

NDDOT ABBREVIATIONS

D-101-1

Ⓚ 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
 Adj adjusted
 Aggr aggregate
 Ahd ahead
 ARV air release valve
 Align alignment
 Al alley
 Alt alternate
 Alum aluminum
 ADA Americans with Disabilities Act
 & 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

C Gdrl cable guardrail
 Calc calculate
 CIP cast iron pipe
 CB catch basin
 CRS cationic rapid setting
 C Gd cattle guard
 C To C center to center
 CL or ☉ centerline
 Ch chain
 Chnlk chain-link
 Ch Blk channel block
 Ch Ch channel change
 Chk check
 Chsld chiseled
 Cir circle
 Cl class
 Clnt clean-out
 Clr clear
 Cl&gr clearing & grubbing
 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
 Co County
 Crse course
 Ct Court
 Xarm cross arm
 Xbuck cross buck
 Xsec cross sections
 Xing crossing
 Xrd crossroad
 Crn crown

Culv culvert
 C&G curb & gutter
 CI curb inlet
 CR curb ramp
 C cut
 Dd Ld dead load
 Defl deflection
 Defm deformed
 DInt delineate
 DIntr delineator
 Depr depression
 Desc description
 Det detail
 DWP detectable warning panel
 Dtr detour
 Dia or ø 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
 Ea each
 Esmt easement
 E East
 EB Eastbound
 Elast elastomeric
 EL electric locker
 E Mtr electric meter
 EVSE electric vehicle supply equipment
 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
 Evgr evergreen
 Exc excavation
 Exst existing
 Exp expansion
 Expy Expressway
 E external of curve
 Extru extruded

FOS factor of safety
 Fed Federal
 FP feed point
 Fn fence
 Fn P fence post
 FO fiber optic
 FD field drive
 F fill
 FAA fine aggregate angularity
 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
 Fnd found
 Fdn foundation
 Frac fractional
 Frwy freeway
 Frt front
 FF front face
 F Disp fuel dispenser
 FFP fuel filler pipes
 FLS fuel leak sensor
 Furn furnish/ed

Bk back
 BF back face
 Balc balcony
 B Wire barbed wire
 Barr barricade
 Btry battery
 BI beehive inlet
 Beg begin
 BG below grade
 BM bench mark
 Bkwy bikeway
 Bit bituminous
 Blk block
 BH bore hole
 Bot bottom
 Blvd Boulevard
 Bndry boundary
 Brkwy breakaway
 Br bridge
 Bldg building
 Bus. business
 BV butterfly valve
 Byp bypass

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
04-23-18	General Revisions
09-20-18	General Revisions
12-18-20	General Revisions
08-16-22	General Revisions
04-14-25	General Revisions

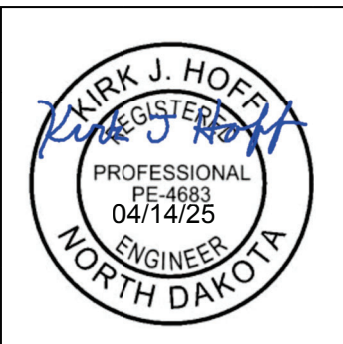


NDDOT ABBREVIATIONS

D-101-2

Galv	galvanized	Ln	lane	Obsc	obscure(d)	Qty	quantity
Gar	garage	Lg	large	Ocpd	occupied	Qtr	quarter
Gs L	gas line	Lat	latitude	Ocpy	occupy		
G Reg	gas line regulator	Lt	left	O/s	offset		
GMV	gas main valve	Lens	lenses	OC	on center	Rad or R	radius
G Mtr	gas meter	Lvl	level	C	one dimensional consolidation	RR	railroad
GSV	gas service valve	Lvng	leveling	OC	organic content	Rlwy	railway
GVP	gas vent pipe	Lht	light	Orig	original	Rsd	raised
GV	gate valve	LP	light pole	O To O	out to out	RC	rapid curing
Ga	gauge	Ltg	lighting	OD	outside diameter	Rec	record
Gov	government	Liq	liquid	OH	overhead	Recy	recycle
Grd	graded/grade	LL	liquid limit			RAP	recycled asphalt pavement
Grnd	ground	Loc	location			RPCC	recycled portland cement concrete
GWM	ground water monitor	Long.	longitude	PMT	pad mounted transformer	Ref	reference
Gdrl	guardrail	Lp	loop	Pg	pages	R Mkr	reference marker
Gtr	gutter	LD	loop detector	Pntd	painted	RM	reference monument
		Lum	luminaire	Pr	pair	RP	reference point
				Pnl	panel	Refl	reflectorized
H Plg	H piling			Pk	park	RCB	reinforced concrete box
Hdwl	headwall	Mb	mailbox	PSD	passing sight distance	RCES	reinforced concrete end section
Ht	height	ML	main line	Pvmt	pavement	RCFES	reinforced concrete flared end section
Hel	helical	MH	manhole	Ped	pedestal	RCP	reinforced concrete pipe
HDPE	high density polyethylene	Mkd	marked	Ped	pedestrian	RCPS	reinforced concrete pipe sewer
HM	high mast	Mkr	marker	PPP	pedestrian pushbutton post	RCTES	reinforced concrete traversable end section
HP	high pressure	Mkg	marking	Pen.	penetration	Reinf	reinforcement
HPS	high pressure sodium	MA	mast arm	Perf	perforated	Res	reservation
HTCG	high tension cable guardrail	Matl	material	Per.	perimeter	Res	residence
Hwy	highway	Max	maximum	Perm	permanent	Ret	retaining
Hor	horizontal			PL	pipeline	Rev	reverse
HBP	hot bituminous pavement	Meas	measure	PI	place	Rt	right
HMA	hot mix asphalt	Mdn	median	P&P	plan & profile	R/W	right of way
Hyd	hydrant	MD	median drain	PL	plastic limit	Riv	river
Ph	hydrogen ion content	MC	medium curing	Pl or \bar{P}	plate	Rd	road
		MGS	Midwest Guardrail System	Pt	point	Rdbd	road bed
		MM	mile marker	PE	polyethylene	Rdwy	roadway
Id	identification	MP	mile post	PVC	polyvinyl chloride	RWIS	roadway weather information system
Incl	inclinometer tube	Min	minimum	PCC	Portland Cement concrete	Rk	rock
IMH	inlet manhole	Misc	miscellaneous	PP	power pole	Rt	route
ID	inside diameter	Mon	monument	Preempt	preemption		
Inst	instrument	Mnd	mound	Prefab	prefabricated		
Intchg	interchange	Mtbl	mountable	Prfmd or Pref	performed		
Intmdt	intermediate	Mtd	mounted	Prep	preparation		
Intscn	intersection	Mtg	mounting	Press.	pressure		
Inv	invert	Mk	muck	PRV	pressure relief valve		
IP	iron pipe			Prestr	prestressed		
				Pvt	private		
				PD	private drive		
Jt	joint	Neop	neoprene	Prod.	production/produce		
Jct	junction	Ntwk	network	Prog	programmed		
		N	North	Prop.	property		
		NE	Northeast	Ppsd	proposed		
		NW	Northwest	PB	pull box		
		NB	Northbound				
		No. or #	number				

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NDDOT ABBREVIATIONS

D-101-3

Salv	salvage(d)	Tel	telephone
San	sanitary sewer line	Tel B	Telephone Booth
Sec	section	Tel P	telephone pole
SL	section line	Tv	television
Sep	separation	Temp	temperature
Seq	sequence	Temp	temporary
Serv	service	TBM	temporary bench mark
Sht	sheet	T	thinwall tube sample
Shtng	sheeting	Ts	topsoil
Shldr	shoulder	Traf	traffic
Sw or Sdwk	sidewalk	TSCB	traffic signal control box
SD	sight distance	Tr	trail
SN	sign number	Transf	transformer
Sig	signal	Trans	transition
Sgl	single	TT	transmission tower
SRCP	slotted reinforced concrete pipe	TES	traversable end section
SC	slow curing	Trans	transverse
SS	slow setting	Trtd	treated
Sm	small	Trmt	treatment
S	South	Qc	triaxial compression
SE	Southeast	TERO	tribal employment rights ordinance
SW	Southwest	Tpl	triple
SB	Southbound	Typ	typical
Sp	spaces		
Spcl	special	Qu	unconfined compressive strength
SA	special assembly	Ugrnd	underground
SP	special provisions	Util	utility
G	specific gravity		
Spk	spike	VG	valley gutter
SB	split barrel sample	Vap	vapor
SH	sprinkler head	Vert	vertical
SV	sprinkler valve	VCP	vitrified clay pipe
Sq	square	Vol	volume
Stk	stake	VSFS	vehicle speed feedback sign
Std	standard		
N	standard penetration test	Wkwy	walkway
Std Specs	standard specifications	W	water content
Stm L	steam line	WGV	water gate valve
SEC	steel encased concrete	WL	water line
SMA	stone matrix asphalt	WM	water main
SSD	stopping sight distance	WMV	water main valve
SD	storm drain	W Mtr	water meter
St	street	WSV	water service valve
SPP	structural plate pipe	WW	water well
SPPA	structural plate pipe arch	Wrng	wearing
Str	structure	WIM	weigh in motion
Subd	subdivision	W	west
Sub	subgrade	WB	westbound
Sub Prep	subgrade preparation	Wrng	wiring
Ss	subsoil	W/	with
SS	supplement specification	W/o	without
Supp	supplemental		
Surf	surfacing		
Surv	survey		
Sym	symmetrical		

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Str	structure	WIM	weigh in motion
Subd	subdivision	W	west
Sub	subgrade	WB	westbound
Sub Prep	subgrade preparation	Wrng	wiring
Ss	subsoil	W/	with
SS	supplement specification	W/o	without
Supp	supplemental	WC	witness corner
Surf	surfacing		
Surv	survey		
Sym	symmetrical		

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NDDOT ABBREVIATIONS

D-101-4

MEASUREMENTS

ac acres
 A ampere
 Bd Ft board feet
 Cd candela
 cm centimeter
 C coulomb
 CF cubic feet
 m3 cubic meter
 m3/s cubic meters per second
 CY cubic yard
 CY/mi cubic yards per mile
 D or Deg degree
 F Fahrenheit
 F farad
 ft feet/foot
 Gal gallon
 G giga
 Ha hectare
 H henry
 Hz hertz
 hr hour(s)
 in. inch
 J joule
 K kelvin
 kN kilo newton
 kPa kilo pascal
 kg kilogram
 kg/m3 kilogram per cubic meter
 km kilometer
 K Kip(s)
 LF linear foot
 L litre
 Lm lumen
 L sum lump sum
 Lx lux
 M Hr man hour
 M mega
 m meter
 m/s meters per second
 mi mile
 mL milliliter
 mm millimeter
 mm/hr millimeters per hour
 n nano
 N newton
 Pa pascal
 lb pounds
 sec seconds
 S siemens
 SF square feet
 km2 square kilometer
 m2 square meter
 SY square yard
 Sta Yd station yards
 SI Systems International

T tesla
 T/mi tons per mile
 V volt
 W watt
 Wb weber

SURVEY DESCRIPTIONS

Az azimuth
 Bs backsight
 Brg bearing
 BP Cap blue plastic cap
 BS both sides
 BC brass cap
 CC closing corner
 CS curve to spiral
 Eq equation
 E external of curve
 FS far side
 FB field book
 Fs foresight
 Geod geodetic
 GIS Geographical Information System
 GPS Global Positioning System
 HI height of instrument
 IM iron monument
 I Pn iron pin
 LS Land Surveyor (licensed)
 LSIT Land Surveyor In Training
 L length of curve
 LC long chord
 LB level book
 MC meander corner
 Mer meridian
 M mid ordinate of curve
 NGS National Geodetic Survey
 NS near side
 Obsn observation
 Off Loc office location
 OP Cap orange plastic cap
 PK Parker-Kalon nail
 P Cap plastic cap
 PP Cap pink plastic cap
 PCC point of compound curve
 PC point of curve
 PI point of intersection
 PRC point of reverse curvature
 PT point of tangent
 POC point on curve
 POT point on tangent
 RTP random traverse point
 Rge range
 RP Cap red plastic cap
 SC spiral to curve
 SC standard corner
 ST spiral to tangent
 Sta station
 SE superelevation
 Tan tangent
 T tangent (semi)
 TS tangent to spiral
 Twp township
 TB transit book
 TP traverse point
 TP turning point
 USC&G US Coast & Geodetic Survey
 USGS US Geologic Survey
 VC vertical curve
 WC witness corner
 WGS World Geodetic System
 YP Cap yellow plastic cap
 Z zenith

SOIL TYPES

Cl clay
 Cl F clay fill
 Cl Hvy clay heavy
 Cl Lm clay loam
 Co S coal slack
 C Gr coarse gravel
 CS coarse sand
 FS fine sand
 Gr gravel
 Lig Co lignite coal
 Lig Sl lignite slack
 Lm loam
 Rk rock
 Sd sand
 Sdy Cl sandy clay
 Sdy Cl Lm sandy clay loam
 Sdy Fl sandy fill
 Sdy Lm sandy loam
 Sc scoria
 Sh shale
 Si Cl silt clay
 Si Cl Lm silty clay loam
 Si Lm silty loam

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

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702COM 702 Communications
 ACCENT Accent Communications
 AGASSIZ WU Agassiz Water Users District
 AGC Associated General Contractors of America
 ALL PL Alliance Pipeline
 ALL SEAS WU All Seasons Water Users District
 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 WRD Burleigh County Water Resource District
 CABLE ONE Cable One
 CABLE SERV Cable Services
 CAP ELEC Capital Electric Cooperative Incorporated
 CASS CO ELEC Cass County Electric Cooperative
 CASS RWU Cass Rural Water Users District
 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
 CENTURYLINK CenturyLink
 COE Corps of Engineers
 CONS COMM Consolidated Communications
 CONS TELCOM Consolidated Telcom
 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 WRD Dickey County Water Resource District
 DICKEY TEL Dickey Telephone
 DNRR Dakota Northern Railroad
 DOME PL Dome Pipeline Company
 DVELEC Dakota Valley Electric Cooperative
 DVMW Dakota, Missouri Valley & Western
 E CENT REG WD East Central Water District
 ENBRDG Enbridge Pipelines Incorporated
 ENVENTIS Enventis Telephone
 EQUINOR Equinor Pipeline
 FALK MNG Falkirk Mining Company
 FHWA Federal Highway Administration
 G FKS-TRL WD Grand Forks-traill Water District
 GETTY TRD & TRAN Getty Trading & Transportation
 GLDN W ELEC Golden West Electric Cooperative

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
 LWR YELL R ELEC Lower Yellowstone Rural Electric
 LUMEN Lumen Technologies Incorporated
 MCKNZ CON McKenzie Consolidated Telcom
 MCKNZ 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 District
 MDU Montana-dakota Utilities
 MIDCO MidContinent Communications
 MIDSTATE TEL Midstate Telephone Company
 MINOT CABLE Minot Cable Television
 MINOT TEL Minot Telephone Company
 MISS VALL COMM Missouri Valley Communications Incorporated
 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
 MLGC Moore & Liberty - Griggs County
 MUNICIPAL City Water And Sewer
 MUNICIPAL City Of '.....'
 N CENT ELEC North Central Electric Cooperative
 N PRAIR REG WD North Prairie Regional Water District
 ND PKS & REC North Dakota Parks And Recreation
 ND TEL North Dakota Telephone Company
 NDDOT North Dakota Department of Transportation
 NE REG WD Northeast Regional Water District
 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
 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
 PAAP Plains All American Pipeline
 P L E M Prairielands Energy Marketing
 POLAR COM Polar Communications
 PVT ELEC Private Electric
 QWEST Qwest Communications
 R&T REG WD R & T Water District

RED RIV COMM Red River Communications
 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
 SE W U Southeast 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 RWD Stutsman Rural Water District
 SW PL PRJ Southwest Pipeline Project
 SWWA Southwest Water Authority
 SUNOCO Sunoco LP
 T M C Turtle Mountain Communications
 TCI TCI of North Dakota
 TESORO HGH PLNS PL Tesoro High Plains Pipeline
 TRI-CNTY WU Tri-County Water Users Incorporated
 TRL CO WRD Traill County Water Resource District
 UNTD TEL United Telephone
 UPPR SOUR WD Upper Souris Water District
 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
 WAPA Western Area Power Administration
 WAWSA Western Area Water Supply Authority
 WEB W. E. B. Water Development Association
 WILLI WRD Williams County Water Resource District
 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

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

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

Proposed Topography

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

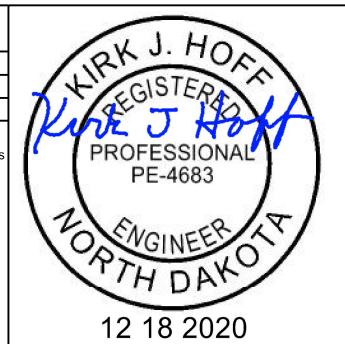
Traffic Utilities

- 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

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

Geotechnical

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

- Small Hidden Object
- Large Hidden Object
- Phantom Object
- Existing Conditions Object
- Centerline Main
- Centerline Secondary
- Excavation Limits
- Proposed Ground
- Sheet Piling

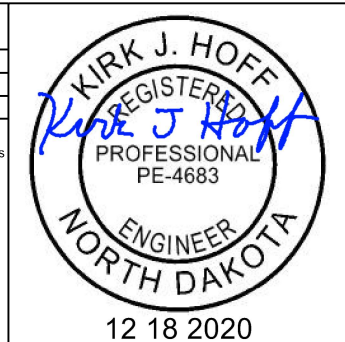
Erosion Control

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

Environmental

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
09-23-16	Added and Revised Items, Organized by Functional Groups General Revisions
12-18-20	



SYMBOLS



North Arrow (Half Scale)



Alignment Data Point



Alignment Monument



Spot Elevation



Existing Miscellaneous Spot



Existing Access Control Arrow



Existing Benchmark



Reset USGS Marker



Iron Monument Found



Iron Pin R/W Monument



Property Corner



Iron Pin Reference Monument



Right of Way Marker (Exst, Ppsd, Reset)



Existing Federal Reference Corner



Existing Section Corner (Full, Quarter, Sixteenth, Meander)



Existing Witness Corner



Existing Control Point (CP, GPS-RTK, TRI)



Existing Traverse PI Aerial Panel



Existing Reference Marker Point NGS



Existing EFB Misc



Existing Bush or Shrub



Existing Large Evergreen Tree



Existing Small Evergreen Tree



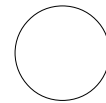
Existing Large Tree



Existing Small Tree



Existing Tree Trunk



Cairn or Stone Circle



Existing Artifact



Existing Satellite Dish



Existing Weather Station



Existing Windmill or Tower



Reinforced Pavement



Continuous Split Barrel Sample



Flight Auger Sample



Split Barrel Sample



Thinwall Tube Sample



Standard Penetration Test



Inclinometer Tube



Excavation Unit



Existing Ground Water Well Bore Hole

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

07-01-14

REVISIONS
















































































DATE	CHANGE
12-18-20	General Revisions



12 18 2020

SYMBOLS

D-101-32

 Existing Luminaire  Luminaire LED  Existing Light Standard Luminaire  Relocate Light Standard  Light Standard Light LED Luminaire  Light Standard 35 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 100 Watt High Pressure Sodium Vapor Luminaire  Light Standard 150 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 400 Watt High Pressure Sodium Vapor Luminaire  Light Standard 700 Watt High Pressure Sodium Vapor Luminaire  Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire  Emergency Vehicle Detector  Video Detection Camera	  High Mast Light Standard 3 Luminaire (Exst, Ppsd)   High Mast Light Standard 4 Luminaire (Exst, Ppsd)   High Mast Light Standard 5 Luminaire (Exst, Ppsd)   High Mast Light Standard 6 Luminaire (Exst, Ppsd)   High Mast Light Standard 7 Luminaire (Exst, Ppsd)   High Mast Light Standard 8 Luminaire (Exst, Ppsd)   High Mast Light Standard 9 Luminaire (Exst, Ppsd)   High Mast Light Standard 10 Luminaire (Exst, Ppsd)   Overhead Sign Structure Load Center (Exst, Ppsd)   Traffic Signal Controller (Exst, Ppsd)   Pad Mounted Traffic Signal Controller (Exst, Ppsd)   Flashing Beacon (Exst, Ppsd)   Concrete Foundation (Exst, Ppsd)   Pipe Mounted Flasher (Exst, Ppsd)   Pad Mounted Feed Point (Exst, Ppsd)   Pipe Mounted Feed Point with Pad (Exst, Ppsd)   Pole Mounted Feed Point (Exst, Ppsd)   Junction Box (Exst, Ppsd)  Existing Pedestrian Head with Number  Existing Signal Head  Pole Mounted Head  Existing Lighting Standard Pole	 Existing Traffic Signal Standard    Pull Box (Exst-Ppsd-Undefined)   Intelligent Transportation Pull Box (Exst, Ppsd)   Transformer (Exst, Ppsd)    Power Pole (Exst-Ppsd-with Transformer)   Wood Pole (Exst, Ppsd)   Pedestrian Push Button Post (Exst, Ppsd)  Existing Pole  Existing Telephone Pole  Existing Post     Connection Conductor (Ground, Neutral, Phase 1, Phase 2)
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NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions



KIRK J. HOFF

REGISTERED

PROFESSIONAL

PE-4683

ENGINEER

NORTH DAKOTA

12 18 2020

SYMBOLS

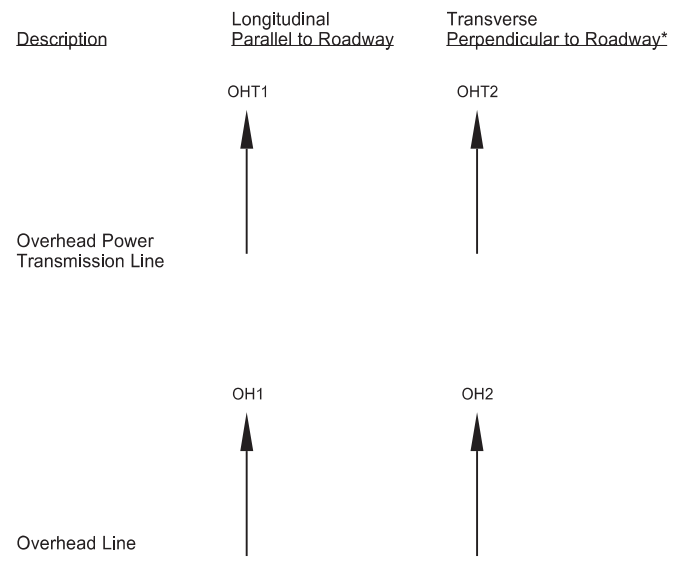
D-101-33

			Existing Manhole (Electrical, Gas, Telephone)		Cap or Stub Exst Gas, Exst Sanitary, Exst Storm Drain, Ppsd Storm Drain, Exst Water
			Water Manhole (Exst, Exst with Valve)		
			Sanitary Sewer Manhole (Exst, Ppsd, Exst with Valve)		Existing Pedestal Electrical, Telephone, Fiber Optic Telephone, TV, Fiber Optic TV, Undefined
			Sanitary Force Main Manhole (Exst, Ppsd, Exst with Valve)		
			Storm Drain Manhole (Exst, Ppsd, Exst with Inlet, Ppsd with Inlet)		Existing Pipe Vent Gas, Fuel, Sanitary, Storm Drain, Water, Undefined
			Force Main Storm Drain Manhole (Exst, Exst with Valve)		
			Manhole (Ppsd, Ppsd 48 Inch, Exst Undefined)		Valve Exst Gas, Exst Water, Ppsd Water, Exst Undefined
			Existing Water Appurtenance		
			Sprinkler Head (Exst, Ppsd)		Pump Sanitary, Storm Drain, Exst Water
			Fire Hydrant (Exst, Ppsd)		
			Cleanout (Exst Sanitary, Underdrain)		Corrugated Metal End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)
			Existing Catch Basin Inlet (Round, Square)		Reinforced Concrete End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)
			Existing Curb Inlet (Round, Square)		
			Existing Slotted Reinforced Concrete Pipe		
			Catch Basin (Riser 30 Inch, Beehive, Type A)		Existing Utility Marker
			Inlet Mountable Curb (Type A, Type B)		Existing Meter
			Inlet Saddle Base (Type 1, Type 2)		Existing Fuel Dispensers
			Inlet Special (Catch Basin, Type 1, Type A)		Existing Fuel Filler Pipes
			Inlet (Tee, Type 1, Type 2, Type 2 Double)		Existing Fuel Leak Sensors
			Median Drain		
			Headwall (Exst, Ppsd, Ppsd Single with Vegetation Barrier, Ppsd Double with Vegetation Barrier)		

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions Sheet added - Continued from D-101-32

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



Light Standard - Multiple Variations
Concrete
Steel
Wood
with Traffic Signal

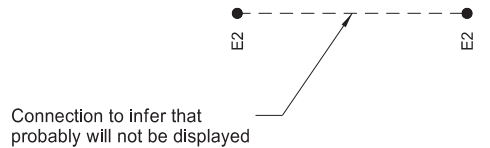
Pole - Multiple Variations
Utility
Brace
Feed Point
Guy
Power
Power Structure
Power with Light
Power with Transformer

Manhole - Multiple Variations
Electric
Fiber Optic
Gas
Inlet
Sanitary Force Main
Sanitary
Sanitary with Valve
Steam
Storm
Storm Force Main
Storm with Valve
Telephone
Water
Water with Meter
Water with Valve
Water with Air Release Valve

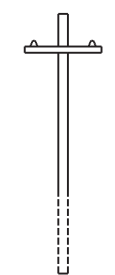
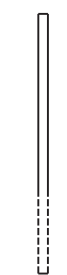
Anchor

High Tension Cable Guardrail

* 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.



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.



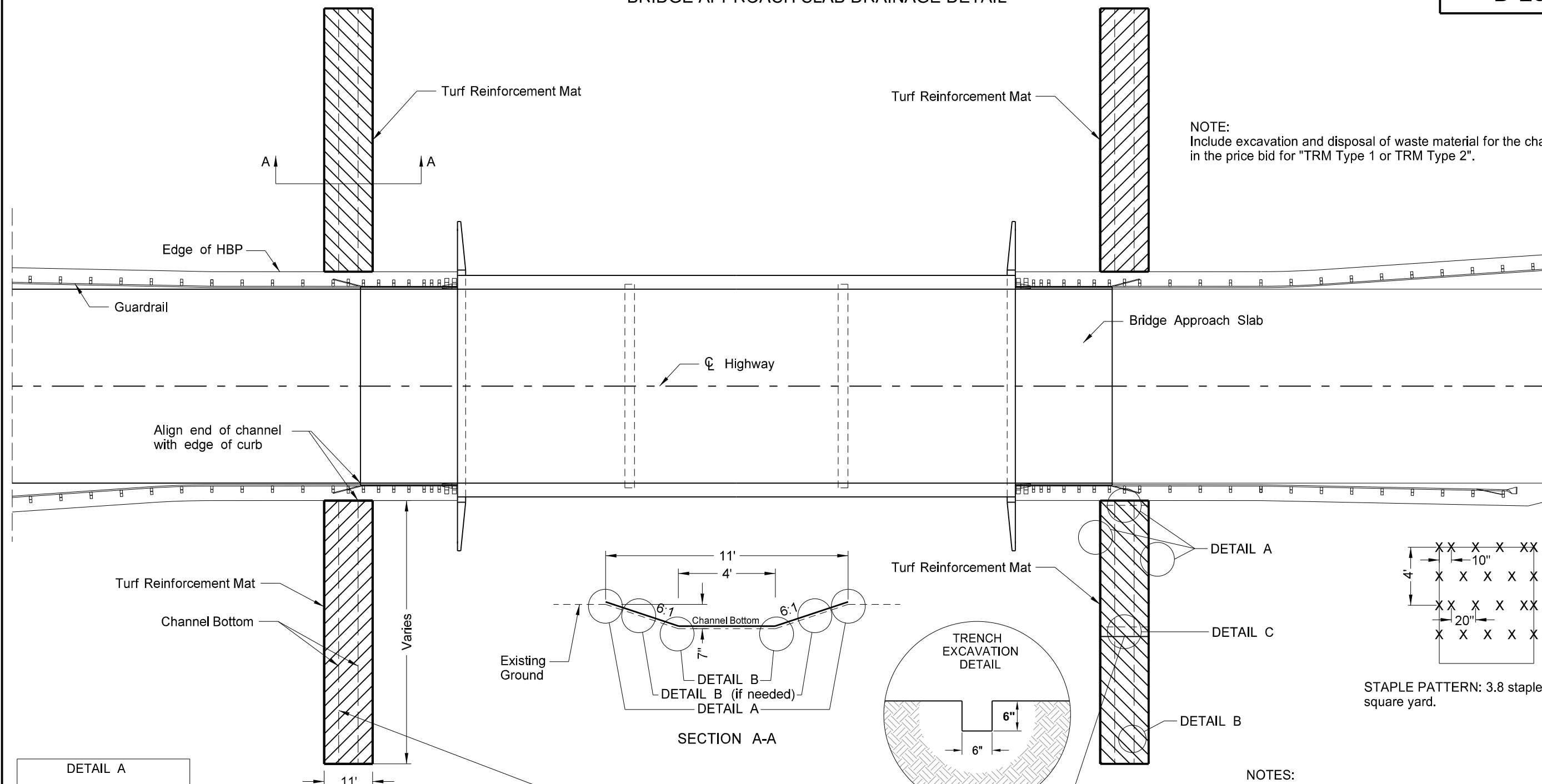
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-20-18	
REVISIONS	
DATE	CHANGE
6/14/2023	CADD Standards Update



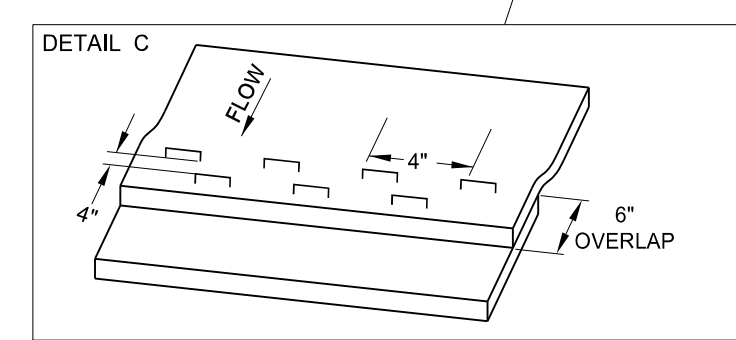
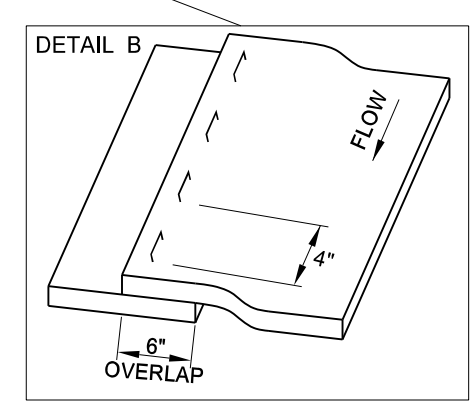
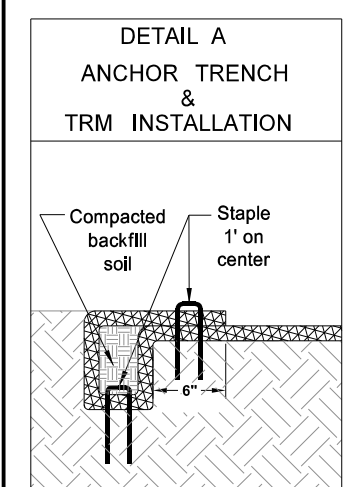
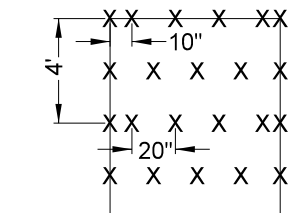
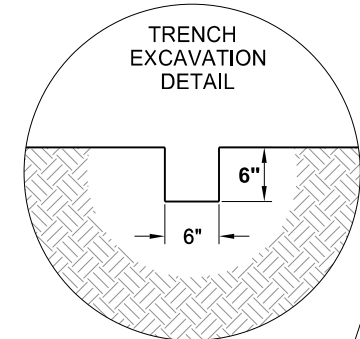
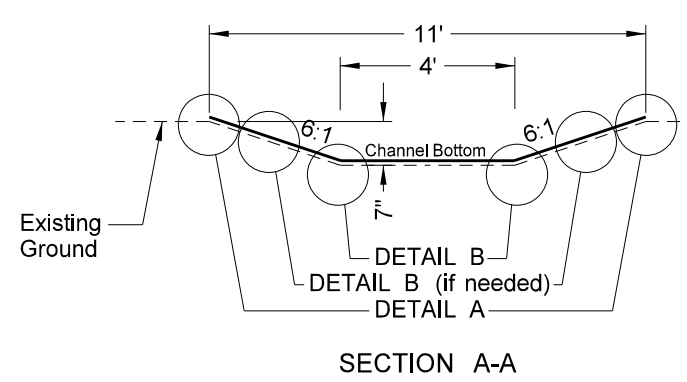
06/14/23

BRIDGE APPROACH SLAB DRAINAGE DETAIL

D-255-1



NOTE:
Include excavation and disposal of waste material for the channel in the price bid for "TRM Type 1 or TRM Type 2".

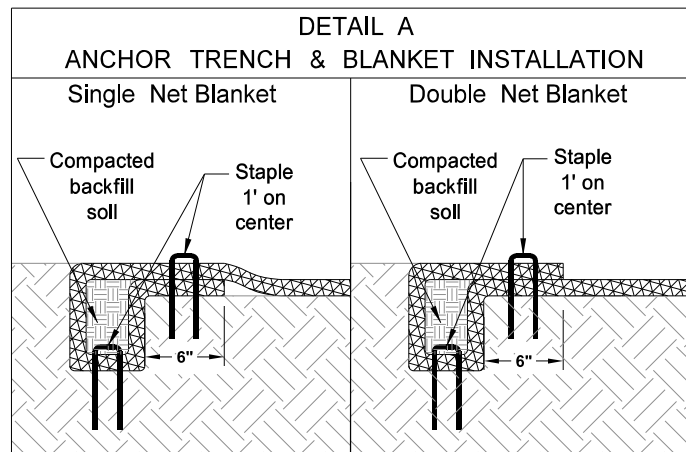


NOTES:
Don't place longitudinal seams along the channel bottom.
Top seam must be minimum 0.5' above the channel bottom.

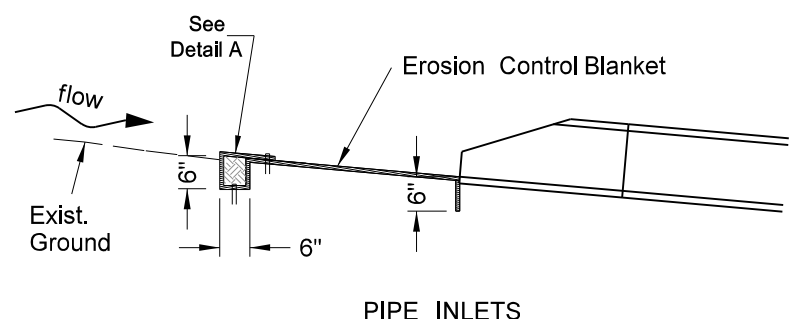
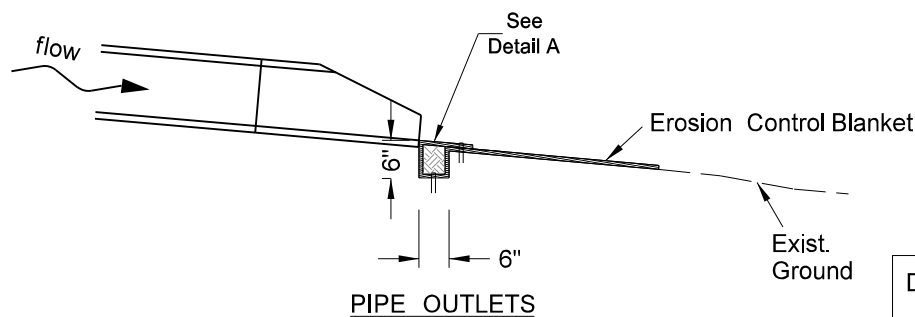
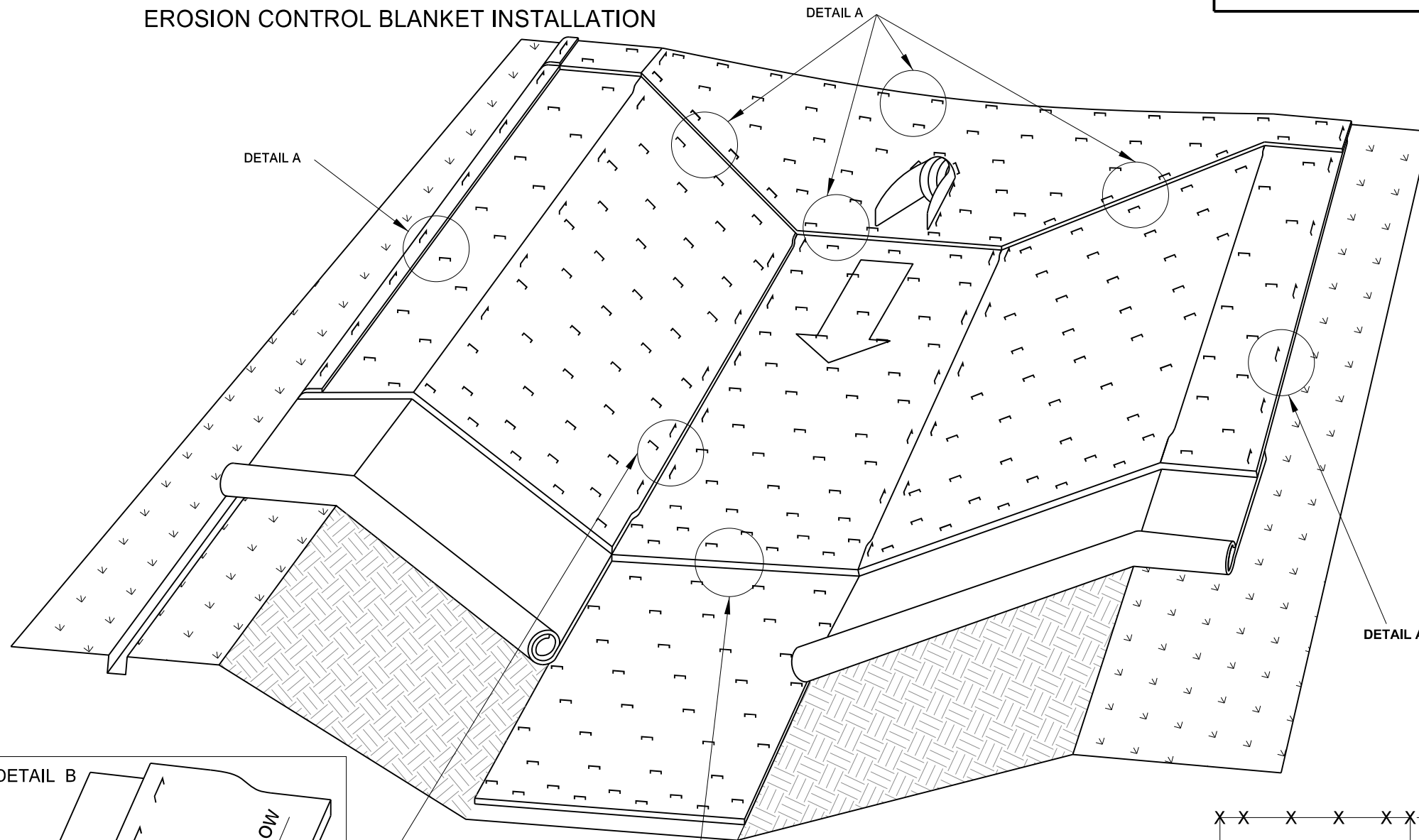
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-4 to D-255-1.
07-27-15	Changed installation details.
08-27-19	New Design Engineer PE Stamp.

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Kirk J Hoff,
Registration Number
PE- 4683,
on 08/27/19 and the original document is stored at the North Dakota Department of Transportation

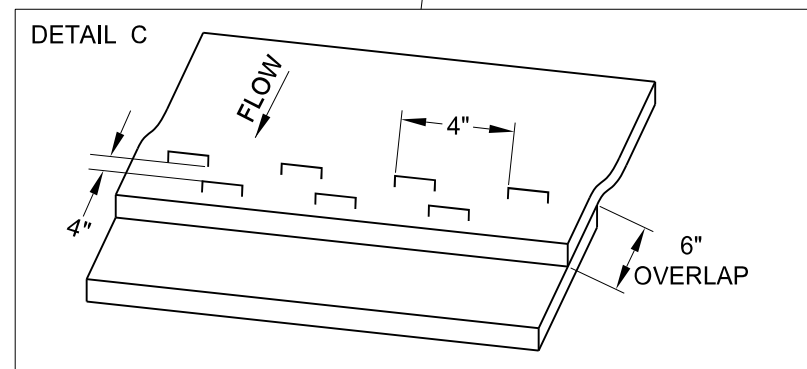
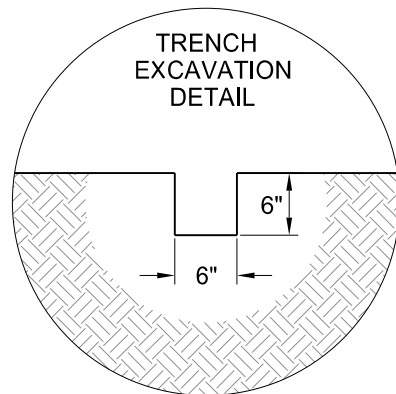
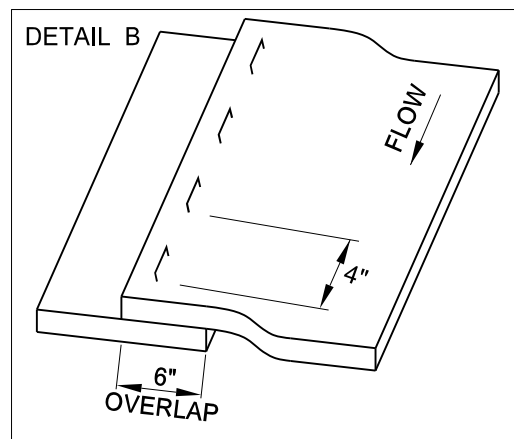
EROSION AND SILTATION CONTROL
EROSION CONTROL BLANKET INSTALLATION



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

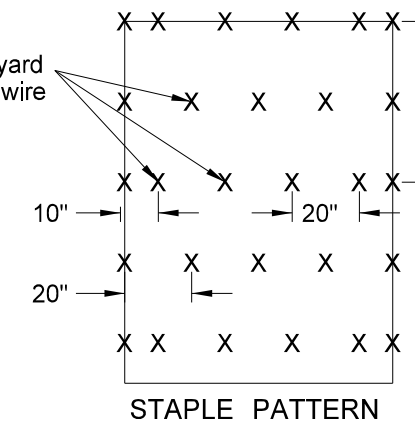


INSTALLATION AT PIPE ENDS



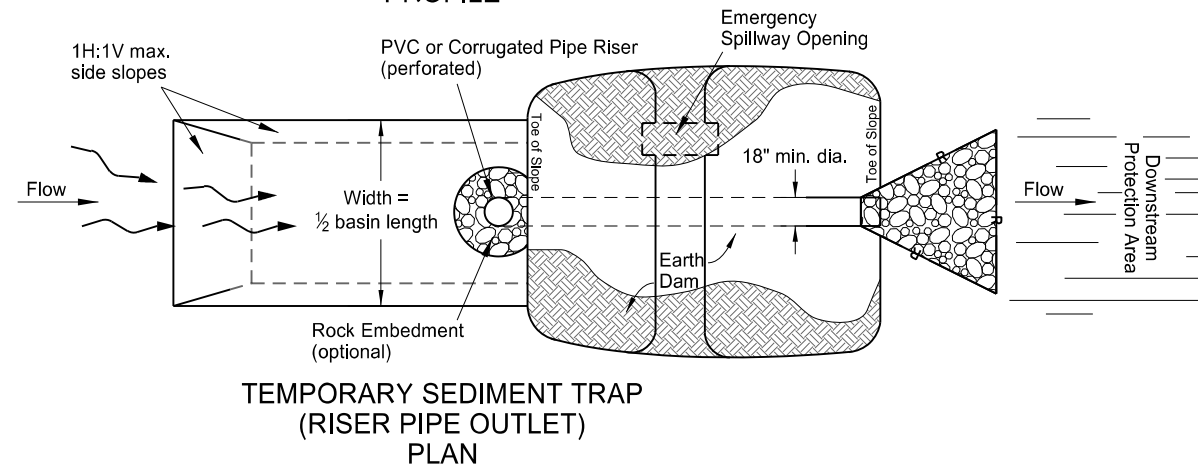
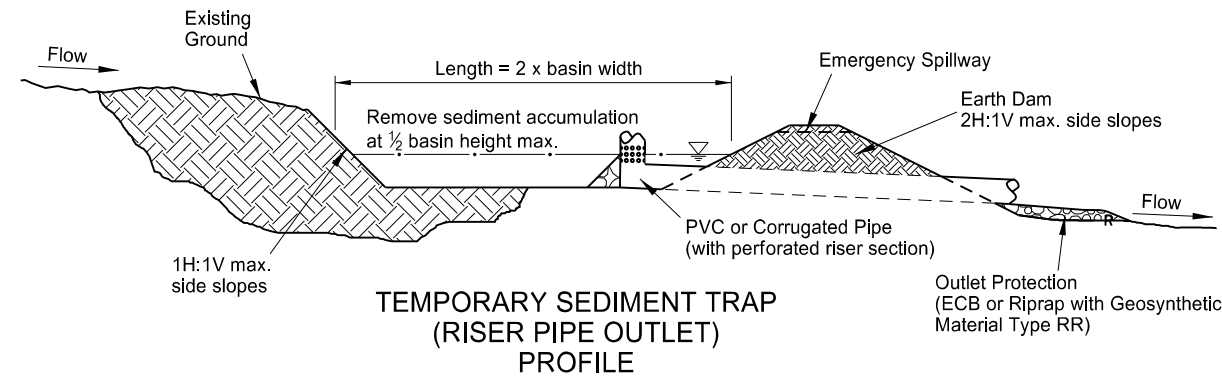
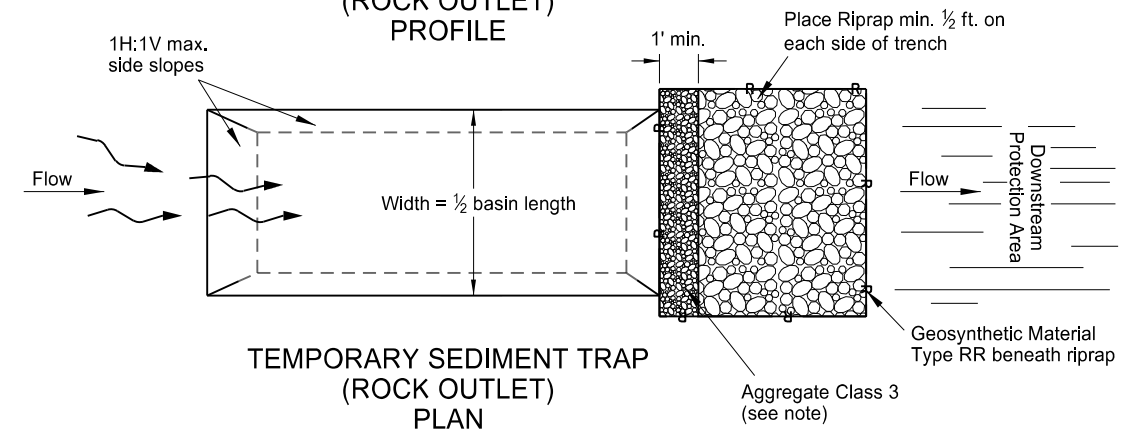
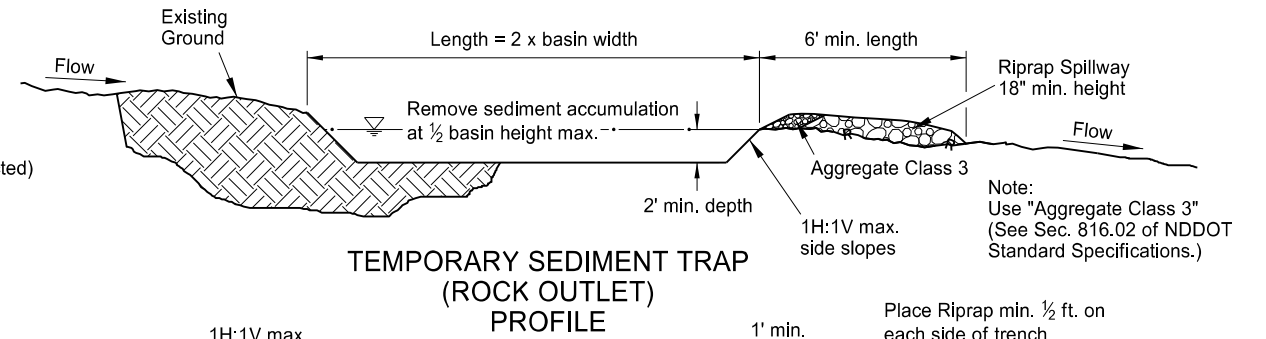
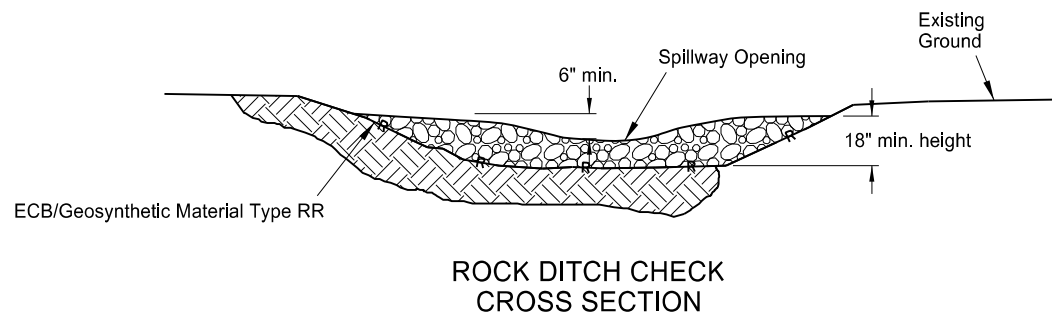
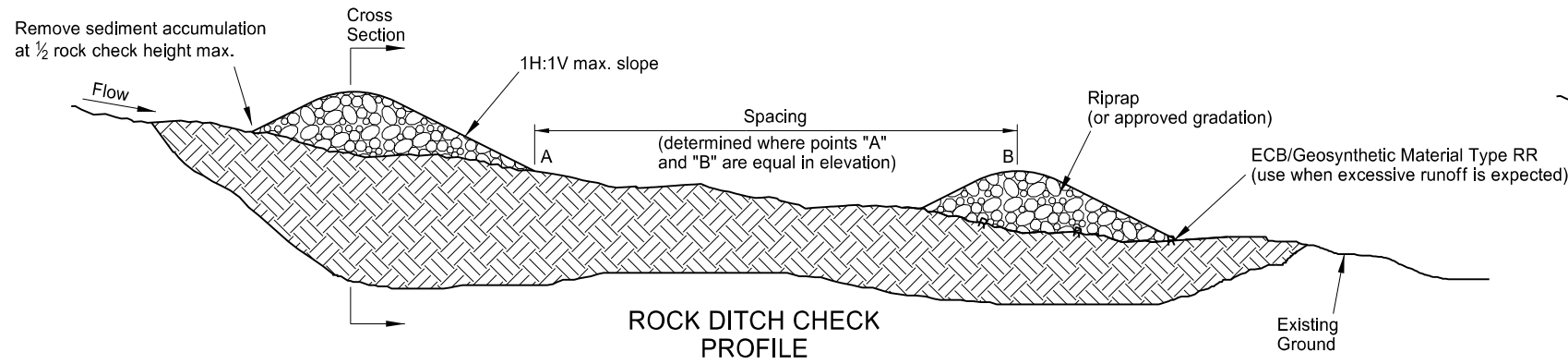
BLANKET LAYOUT
CHANNEL OR SLOPE INSTALLATION

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



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-5 to D-255-2.
07-27-15	Changed Installation details such as trench depth and overlap dimensions.
08-27-19	New Design Engineer PE Stamp.

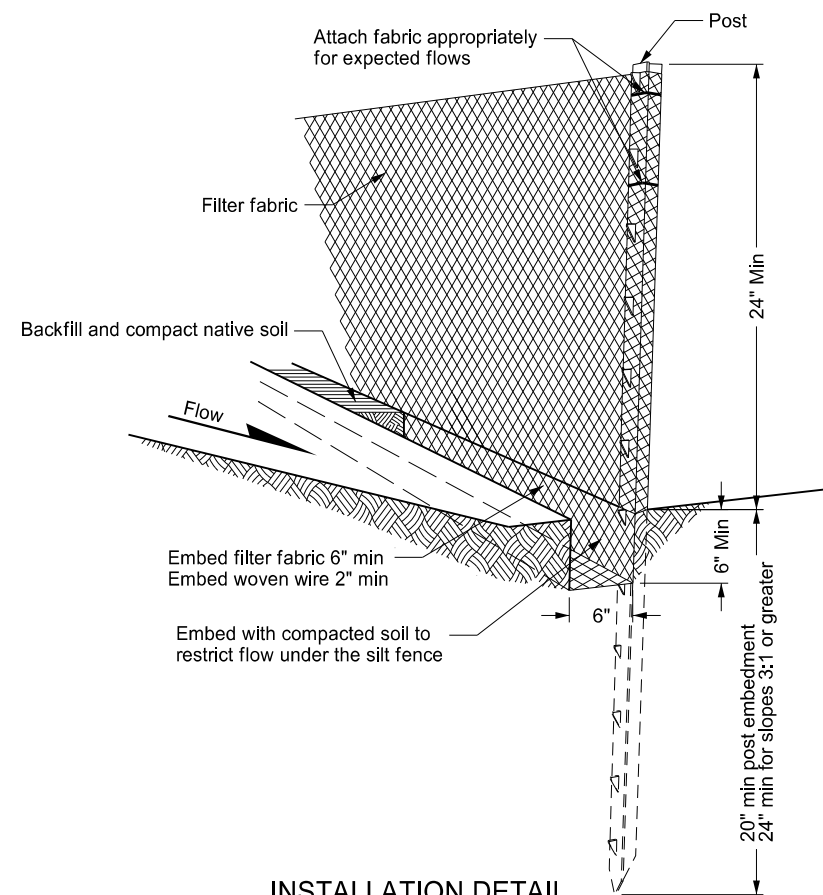
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NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-2 to D-256-1. Deleted silt fence details.
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp

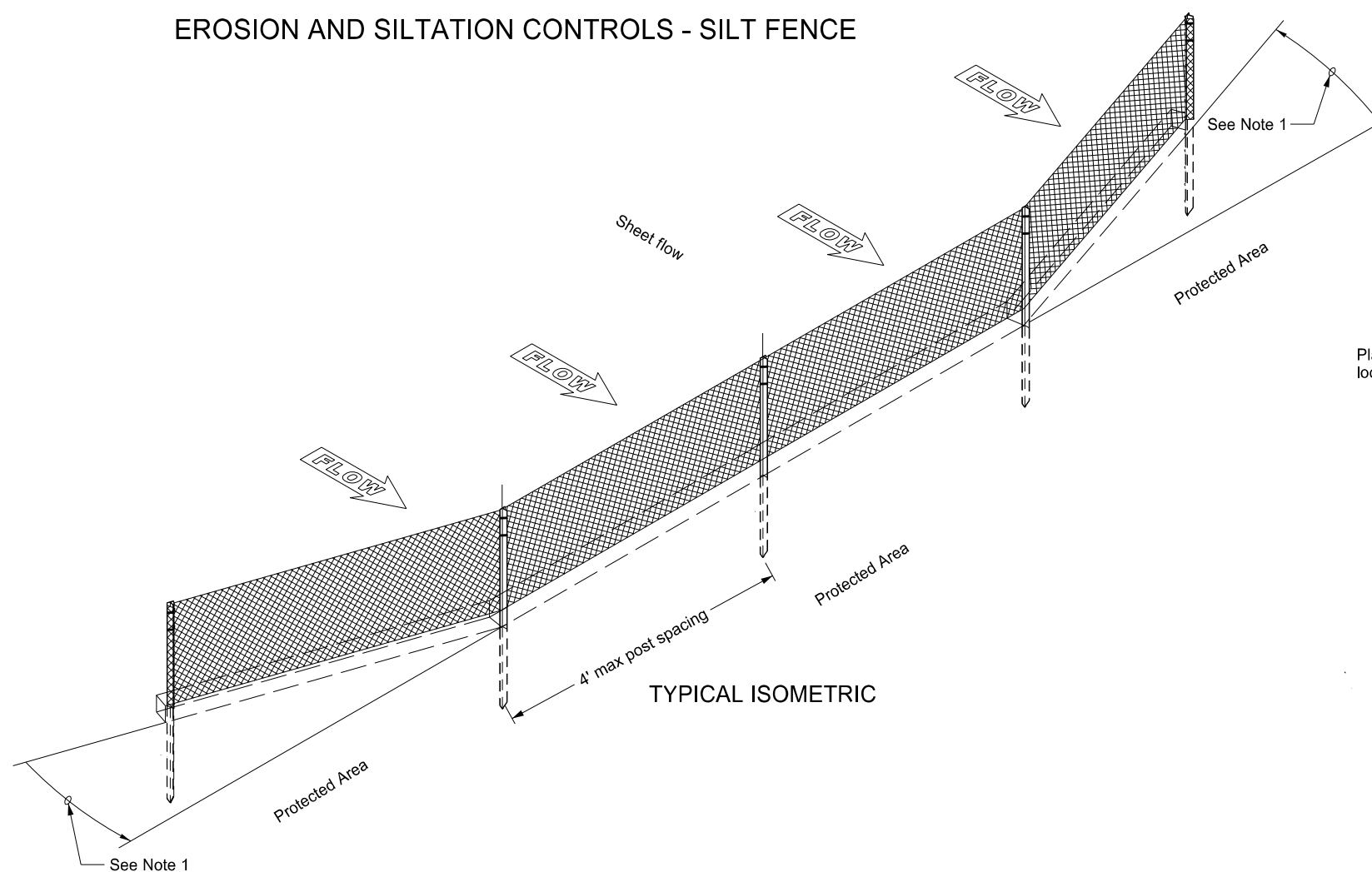
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EROSION AND SILTATION CONTROLS - SILT FENCE

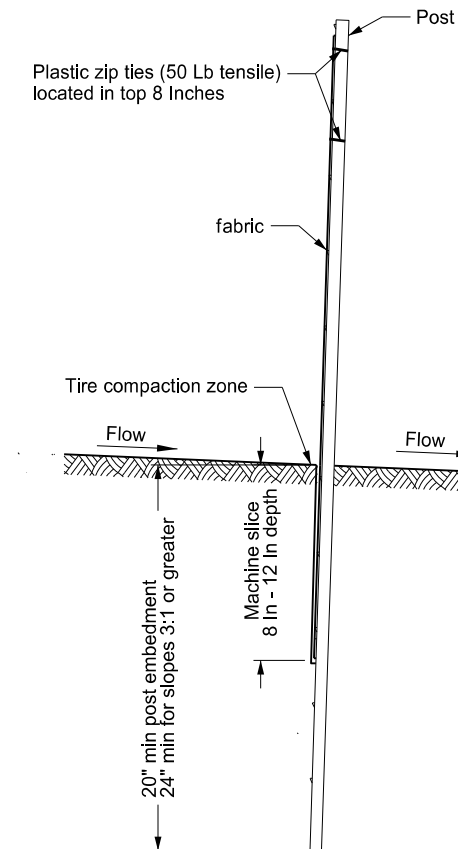


INSTALLATION DETAIL

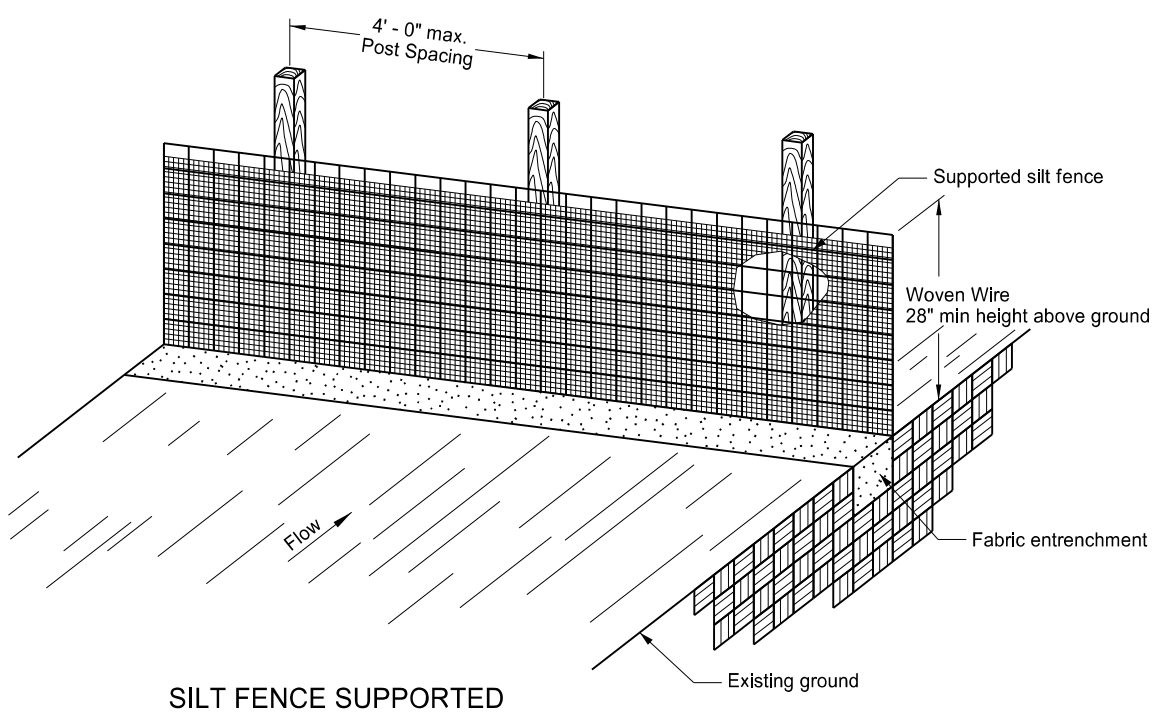
Minimize disturbance of ground around trench and smooth surface after excavation to avoid concentrating flows. Compact to prevent undercutting flows.



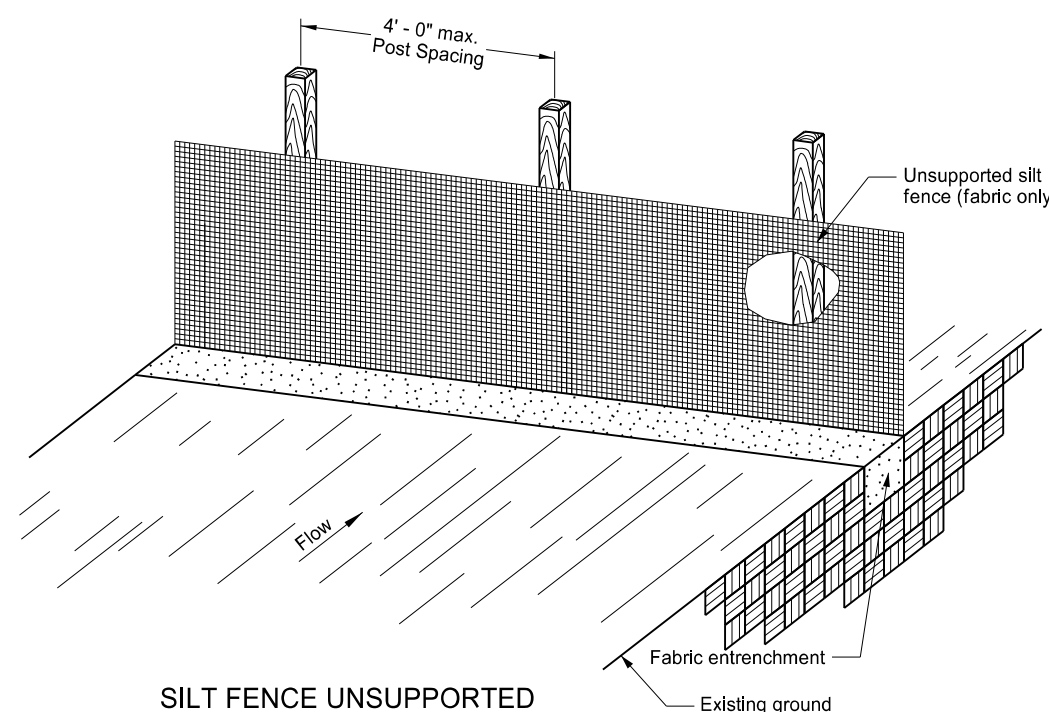
TYPICAL ISOMETRIC



MACHINE SLICED SILT FENCE



SILT FENCE SUPPORTED



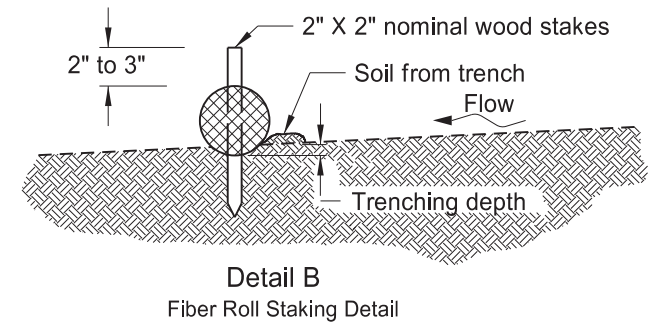
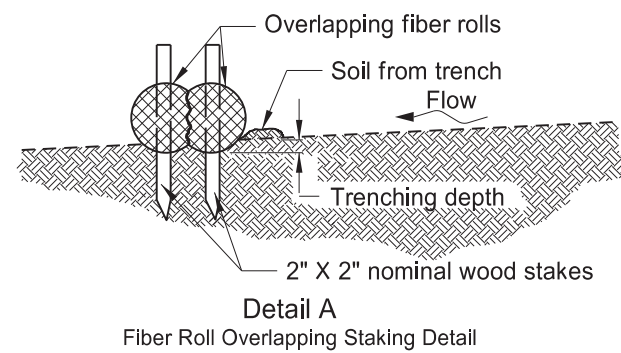
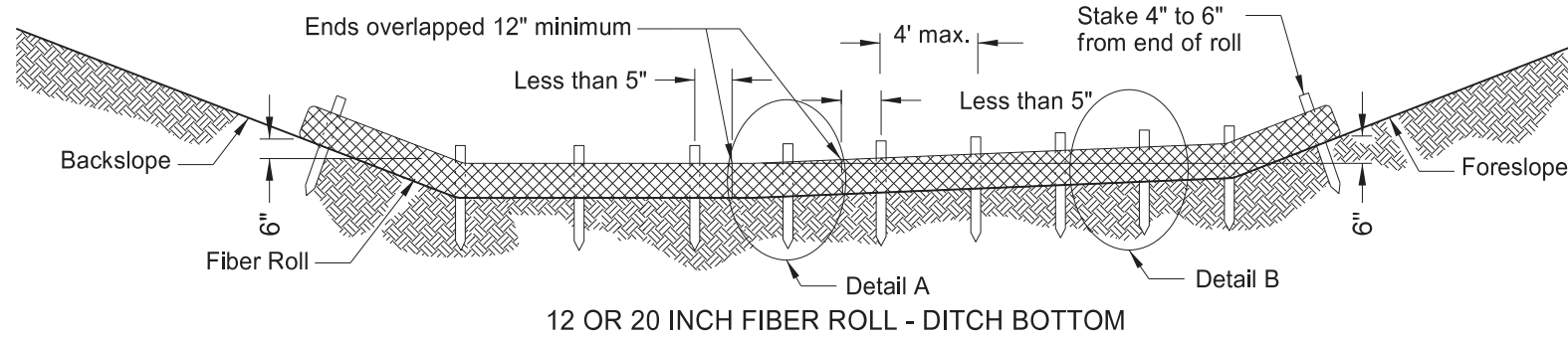
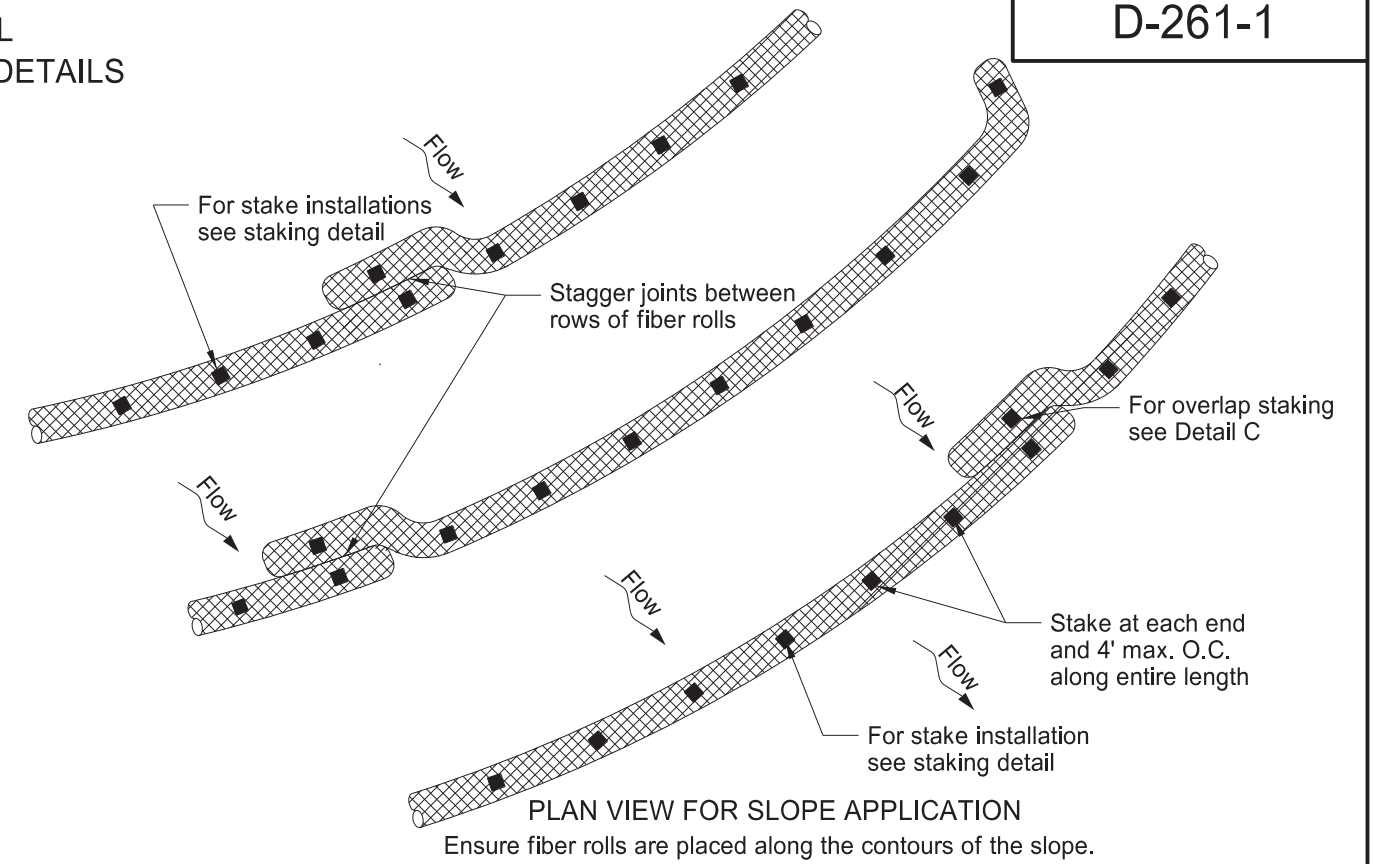
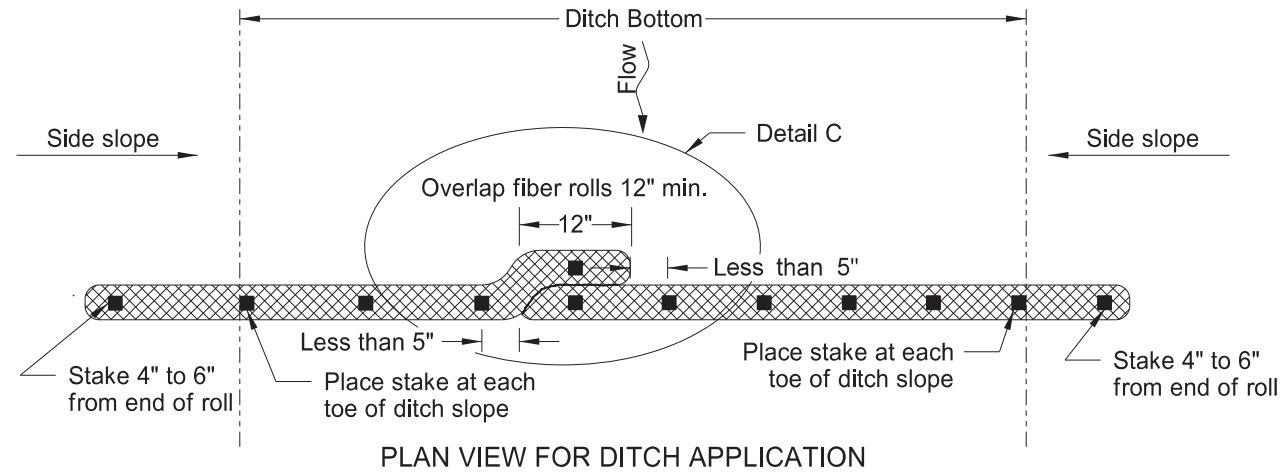
SILT FENCE UNSUPPORTED

- 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.

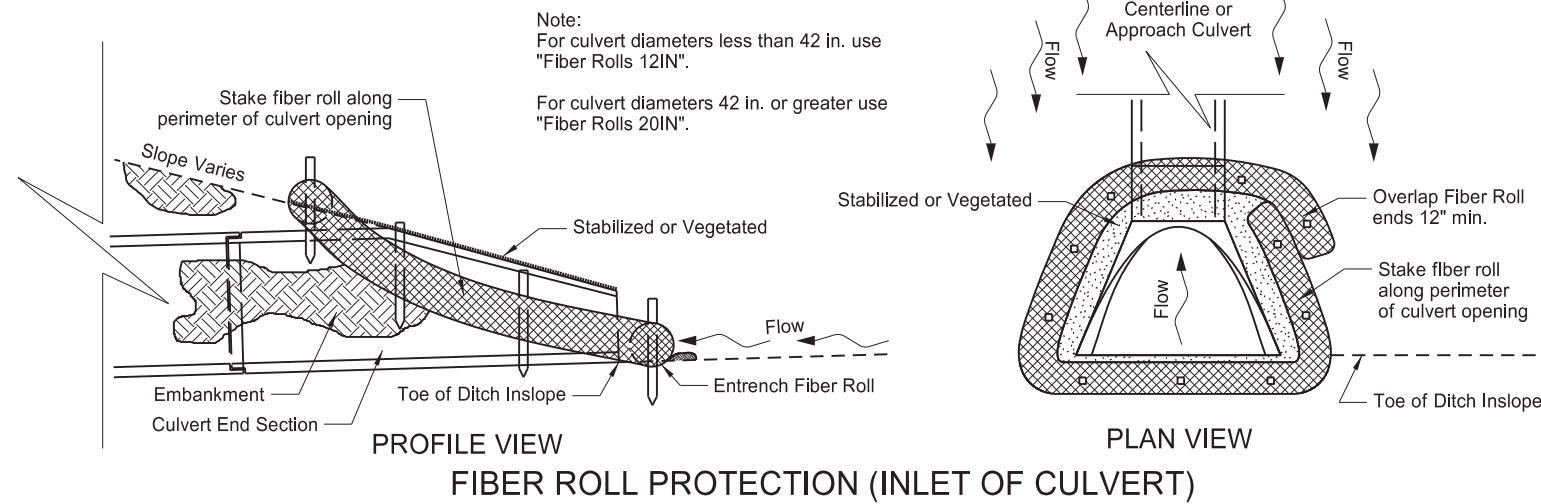
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Standard drawing resulted from splitting standard D-708-2.
06-27-16 08-27-19	Revised details & added new ones, New Design Engineer PE Stamp.

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 North Dakota Department
 of Transportation

EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS



NOTE: Do not allow runoff to run under or around roll.



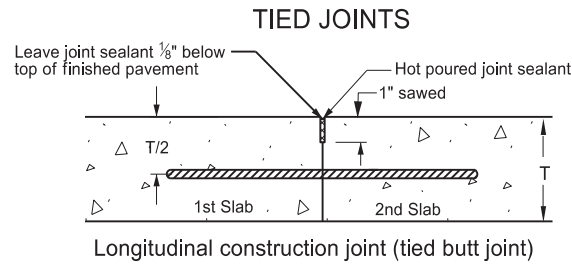
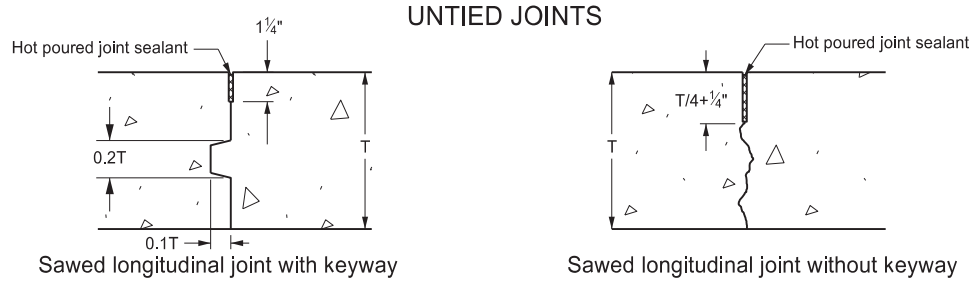
FIBER ROLL DIAMETER	NOMINAL STAKE SIZE	MINIMUM STAKE LENGTH	TRENCH DEPTH	
			MINIMUM	MAXIMUM
6"	2" x 2"	18"	2"	2"
9" or 12"	2" x 2"	24"	2"	3"
20"	2" x 2"	36"	3"	5"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-18-10	
REVISIONS	
DATE	CHANGE
06-10-13	Added plan view for ditch and slope application. Added table with values for stake and trench dimensions.
06-26-14	Revised fiber roll overlap detail. Changed standard drawing number from D-708-7 to D-261-1.
08-27-19	New Design Engineer PE Stamp.
04-22-24	Slope Plan View-overlap change.
03-13-25	Added D-708-6 Culvert Inlet detail.



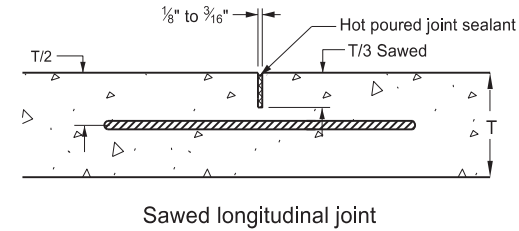
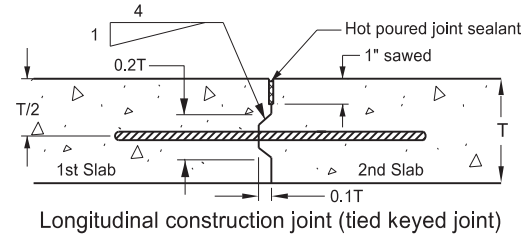
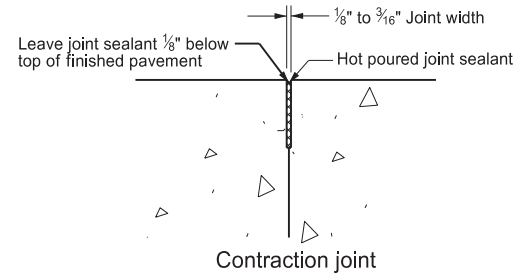
03/13/25

LONGITUDINAL JOINT DETAILS



Notes:

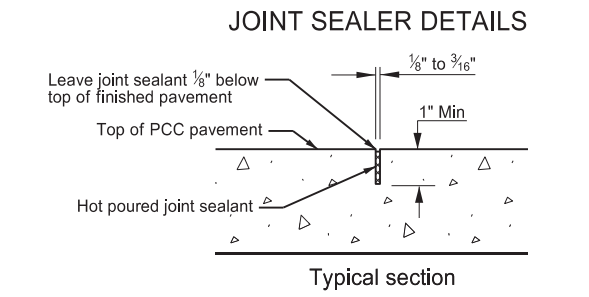
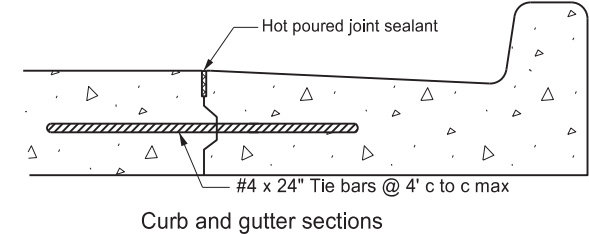
1. Provide hot poured joint sealant meeting the requirements of Section 826.02A.2 of the Standard Specifications.
2. Include all costs of the longitudinal joint and seal in the price bid for the PCC pavement.
3. Do not place tie bars within 18 inches of a transverse joint.
4. Use Grade 40 steel for tie bars installed bent and later straightened.
5. Increase the maximum tie bar spacing up to 10%, when necessary to facilitate construction.
6. Place tie Bars at a 48 inch maximum spacing.
7. A "Warp" joint is a sawed joint or a construction joint with a keyway.
8. A "Butt joint" is a construction joint with no keyway.



TIEBAR SPACINGS (In)*

TIE BARS	STEEL GRADE SIZE & LENGTH	40				60				40				60				40				60																					
		#3x24" BARS				#3x30" BARS				#4x24" BARS				#4x36" BARS				#5x30" BARS				#5x42" BARS				#6x36" BARS				#6x48" BARS													
DIST TO NEAREST FREE EDGE	PCC PVMT DEPTH	4	6	8	10	4	6	8	10	12	14	8	10	12	14	16	8	10	12	14	16	22	24	10	12	14	16	22	24	10	12	14	16	19	22	24	10	12	14	16	19	22	24
6"	WARP																																										
6"	BUTT																																										
8"	WARP	48	39	29	24	48	48	44	35	29	25	48	42	35	30	26	48	48	45	39	28	26	48	48	47	41	30	27	48	48	48	45	41	48	48	48	48	48	48	48			
8"	BUTT	42	27			48	42	31	25			37	29	24			48	44	37	32	27			46	39	33	29			48	48	48	43	32	29	48	48	48	48	48	48	48	
8 1/2"	WARP	48	37	28		48	48	42	33	28	24	48	39	33	28	24	48	48	48	42	37	27	24	48	48	44	38	28	25	48	48	48	42	38	48	48	48	48	48	48	48		
8 1/2"	BUTT	39	26			44	39	29				35	27				48	42	35	29	26			44	36	31	27			48	48	47	41	30	27	48	48	45	39	33	28	26	
9"	WARP	48	35	26		48	48	39	31	26		47	37	31	26		48	48	47	40	35	25		48	48	42	36	26	24	48	48	48	40	36	48	48	48	48	48	48	48		
9"	BUTT	37	24			48	37	27				33	26				48	40	33	28	25			41	34	29	25			48	48	44	39	28	25	48	48	42	37	31	26	24	
9 1/2"	WARP	48	33	25		48	48	37	30	25		44	35	29	25		48	48	44	38	33	24		48	46	39	34	25		48	48	48	38	34	48	48	48	48	48	48	48		
9 1/2"	BUTT	35				48	35	26				31	25				47	37	31	27				39	32	27	25			48	48	42	37	27	24	48	47	40	35	29	25		
10"	WARP	47	31			48	47	35	28			42	34	28	24		48	48	42	36	31			48	44	37	33	24		48	48	48	36	33	48	48	48	48	48	48	48		
10"	BUTT	33				48	33	25				29	24				45	36	29	25				37	31	26	24			48	46	40	35	25		48	45	38	33	28	24		
10 1/2"	WARP	45	30			48	45	34	27			40	32	26			48	48	40	34	30			48	42	36	31			48	48	48	34	31	48	48	48	45	38	33	30		
10 1/2"	BUTT	32				48	32	24				28					42	34	28	24				35	29	25				48	44	38	33	24		48	42	36	32	27			
11"	WARP	43	28			48	43	32	26			38	31	25			48	46	38	33	28			48	40	34	30			48	48	48	45	32	30	48	48	48	43	36	31	28	
11"	BUTT	30				46	30					27					40	32	27					34	28	24				48	42	36	32			48	40	35	30	25			
11 1/2"	WARP	41	27			48	41	31	24			36	29	24			48	44	36	31	27			46	38	32	28			48	48	48	43	31	28	48	48	47	41	34	30	27	
11 1/2"	BUTT	29				44	29					25					39	31	25					32	27					48	40	35	30			46	39	33	29	24			
12"	WARP	39	26			48	39	29				35	28				48	42	35	30	26			44	36	31	28			48	48	47	41	30	27	48	48	45	40	33	28	26	
12"	BUTT	27				42	27					25					37	30	25					31	25					46	39	33	29			45	37	32	28				
12 1/2"	WARP	38	25			48	38	28				33	27				48	40	33	29	25			42	35	30	26			48	48	45	39	28	26	48	48	43	38	32	27	25	
12 1/2"	BUTT	27				40	27					25					35	28						29	25					44	37	32	27			42	35	30	27				
13"	WARP	36	24			48	36	27				32	26				48	39	32	27	24			40	33	29	25			48	48	43	38	27	25	48	48	41	36	30	26	24	
13"	BUTT	25				38	25					26					34	27						28						42	35	30	27			41	34	29	25				
13 1/2"	WARP	35				48	35	26				31	25				47	37	31	26				39	32	28	24			48	48	42	36	26	24	48	47	40	35	29	25		
13 1/2"	BUTT	25				37	25					25					33	26						27						41	34	29	25			39	33	28	25				
14"	WARP	34				48	34	25				30	24				45	36	30	25				37	31	27				48	47	40	35	25		48	45	38	34	28	24		
14"	BUTT	24				35	24					24					32	25						26						39	33	28	25			38	32	27	24				
14 1/2"	WARP	32				48	32	24				29					43	35	29	25				36	30	26				48	45	39	34	24		48	43	37	32	27			
14 1/2"	BUTT	34				34						24					30	25						25						38	32	27	24			36	30	26					
15"	WARP	31				47	31					28					42	33	28	24				35	29	25				48	44	37	33	24		48	42	36	31	26			
15"	BUTT	33				33						24					29							25						37	31	26				35	29	25					

*Spacing where the calculated pullout strength of the tiebar equals the calculated yield strength of the tiebar - 48 inch spacing indicates a calculated spacing of 4 feet or greater.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-2010	
REVISIONS	
DATE	CHANGE
10/23/2012	Expanded Tie Bar Table
03/16/2016	Updated Jt Details & notes
10/25/2019	Corrected "Typo" in Note 3
03/13/2025	Revised C&G Tie Bar Size

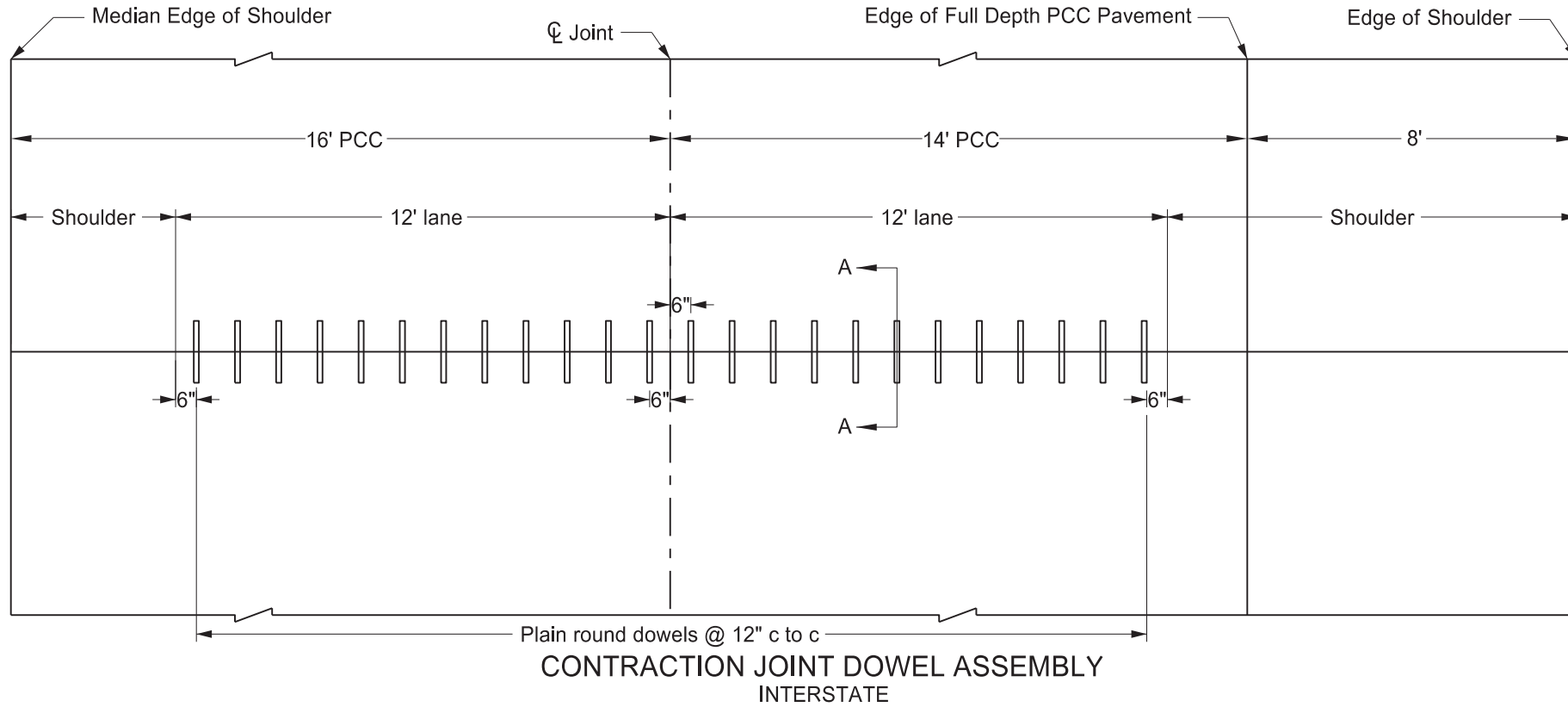
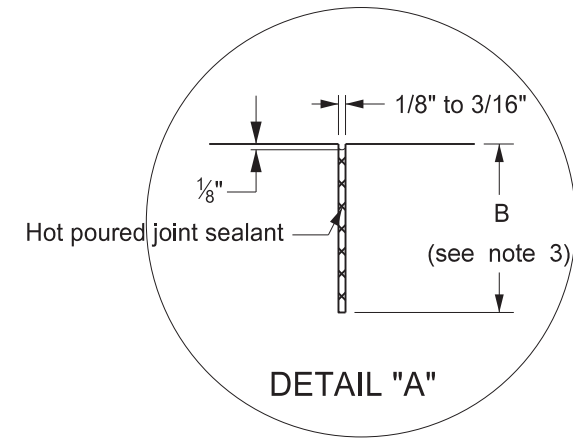


03/13/25

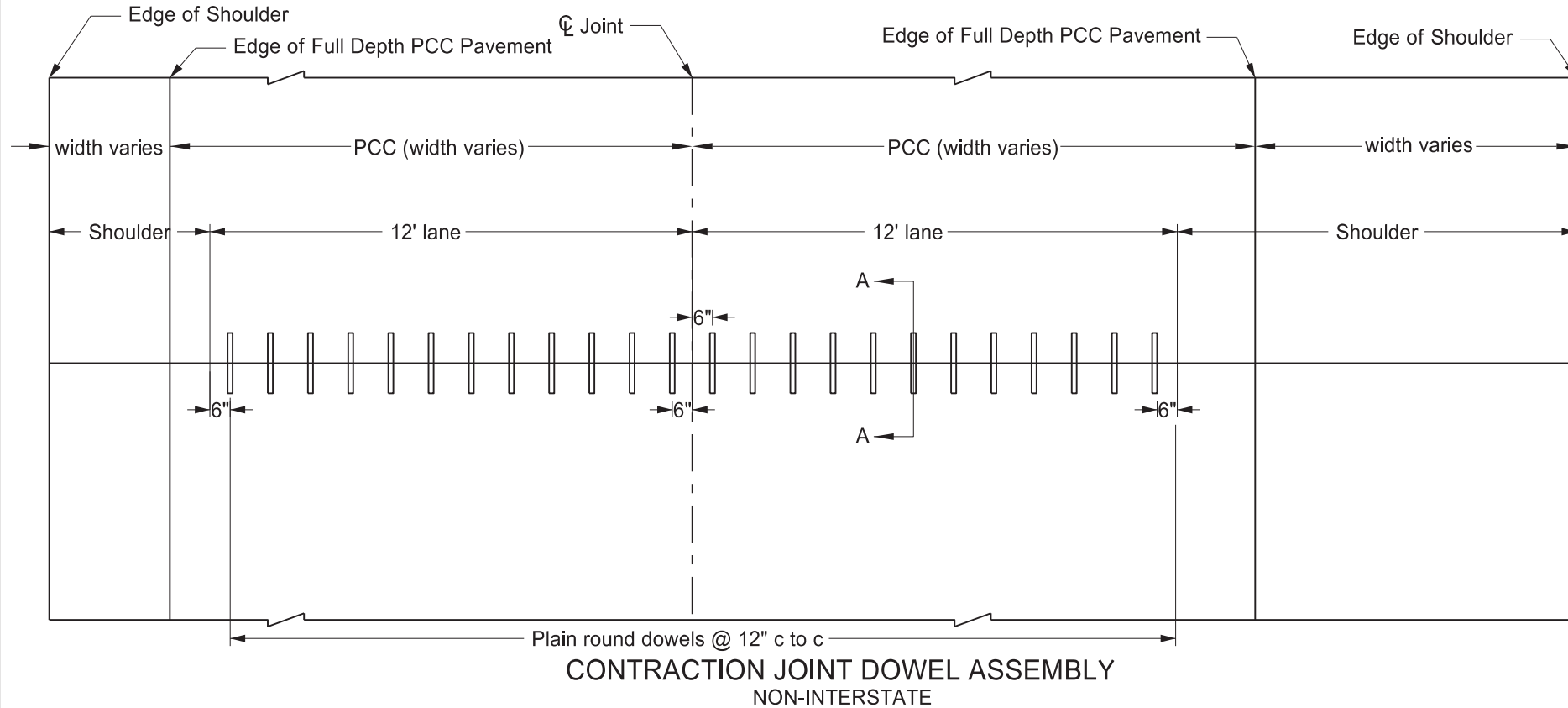
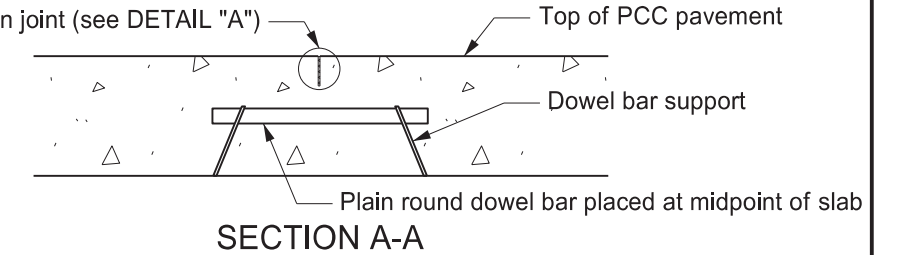
TRANSVERSE CONTRACTION JOINT DETAILS

Notes

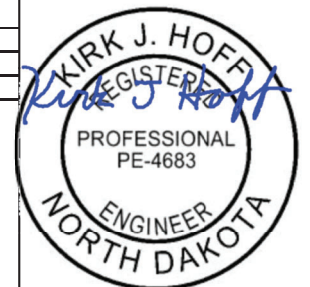
1. The joint seal details apply to both doweled and non-doweled (plain) transverse joints.
2. T = Thickness of pavement.
3. $B = T/4 + 1/4"$ for AE or non-dowelled concrete pavement or $B = T/3$ for AAE or dowelled concrete pavement



Sawed and sealed transverse contraction joint (see DETAIL "A")

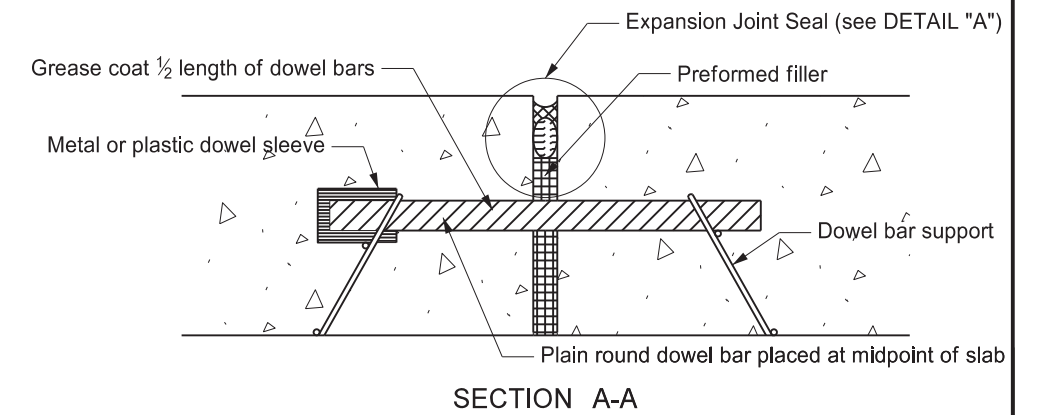
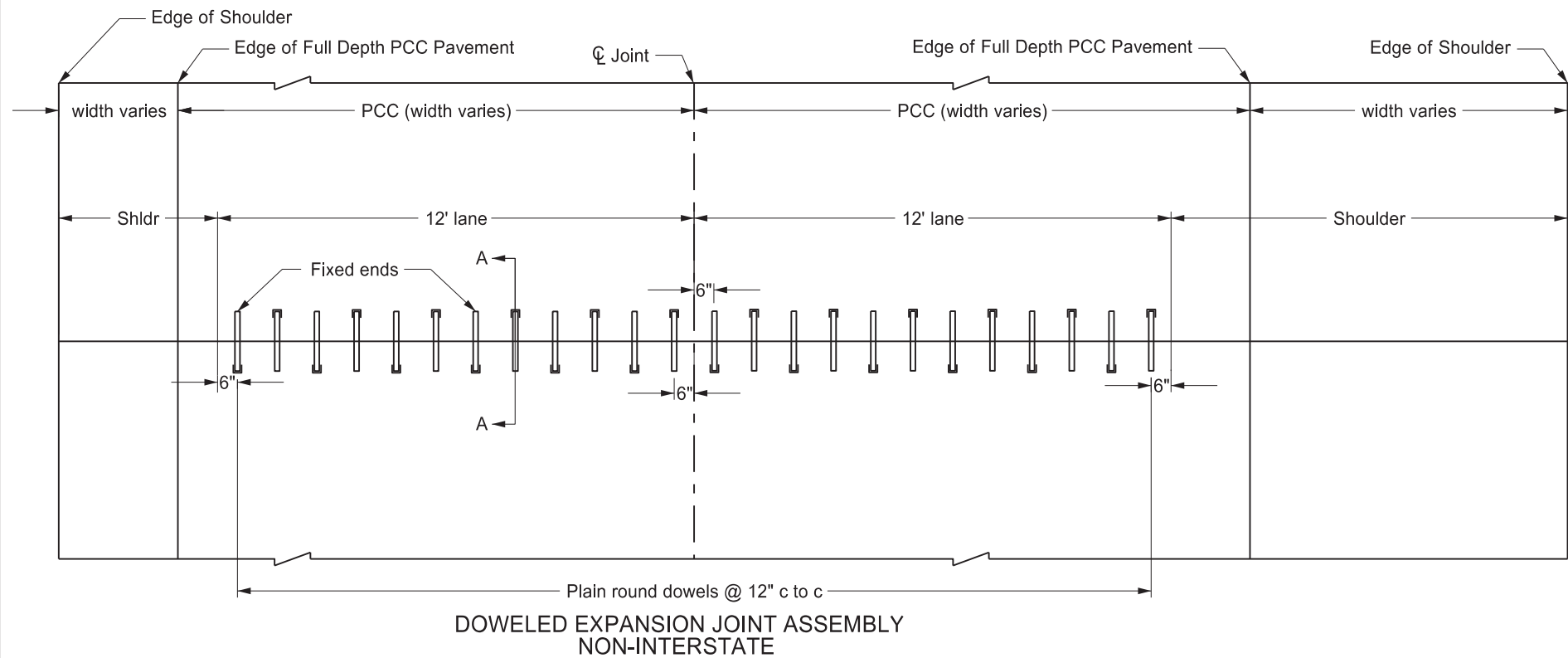
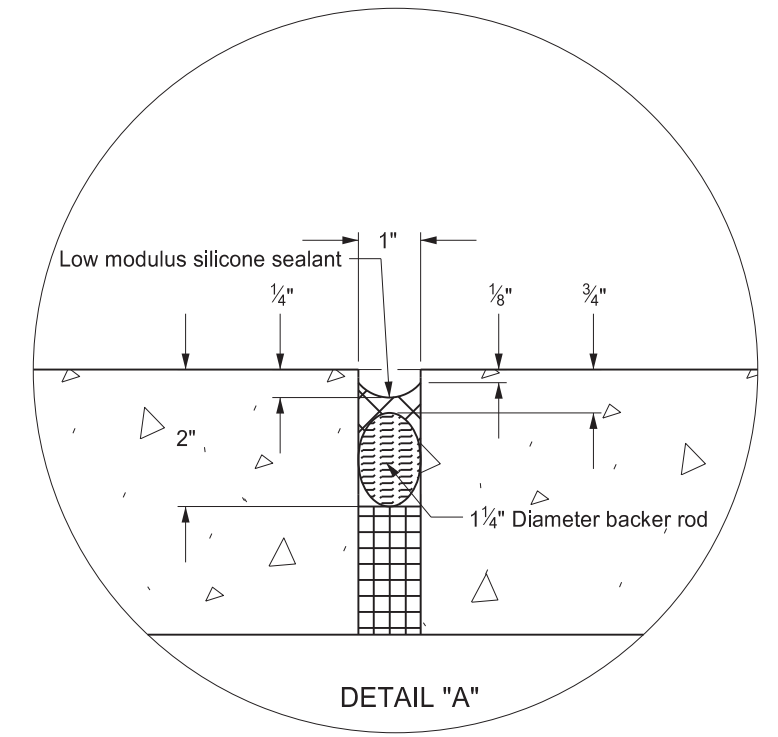
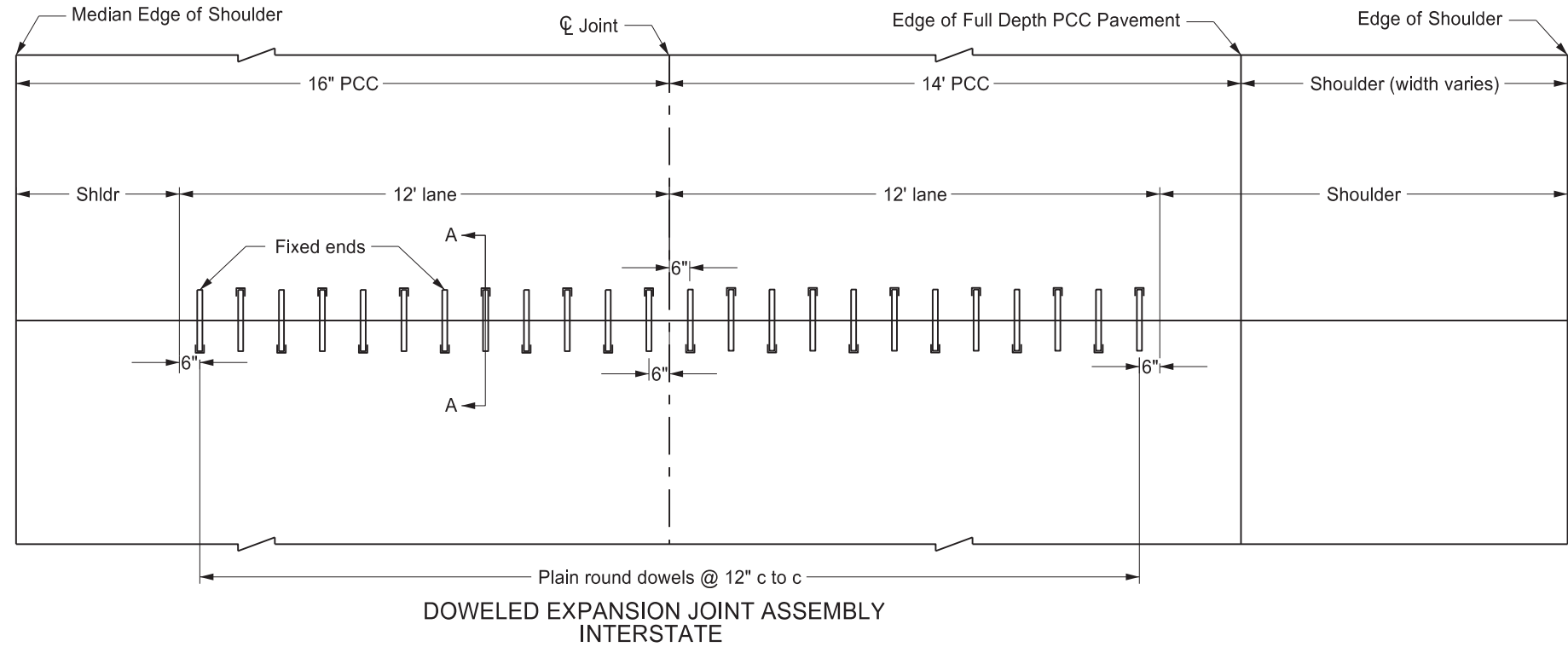


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-10	
REVISIONS	
DATE	CHANGE
6/23/2014	Removed dowel size reference
3/16/2016	Revised Joint Details and notes
10/25/2019	Expanded Details for clarity
03/13/2025	Revised # of Dowels & Note 3.



03/13/25

TRANSVERSE EXPANSION JOINT DETAIL

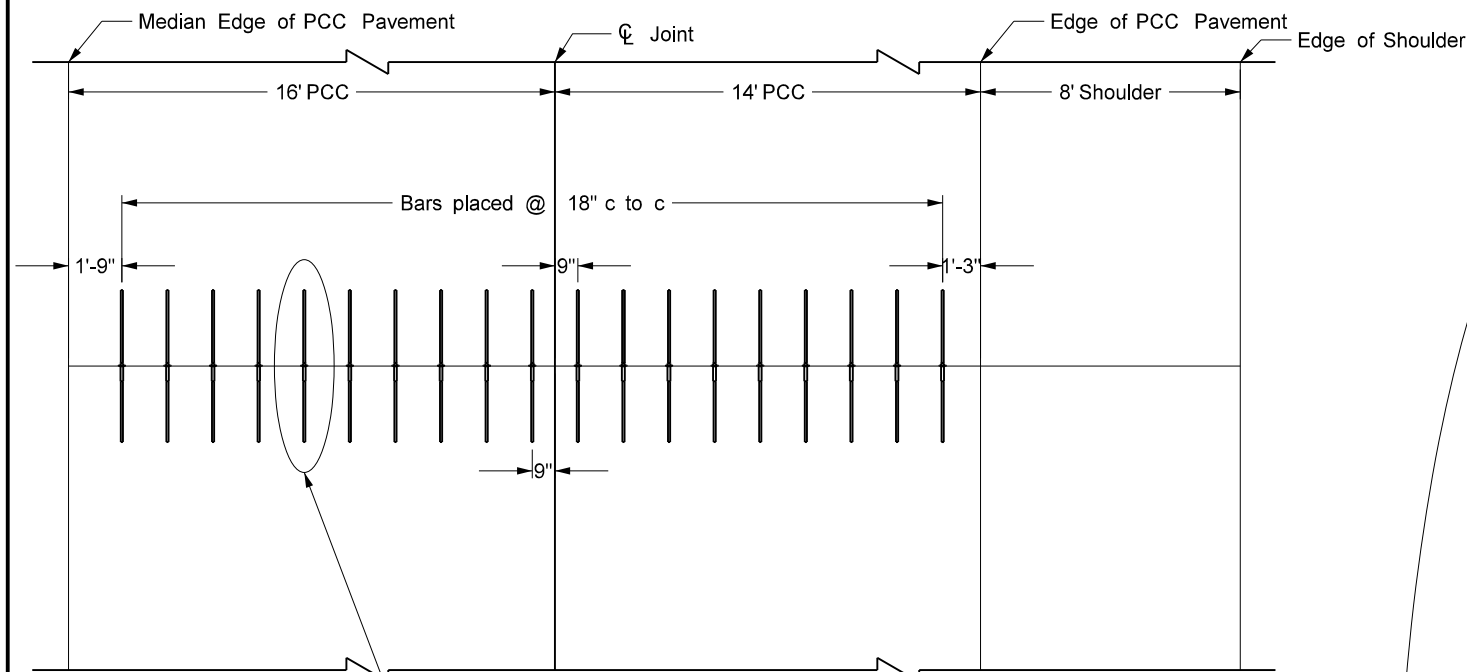


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-2010	
REVISIONS	
DATE	CHANGE
6/23/2014	Removed dowel bar sizes
10/25/2019	Expanded details for clarity
3/13/2025	Revised # of dowels.

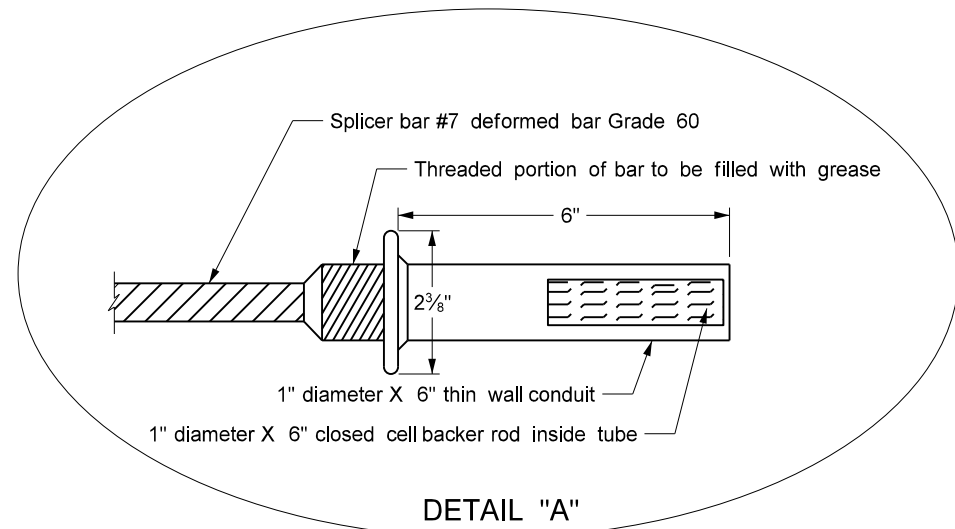


03/13/25

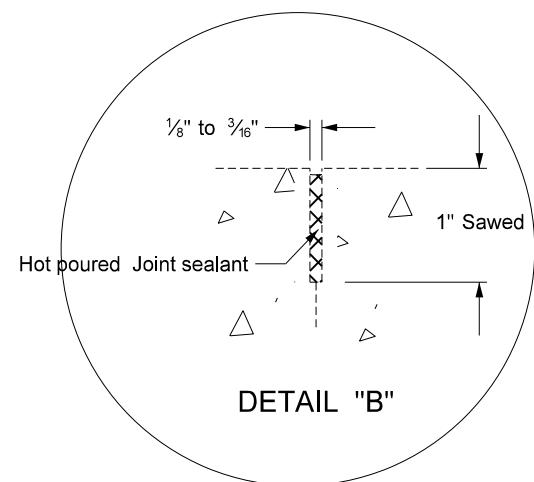
TRANSVERSE CONSTRUCTION JOINT



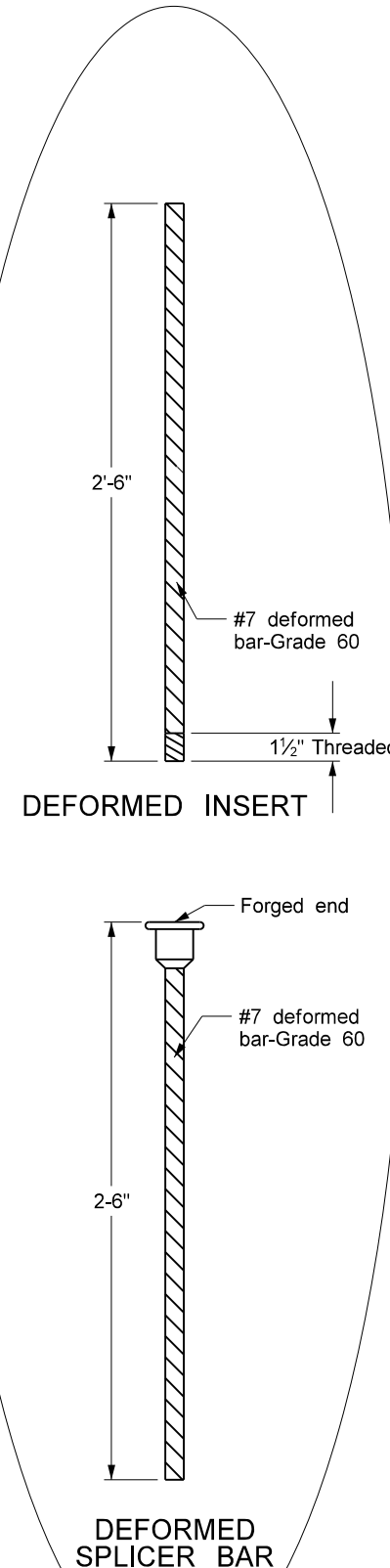
PLAN VIEW



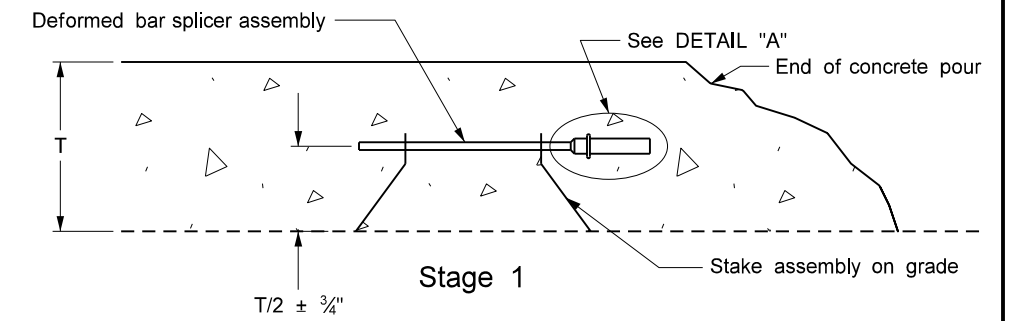
DETAIL "A"



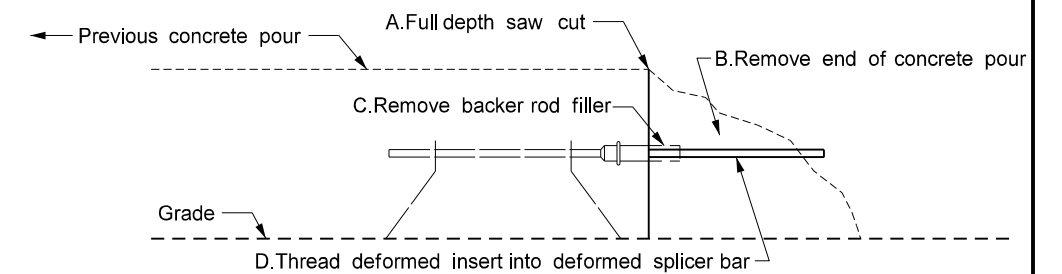
DETAIL "B"



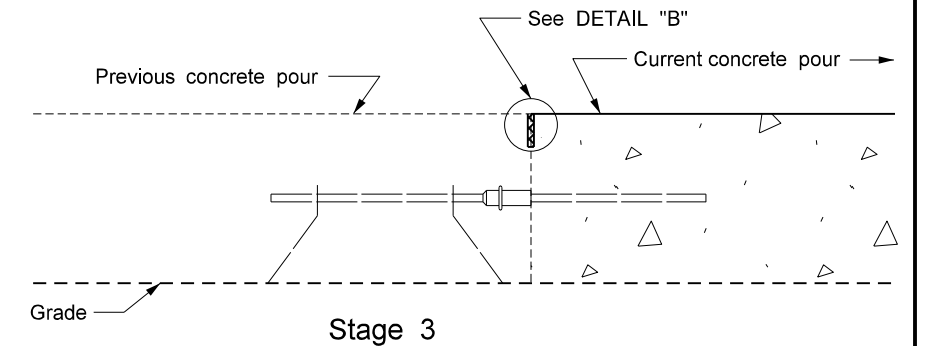
STAGES OF CONSTRUCTION



Stage 1



Stage 2



Stage 3

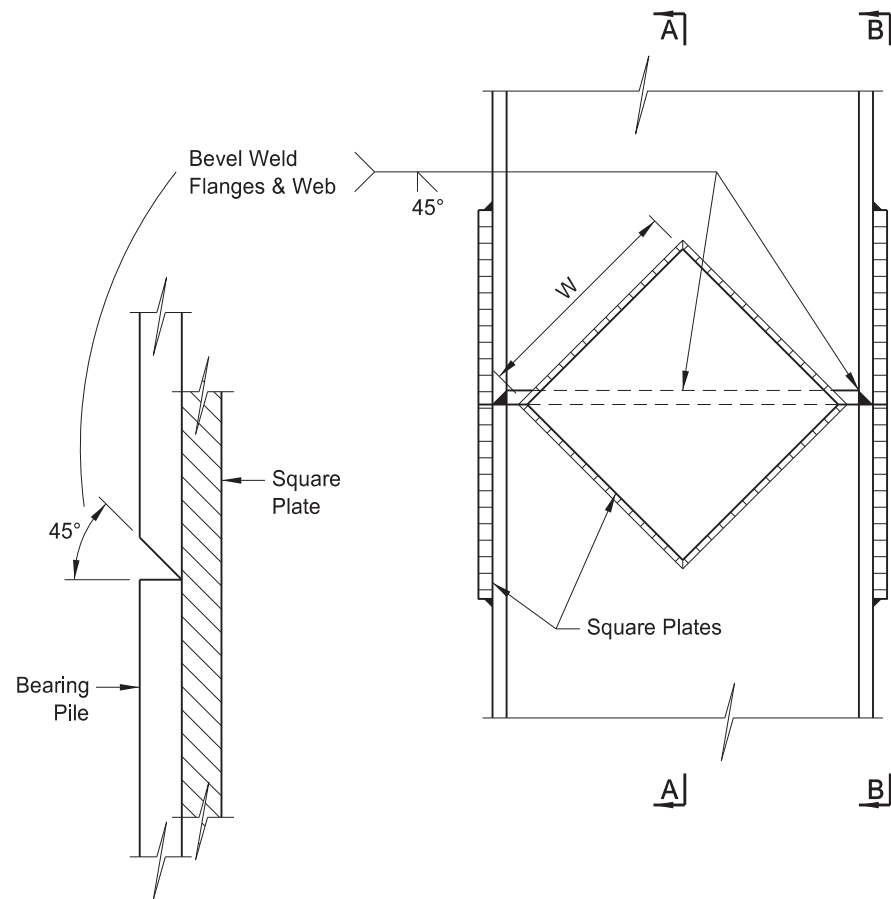
Notes

1. Saw and seal all construction joints.
2. Include all costs for transverse construction joints in the price bid for PCC pavement.
3. Do not saturate the subgrade during the sawing operation.

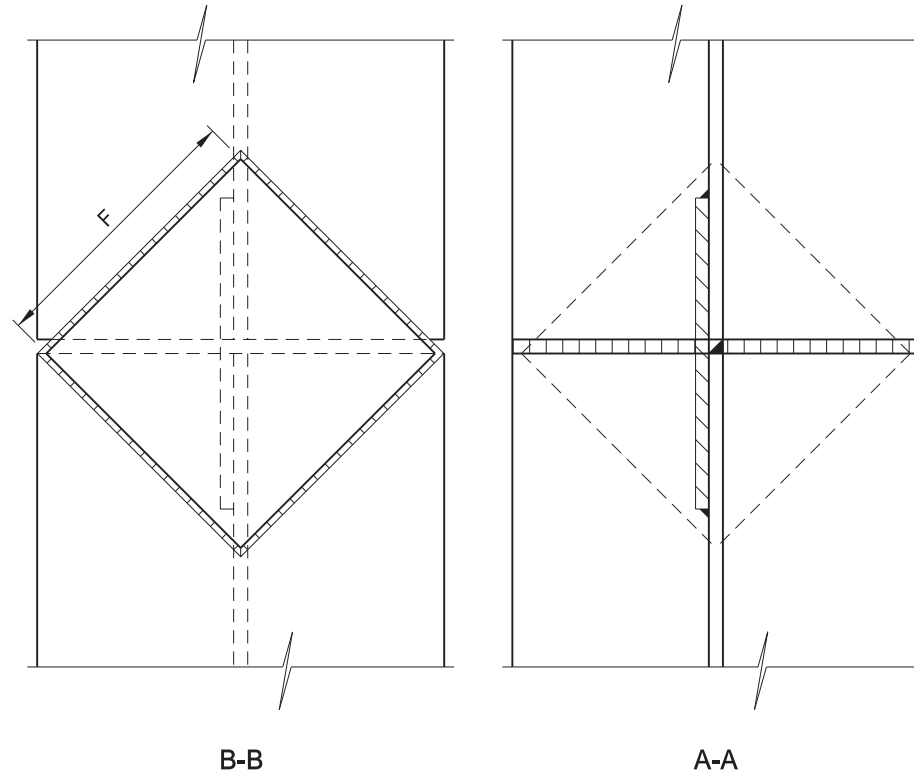
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-2010	
REVISIONS	
DATE	CHANGE
3-16-16 8-27-19	Revised Joint Details & notes. New Design Engr PE Stamp.

This document was originally issued and sealed by
 Kirk J Hoff,
 Registration Number
 PE- 4683,
 on 8/27/19 and the original document is stored at the
 North Dakota Department
 of Transportation

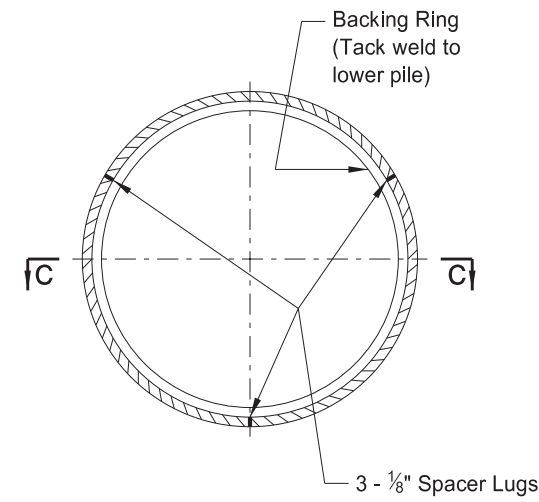
PILE SPLICE DETAILS



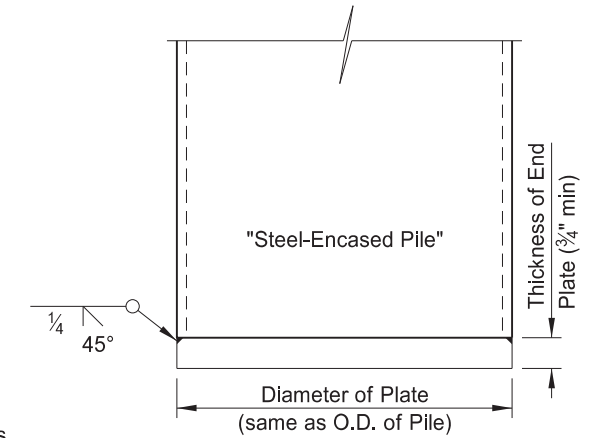
ENLARGED VIEW



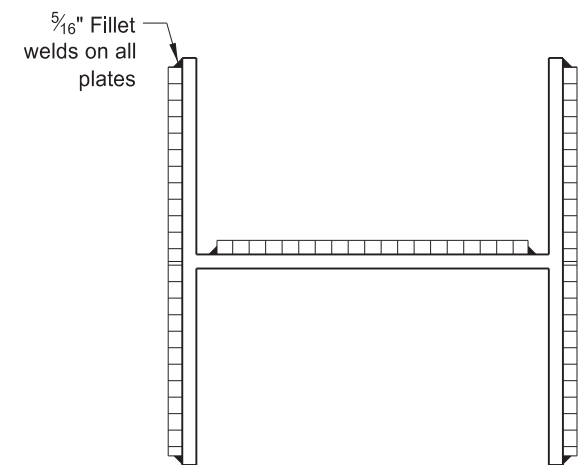
Flame scarf inside of both flanges and one side of web of upper section.



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

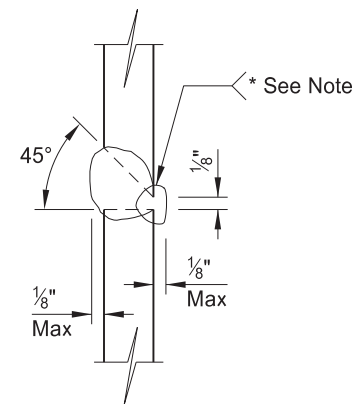


END PLATE DETAIL



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

H-PILE SPLICE DETAIL



ALTERNATE H-PILE SPLICE DETAIL

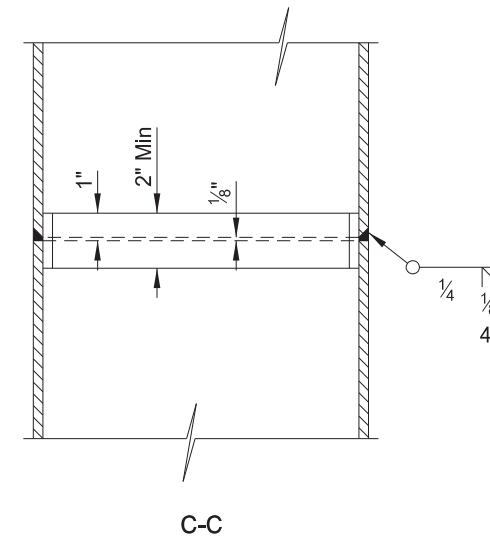
NOTES:

Construct splices in accordance with Section 622. Weld as specified in the latest AASHTO/AWS D 1.5 Bridge Welding Code.

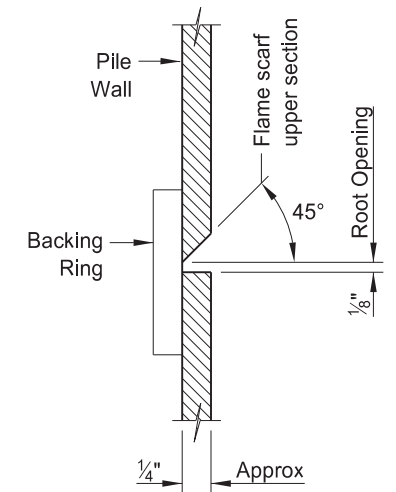
Construct splices in steel H-Piles utilizing complete penetration groove welds in both flanges and the web, or using steel reinforcing plates as shown. If reinforcing plates are used to construct the pile splice, use plates with a minimum thickness equal to the flange thickness of the H-Pile and matching the steel grade of the H-pile.

Use electrodes that meet the requirements of AWS-A5.1, Classification E6010, E6011, or E7018.

* Root gouge to sound metal and weld from the second side if backing material is not used.

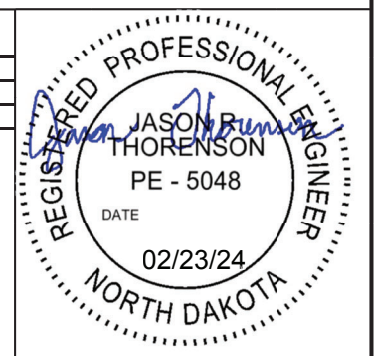


STEEL-ENCASED CONCRETE PILE SPLICE DETAIL

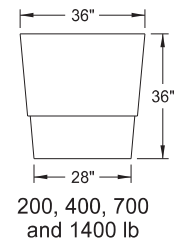
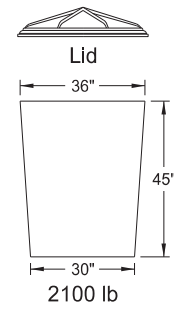


ENLARGED VIEW

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09/14/11	
REVISIONS	
DATE	CHANGE
09/03/19 02/23/24	Updated Signature Updated Signature Revised notes & updated to active voice



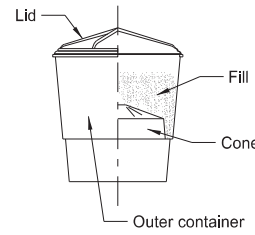
ATTENUATION DEVICE



Outer Containers

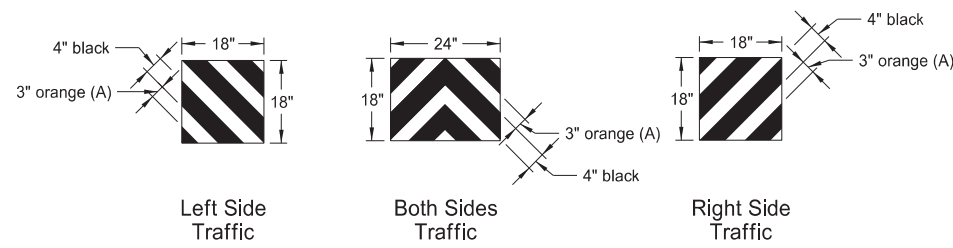


Cones



Typical Assembly

Typical Module Construction Detail

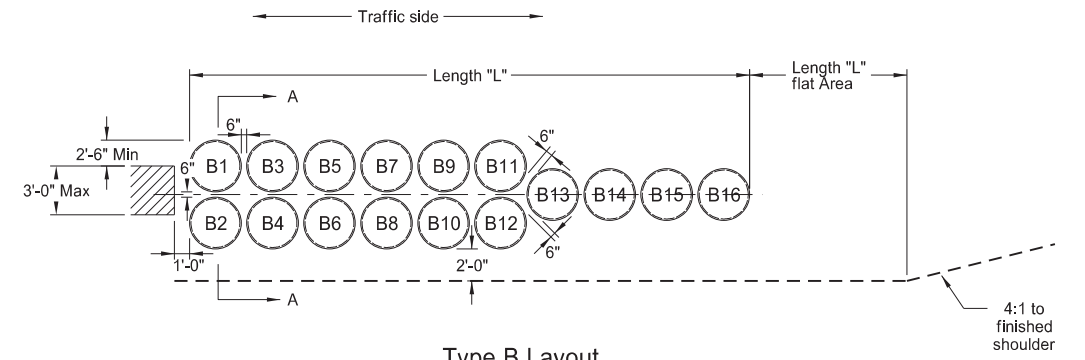


Reflective Sheet Detail

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.

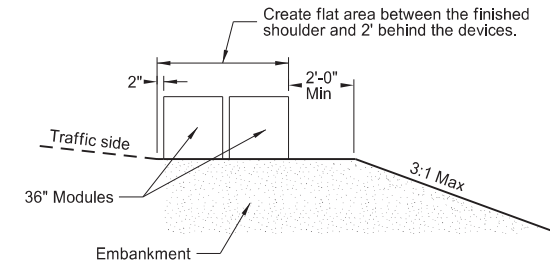
(A) Use 3" orange sheeting for temporary installations, and 3" yellow sheeting for permanent installations.

	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											
	80	75	70	65	60	55	50	45	40	35	30	25
Module Weights (LBS)												
B1	2100	2100										
B2	2100	2100										
B3	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100		
B4	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100		
B5	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B6	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B7	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B8	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B9	700	700	700	700	700	700	700	700	700	700	700	700
B10	700	700	700	700	700	700	700	700	700	700	700	700
B11	700	700	700	700	700	700	700	700	700	700	700	700
B12	700	700	700	700	700	700	700	700	700	700	700	700
B13	700	700	700	700	700	700	700	700	700	700	700	700
B14	400	400	400	400	400	400	400	400	400	400	400	400
B15	400	400	400	400	400	400	400	400	400	400	400	400
B16	200	200	200	200	200	200	200	200	200	200	200	200
Length (L)	34.2'	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	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

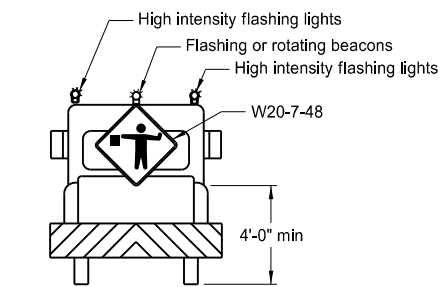
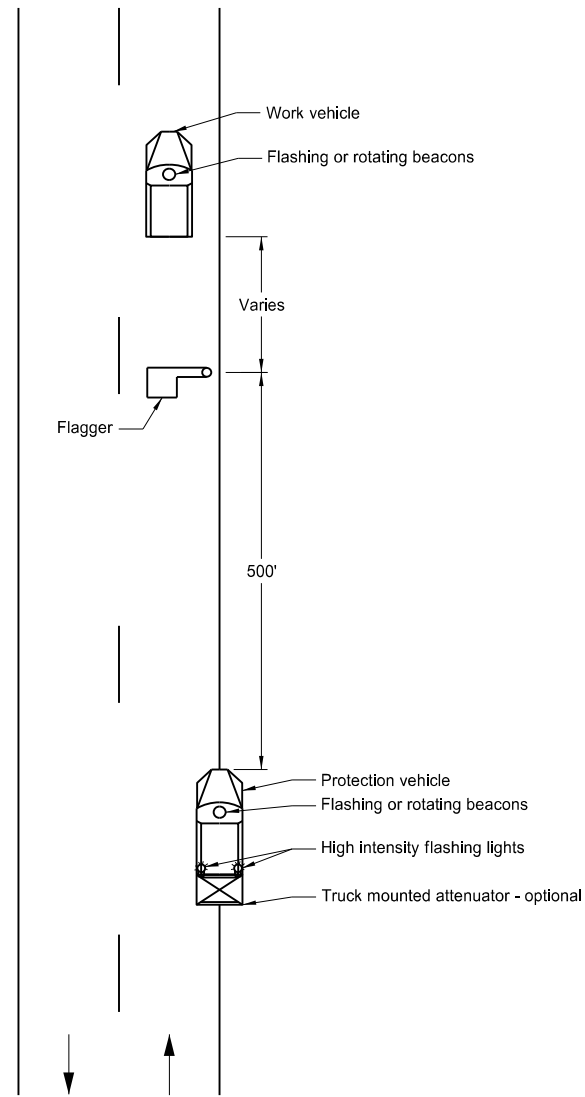
Provide modules in two sizes containing volumes of either 2, 4, 7, 14, or 21 cubic feet minimum.

 - 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
07-18-14	Revised sheeting in reflective sheet detail
09-27-17	Update to active voice
10-03-19	New Design Engr PE Stamp
08-01-24	Electronic Stamp/Signature
06-30-25	Legislative Changes

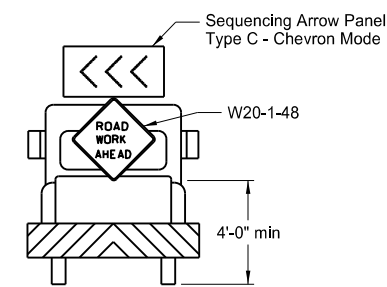
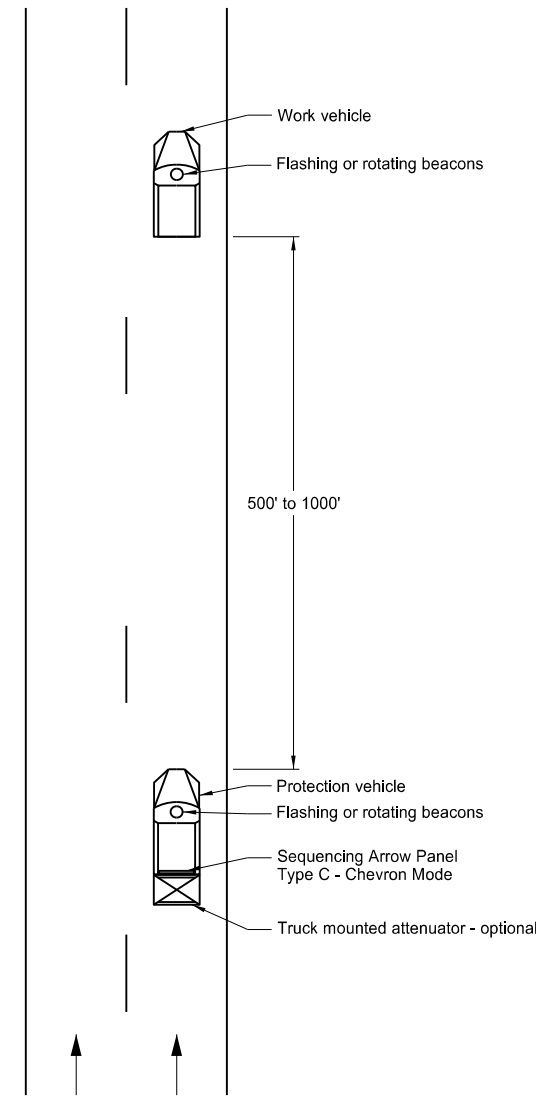


Two Lane, Two Way Roadways



Typical Protection Vehicle

Multilane Roadways



Typical Protection Vehicle

Notes:

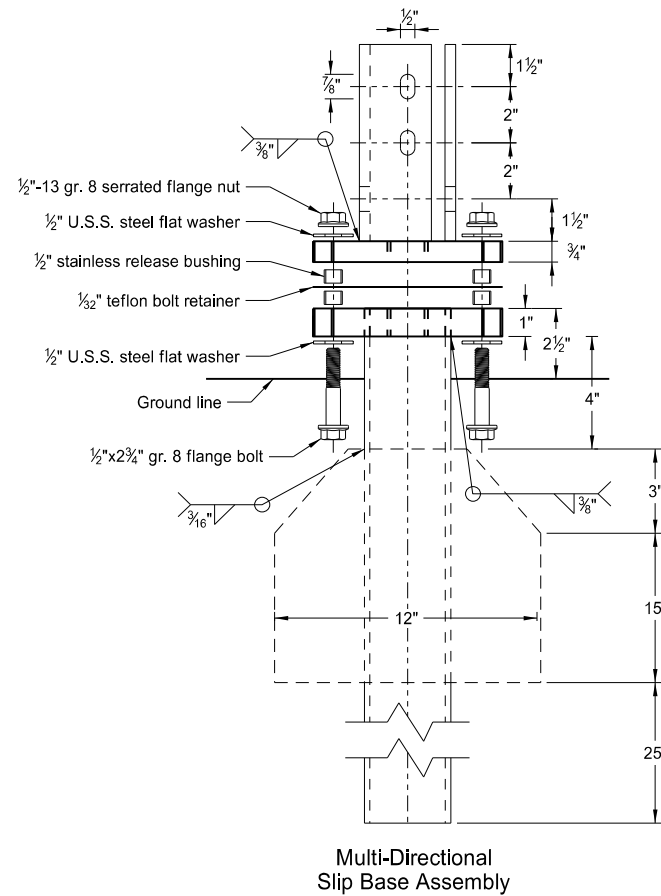
1. Display a 360 degree rotating, flashing, oscillating or strobe light on the working vehicle.
2. Display a 360 degree rotating, flashing, oscillating or strobe light on the shadow vehicle. Operate a sequencing arrow panel Type C in chevron mode on the shadow vehicle for Multilane Roadway.
3. Use these 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 10-03-19	Updated to active voice New Design Engr PE Stamp

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 Kirk J Hoff,
 Registration Number
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 North Dakota Department
 of Transportation

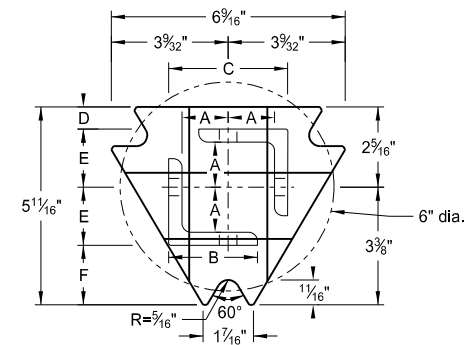
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

Perforated Tube



Multi-Directional Slip Base Assembly

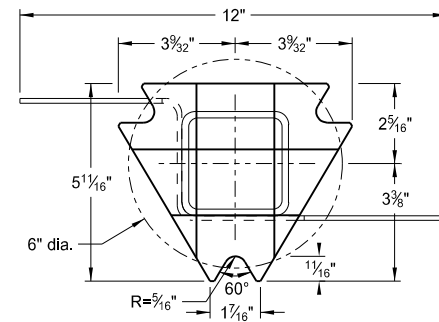
Traffic Flow



Top Post Receiver

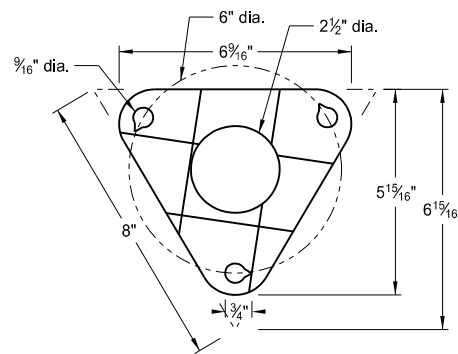
Plate - ASTM A572 grade 50
Angle Receiver - 2 1/2" x 2 1/2" x 3/8" ASTM A36 structural angle

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



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

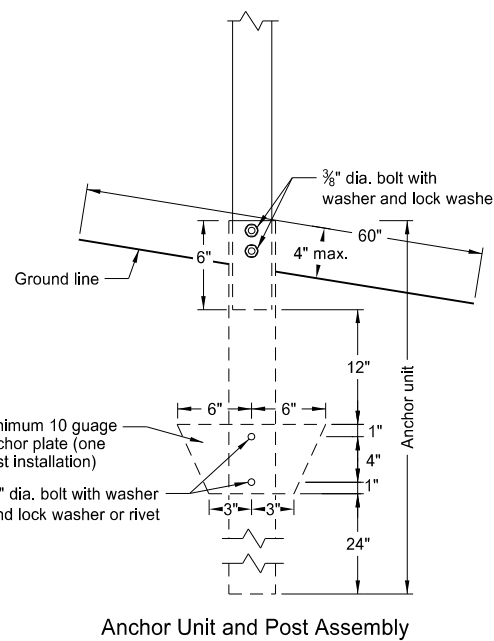
Tube Size in.	Wall Thickness in.	U.S. Standard Gauge	Weight per Foot lbs.	Moment of Inertia in. ⁴	Cross Sec. Area in. ²	Section Modulus in. ³
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	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

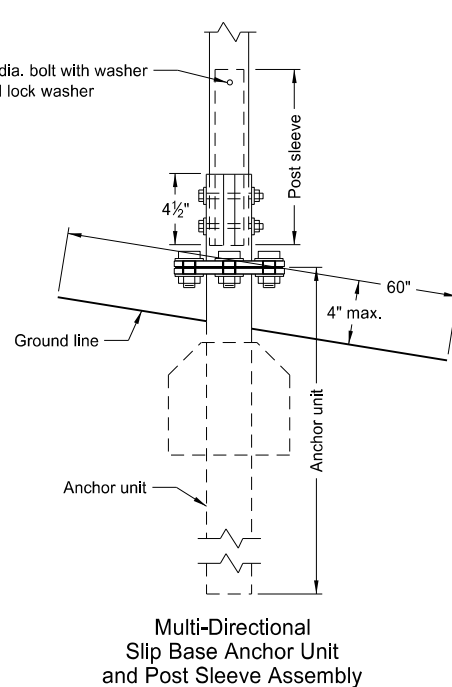
Square Post Sizes (B)	A	B	C	D	E	F
2 3/16" x 10 ga.	1 5/16"	2 1/2"	3 1/2"	2 5/32"	1 33/64"	1 7/8"
2 1/2" x 10 ga.	1 3/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"

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

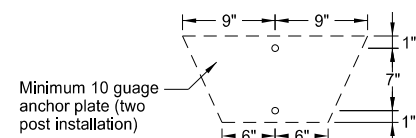
(B) For additional wind load, insert the 2 3/16" x 10 ga. into 2 1/2" x 10 ga.



Anchor Unit and Post Assembly



Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly

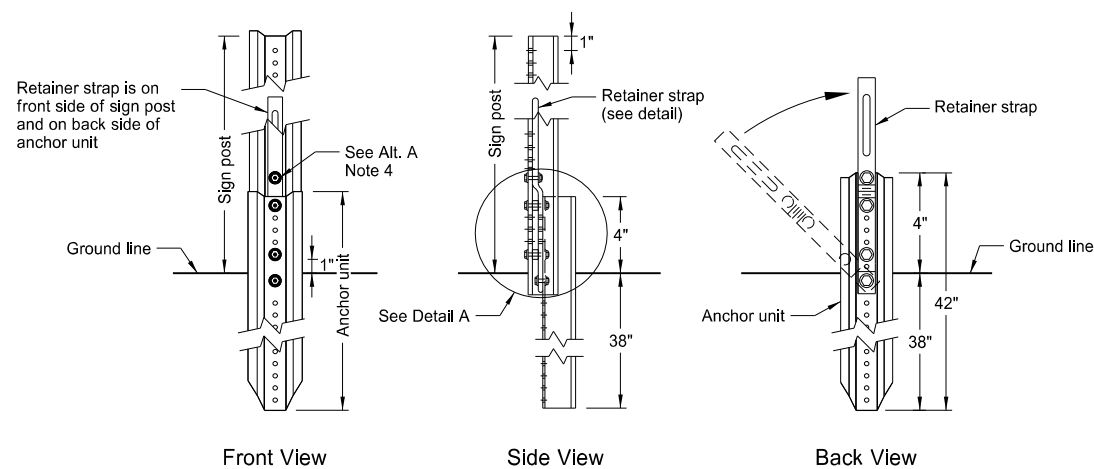
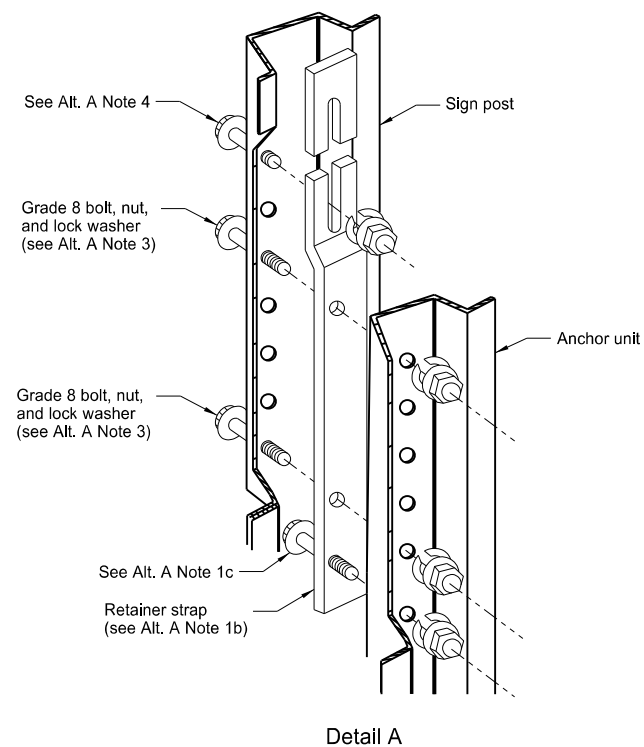


Minimum 10 gauge anchor plate (two post installation)

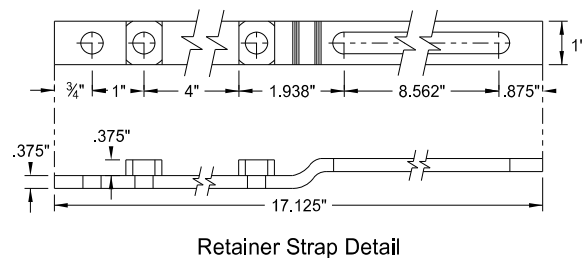
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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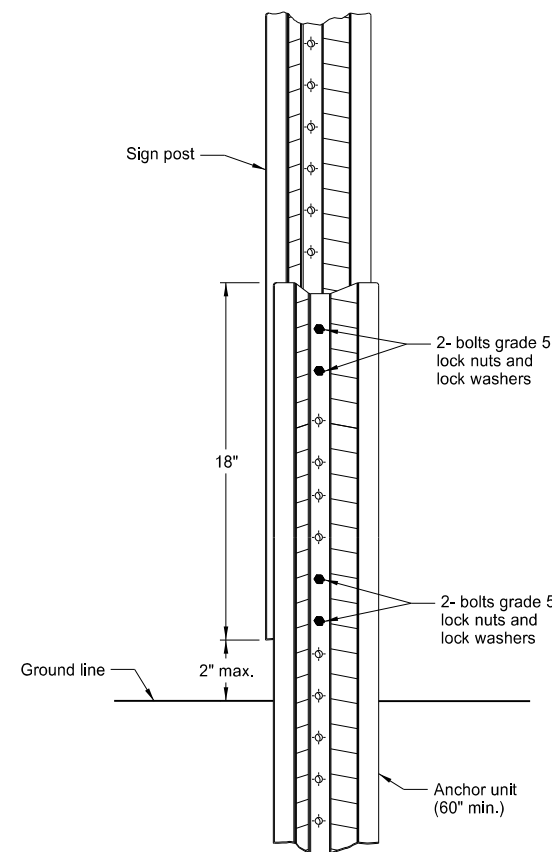
U-Channel Post



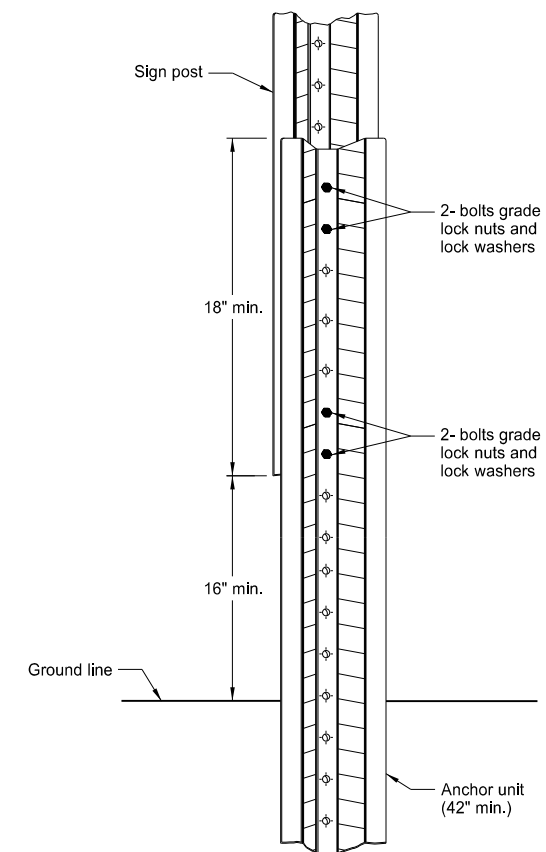
Breakaway U-Channel Detail Alternate A
Install a maximum of 2 posts within 7'.



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'.

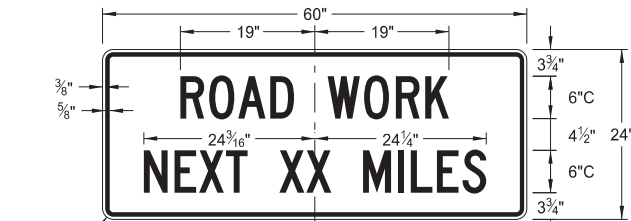
Alternate A Steps of Installation:

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.

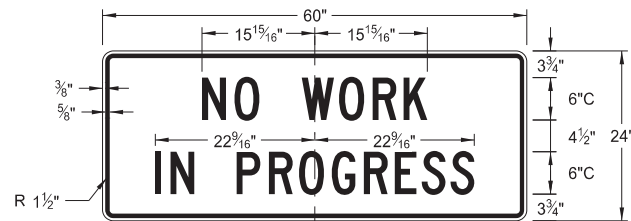
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17 10-03-19	Updated to active voice New Design Engr PE Stamp

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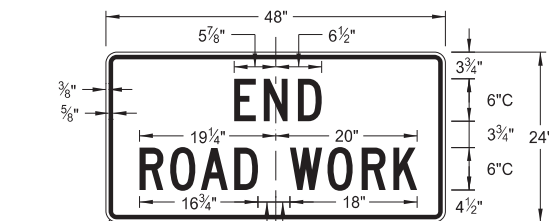
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



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



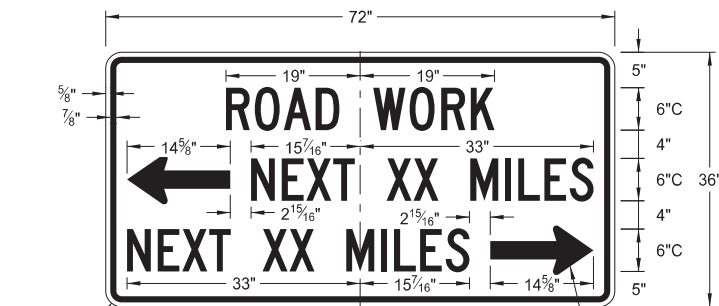
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Background: orange



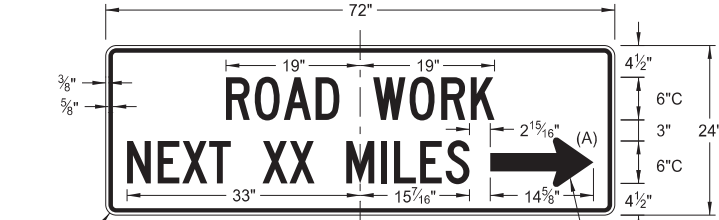
G20-2-48
Legend: black (non-refl)
Background: orange



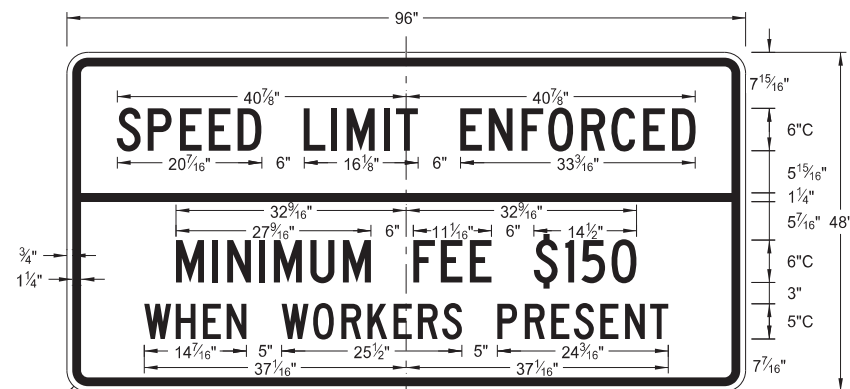
G20-4b-36
Legend: black (non-refl)
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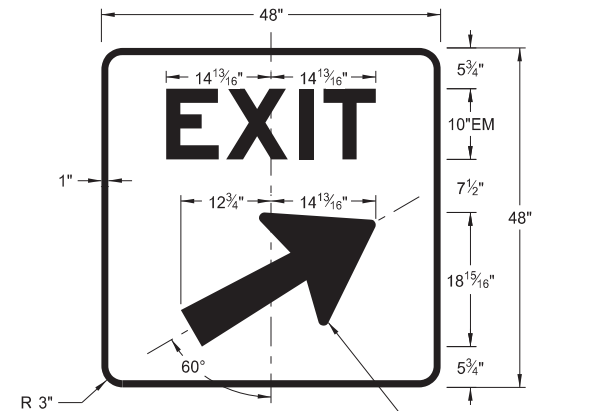
G20-50a-72
Legend: black (non-refl)
Background: orange



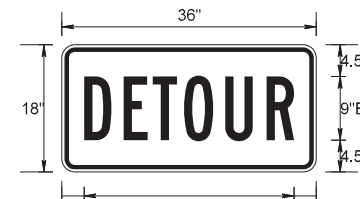
G20-52a-72
Legend: black (non-refl)
Background: orange



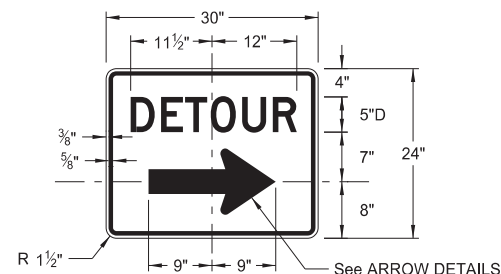
G20-55-96
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Background: orange



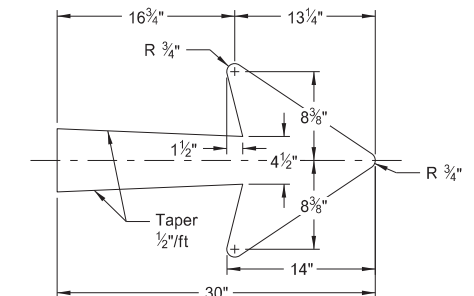
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



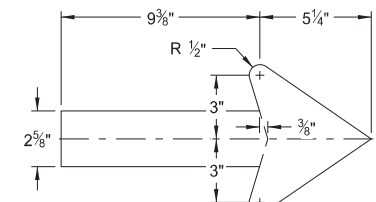
M4-8-36
Legend: black (non-refl)
Background: orange



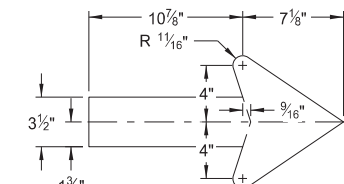
M4-9(L or R)-30 & M4-9-30
Legend: black (non-refl)
Background: orange



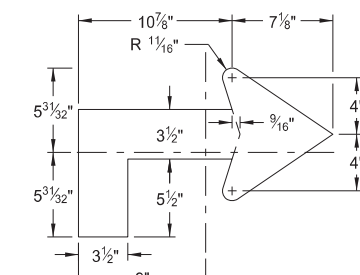
E5-1-48



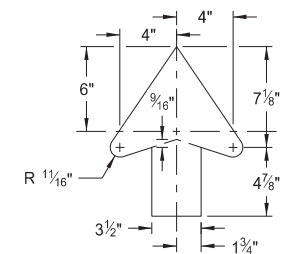
G20-50a-72
G20-52a-72



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

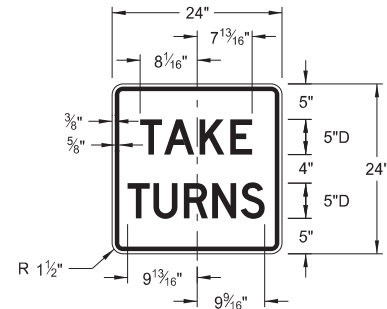
NOTES:

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

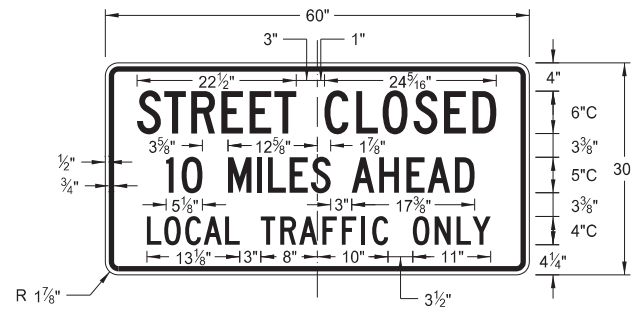
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
08-17-17	Added sign & background color
10-03-19	New Design Engineer PE Stamp
08-01-24	Electronic Stamp/Signature
06-30-25	Legislative Changes



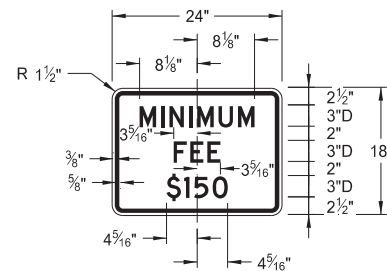
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



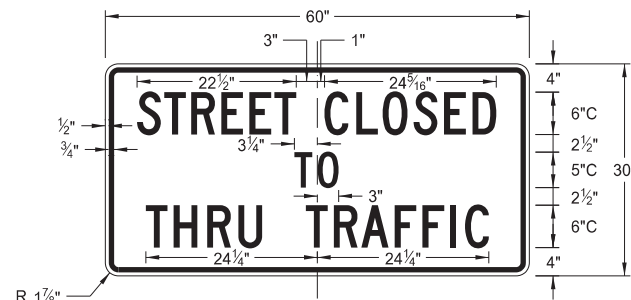
R1-50P-24
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Background: white



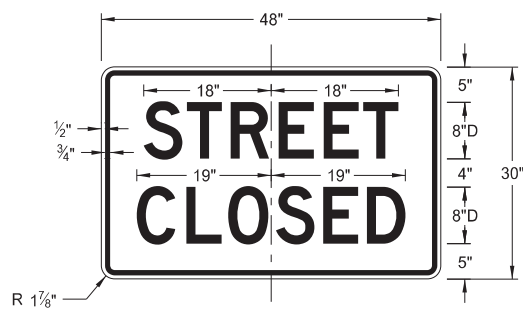
R11-3c-60
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Background: white



R2-1aP-24
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Background: white



R11-4a-60
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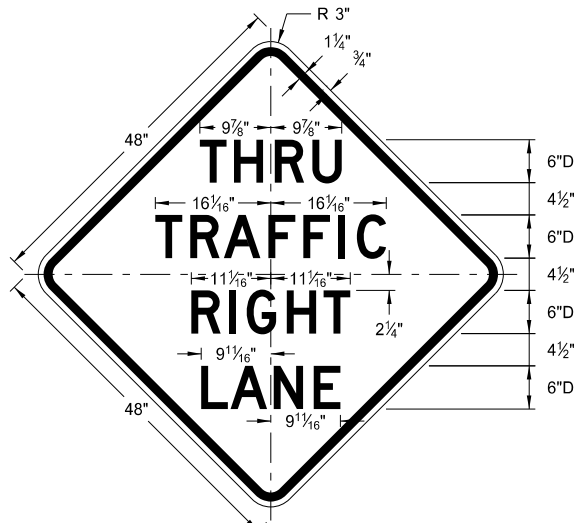


R11-2a-48
Legend: black (non-refl)
Background: white

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
08-17-17	Revised sign number
10-03-19	New Design Engineer PE Stamp
08-01-24	Electronic Stamp/Signature
06-30-25	Legislative Changes

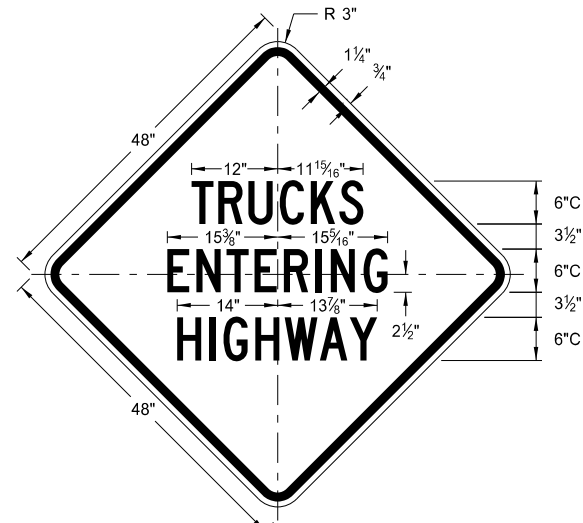


CONSTRUCTION SIGN DETAILS
WARNING SIGNS



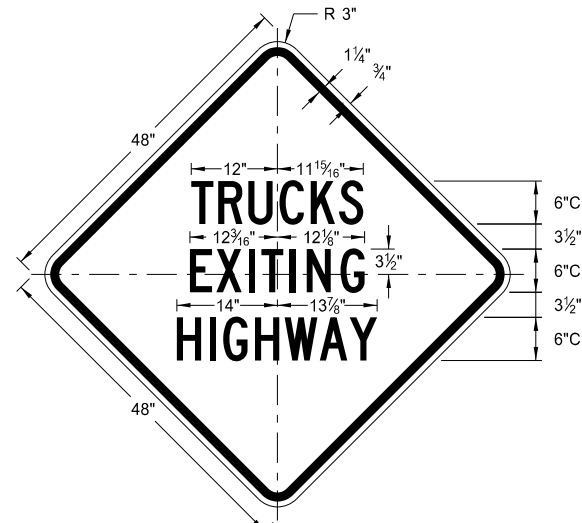
W5-8-48

Legend: black (non-refl)
Background: orange



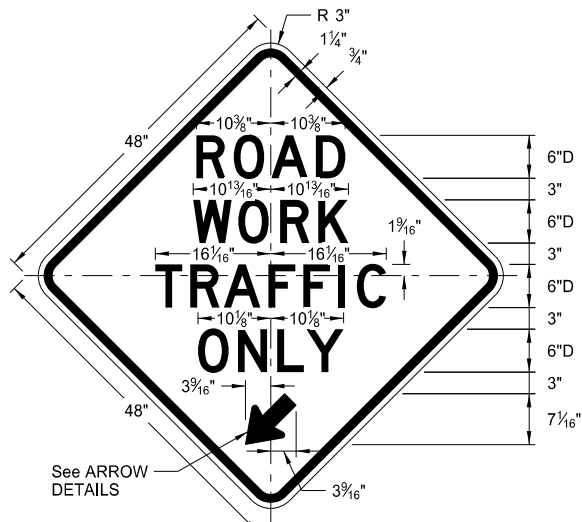
W8-53-48

Legend: black (non-refl)
Background: orange



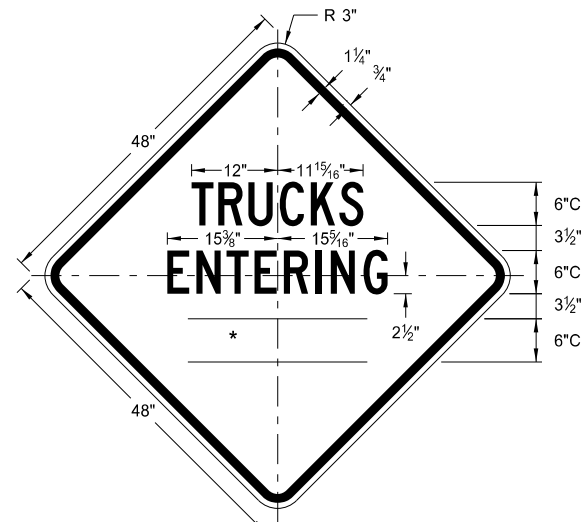
W8-56-48

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Background: orange



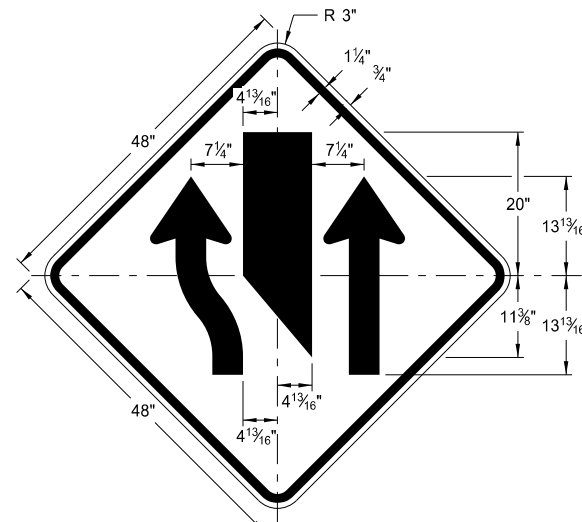
W5-9-48

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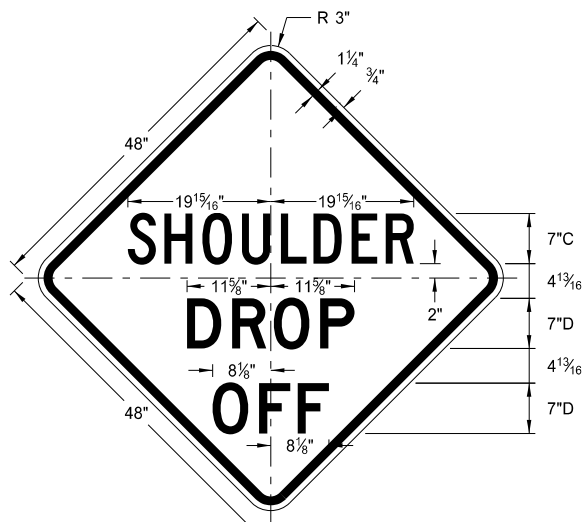
W8-54-48

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Background: orange



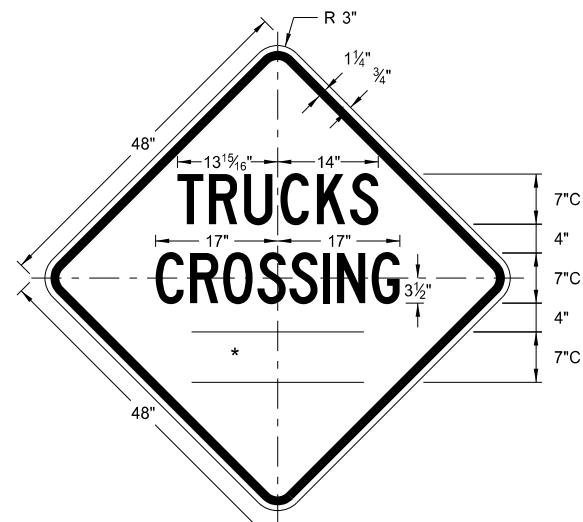
W9-3a-48

Legend: black (non-refl)
Background: orange



W8-9a-48

Legend: black (non-refl)
Background: orange

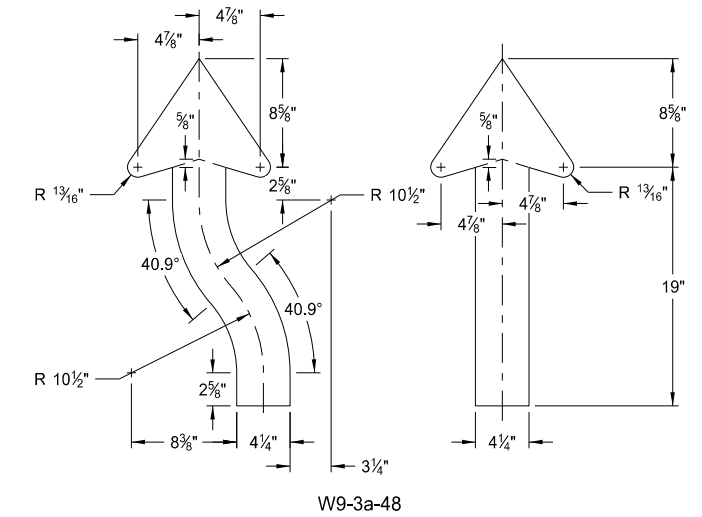
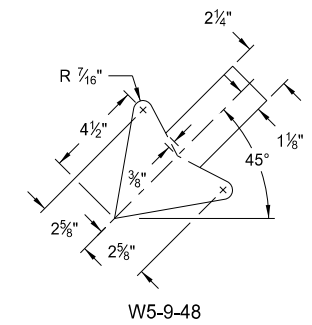


W8-55-48

Legend: black (non-refl)
Background: orange

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

* DISTANCE MESSAGES



ARROW DETAILS

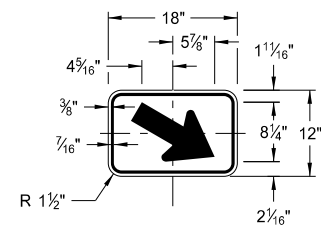
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Updated sign number
5-31-18	Revised sign and arrow details
10-03-19	New Design Engineer PE Stamp

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CONSTRUCTION SIGN DETAILS
WARNING SIGNS

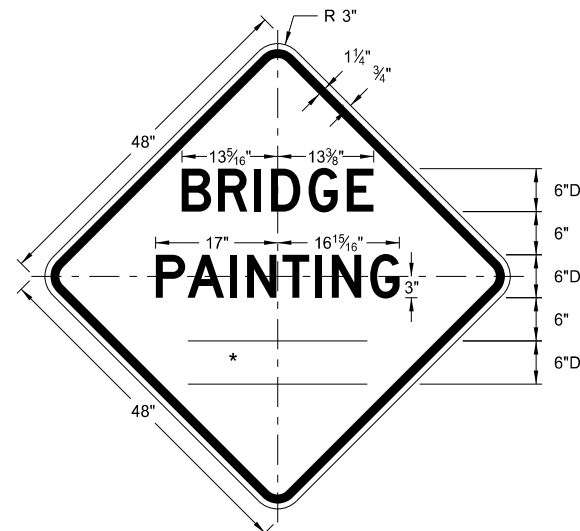
WORD	LETTER SPACING
AHEAD	Standard
200 FT	Standard
350 FT	Standard
500 FT	Standard
1000 FT	Reduce 40%
1500 FT	Reduce 40%
½ MILE	Reduce 50%
1 MILE	Standard

* DISTANCE MESSAGES



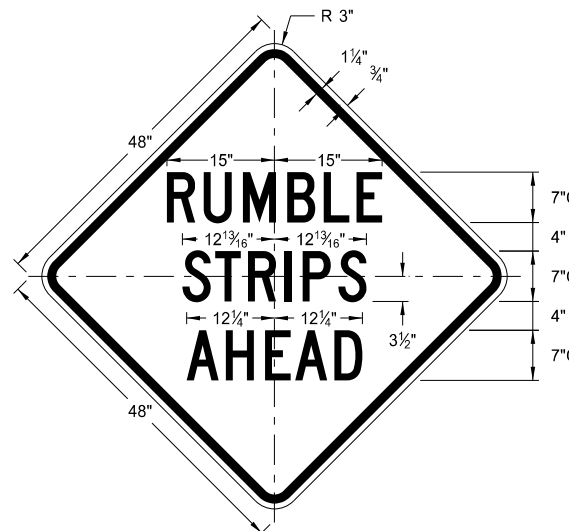
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Background: orange



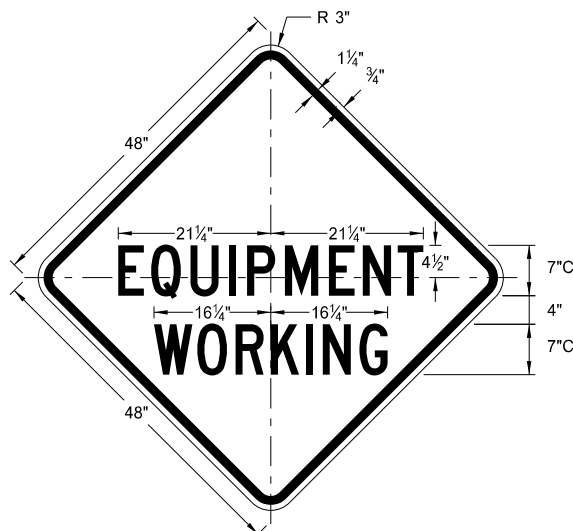
W21-50-48

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Background: orange



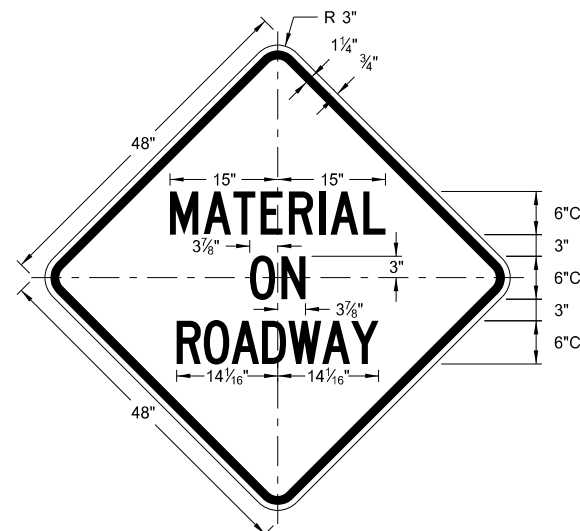
W21-53-48

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Background: orange



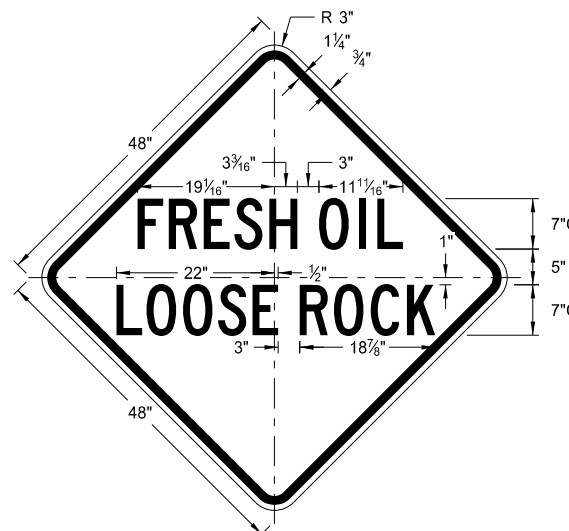
W20-51-48

Legend: black (non-refl)
Background: orange



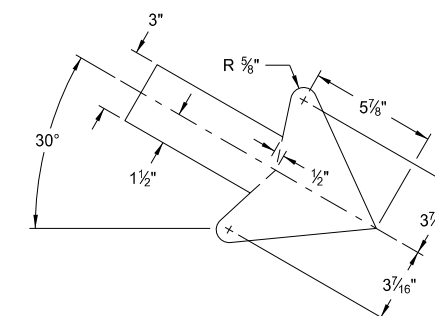
W21-51-48

Legend: black (non-refl)
Background: orange

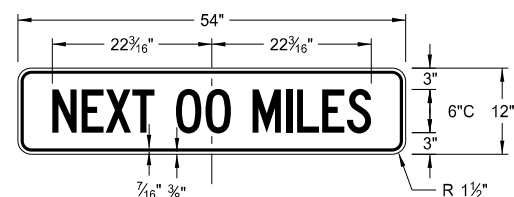


W22-8-48

Legend: black (non-refl)
Background: orange

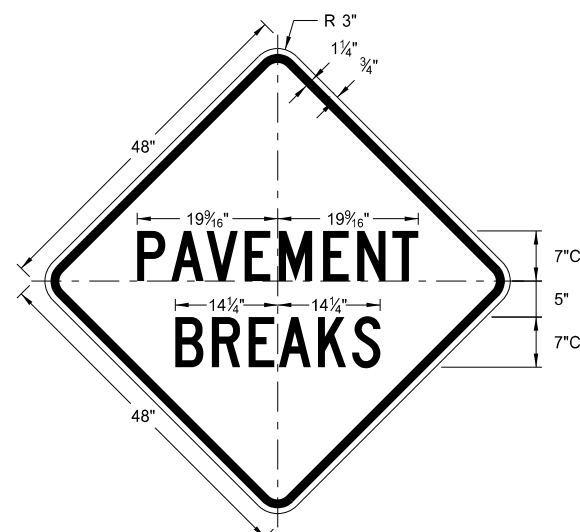


W16-7aP-18



W20-52P-54

Legend: black (non-refl)
Background: orange



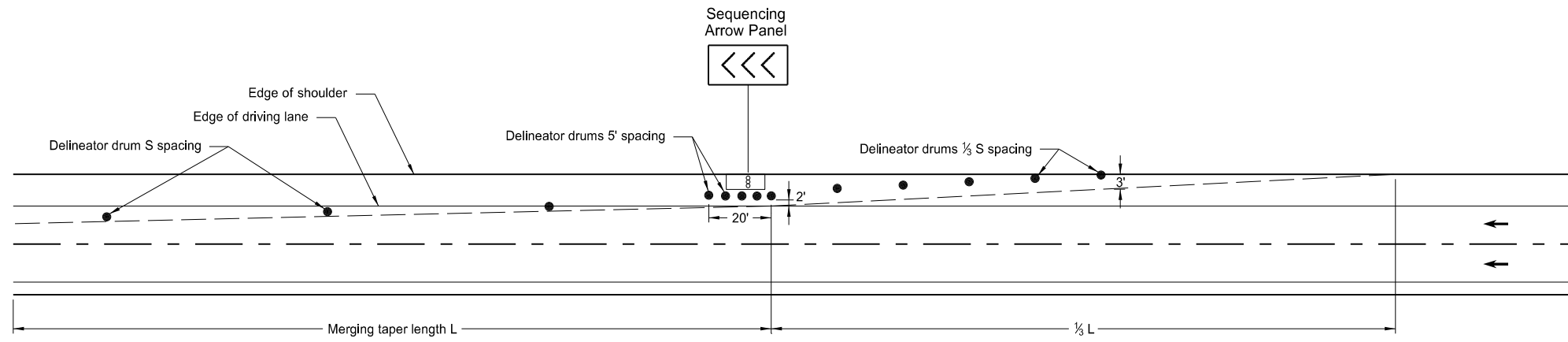
W21-52-48

Legend: black (non-refl)
Background: orange

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
5-31-18	
REVISIONS	
DATE	CHANGE
11-01-19	Added details for sign W16-7aP-18.

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

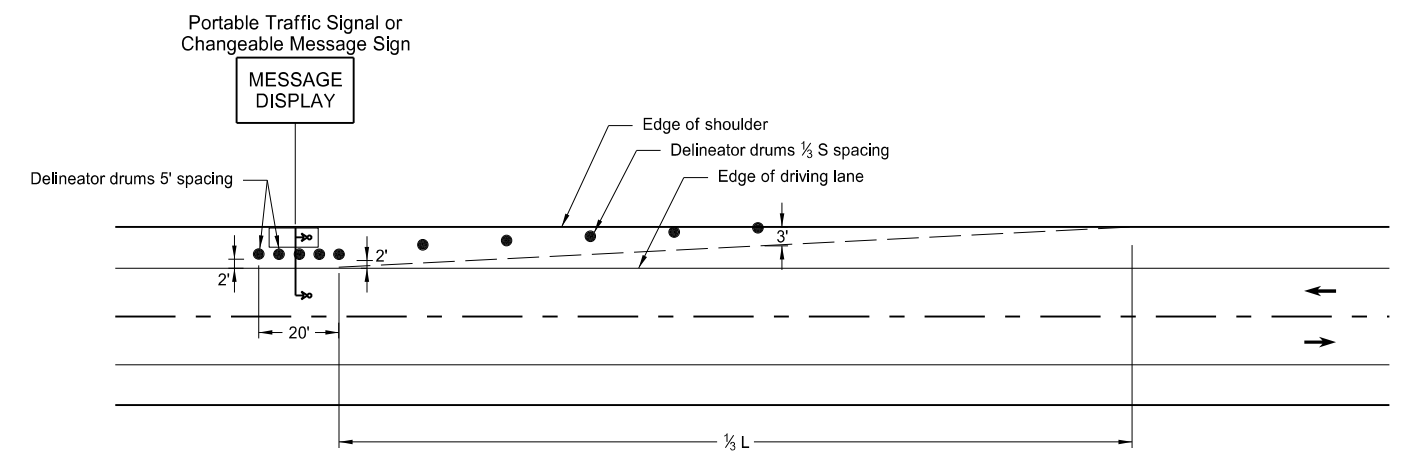
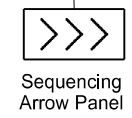
SHOULDER CLOSURE TAPERS



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



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



PORTABLE TRAFFIC SIGNAL OR CHANGEABLE MESSAGE SIGN ON SHOULDER

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

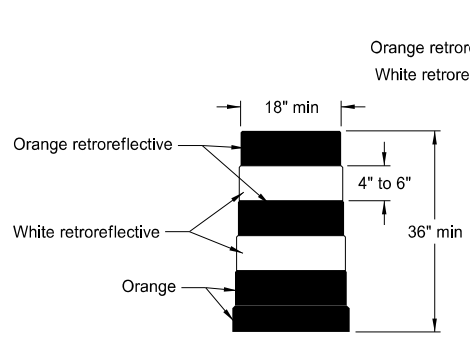
Notes:

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

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

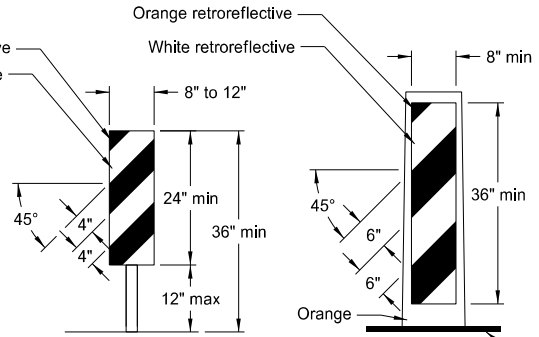
This document was originally issued and sealed by
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Registration Number
PE- 4683,
on 10/25/19 and the original document is stored at the North Dakota Department of Transportation

BARRICADE AND CHANNELIZING DEVICE DETAILS



DELINEATOR DRUM

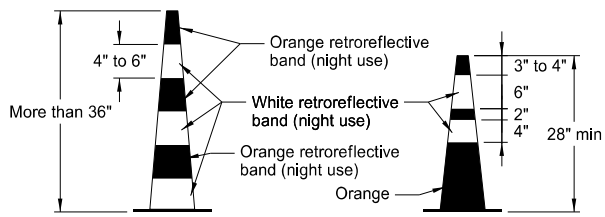
Provide horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide for drum markings. Use a minimum of two orange and two white stripes with the top stripe being orange for each drum. Do not exceed 3" nonretroreflectORIZED spaces between the horizontal orange and 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 STACKABLE

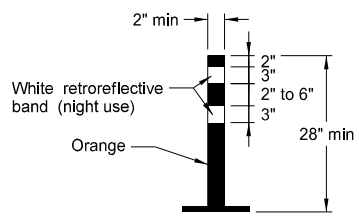
Provide alternating orange and white retroreflective stripes, sloping downward in direction vehicular traffic is to pass. Place retroreflective sheeting on both sides of panel with a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective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

Molded rubber base (min weight 30 lbs)



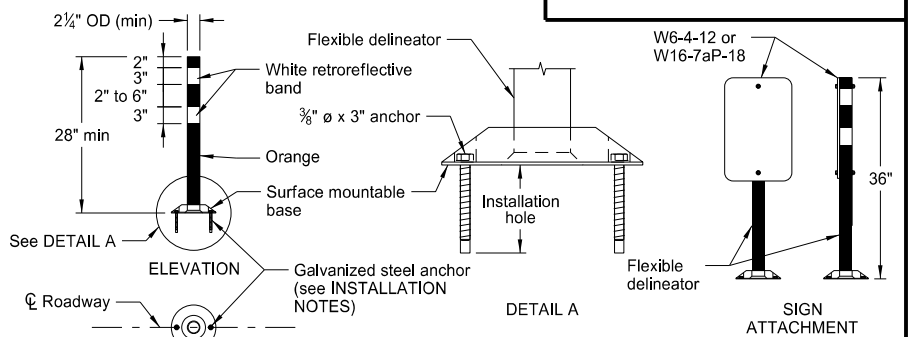
TRAFFIC CONE

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

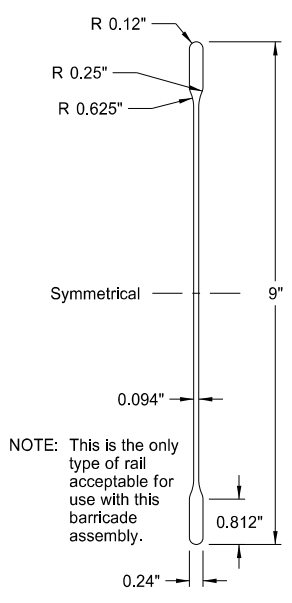
Provide retroreflectORIZATION of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

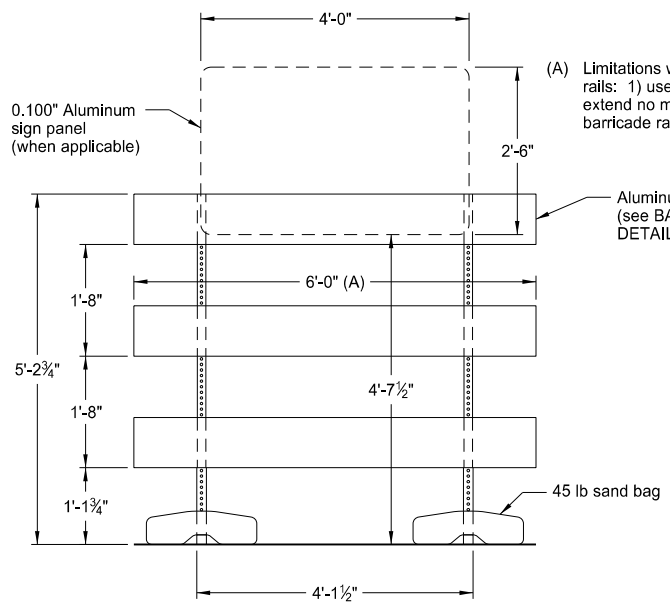
INSTALLATION NOTES:

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.

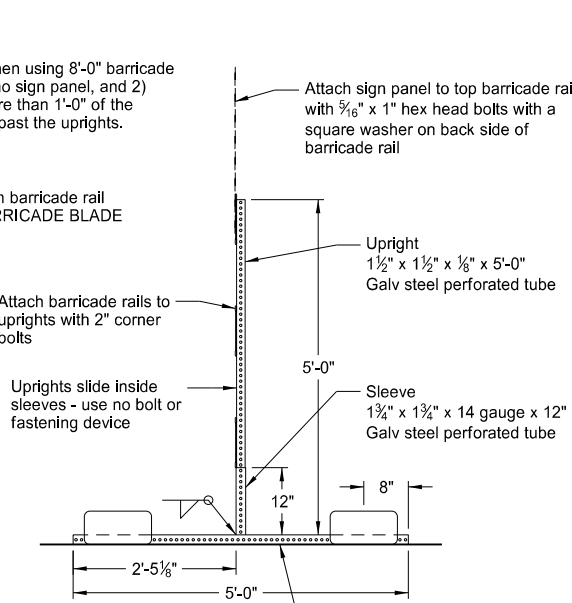


BARRICADE BLADE DETAIL

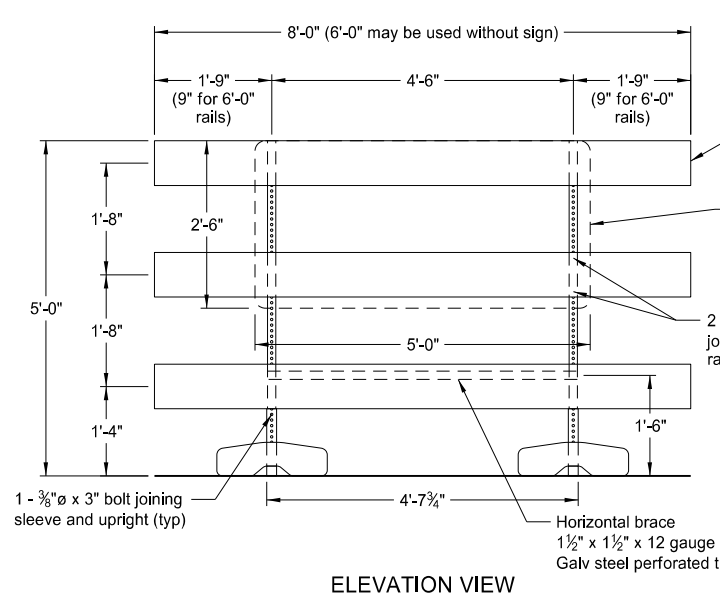
NOTE: This is the only type of rail acceptable for use with this barricade assembly.



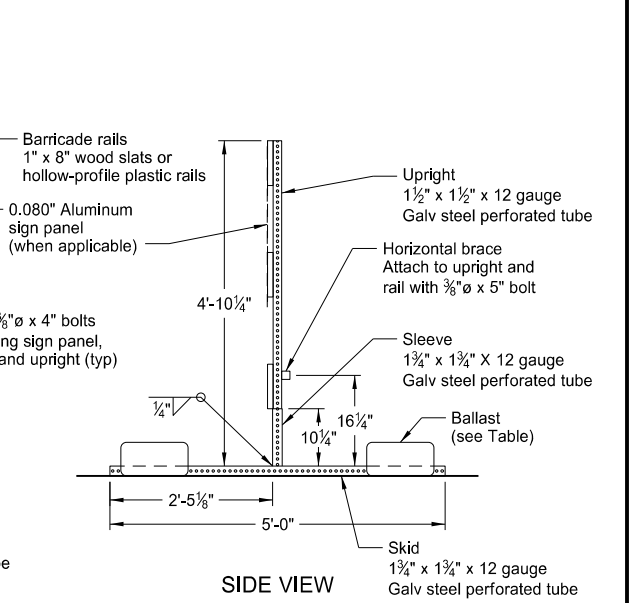
ELEVATION VIEW BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)



SIDE VIEW BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

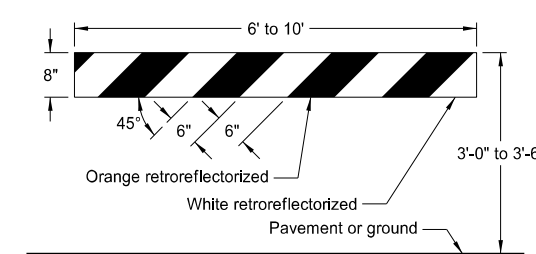


ELEVATION VIEW BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

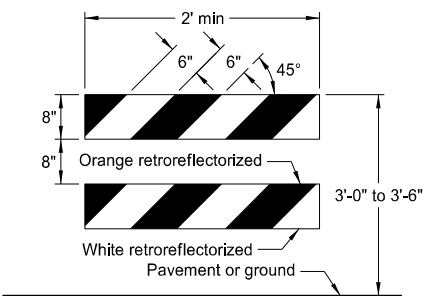


SIDE VIEW BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

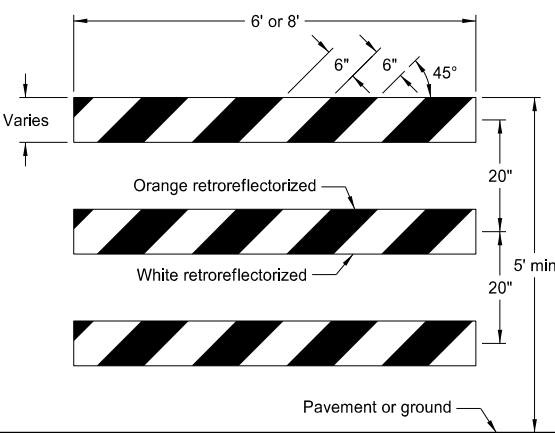
NOTE: For barricade markings use alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Place retroreflective sheeting on both sides of the rails with a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the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



TYPE I BARRICADE

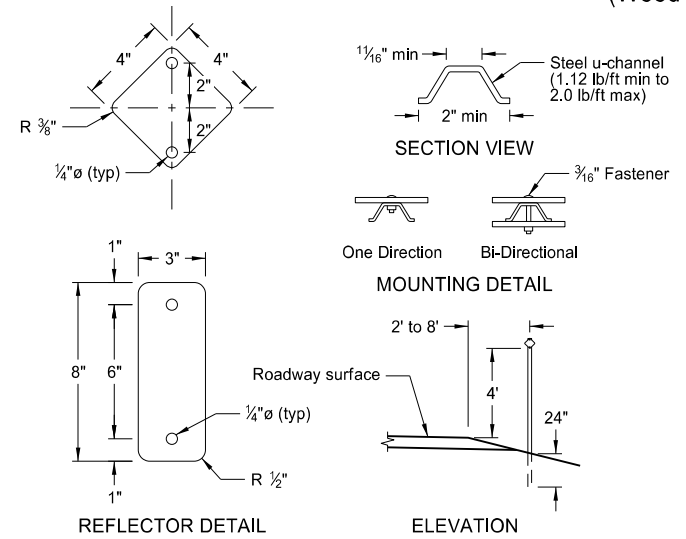


TYPE II BARRICADE

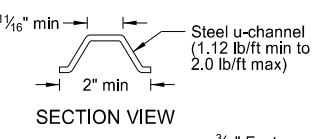


TYPE III BARRICADE

BARRICADE RAIL DETAILS



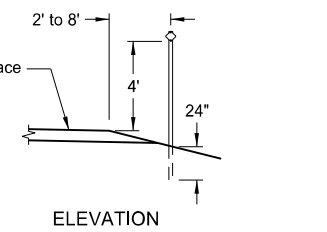
REFLECTOR DETAIL



SECTION VIEW



MOUNTING DETAIL



ELEVATION

DELINEATORS

MINIMUM BALLAST (For each side of barricade support)

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

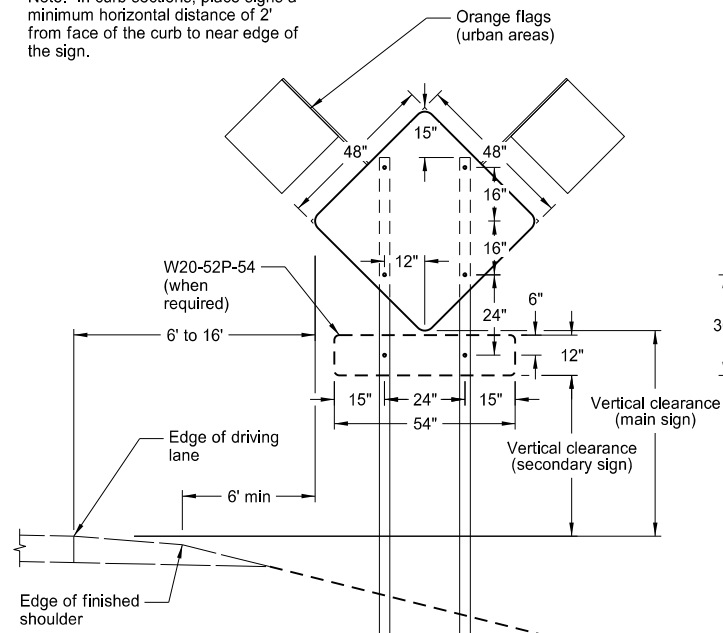
Note: Number of sandbags based on a wind speed of 55 MPH. Sandbags assumed to be placed at or near the ends of the skids.

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

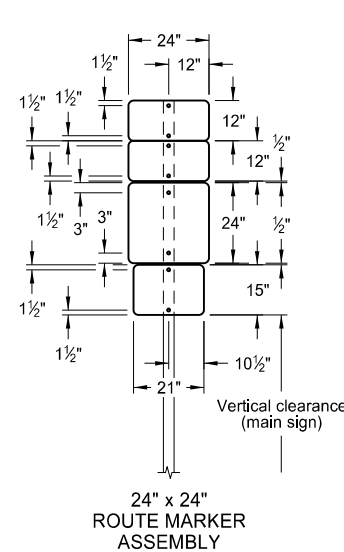
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CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

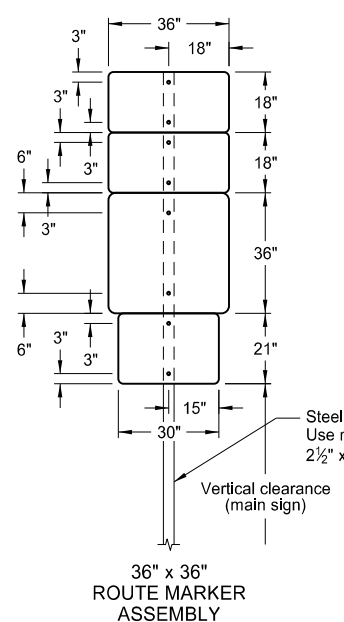
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



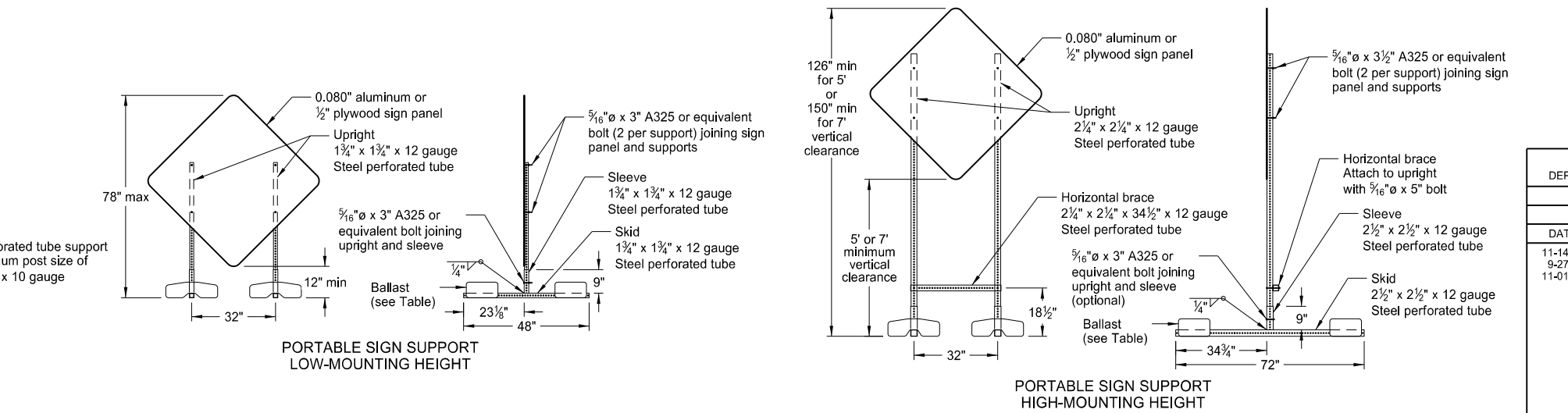
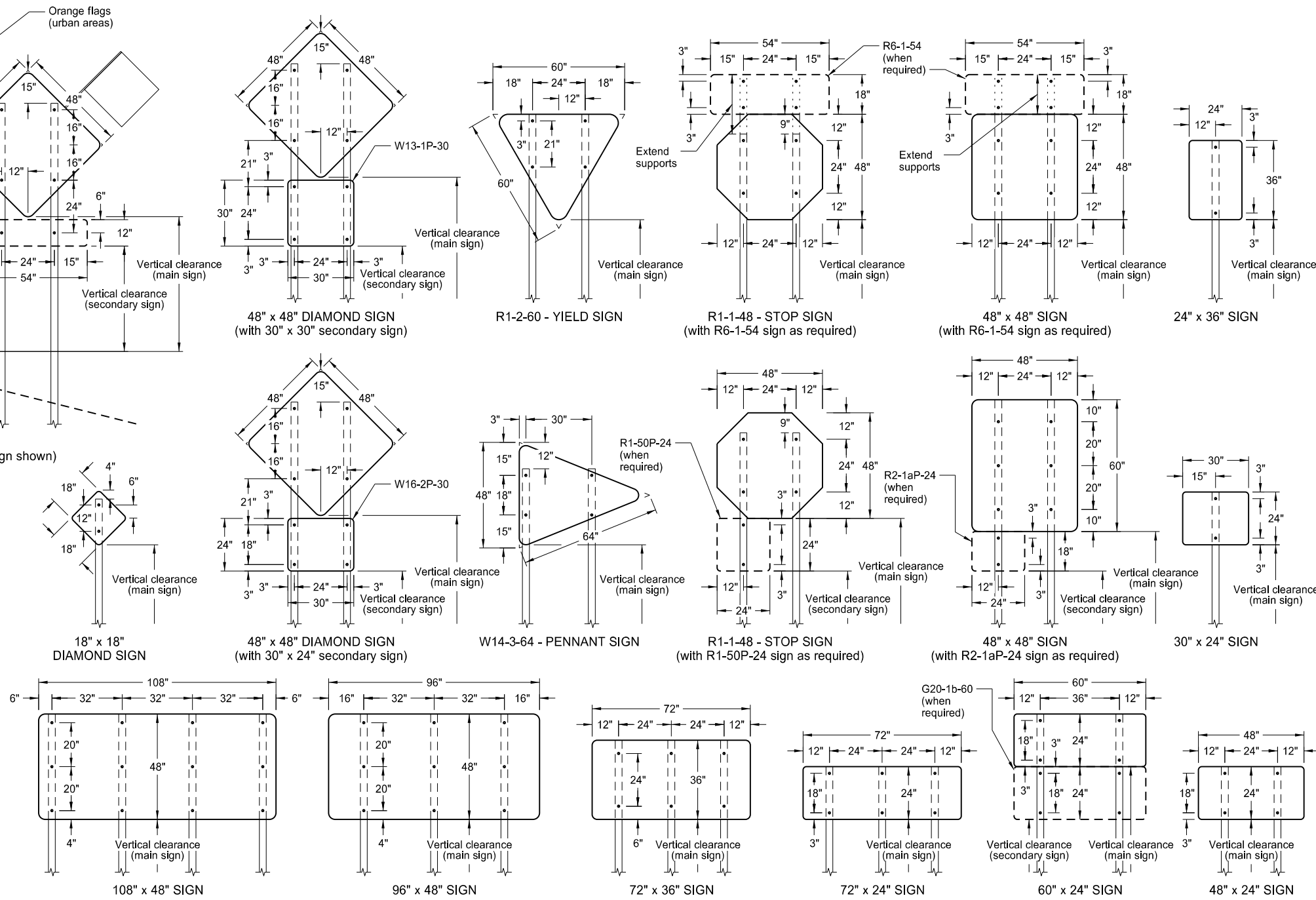
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



24" x 24" ROUTE MARKER ASSEMBLY



36" x 36" ROUTE MARKER ASSEMBLY



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

- 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.

- 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)

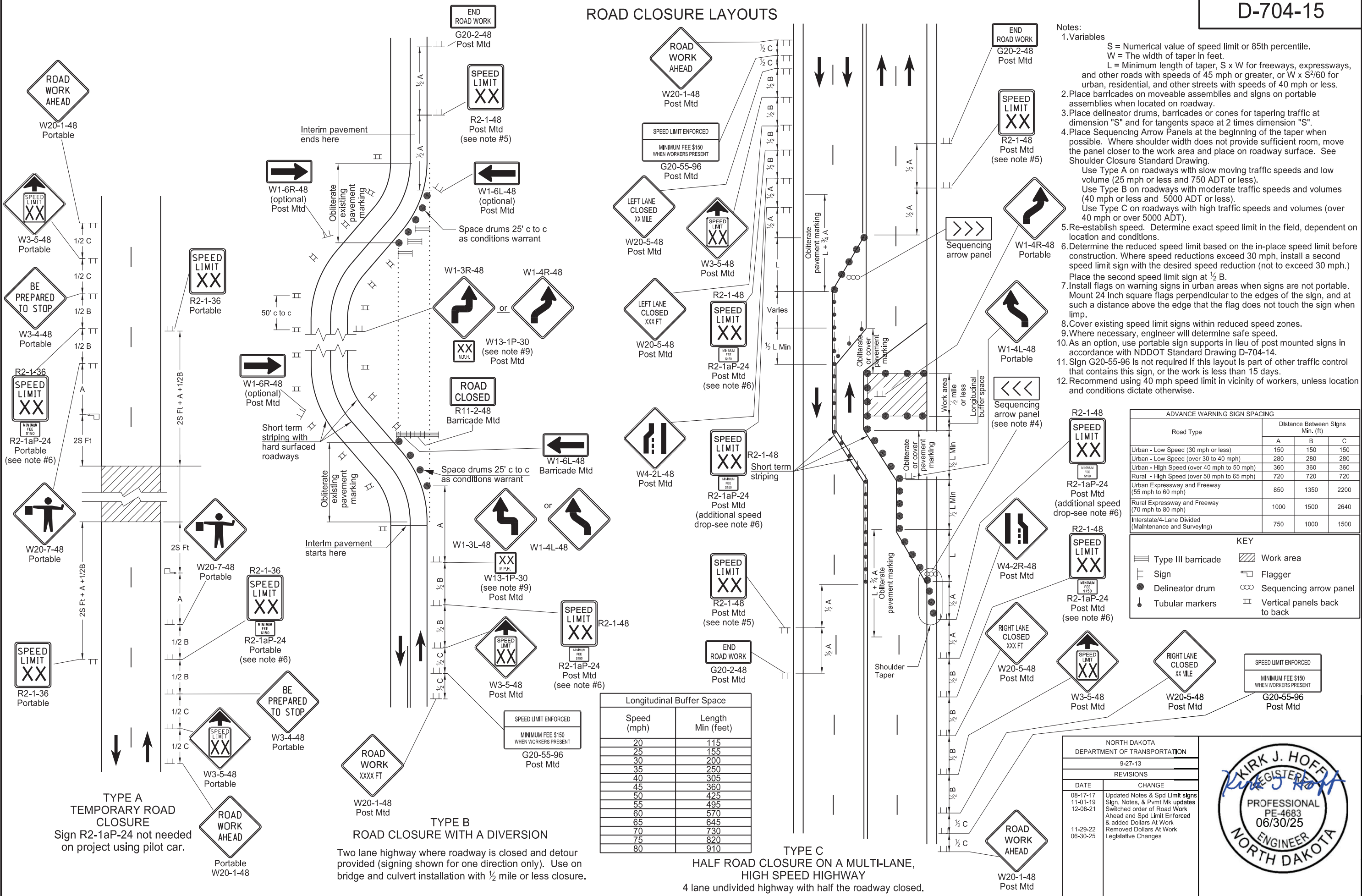
Sign Panel Mounting Height (ft)	Number of 25 lb sandbags for 4' x 4' sign panel
1'	6
5'	8
7'	10

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

ROAD CLOSURE LAYOUTS



- Notes:
- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of taper in feet.
 - L = Minimum length of taper, S x W for freeways, expressways, and other roads with speeds of 45 mph or greater, or W x S²/60 for urban, residential, and other streets with speeds of 40 mph or less.
 - Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
 - Place delineator drums, barricades or cones for tapering traffic at dimension "S" and for tangents space at 2 times dimension "S".
 - Place Sequencing Arrow Panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on roadway surface. See Shoulder Closure Standard Drawing.
 - 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. 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 reduced speed zones.
 - Where necessary, engineer will determine safe speed.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.
 - Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

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 80 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

KEY

	Type III barricade		Work area
	Sign		Flagger
	Delineator drum		Sequencing arrow panel
	Tubular markers		Vertical panels back to back

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
80	910

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
08-17-17	Updated Notes & Spd Limit signs
11-01-19	Sign, Notes, & Pmnt Mk updates
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work
06-30-25	Legislative Changes



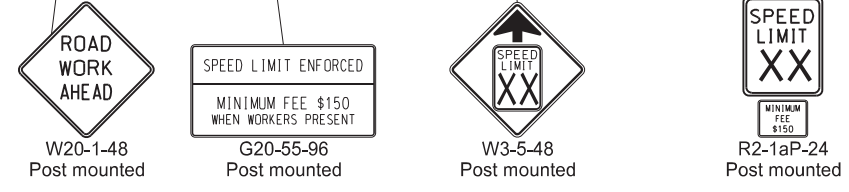
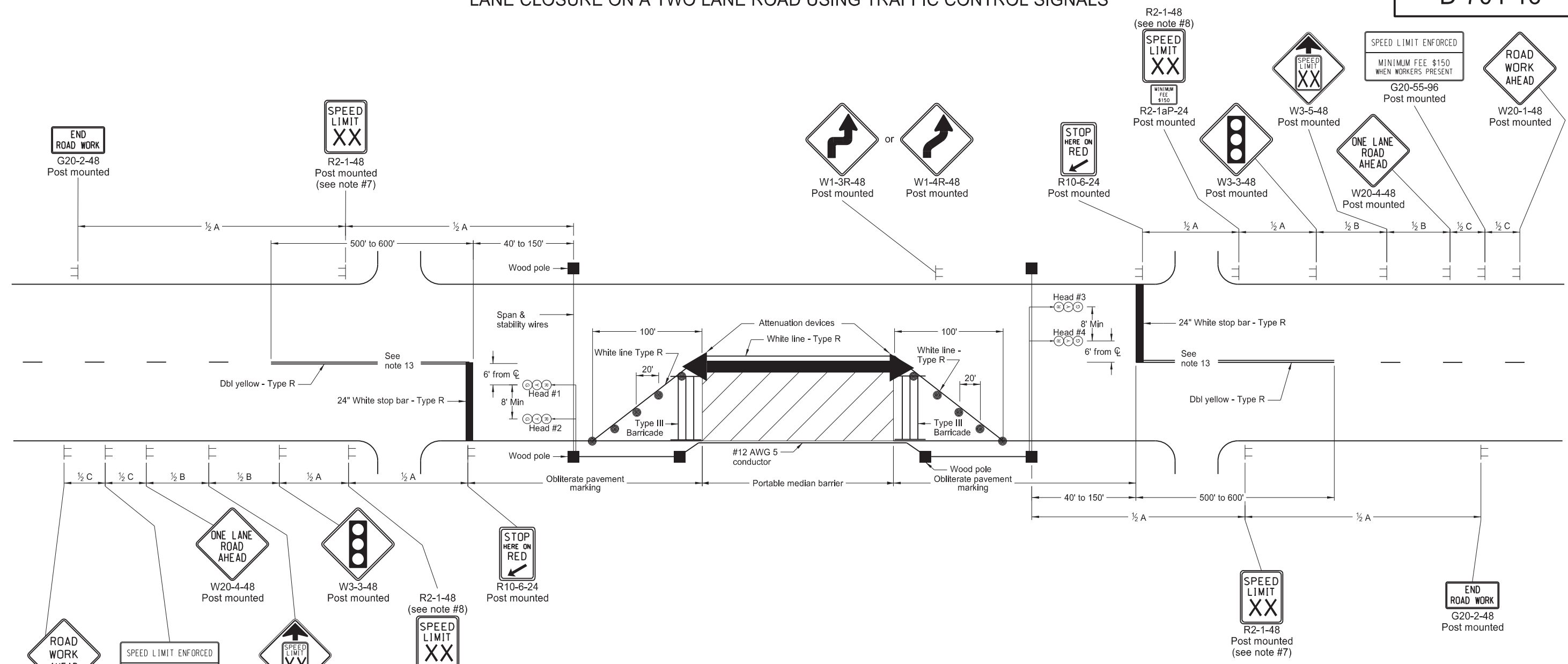
TYPE A TEMPORARY ROAD CLOSURE
Sign R2-1aP-24 not needed on project using pilot car.

TYPE B ROAD CLOSURE WITH A DIVERSION
Two lane highway where roadway is closed and detour provided (signing shown for one direction only). Use on bridge and culvert installation with 1/2 mile or less closure.

TYPE C HALF ROAD CLOSURE ON A MULTI-LANE, HIGH SPEED HIGHWAY
4 lane undivided highway with half the roadway closed.

LANE CLOSURE ON A TWO LANE ROAD USING TRAFFIC CONTROL SIGNALS

D-704-16



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 80 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

	Green			Red		
	Green	Yellow	Red	Green	Yellow	Red
Heads 1 & 2						
Heads 3 & 4						
Time	18.0	4.5	22.5	18.0	4.5	22.5
Cycle = 90 seconds						
Percent of Cycle	20	5	25	20	5	25

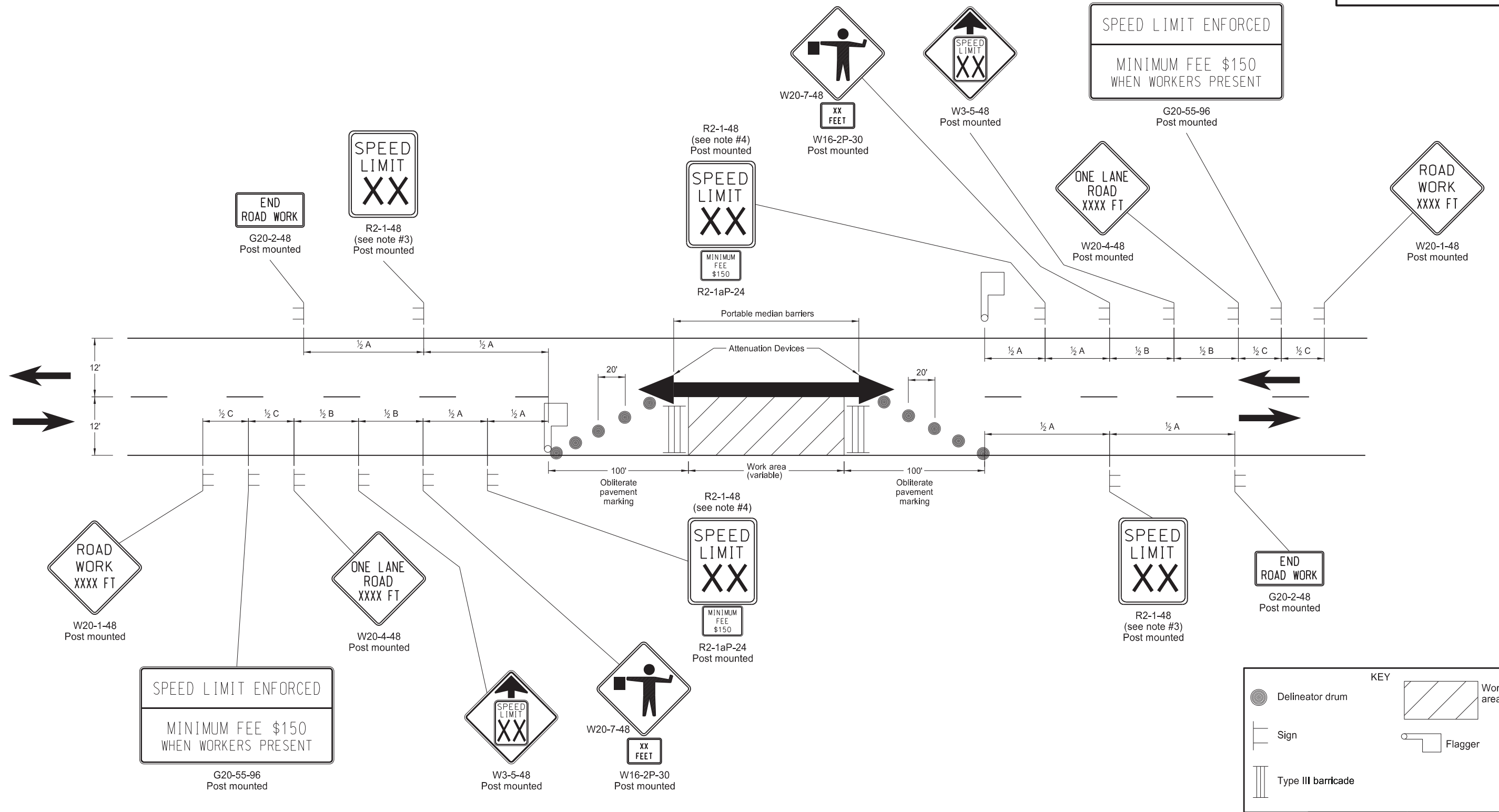
- Notes:
- Span conductor overhead between poles except on bridges, where it may alternately be attached and supported by the bridge structure. When conductor is supported by the bridge structure, attach conductor to avoid interference with bridge construction. Attach conductor on either side of bridge as determined by field personnel.
 - Locate controller on a wood pole in the cable run between signal heads for through traffic movements.
 - The timing schedule is suggested trial setting. Check signals in operation frequently to obtain the most efficient timing schedule.
 - Place wood poles a minimum of 16 feet from edge of driving lane. Provide a minimum 16 to 19 feet clearance from the center line of the roadway to the bottom of traffic signal heads suspended over the roadway.
 - Place traffic signal heads with 12 inch red, yellow and green lenses and 5 inch louvered backplates.
 - See standard drawing "Span Wire Mounted Traffic Signals" for interim traffic construction details.
 - 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.
 - Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - Continue double yellow centerline thru private drives.
 - 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.
 - As an option, use solar powered signals instead of wood pole signal system.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
11-20-15	Revised Note 6 & Renumbered Minimum Fee plaque
08-17-17	Revised notes & added note
11-01-19	Revised sign #s & pvmt mk type
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work
08-31-23	Corrected Note 14 grammar
08-21-24	Pvmt Mkg Width & Med Barrier
06-30-25	Legislative Changes



SIGN LAYOUT FOR ONE LANE CLOSURE TWO LANE ROADWAY

D-704-17



KEY

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

Notes:

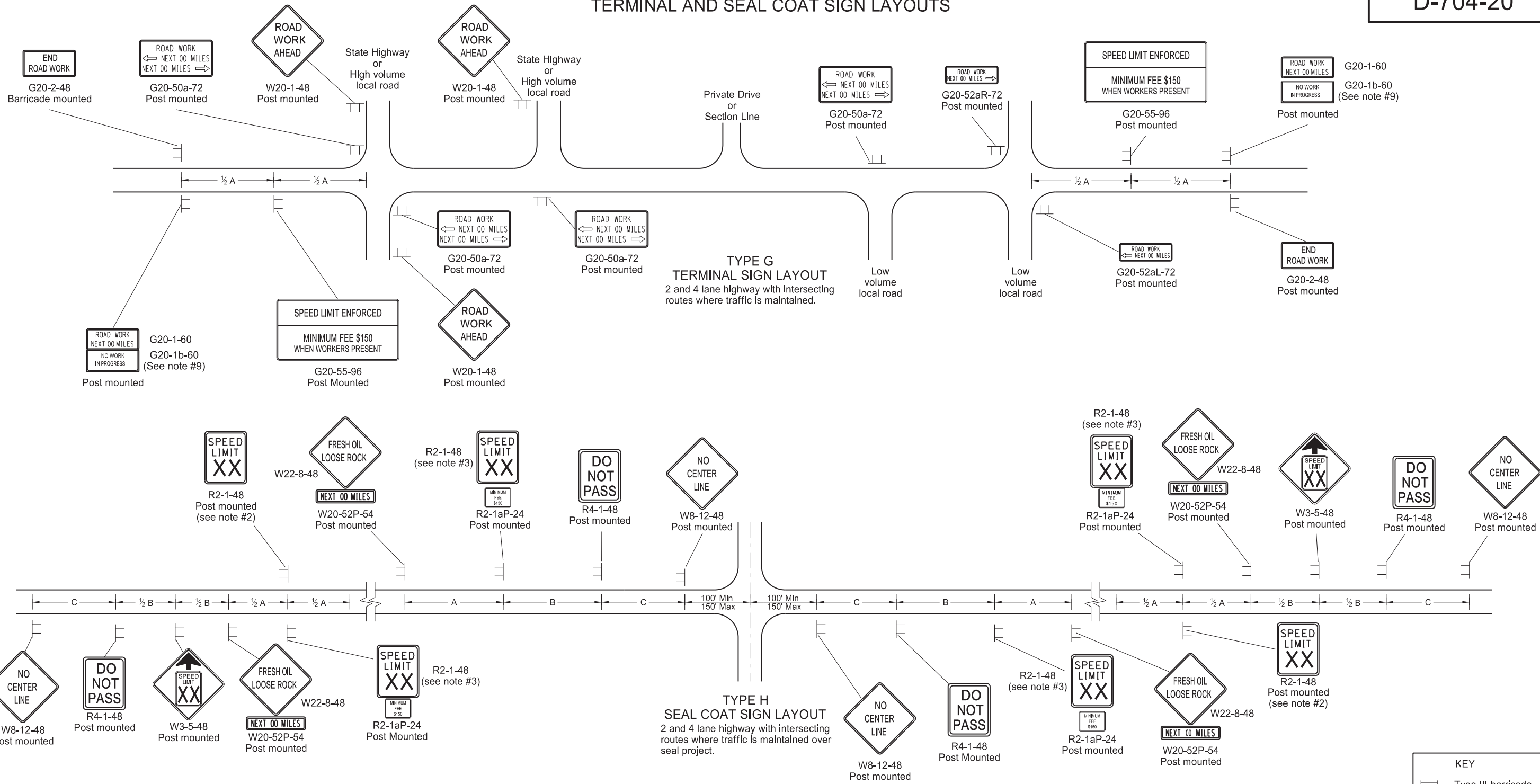
- Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
- Remove existing striping as required. Use back to back delineators when inslope is 4:1 or flatter and roadway alignment is visible to approaching vehicles. Place back to back vertical panels when roadways 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 1/2 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.
- 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.

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 80 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
11-29-22	Removed Dollars At Work
08-21-24	Pvmt Mkg Width & Med Barter
06-30-25	Legislative Changes



TERMINAL AND SEAL COAT SIGN LAYOUTS



**TYPE G
TERMINAL SIGN LAYOUT**
2 and 4 lane highway with intersecting routes where traffic is maintained.

**TYPE H
SEAL COAT SIGN LAYOUT**
2 and 4 lane highway with intersecting routes where traffic is maintained over seal project.

KEY

- ≡ Type III barricade
- ≡ Sign

- Notes:**
- Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
 - Determine the exact speed limit in the field, based on location and conditions.
 - Determine the reduced speed limit based on the in place speed limit before construction. Where speed limit 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.
 - On seal coat projects, place signs R2-1-48, R2-1aP-24, R4-1-48, W22-8-48 and W20-52P-54 after all important intersections and at five mile intervals. Place sign W8-12-48 after all important intersections and at 2 mile intervals until short term center line pavement marking is placed.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Drawing D-704-14.
 - Cover or remove speed limit signs from layout Type H when loose aggregate is removed.
 - Install sign G20-1b-60 when work is suspended for winter.
 - Use other traffic control layouts in immediate work areas. Place sign R2-1aP-24 below speed limit signs in reduced speed limit work areas.
 - Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.
 - Recommend using 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 80 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	Updated notes & sign numbers
11-01-19	Updated note & sign
12-08-21	Switched order of Road Work and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work
06-30-25	Legislative Changes

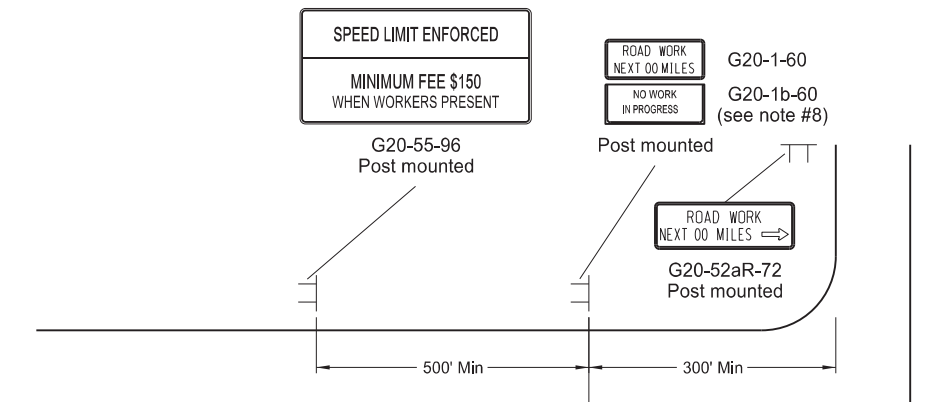
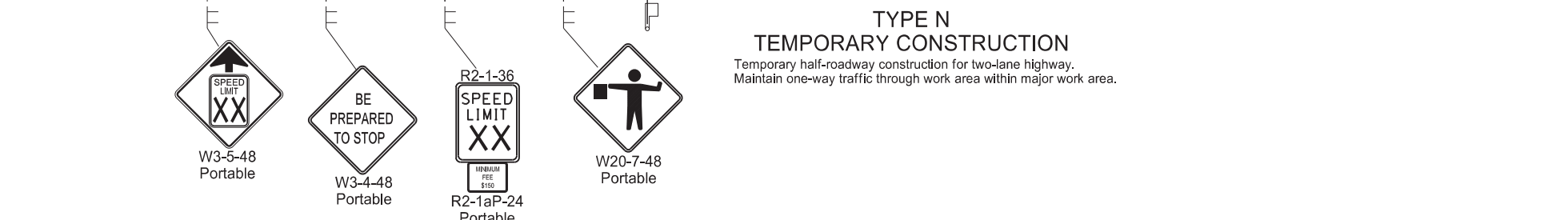
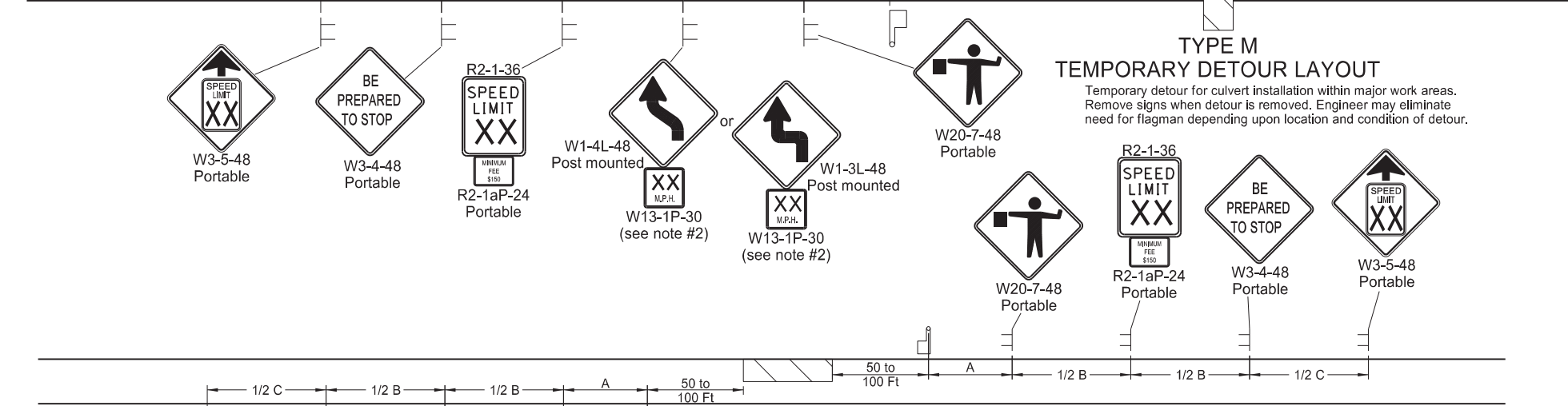
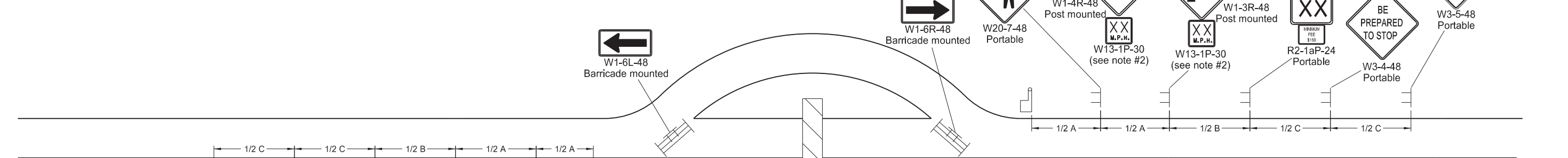
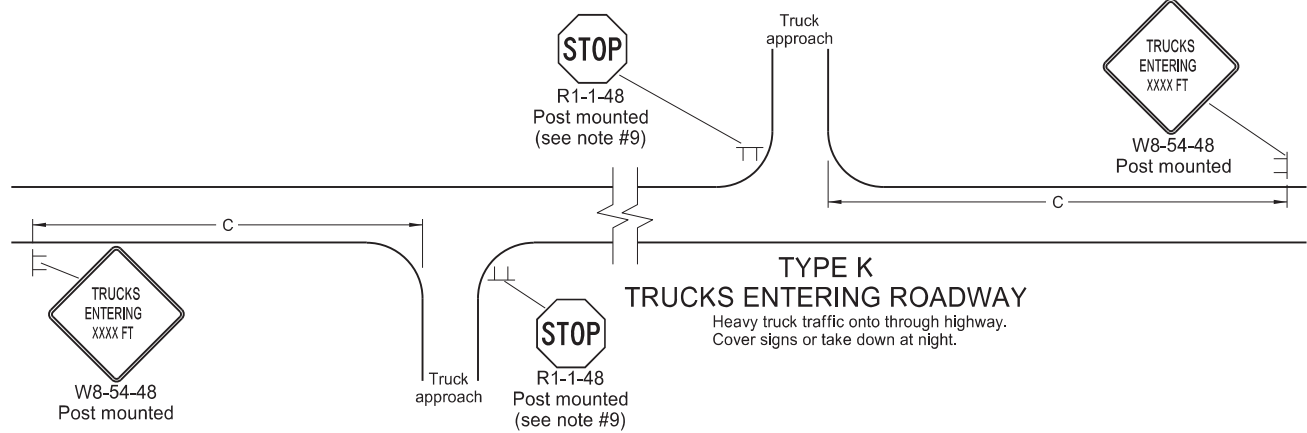


D-704-22

CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

KEY

- Type III barricade
- Sign
- Work area
- Flagger



- Notes:
- Place barricades on a moveable assemblies and signs on portable assemblies when located on roadway.
 - Where necessary, safe speed to be determined by the Engineer.
 - 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.
 - Covered (when approved by engineer) or obliterated pavement marking measured as Obliteration of Pavement Marking.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - Install sign G20-1b-60 when work is suspended for winter.
 - If existing stop sign is in place, a 48" stop sign is not required.
 - Sign G20-55-96 is not required if 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.

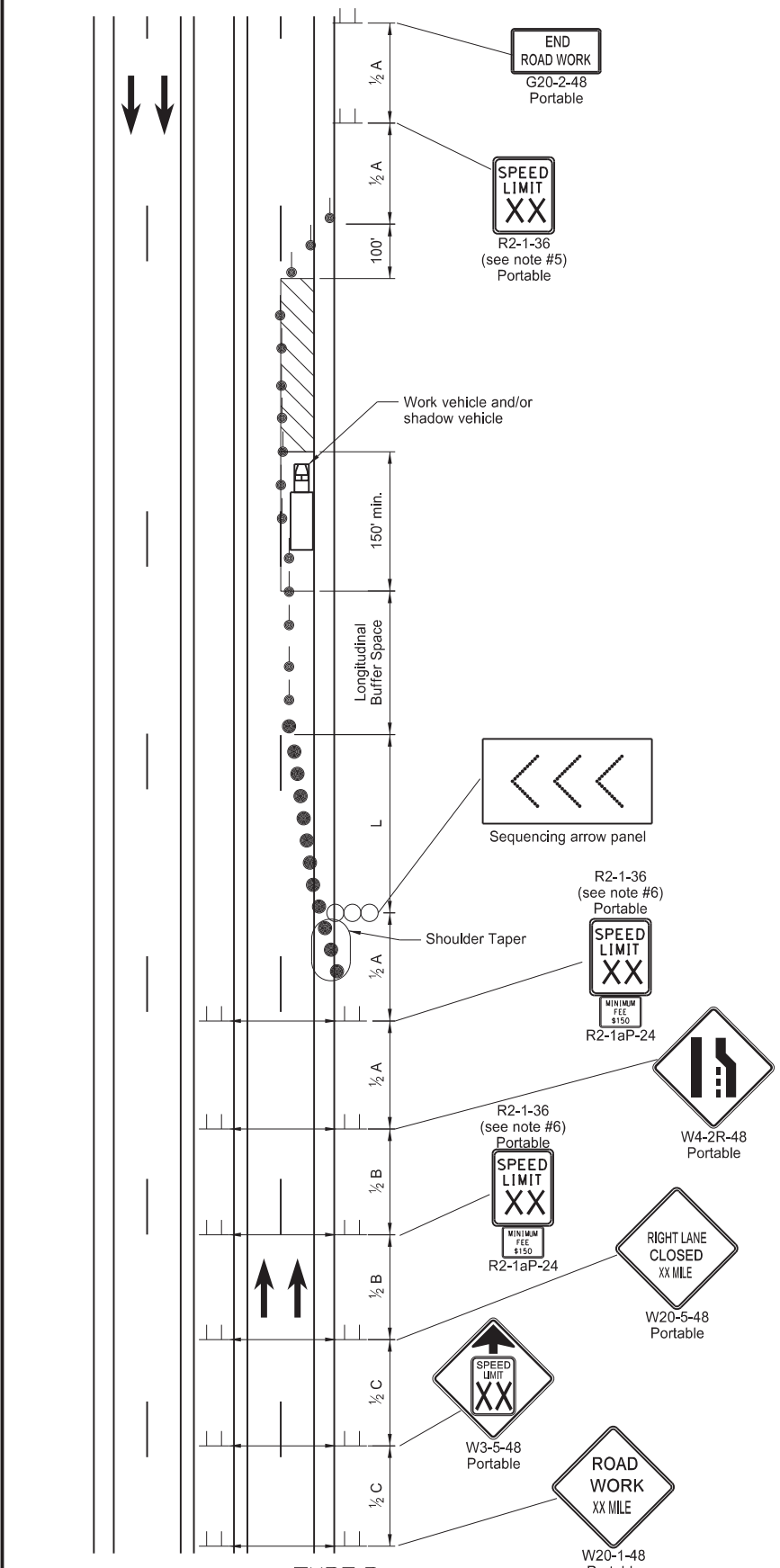
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 80 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	Update notes & sign numbers
11-01-19	Revised sign numbers & note 7
12-09-21	Added Speed Limit Enforced and Dollars At Work signs
11-29-22	Removed Dollars At Work
06-30-25	Legislative Changes

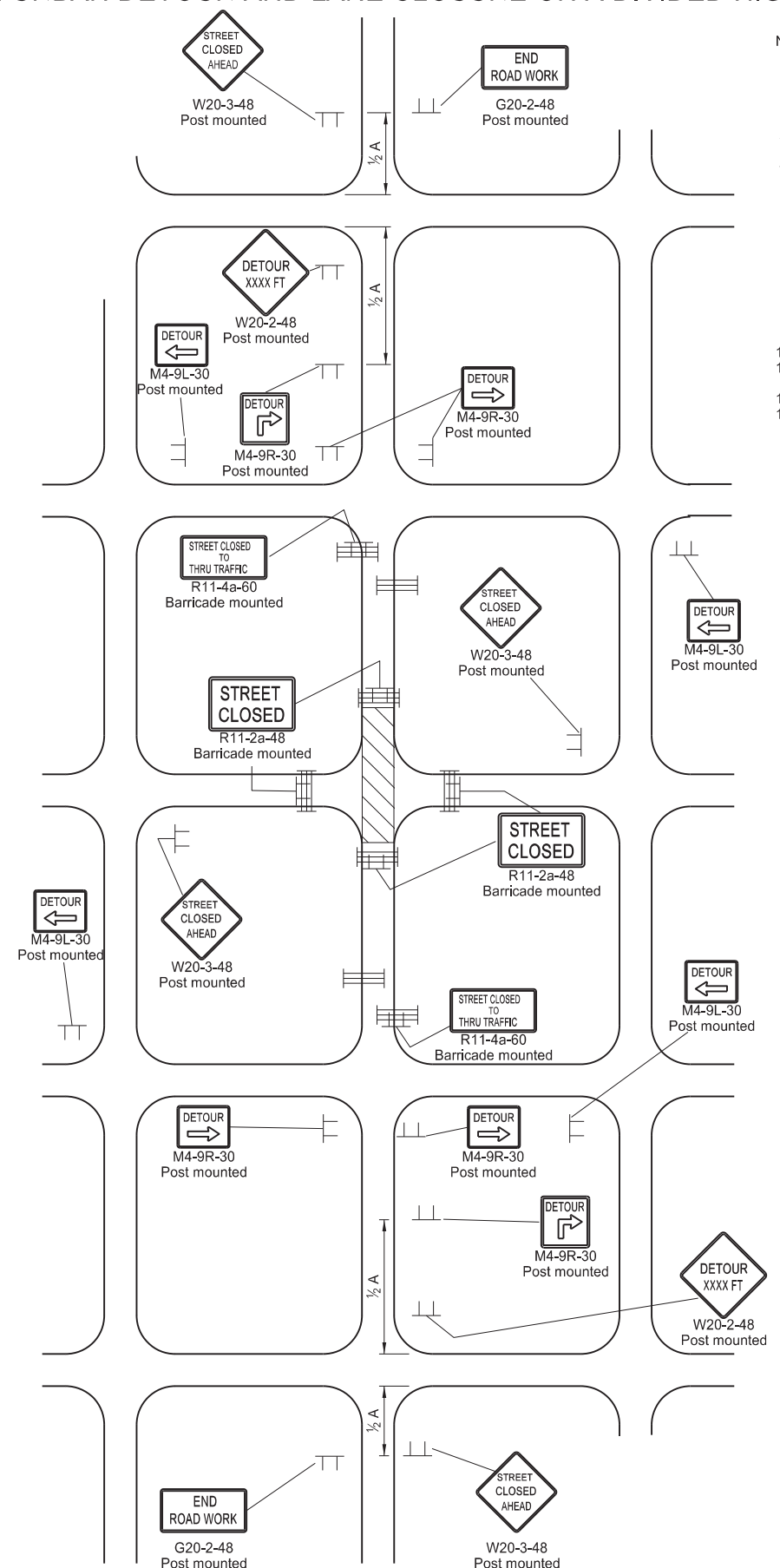


SHORT TERM URBAN DETOUR AND LANE CLOSURE ON A DIVIDED HIGHWAY LAYOUTS

D-704-23



TYPE P
STATIONARY LANE CLOSURE ON A DIVIDED HIGHWAY
 4 lane divided roadway where 1/2 of roadway is closed.
 Short-term (more than 1 hour within a single daylight period.)



TYPE Q
DETOUR FOR A CLOSED STREET
 Where city streets are used for detouring traffic.
 Urban projects do not require the G20-55-96 and R2-1aP-24 signs.

- Notes:
- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of 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.
 - Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
 - Space delineator drums for tapering traffic at dimension "S". Space delineator drums or tubular markers for tangents at 2 times "S".
 - Place Sequencing Arrow Panels at the beginning of taper. Where shoulder width does not provide sufficient room, move panel closer to the work area and place on roadway surface.
 - 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-established 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.
 - Covered (when approved by engineer) or obliterated payment marking measured as as Obliteration of Pavement Marking.
 - Change intersection control on detour for Type Q when determined necessary by the engineer.
 - Engineer to determine safe speed where necessary. When parking is present, place signs so they are entirely visible above parked vehicles or at the edge of the parking area so they are visible to oncoming traffic.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - Recommend using 40 mph speed limit in vicinity of workers for Layout Type P, unless location and conditions dictate otherwise.

KEY

- Type III barricade
- Work area
- Sign
- Sequencing arrow panel
- Delineator Drum
- Tubular Markers

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 80 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

Longitudinal Buffer Space

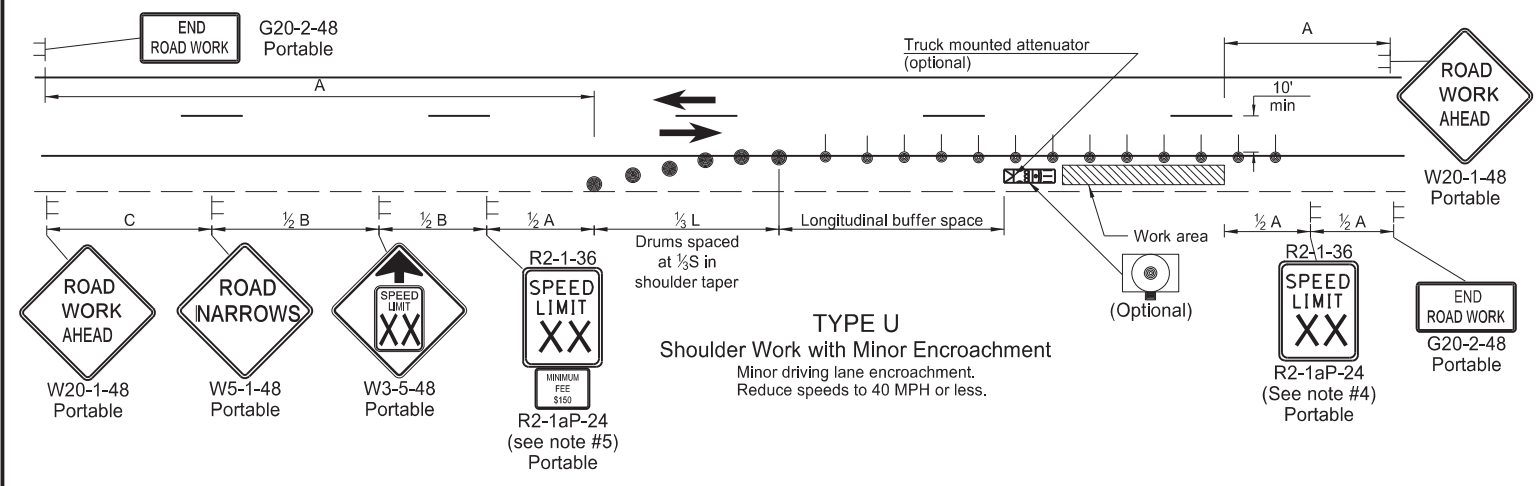
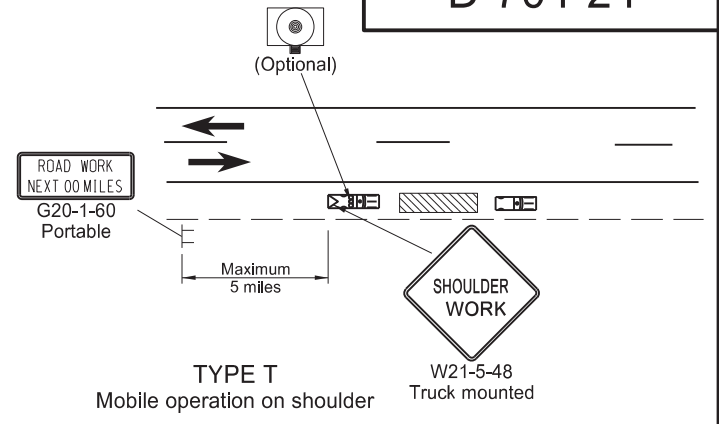
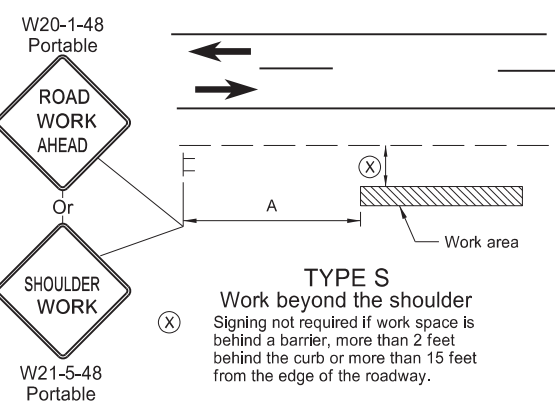
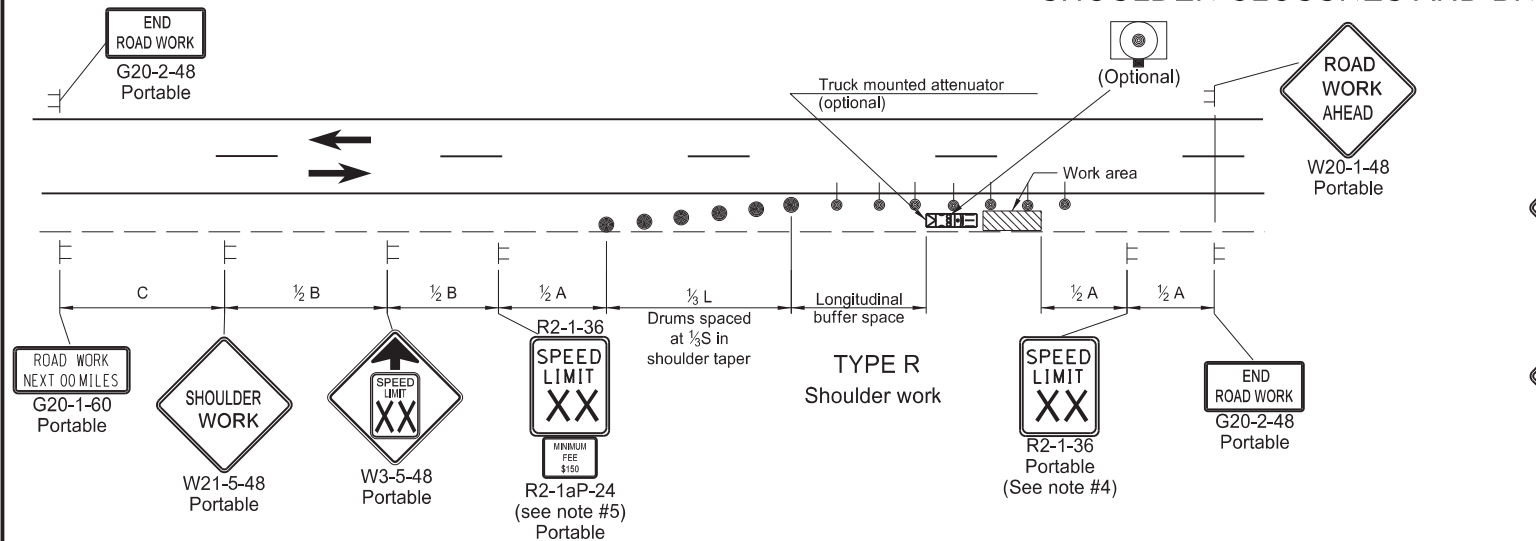
Speed (mph)	Length Min (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820
80	910

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
 9-27-13
REVISIONS

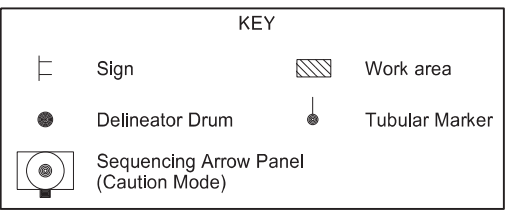
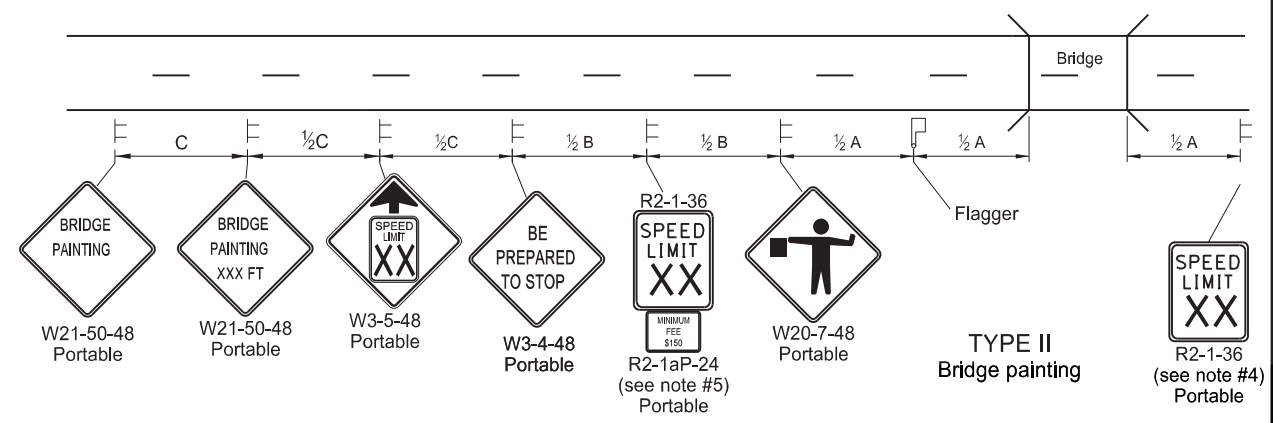
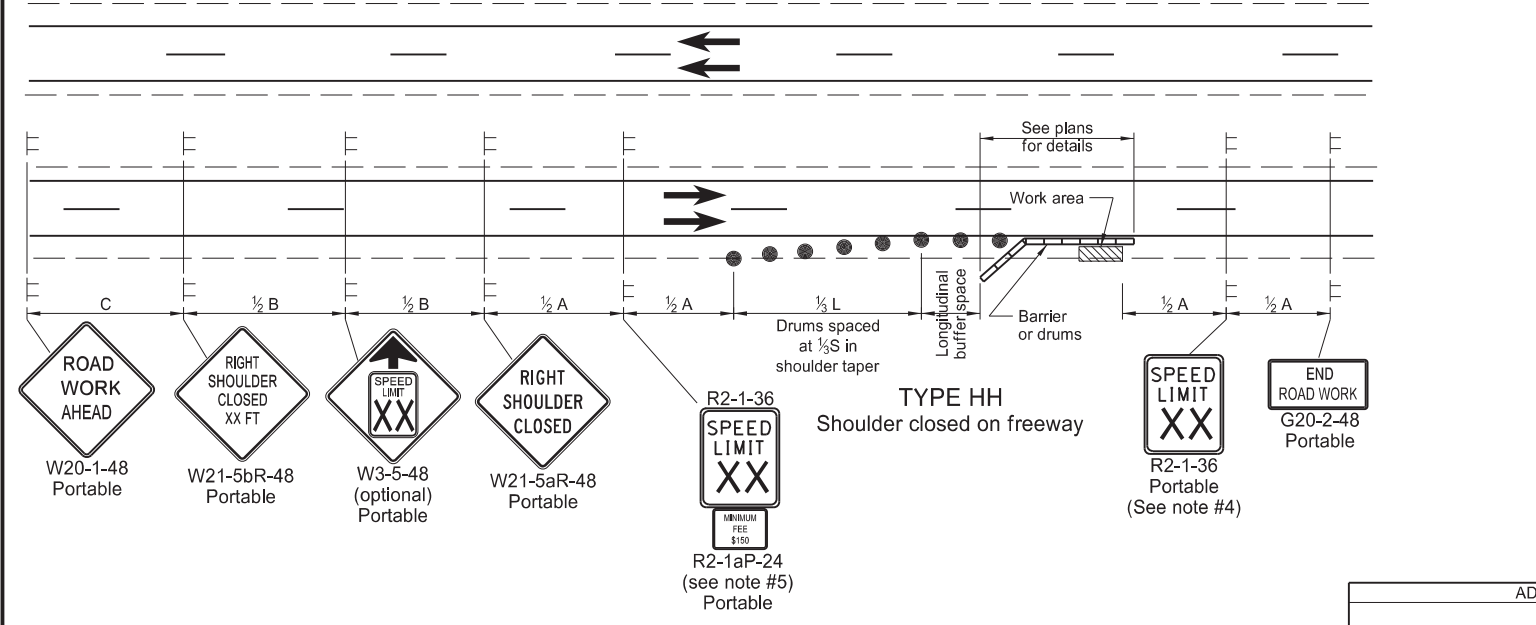
DATE	CHANGE
08-17-17	Removed speed limit signs, & updated notes & sign numbers
11-01-19	Revised sign numbers & note
12-08-21	Added Dollars At Work sign
11-29-22	Removed Dollars At Work
06-30-25	Legislative Changes



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 x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x S² / 60 for urban, residential, and other streets with speeds of 40 mph or less.
 - 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.



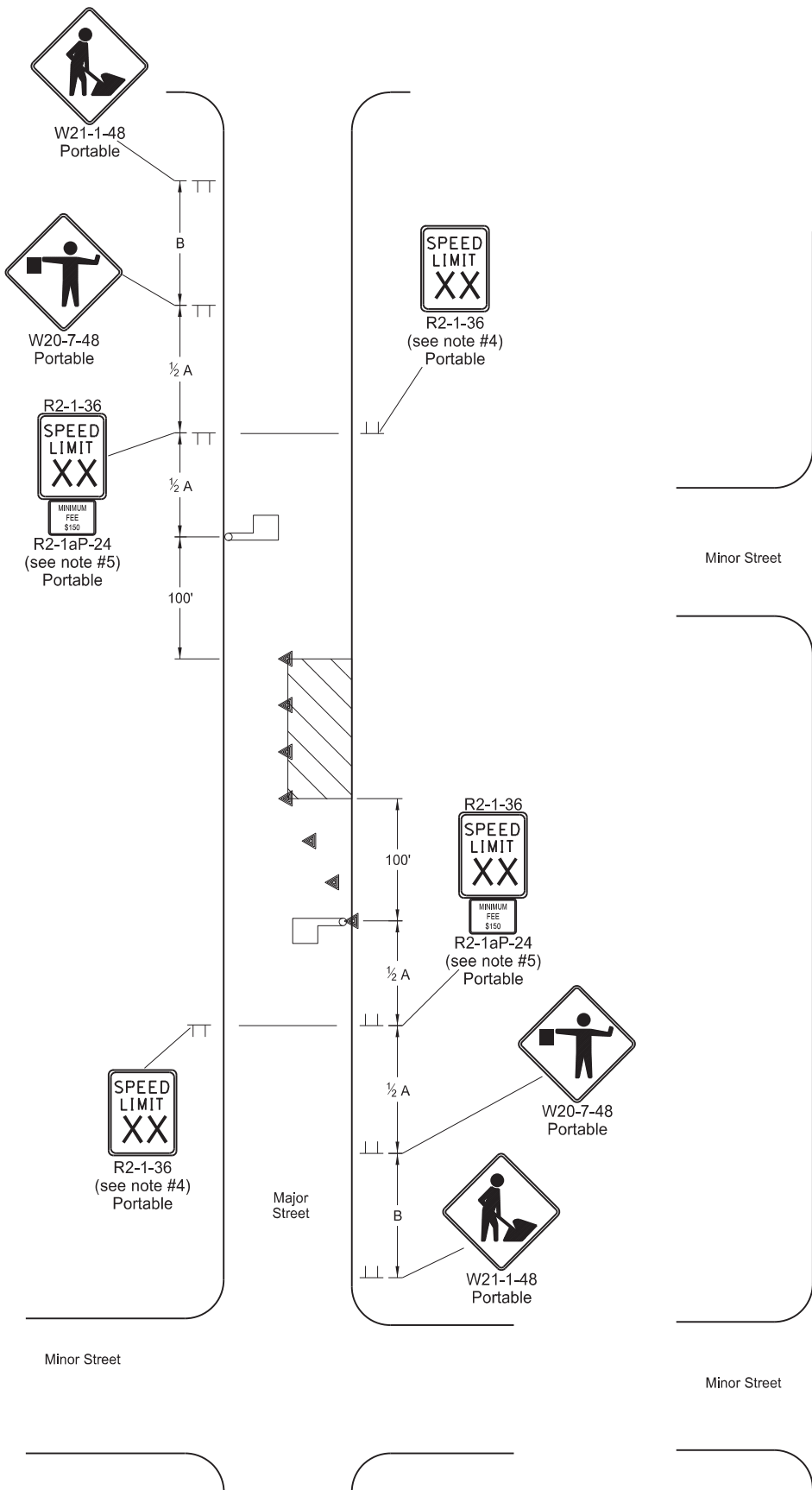
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (65 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 80 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
80	910

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
08-17-17	Updated notes & revised signs
11-01-19	Revised drum spacing & signs nos
08-01-24	Electronic Stamp/Signature
06-30-25	Legislative Changes

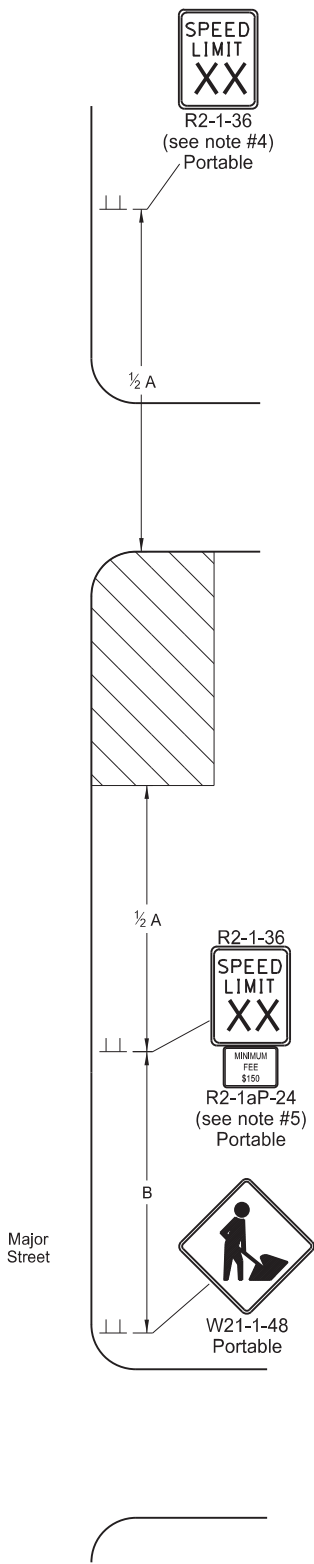


LANE CLOSURES ON URBAN STREETS LAYOUTS



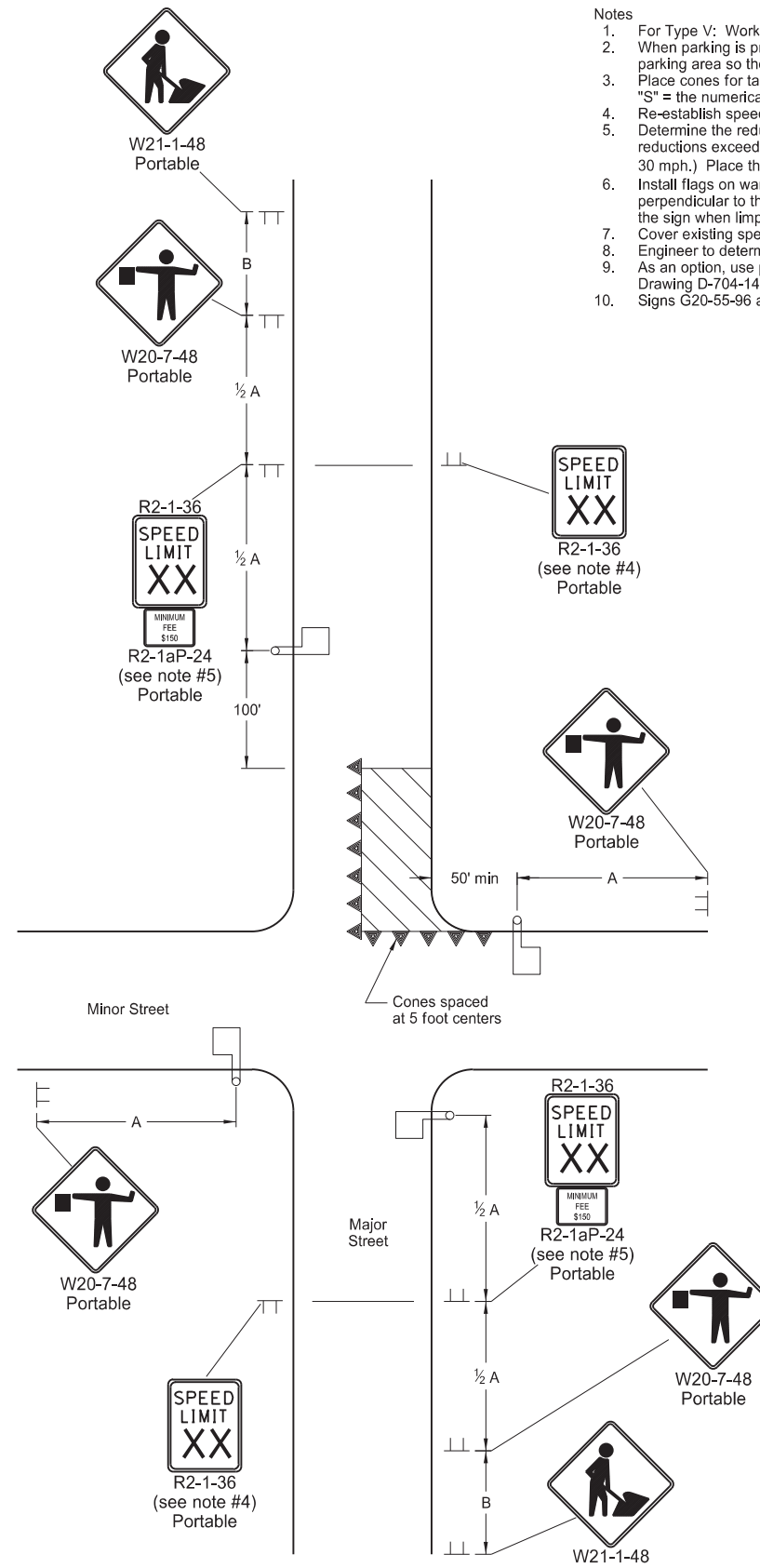
TYPE V
LANE CLOSURE ON URBAN STREET

Portion of roadway closed to traffic only during daylight hours (mid block location).



TYPE W
WORK BEYOND CURB ON URBAN STREET

Work area outside driving lane and no closure necessary.



TYPE X
LANE CLOSURE NEAR INTERSECTION ON URBAN STREET

Portion of roadway closed to traffic only during daylight hours (end block location).

- Notes
- For Type V: Work on one side of roadway at a time so as not to block off more than one lane of traffic.
 - When parking is present, place signs so they are entirely visible above parked vehicles or at the edge of the parking area so they are visible to oncoming traffic. Place signs on portable mounts when located on roadway.
 - Place cones for tapering traffic at 3 equal spaces and cones for tangents at dimension "S". "S" = the numerical value of speed limit.
 - 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 inches 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 reduced speed zones.
 - Engineer to determine safe speed, when necessary.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - Signs G20-55-96 and R2-1aP-24 are not required for urban projects.

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 80 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

KEY

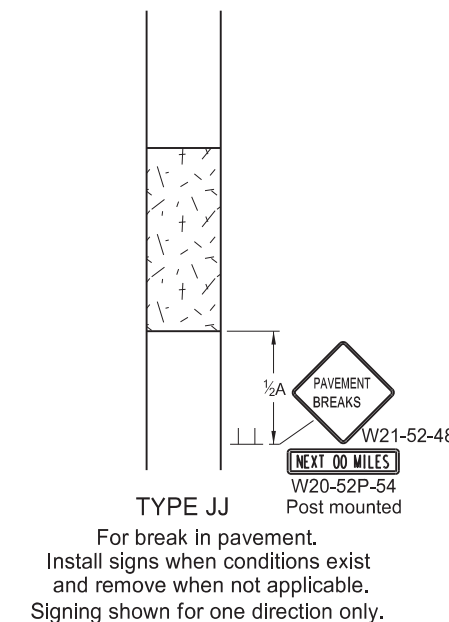
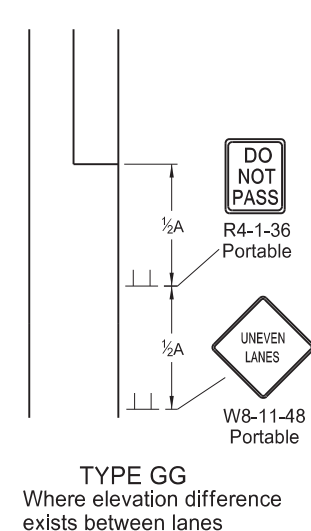
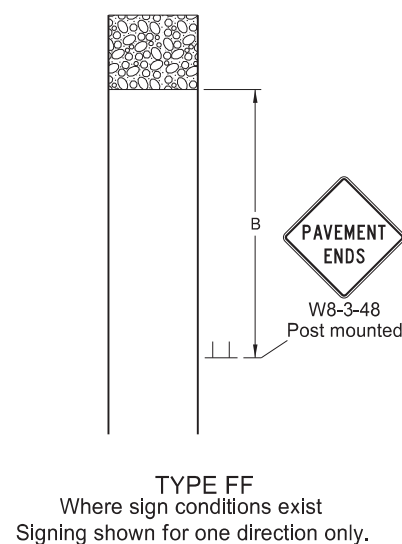
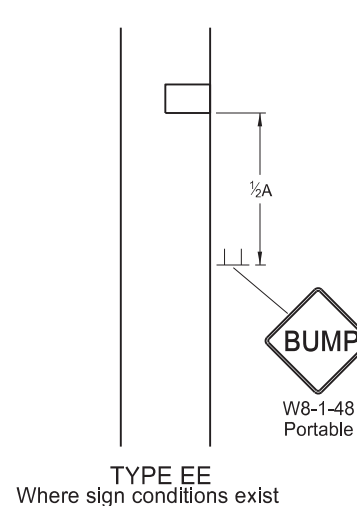
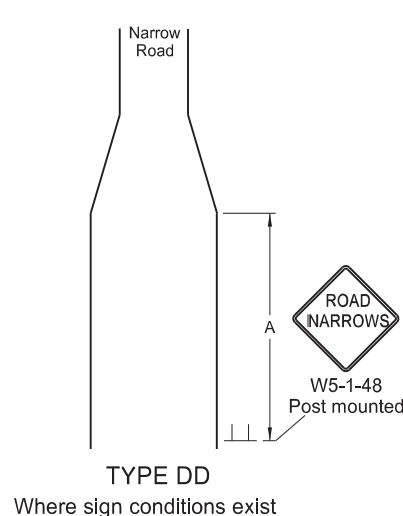
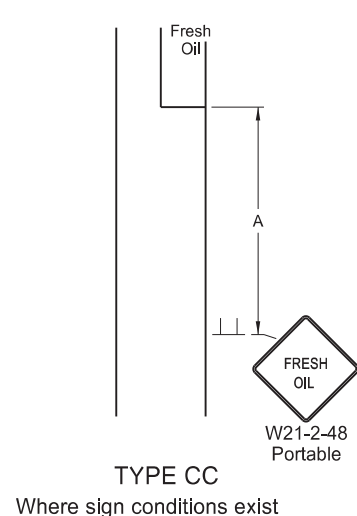
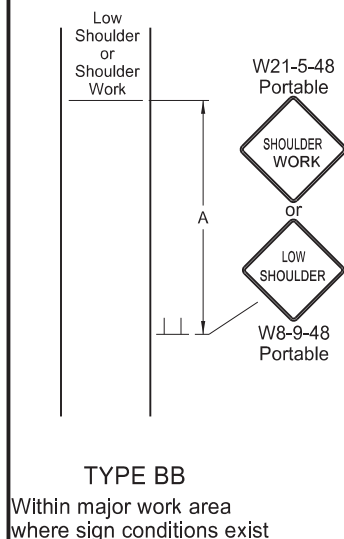
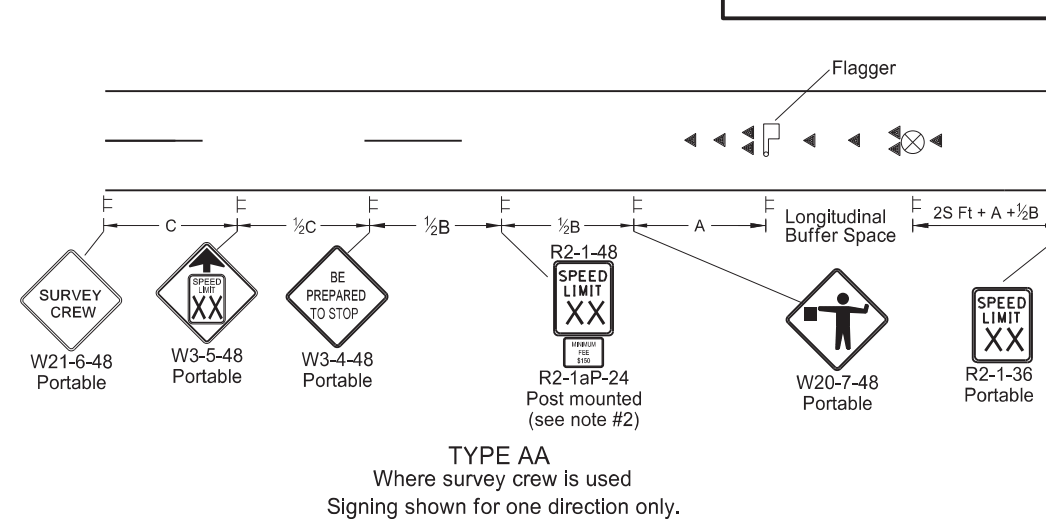
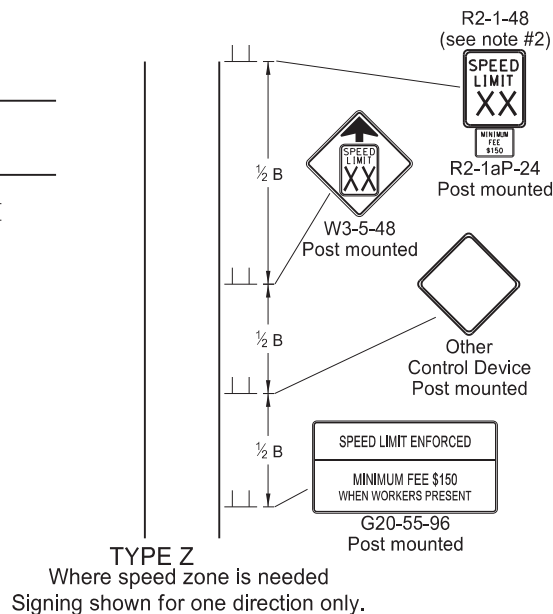
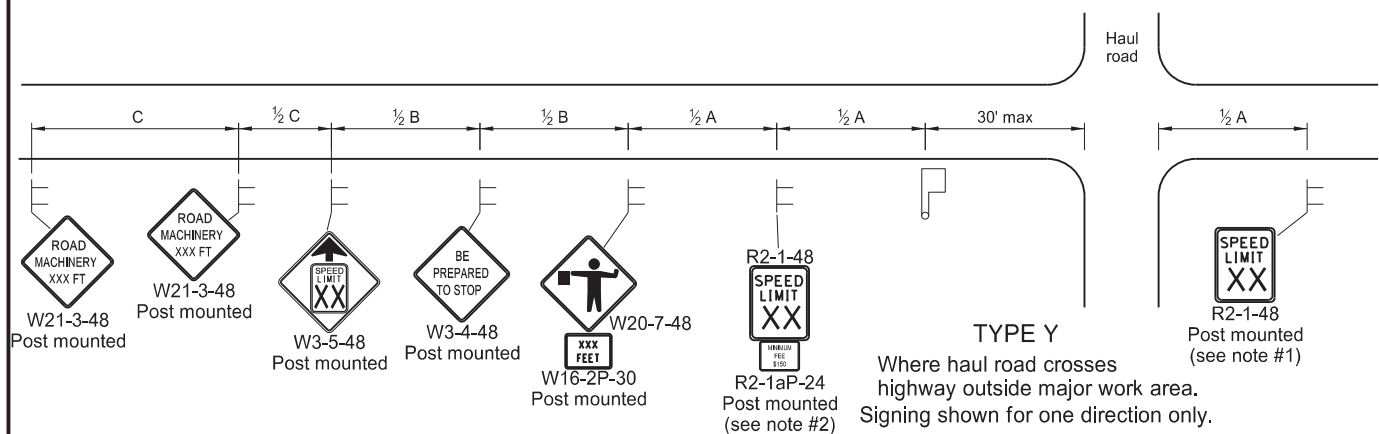
	Sign		Work area
	Cones		Flagger

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
08-17-17	Updated notes & removed signs
11-01-19	Revised note & added Min Fee sign
08-01-24	Electronic Stamp/Signature
06-30-25	Legislative Changes



MISCELLANEOUS SIGN LAYOUTS

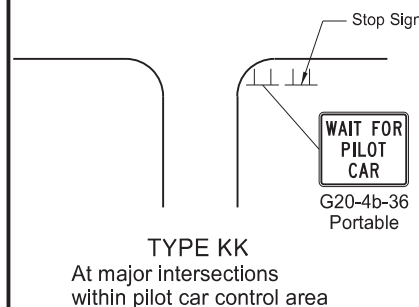
D-704-26



KEY

- Flagger
- Sign
- Cones
- Survey Equipment

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



- Notes**
- Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions. 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.
 - 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 reduced speed zones.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - Sign G20-55-96 is not required if this standard is part of other traffic control layouts, or work is less than 15 days.
 - When pilot car operation is used, place sign G20-4b-36 "Wait For Pilot Car" at major intersections within pilot car control area.
 - Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
 - 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 (65 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 80 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

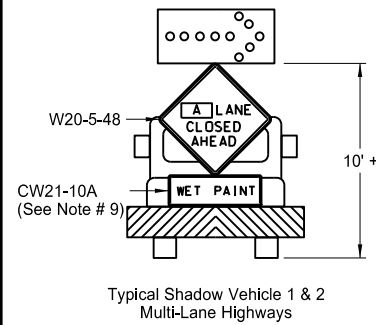
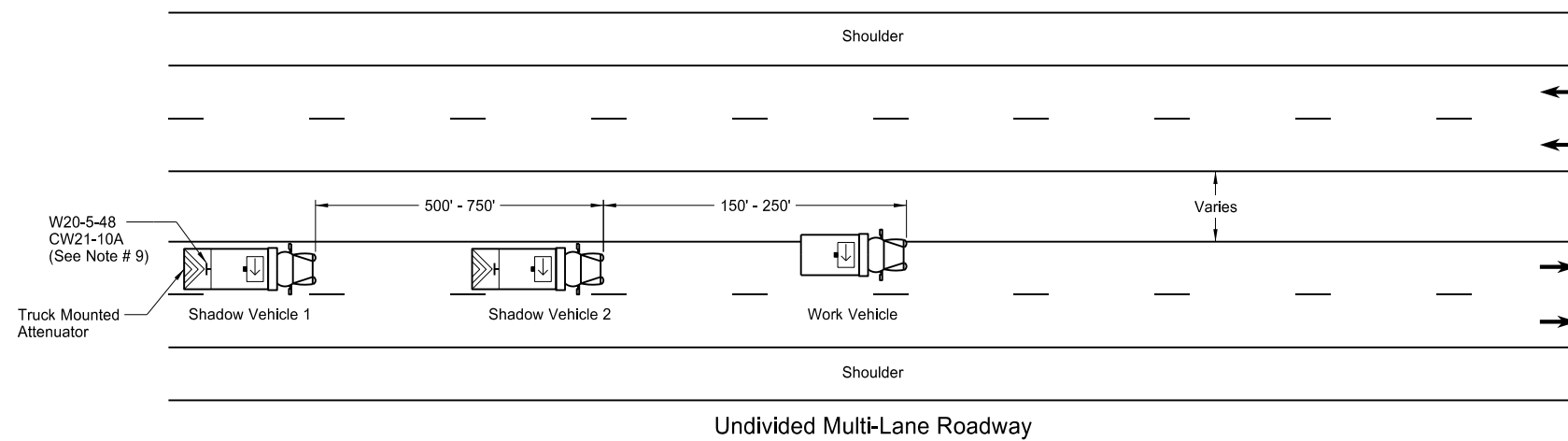
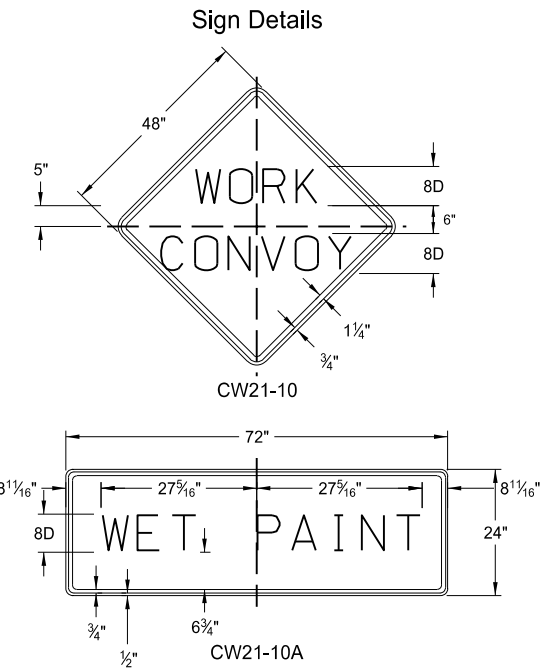
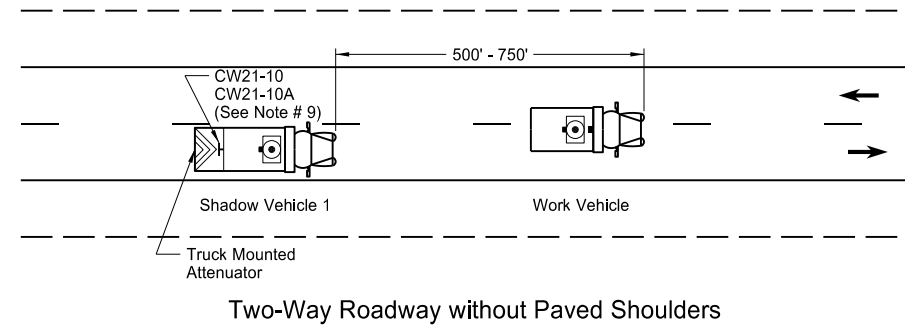
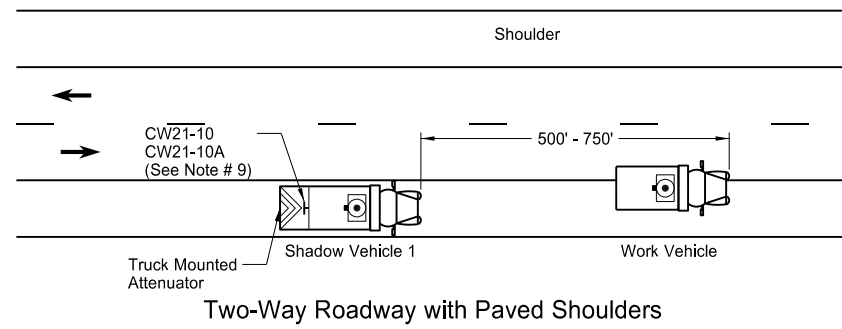
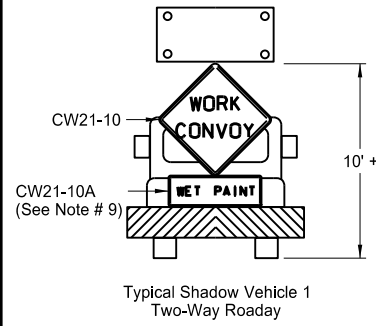
Longitudinal Buffer Space	
*Speed (mph)	Length Min (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820
80	910

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

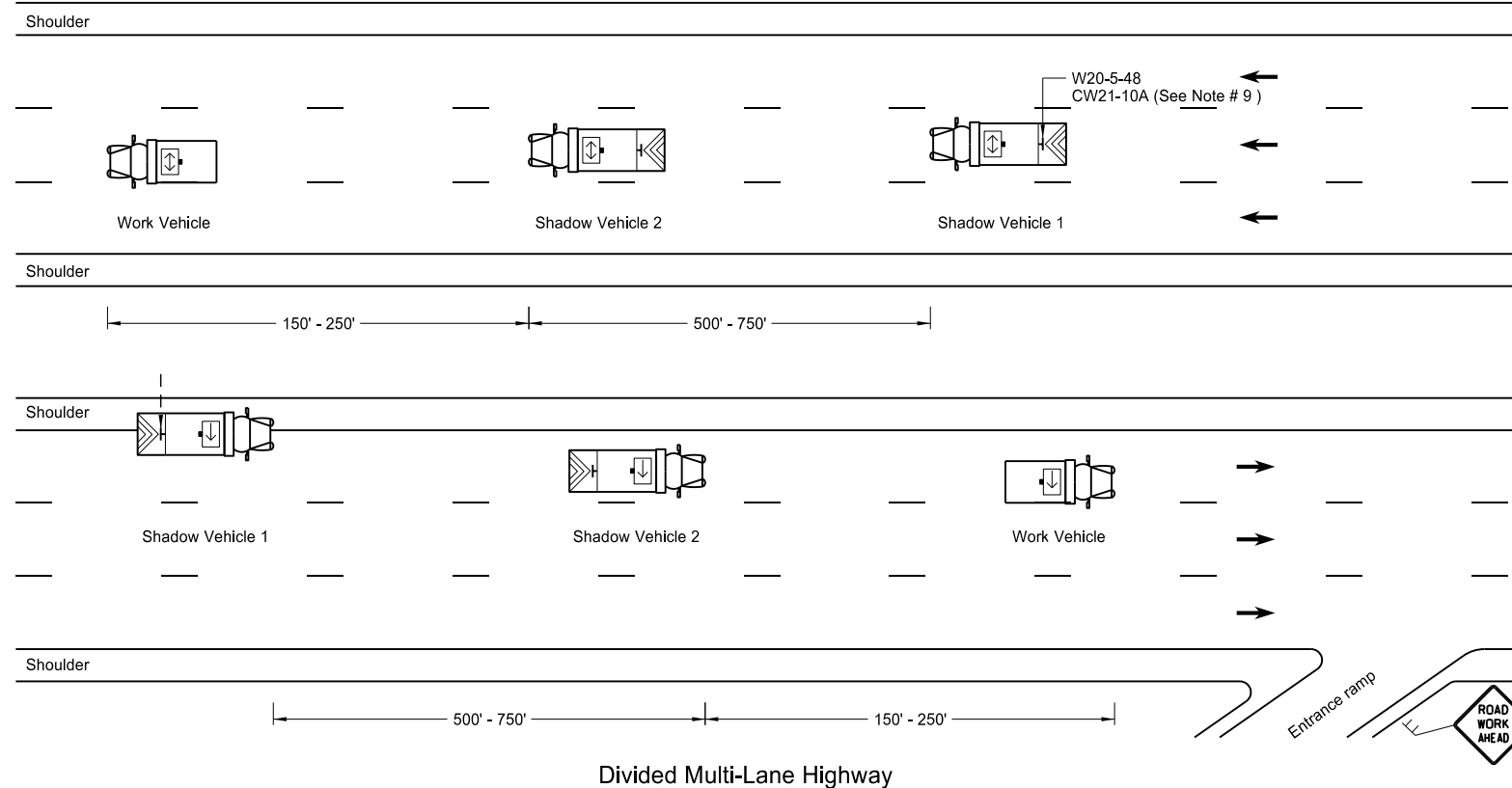
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
08-17-17	Added speed limit signs. Updated notes & sign numbers
11-01-19	Revised note 5 & sign numbers
02-23-23	Revised distance & removed signs
06-30-25	Legislative Changes



MOBILE OPERATION
(PAVEMENT MARKING)

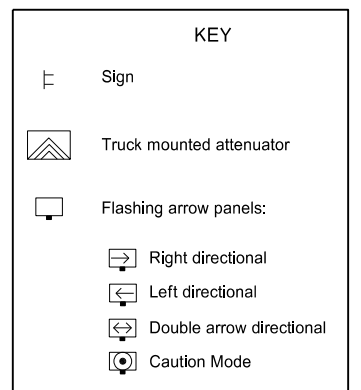


A = Left Right Center



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.

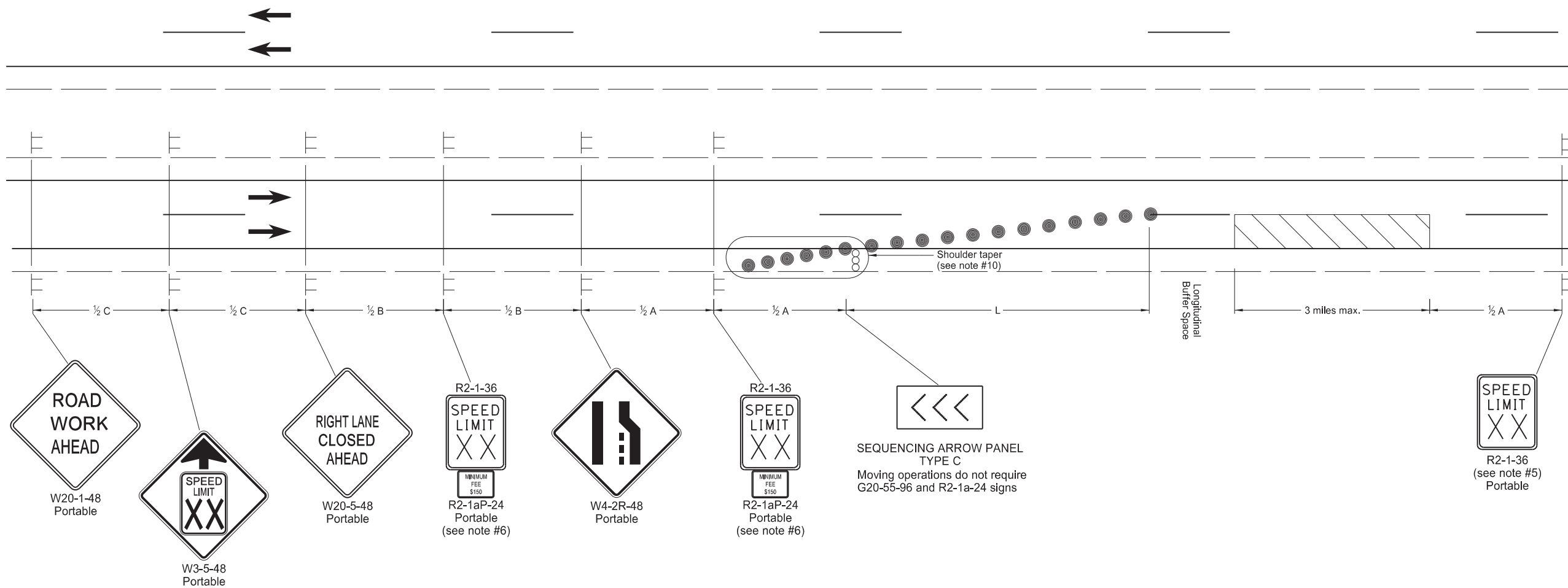


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
6-18-14	Removed shadow vehicle 2 on two lane roadways
9-27-17	Updated to active voice
11-08-19	Changed Standard Heading

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

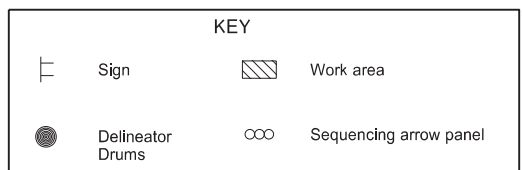
SIGN LAYOUT FOR ONE LANE CLOSED DIVIDED HIGHWAY MOVING OPERATION

D-704-32



- Notes**
- Provide an additional sequencing arrow panel in the closed lane, near the work area, if the moving operation is not visible to the motorist from the end of the taper.
 - Variables
 S = Numerical value of speed limit or 85th percentile.
 W = The width of the taper.
 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".
 - Sequencing Arrow Panels
 Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface.
 Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph & 750 ADT or less).
 Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less).
 Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 5000 ADT).
 - Re-establish speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
 - Determine the reduced speed limit 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.
 - Provide shoulder taper when shoulder is 8' or wider.
 - Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

SEQUENCING ARROW PANEL
TYPE C
Moving operations do not require G20-55-96 and R2-1a-24 signs



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
80	910

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

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 80 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
06-24-14	Revised Note 9
08-17-17	Updated notes & sign numbers
11-01-19	Added sign, revised note & sign #
08-02-24	Electronic Stamp/Signature
06-30-25	Legislative Changes

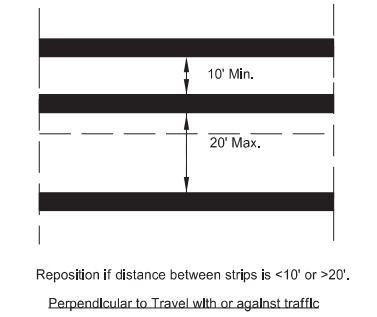
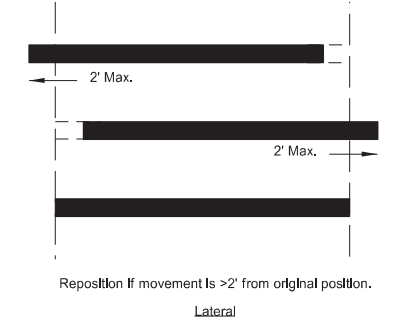
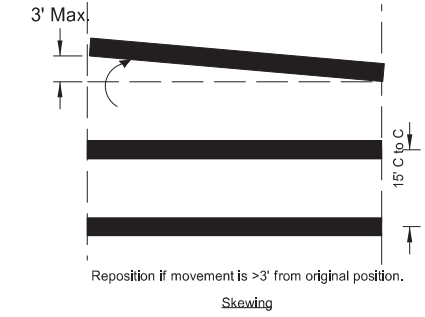
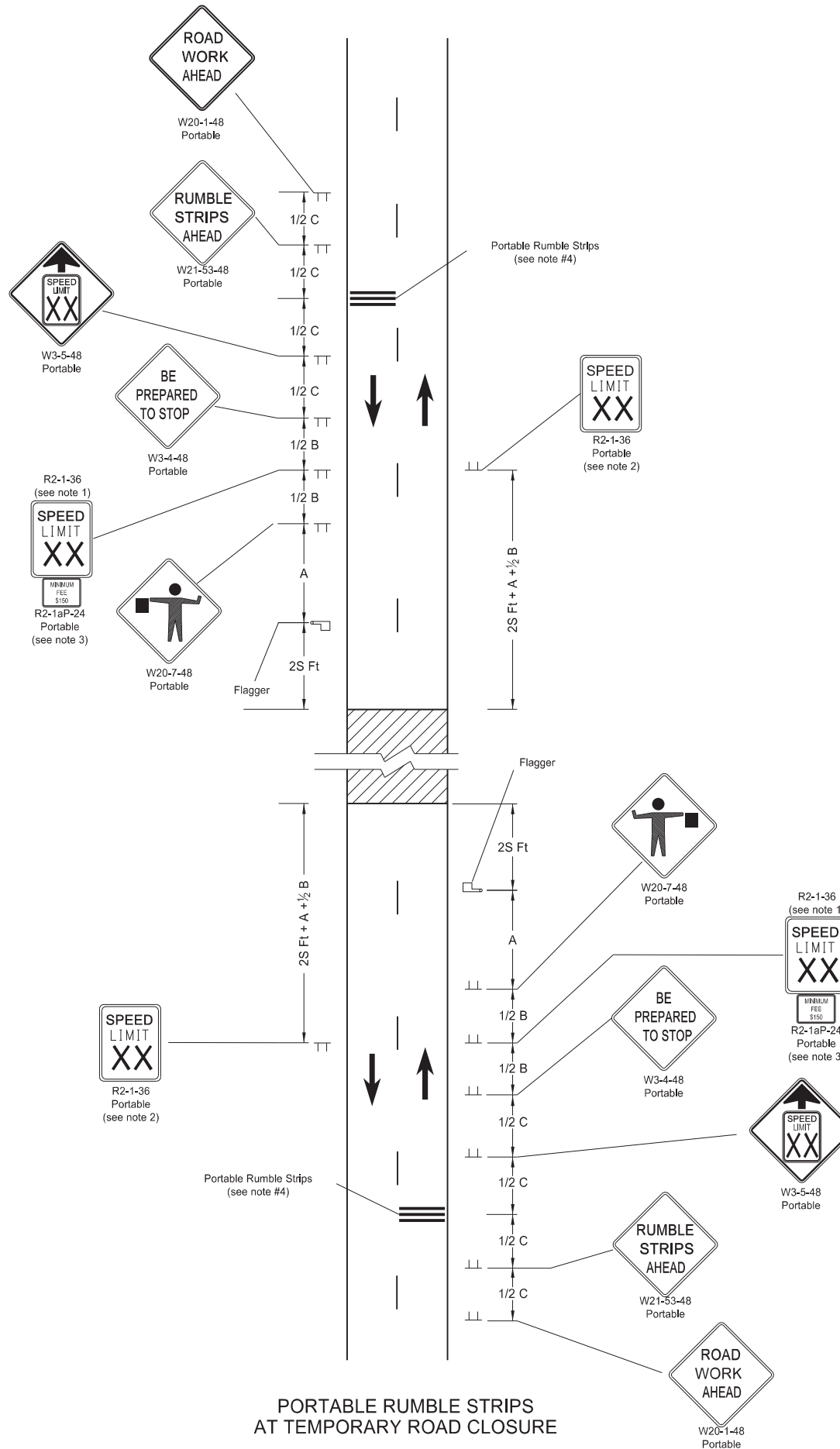


KEY

- Work area
- Flagger
- Sign

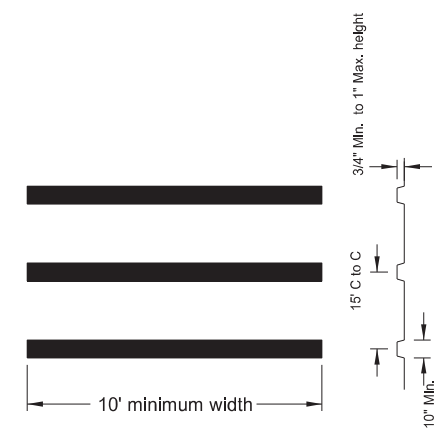
S = Numerical value of speed limit or 85th percentile.

Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - High Speed (over 45 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720



PORTABLE RUMBLE STRIPS ARRAY TYPES OF MOVEMENT AND MAXIMUM ALLOWANCES

- Notes:
- Determine speed in the field based on location and conditions.
 - Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
 - Sign R2-1aP-24 is not required when pilot car operation is used.
 - Do not use rumble strips on a non paved surface or in a pre-construction speed zone of 45 mph or less.



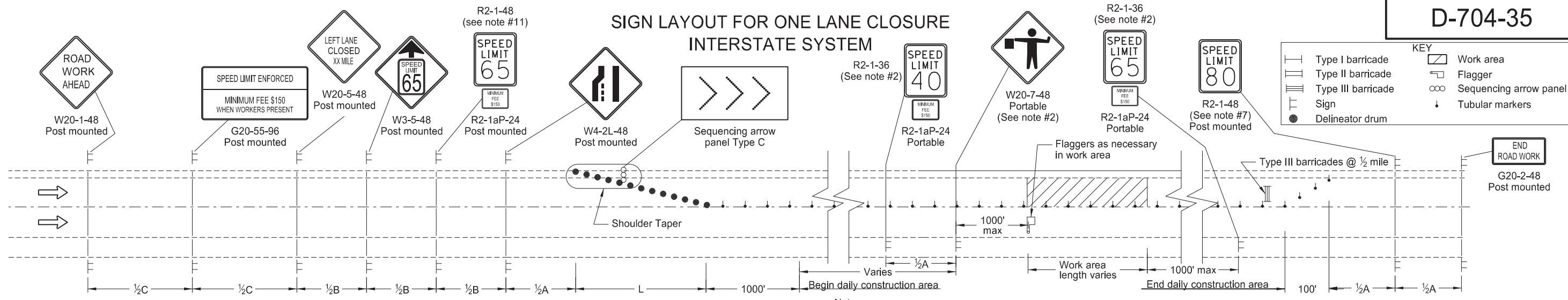
PORTABLE RUMBLE STRIPS ARRAY DETAIL

PORTABLE RUMBLE STRIPS AT TEMPORARY ROAD CLOSURE

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
02-22-22	
REVISIONS	
DATE	CHANGE
03-07-23	Use changed to min 45 mph
06-30-25	Legislative Changes



SIGN LAYOUT FOR ONE LANE CLOSURE INTERSTATE SYSTEM



KEY

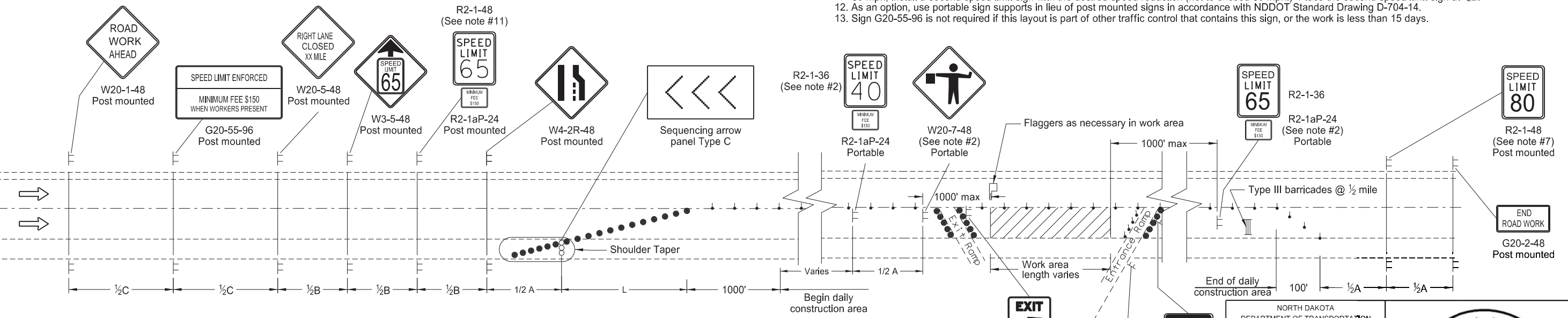
	Type I barricade		Work area
	Type II barricade		Flagger
	Type III barricade		Sequencing arrow panel
	Sign		Tubular markers
	Delineator drum		

LEFT LANE CLOSED WORKERS IN WORK AREA

- Notes:
1. Install advance signs for flagging when flaggers are flagging.
 2. Move the advanced flagger sign and the speed limit signs as the work area moves through the construction zone. When the work area is not visible from the flagger, move the flagger station so the work area is visible. Space the 40 mph speed limit sign at 1/2A in advance of the flagger sign and move the 65 mph speed limit sign. Cover or remove the 40 mph speed limit and Minimum Fee \$150 signs and the 65 mph speed limit sign upon completion of the work day or when workers are not present.
 3. RAMP: When the work area encompasses an entrance ramp, install a 40 mph speed limit sign on the ramp and cover any existing yield sign. Install new yield sign as necessary. Remove the ramp speed limit sign when the main line 40 mph speed zone is moved past the ramp.
 4. Variables:
 - S=Numerical value of speed limit or 85th percentile
 - W=The width of taper.
 - L=Minimum length of taper, or SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater, or WxSxS/60 for urban, residential, and other streets with speeds of 40 mph or less.
 5. Space delineator drums for tapering traffic at the dimension "S". Space tubular markers used for tangents at 2 times dimension "S".
 6. Place sequencing arrow panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface.
 - Use Type C on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater).
 7. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
 8. Cover existing speed limit signs within a reduced speed zone.
 9. Upon approval, the Engineer will measure obliterated or covered pavement marking as Obliteration of Pavement Marking.
 10. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the diamond sign, and at such a distance above the edge that the flag does not touch the sign when limp.
 11. Determine the reduced speed limit dependent on the in place speed limit before construction. When speed limits are to be reduced more than 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.
 12. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 13. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.

ADVANCE WARNING SIGN SPACING

Road Type	Distance Between Signs Min (ft)		
	A	B	C
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 80 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500



RIGHT LANE CLOSED WORKERS IN WORK AREA

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-7-2012

REVISIONS

DATE	CHANGE
06-23-14	Revised Note 12
03-15-16	Removed Do Not Pass signs & updated notes
08-17-17	Moved speed signs & added note
10-17-17	Corrected spelling of "shoulder"
11-01-19	Revised tubular Mkrs symbols
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced, added Dollars At Work, & removed table
11-29-22	Removed Dollars At Work
06-30-25	Legislative Changes



SPEED LIMIT ENFORCED
MINIMUM FEE \$150 WHEN WORKERS PRESENT
G20-55-96 Post mounted
Install this sign only when ramp volume is 1000 ADT or more

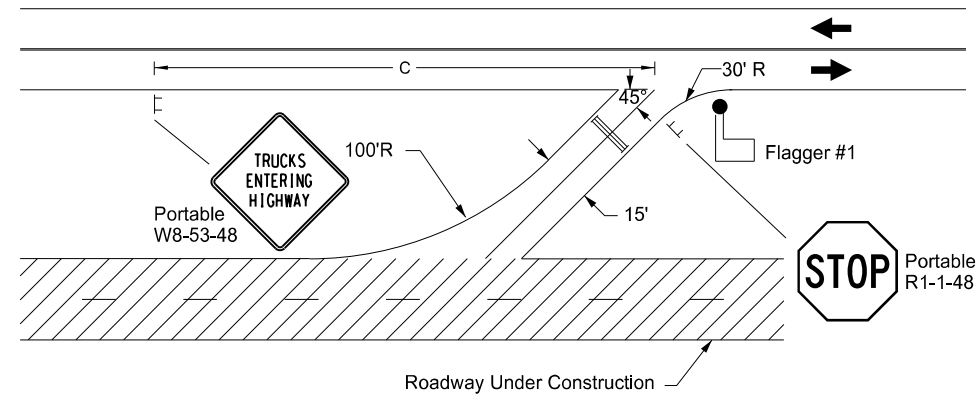
R2-1-36
SPEED LIMIT 40
R2-1aP-24 Portable
(see notes #2 & #3)

R1-2-60 Portable

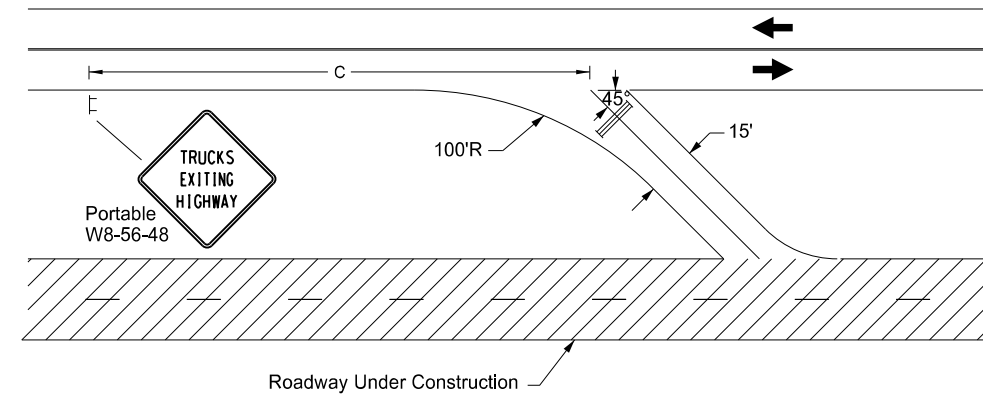
END ROAD WORK
G20-2-48 Post mounted

CONSTRUCTION SIGNING MEDIAN CROSSOVER

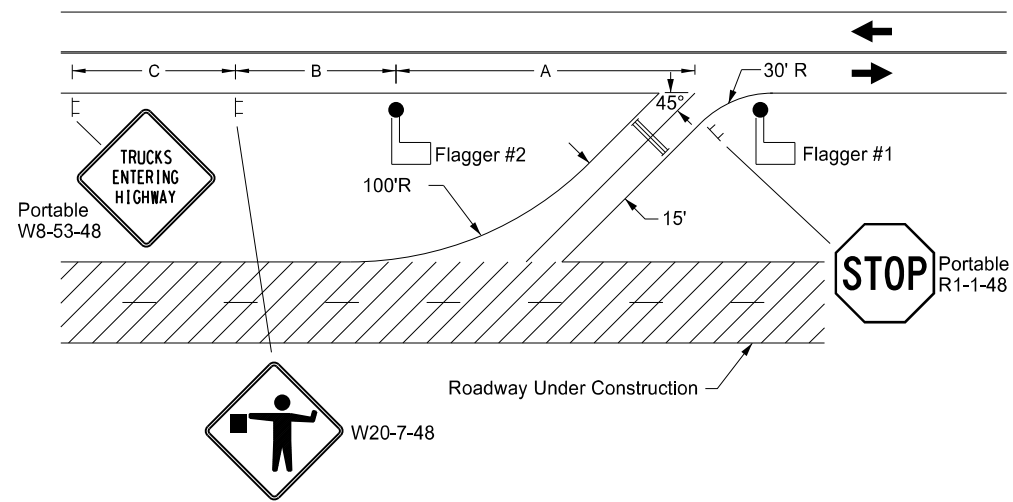
D-704-45



TRUCKS ENTERING ROADWAY
(ADT 2000 or Less)



TRUCKS EXITING ROADWAY



TRUCKS ENTERING ROADWAY
(ADT Over 2000)

NOTES:

1. Do not use Flagger #1 to slow interstate traffic. Flagger #1 is intended to assist truck driver in viewing oncoming traffic for truck's safe entry into traffic.
2. For ADT over 2000, use Flagger #2 to slow, but not stop, interstate traffic for trucks entering traffic.
3. Install barricades on median access when not in use. Place barricades at 45 degrees away from approaching traffic.
4. Do not stop exiting vehicles on roadway carrying traffic.

KEY

- Type III Barricade
- Sign
- Work Area
- Flagger

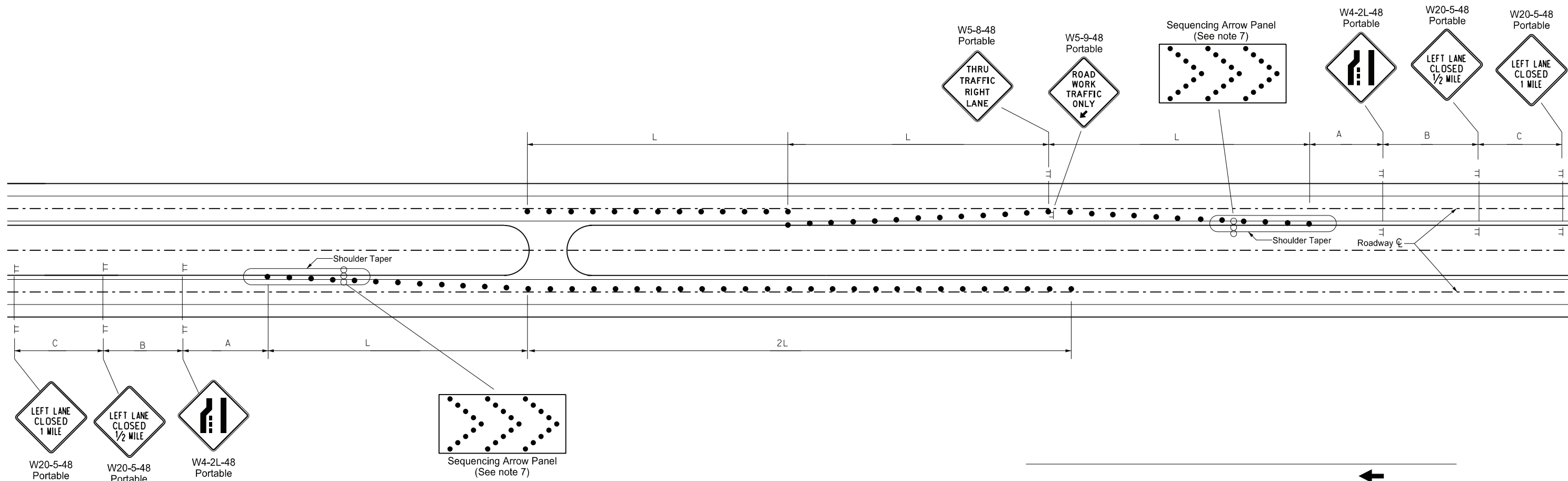
Road Type	ADVANCE WARNING SIGN SPACING		
	Distance Between Signs Min. (FT)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (Over 30 mph to 40 mph)	280	280	280
Urban - High Speed (Over 40 mph to 50 mph)	360	360	360
Rural - High Speed (Over 50 mph to 65 mph)	720	720	720
Urban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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-19-12	
REVISIONS	
DATE	CHANGE
06-19-14	Deleted sign W16-2-24.
09-27-17	Updated to active voice.
11-01-19	New Design Engineer PE Stamp.

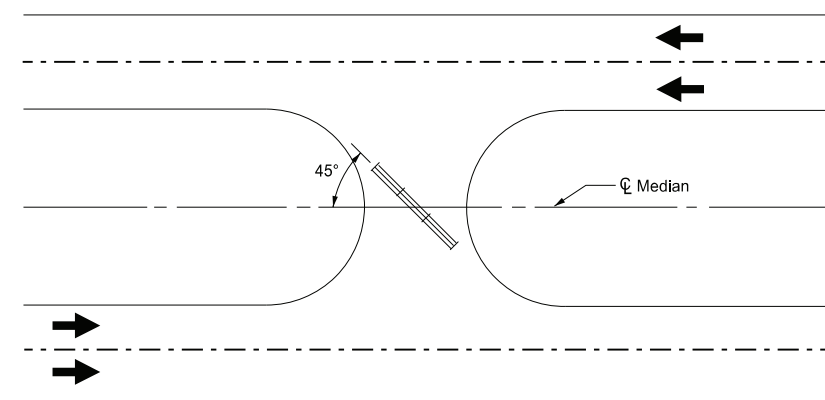
This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS CONSTRUCTION TRAFFIC MEDIAN CROSSING

D-704-49



- Notes:**
1. Include all costs for construction signing and devices in other items.
 2. Remove construction signs and channelizing devices daily and barricade median access during nonworking hours.
 3. Provide a minimum distance of one mile between the work area and the crossover. Use interchange access when the distance between work area and interchange is less than two miles.
 4. Do not allow construction traffic to decelerate until they are well into crossover lane.
 5. Variables:
 S = Numerical value of speed limit or 85th percentile.
 W = The width of taper
 L = Minimum length of taper, or $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S \times 60$ for urban, residential, and other streets with speed of 40 mph or less
 6. Space delineator drums, barricades or cones used for tapering traffic at dimension "S".
 7. Sequencing Arrow Panels:
 Place sequencing arrow panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface.
 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 and over 5000 ADT).



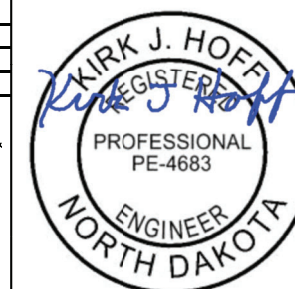
BARRICADE LOCATION DETAIL

Install barricades at 45 degrees away from approaching traffic when median access is not in use.

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

KEY	
	Sign
	Delineator Drum
	Sequencing Arrow Panel
	Type III Barricade

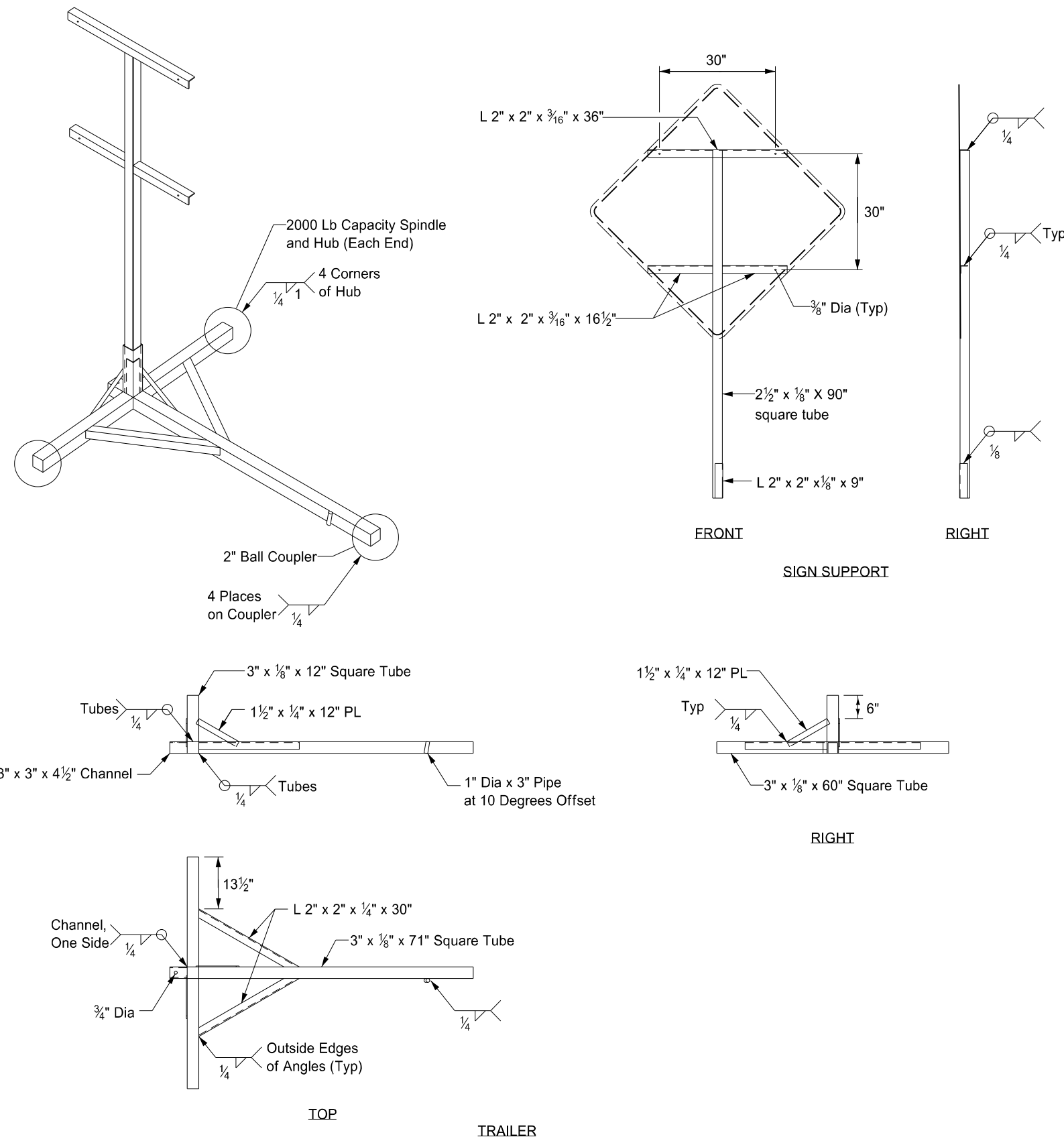
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-19-12	
REVISIONS	
DATE	CHANGE
06-24-14	Changed W5-9-48 to portable mounted.
09-06-19	Update Notes to active voice & New Design Engr PE Stamp.
11-01-19	Identified Shoulder Taper.
08-02-24	Electronic Stamp/Signature.



08/02/24

PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



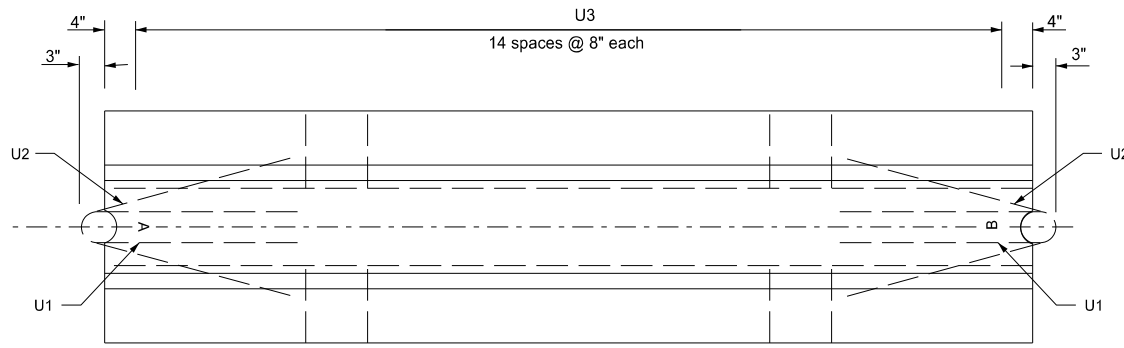
Notes:

- ① Maximum 250 pound weight of assembly.
- ② Use a 14" wheel and tire.
- ③ Use no automotive and equipment axle assemblies for trailer-mounted sign supports.
- ④ Other NCHRP 350 or MASH crash tested assemblies are acceptable.

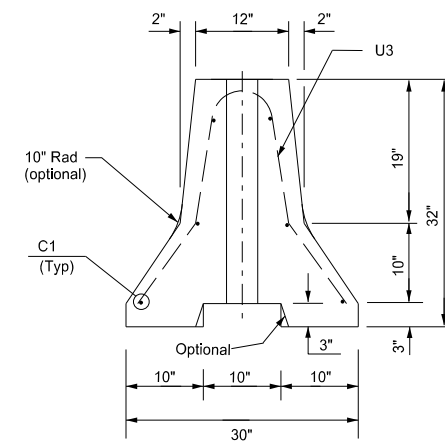
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE
12/02/2020	Updated Note to active voice.

KIRK J. HOFF
 REGISTERED
 PROFESSIONAL
 PE-4683
 ENGINEER
 NORTH DAKOTA
 12 02 2020

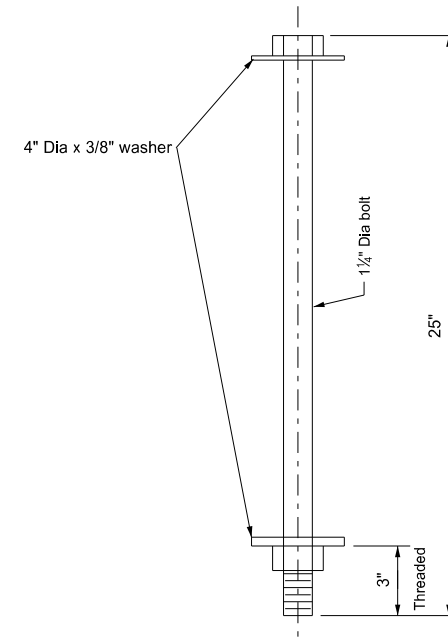
PORTABLE PRECAST CONCRETE MEDIAN BARRIER
(TEMPORARY USAGE)



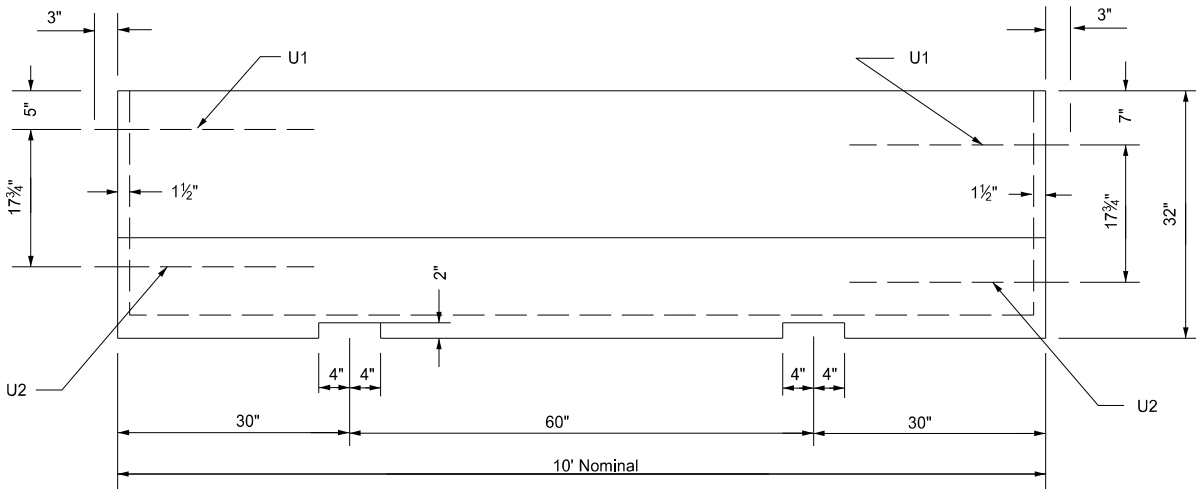
Plan View



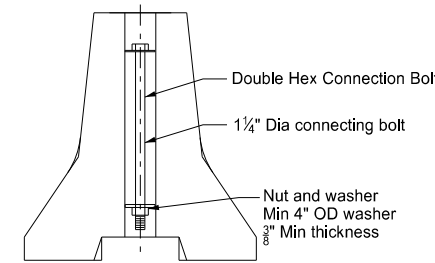
End View



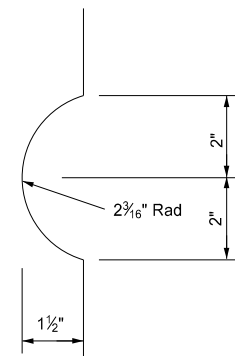
Connecting Bolt Detail
(One per 10 Ft section)



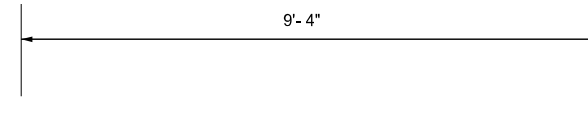
Side View



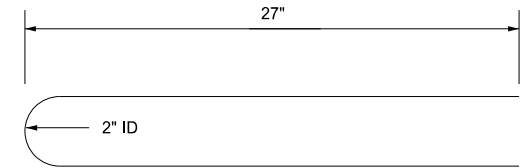
Bolt Connection Detail



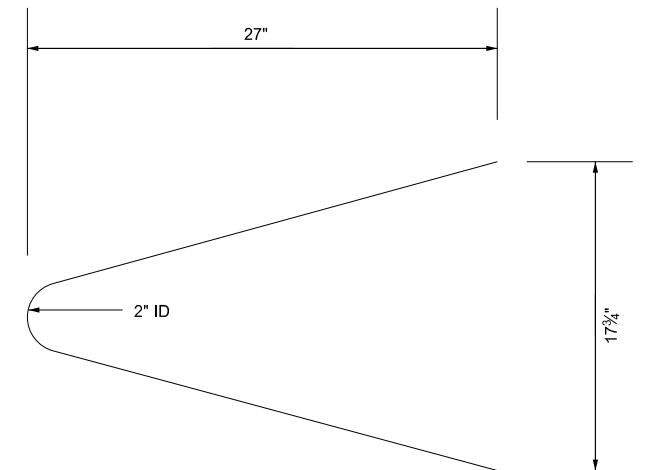
Dap Detail



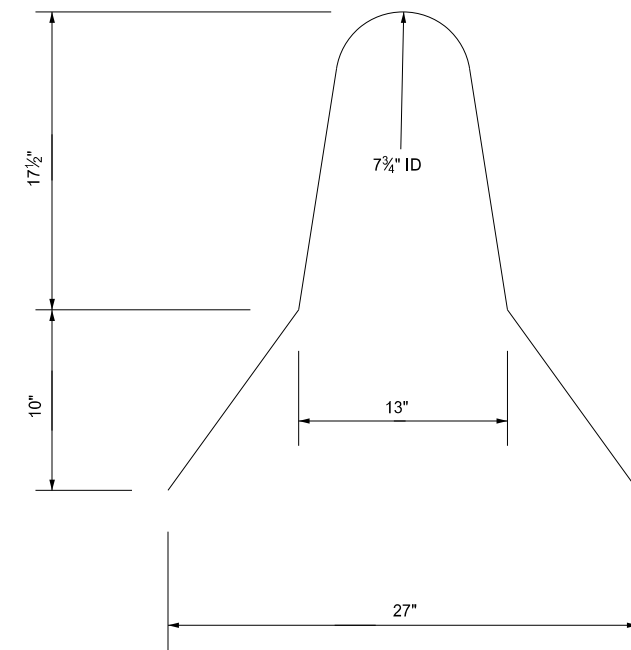
C1 Bar Detail



U1 Bar Detail



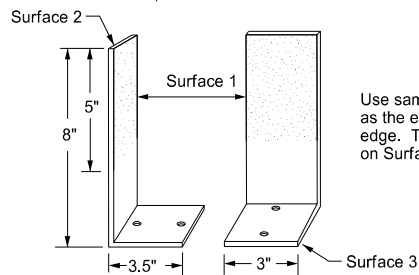
U2 Bar Detail



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.

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

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

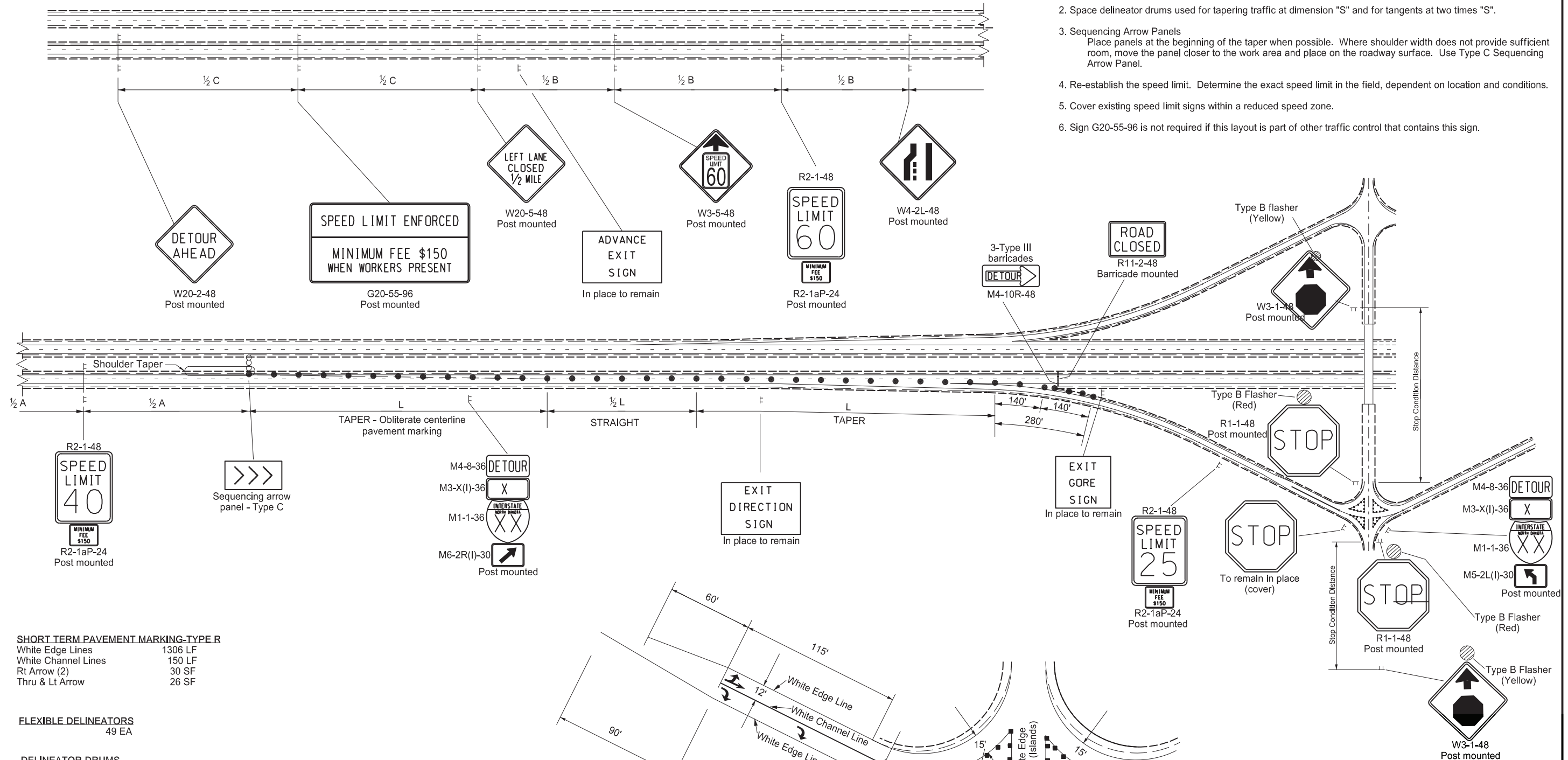
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-20-12	
REVISIONS	
DATE	CHANGE
9-27-17 11-01-19	Updated to active voice New Design Engr PE Stamp

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

INTERSTATE ROAD CLOSURE USING RAMPS CLOSURE FOR MORE THAN ONE DAY and Crossroad is not Closed

Notes:

1. Variables
 S = Numerical value of speed limit or 85th percentile prior to work starting.
 W = The width of the taper.
 L = Minimum length of taper, or SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater, or WxS/60 for urban, residential, and other streets with speeds of 40 mph or less.
2. Space delineator drums used for tapering traffic at dimension "S" and for tangents at two times "S".
3. Sequencing Arrow Panels
 Place panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface. Use Type C Sequencing Arrow Panel.
4. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
5. Cover existing speed limit signs within a reduced speed zone.
6. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign.



SHORT TERM PAVEMENT MARKING-TYPE R

White Edge Lines	1306 LF
White Channel Lines	150 LF
Rt Arrow (2)	30 SF
Thru & Lt Arrow	26 SF

FLEXIBLE DELINEATORS
49 EA

DELINEATOR DRUMS
40 EA

Road Type	Distance Between Signs		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 mph 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 80 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

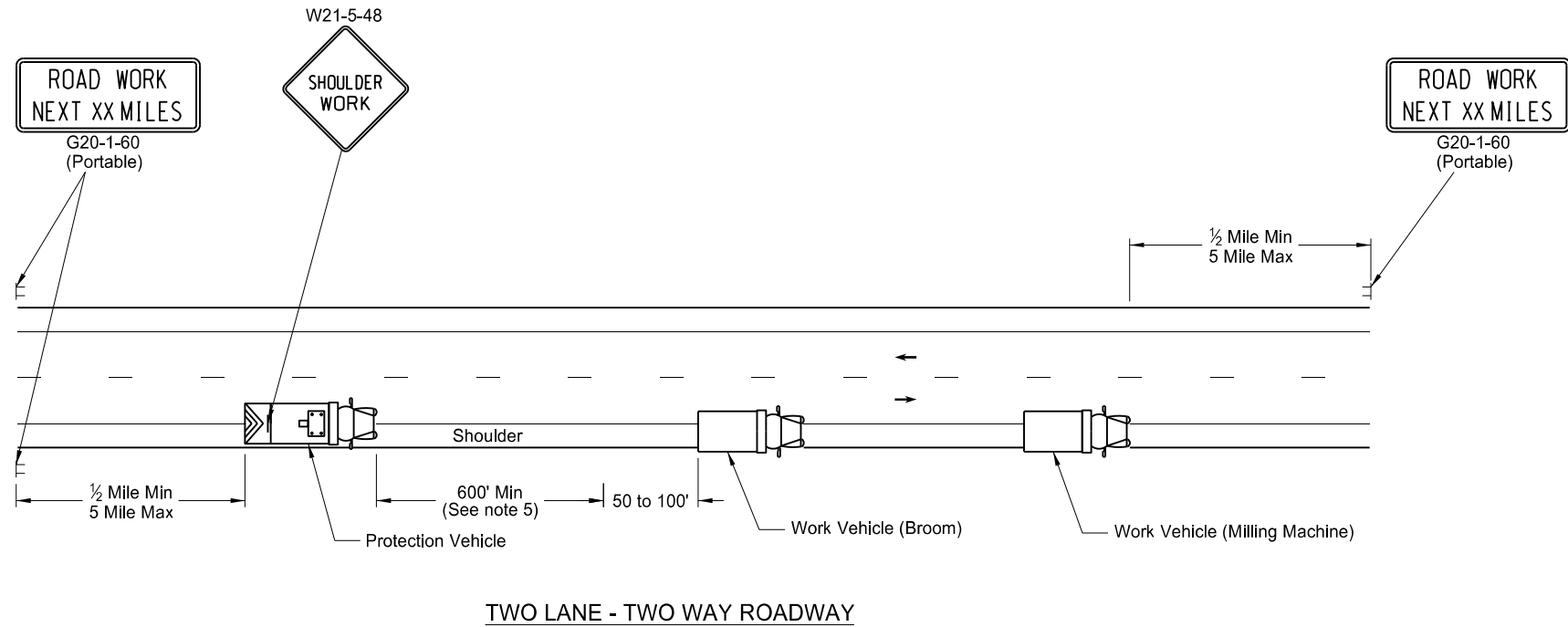
POSTED OR PERCENTILE SPEED	STOP SIGN PLACEMENT DISTANCE	
	85 th PERCENTILE	STOP CONDITION
30 mph	200 ft	
40 mph	305 ft	
50 mph	425 ft	
55 mph	495 ft	
65 mph	645 ft	

KEY	
○○○	Sequencing arrow panel
≡	Type III barricade
⊢	Sign
●	Delineator drum
■	Flexible delineator

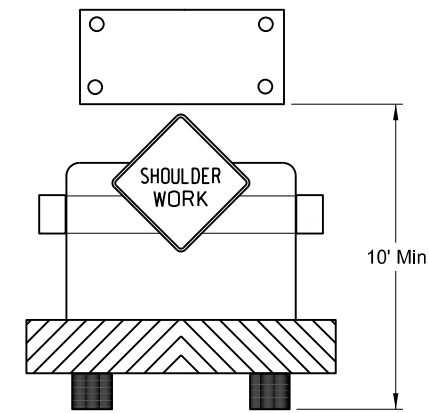
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09-05-12	
REVISIONS	
DATE	CHANGE
06-24-14	Updated sign sizes & Deleted flexible delineators detail
03-15-16	Removed Do Not Pass signs & updated notes
11-01-19	Note 2, sign #s, & shldr taper
12-08-21	Switched order of Detour Ahead and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work
10-01-24	2023 MUTCD Updates
06-30-25	Legislative Changes



MOBILE OPERATION
Grinding Shoulder Rumble Strips

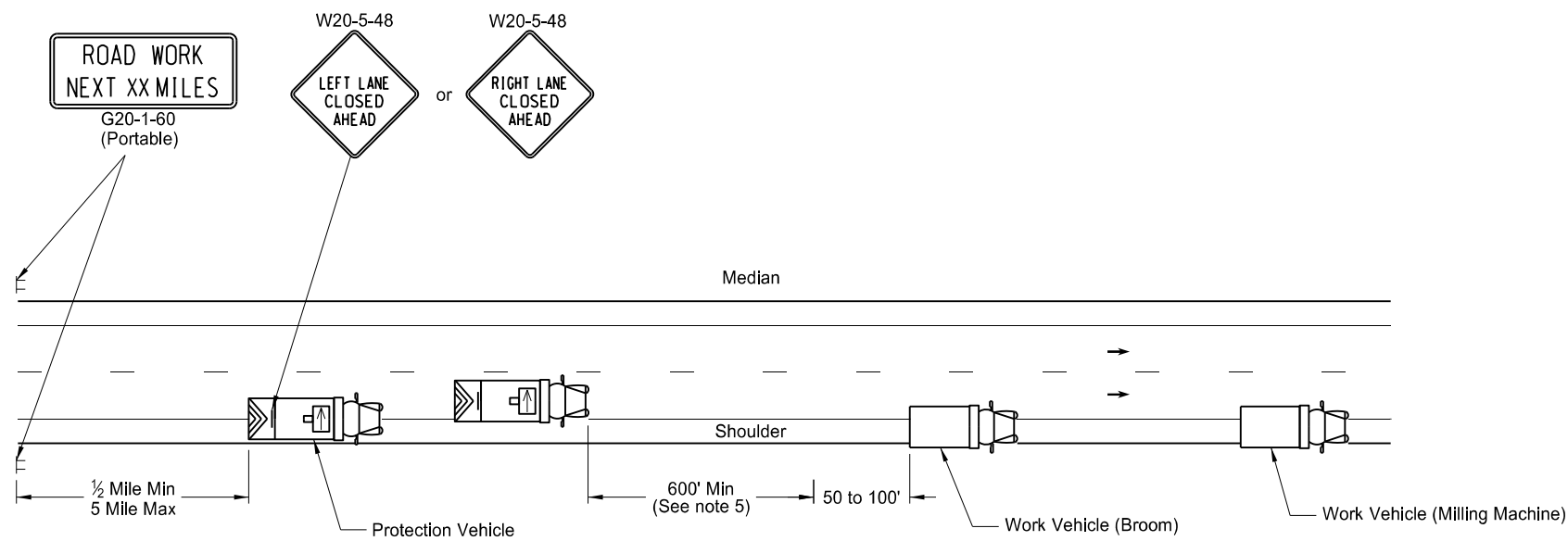


TWO LANE - TWO WAY ROADWAY

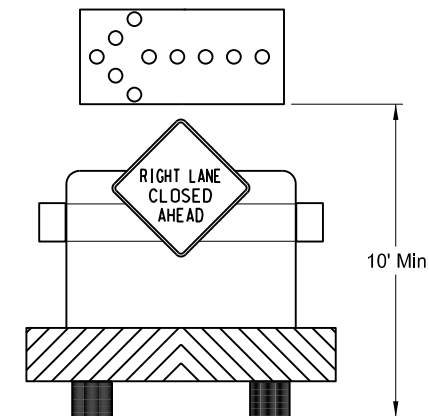


TWO LANE - TWO WAY ROADWAY
Typical Protection Vehicle with
Flashing Arrow Panel In Caution Mode

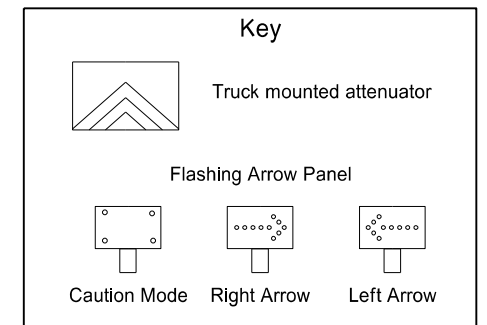
- Notes:
1. Provide truck mounted attenuators on additional vehicles in the convoy, at no additional cost.
 2. Provide rotating, flashing, oscillating, or strobe lights on vehicles.
 3. Provide Type B or Type C flashing arrow panels that are controlled from inside the vehicle.
 4. Provide two - way electronic communication capability in each vehicle.
 5. Vary vehicle spacing between the protection vehicle and work vehicle depending on sight distance restrictions. Keep the spacing of the convoy vehicles such that motorists approaching the work convoy can see the protection vehicle in time to slow down and safely pass the work vehicles.
 6. Move advance Road Work Ahead signs as the work area moves through the construction zone.



INTERSTATE & 4 LANE DIVIDED HIGHWAY



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

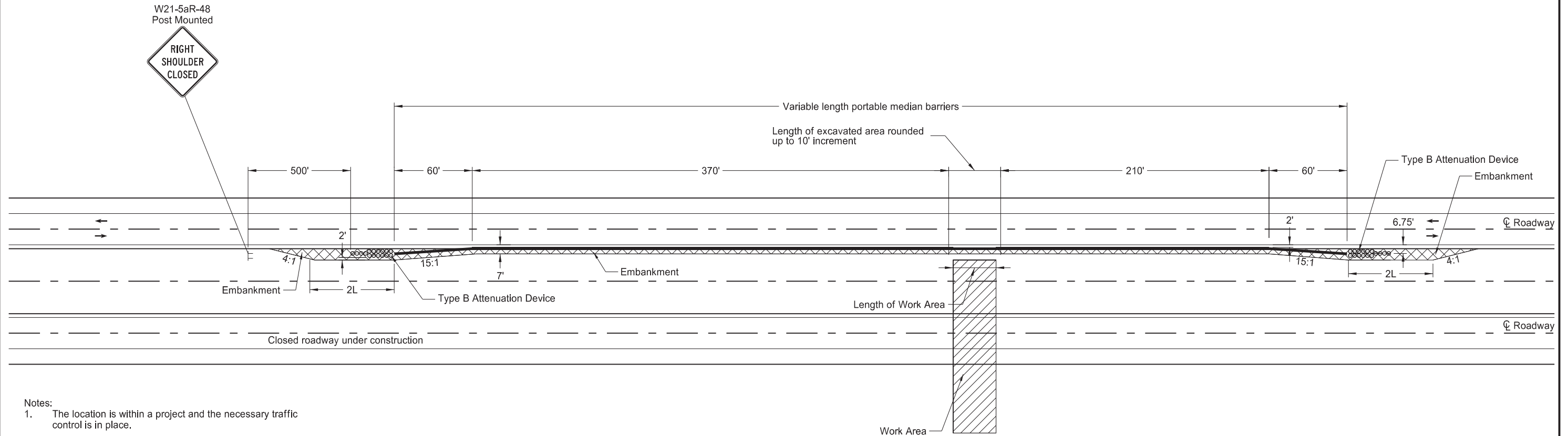


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-15-12	
REVISIONS	
DATE	CHANGE
8-17-17	Updated notes & signs
10-03-19	New Design Engineer PE Stamp

This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
on 10/3/19 and the original document is stored at the
North Dakota Department
of Transportation

Two-way, Two-lane Operation on Divided Highway With Excavation in the Median

D-704-57



- Notes:
- The location is within a project and the necessary traffic control is in place.
 - Install Portable Median Barriers when excavation is within clear zone and 1 foot or more in depth.

L = length of attenuation device

KEY	
[Symbol]	Flagger
[Symbol]	Sign
[Symbol]	Embankment
[Symbol]	Work Area
[Symbol]	Attenuation Device
[Symbol]	Portable Median Barriers

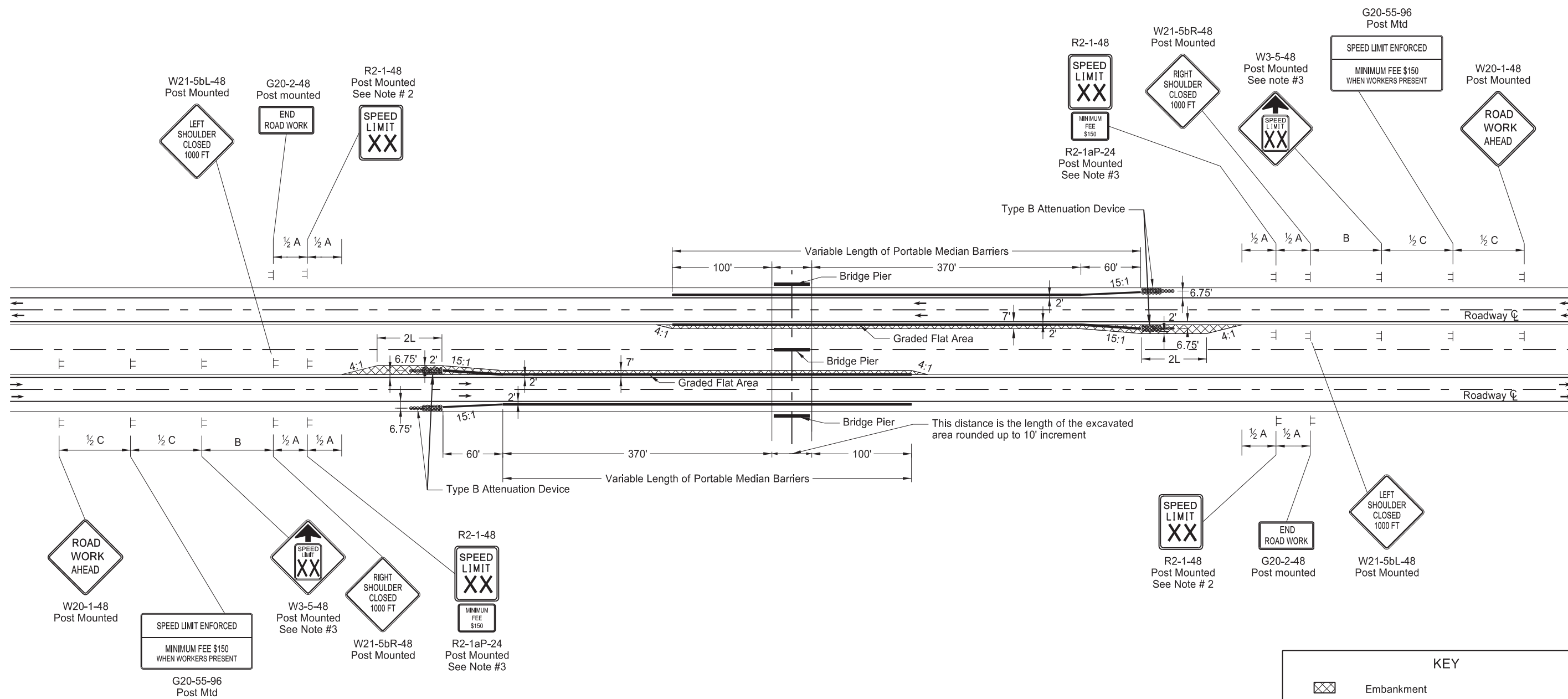
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 80 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-18-15	
REVISIONS	
DATE	CHANGE
9-18-15	Revised Standard Description
9-27-17	Updated to active voice
10-09-19	New Design Engineer PE Stamp
8-21-24	Renamed Portable Median Barrier
07-22-25	Legislative Changes



Divided Highway Operation for Overhead Structure, Pier, and Footing Replacement

D-704-58



Notes:

1. Use when a bridge structure is being constructed.
2. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
3. 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.
4. Close roadway at separations or use ramps at interchanges during removal and installation of beams. See notes in the plans for traffic control requirements for this operation.
5. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.

L = length of attenuation device

KEY

- Embankment
- Sign
- Type B Attenuation Device
- Portable Median Barrier

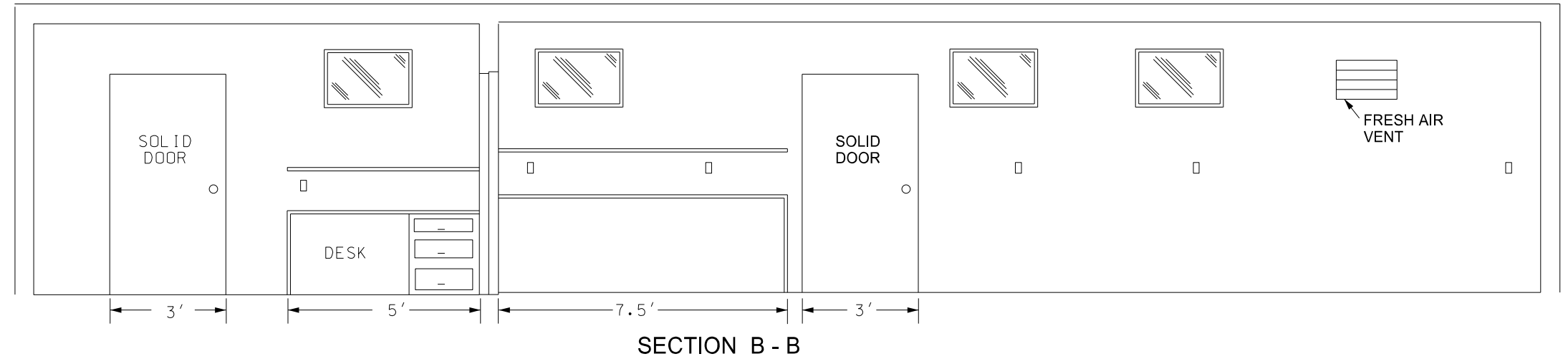
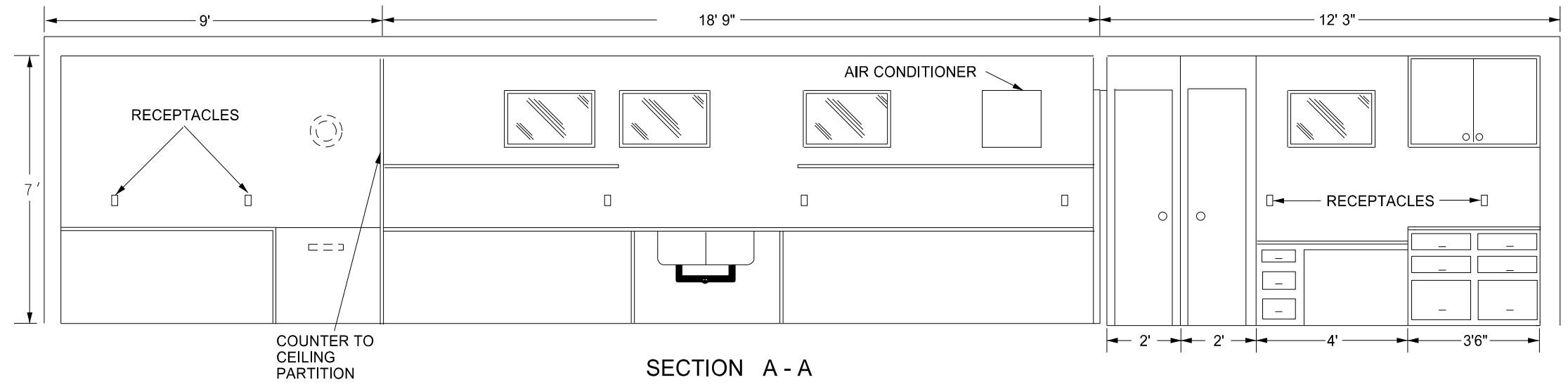
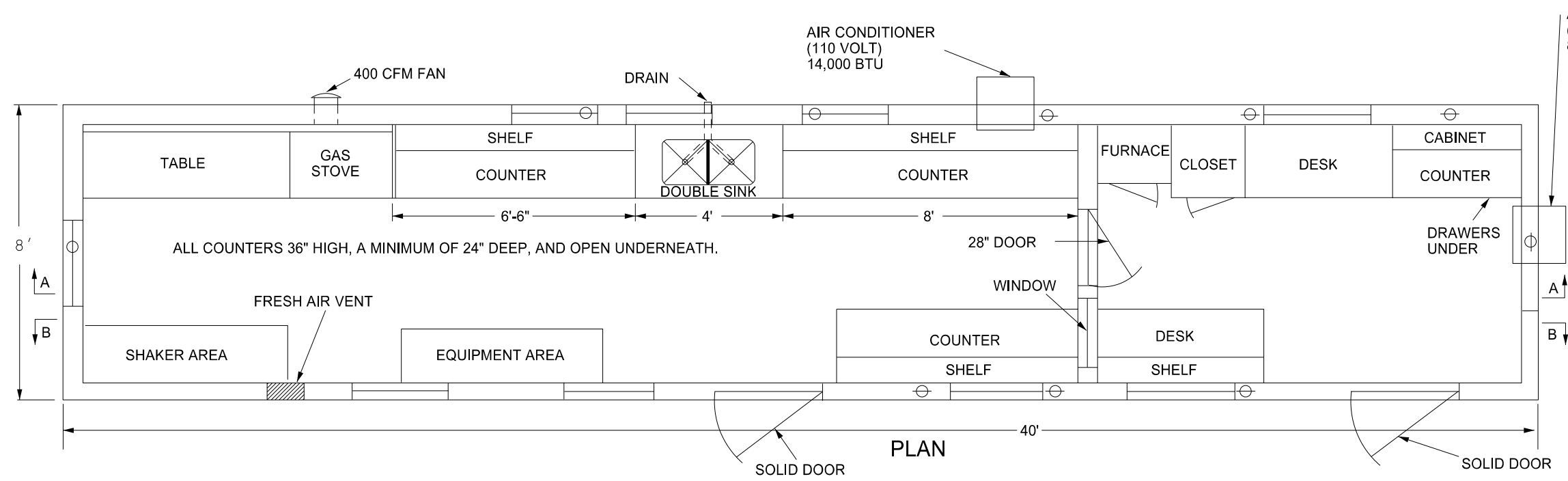
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 80 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-18-15	
REVISIONS	
DATE	CHANGE
09-18-15	Revised Standard Description
09-27-17	Updated to active voice
11-01-19	Atten Device, hatching, & sign #s
12-08-21	Added Minimum Fee sign and Dollars At Work sign
11-29-22	Removed Dollars At Work
08-21-24	Portable Median Barrier Wording
06-30-25	Legislative Changes



BITUMINOUS LABORATORY

D-706-1

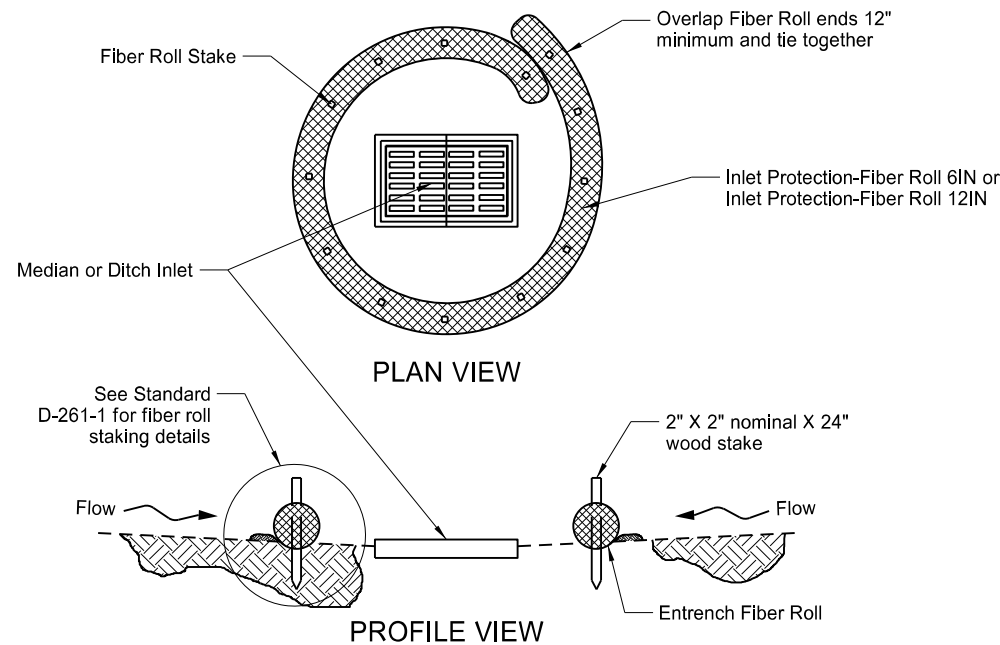


- Provide a laboratory with the following:
1. A 1'x1' shelf at 36" above the regular countertop.
 2. Double compartment stainless steel sink, with each compartment a minimum of 16"x14"x10" deep. Provide water service lines made of copper or plastic and a diameter of 1/2 inch.
 3. An exhaust fan capable 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.

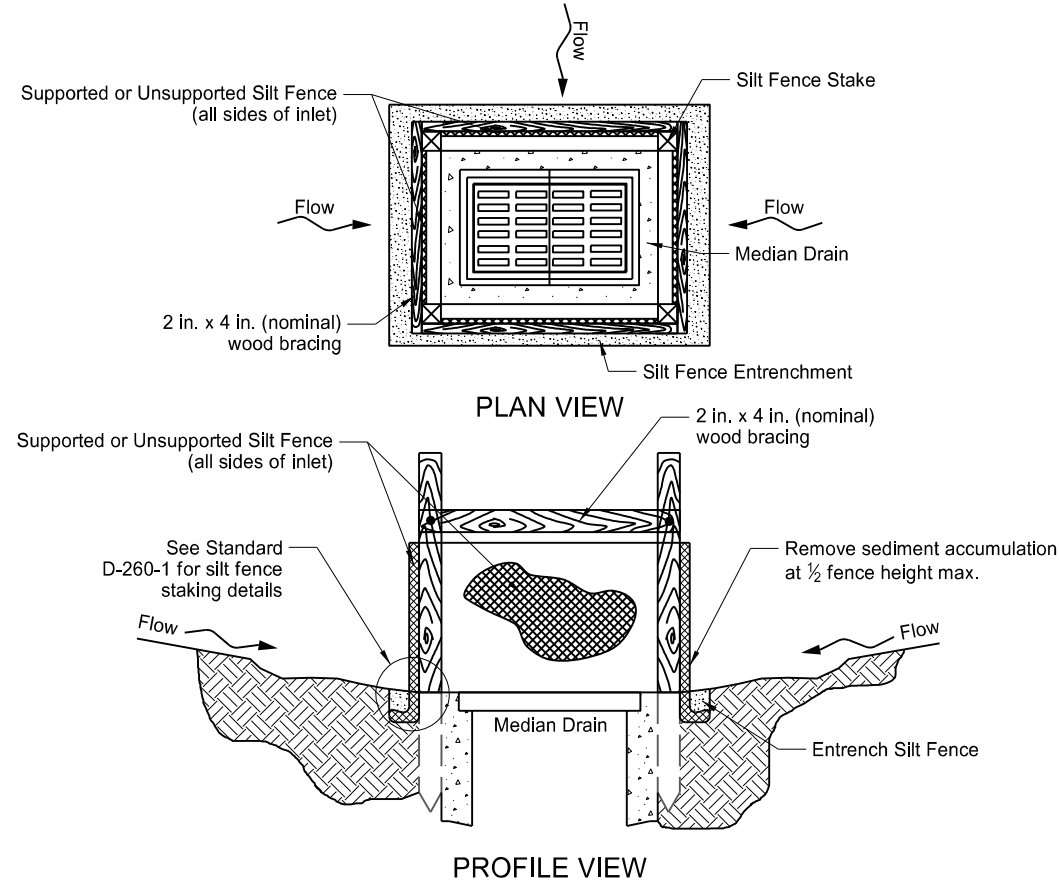
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
07-30-14	Changed standard's title and revised notes.
01-11-16	Revised notes.
08-27-19	New Design Engineer PE Stamp

This document was originally issued and sealed by
Kirk J Hoff,
 Registration Number
PE- 4683,
 on **08/27/19** and the original document is stored at the North Dakota Department of Transportation

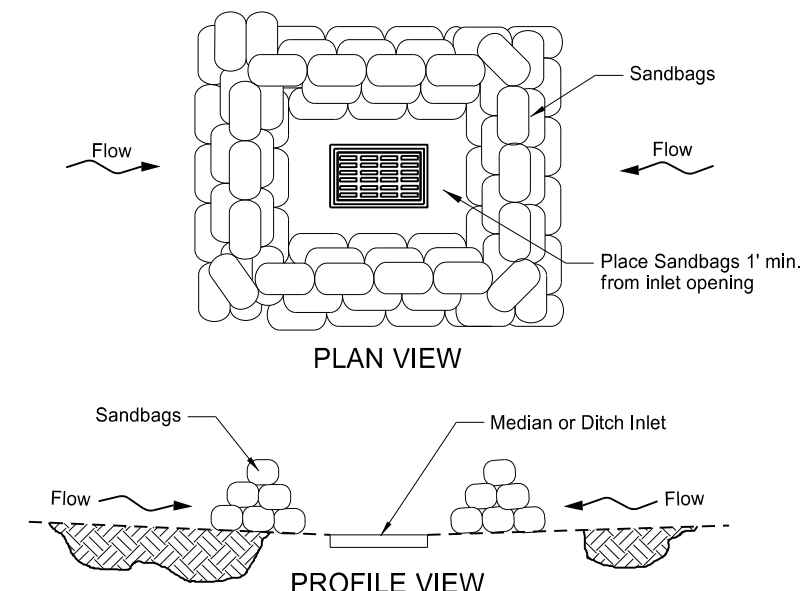
EROSION AND SILTATION CONTROLS
MEDIAN OR DITCH INLET PROTECTION



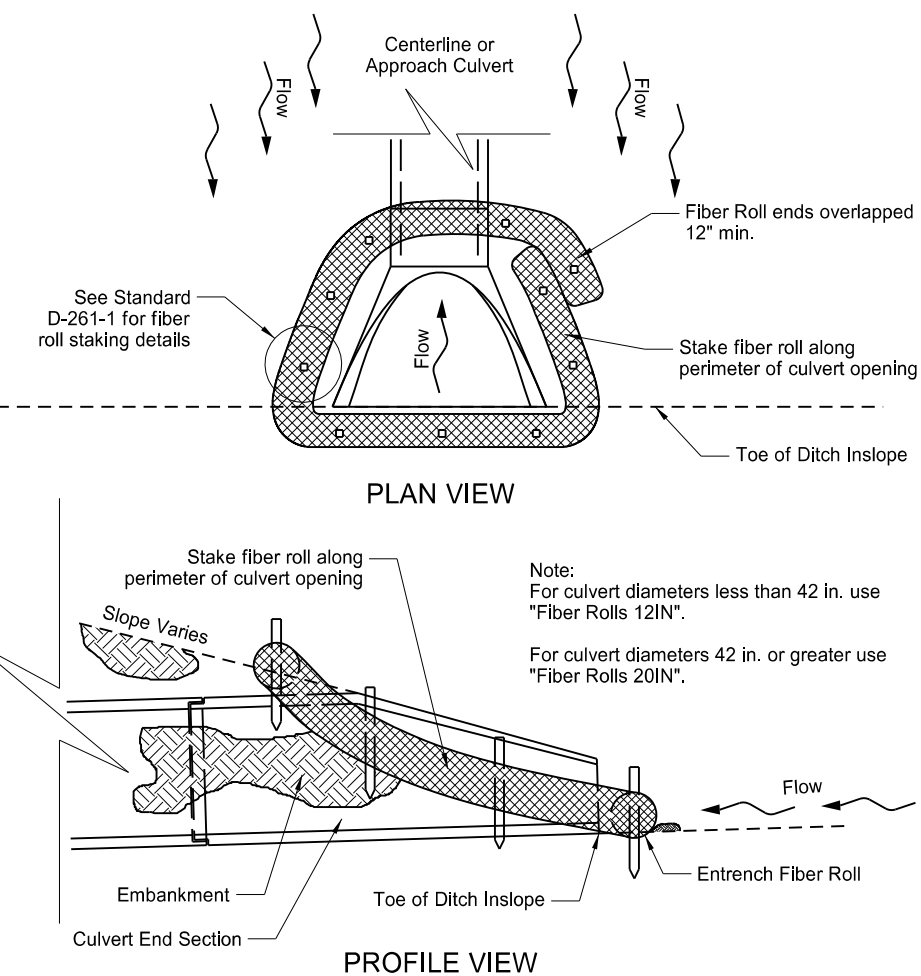
FIBER ROLL PROTECTION
(MEDIAN OR DITCH INLET)



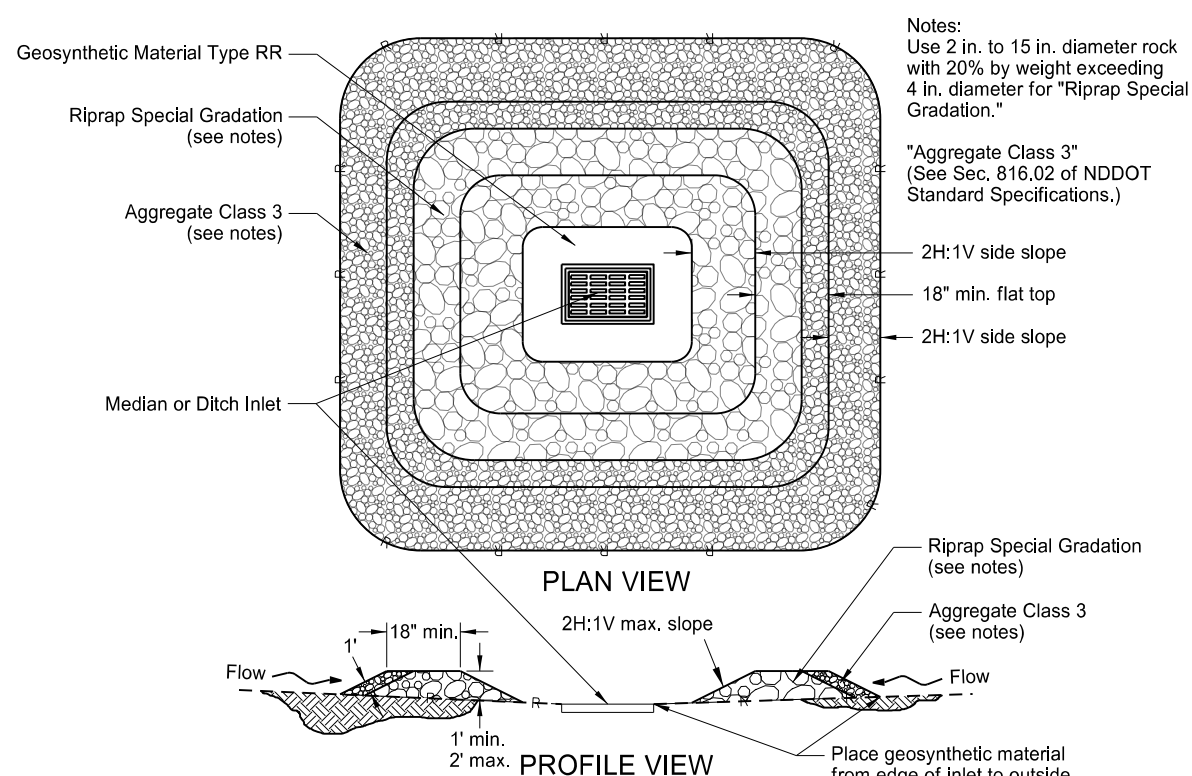
SILT FENCE PROTECTION
(MEDIAN OR DITCH INLET)



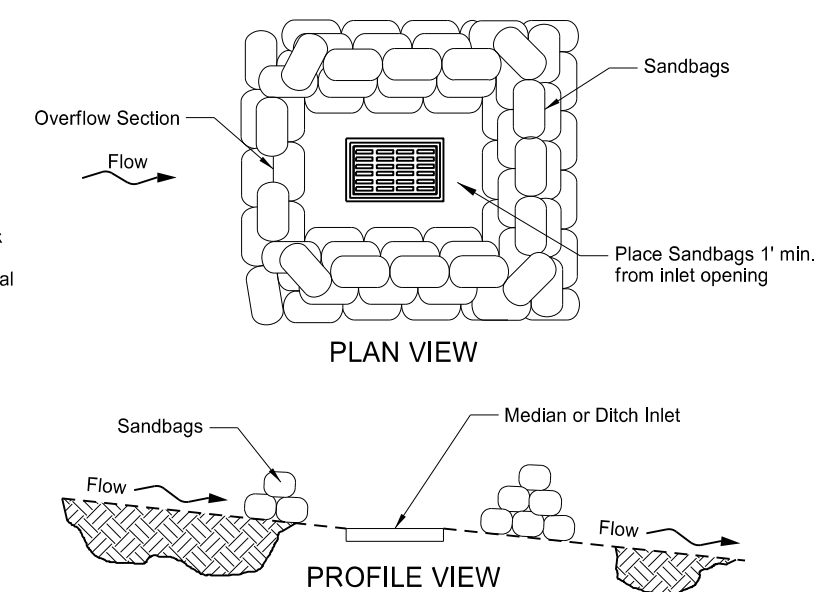
SANDBAG PROTECTION
(LOW POINT)



FIBER ROLL PROTECTION
(INLET OF CULVERT)



GRAVEL INLET PROTECTION
(MEDIAN OR DITCH INLET)



SANDBAG PROTECTION
(ON SLOPE)

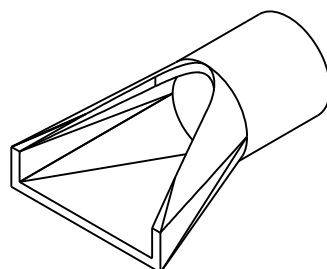
Notes:
 Use 2 in. to 15 in. diameter rock with 20% by weight exceeding 4 in. diameter for "Riprap Special Gradation."
 "Aggregate Class 3"
 (See Sec. 816.02 of NDDOT Standard Specifications.)

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.

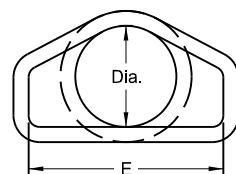
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REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS
(Round Pipe)

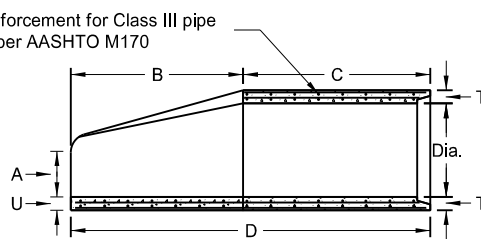
FLARED END SECTION						
TERMINAL DIMENSIONS						
DIA	A	B	C	D	E	U
12	0'-4"	2'-0"	4'-0 ⁷ / ₈ "	6'-0 ⁷ / ₈ "	2'-0"	2"
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2 ¹ / ₄ "
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2 ¹ / ₂ "
21	0'-9"	3'-0"	3'-1"	6'-1"	3'-6"	2 ¹ / ₂ "
24	0'-9 ¹ / ₂ "	3'-7 ¹ / ₂ "	2'-6"	6'-1 ¹ / ₂ "	4'-0"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



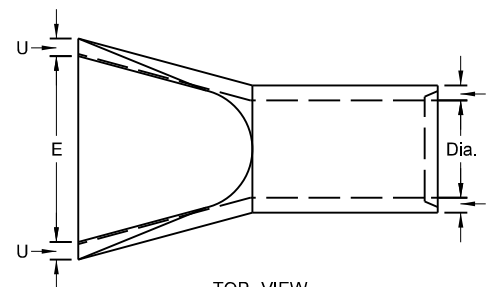
PERSPECTIVE



END VIEW



SIDE VIEW



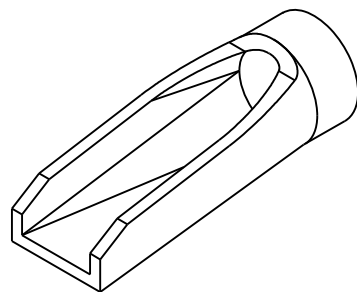
TOP VIEW

REINFORCED CONCRETE PIPE - FLARED END SECTION
Reinforcement to be equivalent to Class III RCP

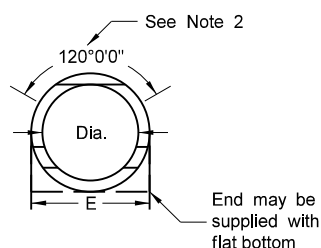
NOTES:

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

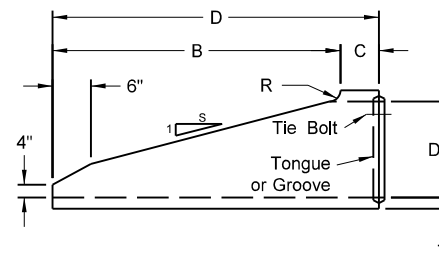
TRAVERSABLE END SECTION						
DIA	B	C	D	E	R	S
15"	4'	9"	4'-9"	1'-7 ¹ / ₂ "	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	3"	6
24"	6'	1'	7'	2'-6"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3 ¹ / ₂ "	4
36"	7'-3"	15"	8'-6"	3'-8"	3"	4



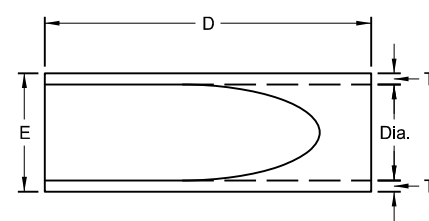
PERSPECTIVE



END VIEW



SIDE VIEW



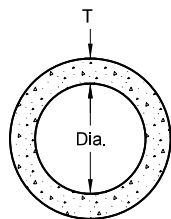
TOP VIEW

REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION
Reinforcement to be equivalent to Class III RCP

NOTES (Traversable End Section):

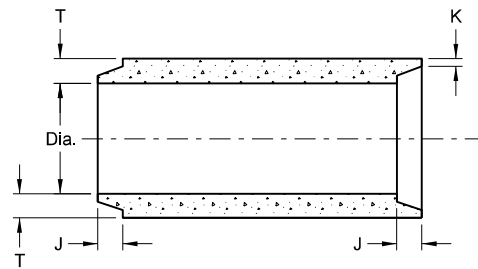
- Manufactured in accordance with applicable portions of ASTM C76/AASHTO M170.
- Reinforcement per Class III RCP with double reinforcement in the upper 120° of the full barrel portion.

All Classifications of Round Concrete Pipe						
Internal Dia. of pipe in Inches	Cross-Sectional Water Area	Weight per Lin. Foot of pipe Std. Wall	Joint J Groove End Min./Max.	Joint K Tongue End Min.	Minimum Wall Thickness (T)	
Dia	Sq. ft.	Lbs.	In.	In.	In.	
12	0.79	92	1 ¹ / ₈ -2 ³ / ₈	3/4	2	
15	1.23	127	1 ³ / ₈ -2 ¹ / ₄	7/8	2 ¹ / ₄	
18	1.77	168	1 ¹ / ₂ -2 ¹ / ₂	1	2 ¹ / ₂	
21	2.40	214	1 ⁷ / ₈ -3 ¹ / ₈	1 ¹ / ₈	2 ³ / ₄	
24	3.14	265	2 ¹ / ₄ -3 ¹ / ₄	1 ¹ / ₂	3	
27	3.98	322	2 ³ / ₄ -4	1 ³ / ₄	3 ¹ / ₄	
30	4.91	384	3 ¹ / ₄ -4 ¹ / ₄	1 ⁷ / ₈	3 ¹ / ₂	
33	5.94	452	3 ³ / ₄ -4 ³ / ₄	1 ⁷ / ₈	3 ³ / ₄	
36	7.07	524	3 ⁷ / ₈ -4 ³ / ₄	1 ⁷ / ₈	4	
42	9.62	685	3 ⁷ / ₈ -4 ³ / ₄	1 ⁷ / ₈	4 ¹ / ₂	
48	12.57	885	3 ⁷ / ₈ -4 ³ / ₄	1 ⁷ / ₈	5	
54	15.90	1070	4 ¹ / ₈ -5 ¹ / ₄	2	5 ¹ / ₂	
60	19.63	1296	4 ¹ / ₂ -5 ¹ / ₂	2 ¹ / ₄	6	
66	23.76	1542	5-6	2 ³ / ₈	6 ¹ / ₂	
72	28.27	1810	5 ⁵ / ₈ -6 ³ / ₄	2 ³ / ₈	7	
78	33.18	2098	6 ¹ / ₄ -7 ¹ / ₄	2 ³ / ₈	7 ¹ / ₂	
84	38.48	2410	6 ⁵ / ₈ -7 ³ / ₄	3 ¹ / ₈	8	
90	44.18	2793	6 ³ / ₄ -8 ¹ / ₂	3 ¹ / ₈	8 ¹ / ₂	
96	50.27	3092	7-8 ¹ / ₄	3 ¹ / ₂	9	
102	56.75	3466	7-8 ¹ / ₄	3 ¹ / ₂	9 ¹ / ₂	
108	63.62	3864	7 ¹ / ₄ -8 ¹ / ₂	3 ³ / ₄	10	

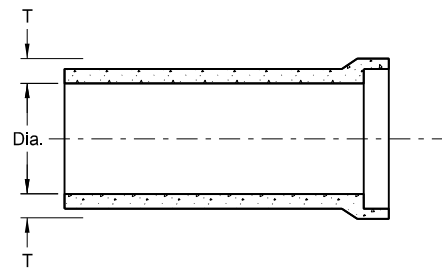


END VIEW

CIRCULAR PIPE

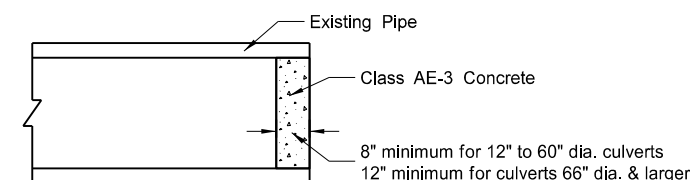


TONGUE & GROOVE JOINT



BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE



CONCRETE PIPE PLUG

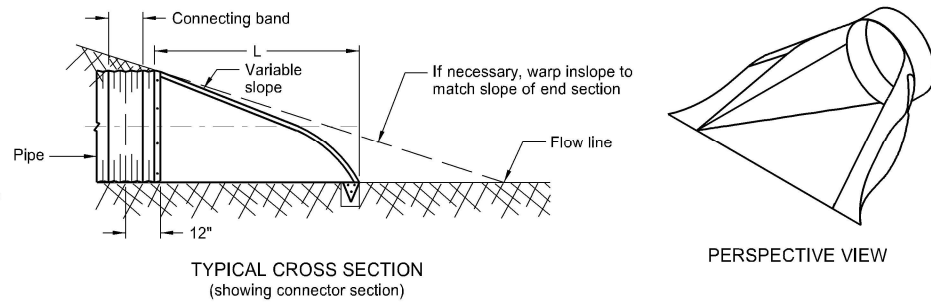
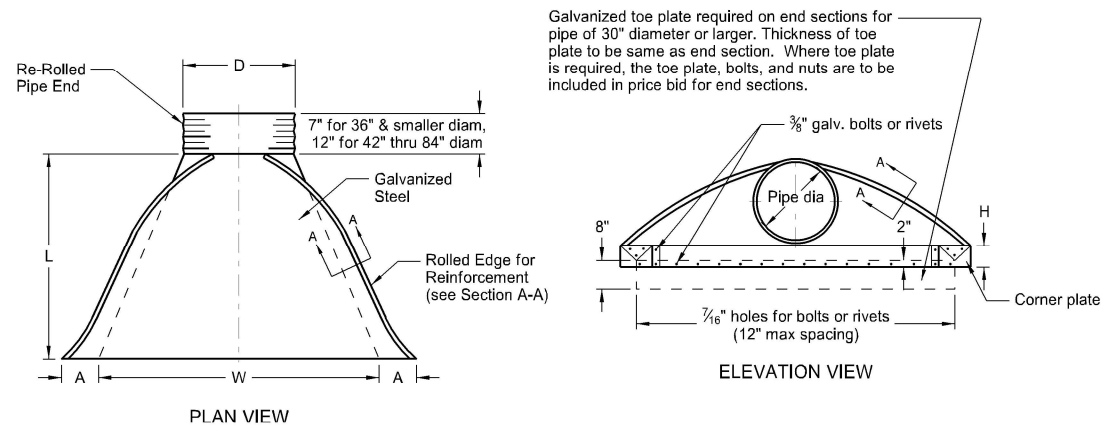
SEE STANDARD DRAWING D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

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

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

ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

D-714-4



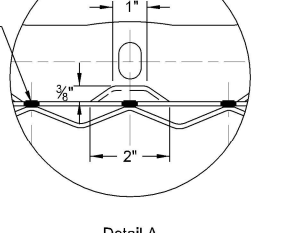
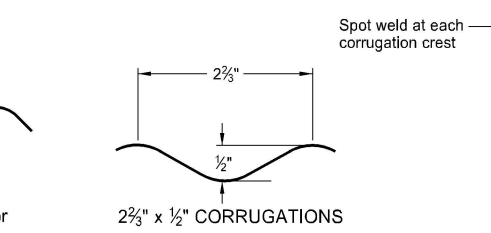
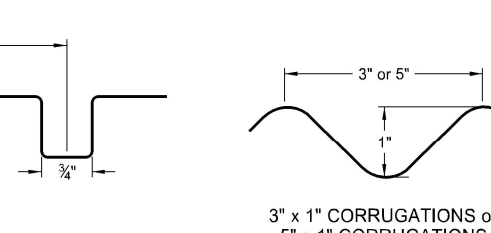
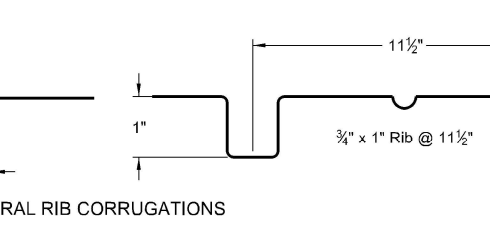
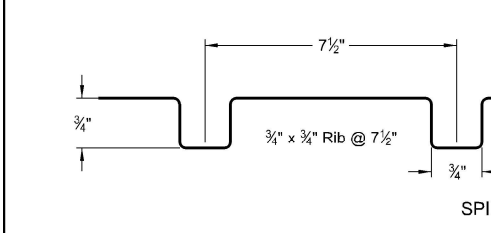
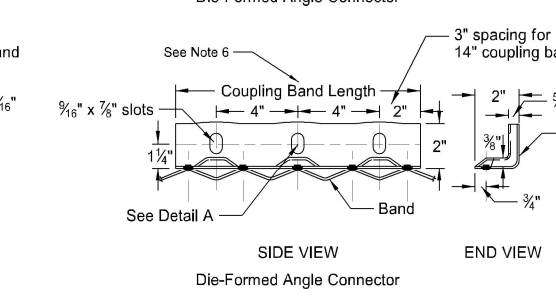
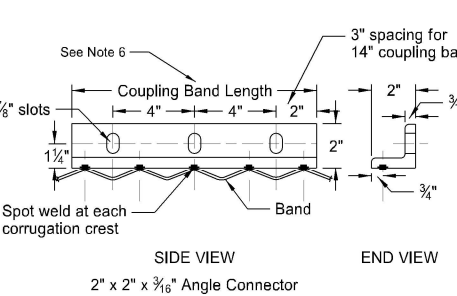
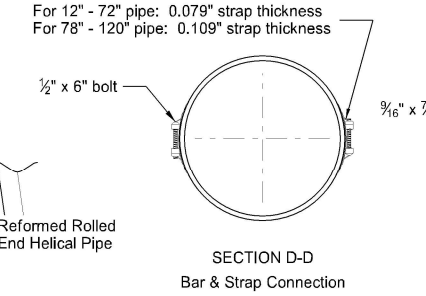
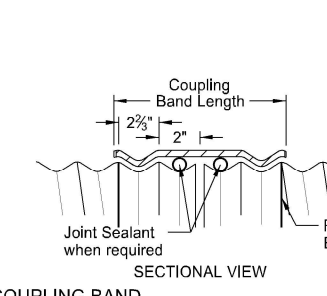
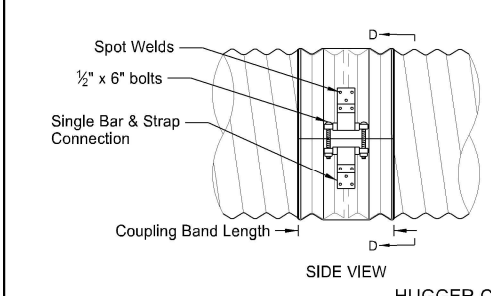
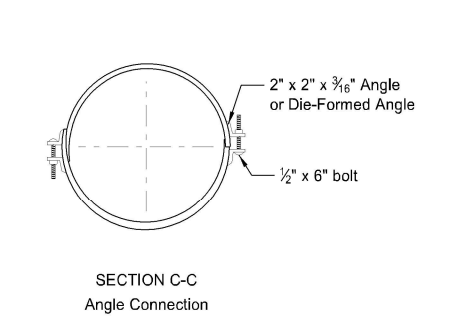
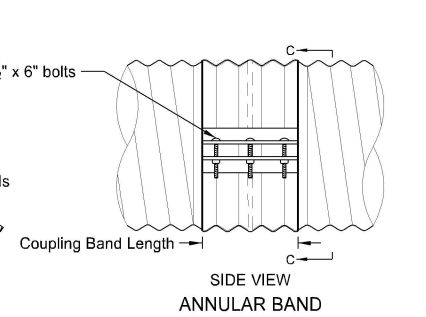
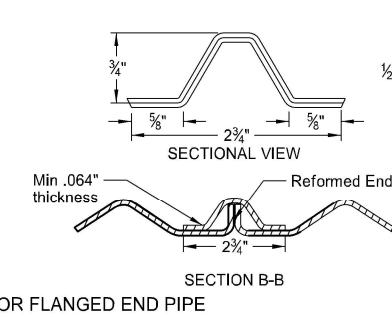
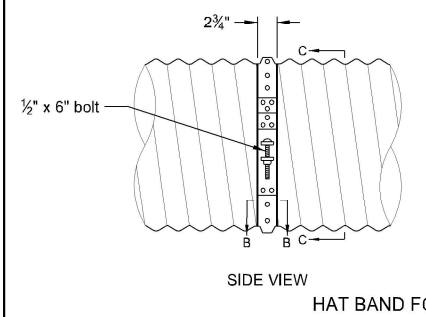
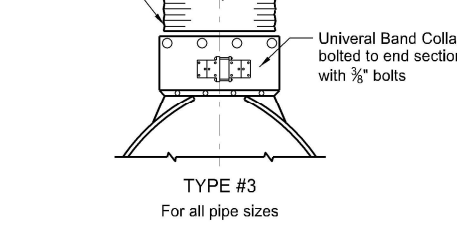
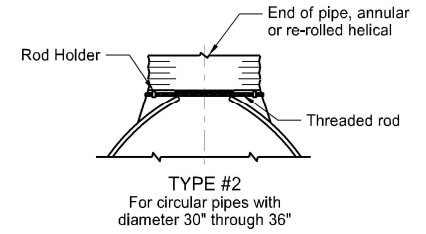
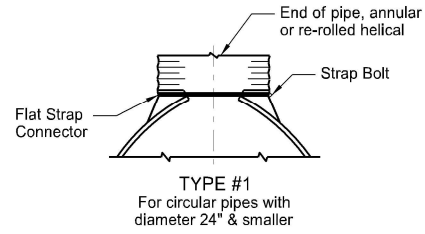
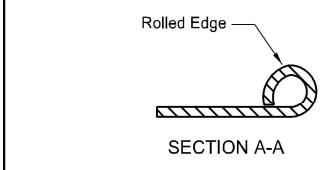
PIPE DIA.	GALVANIZED THICKNESS	END SECTION DIMENSIONS					APPROX. SLOPE	BODY
		A	B	H	L	W		
15	0.064 - 0.079	7	8	6	26	30	2 1/2:1	1
18	0.064 - 0.109	8	10	6	31	36	2 1/2:1	1
24	0.064 - 0.109	10	13	6	41	48	2 1/2:1	1
30	0.064 - 0.109	12	16	8	51	60	2 1/2:1	1 or 2
36	0.064 - 0.109	14	19	9	60	72	2 1/2:1	2
42	0.064 - 0.138	16	22	11	69	84	2 1/2:1	2
48	0.064 - 0.168	18	27	12	78	90	2 1/2:1	2
54	0.064 - 0.168	18	30	12	84	102	2:1	2
*60	0.064 - 0.168	18	33	12	87	114	1 1/2:1	3
*66	0.064 - 0.168	18	36	12	87	120	1 1/2:1	3
*72	0.064 - 0.168	18	39	12	87	126	1 1/2:1	3
*78	0.064 - 0.168	18	42	12	87	132	1 1/2:1	3
*84	0.064 - 0.168	18	45	12	87	138	1 1/2:1	3

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

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

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

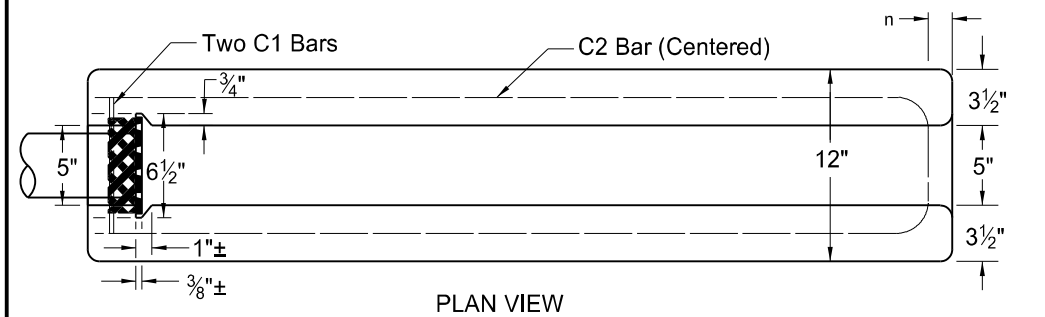
COUPLING BAND DIMENSIONS				
COUPLING TYPE	CORRUGATION PITCH x DEPTH	PIPE SIZE	COUPLING BAND LENGTH	MIN. BAND THICKNESS
Hat Band	2 3/8" x 1/2"	12" - 48"	2 3/4"	.064"
		12" - 72"	12"	.052"
Annular Band	2 3/8" x 1/2"	78" - 84"	12"	.079"
		48" - 120"	14"	.052"
Hugger Band	2 3/8" x 1/2" Rerolled End	12" - 72"	10 1/2"	.052"
		78" - 84"	10 1/2"	.079"
	3" x 1" Rerolled End	48" - 120"	10 1/2"	.052"
		48" - 120"	12"	.064"



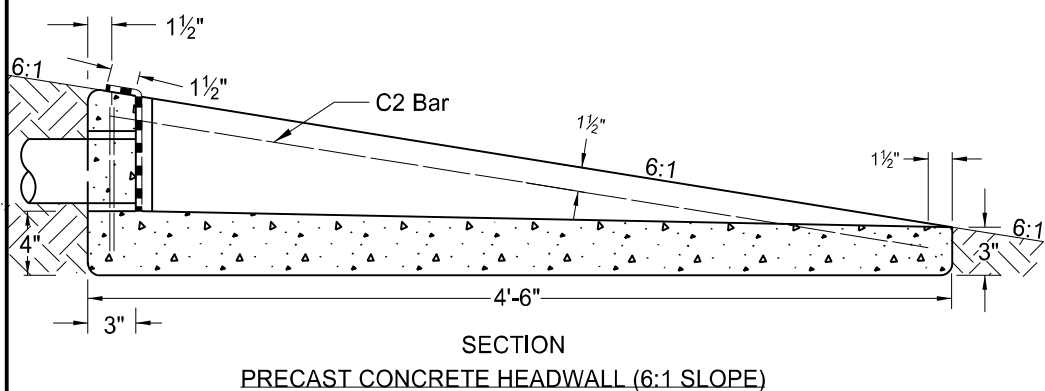
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
08-16-13	
REVISIONS	
DATE	CHANGE
01-07-14	End Section Plan View
02-27-14	3" x 1" Corrugation Detail
09-18-19	Added Perspective View Detail
09-23-22	Galvanized Thickness Table

THAN D KETTNER
 REGISTERED PROFESSIONAL ENGINEER
 PE-4684
 NORTH DAKOTA
 09/23/22

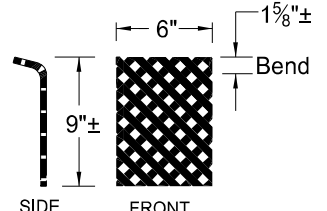
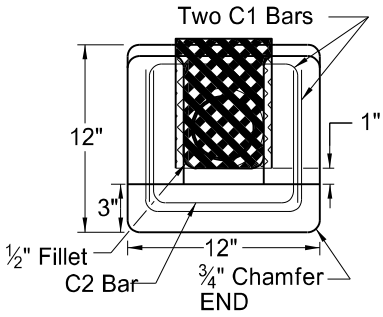
PRECAST CONCRETE HEADWALL DETAILS



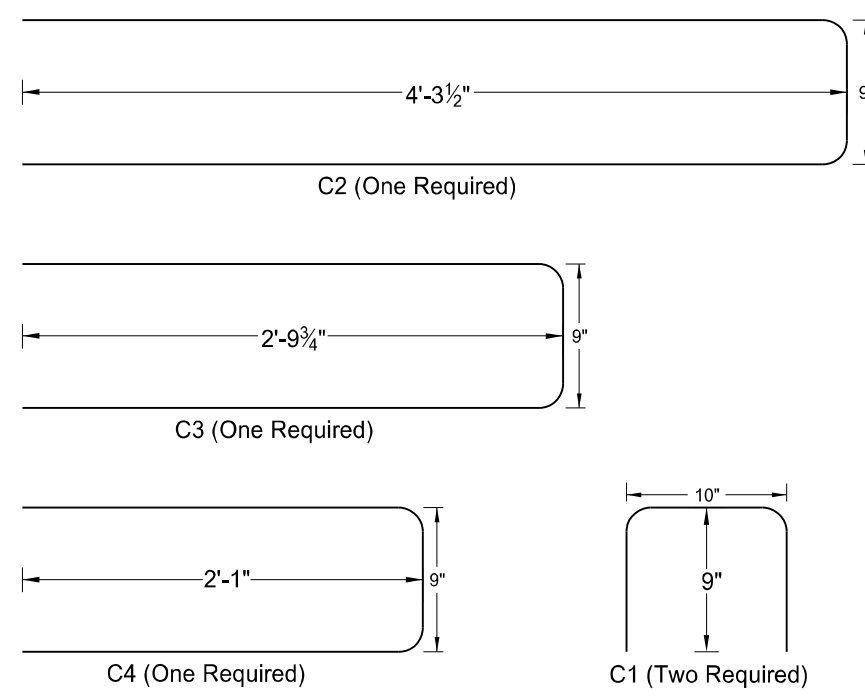
PLAN VIEW



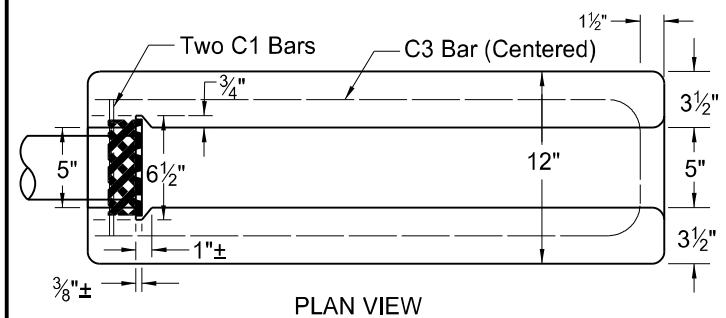
SECTION
PRECAST CONCRETE HEADWALL (6:1 SLOPE)



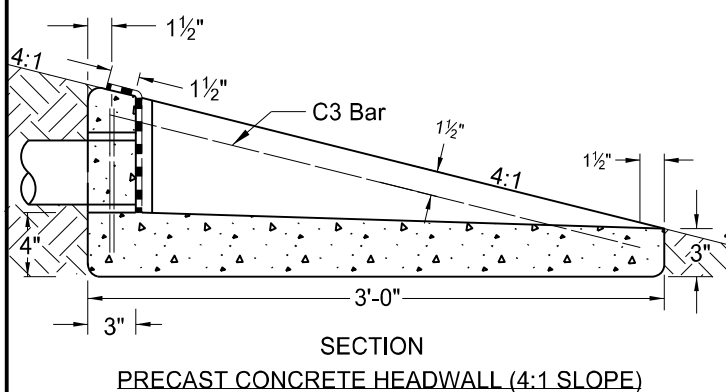
RODENT SCREEN
Dimensions are approximate to allow bend and a snug fit in headwall slot



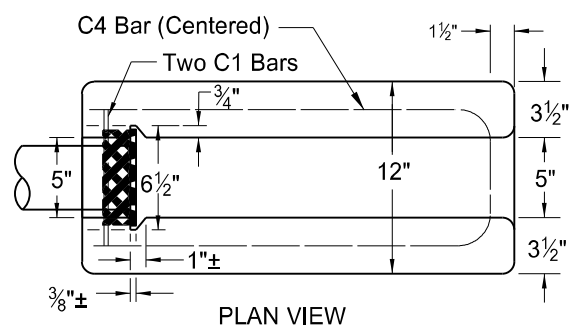
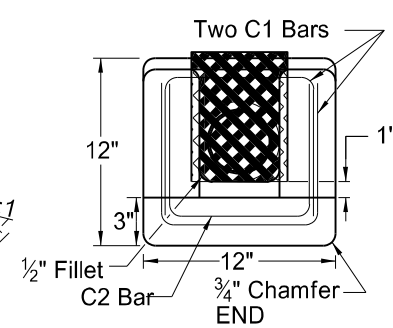
BENT BAR DETAILS



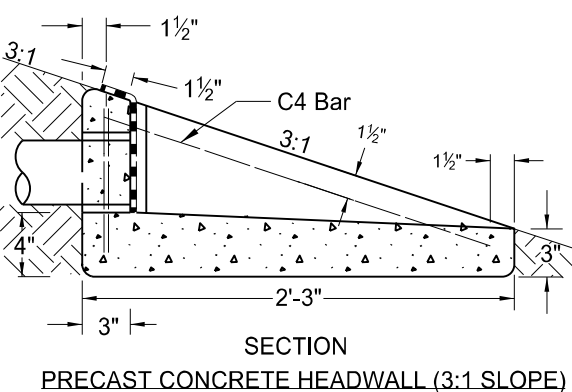
PLAN VIEW



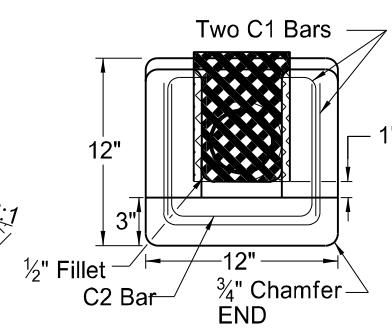
SECTION
PRECAST CONCRETE HEADWALL (4:1 SLOPE)



PLAN VIEW



SECTION
PRECAST CONCRETE HEADWALL (3:1 SLOPE)

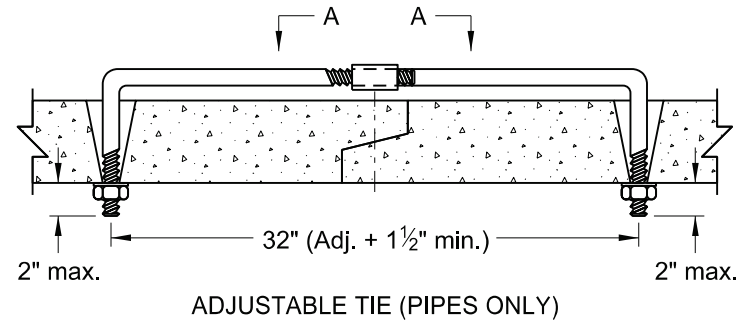
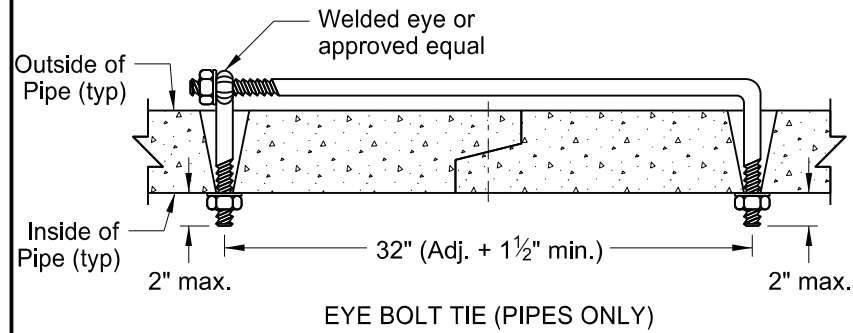


NOTES:

- RODENT SCREEN: Fabricate rodent screen from flattened expanded metal with screen openings of approximately 0.25 square inches. Use 16 ga metal, hot dip galvanized after fabrication, for the screen.
- REINFORCING BARS: Use No. 4 deformed steel reinforcing bars.
- BENT BARS: Bent bar dimensions given out to out.
- SLOPE: Match headwall slope to foreslope.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-27-2010	
REVISIONS	
DATE	CHANGE
12/02/2020	Removed drainable base details Added 4:1 and 3:1 Headwalls

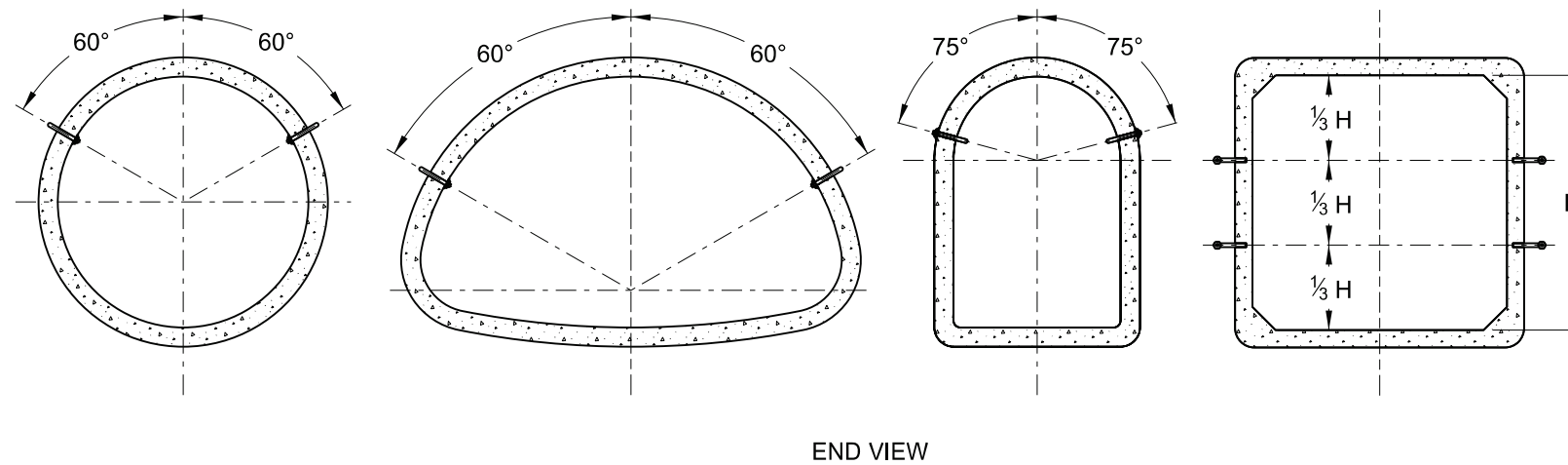
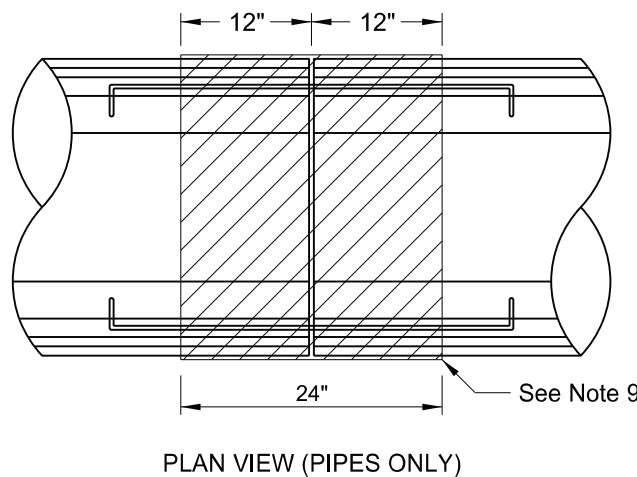
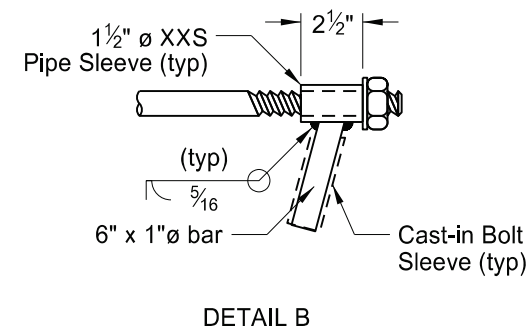
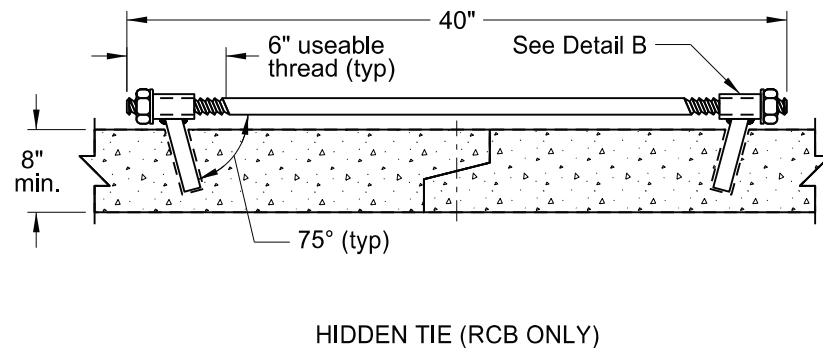
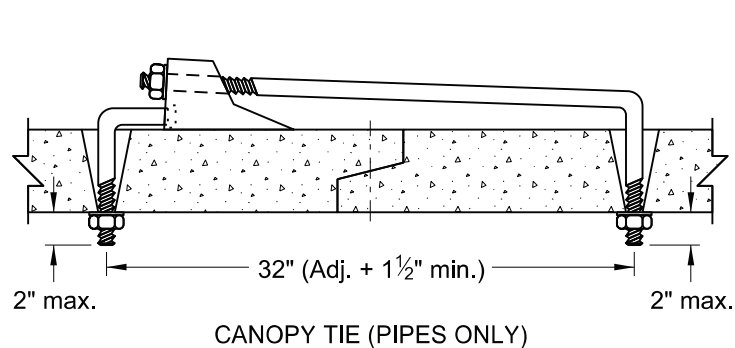
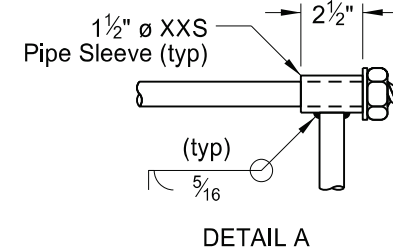
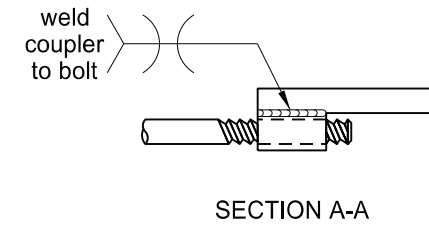
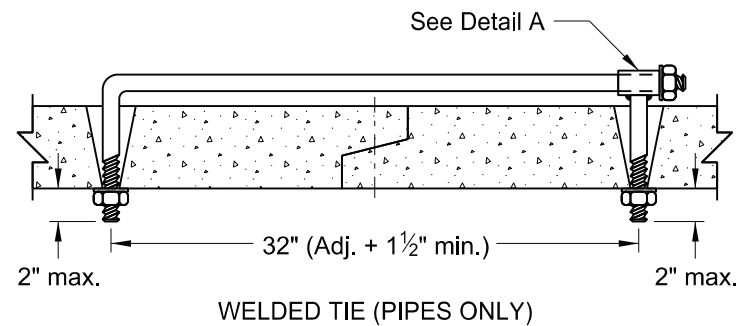
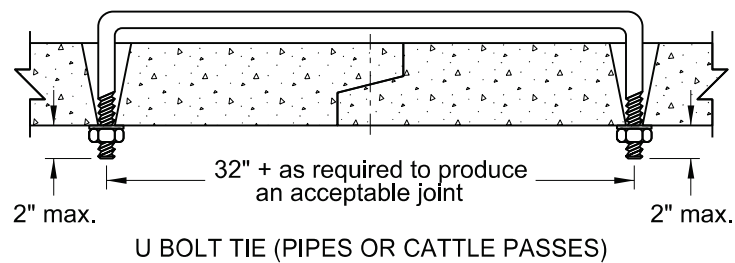
CONCRETE PIPE, CATTLE PASS, OR
PRECAST CONCRETE BOX CULVERT TIES



REQUIRED SIZE OF TIE BOLTS		
PIPE SIZE	THREAD Ø	XXS PIPE SLEEVE INNER Ø
18" - 24"	5/8"	3/4"
30" - 66"	3/4"	1"
72" - 120"	1"	1 1/4"
RCB/CATTLE PASS	1"	1 1/4"

NOTES:

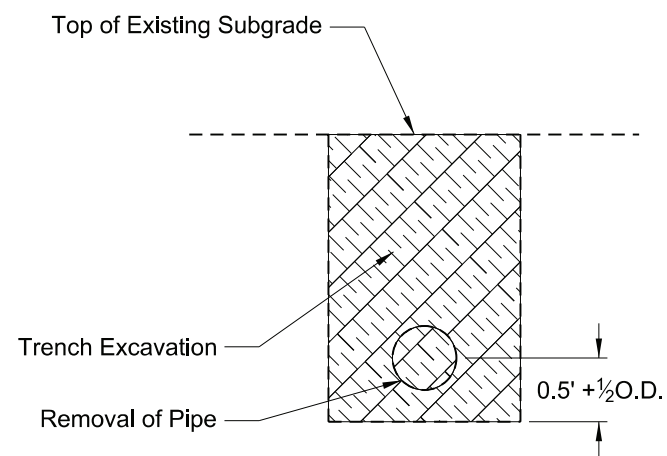
- The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
- Insert pipe ties from the inside of the pipes and grout into place for Cattle Pass and Jacked and Bored pipes. Jacked and bored pipes with a diameter of 24" or less do not require pipe ties.
- Nuts 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 will be precast. Tapered holes are permitted. 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".
- Include the cost of precasting 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 all joints including the end sections 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, use Type S2 geotextile fabric and overlap the joint by 12" in both directions. For box culverts, use a waterproof membrane that meets ASTM C990. 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.
- Provide lock washers or burr threads of concrete box ties after installation and tightening to prevent nut rotation.
- Tie RCB's as noted in the plans.



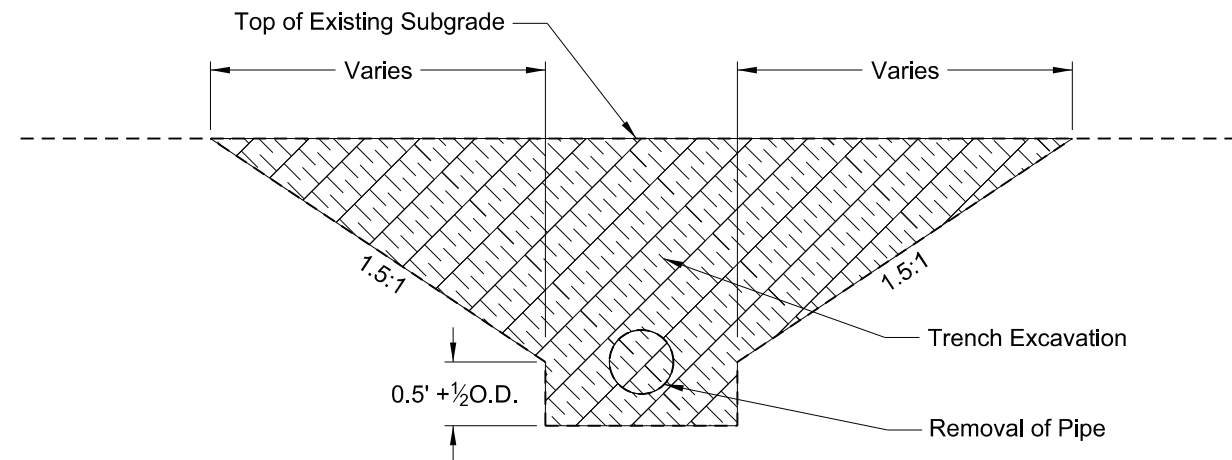
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
3-18-14	
REVISIONS	
DATE	CHANGE
7-21-15	Note 8
6-6-17	Notes 2-11 Table, Title, Labels
8-11-21	Notes 2-12 Table, Label
01-17-25	Notes 9-13 Table, Labels Section A-A, End View



PIPE INSTALLATION DETAIL FOR LONGITUDINAL MAINLINE PIPE
OR PIPE NOT UNDER THE ROADWAY



EXCAVATION DETAIL A



EXCAVATION DETAIL B

Pay Items

- 1) Pipe*
- 2) Removal of Pipe (if required)

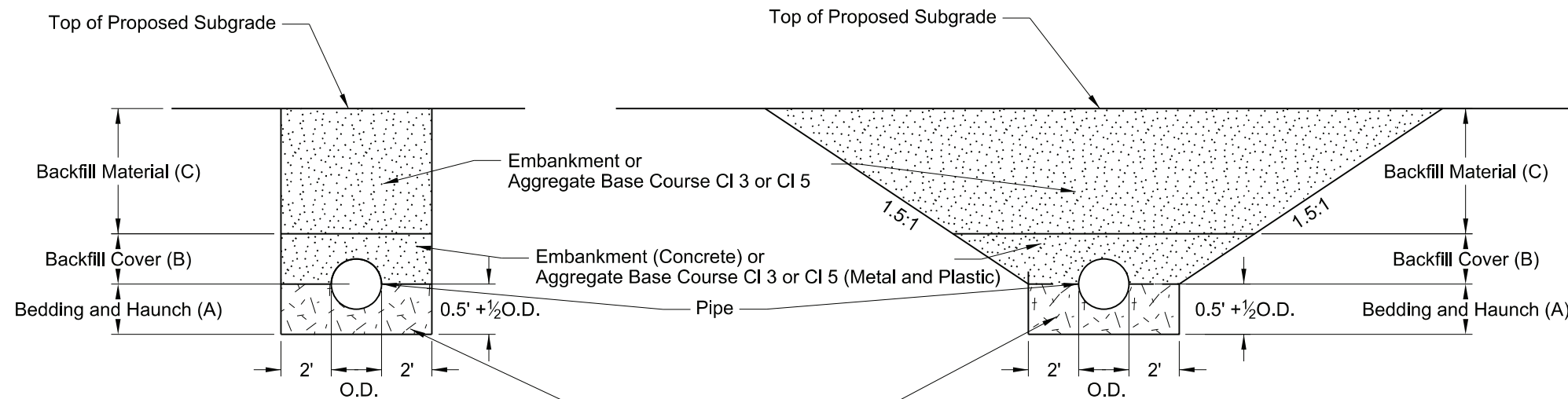
*Included in Pipe Pay Item

- 1) Pipe
- 2) Trench excavation
- 3) Aggregate base course CI 3 or CI 5
- 4) Embankment

NOTES:

- 1) This drawing does not apply to pipes in approaches.
- 2) It is the contractor's option to select Detail A or B.
- 3) Embankment may be either Borrow Excavation or Common Excavation - Type A

Bedding and Haunch (A)
Pipes Not Under Roadway = 0.5 O.D. + 0.5 Feet
Pipes Under the Roadway = 0.5 O.D. + 0.5 Feet
Backfill Cover (B)
Concrete Pipe = 0.5 O.D.
Metal and Plastic = 0.5 O.D. + 1 Foot
Backfill Material (C)
Top of Pipe 4 Feet or Less Below the Top of Proposed Subgrade = Aggregate Base Course CI3 or CI 5
Top of Pipe Greater than 4 Feet Below the Top of Proposed Subgrade = Common Excavation - Type A
Pipe Not Under Roadway = Common Excavation - Type B



BACKFILL DETAIL A

BACKFILL DETAIL B

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-26-13	
REVISIONS	
DATE	CHANGE
10-15-13	Label Formatting
1-21-15	Nomenclature
12-10-15	Added Plastic Pipe
5-27-20	Changed bedding depth and updated table



STANDARD MONUMENTS AND RIGHT OF WAY MARKERS

NOTES:

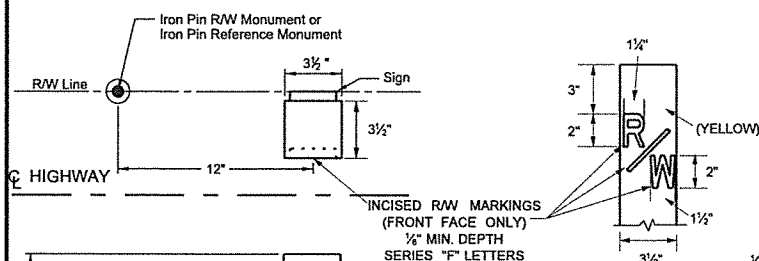
Construct and install Alignment Monuments, Iron Pin Reference Monuments, Iron Pin R/W Monuments, and Right of Way Markers (witness posts) according to Section 720 of the Standard Specifications.

ALIGNMENT MONUMENTS: Place Iron Pin or Precast Concrete Alignment Monuments with aluminum caps on the centerline alignment PI's, section corners, quarter corners, section line crossings, quarter line crossings, and at curve points (PC's, PT's, TS's, and ST's) on the centerline.

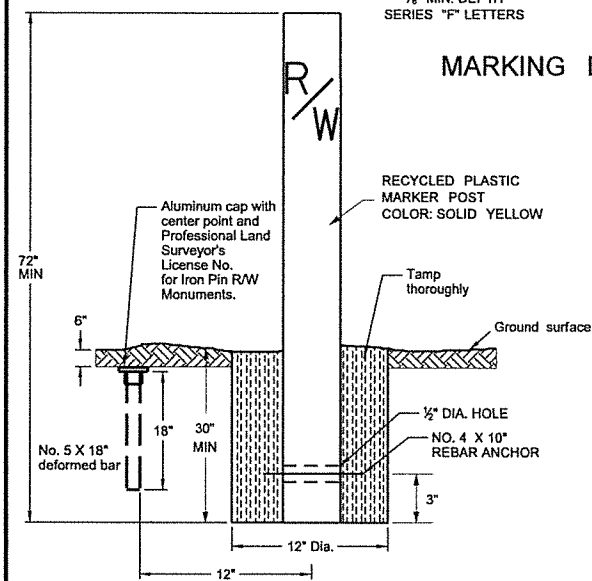
IRON PIN R/W MONUMENT: Place Iron Pins with aluminum caps (No. 5 X 18") at breaks on the Right of Way line, and at curve points (PC's, PT's, TS's and ST's) on the Right of Way line.

IRON PIN REFERENCE MONUMENT: Place Iron Pins without aluminum caps (No. 5 X 18") as reference monuments on the Right of Way line at section corners, quarter corners, section line crossings, and quarter line crossings.

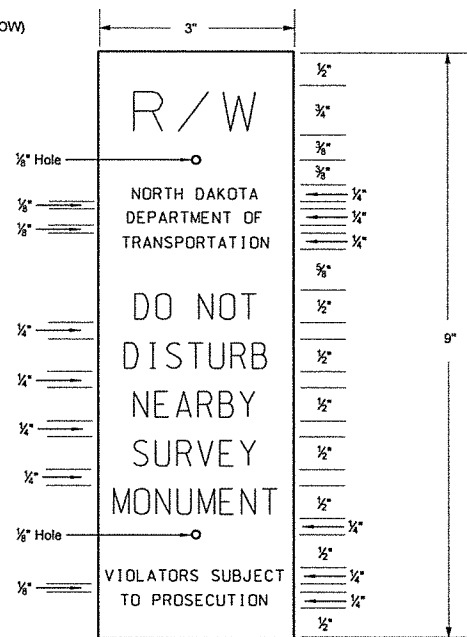
R/W MARKERS (WITNESS POST) WITHIN DRIVEWAYS: If a single iron pin R/W or Reference Monument is within a driveway, place right of way marker (witness post) 50 feet back, in stationing, from the Iron Pin Monument along the R/W line. If R/W break is within a driveway, place right of way markers (witness posts) 50 feet back, or ahead from respective Iron Pin R/W Monuments along the R/W lines. Maintain Iron Pin R/W or Reference Monument original position within driveway.



MARKING DETAIL



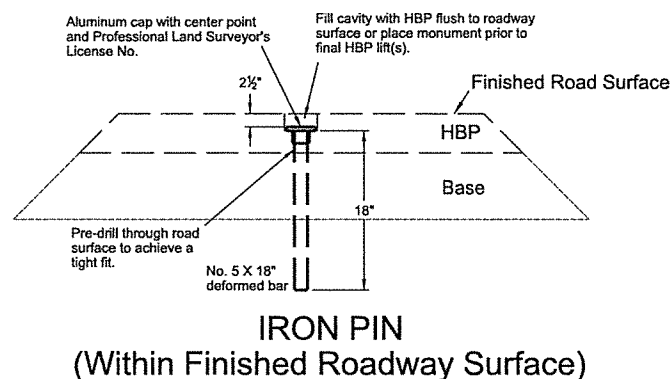
RECYCLED PLASTIC RIGHT OF WAY MARKER (WITNESS POST) DETAILS & IRON PIN REFERENCE AND R/W MONUMENT DETAILS



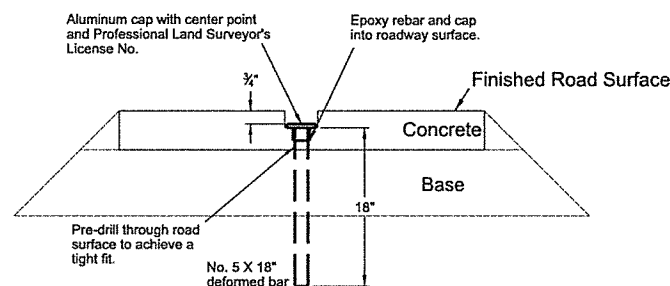
SIGN DETAIL

Black letters on orange high intensity background sheeting meeting ASTM D-4956 Type III or higher on 80 gauge 5052-H38 aluminum. Silk screen graphics. One color print. Attach sign by drilling two holes in the face of the post (side facing the private owner, away from the Department of Transportation right of way). Put inserts into the holes and mount the sign with #4 vandal proof screws. Install sign 2" from top of post.

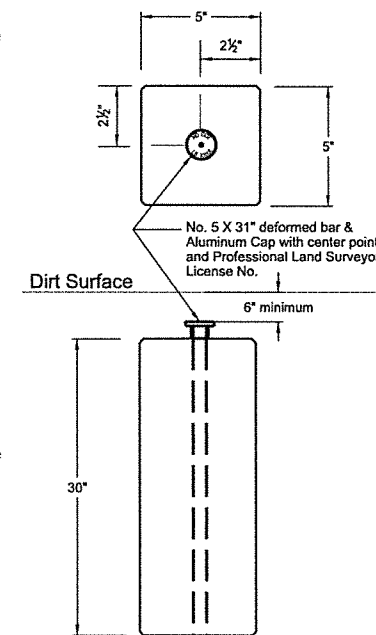
ALIGNMENT MONUMENT DETAILS



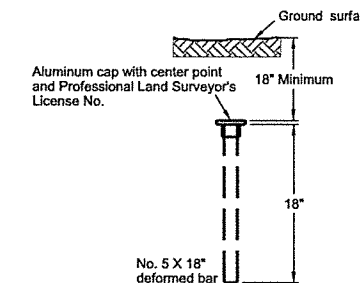
IRON PIN (Within Finished Roadway Surface)



IRON PIN (Within Finished Roadway Surface) (Outside Finished Roadway Surface) (Inside R/W Limits)

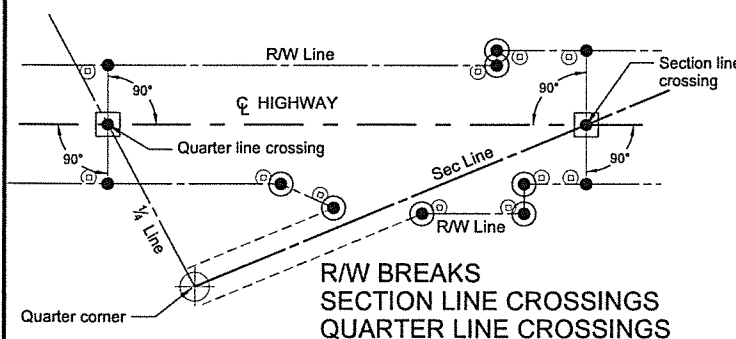


PRECAST CONCRETE (Outside Finished Roadway Surface) (Outside R/W Limits)

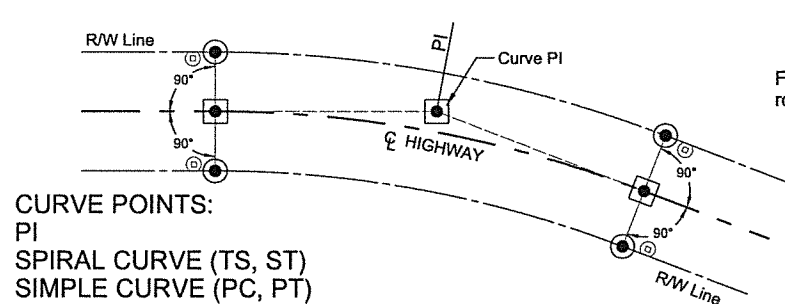


IRON PIN (Outside Finished Roadway Surface) (Outside R/W Limits)

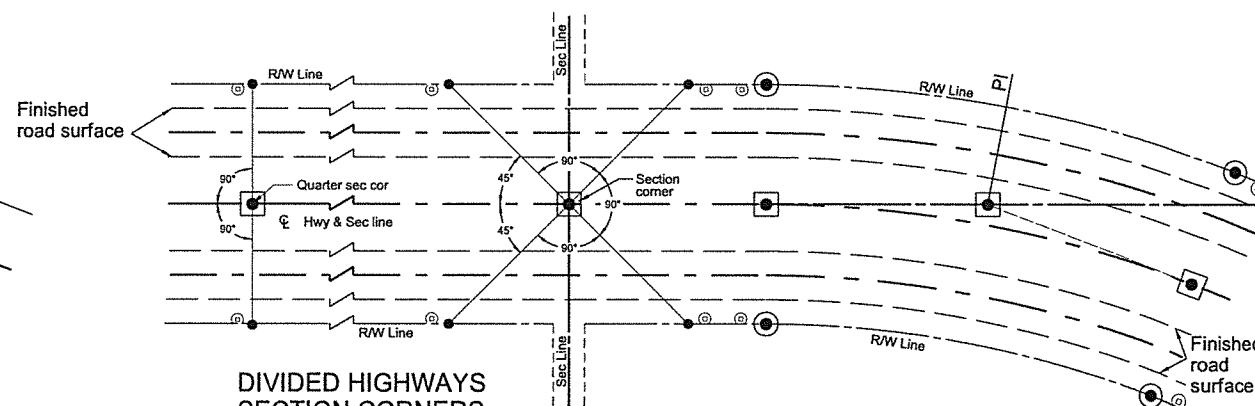
VARIOUS MONUMENT AND MARKER PLACEMENTS



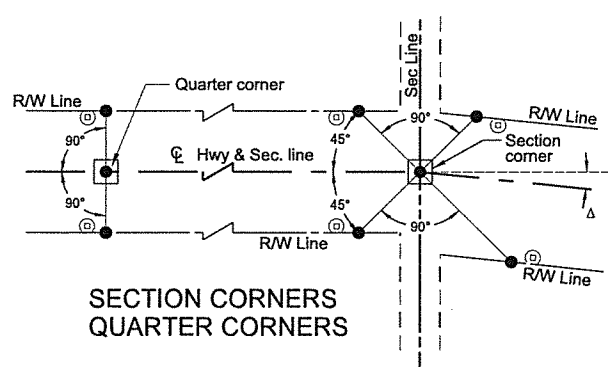
R/W BREAKS SECTION LINE CROSSINGS QUARTER LINE CROSSINGS



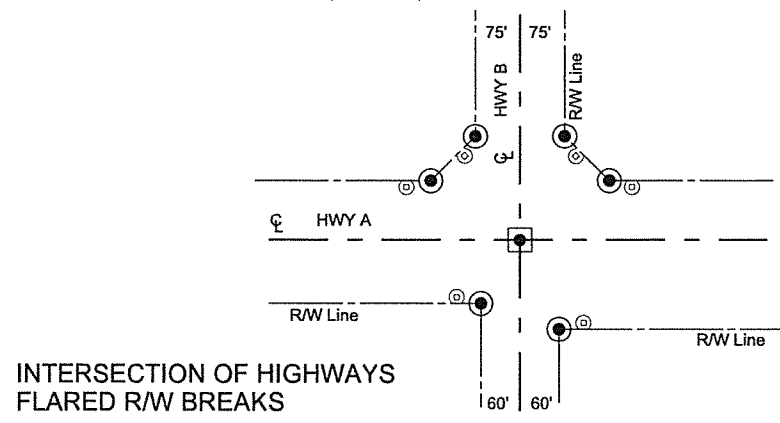
CURVE POINTS: PI SPIRAL CURVE (TS, ST) SIMPLE CURVE (PC, PT)



DIVIDED HIGHWAYS SECTION CORNERS QUARTER CORNERS



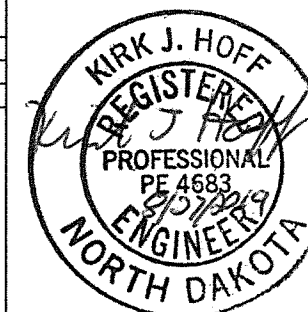
SECTION CORNERS QUARTER CORNERS



INTERSECTION OF HIGHWAYS FLARED R/W BREAKS

- LEGEND
- Iron Pin Reference Monument
 - ⊕ R/W Marker (witness post)
 - Alignment Monument
 - ⊙ Iron Pin R/W Monument

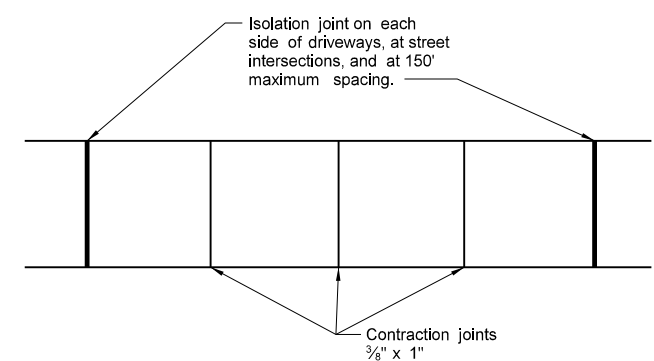
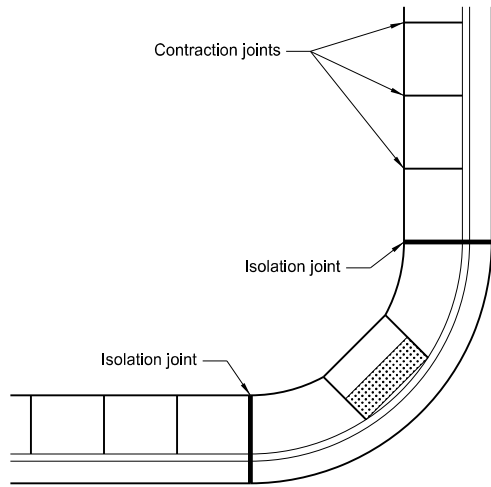
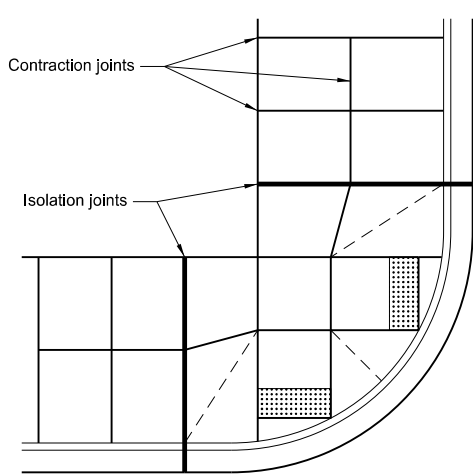
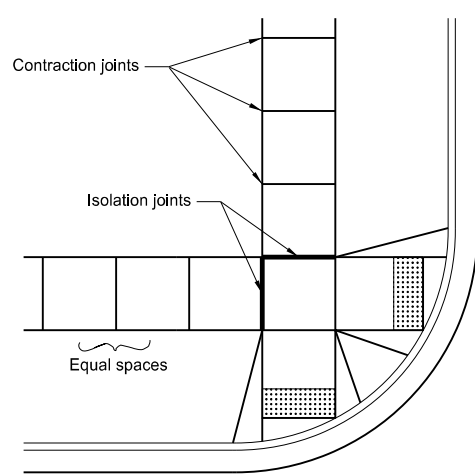
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE
11/12/13	Note for SIGN DETAIL modified to meet ASTM D-4956 Type III or higher on 80 gauge 5052-H38
10/17/17	Updated to active voice.
08/27/19	New Design Engr PE Stamp.



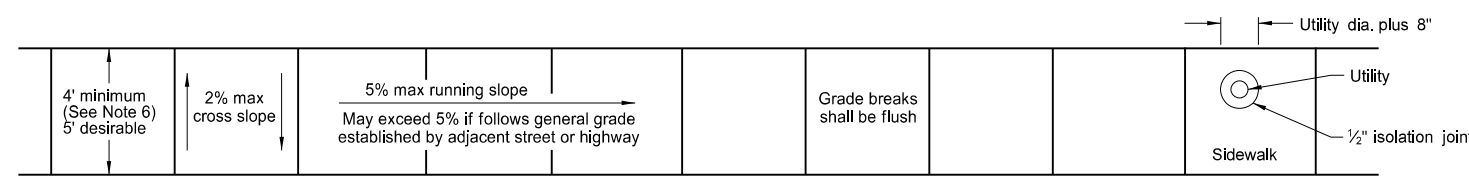
SIDEWALK

NOTES:

1. Curb ramp and detectable warning panel layouts for informational purposes only. See Standard Drawing D-750-3 for curb ramp and detectable warning panel details.
2. Joint Spacing: Vary transverse contraction joint spacing from 4' to 6' to create approximate square panels.
Use longitudinal contraction joints when sidewalk width is 8' or greater, and space at half the sidewalk width.
Saw or groove contraction joints to a minimum depth of 1/3 the depth of the concrete.
When sidewalk is adjacent to curb & gutter, vary the sidewalk joint spacing to match curb & gutter joints.
Use isolation joints between separate concrete pours, or between old and new concrete.
3. Include all costs for labor, equipment, and material necessary to construct contraction and isolation joints in the price bid for sidewalk concrete.
4. Use 4" sidewalk concrete thickness unless otherwise specified.
5. Use 4" base material thickness unless otherwise specified. Include all costs for labor and materials necessary to place the base material in the price bid for "Salvage Base Course" or "Aggregate Base Course CL 5."
Modify existing ground slope with landscaping as needed. If not possible, such as adjacent buildings, use a vertical curb as shown in the detail below. The Engineer will measure curb at the unit price bid for "Curb - Type I" per lineal foot.
6. Sidewalk Width & Grade: Provide a continuous 4' min clear width pedestrian access route with max 2% concrete cross slope, excluding flares. The width of the curb cannot be counted as part of the pedestrian access route.
When clear width of pedestrian access routes is less than 5.0', provide passing spaces at a maximum of 200' with a minimum size of 5.0' by 5.0'.

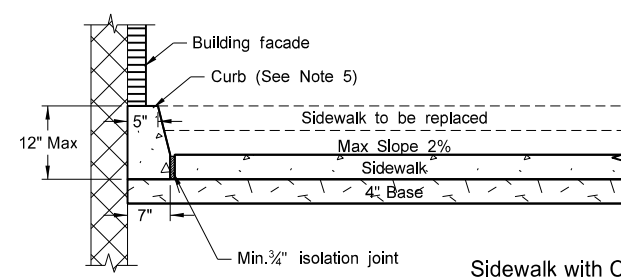


Typical Joint Layouts

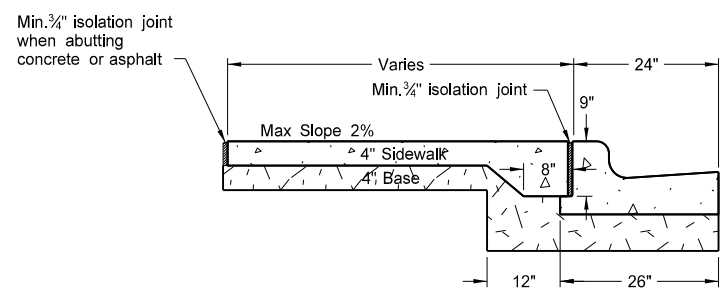


Sidewalk Width and Grade

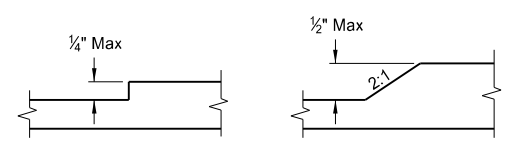
Utility Blockout



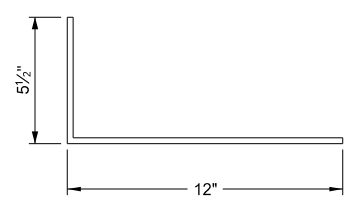
Sidewalk with Curb Detail (Building face application)



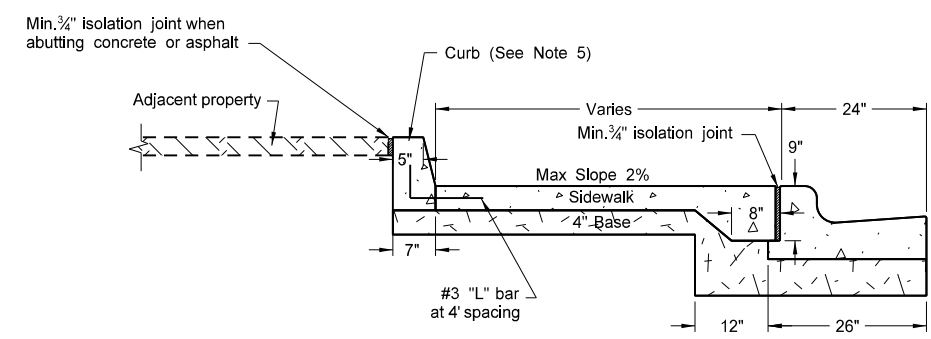
Sidewalk Detail (Installed adjacent to curb and gutter)



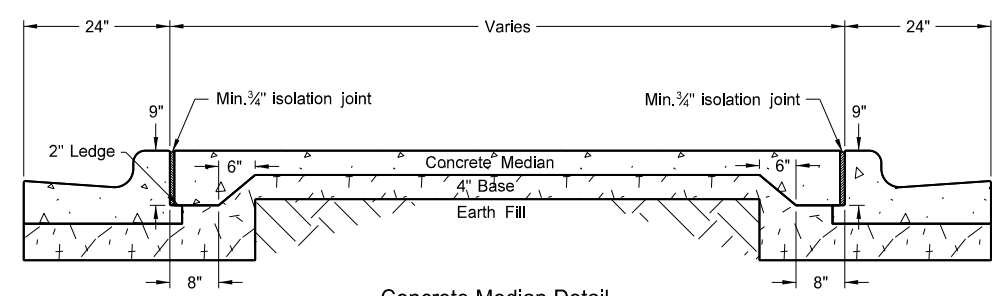
Vertical Discontinuities (As needed for utility covers, vaults, grating, etc..)



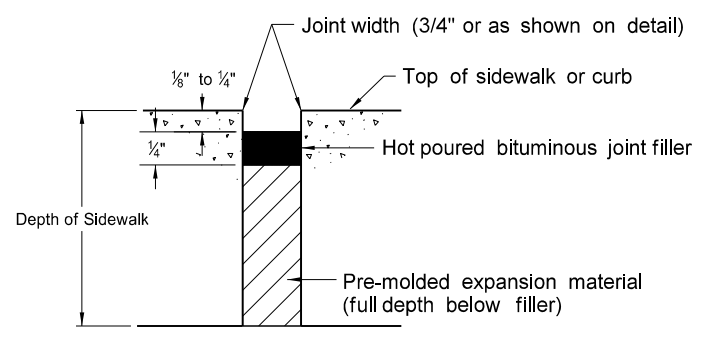
"L" Bar Detail #3 Bar



Sidewalk with Curb Detail (Adjacent property application)



Concrete Median Detail



Typical Isolation Joint Seal (longitudinal and transverse)

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-26-13	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
09-05-18	Added sidewalk details for width and grade and passing lane requirements.
08-27-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 08/27/19 and the original document is stored at the North Dakota Department of Transportation

CURB RAMP RETROFIT DETAILS

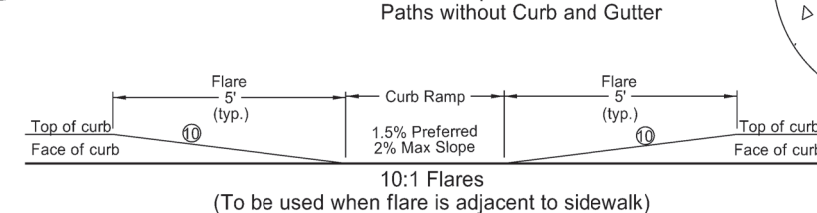
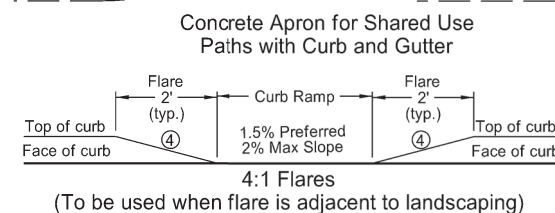
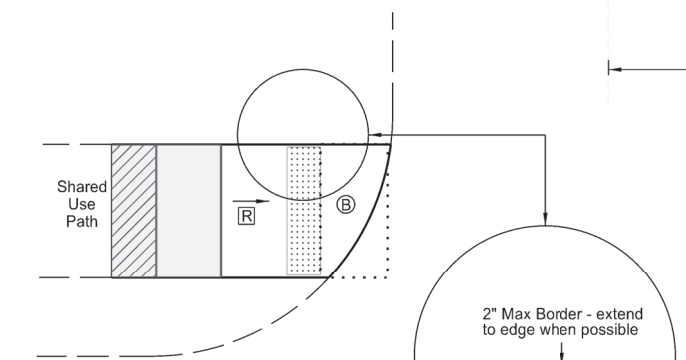
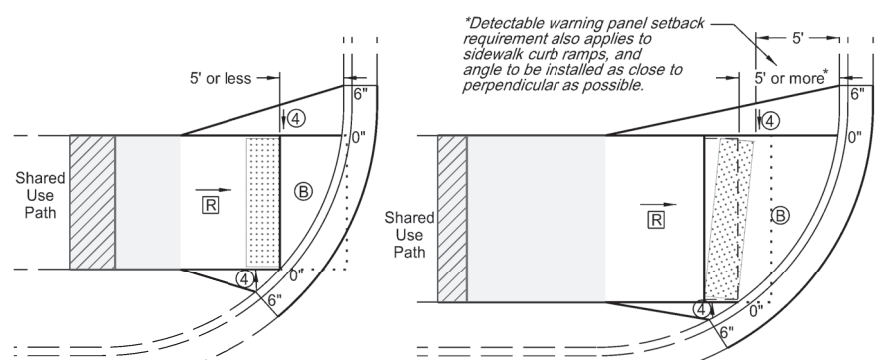
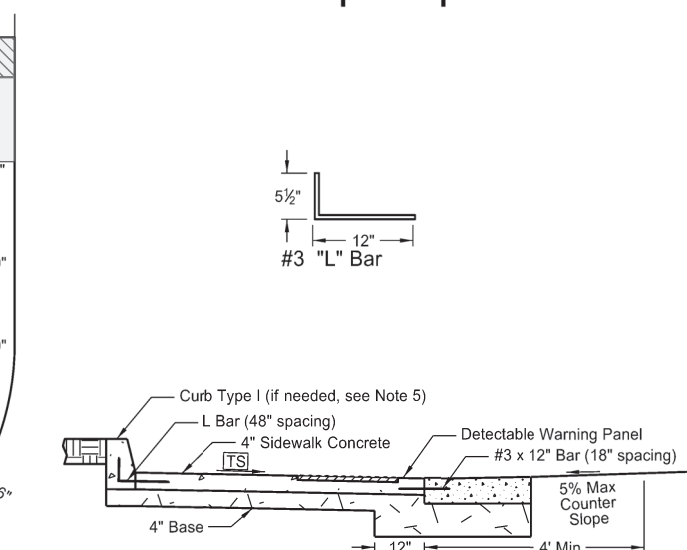
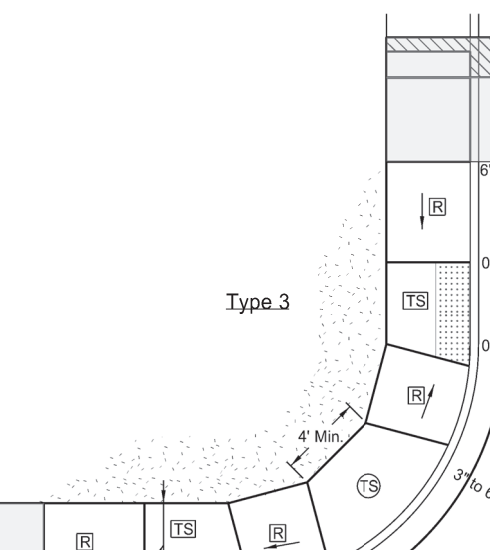
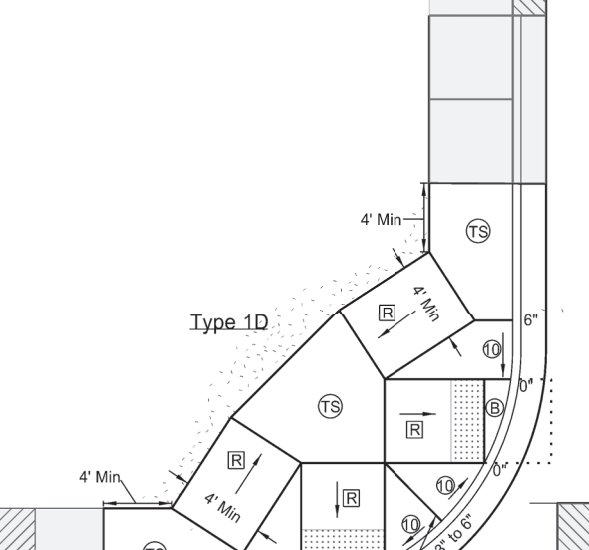
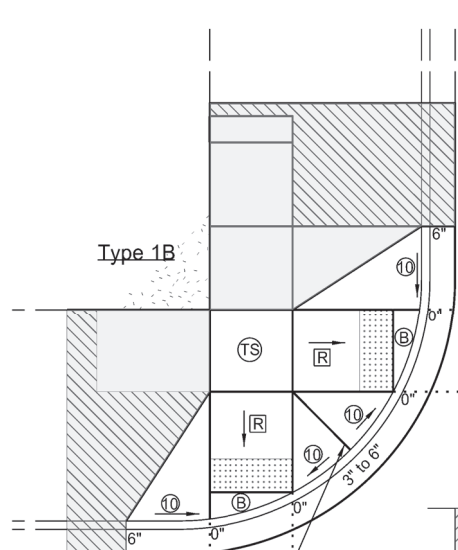
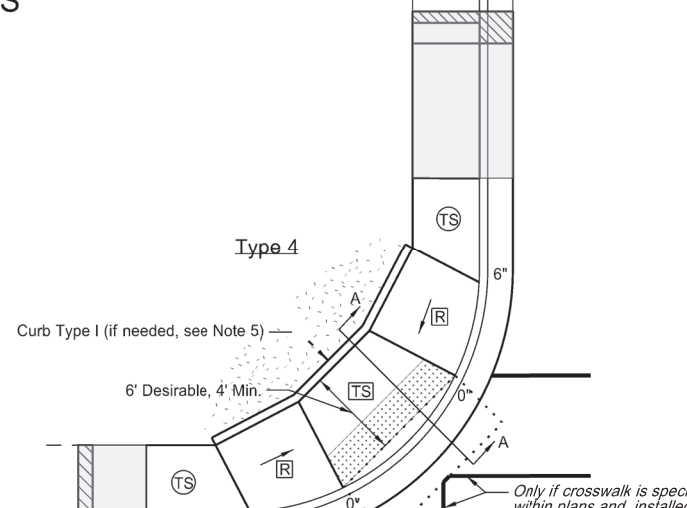
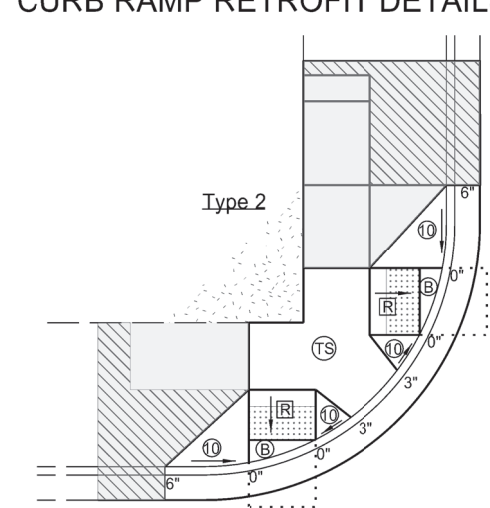
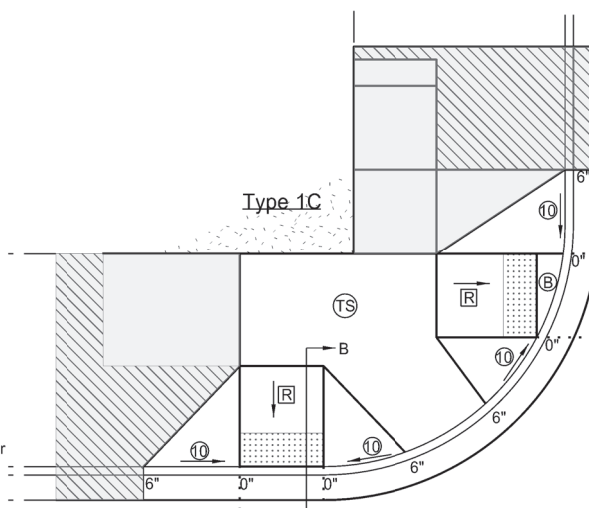
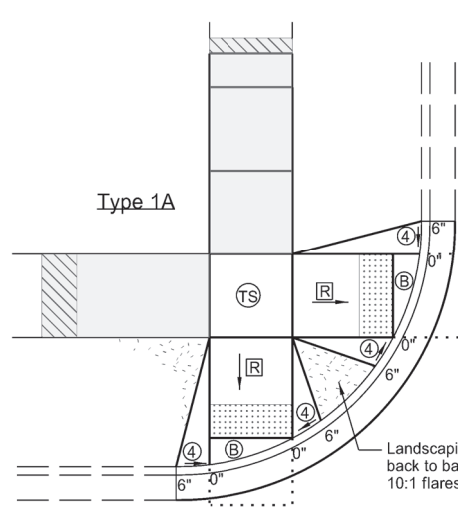
D-750-3

NOTES:

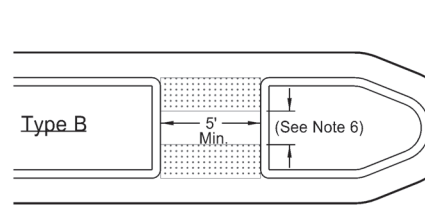
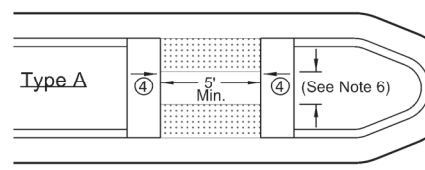
- Ramp width is the useable portion of the ramp, excluding flares. Match curb ramp width to Existing Pedestrian Facility (EPF) width (4' minimum or 5' for island ramps.) Match ramp width to existing shared use path width. Maximum ramp length is 15'.
- Provide turning space with desirable 5' x 5' size or larger and minimum 4' x 4' unconstrained size, for any change of direction. Provide landing 5' long x width of path at the bottom and top of parallel ramps and at the top of perpendicular ramps. Turning spaces and Landings may overlap.
- Match detectable warning panel width to ramp width. Radial panels are allowed. Place detectable warning panel within the lower turning space.
- Provide a continuous 4' minimum width EPF with 1.5% preferred cross slope and max 2% constructed cross slope.
- Modify existing ground slope with landscaping, as needed. If not possible, use a vertical curb as detailed on Standard D-750-2. The Engineer will measure curb at the unit price bid for "Curb - Type I" per lineal foot.
- Islands: If the profile of the island curb ramp is 2% or less, provide a minimum distance of 2' between warning panels. If the profile of the island curb ramp is steeper than 2%, provide a turning space between the ramps.
- Provide generally planar vertical alignments. Provide grade breaks, perpendicular to the direction of the pedestrian travel, at the top and bottom of curb ramps (1.5% preferred, 2% max constructed cross slope).
- See Curb Ramp Retrofit Details Standard D-750-4 for additional information. Also See PROWAG for full compliance in the curb ramp area.
- Grade transitions shall be flush.

LEGEND:

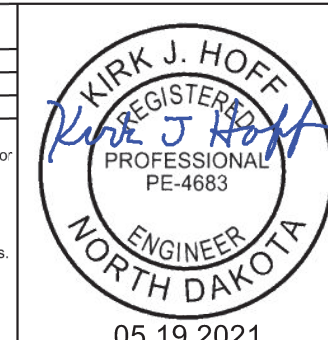
- : Detectable Warning Panel.
- : Landscaping.
- : Transitional tie-in to nearest joint, if needed.
- : Curb Ramp Retrofit Transitional Area (See Standard Drawing D750-4)
- : 4' long x width of EPF or 4' minimum Clear space outside traffic lanes of travel. 1.5% preferred cross slope 2% maximum cross slope 4.7% preferred running and counter slope 5% maximum running and counter slope
- : Turning Space Use at top of ramp or when changing directions. 1.5% preferred slope (2% maximum) all directions.
- : Preferred Ramp Grade = 5% to 7.5%. Maximum Constructed Grade = 8.3%. Preferred Cross Slope = 1.5%. Maximum Constructed Cross Slope = 2%.
- : 1.5% preferred cross slope 2% maximum constructed cross slope running slope consistent with the EPF 4.7% preferred max counter slope 5.0% max constructed counter slope
- : 10:1 maximum constructed slope.
- : 4:1 maximum constructed slope.
- 0", 3", or 6" : Curb Height.



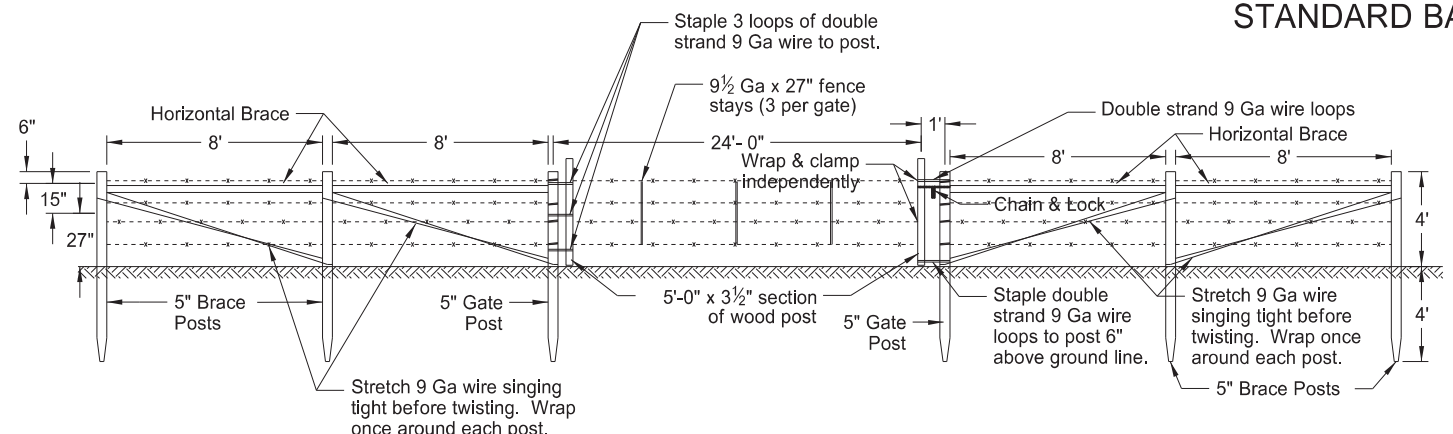
Median Refuge Islands (Cut-Through)



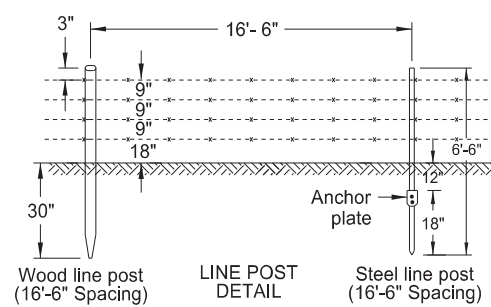
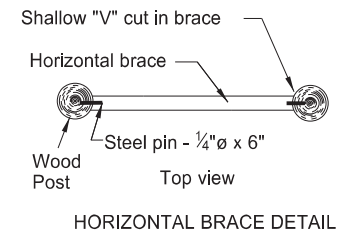
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-26-13	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
09-05-18	Revised Notes, Revision for Turning Space, Added Passing Space Requirements, Turned Detectable Warning Panel
03-15-21	Slope & other clarifications.
05-19-21	Separate Curb Ramp Transition Area from Curb Ramp area



STANDARD BARBED WIRE FENCE

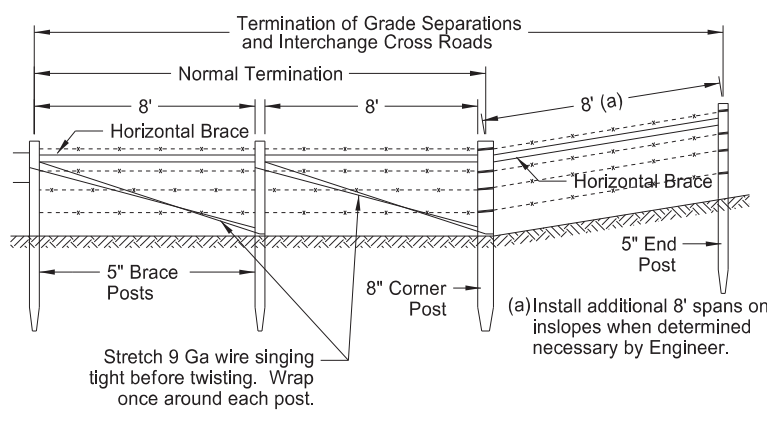


VEHICLE GATE

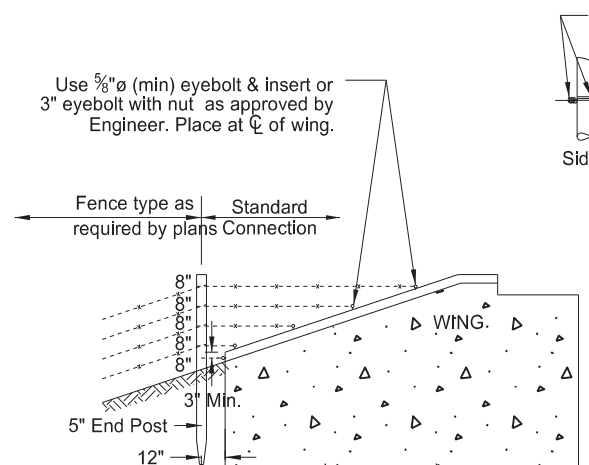


NOTES

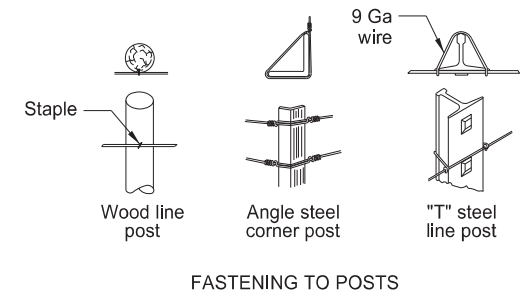
1. No deduction in measured pay length of fence made for gates, corner assemblies, double brace assemblies, fence terminals, or depression fencing. Include all costs for abutment fencing in the price bid for fencing bid items.
2. Install double brace assemblies at locations shown on the plans or established by the Engineer. Place adjacent fence terminals, corner assemblies, or double brace assemblies at a maximum spacing of 1,320 feet.
3. Include all costs of furnishing and installing inserts and eyebolts in the unit price bid for fencing bid items. Use eyebolts galvanized according to AASHTO designation M-30; inserts of corrosion resistant material do not require galvanization. Use concrete inserts capable of developing the full strength of the 5/8" diameter threaded eyebolt, when installed in concrete.
4. Determine post type used, either wood or steel, unless otherwise specified in the plans.
5. Include the cost of bracing at vehicle gates in the price bid for "Vehicle Gate."



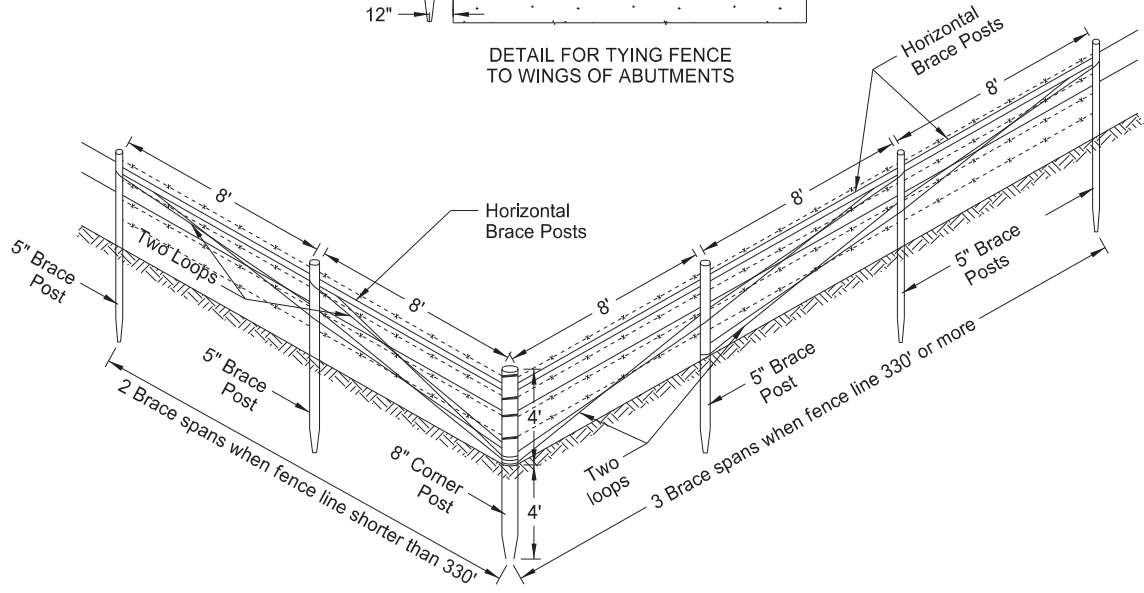
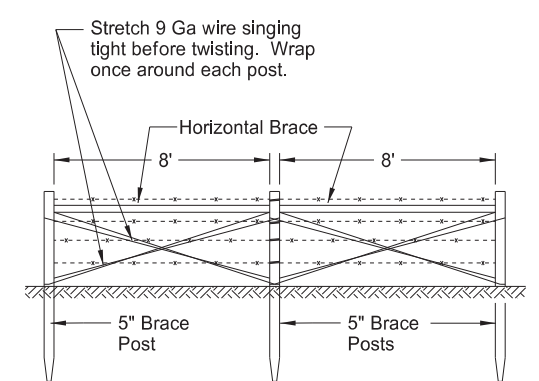
FENCE TERMINAL



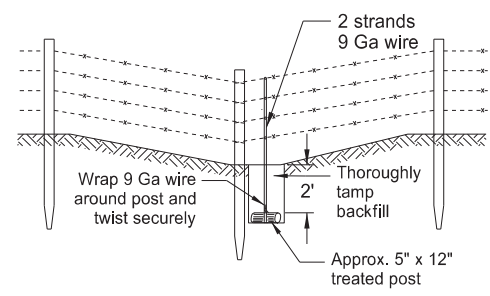
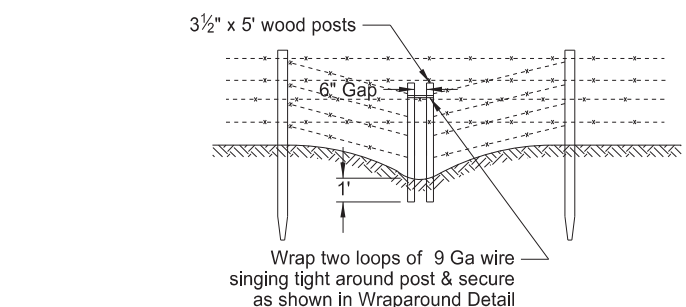
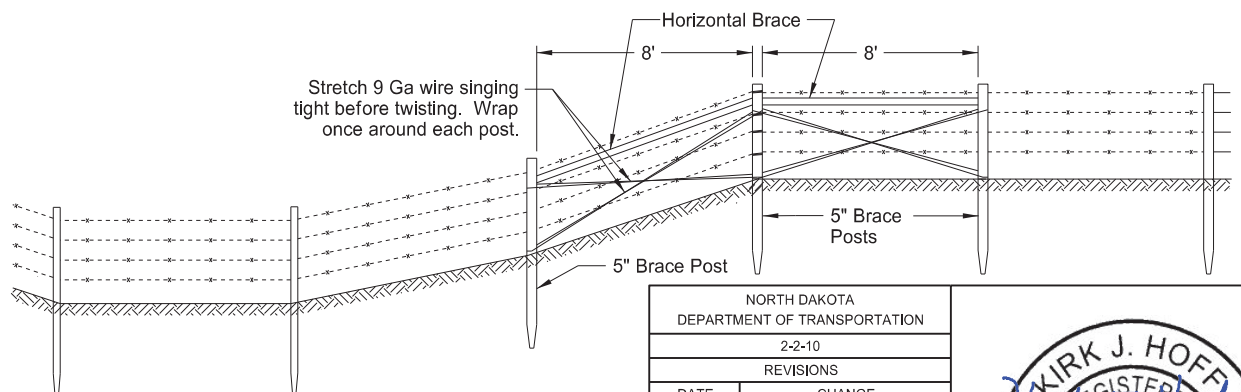
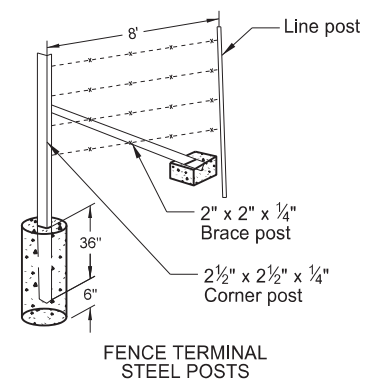
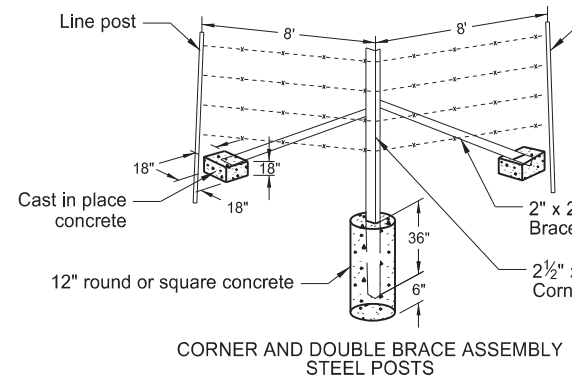
DETAIL FOR TYING FENCE TO WINGS OF ABUTMENTS



USE OF POST	TREATED WOOD		STEEL		
	Post dia.	Post length	Post length	Post wt. Lbs./Ft.	Anchor wt. Lbs.
Line post	3 1/2"	6'-6"	6'-6"	1.33	0.67
Corner post	8"	8'	7'	4.10	(Conc.)
End post	5"	8'			
Brace post	5"	8'	7'	3.19	(Conc.)
Gate post	5"	8'			
Horizontal brace	4"	8'	As approved by the Engineer		



CORNER ASSEMBLY



*Determine locations in the field and include in price bid for fencing. Use other methods of anchoring fence if approved by the Engineer.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-2-10	
REVISIONS	
DATE	CHANGE
10-02-12	Notes, steel assemblies/posts.
11-25-13	Revised Vehicle Gate.
10-17-17	Updated to active voice.
02-23-23	Revised post spacing/brace size.

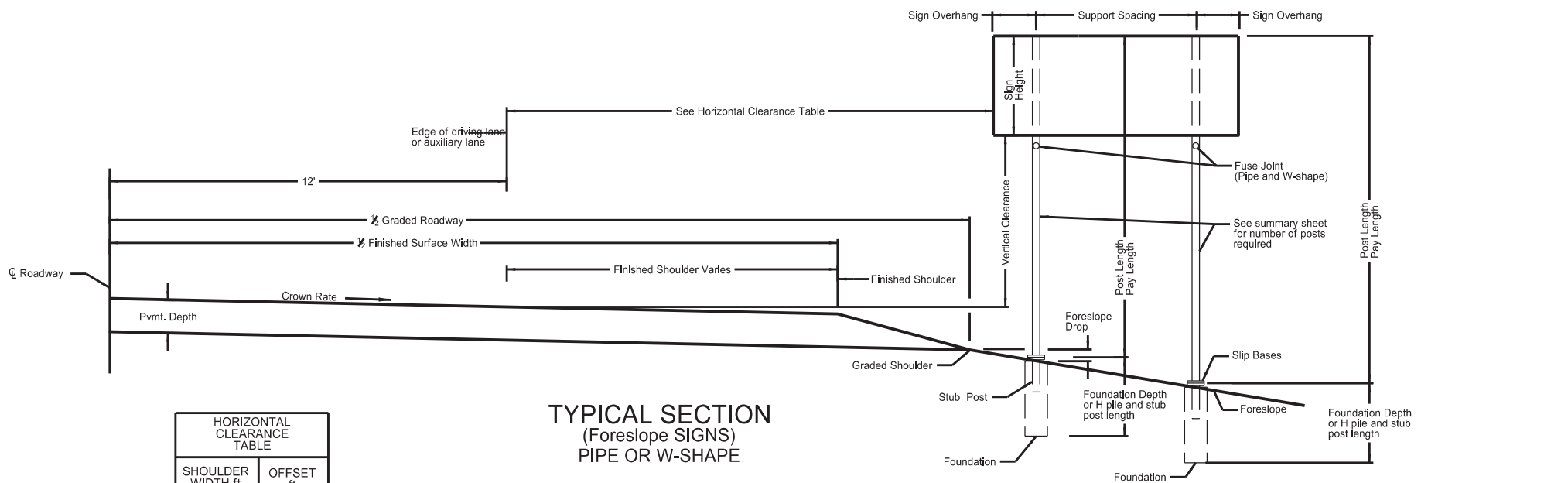


PIPE OR W-SHAPE ASSEMBLY DETAILS

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.

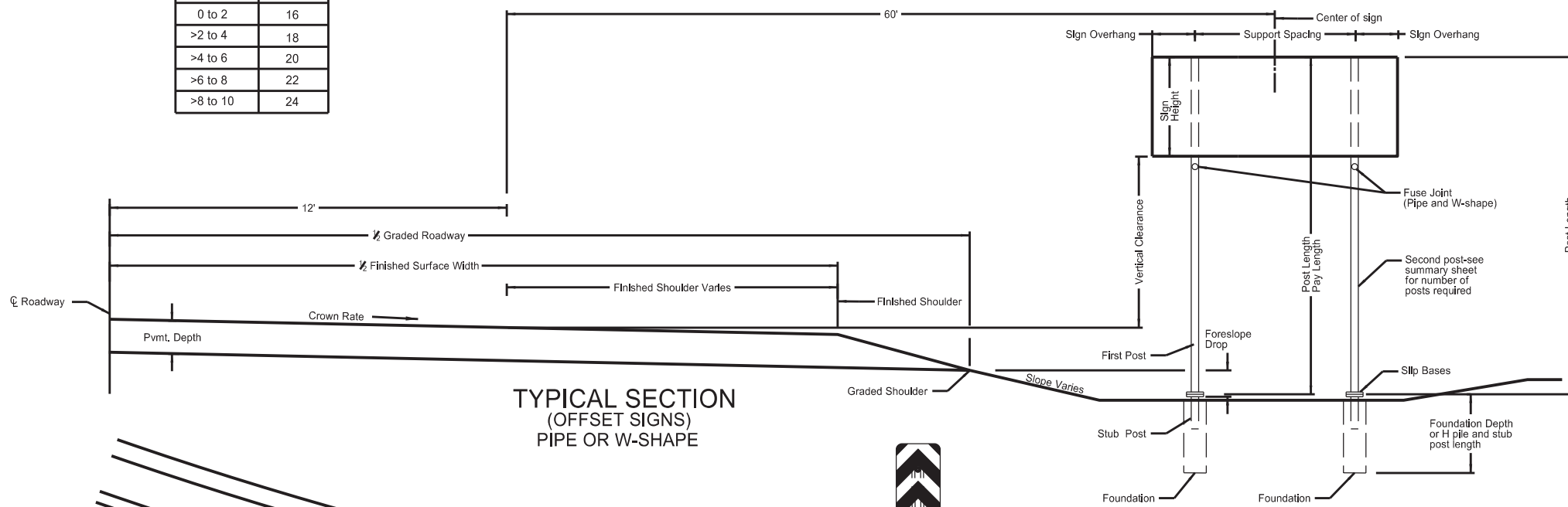
Place signs a maximum of 6" above the vertical clearance specified above.



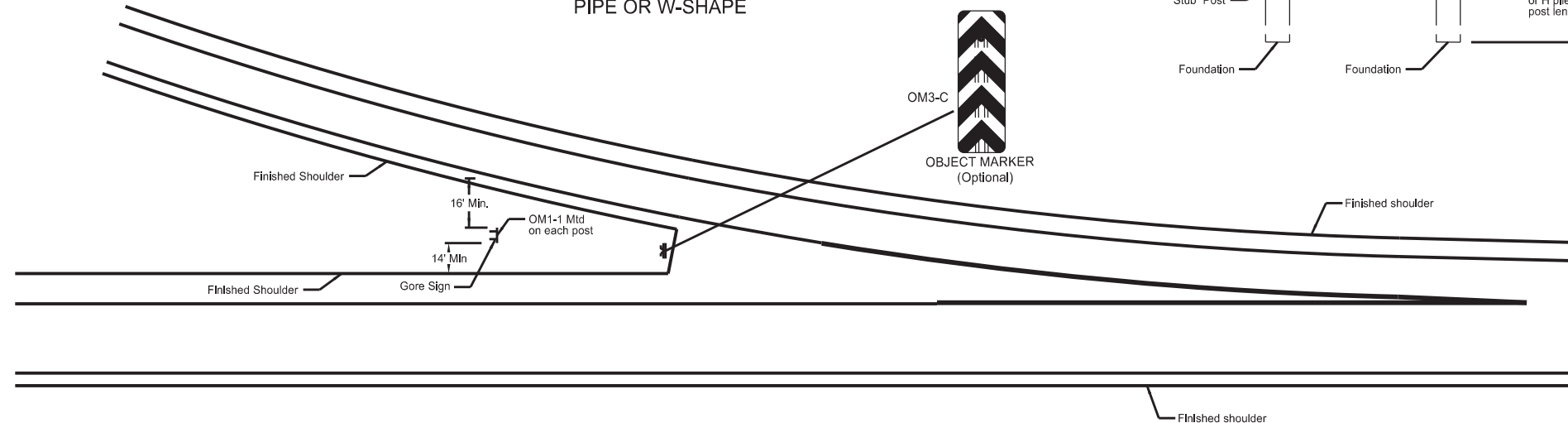
HORIZONTAL CLEARANCE TABLE

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

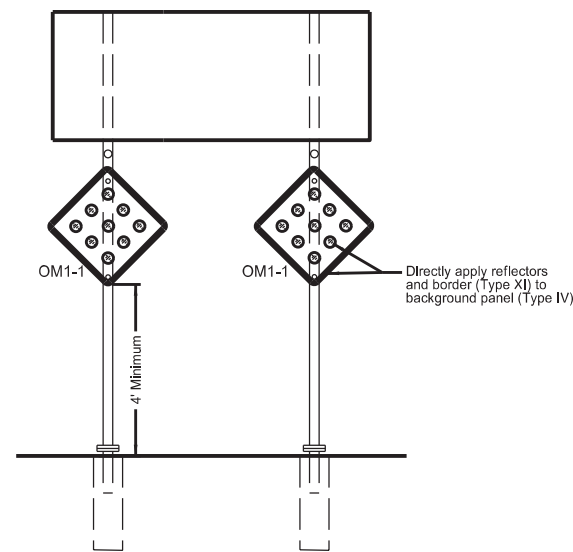
TYPICAL SECTION (FORESLOPE SIGNS) PIPE OR W-SHAPE



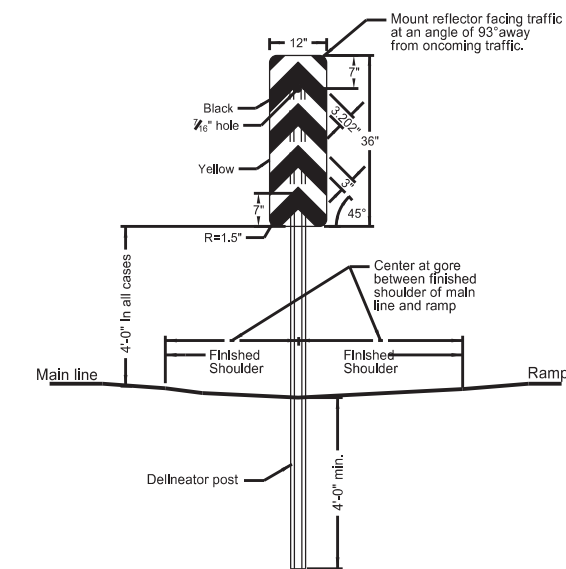
TYPICAL SECTION (OFFSET SIGNS) PIPE OR W-SHAPE



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.

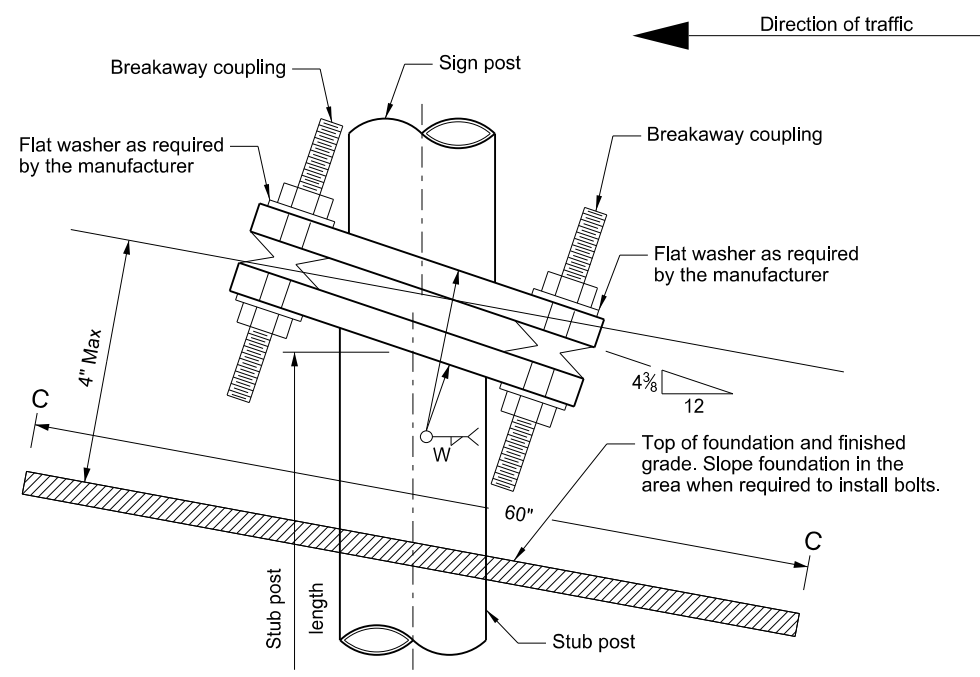


11/26/21

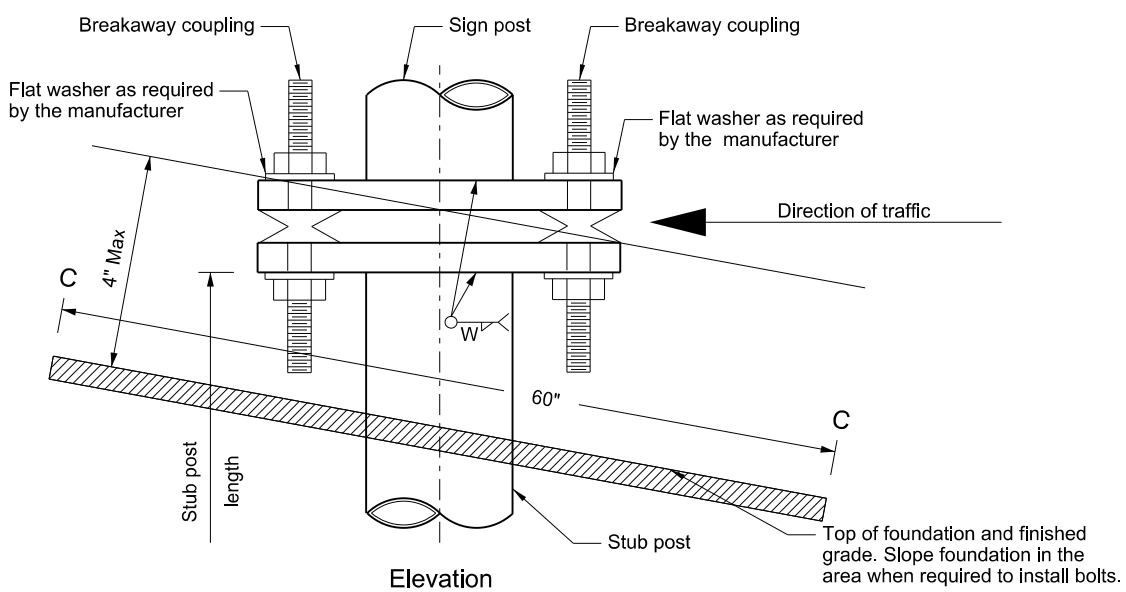
Breakaway Coupler System for Standard Pipe Stub Post

Notes:

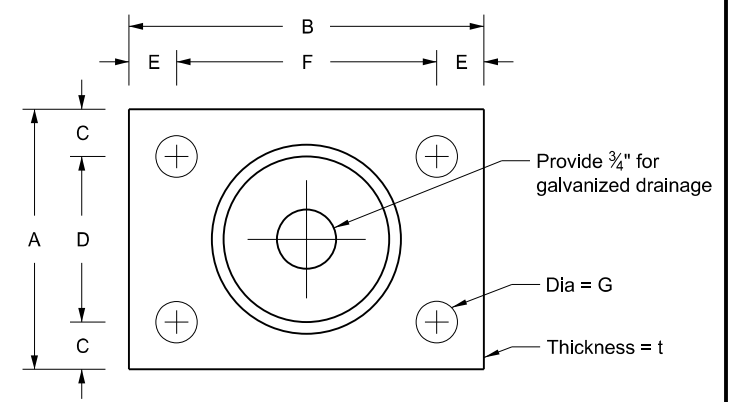
- In lieu of the breakaway base system on standards D-754-3 and D-754-4, use a breakaway coupler system. Manufacture the breakaway coupler system from material meeting the requirements of ASTM A325 fasteners with the special requirements as specified by DENT BREAKAWAY IND., INC. which meets the requirements of NCHRP Report 350.
- Fuse Joint Cuts - For steel posts cut after galvanizing, either galvanize cut after fabrication, or treat cut surface in accordance with ASTM A780. Aluminum posts need no treatment.
- Shim as required to plumb post.
- Tighten all bolts the maximum possible with 12" to 15" wrench.



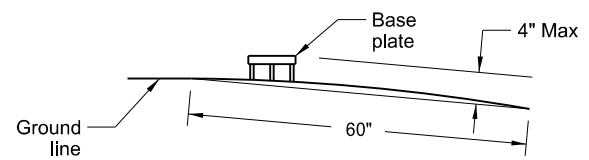
Elevation
Single Post Sign and Stub Post
Type A



Elevation
Two or More Post Sign and Stub Post
For two post signs with 8' or more post spacing
and all three or more post signs
Type C

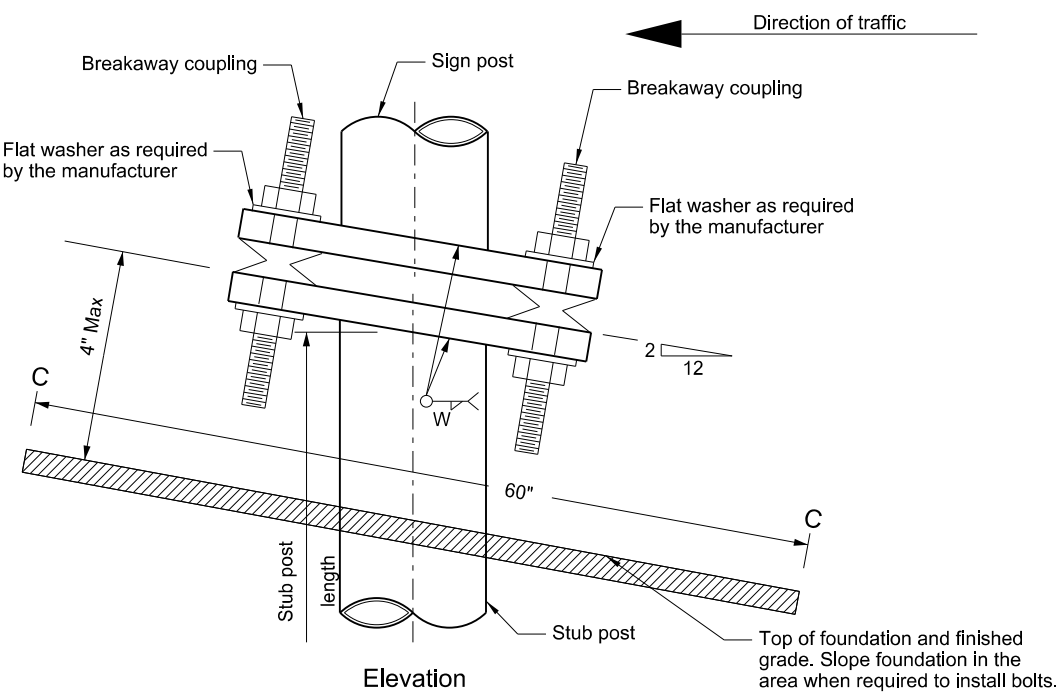


Plan Base Plate

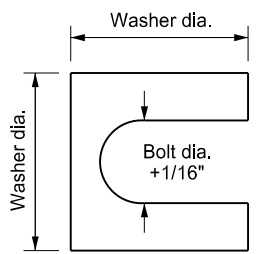


Section C - C

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.



Elevation
Two Post Sign and Stub Post
For signs with less than 8' post spacing
Type B



Shim Detail

Furnish 2 - .012"± thick and 2 - .032"± thick shims per post. Fabricate shims from brass shim stock or strip conforming to ASTM B36.

Dimension Nom. Pipe Size	Breakaway Coupling	Base Table Data										Stub Post Length
		A	B	C	D	E	F	G	t	W		
Steel												
3 1/2"	1/2" x 4 1/2"	5 1/2"	8 3/8"	13 1/16"	3 7/8"	13 1/16"	6 3/4"	9 1/16"	3/4"	3/8"	1'-6"	
4"	5/8" x 4 1/2"	5 1/2"	8 3/4"	1"	3 1/2"	1"	6 3/4"	11 1/16"	3/4"	3/8"	1'-6"	
5"	3/4" x 5 1/4"	6 1/2"	10"	1 1/8"	4 1/4"	1 1/8"	7 3/4"	13 1/16"	1"	7/16"	2'-0"	
6"	1" x 5 1/4"	7 1/2"	11 3/4"	1 3/8"	4 3/4"	1 3/8"	9"	1 1/16"	1 1/4"	7/16"	2'-0"	
8"	1" x 5 1/4"	9 1/2"	13 1/4"	1 3/8"	6 3/4"	1 3/8"	10 1/2"	1 1/16"	1 1/4"	7/16"	2'-6"	
10"	1" x 5 1/4"	11 3/4"	15 1/4"	1 3/8"	9"	1 3/8"	12 1/2"	1 1/16"	1 1/4"	1/2"	3'-0"	
12"	1" x 7"	13 3/4"	18"	1 5/8"	10 1/2"	1 5/8"	14 3/4"	1 1/16"	1 1/2"	1/2"	3'-0"	
Aluminum												
3 1/2"	1/2" x 4 1/2"	5 1/2"	8 3/8"	13 1/16"	3 7/8"	13 1/16"	6 3/4"	9 1/16"	3/4"	3/8"	1'-6"	
4"	5/8" x 4 1/2"	5 1/2"	8 3/4"	1"	3 1/2"	1"	6 3/4"	11 1/16"	3/4"	7/16"	1'-6"	
5"	3/4" x 5 1/4"	6 1/2"	10"	1 1/8"	4 1/4"	1 1/8"	7 3/4"	13 1/16"	1"	7/16"	2'-0"	
6"	1" x 5 1/4"	7 1/2"	11 3/4"	1 3/8"	4 3/4"	1 3/8"	9"	1 1/16"	1 1/4"	1/2"	2'-0"	
8"	1" x 5 1/4"	9 1/2"	13 1/4"	1 3/8"	6 3/4"	1 3/8"	10 1/2"	1 1/16"	1 1/4"	1/2"	2'-6"	
10"	1" x 5 1/4"	11 3/4"	15 1/4"	1 3/8"	9"	1 3/8"	12 1/2"	1 1/16"	1 1/2"	7/16"	3'-0"	
12"	1" x 7"	13 3/4"	18"	1 5/8"	10 1/4"	1 5/8"	14 3/4"	1 1/16"	1 3/4"	1 1/16"	3'-0"	

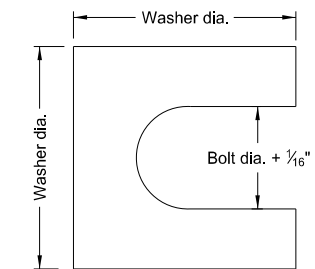
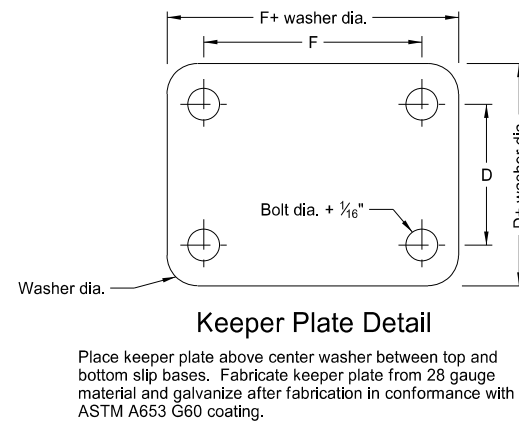
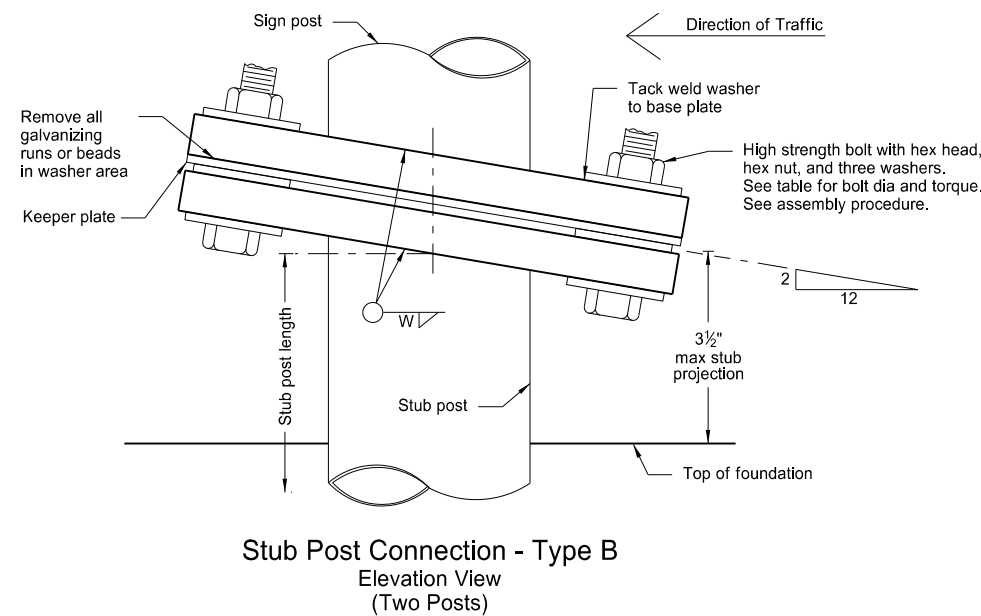
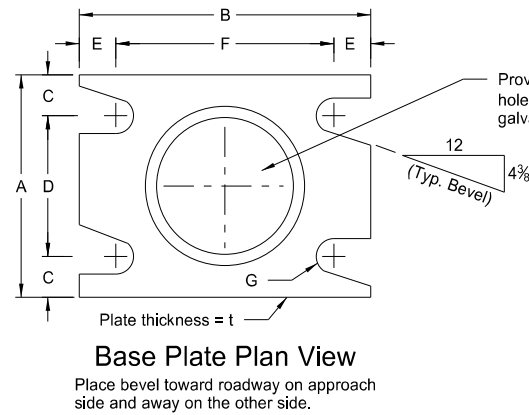
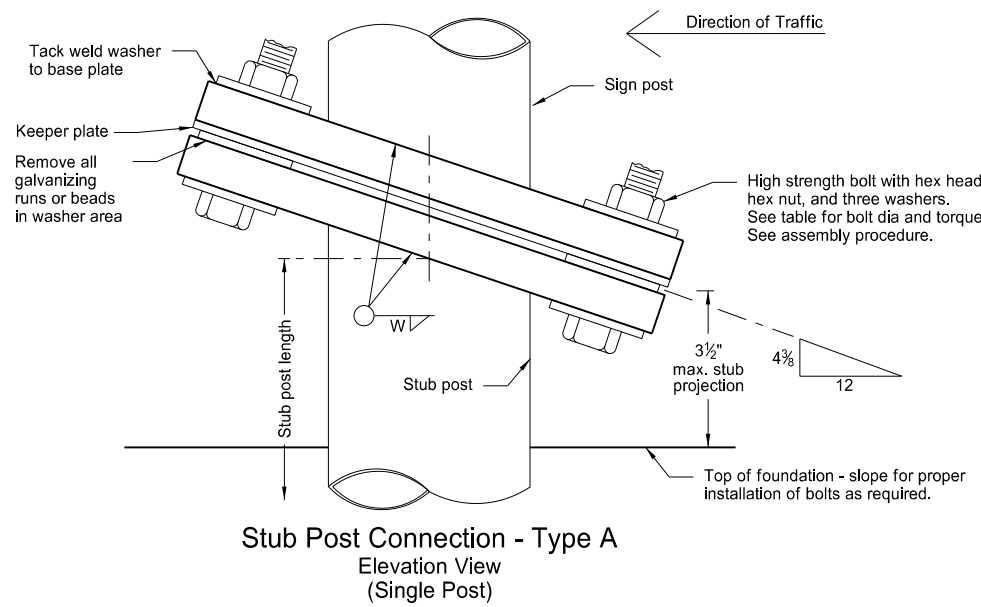
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE
8-30-2018 8-29-2019	Updated notes to active voice. New Design Engineer PE Stamp.

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

Breakaway System for Standard Pipe Stub Post

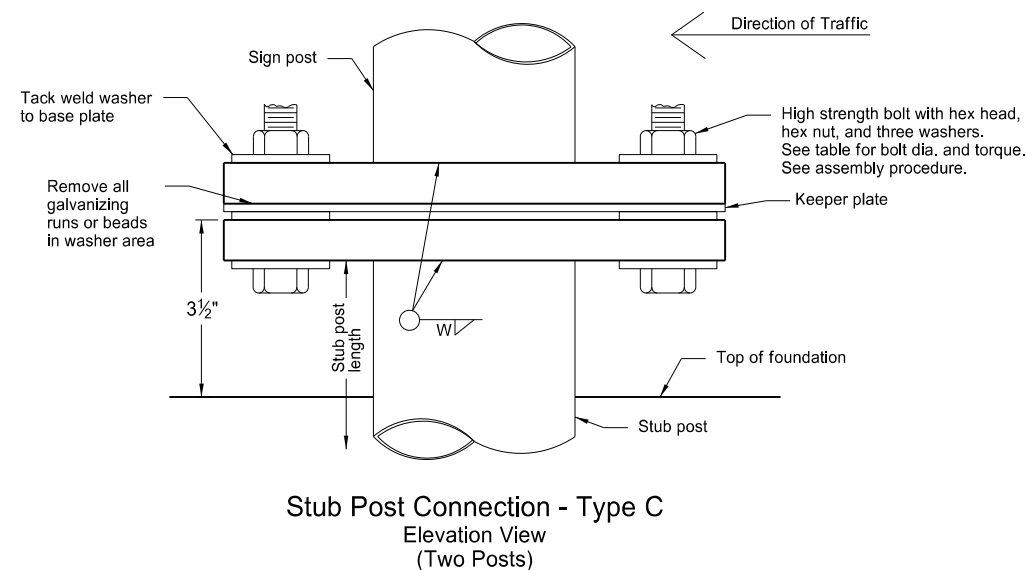
Notes:
Tack weld aluminum base plate washers to the base, when the base plate is aluminum.
Use standard drawing D-754-6 for fuse plate, hinge plate, and foundation details.

- Assembly Procedure:
1. Assemble post to stub with bolts and one flat washer between base plate and keeper plate.
 2. Shim as required.
 3. Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and shims and to clean bolt threads, then loosen.
 4. Retighten bolts in a systematic order to prescribed torque. (see table)
 5. Loosen each bolt and fill the gaps between the thread and mating surface with thread locking liquid resin, conforming to ASTM D5363-03 (2008), forming solid, one part assemblies secure from vibration, pressure, and corrosion.
 6. Retighten each bolt to prescribed torque in the same order as initial retightening.



Furnish 2 each ±.012" thick and 2 each ±.032" thick shims per post. Fabricate shims from brass shim stock or strip in conformance with ASTM B36.

Stub Post Connection - Type B Elevation View (Two Posts)



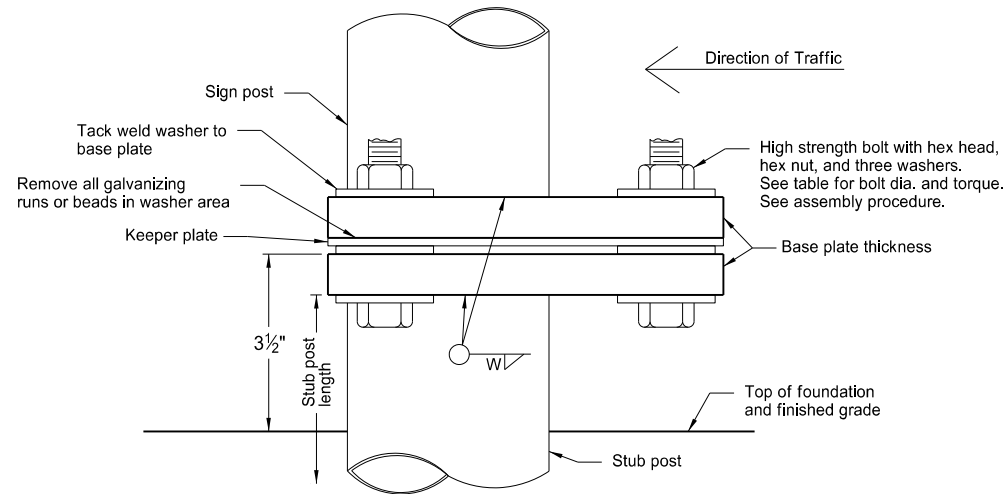
Stub Post Connection - Type C Elevation View (Two Posts)

Base Data Table												
Nominal Post Size dia.	Bolt Size (dia. x length)	Base Bolt Torque ft. lb.	A	B	C	D	E	F	G	t	W	Stub Post Length
Steel												
3 1/2"	1/2"x2 1/2"	12	5 1/2"	8 3/8"	1 3/16"	3 7/8"	1 3/16"	6 3/4"	9/32"	3/4"	3/8"	1'-6"
4"	5/8"x2 3/4"	29	5 1/2"	8 3/4"	1"	3 1/2"	1"	6 3/4"	1 1/32"	3/4"	3/8"	1'-6"
5"	3/4"x3 1/2"	46	6 1/2"	10"	1 1/8"	4 1/4"	1 1/8"	7 3/4"	1 3/32"	1"	7/16"	2'-0"
6"	1"x4 1/4"	61	7 1/2"	11 3/4"	1 3/8"	4 3/4"	1 3/8"	9"	1 7/32"	1 1/4"	7/16"	2'-0"
Aluminum												
3 1/2"	1/2"x2 1/2"	12	5 1/2"	8 3/8"	1 3/16"	3 7/8"	1 3/16"	6 3/4"	9/32"	3/4"	3/8"	1'-6"
4"	5/8"x2 3/4"	29	5 1/2"	8 3/4"	1"	3 1/2"	1"	6 3/4"	1 1/32"	1"	7/16"	1'-6"
5"	3/4"x3 1/2"	46	6 1/2"	10"	1 1/8"	4 1/4"	1 1/8"	7 3/4"	1 3/32"	1"	1/2"	2'-0"
6"	1"x4 1/4"	61	7 1/2"	11 3/4"	1 3/8"	4 3/4"	1 3/8"	9"	1 7/32"	1 1/4"	1/2"	2'-0"

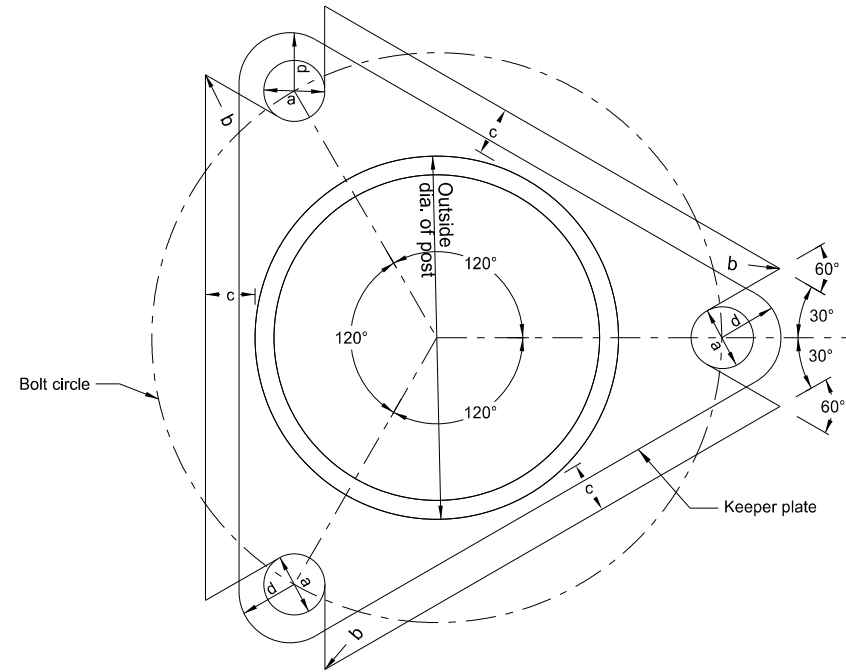
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-21-11	
REVISIONS	
DATE	CHANGE
2-28-14	Removed lower post and foundation details.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.

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Registration Number
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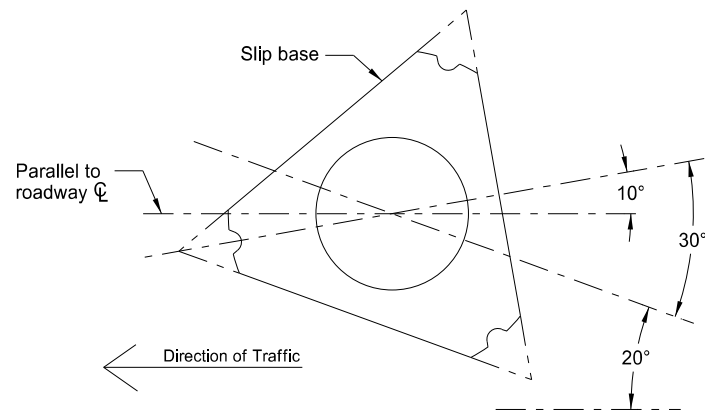
Multi-Directional Breakaway System for Standard Pipe Stub Post



Stub Post Connection - Type D
Elevation View
(Single Post)



Stub Post Detail
Top View



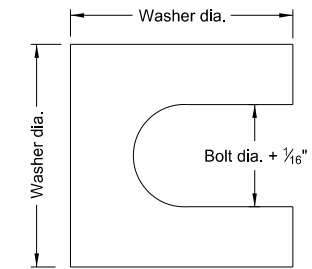
Slip Base Orientation
Top View

Notes:
Tack weld aluminum base plate washers to the base, when the base plate is fabricated from aluminum.

Use standard drawing D-754-6 for fuse plate, hinge plate, and foundation details.

Assembly Procedure:

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



Shim Detail

Furnish 2 each ±.012" thick and 2 each ±.032" thick shims per post. Fabricate shims from brass shim stock or strip conforming to ASTM B36.

Base Data Table											
Nominal Post Size dia.	Outside Post dia.	Bolt Circle	a rad.	b rad.	c rad.	Bolt Size (dia. x length)	Base Plate Thickness	W	Base Bolt Torque ft. lb.	d rad.	Stub Post Length
Steel											
3 1/2"	4"	7"	1 1/16"	1/8"	1 1/8"	1"x4"	1 1/4"	5/16"	55	1 1/8"	1'-6"
4"	4.5"	7 1/2"	1 1/16"	1/8"	1 1/8"	1"x4 1/2"	1 1/2"	3/8"	98	1 1/8"	1'-6"
5"	5.563"	9 1/2"	1 5/16"	1/8"	1 1/8"	1 1/4"x5"	1 1/2"	3/8"	167	1 3/8"	2'-0"
Aluminum											
3 1/2"	4"	7"	1 3/16"	1/8"	7/8"	3/4"x3 1/2"	1"	5/16"	43	7/8"	1'-6"
4"	4.5"	7 1/2"	1 3/16"	1/8"	3/4"	3/4"x4"	1 1/4"	5/16"	76	7/8"	1'-6"
5"	5.563"	9 1/2"	1 1/16"	1/8"	1 1/8"	1"x4"	1 1/4"	5/16"	98	1 1/8"	2'-0"
6"	6.625"	10 1/4"	1 1/16"	1/8"	3/4"	1"x4 1/2"	1 1/2"	3/8"	134	1 1/8"	2'-0"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
8-30-18 8-29-19	Updated notes to active voice. New Design Engineer PE Stamp.

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FOUNDATION DATA FOR STEEL SUPPORTS

D-754-5

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
1' - 4"	4' - 6"	0.23	0.47	4' - 2"	5	6	12	3	6	12
1' - 4"	5' - 0"	0.26	0.52	4' - 8"	5	6	12	3	7	14
1' - 4"	5' - 6"	0.28	0.57	5' - 2"	5	6	12	3	8	16
1' - 4"	6' - 0"	0.31	0.62	5' - 8"	5	6	12	3	8	16
1' - 4"	6' - 6"	0.34	0.67	6' - 2"	5	6	12	3	9	18
1' - 4"	7' - 0"	0.36	0.72	6' - 8"	5	6	12	3	9	18
1' - 4"	7' - 6"	0.39	0.78	7' - 2"	5	6	12	3	10	20
1' - 4"	8' - 0"	0.41	0.83	7' - 8"	5	6	12	3	11	22
1' - 4"	8' - 6"	0.44	0.88	8' - 2"	5	6	12	3	11	22
1' - 4"	9' - 0"	0.47	0.93	8' - 8"	5	6	12	3	12	24
1' - 4"	9' - 6"	0.49	0.98	9' - 2"	5	6	12	3	12	24
1' - 4"	10' - 0"	0.52	1.03	9' - 8"	5	6	12	3	13	26
1' - 4"	10' - 6"	0.54	1.09	10' - 2"	5	6	12	3	14	28
1' - 4"	11' - 0"	0.57	1.14	10' - 8"	5	6	12	3	14	28
1' - 4"	11' - 6"	0.59	1.19	11' - 2"	5	6	12	3	15	30
1' - 4"	12' - 0"	0.62	1.24	11' - 8"	5	6	12	3	15	30

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
1' - 9"	4' - 6"	0.40	0.80	4' - 2"	5	10	20	3	6	12
1' - 9"	5' - 0"	0.45	0.89	4' - 8"	5	10	20	3	7	14
1' - 9"	5' - 6"	0.49	0.98	5' - 2"	5	10	20	3	8	16
1' - 9"	6' - 0"	0.53	1.07	5' - 8"	5	10	20	3	8	16
1' - 9"	6' - 6"	0.58	1.16	6' - 2"	5	10	20	3	9	18
1' - 9"	7' - 0"	0.62	1.25	6' - 8"	5	10	20	3	9	18
1' - 9"	7' - 6"	0.67	1.34	7' - 2"	5	10	20	3	10	20
1' - 9"	8' - 0"	0.71	1.43	7' - 8"	5	10	20	3	11	22
1' - 9"	8' - 6"	0.76	1.51	8' - 2"	5	10	20	3	11	22
1' - 9"	9' - 0"	0.80	1.60	8' - 8"	5	10	20	3	12	24
1' - 9"	9' - 6"	0.85	1.69	9' - 2"	5	10	20	3	12	24
1' - 9"	10' - 0"	0.89	1.78	9' - 8"	5	10	20	3	13	26
1' - 9"	10' - 6"	0.94	1.87	10' - 2"	5	10	20	3	14	28
1' - 9"	11' - 0"	0.98	1.96	10' - 8"	5	10	20	3	14	28
1' - 9"	11' - 6"	1.02	2.05	11' - 2"	5	10	20	3	15	30
1' - 9"	12' - 0"	1.07	2.14	11' - 8"	5	10	20	3	15	30

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
2' - 0"	4' - 6"	0.52	1.05	4' - 2"	6	10	20	3	6	12
2' - 0"	5' - 0"	0.58	1.16	4' - 8"	6	10	20	3	7	14
2' - 0"	5' - 6"	0.64	1.28	5' - 2"	6	10	20	3	8	16
2' - 0"	6' - 0"	0.70	1.40	5' - 8"	6	10	20	3	8	16
2' - 0"	6' - 6"	0.76	1.51	6' - 2"	6	10	20	3	9	18
2' - 0"	7' - 0"	0.81	1.63	6' - 8"	6	10	20	3	9	18
2' - 0"	7' - 6"	0.87	1.75	7' - 2"	6	10	20	3	10	20
2' - 0"	8' - 0"	0.93	1.86	7' - 8"	6	10	20	3	11	22
2' - 0"	8' - 6"	0.99	1.98	8' - 2"	6	10	20	3	11	22
2' - 0"	9' - 0"	1.05	2.09	8' - 8"	6	10	20	3	12	24
2' - 0"	9' - 6"	1.11	2.21	9' - 2"	6	10	20	3	12	24
2' - 0"	10' - 0"	1.16	2.33	9' - 8"	6	10	20	3	13	26
2' - 0"	10' - 6"	1.22	2.44	10' - 2"	6	10	20	3	14	28
2' - 0"	11' - 0"	1.28	2.56	10' - 8"	6	10	20	3	14	28
2' - 0"	11' - 6"	1.34	2.68	11' - 2"	6	10	20	3	15	30
2' - 0"	12' - 0"	1.40	2.79	11' - 8"	6	10	20	3	15	30
2' - 0"	12' - 6"	1.45	2.91	12' - 2"	6	10	20	3	16	32
2' - 0"	13' - 0"	1.51	3.03	12' - 8"	6	10	20	3	17	34
2' - 0"	13' - 6"	1.57	3.14	13' - 2"	6	10	20	3	17	34
2' - 0"	14' - 0"	1.63	3.26	13' - 8"	6	10	20	3	18	36
2' - 0"	14' - 6"	1.69	3.37	14' - 2"	6	10	20	3	18	36
2' - 0"	15' - 0"	1.75	3.49	14' - 8"	6	10	20	3	19	38

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
2' - 4"	4' - 6"	0.71	1.43	4' - 2"	6	14	28	3	6	12
2' - 4"	5' - 0"	0.79	1.58	4' - 8"	6	14	28	3	7	14
2' - 4"	5' - 6"	0.87	1.74	5' - 2"	6	14	28	3	8	16
2' - 4"	6' - 0"	0.95	1.90	5' - 8"	6	14	28	3	8	16
2' - 4"	6' - 6"	1.03	2.06	6' - 2"	6	14	28	3	9	18
2' - 4"	7' - 0"	1.11	2.22	6' - 8"	6	14	28	3	9	18
2' - 4"	7' - 6"	1.19	2.38	7' - 2"	6	14	28	3	10	20
2' - 4"	8' - 0"	1.27	2.53	7' - 8"	6	14	28	3	11	22
2' - 4"	8' - 6"	1.35	2.69	8' - 2"	6	14	28	3	11	22
2' - 4"	9' - 0"	1.43	2.85	8' - 8"	6	14	28	3	12	24
2' - 4"	9' - 6"	1.50	3.01	9' - 2"	6	14	28	3	12	24
2' - 4"	10' - 0"	1.58	3.17	9' - 8"	6	14	28	3	13	26
2' - 4"	10' - 6"	1.66	3.33	10' - 2"	6	14	28	3	14	28
2' - 4"	11' - 0"	1.74	3.48	10' - 8"	6	14	28	3	14	28
2' - 4"	11' - 6"	1.82	3.64	11' - 2"	6	14	28	3	15	30
2' - 4"	12' - 0"	1.90	3.80	11' - 8"	6	14	28	3	15	30
2' - 4"	12' - 6"	1.98	3.96	12' - 2"	6	14	28	3	16	32
2' - 4"	13' - 0"	2.06	4.12	12' - 8"	6	14	28	3	17	34
2' - 4"	13' - 6"	2.14	4.28	13' - 2"	6	14	28	3	17	34
2' - 4"	14' - 0"	2.22	4.43	13' - 8"	6	14	28	3	18	36
2' - 4"	14' - 6"	2.30	4.59	14' - 2"	6	14	28	3	18	36
2' - 4"	15' - 0"	2.38	4.75	14' - 8"	6	14	28	3	19	38
2' - 4"	15' - 6"	2.45	4.91	15' - 2"	6	14	28	3	20	40
2' - 4"	16' - 0"	2.53	5.07	15' - 8"	6	14	28	3	20	40
2' - 4"	16' - 6"	2.61	5.23	16' - 2"	6	14	28	3	21	42
2' - 4"	17' - 0"	2.69	5.38	16' - 8"	6	14	28	3	21	42
2' - 4"	17' - 6"	2.77	5.54	17' - 2"	6	14	28	3	22	44
2' - 4"	18' - 0"	2.85	5.70	17' - 8"	6	14	28	3	23	46

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
2' - 6"	4' - 6"	0.82	1.64	4' - 2"	6	16	32	3	6	12
2' - 6"	5' - 0"	0.91	1.82	4' - 8"	6	16	32	3	7	14
2' - 6"	5' - 6"	1.00	2.00	5' - 2"	6	16	32	3	8	16
2' - 6"	6' - 0"	1.09	2.18	5' - 8"	6	16	32	3	8	16
2' - 6"	6' - 6"	1.18	2.36	6' - 2"	6	16	32	3	9	18
2' - 6"	7' - 0"	1.27	2.55	6' - 8"	6	16	32	3	9	18
2' - 6"	7' - 6"	1.36	2.73	7' - 2"	6	16	32	3	10	20
2' - 6"	8' - 0"	1.45	2.91	7' - 8"	6	16	32	3	11	22
2' - 6"	8' - 6"	1.55	3.09	8' - 2"	6	16	32	3	11	22
2' - 6"	9' - 0"	1.64	3.27	8' - 8"	6	16	32	3	12	24
2' - 6"	9' - 6"	1.73	3.45	9' - 2"	6	16	32	3	12	24
2' - 6"	10' - 0"	1.82	3.64	9' - 8"	6	16	32	3	13	26
2' - 6"	10' - 6"	1.91	3.82	10' - 2"	6	16	32	3	14	28
2' - 6"	11' - 0"	2.00	4.00	10' - 8"	6	16	32	3	14	28
2' - 6"	11' - 6"	2.09	4.18	11' - 2"	6	16	32	3	15	30
2' - 6"	12' - 0"	2.18	4.36	11' - 8"	6	16	32	3	15	30
2' - 6"	12' - 6"	2.27	4.55	12' - 2"	6	16	32	3	16	32
2' - 6"	13' - 0"	2.36	4.73	12' - 8"	6	16	32	3	17	34
2' - 6"	13' - 6"	2.45	4.91	13' - 2"	6	16	32	3	17	34
2' - 6"	14' - 0"	2.55	5.09	13' - 8"	6	16	32	3	18	36
2' - 6"	14' - 6"	2.64	5.27	14' - 2"	6	16	32	3	18	36
2' - 6"	15' - 0"	2.73	5.45	14' - 8"	6	16	32	3	19	38
2' - 6"	15' - 6"	2.82	5.64	15' - 2"	6	16	32	3	20	40
2' - 6"	16' - 0"	2.91	5.82	15' - 8"	6	16	32	3	20	40
2' - 6"	16' - 6"	3.00	6.00	16' - 2"	6	16	32	3	21	42
2' - 6"	17' - 0"	3.09	6.18	16' - 8"	6	16	32	3	21	42
2' - 6"	17' - 6"	3.18	6.36	17' - 2"	6	16	32	3	22	44
2' - 6"	18' - 0"	3.27	6.54	17' - 8"	6	16	32	3	23	46
2' - 6"	18' - 6"	3.36	6.73	18' - 2"	6	16	32	3	23	46
2' - 6"	19' - 0"	3.45	6.91	18' - 8"	6	16	32	3	24	48
2' - 6"	19' - 6"	3.55	7.09	19' - 2"	6	16	32	3	24	48
2' - 6"	20' - 0"	3.64	7.27	19' - 8"	6	16	32	3	25	50

- NOTES:
- Use Grade 60 reinforcing steel.

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

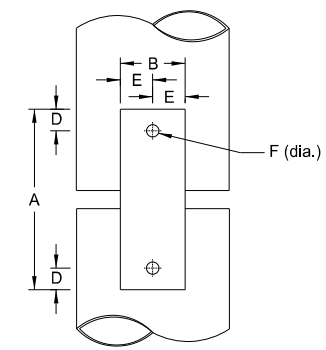
Hinge Plate, Fuse Plate and Foundation Details for Standard Pipe

Notes:
 Fuse Joint Cuts - For steel posts cut after galvanizing, either galvanize cut after fabrication, or treat cut surface in accordance with ASTM A780. Aluminum posts need no treatment.

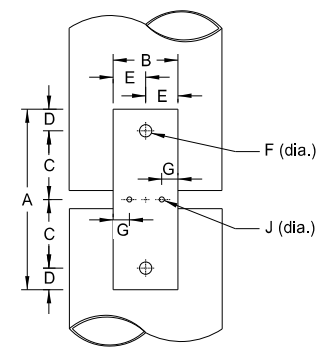
Use standard drawings D-754-2, D-754-3 and D-754-4 for information on breakaway base details.

Maintain the 4" vertical height and 60" diameter horizontal clearance of the break-away base at each post location.

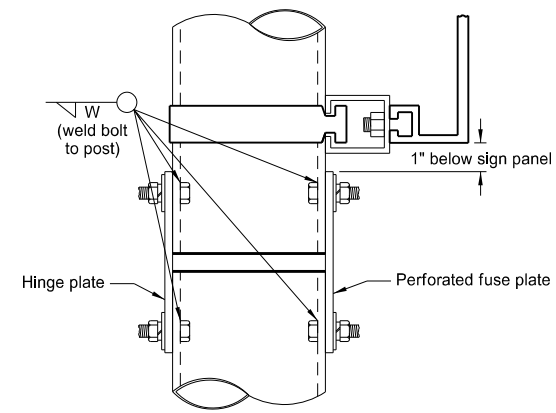
- Assembly Procedure:
1. Assemble hinge plate to post with bolts and one flat washer and lock washer under nut.
 2. Tighten all bolts the maximum possible with 12" to 15" wrench.



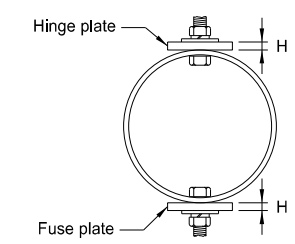
Hinge Plate



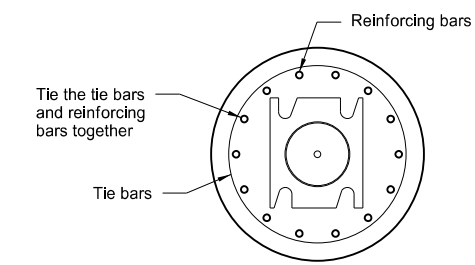
Perforated Fuse Plate



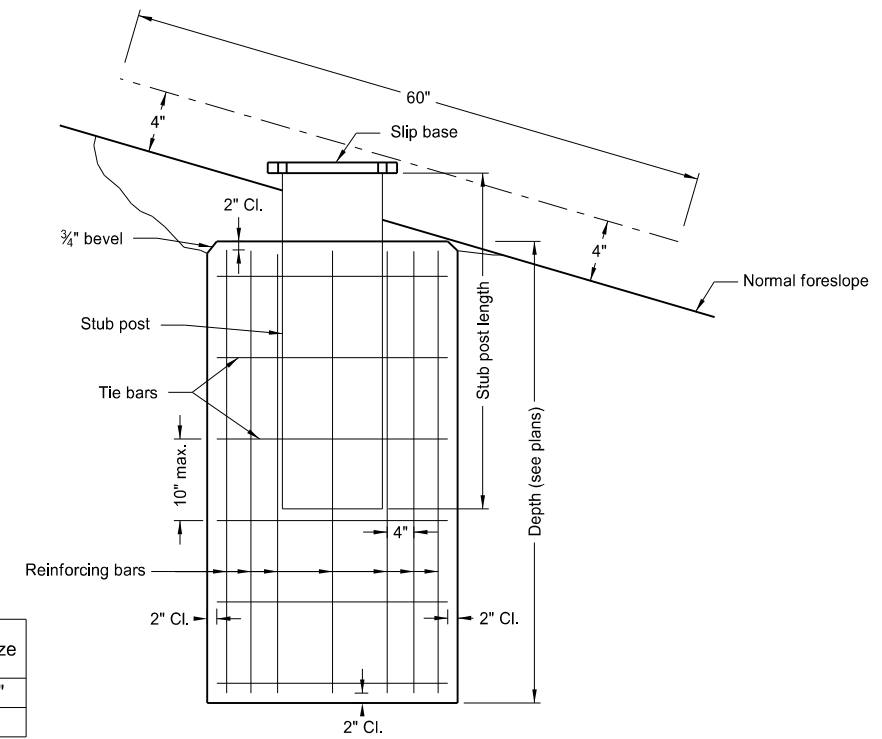
Side View



Top View



Top View
 See standard drawing D-754-5 for size, number, and length of rebar. Use 3 bolt base plate for Type D.



Foundation Front View
 Foundation detail for breakaway base with stub post connection.

Foundation diameter	Post Size
1'-4"	3 1/2"-4"
1'-9"	5"-6"

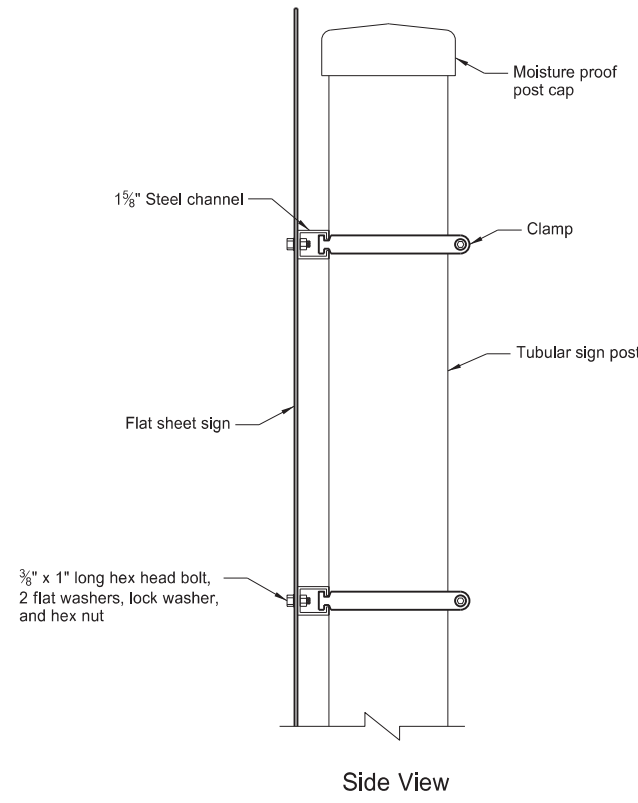
Round Metal Posts							
Dimensions				Properties			
Nominal dia. in.	Outside dia. in.	Inside dia. in.	Wall Thickness in.	Weight per Foot Pound	Moment of Inertia in. ⁴	Cross Sec. Area in. ²	Section Diameter in. ²
Steel							
3 1/2	4.000	3.548	.226	9.11	4.788	2.680	2.394
4	4.500	4.026	.237	10.79	7.233	3.174	3.215
5	5.563	5.047	.258	14.62	15.16	4.300	5.449
6	6.625	6.065	.280	18.97	28.14	5.581	8.495
Aluminum							
3 1/2	4.000	3.548	.226	3.151	4.788	2.680	2.394
4	4.500	4.026	.237	3.733	7.232	3.174	3.214
5	5.563	5.047	.258	5.057	15.16	4.300	5.451
6	6.625	6.065	.280	6.564	28.14	5.581	8.496

Nominal Pipe Size dia.	Fuse and Hinge Plate Data										
	Bolt Size	A	B	C	D	E	F	G	H	I	J
3 1/2"	1/2"Ø x 1 1/2"	5"	1 3/4"	1 1/16"	1 3/16"	7/8"	9/16"	15/32"	1/4"	13/32"	7/16"
4"	5/8"Ø x 1 1/2"	5 3/4"	2"	1 7/8"	1"	1"	1 1/16"	17/32"	3/8"	15/32"	9/16"
5"	5/8"Ø x 1 3/4"	5 3/4"	2"	1 7/8"	1"	1"	1 1/16"	9/16"	1/2"	7/16"	5/8"
6"	3/4"Ø x 2 1/4"	6 1/4"	2 1/4"	2"	1 1/8"	1 1/8"	1 3/16"	5/8"	1/2"	1/2"	5/8"

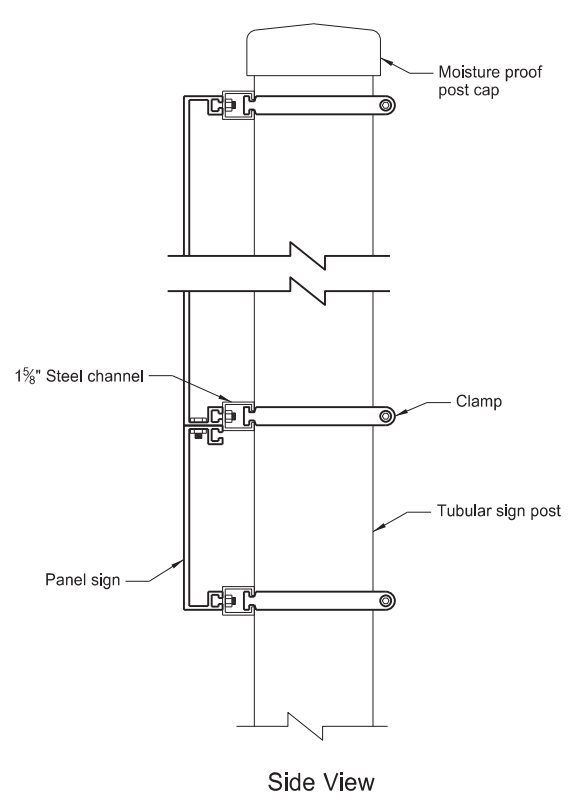
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.

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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

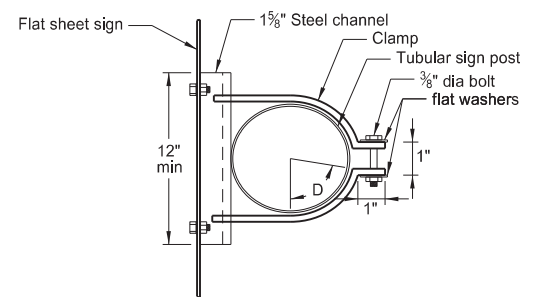
PIPE SUPPORT AND SIGN MOUNTING DETAILS



Side View

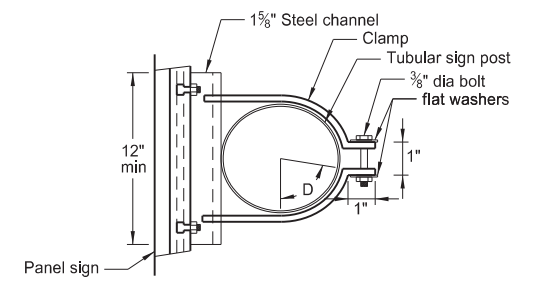


Side View



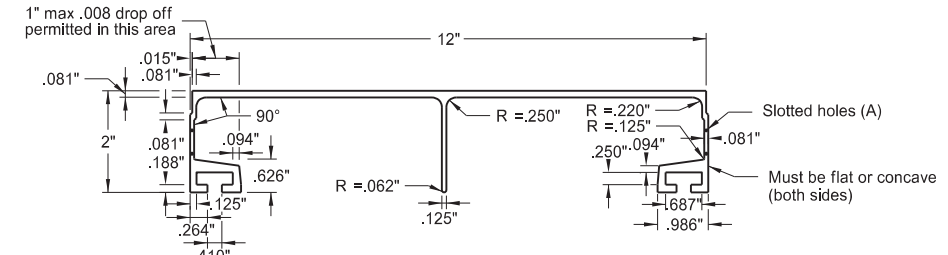
Top View

Flat Sheet Sign Clamp Mounting Details

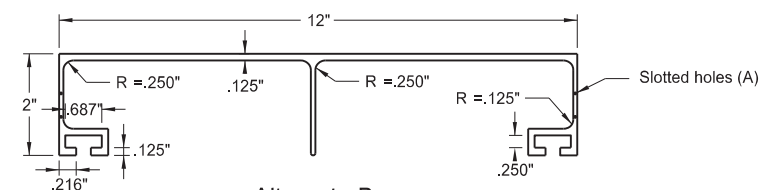


Top View

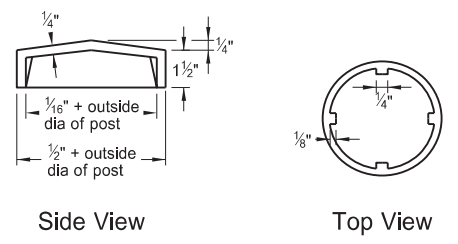
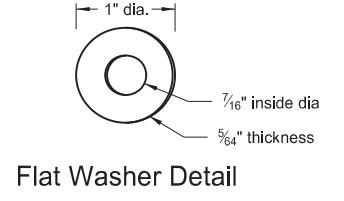
Panel Sign Clamp Mounting Details



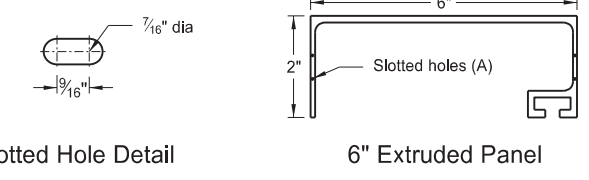
Alternate A 12" Extruded Panel



Alternate B 12" Extruded Panel



Furnish post caps for all steel or aluminum posts or weld a 1/8" plate all around.

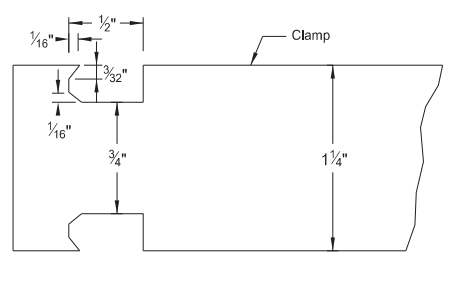


Aluminum Panel Details

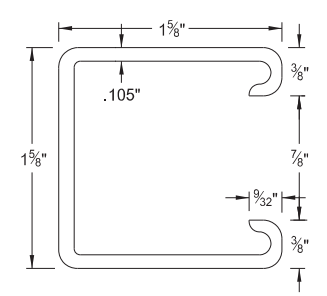
(A) Punch slotted holes in aluminum panels at 1'-0" on center, space from end as listed below:

- 12" even length panels 4'-0" etc.
- 9" odd + 6" length panels 5'-6" etc.
- 6" odd length panels 5'-0" etc.
- 3" even + 6" length panels 4'-6" etc.

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



Clamp Detail



Steel Channel Detail

Post Size dia	Clamp Gauge min
3 1/2" to 5"	11
6" to 12"	10

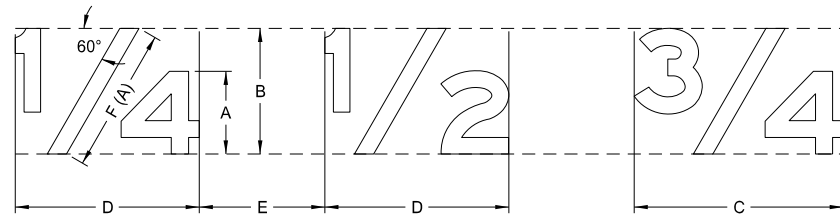
Post Size dia (in)	D (in)
3 1/2	3
4	3 3/16
5	5 1/8
6	7 1/16
8	13 1/16
10	20 3/4
12	29 5/8

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-21-14	
REVISIONS	
DATE	CHANGE
08-30-18	Updated to active voice, defined bolt & washer for fastening sign.
08-29-19	New Design Engineer PE Stamp.
10-19-22	Added washers to clamp.



LETTER AND ARROW DETAILS

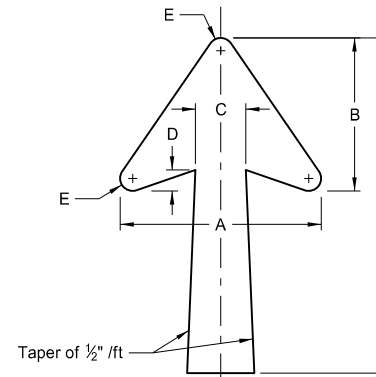
NOTE: Measure rotation angle of arrows counterclockwise from positions shown in details.



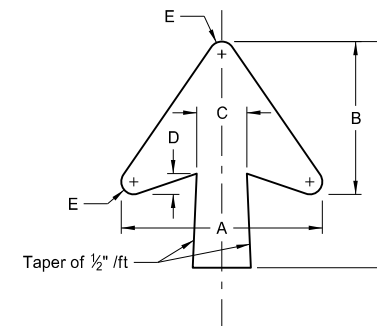
DETERMINE SIZE OF THE FRACTION AS FOLLOWS:

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

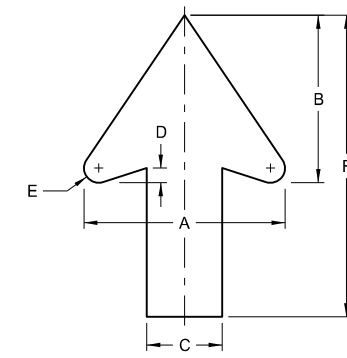
(A) Center diagonal stroke of fraction optically.



TYPE A



TYPE B

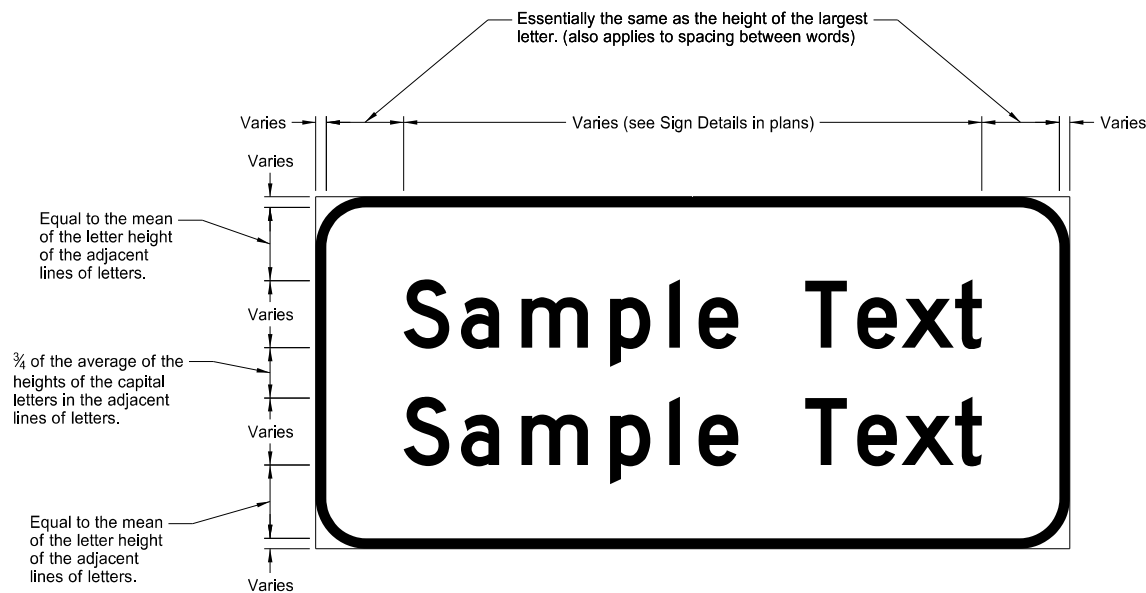


TYPE D

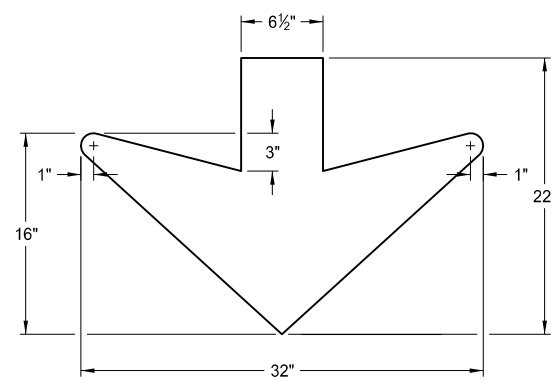
DESIGNATION	LETTER SIZE (Upper Case)	A	B	C	D	E	F	G
ND_6IN	6"	12"	9.125"	3"	1"	0.625"	20"	13.5"
ND_8IN	8"	15.125"	11.563"	3.75"	1.313"	0.813"	25"	17"
ND_10IN	10"	18.25"	14"	4.5"	1.5"	0.75"	30"	20"
ND_12IN	12"							
ND_13IN	13.3"	22.25"	17"	5.375"	1.75"	1"	35"	25"
ND_16IN	16"							
ND_20IN	20"							

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

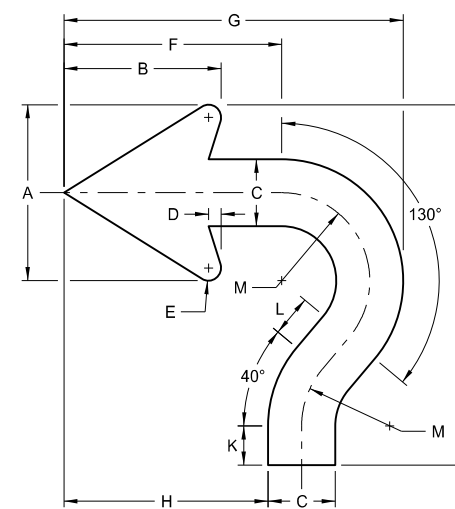
DESIGNATION	LETTER SIZE (Upper Case)	A	B	C	D	E	F
ND_2IN	2"	2"	1.625"	0.75"	0.125"	0.125"	3"
ND_4IN	4"	4"	3.313"	1.5"	0.25"	0.25"	6"
ND_6IN	6"	6"	4.875"	2.25"	0.375"	0.375"	9"
ND_8IN	8"	8"	6.625"	3"	0.5"	0.5"	12"
ND_10IN	10"	10"	8.375"	3.75"	0.75"	0.75"	15"
ND_12IN	12"	12"	10"	4.5"	0.875"	0.875"	18"



TYPICAL SPACING

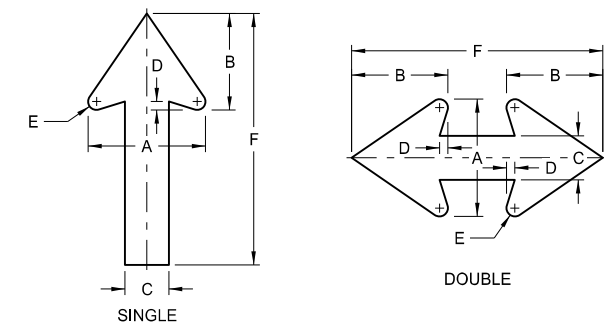


DOWN ARROW



ROUNDBOUT

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"



SPECIAL

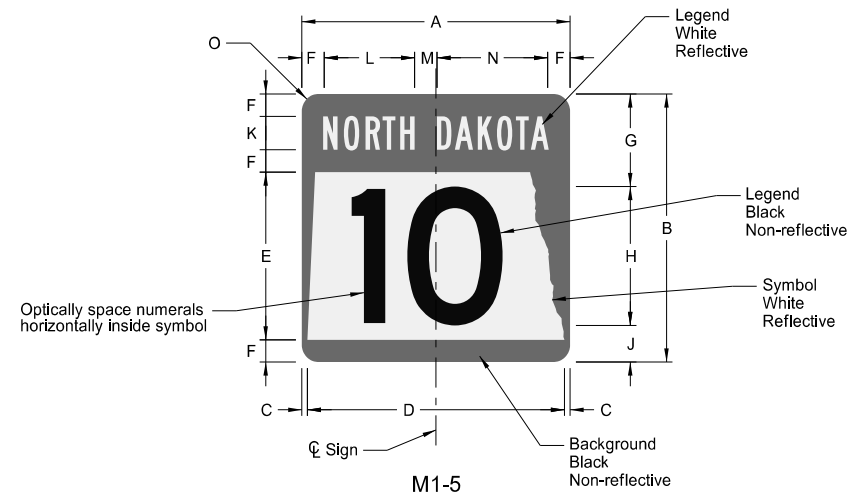
DESIGNATION	A	B	C	D	E	F	USES
ND_0.75IN	2"	1.625"	0.75"	0.125"	0.125"	7.75"	Parking Signs (Regulatory)
ND_2.625IN	7"	5.75"	2.625"	0.5"	0.5"	15"	Frontage Road Signs

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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STATE HIGHWAY ROUTE SHIELD DETAIL

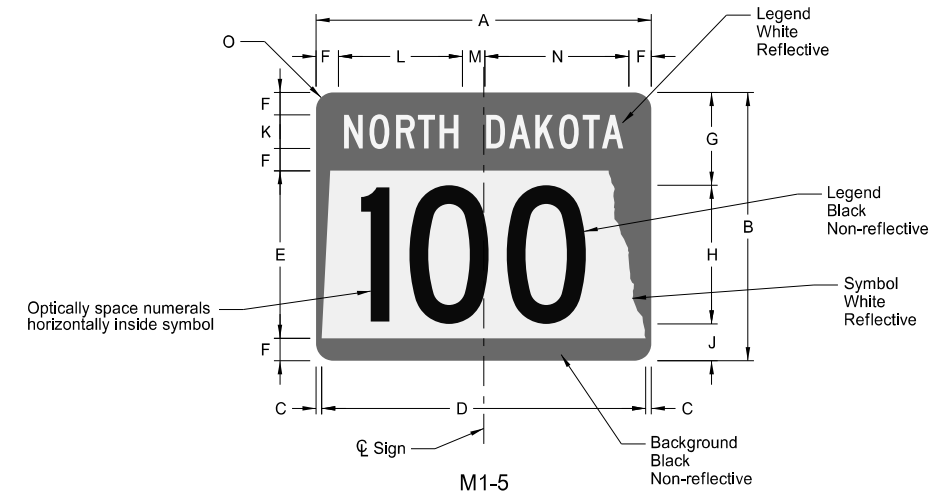
D-754-11



STATE ROUTE MARKER

SIGN	DIMENSION (INCHES)													
	A	B	C	D	E	F	G	H	J	K	L	M	N	O
1, 2 digits	18*	18*	0.38	17.25	11.25	1.5	6.38	9 D**	2.63	2.25 B	6.1	1.5	7.4	1.5
1, 2 digits	24	24	0.5	23	15	2	8.5	12 D**	3.5	3 B	8.1	2	9.9	1.5
1, 2 digits	36	36	0.75	34.5	22.5	3	12.75	18 D**	5.25	4.5 B	12.1	3	14.9	2.25
1, 2 digits	48*	48*	1	46	30	4	17	24 D**	7	6 B	16.2	4	19.8	3

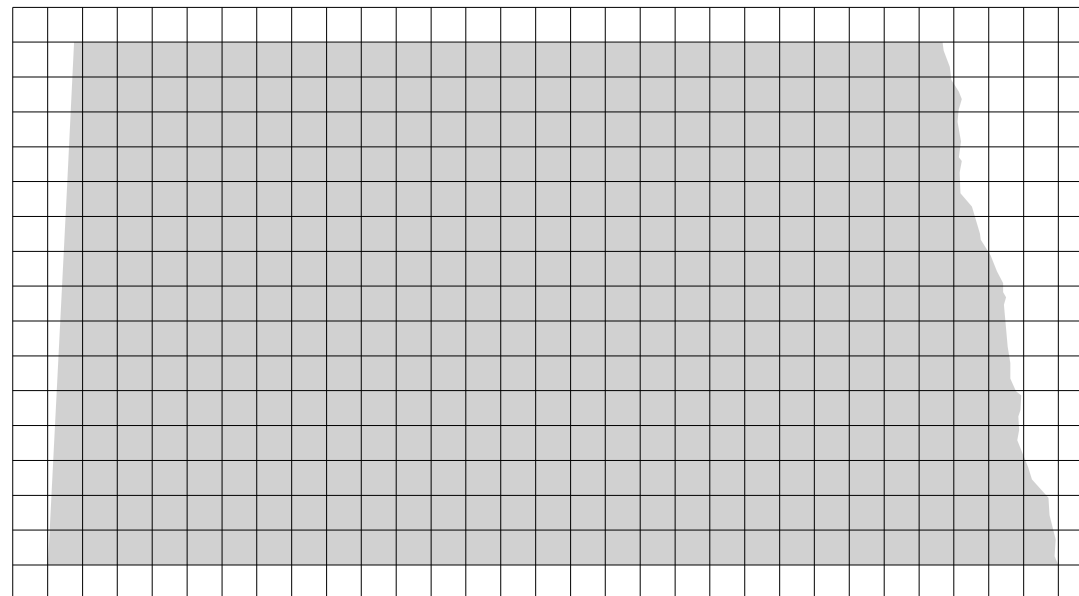
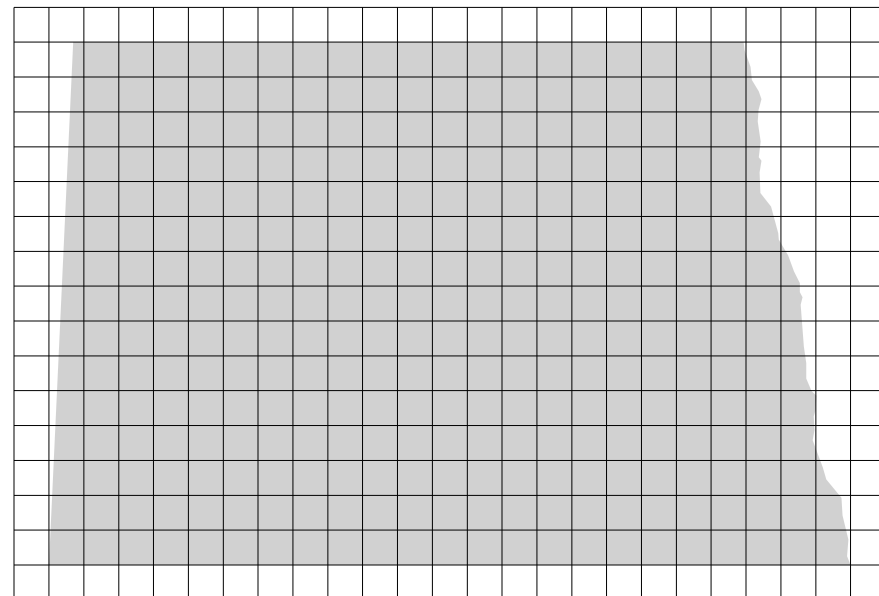
* Size not for independent use (only for use within a guide sign)
 ** Reduce numeral spacing by 25%



STATE ROUTE MARKER

SIGN	DIMENSION (INCHES)													
	A	B	C	D	E	F	G	H	J	K	L	M	N	O
3 digits	24*	18*	1.13	21.75	11.25	1.5	6.38	9 C**	2.63	2.25 C	8.8	2	10.2	1.5
3 digits	30	24	0.5	29	15	2	8.5	12 C**	3.5	3 C	10.7	2.5	12.8	1.5
3 digits	45	36	0.75	43.5	22.5	3	12.75	18 C**	5.25	4.5 C	16.1	3.8	19.1	2.25
3 digits	60*	48*	1	58	30	4	17	24 C**	7	6 C	21.5	5	25.5	3
4 digits	24*	18*	1.13	21.75	11.25	1.5	6.38	9 B***	2.63	2.25 C	8.8	2	10.2	1.5
4 digits	30	24	0.5	29	15	2	8.5	12 B***	3.5	3 C	10.7	2.5	12.8	1.5
4 digits	45	36	0.75	43.5	22.5	3	12.75	18 B***	5.25	4.5 C	16.1	3.8	19.1	2.25
4 digits	60*	48*	1	58	30	4	17	24 B***	7	6 C	21.5	5	25.5	3

* Size not for independent use (only for use within a guide sign)
 ** Reduce numeral spacing by 25%
 *** Reduce numeral spacing by 50%

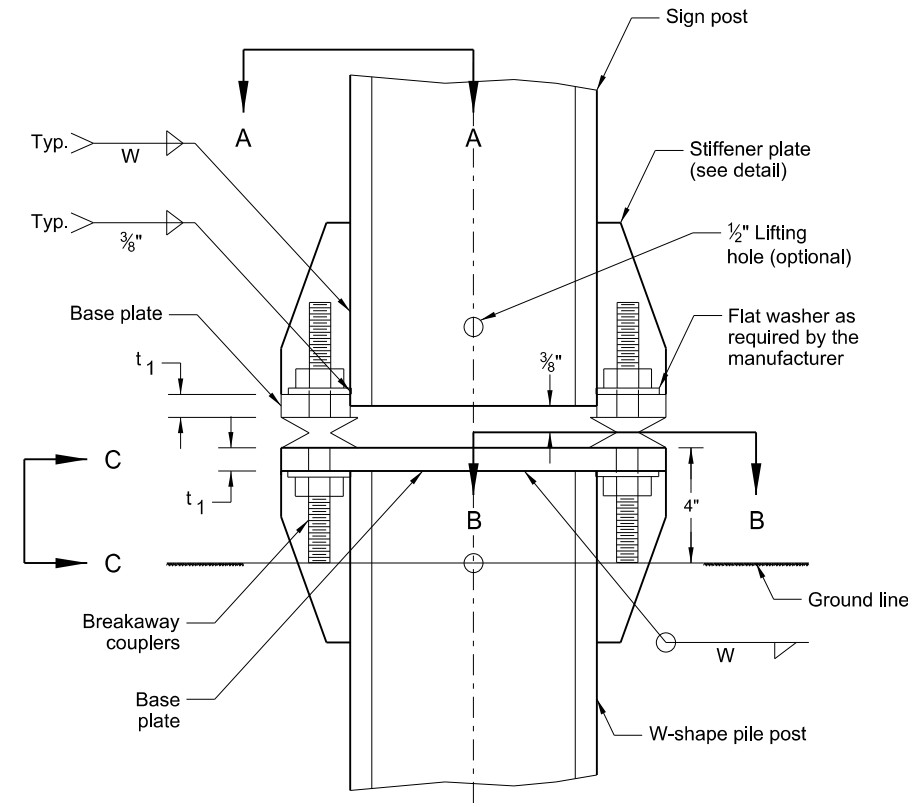


Note: North Dakota symbol graphics file may be obtained from the Design Division of North Dakota Department of Transportation.

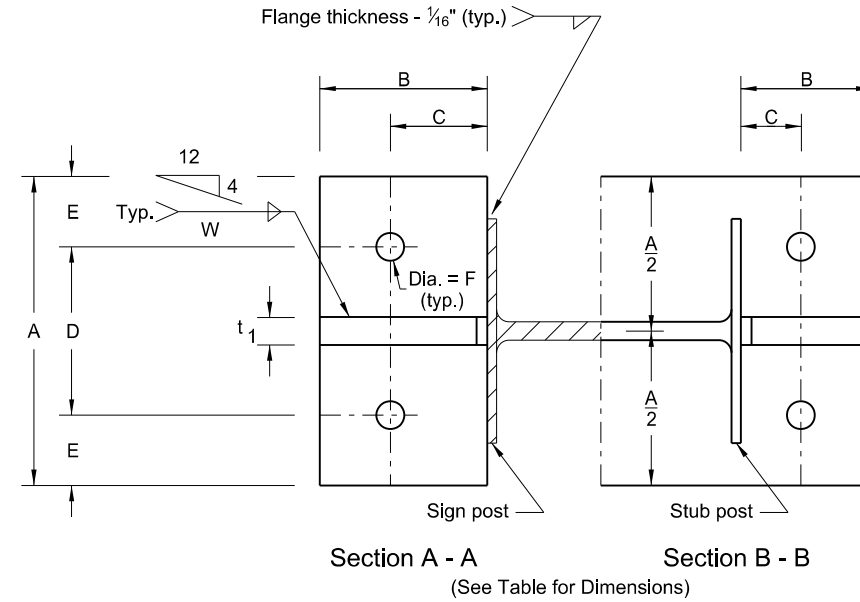
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
4-23-18	
REVISIONS	
DATE	CHANGE
8-29-19	New Design Engineer PE Stamp.

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

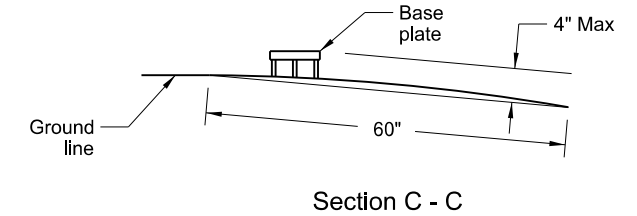
Breakaway Coupler System Structural Details for W-Shape Supports



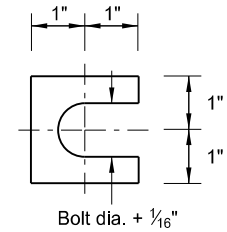
Sign Post and Stub Post
Elevation



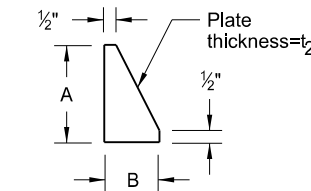
Section A - A Section B - B
(See Table for Dimensions)



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.

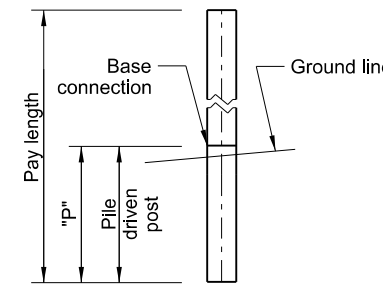


Shim Detail



Stiffener Plate Detail
(See Table for Dimensions)

Sections shown are for installations on right shoulder and in gore. Plate slot bevels are opposite hand from that shown for installations on left shoulder.



W-Shape - Pile Footing

Furnish 2 - .012"± thick and 2 - .032"± thick shims per post. Fabricate shims from brass shim stock or strip conforming to ASTM B36.

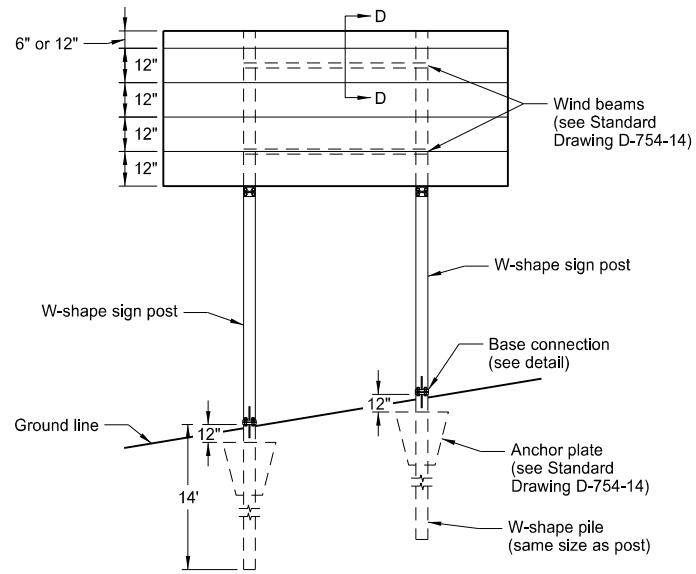
W-Shape Post & Pile Size	Base Connection Data										Footing Data W-Shape Pile Post "P"
	Bolt Size	A	B	C	D	E	t ₁	t ₂	W	F	
W4X13	3/4" x 5 1/4"	6"	2 1/2"	1 1/2"	3 1/2"	1 1/4"	1"	1/2"	1/4"	13/16"	14'
W5X16		14'									
W6X20	7/8" x 5 1/4"	8"	3"	1 3/4"	4"	2"	1 1/4"	1/2"	1/4"	15/16"	14'
W8X24		14'									
W8X28	1" x 5 1/4"	8"	3"	2"	4"	2"	1 1/2"	3/4"	5/16"	1 1/16"	14'

Notes:

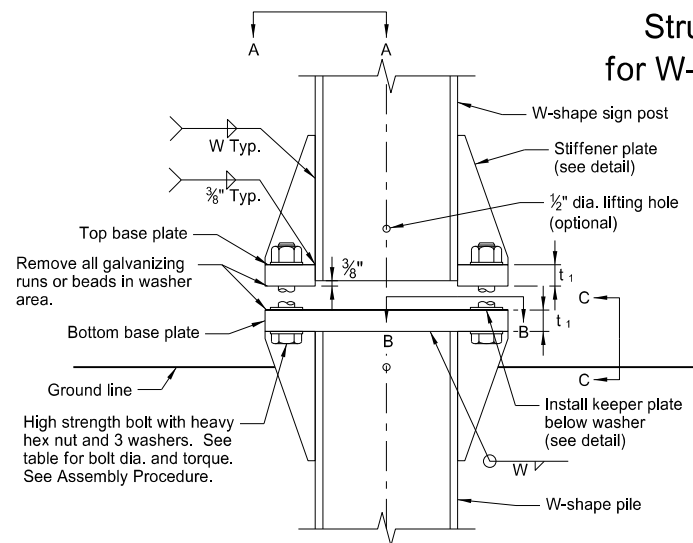
1. Use either the breakaway base system shown on standard D-754-13 or a breakaway coupling system manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements as specified by DENT BREAKAWAY IND., INC. which meets the requirements of NCHRP Report 350.
2. Use structural steel conforming to Sec. 894.03 B.6 and high strength bolts conforming to ASTM - A325. Refer to "Sign Summary" sheet for specific data on each individual sign installation.
3. Use manufacturer's recommendations for assembly procedures.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION		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
10-4-2013		
REVISIONS		
DATE	CHANGE	
7-8-14	Revised notes 2 and 3.	
8-30-18	Updated notes to active voice.	
8-29-19	New Design Engineer PE Stamp.	

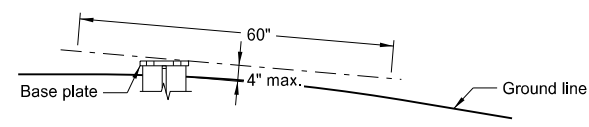
Breakaway System Structural Details for W-Shape Supports



Typical Panel Mounting on W-shape Sign Posts

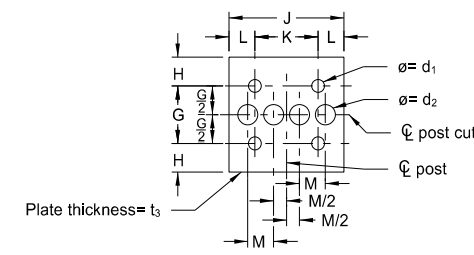


Base Connection Detail

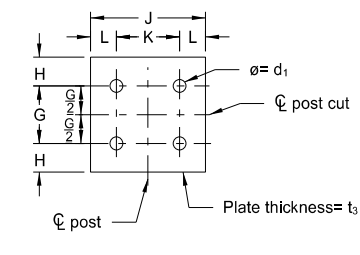


Section C-C
Stub Height Requirements

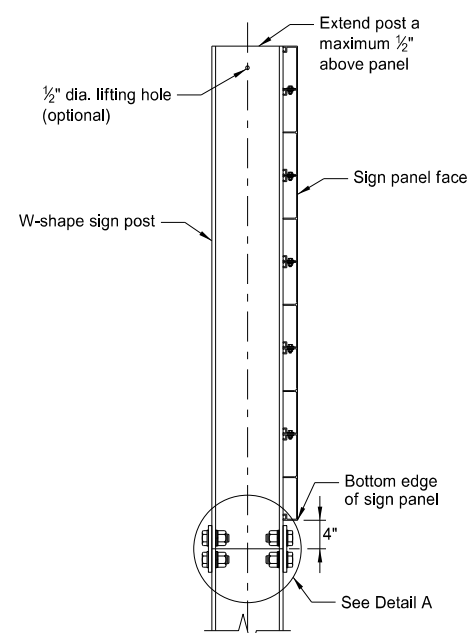
Maximum projection of base plate limits are defined as a line 4" parallel to any chord, which is perpendicular to, or aligned radially to, the center line of the highway and has the chord's end points on the ground surface on opposite sides of the stub post.



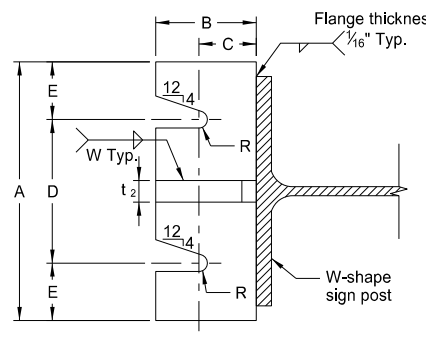
Perforated Fuse Plate



Hinge Plate

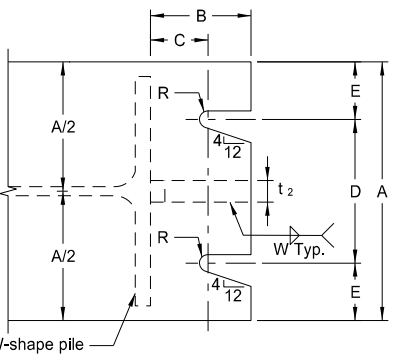


Fuse Joint (Side View)

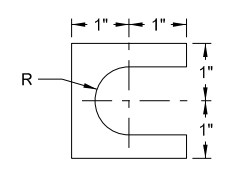


Section A-A

Sections shown for installations on right shoulder. Reverse plate slot bevels for installations on left shoulder.

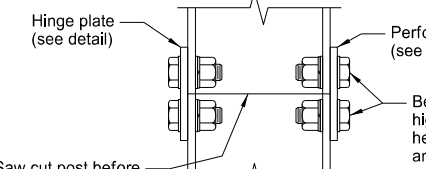


Section B-B

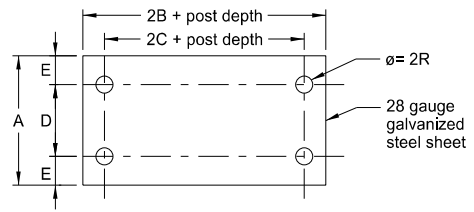


Shim Detail

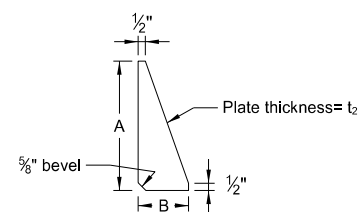
Furnish 2 each .012"± thick and 2 each .032"± thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.



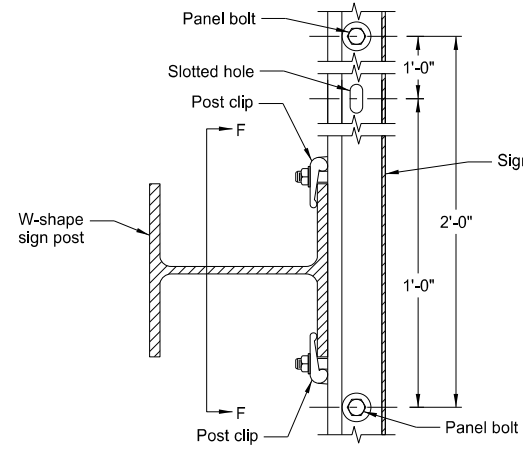
Detail A



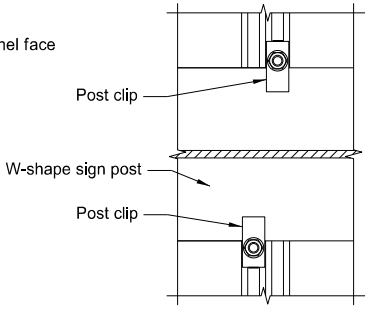
Keeper Plate



Stiffener Plate

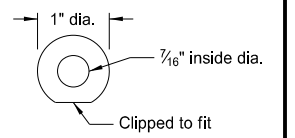


Section E-E

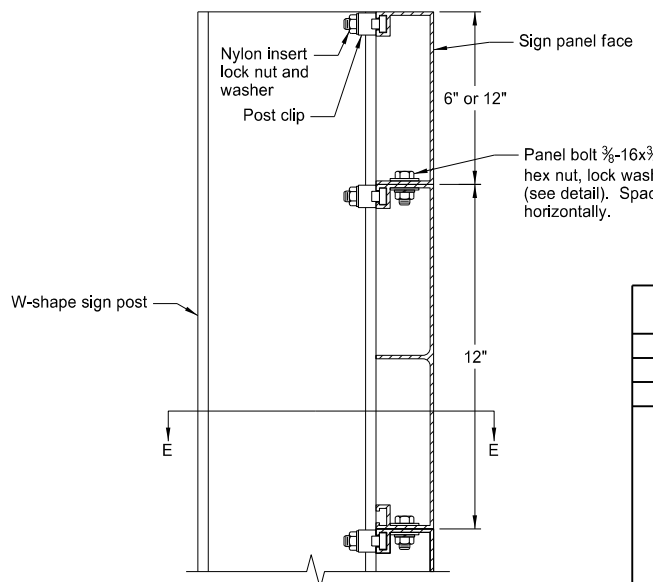


Section F-F

Install post clips on both sides of each post at each panel joint indicated.



Flat Washer Detail
Thickness = 5/64"



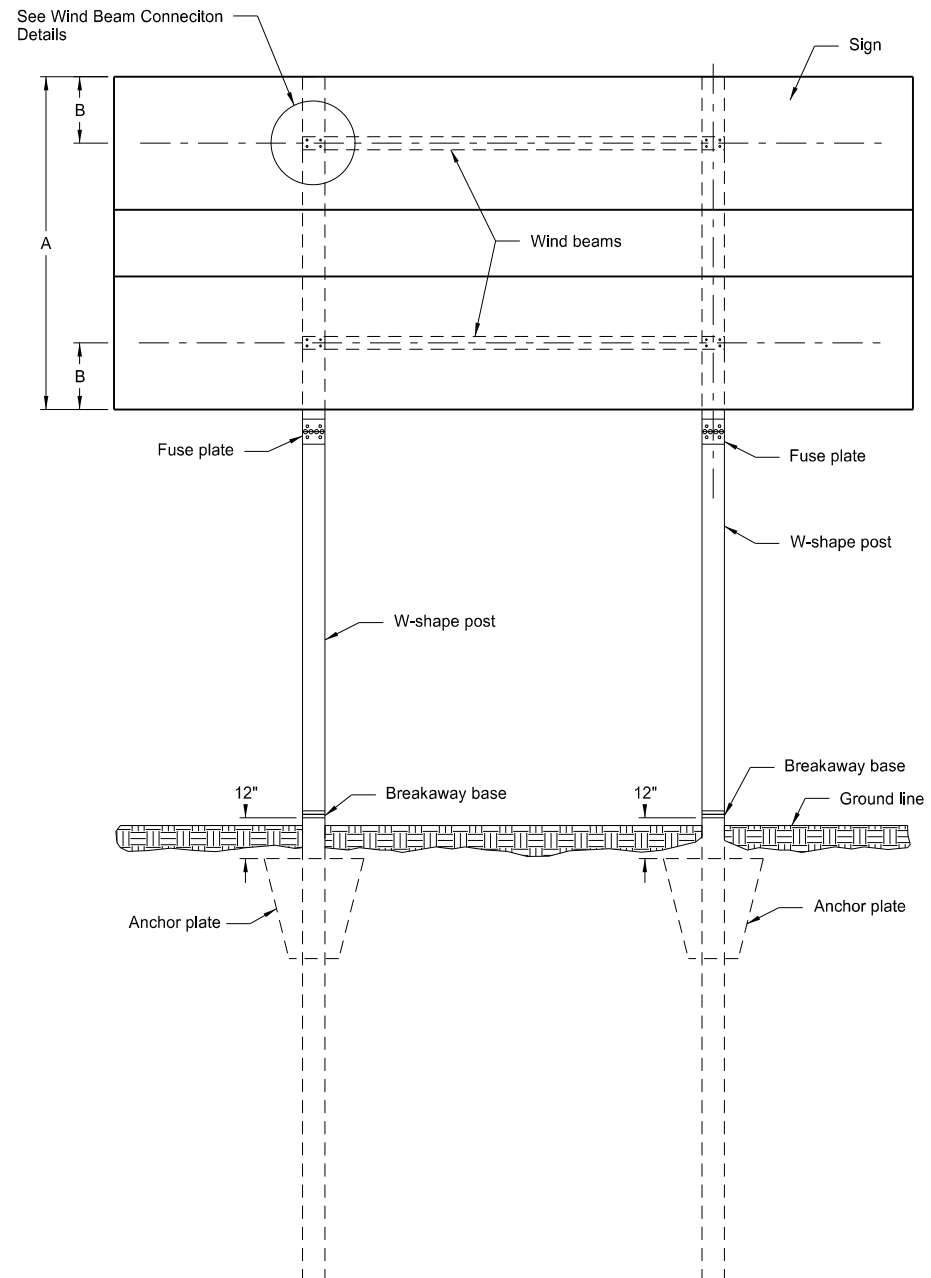
Section D-D

W-Shape Post and Pile Size	Bolt Size and Torque	Base Connection Dimensions										Fuse and Hinge Plate Dimensions									
		A	B	C	D	E	t ₁	t ₂	W	R	G	H	J	K	L	M	d ₁	d ₂	t ₃	Bolt dia.	
W4x13	3/4" ϕ x 3 1/2" Torque = 600 in-lb	6"	2 1/2"	1 1/2"	3 1/2"	1 1/4"	1"	1/2"	1/4"	1 9/32"	2"	1 1/4"	4"	2 1/4"	7/8"	1"	1 1/16"	3/4"	3/8"	5/8"	
W5x16	3/4" ϕ x 3 1/2" Torque = 600 in-lb	6"	2 1/2"	1 1/2"	3 1/2"	1 1/4"	1"	1/2"	1/4"	1 9/32"	2 1/2"	1 1/4"	5"	2 3/4"	1 1/8"	1 1/8"	1 3/16"	7/8"	3/8"	3/4"	
W6x20	7/8" ϕ x 4 1/4" Torque = 800 in-lb	8"	3"	1 3/4"	4"	2"	1 1/4"	1/2"	1/4"	1 5/32"	2 1/2"	1 1/4"	6"	3 1/2"	1 1/4"	1 3/8"	1 3/16"	1 1/8"	3/8"	3/4"	
W8x24	7/8" ϕ x 4 1/4" Torque = 800 in-lb	8"	3"	1 3/4"	4"	2"	1 1/4"	1/2"	1/4"	1 5/32"	2 1/2"	1 1/2"	6 1/2"	3 1/2"	1 1/2"	1 1/2"	1 5/16"	1 1/4"	1/2"	7/8"	
W8x28	1" ϕ x 5" Torque = 1000 in-lb	8"	3"	2"	4"	2"	1 1/2"	3/4"	5/16"	1 7/32"	2 1/2"	1 1/2"	6 1/2"	3 1/2"	1 1/2"	1 5/8"	1 1/16"	1 1/8"	1/2"	1"	
W8x31	1 1/8" ϕ x 5" Torque = 1200 in-lb	9"	3 1/2"	2"	5"	2"	1 1/2"	3/4"	5/16"	1 9/32"	3"	1 3/4"	8"	5 1/2"	1 1/4"	2"	1 1/16"	1 1/2"	1/2"	1"	
W10x39	1 1/8" ϕ x 5" Torque = 1200 in-lb	9"	3 1/2"	2"	5"	2"	1 1/2"	3/4"	5/16"	1 9/32"	3"	1 3/4"	8"	5 1/2"	1 1/4"	1 7/8"	1 3/16"	1 3/8"	1/2"	1 1/8"	

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 2-28-14	
REVISIONS	
DATE	CHANGE
7-18-14	Revised first note.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.

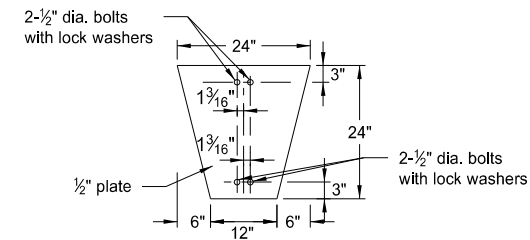
This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE-4683,
on 8/29/19 and the original document is stored at the North Dakota Department of Transportation

WIND BEAMS AND ANCHOR PLATES
FOR W-SHAPE SUPPORTS

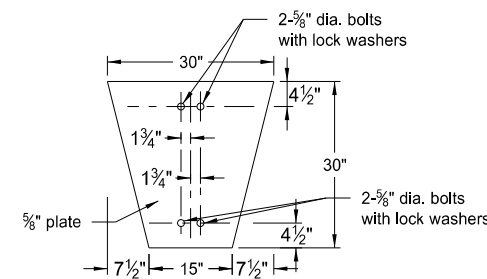


ASSEMBLY DETAIL
FOR WIND BEAMS
AND ANCHOR PLATES

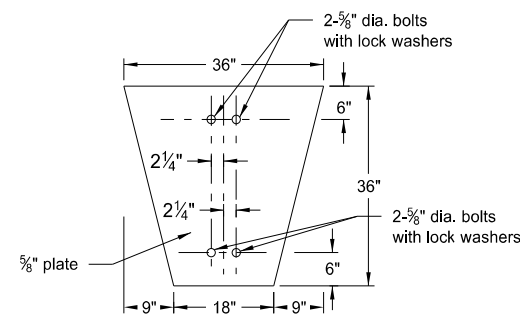
Notes:
Calculate the B distance using the formula, $B=A/4$.
Use wind beam conforming to Section 894.03 B.6 of the Standard Specifications.
Use bolts conforming to ASTM A307 and galvanized according to ASTM A153.



W4-13 & W5-16

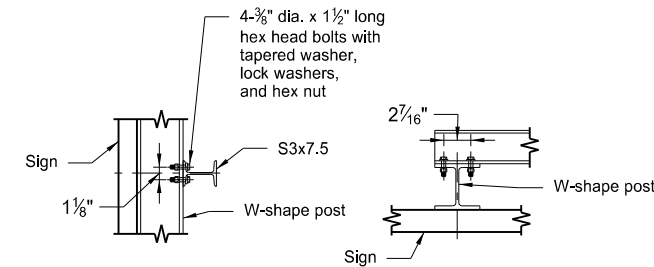


W6-20, W8-24 & W8-28

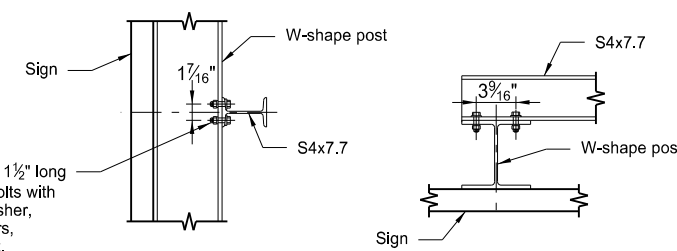


W8-31 & W10-39

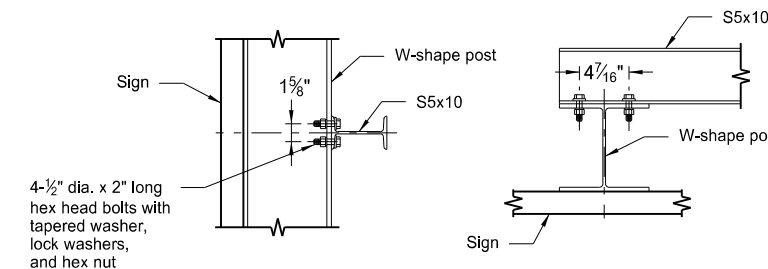
ANCHOR PLATE DETAILS



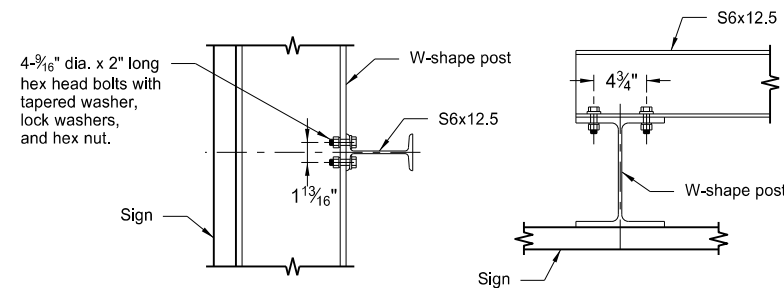
End View
Top View
W4-13 & W5-16



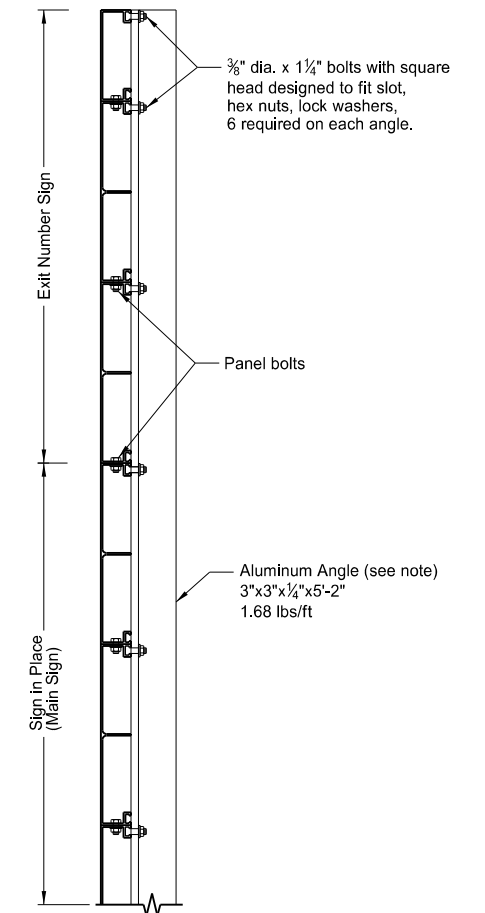
End View
Top View
W6-20, W8-24 and W8-28



End View
Top View
W8-31



End View
Top View
W10-39
WIND BEAM CONNECTION DETAILS



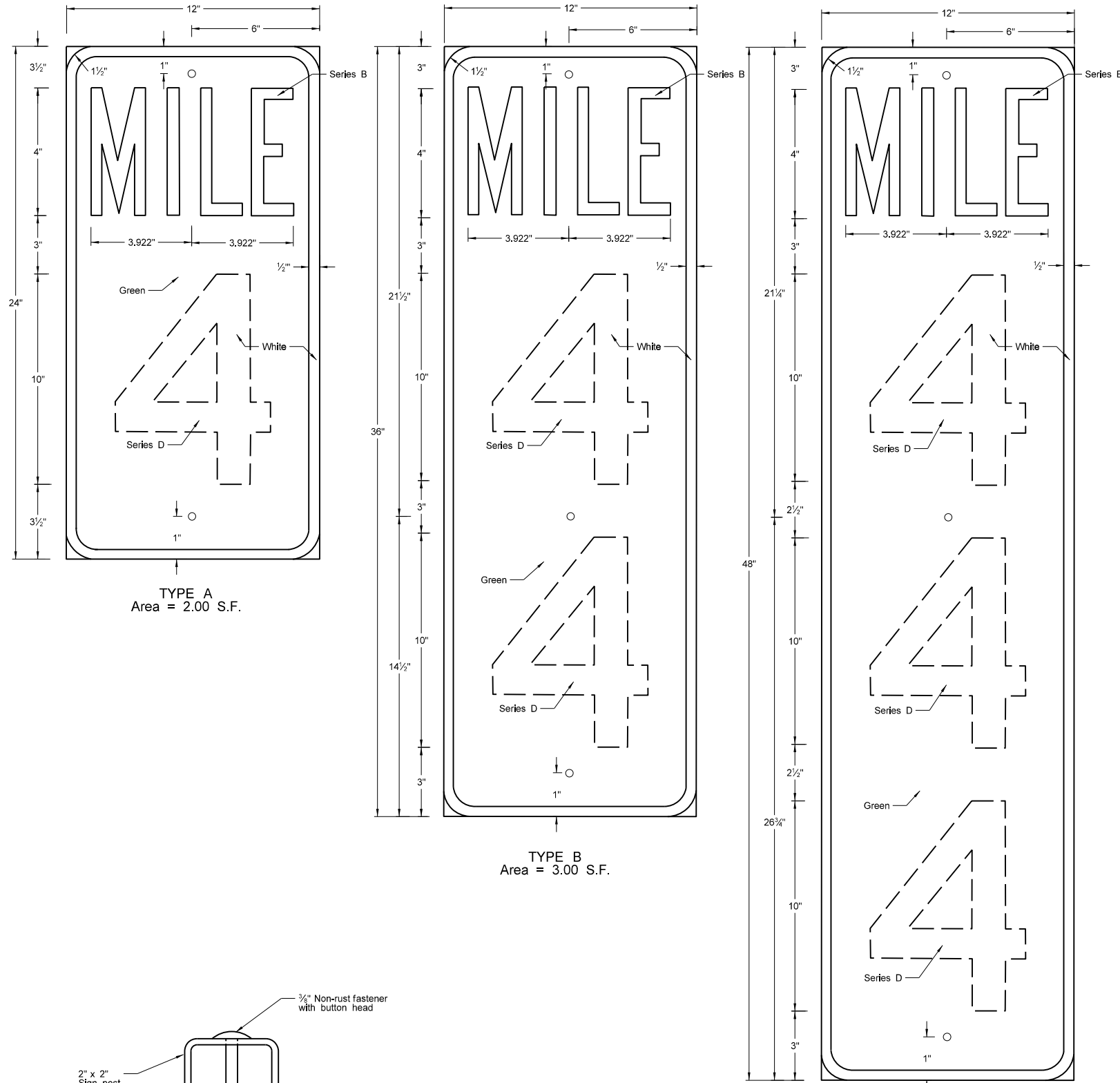
ASSEMBLY DETAIL FOR
EXIT NUMBER SIGNS

Note: Use two aluminum angles on each sign. Vary distance between angles dependent on post spacing of sign in place. Place angles as near as possible to posts. The Engineer will determine exact location.

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

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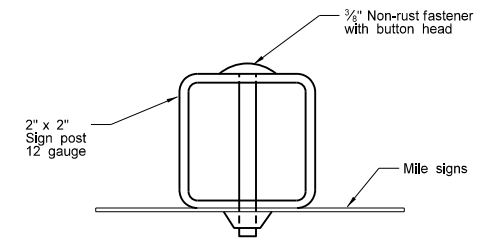
(EXPRESSWAY-FREEWAY USE) MILE POSTS



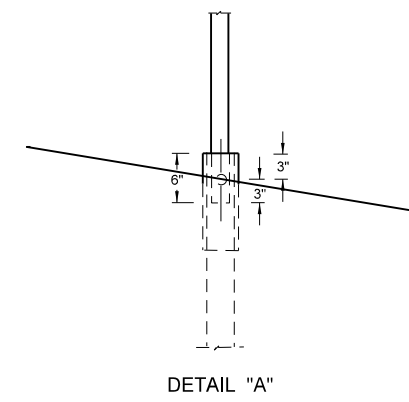
TYPE A
Area = 2.00 S.F.

TYPE B
Area = 3.00 S.F.

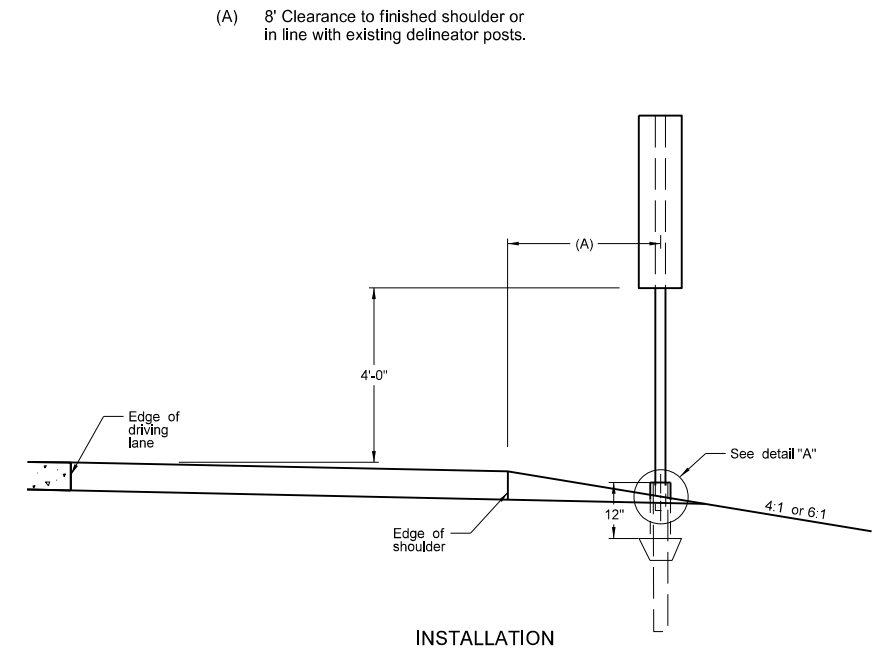
TYPE C
Area = 4.00 S.F.



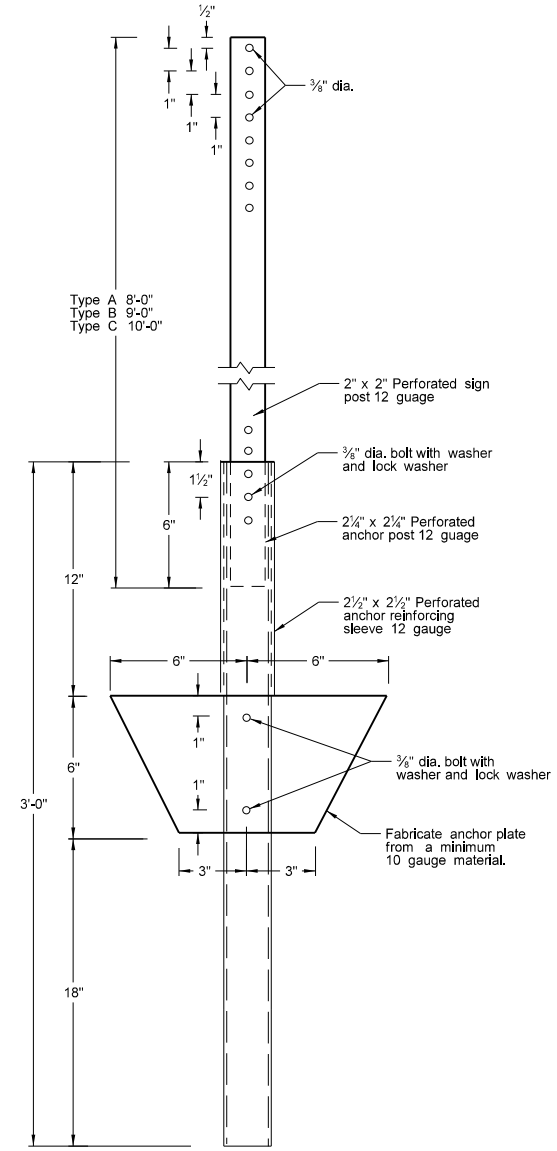
ASSEMBLY DETAIL



DETAIL "A"



INSTALLATION



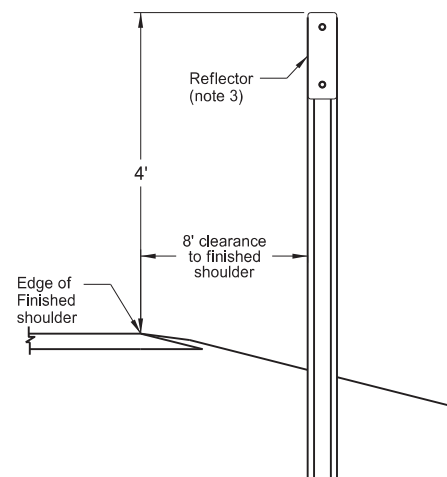
POST AND ANCHOR PLATE DETAIL

- NOTES:
 Installation: Install posts along right shoulder in line with delineators.
 Mile Sign Backing: Fabricate backing of 0.080 aluminum.
 Fasteners: Attach signs to post with tension pin type fastener or other suitable vandal resistant non-rust fastener.
 Reflective Sheeting: Use Type IV sheeting.
 Numbers: Use screened or applied copy numbers of the series shown.

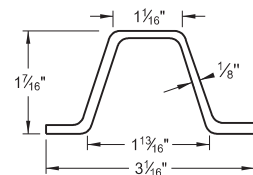
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
7-8-14	Revised post and reflective sheeting notes.
8-30-18	Updated to active voice.
8-29-19	New Design Engineer PE Stamp

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 of Transportation

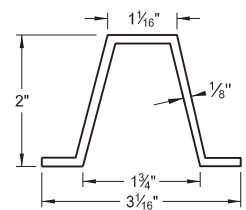
REFLECTORIZED DELINEATORS - DIVIDED HIGHWAY



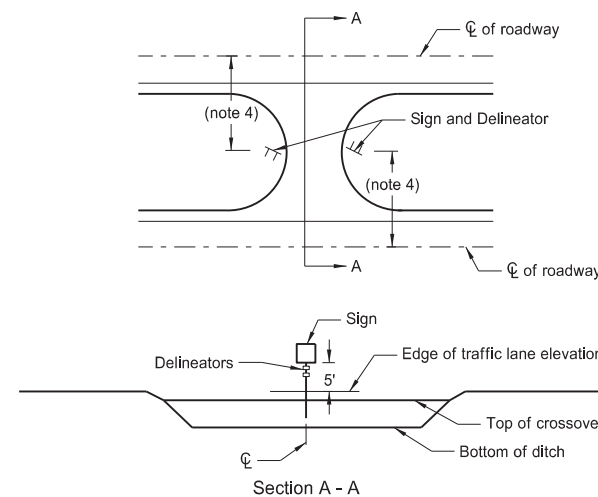
Installation
(Type A, B, and C)



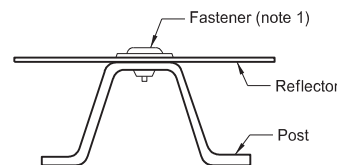
Steel Post Detail
Approx. 2.0 lbs/ft



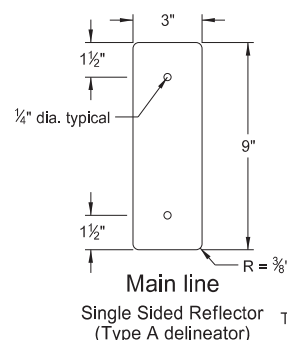
Aluminum Post Detail
Approx. 0.88 lbs/ft



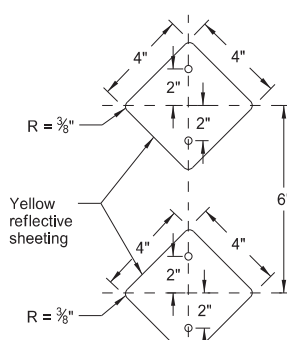
Section A - A
Median Crossovers
Signing and Delineation system



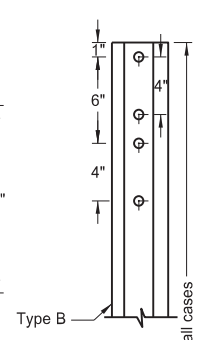
Type A, Type B, and Type C
Delineator Attachment Detail



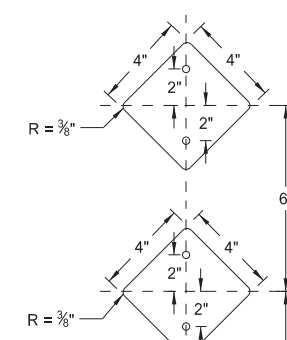
Main line
Single Sided Reflector
(Type A delineator)



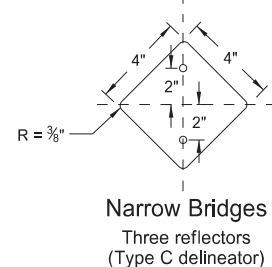
Ramps
Two reflectors
(Type B delineator)



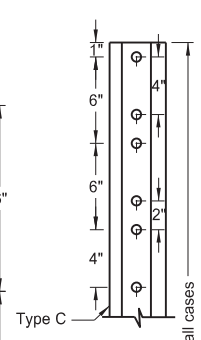
Type B
9' total length in all cases



Type C
9' total length in all cases

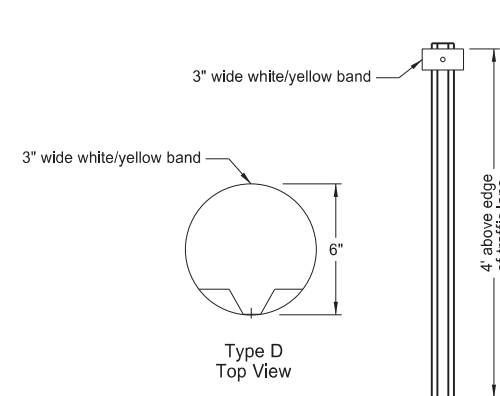


Narrow Bridges
Three reflectors
(Type C delineator)

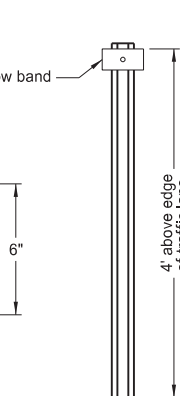


Type C
9' total length in all cases

U-type Post
(Delineators-Type C)

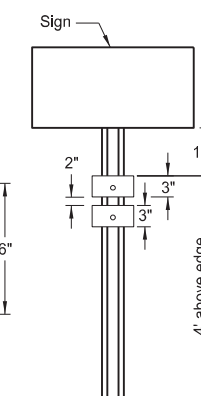


Type D
Top View

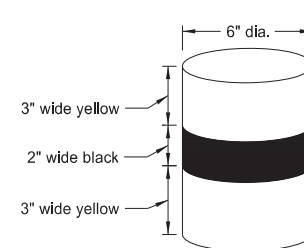


Type E
Top View

Median
One reflector
(Delineators-Type D)



Median
Two reflectors
(Delineators-Type E)



Alternate Type E delineator

Delineator Details
Type A, B, and C

Installation: Install posts along the right shoulder line, in the direction of travel, unless shown otherwise on the plans.
Reflectors: Use reflector of the same color as the adjacent pavement marking with a 0.080 inch minimum thickness sign backing material.

Type E

Alternate: As an alternate, use one unit consisting of two yellow stripes separated by a 2" black stripe in place of two 3" yellow bands.

(1) Use fasteners that are a minimum 1/4" diameter. Use double headed rivet or other non-rust vandal resistant fastener.

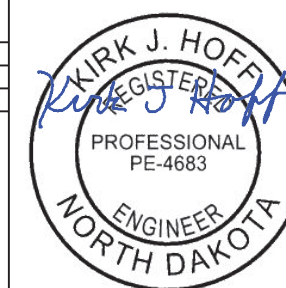
(2) Drill only those holes required to attach the number of reflectors on that post, or drill all the posts the same so that any number of reflectors may be added.

(3) Mount reflector facing traffic at an angle of 90° away from oncoming traffic.

(4) Median width may vary. Place sign and delineator assembly in the median crossover an equal distance from each roadway.

(5) Include all costs for materials, labor, and equipment to install single sided type A delineators in the unit price bid for "Delineators-Type A-Single Sided." Include all costs for materials, labor, and equipment to install single sided type B, type C, type D, and type E delineators in the unit price bid for "Delineators-Type B", "Delineators-Type C", "Delineators-Type D", and "Delineators-Type E."

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12/16/22	
REVISIONS	
DATE	CHANGE



12/16/22

TYPE A REFLECTORIZED DELINEATOR SPACING - DIVIDED HIGHWAY

D-754-21A

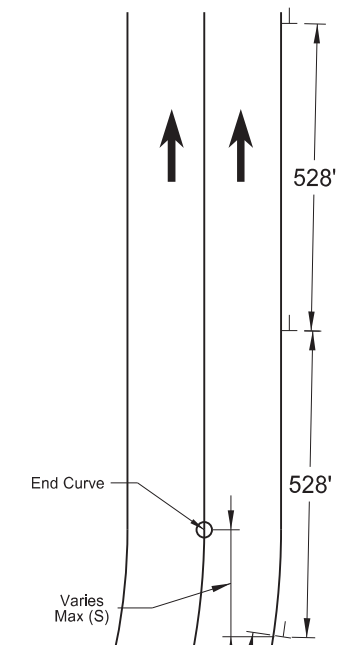
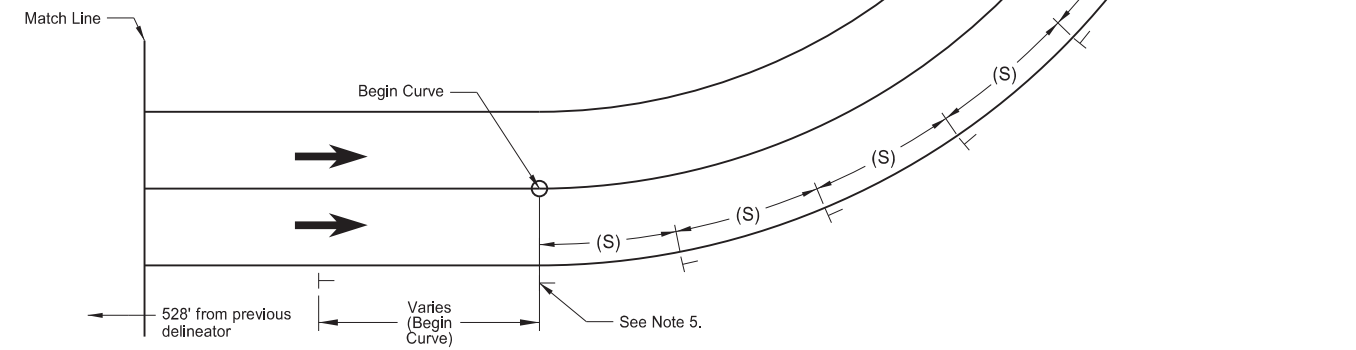
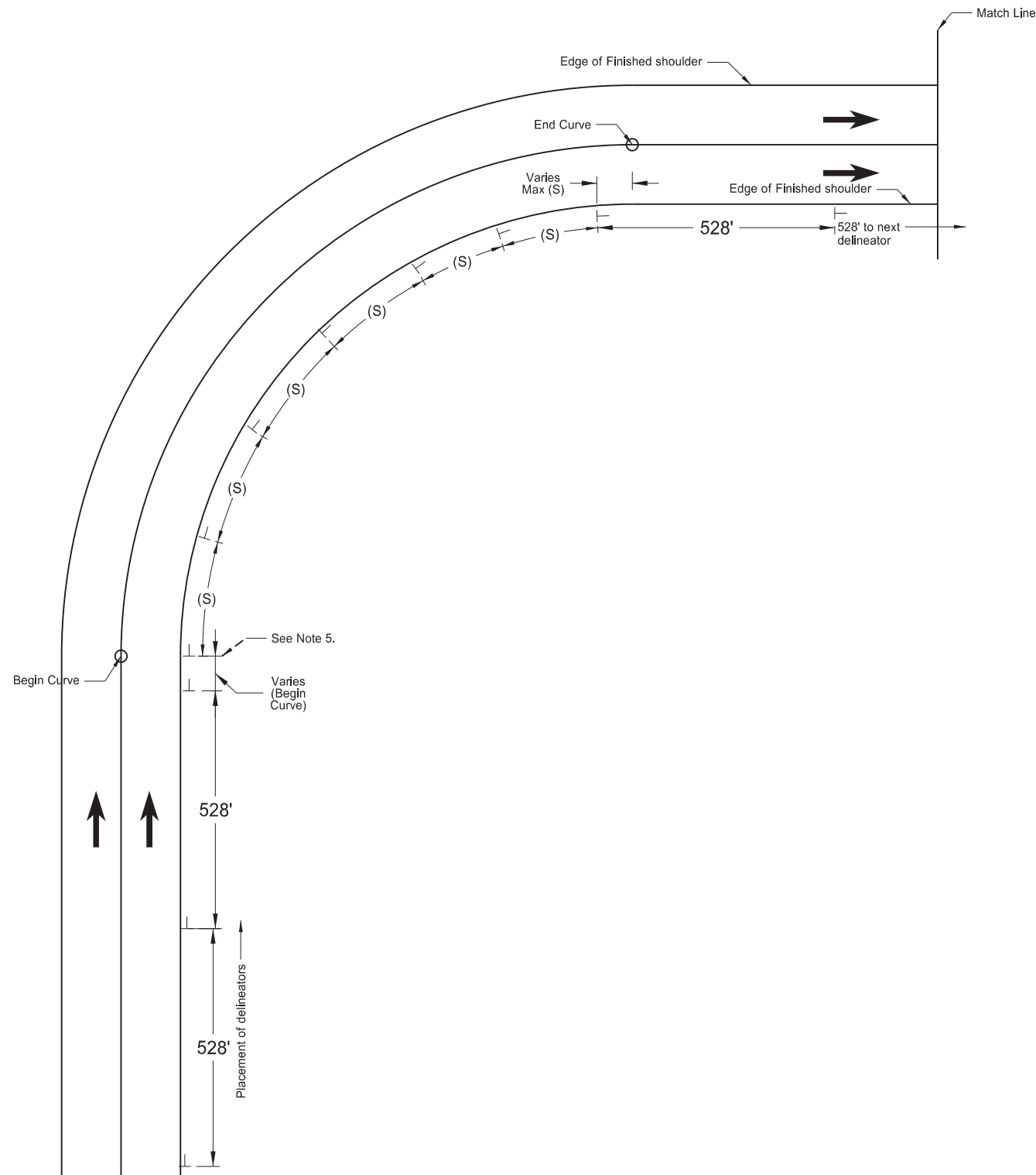
Spacing:

Curve Radius	Spacing (S) on Center
$R > 11,500'$	528'
$11,500' \geq R > 1,200'$	264'
$1,200' \geq R$	See table below

Radius (R) of Curve	Approx. Spacing (S) on Curve
$1,200' \geq R > 1,000'$	90'
$1,000' \geq R > 800'$	80'
$800' \geq R > 500'$	65'
$500' \geq R > 300'$	50'
$300' \geq R > 180'$	35'
$180' \geq R > 50'$	20'

Notes:

- Do not place delineators within 100' of a railroad crossing. Shift delineators in either direction to minimize impact to uniform spacing. Reestablish uniform spacing based on the last delineator location.
- For Type A delineators that land within approaches or ramps, shift delineators in either direction a distance not exceeding $\frac{1}{4}$ of the uniform spacing. Eliminate delineators that still fall within approaches or ramps.
- Eliminate delineators landing within guardrail. Reestablish uniform spacing based on last delineator.
- Do not place delineators within $\frac{1}{4}$ of the uniform spacing of a reference point marker.
- Install Type A delineators along the right shoulder line at the start of each curve.
- Only one roadway is shown. When installation is required for both roadways, install Type A delineators on each roadway as shown (Independent of the other roadway).
- Discontinue delineators on outside of curve where chevrons exist.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-16-22	
REVISIONS	
DATE	CHANGE

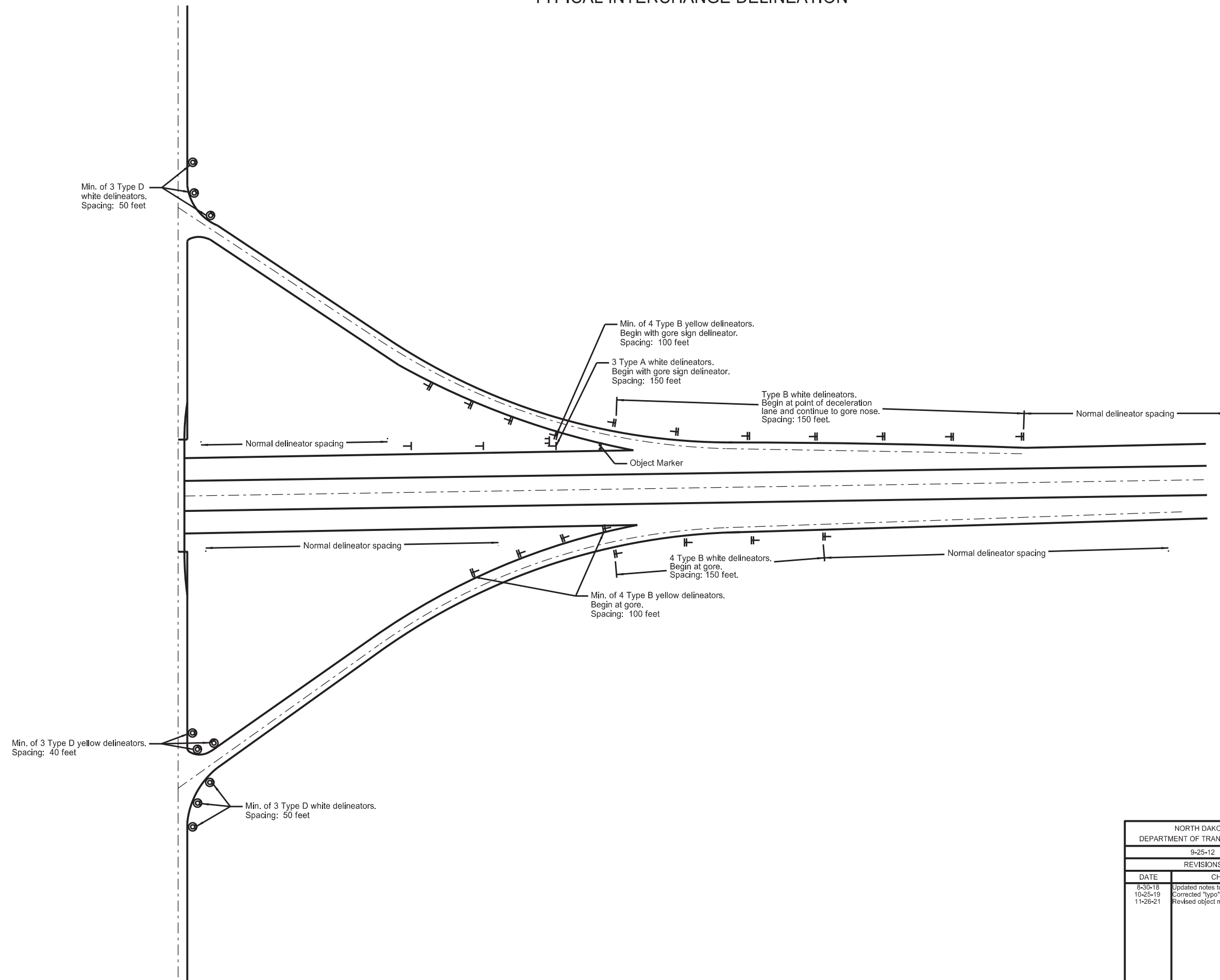


12/16/22

TYPICAL INTERCHANGE DELINEATION

D-754-22A

Interstate mainline delineator spacing:
528' on tangent and curves less than 0°30'
264' on curves 0°30' and greater.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
10-25-19	Corrected "typo" in exit ramp layout.
11-26-21	Revised object marker designation.



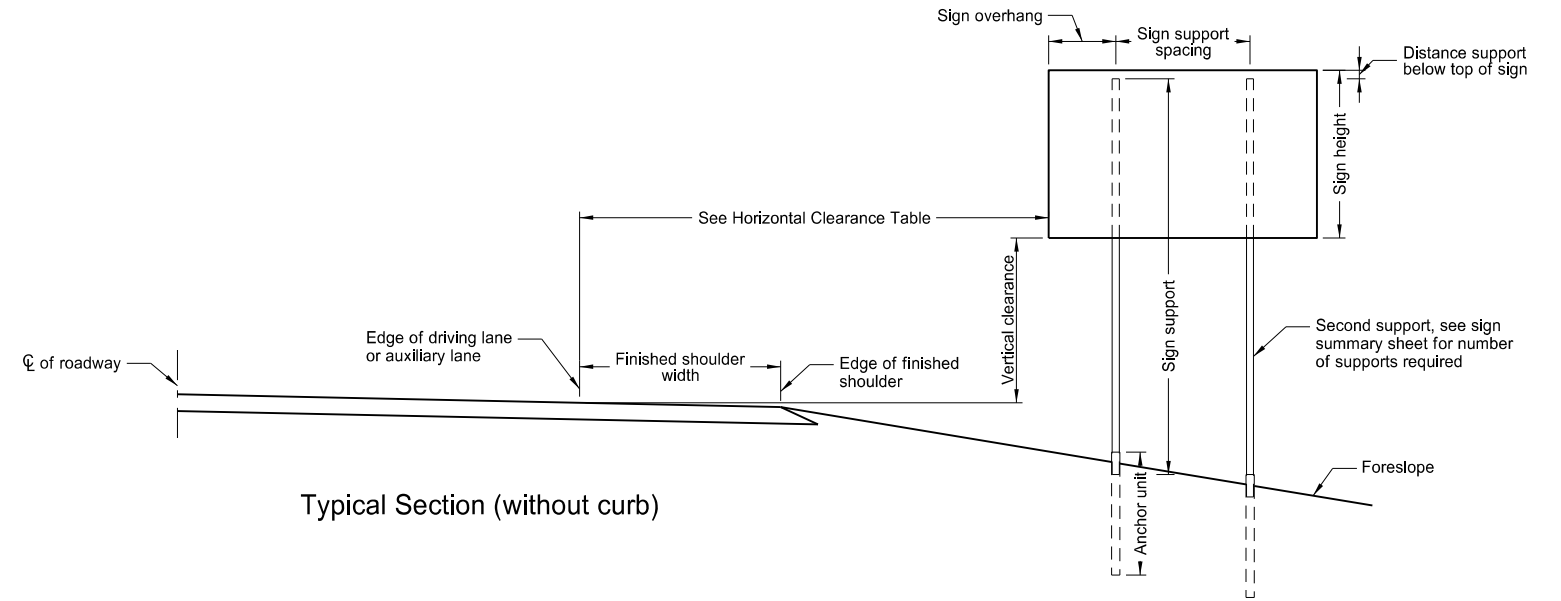
11/26/21

PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

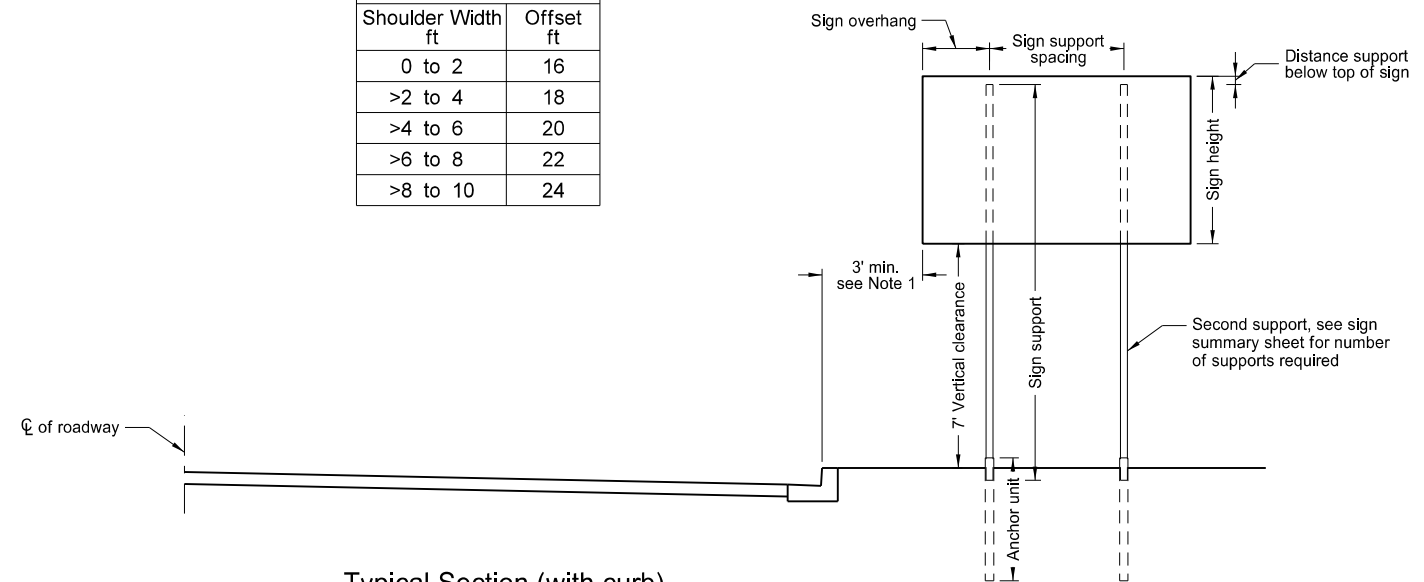
Notes:

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'.

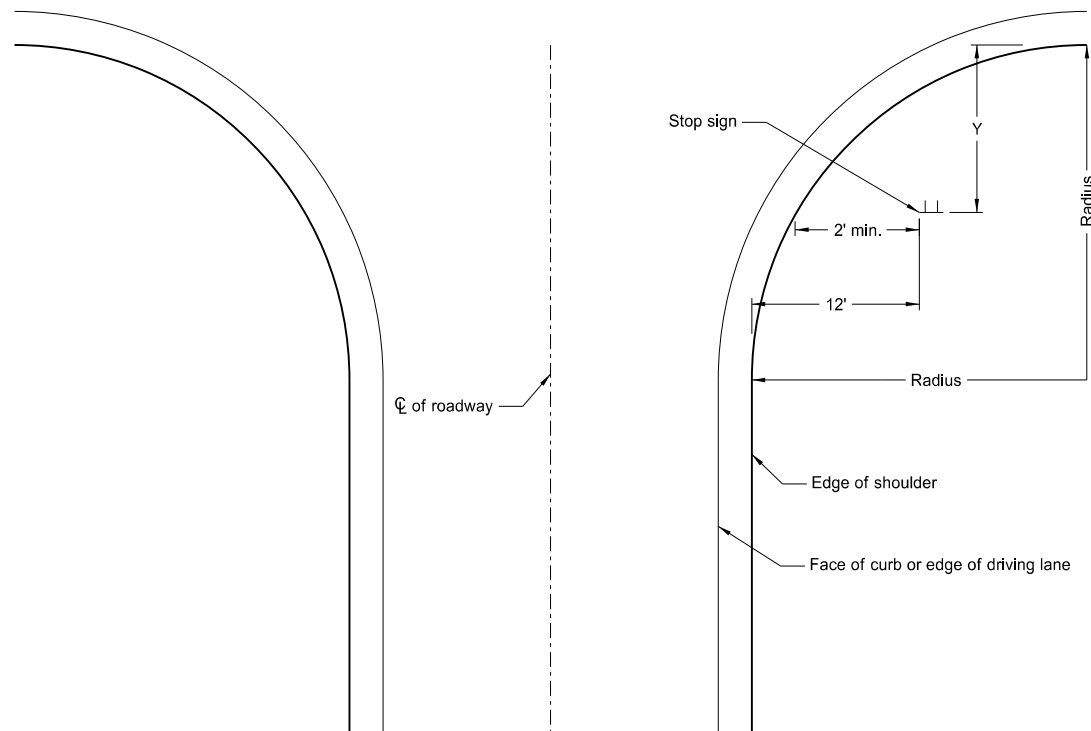


Typical Section (without curb)

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



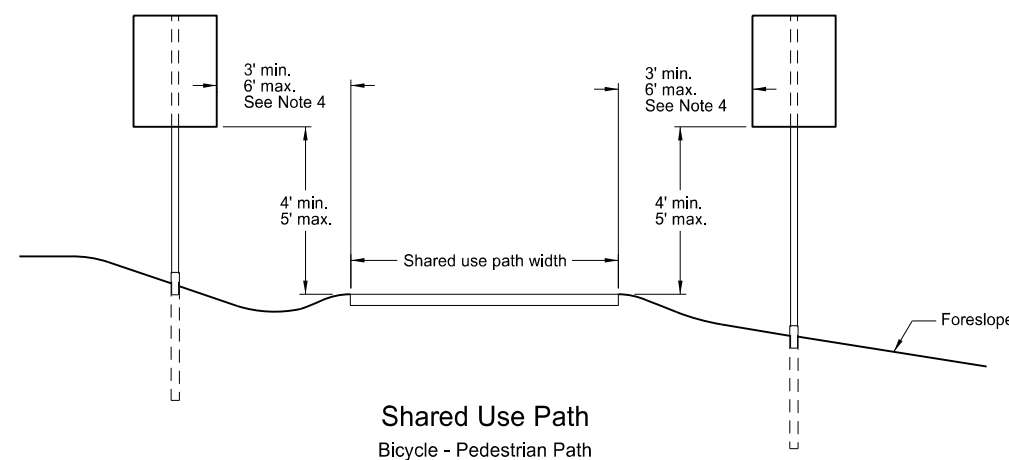
Typical Section (with curb)
Residential or Business District



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



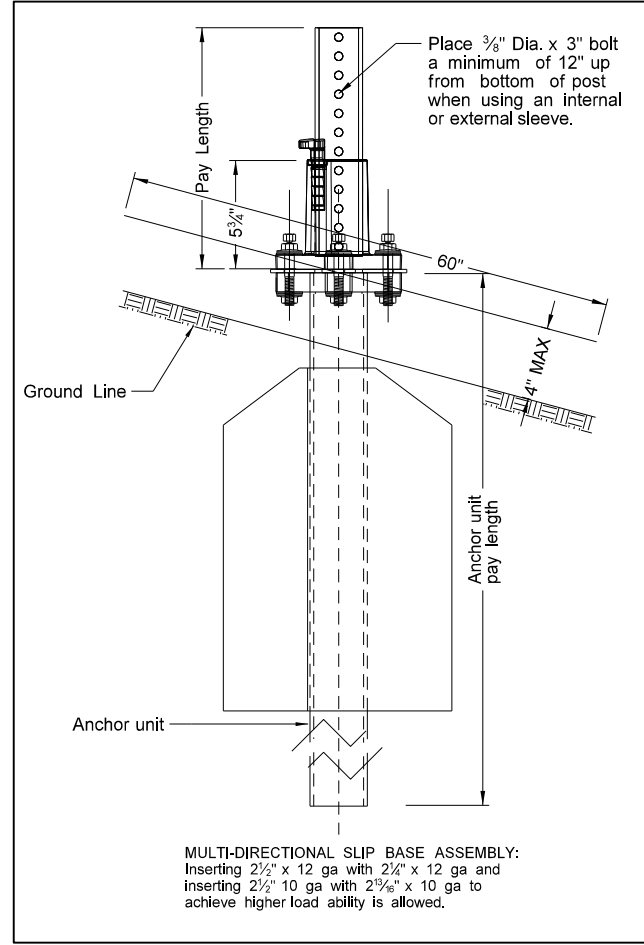
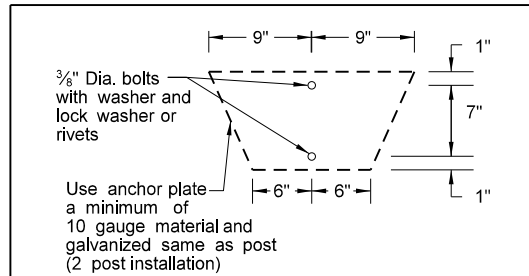
Shared Use Path
Bicycle - Pedestrian Path

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

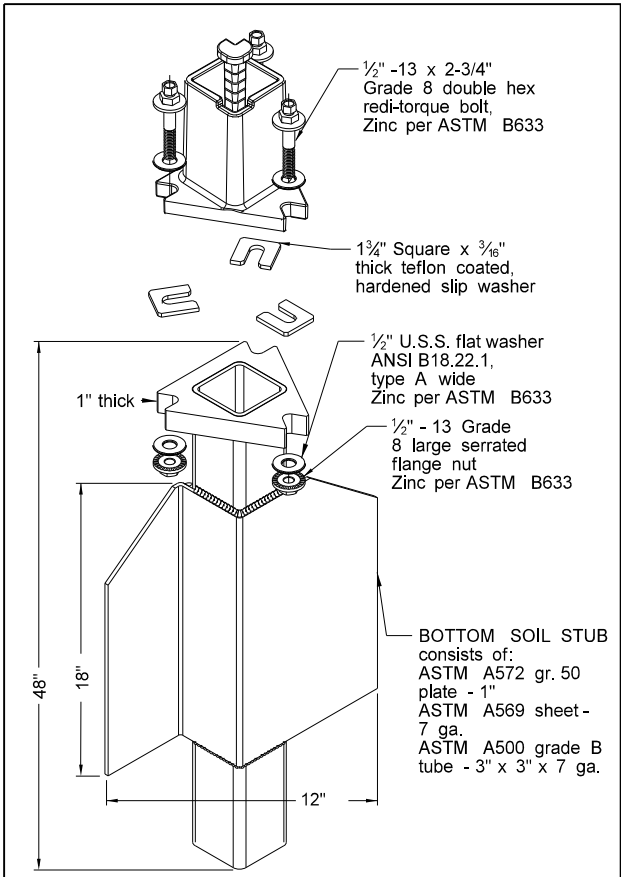
Telescoping Perforated Tube							
Number of Posts	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2 1/2(D)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

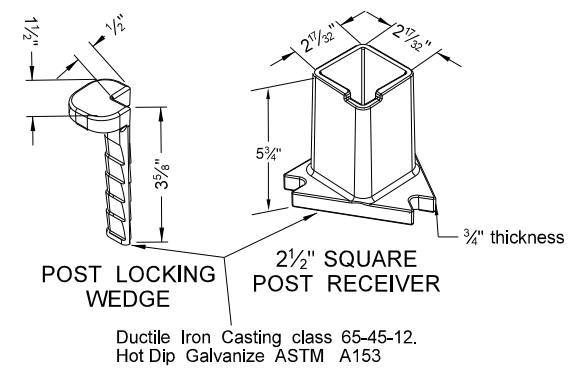


MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:
 Inserting 2 1/2" x 12 ga with 2 1/4" x 12 ga and inserting 2 1/2" 10 ga with 2 3/8" x 10 ga to achieve higher load ability is allowed.

Mounting Details Perforated Tube

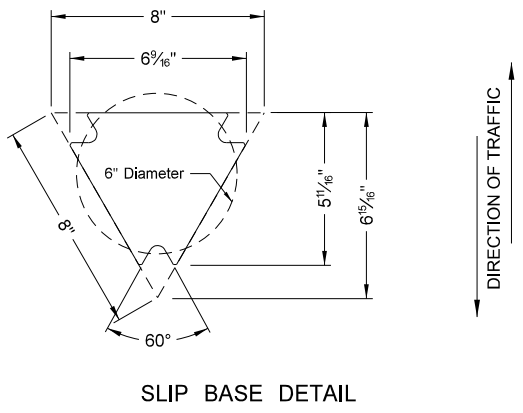


SLIP BASE FOR 2 1/2" POST



2 1/2" SQUARE POST RECEIVER
 POST LOCKING WEDGE

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

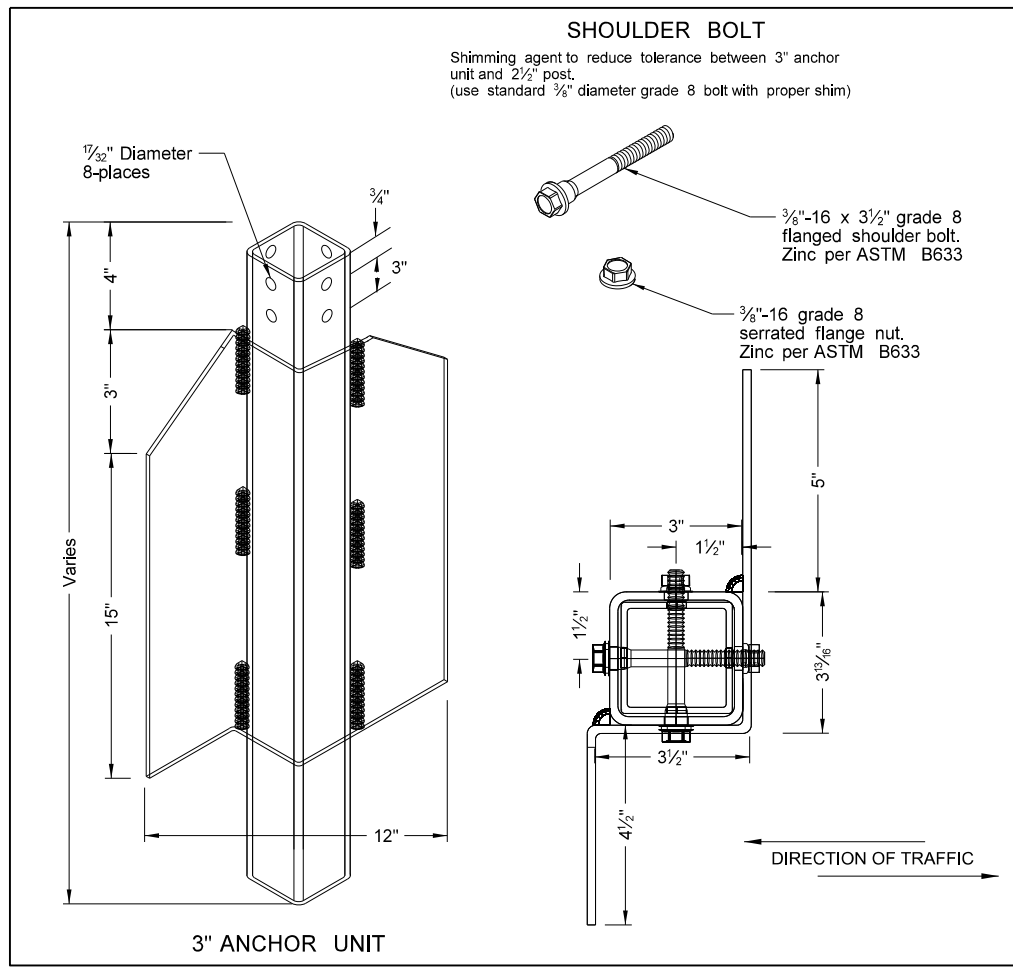


SLIP BASE DETAIL

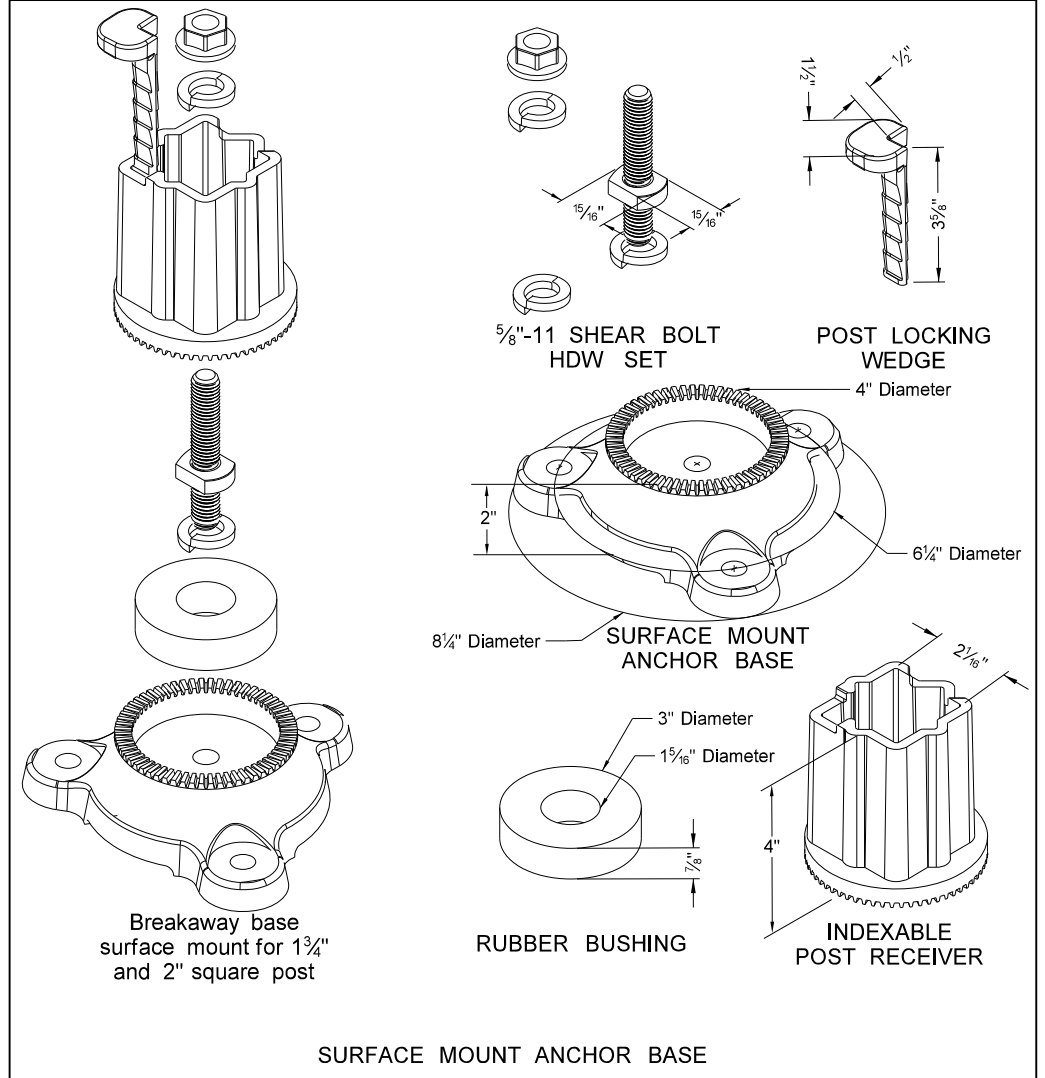
Properties of Telescoping Perforated Tubes							
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. Area In. ²	Section Modulus In. ³	
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172	
2 x 2	0.105	12	2.416	0.372	0.590	0.372	
2 1/4 x 2 1/4	0.105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

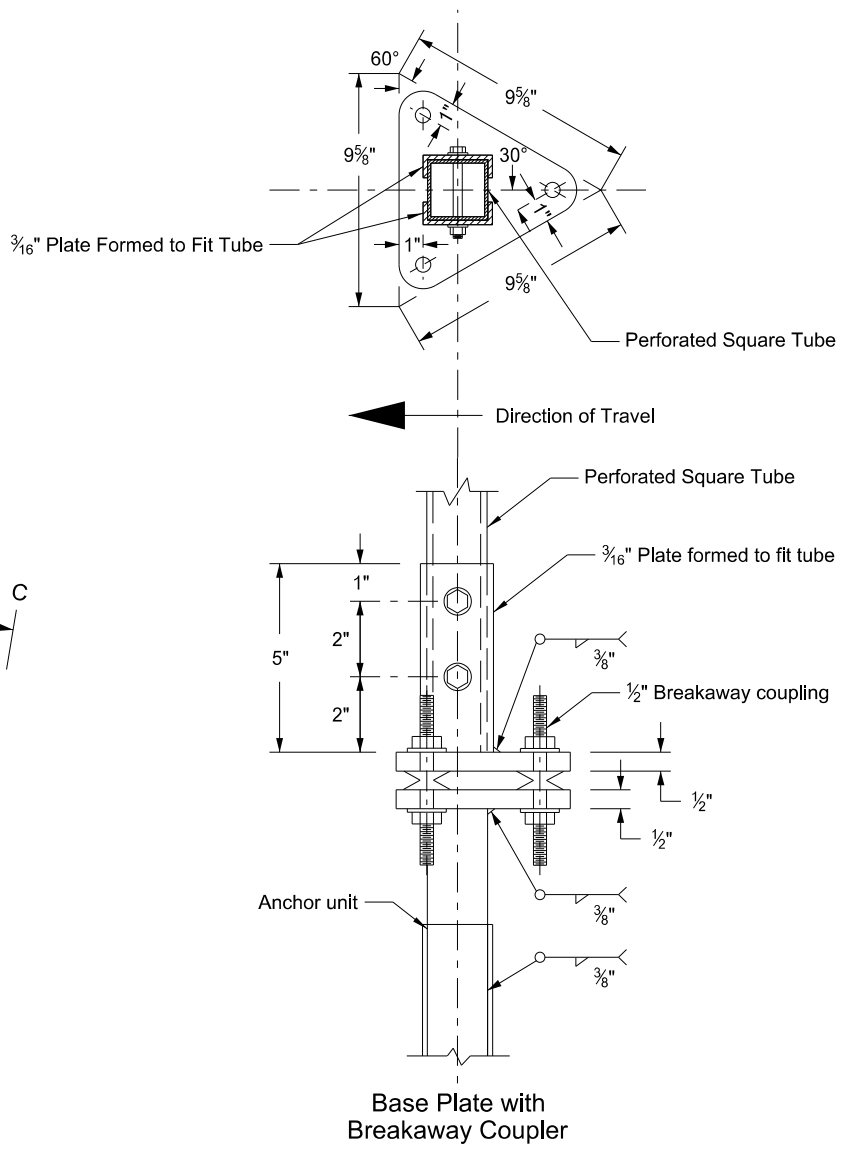
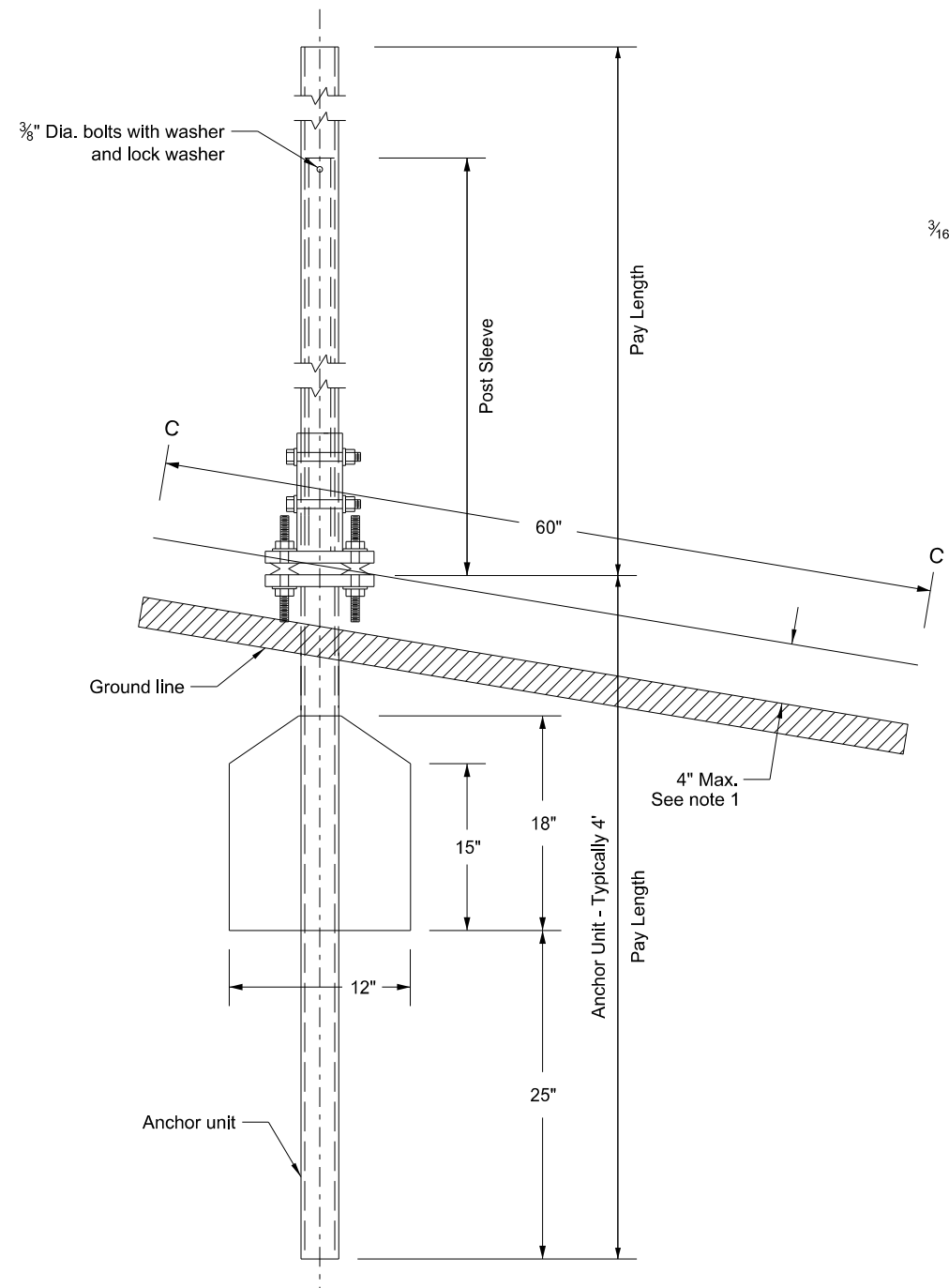
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice & corrected max height of base.
8-29-19	New Design Engineer PE Stamp.

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

Breakaway Coupler System for Perforated Tubes

Notes:

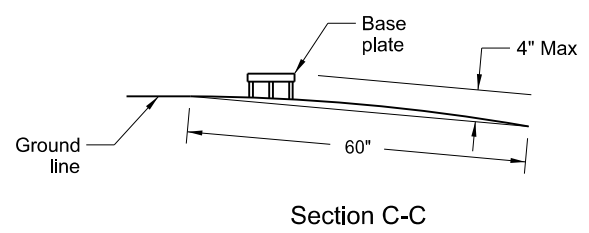
1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.
2. Use anchor unit of the same size and specification as the post.
3. Provide a minimum 8' distance between the first and fourth post on four post signs.
4.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



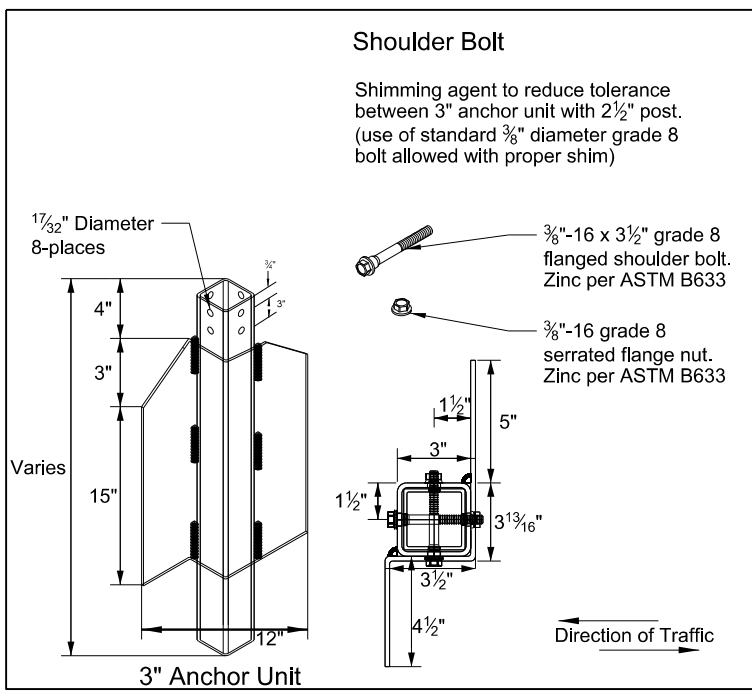
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2	12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



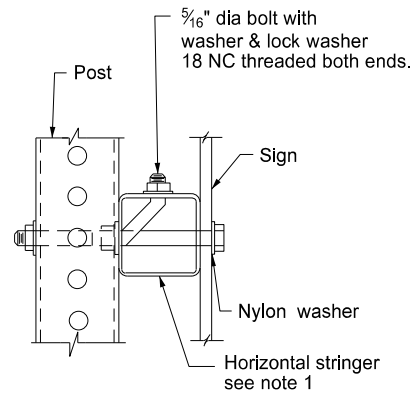
Max protection of the stub post is 4" above a 60" chord aligned radially to the center line of the highway and connecting any point, within the length of the chord, on the ground surface on one side of the support to a point in the ground surface on the other side.



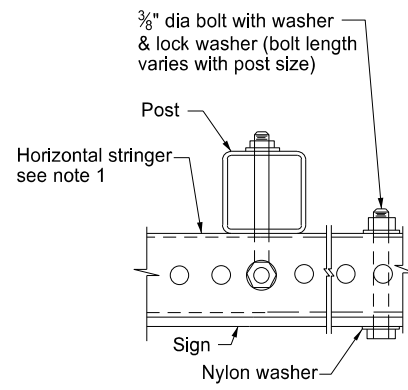
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engr PE Stamp.

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

Mounting Details Perforated Tube

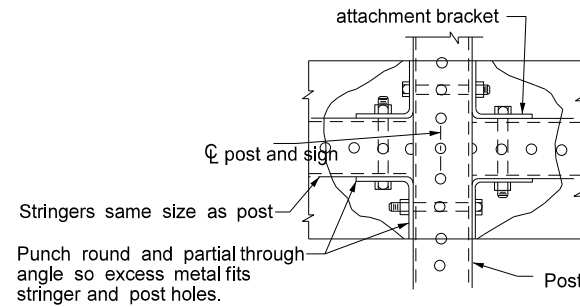


Side View



Top View

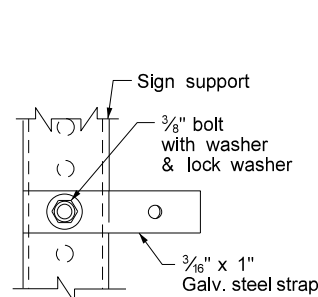
STRINGER MOUNTING (WITH STRINGER IN FRONT OF POST)



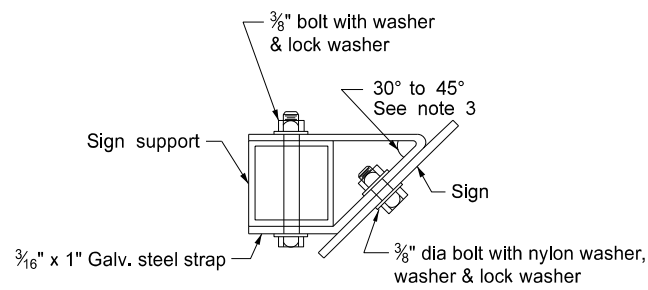
STREET NAME SIGNS AND ONE WAY SIGNS SINGLE POST ASSEMBLY ONE STRINGER OR BACK TO BACK MOUNTING

Note:

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

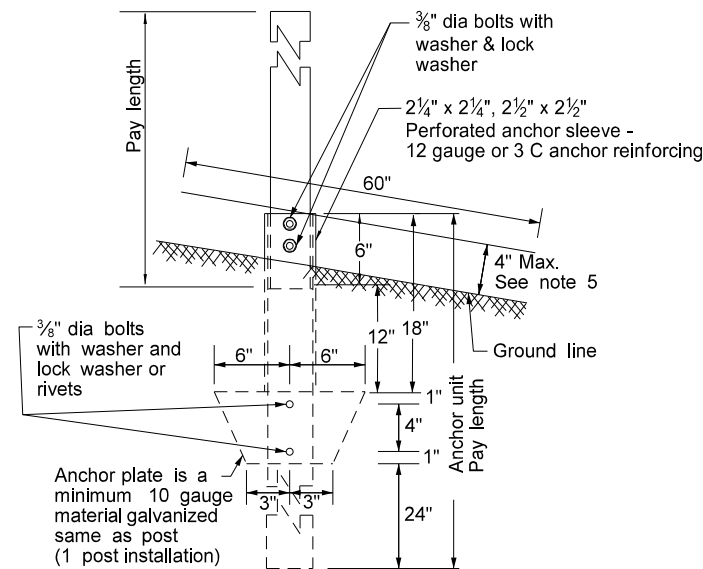


Side View

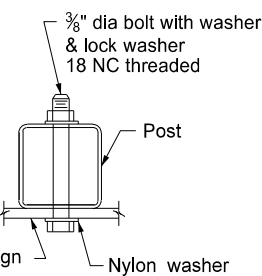


Top View

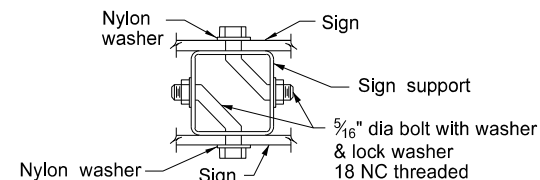
STRAP DETAIL



ANCHOR UNIT AND POST ASSEMBLY

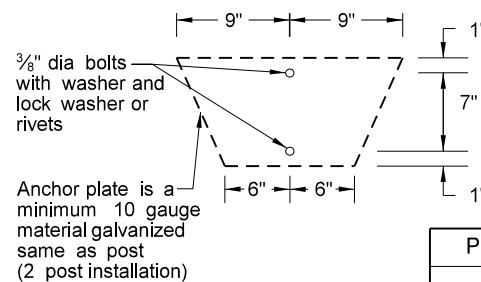


BOLT MOUNTING



Top View

BACK TO BACK MOUNTING



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

The 2 3/16" size 10 gauge is shown as 2.19" size on the plans.
The 2 1/2" size is shown as 2.51" size on the plans.

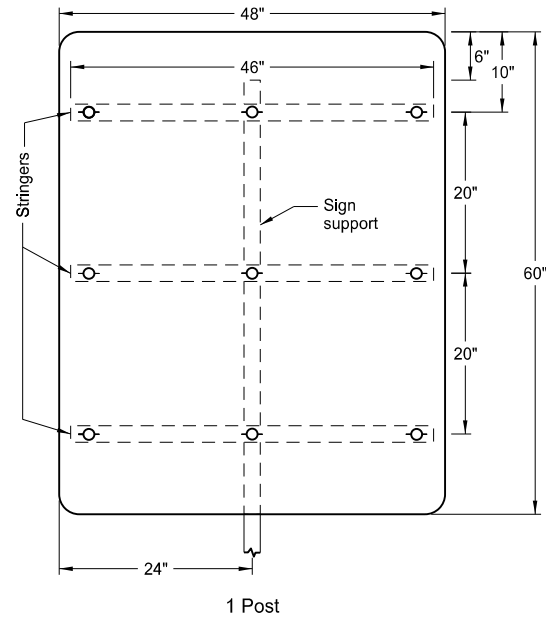
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2 1/2(D)	12	Yes		7
1	2 1/2	12	2 1/4	12	Yes		7
2	2 1/2	10			Yes		7
2	2 1/4	12	2 1/2(D)	12	Yes		7
2	2 1/2	12	2 1/4	12	Yes		7
3 & 4	2 1/2	12			Yes		7
3 & 4	2 1/2	10			Yes		7
3 & 4	2 1/2	12	2 1/4	12	Yes		7
3 & 4	2 1/4	12	2 1/2(D)	12	Yes		7
3 & 4	2 1/2	10	2 3/16	10	Yes		7

(B) - When placing 2 1/2", 12 gauge posts in standard soils without breakaway bases, provide a shim as specified by the manufacturer. Provide breakaway base when placing the support in weak soils. Engineer will determine if soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2 1/2" x 12 ga. x 18" minimum length external sleeve required.

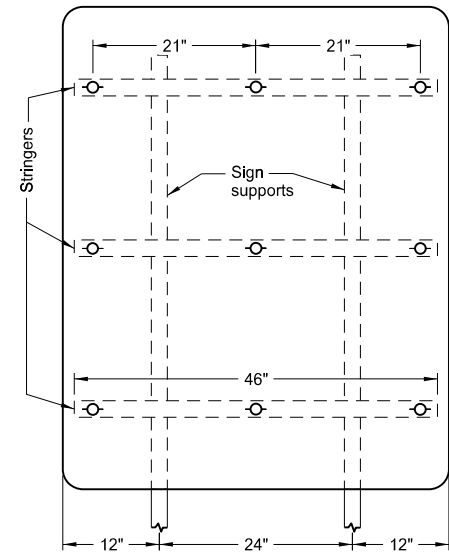
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
7-8-14	Revised Note 3.
8-30-18	Updated notes to active voice.
8-30-19	New Design Engr PE Stamp.

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

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

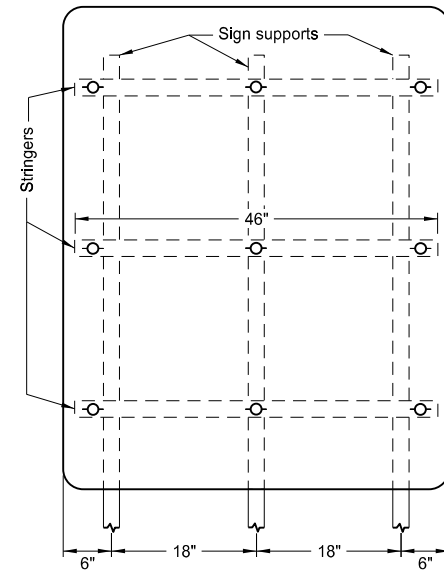


1 Post

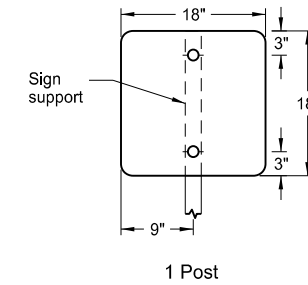


2 Posts

Assembly No. 12

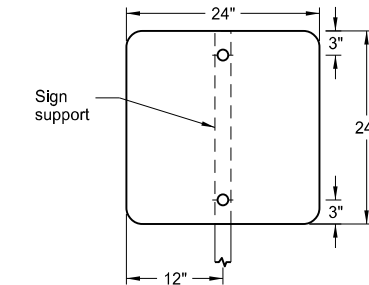


3 Posts



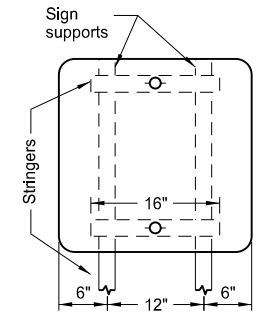
1 Post

Assembly No. 13

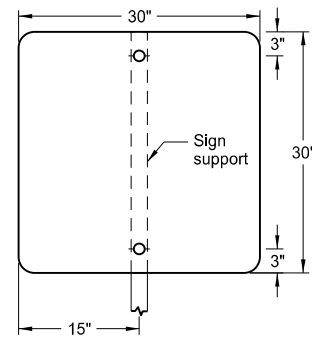


1 Post

Assembly No. 14

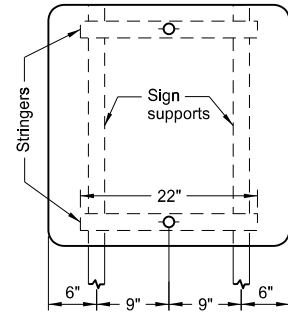


2 Posts

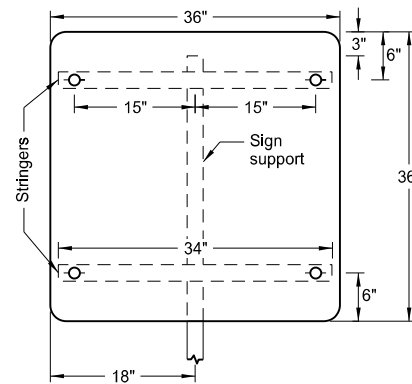


1 Post

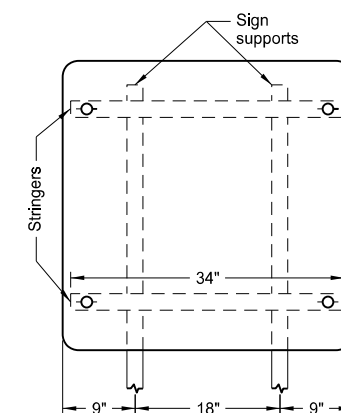
Assembly No. 15



2 Posts

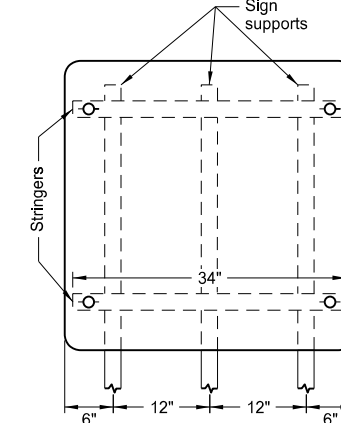


1 Post



2 Posts

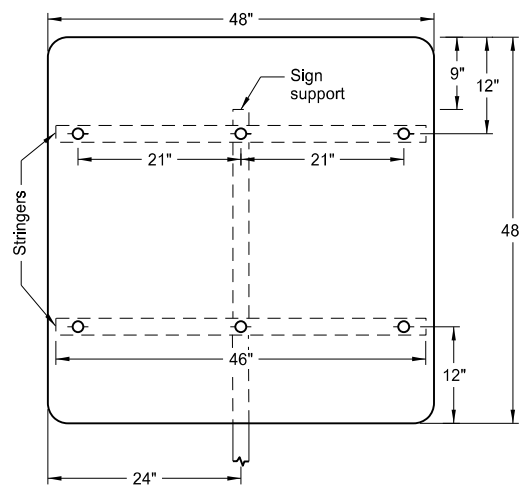
Assembly No. 16



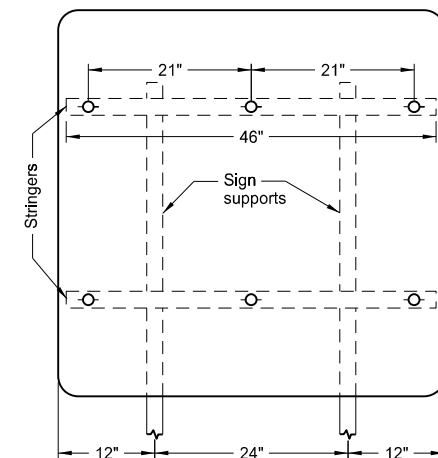
3 Posts

Notes:

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

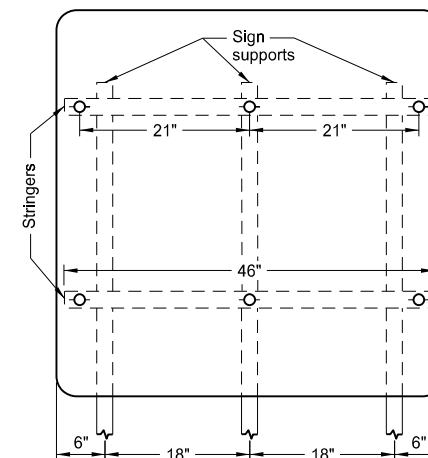


1 Post



2 Posts

Assembly No. 17



3 Posts

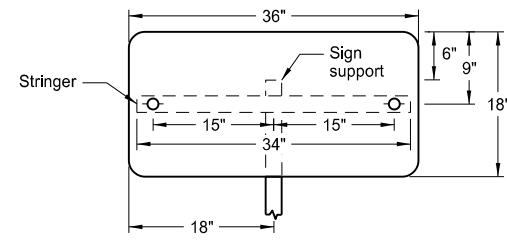
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated to active voice & changed Assembly 16 post spacing.
8-30-19	New Design Engineer PE Stamp.

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

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

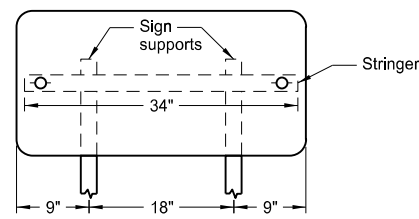
Notes:

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

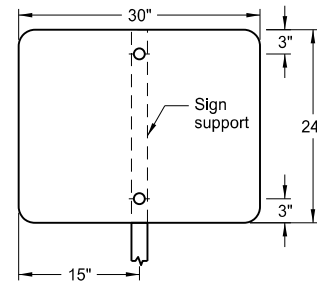


1 Post

Assembly No. 31

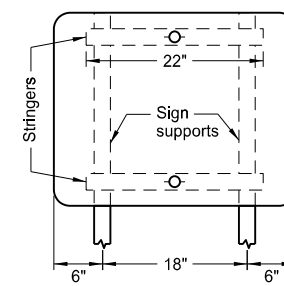


2 Posts

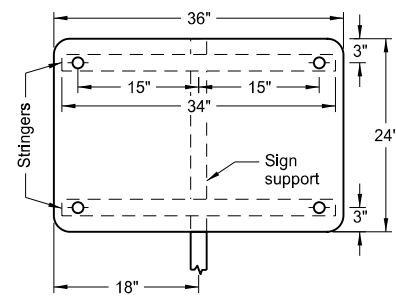


1 Post

Assembly No. 32

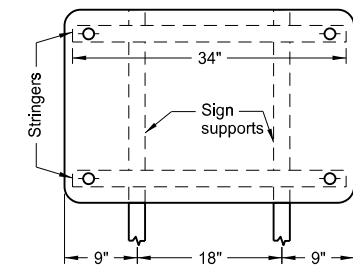


2 Posts

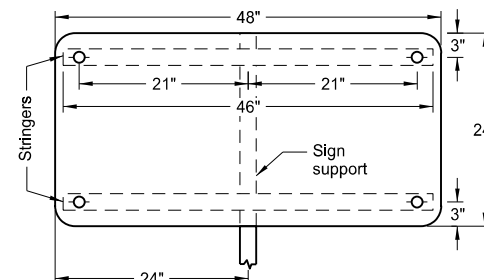


1 Post

Assembly No. 33

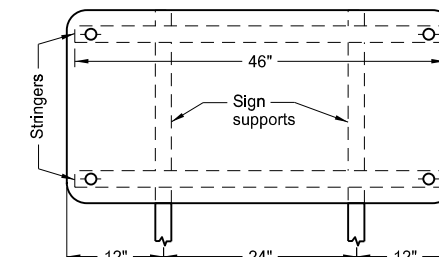


2 Posts

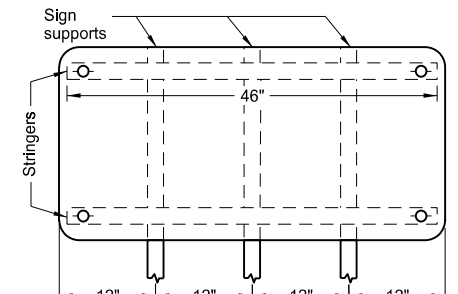


1 Post

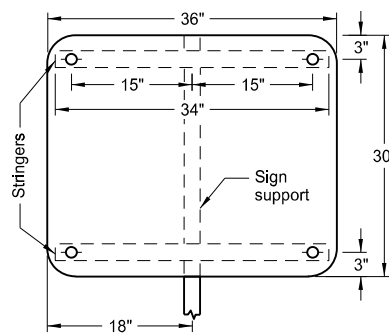
Assembly No. 34



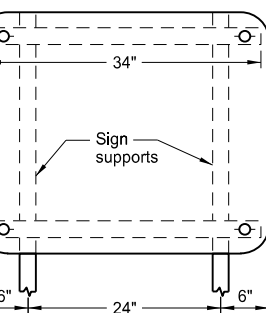
2 Posts



3 Posts

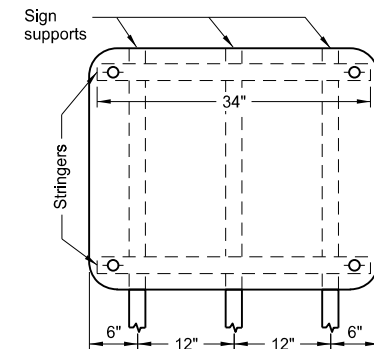


1 Post

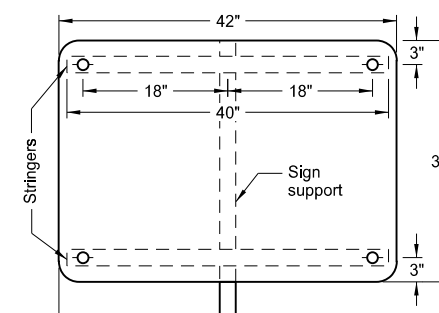


2 Posts

Assembly No. 35

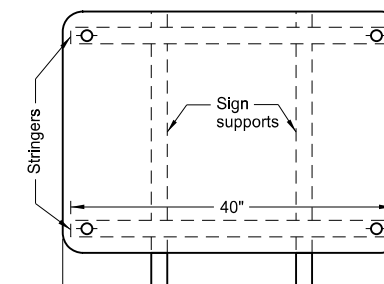


3 Posts

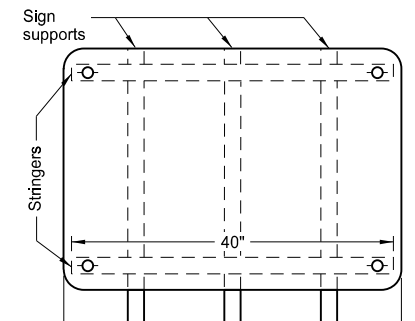


1 Post

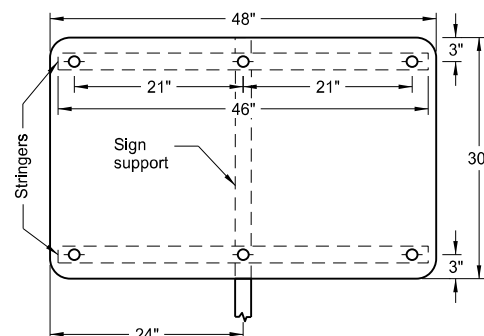
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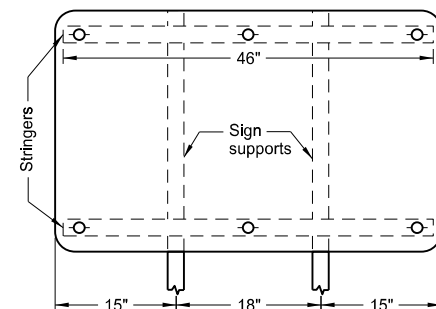
2 Posts



3 Posts

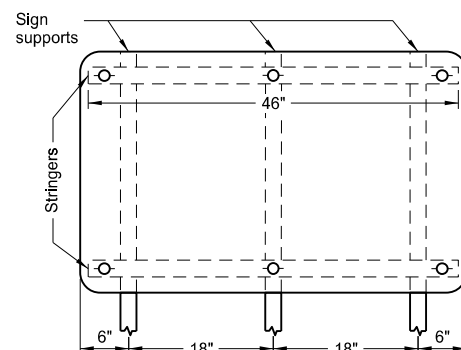


1 Post



2 Posts

Assembly No. 37

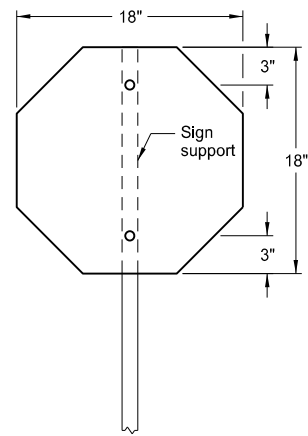


3 Posts

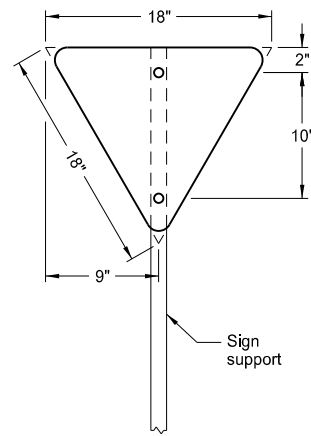
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

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

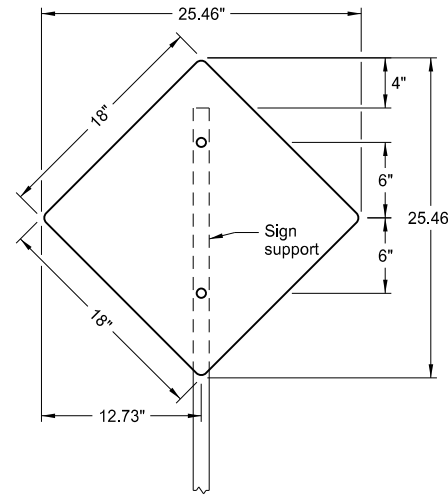
PUNCHING, STRINGER, AND SUPPORT LOCATION DETAILS FOR REGULATORY, WARNING AND GUIDE BIKE ROUTE SIGNS



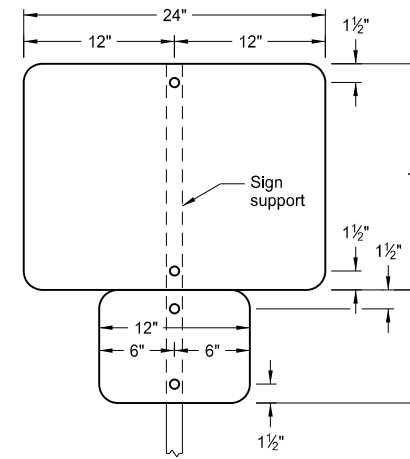
1 Post
Assembly No. 100



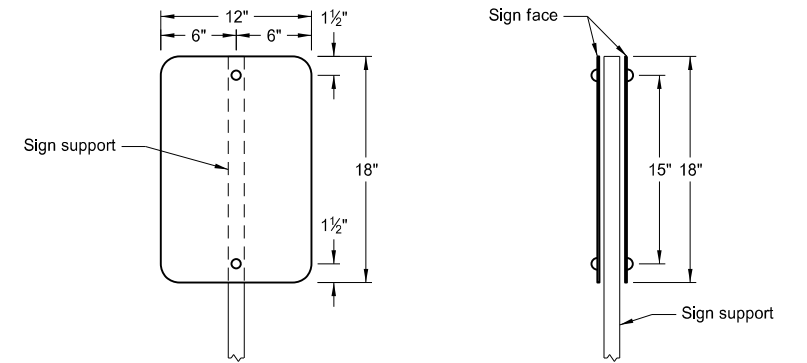
1 Post
Assembly No. 101



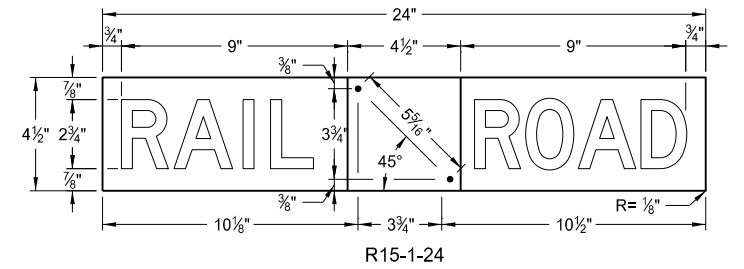
1 Post
Assembly No. 102



1 Post
Assembly No. 103

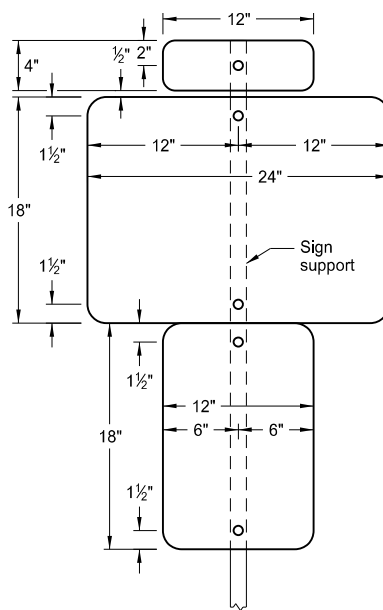


1 Post
back to back
Assembly No. 104

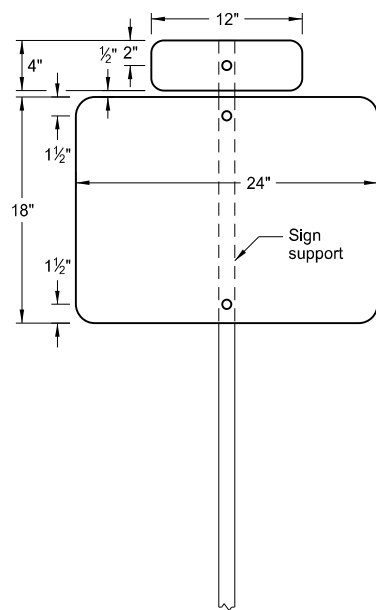


White reflectorized background
Black non-reflectorized letters
Punch holes round for 3/8" dia bolts. Rotate bolt location 90 degrees from detail above.

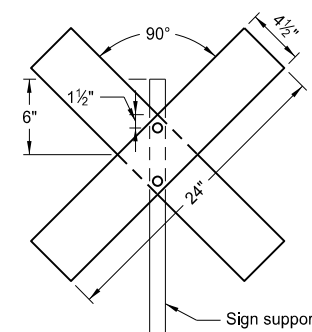
R15-1-24
Railroad Crossing Sign Details



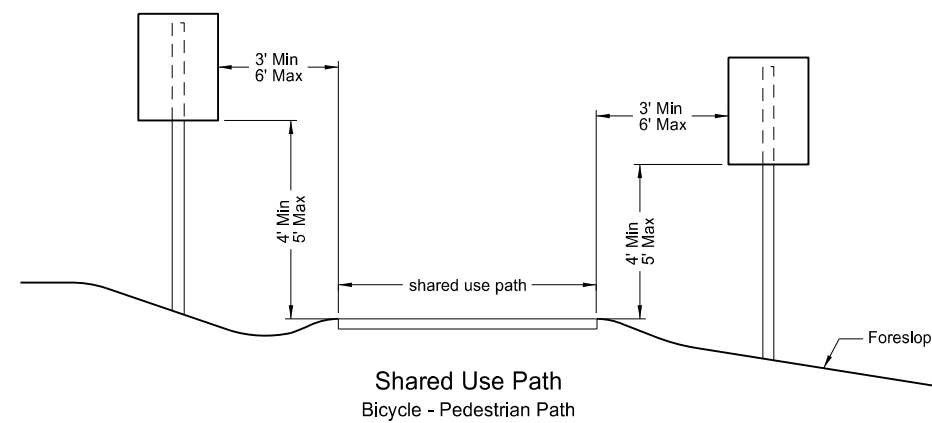
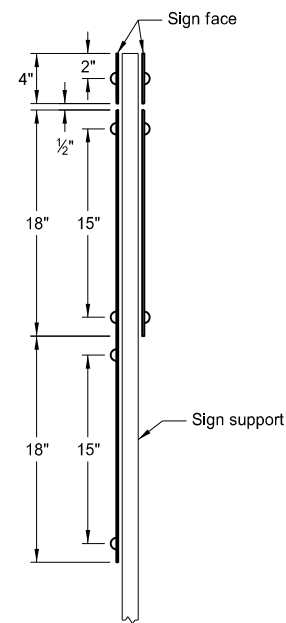
1 Post
back to back
Assembly No. 105



1 Post
Assembly No. 106



1 Post
Assembly No. 107



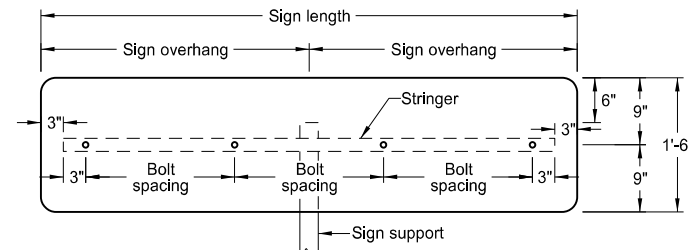
Shared Use Path
Bicycle - Pedestrian Path

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

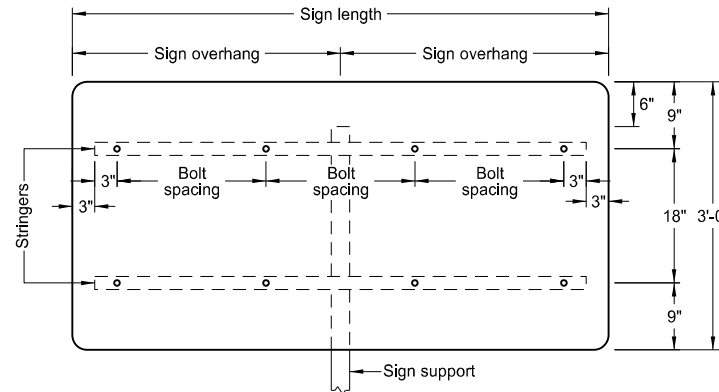
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
9-18-15	Revised Title Name.
8-30-18	Updated notes to active voice.
9-04-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by
Kirk J Hoff,
Registration Number
PE- 4683,
on 9/04/19 and the original document is stored at the North Dakota Department of Transportation

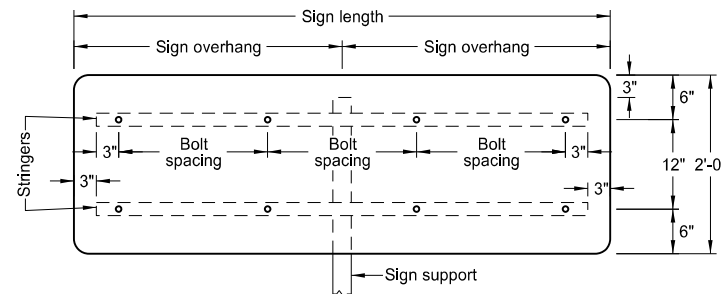
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS



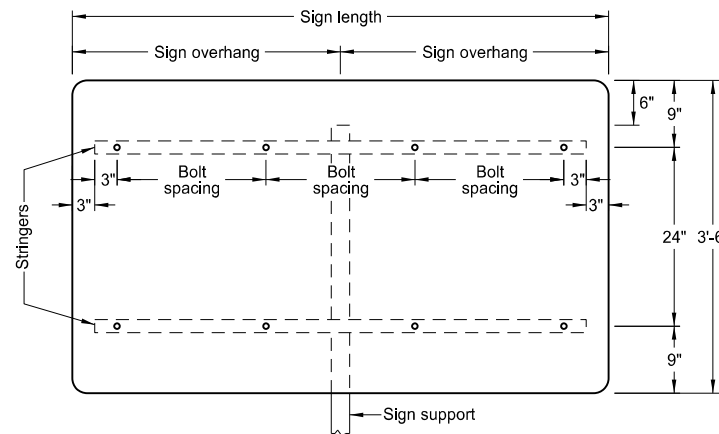
VARIES X 1'-6"



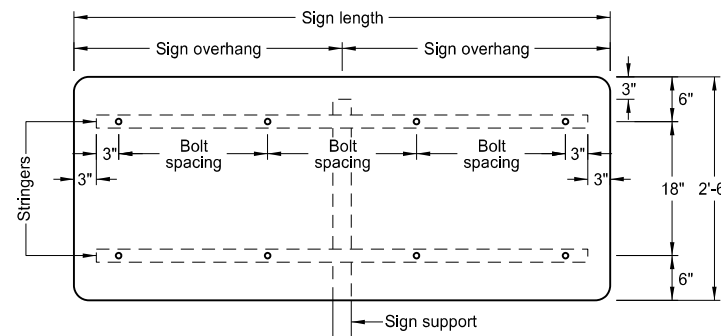
VARIES X 3'-0"



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"

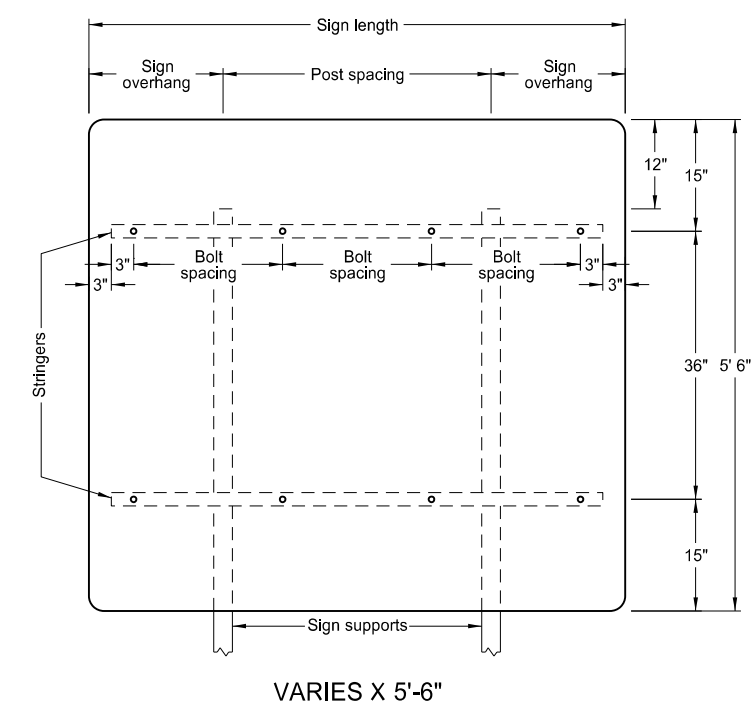
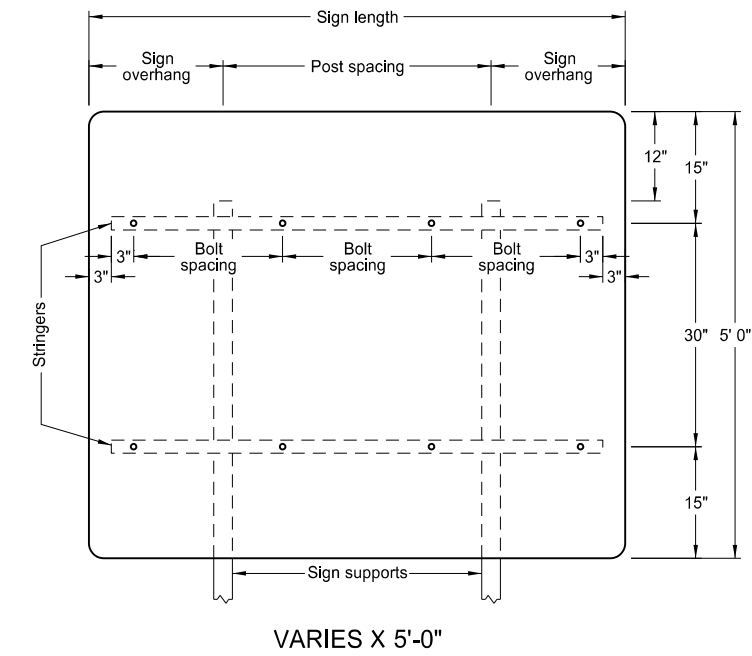
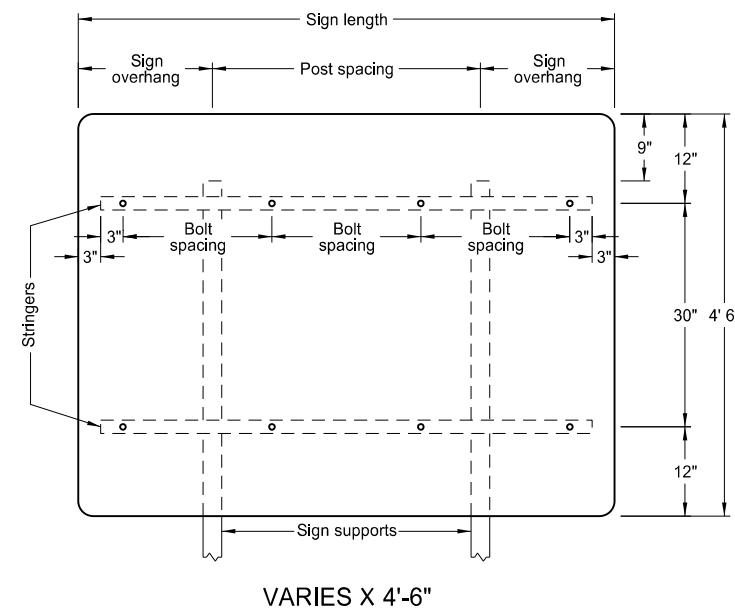
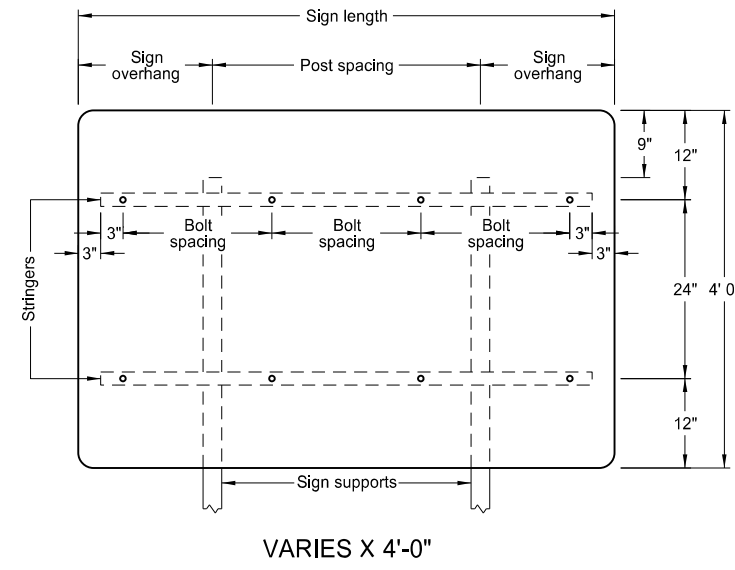
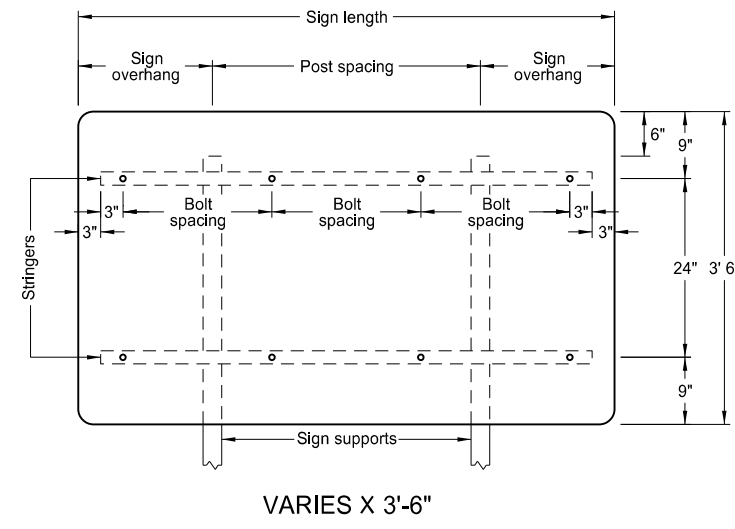
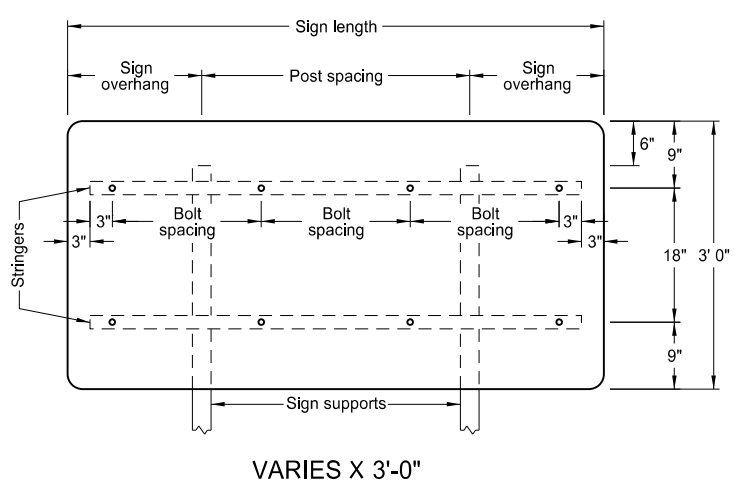
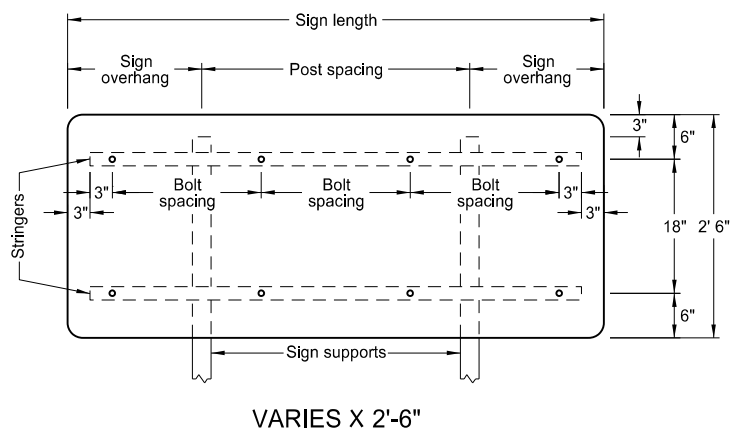
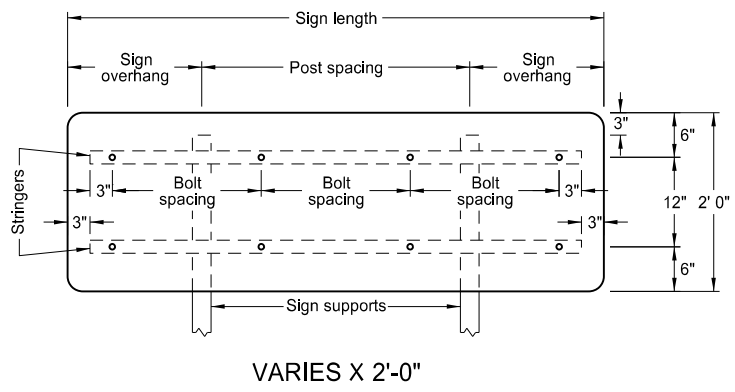
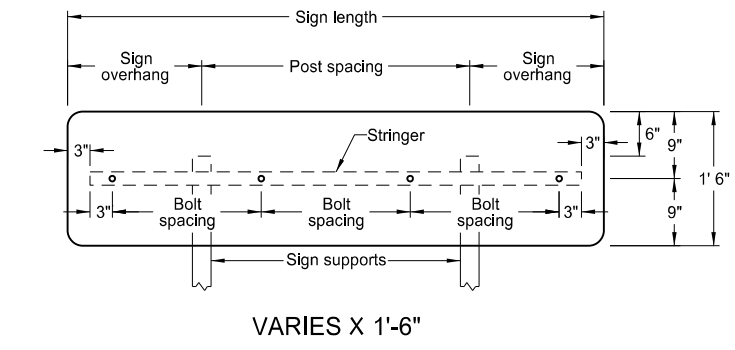
Notes:

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



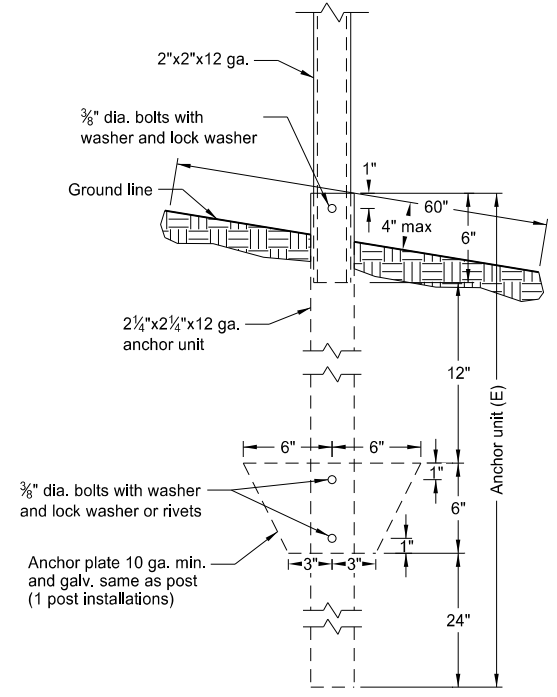
2 POSTS			
Sign Length	Sign Overhang	Post Spacing	Bolt Spacing
4'-0"	1'-0"	2'-0"	18"
4'-6"	1'-3"	2'-0"	21"
5'-0"	1'-0"	3'-0"	24"
5'-6"	1'-3"	3'-0"	18"
6'-0"	1'-6"	3'-0"	20"
6'-6"	1'-3"	4'-0"	22"
7'-0"	1'-6"	4'-0"	24"
7'-6"	1'-9"	4'-0"	2-20" & 2-19"
8'-0"	2'-0"	4'-0"	21"
8'-6"	1'-9"	5'-0"	2-22" & 2-23"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

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

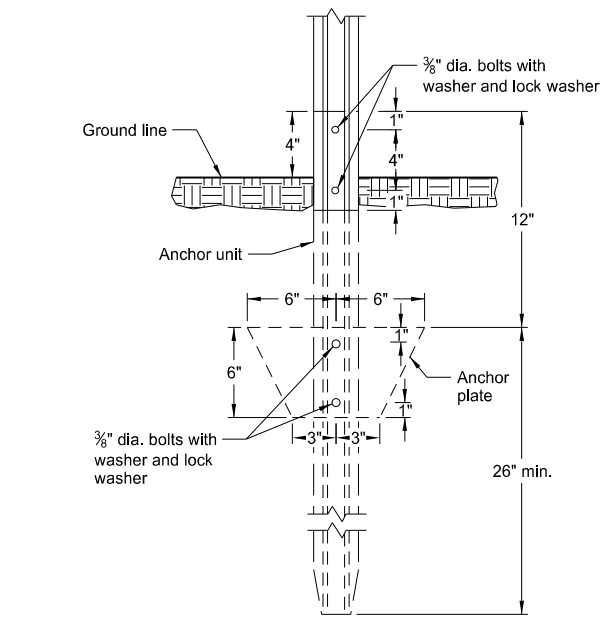
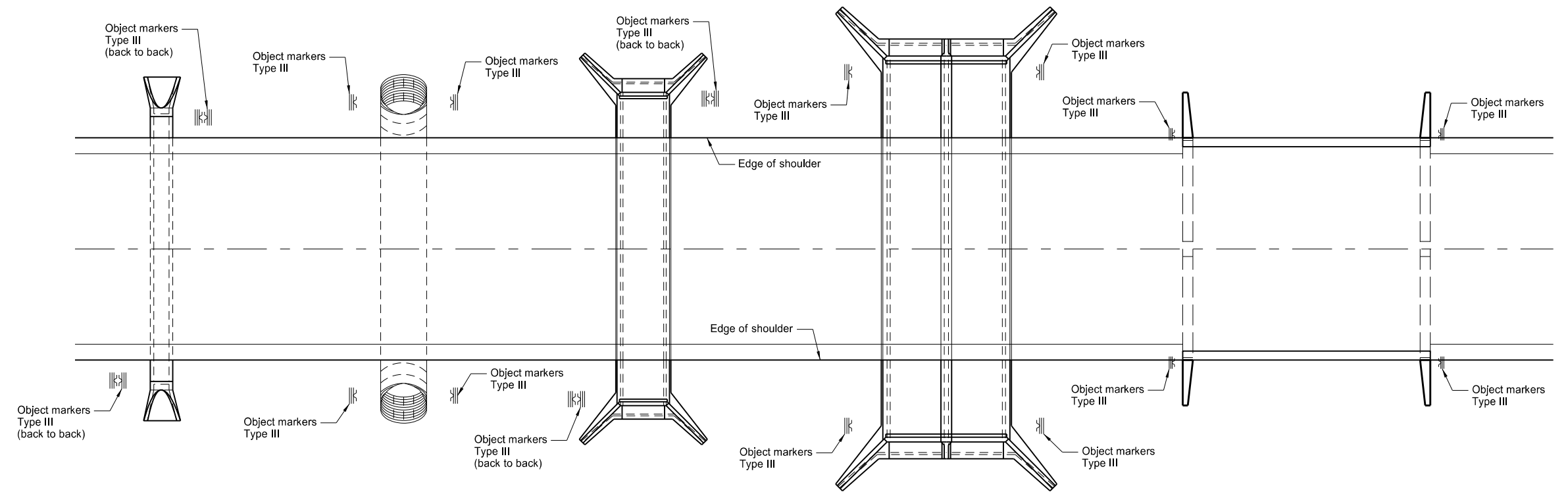
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
9-04-19	New Design Engineer PE Stamp.

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 of Transportation

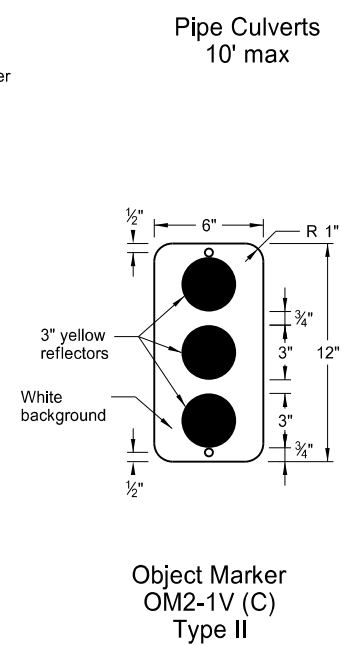
OBJECT MARKERS



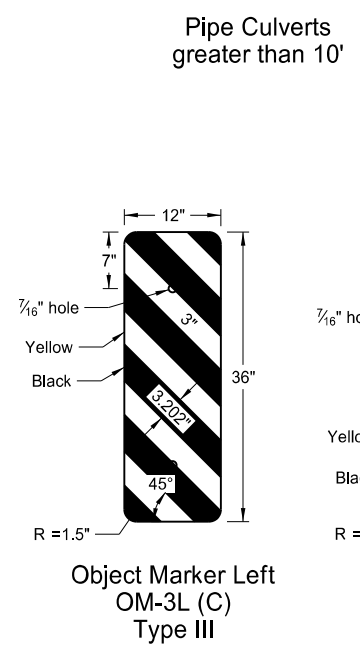
Perforated Tube Anchor Unit Assembly



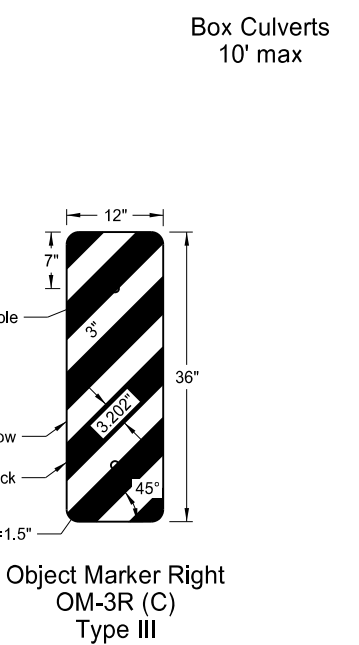
U-Channel Anchor Unit Assembly



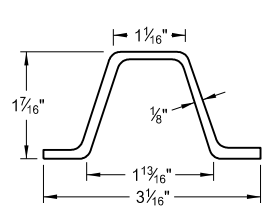
Object Marker OM2-1V (C) Type II



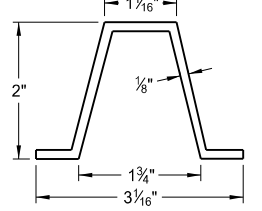
Object Marker Left OM-3L (C) Type III



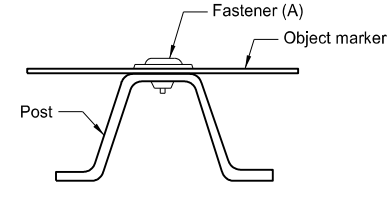
Object Marker Right OM-3R (C) Type III



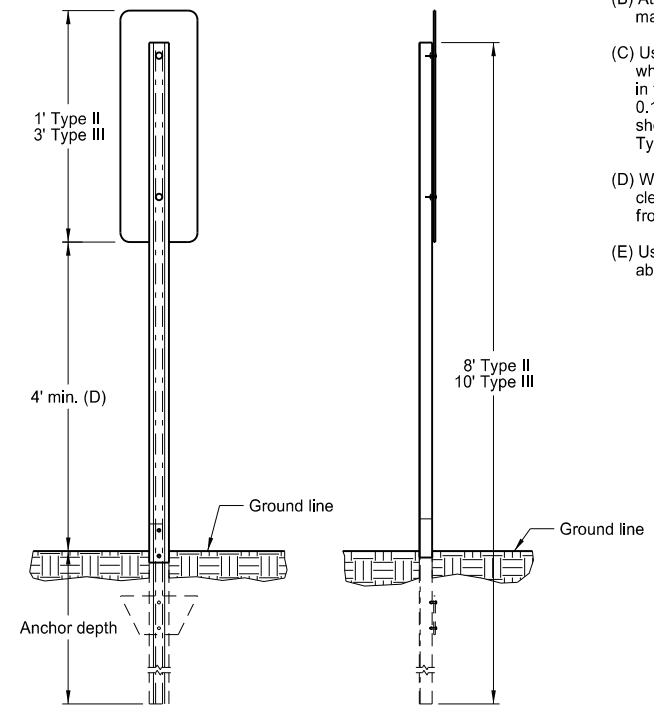
Steel Post Detail
Approx. 2 lb/ft



Aluminum Post Detail
Approx. 0.88 lb/ft



Fastener Detail



Object Marker Installation Detail

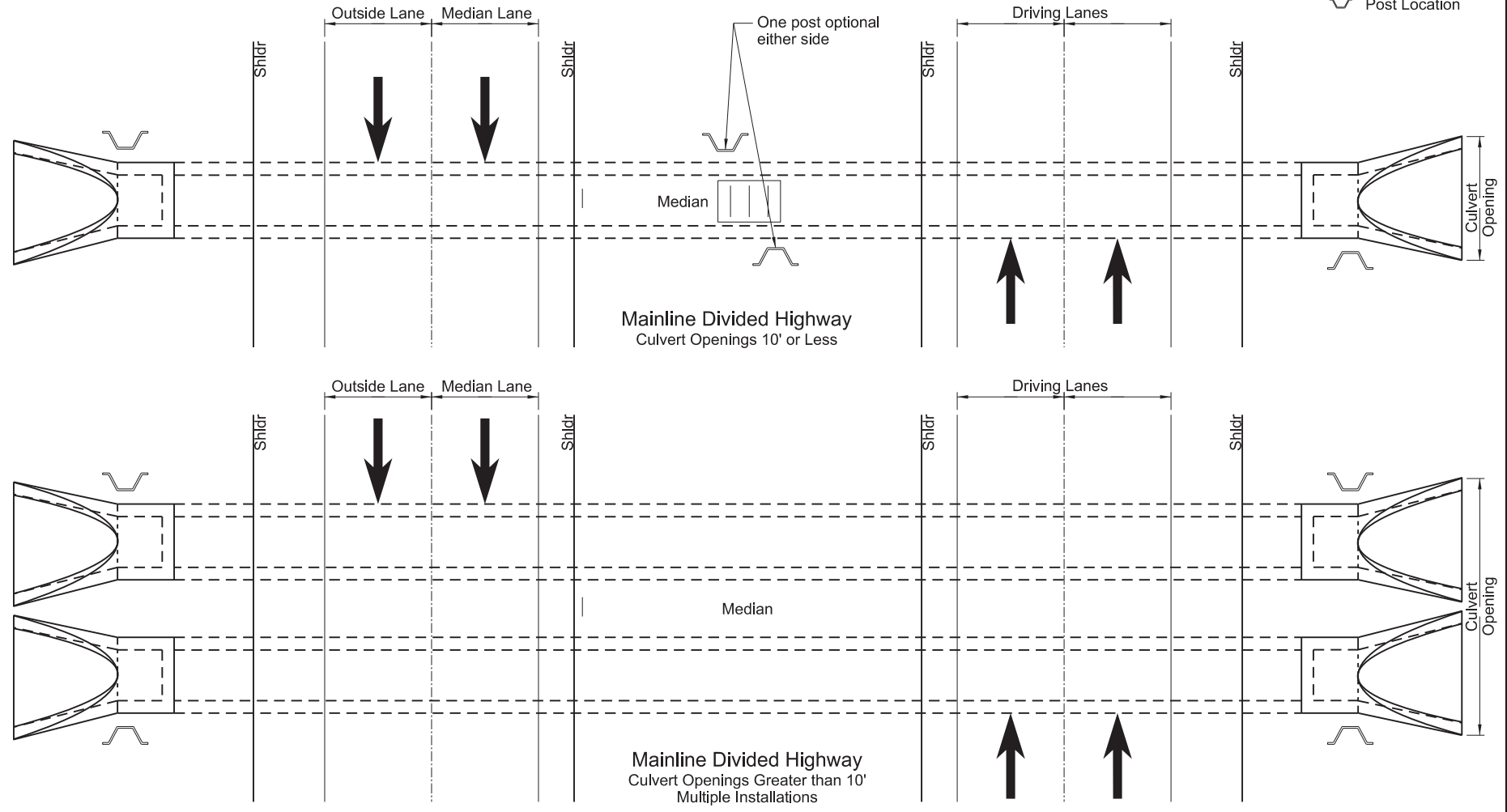
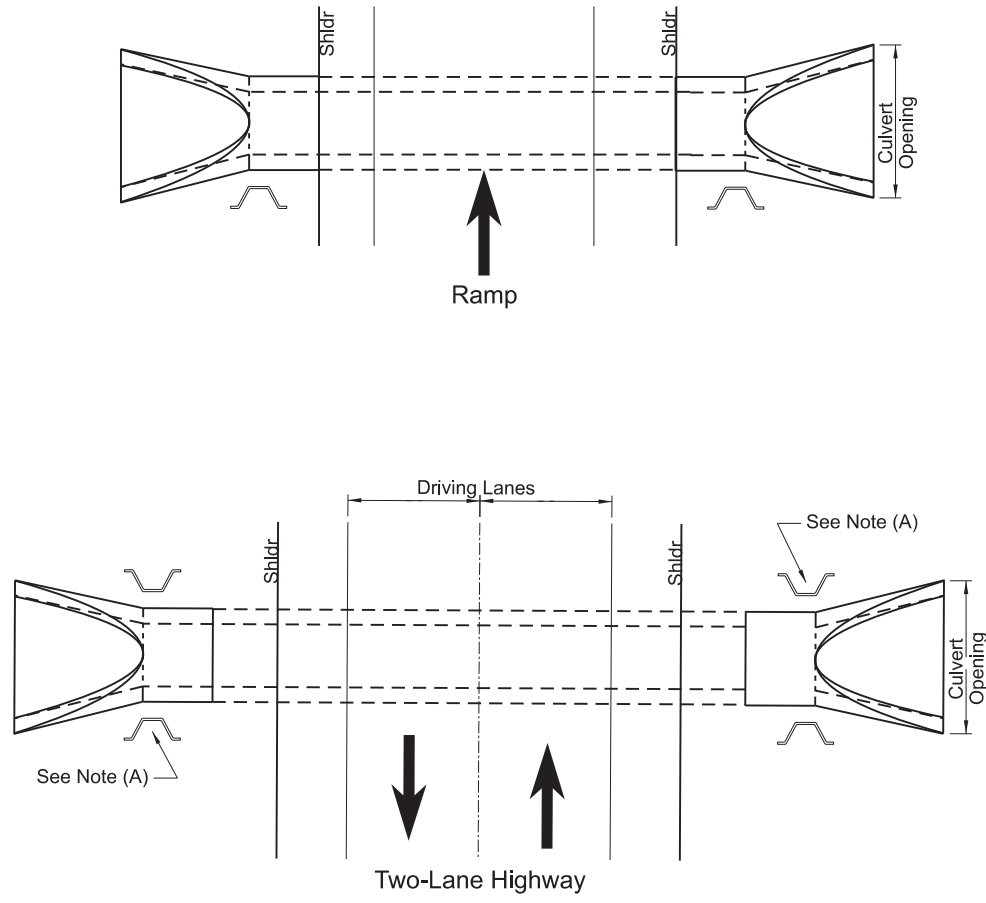
Notes:

- (A) Use 3/8" dia. tension pin type or other non-rust vandal resistant fastener with min. outside dia. 1 3/16" flat washer.
- (B) At locations of approach guardrail with reflectors and end terminal with impact head object markers, do not install object markers.
- (C) Use two object markers for back to back mountings. On bridges where the distance between wheel guards is less than the approach width, mount object markers vertically on steel posts in front of the bridge railing on each side of highway to mark the horizontal clearance. Use 0.100" minimum thickness sheet aluminum for sign backing material. Use ASTM Type XI sheeting for Type III object markers and ASTM Type IV background sheeting with ASTM Type XI reflectors for Type II object markers.
- (D) When object marker is located 8' or less from shoulder or curb, provide 4' minimum vertical clearance from near edge of traveled way to bottom of sign. When located more than 8' from shoulder or curb provide 4' minimum vertical clearance from ground to bottom of sign.
- (E) Use 4" vertical clearance for anchor or breakaway base. Provide 4"x60" measurement above and below post location and back and ahead of post.

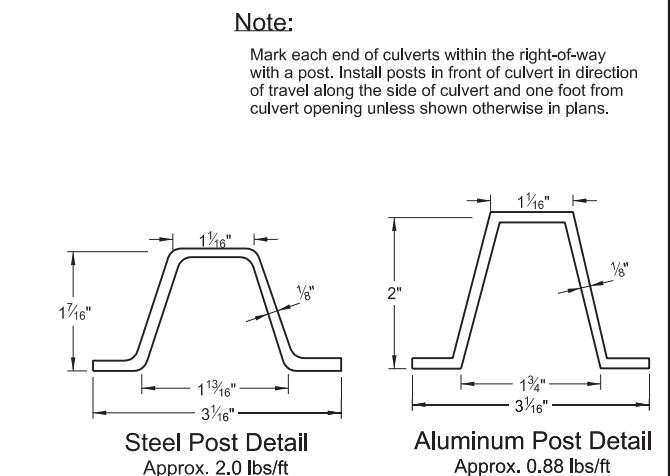
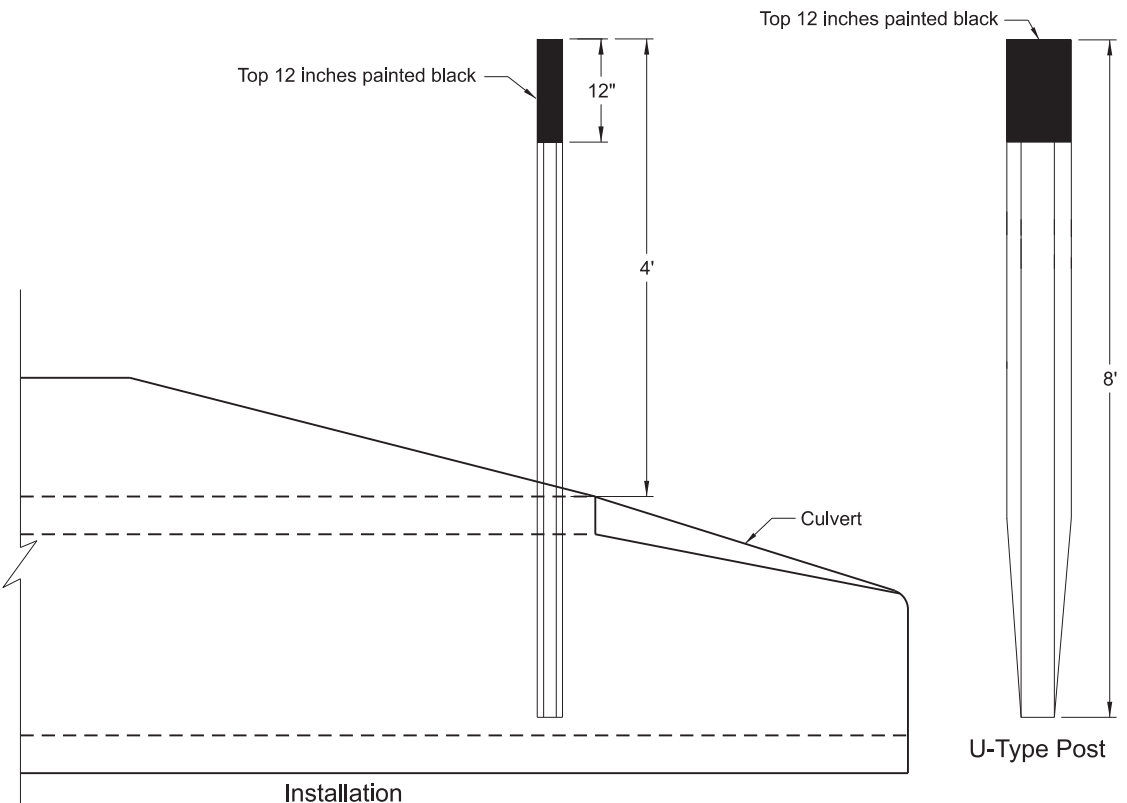
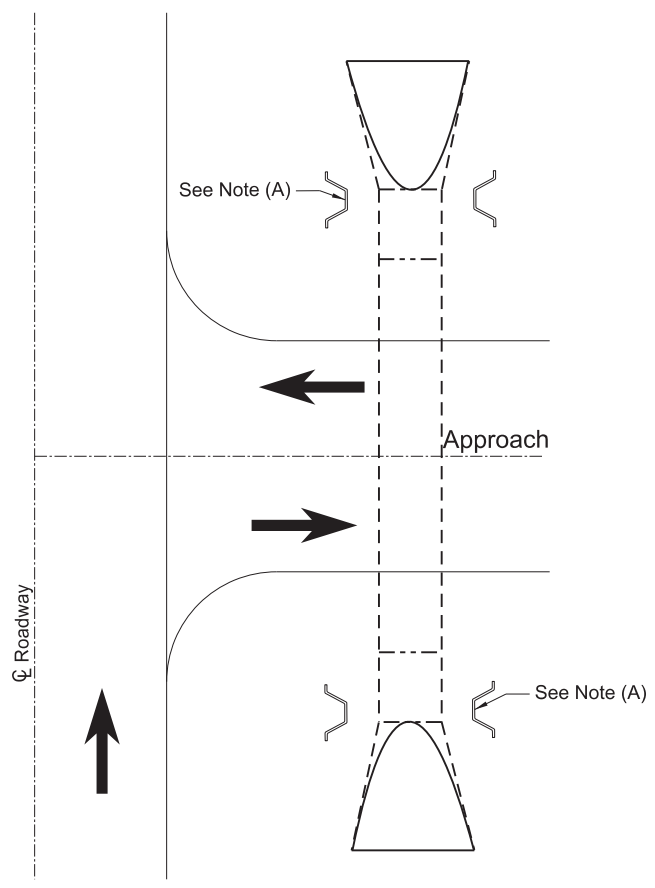
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-18-14	Revised Note C
8-30-18	Updated notes to active voice and removed note.
9-05-19	New Design Engineer PE Stamp.

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OBJECT MARKERS - CULVERTS



(A) Install additional marker where multiple pipe installations have a width greater than 10'.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-05-13	
REVISIONS	
DATE	CHANGE
7-7-14	Revised Notes
8-30-18	Updated notes to active voice.
9-05-19	New Design Engineer PE Stamp.
3-13-25	Added Approach Pipe Detail.



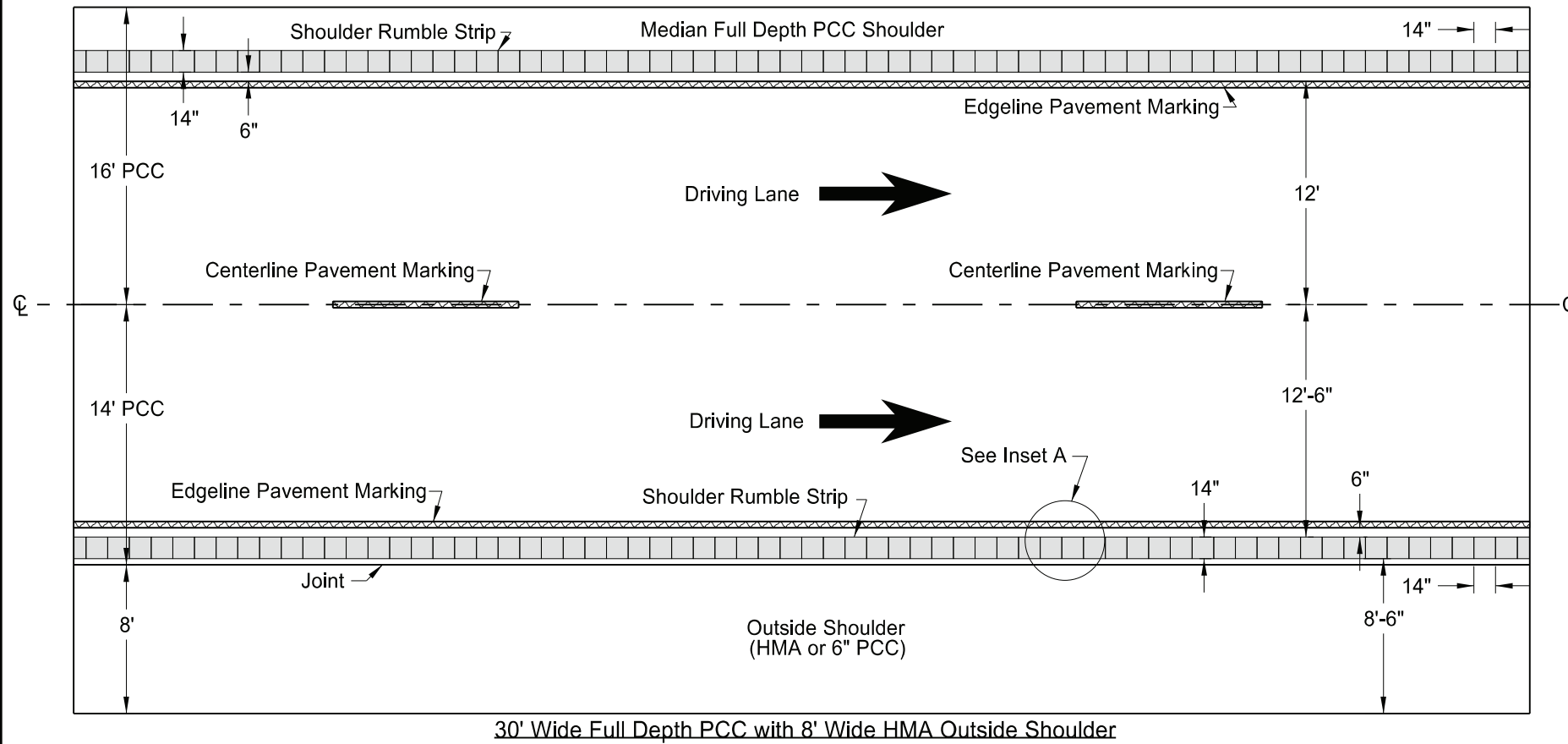
03/13/25

RUMBLE STRIPS INTERSTATE HIGHWAYS

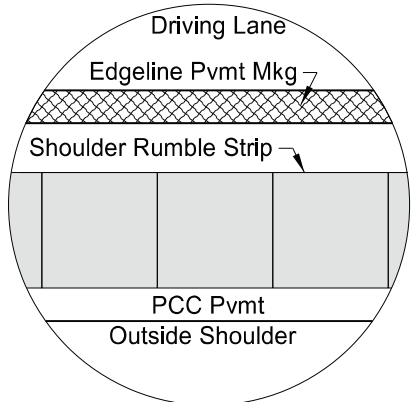
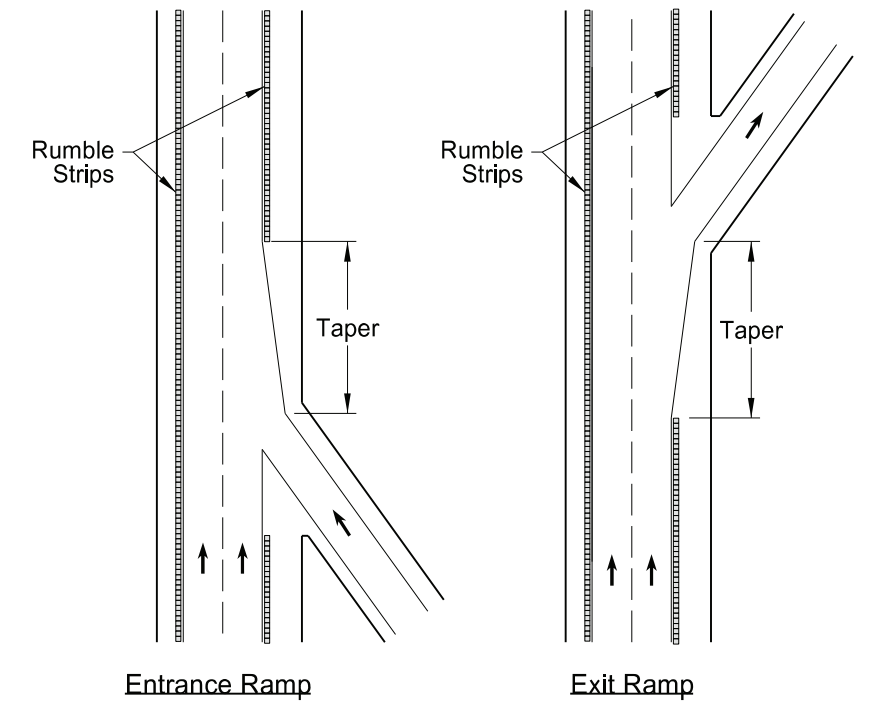
D-760-1

NOTES:

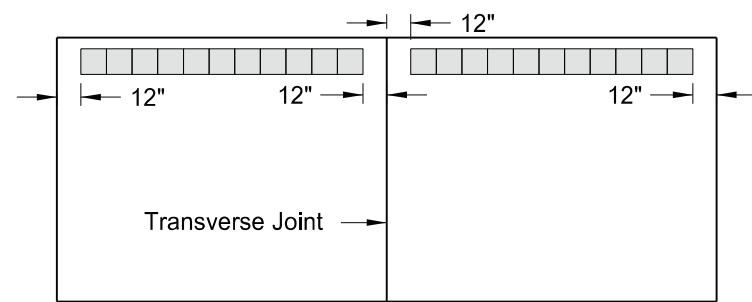
- 1) Discontinue rumble strips through ramps and tapers.



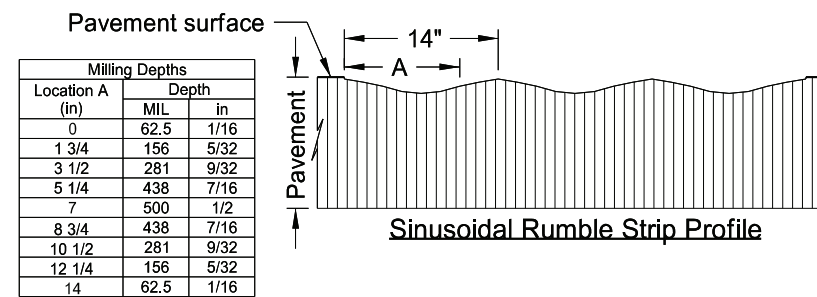
30' Wide Full Depth PCC with 8' Wide HMA Outside Shoulder



Inset A - Shoulder Rumble Strip
(Layout for opposite shoulder reversed)



Discontinue rumble strip approx. 12" on both sides of PCC transverse joint

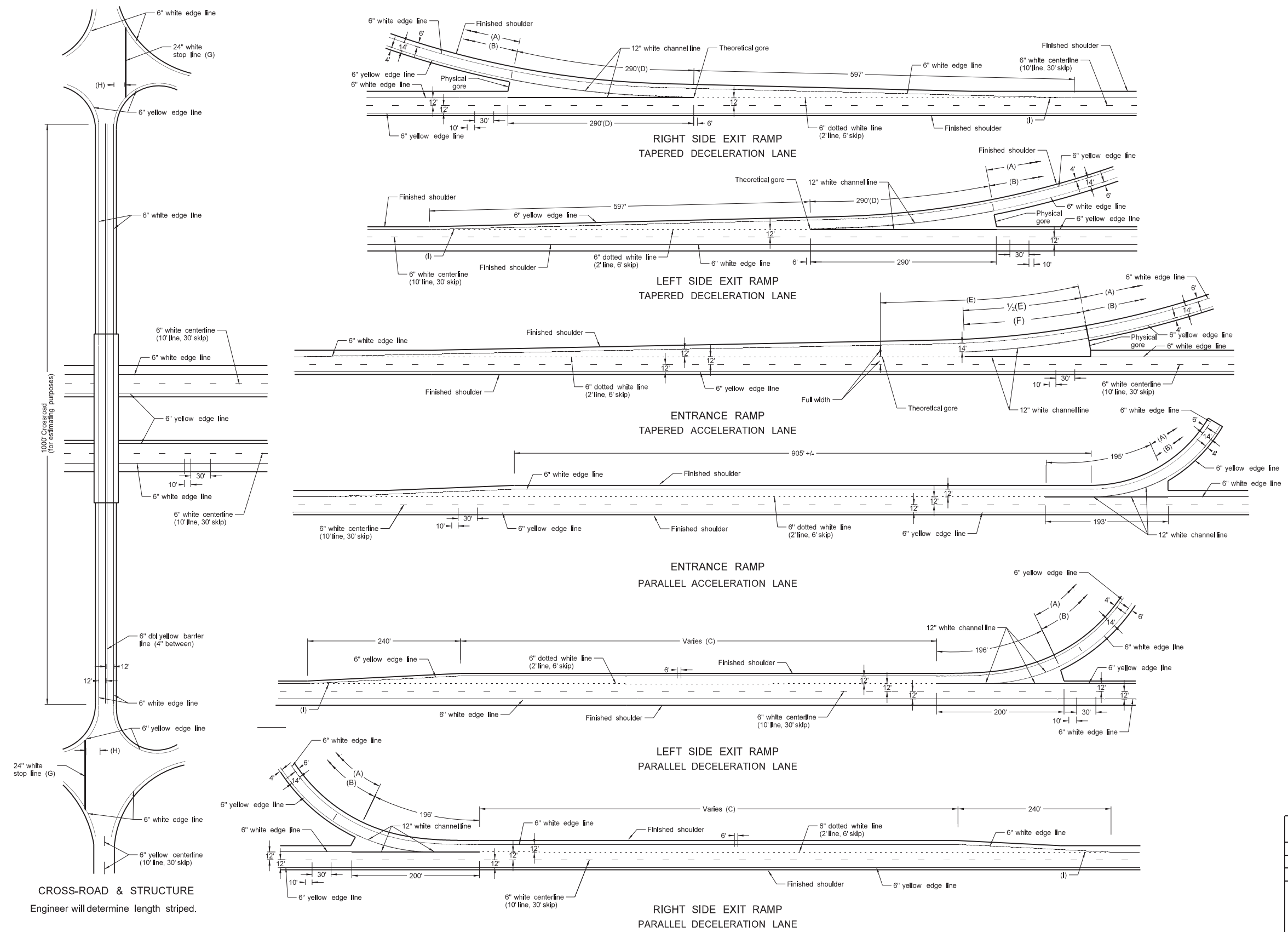


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-29-09	
REVISIONS	
DATE	CHANGE
2-25-10	Note 4 was added.
9-08-11	Revised Notes and D-760-1.
8-30-18	Revised drawings for clarity.
10-25-19	Added missing dimensions.
11-16-21	Added rumbles to end of taper.
5-26-23	Rumble strips made sinusoidal.



05/26/23

INTERSTATE PAVEMENT MARKING 4 LANE DIVIDED HIGHWAY



- NOTE:
- (A) Normal width white edge line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph.
Use 4 or 6 inch wide pavement marking for all other roadways with speed limits ≤ 40 mph.
 - (B) Normal width yellow edge line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph.
Use 4 or 6 inch wide pavement marking for all other roadways with speed limits ≤ 40 mph.
 - (C) Assume "varies" equals 790' for purpose of estimate. Place pavement marking from beginning of taper to the 12" line.
 - (D) Beginning of physical gore to theoretical gore.
 - (E) If the distance is less than 350' extend the 12" channel line to the theoretical gore, otherwise use 195'.
 - (F) Use 195' for estimating purposes.
 - (G) Not required for gravel surface crossroad approaches.
 - (H) 4' minimum, 15' maximum from nearest edge of intersection traveled way.
 - (I) Extend dotted line until it touches the edgeline.

LOCATION	BASIS OF ESTIMATE	
	ITEM	
Right or Left Side Exit Ramp TAPERED	12" White channel line	580 LF
	24" White stop line	60 LF
	6" White dotted line	148 LF
	6" White edge line	1115 LF
	6" Yellow edge line	1075 LF
Entrance Ramp TAPERED	12" White channel line	390 LF
	6" White dotted line	258 LF
	6" White edge line	1270 LF
Right or Left Side Exit Ramp PARALLEL	12" White channel line	398 LF
	24" White stop line	60 LF
	6" White dotted line (C)	258 LF
	6" White edge line	1115 LF
	6" Yellow edge line	1075 LF
Entrance Ramp PARALLEL	12" White channel line	388 LF
	6" White dotted line	283 LF
	6" White edge line	1275 LF
	6" Yellow edge line	1075 LF
Main Line (Both Roadways)	6" White lane line, 10' line, 30' skip	2640 LF/MI
	6" White edge line	10,560 LF/MI
	6" Yellow edge line	10,560 LF/MI
Cross Road	6" White edge line	2000 LF
	6" Dbl yellow barrier line (4" between)	2000 LF

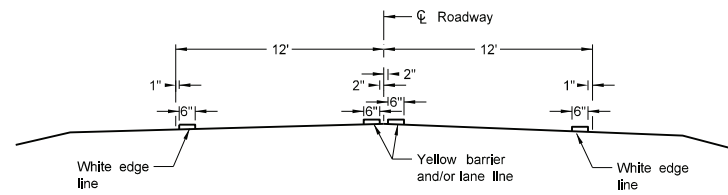
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-3-11	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice
10-25-19	Replaced 2' Max dim with Note (I)
11-05-21	Revised labels
11-22-23	Revised pvmt marking widths
1-17-24	Revised wide pvmt marking width



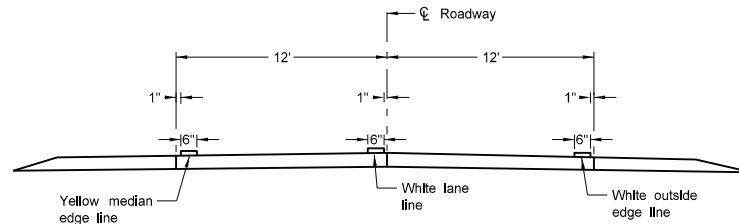
CROSS-ROAD & STRUCTURE
Engineer will determine length striped.

PAVEMENT MARKING

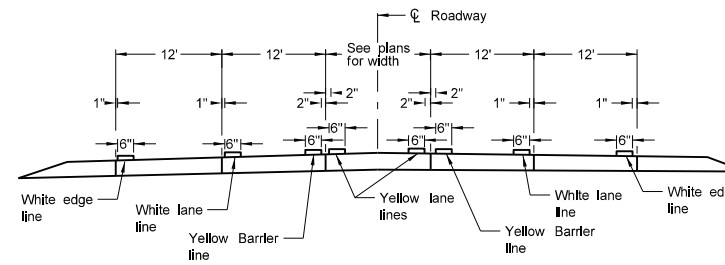
D-762-4



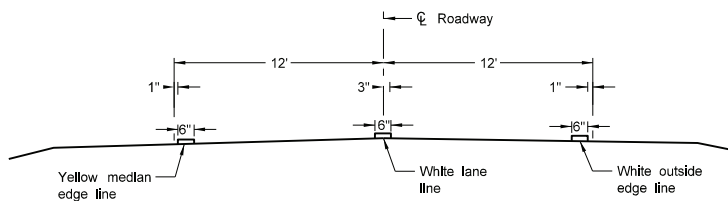
Two Lane Two Way
RURAL ROADWAY



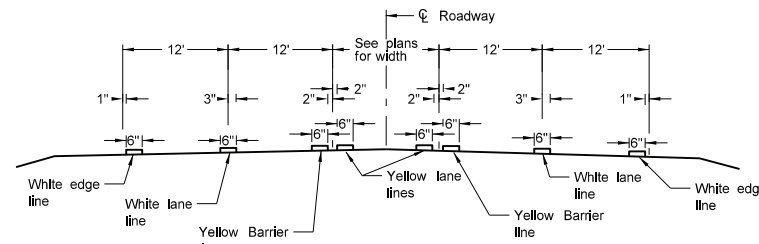
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



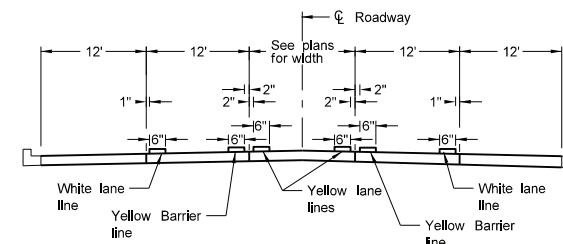
RURAL FIVE LANE ROADWAY
Concrete Section



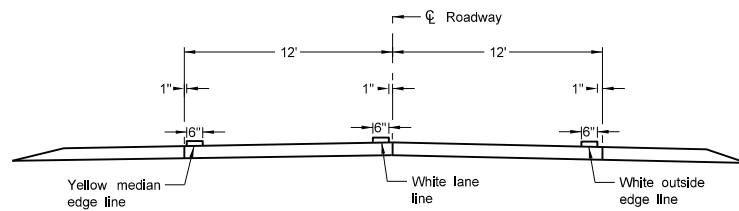
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



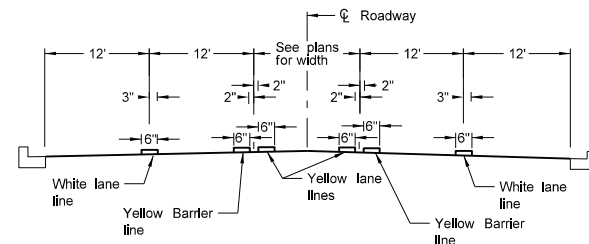
RURAL FIVE LANE ROADWAY
Asphalt Section



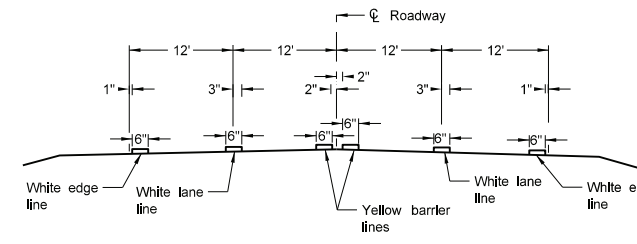
URBAN FIVE LANE SECTION
Concrete Section



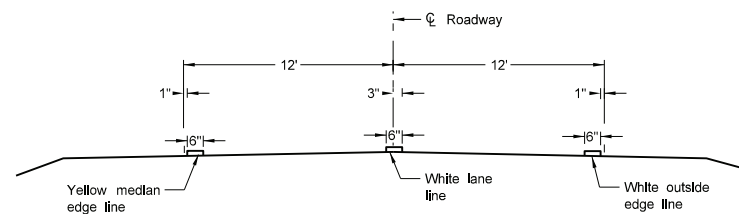
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Concrete Section



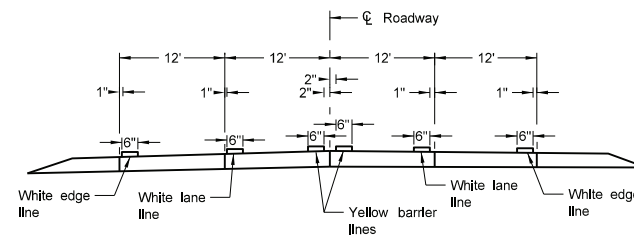
URBAN FIVE LANE SECTION
Asphalt Section



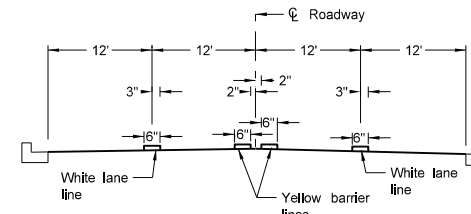
RURAL FOUR LANE ROADWAY
Asphalt Section



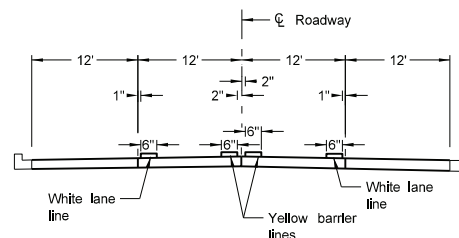
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



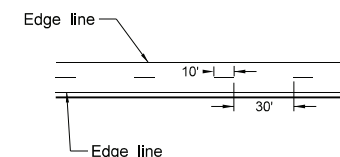
RURAL FOUR LANE ROADWAY
Concrete Section



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.

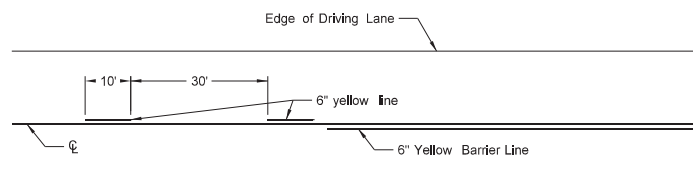
For section lines, county roads, and street approaches, stripe the radii and edge lines of the paved surface within the right of way except where curb and gutter is present.
2. Normal width line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph,
3. Use 4 or 6 inch wide pavement marking for all other roadways with speed limits < 40 mph.

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.
11-22-23	Revised pavement marking widths.
07-09-24	Modified Note 1.

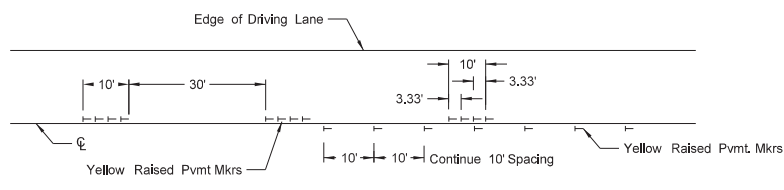


SHORT-TERM PAVEMENT MARKING

D-762-11

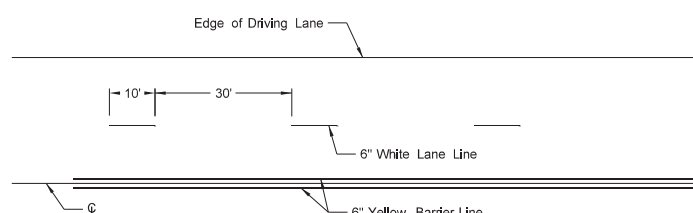


Painted or Tape Lines

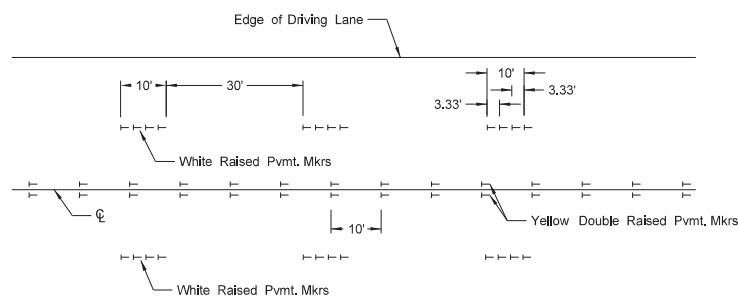


Raised Pavement Markers

TWO-LANE TWO-WAY ROADWAY

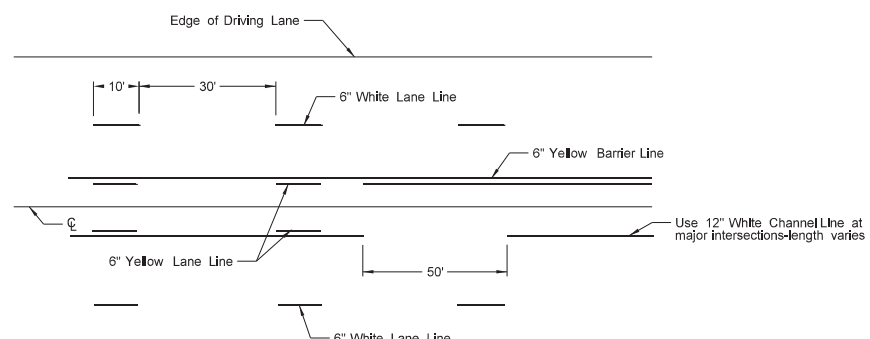


Painted or Tape Lines

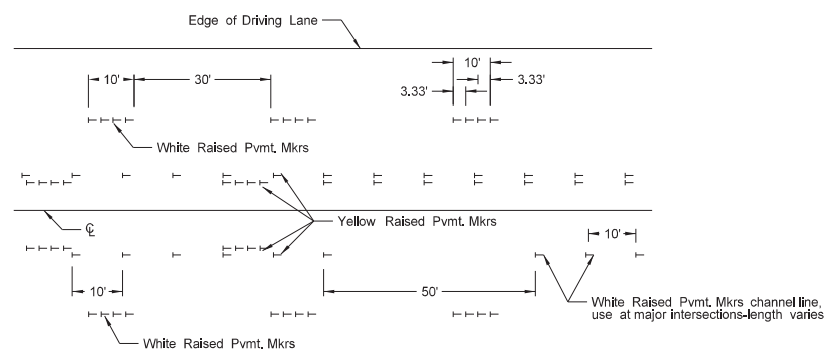


Raised Pavement Markers

FOUR LANE ROADWAY

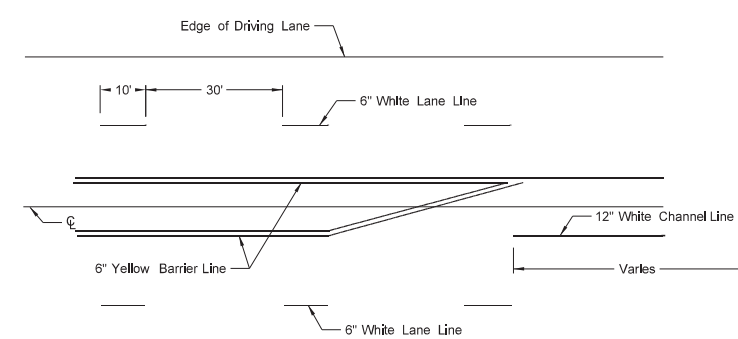


Painted or Tape Lines

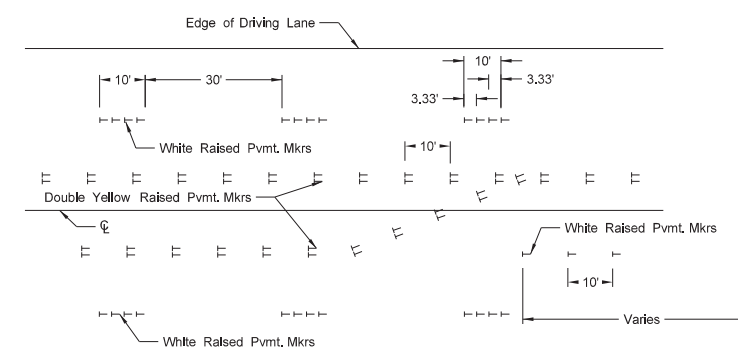


Raised Pavement Markers

FIVE LANE ROADWAY TWO WAY LEFT TURN



Painted or Tape Lines



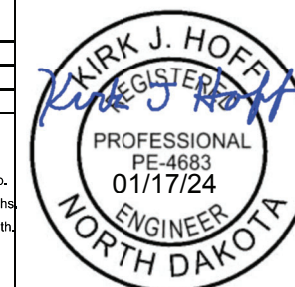
Raised Pavement Markers

FIVE LANE ROADWAY WITH MARKED ISLANDS

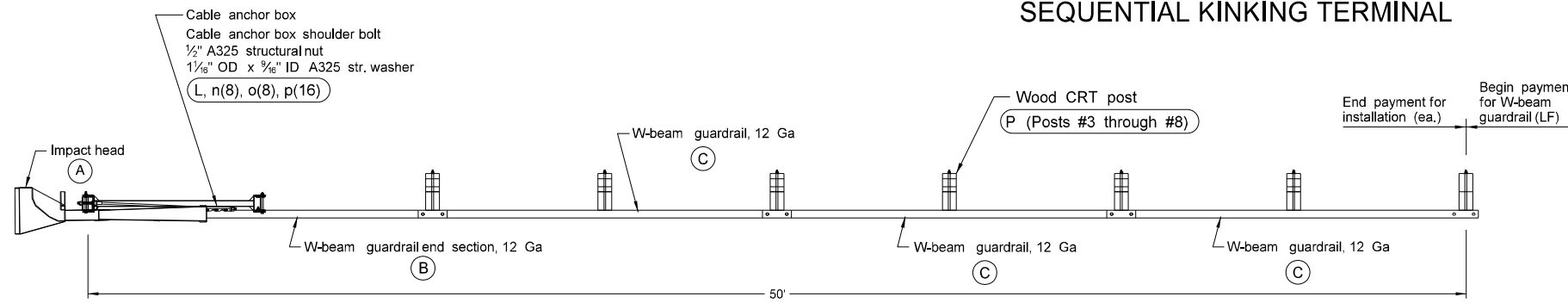
NOTES:

1. Place no passing zones on two-lane two-way roadways as shown. In lieu of short term no passing zone pavement markings, place no passing zone signs. Replace no passing zone signs with short term no passing zone pavement marking within three days.
2. Place short term center line stripe (paint) on top lift to match exact placement of permanent stripe.
3. Remove raised markers and tape markings after permanent pavement marking is installed.
4. Normal width line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph.
5. Use 4 or 6 inch wide pavement marking for all other roadways with speed limits ≤ 40 mph.
6. Wide lines - 8 inches wide if 4 inch normal width lines are used and 12 inches wide if 6 inch normal width lines are used.

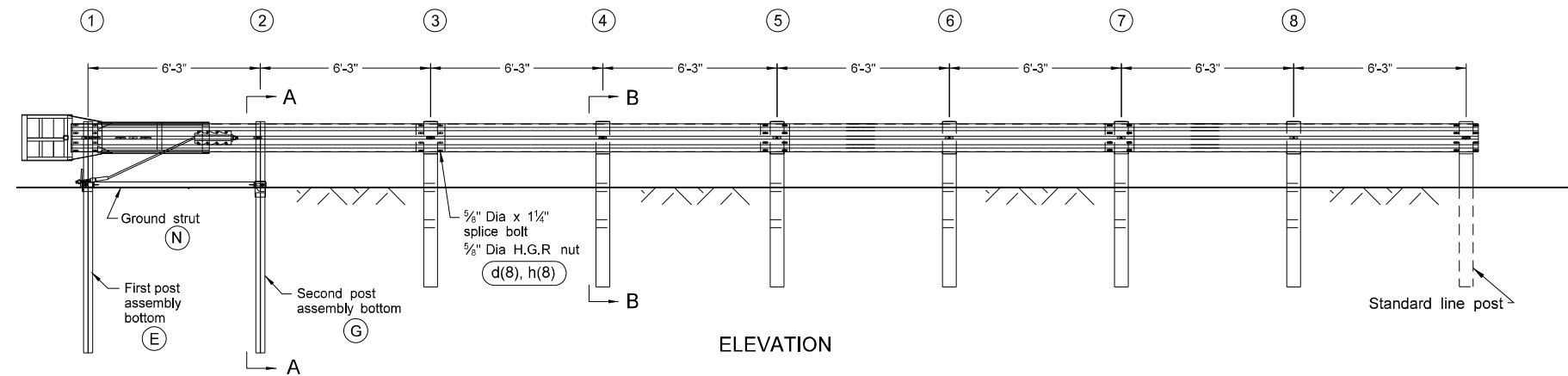
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
3-29-16	Re-numbered to be D-762-11 (previously was D-762-6)
10-17-17	Updated to active voice.
8-27-19	New Desgn Engineer PE Stamp.
11-22-23	Revised pavement marking widths
1-17-24	Revised wide pvmt marking width.



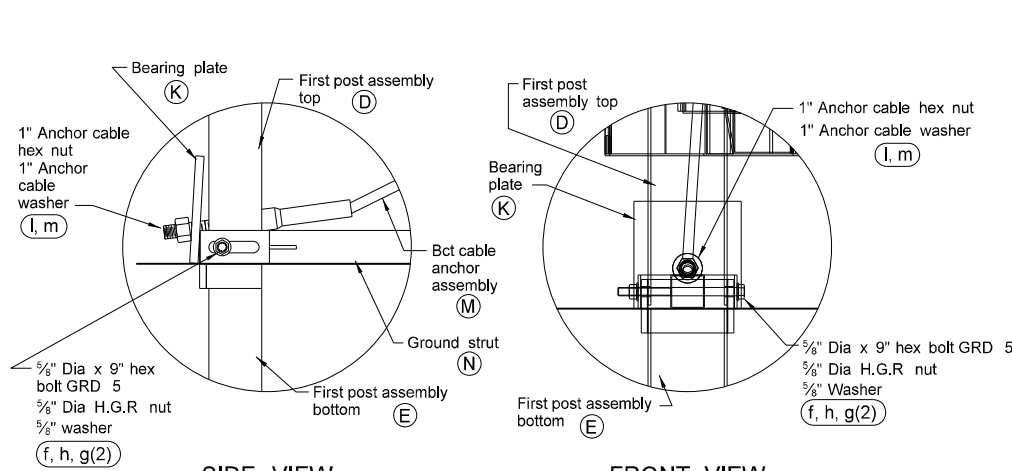
SEQUENTIAL KINKING TERMINAL



PLAN



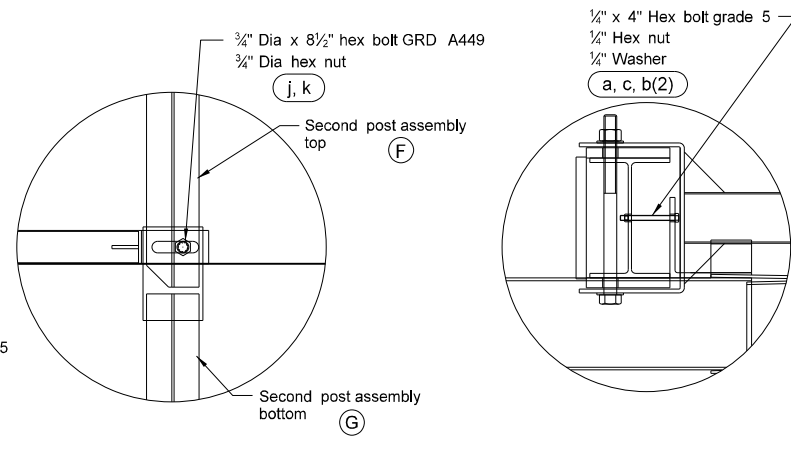
ELEVATION



SIDE VIEW

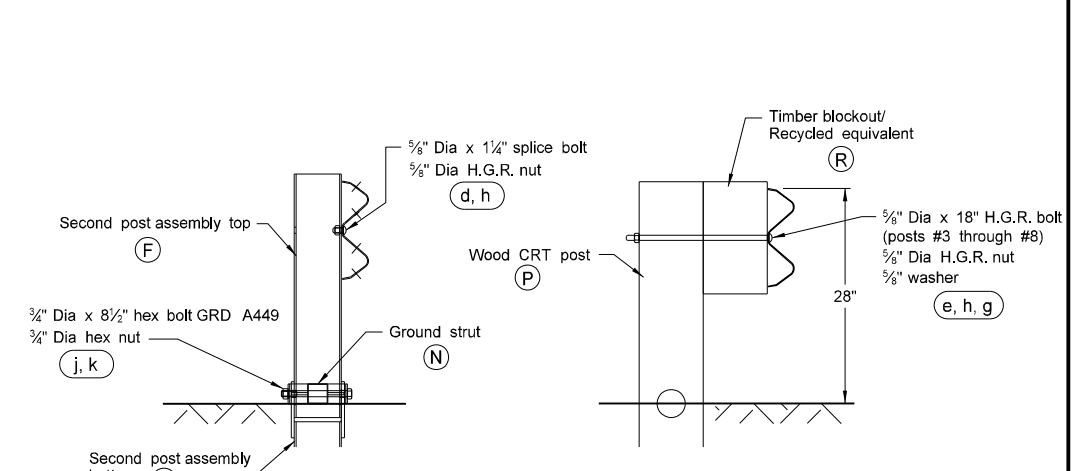
FRONT VIEW

POST #1 CONNECTION DETAILS



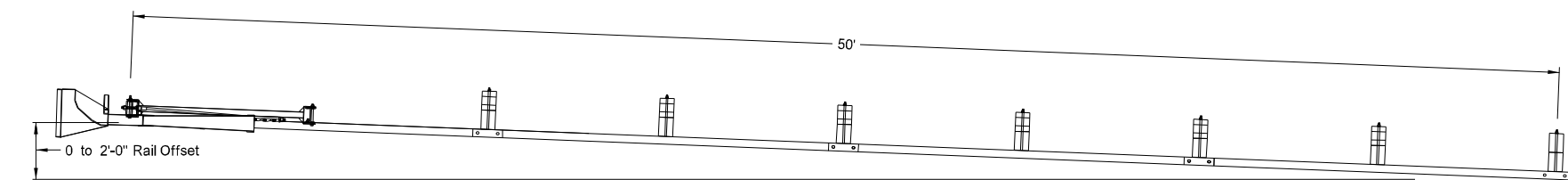
SIDE VIEW DETAIL OF POST #2

IMPACT HEAD CONNECTION DETAIL



SECTION A-A
Post #2

SECTION B-B
Posts #3 through #8



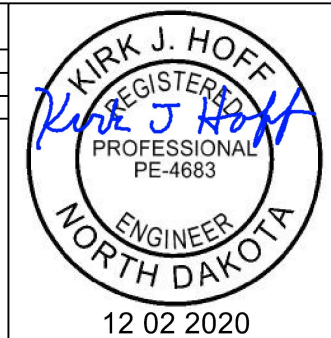
FLARED INSTALLATION
25:1 maximum flare rate

GENERAL NOTES:

- Use breakaway posts with the SKT.
- Use galvanized bolts, nuts, cable assemblies, cable anchors, and bearing plates.
- Flare the SKT at a rate of up to 25:1 to prevent shoulder encroachment by the impact head.
- Grade site as needed to prevent lower sections of the posts from protruding more than 4" above ground (measured along a 5' cord).
- Drive the lower section of the hinged posts without the upper post attached. If the post is placed in a drilled hole, compact the backfill material satisfactorily to prevent settlement.
- When rock is encountered during excavation, use a 10" diameter post hole, 20" into the rock surface, if approved by the engineer. Place granular material in the bottom of the hole, approximately 2 1/2" deep to provide drainage. Field cut posts 1 & 2 to length, place in the hole, and backfill with adequately compacted material excavated from the hole.
- Place the breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent the cable from twisting when tightening nuts.
- "Toe nail" the wood blockouts on post #3 through post #8 with two 20 penny galvanized nails in each rectangular post, to prevent them from turning when the wood shrinks.

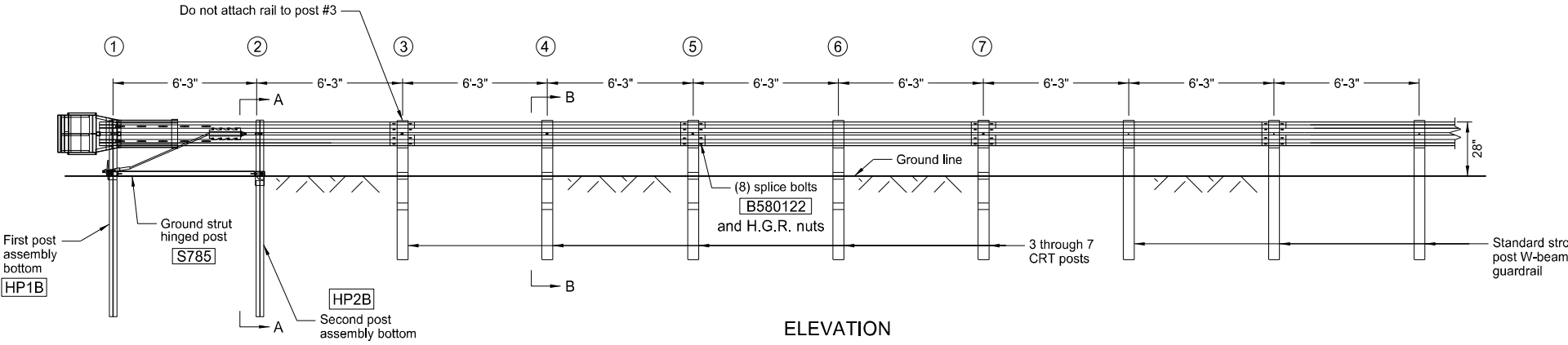
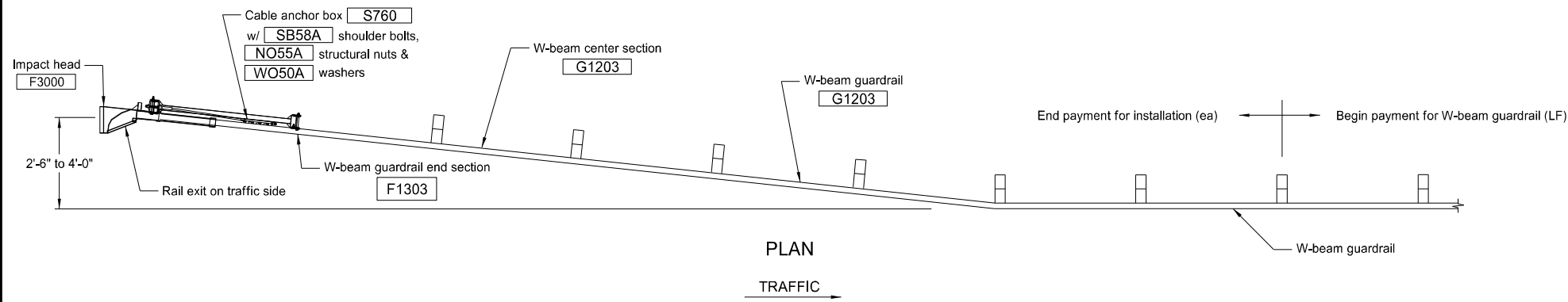
BILL OF MATERIALS		
ITEM	QTY	
A	1	IMPACT HEAD
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga
C	3	W-BEAM GUARDRAIL, 12 Ga
D	1	FIRST POST ASSEMBLY TOP
E	1	FIRST POST ASSEMBLY BOTTOM
F	1	SECOND POST ASSEMBLY TOP
G	1	SECOND POST ASSEMBLY BOTTOM
K	1	BEARING PLATE
L	1	CABLE ANCHOR BOX
M	1	BCT CABLE ANCHOR ASSEMBLY
N	1	GROUND STRUT HINGED POST
P	6	WOOD CRT POST
R	6	TIMBER BLOCKOUT/RCY EQUIVALENT
HARDWARE		
a	2	1/4 " x 4" HEX BOLT Grade 5
b	4	1/2" WASHER
c	2	1/4" HEX NUT
d	25	5/8" Dia X 1 1/4" SPLICE BOLT, POST #2
e	6	5/8" Dia X 18" H.G.R. BOLT (POSTS 3 THRU 8)
f	1	5/8" Dia X 9" HEX BOLT GRD 5
g	8	5/8" WASHER
h	32	5/8" Dia H.G.R. NUT
j	1	3/4" Dia X 8 1/2" HEX BOLT GRD A449
k	1	3/4" Dia HEX NUT
l	2	1" ANCHOR CABLE HEX NUT
m	2	1" ANCHOR CABLE WASHER
n	8	GROUND STRUT HINGED POST
o	8	1/2" A325 STRUCTURAL NUT
p	16	1 1/8" OD X 5/8" ID A325 STR. WASHER

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.



FLARED ENERGY ABSORBING TERMINAL

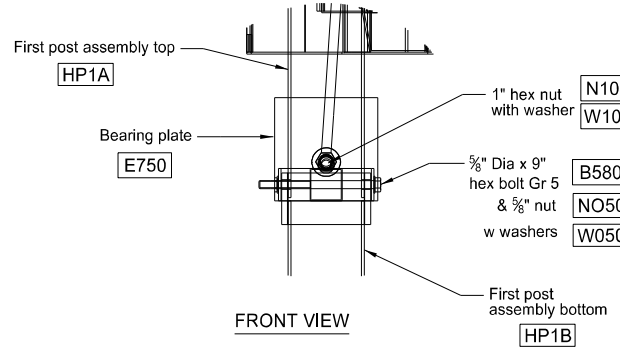
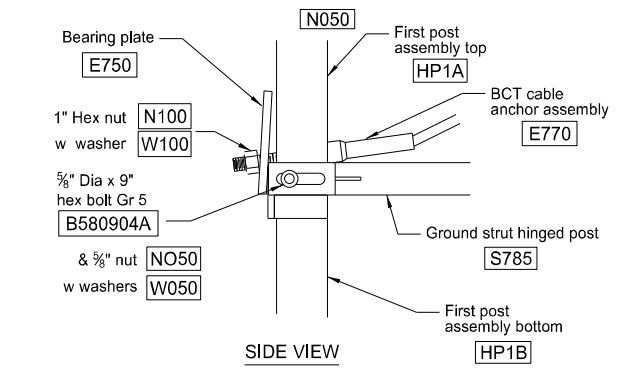
D-764-6



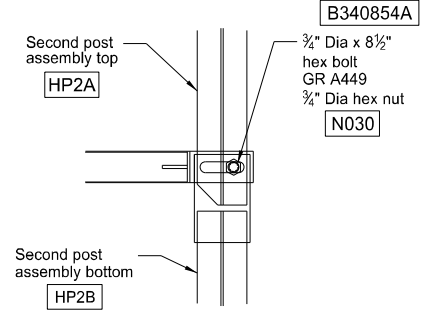
ITEM #	QTY	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA
G1203	2	W-BEAM GUARDRAIL, 12 GA
HP1A	1	FIRST POST ASSEMBLY TOP
HP1B	1	FIRST POST ASSEMBLY BOTTOM
HP2A	1	SECOND POST ASSEMBLY TOP
HP2B	1	SECOND POST ASSEMBLY BOTTOM
P671	5	WOOD CRT POST
P675	5	TIMBER BLOCKOUT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

GENERAL NOTES

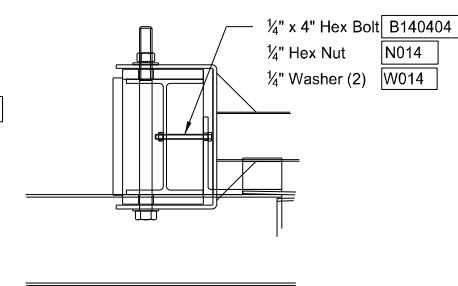
- Use wood posts with the Flared Energy Absorbing Terminal except posts #1 and #2.
- Use galvanized bolts, nuts, cable assemblies, cable anchors, and bearing plates.
- Grade site as needed to prevent lower sections of the posts from protruding more than 4 inches above the ground (measured along a 60 inch cord).
- Drive the lower section without the upper post attached. If the post is placed in a drilled hole, compact the backfill material satisfactorily to prevent settlement.
- When rock is encountered during excavation, use a 12" diameter post hole 20" into the rock surface, if approved by the Engineer. Place granular material in the bottom of hole approximately 2 1/2" deep to provide drainage. Field cut soil tubes to length, place in hole, and back fill with adequately compacted material excavated from hole.
- Place the breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent the cable from twisting when tightening nuts.
- "Toe nail" the wood blockouts to the rectangular wood posts with two 20 penny galvanized nails in each post to prevent them from turning when the wood shrinks.
- Flare the Flared Energy Absorbing Terminal when the approach guardrail is parallel with the roadway. When the approach guardrail is flared at 16:1 to 10:1, flare the Flared Energy Absorbing Terminal at the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, turn the Flared Energy Absorbing Terminal parallel to the roadway.



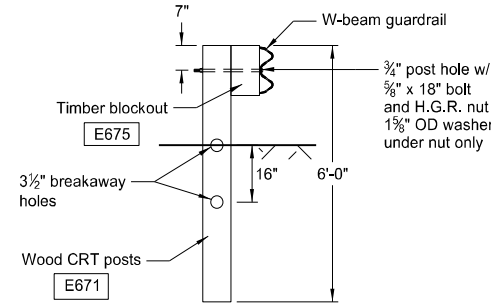
POST #1 CONNECTION DETAILS



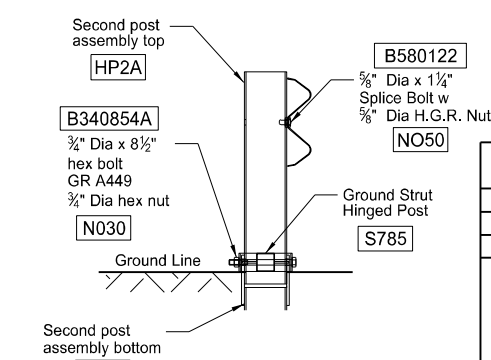
SIDE VIEW DETAIL OF POST #2



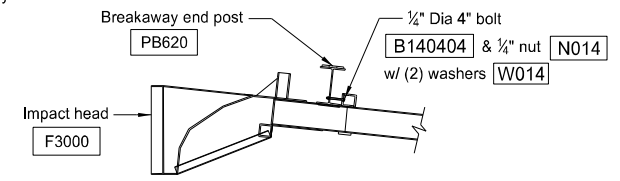
IMPACT HEAD CONNECTION DETAIL



SECTION B-B
POST 3 THRU 7



SECTION A-A
at Post #2



IMPACT HEAD CONNECTING DETAIL

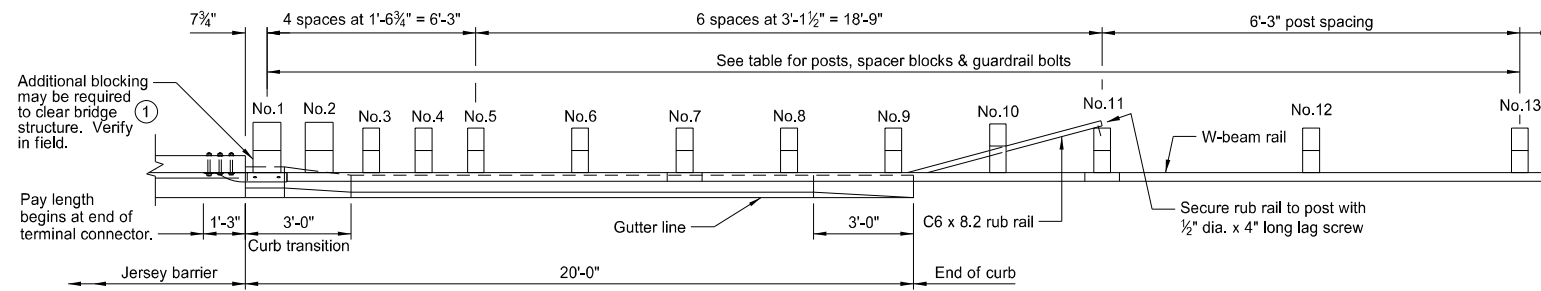
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE
12-02-20	Update notes to active voice.



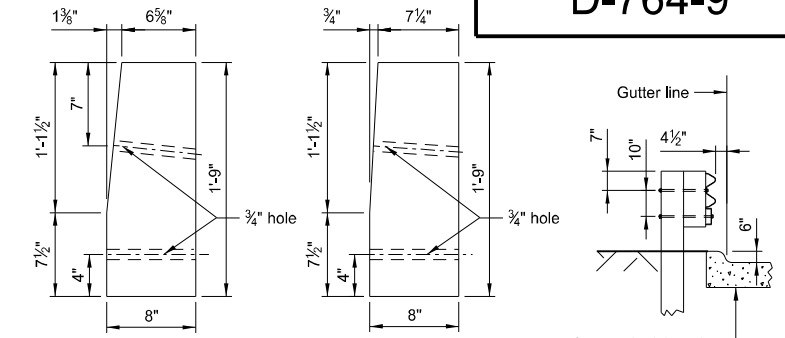
12 02 2020

W-BEAM TRANSITION TO CONCRETE JERSEY BARRIER WITH APPROACH CURB

D-764-9

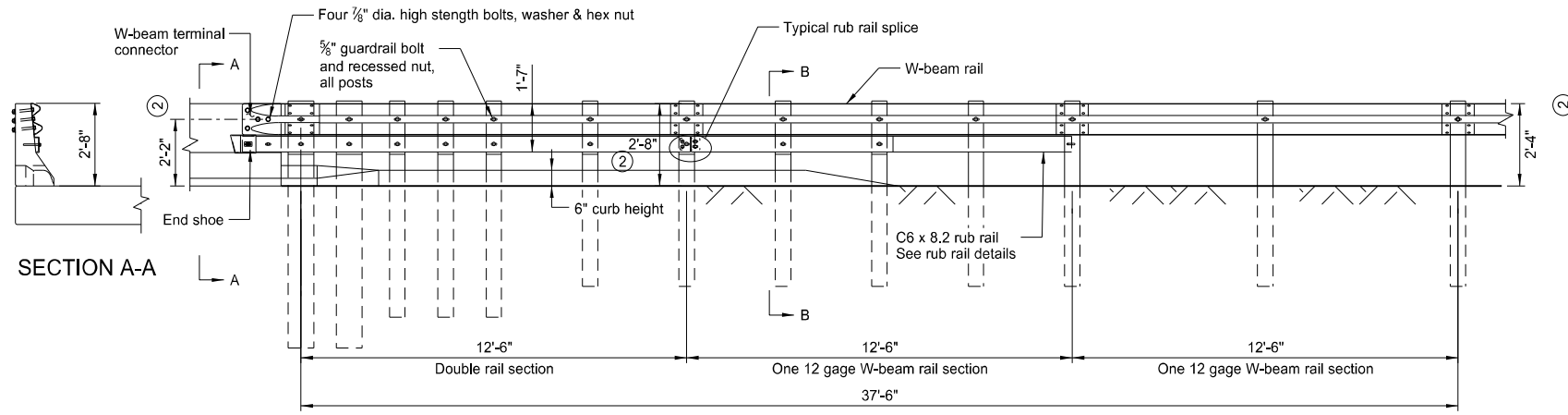


PLAN

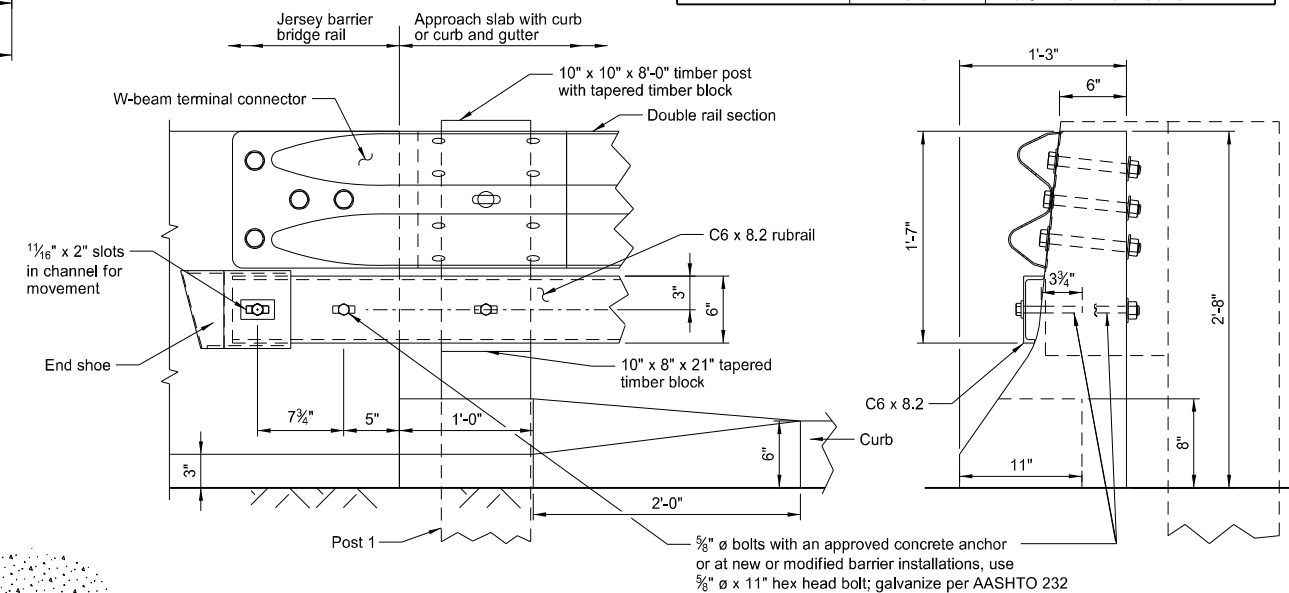


TAPERED TIMBER BLOCK DETAILS

POST, TIMBER BLOCK & BOLT TABLE		
DESCRIPTION	POST NO.	SIZE
Post	1 & 2	10" X 10" X 8'-0" min long
	3-5	6" X 8" X 7'-0" min long
	6-13	6" X 8" X 6'-0" min long
Spacer block	1-2	10" X 8" X 21" tapered block
	3-9	6" X 8" X 21"
	10	6" X 9 3/4" X 14"
	11-13	6" X 8" X 14"
Guardrail bolt & recessed nut	1 & 2 & 10	5/8" Dia X 20" - guardrail
	3-9, 11-13	5/8" Dia X 18" - guardrail
	1-2	5/8" Dia X 22" - rub rail
	3-9	5/8" Dia X 20" - rub rail

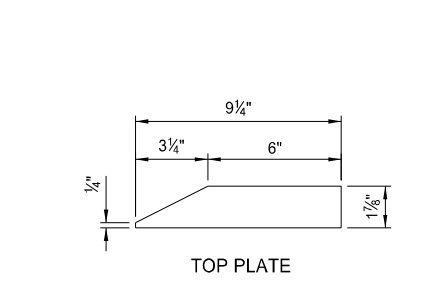


GENERAL ASSEMBLY DETAILS

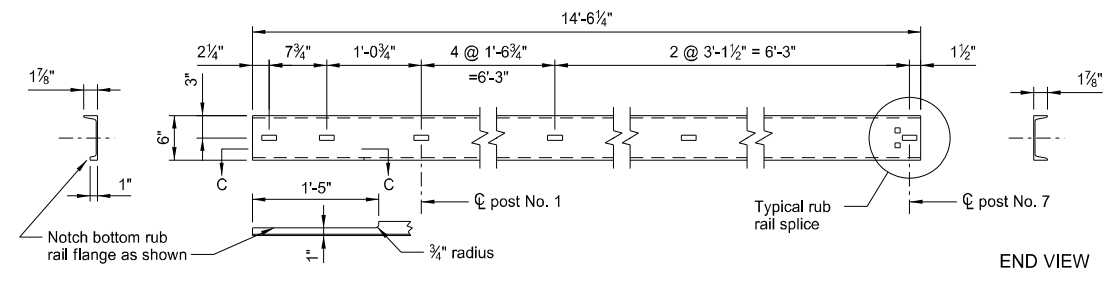


TRAFFIC SIDE ELEVATION
RAIL ATTACHMENT AND CURB DETAIL

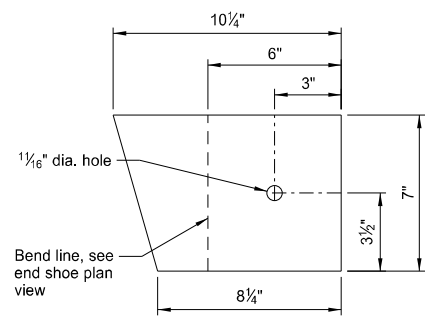
- ① Additional blocking may be required at post No. 1.
- ② Height is 2'-8" from 0' to 12'-6" from bridge. Height tapers from 2'-8" to 2'-4" between 12'-6" to 37'-6" from bridge.



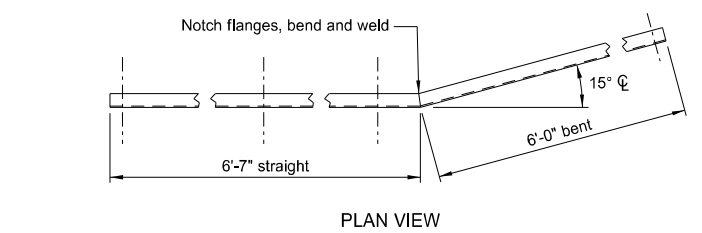
TOP PLATE



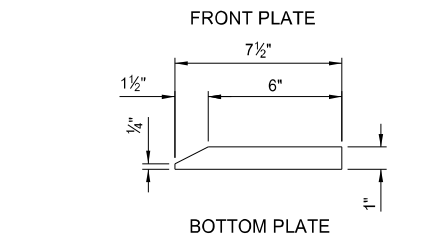
SECTION C-C
RUB RAIL STRAIGHT SECTION



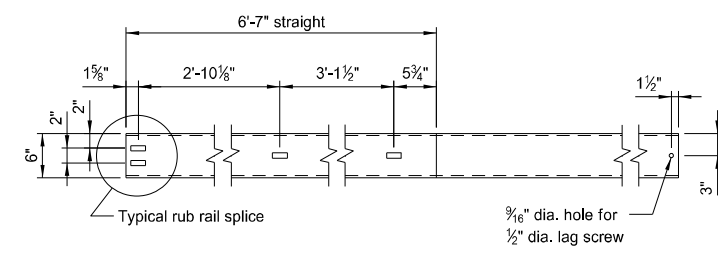
FRONT PLATE



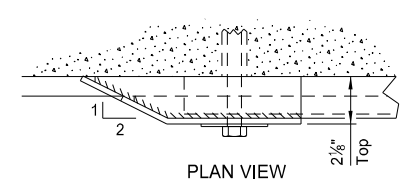
PLAN VIEW
RUB RAIL BENT SECTION



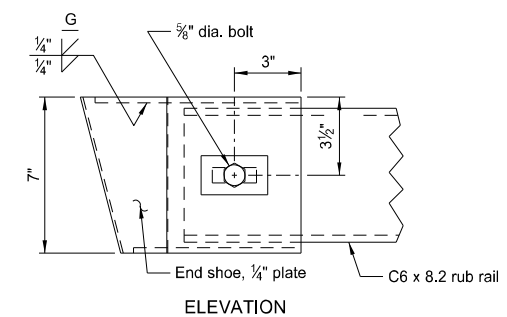
BOTTOM PLATE



ELEVATION
RUB RAIL BENT SECTION



PLAN VIEW
RUB RAIL END SHOE ASSEMBLY



ELEVATION
RUB RAIL END SHOE ASSEMBLY

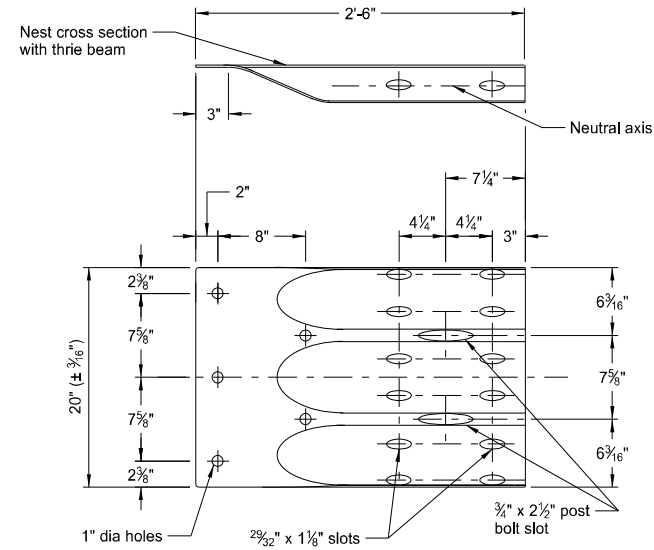
NOTES:
Galvanize all hardware in accordance with AASHTO M232.
Use AASHTO 270M Grade 250 C6 x 8.2 rub rail and structural steel galvanized after fabrication in accordance with AASHTO M111.
All rub rail slotted holes are 1 1/16" x 2".
All rub rail square holes are 1 1/16".
Use timber posts and blocks for the W-beam guardrail.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.

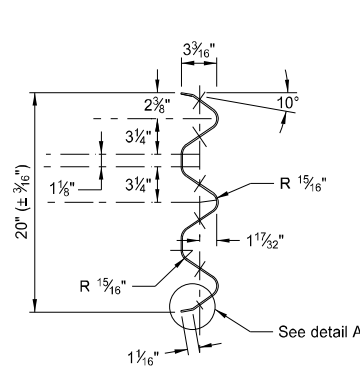


THRIE BEAM TRANSITION TO DOUBLE BOX BEAM RETROFIT

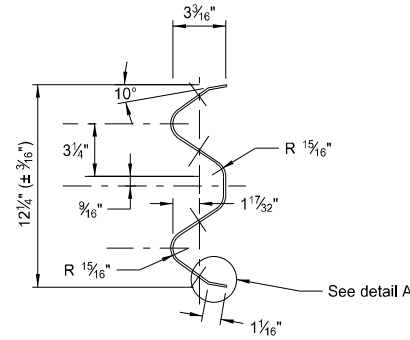
D-764-10



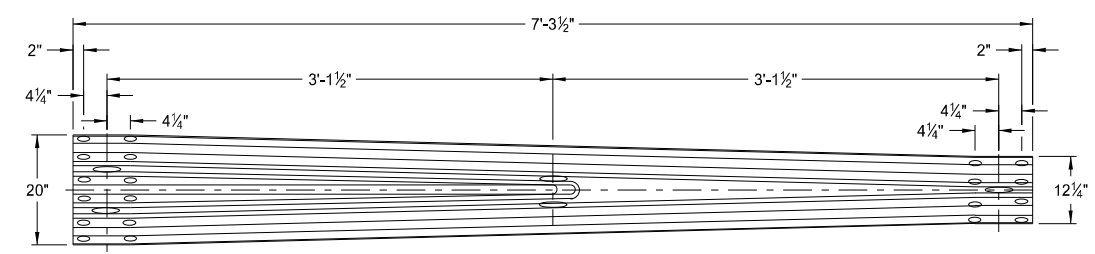
THRIE BEAM TERMINAL CONNECTOR



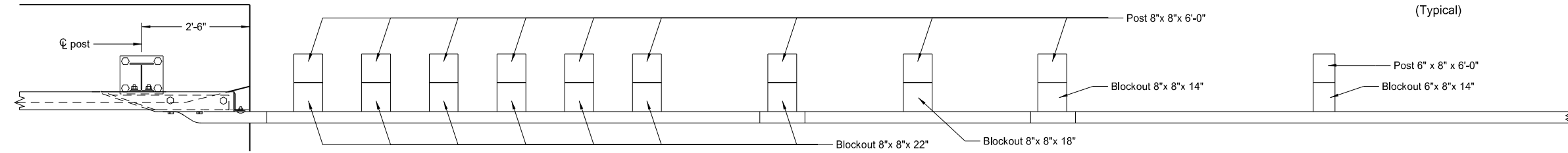
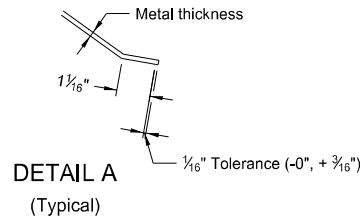
THRIE BEAM END VIEW



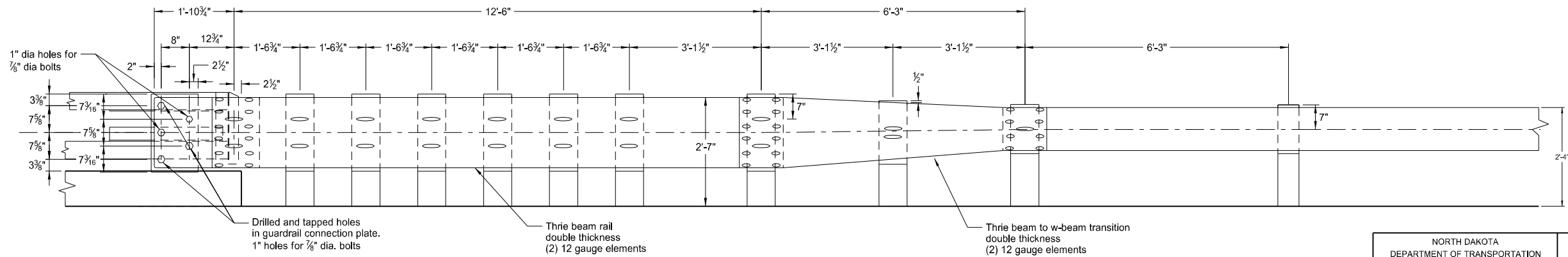
W-BEAM END VIEW



THRIE BEAM TO W-BEAM TRANSITION SECTION



PLAN



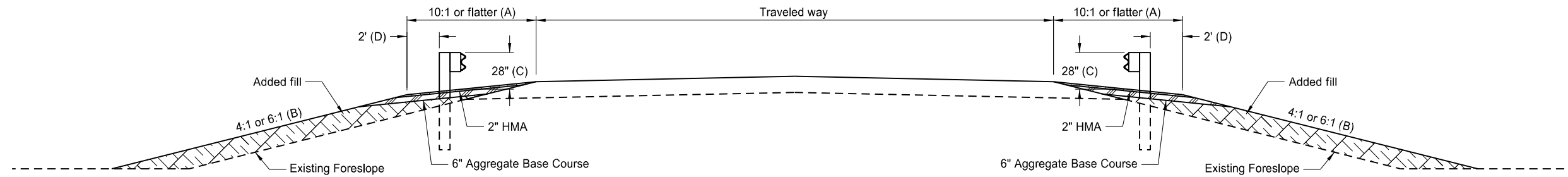
ELEVATION

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE
12/02/20	Updated text to active voice.

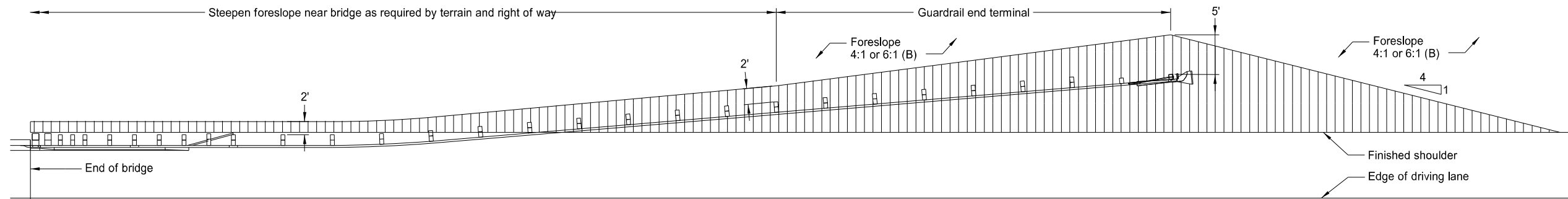


TYPICAL GRADING AT BRIDGE ENDS
WITH W-BEAM GUARDRAIL

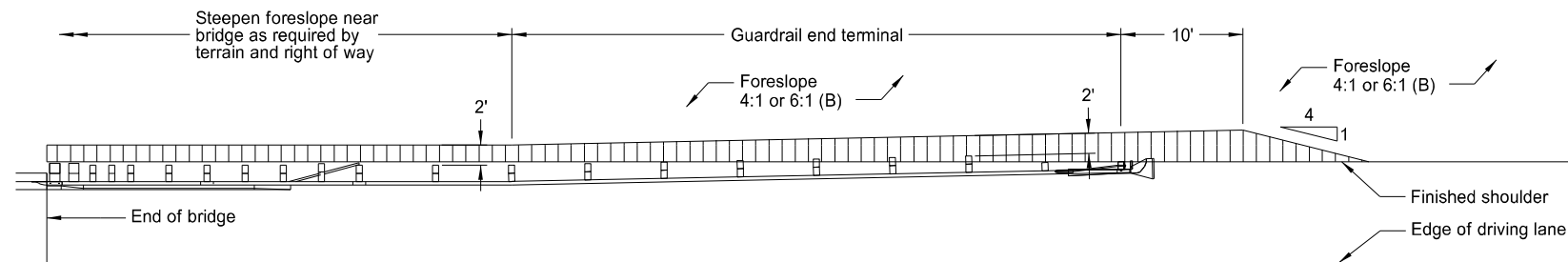
D-764-22



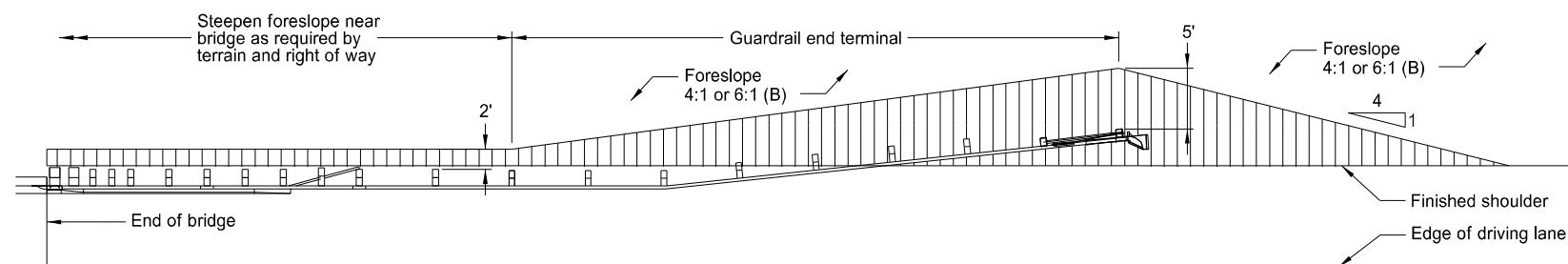
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

- (A) Use slope flatter than 10:1 when necessary to provide proper guardrail height.
- (B) When normal foreslope is 4:1, use added fill slope of 4:1. When normal foreslope is 6:1, use added fill slope of 6:1.
- (C) Measure from top of guardrail to top of surfacing at front face of guardrail.
- (D) Dimension at end terminals vary per Plan Layouts shown on this sheet.

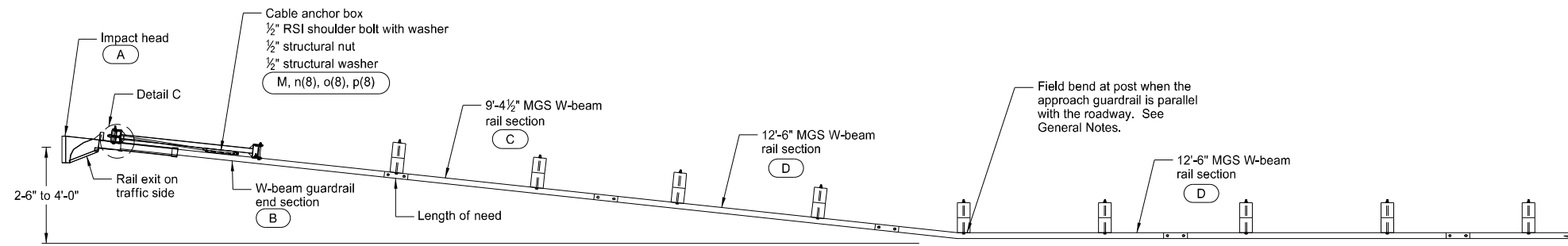
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.



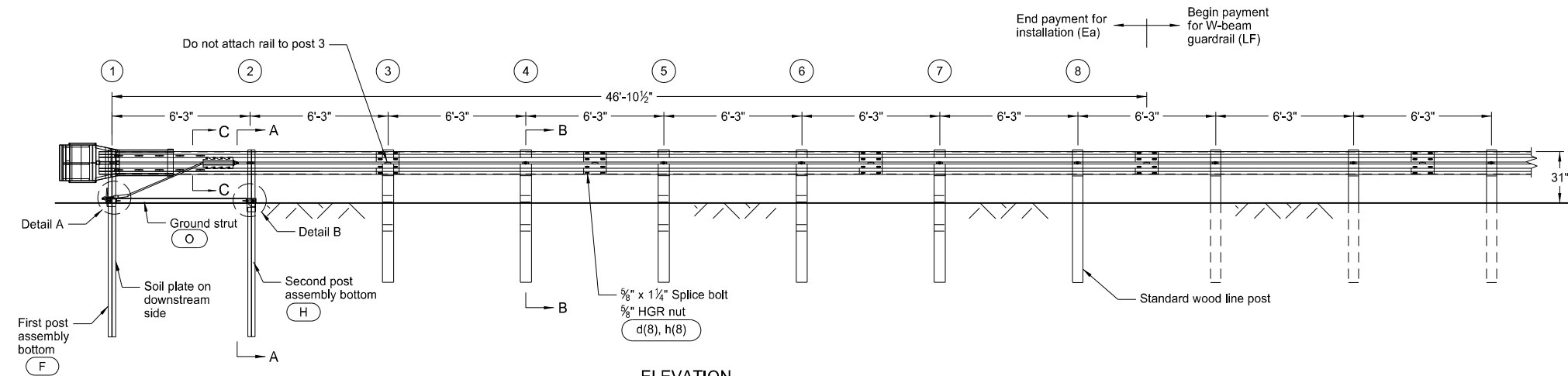
12 02 2020

MGS FLARED ENERGY ABSORBING TERMINAL - WOOD POST

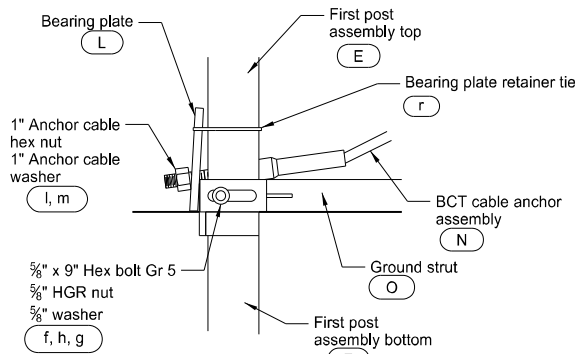
D-764-38



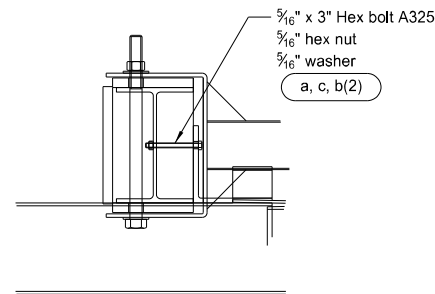
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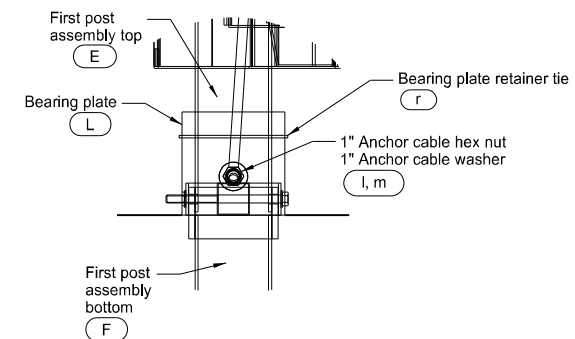
ELEVATION



SIDE VIEW

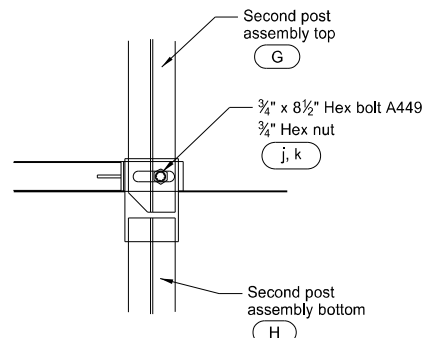


DETAIL C
Post 1 (Impact Head connection)

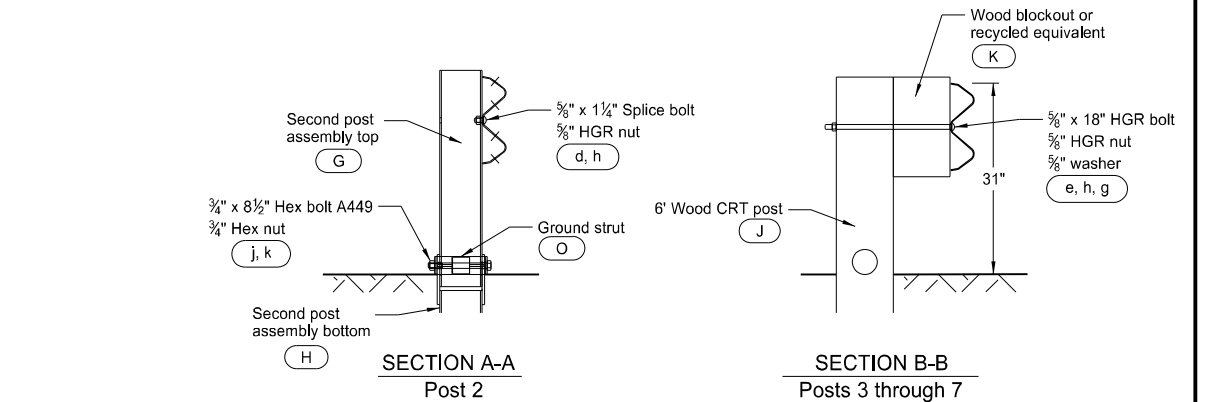


FRONT VIEW

DETAIL A
Post 1

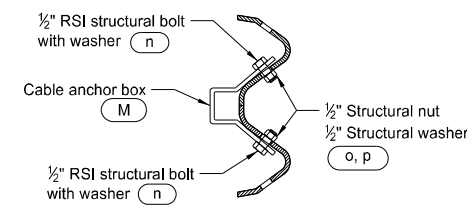


DETAIL B
Post 2



SECTION A-A
Post 2

SECTION B-B
Posts 3 through 7



SECTION C-C

GENERAL NOTES:

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

ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	F3000	IMPACT HEAD	1
B	SF1303	W-BEAM GUARDRAIL END SECTION, 12 Ga	1
C	G12025	9'-4 1/2" MGS W-BEAM RAIL SECTION, 12 Ga	1
D	G1203A	12'-6" MGS W-BEAM RAIL SECTION, 12 Ga	2
E	UHP1A	FIRST POST ASSEMBLY TOP	1
F	HP1B	FIRST POST ASSEMBLY BOTTOM	1
G	UHP2A	SECOND POST ASSEMBLY TOP	1
H	HP2B	SECOND POST ASSEMBLY BOTTOM	1
J	UP671	WOOD CRT POST	5
K	P675	WOOD BLOCKOUT OR RECYCLE EQUIVALENT	5
L	E750	BEARING PLATE	1
M	S760	CABLE ANCHOR BOX	1
N	E770	BCT CABLE ANCHOR ASSEMBLY	1
O	S785	GROUND STRUT HINGED POST	1
HARDWARE			
a	B5160304A	5/16" x 3" HEX BOLT A325	2
b	W0516	5/16" WASHER	4
c	N0516	5/16" HEX NUT	2
d	B580122	5/8" Dia x 1 1/4" SPLICE BOLT	33
e	B581802	5/8" Dia X 18" HGR BOLT	5
f	B580904A	5/8" Dia x 9" HEX BOLT GRD 5	1
g	W050	5/8" WASHER	7
h	N050	5/8" Dia HGR NUT	39
j	B340854A	3/4" Dia x 8 1/2" HEX BOLT GRD A449	1
k	N030	3/4" Dia HEX NUT	1
l	N100	1" ANCHOR CABLE HEX NUT	2
m	W100	1" ANCHOR CABLE WASHER	2
n	SB12A	1/2" RSI SHOULDER BOLT WITH WASHER	8
o	N012A	1/2" STRUCTURAL NUT	8
p	W012A	1/2" STRUCTURAL WASHER	8
r	CT-100ST	BEARING PLATE RETAINER TIE	1

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

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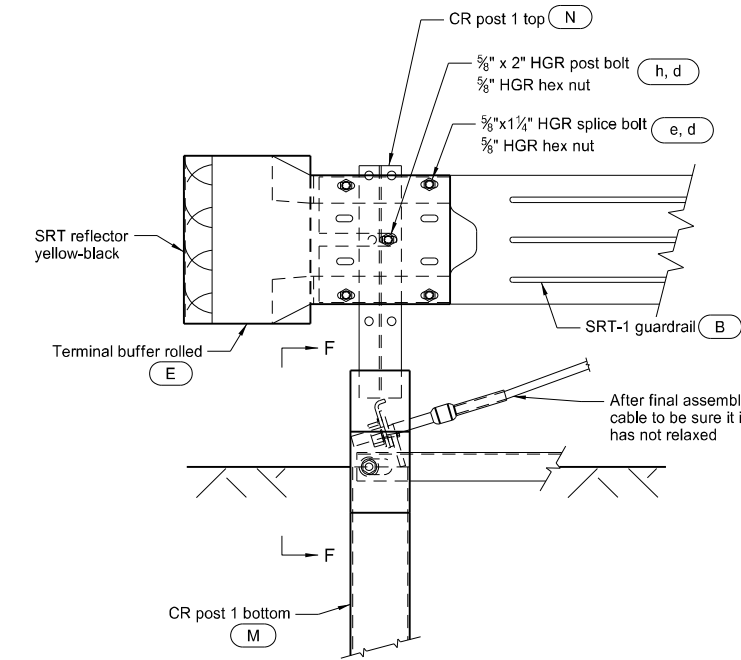
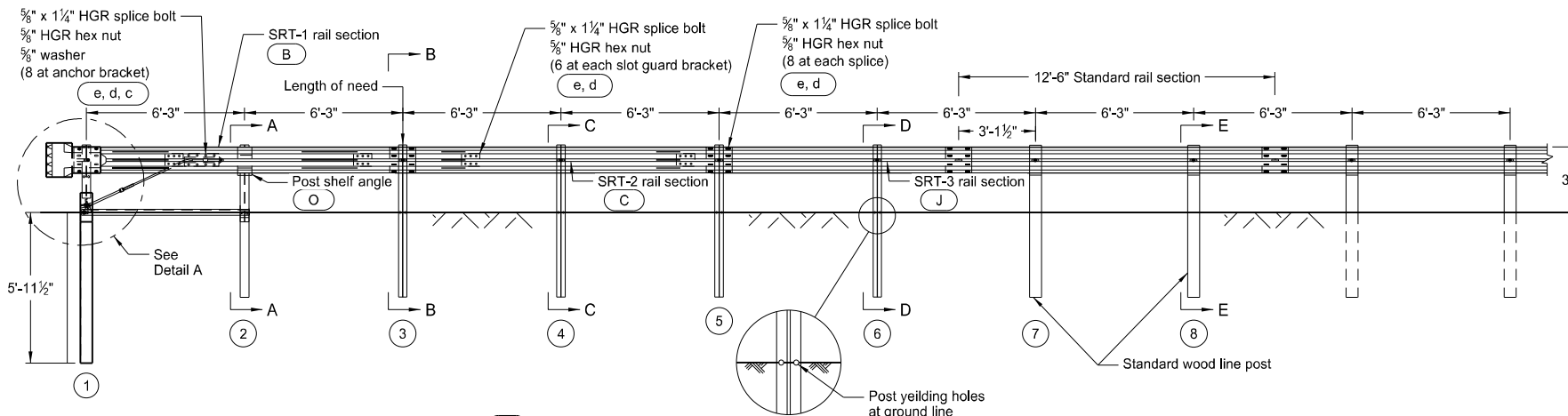
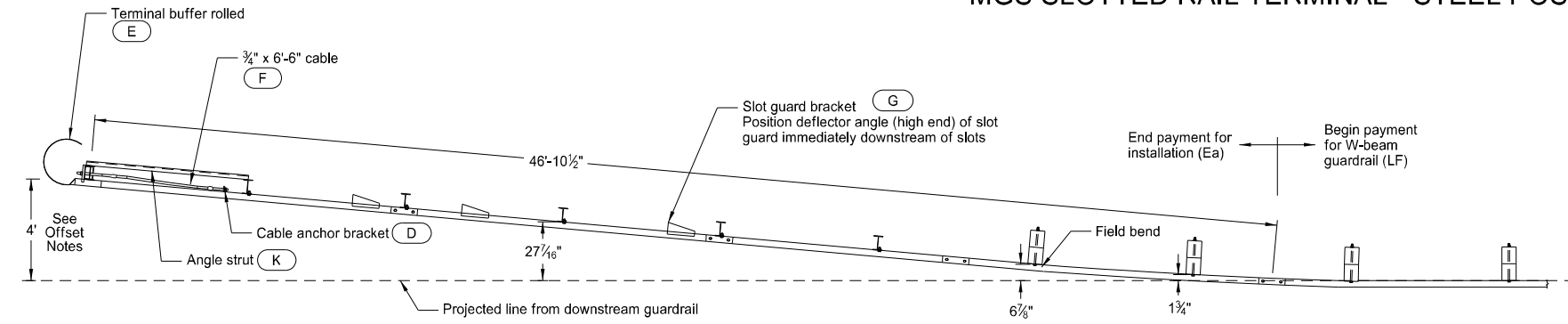
REVISIONS
DATE CHANGE
12-02-20 Updated notes to active voice.



12 02 2020

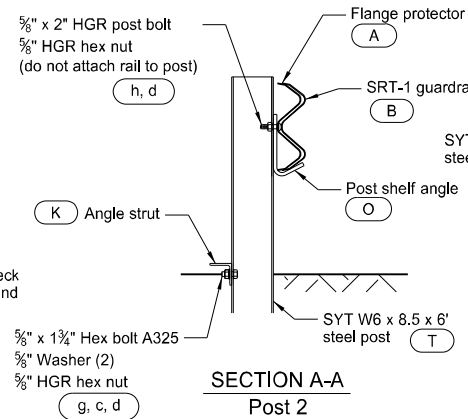
MGS SLOTTED RAIL TERMINAL - STEEL POST

D-764-39

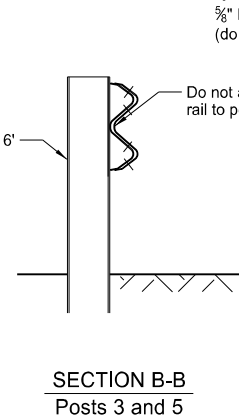


DETAIL A
Post 1

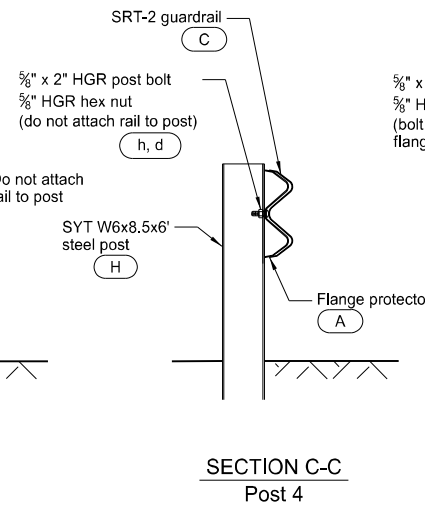
DETAIL B
Posts 3 through 6



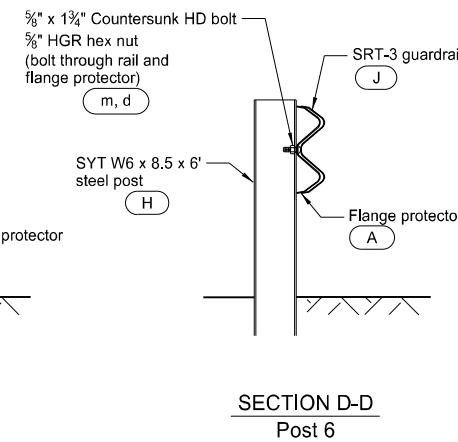
SECTION A-A
Post 2



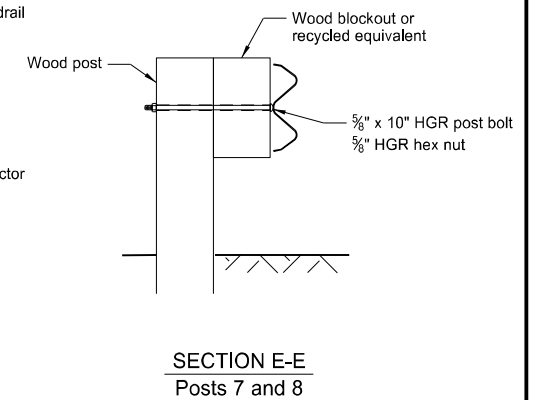
SECTION B-B
Posts 3 and 5



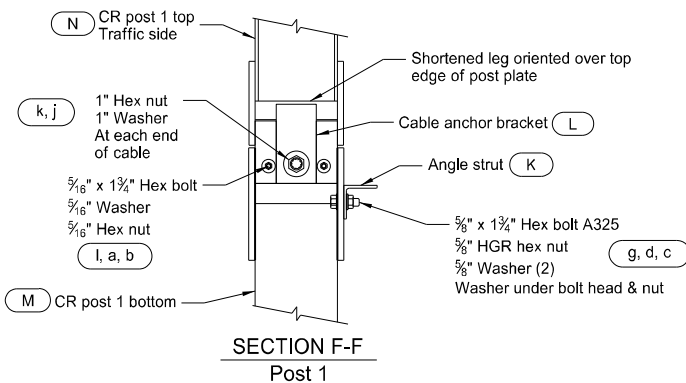
SECTION C-C
Post 4



SECTION D-D
Post 6



SECTION E-E
Posts 7 and 8



SECTION F-F
Post 1

GENERAL NOTES:

- Galvanize all bolts, nuts, cable assemblies, cable anchors, bearing plates, slot guards, struts, nails, pipes soil tubes and soil plates.
- Install breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent cable from twisting when tightening nuts.
- For curb installation, end curb prior to post 7. Where curb extends beyond post 7, do not use the flared Slotted Rail Terminal. Use a straight end treatment at the end of straight guardrail placed at the face of the curb.
- For details not shown, see the manufacturer's installation manual.
- Only use the Slotted Rail Terminal as an end terminal when a minimum length of 175 feet, including the length of the end terminal, is provided in advance of fixed objects.

OFFSET NOTES:

- Post offset dimensions are given to the center of the traffic face of posts, except at posts 7 and 8 where dimensions are to the center of the traffic face of the blockouts.
- Guardrail between posts 1-7 is on a straight line flare.
- Install the Slotted Rail Terminal with a 4" flare for either a straight or flared guardrail installation.

ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	7G	12/6"/FLANGE PROTECTOR (POSTS 2, 4, 6)	3
B	30G	12/12-6"/S SRT-1 RAIL SECTION	1
C	39G	12/12-6"/S SRT-2 RAIL SECTION	1
D	700A	CABLE ANCHOR BRACKET	1
E	907G	TERMINAL BUFFER ROLLED	1
F	3000G	3/4" x 6-6" CABLE	1
G	9960G	SLOT GUARD BRACKET	4
H	15000G	SYT W6x8.5 6' STEEL POST	5
J	10967G	12/9-4 1/2"/3-1 1/2"/S SRT-3 RAIL SECTION	1
K	33875G	ANGLE STRUT 3" x 3" x 1/4"	1
L	33909G	CABLE ANCHOR BRACKET (POST 1)	1
M	34052A	CR POST 1 BOTTOM W6x15	1
N	34053A	CR POST 1 TOP W6x8.5	1
O	34054G	POST SHELF ANGLE (POST 2)	1
HARDWARE			
a	3240G	5/16" WASHER	2
b	3245G	5/16" HEX NUT	2
c	3300G	5/8" WASHER	12
d	3340G	5/8" HGR HEX NUT	75
e	3360G	5/8" Dia x 1 1/4" HGR SPLICE BOLT	60
f	3380G	5/8" Dia x 1 1/2" HEX HD BOLT	8
g	3391G	5/8" Dia x 1 3/4" HEX BOLT A325 (AT STRUT)	2
h	3400G	5/8" Dia x 2" HGR POST BOLT (POSTS 1, 2 4)	4
j	3900G	1" WASHER (AT CABLE)	2
k	3910G	1" HEX NUT (AT CABLE)	2
l	4211G	5/16" Dia x 1 3/4" HEX BOLT (POST 1)	2
m	4419G	5/8" Dia x 1 3/4" COUNTERSUNK HD BOLT (POST 6)	1

NOTE: Standard rail section and standard wood line posts (including the blocks, and associated hardware) not included in Bill of Materials Table. All splice bolts (including associated nuts) are included in the Bill of Materials Table.

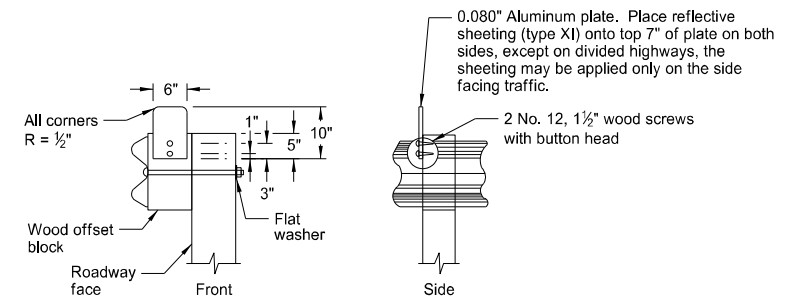
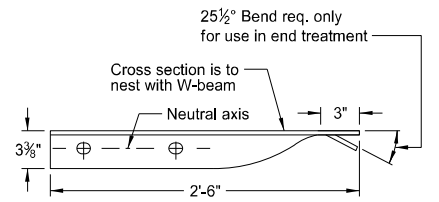
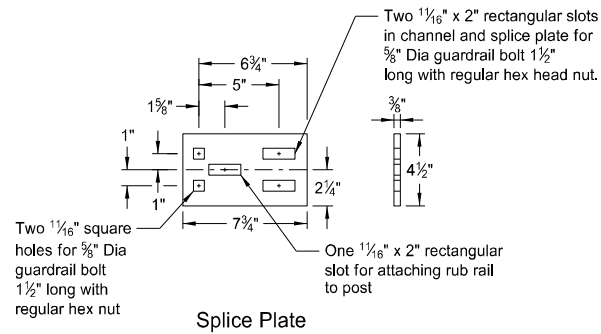
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.



MGS W-BEAM GUARDRAIL GENERAL DETAILS

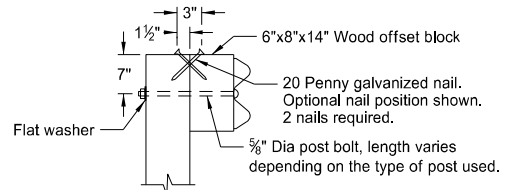
NOTES:

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

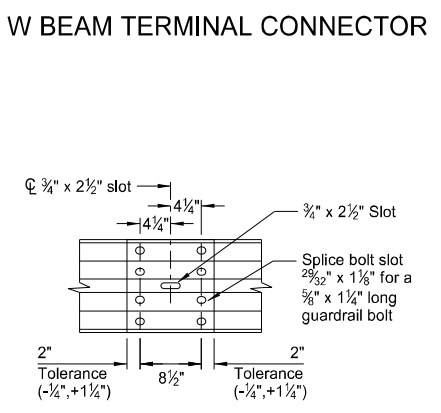
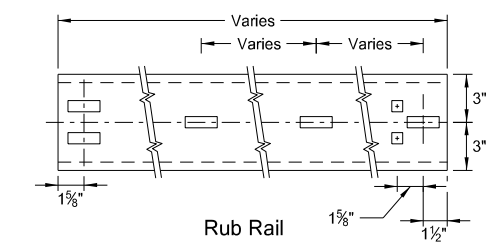
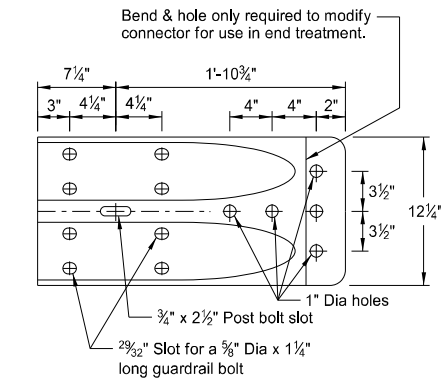
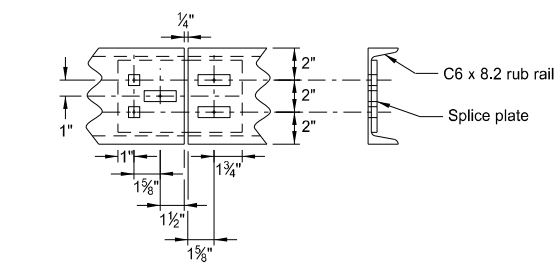


REFLECTORIZED PLATE DETAIL

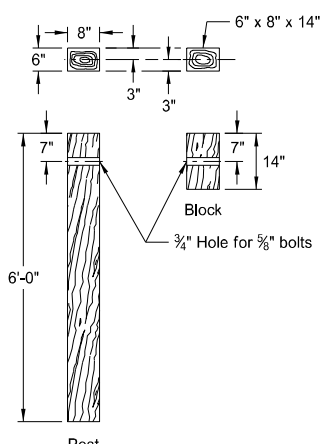
NOTE: Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.



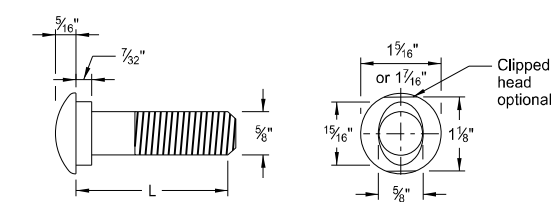
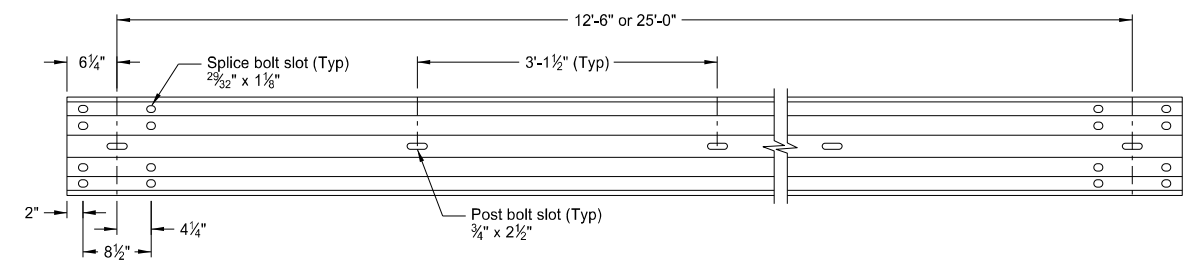
TYPICAL WOOD POST ATTACHMENT DETAIL



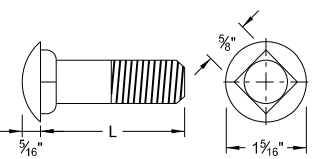
NOTE: Do not install center bolt in the 3/4" x 2 1/2" slot at mid span splices.



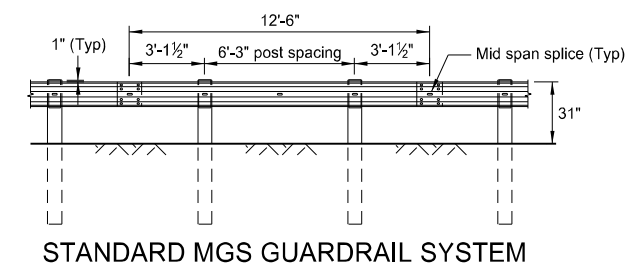
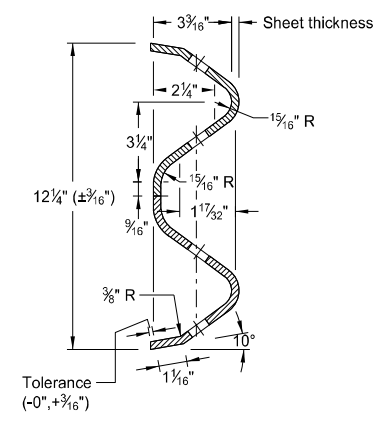
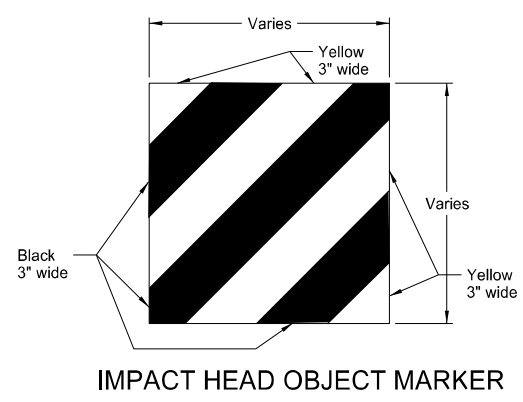
NOTE: Where soil conditions require, alternate lengths may be specified, in 6" increments.



L	Thread Length
1 1/4"	Full length thread
2"	1 3/4" Min thread length
9 1/2"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length

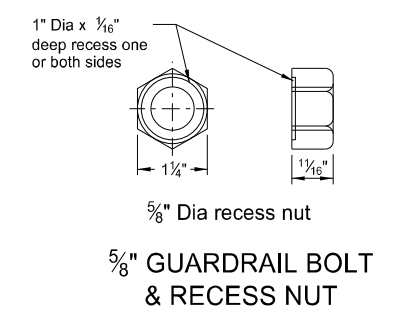


L	Thread Length
1 1/2"	Full length thread
3"	1 1/2" Min thread length
11"	1 3/4" Min thread length
13"	1 3/4" Min thread length



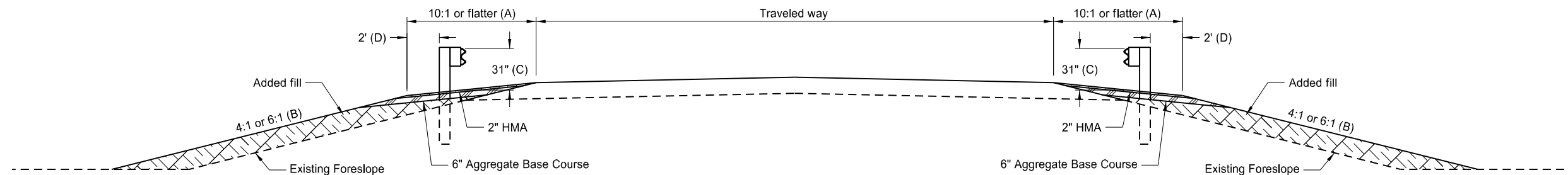
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12-02-20	Updated clipped head to optional

KIRK J. HOFF
REGISTERED
PROFESSIONAL
ENGINEER
NORTH DAKOTA
12 02 2020

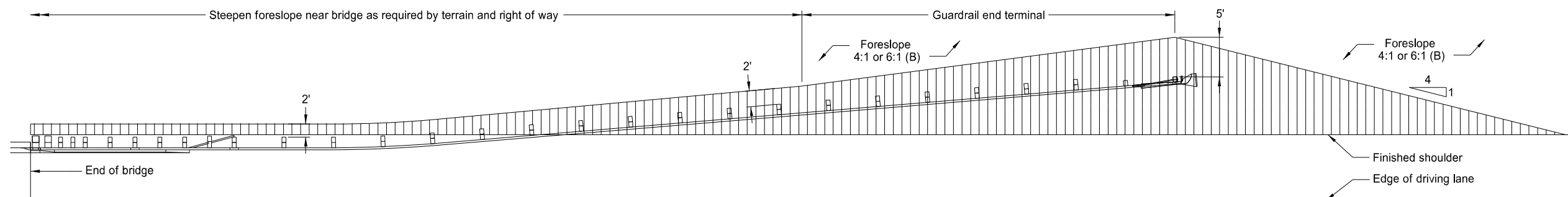


TYPICAL GRADING AT BRIDGE ENDS
WITH MGS W-BEAM GUARDRAIL

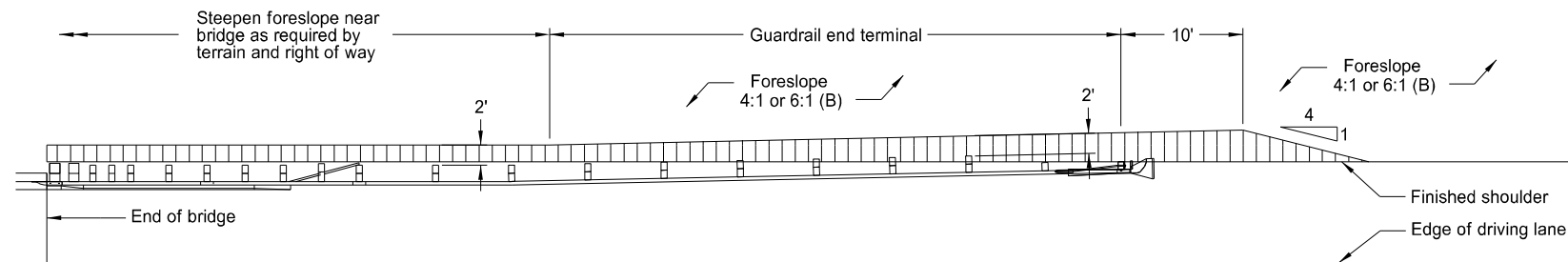
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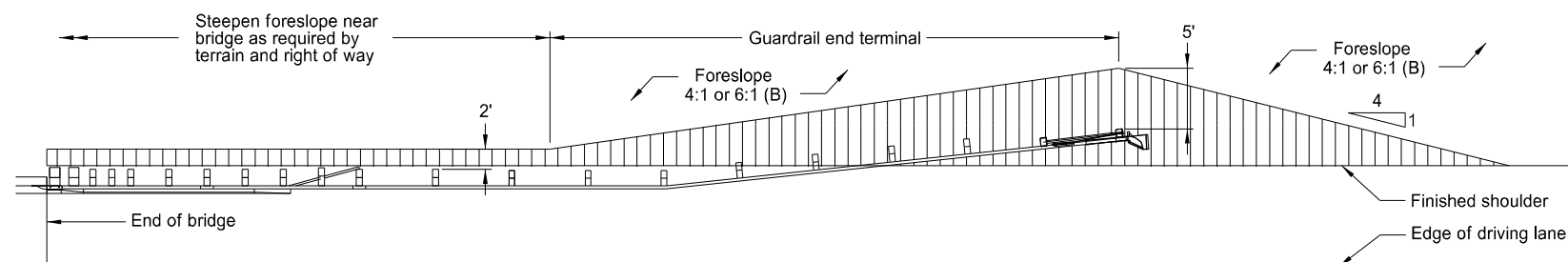
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL

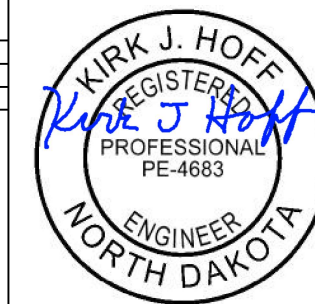


PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

- (A) Use slope flatter than 10:1 when required to provide proper guardrail height.
- (B) When normal foreslope is 4:1, use added fill slope of 4:1. When normal foreslope is 6:1, use added fill slope of 6:1.
- (C) Measure from top of guardrail to top of surfacing at front face of guardrail.
- (D) Vary dimension at end terminals per Plan Layouts shown on this sheet.

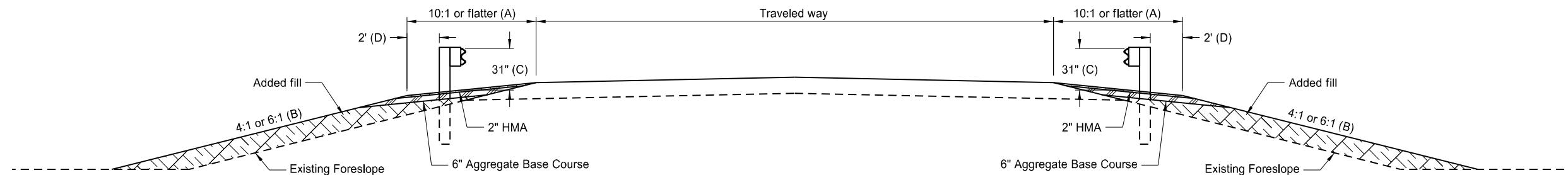
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7-14-17	
REVISIONS	
DATE	CHANGE
12/02/20	Updated notes to active voice.



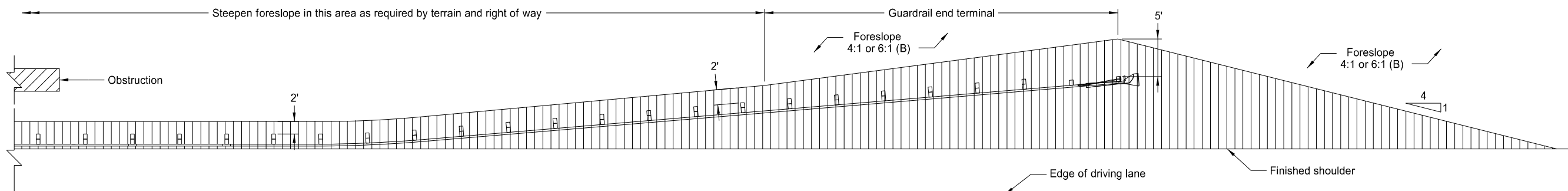
12 02 2020

TYPICAL GRADING AT OBSTRUCTIONS
WITH MGS W-BEAM GUARDRAIL

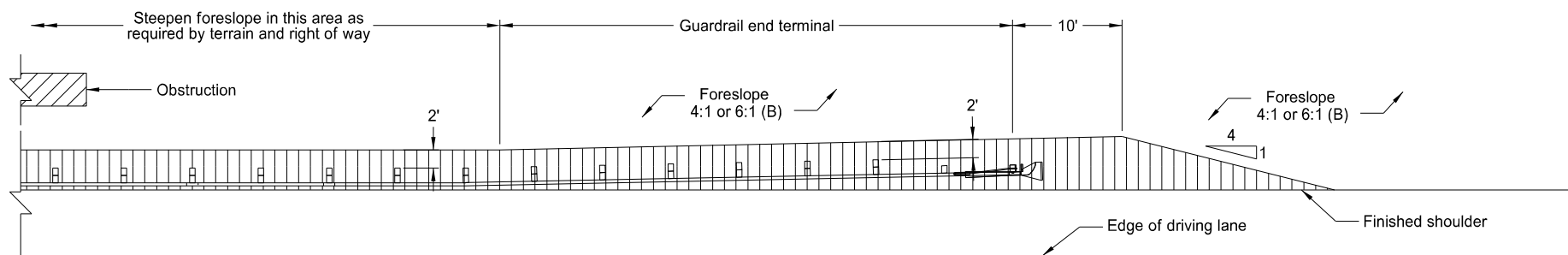
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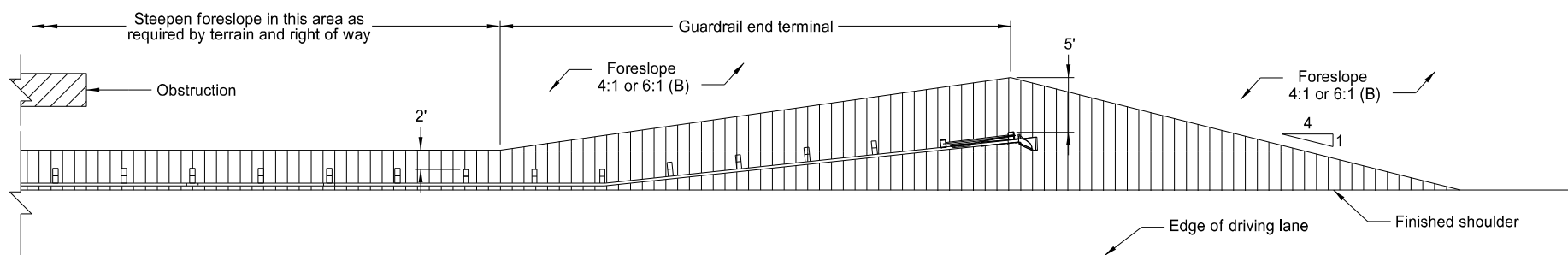
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL TANGENT END TERMINAL

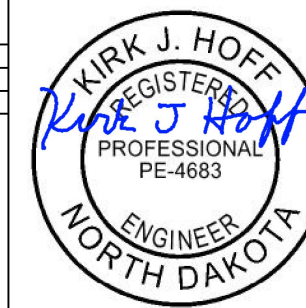


PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

- (A) Use slope flatter than 10:1 when required to provide proper guardrail height.
- (B) When normal foreslope is 4:1, use added fill slope of 4:1. When normal foreslope is 6:1, use added fill slope of 6:1.
- (C) Measure from top of guardrail to top of surfacing at front face of guardrail.
- (D) Dimension at end terminals vary per Plan Layouts shown on this sheet.

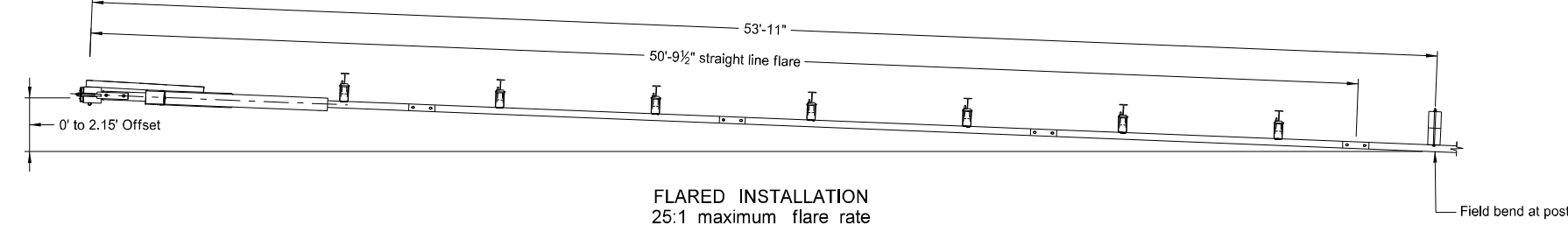
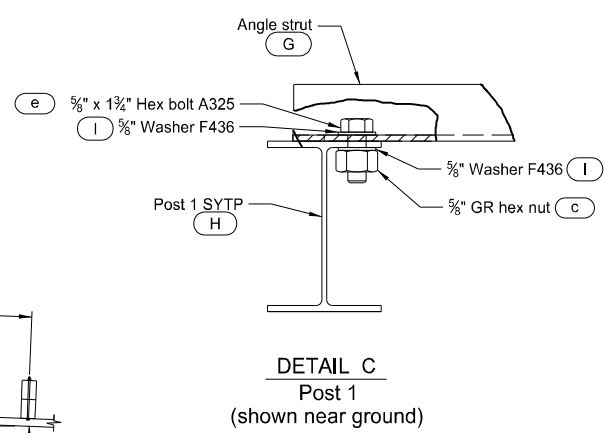
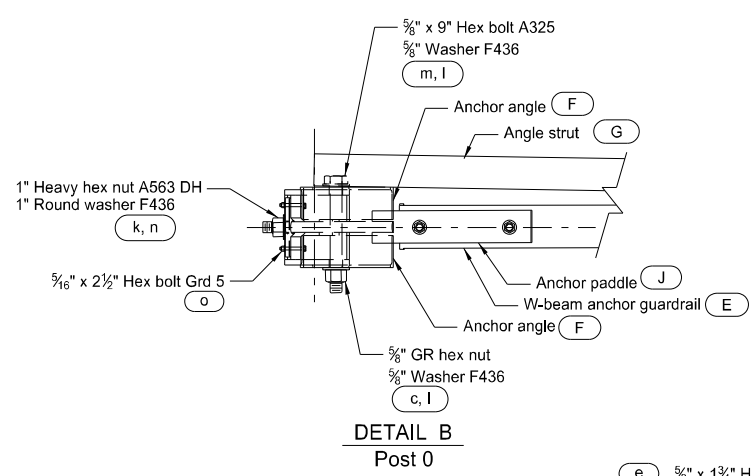
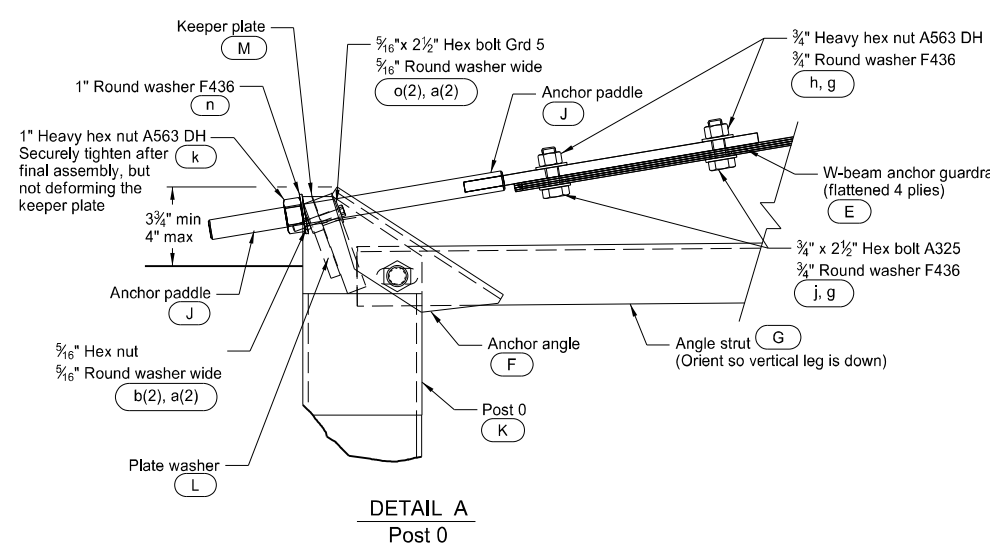
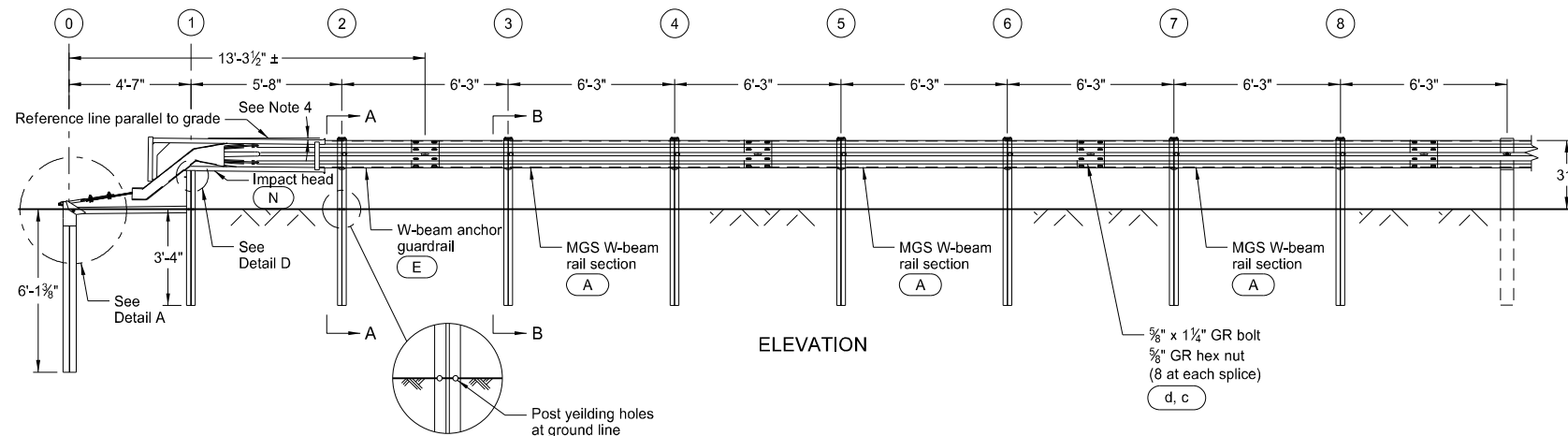
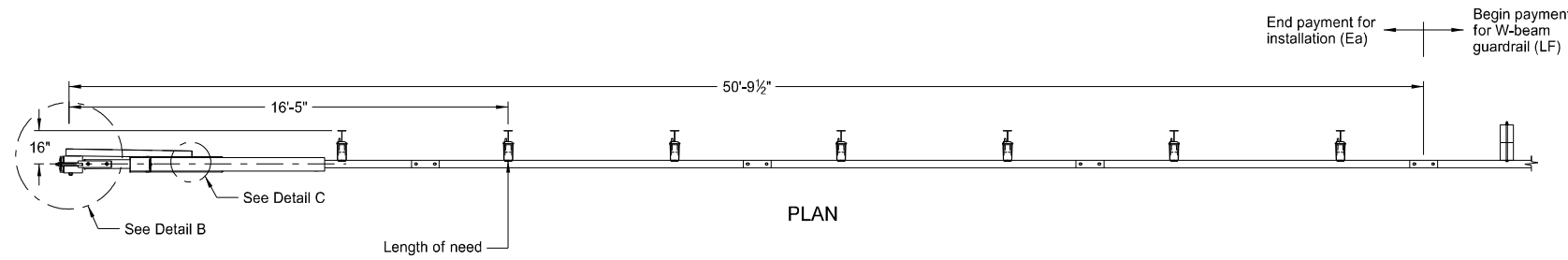
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12/02/20	Updated notes to active voice.



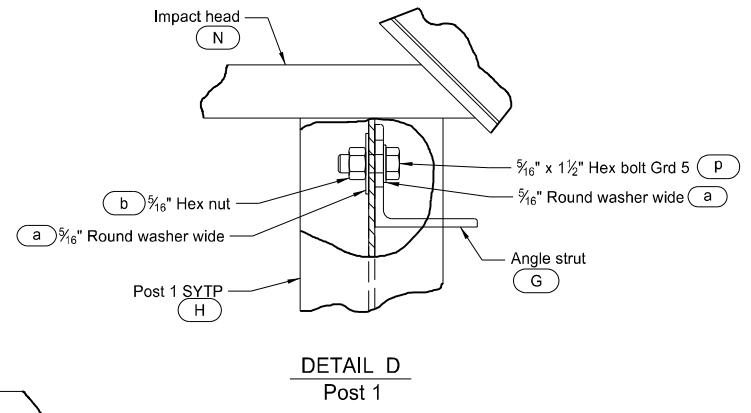
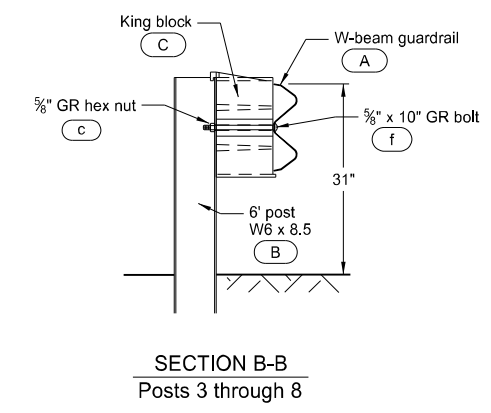
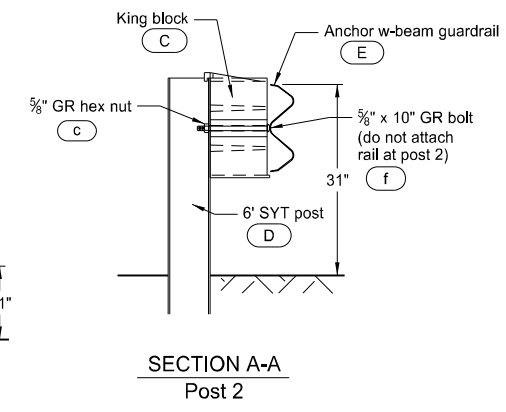
12 02 2020

MASH SOFTSTOP END TERMINAL - STEEL POST

D-764-50



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



ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	000011	12 / 12'-6" / 3'-1 1/2" / S MGS W-BEAM RAIL SECTION	3
B	000533	6'-0" STEEL POST W6 x 8.5	6
C	006777	KING BLOCK 4" X 7 1/2" X 1'-2"	7
D	015000	6'-0" SYT POST / 8.5 / 31" GR HT	1
E	015200	SFST - ANCHOR GUARDRAIL 12'-6"	1
F	015201	SFST - ANCHOR ANGLE	2
G	015202	SFST - ANGLE STRUT	1
H	015203	SFST - POST #1 SYTP	1
J	015204	SFST - ANCHOR PADDLE	1
K	015205	SFST - POST #0	1
L	015206	SFST - PLATE WASHER	1
M	015207	SFST - KEEPER PLATE	1
N	015208	SFST - IMPACT HEAD	1

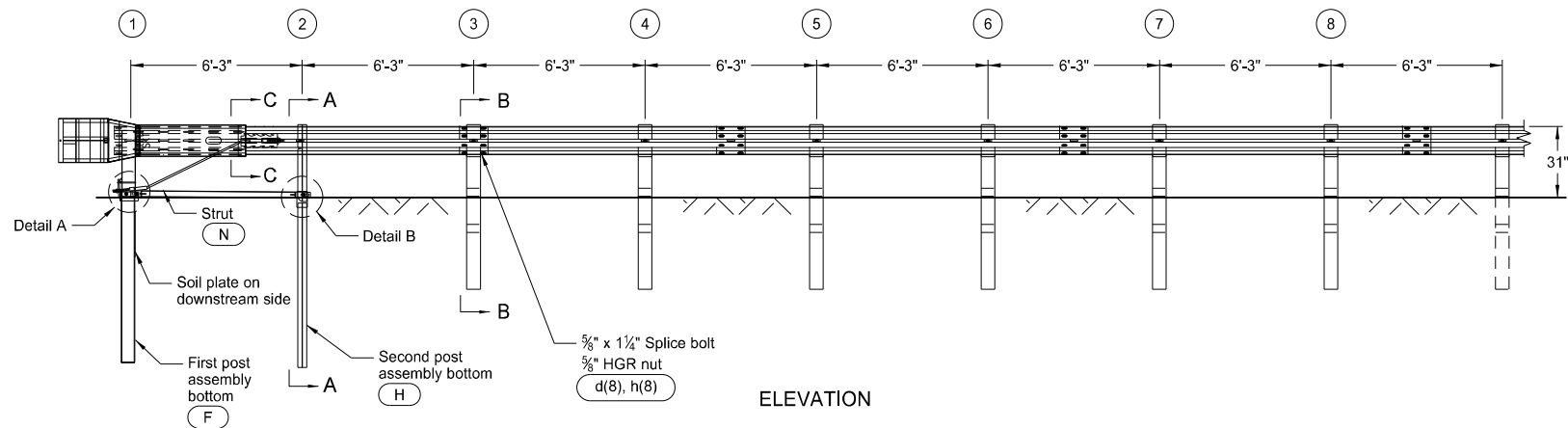
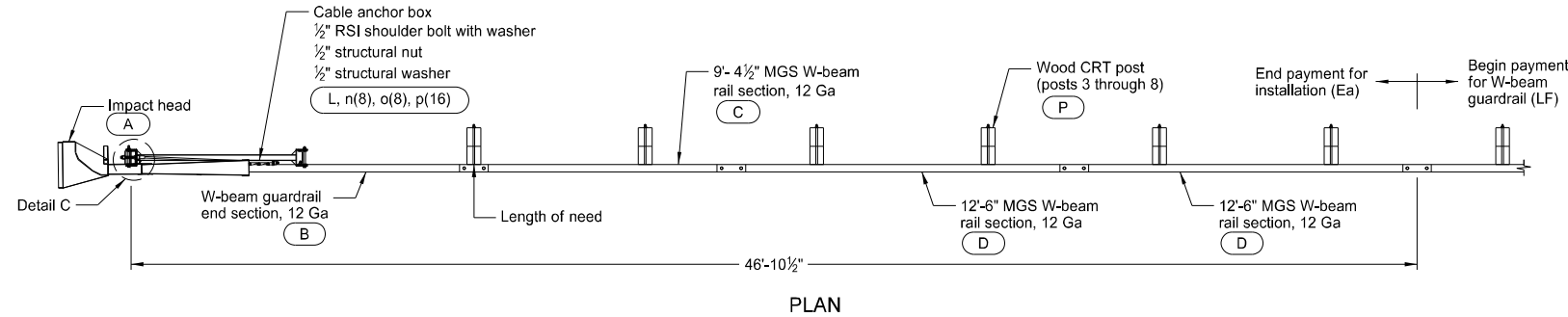
HARDWARE			
a	003240	5/16" ROUND WASHER WIDE	6
b	003245	5/16" HEX NUT	3
c	003340	5/8" GR HEX NUT	41
d	003360	5/8" x 1 1/2" GR BOLT	32
e	003391	5/8" x 1 3/4" HEX BOLT A325	1
f	003500	5/8" x 10" GR BOLT A307	7
g	003701	3/4" ROUND WASHER F436	4
h	003704	3/4" HVY HEX NUT A563 DH	2
j	003717	3/4" x 2 1/2" HEX BOLT A325	2
k	003908	1" HVY HEX NUT A563 DH	1
l	004372	5/8" WASHER F436	4
m	004489	5/8" x 9" HEX BOLT A325	1
n	004902	1" ROUND WASHER F436	1
o	105285	5/16" x 2 1/2" HEX BOLT GRD 5	2
p	105286	5/16" x 1 1/2" HEX BOLT GRD 5	1

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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12-02-20	Updated notes to active voice.



MASH SEQUENTIAL KINKING TERMINAL - WOOD POST

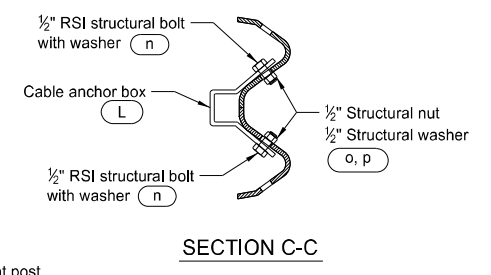
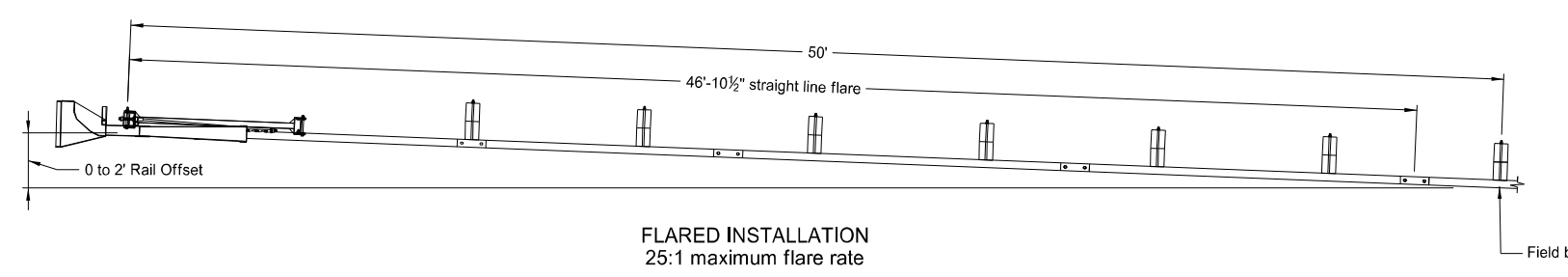
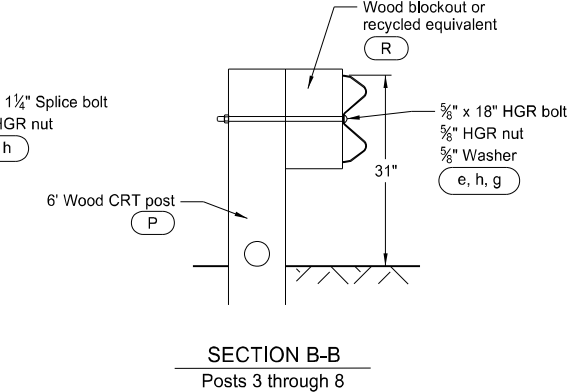
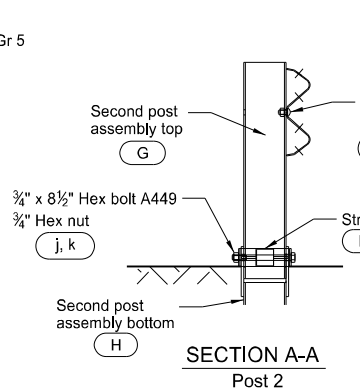
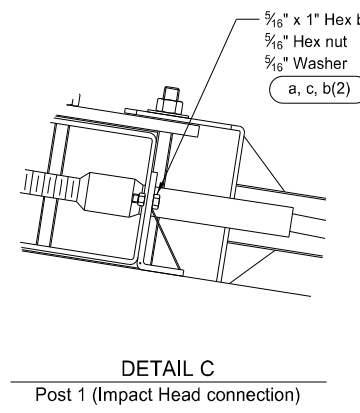
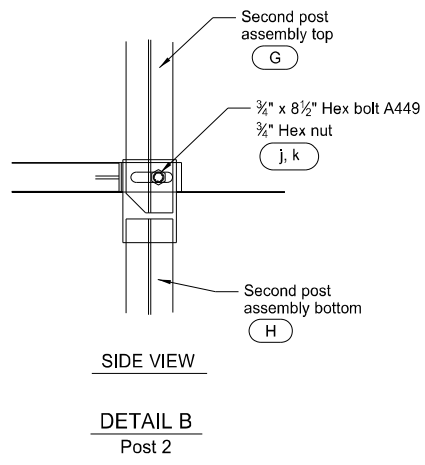
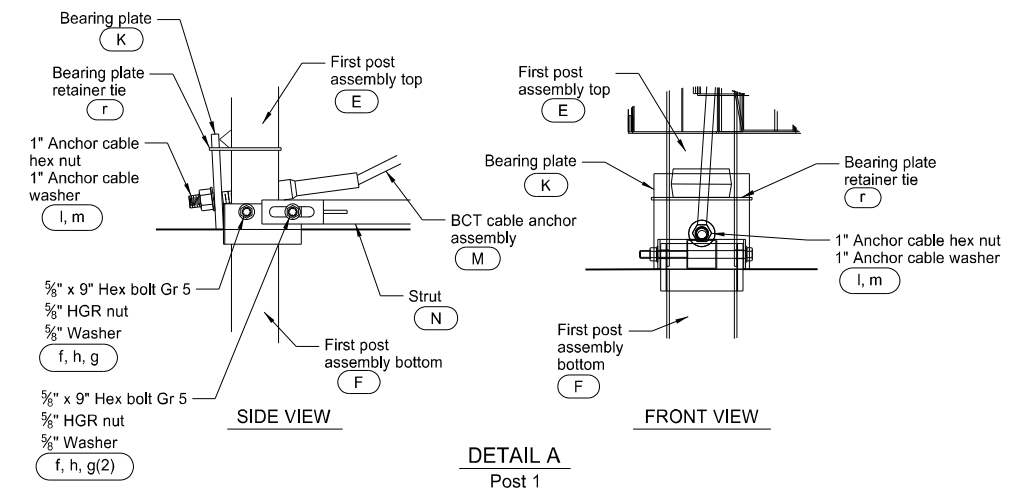
D-764-51



GENERAL NOTES:

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

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

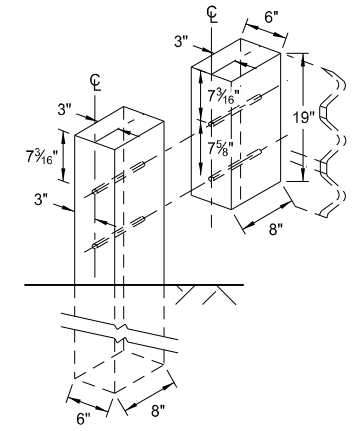
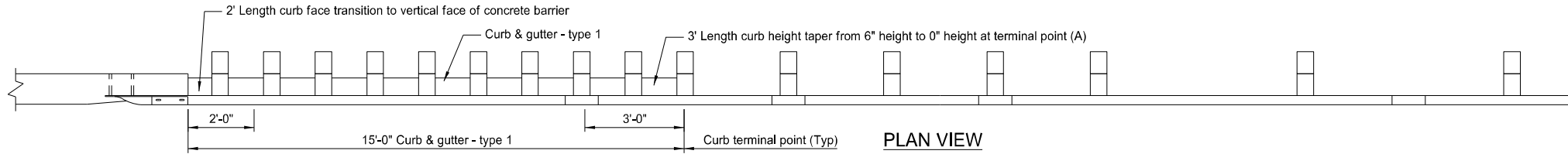


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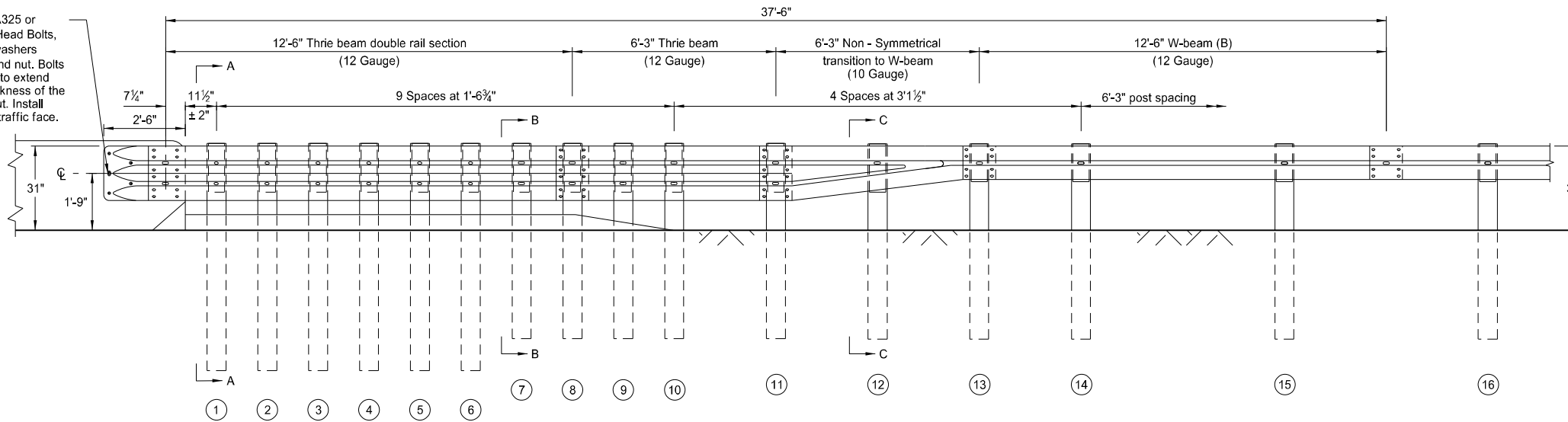
KIRK J. HOFF
 REGISTERED PROFESSIONAL ENGINEER
 PE-4683
 NORTH DAKOTA
 12 02 2020

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

D-764-60

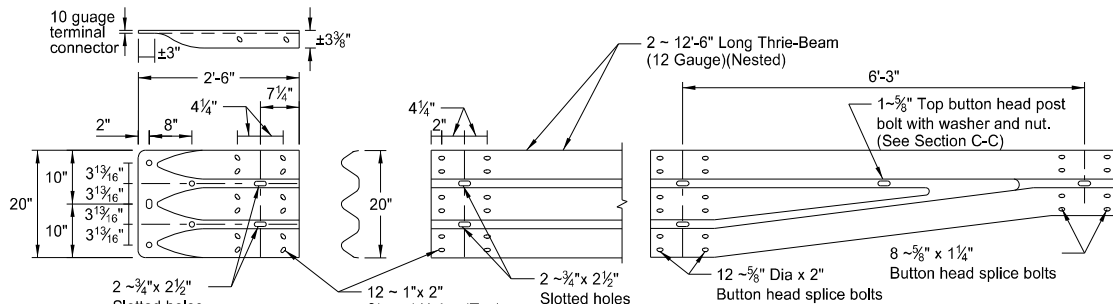


5 - 5/8" Dia. (ASTM A325 or A449) Heavy Hex Head Bolts, with two 1 3/4" O.D. washers under each head and nut. Bolts of sufficient length to extend through the full thickness of the rail, washer, and nut. Install with bolt heads on traffic face.



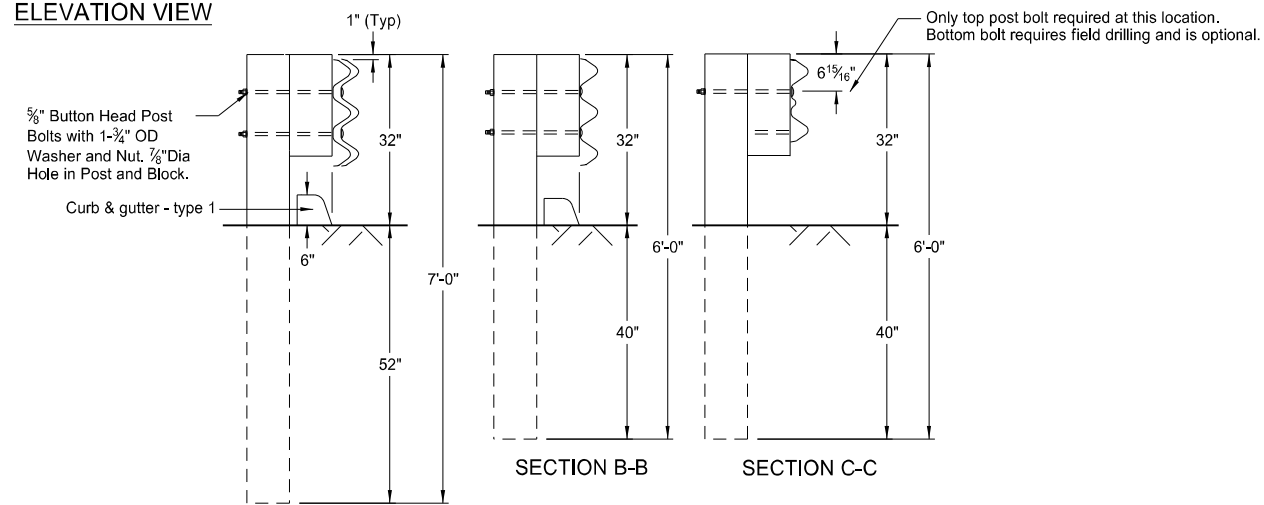
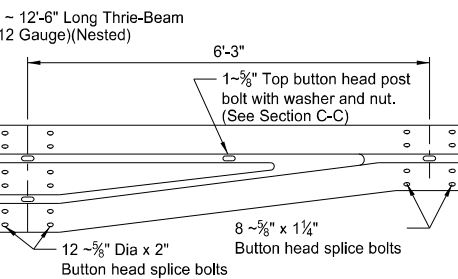
TRANSITION POST AND TIMBER BLOCKOUT SIZING		
POST NO.	POST SIZE	BLOCKOUT SIZE
1-6	6" X 8" X 7'-0" long	6" X 8" X 19"
7-12	6" X 8" X 6'-0" long	6" X 8" X 19"
13-16	6" X 8" X 6'-0" long	6" X 8" X 14"

ELEVATION VIEW

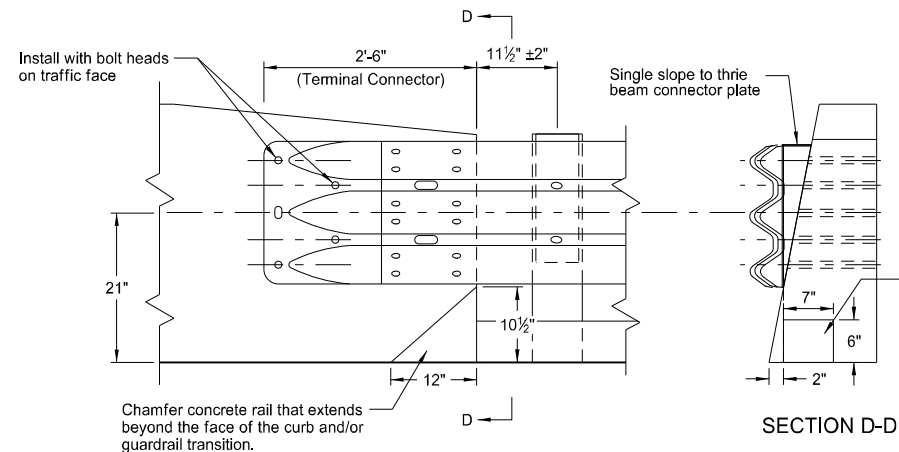


THRIE-BEAM TERMINAL CONNECTION

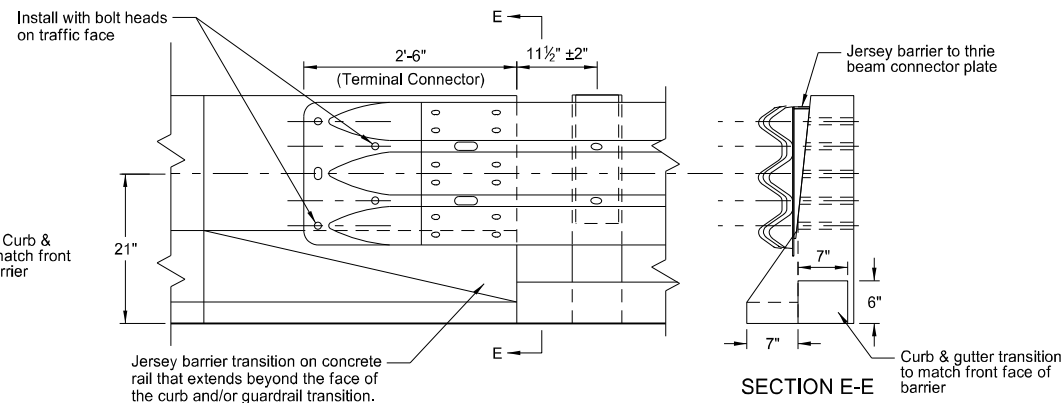
NON-SYMMETRICAL TRANSITION TO W-BEAM (10 GAUGE)



TRANSITION SECTIONS



CONNECTION TO CONCRETE SINGLE SLOPE BRIDGE RAIL AND TRAFFIC BARRIERS



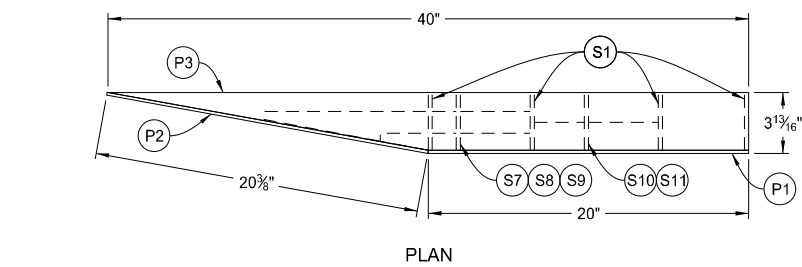
CONNECTION TO CONCRETE JERSEY BARRIER BRIDGE RAIL AND TRAFFIC BARRIERS

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

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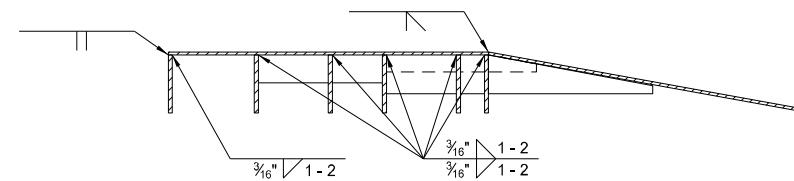
KIRK J. HOFF
REGISTERED
Kirk J Hoff
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA
12 02 2020

SINGLE SLOPE TO THRIE BEAM CONNECTOR PLATE DETAILS

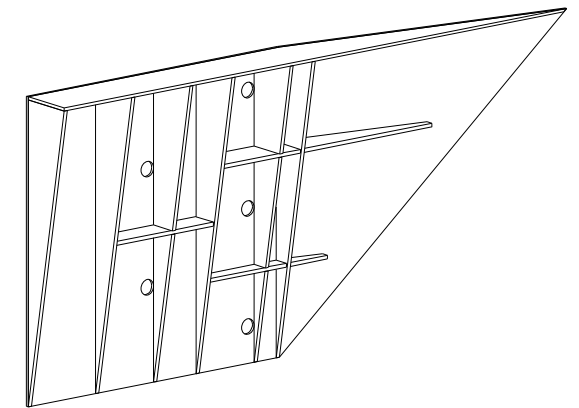


PLAN

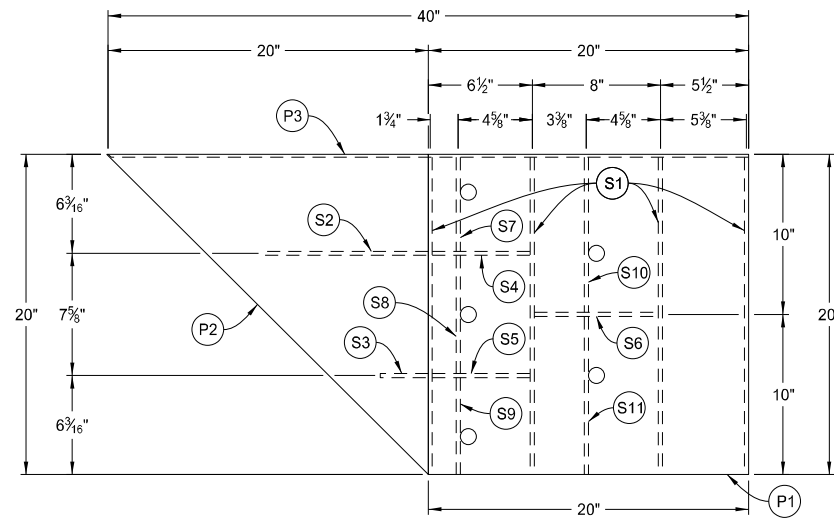
NOTE: Assembly Detail is shown for guardrail installation on right hand side of entrance end of bridge barrier. Mirror for opposite side installation.



SECTION A-A

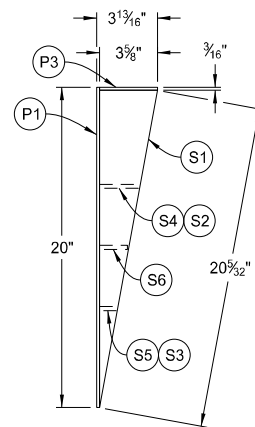


PICTORIAL DRAWING
(Showing Back of Connector Plate)

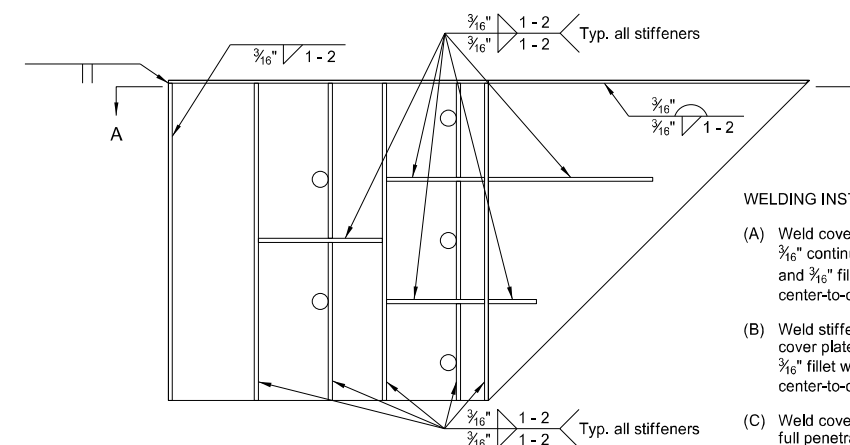


ELEVATION

ASSEMBLY DETAIL
(Front View)



END



ELEVATION

WELDING DETAIL
(Back View)

WELDING INSTRUCTIONS:

- (A) Weld cover plate P3 as follows:
3/16" continuous back weld on exterior sides and 3/16" fillet weld 1" long spaced at 2" center-to-center on interior sides.
- (B) Weld stiffeners located on the inside of the cover plates as follows:
3/16" fillet weld 1" long spaced at 2" center-to-center.
- (C) Weld cover plates P1 and P2 together with full penetration groove weld.

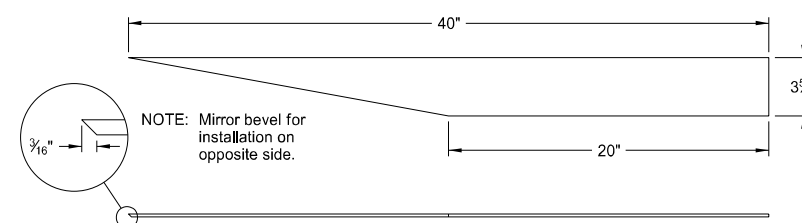


PLATE P3
Quantity: 1

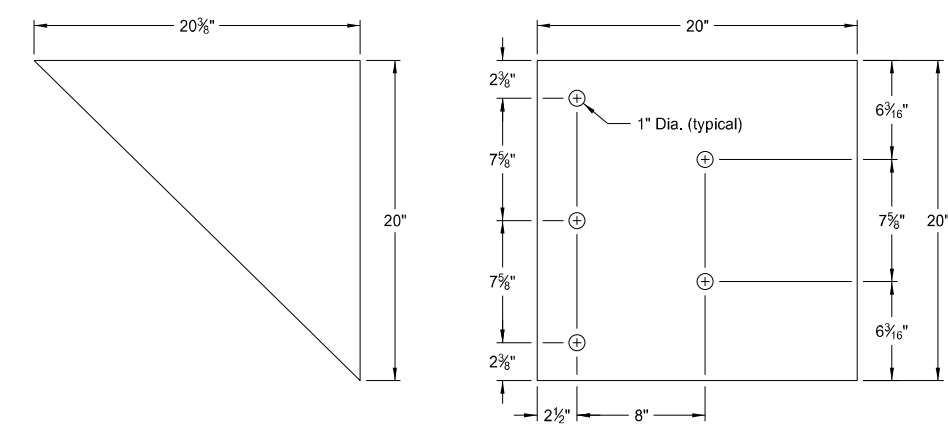
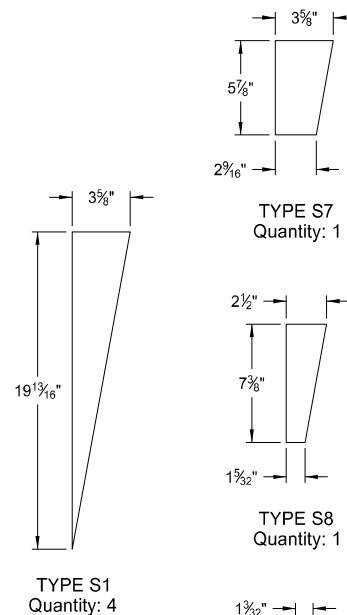


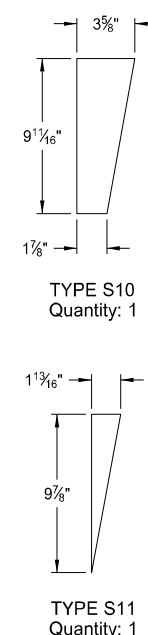
PLATE P2
Quantity: 1

PLATE P1
Quantity: 1

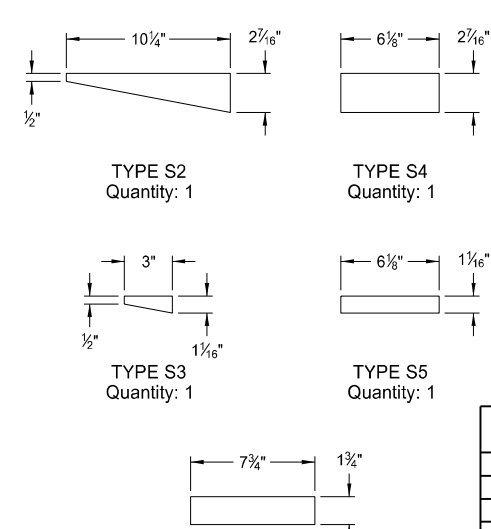
COVER PLATES



VERTICAL PLATES



STIFFENER PLATES



HORIZONTAL PLATES

NOTES:

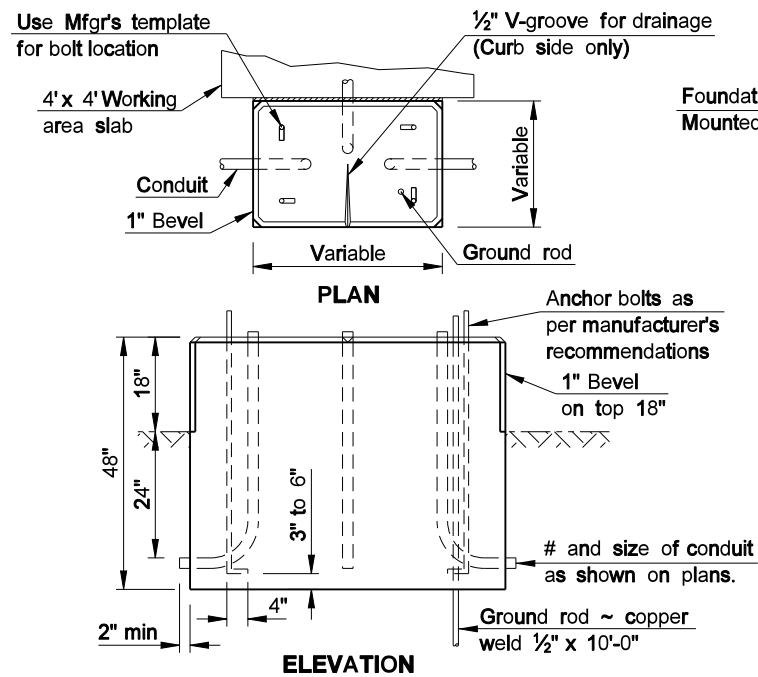
1. Fabricate cover plates P1, P2, and P3 from 3/16" thick ASTM A36 Grade structural steel.
2. Fabricate stiffener plates from 1/4" thick ASTM A36 Grade structural steel.
3. Galvanize connector plate in accordance with AASHTO M111.

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7-14-17	
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DATE	CHANGE
12-02-20	Updated notes to active voice.



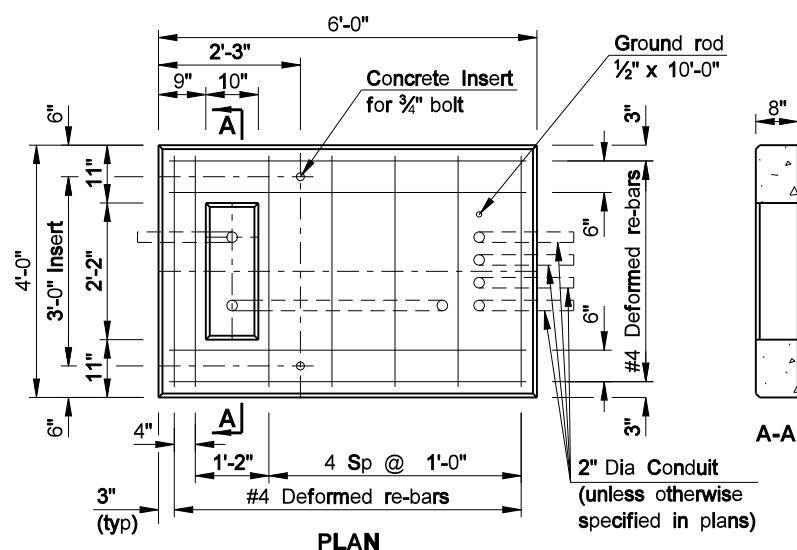
12 02 2020

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

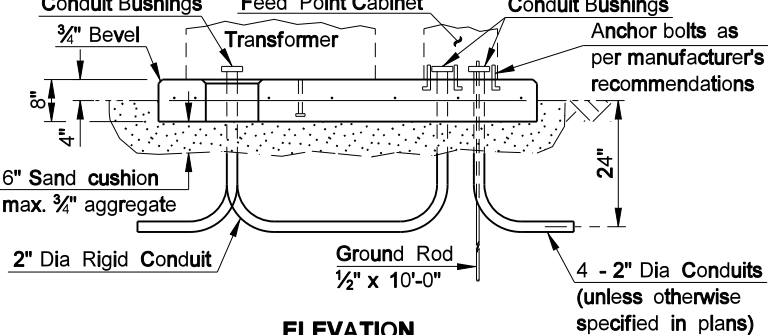


CONTROLLER CABINET FOUNDATION PAD MOUNT

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

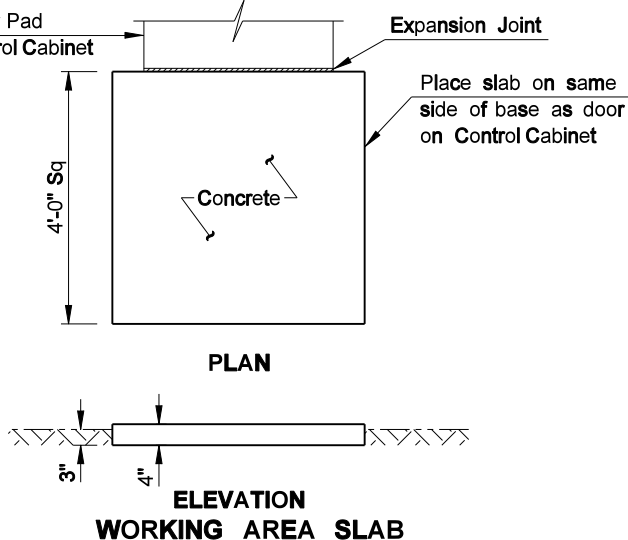


TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

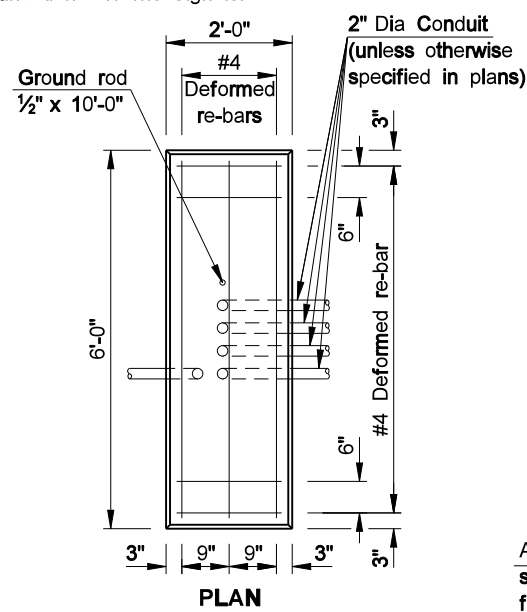


TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

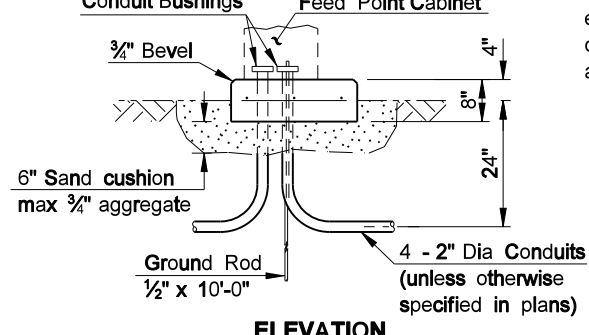
The Transformer & Feed Point Cabinet Foundation Pad Mount shall be bid as Concrete Foundation ~ Feed Point ~ Type A.



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.

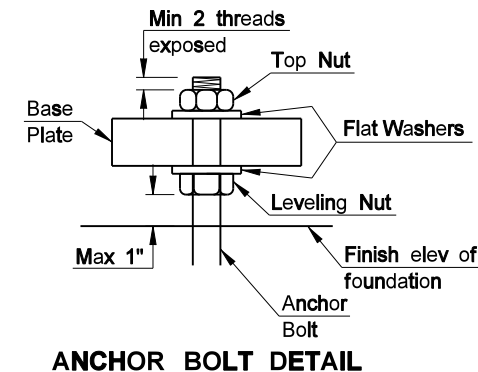


FEED POINT CABINET FOUNDATION PAD MOUNT

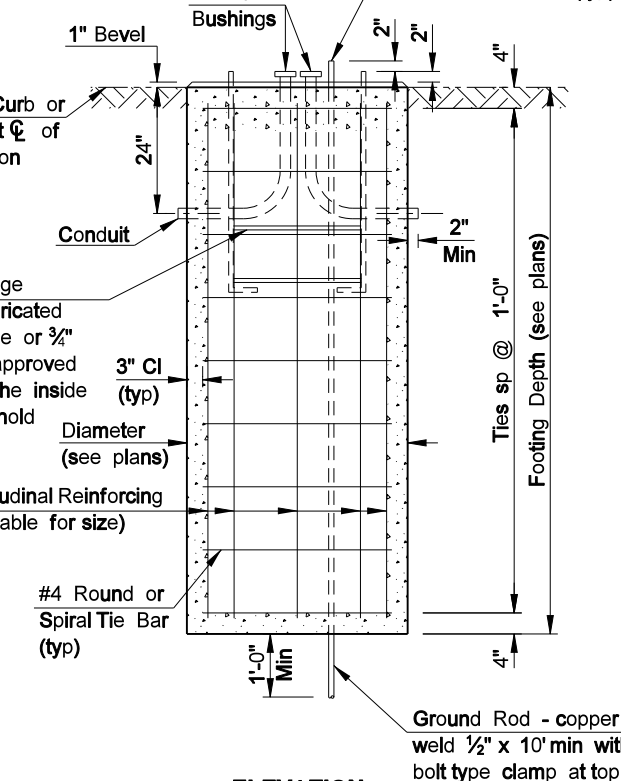
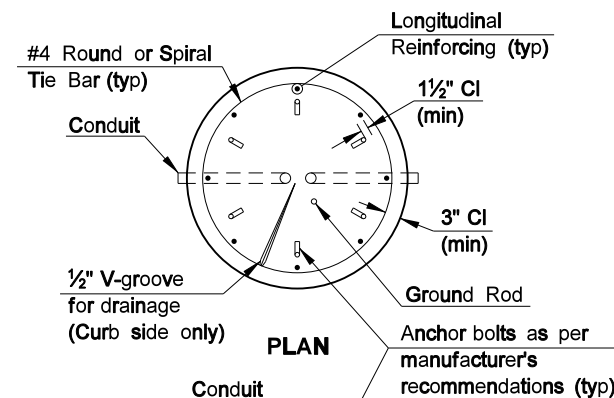


FEED POINT CABINET FOUNDATION PAD MOUNT

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



ANCHOR BOLT DETAIL



LIGHT & SIGNAL STANDARD FOUNDATION

An anchor bolt cage shall be shop fabricated from #6 bar circle or 3/4\"/>

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\"/>

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\"/>

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.

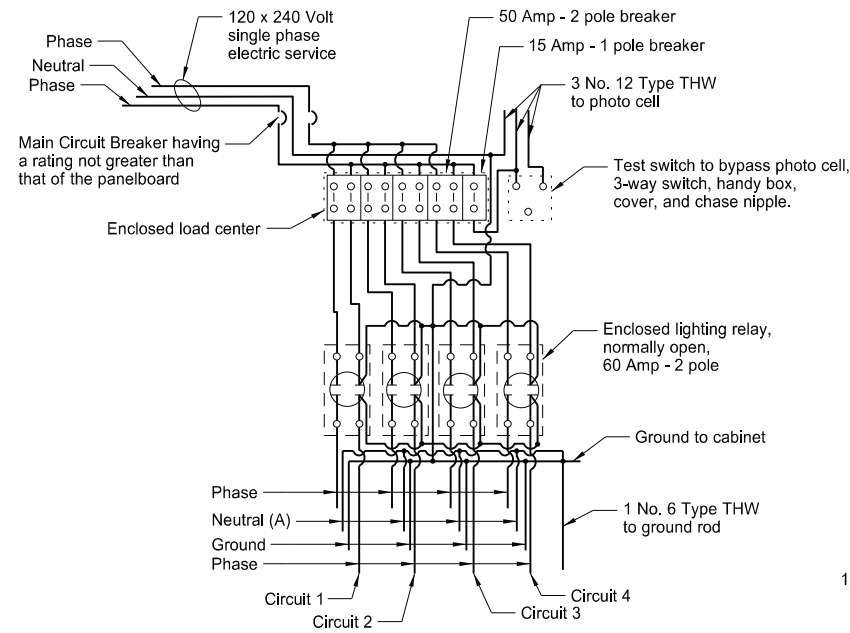
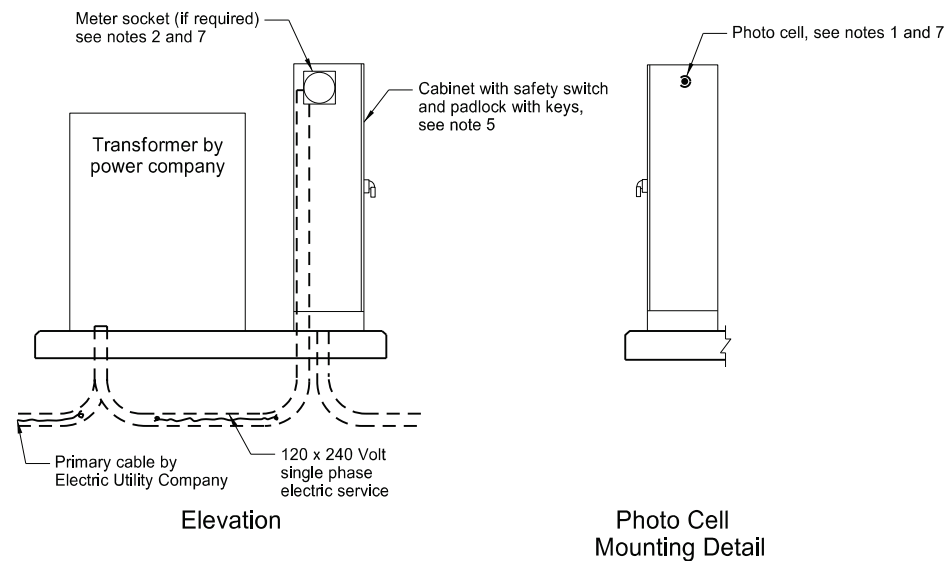
FEED POINT CABINET FOUNDATION PAD MOUNTED: The foundation shall have a wood float finish. All conduits shown shall be installed. Conduit that is not used at this time shall be plugged with an expandable plug.

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 Registration Number PE- 2674 , on 6/15/10 and the original document is stored at the North Dakota Department of Transportation

FEED POINTS (ROADWAY LIGHTING)



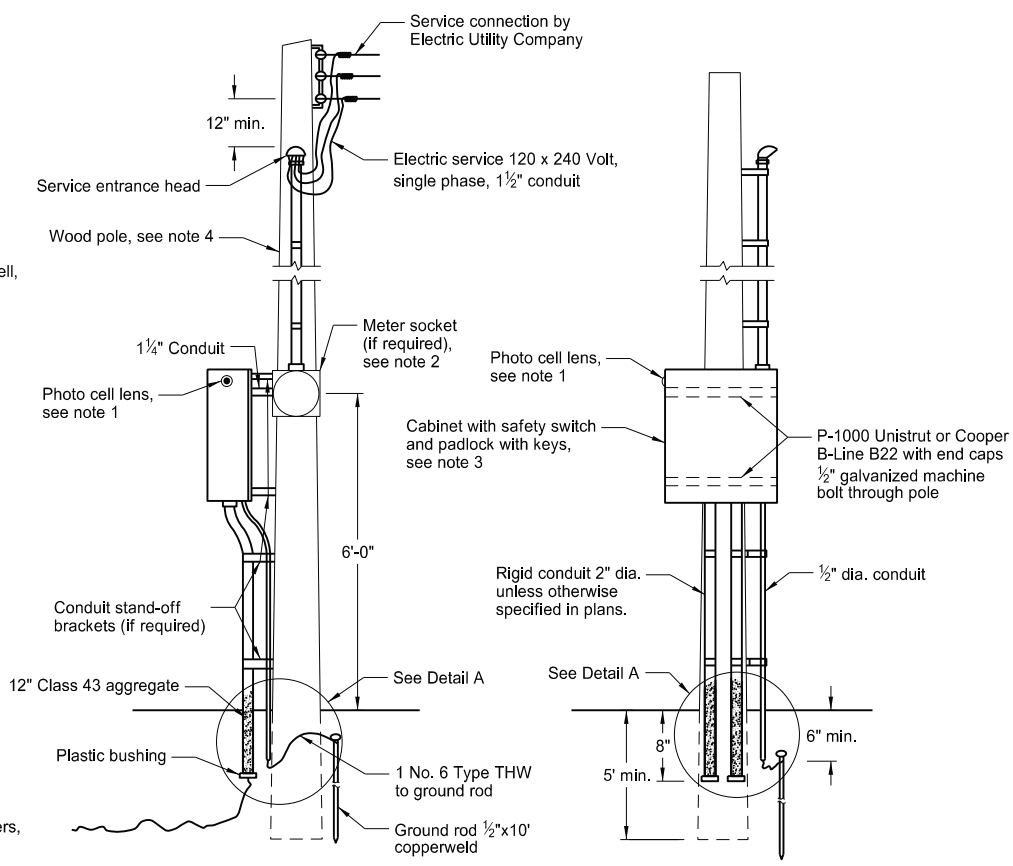
Feed Point Type IV

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.

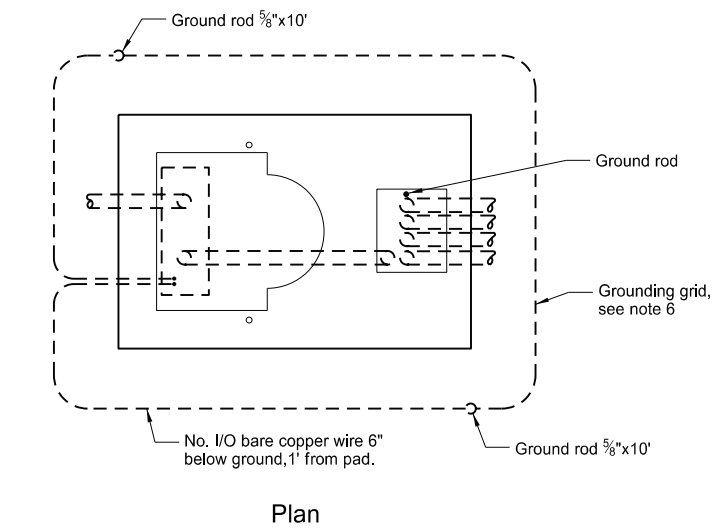
Provide Type III feed point similar to Type IV, except with three electrical circuits, three 50 Amp - 2 pole breakers, and three lighting relays, normally open.

(A) Install when festoon circuit is required.

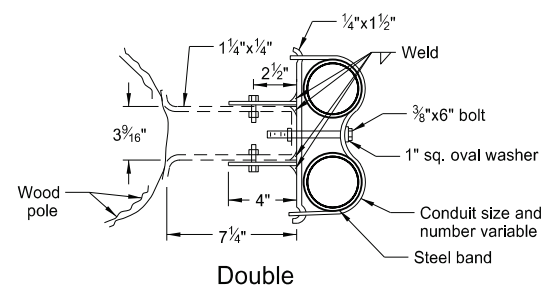


Feed Point Pole Mounted

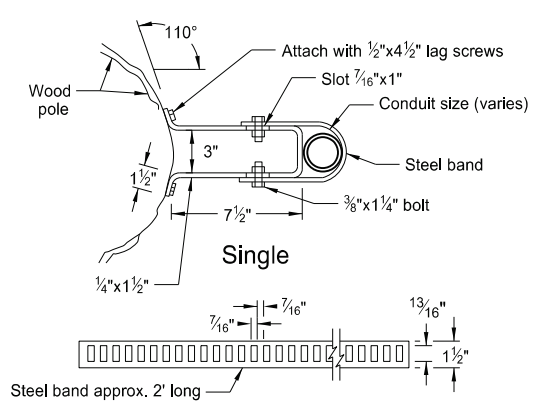
- Notes:
- Photo Cell: Furnish and install the photoelectric cell. Face photo lens north.
 - Meter Socket: Install meter socket and trim if the meter is required by local Utility Company. Meter furnished and installed by Utility Company.
 - Pole Mounted Cabinet: Provide cabinet with lock drip shield, 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.
 - 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.



Plan
Transformer and Feed Point Cabinet Pad Mounted



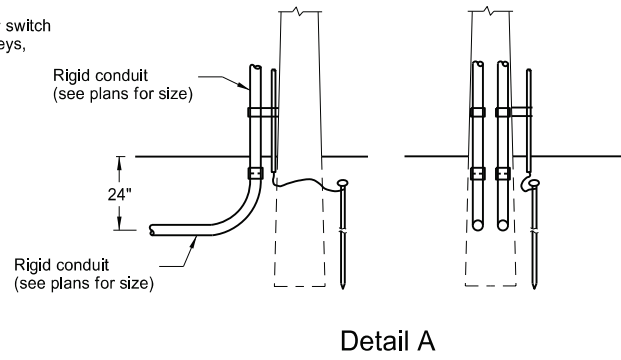
Double



Single

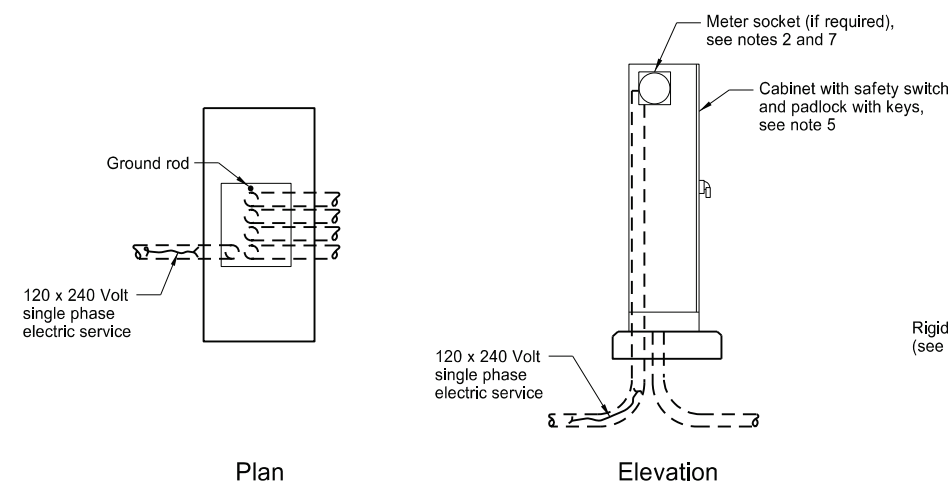
Conduit Standoff Bracket

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



Detail A

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



Plan
Elevation
Feed Point Cabinet Pad Mounted

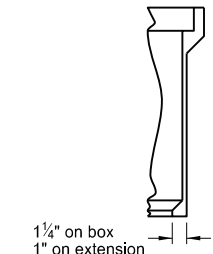
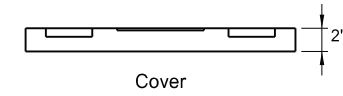
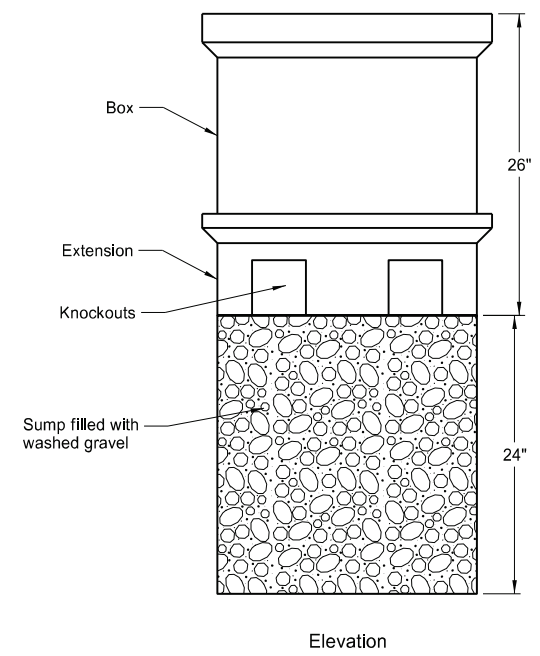
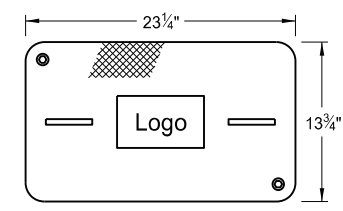
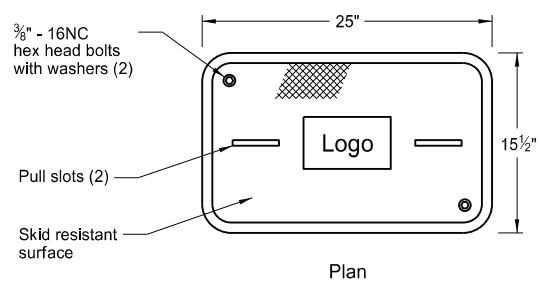
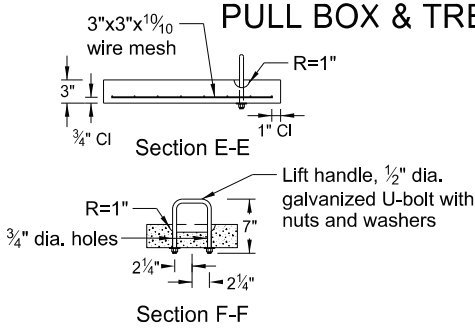
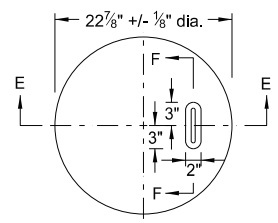
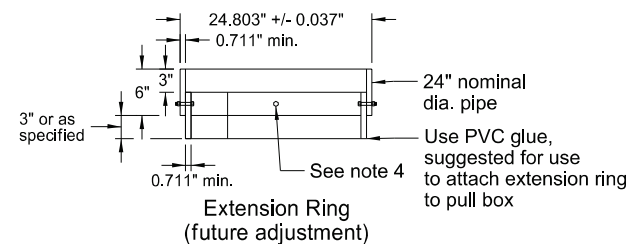
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-8-13	
REVISIONS	
DATE	CHANGE
07-08-14	Revised note 3.
10-17-17	Updated to active voice.
08-28-19	New Design Engineer PE Stamp.
11-01-24	Revised note 5.



PULL BOX & TRENCHING DETAILS

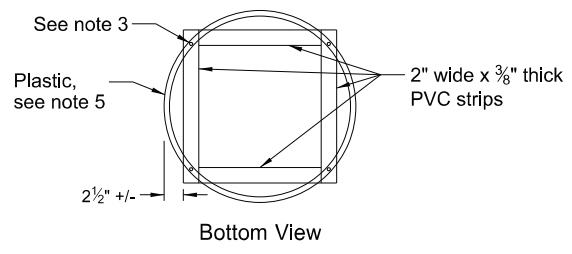
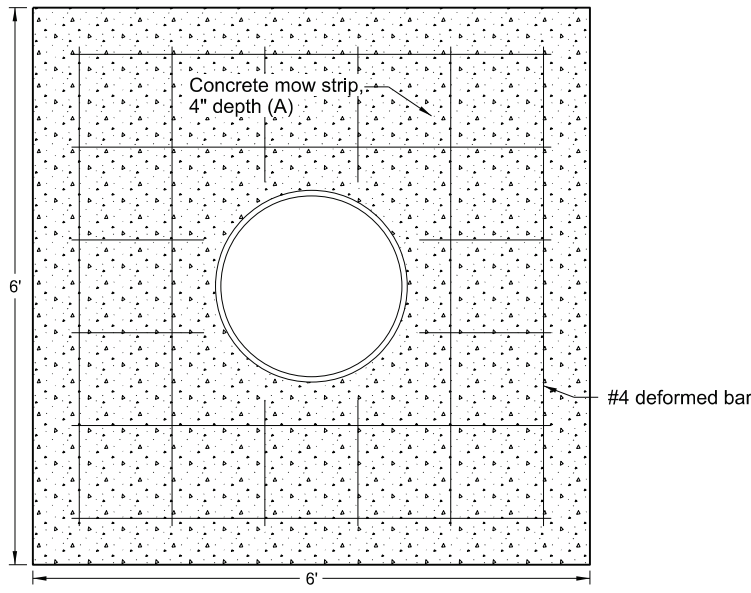
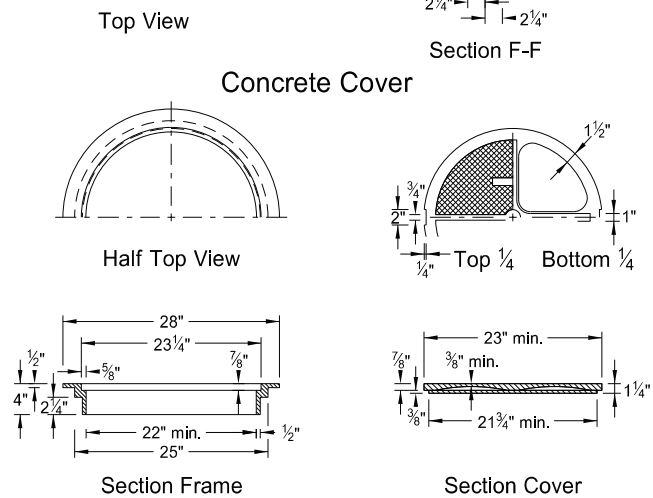
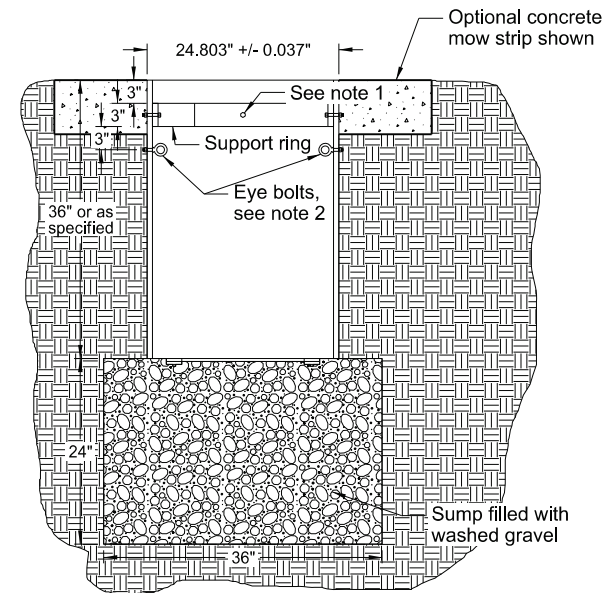
General Pull Box Notes:

1. Duct seal all conduits entering and exiting pull boxes.
2. Ensure all pull boxes are UL listed.



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.
4. Ensure the pull box constructed of polymer concrete reinforced by a heavy weave fiberglass.

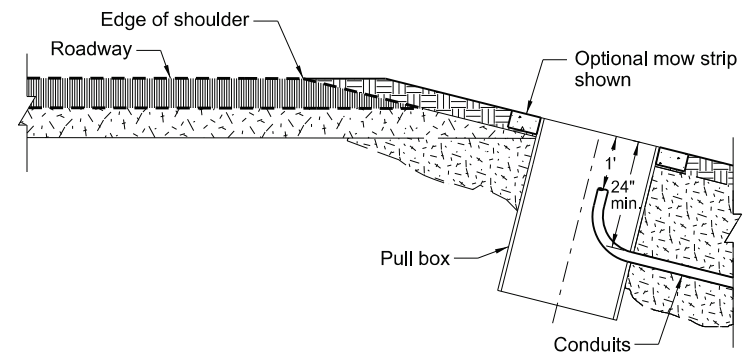


PVC Pull Box Notes:

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 located in barrel section no more than 1" larger than size of conduit being used.
7. After pull box and conduit installation, install water tight seal for inside walls and cover.
8. PVC pipe to meet requirements of ASTM F679 or equal.
9. Provide Austenitic Stainless Steel Hex Head bolts and nuts. Other fasteners to be galvanized as per ASTM A153.
10. Install an epoxy coating on the top and sides of the concrete cover. Provide an epoxy protective coating that is light gray, clear, or neutral in color and apply as recommended by the pull box manufacturer. Before application, clean with a wire brush and dry the surfaces of the concrete to which the epoxy protective coating is applied.
11. If a Cast Iron cover is provided, use grey iron as per AASHTO M 306.

Polymer Concrete Pull Box

Pull Box Installation Details



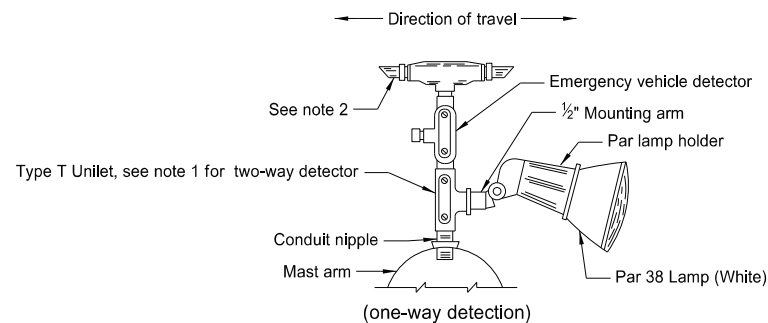
Note: The location of pull box will vary, refer to layout sheets for actual location.

When required, install a mow strip around the pull box. Place expansion material between the foundation and the mow strip. Ensure the mow strip is 4" depth and 2' width from the foundation. Use #4 deformed bars in the mow strip. Space the bars 6" from the outside edge. Place the bars in a grid pattern at 1' apart.

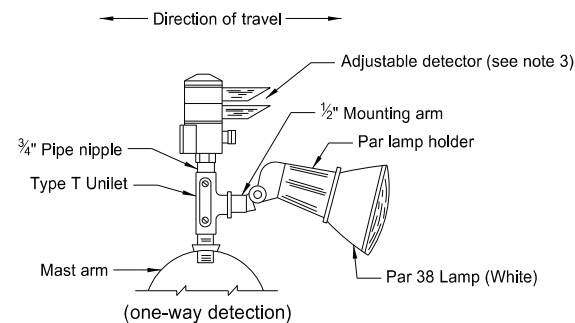
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-8-13	
REVISIONS	
DATE	CHANGE
11-01-24	Updated PVC pull box, trenching.



LIGHTING AND SIGNAL DETAILS

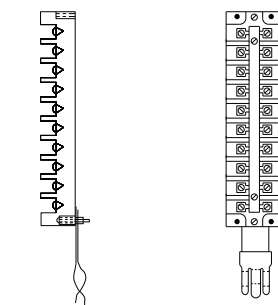


Emergency Vehicle Detector Detail

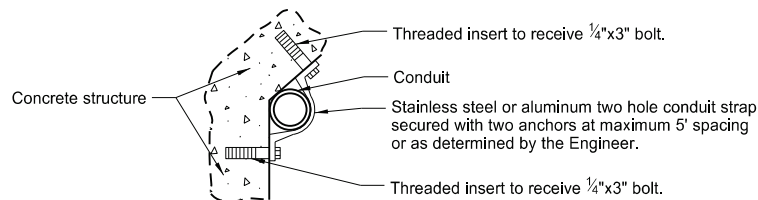


Alternate Emergency Vehicle Detector Detail (adjustable)

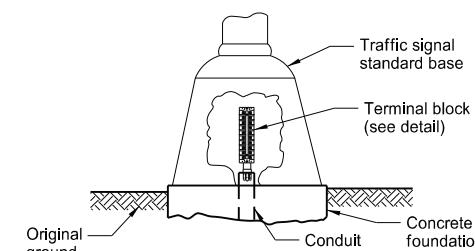
- Notes:
 1. Use Type X Unilet with two Par lamp holders and lamps for Two-way Detectors. (one in each direction).
 2. Plug unused end of One-way Detector with metal pipe plug.
 3. Rotate detector lens to face direction of travel on Two-way Detectors.



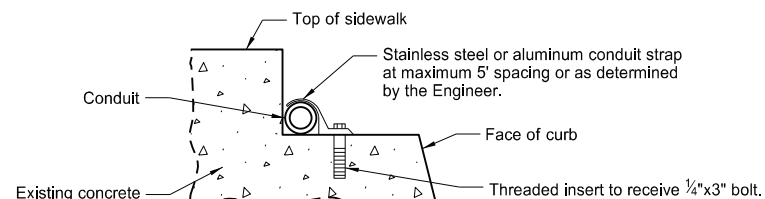
Terminal Block Detail



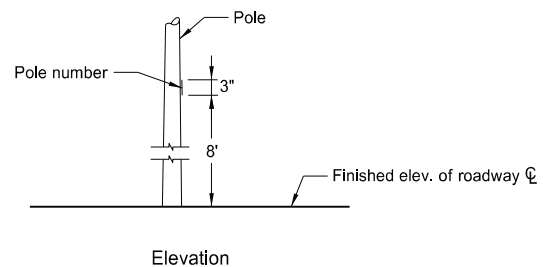
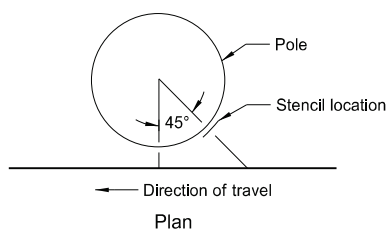
Bridge Mounted Conduit Hanger



Terminal Block (rigid mounted)

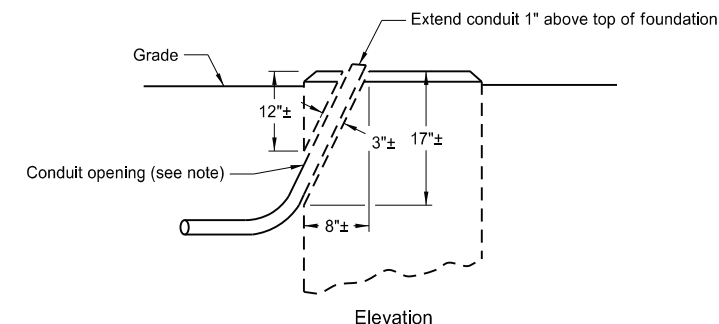


Bridge Curb Mounted Conduit



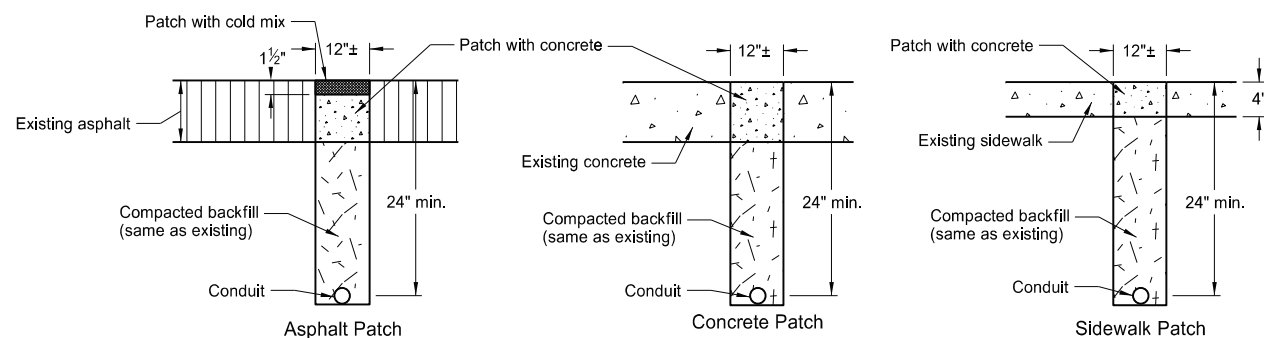
Light Standard Numbering

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



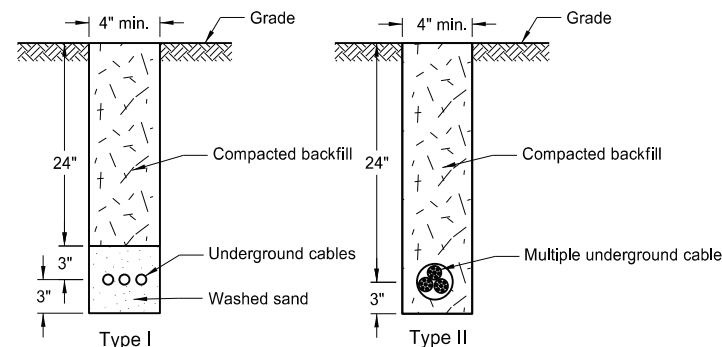
Revise Concrete Foundation

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

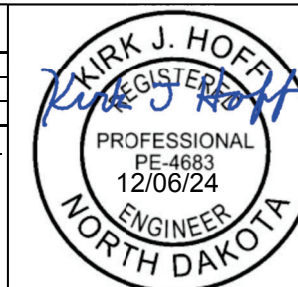
Note: Saw cut trenches. Use PCC pavement for replacement concrete with the coarse aggregate gradation, maximum size and method of curing as approved by the Engineer. Immediately prior to pouring replacement concrete, paint all surfaces with an approved epoxy compound.



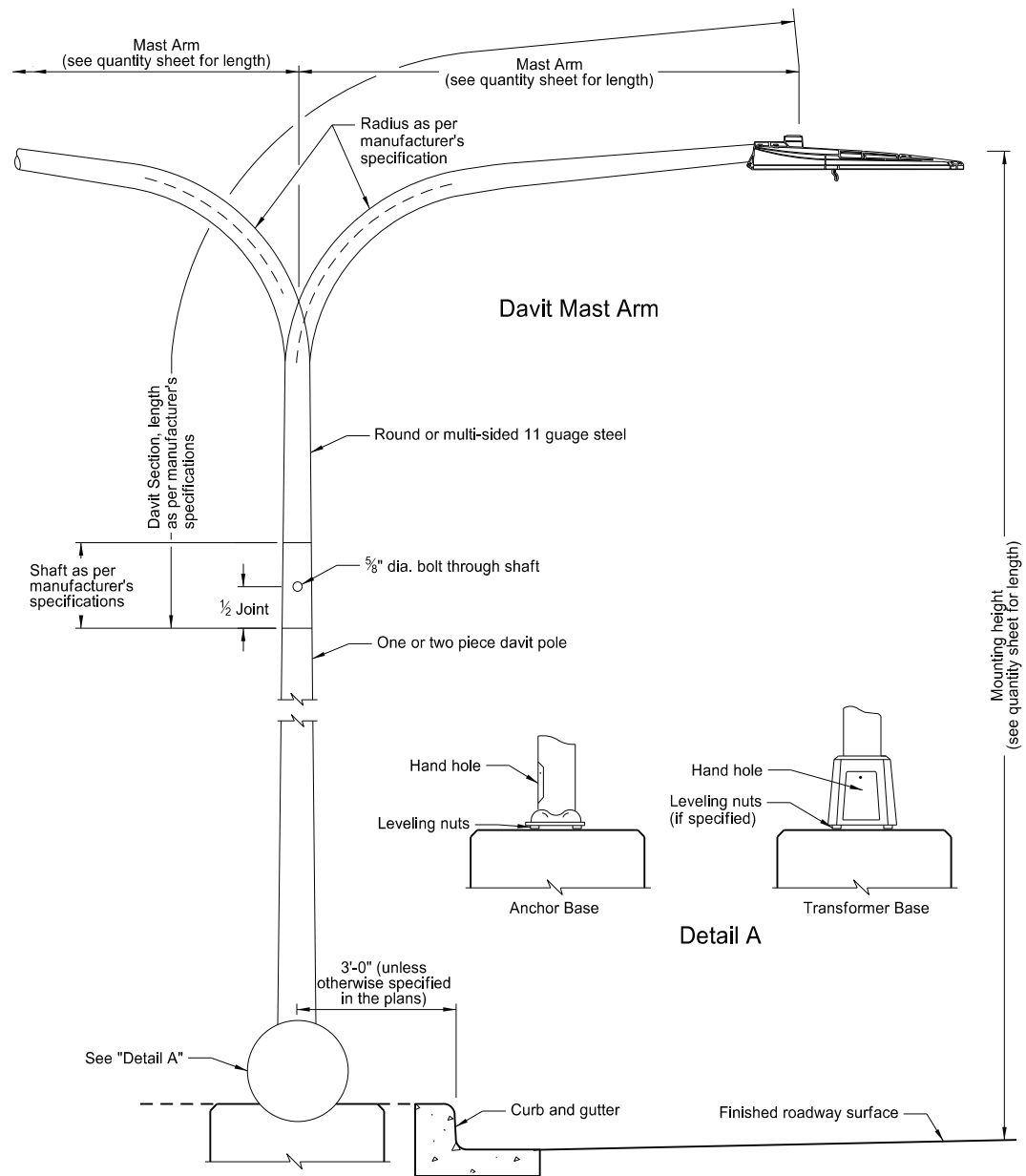
Cable Trench

Note: Seed entire area disturbed by trenching.

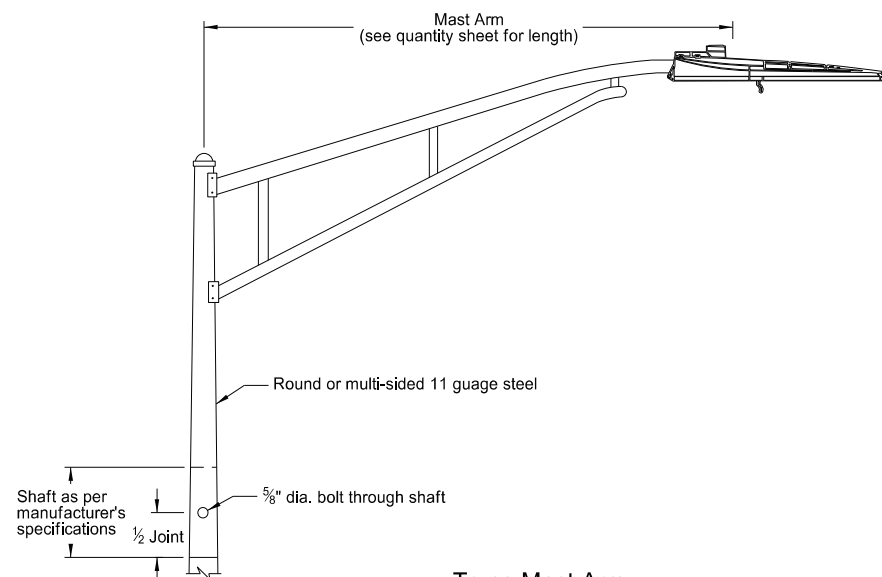
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-8-13	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
10-25-19	Removed conduit under RR detail.
11-01-24	Updated bridge hanger detail.



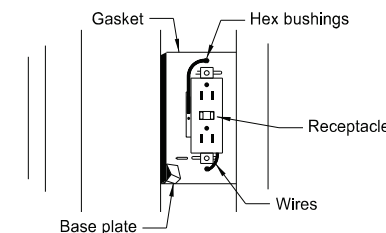
LIGHT STANDARD DETAILS



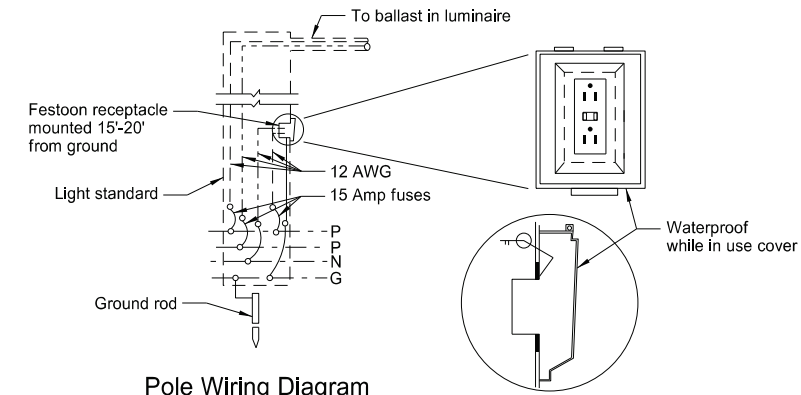
Light Standard Details



Truss Mast Arm



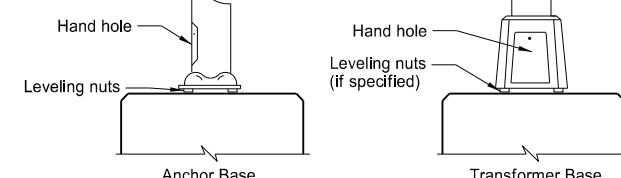
Optional: Festoon receptacle mounted on multi-sided pole.



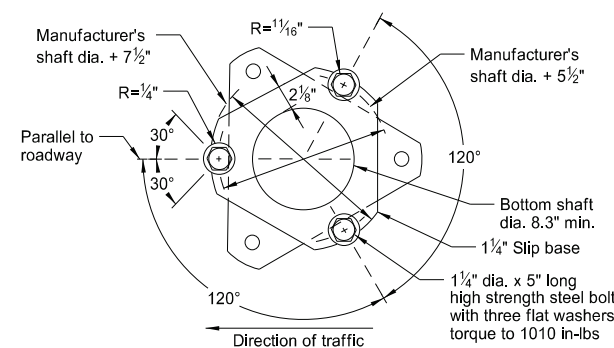
Pole Wiring Diagram

Receptacle Mounting Detail (B)

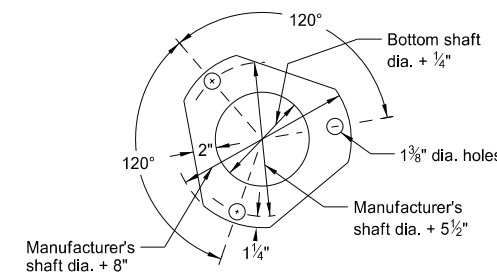
(B) Mount receptacle on side of pole that faces the street. Install Festoon Receptacle only when specified in the plans.



Detail A



Top View



Plan View

Keeper Plate Detail (A)

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

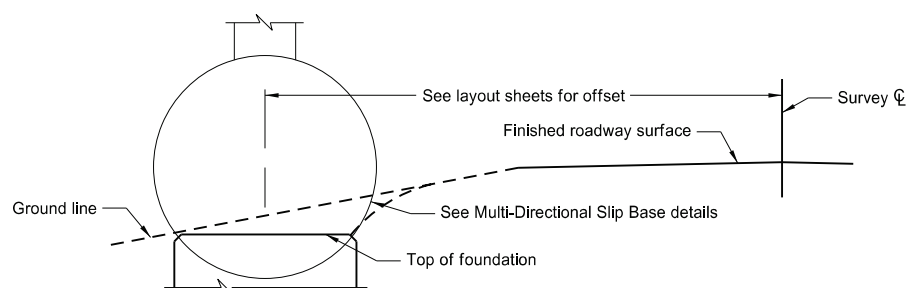
Notes:

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.

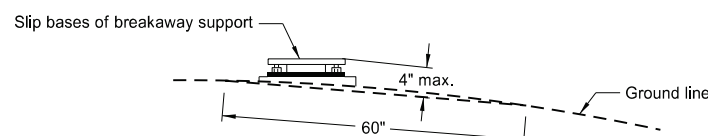
Steel Standards: Touch up marred or scratched areas after erection.

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

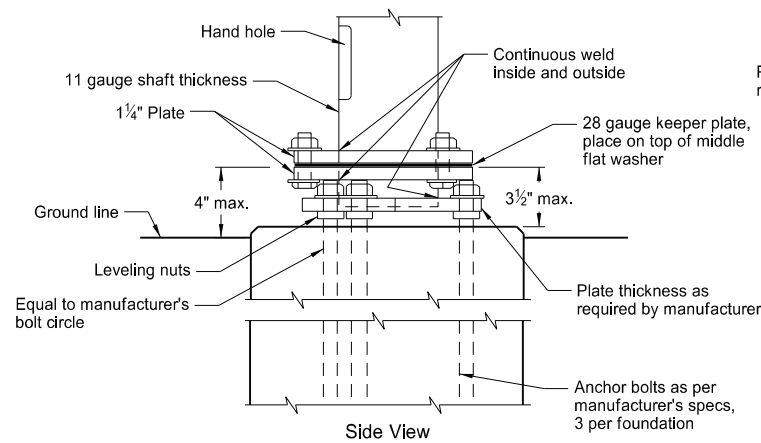
Fusing: Fusing in base, see specifications.



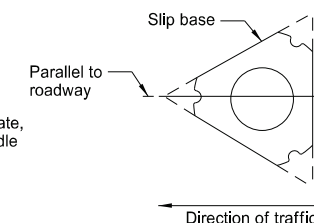
Concrete Foundation Location



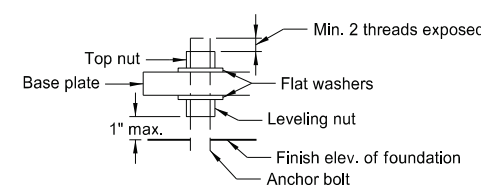
Breakaway Support Stub Clearance Diagram



Steel Base Detail



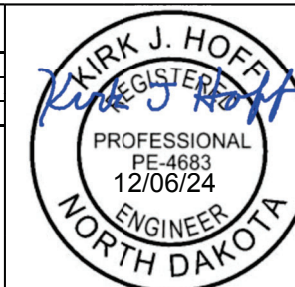
Slip Base Placement Detail

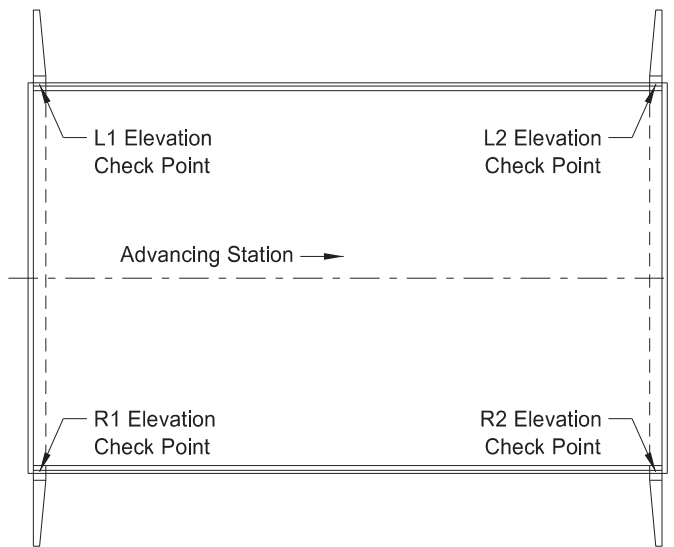


Anchor Bolt Detail

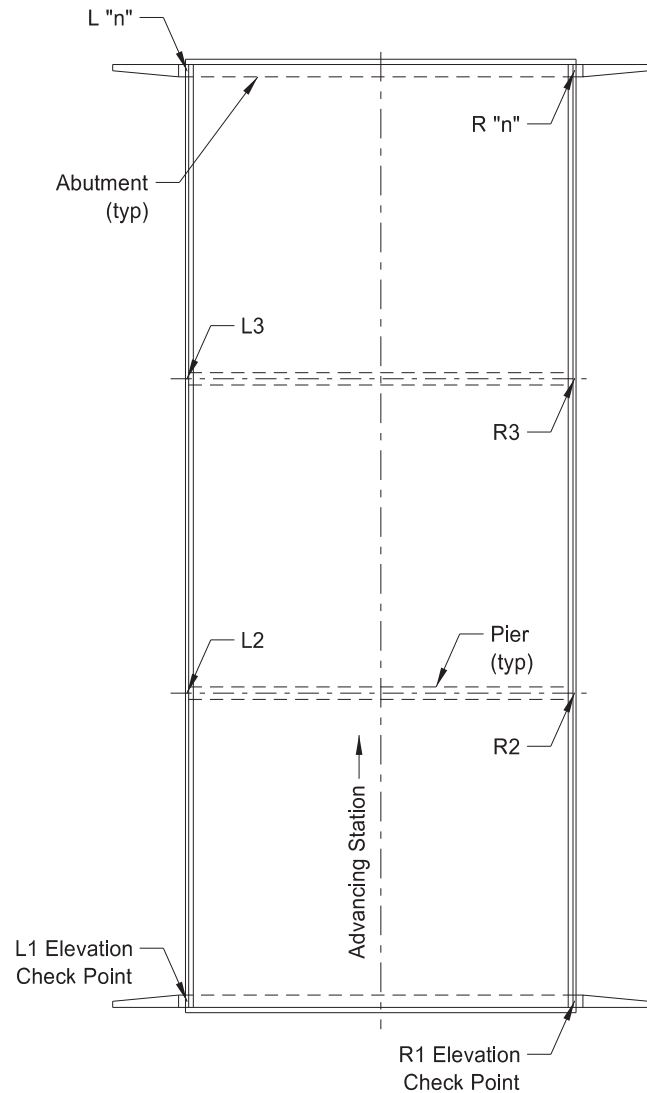
Multi-Directional Slip Base

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-8-13	
REVISIONS	
DATE	CHANGE
10-17-17 08-28-19 11-01-24	Updated to active voice. New Design Engineer PE Stamp. Revised luminaire details/notes.



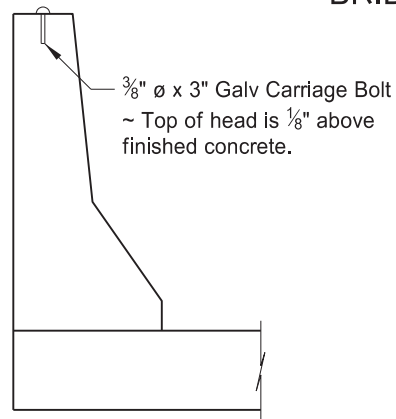


GENERAL LAYOUT FOR SINGLE SPAN

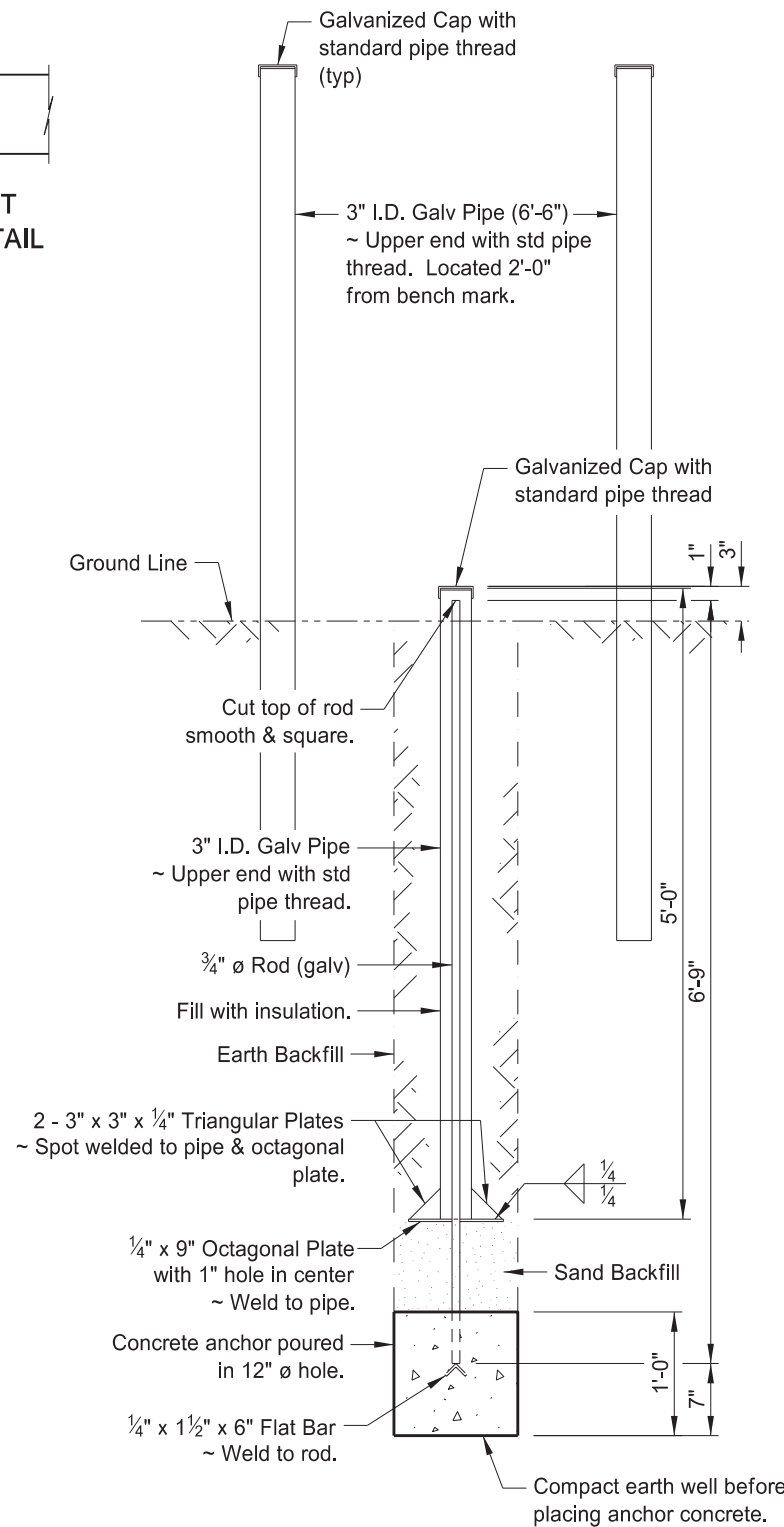


GENERAL LAYOUT FOR MULTIPLE SPAN

BRIDGE BENCH MARKS



CHECK POINT LOCATION DETAIL



BENCH MARK DETAIL

NOTES:

Install elevation check points in the top of the concrete barriers at the locations shown in the General Layout view. Install the checkpoints in the barriers over each substructure unit at each bridge location. Use 3/8" diameter x 3" long galvanized carriage bolts set with the top of the bolt head projected 1/8" above the top of the finished concrete.

Set two bench marks as shown in the Bench Mark Detail at each bridge location. Locate the bench marks diagonally from one another at opposite corners of each bridge. Set the bench marks near the Right of Way line at least 300 feet from the nearest point of the structure. Extend two of the galvanized steel pipes 4'-0" above ground and paint with white paint suitable for painting over galvanized steel surfaces.

The Project Engineer will run a set of levels to determine the elevation of the bridge bench marks and elevation check points immediately after completion of the bridge. List the elevation of Bench Mark #1 as elevation 1,000, or as the actual surveyed elevation. The Project Engineer will record the information of SFN 13420 and submit to the Bridge Engineer.

Galvanize all metal parts per Section 854 after fabrication.

At the time of installation, coat the threads with synthetic grease containing teflon. Screw the cap to a snug fit.

Include the cost of furnishing and installing two bridge bench marks and the number of elevation check points required for one structure in the price bid for each set of Bridge Bench Marks.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09/14/11	
REVISIONS	
DATE	CHANGE
09/03/19	UPDATED SIGNATURE
02/23/24	Updated Signature Revised notes & updated to active voice

