

NDDOT ABBREVIATIONS

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

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

BV butterfly valve
 Byp bypass
 C Gdrl cable guardrail
 Calc calculate
 Cd candela
 CIP cast iron pipe
 CB catch basin
 CRS cationic rapid setting
 C Gd cattle guard
 C To C center to center
 Cl or C centerline
 Cm centimeter
 Ch chain
 Chnlk chain-link
 Ch Blk channel block
 Ch Ch channel change
 Chk check
 Chsld chiseled
 Cir circle
 Cl class
 Cl clay
 Cl F clay fill
 Cl Hvy clay heavy
 Cl Lm clay loam
 Clnt clean-out
 Clr clear
 Cl&gr clearing & grubbing
 Co S coal slack
 Comb. combination
 Coml commercial
 Compr compression
 CADD computer aided drafting & design
 Conc concrete
 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
 CSP corrugated steel pipe
 C coulomb
 Co County
 Crse course
 C Gr course gravel
 CS course sand

Ct Court
 Xarm cross arm
 Xbuck cross buck
 Xsec cross sections
 Xing crossing
 Xrd Crossroad
 Crn crown
 CF cubic feet
 M3 cubic meter
 M3/s cubic meters per second
 CY cubic yard
 Cy/mi cubic yards per mile
 Culv culvert
 C&G curb & gutter
 CI curb inlet
 CR curb ramp
 CS curve to spiral
 C cut
 Dd Ld dead load
 Defl deflection
 Defm deformed
 Deg or D degree
 DInt delineate
 DIntr delineator
 Depr depression
 Desc description
 Det detail
 DWP detectable warning panel
 Dtr detour
 Dia 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
 Elec electric/al
 EDM electronic distance meter
 Elev or El elevation
 Ellipt elliptical
 Emb embankment
 Emuls emulsion/emulsified

ES end section
 Engr engineer
 ESS environmental sensor station
 Eq equal
 Eq equation
 Evgr evergreen
 Exc excavation
 Exst existing
 Exp expansion
 Expy Expressway
 E external of curve
 Extru extruded
 FOS factor of safety
 F Fahrenheit
 FS far side
 F farad
 Fed Federal
 FP feed point
 Ft feet/foot
 Fn fence
 Fn P fence post
 FO fiber optic
 FB field book
 FD field drive
 F fill
 FAA fine aggregate angularity
 FS fine sand
 FH fire hydrant
 Fl flange
 Flrd flared
 FES flared end section
 F Bcn flashing beacon
 FA flight auger sample
 FL flow line
 Ftg footing
 FM force main
 Fs foresight
 Fnd found
 Fdn foundation
 Frac fractional
 Frwy freeway
 Frt front
 FF front face
 F Disp fuel dispenser

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D-101-2

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

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Qty quantity
 Qtr quarter
 Rad or R radius
 RR railroad
 Rlwy railway
 Rsd raised
 RTP random traverse point
 Rge or R range
 RC rapid curing
 Rec record
 Rcy recycle
 RPCC recycled Portland cement concrete
 Ref reference
 R Mkr reference marker
 RM reference monument
 Refl reflectorized
 RCB reinforced concrete box
 RCES reinforced concrete end section
 RCP reinforced concrete pipe
 RCPS reinforced concrete pipe sewer
 Reinf reinforcement
 Res reservation
 Ret retaining
 Rev reverse
 Rt right
 R/W right of way
 Riv river
 Rd road
 Rdbd road bed
 Rdwy roadway
 RWIS Roadway Weather Information System
 Rk rock
 Rt route
 Salv salvage(d)
 Sd sand
 Sdy Cl sandy clay
 Sdy Cl Lm sandy clay loam
 Sdy Fl sandy fill
 Sdy Lm sandy loam
 San sanitary sewer line
 Sc scoria
 Sec seconds
 Sec section
 SL section line
 Sep separation
 Seq sequence
 Serv service
 Sh shale
 Sht sheet
 Shtng sheeting
 Shldr shoulder
 Sw sidewalk
 S siemens
 SD sight distance
 SN sign number

Sig signal
 Si Cl silt clay
 Si Cl Lm silty clay loam
 Si Lm silty loam
 Sgl single
 SC slow curing
 SS slow setting
 Sm small
 S South
 SE South East
 SW South West
 SB Southbound
 Sp spaces
 Spcl special
 SA special assembly
 SP special provisions
 G specific gravity
 Spk spike
 SC spiral to curve
 ST spiral to tangent
 SB split barrel sample
 SH sprinkler head
 SV sprinkler valve
 Sq square
 SF square feet
 Km2 square kilometer
 M2 square meter
 SY square yard
 Stk stake
 Std standard
 N standard penetration test
 Std Specs Standard Specifications
 Sta station
 Sta Yd station yards
 Stm L steam line
 SEC steel encased concrete
 SSD stopping sight distance
 SD storm drain
 St street
 SPP structural plate pipe
 SPPA structural plate pipe arch
 Str structure
 Subd subdivision
 Sub subgrade
 Sub Prep subgrade preparation
 Ss subsoil
 SE superelevation
 SS supplement specification
 Supp supplemental
 Surf surfacing
 Surv survey
 Sym symmetrical
 SI Systems International
 Tan tangent
 T tangent (semi)

TS tangent to spiral
 Tel telephone
 Tel B Telephone Booth
 Tel P telephone pole
 Tv television
 Temp temperature
 Temp temporary
 TBM temporary bench mark
 T tesla
 T thinwall tube sample
 T/mi tons per mile
 Ts topsoil
 Twp or T township
 Traf traffic
 TSCB traffic signal control box
 Tr trail
 Transf transformer
 TB transit book
 Trans transition
 TT transmission tower
 Trans transverse
 Trav traverse
 TP traverse point
 Trtd treated
 Trmt treatment
 Qc triaxial compression
 TERO tribal employment rights ordinance
 Tpl triple
 TP turning point
 Typ typical
 Qu unconfined compressive strength
 Ugrnd underground
 USC&G US Coast & Geodetic Survey
 USGS US Geologic Survey
 Util utility
 VG valley gutter
 Vap vapor
 Vert vertical
 VC vertical curve
 VCP vitrified clay pipe
 V volt
 Vol volume
 Wkwy walkway
 W water content
 WGV water gate valve
 WL water line
 WM water main
 WMV water main valve
 W Mtr water meter
 WSV water service valve
 WW water well
 W watt
 Wrng wearing
 Wb weber
 WIM Weigh In Motion
 W West

WB Westbound
 Wrng wiring
 W/ with
 W/o without
 WC witness corner
 WGS World Geodetic System
 Z zenith

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

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

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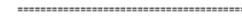
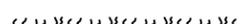
Line Styles

.....	Limits of Const Transition Line	—— s —— s ——	Floating Silt Curtain	—— ——— ———	Existing Aggregate (Cross Section View)	- - - - -	Existing Centerline
.....	Bale Check	—— ——— T ——	Existing Telephone Line	—— ——— ———	Existing Curb and Gutter (Cross Section View)	- - - - -	Supplemental Contour
.....	Rock Check	—— ——— TV ——	Existing TV Line	—— ——— ———	Existing Riprap	—— - - - - -	Right of Way
.....	Sight Distance Triangle Line	Void — void — void — v	Existing Assumed Ground (Not Surveyed)	—— ——— ———	Existing Underground Vault or Lift Station	—— - - - - -	Existing Right of Way
- - - - -	Small Hidden Object	Void — void — void — v	Tentative Ground Line	—— ——— ———	Tangent Line	—— - - - - -	Existing Right of Way Railroad
- - - - -	Dimension Leader	—— ——— w ——	Existing Water or Steam Line	- - - - -	Hidden Object	- - - - -	Failure Line
- - - - -	Existing Ground	=====	Existing Under Drain	—— ——— ———	Existing Dirt Surface	- - - - -	Existing Conditions
- - - - -	Existing Topsoil (Cross Section View)	=====	Under Drain	—— ——— ———	Existing Conduit	- - - - -	Existing Ground (Details)
—— ——— ———	Large Hidden Object	=====	Wall	—— ——— ———	Topsoil Profile	—— - - - - -	Existing Sixteenth Section Line
—— ——— ———	Edge Drain	=====	Existing Slotted Drain	- - - - -	Existing Conductor	- - - - -	Existing Right of Way Not State Owned
—— D —— D ——	Geotextile Fabric Type D	—— + —— + ——	Existing Cemetary Boundary	- - - - -	Conductor	- - - - -	Phantom Object
—— ——— E ——	Existing Electrical	—— ——— ———	Centerline Pavement Marking	- - - - -	Fiber Optic	- - - - -	Centerline Main
—— ——— FO ——	Existing Fiber Optic Line	=====	Barrier with Centerline Pavement Marking	- - - - -	Existing Loop Detector	-	Existing Guardrail Cable
—— ——— FO ——	Existing TV Fiber Optic	=====	Barrier Pavement Marking	- - - - -	Subgrade, Subcut or Ditch Grade	— • — • — • — •	Existing Guardrail Metal
—— ——— G ——	Existing Gas Pipe	- - - - -	Stripe 4 IN Dotted Extension White	—— ——— ———	Existing Asphalt Surface	—— . ——— . ——— . ——— .	Existing Edge of Water
—— ——— Geo —— Geo ——	Geogrid	- - - - -	Stripe 8 IN Dotted Extension White	—— ——— ———	Existing Asphalt (Cross Section View)	- - - - -	Excavation Limits
—— ——— OH ——	Existing Overhead Utility Line	- - - - -	Stripe 8 IN Lane Drop	—— ——— ———	Existing Reinforcement Rebar	——	Existing Government Lot Line
—— ——— P ——	Existing Power	—— ——— ———	Wetland Mitigation	—— ——— ———	Existing Tie Point Line	.....	Existing Adjacent Block Lines
—— ——— PL ——	Existing Fuel Pipeline	- - - - -	Existing Box Culvert Bridge	—— ——— ———	Existing State or International Line	.....	Existing Adjacent Lot Lines
—— ——— PL ——	Existing Undefined Above Ground Pipe Line	- - - - -	Existing Concrete Surface	—— ——— ———	Existing Quarter Section Line	.....	Existing Adjacent Property Line
—— ——— R —— R ——	Geotextile Fabric Type R	- - - - -	Existing Drainage Structure	—— ——— ———	Existing County	.....	Existing Adjacent Subdivision Lines
—— ——— R —— R ——	Geotextile Fabric Type R1	- - - - -	Easement	—— ——— ———	Existing Section Line	.....
—— REMOVE —— REMOVE ——	Remove Line	- - - - -	Existing Concrete	—— ——— ———	Existing Township	.....
—— ——— RR —— RR ——	Geotextile Fabric Type RR	- - - - -	Existing Easement	—— ——— ———	Existing Railroad Centerline	
—— ——— S —— S ——	Geotextile Fabric Type S	—— ——— ———	Existing Gravel Surface	—— ——— ———	Centerline	

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Line Styles

	Subgrade Reinforcement		Existing Railroad Switch		Sheet Piling
	Existing Down Guy Wire Down Guy		Overhead Sign Structure Cantilever		W-Beam w Posts
	Existing Fence		24 Inch Pipe		Existing W-Beam Guardrail with Posts
	Existing Railroad		Reinforced Concrete Pipe		Exst Wet Area-Vegetation Break
	Existing Sanitary Sewer		Signal Head with Mast Arm		Existing Wetland Delineated
	Existing Sanitary Force Main		Existing Signal Head with Mast Arm		
	Existing Storm Drain		Tie Bar at Random Spacing		
	Existing Storm Drain Force Main		3-Cable w Posts		
	Fence		Existing 3-Cable w Posts		
	Silt Fence		Site Boundary		
	Existing Field Line		Fiber Rolls		
	Exst Flow		Doweled Joint		
	Flow		Tie Bar 30 Inch 4 Foot Center to Center		
	Existing Culvert		Tie Bar 18 Inch 3 Foot Center to Center		
	Existing Curb		Existing Berm, Dike, Pit, or Earth Dam		
	Existing Valley Gutter		Existing Ditch Block		
	Existing Driveway Gutter		Depression Contours		
	Existing Curb and Gutter		Existing City Corporate Limits or Reservation Boundary		
	Existing Mountable Curb and Gutter		Gravel Pit - Borrow Area		
	Existing Double Micro Loop Detector		Existing Tree Boundary		
	Micro Loop Detector Double		Tree Row		
	Existing Overhead Sign Structure		Existing Brush or Shrub Boundary		
	Existing Micro Loop Detector		Existing Retaining Wall		
	Micro Loop Detector		Existing Planter or Wall		
	Existing Overhead Sign Structure Cantilever		Retaining Wall (Plan View)		

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Symbols

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

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

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Symbols

	Existing Light Standard		Existing Manhole with Valve Water		Existing Telephone Pole		Existing Undefined Manhole
	Existing High Mast Light Standard 10 Luminaire		Existing Water Manhole		Existing Wood Pole		Existing Undefined Pull Box
	Existing High Mast Light Standard 3 Luminaire		Existing Mile Post Type A		Existing Post		Existing Undefined Pedestal
	Existing High Mast Light Standard 4 Luminaire		Existing Mile Post Type B		Existing Pedestrian Push Button Post		Existing Undefined Valve
	Existing High Mast Light Standard 5 Luminaire		Existing Mile Post Type C		Existing Control Point CP		Existing Undefined Pipe Vent
	Existing High Mast Light Standard 6 Luminaire		Existing Reference Marker		Existing Control Point GPS-RTK		Existing Gas Valve
	Existing High Mast Light Standard 7 Luminaire		Existing RW Marker		Existing Control Point TRI		Existing Water Valve
	Existing High Mast Light Standard 8 Luminaire		Existing Utility Marker		Existing Reference Marker Point NGS		Existing Fuel Pipe Vent
	Existing High Mast Light Standard 9 Luminaire		Iron Monument Found		Existing Pull Box		Existing Gas Pipe Vent
	Existing Overhead Sign Structure Load Center		Iron Pin R/W Monument		Existing Intelligent Transportation Pull Box		Existing Sanitary Pipe Vent
	Existing Luminaire		Existing Object Marker Type I		Existing Water Pump		Existing Storm Drain Pipe Vent
	Existing Light Standard Luminaire		Existing Object Marker Type II		Existing Slotted Reinforced Concrete Pipe		Existing Water Pipe Vent
	Existing Federal Mailbox		Existing Object Marker Type III		Existing RR Profile Spot		Existing Weather Station
	Existing Private Mailbox		Existing Electrical Pedestal		Existing Fuel Leak Sensors		Existing Ground Water Well Bore Hole
	Existing Meander Section Corner		Existing Telephone Pedestal		Existing Highway Sign		Existing Windmill or Tower
	Existing Meter		Existing Fiber Optic Telephone Pedestal		Existing Miscellaneous Spot		Existing Witness Corner
	Existing Electrical Manhole		Existing TV Pedestal		Existing Lighting Standard Pole		Flashing Beacon
	Existing Gas Manhole		Existing Fiber Optic TV Pedestal		Existing Traffic Signal Standard		Flagger
	Existing Sanitary Manhole		Existing Fuel Filler Pipes		Existing Transformer		Pipe Mounted Flasher
	Existing Sanitary Force Main Manhole		Existing Traverse PI Aerial Panel		Existing Large Evergreen Tree		Sanitary Force Main with Valve
	Existing Sanitary Manhole with Valve		Existing Pole		Existing Small Evergreen Tree		
	Existing Storm Drain Manhole		Existing Power Pole		Existing Large Tree		
	Existing Force Main Storm Drain Manhole		Existing Power Pole with Transformer		Existing Small Tree		
	Existing Force Main Storm Drain Manhole with Valve				Existing Tree Trunk		
	Existing Telephone Manhole				Existing Pad Mounted Traffic Signal Control Box		

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
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Symbols

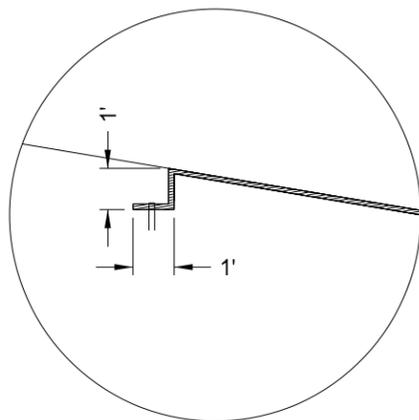
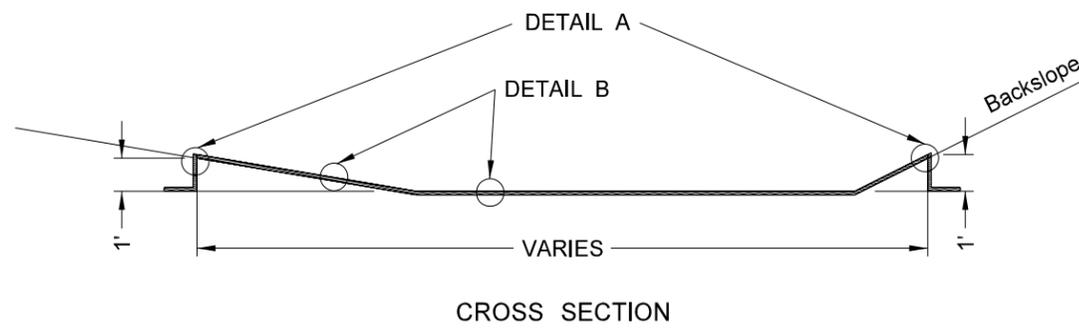
D-101-32

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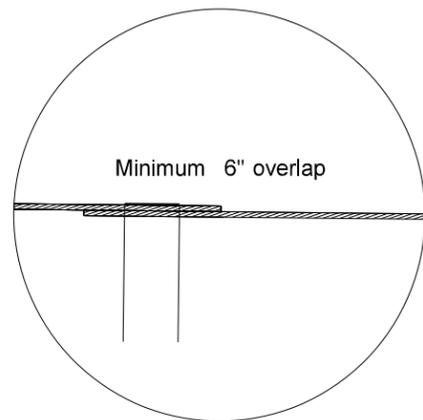
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
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DATE	CHANGE

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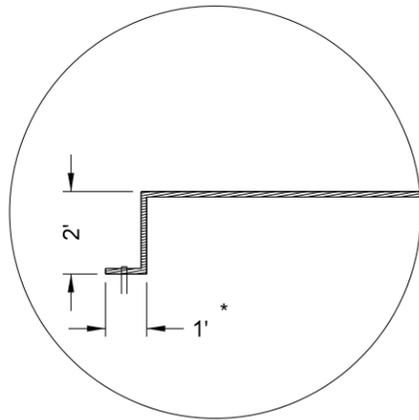
EROSION AND SILTATION CONTROL
EROSION CONTROL BLANKET INSTALLATION



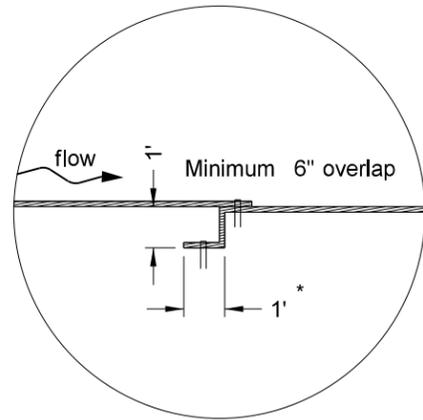
DETAIL A



DETAIL B



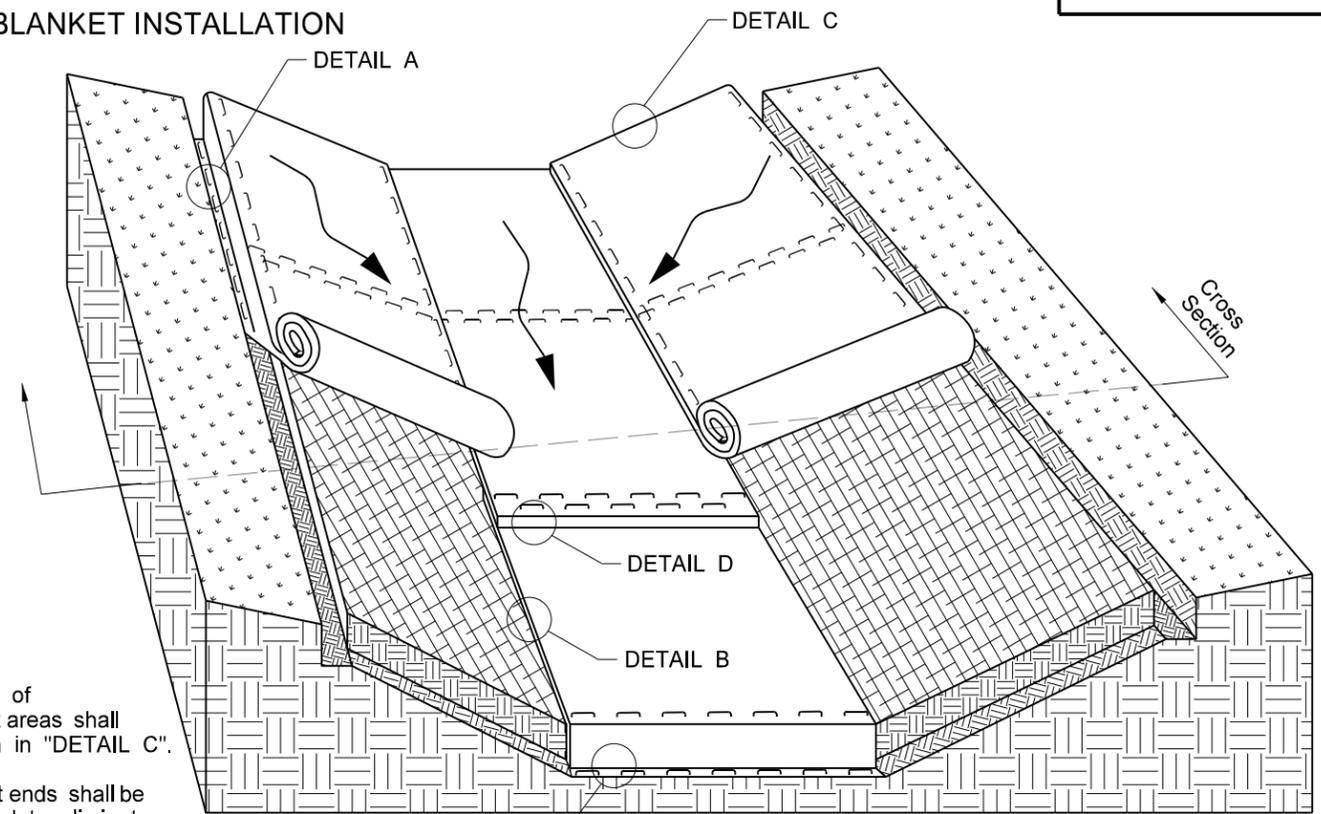
DETAIL C



DETAIL D

* This tie may be placed ahead or back.

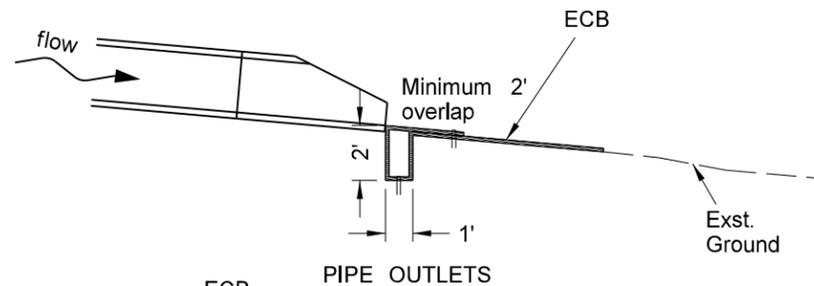
DETAILS
CHANNEL OR SLOPE INSTALLATION



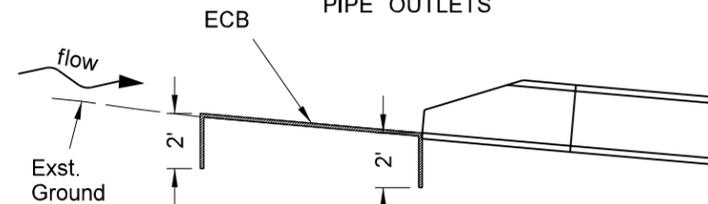
BLANKET LAYOUT
CHANNEL OR SLOPE INSTALLATION

Notes:
Beginning and ending of erosion control blanket areas shall be installed as shown in "DETAIL C".

Erosion control blanket ends shall be entrenched and stapled to eliminate undermining on side slopes.



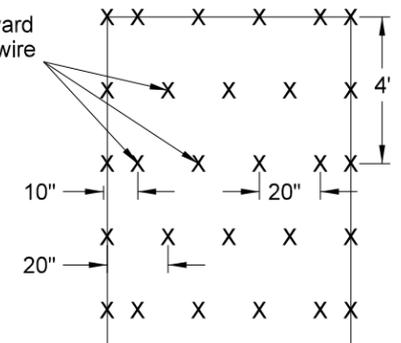
PIPE OUTLETS



PIPE INLETS

INSTALLATION AT PIPE ENDS

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



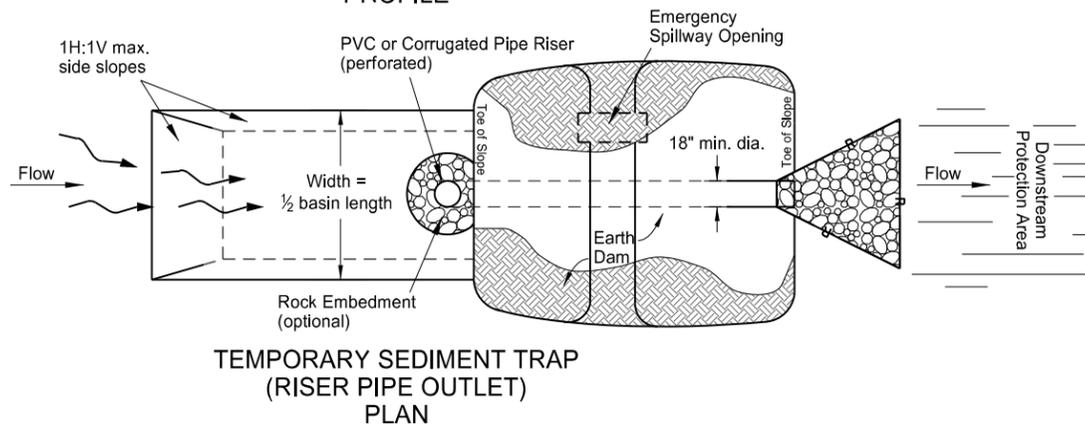
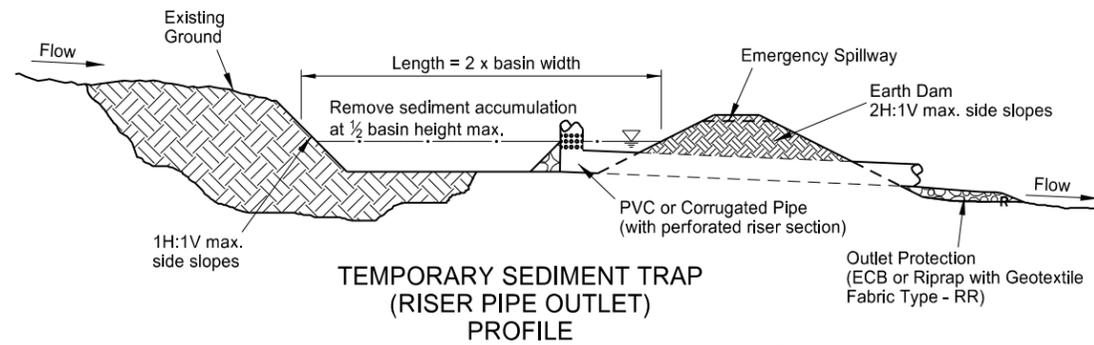
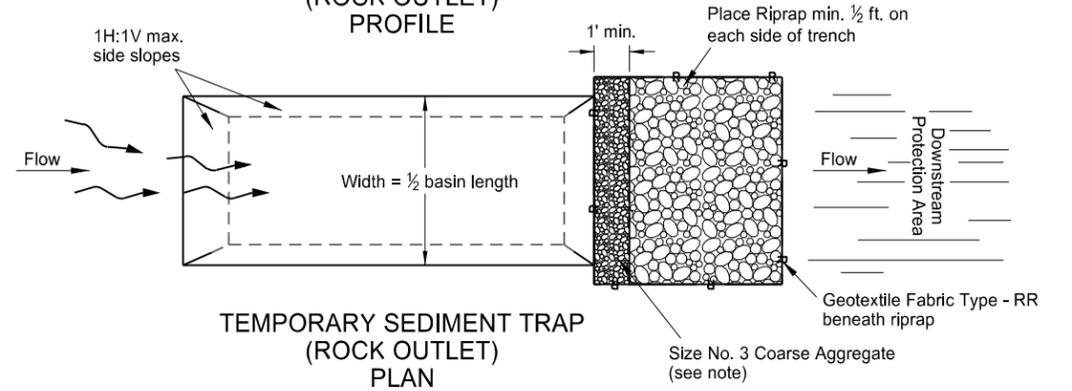
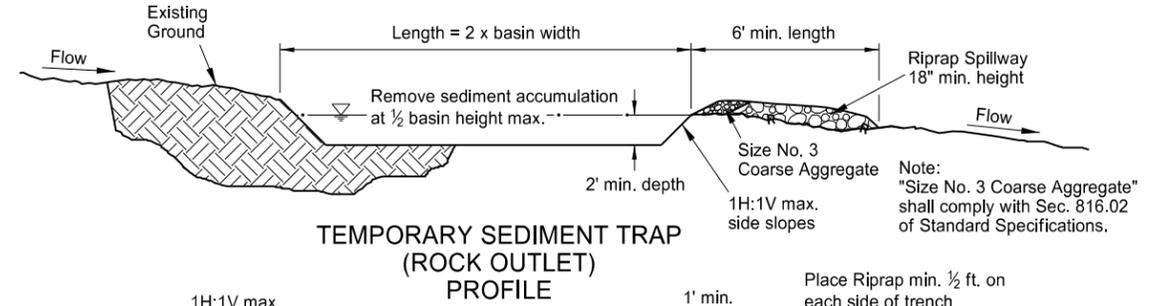
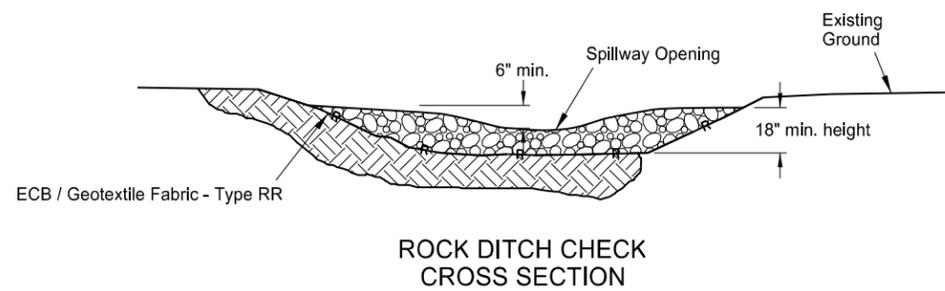
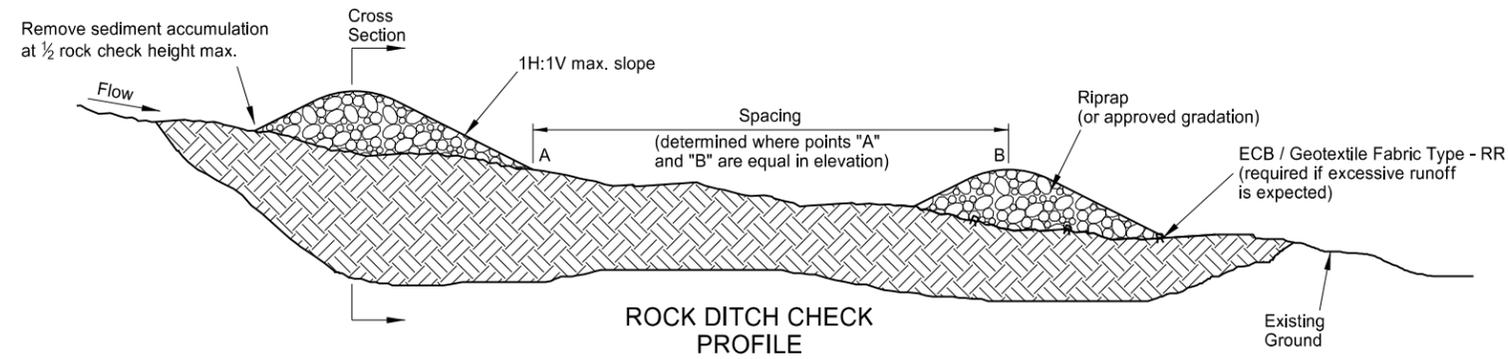
STAPLE PATTERN

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.

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EROSION AND SILTATION CONTROLS

D-256-1

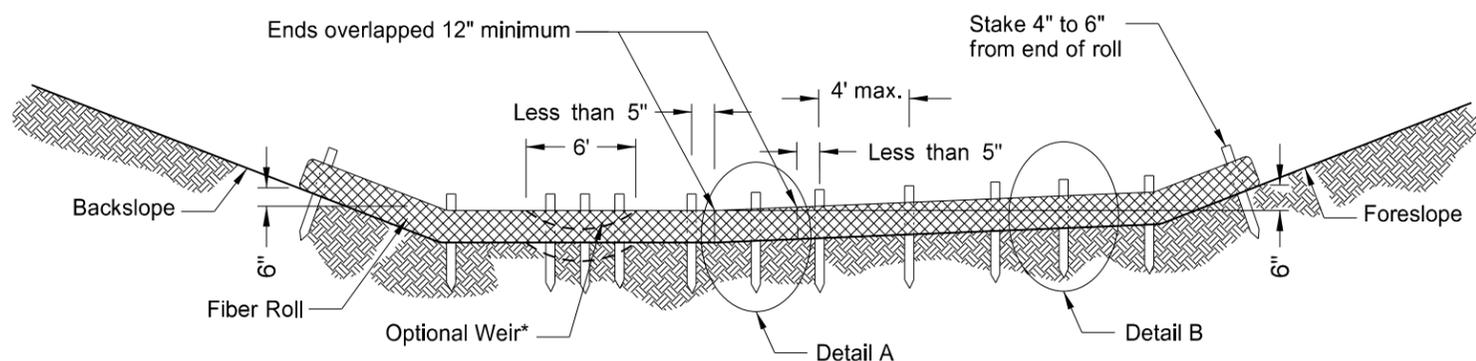


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE

06-26-14	Changed standard drawing number from D-708-2 to D-256-1. Deleted silt fence details.
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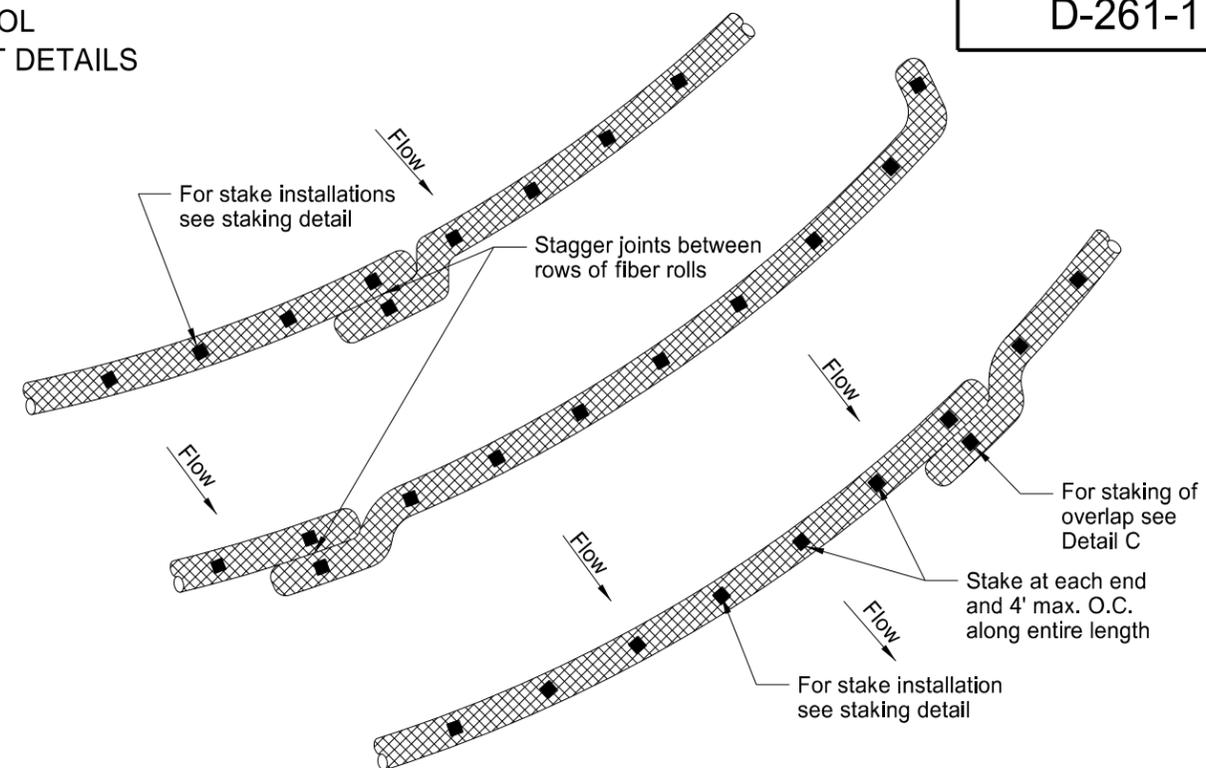
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EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

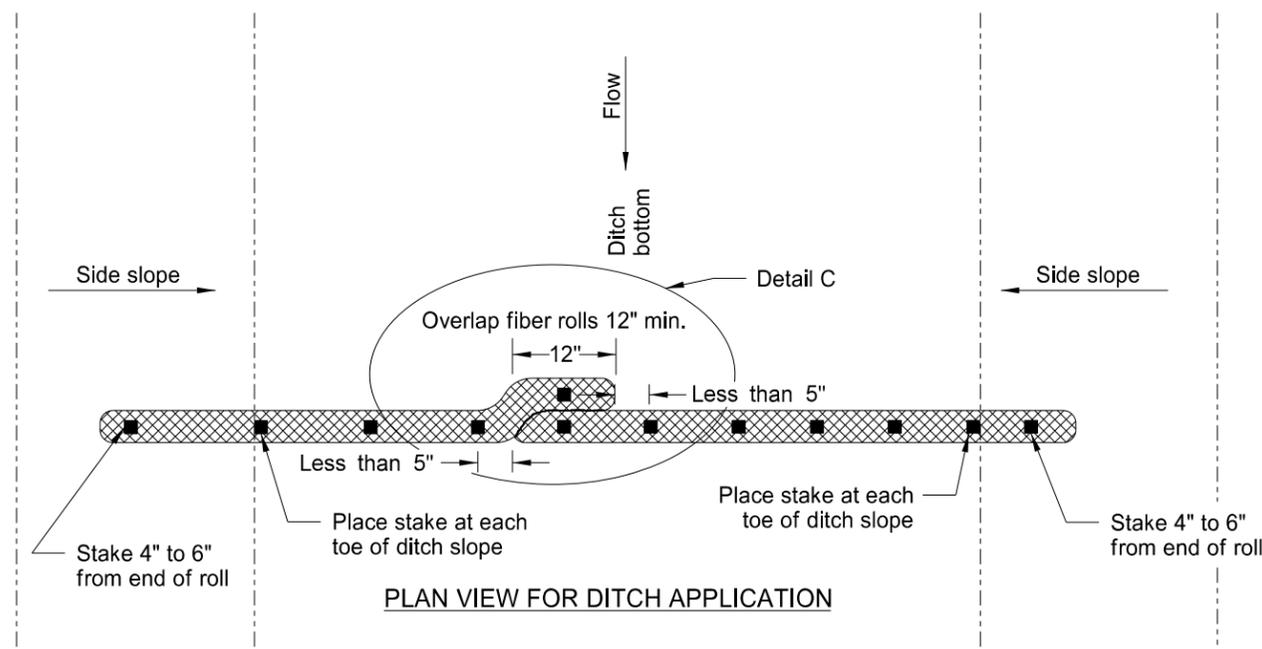


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

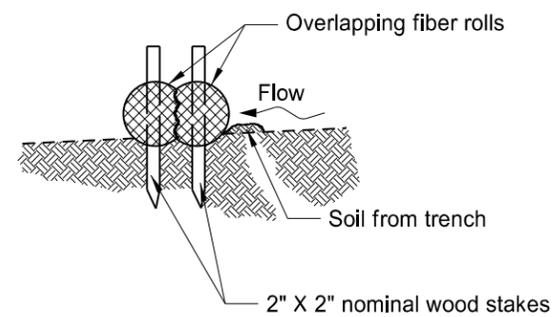
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



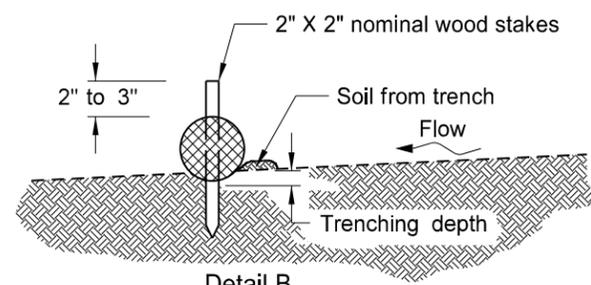
PLAN VIEW FOR SLOPE APPLICATION



PLAN VIEW FOR DITCH APPLICATION



Detail A
Fiber Roll Overlapping Staking Detail



Detail B
Fiber Roll Staking Detail

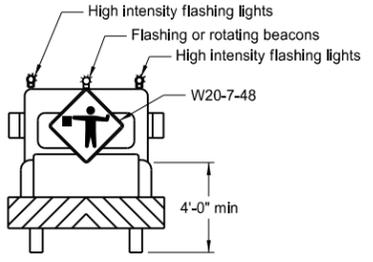
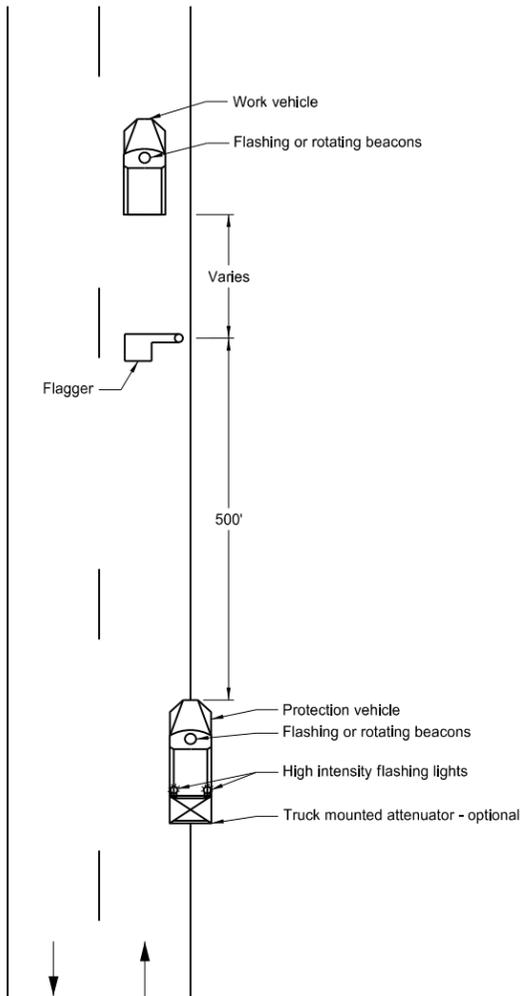
FIBER ROLL DIAMETER	NOMINAL STAKE SIZE	MINIMUM STAKE LENGTH	MINIMUM TRENCH DEPTH	MAXIMUM TRENCH DEPTH
6"	2" x 2"	18"	2"	2"
12"	2" x 2"	24"	2"	3"
20"	2" x 2"	36"	3"	5"

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

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

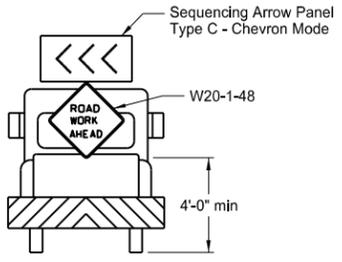
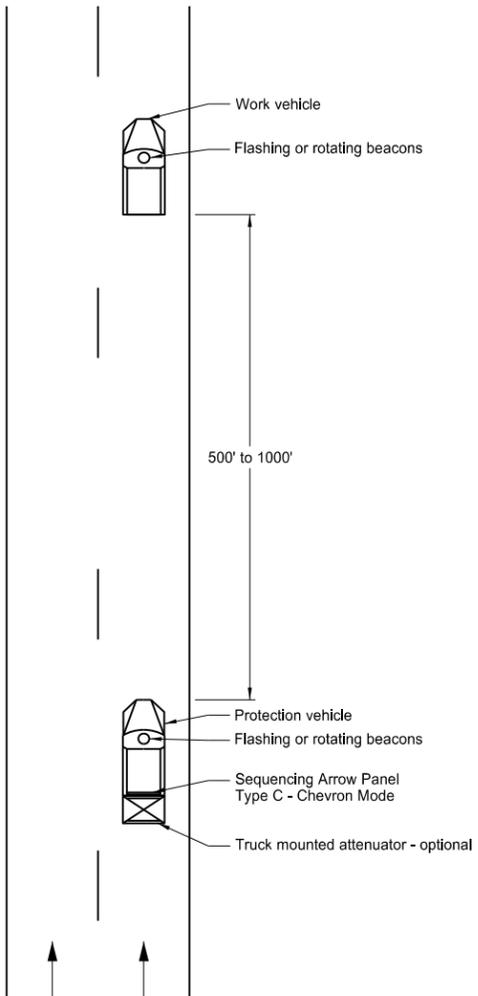
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Two Lane, Two Way Roadways



Typical Protection Vehicle

Multilane Roadways



Typical Protection Vehicle

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

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

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WORK ZONE BUSINESS SIGN DETAILS

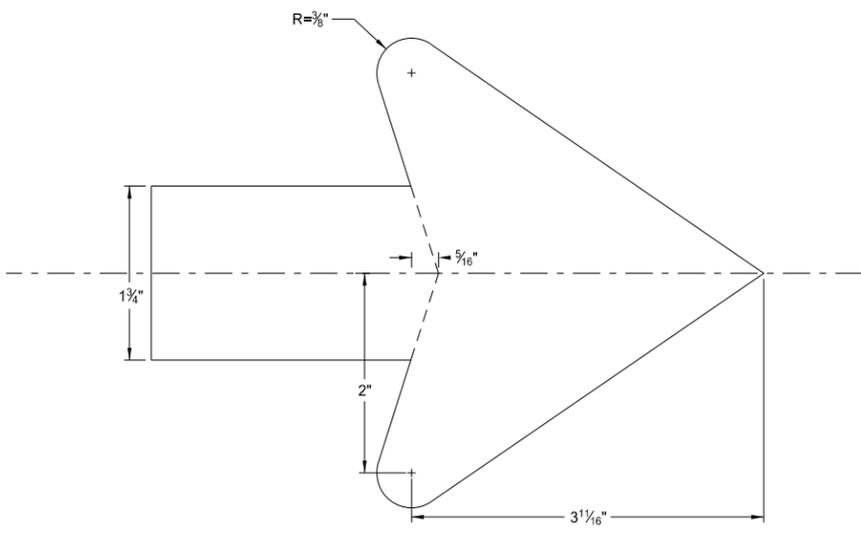
D-704-4

SIGN NUMBER	Con Sign					STATION(S):	AREA: 6.0 Sq.Ft.
WIDTH x HEIGHT	3'-0" x 2'-0"						
BORDER WIDTH	0.5" (Inset 0")						
CORNER RADIUS	1.5"						
MOUNTING	Ground						
BACKGROUND	TYPE: IV Reflective COLOR: Blue						
LEGEND/BORDER	TYPE: IV Reflective COLOR: White						
SYMBOL	X	Y	WID	HT	ANGLE		
ARDD	4.5	1.5	4.8	6	180		
ARDD	25.5	1.5	4.8	6	0		

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

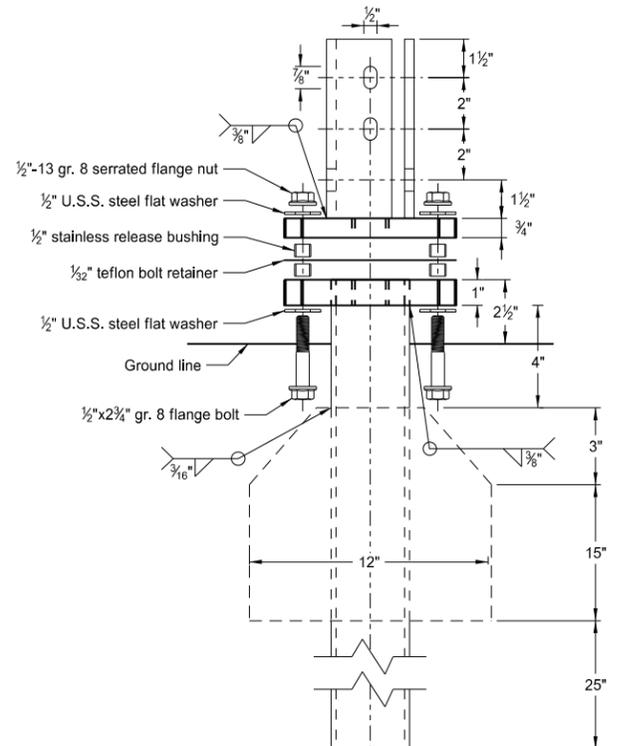
LETTER POSITION (X)											LENGTH	SIZE	SERIES
S	T	E	A	K		H	O	U	S	E	27.1	4	ClearviewHwy-1-W
4.5	6.8	9.2	11.3	14.4	16.3	18.7	21.5	24.7	27.4	30.1			
G	A	S		S	T	A	T	I	O	N	26	4	ClearviewHwy-1-W
5	7.8	10.6	12.4	14.6	16.9	19.1	21.9	24.3	25.7	28.9			
C	A	F	E								9.2	4	ClearviewHwy-1-W
13.4	15.9	18.9	21.2										

Note:
The ground mounted business name sign area has been calculated using a 36"x 24" sign panel. The contractor shall determine the size needed and the exact length required to accommodate the message. The maximum size of the sign shall be 36"x24". The letters shall be 4" Clearview 1-W. The color shall be blue background with white legend and border. The sign shall be post mounted. The arrow shall be positioned either on the right or left side of the sign as required.



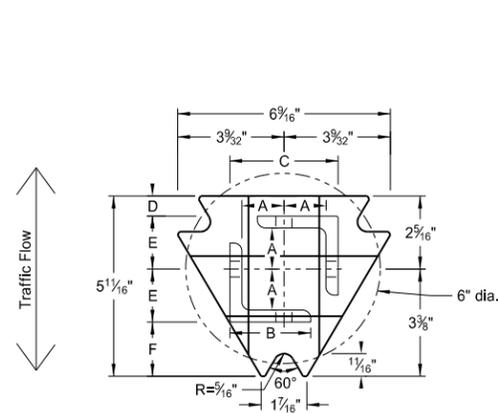
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
7-18-14	Revised sheeting to type IV

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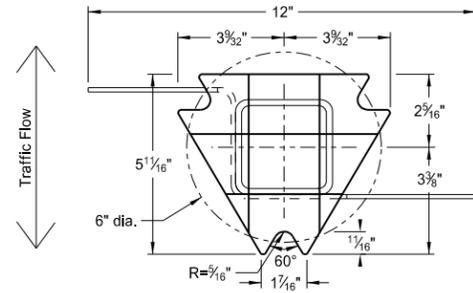


Multi-Directional Slip Base Assembly

Perforated Tube



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



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

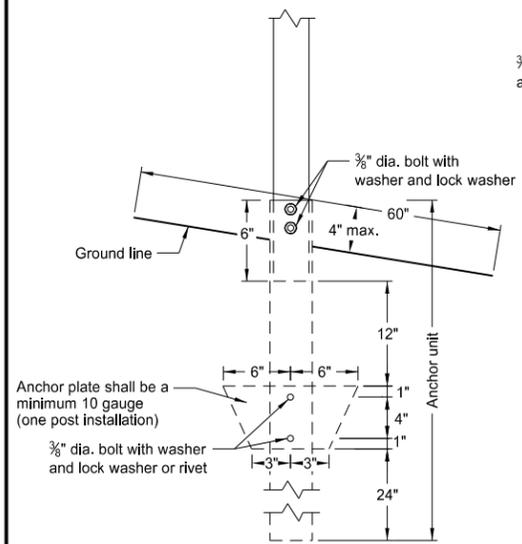
Notes:

1. Slip base bolts shall be torqued as specified by the manufacturer.
2. Anchor shall have a yield strength of 43.9 KSI and tensile strength of 59.3 KSI.
3. The 4" vertical clearance is required for the anchor or breakaway base. The 4"x60" measurement shall be made above and below post location and also back and ahead of the post.
4. When used in concrete sidewalk, anchor shall be same except without the wings.
5. Four post signs shall have over 7' between the first and the fourth posts.

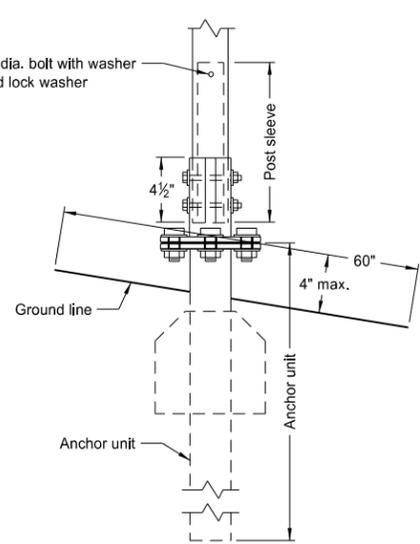
Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thickness Gauge	Sleeve Size in.	Wall Thickness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2 1/4
1	2 1/4	12			No	2 1/2
1	2 1/2	12			(A)	3
1	2 1/2	10			Yes	
1	2 1/4	12	2	12	Yes	
1	2 1/2	12	2 1/4	12	Yes	
2	2	12			No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

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

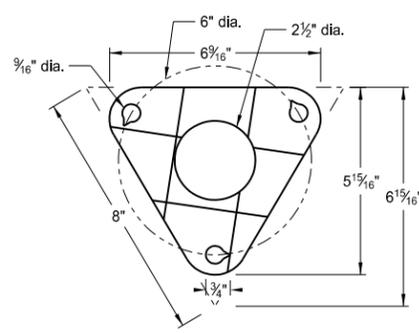
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2 3/16"x10 ga.	1 9/64"	2 1/2"	3 1/32"	2 5/32"	1 33/64"	1 1/8"
2 1/2"x10 ga.	1 9/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"



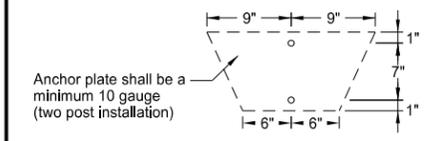
Anchor Unit and Post Assembly



Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly



Bolt Retainer for Base Connection
Bolt Retainer - 1/32" Reprocessed Teflon



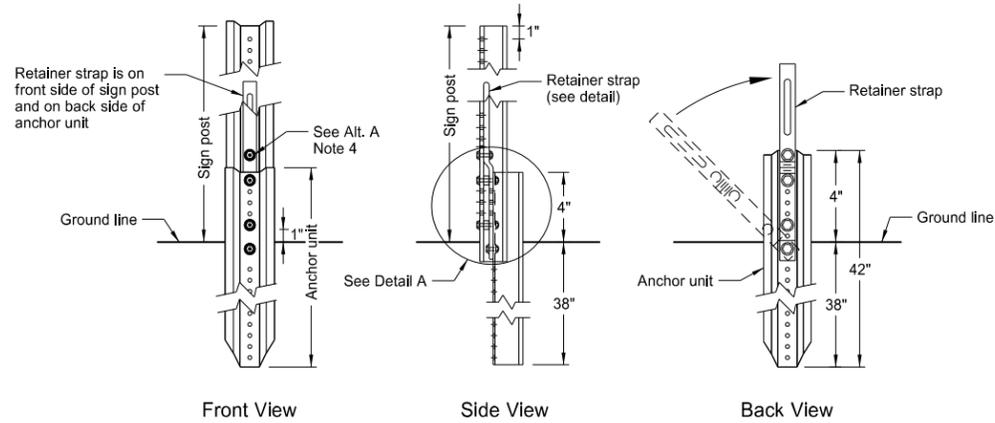
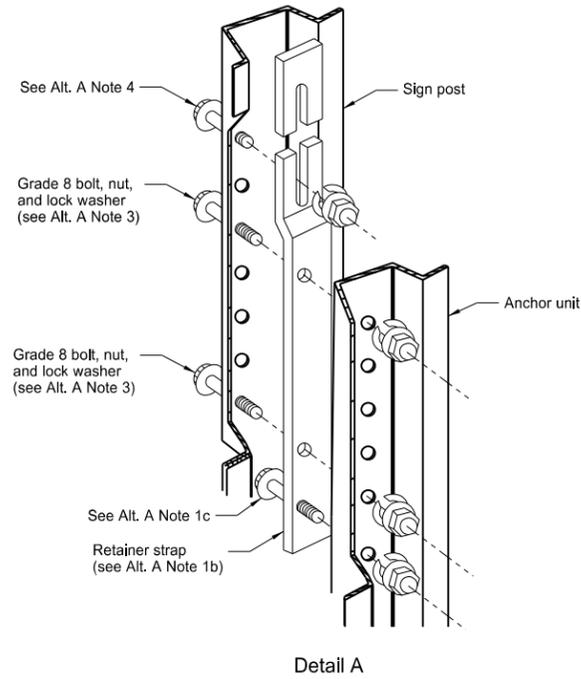
Anchor plate shall be a minimum 10 gauge (two post installation)

- (A) The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak.
- (B) The 2 3/16"x10 ga. may be inserted into 2 1/2"x10 ga. for additional wind load.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE

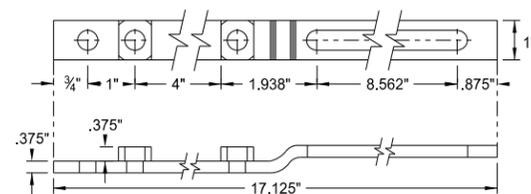
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U-Channel Post

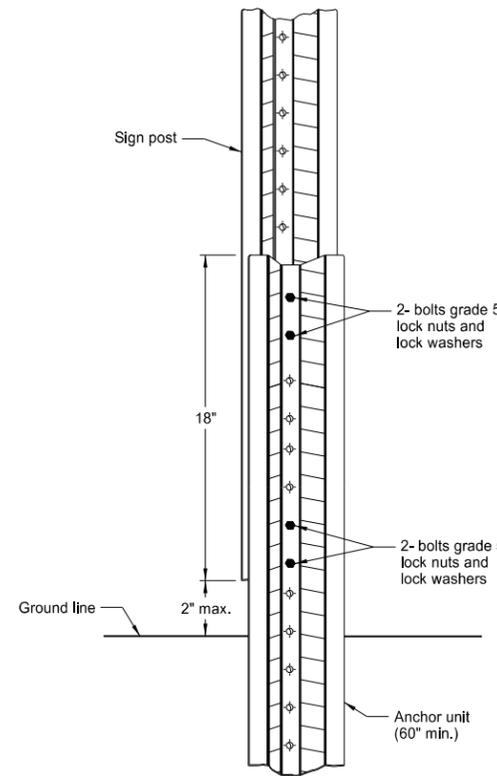


Breakaway U-Channel Detail Alternate A

A maximum of 2 posts shall be installed within 7'.

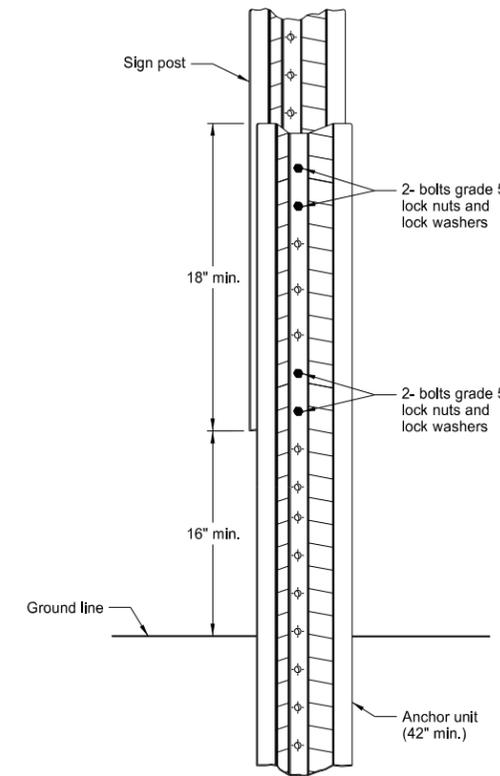


Retainer Strap Detail



Breakaway U-Channel Splice Detail Alternate B (2.5 and 3 lb/ft)

A maximum of 3 posts shall be installed within 7'.



Breakaway U-Channel Splice Detail Alternate C (2.5 and 3 lb/ft)

A maximum of 3 posts shall be installed within 7'.

Alternate A Steps of Installation:

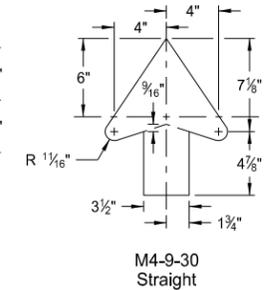
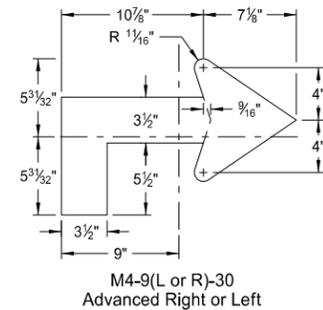
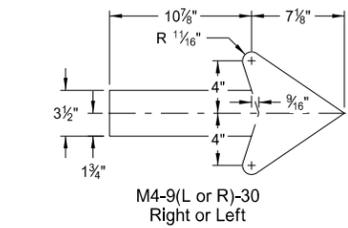
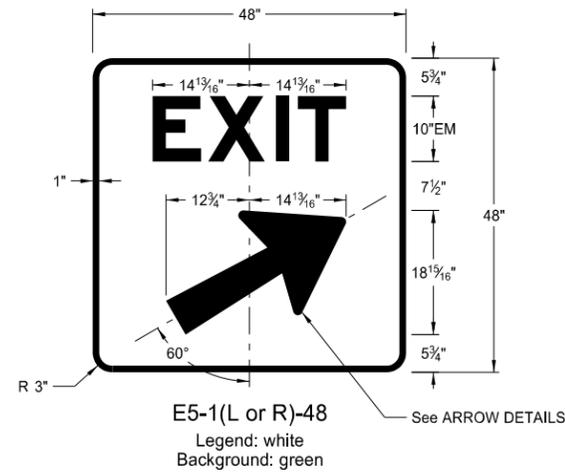
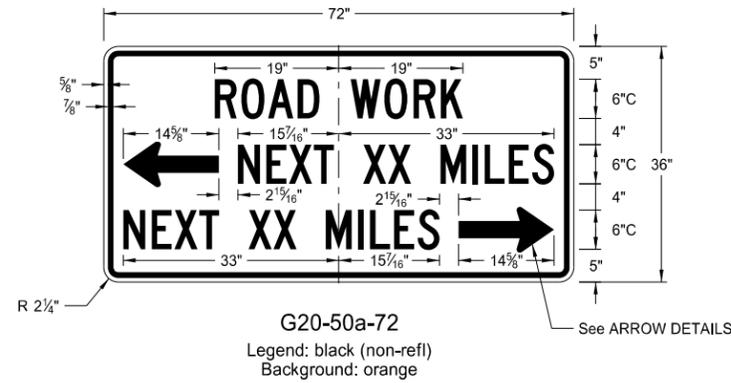
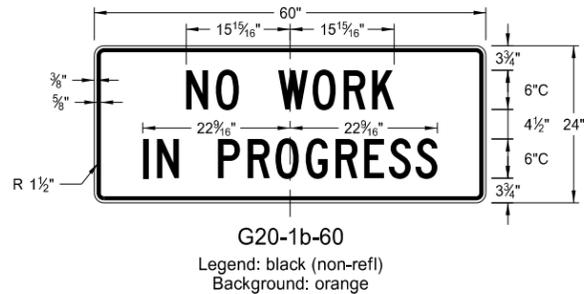
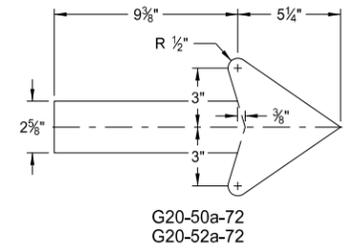
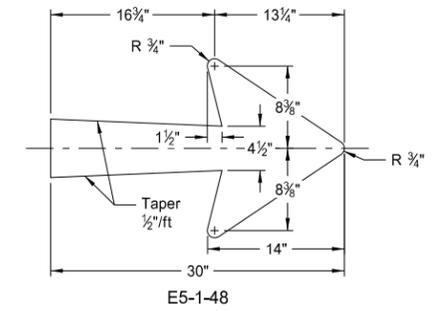
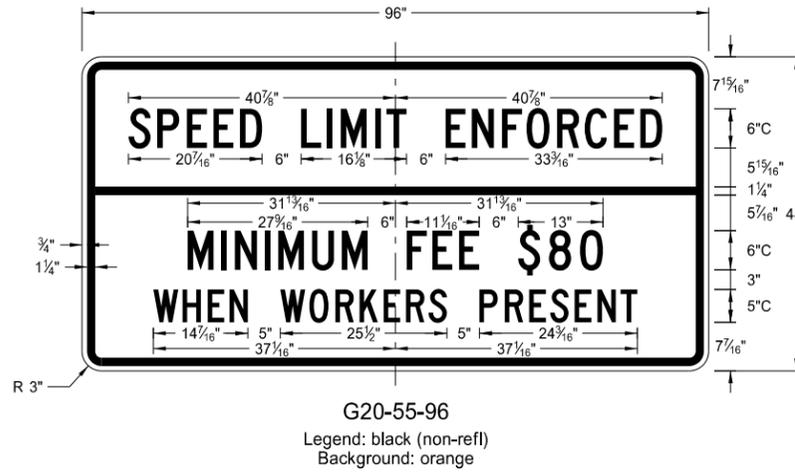
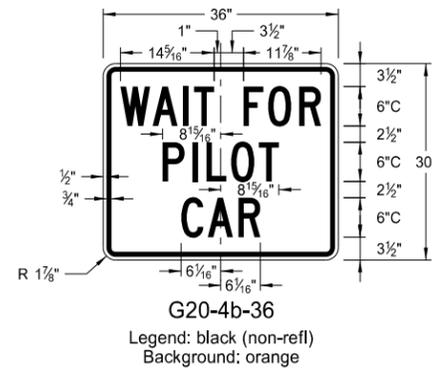
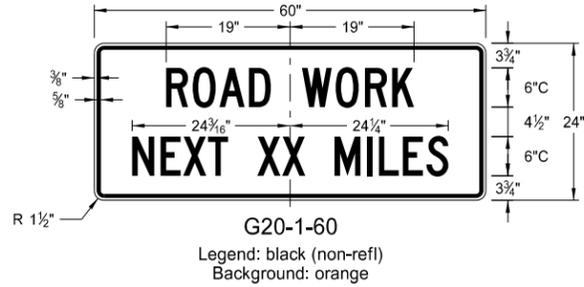
1. a) Drive anchor unit to within 12" of ground level.
b) Proper assembly established by lining up the bottom hole of retainer strap with the 6th hole from the top of the anchor unit.
c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
d) Rotate strap 90° to left.
2. a) 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. The base post, strap and sign post shall be properly nested. Proper nesting occurs when all flat surfaces of the base post, strap, and sign post at the bolts have full contact across the entire width.

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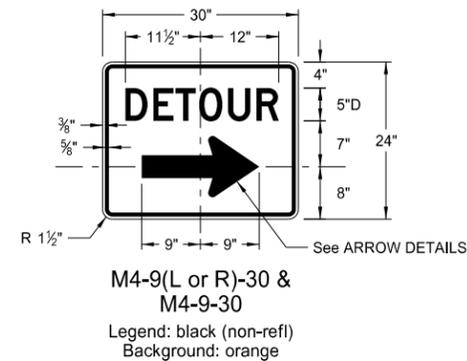
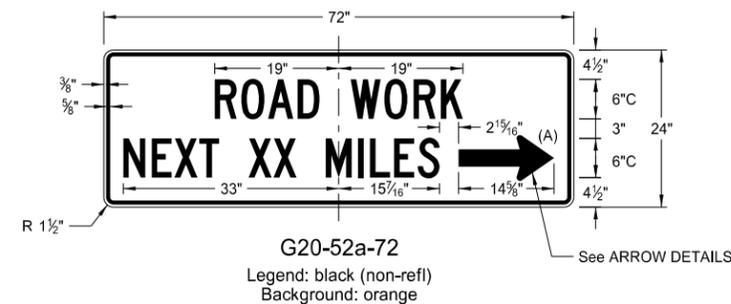
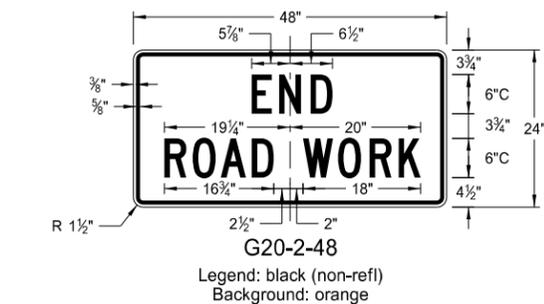
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CONSTRUCTION SIGN DETAILS
 TERMINAL AND GUIDE SIGNS

D-704-9



ARROW DETAILS



NOTES:

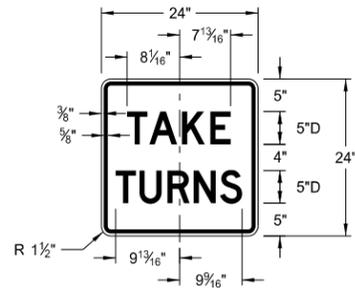
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

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8-13-13	
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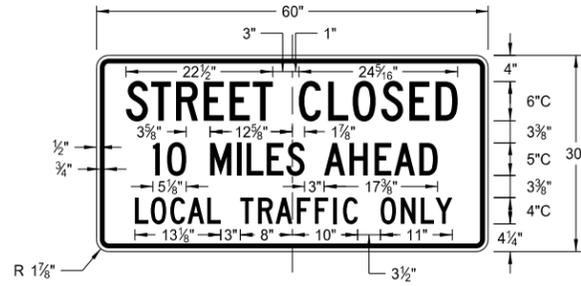
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS

D-704-10



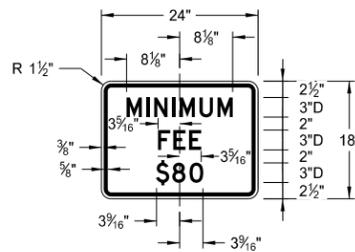
R1-50-24

Legend: black (non-refl)
Background: white



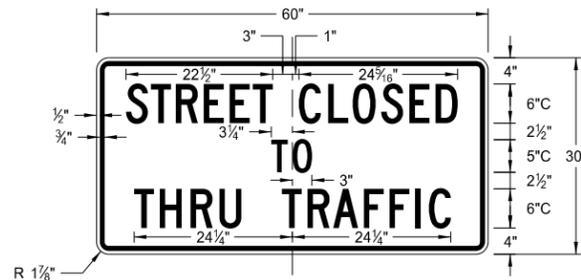
R11-3c-60

Legend: black (non-refl)
Background: white



R2-1a-24

Legend: black (non-refl)
Background: white



R11-4a-60

Legend: black (non-refl)
Background: white



R11-2a-48

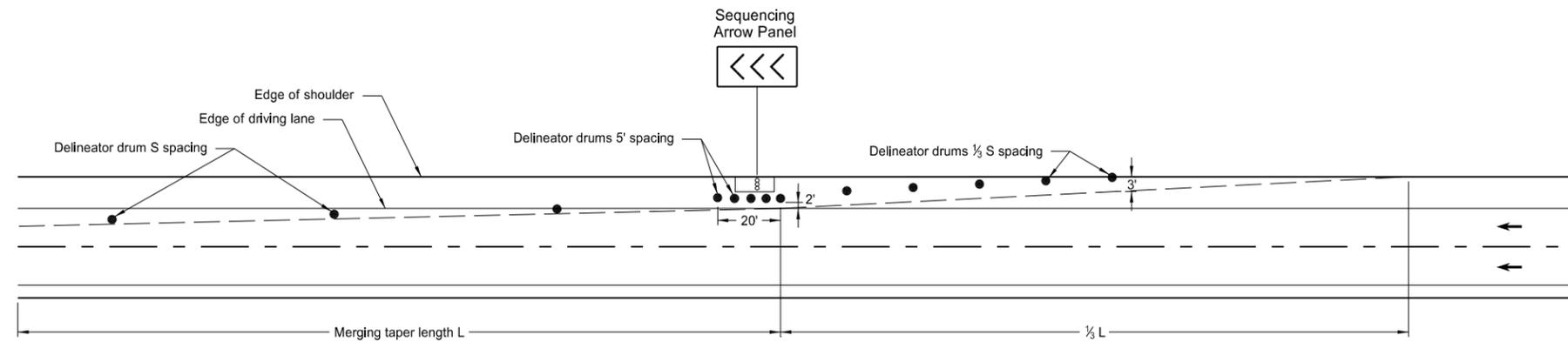
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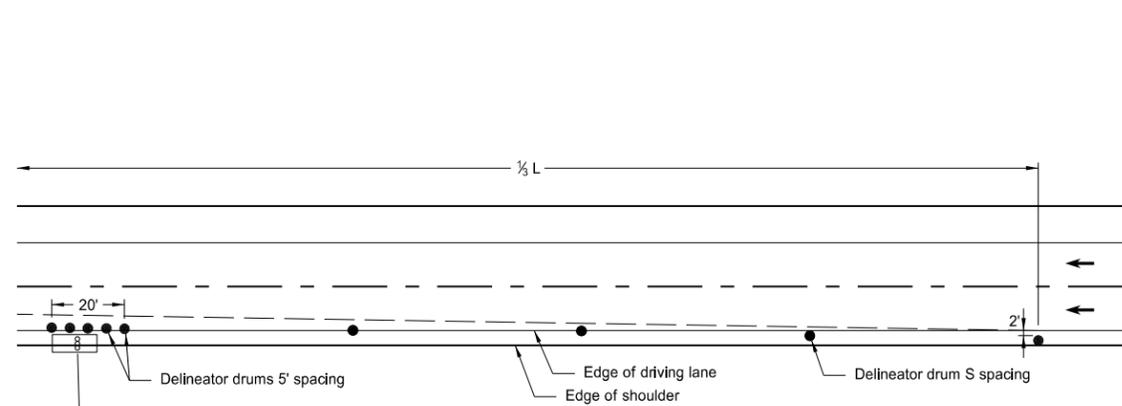
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SHOULDER CLOSURE TAPERS

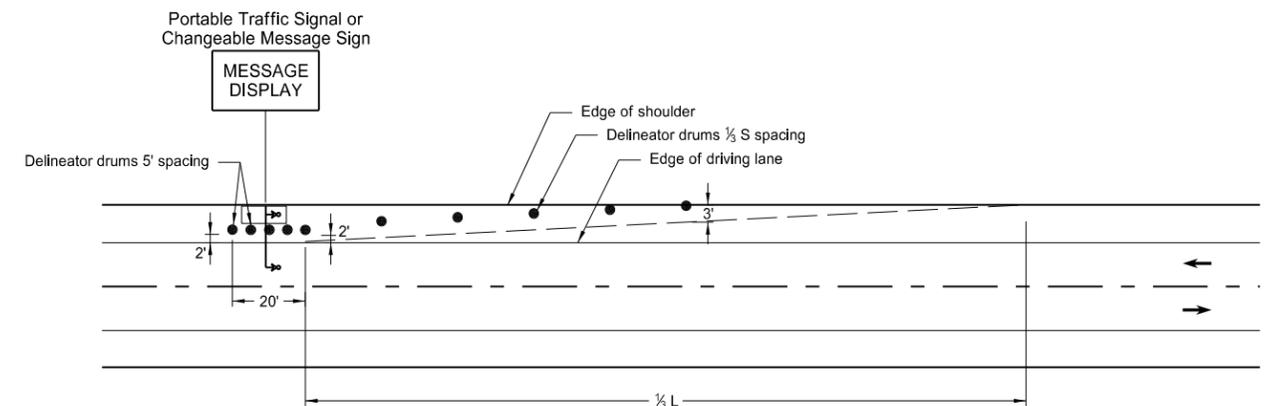
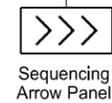
D-704-12



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

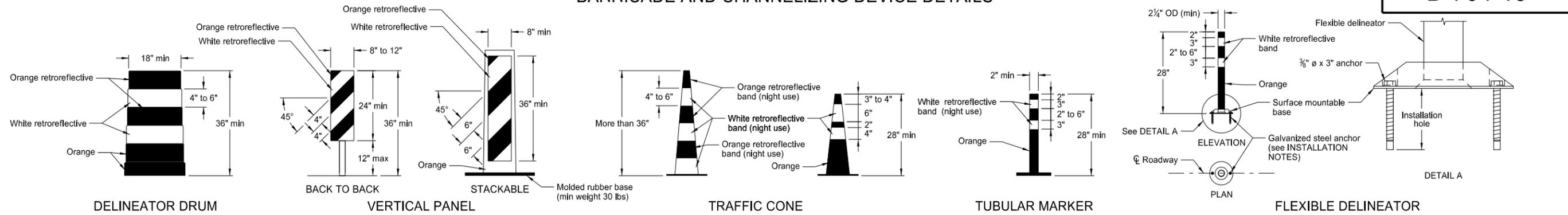
Notes:

- S = Posted Speed Limit in mph
W = Width of offset in feet
L = Taper length in feet
L = WS²/60 (40mph or less)
L = WS (45mph or more)
- If a shoulder taper is used, it should have a length of approximately 1/3 L. If a shoulder is used as a travel lane, a normal merging or shifting taper should be used.
- When paved shoulders of 8 foot width or more are closed, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct vehicular traffic to remain within the traveled way.

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BARRICADE AND CHANNELIZING DEVICE DETAILS



INSTALLATION NOTES:

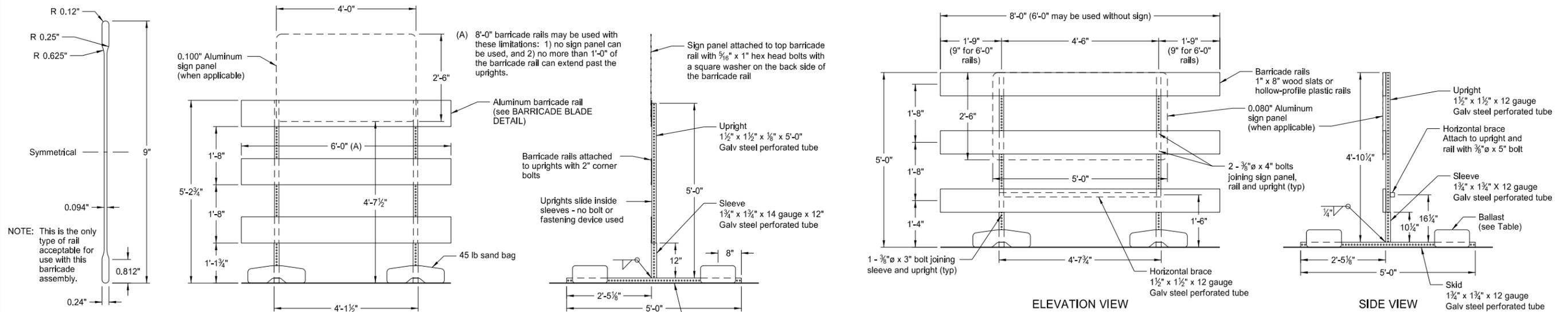
1. Drill installation holes to diameter and depth as required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, the contractor may use an 8" x 8" butyl pad or hot melt butyl.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

The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflective spaces between the horizontal orange and white stripes shall not exceed 3" wide. Stripes shall not be placed on ribs or indentations in the drum. Drums shall have closed tops that will not allow collection of construction debris or other debris. Ballast shall not be placed on the top of a drum.

Markings for vertical panels shall be alternating orange and white retroreflective stripes, sloping downward in the direction vehicular traffic is to pass. Retroreflective sheeting shall be placed on both sides of panel and shall have 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, a stripe width of 6 inches shall be used.

Retroreflectization of cones more than 36" in height shall be provided by alternating orange and white retroreflective stripes. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflective space between the orange and white stripes shall not exceed 3" wide.

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

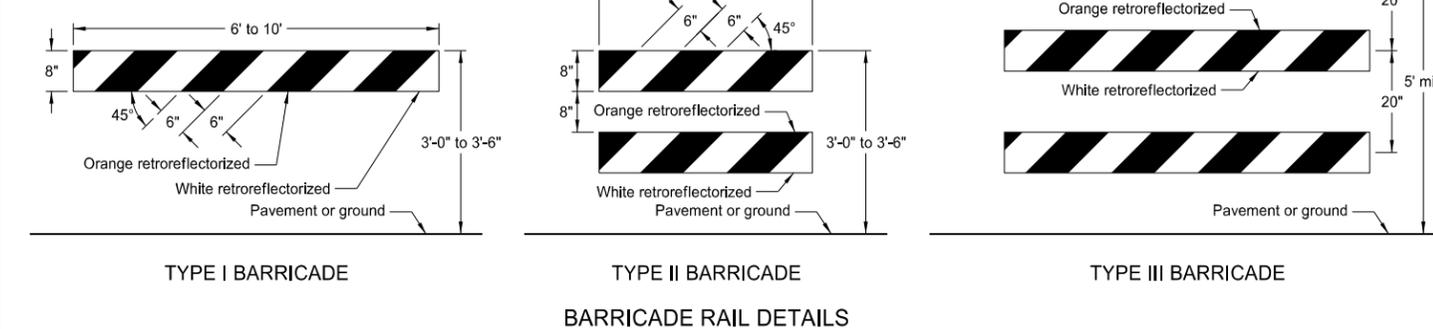


BARRICADE BLADE DETAIL

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

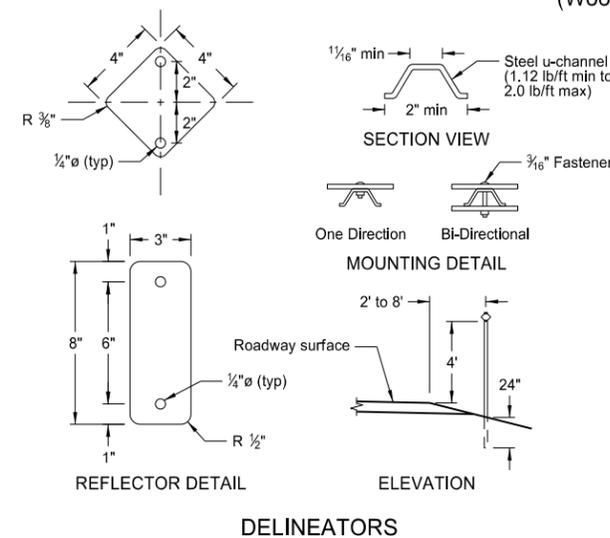
NOTE: Markings for barricades shall be alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Retroreflective sheeting shall be placed on both sides of the rails and shall have a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the barricade length is less than 36", the rail stripe width shall be 4".



TYPE I BARRICADE

TYPE II BARRICADE BARRICADE RAIL DETAILS

TYPE III BARRICADE



MINIMUM BALLAST (For each side of barricade support)

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

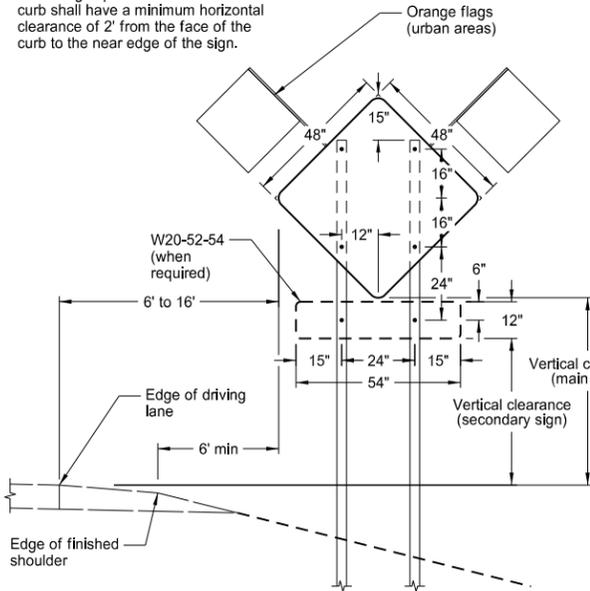
Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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DATE	CHANGE

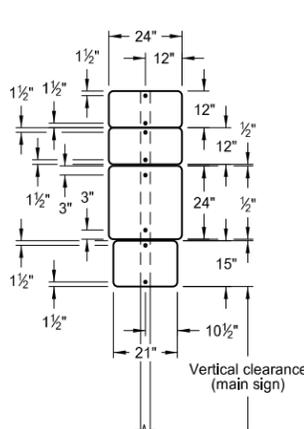
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CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

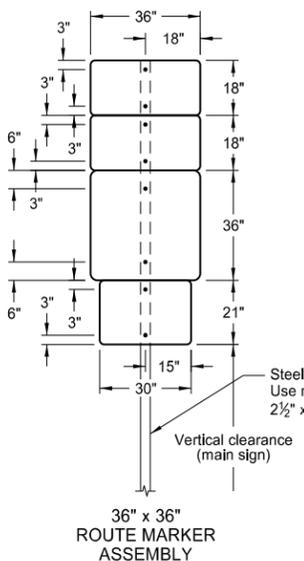
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



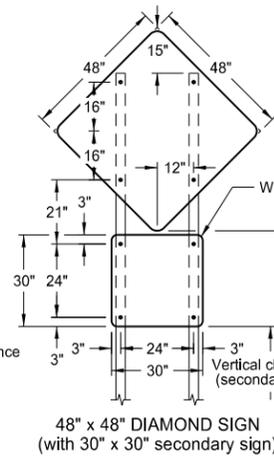
TYPICAL SECTION (48" x 48" diamond warning sign shown)



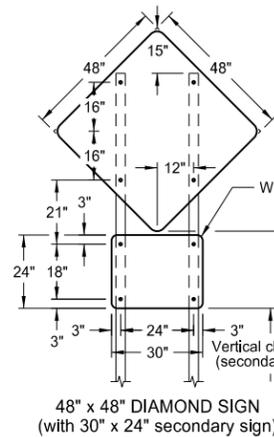
24" x 24" ROUTE MARKER ASSEMBLY



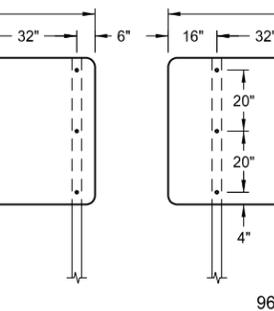
36" x 36" ROUTE MARKER ASSEMBLY



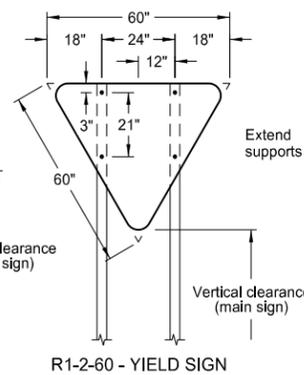
48" x 48" DIAMOND SIGN (with 30" x 30" secondary sign)



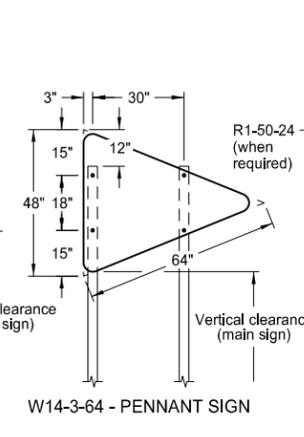
18" x 18" DIAMOND SIGN



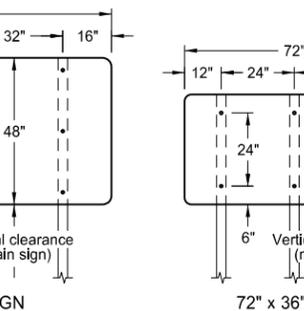
108" x 48" SIGN



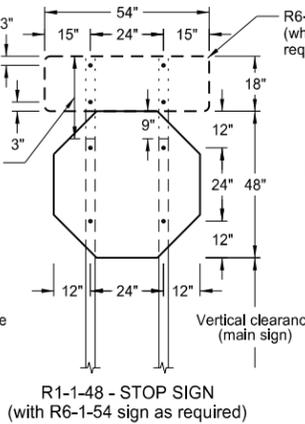
R1-2-60 - YIELD SIGN



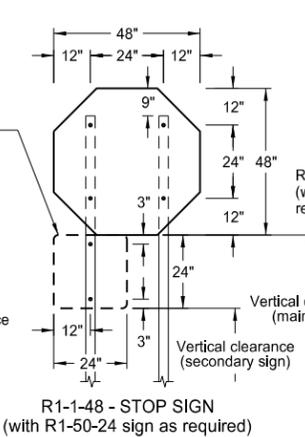
W14-3-64 - PENNANT SIGN



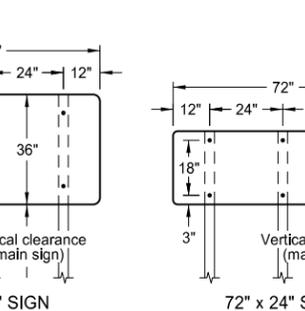
96" x 48" SIGN



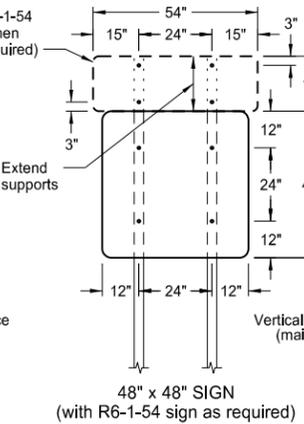
R1-1-48 - STOP SIGN (with R6-1-54 sign as required)



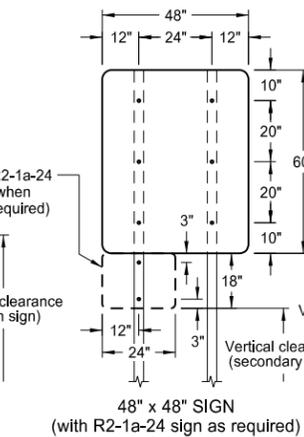
R1-1-48 - STOP SIGN (with R1-50-24 sign as required)



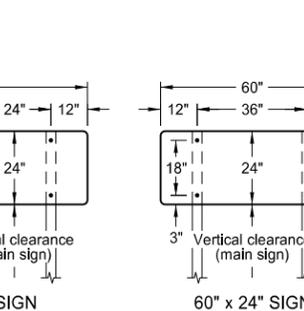
72" x 36" SIGN



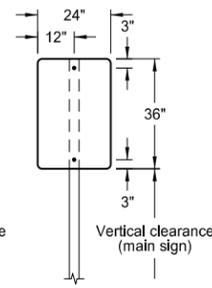
48" x 48" SIGN (with R6-1-54 sign as required)



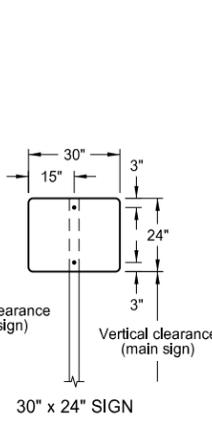
48" x 48" SIGN (with R2-1a-24 sign as required)



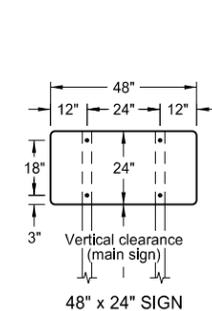
60" x 24" SIGN



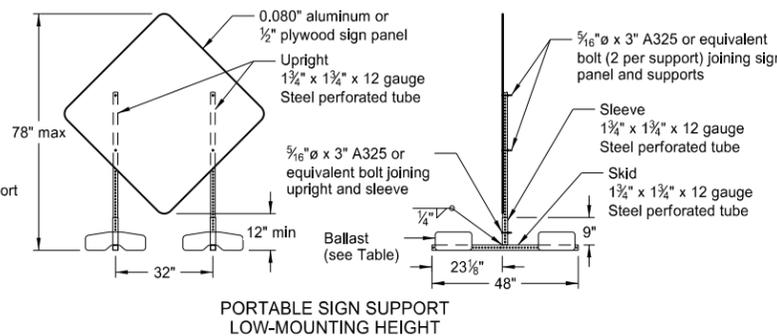
24" x 36" SIGN



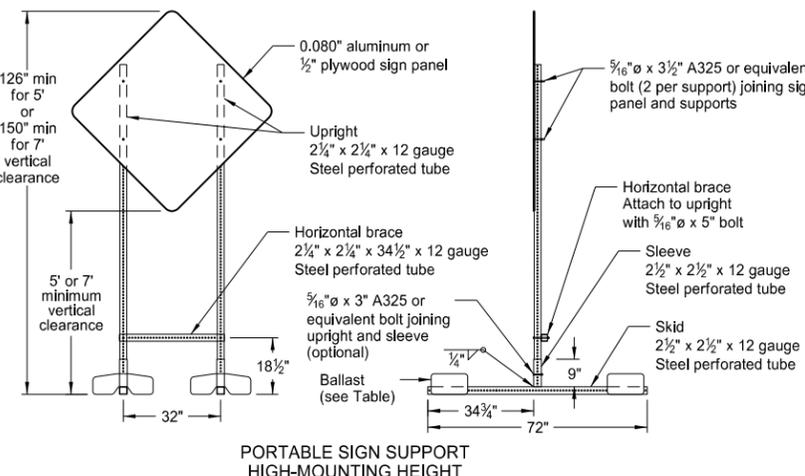
30" x 24" SIGN



48" x 24" SIGN



PORTABLE SIGN SUPPORT LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT HIGH-MOUNTING HEIGHT

NOTES:

- Sign Supports: Supports shall be galvanized or painted. 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, the minimum post size for assemblies containing a secondary sign is 3.0 lb/ft. Post sizes are based on a wind speed of 55 MPH.
Signs over 50 square feet should be installed on 2 1/2" x 2 1/2" perforated tube supports as a minimum.
Guy wires shall not be attached to sign supports. Wind beams may be attached to u-posts behind the sign panels.
- Sign Panels: Provide sign panels made of 0.100" aluminum, 1/2" plywood, or other approved material, except where noted. All holes to be punched round for 3/8" bolts.
- Alternate Messages: The signs that have alternate messages may have these alternate messages placed on a reflectorized plate (without a border) and installed and removed as required. (i.e. "Left" and "Right" message on a 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 as stated above.
Large signs having an area exceeding 50 square feet shall have a minimum clearance of 7'-0" from the ground at the post.
- Portable Signs: Provide portable signs that meet the vertical clearance as stated above. Use portable signs when it is necessary to place signs within the pavement surface.
When portable signs are used for 5 days or less, low-mounting height (minimum 12" vertical clearance) sign supports may be used as long as the view of the sign is not obstructed. Time delays caused by unforeseen circumstances, such as equipment breakdown, rain, subgrade failures, etc., will not accrue towards the 5 day period. The R9-8 through R9-11a series, W1-5 through W1-8 series, M4-10, and E5-1 may be used for longer than 5 days.
Signs mounted to the portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT Details shall have 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. The sandbags are assumed to be placed at or near the ends of the skids.

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11-14-13	Revised Note 6.

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ROAD CLOSURE LAYOUTS

Notes

- 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 $W \times S^2/60$ for urban, residential, and other streets with speeds of 40 mph or less.
- Barricades placed on roadway shall be on a moveable assembly. Signs placed on roadway shall be placed on skid mounted assemblies.
- Delineator drums, barricades or cones used for tapering traffic shall be spaced at the dimension "S". Delineator drums or cones used for tangents shall be spaced at 2 times dimension "S".
- 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. See Shoulder Closure Standard Drawing.
 Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
 Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
 Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at $\frac{1}{2}$ B.
- Use when work area is 1 mile or longer.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
- G20-55-96 sign is not required if this standard is part of other traffic control layouts, or the work is less than 15 days.

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

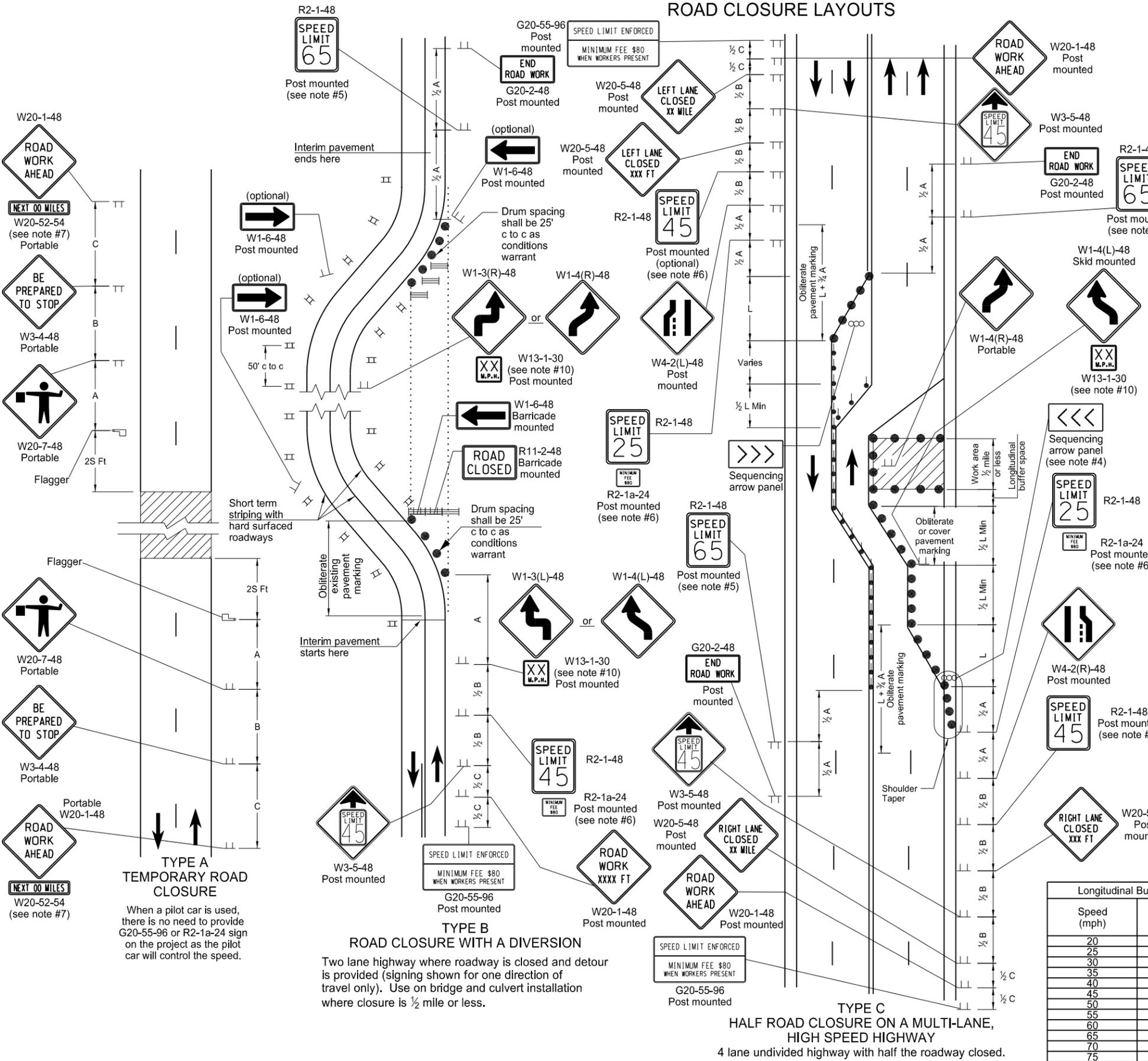
KEY

	Type 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

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TYPE A TEMPORARY ROAD CLOSURE
 When a pilot car is used, there is no need to provide G20-55-96 or R2-1a-24 sign on the project as the pilot car will control the speed.

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

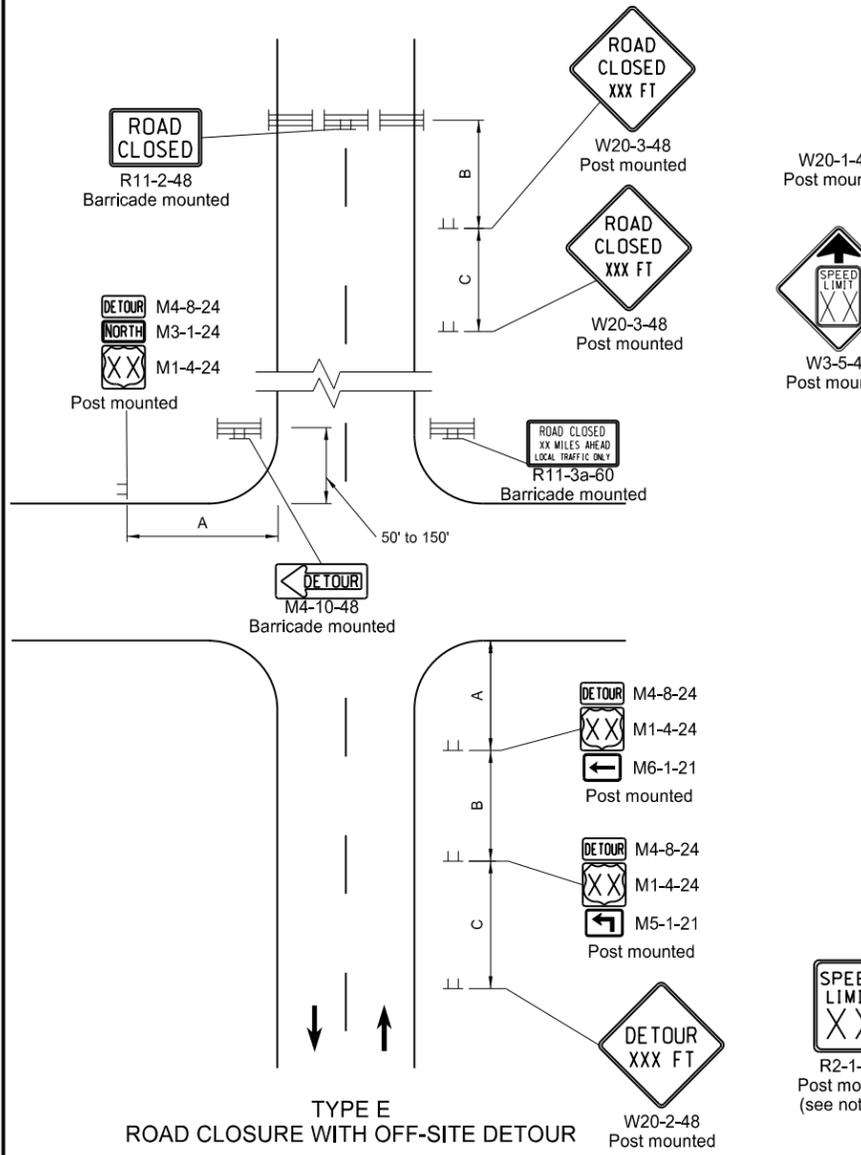
TYPE C HALF ROAD CLOSURE ON A MULTI-LANE, HIGH SPEED HIGHWAY
 4 lane undivided highway with half the roadway closed.

ROAD CLOSURE AND LANE CLOSURE ON A TWO WAY ROAD LAYOUTS

D-704-19

Notes

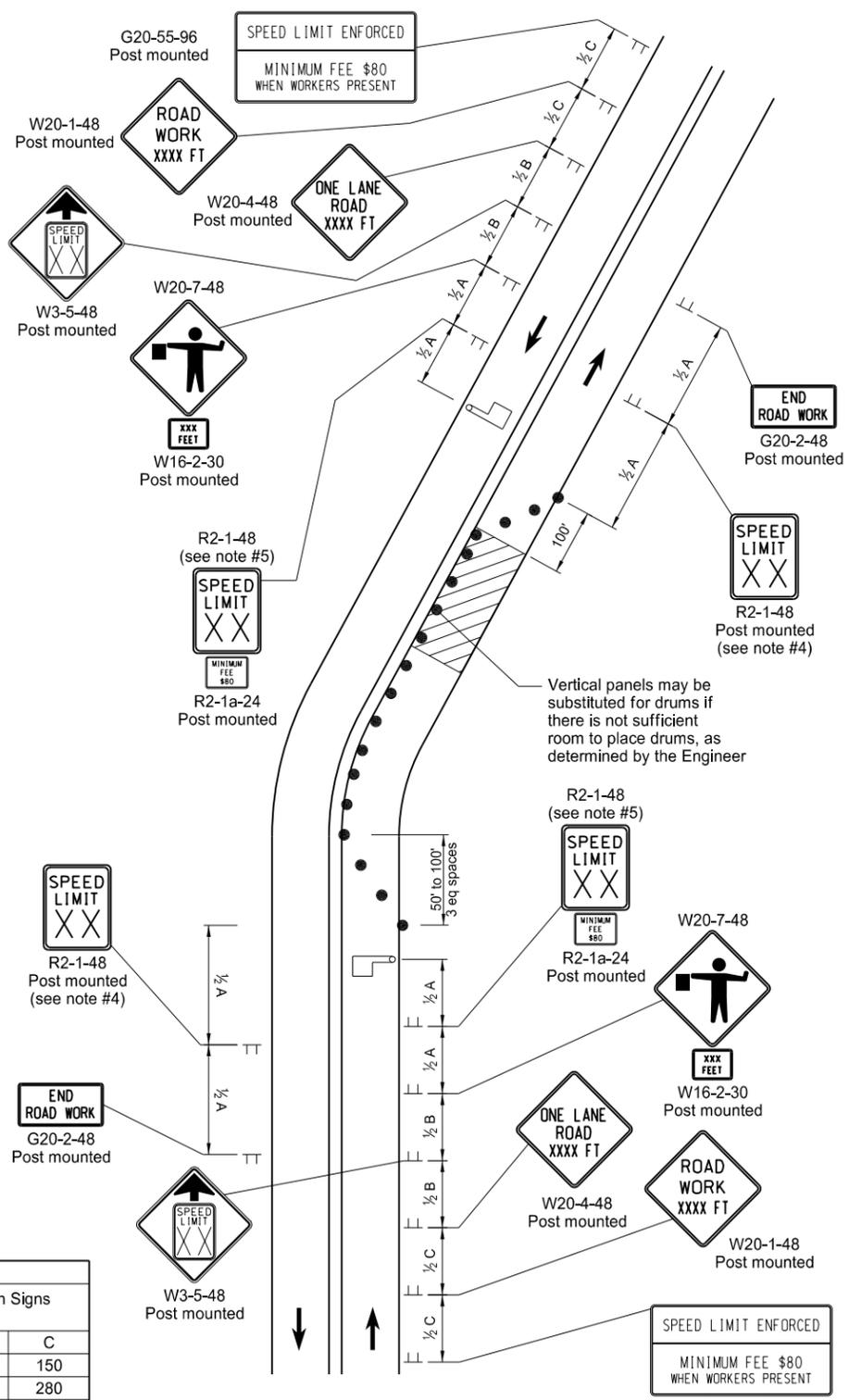
- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of taper
 - L = Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x S²/60 for urban, residential, and other streets with speeds of 40 mph or less.
- Barricades placed on roadway shall be on a moveable assembly.
- Signs placed on the roadway shall be placed on skid mounted assemblies.
- Delineator drums used for tapering traffic shall be placed at 3 equal spaces. Delineator drums for tangents shall be spaced at 2 times dimension "S".
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
- G20-55-96 or R2-1a-24 sign are not required when a pilot car operation is used, if this standard is part of other traffic control layouts, or the work is less than 15 days.
- When highway-rail grade crossings exist either within or in the vicinity of the roadway work activities:
 - Extra care shall be taken to minimize the probability of conditions being created, either by lane restrictions, flagging or other operations, where vehicles might be stopped within the highway-rail grade crossing (considered as being 15 feet on either side of the closest and farthest rail.)
 - A "Do Not Stop on Tracks" sign (R8-8-24) should be placed near the cross buck in each direction while the lane closure is in the vicinity of the tracks.
 - A buffer space between the work zone and the lane closure transition should be extended upstream of the highway-rail grade crossing so a queue created by the flagging operation will not extend across the highway-rail grade crossing.
 - If the queuing of vehicles across active rail tracks cannot be avoided, a flagger shall be provided at the highway-rail grade crossing to prevent vehicles from stopping within the highway-rail grade crossing, even if automatic warning devices are in place.



**TYPE E
ROAD CLOSURE WITH OFF-SITE DETOUR**

Used where a road is closed beyond a detour point. Signing shown for one direction only. Sign not shown on detour shall be shown in plans and installed and maintained by the contractor.

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



**TYPE F
LANE CLOSURE ON A TWO WAY ROAD USING FLAGGERS**

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

KEY

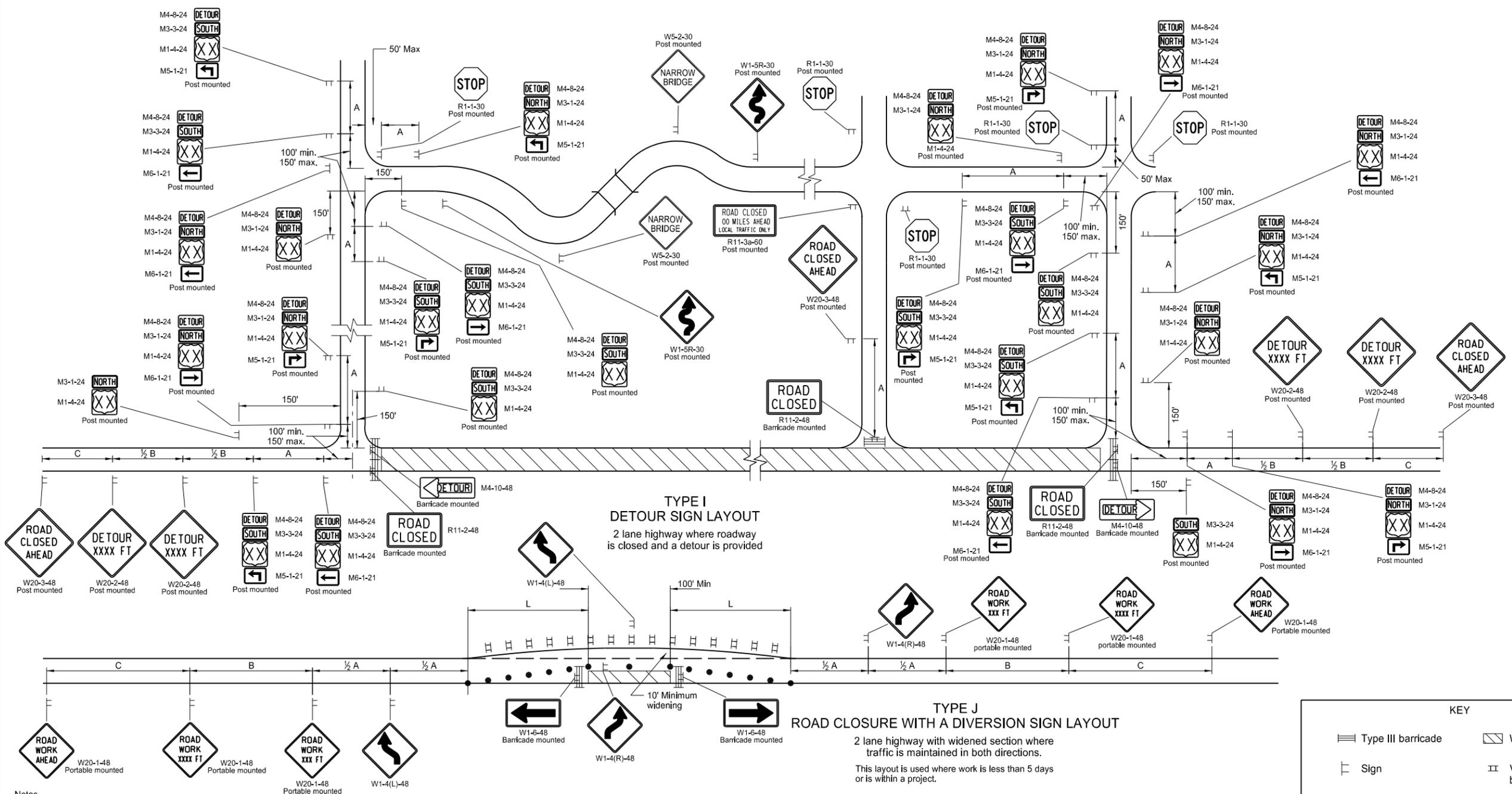
- Delineator Drum
- ▬ Sign
- ▬ Type III Barricade
- ▨ Work/Hazard Area
- ☞ Flagger

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
3-13-14	Revised Sign Cell "ROAD WORK XXX FT"

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 Registration Number
 PE-2930,
 on 03/13/14 and the original document is stored at the
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DETOUR AND ROADWAY DIVERSION SIGN LAYOUTS

D-704-21



- Notes**
- 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 $W \times S^2 / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
 - Barricades placed on roadway shall be on a moveable assembly. Signs placed on roadway shall be placed on skid mounted assemblies.
 - Delineator drums and vertical panels used for tapering traffic shall be spaced at dimension "S".
Delineator drums, tubular markers and vertical panels used for tangents shall be spaced at 2 times "S".
The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 MPH. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at $\frac{1}{2}$ B.
 - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 - Existing speed limit signs within a reduced speed zone shall be covered.
 - Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
 - The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.

9. A W24-1-48 sign may be used in place of the double reverse curve signs if the tangent between tapers is less than 60'.

KEY

	Type III barricade		Work area
	Sign		Vertical panels back to back
	Delineator drum		

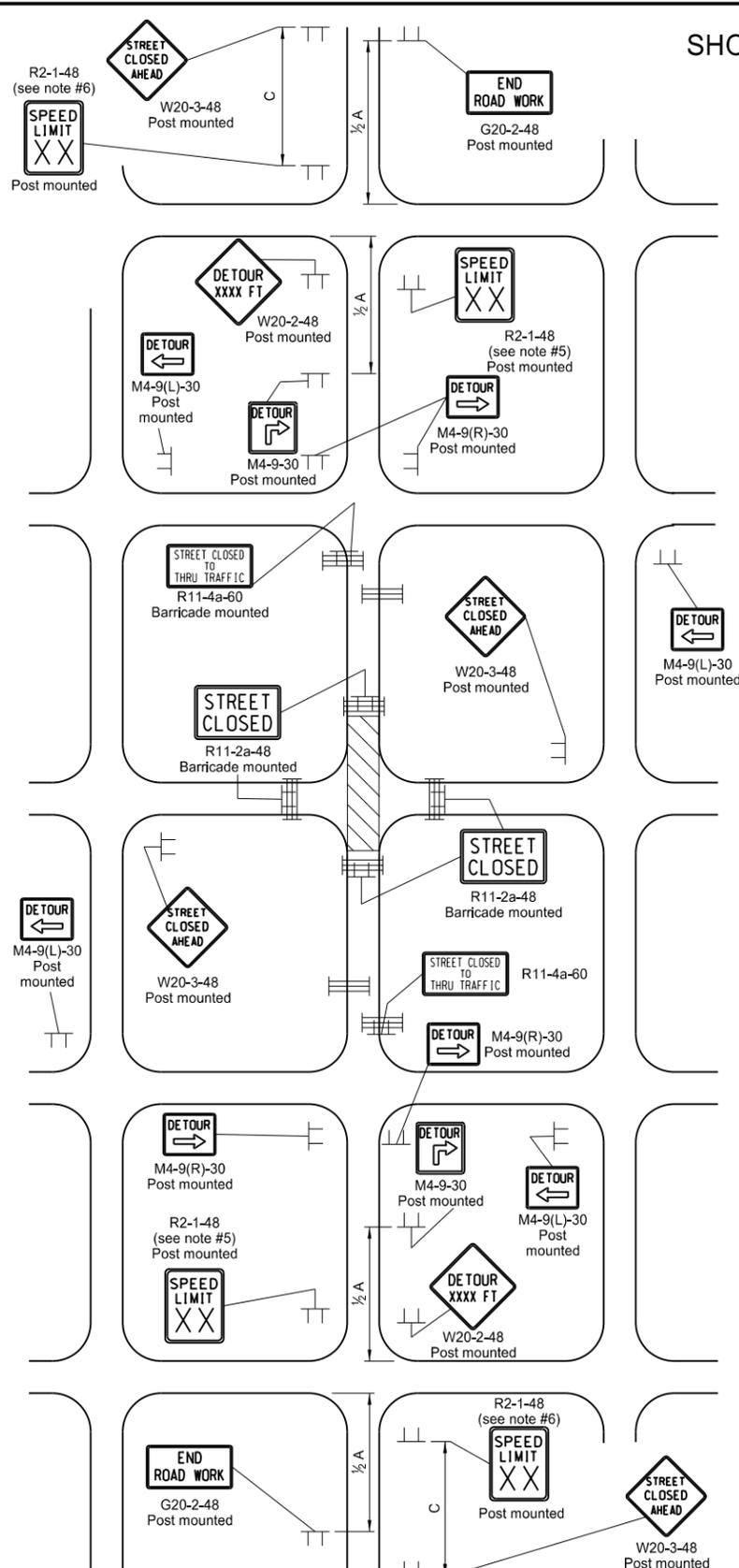
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE

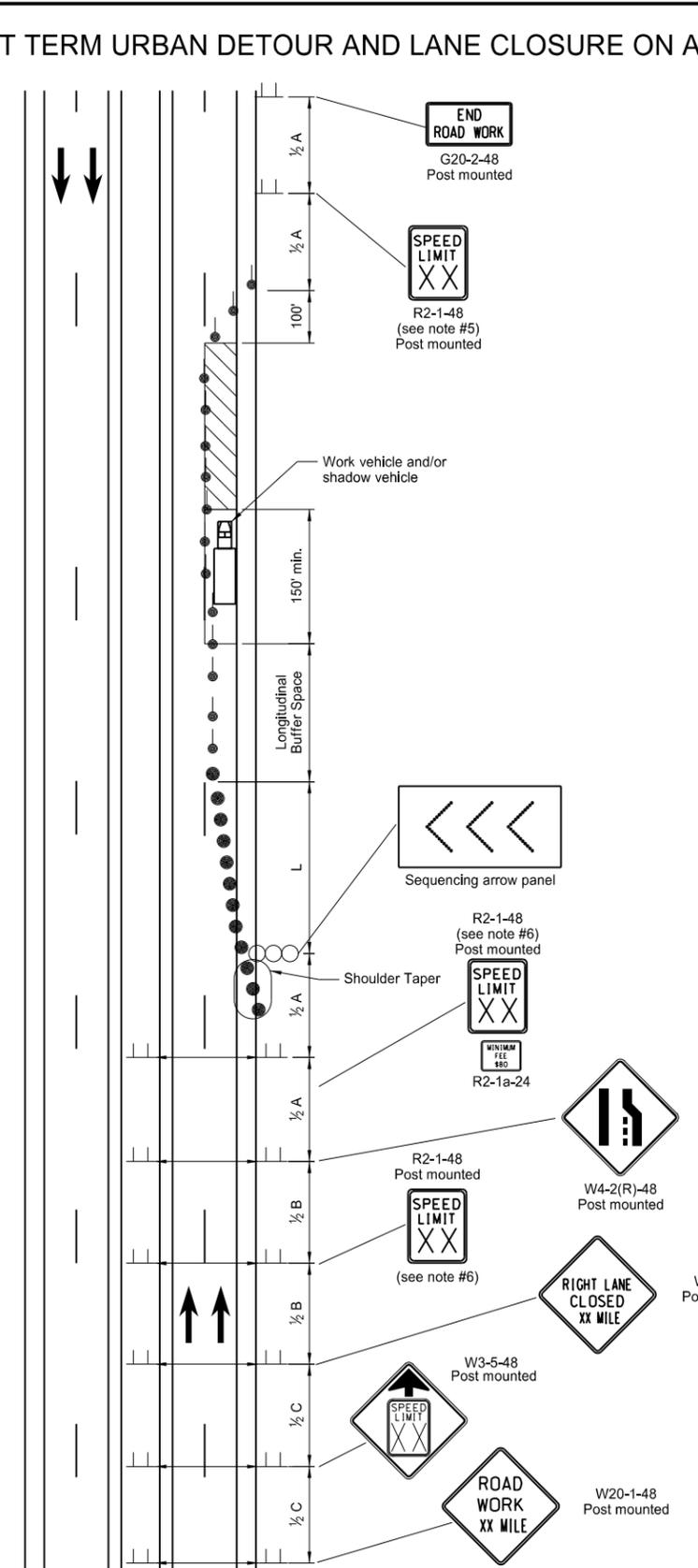
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 on **09/27/13** and the original document is stored at the
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SHORT TERM URBAN DETOUR AND LANE CLOSURE ON A DIVIDED HIGHWAY LAYOUTS

D-704-23



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 R2-1a-24 signs.



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.)

- Notes
- 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 $W \times S^2 / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
 - Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies.
 - Delinicator drums used for tapering traffic shall be spaced at dimension "S". Delinicator drums or tubular markers used for tangents shall be spaced at 2 times "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 or less and 750 ADT or less).
 - Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
 - Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
 - The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
 - The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
 - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 - Existing speed limit signs within a reduced speed zone shall be covered.
 - Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
 - Intersection control for Type Q may have to be changed on detour. The Engineer in the field shall determine what control is necessary.
 - Where necessary, safe speed to be determined by the Engineer. When parking is present, signs shall be placed so they are entirely visible above parked vehicles or placed at the edge of the parking area so they are visible to oncoming traffic. These signs may be skid mounted when placed on the roadway surface.
 - The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.

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

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

KEY

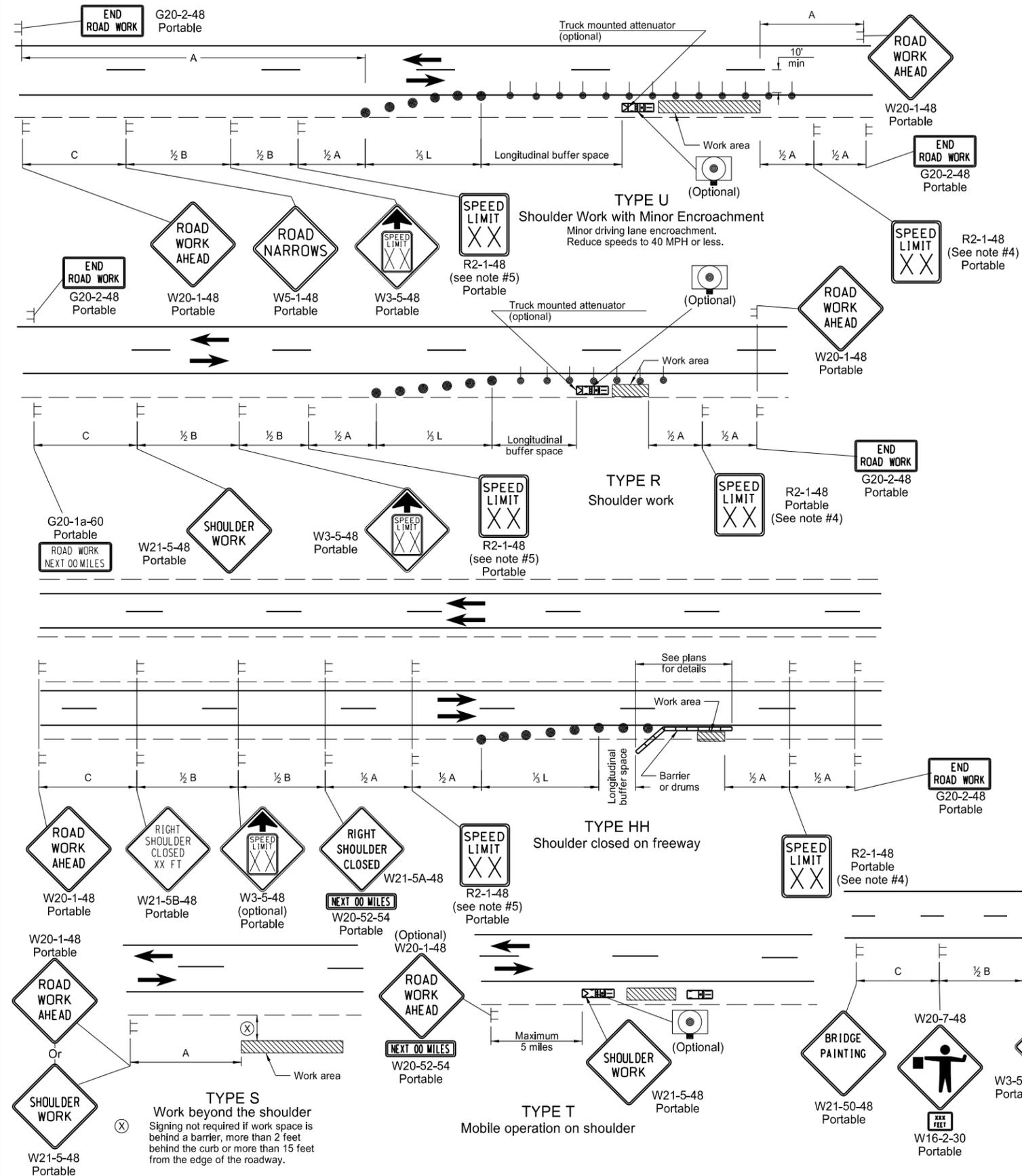
	Type III barricade		Work area
	Sign		Sequencing arrow panel
	Delineator Drum		Tubular Markers

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
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SHOULDER CLOSURES AND BRIDGE PAINTING LAYOUTS

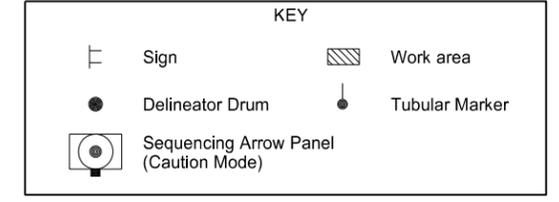
D-704-24



- Notes
- Variables
S = Numerical value of speed limit or 85th percentile.
W = The width of the taper.
L = Minimum length of taper, or $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2 / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
 - Delineator drums used for tapering traffic shall be spaced at dimension "S".
Delineator drums or tubular markers used for tangents shall be spaced at 2 times "S".
 - Sequencing Arrow Panels
Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
 - The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
 - The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at $\frac{1}{2}B$.
 - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 - Existing speed limit signs within a reduced speed zone shall be covered.
 - The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.

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

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

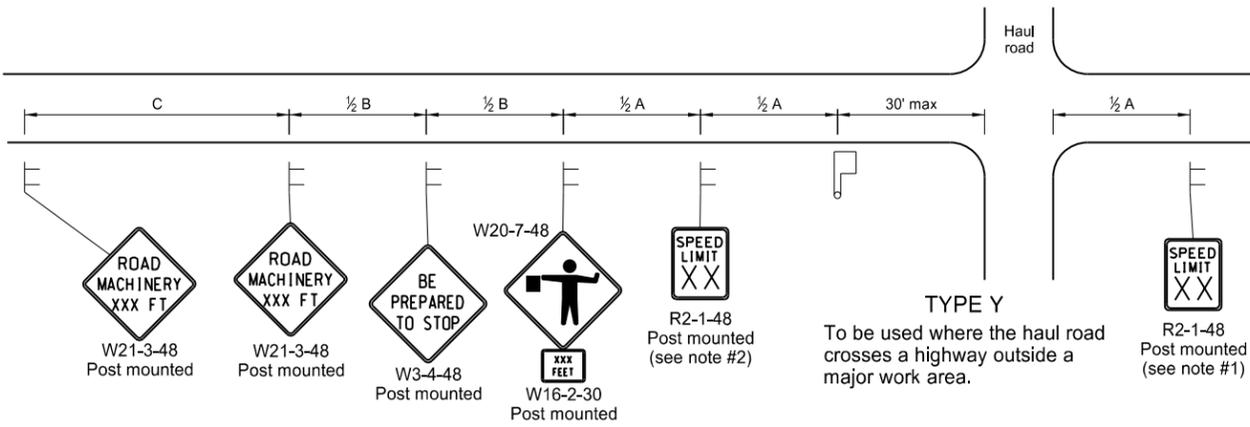


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9-27-13	
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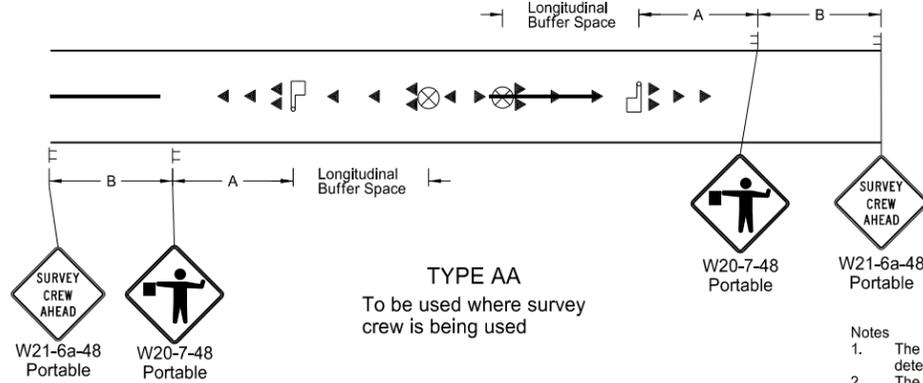
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MISCELLANEOUS SIGN LAYOUTS

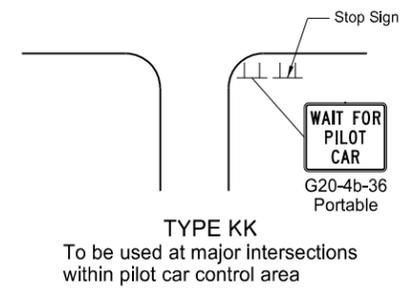
D-704-26



TYPE Y
To be used where the haul road crosses a highway outside a major work area.

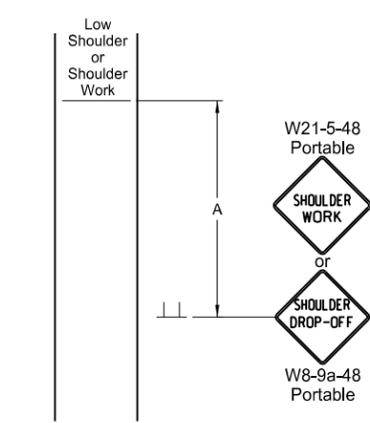


TYPE AA
To be used where survey crew is being used

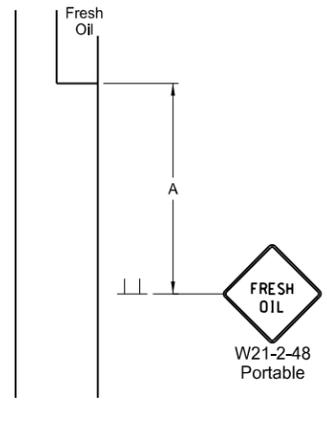


TYPE KK
To be used at major intersections within pilot car control area

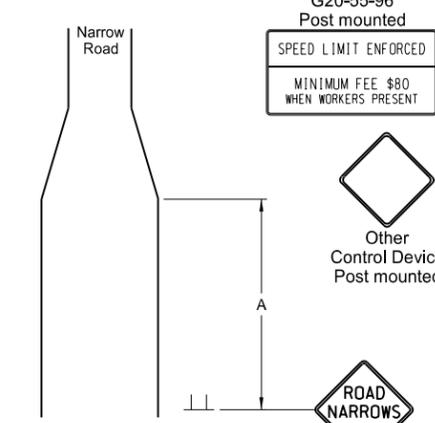
- Notes
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
 - The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
 - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 - Existing speed limit signs within a reduced speed zone shall be covered.
 - The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
 - G20-55-96 signs are not required if this standard is part of other traffic control layouts, or the work is less than 15 days.
 - When a pilot car operation is used, place a G20-4b-36 "Wait For Pilot Car" sign at major intersections within pilot car control area.



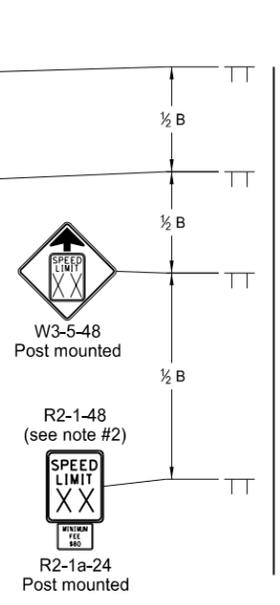
TYPE BB
To be used within a major work area where the sign conditions exist



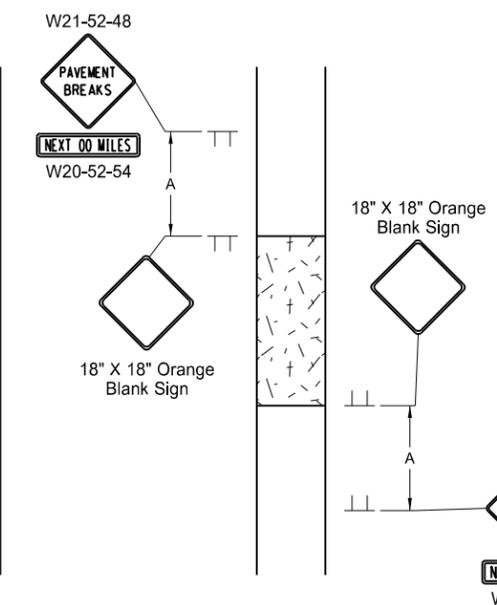
TYPE CC
To be used where the sign conditions exist



TYPE DD
To be used where the sign conditions exist



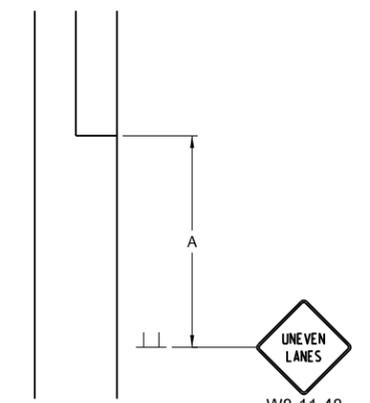
TYPE Z
To be used where speed zone is needed



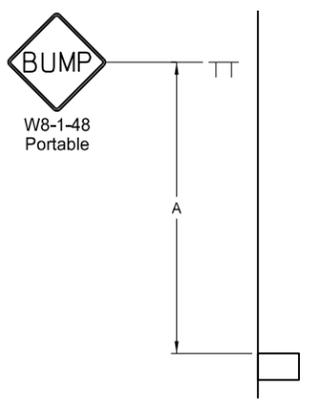
TYPE JJ
To be used where there is a break in the pavement. These signs may be skid mounted or post mounted and shall be installed when conditions exist and removed when not applicable.

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

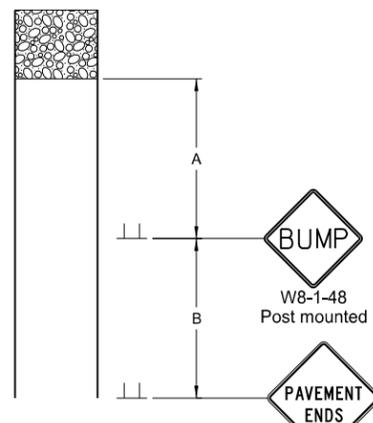
* Posted speed, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.



TYPE GG
To be used where a difference of elevation between lanes exist



TYPE EE
To be used where the sign conditions exist



TYPE FF
To be used where the sign conditions exist

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 (represented by a vertical line with a horizontal bar)

Flagger (represented by a square with a diagonal line)

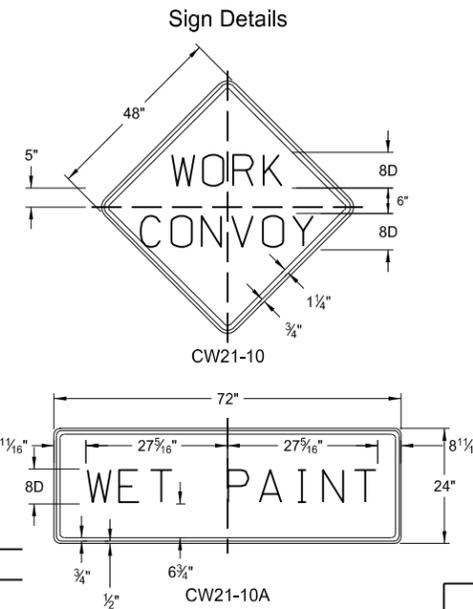
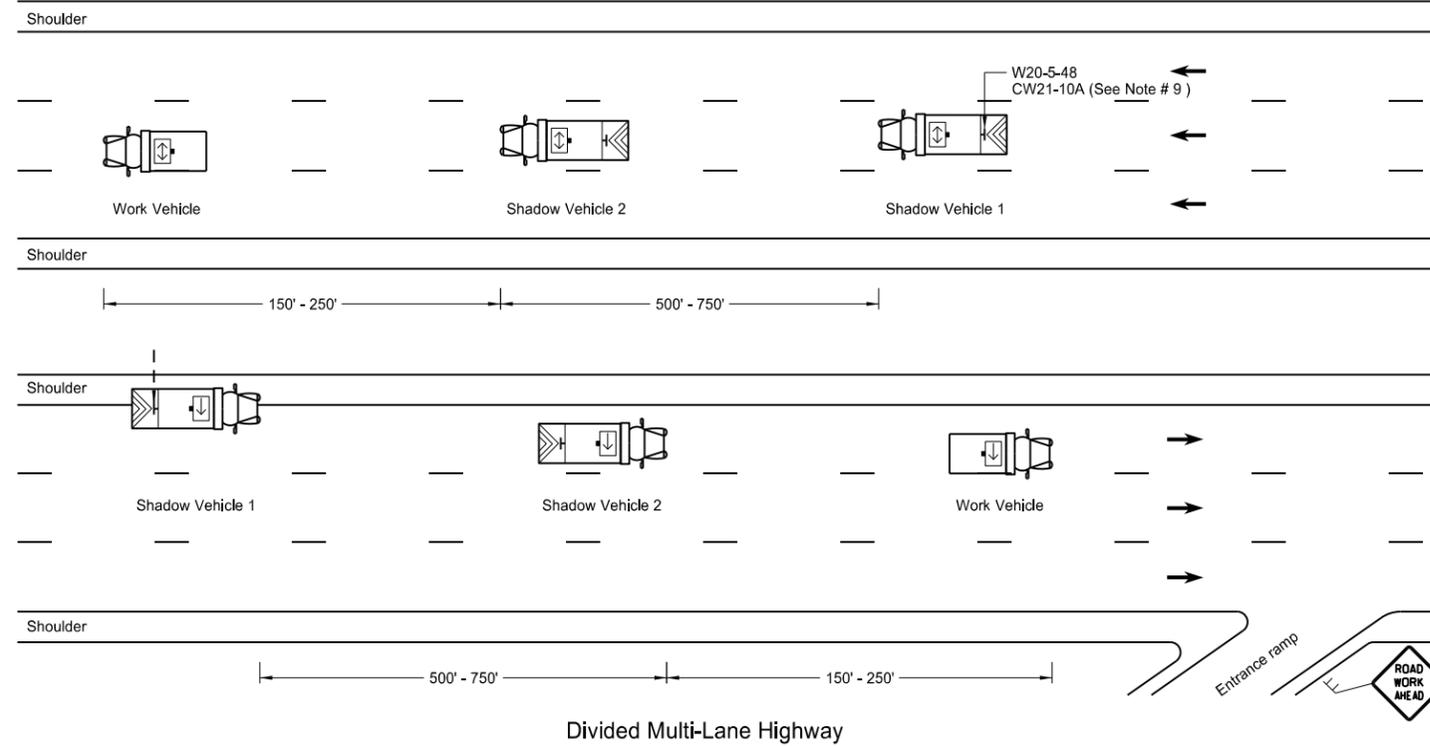
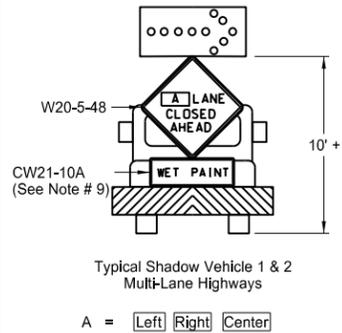
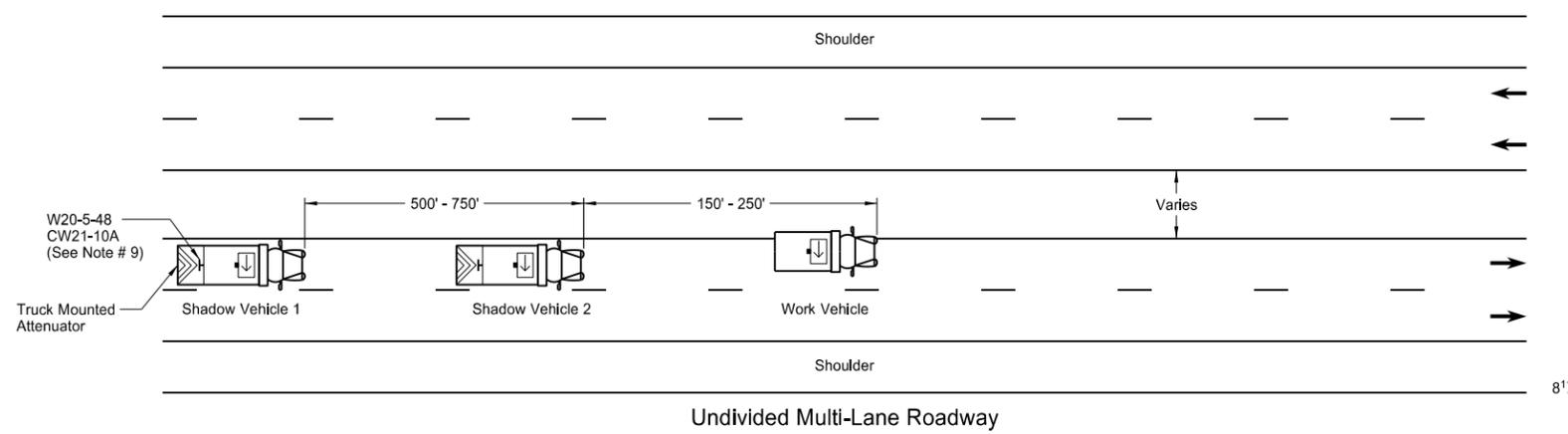
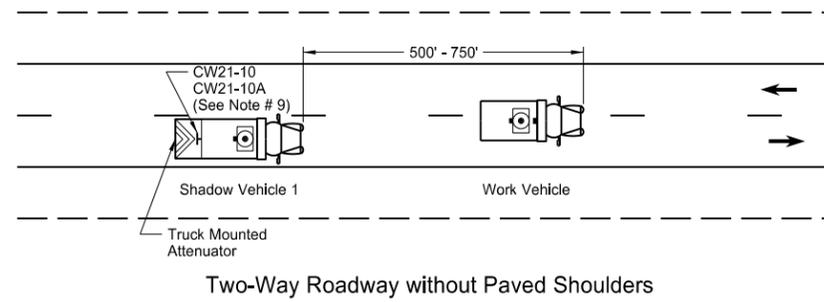
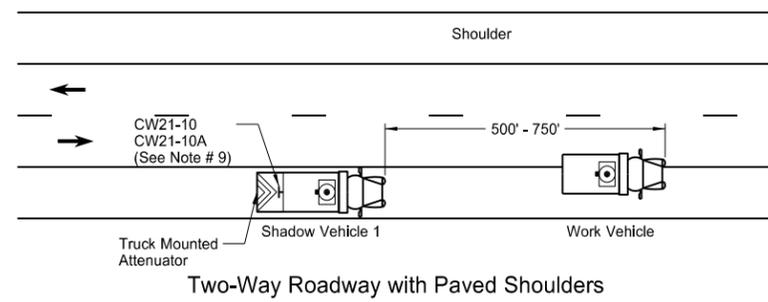
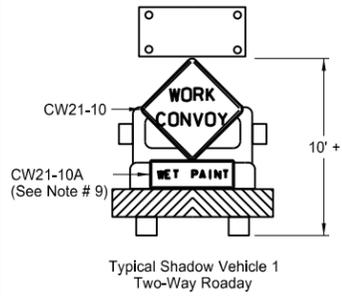
Cones (represented by a triangle)

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE

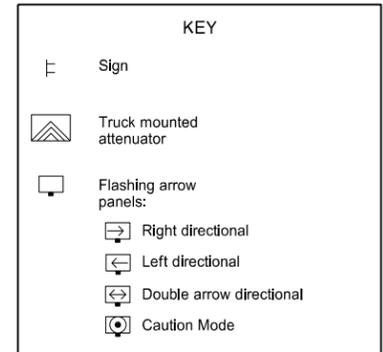
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TRAFFIC CONTROL PLAN FOR MOVING OPERATIONS

D-704-27



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

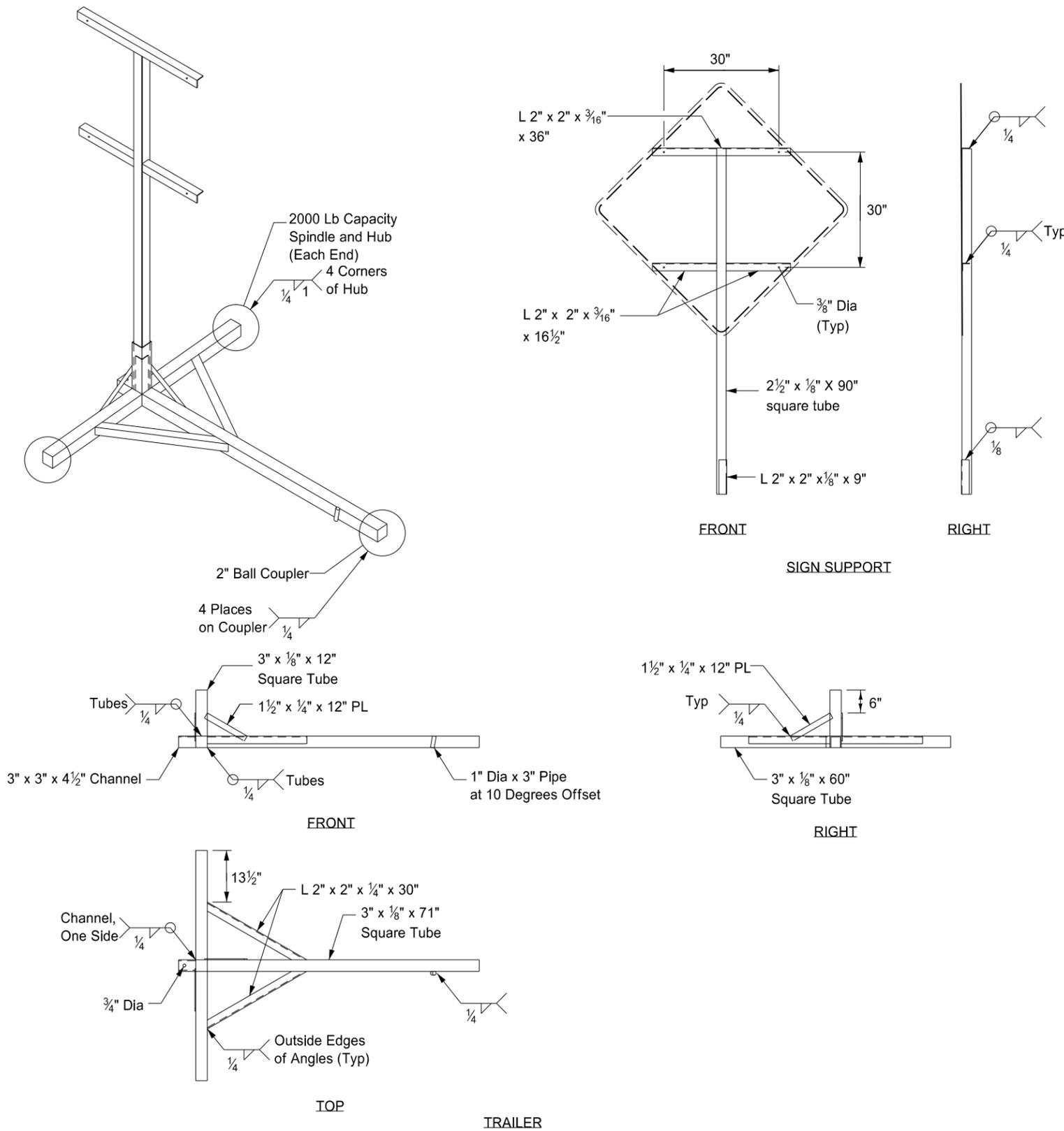


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
6-18-14	Removed shadow vehicle 2 on two lane roadways

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PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



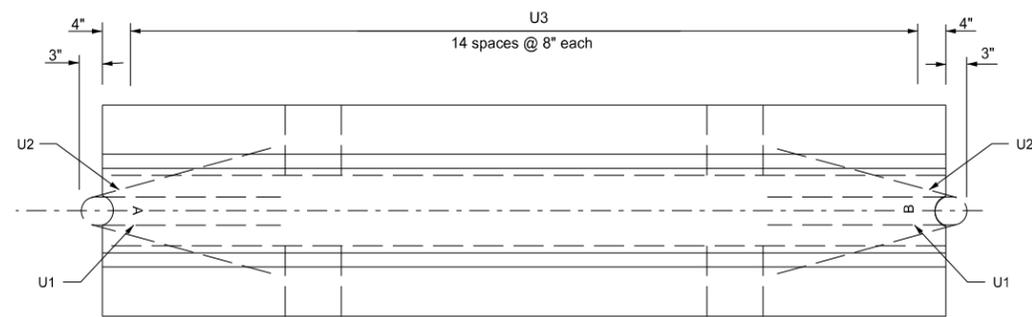
Notes:

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

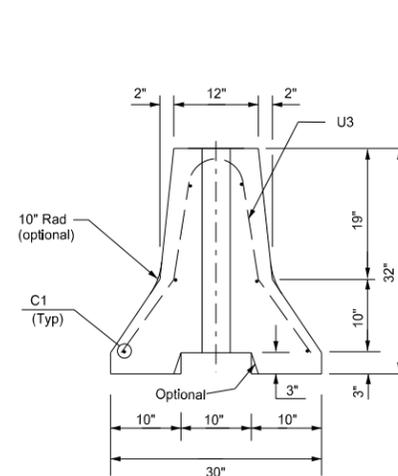
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE

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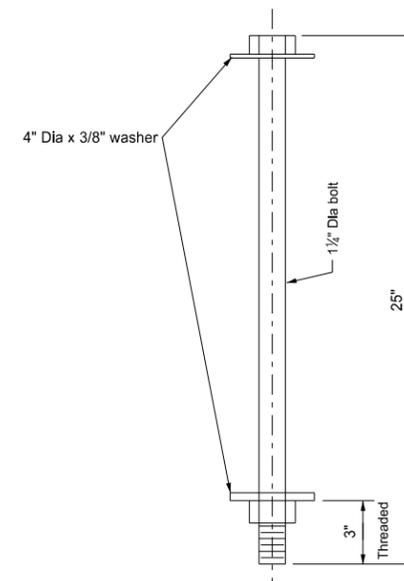
PORTABLE PRECAST CONCRETE MEDIAN BARRIER
(TEMPORARY USAGE)



Plan View



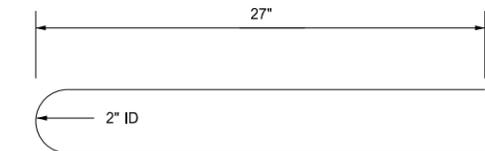
End View



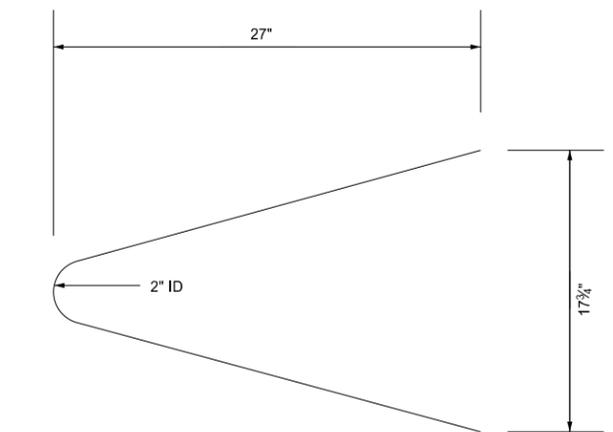
Connecting Bolt Detail
(One per 10 Ft section)

Notes:

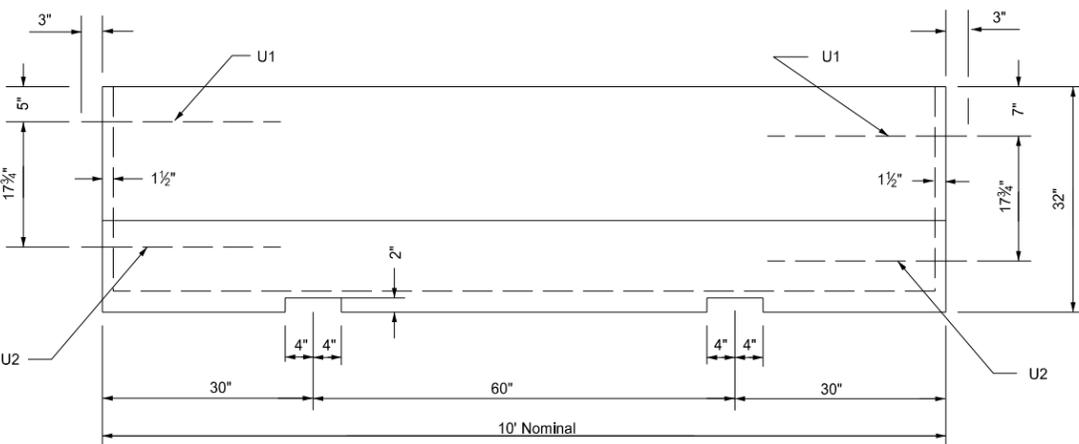
- All exposed hardware shall be galvanized as per ASTM A153, except for the loop inserts.
- Concrete shall be Class AAE-3.
- All steel shall conform to Section 612 of the NDDOT Standard Specifications.
- Barrier ends shall be imprinted A and B as shown with 4 inch letters. Field placement shall match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



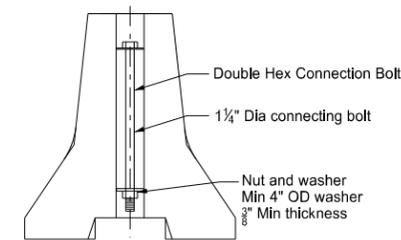
U1 Bar Detail



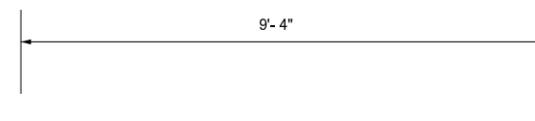
U2 Bar Detail



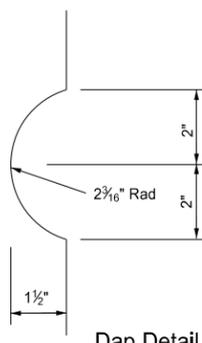
Side View



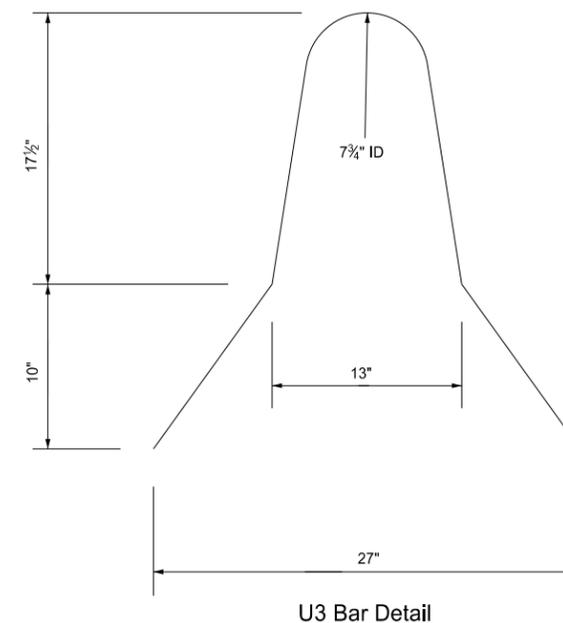
Bolt Connection Detail



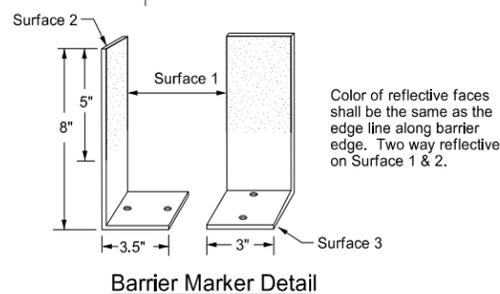
C1 Bar Detail



Dap Detail



U3 Bar Detail



Barrier Marker Detail

Color of reflective faces shall be the same as the edge line along barrier edge. Two way reflective on Surface 1 & 2.

Reflective Tape

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

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

Adhesive

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

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

Marker Body

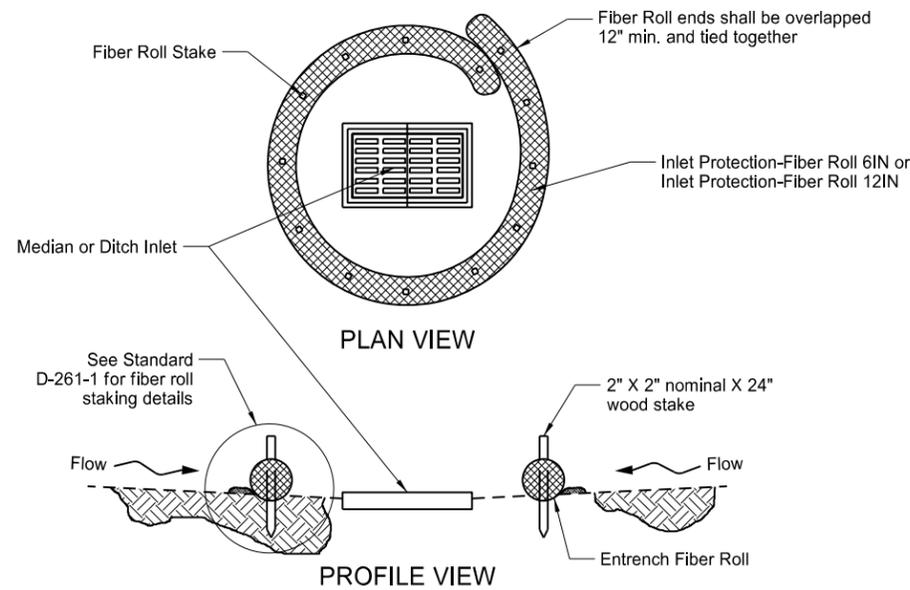
The marker shall be made of a high impact, weatherable engineering thermo-plastic material which conforms to the following:

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

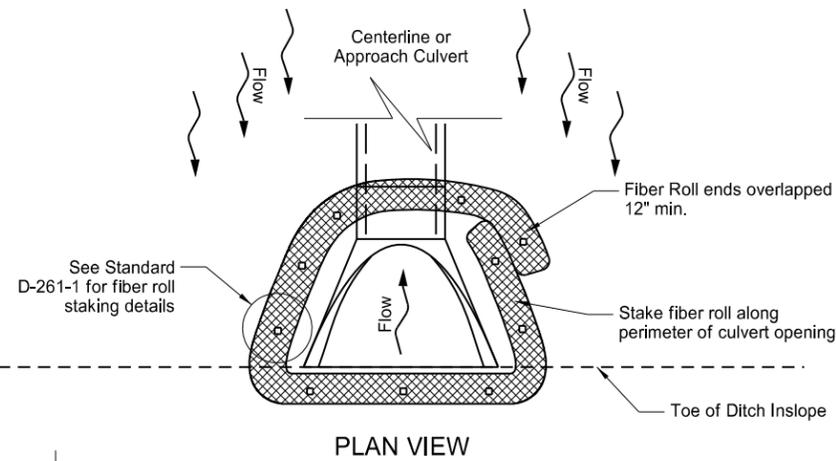
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-20-12	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by
Roger Weigel
Registration Number
PE- 2930,
on 07/20/12 and the original document is stored at the
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of Transportation

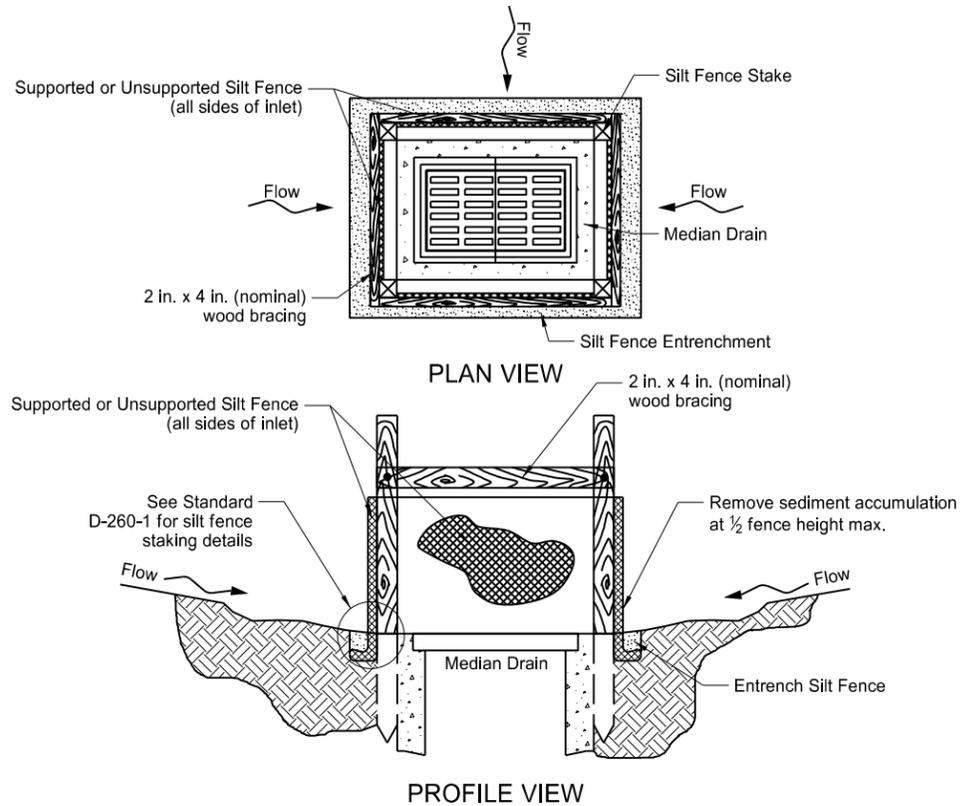
EROSION AND SILTATION CONTROLS
MEDIAN OR DITCH INLET PROTECTION



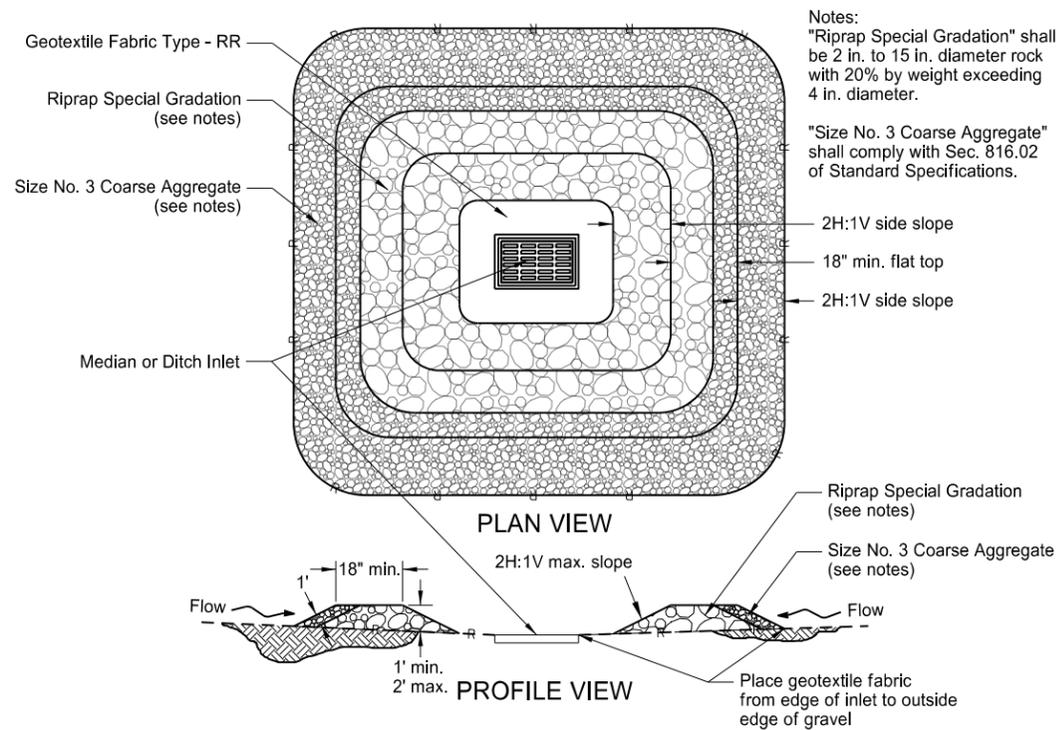
FIBER ROLL PROTECTION (MEDIAN OR DITCH INLET)



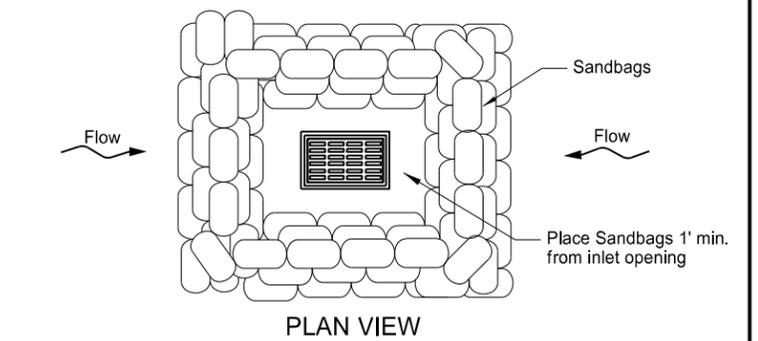
FIBER ROLL PROTECTION (INLET OF CULVERT)



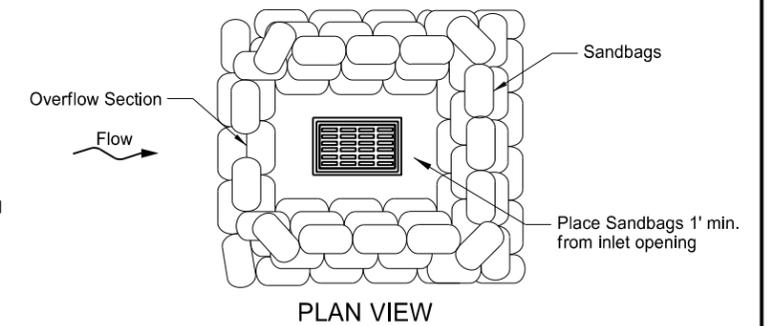
SILT FENCE PROTECTION (MEDIAN OR DITCH INLET)



GRAVEL INLET PROTECTION (MEDIAN OR DITCH INLET)



SANDBAG PROTECTION (LOW POINT)



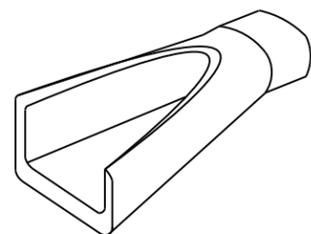
SANDBAG PROTECTION (ON SLOPE)

Notes:
"Riprap Special Gradation" shall be 2 in. to 15 in. diameter rock with 20% by weight exceeding 4 in. diameter.
"Size No. 3 Coarse Aggregate" shall comply with Sec. 816.02 of Standard Specifications.

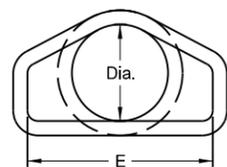
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Updated reference to standard drawing number for fiber roll staking details.
10-01-14	Updated reference to standard drawing number for silt fence.

This document was originally issued and sealed by
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PE-2930,
on 10/01/14 and the original document is stored at the North Dakota Department of Transportation

REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS
(Round Pipe)

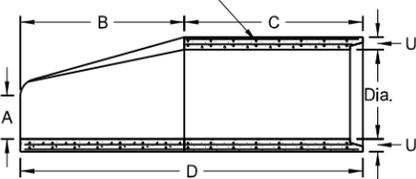


PERSPECTIVE

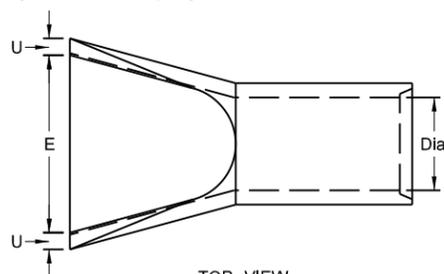


END VIEW

Standard Reinforcement for Class III pipe reinforced as per AASHTO M170



SIDE VIEW

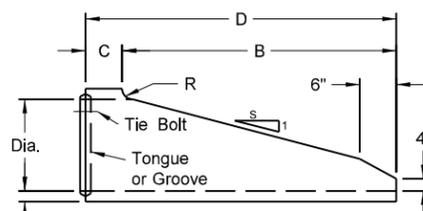


TOP VIEW

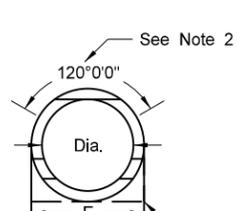
REINFORCED CONCRETE PIPE - FLARED END SECTION

Reinforcement to be equivalent to Class III RCP

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



SIDE VIEW



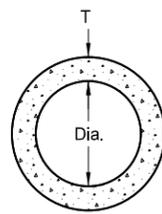
END VIEW

NOTES (Traversable End Section):

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

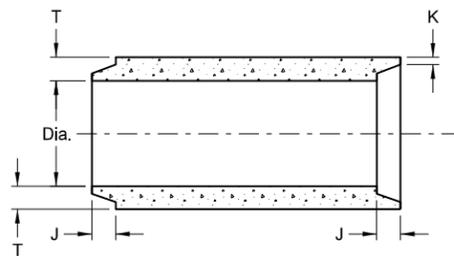
REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION

Reinforcement to be equivalent to Class III RCP

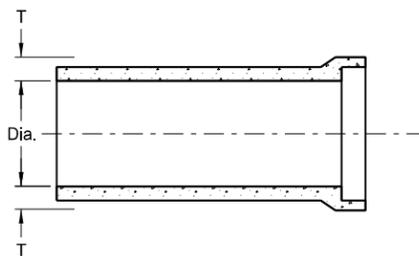


END VIEW

CIRCULAR PIPE

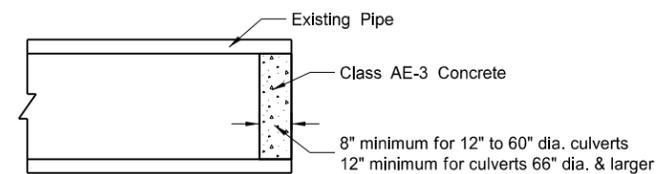


TONGUE & GROOVE JOINT



BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE



CONCRETE PIPE PLUG

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

All Classifications of Round Concrete Pipe

Internal Dia. of Pipe (In.)	Cross-Sectional Water Area (Sq. ft.)	Weight per Lin. Foot of Pipe (Lbs.)	Joint Groove Min./Max. (In.)	Joint Tongue Min./Max. (In.)	Minimum Wall Thickness (In.)
12	0.79	92	1 1/8-2 3/8	3/4	2
15	1.23	127	1 1/4-2 3/4	7/8	2 1/4
18	1.77	168	1 1/2-2 7/8	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 3/4	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 3/4	3 1/2
33	5.94	452	3 1/2-4 1/2	1 3/4	3 3/4
36	7.07	524	3 3/4-4 1/2	1 3/4	4
42	9.62	685	3 3/4-4 1/2	1 3/4	4 1/2
48	12.57	885	3 3/4-4 1/2	1 3/4	5
54	15.90	1070	4 1/2-5 1/2	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 1/2	6 1/2
72	28.27	1810	5 1/2-6 3/4	2 1/2	7
78	33.18	2098	6 1/4-7 1/4	2 1/2	7 1/2
84	38.48	2410	5 1/2-7 3/4	3 3/8	8
90	44.18	2793	6 3/4-8 1/2	3 3/8	8 1/2
96	50.27	3092	7-8 1/4	3 1/2	9
102	56.75	3466	7-8 1/4	3 1/2	9 1/2
108	63.62	3864	7 1/4-8 1/2	3 3/4	10

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

NOTES:

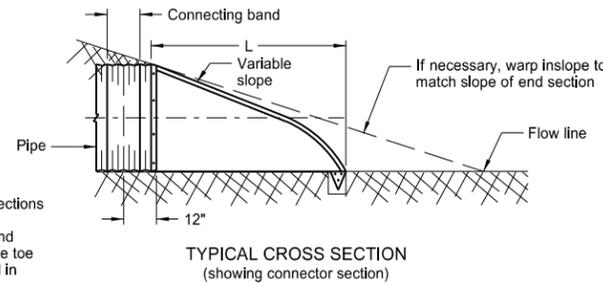
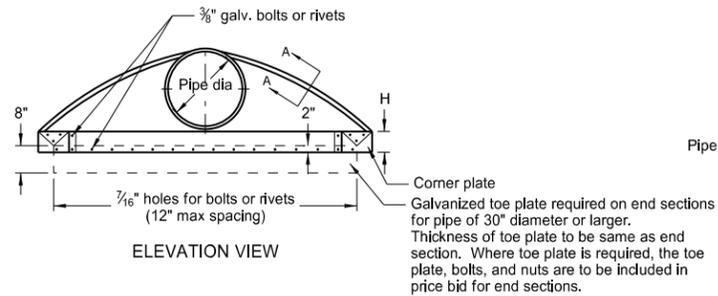
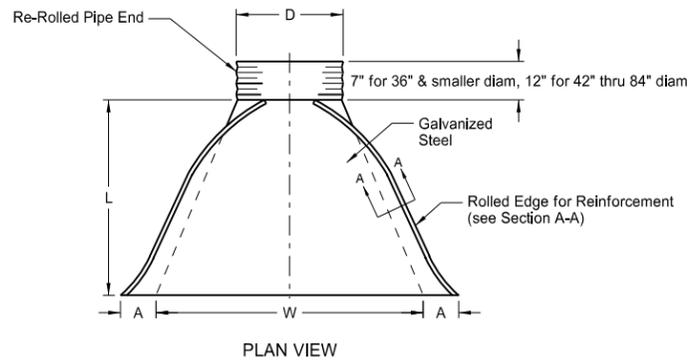
1. All reinforcing steel shall meet AASHTO M170 requirements.
2. All circular, longitudinal, and elliptical reinforcement shall be assembled and securely fastened in cage fashion so as to maintain reinforcement in exact shape and correct positions within the forms.
3. Laying length of pipe: 12" to 66"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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-12-14	
REVISIONS	
DATE	CHANGE
01-21-15	Revised Note 5

This document was originally issued and sealed by Terrence R. Udland, Registration Number PE-2674, on 01/21/15 and the original document is stored at the North Dakota Department of Transportation

ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

D-714-4



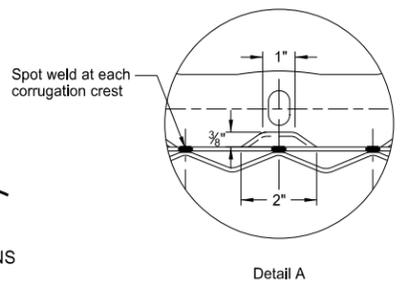
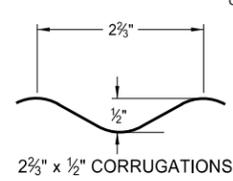
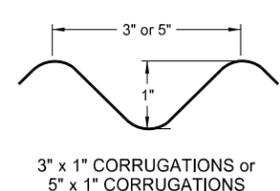
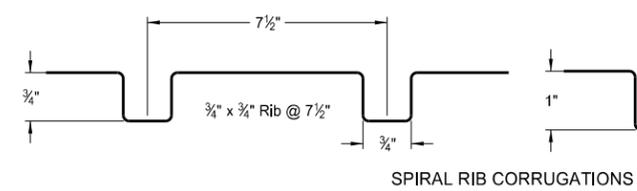
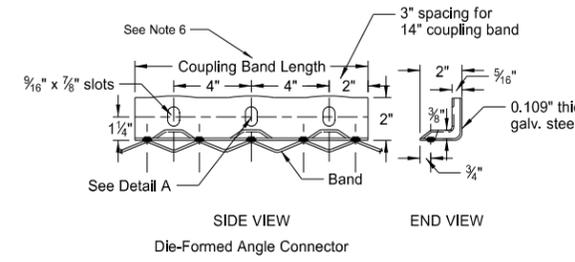
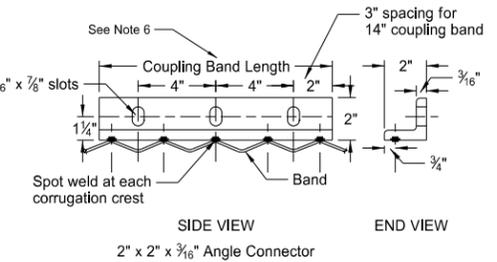
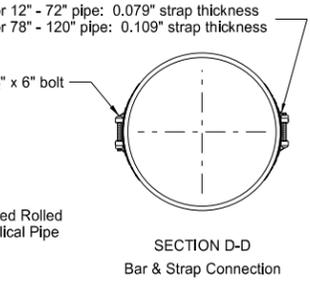
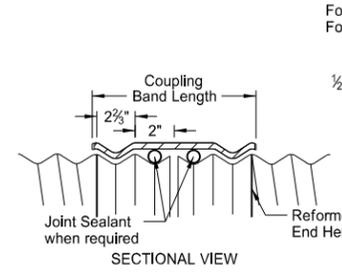
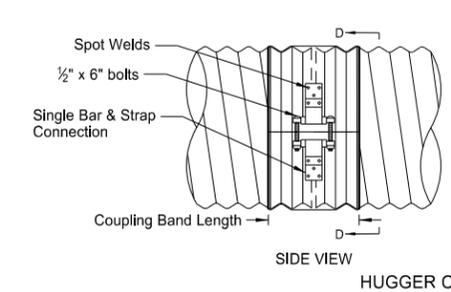
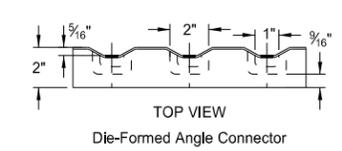
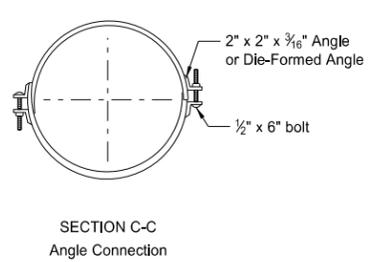
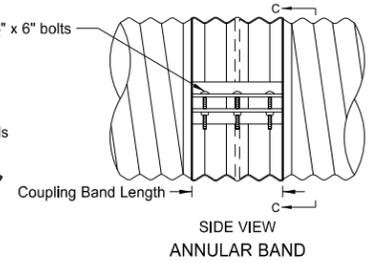
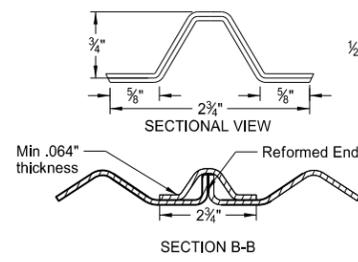
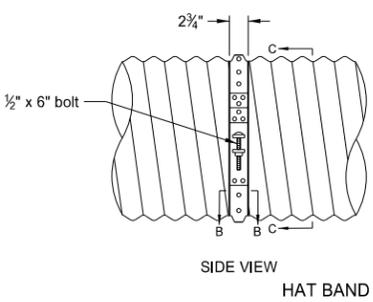
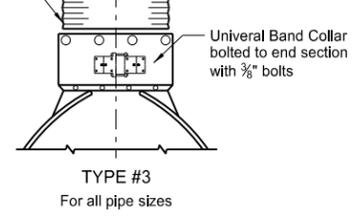
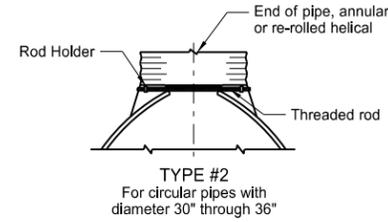
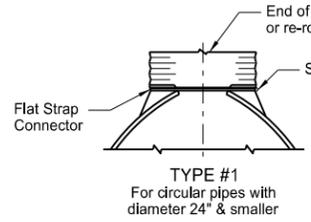
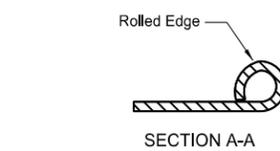
PIPE DIA. IN	GALV. THICK.	END SECTION DIMENSIONS					APPROX. SLOPE	BODY PIECE
		A IN	B IN	H IN	L IN	W IN		
15	0.064	7	8	6	26	30	2 1/2:1	1
18	0.064	8	10	6	31	36	2 1/2:1	1
24	0.064	10	13	6	41	48	2 1/2:1	1
30	0.079	12	16	8	51	60	2 1/2:1	1 or 2
36	0.079	14	19	9	60	72	2 1/2:1	2
42	0.109	16	22	11	69	84	2 1/2:1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

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

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

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 ±.

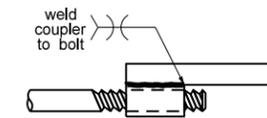
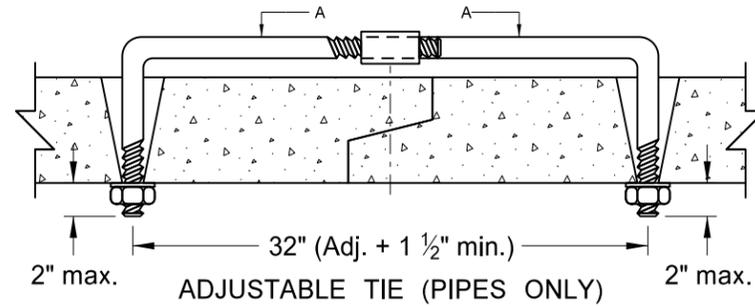
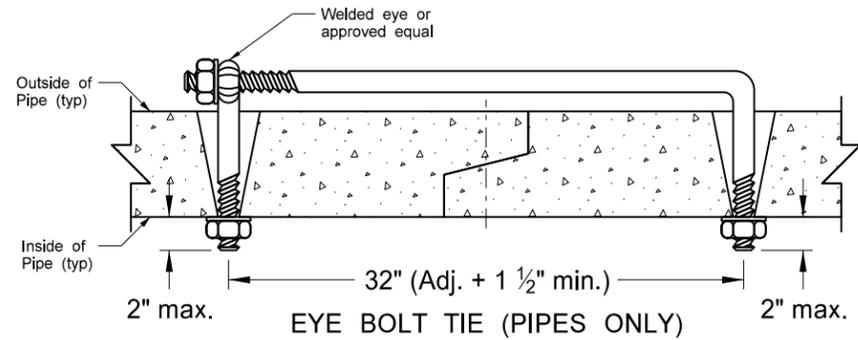
- NOTES:
- Pipes and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
 - Top edge of all end sections to have rolled edges for reinforcement (see Section A-A). The reinforced edges are to be supplemented with 2" x 2" x 1/4" galv. angle for 60" 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".



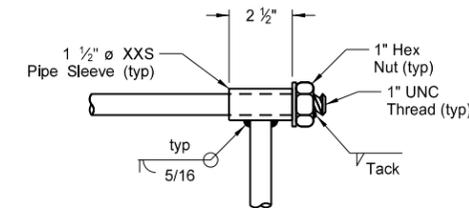
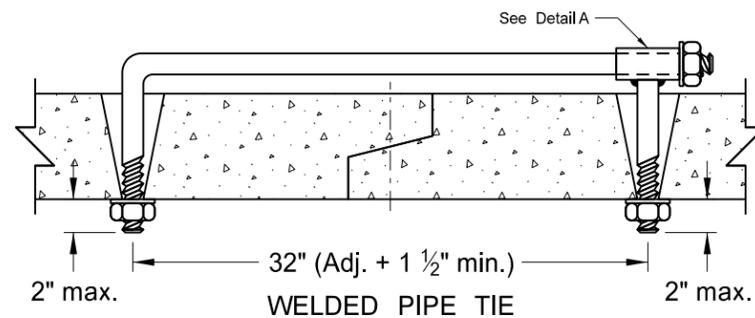
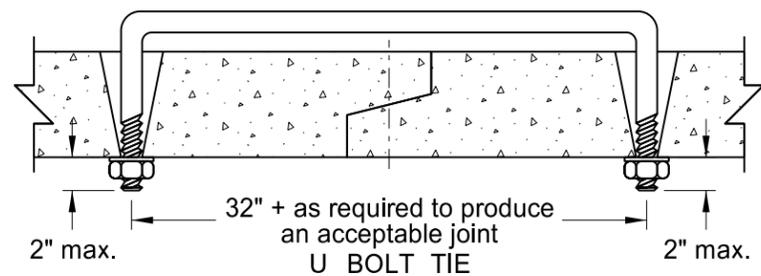
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
08-06-13	
REVISIONS	
DATE	CHANGE
01-07-14	End Section Plan View
02-27-14	3" x 1" Corrugation Detail

This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674 , on 02/27/2014 and the original document is stored at the North Dakota Department of Transportation

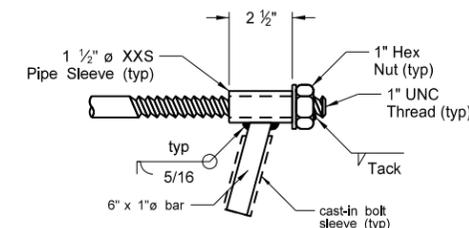
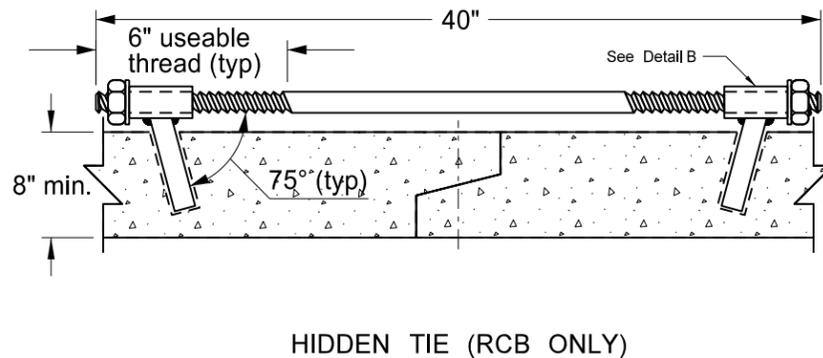
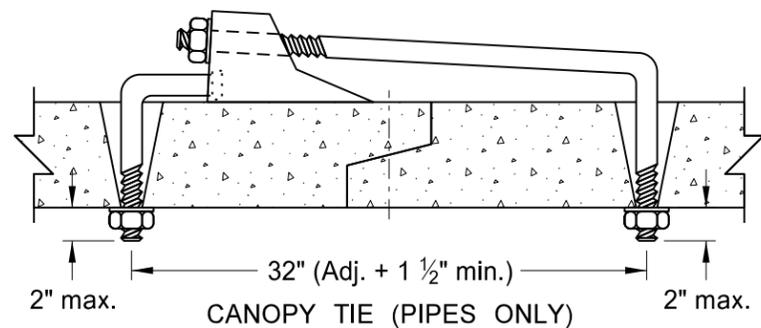
CONCRETE PIPE OR PRECAST CONCRETE BOX CULVERT TIES



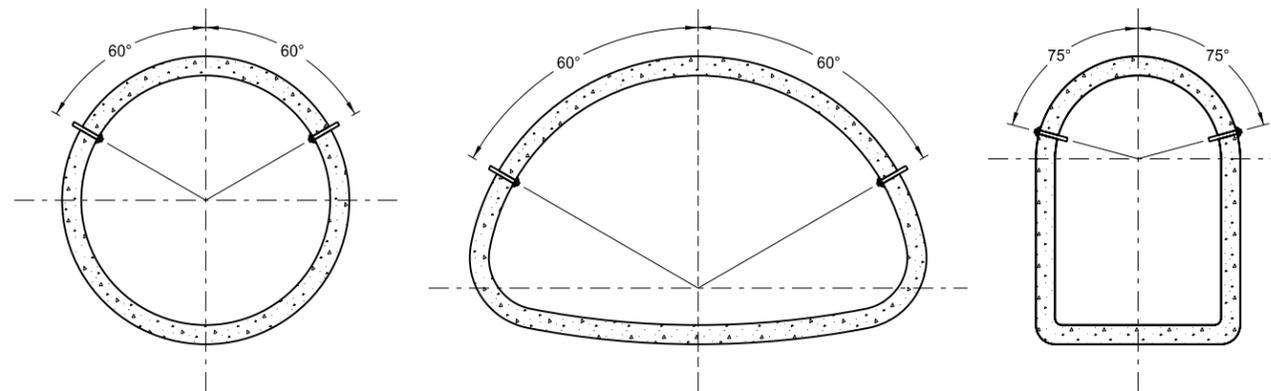
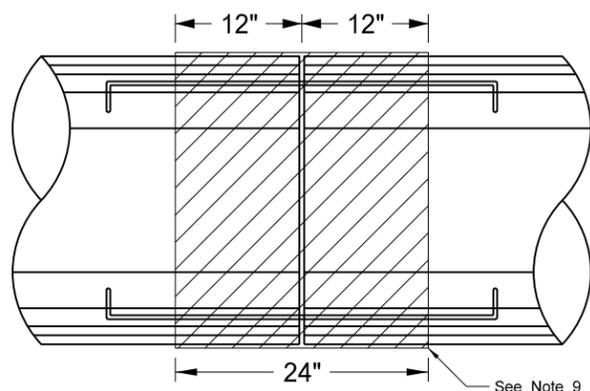
SECTION A-A



DETAIL A



DETAIL B



REQUIRED SIZE OF TIE BOLTS		
Pipe Size	Thread ø	XXS Pipe Sleeve Inner ø
18" - 24"	5/8" See note 2	3/4"
30" - 66"	3/4"	1"
72" - 78"	1"	1 1/4"
RCB		

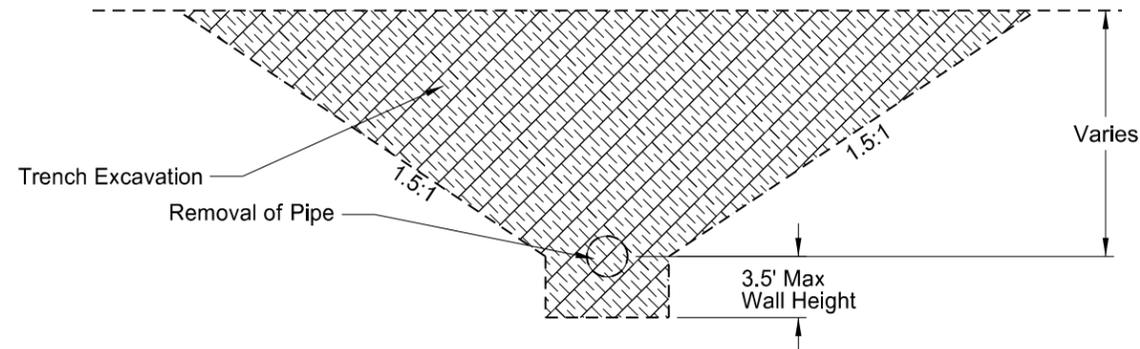
NOTES:

- The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
- Nuts and washers are not required on Jacked and Bored pipes or pipes with a 24" diameter or less. Where nuts and washers are not used, the tie bars shall be inserted and grouted into place.
- Ties are only for holding pipe or RCB sections together, not for pulling sections tight.
- Tie bolt assembly shall be hot dip galvanized in accordance with AASHTO M232.
- Holes in pipes to accommodate tie bolts can be precast or drilled. Tapered holes are permitted when precast. Holes shall have a diameter 1/4" larger than the diameter of the thread. Holes in precast RCB's shall contain cast-in bolt sleeves with an inside diameter of 1 1/4".
- The contractor has the option of selecting the type of tie bolt used from those shown.
- The cost of precasting or drilling the required holes and furnishing and installing the tie bolts shall be included in the price bid for the appropriate conduit or RCB pay item.
- All concrete culvert and storm sewer joints, including the end section joints, shall be tied unless otherwise specified.
- When joint wrap is specified in the plans, place wrap beneath ties. Overlap the joint by 12" in both directions.
- Tie bolts shall conform to ASTM A 36. Nuts shall be heavy hex and conform to ASTM A 563. Washers shall conform to ASTM F 436, Type 1. Welded pipe sleeves and cast-in bolt sleeves shall conform to ASTM A 53, Grade B.
- Cattle Pass and Jacked and Bored pipes shall have pipe ties inserted from the inside of the pipes and grouted into place. Jacked and bored pipes with a diameter of 24" or less do not require pipe ties.
- RCB tie locations shall be as shown on the plans.

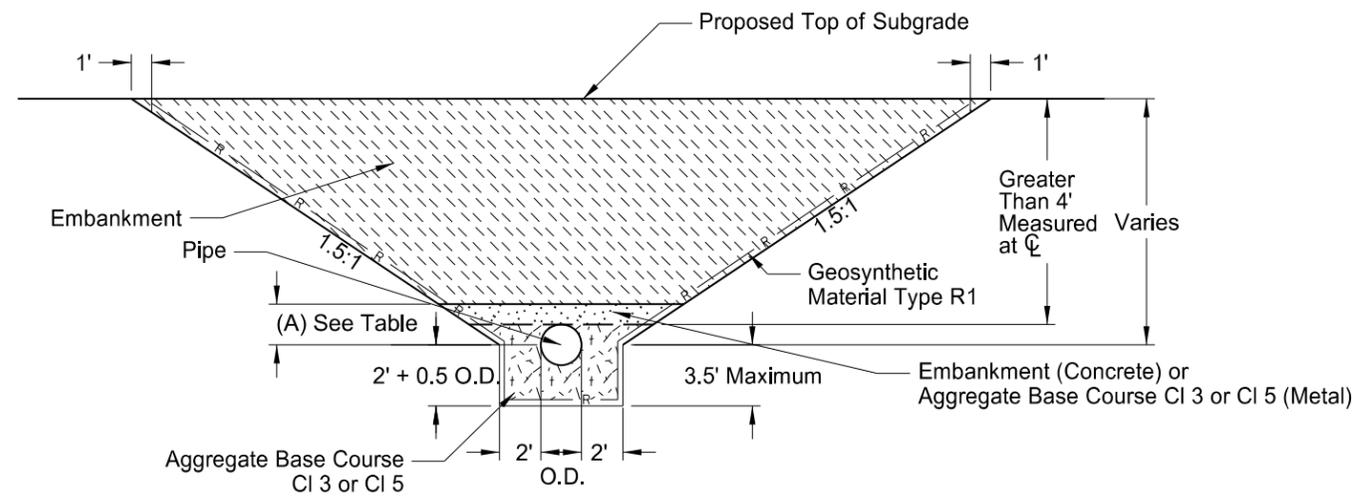
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
3-18-14	
REVISIONS	
DATE	CHANGE

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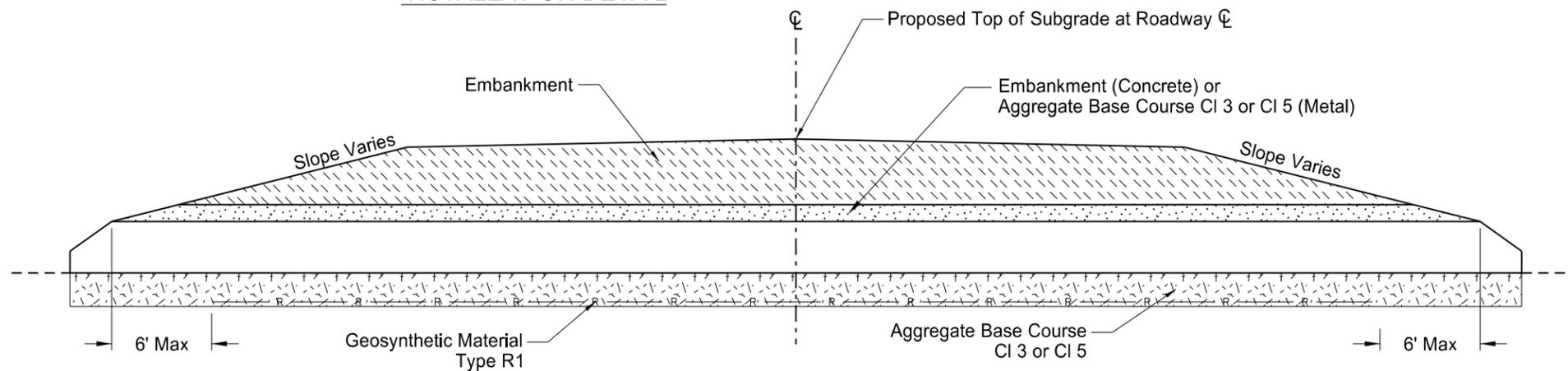
TRANSVERSE MAINLINE PIPE INSTALLATION DETAIL FOR
PIPES MORE THAN 4 FEET BELOW THE TOP OF PROPOSED SUBGRADE



EXCAVATION DETAIL



INSTALLATION DETAIL



CROSS SECTION

Pay Items

- 1) Pipe*
- 2) Geosynthetic Material Type R1
- 3) 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:

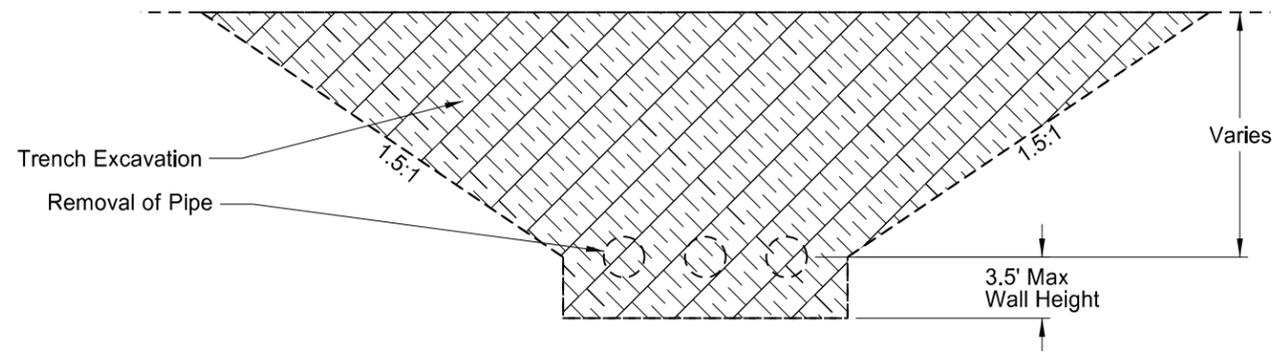
- 1) This drawing applies to new/replaced mainline and paved intersection roadways (including ramps). It does not include pipes in approaches.
- 2) Embankment may be either Borrow Excavation or Common Excavation - Type A

Backfill Dimensions	
Pipe Materials	Dimension (A)
Concrete	0.5 O.D.
Metal	0.5 O.D. + 1 Foot

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-26-13	
REVISIONS	
DATE	CHANGE
10-15-13	Label Formatting
1-21-14	Nomenclature

This document was originally issued and sealed by
Ron Horner,
Registration Number
PE-2087,
on 1/22/2015 and the original document is stored at the North Dakota Department of Transportation

TRANSVERSE MAINLINE PIPE INSTALLATION DETAIL FOR
MULTIPLE PIPES MORE THAN 4 FEET BELOW THE TOP OF PROPOSED SUBGRADE



Pay Items

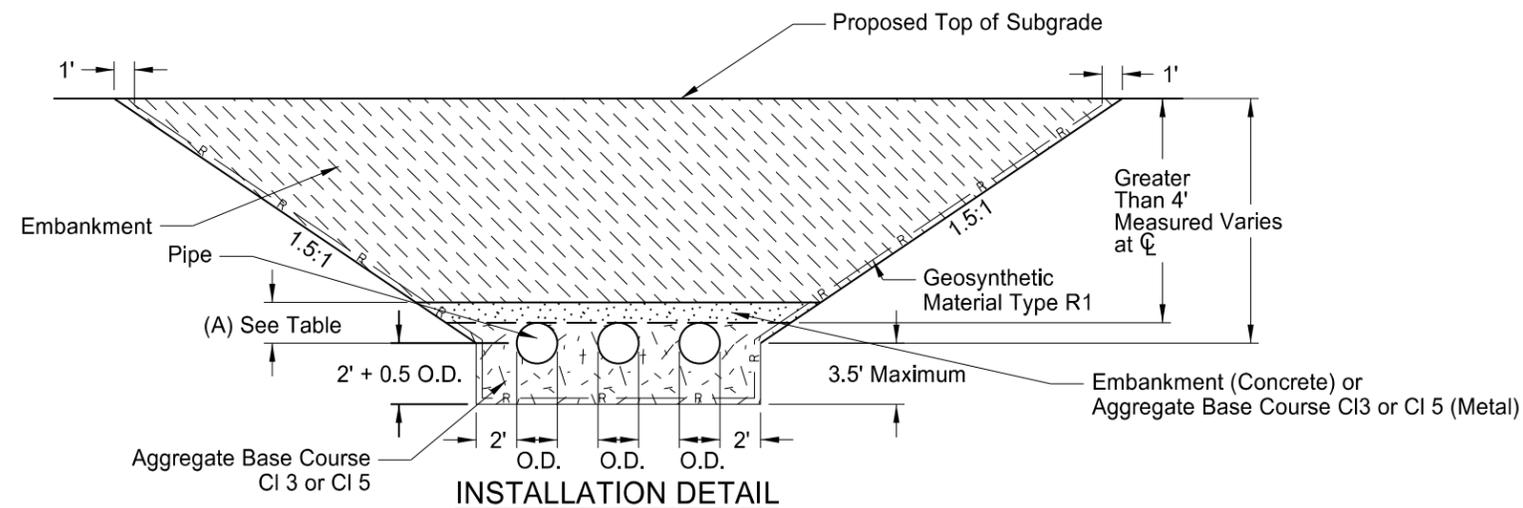
- 1) Pipe*
- 2) Geosynthetic Material Type R1
- 3) Removal of Pipe (if required)

*Included in Pipe Pay Items

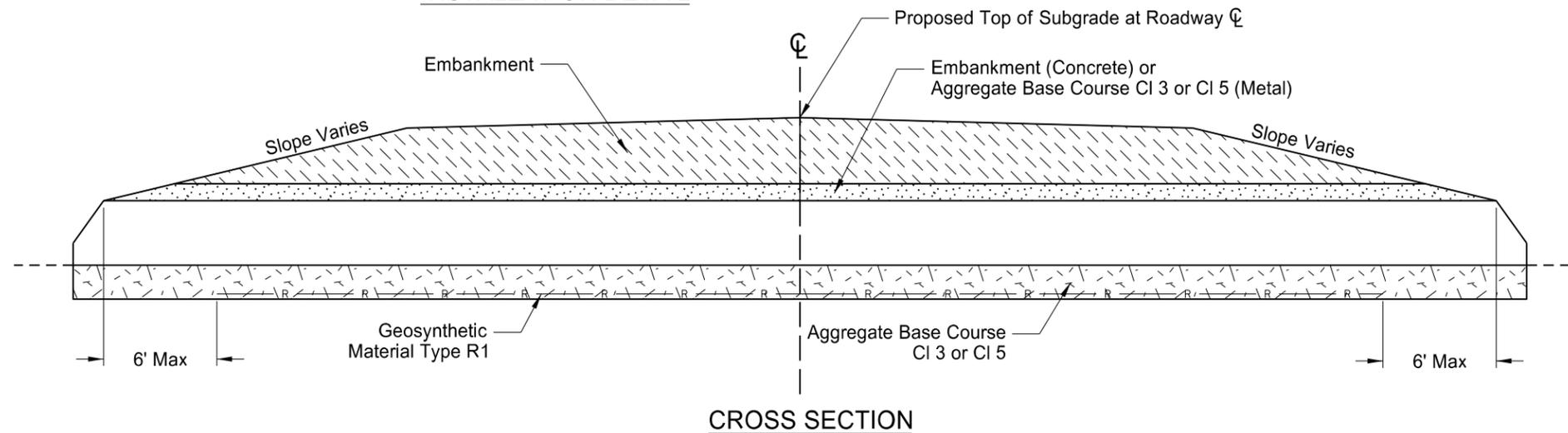
- 1) Pipe
- 2) Trench Excavation
- 3) Aggregate Base Course CI 3 or CI 5
- 4) Embankment

NOTES:

- 1) This drawing applies to new/replaced mainline and paved intersection roadways (including ramps). It does not include pipes in approaches.
- 2) Embankment may be either Borrow Excavation or Common Excavation - Type A



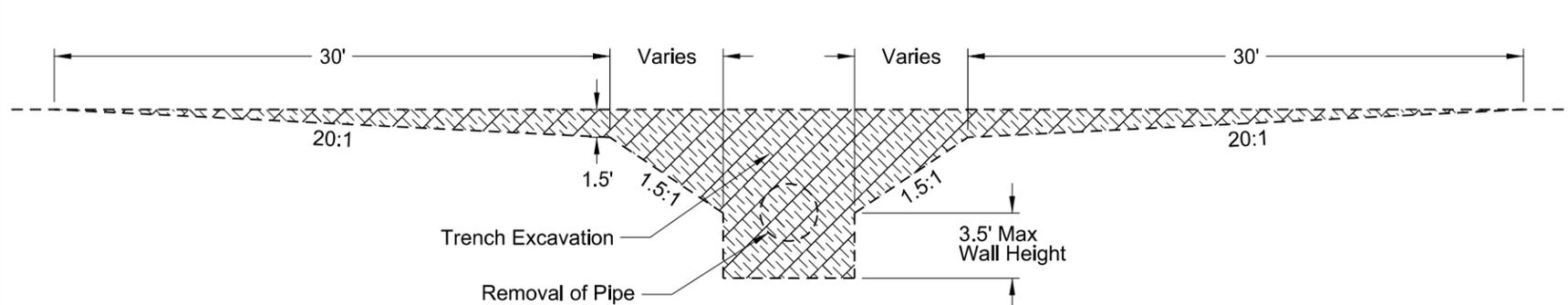
Backfill Dimensions	
Pipe Materials	Dimension (A)
Concrete	0.5 O.D.
Metal	0.5 O.D. + 1'



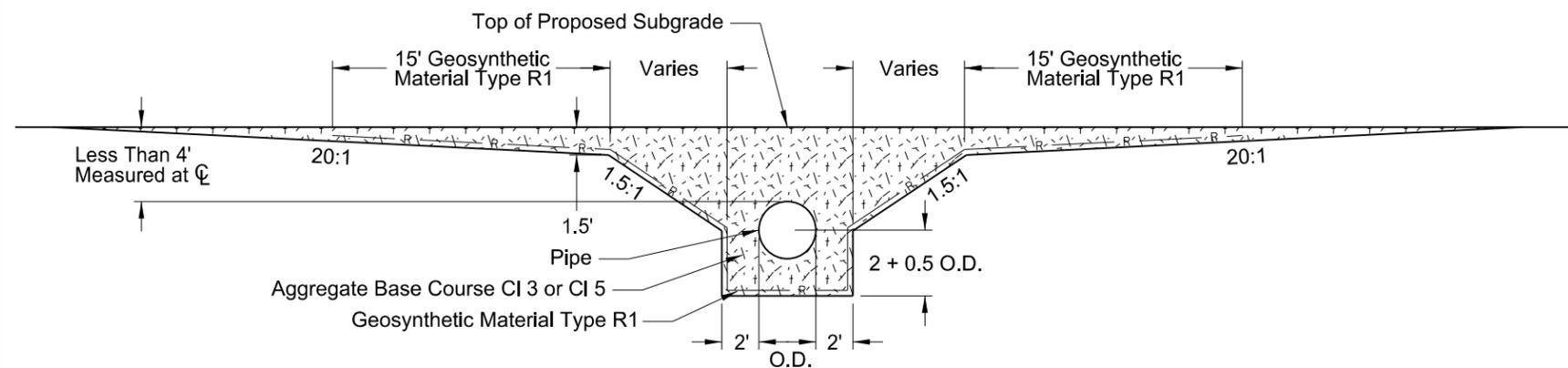
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-4-14	
REVISIONS	
DATE	CHANGE
3-3-14 1-21-14	Spelling Nomenclature

This document was originally issued and sealed by
Ron Horner
Registration Number
PE-2087,
on 1/22/2015 and the original document is stored at the North Dakota Department of Transportation

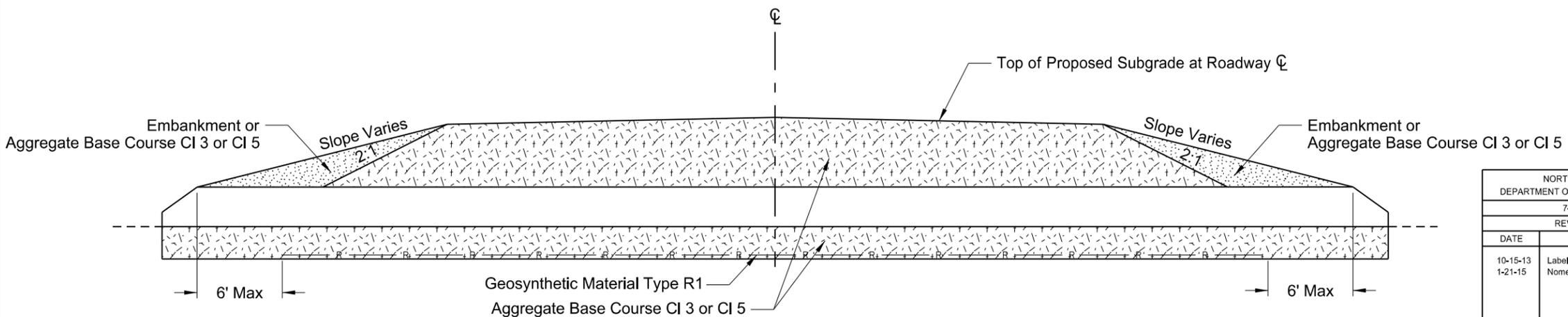
TRANSVERSE MAINLINE PIPE INSTALLATION DETAIL FOR PIPES
4 FEET OR LESS BELOW THE TOP OF THE PROPOSED SUBGRADE



EXCAVATION DETAIL



INSTALLATION DETAIL



CROSS SECTION

Pay Items

- 1) Pipe*
- 2) Geosynthetic Material Type R1
- 3) 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 applies to new/replaced mainline and paved intersection roadway pipes only (including ramps). It does not include pipes in approaches.
- 2) Embankment may be either Borrow Excavation or Common Excavation - Type A

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-26-13	
REVISIONS	
DATE	CHANGE
10-15-13 1-21-15	Label Formatting Nomenclature

This document was originally issued and sealed by
Ron Homer,
Registration Number
PE-2087,
on 1/22/2015 and the original document is stored at the North Dakota Department of Transportation

STANDARD MONUMENTS AND RIGHT OF WAY MARKERS

NOTES:

The construction and installation of Alignment Monuments, Iron Pin Reference Monuments, Iron Pin R/W Monuments, and Right of Way Markers (witness posts) shall conform to Section 720 of the Standard Specifications.

ALIGNMENT MONUMENTS:

Iron Pin or Precast Concrete Alignment Monuments with aluminum caps will be placed 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.

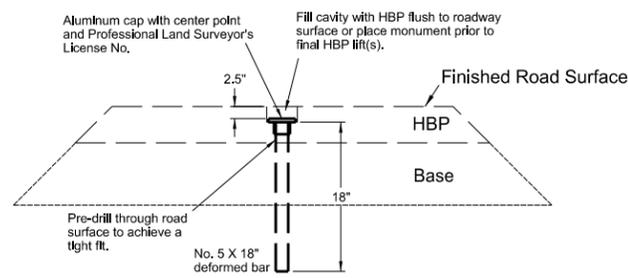
IRON PIN R/W MONUMENT:

Iron pins with aluminum caps (No. 5 X 18") will be placed 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.

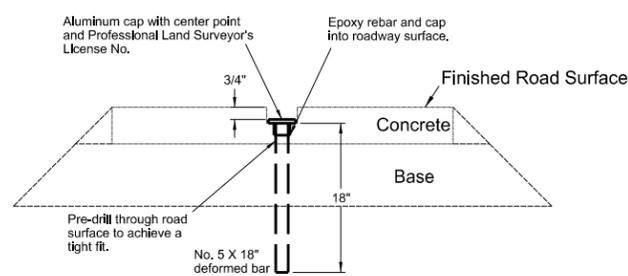
IRON PIN REFERENCE MONUMENT:

Iron Pins without aluminum caps (No. 5 X 18") will be placed as reference monuments on the Right of Way line at section corners, quarter corners, section line crossings, and quarter line crossings.

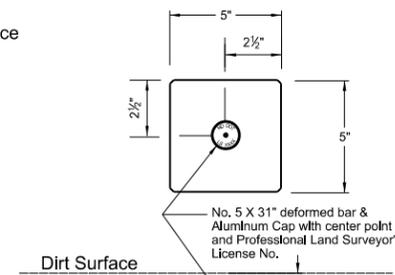
ALIGNMENT MONUMENT DETAILS



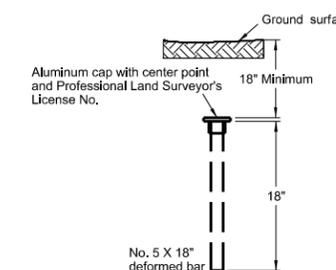
IRON PIN
(Within Finished Roadway Surface)



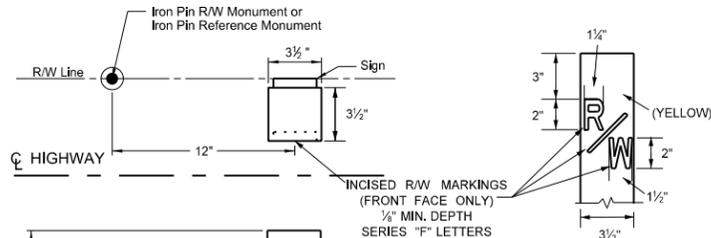
IRON PIN
(Within Finished Roadway Surface)



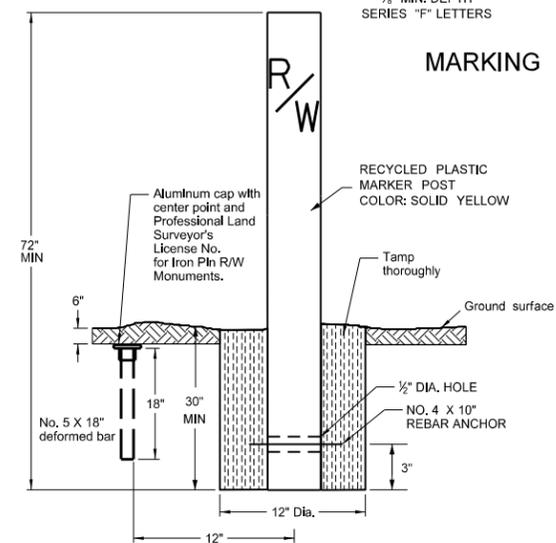
PRECAST CONCRETE
(Outside Finished Roadway Surface)
(Inside R/W Limits)



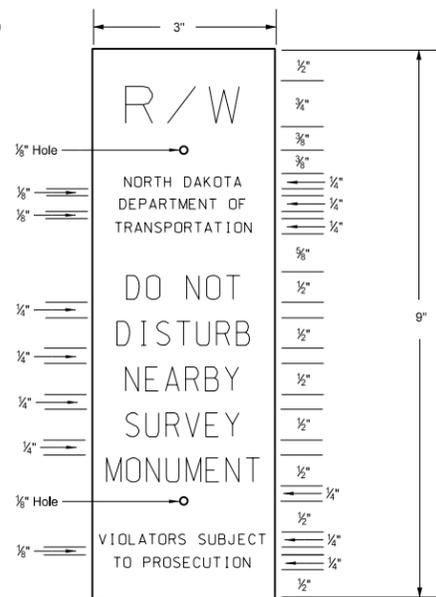
IRON PIN
(Outside Finished Roadway Surface)
(Outside R/W Limits)



MARKING DETAIL



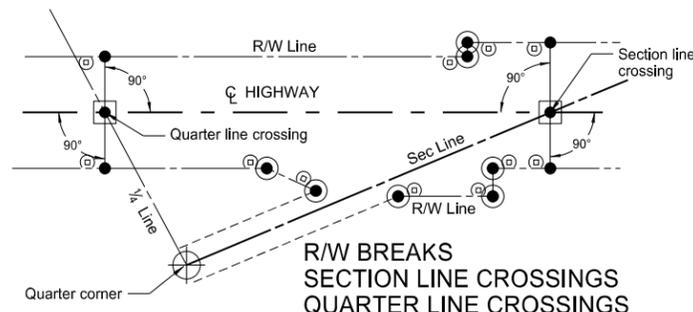
RECYCLED PLASTIC
RIGHT OF WAY MARKER
(WITNESS POST) DETAILS
&
IRON PIN REFERENCE AND R/W
MONUMENT DETAILS



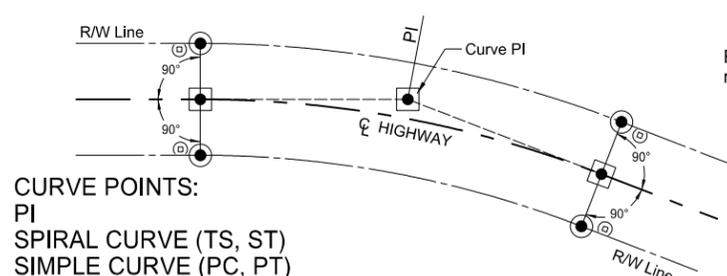
SIGN DETAIL

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. Sign shall be attached by drilling two holes in the face of the post (side facing the private owner, away from the Department of Transportation right of way). Put inserts into the holes and mount the sign with #4 vandal proof screws. Sign shall be installed 2" from top of post.

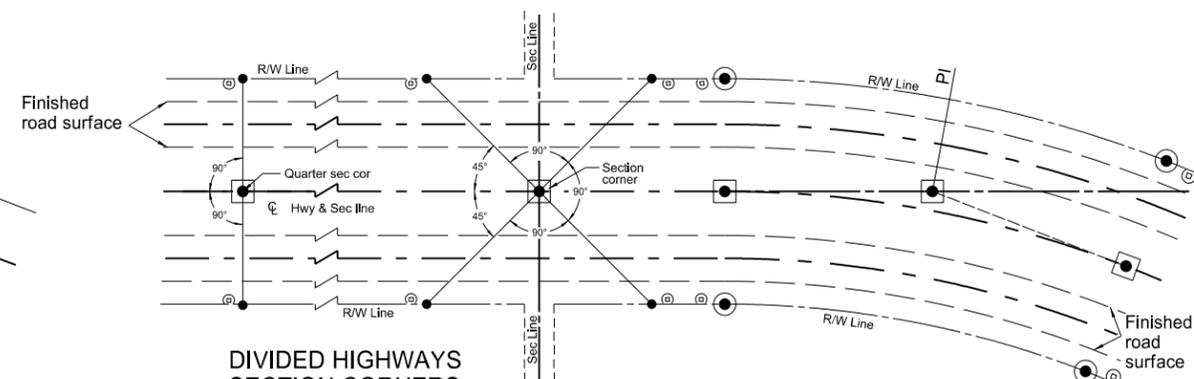
VARIOUS MONUMENT AND MARKER PLACEMENTS



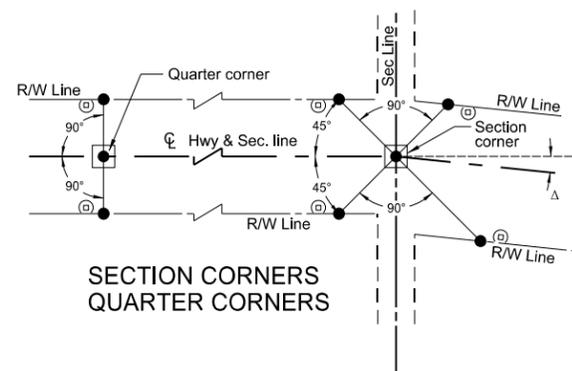
R/W BREAKS
SECTION LINE CROSSINGS
QUARTER LINE CROSSINGS



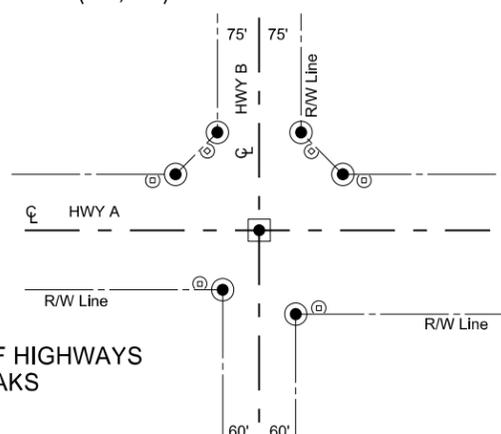
CURVE POINTS:
PI
SPIRAL CURVE (TS, ST)
SIMPLE CURVE (PC, PT)



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

This document was originally issued and sealed by
Roger Weigel
Registration Number
PE-2930,
on 11/12/13 and the original document is stored at the
North Dakota Department
of Transportation

INLET - SPECIAL

D-722-1B

TYPE 1
(See Standard Drawing D-722-1)

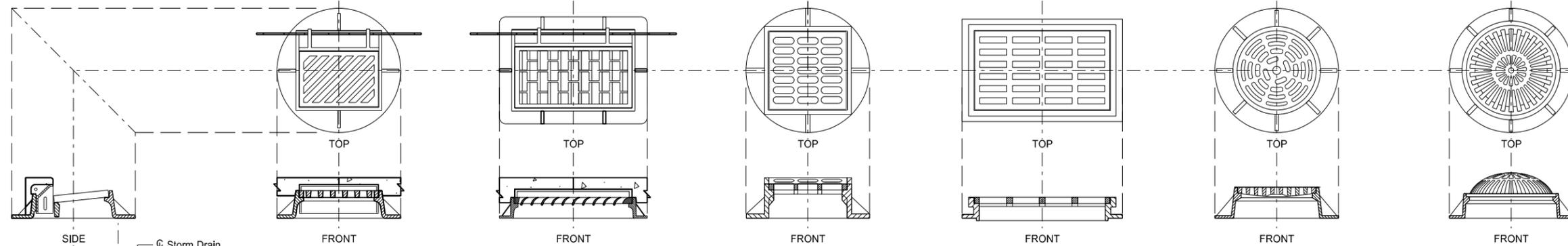
TYPE 2
(See Standard Drawing D-722-2)

MOUNTABLE - TYPE A
(See Standard Drawing D-722-3)

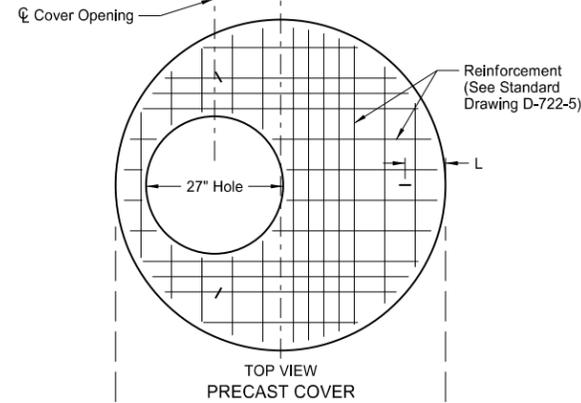
MOUNTABLE - TYPE B
(See Standard Drawing D-722-3)

CATCH BASIN - TYPE A
(See Standard Drawing D-722-1A)

CATCH BASIN - BEEHIVE (6 in. or 9 in.)
(See Standard Drawing D-722-1A)



See Note 1.



RISER DIAMETER	COVER DIAMETER	BASE DIAMETER
48"	58"	66"
60"	72"	78"
72"	86"	92"

See Note 4.

PAY ITEMS

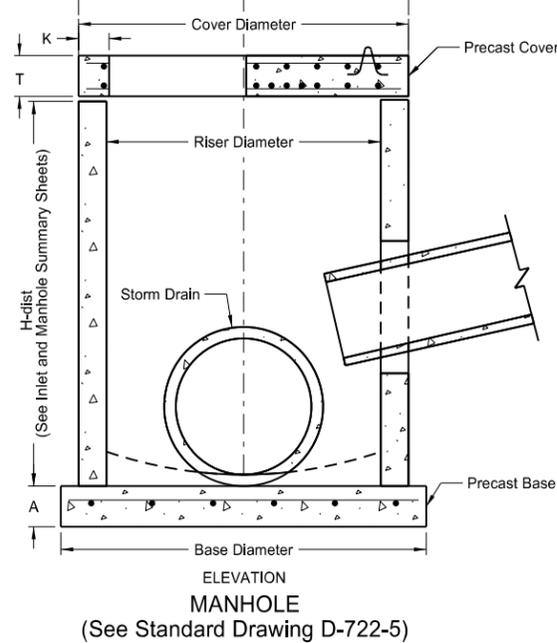
48 in. Riser	Inlet Special - Type 1 48 in.	Ea.
	Inlet Special - Type 2 48 in.	Ea.
	Inlet Special Mountable - Type A 48 in.	Ea.
	Inlet Special Mountable - Type B 48 in.	Ea.
	Inlet Special Catch basin 6 in. beehive 48 in.	Ea.
	Inlet Special Catch basin - Type A 48 in.	Ea.

60 in. Riser	Inlet Special - Type 1 60 in.	Ea.
	Inlet Special - Type 2 60 in.	Ea.
	Inlet Special Mountable - Type A 60 in.	Ea.
	Inlet Special Mountable - Type B 60 in.	Ea.
	Inlet Special Catch basin 6 in. beehive 60 in.	Ea.
	Inlet Special Catch basin - Type A 60 in.	Ea.

72 in. Riser	Inlet Special - Type 1 72 in.	Ea.
	Inlet Special - Type 2 72 in.	Ea.
	Inlet Special Mountable - Type A 72 in.	Ea.
	Inlet Special Mountable - Type B 72 in.	Ea.
	Inlet Special Catch basin 6 in. beehive 72 in.	Ea.
	Inlet Special Catch basin - Type A 72 in.	Ea.

NOTES:

- For inlet casting details, see Standard Drawings D-722-1, D-722-21A, D-722-2, and D-722-3. Other castings, similar in dimension, may be used provided the casting meets the requirements set forth in the referenced Standard Drawings. The grate style shall be as specified on the plans and included in the price bid for "Inlet Special - (casting type & riser size)".
- Metal used in the manufacture of castings shall conform to AASHTO M-105, Class 35B.
- The Class of concrete, aggregate size, and methods of construction for the manhole riser, cover, and base shall be as detailed in Standard Drawing D-722-5.
- See Standard Drawing D-722-5 for manhole riser, cover, and base details, dimensions, and reinforcement requirements.
- The distance between the centerline of the cover opening and the centerline of the storm drain shall be noted on the Plan & Profile sheets.
- Manhole steps, if noted on the Plan and Profile sheets, shall be constructed per Standard Drawing D-722-5.
- On projects with P.C.C. pavement, all risers shall be constructed 4 to 5 inches below final elevation and adjusted to final elevation after paving. Adjustments may be made with adjusting rings or cast-in-place concrete. All costs for this adjustment shall be included in the price bid for "Inlet - Special, (casting type & riser size)".



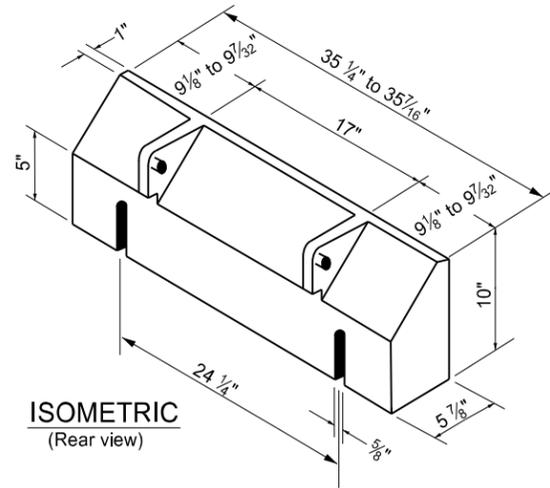
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
03-18-14	
REVISIONS	
DATE	CHANGE

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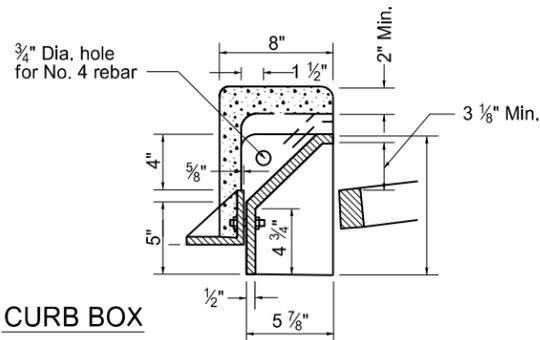
INLET - TYPE 2

D-722-2

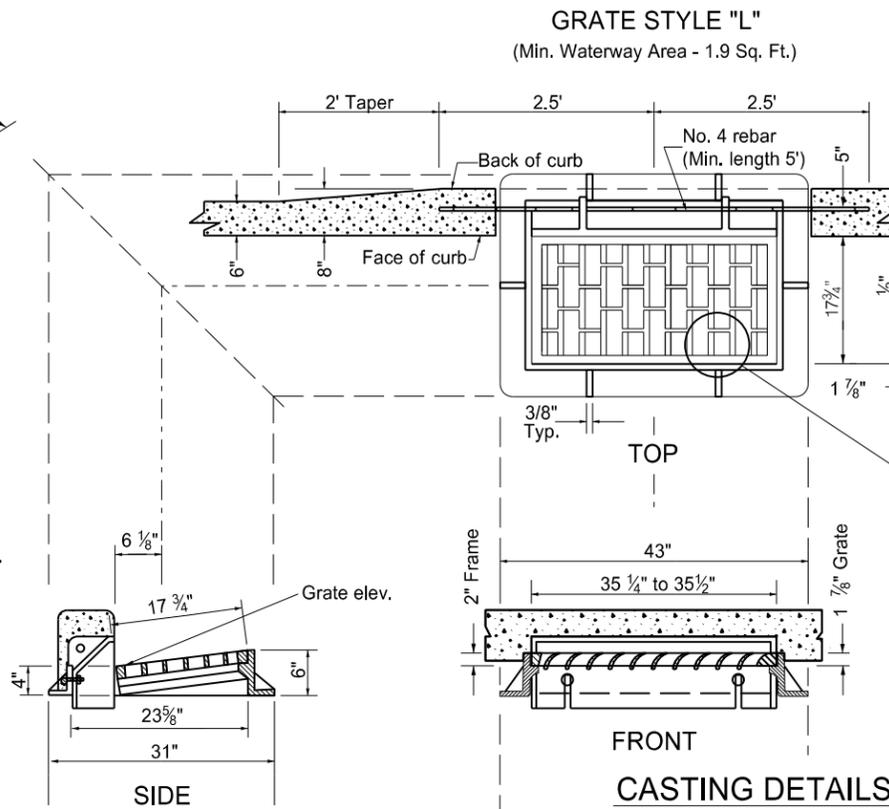
Pay Items
 Inlet - Type 2Ea.
 Inlet - Type 2, Double.....Ea.



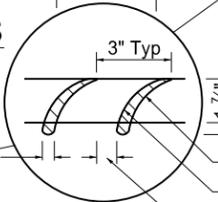
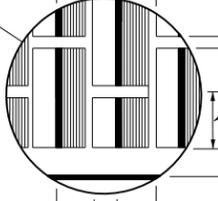
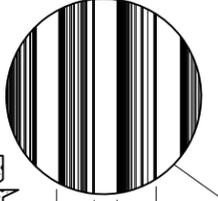
ISOMETRIC
(Rear view)



CURB BOX

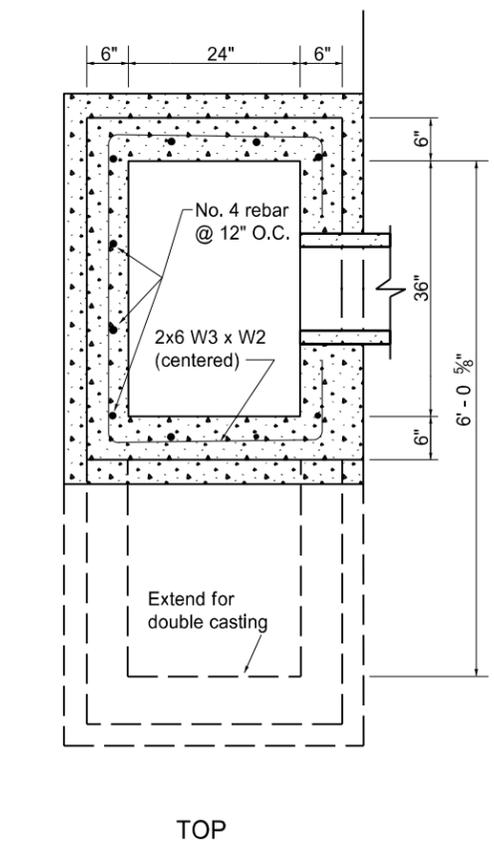


GRATE STYLE "L"
(Min. Waterway Area - 1.9 Sq. Ft.)

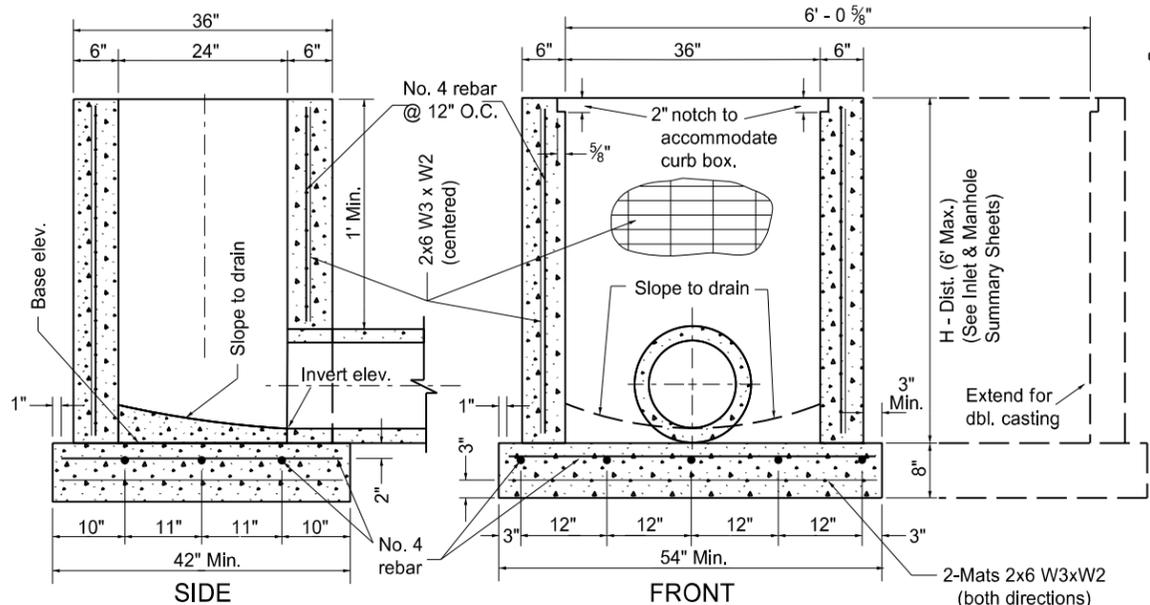


GRATE STYLE "V"
(Min. Waterway Area - 2.4 Sq. Ft.)

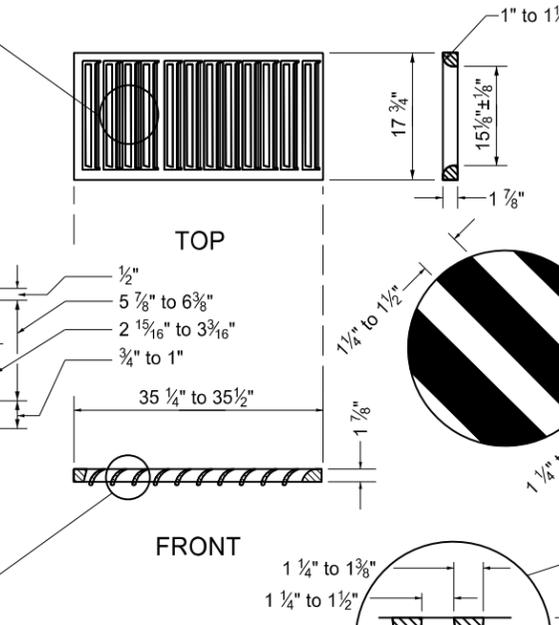
GRATE STYLE "D"
(Min. Waterway area - 1.6 Sq. Ft.)



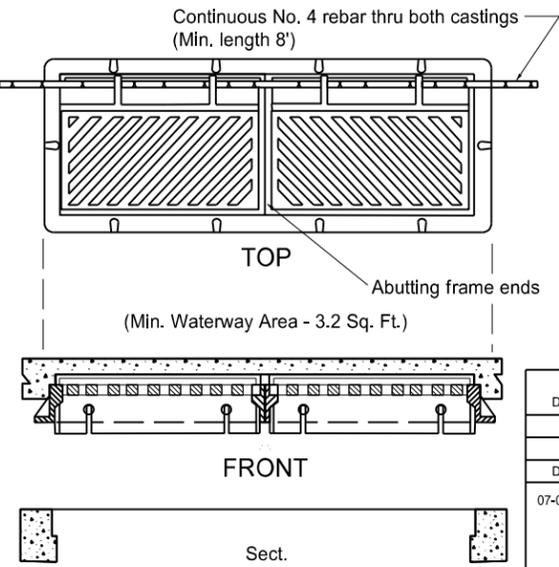
TOP



RISER DETAILS



CASTING DETAILS



INLET - TYPE 2 - DOUBLE

Notes:

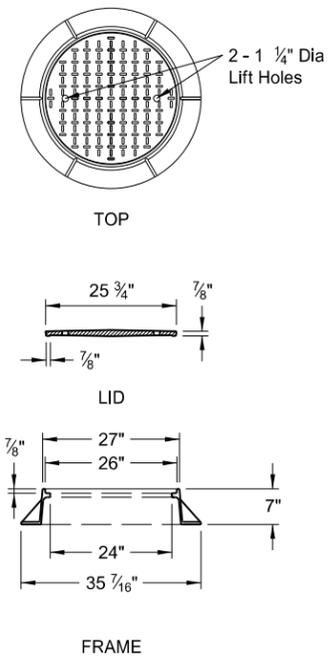
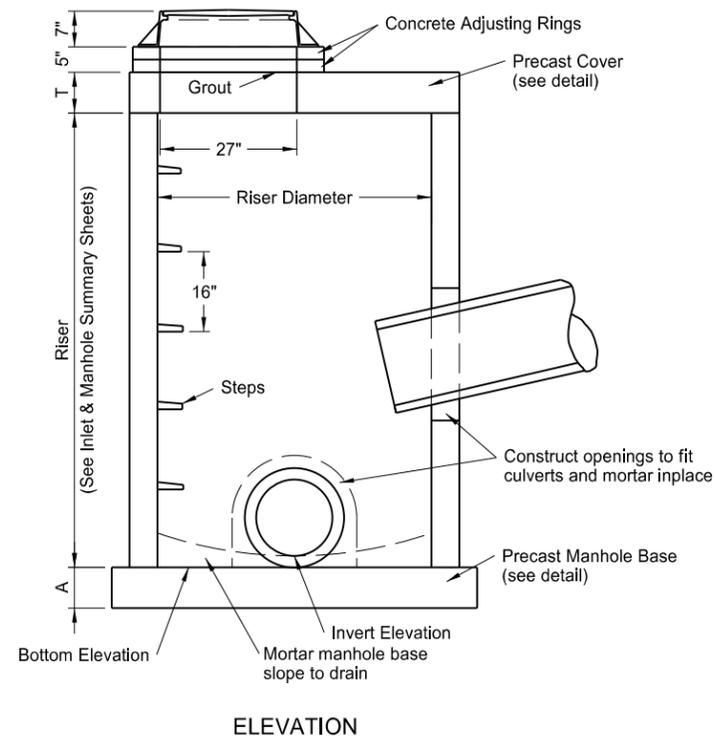
1. Drainage structure castings shall be manufactured in accordance with AASHTO M306. Metal used in the manufacture of castings shall conform to AASHTO M105 Class 35B.
2. Other castings, similar in dimension, may be used if the casting conforms to the riser section and has the grate style as specified in the plans. If modifications to the inlet riser are required to accommodate similar castings, the contractor must receive written approval from the engineer.
3. Precast risers shall be constructed in accordance with ASTM C858.
4. The contractor shall have the option of using precast or poured in place bases. Cast in place concrete shall be Class AE-3. Construction shall be in accordance with section 722 of the Standard Specifications.
5. On projects with P.C.C. pavement, all inlet risers or barrels shall be constructed 4 to 5 inches below final elevation and adjusted to final grade after paving. Adjustment may be done with adjusting rings or cast-in-place concrete. All costs for this adjustment shall be included in the price bid for the inlet.
6. Welded wire reinforcing fabric shall conform to AASHTO M55 Grade 65.
7. The deformed reinforcing steel shall conform to AASHTO M31.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-12-14	
REVISIONS	
DATE	CHANGE
07-07-14	Revised Note 4

This document was originally issued and sealed by **TERRENCE R. UDLAND** Registration Number PE-2674, on 07/07/14 and the original document is stored at the North Dakota Department of Transportation

MANHOLE DETAILS

D-722-5



PRECAST MANHOLE COVERS

RISER DIAMETER	COVER DIAMETER	WEIGHT OF SECTION	T	K	L	BOTTOM * BARS	TOP * BARS
48"	58"	1,080 Lb	6"	6"	8"	#4 at 6"	—
54"	65"	1,910 Lb	8"	6"	8"	#4 at 6"	—
60"	72"	2,430 Lb	8"	7"	9"	#4 at 6"	#4 at 11"
66"	79"	3,010 Lb	8"	7"	9"	#4 at 6"	#4 at 11"
72"	86"	3,640 Lb	8"	8"	10"	#4 at 6"	#4 at 11"
84"	100"	5,060 Lb	8"	9"	11"	#5 at 6"	#5 at 11"
96"	114"	6,695 Lb	8"	9"	11"	#5 at 6"	#5 at 11"
108"	128"	12,810 Lb	12"	10"	12"	#5 at 6"	#5 at 11"
120"	142"	15,900 Lb	12"	11"	13"	#5 at 6"	#5 at 11"

* - Reinforcement listed shall be placed in each direction.

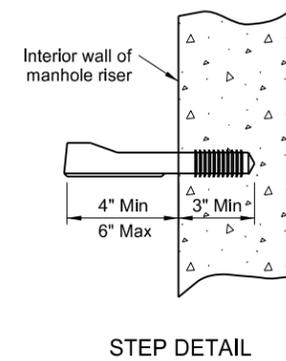
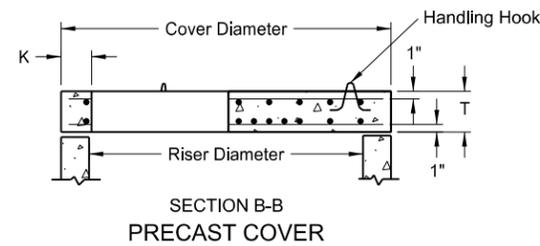
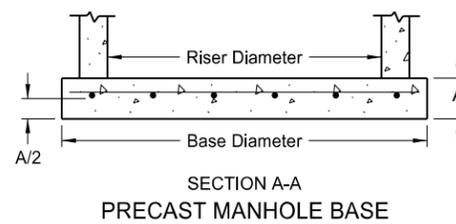
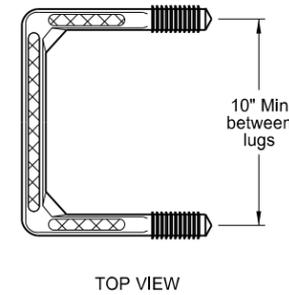
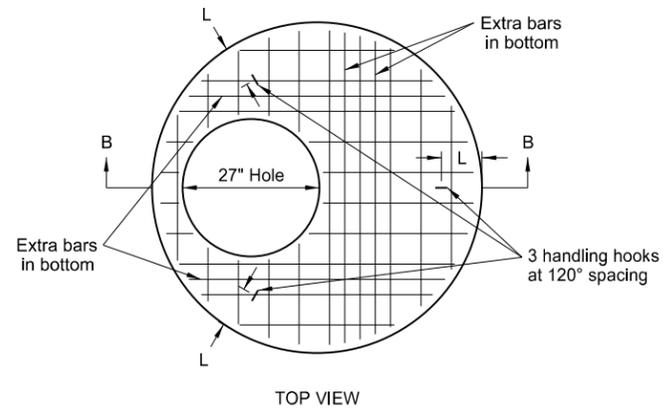
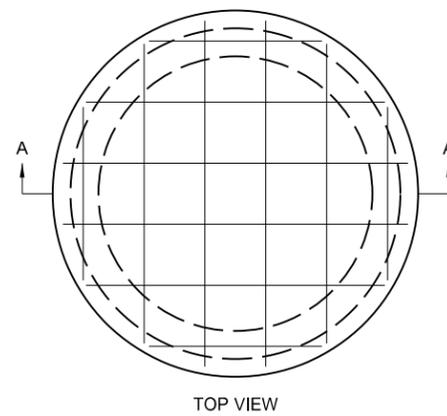
MANHOLE BASES

RISER DIAMETER	BASE DIAMETER	WEIGHT OF SECTION	A	BARS *
48"	66"	1,785 Lb	6"	#4 at 12"
54"	72"	2,830 Lb	8"	#4 at 12"
60"	78"	3,320 Lb	8"	#4 at 12"
66"	86"	4,035 Lb	8"	#4 at 12"
72"	92"	4,620 Lb	8"	#4 at 12"
84"	107"	6,245 Lb	8"	#4 at 12"
96"	120"	7,855 Lb	8"	#4 at 12"
108"	132"	14,255 Lb	12"	#4 at 8"
120"	148"	17,925 Lb	12"	#4 at 8"

* - Reinforcement listed shall be placed in each direction.

NOTES:

- The contractor shall have the option of using precast or cast-in-place bases. Class of concrete shall be AE. The aggregate size shall be approved by the engineer in the field. Construction shall be in accordance with the NDDOT Standard Specifications.
- Precast concrete manholes, risers and steps shall conform to AASHTO M199.
- Precast concrete bases and covers shall be reinforced as shown in the table for the corresponding riser diameter.
- All reinforcing steel shall be Grade 60 steel.
- Bottoms of manhole risers shall be cut or precast square to fit the manhole base. Grout joint between base and riser with cement mortar.
- The manhole riser length listed in the plans has been determined assuming the use of the 7" manhole casting plus 2 concrete adjusting rings (5") plus the "T" dimension shown in the Precast Manhole Covers table.
- Manhole steps shall be corrosion resistant and shall have a minimum vertical load resistance of 800 pounds and a minimum horizontal pull-out resistance of 400 pounds. Configuration of the steps shall be approved by the Engineer.
- Precast concrete manhole covers shown are designed for an HS-20 wheel load and a maximum fill height of 15'-0". Special design required for heavier wheel loads and/or greater fill heights.
- Other castings, similar in dimension, may be used if the casting conforms to the manhole cover and has a lid style as specified. If modifications to the manhole cover are required to facilitate similar castings the contractor must receive written approval from the engineer.
- Castings shall be manufactured in accordance with AASHTO M306-09. Metal used in the manufacture of castings shall conform to AASHTO M105 Class 35B.

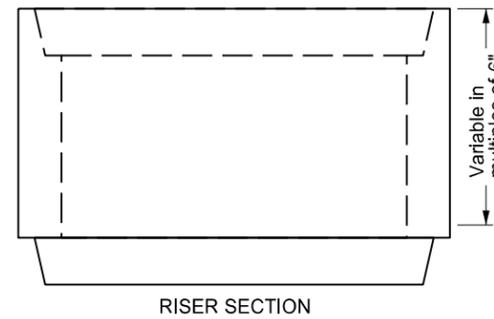
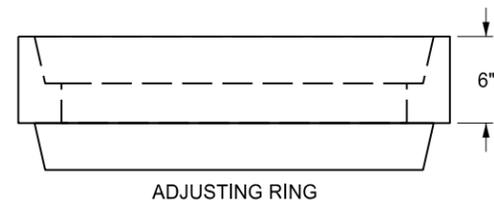
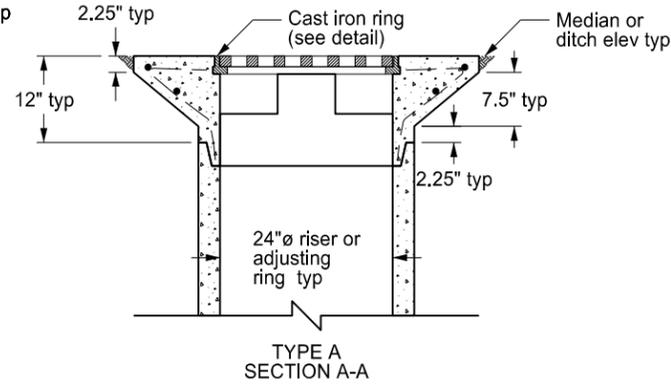
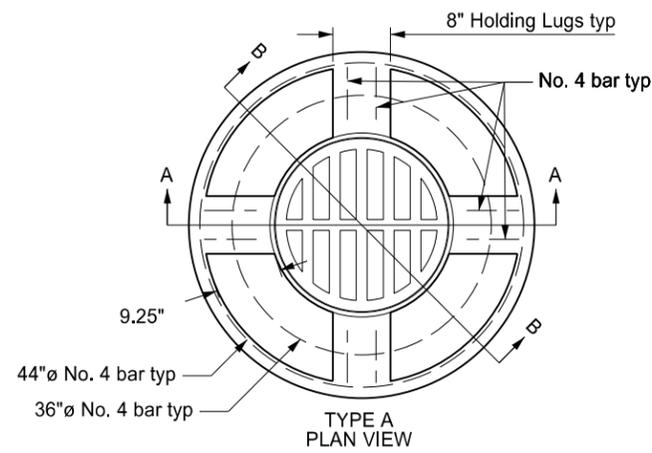


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-14-2013	
REVISIONS	
DATE	CHANGE
6-24-14	Revised notes 1 & 6, added dimensions to Elev. drawing

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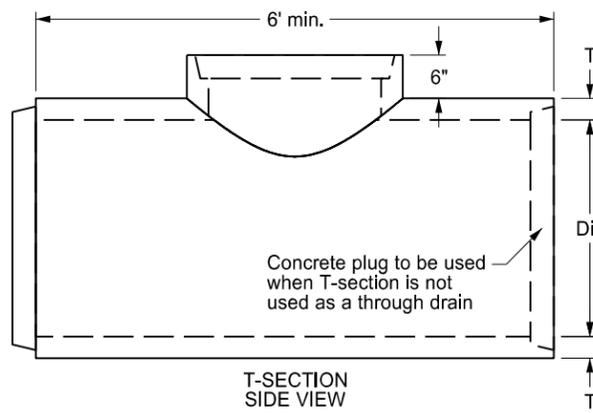
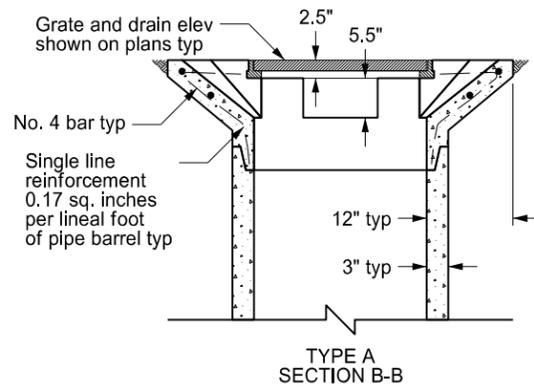
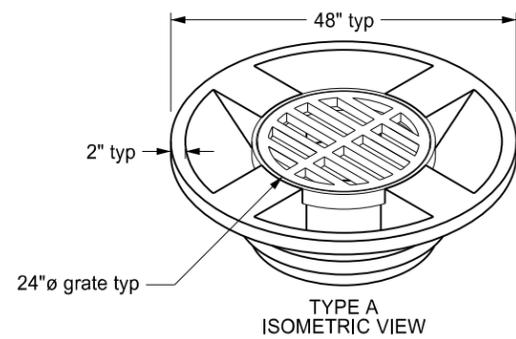
PRECAST CONCRETE MEDIAN DRAIN

D-722-7

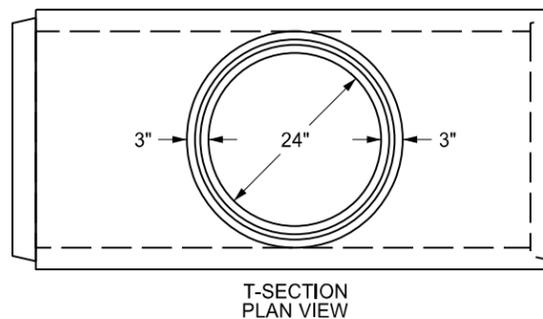
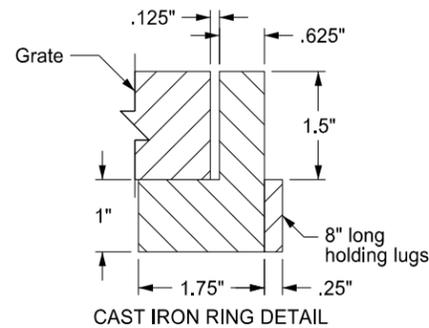
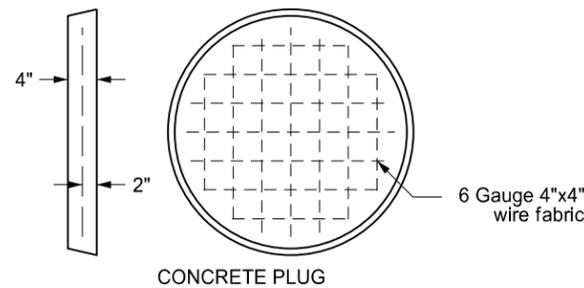


Notes:

1. Use Neenah R-4370-23G, East Jordan 1310 grate, or equal with a minimum waterway of 1.2 SF. If modifications to the drain are required to facilitate similar castings, the contractor must receive written approval from the Engineer.
2. Castings shall be manufactured in accordance with AASHTO M 306. Metal used in the manufacture of castings shall conform to AASHTO M 105, Class 35B.
3. Precast concrete median drains, adjusting rings, and riser sections shall be constructed in accordance with AASHTO M 199. T-sections shall be constructed in accordance with AASHTO M 170.
4. All reinforcing steel shall be Grade 60 steel. Reinforcing for adjusting rings, riser sections, and T-sections shall be in accordance with AASHTO M170.
5. The cost of furnishing and installing the castings and drains shall be included in the price bid for "Median Drain Precast Concrete-Type A". The cost of furnishing and installing the adjusting rings and riser sections shall be included in the price bid for "Pipe Conc Reinf 24IN (CL _)". The cost of furnishing and installing the T-sections and concrete plugs shall be included in the price bid for "Pipe Conc Reinf (_ IN) (CL _)".
6. Seal all joints with rubber gaskets or with sealer approved by the engineer.



Dia = Diameter of drainage pipe
T = Wall thickness of drainage pipe



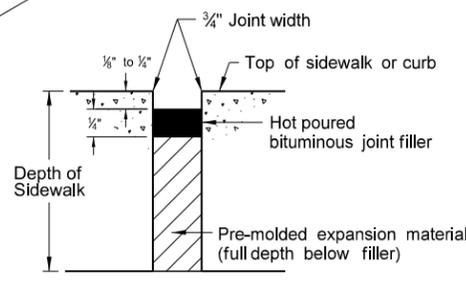
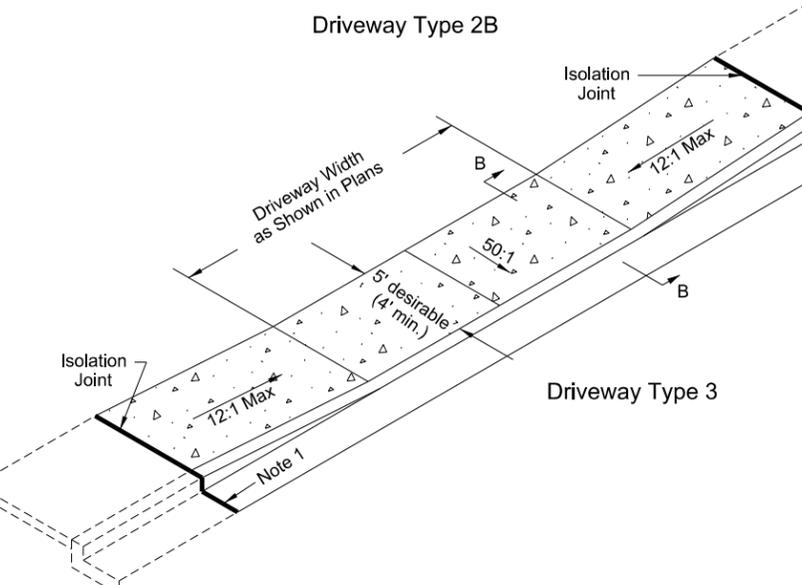
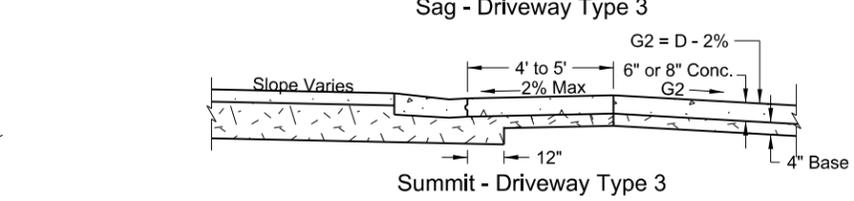
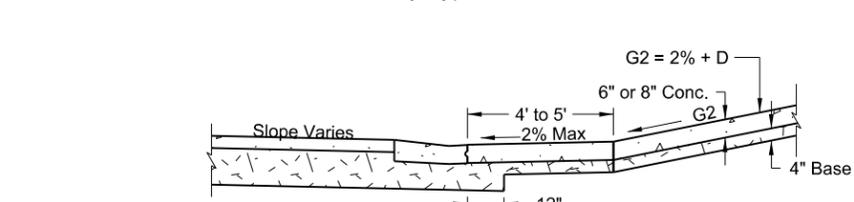
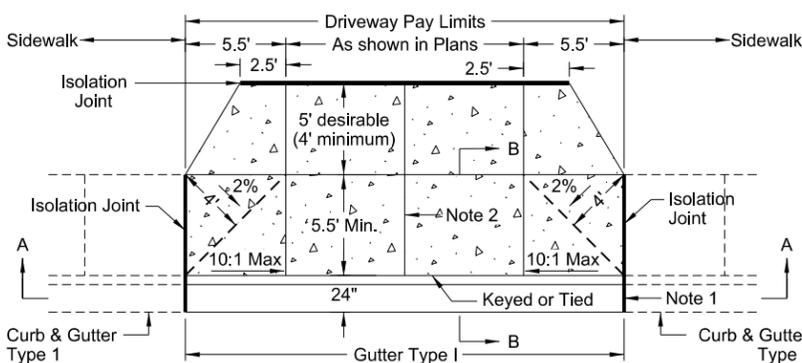
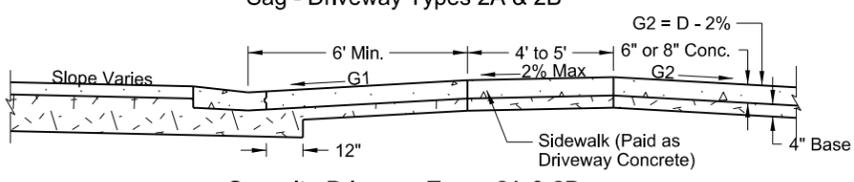
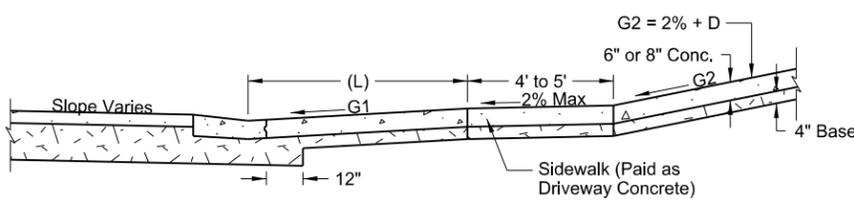
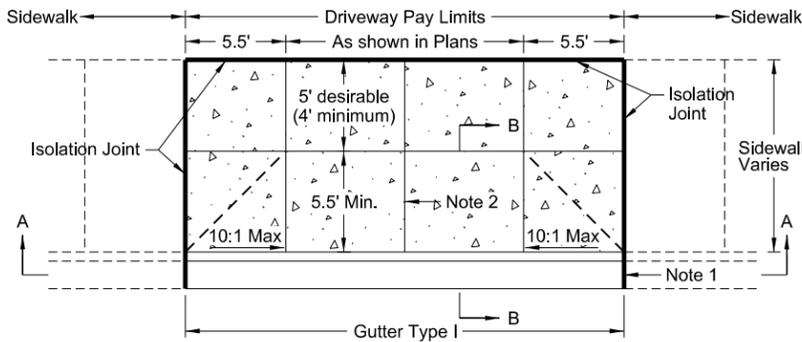
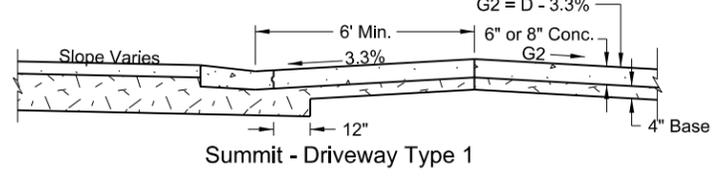
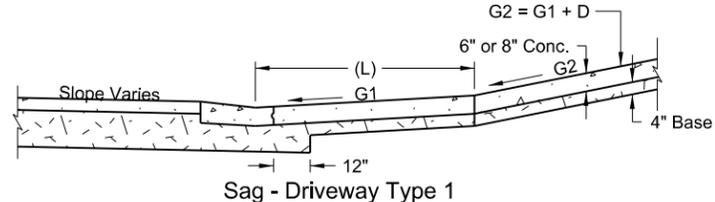
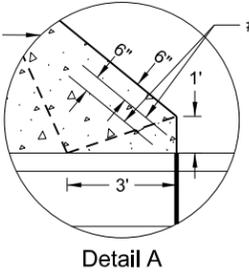
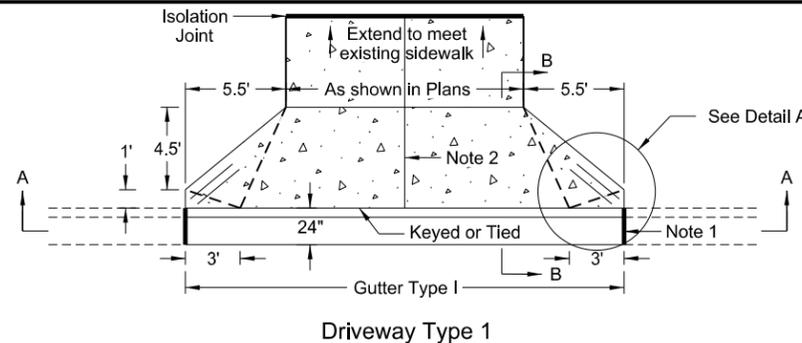
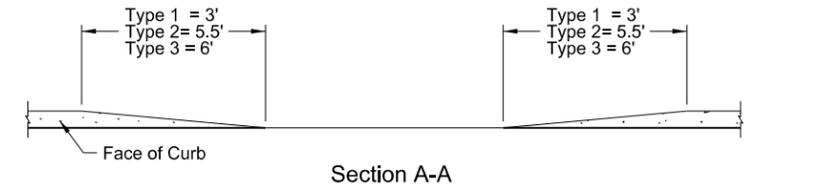
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DATE	CHANGE

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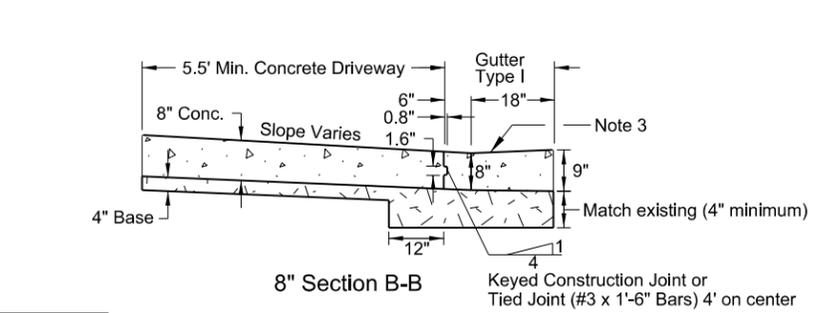
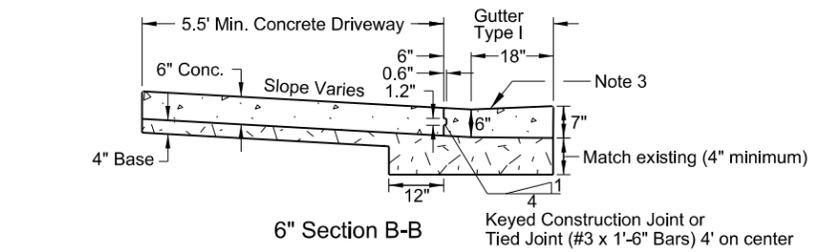
CONCRETE DRIVEWAY - URBAN

NOTES:

- See Standard D-748-1 for curb and gutter isolation joint detail. On PCC roadways, the curb and gutter joints should match those of the pavement as much as practical.
- Joint Spacing: 1 Center contraction joint to be used on all driveways 20' width or less, 2 center contraction joints for driveways > 20' to 30' width, and 3 center contraction joints for driveways greater than 30' width.
The contraction joints may be sawed or a grooved joint, and shall be a minimum of 1/3 the depth of the concrete.
Isolation joints should also be used between separately poured concretes, or between old and new concrete.
All joints shall be sealed with hot pour bituminous filler or low modulus silicone. The sealant shall be installed and tooled in accordance with the manufacturer's recommendations.
All costs for labor, equipment, and material necessary to construct and seal joints shall be included in the price bid for the driveway.
- Gutter-Type 1 shall be paid for at the unit price bid for "Curb and Gutter-Type 1".
- 6" Driveway to be used unless otherwise specified.
- 4" base material shall be placed under the concrete driveway. All labor and materials necessary to place the base material shall be included in the price bid for Salvage Base Course or Aggregate Base Course CL 5.
- Sidewalk that falls behind a driveway shall be constructed to the same thickness as the driveway and shall be paid for as driveway concrete.



Typical Isolation Joint Seal (longitudinal and transverse)



Driveway ADT	Grade G1		Dimension (L) ft.		Grade Changes (D)	
	Desirable	Maximum	Desirable	Maximum	Desirable	Maximum
(0-500)	5%	12% or controlled by vehicle clearance	12	6	6%	15% or controlled by vehicle clearance
(500-1500)	3%	8%	20	20	3%	6%
(> 1500)	2%	5%	40	40	0%	3%

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-13-2014	
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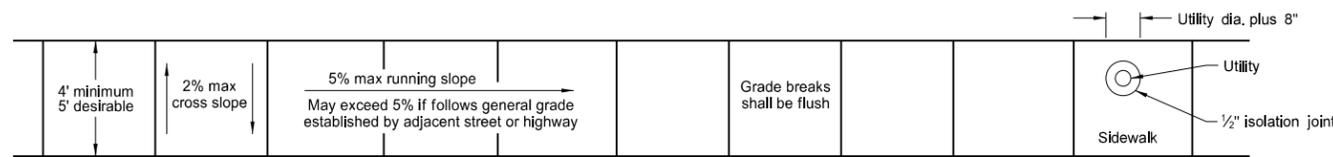
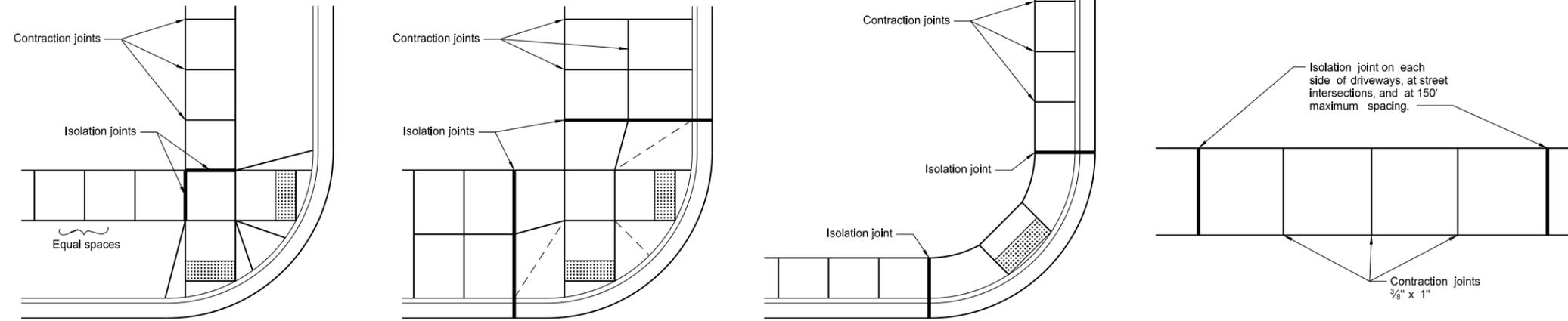
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SIDEWALK

D-750-2

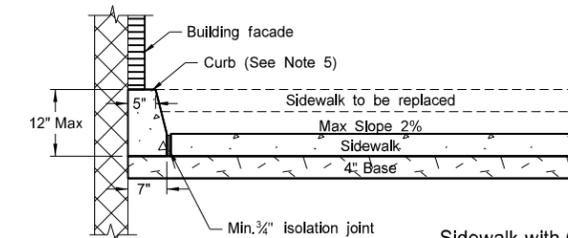
NOTES:

1. Curb ramp and detectable warning panel layouts are for informational purposes only. See Standard Drawing D-750-3 for curb ramp and detectable warning panel details.
2. Joint Spacing: Transverse contraction joint spacing shall vary from 4' to 6' to create approximate square panels. Longitudinal contraction joints shall be used where the sidewalk width is 8' or greater, and shall be spaced at half the sidewalk width. The contraction joints may be sawed or a grooved joint, and shall be a minimum of 1/3 the depth of the concrete. When the sidewalk is adjacent to the curb & gutter, the sidewalk joint spacing shall be varied to match up with the curb & gutter joints. Isolation joints should also be used between separately poured concretes, or between old and new concrete. The cost for all labor, equipment, and material necessary to construct contraction and isolation joints shall be included in the price bid for sidewalk concrete.
3. 4" sidewalk concrete thickness to be used unless otherwise specified in the plans.
4. 4" base material thickness to be used unless otherwise specified in the plans. All labor and materials necessary to place the base material shall be included in the price bid for "Salvage Base Course" or "Aggregate Base Course CL 5."
5. Landscaping is preferred to modify existing ground slope changes as needed. If not possible, such as adjacent buildings, a vertical curb may be used as shown in the detail below. The curb will be paid for at the unit price bid for the item "Curb - Type I" per lineal foot.

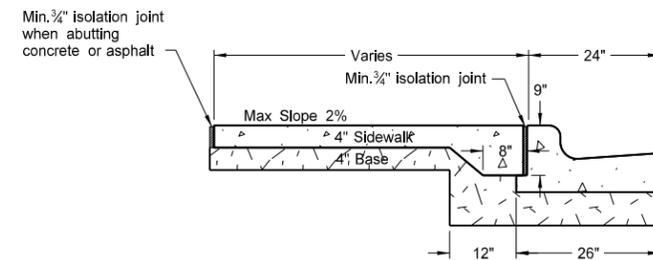


Sidewalk Width and Grade

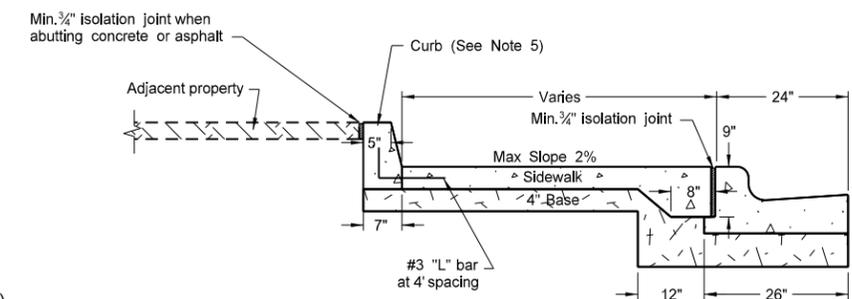
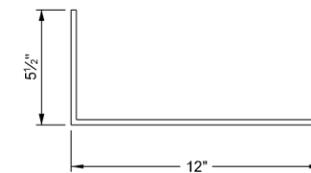
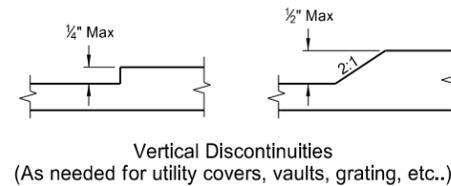
Utility Blockout



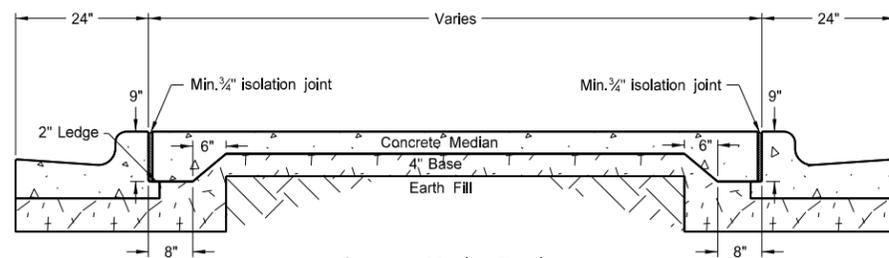
Sidewalk with Curb Detail (Building face application)



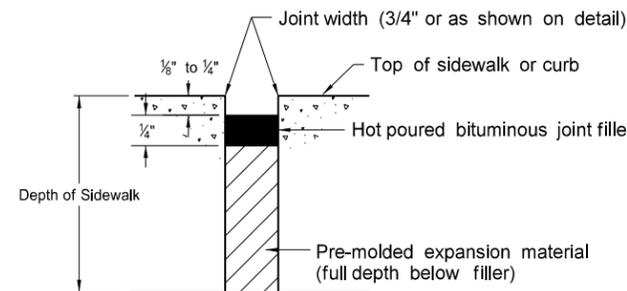
Sidewalk Detail (Installed adjacent to curb and gutter)



Sidewalk with Curb Detail (Adjacent property application)



Concrete Median Detail



Typical Isolation Joint Seal (longitudinal and transverse)

NORTH DAKOTA	
DEPARTMENT OF TRANSPORTATION	
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CURB RAMP DETAILS

D-750-3

+More Right of Way

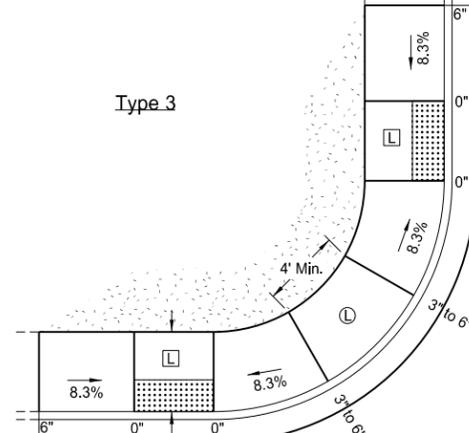
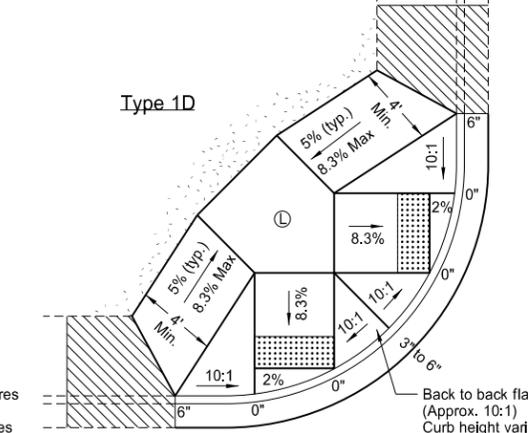
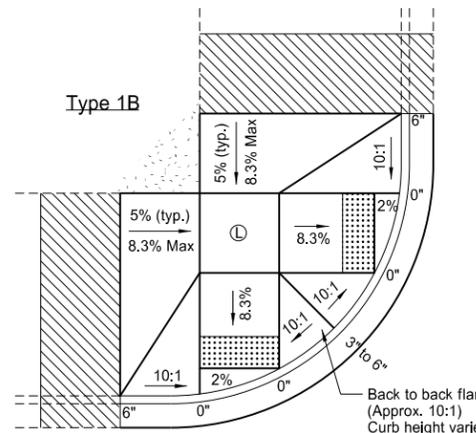
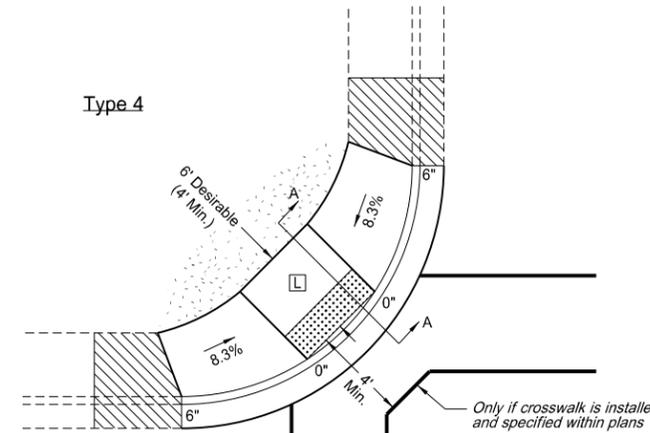
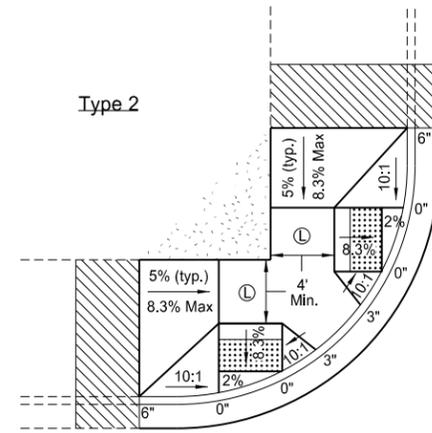
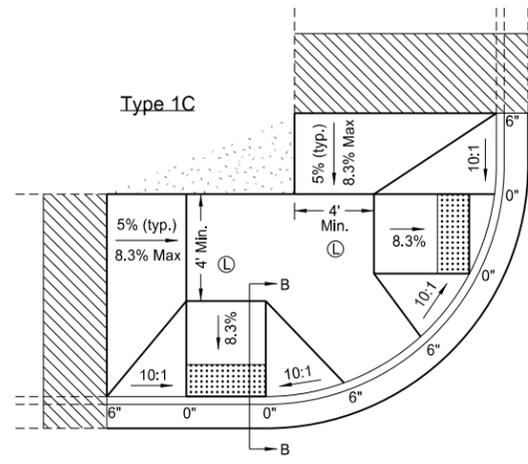
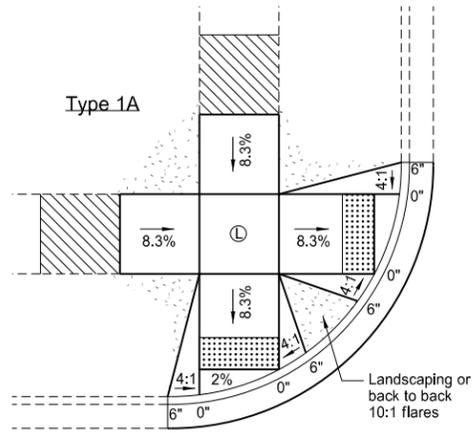
Less Right of Way

NOTES:

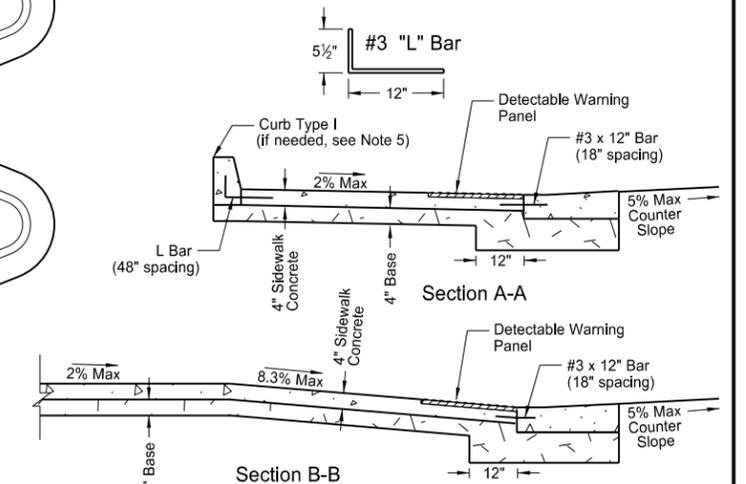
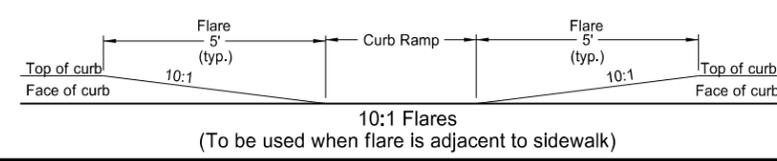
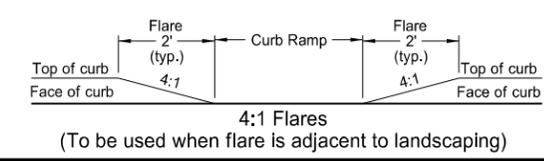
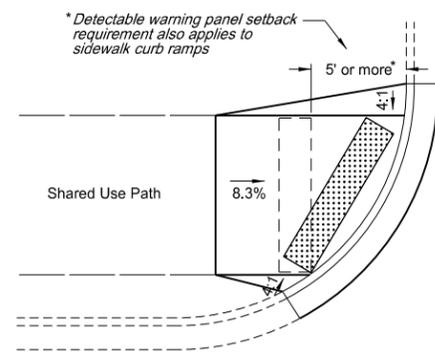
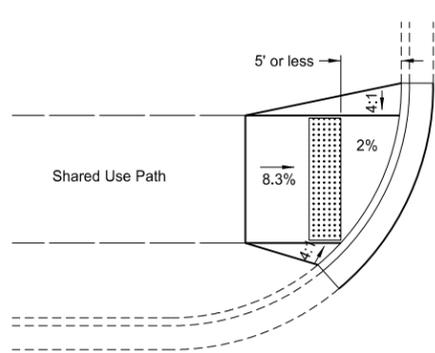
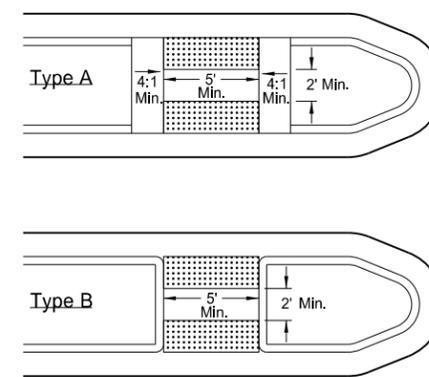
- Ramp width is defined as the useable portion of the ramp, excluding flares if used.
Curb ramp width should match the existing sidewalk width. 4' width minimum.
Ramp width for shared-use paths should match the existing shared use path width.
Ramp length shall be maximum of 15'.
- Landings shall be a minimum of 4' x 4' and shall have a max 2% slope in any direction. Landings are desirably 5' x 5' or larger.
- Detectable warning panels shall match the ramp width. Radial panels may also be used. The detectable warning panel may be located within the lower landing.
- The pedestrian access route shall be continuous 4' min. width. Max 2% cross slope applies to all concrete, excluding flares.
- Landscaping is preferred to modify existing ground slope changes as needed. If not possible, such as adjacent buildings, a vertical curb may be used as shown in the detail below. The curb will be paid for at the unit price bid for the item "Curb - Type I" per lineal foot.

LEGEND:

- : Detectable Warning Panel
- : Landscaping
- : Transitional tie-in segment if needed for retrofits. Max grade slope 8.3%.
- : Upper Landing
- : Lower Landing
- 0", 3", or 6" : Curb Height
- 8.3% : All slopes shown are max grades. Flatter slopes may be used.



Median Refuge Islands (Cut-Through)



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-26-13	
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DATE	CHANGE

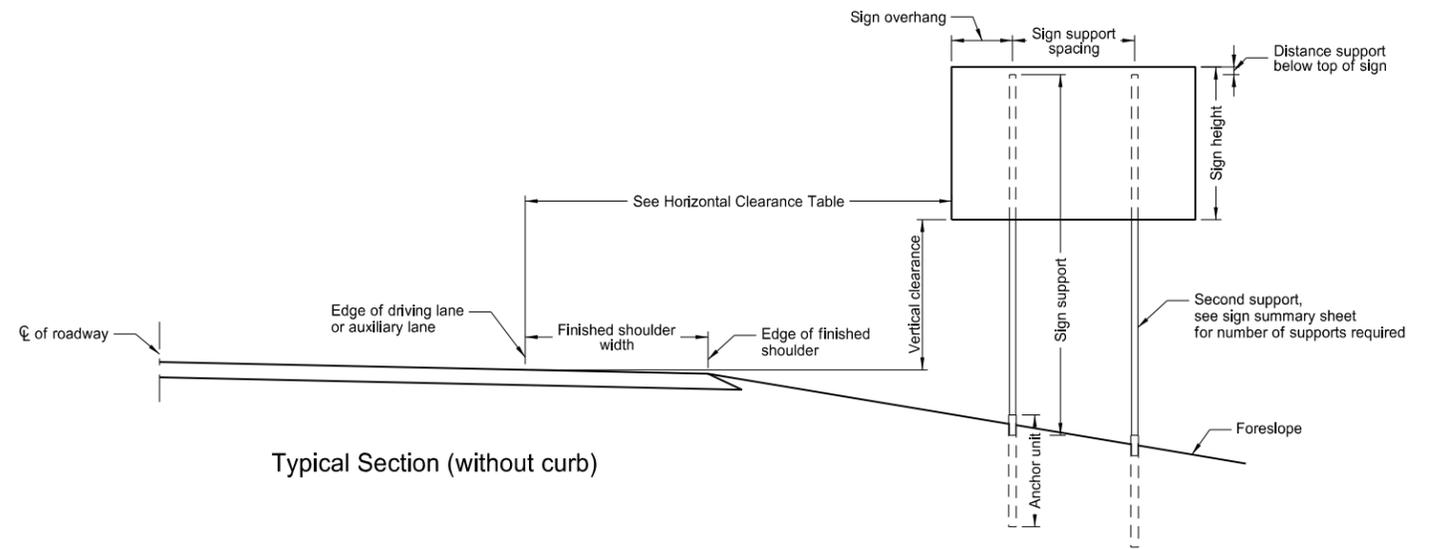
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PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

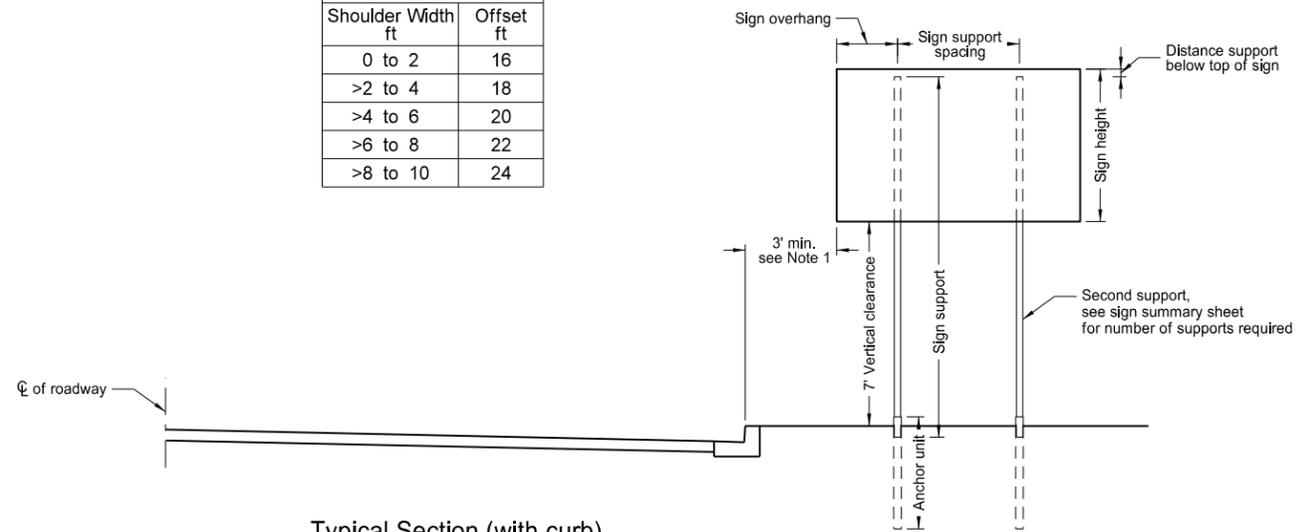
Notes:

1. Curbed Roadways: The clearance from the face of the curb should be 3' except where right of way or sidewalk width is limited, a minimum clearance of 2' shall be provided. The horizontal clearance may need to be increased to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.
2. Minimum vertical clearance: Signs installed at the side of the road in rural districts shall be at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least 7'.
- Signs on expressways shall be installed with a minimum height of 7'.
- Adopt-a-highway signs installed on Freeways shall be at least 7' above the edge of the driving lane.
- The vertical clearance shall have a maximum height of 6" above the vertical clearance specified above.
3. Offset signs: Where signs are placed at least 30 feet or more from the edge of the traveled way, the height to the bottom of such sign shall be 5' above the edge of the driving lane.
4. The clearance from edge of shared use path to edge of sign should be 3' except where width is limited, a minimum clearance of 2' shall be provided.

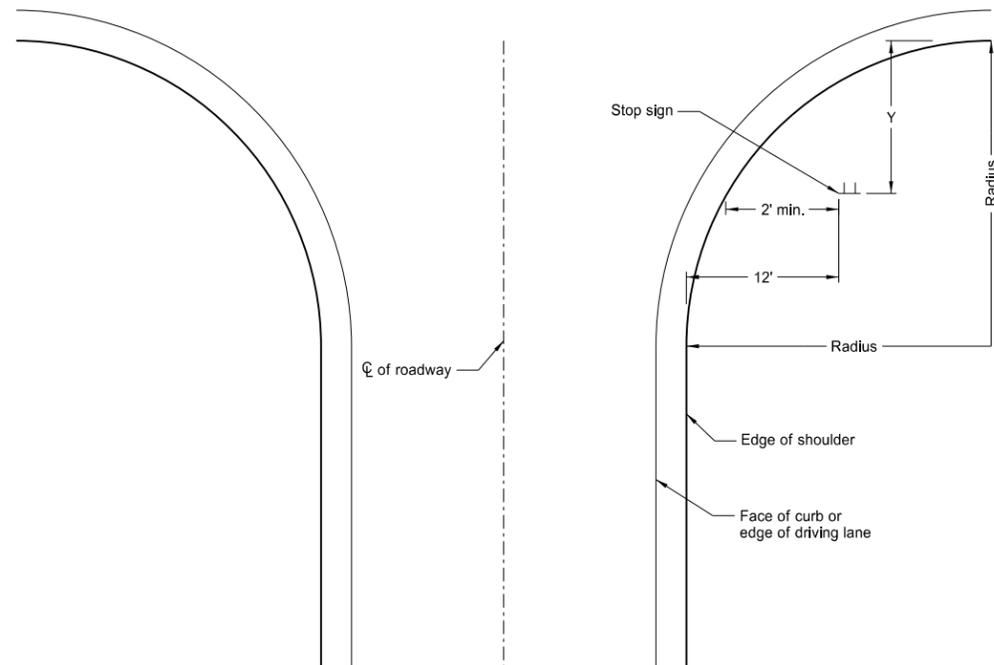


Typical Section (without curb)

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



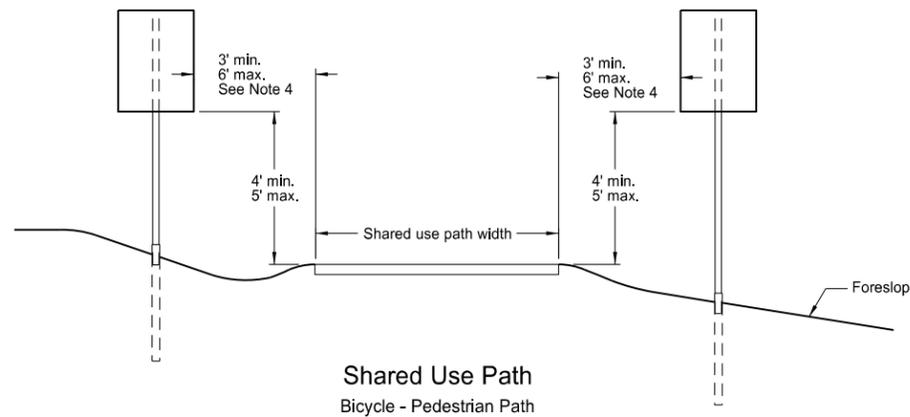
Typical Section (with curb)
Residential or Business District



Stop Sign Location
Wide Throat Intersection

This layout is to be used 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



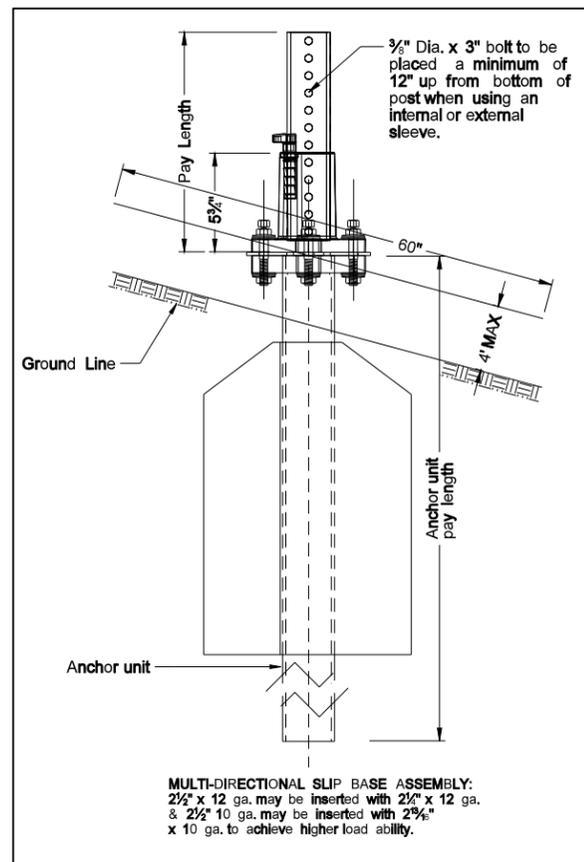
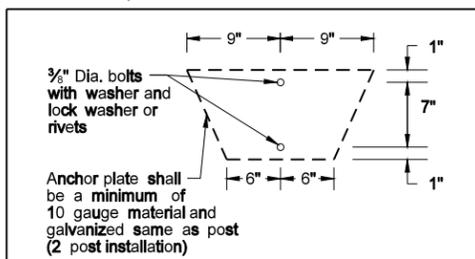
Shared Use Path
Bicycle - Pedestrian Path

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-8-14	Revised note 2, added note 4.

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 North Dakota Department
 of Transportation

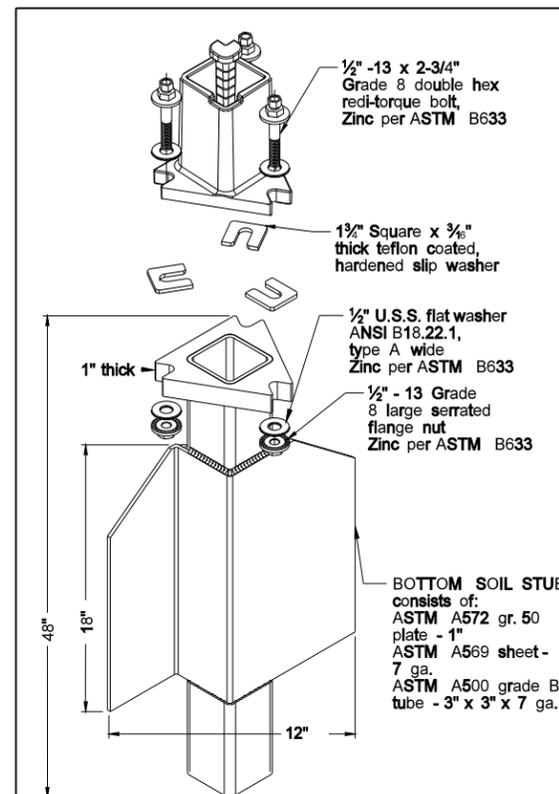
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/2	12
1	2 1/2	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/2	12	2 1/2(D)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

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

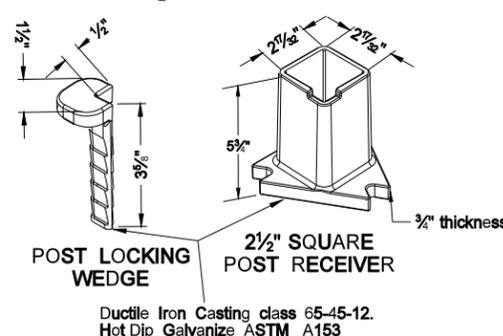


MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:
 2 1/2" x 12 ga. may be inserted with 2 1/2" x 12 ga. & 2 1/2" 10 ga. may be inserted with 2 3/8" x 10 ga. to achieve higher load ability.

Mounting Details Perforated Tube



SLIP BASE FOR 2 1/2" POST



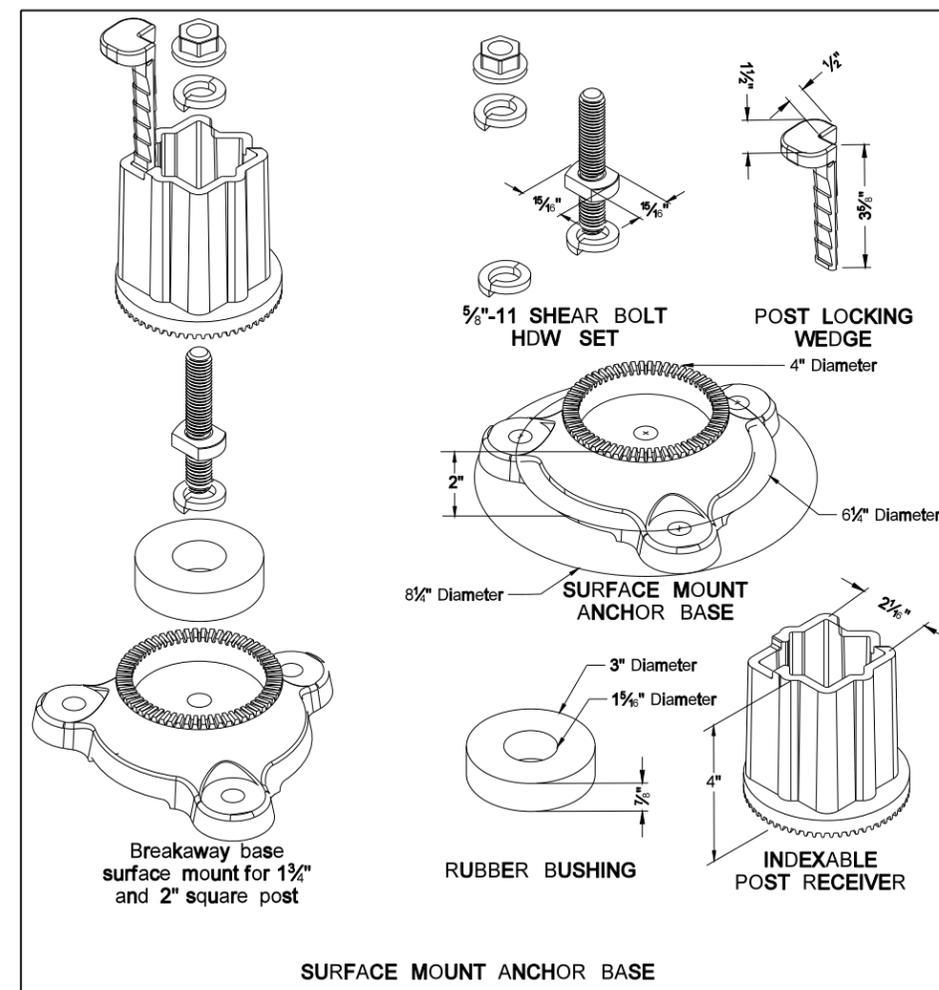
SLIP BASE DETAIL

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

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

NOTE:

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



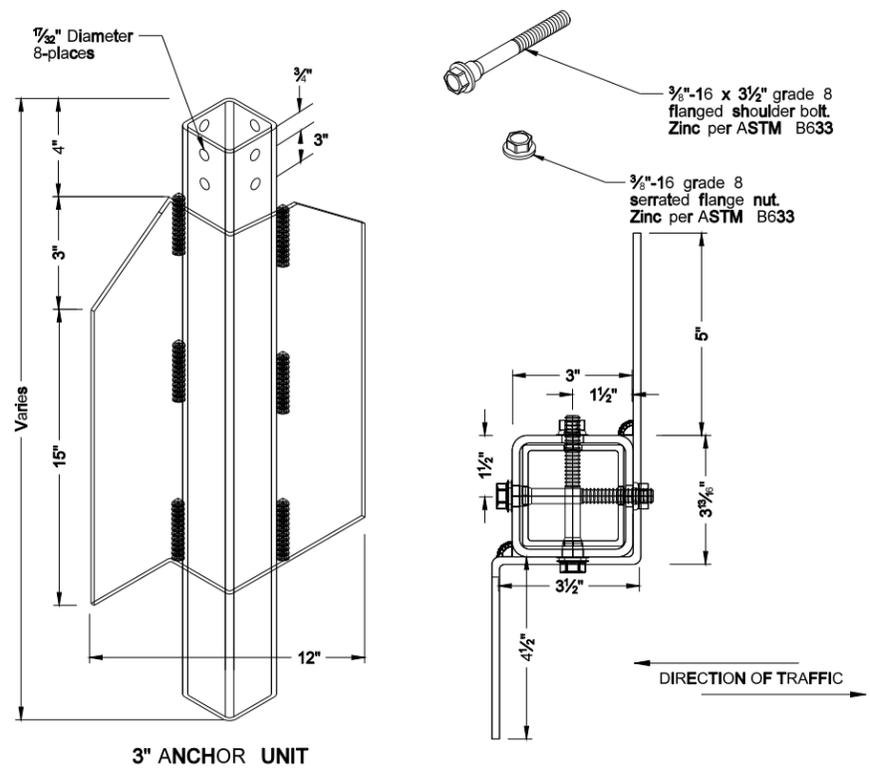
SURFACE MOUNT ANCHOR BASE

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

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SHOULDER BOLT

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

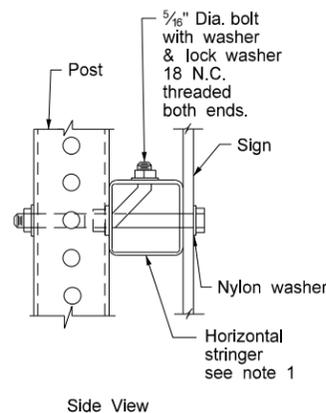


3" ANCHOR UNIT

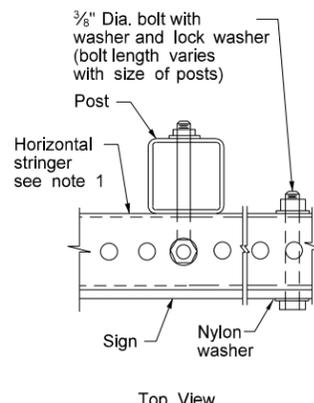
Mounting Details Perforated Tube

Note:

- Horizontal stringers - In lieu of perforated tubes, the contractor may substitute z bar stringers. The z bar stringers shall be 1 1/2" x 3/16" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel.
- Metal washers used on sign face shall have a minimum outside diameter of 5/16" ± 1/65" and 10 gauge thickness.
- No Parking Signs: All no parking signs with directional arrows shall be placed at a 30 to 45 degree angle with the line of traffic flow. No parking signs required at the above angles may have the support turned to the correct angle. If the no parking sign is placed with another sign that has to be placed at a 90 degree angle with the line of traffic flow, the detailed angle strap should be used to mount the no parking sign. Flat washers and lock washers shall be used with all nylon washers.
- In lieu of using the bent bolt to attach the post to the stringer, the contractor may choose to punch the sign backing and place the bolt through the sign, the stringer and the post.
- 4" vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.

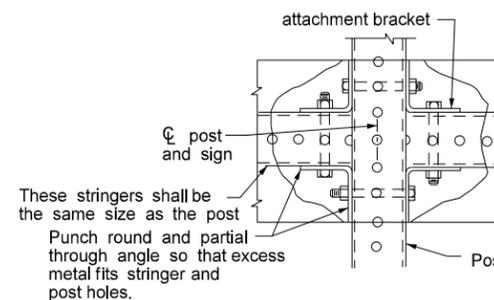


Side View



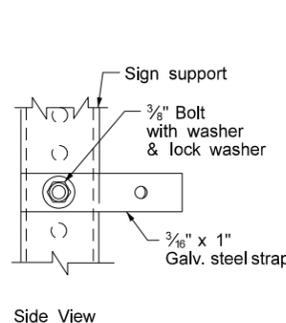
Top View

STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)

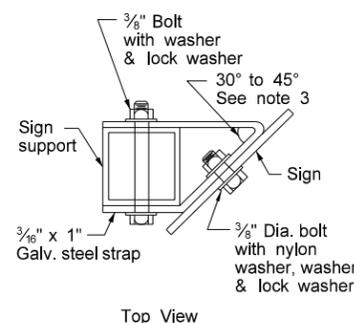


These stringers shall be the same size as the post. Punch round and partial through angle so that excess metal fits stringer and post holes.

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

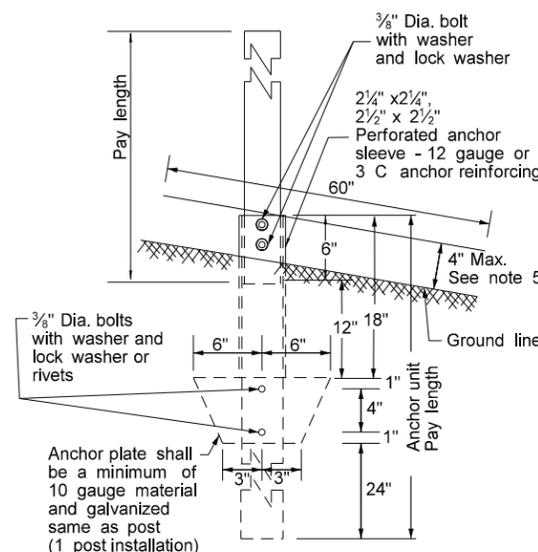


Side View

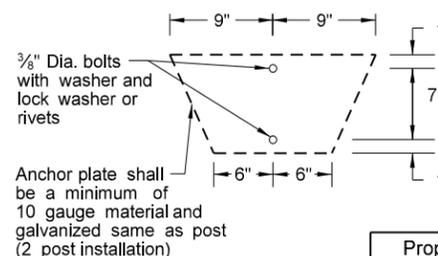


Top View

STRAP DETAIL



ANCHOR UNIT AND
POST ASSEMBLY

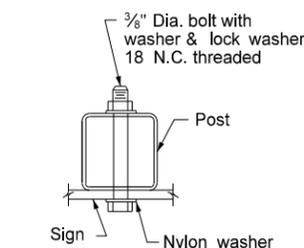


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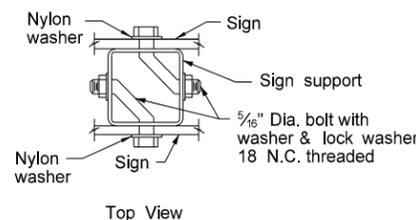
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1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
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1	2 1/2	12	2 1/4	12	Yes		7
2	2 1/2	10			Yes		7
2	2 1/4	12	2 1/2(D)	12	Yes		7
2	2 1/2	12	2 1/4	12	Yes		7
3 & 4	2 1/2	12			Yes		7
3 & 4	2 1/2	10			Yes		7
3 & 4	2 1/2	12	2 1/4	12	Yes		7
3 & 4	2 1/4	12	2 1/2(D)	12	Yes		7
3 & 4	2 1/2	10	2 3/8	10	Yes		7

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



BOLT MOUNTING



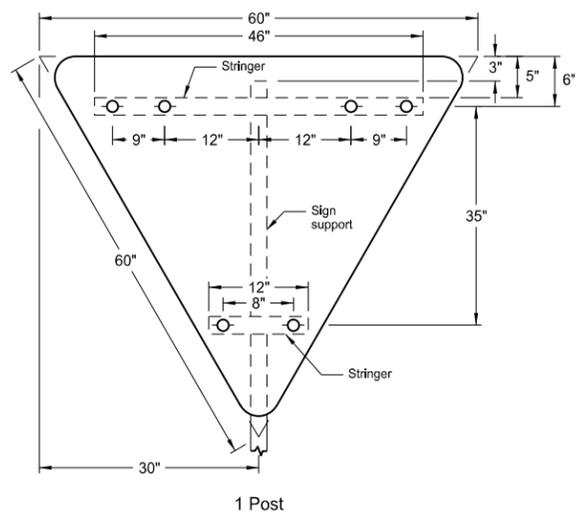
Top View

BACK TO BACK
MOUNTING

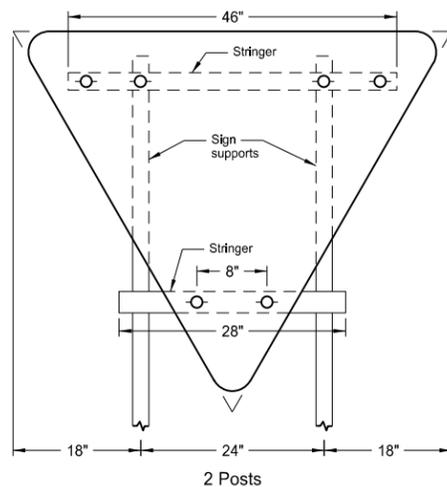
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
7-8-14	Revised Note 3

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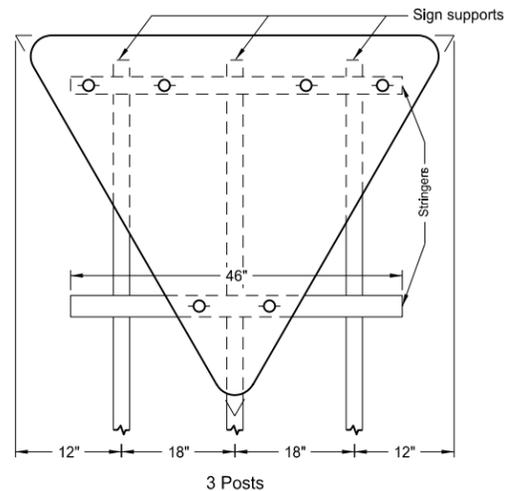
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



1 Post



2 Posts

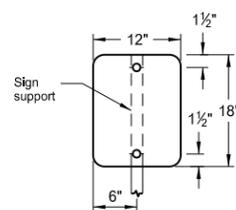


3 Posts

Assembly No. 6

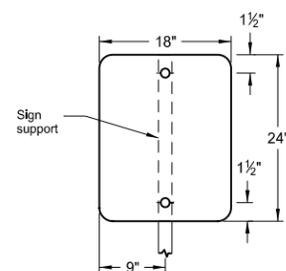
Notes:

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



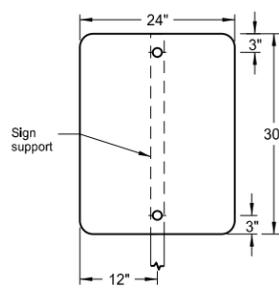
1 Post

Assembly No. 7



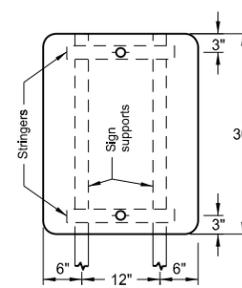
1 Post

Assembly No. 8

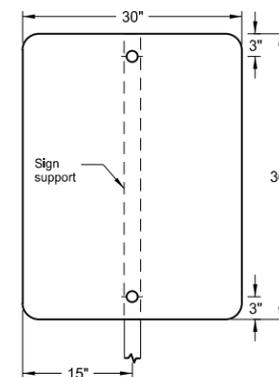


1 Post

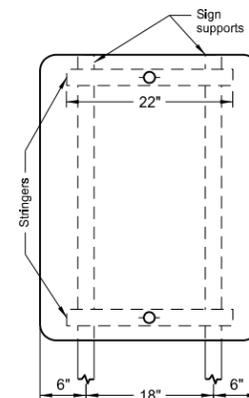
Assembly No. 9



2 Posts

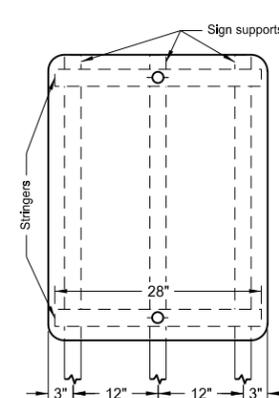


1 Post

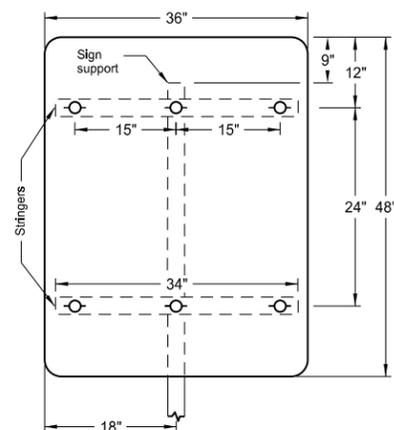


2 Posts

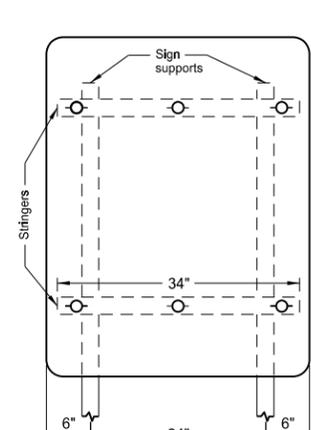
Assembly No. 10



3 Posts

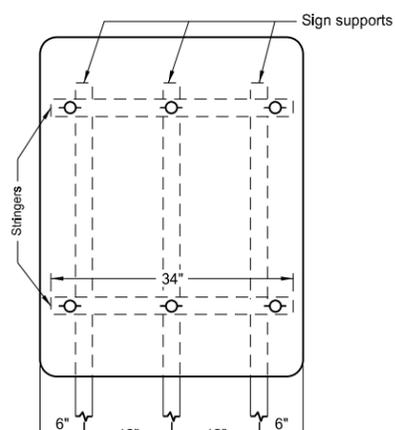


1 Post



2 Posts

Assembly No. 11

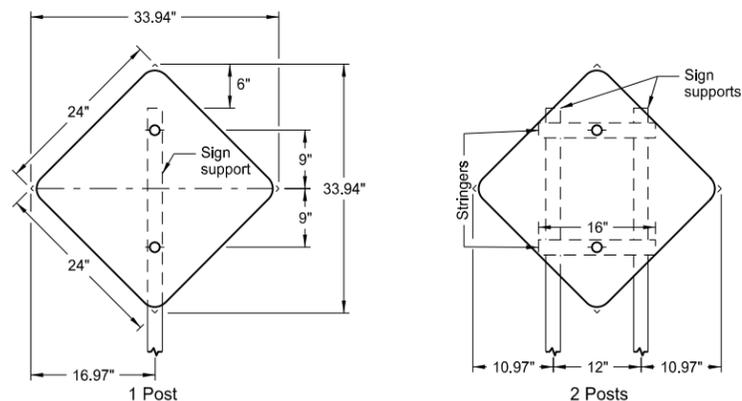


3 Posts

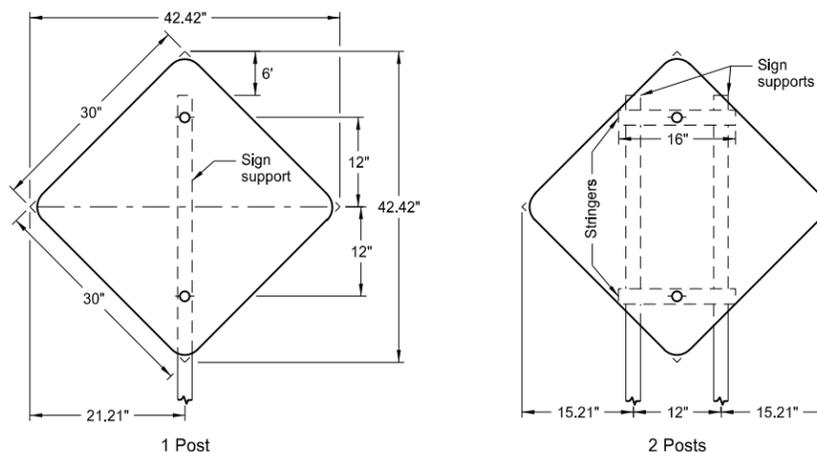
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

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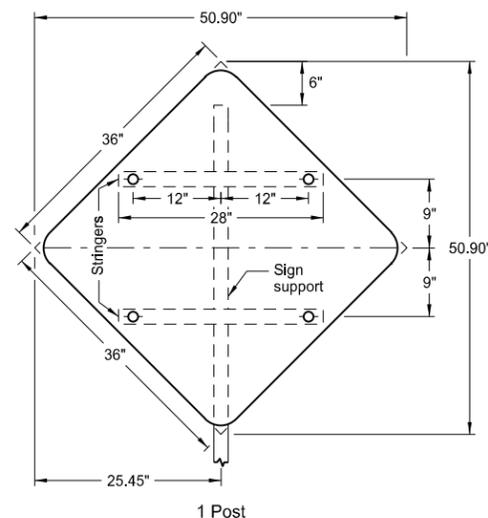
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



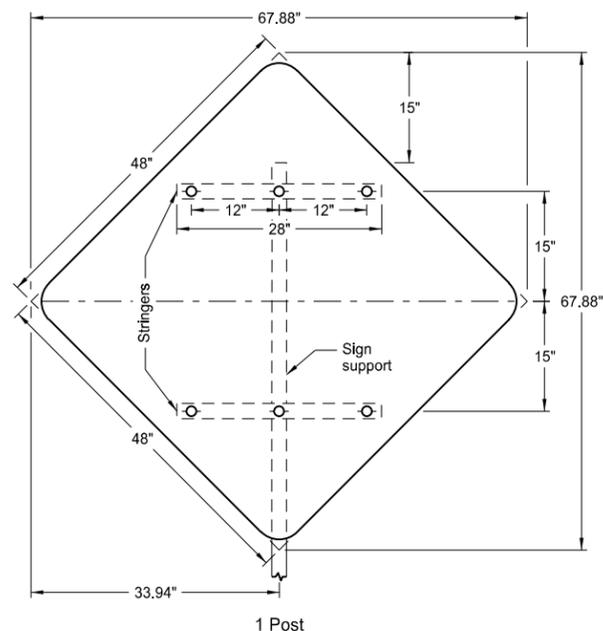
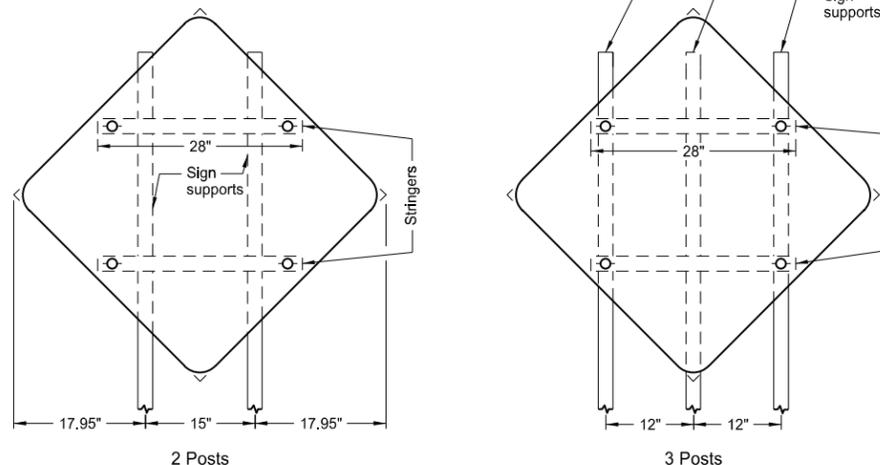
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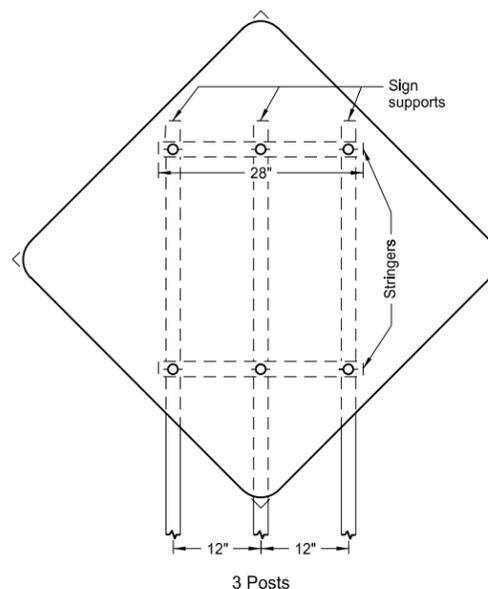
Assembly No. 19



Assembly No. 20



Assembly No. 21



Notes:

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

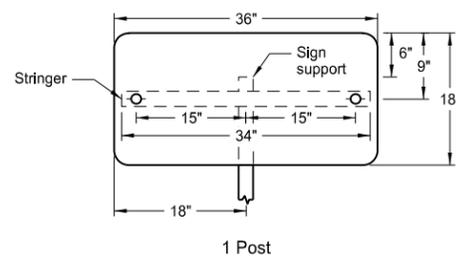
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
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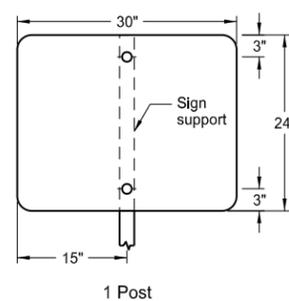
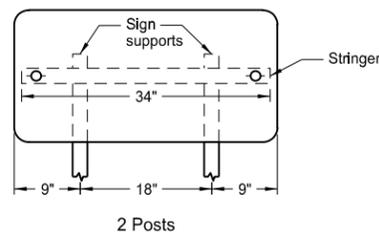
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS

Notes:

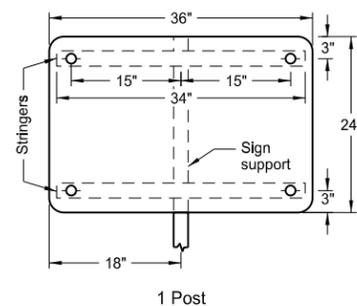
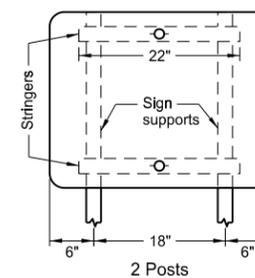
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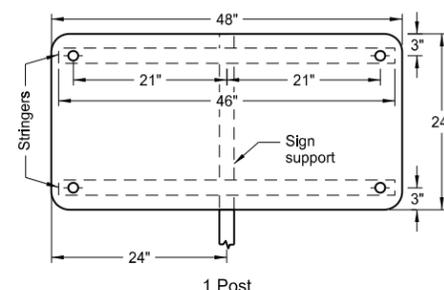
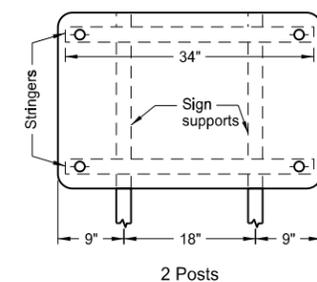
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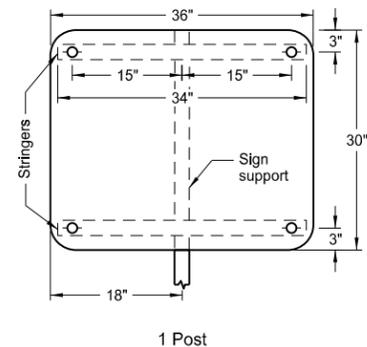
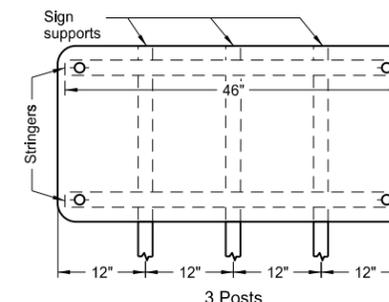
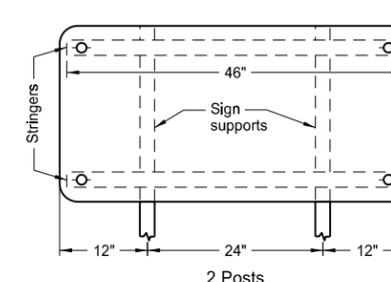
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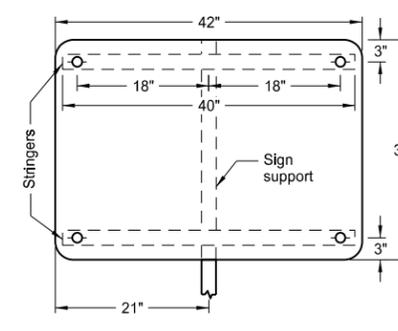
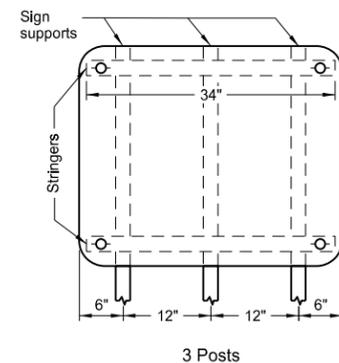
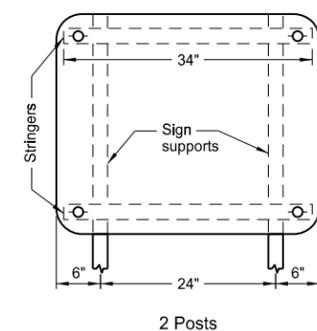
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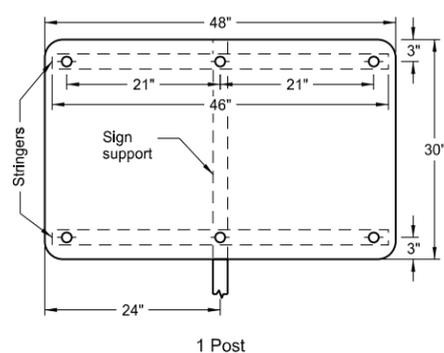
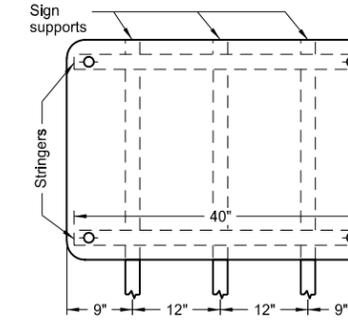
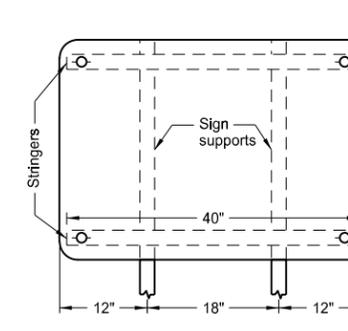
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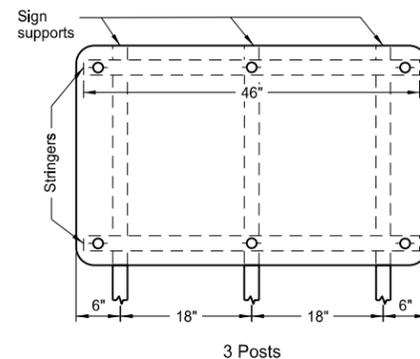
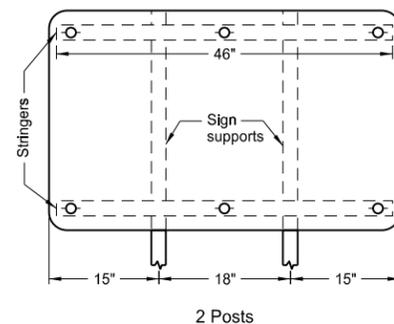
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Assembly No. 36



Assembly No. 37

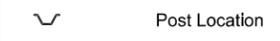
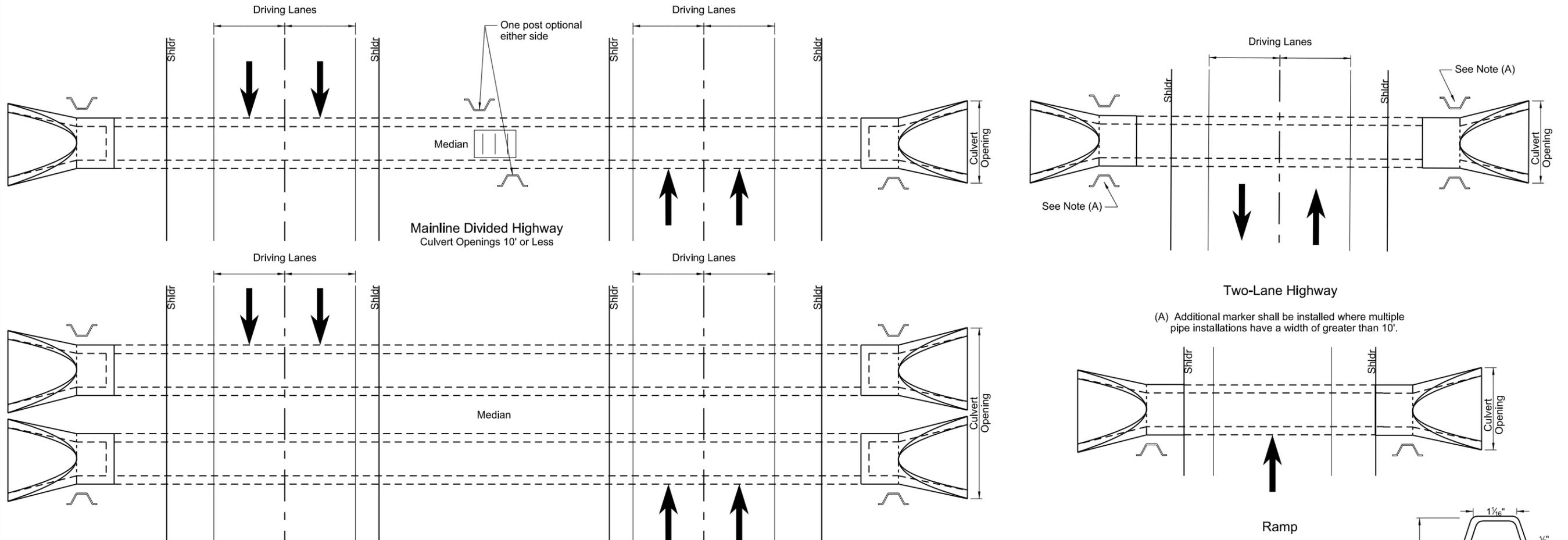


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

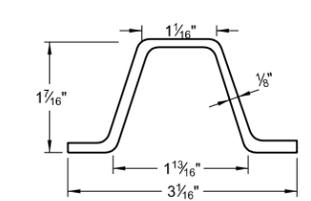
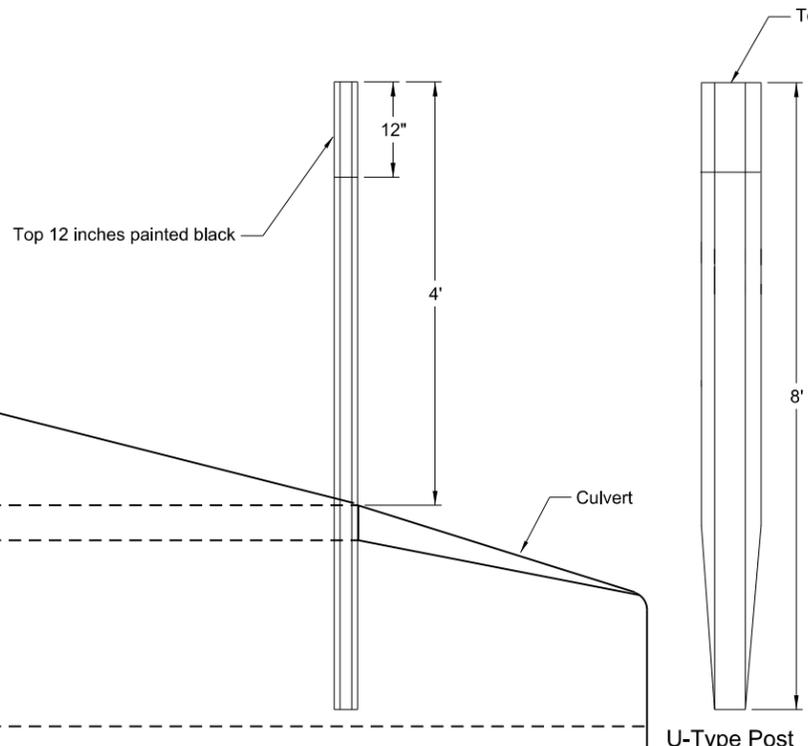
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OBJECT MARKERS - CULVERTS

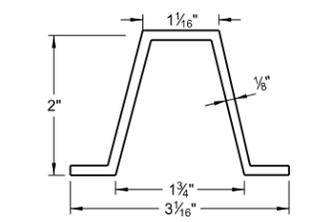
D-754-83



Mainline Divided Highway
Culvert Openings Greater than 10'
Multiple Installations

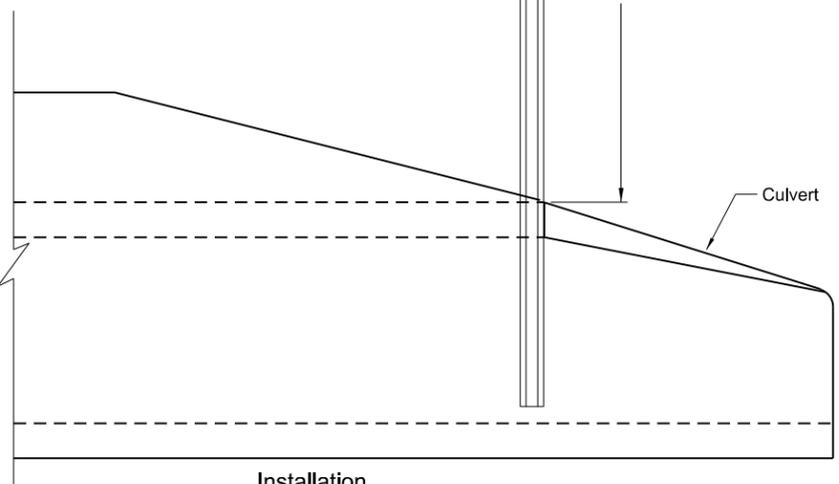


Steel Post Detail
Approx. 2.0 lbs/ft



Aluminum Post Detail
Approx. 0.88 lbs/ft

- Notes:**
- Installation:** Construction requirements shall meet 754.04D. Each end of culverts crossing the roadway within the right-of-way shall be marked with a post as shown. Posts are to be installed in front of the culvert in the direction of travel along the side of the culvert and one foot from the culvert opening unless shown otherwise on the plans.
 - Posts:** Posts shall conform to section 894.04A of the Standard Specifications with the exception that the post may or may not have holes drilled.
 - Basis of Payment:** The quantity will be measured by the number of object markers each installed. All costs for furnishing and installing the markers shall be included in the price bid for the item "Object Markers - Culverts".

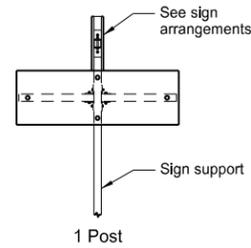


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 8-05-13	
REVISIONS	
DATE	CHANGE
7-7-14	Revised Notes

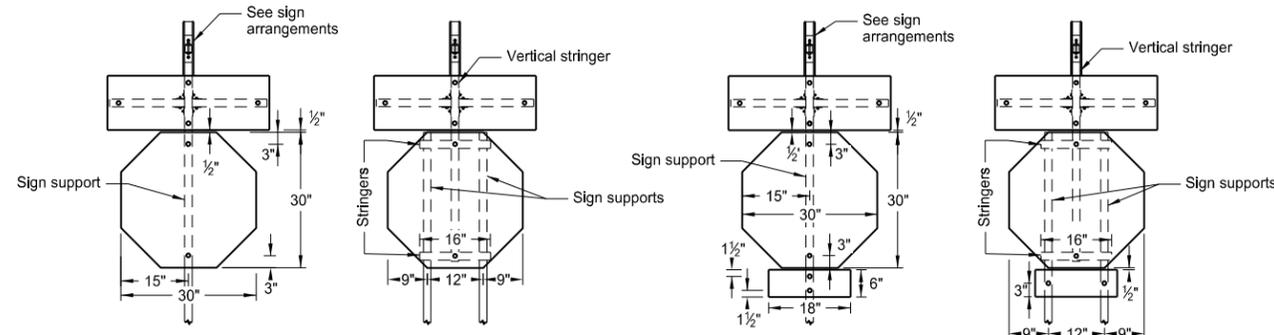
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR STREET NAME SIGNS AND 911 SIGNS

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

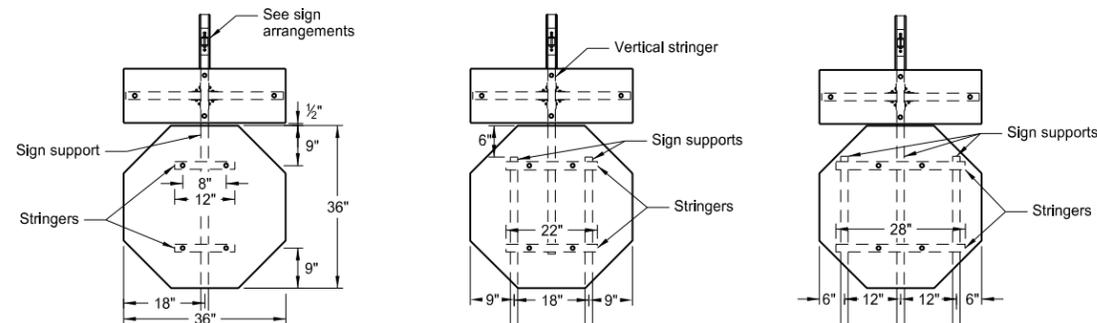


Special Assembly 1 (A, B, C, D or E)

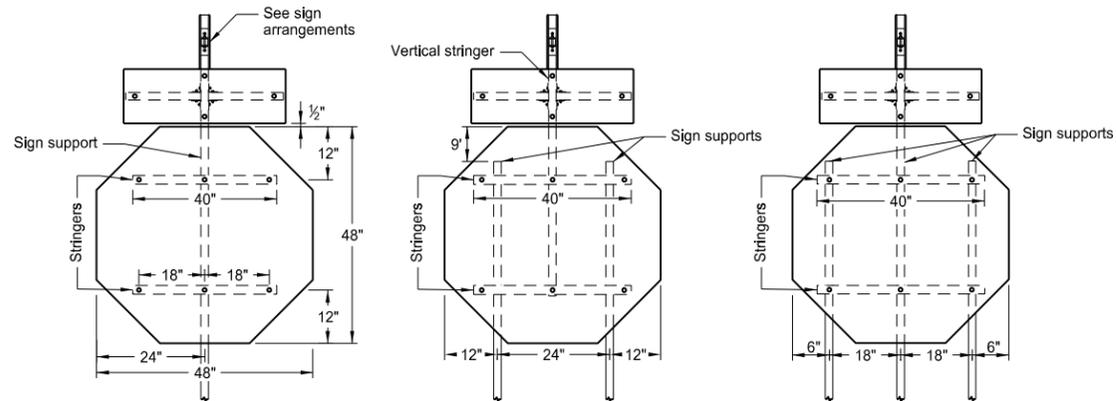


Special Assembly 2 (A, B, C, D or E)

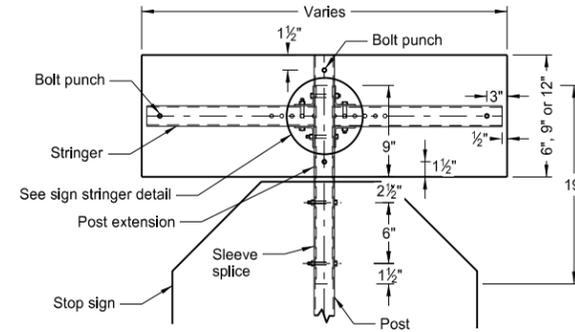
Special Assembly 3 (A, B, C, D or E)



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

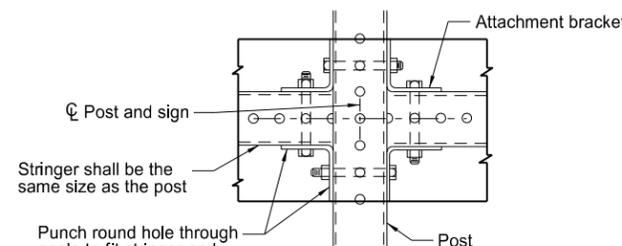


Special Assembly 5 (A, B, C, D or E)



Sleeve Splice Detail

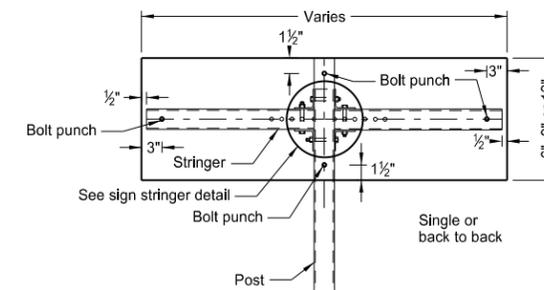
Note: The splice method may be used upon approval of the engineer.



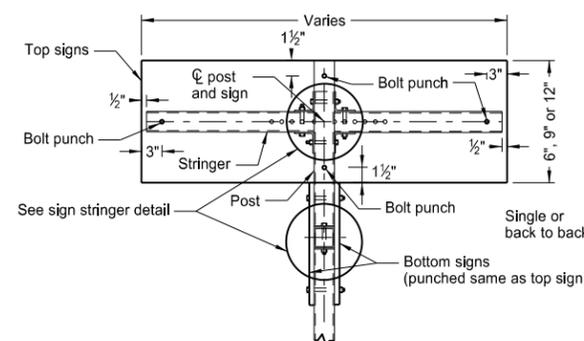
Sign Stringer Detail

Stringer shall be the same size as the post

Punch round hole through angle to fit stringer and post holes.

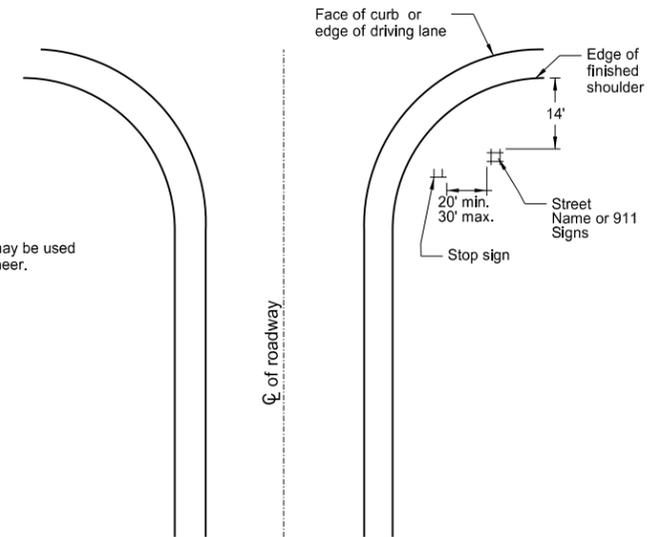


Detail A or B



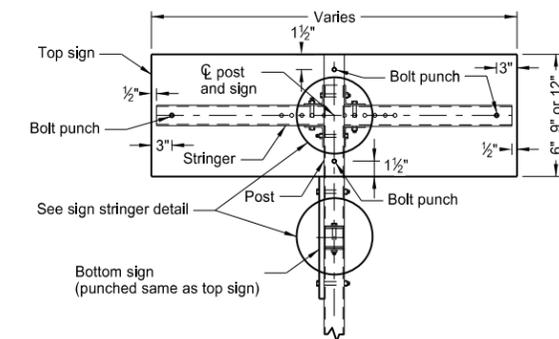
Detail D or E

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



Intersection Layout

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



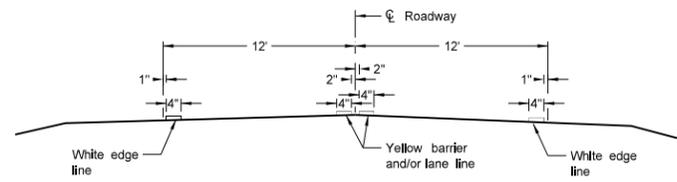
Detail C

Sign Arrangements

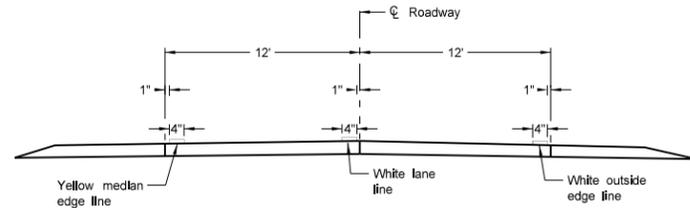
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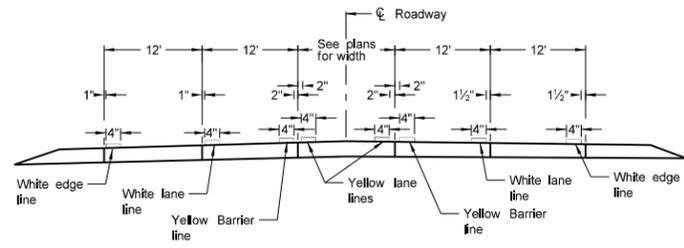
PAVEMENT MARKING



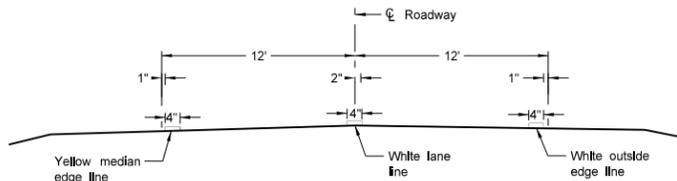
Two Lane Two Way
RURAL ROADWAY



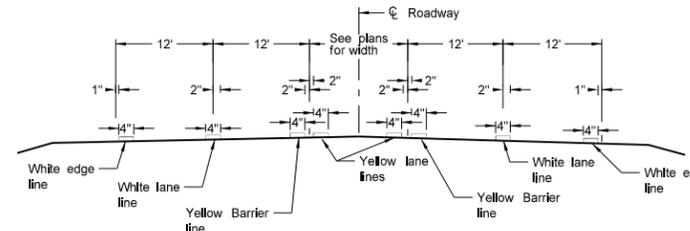
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



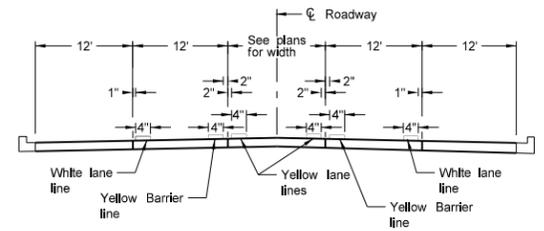
RURAL FIVE LANE ROADWAY
Concrete Section



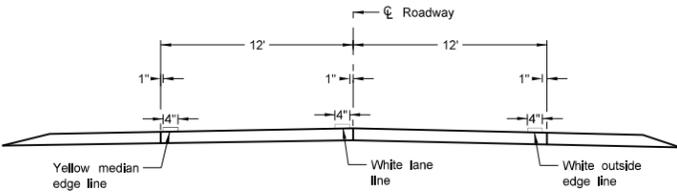
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



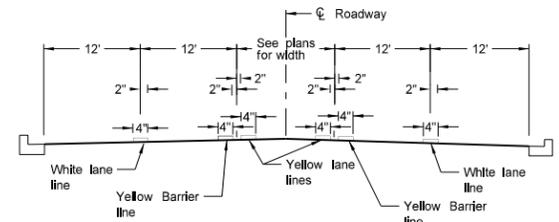
RURAL FIVE LANE ROADWAY
Asphalt Section



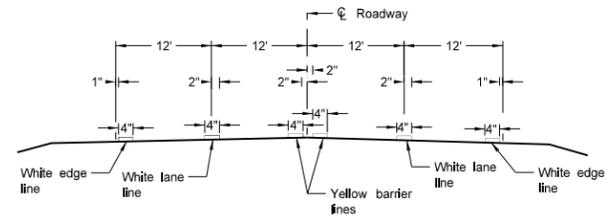
URBAN FIVE LANE SECTION
Concrete Section



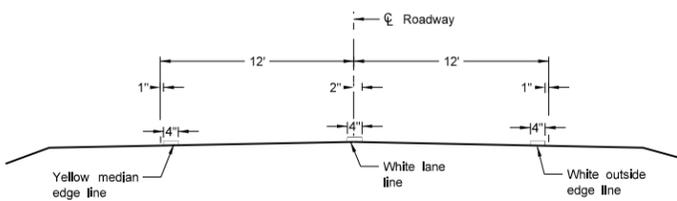
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



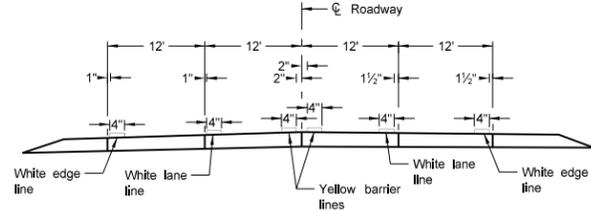
URBAN FIVE LANE SECTION
Asphalt Section



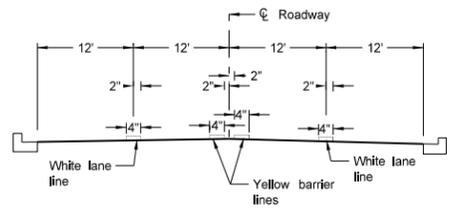
RURAL FOUR LANE ROADWAY
Asphalt Section



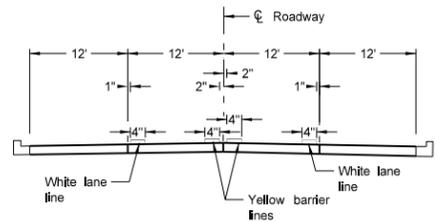
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



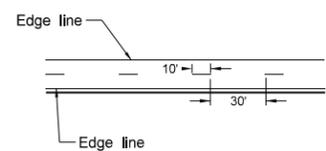
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



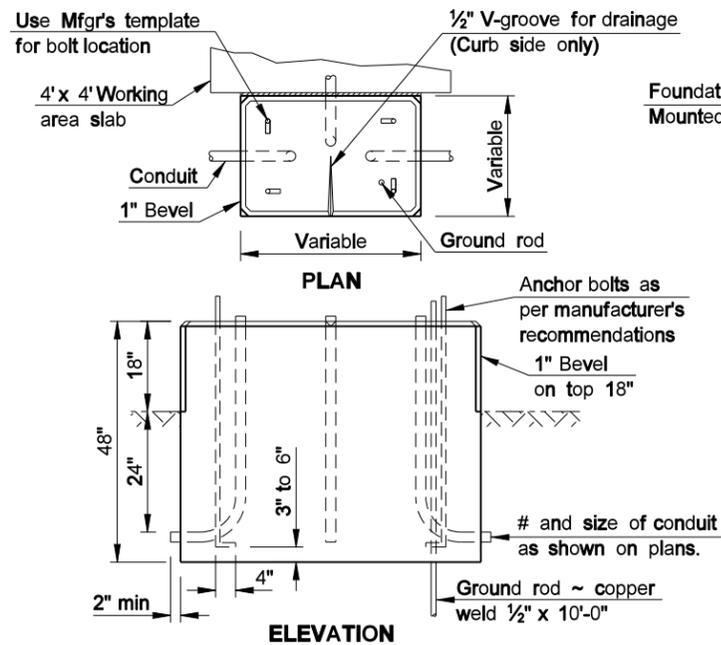
CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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DATE	CHANGE

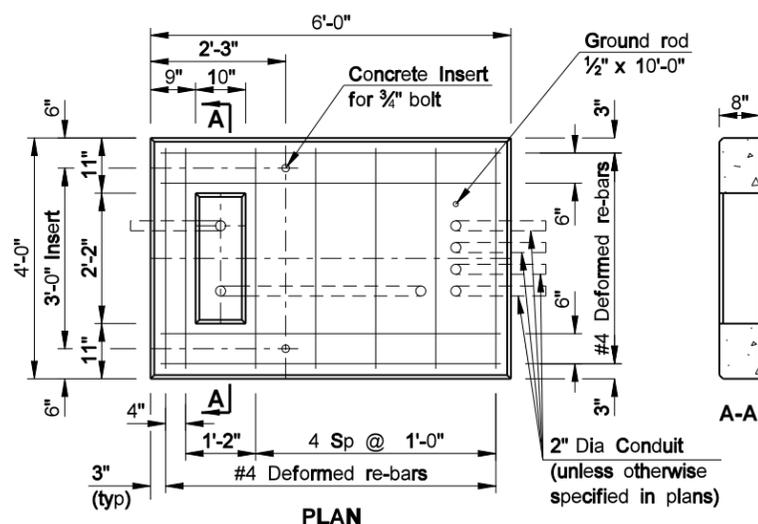
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**CONCRETE FOUNDATIONS
(TRAFFIC SIGNALS & HIGHWAY LIGHTING)**

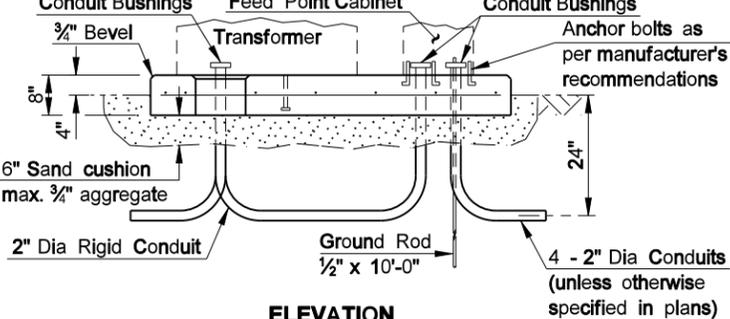


CONTROLLER CABINET FOUNDATION PAD MOUNT

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

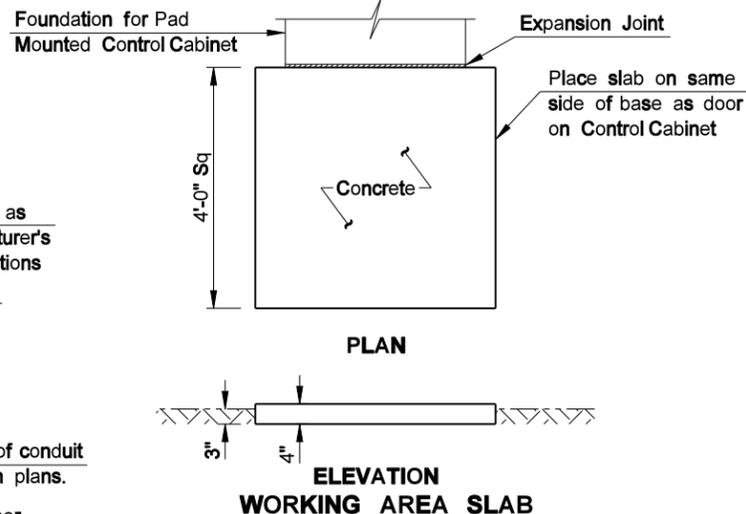


TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

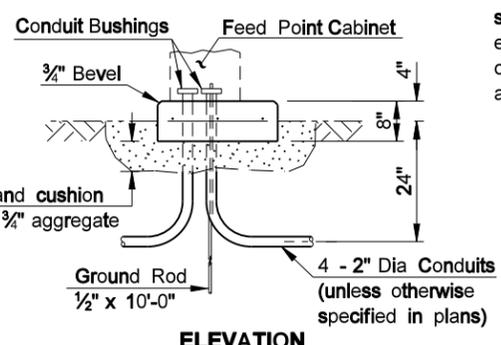
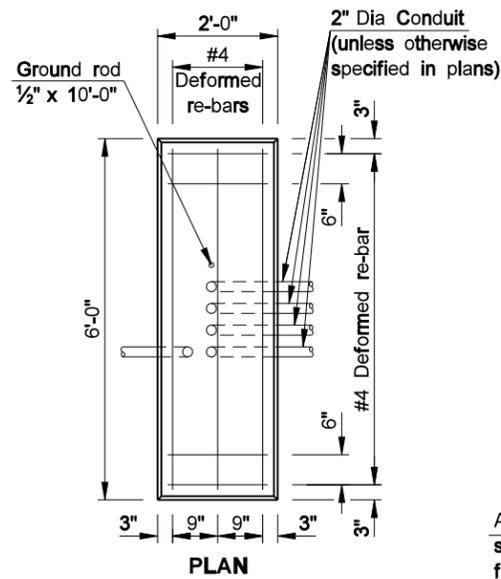


TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

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

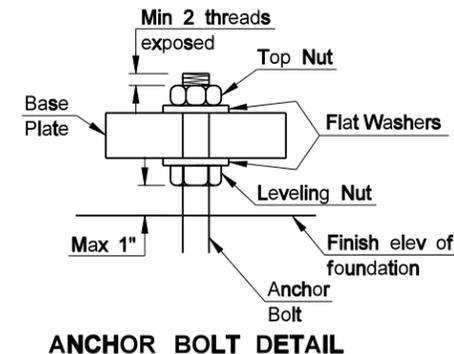


The Working Area Slab shall be installed where shown on the plans and shall not be bid separately but shall be included in the price bid for Concrete Foundation - Traffic Signals.

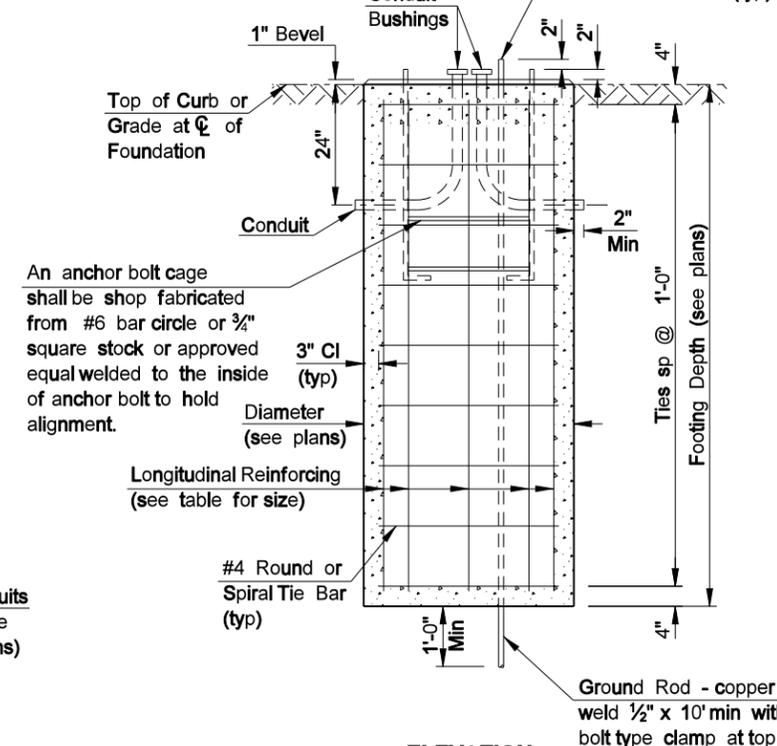
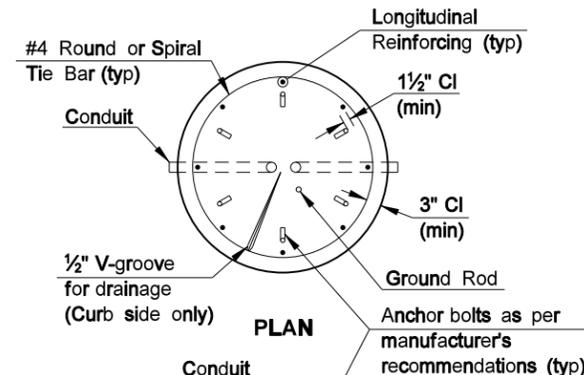


FEED POINT CABINET FOUNDATION PAD MOUNT

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



ANCHOR BOLT DETAIL



LIGHT & SIGNAL STANDARD FOUNDATION

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

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

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

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

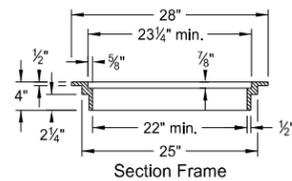
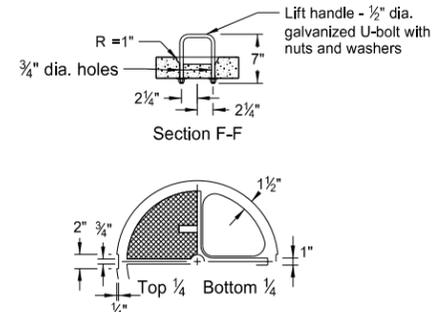
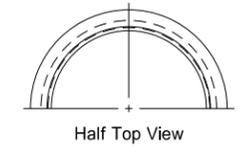
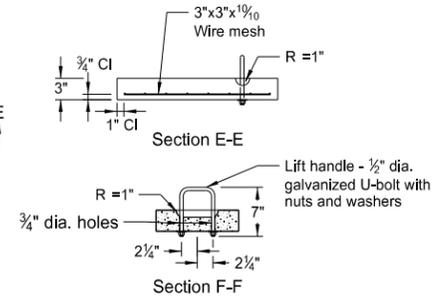
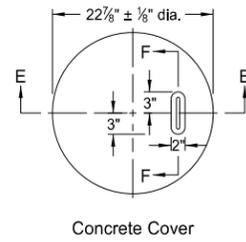
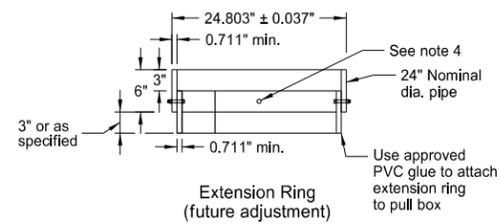
FEED POINT CABINET FOUNDATION PAD MOUNTED: The foundation shall have a wood float finish. All conduits shown shall be installed. Conduit that is not used at this time shall be plugged with an expandable plug.

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

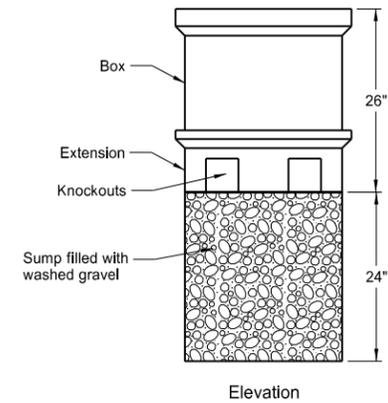
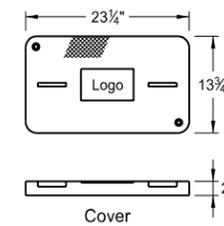
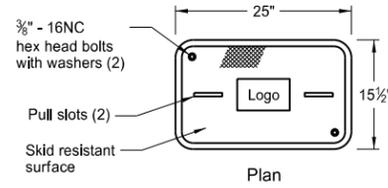
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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PULL BOX DETAILS



Cast Iron Frame and Cover

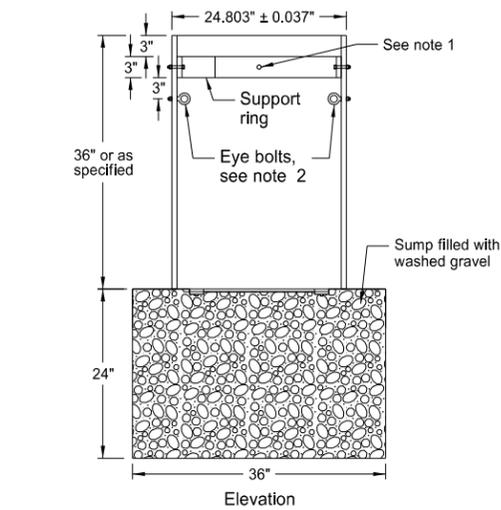


Polymer Concrete Pull Box

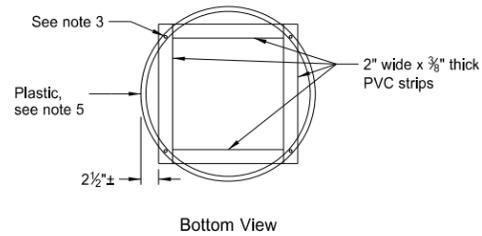
Note: Polymer concrete reinforced by a heavy weave fiberglass

Notes:

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

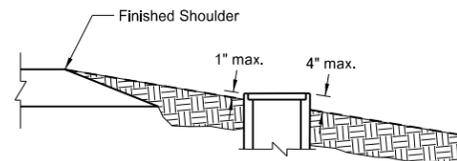


PVC Pull Box



PVC Pull Box Notes:

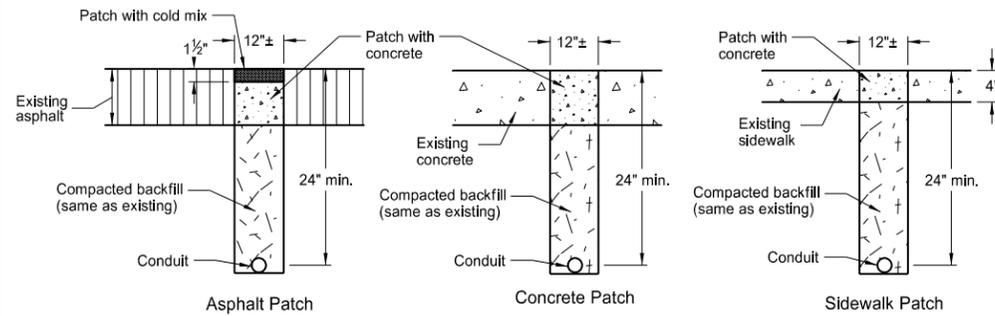
1. Attach split 24" nominal diameter PVC cover support ring with four 3/8" dia. x 2" long stainless steel hex head bolts with nuts at 90 degrees apart.
2. Two type 2 shoulder eye bolts, 3/8" dia. x 1 1/4" shank length with hex nuts 180 degrees apart (for lifting pull box and supporting electric cable).
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. Conduit holes located in barrel section shall be sized no more than 1" larger than size of conduit being used.
7. After pull box and conduit installation all inside walls and cover shall be made water tight to the satisfaction of the Engineer.
8. PVC pipe to meet requirements of ASTM F679T-1 or equal.
9. Hex head bolts and nuts shall be austenitic stainless steel. Other fasteners to be galvanized as per AASHTO M-232.
10. Concrete cover shall be coated on top and sides with an approved epoxy coating. The epoxy protective coating shall be light gray, clear, or neutral in color and shall be applied as recommended by the manufacturer. The surfaces of the concrete to which the epoxy protective coating is applied, shall be cleaned by wire brush and shall be dry before application.
11. Cast Iron Cover castings shall be gray iron as per AASHTO M 105, Class 35B.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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DATE	CHANGE
7-8-14	Added Note 3

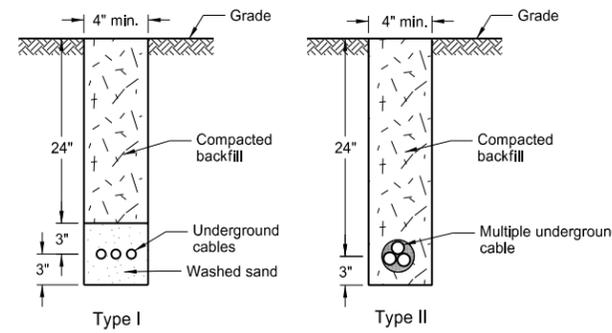
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LIGHTING AND SIGNAL DETAILS



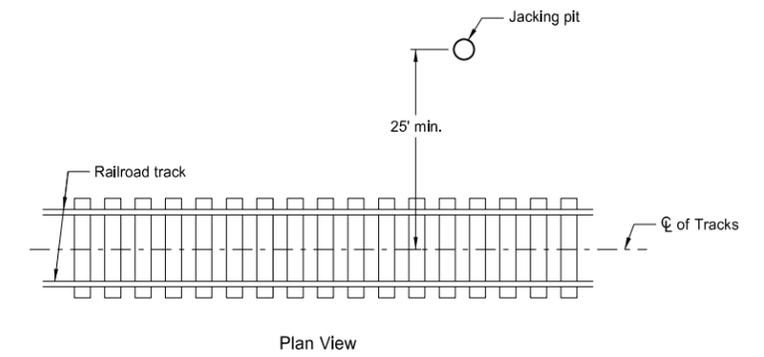
Surface Patch Details

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

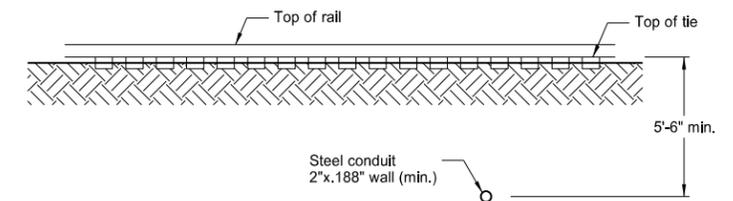


Cable Trench

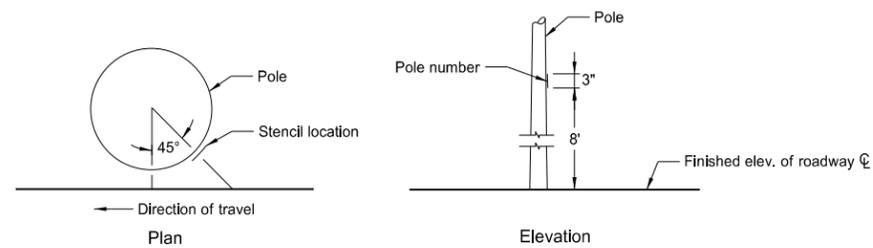
Note: The entire area which is disturbed by the trenching shall be sodded or as directed by the Engineer.



Plan View

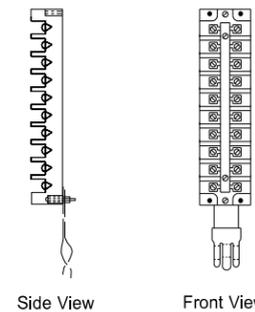


Elevation View
Conduit Placement under Railroad Tracks



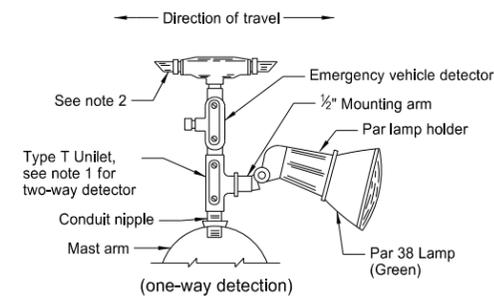
Light Standard Numbering

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

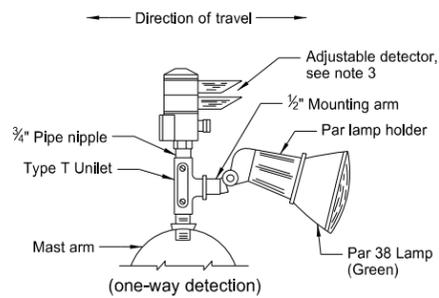


Side View Front View

Terminal Block Detail

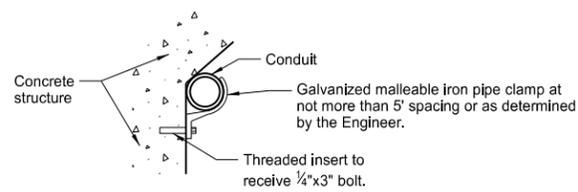


Emergency Vehicle Detector Detail

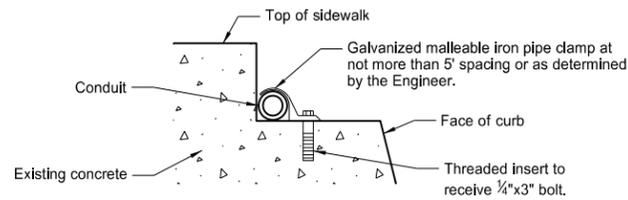


Alternate Emergency Vehicle Detector Detail (adjustable)

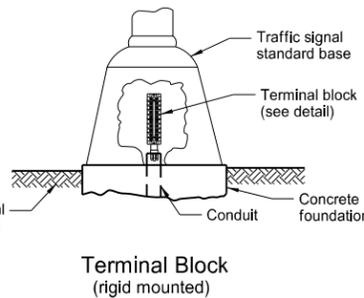
Notes:
1. Two-way Detector shall have Type X Unilet with two Par lamp holders and lamps. (one in each direction).
2. One-way Detector shall have the unused end plugged with metal pipe plug.
3. Two-way Detector shall have the detector lens rotated to face the direction of travel, and shall have Type X Unilet with two Par lamp holders and lamps (one in each direction).



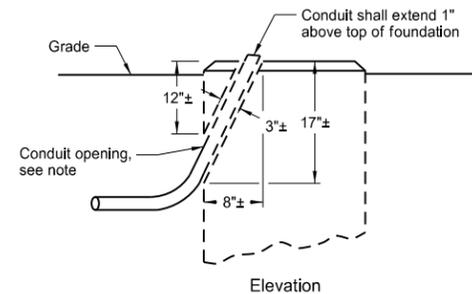
Bridge Mounted Conduit Hanger



Curb Mounted Conduit



Terminal Block (rigid mounted)

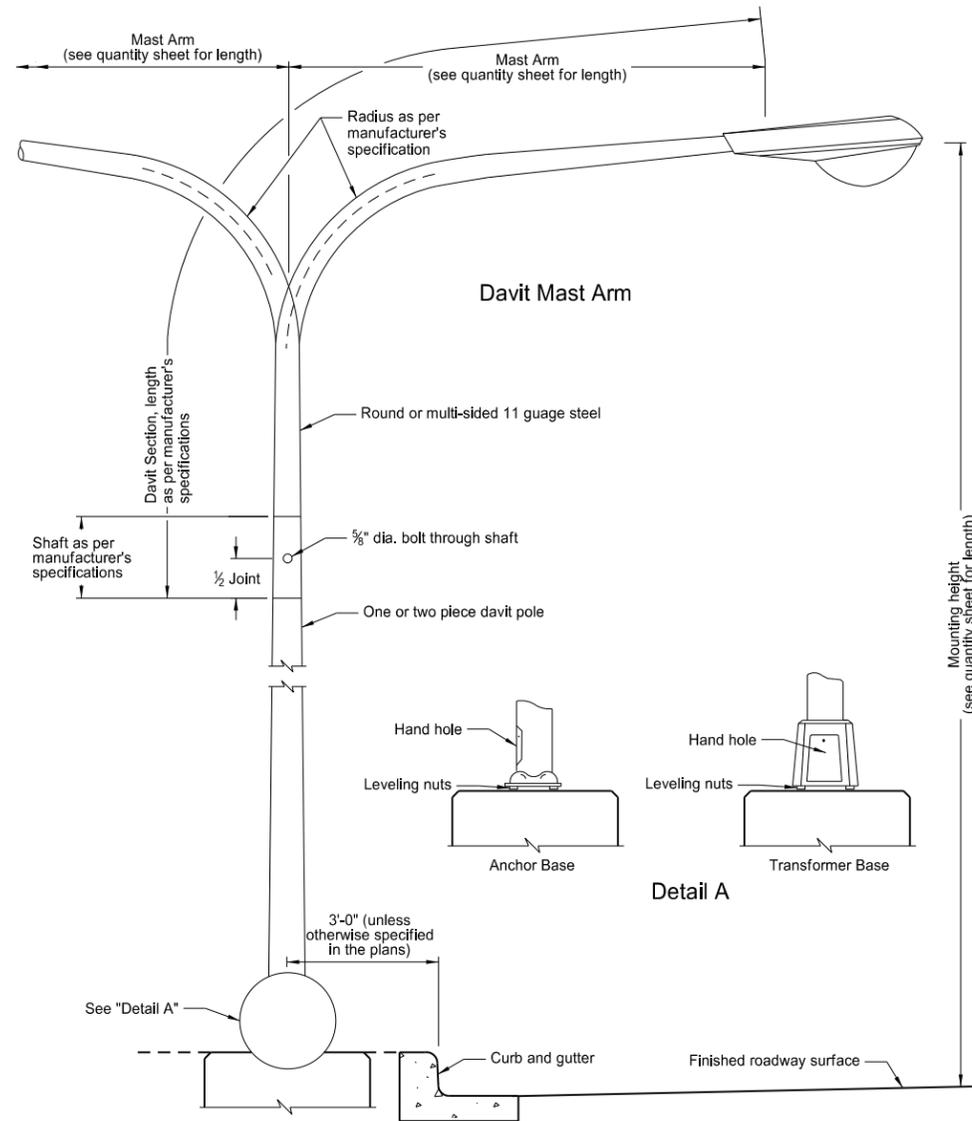


Revise Concrete Foundation

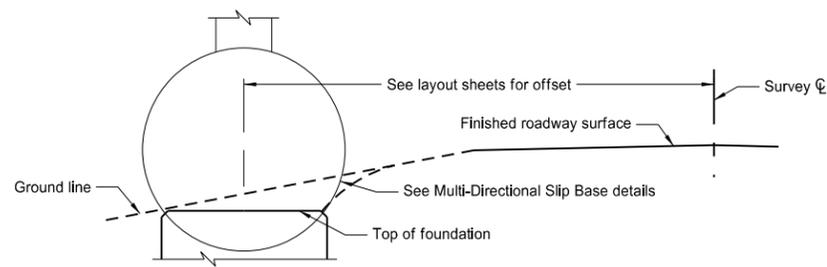
Note: Jackhammer or drill to remove material and provide a location for conduit. Make opening no larger than necessary. Place conduit, fill with concrete and finish foundation to original appearance.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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DATE	CHANGE

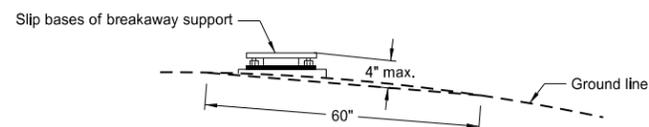
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Light Standard Details

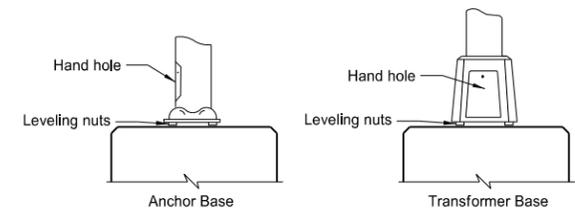


Concrete Foundation Location



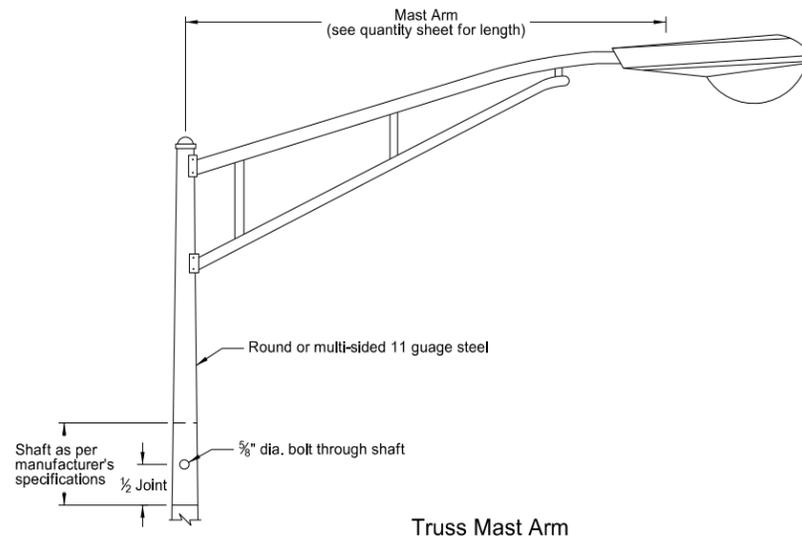
Breakaway Support Stub Clearance Diagram

Mounting height (see quantity sheet for length)

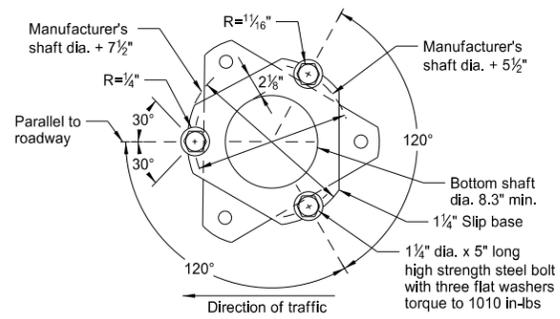


Detail A

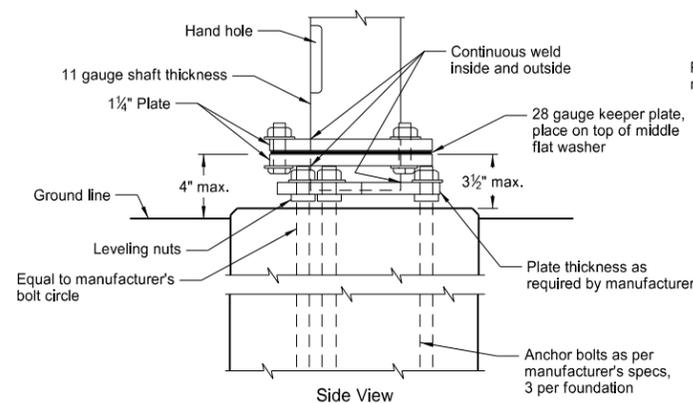
LIGHT STANDARD DETAILS



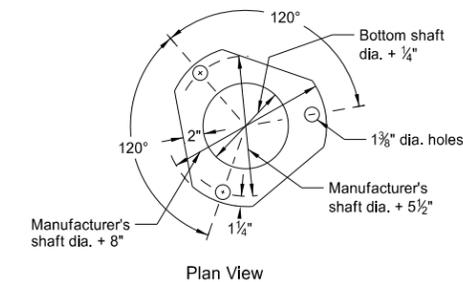
Truss Mast Arm



Top View



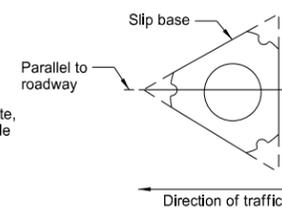
Steel Base Detail



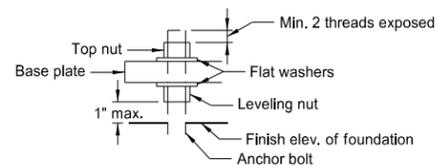
Plan View

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

Keeper Plate Detail (A)

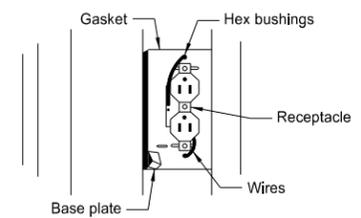


Slip Base Placement Detail

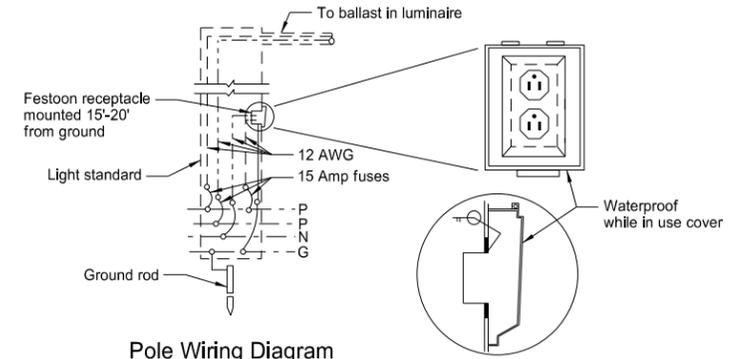


Anchor Bolt Detail

Multi-Directional Slip Base



Optional: Festoon receptacle mounted on multi-sided pole.



Pole Wiring Diagram

Receptacle Mounting Detail (B)

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

Notes:

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

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

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

Fusing: Fusing in base, see specifications.

Slip Base Bolt Torque Procedure:

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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