

NDDOT ABBREVIATIONS

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

Abn abandoned
 Abut abutment
 Ac acres
 Adj adjusted
 Aggr aggregate
 Ahd ahead
 ARV air release valve
 Align alignment
 Al alley
 Alt alternate
 Alum aluminum
 ADA Americans with Disabilities Act
 A ampere
 & and
 Appr approach
 Approx approximate
 ACP asbestos cement pipe
 Asph asphalt
 AC asphalt cement
 Assmd assumed
 @ at
 Atten attenuation
 ATR automatic traffic recorder
 Ave Avenue
 Avg average
 ADT average daily traffic
 Az azimuth
 Bk back
 BF back face
 Bs backsight
 Balc balcony
 B Wire barbed wire
 Barr barricade
 Btry battery
 Brg bearing
 BI beehive inlet
 Beg begin
 BG below grade
 BM bench mark
 Bkwy bikeway
 Bit bituminous
 Blk block
 Bd Ft board feet
 BH bore hole
 BS both sides
 Bot bottom
 Blvd Boulevard
 Bndry boundary
 BC brass cap
 Brkwy breakaway
 Br bridge

Bldg building
 BV butterfly valve
 Byp bypass
 C Gdrl cable guardrail
 Calc calculate
 Cd candela
 CIP cast iron pipe
 CB catch basin
 CRS cationic rapid setting
 C Gd cattle guard
 C To C center to center
 Cl or C centerline
 Cm centimeter
 Ch chain
 Chnlk chain-link
 Ch Blk channel block
 Ch Ch channel change
 Chk check
 Chsld chiseled
 Cir circle
 Cl class
 Cl clay
 Cl F clay fill
 Cl Hvy clay heavy
 Cl Lm clay loam
 Clnt clean-out
 Clr clear
 Cl&gr clearing & grubbing
 Co S coal slack
 C Gr coarse gravel
 CS coarse sand
 Comb. combination
 Coml commercial
 Compr compression
 CADD computer aided drafting & design
 Conc concrete
 CECB concrete erosion control blanket
 Cond conductor
 Const construction
 Cont continuous
 CSB continuous split barrel sample
 Contr contraction
 Contr contractor
 CP control point
 Coord coordinate
 Cor corner
 Corr corrected
 CAES corrugated aluminum end section
 CAP corrugated aluminum pipe
 CMES corrugated metal end section
 CMP corrugated metal pipe
 CPVCP corrugated poly-vinyl chloride pipe
 CSES corrugated steel end section
 CSFES corrugated steel flared end section

CSP corrugated steel pipe
 CSTES corrugated steel traversable end section
 C coulomb
 Co County
 Crse course
 Ct Court
 Xarm cross arm
 Xbuck cross buck
 Xsec cross sections
 Xing crossing
 Xrd Crossroad
 Crn crown
 CF cubic feet
 M3 cubic meter
 M3/s cubic meters per second
 CY cubic yard
 Cy/mi cubic yards per mile
 Culv culvert
 C&G curb & gutter
 CI curb inlet
 CR curb ramp
 CS curve to spiral
 C cut
 Dd Ld dead load
 Defl deflection
 Defm deformed
 Deg or D degree
 DInt delineate
 DIntr delineator
 Depr depression
 Desc description
 Det detail
 DWP detectable warning panel
 Dtr detour
 Dia or \emptyset diameter
 Dir direction
 Dist distance
 DM disturbed material
 DB ditch block
 DG ditch grade
 Dbl double
 Dn down
 Dwg drawing
 Dr drive
 Drwy driveway
 DI drop inlet
 D dry density
 DSDS dynamic speed display sign
 Ea each
 Esmt easement
 E East
 EB Eastbound
 Elast elastomeric
 EL electric locker
 E Mtr electric meter
 Elec electric/al

EDM electronic distance meter
 Elev or El elevation
 Ellipt elliptical
 Emb embankment
 Emuls emulsion/emulsified
 ES end section
 Engr engineer
 ESS environmental sensor station
 Eq equal
 Eq equation
 Evgr evergreen
 Exc excavation
 Exst existing
 Exp expansion
 Expy Expressway
 E external of curve
 Extru extruded
 FOS factor of safety
 F Fahrenheit
 FS far side
 F farad
 Fed Federal
 FP feed point
 Ft feet/foot
 Fn fence
 Fn P fence post
 FO fiber optic
 FB field book
 FD field drive
 F fill
 FAA fine aggregate angularity
 FS fine sand
 FH fire hydrant
 Fl flange
 Flrd flared
 FES flared end section
 F Bcn flashing beacon
 FA flight auger sample
 FL flow line
 Ftg footing
 FM force main
 Fs foresight

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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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 P _L	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	preparation
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				

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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 preparation	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

D-101-10

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

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

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

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Line Styles

D-101-20

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

Proposed Topography

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

D-101-21

Right Of Way

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

Boundary Control

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

Cross Sections and Typical

- Existing Ground
- Existing Topsoil (Cross Section View)
- 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

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

Countours

- Depression Contours
- Supplemental Contour

Profile

- Subgrade, Subcut or Ditch Grade
- Topsoil Profile

Striping

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

Pavement Joints

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

Bridge Details

- 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
- Floating Silt Curtain
- Silt Fence
- Excavation Limits
- Fiber Rolls

Environmental

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

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Symbols

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

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

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

Symbols

	Existing Light Standard		Existing Manhole with Valve Water		Existing Telephone Pole		Existing Undefined Manhole
	Existing High Mast Light Standard 10 Luminaire		Existing Water Manhole		Existing Wood Pole		Existing Undefined Pull Box
	Existing High Mast Light Standard 3 Luminaire		Existing Mile Post Type A		Existing Post		Existing Undefined Pedestal
	Existing High Mast Light Standard 4 Luminaire		Existing Mile Post Type B		Existing Pedestrian Push Button Post		Existing Undefined Valve
	Existing High Mast Light Standard 5 Luminaire		Existing Mile Post Type C		Existing Control Point CP		Existing Undefined Pipe Vent
	Existing High Mast Light Standard 6 Luminaire		Existing Reference Marker		Existing Control Point GPS-RTK		Existing Gas Valve
	Existing High Mast Light Standard 7 Luminaire		Existing RW Marker		Existing Control Point TRI		Existing Water Valve
	Existing High Mast Light Standard 8 Luminaire		Existing Utility Marker		Existing Reference Marker Point NGS		Existing Fuel Pipe Vent
	Existing High Mast Light Standard 9 Luminaire		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		

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

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Symbols

D-101-32

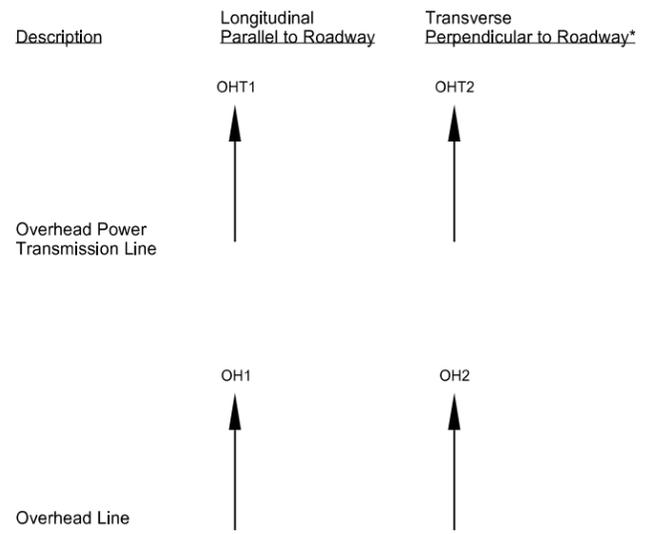
 Pad Mounted Feed Point  Pipe Mounted Feed Point with Pad  Pole Mounted Feed Point  Headwall  Double Headwall with Vegetation Barrier  Single Headwall with Vegetation Barrier  Pole Mounted Head  Sprinkler Head  Fire Hydrant  Inlet Type 1  Inlet Type 2  Double Inlet Type 2  Inlet Gate Type 2  Junction Box  High Mast Light Standard 10 Luminaire  High Mast Light Standard 3 Luminaire  High Mast Light Standard 4 Luminaire  High Mast Light Standard 5 Luminaire  High Mast Light Standard 6 Luminaire  High Mast Light Standard 7 Luminaire  High Mast Light Standard 8 Luminaire  High Mast Light Standard 9 Luminaire  Relocate Light Standard  Overhead Sign Structure Load Center  Light Standard 100 Watt High Pressure Sodium Vapor Luminaire	 Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire  Light Standard 150 Watt High Pressure Sodium Vapor Luminaire  Light Standard 175 Watt High Pressure Sodium Vapor Luminaire  Light Standard 200 Watt High Pressure Sodium Vapor Luminaire  Light Standard 250 Watt High Pressure Sodium Vapor Luminaire  Light Standard 310 Watt High Pressure Sodium Vapor Luminaire  Light Standard 35 Watt High Pressure Sodium Vapor Luminaire  Light Standard 400 Watt High Pressure Sodium Vapor Luminaire  Light Standard 50 Watt High Pressure Sodium Vapor Luminaire  Light Standard 70 Watt High Pressure Sodium Vapor Luminaire  Light Standard 700 Watt High Pressure Sodium Vapor Luminaire  Manhole  Manhole 48 Inch  Sanitary Force Main Manhole  Sanitary Sewer Manhole  Storm Drain Manhole  Storm Drain Manhole with Inlet  Reset Mile Post  Mile Post Type A  Mile Post Type B  Mile Post Type C  Right of Way Marker  Tubular Marker  Alignment Monument  Iron Pin Reference Monument	 Object Marker Type I  Object Marker Type II  Object Marker Type III  Caution Mode Arrow Panel  Back to Back Vertical Panel Sign  Double Direction Arrow Panel  Left Directional Arrow Panel  Right Directional Arrow Panel  Sequencing Arrow Panel  Truck Mounted Arrow Panel  Power Pole  Wood Pole  Pedestrian Push Button Post  Property Corner  Pull Box  Intelligent Transportation Pull Box  Sanitary Pump  Storm Drain Pump  Reinforced Pavement  Reinforced Concrete End Section 15 Inch  Reinforced Concrete End Section 18 Inch  Reinforced Concrete End Section 24 Inch  Reinforced Concrete End Section 30 Inch  Reinforced Concrete End Section 36 Inch  Reinforced Concrete End Section 42 Inch	 Reinforced Concrete End Section 48 Inch  Reinforced Concrete End Section 54 Inch  Reset Right of Way Marker  Reset USGS Marker  Right of Way Markers  Riser 30 Inch  Continuous Split Barrel Sample  Flight Auger Sample  Split Barrel Sample  Thinwall Tube Sample  Highway Sign  SNOW GATE 18 FT  SNOW GATE 28 FT  SNOW GATE 40 FT  Standard Penetration Test  Transformer  Inclinometer Tube  Underdrain Cleanout  Excavation Unit  Water Valve
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NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE

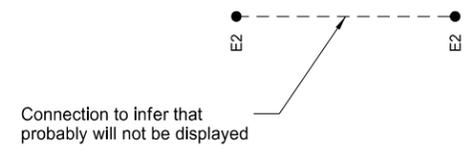
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Cross Section Legend

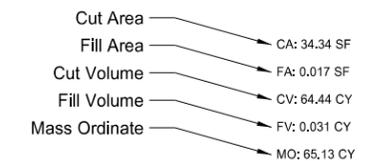
Description	Longitudinal Parallel to Roadway	Transverse Perpendicular to Roadway*
Cable Line	● CBL1	● CBL2
Conduit Line	● CDU1	● CDU2
Electric Line	● E1	● E2
Fiber Optic Line	● F1	● F2
Gas Main Line	● GM1	● GM2
Gas Service Line	● GS1	● GS2
Gas Transmission Line	● GT1	● GT2
Fuel Pipeline	● PL1	● PL2
Sanitary 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



* 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 an earthwork table. The following example (values not related to project) details the earthwork table layout.



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.

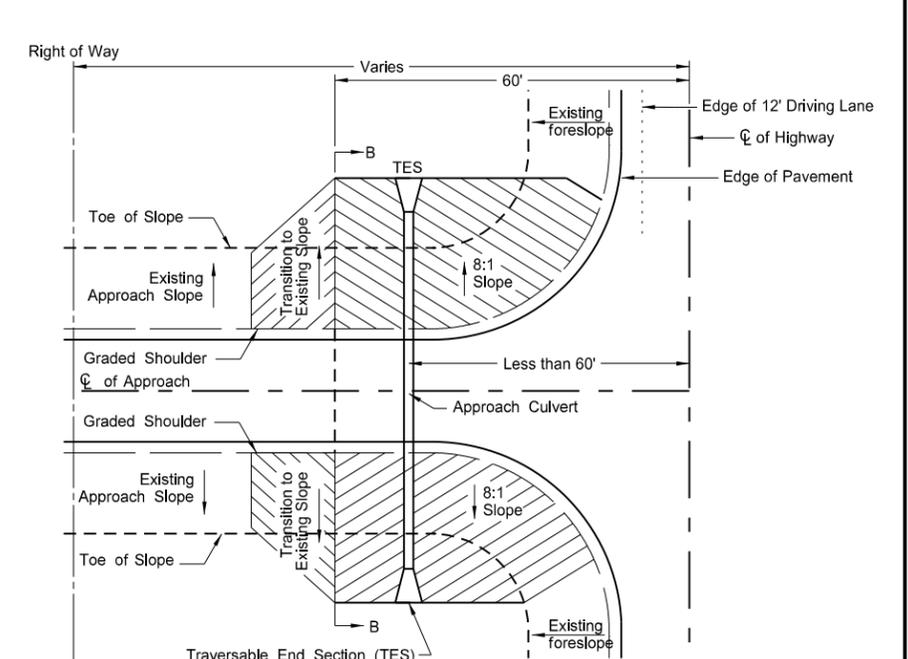
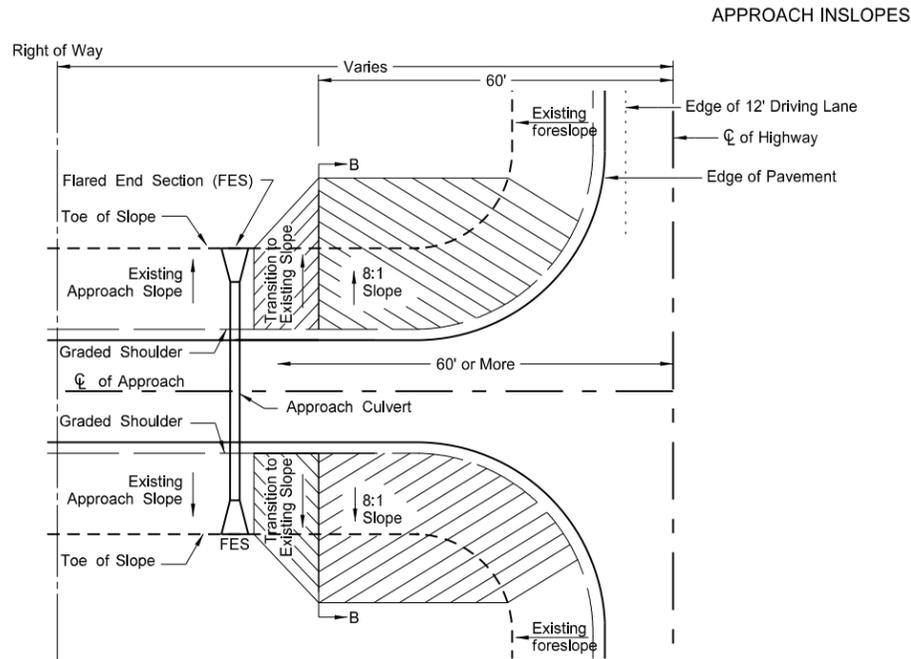
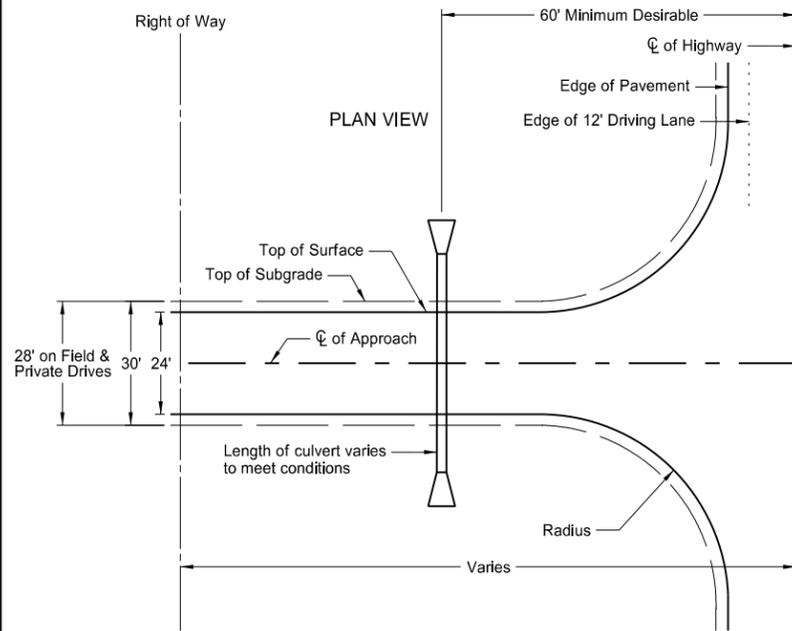


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-20-18	
REVISIONS	
DATE	CHANGE

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STANDARD RURAL APPROACHES

D-203-8

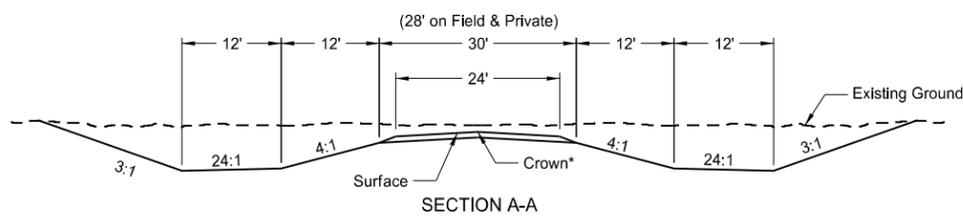


CASE 1
APPROACH PIPE LOCATED
60' OR MORE FROM $\text{C}\ell$

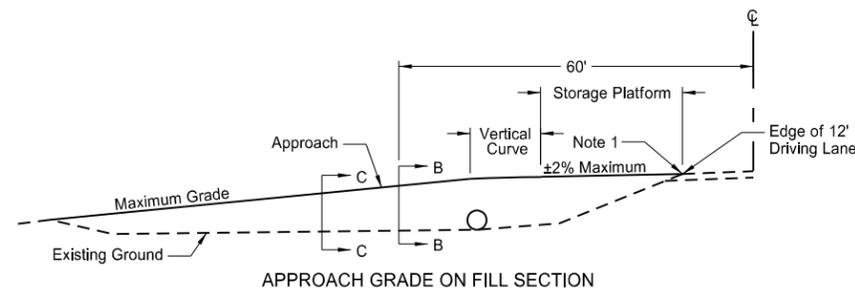
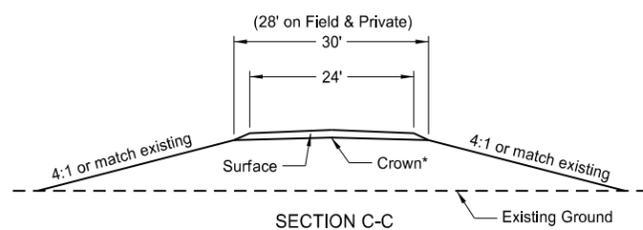
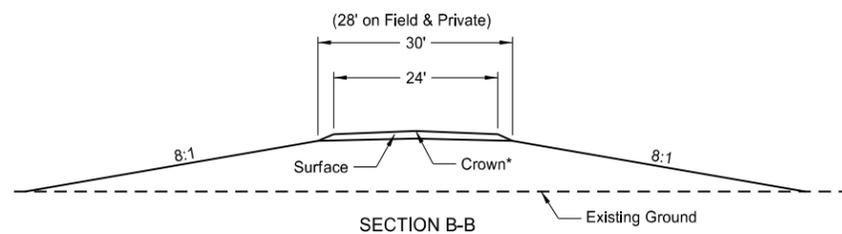
CASE 2
APPROACH PIPE LOCATED
LESS THAN 60' FROM $\text{C}\ell$

CRITERIA FOR RURAL APPROACH TYPES

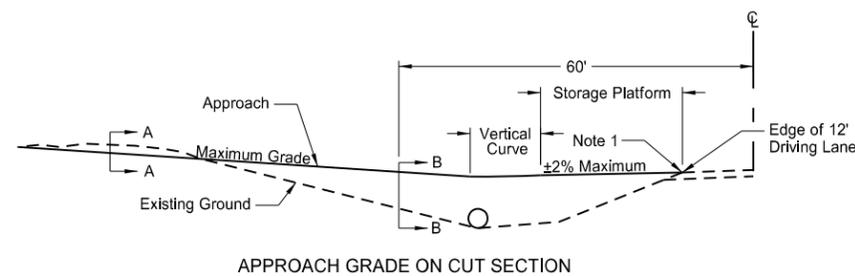
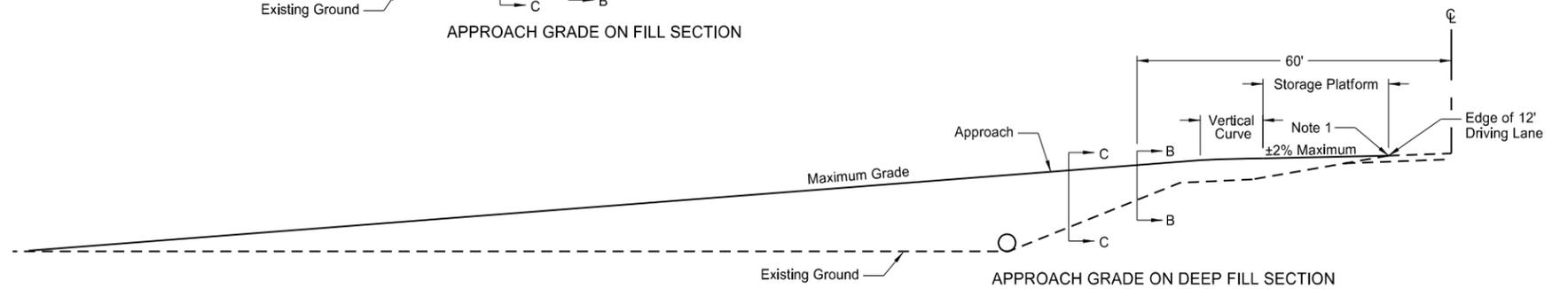
	Field Drives	Private Drives	Low Volume Public Roads
Radius	R=40 ft	R=40 ft	R=50 ft
Maximum Grade	10%	7%	7%
Storage Platform	24 ft	50 ft	
Vertical Curve Length	10 ft	10 ft	Varies (Min. 20 mph)



*2.1% crown for paved surface
*3.0% crown for gravel surface



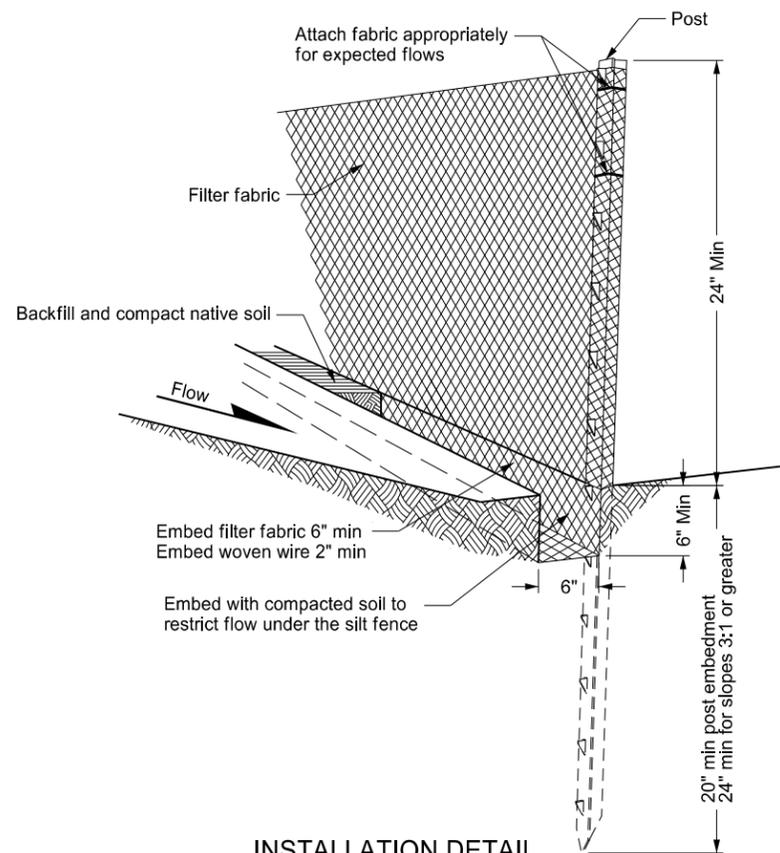
NOTES:
1. 5% Max Rollover between approach storage platform and highway.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-25-14	
REVISIONS	
DATE	CHANGE
6-30-2017	Revised Radius, Storage Platform, Inslope dimensions, and Note 1.
10-25-2019	Changed "Inslope" to "Foreslope".

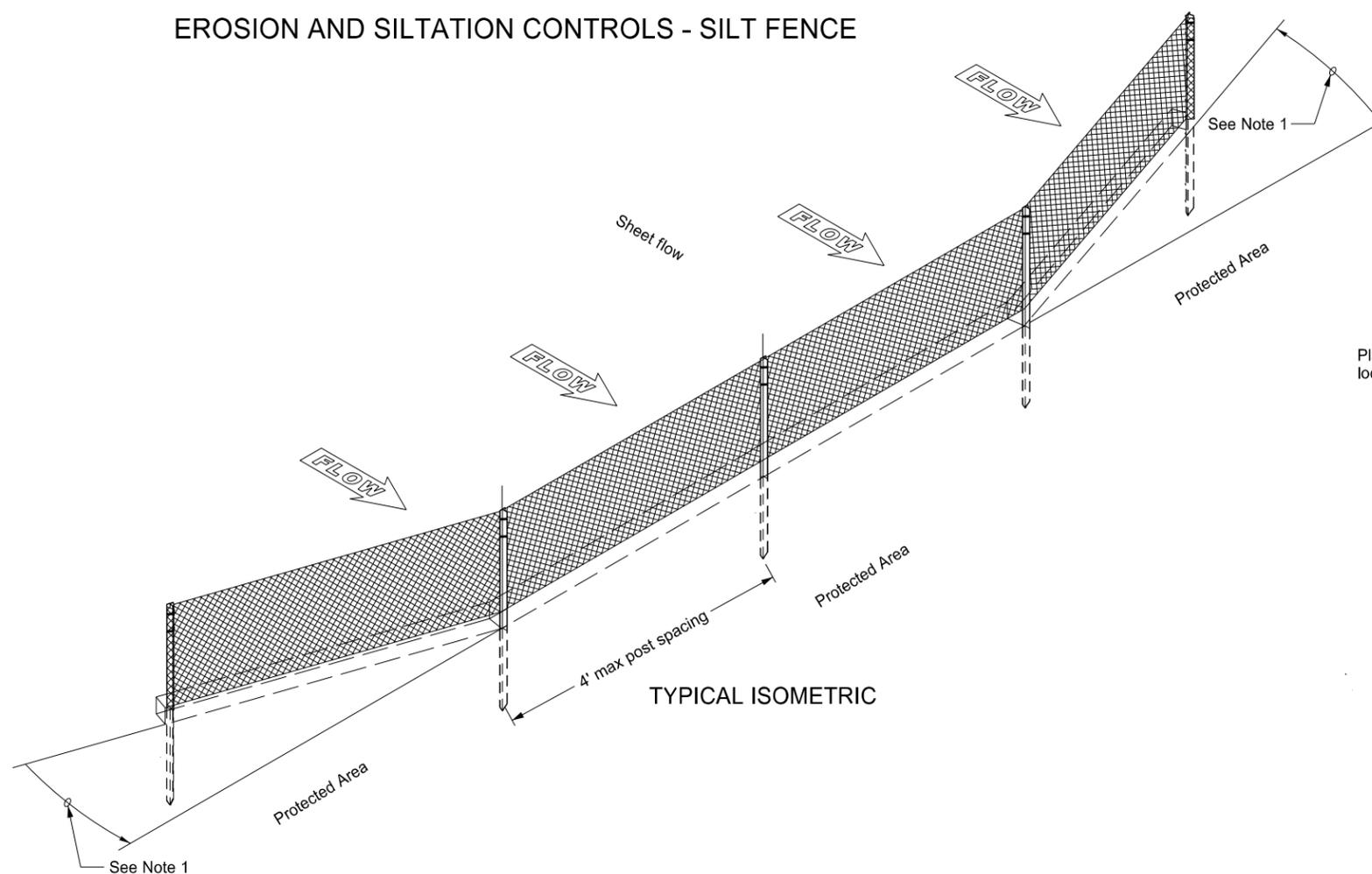
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EROSION AND SILTATION CONTROLS - SILT FENCE

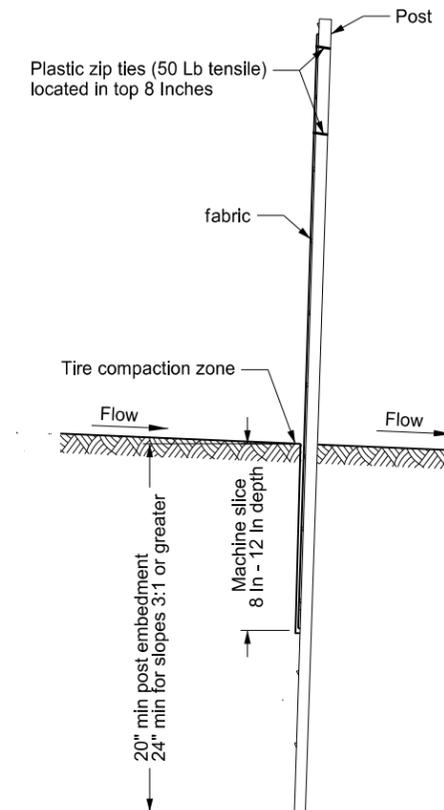


INSTALLATION DETAIL

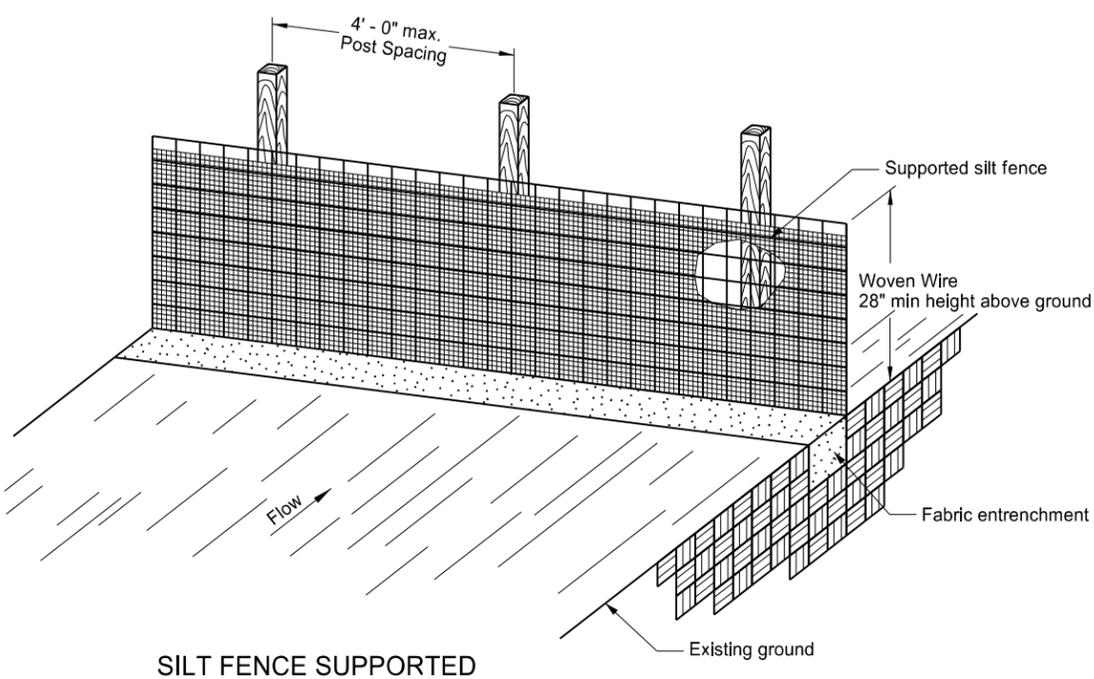
Minimize disturbance of ground around trench and smooth surface after excavation to avoid concentrating flows. Compact to prevent undercutting flows.



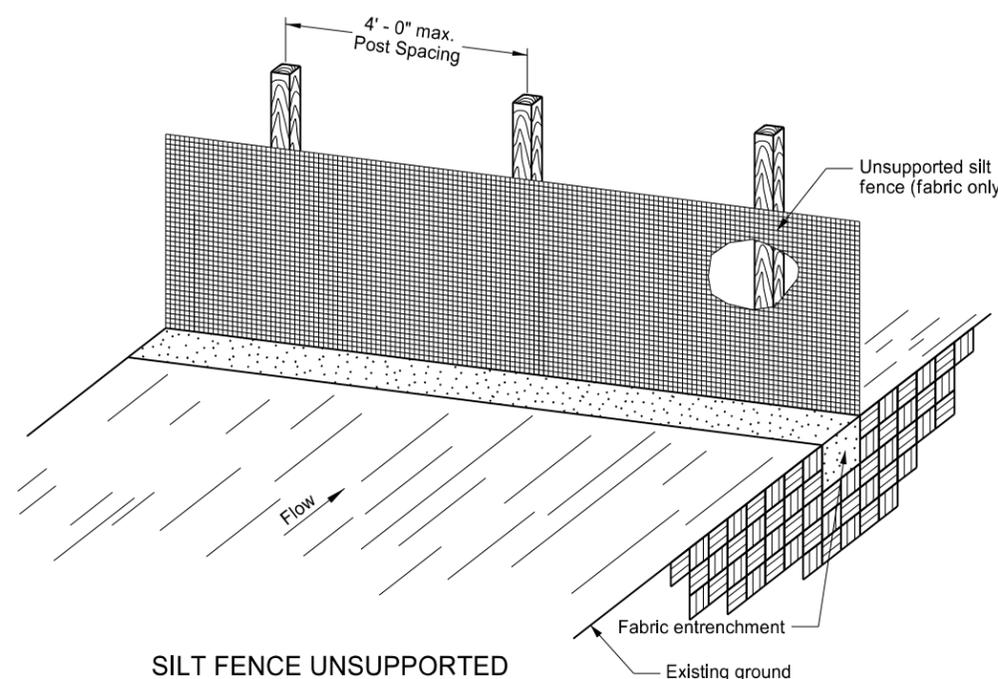
TYPICAL ISOMETRIC



MACHINE SLICED SILT FENCE



SILT FENCE SUPPORTED



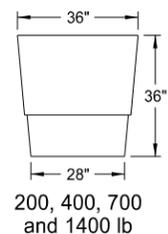
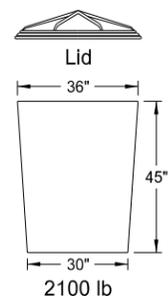
SILT FENCE UNSUPPORTED

- 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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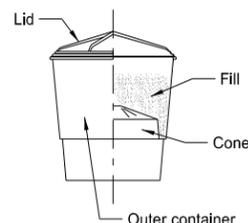
ATTENUATION DEVICE



Outer Containers

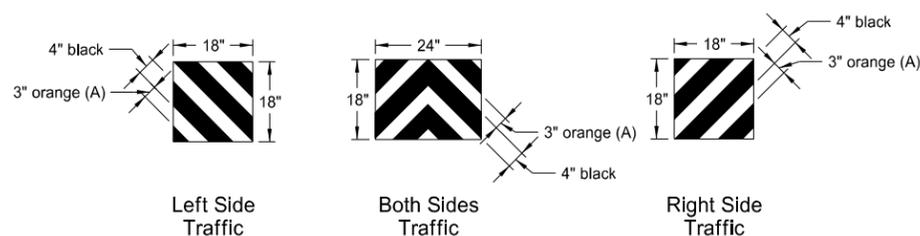


Cones



Typical Assembly

Typical Module Construction Detail

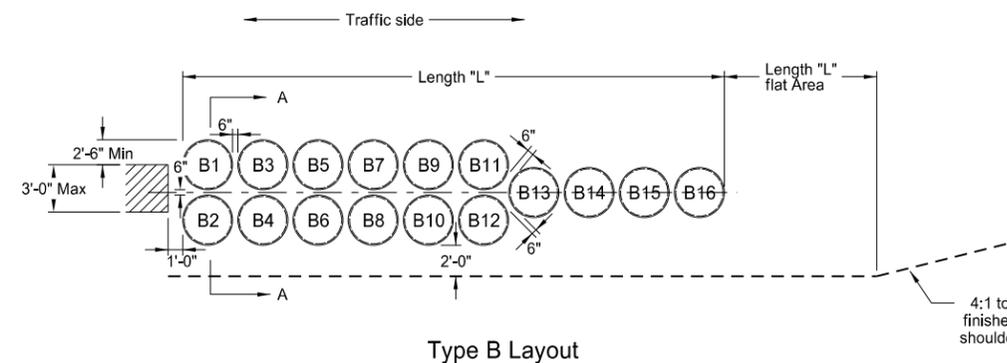


Reflective Sheet Detail

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.

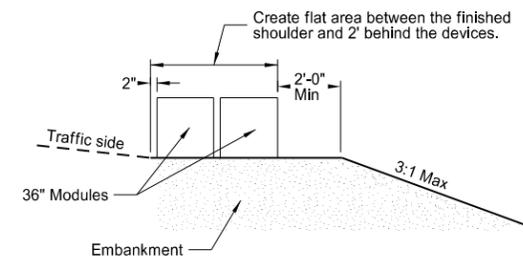
(A) Use 3" orange sheeting for temporary installations, and 3" yellow sheeting for permanent installations.

	Fill Chart				
	Module Weights (LBS)				
Distance from top edge	8 1/2"	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	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

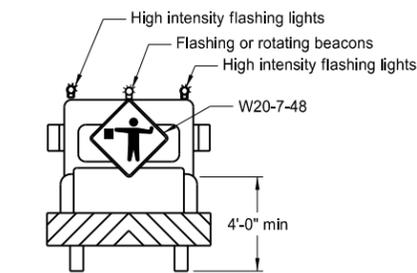
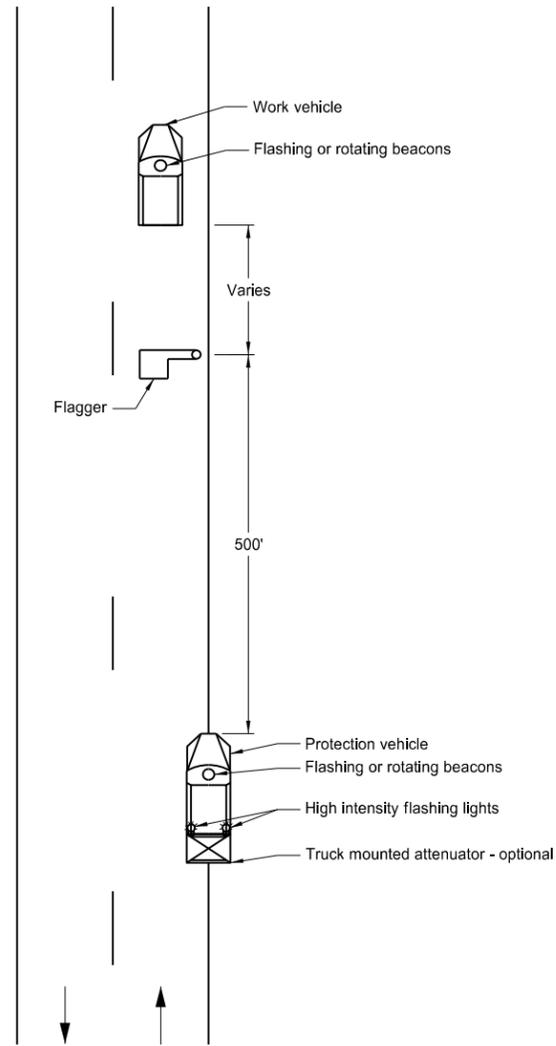
Provide modules in two sizes containing volumes of either 2, 4, 7, 14, or 21 cubic feet minimum.

 - 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 3 1/2" 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

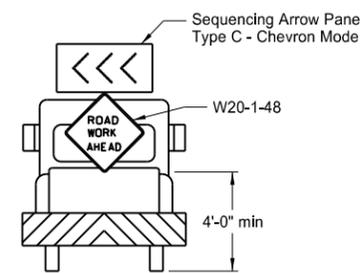
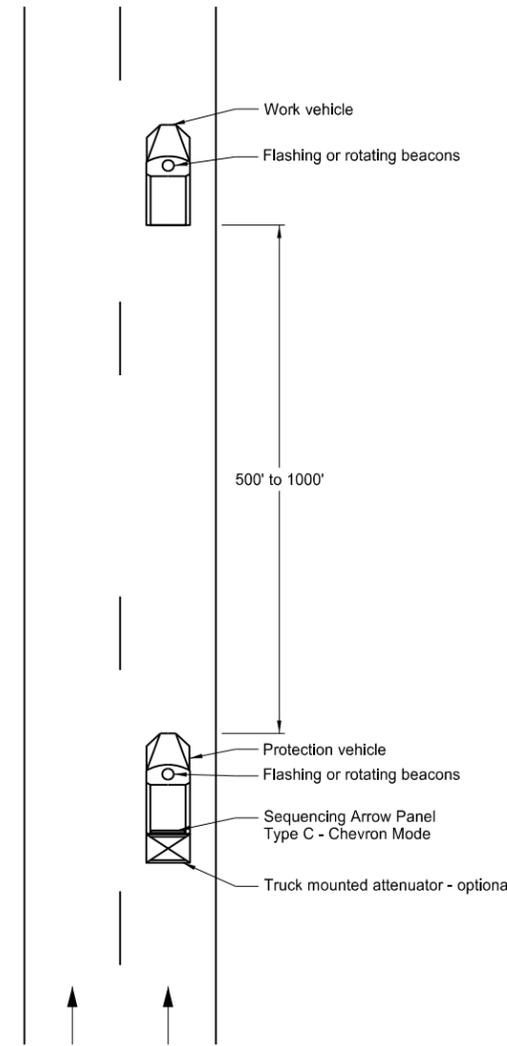
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Two Lane, Two Way Roadways



Typical Protection Vehicle

Multilane Roadways



Typical Protection Vehicle

Notes:

1. Display a 360 degree rotating, flashing, oscillating or strobe light on the working vehicle.
2. Display a 360 degree rotating, flashing, oscillating or strobe light on the shadow vehicle. Operate a sequencing arrow panel Type C in chevron mode on the shadow vehicle for Multilane Roadway.
3. Use these layouts during daylight hours and in areas of good visibility only.
4. Use flagger to protect the work area and warn oncoming traffic for two lane, two way roadway.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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WORK ZONE BUSINESS SIGN DETAILS

D-704-4

Note:

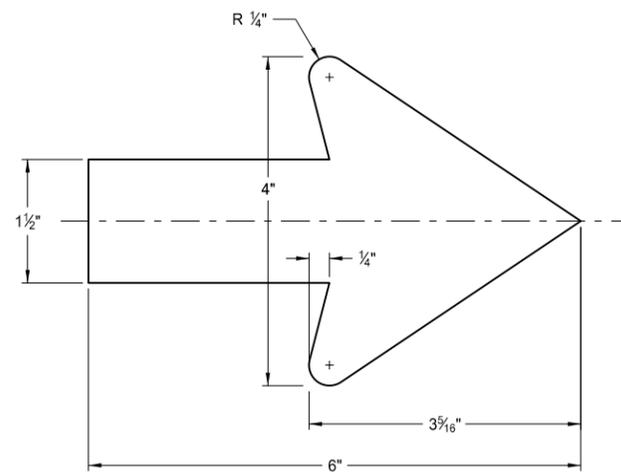
Ground mounted business name sign area is based on a 36"x 24" sign panel. Determine size needed and exact length required to accommodate message. Use maximum 36"x24" sign size. Use 4" Series B 2000 letters. Use blue background color with white legend and border. Post mount sign and position arrow on right or left side of sign as needed.

SIGN NUMBER	Business_#	STATION(S):	AREA: 6.0 Sq.Ft.		
WIDTH X HEIGHT	3'-0" x 2'-0"				
BORDER WIDTH	0.5" (inset 0")				
CORNER RADIUS	1.5"				
MOUNTING	Ground				
BACKGROUND	TYPE: IV Reflective COLOR: Blue				
LEGEND/BORDER	TYPE: IV Reflective COLOR: White				
SYMBOL	X Y WID HT ANGLE				
ND_4IN_TYPE D	2.5 1.5 4 6 90				
ND_4IN_TYPE D	27.5 1.5 4 6 270				

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

PANEL STYLE: ND_TTC_Business.asd

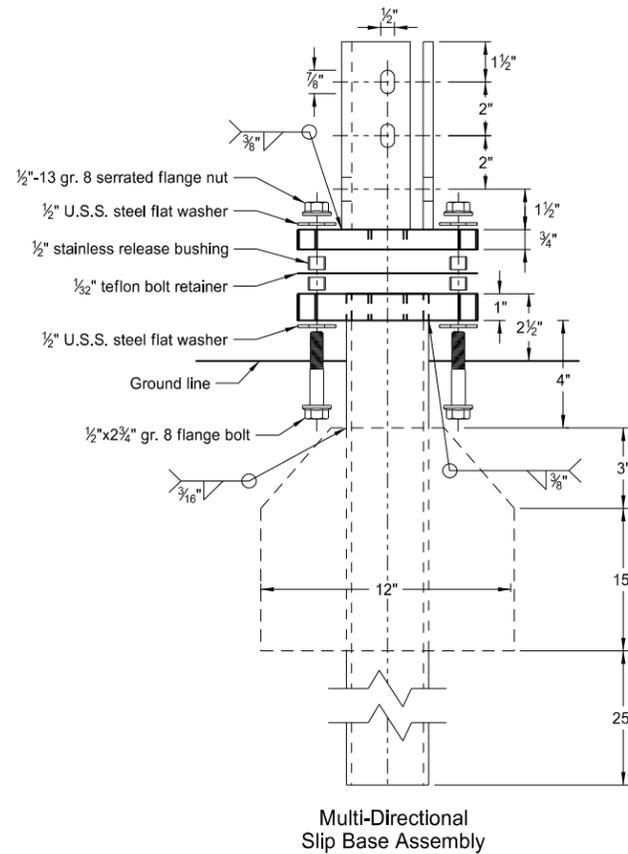
LETTER POSITION (X)												LENGTH	SIZE	SERIES					
S	T	E	A	K		H	O	U	S	E							23.8	4	B 2000
6.1	8.2	10.2	12.1	14.8	16.6	18.6	21	23.6	26	28.4									
G	A	S		S	T	A	T	I	O	N									
6.9	9	11.5	13.2	15.2	17.3	19	21.4	23.5	24.8	27.4									
C	A	F	E																
13.8	15.9	18.6	20.7																



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION		<p>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</p>
9-25-12		
REVISIONS		
DATE	CHANGE	
7-18-14 8-17-17 10-03-19	Revised sheeting to type IV Revised font & arrow detail New Design Engineer PE Stamp	

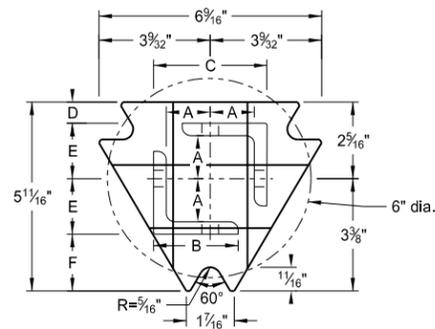
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

Perforated Tube



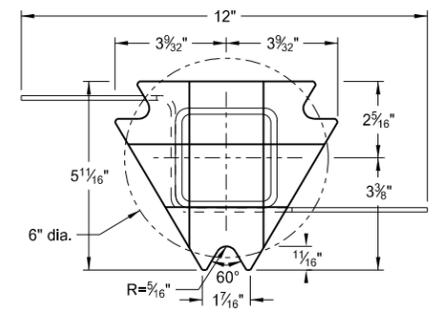
Multi-Directional Slip Base Assembly

Traffic Flow

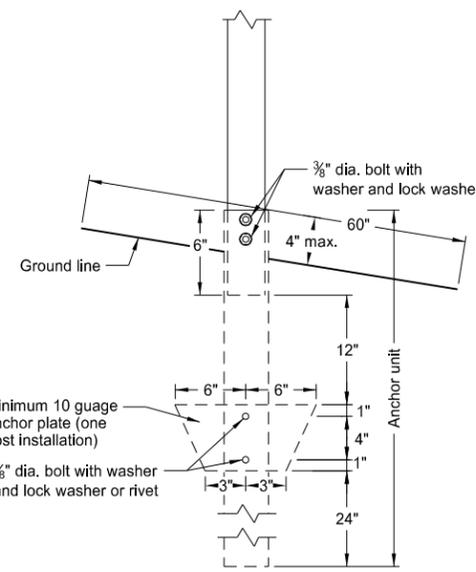


Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2 1/2" x 2 1/2" x 3/8" ASTM A36 structural angle

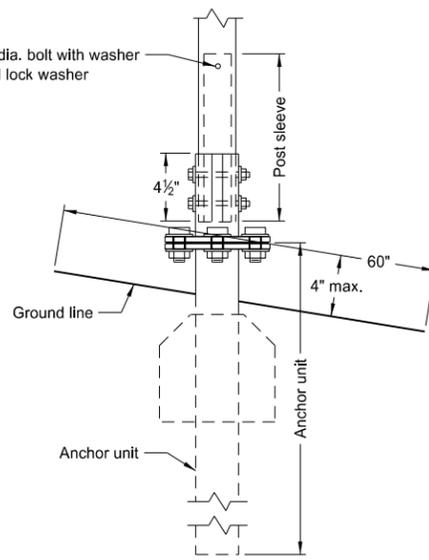
Traffic Flow



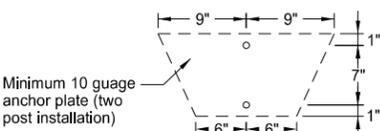
Bottom Soil Stub
Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50



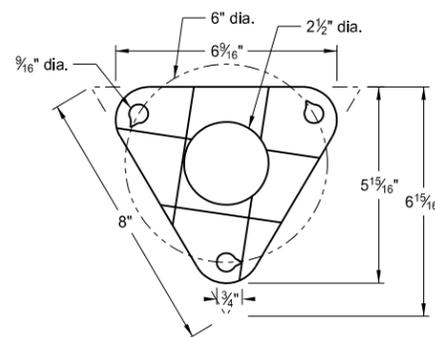
Anchor Unit and Post Assembly



Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly



Minimum 10 gauge anchor plate (two post installation)



Bolt Retainer for Base Connection
Bolt Retainer- 1/2" Reprocessed Teflon

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 Thickness Gauge	Sleeve Size in.	Wall Thickness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2 1/4
1	2 1/4	12			No	2 1/2
1	2 1/2	12			(A)	3
1	2 1/2	10			Yes	
1	2 1/2	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 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2 1/2 x 2 1/2	0.105	12	3.141	0.804	0.803	0.643
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.785

Top Post Receiver Data Table

Square Post Sizes (B)	A	B	C	D	E	F
2 3/16" x 10 ga.	1 5/16"	2 1/2"	3 1/2"	2 5/32"	1 33/64"	1 7/8"
2 1/2" x 10 ga.	1 3/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"

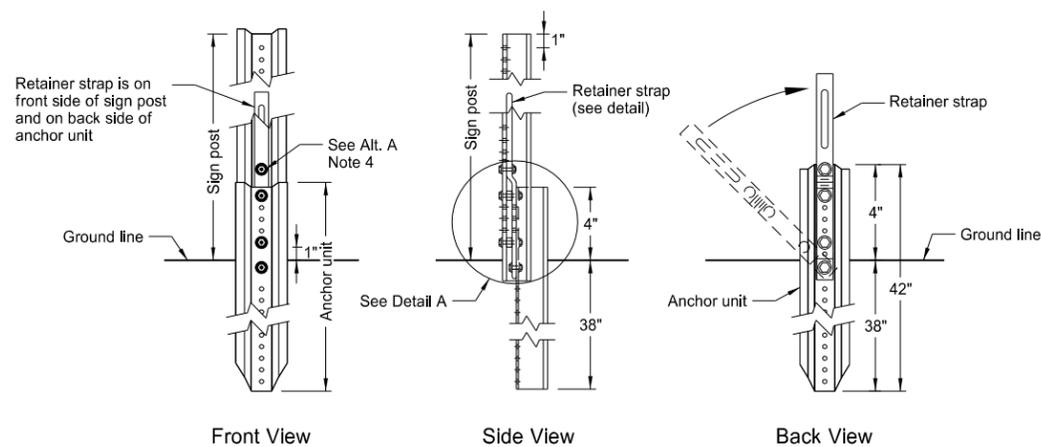
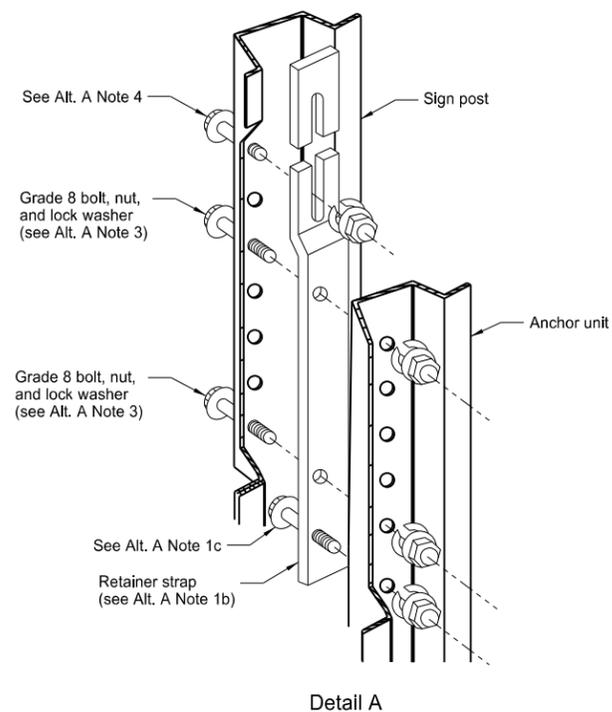
(A) Use breakaway base when support is placed in weak soils. Engineer determines if soils are weak.

(B) For additional wind load, insert the 2 3/16" x 10 ga. into 2 1/2" x 10 ga.

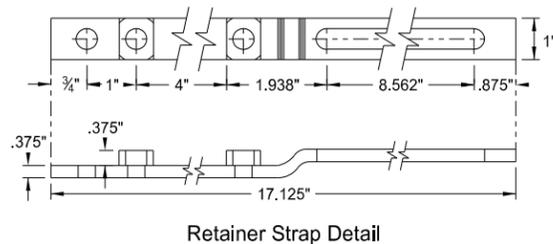
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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
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of Transportation

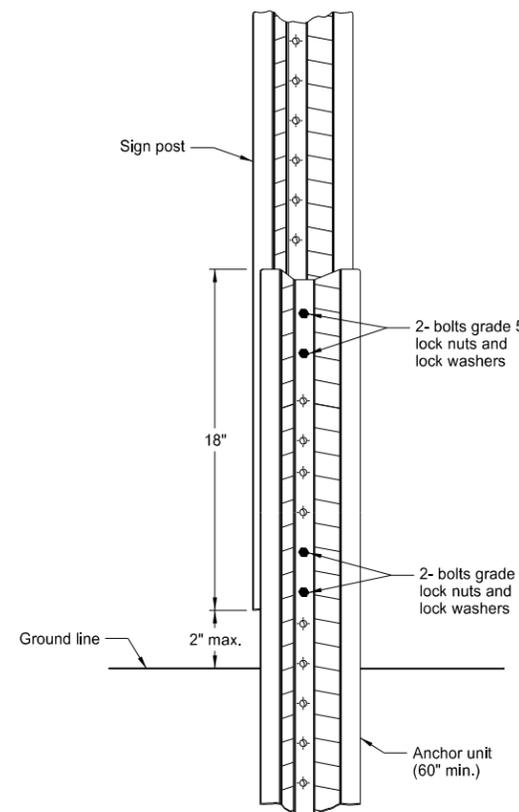
U-Channel Post



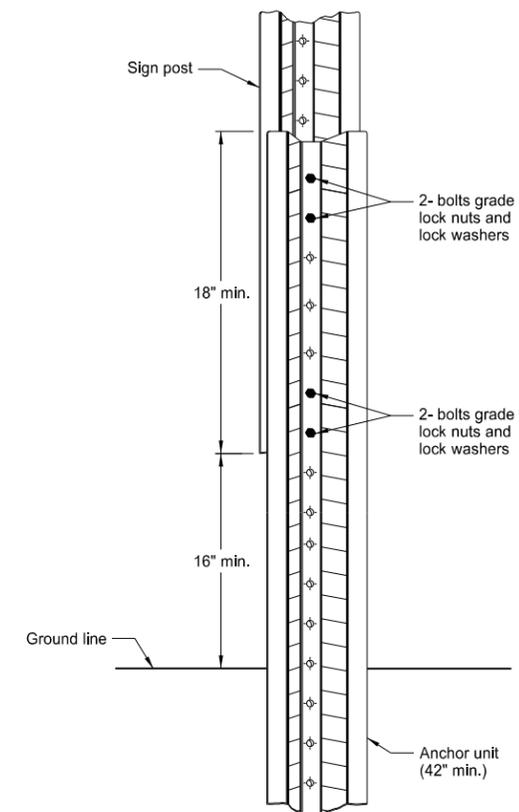
Breakaway U-Channel Detail Alternate A
Install a maximum of 2 posts within 7'.



Retainer Strap Detail



Breakaway U-Channel Splice Detail Alternate B
(2.5 and 3 lb/ft)
Install a maximum of 3 posts within 7'.



Breakaway U-Channel Splice Detail Alternate C
(2.5 and 3 lb/ft)
Install a maximum of 3 posts within 7'.

Alternate A Steps of Installation:

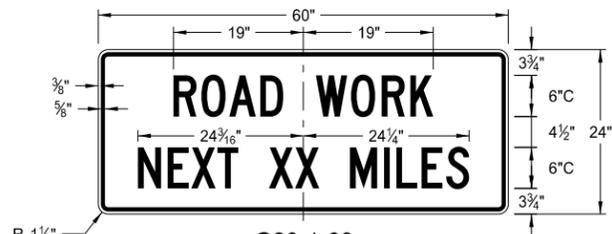
1. a) Drive anchor unit to within 12" of ground level.
b) Establish proper assembly by lining up bottom hole of retainer strap with 6th hole from the top of the anchor unit.
c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
d) Rotate strap 90° to left.
2. a) Drive anchor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

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

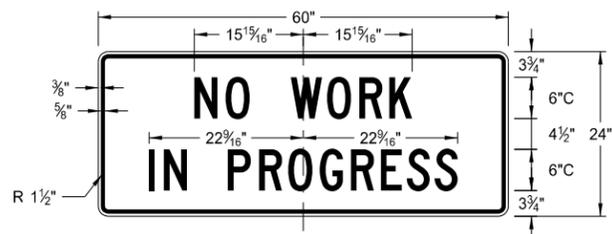
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CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS

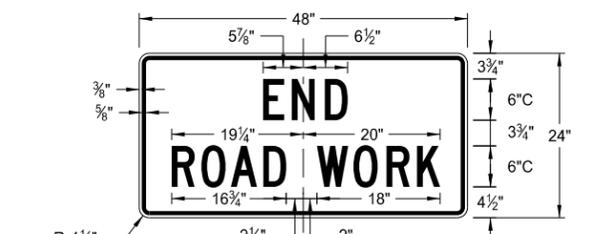
D-704-9



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



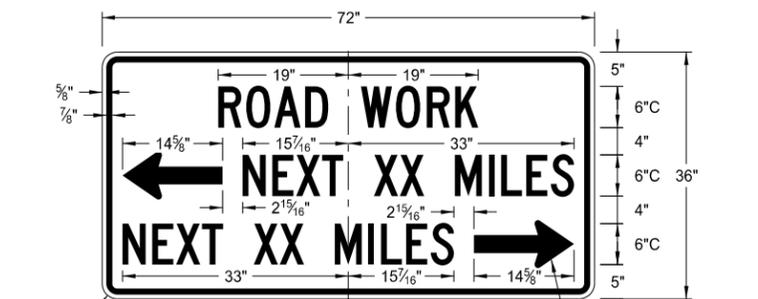
G20-1b-60
Legend: black (non-refl)
Background: orange



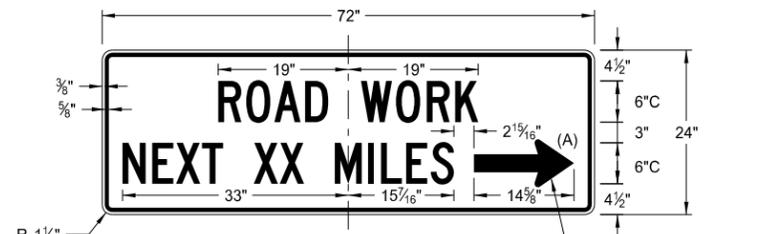
G20-2-48
Legend: black (non-refl)
Background: orange



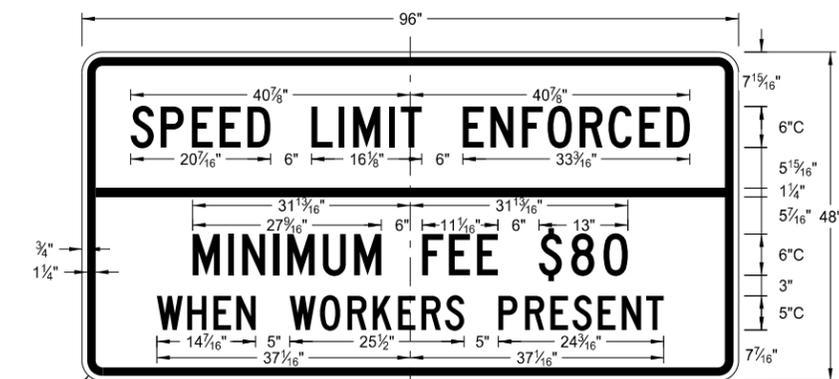
G20-4b-36
Legend: black (non-refl)
Background: orange



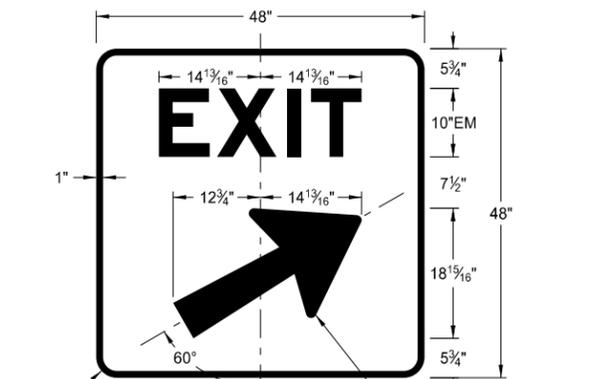
G20-50a-72
Legend: black (non-refl)
Background: orange



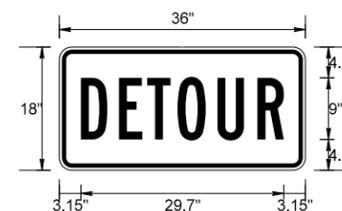
G20-52a-72
Legend: black (non-refl)
Background: orange



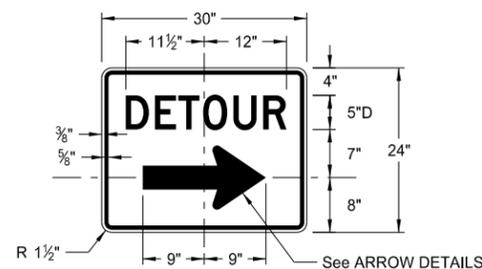
G20-55-96
Legend: black (non-refl)
Background: orange



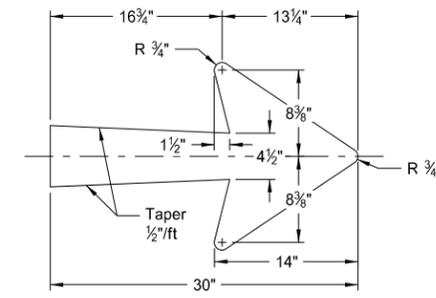
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



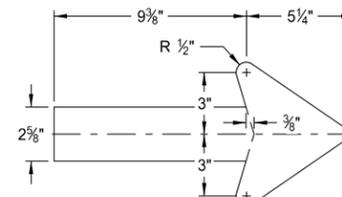
M4-8-36
Legend: black (non-refl)
Background: orange



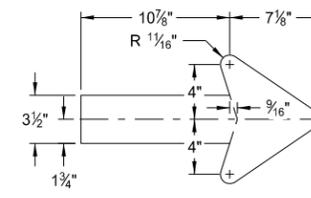
M4-9(L or R)-30 & M4-9-30
Legend: black (non-refl)
Background: orange



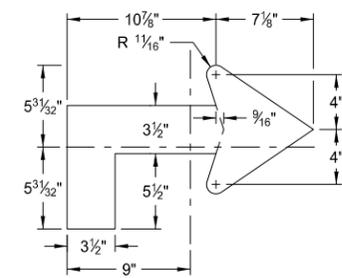
E5-1-48



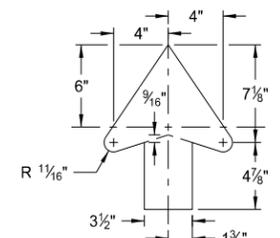
G20-50a-72
G20-52a-72



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



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



M4-9-30
Straight

ARROW DETAILS

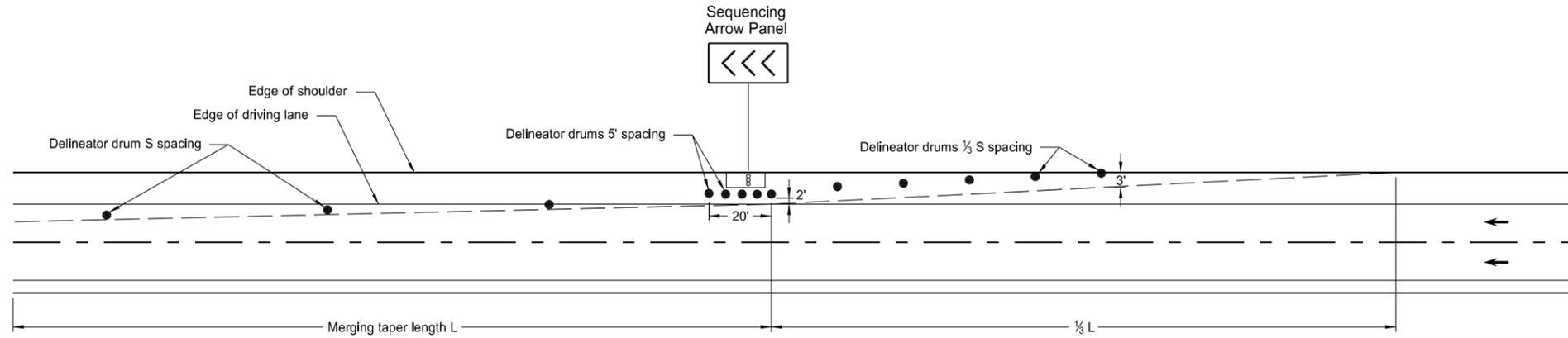
NOTES:

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

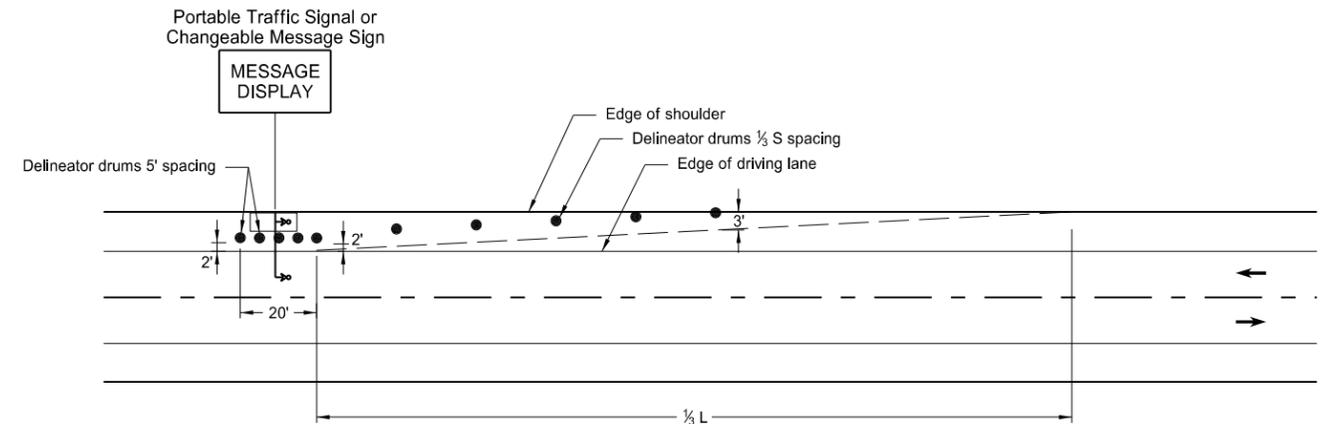
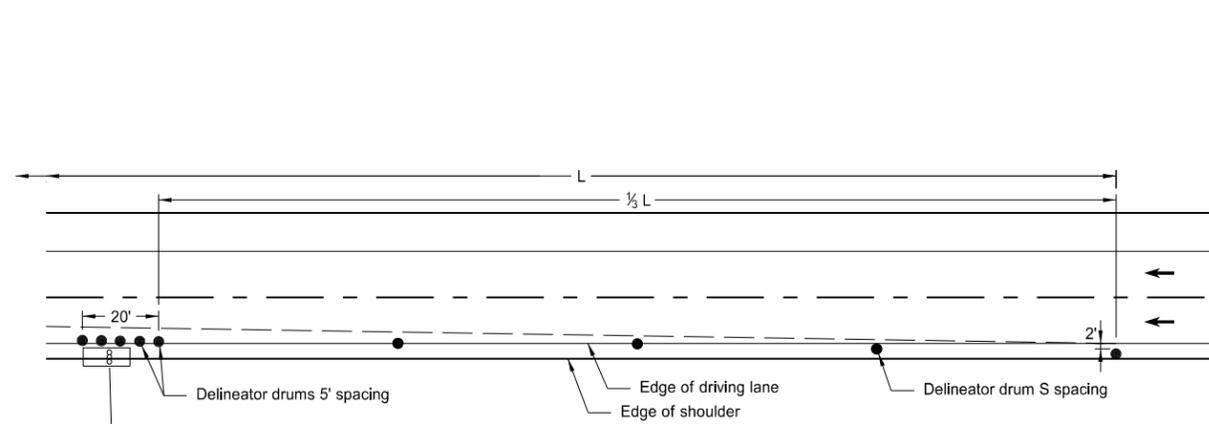
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17 10-03-19	Added sign & background color New Design Engineer PE Stamp

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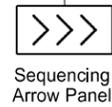
SHOULDER CLOSURE TAPERS



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



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



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

PORTABLE TRAFFIC SIGNAL OR CHANGEABLE MESSAGE SIGN ON SHOULDER

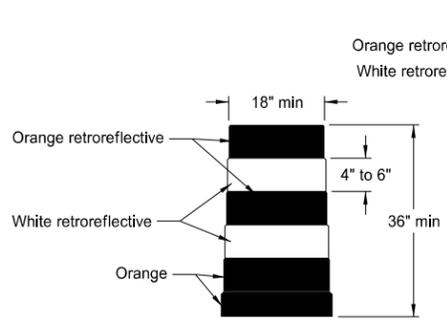
Notes:

- 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

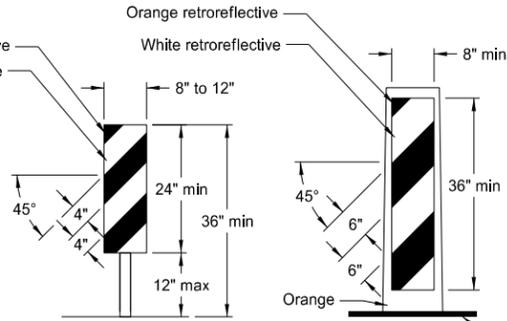
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BARRICADE AND CHANNELIZING DEVICE DETAILS



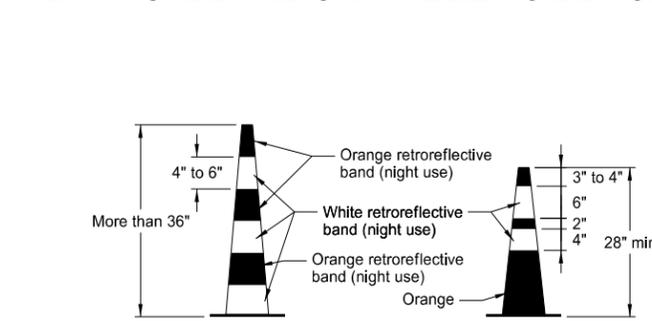
DELINEATOR DRUM

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.



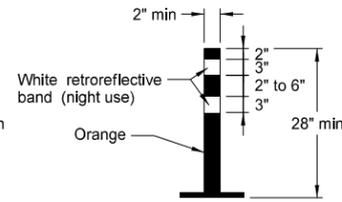
BACK TO BACK VERTICAL PANEL

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.



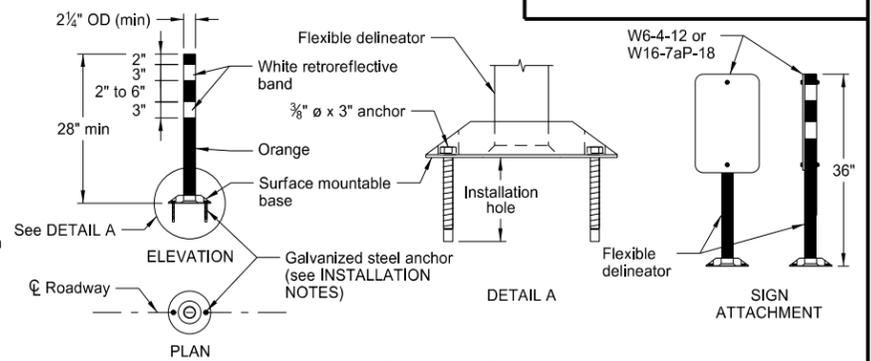
TRAFFIC CONE

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.



TUBULAR MARKER

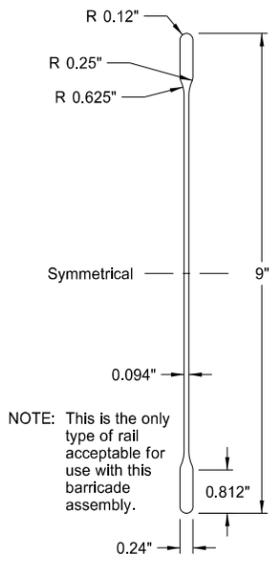
Provide retroreflectORIZATION of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

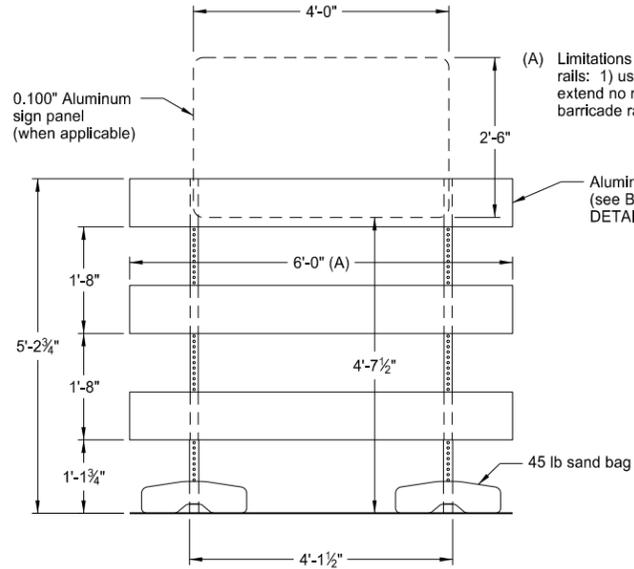
INSTALLATION NOTES:

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.



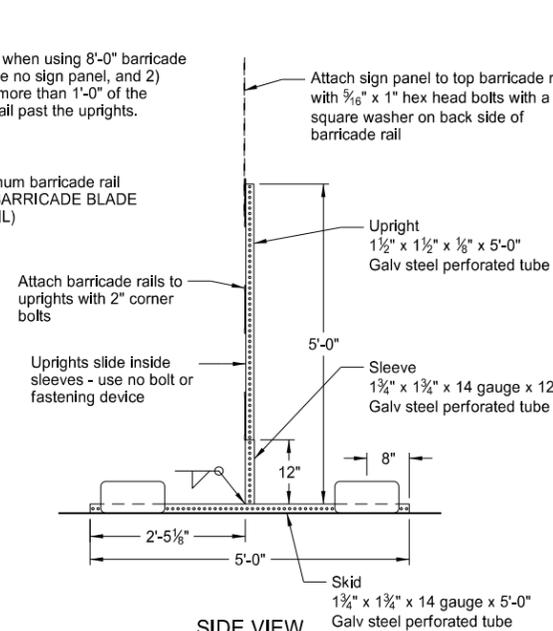
BARRICADE BLADE DETAIL

NOTE: This is the only type of rail acceptable for use with this barricade assembly.



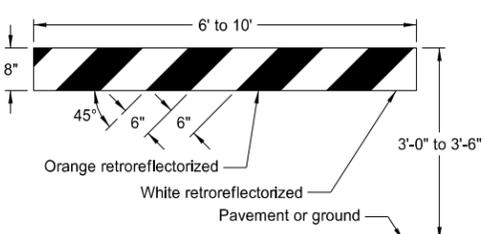
ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

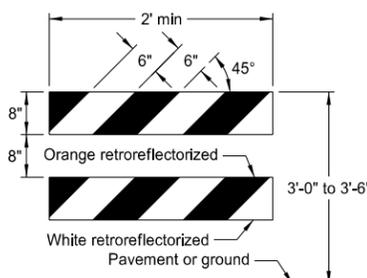


SIDE VIEW

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

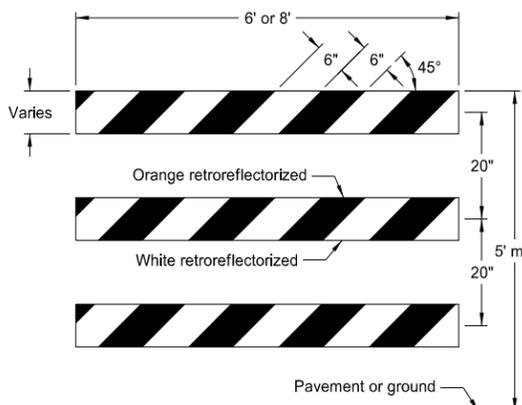


TYPE I BARRICADE

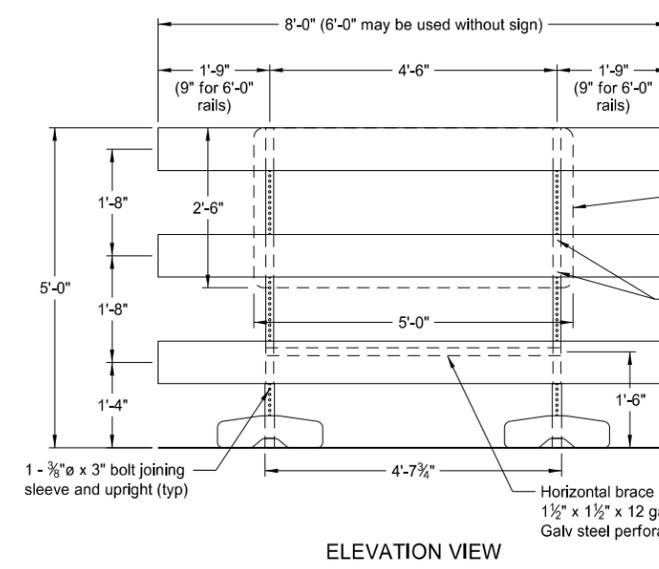


TYPE II BARRICADE

BARRICADE RAIL DETAILS

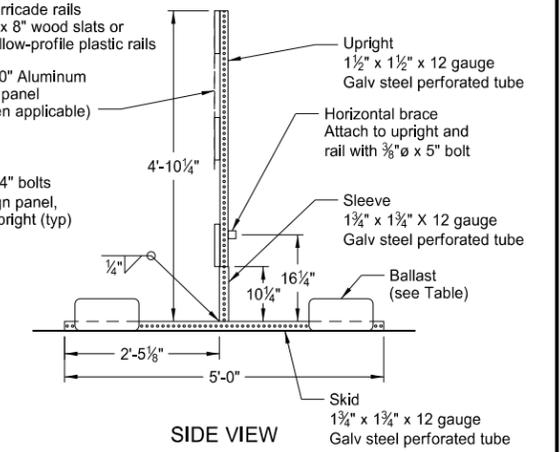


TYPE III BARRICADE

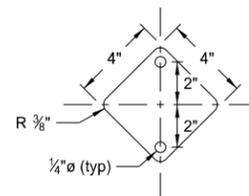


ELEVATION VIEW

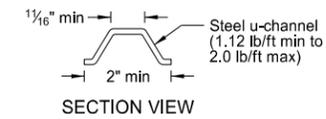
BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)



SIDE VIEW



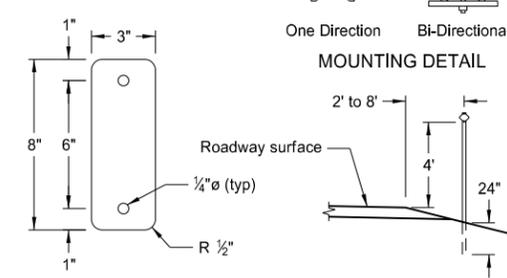
REFLECTOR DETAIL



SECTION VIEW



MOUNTING DETAIL



DELINEATORS

MINIMUM BALLAST (For each side of barricade support)

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

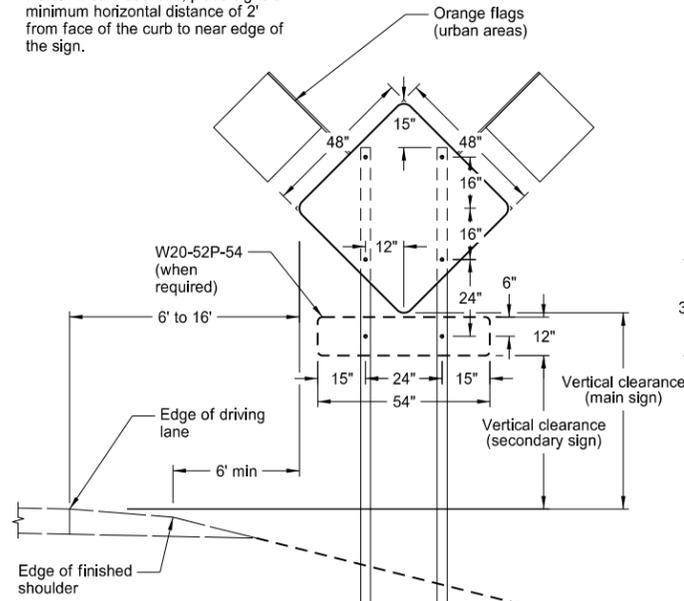
Note: Number of sandbags based on a wind speed of 55 MPH. Sandbags assumed to be placed at or near the ends of the skids.

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

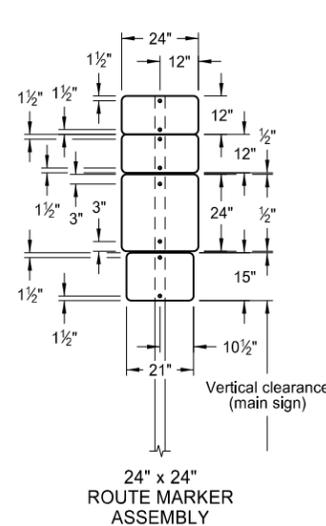
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CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

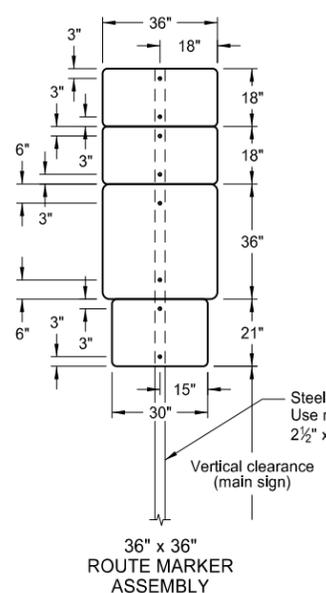
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



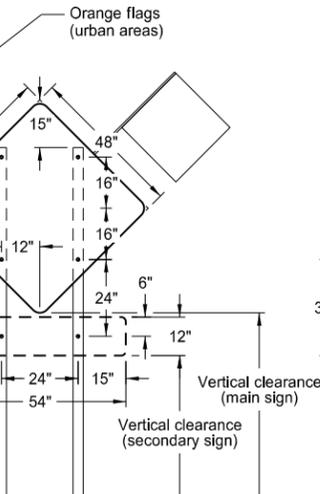
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



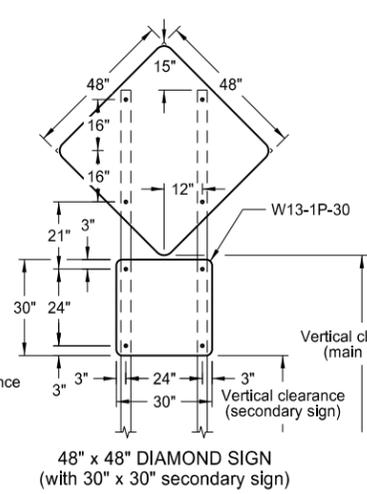
24" x 24" ROUTE MARKER ASSEMBLY



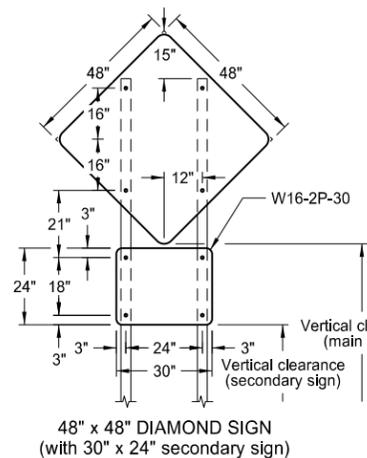
36" x 36" ROUTE MARKER ASSEMBLY



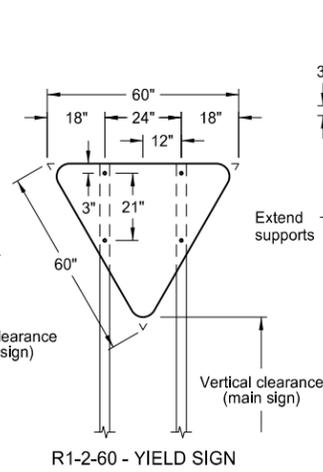
18" x 18" DIAMOND SIGN



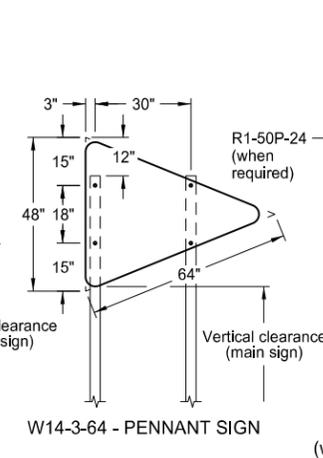
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



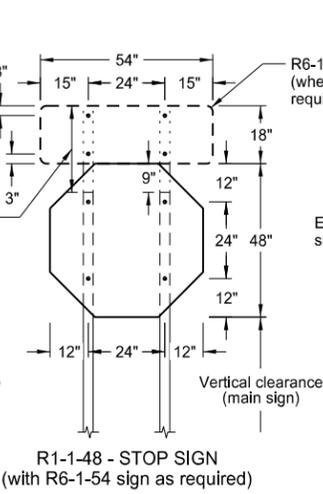
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



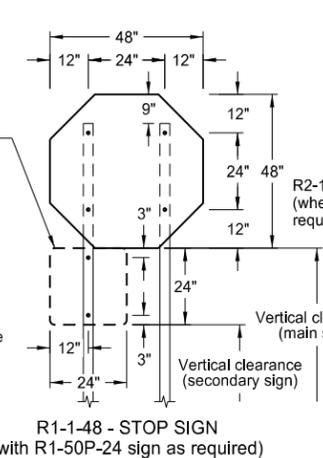
R1-2-60 - YIELD SIGN



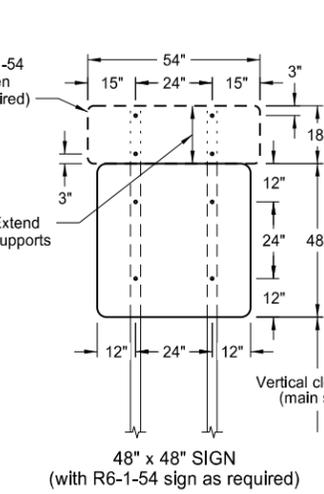
W14-3-64 - PENNANT SIGN



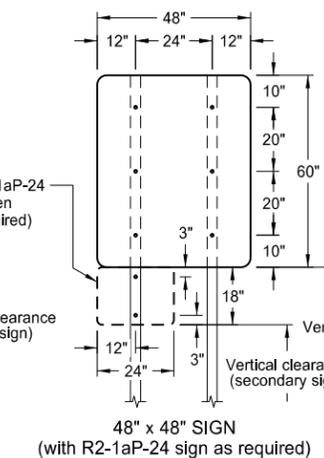
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



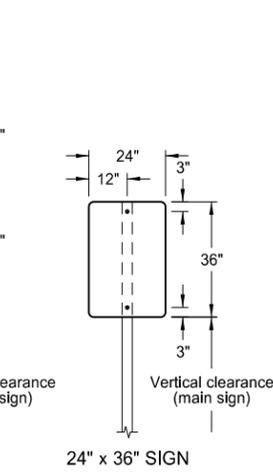
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



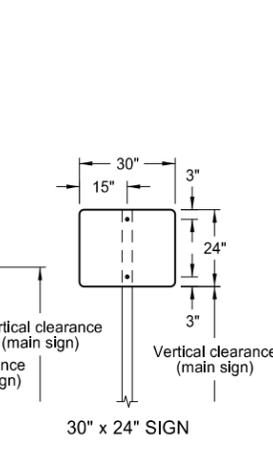
48" x 48" SIGN
(with R6-1-54 sign as required)



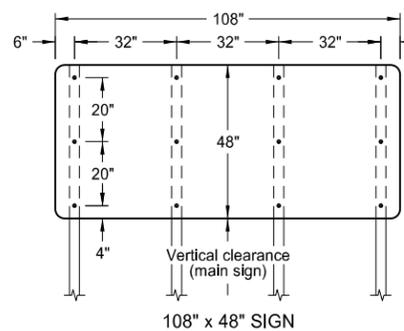
48" x 48" SIGN
(with R2-1aP-24 sign as required)



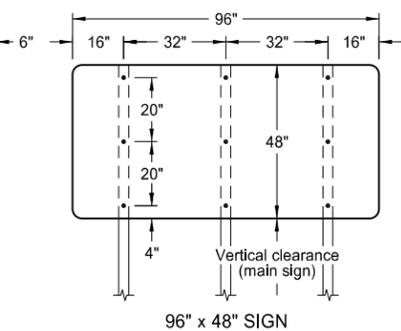
24" x 36" SIGN



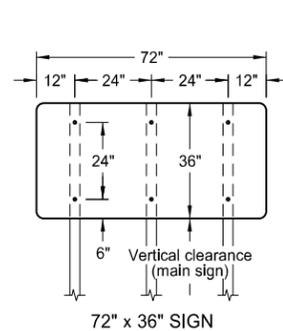
30" x 24" SIGN



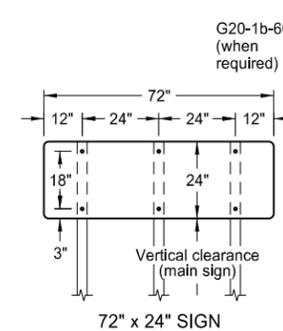
108" x 48" SIGN



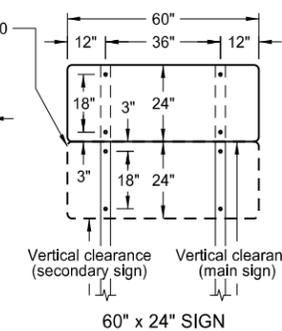
96" x 48" SIGN



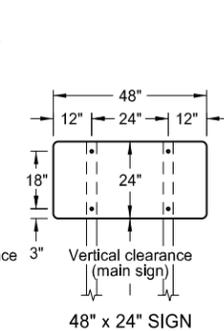
72" x 36" SIGN



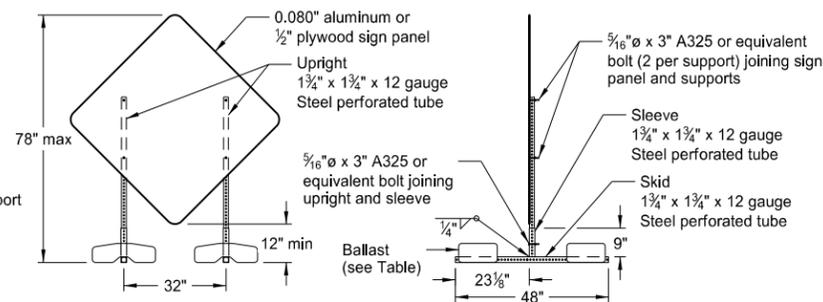
72" x 24" SIGN



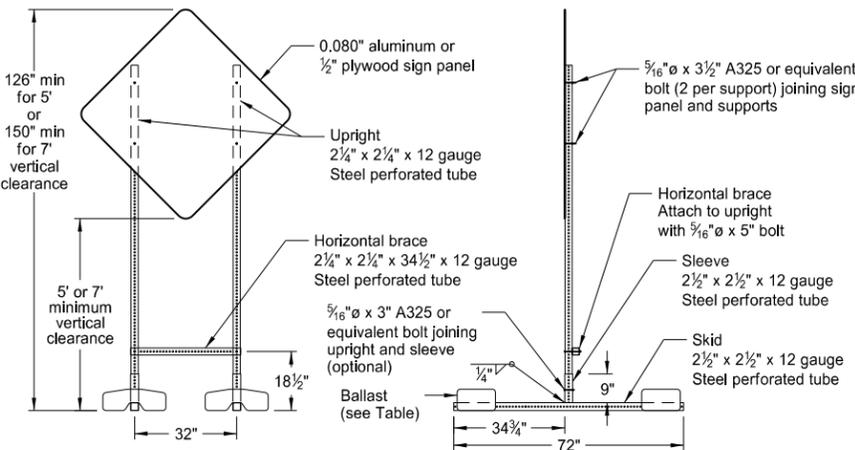
60" x 24" SIGN



48" x 24" SIGN



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

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

Place signs over 50 square feet on 2 1/2" x 2 1/2" perforated tube supports as a minimum.

Do not attach guy wires to sign supports. Attach wind beams behind sign panels when used with u-posts.
- Sign Panels: Provide sign panels made of 0.100" aluminum, 1/2" plywood, or other approved material, except where noted. Punch all holes round for 5/16" bolts.
- Alternate Messages: Install and remove alternate message signs on reflectorized plate (without borders) as required. (i.e. "Left" and "Right" message on lane closure sign)
- Route Marker Auxiliary Signs: Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:

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

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 breakdowns, 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

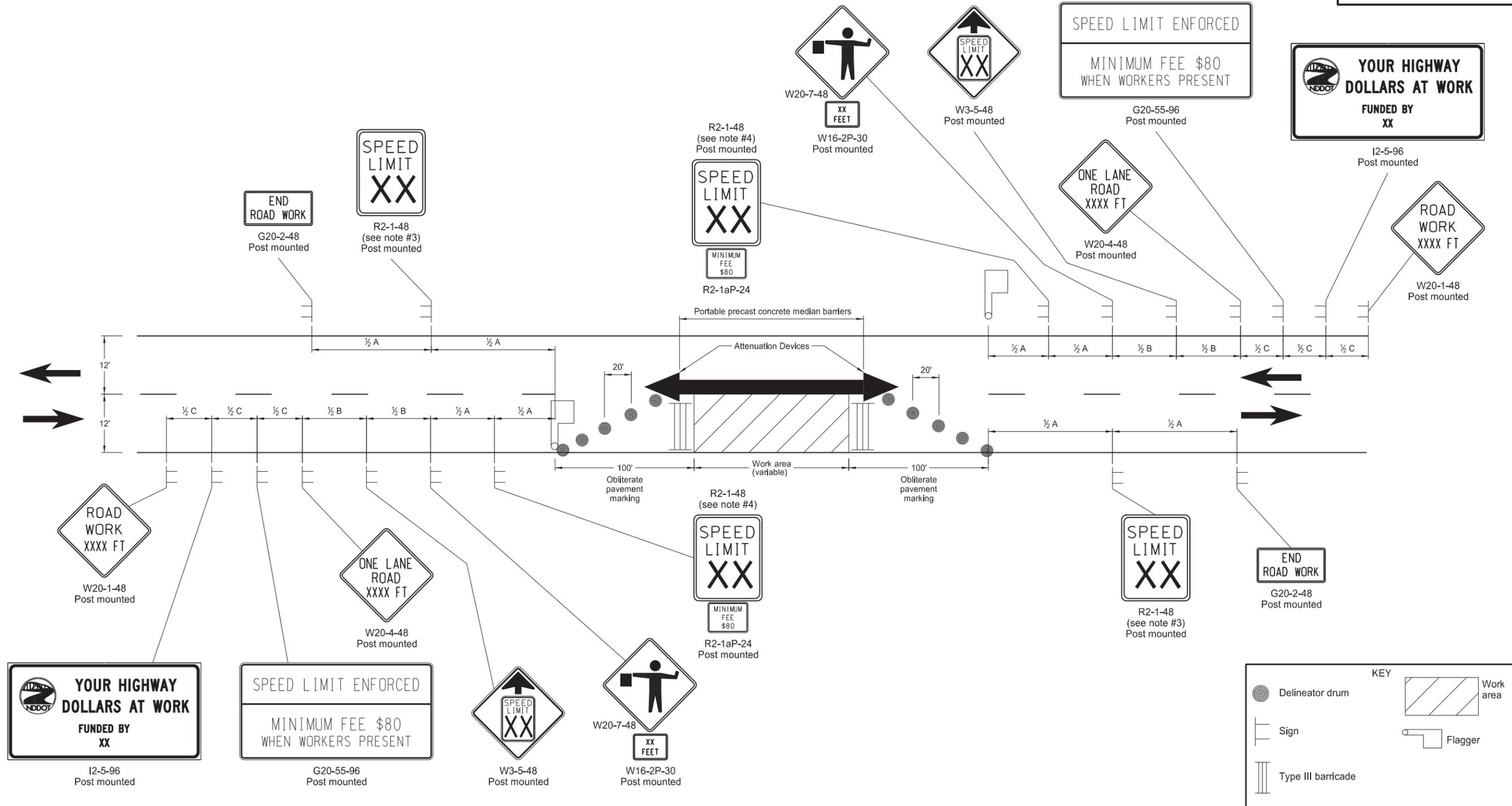
Note: The number of sandbags are based on a wind speed of 55 MPH. Place sandbags at or near the ends of skids.

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 ONE LANE CLOSURE TWO LANE ROADWAY

D-704-17



KEY

- Delineator drum
- Sign
- Type III barricade
- Work area
- Flagger

Notes:

- Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
- Remove existing striping as required. Use back to back delineators when inslope is 4:1 or flatter and roadway alignment is visible to approaching vehicles. Place back to back vertical panels when roadways have steep slopes and alignment is not visible to approaching traffic.
- Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
- Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 MPH.) Place the second speed limit sign at 1/2B.
- Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
- As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
- Cover existing speed limit signs within a reduced speed zone.
- Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or if work is less than 15 days.
- Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
- Sign I2-5-96 is not required if this layout is part of other traffic control that contains this sign.

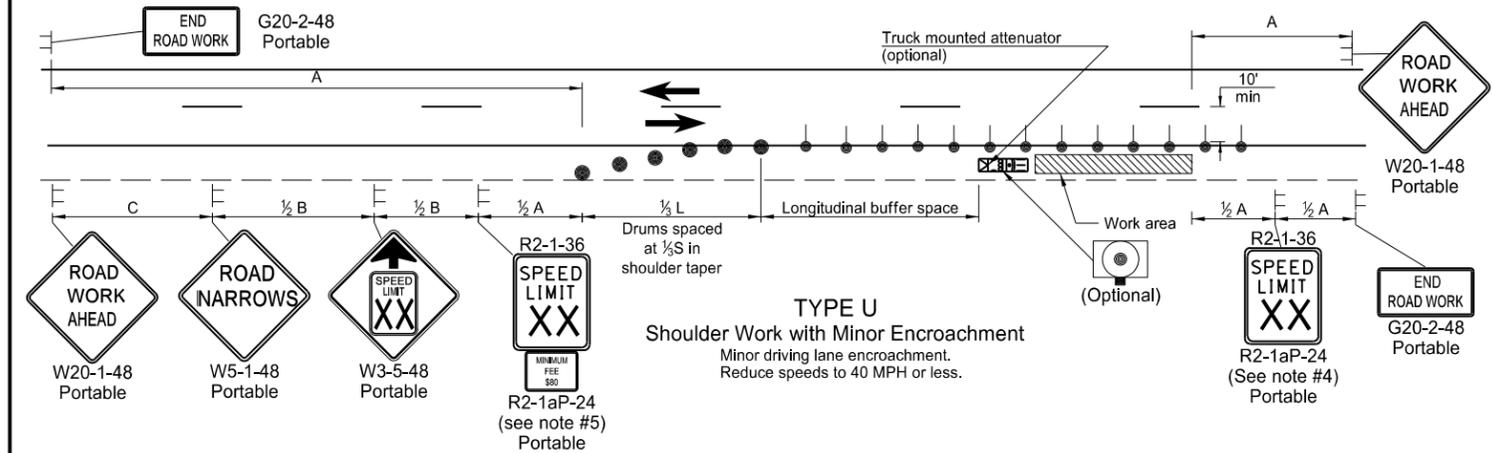
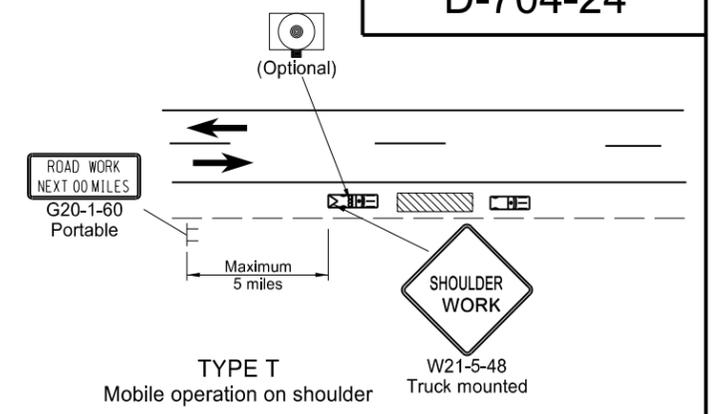
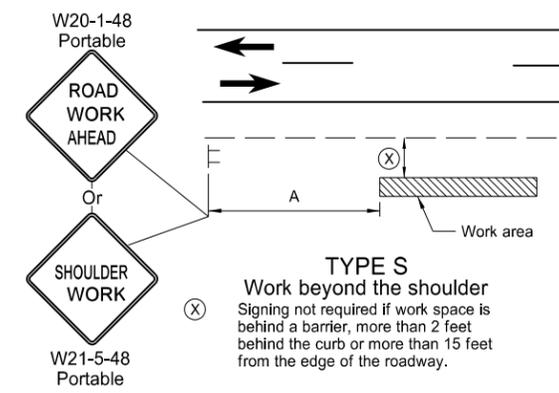
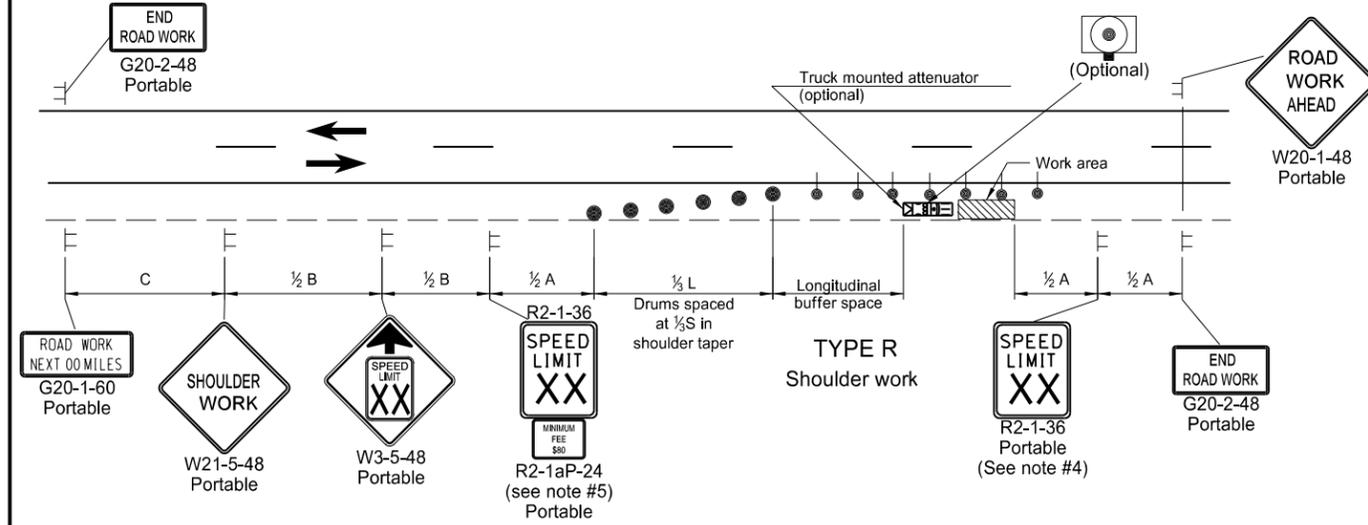
Road Type	ADVANCE WARNING SIGN SPACING		
	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway 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
08-17-17	Note update & sign numbers
11-01-19	Removed signs & revised note
12-08-21	Switched order of Road Work XXXX and Spd Limit Enforced & added Dollars At Work

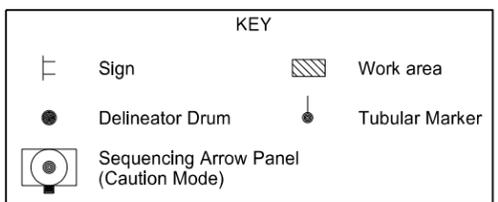
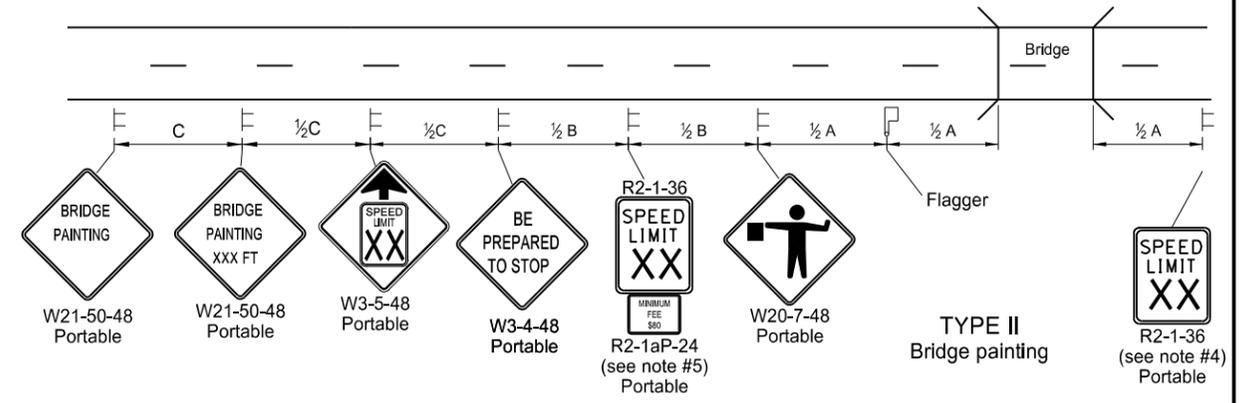
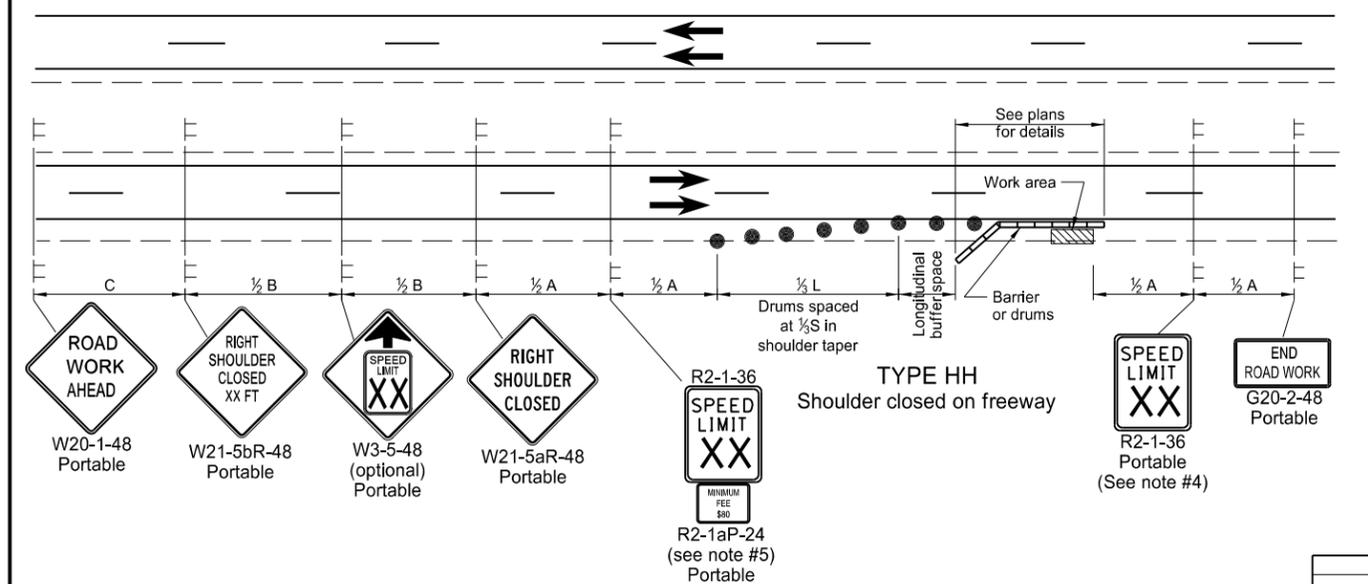
KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

12/08/21

SHOULDER CLOSURES AND BRIDGE PAINTING LAYOUTS



- Notes
- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of the taper in feet.
 - L = Minimum length of taper, $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2 / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
 - Space delineator drums for tapering traffic at dimension "S". Space delineator drums or tubular markers for tangents at 2 times "S".
 - Sequencing Arrow Panels
 - Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
 - Use Type B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
 - Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
 - Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
 - Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at 1/2 B.
 - Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
 - Cover existing speed limit signs within a reduced speed zone.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.



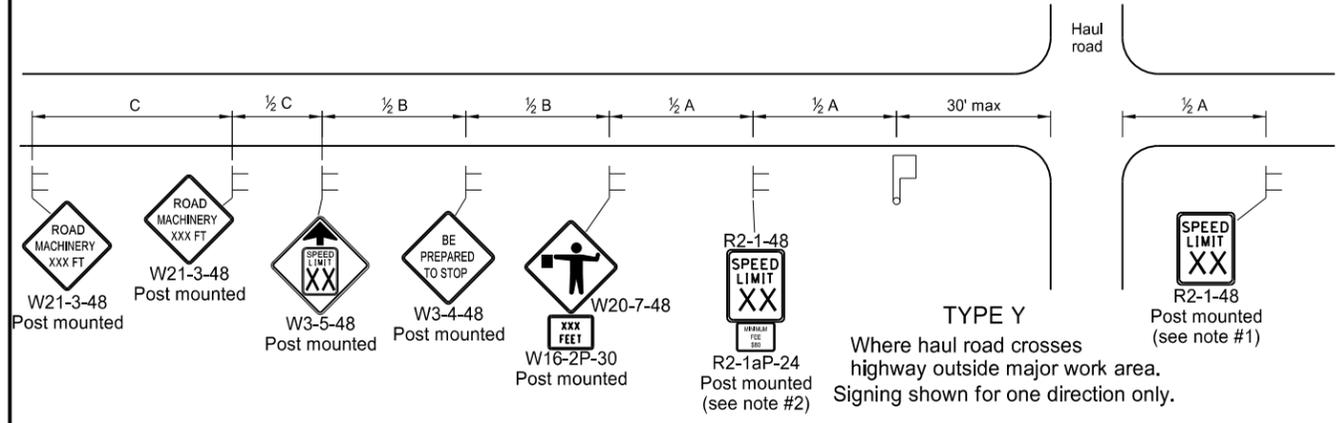
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway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

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

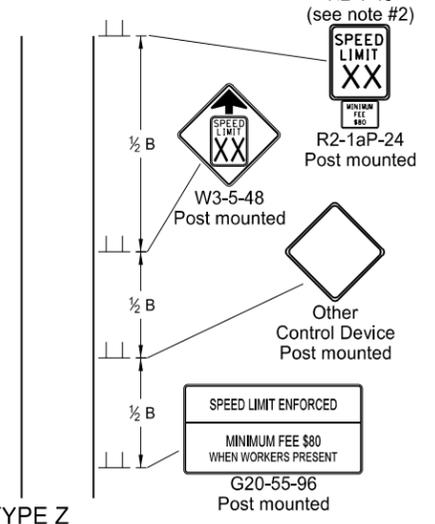
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
8-17-17 11-01-19	Updated notes & revised signs Revised drum spacing & signs nos.

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

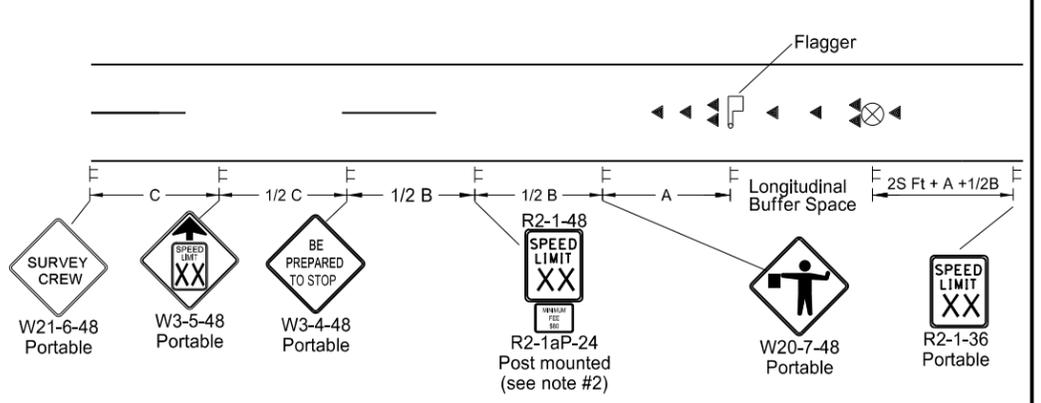
MISCELLANEOUS SIGN LAYOUTS



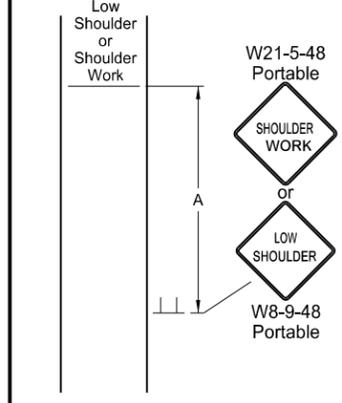
TYPE Y
Where haul road crosses highway outside major work area. Signing shown for one direction only.



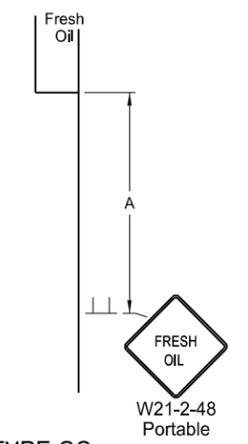
TYPE Z
Where speed zone is needed. Signing shown for one direction only.



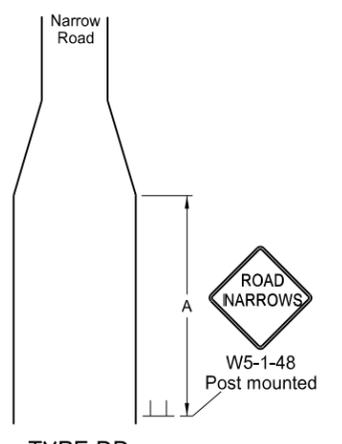
TYPE AA
Where survey crew is used. Signing shown for one direction only.



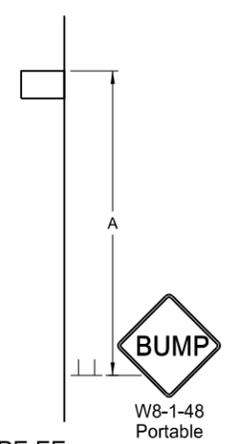
TYPE BB
Within major work area where sign conditions exist



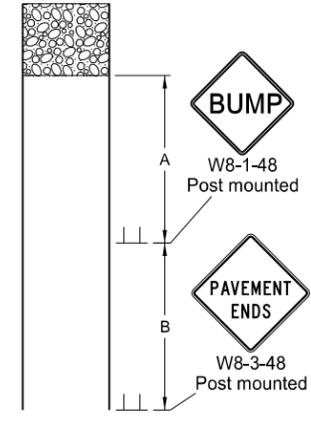
TYPE CC
Where sign conditions exist



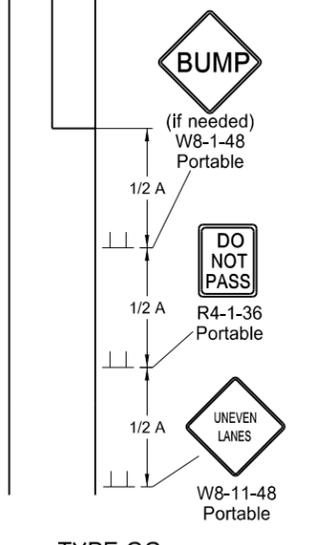
TYPE DD
Where sign conditions exist



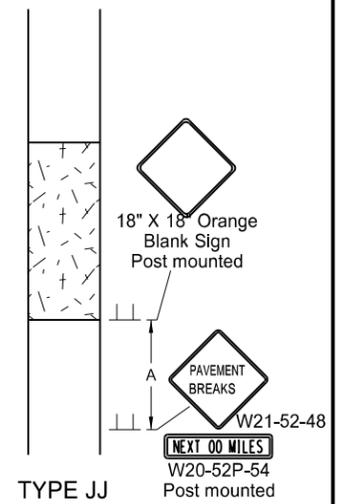
TYPE EE
Where sign conditions exist



TYPE FF
Where sign conditions exist. Signing shown for one direction only.



TYPE GG
Where elevation difference exists between lanes

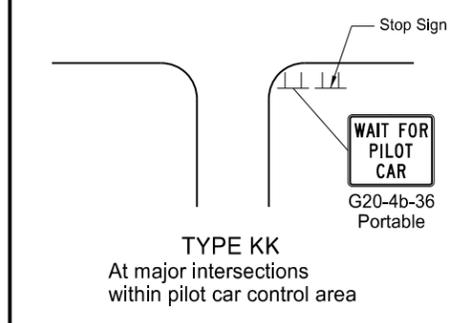


TYPE JJ
For break in pavement. Install signs when conditions exist and remove when not applicable. Signing shown for one direction only.

KEY

- Flagger
- Sign
- Cones
- Survey Equipment

S = Numerical value of speed limit or 85th percentile.



TYPE KK
At major intersections within pilot car control area

- Notes**
1. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
 2. Determine reduced speed limit based on in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at 1/2B.
 3. 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.
 4. Cover existing speed limit signs within reduced speed zones.
 5. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 6. Sign G20-55-96 is not required if this standard is part of other traffic control layouts, or work is less than 15 days.
 7. When pilot car operation is used, place sign G20-4b-36 "Wait For Pilot Car" at major intersections within pilot car control area.
 8. Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
 9. Layouts shown for one direction only.

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

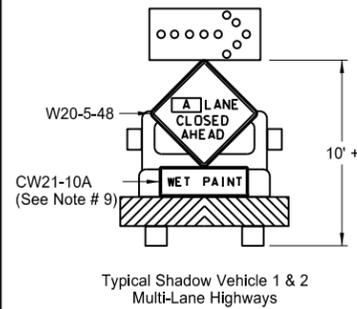
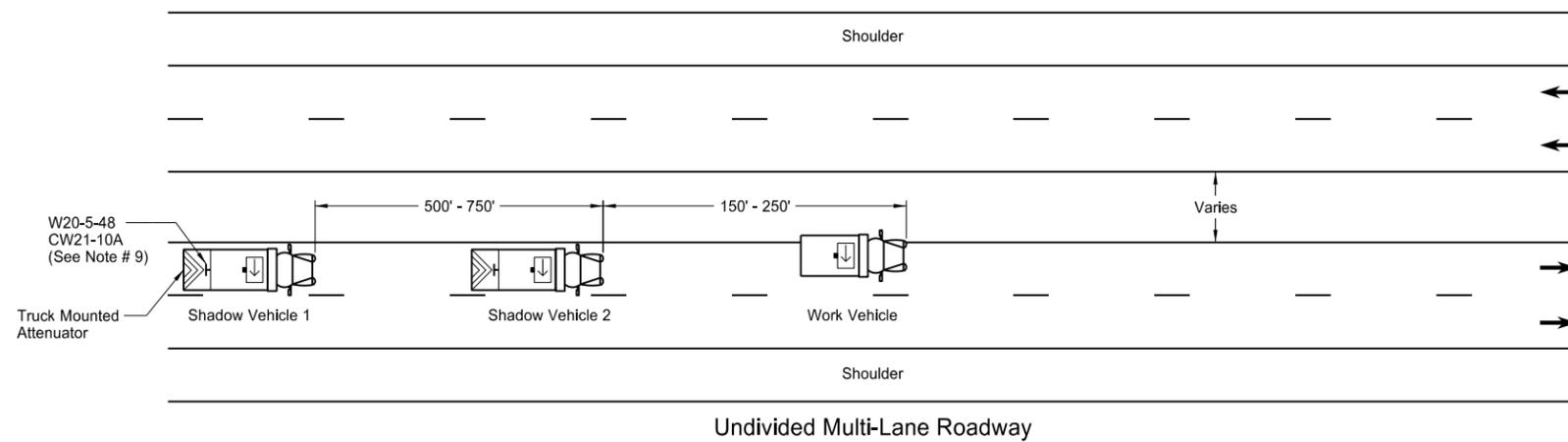
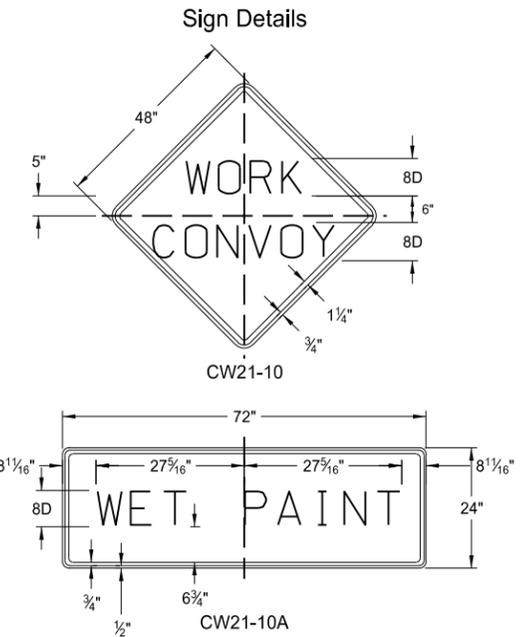
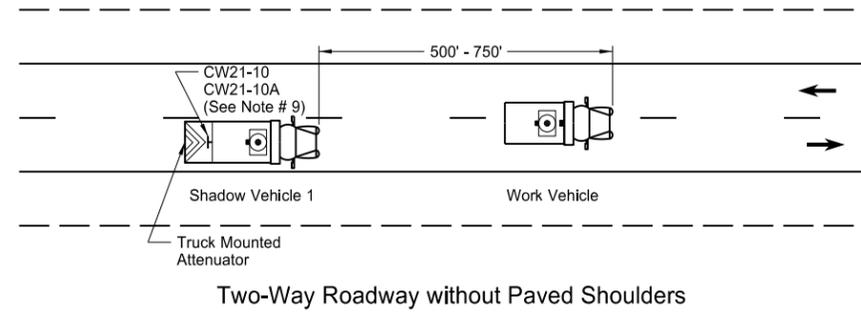
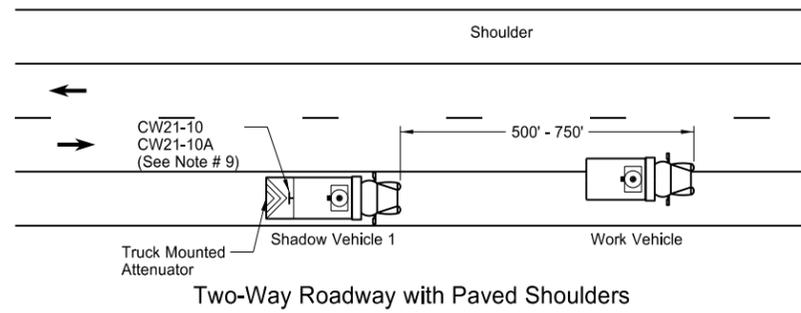
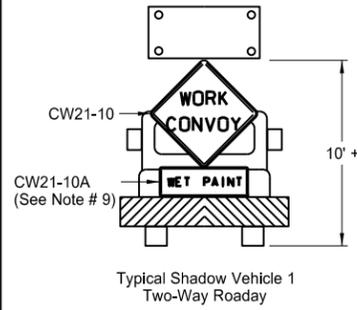
Longitudinal Buffer Space	
*Speed (mph)	Length Min (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

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

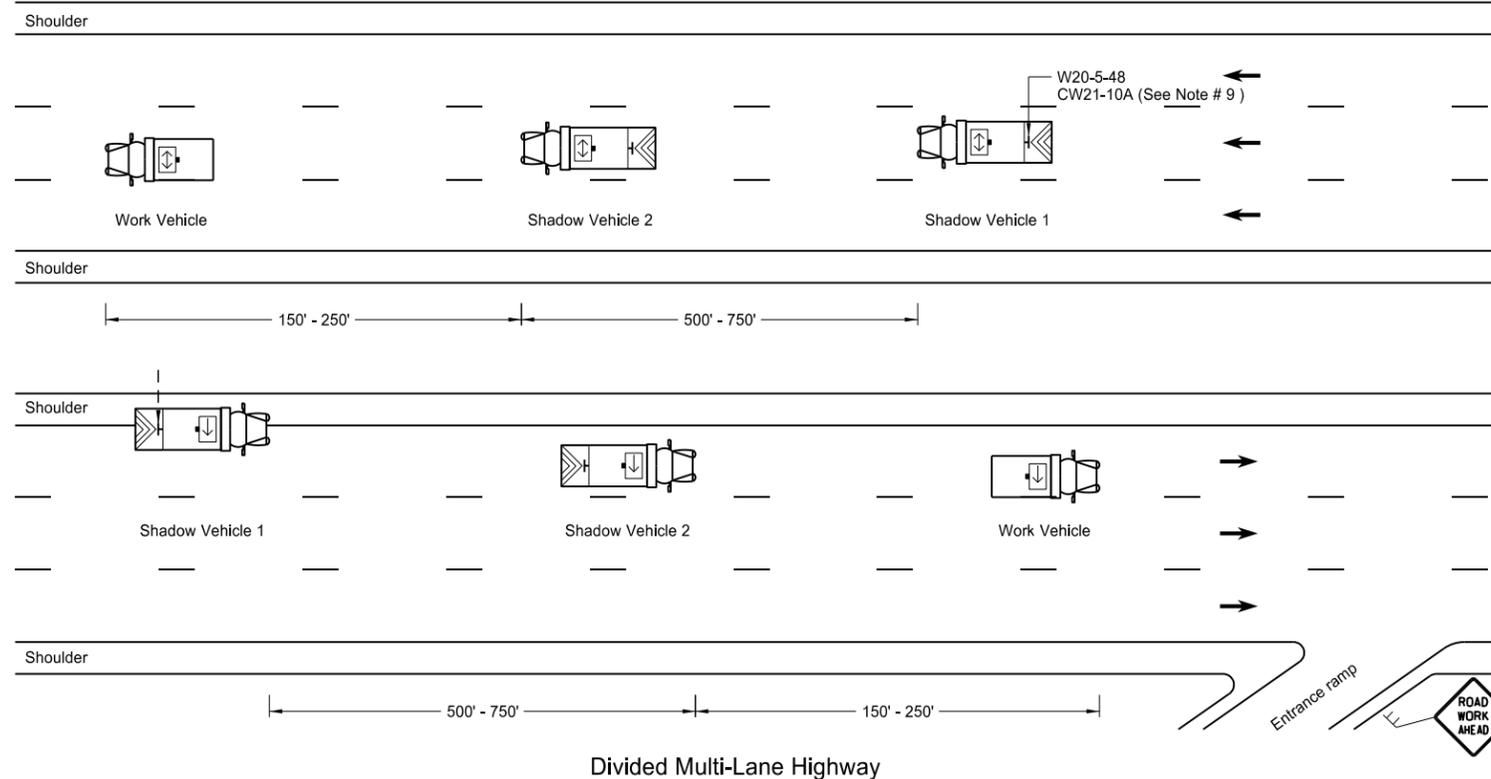
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
8-17-17	Added speed limit signs. Updated notes & sign numbers
11-01-19	Revised note 5 & sign numbers

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

MOBILE OPERATION
(PAVEMENT MARKING)

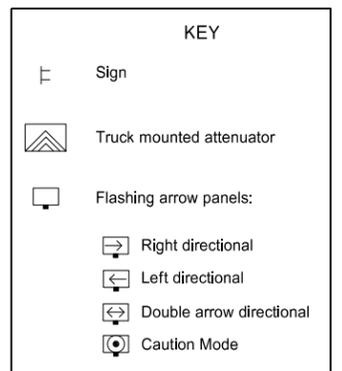


A = Left Right Center



Notes

- Use additional vehicles you choose to be in the convoy with truck mounted attenuators, at your own expense.
- Display yellow rotating beacons or strobe lights on shadow and work vehicles, unless otherwise stated in the plans.
- Use Type B or Type C flashing arrow panels controlled from inside the vehicle.
- Provide each vehicle with two-way electronic communication capability.
- Move shadow vehicle 1 first to shadow other convoy vehicles when convoy changes lane.
- Vary vehicle spacing between shadow vehicle 1 and shadow vehicle 2 based on sight distance restrictions. Motorists approaching the work convoy need to see trail vehicle in time to slow down and/or change lanes as they approach shadow vehicle.
- Sign Colors
Letters = Black
Border = Black
Background = Orange
- As an option, use shadow vehicle 2 the paint tender vehicle.
- Use sign CW21-10A only during painting operation.
- Pull over work and shadow vehicles periodically to allow motor vehicle traffic to pass on two lane - two way roadways.

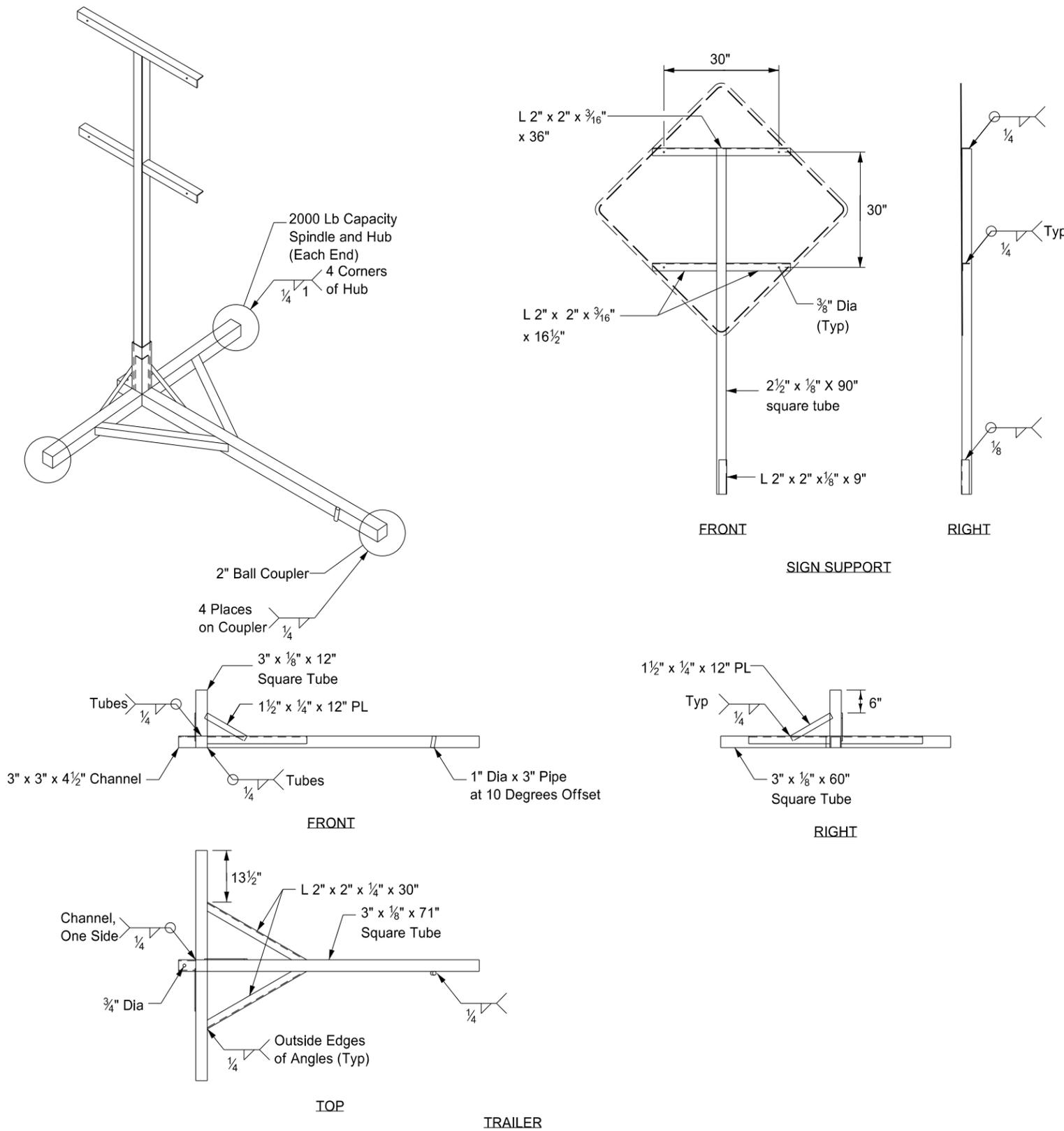


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
6-18-14	Removed shadow vehicle 2 on two lane roadways
9-27-17	Updated to active voice
11-08-19	Changed Standard Heading

This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
on 11/08/19 and the original document is stored at the
North Dakota Department
of Transportation

PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



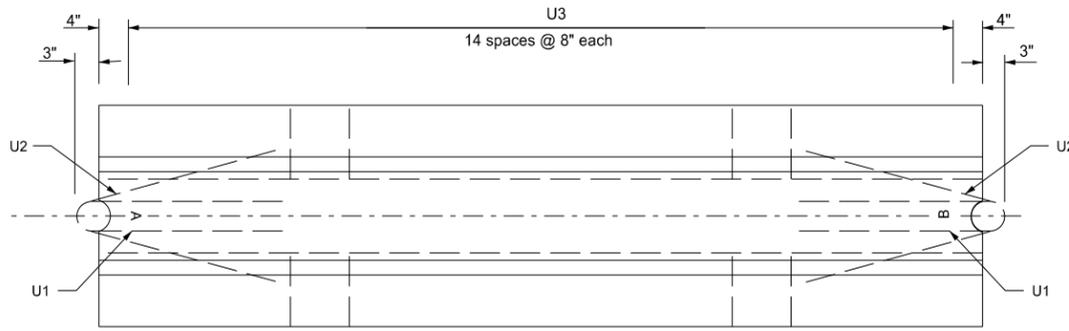
Notes:

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

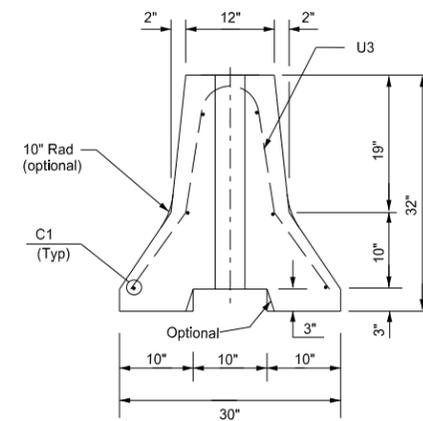
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE

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

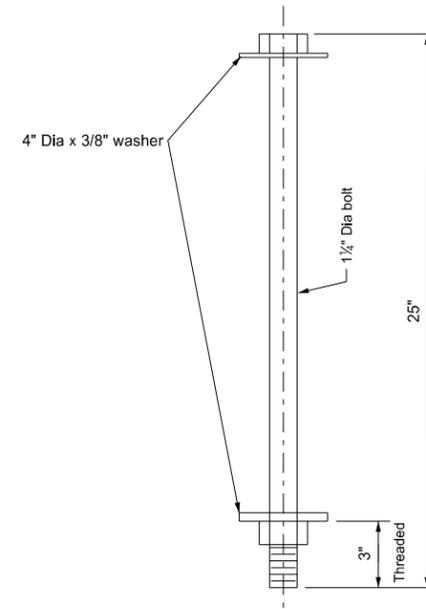
PORTABLE PRECAST CONCRETE MEDIAN BARRIER
(TEMPORARY USAGE)



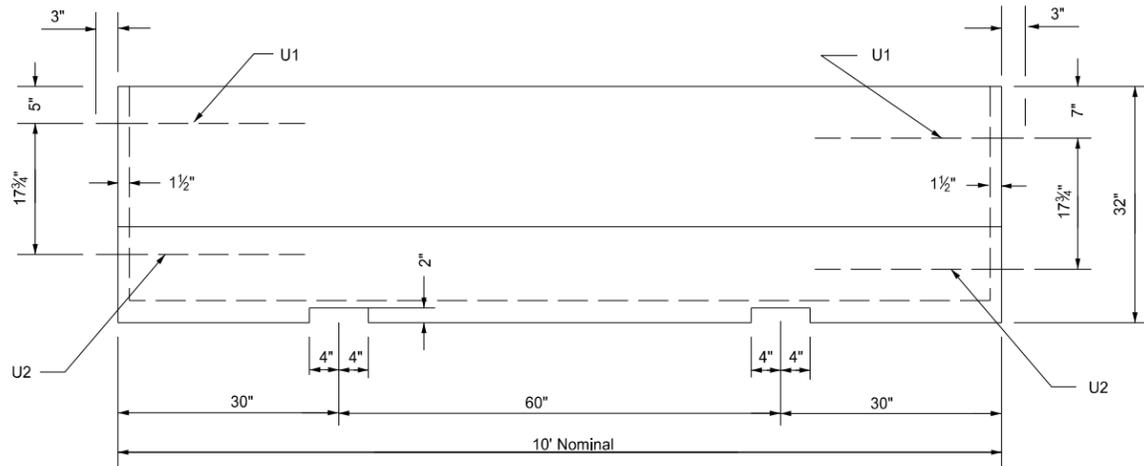
Plan View



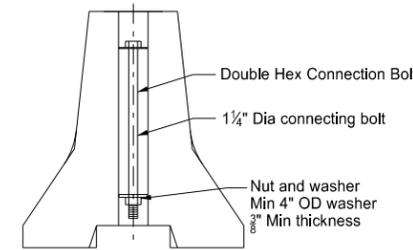
End View



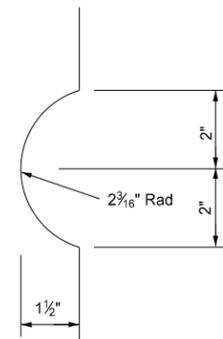
Connecting Bolt Detail
(One per 10 Ft section)



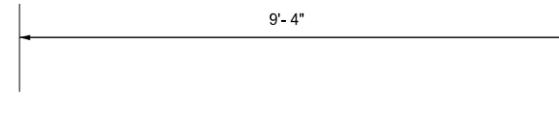
Side View



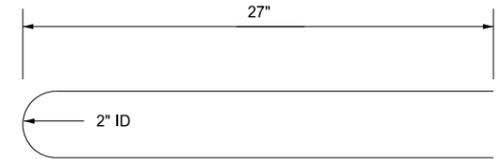
Bolt Connection Detail



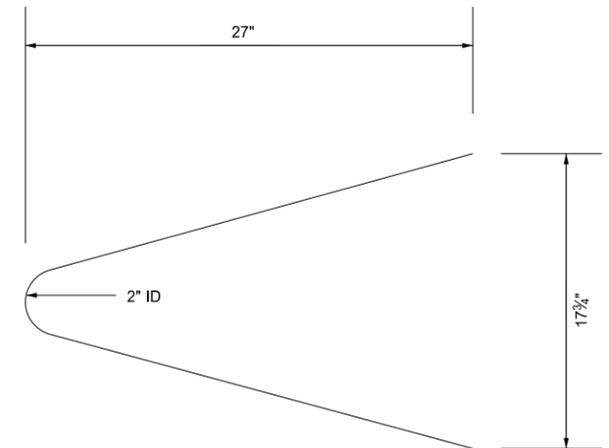
Dap Detail



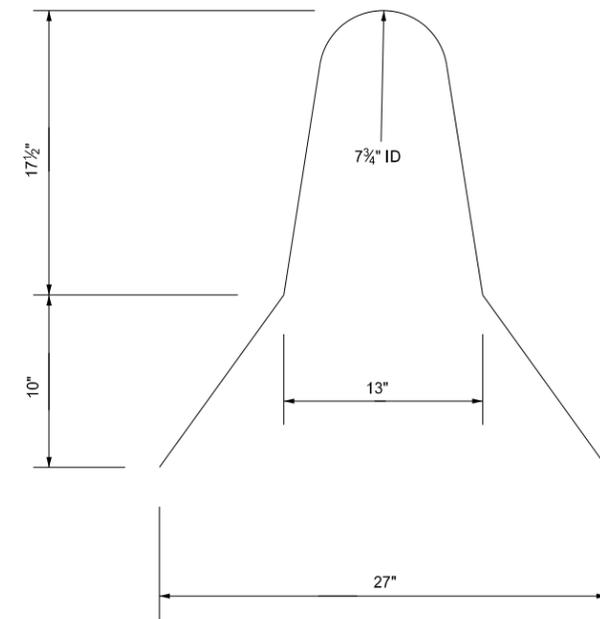
C1 Bar Detail



U1 Bar Detail



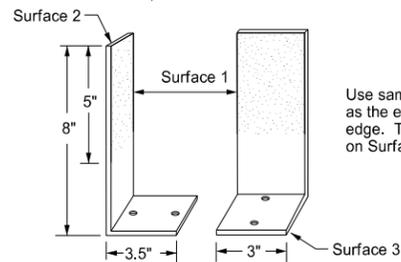
U2 Bar Detail



U3 Bar Detail

Notes:

- Galvanize all exposed hardware as per ASTM A153, except for the loop inserts.
- Use AAE-3 Concrete.
- Provide steel in accordance with Section 612 of NDDOT Standard Specifications.
- Imprint barrier ends A and B as shown with 4 inch letters. Field match A end with B end.
- Place barrier markers at the center of the barrier at 20' centers.
- 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.
- Place barrier to minimize openings between individual sections.



Barrier Marker Detail

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

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

Marker Body
Use high impact, weatherable engineering thermo-plastic material conforming to the following:

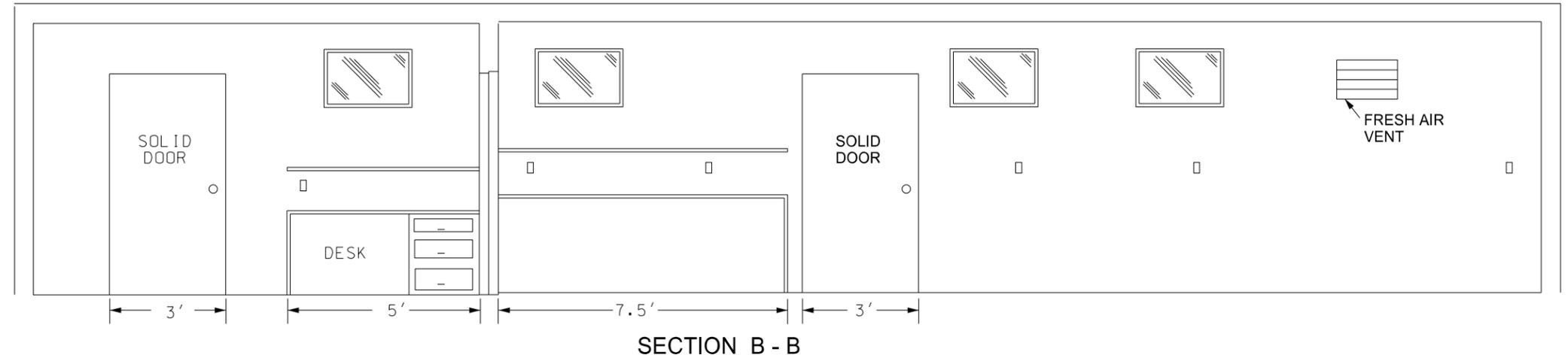
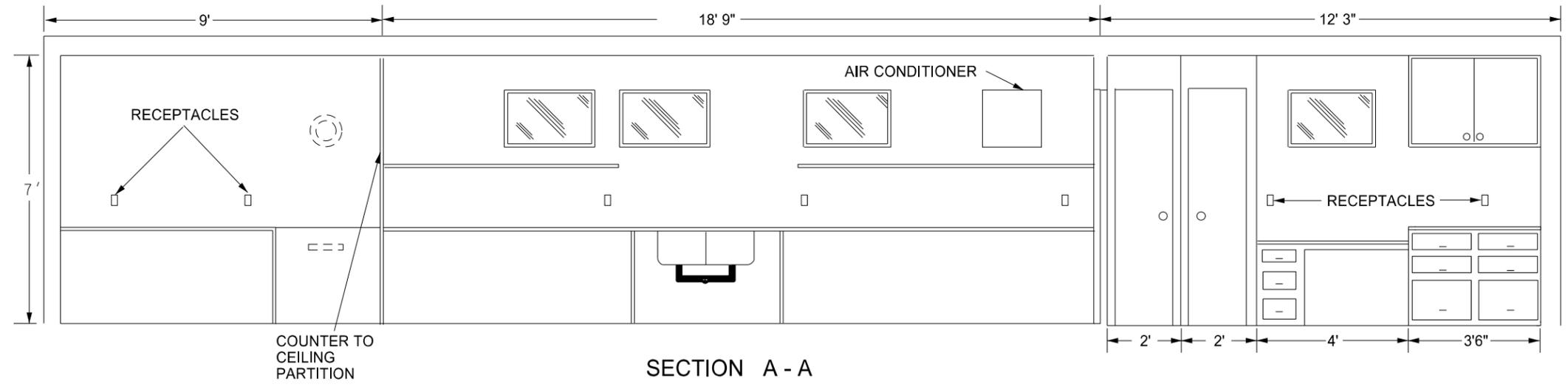
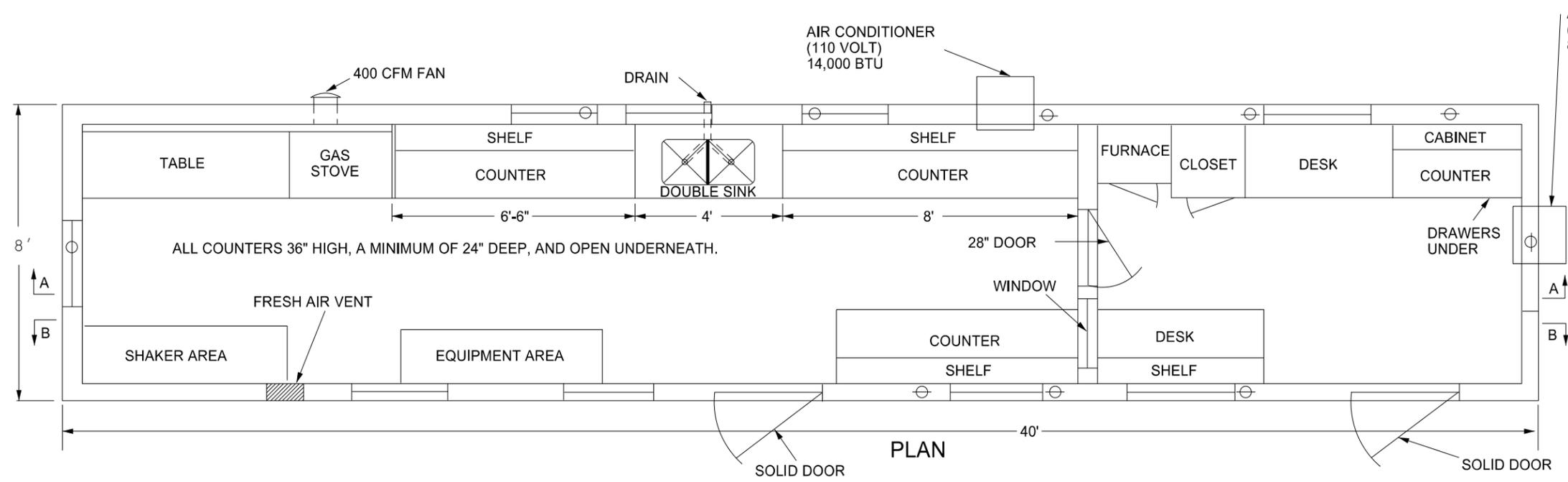
Property	Result	ASTM Test Method
Thickness (min)	.090"	—
Tensile strength (min psi) @ yield	5,500	D638
Impact strength @ -20°F (ft-lbs/in of notch)	3.2	D256 Method A
Impact strength @ 73°F (ft-lbs/in of notch)	14.0	D256 Method A
Flexural strength, PSI 1/4" @ 73°F	8,000	D790
Flexural modulus, PSI 1/4"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

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

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

BITUMINOUS LABORATORY

D-706-1

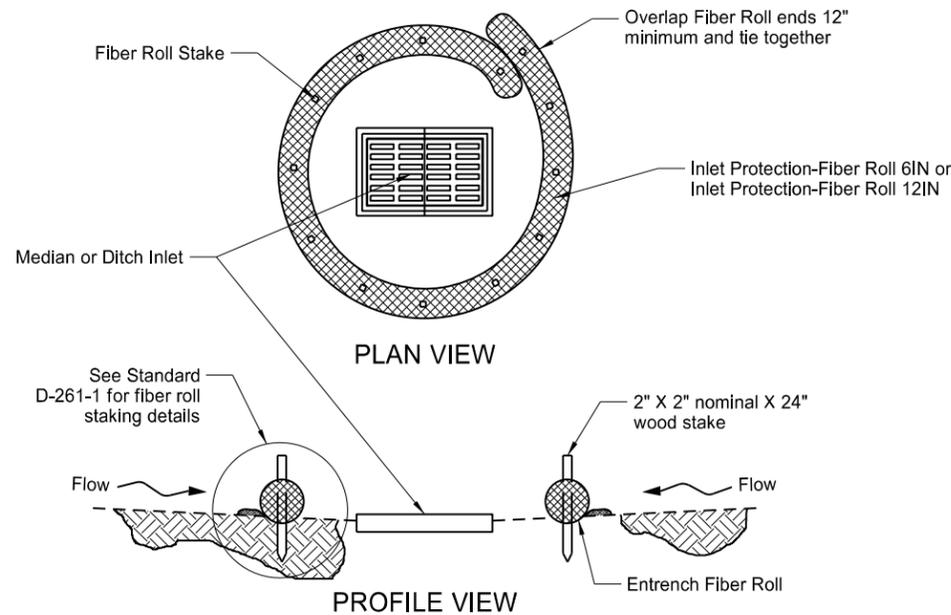


- Provide a laboratory with the following:
1. A 1'x1' shelf at 36" above the regular countertop.
 2. Double compartment stainless steel sink, with each compartment a minimum of 16"x14"x10" deep. Provide water service lines made of copper or plastic and a diameter of 1/2 inch.
 3. An exhaust fan capable of removing inside air at a rate of 400 CFM.
 4. Fresh air vent hinged to open or close manually.
 5. 24" x 48" table capable of holding a 200 lb masonry saw with a minimum clearance of 36" above the table.
 6. A water supply tank with a capacity of 500 gallons and a 20 gallon capacity pressure tank on the pump.
 7. Heavy duty type locks, latches, and hinges for doors made to withstand the intense use in service.
 8. A wall between the office and the work area properly insulated to prevent the transmission of heat and noise.
 9. The steel cable tie downs and ground anchors at each corner of the lab.
 10. Electrical service entrance wired for 100 amps and separate circuits for air conditioners. Space convenience outlets in counter areas a minimum of four feet apart.

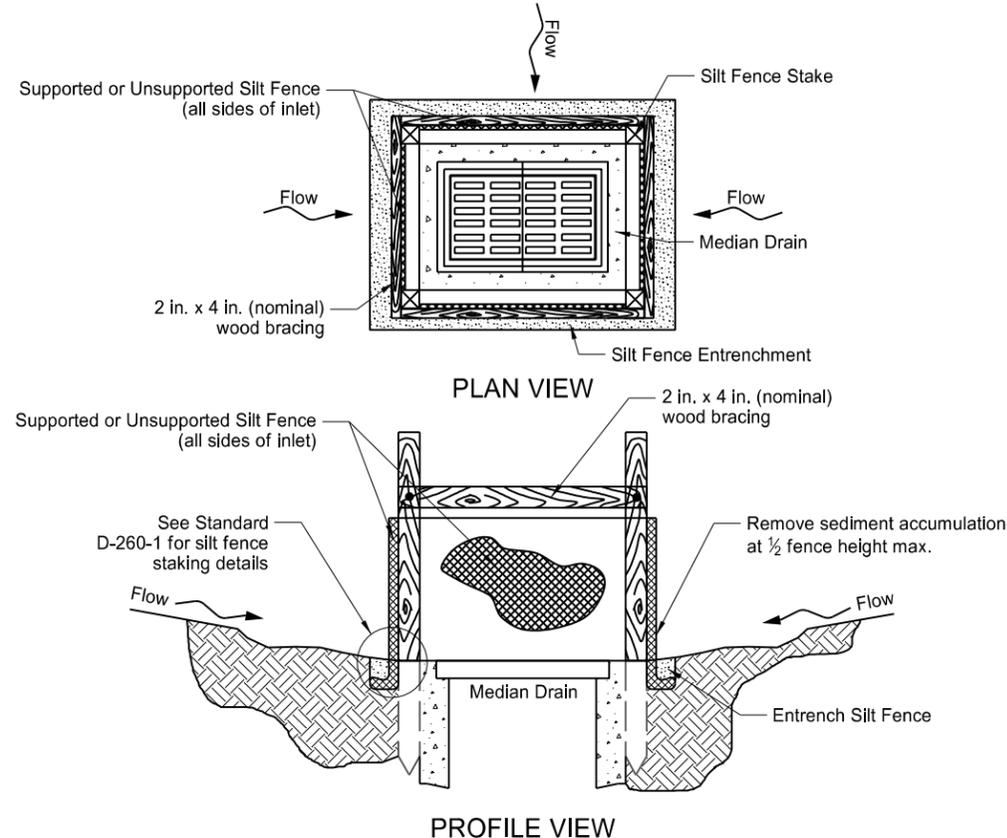
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
07-30-14	Changed standard's title and revised notes.
01-11-16	Revised notes.
08-27-19	New Design Engineer PE Stamp

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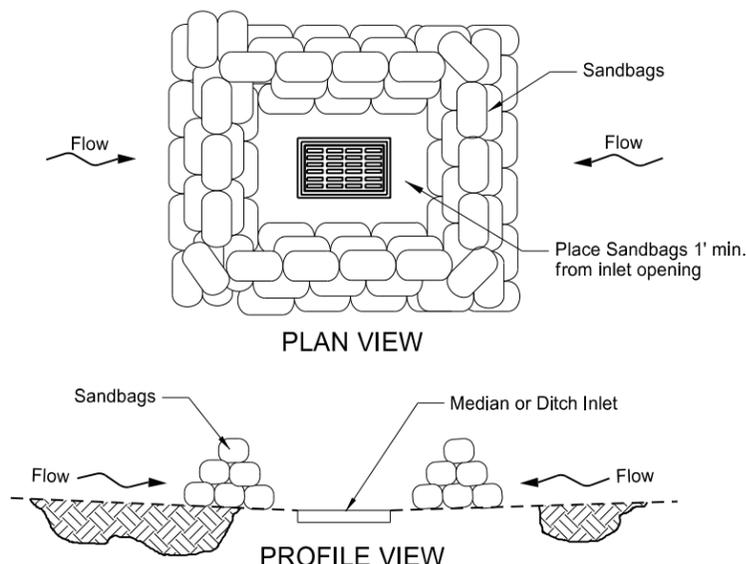
EROSION AND SILTATION CONTROLS
MEDIAN OR DITCH INLET PROTECTION



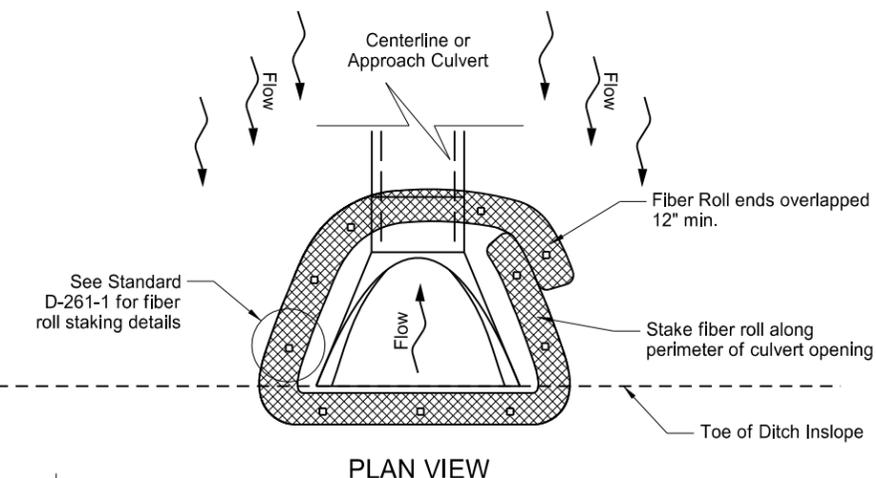
FIBER ROLL PROTECTION (MEDIAN OR DITCH INLET)



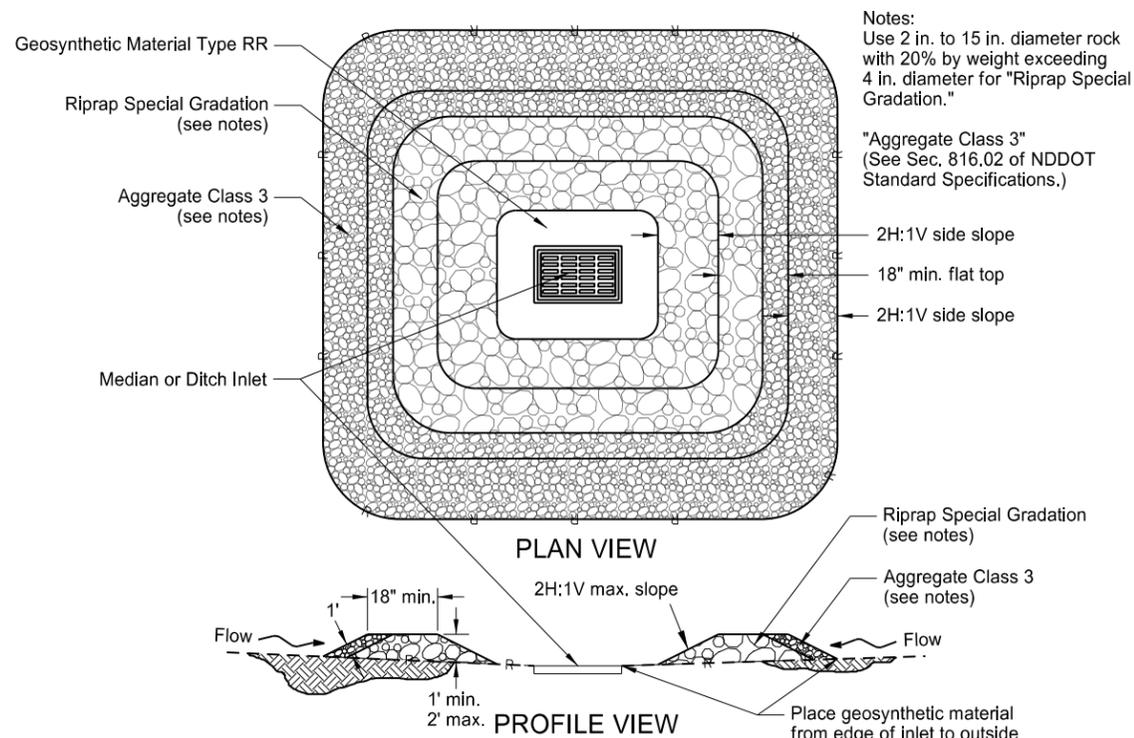
SILT FENCE PROTECTION (MEDIAN OR DITCH INLET)



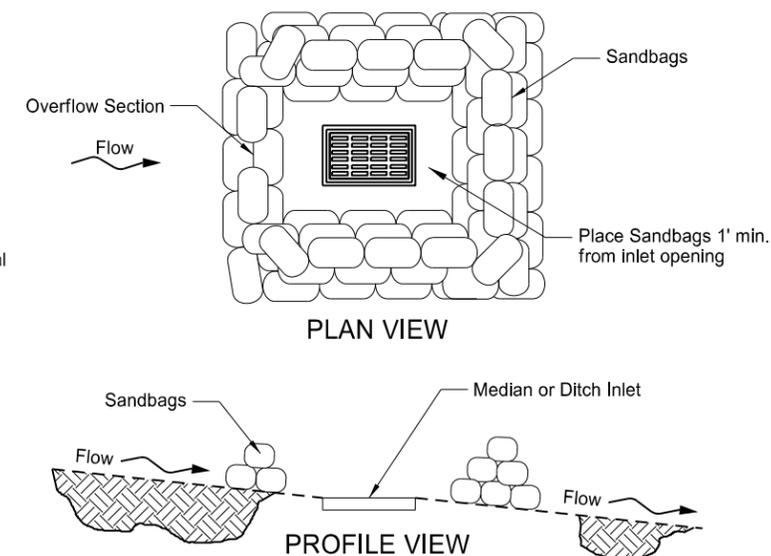
SANDBAG PROTECTION (LOW POINT)



FIBER ROLL PROTECTION (INLET OF CULVERT)



GRAVEL INLET PROTECTION (MEDIAN OR DITCH INLET)



SANDBAG PROTECTION (ON SLOPE)

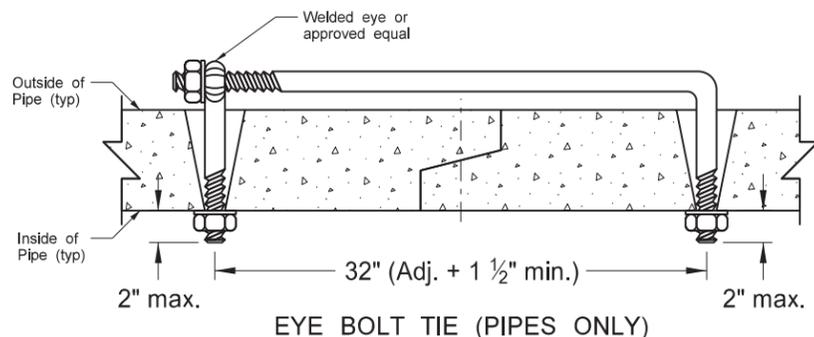
Notes:
 Use 2 in. to 15 in. diameter rock with 20% by weight exceeding 4 in. diameter for "Riprap Special Gradation."
 "Aggregate Class 3"
 (See Sec. 816.02 of NDDOT Standard Specifications.)

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

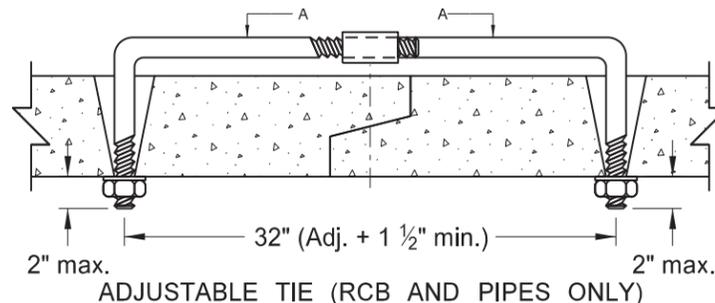
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CONCRETE PIPE, CATTLE PASS, OR PRECAST CONCRETE BOX CULVERT TIES

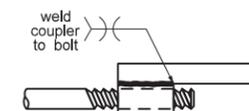
REQUIRED SIZE OF TIE BOLTS		
Pipe Size	Thread ϕ	XXS Pipe Sleeve Inner ϕ
18" - 24"	$\frac{5}{8}$ " See note 3	$\frac{3}{4}$ "
30" - 66"	$\frac{3}{4}$ "	1"
72" - 120"	1"	1 $\frac{1}{4}$ "
RCB/Cattle Pass		



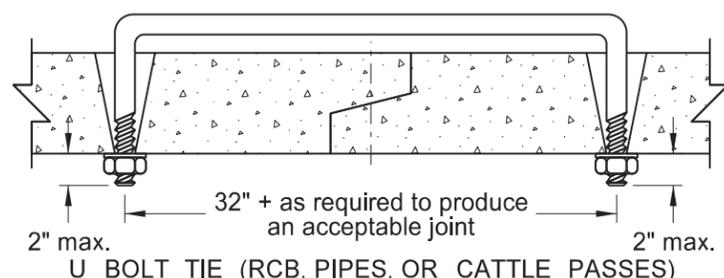
EYE BOLT TIE (PIPES ONLY)



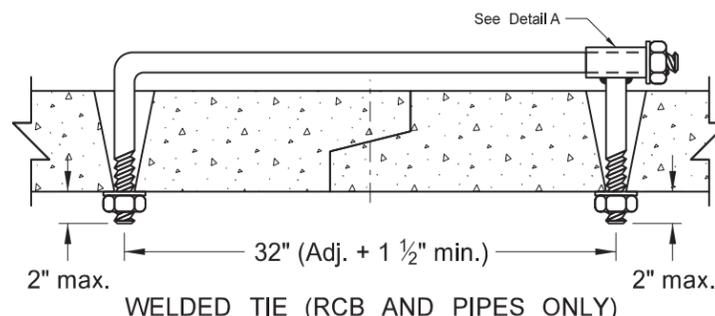
ADJUSTABLE TIE (RCB AND PIPES ONLY)



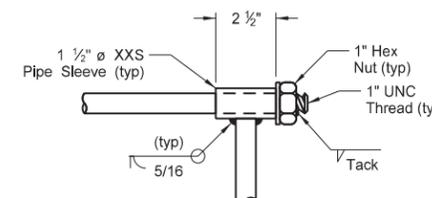
SECTION A-A



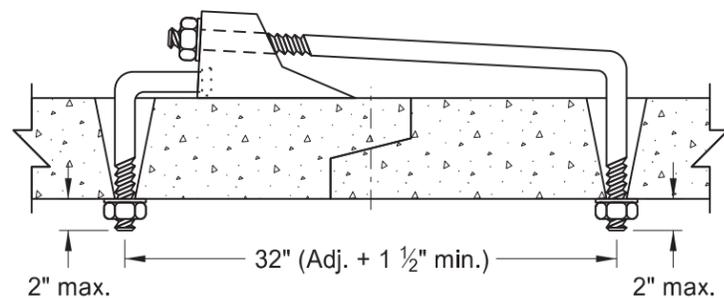
U BOLT TIE (RCB, PIPES, OR CATTLE PASSES)



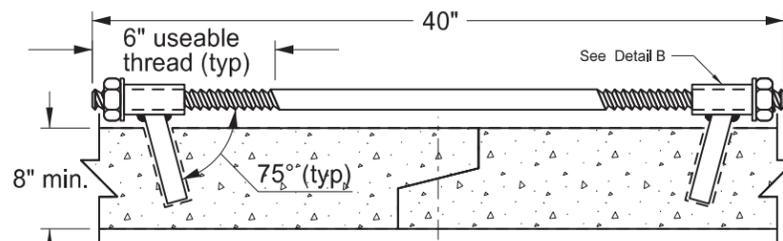
WELDED TIE (RCB AND PIPES ONLY)



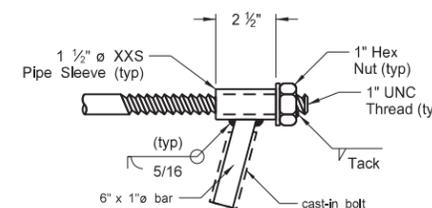
DETAIL A



CANOPY TIE (PIPES ONLY)

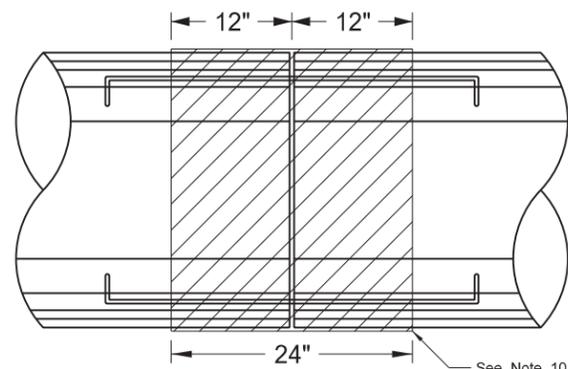


HIDDEN TIE (RCB ONLY)

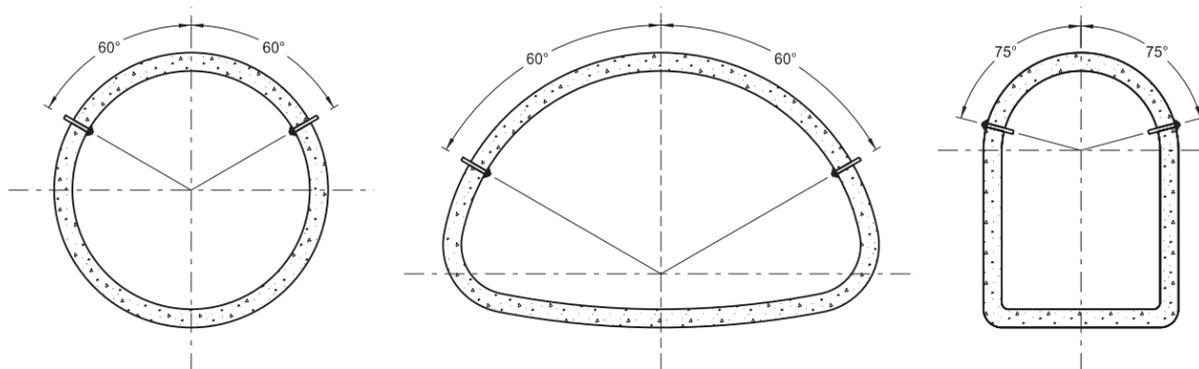


DETAIL B

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



PLAN VIEW (PIPES ONLY)



END VIEW

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

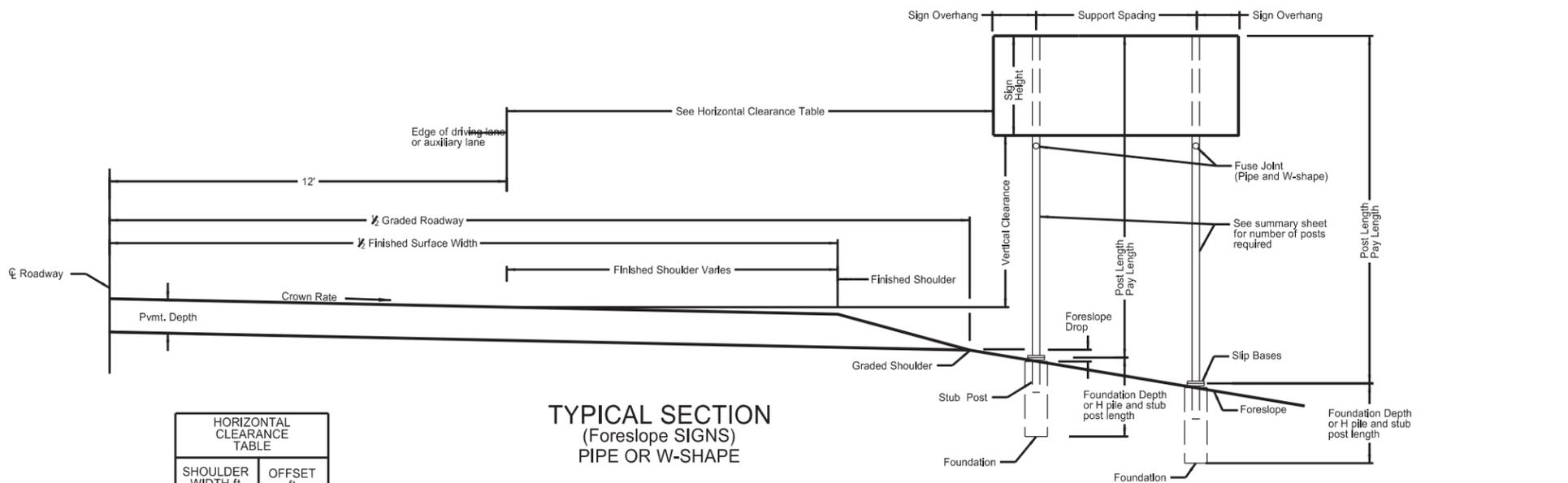


PIPE OR W-SHAPE ASSEMBLY DETAILS

NOTES:
 MINIMUM VERTICAL CLEARANCE:
 Install signs with a minimum 5 foot vertical clearance from bottom of sign to top edge of the driving lane or auxiliary lane in rural locations. Provide a minimum 7 foot vertical clearance where parking or pedestrian movements occur. Install signs with a minimum 7 foot vertical clearance on freeways, expressways, and multi-lane conventional roadways.

A vertical clearance of 5 feet is acceptable where signs are placed a minimum of 30 feet from the edge of the traveled way.

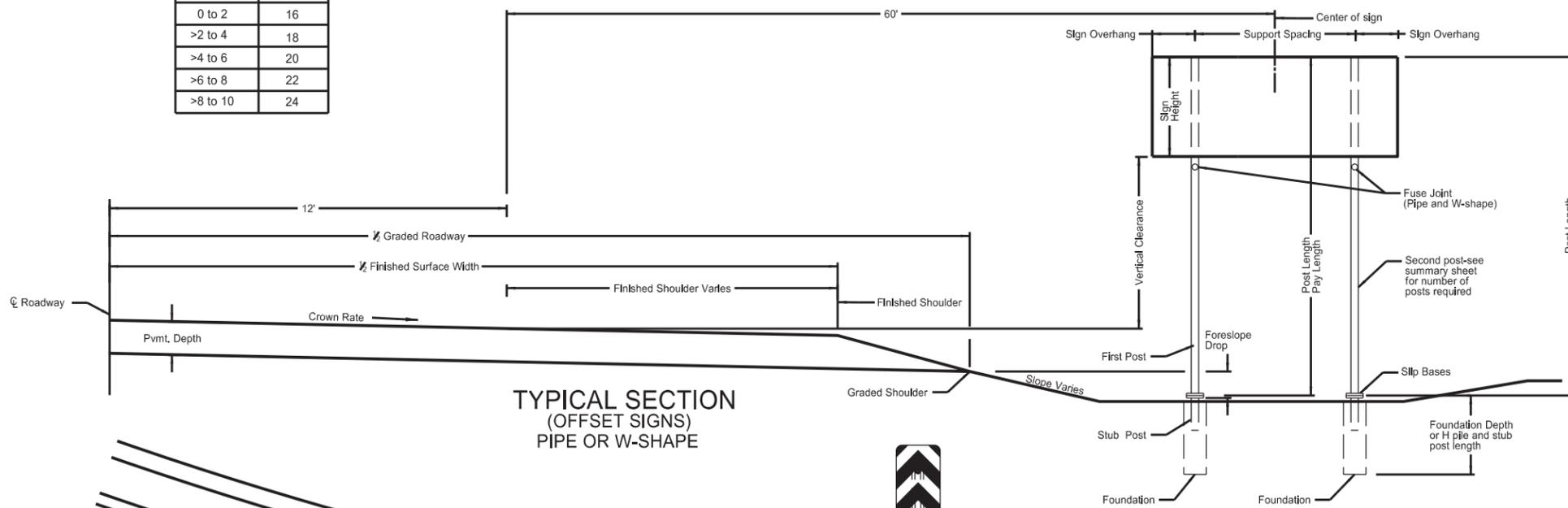
Place signs a maximum of 6" above the vertical clearance specified above.



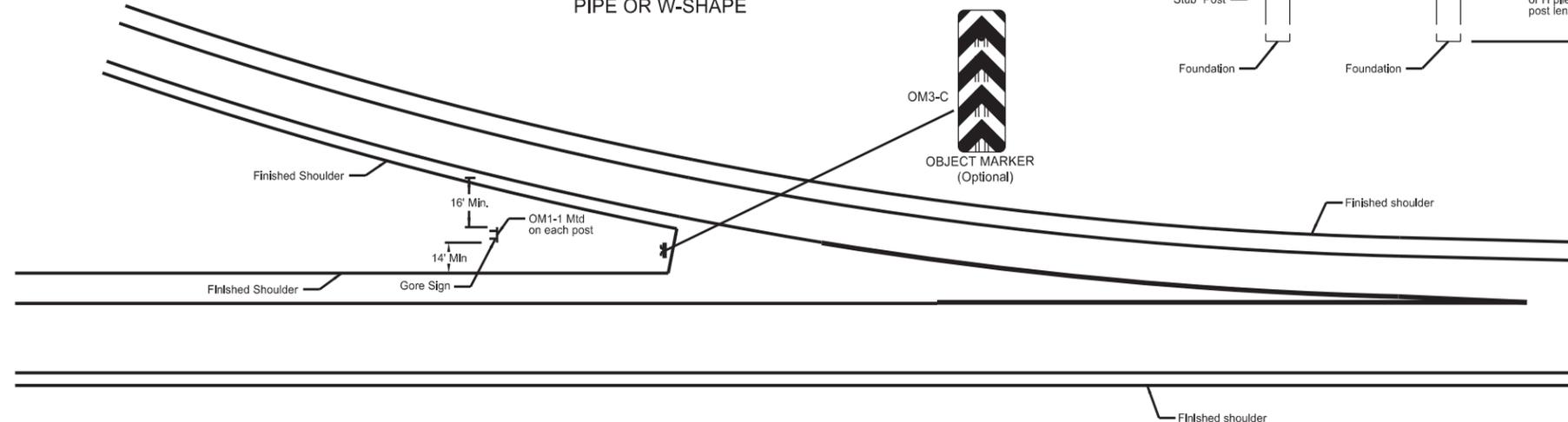
HORIZONTAL CLEARANCE TABLE

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

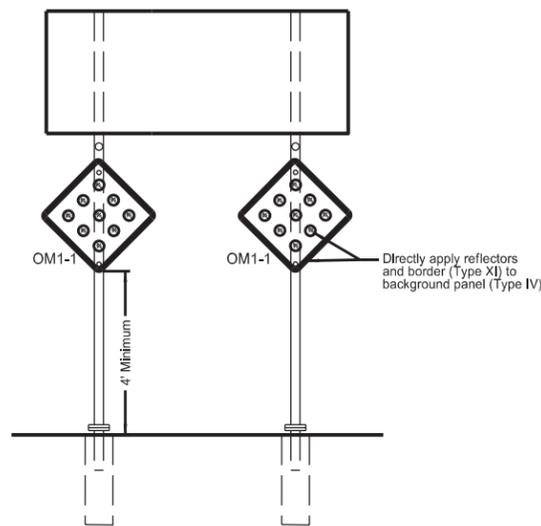
TYPICAL SECTION (FORESLOPE SIGNS) PIPE OR W-SHAPE



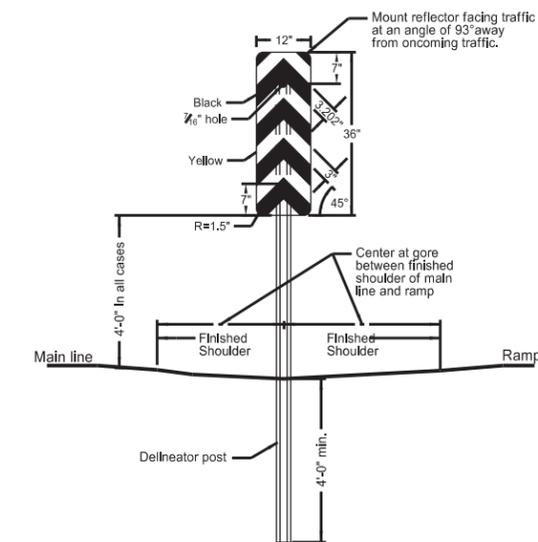
TYPICAL SECTION (OFFSET SIGNS) PIPE OR W-SHAPE



EXIT RAMP GORE SIGN PLACEMENT



GORE SIGN OBJECT MARKER INSTALLATION



OBJECT MARKER INSTALLATION

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
 12-1-10

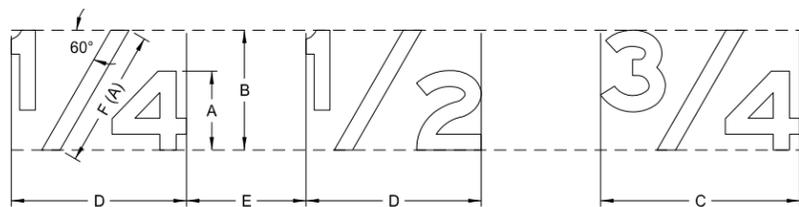
REVISIONS	
DATE	CHANGE
7-18-14	Modify notes and update reflective sheeting for object marker. Add correct section number for object marker post.
8-30-18	Updated notes to active voice.
11-26-21	Revised Object Marker signs.



11/26/21

LETTER AND ARROW DETAILS

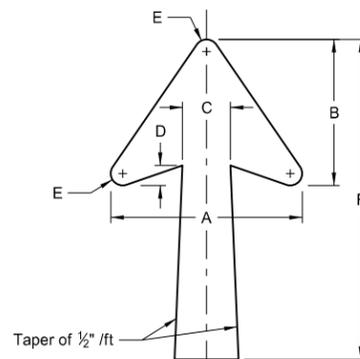
NOTE: Measure rotation angle of arrows counterclockwise from positions shown in details.



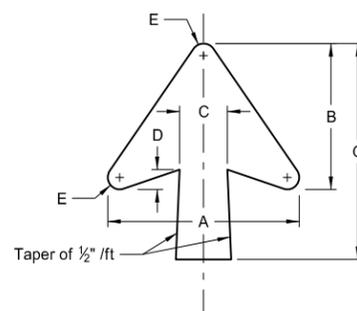
DETERMINE SIZE OF THE FRACTION AS FOLLOWS:

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

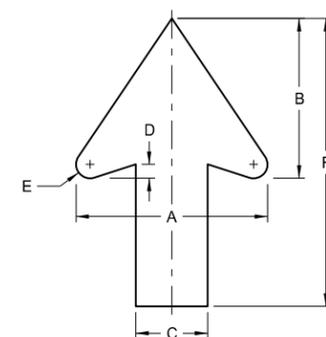
(A) Center diagonal stroke of fraction optically.



TYPE A



TYPE B

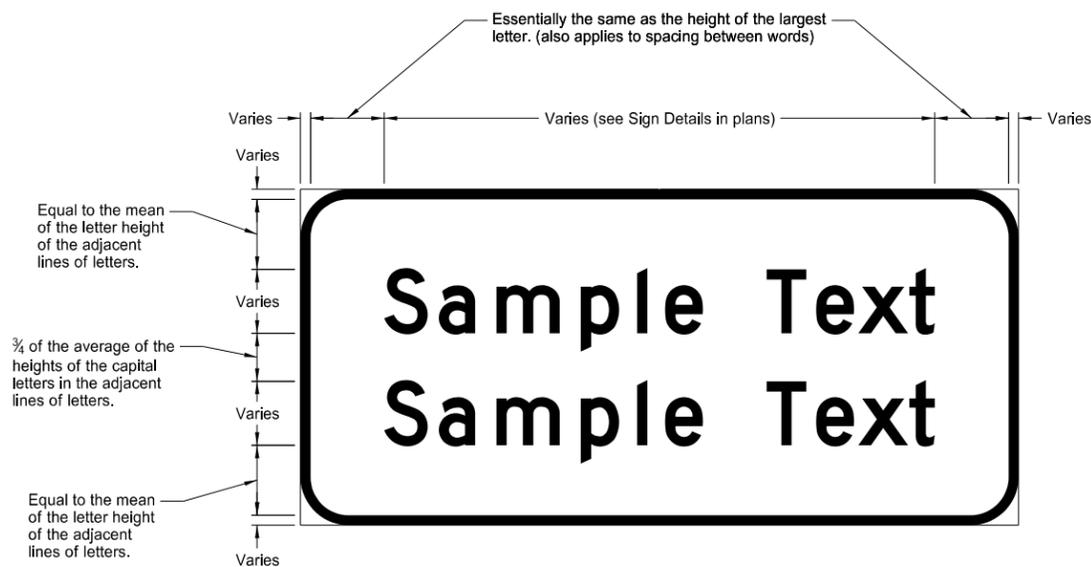


TYPE D

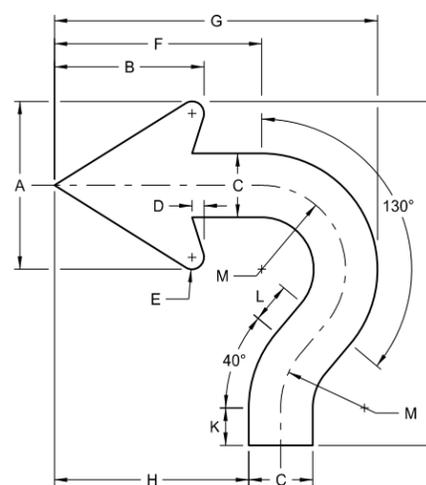
DESIGNATION	LETTER SIZE (Upper Case)	A	B	C	D	E	F	G
ND_6IN	6"	12"	9.125"	3"	1"	0.625"	20"	13.5"
ND_8IN	8"	15.125"	11.563"	3.75"	1.313"	0.813"	25"	17"
ND_10IN	10"	18.25"	14"	4.5"	1.5"	0.75"	30"	20"
ND_12IN	12"							
ND_13IN	13.3"	22.25"	17"	5.375"	1.75"	1"	35"	25"
ND_16IN	16"							
ND_20IN	20"							

NOTE: Arrow size on gore signs is based on the letter size of "EXIT".

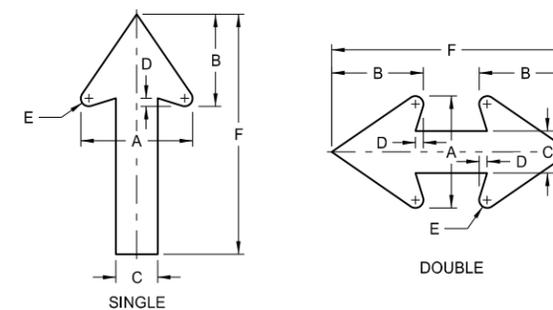
DESIGNATION	LETTER SIZE (Upper Case)	A	B	C	D	E	F
ND_2IN	2"	2"	1.625"	0.75"	0.125"	0.125"	3"
ND_4IN	4"	4"	3.313"	1.5"	0.25"	0.25"	6"
ND_6IN	6"	6"	4.875"	2.25"	0.375"	0.375"	9"
ND_8IN	8"	8"	6.625"	3"	0.5"	0.5"	12"
ND_10IN	10"	10"	8.375"	3.75"	0.75"	0.75"	15"
ND_12IN	12"	12"	10"	4.5"	0.875"	0.875"	18"



TYPICAL SPACING

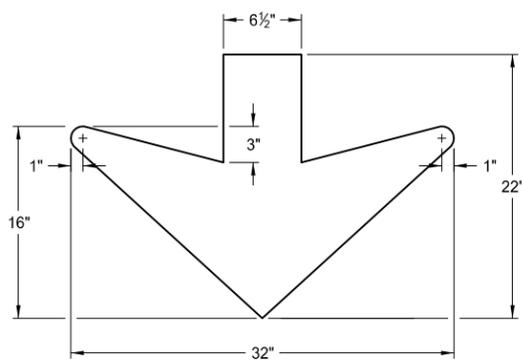


ROUNDBOUT



SPECIAL

DESIGNATION	A	B	C	D	E	F	USES
ND_0.75IN	2"	1.625"	0.75"	0.125"	0.125"	7.75"	Parking Signs (Regulatory)
ND_2.625IN	7"	5.75"	2.625"	0.5"	0.5"	15"	Frontage Road Signs



DOWN ARROW

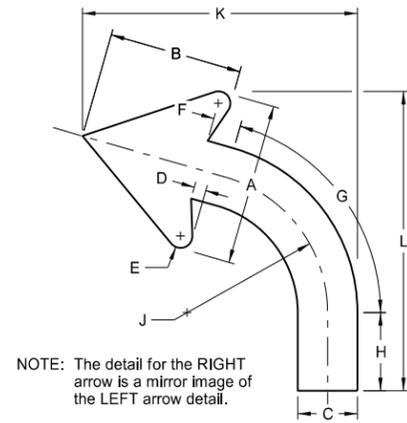
DESIGNATION	LETTER SIZE (Upper Case)	A	B	C	D	E	F	G	H	J	K	L	M
ND_6IN	6"	5.25"	4.688"	2"	0.375"	0.375"	6.5"	10.125"	6.094"	10.75"	1.168"	1.25"	2.625"
ND_8IN	8"	7"	5.75"	2.625"	0.5"	0.5"	8.688"	13.5"	8.166"	14.333"	1.557"	1.667"	3.5"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-3-11	
REVISIONS	
DATE	CHANGE
7-8-14	Revised gore sign and added 4" D & D arrow
5-4-16	Revised Distance & Destination and Typical Spacing details
4-23-18	Revised arrow details
8-30-18	Updated notes to active voice.
8-29-19	New Design Engr PE Stamp.

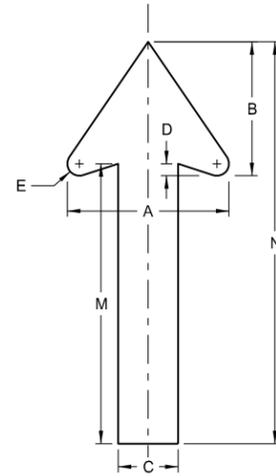
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ARROW DETAILS FOR LANE CONTROL AND ARROW-PER-LANE SIGNS

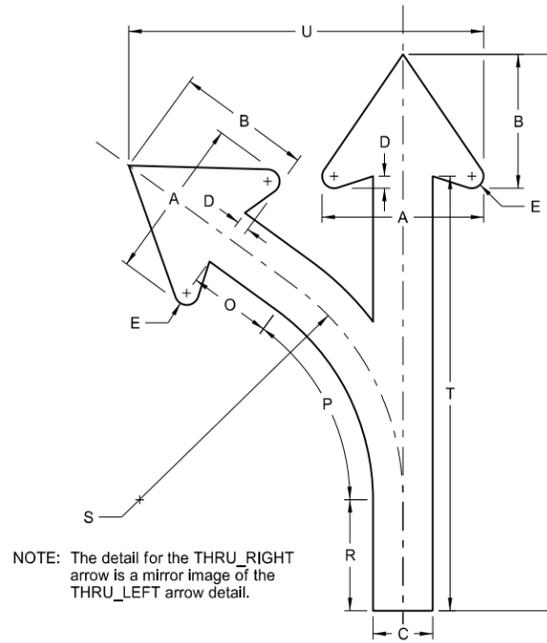
D-754-10



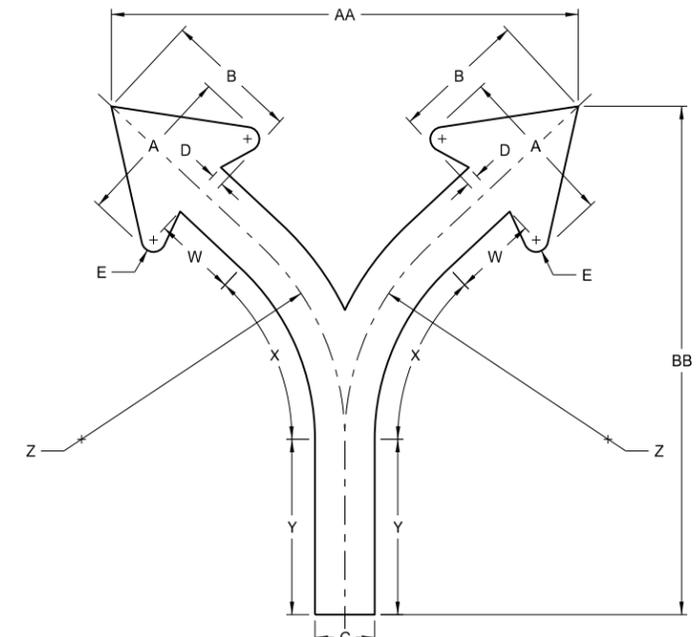
LEFT



THRU



THRU_LEFT



SPLIT

ADVANCE INTERSECTION CONTROL

DESIGNATION	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	S	T	U	V	W	X	Y	Z	AA	BB
ND_2.5IN	6.75"	5.563"	2.5"	0.5"	0.5"	1.140"	74°	3.279"	5.875"	11.468"	12.478"	13.687"	18.75"	3.480"	54°	4.642"	11"	18.125"	14.813"	23.188"	3.485"	47°	9.313"	11"	19.5"	23.188"
ND_3IN	8.126"	6.688"	3"	0.563"	0.563"	1.444"	74°	3.752"	7.731"	14.376"	15.487"	16.927"	23.052"	3.448"	54°	6.811"	13.2"	22.367"	17.232"	28.492"	3.508"	46°	12.305"	13.2"	21.92"	28.492"
ND_3.75IN	10.126"	8.375"	3.75"	0.75"	0.75"	1.679"	74°	4.889"	8.813"	17.202"	18.717"	20.5"	28.125"	5.195"	54°	6.960"	16.5"	27.157"	22.220"	34.782"	5.198"	47°	13.969"	16.5"	29.25"	34.782"

LANE-USE CONTROL

DESIGNATION	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	S	T	U	V	W	X	Y	Z	AA	BB
ND_4.5IN	12.126"	10"	4.5"	0.875"	0.875"	1.519"	72°	6.326"	11.4"	20.25"	23.418"	14.293"	23.418"	-	-	-	-	-	-	-	-	-	-	-	-	-

ARROW-PER-LANE

DESIGNATION	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	S	T	U	V	W	X	Y	Z	AA	BB
ND_7.75IN	21"	17.25"	7.75"	1.5"	1.5"	6.701"	66°	14.303"	20"	36.25"	45"	50.25"	66"	11.831"	68°	4.125"	31.875"	50.25"	56"	66"	0.127"	60°	8.190"	43.25"	70.75"	55"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
4-23-18	
REVISIONS	
DATE	CHANGE
8-29-19	New Design Engineer PE Stamp.

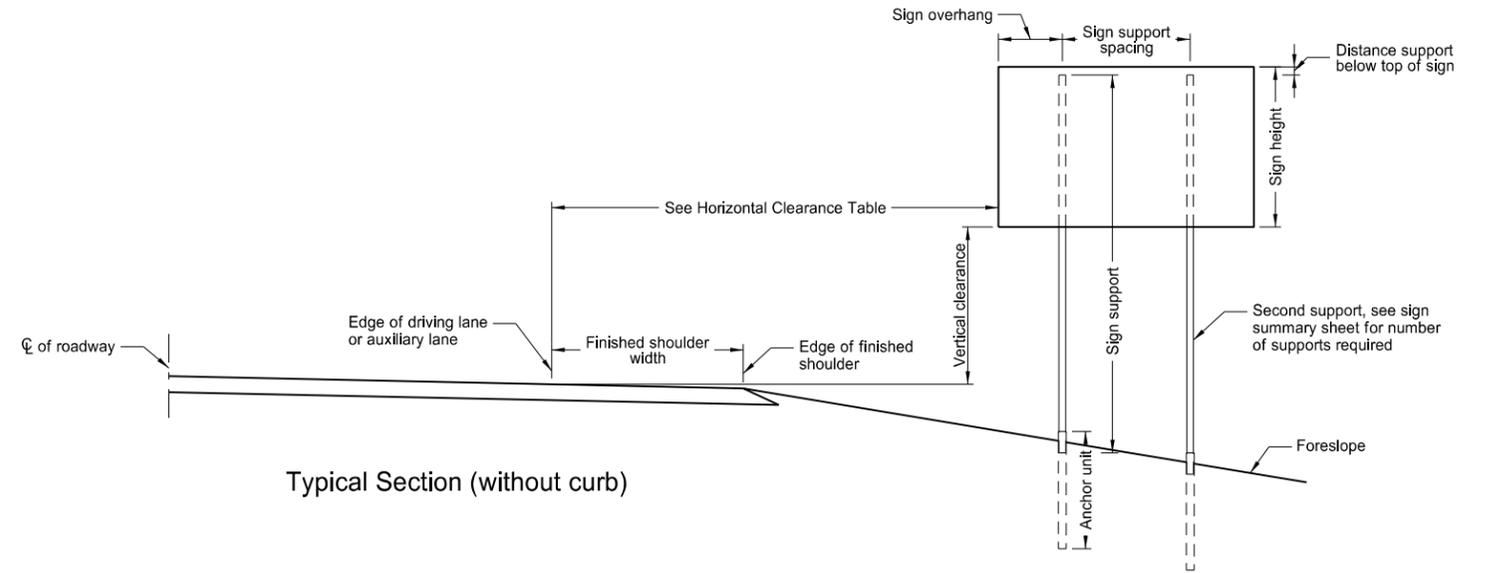
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 8/29/19 and the original document is stored at the North Dakota Department of Transportation

PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

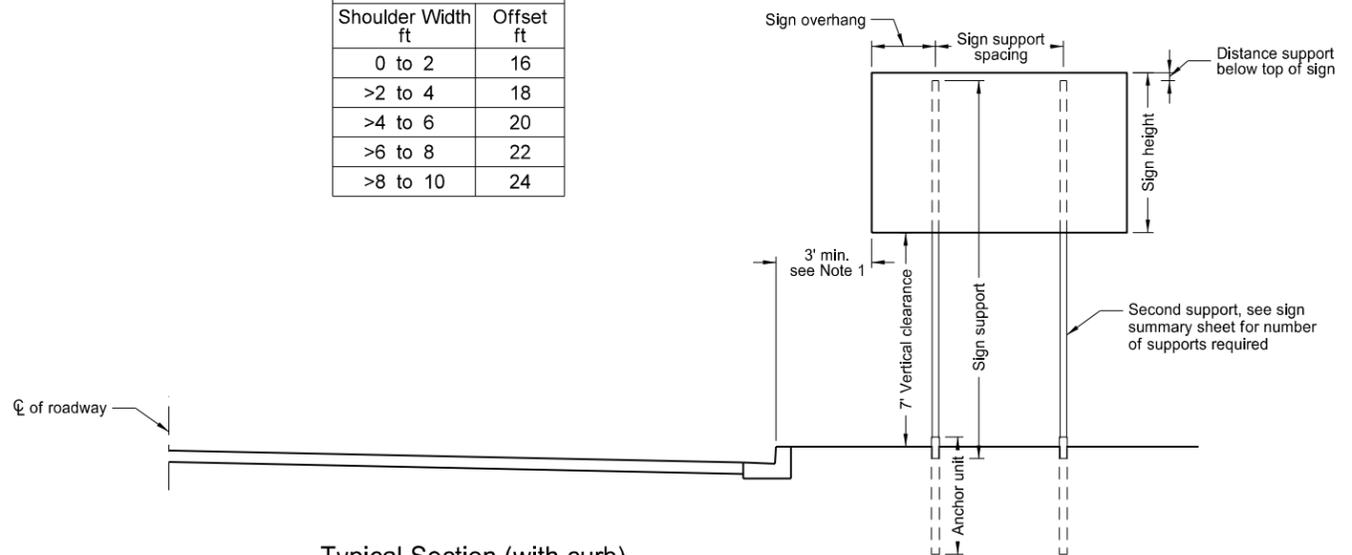
Notes:

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'.

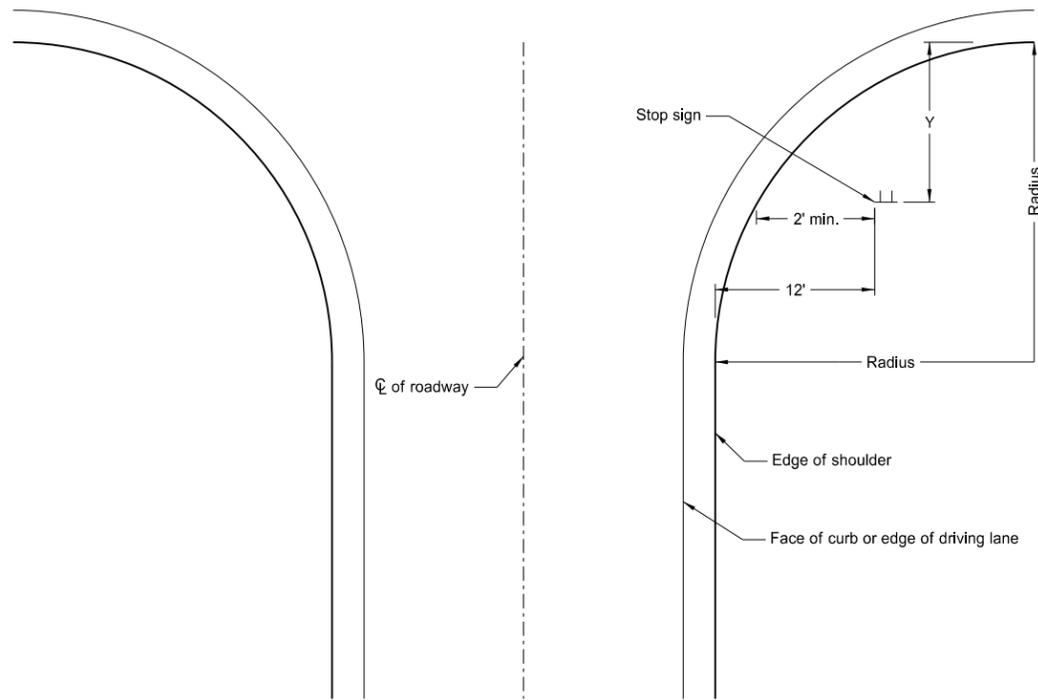


Typical Section (without curb)

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



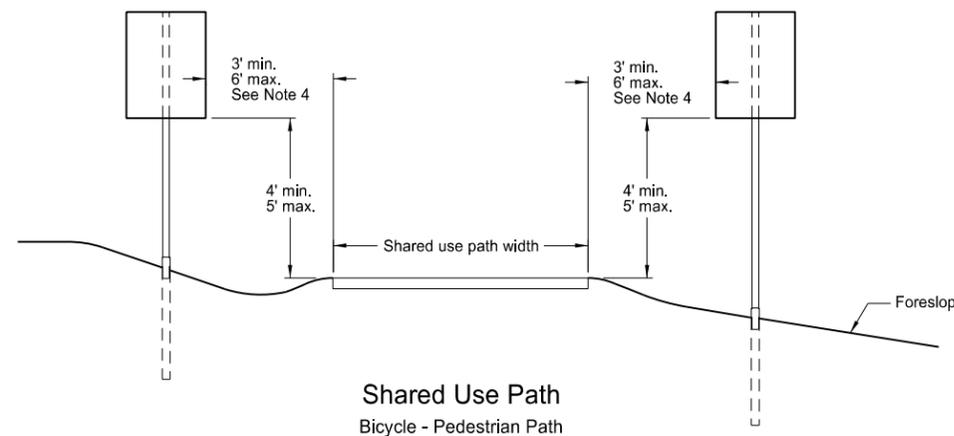
Typical Section (with curb)
Residential or Business District



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



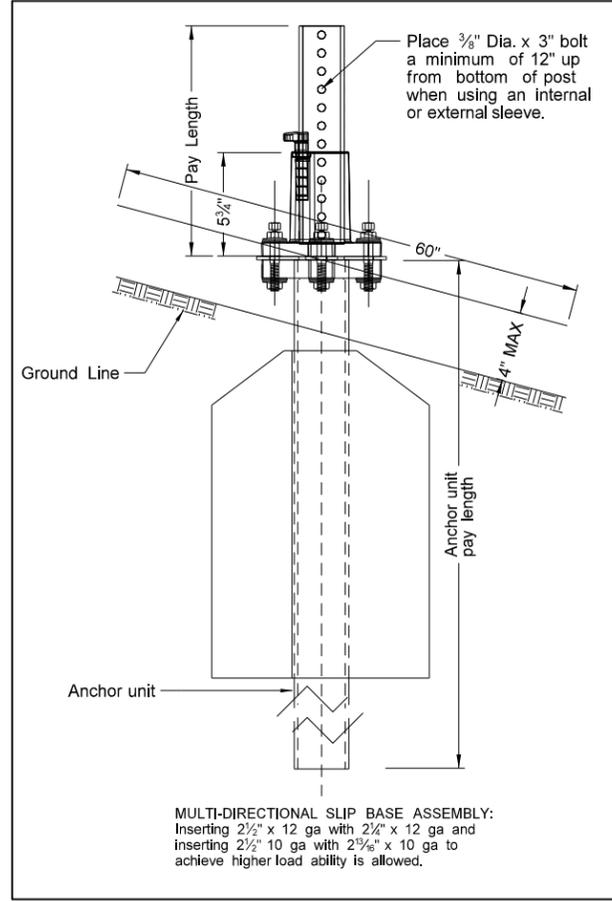
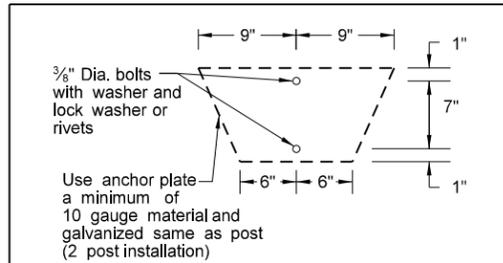
Shared Use Path
Bicycle - Pedestrian Path

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 volcs.
8-29-19	New Design Engineer PE Stamp.

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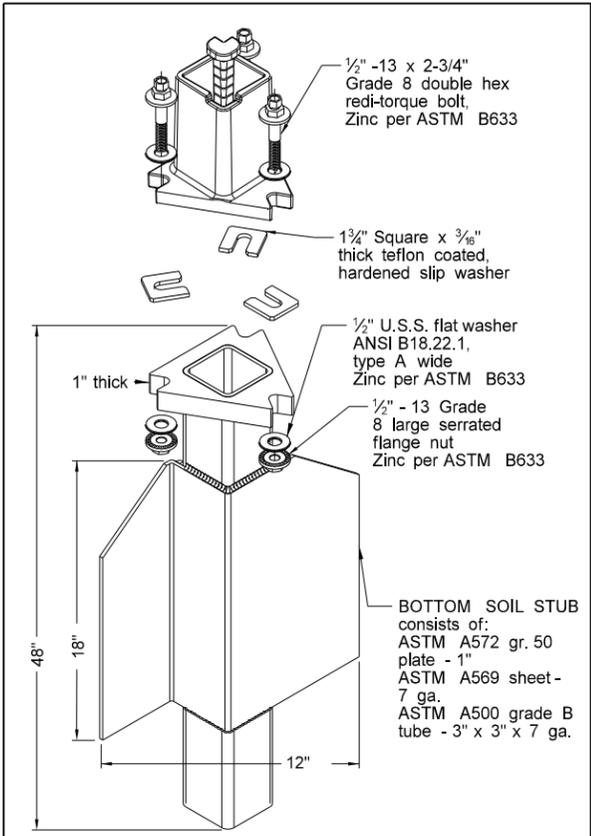
Telescoping Perforated Tube							
Number of Posts	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2 1/2(D)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

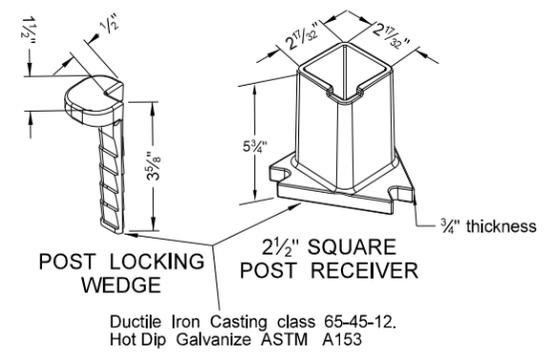


MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:
 Inserting 2 1/2" x 12 ga with 2 1/4" x 12 ga and inserting 2 1/2" 10 ga with 2 3/8" x 10 ga to achieve higher load ability is allowed.

Mounting Details Perforated Tube



SLIP BASE FOR 2 1/2" POST

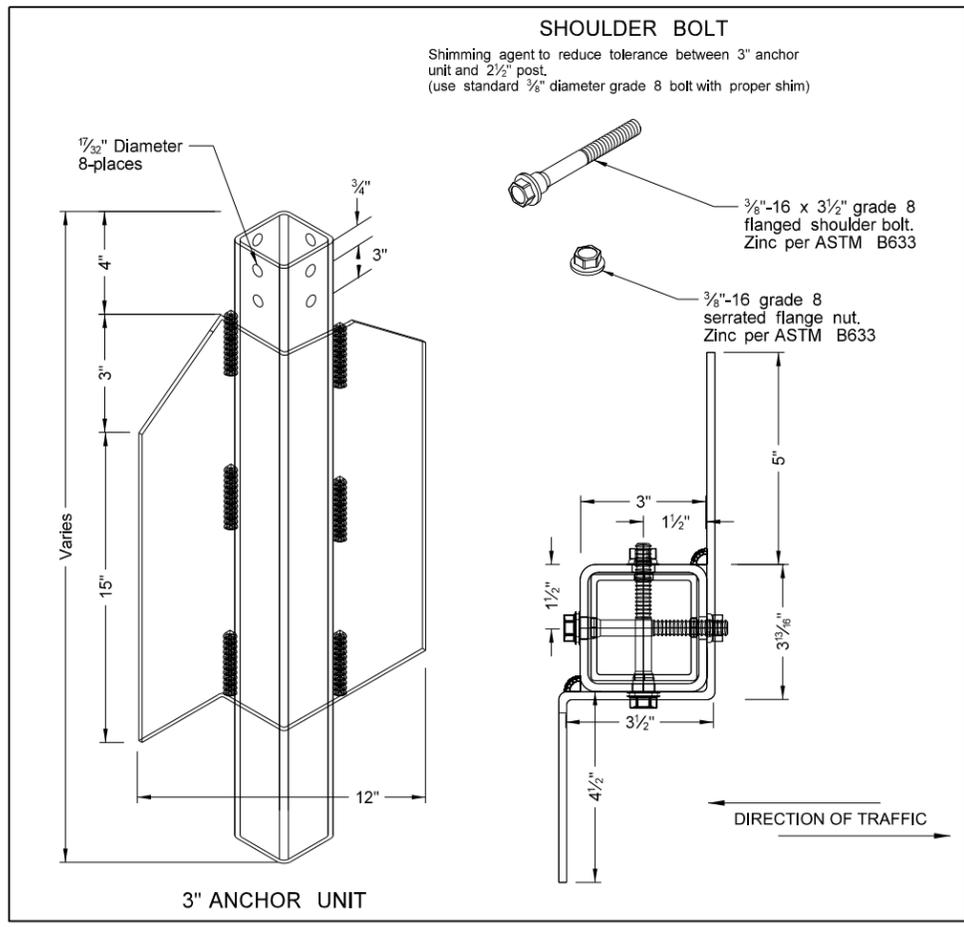


SLIP BASE DETAIL

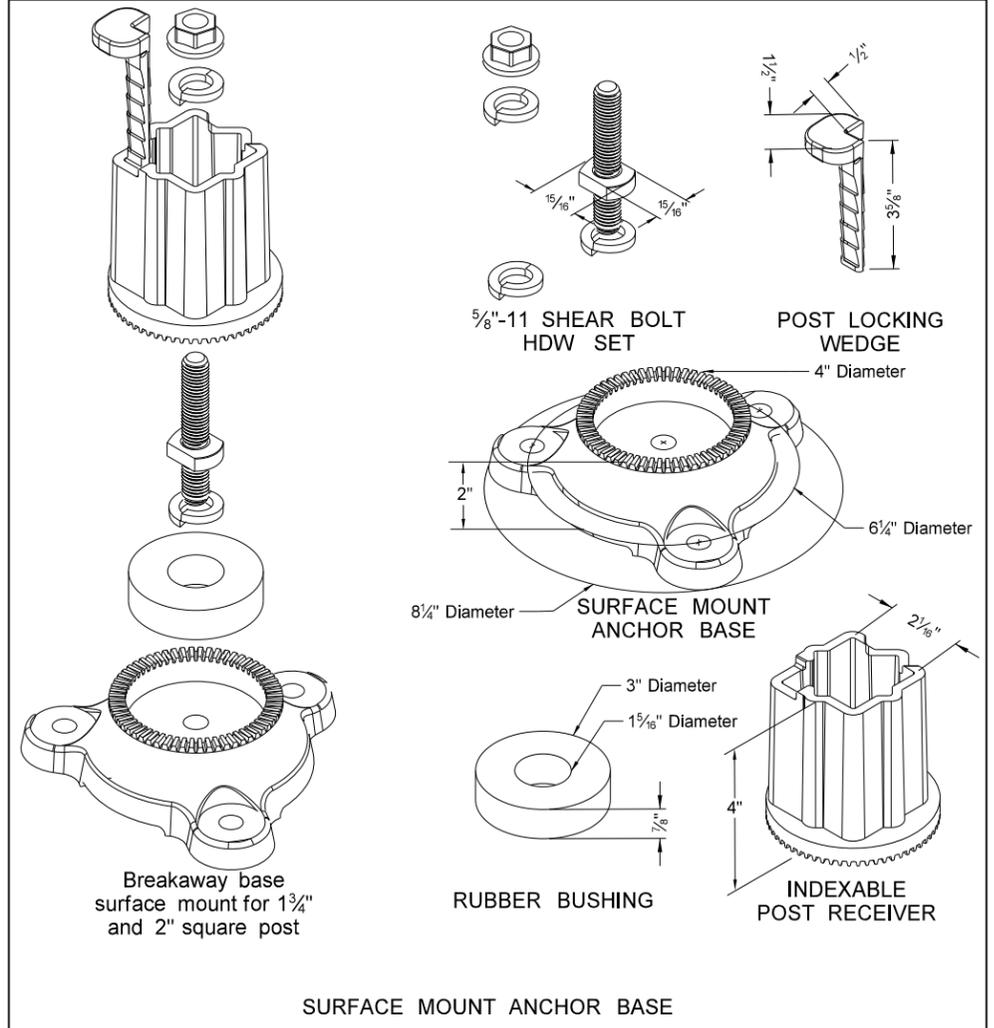
Properties of Telescoping Perforated Tubes							
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. Area In. ²	Section Modulus In. ³	
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172	
2 x 2	0.105	12	2.416	0.372	0.590	0.372	
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499	
2 3/8 x 2 3/8	0.135	10	3.432	0.605	0.841	0.590	
2 1/2 x 2 1/2	0.105	12	3.141	0.804	0.803	0.643	
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.783	

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

- NOTE:
- 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.
 - Provide 7 gauge HRPO commercial quality ASTM A569 and 3" x 3" x 7" gauge ASTM A500 grade B anchor material with 43.9 KSI yield strength and 59.3 KSI tensile strength. Hot dip galvanize anchor per ASTM A123/153. Tolerances on anchor unit and slip base bottom assembly are +/- 0.005" unless otherwise noted.
 - Eliminate wings when anchor is used in concrete sidewalk.
 - Provide a minimum 8" distance between the first and fourth post on four post signs.
 - Install in accordance with manufacturers recommendation.
 - Use a minimum 1/2" diameter x 4" grade 8 concrete fastener for surface mount breakaway base.



3" ANCHOR UNIT

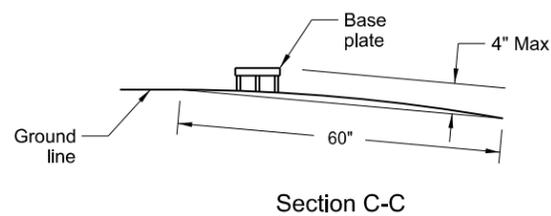
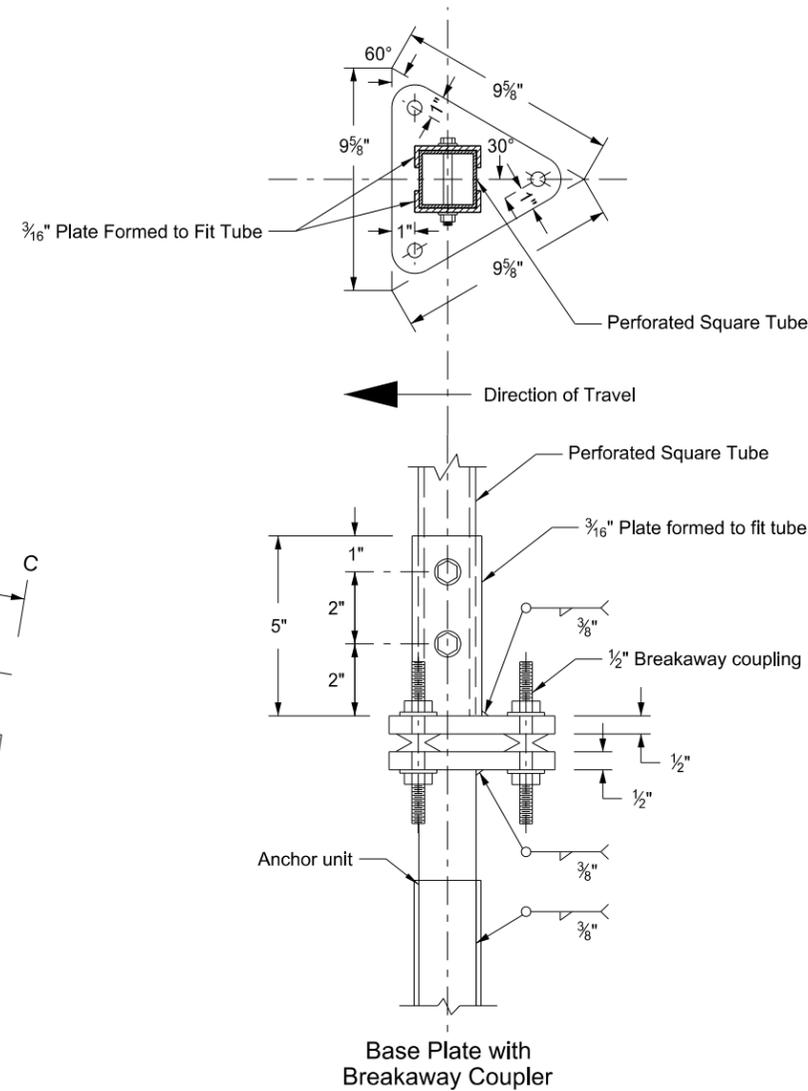
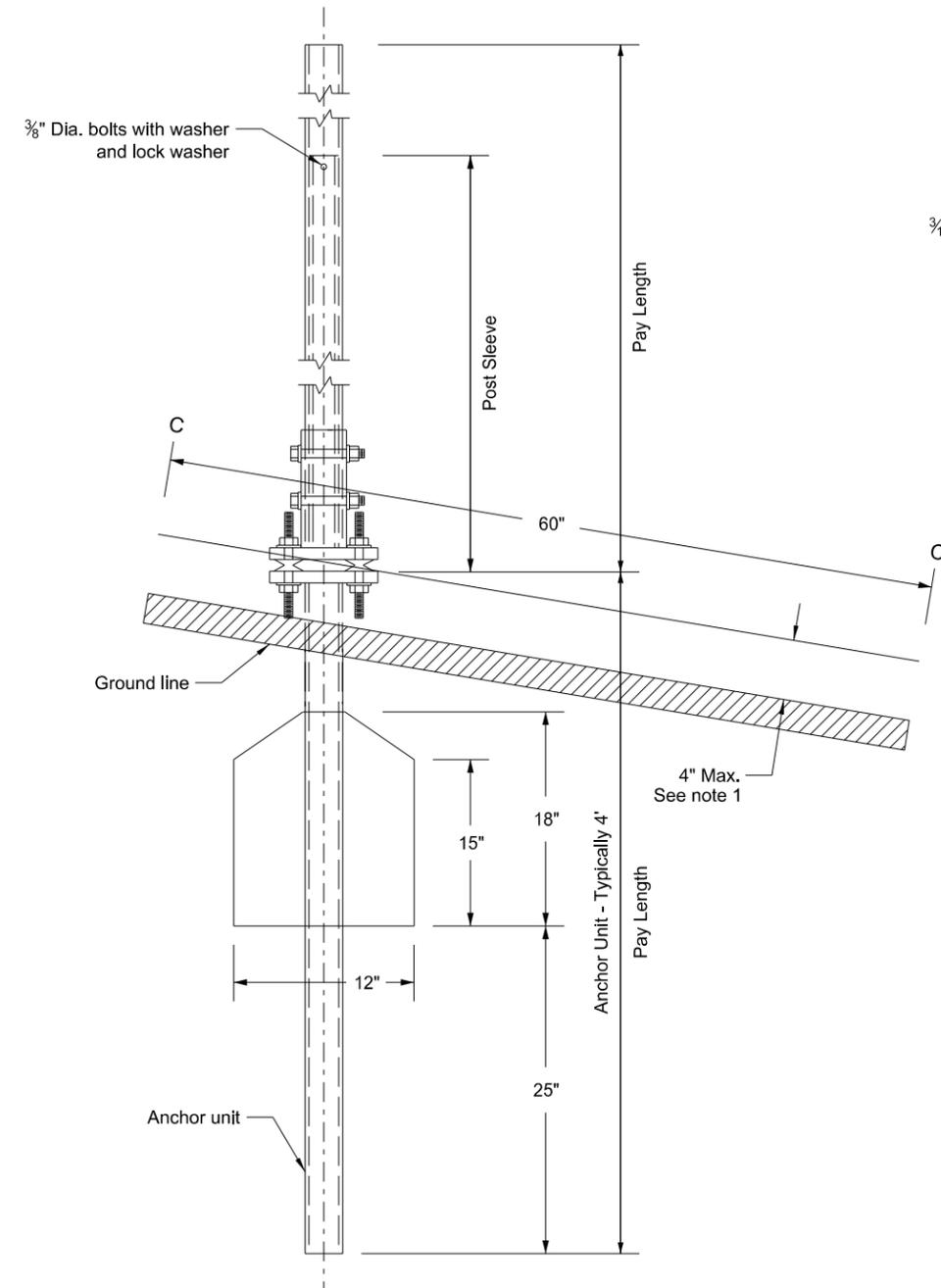


SURFACE MOUNT ANCHOR BASE

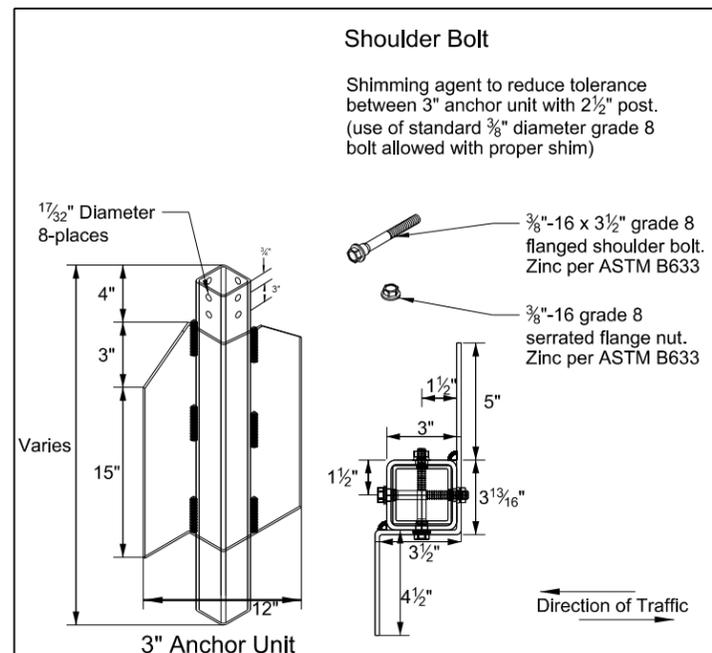
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice & corrected max height of base.
8-29-19	New Design Engineer PE Stamp.

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

Breakaway Coupler System for Perforated Tubes



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.



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 Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2	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	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	12	Yes		7
3 & 4	2 1/2	10	2 3/16	10	Yes		7

(B) - 2 1/2" 12 gauge posts do not need breakaway bases unless support is placed in boggy, wet, or loose soil areas.

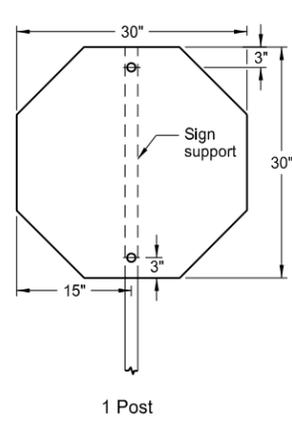
(C) - 3" anchor unit

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

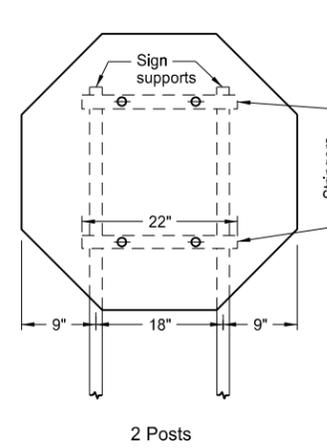
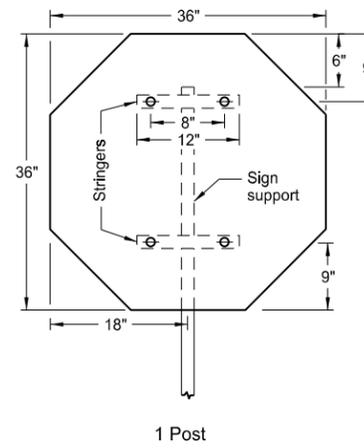
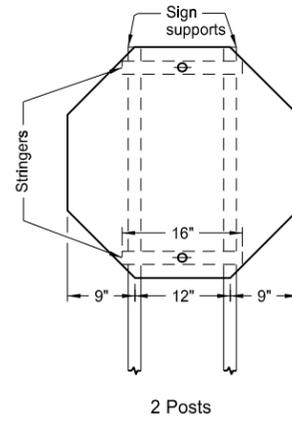
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS

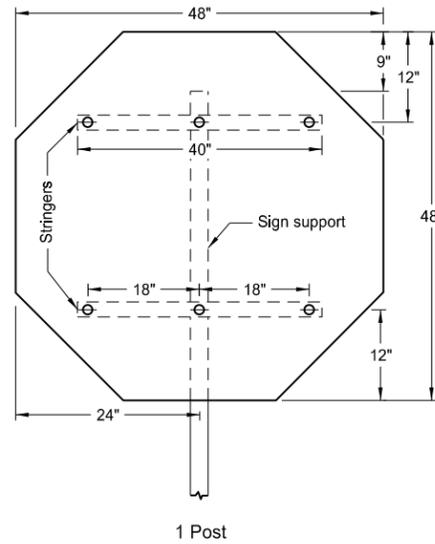
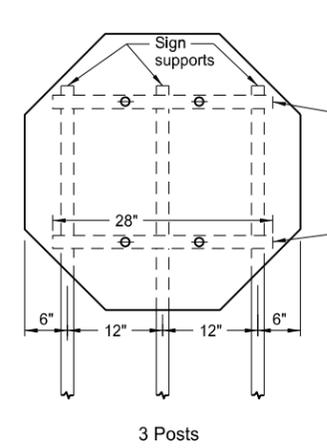
- Notes:
1. Use 0.100 inch minimum thickness sign backing material.
 2. Use 1½" x 1½" perforated square tube stringers.
 3. Punch holes round for ⅜" bolt.



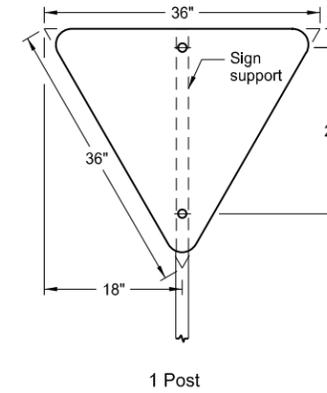
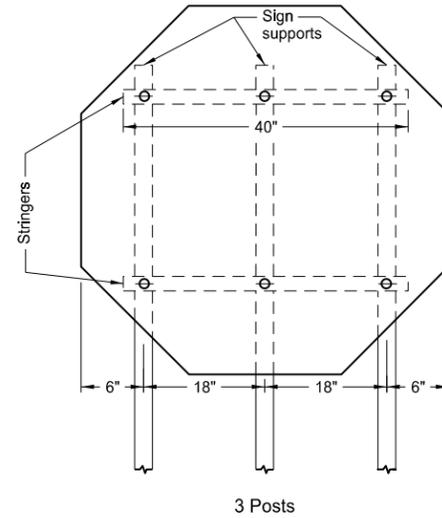
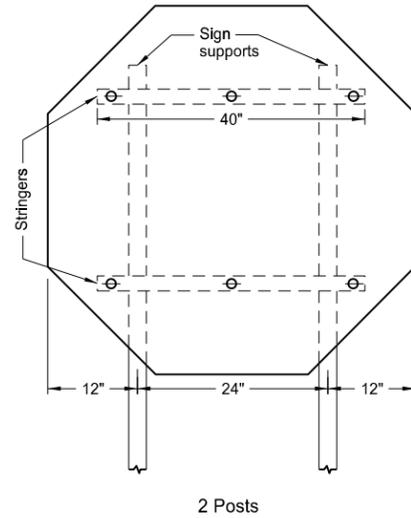
Assembly No. 1



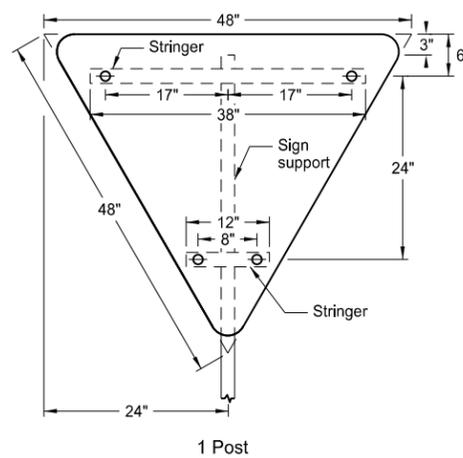
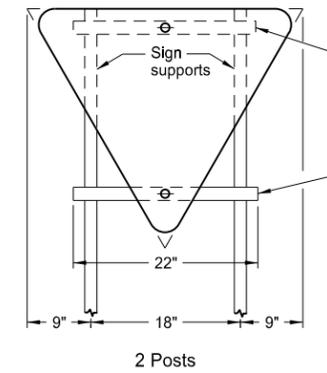
Assembly No. 2



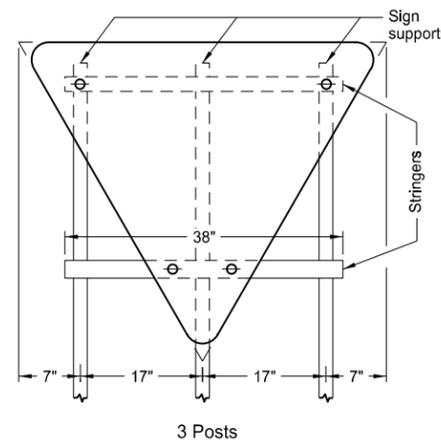
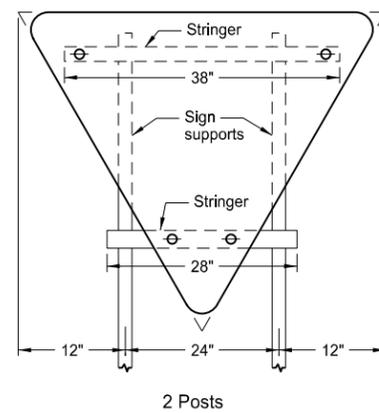
Assembly No. 3



Assembly No. 4



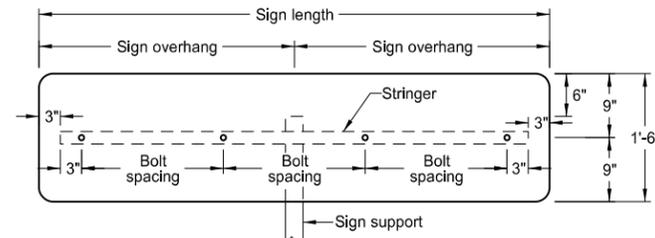
Assembly No. 5



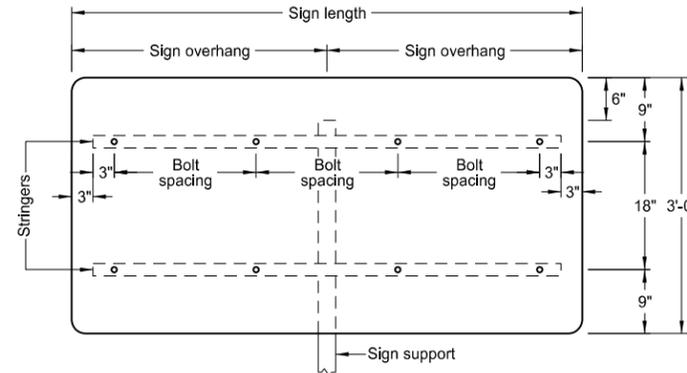
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

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

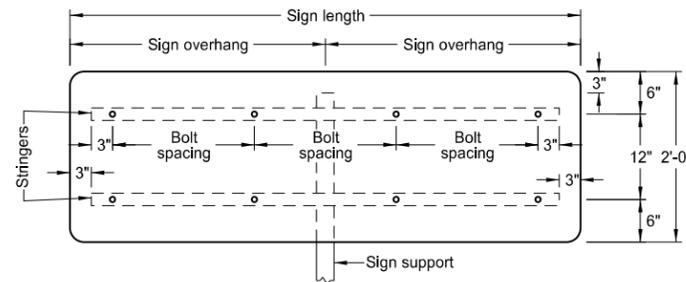
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS



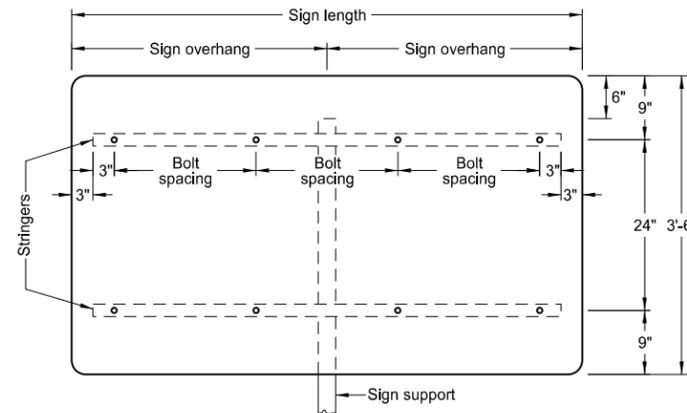
VARIES X 1'-6"



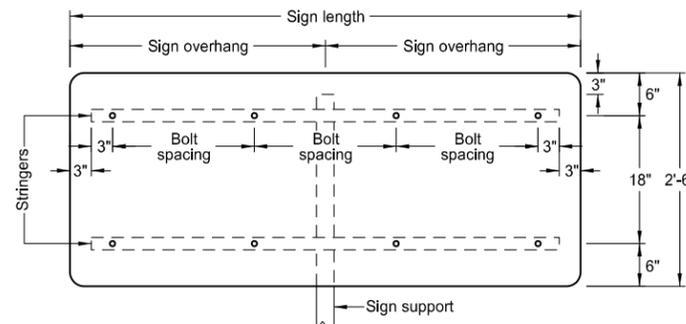
VARIES X 3'-0"



VARIES X 2'-0"



VARIES X 3'-6"



VARIES X 2'-6"

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

Notes:

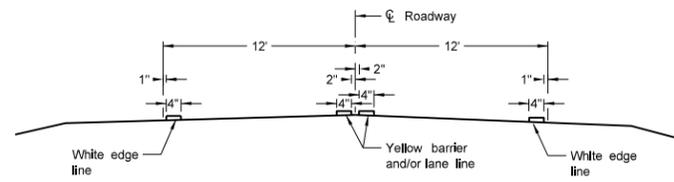
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.
4. Attach single stringer to single post signs with special stringer angle, shown on "Mounting Details Perforated Tube" standard drawing.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
9-04-19	New Design Engr PE Stamp.

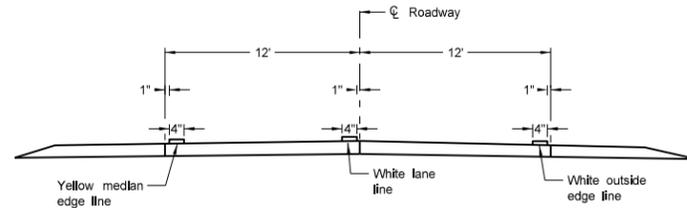
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 Registration Number
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 North Dakota Department
 of Transportation

PAVEMENT MARKING

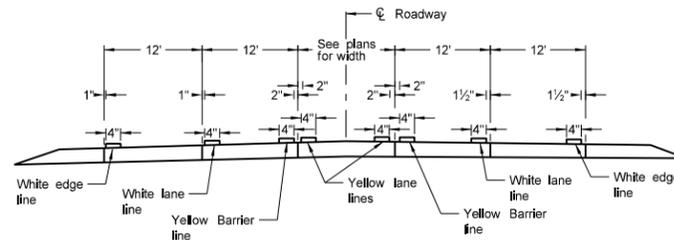
D-762-4



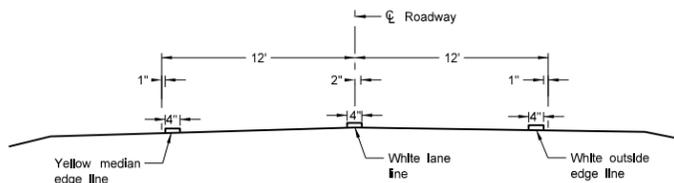
Two Lane Two Way
RURAL ROADWAY



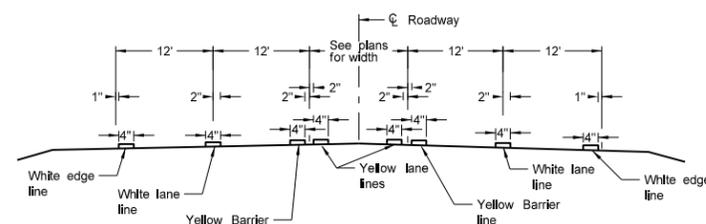
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



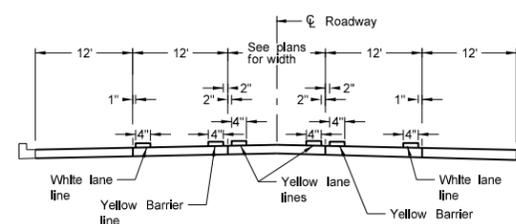
RURAL FIVE LANE ROADWAY
Concrete Section



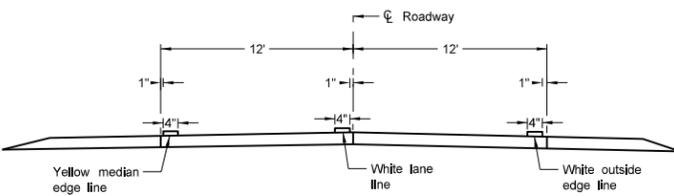
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



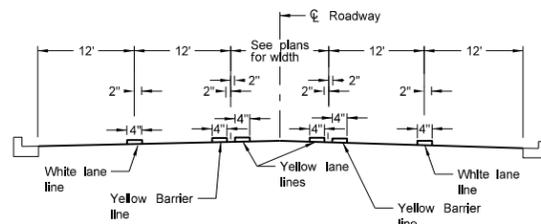
RURAL FIVE LANE ROADWAY
Asphalt Section



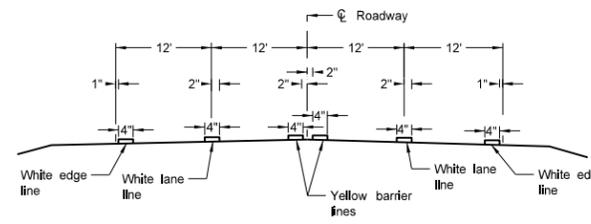
URBAN FIVE LANE SECTION
Concrete Section



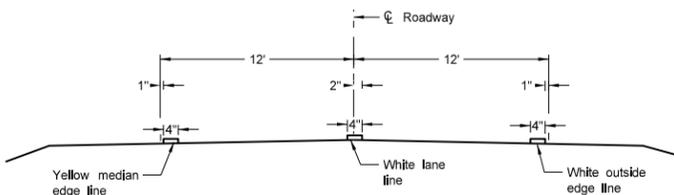
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



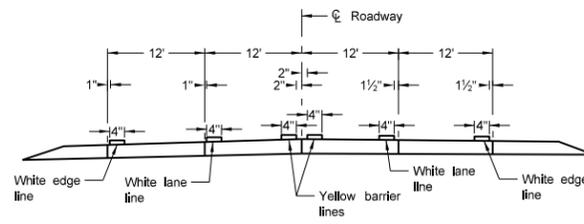
URBAN FIVE LANE SECTION
Asphalt Section



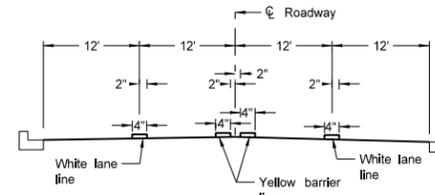
RURAL FOUR LANE ROADWAY
Asphalt Section



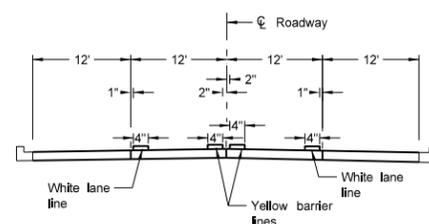
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



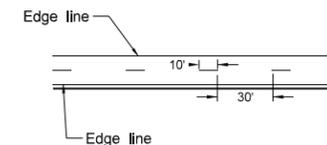
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

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

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

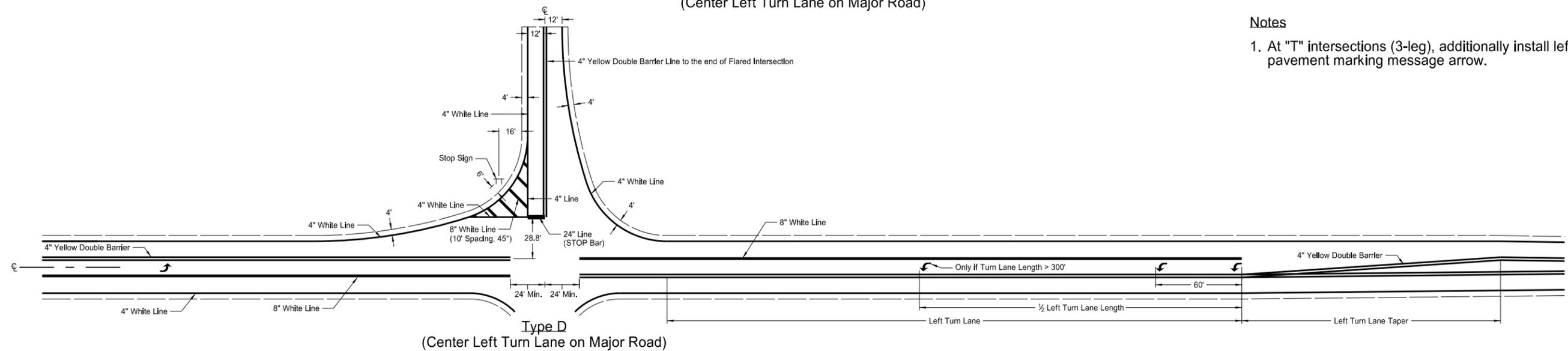
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PAVEMENT MARKING FOR STANDARD 90 DEGREE FLARED INTERSECTION

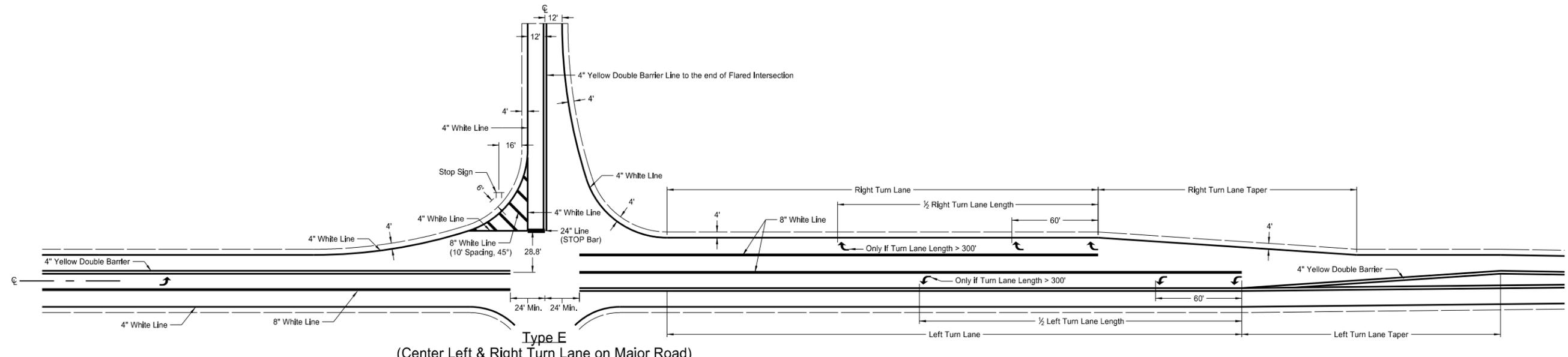
(Center Left Turn Lane on Major Road)

Notes

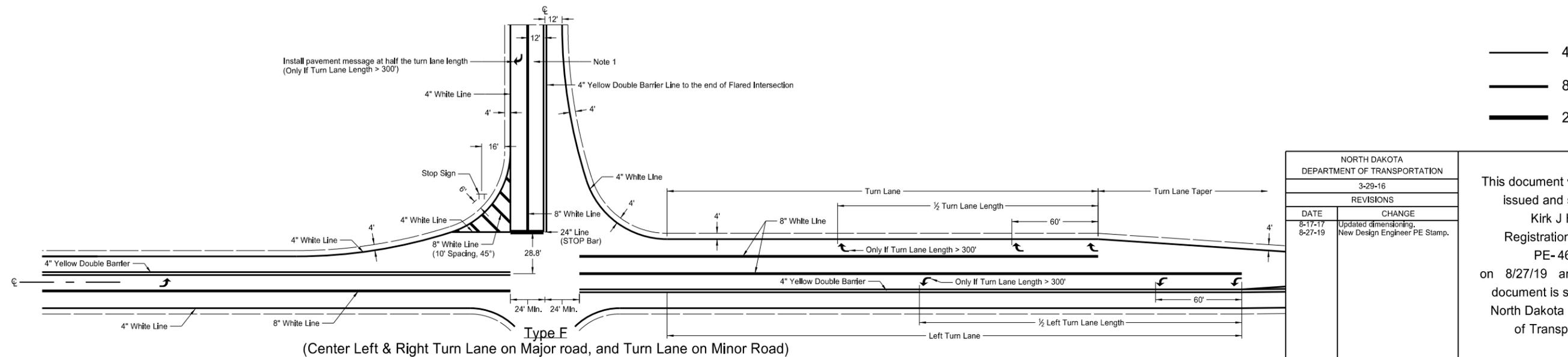
- At "T" intersections (3-leg), additionally install left turn pavement marking message arrow.



Type D
(Center Left Turn Lane on Major Road)



Type E
(Center Left & Right Turn Lane on Major Road)



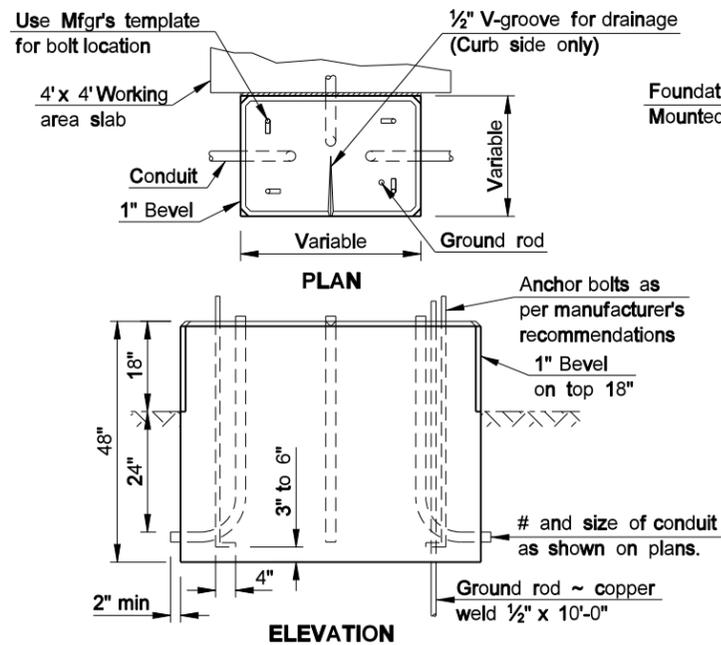
Type E
(Center Left & Right Turn Lane on Major road, and Turn Lane on Minor Road)

—— 4" Marking
 = 8" Marking
 = 24" Marking

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
3-29-16	
REVISIONS	
DATE	CHANGE
8-17-17	Updated dimensioning.
8-27-19	New Design Engineer PE Stamp.

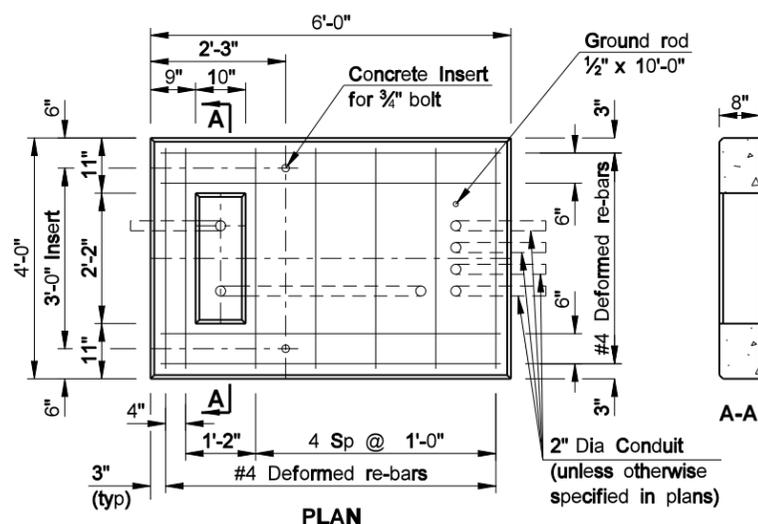
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**CONCRETE FOUNDATIONS
(TRAFFIC SIGNALS & HIGHWAY LIGHTING)**

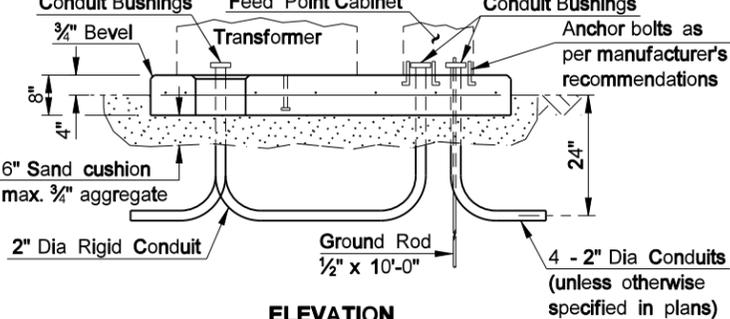


CONTROLLER CABINET FOUNDATION PAD MOUNT

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

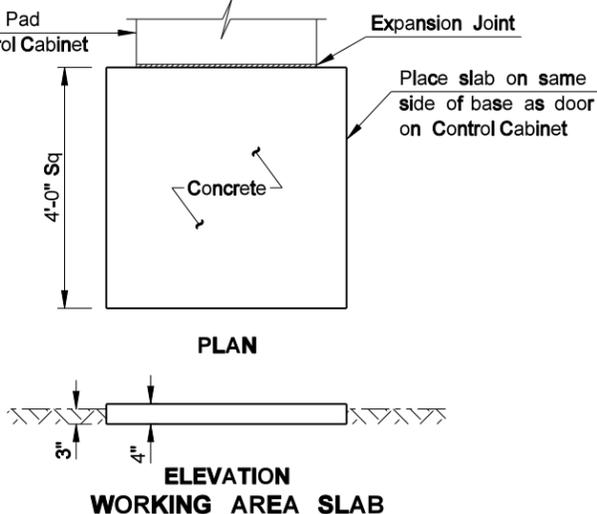


TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

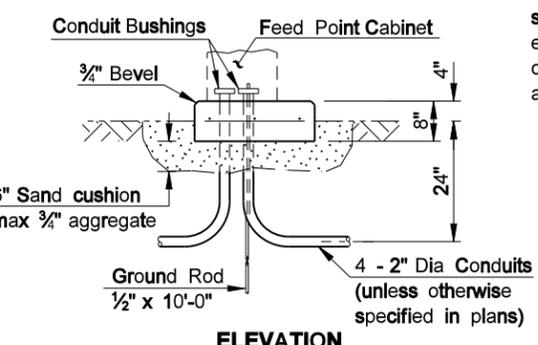
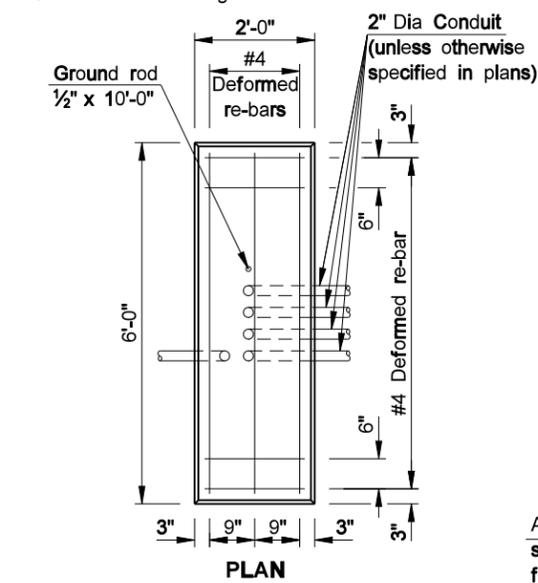


TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

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

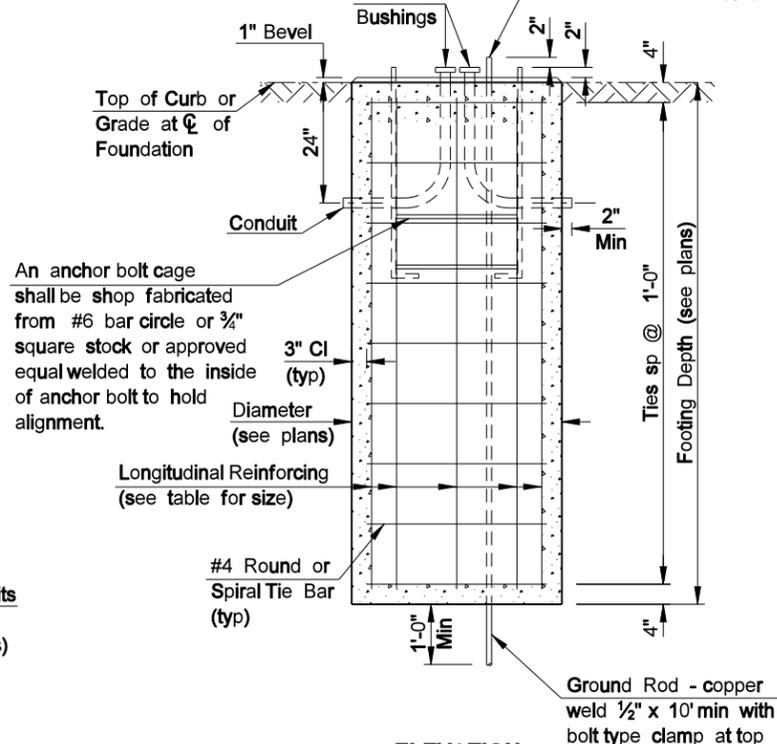
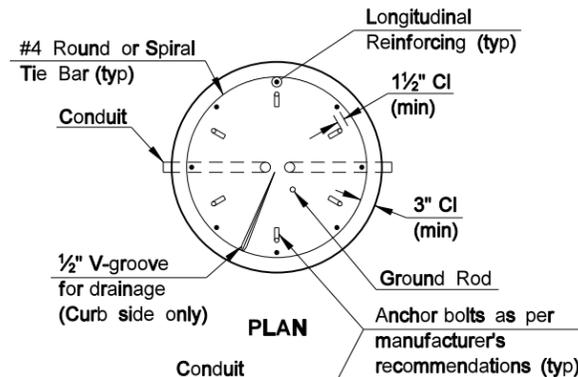
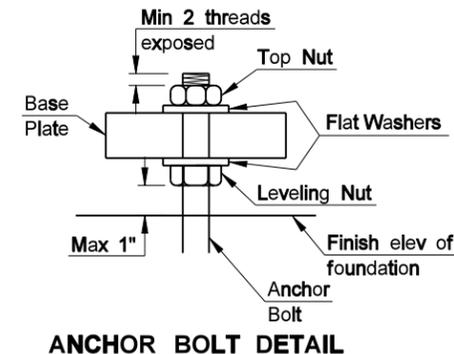


The Working Area Slab shall be installed where shown on the plans and shall not be bid separately but shall be included in the price bid for Concrete Foundation - Traffic Signals.



FEED POINT CABINET FOUNDATION PAD MOUNT

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



An anchor bolt cage shall be shop fabricated from #6 bar circle or 3/4" square stock or approved equal welded to the inside of anchor bolt to hold alignment.

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.

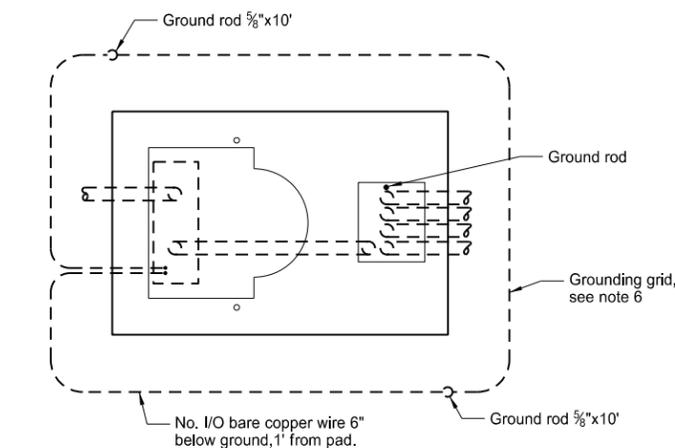
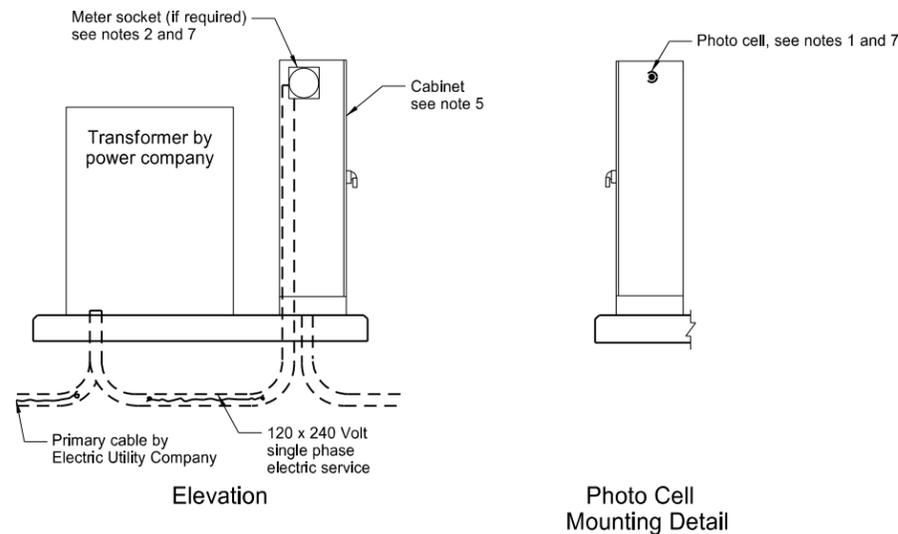
FEED POINT CABINET FOUNDATION PAD MOUNTED: The foundation shall have a wood float finish. All conduits shown shall be installed. Conduit that is not used at this time shall be plugged with an expandable plug.

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

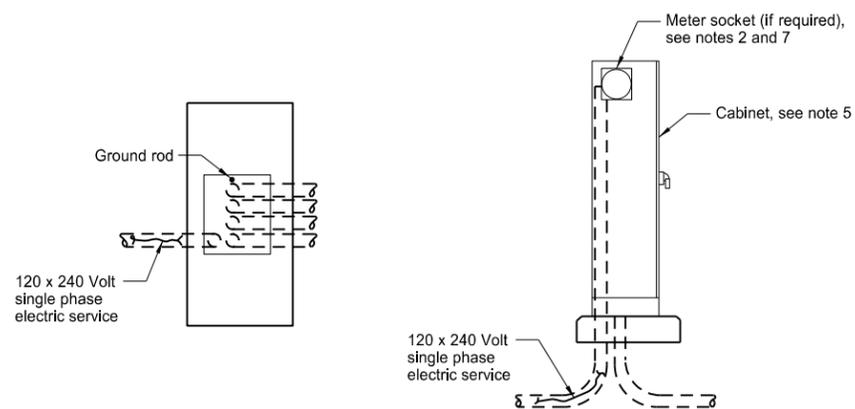
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
6-15-10	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Terrence R. Udland
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 on 6/15/10 and the original document is stored at the North Dakota Department of Transportation

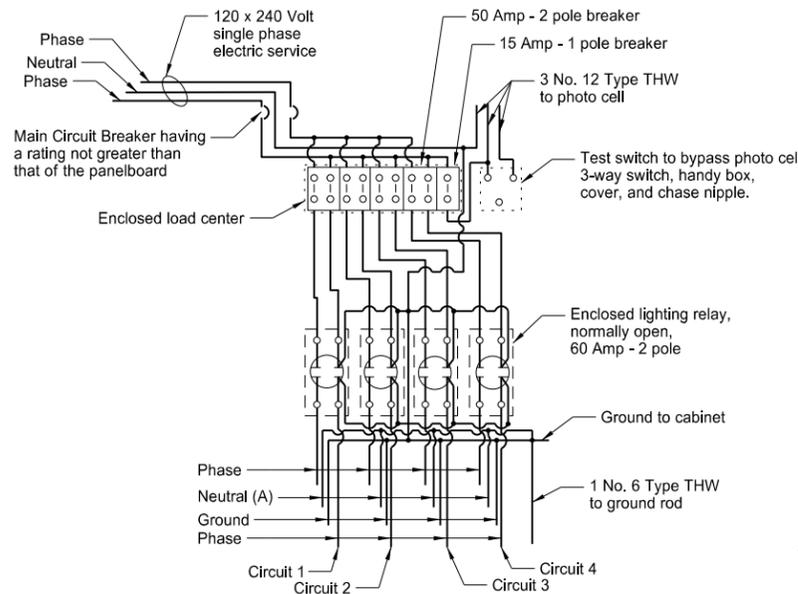
FEED POINTS (ROADWAY LIGHTING)



Plan
Transformer and Feed Point Cabinet Pad Mounted



Plan
Elevation
Feed Point Cabinet Pad Mounted



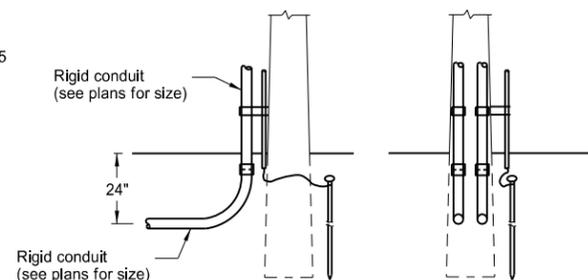
Feed Point Type IV

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.

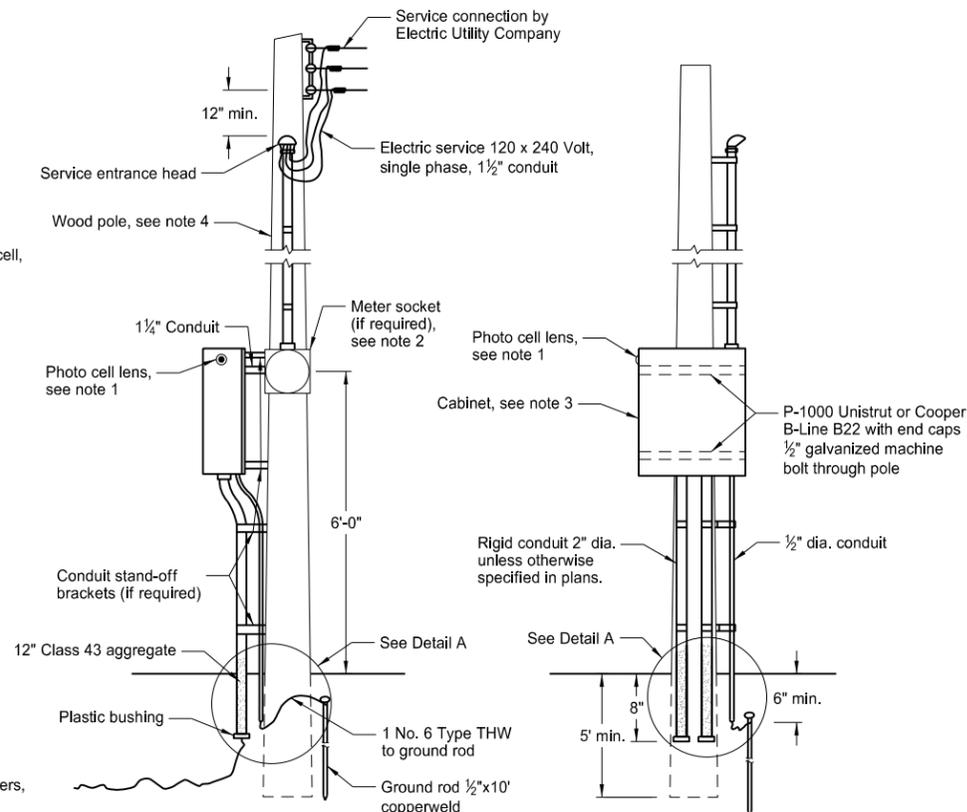
Provide Type II feed point similar to Type IV, except with two electrical circuit, two 50 Amp - 2 pole breakers, and two lighting relays, normally open.

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.



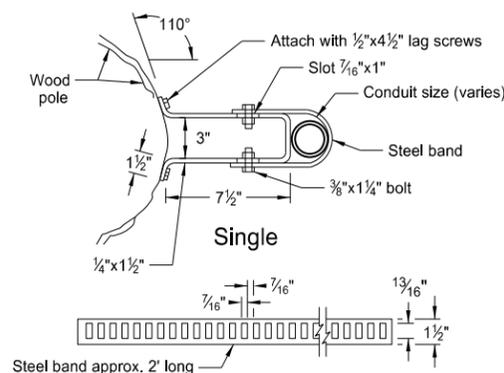
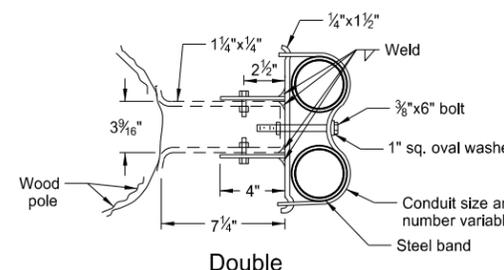
Detail A
Use this detail for a continuous run of conduit from the feed point to the first light standard.



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.
Provide 30" high x 24" wide x 8" deep Type I and II feed points. Provide 30" high x 42" wide x 10" deep or 36" high x 36" wide x 10" deep Type III and IV feed points.
- 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.



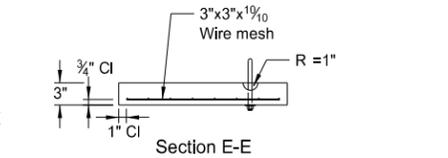
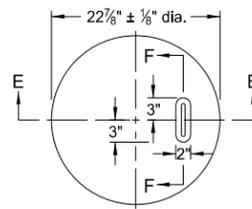
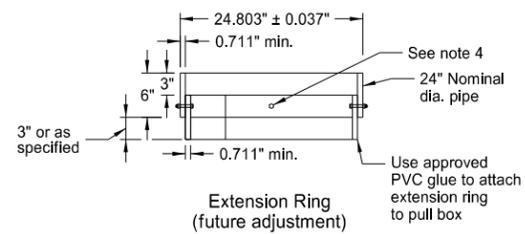
Conduit Standoff Bracket

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

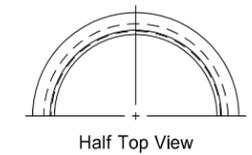
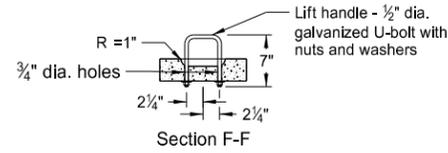
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-8-13	
REVISIONS	
DATE	CHANGE
7-8-14	Revised note 3.
10-17-17	Updated to active voice.
8-28-19	New Design Engineer PE Stamp.

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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

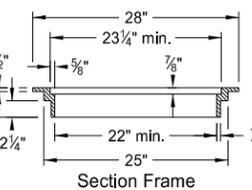
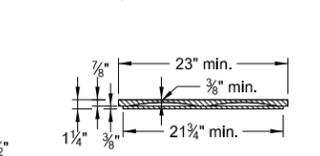
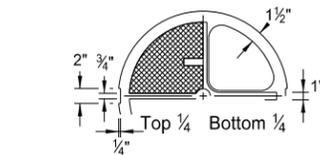
PULL BOX DETAILS



Concrete Cover



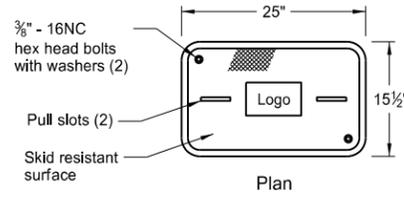
Half Top View



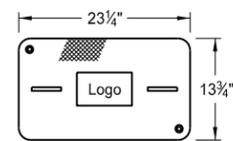
Section Frame

Section Cover

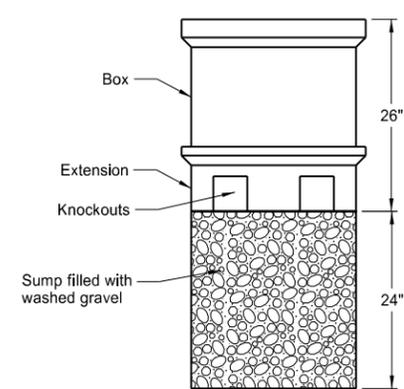
Cast Iron Frame and Cover



Plan



Cover



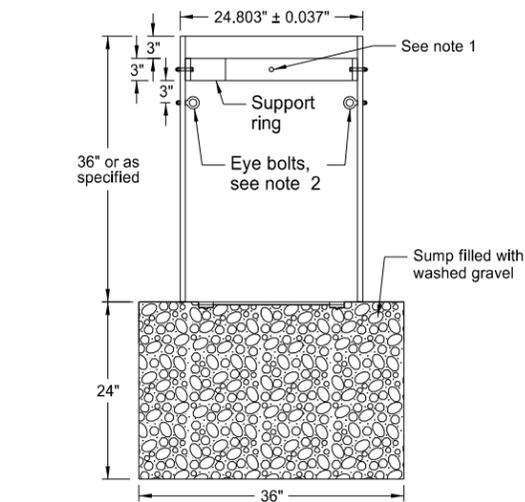
Elevation

Polymer Concrete Pull Box

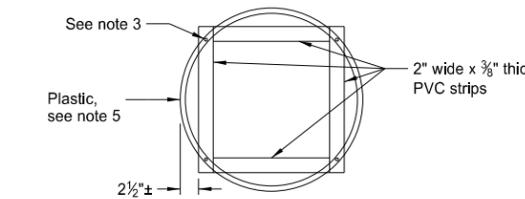
Note: Polymer concrete reinforced by a heavy weave fiberglass

Polymer Concrete Pull Box Notes:

1. Place top of pull box flush with surfaced area and approximately one inch above earth or sodded areas on level surfaces.
2. Provide at least one knockout per side in pull box.
3. Provide Polymer Concrete pull box meeting Tier 22 as per ANSI / SCTE 77.

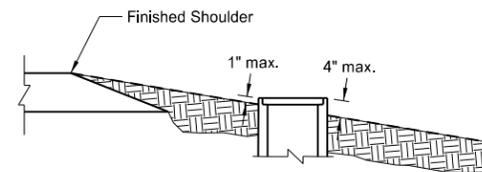


Elevation



Bottom View

PVC Pull Box



Typical Pull Box in Rural Section

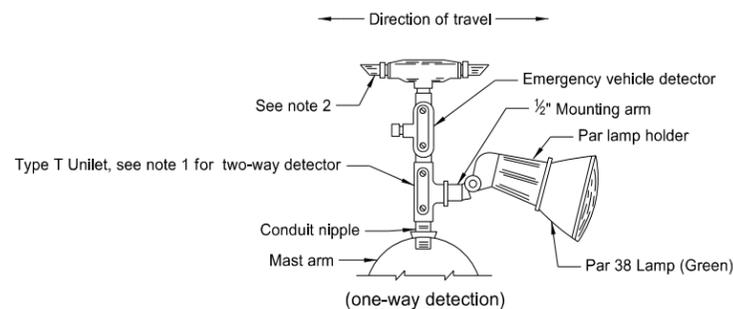
PVC Pull Box Notes:

1. Attach split 24" nominal diameter PVC cover support ring with four 3/8" dia. x 2" long stainless steel hex head bolts with nuts at 90 degrees apart.
2. Two type 2 shoulder eye bolts, 3/8" dia. x 1 1/4" shank length with hex nuts 180 degrees apart (for lifting pull box and supporting electric cable).
3. Four 1/4" x 1 1/4" long galvanized lag screws. Screw assembly together.
4. Attach split 24" nominal diameter PVC cover support extension ring with four 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 shall be gray iron as per AASHTO M 105, Class 35B.

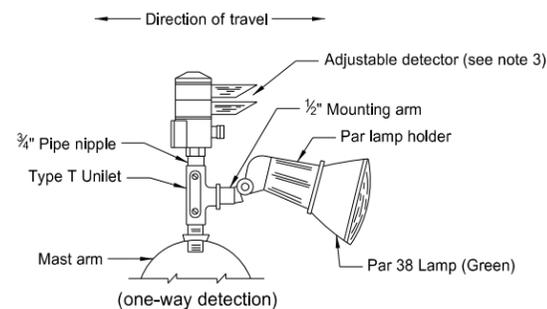
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-8-13	
REVISIONS	
DATE	CHANGE
7-8-14 10-17-17 8-28-19	Added Note 3 Updated to active voice. New Design Engineer PE Stamp.

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Registration Number
PE- 4683,
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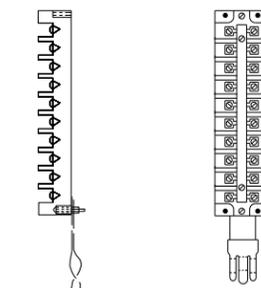
LIGHTING AND SIGNAL DETAILS



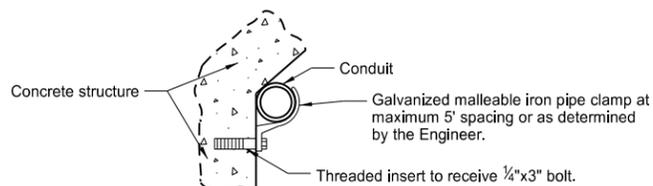
Emergency Vehicle Detector Detail



Alternate Emergency Vehicle Detector Detail (adjustable)

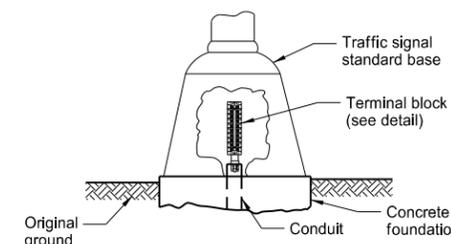


Terminal Block Detail

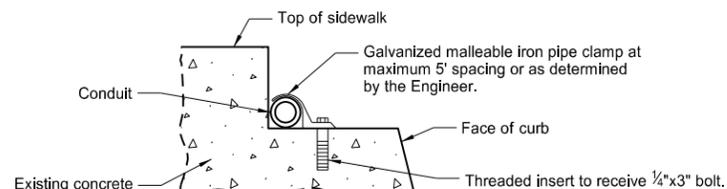


Bridge Mounted Conduit Hanger

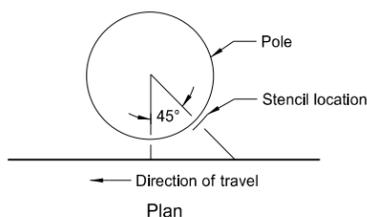
- Notes:
 1. Use Type X Unilet with two Par lamp holders and lamps for Two-way Detectors. (one in each direction).
 2. Plug unused end of One-way Detector with metal pipe plug.
 3. Rotate detector lens to face direction of travel on Two-way Detectors.



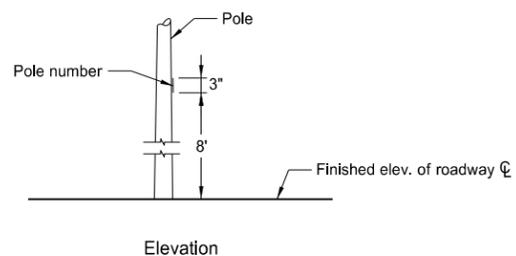
Terminal Block (rigid mounted)



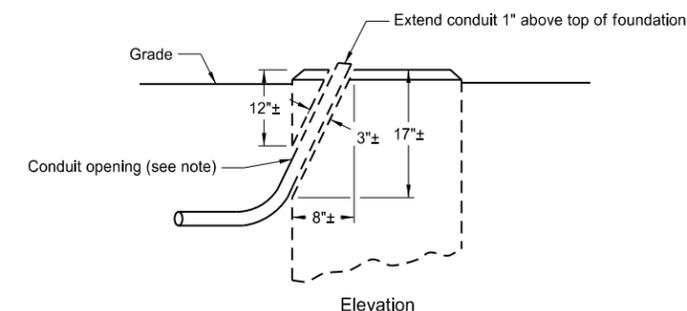
Bridge Curb Mounted Conduit



Light Standard Numbering

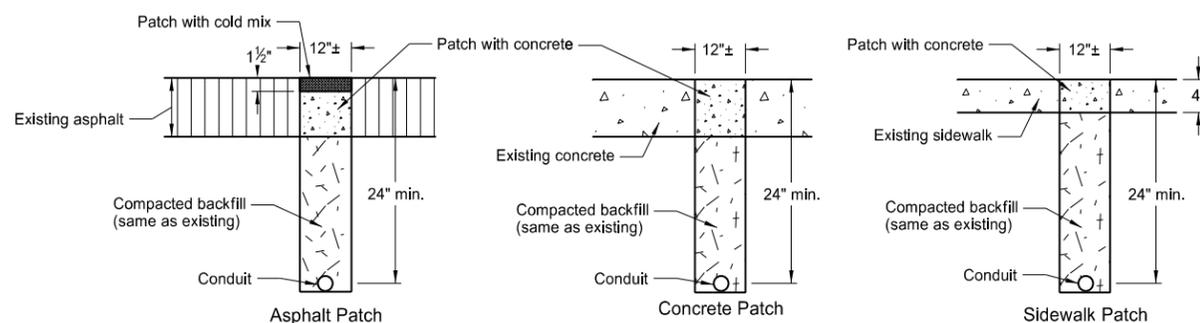


Note: On the roadway side of each light standard, stencil the pole number using black paint or an adhesive coated plastic such as Scotchcal by 3M or as approved by the Engineer. See layout sheets for pole numbers.



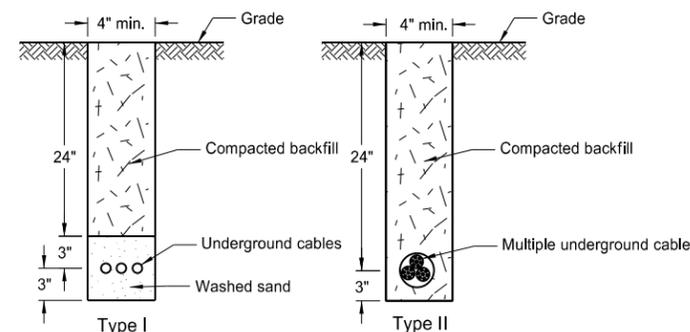
Revise Concrete Foundation

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.

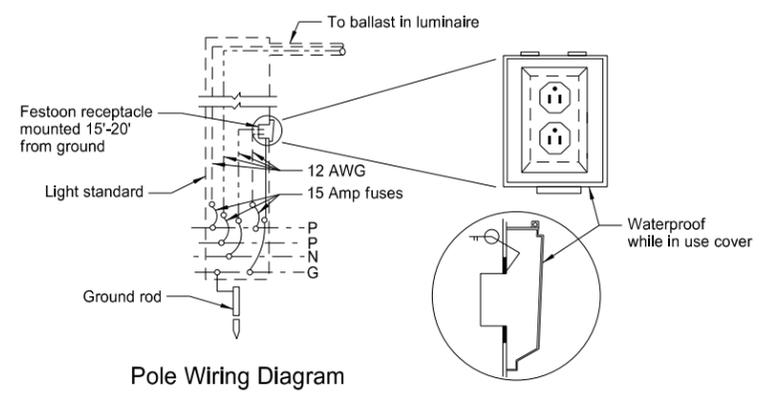
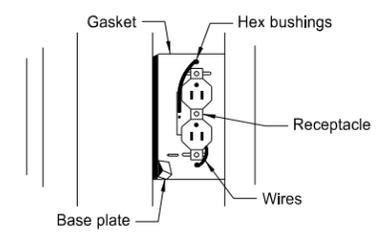
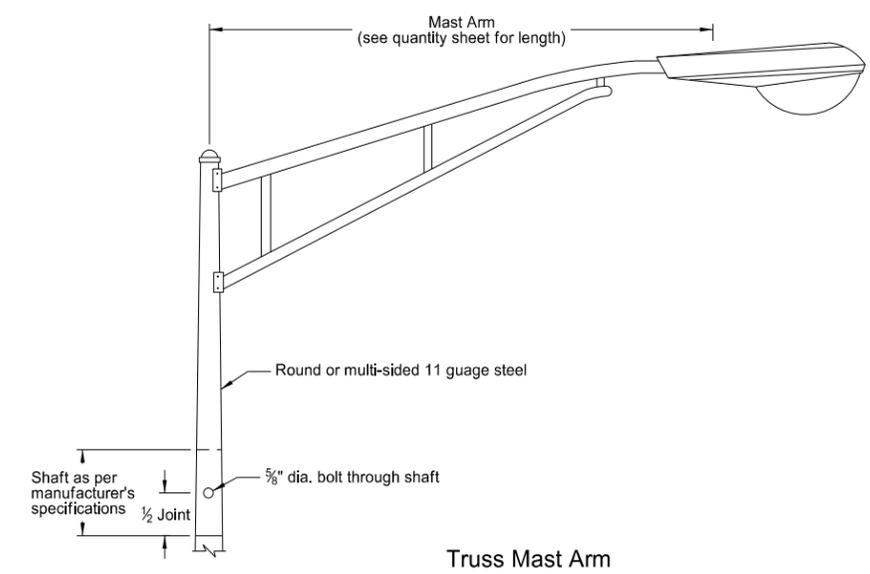
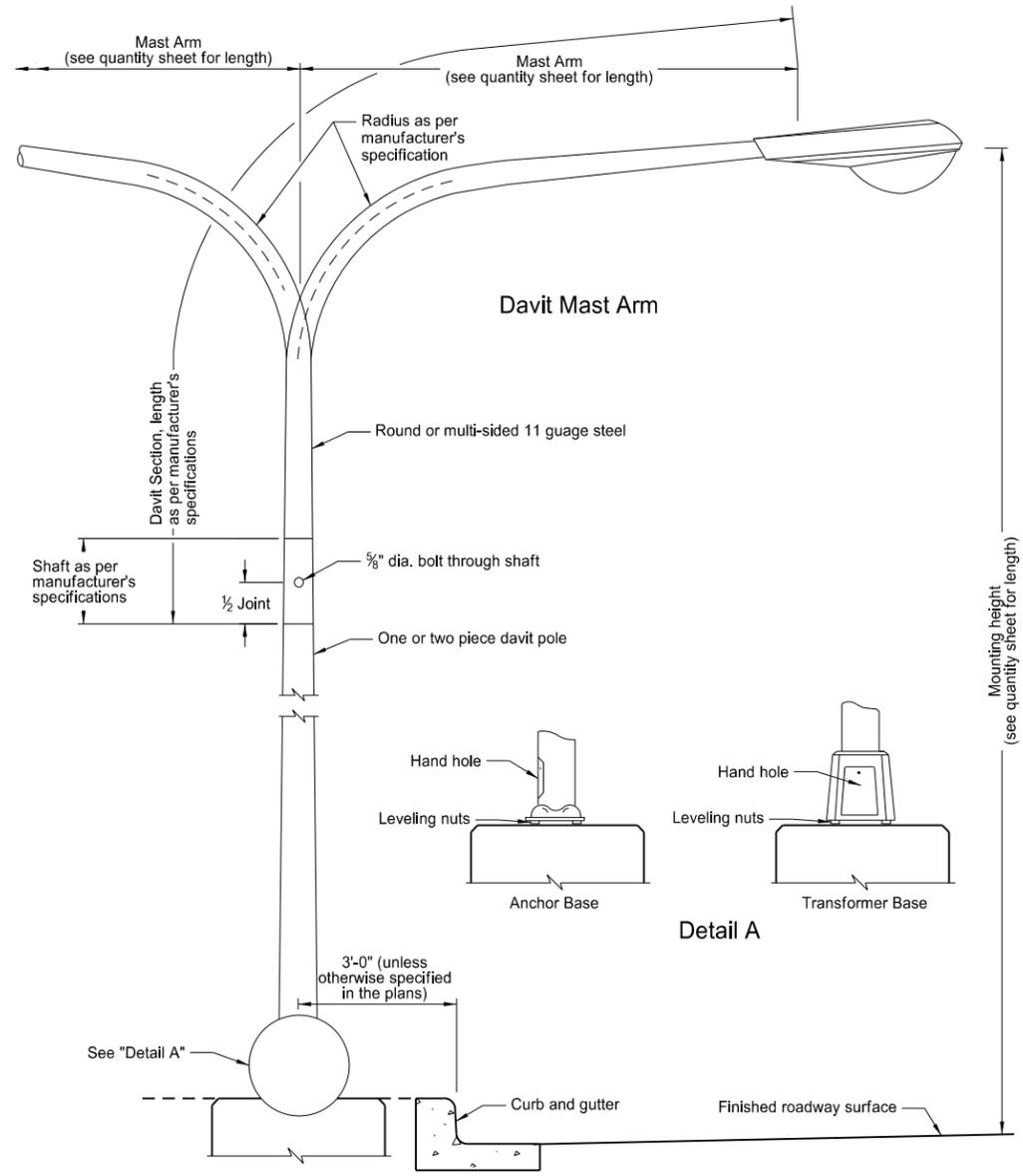


Cable Trench

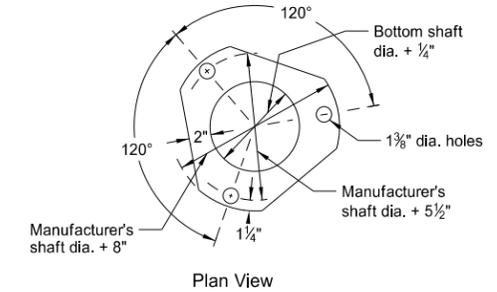
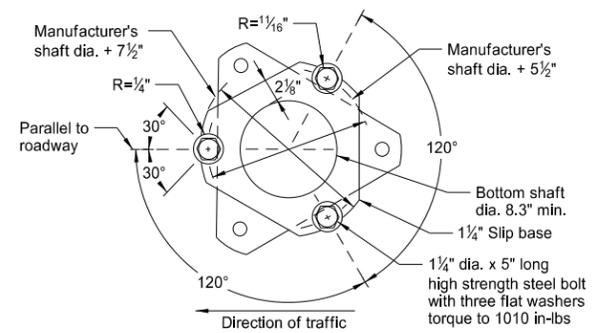
Note: Sod entire area disturbed by trenching, unless directed otherwise by the Engineer.

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

LIGHT STANDARD DETAILS



Receptacle Mounting Detail (B)
 (B) Mount receptacle on side of pole that faces the street. Install Festoon Receptacle only when specified in the plans.



(A) ASTM A446 Grade "A" 28 gauge keeper plate on top of middle flat washer. Galvanize Keeper plate after fabrication.

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.

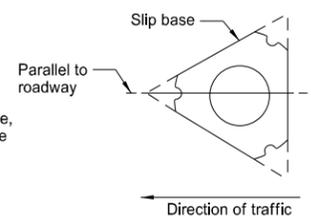
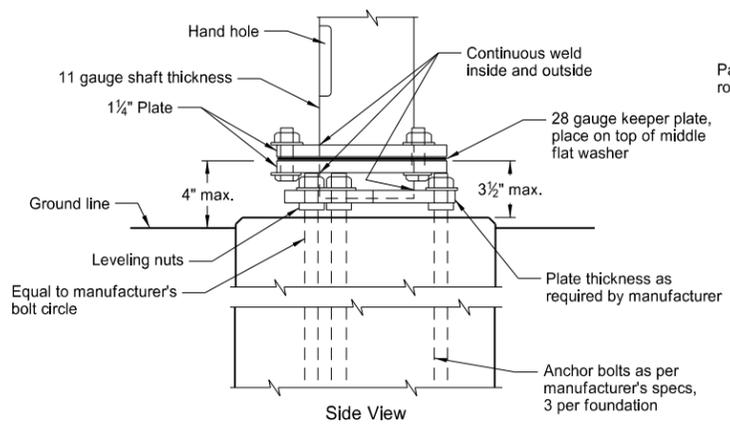
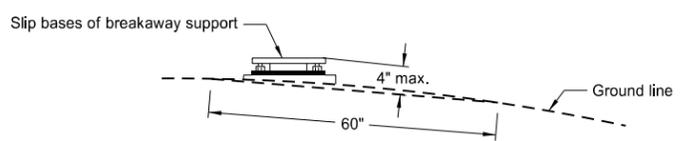
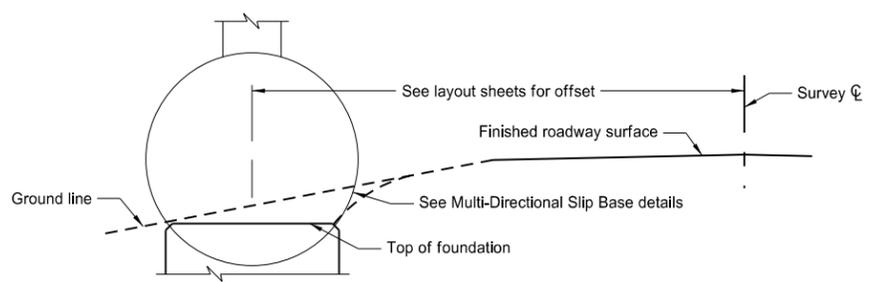
Steel Standards: Touch up marred or scratched areas after erection.

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

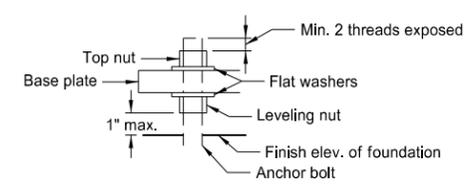
Fusing: Fusing in base, see specifications.

- 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



Slip Base Placement Detail



Multi-Directional Slip Base

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

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