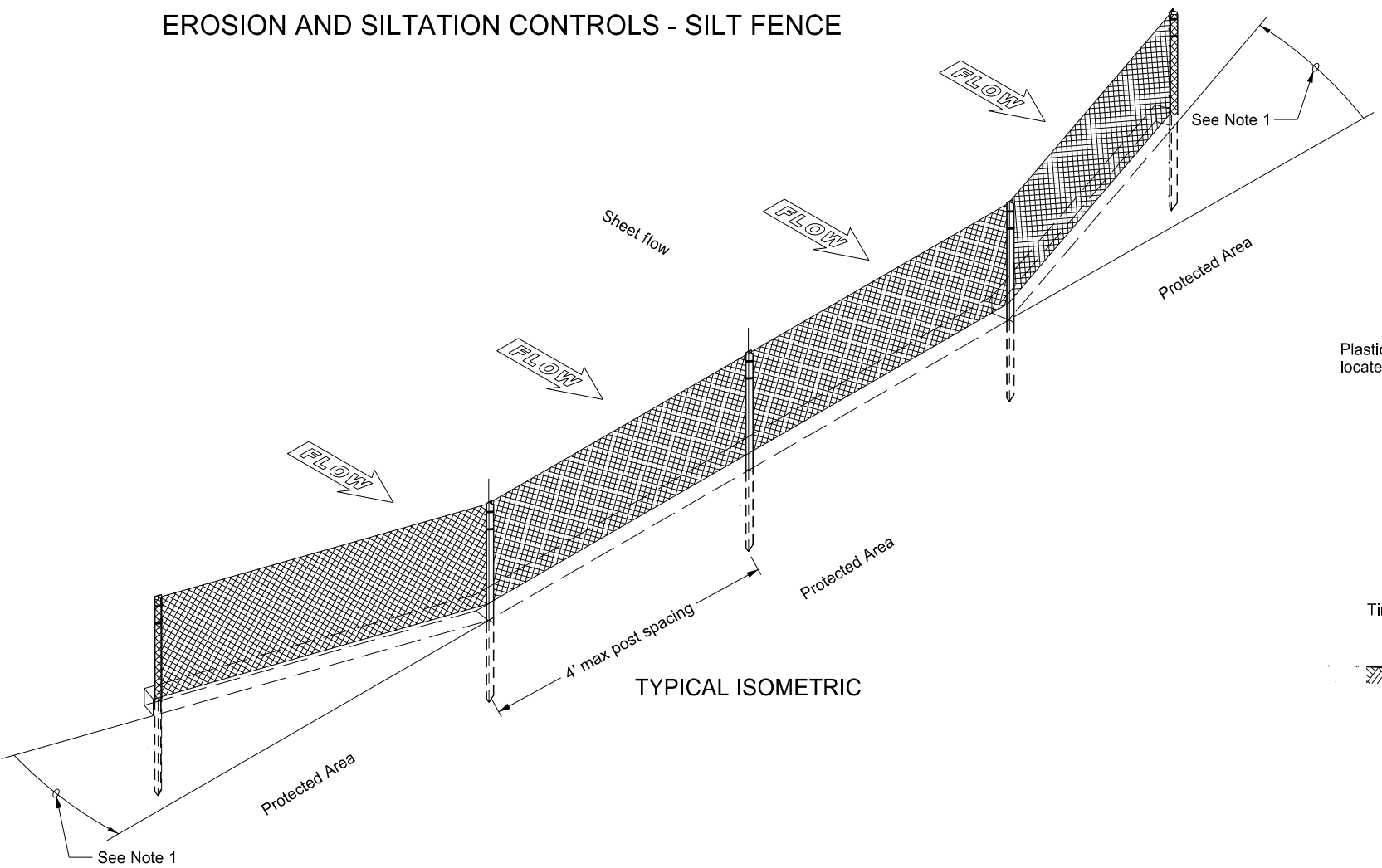
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EROSION AND SILTATION CONTROLS - SILT FENCE

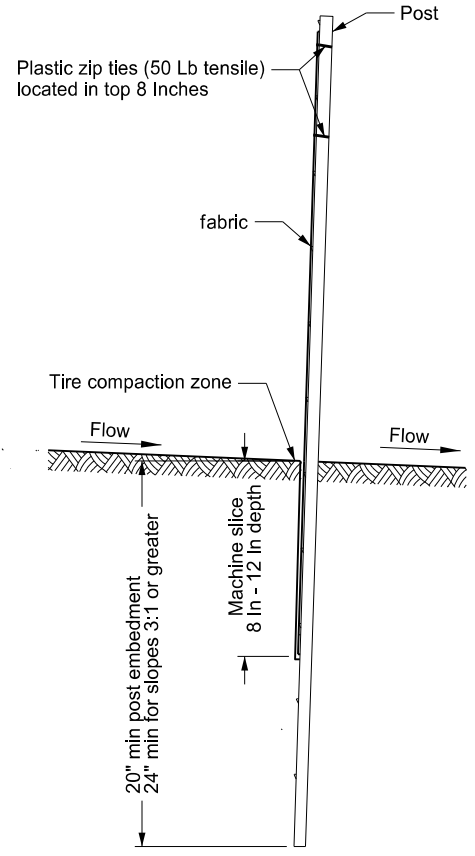


INSTALLATION DETAIL

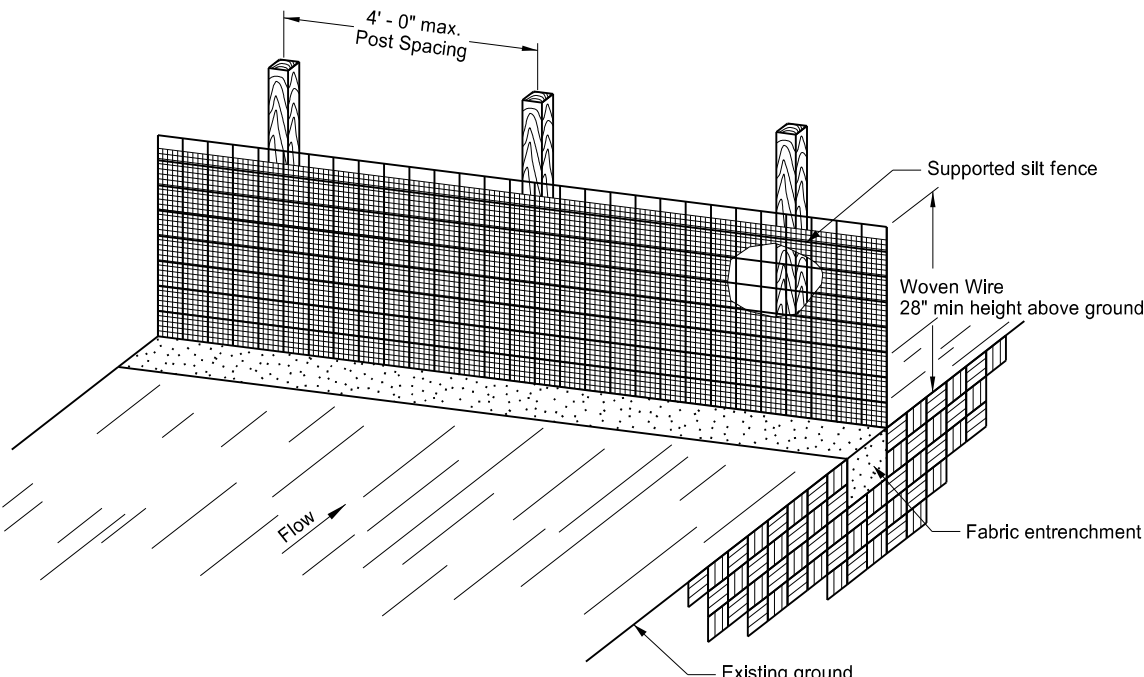
Minimize disturbance of ground around trench and smooth surface after excavation to avoid concentrating flows. Compact to prevent undercutting flows.



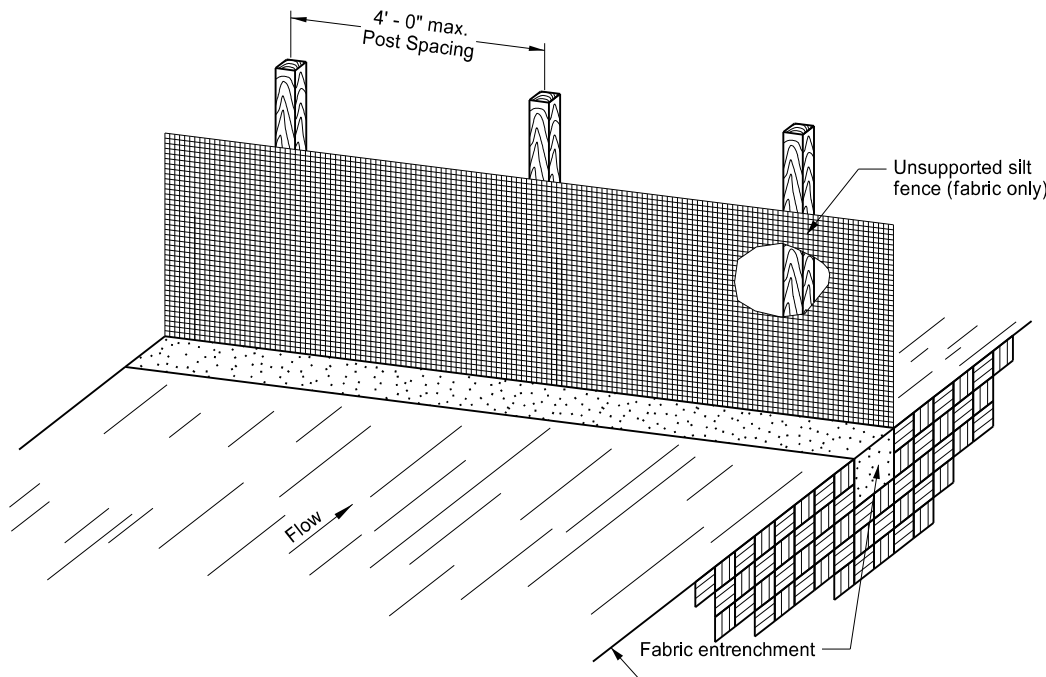
TYPICAL ISOMETRIC



MACHINE SLICED SILT FENCE



SILT FENCE SUPPORTED



SILT FENCE UNSUPPORTED

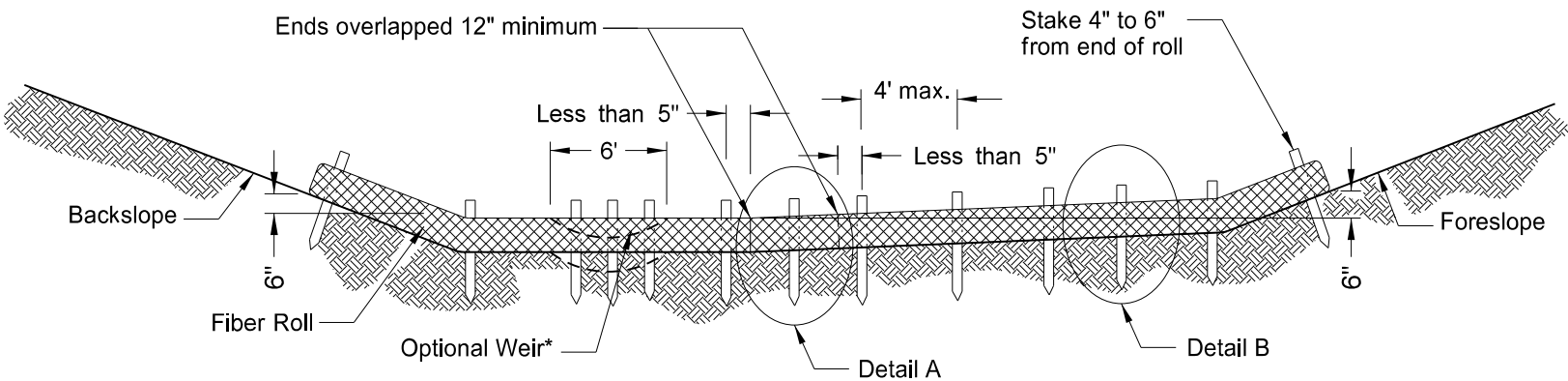
- NOTES:
- 1. Install the ends of the silt fence to point slightly upslope to prevent sediment from flowing around the ends of the fence.
 - 2. Place splices outside low spots.
 - 3. Install silt fencing parallel to contour lines.
 - 4. Do not embed silt fence when placed in standing water.
 - 5. Silt fence material does not need to reach the top of woven wire support.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Standard drawing resulted from splitting standard D-708-2.
06-27-16 08-27-19	Revised details & added new ones. New Design Engineer PE Stamp.

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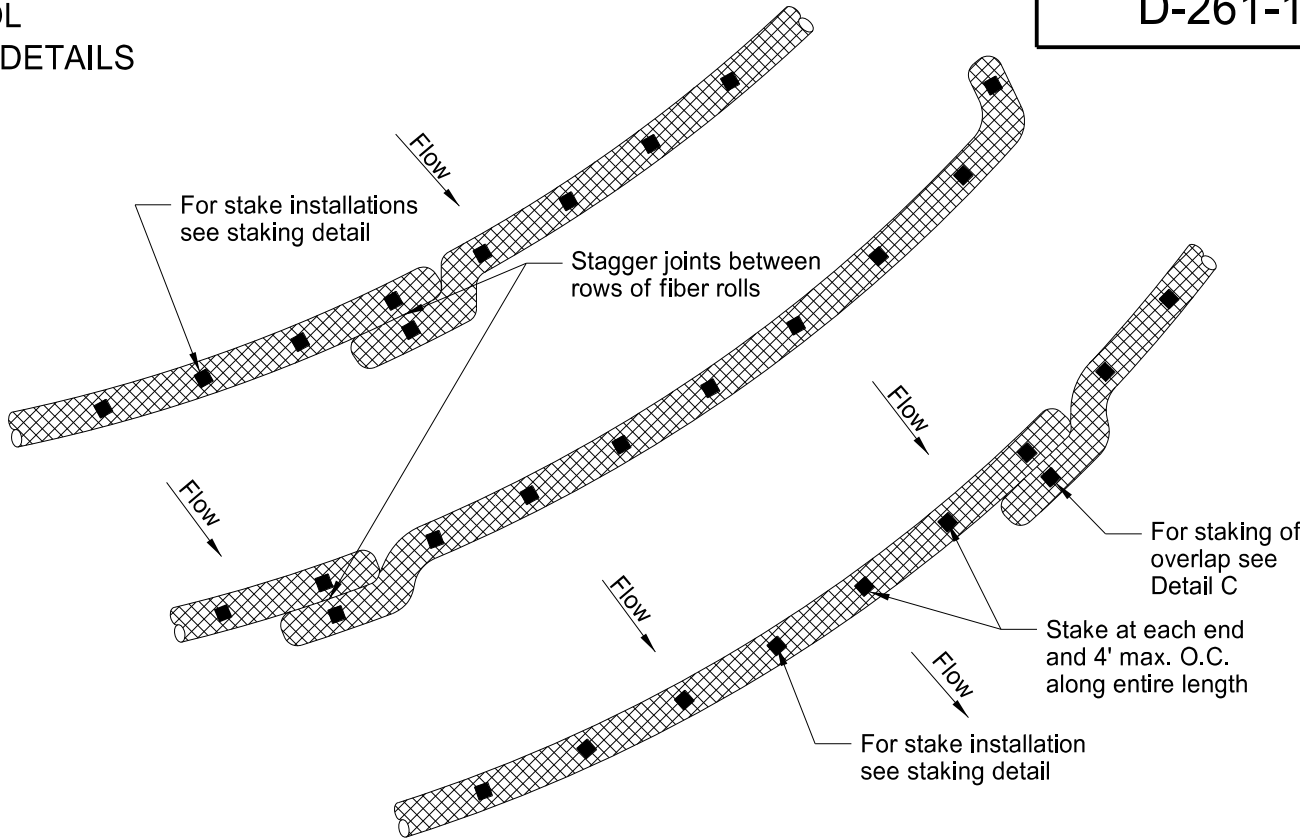
EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

D-261-1

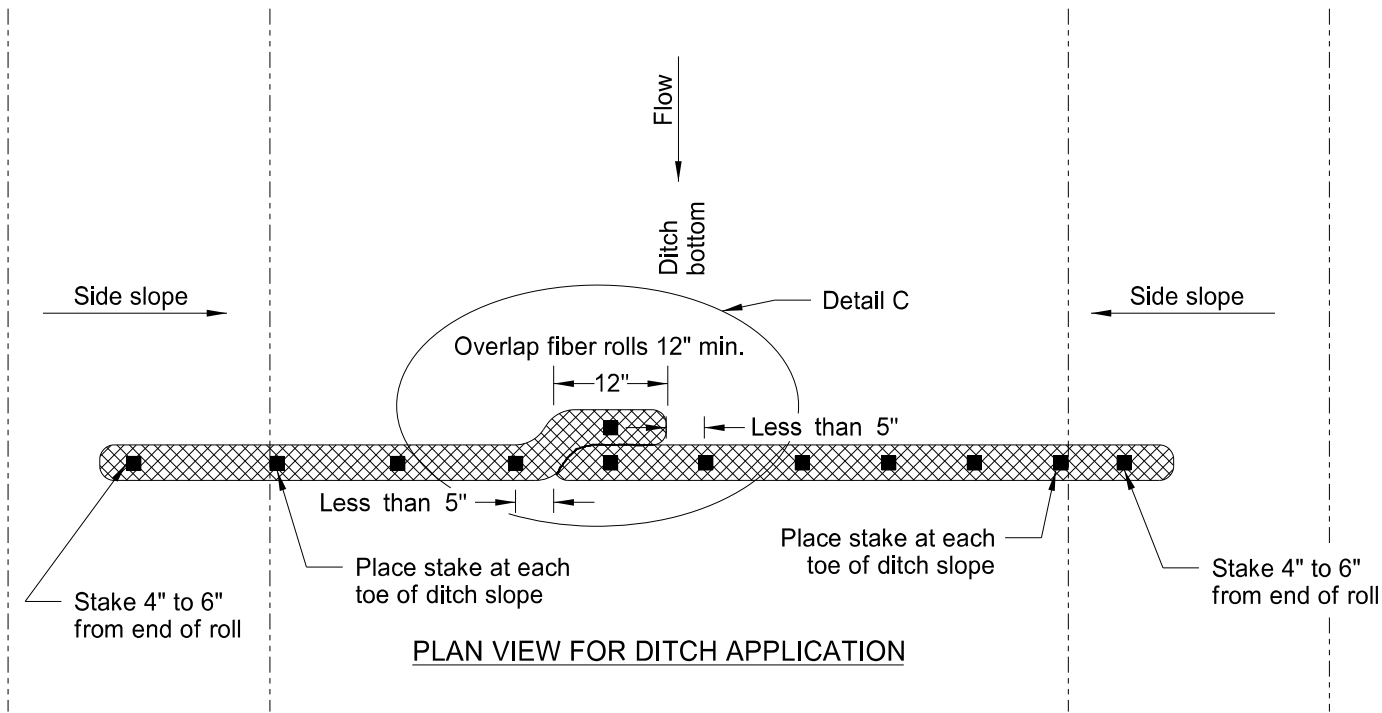


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

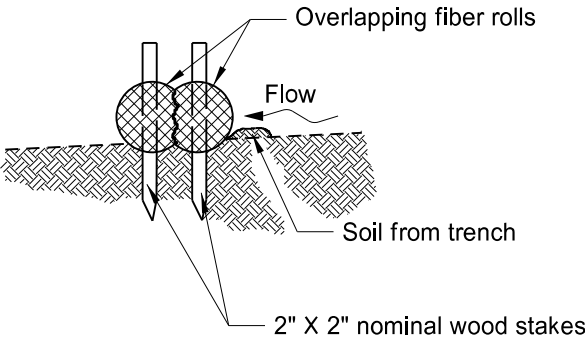
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



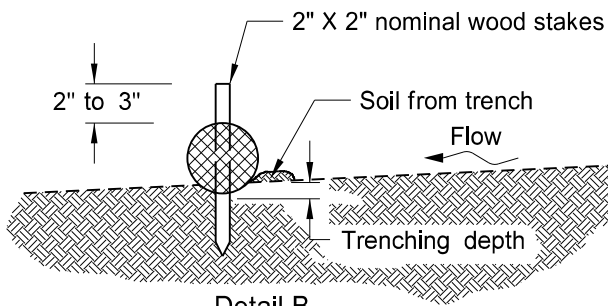
PLAN VIEW FOR SLOPE APPLICATION



PLAN VIEW FOR DITCH APPLICATION



Detail A
Fiber Roll Overlapping Staking Detail



Detail B
Fiber Roll Staking Detail

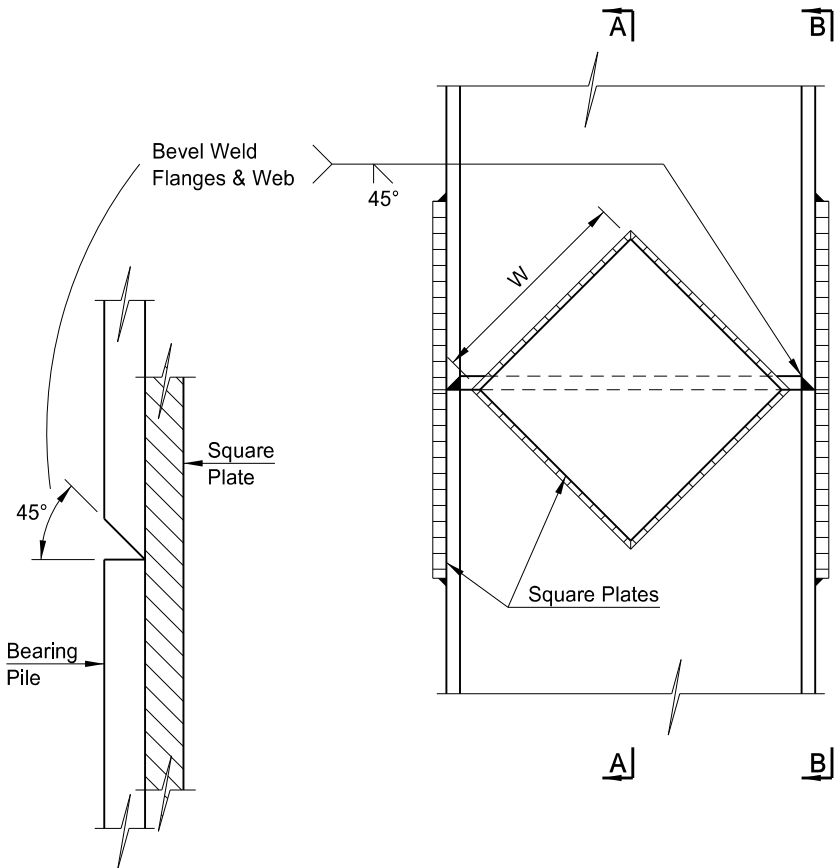
FIBER ROLL DIAMETER	NOMINAL STAKE SIZE	MINIMUM STAKE LENGTH	MINIMUM TRENCH DEPTH	MAXIMUM TRENCH DEPTH
6"	2" x 2"	18"	2"	2"
12"	2" x 2"	24"	2"	3"
20"	2" x 2"	36"	3"	5"

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

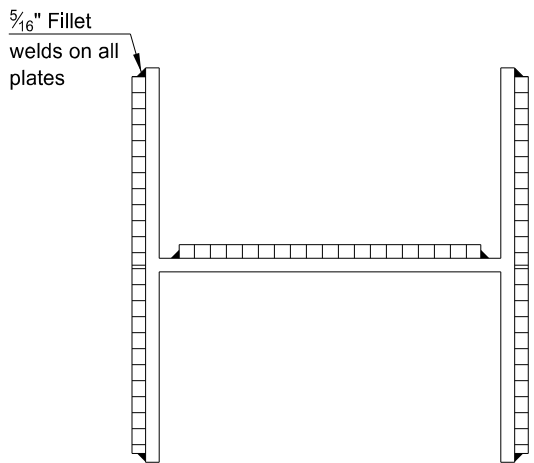
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-18-10	
REVISIONS	
DATE	CHANGE
06-10-13	Added plan view for ditch and slope application. Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.
06-26-14	Changed standard drawing number from D-708-7 to D-261-1.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

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PILE SPLICE DETAILS

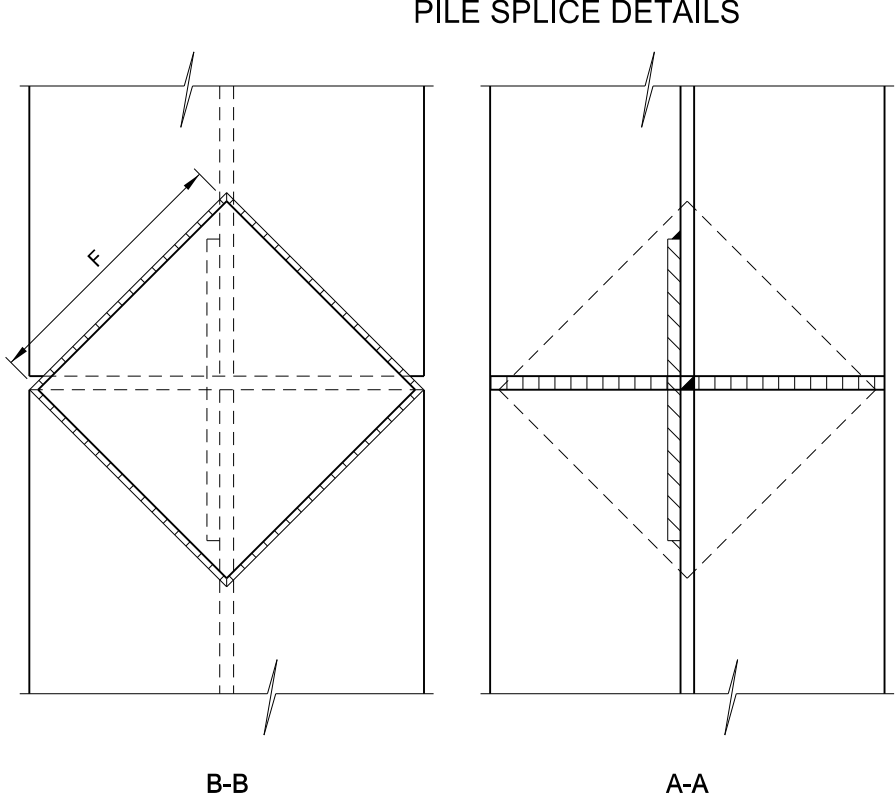


ENLARGED VIEW

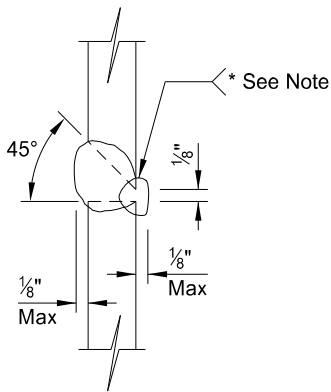


PILE	8"	10"	12"	14"
"F" FLANGE	5"	6½"	8"	10"
"W" WEB	4"	5½"	6½"	8"

H-PILE SPLICE DETAIL



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



ALTERNATE H-PILE SPLICE DETAIL

NOTES:

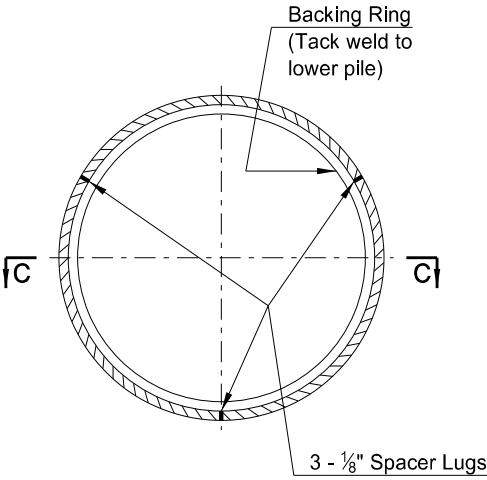
Steel H-Pile may be spliced with complete penetration groove welds in both flanges and web in lieu of using the reinforcing plates.

AWS classification E70XX Low Hydrogen Electrodes shall be used.

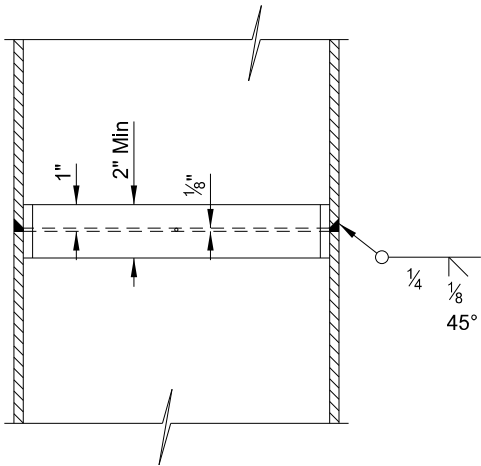
* Welds made without the use of backing material shall have the root gouged to sound metal and welded from the second side.

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

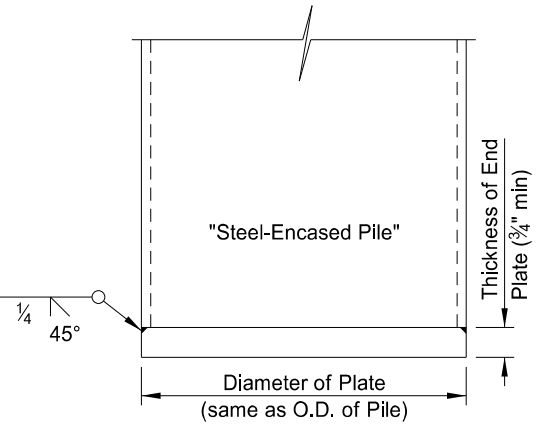
The thickness of the steel square plates shall at a minimum be as thick as the flanges and web of the pile being spliced.



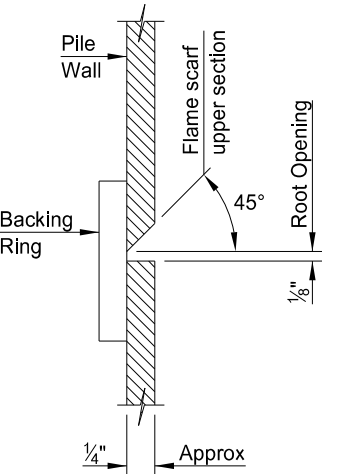
Backing Ring may be made from pile cut-offs or other material of a like quality.



STEEL-ENCASED CONCRETE PILE SPLICE DETAIL



END PLATE DETAIL

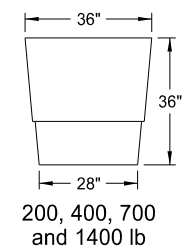
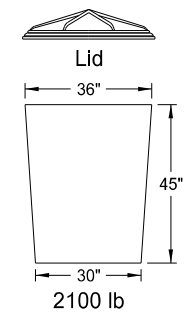


ENLARGED VIEW

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09/14/11	
REVISIONS	
DATE	CHANGE
09/03/19	UPDATED SIGNATURE

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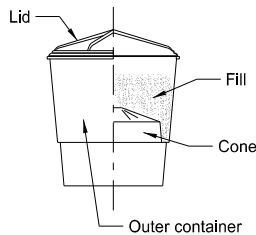
ATTENUATION DEVICE



Outer Containers

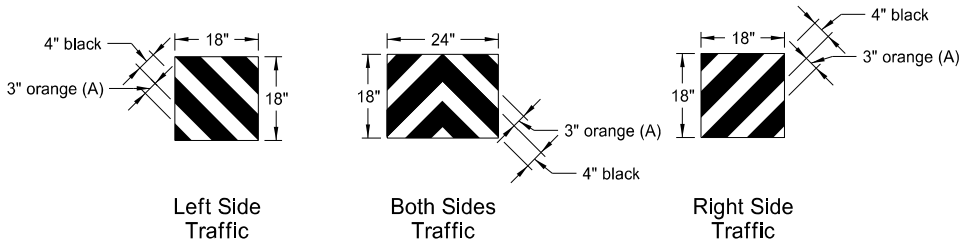


Cones



Typical Assembly

Typical Module Construction Detail

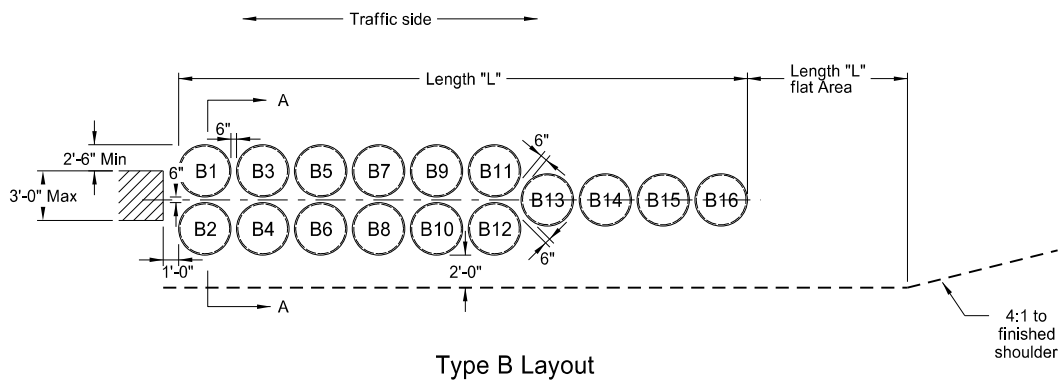


Reflective Sheet Detail

Note:
Apply Type IV reflective sheeting (as specified in the NDDOT Standard Specifications) directly to the outer container of the last attenuation device facing traffic, following the details above.
Or apply the sheet to a metallic sheet and attach it to the container with approved fasteners.

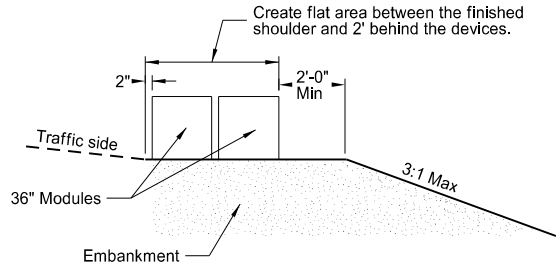
(A) Use 3" orange sheeting for temporary installations, and 3" yellow sheeting for permanent installations.

Fill Chart					
	Module Weights (LBS)				
	200	400	700	1400	2100
Distance from top edge	8½"	5"	4"	3"	0"



Type B Layout

Note:
Angle attenuation devices 10 degrees towards traffic when placed at piers offset from roadway.



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		
B5	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B6	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B7	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B8	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B9	700	700	700	700	700	700	700	700	700	700	700
B10	700	700	700	700	700	700	700	700	700	700	700
B11	700	700	700	700	700	700	700	700	700	700	700
B12	700	700	700	700	700	700	700	700	700	700	700
B13	700	700	700	700	700	700	700	700	700	700	700
B14	400	400	400	400	400	400	400	400	400	400	400
B15	400	400	400	400	400	400	400	400	400	400	400
B16	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	1400	700	400	200	2100	1400	700	400	200	2100
2100	1	1	1	1	1	1	1	1	1	1	1
1400	1	1	1	1	1	1	1	1	1	1	1
700	2	2	2	2	2	2	2	2	2	2	2
400	1	1	1	1	1	1	1	1	1	1	1
200	2	2	2	1	1	1	1	1	1	1	1

Notes:

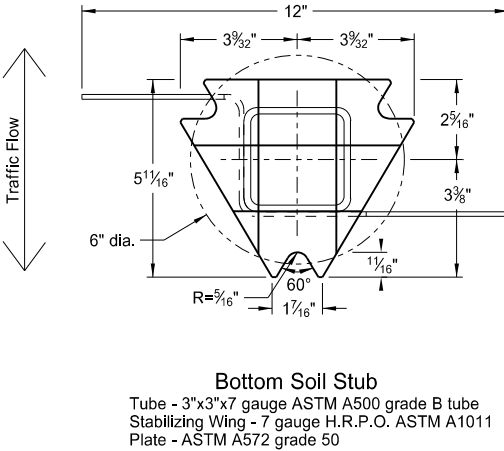
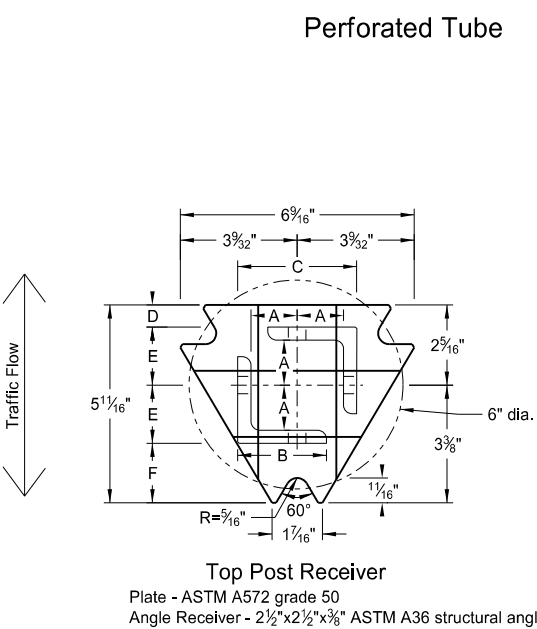
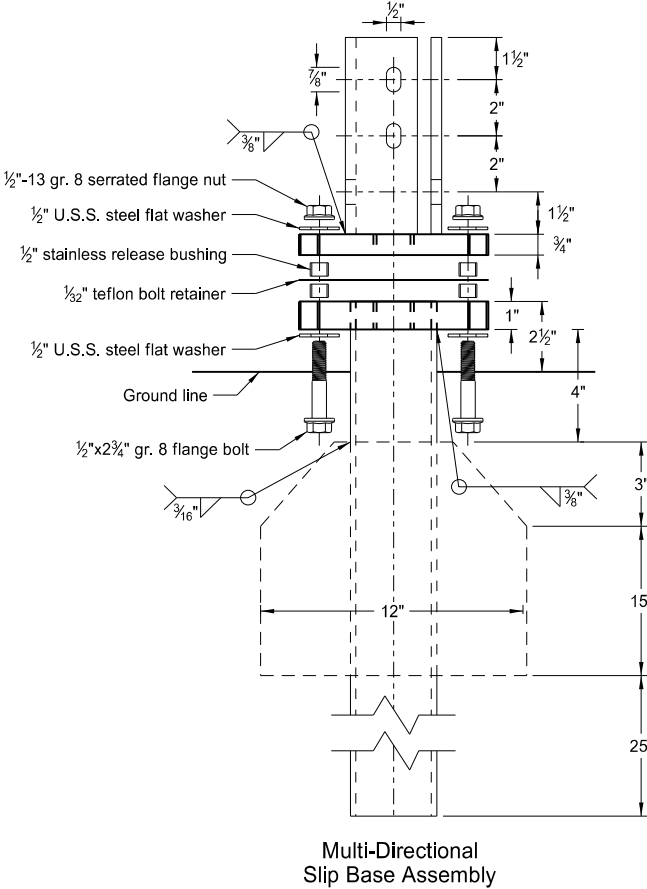
- Materials
 - Use modules manufactured from frangible polyethylene material which shatters upon impact.
 - Fill modules with class 43 aggregate meeting NDDOT Standard Specifications aggregate requirements. Use fill with a unit weight of at least 100 pounds per cubic foot. Use fill with a moisture content of 2% or less when left over winter.
- Modules
 - Provide three components for 2, 4, or 7 cubic foot module containers:
 - A 14 C.F., yellow outer container.
 - A black lid securely locking over the top lip of the container.
 - A variable cone-shaped supporting insert capable of supporting 200, 400, or 700 pounds of sand mass to allow for three sizes of modules. Place cone inserts inside the 14 cubic foot container.
 - Provide two components for the 14 cubic foot module container:
 - A 14 C.F., yellow outer container.
 - A black lid securely locking over the top lip of the container.
 - Provide two components for the 21 cubic foot module container:
 - A 36" height X 36" width yellow outer container.
 - A black lid which locks securely over the top of the container.
- For temporary installations use 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 approved equal modules. As an option, place attenuation devices on 3½" maximum thickness pallets to facilitate maintenance.
- For permanent installations use Barrel Attenuation Device consisting of one-piece outer sand container modules with separate detachable lid. Energite attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, TrafFix barrels manufactured by TrafFix Devices, Inc. of San Clemente, CA, or approved equal meet these requirements.
- The Typical Module Construction Detail and Type B Layout are based on the Energite Crash Cushion manufactured by Energy Absorption. Provide any required layouts and details from other sand filled attenuation module manufacturers which differ from those shown here.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
7-18-14	Revised sheeting in reflective sheet detail
9-27-17	Update to active voice
10-03-19	New Design Engr PE Stamp

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Perforated Tube

- Notes:
1. Torque slip base bolts as specified by manufacturer.
 2. Use anchor with 43.9 KSI yield strength and 59.3 KSI tensile strength.
 3. Provide 4" vertical clearance for anchor or breakaway base. Measure the 4"x60" measurement above and below post location and back and ahead of post.
 4. In concrete sidewalk, use same anchor without wings.
 5. Provide more than 7' between the first and fourth posts of a four post sign.

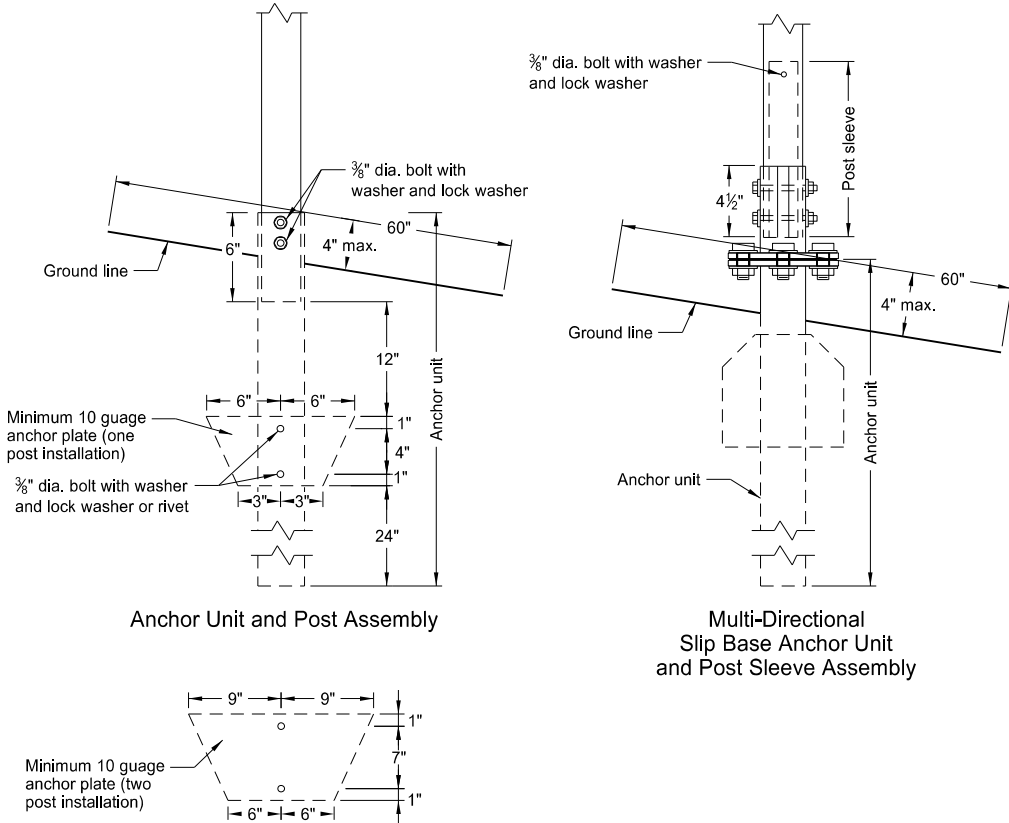


Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thick-ness Gauge	Sleeve Size in.	Wall Thick-ness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2 1/4
1	2 1/4	12			No	2 1/2
1	2 1/2	12			(A)	3
1	2 1/2	10			Yes	
1	2 1/4	12	2	12	Yes	
1	2 1/2	12	2 1/4	12	Yes	
2	2	12			No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

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

Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2 3/16"x10 ga.	1 5/16"	2 1/2"	3 1/2"	2 5/32"	1 33/64"	1 7/8"
2 1/2"x10 ga.	1 3/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"

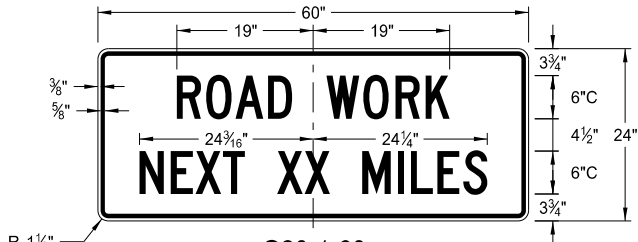
- (A) Use breakaway base when support is placed in weak soils. Engineer determines if soils are weak.
- (B) For additional wind load, insert the 2 3/8"x10 ga. into 2 1/2"x10 ga.



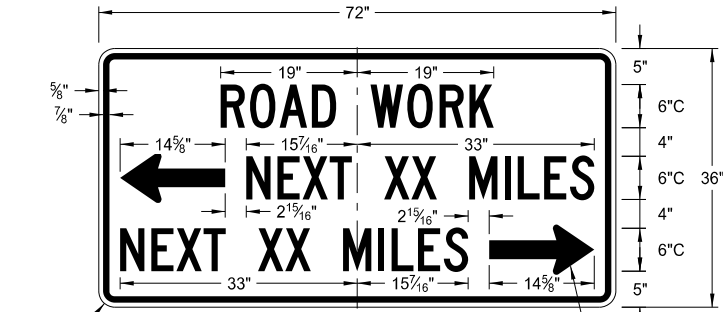
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION		This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 10/03/19 and the original document is stored at the North Dakota Department of Transportation
2-28-14		
REVISIONS		
DATE	CHANGE	
9-27-17 10-03-19	Updated to active voice New Design Engr PE Stamp	

CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS

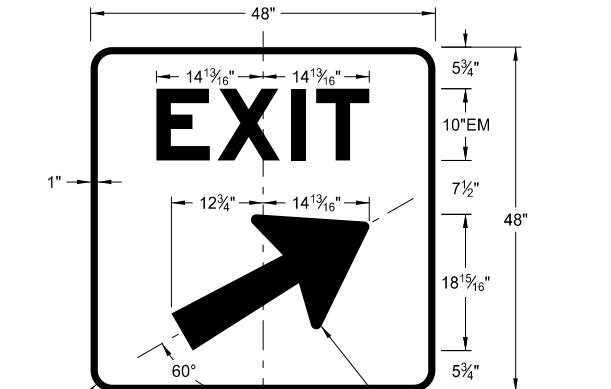
D-704-9



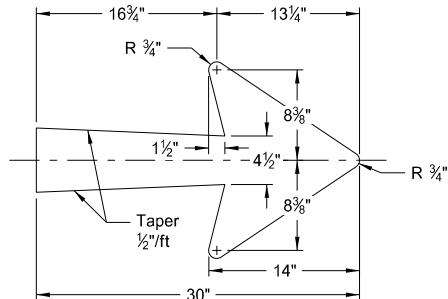
G20-1-60
Legend: black (non-refl)
Background: orange



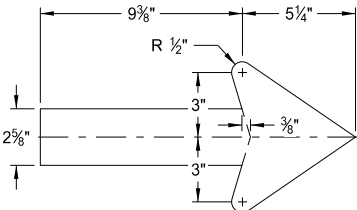
G20-50a-72
Legend: black (non-refl)
Background: orange



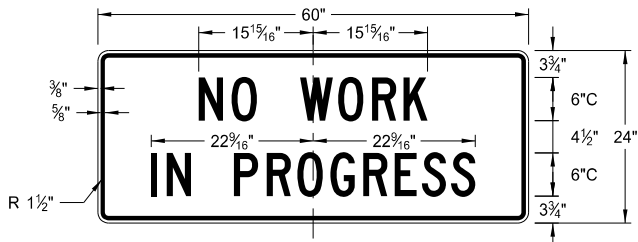
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



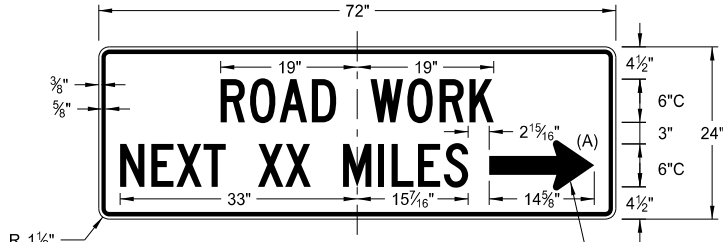
E5-1-48



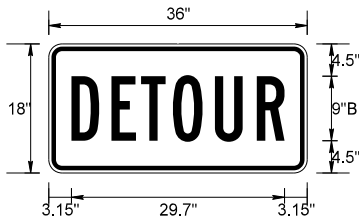
G20-50a-72
G20-52a-72



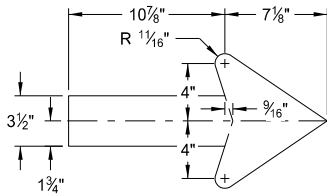
G20-1b-60
Legend: black (non-refl)
Background: orange



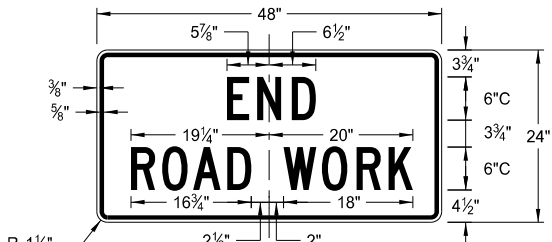
G20-52a-72
Legend: black (non-refl)
Background: orange



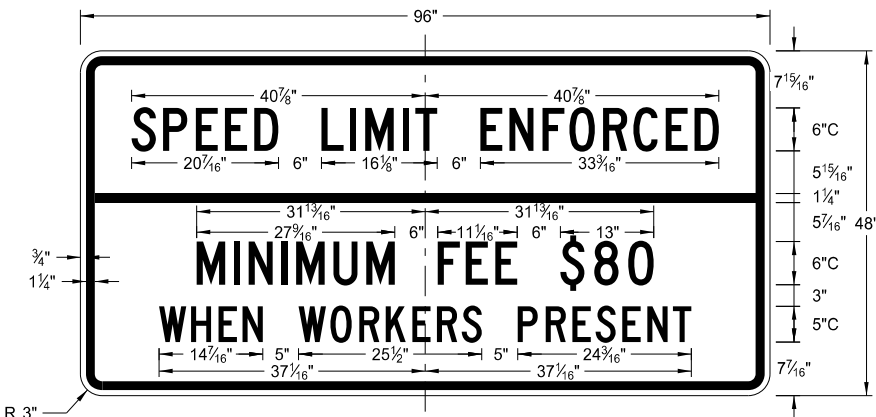
M4-8-36
Legend: black (non-refl)
Background: orange



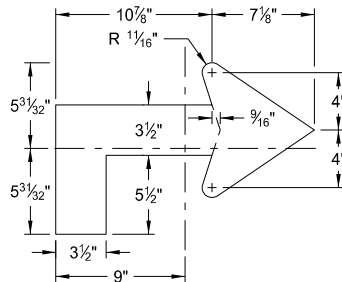
M4-9(L or R)-30
Right or Left



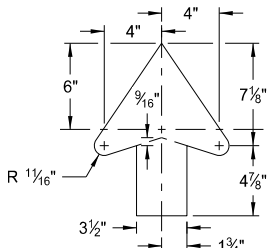
G20-2-48
Legend: black (non-refl)
Background: orange



G20-55-96
Legend: black (non-refl)
Background: orange



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



M4-9-30
Straight

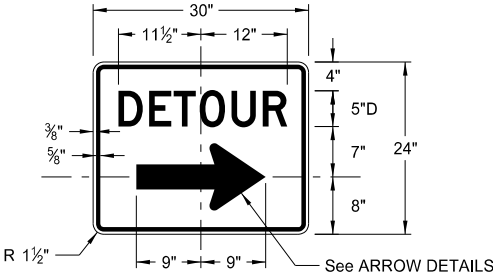
ARROW DETAILS

NOTES:

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

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

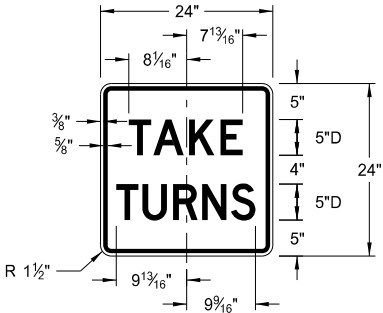
This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
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on 10/03/19 and the original document is stored at the
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of Transportation



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

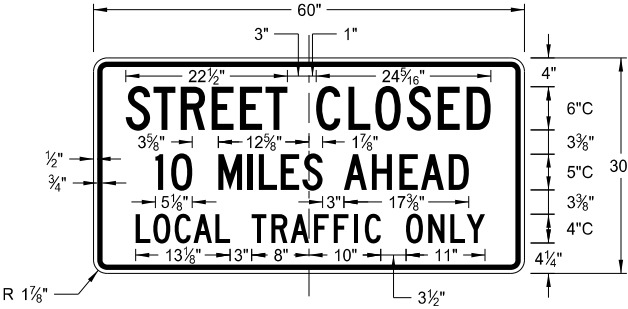
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS

D-704-10



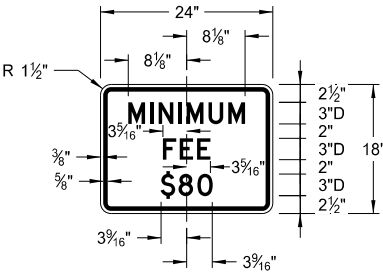
R1-50P-24

Legend: black (non-refl)
Background: white



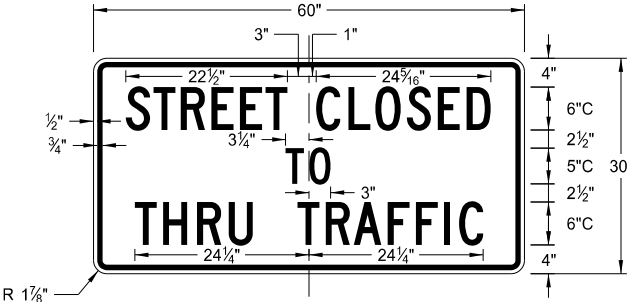
R11-3c-60

Legend: black (non-refl)
Background: white



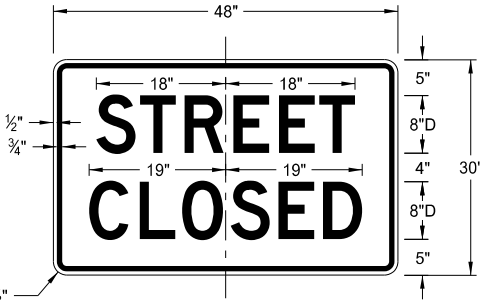
R2-1aP-24

Legend: black (non-refl)
Background: white



R11-4a-60

Legend: black (non-refl)
Background: white

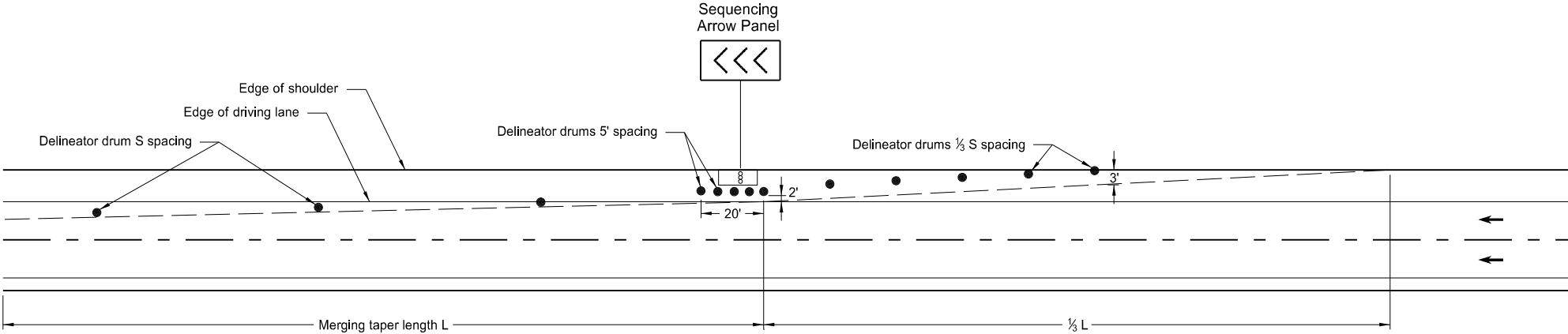


R11-2a-48

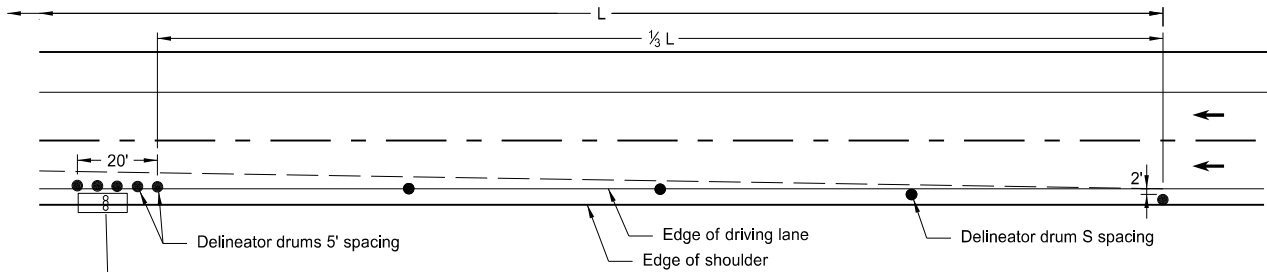
Legend: black (non-refl)
Background: white

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

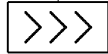
This document was originally
issued and sealed by
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on 10/03/19 and the original
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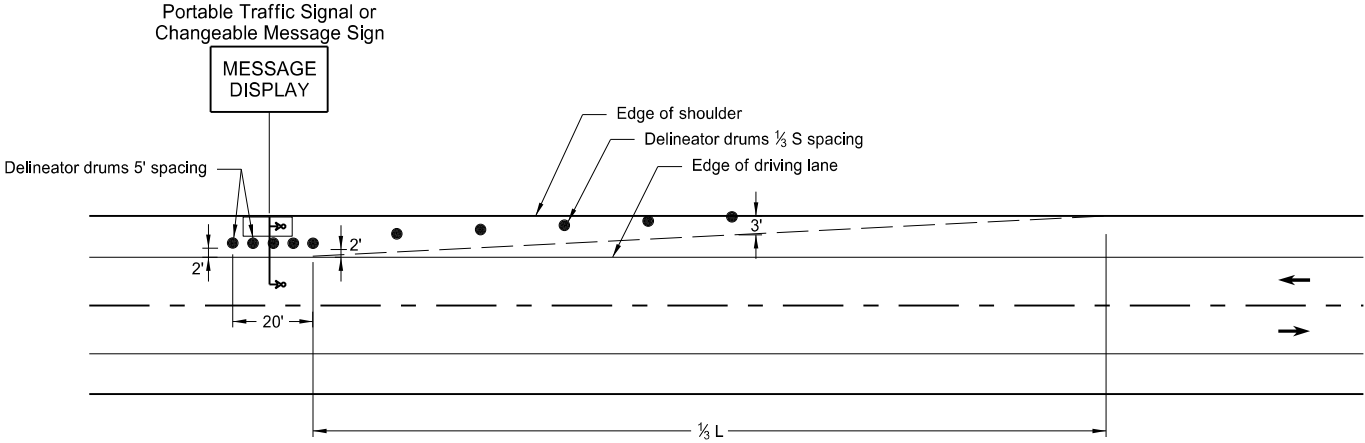
SHOULDER CLOSURE WITH LANE CLOSURE
(when shoulder is 8' or wider)



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



Sequencing
Arrow Panel



PORTABLE TRAFFIC SIGNAL OR CHANGEABLE MESSAGE SIGN ON SHOULDER

KEY

- Delineator Drum
- Message Display
- ∞ Sequencing Arrow Panel
- LT Portable Traffic Signal

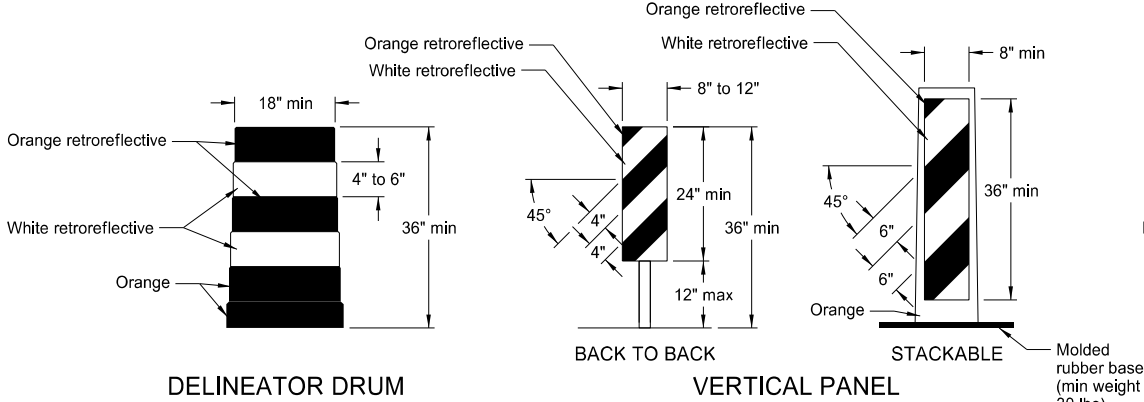
Notes:

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

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

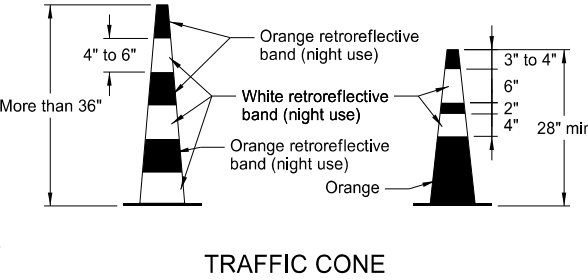
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BARRICADE AND CHANNELIZING DEVICE DETAILS

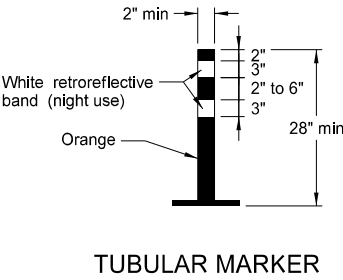


Provide horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide for drum markings. Use a minimum of two orange and two white stripes with the top stripe being orange for each drum. Do not exceed 3" nonretroreflectORIZED spaces between the horizontal orange and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

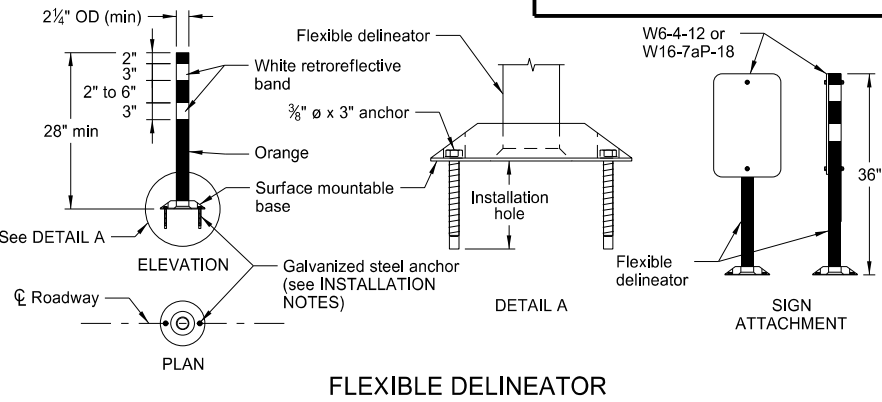
Provide alternating orange and white retroreflective stripes, sloping downward in direction vehicular traffic is to pass. Place retroreflective sheeting on both sides of panel with a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective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



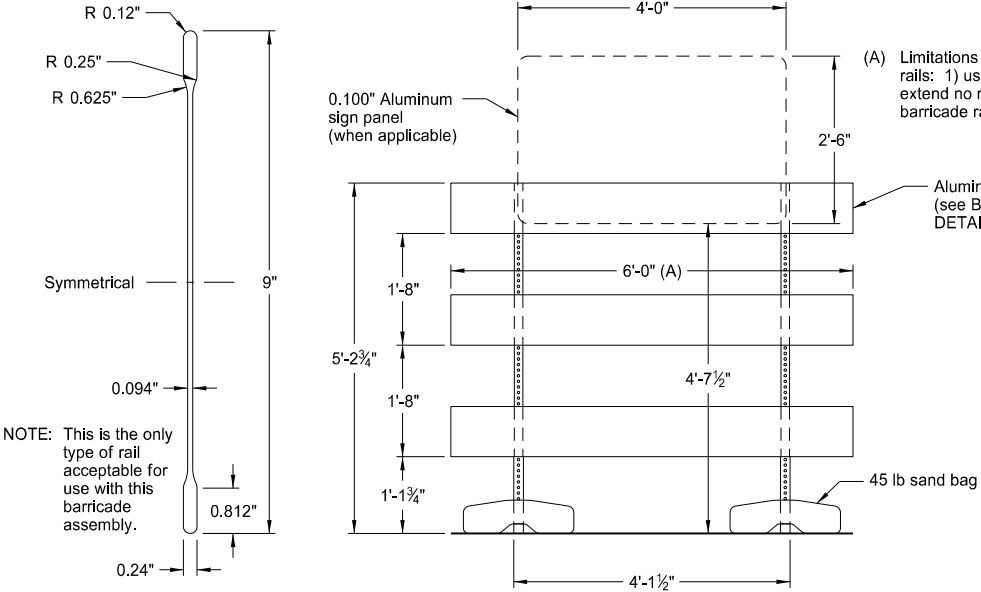
Provide retroreflectORIZATION of cones more than 36" in height by alternating orange and white retroreflective stripes. Use a minimum of two orange and two white stripes for each cone with the top stripe being orange. Use maximum 3" nonretroreflectORIZED space between the orange and white stripes.



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



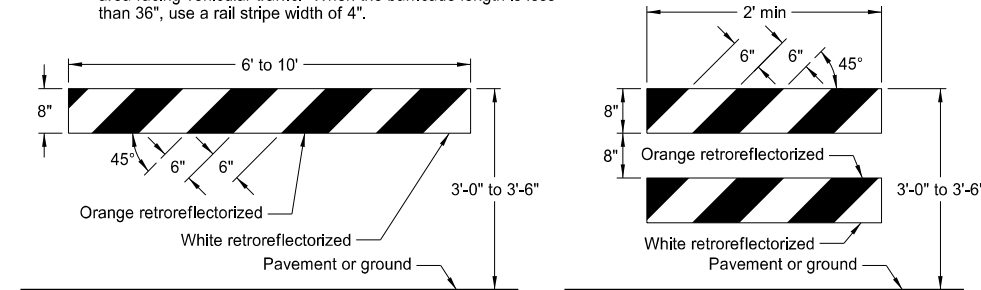
- INSTALLATION NOTES:
1. Drill installation holes to diameter and depth required by manufacturer's specifications.
 2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
 3. In lieu of bolted down base, use an 8" x 8" butyl pad or hot melt butyl.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



BARRICADE BLADE DETAIL

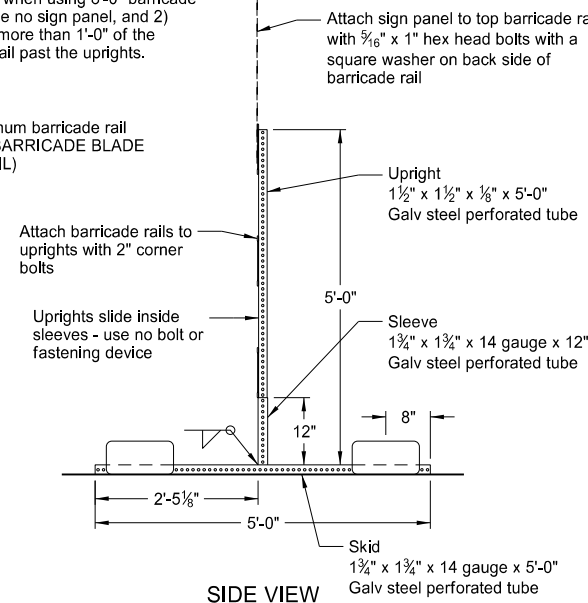
BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

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

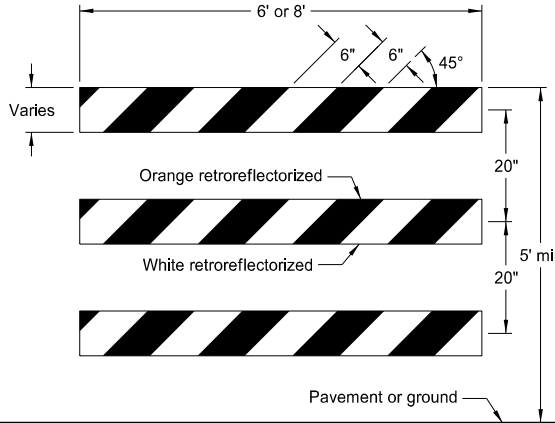


TYPE I BARRICADE

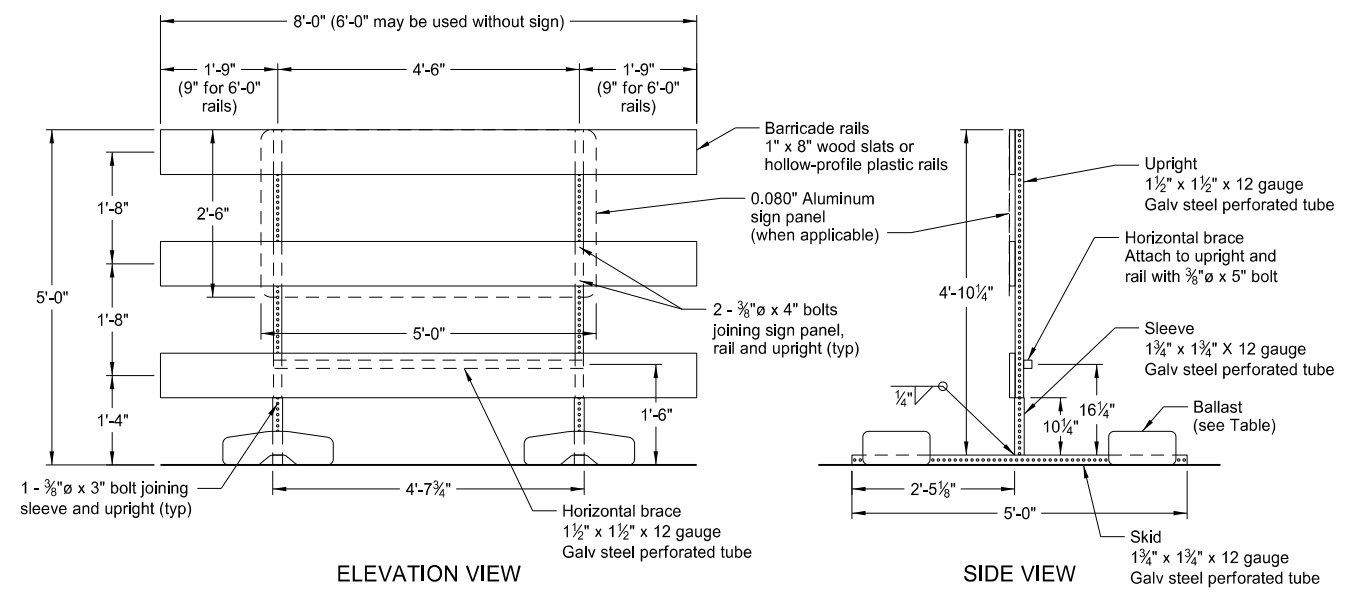
TYPE II BARRICADE
BARRICADE RAIL DETAILS



SIDE VIEW



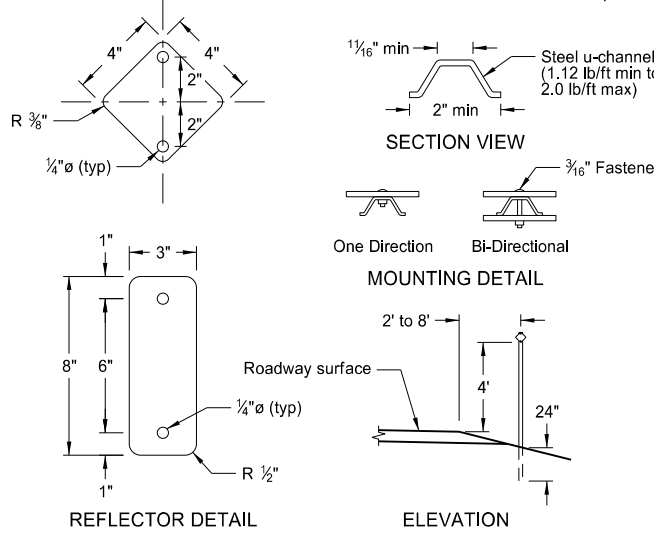
TYPE III BARRICADE



ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

SIDE VIEW



REFLECTOR DETAIL

ELEVATION

DELINEATORS

MINIMUM BALLAST (For each side of barricade support)

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

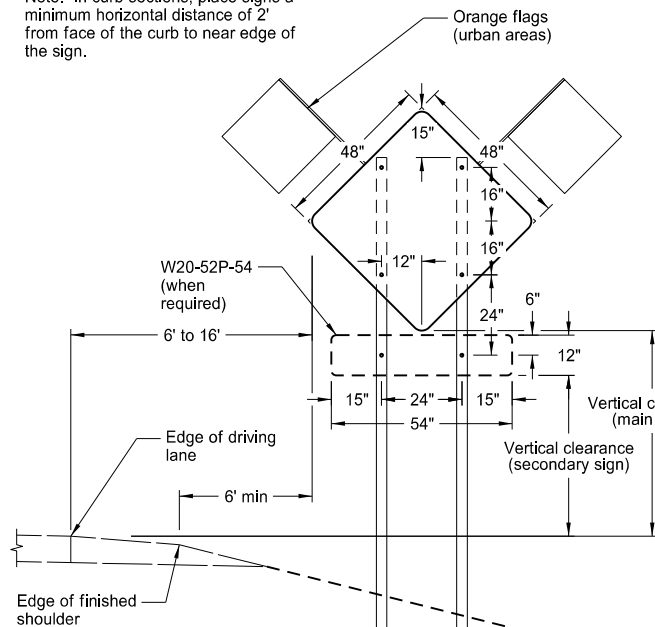
Note: Number of sandbags based on a wind speed of 55 MPH. Sandbags assumed to be placed at or near the ends of the skids.

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

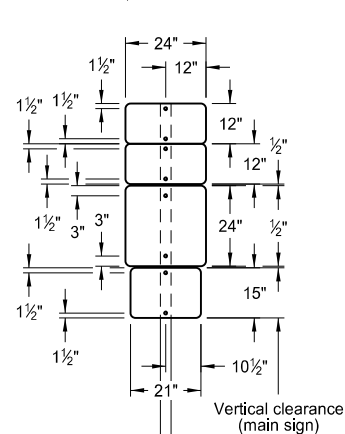
This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
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CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

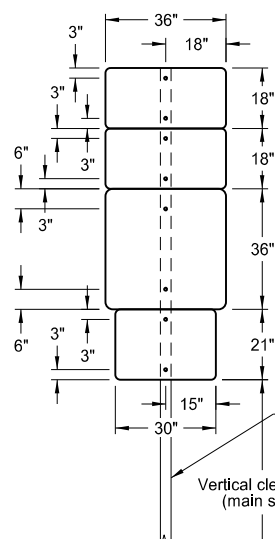
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



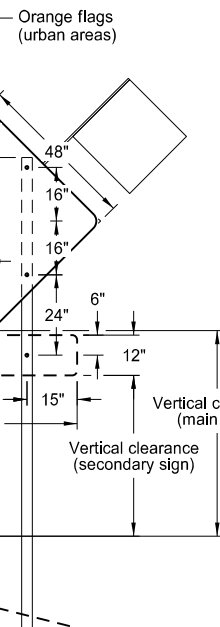
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



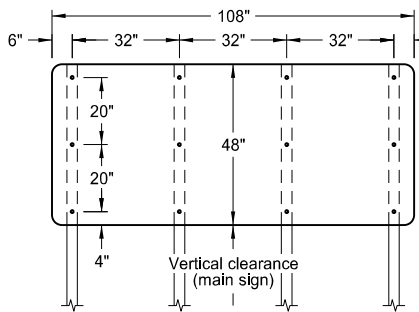
24" x 24"
ROUTE MARKER
ASSEMBLY



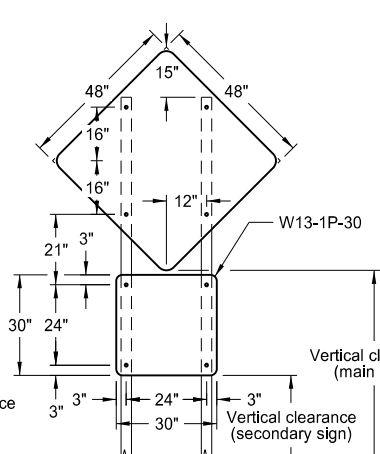
36" x 36"
ROUTE MARKER
ASSEMBLY



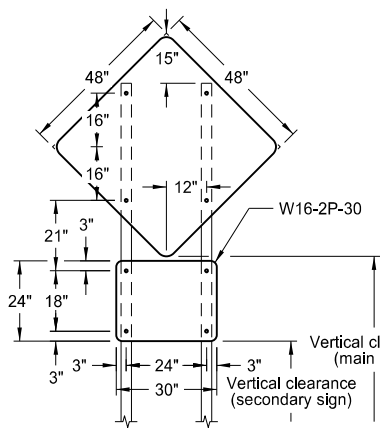
18" x 18"
DIAMOND SIGN



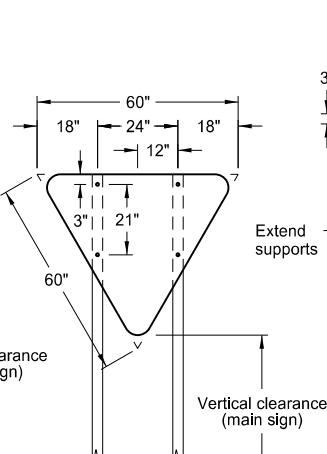
108" x 48" SIGN



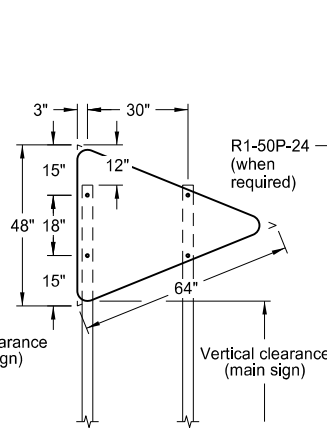
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



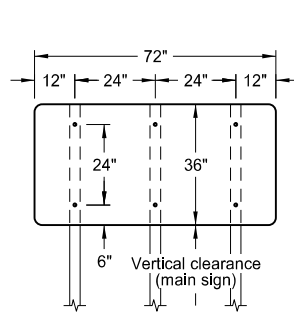
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



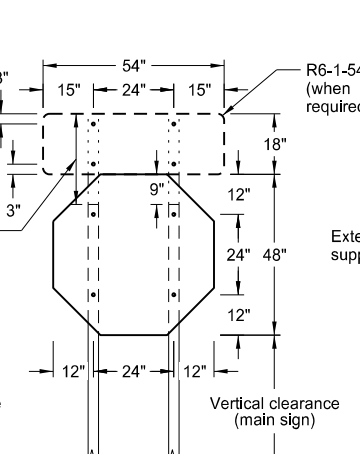
R1-2-60 - YIELD SIGN



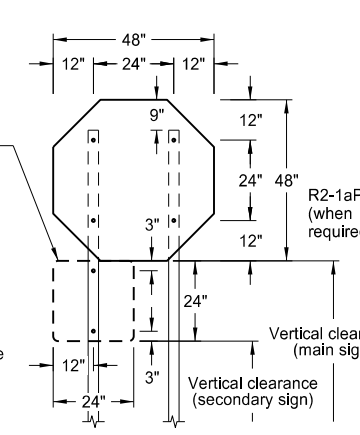
W14-3-64 - PENNANT SIGN



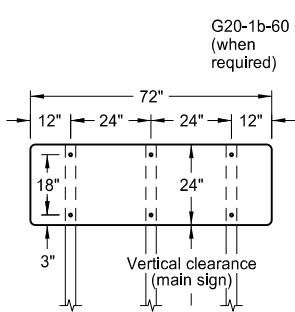
72" x 36" SIGN



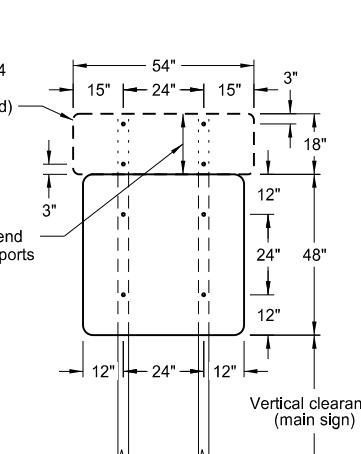
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



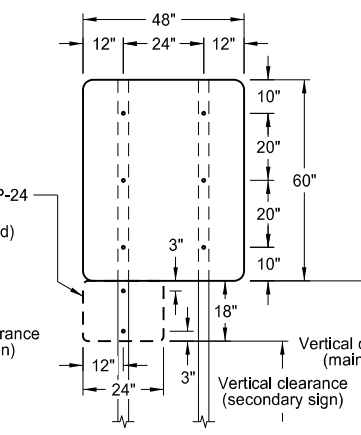
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



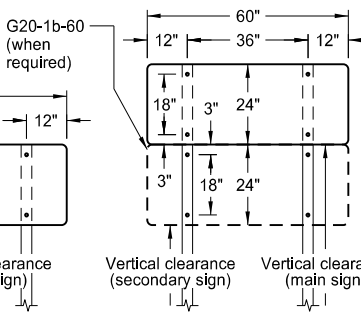
72" x 24" SIGN



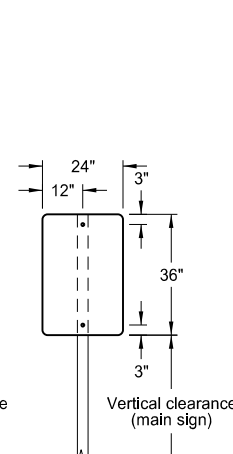
48" x 48" SIGN
(with R6-1-54 sign as required)



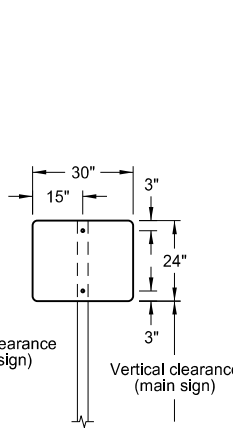
48" x 48" SIGN
(with R2-1aP-24 sign as required)



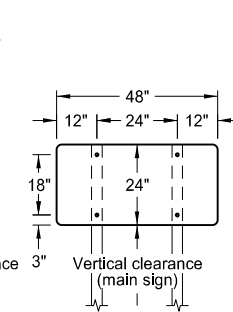
60" x 24" SIGN



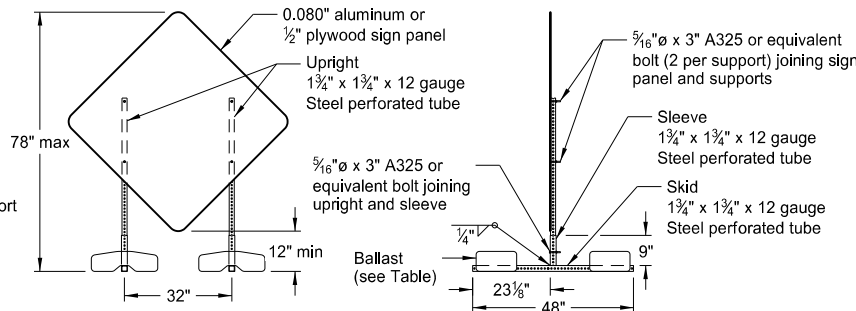
24" x 36" SIGN



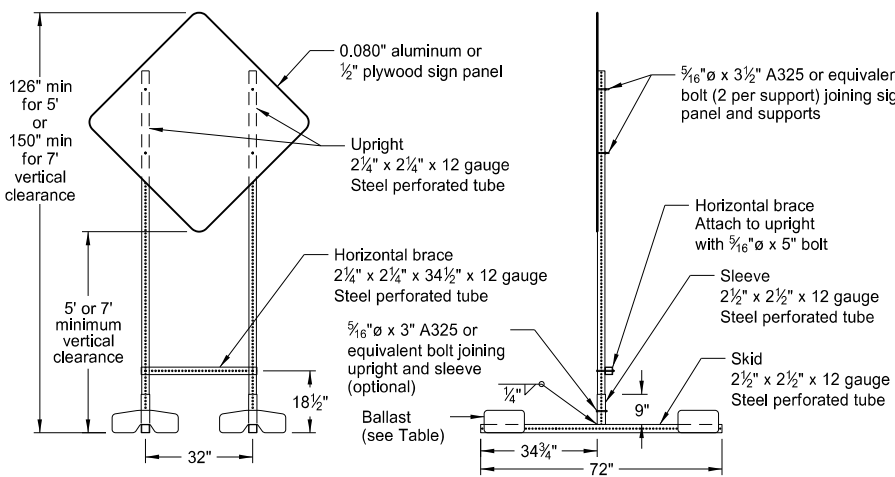
30" x 24" SIGN



48" x 24" SIGN



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

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

Place signs over 50 square feet on 2½" x 2½" perforated tube supports as a minimum.

Do not attach guy wires to sign supports. Attach wind beams behind sign panels when used with u-posts.
2. Sign Panels: Provide sign panels made of 0.100" aluminum, ½" plywood, or other approved material, except where noted. Punch all holes round for ⅝" bolts.
3. Alternate Messages: Install and remove alternate message signs on reflectorized plate (without borders) as required. (i.e. "Left" and "Right" message on lane closure sign)
4. Route Marker Auxiliary Signs: Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:

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

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

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

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

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

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

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

MINIMUM BALLAST
(For each side of sign support base)

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

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

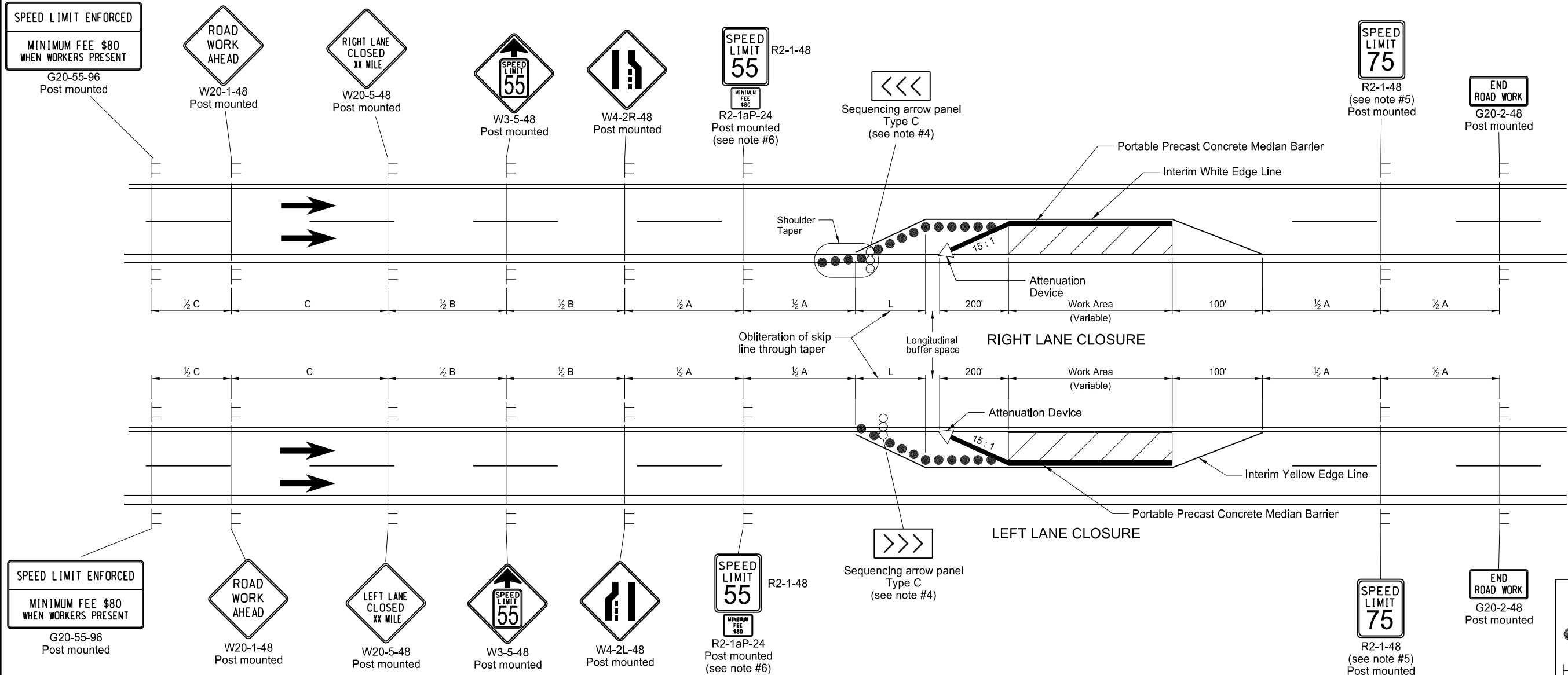
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-13	
REVISIONS	
DATE	CHANGE
11-14-13	Revised Note 6
9-27-17	Updated to active voice
11-01-19	Revised 60"x24" sign detail

This document was originally issued and sealed by

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

SIGN LAYOUT FOR INTERSTATE SYSTEM ONE LANE CLOSURE

D-704-18



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

* Posted speed, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.

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

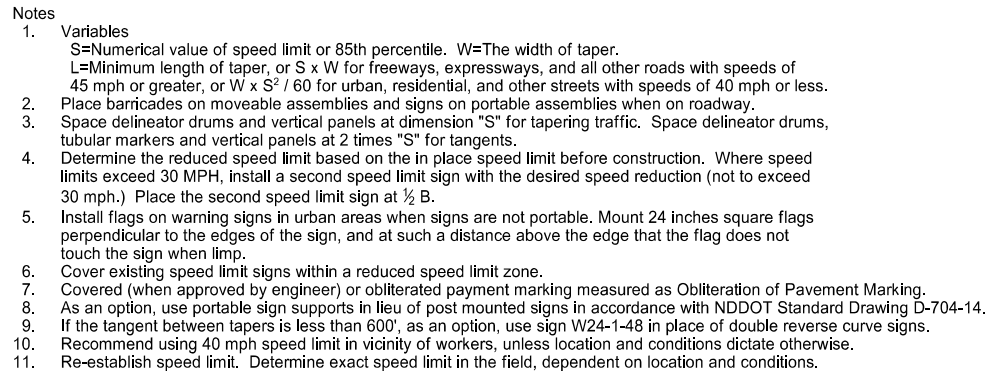
- Notes
- Variables
S = Numerical value of posted speed limit, off-peak 85th percentile speed prior to work starting, or anticipated operating speed in MPH.
W = The width of offset in feet.
L = Minimum taper length in feet. S x W for freeways, expressways, and roads with speeds of 45 mph or greater, or W x S² /60 for urban, residential, and streets with speeds of 40 mph or less.
 - Place barricades on moveable assemblies and signs on portable assemblies when located on the roadway.
 - Space delineator drums used for tapering traffic and on tangent at dimension "S".
 - Place Sequencing Arrow Panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface. See Shoulder Closure Standard Drawing. Use Type C on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater).
 - Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
 - Determine the reduced speed limit based on the in place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 MPH.) Place the second speed limit sign at ½ B.
 - Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
 - Cover existing speed limit signs within a reduced speed zone.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with the Standard D-704-14.
 - Sign G20-55-96 is not required if layout is not part of other traffic control or if work is less than 15 days.
 - Reduce speed limit further, if location and conditions dictate.

KEY

- Delineator Drum
- Sign
- Attenuation Device
- Sequencing Arrow Panel
- Work Area

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
1-13-16	Changed to interim yellow edge line
3-15-16	Removed Do Not Pass signs and updated notes
8-17-17	Updated notes & sign numbers
11-01-19	Note, sign #, & pvtl obliti changes

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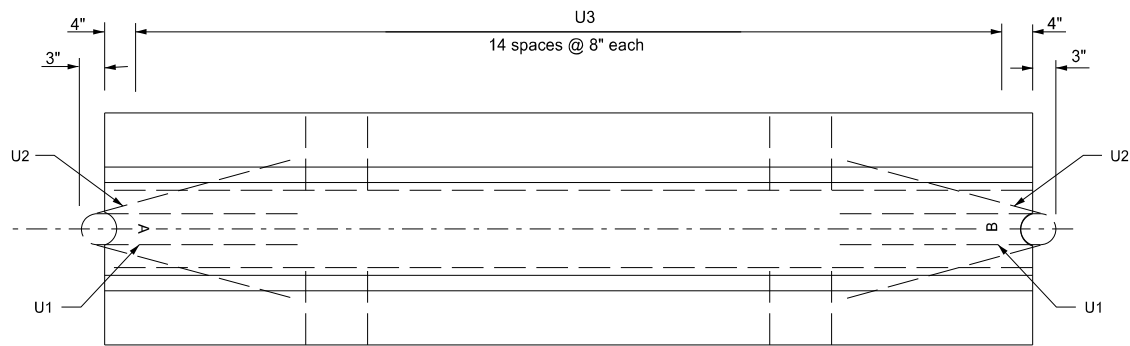
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
8-17-17 11-01-19	Updated notes. Added speed limit. Revised sign numbers and note 8.

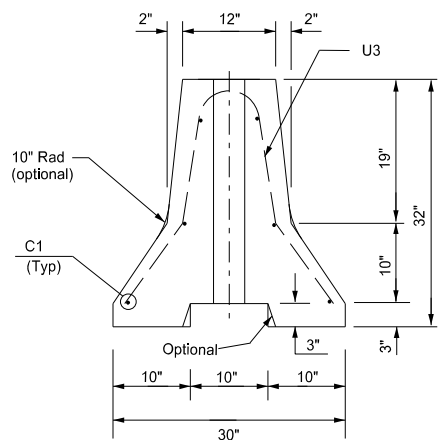
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PORTABLE PRECAST CONCRETE MEDIAN BARRIER
(TEMPORARY USAGE)

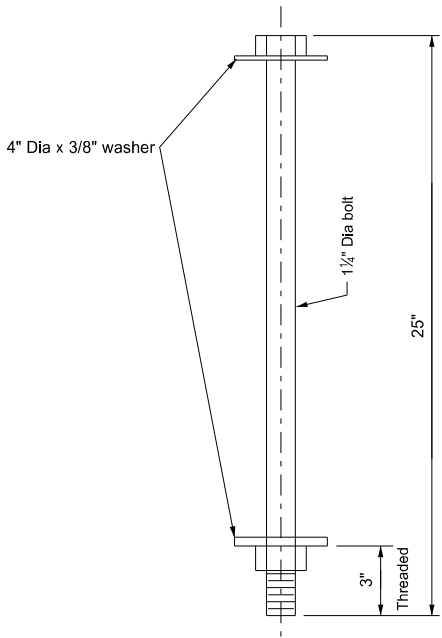
D-704-51



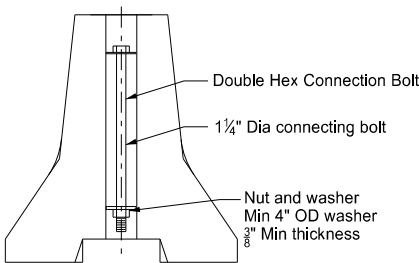
Plan View



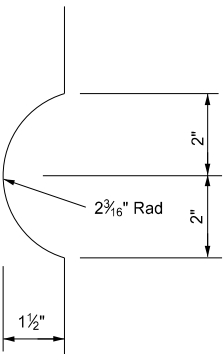
End View



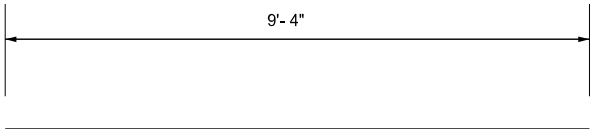
Connecting Bolt Detail
(One per 10 Ft section)



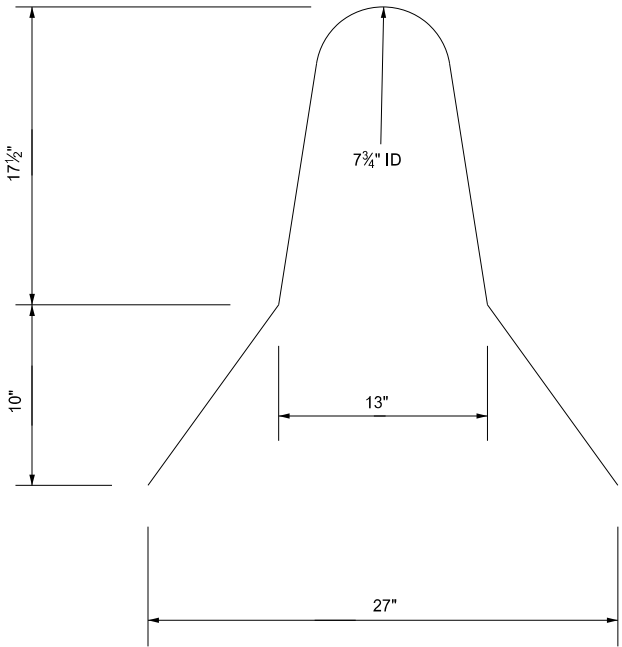
Bolt Connection Detail



Dap Detail



C1 Bar Detail



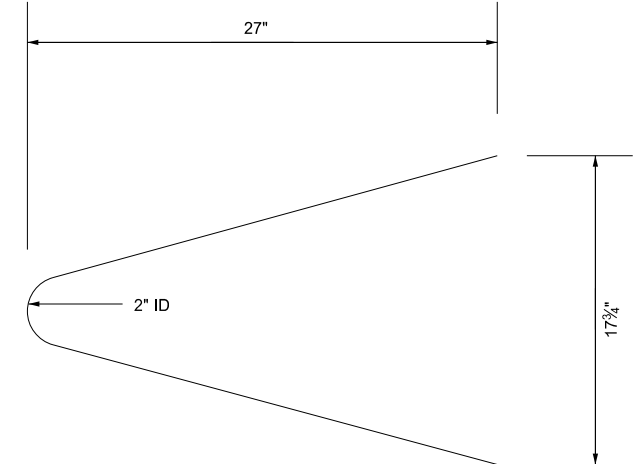
U3 Bar Detail

Notes:

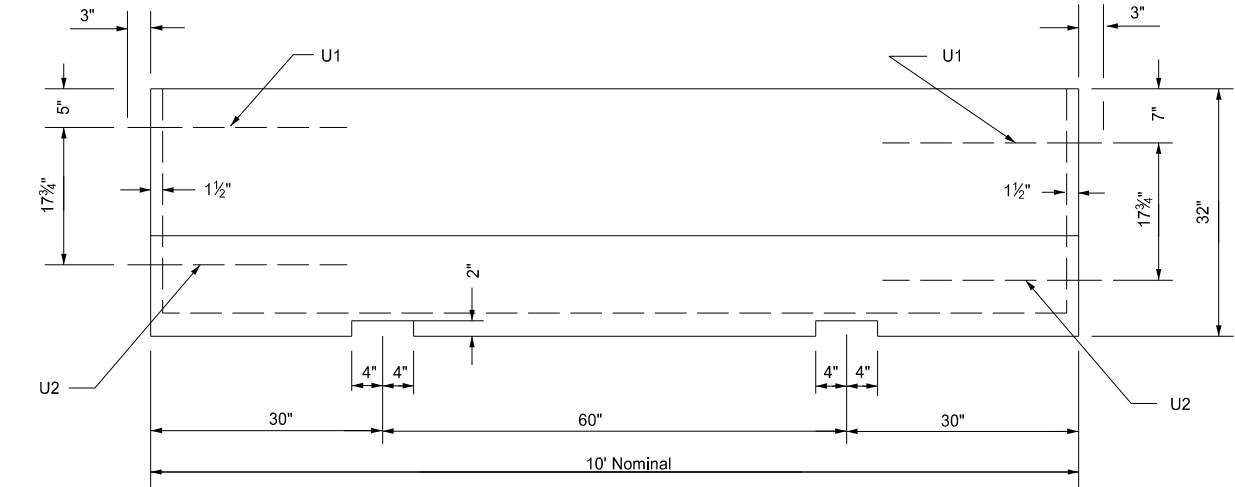
1. Galvanize all exposed hardware as per ASTM A153, except for the loop inserts.
2. Use AAE-3 Concrete.
3. Provide steel in accordance with Section 612 of NDDOT Standard Specifications.
4. Imprint barrier ends A and B as shown with 4 inch letters. Field match A end with B end.
5. Place barrier markers at the center of the barrier at 20' centers.
6. Connect barrier sections with 1 1/4" Dia A-307 double hex connecting bolt. Maintain bottom nut and washer connection for duration of barrier installation.
7. Place barrier to minimize openings between individual sections.



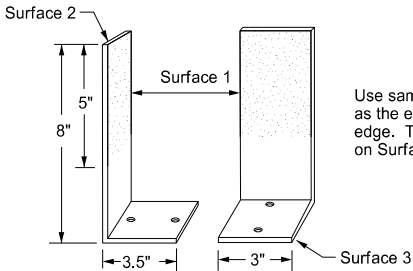
U1 Bar Detail



U2 Bar Detail



Side View



Barrier Marker Detail

Use same color reflective faces as the edge line along barrier edge. Two way reflective on Surface 1 & 2.

Marker Body
Use high impact, weatherable engineering thermo-plastic material conforming 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

Reflective Tape
Use 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 for the reflector:

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

Adhesive
Use factory applied solid butyl rubber 1/8" thick, 2" wide on 2 1/4" wide release paper on surface 3 to temporarily mount markers to portable concrete barrier.

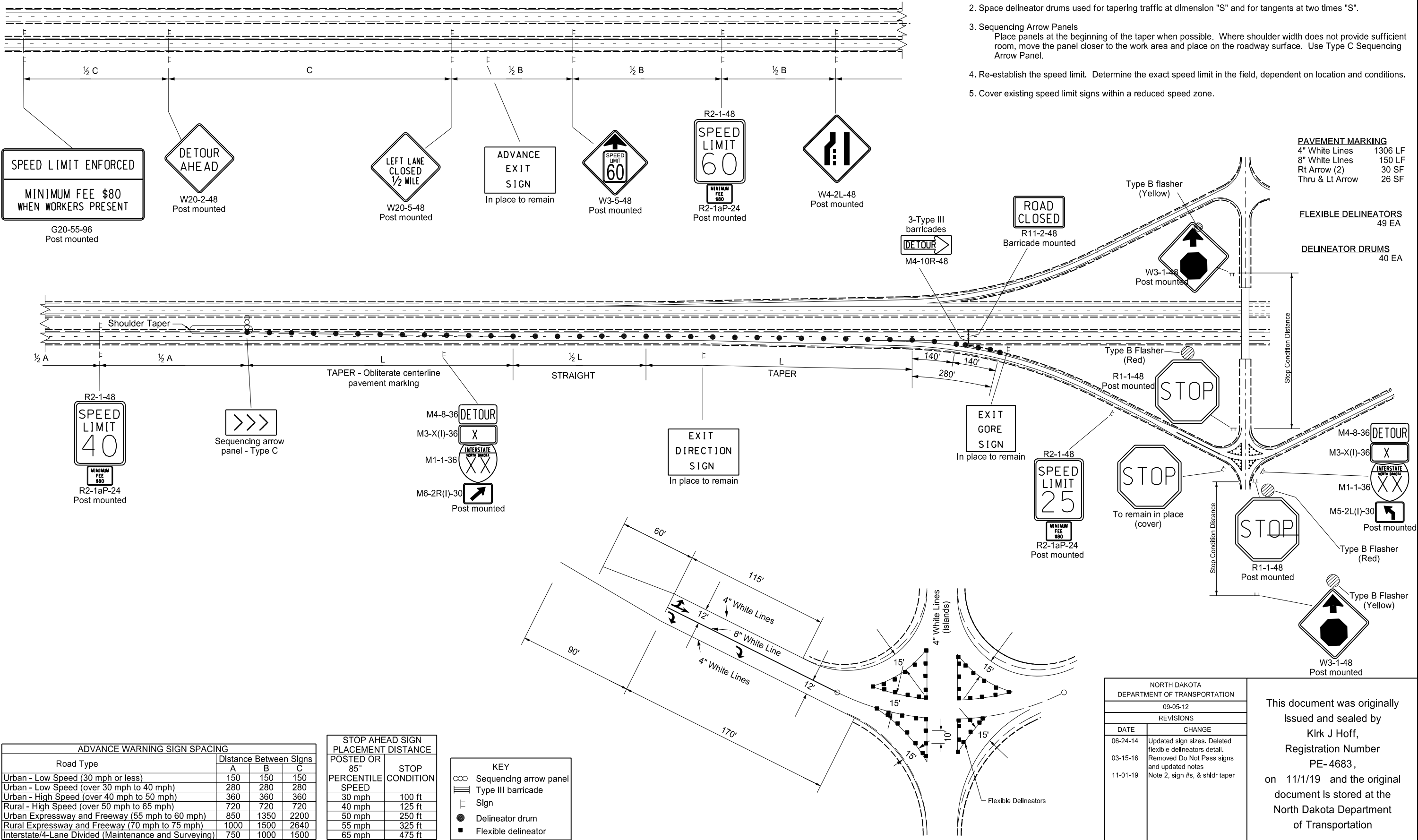
Bar List				
Mark	Size	No.	Length	Shape
C1	4	6	9'- 4"	Straight
U1	4	2	4'- 8"	Bent
U2	4	2	4'- 10 1/4"	Bent
U3	4	15	5'- 4"	Bent

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-20-12	
REVISIONS	
DATE	CHANGE
9-27-17 11-01-19	Updated to active voice New Design Engr PE Stamp

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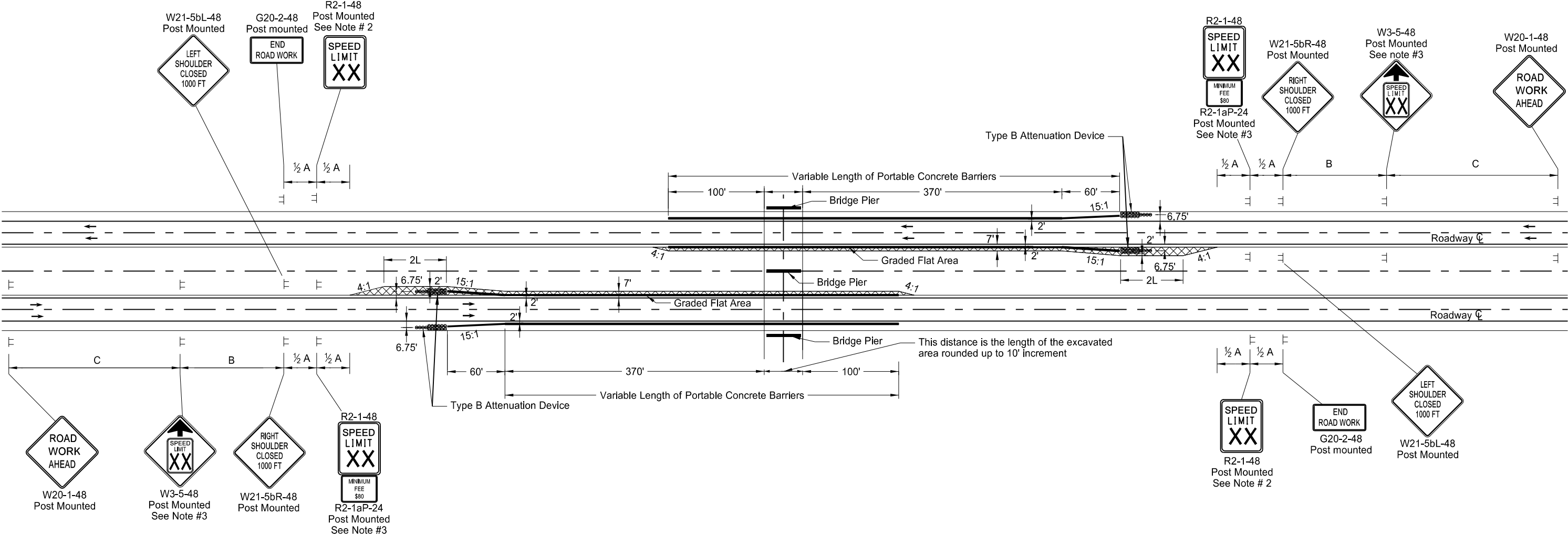
INTERSTATE ROAD CLOSURE USING RAMPS
CLOSURE FOR MORE THAN FIVE DAYS
and Crossroad is not Closed

- Notes:
1. Variables
S = Numerical value of speed limit or 85th percentile prior to work starting.
W = The width of the taper.
L = Minimum length of taper, or SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater, or WxS/60 for urban, residential, and other streets with speeds of 40 mph or less.
2. Space delineator drums used for tapering traffic at dimension "S" and for tangents at two times "S".
3. Sequencing Arrow Panels
Place panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface. Use Type C Sequencing Arrow Panel.
4. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
5. Cover existing speed limit signs within a reduced speed zone.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09-05-12	
REVISIONS	
DATE	CHANGE
06-24-14	Updated sign sizes. Deleted flexible delineators detail.
03-15-16	Removed Do Not Pass signs and updated notes
11-01-19	Note 2, sign #s, & shldr taper

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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

- NOTES:
- Use when a bridge structure is being constructed.
 - Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
 - Determine the reduced speed limit based on the in place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½ B.
 - Close roadway at separations or use ramps at interchanges during removal and installation of beams. See notes in the plans for traffic control requirements for this operation.

L = length of attenuation device

KEY

Embankment

Sign

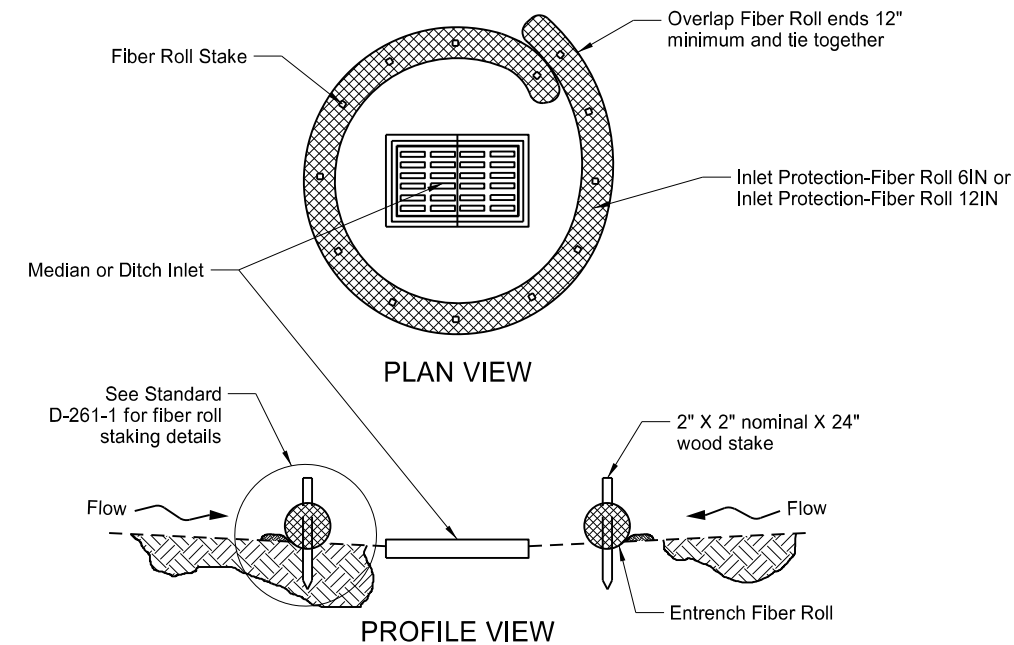
Type B Attenuation Device

Precast Concrete Median Barrier

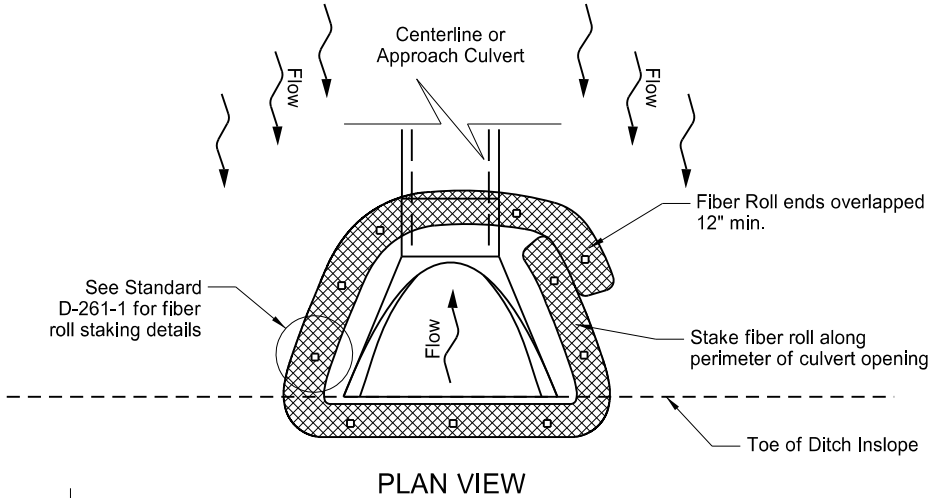
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-18-15	
REVISIONS	
DATE	CHANGE
8-18-15 9-27-17 11-01-19	Revised Standard Description Updated to active voice Atten Device, hatching, & sign #s

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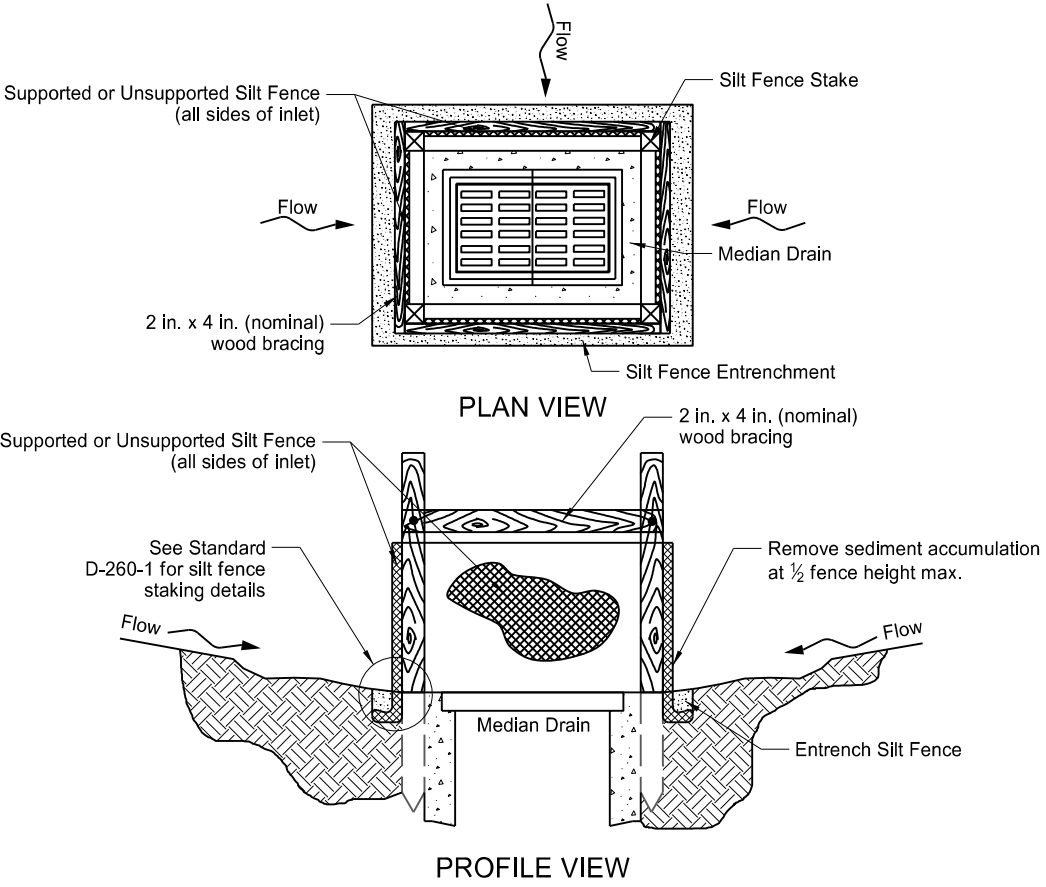
EROSION AND SILTATION CONTROLS
MEDIAN OR DITCH INLET PROTECTION



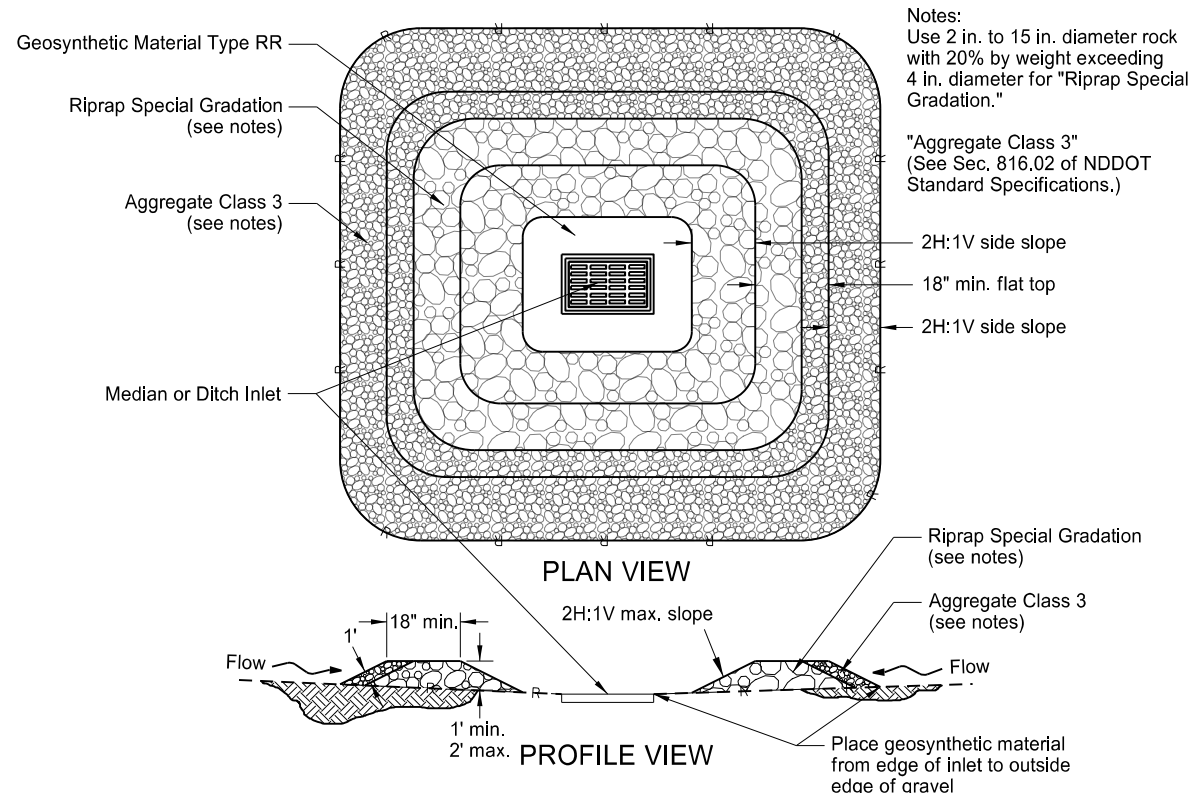
FIBER ROLL PROTECTION
(MEDIAN OR DITCH INLET)



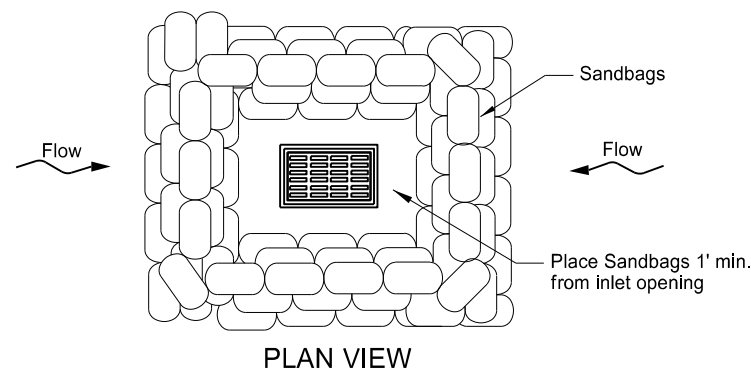
FIBER ROLL PROTECTION
(INLET OF CULVERT)



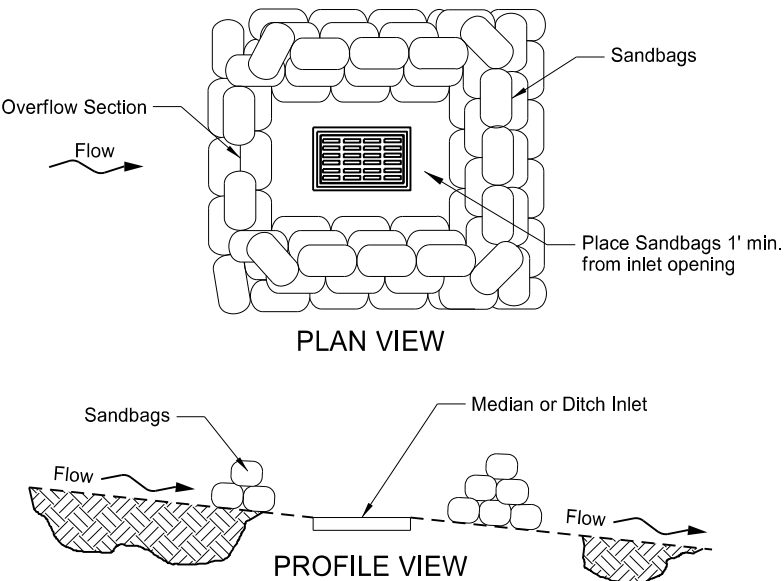
SILT FENCE PROTECTION
(MEDIAN OR DITCH INLET)



GRAVEL INLET PROTECTION
(MEDIAN OR DITCH INLET)



SANDBAG PROTECTION
(LOW POINT)

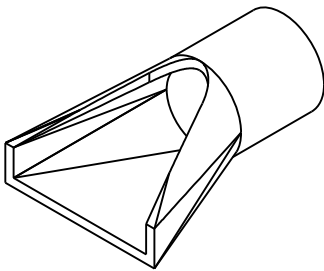


SANDBAG PROTECTION
(ON SLOPE)

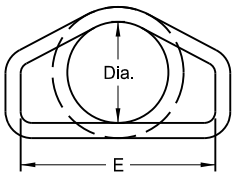
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Updated reference to standard drawing number for fiber roll staking details.
10-01-14	Updated reference to standard drawing number for silt fence.
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp.

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

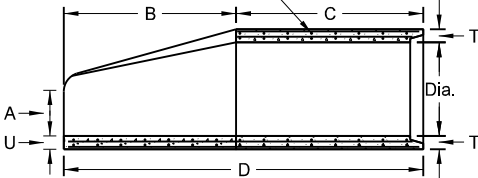


PERSPECTIVE

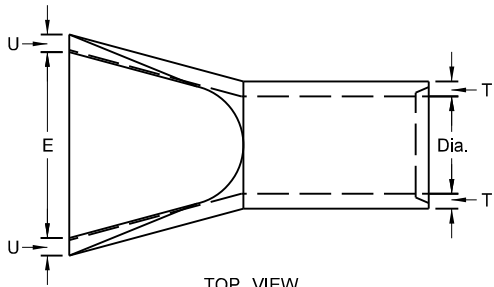


END VIEW

Standard Reinforcement for Class III pipe reinforced as per AASHTO M170



SIDE VIEW



TOP VIEW

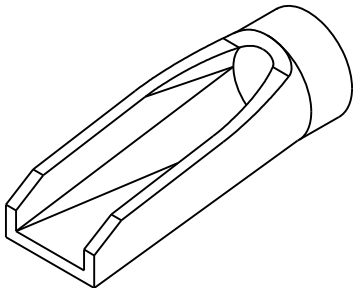
NOTES:

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

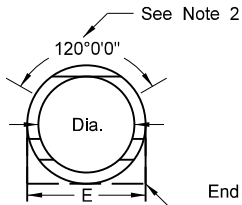
REINFORCED CONCRETE PIPE - FLARED END SECTION

Reinforcement to be equivalent to Class III RCP

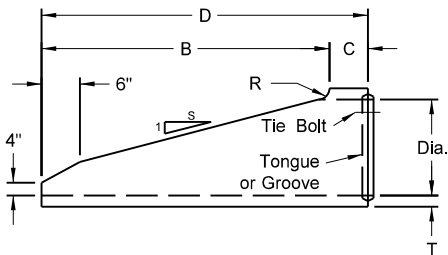
TRAVERSABLE END SECTION						
DIA	B	C	D	E	R	S
15"	4'	9"	4'-9"	1'-7 ¹ / ₂ "	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	3"	6
24"	6'	1'	7'	2'-6"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3 ¹ / ₂ "	4
36"	7'-3"	15"	8'-6"	3'-8"	3"	4



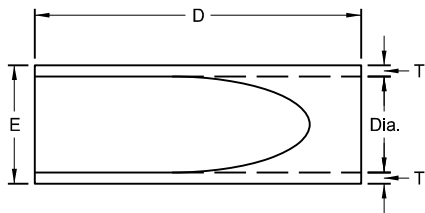
PERSPECTIVE



END VIEW



SIDE VIEW



TOP VIEW

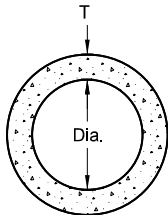
NOTES (Traversable End Section):

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

REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION

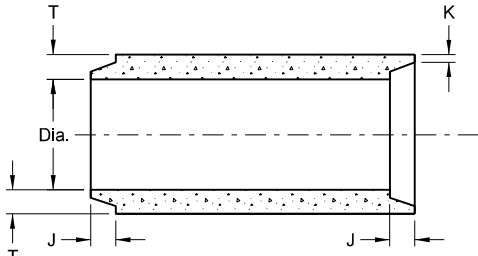
Reinforcement to be equivalent to Class III RCP

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

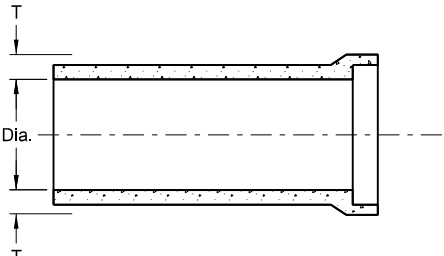


END VIEW

CIRCULAR PIPE

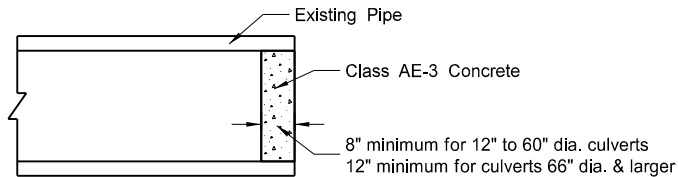


TONGUE & GROOVE JOINT



BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE



CONCRETE PIPE PLUG

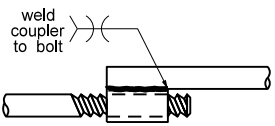
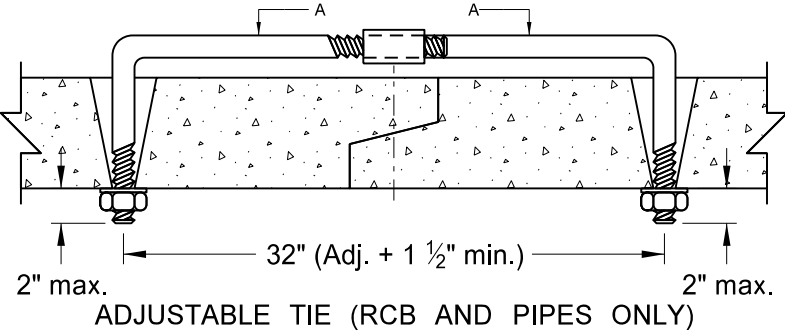
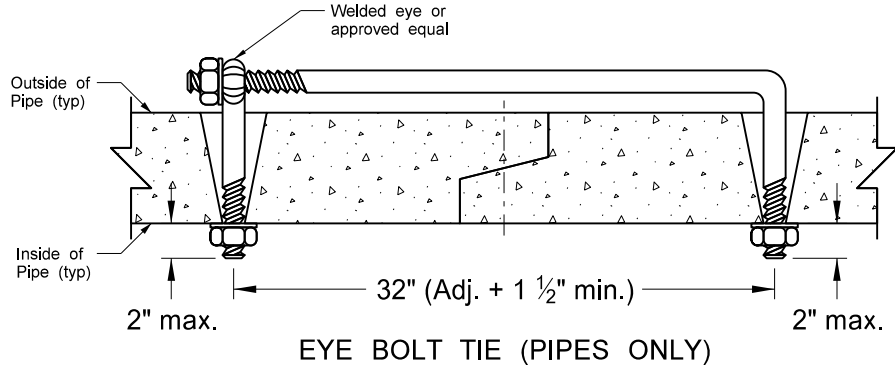
SEE STANDARD DRAWING D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

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

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

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

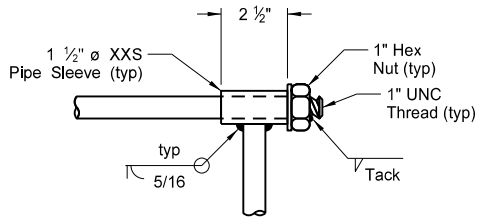
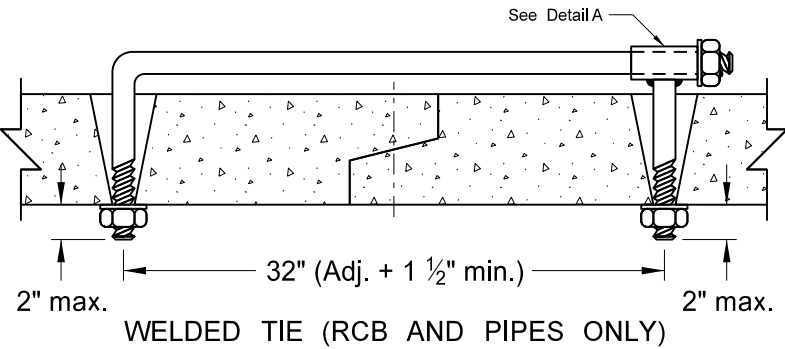
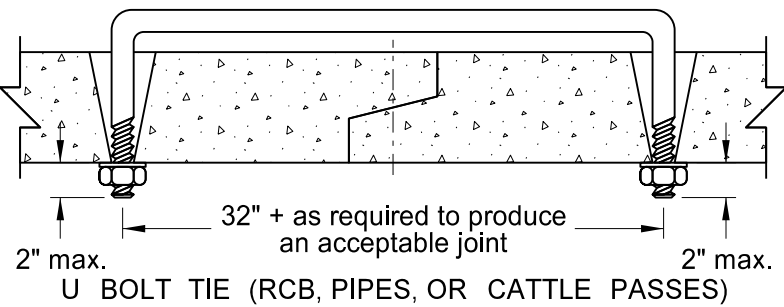
D-714-22



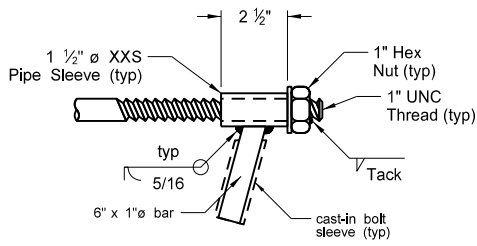
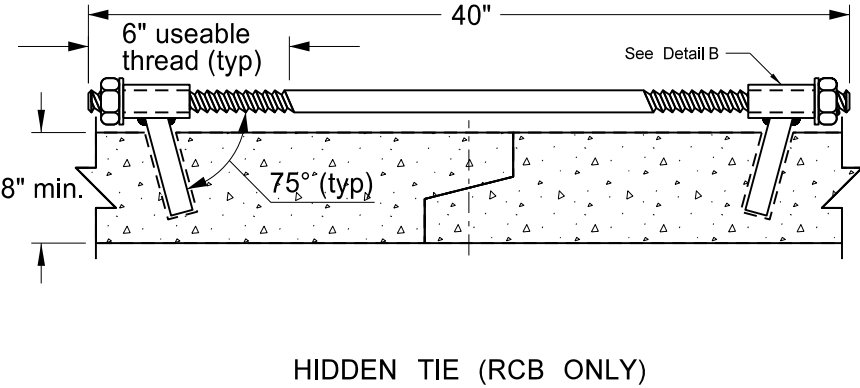
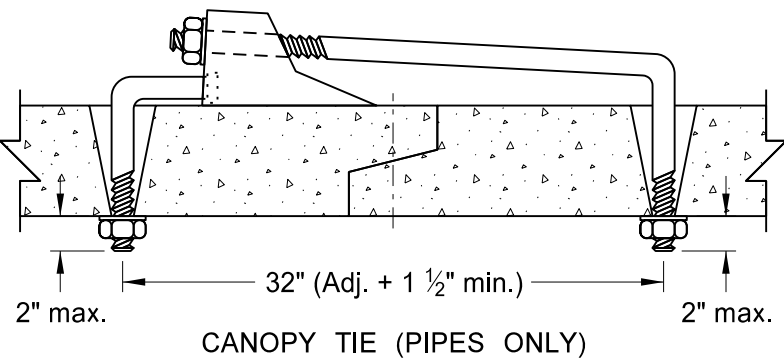
SECTION A-A

REQUIRED SIZE OF TIE BOLTS		
Pipe Size	Thread ϕ	XXS Pipe Sleeve Inner ϕ
18" - 24"	$\frac{5}{8}$ " See note 2	$\frac{3}{4}$ "
30" - 66"	$\frac{3}{4}$ "	1"
72" - 78"	1"	1 $\frac{1}{4}$ "
RCB/Cattle Pass		

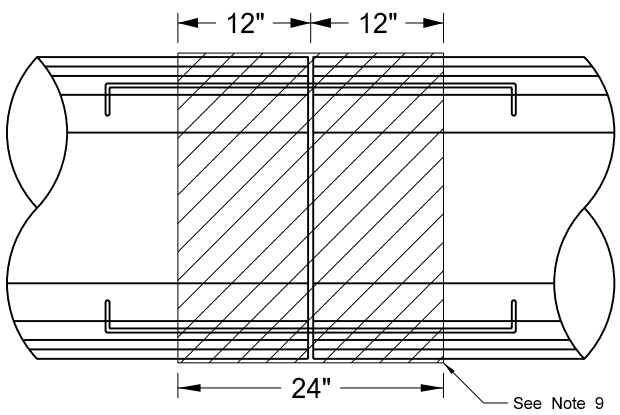
- NOTES:
- The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
 - Cattle Pass and Jacked and Bored pipes shall have pipe ties inserted from the inside of the pipes and grouted into place. Jacked and bored pipes with a diameter of 24" or less do not require pipe ties.
 - Nuts and washers are not required on Jacked and Bored pipes or pipes with a 24" diameter or less. Where nuts and washers are not used, the tie bars shall be inserted and grouted into place.
 - Ties are only for holding pipe or RCB sections together, not for pulling sections tight.
 - Tie bolt assembly shall be hot dip galvanized in accordance with AASHTO M232.
 - Holes in pipes to accommodate tie bolts can be precast or drilled. Tapered holes are permitted when precast. Holes shall have a diameter $\frac{1}{4}$ " larger than the diameter of the thread. Holes in precast RCB's shall contain cast-in bolt sleeves with an inside diameter of 1 $\frac{1}{4}$ ".
 - The contractor has the option of selecting the type of tie bolt used from those shown.
 - The cost of precasting or drilling the required holes and furnishing and installing the tie bolts shall be included in the price bid for the appropriate conduit or RCB pay item.
 - All centerline and approach RCP culvert joints shall be tied. Storm drain systems shall have the first three joints including the end section of all free ends tied. Free ends are defined as any storm drain end which does not terminate at an inlet or manhole. Outfall culverts with end sections which drain adjacent ditches are examples of free ends.
 - Place joint wrap prior to installing ties. Overlap the joint by 12" in both directions.
 - Tie bolts shall conform to ASTM A 36. Nuts shall be heavy hex and conform to ASTM A 563. Washers shall conform to ASTM F 436, Type 1. Welded pipe sleeves and cast-in bolt sleeves shall conform to ASTM A 53, Grade B.
 - RCB tie locations shall be as shown on the plans.



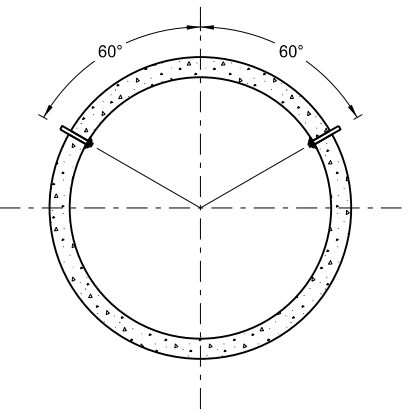
DETAIL A



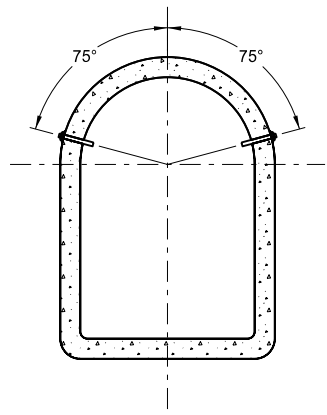
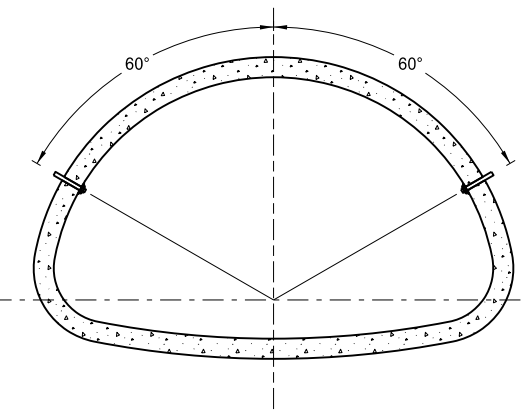
DETAIL B



PLAN VIEW



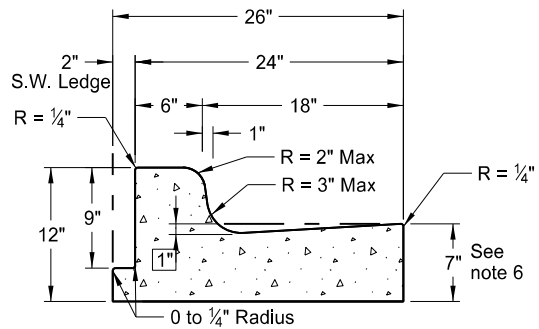
END VIEW



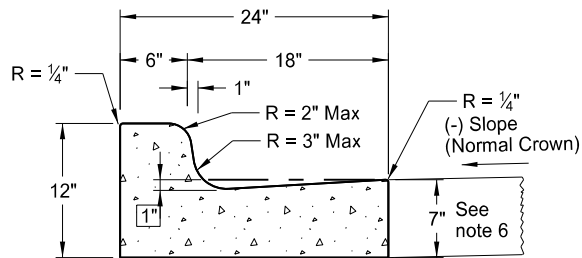
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
3-18-14	
REVISIONS	
DATE	CHANGE
7-21-15 6-6-17	Note 8 Notes 2-11, Table, Title, Labels

This document was originally issued and sealed by Jonathan David Ketterling, Registration Number PE-4684, on 6/6/2017 and the original document is stored at the North Dakota Department of Transportation

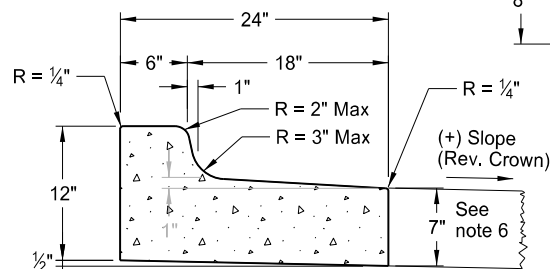
Curb & Gutter and Valley Gutter



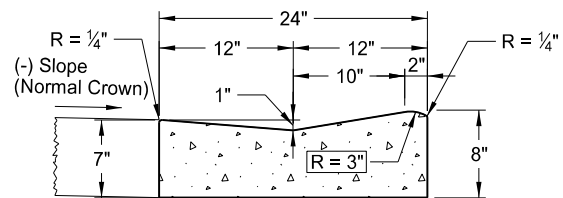
Curb & Gutter Type 1 (Sec. A & B)
Adjacent to Concrete Sidewalk,
Median, or Parking Lot.
(Sec. A shown. See Sec B for
additional details.)



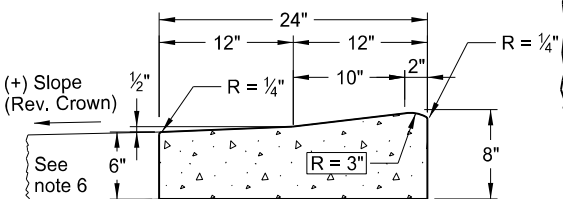
Curb & Gutter Type 1 (Sec. A)



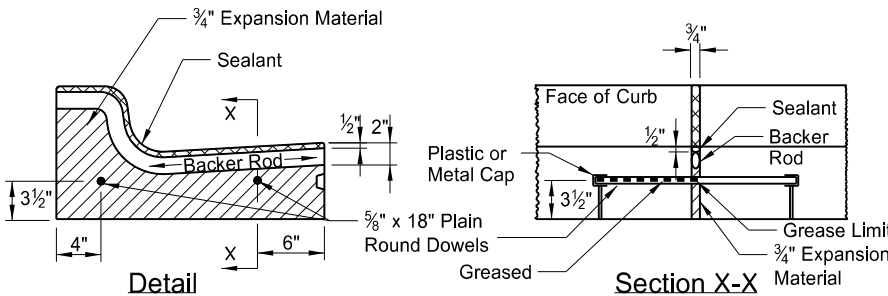
Curb & Gutter Type 1 (Sec. B)



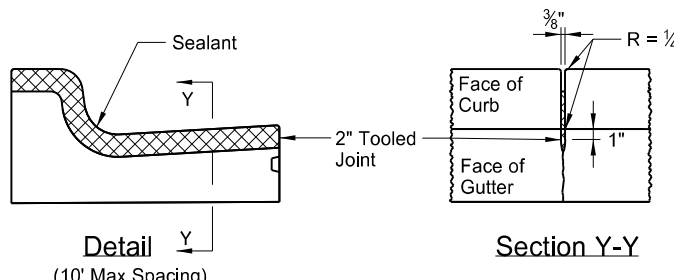
Mountable Curb & Gutter Type 1 (Sec. A)



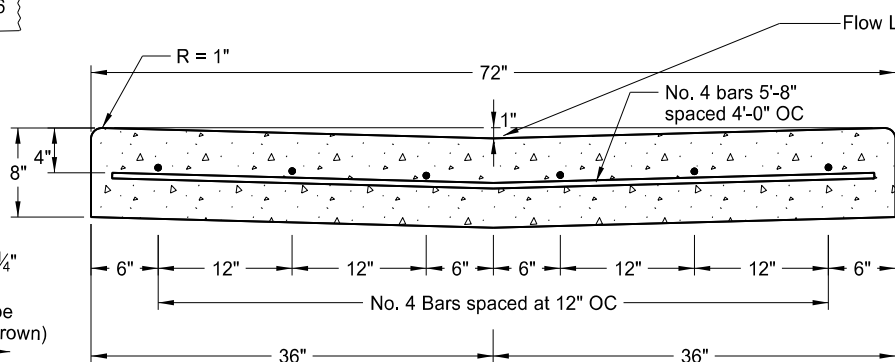
Mountable Curb & Gutter Type 1 (Sec. B)



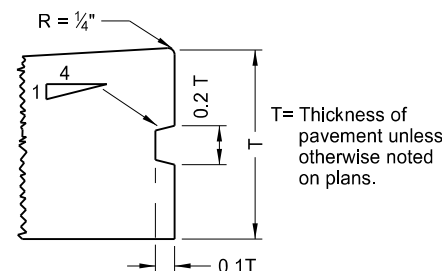
Isolation Joint



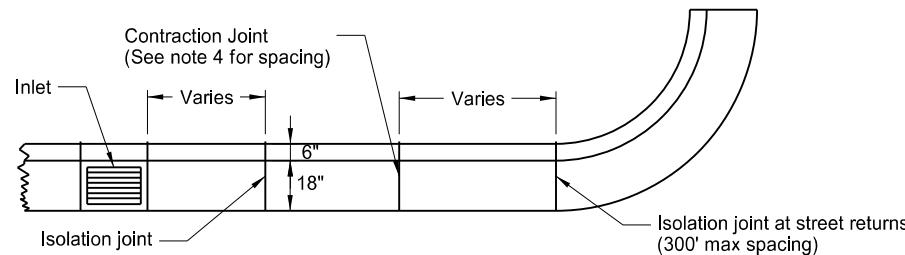
Contraction Joint



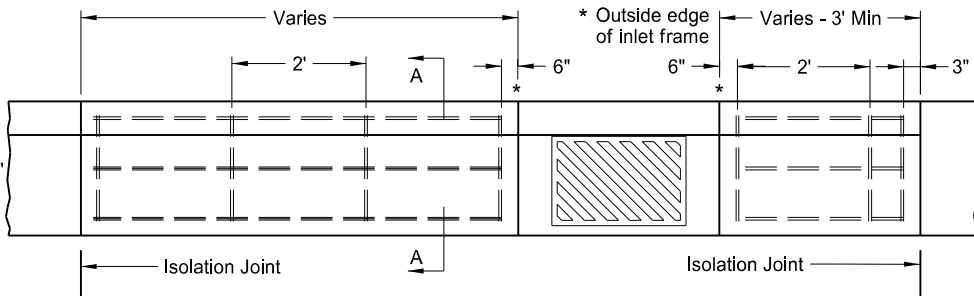
72" Concrete Valley Gutter Detail



Keyway Detail for Curb & Gutter
(To be used with PCC Pavement and Drives)

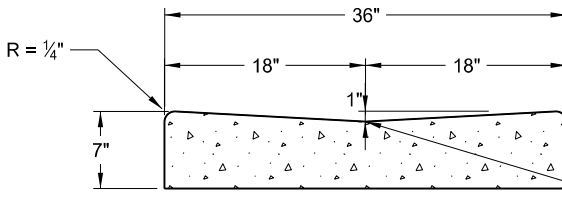


Joint Location Detail

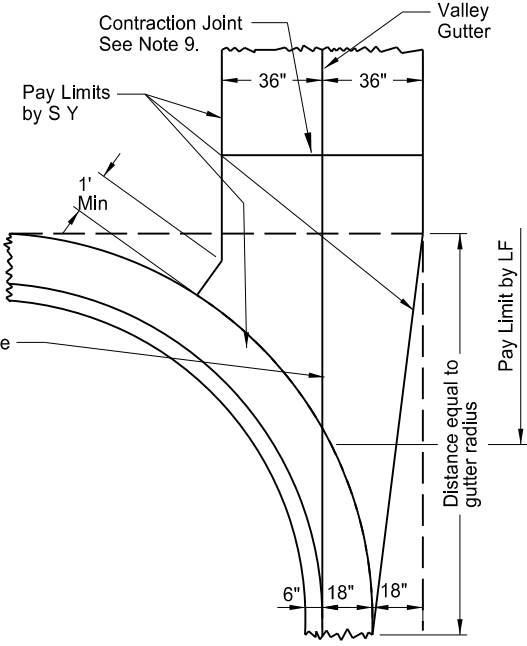


Curb & Gutter Reinforcing at Inlets

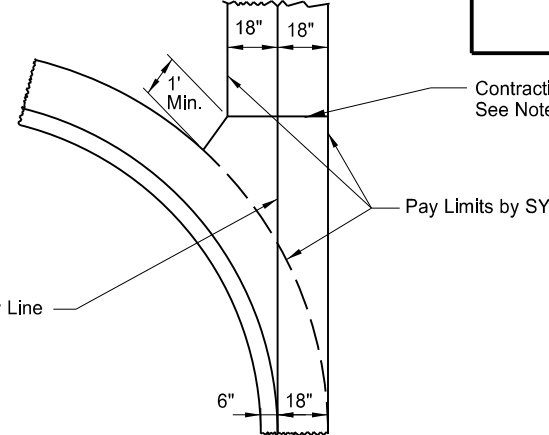
NOTE: Use #4 deformed reinforcing bars without splices. Include all costs for reinforcing bars at inlet locations (even inlets located on radii) in the price bid for "Curb and Gutter - Type 1." Extend reinforcement to the second joint (rebar placed through the first joint) in cases where the 3' min. panel length cannot be obtained.



36" Concrete Valley Gutter Detail



72" Concrete Valley Gutter Plan



36" Concrete Valley Gutter Plan

NOTES:

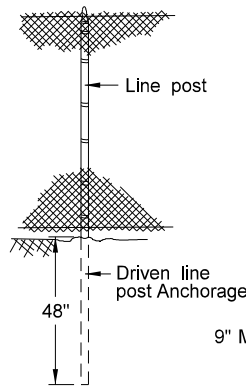
1. Use Curb and Gutter Type 1 (Sec. A & B). Use section "A" with (-) pavement slopes and section "B" with (+) pavement slopes.
2. Contraction Joints: Tool the Curb & Gutter 2" as shown on the contraction joint details.
3. Isolation Joints: Use 3/4" expansion joint filler for isolation joint material. Form the backer rod and joint sealant opening with a pre-cut piece of wood or other material approved by the engineer. Dowel supports are not required on the second pour at a cold joint. Install plastic or metal caps and greased dowels in the cold joint for the second pour.
4. Joint Spacing: For hot bituminous pavements use a 10' max joint spacing for the curb and gutter with panels on each side of the inlets. For concrete pavements match the joint spacing for the curb and gutter to the pavement joint on PCC Pavements (approximately 15' spacing.)
5. Joint sealing: Seal contraction and isolation joints as shown in the details. Use joint sealant for contraction joints that conforms to section 826.02B. Use sealant for expansion joints specified in note 3 above. Tool and install sealant in accordance with the manufacturer's recommendations.
6. Face of Gutter Depth: For hot bituminous pavement use 7" gutter depth as shown. For PCC pavements, match the gutter depth to the depth of adjacent PCC pavement or to construct a 7" depth as shown.
7. Tie curb and gutter to abutting PCC pavement with No. 3 bars, 1'-6" in length, spaced at 4' centers.
8. On street returns and other locations where new curb and gutter ends and does not abut existing curb and gutter, taper the last two (2) feet of the curb from 6" in height to 0". Install a 1/2" premolded full depth isolation joint, the same shape as the curb and gutter just ahead of the taper. Install an 18" tie bar across the joint.
9. Valley Gutter Joints: Form, saw, or score 1/8" min. to 3/8" max. width contraction joints (a minimum 2" depth) at approx 10' intervals. Seal the joints with hot poured elastic type joint sealer (Section 826.02A.2 of the Standard Specifications.) Include all costs for the joint and sealant in the price bid for Valley Gutter.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-7-2013	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
08-27-19	New Design Engr PE Stamp.

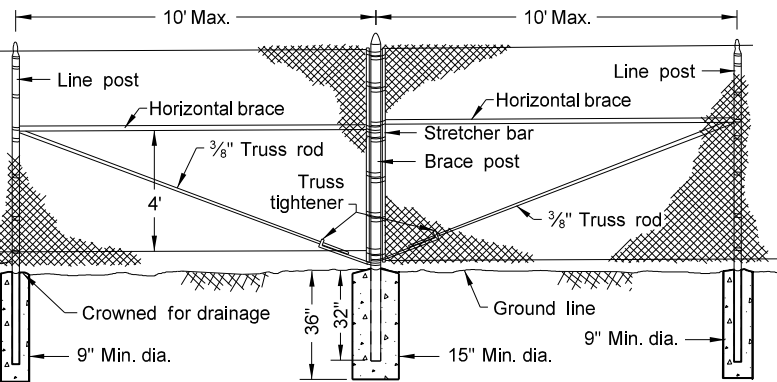
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PE- 4683,
on 8-27-19 and the original
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of Transportation

CHAIN LINK FENCE

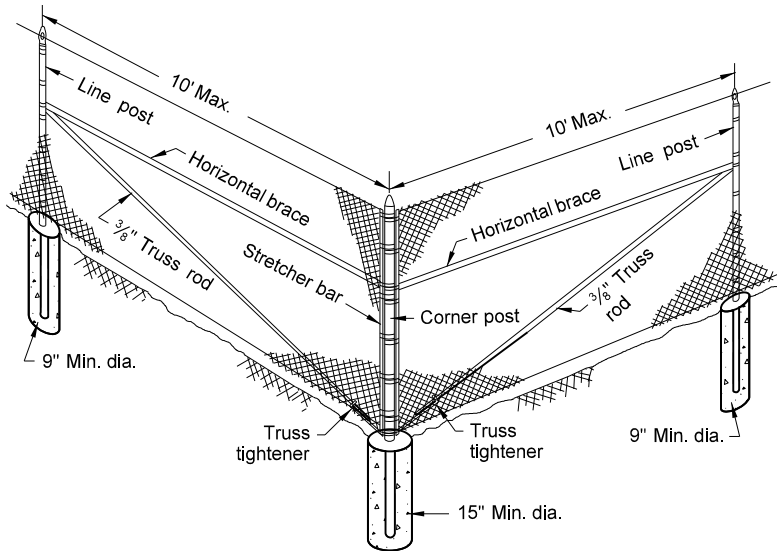
ALTERNATE
LINE POST
ANCHORAGE



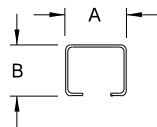
LINE POST



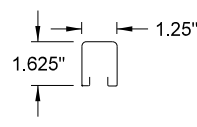
DOUBLE BRACE ASSEMBLY



CORNER ASSEMBLY

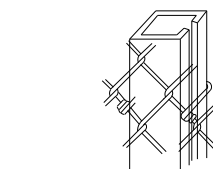


LINE POST

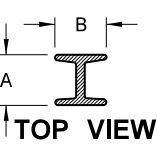


TOP & BRACE RAIL

ROLL FORMED POST

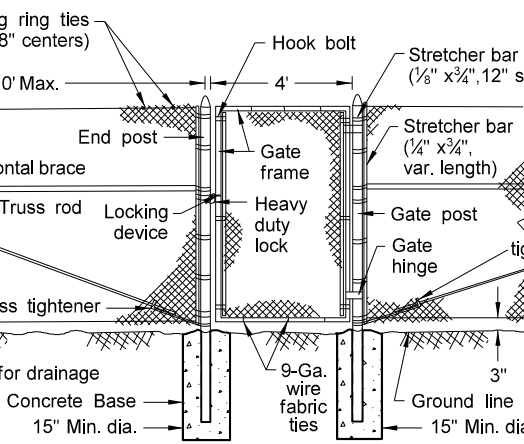


ROLL FORMED POST

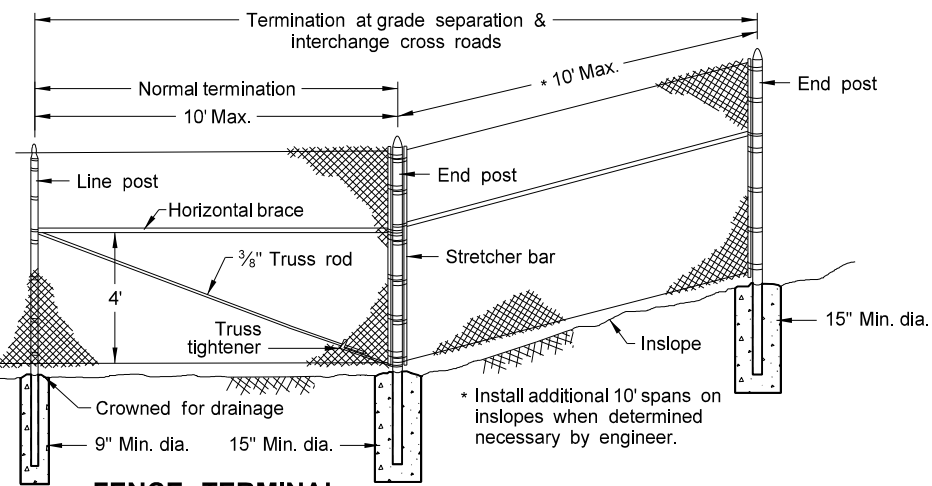


TOP VIEW

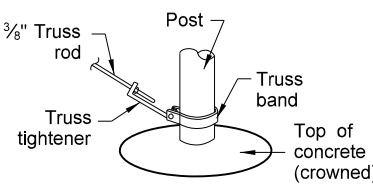
"H" COLUMN POST



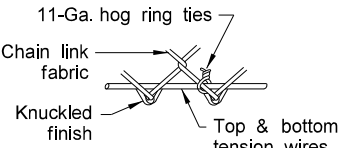
PEDESTRIAN GATE



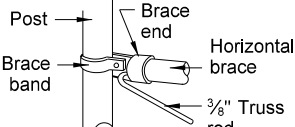
FENCE TERMINAL



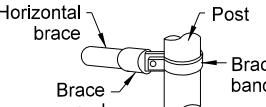
TRUSS ATTACHMENT
AT TERMINAL POSTS



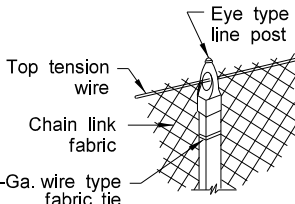
HOG RING
FASTENER DETAIL



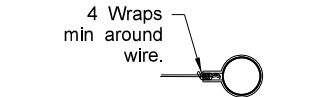
BRACE & TRUSS
ATTACHMENT



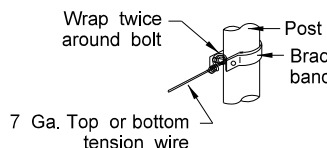
BRACE
ATTACHMENT



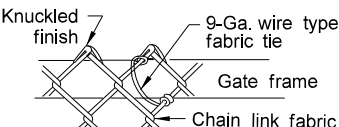
LINE POST TOP DETAIL



TOP VIEW



TENSION WIRE
ANCHORAGE



WIRE TYPE FABRIC
TIE DETAIL



STRETCHER
BAR BAND

VEHICLE GATE

NOTES:

1. Install double brace assemblies at locations shown on the plans or established by the Engineer. Place adjacent fence terminals, corner assemblies, or double brace assemblies at a maximum spacing of 1000 feet. No deduction in measured pay length of chain link fence for gates, corner assemblies, double brace assemblies, or fence terminals.
2. Provide miscellaneous fittings of the type and size recommended by the manufacturer of the fence and approved by the Engineer.
3. Use 6' High fabric unless otherwise shown on the plans.
4. Use Class YE concrete for post bases in accordance with Sec. 802 of the Standard Specifications. Use size No. 4 or 5 course aggregate for concrete mix, but do not change during the work, except by Engineer's written permission.
5. Use any of the types of posts shown in the table of equivalent post sizes and weights for the specified use.
6. Do not connect private fences to highway right-of-way fence.
7. Use a concrete anchorage for all end, corner, and brace posts, and for first line post(s) adjacent to terminal posts.

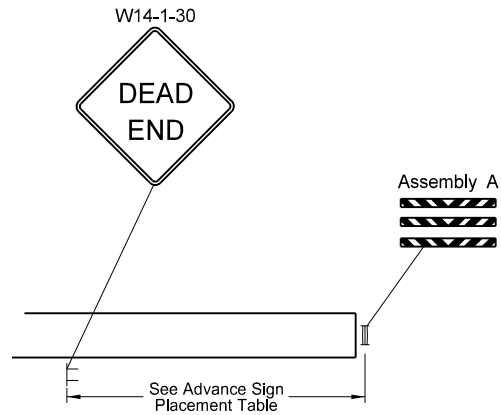
EQUIVALENT POST SIZES AND WEIGHTS										
USE OF POST	FABRIC HEIGHT	ROUND STEEL			ROLL FORMED			"H" COLUMN STEEL		
		Size	Weight - Lbs./Ft.		Size		Weight	Size		Weight
		Out. Dia.	Grade 1	Grade 2	A	B	Lbs./Ft.	A	B	Lbs./Ft.
LINE POST	6' or less	1.900"	2.72	2.28	1.875"	1.625"	2.40	2.25"	1.70"	3.26
	Over 6'	2.375"	3.65	3.12	2.25"	1.70"	2.78	2.25"	1.70"	3.26
END or CORNER	6' or less	2.375"	3.65	3.12	ROLL FORMED STEEL POSTS NOT PERMITTED			"H" COLUMN STEEL POSTS NOT PERMITTED		
	Over 6'	2.875"	5.79	4.64						
BRACE POST	6' or less	2.375"	3.65	3.12						
	Over 6'	2.875"	5.79	4.64						
GATE POST	6' or less	3.500"	7.58	5.71						
	Over 6'	4.000"	9.11	6.56						
EXTERIOR FRAME FOR GATE	Gate width 6' or less	1.660"	2.27	1.84						
	Gate width over 6'	1.900"	2.72	2.28						
HORIZONTAL BRACE	All	1.660"	2.27	1.84	1.625" x 1.25"		1.35			

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-5-09	
REVISIONS	
DATE	CHANGE
9-28-10	Revised Equivalent Post Sizes and Weights, details, & notes.
10-17-17	Updated to active voice.

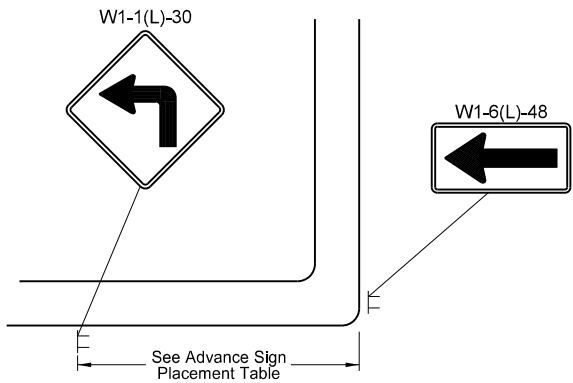
This document was originally issued and sealed by
Roger Weigel,
Registration Number
PE- 2930,
on 10-17-2017 and the original document is stored at the
North Dakota Department
of Transportation

BARRICADE AND ADVANCE SIGNS
FOR FORWARD ROADWAY TERMINATION

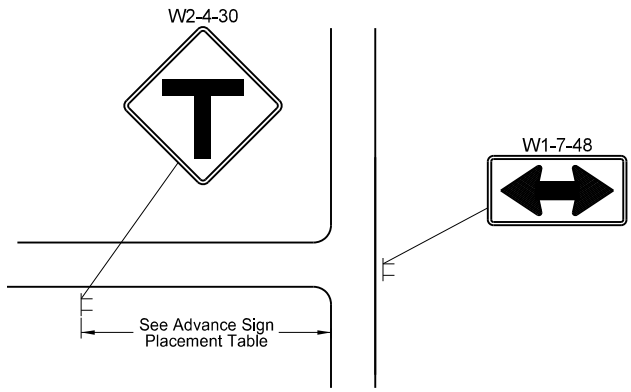
D-754-18



Roadway Termination
with Dead End
Type A



Roadway Termination
with Right or Left Turn
Type B



Roadway Termination
with T-Intersection
Type C

Notes:

Barricade Rails: Fabricate 8" or 9" x 120" rails from anodized aluminum and attach to perforated tube posts with two 3/8" diameter bolts per post placed between the reinforcing ribs.

Barricade Supports: Use material specified for sign supports.

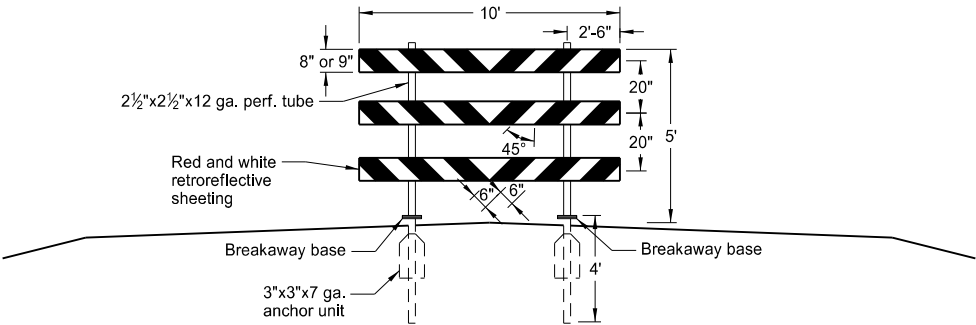
Method of Measurement: The number of each location completed, in place, and accepted by the Engineer.

Basis of Payment: Include all cost for furnishing, delivering, and installing all necessary signs and barricades at each location shown on the plans in the unit price bid for each location.

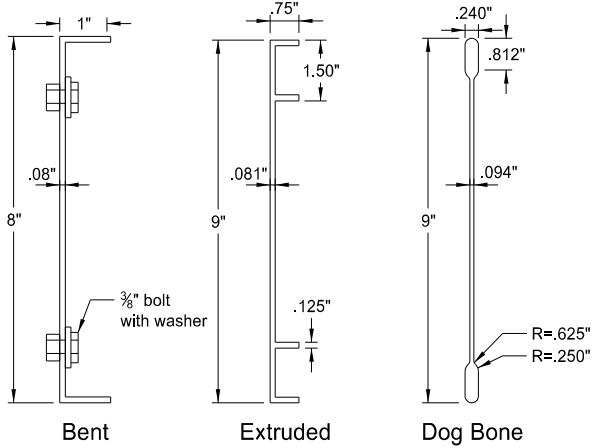
Vertical Clearance: 5' minimum, 7' residential and business districts where parking and/or pedestrian movements occur.

Place breakaway base and anchor unit as shown on D-754-24 or D-754-24A.

Use Type XI reflective sheeting.



Type III Barricade
Assembly A



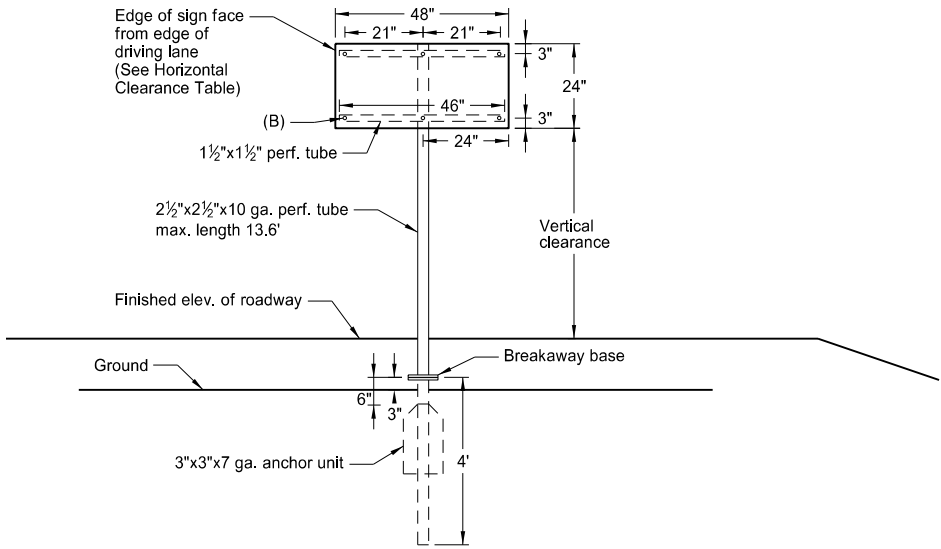
Barricade Bar Details

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

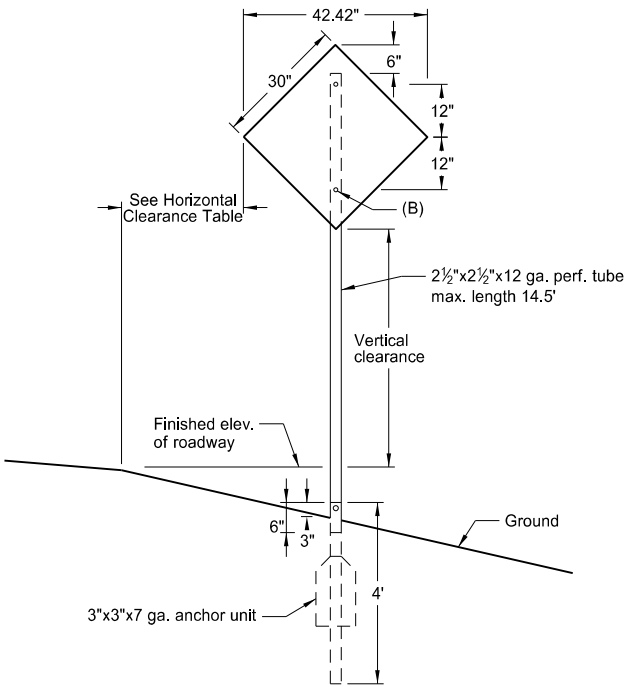
Advance Sign Placement Table (A)	
Posted or 85th Percentile Speed	Minimum Distance
0 to 40 mph	125 ft
45 mph	175 ft
50 mph	250 ft
55 mph	325 ft
60 mph	400 ft
65 mph	475 ft
70 mph	550 ft
75 mph	650 ft

(A) If roadway termination is 1/2 mile or less from a section line road, place the advanced warning sign just after the section line road.

(B) Punch round holes for 3/8" fasteners.



Assembly Detail for
Directional Arrow Signs



Assembly Detail for 30" Signs

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
11-4-13	Non bkwy base for 30" signs
7-8-14	Note added for Refl. sheeting and revised Assembly detail for directional arrow signs.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.

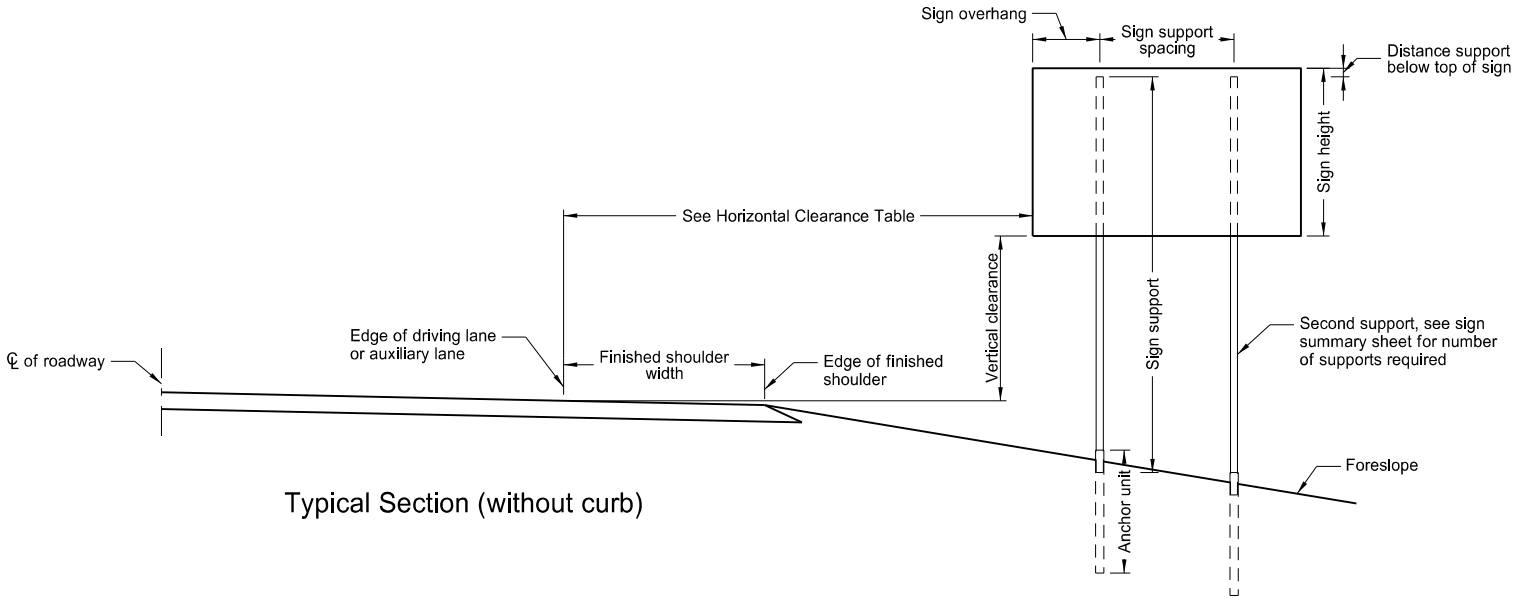
This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
on 8/29/19 and the original document is stored at the North Dakota Department of Transportation

PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

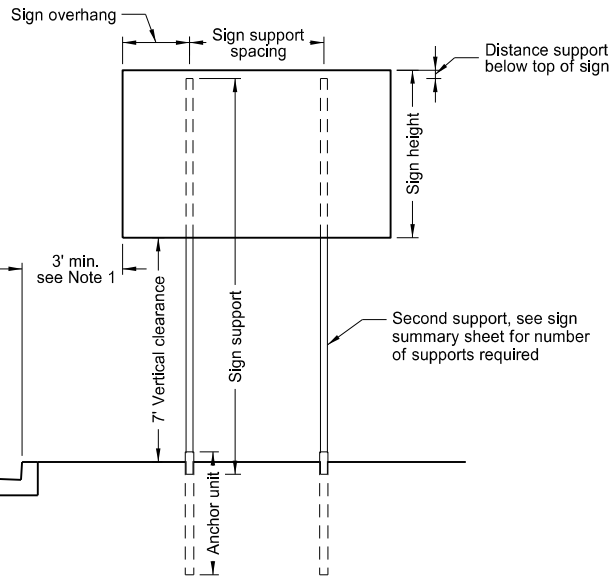
Notes:

1. Curbed Roadways: Use a 3' clearance from face of the curb except where right of way or sidewalk width is limited; Use a minimum 2' clearance. Increase the horizontal clearance if required to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.
2. Minimum vertical clearance: Provide at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane at the side of the road in rural districts. Provide at least 7' clearance to the bottom of the sign, where parking or pedestrian movements occur.
- Install signs on expressways a minimum height of 7'.
- Install adopt-a-highway signs on Freeways at least 7' above the edge of the driving lane.
- Maximum vertical clearance is 6" greater than the minimum vertical clearance.
3. Offset signs: Use a vertical clearance of 5' above the edge of the driving lane for signs placed 30 feet or more from the edge of the traveled way.
4. Provide a horizontal clearance from edge of shared use path to edge of sign of 3', except where width is limited. Provide a minimum clearance of 2'.

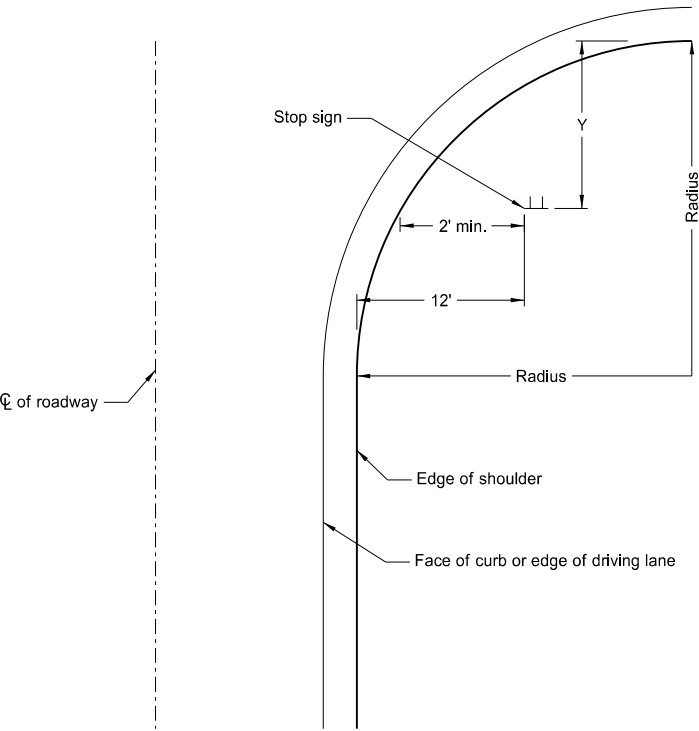


Typical Section (without curb)

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

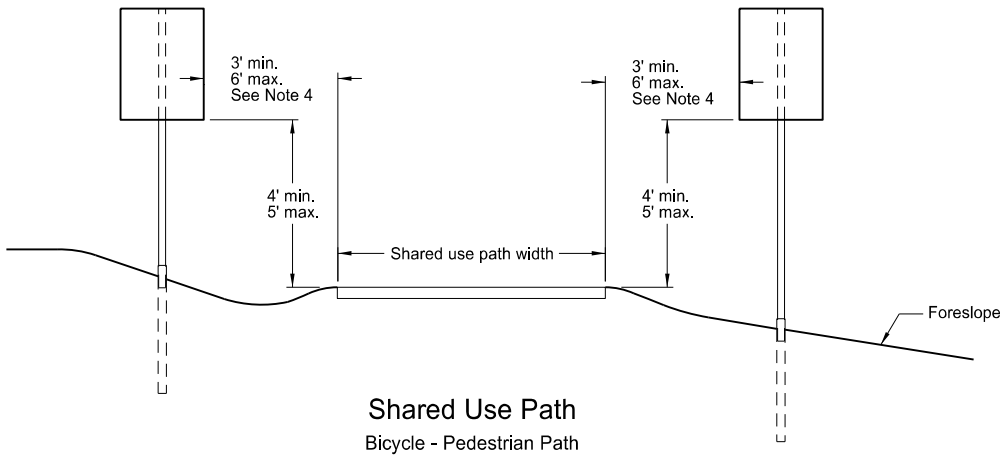


Typical Section (with curb)
Residential or Business District



Stop Sign Location
Wide Throat Intersection
Use layout for the placement of "Stop" signs.

Radius ft.	Y-max. ft.	Y-min. ft.
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



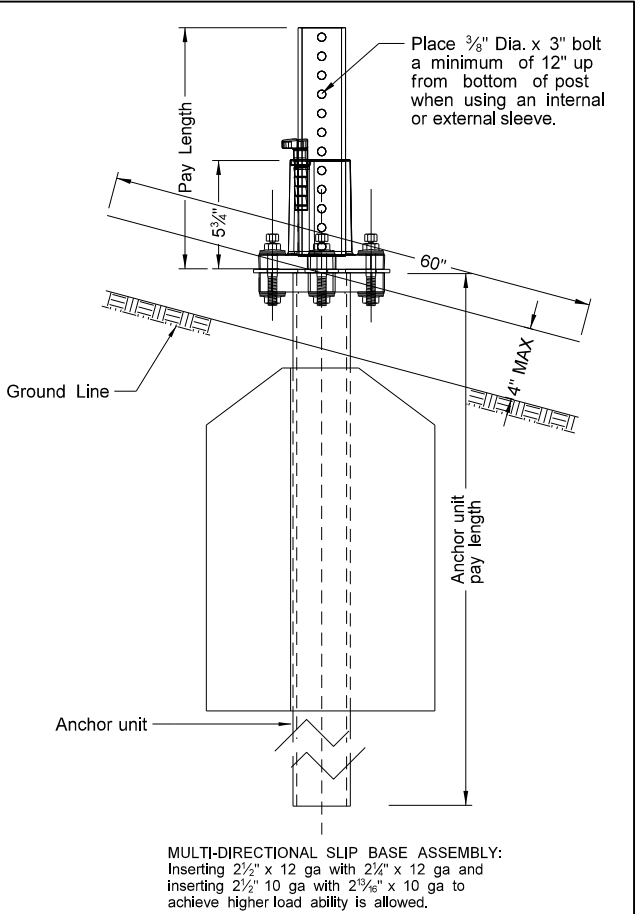
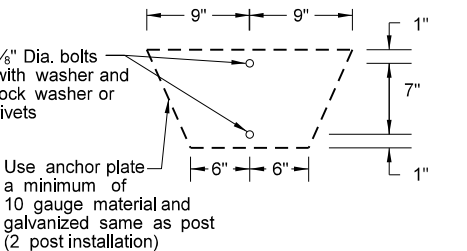
Shared Use Path
Bicycle - Pedestrian Path

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-8-14	Revised note 2, added note 4.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.

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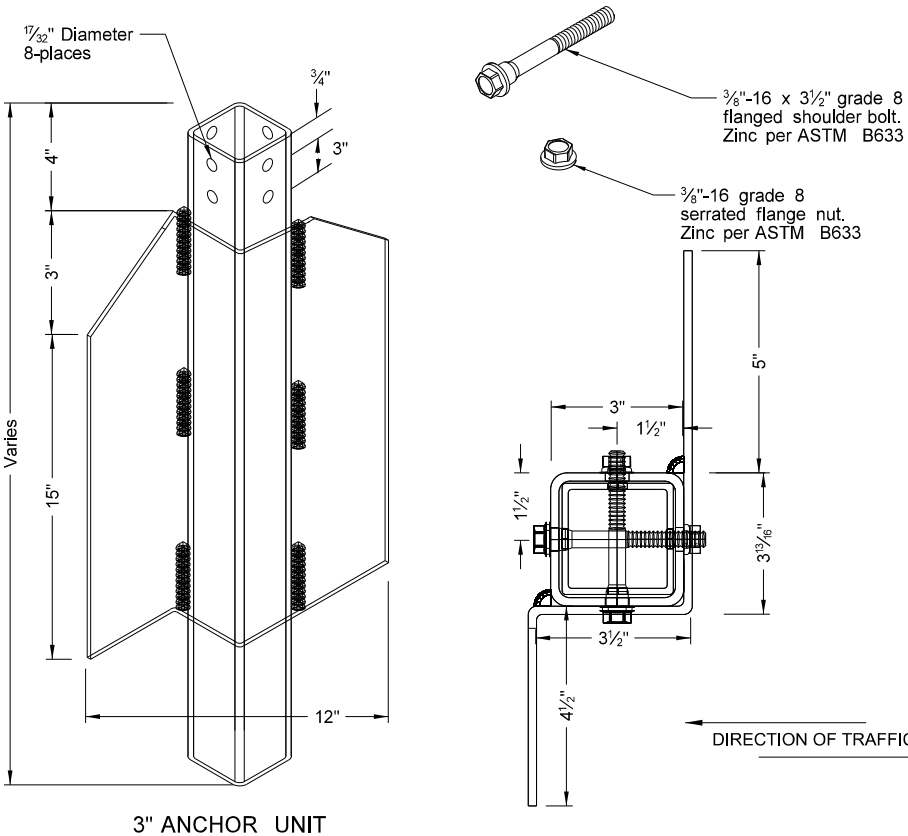
Telescoping Perforated Tube							
Number of Posts	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thick-ness Gauge
1	2	12			No	2 1/2	12
1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2 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) - Provide a shim as specified by the manufacturer when placing 2 1/2", 12 gauge posts in standard soils without breakaway bases. Provide breakaway base when placing the support in weak soils. The Engineer will 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.

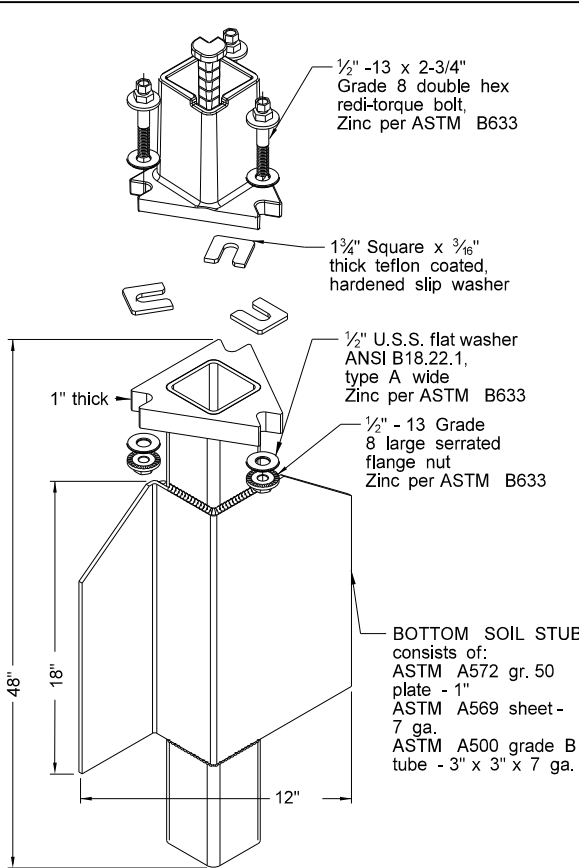


SHOULDER BOLT

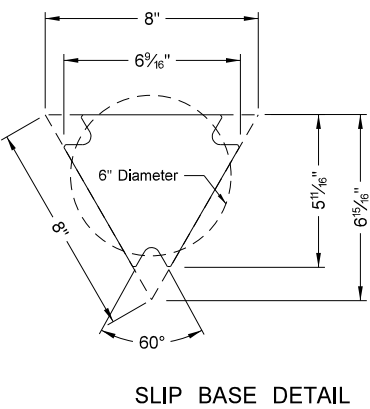
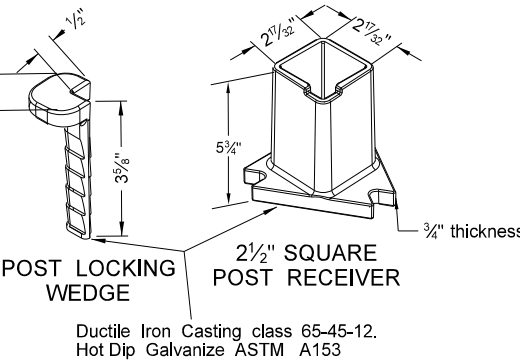
Shimming agent to reduce tolerance between 3" anchor unit and 2 1/2" post.
(use standard 3/8" diameter grade 8 bolt with proper shim)



Mounting Details Perforated Tube

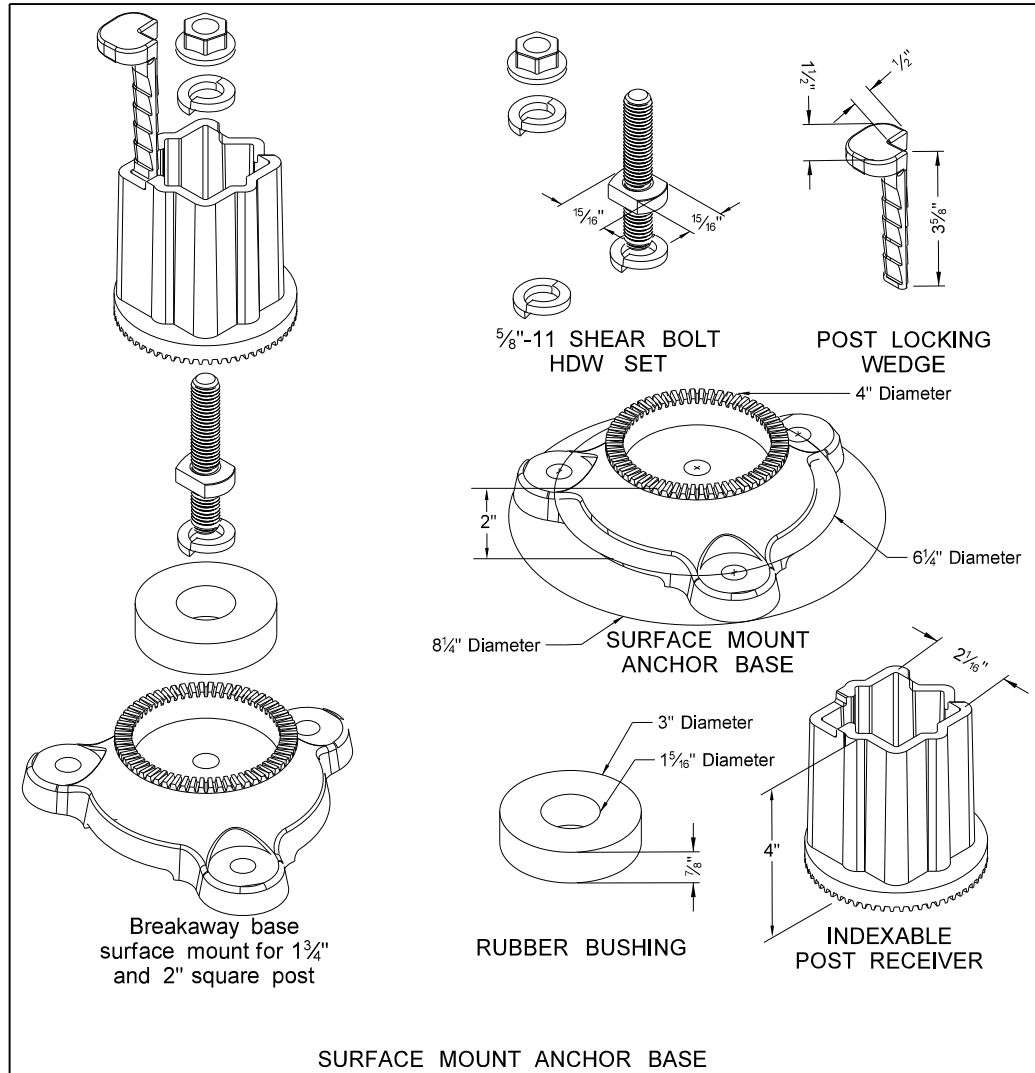


SLIP BASE FOR 2 1/2" POST



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.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice & corrected max height of base.
8-29-19	New Design Engineer PE Stamp.

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Breakaway Coupler System
for Perforated Tubes

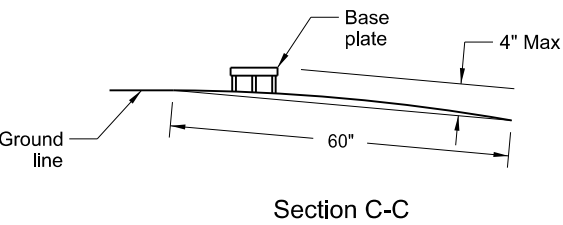
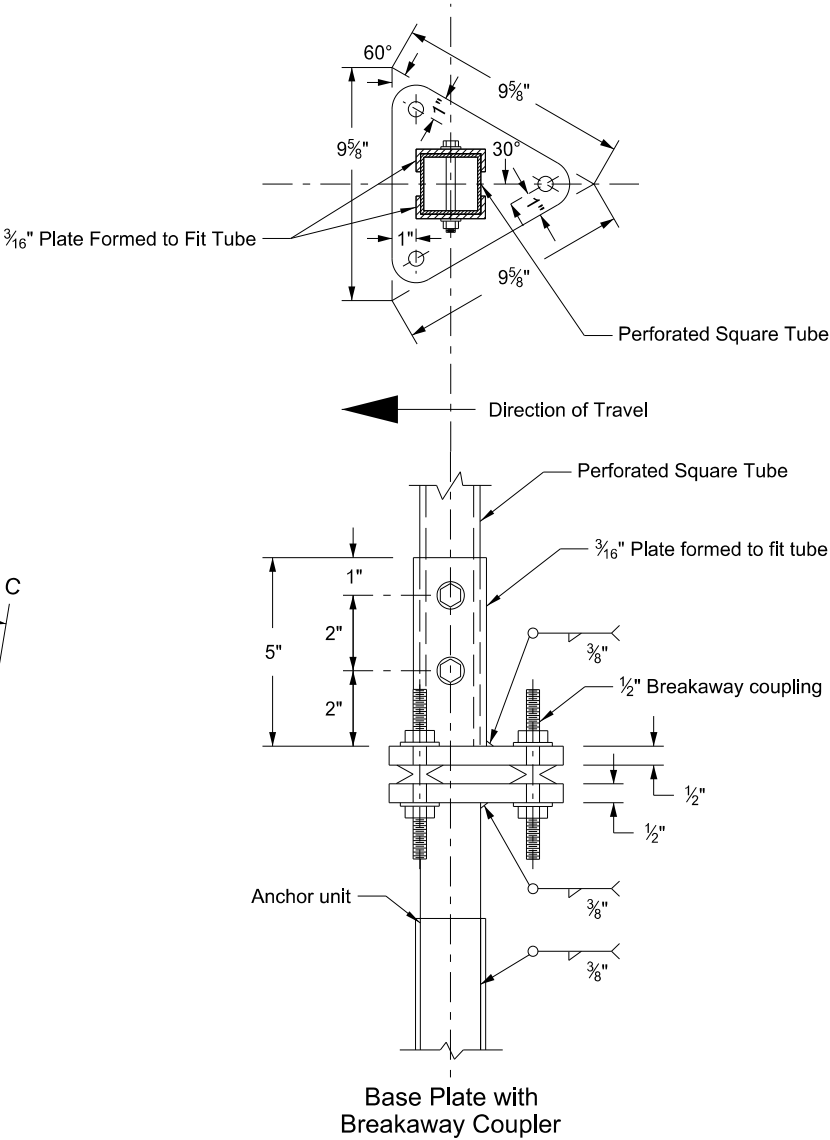
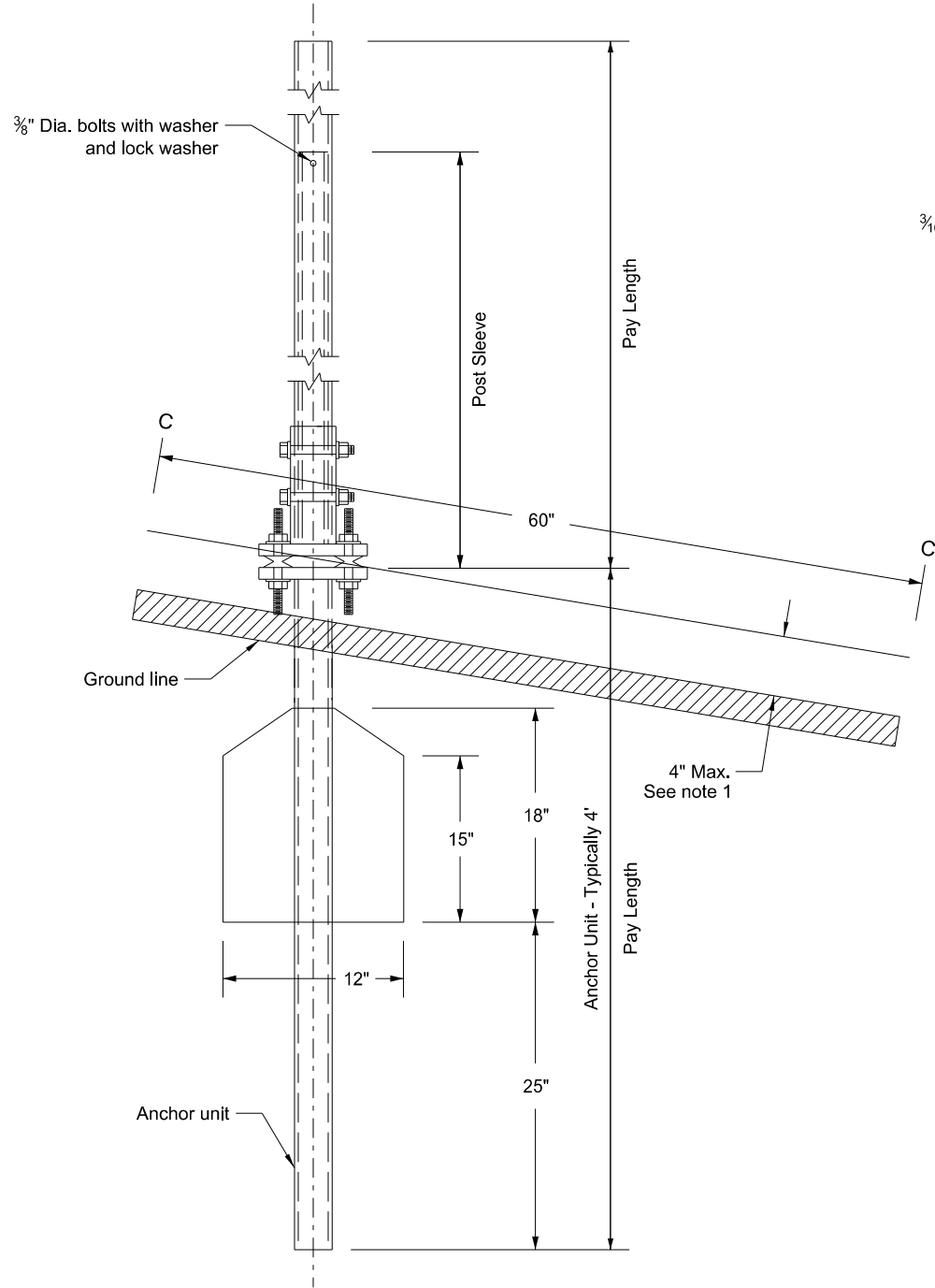
Notes:

1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.
2. Use anchor unit of the same size and specification as the post.
3. Provide a minimum 8' distance between the first and fourth post on four post signs.
4. Use the breakaway base system on standard D-754-24 or the breakaway coupling system manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements specified by DENT BREAKAWAY IND., INC. which meets the test requirements of NCHRP Report 350.

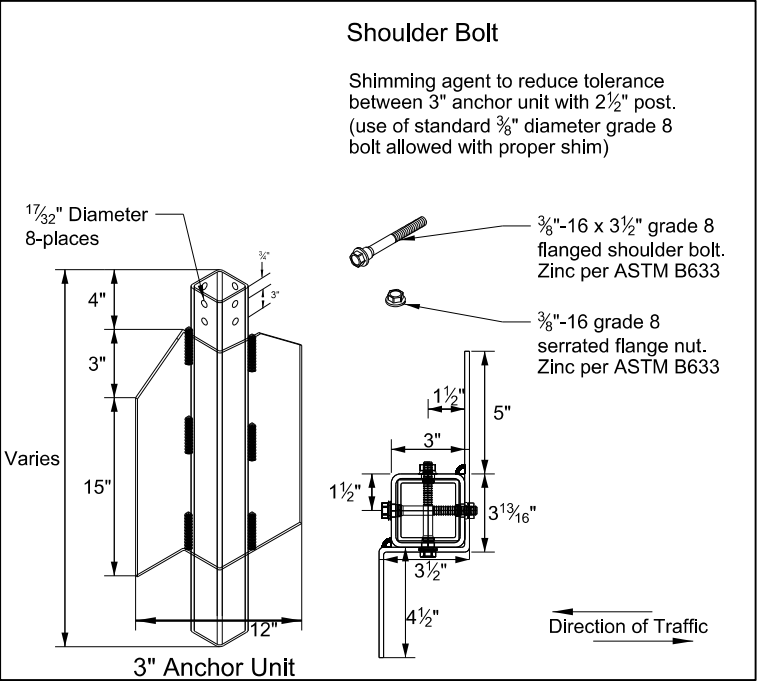
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2¼	12
1	2¼	12			No	2½	12
1	2½	12			(B)	3(C)	7
1	2½	10			Yes		7
1	2¼	12	2	12	Yes		7
1	2½	12	2¼	12	Yes		7
2	2½	10			Yes		7
2	2¼	12	2	12	Yes		7
2	2½	12	2¼	12	Yes		7
3 & 4	2½	12			Yes		7
3 & 4	2½	10			Yes		7
3 & 4	2½	12	2¼	12	Yes		7
3 & 4	2¼	12	2	12	Yes		7
3 & 4	2½	10	2¾	10	Yes		7

(B) - 2½" 12 gauge posts do not need breakaway bases unless support is placed in boggy, wet, or loose soil areas.

(C) - 3" anchor unit

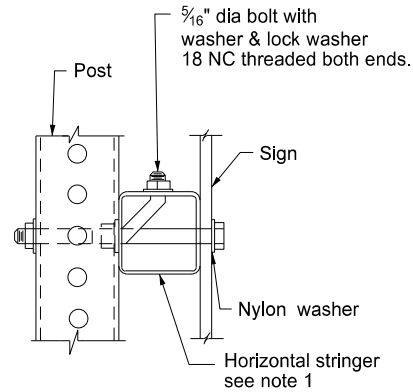


Max protection of the stub post is 4" above a 60" chord aligned radially to the center line of the highway and connecting any point, within the length of the chord, on the ground surface on one side of the support to a point in the ground surface on the other side.

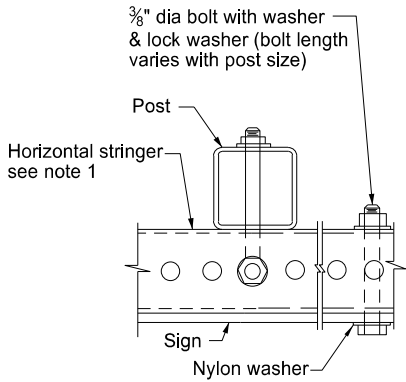


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10-3-2013		
REVISIONS		
DATE	CHANGE	
8-30-18 8-30-19	Updated notes to active voice. New Design Engr PE Stamp.	

Mounting Details Perforated Tube

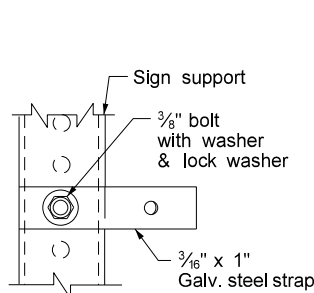


Side View

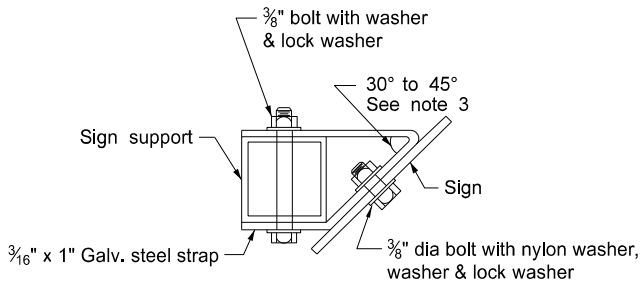


Top View

STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)

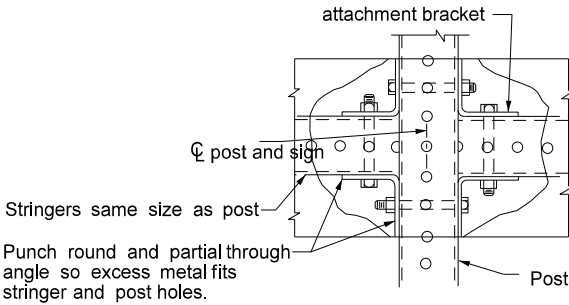


Side View



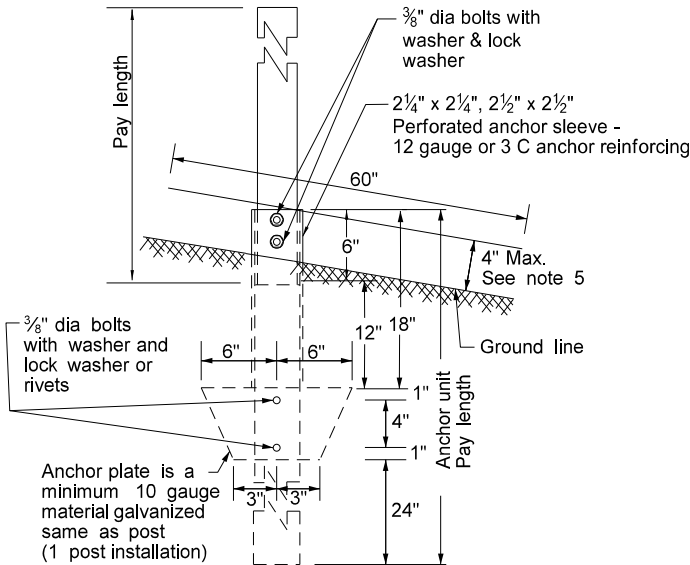
Top View

STRAP DETAIL

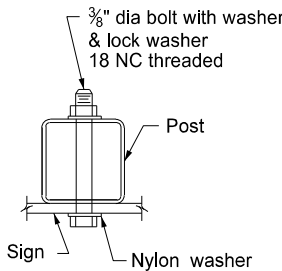


Stringers same size as post
Punch round and partial through angle so excess metal fits stringer and post holes.

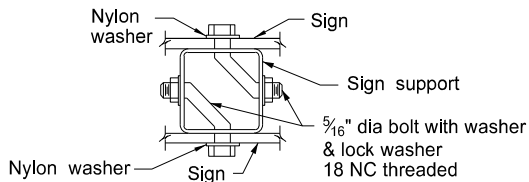
STREET NAME SIGNS AND ONE WAY SIGNS
SINGLE POST ASSEMBLY
ONE STRINGER OR BACK TO BACK MOUNTING



ANCHOR UNIT AND POST ASSEMBLY

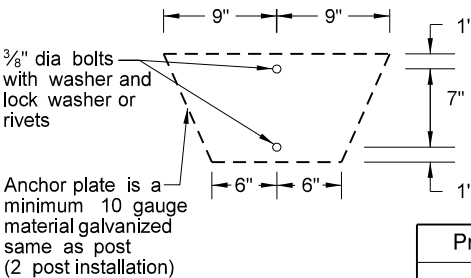


BOLT MOUNTING



Top View

BACK TO BACK MOUNTING



Anchor plate is a minimum 10 gauge material galvanized same as post (2 post installation)

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
1½ x 1½	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
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2¾ x 2¾	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.783

The 2¾" size 10 gauge is shown as 2.19" size on the plans.
The 2½" size is shown as 2.51" size on the plans.

Note:

1. Horizontal stringers - Use perforated tubes or 1¾" x ¾" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel z bar stringers.
2. Use minimum outside diameter 1½" ± 1/16" and 10 gauge thick metal washers on sign face.
3. Place No Parking signs with directional arrows at a 30 to 45 degree angle with the line of traffic flow. Turning the support to the correct angle for No Parking signs requiring the above angles is allowed. If the No Parking sign is placed with another sign that requires placement at a 90 degree angle with the line of traffic flow, use the detailed angle strap to mount the No Parking sign. Use flat washers and lock washers with all nylon washers.
4. Punching the sign backing and placing the bolt through the sign, the stringer and the post is allowed in lieu of using the bent bolt to attach the post to the stringer.
5. 4" vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.

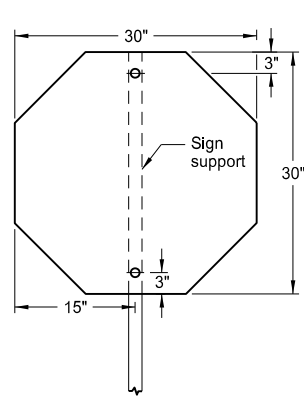
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2¼	12
1	2¼	12			No	2½	12
1	2½	12			(B)	3(C)	7
1	2½	10			Yes		7
1	2¼	12	2½(D)	12	Yes		7
1	2½	12	2¼	12	Yes		7
2	2½	10			Yes		7
2	2¼	12	2½(D)	12	Yes		7
2	2½	12	2¼	12	Yes		7
3 & 4	2½	12			Yes		7
3 & 4	2½	10			Yes		7
3 & 4	2½	12	2¼	12	Yes		7
3 & 4	2¼	12	2½(D)	12	Yes		7
3 & 4	2½	10	2¾	10	Yes		7

(B) - When placing 2½", 12 gauge posts in standard soils without breakaway bases, provide a shim as specified by the manufacturer. Provide breakaway base when placing the support in weak soils. Engineer will determine if soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2½" x 12 ga. x 18" minimum length external sleeve required.

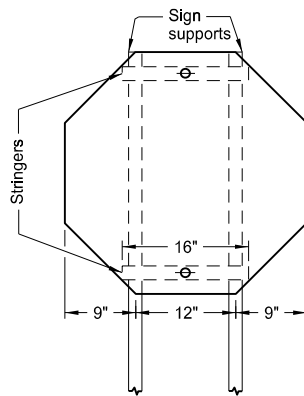
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8-6-09		
REVISIONS		
DATE	CHANGE	
7-8-14 8-30-18 8-30-19	Revised Note 3. Updated notes to active voice. New Design Engr PE Stamp.	

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

D-754-26

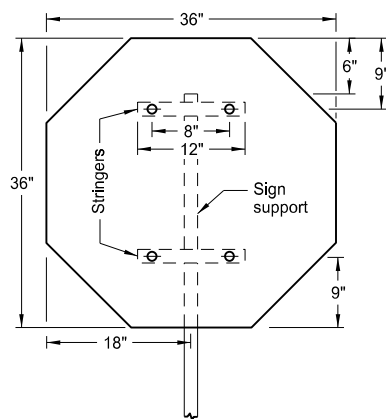


1 Post

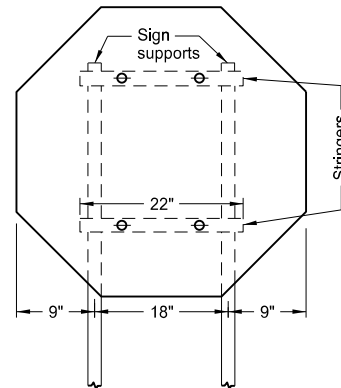


2 Posts

Assembly No. 1

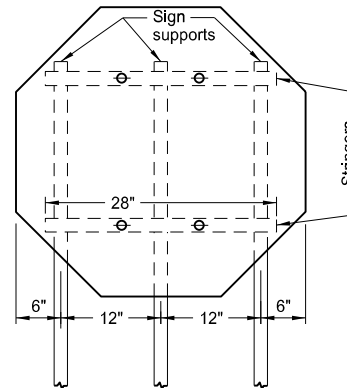


1 Post



2 Posts

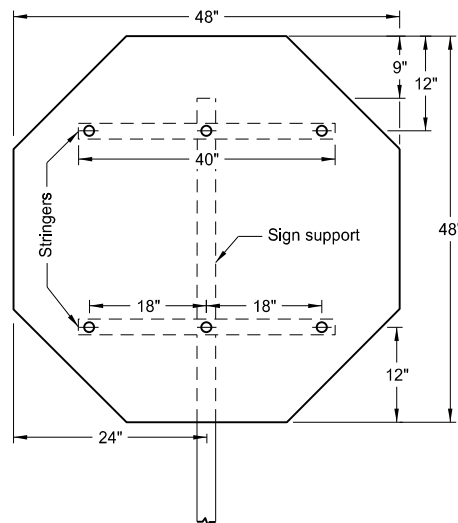
Assembly No. 2



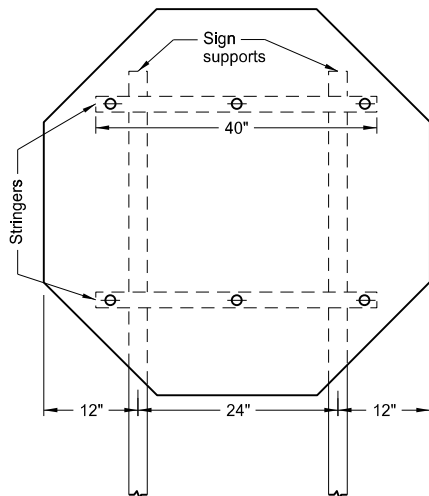
3 Posts

Notes:

1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

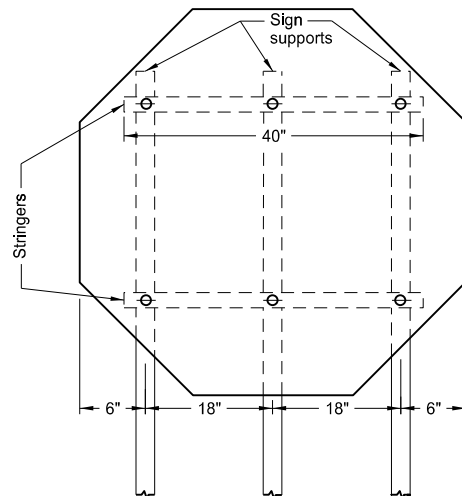


1 Post

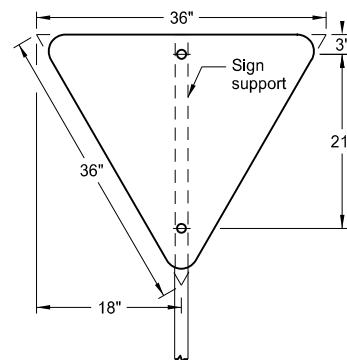


2 Posts

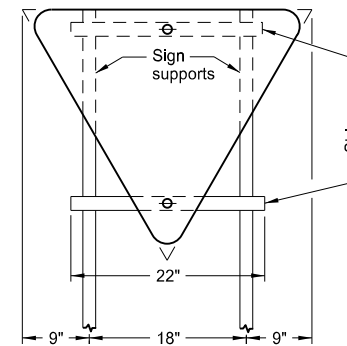
Assembly No. 3



3 Posts

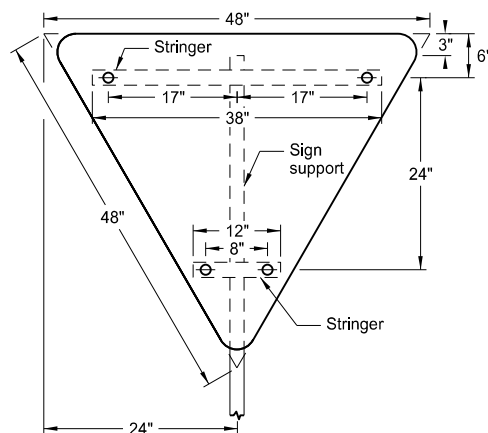


1 Post

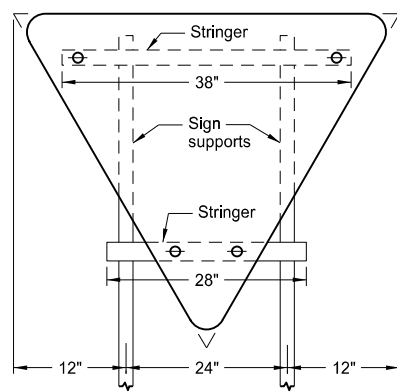


2 Posts

Assembly No. 4

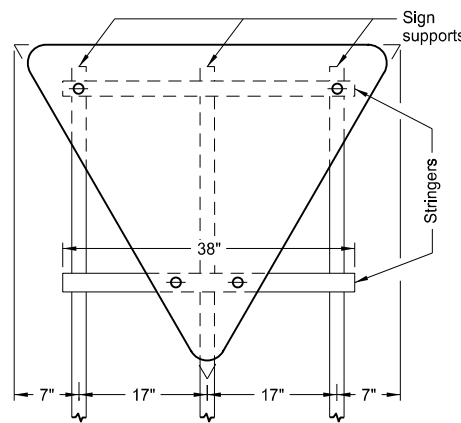


1 Post



2 Posts

Assembly No. 5

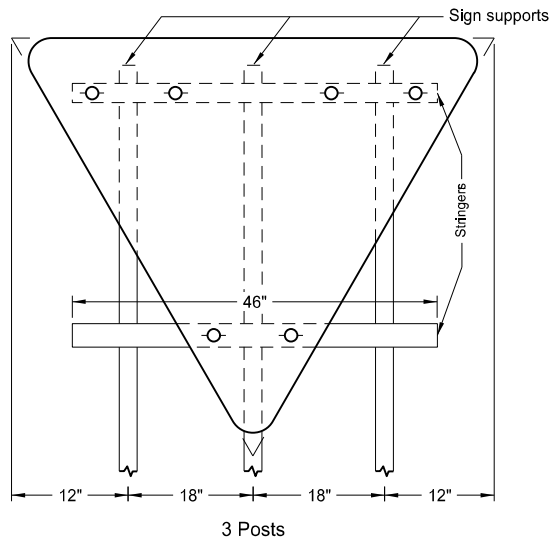
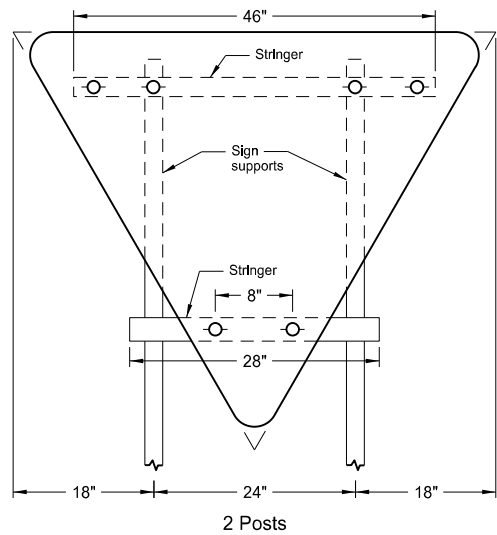
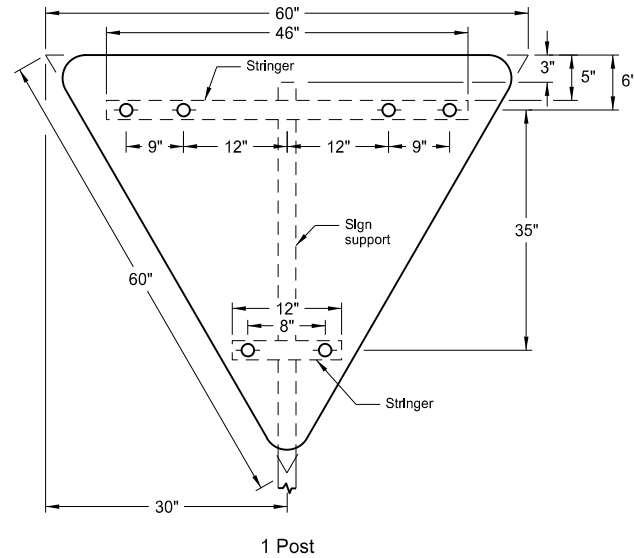


3 Posts

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

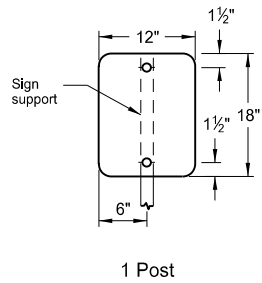
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS

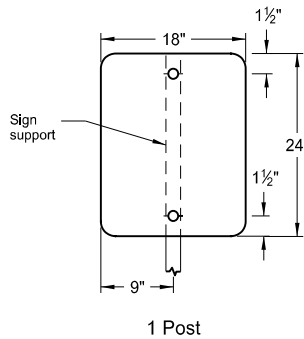


- Notes:
1. Use 0.100 inch minimum thickness sign backing material.
 2. Use 1½" x 1½" perforated square tube stringers.
 3. Punch holes round for ⅝" bolt.

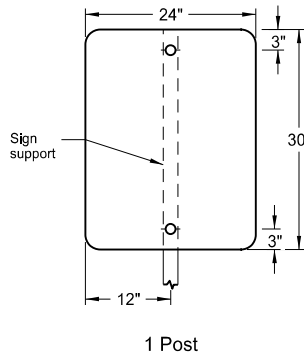
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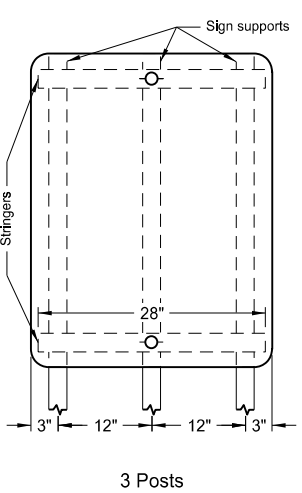
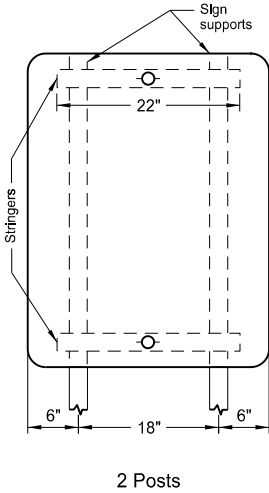
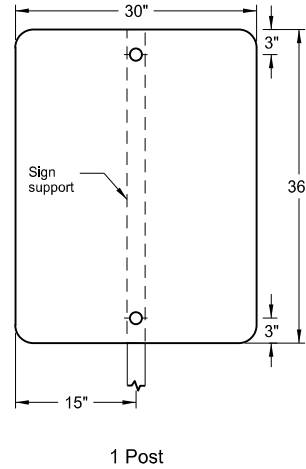
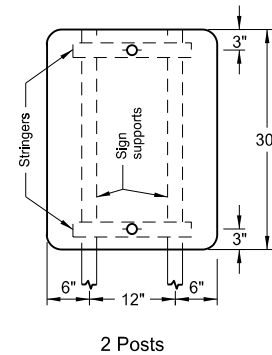
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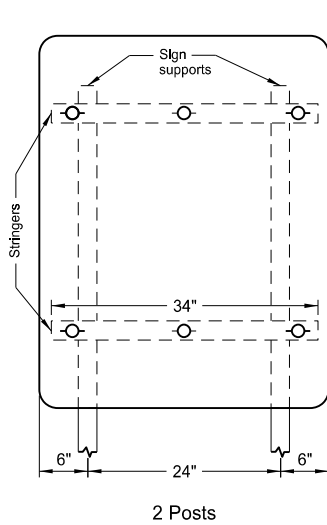
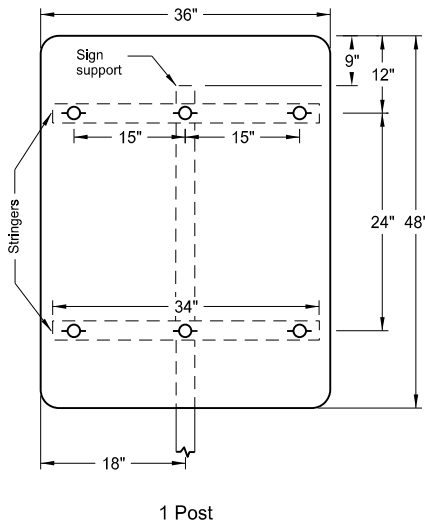
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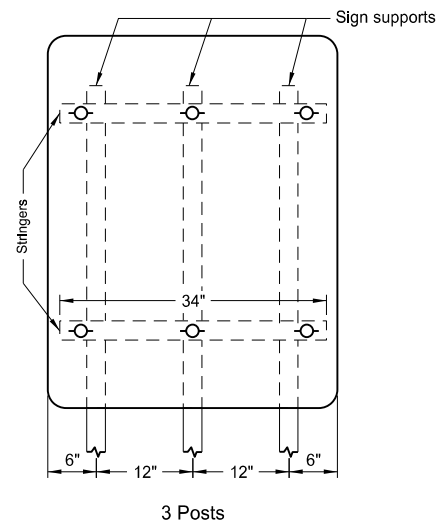
Assembly No. 9



Assembly No. 10



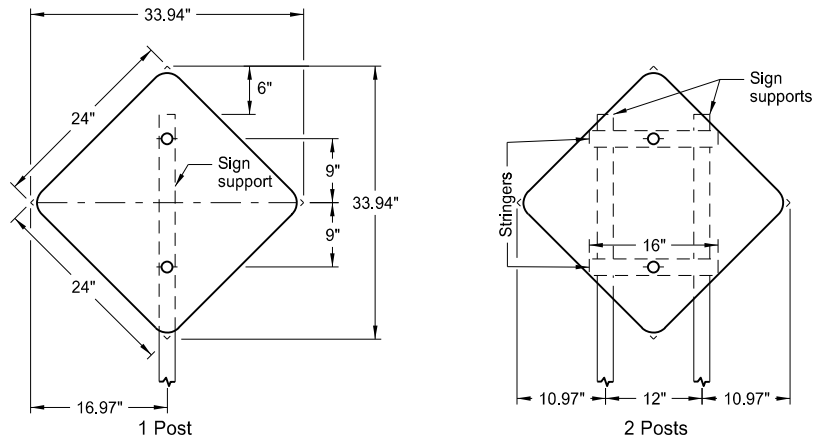
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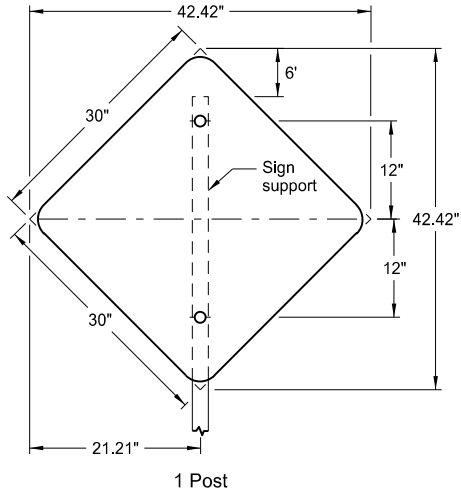
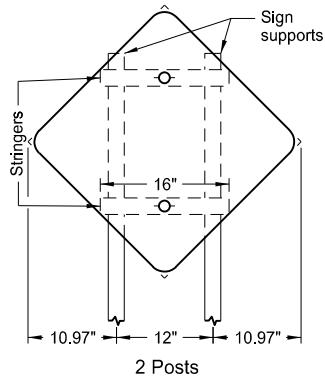
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

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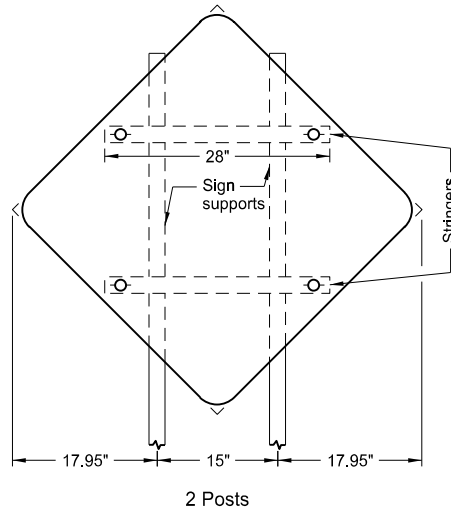
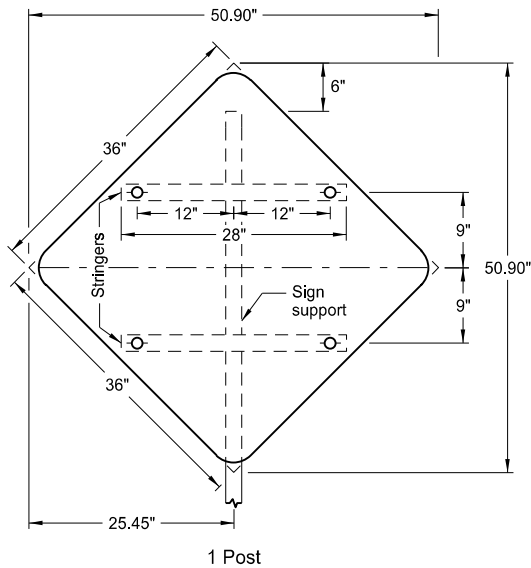
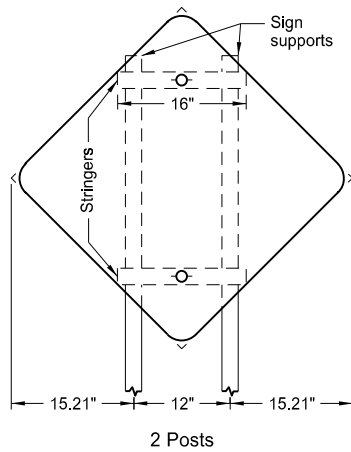
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



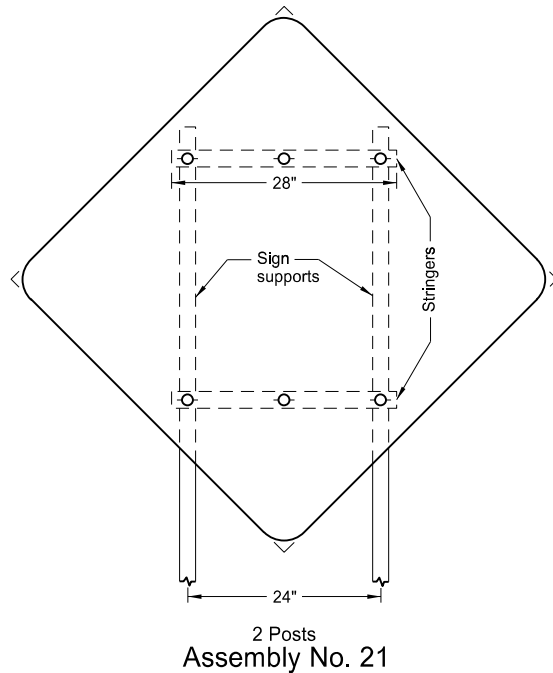
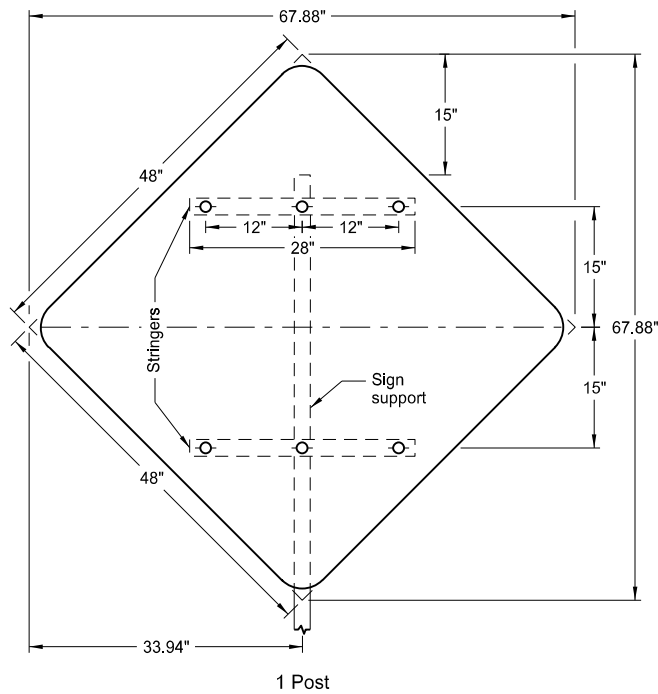
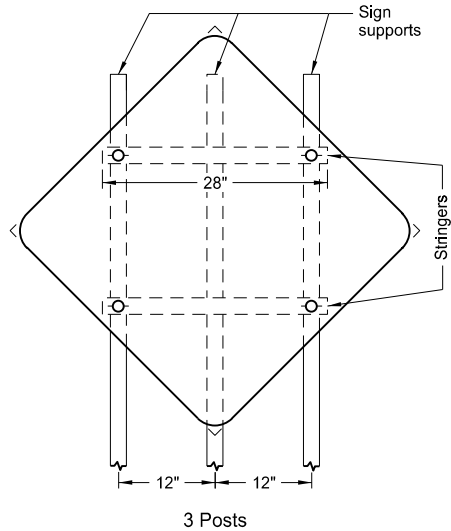
Assembly No. 18



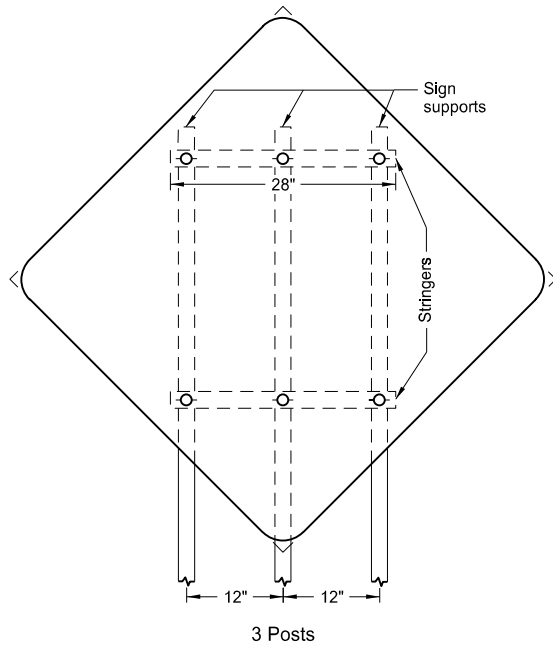
Assembly No. 19



Assembly No. 20



Assembly No. 21

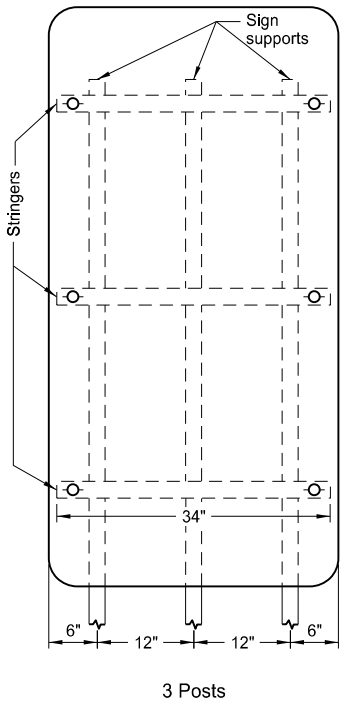
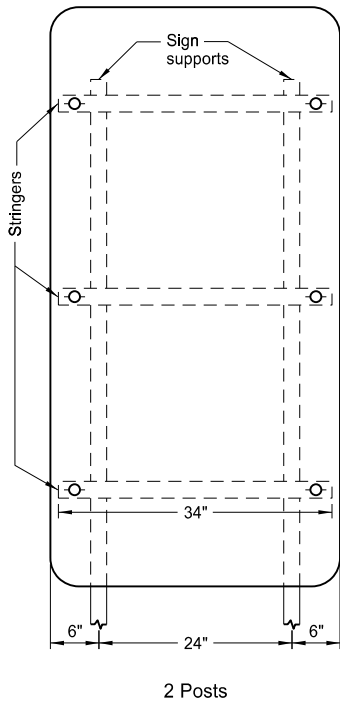
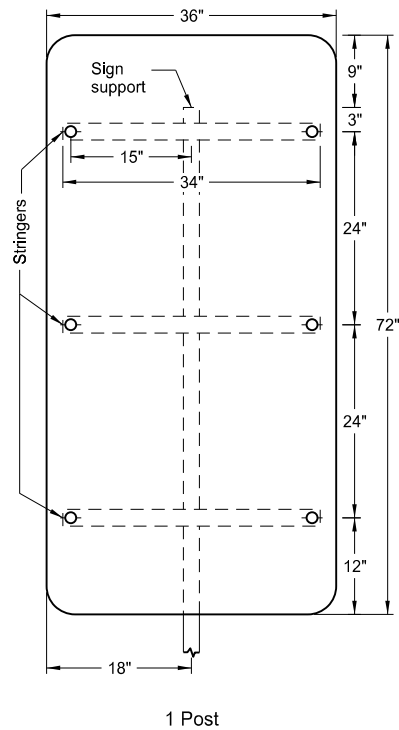


- Notes:
1. Use 0.100 inch minimum thickness sign backing material.
 2. Use 1½" x 1½" perforated square tube stringers.
 3. Punch holes round for ⅜" bolt.

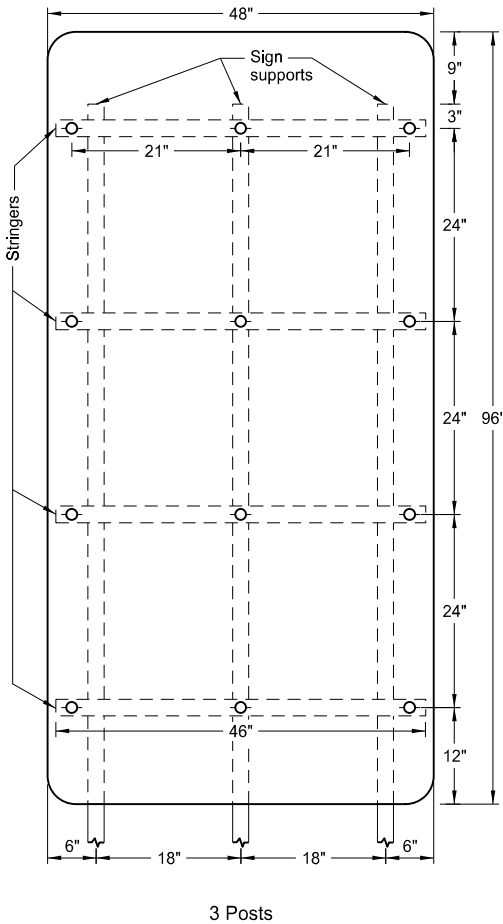
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
on 8/30/19 and the original document is stored at the
North Dakota Department
of Transportation

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

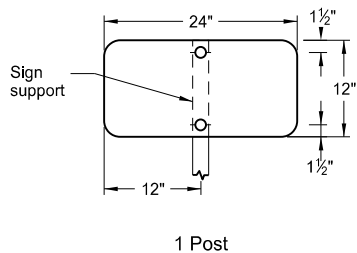


Assembly No. 24

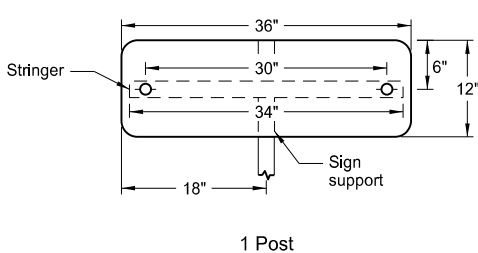


Assembly No. 25

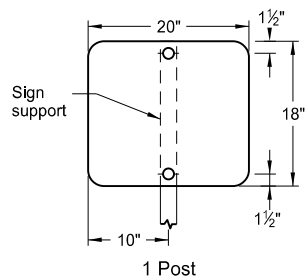
- Notes:
1. Use 0.100 inch minimum thickness sign backing material.
 2. Use 1 1/2" x 1 1/2" perforated square tube stringers.
 3. Punch holes round for 3/8" bolt.



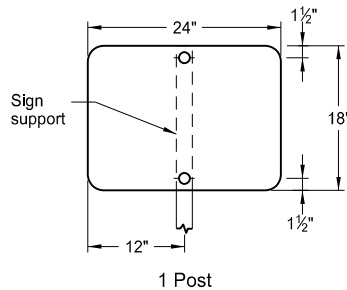
Assembly No. 26



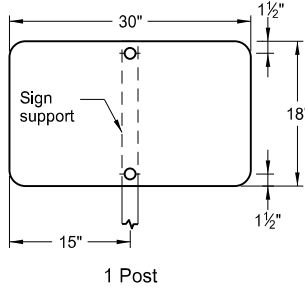
Assembly No. 27



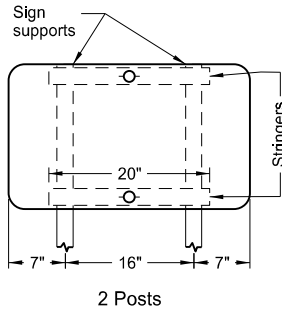
Assembly No. 28



Assembly No. 29



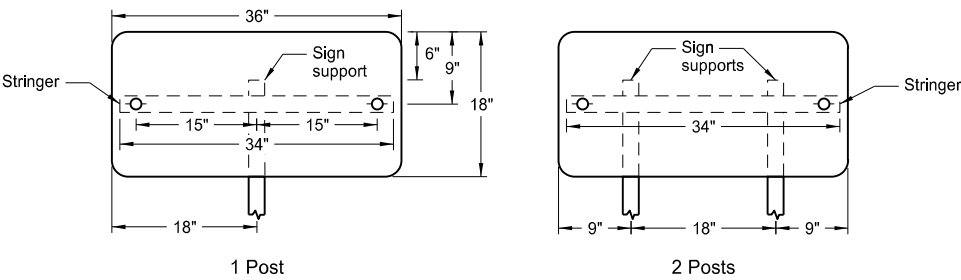
Assembly No. 30



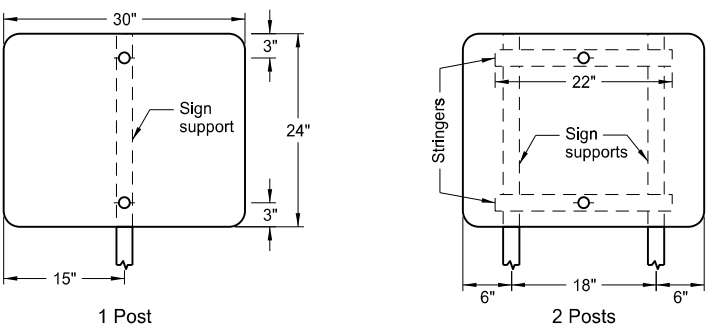
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

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

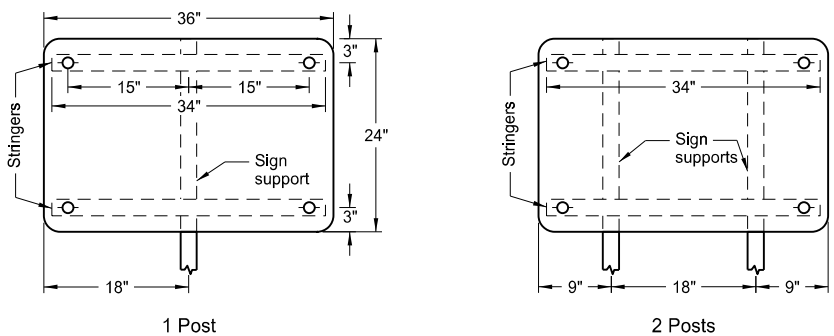


Assembly No. 31

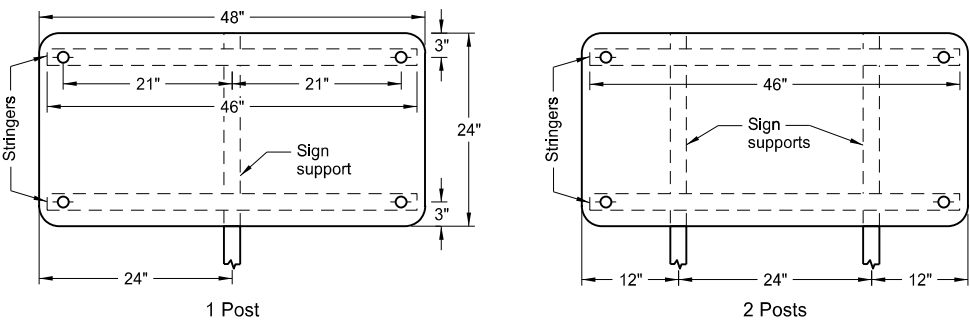


Assembly No. 32

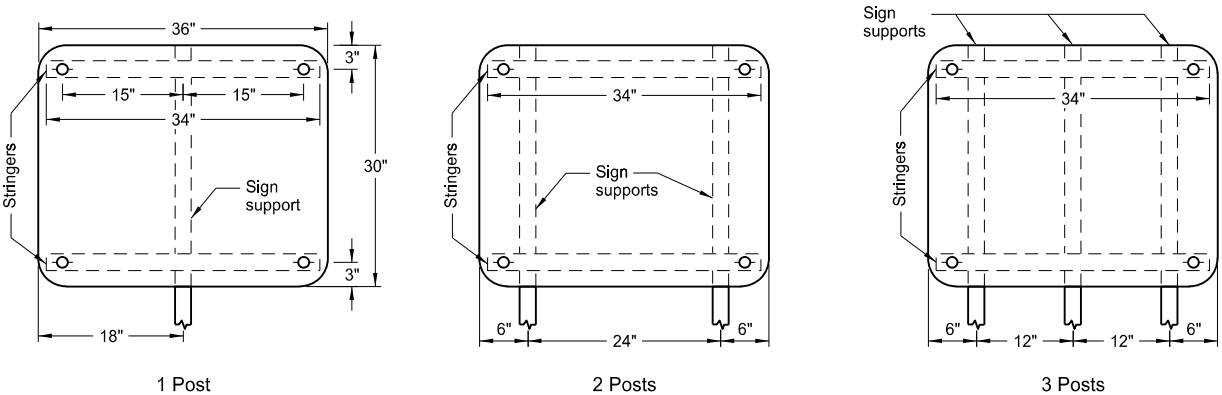
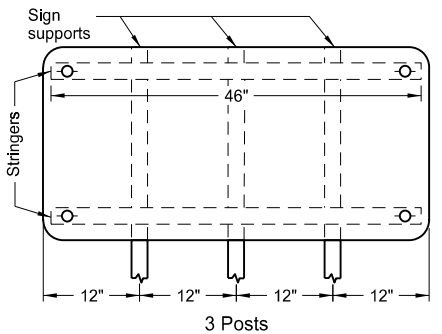
- Notes:
1. Use 0.100 inch minimum thickness sign backing material.
 2. Use 1½" x 1½" perforated square tube stringers.
 3. Punch holes round for ⅜" bolt.



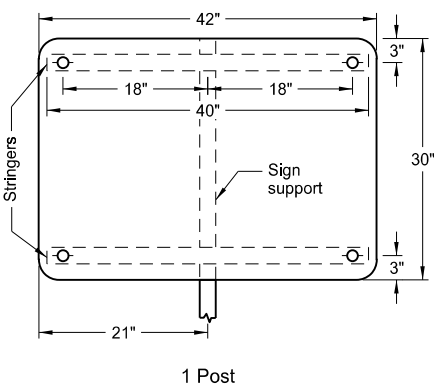
Assembly No. 33



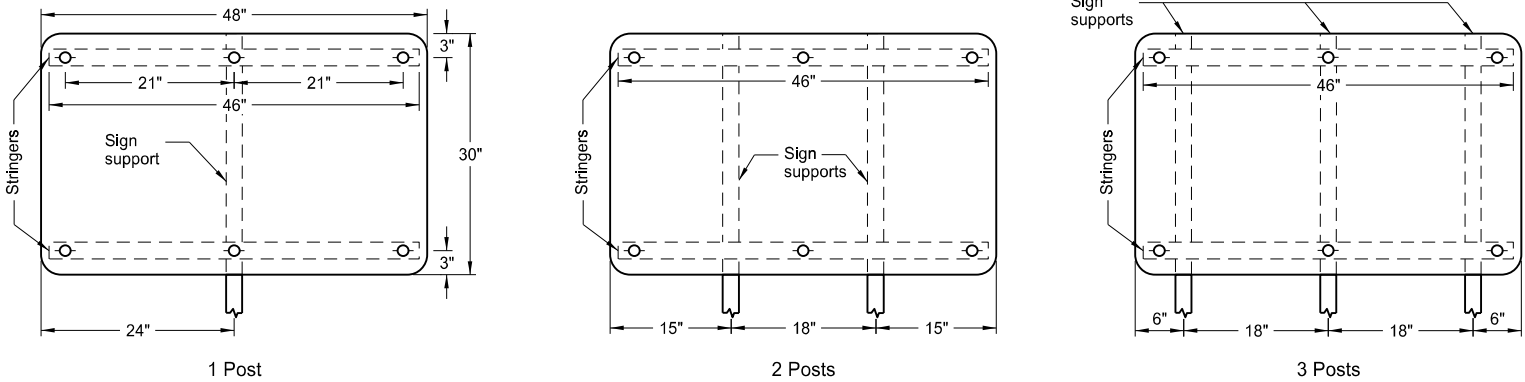
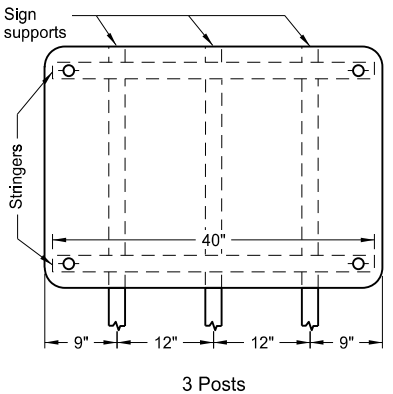
Assembly No. 34



Assembly No. 35



Assembly No. 36



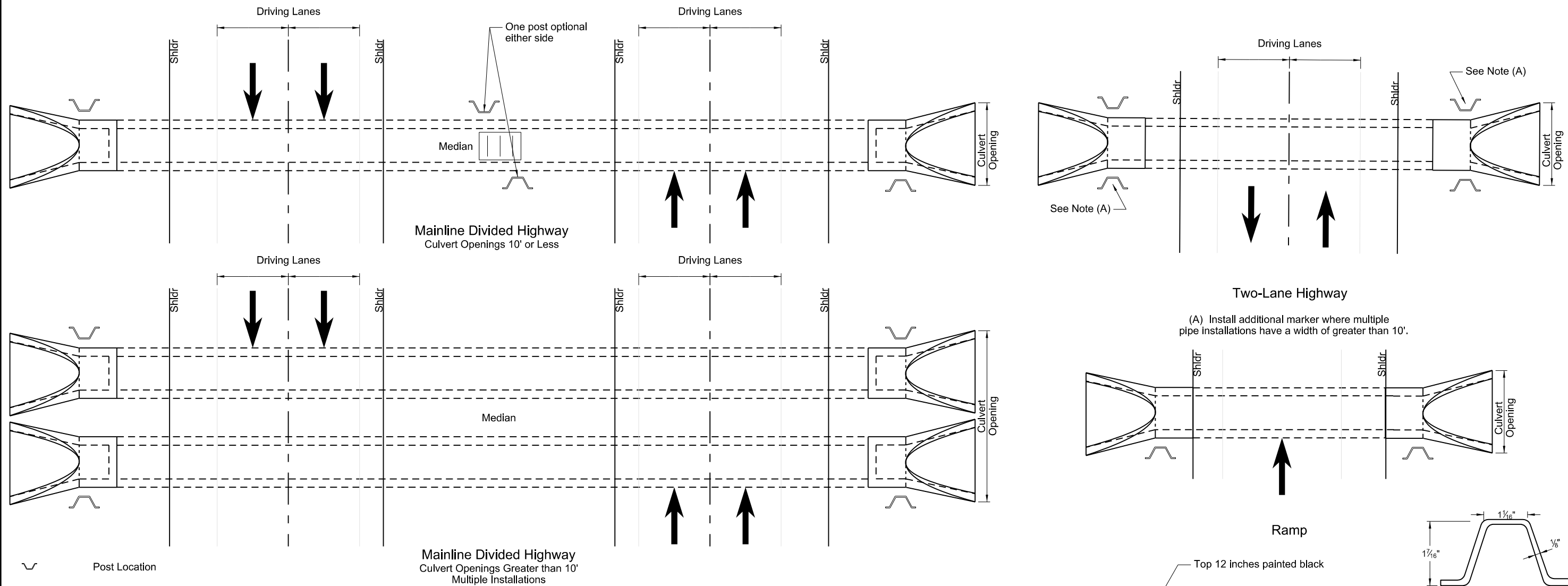
Assembly No. 37

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
on 8/30/19 and the original document is stored at the
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of Transportation

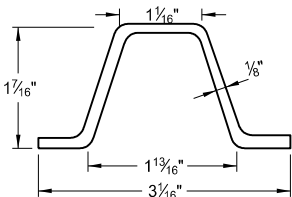
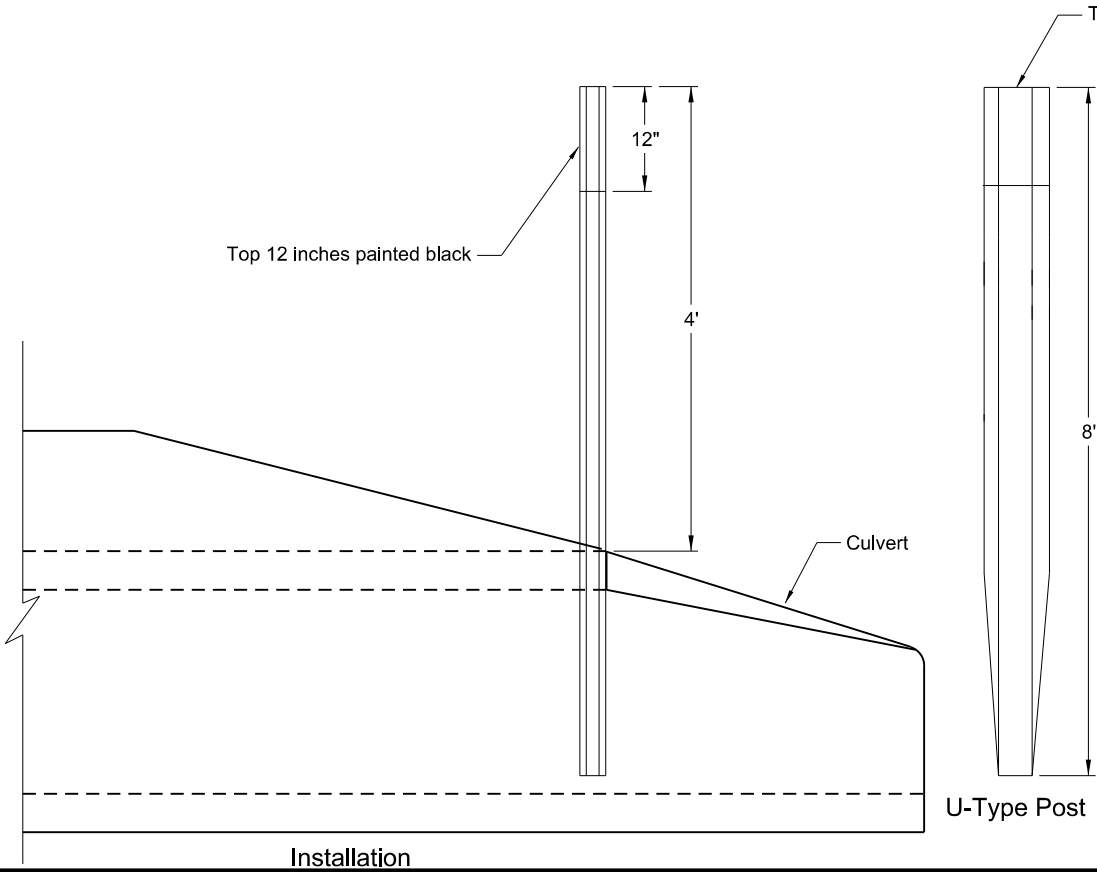
OBJECT MARKERS - CULVERTS

D-754-83

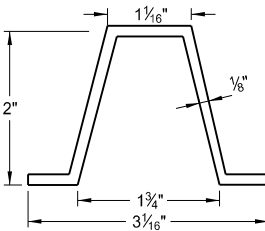


Notes:

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



Steel Post Detail
Approx. 2.0 lbs/ft



Aluminum Post Detail
Approx. 0.88 lbs/ft

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

This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
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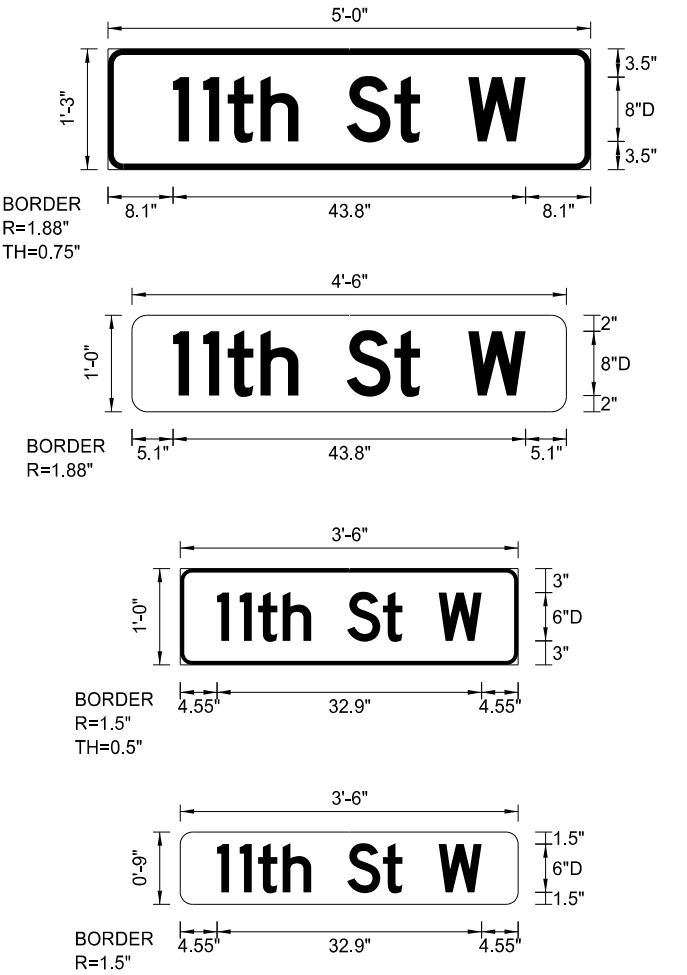
911 SIGN SUPPORT INFORMATION AND SIGN DETAILS

D-754-86

POST INFORMATION FOR VARIOUS SIGN CONFIGURATIONS													
ASSEMBLY NUMBER	STREET NAME SIGN SIZE	VERTICAL CLEARANCE	MAXIMUM POST LENGTH	NUMBER OF POSTS	SUPPORT SIZE	SLEEVE LENGTH (A)			SLEEVE SIZE	ANCHOR			BREAKAWAY
						1st	2nd	3rd		NUMBER	LENGTH	SIZE	
						LF	LF	LF					
Special Assembly 1	48"x15"	7	14.5	1	2.5 x 2.5 12 ga					1	4.0	3 x 3 7 ga	
	54"x15"	7	16.1	1	2.5 x 2.5 12 ga					1	4.0	3 x 3 7 ga	
	60"x15"	7	18.9	1	2.25 x 2.25 12 ga	2.6			2 x 2 12 ga	1	4.0	3 x 3 7 ga	1
	66"x15"	7	15.8	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	72"x15"	7	14.6	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	78"x15"	7	17.6	2	2.5 x 2.5 12 ga					2	4.0	3 x 3 7 ga	2
	84"x15"	7	15.8	2	2.25 x 2.25 12 ga					2	4.0	2.5 x 2.5 12 ga	
	90"x15"	7	15.3	2	2.5 x 2.5 12 ga					2	4.0	3 x 3 7 ga	2
	96"x15"	7	17.4	2	2.5 x 2.5 10 ga					2	4.0	3 x 3 7 ga	2
	48"x12"	7	17.5	1	2.5 x 2.5 12 ga					1	4.0	3 x 3 7 ga	
	54"x12"	7	15.2	1	2.25 x 2.25 12 ga					1	4.0	2.5 x 2.5 12 ga	
	60"x12"	7	14.2	1	2.5 x 2.5 12 ga					1	4.0	3 x 3 7 ga	
	66"x12"	7	15.9	1	2.5 x 2.5 12 ga					1	4.0	3 x 3 7 ga	
	72"x12"	7	14.7	1	2.5 x 2.5 12 ga					1	4.0	3 x 3 7 ga	
	78"x12"	7	15.7	2	2 x 2 12 ga					2	4.0	2.25 x 2.25 12 ga	
	84"x12"	7	15.6	2	2.25 x 2.25 12 ga					2	4.0	2.5 x 2.5 12 ga	
	90"x12"	7	18.6	2	2.5 x 2.5 12 ga					2	4.0	3 x 3 7 ga	2
	96"x12"	7	17.5	2	2.5 x 2.5 12 ga					2	4.0	3 x 3 7 ga	2
	24"x12"	5	20.3	1	2 x 2 12 ga					1	4.0	2.25 x 2.25 12 ga	
	30"x12"	5	16.4	1	2 x 2 12 ga					1	4.0	2.25 x 2.25 12 ga	
	36"x12"	5	13.8	1	2 x 2 12 ga					1	4.0	2.25 x 2.25 12 ga	
	42"x12"	5	14.7	1	2 x 2 12 ga					1	4.0	2.25 x 2.25 12 ga	
	48"x12"	5	12.9	1	2 x 2 12 ga					1	4.0	2.25 x 2.25 12 ga	
	54"x12"	5	15.2	1	2.25 x 2.25 12 ga					1	4.0	2.5 x 2.5 12 ga	
	60"x12"	5	13.8	1	2.25 x 2.25 12 ga					1	4.0	2.5 x 2.5 12 ga	
	24"x9"	5	24.1	1	2 x 2 12 ga					1	4.0	2.25 x 2.25 12 ga	
	30"x9"	5	21	1	2 x 2 12 ga					1	4.0	2.25 x 2.25 12 ga	
	36"x9"	5	17.3	1	2 x 2 12 ga					1	4.0	2.25 x 2.25 12 ga	
	42"x9"	5	15.4	1	2 x 2 12 ga					1	4.0	2.25 x 2.25 12 ga	
	48"x9"	5	13.5	1	2 x 2 12 ga					1	4.0	2.25 x 2.25 12 ga	
	54"x9"	5	14.8	1	2 x 2 12 ga					1	4.0	2.25 x 2.25 12 ga	
	60"x9"	5	13.3	1	2 x 2 12 ga					1	4.0	2.25 x 2.25 12 ga	
Special Assembly 2	24"x12"	5	17.2	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	30"x12"	5	16.3	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	36"x12"	5	15.4	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	42"x12"	5	14.6	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	48"x12"	5	15.2	1	2.25 x 2.25 12 ga	4.5			2 x 2 12 ga	1	4.0	3 x 3 7 ga	1
	54"x12"	5	20.6	1	2.5 x 2.5 10 ga	1.5			2.19 x 2.19 10 ga	1	4.0	3 x 3 7 ga	1
	60"x12"	5	16.7	1	2.5 x 2.5 12 ga	3.9			2.25 x 2.25 12 ga	1	4.0	3 x 3 7 ga	1
	24"x9"	5	15.2	1	2.5 x 2.5 12 ga					1	4.0	3 x 3 7 ga	
	30"x9"	5	14.4	1	2.5 x 2.5 12 ga					1	4.0	3 x 3 7 ga	
	36"x9"	5	16.4	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	42"x9"	5	15.8	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	48"x9"	5	14.4	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	54"x9"	5	15.1	1	2.25 x 2.25 12 ga	4.2			2 x 2 12 ga	1	4.0	3 x 3 7 ga	1
	60"x9"	5	14.5	1	2.25 x 2.25 12 ga	4.7			2 x 2 12 ga	1	4.0	3 x 3 7 ga	1

POST INFORMATION FOR VARIOUS SIGN CONFIGURATIONS													
ASSEMBLY NUMBER	STREET NAME SIGN SIZE	VERTICAL CLEARANCE	MAXIMUM POST LENGTH	NUMBER OF POSTS	SUPPORT SIZE	SLEEVE LENGTH (A)			SLEEVE SIZE	ANCHOR			BREAKAWAY
						1st	2nd	3rd		NUMBER	LENGTH	SIZE	
						LF	LF	LF					
Special Assembly 3	24"x12"	5	16.2	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	30"x12"	5	15.3	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	36"x12"	5	15.9	1	2.25 x 2.25 12 ga	4.3			2 x 2 12 ga	1	4.0	3 x 3 7 ga	1
	42"x12"	5	15.2	1	2.25 x 2.25 12 ga	4.8			2 x 2 12 ga	1	4.0	3 x 3 7 ga	1
	48"x12"	5	15.2	1	2.5 x 2.5 12 ga	5			2.25 x 2.25 12 ga	1	4.0	3 x 3 7 ga	1
	54"x12"	5	20.6	1	2.5 x 2.5 10 ga	1.9			2.19 x 2.19 10 ga	1	4.0	3 x 3 7 ga	1
	60"x12"	5	16	1	2.5 x 2.5 12 ga	4.7			2.25 x 2.25 12 ga	1	4.0	3 x 3 7 ga	1
	24"x9"	5	16.8	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	30"x9"	5	16.1	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	36"x9"	5	15.4	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	42"x9"	5	14.9	1	2.5 x 2.5 10 ga					1	4.0	3 x 3 7 ga	1
	48"x9"	5	15.7	1	2.25 x 2.25 12 ga	4.2			2 x 2 12 ga	1	4.0	3 x 3 7 ga	1
	54"x9"	5	14.9	1	2.5 x 2.5 12 ga	4.8			2.25 x 2.25 12 ga	1	4.0	3 x 3 7 ga	1
	60"x9"	5	20.5	1	2.5 x 2.5 10 ga	1.6			2.19 x 2.19 10 ga	1	4.0	3 x 3 7 ga	1
Special Assembly 4	24"x12"	5	15.1	1	2.25 x 2.25 12 ga	4.8			2 x 2 12 ga	1	4.0	3 x 3 7 ga	1
	30"x12"	5	15.1	1	2.5 x 2.5 12 ga	5			2.25 x 2.25 12 ga	1	4.0	3 x 3 7 ga	1
	36"x12"	5	17.4	1	2.5 x 2.5 12 ga	3.6			2.25 x 2.25 12 ga	1	4.0	3 x 3 7 ga	1
	42"x12"	5	16.8	1	2.5 x 2.5 12 ga	4.1			2.25 x 2.25 12 ga	1	4.0	3 x 3 7 ga	1
	48"x12"	5	16.1	1	2.5 x 2.5 12 ga	4.5			2.25 x 2.25 12 ga	1	4.0	3 x 3 7 ga	1
	54"x12"	5	15.5	1	2.5 x 2.5 12 ga	4.9			2.25 x 2.25 12 ga	1	4.0	3 x 3 7 ga	1
	60"x12"	5	16.7	1	2.5 x 2.5 10 ga	4.2			2.19 x 2.19 10 ga	1	4.0	3 x 3 7 ga	1
	24"x9"	5	15.5	1	2.25 x 2.25 12 ga	4.2			2 x 2 12 ga	1	4.0	3 x 3 7 ga	1
	30"x9"	5	15	1	2.25 x 2.25 12 ga	4.5			2 x 2 12 ga	1	4.0	3 x 3 7 ga	1
	36"x9"	5	14.5	1	2.25 x 2.25 12 ga	4.8			2 x 2 12 ga	1	4.0	3 x 3 7 ga	1
	42"x9"	5	14.7	1	2.5 x 2.5 12 ga	4.9			2.25 x 2.25 12 ga	1	4.0	3 x 3 7 ga	1
	48"x9"	5	17.2	1	2.5 x 2.5 12 ga	3.5			2.25 x 2.25 12 ga	1	4.0	3 x 3 7 ga	1
	54"x9"	5	15.8	1	2.5 x 2.5 12 ga	4.4			2.25 x 2.25 12 ga	1	4.0	3 x 3 7 ga	1
	60"x9"	5	15.3	1	2.5 x 2.5 12 ga	4.7			2.25 x 2.25 12 ga	1	4.0	3 x 3 7 ga	1
Special Assembly 5	24"x12"	5	17.1	2	2.5 x 2.5 10 ga					2	4.0	3 x 3 7 ga	2
	30"x12"	5	16.7	2	2.5 x 2.5 10 ga					2	4.0	3 x 3 7 ga	2
	36"x12"	5	17.7	2	2.25 x 2.25 12 ga	4	4.5		2 x 2 12 ga	2	4.0	3 x 3 7 ga	2
	42"x12"	5	17.3	2	2.25 x 2.25 12 ga	4.3	4.8		2 x 2 12 ga	2	4.0	3 x 3 7 ga	2
	48"x12"	5	16.8	2	2.25 x 2.25 12 ga	4.5	5		2 x 2 12 ga	2	4.0	3 x 3 7 ga	2
	54"x12"	5	16.5	2	2.25 x 2.25 12 ga	4.8	5.3		2 x 2 12 ga	2	4.0	3 x 3 7 ga	2
	60"x12"	5	17.5	3	2.5 x 2.5 12 ga					3	4.0	3 x 3 7 ga	3
	24"x9"	5	17.3	2	2.5 x 2.5 10 ga					2	4.0	3 x 3 7 ga	2
	30"x9"	5	17	2	2.5 x 2.5 10 ga					2	4.0	3 x 3 7 ga	2
	36"x9"	5	16.6	2	2.5 x 2.5 10 ga					2	4.0	3 x 3 7 ga	2
	42"x9"	5	16.3	2	2.5 x 2.5 10 ga					2	4.0	3 x 3 7 ga	2
	48"x9"	5	16	2	2.5 x 2.5 10 ga					2	4.0	3 x 3 7 ga	2
	54"x9"	5	17.1	2	2.25 x 2.25 12 ga	4	4.6		2 x 2 12 ga	2	4.0	3 x 3 7 ga	2
	60"x9"	5	16.8	2	2.25 x 2.25 12 ga	4.2	4.8		2 x 2 12 ga	2	4.0	3 x 3 7 ga	2

(A) The sleeve length shown is for the maximum post length. The required sleeve length is the "sleeve length" minus the difference between the "maximum post length" and the post length required in the field.



Notes:
Use 6 Inch legend except on multi-lane divided roads with speeds of 45 mph or greater.
On divided multi-lane roadways, do not place 911 signs on top of stop sign.

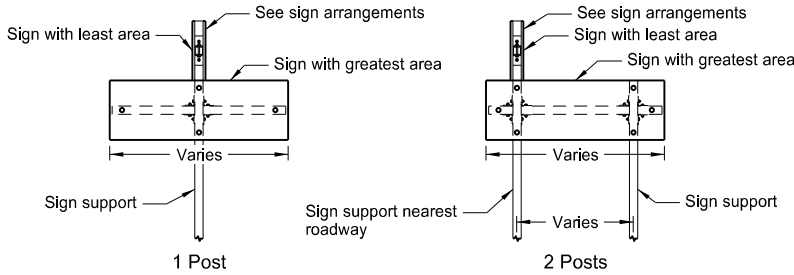
When installing signs on existing supports, check support and sleeve size to determine if they meet table requirements. Measure maximum post length from ground to top of street name sign. If calculated support length is greater than maximum post length shown, recalculate support size.

See Standard Drawing D-754-87 for sign punching, stringer and support location details.

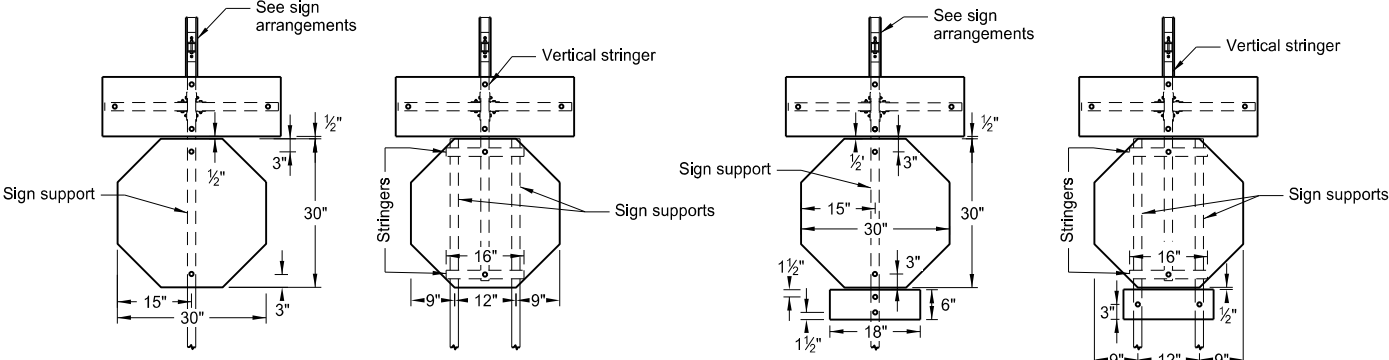
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-18-14 8-30-18	Revised street name sign layouts. Revised tables, lettering, & signs and updated notes to active voice.
9-05-19	New

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

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

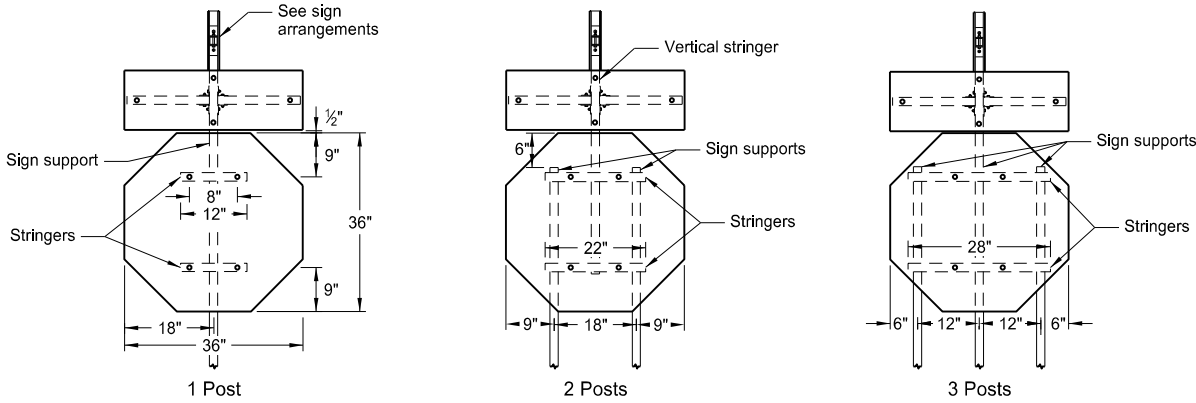


Special Assembly 1 (A, B, C, D or E)

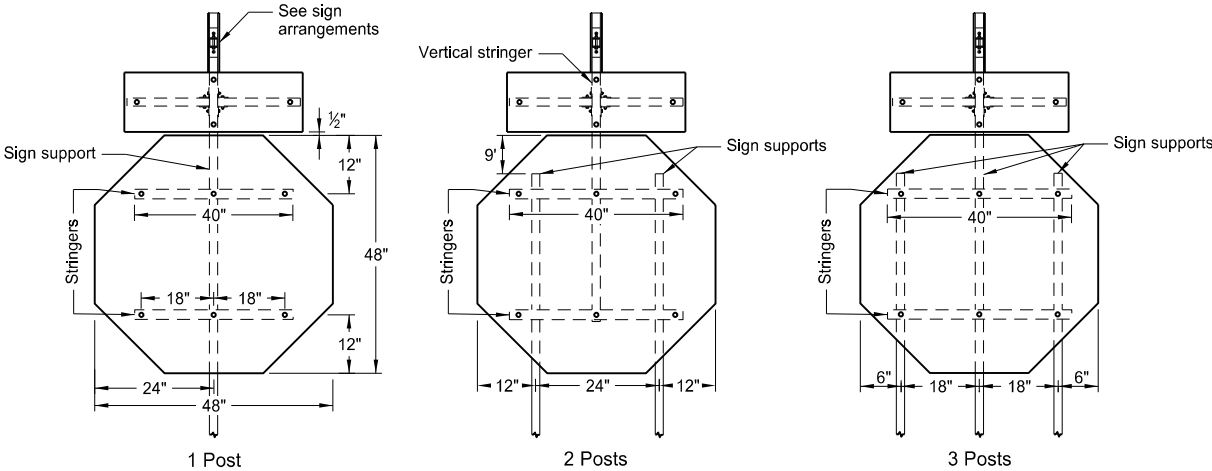


Special Assembly 2 (A, B, C, D or E)

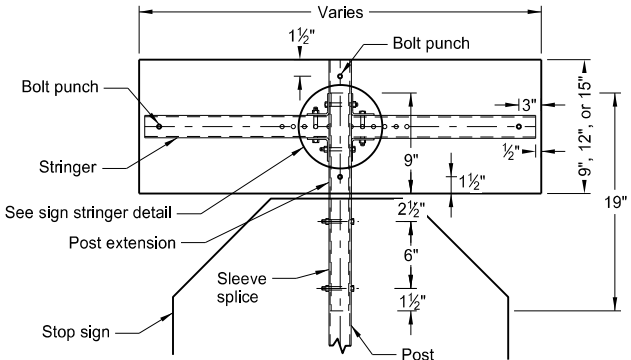
Special Assembly 3 (A, B, C, D or E)



Special Assembly 4 (A, B, C, D or E)

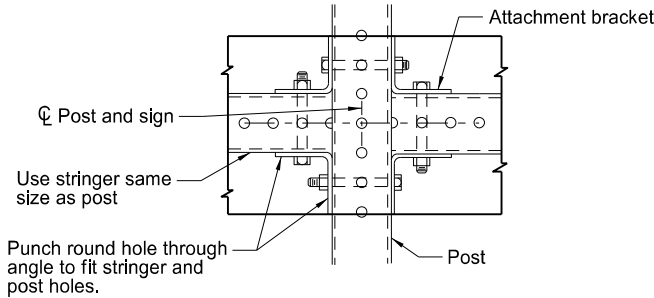


Special Assembly 5 (A, B, C, D or E)

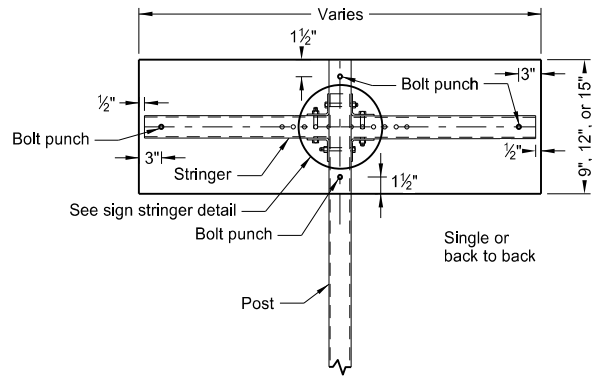


Front View
Sleeve Splice Detail

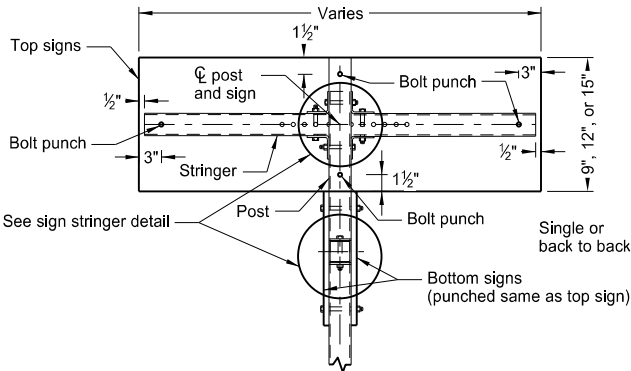
Note: Only use splice method with approval of engineer.



Sign Stringer Detail

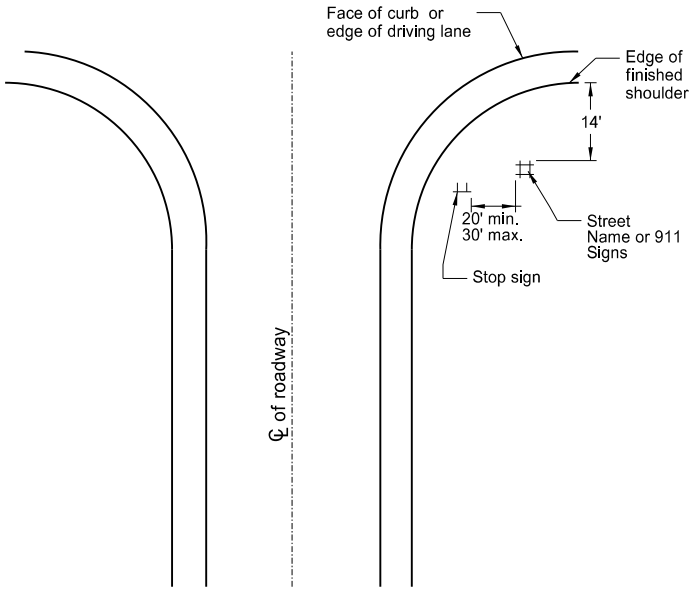


Detail A or B



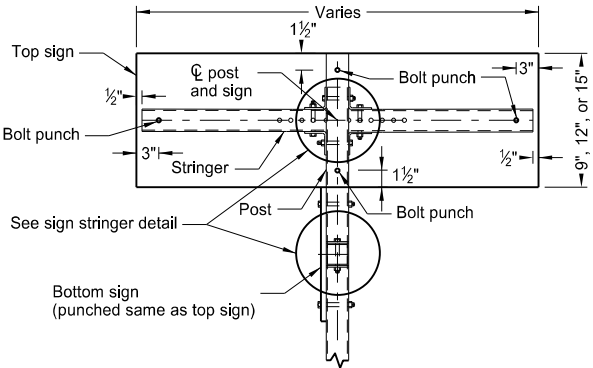
Detail D or E

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



Intersection Layout

Note: Use layout for street name signs or 911 signs with Special Assembly 1.



Detail C

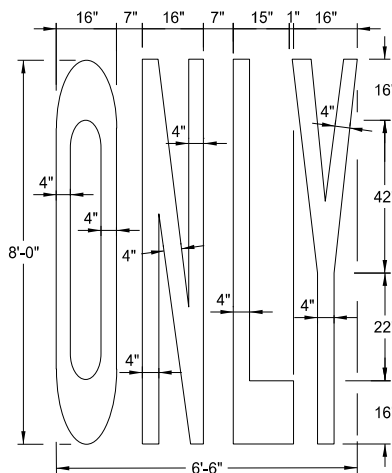
Sign Arrangements

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
8-30-18	Added 2 post layout for SA1 and Updated notes to active voice.
9-05-19	New Design Engineer PE Stamp.

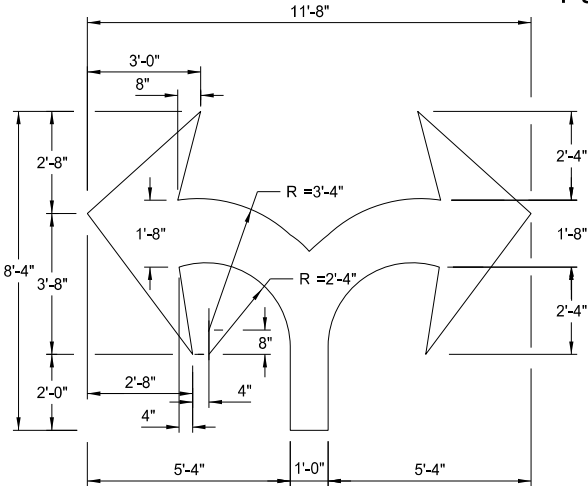
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Pavement Marking Message Details

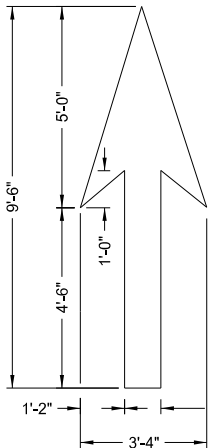
D-762-1



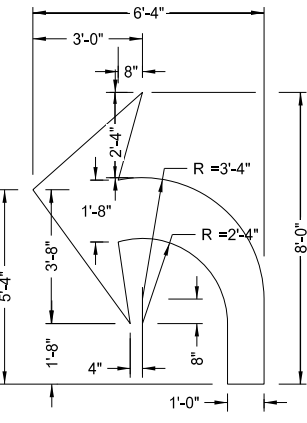
22 S. F.



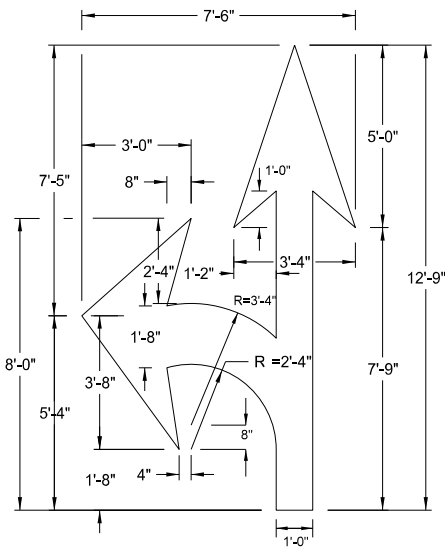
29 S. F.



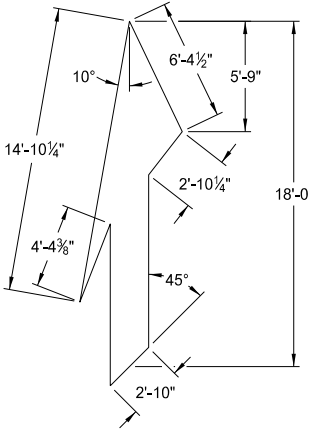
12 S. F.



16 S. F.

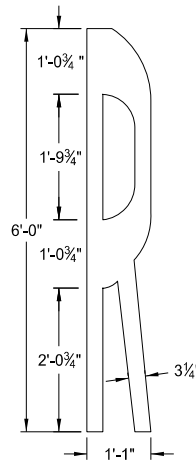


27 S. F.

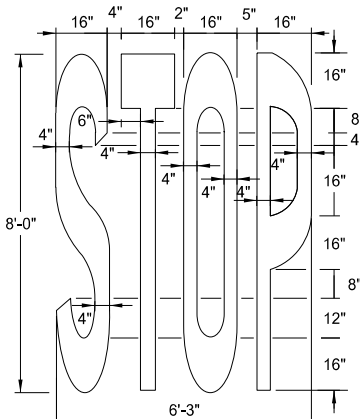


41 S. F.

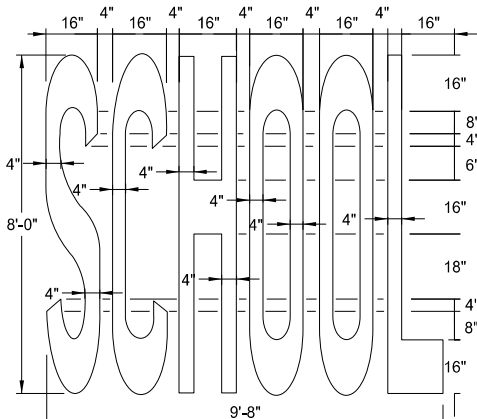
Note: Rotate merge arrow 20° from edge of roadway.



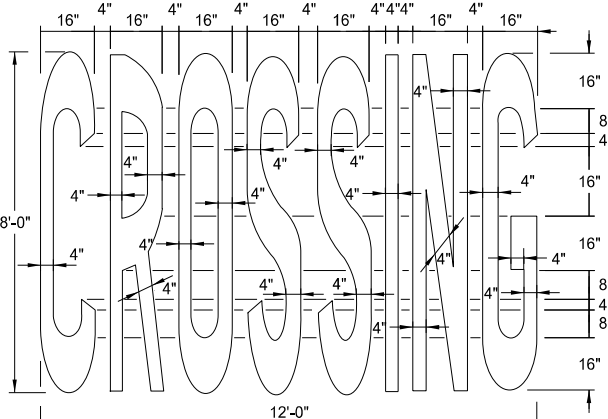
4 S. F.



22 S. F.



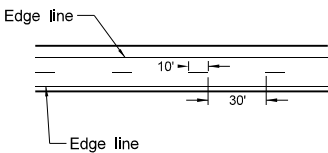
34.5 S. F.



46 S. F.

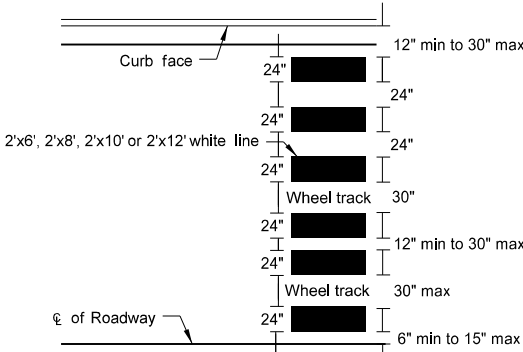
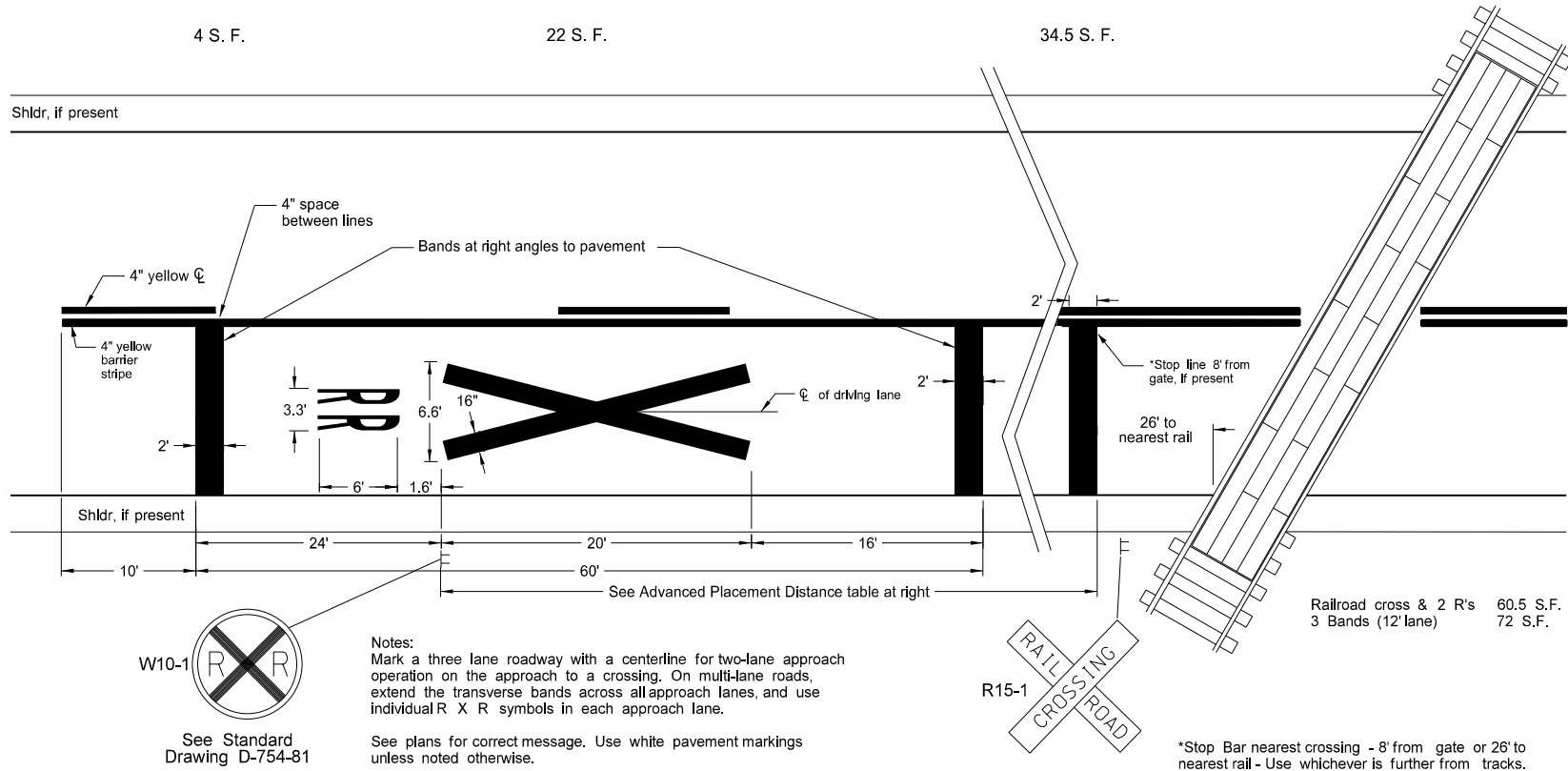
Speed Limit	Chevron Width	Chevron Spacing 45° to Traffic
0-25 mph	8"	5'
30-40 mph	8"	15'
45 mph and above	12"	25'

Chevron Crosshatching Table



Centerline Pavement Marking Skip Spacing Detail

Advance Placement Distance for Railroad Warning Signs	
Posted or 85th Percentile Speed	Advance Distance
20 mph	min. 100 ft
25 mph	min. 100 ft
30 mph	min. 100 ft
35 mph	min. 100 ft
40 mph	125 ft
45 mph	175 ft
50 mph	250 ft
55 mph	325 ft
60 mph	400 ft
65 mph	475 ft
70 mph	550 ft



Continental Crosswalk Detail

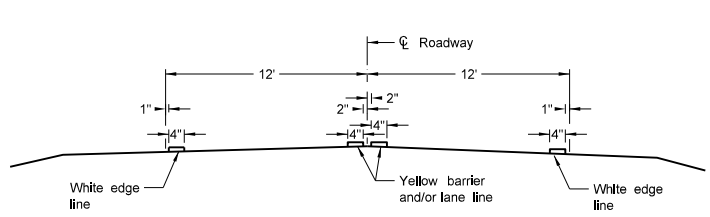
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-6-11	
REVISIONS	
DATE	CHANGE
10-17-17 08-27-19 01-28-2020	Updated to active voice. New Design Engineer PE Stamp. Revised min Stop Bar distance to rail.

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PE-4683,
on 1/28/2020 and the original document is stored at the
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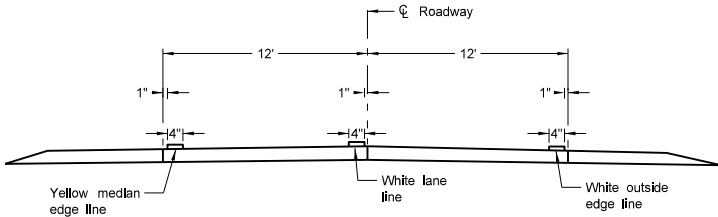
PAVEMENT MARKING

D-762-4

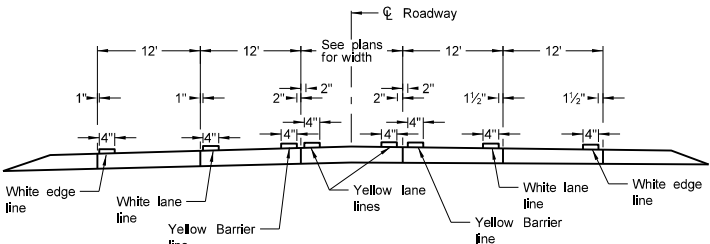
- NOTES:
- 1. Continue edge lines through private drives and field drives. Break edge lines for intersections.



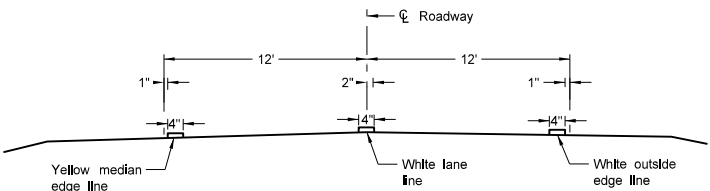
Two Lane Two Way
RURAL ROADWAY



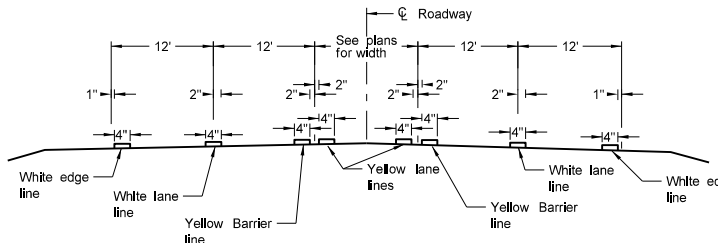
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



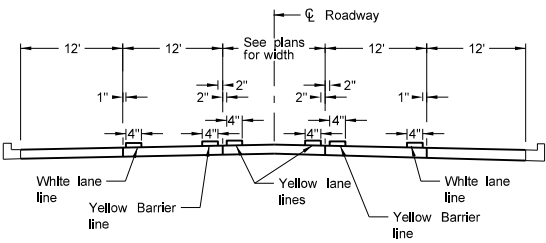
RURAL FIVE LANE ROADWAY
Concrete Section



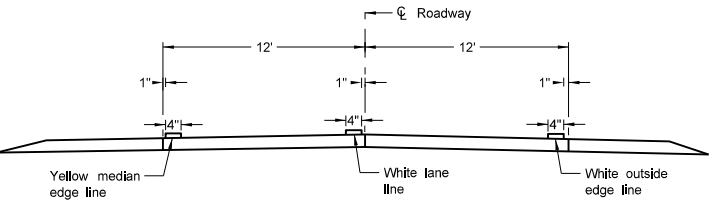
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



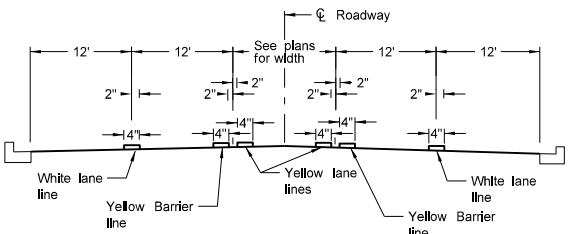
RURAL FIVE LANE ROADWAY
Asphalt Section



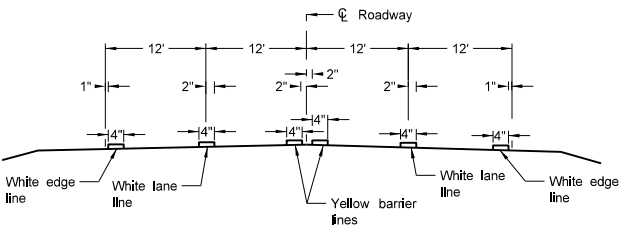
URBAN FIVE LANE SECTION
Concrete Section



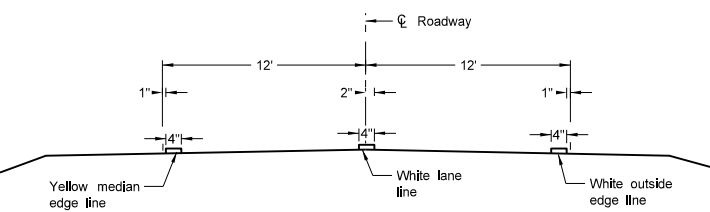
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



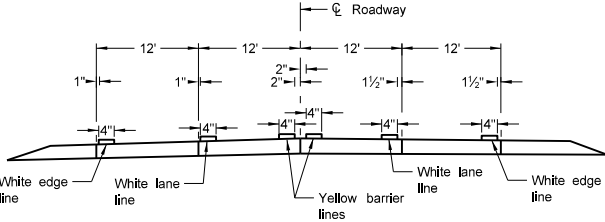
URBAN FIVE LANE SECTION
Asphalt Section



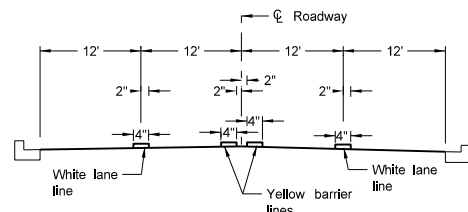
RURAL FOUR LANE ROADWAY
Asphalt Section



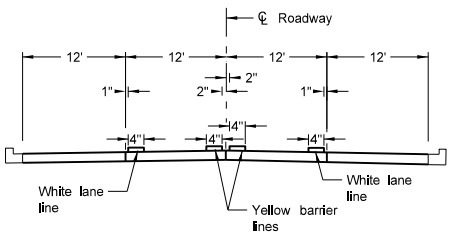
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



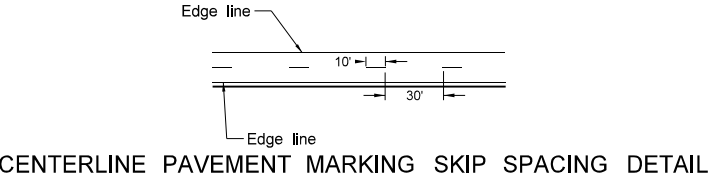
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



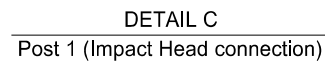
URBAN FOUR LANE SECTION
Concrete Section



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
10-17-17 08-27-19	Updated to active voice. New Design Engineer PE Stamp.

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on 8/27/19 and the original document is stored at the
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of Transportation

D-764-38



SECTION B-B
Posts 3 through 7



DETAIL A

Post 1



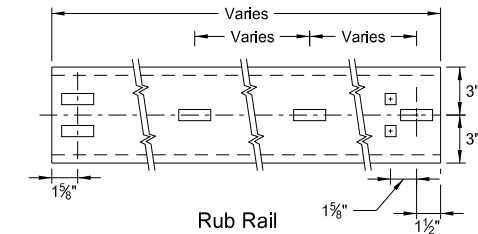
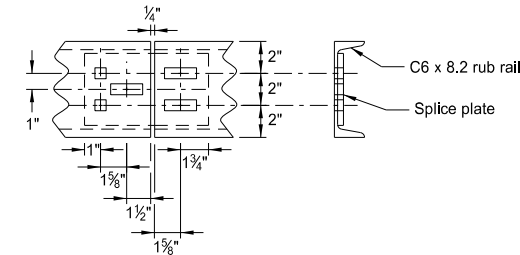
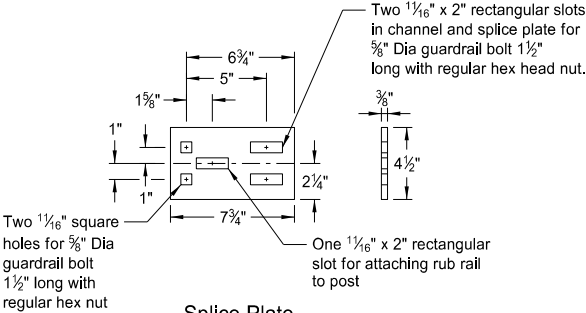
NOTE: Standard wood line post, block, and associated hardware not included in Bill of Materials Table.

1. Wood posts are required with the Flared Energy Absorbing Terminal except posts 1 and 2.
2. Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
3. Flare the Flared Energy Absorbing Terminal when the approach guardrail is parallel with the roadway. When the approach guardrail is flared at 16:1 to 10:1, ensure the Flared Energy Absorbing Terminal has only the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, ensure the Flared Energy Absorbing Terminal is turned parallel to the roadway.
4. Ensure the lower sections of the posts do not protrude more than 4" above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
5. Install the lower section of the hinged posts without the upper post attached. If the post is placed in a drilled hole, the backfill material must be compacted to prevent settlement.
6. The breakaway cable assembly must be taut. Use a locking device (vice grips or channel lock pliers) to prevent cable from twisting when tightening nuts.
7. "Toe nail" the wood blockouts to the rectangular wood posts. Use two 20 penny galvanized nails.

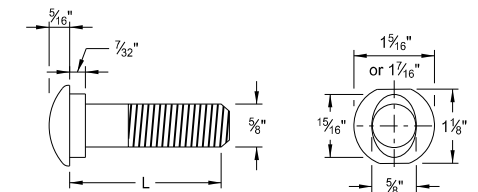
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MGS W-BEAM GUARDRAIL GENERAL DETAILS

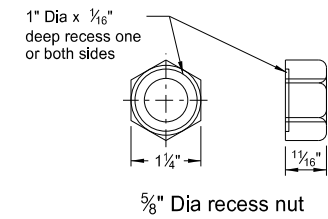
D-764-40



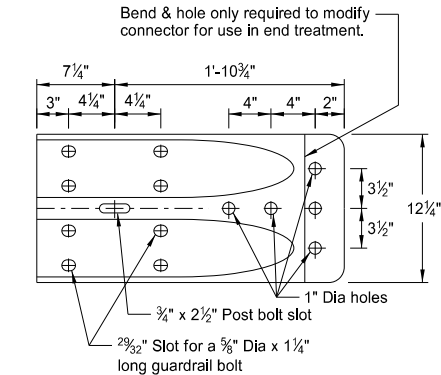
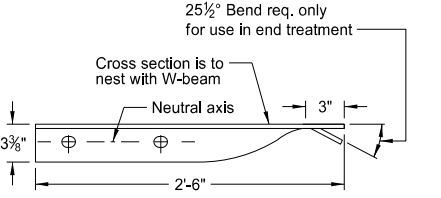
C6x8.2 RUB RAIL AND SPLICE PLATE



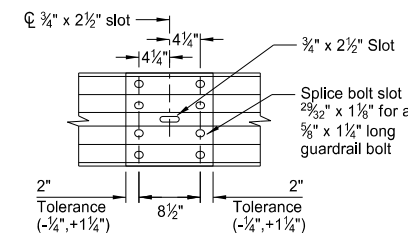
5/8" Diameter Guardrail Bolt	
L	Thread Length
1 1/4"	Full length thread
2"	1 3/4" Min thread length
9 1/2"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length



5/8" GUARDRAIL BOLT & RECESS NUT

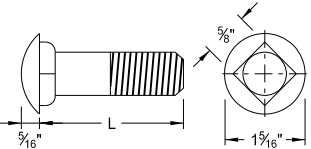


W BEAM TERMINAL CONNECTOR



SPLICE DETAIL

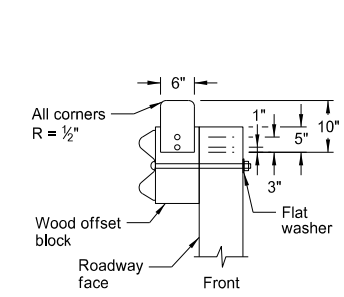
NOTE: Do not install center bolt in the 3/4" x 2 1/2" slot at mid span splices.



5/8" Diameter Carriage Bolt	
L	Thread Length
1 1/2"	Full length thread
3"	1 1/2" Min thread length
11"	1 3/4" Min thread length
13"	1 3/4" Min thread length

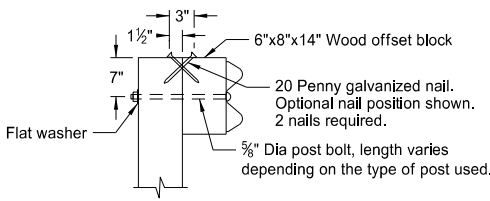


5/8" CARRIAGE BOLT & NUT

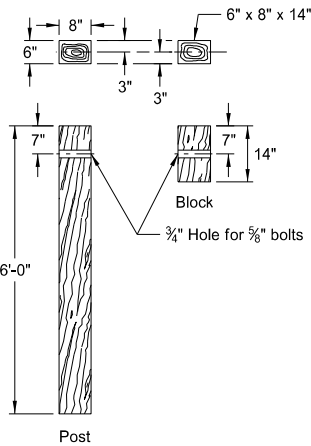


REFLECTORIZED PLATE DETAIL

NOTE: Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.

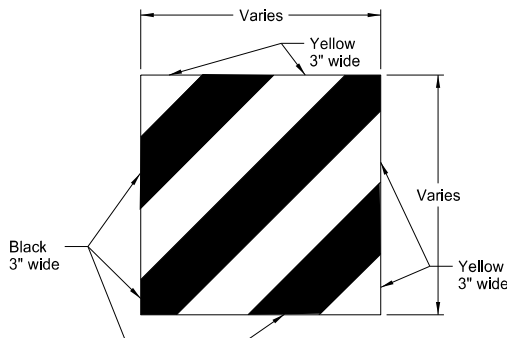


TYPICAL WOOD POST ATTACHMENT DETAIL

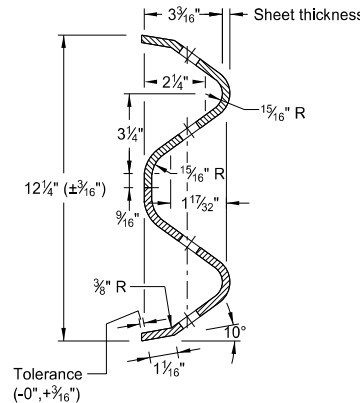


6" x 8" WOOD POST & BLOCK

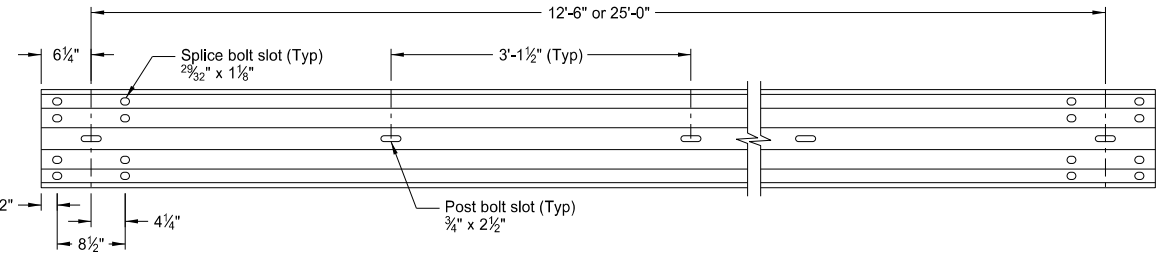
NOTE: Where soil conditions require, alternate lengths may be specified, in 6" increments.



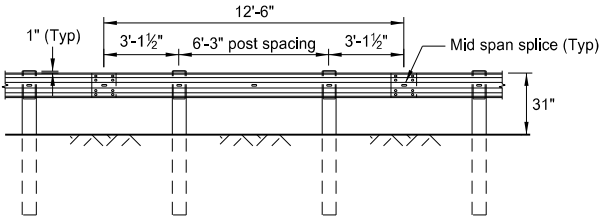
IMPACT HEAD OBJECT MARKER



W-BEAM CROSS SECTION



STANDARD MGS GUARDRAIL PANEL



STANDARD MGS GUARDRAIL SYSTEM

NOTES:

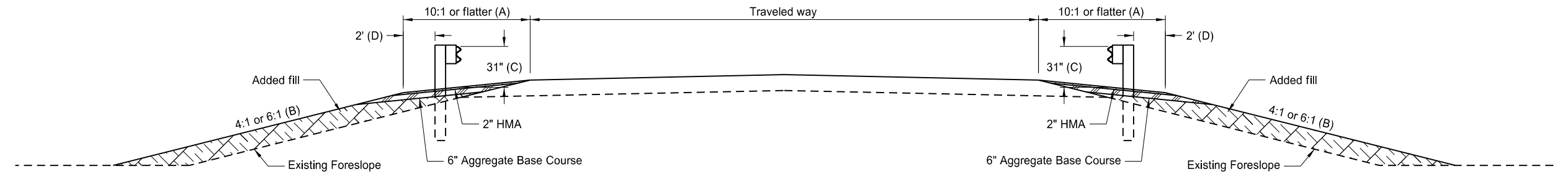
1. Begin reflector plates at the first post and space at 25' centers on guardrail less than 250' length and at 50' centers for guardrail over 250' length. Provide the reflector the same color as the pavement marking adjacent to it unless noted otherwise on the plans.
2. Replacing bituminous material at guardrail post: Dispose all excess earth from excavations for guard posts as directed by the engineer. Replace bituminous material wherever guardrail is installed after mat has been laid. Cost of excavation and replacing of bituminous material to be included in the price bid for other items.
3. Fit the Object Marker within the vertical edges of the Impact Plate. Provide type XI retroreflective sheeting meeting the requirements of Section 894.02.E of the standard specifications. Apply the sheeting to 0.100 Aluminum sheeting meeting the requirements of Section 894.01.A. Attach the Object Marker to the Impact Head Plate with rivets or other attachment device. Ensure the rivets or attachment device are non-rust. Slope the stripes downward toward the roadway side.
4. Guardrail installation height tolerance = ±1".

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE

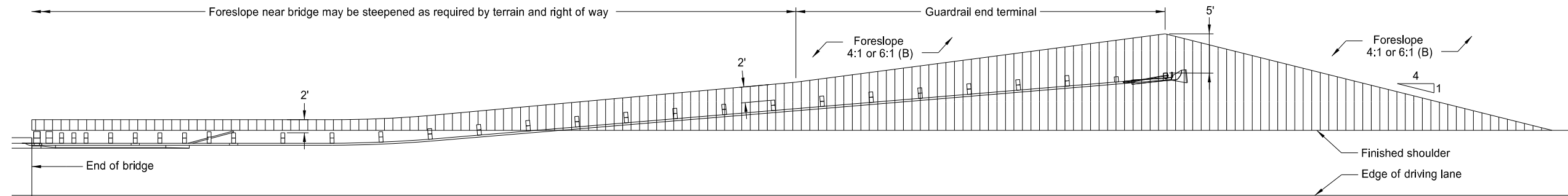
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of Transportation

TYPICAL GRADING AT BRIDGE ENDS
WITH MGS W-BEAM GUARDRAIL

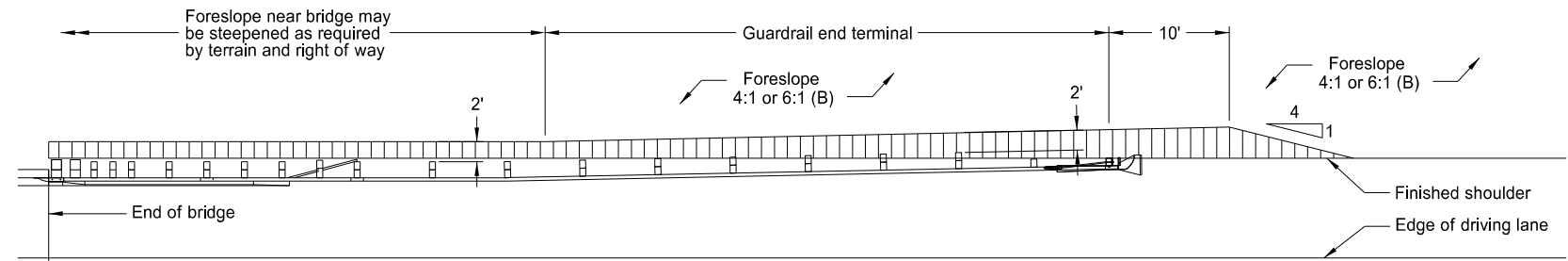
D-764-48



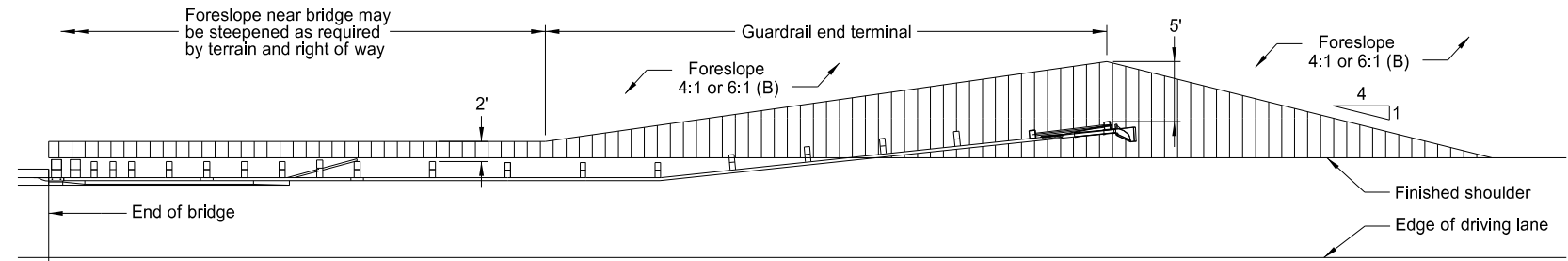
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

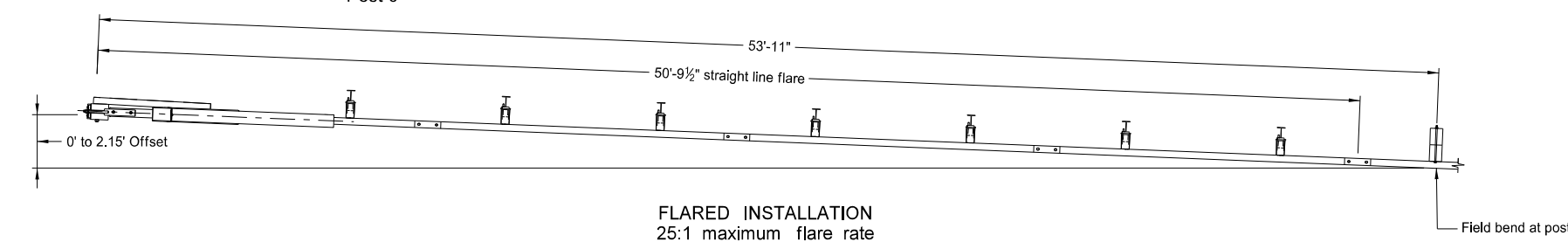
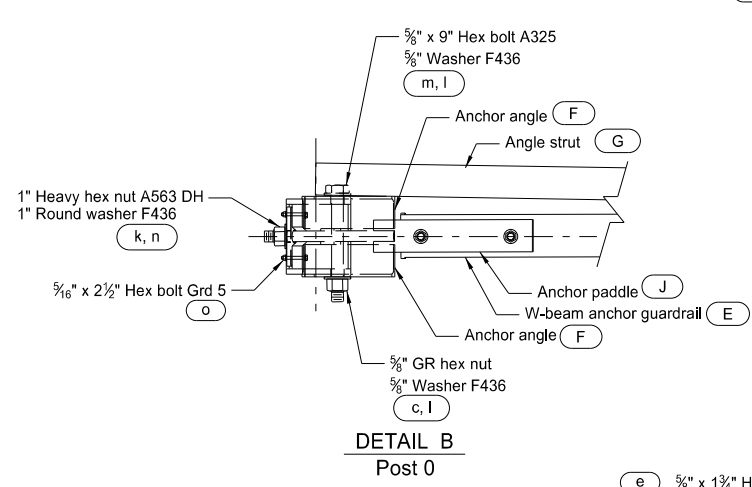
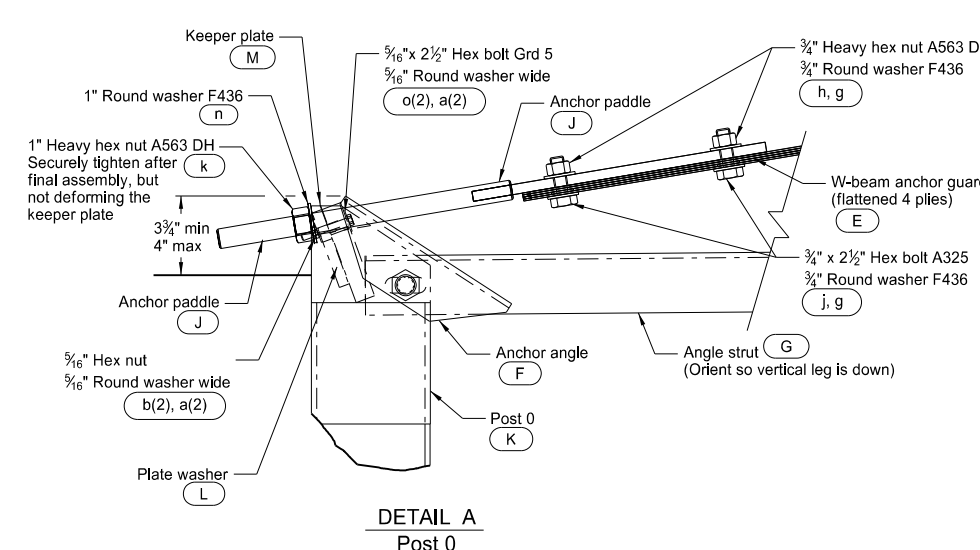
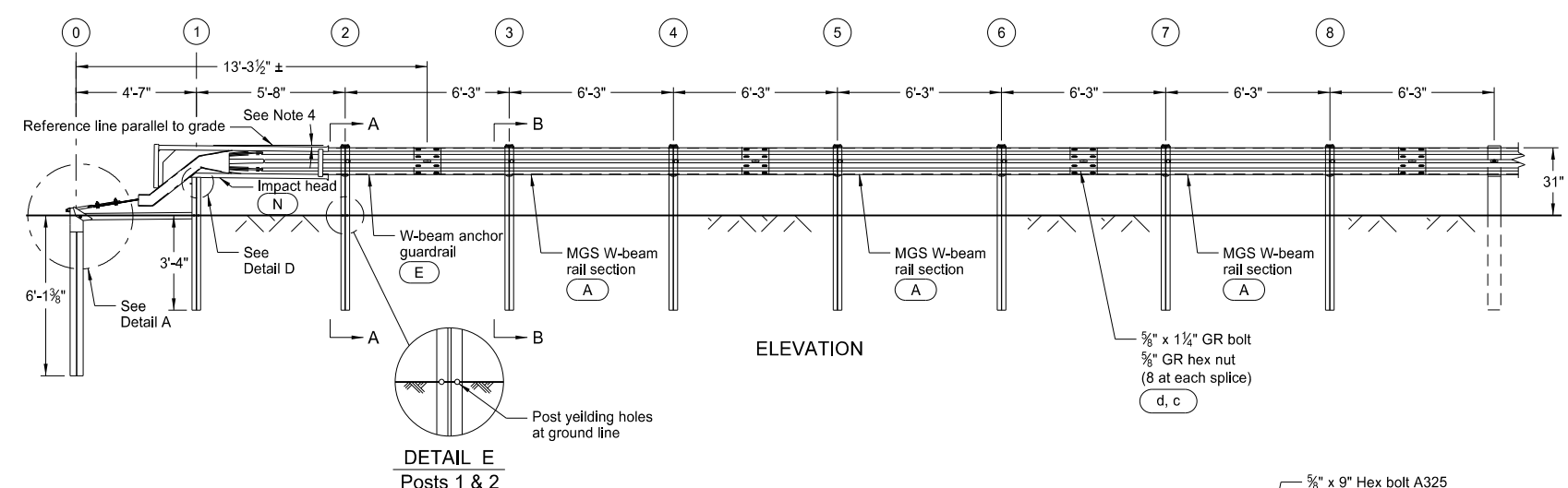
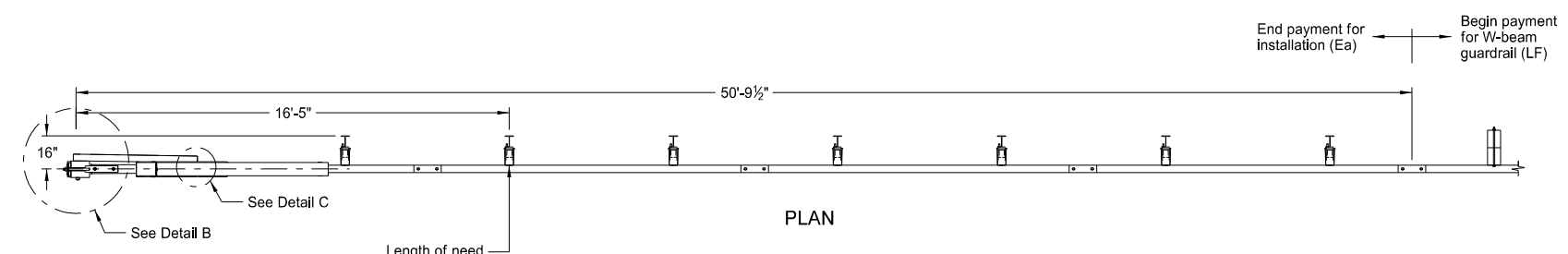
- (A) Slope flatter than 10:1 may be required to provide proper guardrail height.
- (B) Where normal foreslope is 4:1 the added fill shall be 4:1. Where normal foreslope is 6:1 the added fill shall be 6:1.
- (C) Measured from top of guardrail to top of surfacing at front face of guardrail.
- (D) Dimension at end terminals may vary per Plan Layouts shown on this sheet.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE

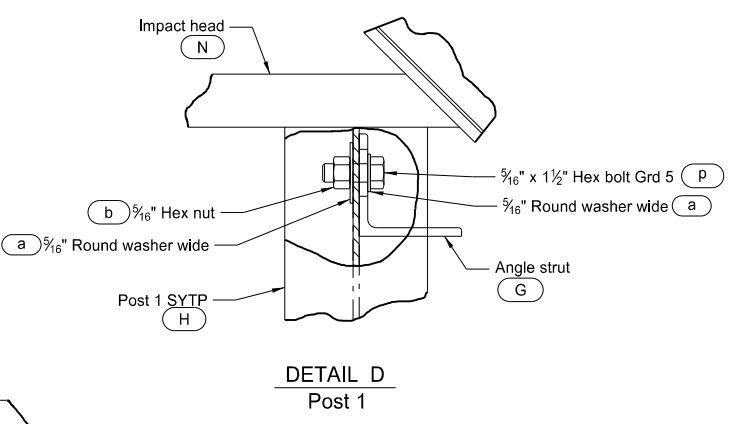
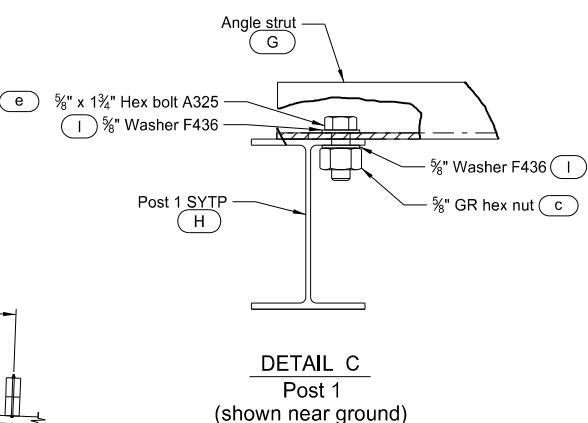
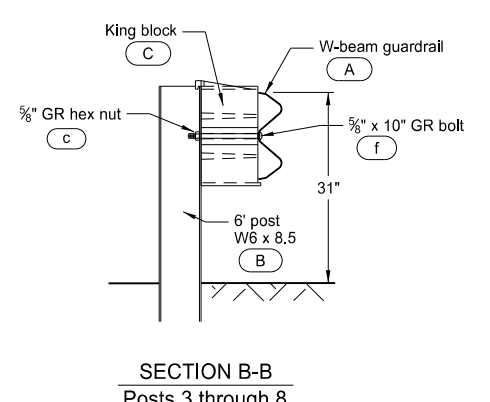
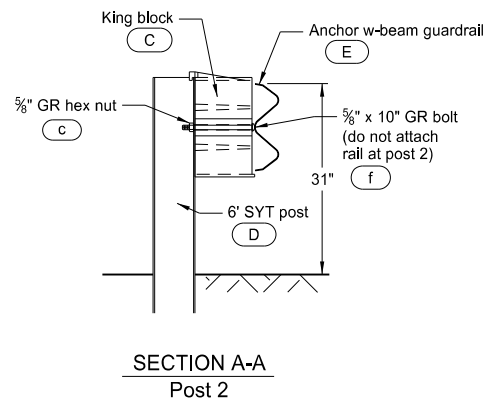
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MASH SOFTSTOP END TERMINAL - STEEL POST

D-764-50



- GENERAL NOTES:
1. Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
 2. The SoftStop can be flared at a rate of 25:1 or flatter.
 3. Do not curve the guardrail within the SoftStop under any circumstances.
 4. It is acceptable to install the SoftStop impact head parallel to the grade line or with an upward tilt. See softstop assembly manual for specific details.



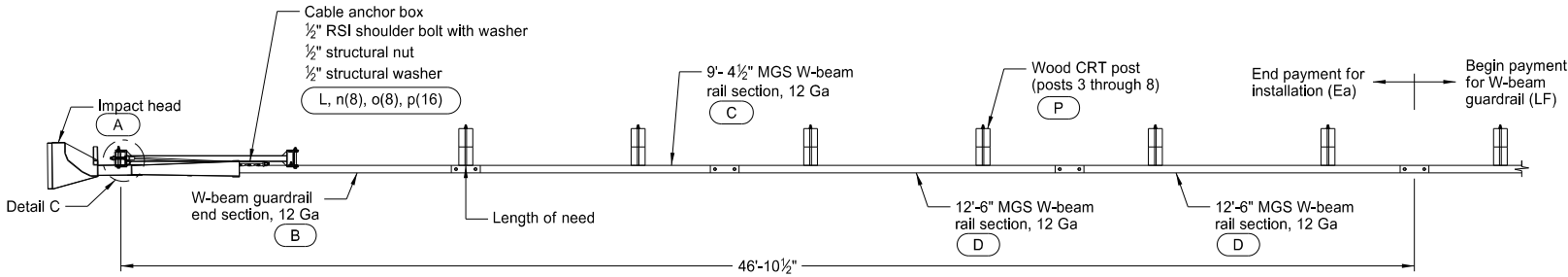
ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	000011	12 / 12'-6" / 3'-1 1/2" / S MGS W-BEAM RAIL SECTION	3
B	000533	6'-0" STEEL POST W6 x 8.5	6
C	006777	KING BLOCK 4" X 7 1/2" X 1'-2"	7
D	015000	6'-0" SYT POST / 8.5 / 31" GR HT	1
E	015200	SFST - ANCHOR GUARDRAIL 12'-6"	1
F	015201	SFST - ANCHOR ANGLE	2
G	015202	SFST - ANGLE STRUT	1
H	015203	SFST - POST #1 SYTP	1
J	015204	SFST - ANCHOR PADDLE	1
K	015205	SFST - POST #0	1
L	015206	SFST - PLATE WASHER	1
M	015207	SFST - KEEPER PLATE	1
N	015208	SFST - IMPACT HEAD	1
HARDWARE			
a	003240	5/16" ROUND WASHER WIDE	6
b	003245	5/16" HEX NUT	3
c	003340	5/8" GR HEX NUT	41
d	003360	5/8" x 1 1/4" GR BOLT	32
e	003391	5/8" x 1 3/4" HEX BOLT A325	1
f	003500	5/8" x 10" GR BOLT A307	7
g	003701	3/4" ROUND WASHER F436	4
h	003704	3/4" HVY HEX NUT A563 DH	2
j	003717	3/4" x 2 1/2" HEX BOLT A325	2
k	003908	1" HVY HEX NUT A563 DH	1
l	004372	5/8" WASHER F436	4
m	004489	5/8" x 9" HEX BOLT A325	1
n	004902	1" ROUND WASHER F436	1
o	105285	5/16" x 2 1/2" HEX BOLT GRD 5	2
p	105286	5/16" x 1 1/2" HEX BOLT GRD 5	1

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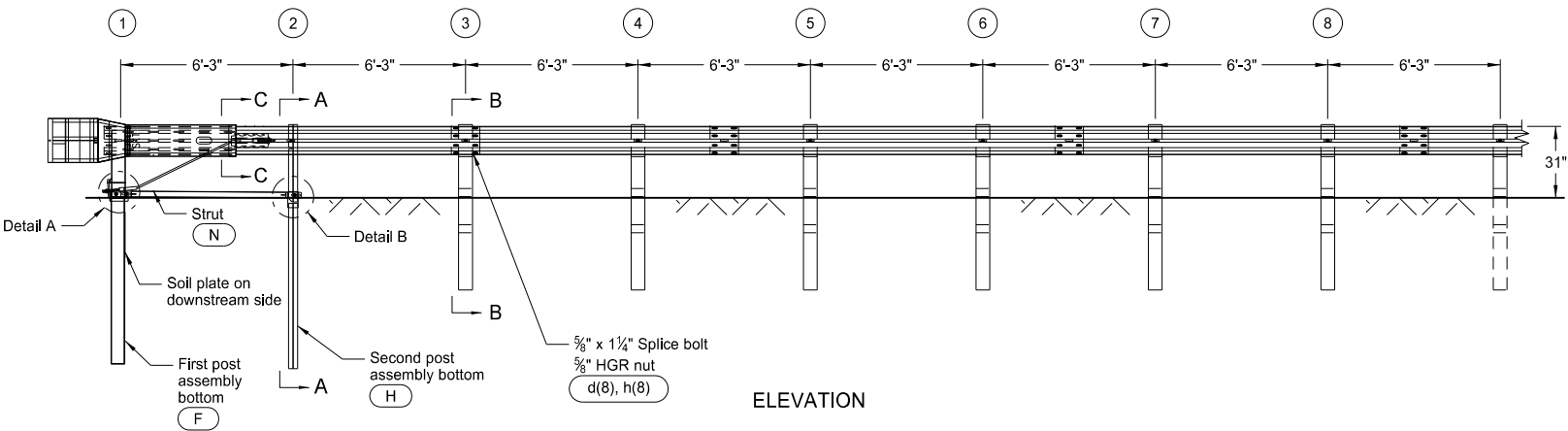
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MASH SEQUENTIAL KINKING TERMINAL - WOOD POST

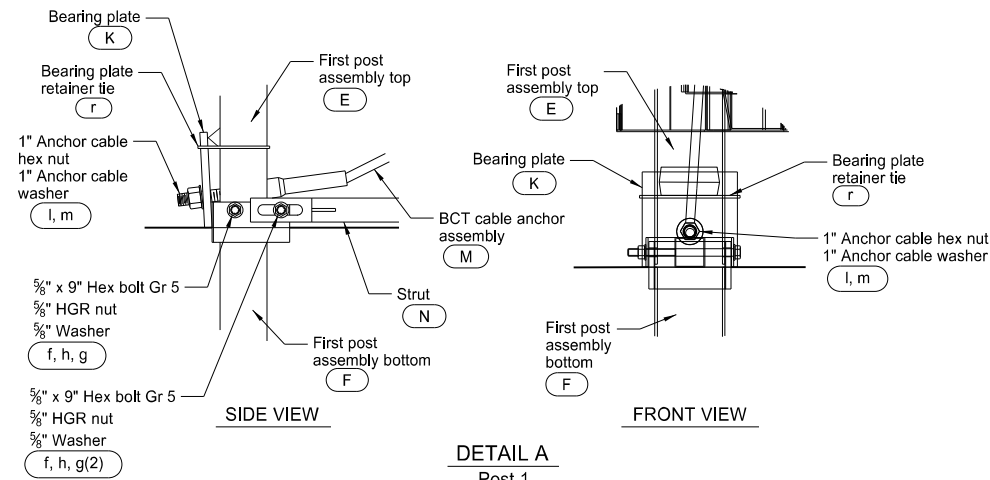
D-764-51



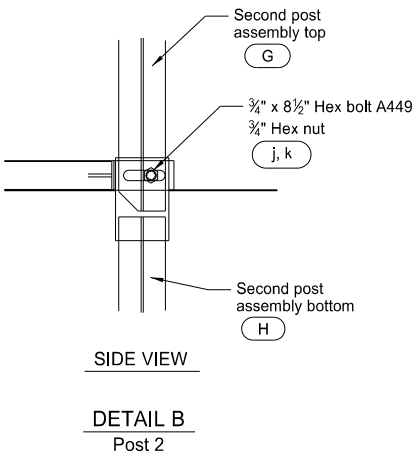
PLAN



ELEVATION

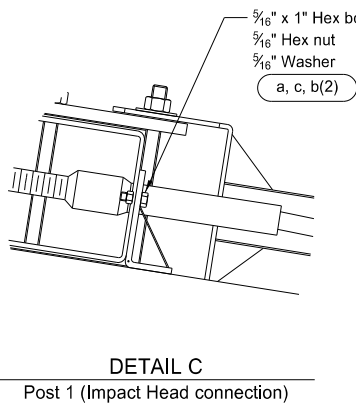


DETAIL A
Post 1



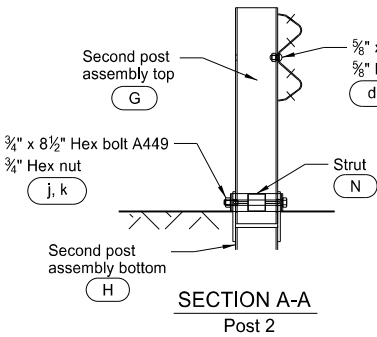
SIDE VIEW

DETAIL B
Post 2

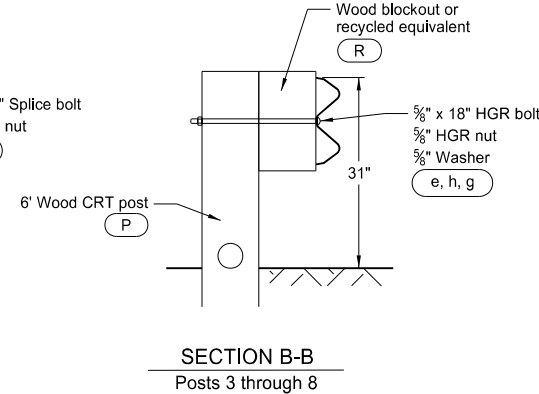


DETAIL C

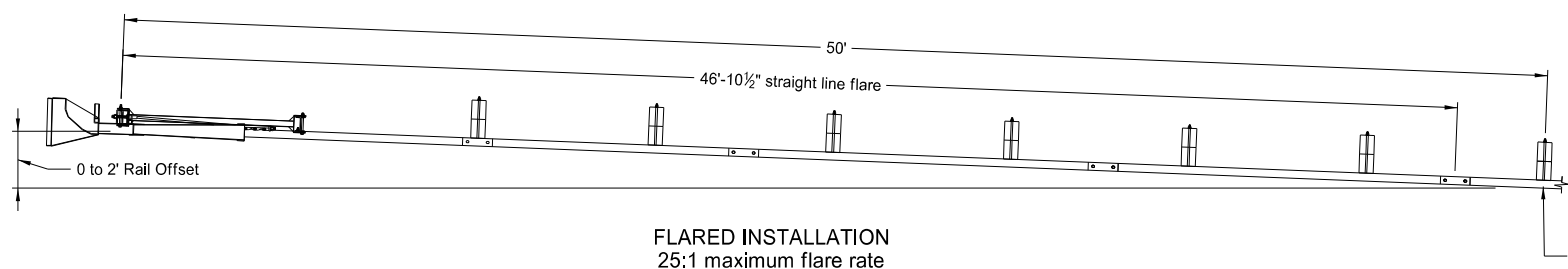
Post 1 (Impact Head connection)



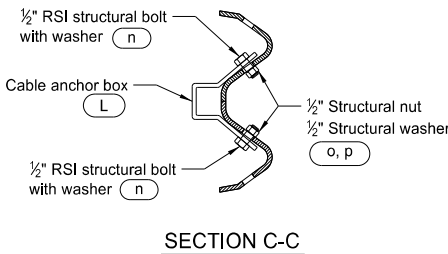
SECTION A-A
Post 2



SECTION B-B
Posts 3 through 8



FLARED INSTALLATION
25:1 maximum flare rate



SECTION C-C

GENERAL NOTES:

- Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
- The MSKT can be flared at a rate of up to 25:1 to prevent the impact head from encroaching on the shoulder.
- Ensure the lower sections of the posts do not protrude more than 4" above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
- Install the lower section of the hinged posts without the upper post attached. If the post is placed in a drilled hole, the backfill material must be compacted to prevent settlement.
- The breakaway cable assembly must be taut. Use a locking device (vice grips or channel lock pliers) to prevent the cable from twisting when tightening nuts.
- "Toe nail" the wood blockouts to the rectangular wood posts at post 3 through post 8. Use two 20 penny galvanized nails.

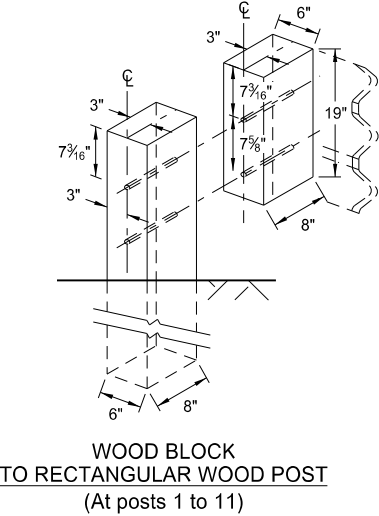
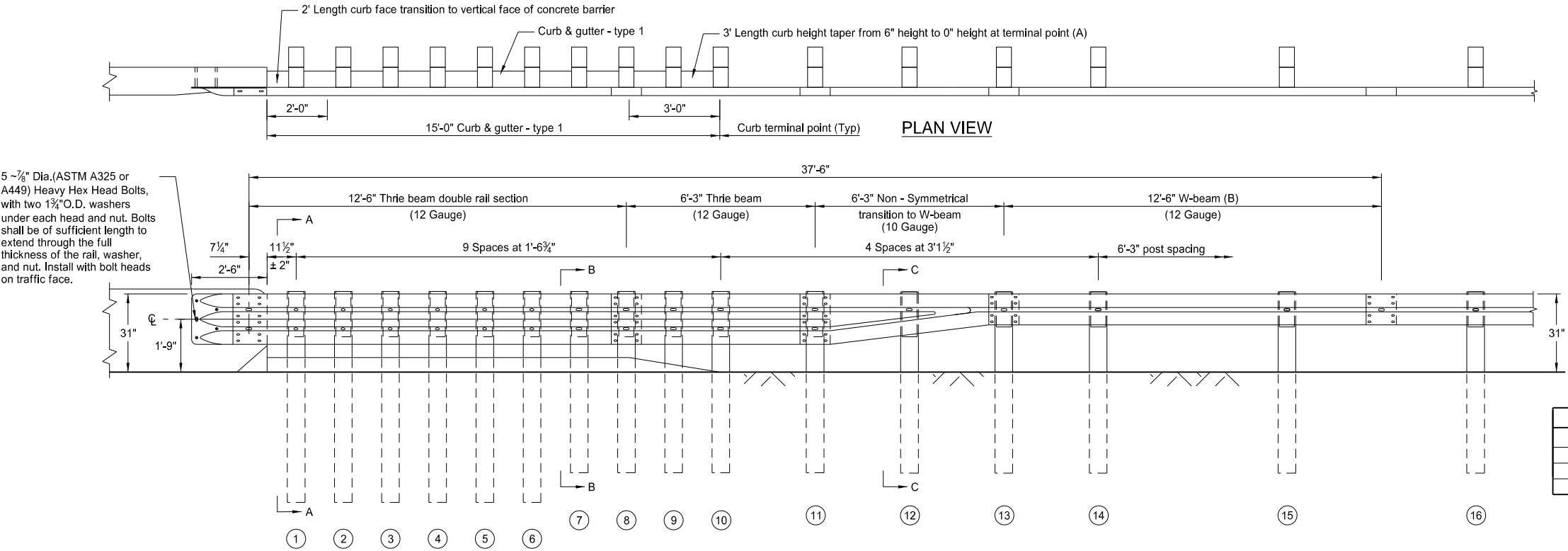
ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	MS3000	IMPACT HEAD	1
B	SF1303	W-BEAM GUARDRAIL END SECTION, 12 Ga	1
C	G12025	9'-4 1/2" MGS W-BEAM RAIL SECTION, 12 Ga	1
D	G1203A	12'-6" MGS W-BEAM RAIL SECTION, 12 Ga	2
E	MTPHP1A	FIRST POST ASSEMBLY TOP (6" X 6" X 1/8" Tube)	1
F	MTPHP1B	FIRST POST ASSEMBLY BOTTOM (6" W6X15)	1
G	UHP2A	SECOND POST ASSEMBLY TOP	1
H	HP2B	SECOND POST ASSEMBLY BOTTOM	1
K	E750	BEARING PLATE	1
L	S760	CABLE ANCHOR BOX	1
M	E770	BCT CABLE ANCHOR ASSEMBLY	1
N	MS785	STRUT	1
P	UP671	6" WOOD CRT POST	6
R	P675	WOOD BLOCKOUT OR RECYCLED EQUIVALENT	6
HARDWARE			
a	B5160104A	5/16" x 1" HEX BOLT GR 5	2
b	W0516	5/16" WASHER	4
c	N0516	5/16" HEX NUT	2
d	B580122	5/8" Dia x 1 1/4" SPLICE BOLT	33
e	B581802	5/8" Dia x 18" HGR BOLT (POSTS 3 THRU 8)	6
f	B580904A	5/8" x 9" HEX BOLT GR 5	2
g	W050	5/8" WASHER	9
h	N050	5/8" Dia HGR NUT	35
j	B340854A	3/4" Dia x 8 1/2" HEX BOLT GRD A449	1
k	N030	3/4" Dia HEX NUT	1
l	N100	1" ANCHOR CABLE HEX NUT	2
m	W100	1" ANCHOR CABLE WASHER	2
n	SB12A	1/2" RSI SHOULDER BOLT WITH WASHER	8
o	N012A	1/2" STRUCTURAL NUT	8
p	W012A	1/2" STRUCTURAL WASHER	8
r	CT-100ST	BEARING PLATE RETAINER TIE	1

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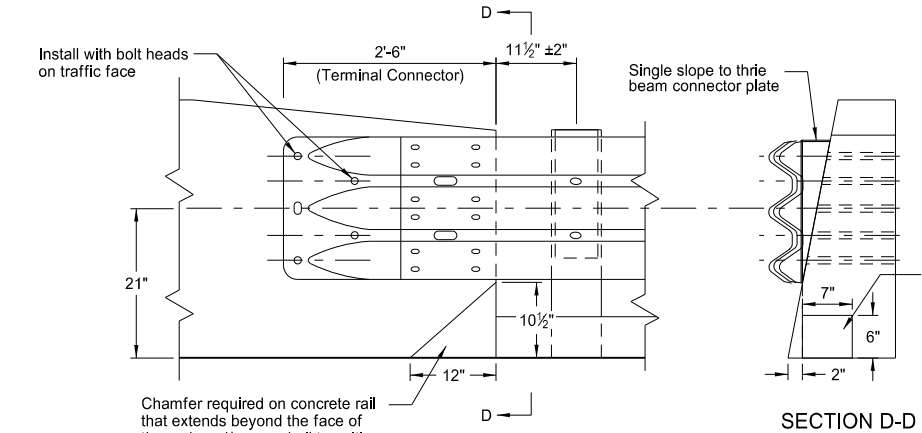
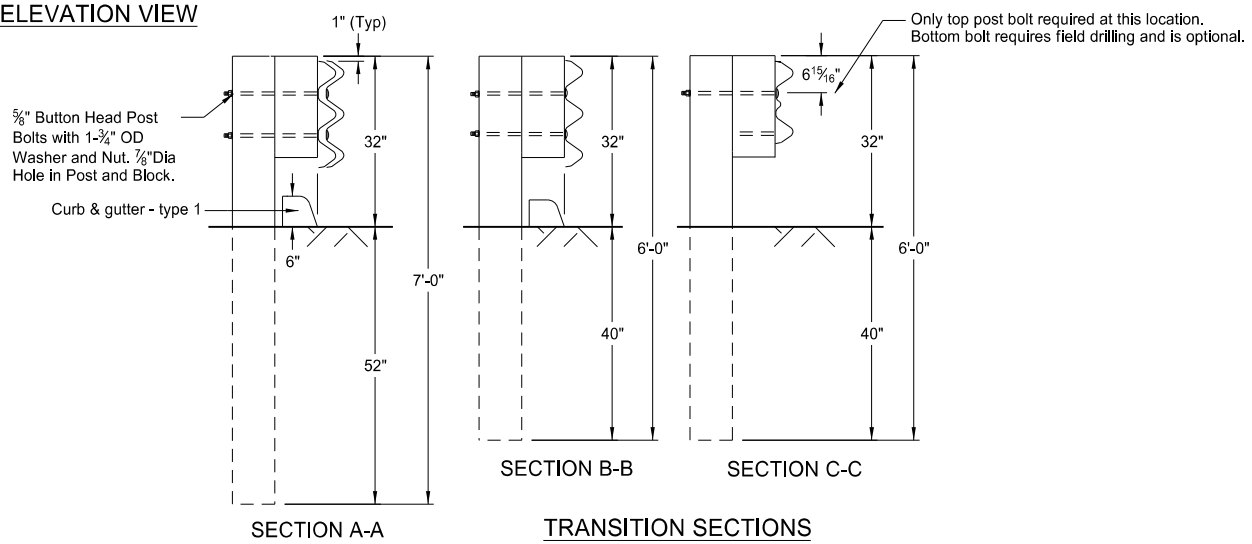
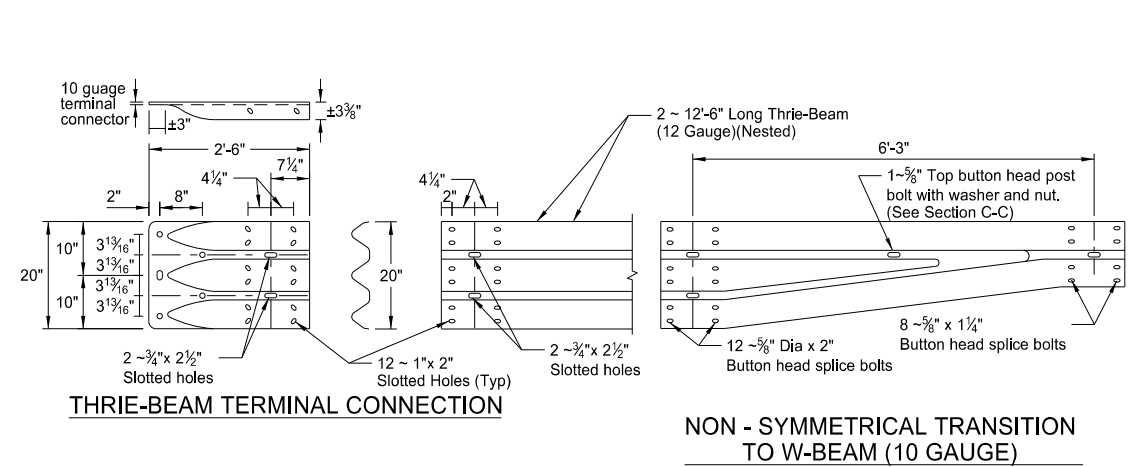
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MGS W-BEAM TRANSITION WITH APPROACH CURB TO CONCRETE SINGLE SLOPE OR JERSEY BARRIER

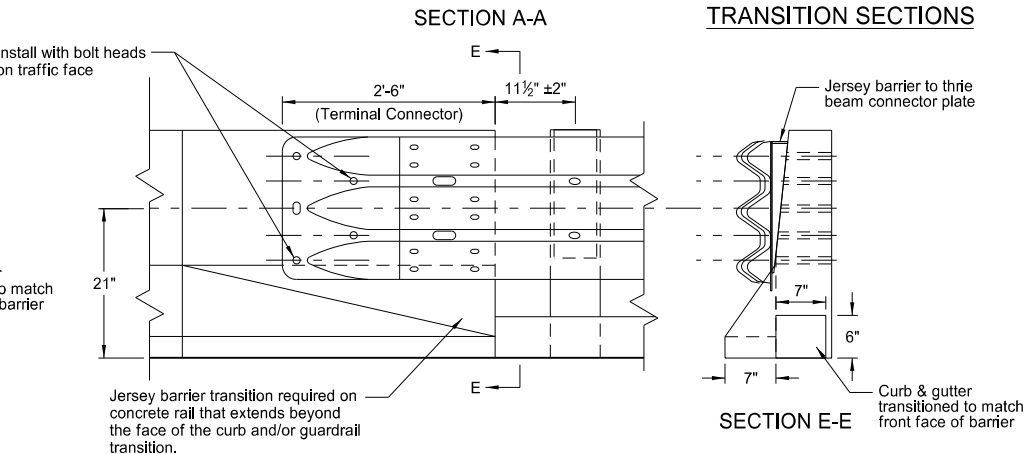
D-764-60



TRANSITION POST AND TIMBER BLOCKOUT SIZING		
POST NO.	POST SIZE	BLOCKOUT SIZE
1-6	6" X 8" X 7'-0" long	6" X 8" X 19"
7-12	6" X 8" X 6'-0" long	6" X 8" X 19"
13-16	6" X 8" X 6'-0" long	6" X 8" X 14"



CONNECTION TO CONCRETE SINGLE SLOPE BRIDGE RAIL AND TRAFFIC BARRIERS



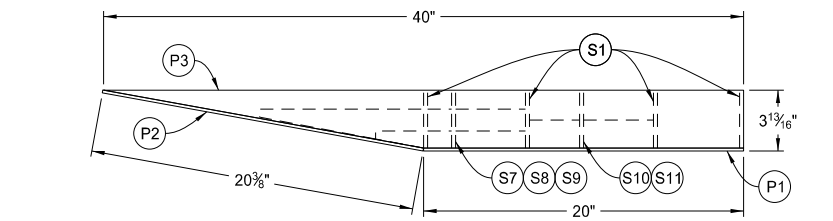
CONNECTION TO CONCRETE JERSEY BARRIER BRIDGE RAIL AND TRAFFIC BARRIERS

- (A) Where curb is required to continue past 15' length, taper the curb down to 3" height at the terminal point shown above, instead of 0" height. Between posts 10 and 16 the curb must be 3" height.
- (B) Install a 12'-6" length W-beam double rail section at this location where curb extends past 15' length.

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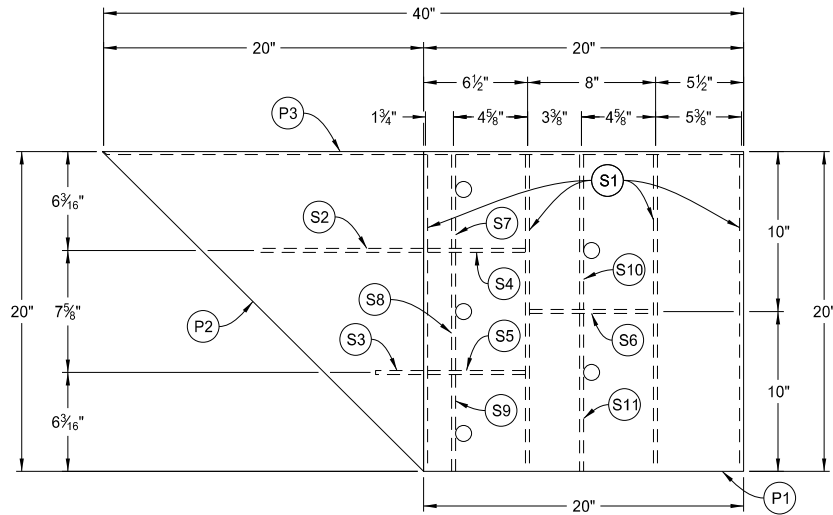
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SINGLE SLOPE TO THRIE BEAM CONNECTOR PLATE DETAILS



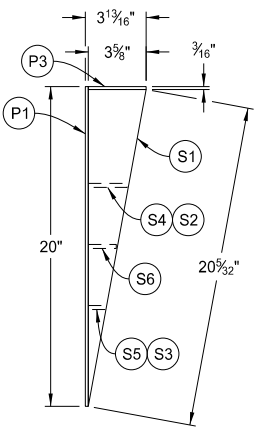
PLAN

NOTE: Assembly Detail is shown for guardrail installation on right hand side of entrance end of bridge barrier. Mirror for opposite side installation.

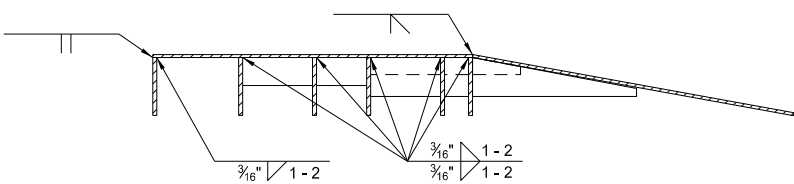


ELEVATION

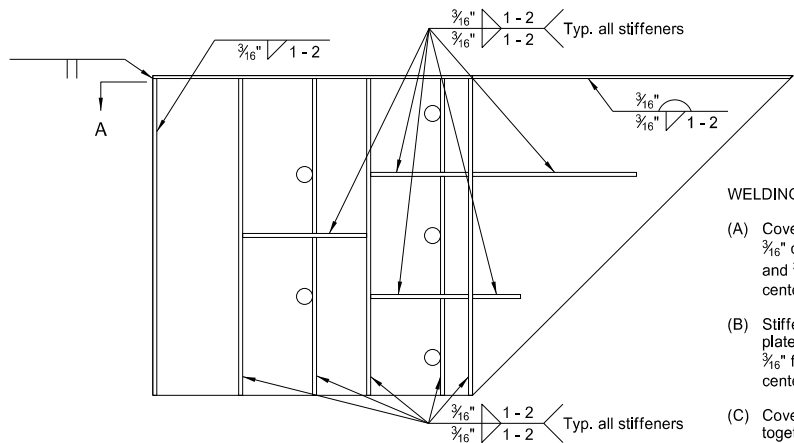
ASSEMBLY DETAIL
(Front View)



END



SECTION A-A

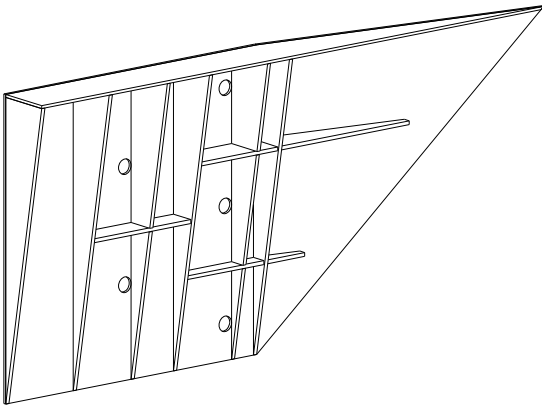


ELEVATION

WELDING DETAIL
(Back View)

WELDING INSTRUCTIONS:

- Cover plate P3 shall be welded as follows:
3/16" continuous back weld on exterior sides and 3/16" fillet weld 1" long spaced at 2" center-to-center on interior sides.
- Stiffeners located on the inside of the cover plates shall be welded as follows:
3/16" fillet weld 1" long spaced at 2" center-to-center.
- Cover plates P1 and P2 shall be welded together with full penetration groove weld.



PICTORIAL DRAWING
(Showing Back of Connector Plate)

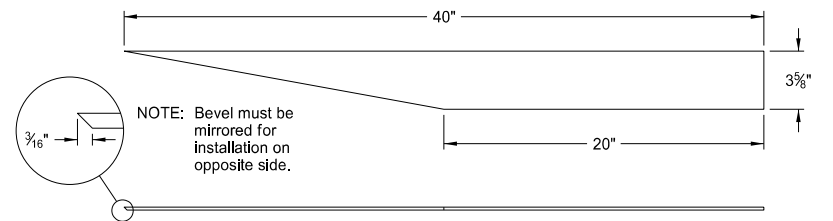


PLATE P3
Quantity: 1

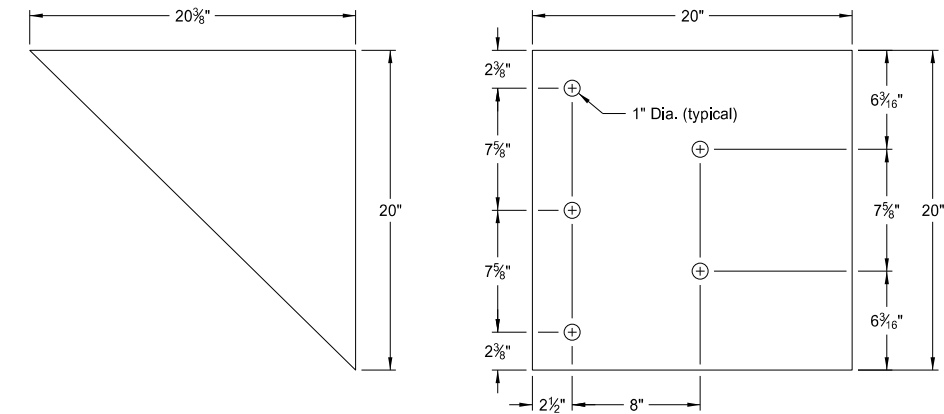
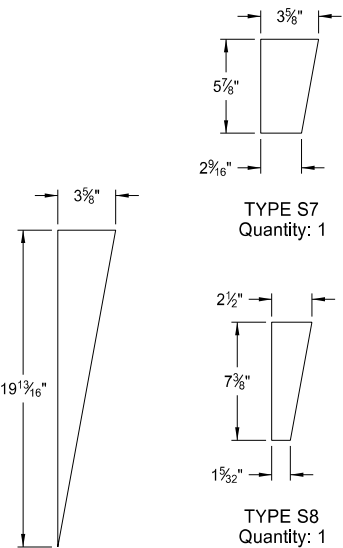


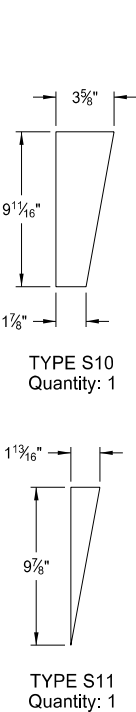
PLATE P2
Quantity: 1

PLATE P1
Quantity: 1

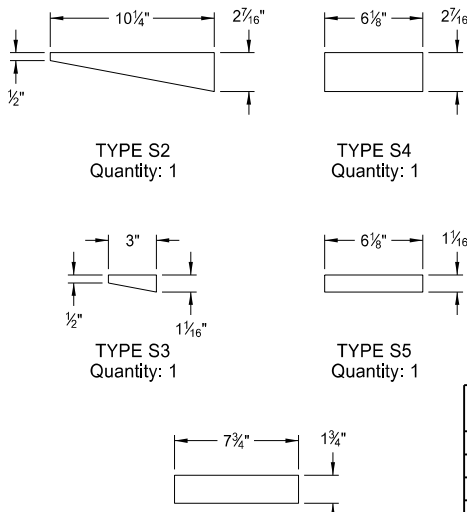
COVER PLATES



VERTICAL PLATES



STIFFENER PLATES



HORIZONTAL PLATES

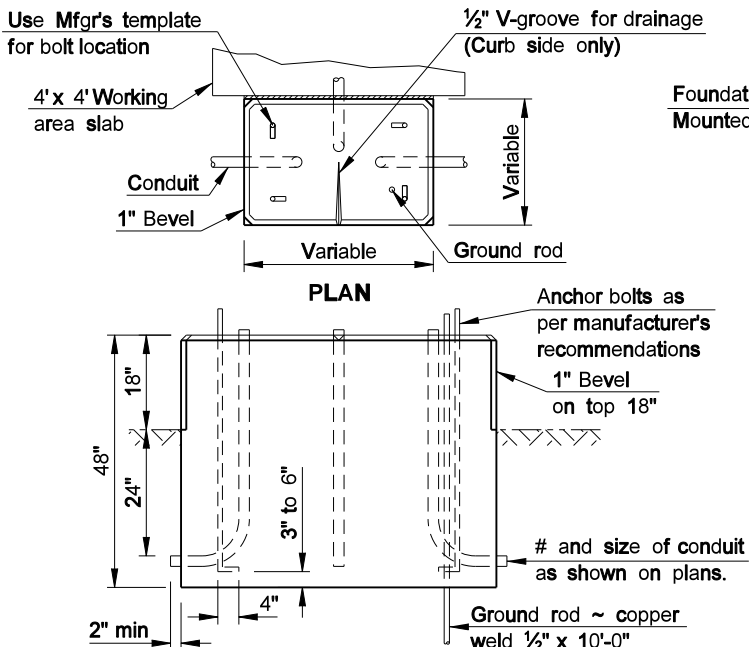
NOTES:

- Cover plates P1, P2, and P3 shall be fabricated from 3/16" thick ASTM A36 Grade structural steel.
- Stiffener plates shall be fabricated from 1/4" thick ASTM A36 Grade structural steel.
- Connector plate shall be galvanized in accordance with AASHTO M111.

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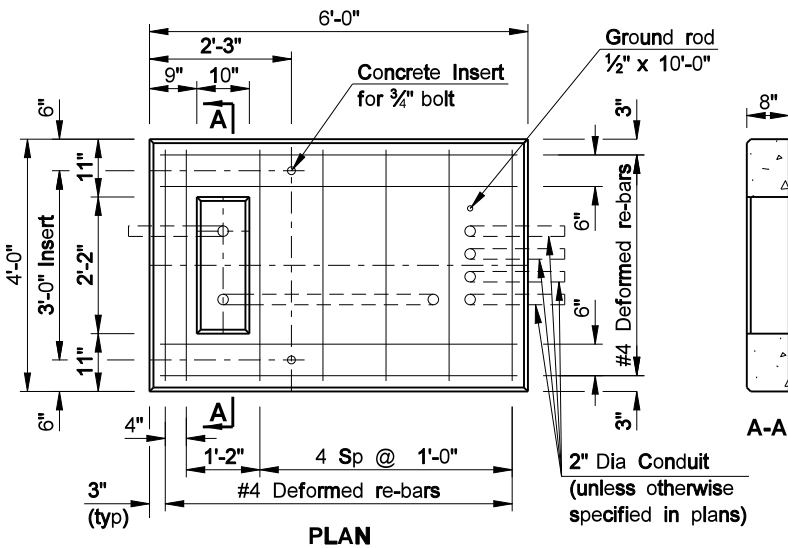
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CONCRETE FOUNDATIONS
(TRAFFIC SIGNALS & HIGHWAY LIGHTING)



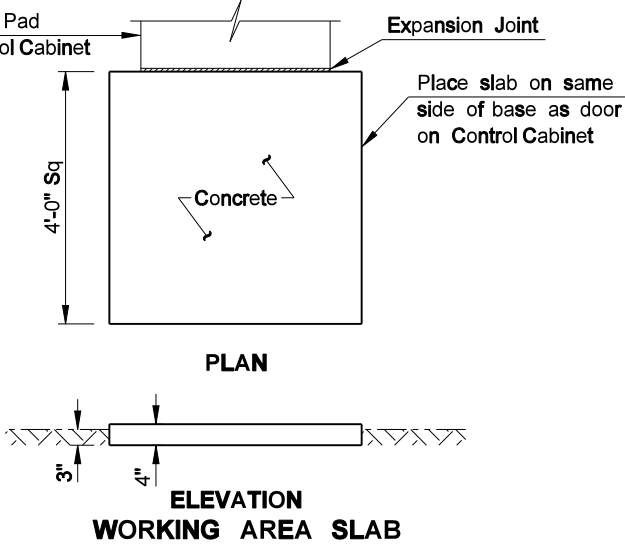
CONTROLLER CABINET FOUNDATION PAD MOUNT

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

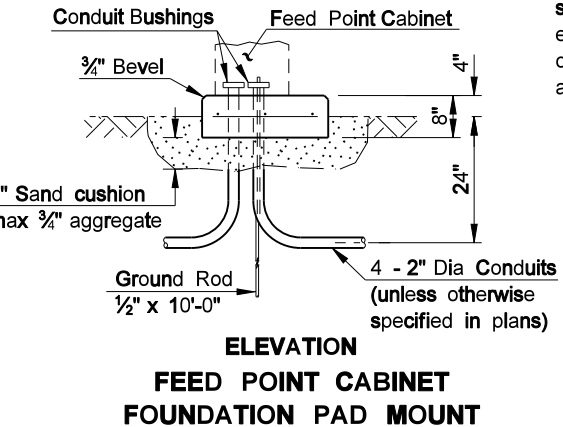
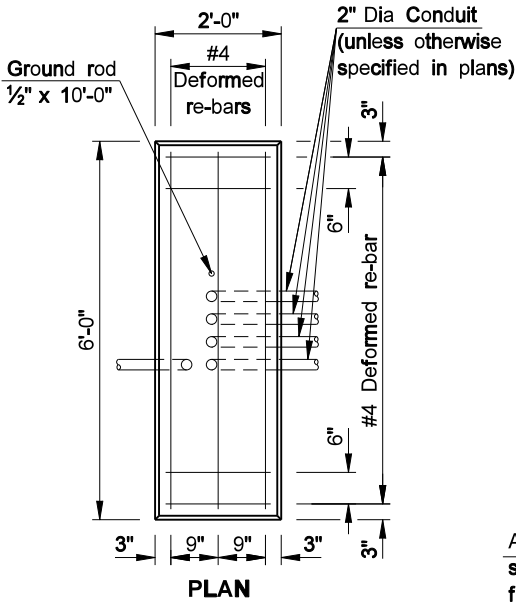


TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

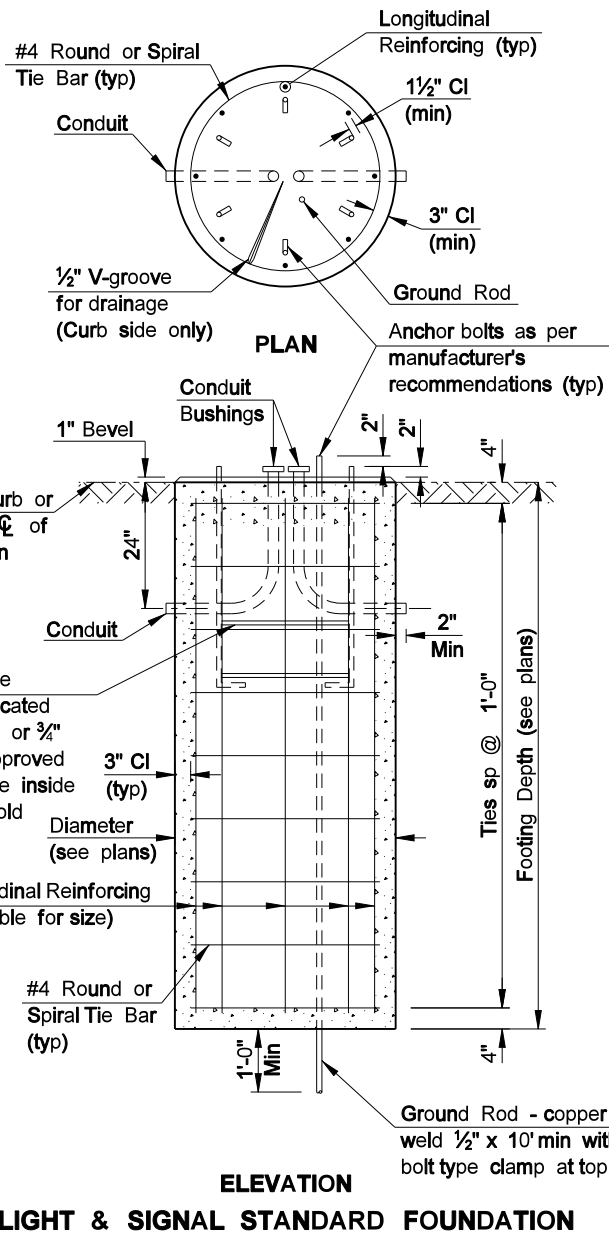
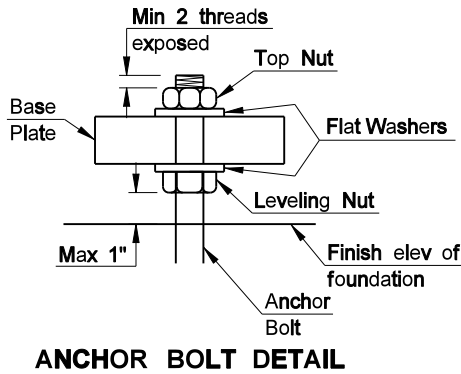
The Transformer & Feed Point Cabinet Foundation Pad Mount shall be bid as Concrete Foundation ~ Feed Point ~ Type A.



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.



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



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.

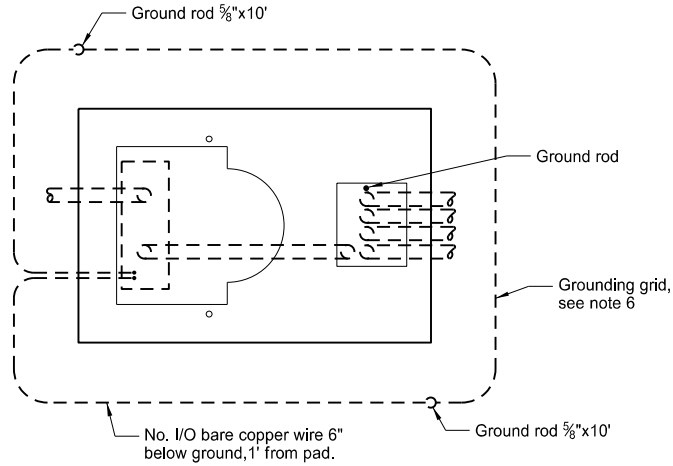
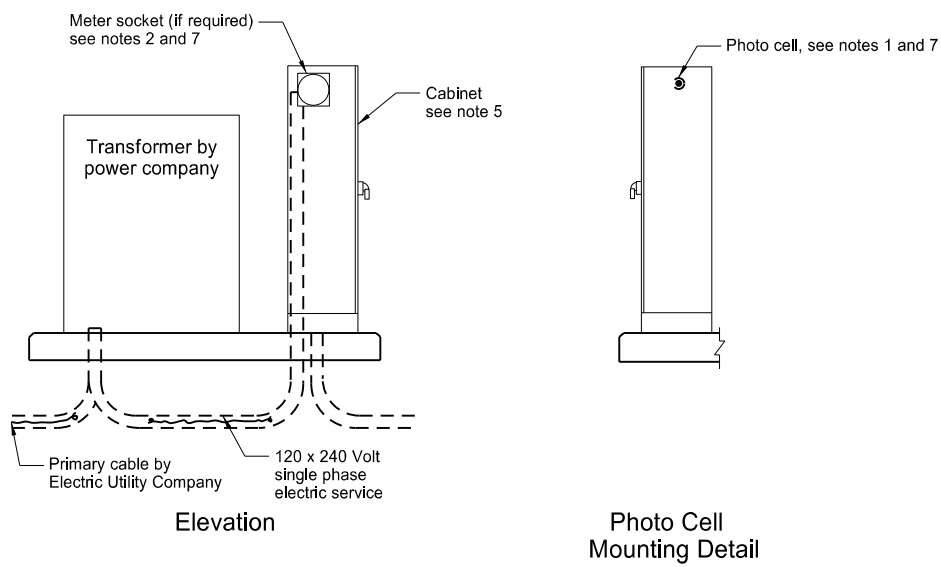
FEED POINT CABINET FOUNDATION PAD MOUNTED: The foundation shall have a wood float finish. All conduits shown shall be installed. Conduit that is not used at this time shall be plugged with an expandable plug.

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

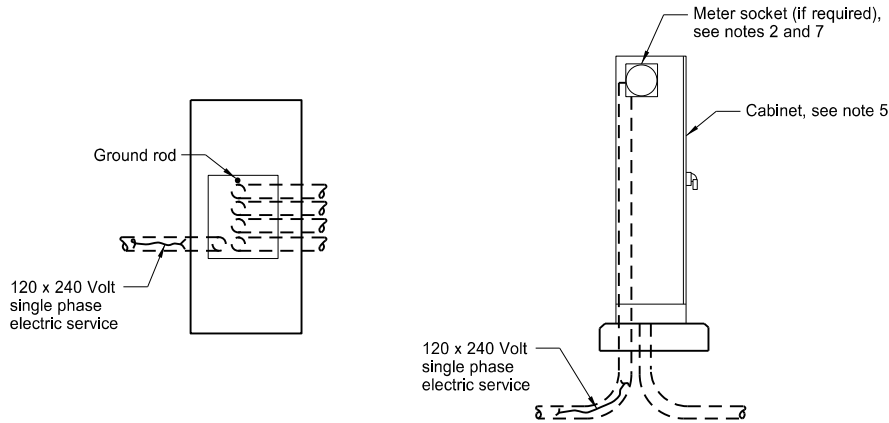
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6-15-10	
REVISIONS	
DATE	CHANGE

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FEED POINTS
(ROADWAY LIGHTING)

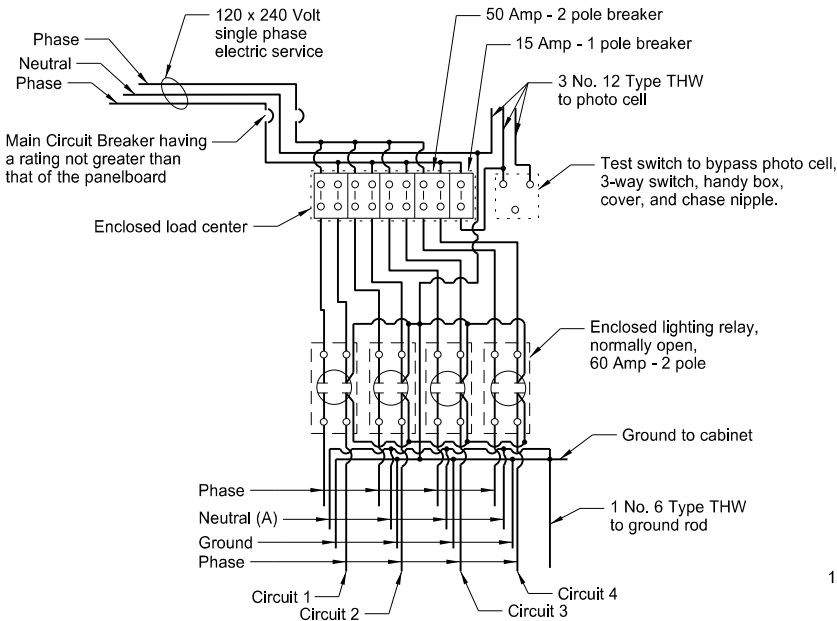


Plan
Transformer and Feed Point Cabinet Pad Mounted



Plan
Feed Point Cabinet Pad Mounted

Elevation



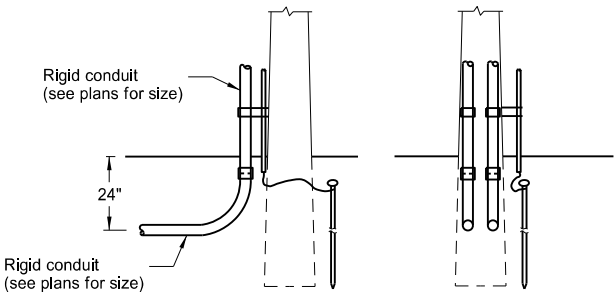
Feed Point Type IV

Provide Type I feed point similar to Type IV, except with one electrical circuit, one 50 Amp - 2 pole breakers, and one lighting relay, normally open.

Provide Type II feed point similar to Type IV, except with two electrical circuit, two 50 Amp - 2 pole breakers, and two lighting relays, normally open.

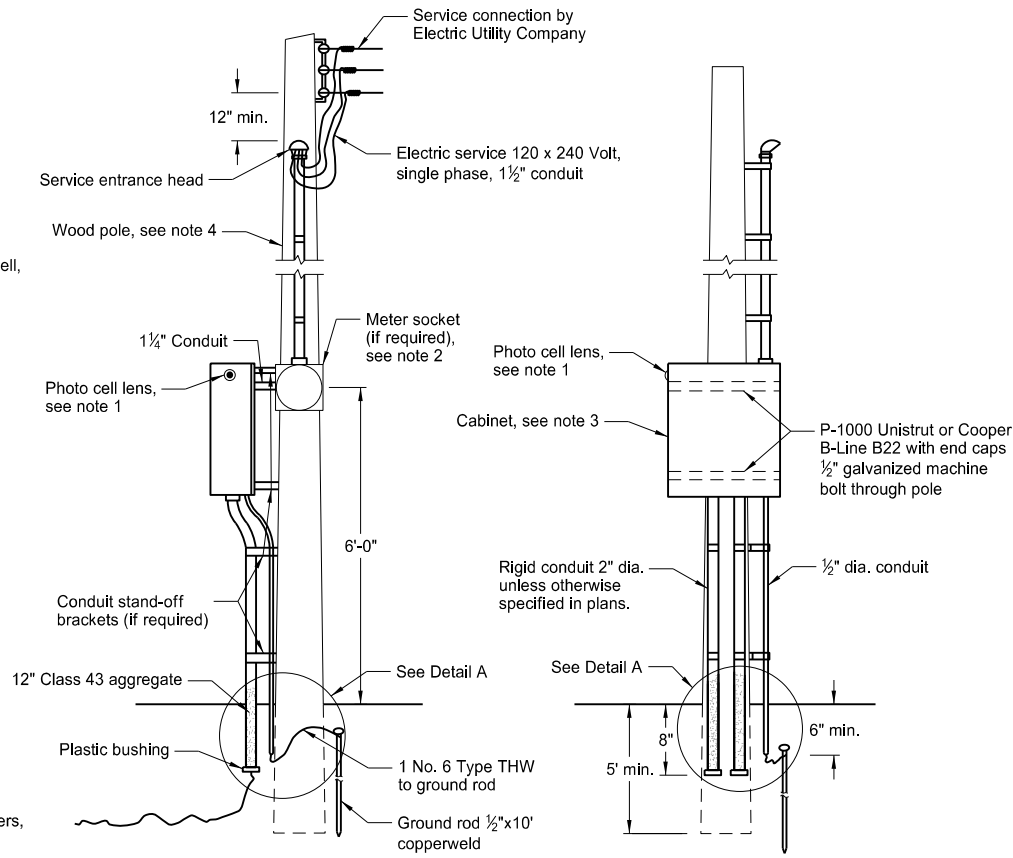
Provide Type III feed point similar to Type IV, except with three electrical circuits, three 50 Amp - 2 pole breakers, and three lighting relays, normally open.

(A) Install when festoon circuit is required.



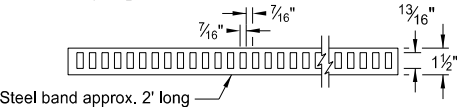
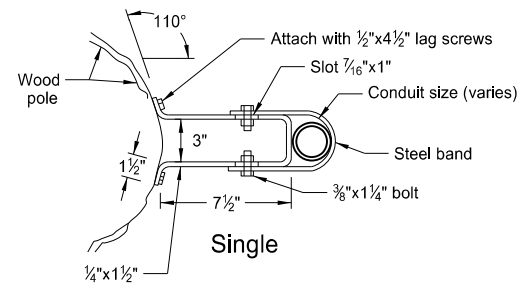
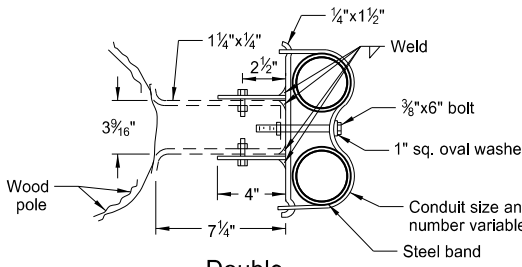
Detail A

Use this detail for a continuous run of conduit from the feed point to the first light standard.



Feed Point Pole Mounted

- Notes:
- Photo Cell: Furnish and install the photoelectric cell. Face photo lens north.
 - Meter Socket: Install meter socket and trim if the meter is required by local Utility Company. Meter furnished and installed by Utility Company.
 - Pole Mounted Cabinet: Provide cabinet with lock drip shield, factory installed steel backing, stainless steel hardware, and side hinge door. Shop coat cabinet with one coat of primer and two coats of exterior gray enamel.
 - Wood Pole: Provide minimum 20' Class VII full length penta pressure treated wood pole. (if required, see layout sheets)
 - Pad Mounted Cabinet: Provide 56" high x 26" wide x 14" deep weatherproof cabinet. Minimum 12 gauge steel or aluminum with provisions for padlock. Provide steel cabinet with one coat of primer and two coats of exterior dark green enamel.
 - Grounding Grid: Provide grounding grid with a maximum ground resistance of 25 ohms, using one or more 5/8"x10' copperweld ground rods in parallel or series at two corners. Provide a minimum distance between ground unit assemblies of 6'0".
 - Meter Location: Do not mount the meter (if required) on the same side of the cabinet as the photo cell.



Conduit Standoff Bracket

Omission of conduit standoff brackets allowed when not required by local utility company.

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10-8-13	
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DATE	CHANGE
7-8-14	Revised note 3.
10-17-17	Updated to active volcs.
8-28-19	New Design Engineer PE Stamp.

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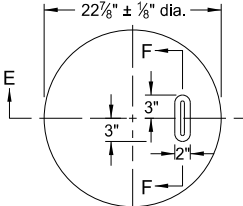
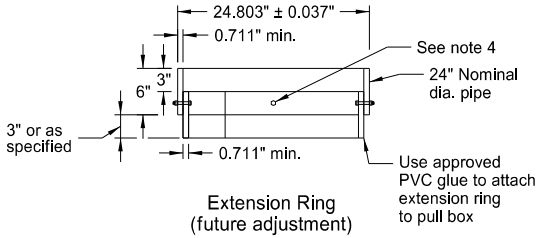
Kirk J Hoff,

Registration Number

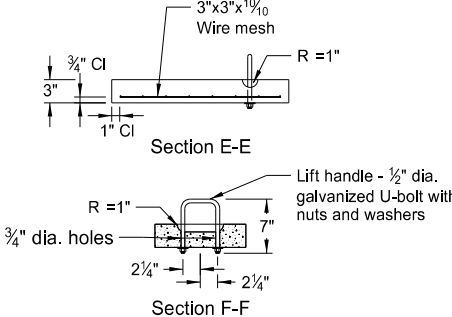
PE- 4683,

on 8/28/19 and the original document is stored at the North Dakota Department of Transportation

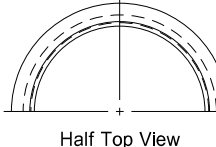
PULL BOX DETAILS



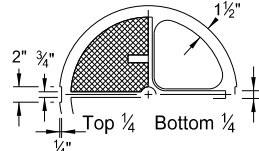
Concrete Cove



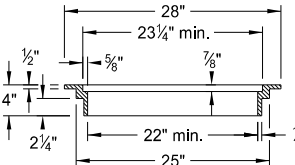
Section F-F



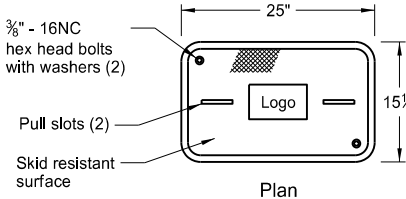
Half Top View



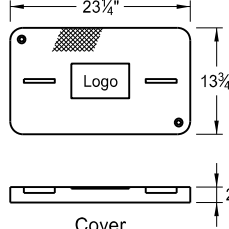
Section Cover



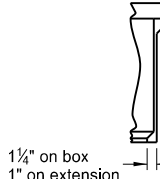
Cast Iron Frame and Cover



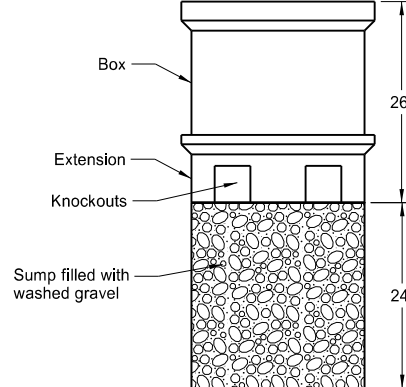
Pla



Cove



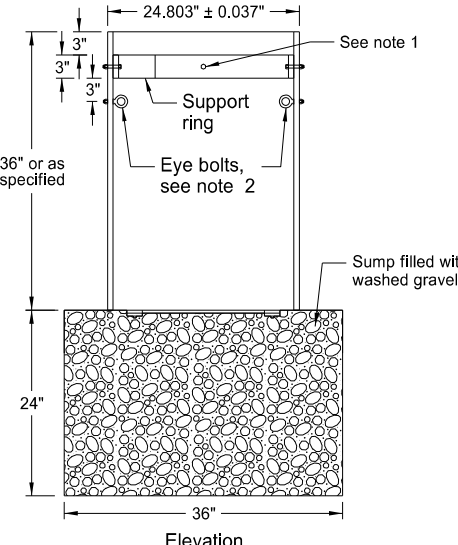
1 1/4" on box
1" on extensio



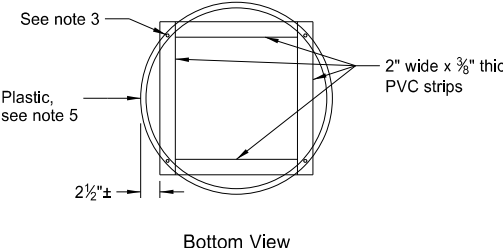
Elevation

Polymer Concrete Pull Bo

Note: Polymer concrete reinforced by a heavy weave fiberglass

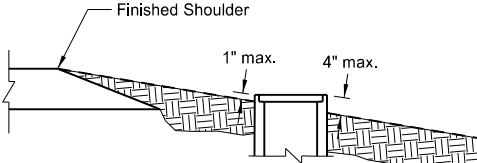


Elevation



Bottom View

PVC Pull Box



Typical Pull Box in Rural Section

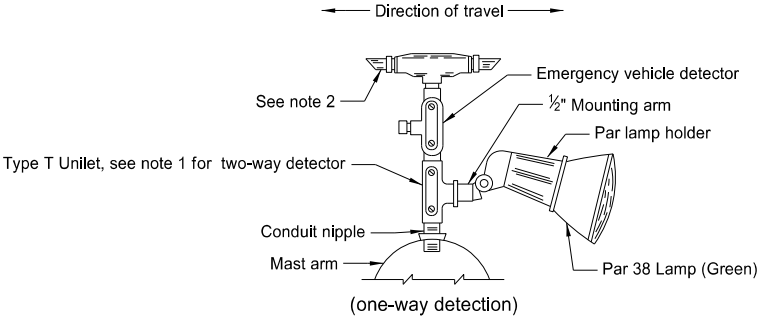
PVC Pull Box Notes

1. Attach split 24" nominal diameter PVC cover support ring with four $\frac{3}{8}$ " dia. x 2" long stainless steel hex head bolts with nuts at 90 degrees apart.
2. Two type 2 shoulder eye bolts, $\frac{3}{8}$ " dia. x $1\frac{1}{4}$ " shank length with hex nuts 180 degrees apart (for lifting pull box and supporting electric cable).
3. Four $\frac{1}{4}$ " x $1\frac{1}{4}$ " long galvanized lag screws. Screw assembly together.
4. Attach split 24" nominal diameter PVC cover support extension ring with four $\frac{3}{8}$ " dia. x 2" long stainless steel hex head bolts with nuts at 90 degrees apart.
5. Bolt assembly together.
6. Size conduit holes in barrel section a maximum of 1" larger than size of conduit being used.
7. After pull box and conduit installation, make inside walls and cover water tight to the satisfaction of the Engineer.
8. PVC pipe to meet requirements of ASTM F679T-1 or equal.
9. Use austenitic stainless steel hex head bolts and nuts. Galvanize other fasteners as per AASHTO M-232.
10. Coat concrete cover on top and sides with an approved epoxy coating. Apply light gray, clear, or neutral color epoxy protective coating as recommended by the manufacturer. Clean the surfaces of concrete receiving the epoxy protective coating by wire brush and dry before application.
11. Cast Iron Cover castings should be gray iron as per AASHTO M 105, Class 35B.

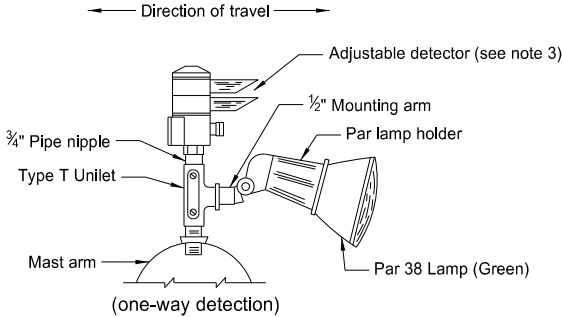
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-8-13	
REVISIONS	
DATE	CHANGE
7-8-14	Added Note 3
10-17-17	Updated to active voice.
8-28-19	New Design Engineer PE Stamp

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LIGHTING AND SIGNAL DETAILS

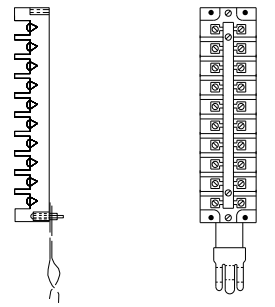


Emergency Vehicle Detector Detail

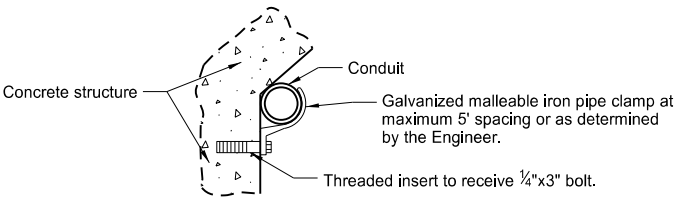


Alternate Emergency Vehicle Detector Detail (adjustable)

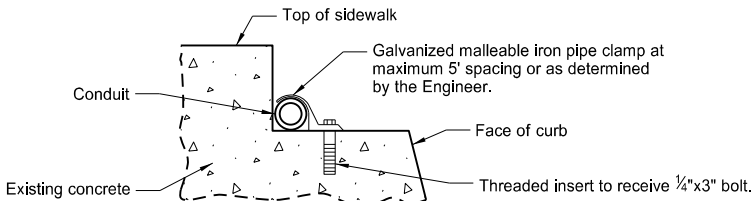
- Notes:
- 1. Use Type X Unilet with two Par lamp holders and lamps for Two-way Detectors. (one in each direction).
 - 2. Plug unused end of One-way Detector with metal pipe plug.
 - 3. Rotate detector lens to face direction of travel on Two-way Detectors.



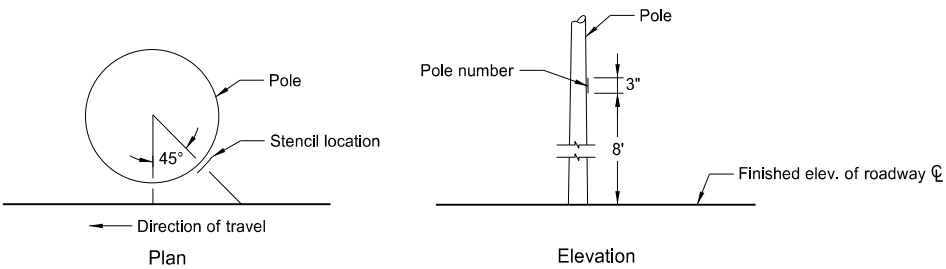
Terminal Block Detail



Bridge Mounted Conduit Hanger

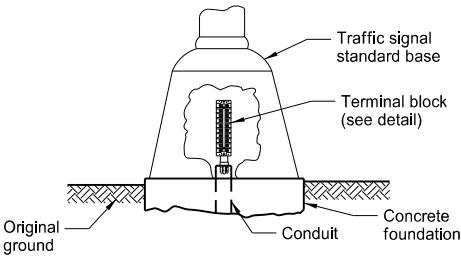


Bridge Curb Mounted Conduit

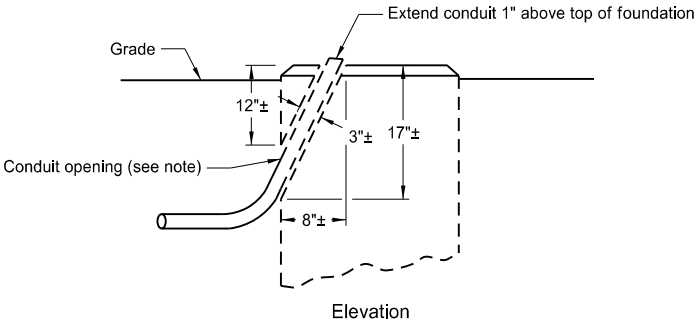


Light Standard Numbering

Note: On the roadway side of each light standard, stencil the pole number using black paint or an adhesive coated plastic such as Scotchcal by 3M or as approved by the Engineer. See layout sheets for pole numbers.

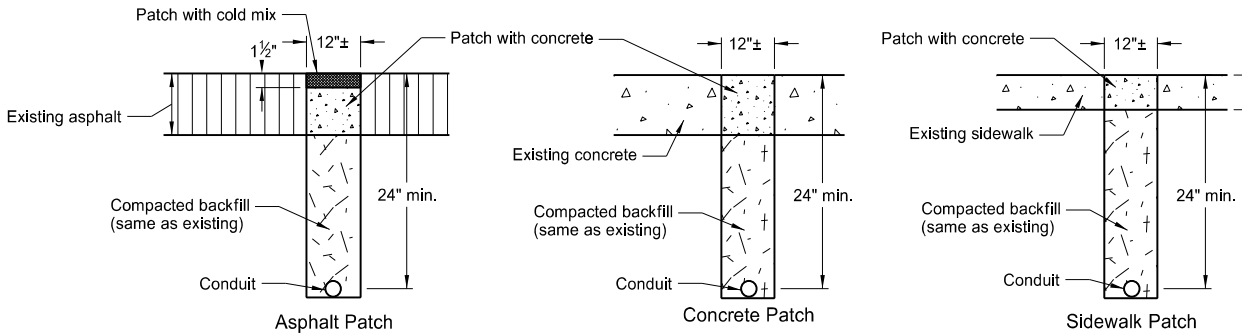


Terminal Block (rigid mounted)



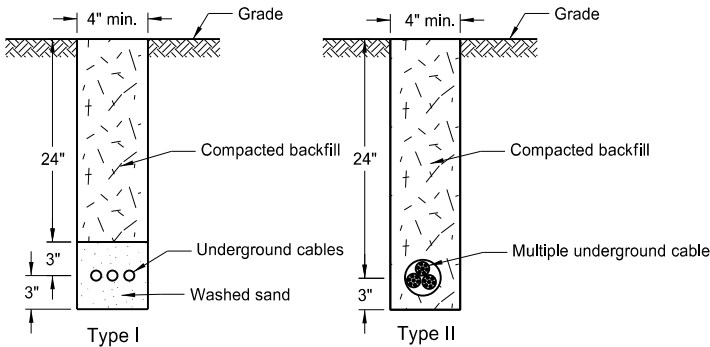
Revise Concrete Foundation

Note: Jackhammer or drill to remove material and provide a location for conduit. Make opening no larger than necessary. Place conduit, fill with concrete and finish foundation to original appearance.



Surface Patch Details

Note: Saw cut trenches. Use PCC pavement for replacement concrete with the coarse aggregate gradation, maximum size and method of curing as approved by the Engineer. Immediately prior to pouring replacement concrete, paint all surfaces with an approved epoxy compound.

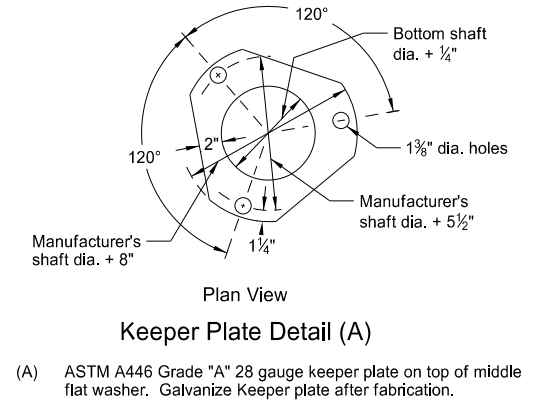
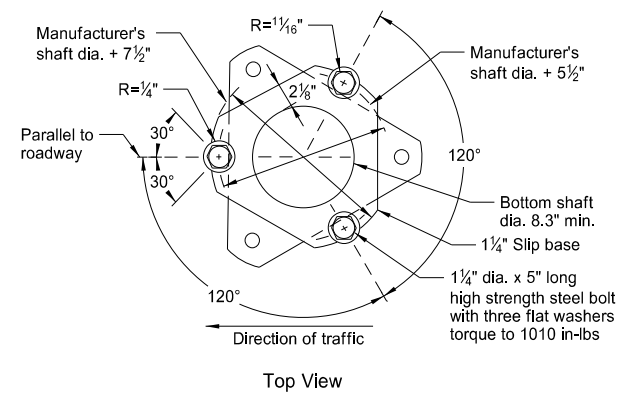
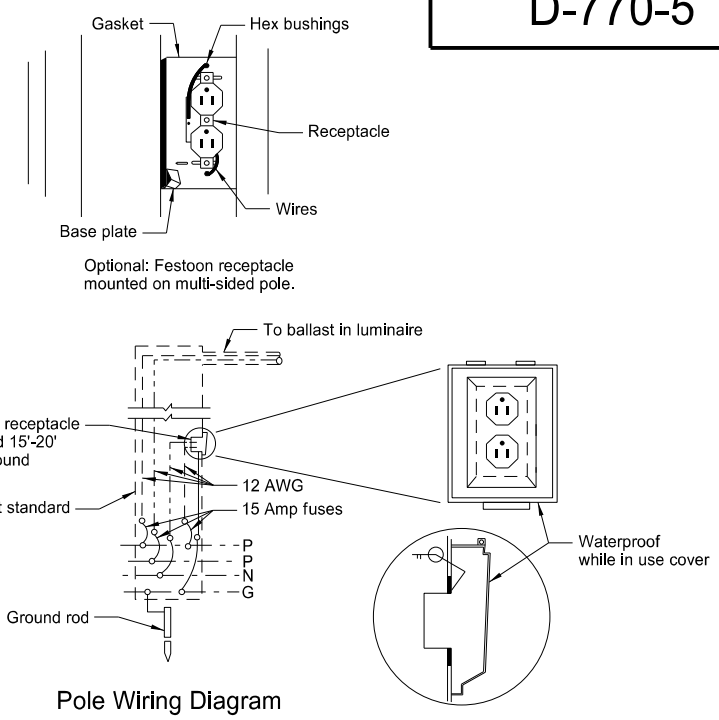
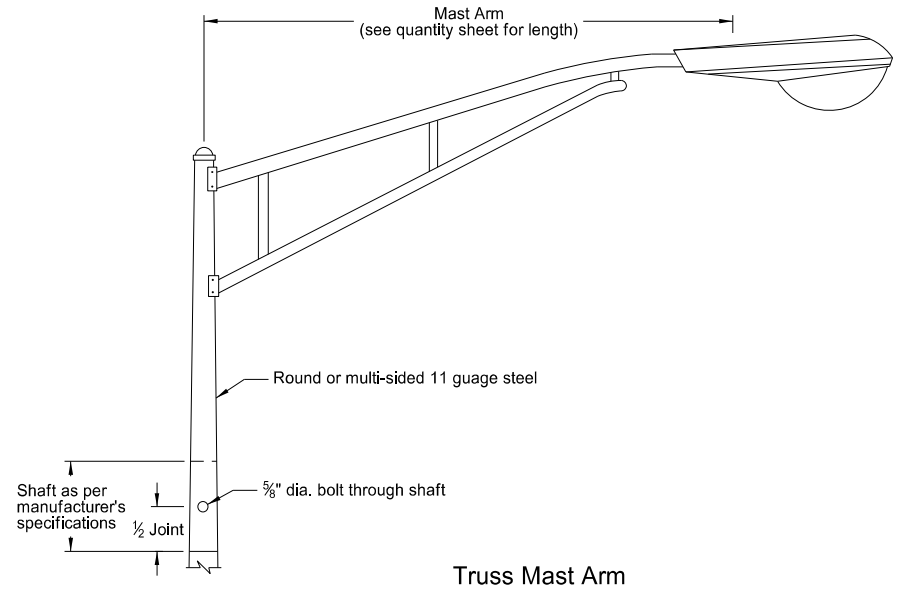
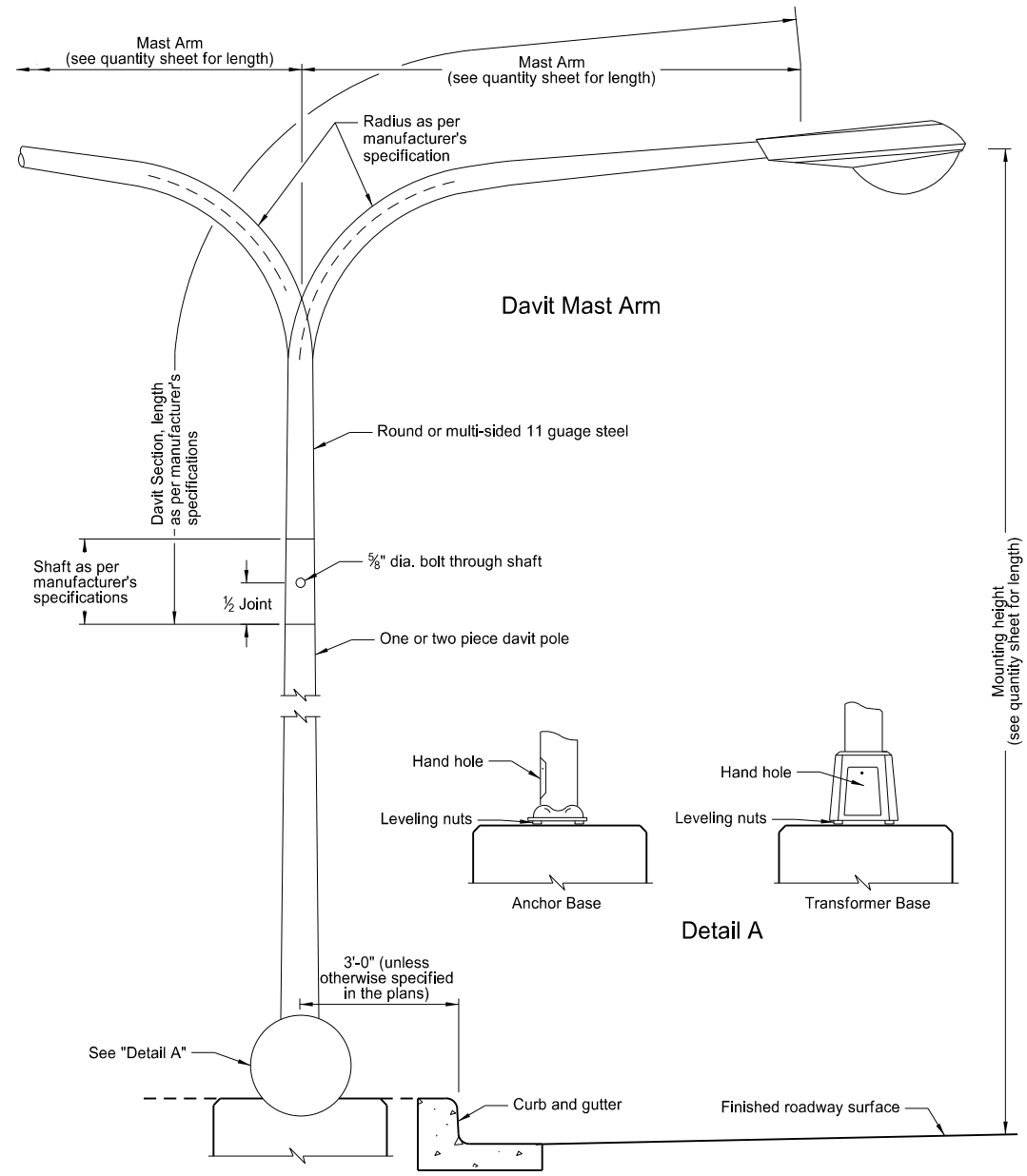


Cable Trench

Note: Sod entire area disturbed by trenching, unless directed otherwise by the Engineer.

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10-8-13		
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DATE	CHANGE	
10-17-17 10-25-19	Updated to active voice. Removed conduit under RR detail.	

LIGHT STANDARD DETAILS



Notes:

Light Standard Locations: The minimum offset distance from the curb face is 3 feet. Offset light standards at least 3 feet in urban areas and where speeds are less than 30 mph. Where speeds are 30 mph or more, place light standards at least 16 feet from the driving lane.

Steel Standards: Touch up marred or scratched areas after erection.

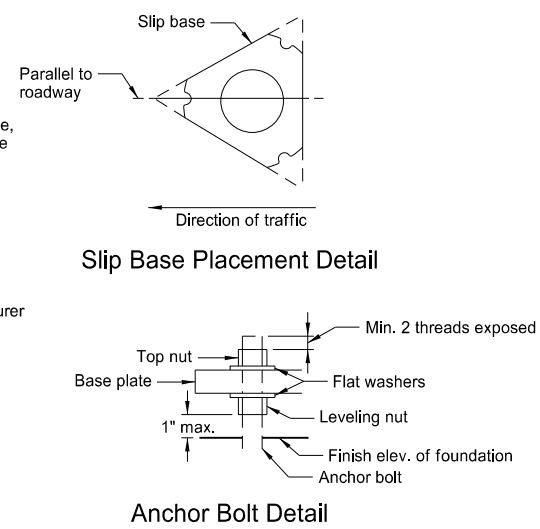
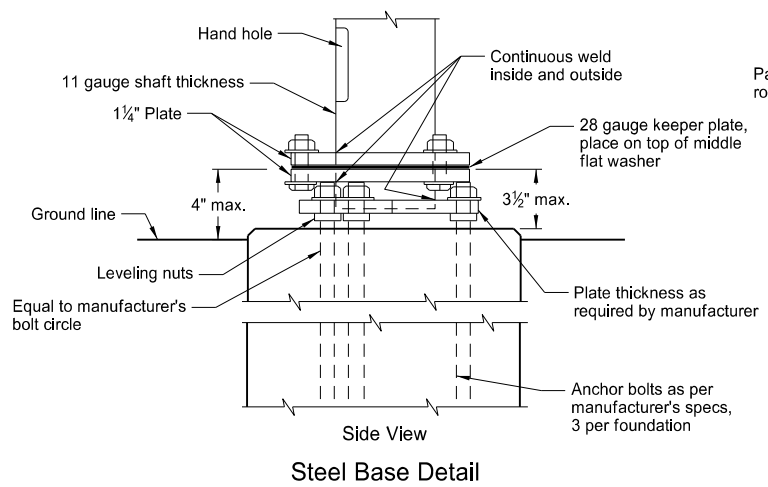
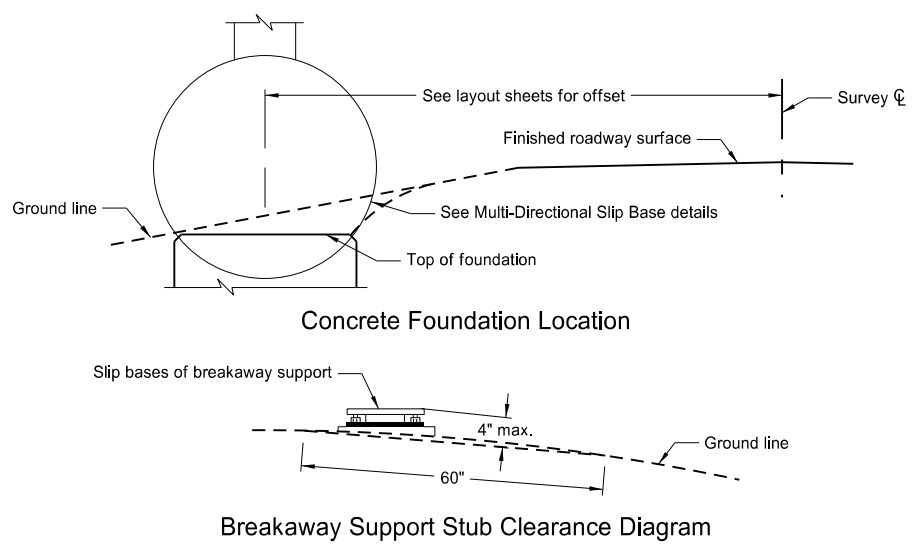
Luminaire: Use internal ballast-constant wattage 120x240 voltage. See layout sheets for type of luminaire, wattage, I.E.S. distribution, and operating system.

Fusing: Fusing in base, see specifications.

Slip Base Bolt Torque Procedure:

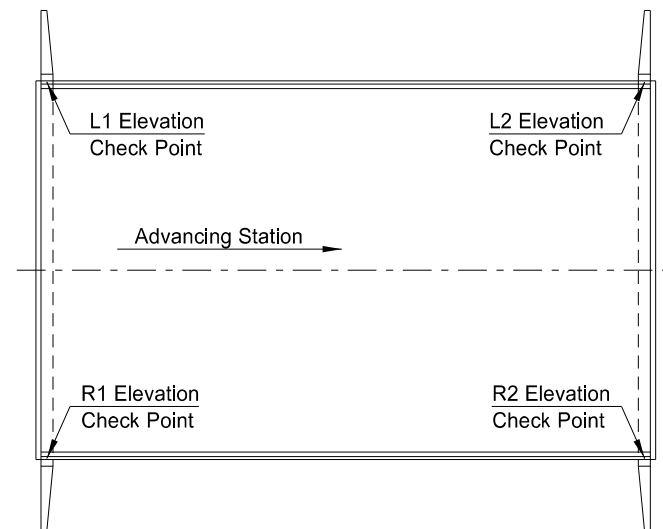
1. Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and to clean bolt threads, then loosen.
2. Retighten bolts with a systematic order to prescribed torque.
3. Loosen each bolt and retighten to prescribed torque in the same order as initial retightening.
4. Burr threads of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

Light Standard Details

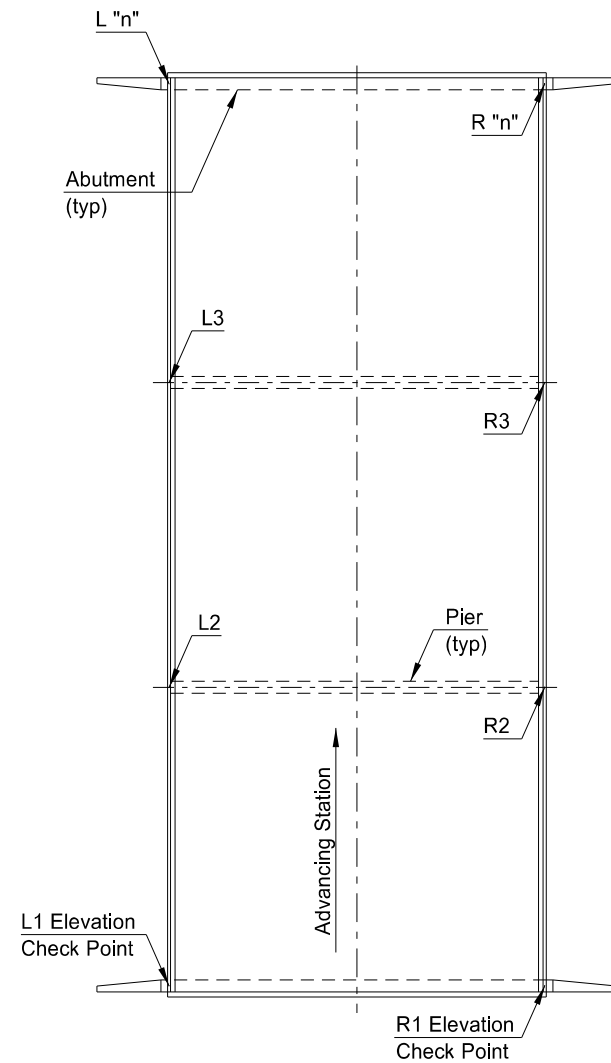


Multi-Directional Slip Base

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10-8-13		
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DATE	CHANGE	
10-17-17 8-28-19	Updated to active voice. New Design Engineer PE Stamp.	

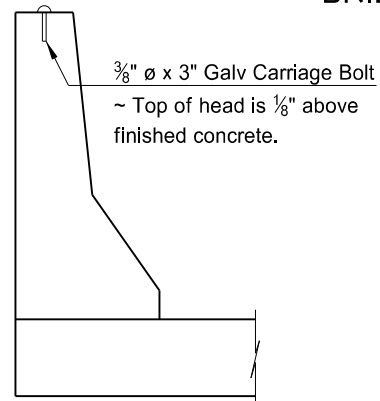


GENERAL LAYOUT FOR SINGLE SPAN

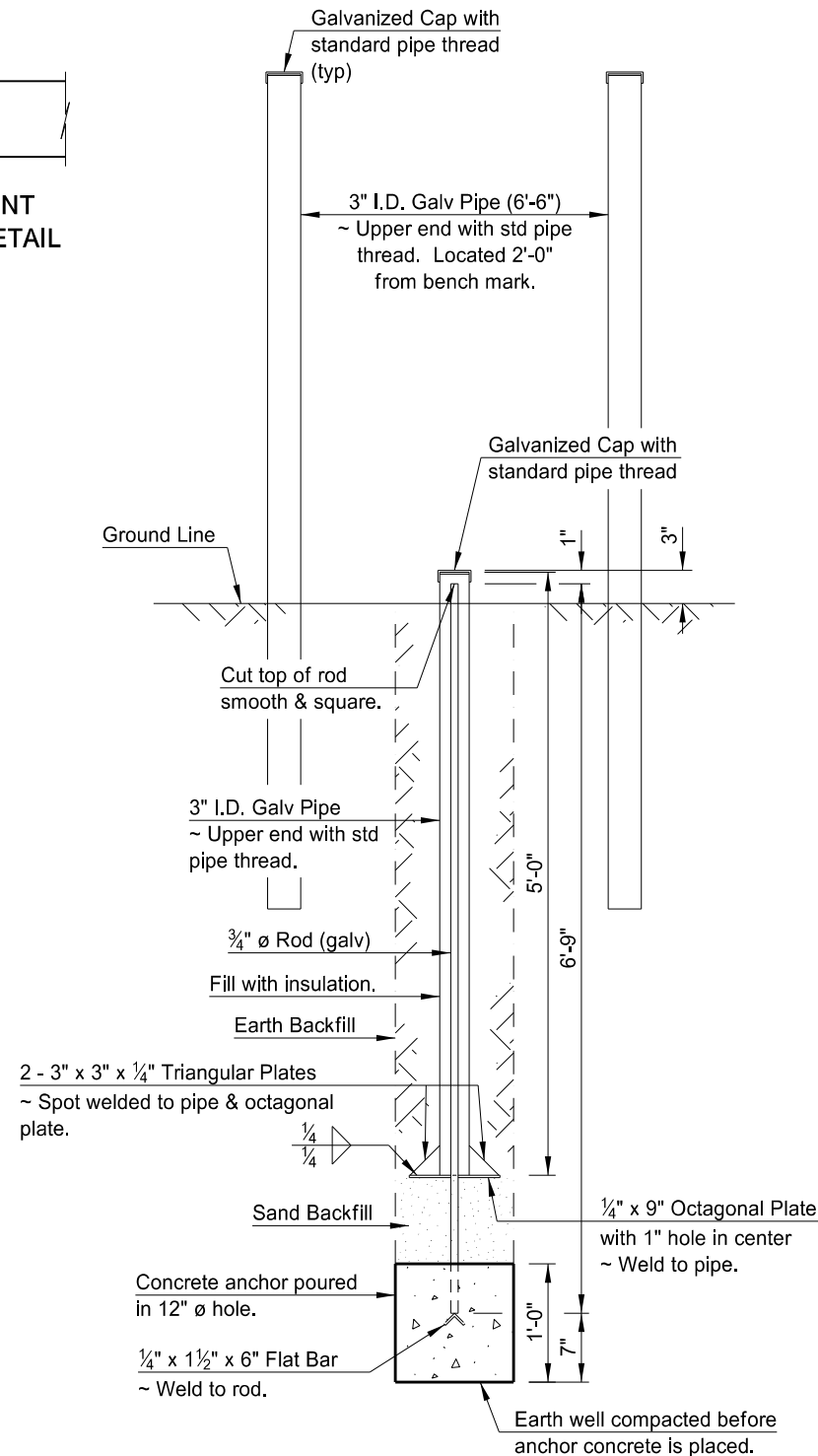


GENERAL LAYOUT FOR MULTIPLE SPAN

BRIDGE BENCH MARKS



CHECK POINT LOCATION DETAIL



BENCH MARK DETAIL

NOTES:

Elevation check points shall consist of 3/8" \varnothing 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 head 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.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09/14/11	
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DATE	CHANGE
09/03/19	UPDATED SIGNATURE

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Jon Ketterling
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