

?	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	BV	butterfly valve
Abut	abutment	Byp	bypass
Ac	acres	C Gdrl	cable guardrail
Adj	adjusted	Calc	calculate
Aggr	aggregate	Cd	candela
Ahd	ahead	CIP	cast iron pipe
ARV	air release valve	CB	catch basin
Align	alignment	CRS	cationic rapid setting
Al	alley	C Gd	cattle guard
Alt	alternate	C To C	center to center
Alum	aluminum	Cl or C_L	centerline
ADA	Americans with Disabilities Act	Cm	centimeter
A	ampere	Ch	chain
&	and	Chnlk	chain-link
Appr	approach	Ch Blk	channel block
Approx	approximate	Ch Ch	channel change
ACP	asbestos cement pipe	Chk	check
Asph	asphalt	Chsld	chiseled
AC	asphalt cement	Cir	circle
Assmd	assumed	Cl	class
@	at	Cl	clay
Atten	attenuation	Cl F	clay fill
ATR	automatic traffic recorder	Cl Hvy	clay heavy
Ave	Avenue	Cl Lm	clay loam
Avg	average	Clnt	clean-out
ADT	average daily traffic	Clr	clear
Az	azimuth	Cl&gr	clearing & grubbing
Bk	back	Co S	coal slack
BF	back face	Comb.	combination
Bs	backsight	Coml	commercial
Balc	balcony	Compr	compression
B Wire	barbed wire	CADD	computer aided drafting & design
Barr	barricade	Conc	concrete
Btry	battery	Cond	conductor
Brg	bearing	Const	construction
BI	beehive inlet	Cont	continuous
Beg	begin	CSB	continuous split barrel sample
BM	bench mark	Contr	contraction
Bkwy	bikeway	Contr	contractor
Bit	bituminous	CP	control point
Blk	block	Coord	coordinate
Bd Ft	board feet	Cor	corner
BH	bore hole	Corr	corrected
BS	both sides	CAES	corrugated aluminum end section
Bot	bottom	CAP	corrugated aluminum pipe
Blvd	Boulevard	CMES	corrugated metal end section
Bndry	boundary	CMP	corrugated metal pipe
BC	brass cap	CPVCP	corrugated poly-vinyl chloride pipe
Brkwy	breakaway	CSES	corrugated steel end section
Br	bridge	CSP	corrugated steel pipe
Bldg	building	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
		FI	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
		Fr	front
		FF	front face
		F Disp	fuel dispenser

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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NDDOT ABBREVIATIONS

D-101-2

FFP	fuel filler pipes	IPn	Iron Pin	MC	medium curing	Ped	pedestal
FLS	fuel leak sensor	IP	Iron Pipe	M	mega	Ped	pedestrian
Furn	furnish/ed	Jt	joint	Mer	meridian	PPP	pedestrian pushbutton post
Gal	gallon	J	joule	M	meter	Pen.	penetration
Galv	galvanized	Jct	junction	M/s	meters per second	Perf	perforated
Gar	garage	K	kelvin	M	mid ordinate of curve	Per.	perimeter
Gs L	gas line	Kn	kilo newton	Mi	mile	PL	pipeline
G Reg	gas line regulator	Kpa	kilo pascal	MM	mile marker	PI	place
GMV	gas main valve	Kg	kilogram	MP	mile post	P&P	plan & profile
G Mtr	gas meter	Kg/m3	kilogram per cubic meter	MI	milliliter	PL	plastic limit
GSV	gas service valve	Km	kilometer	Mm	millimeter	PI	plate
GVP	gas vent pipe	K	Kip(s)	Mm/hr	millimeters per hour	Pt	point
GV	gate valve	LS	Land Surveyor (licensed)	Min	minimum	PCC	point of compound curve
Ga	gauge	LSIT	Land Surveyor In Training	Misc	miscellaneous	PC	point of curve
Geod	geodetic	Ln	lane	Mon	monument	PI	point of intersection
GIS	Geographical Information System	Lg	large	Mnd	mound	PRC	point of reverse curvature
G	giga	Lat	latitude	Mtbl	mountable	PT	point of tangent
GPS	Global Positioning System	Lt	left	Mtd	mounted	POC	point on curve
Gov	government	L	length of curve	Mtg	mounting	POT	point on tangent
Grd	graded/grade	Lens	lenses	Mk	muck	PE	polyethylene
Gr	gravel	Lvl	level	Mun	municipal	PVC	polyvinyl chloride
Grnd	ground	LB	level book	N	nano	PCC	Portland Cement concrete
GWM	ground water monitor	Lvlng	leveling	NGS	National Geodetic Survey	Lb or #	pounds
Gdrl	guardrail	Lht	light	NS	near side	PP	power pole
Gtr	gutter	LP	light pole	Neop	neoprene	Preempt	preemption
H Plg	H piling	Ltg	lighting	Ntwk	network	Prefab	prefabricated
Hdwl	headwall	Lig Co	lignite coal	N	newton	Prfmd	preformed
Ha	hectare	Lig Sl	lignite slack	N	North	Prep	preperation
Ht	height	LF	linear foot	NE	North East	Press.	pressure
HI	height of instrument	Liq	liquid	NW	North West	PRV	pressure relief valve
Hel	helical	LL	liquid limit	NB	Northbound	Prestr	prestressed
H	henry	L	litre	No. or #	number	Pvt	private
Hz	hertz	Lm	loam	Obsc	obscure(d)	PD	private drive
HDPE	high density polyethylene	Loc	location	Obsn	observation	Prod.	production/produce
HM	high mast	LC	long chord	Ocpd	occupied	Prog	programmed
HP	high pressure	Long.	longitude	Ocpy	occupy	Prop.	property
HPS	high pressure sodium	Lp	loop	Off Loc	office location	Prop Ln	property line
Hwy	highway	LD	loop detector	O/s	offset	Ppsd	proposed
Hor	horizontal	Lm	lumen	OC	on center	PB	pull box
HBP	hot bituminous pavement	Lum	luminaire	C	one dimensional consolidation		
HMA	hot mix asphalt	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		

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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NDDOT ABBREVIATIONS

D-101-3

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

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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 HGH 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		
DOME 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-trail 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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Existing Topography

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

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

Proposed Topography

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

Existing Utilities

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

Proposed Utilities

	24 Inch Pipe
	Reinforced Concrete Pipe
	Under Drain
	Edge Drain

Traffic Utilities

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

Sign Structures

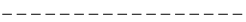
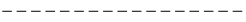




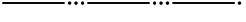






	Existing Overhead Sign Structure
	Existing Overhead Sign Structure Cantilever
	Overhead Sign Structure Cantilever

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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09-23-16	Added and Revised Items, Organized by Functional Groups

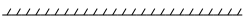





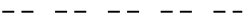


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Line Styles

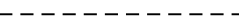
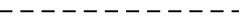
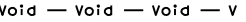
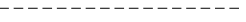




Right Of Way

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







Boundary Control

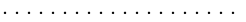

	Existing City Corporate Limits or Reservation Boundary
	Existing State or International Line
	Existing Township
	Existing County
	Existing Section Line
	Existing Quarter Section Line
	Existing Sixteenth Section Line
	Existing Centerline
	Tangent Line

Cross Sections and Typicals



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

Geotechnical

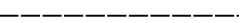
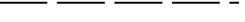
	Geotextile Fabric Type D
	Geogrid
	Geotextile Fabric Type R
	Geotextile Fabric Type R1
	Geotextile Fabric Type RR
	Geotextile Fabric Type S

	Subgrade Reinforcement
	Failure Line


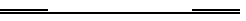

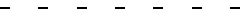


Countours

	Depression Contours
	Supplemental Contour


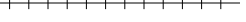


Profile

	Subgrade, Subcut or Ditch Grade
	Topsoil Profile










Striping

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

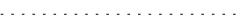





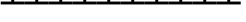
Pavement Joints

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





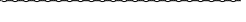
Bridge Details

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

Erosion Control

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

Environmental

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

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

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

















































































Symbols

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

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07-01-14		
REVISIONS		
DATE	CHANGE	

Symbols

D-101-31

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

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

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Symbols



Pad Mounted Feed Point



Pipe Mounted Feed Point with Pad



Pole Mounted Feed Point



Headwall



Double Headwall with Vegetation Barrier



Single Headwall with Vegetation Barrier



Pole Mounted Head



Sprinkler Head



Fire Hydrant



Inlet Type 1



Inlet Type 2



Double Inlet Type 2



Inlet Grate Type 2



Junction Box



High Mast Light Standard 10 Luminaire



High Mast Light Standard 3 Luminaire



High Mast Light Standard 4 Luminaire



High Mast Light Standard 5 Luminaire



High Mast Light Standard 6 Luminaire



High Mast Light Standard 7 Luminaire



High Mast Light Standard 8 Luminaire



High Mast Light Standard 9 Luminaire



Relocate Light Standard



Overhead Sign Structure Load Center



Light Standard 100 Watt High Pressure Sodium Vapor Luminaire



Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire



Light Standard 150 Watt High Pressure Sodium Vapor Luminaire



Light Standard 175 Watt High Pressure Sodium Vapor Luminaire



Light Standard 200 Watt High Pressure Sodium Vapor Luminaire



Light Standard 250 Watt High Pressure Sodium Vapor Luminaire



Light Standard 310 Watt High Pressure Sodium Vapor Luminaire



Light Standard 35 Watt High Pressure Sodium Vapor Luminaire



Light Standard 400 Watt High Pressure Sodium Vapor Luminaire



Light Standard 50 Watt High Pressure Sodium Vapor Luminaire



Light Standard 70 Watt High Pressure Sodium Vapor Luminaire



Light Standard 700 Watt High Pressure Sodium Vapor Luminaire



Manhole



Manhole 48 Inch



Sanitary Force Main Manhole



Sanitary Sewer Manhole



Storm Drain Manhole



Storm Drain Manhole with Inlet



Reset Mile Post



Mile Post Type A



Mile Post Type B



Mile Post Type C



Right of Way Marker



Tubular Marker



Alignment Monument



Iron Pin Reference Monument



Object Marker Type I



Object Marker Type II



Object Marker Type III



Caution Mode Arrow Panel



Back to Back Vertical Panel Sign



Double Direction Arrow Panel



Left Directional Arrow Panel



Right Directional Arrow Panel



Sequencing Arrow Panel



Truck Mounted Arrow Panel



Power Pole



Wood Pole



Pedestrian Push Button Post



Property Corner



Pull Box



Intelligent Transportation Pull Box



Sanitary Pump



Storm Drain Pump



Reinforced Pavement



Reinforced Concrete End Section 15 Inch



Reinforced Concrete End Section 18 Inch



Reinforced Concrete End Section 24 Inch



Reinforced Concrete End Section 30 Inch



Reinforced Concrete End Section 36 Inch



Reinforced Concrete End Section 42 Inch



Reinforced Concrete End Section 48 Inch



Reinforced Concrete End Section 54 Inch



Reset Right of Way Marker



Reset USGS Marker



Right of Way Markers



Riser 30 Inch



Continuous Split Barrel Sample



Flight Auger Sample



Split Barrel Sample



Thinwall Tube Sample



Highway Sign



SNOW GATE 18 FT



SNOW GATE 28 FT



SNOW GATE 40 FT



Standard Penetration Test



Transformer



Inclinometer Tube



Underdrain Cleanout



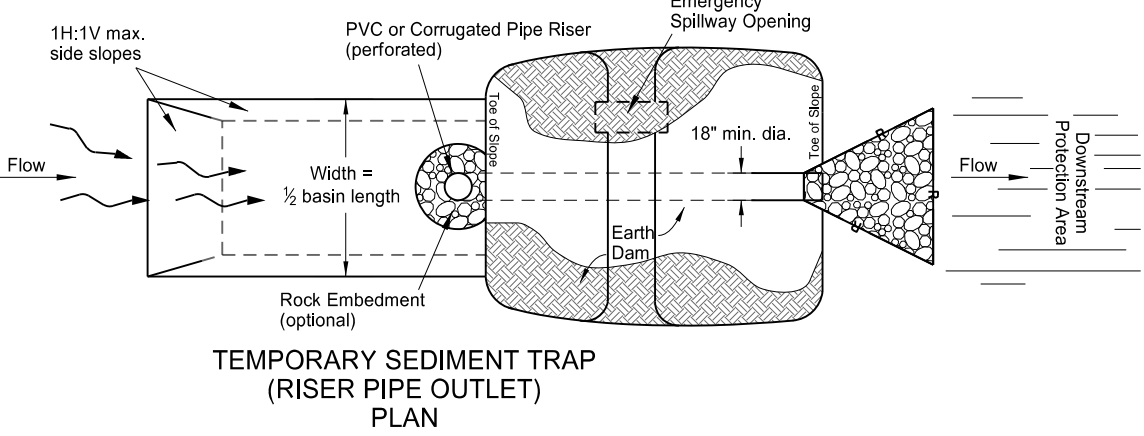
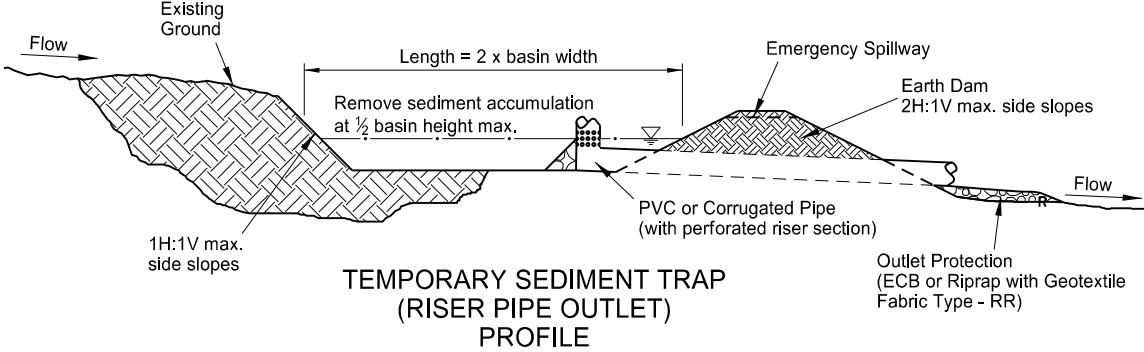
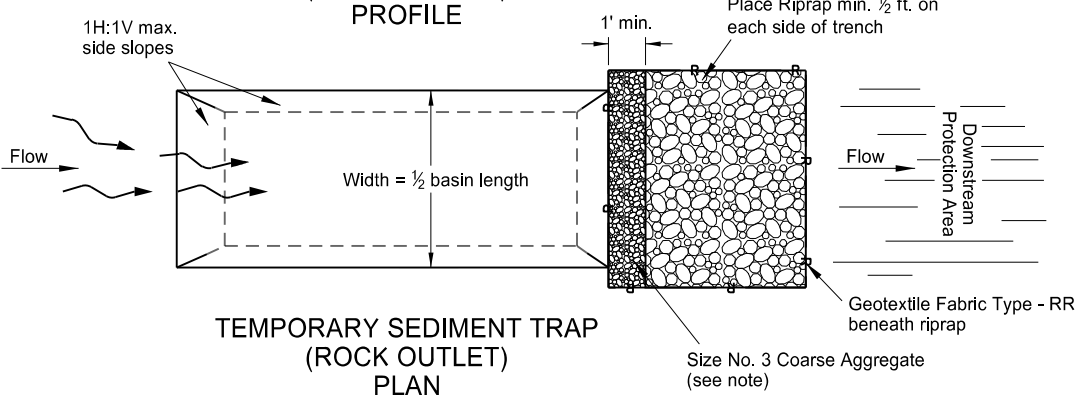
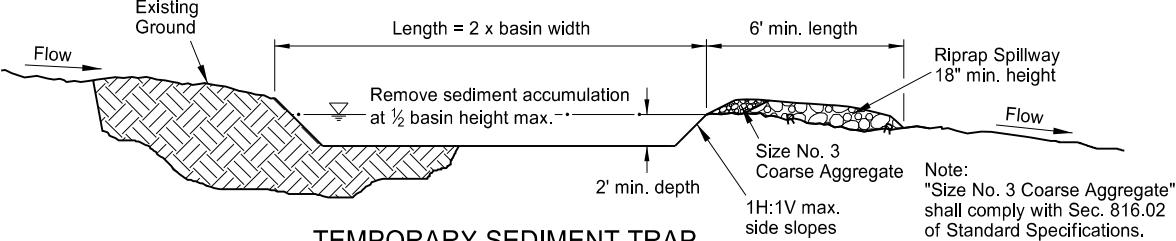
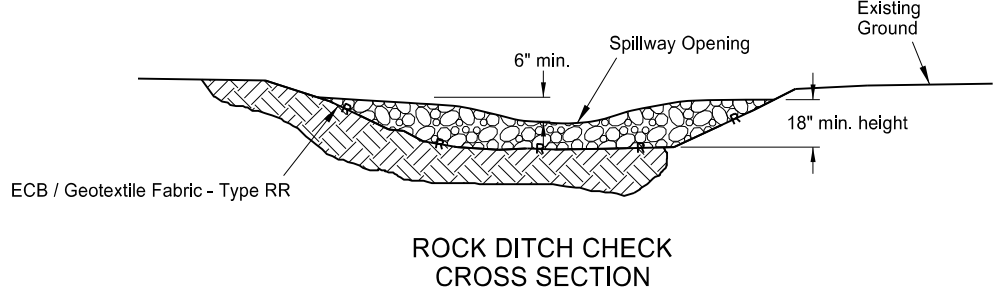
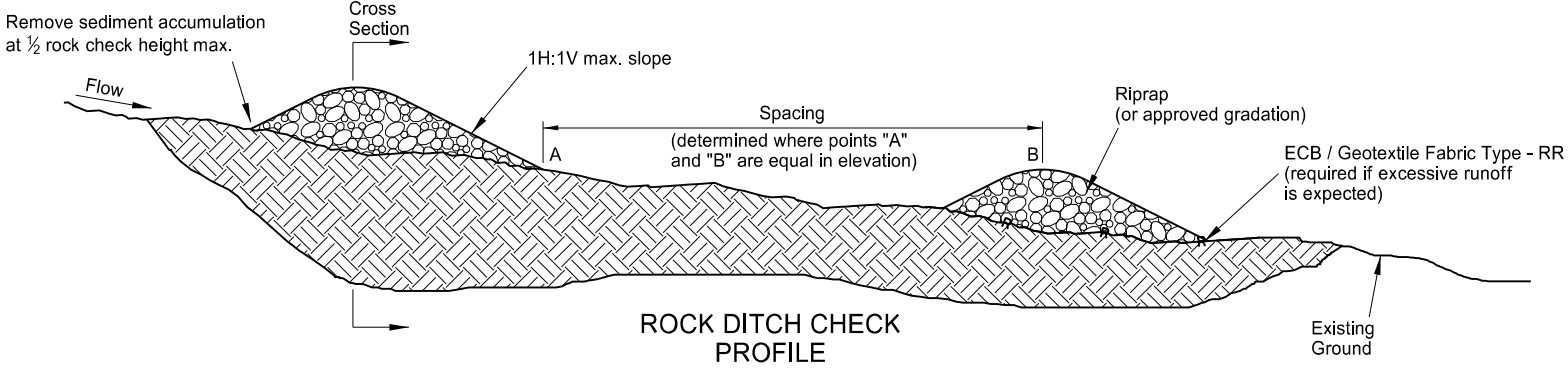
Excavation Unit



Water Valve

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

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NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-2 to D-256-1. Deleted silt fence details.

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EROSION CONTROL FIBER ROLL PLACEMENT DETAILS

D-261-1

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

12 OR 20 INCH FIBER ROLL - DITCH BOTTOM

PLAN VIEW FOR SLOPE APPLICATION

PLAN VIEW FOR DITCH APPLICATION

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"

Detail A
Fiber Roll Overlapping Staking Detail

Detail B
Fiber Roll Staking Detail

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

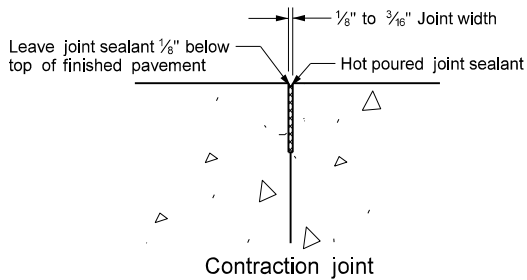
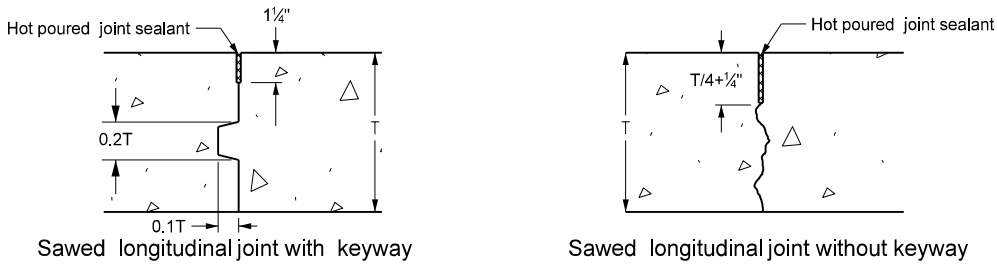
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-18-10	
REVISIONS	
DATE	CHANGE
06-10-13	Added plan view for ditch and slope application. Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.
06-26-14	Changed standard drawing number from D-708-7 to D-261-1.

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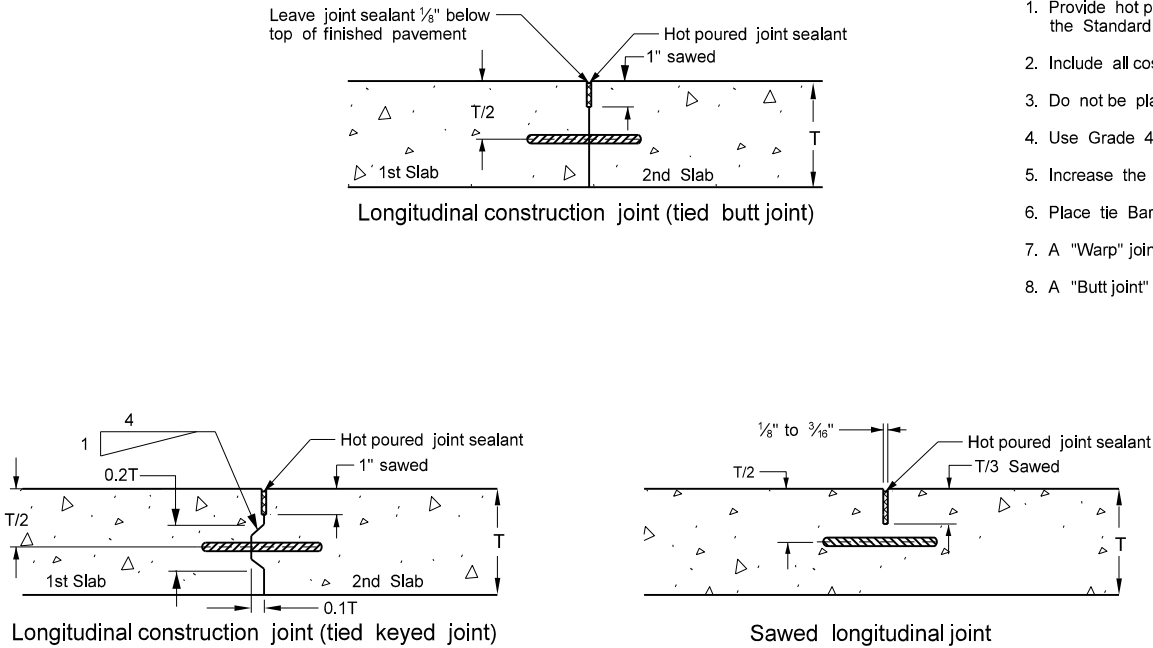
LONGITUDINAL JOINT DETAILS

D-550-2

UNTIED JOINTS



TIED JOINTS



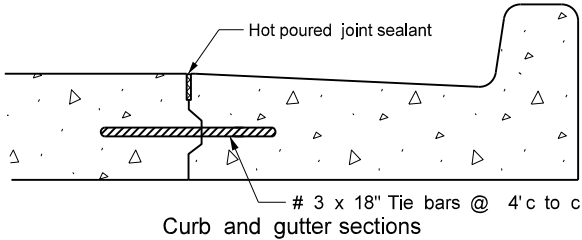
Notes:

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

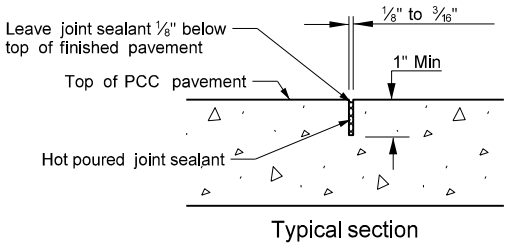
BAR SIZE
GRADE STEEL
BAR LENGTH
DIST TO FREE EDGE
JOINT TYPE
PVTM THICKNESS

TIEBAR SPACINGS (In)

		# 3 BAR					# 4 BAR					# 5 BAR					# 6 BAR				
		GRADE 40					GRADE 60					GRADE 40					GRADE 60				
		24"					30"					24"					36"				
		4	6	8	10		4	6	8	10	12	14	16		8	10	12	14	16	22	24
6"	WARP																				
	BUTT																				
8"	WARP	48	39	29	24		48	48	44	35	29	25		48	42	35	30	26			
	BUTT	42	27				48	42	31	25				48	44	37	32	27			
8 1/2"	WARP	48	37	28			48	48	42	33	28	24		48	48	48	42	37	27	24	
	BUTT	39	26				44	39	29					44	36	31	27				
9"	WARP	48	35	26			48	48	39	31	26			48	48	47	40	35	25		
	BUTT	37	24				48	37	27					48	40	33	28	25			
9 1/2"	WARP	48	33	25			48	48	37	30	25			48	48	44	38	33	24		
	BUTT	35					48	35	26					48	37	31	27				
10"	WARP	47	31				48	47	35	28				48	48	42	36	31			
	BUTT	33					48	33	25					45	36	29	25				
10 1/2"	WARP	45	30				48	45	34	27				48	48	40	34	30			
	BUTT	32					48	32	24					42	34	28	24				
11"	WARP	43	28				48	43	32	26				48	46	38	33	28			
	BUTT	30					46	30						40	32	27					
11 1/2"	WARP	41	27				48	41	31	24				48	44	36	31	27			
	BUTT	29					44	29						39	31	25					
12"	WARP	39	26				48	39	29					48	42	35	30	26			
	BUTT	27					42	27						37	30	25					
12 1/2"	WARP	38	25				48	38	28					48	40	33	29	25			
	BUTT	27					40	27						35	28						
13"	WARP	36	24				48	36	27					48	39	32	27	24			
	BUTT	25					38	25						34	27						
13 1/2"	WARP	35					48	35	26					47	37	31	26				
	BUTT	25					37	25						33	26						
14"	WARP	34					48	34	25					45	36	30	25				
	BUTT	24					35	24						32	25						
14 1/2"	WARP	32					48	32	24					43	35	29	25				
	BUTT						34							30	25						
15"	WARP	31					47	31						42	33	28	24				
	BUTT						33							29							



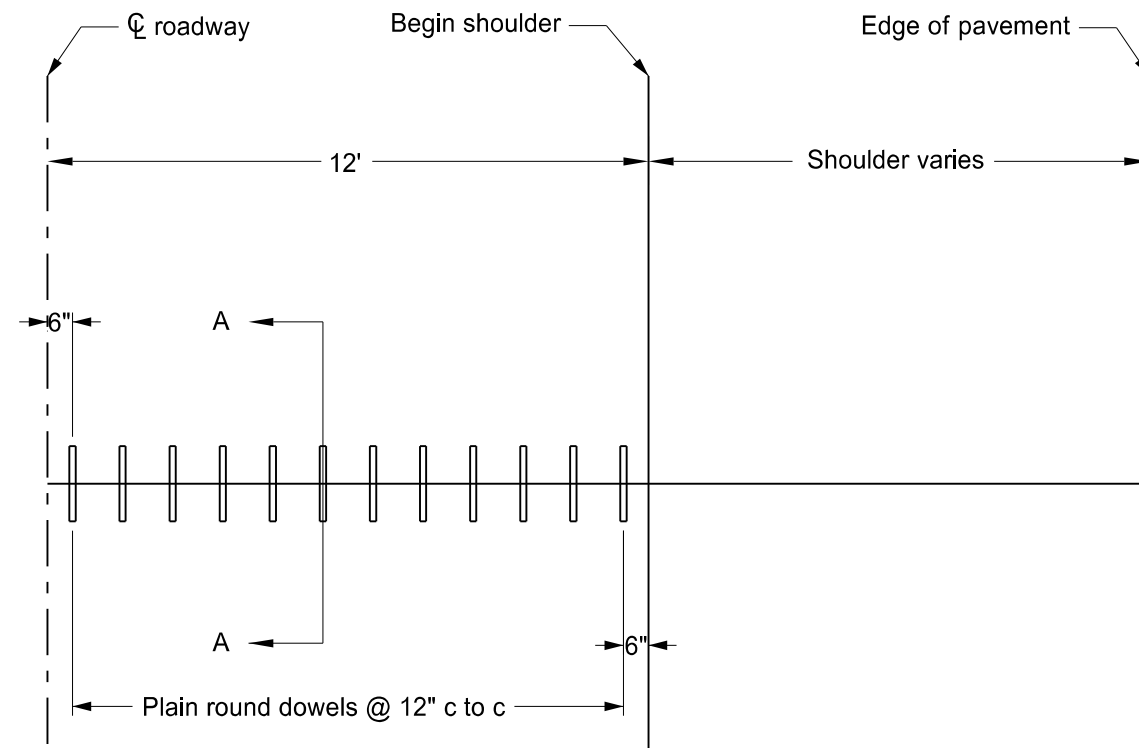
JOINT SEALER DETAILS



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-2010	
REVISIONS	
DATE	CHANGE
10/23/2012	Expanded Tie Bar Table
03/16/2016	Updated Jt Details & notes

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TRANSVERSE CONTRACTION JOINT DETAILS

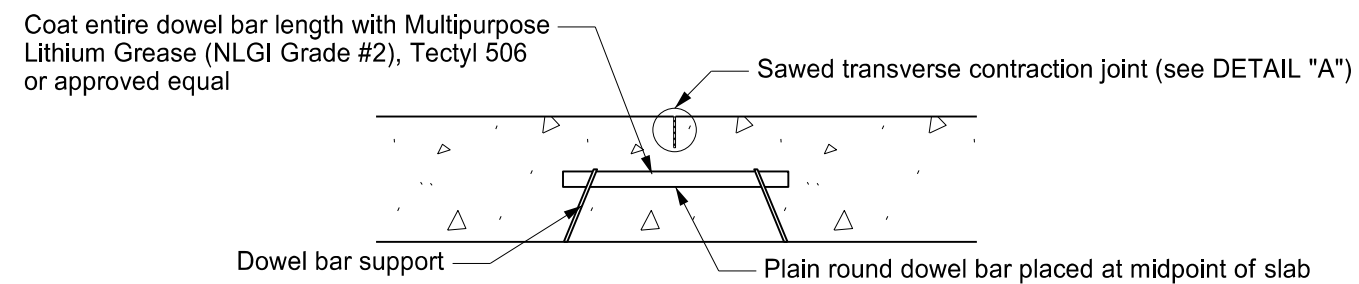


CONTRACTION JOINT DOWEL ASSEMBLY

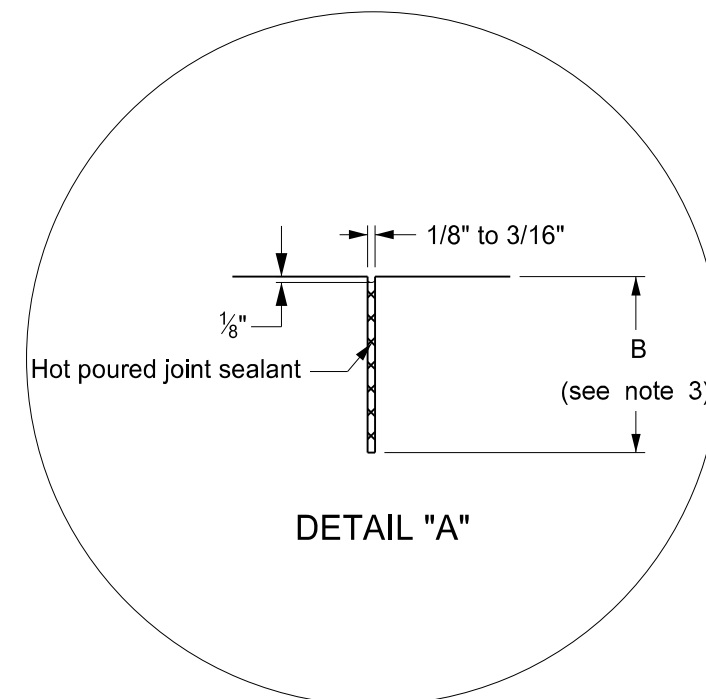
(1/2 roadway shown)

- ## Notes

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



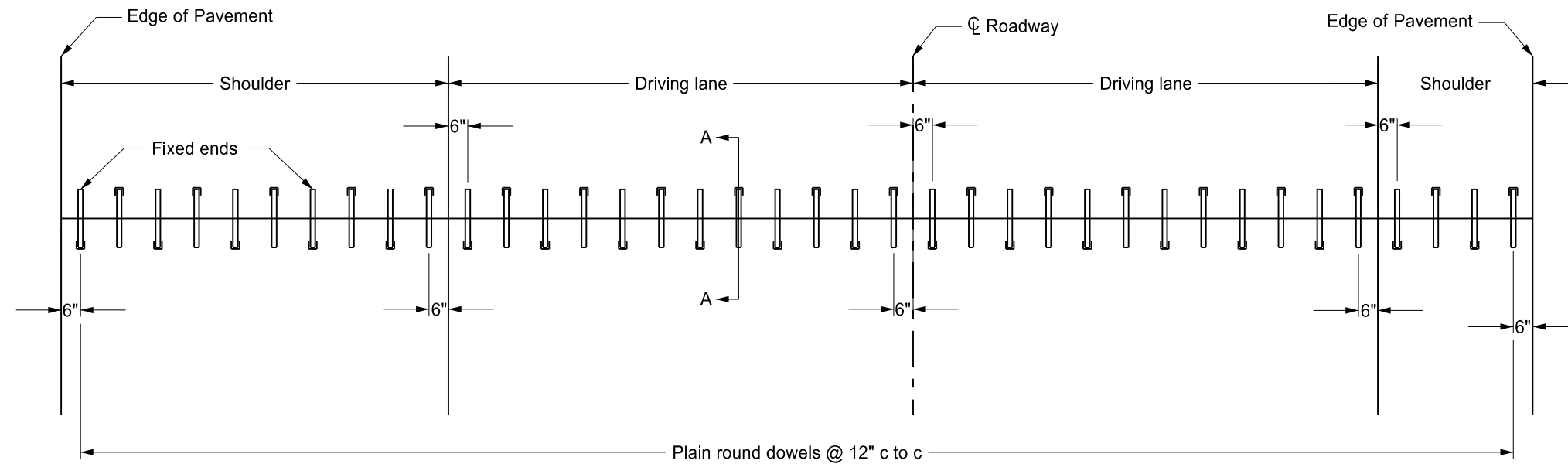
SECTION A-A



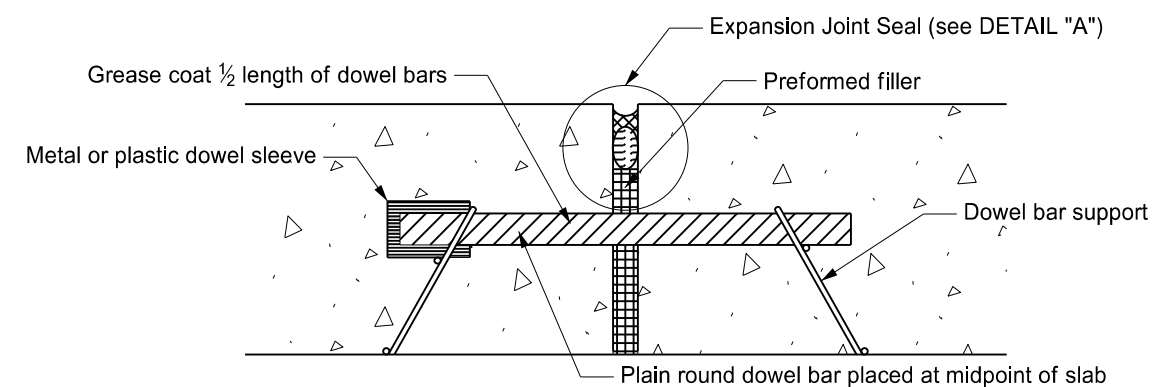
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-2010	
REVISIONS	
DATE	CHANGE
6/23/2014	Removed dowel size reference
3/16/2016	Revised Joint Details and notes

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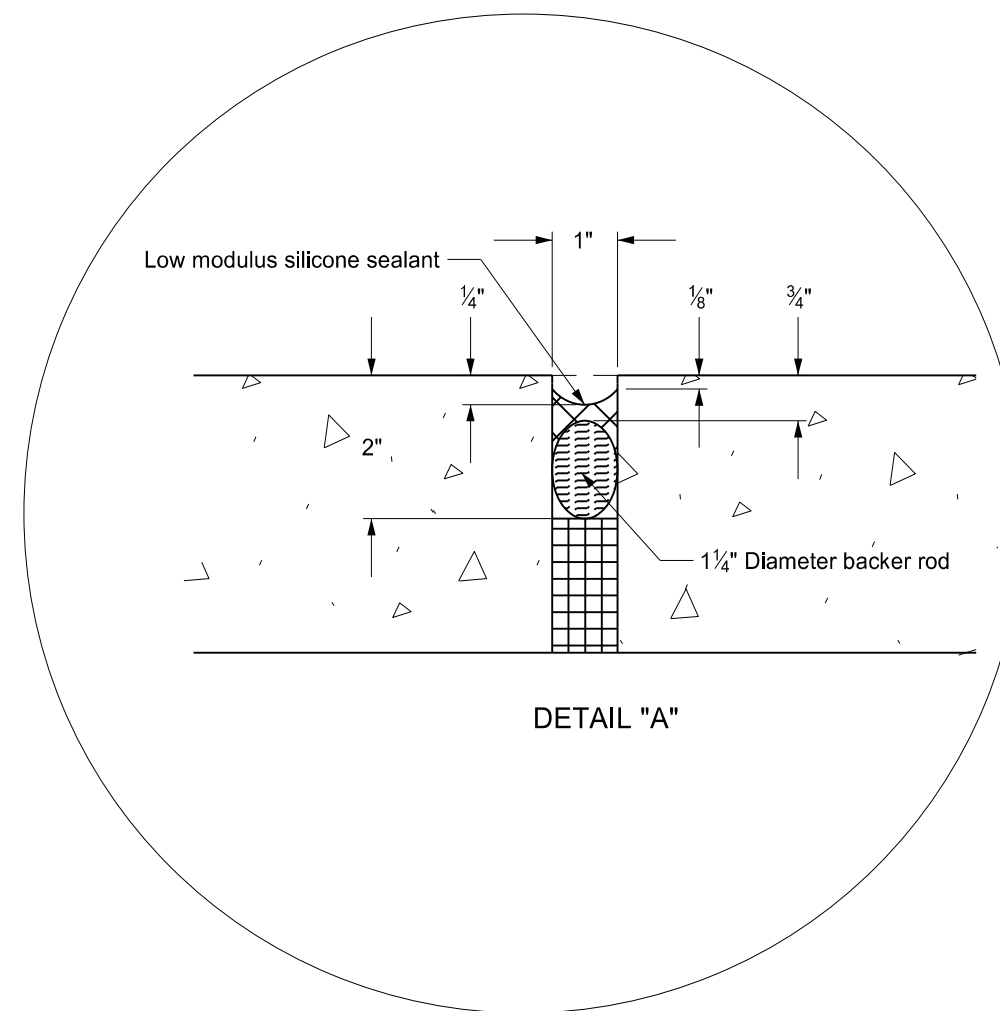
TRANSVERSE EXPANSION JOINT DETAIL



DOWELED EXPANSION JOINT ASSEMBLY



SECTION A-A

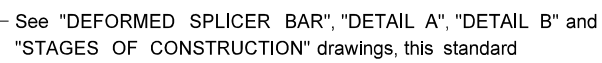


DETAIL "A"

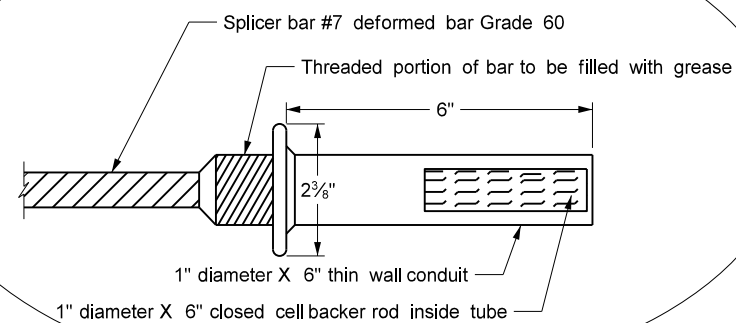
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-2010	
REVISIONS	
DATE	CHANGE
6/23/2014	Removed dowel bar sizes

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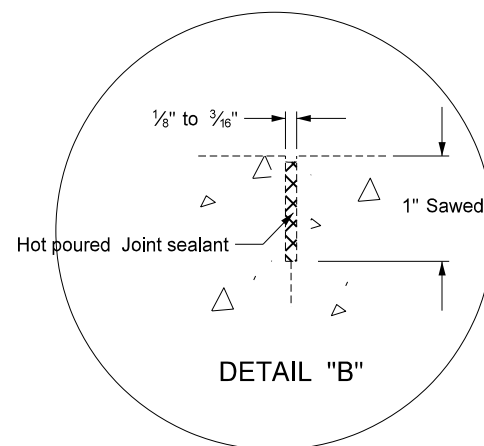
D-550-5



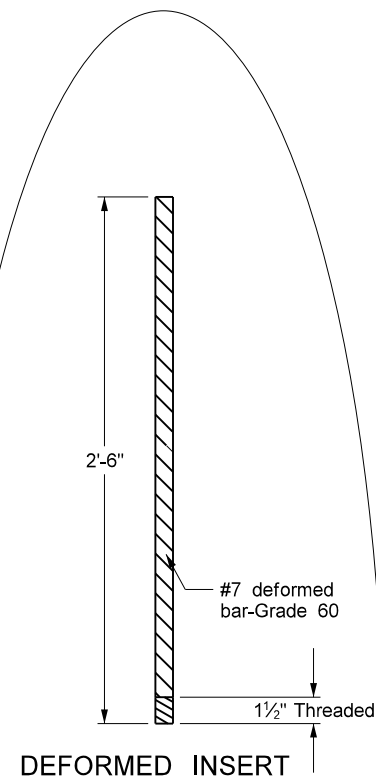
PLAN VIEW



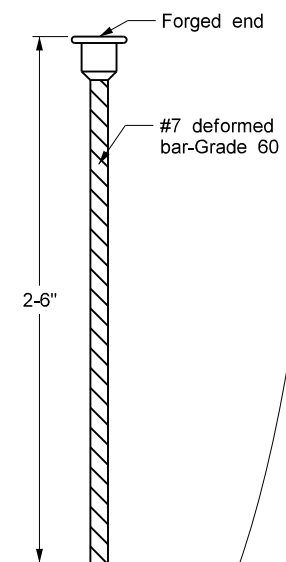
DETAIL "A"



DETAIL "B"



DEFORMED INSERT



DEFORMED
SPLICER BAR

Deformed bar splicer assembly

See DETAIL "A"

End of concrete pour

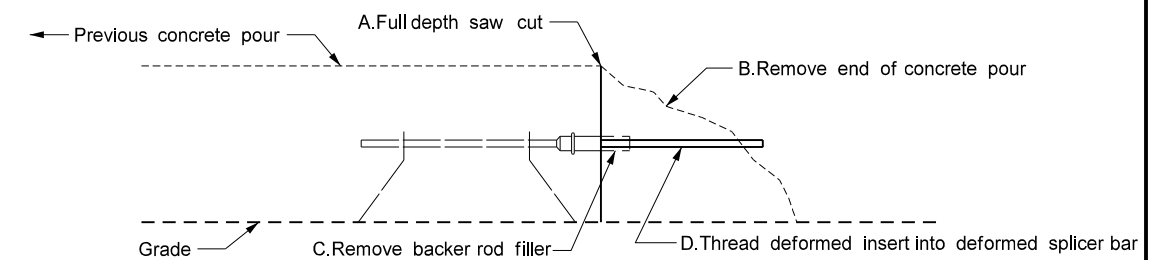
Stake assembly on grade

Stage 1

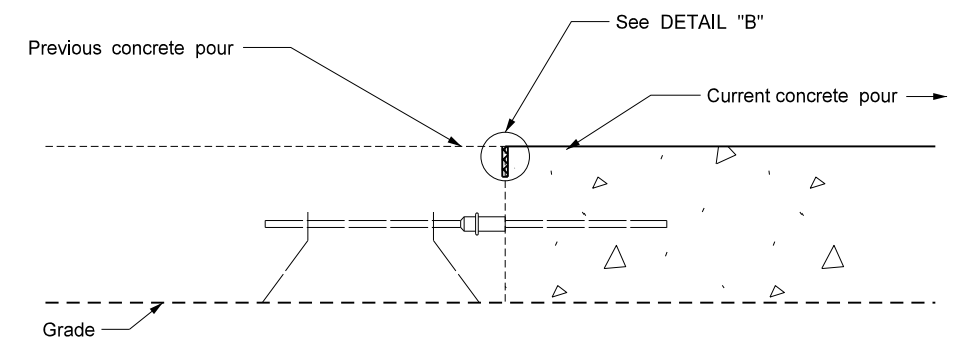
$T/2 \pm \frac{3}{4}"$

T

Stage 1



Stage 2



Stage 3

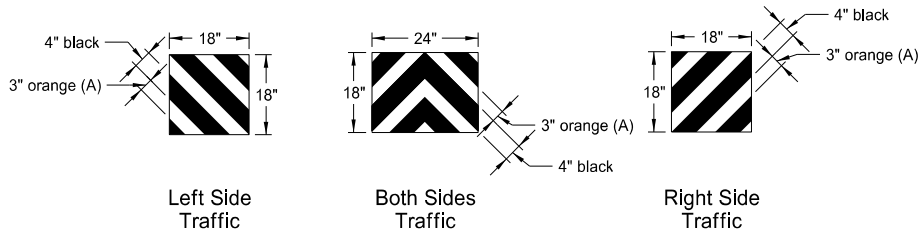
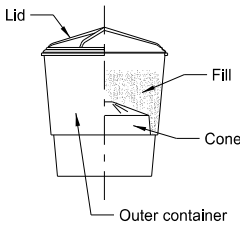
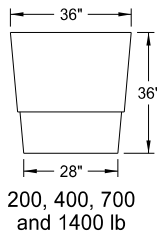
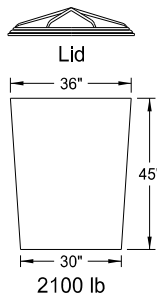
1. Saw and seal all construction joints.
2. Include all costs for transverse construction joints in the price bid for PCC pavement.
3. Do not saturate the subgrade during the sawing operation.

[illegible]

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ATTENUATION DEVICE

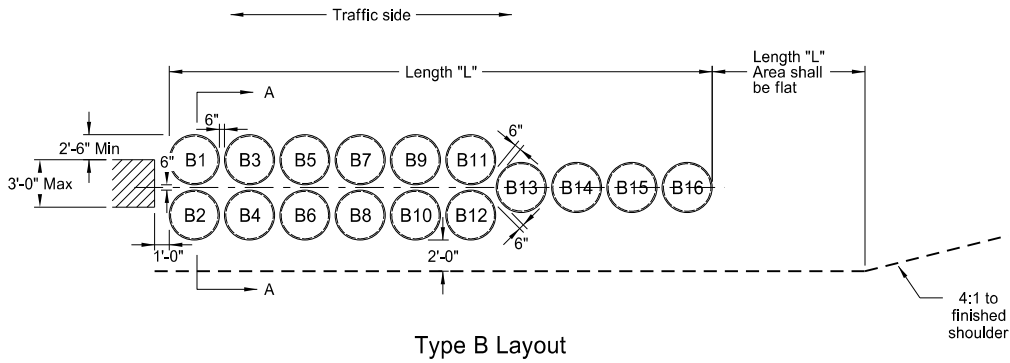
D-704-1



Reflective Sheet Detail

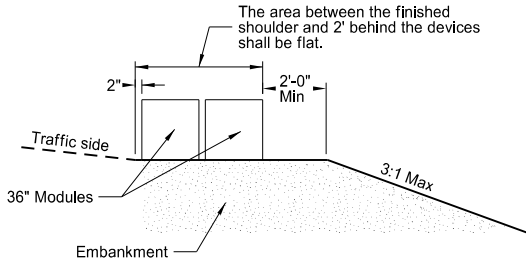
Note:
The last attenuation device facing traffic shall have a reflective sheet, following the details above, directly applied to the outer container. The sheet may also be applied to a metallic sheet and attached to the container with approved fasteners. The reflective sheeting shall be Type IV as specified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

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



Type B Layout

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



Section A-A
(Type B Layout)

Typical Module
Construction Detail

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

Notes:

- Materials
 - Modules shall be manufactured from a frangible polyethylene material which will shatter upon impact.
 - Modules shall be filled with class 43 aggregate meeting the requirements for aggregate according to NDDOT Standard Specifications. The fill unit weight shall be at least 100 pounds per cubic foot. Fill left over winter shall have a moisture content of 2% or less.
- Modules
 - The modules shall be provided in two sizes to contain volumes of either 2, 4, 7, 14, or 21 cubic feet as a minimum.
 - The module for the 2, 4 or 7 cubic foot container shall consist of three components:
 - A 14 C.F., yellow outer container.
 - A black lid which locks securely over the top lip of the container.
 - A cone-shaped supporting insert. The insert shall be varied to allow for the three sizes of modules and capable of supporting 200, 400, or 700 pounds of sand mass. The cone inserts shall be placed inside the 14 cubic foot container.
 - The module for the 21 cubic foot container shall consist of two components:
 - A 36" height X 36" width yellow outer container.
 - A black lid which locks securely over the top of the container.
- For temporary use: The modules shall be Energite or Fitch attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, TrafFix barrels manufactured by TrafFix Devices, Inc. of San Clemente, CA, or an approved equal. The attenuation devices may be placed on pallets to facilitate maintenance. Pallets shall have a maximum thickness of 3½".
- For permanent use: Barrel Attenuation Device installations, the outer sand container portion of the modules shall consist of a one-piece container with separate detachable lid. The modules which meet these requirements are Energite attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, TrafFix barrels manufactured by TrafFix Devices, Inc. of San Clemente, CA, or an approved equal. Modules having outer sand containers assembled from multiple pieces shall not be accepted for permanent installations.
- The Typical Module Construction Detail and Type B Layout are based on the Energite Crash Cushion manufactured by Energy Absorption. The manufacturer of other sand filled attenuation modules shall provide any necessary layouts and details required which differ from those shown here.

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
7-18-14	Revised sheeting in reflective sheet detail

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WORK ZONE BUSINESS SIGN DETAILS

D-704-4

SIGN NUMBER	Con Sign				
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

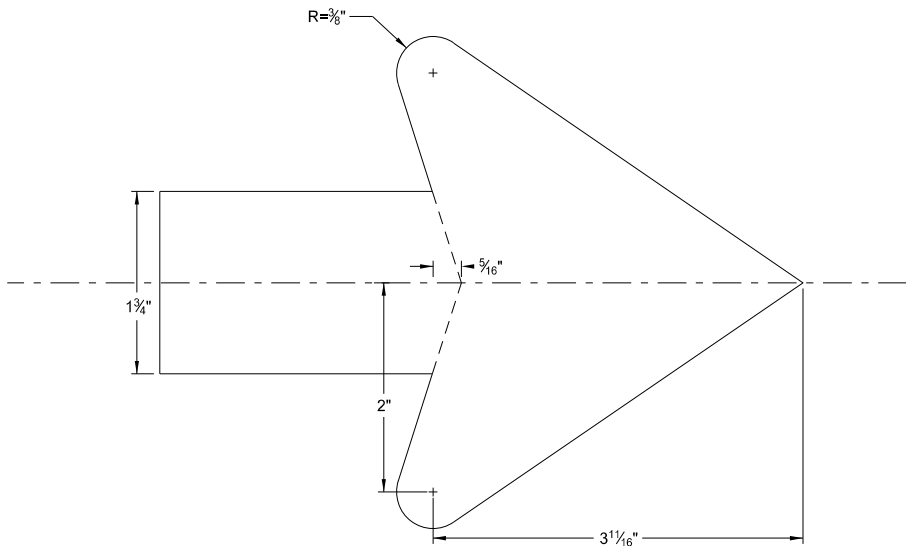
STATION(S):

AREA: 6.0 Sq.Ft.

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

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.



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9-25-12		
REVISIONS		
DATE	CHANGE	
7-18-14	Revised sheeting to type IV	

CONSTRUCTION SIGN DETAIL

D-704-5

SIGN NUMBER	G20-10-108				
WIDTH x HEIGHT	9'-0" x 4'-0"				
BORDER WIDTH	1.25" (Inset 0.75")				
CORNER RADIUS	3"				
MOUNTING	Ground				
BACKGROUND	TYPE: IV Reflective				
	COLOR: Fluorescent Orange				
LEGEND/BORDER	TYPE: Non-Refl				
	COLOR: Black				

SYMBOL	X	Y	WID	HT	ANGLE
	42.1	6.2	24	4	0

STATION(S):

AREA: 36.0 Sq.Ft.

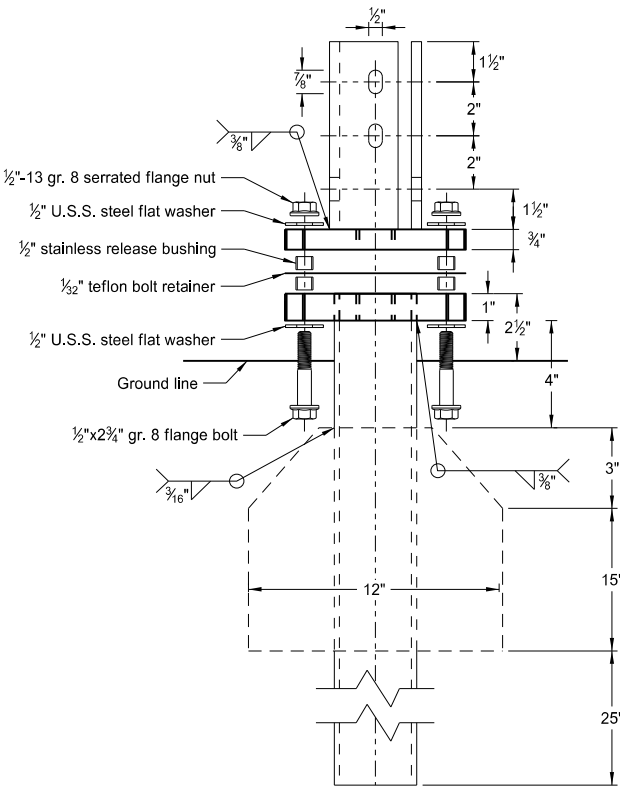
Dimensions are in inches, tenths Letter locations are panel edge to lower left corner

Notes:

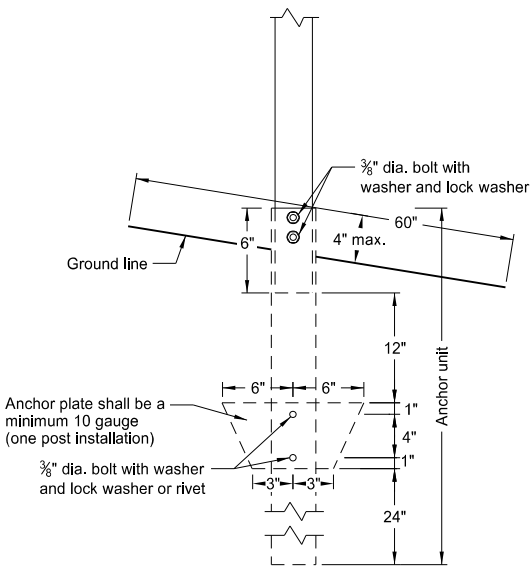
1. Sign shall be placed a distance of $\frac{1}{2}A$ following the End Road Work (G20-2a-48) sign. There shall be a maximum of 2 signs per project.
2. Sign shall be post mounted.
3. Sign required on rural projects with a 30 day or longer duration and it is not required on seal coat projects or other short duration projects.
4. Sign shall not be placed in urban areas or within city limits.

Advance Warning Sign Spacing (A)			
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

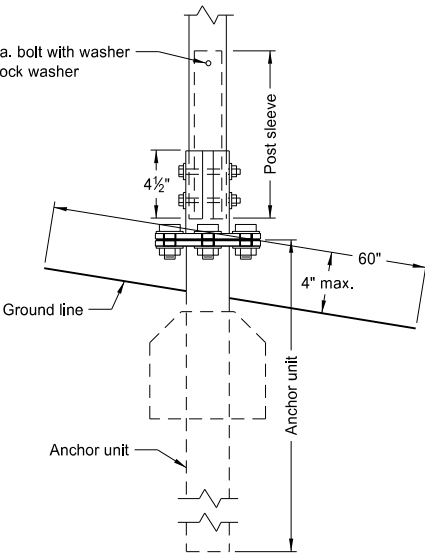
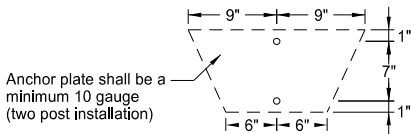
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION		This document was originally issued and sealed by Roger Weigel Registration Number PE- 2930 , on 7/18/14 and the original document is stored at the North Dakota Department of Transportation
8-22-12		
REVISIONS		
DATE	CHANGE	
7-18-14	Revise sheeting to type IV	



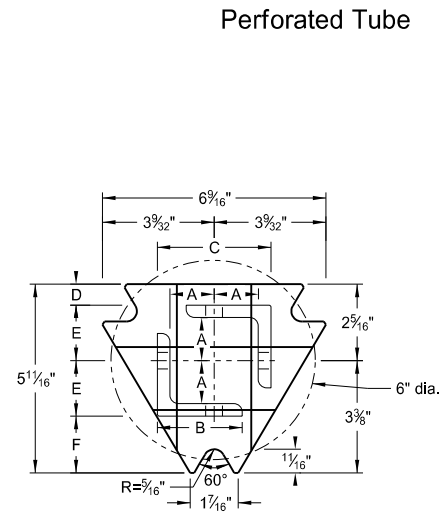
Multi-Directional Slip Base Assembly



Anchor Unit and Post Assembly

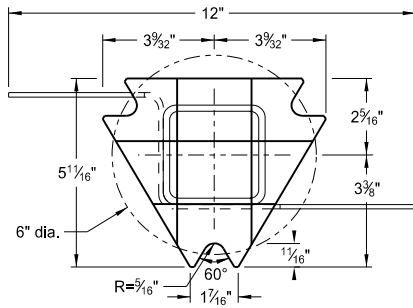


Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly



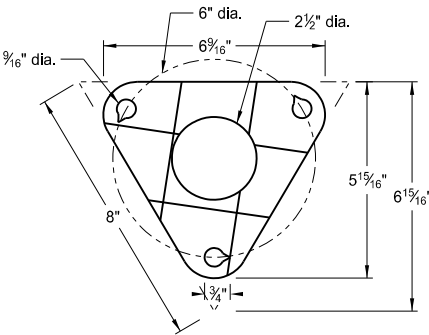
Top Post Receiver

Plate - ASTM A572 grade 50
Angle Receiver - 2 1/2"x2 1/2"x3/8" 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



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

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

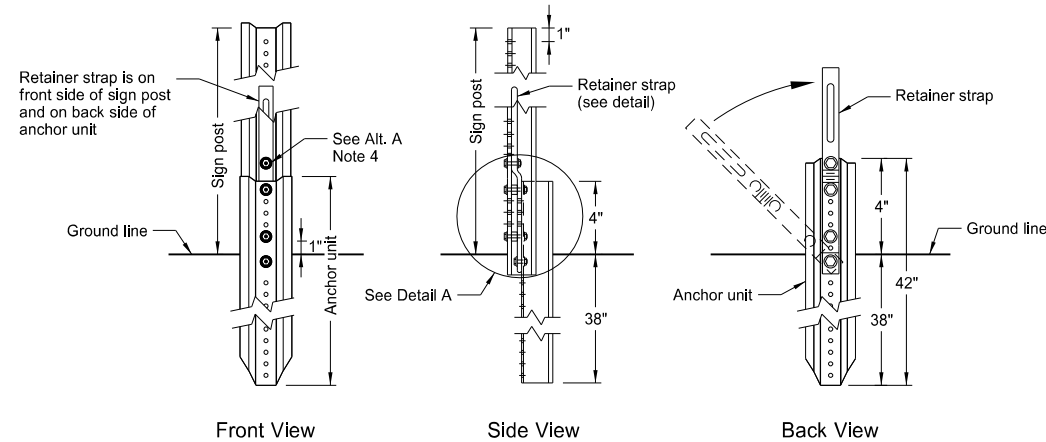
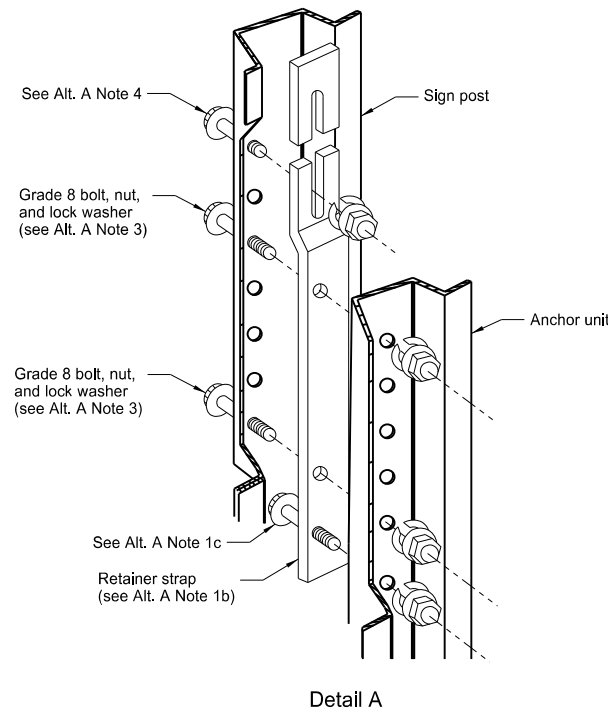
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2 3/16"x10 ga.	1 9/64"	2 1/2"	3 1/32"	2 5/32"	1 33/64"	1 7/8"
2 1/2"x10 ga.	1 9/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"

- (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

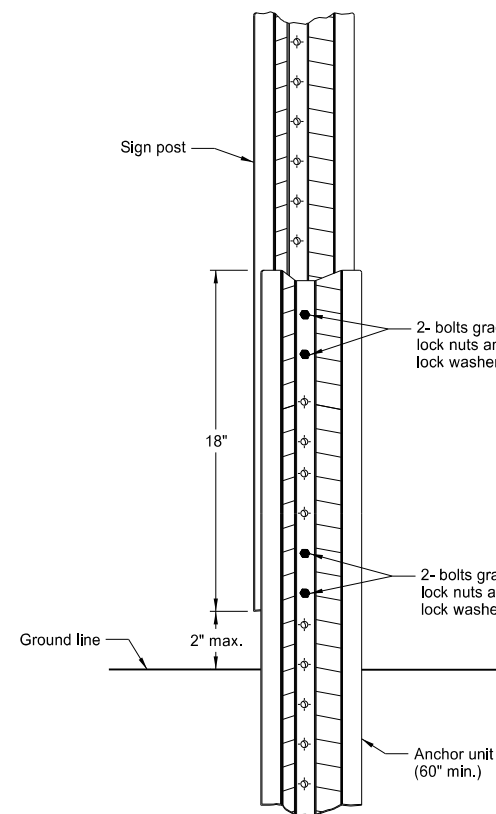
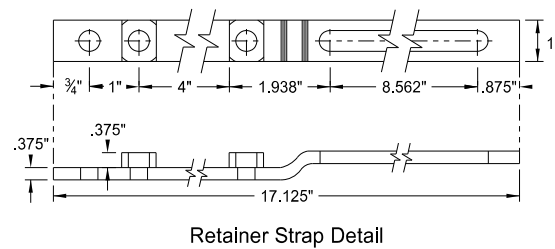
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U-Channel Post



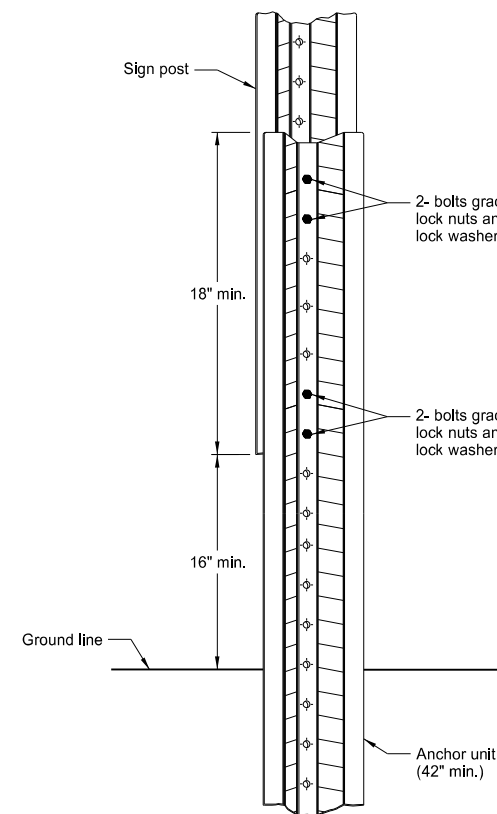
Breakaway U-Channel Detail Alternate A

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



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:

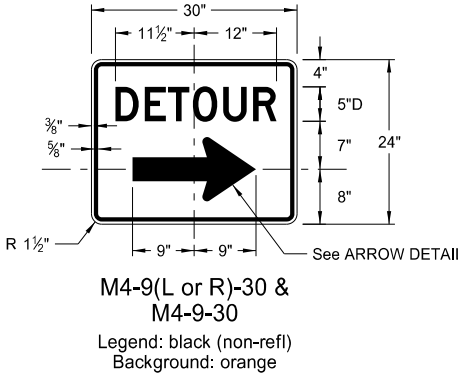
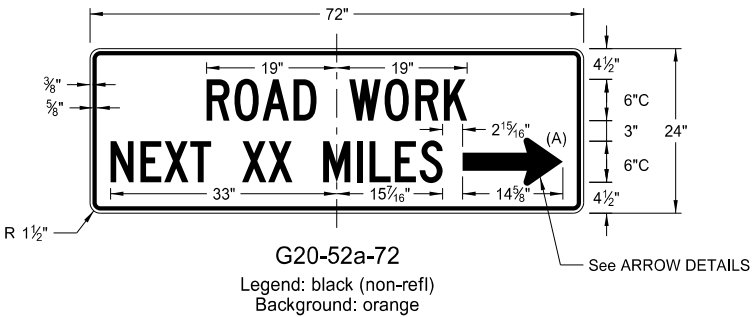
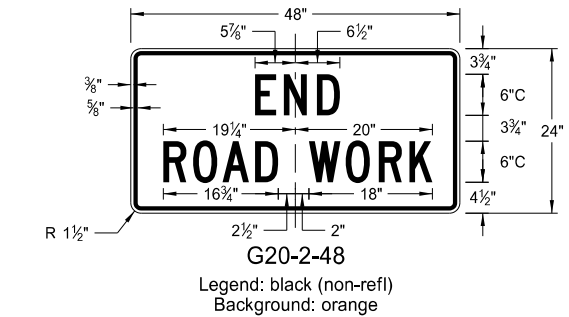
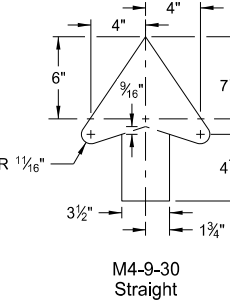
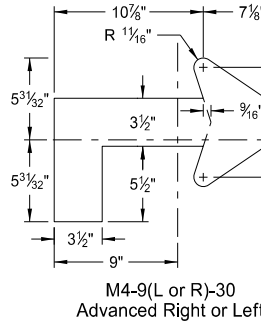
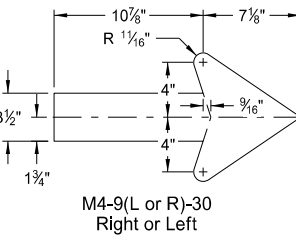
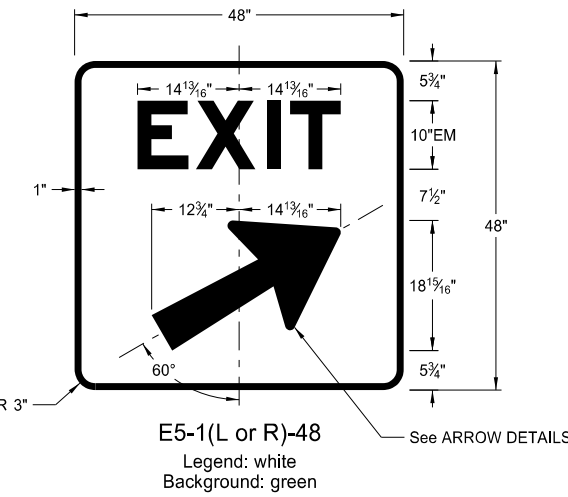
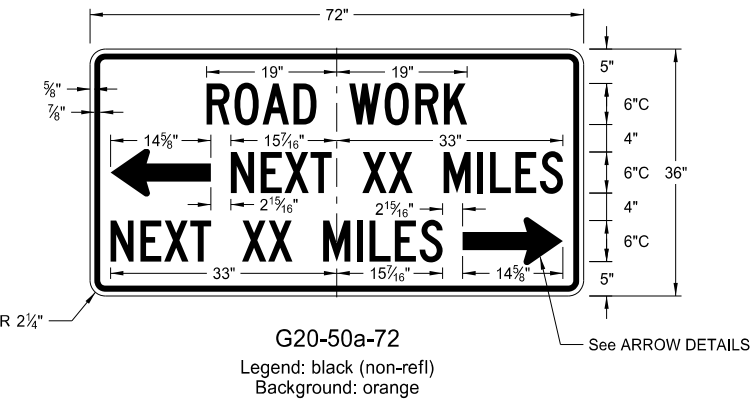
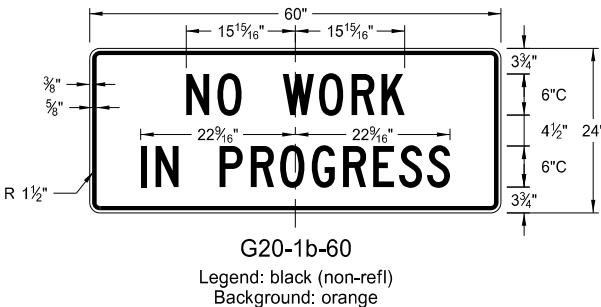
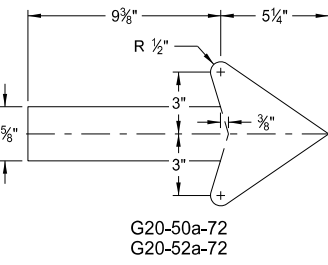
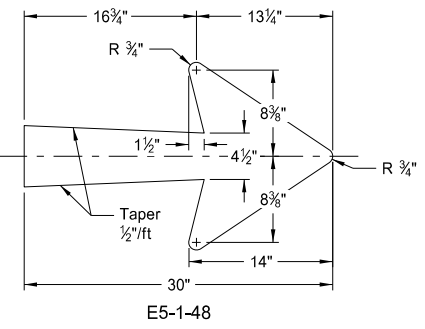
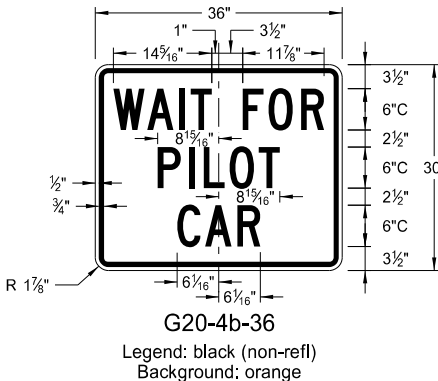
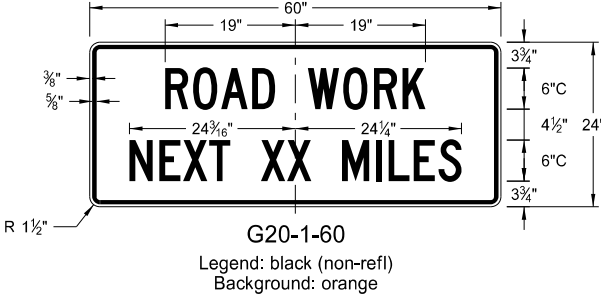
- a) Drive anchor unit to within 12" of ground level.
b) Proper assembly established by lining up the bottom hole of retainer strap with the 6th hole from the top of the anchor unit.
c) Assemble strap to back of anchor unit using $\frac{5}{16}$ "x2" bolt, lock washer and nut.
d) Rotate strap 90° to left.
- a) Drive anchor unit to 4" above ground.
b) Rotate strap to vertical position.
- a) Place $\frac{5}{16}$ "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.
- Complete assembly by tightening $\frac{5}{16}$ "x2" bolt (this fastens sign post to retainer strap).
- 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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CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS

D-704-9



ARROW DETAILS

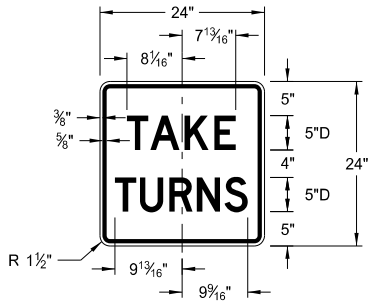
NOTES:
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
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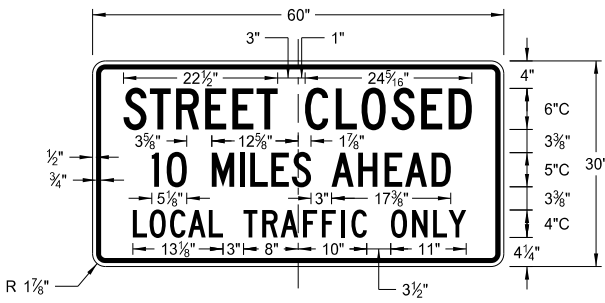
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CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS

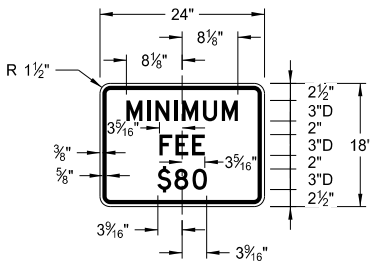
D-704-10



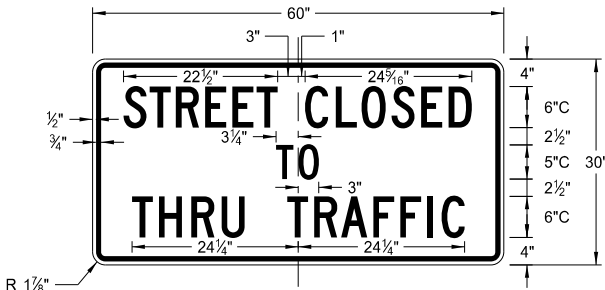
R1-50-24
Legend: black (non-refl)
Background: white



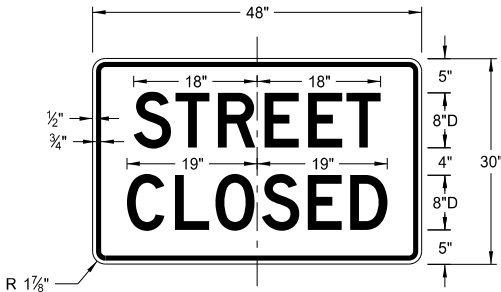
R11-3c-60
Legend: black (non-refl)
Background: white



R2-1a-24
Legend: black (non-refl)
Background: white



R11-4a-60
Legend: black (non-refl)
Background: white



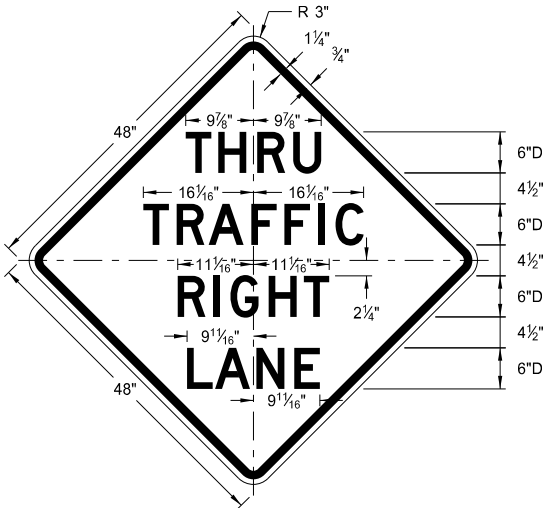
R11-2a-48
Legend: black (non-refl)
Background: white

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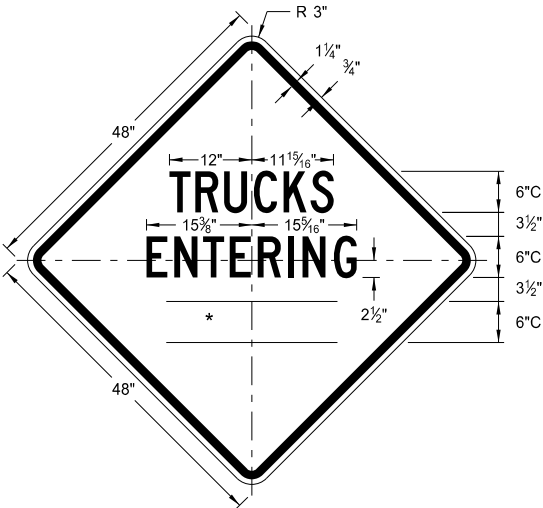
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CONSTRUCTION SIGN DETAILS
WARNING SIGNS

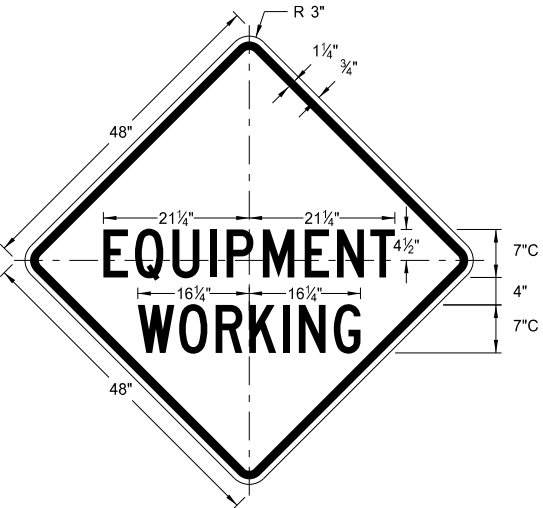
D-704-11



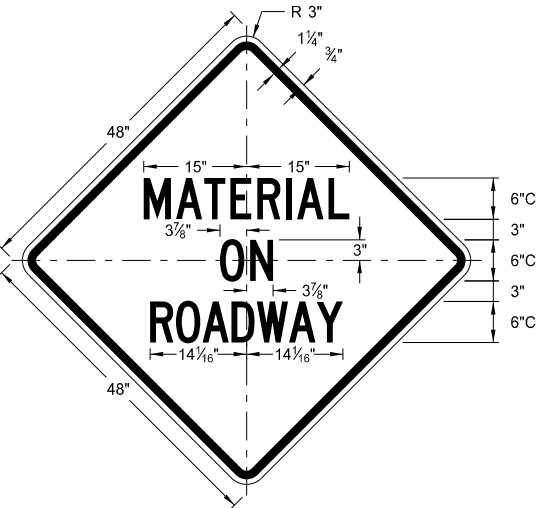
W5-8-48
Legend: black (non-refl)
Background: orange



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



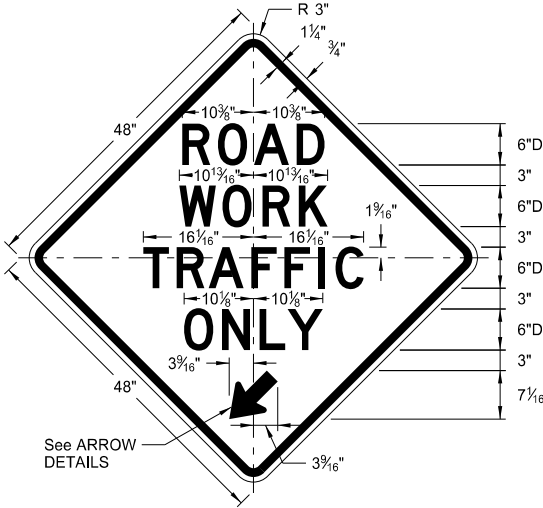
W20-51-48
Legend: black (non-refl)
Background: orange



W21-51-48
Legend: black (non-refl)
Background: orange

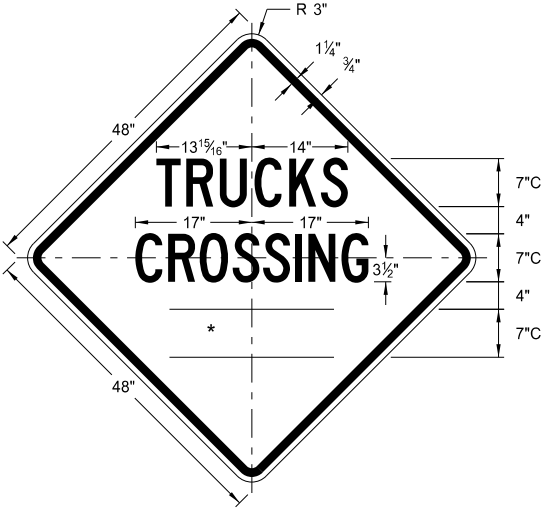
WORD	LETTER SPACING
AHEAD	Standard
200 FT	Standard
350 FT	Standard
500 FT	Standard
1000 FT	Reduce 40%
1500 FT	Reduce 40%
1/2 MILE	Reduce 50%
1 MILE	Standard

* DISTANCE MESSAGES

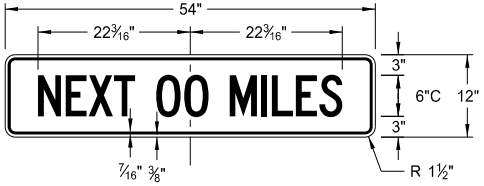


See ARROW
DETAILS

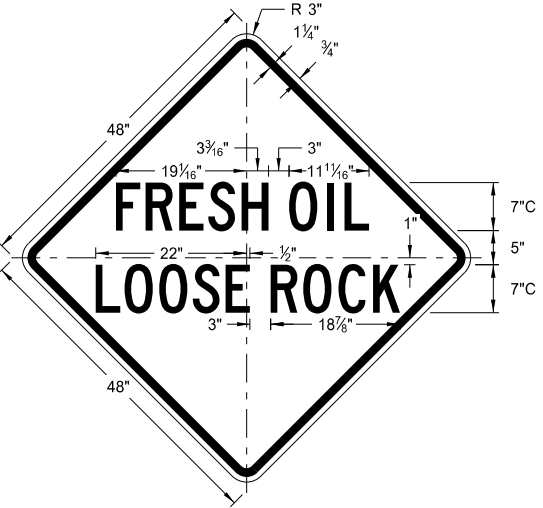
W5-9-48
Legend: black (non-refl)
Background: orange



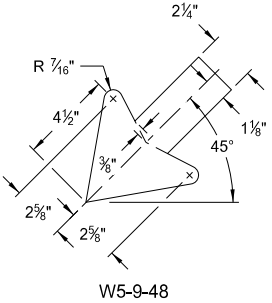
W8-55-48
Legend: black (non-refl)
Background: orange



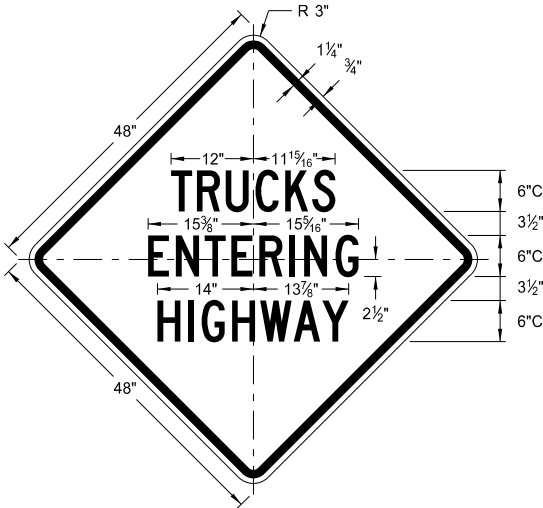
W20-52-54
Legend: black (non-refl)
Background: orange



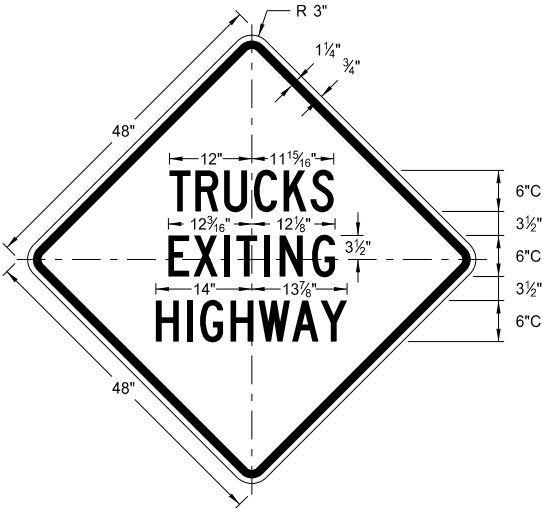
W22-8-48
Legend: black (non-refl)
Background: orange



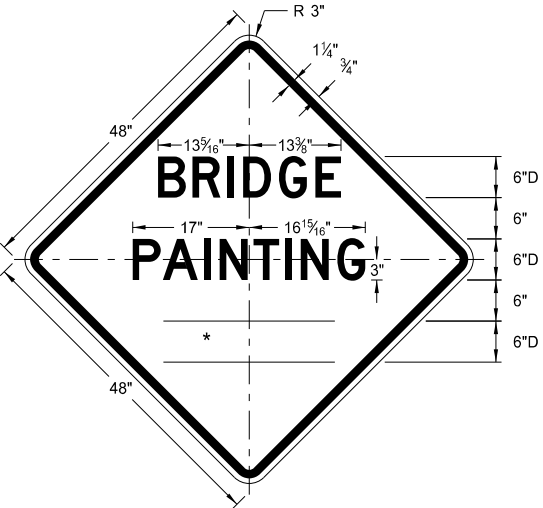
ARROW DETAILS



W8-53-48
Legend: black (non-refl)
Background: orange



W8-56-48
Legend: black (non-refl)
Background: orange



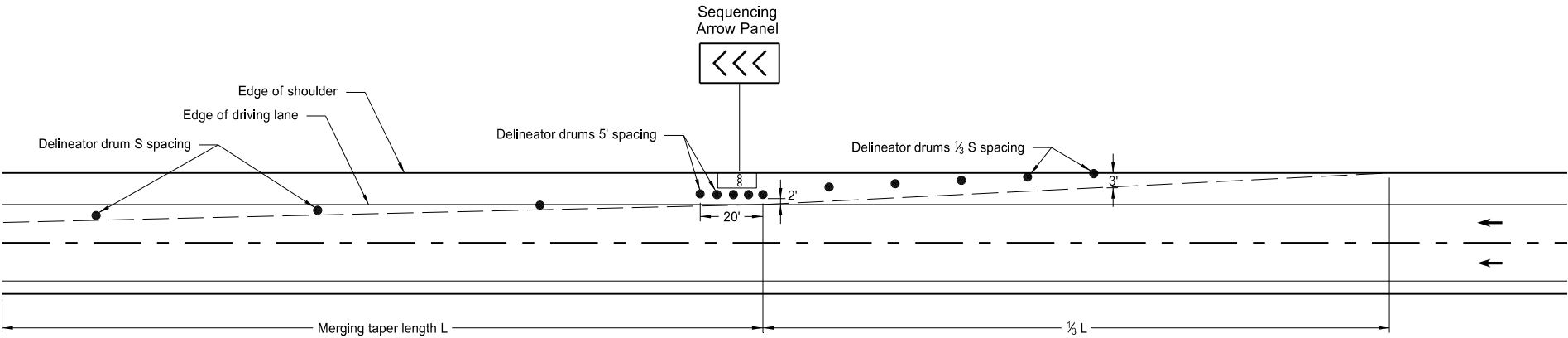
W21-50-48
Legend: black (non-refl)
Background: orange

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8-13-13	
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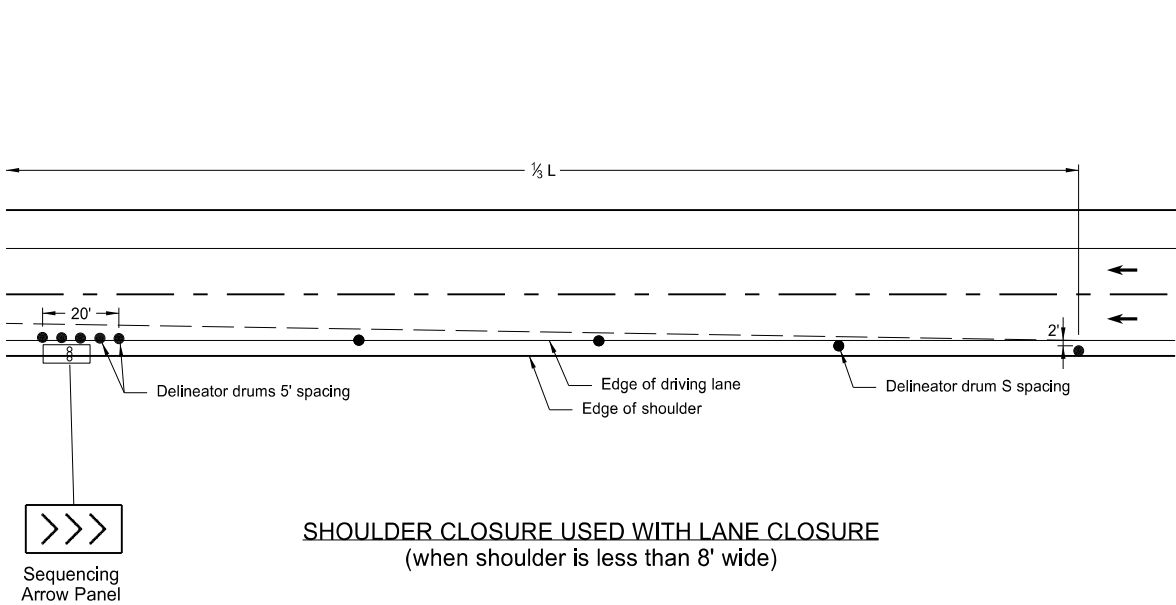
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SHOULDER CLOSURE TAPERS

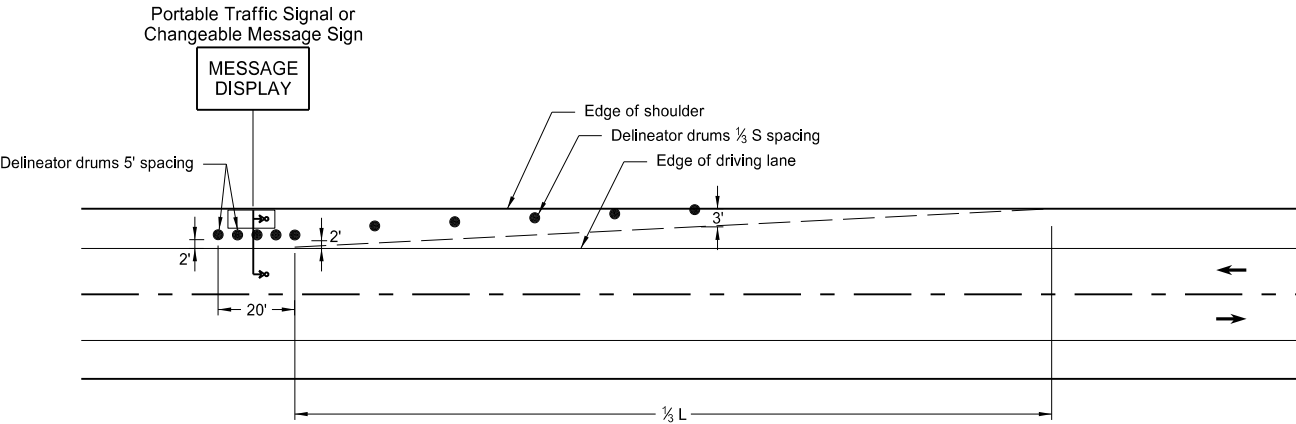
D-704-12



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

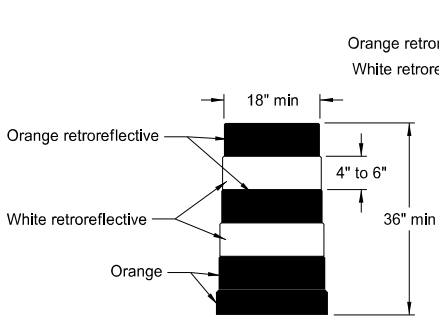
- Notes:
- S = Posted Speed Limit in mph
W = Width of offset in feet
L = Taper length in feet
 $L = WS^2/60$ (40mph or less)
 $L = WS$ (45mph or more)
 - If a shoulder taper is used, it should have a length of approximately $1/3L$. If a shoulder is used as a travel lane, a normal merging or shifting 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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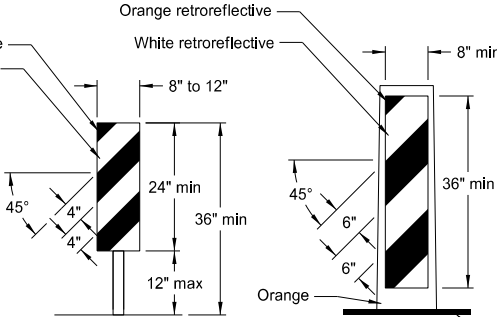
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



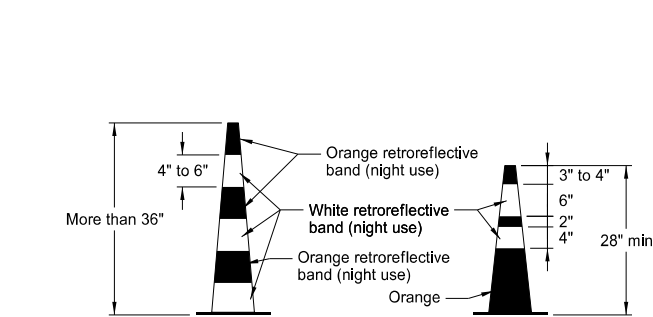
DELINEATOR DRUM

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 nonretroreflectORIZED 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.



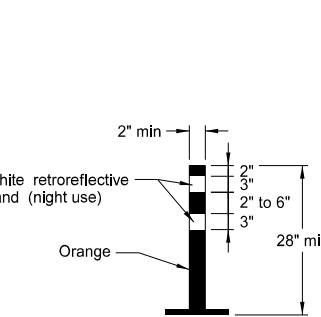
VERTICAL PANEL

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.



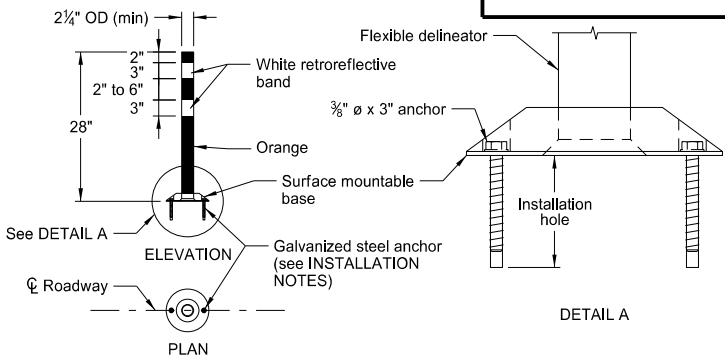
TRAFFIC CONE

RetroreflectORIZATION 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 nonretroreflectORIZED space between the orange and white stripes shall not exceed 3" wide.



TUBULAR MARKER

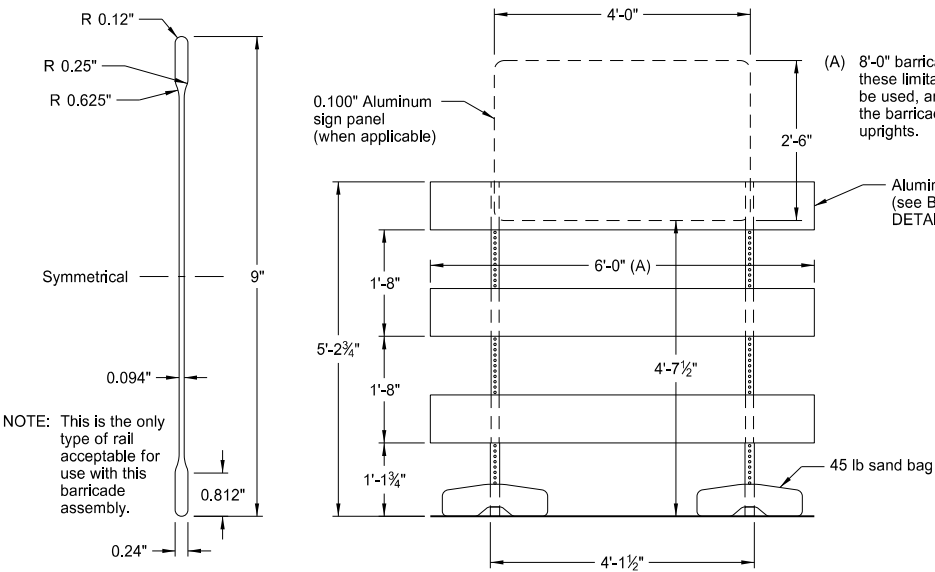
RetroreflectORIZATION of tubular markers more than 42" in height shall be provided by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

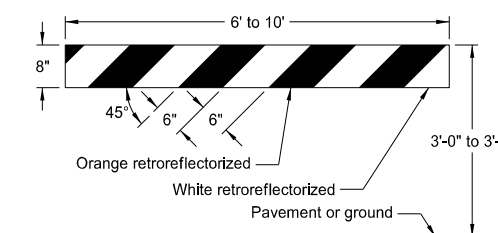
INSTALLATION NOTES:

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.

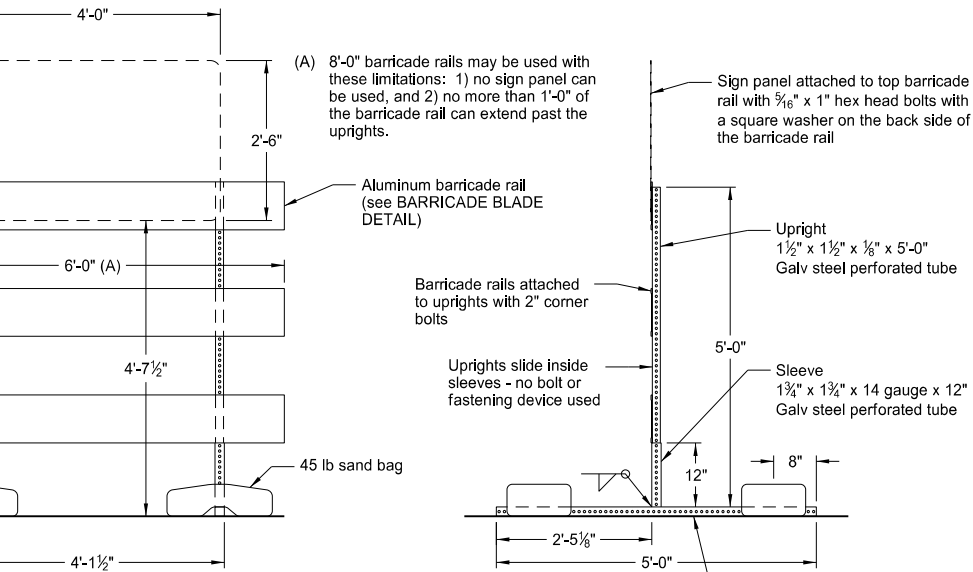


BARRICADE BLADE DETAIL

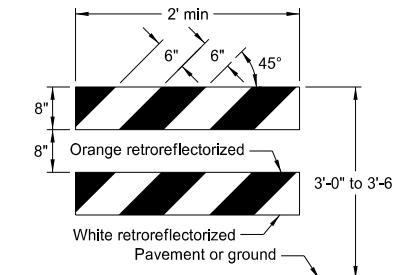
NOTE: This is the only type of rail acceptable for use with this barricade assembly.



TYPE I BARRICADE

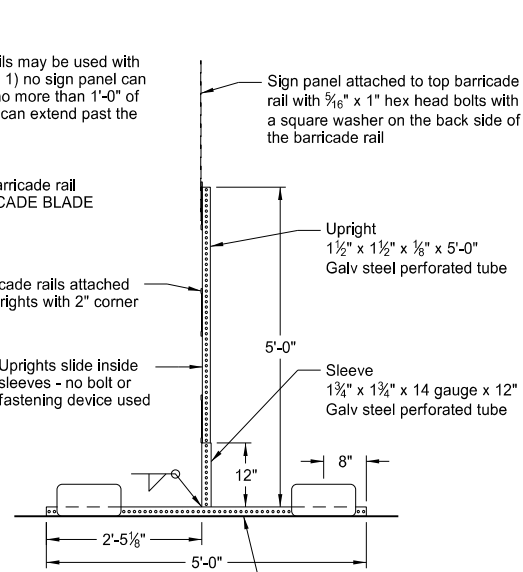


BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

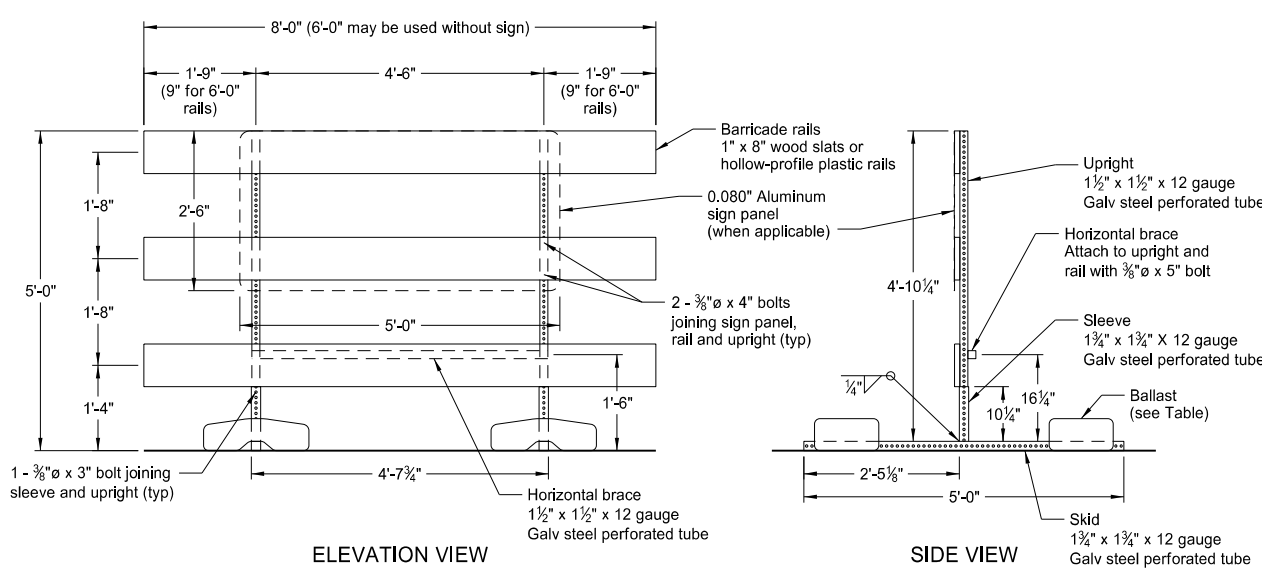


TYPE II BARRICADE

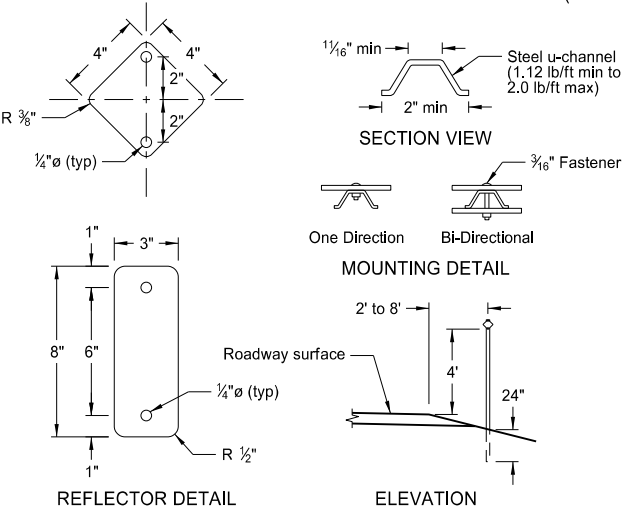
BARRICADE RAIL DETAILS



TYPE III BARRICADE



BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)



DELINEATORS

MINIMUM BALLAST (For each side of barricade support)

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

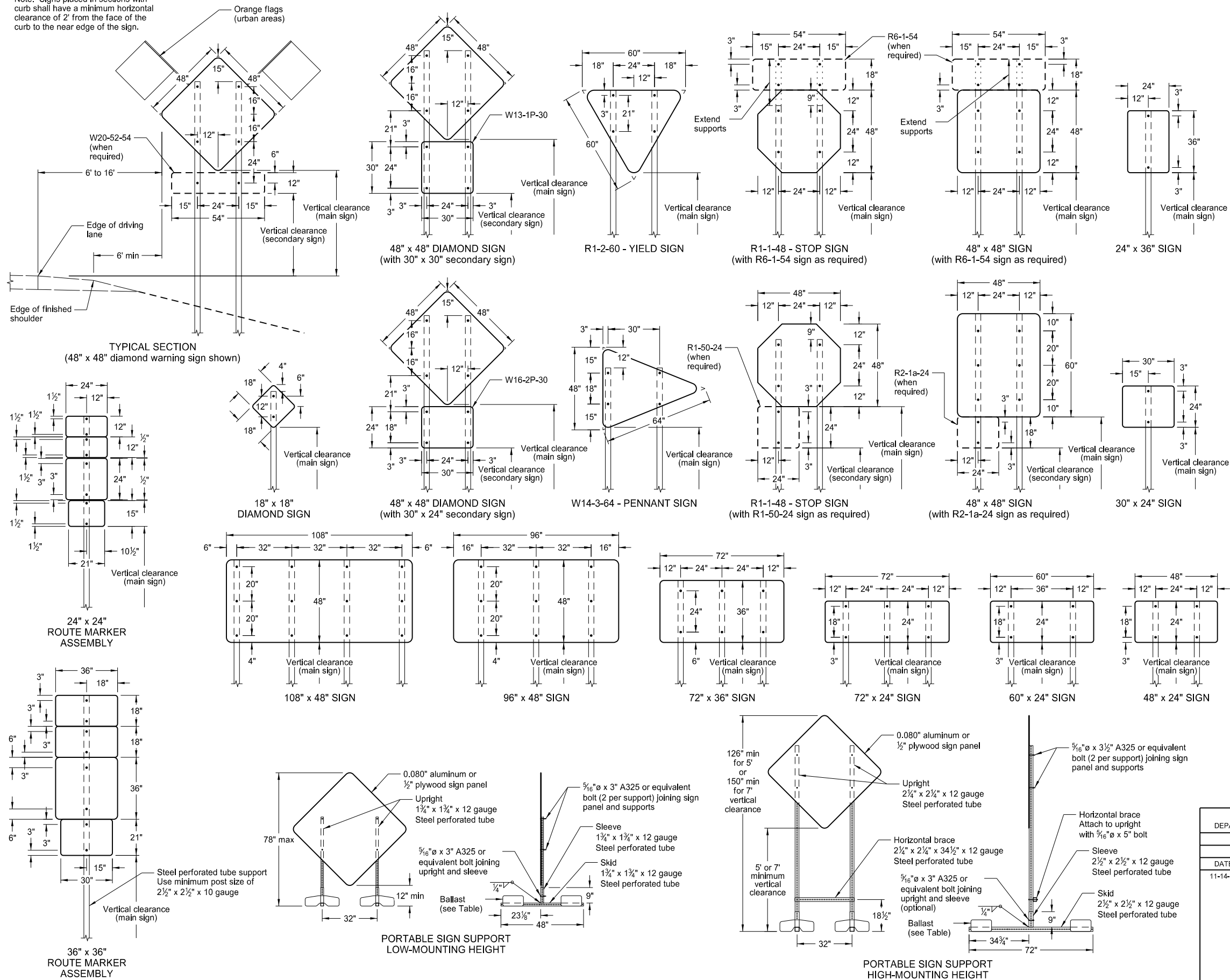
Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
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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.



NOTES:

1. 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.

2. 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.
3. 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)

4. Route Marker Auxiliary Signs: Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:

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

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

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

6. 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, W1-6 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.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-13	
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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.

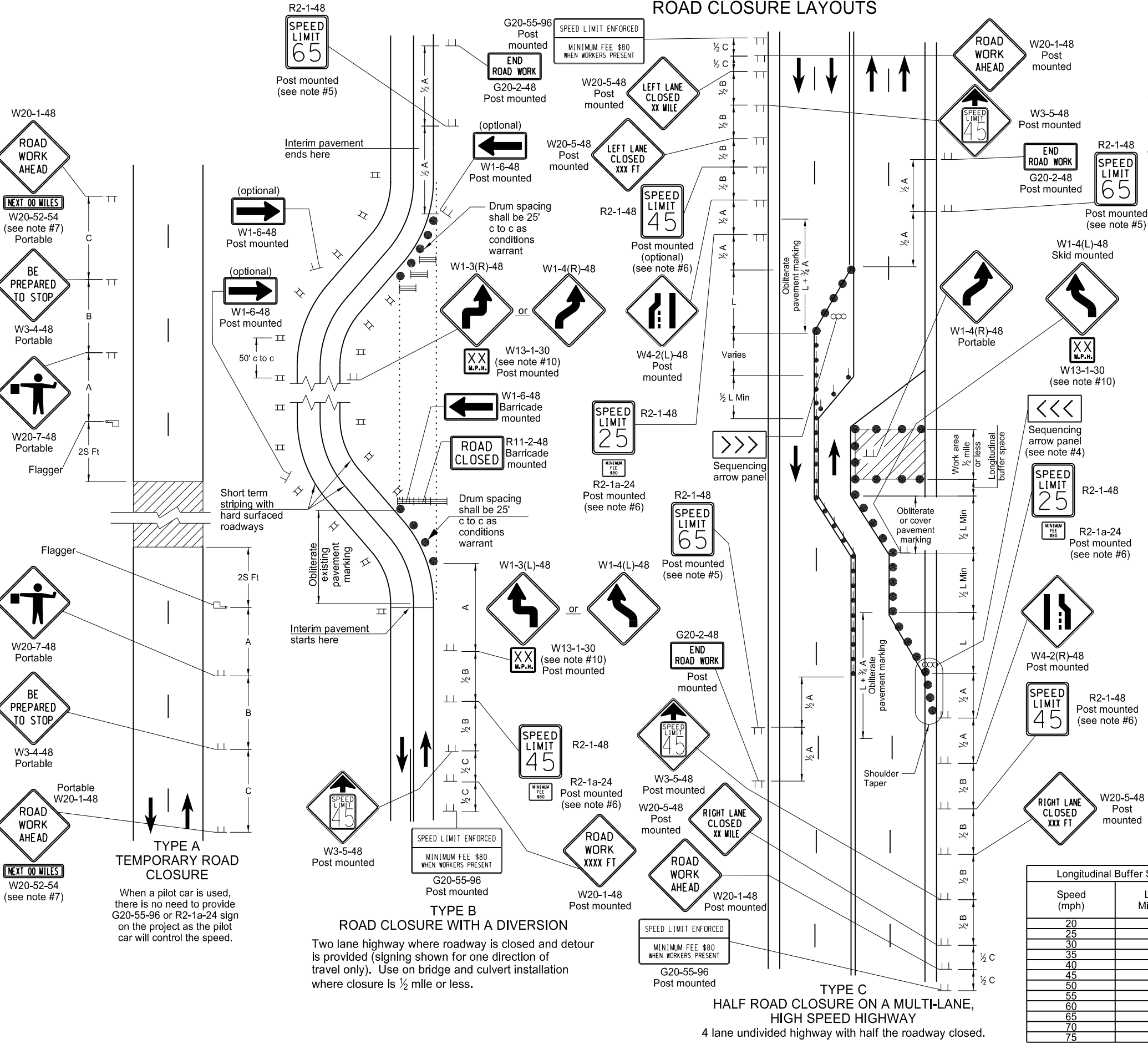
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway 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	
	Type III barricade
	Sign
	Delineator drum
	Tubular markers
	Work area
	Flagger
	Sequencing arrow panel
	Vertical panels back to back

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

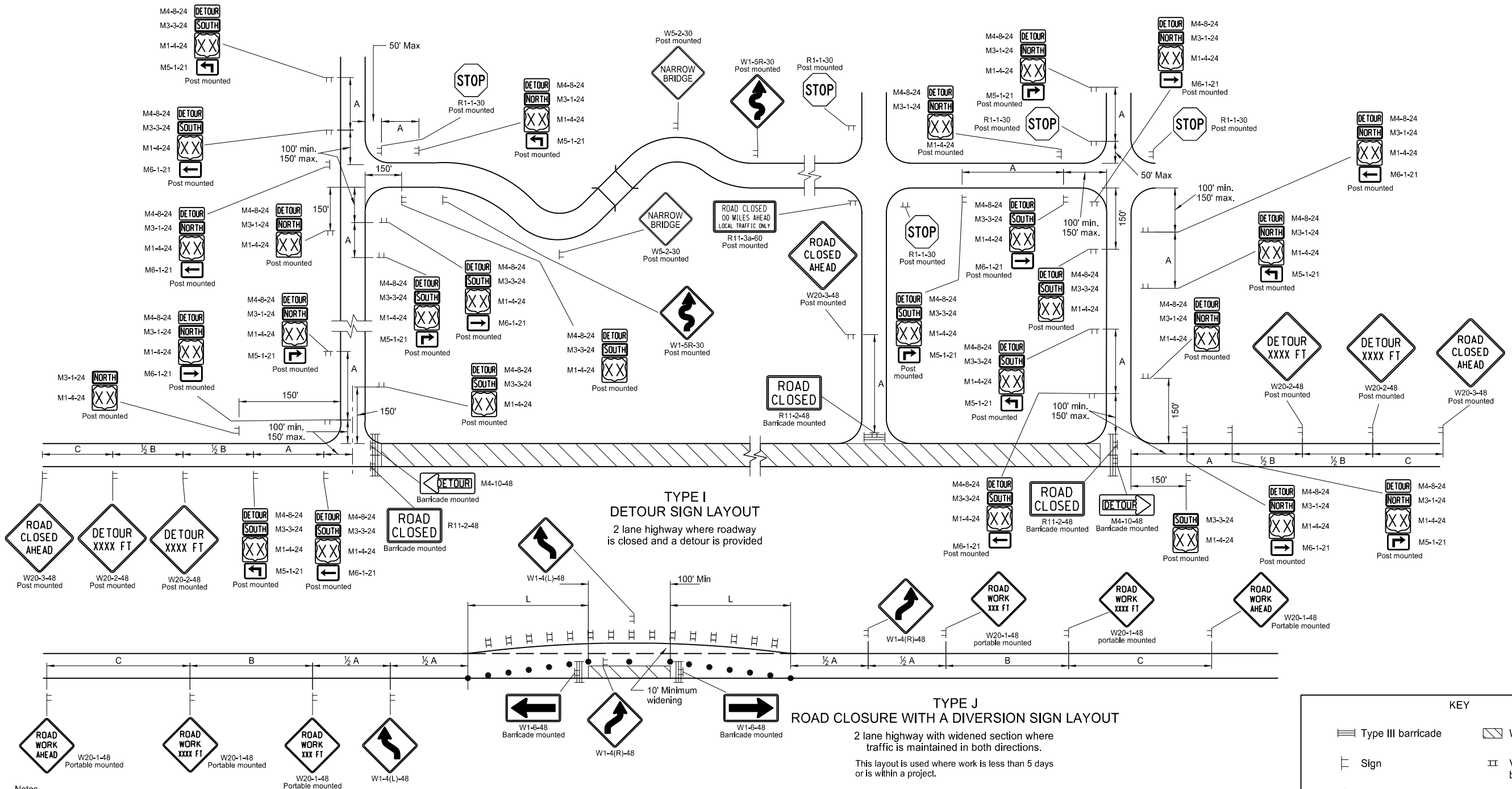
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DETOUR AND ROADWAY DIVERSION SIGN LAYOUTS

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 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 payment 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.

- A W24-1-48 sign may be used in place of the double reverse curve signs if the tangent between tapers is less than 600'.

KEY

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

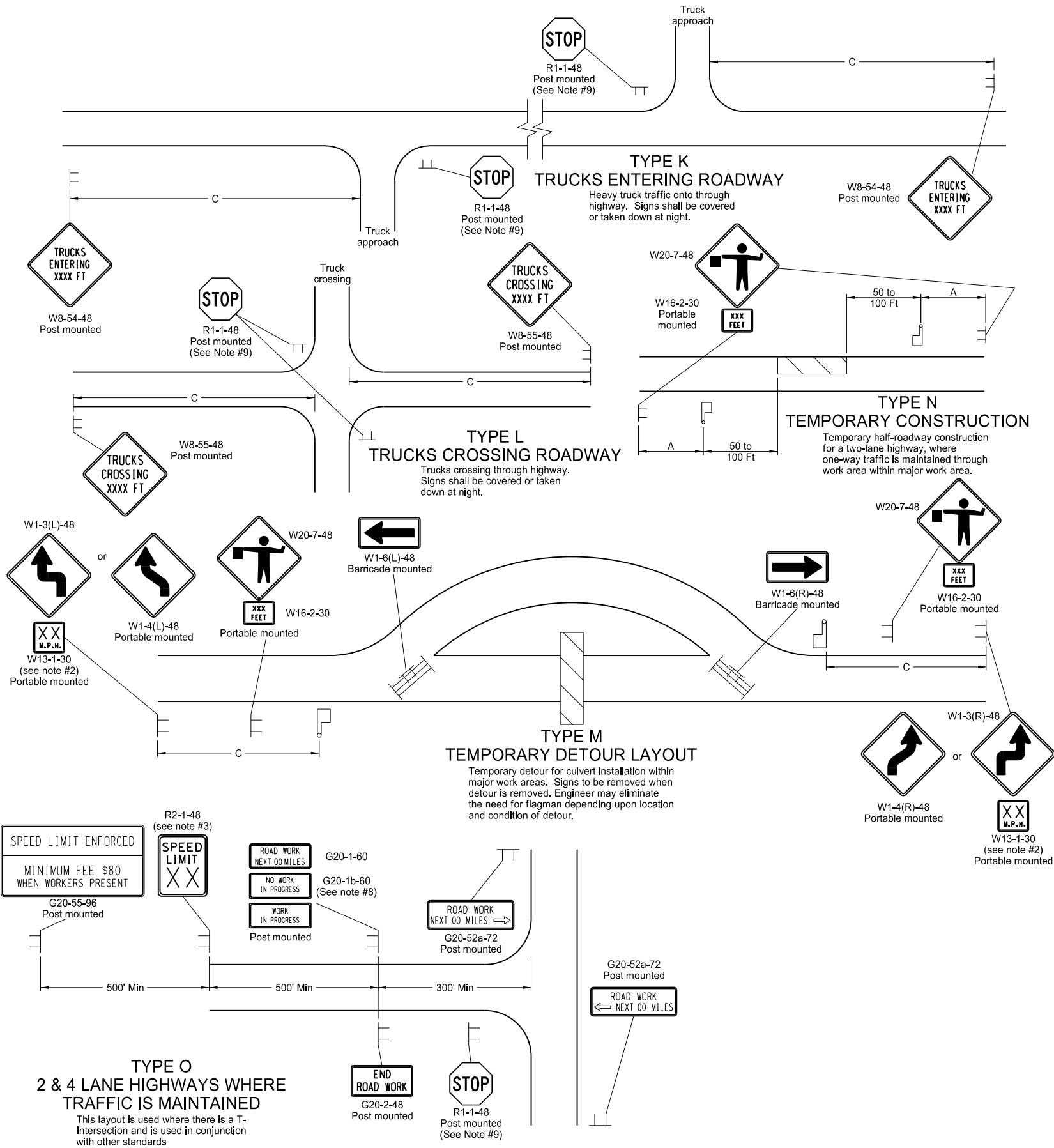
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway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

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CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

D-704-22



- Notes
1. Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies. Where necessary, safe speed to be determined by the Engineer.
 2. 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 ½ B.
 3. 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.
 4. Existing speed limit signs within a reduced speed zone shall be covered.
 5. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
 6. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
 7. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
 8. If existing stop sign is in place, a 48" stop sign is not required.
 9. G20-55-96 sign is not required if this standard is part of other traffic control layouts with this sign or the work is less than 15 days.
 - 10.

KEY

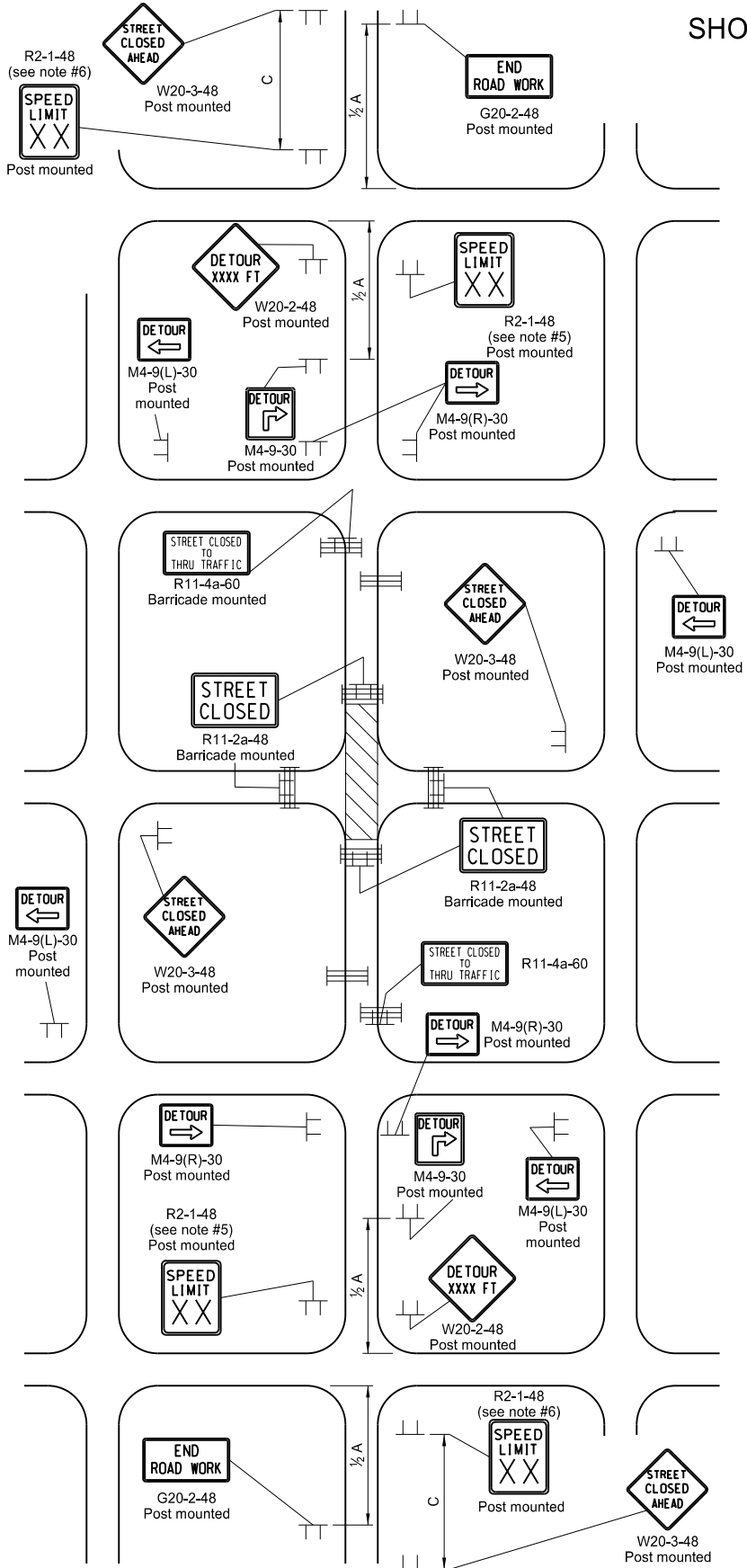
	Type III barricade		Work area
	Sign		Flagger

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 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

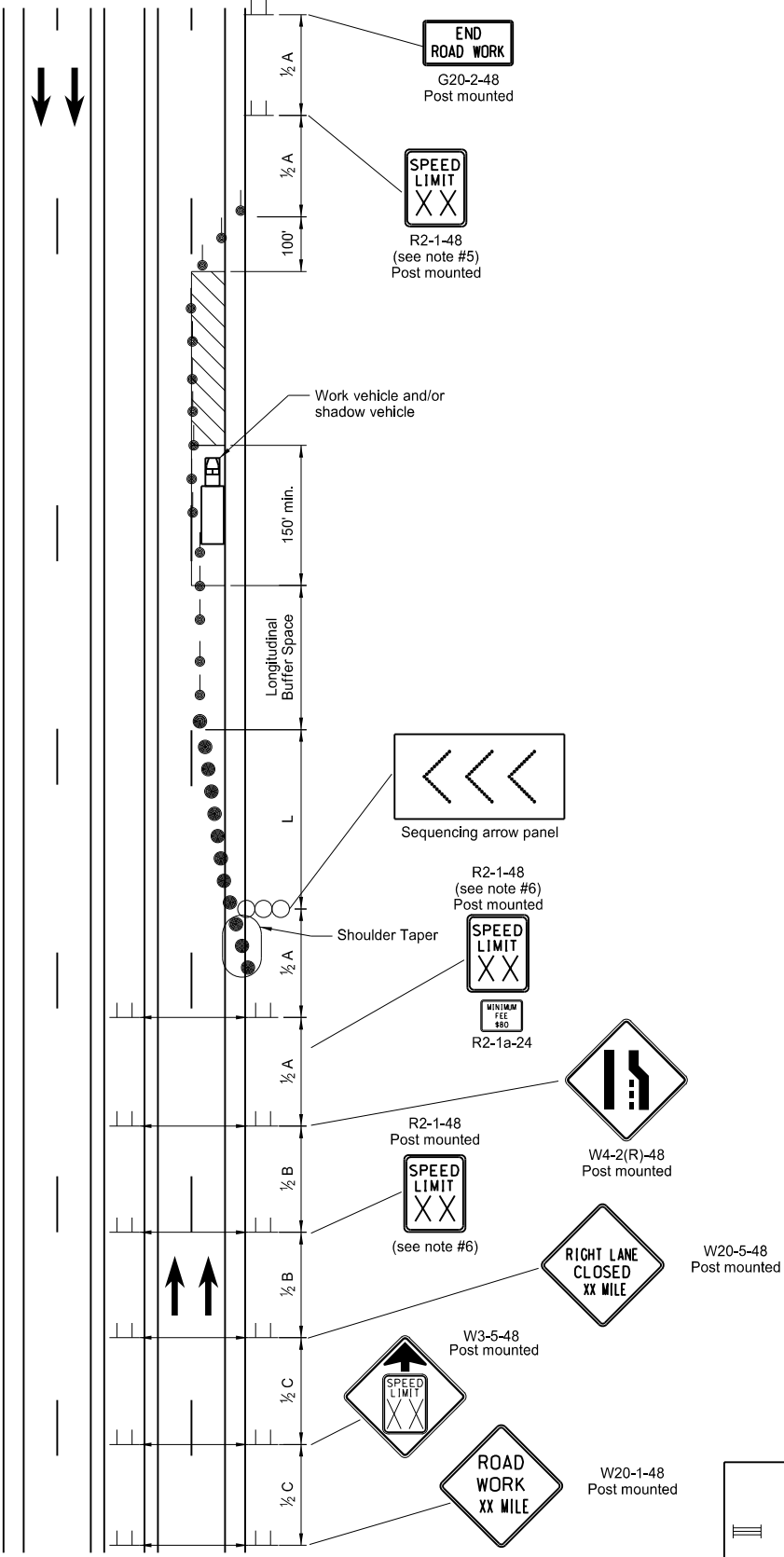
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SHORT TERM URBAN DETOUR AND LANE CLOSURE ON A DIVIDED HIGHWAY LAYOUTS



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 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 spaced at dimension "S". Delineator 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 payment 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.

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

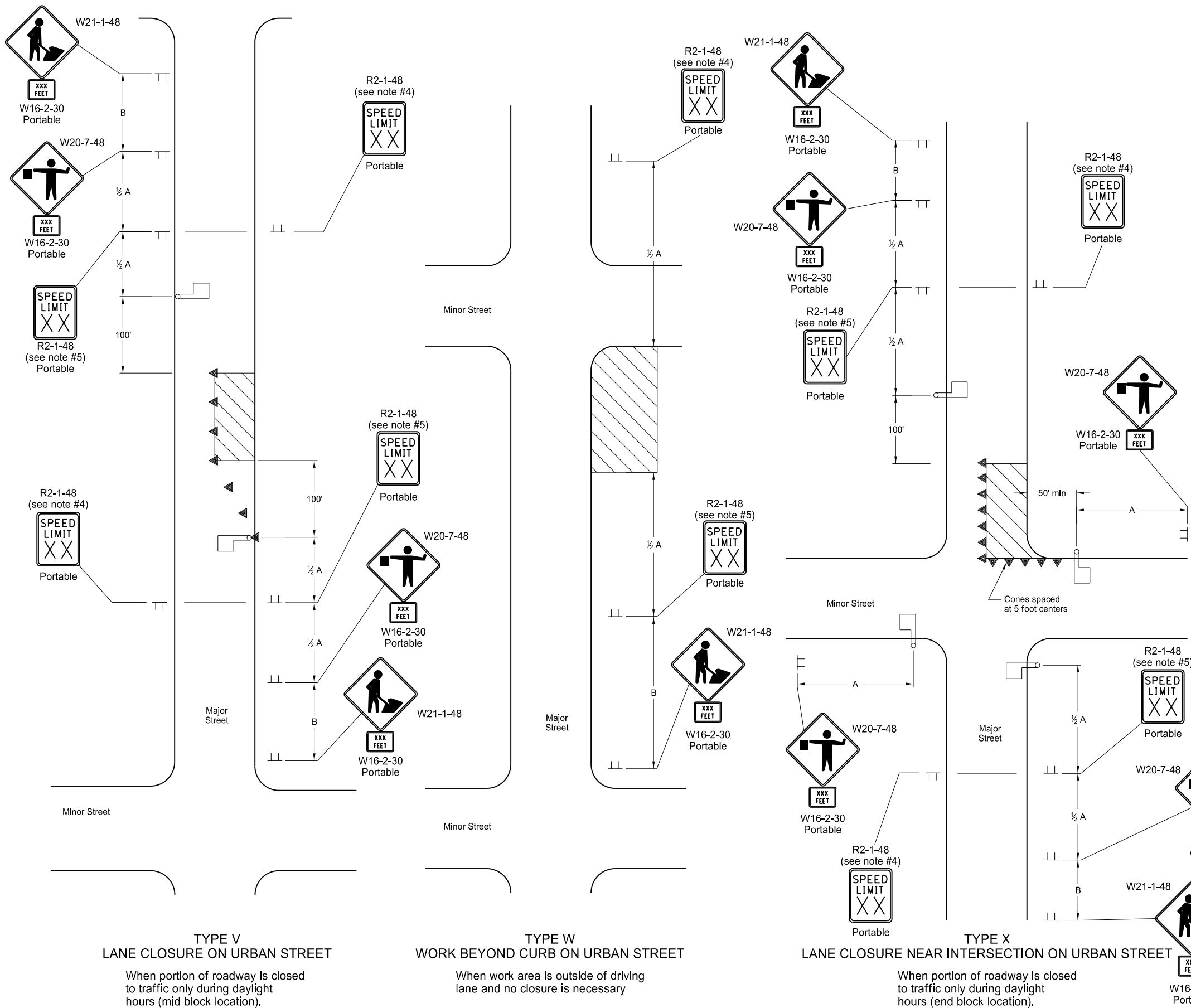
KEY			
	Type III barricade		Work area
	Sign		Sequencing arrow panel
	Delineator Drum		Tubular Markers

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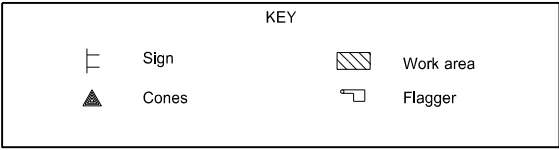
LANE CLOSURES ON URBAN STREETS LAYOUTS

D-704-25



- Notes
- For Type V: The contractor will be allowed to work only on one side of the roadway at a time so as not to block off any more than one lane of traffic.
 - When parking is present, the signs shall be placed so they are entirely visible above the 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.
 - Delineator cones used for tapering traffic shall be placed at 3 equal spaces. Delineator cones for tangents shall be spaced at dimension "S". "S" = the numerical value of speed limit.
 - 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.
 - 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.
 - Urban projects do not need the G20-55-96 and R2-1a-24 signs.

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

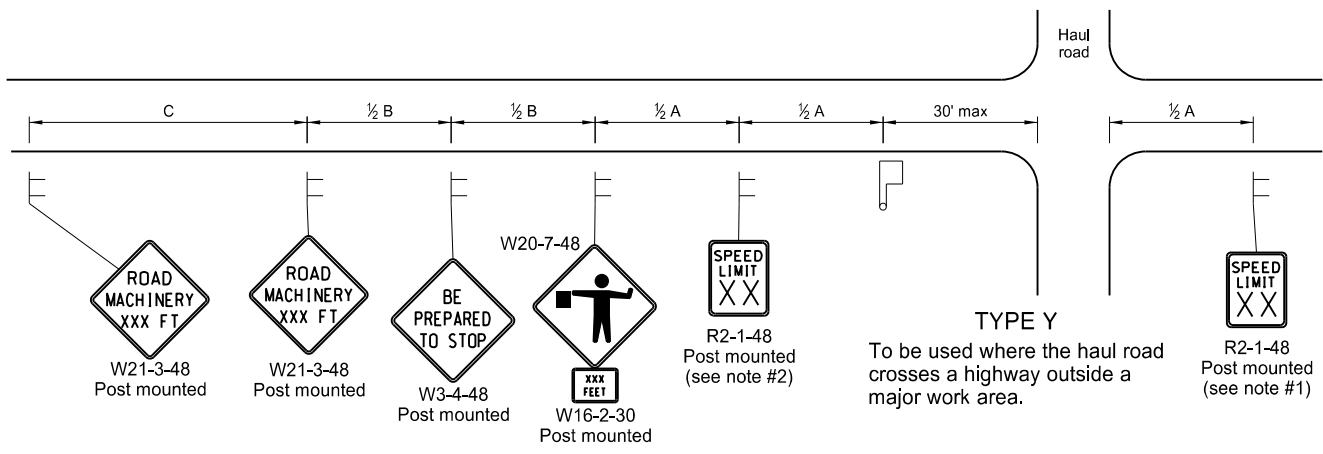


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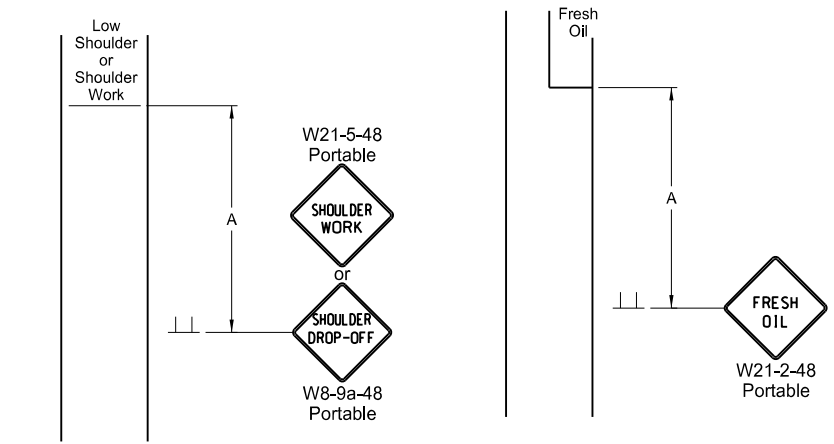
MISCELLANEOUS SIGN LAYOUTS

D-704-26



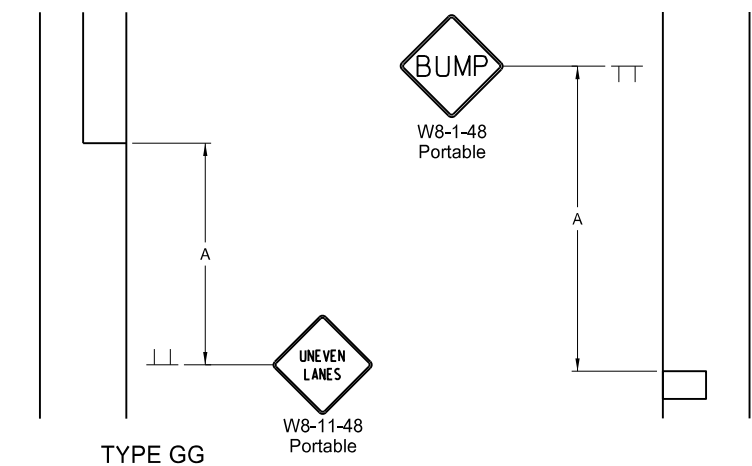
TYPE Y
To be used where the haul road crosses a highway outside a major work area.

R2-1-48
Post mounted
(see note #1)



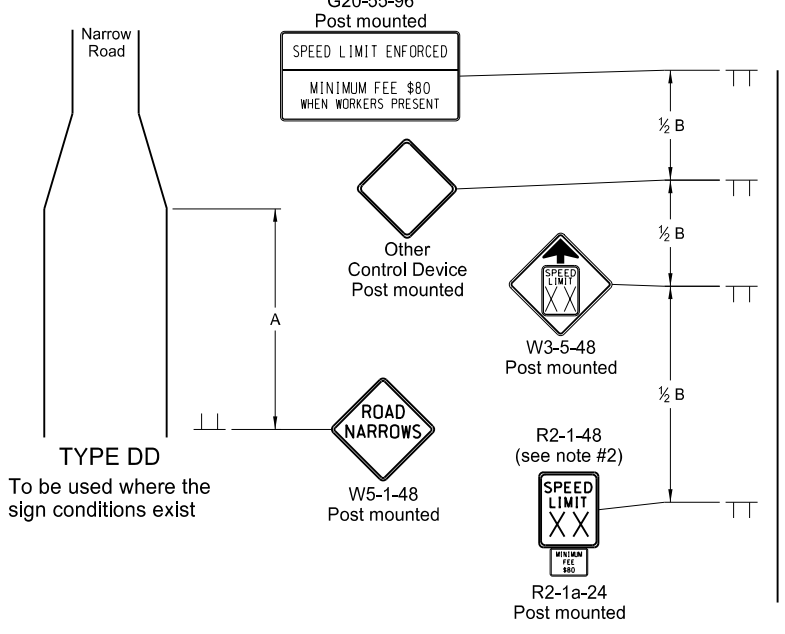
TYPE BB
To be used within a major work area where the sign conditions exist

TYPE CC
To be used where the sign conditions exist



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

TYPE EE
To be used where the sign conditions exist



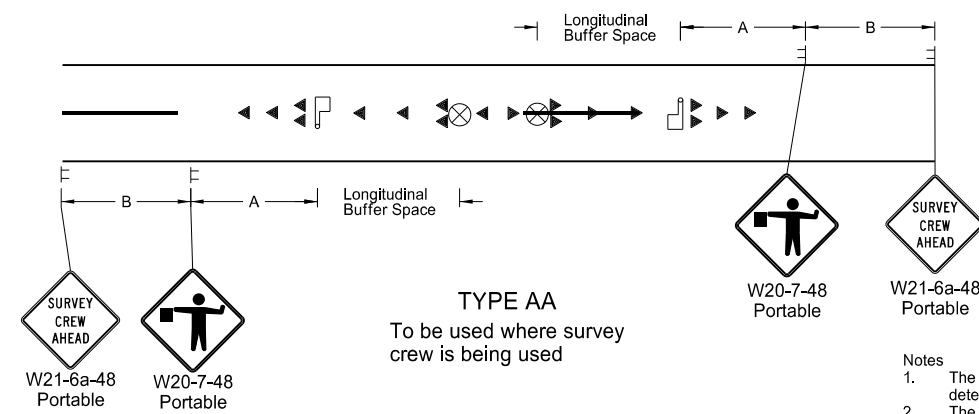
TYPE DD
To be used where the sign conditions exist

TYPE Z
To be used where speed zone is needed

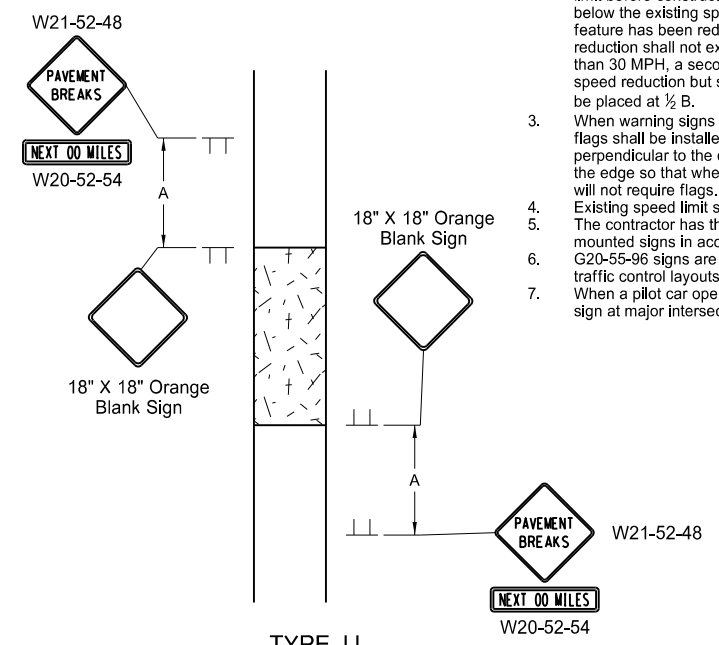
W3-5-48
Post mounted

R2-1-48
(see note #2)

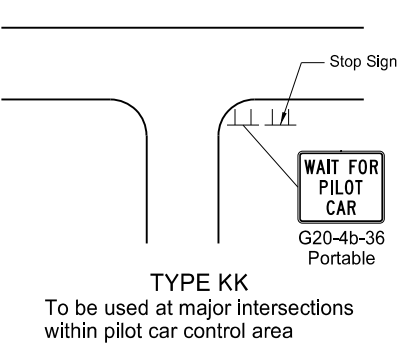
R2-1a-24
Post mounted



TYPE AA
To be used where survey crew is being used



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.



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

- Notes
1. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
 2. 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.
 3. 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.
 4. Existing speed limit signs within a reduced speed zone shall be covered.
 5. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
 6. 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.
 7. 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.

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.

KEY

Sign Flagger

Cones

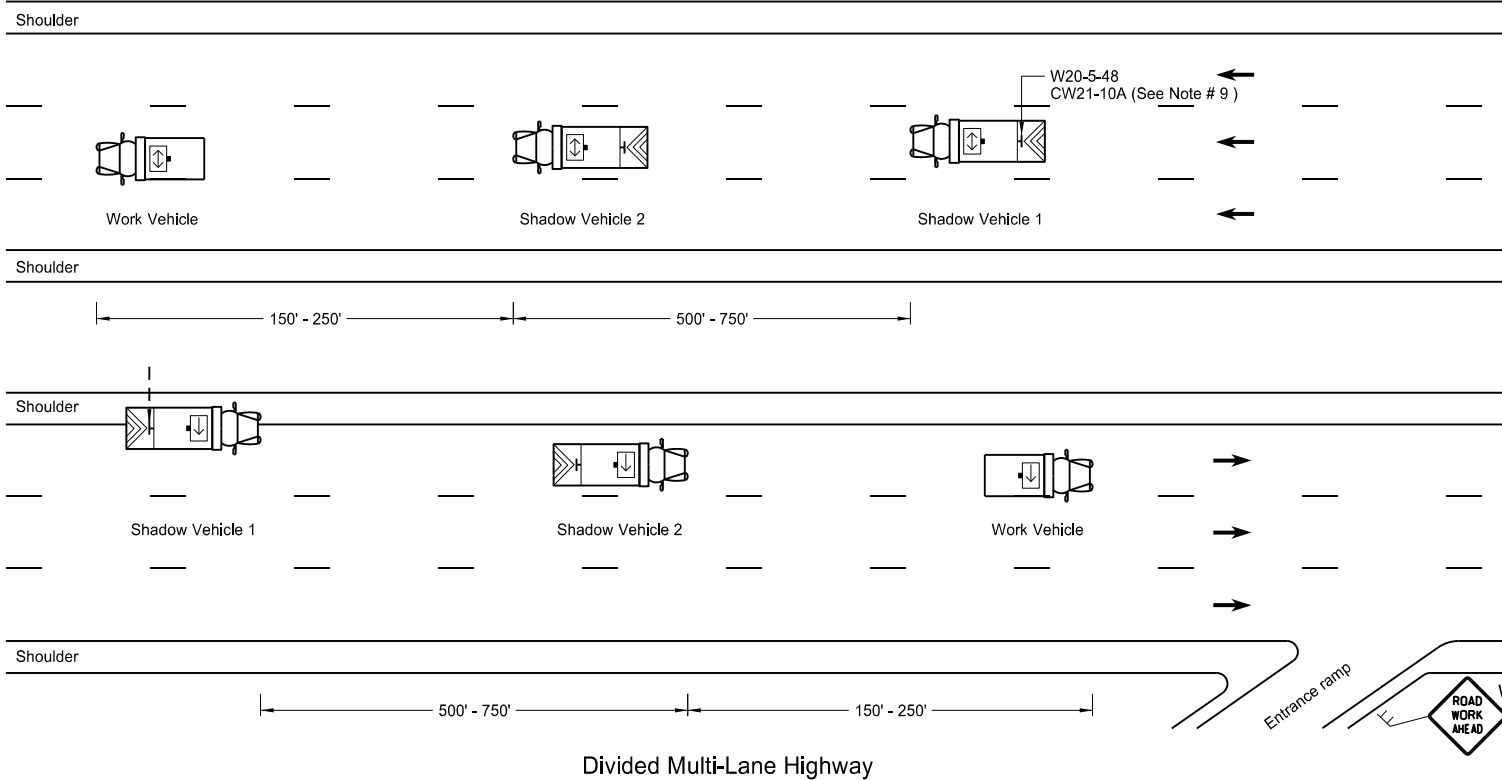
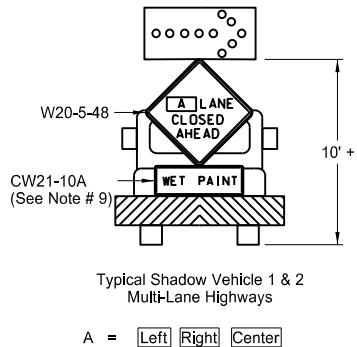
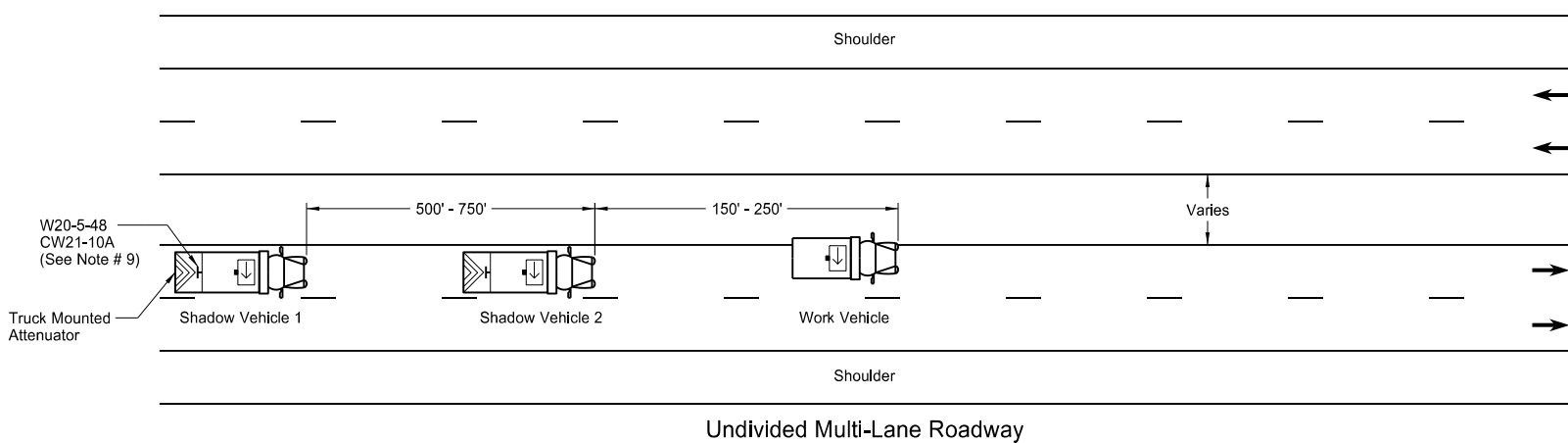
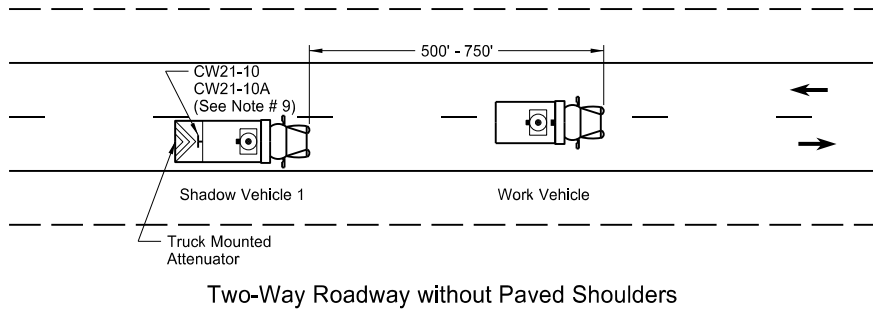
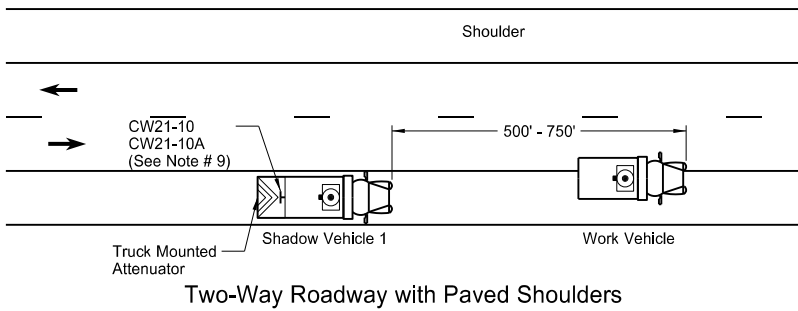
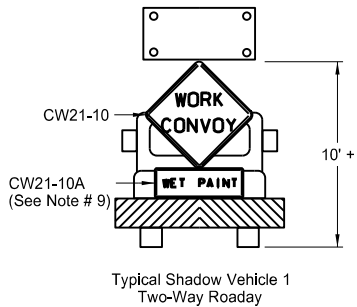
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway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

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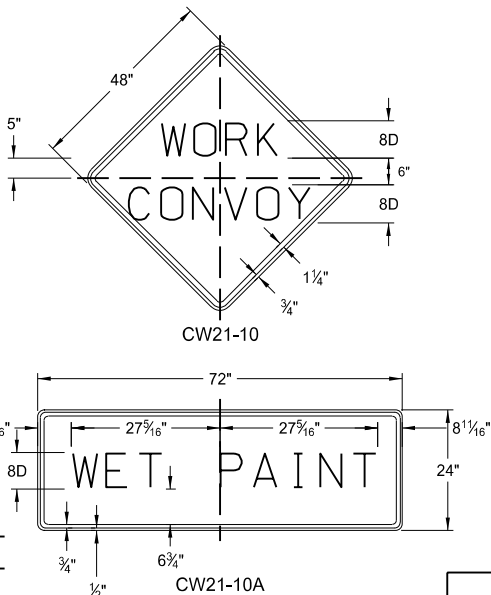
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TRAFFIC CONTROL PLAN FOR MOVING OPERATIONS

D-704-27



Sign Details



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.

KEY

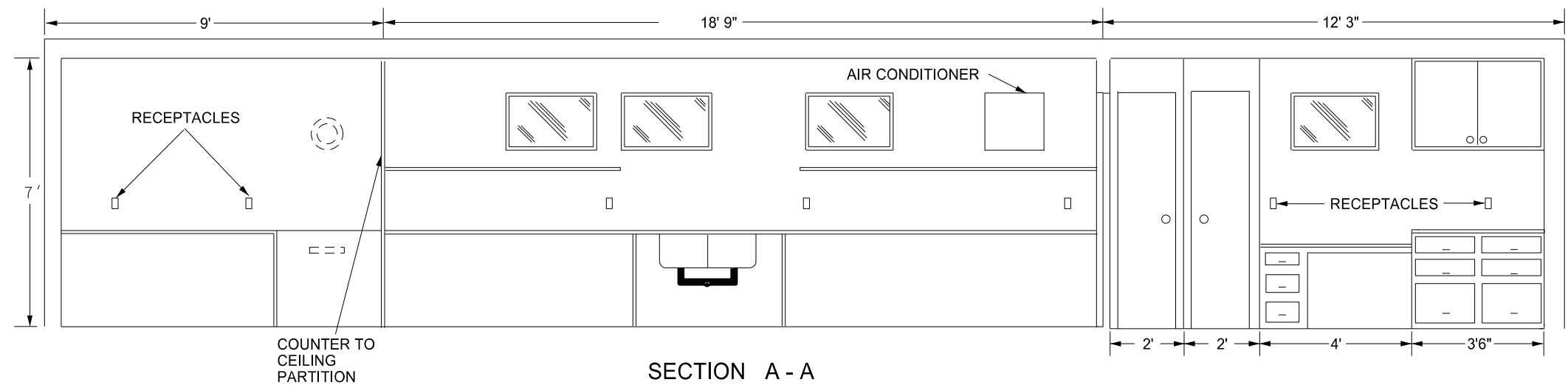
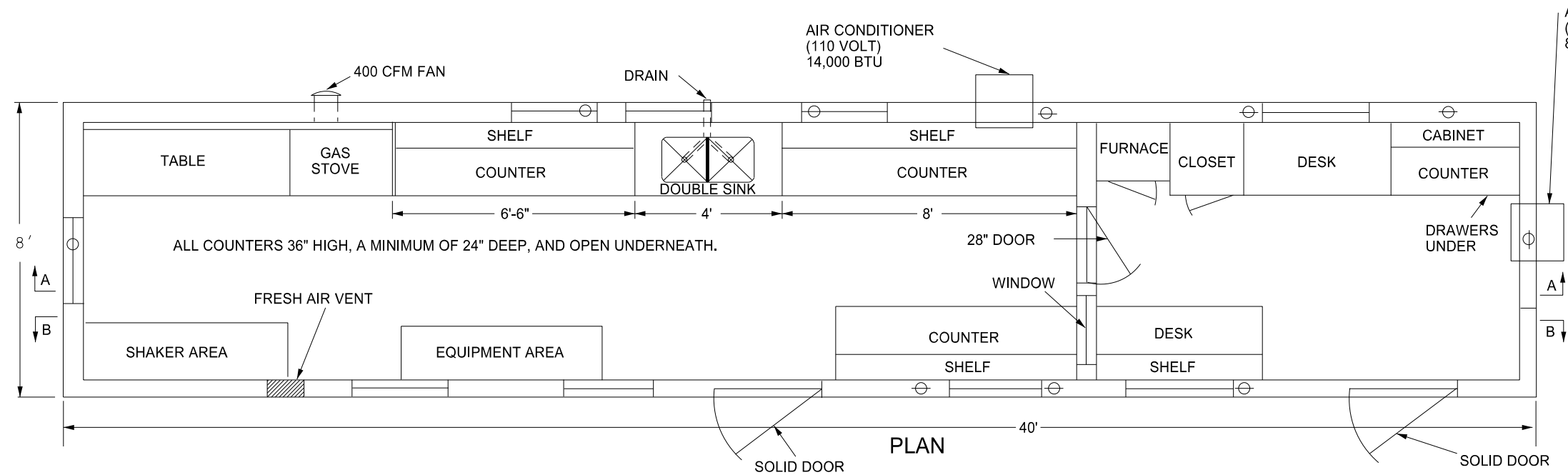
- Sign
- Truck mounted attenuator
- Flashing arrow panels:
- Right directional
 - Left directional
 - Double arrow directional
 - Caution Mode

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

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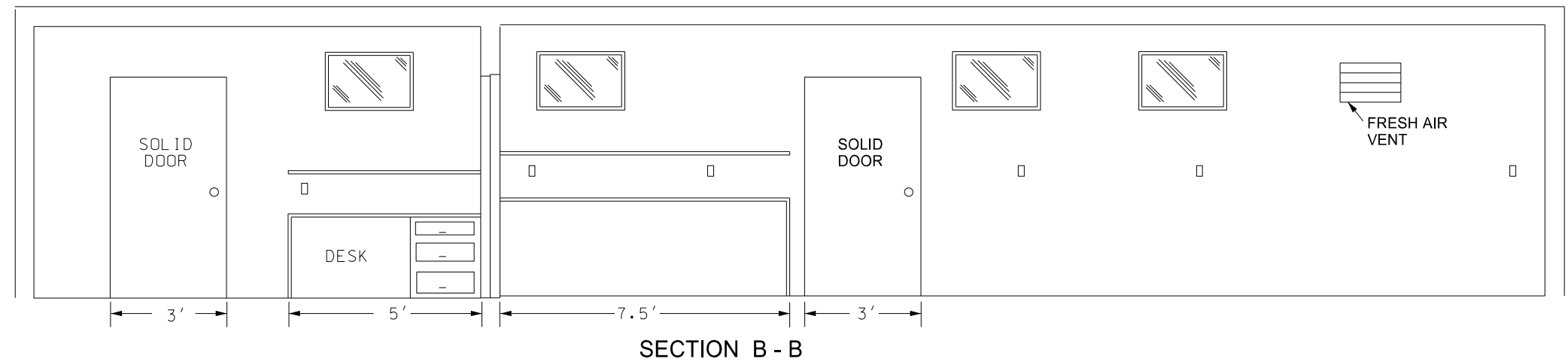
BITUMINOUS LABORATORY

D-706-1



Provide a laboratory with the following:

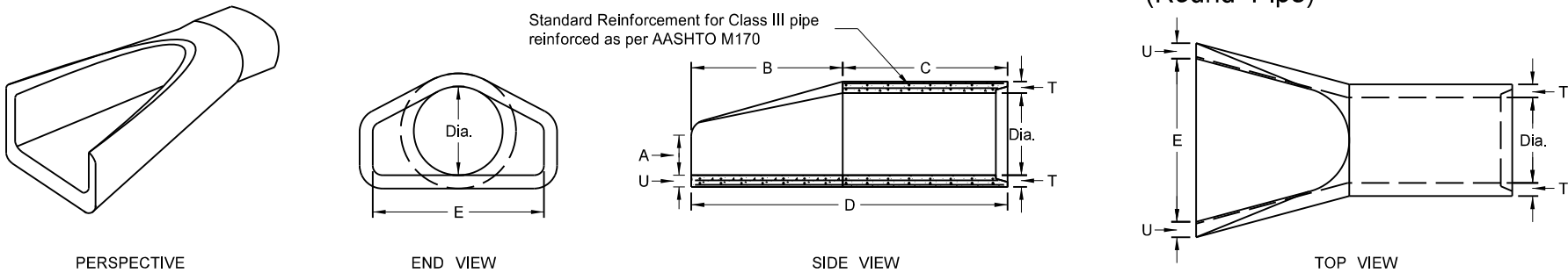
1. A 1'x1' shelf at 36" above the regular countertop.
2. Double compartment stainless steel sink, with each compartment a minimum of 16"x14"x10" deep. Provide water service lines made of copper or plastic and a diameter of ½ inch.
3. An exhaust fan capable of removing inside air at a rate of 400 CFM.
4. Fresh air vent hinged to open or close manually.
5. 24" x 48" table capable of holding a 200 lb masonry saw with a minimum clearance of 36" above the table.
6. A water supply tank with a capacity of 500 gallons and a 20 gallon capacity pressure tank on the pump.
7. Heavy duty type locks, latches, and hinges for doors made to withstand the intense use in service.
8. A wall between the office and the work area properly insulated to prevent the transmission of heat and noise.
9. The steel cable tie downs and ground anchors at each corner of the lab.
10. Electrical service entrance wired for 100 amps and separate circuits for air conditioners. Space convenience outlets in counter areas a minimum of four feet apart.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
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DATE	CHANGE
07-30-14	Changed standard's title and revised notes.
01-11-16	Revised notes.

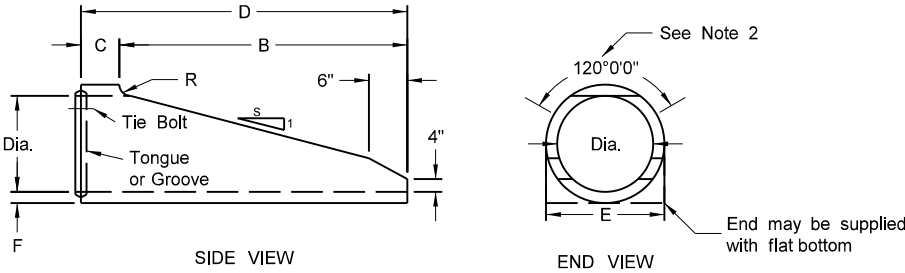
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REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS
(Round Pipe)



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

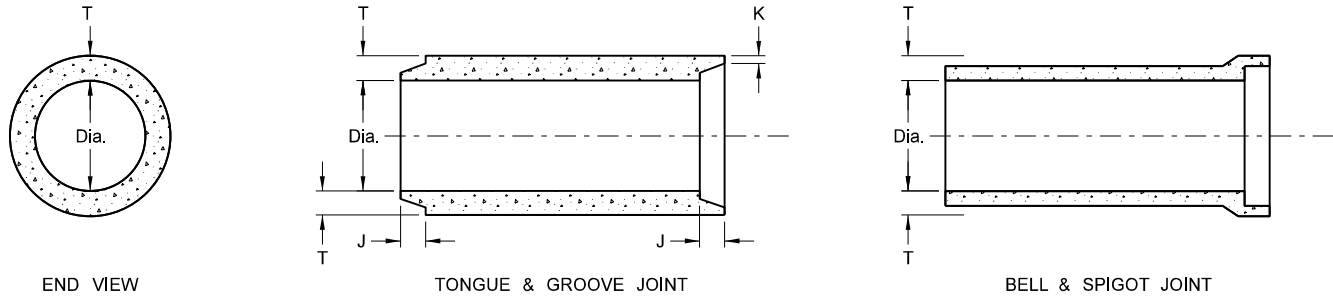
TRAVERSABLE END SECTION							
DIA	B	C	D	E	F	R	S
15"	4"	9"	4'-9"	1'-7½"	2½"	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	2½"	3"	6
24"	6"	1'	7"	2'-6"	3"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3½"	3½"	4
36"	7'-3"	15"	8'-6"	3'-8"	4"	3"	4



- 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.

FLARED END SECTION						
TERMINAL DIMENSIONS						
DIA	A	B	C	D	E	U
12	0'-4"	2'-0"	4'-0⅞"	6'-0⅞"	2'-0"	2"
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2½"
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2½"
21	0'-9"	3'-0"	3'-1"	6'-1"	3'-6"	2½"
24	0'-9½"	3'-7½"	2'-6"	6'-1½"	4'-0"	3"
27	0'-10½"	4'-0"	2'-1½"	6'-1½"	4'-6"	3½"
30	1'-0"	4'-6"	1'-7¾"	6'-1¾"	5'-0"	3½"
36	1'-3"	5'-3"	2'-9"	8'-0"	6'-0"	4"
42	1'-9"	5'-3"	2'-9"	8'-0"	6'-6"	4½"
48	2'-0"	6'-0"	2'-0"	8'-0"	7'-0"	5"
54	2'-3"	5'-5"	2'-9¼"	8'-2¼"	7'-6"	5½"
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	5"
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	5½"
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	6"
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	6½"
84	3'-0"	7'-6½"	1'-9"	9'-3½"	10'-0"	6½"
90	3'-5"	7'-3½"	2'-0"	9'-3½"	11'-0"	6½"

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



CIRCULAR PIPE

JOINTS FOR REINFORCED CONCRETE PIPE

- 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.

All Classifications of Round Concrete Pipe					
Internal Dia. of Pipe in Inches	Cross-Sectional Water Area	Weight per Lin. Foot of Pipe Std. Wall	Joint J Groove End Min./Max.	Joint K Tongue Min.	Minimum Wall Thickness (T)
Dia	Sq. ft.	Lbs.	In.	In.	In.
12	0.79	92	1⅝-2⅜	¾	2
15	1.23	127	1¾-2¾	⅞	2½
18	1.77	168	1⅝-2⅝	1	2½
21	2.40	214	1⅞-3⅝	1⅞	2¾
24	3.14	265	2¾-3¾	1⅞	3
27	3.98	322	2¾-4	1¼	3¼
30	4.91	384	3¼-4¼	1¼	3½
33	5.94	452	3¼-4¼	1½	3¾
36	7.07	524	3¼-4¼	1½	4
42	9.62	685	3¾-4¾	1¾	4½
48	12.57	685	3¾-4¾	1⅞	5
54	15.90	1070	4½-5½	2	5½
60	19.63	1296	4½-5½	2¼	6
66	23.76	1542	5-6	2⅞	6½
72	28.27	1810	5½-6½	2⅞	7
78	33.18	2098	6¼-7¼	2⅞	7½
84	38.48	2410	5½-7¾	3⅞	8
90	44.18	2793	6¾-8½	3⅞	8½
96	50.27	3092	7-8¼	3½	9
102	56.75	3466	7-8¼	3½	9½
108	63.62	3864	7¼-8½	3¾	10

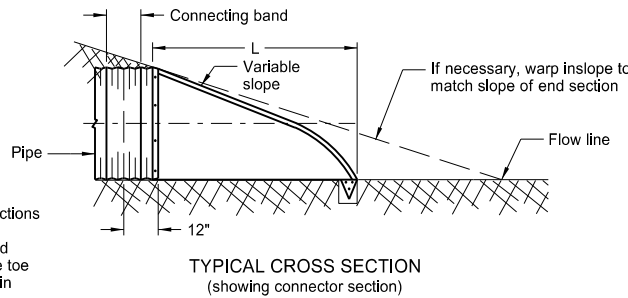
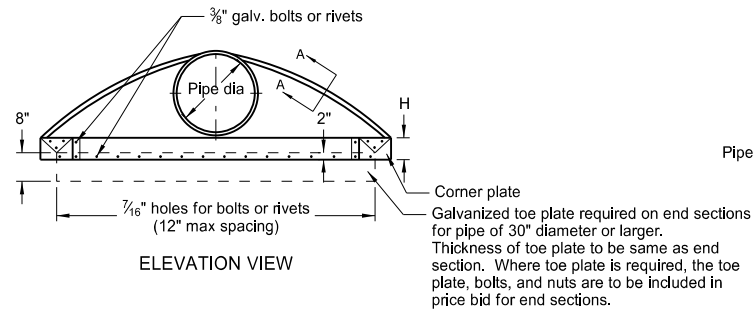
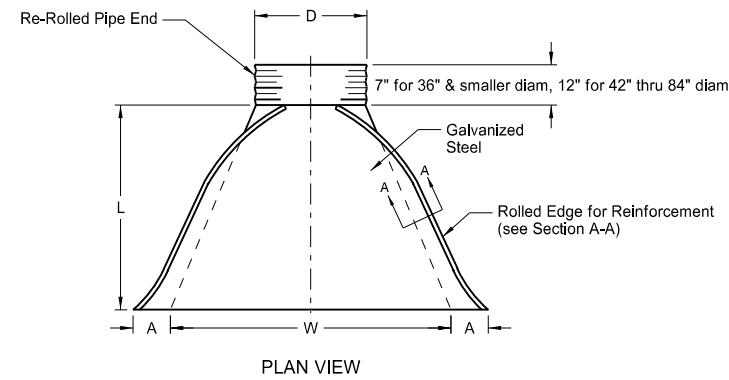
SEE STANDARD DRAWING D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-12-14	
REVISIONS	
DATE	CHANGE
01-21-15 11-21-16	Revised Note 5 Revised End Section Dimensions

This document was originally issued and sealed by
Jon Ketterling
Registration Number
PE- 4684,
on 11/21/16 and the original document is stored at the
North Dakota Department
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ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

D-714-4



PIPE DIA.	GALV. THICK.	END SECTION DIMENSIONS					APPROX. SLOPE RATE	BODY PIECE
		A	B	H	L	W		
IN	IN	IN	IN	IN	IN	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 1/4:1	3
* 84	0.109	18	45	12	87	138	1 1/6 :1	3

* These sizes have 0.109" sides and 0.138" center panels.

* * Pipe diameter is equal to dimension "D" of end section.

Manufacturers tolerances of above dimensions will be allowed.

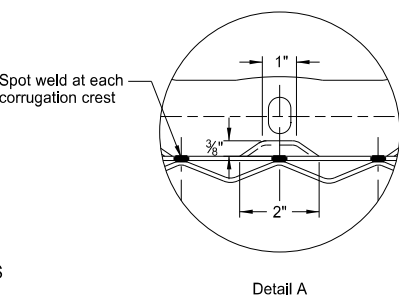
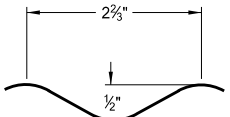
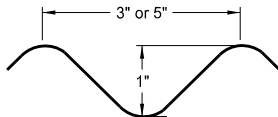
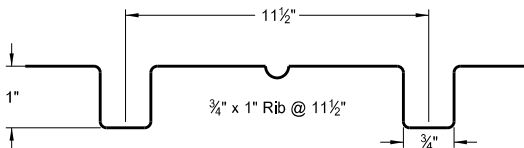
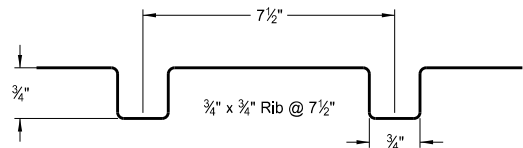
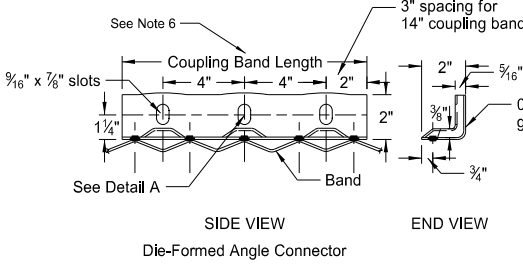
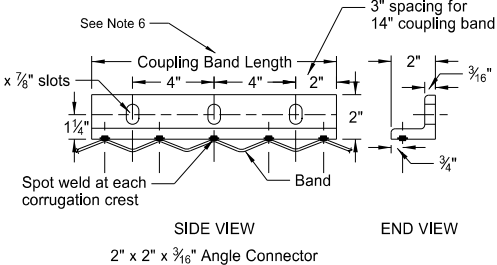
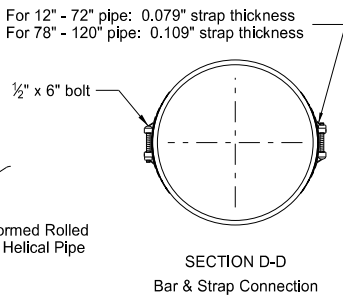
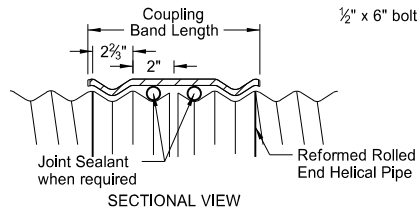
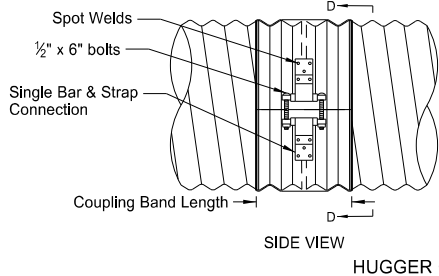
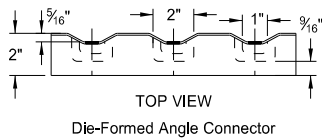
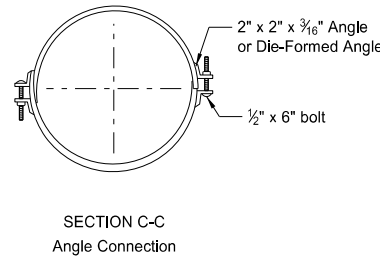
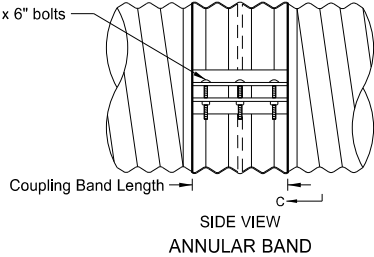
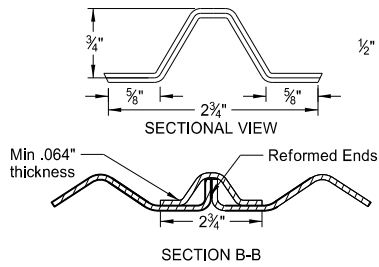
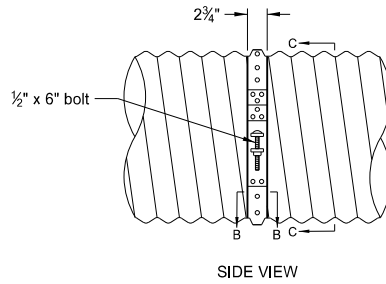
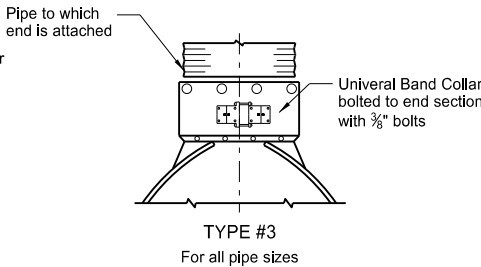
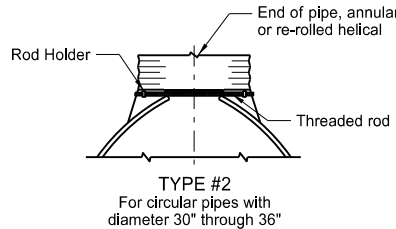
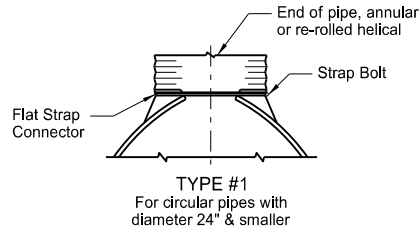
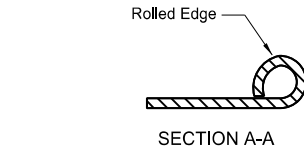
Splices to be the lap riveted type.

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

NOTES:

- 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 1/8" galv. angle for 60" through 72" dia. and 2 1/2" x 2 1/2" x 1/4" galv. angle for 78" and 84" dia.. Angles to be attached by galv. 3/8" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
- Elongated pipes shall be factory preformed so that the vertical diameter shall be 5% greater and the horizontal diameter 5% less than a circular pipe.
- Coupling bands shall be two-piece for pipes larger than 36" as shown in Section C-C & D-D details. For pipes 36" and smaller, a one-piece band is acceptable.
- 1/2" x 8" bolts may be used as a substitute for the 1/2" x 6" bolts shown in the details.
- Coupling bands wider than 14" may be used if a minimum of four 1/2" bolts with maximum spacing of 5 1/2" are used for the connection.
- Length of spot welds shall be minimum 1/2".

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

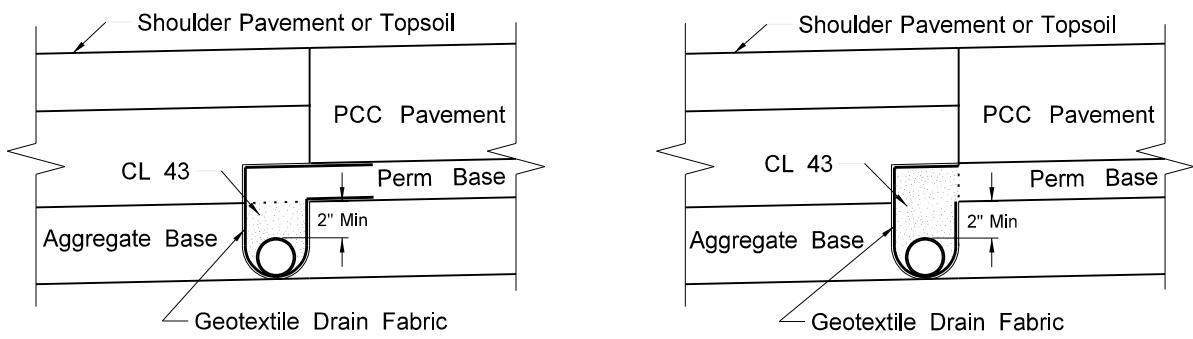


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
08-06-13	
REVISIONS	
DATE	CHANGE
01-07-14	End Section Plan View
02-27-14	3" x 1" Corrugation Detail

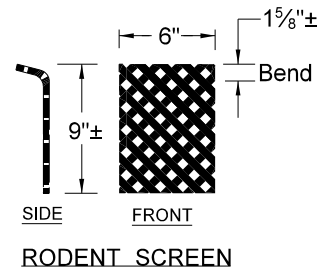
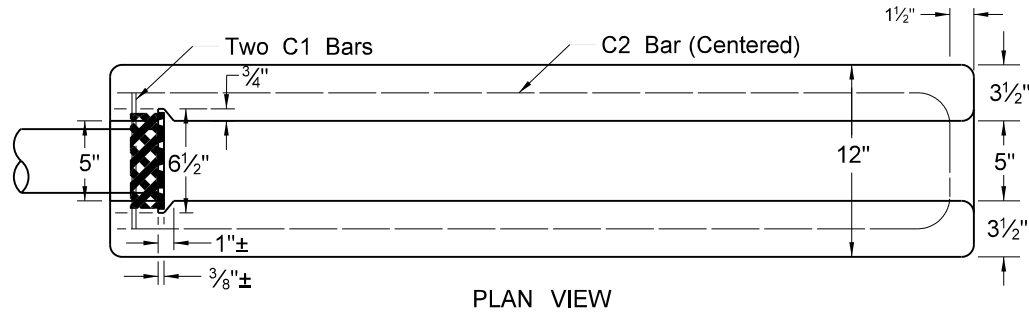
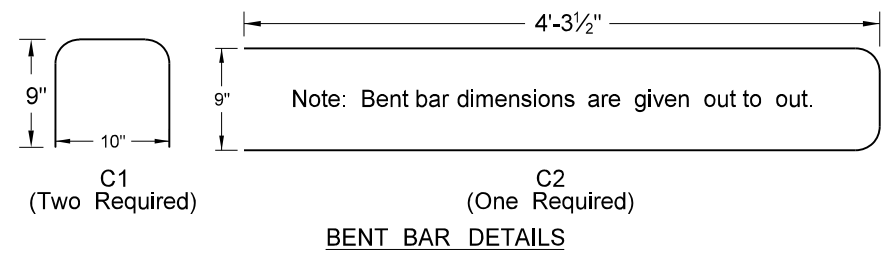
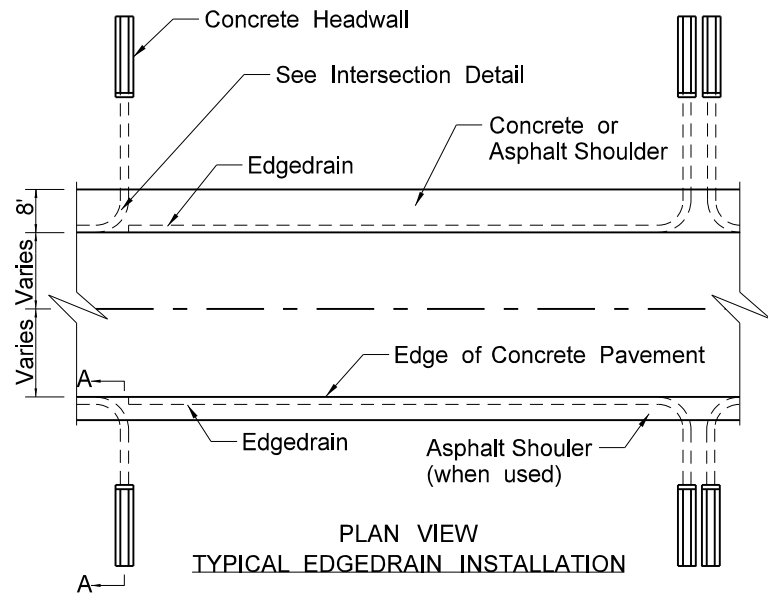
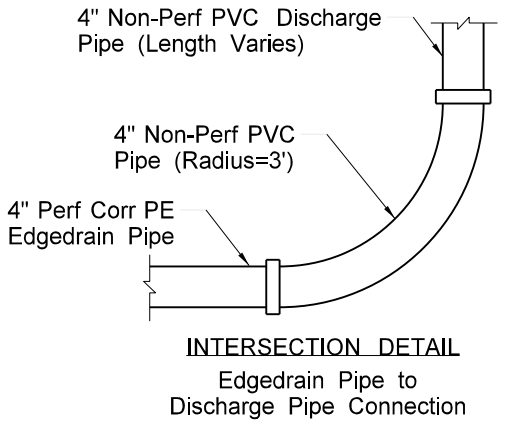
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EDGEDRAIN DETAILS

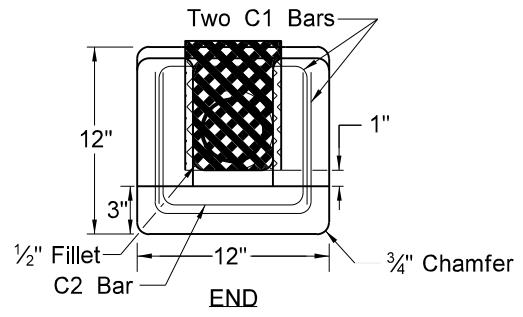
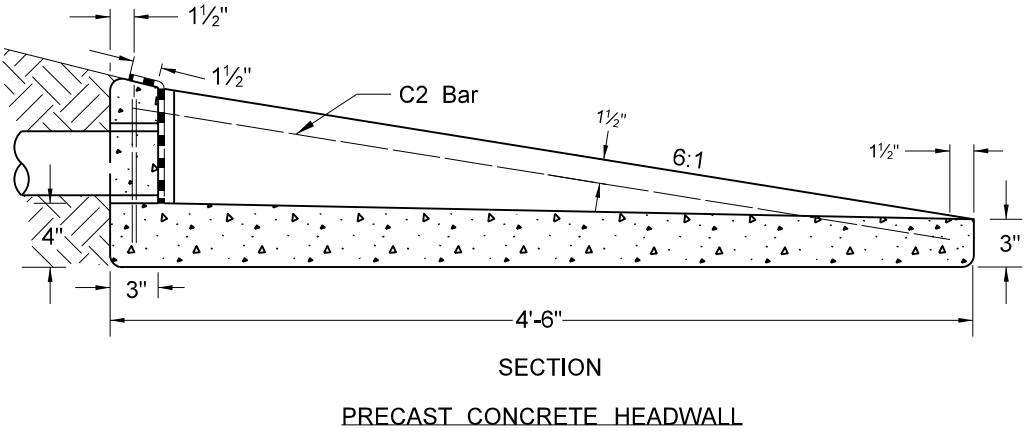
D-714-18



TRENCH WRAP DETAILS



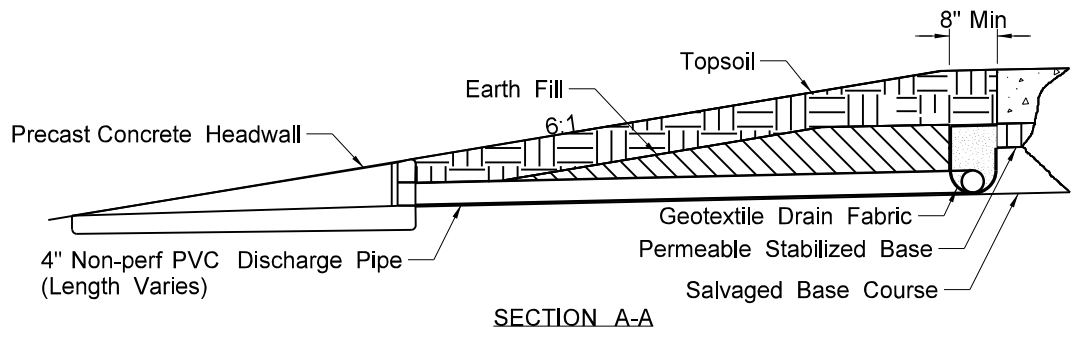
Dimensions are approximate to allow bend and a snug fit in headwall slot



SUPERELEVATED CURVES: The edgedrain, outlets, and headwalls shall be omitted from the high side of superelevated curves.

RODENT SCREEN: The rodent screen shall be fabricated from flattened expanded metal with screen openings of approximately 0.25 square inches. The screen shall be 16 ga metal, hot dip galvanized after fabrication.

REINFORCING BARS: Reinforcing bars shall be No. 4 deformed steel bars.



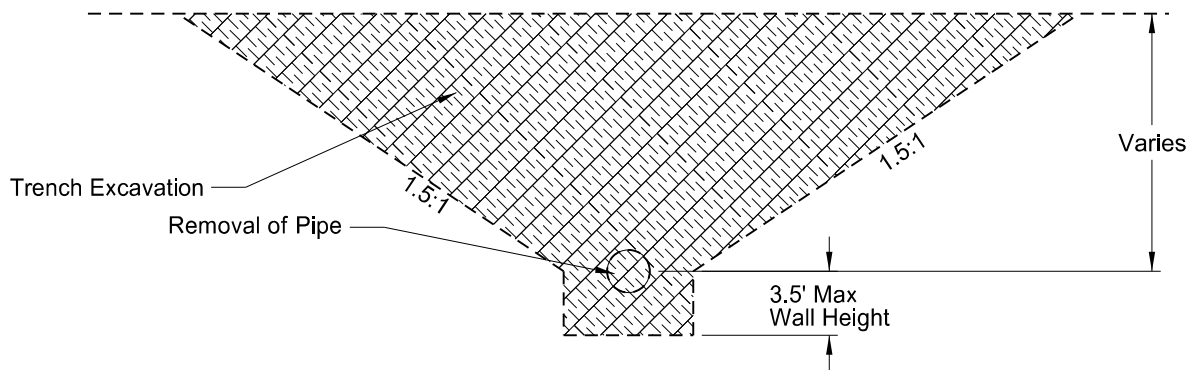
Section A-A shows edgedrain location for median concrete shoulder installations on Interstate highways. For installations where asphalt shoulders will be constructed, or the outside shoulder is to be concrete, the edgedrain is to be trenched adjacent to the roadway concrete pavement, and will be located beneath the shoulder pavement.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-27-2010	
REVISIONS	
DATE	CHANGE

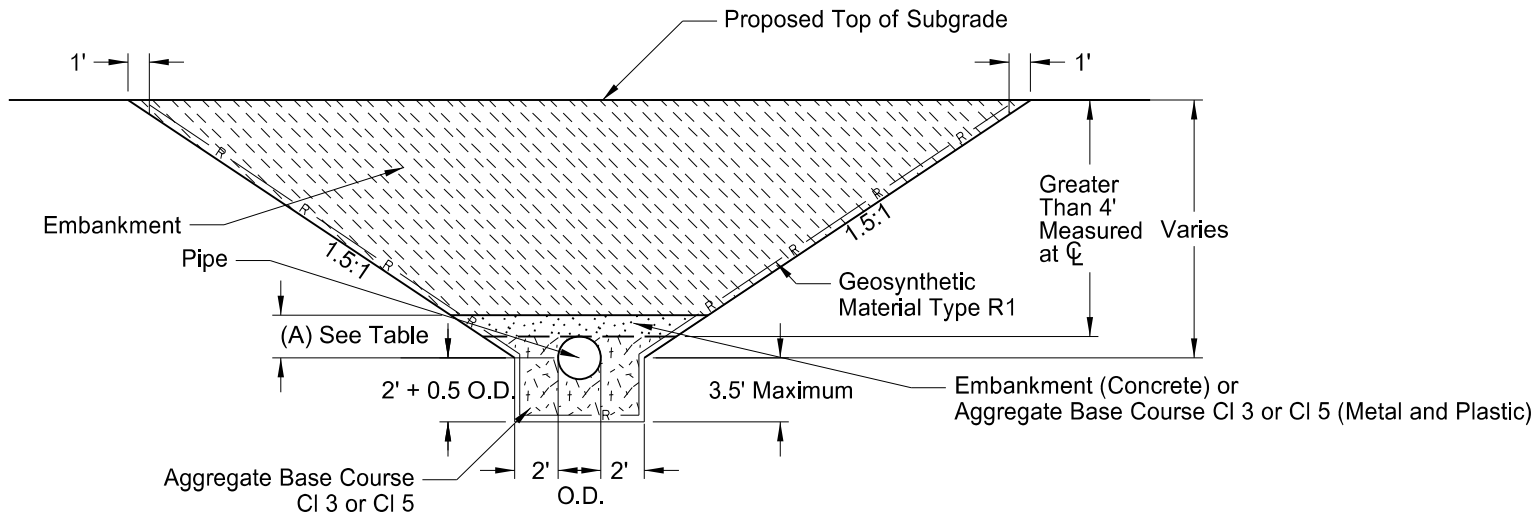
This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930 , on 10/27/2010 and the original document is stored at the North Dakota Department of Transportation

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

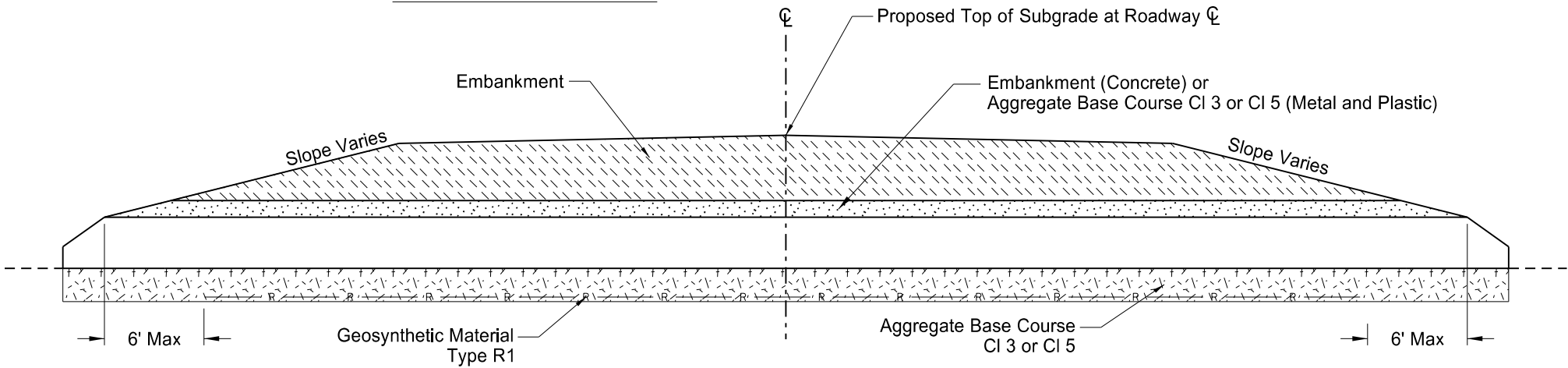
D-714-25



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:

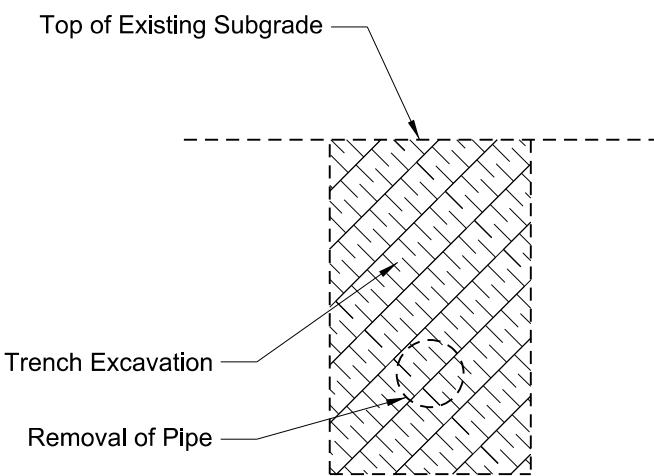
- 1) This drawing applies to new/replaced mainline and paved intersection roadways (including ramps). It does not include pipes in approaches.
- 2) Embankment may be either Borrow Excavation or Common Excavation - Type A

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

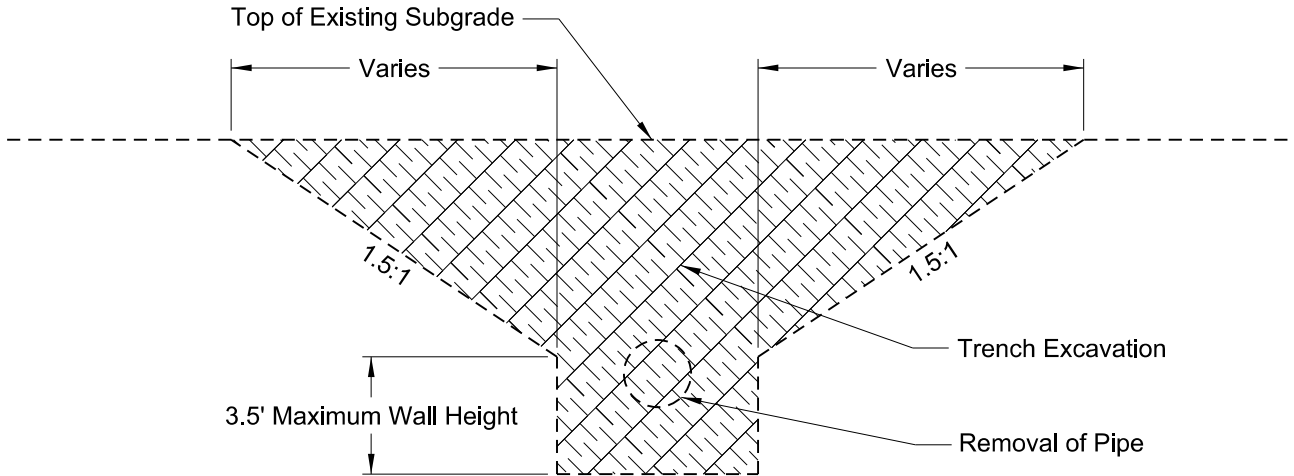
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-26-13	
REVISIONS	
DATE	CHANGE
10-15-13	Label Formatting
1-21-14	Nomenclature
9-18-15	Title Rewording
12-10-15	Added Plastic Pipe

This document was originally issued and sealed by
Ron Horner,
Registration Number
PE-2087,
on 12/10/2015 and the original document is stored at the
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PIPE INSTALLATION DETAIL FOR LONGITUDINAL MAINLINE PIPE
OR PIPE NOT UNDER THE ROADWAY



EXCAVATION DETAIL A



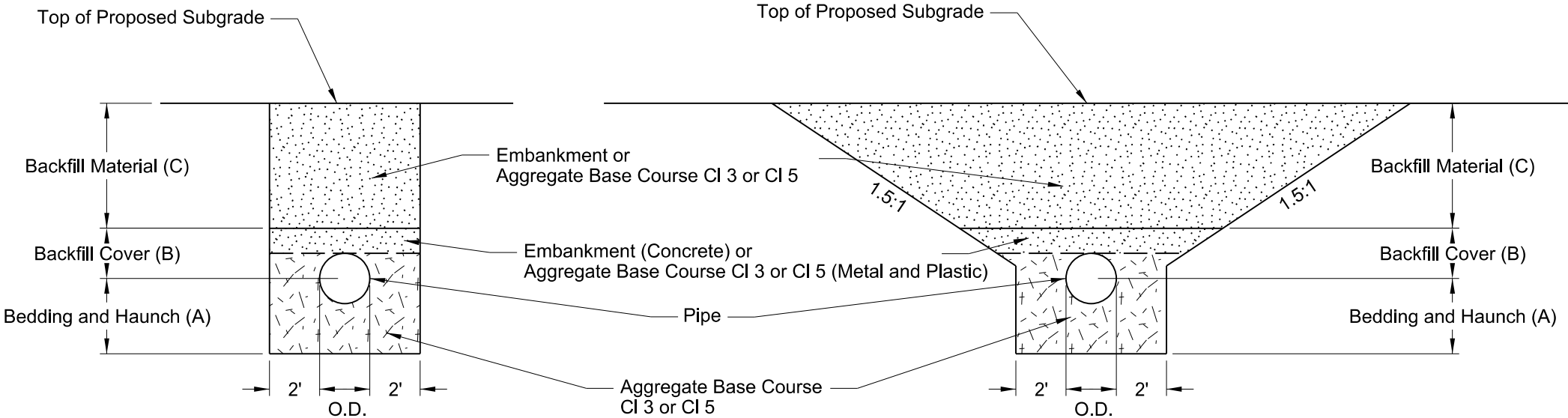
EXCAVATION DETAIL B

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

- *Included in Pipe Pay Item
- 1) Pipe
 - 2) Trench excavation
 - 3) Aggregate base course CI 3 or CI 5
 - 4) Embankment

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

Bedding and Haunch (A)
Pipes Not Under Roadway = 0.5 O.D. + 4 Inches
Pipes Under the Roadway = 0.5 O.D. + 2 Feet
Backfill Cover (B)
Concrete Pipe = 0.5 O.D.
Metal and Plastic = 0.5 O.D. + 1 Foot
Backfill Material (C)
Top of Pipe 4 Feet or Less Below the Top of Proposed Subgrade = Aggregate Base Course CI3 or CI 5
Top of Pipe Greater than 4 Feet Below the Top of Proposed Subgrade = Common Excavation - Type A
Pipe Not Under Roadway = Common Excavation - Type B



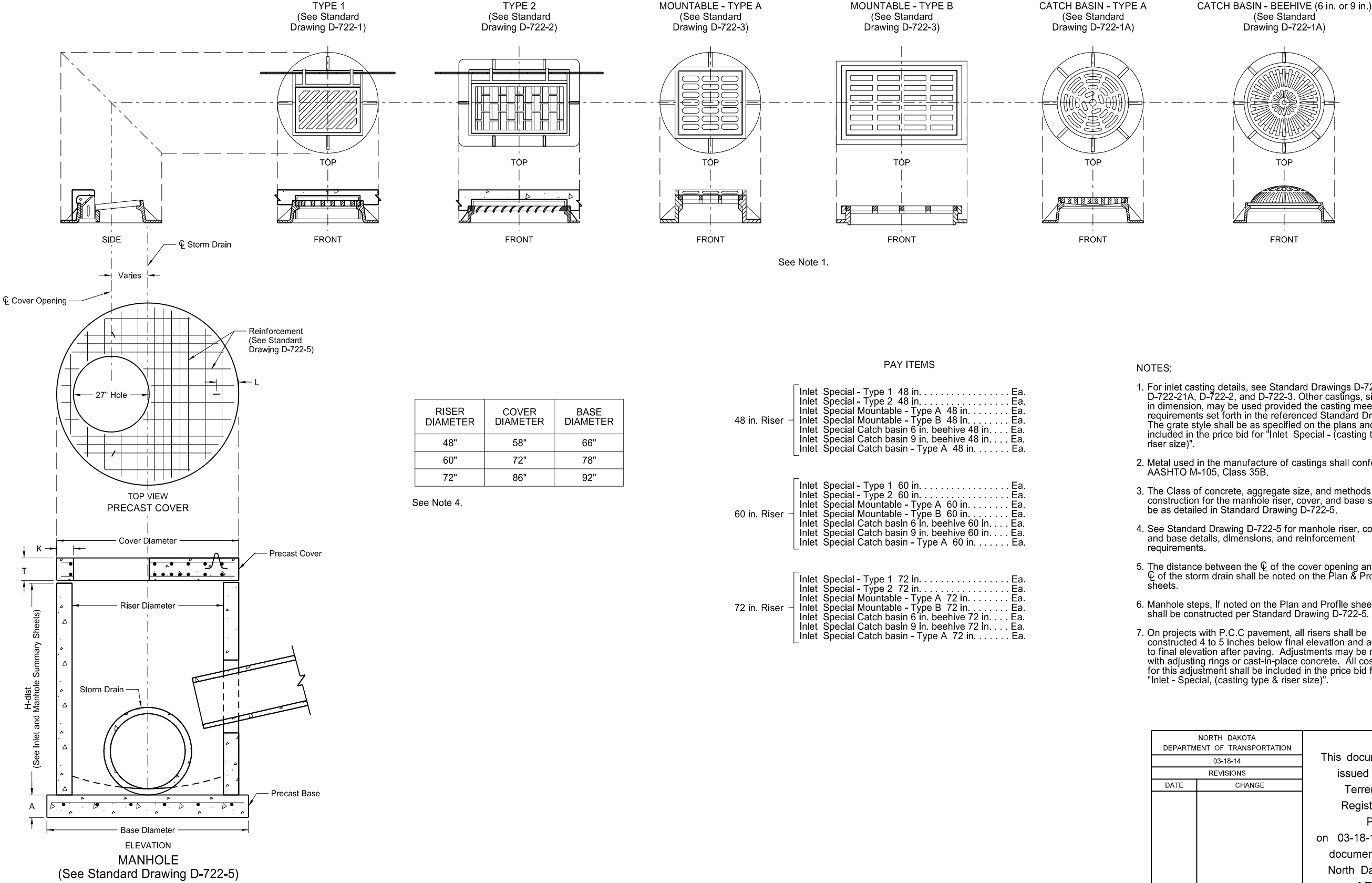
BACKFILL DETAIL A

BACKFILL DETAIL B

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION		This document was originally issued and sealed by Ron Horner, Registration Number PE- 2087 , on 12/10/2015 and the original document is stored at the North Dakota Department of Transportation
7-26-13		
REVISIONS		
DATE	CHANGE	
10-15-13 1-21-15 12-10-15	Label Formatting Nomenclature Added Plastic Pipe	

INLET - SPECIAL

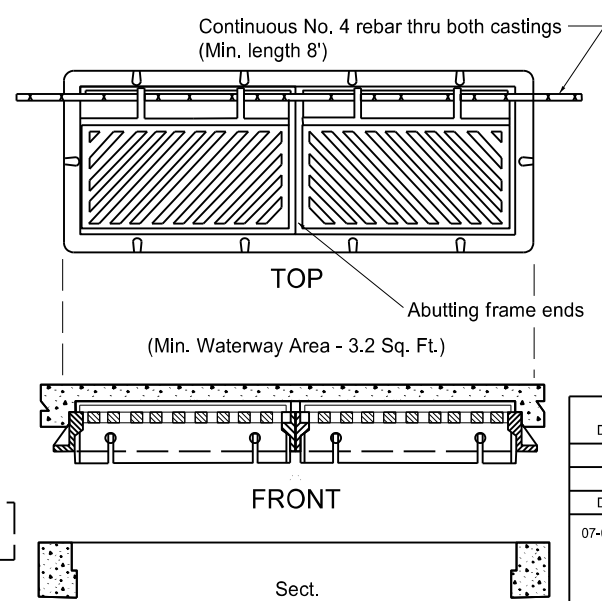
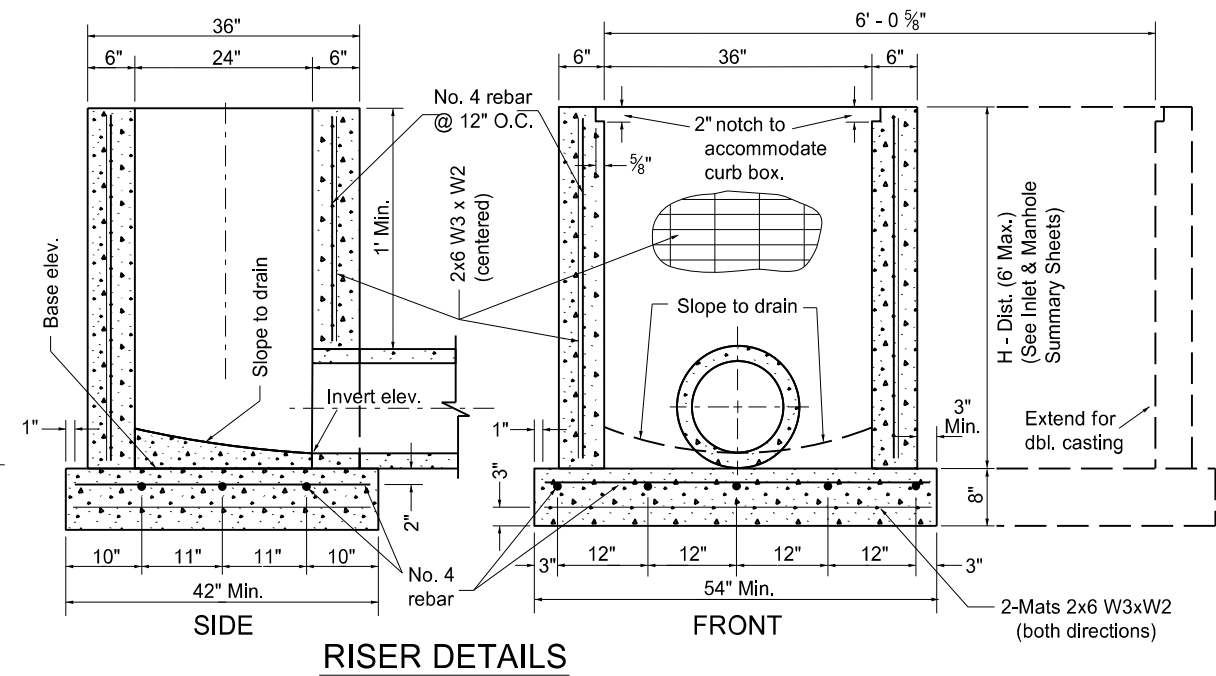
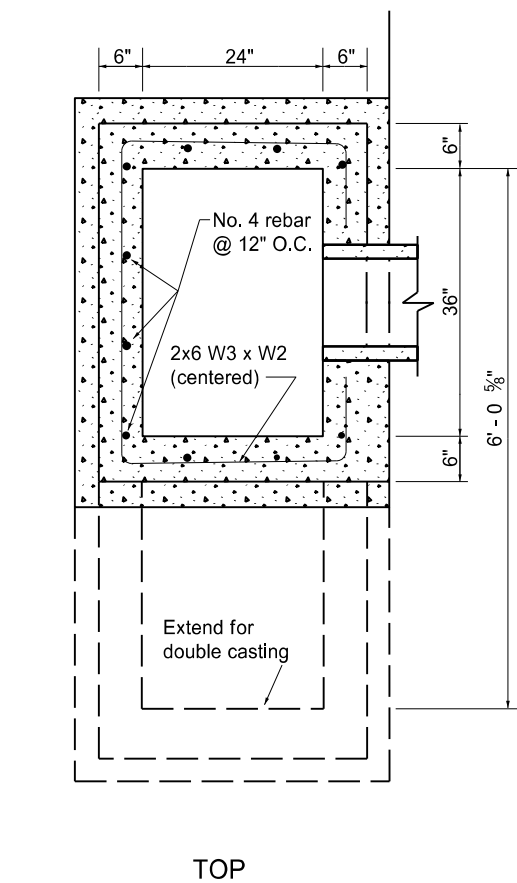
D-722-1B



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

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



Notes:

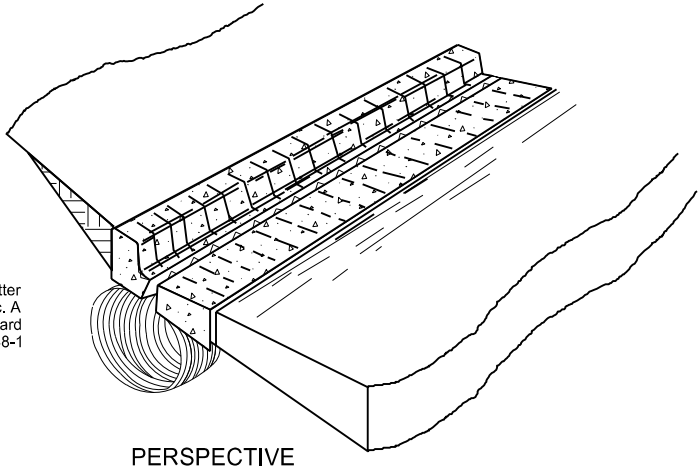
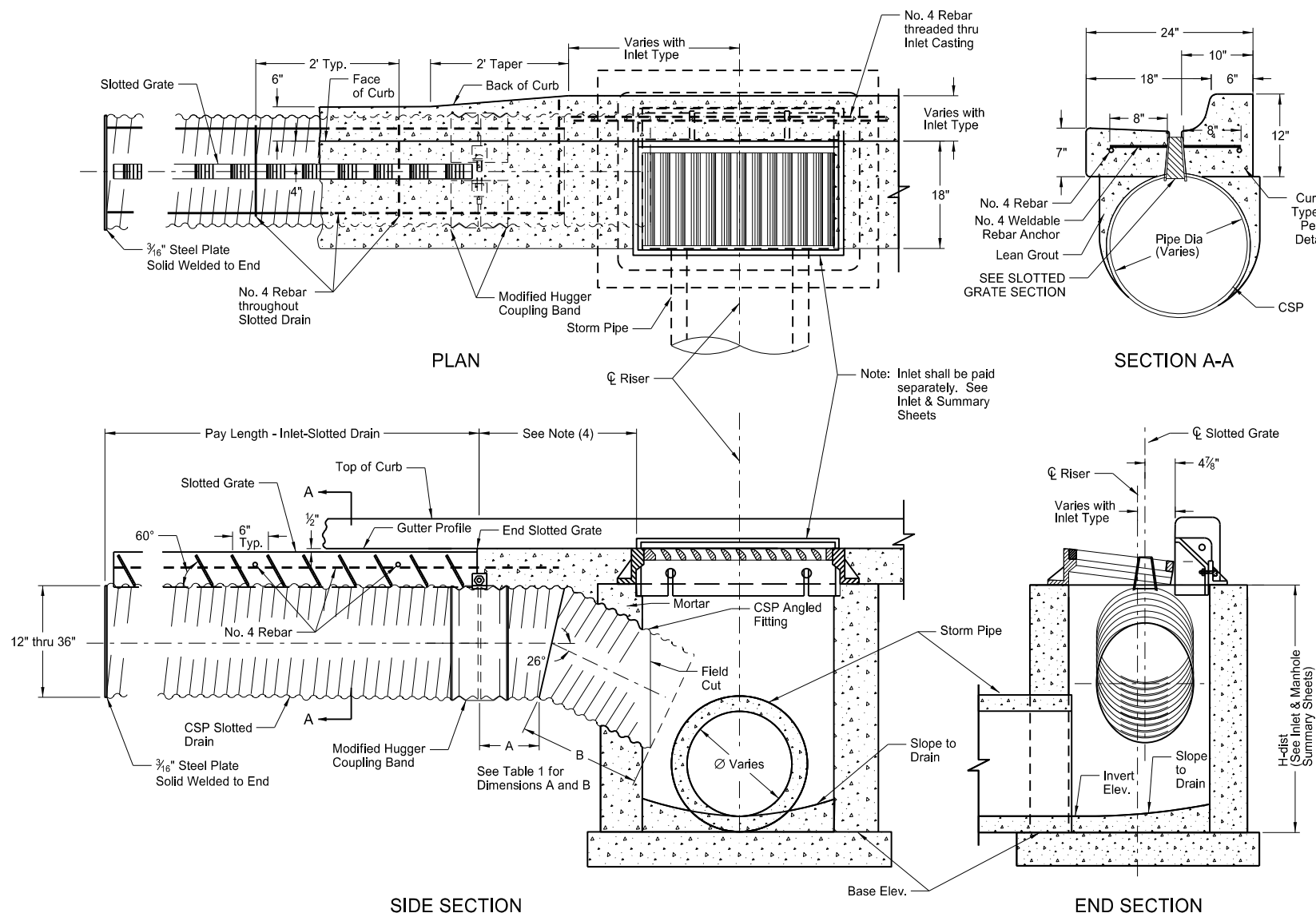
1. Drainage structure castings shall be manufactured in accordance with AASHTO M306. Metal used in the manufacture of castings shall conform to AASHTO M105 Class 35B.
2. Other castings, similar in dimension, may be used if the casting conforms to the riser section and has the grate style as specified 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

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Registration Number
PE- 2674 ,
on 07/07/14 and the original document is stored at the
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INLET - SLOTTED DRAIN

D-722-3A



- NOTES:
1. Corrugated steel pipe shall conform with applicable sections of NDDOT Standard Specifications and AASHTO M 36.
 2. Slotted grate assembly, including rebar and steel plate end, shall be a weldable grade of steel complying with the mechanical requirements of AASHTO M 183 and shall be hot dip galvanized in accordance with AASHTO M 111.
 3. All labor, equipment and materials necessary to complete the work, except for the concrete curb and gutter and the inlets, shall be included in the price bid for "Inlet - Slotted Drain (Size)".
 4. The non-slotted corrugated pipe angled fitting (see Table 1) shall not be paid for separately but shall be included in the price bid for the Inlet - Slotted Drain.
 5. Construction shall be in accordance with Sections 714 and 722 of the Standard Specifications.

PAY ITEMS

Inlet - Slotted Drain, 12 In	L.F.
Inlet - Slotted Drain, 15 In	L.F.
Inlet - Slotted Drain, 18 In	L.F.
Inlet - Slotted Drain, 24 In	L.F.
Inlet - Slotted Drain, 30 In	L.F.
Inlet - Slotted Drain, 36 In	L.F.

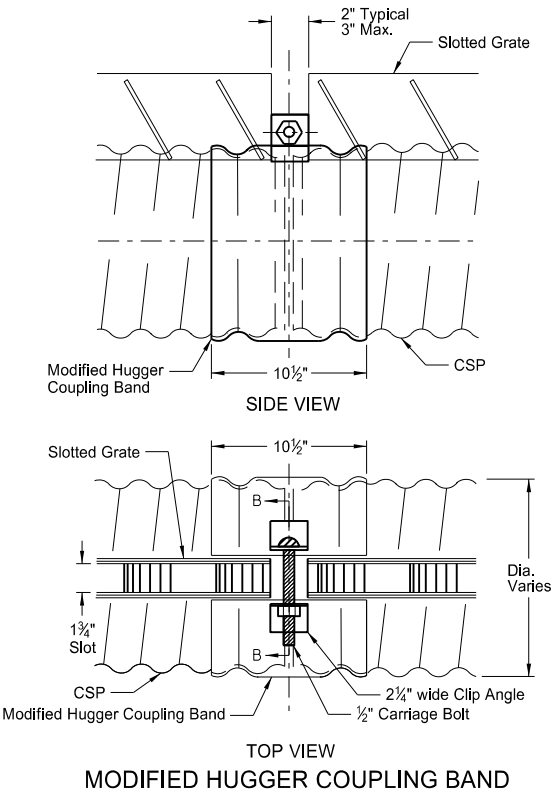
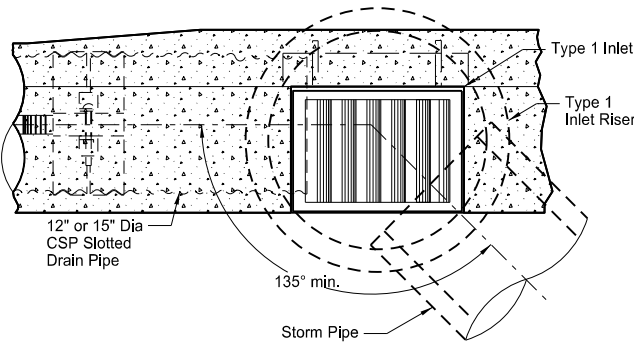


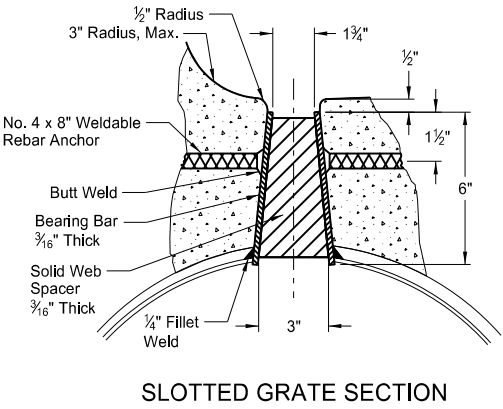
TABLE 1
CSP Angled Fitting Dimensions

Slotted Drain Pipe Dia (in.)	A (in.)	B (in.)							
		Inlet		Inlet - Special					
		Type 1	Type 2	Type 1 48"	Type 1 60"	Type 1 72"	Type 2 48"	Type 2 60"	Type 2 72"
12	12	18(A)	18	35	41	42	31	36	37
15	12	18(A)	18	36	42	43	31	37	38
18	12		18	37	42	43	32	38	39
24	24				44	45		39	41
30	24				45	46		41	42
36	24					48			44

(A) 135° min. angle required between CSP and Storm Pipe for Type 1 Inlet - see Type 1 Inlet Connection Detail)



TYPE 1 INLET CONNECTION DETAIL
For 12" and 15" Slotted Drain Installation

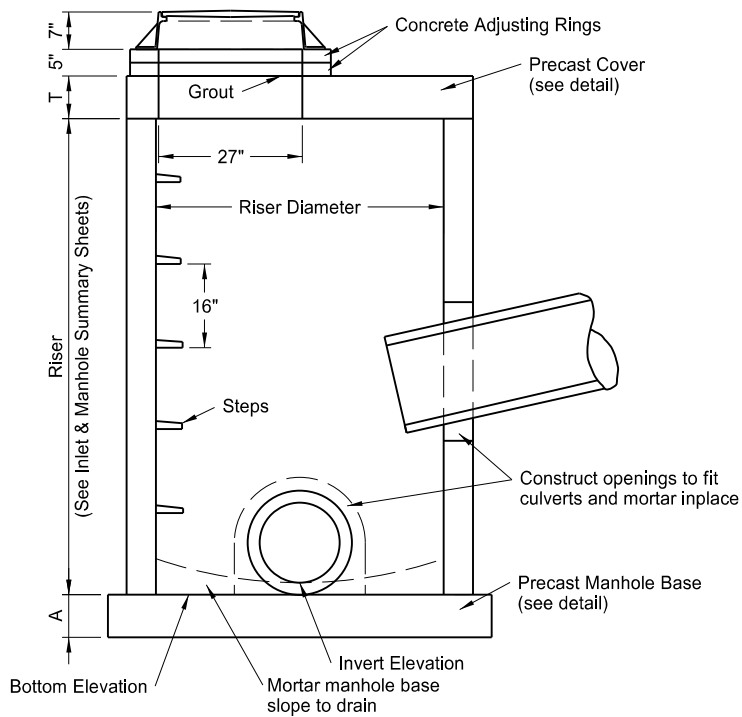


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
03-17-2014	
REVISIONS	
DATE	CHANGE

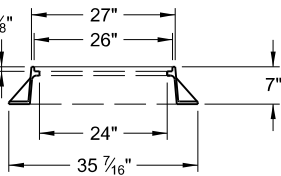
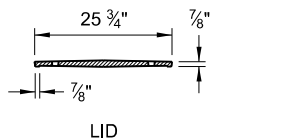
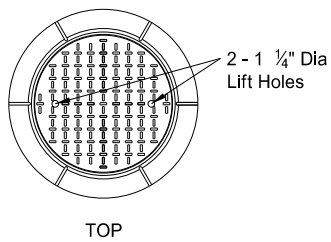
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MANHOLE DETAILS

D-722-5



ELEVATION



MANHOLE CAST IRON RING & COVER

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.

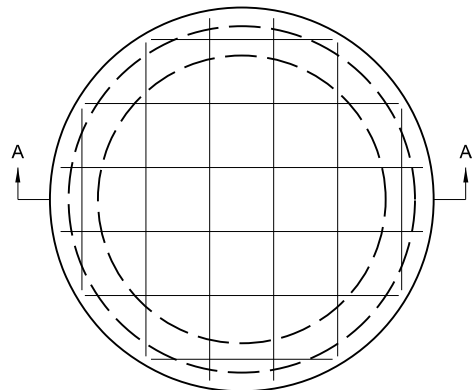
MANHOLE BASES

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"

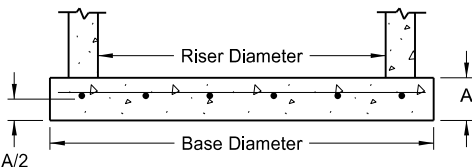
* - Reinforcement listed shall be placed in each direction.

NOTES:

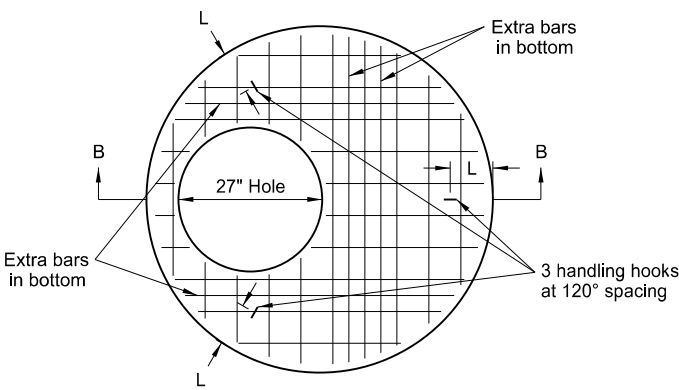
- The contractor shall have the option of using precast or cast-in-place bases. Class of concrete shall be AE. The aggregate size shall be approved by the engineer in the field. Construction shall be in accordance with the NDDOT Standard Specifications.
- Precast concrete manholes, risers and steps shall 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.



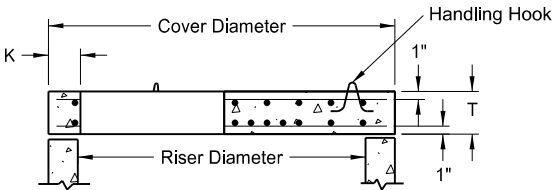
TOP VIEW



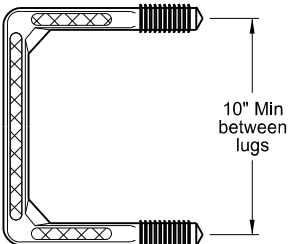
SECTION A-A
PRECAST MANHOLE BASE



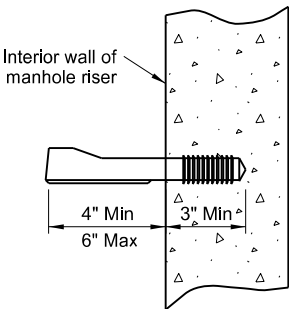
TOP VIEW



SECTION B-B
PRECAST COVER



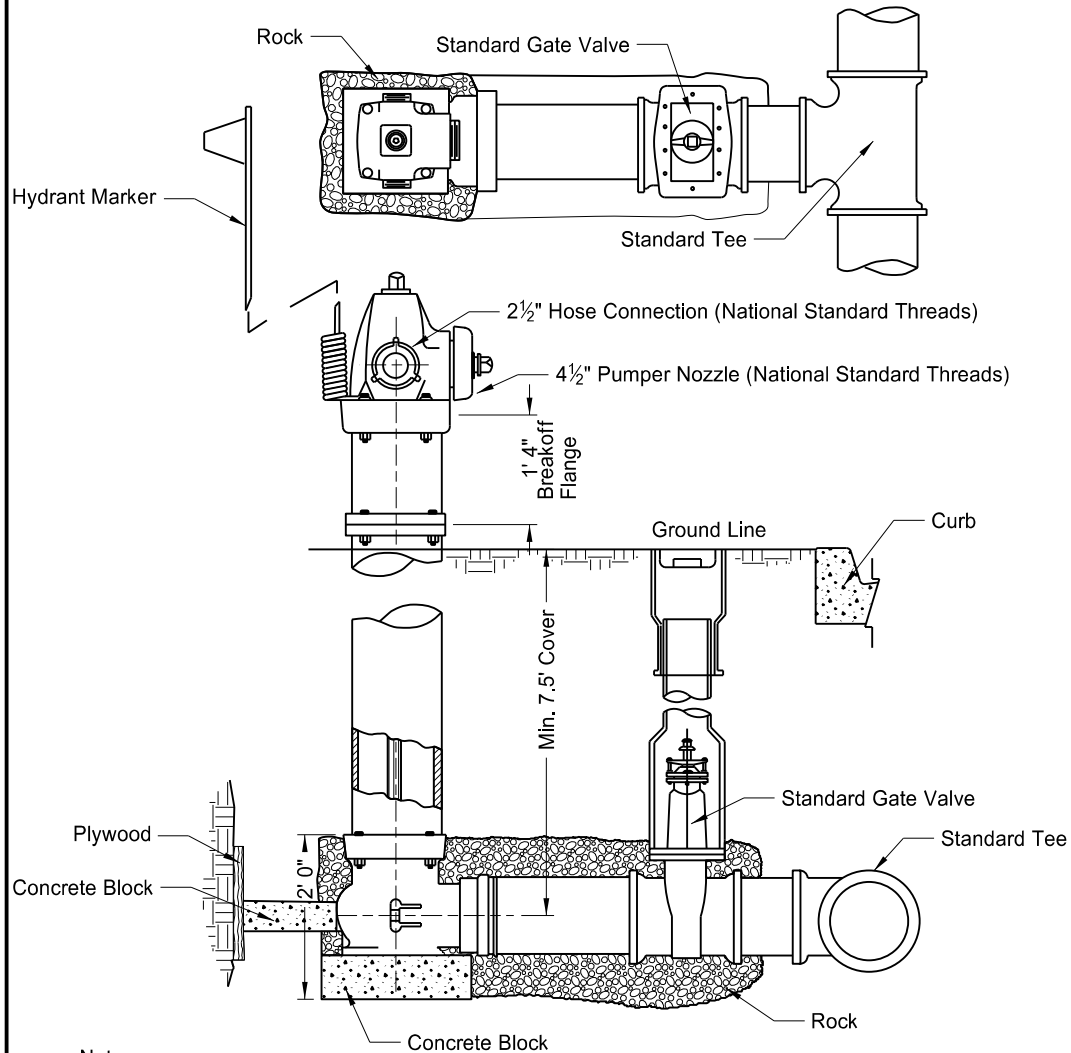
TOP VIEW



STEP DETAIL

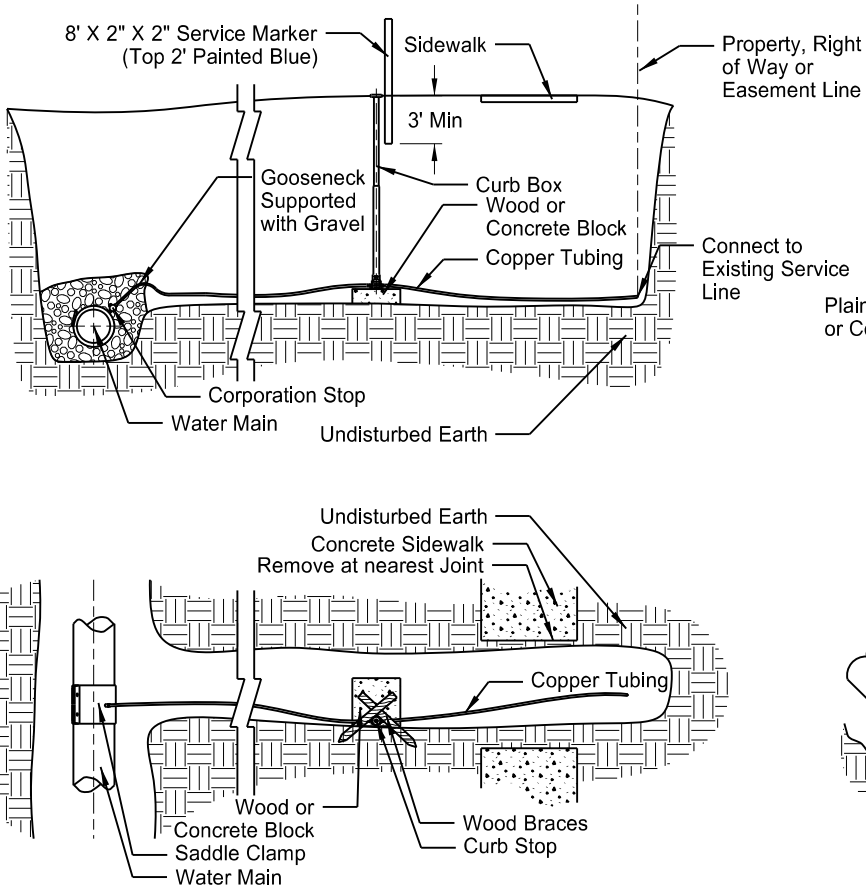
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION		This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 6-24-14 and the original document is stored at the North Dakota Department of Transportation
05-14-2013		
REVISIONS		
DATE	CHANGE	
6-24-14	Revised notes 1 & 6, added dimensions to Elev. drawing	

WATERWORKS



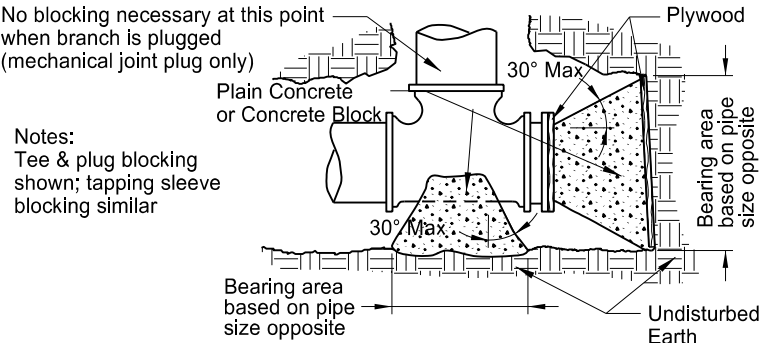
- Notes:
1. Operating & Cap Nuts: City Standards
 2. Supply and furnish and install hydrant marker. Cost will be included with the unit bid price for the hydrant. The hydrant marker shall be current with city standards or as approved by the engineer in the field.

STANDARD FIRE HYDRANT & CONNECTION



- Notes:
1. Service clamp are not required where small size service lines are connected to large cast iron or ductile iron pipe and three threads of the corporation stop make contact with the wall.
 2. Trench shall be gravel backfill from water main to back of curb line and under sidewalk areas or standard compaction of earth backfill where specified.

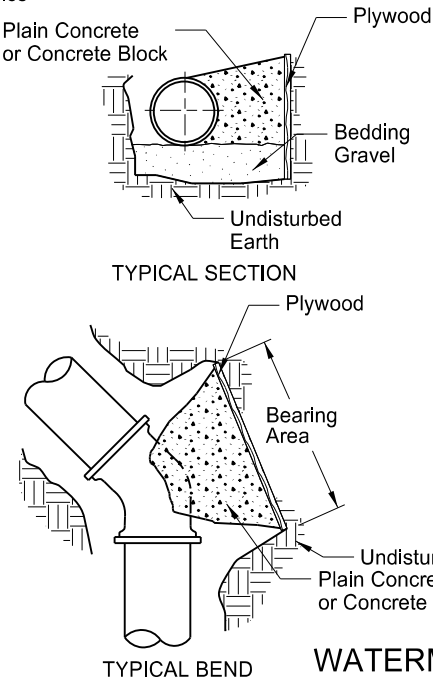
WATER CURB CONNECTION



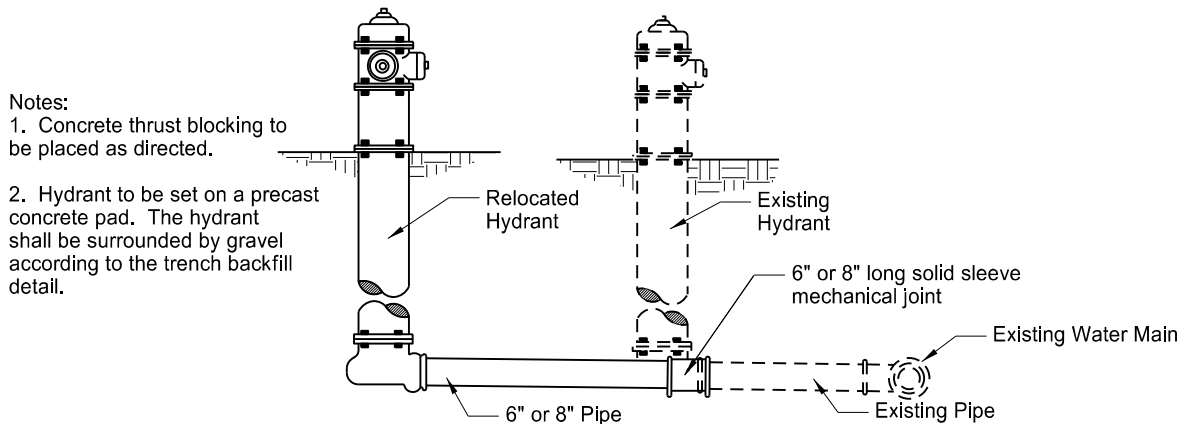
- Notes:
- Tee & plug blocking shown; tapping sleeve blocking similar

Table of Required Bearing Areas						
Size of Pipe	90° Bend	45° Bend	22.5° Bend	11.25° Bend	Tees, Plugs & Tapping Sleeves	
4"	2' Sq	2' Sq	2' Sq	2' Sq	2' Sq	
6"	3' Sq	2' Sq	2' Sq	2' Sq	3' Sq	
8"	5' Sq	3' Sq	2' Sq	2' Sq	4' Sq	
10"	8' Sq	4' Sq	3' Sq	2' Sq	6' Sq	
12"	11' Sq	6' Sq	3' Sq	2' Sq	8' Sq	
16"	20' Sq	11' Sq	6' Sq	4' Sq	15' Sq	
18"	25' Sq	14' Sq	7' Sq	4' Sq	18' Sq	

- Notes:
1. Concrete blocking to be poured against undisturbed earth and plywood. Keep bells and bolts free of concrete. Concrete in place to be included in price bid for water main.
 2. If approved by the engineer, solid concrete blocks may be used for blocking on 8" Dia. pipe and below. 10" Dia. pipe and above will conform to concrete poured in place areas as shown above.

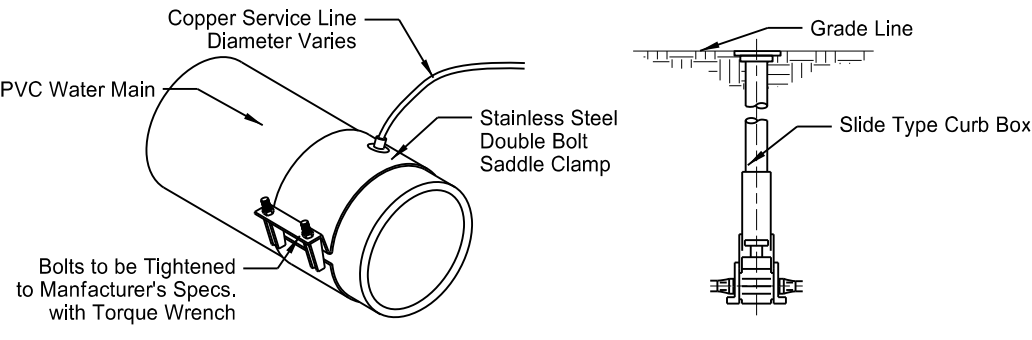


WATERMAIN THRUST BLOCK DETAILS

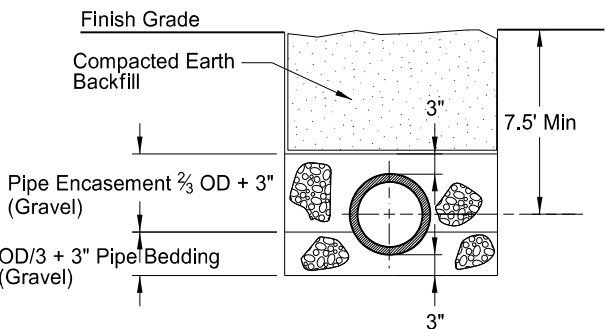


- Notes:
1. Concrete thrust blocking to be placed as directed.
 2. Hydrant to be set on a precast concrete pad. The hydrant shall be surrounded by gravel according to the trench backfill detail.

LAYOUT FOR RELOCATION OF HYDRANTS



TYPICAL CORPORATION STOP AND CURB STOP

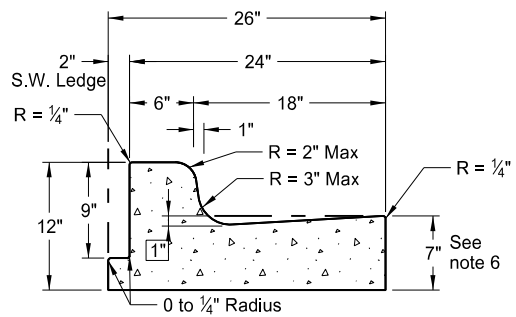


TRENCH BACKFILL

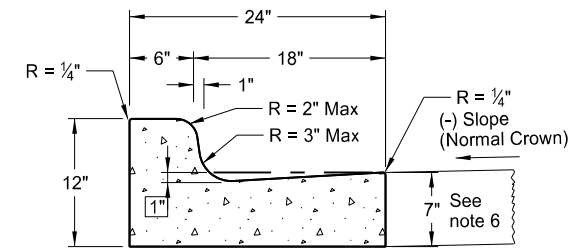
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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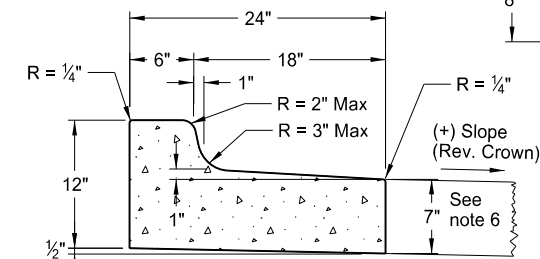
Curb & Gutter and Valley Gutter



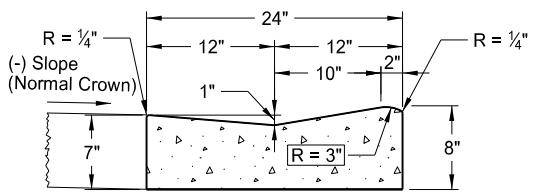
Curb & Gutter Type 1 (Sec. A & B)
Adjacent to Concrete Sidewalk,
Median, or Parking Lot.
(Sec. A shown. See Sec B for
additional details.)



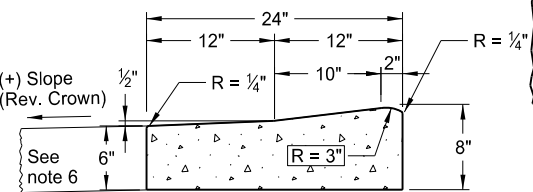
Curb & Gutter Type 1 (Sec. A)



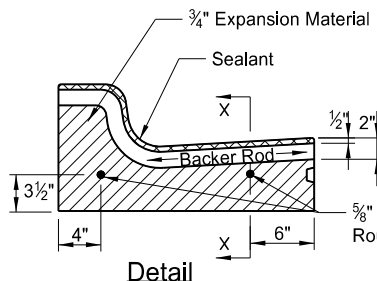
Curb & Gutter Type 1 (Sec. B)



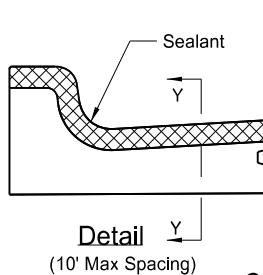
Mountable Curb & Gutter Type 1 (Sec. A)



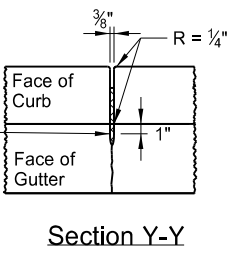
Mountable Curb & Gutter Type 1 (Sec. B)



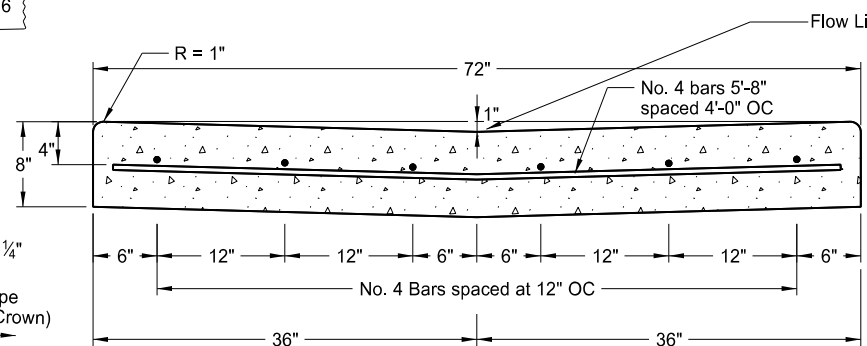
Isolation Joint



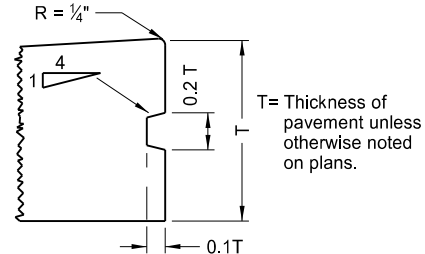
Contraction Joint



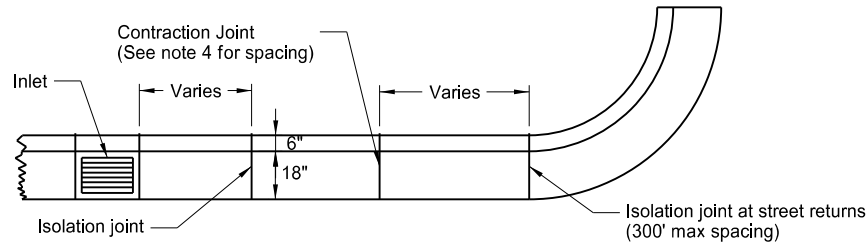
Section Y-Y



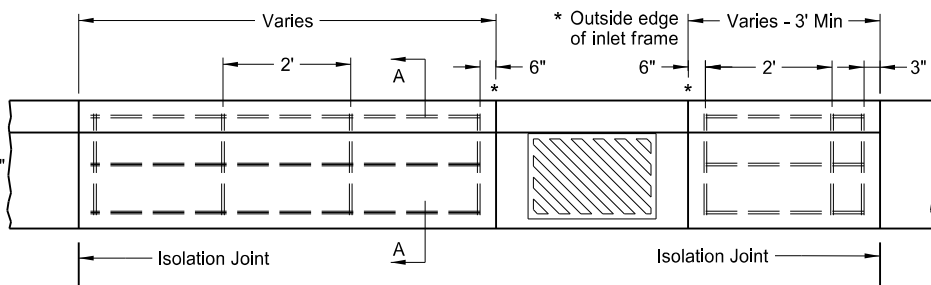
72" Concrete Valley Gutter Detail



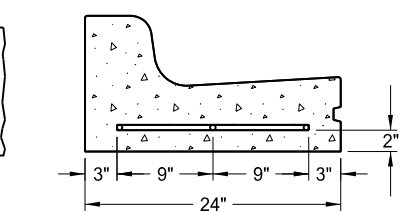
Keyway Detail for Curb & Gutter
(To be used with PCC Pavement and Drives)



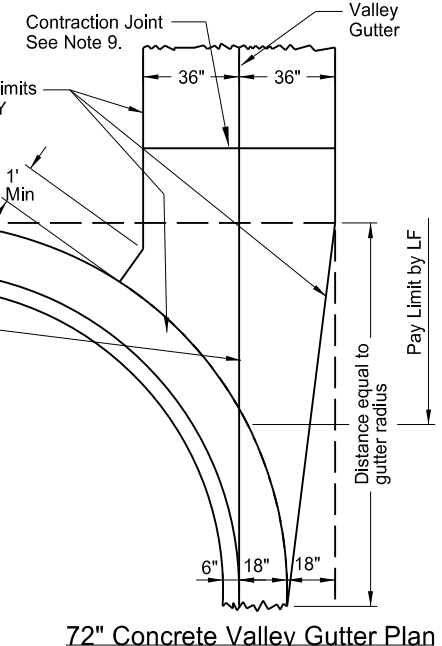
Joint Location Detail



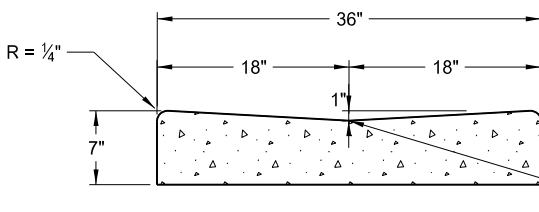
Curb & Gutter Reinforcing at Inlets



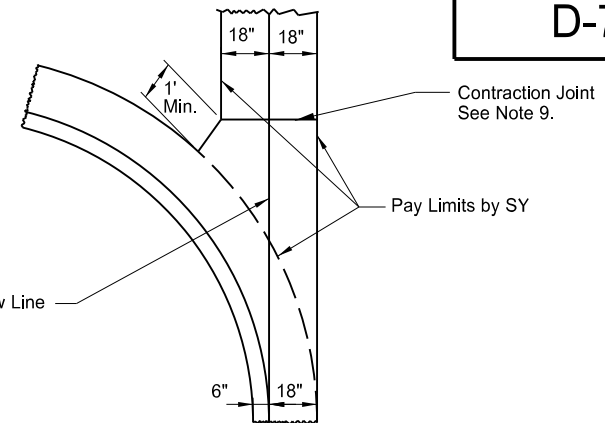
Section A-A



72" Concrete Valley Gutter Plan



36" Concrete Valley Gutter Detail



36" Concrete Valley Gutter Plan

- NOTES:**
1. Curb and Gutter Type 1 (Sec. A & B) to be used. Section "A" to be used with (-) pavement slopes and section "B" to be used with (+) pavement slopes.
 2. Contraction Joints: Tool the Curb & Gutter 2" as shown on the contraction joint details.
 3. Isolation Joints: Isolation joint material shall be 3/4" preformed expansion joint filler conforming to the standard specifications. The opening for the backer rod and joint sealant shall be formed by a pre-cut piece of wood or other material approved by the engineer. Dowel supports are not required on the second pour at a cold joint, plastic or metal caps and greased dowels shall be installed in the cold joint for the second pour.
 4. Joint Spacing: For hot bituminous pavements the joint spacing for the curb and gutter shall be 10' max. with the panels on each side of the inlets. For concrete pavements the joint spacing for the curb and gutter shall match the pavement joint on PCC Pavements of approximately 15' spacing.
 5. Joint sealing: All contraction and isolation joints shall be sealed as shown in the details. The joint sealant for contraction joints shall conform to section 826.02B. The sealant for expansion joints shall be as specified in note 3 above. The sealant shall be tooled and installed in accordance with the manufacturer's recommendations.
 6. Depth of Face of Gutter: For hot bituminous pavement the depth of gutter shall be 7" as shown. For PCC pavements, the Contractor has the option to match the depth of gutter to the depth of the adjacent PCC pavement or to construct a 7" depth as shown.
 7. When the curb and gutter abuts PCC pavement, it shall be tied to the PCC pavement. The tie bar shall consist of a No. 3 bar, 1'-6" in length spaced 4' center to center.
 8. On street returns and other locations where the new curb and gutter ends and does not abut existing curb and gutter, the end two (2) feet of the curb shall be tapered from 6" in height to 0". A 1/2" premolded isolation joint which is full depth and the same shape as the curb and gutter shall be installed just ahead of the taper. An 18" tie bar shall be installed across the joint.
 9. Valley Gutter Joints: Contraction joints are required at approx. 10' intervals. The contraction joints shall be 1/8" min. to 3/8" max. in width. The joints shall be formed by sawing or scoring to a minimum depth of 2". The joint sealant shall be a hot poured elastic type joint sealer in accordance with Section 826.02A.2 of the Standard Specifications. The joint and sealant shall be included in the price bid for Valley Gutter.

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NOTE: All bars shall be #4 deformed reinforcing bars. Splices will not be permitted. Reinforcing bars at inlet locations will not be paid for separately, but shall be included in the price bid for "Curb and Gutter - Type 1." This includes inlets located on radii. The reinforcement shall be extended to the second joint (rebar placed through the first joint) in cases where the 3' min. panel length cannot be obtained.

CONCRETE DRIVEWAY - URBAN

D-750-1

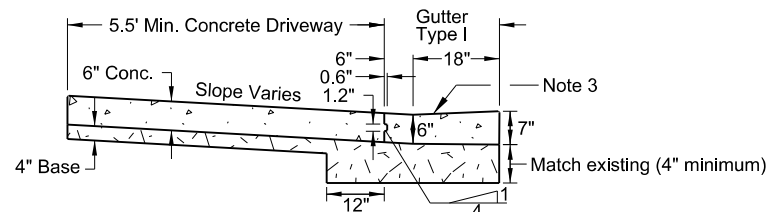
NOTES:

- 1. 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.
- 2. 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.

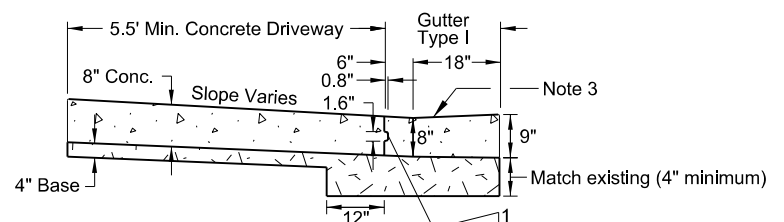
The contraction joints may be sawed or a grooved joint, and shall be a minimum of 1/3 the depth of the concrete.
- Isolatin joints should also be used between seperately poured concretes, or between old and new concrete.
- All joints shall be sealed with hot pour bituminous filler or low modulus silicone. 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.
- 3. Gutter-Type 1 shall be paid for at the unit price bid for "Curb and Gutter-Type 1".
- 4. 6" Driveway to be used unless otherwise specified.
- 5. 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.
- 6. Sidewalk that falls behind a driveway shall be constructed to the same thickness as the driveway and shall be paid for as driveway concrete.



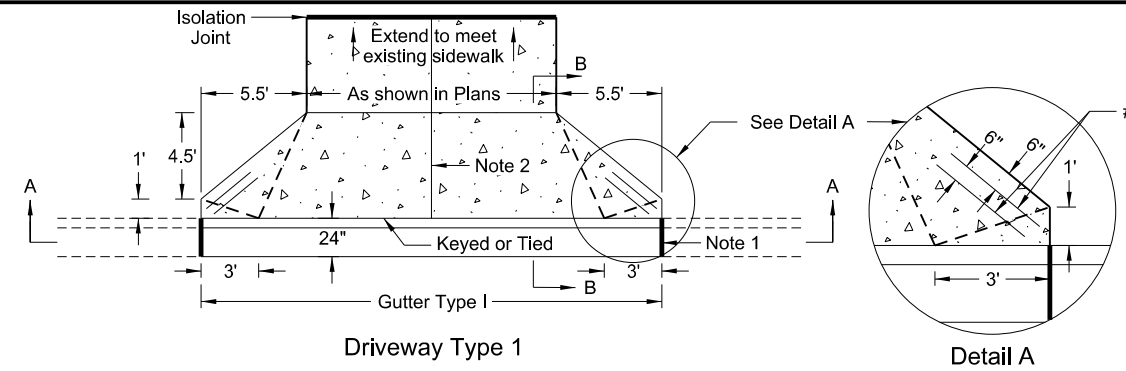
Section A-A



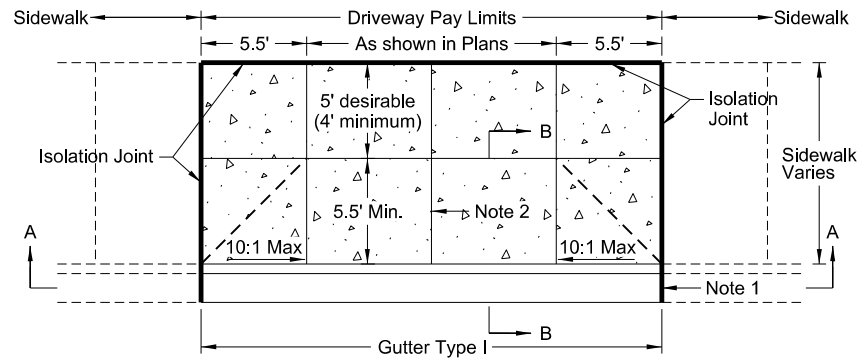
6" Section B-B



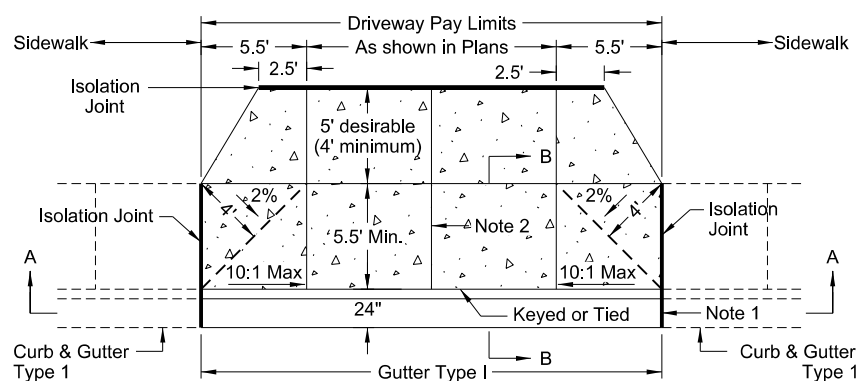
8" Section B-B



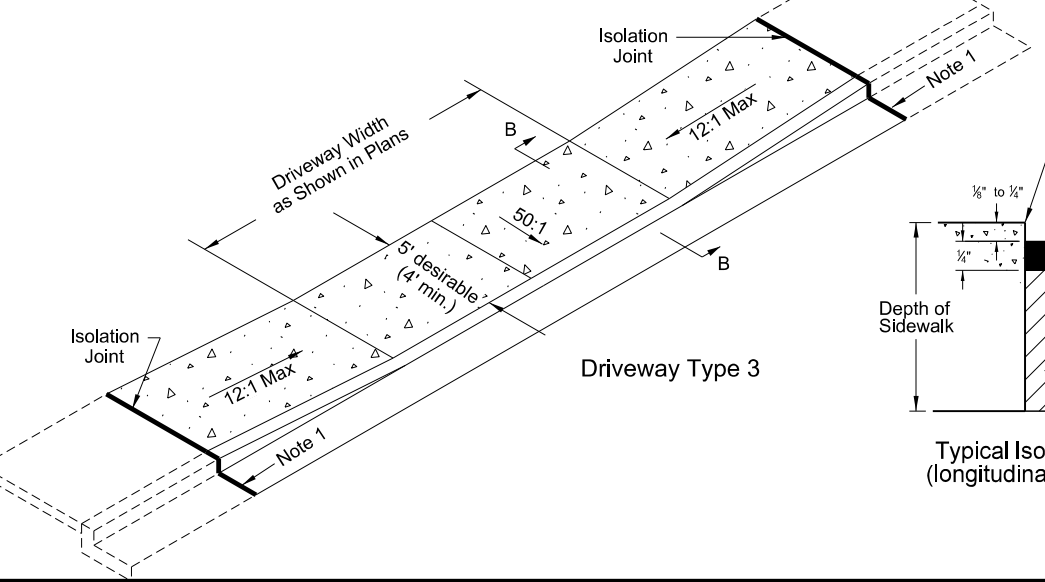
Driveway Type 1



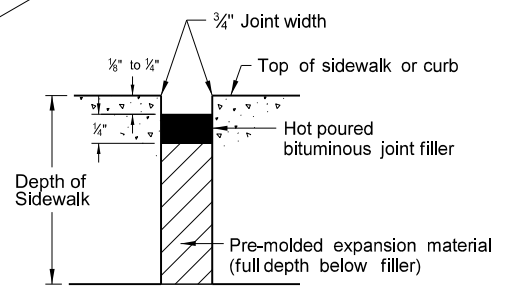
Driveway Type 2A



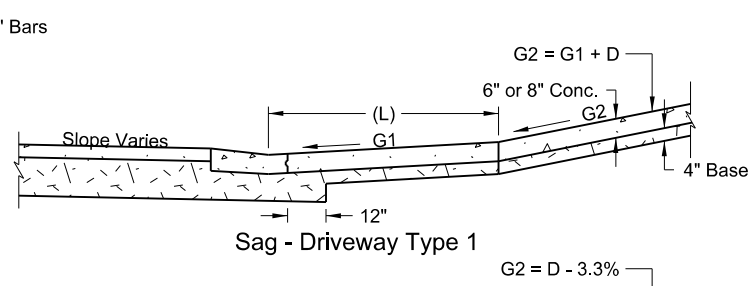
Driveway Type 2B



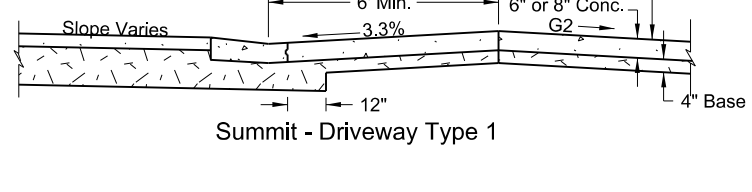
Driveway Type 3



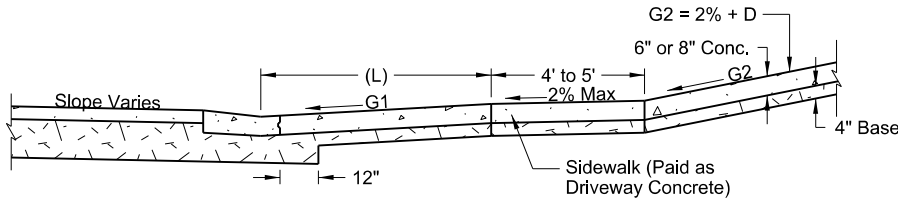
Typical Isolation Joint Seal (longitudinal and transverse)



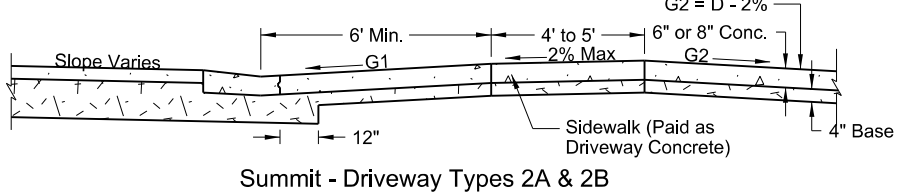
Sag - Driveway Type 1



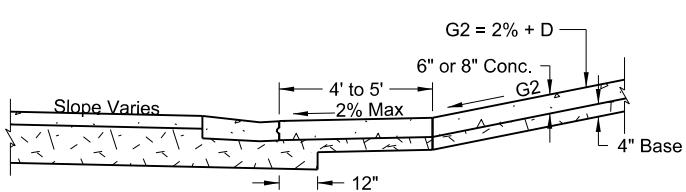
Summit - Driveway Type 1



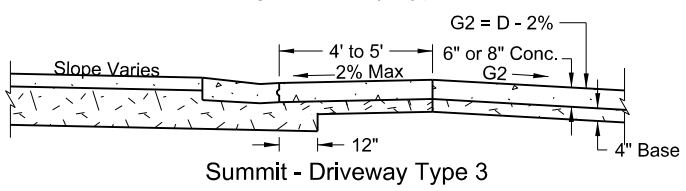
Sag - Driveway Types 2A & 2B



Summit - Driveway Types 2A & 2B



Sag - Driveway Type 3



Summit - Driveway Type 3

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%

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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.

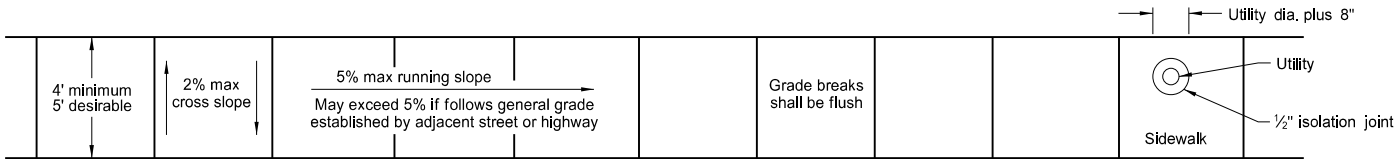
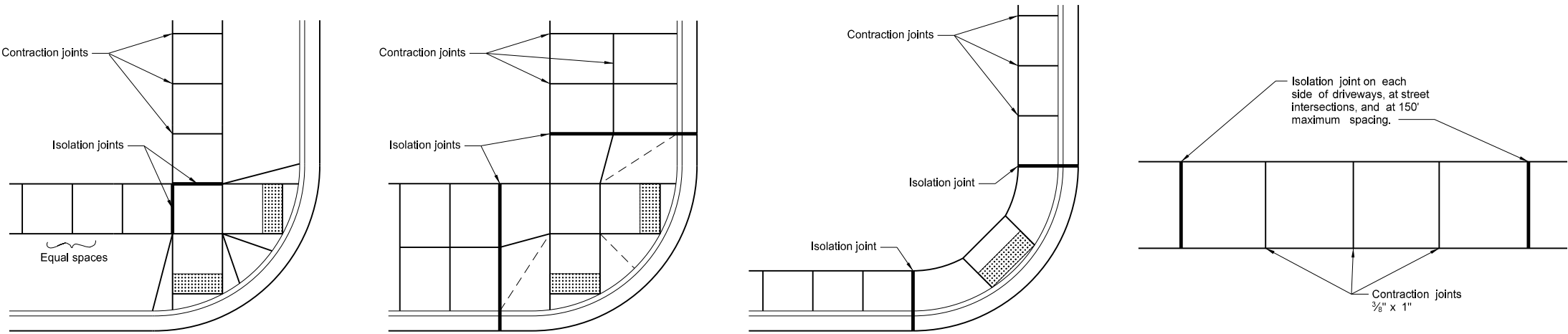
Longitudinal contraction joints shall be used where the sidewalk width is 8' or greater, and shall be spaced at half the sidewalk width.

The contraction joints may be sawed or a grooved joint, and shall be a minimum of 1/3 the depth of the concrete.

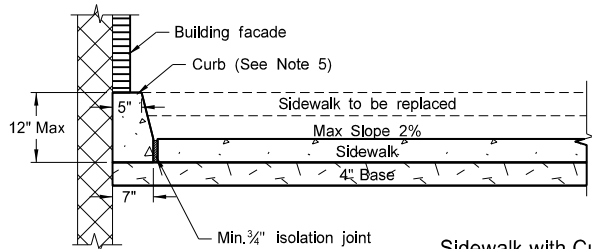
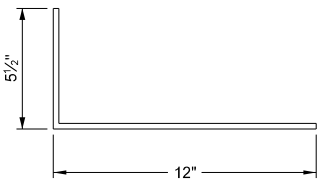
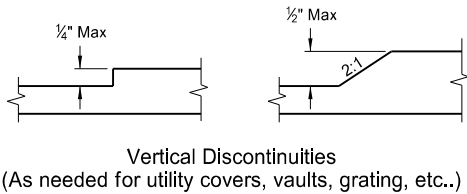
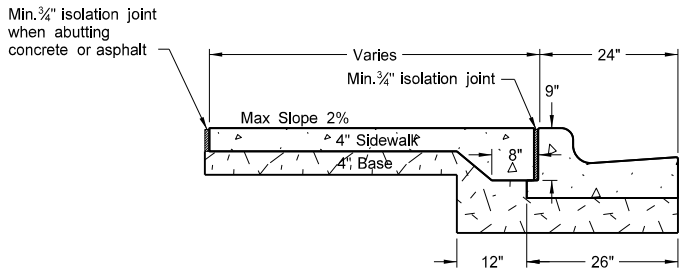
When the sidewalk is adjacent to the curb & gutter, the sidewalk joint spacing shall be varied to match up with the curb & gutter joints.

Isolation joints should also be used between separately poured concretes, or between old and new concrete.

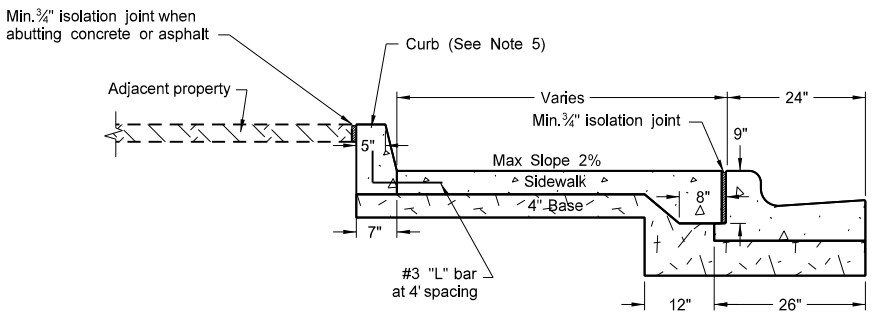
The cost for all labor, equipment, and material necessary to construct contraction and isolation joints shall be included in the price bid for sidewalk concrete.
3. 4" sidewalk concrete thickness to be used unless otherwise specified in the plans.
4. 4" base material thickness to be used unless otherwise 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.



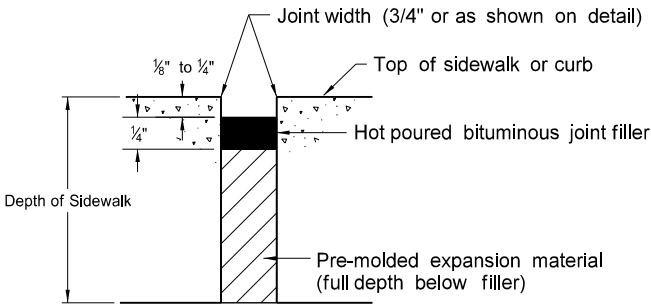
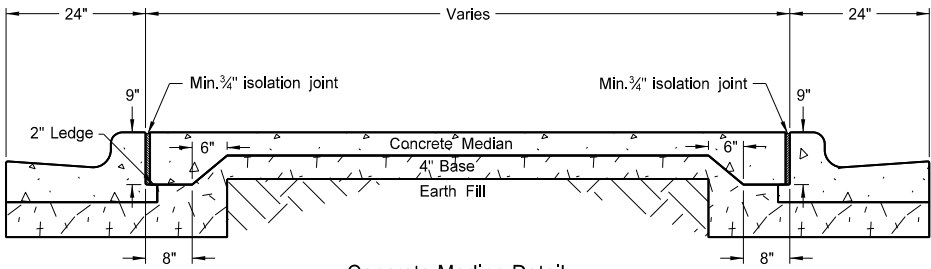
Utility Blockout



Sidewalk with Curb Detail
(Building face application)



Sidewalk with Curb Detail
(Adjacent property application)



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11-26-13	
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DATE	CHANGE

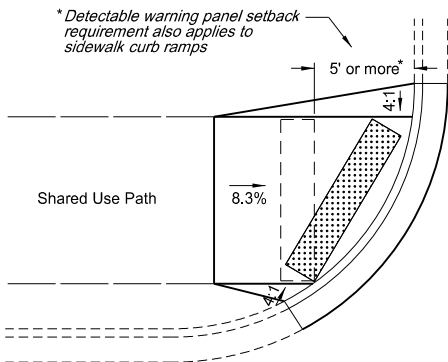
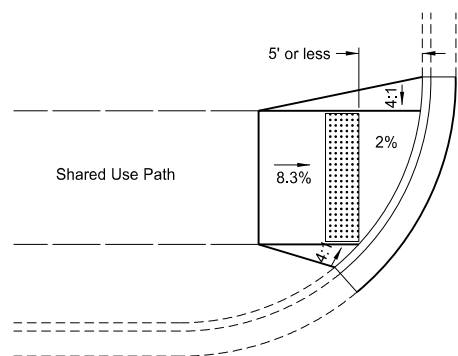
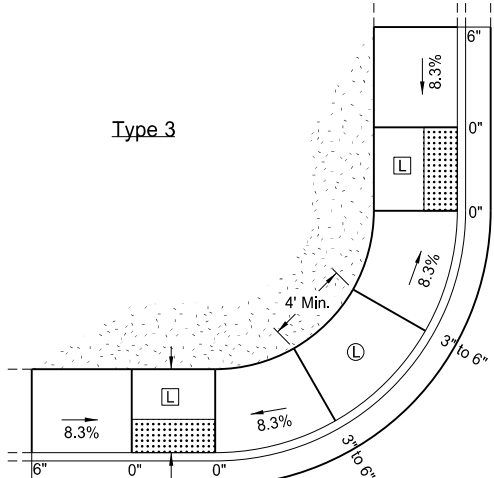
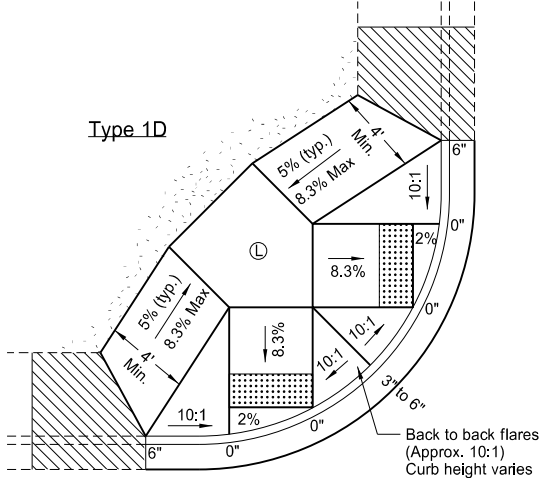
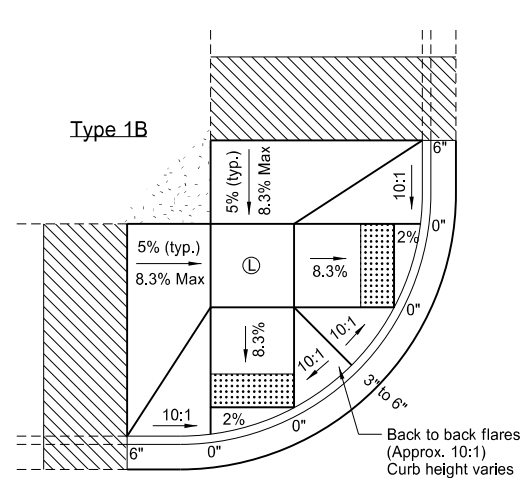
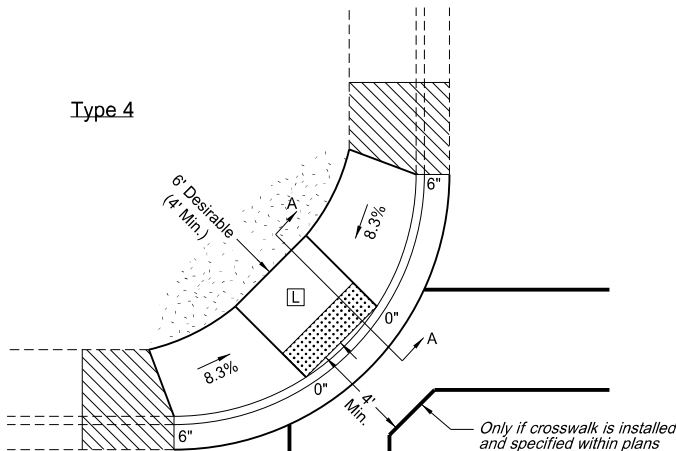
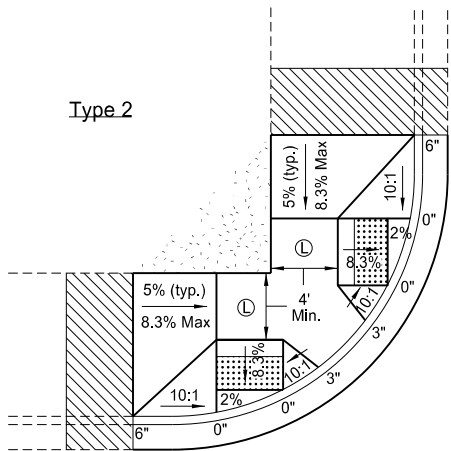
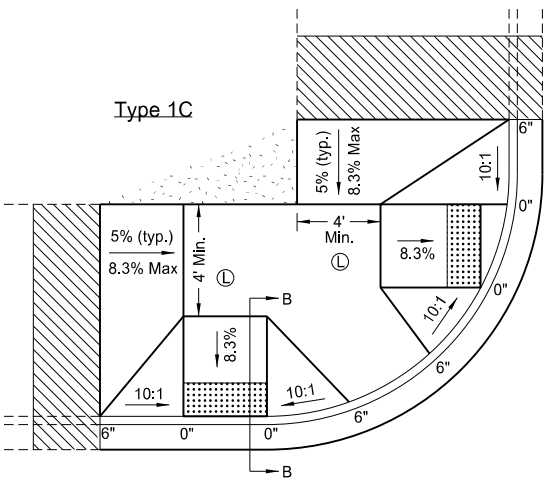
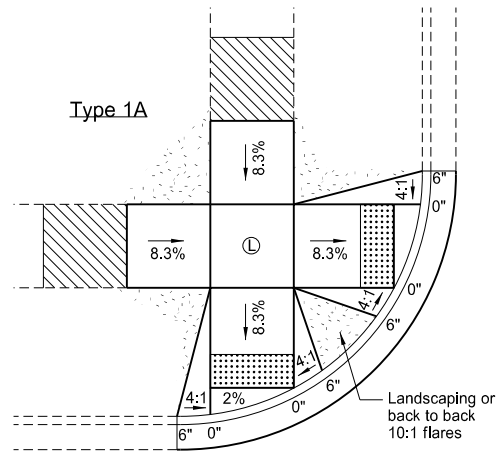
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CURB RAMP DETAILS

D-750-3

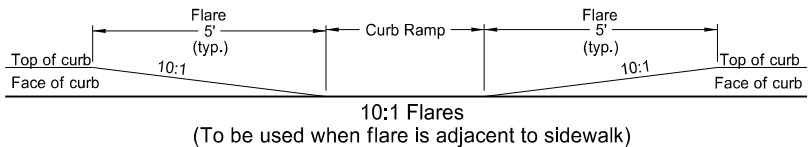
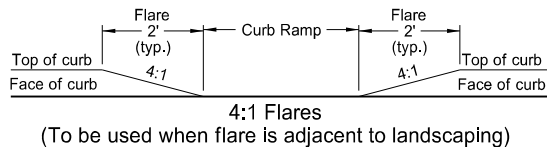
+More Right of Way

Less Right of Way

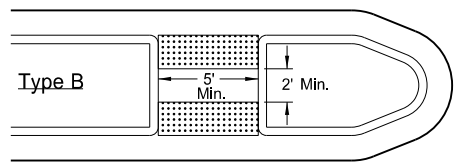
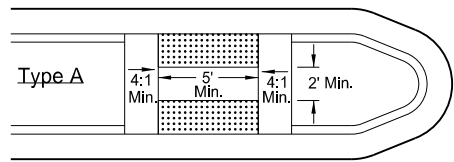


Concrete Apron for Shared Use Paths with Curb and Gutter

Concrete Apron for Shared Use Paths without Curb and Gutter



Median Refuge Islands (Cut-Through)



NOTES:

- Ramp width is defined as the useable portion of the ramp, excluding flares if used.

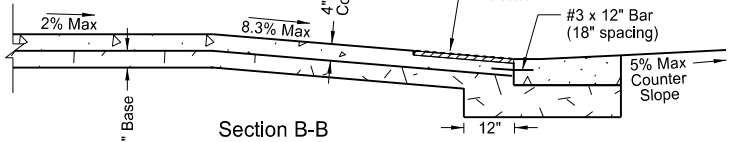
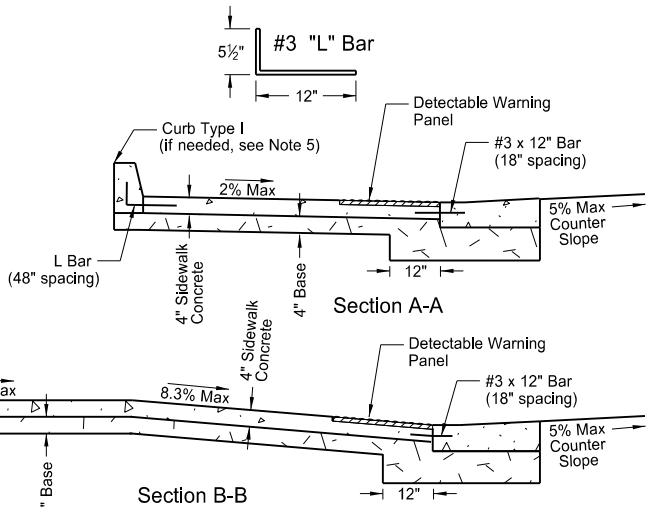
Curb ramp width should match the existing sidewalk width. 4' width minimum.

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.

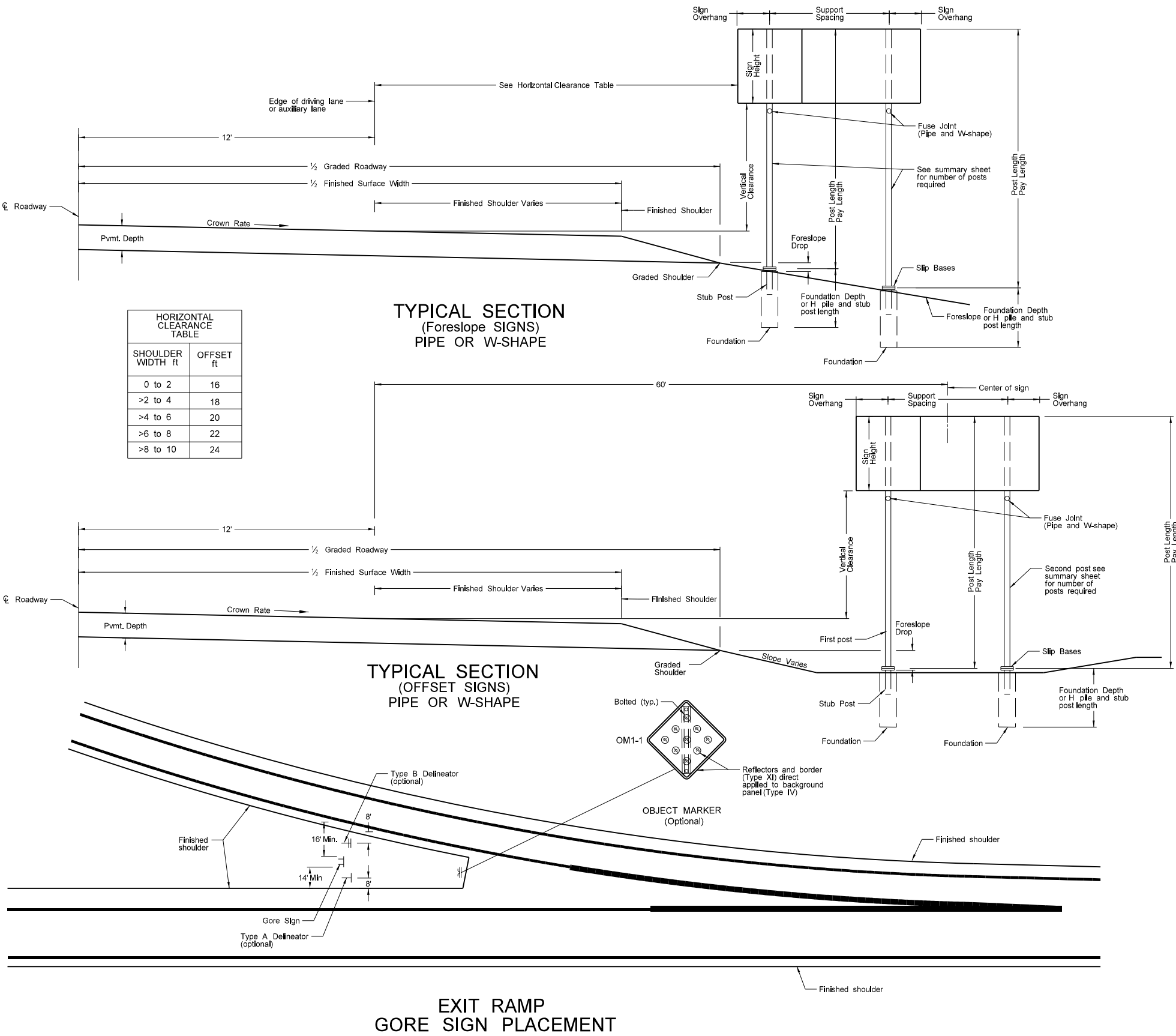


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11-26-13	
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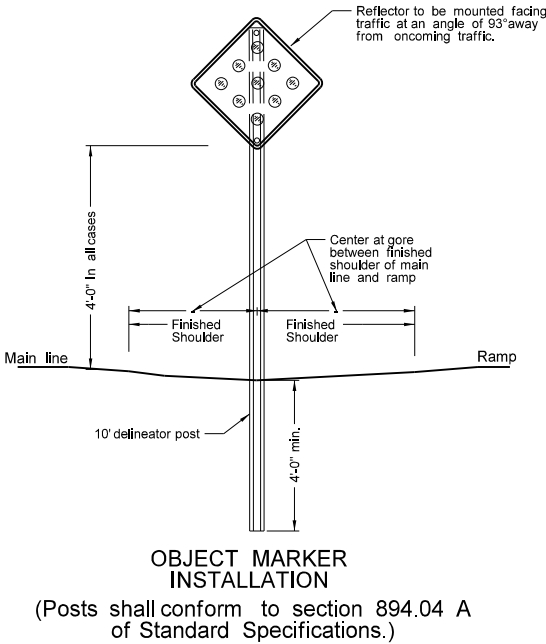
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PIPE OR W-SHAPE ASSEMBLY DETAILS

D-754-1

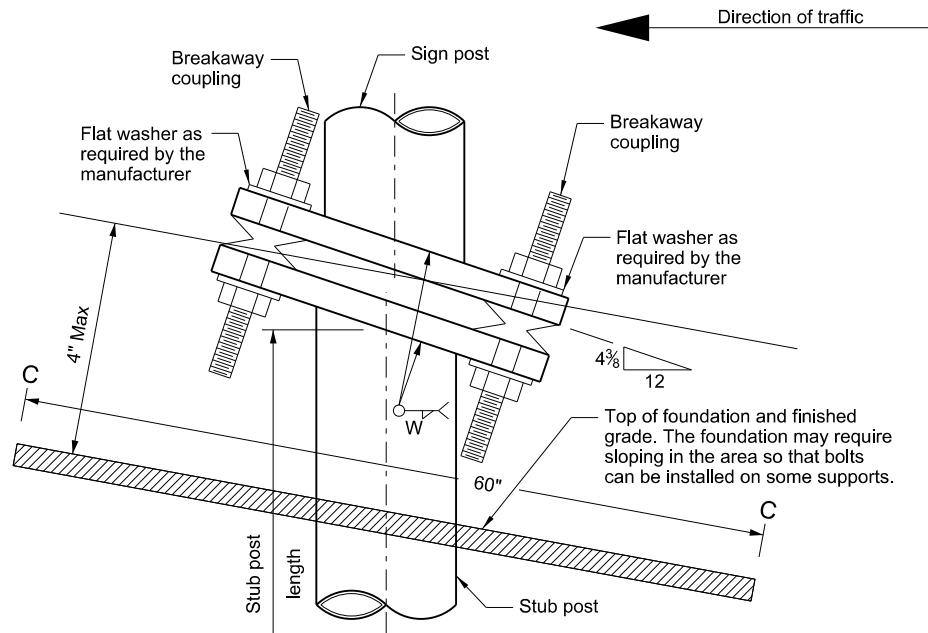


NOTES:
MINIMUM VERTICAL CLEARANCE:
Signs installed at the side of the road in rural districts shall be at least 5 feet measured from the bottom of the sign to the edge of driving lane, or Auxiliary Lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least 7 feet.
Signs on freeways, expressways, and multi-lane conventional roadways shall be installed with a minimum height of 7 feet.
Where signs are placed at least 30 feet or more from the edge of the traveled way, the height to the bottom of such sign shall be 5 feet above the edge of driving lane.
Signs may be placed a maximum of 6" above the vertical clearance specified above.

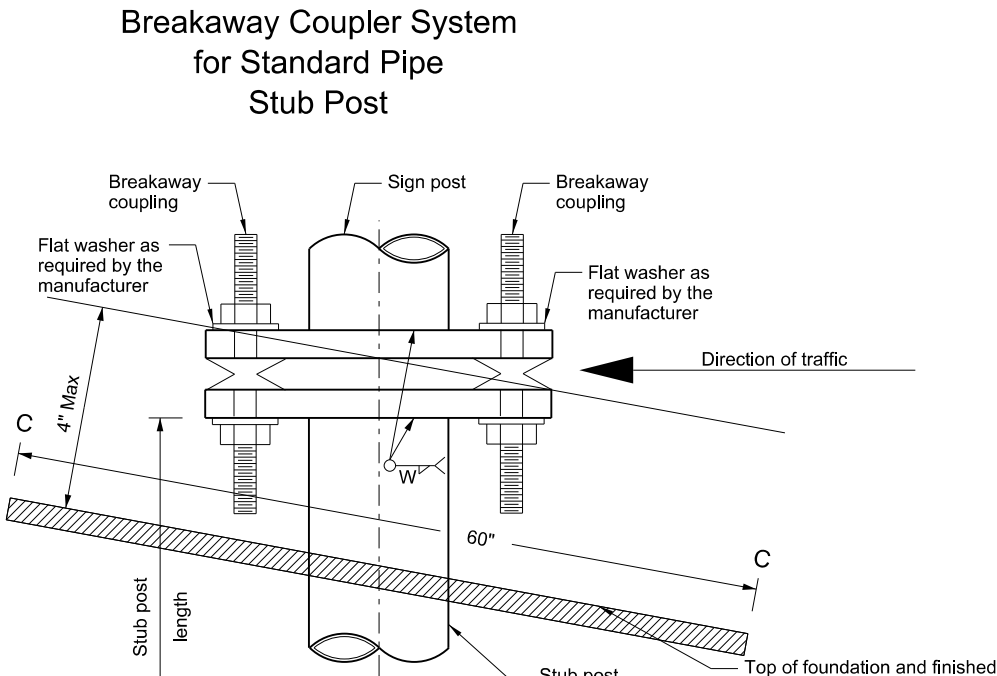


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
7-18-14	Modify notes and update reflective sheeting for object marker. Add correct section number for object marker post.

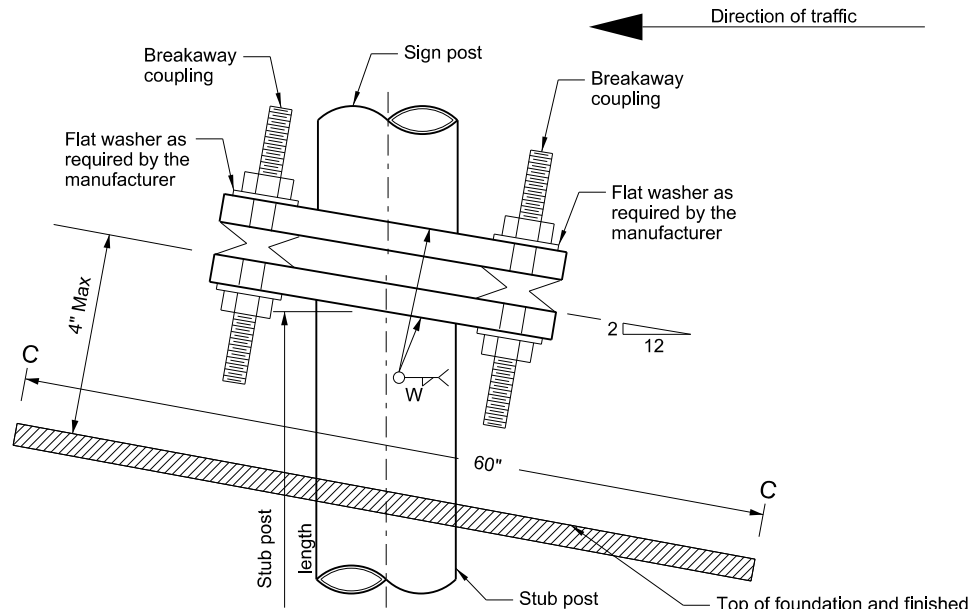
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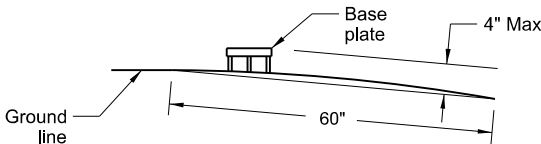
Single Post Sign and Stub Post
Type A



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



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

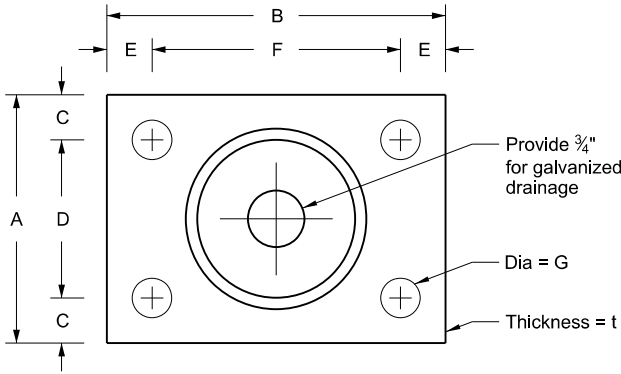


Section C - C

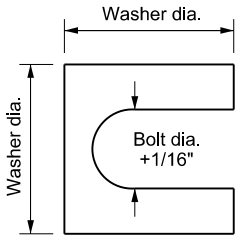
Max. protection of the stub post is 4" above a 60" chord aligned radially to the center line of the highway and connecting any point, within the length of the chord, on the ground surface on one side of the support to a point in the ground surface on the other side.

Notes:

1. In lieu of the breakaway base system on standards D-754-3 and D-754-4 the breakaway coupler system may be used. The breakaway coupler system shall be manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements as specified by DENT BREAKAWAY IND., INC. which meets the requirements of NCHRP Report 350.
2. Fuse Joint Cuts - Steel posts may be cut after galvanizing and cut surface treated in accordance with ASTM A780 or the cut may be galvanized after fabrication. Aluminum posts will need no treatment.
3. Shim as required to plumb post.
4. Tighten all bolts the maximum possible with 12" to 15" wrench.



Plan Base Plate



Shim Detail

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE

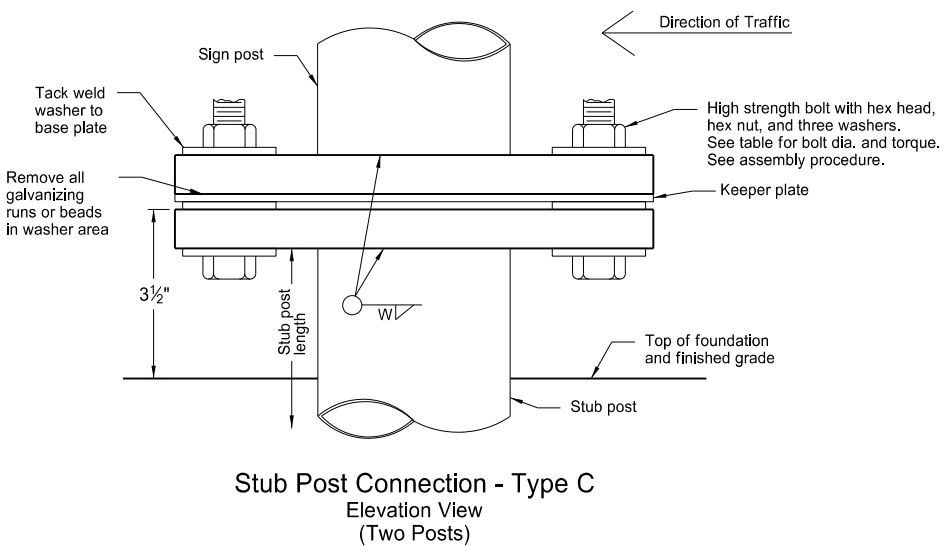
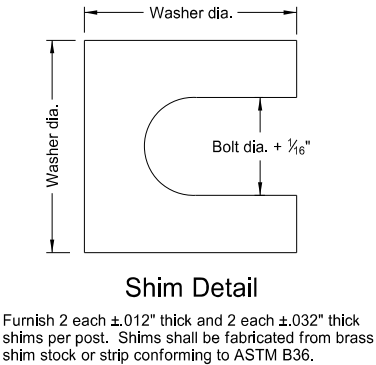
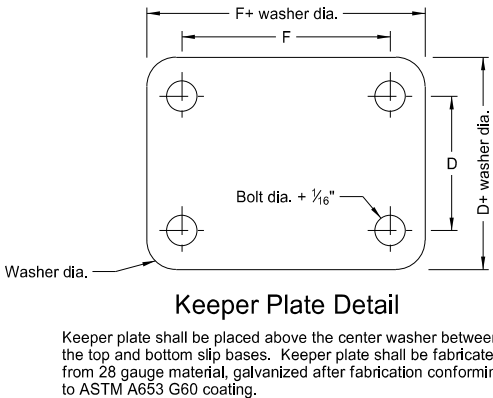
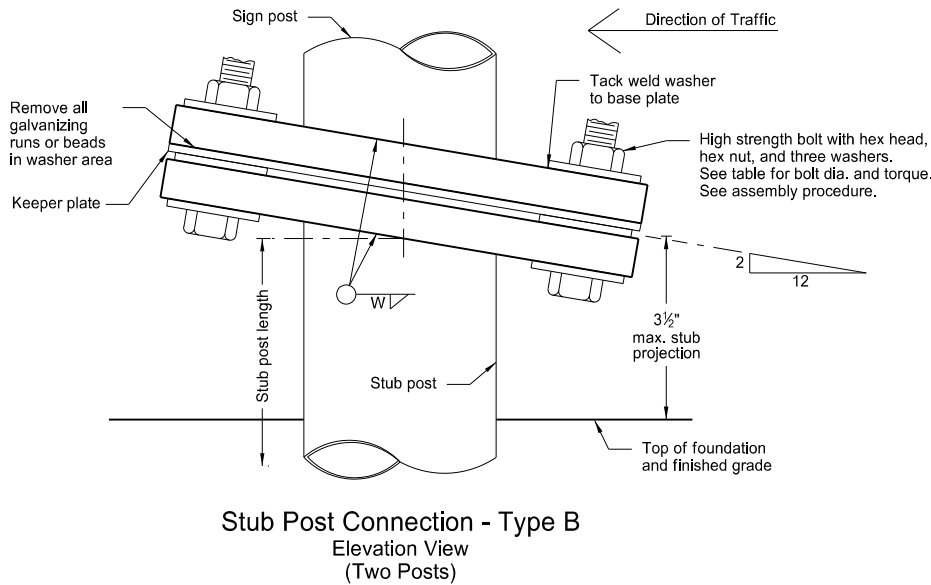
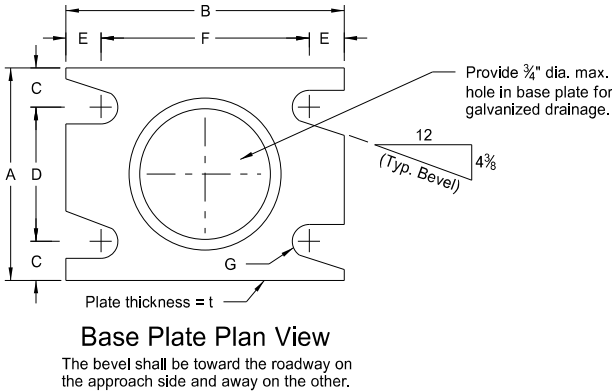
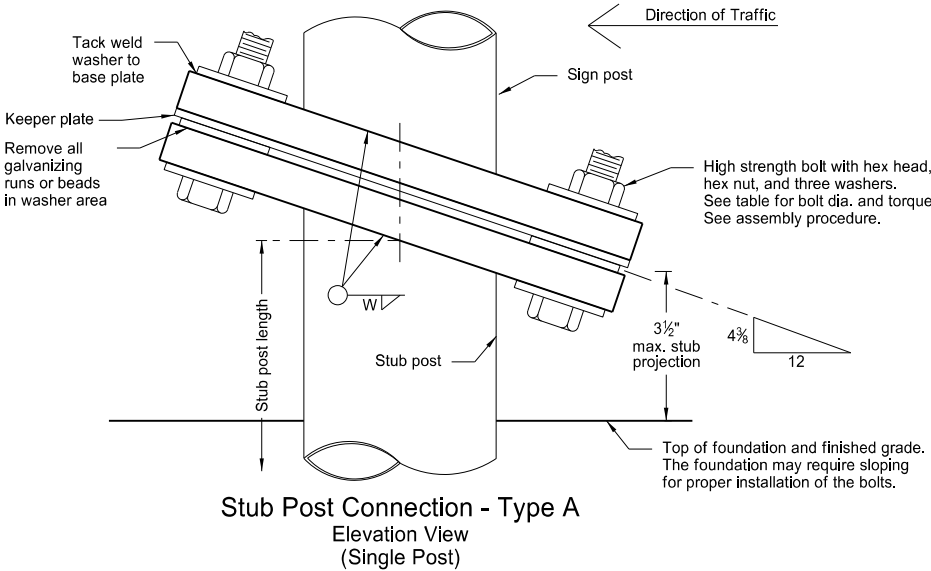
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Breakaway System
for Standard Pipe
Stub Post

Notes:
When the base plate is fabricated in aluminum, the aluminum base plate washers shown shall be tack welded to the base as shown.

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

- Assembly Procedure:
1. Assemble post to stub with bolts and with one flat washer between base plates and keeper plate.
 2. Shim as required.
 3. Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and shims and to clean bolt threads, then loosen.
 4. Retighten bolts in a systematic order to prescribed torque. (see table)
 5. Loosen each bolt and apply thread locking liquid resin. The liquid locking resin shall conform to ASTM D5363-Q3 (2008). The thread locker shall secure the entire assembly from vibration, pressure and corrosion. The thread locker shall fill the gaps between the thread and the mating surface to form solid, one part assemblies.
 6. Retighten each bolt to prescribed torque in the same order as initial retightening.



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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-21-11	
REVISIONS	
DATE	CHANGE
2-28-14	Removed lower post and foundation details.

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FOUNDATION DATA FOR STEEL SUPPORTS

D-754-5

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

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

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

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

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

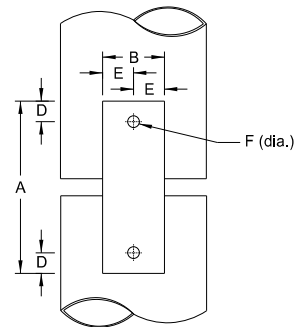
NOTES:

1. All reinforcing steel shall be Grade 60 steel.

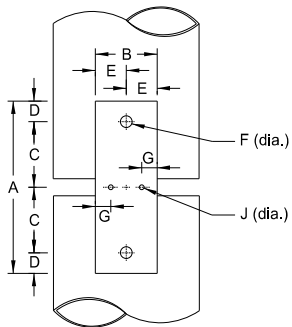
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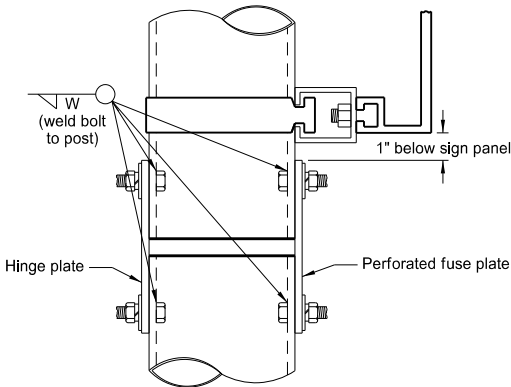
Hinge Plate, Fuse Plate
and Foundation Details
for Standard Pipe



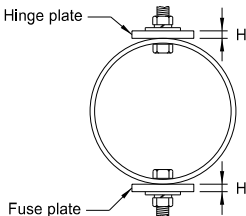
Hinge Plate



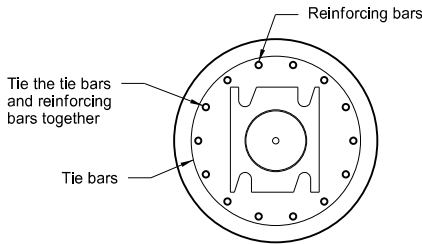
Perforated Fuse Plate



Side View

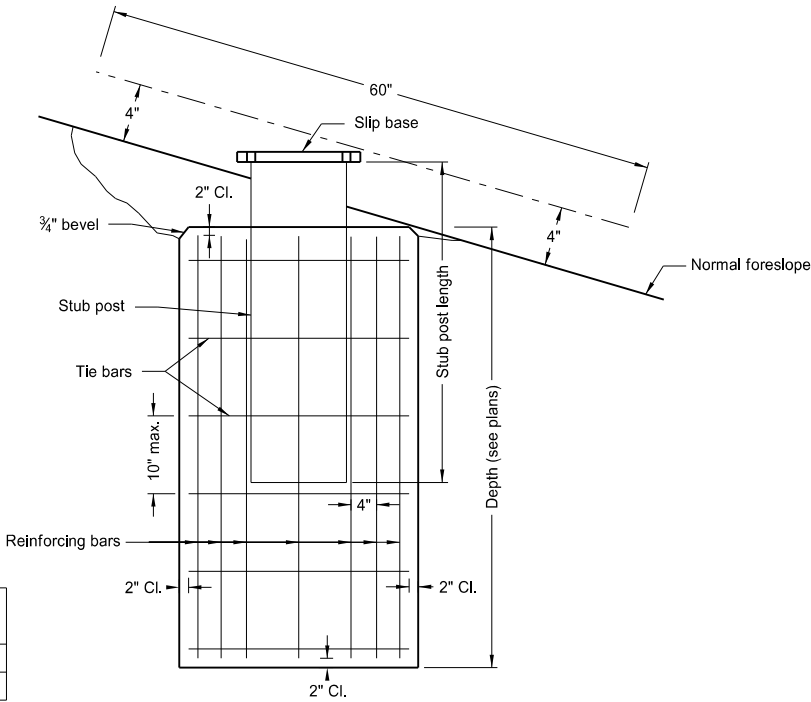


Top View



Top View

See standard drawing D-754-5 for size, number and length of rebar. If using Type D only 3 bolt base plate is required.



Foundation
Front View

Foundation detail for breakaway base with stub post connection.

Foundation diameter	Post Size
1'-4"	3½"-4"
1'-9"	5"-6"

Round Metal Posts							
Dimensions				Properties			
Nominal dia. in.	Outside dia. in.	Inside dia. in.	Wall Thickness in.	Weight per Foot Pound	Moment of Inertia in. ⁴	Cross Sec. Area in. ²	Section Diameter in. ²
Steel							
3½	4.000	3.548	.226	9.11	4.788	2.680	2.394
4	4.500	4.026	.237	10.79	7.233	3.174	3.215
5	5.563	5.047	.258	14.62	15.16	4.300	5.449
6	6.625	6.065	.280	18.97	28.14	5.581	8.495
Aluminum							
3½	4.000	3.548	.226	3.151	4.788	2.680	2.394
4	4.500	4.026	.237	3.733	7.232	3.174	3.214
5	5.563	5.047	.258	5.057	15.16	4.300	5.451
6	6.625	6.065	.280	6.564	28.14	5.581	8.496

Nominal Pipe Size dia.	Fuse and Hinge Plate Data										
	Bolt Size	A	B	C	D	E	F	G	H	I	J
3½"	½"Ø x 1½"	5"	1¾"	1¹¹⁄₁₆"	1³⁄₁₆"	⁷⁄₈"	⁹⁄₁₆"	1⁵⁄₃₂"	¼"	1³⁄₃₂"	⁷⁄₁₆"
4"	⁵⁄₈"Ø x 1½"	5¾"	2"	1⁷⁄₈"	1"	1"	1¹⁄₁₆"	1⁷⁄₃₂"	⅜"	1⁵⁄₃₂"	⁹⁄₁₆"
5"	⁵⁄₈"Ø x 1¾"	5¾"	2"	1⁷⁄₈"	1"	1"	1¹⁄₁₆"	⁹⁄₁₆"	½"	⁷⁄₁₆"	⁵⁄₈"
6"	¾"Ø x 2¼"	6¼"	2¼"	2"	1⅞"	1⅞"	1³⁄₁₆"	⁵⁄₈"	½"	½"	⁵⁄₈"

Notes:
Fuse joints cuts for steel posts may be cut after galvanizing and cut surface shall be treated with an approved method meeting ASTM A780 or the cut may be galvanized after fabrication. Aluminum posts will not require treatment.

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

The vertical clearance of the break-away base, 4" height and 60" clearance, shall be made above and below post location, and also back and ahead of post.

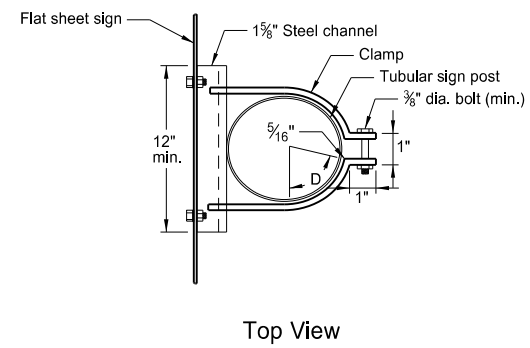
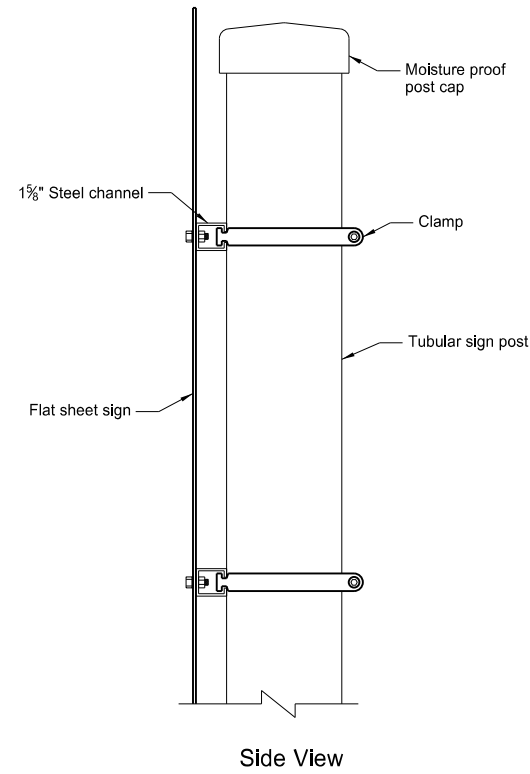
- Assembly Procedure:
1. Assemble hinge plate to post with bolts and one flat washer and lock washer under nut.
 2. Tighten all bolts the maximum possible with 12" to 15" wrench.

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2-28-14	
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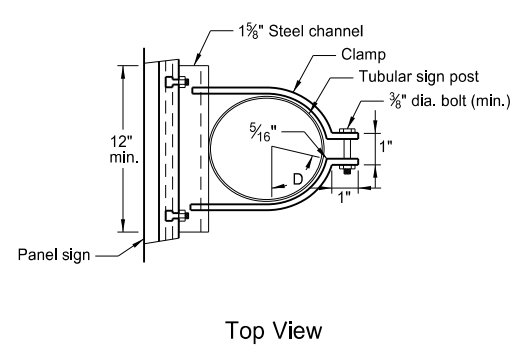
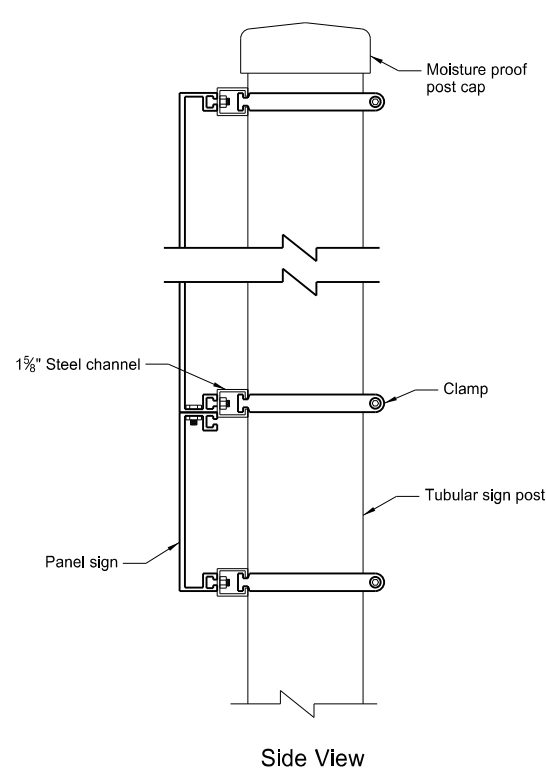
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PIPE SUPPORT AND SIGN MOUNTING DETAILS

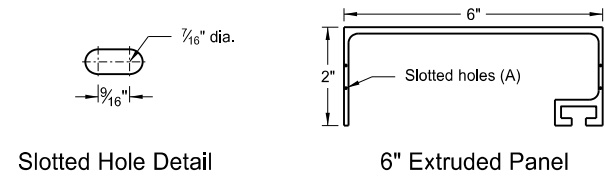
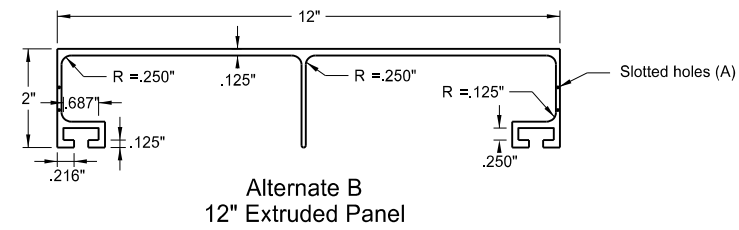
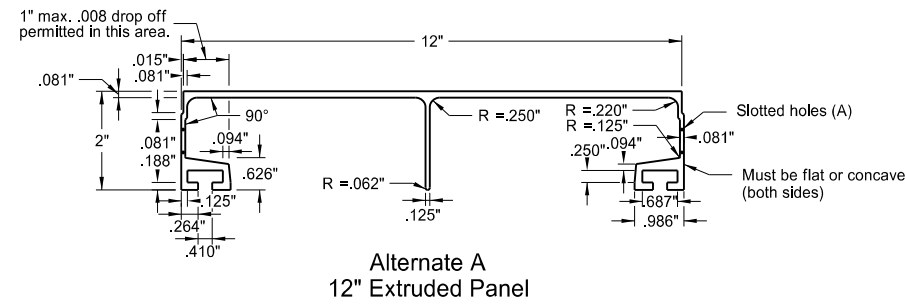
D-754-7



Flat Sheet Sign Clamp Mounting Details



Panel Sign Clamp Mounting Details

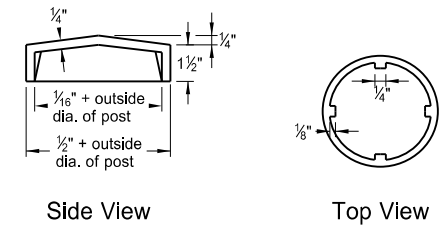
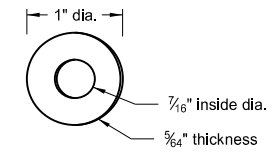


Aluminum Panel Details

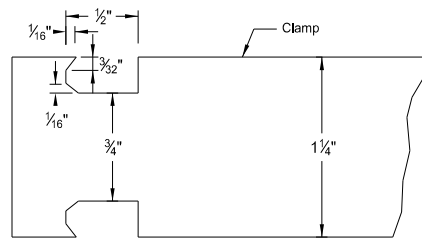
(A) Slotted holes shall be punched in the aluminum panels at 1'-0" on center, spacing from end as listed below:

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

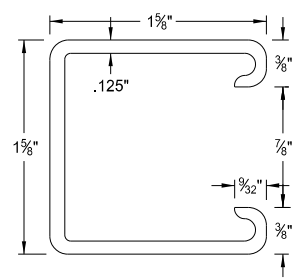
Wall thickness = .078" unless specified otherwise.
All inside and outside corners = .031" radius unless specified otherwise.



Post caps shall be furnished for all steel or aluminum posts.
In place of post cap, a 1/8" plate welded all around may be used.



Clamp Detail



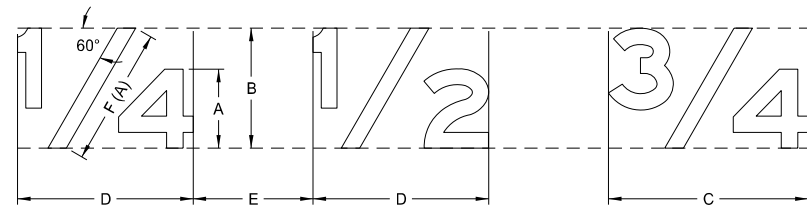
Steel Channel Detail

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

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

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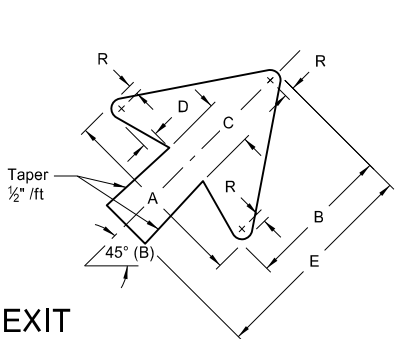
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SIZE OF THE FRACTION IS DETERMINED AS FOLLOWS:

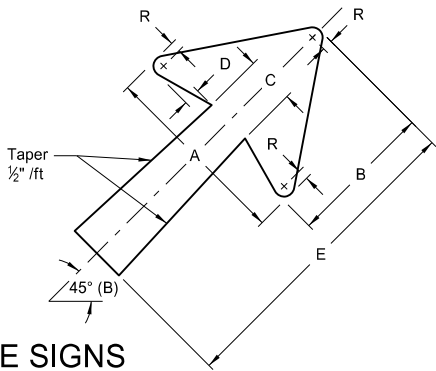
SYMBOL	TITLE	RATIO TO HEIGHT OF CAPITAL OR UPPER CASE
A	Letter height	1.0 of capital or upper case
B	Fraction height	1.5 X A
C	Fraction width	2.5 X A
D	Fraction width	2 X A
E	Space to next character	1 to 1.5 X A
F(A)	Length of diagonal	1.75 X A

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



EXIT
DIRECTION SIGNS

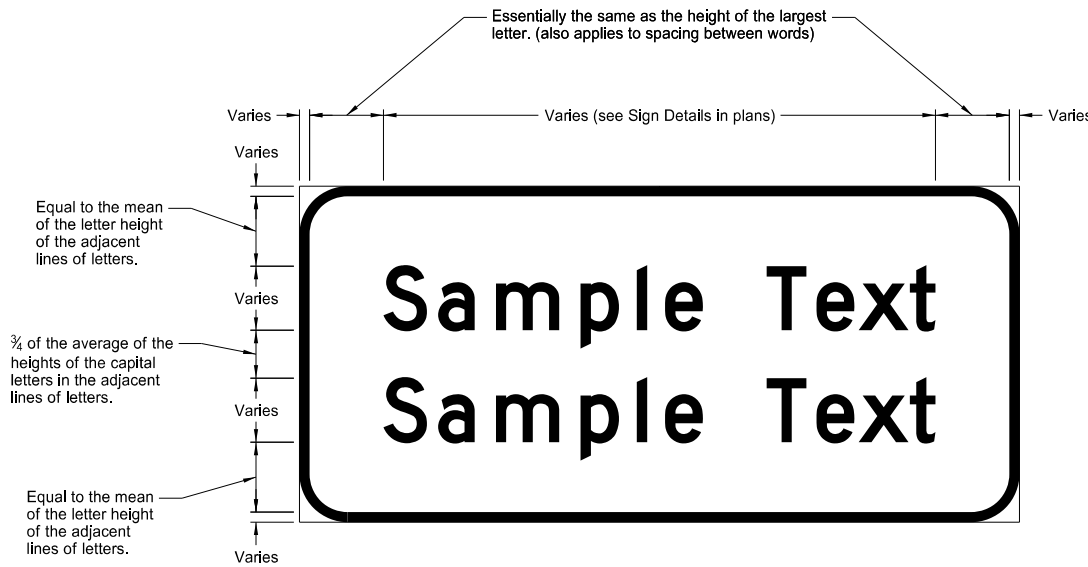
LETTER SIZE (Upper Case)	A	B	C	D	E	R
8"	15 1/8"	11 9/16"	3 3/4"	1 5/16"	17"	1 3/16"
10" - 13 1/3"	18 1/4"	14"	4 1/2"	1 1/2"	20"	3/4"
16" - 20"	22 1/4"	17"	5 3/8"	1 3/4"	25"	1"



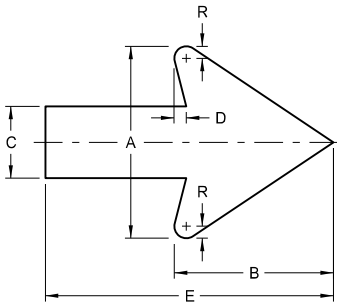
(B) When there is no exit number in the sign face, the arrow shall be at 30°

GORE SIGNS

"EXIT" LETTER SIZE (Upper Case)	A	B	C	D	E	R
8"	15 1/8"	11 9/16"	3 3/4"	1 5/16"	25"	1 3/16"
10" - 13 1/3"	18 1/4"	14"	4 1/2"	1 1/2"	30"	3/4"

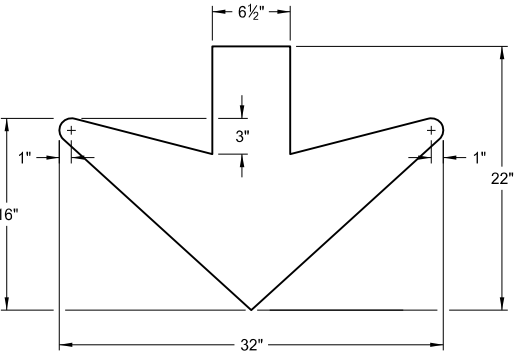


TYPICAL SPACING



DISTANCE AND
DESTINATION SIGNS

LETTER SIZE (Upper Case)	A	B	C	D	E	R
4"	4"	3 5/16"	1 1/2"	1/4"	6"	1/4"
6"	6"	4 7/8"	2 1/4"	3/8"	9"	3/8"
8"	8"	6 5/8"	3"	1/2"	12"	1/2"
12"	12"	10"	4 1/2"	7/8"	18"	7/8"



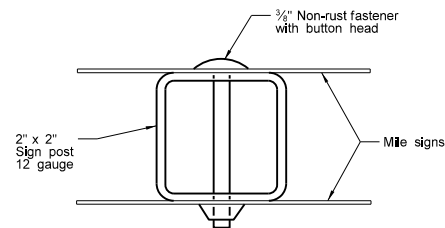
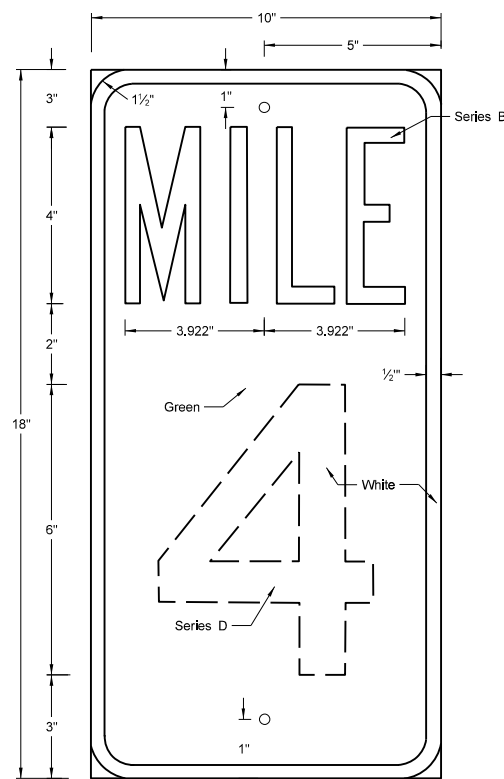
DOWN ARROW

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-3-11	
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DATE	CHANGE
7-8-14	Revised gore sign and added 4" D & D arrow
5-4-16	Revised Distance & Destination and Typical Spacing details

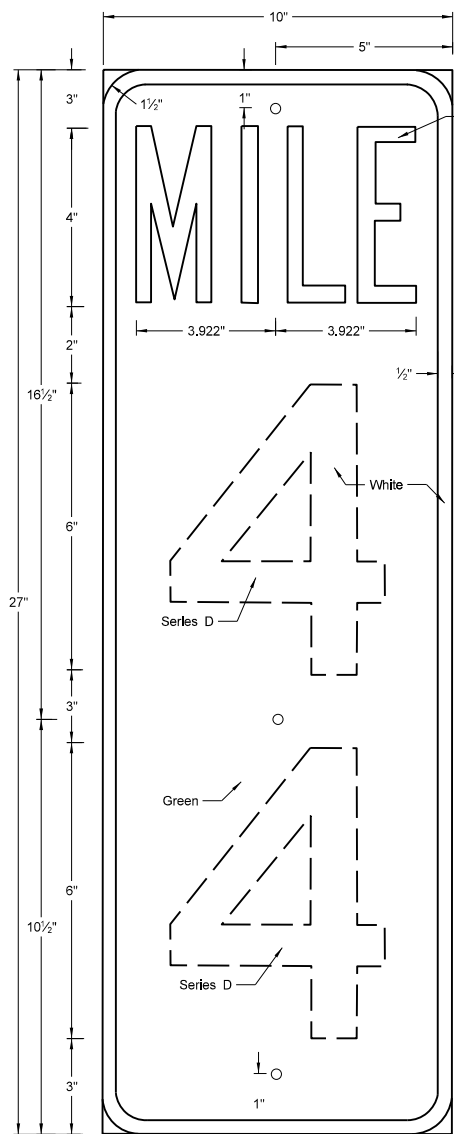
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(CONVENTIONAL USE) REFERENCE MARKERS

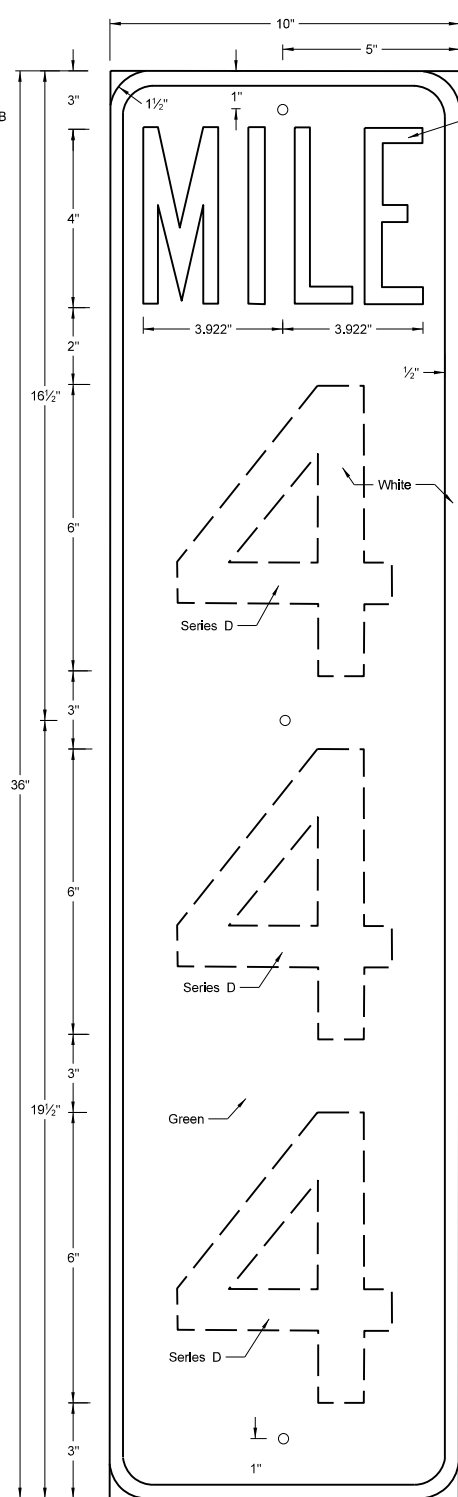
D-754-19



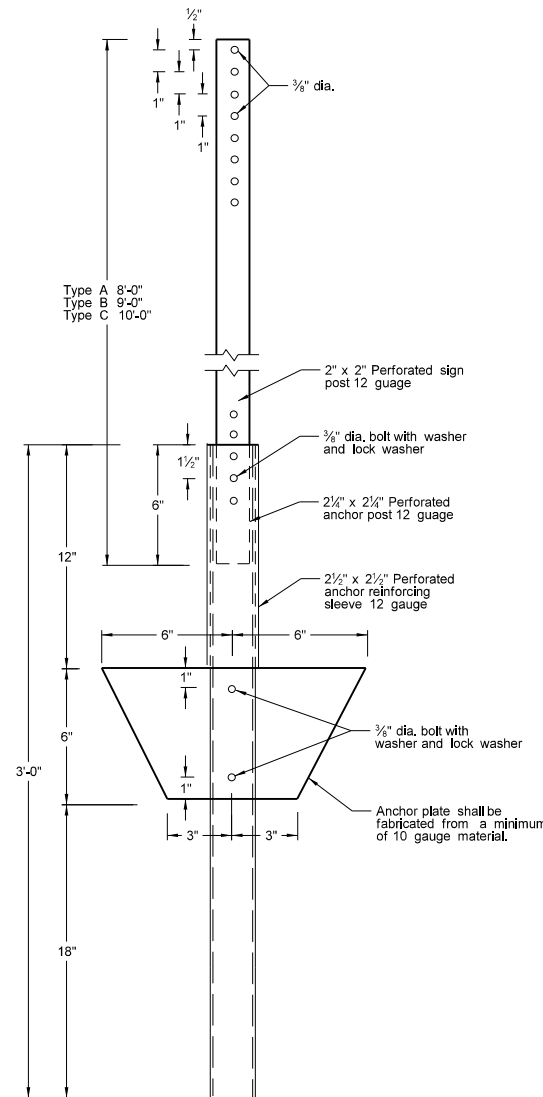
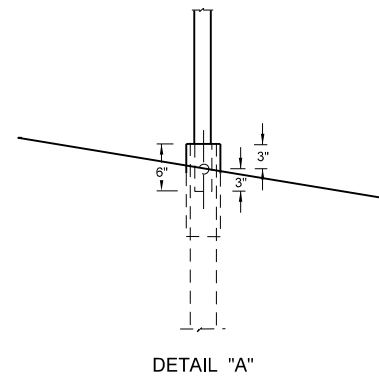
ASSEMBLY DETAIL
(back to back)



TYPE B
Area = 1.88 S.F.

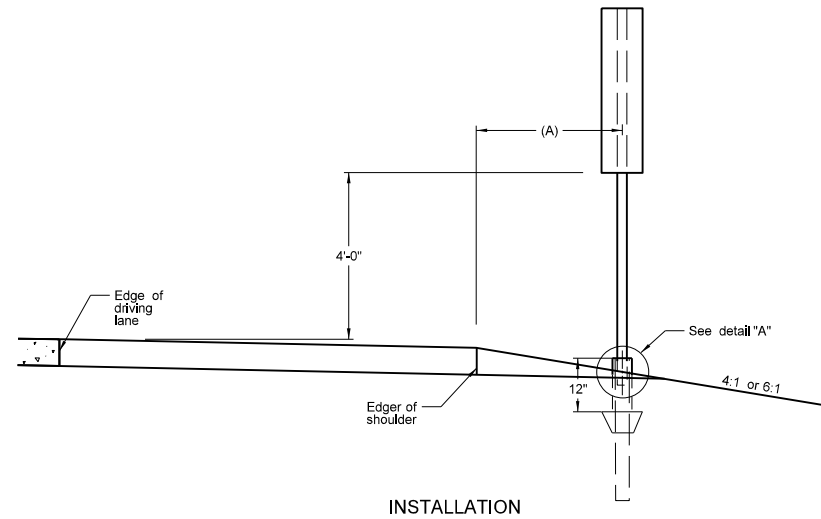


TYPE C
Area = 2.50 S.F.



POST AND ANCHOR PLATE DETAIL

(A) 8' Clearance to finished shoulder or in line with existing delineator posts



NOTES:
Installation: Posts shall be installed along right shoulder.

Sign: Backing shall be fabricated of 0.080 aluminum. Sheeting shall conform to section 894.01 of the Standard Specifications.

Posts: Posts shall conform to section 894.03 of the Standard Specifications.

Fasteners: The signs shall be attached to the post by tension pin type fastener or other suitable vandal resistant non-rust fastener.

Reflective Sheeting: Sheeting shall be Type IV.

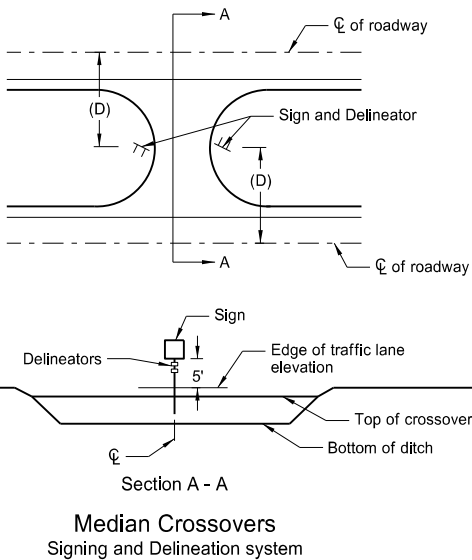
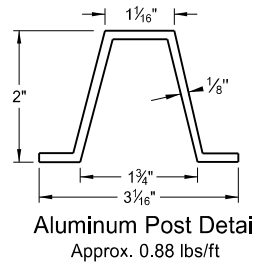
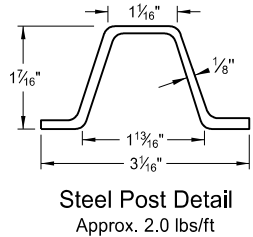
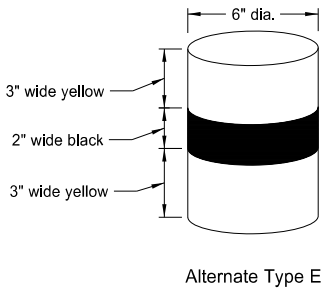
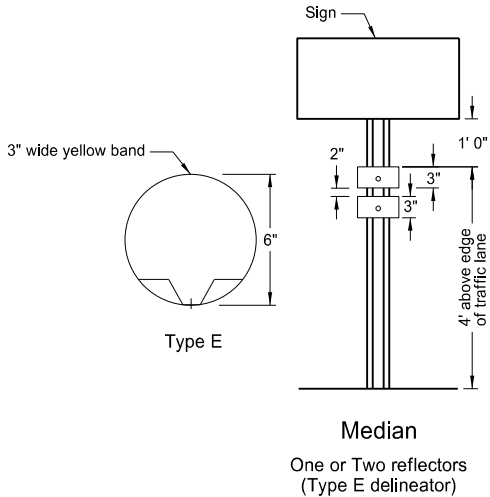
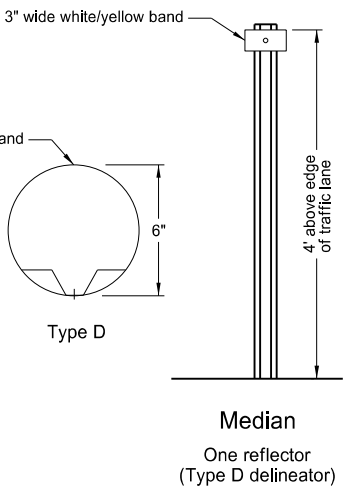
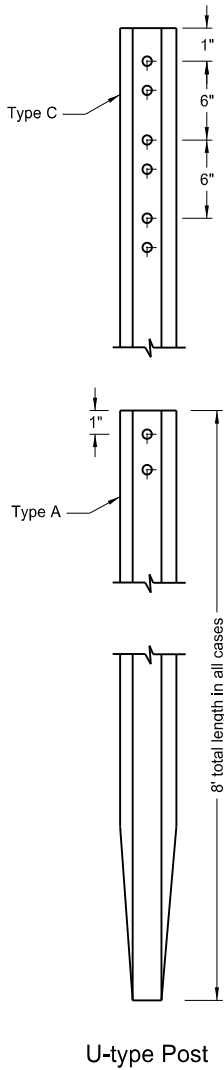
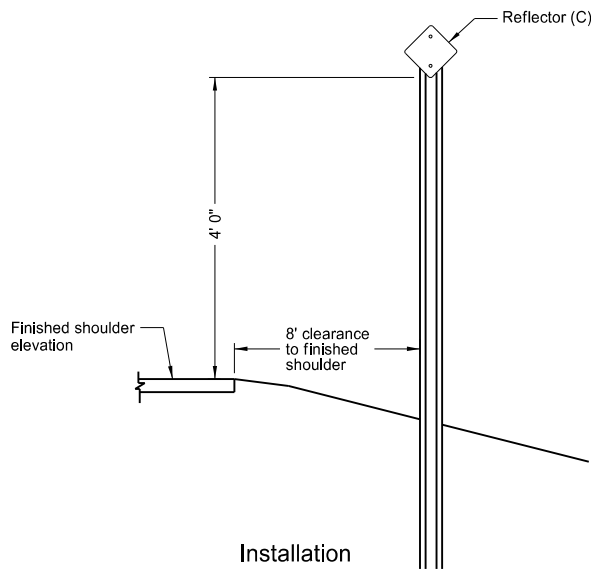
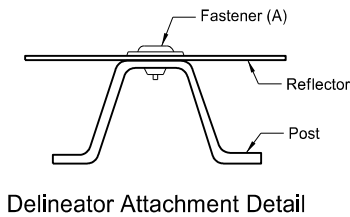
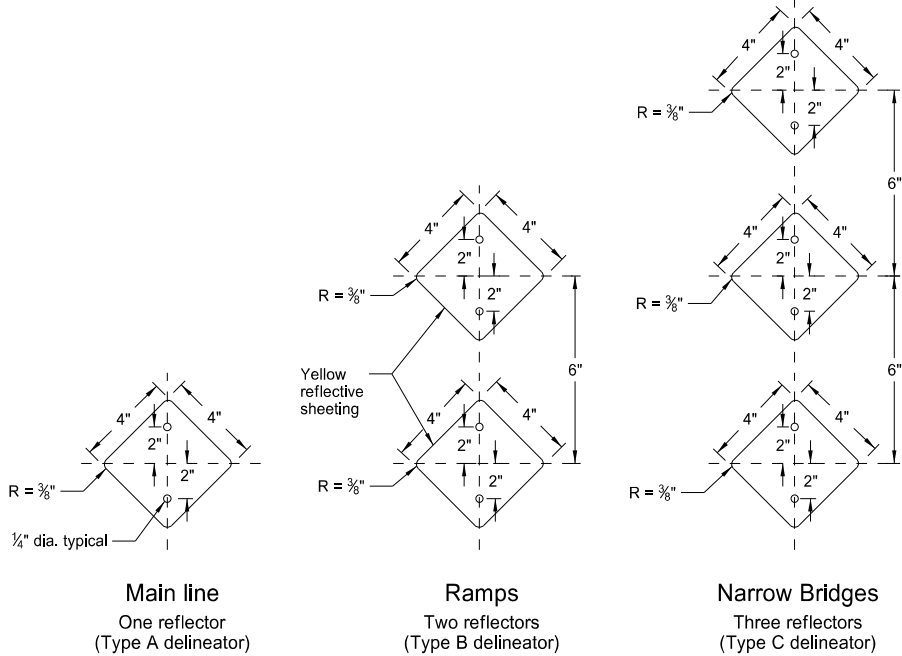
Numbers: Numbers shall be of the series shown and may be screened or applied copy. Screening and reflective sheeting for applied copy shall conform to section 754 & 894 of the Standard Specifications.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
7-8-14	Revised post and reflective sheeting notes

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REFLECTORIZED DELINEATORS

D-754-21



Delineator Details
Type A, B, and C

- Installation:** Posts are to be installed along the right shoulder line unless shown otherwise on the plans.
- Reflectors:** Reflector shall be the same color as the adjacent pavement marking.
- Spacing:** Delineator spacing along main line tangents and curves with radius greater than 11500' (less than 0° 30') shall be at 528' centers. Curves with a radius less than 11500' but greater than 1200' the spacing shall be at 264' centers. With curves less than 1200' use spacing (S) = 3*√R-50

- Type E**
- Alternate:** One unit band consisting of two yellow stripes separated by a 2" black stripe may be used in place of two 3" yellow bands.

- (A) The fastener shall be 3/8" dia. with flat washer having a min. outside dia. of 1 1/16". Fasteners shall be tension pin type or other non-rust vandal resistant fastener.
- (B) The contractor may drill only those holes required to attach the number of reflectors on that post, or drill all the posts the same so that any number of reflectors may be added.
- (C) Reflector to be mounted facing traffic at an angle of 93° away from oncoming traffic.
- (D) The median width may vary. The sign and delineator assembly shall be placed in the median crossover an equal distance from each roadway.

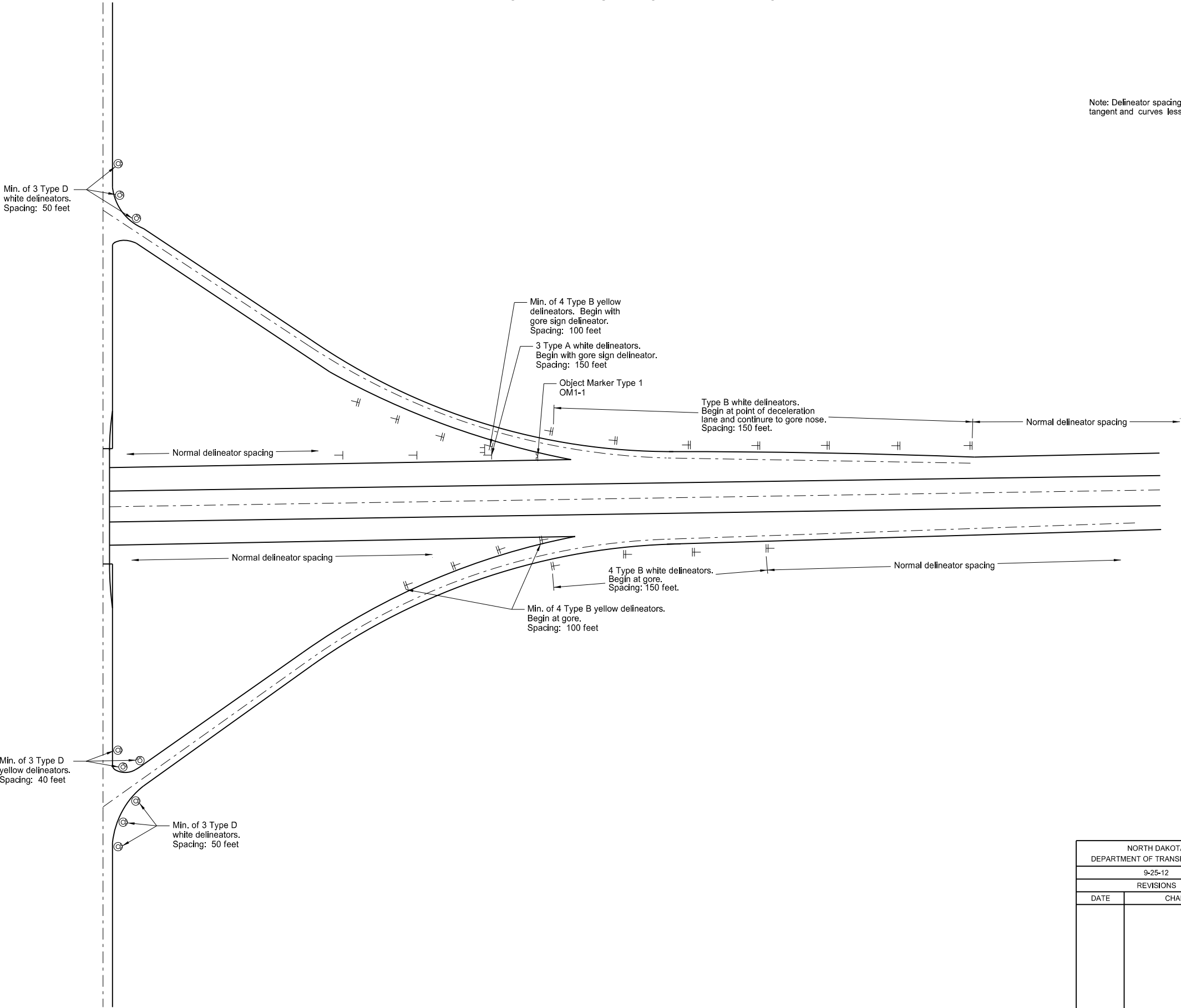
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
7-18-14	Revised reflective sheeting

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TYPICAL INTERCHANGE DELINEATION

D-754-22A

Note: Delineator spacing along interstate mainline shall be at 528' centers on tangent and curves less than 0°30' and 264' on curves 0°30' and greater.



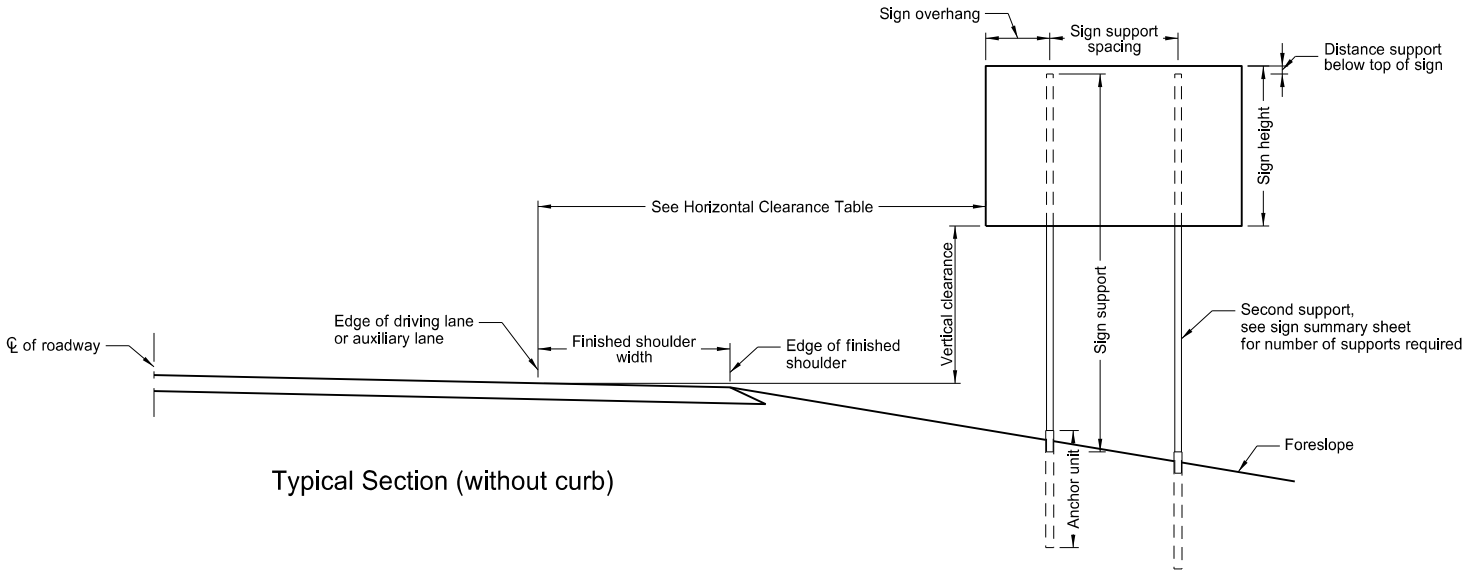
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE

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PERFORATED TUBE ASSEMBLY DETAILS

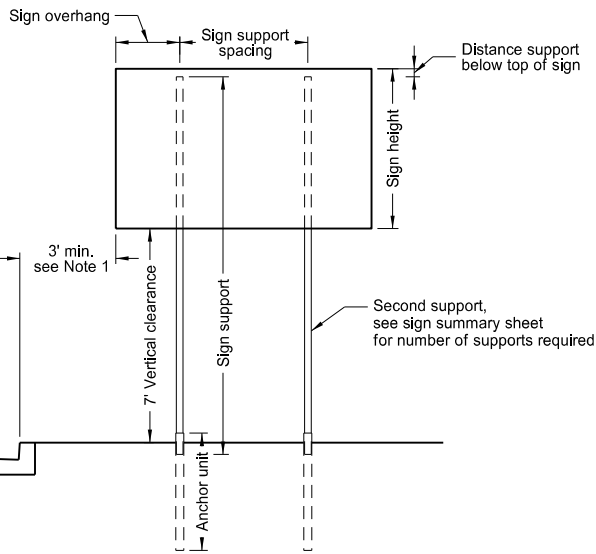
Notes:

- 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.

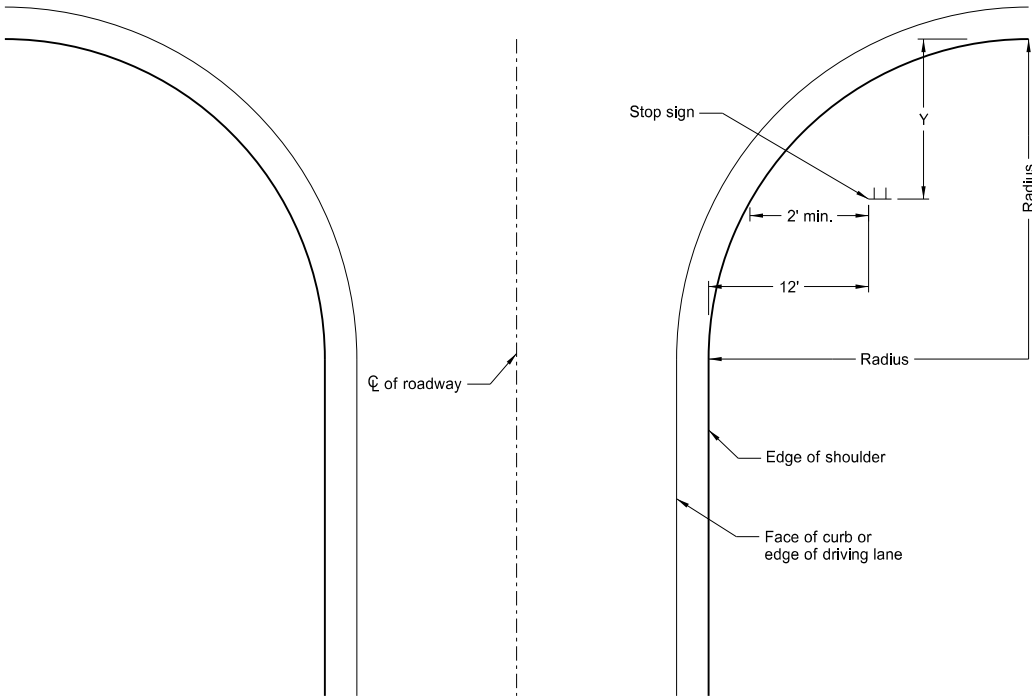


Typical Section (without curb)

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



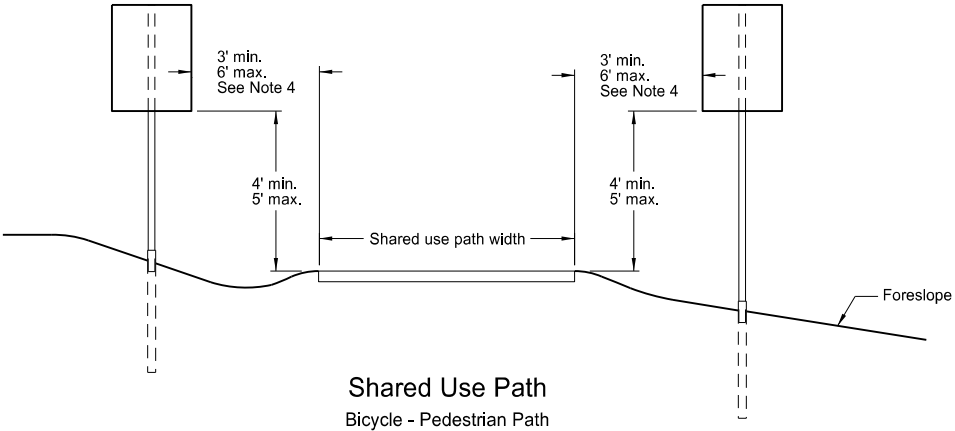
Typical Section (with curb)
Residential or Business District



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



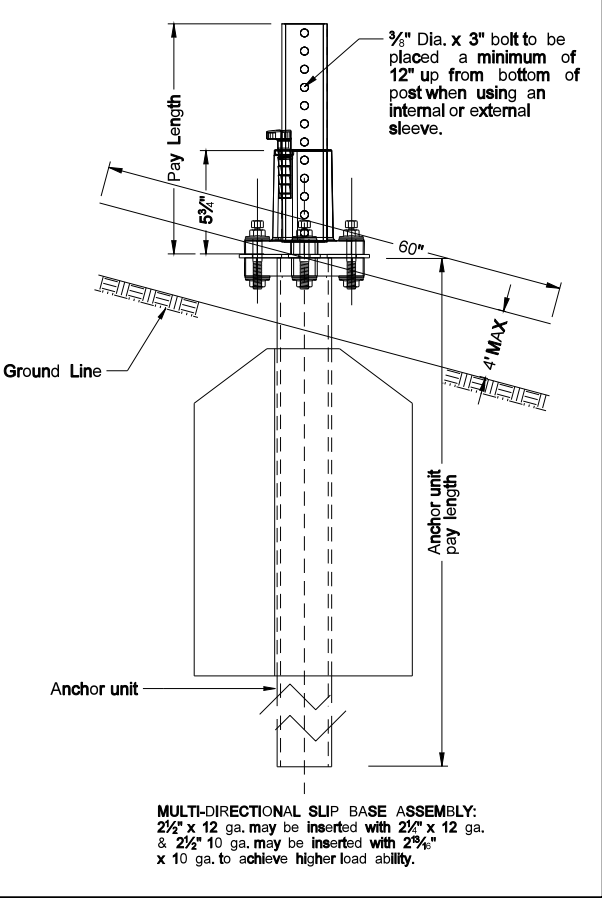
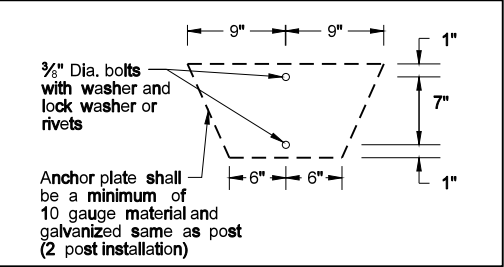
Shared Use Path
Bicycle - Pedestrian Path

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

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Telescoping Perforated Tube							
Number of Posts	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thick-ness Gauge
1	2	12			No	2 1/2	12
1	2 1/2	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

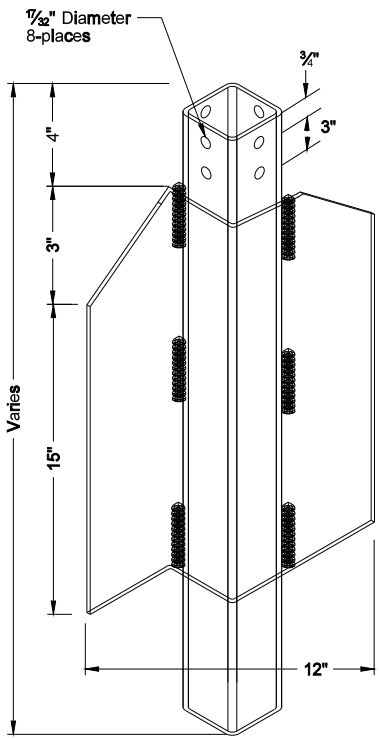
(B) - The 2 1/2", 12 gauge posts do not need breakaway bases when placed in standard soils, but require a shim as specified by the manufacturer. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak. Weak soils are classified as boggy,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



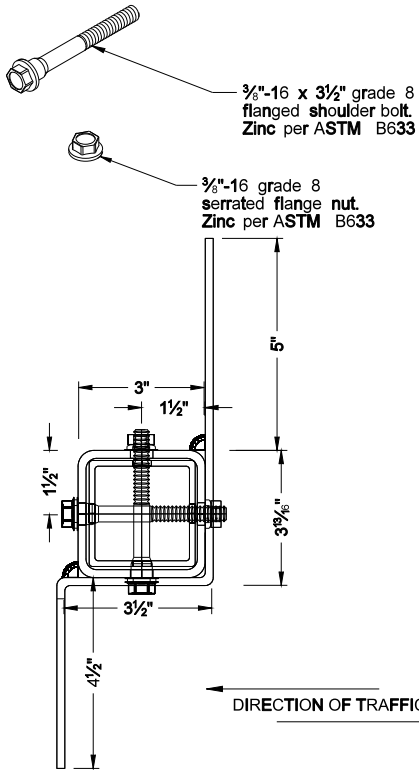
MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:
2 1/2" x 12 ga. may be inserted with 2 1/2" x 12 ga.
& 2 1/2" 10 ga. may be inserted with 2 1/2" x 10 ga. to achieve higher load ability.

SHOULDER BOLT

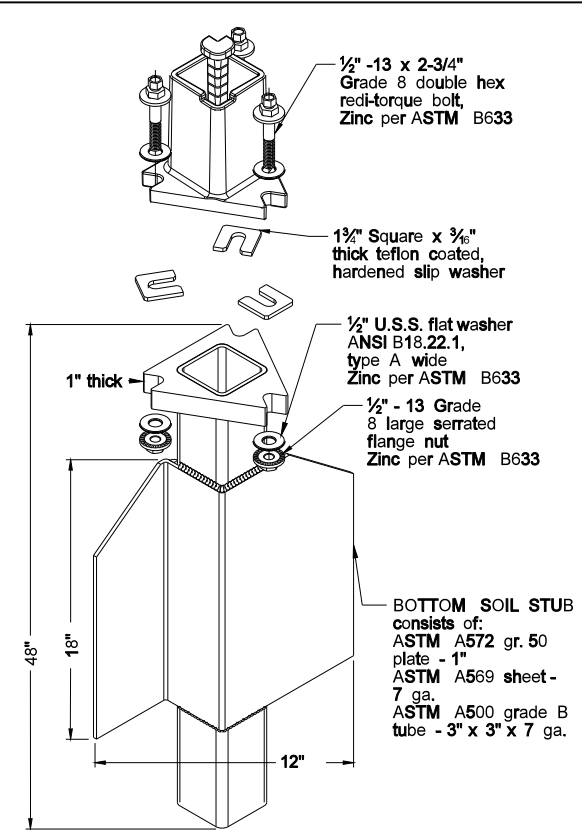
Shimming agent to reduce tolerance between 3" anchor unit and 2 1/2" post.
(standard 3/8" diameter grade 8 bolt may be used with proper shim)



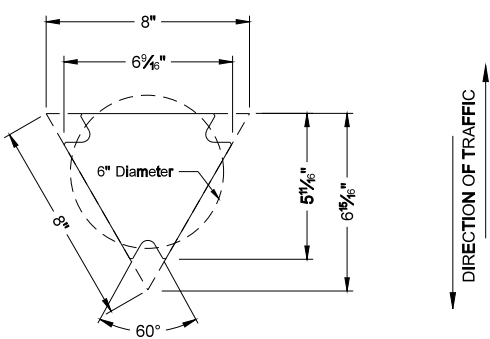
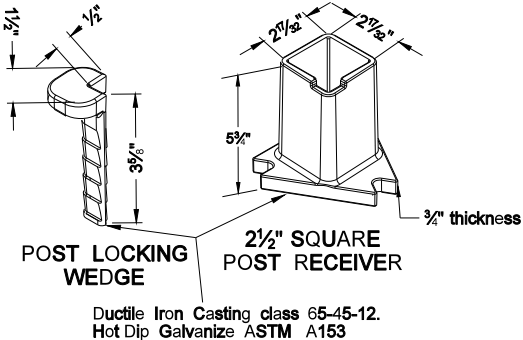
3" ANCHOR UNIT



Mounting Details Perforated Tube



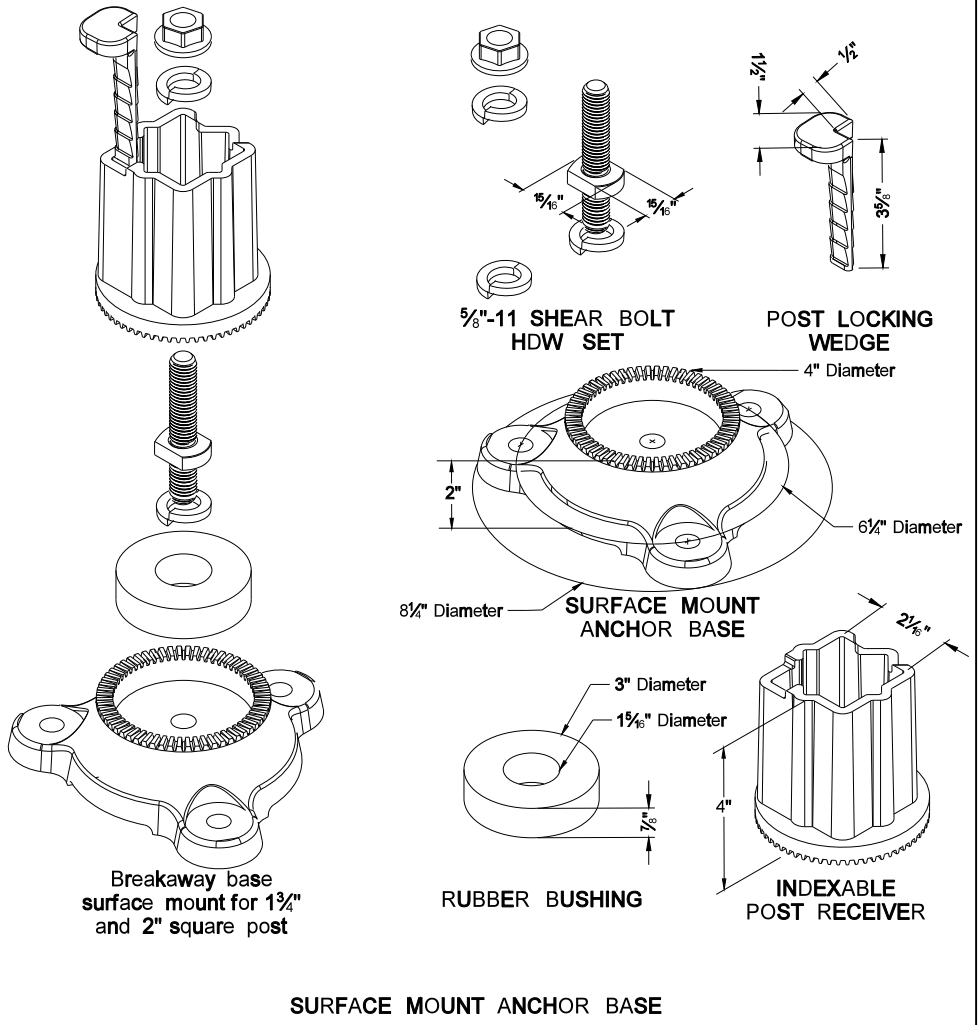
SLIP BASE FOR 2 1/2" POST



SLIP BASE DETAIL

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

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

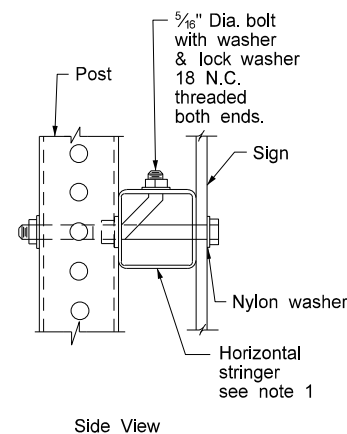


NOTE:

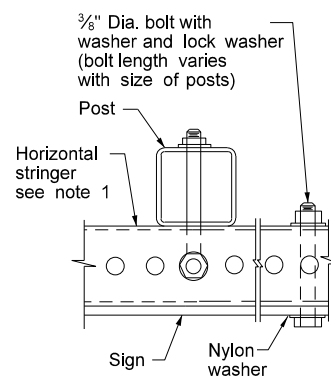
- 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.
- Anchor material shall be 7 gauge H.R.P.O. Commercial quality ASTM A569 and 3" x 3" x 7" gauge ASTM A500 grade B. Anchor shall have a yield strength 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.

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

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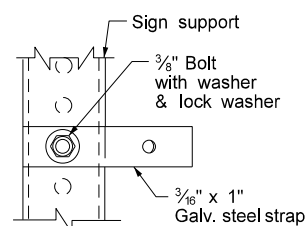


Side View

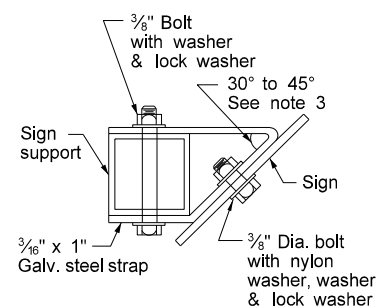


Top View

STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)

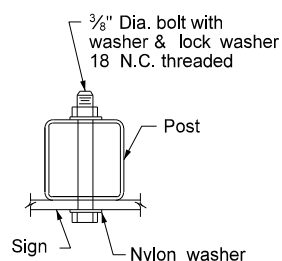


Side View

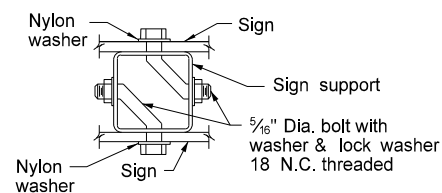


Top View

STRAP DETAIL

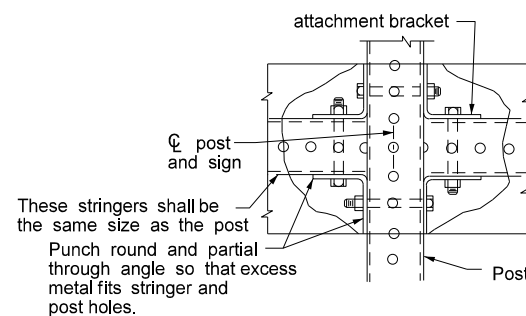


BOLT MOUNTING



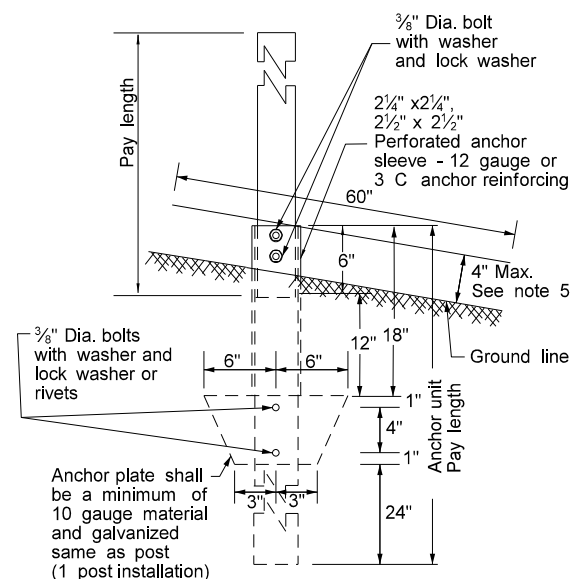
Top View

BACK TO BACK MOUNTING

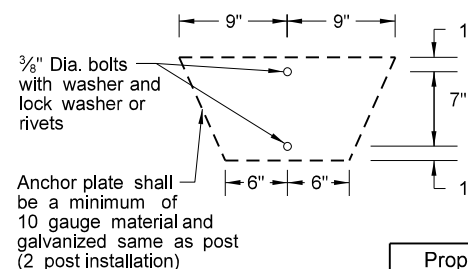


These stringers shall be the same size as the post Punch round and partial through angle so that excess metal fits stringer and post holes.

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



ANCHOR UNIT AND POST ASSEMBLY



Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Gross Sect. area In. ²	Section Modulus
1½ x 1½	0.105	12	1.702	0.129	0.380	0.17
2 x 2	0.105	12	2.416	0.372	0.590	0.37
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.49
2⅜ x 2⅜	0.135	10	3.432	0.605	0.841	0.59
2½ x 2½	0.105	12	3.141	0.804	0.803	0.64
2½ x 2½	0.135	10	4.066	0.979	1.010	0.78

The 2 $\frac{3}{16}$ " size 10 gauge is shown as 2.19" size on the plans.
The 2 $\frac{1}{2}$ " size is shown as 2.51" size on the plans.

Note:

1. Horizontal stringers - In lieu of perforated tubes, the contractor may substitute z bar stringers. The z bar stringers shall be $1\frac{3}{4}'' \times \frac{3}{16}''$ thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel.
2. Metal washers used on sign face shall have a minimum outside diameter of $1\frac{5}{16}'' \pm \frac{1}{16}''$ and 10 gauge thickness.
3. 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.
4. 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.
5. 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.

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

(B) - The 2½", 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) - 2½" x 12 ga. x 18" minimum length external sleeve required.

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

Breakaway Coupler System
for Perforated Tubes

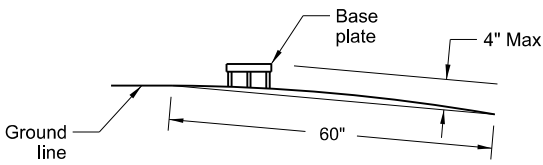
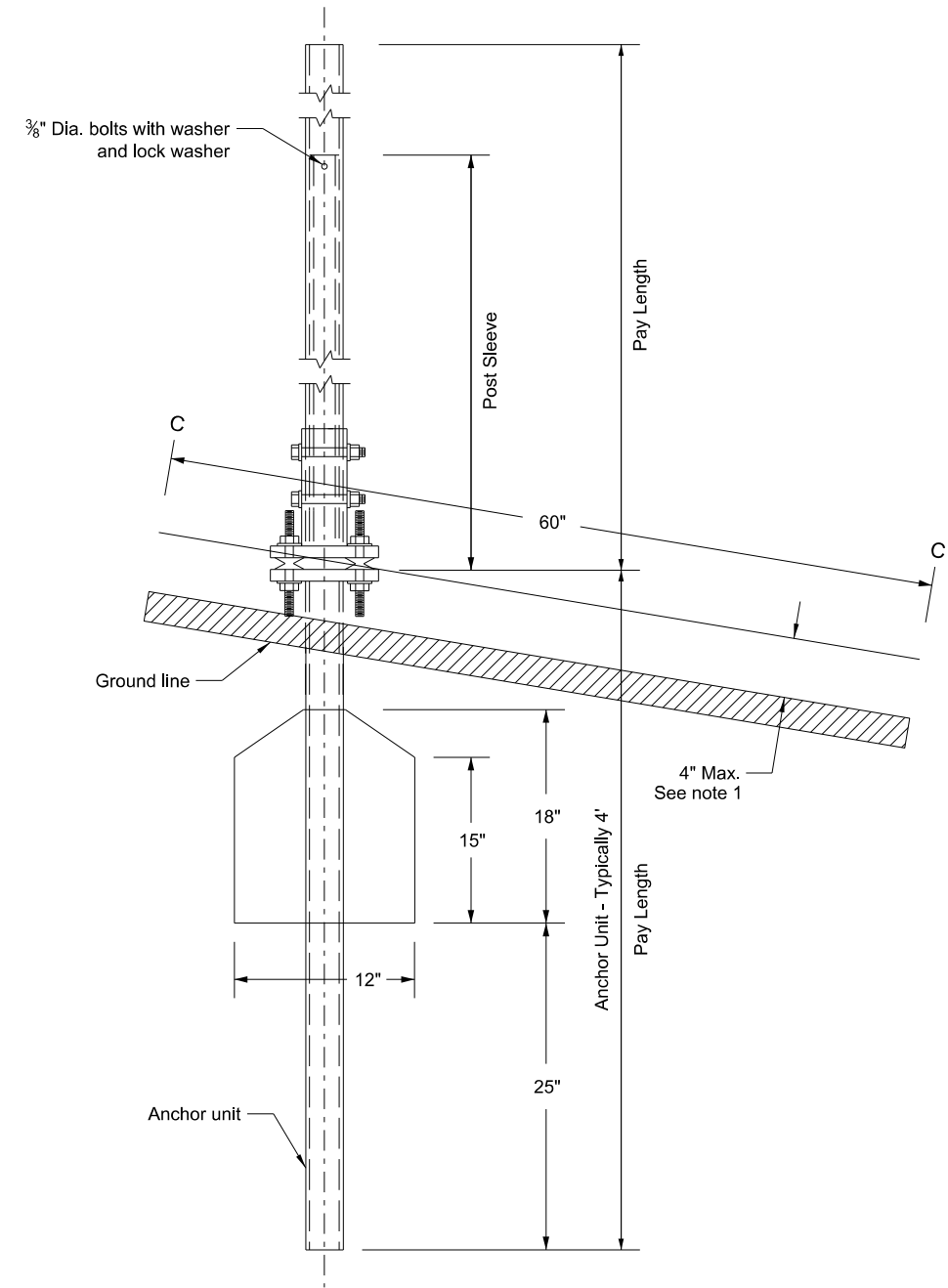
Notes:

- 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 unit shall be the same size as the post and shall have the same specification as the post.
- Four post signs shall have over 8' between the first and fourth post.
- In lieu of the breakaway base system on standard D-754-24 the breakaway coupling system may be used. The breakaway coupler system shall be manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements as specified by DENT BREAKAWAY IND., INC. which meets the test requirements of NCHRP Report 350.

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

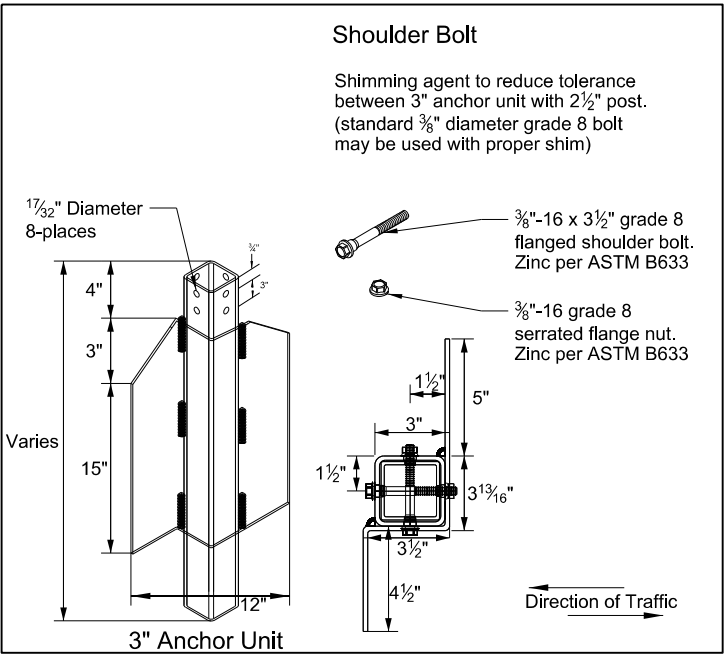
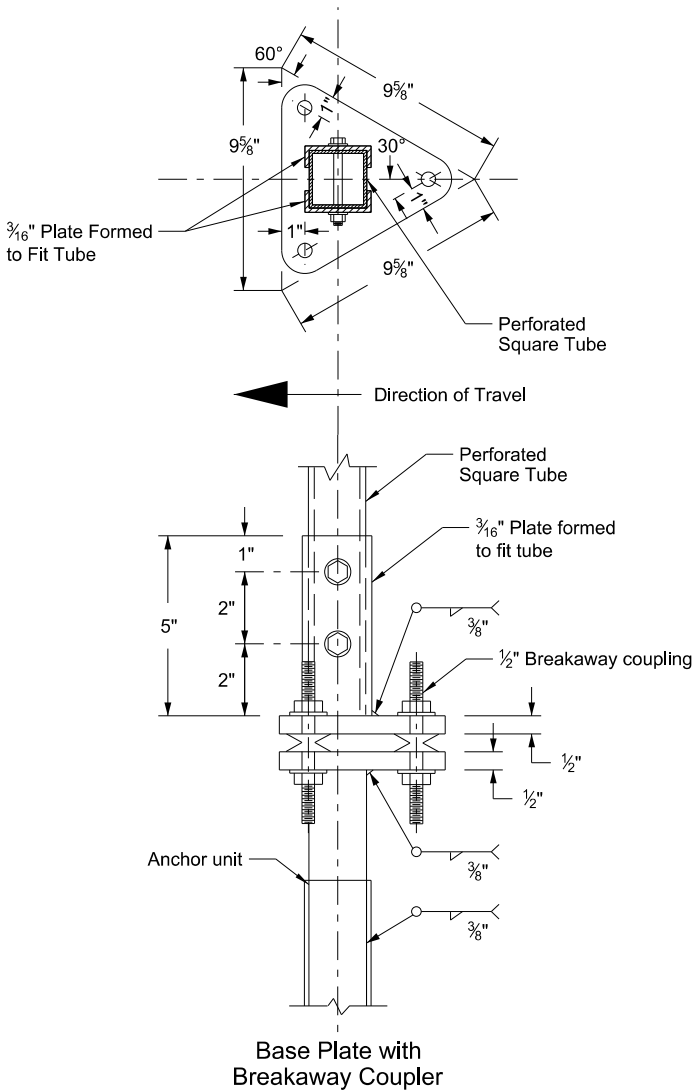
(B) - The 2½" 12 gauge posts do not need breakaway bases when placed in standard soils. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.

(C) - 3" anchor unit



Section C-C

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



Shoulder Bolt

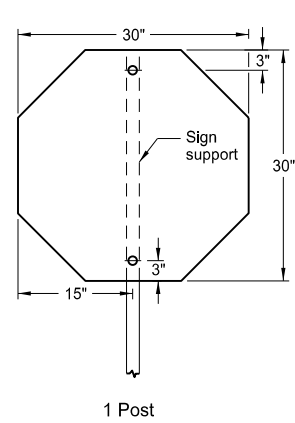
Shimming agent to reduce tolerance between 3" anchor unit with 2½" post. (standard ¾" diameter grade 8 bolt may be used with proper shim)

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE

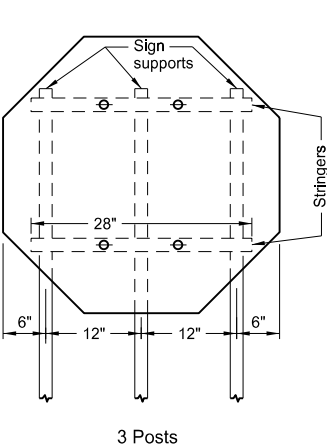
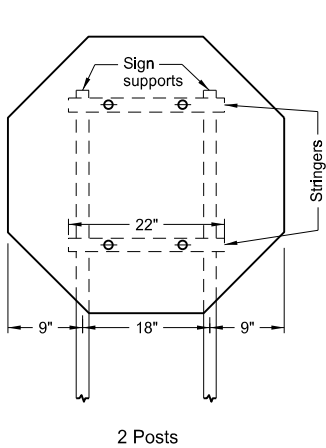
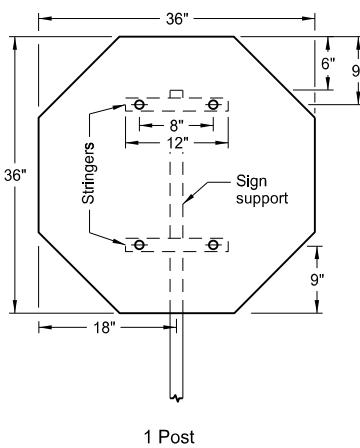
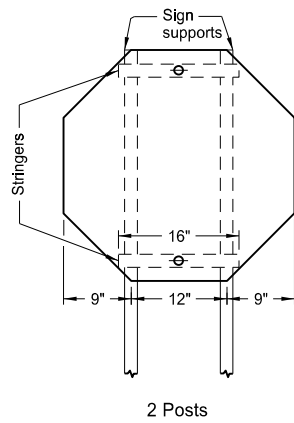
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS

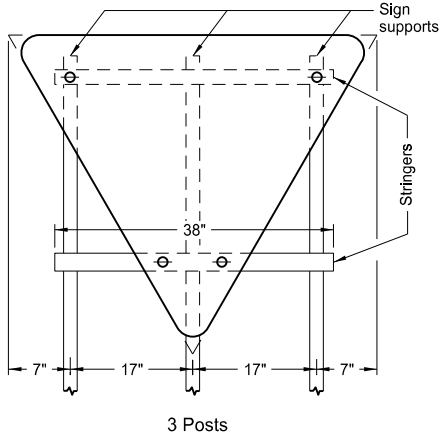
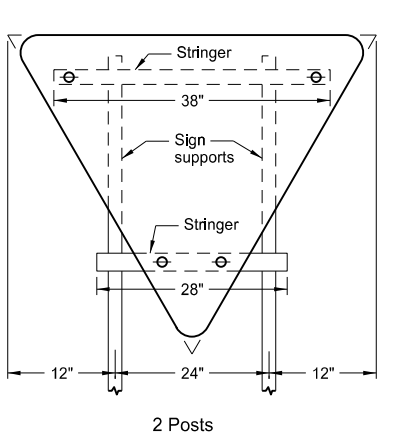
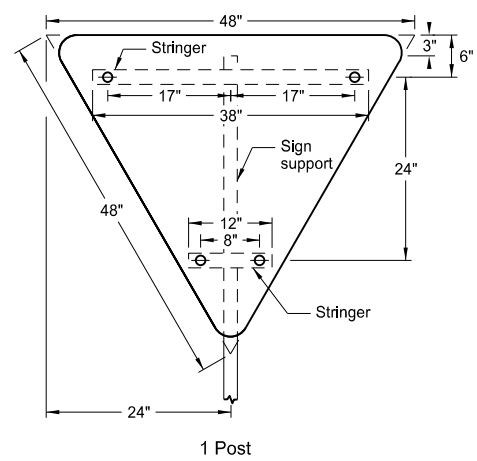
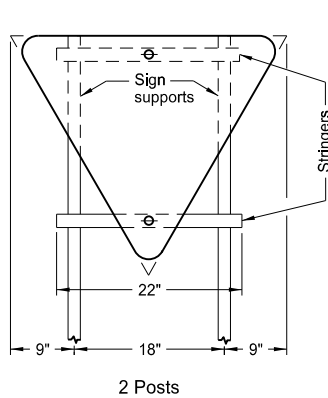
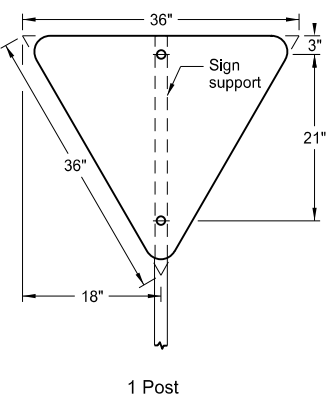
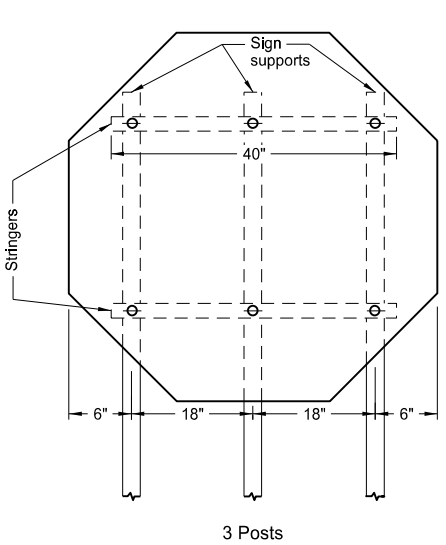
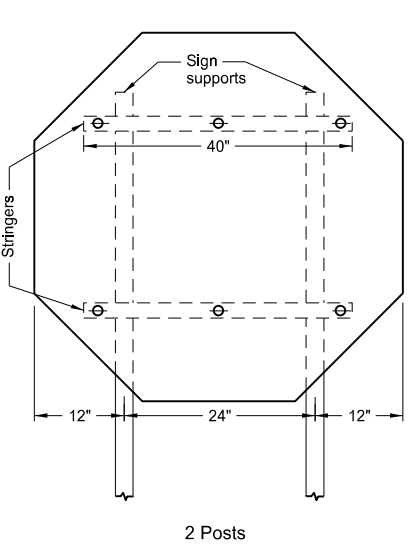
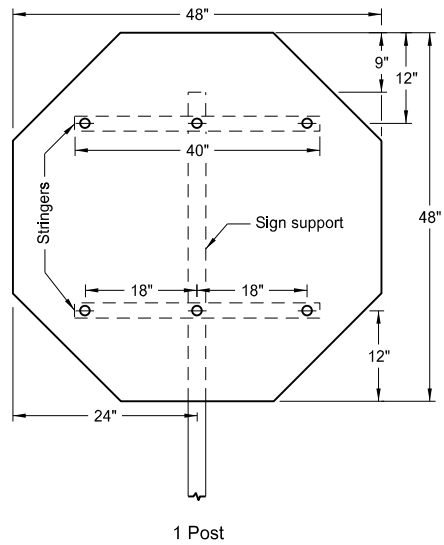
D-754-26



Assembly No. 1



- 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.



Assembly No. 4

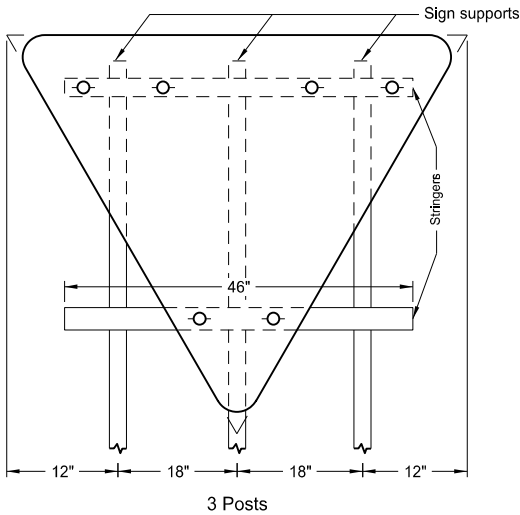
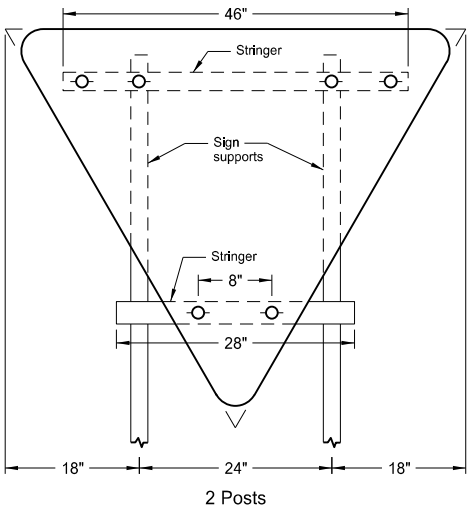
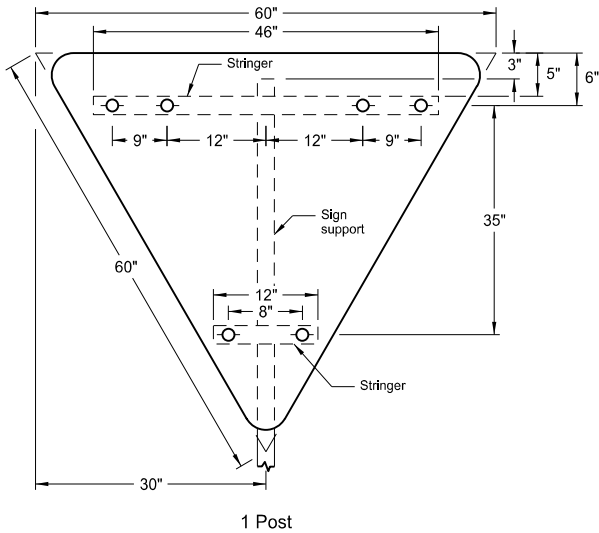
Assembly No. 3

Assembly No. 5

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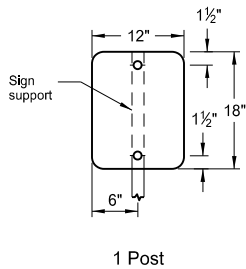
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



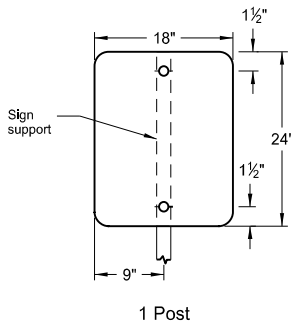
Assembly No. 6

Notes:

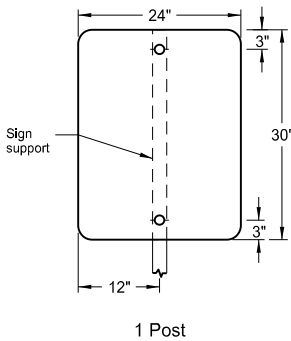
1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1½" x 1½".
4. All holes shall be punched round for ⅜" bolt.



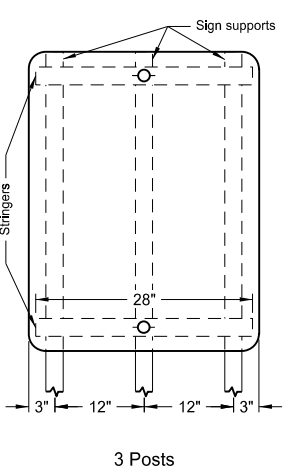
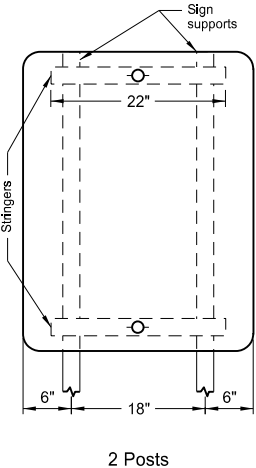
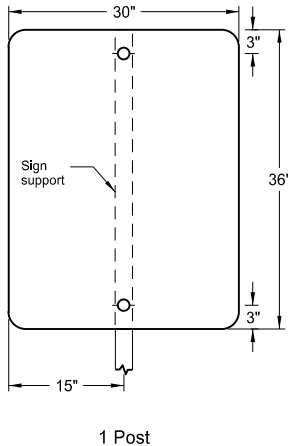
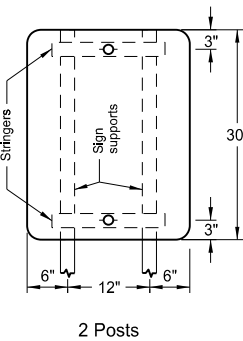
Assembly No. 7



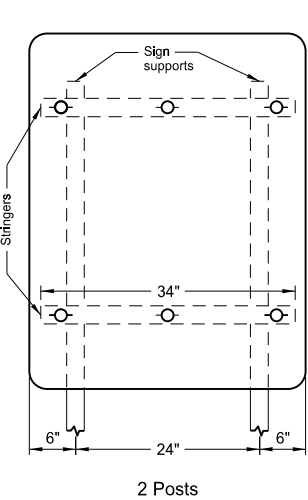
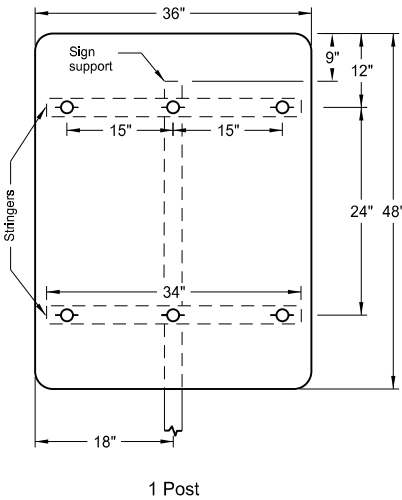
Assembly No. 8



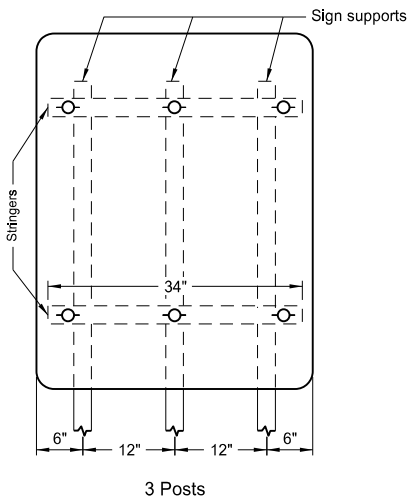
Assembly No. 9



Assembly No. 10



Assembly No. 11

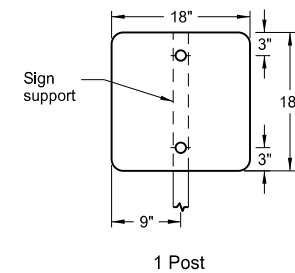
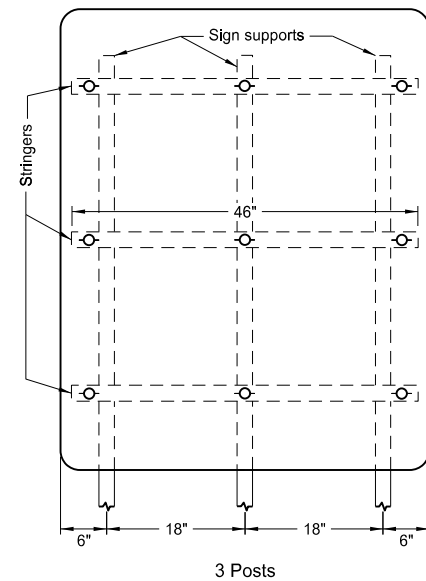
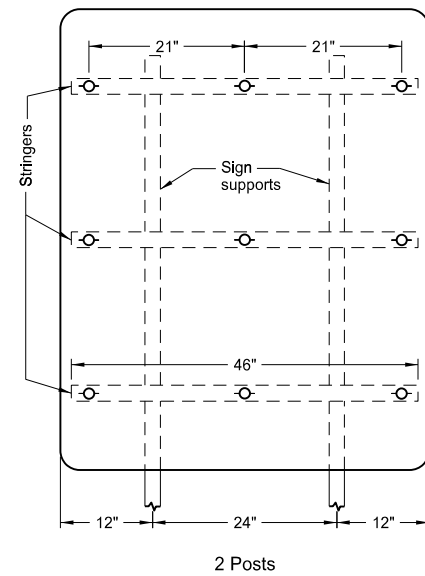
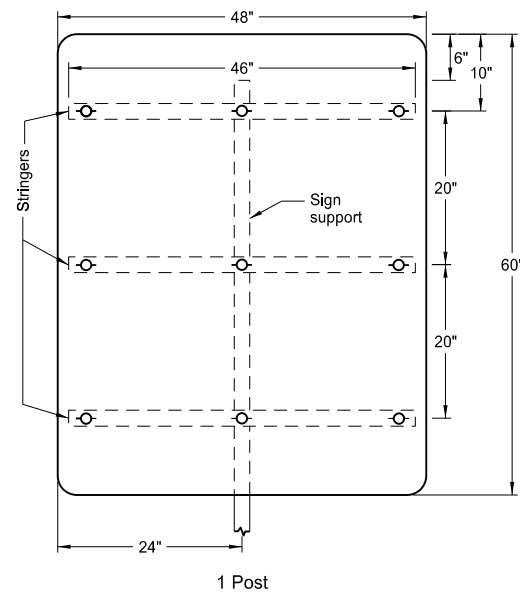


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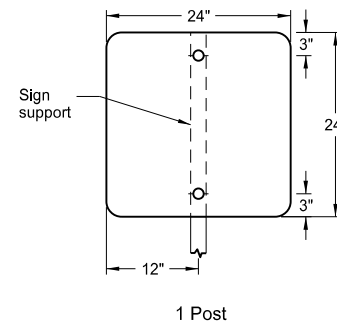
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS

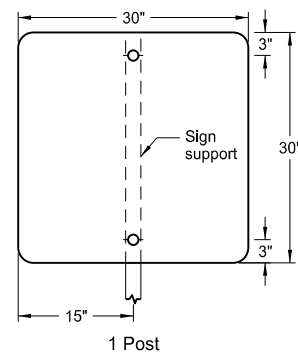
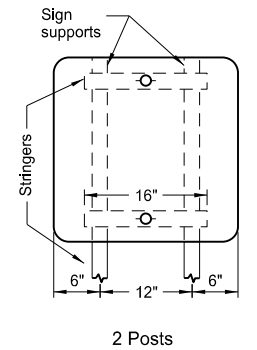
D-754-28



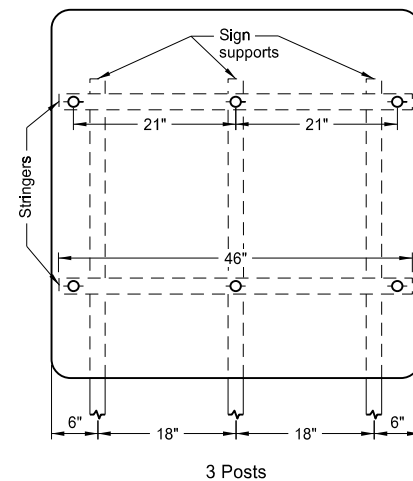
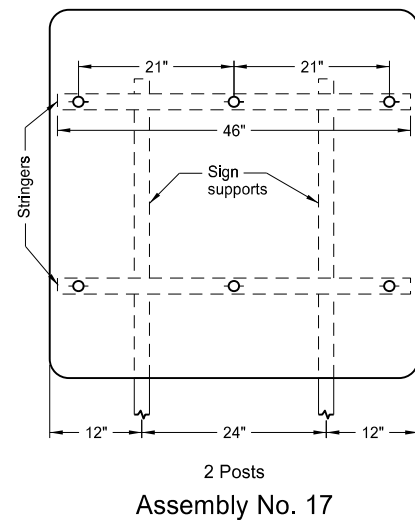
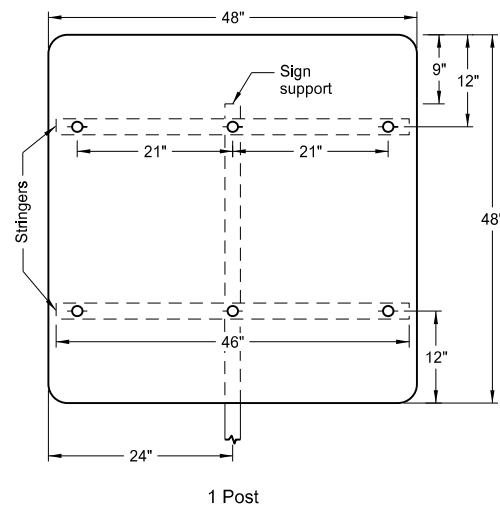
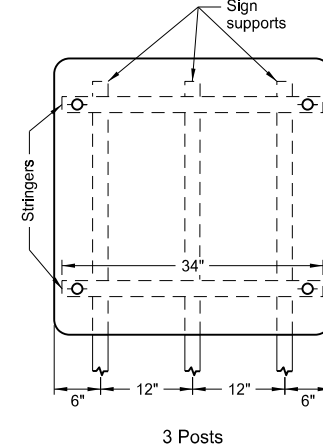
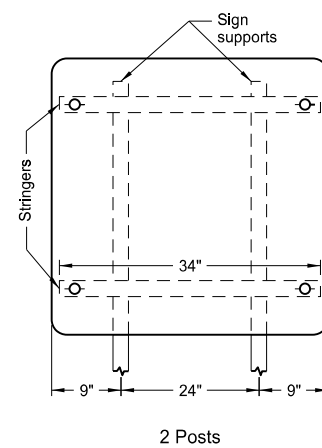
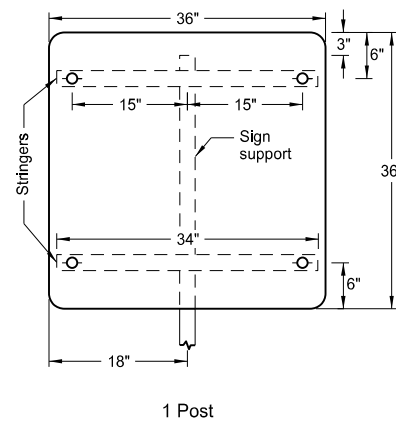
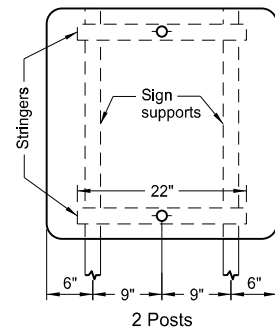
Assembly No. 13



Assembly No. 14



Assembly No. 15



Notes:

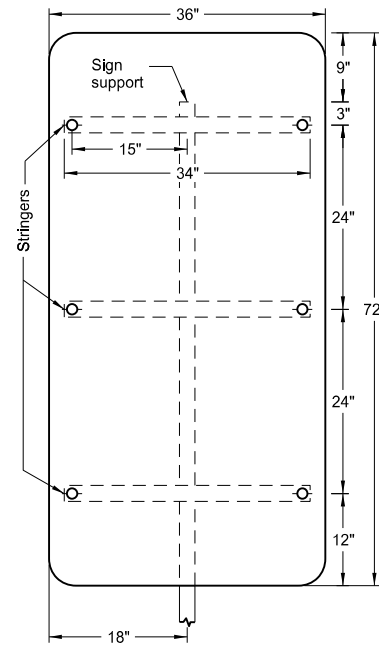
1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1½" x 1½".
4. All holes shall be punched round for ⅜" bolt.

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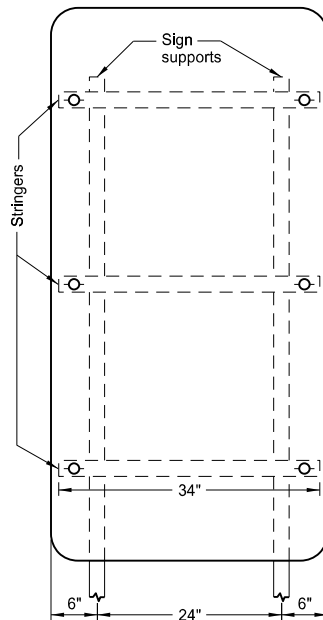
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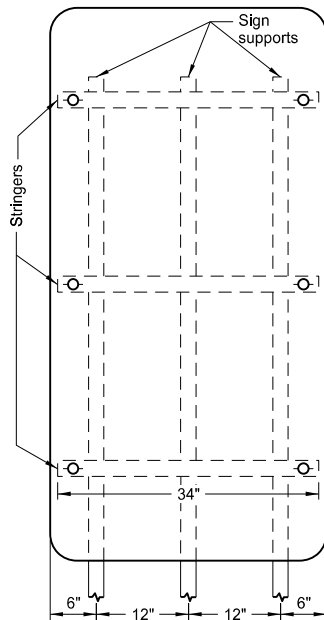
D-754-31



1 Post

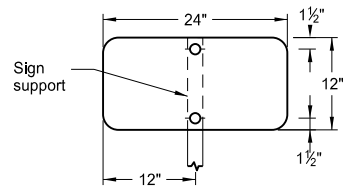


2 Posts



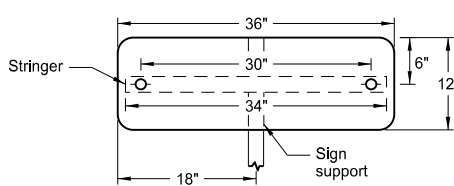
3 Posts

Assembly No. 24



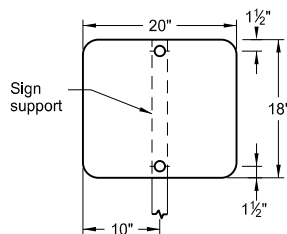
1 Post

Assembly No. 26



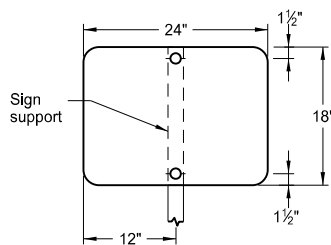
1 Post

Assembly No. 27



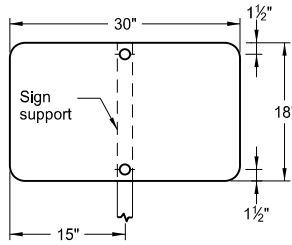
1 Post

Assembly No. 28



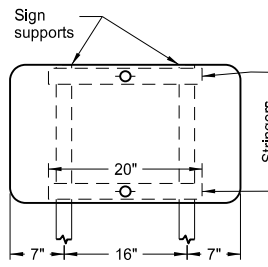
1 Post

Assembly No. 29

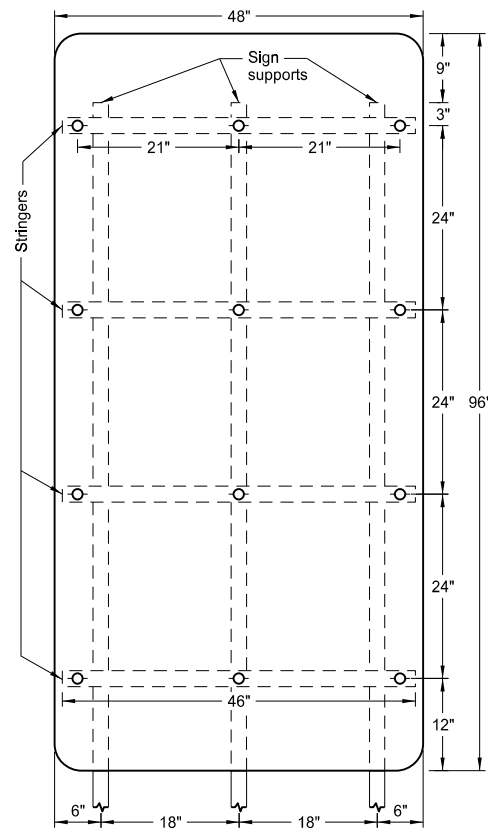


1 Post

Assembly No. 30



2 Posts



3 Posts

Assembly No. 25

Notes:

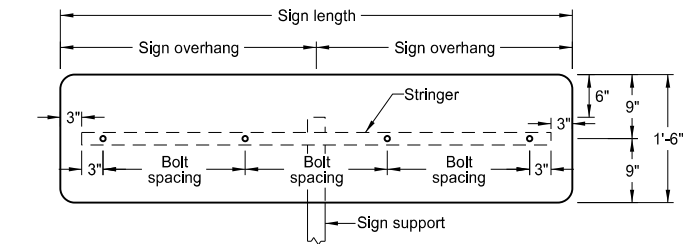
1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1 1/2" x 1 1/2".
4. All holes shall be punched round for 3/8" bolt.

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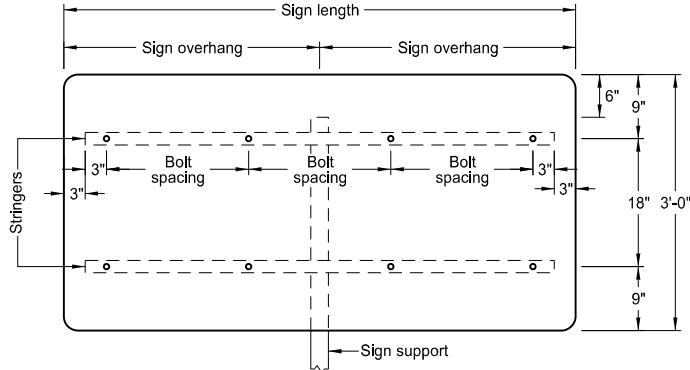
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
FOR VARIABLE LENGTH SIGNS

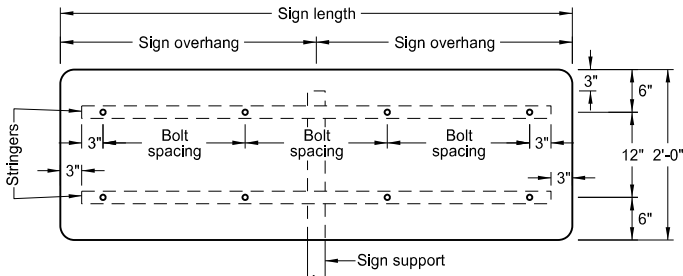
D-754-47



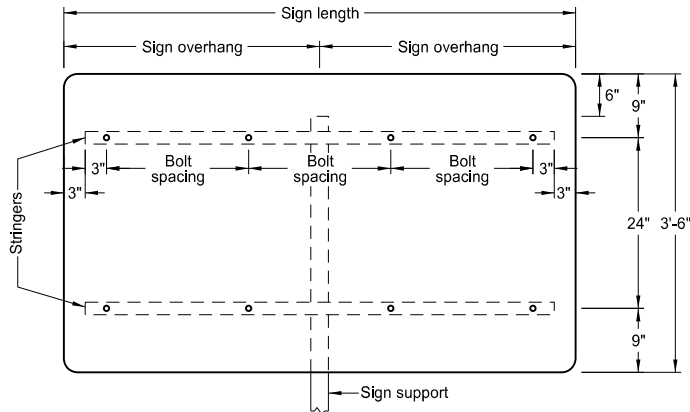
VARIES X 1'-6"



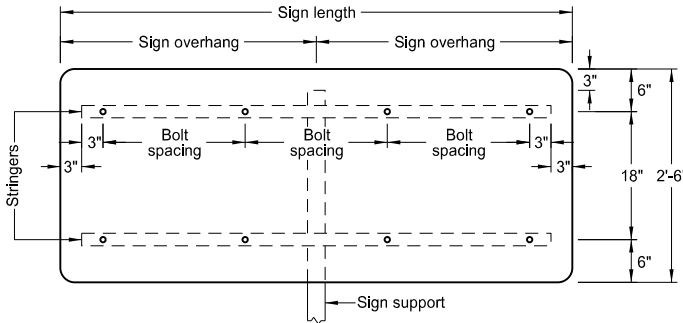
VARIES X 3'-0"



VARIES X 2'-0"



VARIES X 3'-6"



VARIES X 2'-6"

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

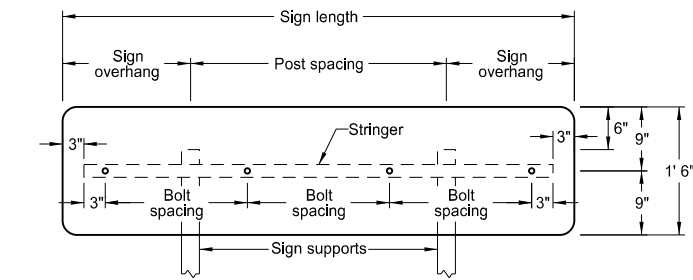
- Notes:
1. The minimum sign backing material thickness shall be 0.100 inch.
 2. Perforated square tube stringer shall be 1½" x 1½".
 3. All holes shall be punched round for ⅜" bolt.
 4. Single stringer and single post signs shall have stringers attached to the post using the special stringer angle, shown on the "Mounting Details Perforated Tube" standard drawing.

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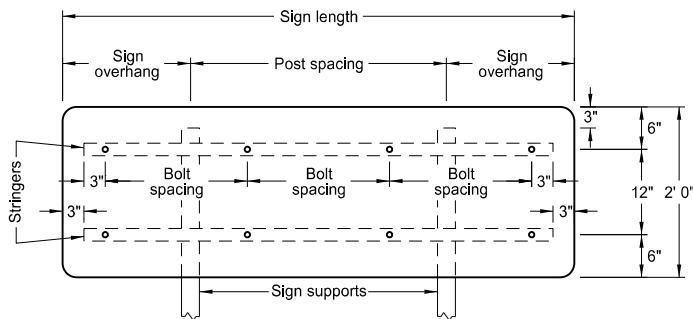
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
FOR VARIABLE LENGTH SIGNS

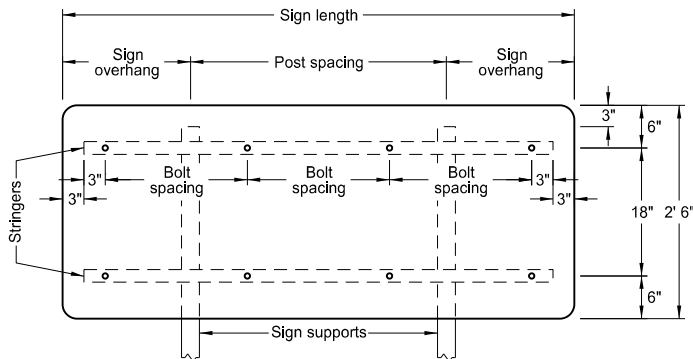
D-754-48



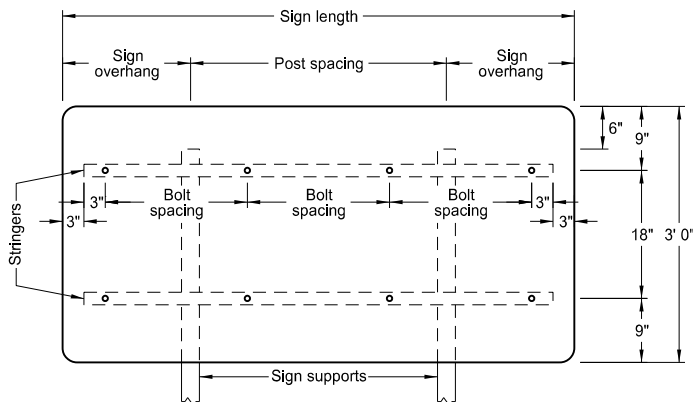
VARIES X 1'-6"



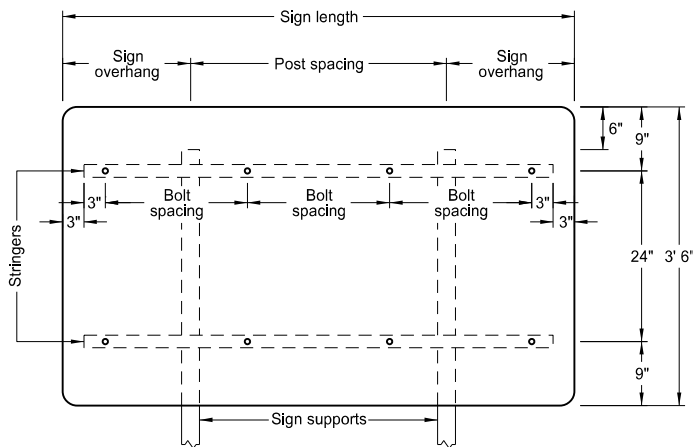
VARIES X 2'-0"



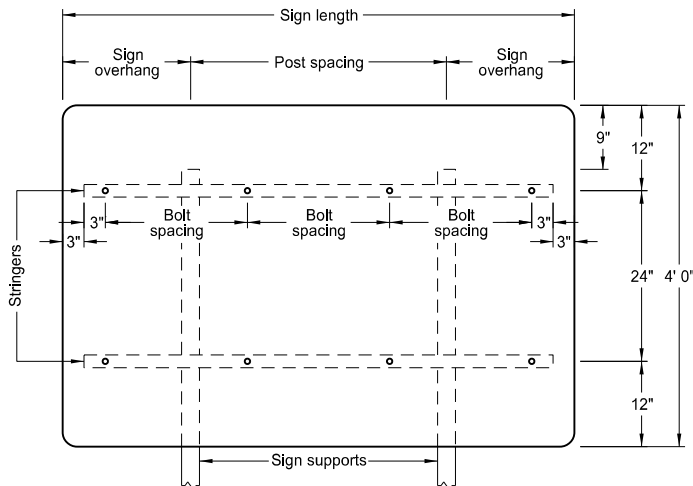
VARIES X 2'-6"



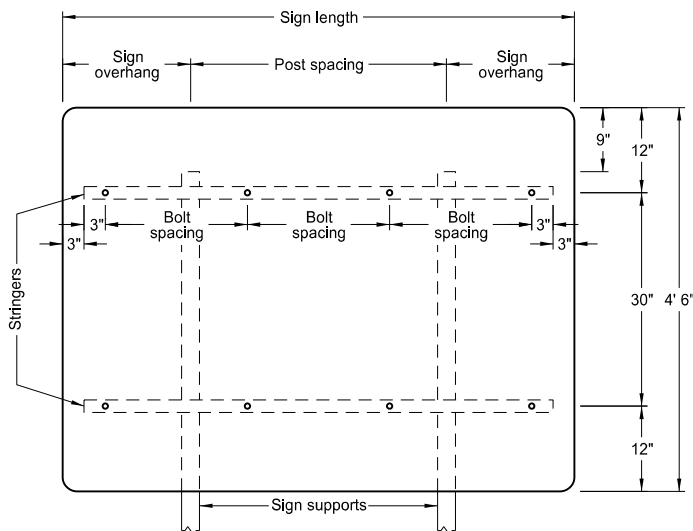
VARIES X 3'-0"



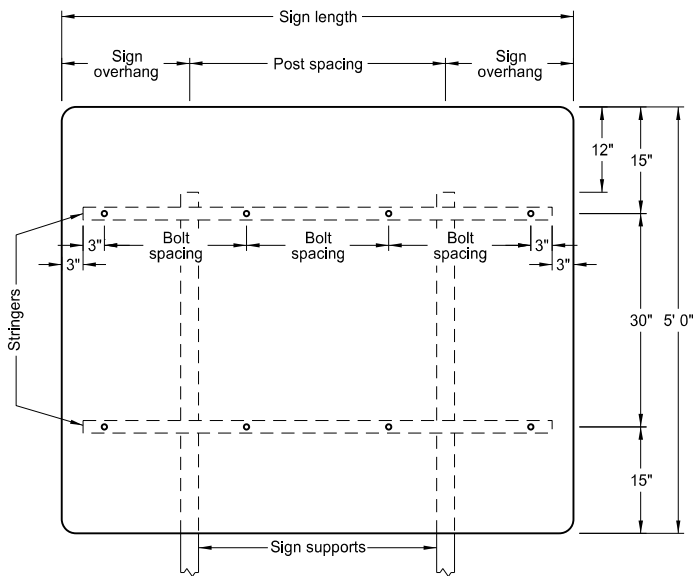
VARIES X 3'-6"



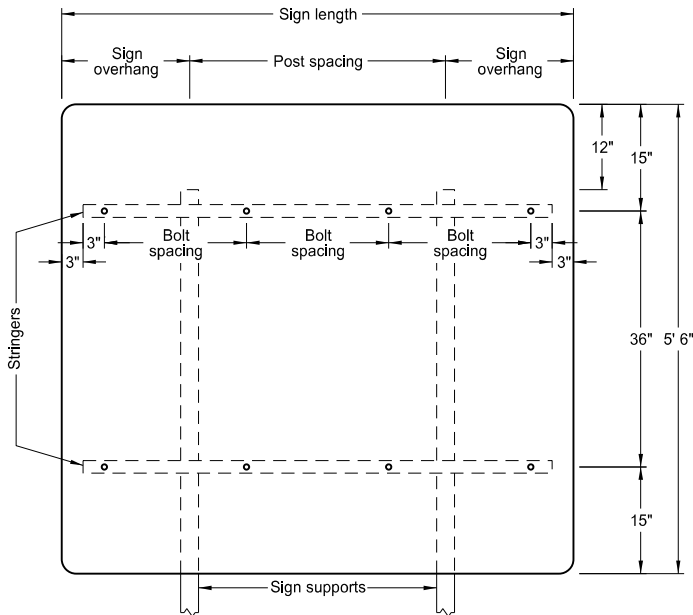
VARIES X 4'-0"



VARIES X 4'-6"



VARIES X 5'-0"



VARIES X 5'-6"

Notes:

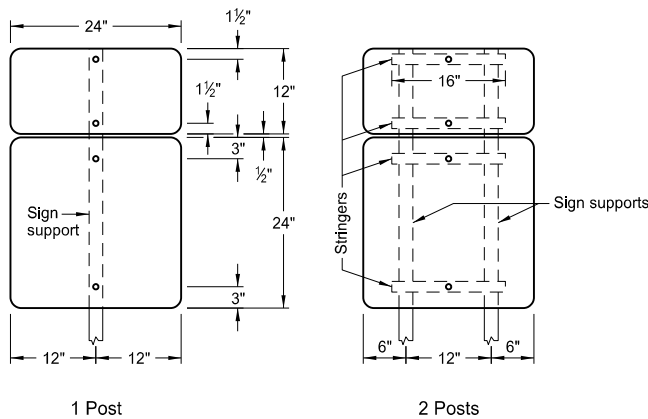
1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1½" x 1½".
3. All holes shall be punched round for ⅜" bolt.

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

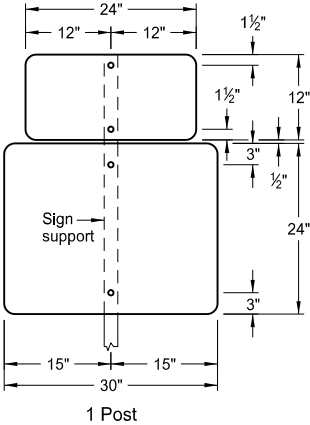
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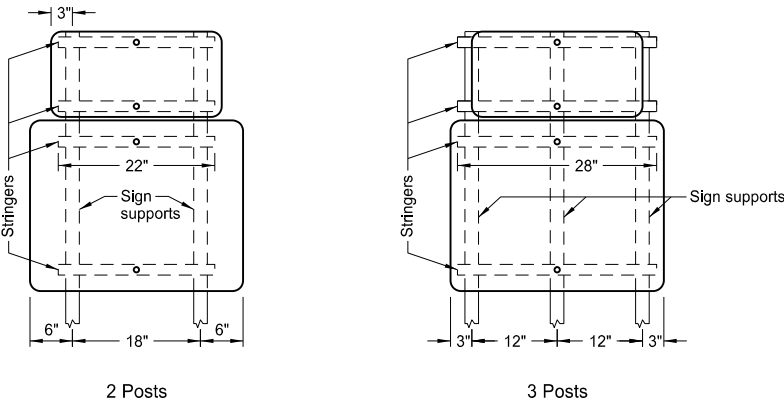
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS



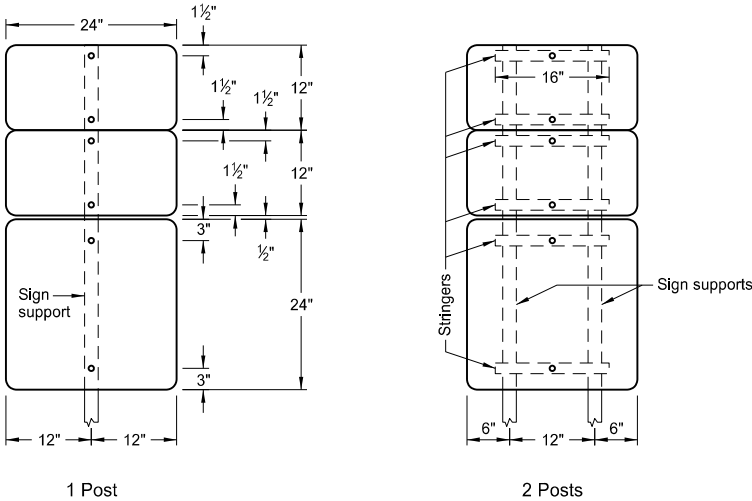
ASSEMBLY NO. 371



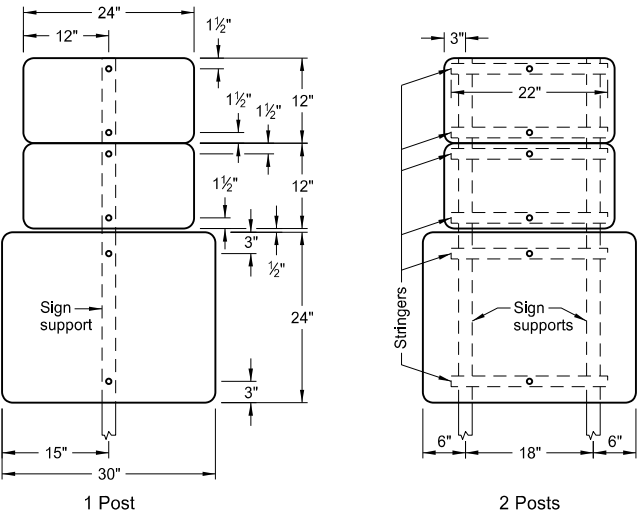
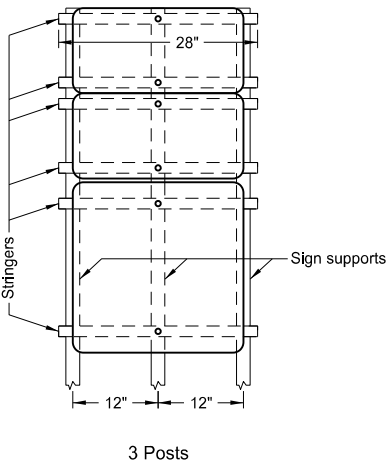
ASSEMBLY NO. 372



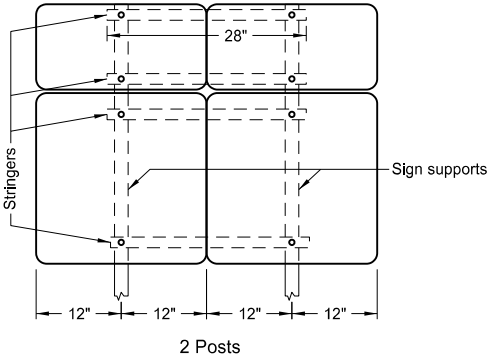
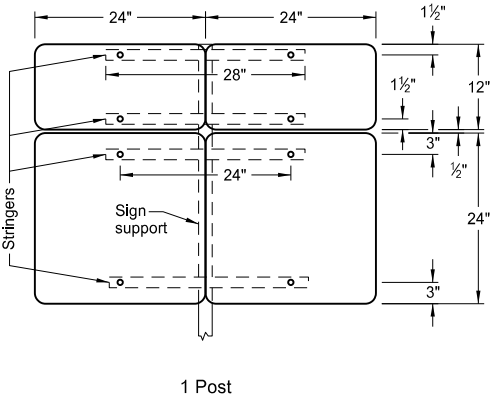
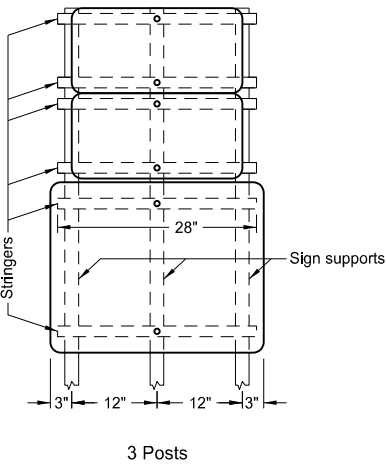
- Notes:
1. The minimum sign backing material thickness shall be 0.100 inch.
 2. Perforated square tube stringer shall be 1 1/2"x1 1/2".
 3. All holes shall be punched round for 3/8" bolt.



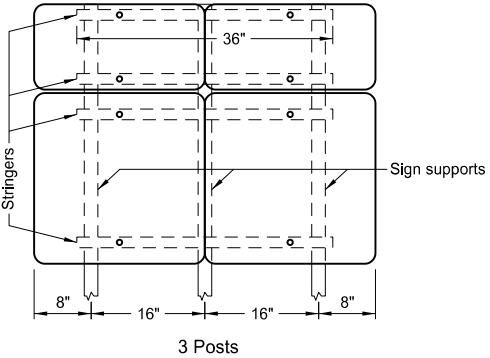
ASSEMBLY NO. 373



ASSEMBLY NO. 374



ASSEMBLY NO. 375

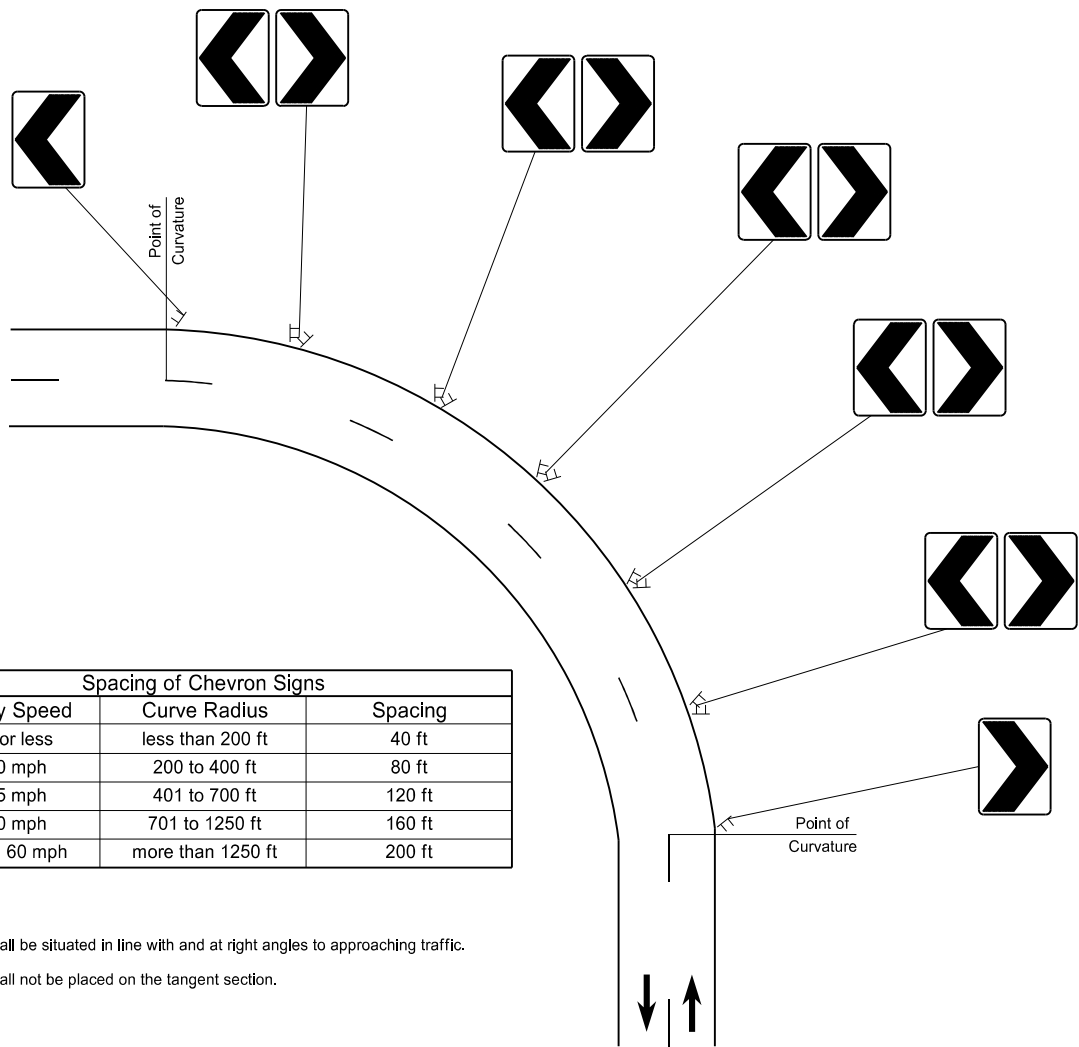


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DATE	CHANGE

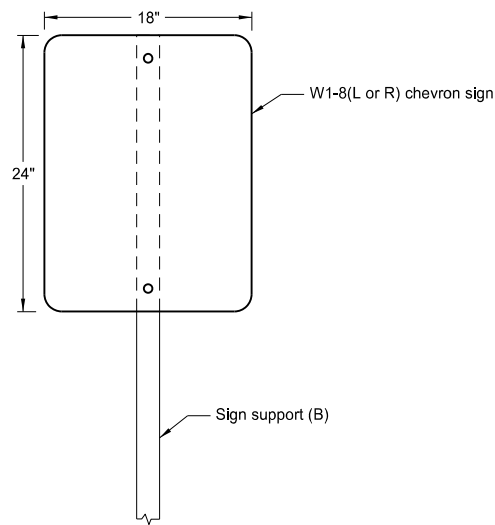
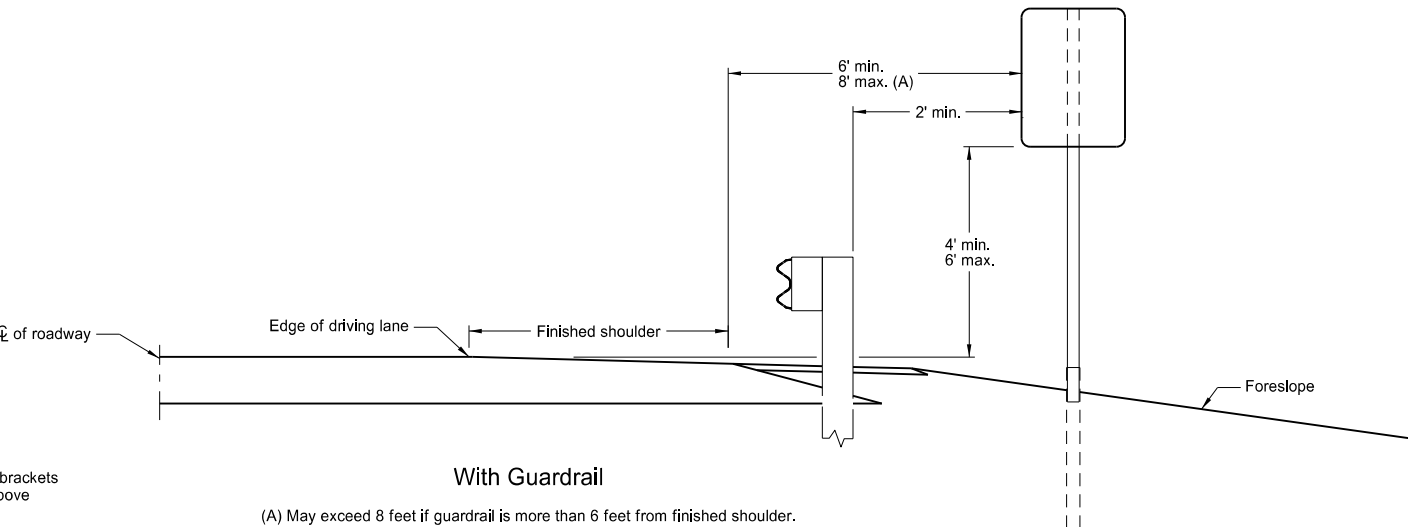
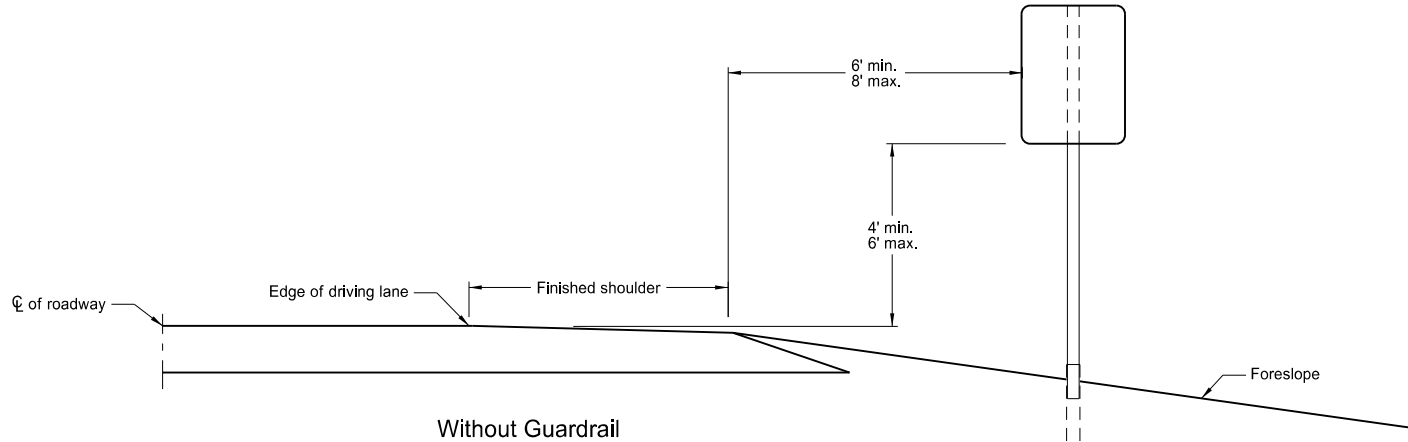
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CHEVRON INSTALLATION DETAILS

D-754-79

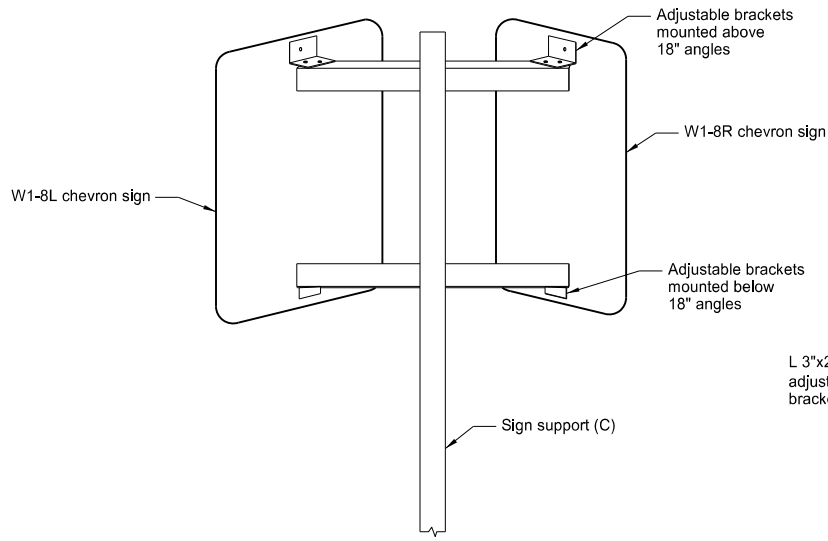


- Notes:
- 1. Chevrons shall be situated in line with and at right angles to approaching traffic.
 - 2. Chevrons shall not be placed on the tangent section.



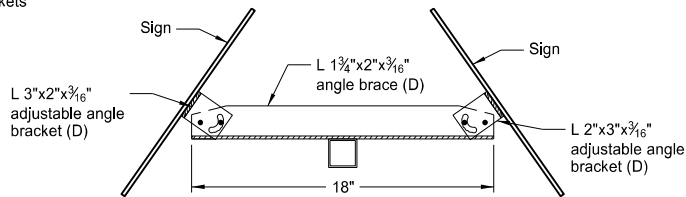
Chevron Single Sign Assembly

(B) Single sign support shall be 2x2x12ga. perforated tube
Anchor unit shall be 2.25x2.25x12ga. perforated tube



Chevron Double Sign Assembly

(C) Double sign support shall be 2.25x2.25x12ga. perforated tube
Anchor unit shall be 2.5x2.5x12ga. perforated tube



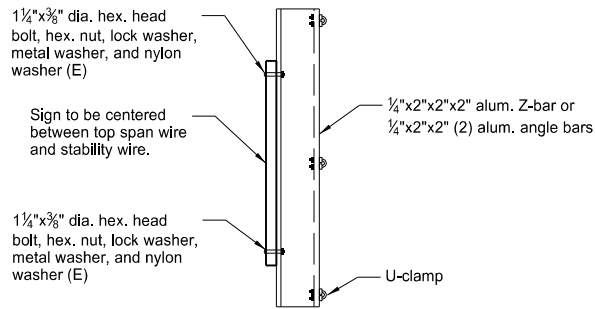
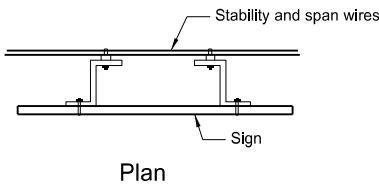
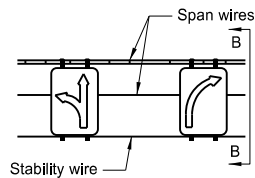
Top View

(D) All angles shown shall be aluminum or steel. The sizes are the minimum allowed, larger sizes may be used if approved by the Engineer.

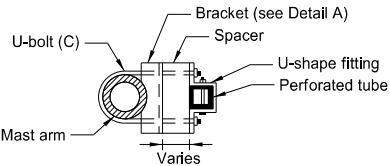
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-10-13	
REVISIONS	
DATE	CHANGE

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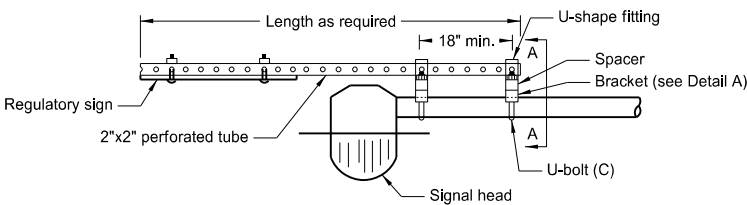
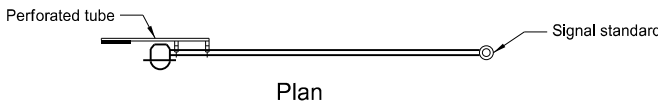
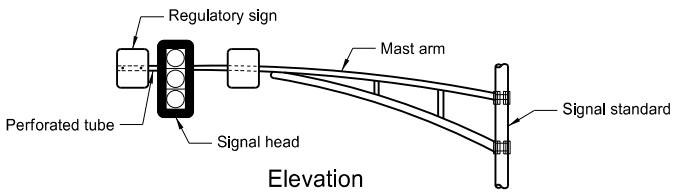
LIGHT STANDARD, SIGNAL STANDARD,
AND SPAN WIRE MOUNTED SIGN
ASSEMBLY DETAIL



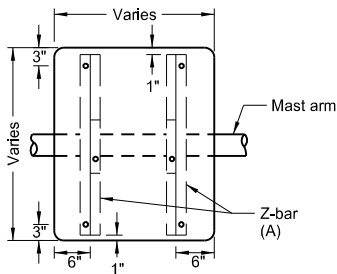
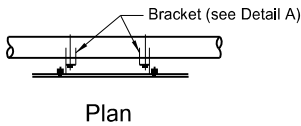
Section B-B
Span Wire Mounted Sign Detail



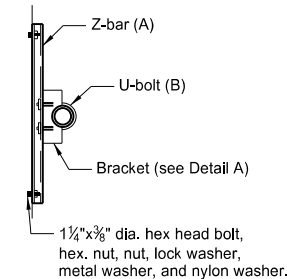
Section A-A



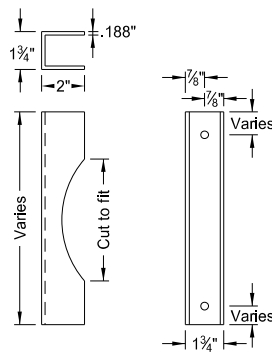
Sign Mounted Beyond End of Mast Arm Detail



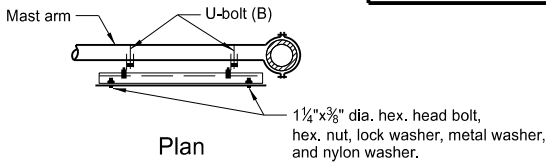
Elevation



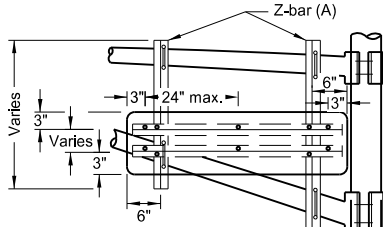
Side View



Detail A

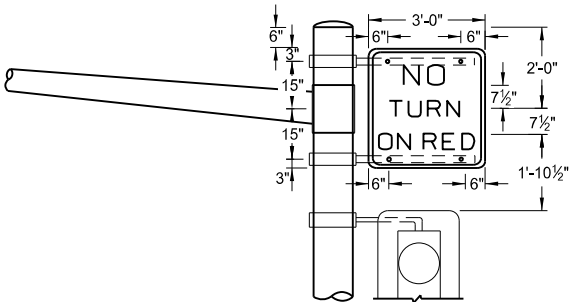


Plan

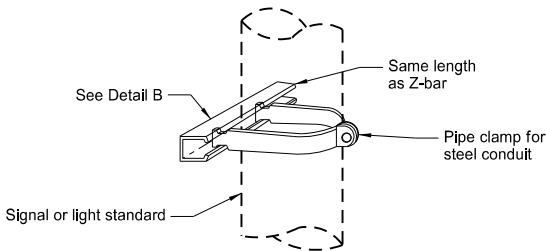


Elevation

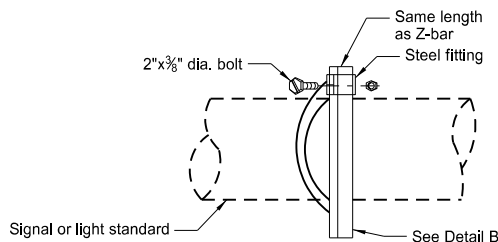
Mast Arm Mounted Street Name Sign Detail



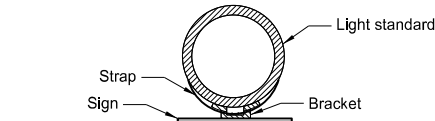
Signal Standard Mounted Sign Attachment Detail



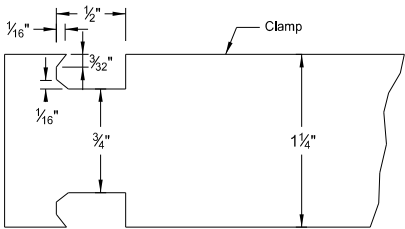
Vertical Mounting
(2 clamps required per sign)



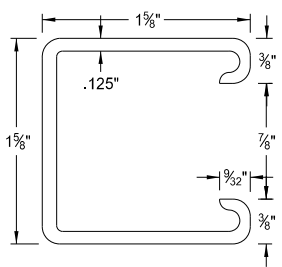
Horizontal Mounting
alternate clamp mounting
(2 clamps required per sign)



Light Standard Mounted Sign Bracket Detail
Max. 24"x30" signs (D)



Clamp Detail



Detail B
Steel Channel

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

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

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

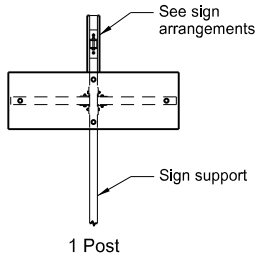
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Registration Number
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North Dakota Department
of Transportation

- Notes:
- (A) Z-bar - Use 1 3/4"x3/16" thick 1.08 lb/ft aluminum alloy. In place of Z-bar, two angles bolted together may be used or a channel. 1 3/4"x1 3/4"x3/16" angles or 1 3/4"x2"x.188" channels.
- (B) 3/8" U-bolt, hex. nut, lock washer, and length depends on dia. of mast arm.
- (C) 3/8" U-bolt, hex. nut, lock washer, and length depends on dia. of mast arm.
2"x2" maximum support length 9.9'
2 1/4"x2 1/4" maximum support length 12.6'
2 1/2"x2 1/2" maximum support length 15.7'
- (D) Bracket shall be of galv. steel consisting of strap and sign attachment bracket similar to the one shown in the detail. The cost of the bracket assembly is to be included in the price bid for flat sheet signs. Punching shall be as shown on the Standard Drawings. There shall be a 7" vertical clearance to the bottom of all signs mounted on light standards.
- (E) Metal washers and nylon washers used on sign face shall have a minimum outside dia. of 1 5/16" ± 1/16" and 10 gauge thickness.

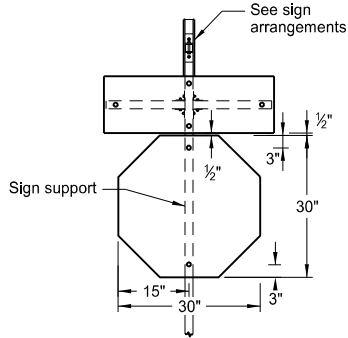
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
FOR STREET NAME SIGNS AND 911 SIGNS

D-754-87

- 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

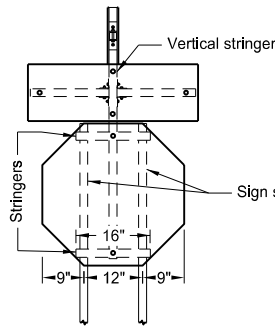


Special Assembly 1 (A, B, C, D or E)

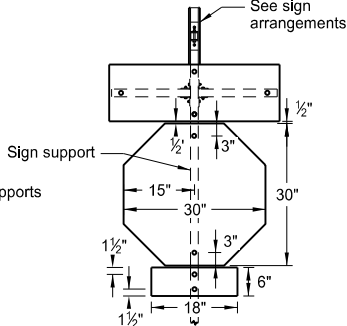


1 Post

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

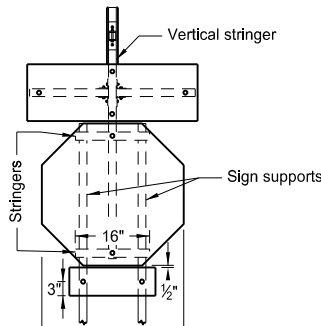


2 Posts

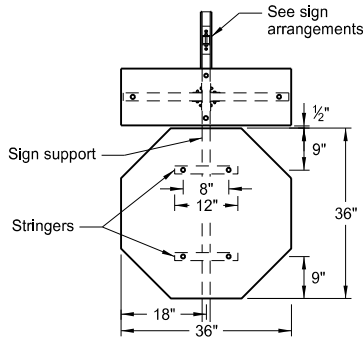


1 Post

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

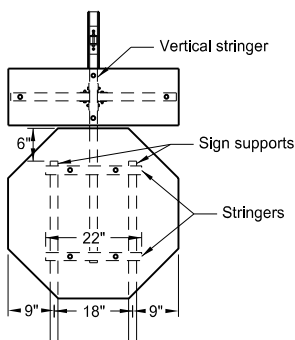


2 Posts

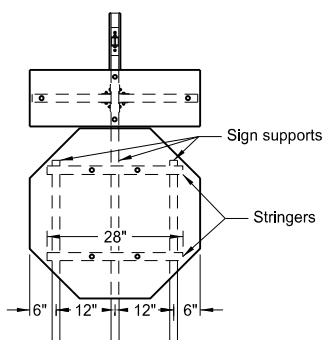


1 Post

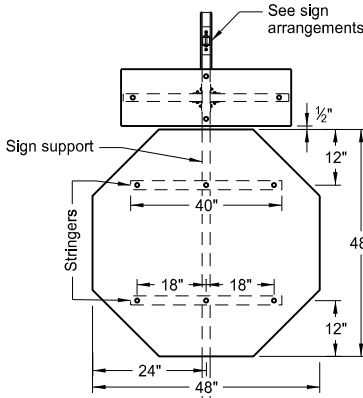
Special Assembly 4 (A, B, C, D or E)



2 Posts

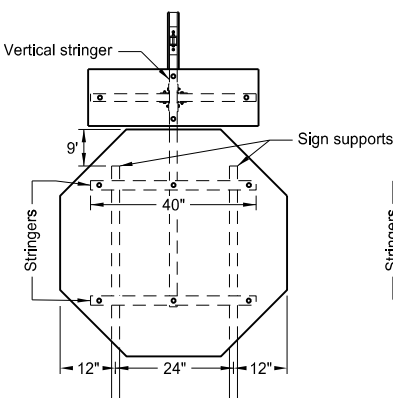


3 Posts

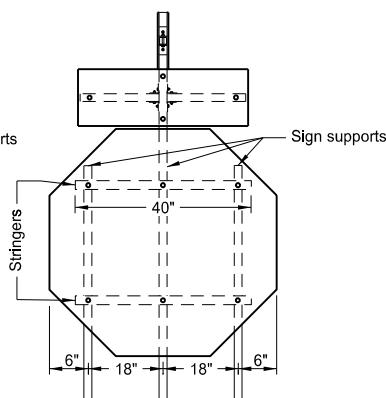


1 Post

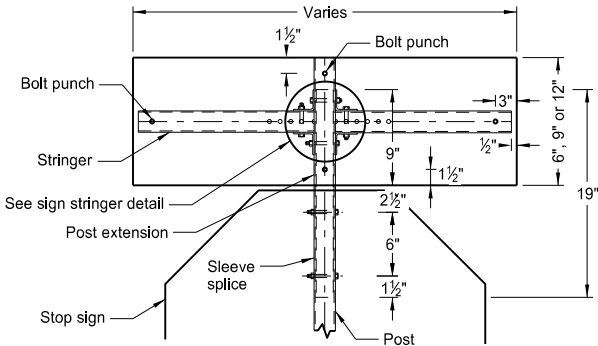
Special Assembly 5 (A, B, C, D or E)



2 Posts

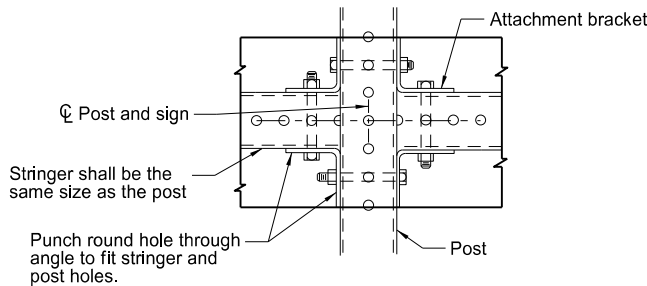


3 Posts

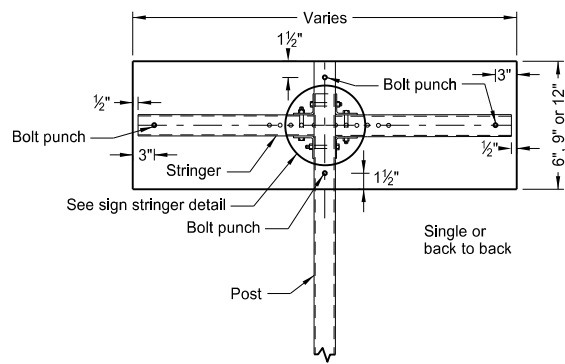


Front View
Sleeve Splice Detail

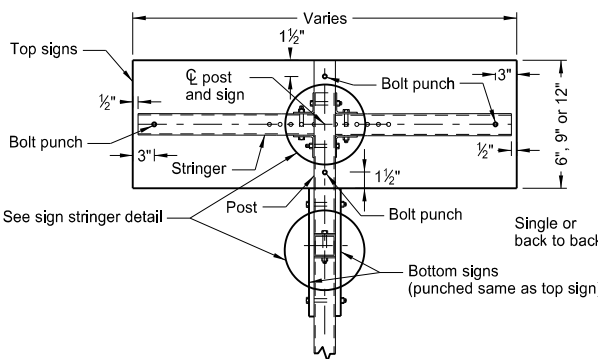
Note: The splice method may be used upon approval of the engineer.



Sign Stringer Detail

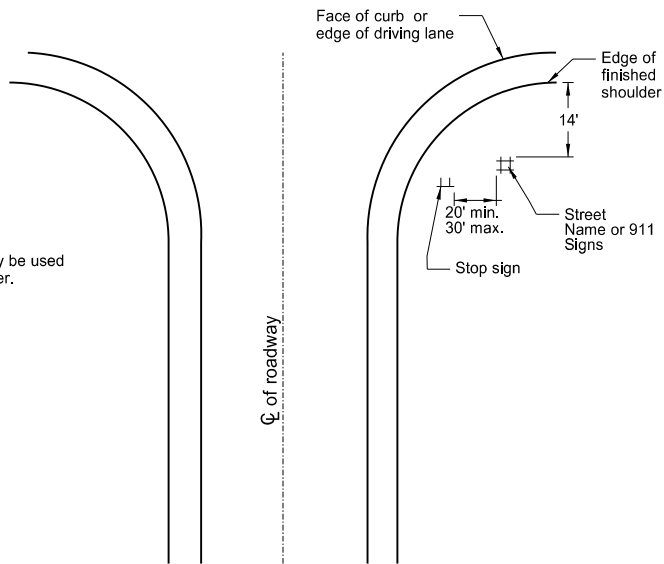


Detail A or B



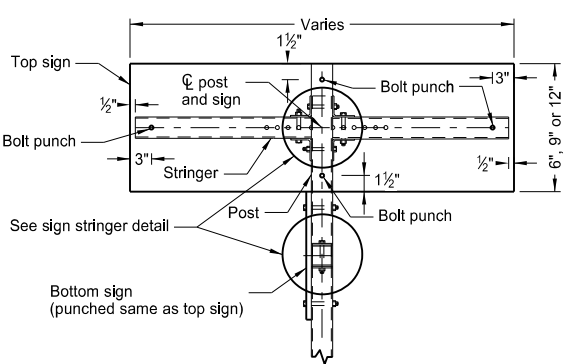
Detail D or E

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



Intersection Layout

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



Detail C

Sign Arrangements

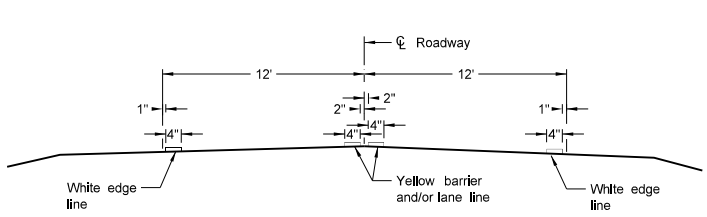
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
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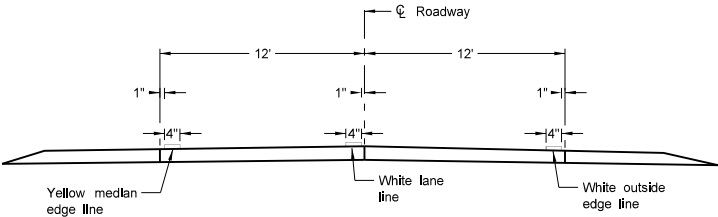
PAVEMENT MARKING

D-762-4

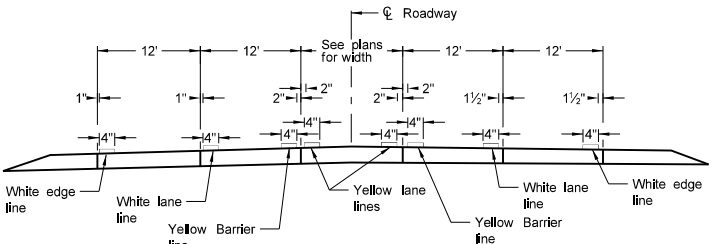
- NOTES:
- 1. Edge lines shall be continued through private drives and field drives and broken for intersections.



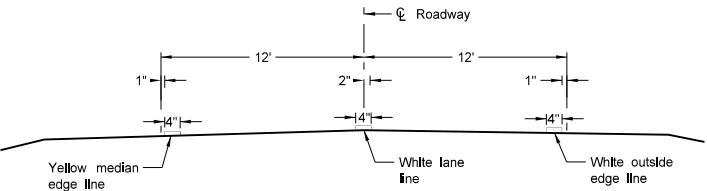
Two Lane Two Way
RURAL ROADWAY



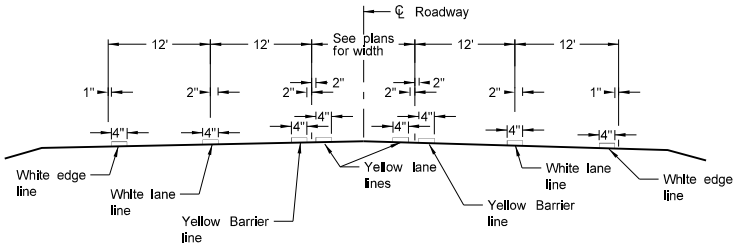
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



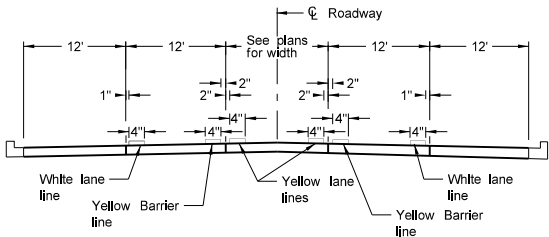
RURAL FIVE LANE ROADWAY
Concrete Section



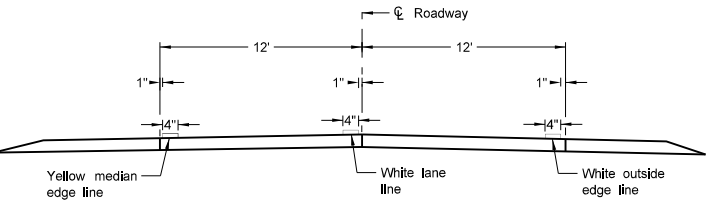
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



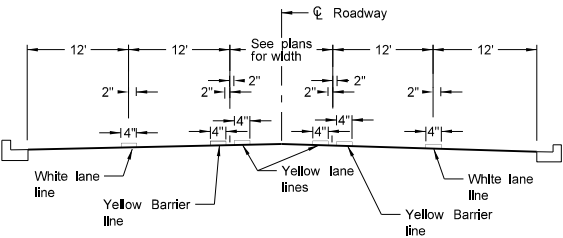
RURAL FIVE LANE ROADWAY
Asphalt Section



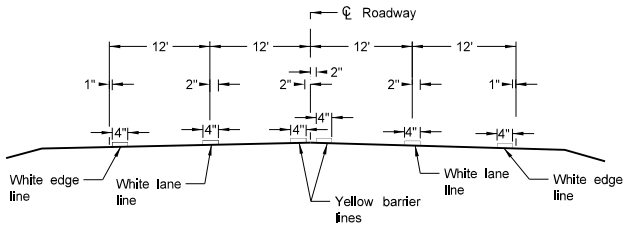
URBAN FIVE LANE SECTION
Concrete Section



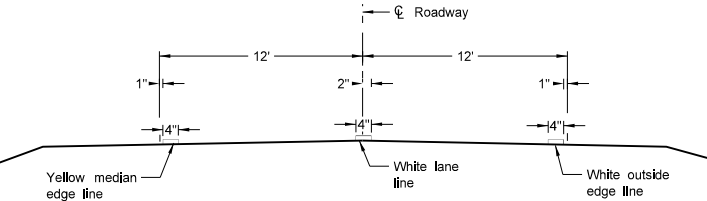
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



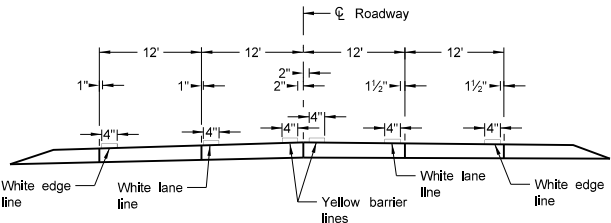
URBAN FIVE LANE SECTION
Asphalt Section



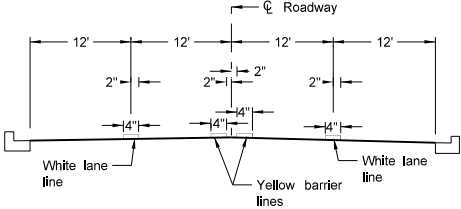
RURAL FOUR LANE ROADWAY
Asphalt Section



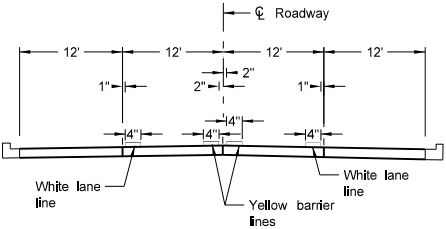
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



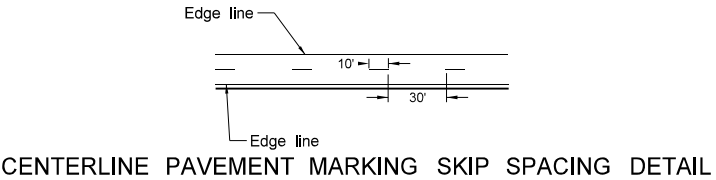
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



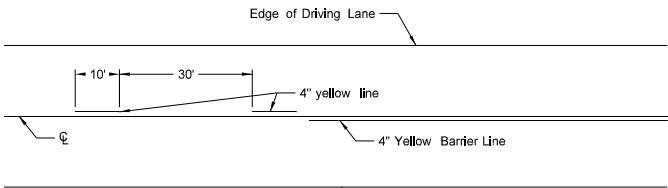
CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

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

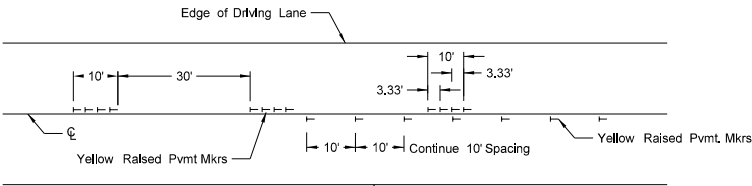
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SHORT-TERM PAVEMENT MARKING

D-762-11

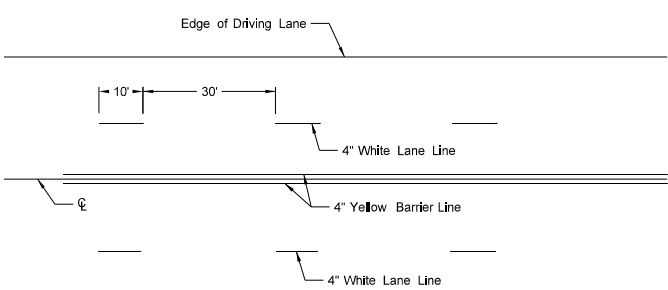


Painted or Tape Lines

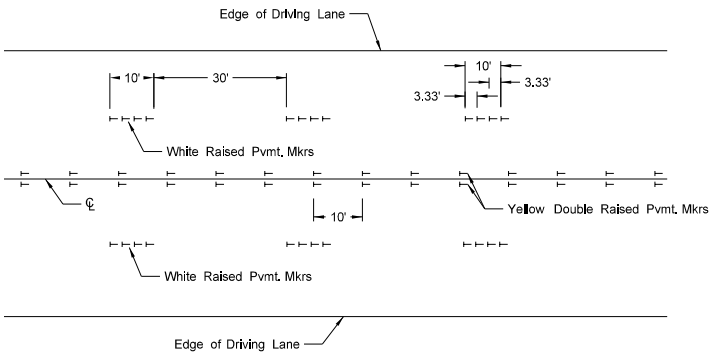


Raised Pavement Markers

TWO-LANE TWO-WAY ROADWAY

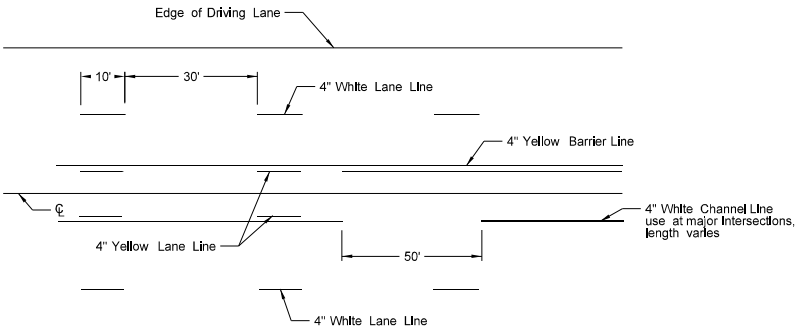


Painted or Tape Lines

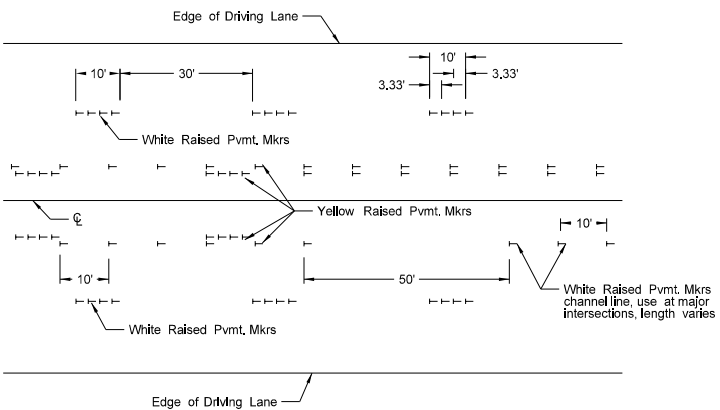


Raised Pavement Markers

FOUR LANE ROADWAY

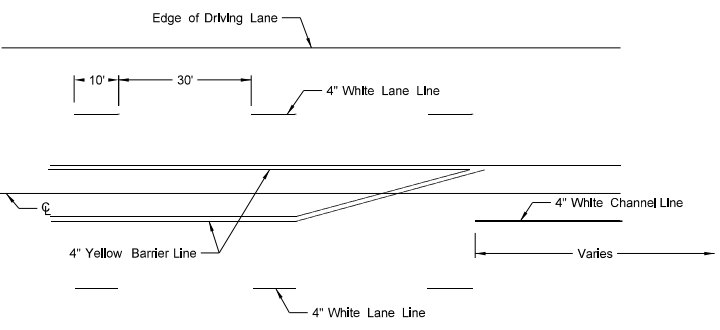


Painted or Tape Lines

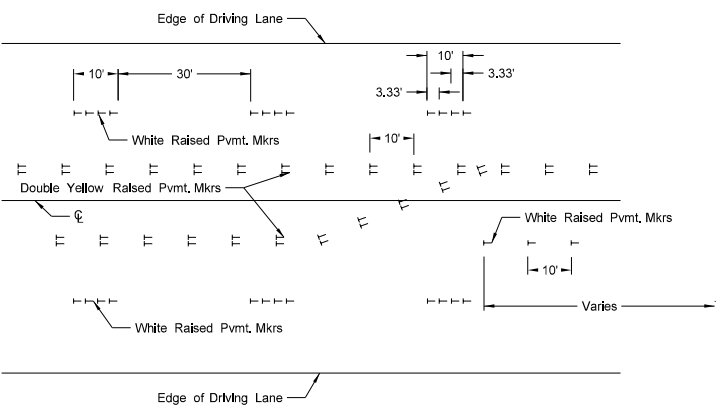


Raised Pavement Markers

FIVE LANE ROADWAY TWO WAY LEFT TURN



Painted or Tape Lines



Raised Pavement Markers

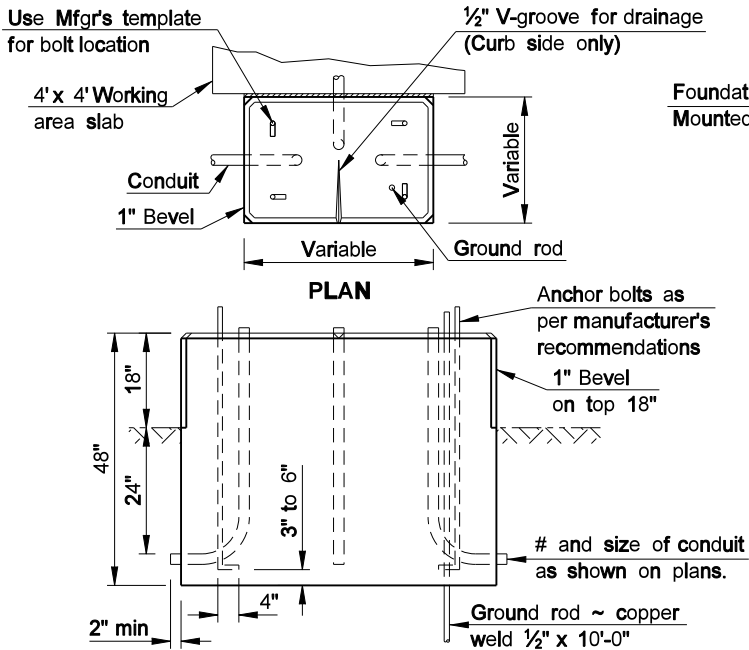
FIVE LANE ROADWAY WITH MARKED ISLANDS

- NOTES:
- Two-lane two-way roadways shall have no passing zones placed as shown. No passing zone signs may be placed in lieu of short term no passing zone pavement markings. These signs will be allowed to remain in place for three days, at which time the short term no passing zone pavement marking shall be placed.
 - Short term center line stripe (paint) on top lift shall be carefully placed with exact spacing so that the permanent stripe will match when applied.
 - Raised markers and tape markings shall be removed after permanent pavement marking has been installed. Removed markings shall become the property of the contractor.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
3-29-16	Re-numbered to be D-762-11 (previously was D-762-6)

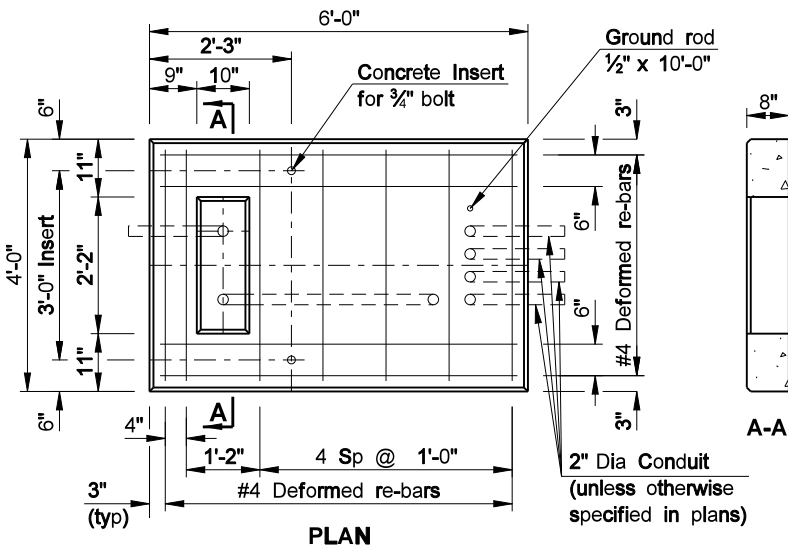
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CONCRETE FOUNDATIONS
(TRAFFIC SIGNALS & HIGHWAY LIGHTING)



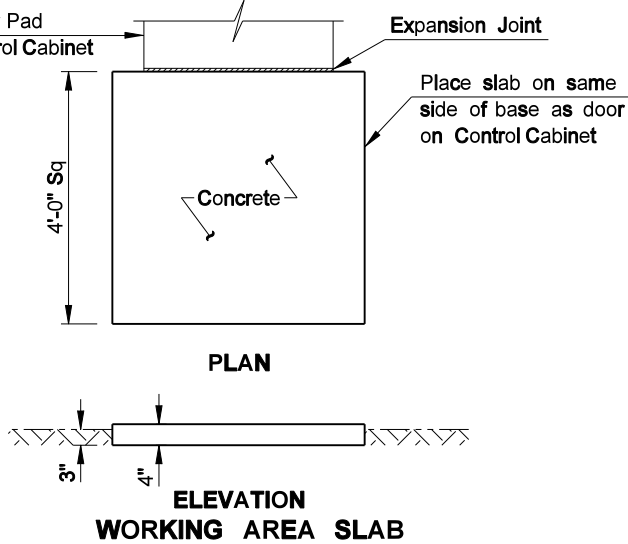
CONTROLLER CABINET FOUNDATION PAD MOUNT

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

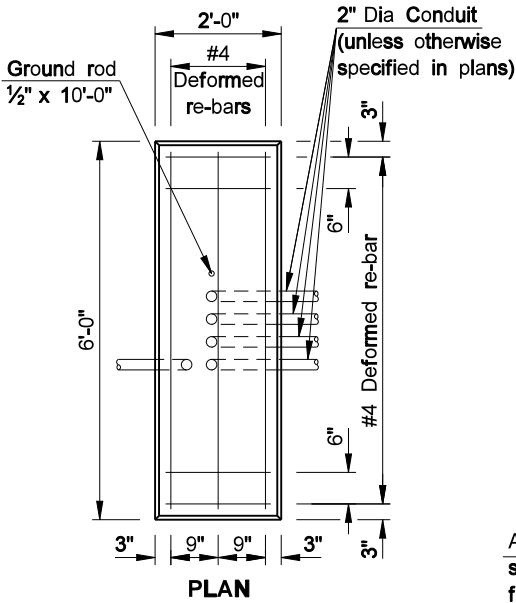


TRANSFORMER & FEED POINT
CABINET FOUNDATION PAD MOUNT

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

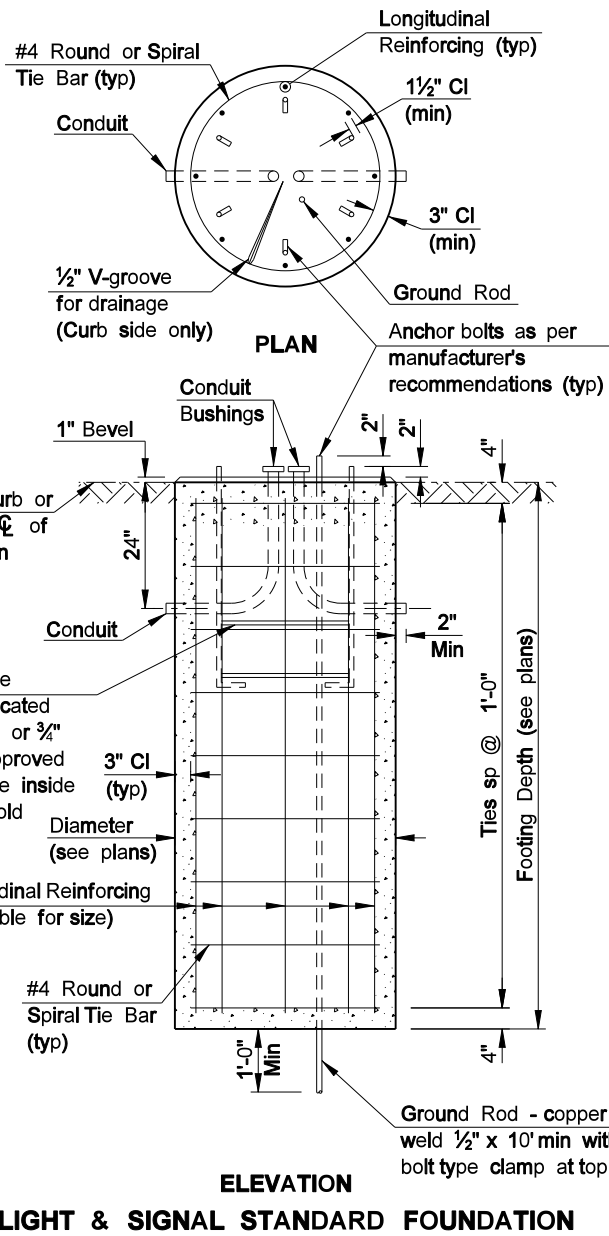
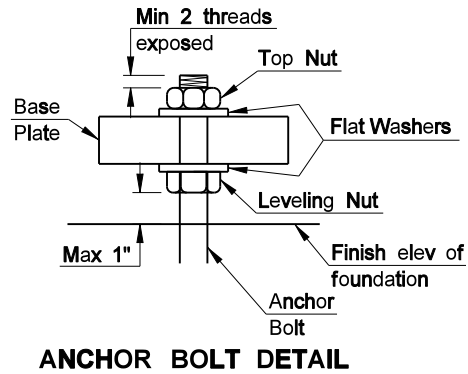


The Working Area Slab shall be installed where shown on the plans and shall not be bid separately but shall be included in the price bid for Concrete Foundation - Traffic Signals.



FEED POINT CABINET
FOUNDATION PAD MOUNT

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



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

NOTES:

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

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

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

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

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

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

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FEED POINTS (ROADWAY LIGHTING)

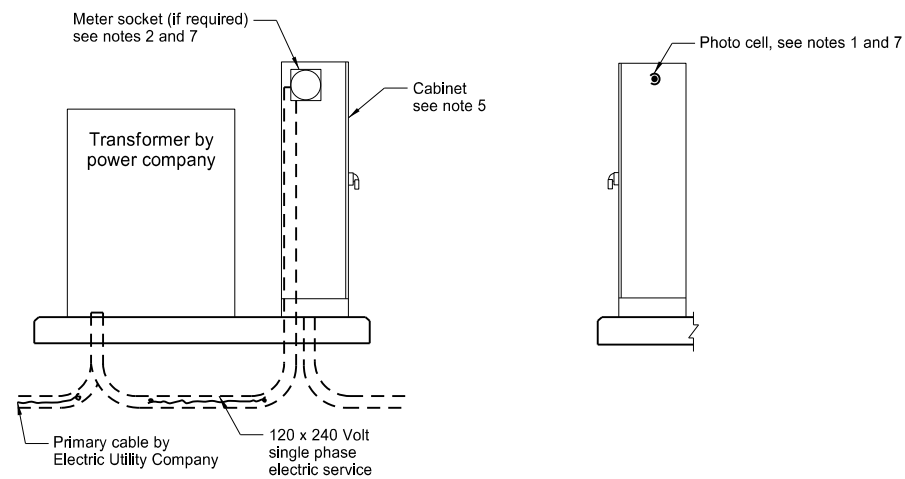
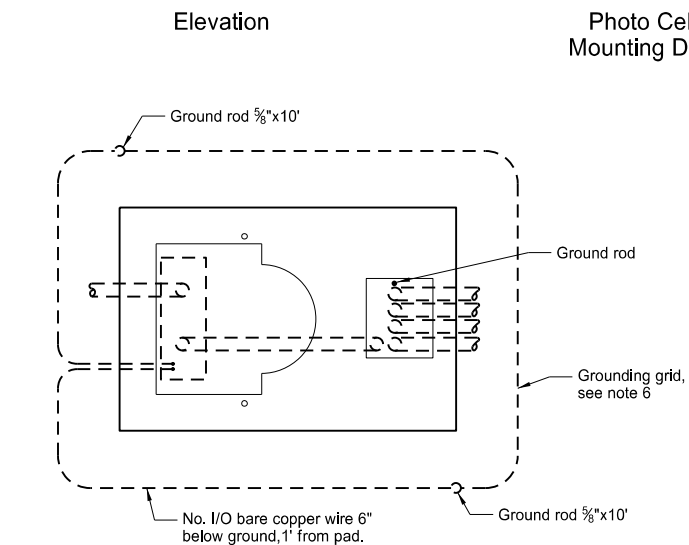
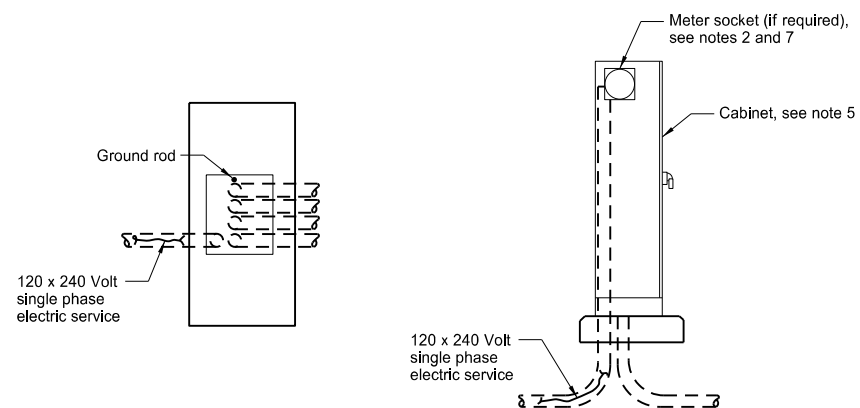


Photo Cell Mounting Detail



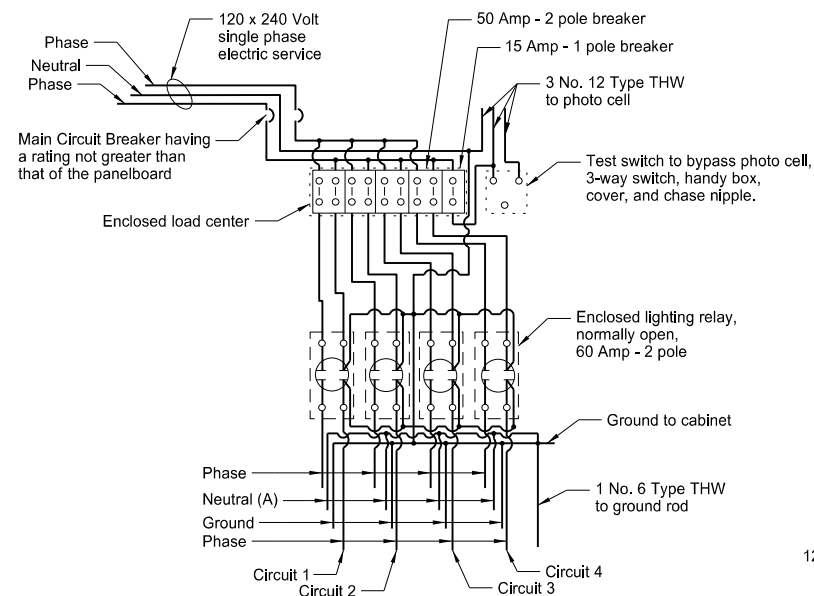
Plan

Transformer and Feed Point Cabinet Pad Mounted



Plan

Feed Point Cabinet Pad Mounted



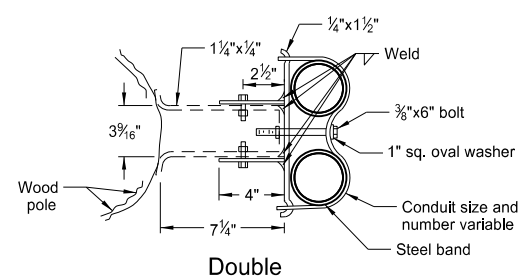
Feed Point Type IV

Type I feed point is similar to Type IV except only one electrical circuit, one 50 Amp - 2 pole breakers and one lighting relay, normally open, shall be installed.

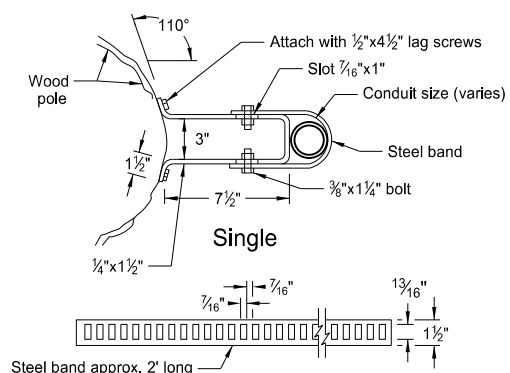
Type II feed point is similar to Type IV except only two electrical circuit, two 50 Amp - 2 pole breakers and two lighting relays, normally open, shall be installed.

Type III feed point is similar to Type IV except only three electrical circuits, three 50 Amp - 2 pole breakers and three lighting relays, normally open, shall be installed.

(A) Install when festoon circuit is required.



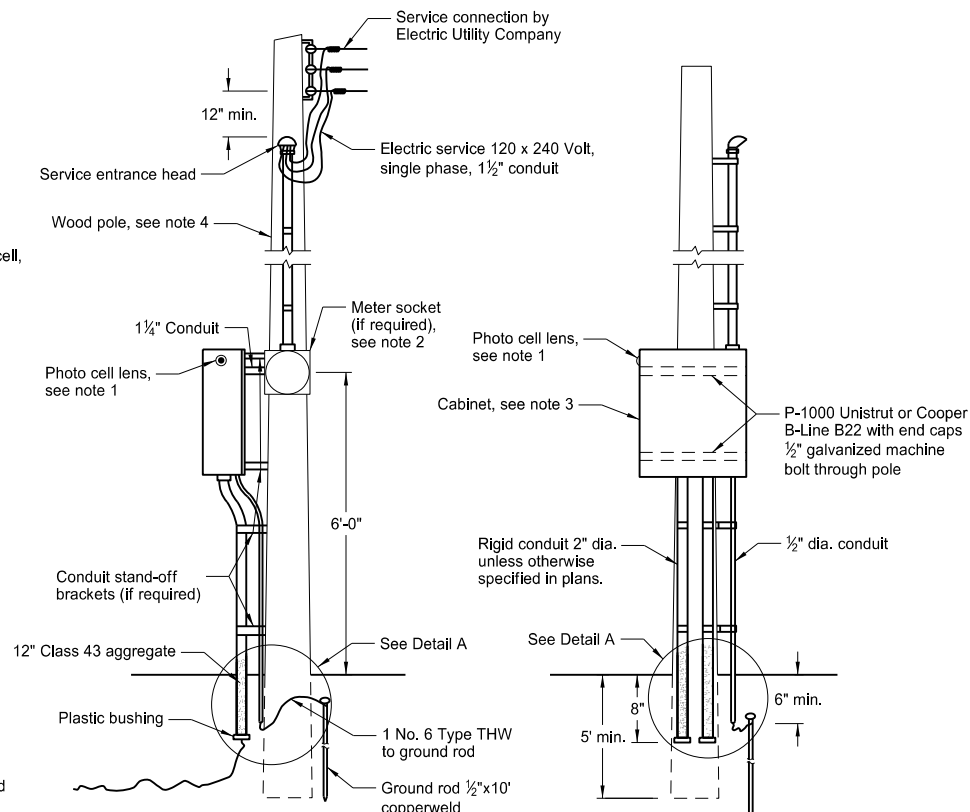
Double



Single

Conduit Standoff Bracket

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



Feed Point Pole Mounted

Notes:

1. Photo Cell: The electrical contractor shall furnish and install the photoelectric cell. The photo lens shall face north.
2. Meter Socket: The contractor shall install the meter socket and trim if the meter is required by local Utility Company. Meter to be furnished and installed by Utility Company.
3. Pole Mounted Cabinet: Cabinet shall have knock drip shield, factory installed steel backing, stainless steel hardware, and side hinge door. Cabinet shall be shop coated with one coat of primer and have two coats of exterior gray enamel.

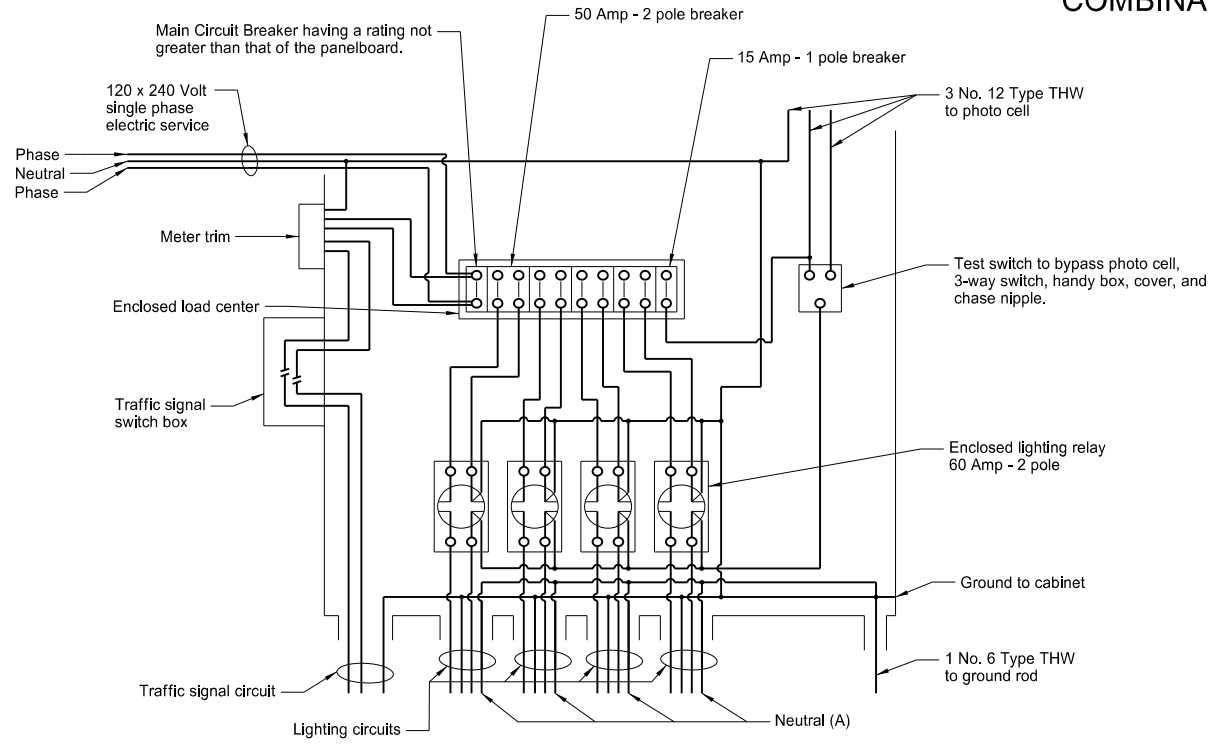
Type I and II feed point shall be 30" high x 24" wide x 8" deep, Type III and IV feed point shall be 30" high x 42" wide x 10" deep or 36" high x 36" wide x 10" deep.
4. Wood Pole: Minimum 20' Class VII full length penta pressure treated wood pole. (if required, see layout sheets)
5. Pad Mounted Cabinet: Cabinet shall be 56" high x 26" wide x 14" deep. Minimum 12 gauge steel or aluminum with provisions for padlock. Cabinet shall be weatherproof. A steel cabinet shall have one coat of primer and two coats of exterior dark green enamel.
6. Grounding Grid: The grounding grid shall have a ground resistance not to exceed 25 ohms. This shall be obtained by one or more $\frac{1}{8}$ "x10' copperweld ground rods in parallel or series at two corners. Minimum distance between ground unit assemblies shall be 6'0".
7. Meter Location: The meter (if required) shall not be mounted on the same side of the cabinet as the photo cell.

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7-8-14	Revised note 3

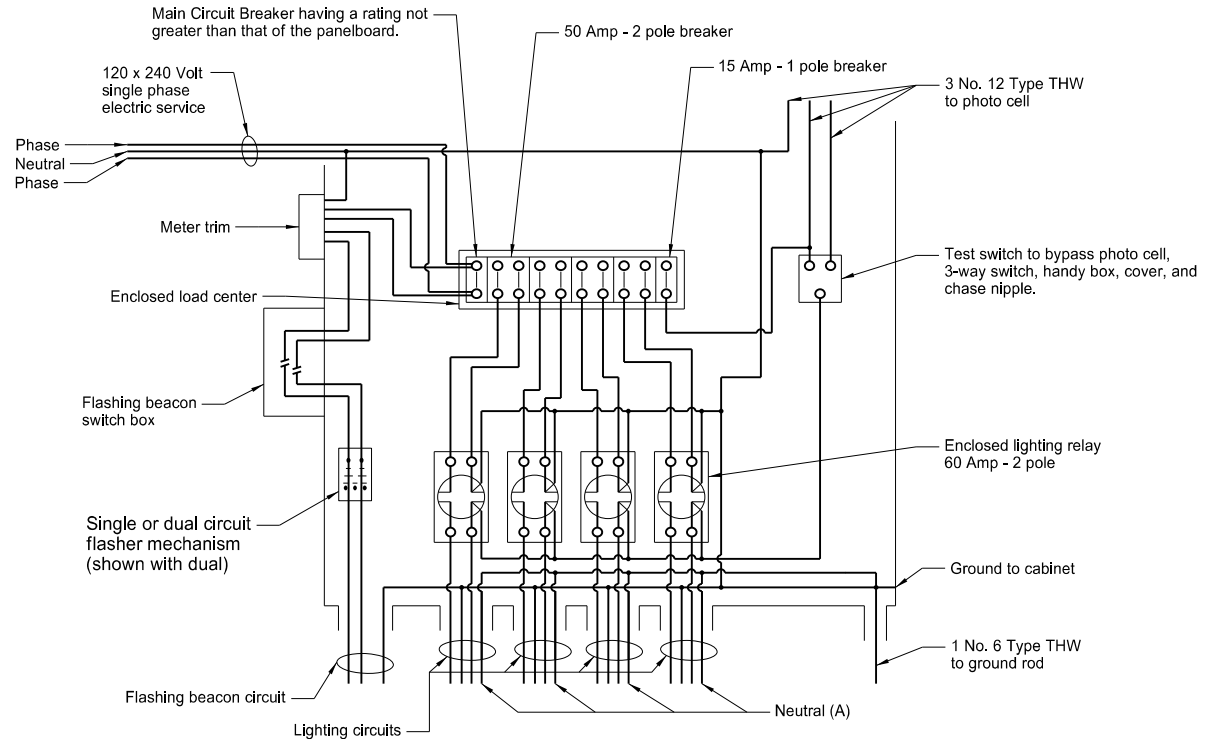
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COMBINATION FEED POINT DETAILS

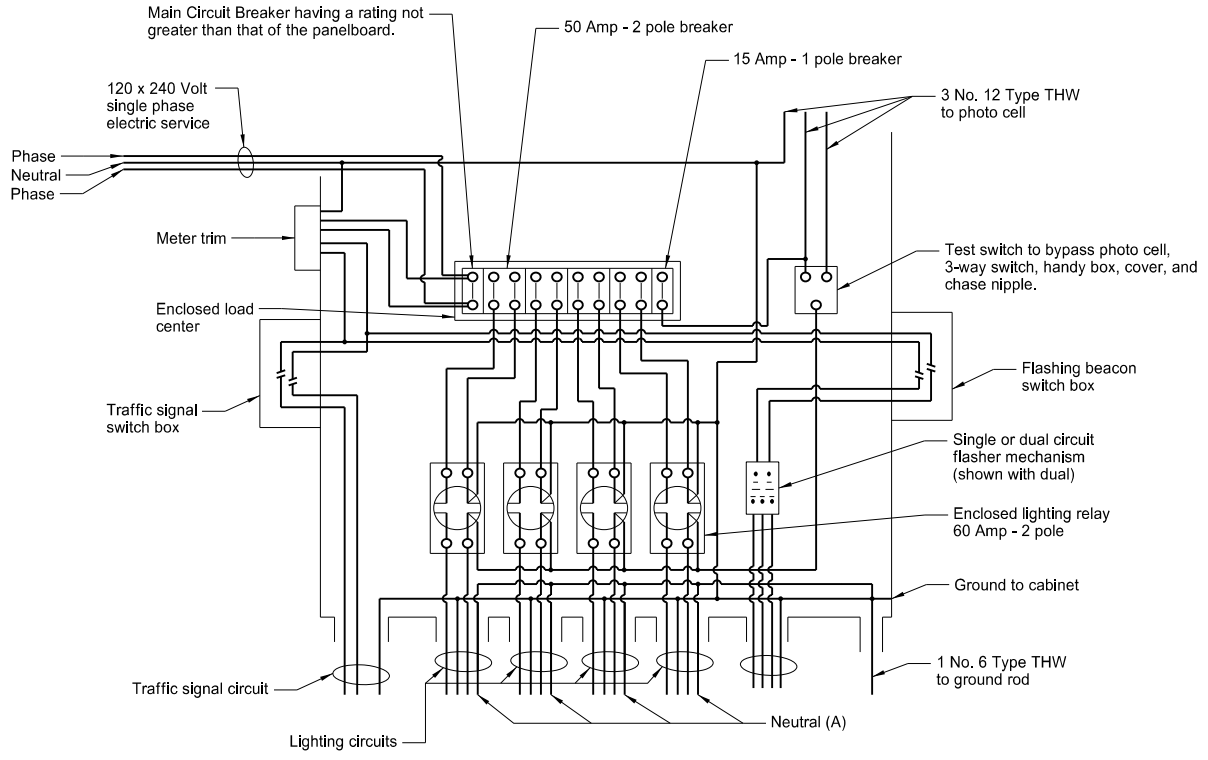
D-770-2A



Combination Lighting and Signal Feed Point Type IV



Combination Lighting and Flashing Beacon Feed Point Type IV



Combination Lighting, Signal, and Flashing Beacon Feed Point Type IV

Notes:

Type I feed point is similar to Type IV except only one electrical circuit, one 50 Amp - 2 pole breaker and one lighting relay, normally open, shall be installed.

Type II feed point is similar to Type IV except only two electrical circuits, two 50 Amp - 2 pole breakers and two lighting relays, normally open, shall be installed.

Type III feed point is similar to Type IV except only three electrical circuits, three 50 Amp - 2 pole breakers and three lighting relays, normally open, shall be installed.

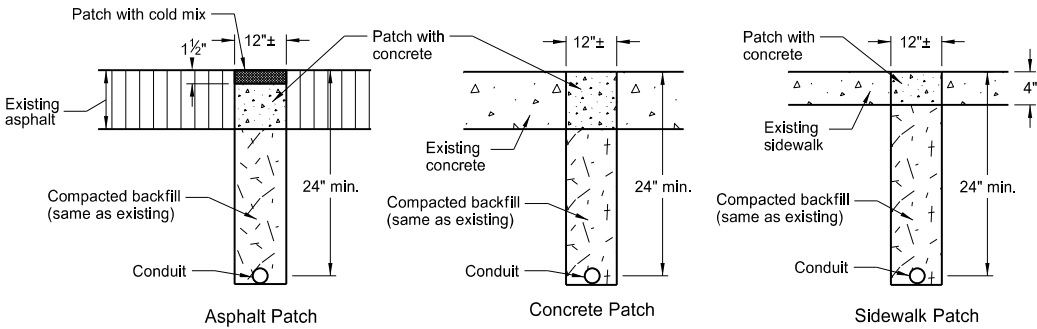
(A) Install when festoon circuits are required

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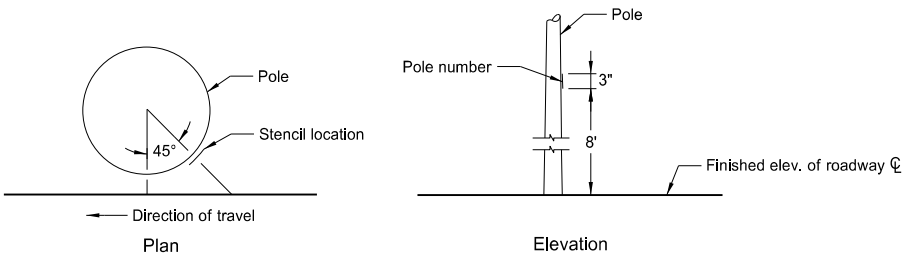
LIGHTING AND SIGNAL DETAILS

D-770-4



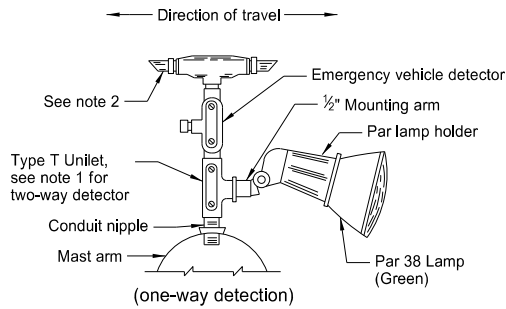
Surface Patch Details

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.

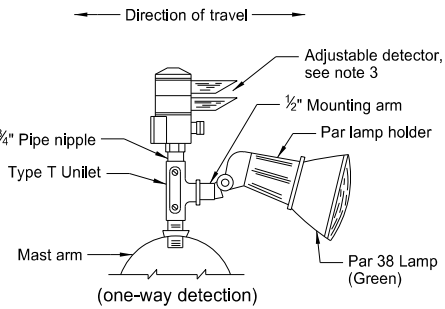


Light Standard Numbering

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.

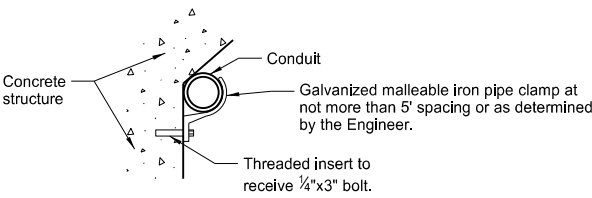


Emergency Vehicle Detector Detail

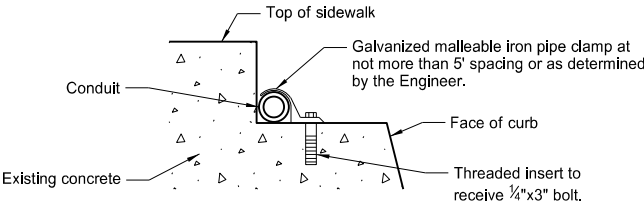


Alternate Emergency Vehicle Detector Detail (adjustable)

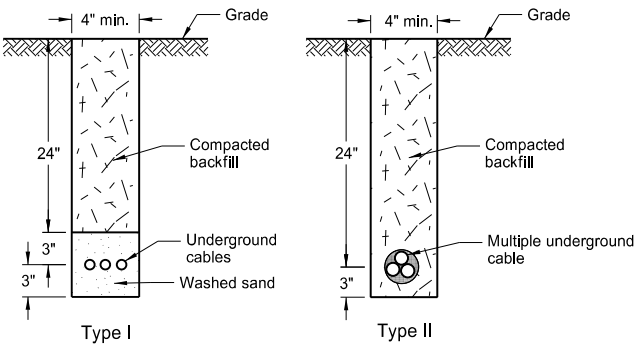
- Notes:
1. Two-way Detector shall have Type X Unilet with two Par lamp holders and lamps. (one in each direction).
 2. One-way Detector shall have the unused end plugged with metal pipe plug.
 3. Two-way Detector shall have the detector lens rotated to face the direction of travel, and shall have Type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



Bridge Mounted Conduit Hanger

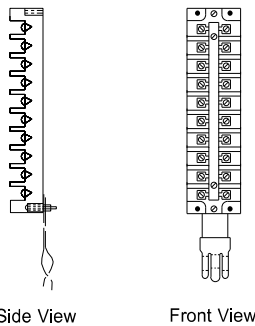


Curb Mounted Conduit

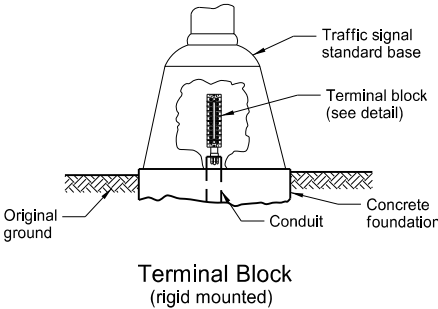


Cable Trench

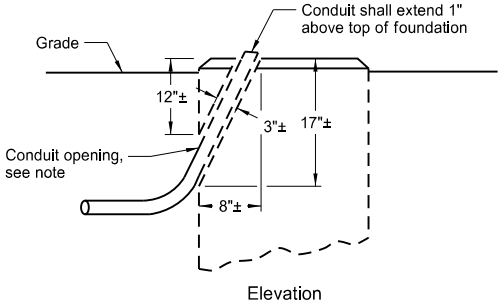
Note: The entire area which is disturbed by the trenching shall be sodded or as directed by the Engineer.



Terminal Block Detail

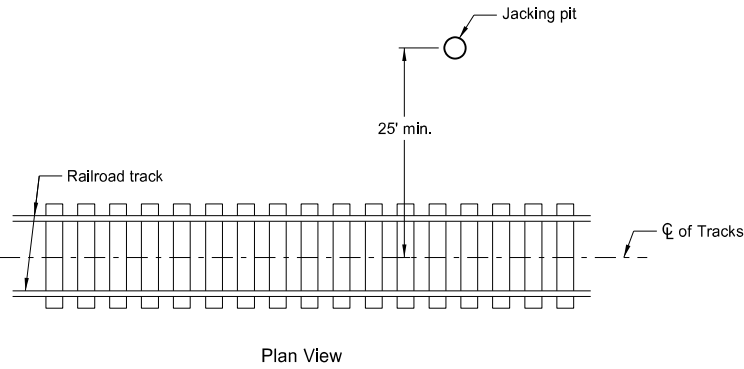


Terminal Block (rigid mounted)

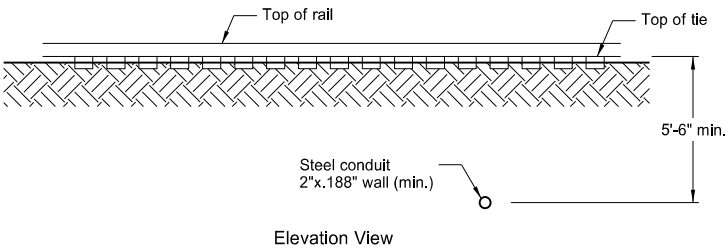


Revise Concrete Foundation

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.



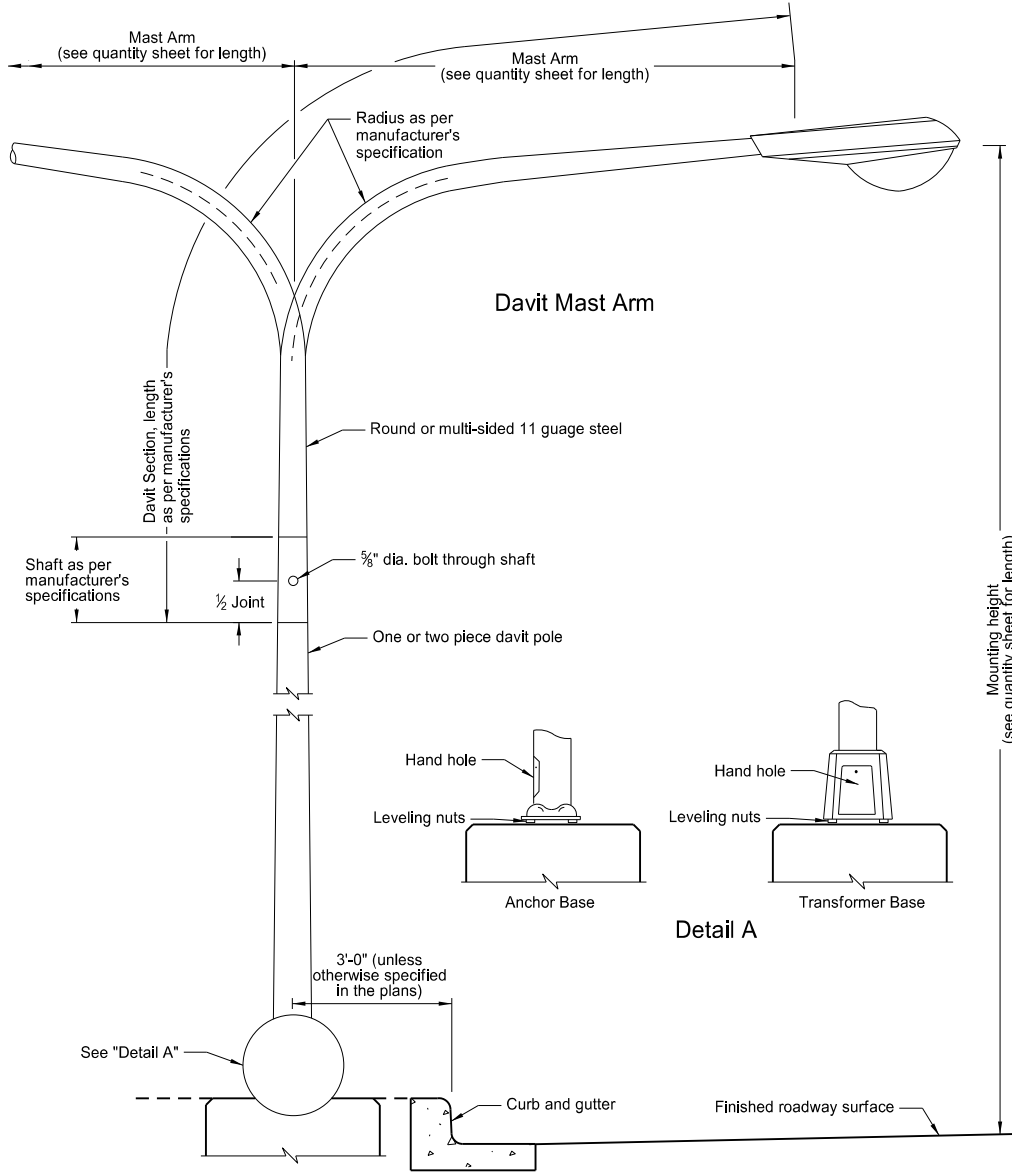
Plan View



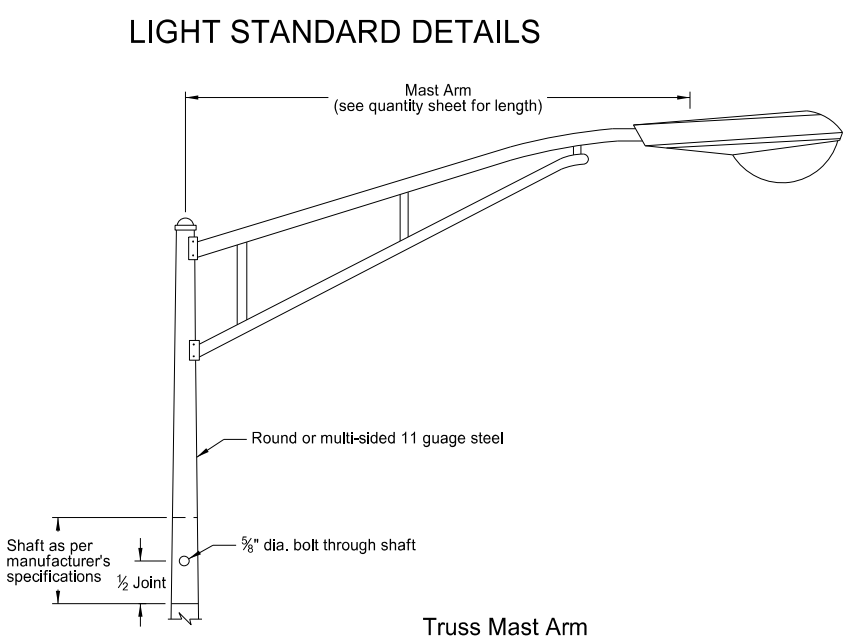
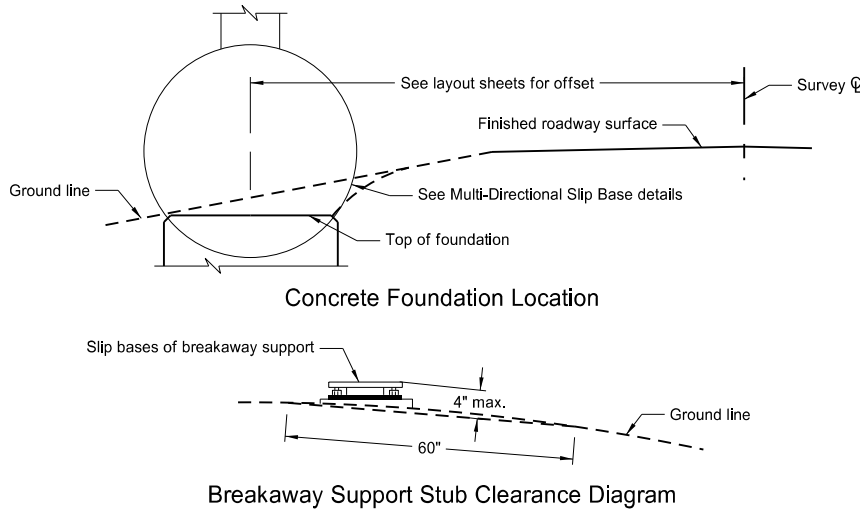
Conduit Placement under Railroad Tracks

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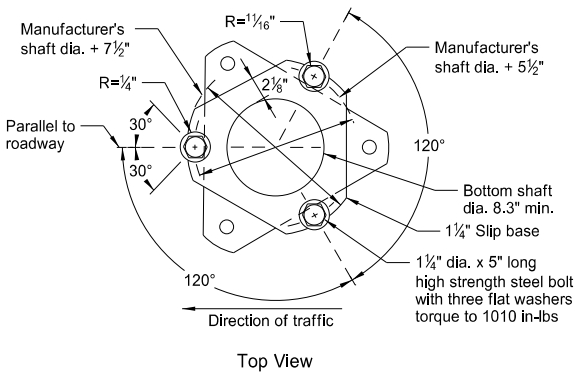
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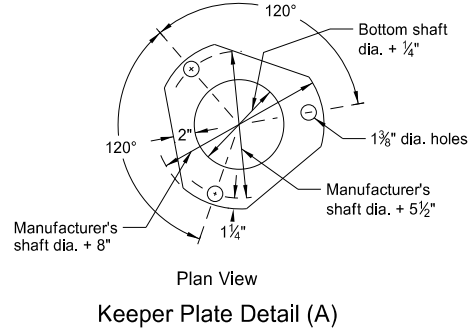
Light Standard Details



Truss Mast Arm



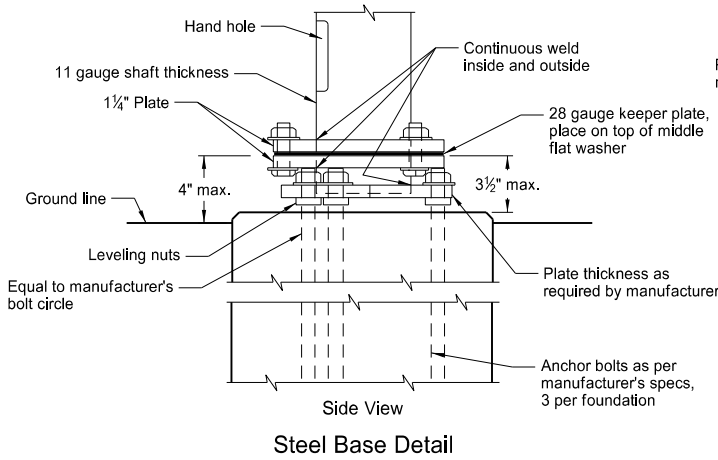
Top View



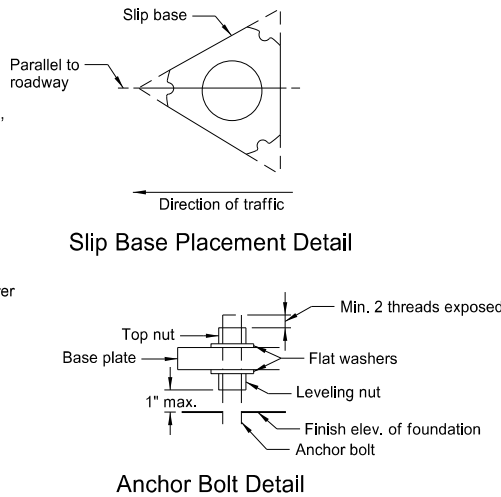
Plan View

Keeper Plate Detail (A)

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



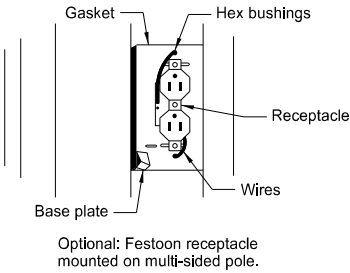
Steel Base Detail



Slip Base Placement Detail

Anchor Bolt Detail

Multi-Directional Slip Base



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.

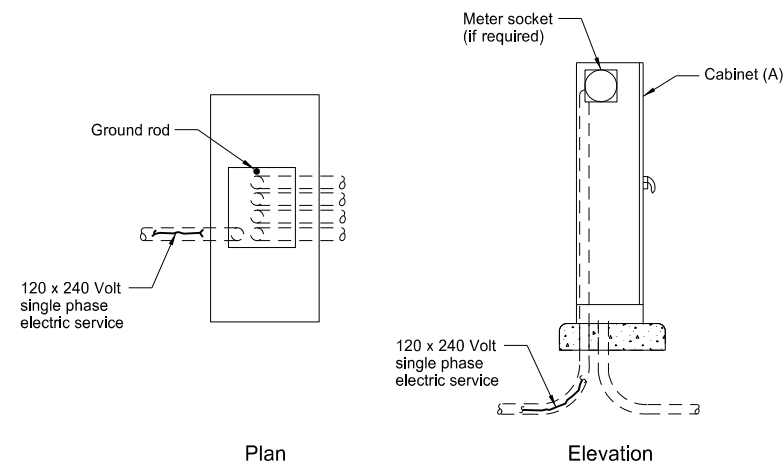
Luminaire: Shall be internal ballast-constant wattage 120x240 voltage. See layout sheets for type of luminaire, wattage, I.E.S. distribution, and operating system.

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.

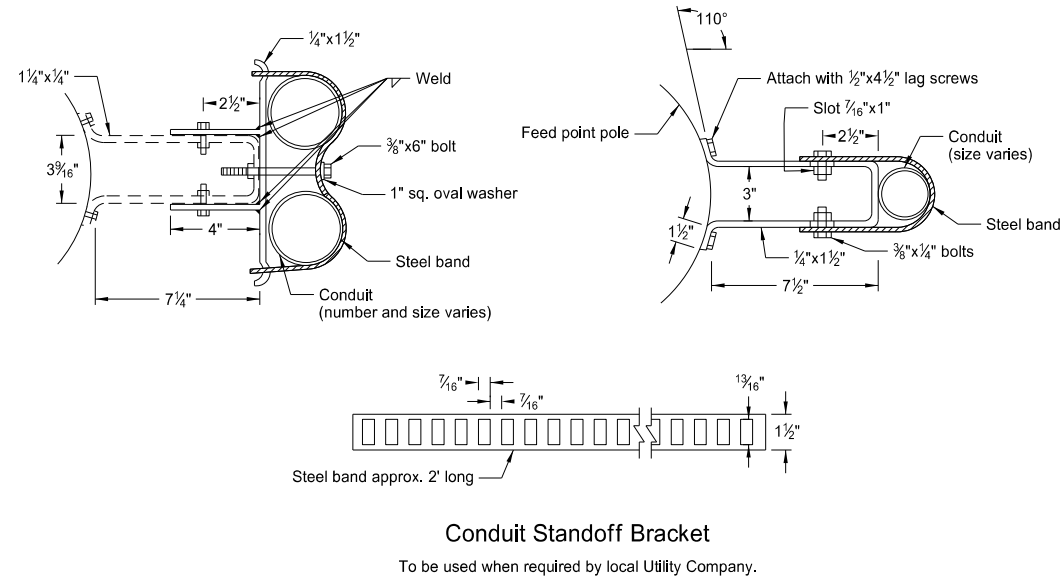
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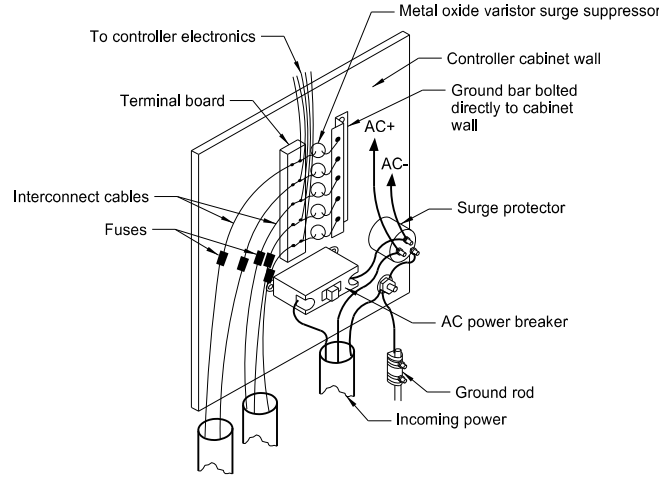
Circuit Breaker Cabinet Pad Mounted

(A) Cabinet shall be 56 in. high x 26 in. wide x 14 in. deep, 12 gauge steel (min.) or aluminum with provisions for padlock. Cabinet shall be weatherproof. A steel cabinet shall have one coat of primer and two coats of exterior dark green enamel.

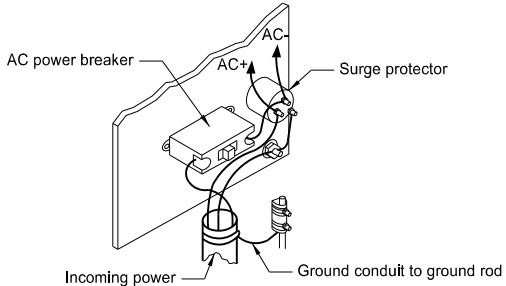


Conduit Standoff Bracket

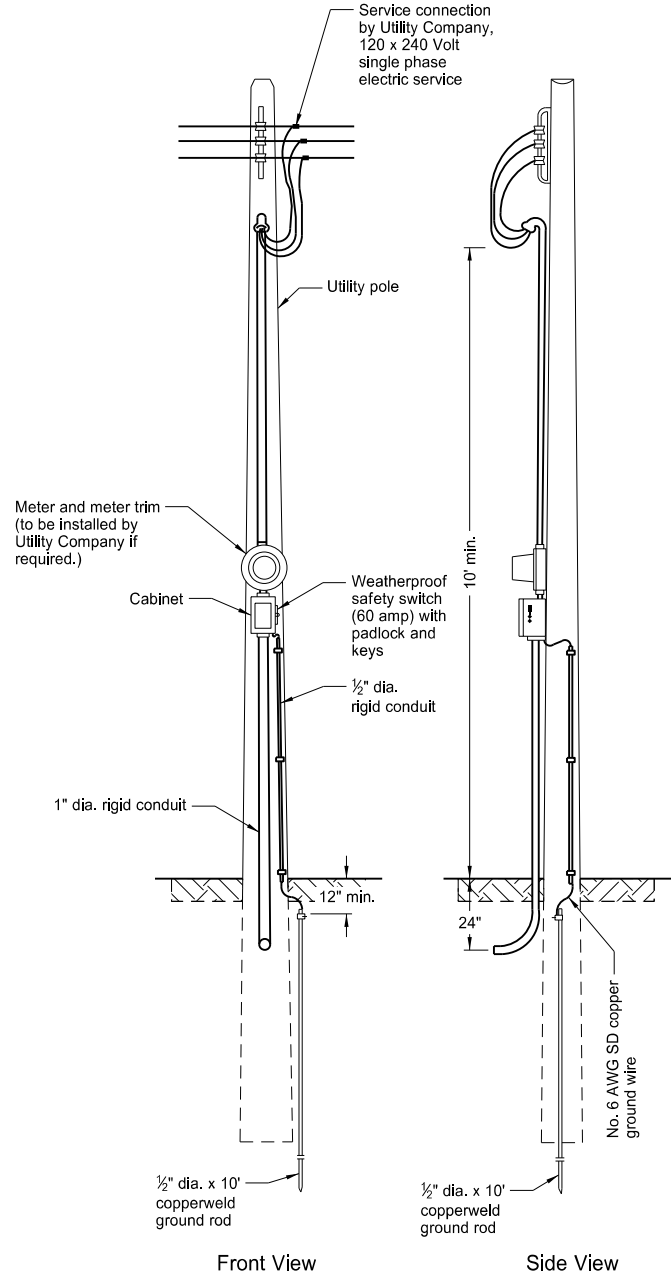
To be used when required by local Utility Company.



Controller Cabinet Interconnect and Power Cable Lightning Protection



Feed Point Cabinet Lightning Protection

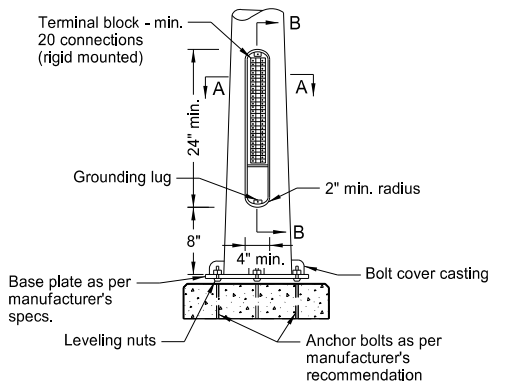
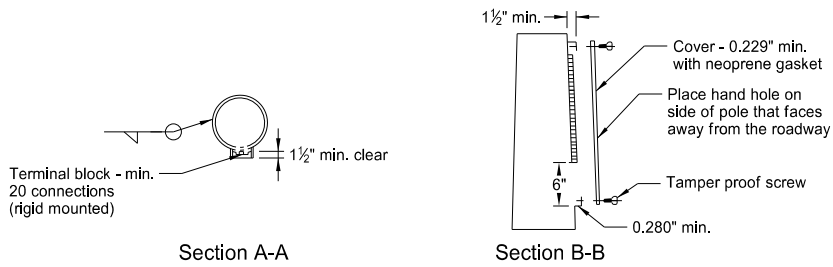


Front View

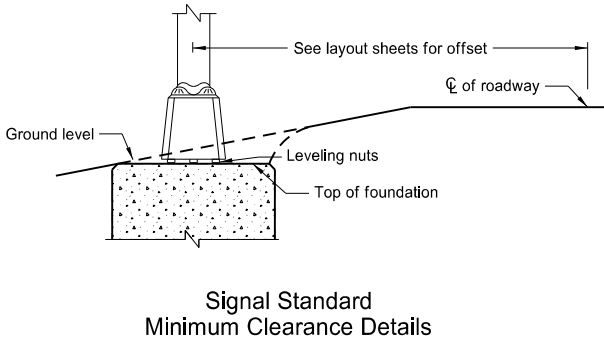
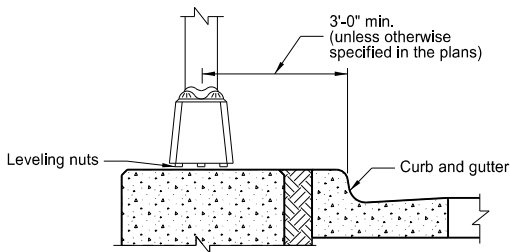
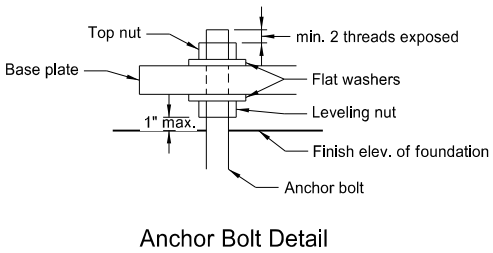
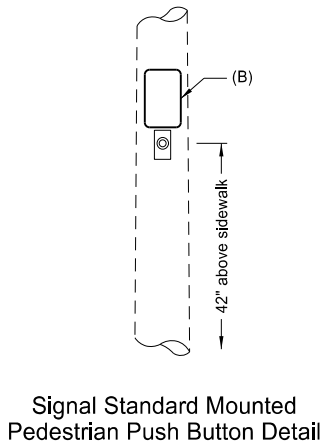
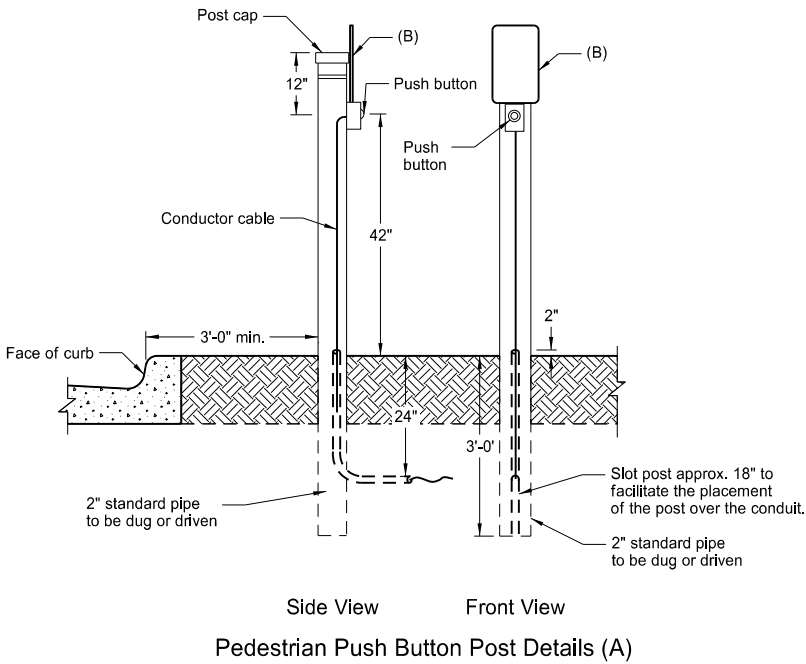
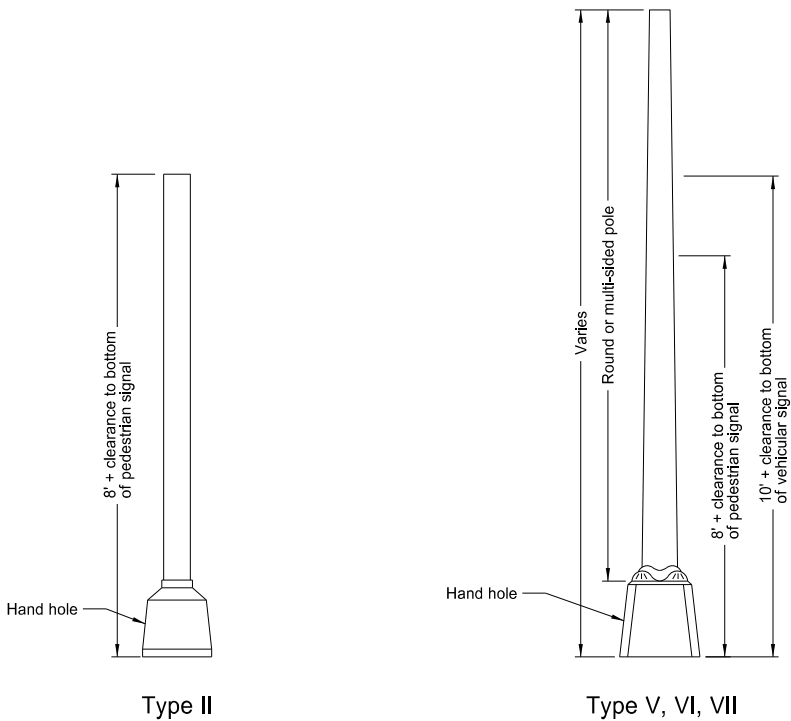
Side View

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Alternate Signal Standard Base
For use only with Type V, VI, and VII signal standards.



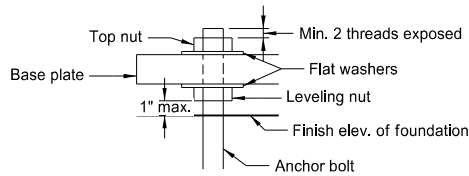
- (A) The positioning of the sign, pushbutton, and direction of arrow shall clearly indicate which crosswalk is actuated by the push button. The type of sign will depend on the jurisdiction they are to be placed in.
- (B) Sign shall be attached to post using rust resistant bracket and banding. The material shall be 0.081 aluminum. See Standard Signs book for dimensions and legend series. See plans for type of sign.

- Notes:
- Signal Heads: See traffic signal layout for correct mounting position, number, size, and arrangement of lenses.
- Steel Standards: The center of the signal standard shall be a minimum of 3 ft. from the face of the curb unless shown otherwise on the layout sheets.
- Paint: See note sheet for required color of paint.
- Transformer Base: In lieu of the transformer base the contractor may use the alternate signal standard base.

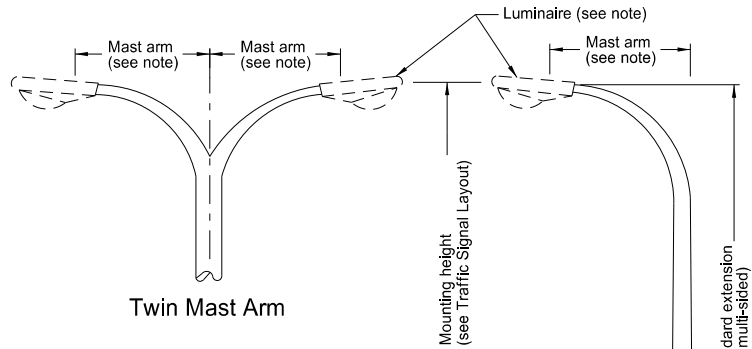
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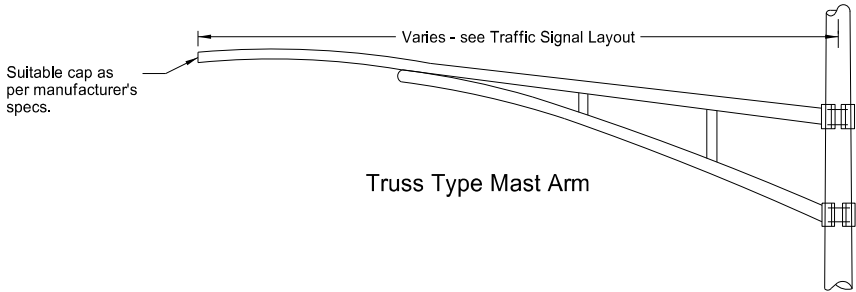
TRAFFIC SIGNAL STANDARDS
(MAST ARM TYPE)



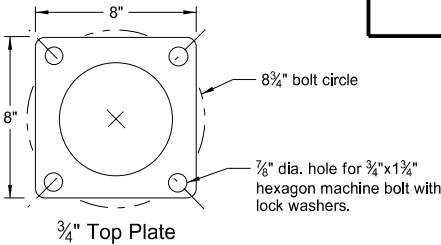
Anchor Bolt Detail



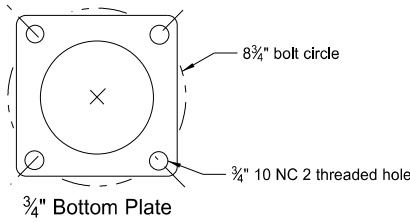
Twin Mast Arm



Truss Type Mast Arm



3/4" Top Plate



3/4" Bottom Plate

Detail A

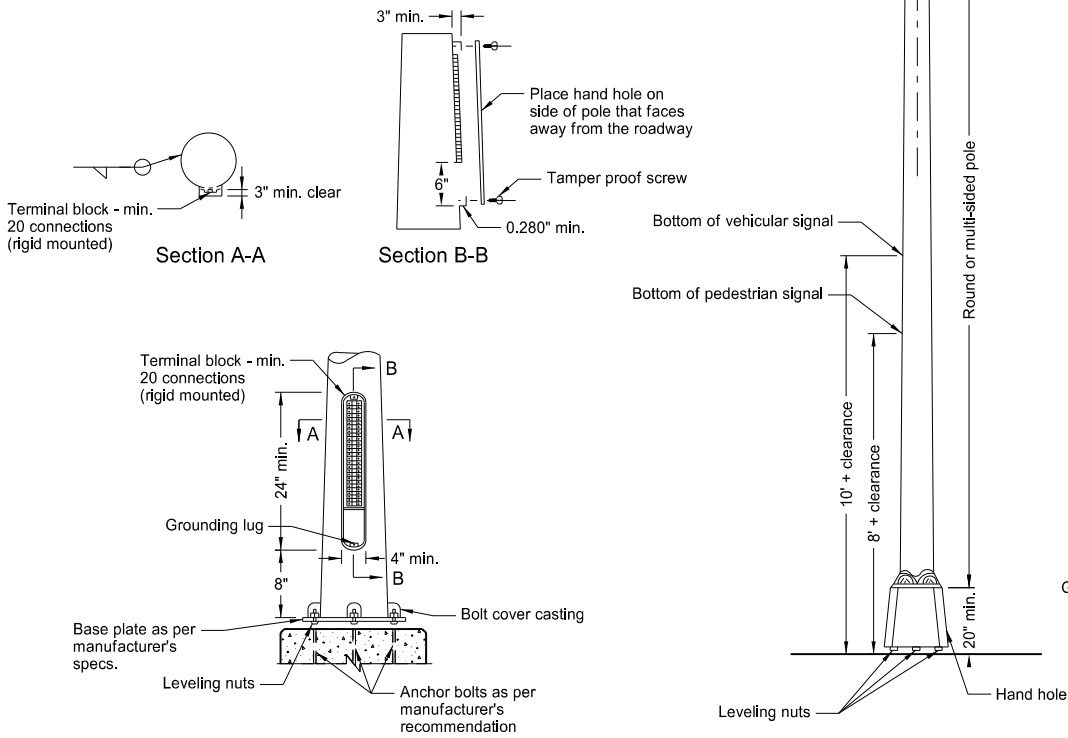
Note: In lieu of the plate type connection a telescoping clamp type extension may be used.

Combination Signal and Light Standard			
Signal Standard Type	Luminaire Mounting height (ft)	Install Light Standard Extension and Luminaire	Luminaire Mast Arm
A	30	yes	single
B	30	(A)	single
C	40	yes	single
D	40	(A)	single
E	30	yes	twin
F	30	(A)	twin
G	40	yes	twin
H	40	(A)	twin
I	50	yes	single
J	50	yes	twin

(A) The light standard extension for these signal standards shall be installed at a later date under a separate contract.

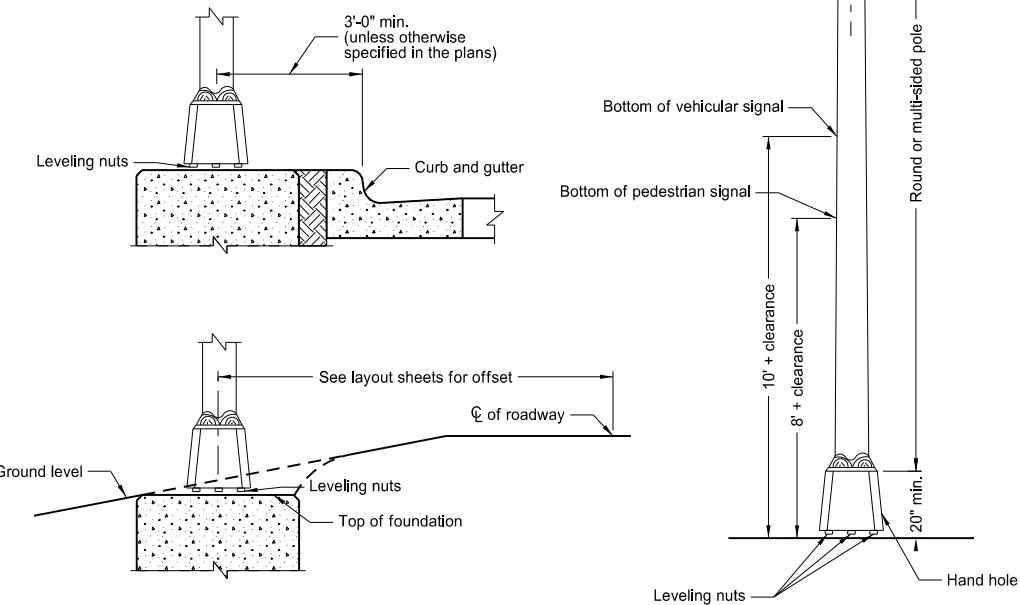
Notes:

- Light standard extension: The mast arm shall be 6 ft. unless otherwise noted on the plans. The light standard extension shall be galvanized. Galvanizing shall be in accordance with ASTM A 123.
- Luminaire: Luminaires shall be internal ballast - constant wattage 120 x 240 voltage. See layout sheets for type of luminaire, wattage, and I.E.S. distribution.
- Signal head: See Traffic Signal Layout for correct mounting position, number, size, and arrangement of lenses. Clearance from the center of the roadway to the bottom of mast arm mounted signal heads shall be 17 ft. minimum and 19 ft. maximum.
- Multi-sided poles: Shall have a means that will not allow the mast arm to be rotated by wind forces other than friction. The pole shall be so fabricated so that the mast arm is rotatable. This feature shall be approved by the Engineer.
- Transformer base: In lieu of the transformer base the Contractor may use the alternate signal standard base.



Alternate Signal Standard Base

Note: For use only with Type IV and combination signal standards



Combination Signal and Light Standard

Signal Standard Minimum Clearance Detail

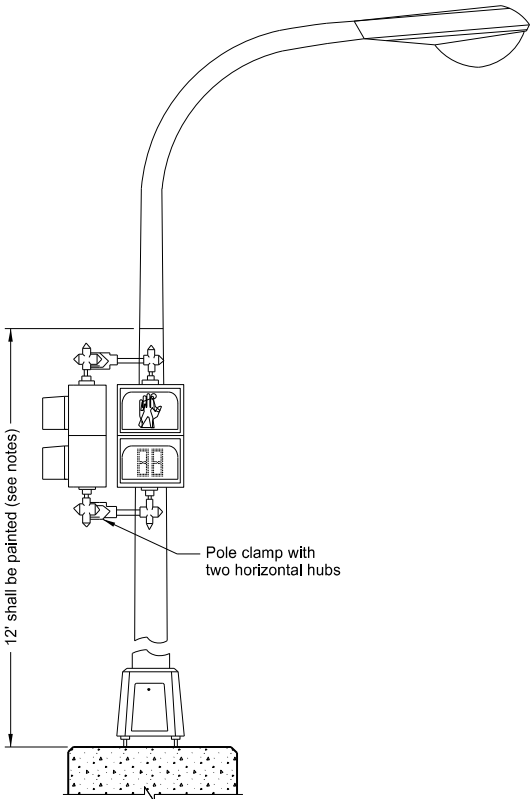
Type IV Signal Standard

(B) On combination signal and light standards Type B, D, F, and H, and on all Type IV signal standards install a suitable pole cap as per manufacturer's specifications.

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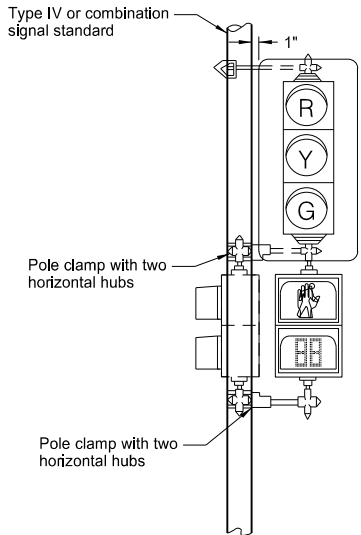
TRAFFIC SIGNAL HEAD MOUNTING



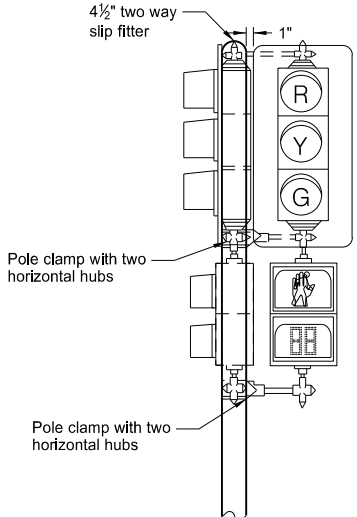
Light Standard Mounted
Pedestrian Signal Head (A)



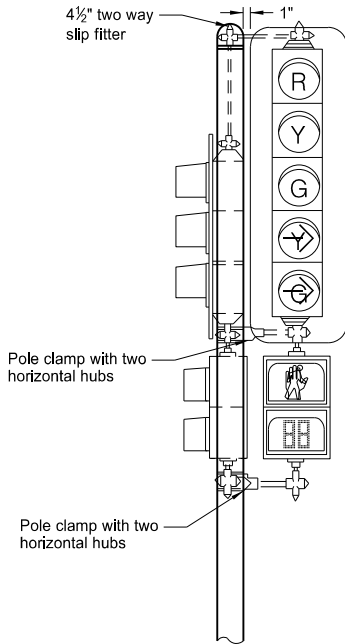
Type II
Pedestal Mounted - Pedestrian (A)



Type IV
Post Mounted - Vehicular
Post Mounted - Pedestrian (A)



Type V
Post Mounted - Vehicular
Post Mounted - Pedestrian (A)

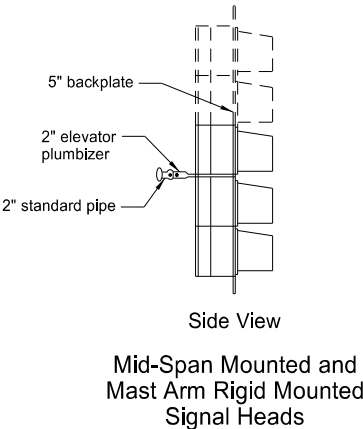


Type VI
Post Mounted - Vehicular
Post Mounted - Pedestrian (A)

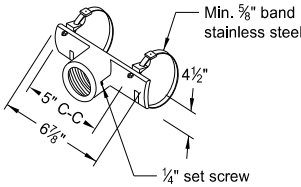
- Notes:
- Reinforcing Plates: Polycarbonate signal heads shall have reinforcing plates installed where the mounting hardware attaches to the signal head. Where a plumbizer is used reinforcing plates shall be placed on each side of the plumbizer.
- Clearance: Clearance from the ground line or sidewalk to the bottom of post or pedestal mounted vehicular signal heads shall be 10 ft. minimum, from pedestrian signal heads shall be 8 ft. minimum.
- Signal Heads: See traffic signal layout for correct mounting position, numbers, size, and arrangement of lenses.
- Pole Clamps: A pole plate with suitable banding material, as approved by the Engineer, may be substituted for the pole clamps. Where traffic signal heads and pedestrian signal heads are mounted one above the other, one pole clamp assembly may be used.
- Paint: Signal housing shall be painted yellow. Backplates shall be painted dull black. Pole clamps and signal head mounting hardware shall be painted the same color as the signal standard shaft.
- When pedestrian heads are light standard mounted, the lower 12 ft. shall be painted the same color as the other traffic signal standards.
- Mounting Details: All signal heads shown are viewed from direction of travel.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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DATE	CHANGE
7-8-14	Added reinforcing plate note

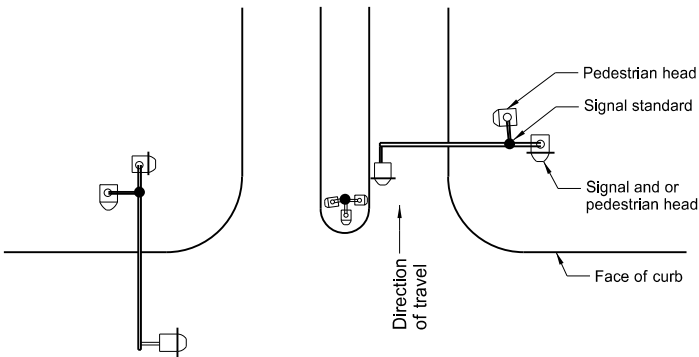
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Registration Number
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on 07/08/14 and the original document is stored at the
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Side View
Mid-Span Mounted and
Mast Arm Rigid Mounted
Signal Heads

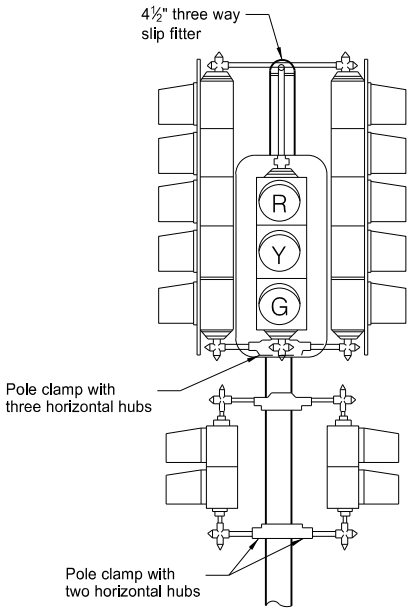


Mast Arm Signal
Head Bracket

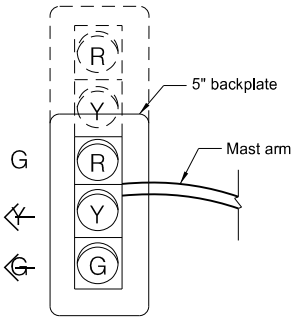


Note: Signal heads shall not protrude over the face of the curb.

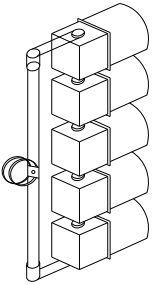
Plan Layout
(typical)



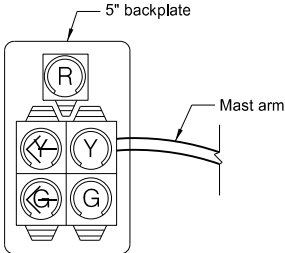
Type VII
Post Mounted - Vehicular
Post Mounted - Pedestrian (A)



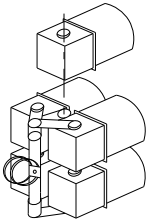
Front View



Isometric View
End Mounted and Mast Arm Rigid Mounted
Signal Heads



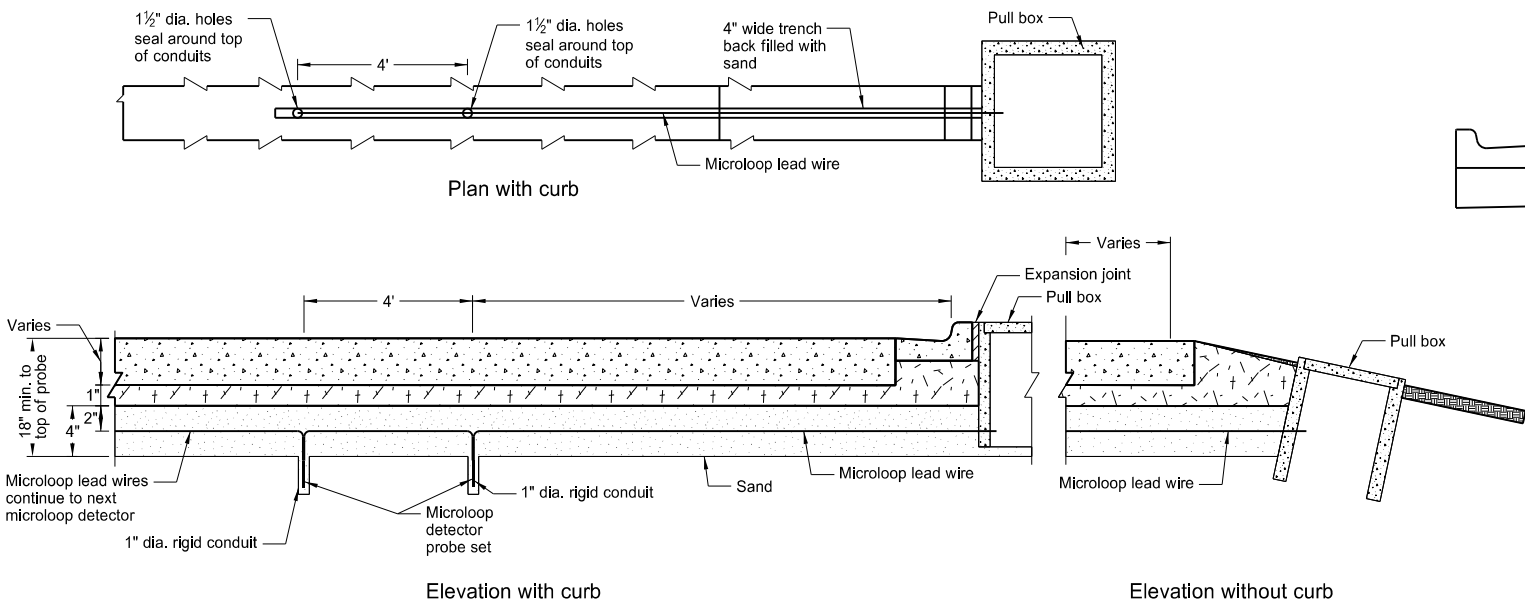
Front View



Isometric View

LOOP DETAILS

D-772-5A

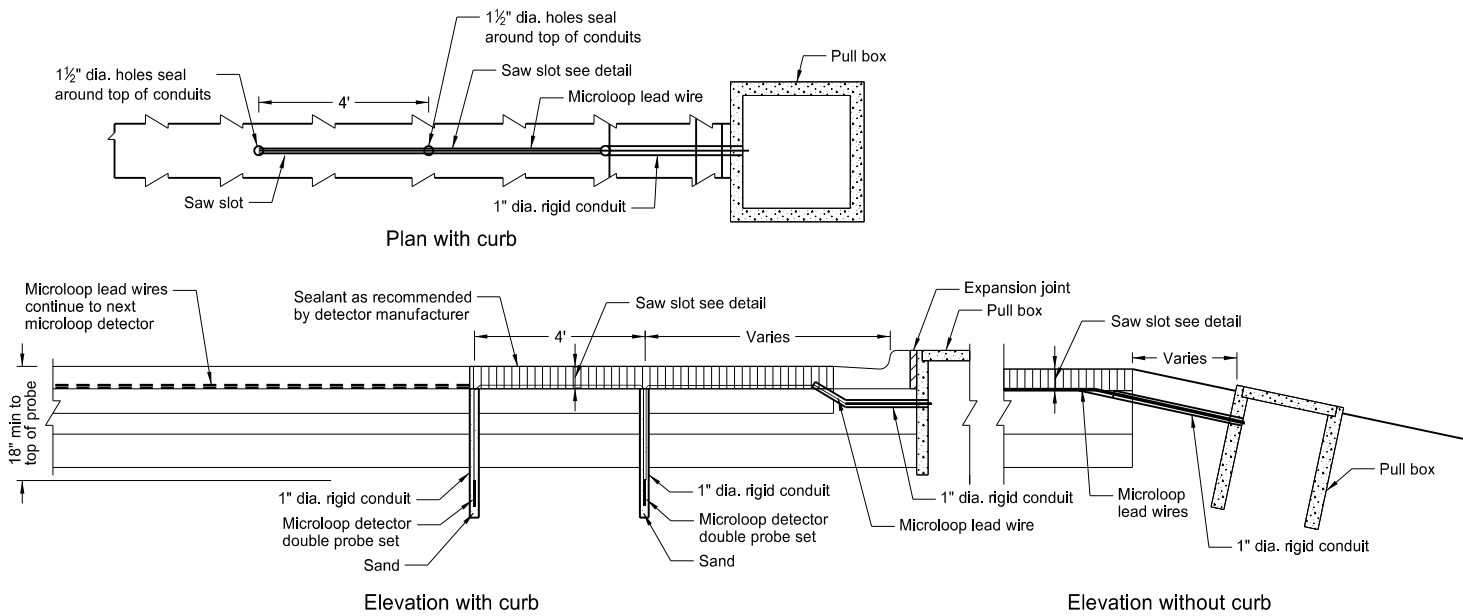


Microloop Placement in New Pavement

Notes:

After the installation and compaction of the aggregate base, the contractor shall trench a 4 in. trench and drill the 1 1/2 in. dia. holes. The microloop detectors shall be installed, embedded in the sand as shown. The aggregate base shall be recompact to the density of the surrounding material and the microloops shall be tested prior to PCC pavement placement.

The 1 1/2 in. dia. holes shall be drilled a minimum of 2 in. below the bottom of the microloop detector probe.

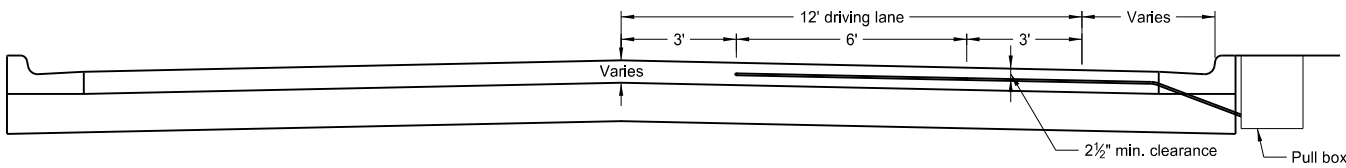


Microloop Placement in Existing Pavement

Notes:

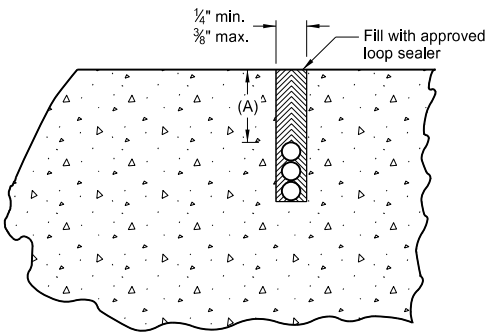
The contractor shall drill the 1 1/2 in. dia. holes, cut the saw slot in the pavement, install the 1 in. conduit and install the microloop detectors so the tops of the probes are 15 in. below the road surface. The 1 in. dia. conduit shall be filled with sand and the saw slot sealed. The microloops shall be tested.

The 1 1/2 in. dia. holes shall be drilled a minimum of 2 in. below the bottom of the microloop detector probe.



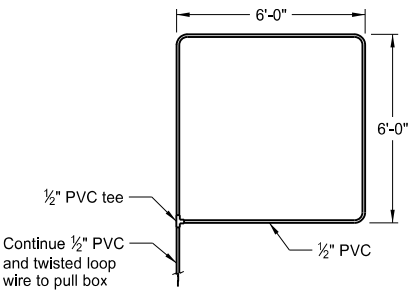
Elevation
Preformed Loop Detector Layout

Installation of Preformed Loop detector when placed in new pavement.



Saw Slot Details

(A) 1" minimum on concrete surface
2" minimum on asphalt surface



Preformed Loop Detector Layout

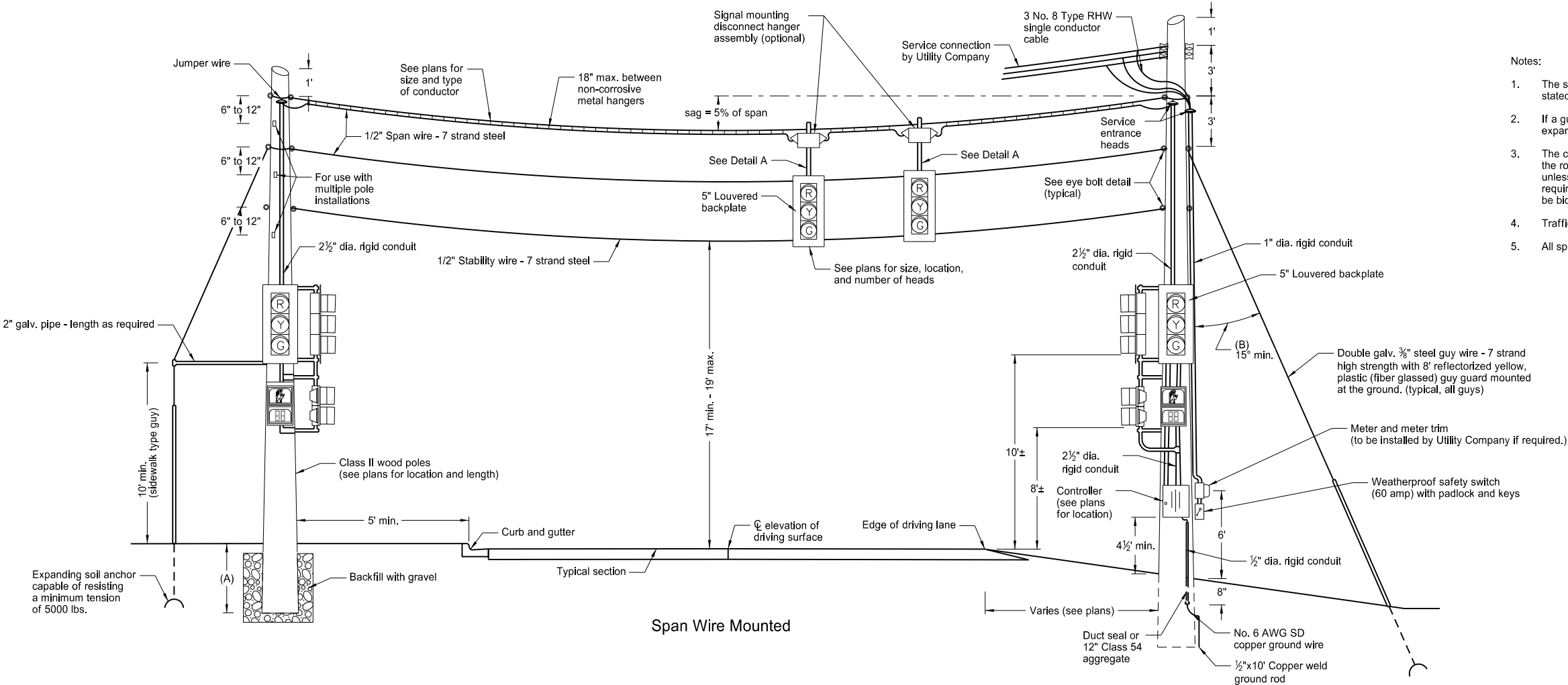
The Preformed Loop shall be securely tied down to prevent the loop from floating while placing the concrete.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-14-13	
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DATE	CHANGE

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SPAN WIRE MOUNTED TRAFFIC SIGNALS

D-772-6

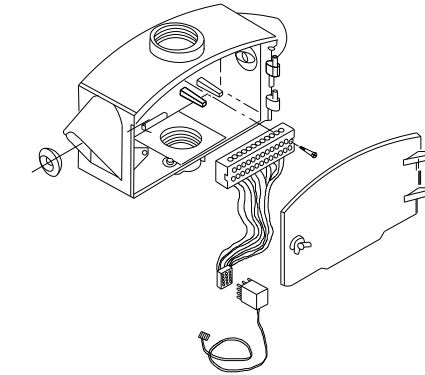


Notes:

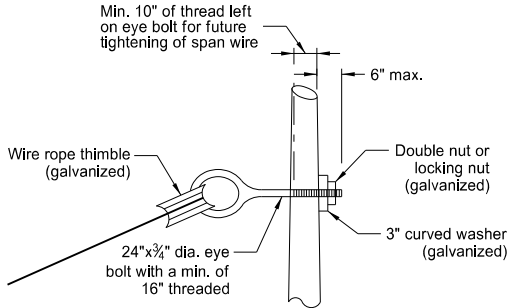
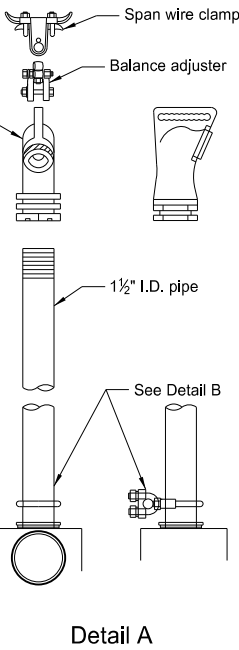
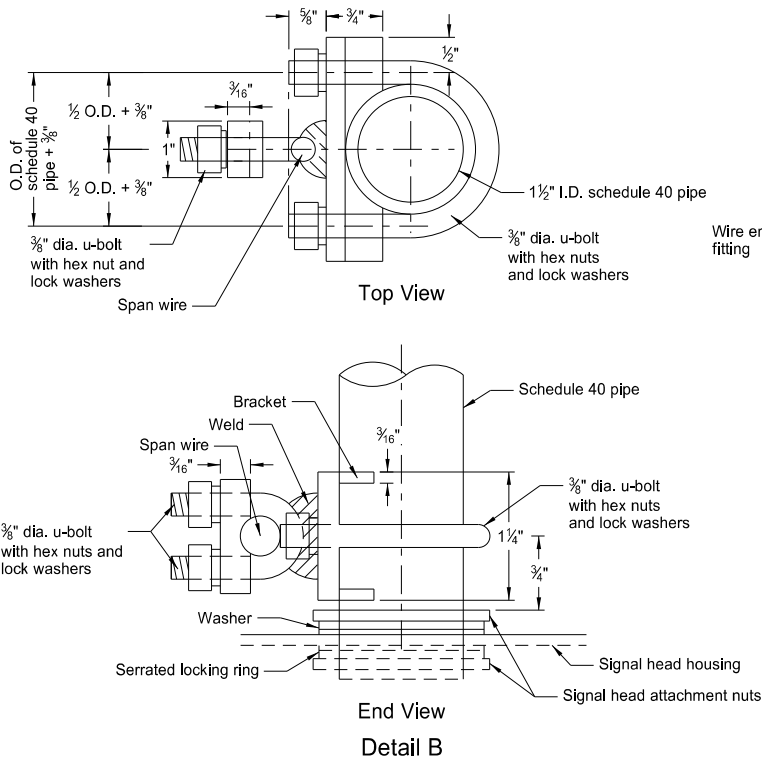
1. The span wire mounted traffic signals shall meet the requirements as stated in the Standard Specifications Section 772 and 896.
2. If a guy wire angle of less than 45° is used, the capability of the expanding soil anchor to resist tensions on site must be increased.
3. The contractor shall maintain the required 17 to 19 ft. signal height over the roadway for a minimum period of 90 calendar days after installation, unless written permission is granted the engineer to waive the 90 day requirement. The cost of maintaining the signal head elevation shall not be bid separately but shall be included in the price bid for interim signals.
4. Traffic signal controller shall be operated on 120 volts.
5. All span wire and stability wire shall have thimble type connections.

(A) Pole Depth of Setting	
Length of pole (ft)	Depth of pole min. (ft)
35	6
40	6
45	6.5
50	7
55	7.5

(B) Guy Wire	
Angle	Anchor Resistance min.
30°	12,000 lbs.
15°	24,500 lbs.



Signal Mounting Disconnect Hanger Assembly



Eye Bolt Detail

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
7-8-14	Title change, span wire size and sag

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