

NDDOT ABBREVIATIONS

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

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

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

Ct Court
 Xarm cross arm
 Xbuck cross buck
 Xsec cross sections
 Xing crossing
 Xrd Crossroad
 Crn crown
 CF cubic feet
 M3 cubic meter
 M3/s cubic meters per second
 CY cubic yard
 Cy/mi cubic yards per mile
 Culv culvert
 C&G curb & gutter
 CI curb inlet
 CR curb ramp
 CS curve to spiral
 C cut
 Dd Ld dead load
 Defl deflection
 Defm deformed
 Deg or D degree
 DInt delineate
 DIntr delineator
 Depr depression
 Desc description
 Det detail
 DWP detectable warning panel
 Dtr detour
 Dia diameter
 Dir direction
 Dist distance
 DM disturbed material
 DB ditch block
 DG ditch grade
 Dbl double
 Dn down
 Dwg drawing
 Dr drive
 Drwy driveway
 DI drop inlet
 D dry density
 Ea each
 Esmt easement
 E East
 EB Eastbound
 Elast elastomeric
 EL electric locker
 E Mtr electric meter
 Elec electric/al
 EDM electronic distance meter
 Elev or El elevation
 Ellipt elliptical
 Emb embankment
 Emuls emulsion/emulsified

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

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| | | | | | | | |
|---------|---------------------------------|--------|---------------------------|----------|-------------------------------|---------|----------------------------|
| 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 | Lvng | 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 | performed |
| Ha | hectare | Lig Sl | lignite slack | N | North | Prep | preparation |
| 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 | | |

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| | | | | | | | |
|-----------|------------------------------------|-----------|----------------------------|----------|------------------------------------|------|-----------------------|
| 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 | Twp 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 GHG PLNS PL | Tesoro High Plains Pipeline |
| CABLE SERV | Cable Services | MISS W W S | Missouri West Water System | TRI-CNTY WU | Tri-County Water Users Incorporated |
| CAP ELEC | Capital Electric Cooperative Incorporat | MNKOTA PWR | Minnkota Power | TRL CO RWU | Traill County Rural Water Users |
| CASS CO ELEC | Cass County Electric Cooperative | MOR-GRAN-SOU ELEC | Mor-gran-sou Electric Cooperative | UNTD TEL | United Telephone |
| CASS RWU | Cass Rural Water Users Incorporated | MOUNT-WILLI ELEC | Mountrail-williams Electric Cooperative | UPPR SOUR WUA | Upper Souris Water Users Association |
| CAV ELEC | Cavalier Rural Electric Cooperative | MRE LBTY TEL | Moore & Liberty Telephone | US SPRINT | U.S. Sprint |
| CBLCOM | Cablecom Of Fargo | MUNICIPAL | City Water And Sewer | USAF MSL CABLE | U.S.A.F. Missile Cable |
| CENEX PL | Cenex Pipeline | MUNICIPAL | City Of '.....' | USFWS | US Fish and Wildlife Service |
| CENT PL WATER DIST | Central Pipe Line Water District | N CENT ELEC | North Central Electric Cooperative | USW COMM | U.S. West Communications |
| CENT PWR ELEC | Central Power Electric Cooperative | N VALL W DIST | North Valley Water District | VRNDRY ELEC | Verendrye Electric Cooperative |
| COE | Corps of Engineers | ND PKS & REC | North Dakota Parks And Recreation | W RIV TEL | West River Telephone Incorporated |
| CONS TEL | Consolidated Telephone | ND TEL | North Dakota Telephone Company | WEB | W. E. B. Water Development Association |
| CONT RES | Continental Resource Inc | NDDOT | North Dakota Department of Transportation | WILLI RWA | Williams Rural Water Association |
| CPR | Canadian Pacific Railway | NDSU SOIL SCI DEPT | NDSU Soil Science Department | WILSTN BAS PL | Williston Basin Interstate Pipeline Company |
| D O E | Department Of Energy | NEMONT TEL | Nemont Telephone | WLSH RWD | Walsh Water Rural Water District |
| DAK CARR | Dakota Carrier Network | NODAK R ELEC | Nodak Rural Electric Cooperative | WOLVRTN TEL | Wolverton Telephone |
| DAK CENT TEL | Dakota Central Telephone | NOON FRMS TEL | Noonan Farmers Telephone Company | XLENER | Xcel Energy |
| DAK RWD | Dakota Rural Water District | NPR | Northern Plains Railroad | YSVR | Yellowstone Valley Railroad |
| DGC | Dakota Gasification Company | NSP | Northern States Power | | |
| DICKEY R NET | Dickey Rural Networks | NTH PRAIR RW | Northern Prairie Rural Water Association | | |
| DICKEY RWU | Dickey Rural Water Users Association | NTHN BRDR PL | Northern Border Pipeline | | |
| DICKEY TEL | Dickey Telephone | NTHN PLNS ELEC | Northern Plains Electric Cooperative Incorporated | | |
| DNRR | Dakota Northern Railroad | NTHWSTRN REF | Northwestern Refinery Company | | |
| DOPE PL | Dome Pipeline Company | NW COMM | Northwest Communication Cooperation | | |
| DVELEC | Dakota Valley Electric Cooperative | ONEOK | Oneok gas | | |
| DVMW | Dakota, Missouri Valley & Western | OSHA | Occupational Safety and Health Administration | | |
| ENBRDG | Enbridge Pipelines Incorporated | OTTR TL PWR | Otter Tail Power Company | | |
| ENVENTIS | Enventis Telephone | P L E M | Prairielands Energy Marketing | | |
| FALK MNG | Falkirk Mining Company | POLAR COM | Polar Communications | | |
| FHWA | Federal Highway Administration | PVT ELEC | Private Electric | | |
| G FKS-TRL WD | Grand Forks-traill Water District | QWEST | Qwest Communications | | |
| GETTY TRD & TRAN | Getty Trading & Transportation | R&T W SUPPLY | R & T Water Supply Association | | |
| GLDN W ELEC | Golden West Electric Cooperative | RAMSEY R SEW | Ramsey Rural Sewer Association | | |
| GRGS CO TEL | Griggs County Telephone | RAMSEY RW | Ramsey Rural Water Association | | |
| | | RAMSEY UTIL | Ramsey County Rural Utilities | | |

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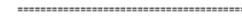
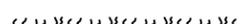
Line Styles

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

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Line Styles

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

| | |
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| 07-01-14 | |
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| DATE | CHANGE |
| | |

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Symbols

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

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Symbols

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

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Symbols

D-101-32

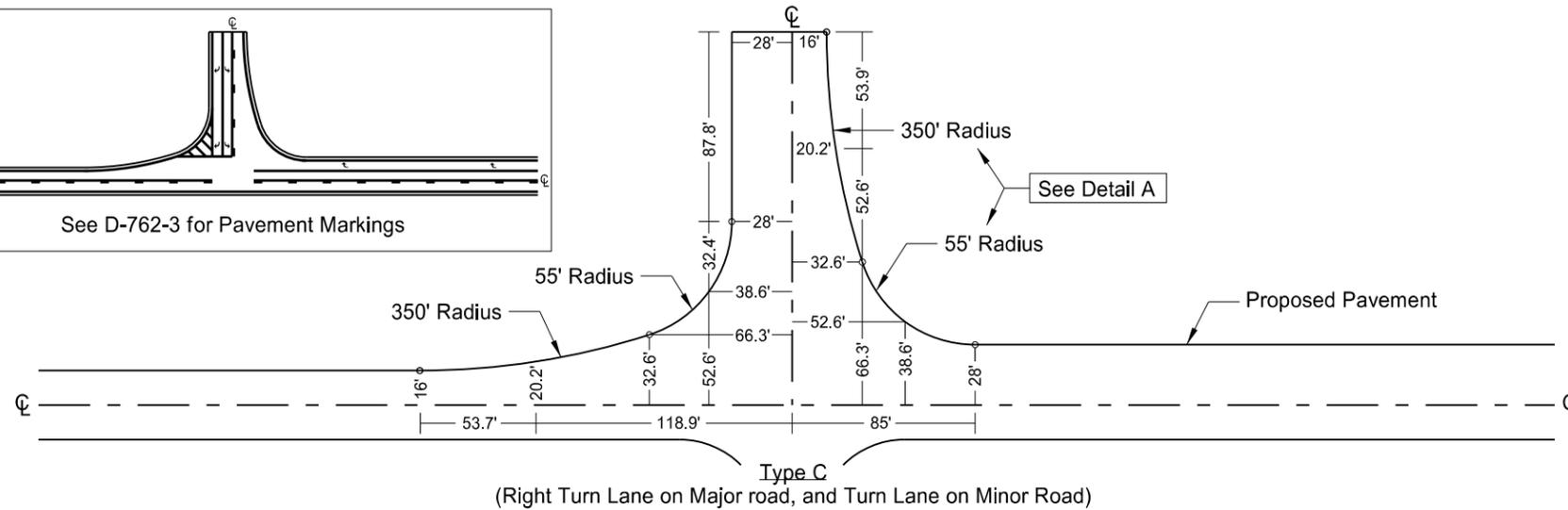
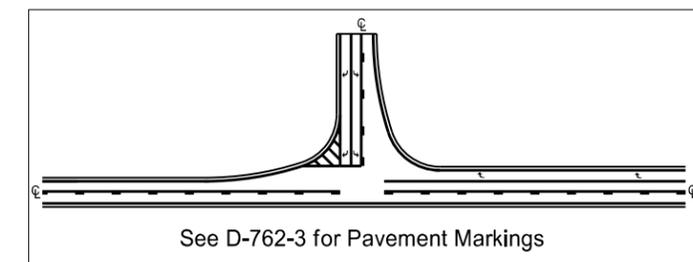
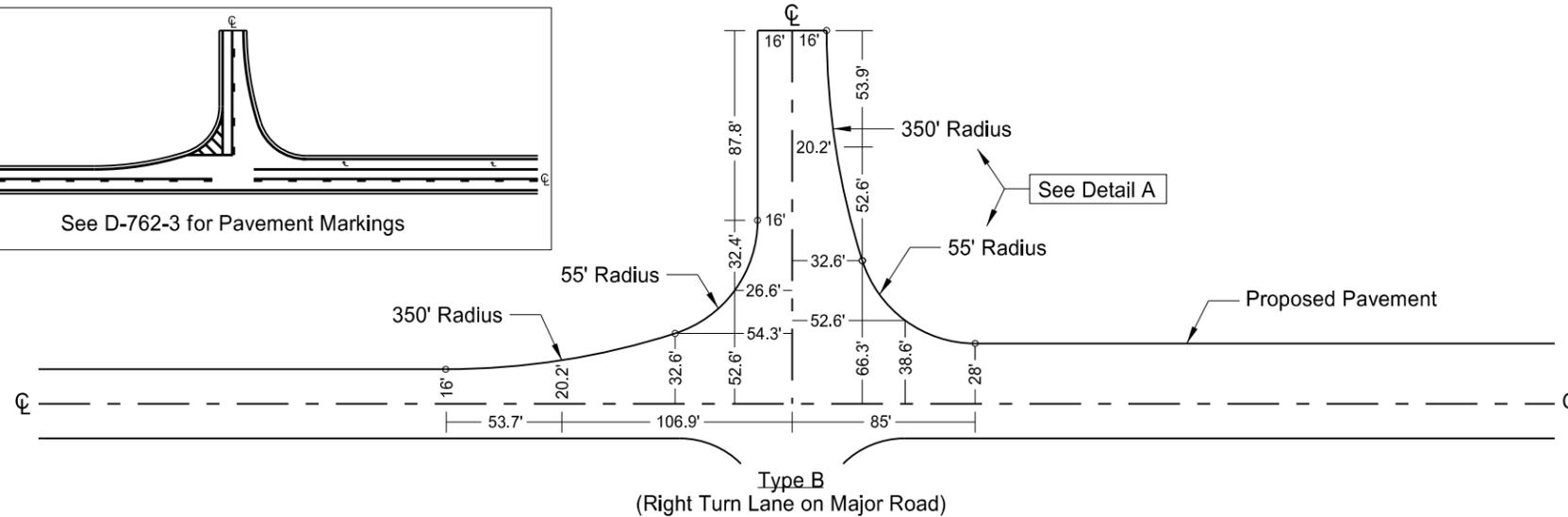
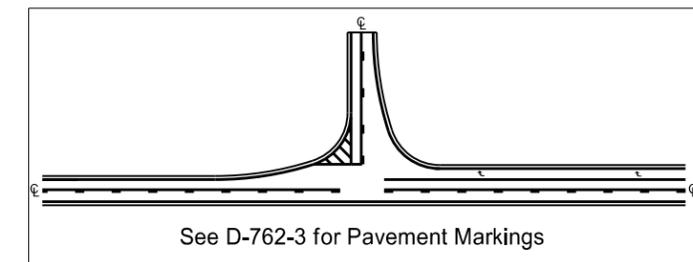
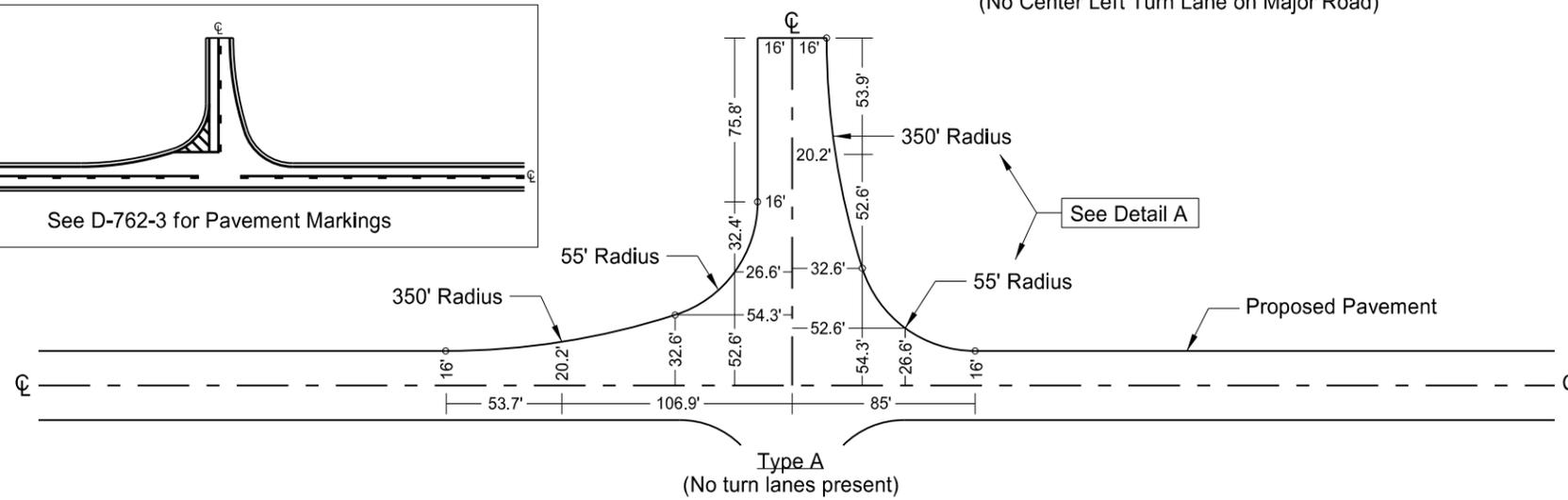
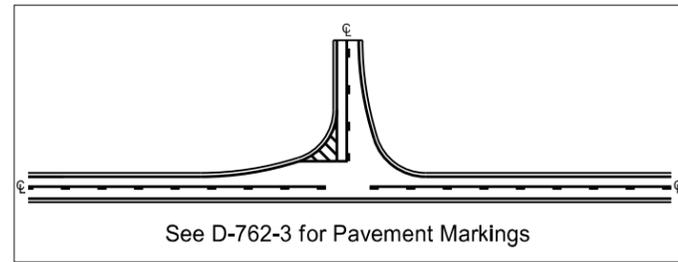
| | | | |
|---|--|---|--|
|  Pad Mounted Feed Point  Pipe Mounted Feed Point with Pad  Pole Mounted Feed Point  Headwall  Double Headwall with Vegetation Barrier  Single Headwall with Vegetation Barrier  Pole Mounted Head  Sprinkler Head  Fire Hydrant  Inlet Type 1  Inlet Type 2  Double Inlet Type 2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

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

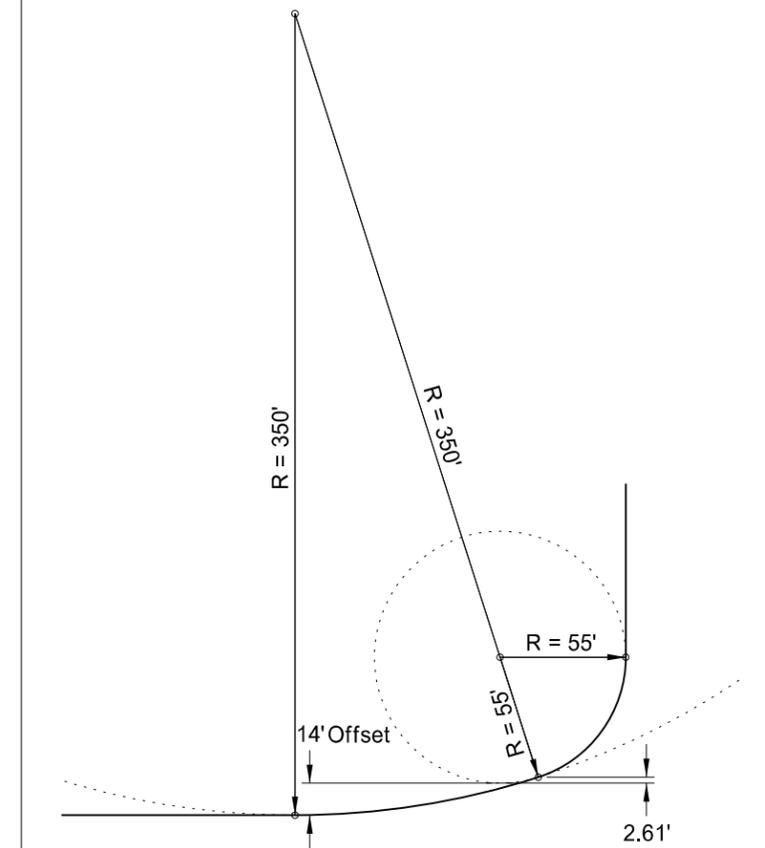
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STANDARD 90 DEGREE FLARED INTERSECTION

(No Center Left Turn Lane on Major Road)



Detail A
Compound Curve (350' Radius, 55' Radius, 14' Offset)

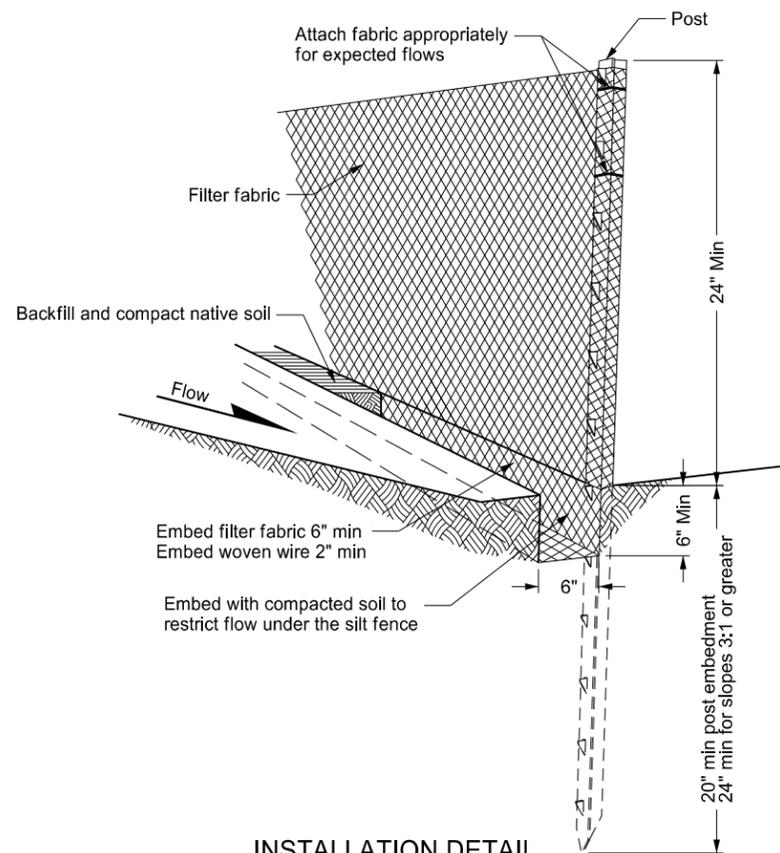


- Radius Tangent Point
- xx.x'— Pavement widths
- Proposed Pavement

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| 3-29-16 | |
| REVISIONS | |
| DATE | CHANGE |
| | |

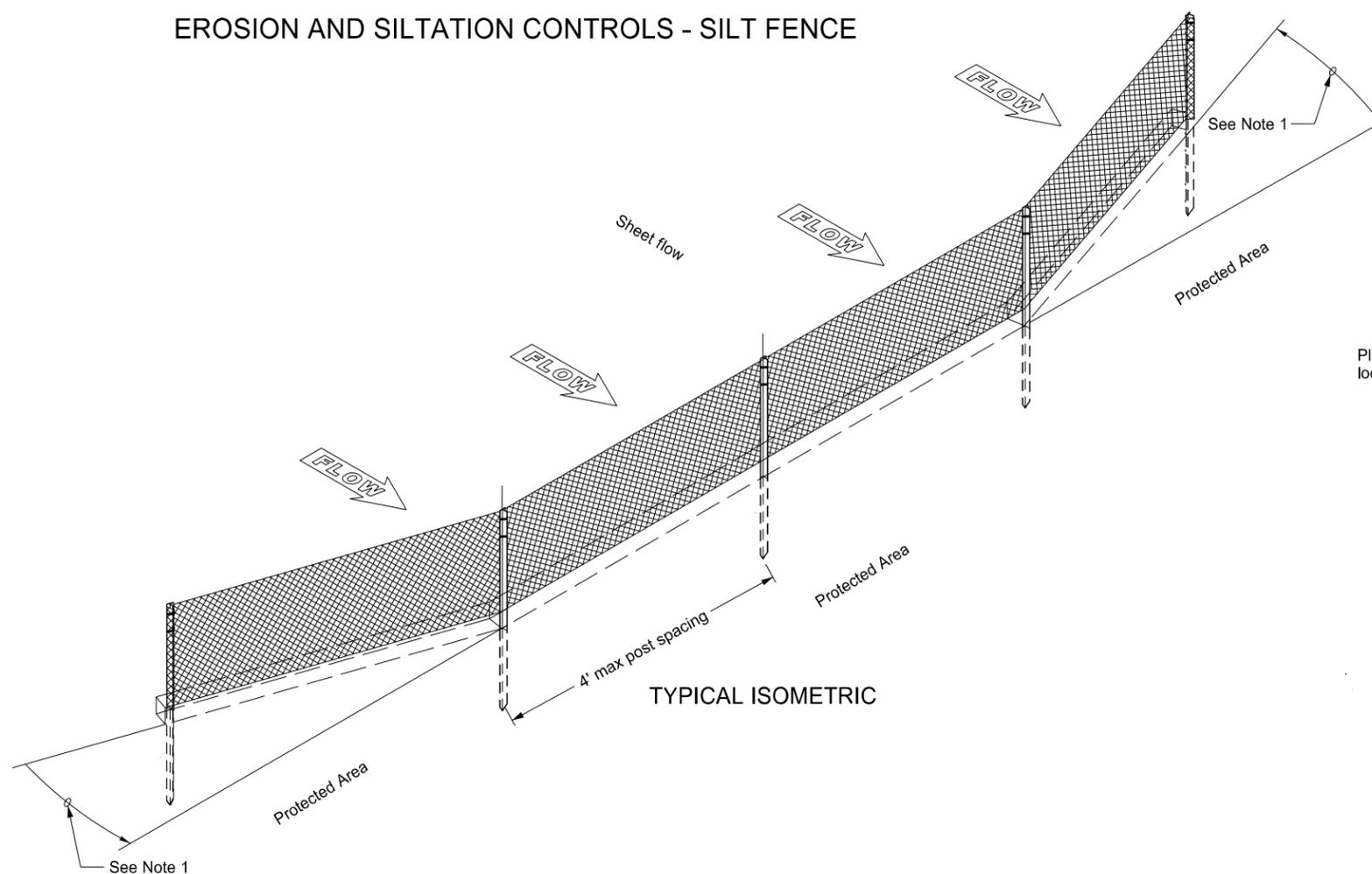
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EROSION AND SILTATION CONTROLS - SILT FENCE

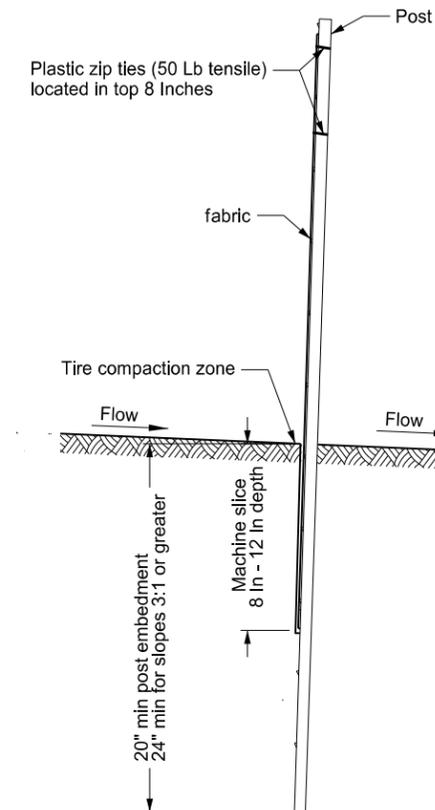


INSTALLATION DETAIL

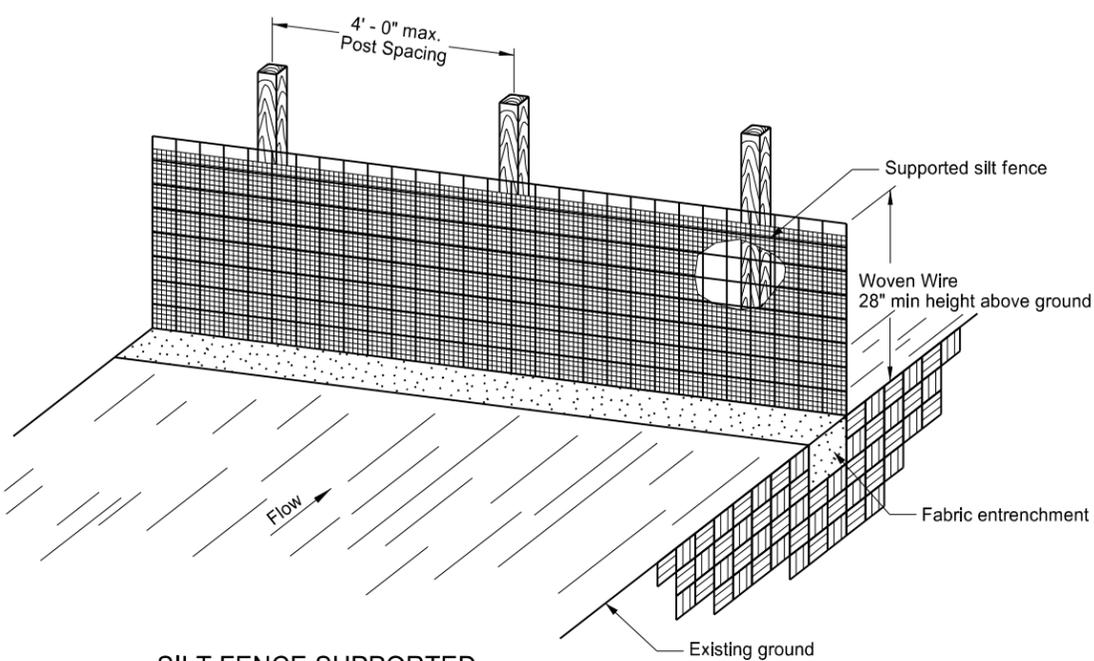
Minimize disturbance of ground around trench and smooth surface after excavation to avoid concentrating flows. Compact to prevent undercutting flows.



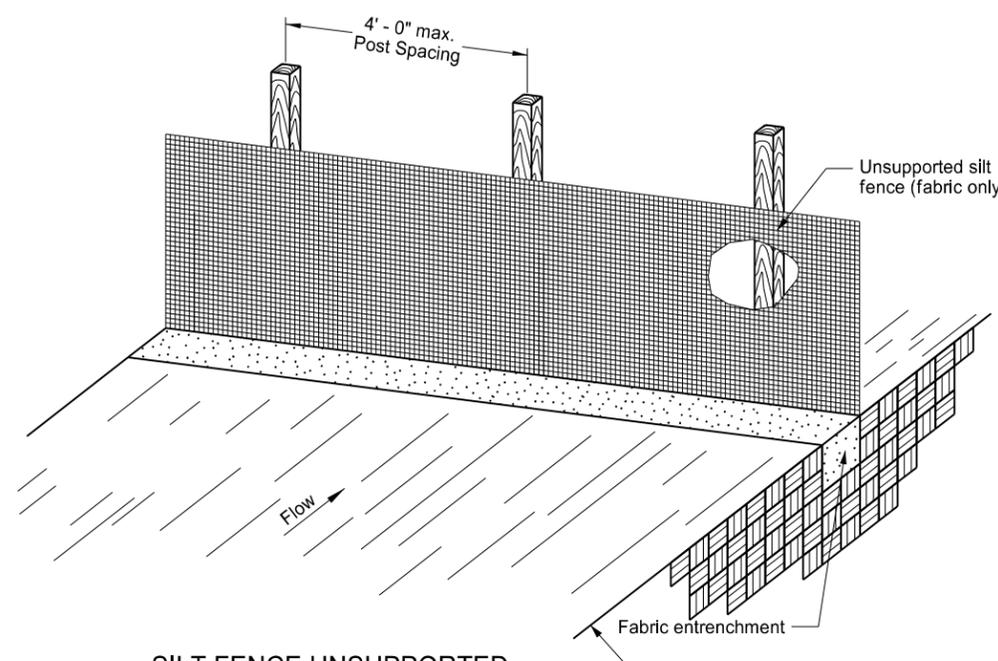
TYPICAL ISOMETRIC



MACHINE SLICED SILT FENCE



SILT FENCE SUPPORTED



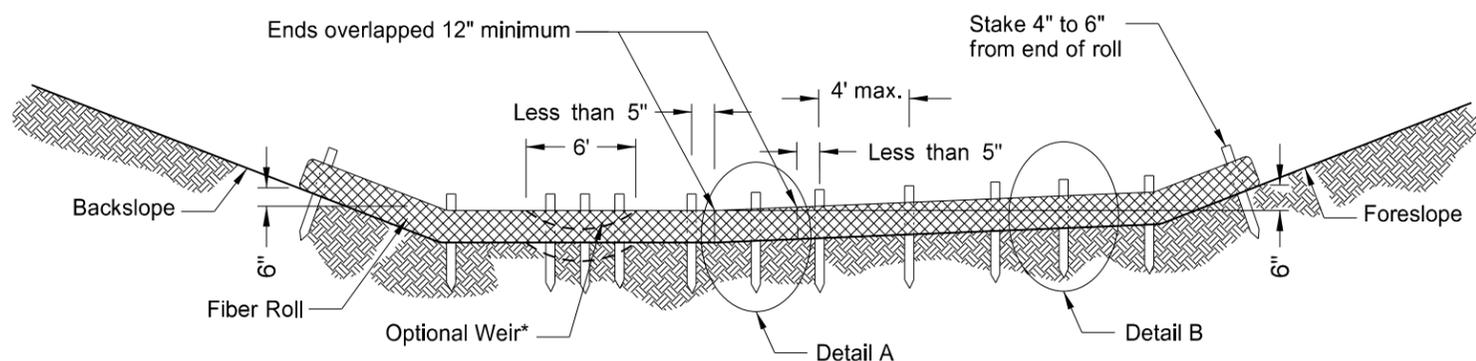
SILT FENCE UNSUPPORTED

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

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

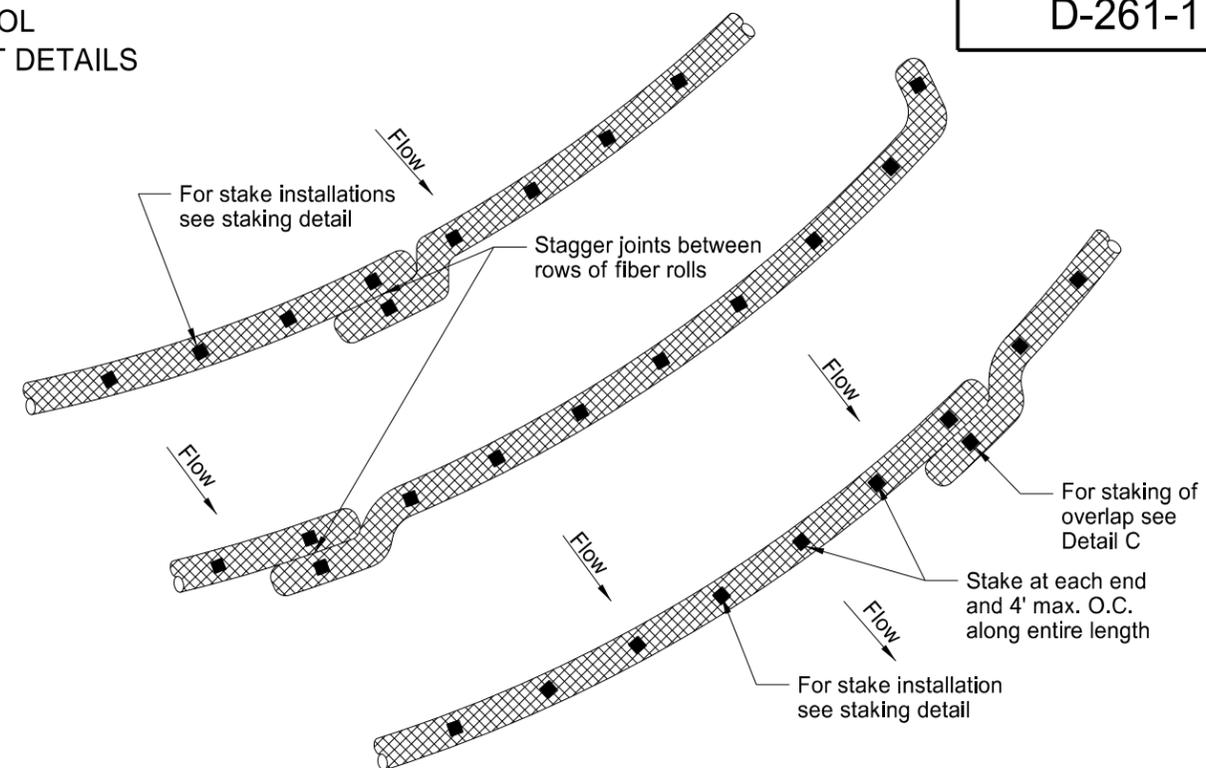
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EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

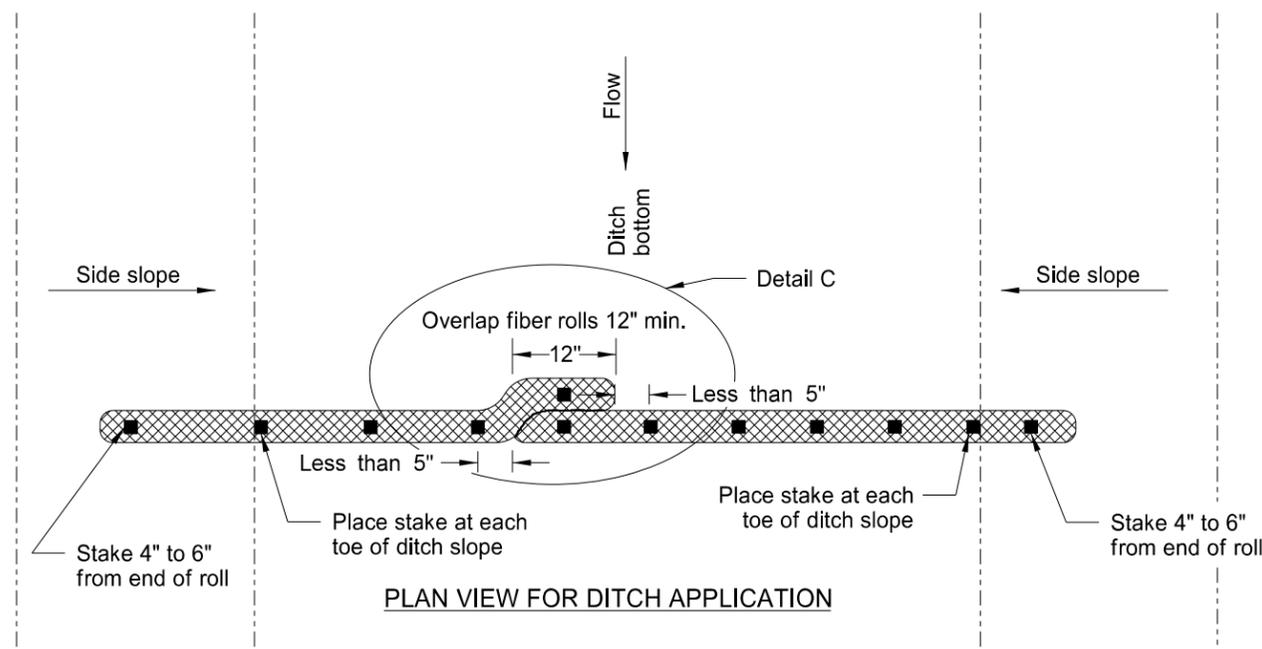


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

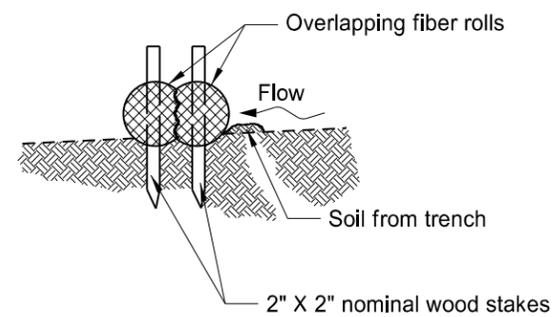
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



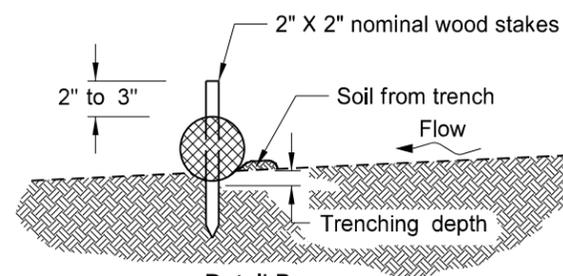
PLAN VIEW FOR SLOPE APPLICATION



PLAN VIEW FOR DITCH APPLICATION



Detail A
Fiber Roll Overlapping Staking Detail



Detail B
Fiber Roll Staking Detail

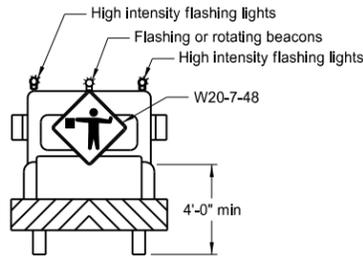
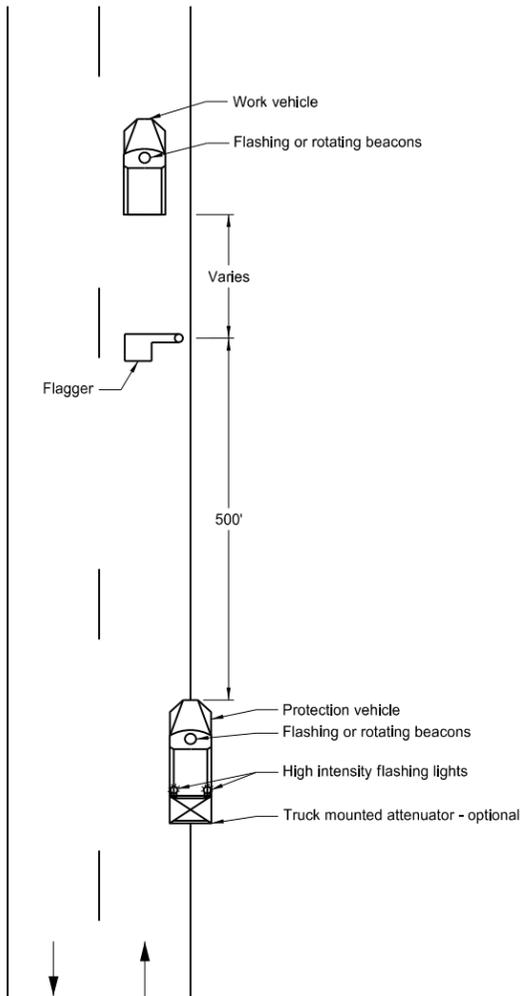
| FIBER ROLL DIAMETER | NOMINAL STAKE SIZE | MINIMUM STAKE LENGTH | MINIMUM TRENCH DEPTH | MAXIMUM TRENCH DEPTH |
|---------------------|--------------------|----------------------|----------------------|----------------------|
| 6" | 2" x 2" | 18" | 2" | 2" |
| 12" | 2" x 2" | 24" | 2" | 3" |
| 20"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

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

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

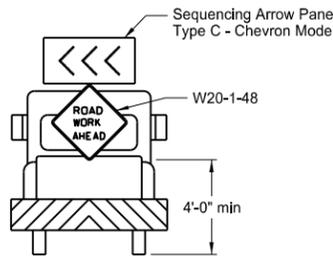
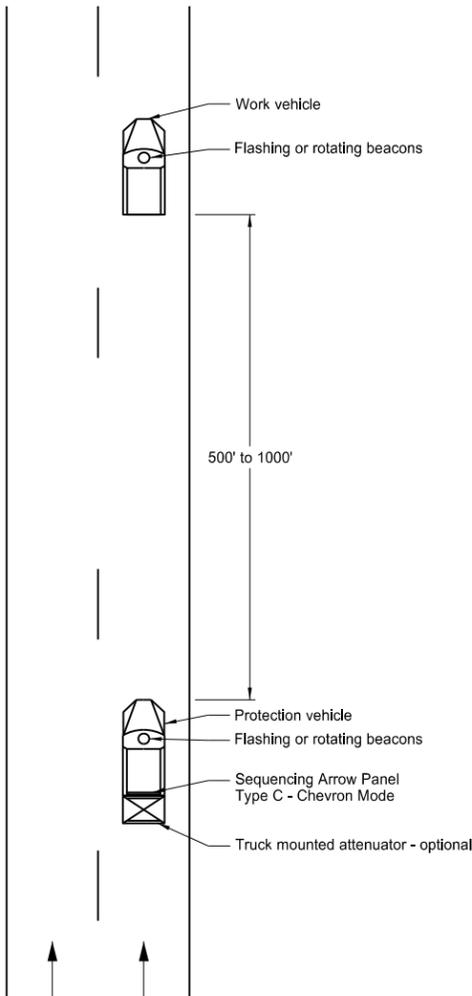
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Two Lane, Two Way Roadways



Typical Protection Vehicle

Multilane Roadways



Typical Protection Vehicle

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

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| 9-25-12 | |
| REVISIONS | |
| DATE | CHANGE |
| | |

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CONSTRUCTION SIGN DETAIL

D-704-5

| | | | | | | |
|-----------------------|--|--------------------|----------|--------------|-------------|--------------|
| SIGN NUMBER | G20-10-108 | STATION(S): | | AREA: | 36.0 Sq.Ft. | |
| 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 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

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

| LETTER POSITION (X) | | | | | | | | | | | | | | | LENGTH | SIZE | SERIES | | |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--------|------|--------|---|--------|
| C | O | N | S | T | R | U | C | T | E | D | B | Y | | | 69.7 | 6 | D 2000 | | |
| 19.2 | 24.5 | 30 | 35.1 | 39.7 | 44.3 | 49.4 | 54.8 | 59.7 | 64.3 | 69 | 73.1 | 79.1 | 83.7 | | | | | | |
| Y | O | U | R | | C | O | M | P | A | N | Y | | N | A | M | E | 91.5 | 6 | D 2000 |
| 8.3 | 14.2 | 19.8 | 25.3 | 29.4 | 35.4 | 40.7 | 46.2 | 52.4 | 56.8 | 62.8 | 67.8 | 72.9 | 78.9 | 83.9 | 89.9 | 96 | | | |
| Y | O | U | R | | T | O | W | N | | | | N | D | | | | 64.6 | 6 | D 2000 |
| 21.7 | 27.6 | 33.2 | 38.7 | 42.8 | 48.8 | 53.3 | 58.4 | 64.6 | 69.6 | 70.7 | 76.7 | 82.2 | | | | | | | |

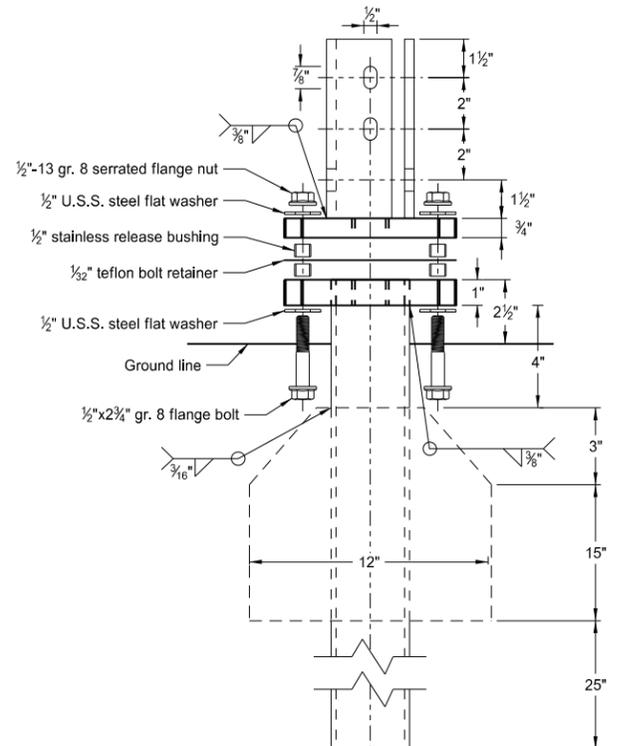
Notes:

1. Sign shall be placed a distance of 1/2A 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 |

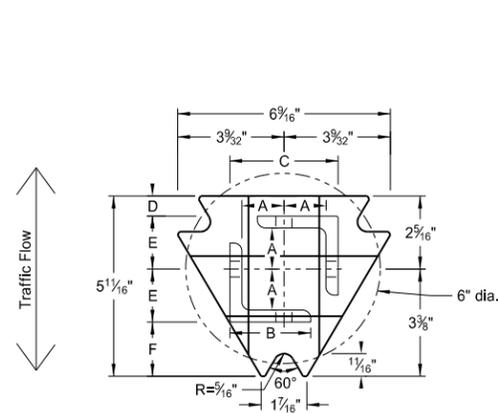
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|--|----------------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 8-22-12 | |
| REVISIONS | |
| DATE | CHANGE |
| 7-18-14 | Revise sheeting to type IV |

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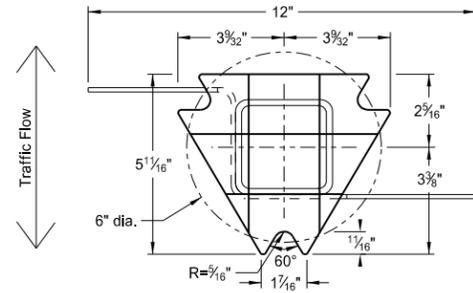


Multi-Directional Slip Base Assembly

Perforated Tube



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



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

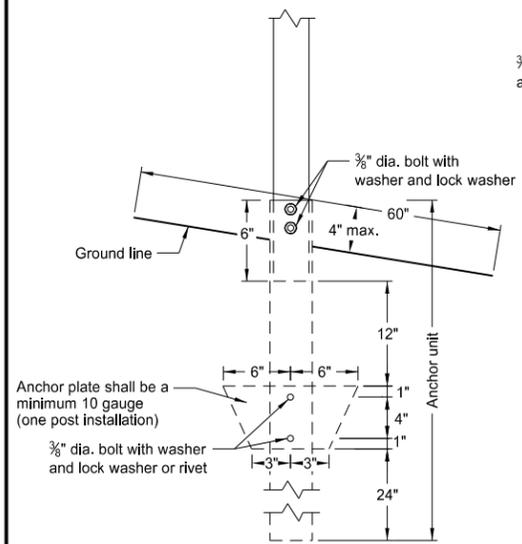
Notes:

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

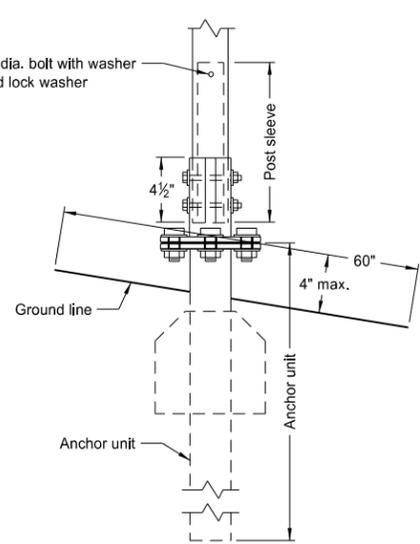
| Telescoping Perforated Tube | | | | | | |
|-----------------------------|---------------|----------------------|-----------------|----------------------|-----------|-----------------------------------|
| Number of Posts | Post Size in. | Wall Thickness Gauge | Sleeve Size in. | Wall Thickness Gauge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

| Properties of Telescoping Perforated Tube | | | | | | |
|---|--------------------|---------------------|----------------------|------------------------------------|----------------------------------|----------------------------------|
| Tube Size in. | Wall Thickness in. | U.S. Standard Gauge | Weight per Foot lbs. | Moment of Inertia in. ⁴ | Cross Sec. Area in. ² | Section Modulus in. ³ |
| 1 1/2 x 1 1/2 | 0.105 | 12 | 1.702 | 0.129 | 0.380 | 0.172 |
| 2 x 2 | 0.105 | 12 | 2.416 | 0.372 | 0.590 | 0.372 |
| 2 1/4 x 2 1/4 | 0.105 | 12 | 2.773 | 0.561 | 0.695 | 0.499 |
| 2 3/16 x 2 3/16 | 0.135 | 10 | 3.432 | 0.605 | 0.841 | 0.590 |
| 2 1/2 x 2 1/2 | 0.105 | 12 | 3.141 | 0.804 | 0.803 | 0.643 |
| 2 1/2 x 2 1/2 | 0.135 | 10 | 4.006 | 0.979 | 1.010 | 0.785 |

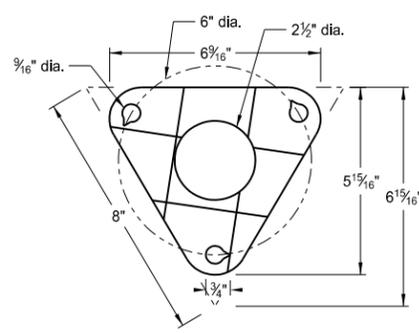
| Top Post Receiver Data Table | | | | | | |
|------------------------------|---------|--------|---------|---------|----------|--------|
| Square Post Sizes (B) | A | B | C | D | E | F |
| 2 3/16"x10 ga. | 1 9/64" | 2 1/2" | 3 1/32" | 2 5/32" | 1 33/64" | 1 1/8" |
| 2 1/2"x10 ga. | 1 9/32" | 2 1/2" |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



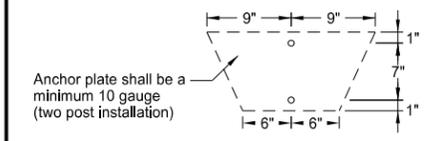
Anchor Unit and Post Assembly



Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly



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



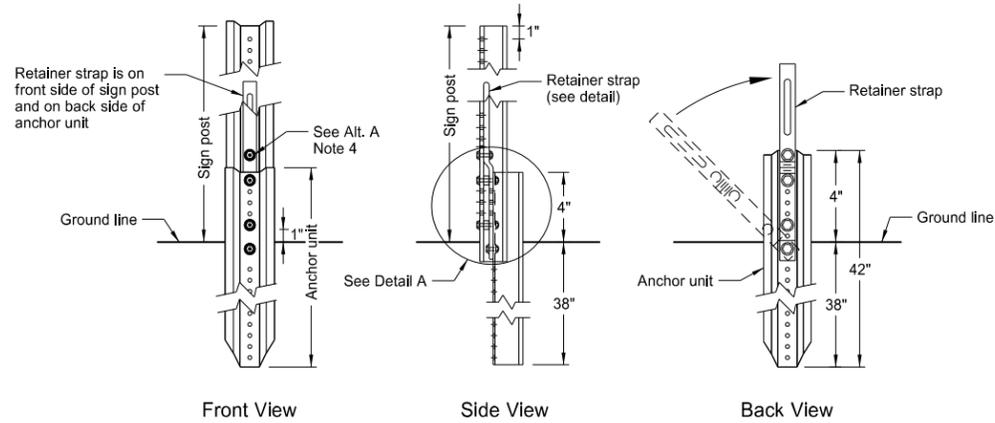
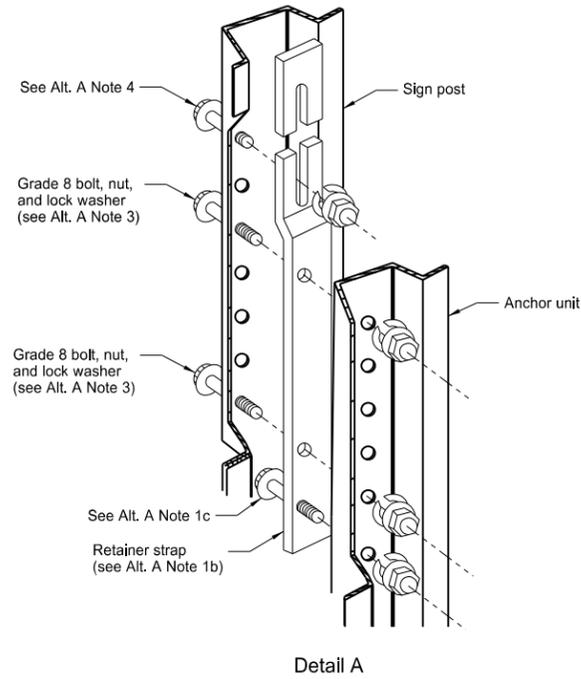
Anchor plate shall be a minimum 10 gauge (two post installation)

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

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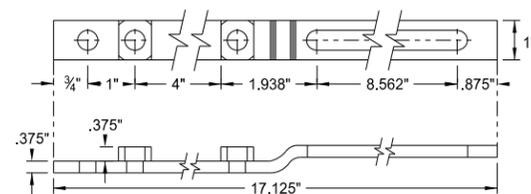
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U-Channel Post

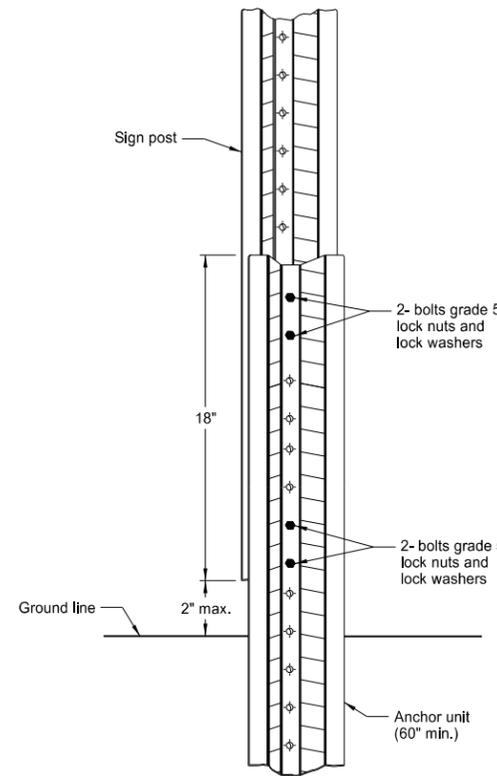


Breakaway U-Channel Detail Alternate A

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

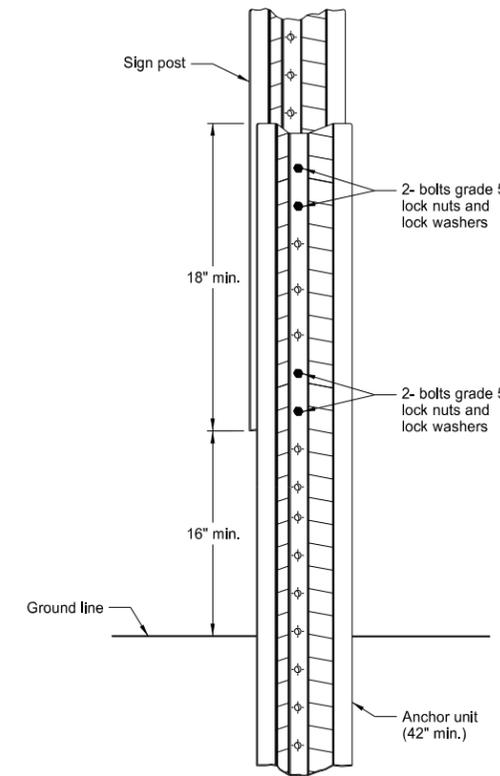


Retainer Strap Detail



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

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



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

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

Alternate A Steps of Installation:

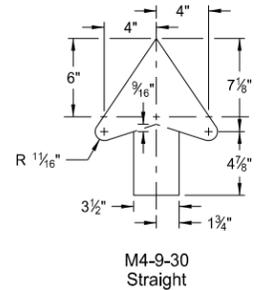
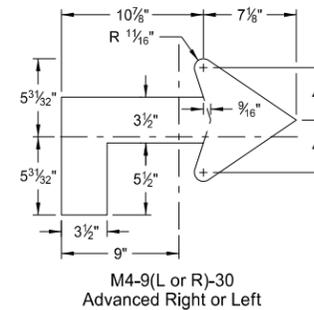
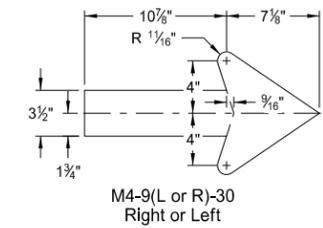
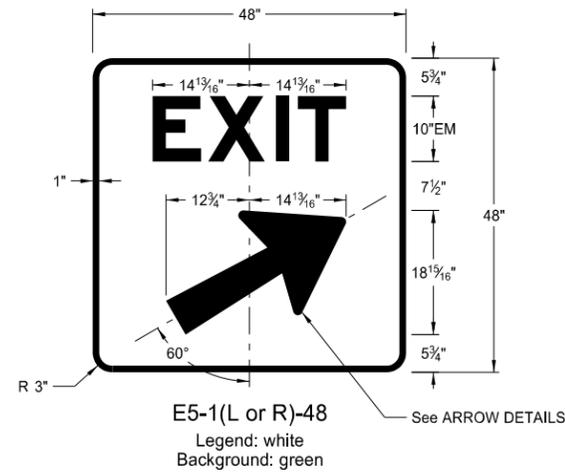
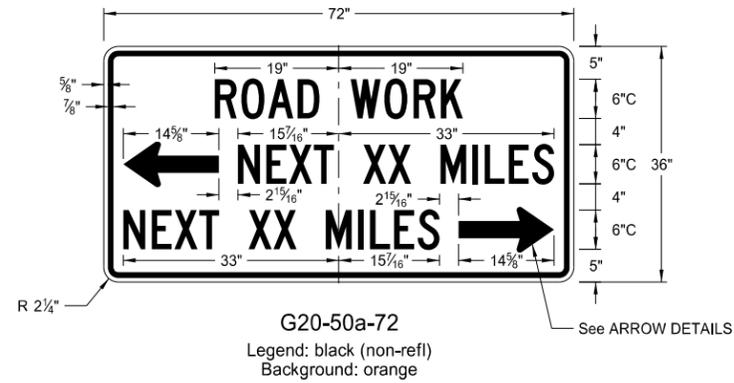
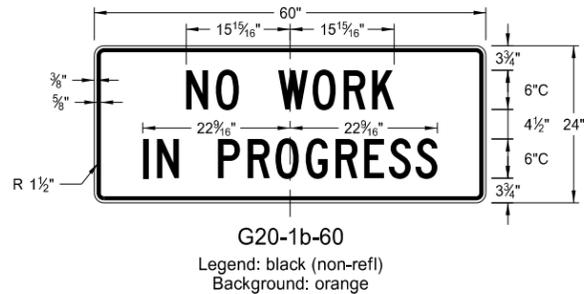
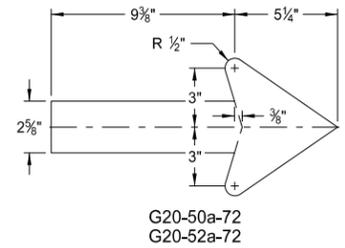
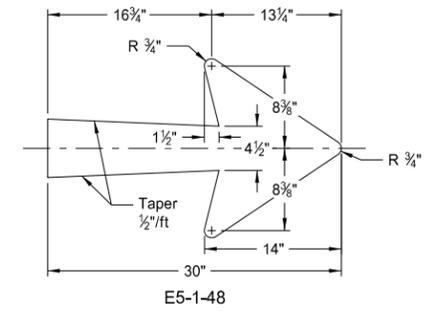
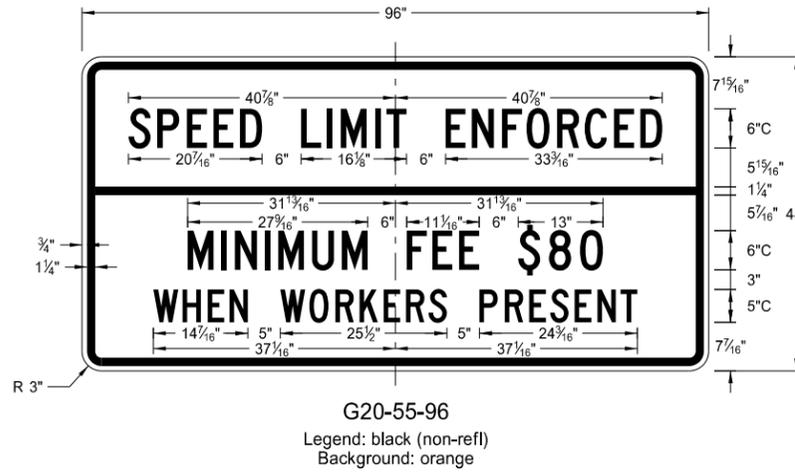
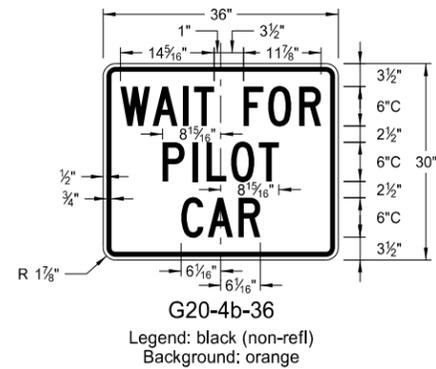
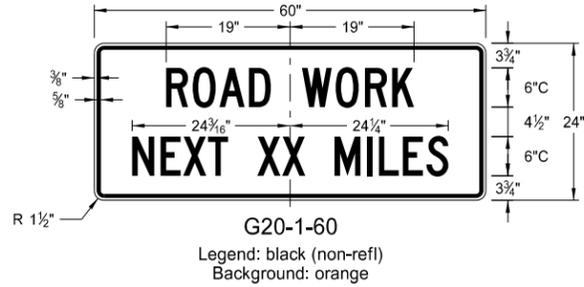
- Drive anchor unit to within 12" of ground level.
 - Proper assembly established by lining up the bottom hole of retainer strap with the 6th hole from the top of the anchor unit.
 - Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
 - Rotate strap 90° to left.
- Drive anchor unit to 4" above ground.
 - Rotate strap to vertical position.
- Place 5/16"x2" bolt, lock washer and nut in bottom of sign post to facilitate alignment of sign post with proper hole in anchor unit.
 - Alternately tighten two connector bolts.
- Complete assembly by tightening 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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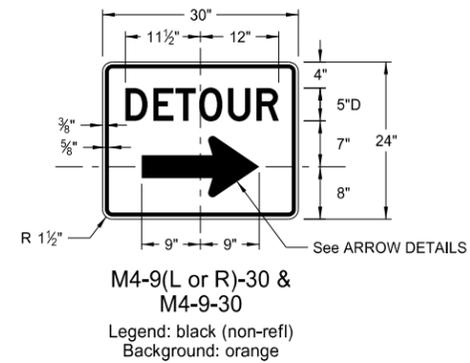
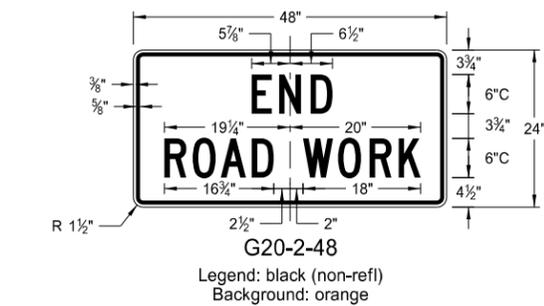
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CONSTRUCTION SIGN DETAILS
 TERMINAL AND GUIDE SIGNS

D-704-9



ARROW DETAILS



NOTES:

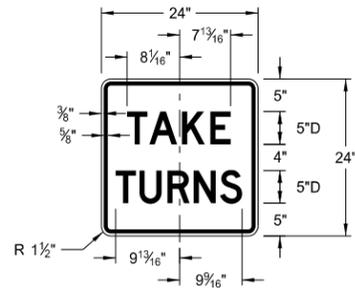
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

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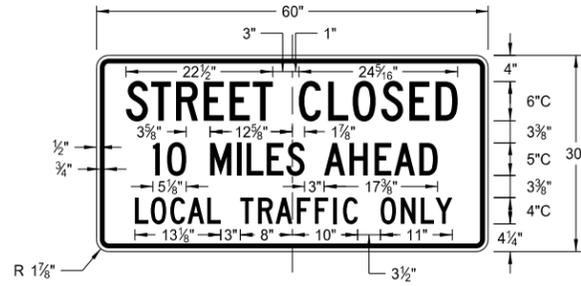
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS

D-704-10



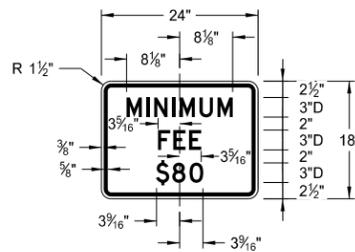
R1-50-24

Legend: black (non-refl)
Background: white



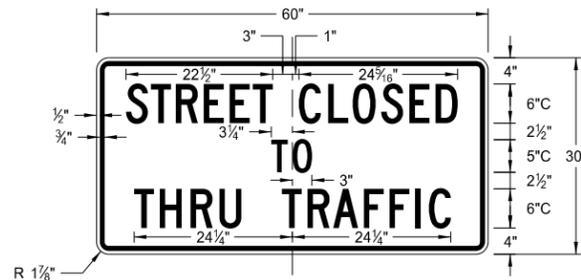
R11-3c-60

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

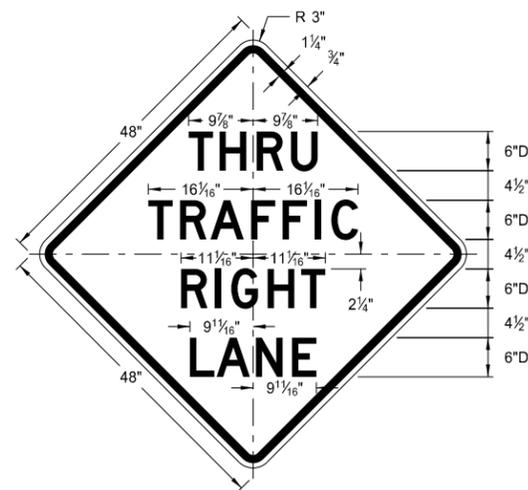
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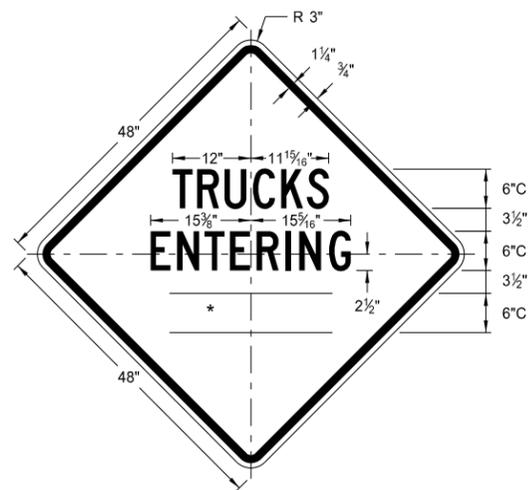
CONSTRUCTION SIGN DETAILS
WARNING SIGNS

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

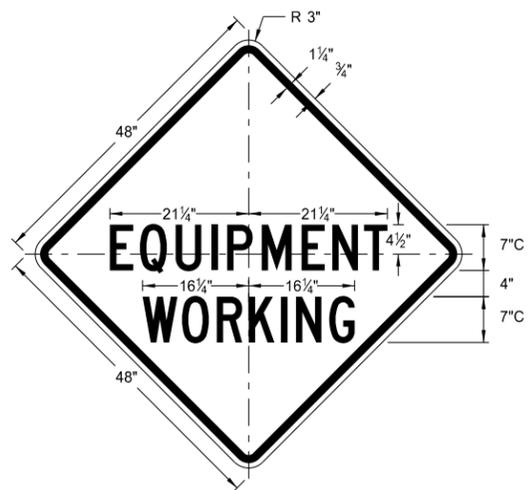
* DISTANCE MESSAGES



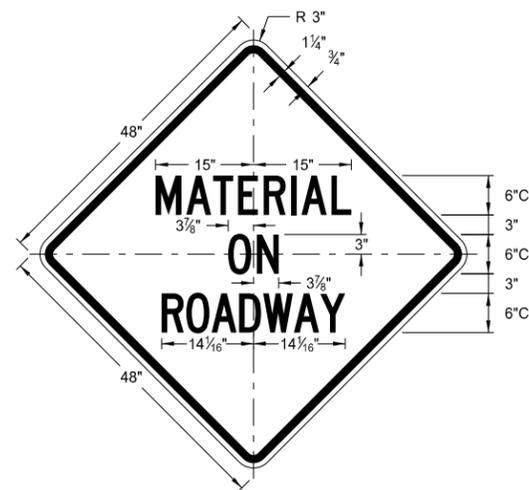
W5-8-48
Legend: black (non-refl)
Background: orange



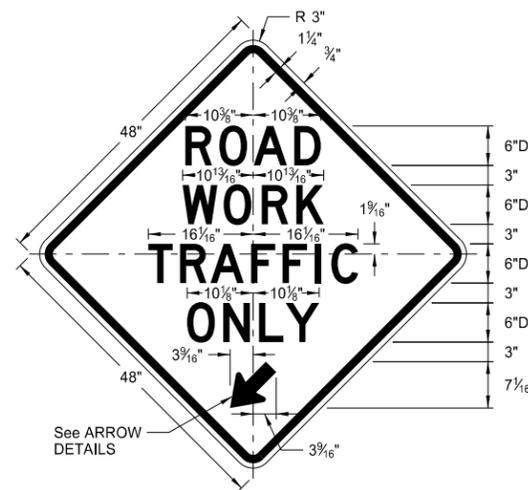
W8-54-48
Legend: black (non-refl)
Background: orange



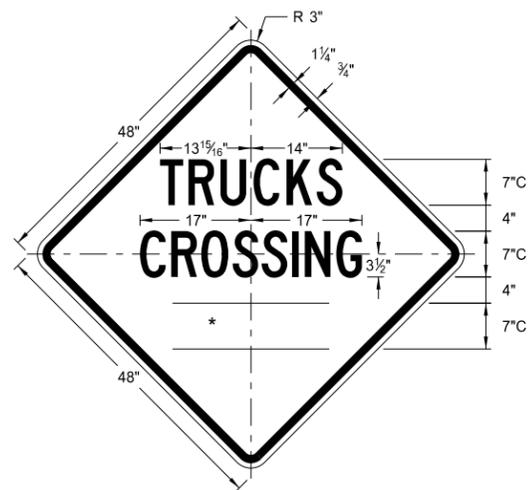
W20-51-48
Legend: black (non-refl)
Background: orange



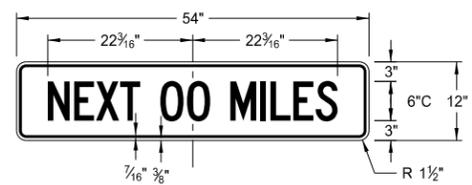
W21-51-48
Legend: black (non-refl)
Background: orange



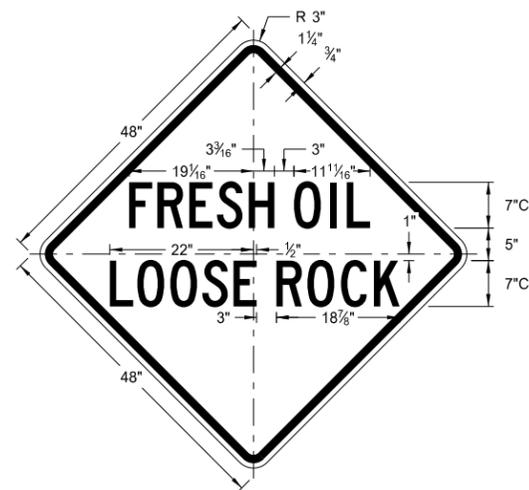
W5-9-48
Legend: black (non-refl)
Background: orange



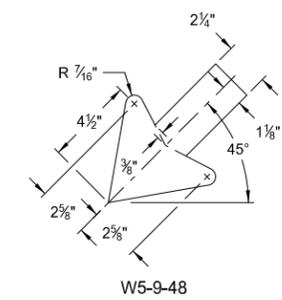
W8-55-48
Legend: black (non-refl)
Background: orange



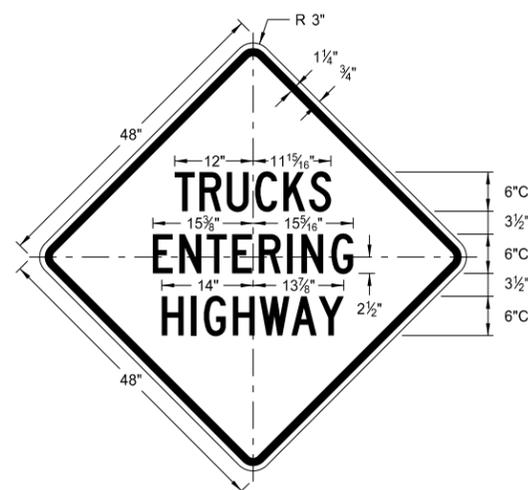
W20-52-54
Legend: black (non-refl)
Background: orange



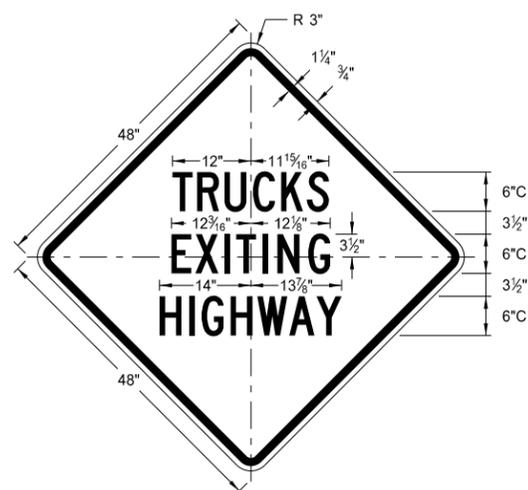
W22-8-48
Legend: black (non-refl)
Background: orange



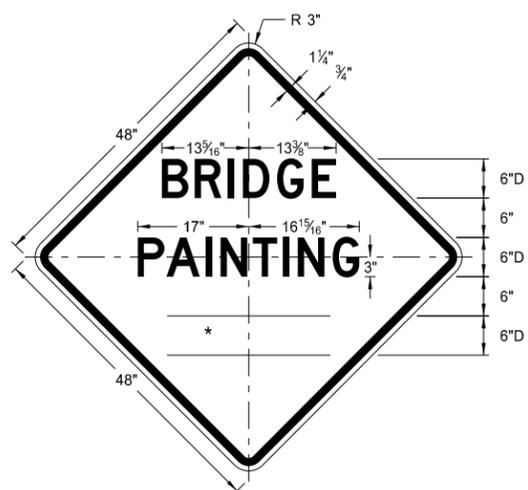
W5-9-48
ARROW DETAILS



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



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



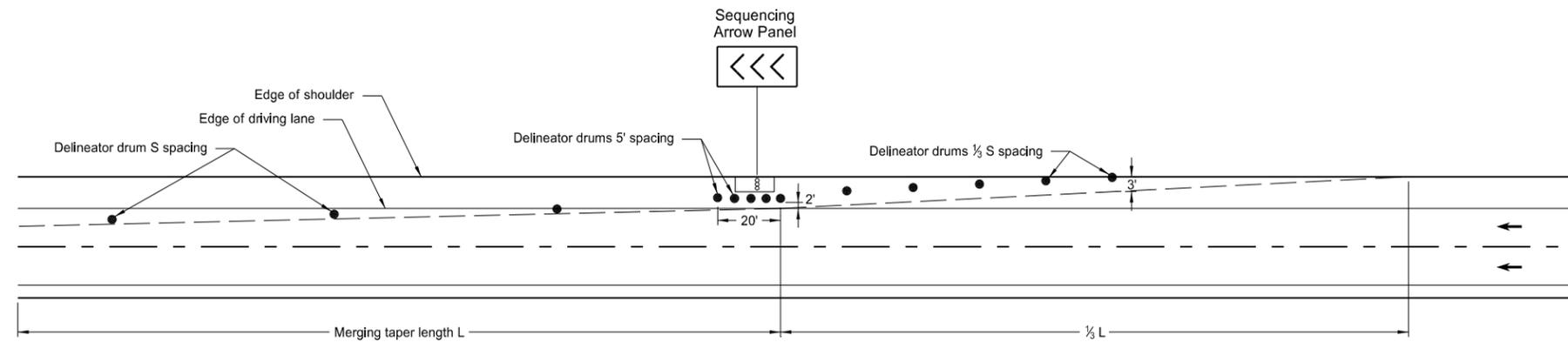
W21-50-48
Legend: black (non-refl)
Background: orange

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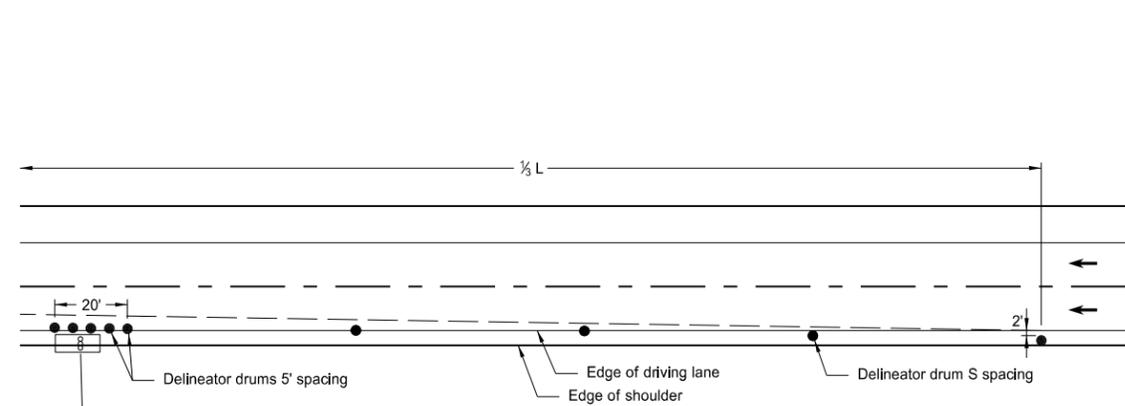
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SHOULDER CLOSURE TAPERS

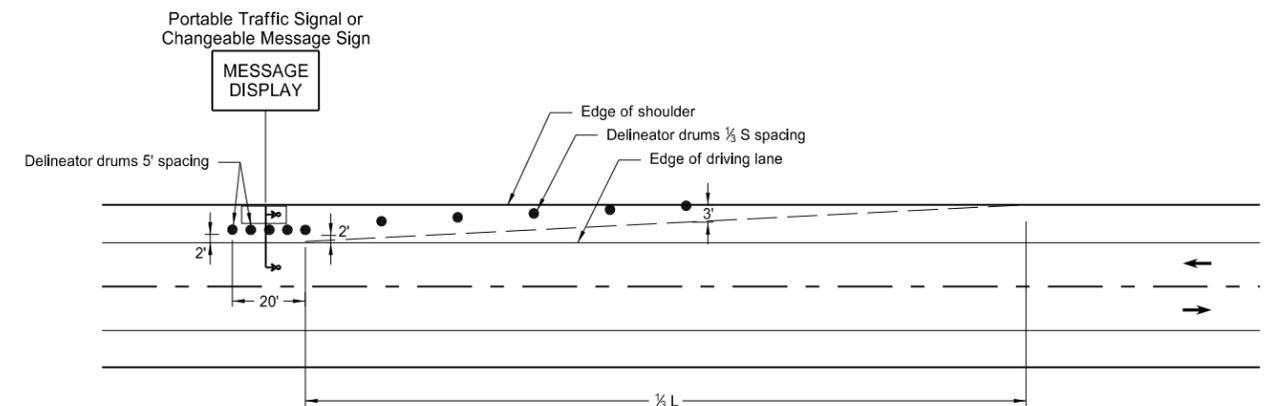
D-704-12



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 |

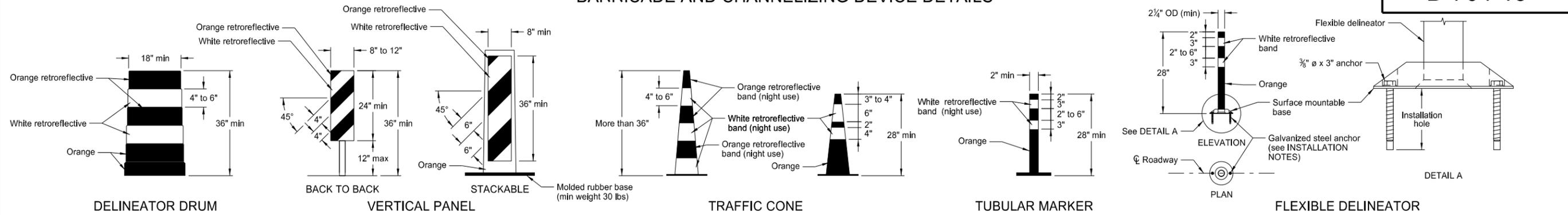
Notes:

- 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



INSTALLATION NOTES:

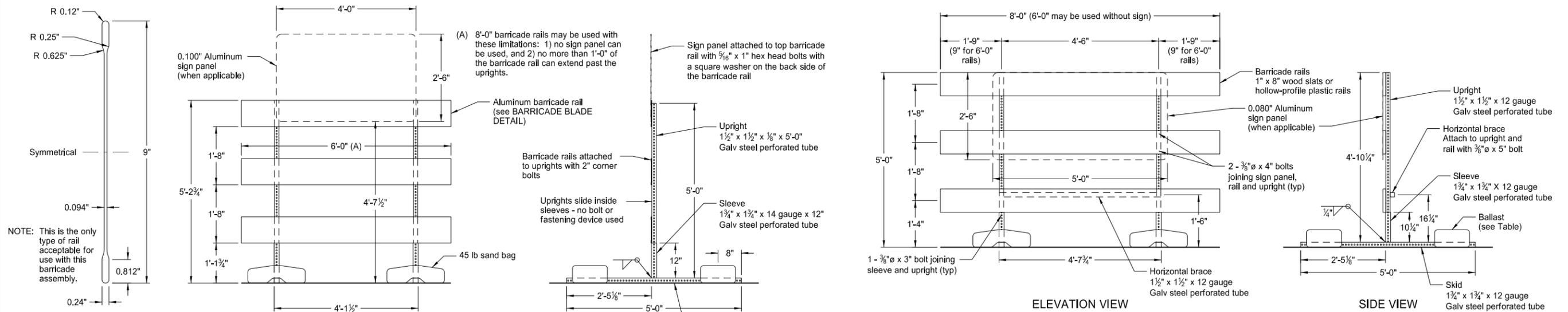
1. Drill installation holes to diameter and depth as required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, the contractor may use an 8" x 8" butyl pad or hot melt butyl.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

The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any 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.

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.

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.

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.



BARRICADE BLADE DETAIL

ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

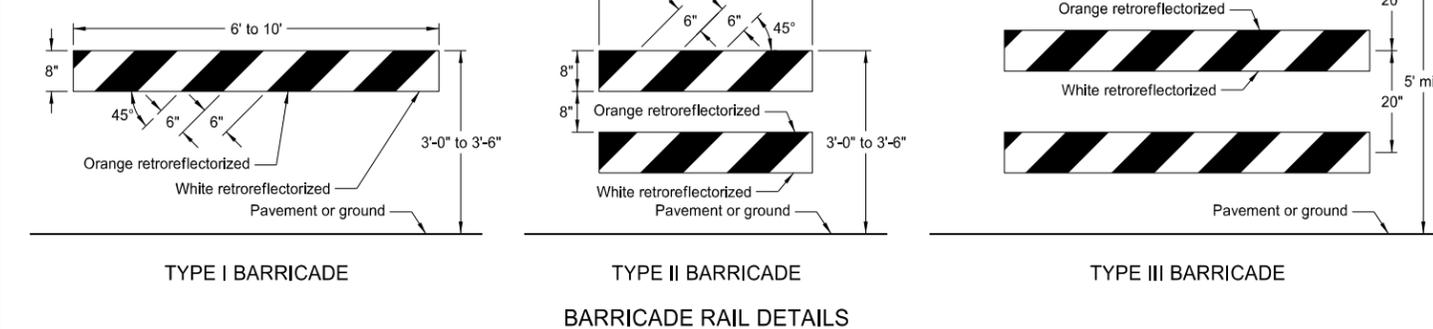
SIDE VIEW

ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

SIDE VIEW

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

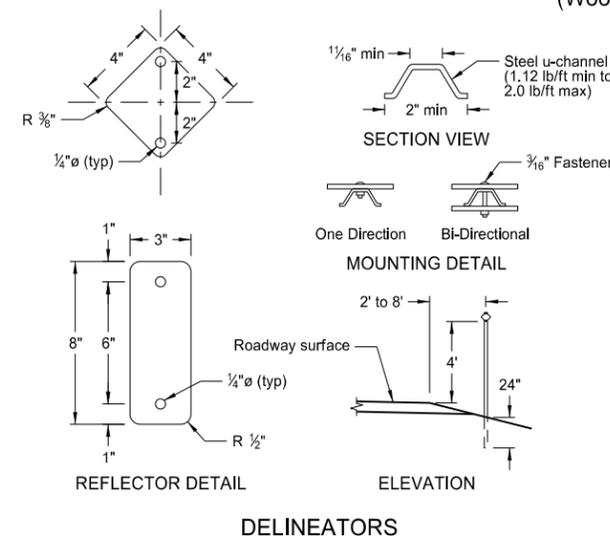


TYPE I BARRICADE

TYPE II BARRICADE

TYPE III BARRICADE

BARRICADE RAIL DETAILS



REFLECTOR DETAIL

DELINEATORS

MINIMUM BALLAST (For each side of barricade support)

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

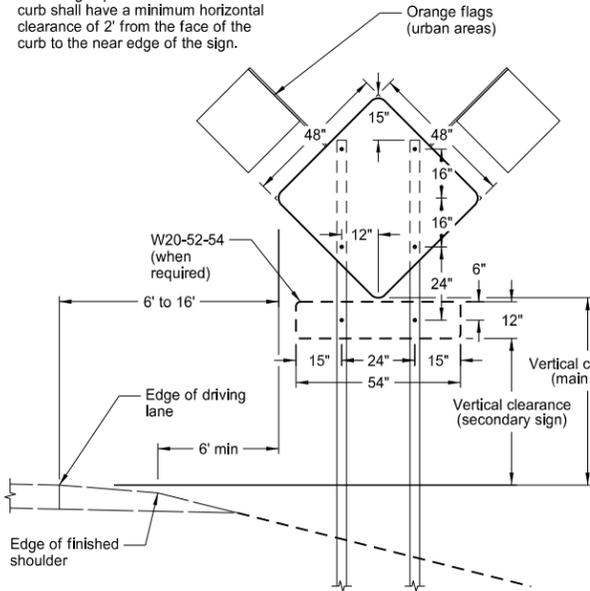
Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

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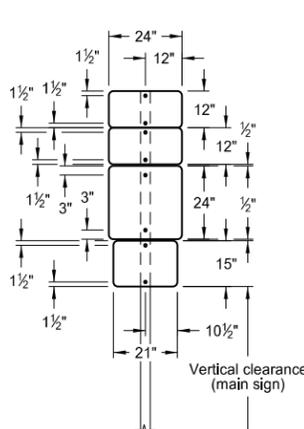
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CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

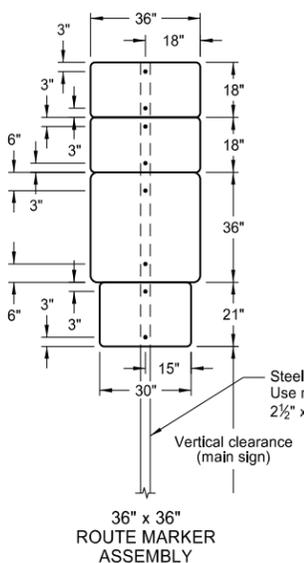
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



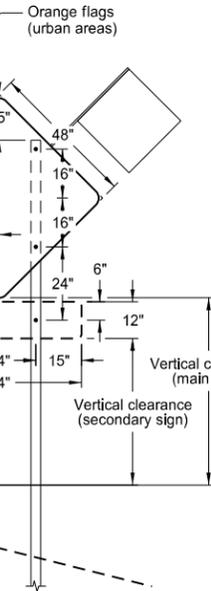
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



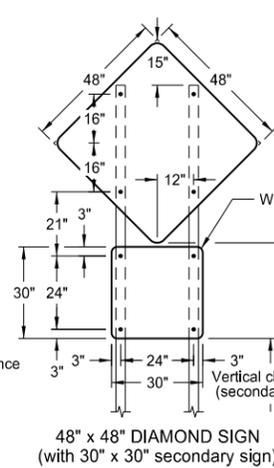
24" x 24" ROUTE MARKER ASSEMBLY



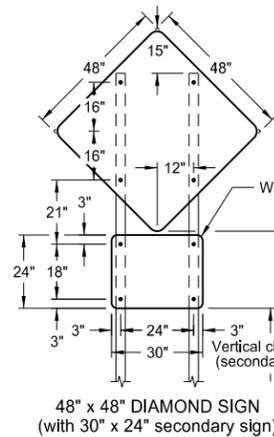
36" x 36" ROUTE MARKER ASSEMBLY



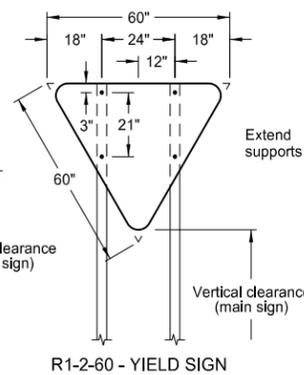
18" x 18" DIAMOND SIGN



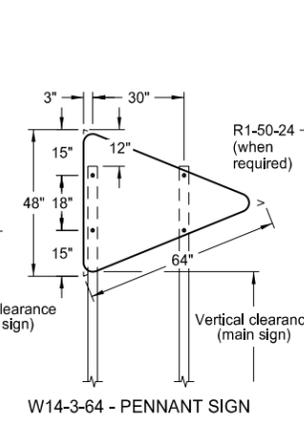
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



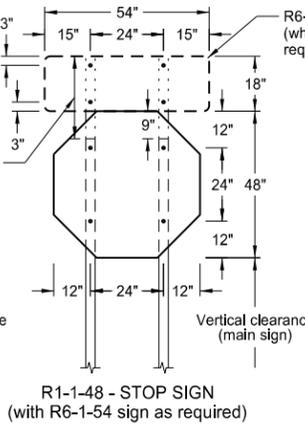
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



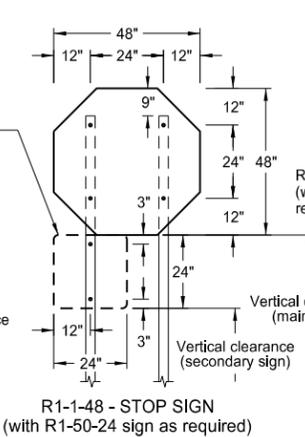
R1-2-60 - YIELD SIGN



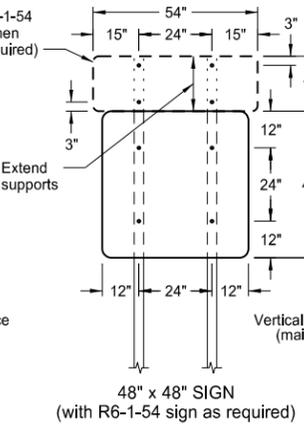
W14-3-64 - PENNANT SIGN



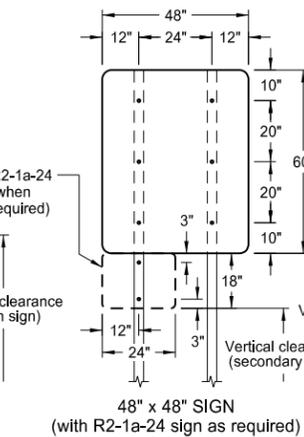
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



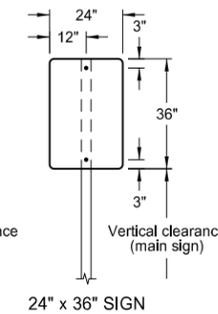
R1-1-48 - STOP SIGN
(with R1-50-24 sign as required)



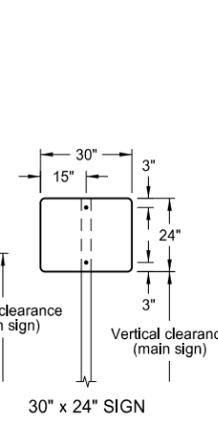
48" x 48" SIGN
(with R6-1-54 sign as required)



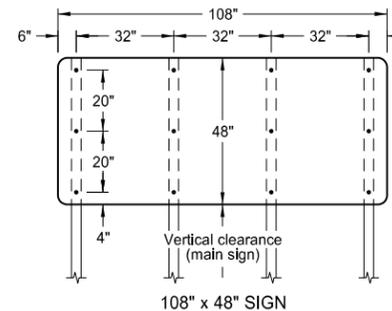
48" x 48" SIGN
(with R2-1a-24 sign as required)



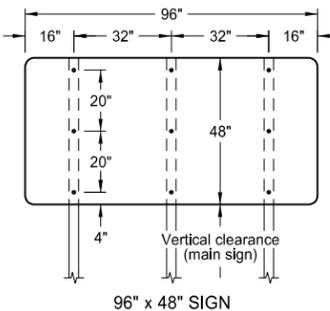
24" x 36" SIGN



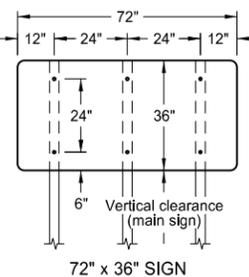
30" x 24" SIGN



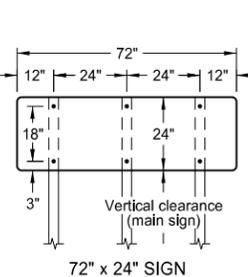
108" x 48" SIGN



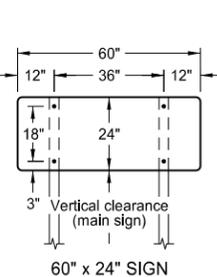
96" x 48" SIGN



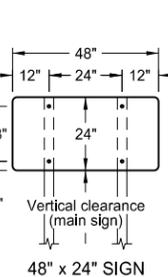
72" x 36" SIGN



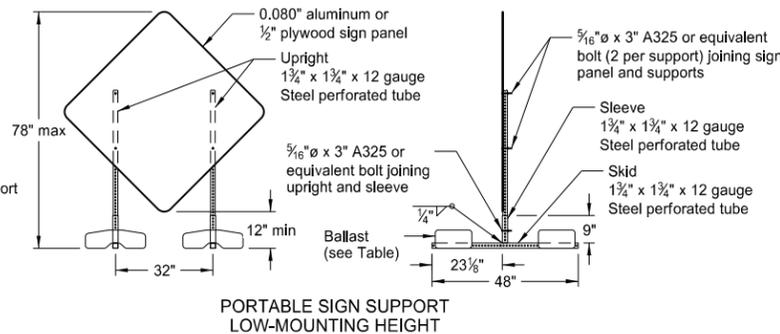
72" x 24" SIGN



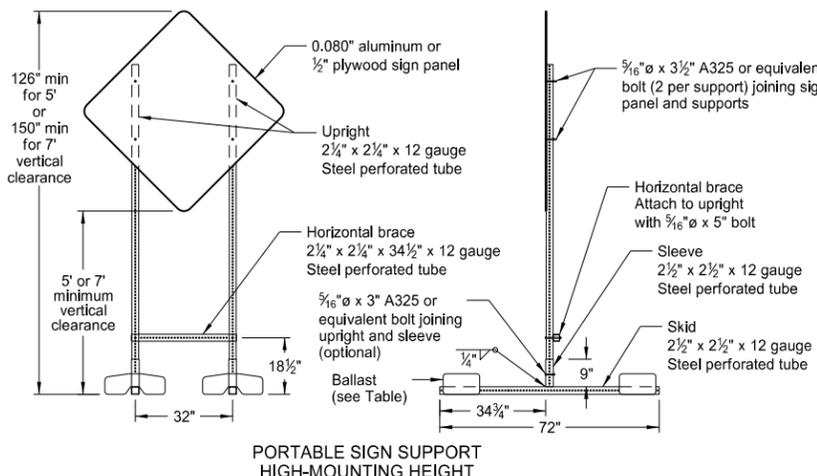
60" x 24" SIGN



48" x 24" SIGN



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

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

Signs over 50 square feet should be installed on 2 1/2" x 2 1/2" perforated tube supports as a minimum.

Guy wires shall not be attached to sign supports. Wind beams may be attached to u-posts behind the sign panels.
- Sign Panels:** Provide sign panels made of 0.100" aluminum, 1/2" plywood, or other approved material, except where noted. All holes to be punched round for 3/8" bolts.
- Alternate Messages:** The signs that have alternate messages may have these alternate messages placed on a reflectorized plate (without a border) and installed and removed as required. (i.e. "Left" and "Right" message on a lane closure sign)
- Route Marker Auxiliary Signs:** Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:

Interstate - white legend on blue background
Interstate Business Loop - white legend on green background
US and State - black legend on white background
County - yellow legend on blue background
- Vertical Clearance:** Install signs with a vertical clearance of 5'-0" (see TYPICAL SECTION.) In areas where parking or pedestrian movements are likely or the view of the sign may be obstructed, install signs with a vertical clearance of 7'-0" from the top of the curb or from the near edge of the driving lane in absence of a curb.

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

Large signs having an area exceeding 50 square feet shall have a minimum clearance of 7'-0" from the ground at the post.
- Portable Signs:** Provide portable signs that meet the vertical clearance as stated above. Use portable signs when it is necessary to place signs within the pavement surface.

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

Signs mounted to the portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT Details shall have a maximum surface area of 16 square feet.

MINIMUM BALLAST
(For each side of sign support base)

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

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

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|-----------------|
| 10-4-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 11-14-13 | Revised Note 6. |

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Roger Weigel,
Registration Number
PE-2930,
on 11/14/13 and the original document is stored at the North Dakota Department of Transportation

ROAD CLOSURE LAYOUTS

Notes

- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of taper.
 - L = Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2/60$ 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 1/2 B.
- Use when work area is 1 mile or longer.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
- G20-55-96 sign is not required if this standard is part of other traffic control layouts, or the work is less than 15 days.

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

KEY

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

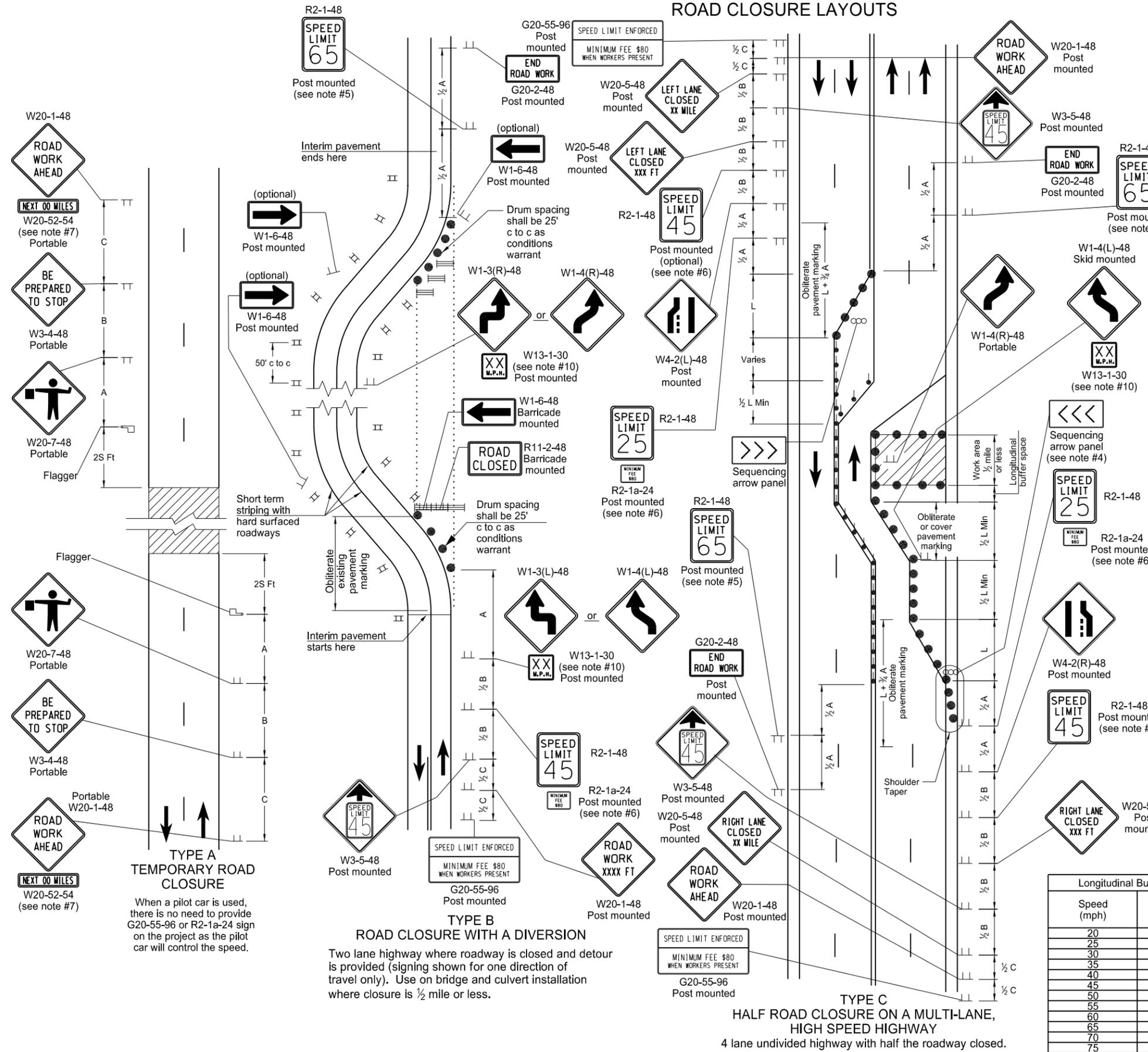
Longitudinal Buffer Space

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

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
9-27-13
REVISIONS

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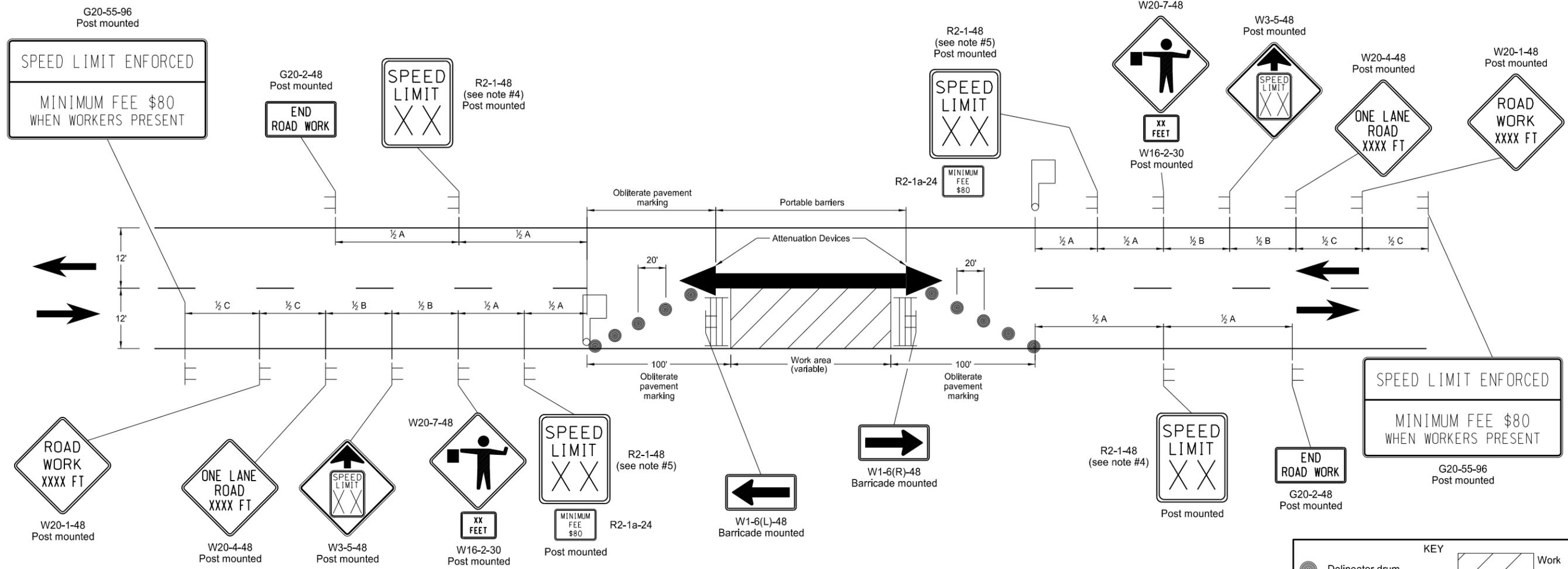
TYPE A TEMPORARY ROAD CLOSURE
When a pilot car is used, there is no need to provide G20-55-96 or R2-1a-24 sign on the project as the pilot car will control the speed.

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

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

SIGN LAYOUT FOR ONE LANE CLOSURE TWO LANE ROADWAY

D-704-17



Notes

- Floodlights shall be provided to mark flagger stations at night. The lighting shall not create a disabling glare for drivers. Placement and elimination of potential glare can best be determined by driving through and observing the floodlighted area from each direction on the main roadway after lighting is set up.
- Barricades placed on roadway shall be on a movable assembly. Signs placed on the roadway shall be placed on skid mounted assembly.
- Existing striping shall be removed as required. Delineators will only be used when inslope is 4:1 or flatter and roadway alignment is visible to approaching vehicles. Vertical panels shall be used where roadways have steep slopes and alignment is not visible to approaching vehicles. Delineators and vertical panels shall be installed back to back.
- 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.
- 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.
- Existing speed limit signs within a reduced speed zone shall be covered. 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.
-

KEY

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

| Road Type | Distance Between Signs (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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| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 9-27-13 | |
| REVISIONS | |
| DATE | CHANGE |
| | |

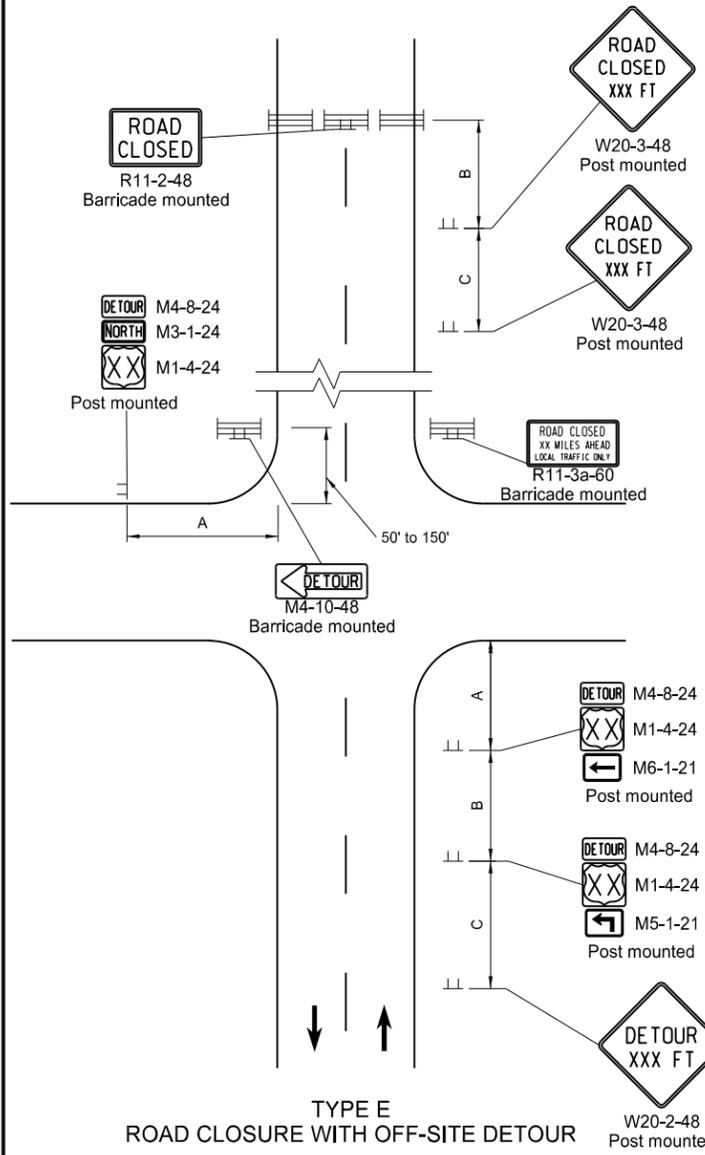
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ROAD CLOSURE AND LANE CLOSURE ON A TWO WAY ROAD LAYOUTS

D-704-19

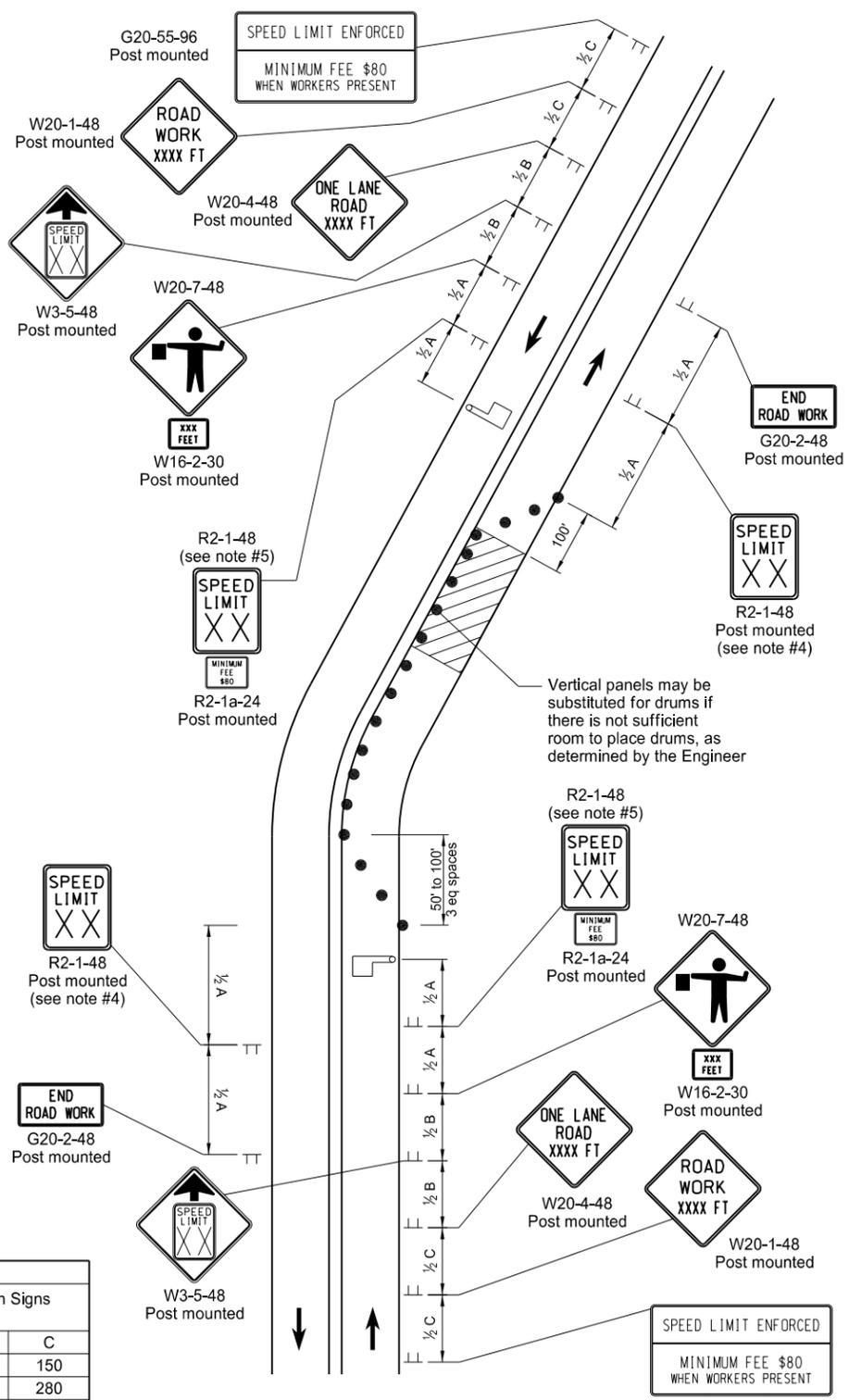
Notes

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



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

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



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

KEY

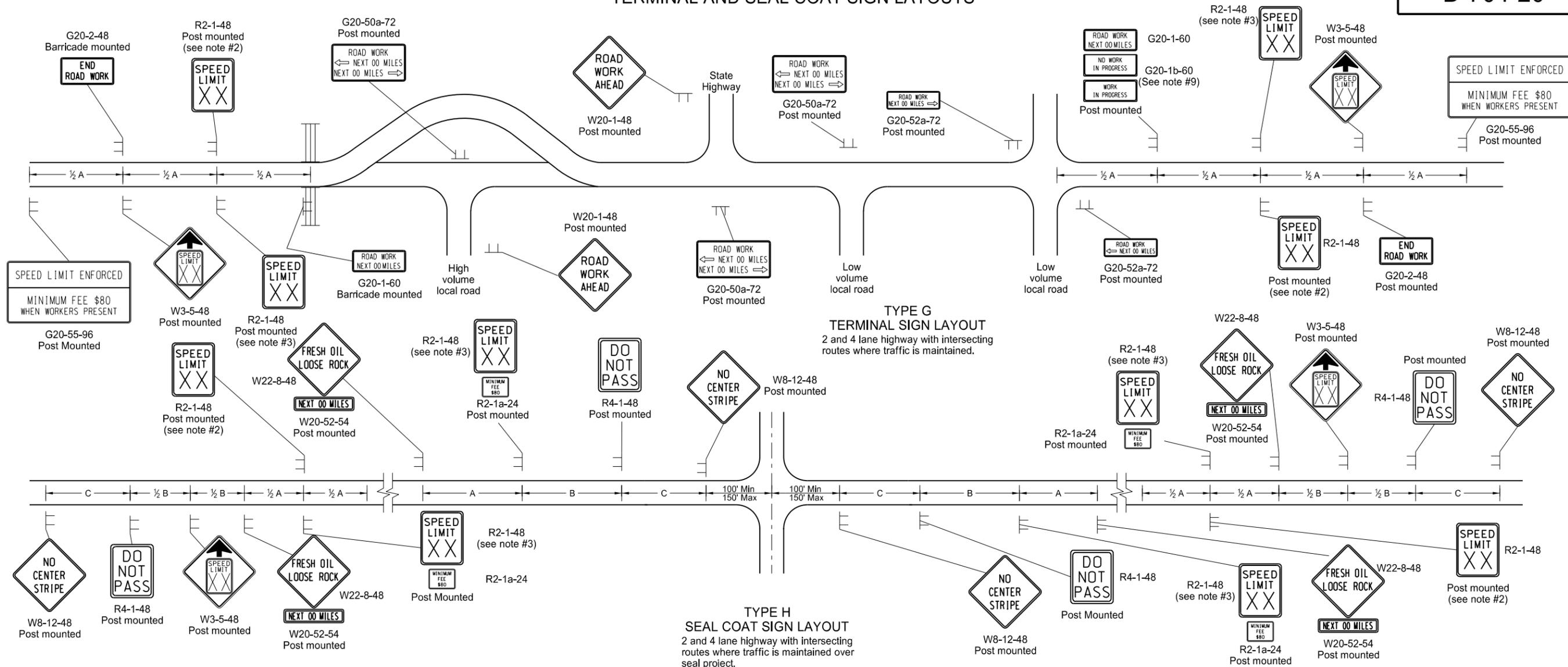
- Delineator Drum
- ▬ Sign
- ▬ Type III Barricade
- ▨ Work/Hazard Area
- ☞ Flagger

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

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TERMINAL AND SEAL COAT SIGN LAYOUTS

D-704-20



1. Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies.
2. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
3. 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.
4. 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.
5. Existing speed limit signs within a reduced speed zone shall be covered.
6. On seal projects, signs R2-1-48, R2-1a-24, R4-1-48, W22-8-48 and W20-52-54 shall be placed just after all important intersections and at five mile intervals thereafter. Sign W8-12-48 shall be placed just after all important intersections and at 2 mile intervals thereafter until the short term center line pavement marking is in place. No short term pavement markings are placed when traffic volumes are 750 ADT or less.
7. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
8. Type H construction sign traffic control shall have the speed limit signs covered or removed once the loose aggregate has been removed.
9. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
10. Other traffic control layouts will be required in the immediate work areas. If the speed limit is reduced in the work area, speed limit signs shall have the R2-1a-24 sign placed below.
11. G20-55-96 sign is not required if work is less than 15 days.

KEY

Type III barricade
 Sign

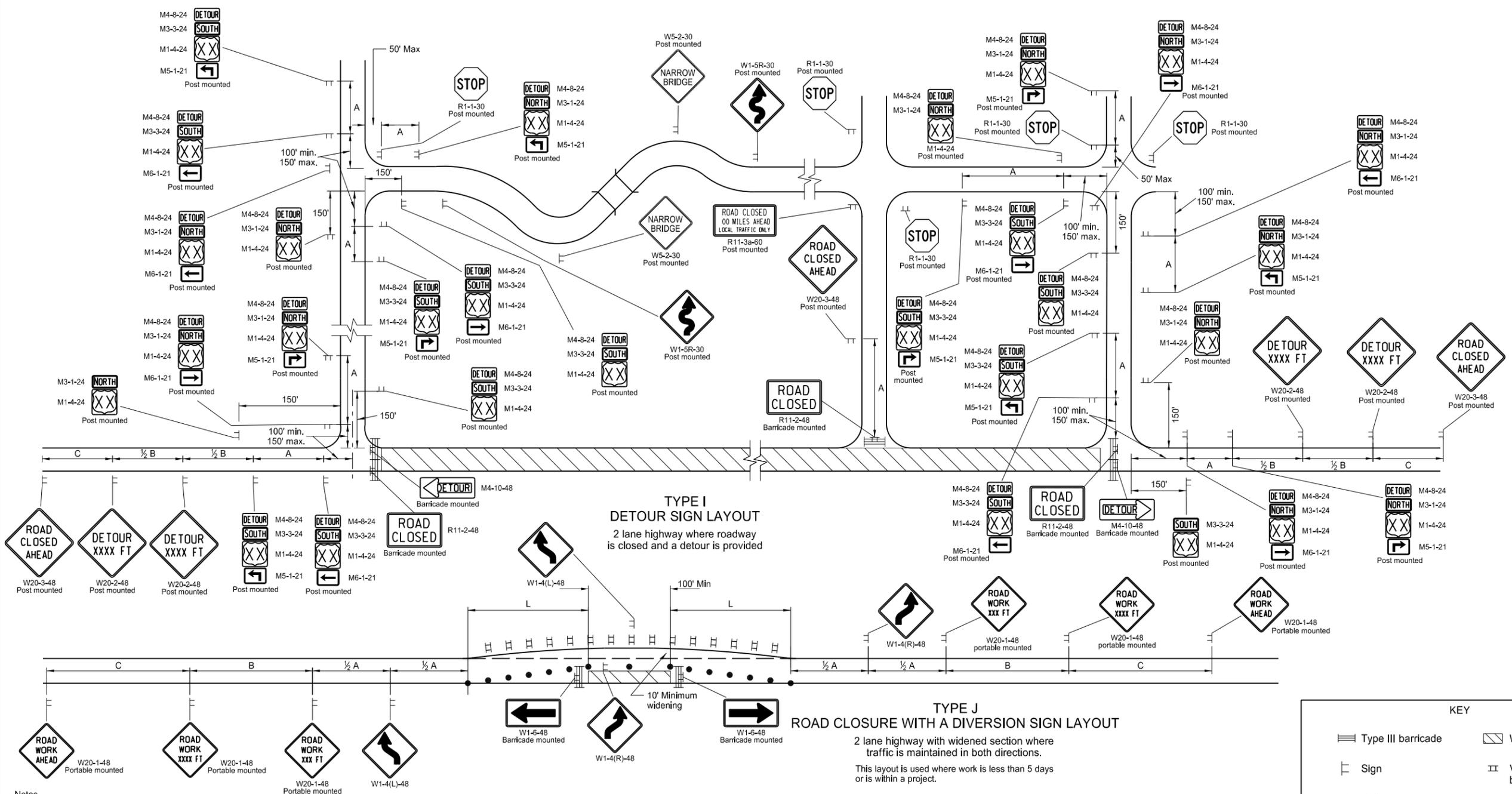
| ADVANCE WARNING SIGN SPACING | | | |
|---|----------------------------------|------|------|
| Road Type | Distance Between Signs Min. (ft) | | |
| | A | B | C |
| Urban - Low Speed (30 mph or less) | 150 | 150 | 150 |
| Urban - Low Speed (over 30 to 40 mph) | 280 | 280 | 280 |
| Urban - High Speed (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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DETOUR AND ROADWAY DIVERSION SIGN LAYOUTS

D-704-21



- Notes**
- Variables
S=Numerical value of speed limit or 85th percentile. W=The width of taper.
L=Minimum length of taper, or $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2 / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
 - Barricades placed on roadway shall be on a moveable assembly. Signs placed on roadway shall be placed on skid mounted assemblies.
 - Delineator drums and vertical panels used for tapering traffic shall be spaced at dimension "S". Delineator drums, tubular markers and vertical panels used for tangents shall be spaced at 2 times "S". The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 MPH. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at $\frac{1}{2}$ B.
 - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 - Existing speed limit signs within a reduced speed zone shall be covered.
 - Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
 - The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.

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

KEY

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

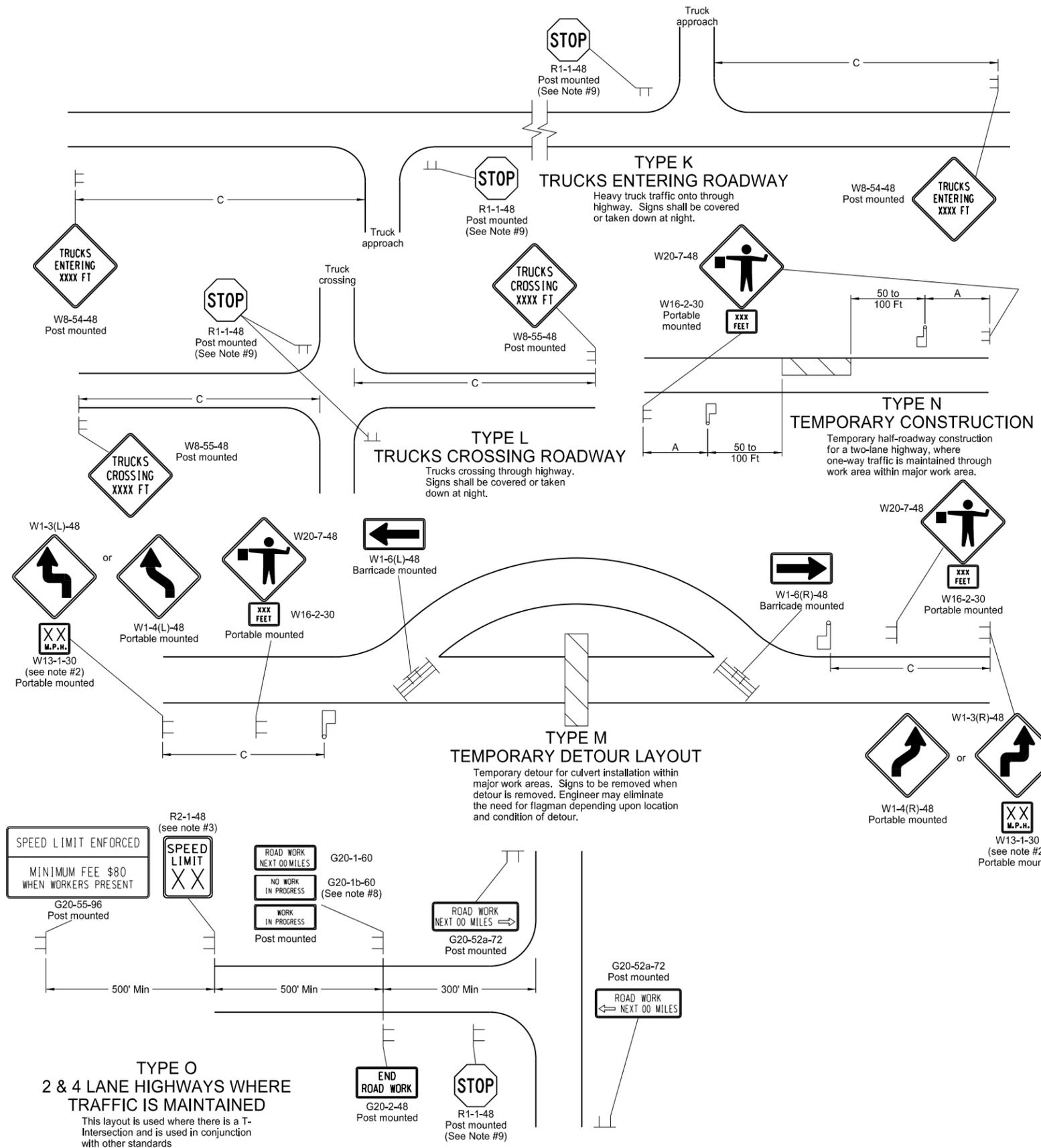
| ADVANCE WARNING SIGN SPACING | | | |
|---|----------------------------------|------|------|
| Road Type | Distance Between Signs Min. (ft) | | |
| | A | B | C |
| Urban - Low Speed (30 mph or less) | 150 | 150 | 150 |
| Urban - Low Speed (over 30 to 40 mph) | 280 | 280 | 280 |
| Urban - High Speed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

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

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 Registration Number
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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 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. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
 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. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
 7. If existing stop sign is in place, a 48" stop sign is not required.
 8. 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.

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 |

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
9-27-13

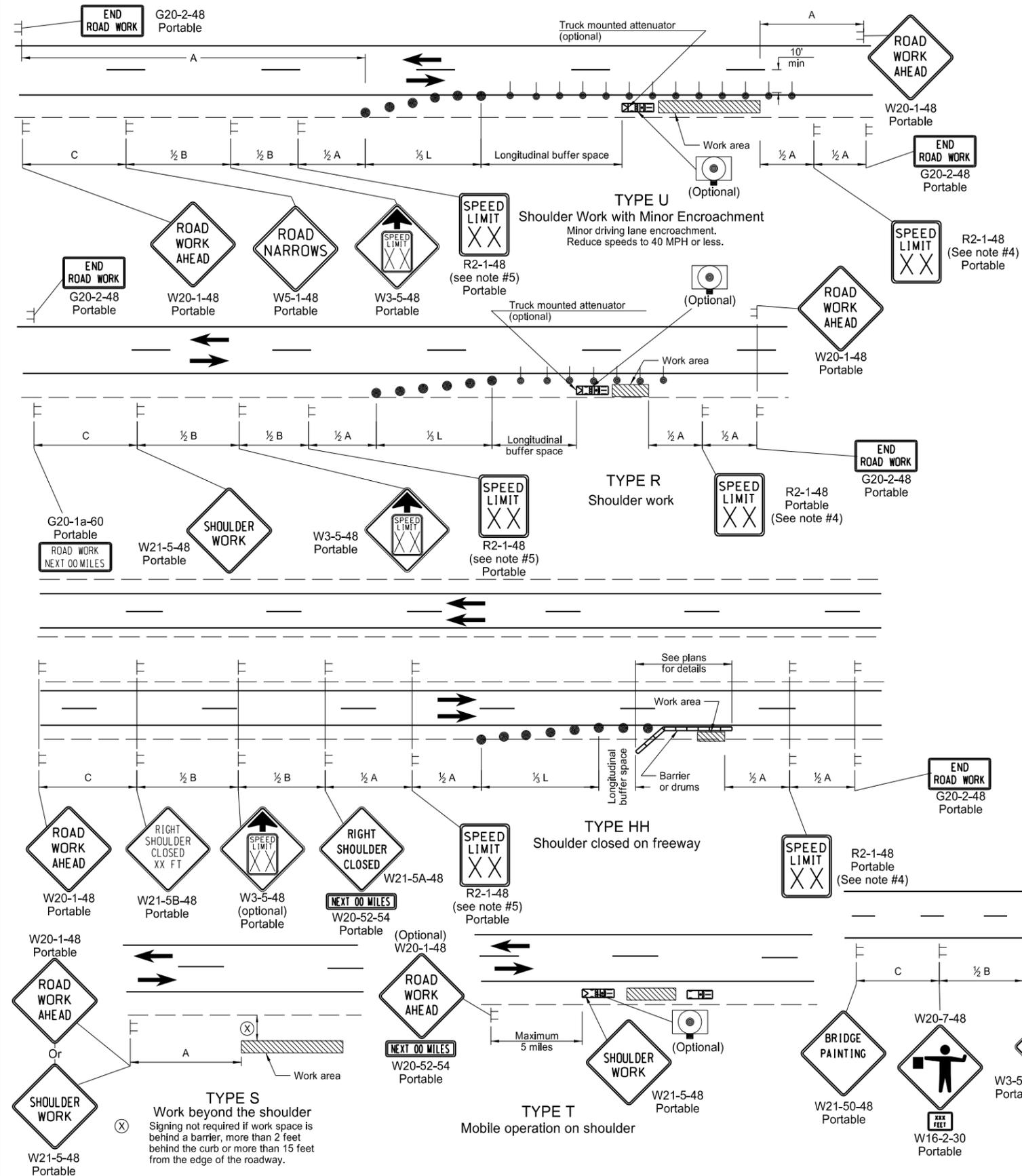
REVISIONS

| DATE | CHANGE |
|------|--------|
| | |

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SHOULDER CLOSURES AND BRIDGE PAINTING LAYOUTS

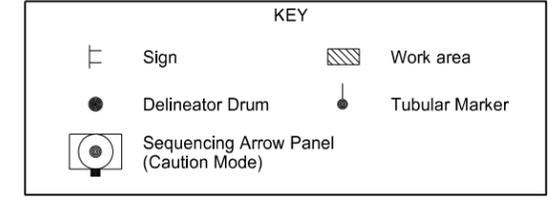
D-704-24



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

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

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

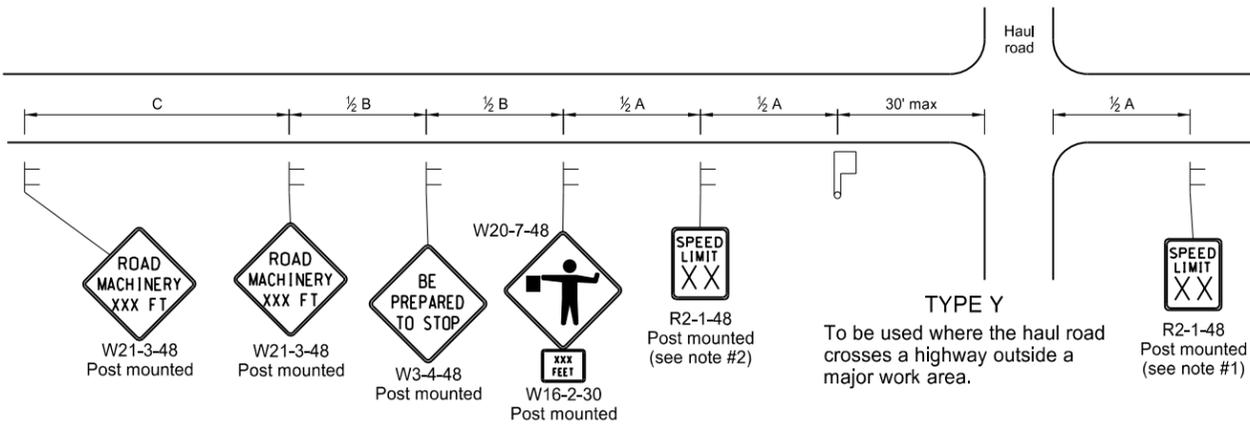


| | |
|--|--------|
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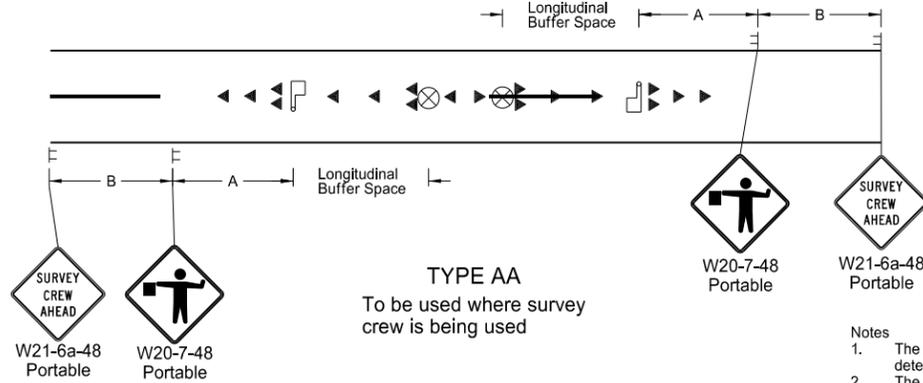
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MISCELLANEOUS SIGN LAYOUTS

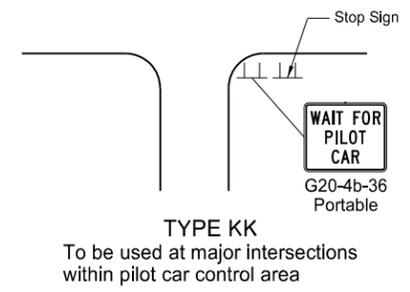
D-704-26



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

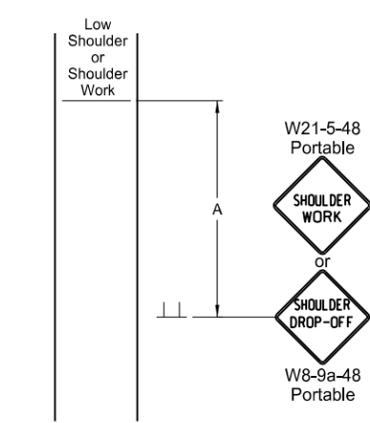


TYPE AA
To be used where survey crew is being used

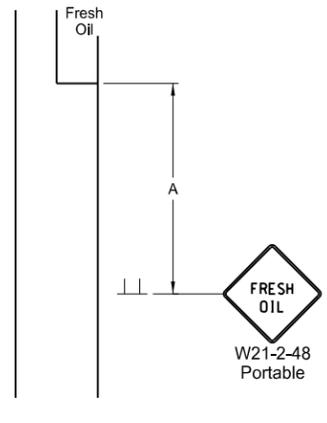


TYPE KK
To be used at major intersections within pilot car control area

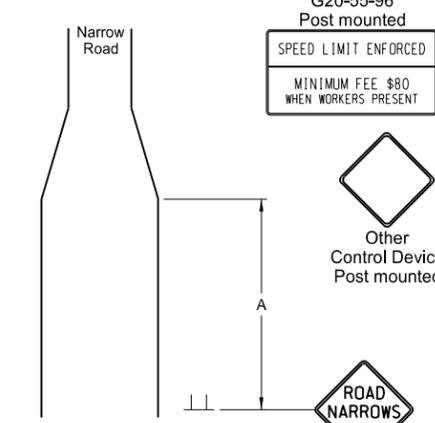
- Notes
1. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
 2. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph 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.



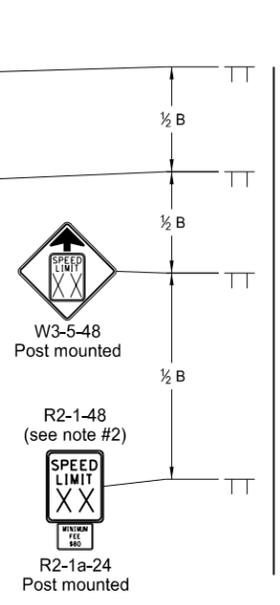
TYPE BB
To be used within a major work area where the sign conditions exist



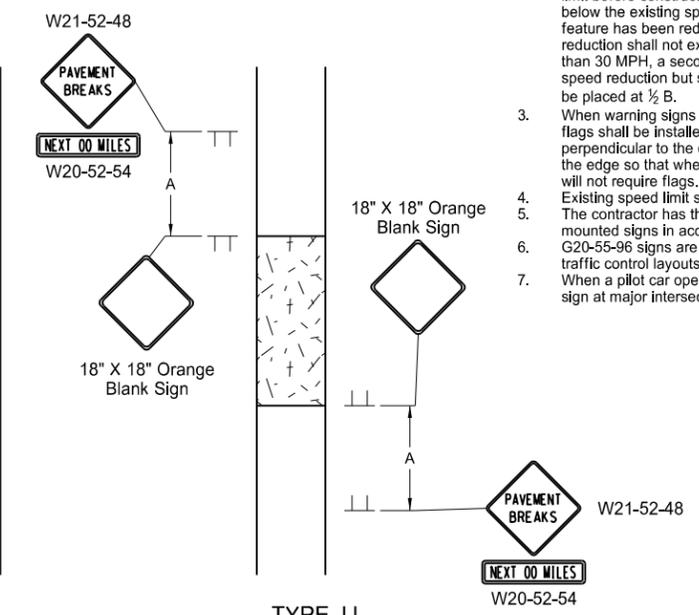
TYPE CC
To be used where the sign conditions exist



TYPE DD
To be used where the sign conditions exist



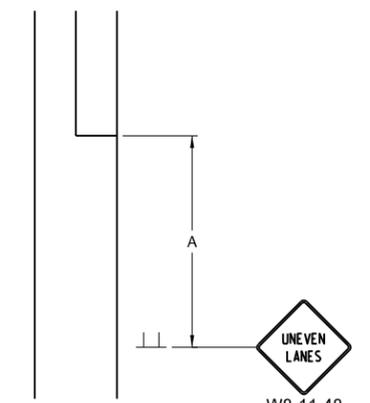
TYPE Z
To be used where speed zone is needed



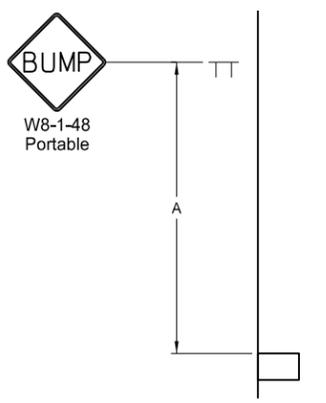
TYPE JJ
To be used where there is a break in the pavement. These signs may be skid mounted or post mounted and shall be installed when conditions exist and removed when not applicable.

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

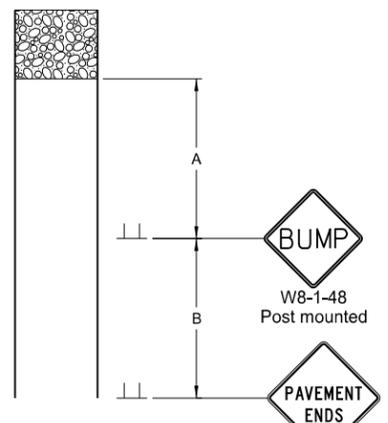
* Posted speed, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.



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



TYPE EE
To be used where the sign conditions exist



TYPE FF
To be used where the sign conditions exist

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

KEY

Sign (represented by a vertical line with a horizontal bar)

Flagger (represented by a square with a diagonal line)

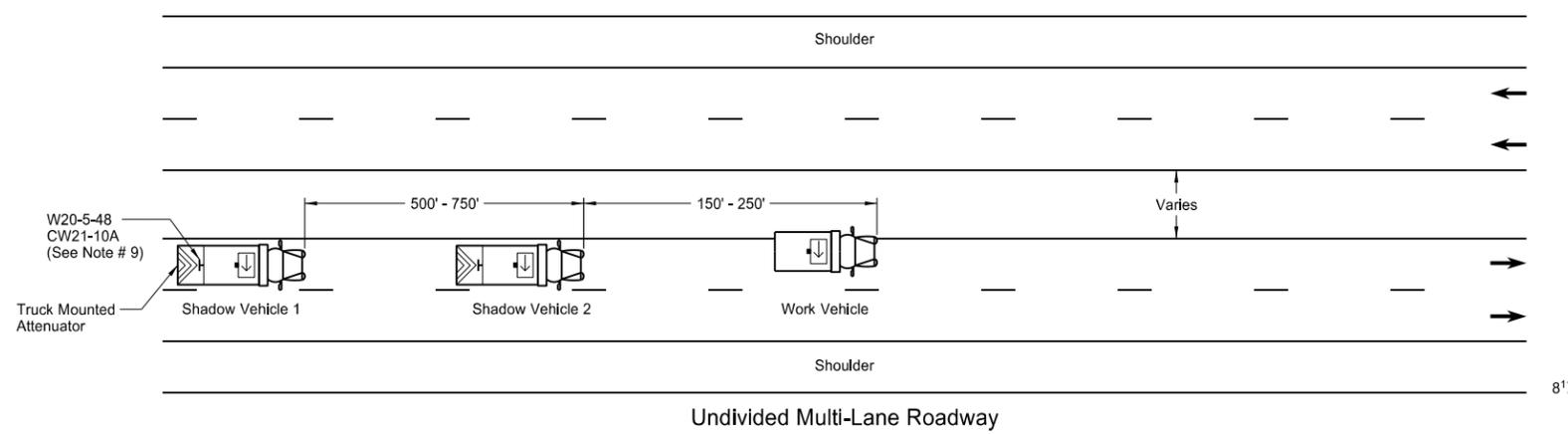
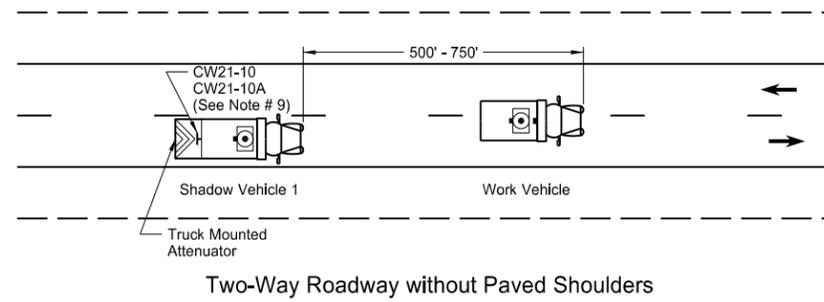
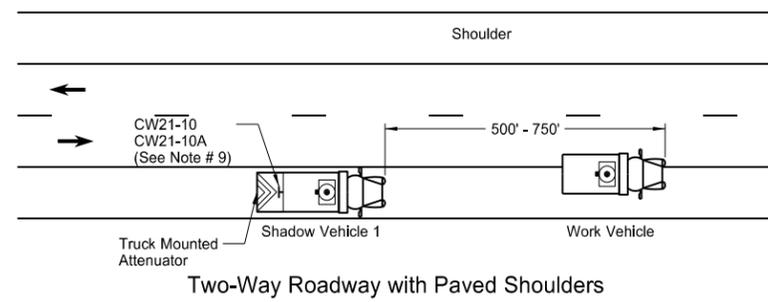
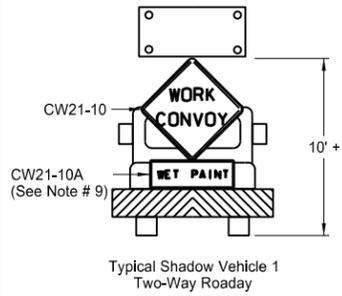
Cones (represented by a triangle)

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| DATE | CHANGE |
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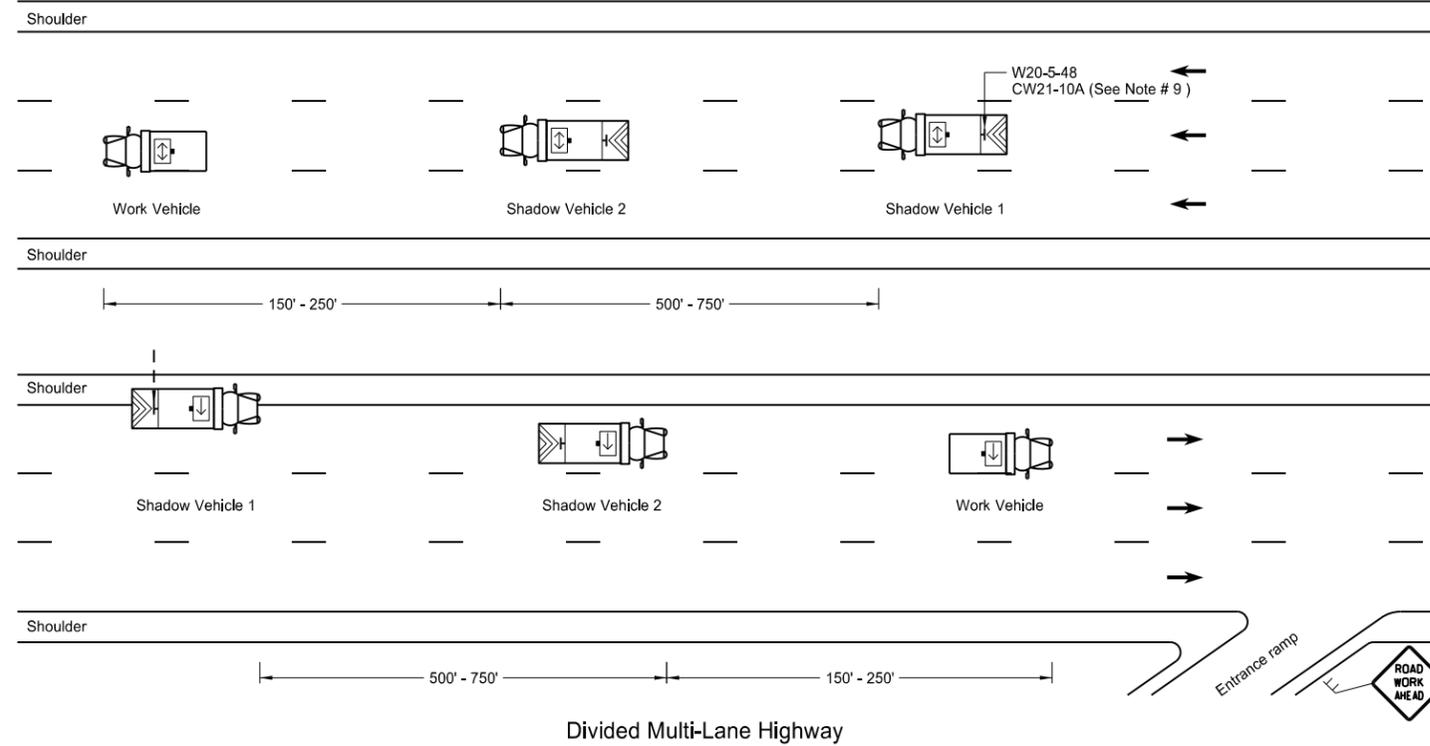
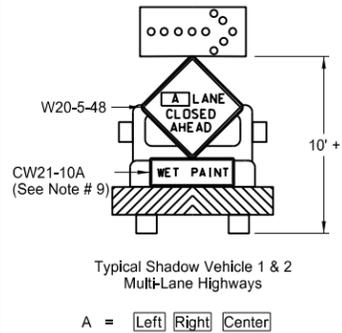
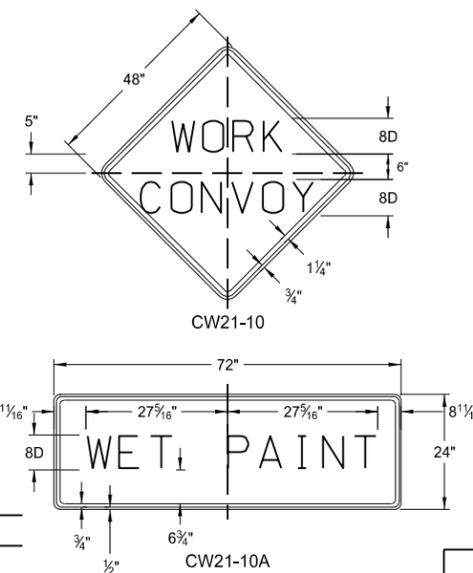
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TRAFFIC CONTROL PLAN FOR MOVING OPERATIONS

D-704-27



Sign Details



Notes

- 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.
- Shadow and work vehicles shall display yellow rotating beacons or strobe lights unless otherwise stated elsewhere in the plans.
- Flashing arrow panels shall be Type B or Type C. The panel operation shall be controlled from inside the vehicle.
- Each vehicle shall have two-way electronic communication capability.
- When work convoys must change lanes, shadow vehicle 1 should change lanes first to shadow other convoy vehicles.
- 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.
- Sign Colors
Letters = Black
Border = Black
Background = Orange
- Shadow vehicle 2 may be used as the paint tender vehicle.
- Sign CW21-10A shall only be used during a painting operation.
- On two lane - two way roadways, the work and shadow vehicles should pull over periodically to allow motor vehicle traffic to pass.

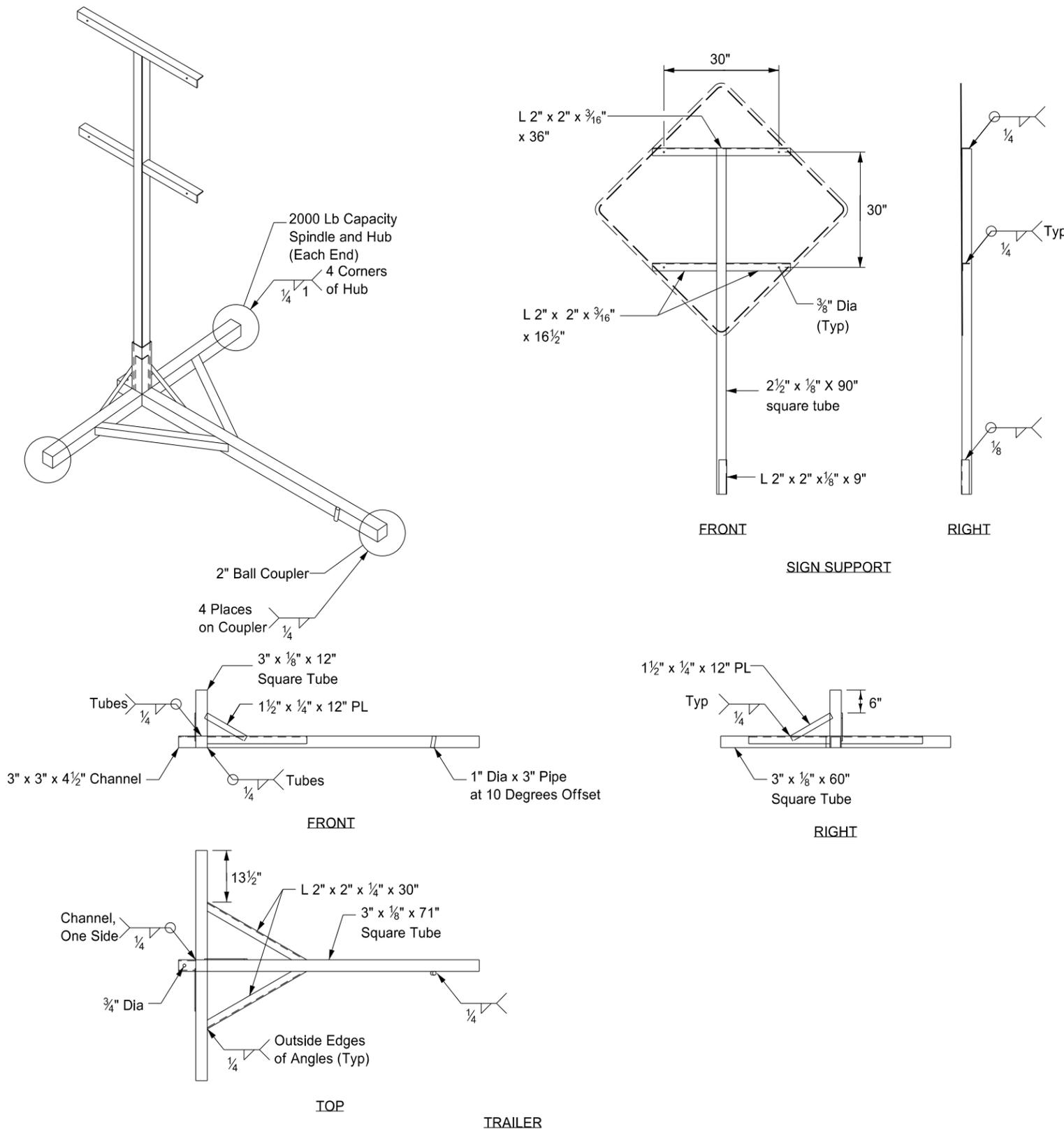
| KEY | |
|-----|--------------------------|
| | Sign |
| | Truck mounted attenuator |
| | Flashing arrow panels: |
| | Right directional |
| | Left directional |
| | Double arrow directional |
| | Caution Mode |

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

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PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



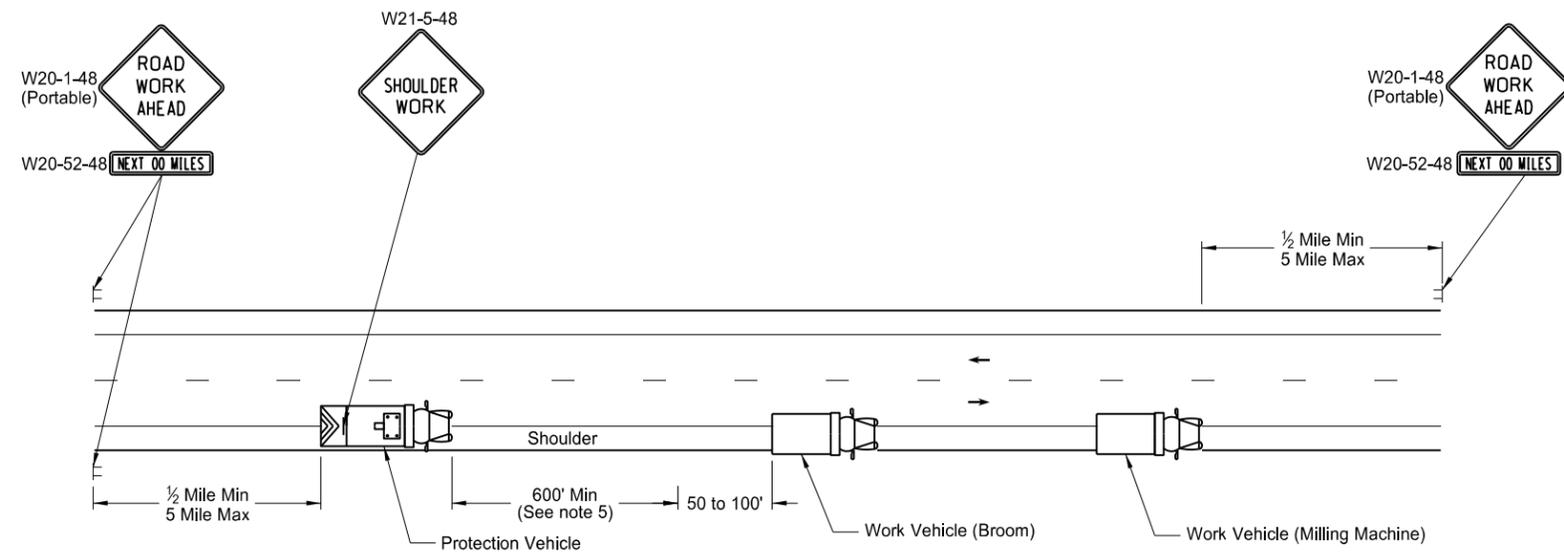
Notes:

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

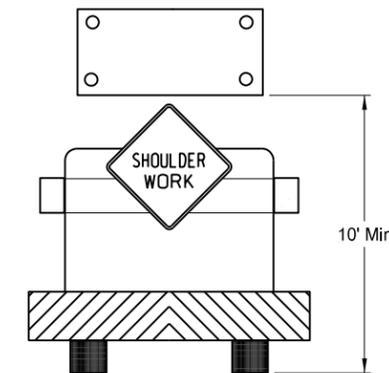
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| 11-23-10 | |
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MOBILE OPERATION
Grinding Shoulder Rumble Strips



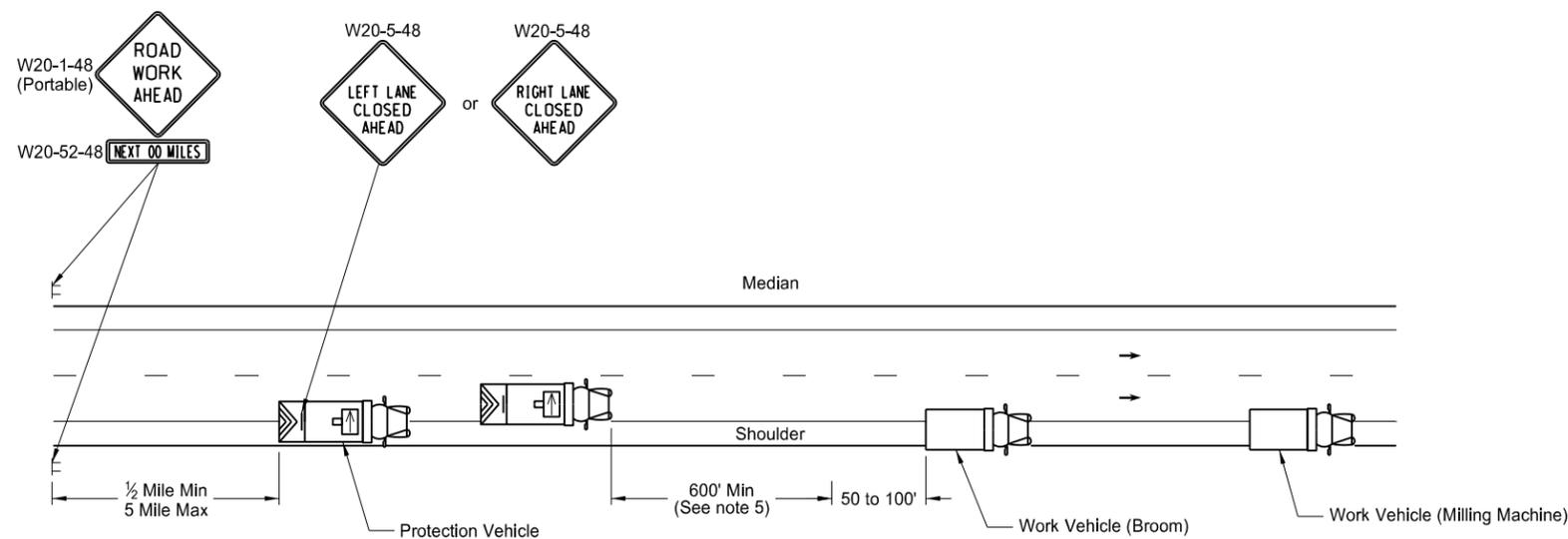
TWO LANE - TWO WAY ROADWAY



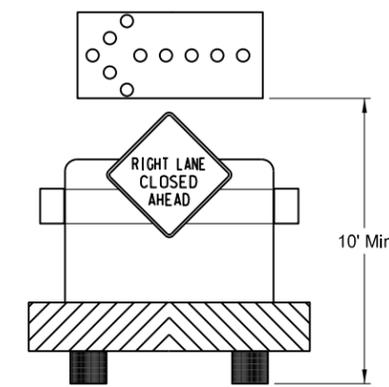
TWO LANE - TWO WAY ROADWAY
Typical Protection Vehicle with
Flashing Arrow Panel In Caution Mode

Notes:

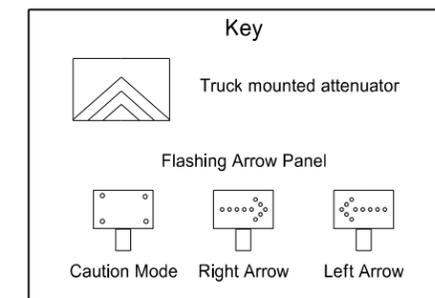
1. If the contractor chooses to place more vehicles in the convoy than are shown, these vehicles shall have the truck mounted attenuator and shall be at the contractors expense.
2. Vehicles shall have a rotating, flashing, oscillating or strobe lights.
3. Flashing arrow panels shall be Type B or Type C. The panel operation shall be controlled from inside the vehicle.
4. Each vehicle shall have two - way electronic communication capability.
5. Vehicle spacing between the protection vehicle and work vehicle will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the protection vehicle in time to slow down and safely pass the work vehicles.
6. ROAD WORK AHEAD SIGN: Advance Road Work Ahead signs shall be moved as the work area moves through the construction zone.
7. Next XX Miles sign required when the distance from Road Work Ahead sign to the work location is two miles or greater.



INTERSTATE & 4 LANE DIVIDED HIGHWAY



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

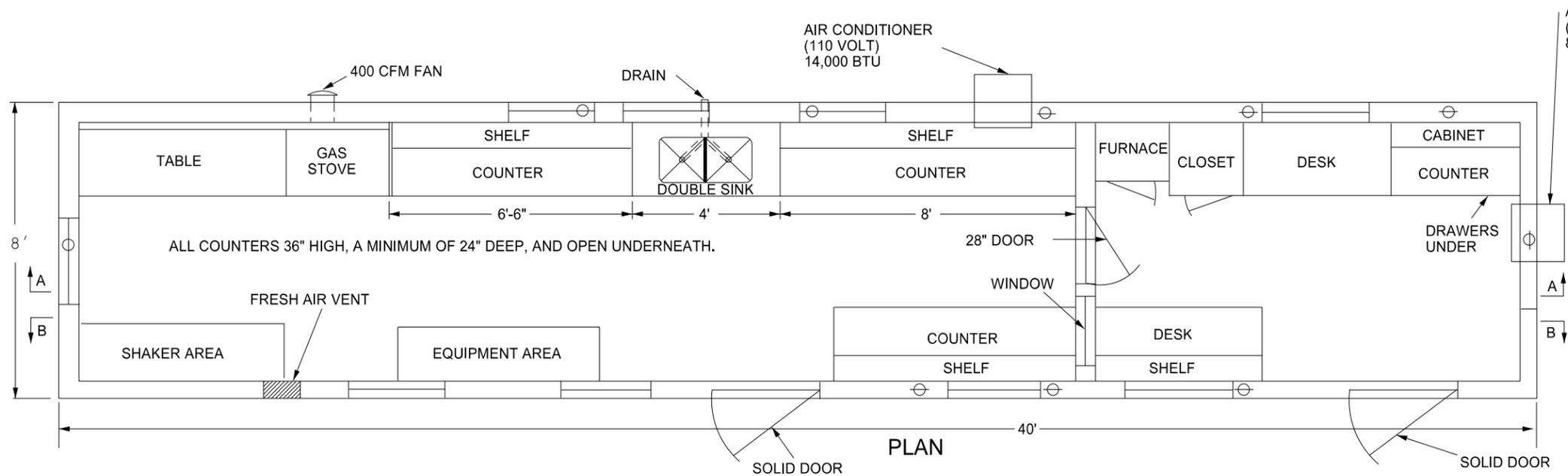


| | |
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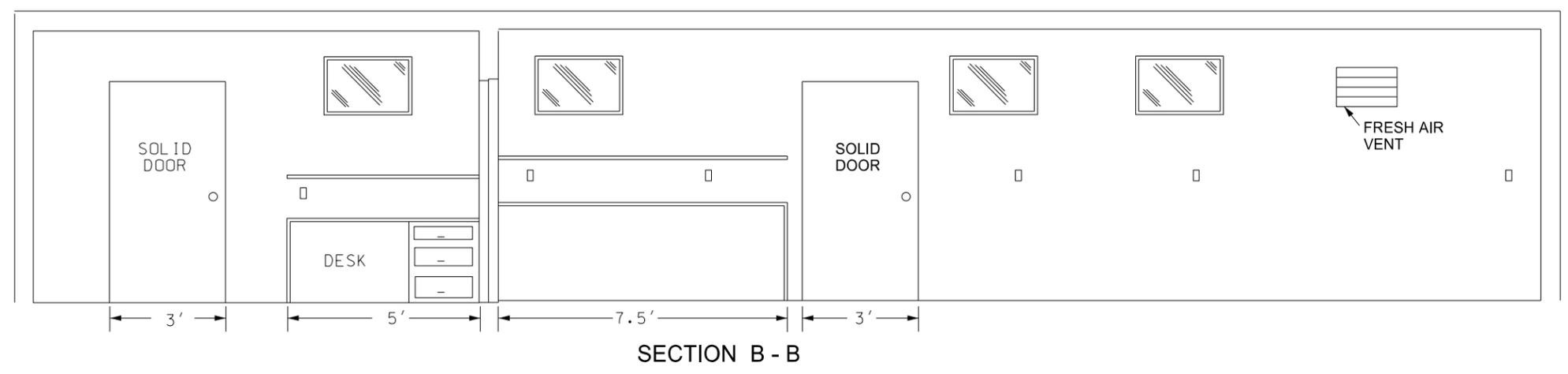
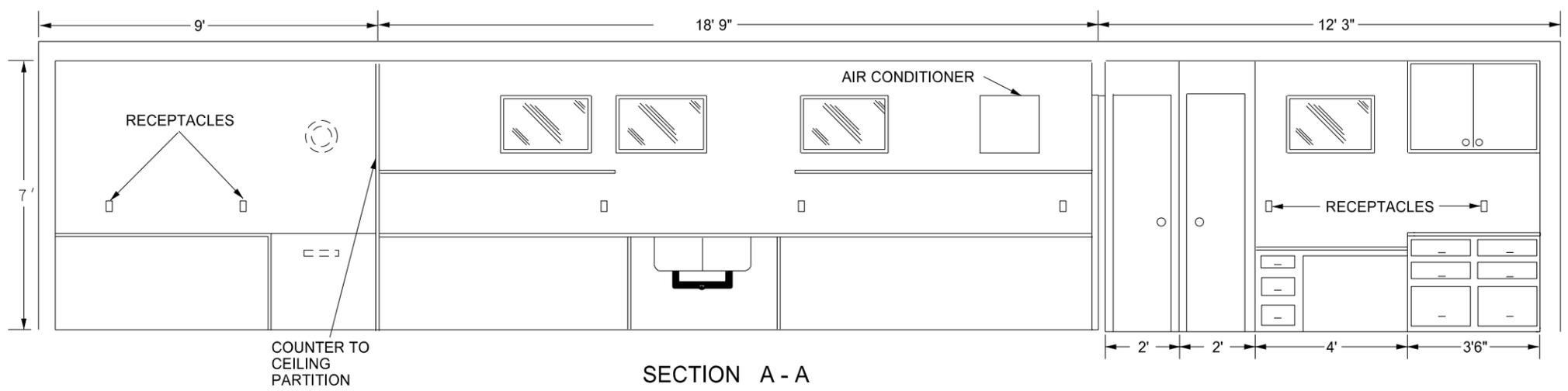
BITUMINOUS LABORATORY

D-706-1



Provide a laboratory with the following:

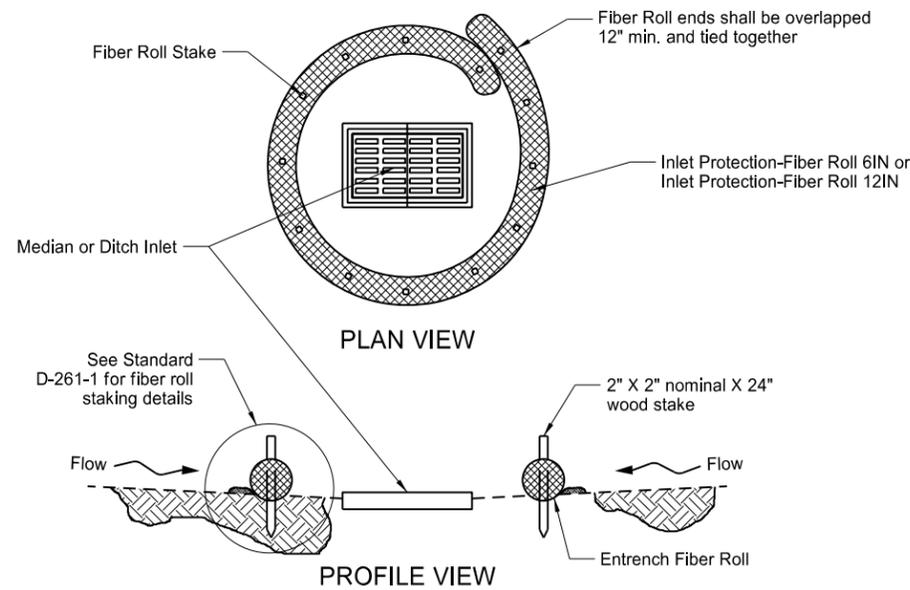
1. A 1'x1' shelf at 36" above the regular countertop.
2. Double compartment stainless steel sink, with each compartment a minimum of 16"x14"x10" deep. Provide water service lines made of copper or plastic and a diameter of 1/2 inch.
3. An exhaust fan capable of removing inside air at a rate of 400 CFM.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



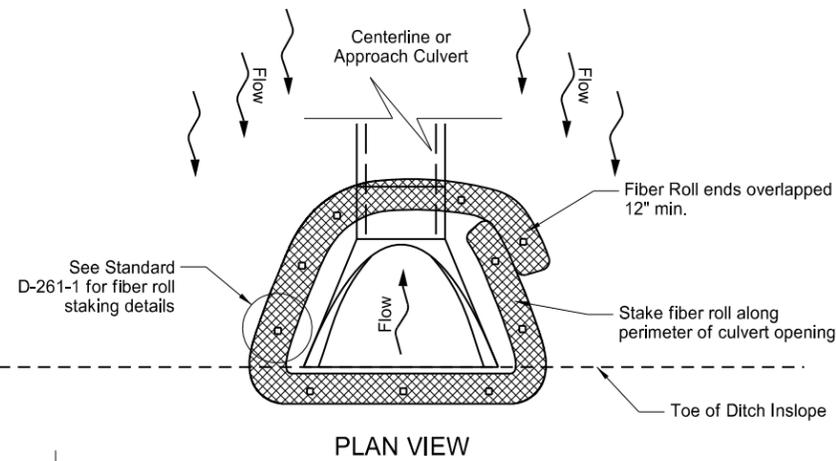
| | |
|--|---|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 10-03-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 07-30-14 | Changed standard's title and revised notes. |
| 01-11-16 | Revised notes. |

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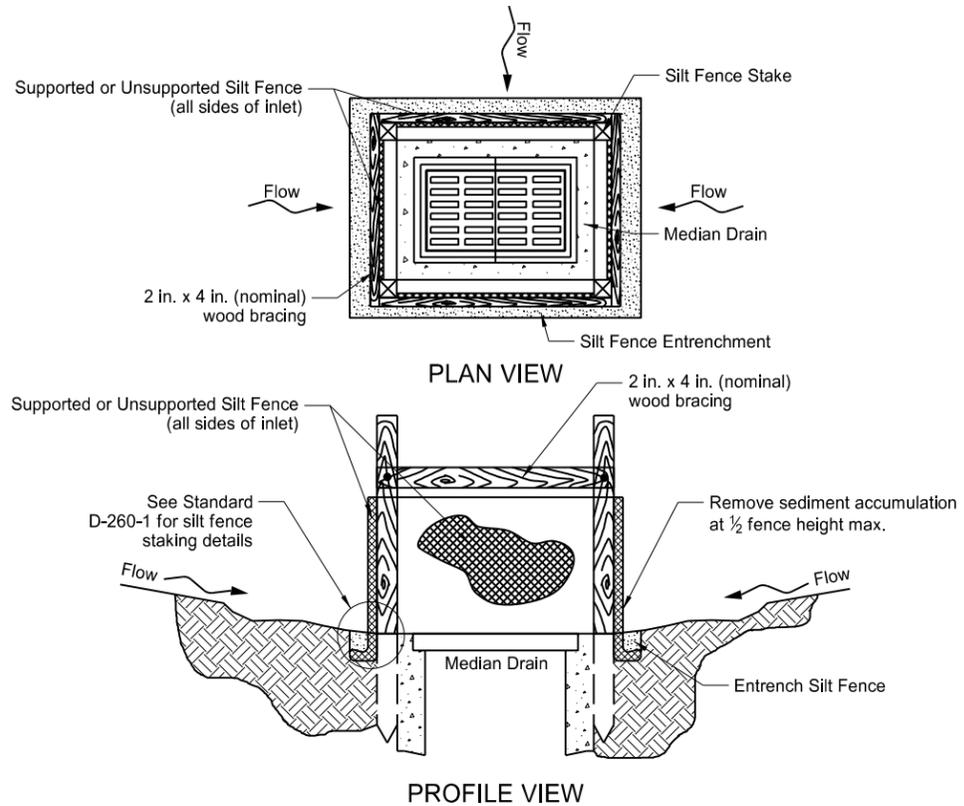
EROSION AND SILTATION CONTROLS
MEDIAN OR DITCH INLET PROTECTION



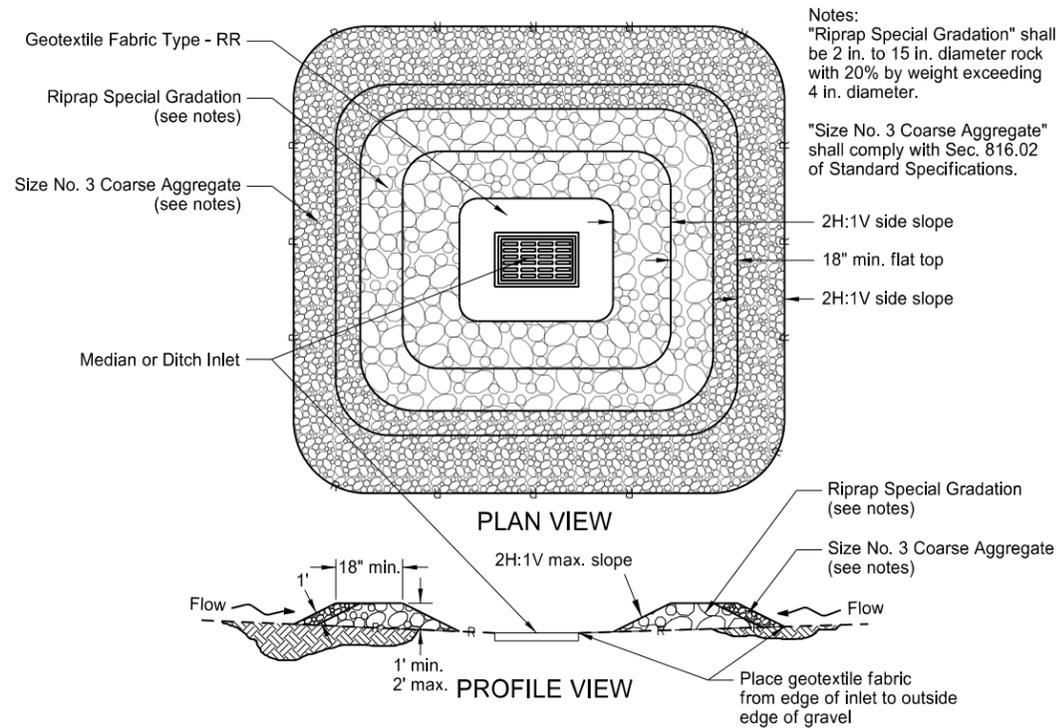
FIBER ROLL PROTECTION (MEDIAN OR DITCH INLET)



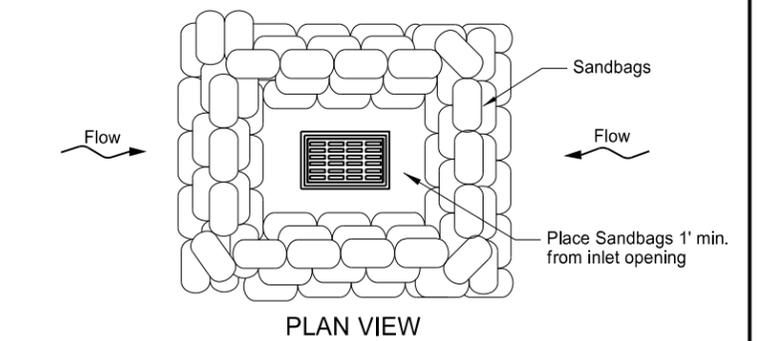
FIBER ROLL PROTECTION (INLET OF CULVERT)



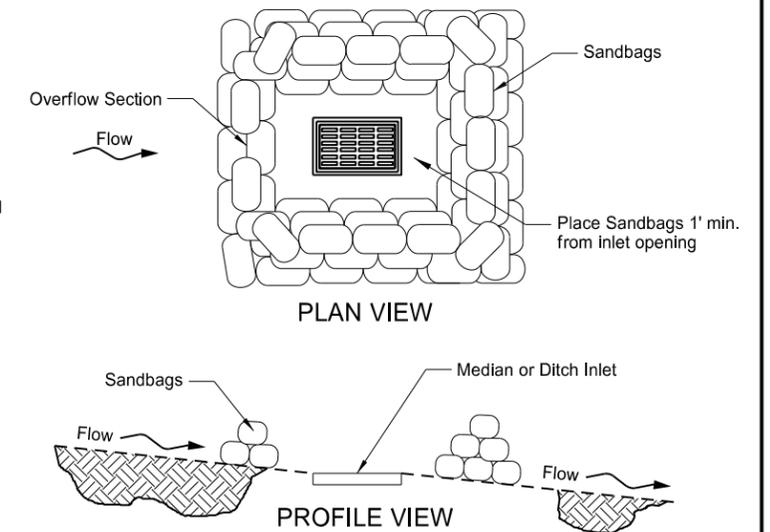
SILT FENCE PROTECTION (MEDIAN OR DITCH INLET)



GRAVEL INLET PROTECTION (MEDIAN OR DITCH INLET)



SANDBAG PROTECTION (LOW POINT)



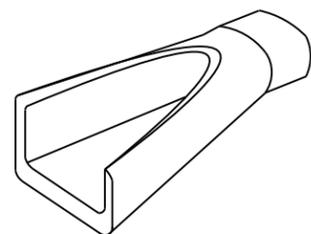
SANDBAG PROTECTION (ON SLOPE)

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

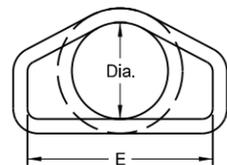
| | |
|--|--|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 10-03-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 06-26-14 | Updated reference to standard drawing number for fiber roll staking details. |
| 10-01-14 | Updated reference to standard drawing number for silt fence. |

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REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS
(Round Pipe)

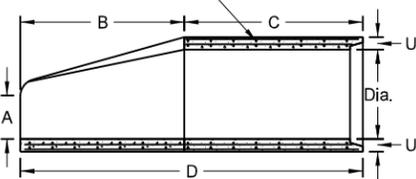


PERSPECTIVE

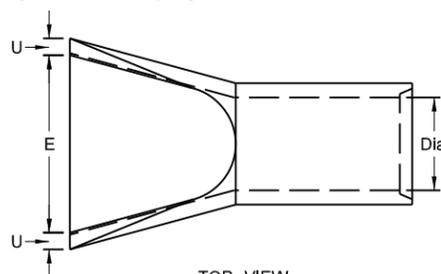


END VIEW

Standard Reinforcement for Class III pipe reinforced as per AASHTO M170



SIDE VIEW

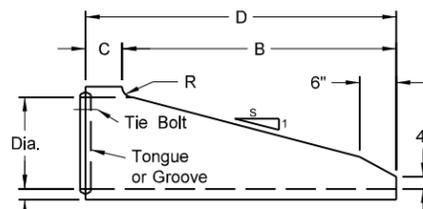


TOP VIEW

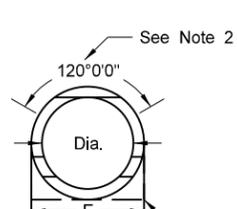
REINFORCED CONCRETE PIPE - FLARED END SECTION

Reinforcement to be equivalent to Class III RCP

| TRAVERSABLE END SECTION | | | | | | | |
|-------------------------|-------|-----|-------|--------|-----|-----|---|
| DIA | B | C | D | E | F | R | S |
| 15" | 4' | 9" | 4'-9" | 1'-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 |



SIDE VIEW



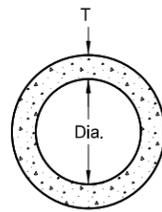
END VIEW

NOTES (Traversable End Section):

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

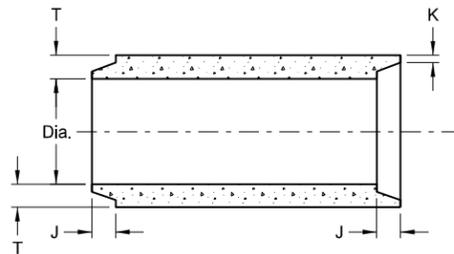
REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION

Reinforcement to be equivalent to Class III RCP

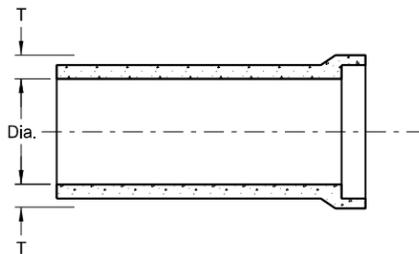


END VIEW

CIRCULAR PIPE

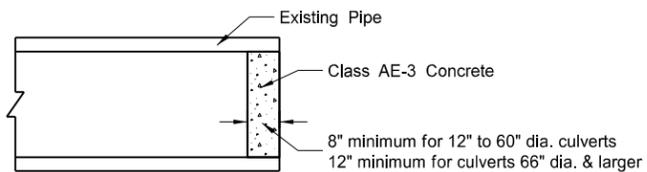


TONGUE & GROOVE JOINT



BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE



CONCRETE PIPE PLUG

| FLARED END SECTION | | | | | | |
|---------------------|---------|--------|--------|--------|--------|-----|
| TERMINAL DIMENSIONS | | | | | | |
| DIA | A | B | C | D | E | U |
| 12 | 0'-4" | 2'-0" | 4'-0½" | 6'-0½" | 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'-9½" | 8'-2½" | 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" |

All Classifications of Round Concrete Pipe

| Internal Dia. of Pipe (In.) | Cross-Sectional Water Area (Sq. ft.) | Weight per Lin. Foot of Pipe (Lbs.) | Joint Groove End (In.) | Joint Tongue End (In.) | Minimum Wall Thickness (In.) |
|-----------------------------|--------------------------------------|-------------------------------------|------------------------|------------------------|------------------------------|
| 12 | 0.79 | 92 | 1½-2¾ | ¾ | 2 |
| 15 | 1.23 | 127 | 1¾-2¾ | ¾ | 2½ |
| 18 | 1.77 | 168 | 1¾-2¾ | 1 | 2½ |
| 21 | 2.40 | 214 | 1¾-3¾ | 1½ | 2¾ |
| 24 | 3.14 | 265 | 2¾-3¾ | 1½ | 3 |
| 27 | 3.98 | 322 | 2¾-4 | 1¾ | 3¼ |
| 30 | 4.91 | 384 | 3¾-4¼ | 1¾ | 3½ |
| 33 | 5.94 | 452 | 3¾-4¼ | 1½ | 3¾ |
| 36 | 7.07 | 524 | 3¾-4¼ | 1½ | 4 |
| 42 | 9.62 | 685 | 3¾-4¼ | 1¾ | 4½ |
| 48 | 12.57 | 885 | 3¾-4¼ | 1¾ | 5 |
| 54 | 15.90 | 1070 | 4½-5½ | 2 | 5½ |
| 60 | 19.63 | 1296 | 4½-5½ | 2¼ | 6 |
| 66 | 23.76 | 1542 | 5-6 | 2½ | 6½ |
| 72 | 28.27 | 1810 | 5½-6¾ | 2½ | 7 |
| 78 | 33.18 | 2098 | 6¼-7¼ | 2½ | 7½ |
| 84 | 38.48 | 2410 | 5½-7¼ | 3¾ | 8 |
| 90 | 44.18 | 2793 | 6¾-8½ | 3¾ | 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).

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.

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DEPARTMENT OF TRANSPORTATION

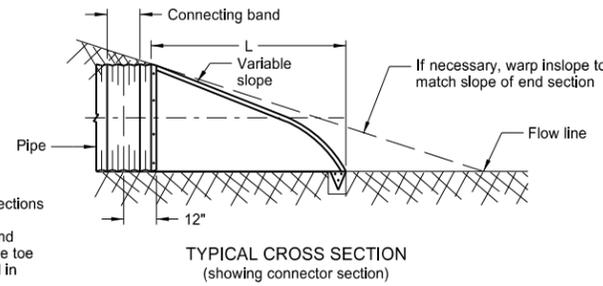
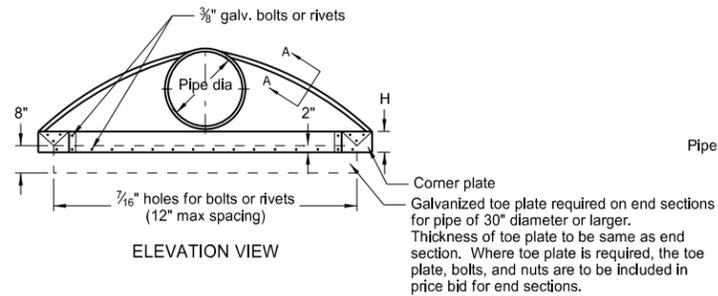
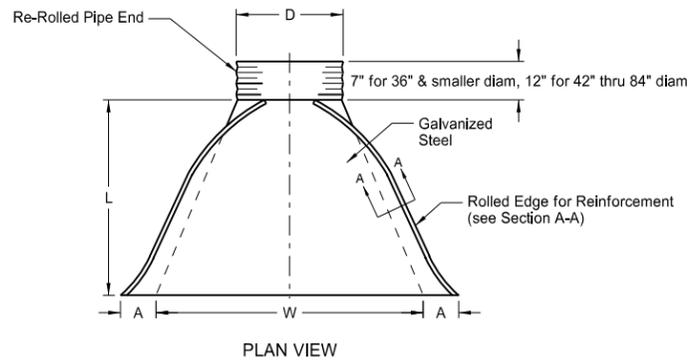
05-12-14
REVISIONS

| DATE | CHANGE |
|----------|----------------|
| 01-21-15 | Revised Note 5 |

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ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

D-714-4



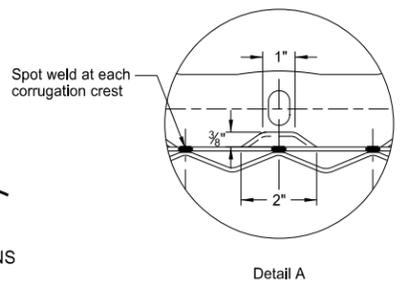
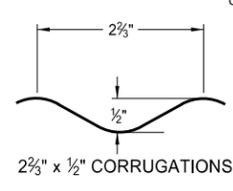
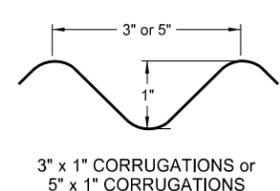
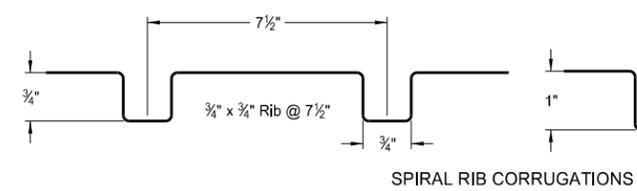
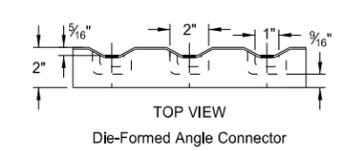
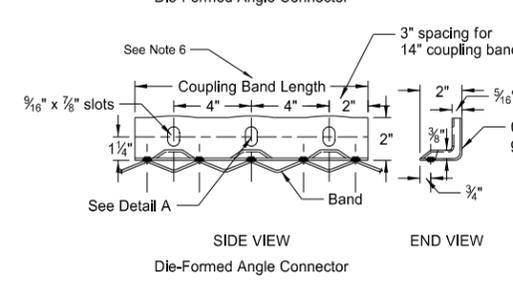
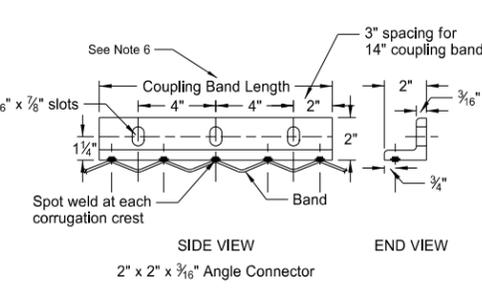
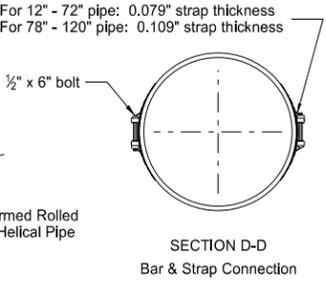
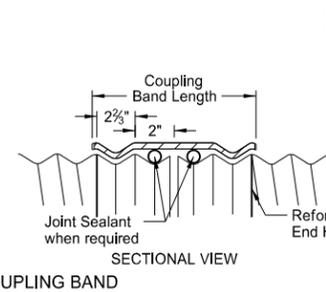
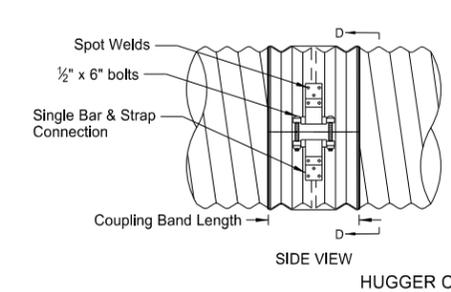
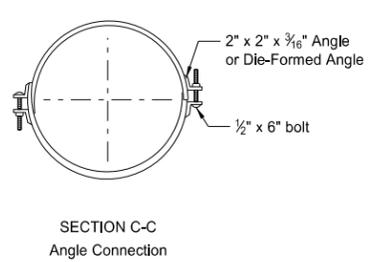
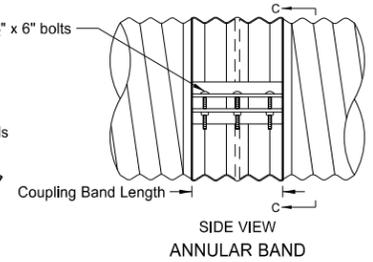
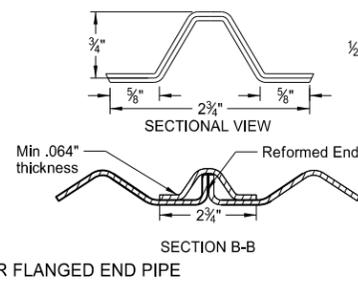
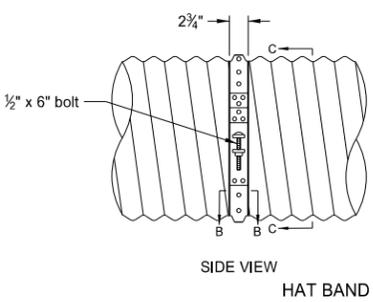
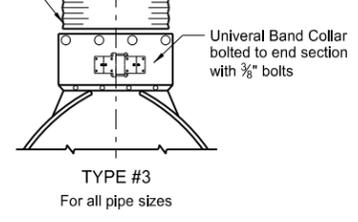
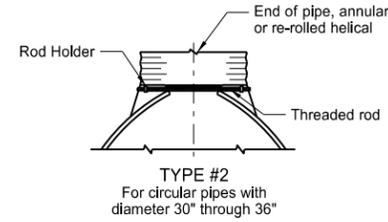
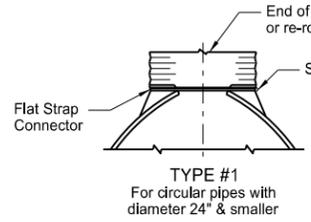
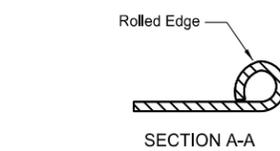
| PIPE DIA. IN | GALV. THICK. | END SECTION DIMENSIONS | | | | | APPROX. SLOPE | BODY PIECE |
|--------------|--------------|------------------------|------|------|------|------|---------------|------------|
| | | A IN | B IN | H IN | L IN | W IN | | |
| 15 | 0.064 | 7 | 8 | 6 | 26 | 30 | 2 1/2:1 | 1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

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

| COUPLING BAND DIMENSIONS | | | | |
|--------------------------|----------------------------|------------|----------------------|---------------------|
| COUPLING TYPE | CORRUGATION PITCH x DEPTH | PIPE SIZE | COUPLING BAND LENGTH | MIN. BAND THICKNESS |
| Hat Band | 2 3/8" x 1/2" | 12" - 48" | 2 3/4" | .064" |
| Annular Band | 2 3/8" x 1/2" | 12" - 72" | 12" | .052" |
| | | 78" - 84" | 12" | .079" |
| Hugger Band | 2 5/8" x 1/2" Rerolled End | 12" - 72" | 10 1/2" | .052" |
| | | 78" - 84" | 10 1/2" | .079" |
| | 3" x 1" Rerolled End | 48" - 120" | 10 1/2" | .052" |
| | 5" x 1" Rerolled End | 48" - 120" | 12" | .064" |

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

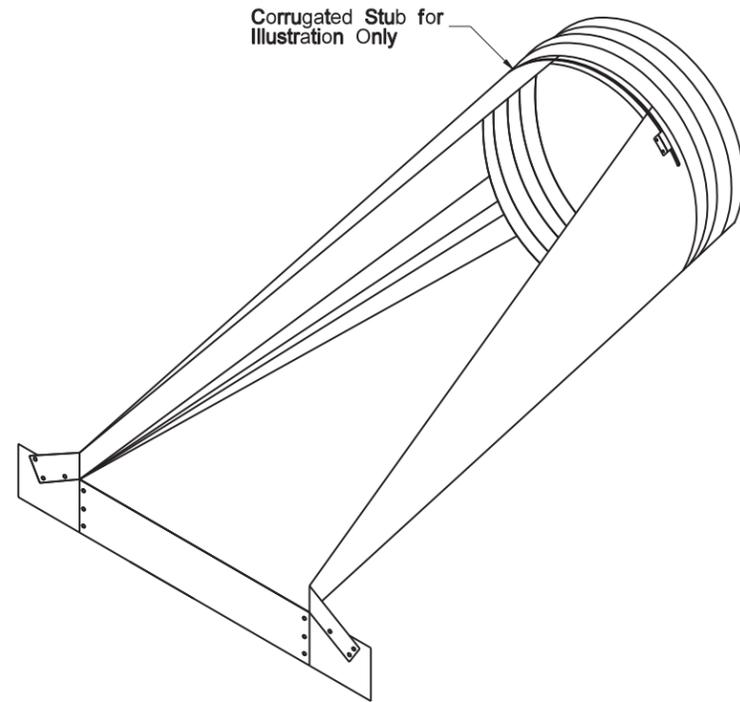
- NOTES:
1. Pipes and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
 2. Top edge of all end sections to have rolled edges for reinforcement (see Section A-A). The reinforced edges are to be supplemented with 2" x 2" x 1/4" galv. angle for 60" through 72" dia. and 2 1/2" x 2 1/2" x 1/4" galv. angle for 78" and 84" dia.. Angles to be attached by galv. 3/8" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
 3. 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.
 4. 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.
 5. 1/2" x 8" bolts may be used as a substitute for the 1/2" x 6" bolts shown in the details.
 6. 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.
 7. Length of spot welds shall be minimum 1/2".



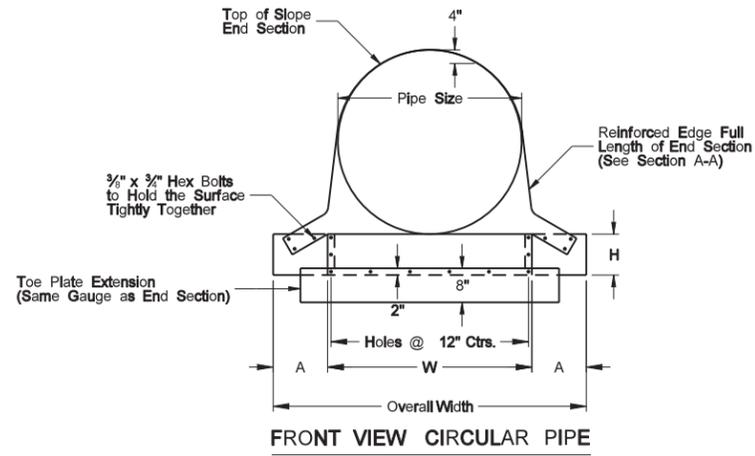
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|----------------------------|
| 08-06-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 01-07-14 | End Section Plan View |
| 02-27-14 | 3" x 1" Corrugation Detail |

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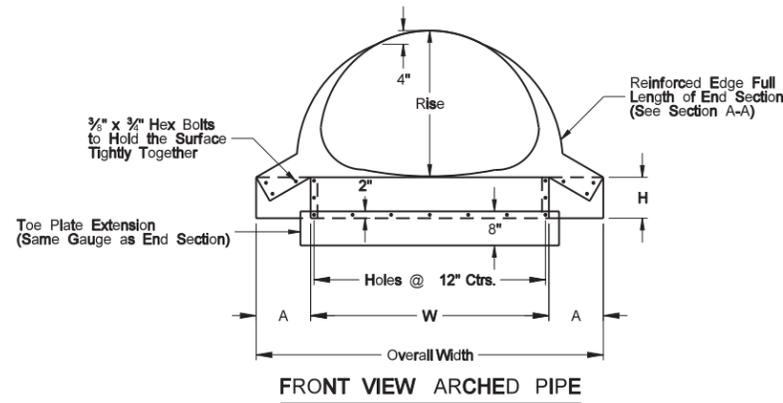
TRAVERSABLE END SECTIONS FOR CORRUGATED STEEL PIPE CULVERTS



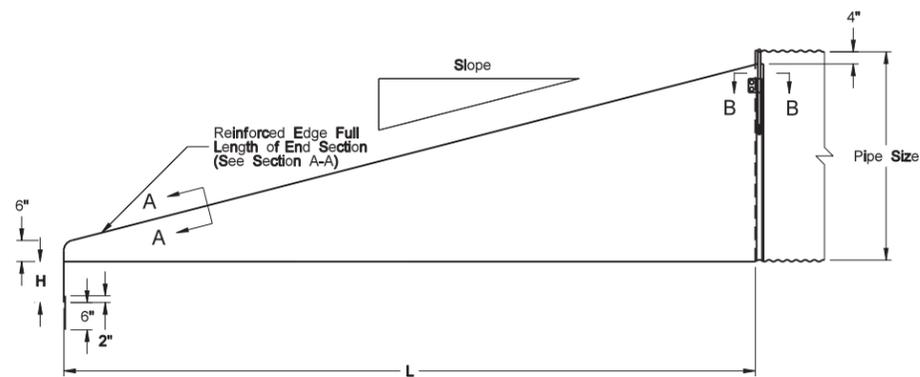
ISOMETRIC VIEW



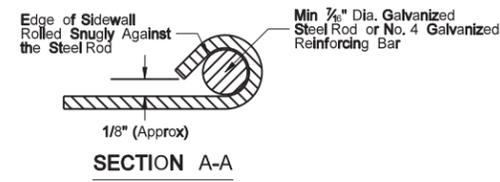
FRONT VIEW CIRCULAR PIPE



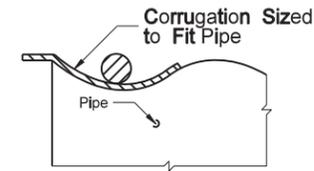
FRONT VIEW ARCHED PIPE



SIDE VIEW



SECTION A-A



SECTION B-B

TRAVERSABLE END SECTIONS FOR CIRCULAR PIPES

| Pipe Dia. (in.) | Min. Thick. | | Dimensions (inches) | | | | L Dimensions | | | |
|-----------------|-------------|-------|---------------------|---|----|---------------|--------------|--------------|-------|--------------|
| | in. | Gauge | A | H | W | Overall Width | Slope | Length (in.) | Slope | Length (in.) |
| 15 | .064 | 16 | 8 | 6 | 21 | 37 | 4:1 | 20 | 6:1 | 30 |
| 18 | .064 | 16 | 8 | 6 | 24 | 40 | 4:1 | 32 | 6:1 | 48 |
| 24 | .064 | 16 | 8 | 6 | 30 | 46 | 4:1 | 56 | 6:1 | 84 |
| 30 | .109 | 12 | 12 | 9 | 36 | 60 | 4:1 | 80 | 6:1 | 120 |

TRAVERSABLE END SECTIONS FOR ARCHED PIPES

| Equiv. Dia. (in.) | (inches) | | Min. Thick. | | Dimensions (inches) | | | | L Dimensions | | | |
|-------------------|----------|------|-------------|-------|---------------------|---|----|---------------|--------------|--------------|-------|--------------|
| | Span | Rise | in. | Gauge | A | H | W | Overall Width | Slope | Length (in.) | Slope | Length (in.) |
| 18 | 21 | 15 | .064 | 16 | 8 | 6 | 27 | 43 | 4:1 | 20 | 6:1 | 30 |
| 21 | 24 | 18 | .064 | 16 | 8 | 6 | 30 | 46 | 4:1 | 32 | 6:1 | 48 |
| 24 | 28 | 20 | .064 | 16 | 8 | 6 | 34 | 50 | 4:1 | 40 | 6:1 | 60 |

Note: See Standard Drawing D-714-04 for end section to pipe details.

For 15", 18" and 24" diameter end sections, 1/2" diameter rod, or strap type connection to corrugated steel pipe shall be used.

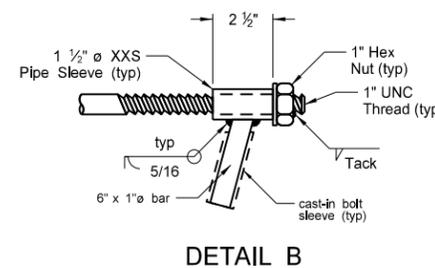
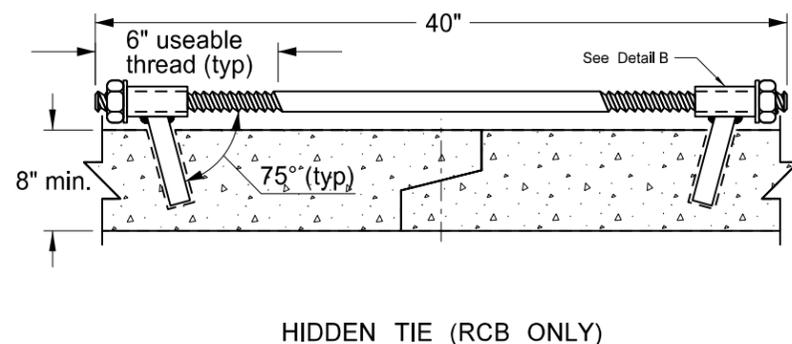
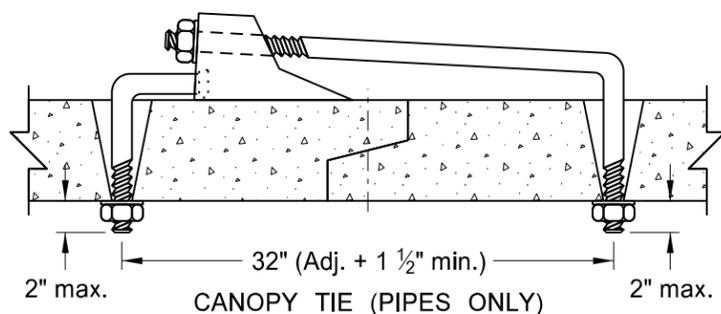
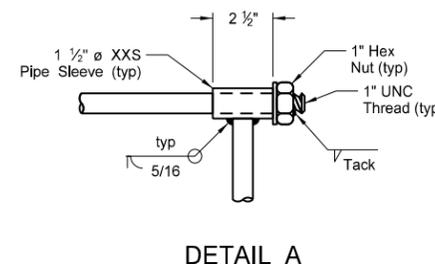
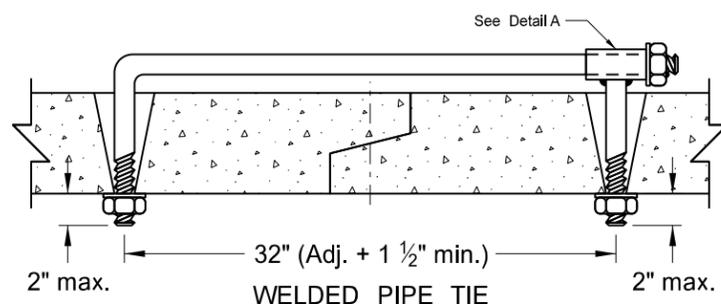
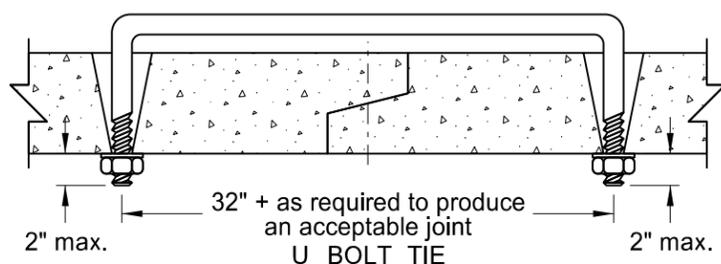
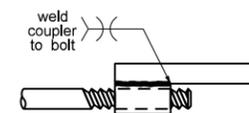
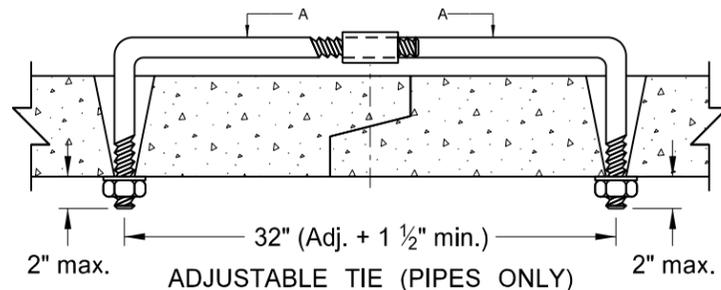
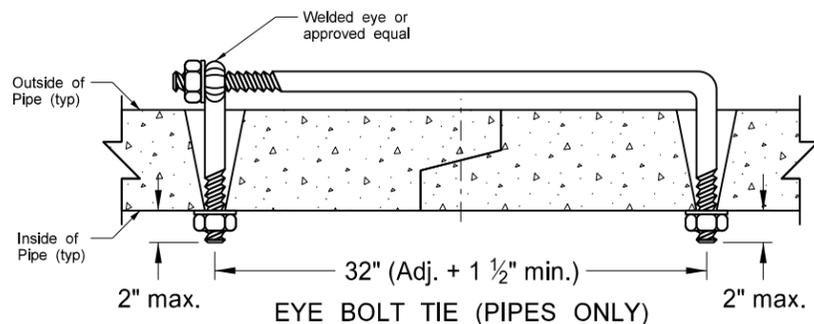
For 30" diameter round end sections, rod type connection to corrugated steel pipe, using 5/8" diameter rod shall be used.

For arched pipe end sections (21" X 15" through 28" X 20"), rod type connection to corrugated steel pipe, using 1/2" diameter rod shall be used.

| | |
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| 07-23-09 | |
| REVISIONS | |
| DATE | CHANGE |

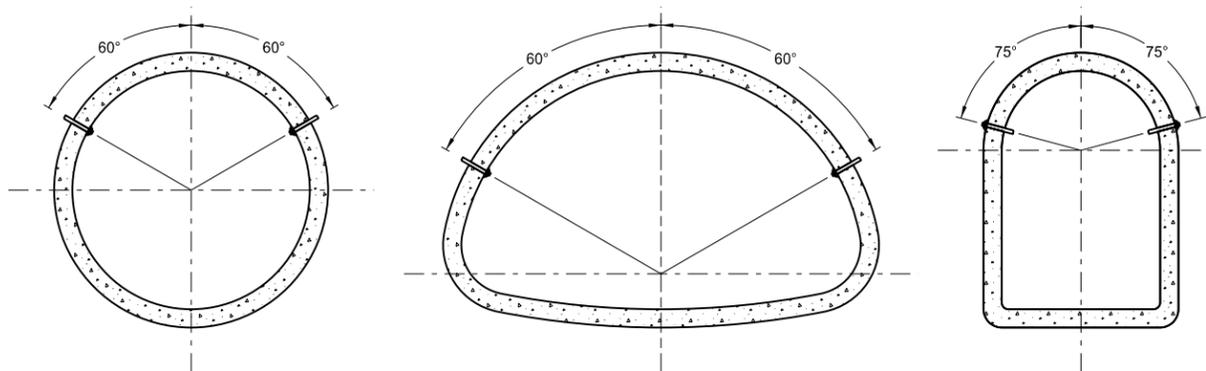
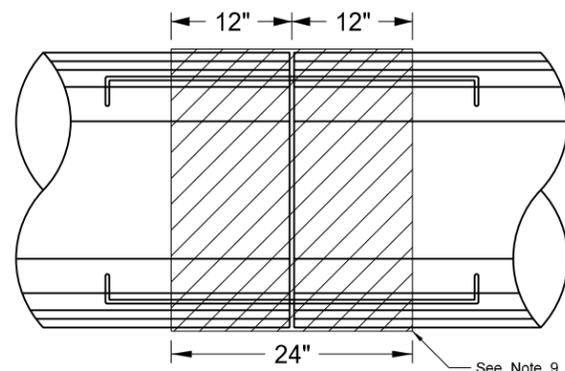
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CONCRETE PIPE OR PRECAST CONCRETE BOX CULVERT TIES



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

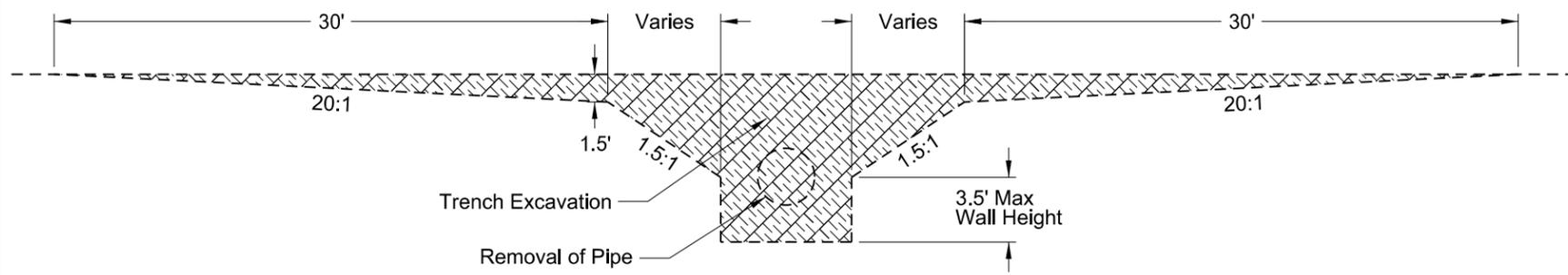
- NOTES:
- The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
 - Nuts and washers are not required on Jacked and Bored pipes or pipes with a 24" diameter or less. Where nuts and washers are not used, the tie bars shall be inserted and grouted into place.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



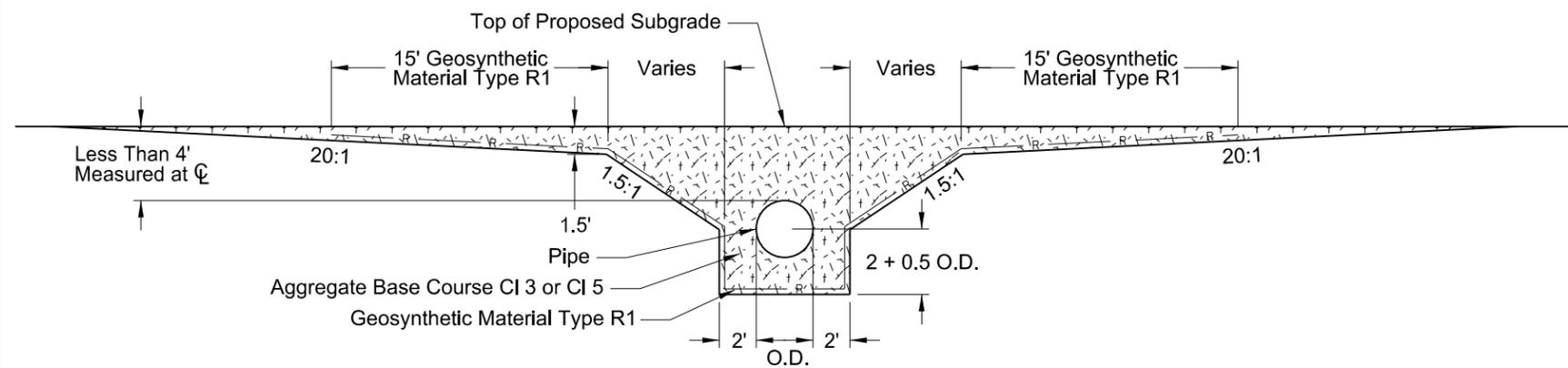
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| 3-18-14 | |
| REVISIONS | |
| DATE | CHANGE |
| 7-21-15 | Note 8 |

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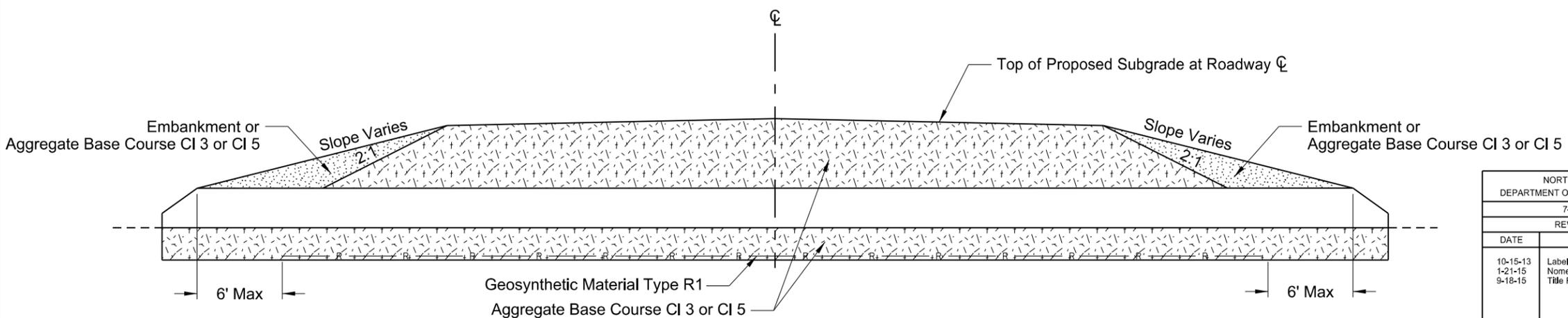
TRANSVERSE MAINLINE PIPE INSTALLATION DETAIL
PIPES 4 FEET OR LESS BELOW TOP OF SUBGRADE



EXCAVATION DETAIL



INSTALLATION DETAIL



CROSS SECTION

Pay Items

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

*Included in Pipe Pay Item

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

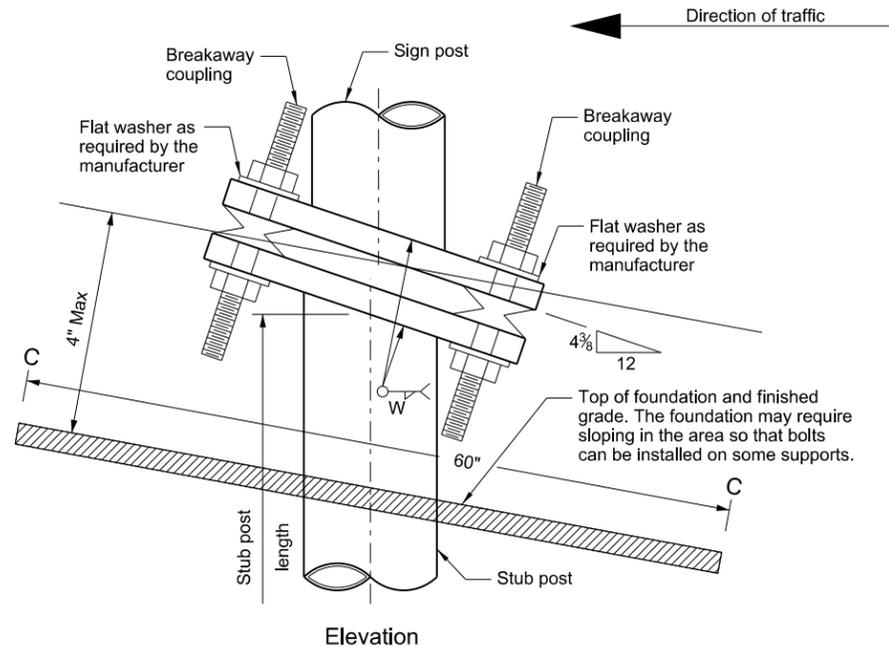
NOTES:

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

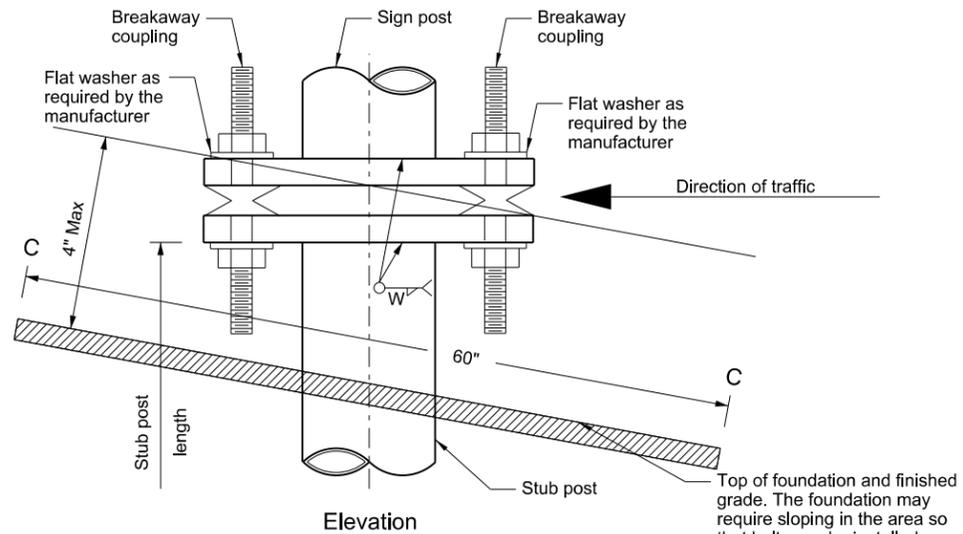
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|--|---|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 7-26-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 10-15-13 1-21-15 9-18-15 | Label Formatting Nomenclature Title Rewording |

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Ron Homer,
Registration Number
PE-2087,
on 9/18/2015 and the original document is stored at the North Dakota Department of Transportation

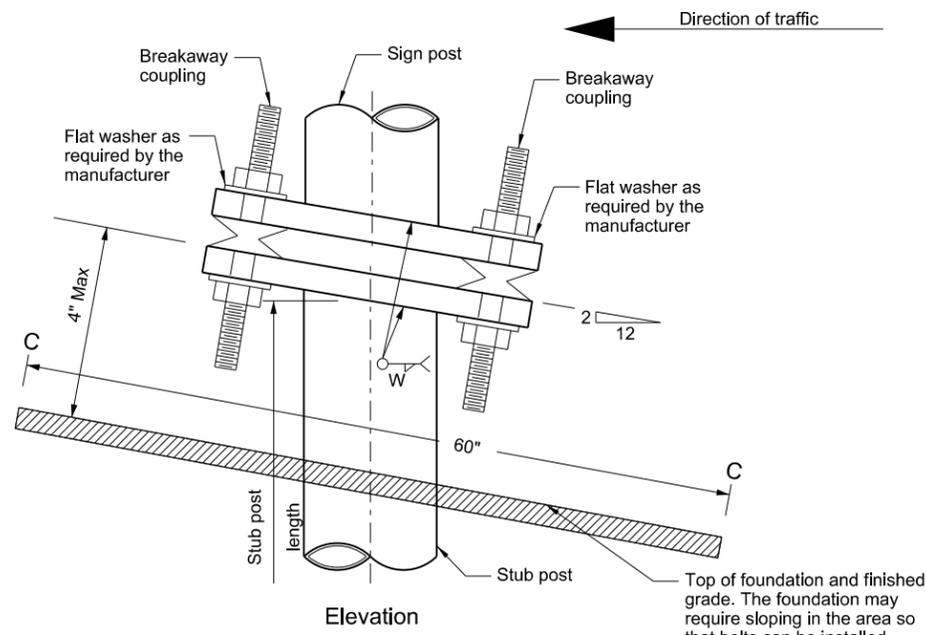
Breakaway Coupler System for Standard Pipe Stub Post



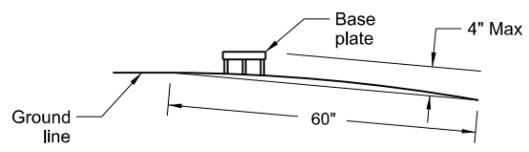
Single Post Sign and Stub Post Type A



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



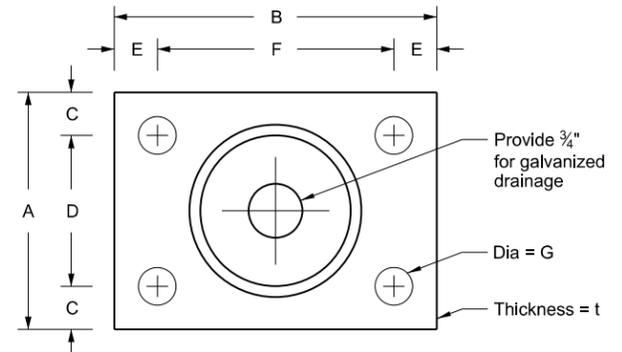
Two Post Sign and Stub Post For signs with less than 8' post spacing Type B



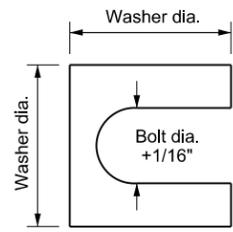
Section C - C
Max. protection of the stub post is 4" above a 60" chord aligned radially to the center line of the highway and connecting any point, within the length of the chord, on the ground surface on one side of the support to a point in the ground surface on the other side.

Notes:

- 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.
- 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.
- Shim as required to plumb post.
- Tighten all bolts the maximum possible with 12" to 15" wrench.



Plan Base Plate



Shim Detail

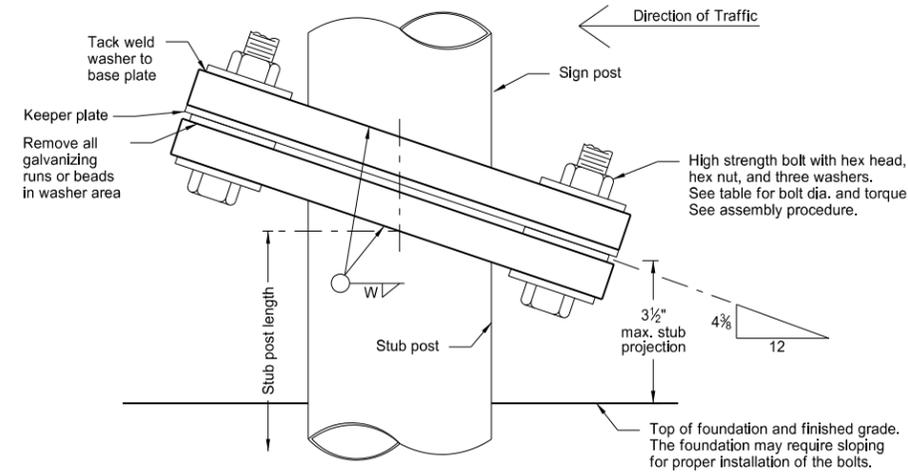
Furnish 2 - .012"± thick and 2 - .032"± thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.

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

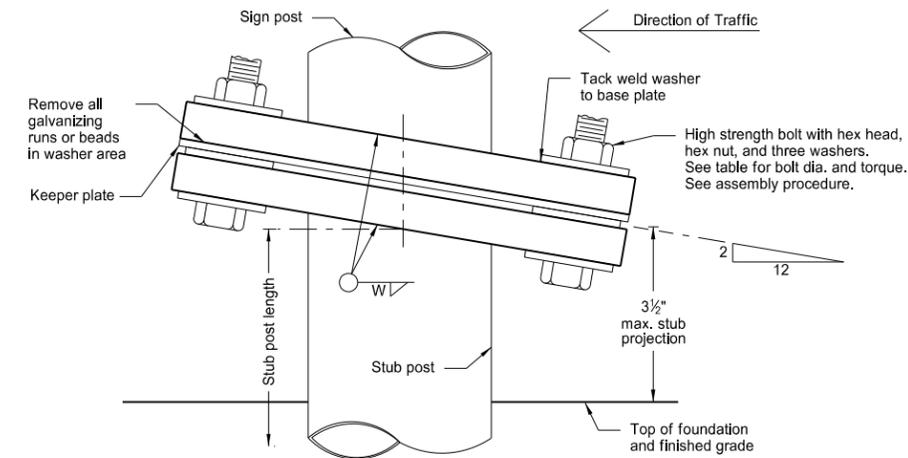
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| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 10-3-2013 | |
| REVISIONS | |
| DATE | CHANGE |

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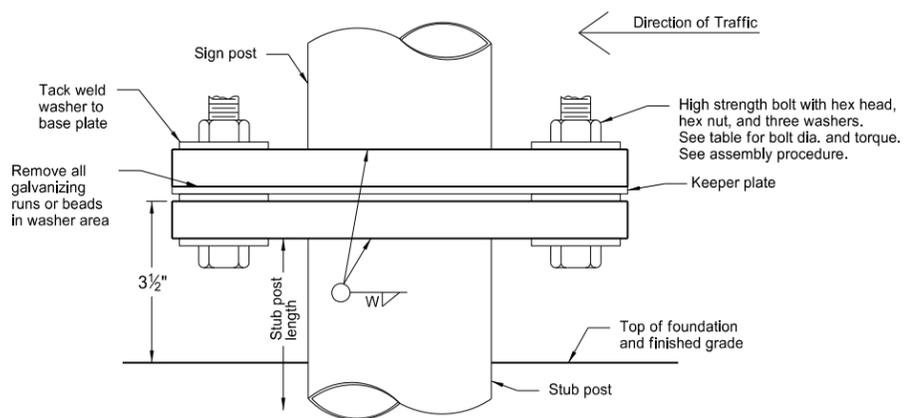
Breakaway System for Standard Pipe Stub Post



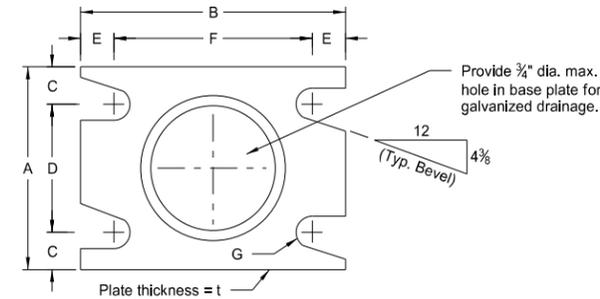
Stub Post Connection - Type A
Elevation View
(Single Post)



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

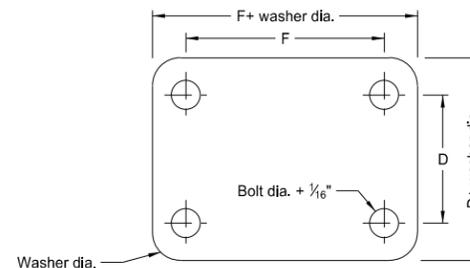


Stub Post Connection - Type C
Elevation View
(Two Posts)



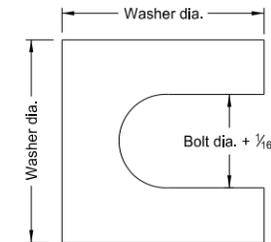
Base Plate Plan View

The bevel shall be toward the roadway on the approach side and away on the other.



Keeper Plate Detail

Keeper plate shall be placed above the center washer between the top and bottom slip bases. Keeper plate shall be fabricated from 28 gauge material, galvanized after fabrication conforming to ASTM A653 G60 coating.



Shim Detail

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

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 D5363-03 (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 3/32" | 1" | 7/16" | 2'-0" |
| 6" | 1"x4 1/4" | 61 | 7 1/2" | 11 1/4" | 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 3/32" | 1" | 1/2" | 2'-0" |
| 6" | 1"x4 1/4" | 61 | 7 1/2" | 11 1/4" | 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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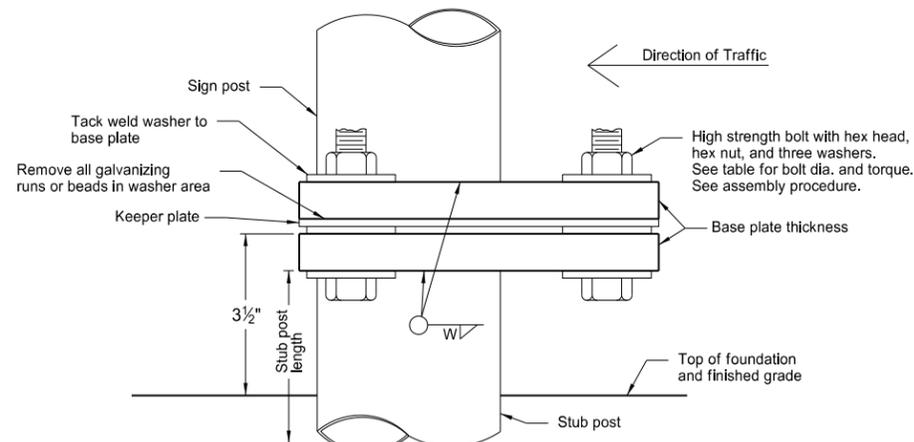
Multi-Directional Breakaway System for Standard Pipe Stub Post

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

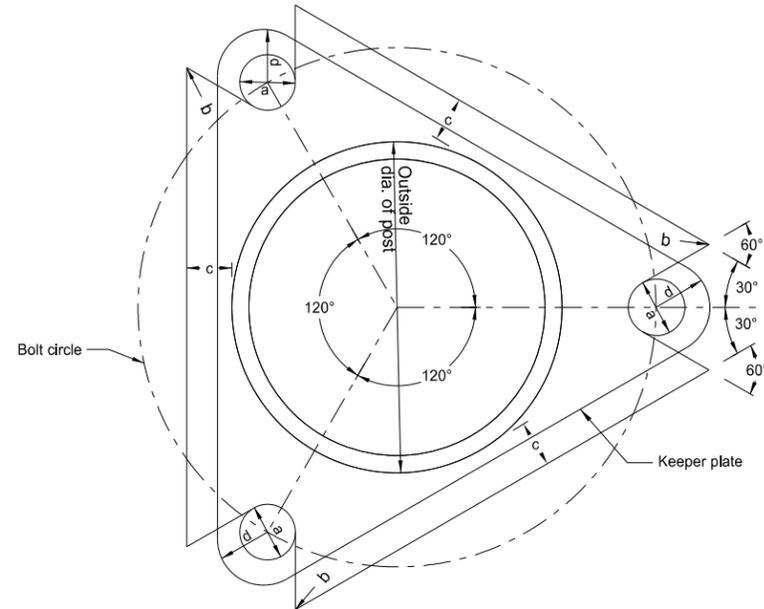
Use standard drawing D-754-6 for fuse plate, hinge plate, and foundation details.

Assembly Procedure:

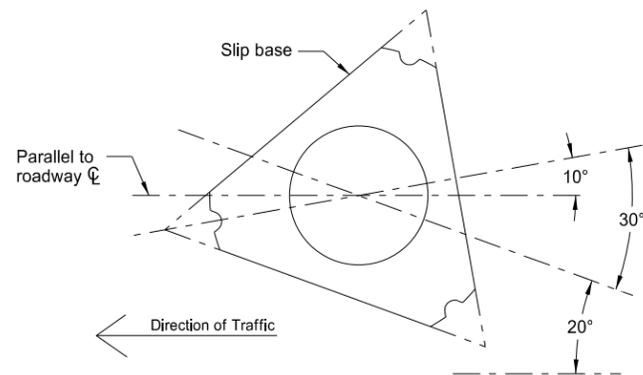
1. Assemble post to stub with bolts and with one flat washer between base plates and keeper plate.
2. Shim as required.
3. Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and shims and to clean bolt threads, then loosen.
4. Retighten bolts in a systematic order to prescribed torque. (see table)
5. Loosen each bolt and apply thread locking liquid resin. The liquid locking resin shall conform to ASTM D5363-03 (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.



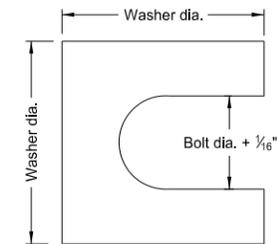
Stub Post Connection - Type D
Elevation View
(Single Post)



Stub Post Detail
Top View



Slip Base Orientation
Top View



Shim Detail

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

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

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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.

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

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Hinge Plate, Fuse Plate and Foundation Details for Standard Pipe

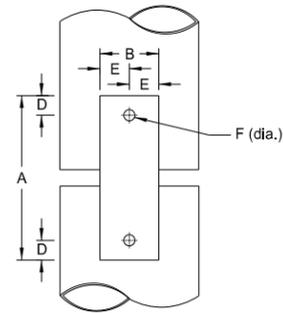
Notes:
Fuse joints cuts for steel posts may be cut after galvanizing and cut surface shall be treated with an approved method meeting ASTM A780 or the cut may be galvanized after fabrication. Aluminum posts will not require treatment.

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

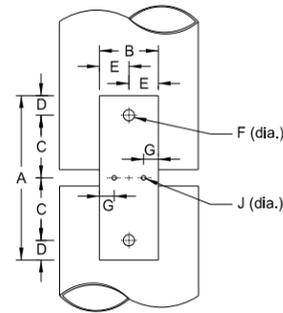
The vertical clearance of the break-away base, 4" height and 60" clearance, shall be made above and below post location, and also back and ahead of post.

Assembly Procedure:

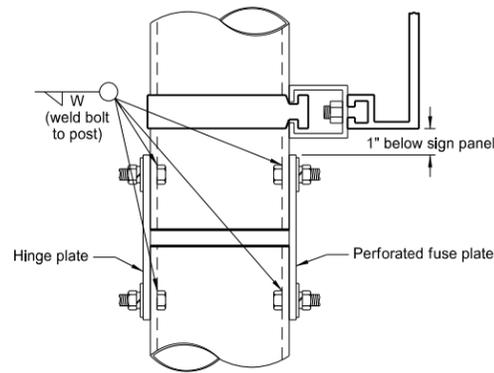
1. Assemble hinge plate to post with bolts and one flat washer and lock washer under nut.
2. Tighten all bolts the maximum possible with 12" to 15" wrench.



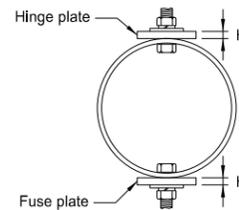
Hinge Plate



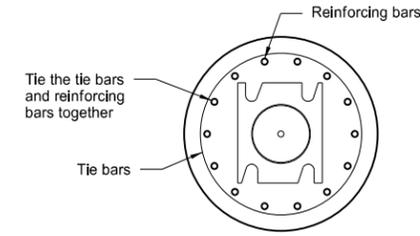
Perforated Fuse Plate



Side View

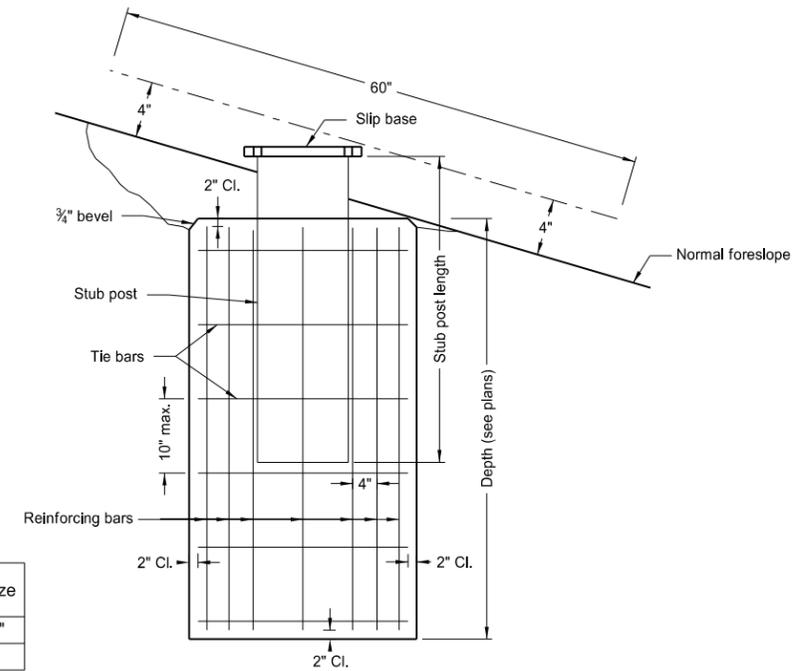


Top View



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" | 3 1/2"-4" |
| 1'-9" | 5"-6" |

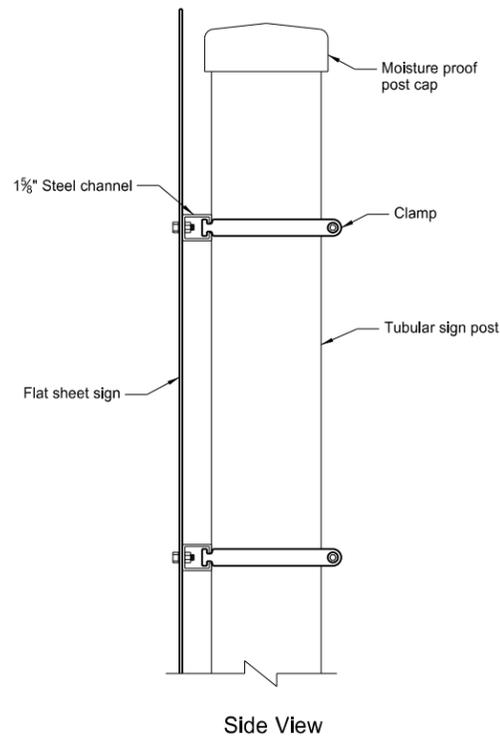
| Round Metal Posts | | | | | | | |
|-------------------|------------------|-----------------|--------------------|-----------------------|------------------------------------|----------------------------------|-----------------------------------|
| Dimensions | | | | Properties | | | |
| Nominal dia.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

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

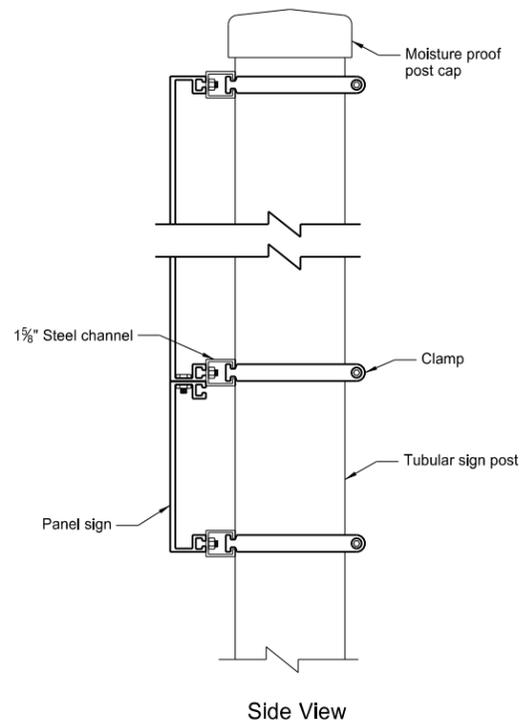
| | |
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| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 2-28-14 | |
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| DATE | CHANGE |

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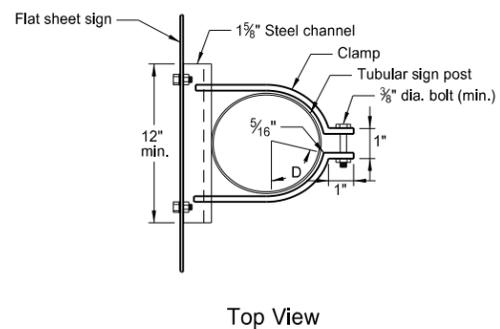
PIPE SUPPORT AND SIGN MOUNTING DETAILS



Side View

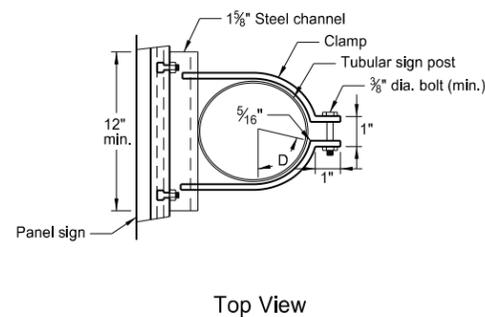


Side View



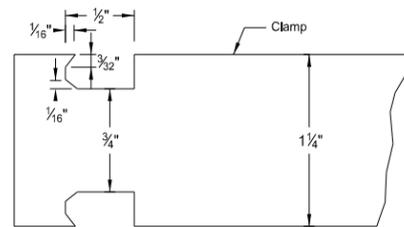
Top View

Flat Sheet Sign Clamp Mounting Details

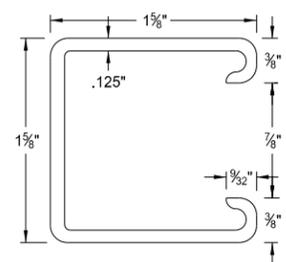


Top View

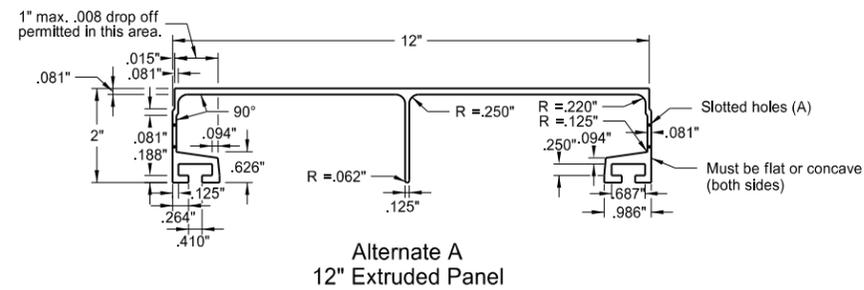
Panel Sign Clamp Mounting Details



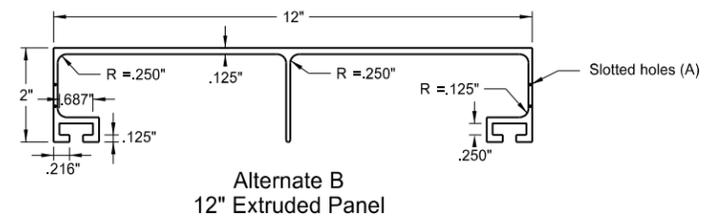
Clamp Detail



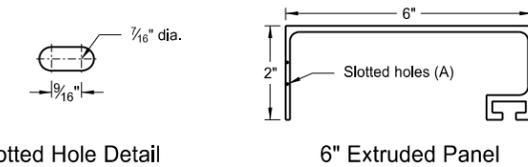
Steel Channel Detail



Alternate A
12" Extruded Panel



Alternate B
12" Extruded Panel



6" Extruded Panel

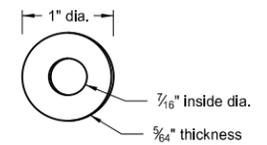
Slotted Hole Detail

Aluminum Panel Details

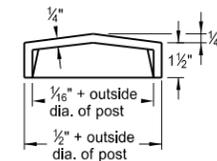
(A) Slotted holes shall be punched in the aluminum panels at 1'-0" on center, spacing from end as listed below:

| | |
|----------------------------|------------|
| 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. |

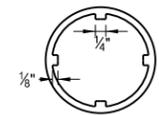
Wall thickness = .078" unless specified otherwise.
All inside and outside corners = .031" radius unless specified otherwise.



Flat Washer Detail



Side View



Top View

Post Cap Detail

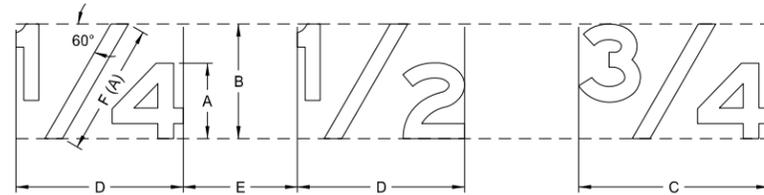
Post caps shall be furnished for all steel or aluminum posts.
In place of post cap, a 1/8" plate welded all around may be used.

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

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

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|--------|
| 2-21-14 | |
| REVISIONS | |
| DATE | CHANGE |
| | |

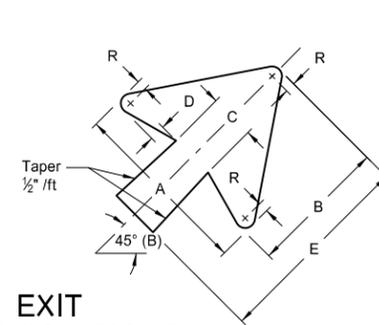
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SIZE OF THE FRACTION IS DETERMINED AS FOLLOWS:

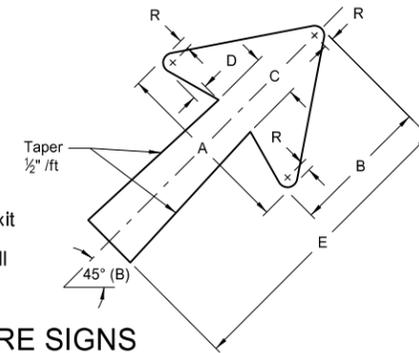
| SYMBOL | TITLE | RATIO TO HEIGHT OF CAPITAL OR UPPER CASE |
|--------|-------------------------|--|
| A | Letter height | 1.0 of capital or upper case |
| B | Fraction height | 1.5 X A |
| C | Fraction width | 2.5 X A |
| D | Fraction width | 2 X A |
| E | Space to next character | 1 to 1.5 X A |
|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

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



EXIT DIRECTION SIGNS

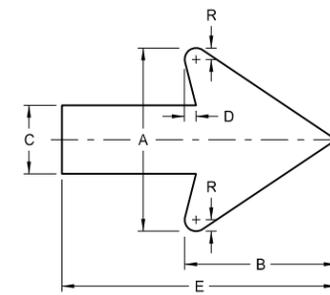
| LETTER SIZE (Upper Case) | A | B | C | D | E | R |
|--------------------------|---------|----------|--------|---------|-----|---------|
| 8" | 15 1/8" | 11 1/16" | 3 3/4" | 1 5/16" | 17" | 1 3/16" |
| 10" - 13 1/3" | 18 1/4" | 14" | 4 1/2" | 1 1/2" | 20" | 3/4" |
| 16" - 20" | 22 1/4" | 17" | 5 3/8"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



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

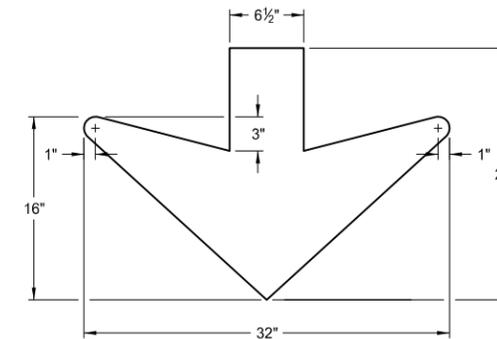
GORE SIGNS

| "EXIT" LETTER SIZE (Upper Case) | A | B | C | D | E | R |
|---------------------------------|---------|----------|--------|---------|-----|---------|
| 8" | 15 1/8" | 11 1/16" | 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" |

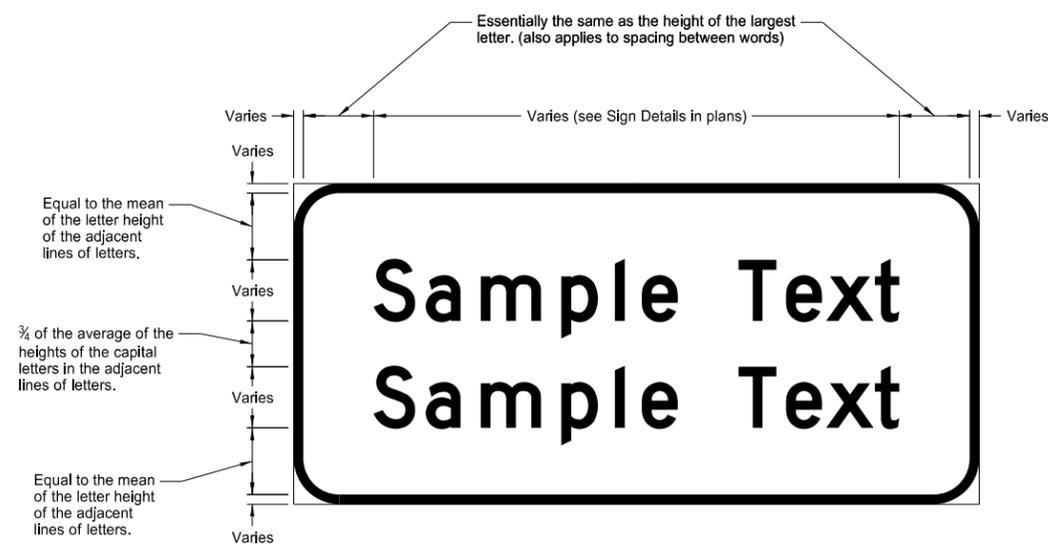


DISTANCE AND DESTINATION SIGNS

| 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



TYPICAL SPACING

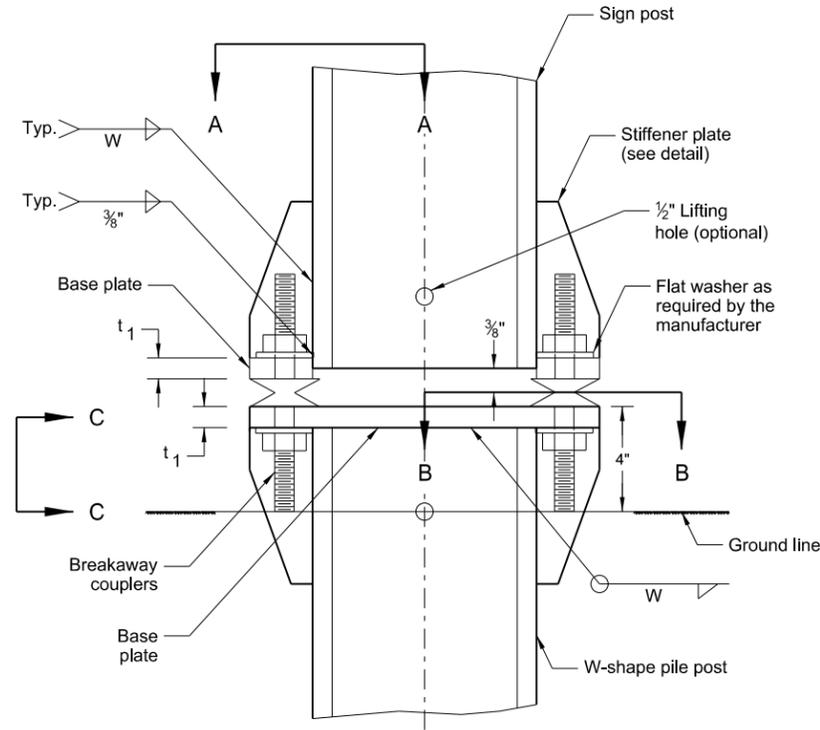
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|--|
| 8-3-11 | |
| REVISIONS | |
| DATE | CHANGE |
| 7-8-14 | Revised gore sign and added 4" D & D arrow |
| 5-4-16 | Revised Distance & Destination and Typical Spacing details |

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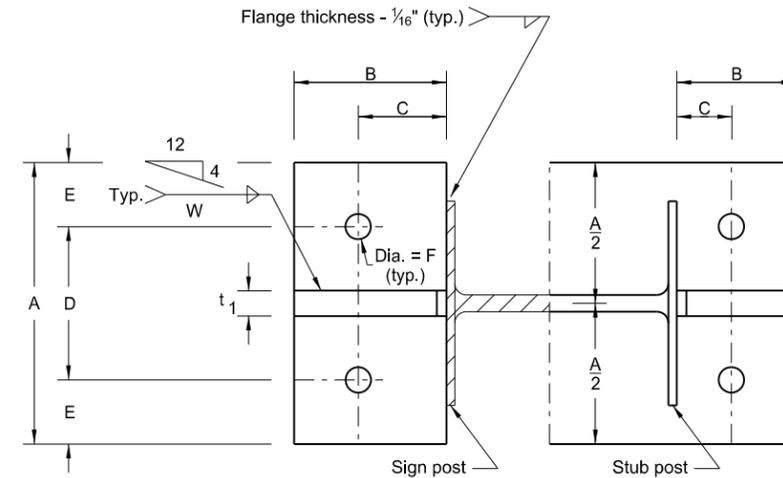
Breakaway Coupler System Structural Details for W-Shape Supports

Notes:

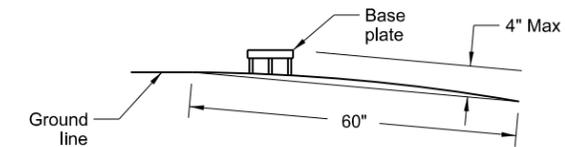
- In lieu of the breakaway base system shown on standard D-754-13 the breakaway coupling system may be used. The breakaway coupling system shall be manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements as specified by DENT BREAKAWAY IND., INC. which meets the requirements of NCHRP Report 350.
- Structural steel shall conform to Sec. 894.03 B.6. High strength bolts shall conform to ASTM - A325. Refer to "Sign Summary" sheet for specific data on each individual sign installation.
- Assembly procedure according to the manufacturer's recommendations.



Sign Post and Stub Post
Elevation



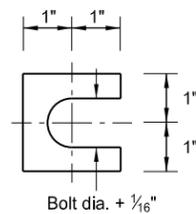
Section A - A Section B - B
(See Table for Dimensions)



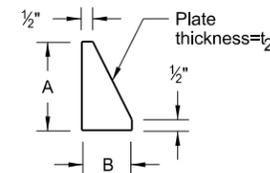
Section C - C

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.

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

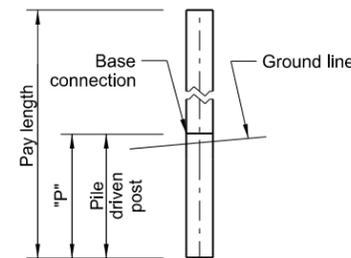


Shim Detail



Stiffener Plate Detail
(See Table for Dimensions)

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.



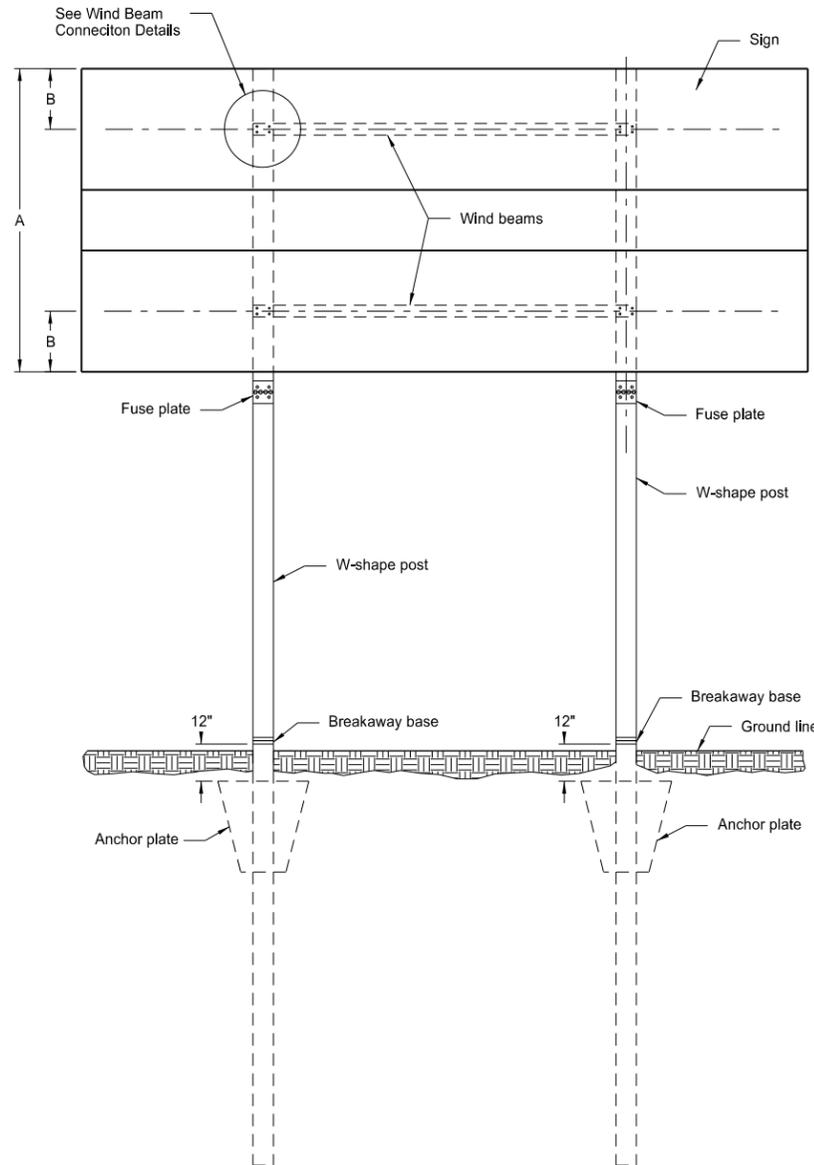
W-Shape - Pile Footing

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

| | |
|--|-----------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 10-4-2013 | |
| REVISIONS | |
| DATE | CHANGE |
| 7-8-14 | Revised notes 2 and 3 |

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Registration Number
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WIND BEAMS AND ANCHOR PLATES
FOR W-SHAPE SUPPORTS



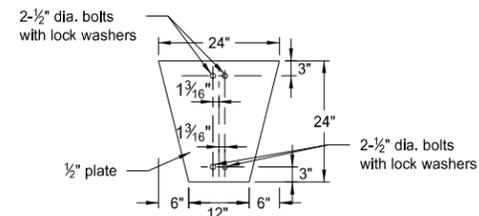
ASSEMBLY DETAIL
FOR WIND BEAMS
AND ANCHOR PLATES

Notes:

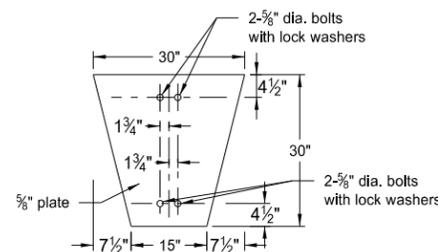
The B distance is calculated by the following formula, $B=A/4$.

The wind beam shall conform to Section 894.03 B.6 of the Standard Specifications.

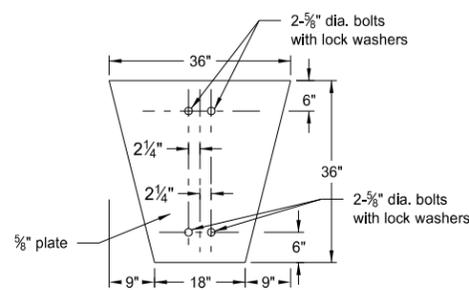
The bolts shall conform to requirements of ASTM A307 and galvanized according to ASTM A153.



W4-13 & W5-16

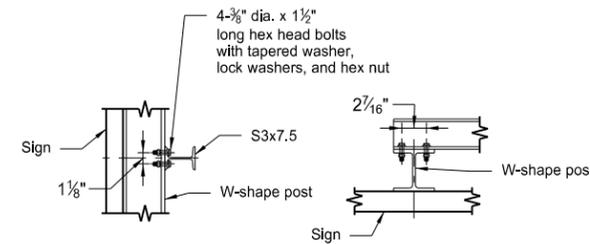


W6-20, W8-24 & W8-28

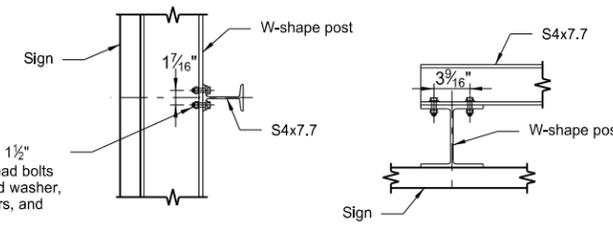


W8-31 & W10-39

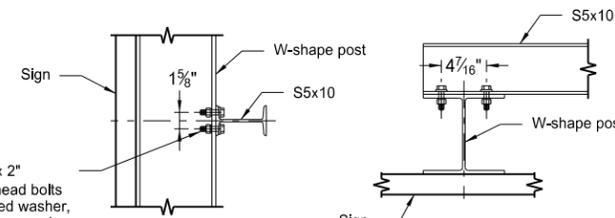
ANCHOR PLATE DETAILS



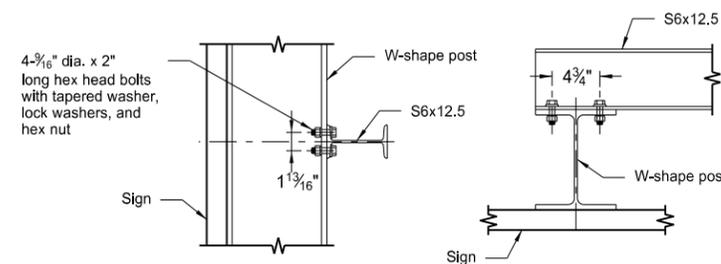
End View
W4-13 & W5-16



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

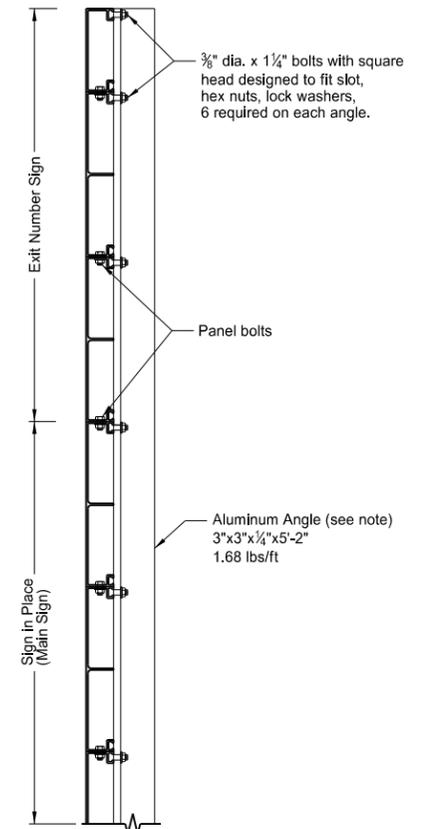


End View
W8-31



End View
W10-39

WIND BEAM CONNECTION DETAILS



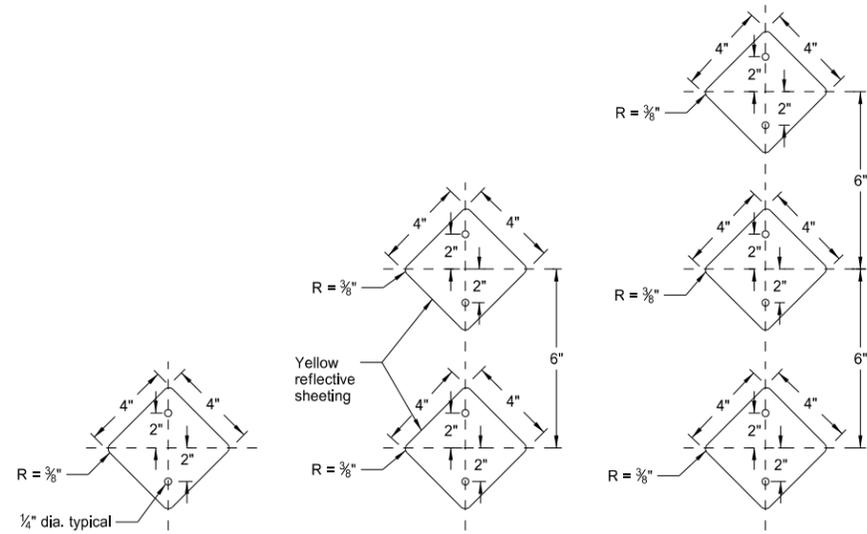
ASSEMBLY DETAIL FOR
EXIT NUMBER SIGNS

Note: Two aluminum angles required on each sign. The distance between angles varies depending on post spacing of sign in place. Angles shall be placed as near as possible to posts. The Engineer shall determine the exact location.

| | |
|--|---------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 10-3-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 7-8-14 | Revised second note |

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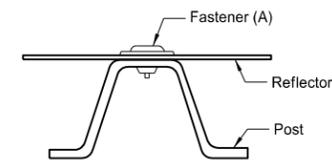
REFLECTORIZED DELINEATORS



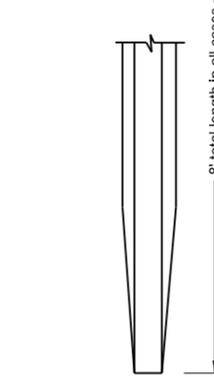
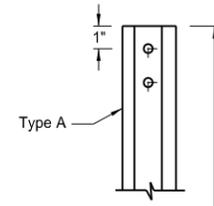
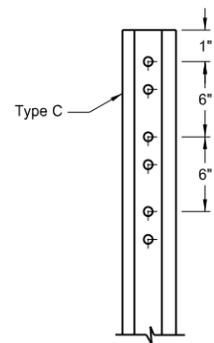
Main line
One reflector
(Type A delineator)

Ramps
Two reflectors
(Type B delineator)

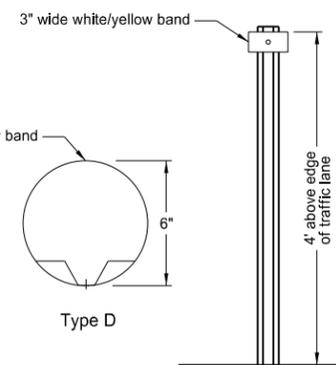
Narrow Bridges
Three reflectors
(Type C delineator)



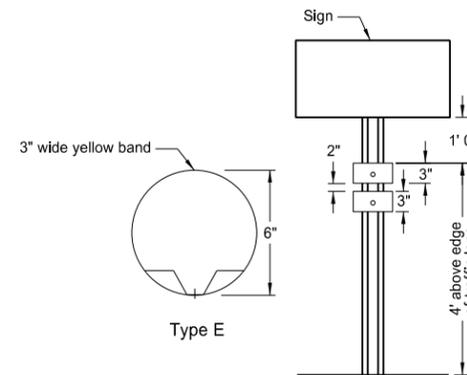
Delineator Attachment Detail



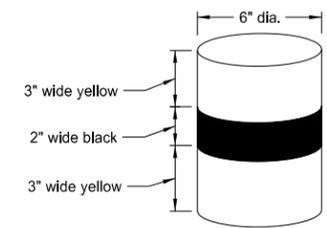
U-type Post



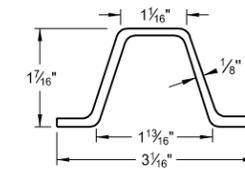
Median
One reflector
(Type D delineator)



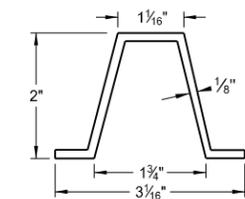
Median
One or Two reflectors
(Type E delineator)



Alternate Type E



Steel Post Detail
Approx. 2.0 lbs/ft



Aluminum Post Detail
Approx. 0.88 lbs/ft

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 $(S) = 3\sqrt{R-50}$

Type E

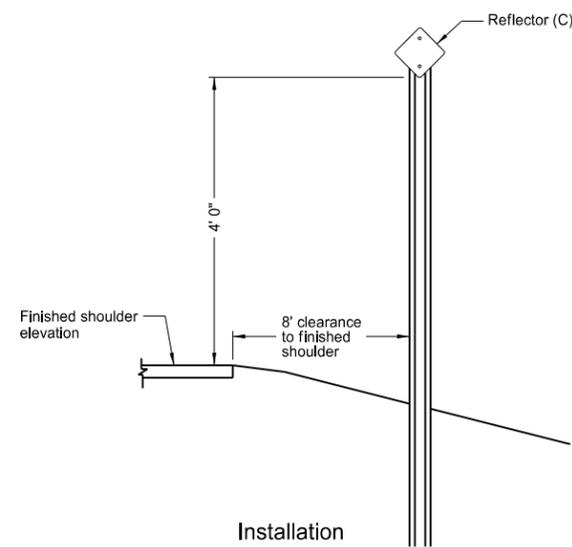
Alternate: One unit band consisting of two yellow stripes separated by a 2" black stripe may be used in place of two 3" yellow bands.

(A) The fastener shall be $\frac{3}{8}$ " dia. with flat washer having a min. outside dia. of $1\frac{3}{16}$ ". Fasteners shall be tension pin type or other non-rust vandal resistant fastener.

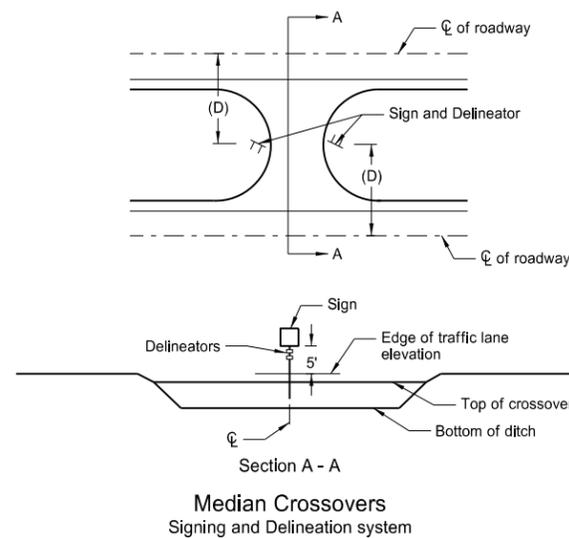
(B) The contractor may drill only those holes required to attach the number of reflectors on that post, or drill all the posts the same so that any number of reflectors may be added.

(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.



Installation



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

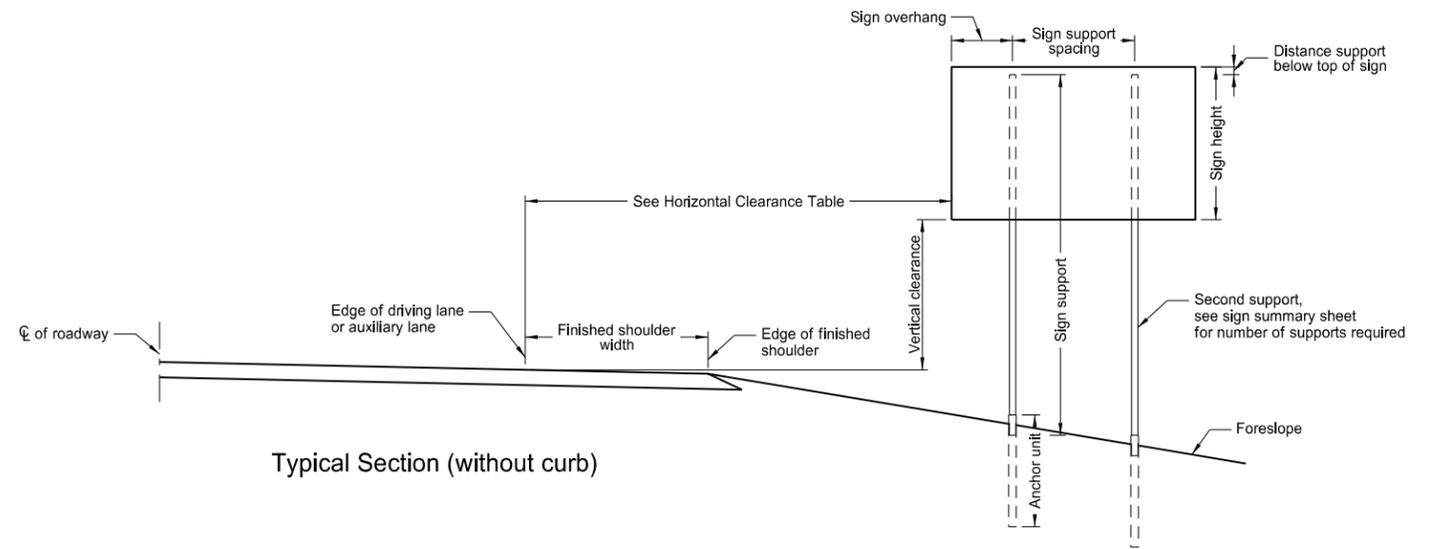
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PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

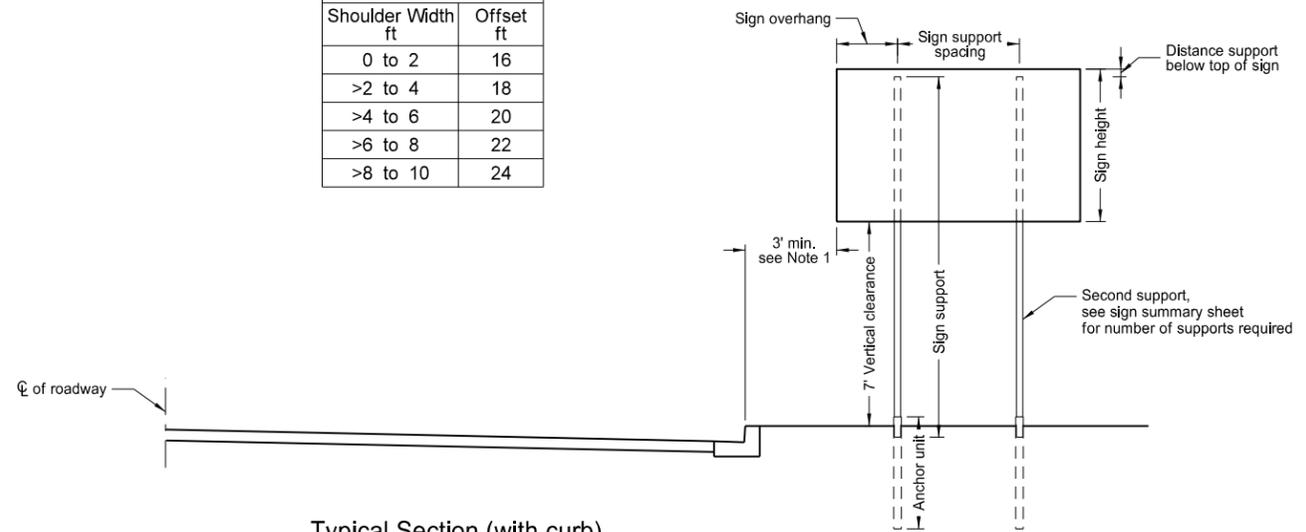
Notes:

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

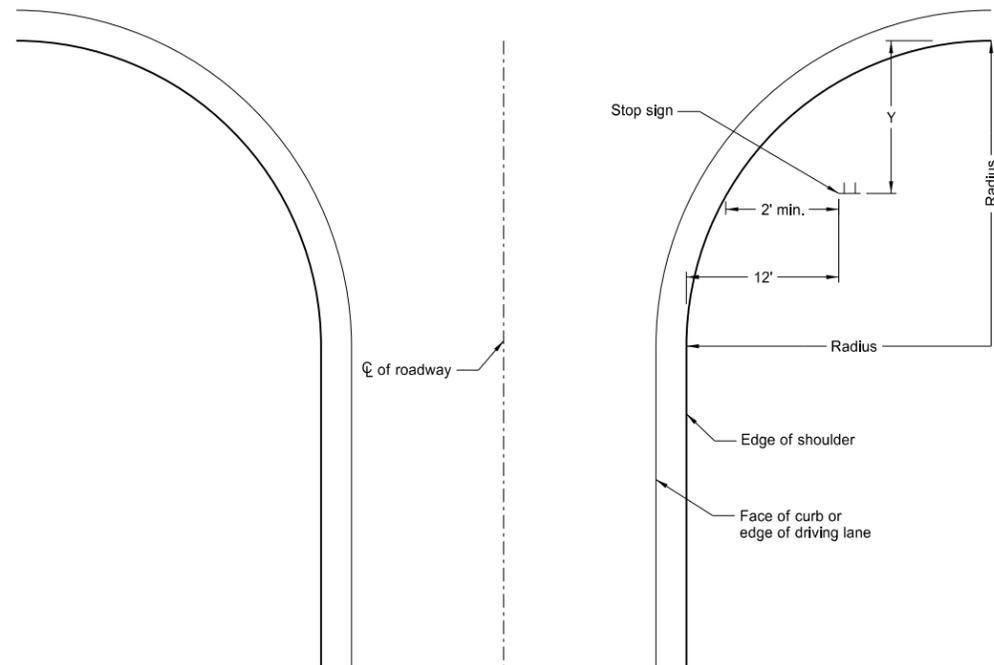


Typical Section (without curb)

| Horizontal Clearance Table | |
|----------------------------|-----------|
| Shoulder Width ft | Offset ft |
| 0 to 2 | 16 |
| >2 to 4 | 18 |
| >4 to 6 | 20 |
| >6 to 8 | 22 |
| >8 to 10 | 24 |



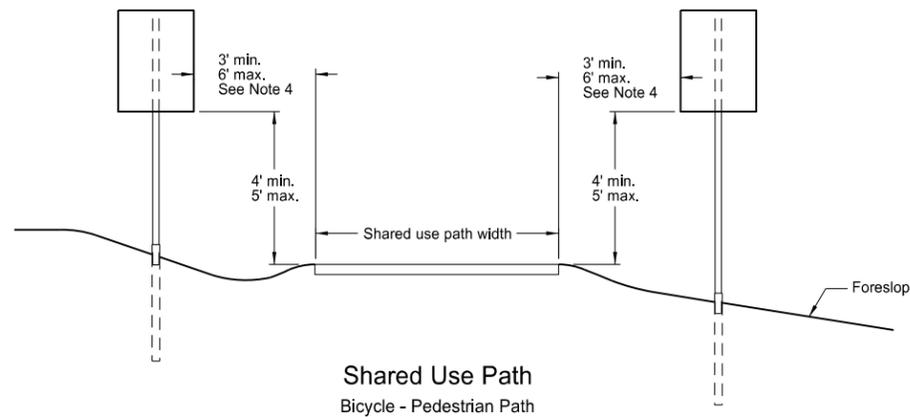
Typical Section (with curb)
Residential or Business District



Stop Sign Location
Wide Throat Intersection

This layout is to be used for the placement of "Stop" signs.

| Radius ft. | Y-max. ft. | Y-min. ft. |
|------------|------------|------------|
| 40 | 50 | 15 |
| 45 | 50 | 18 |
| 50 | 50 | 21 |
| 55 | 50 | 25 |
| 60 | 50 | 28 |
| 65 | 50 | 32 |
| 70 | 50 | 35 |
| 75 | 50 | 39 |
| 80 | 50 | 43 |



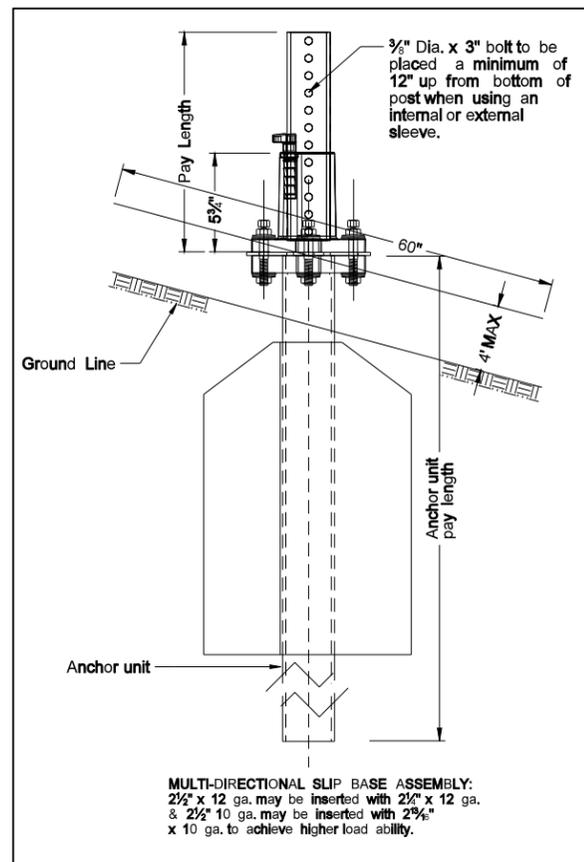
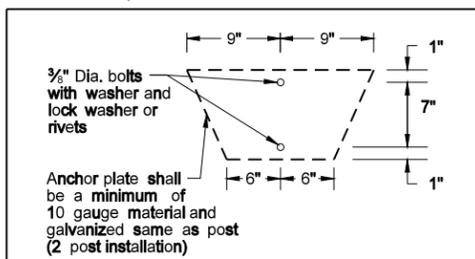
Shared Use Path
Bicycle - Pedestrian Path

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

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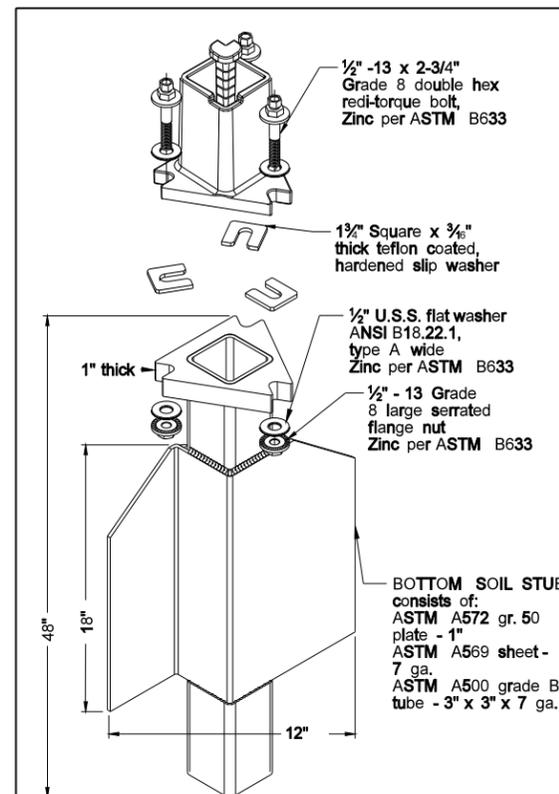
| Number of Posts | Telescoping Perforated Tube | | | | | | |
|-----------------|-----------------------------|----------------------|-----------------|----------------------|-----------|-----------------------------------|-----------------------------|
| | Post Size In. | Wall Thickness Gauge | Sleeve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

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

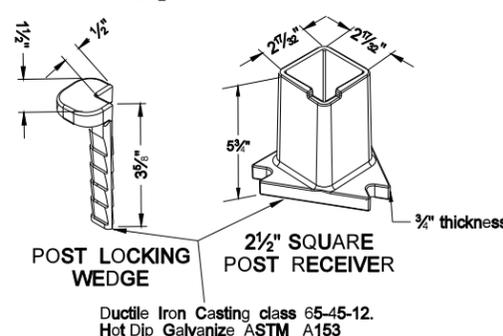


MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:
 2 1/2" x 12 ga. may be inserted with 2 1/2" x 12 ga. & 2 1/2" 10 ga. may be inserted with 2 3/8" x 10 ga. to achieve higher load ability.

Mounting Details Perforated Tube

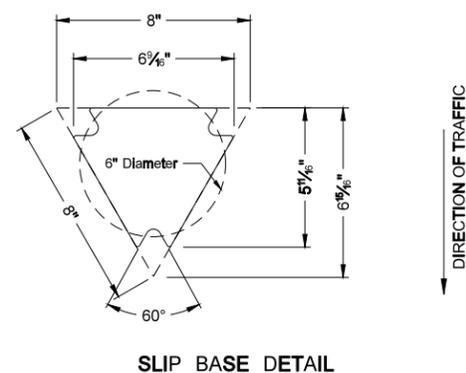


SLIP BASE FOR 2 1/2" POST



2 1/2" SQUARE POST RECEIVER

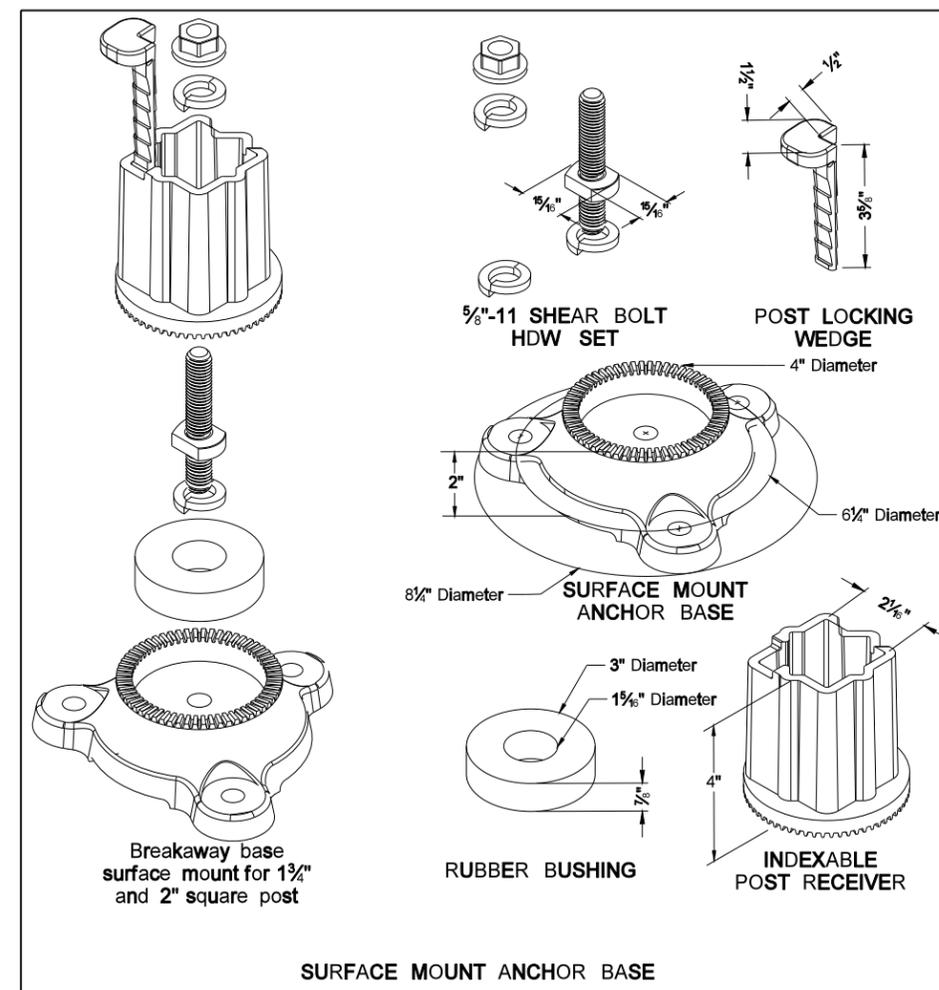
Ductile Iron Casting class 65-45-12. Hot Dip Galvanize ASTM A153



SLIP BASE DETAIL

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

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



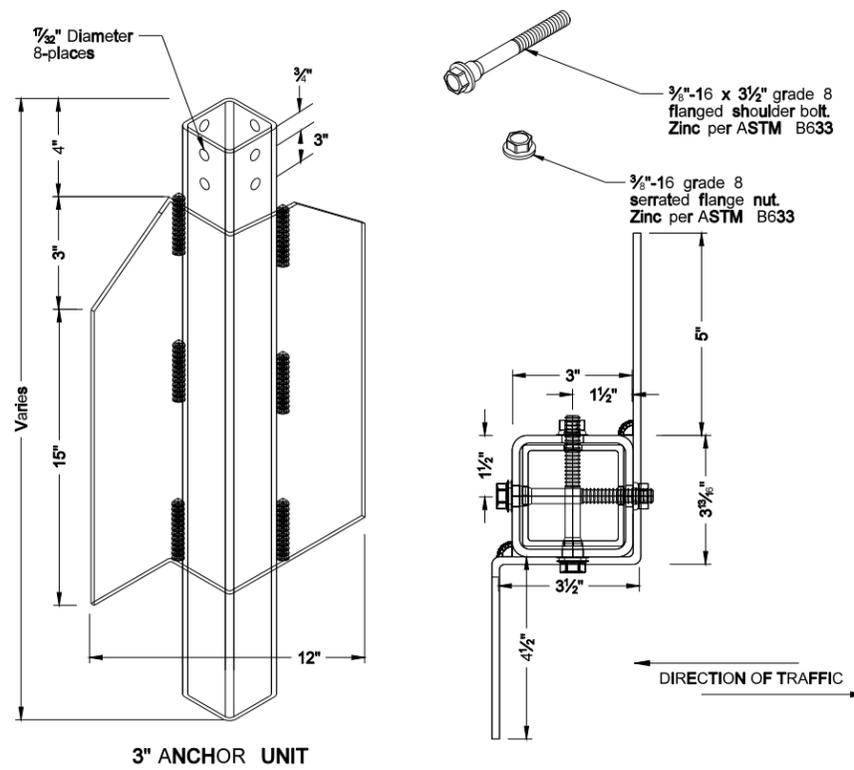
SURFACE MOUNT ANCHOR BASE

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.

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

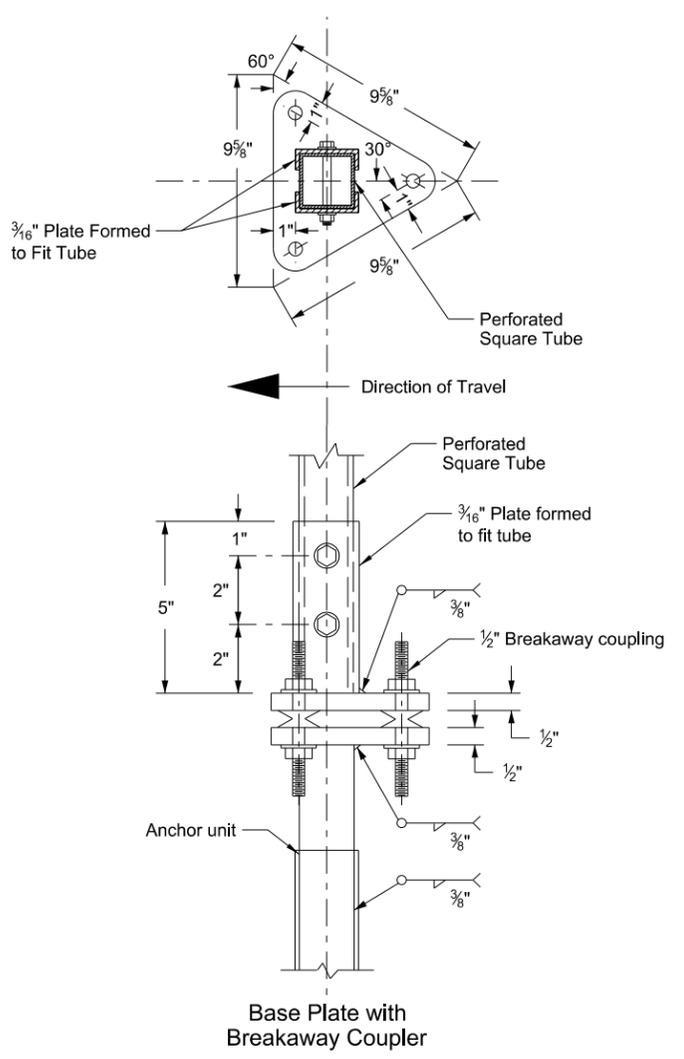
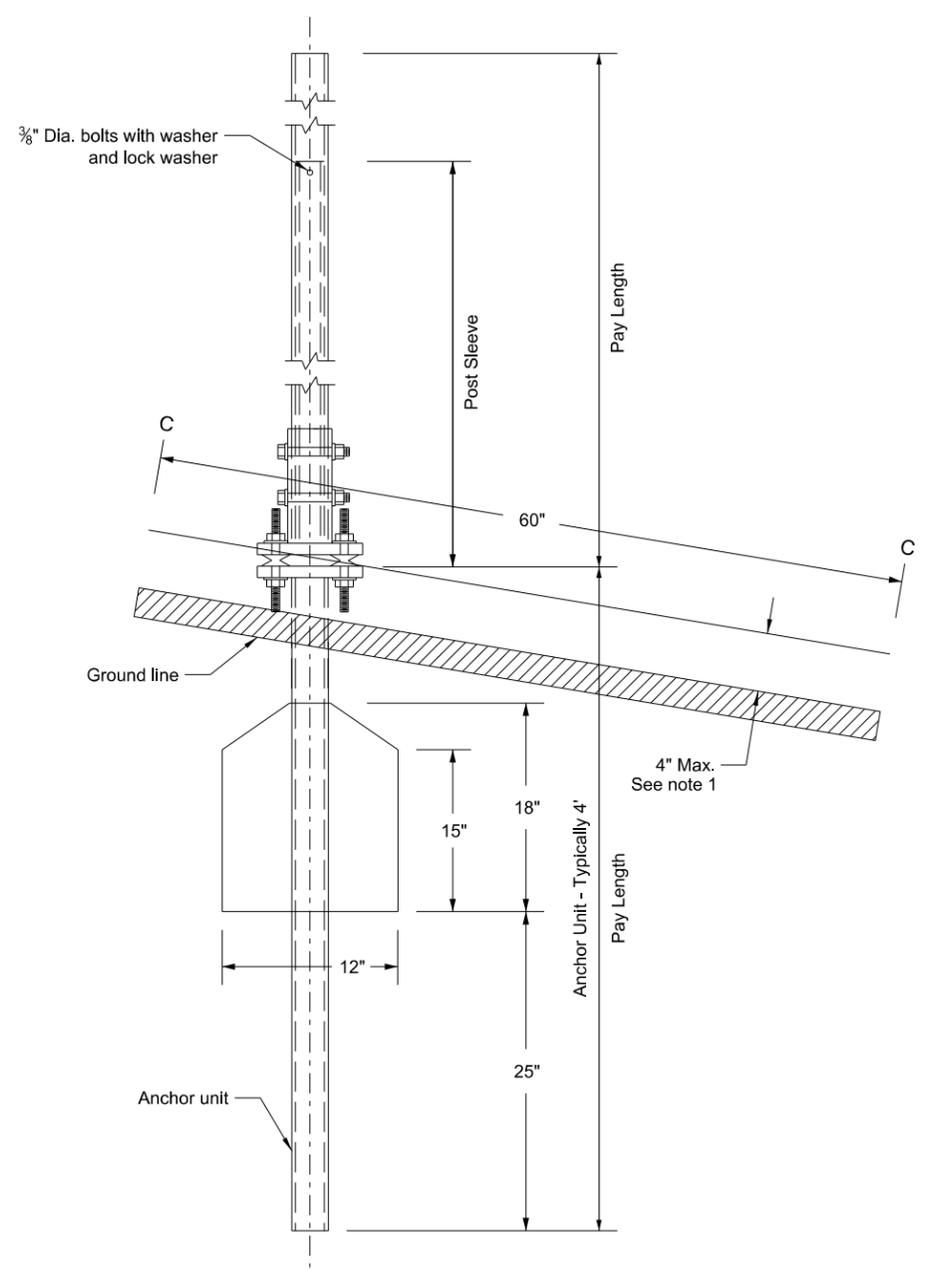
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| 8-6-09 | |
| REVISIONS | |
| DATE | CHANGE |

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Breakaway Coupler System for Perforated Tubes

Notes:

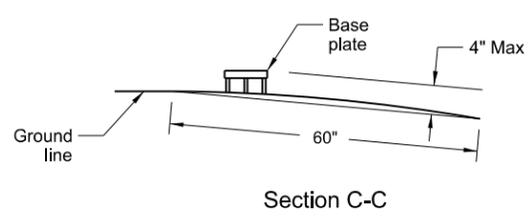
- 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.
- Anchor unit shall be the same size as the post and shall have the same specification as the post.
- Four post signs shall have over 8' between the 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.



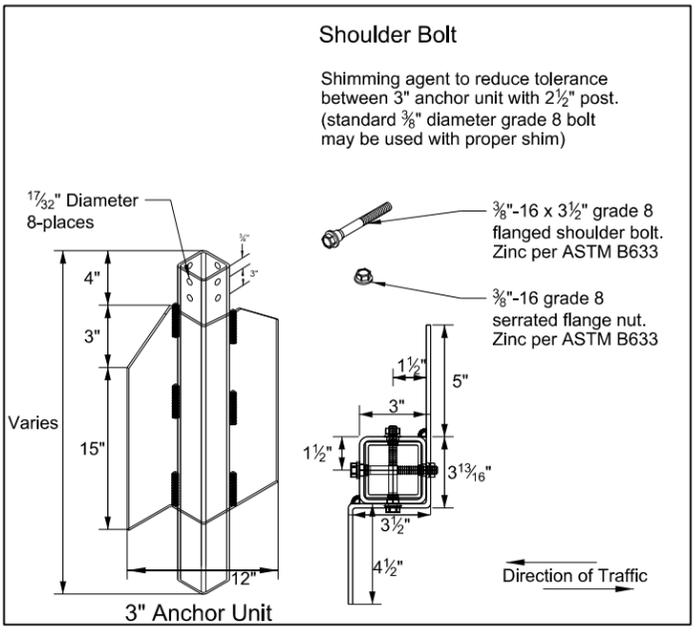
| Number of Posts | Telescoping Perforated Tube | | | | | | |
|-----------------|-----------------------------|----------------------|-----------------|----------------------|-----------|-----------------------------------|-----------------------------|
| | Post Size In. | Wall Thickness Gauge | Sleeve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

(B) - The 2 1/2" 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



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



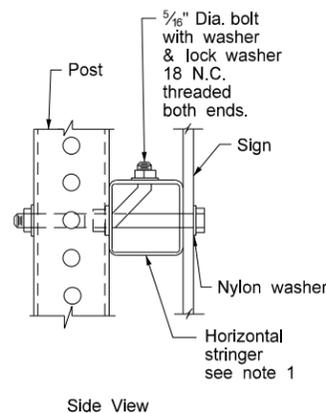
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|---|--------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 10-3-2013 | |
| REVISIONS | |
| DATE | CHANGE |
| | |

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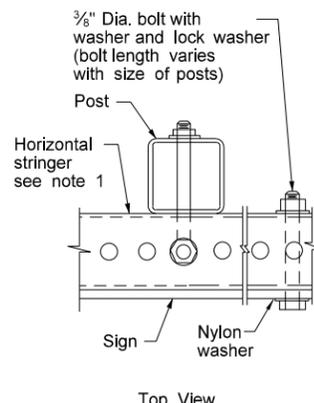
Mounting Details Perforated Tube

Note:

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

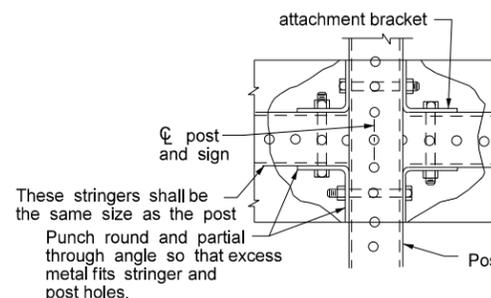


Side View



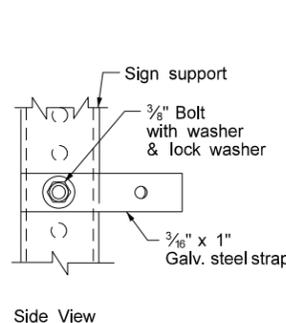
Top View

STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)

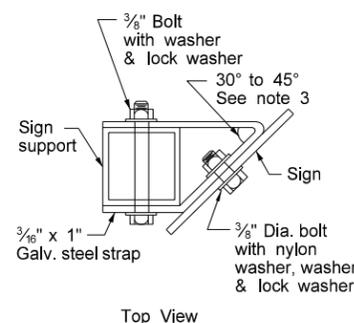


These stringers shall be the same size as the post. Punch round and partial through angle so that excess metal fits stringer and post holes.

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

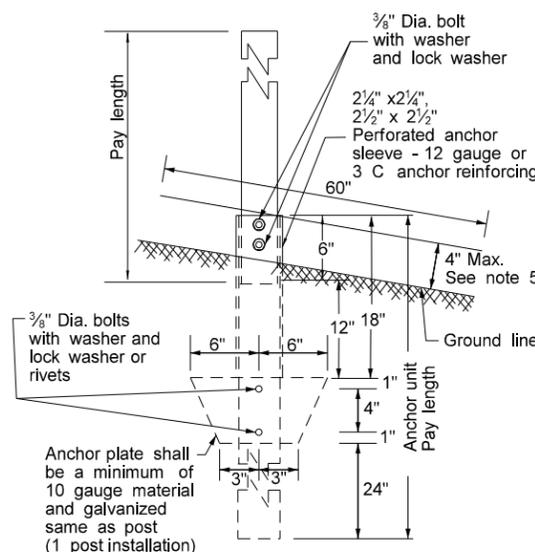


Side View

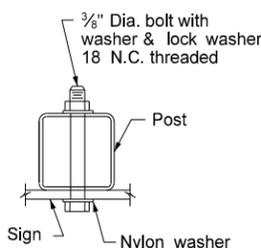


Top View

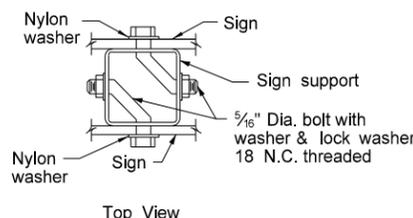
STRAP DETAIL



ANCHOR UNIT AND
POST ASSEMBLY

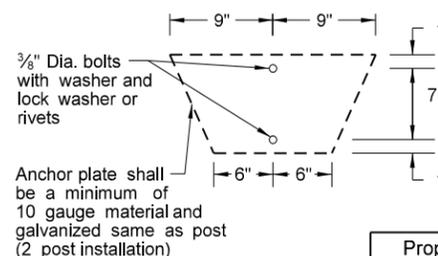


BOLT MOUNTING



Top View

BACK TO BACK
MOUNTING



| Properties of Telescoping Perforated Tubes | | | | | | | |
|--|--------------------|---------------------|----------------------|------------------------------------|-----------------------------------|----------------------------------|--|
| Tube Size In. | Wall Thickness In. | U.S. Standard Gauge | Weight Per Foot Lbs. | Moment of Inertia In. ⁴ | Cross Sect. area In. ² | Section Modulus In. ³ | |
| 1 1/2 x 1 1/2 | 0.105 | 12 | 1.702 | 0.129 | 0.380 | 0.172 | |
| 2 x 2 | 0.105 | 12 | 2.416 | 0.372 | 0.590 | 0.372 | |
| 2 1/4 x 2 1/4 | 0.105 | 12 | 2.773 | 0.561 | 0.695 | 0.499 | |
| 2 3/8 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.

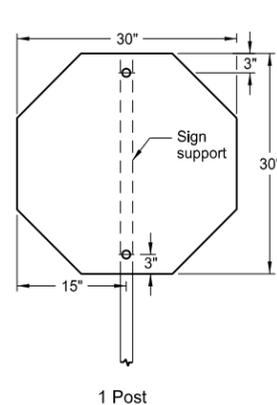
| Number of Posts | Telescoping Perforated Tube | | | | | | |
|-----------------|-----------------------------|----------------------|-----------------|----------------------|-----------|-----------------------------------|-----------------------------|
| | Post Size In. | Wall Thickness Gauge | Sleeve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

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

| | |
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| REVISIONS | |
| DATE | CHANGE |
| 7-8-14 | Revised Note 3 |

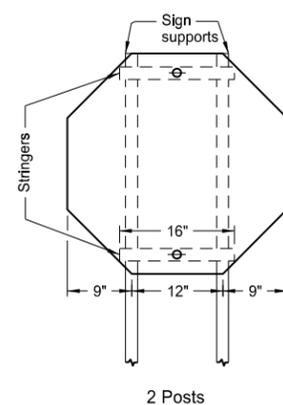
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS

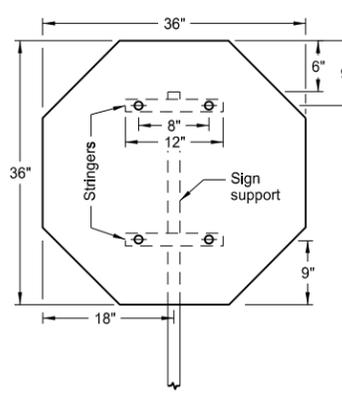


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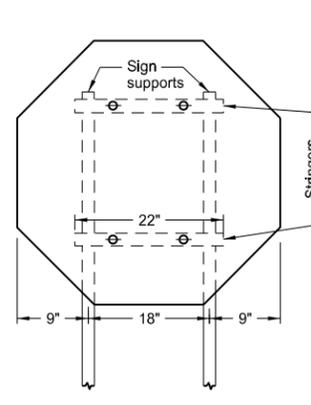
Assembly No. 1



2 Posts

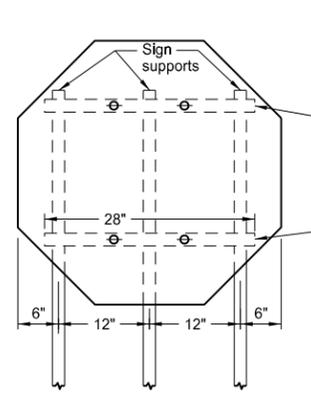


1 Post



2 Posts

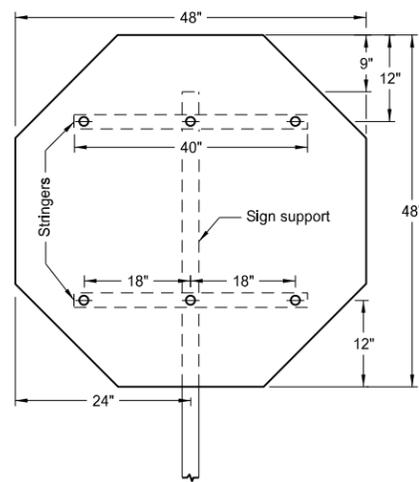
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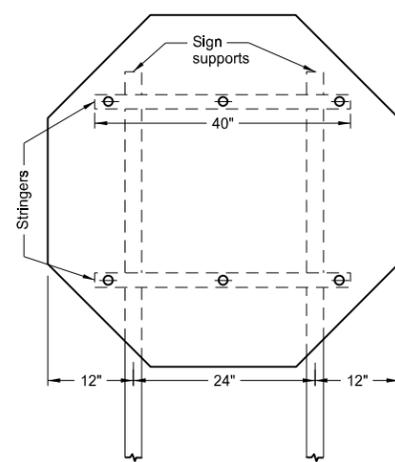
3 Posts

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 ¾" bolt.

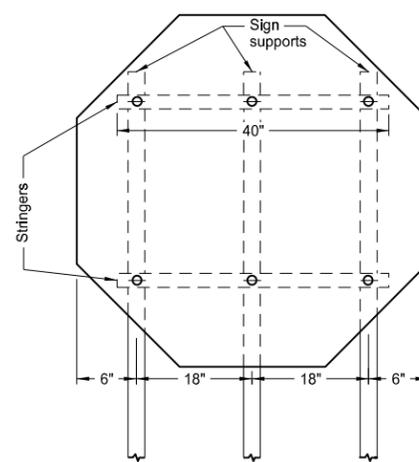


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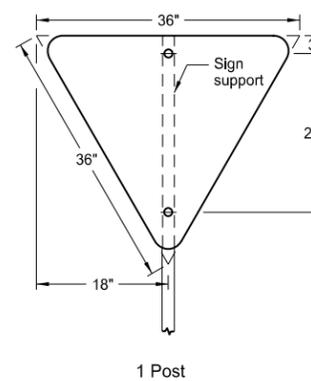


2 Posts

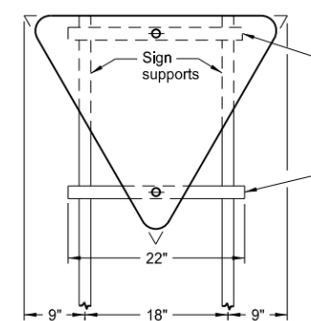
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3 Posts

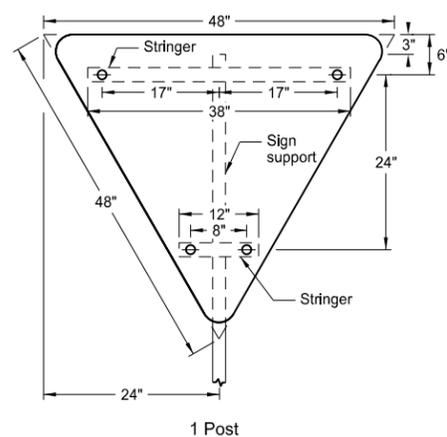


1 Post

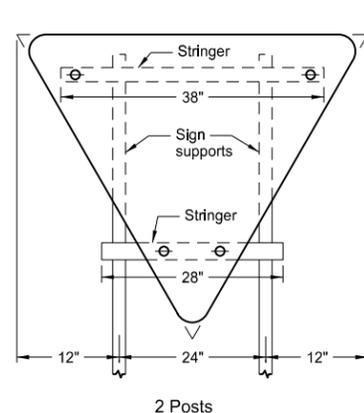


2 Posts

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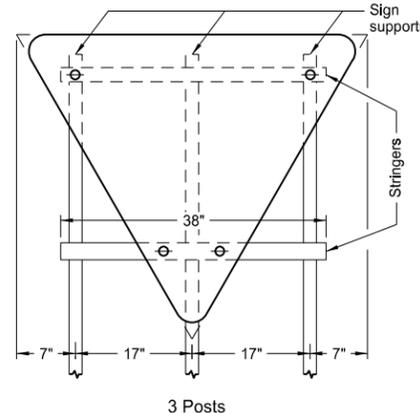


1 Post



2 Posts

Assembly No. 5

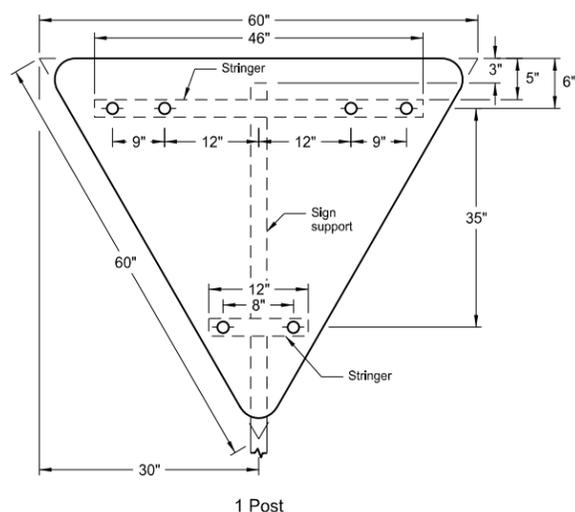


3 Posts

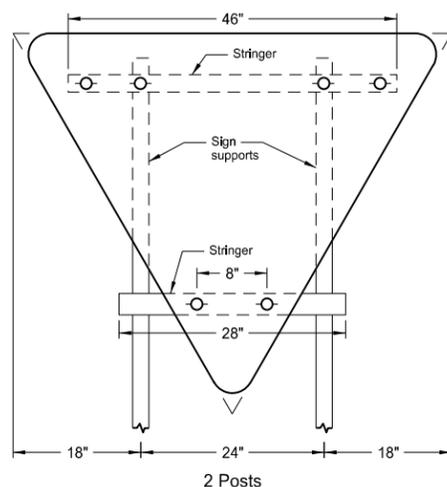
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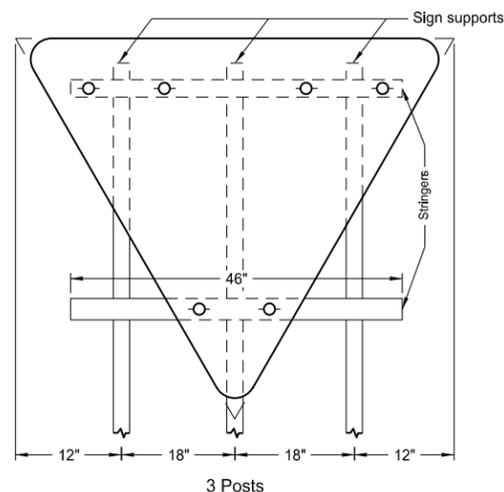
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



1 Post



2 Posts

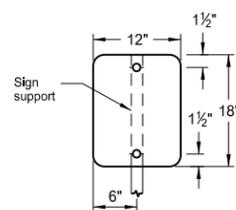


3 Posts

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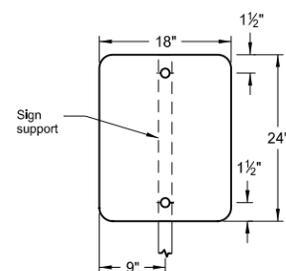
Notes:

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.



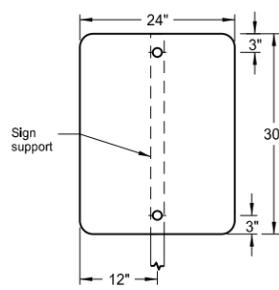
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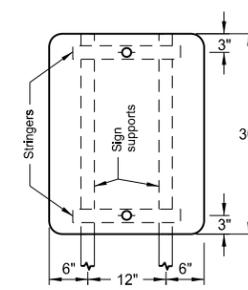
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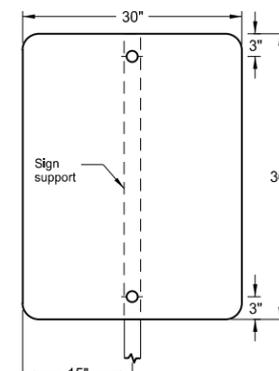


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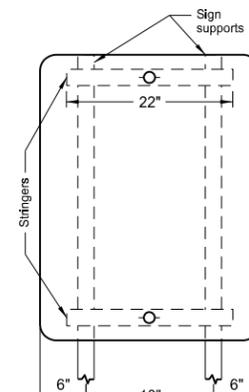
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2 Posts

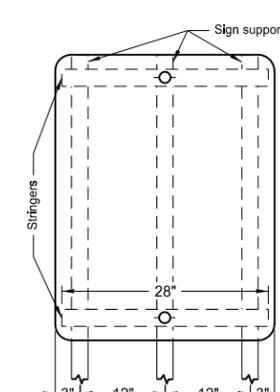


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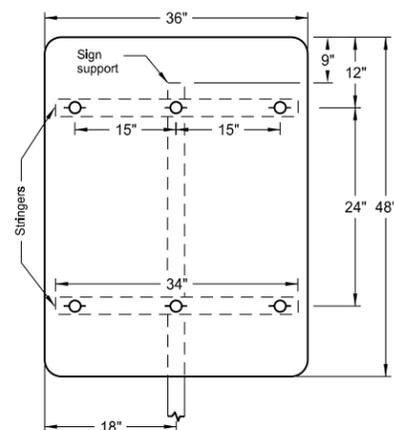


2 Posts

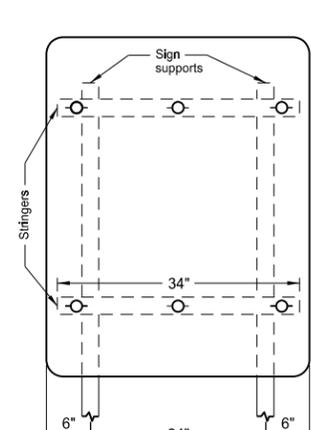
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3 Posts

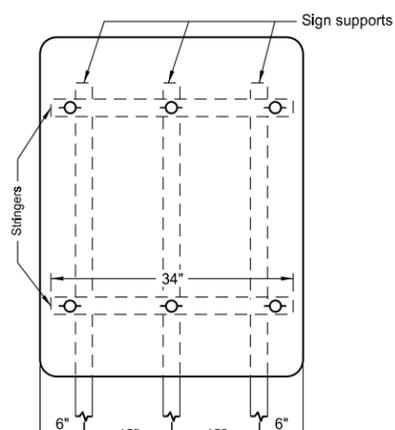


1 Post



2 Posts

Assembly No. 11

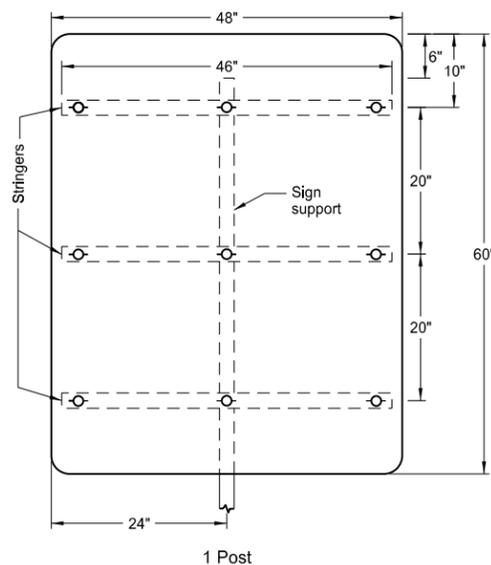


3 Posts

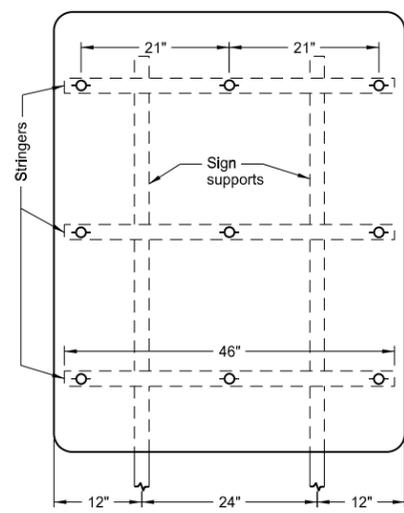
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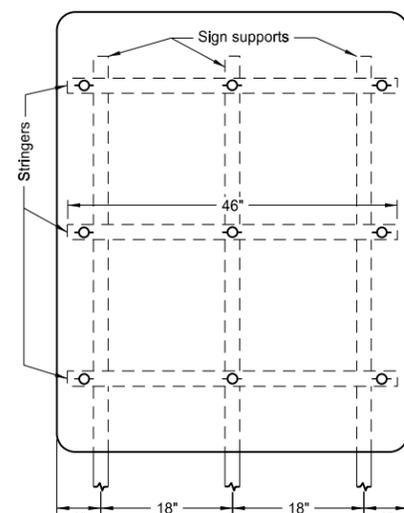


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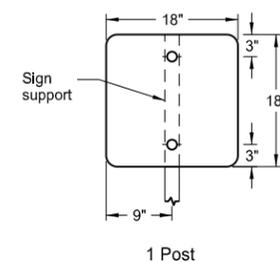


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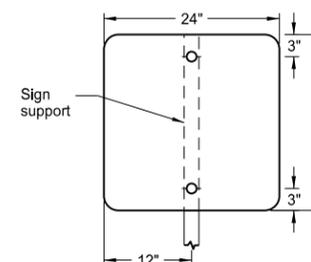


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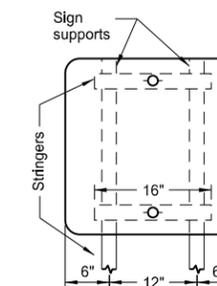
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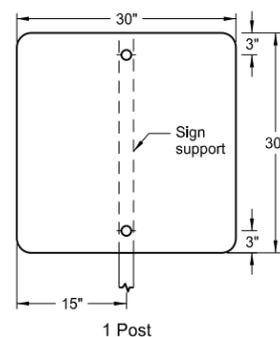


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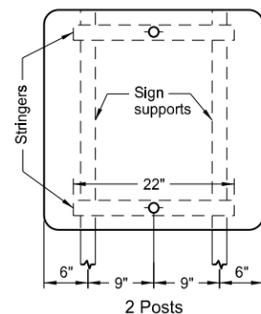


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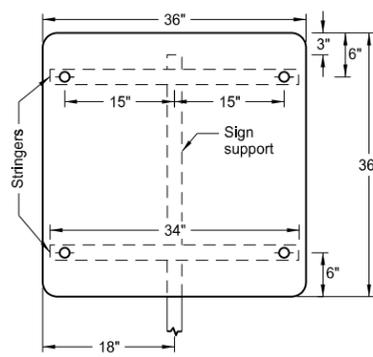


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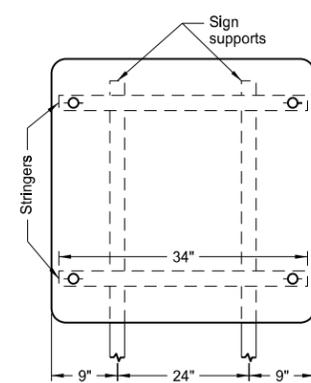
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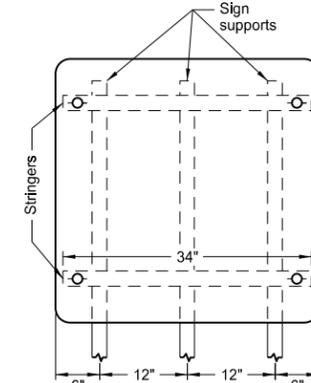


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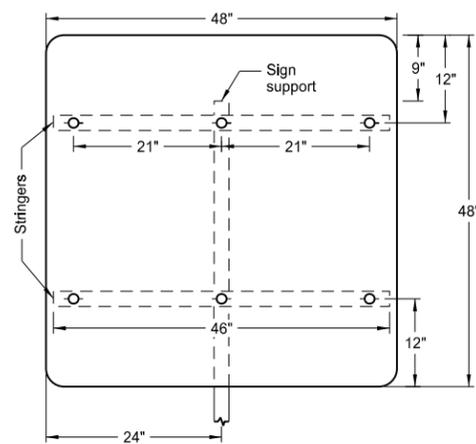


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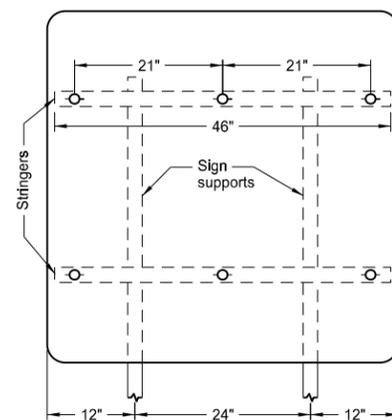
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3 Posts

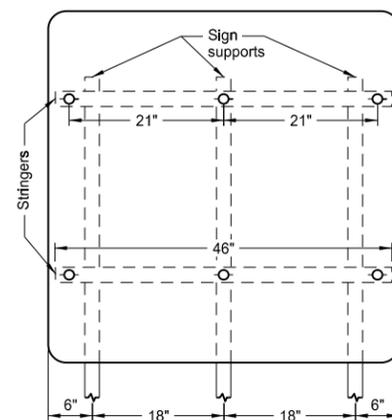


1 Post



2 Posts

Assembly No. 17



3 Posts

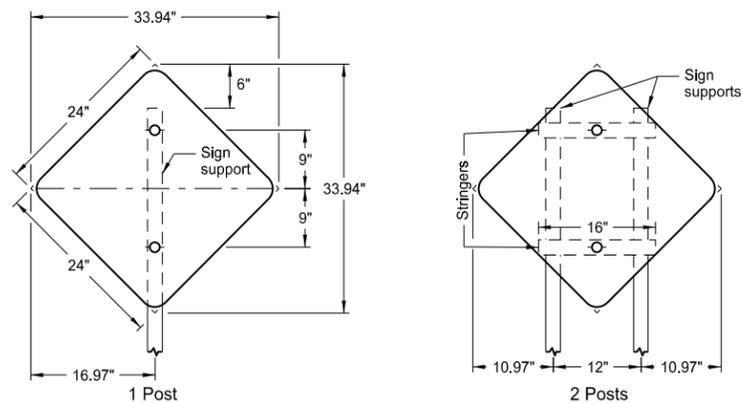
Notes:

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.

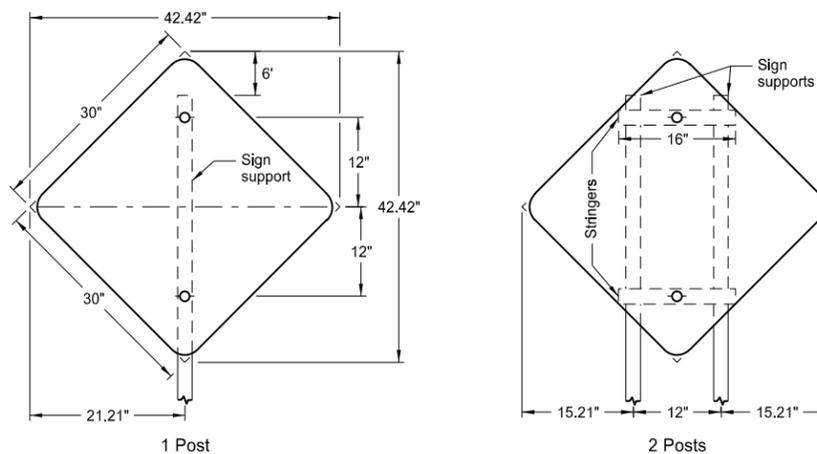
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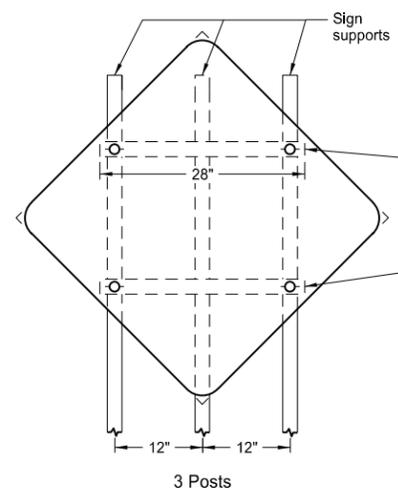
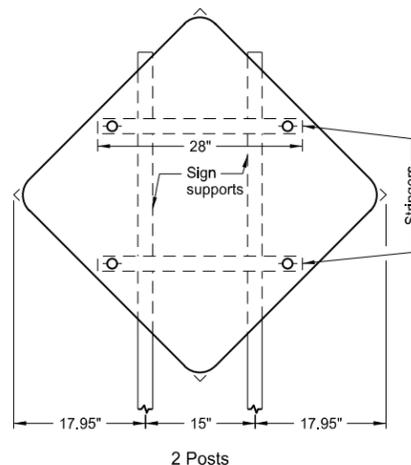
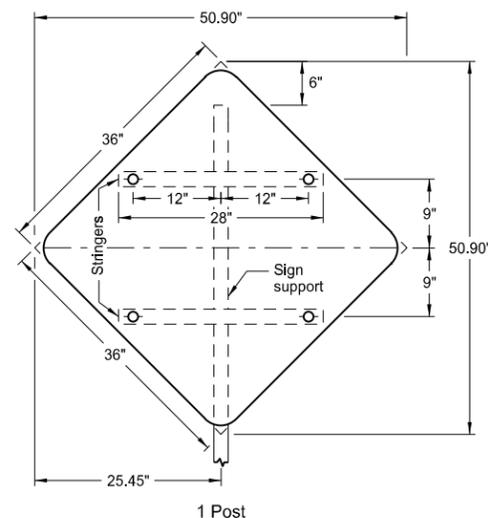
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DETAILS REGULATORY, WARNING AND GUIDE SIGNS



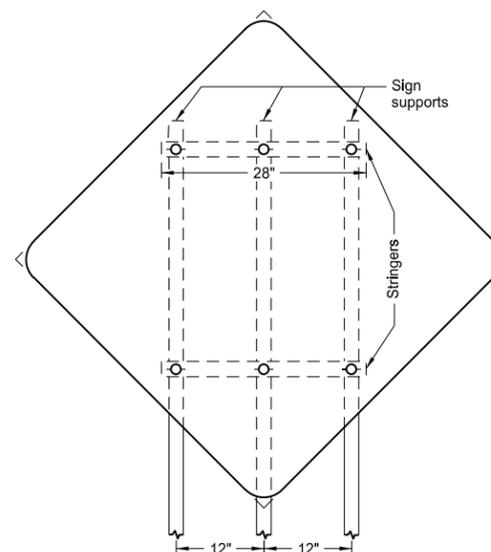
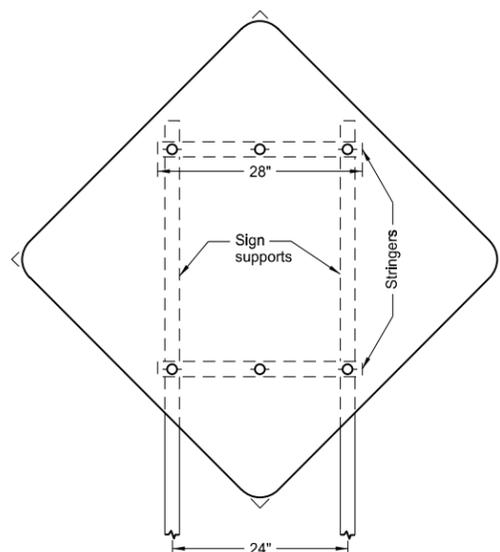
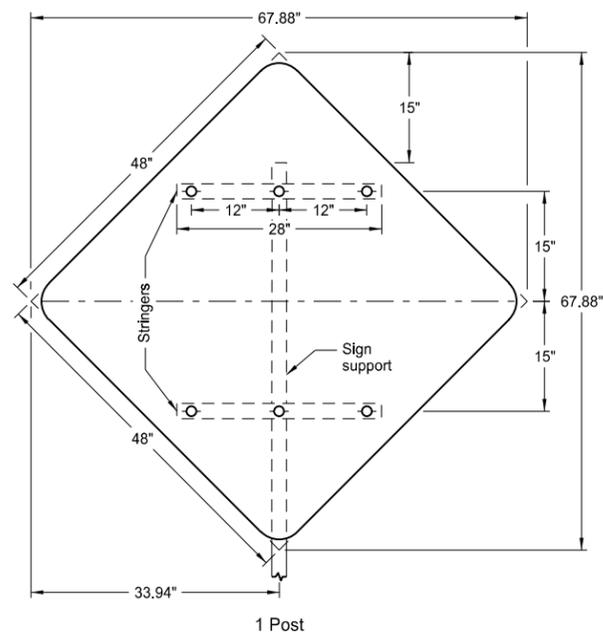
Assembly No. 18



Assembly No. 19



Assembly No. 20



Assembly No. 21

Notes:

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

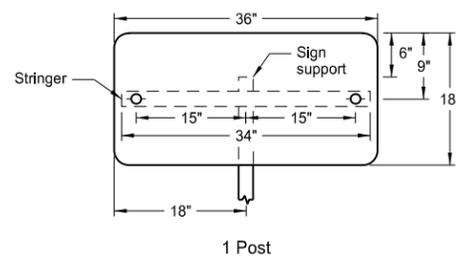
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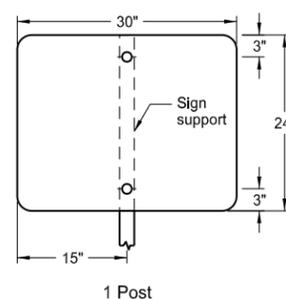
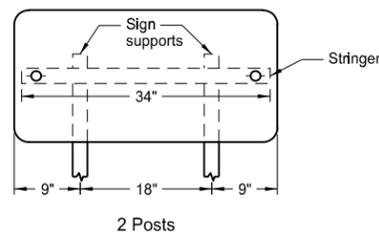
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DETAILS REGULATORY, WARNING AND GUIDE SIGNS

Notes:

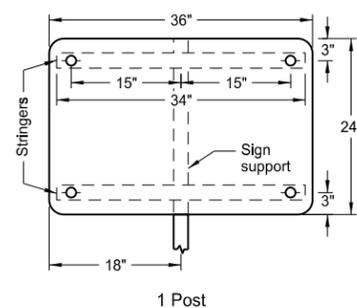
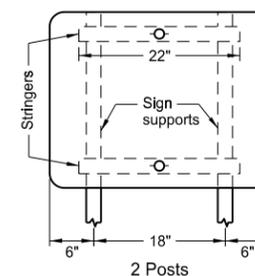
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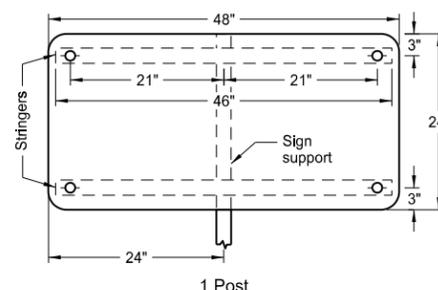
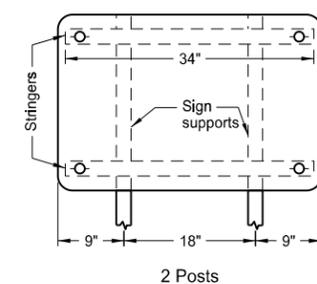
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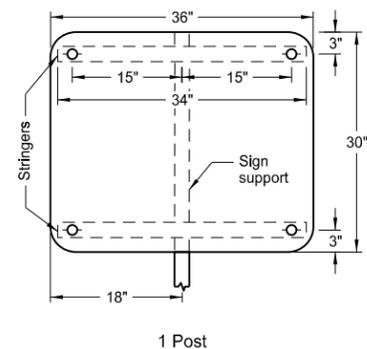
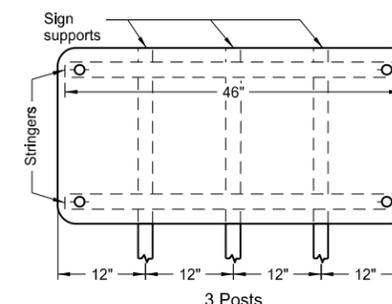
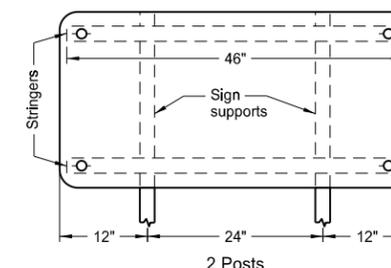
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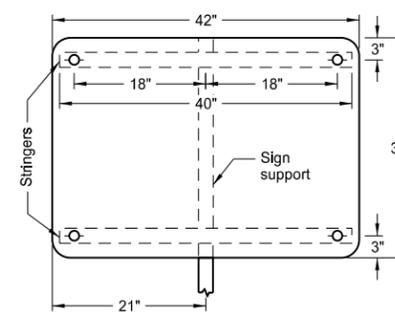
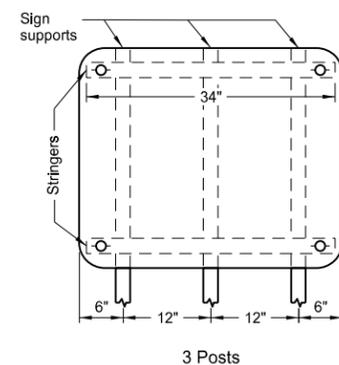
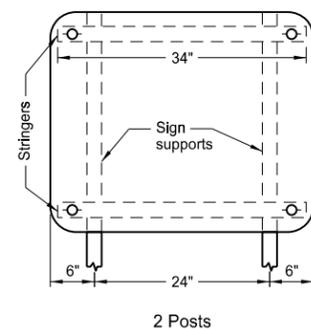
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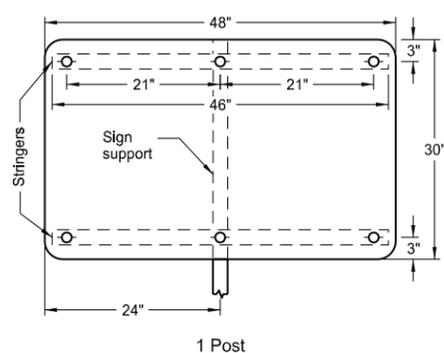
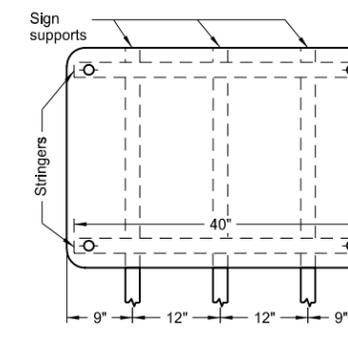
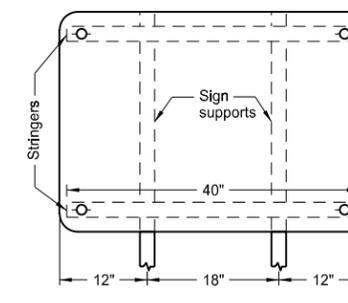
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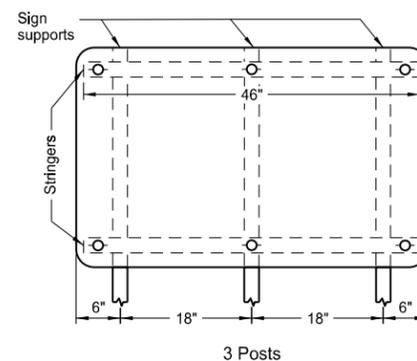
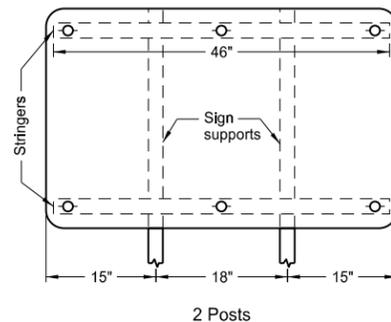
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Assembly No. 36



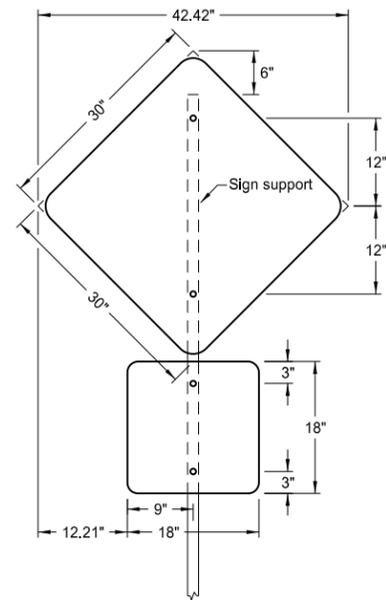
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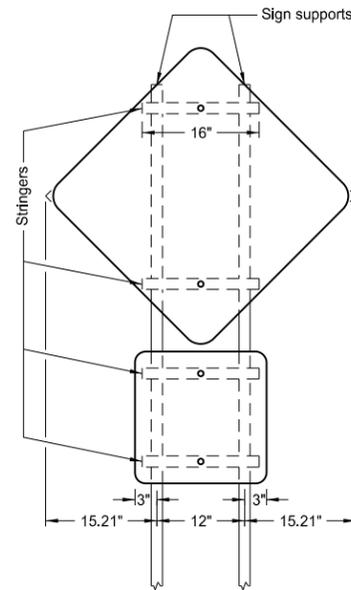
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| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 12-1-10 | |
| REVISIONS | |
| DATE | CHANGE |
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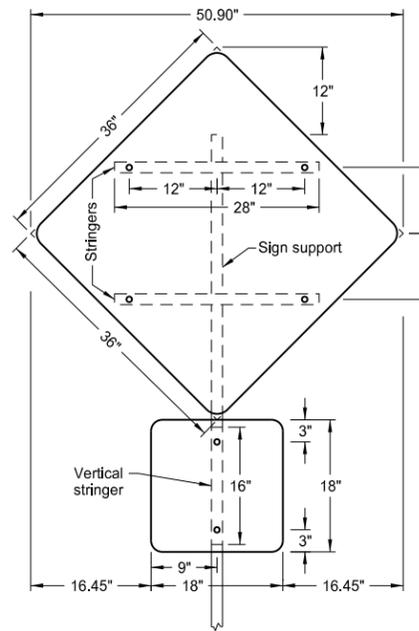
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
REGULATORY, WARNING AND GUIDE SIGNS



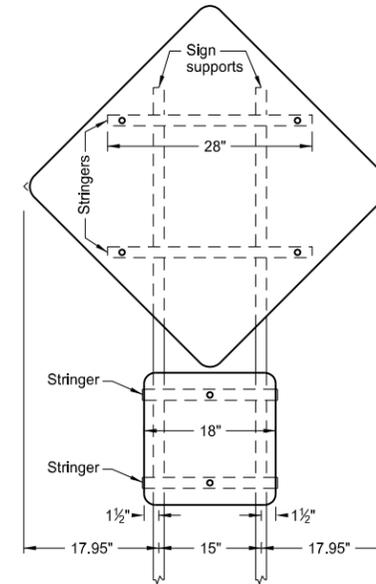
1 Post



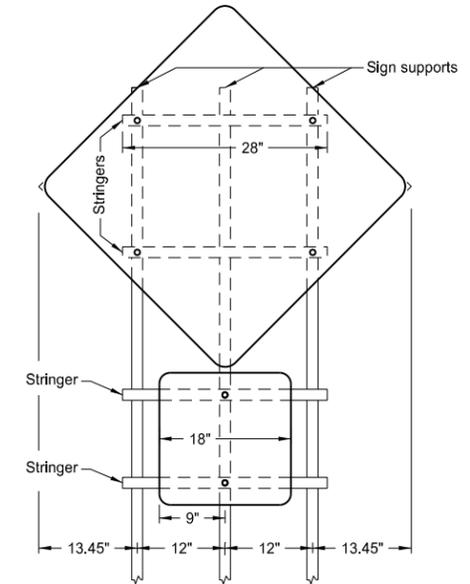
2 Posts



1 Post



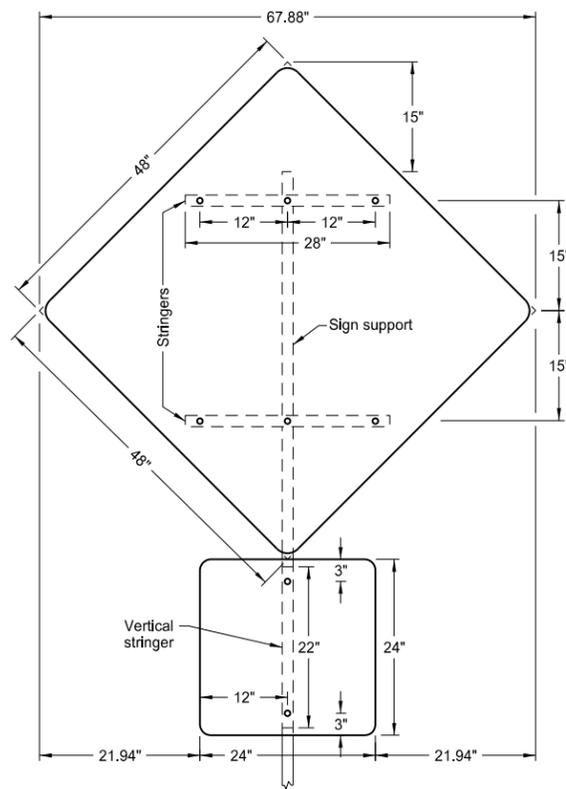
2 Posts



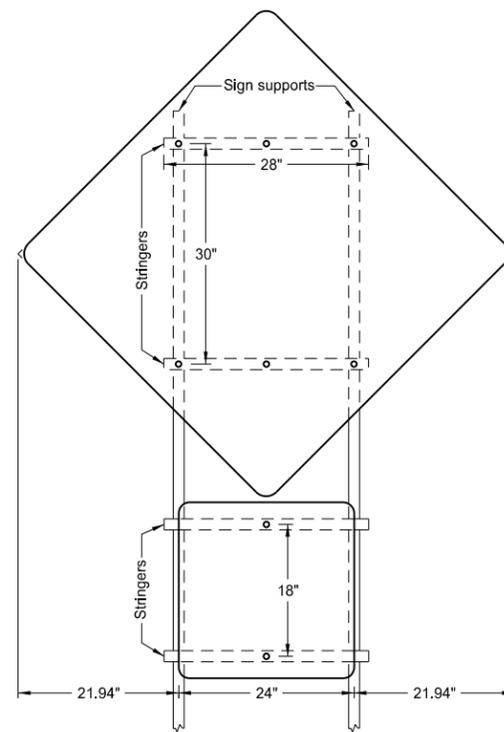
3 Posts

ASSEMBLY NO. 53

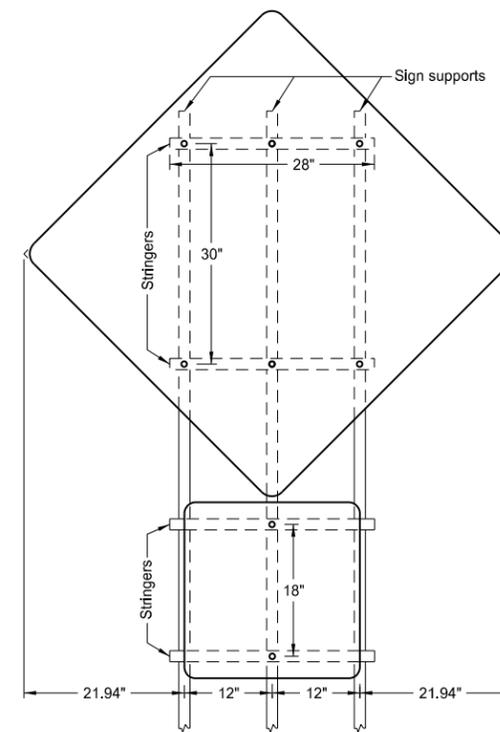
ASSEMBLY NO. 54



1 Post



2 Posts



3 Posts

ASSEMBLY NO. 55

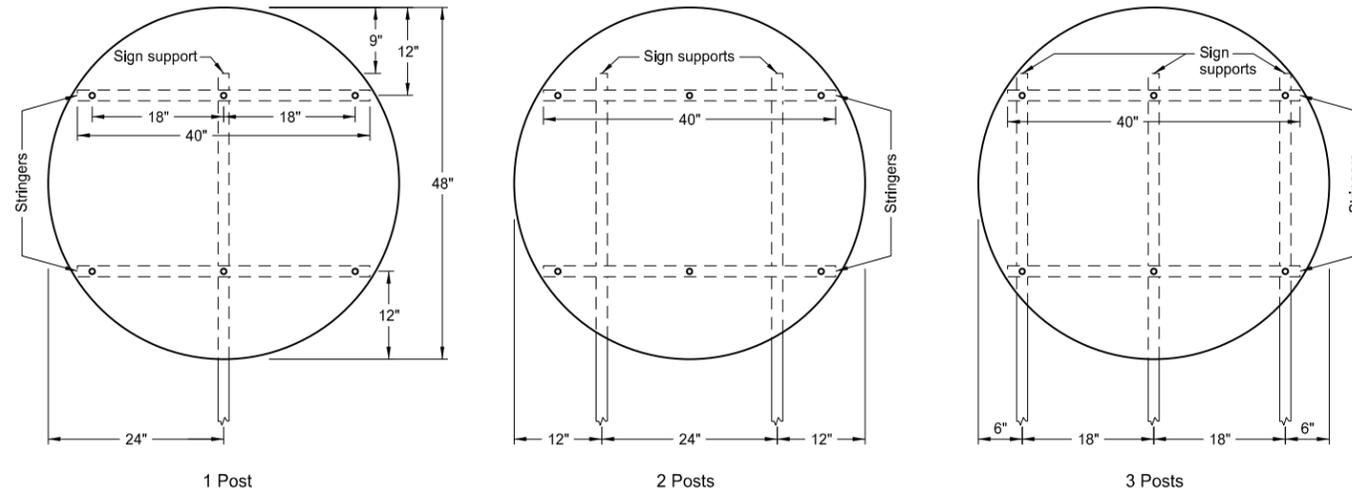
- Notes:
1. The minimum sign backing material thickness shall be 0.100 inch.
 2. Perforated square tube stringer shall be 1½"x1½".
 3. All holes shall be punched round for ⅜" bolt.

| | |
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| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 9-25-12 | |
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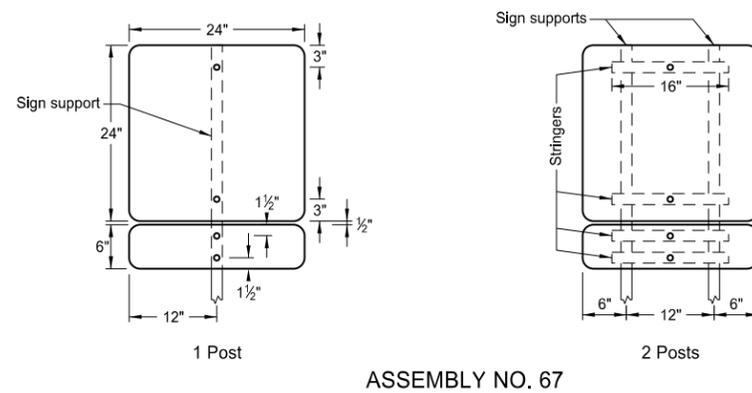
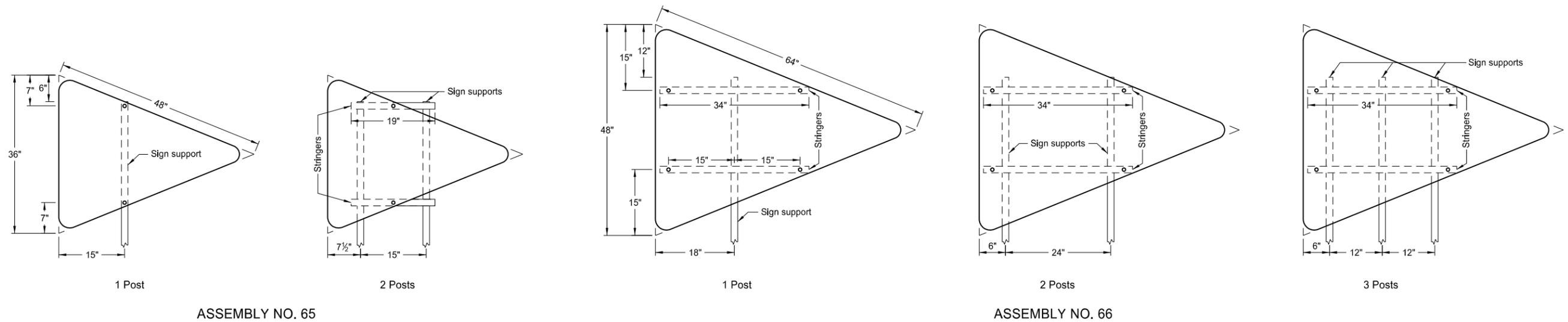
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**SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
REGULATORY, WARNING AND GUIDE SIGNS**

D-754-41



- 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.



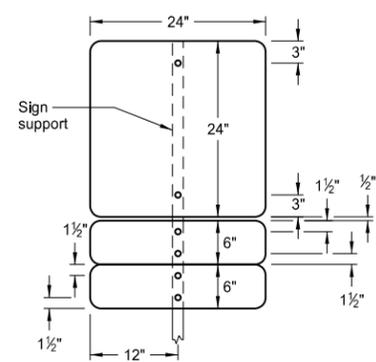
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| 8-22-12 | |
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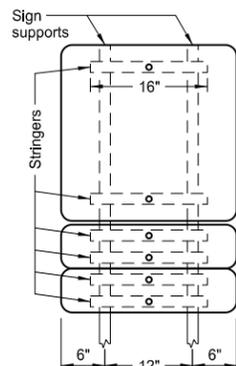
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
REGULATORY, WARNING, AND GUIDE SIGNS

Notes:

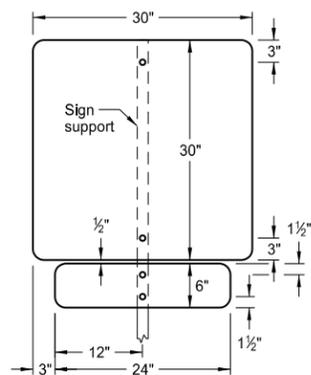
1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1½"x1½".
3. All holes shall be punched round for ⅜" bolt.



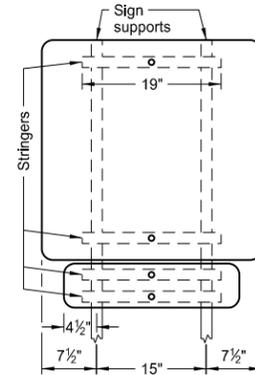
1 Post



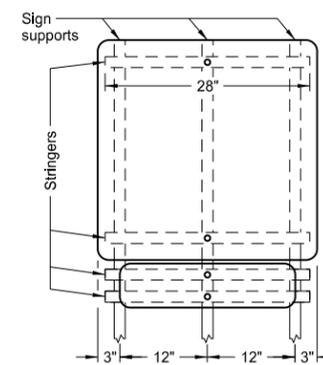
2 Posts



1 Post



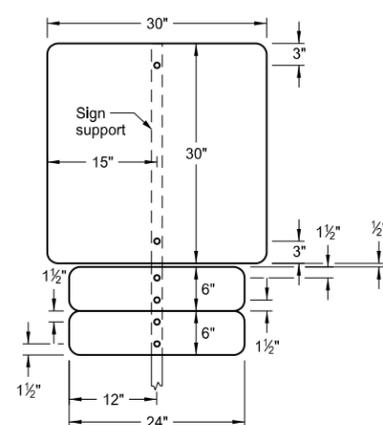
2 Posts



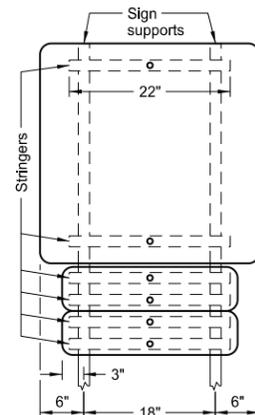
3 Posts

ASSEMBLY NO. 68

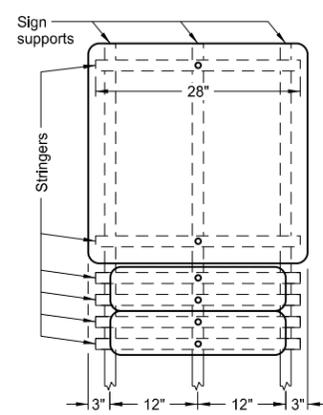
ASSEMBLY NO. 69



1 Post

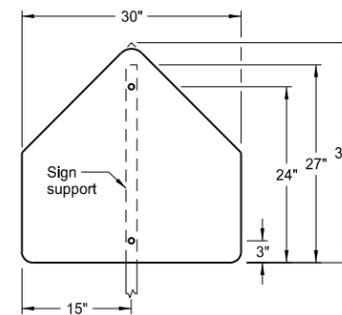


2 Posts

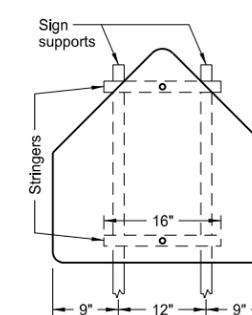


3 Posts

ASSEMBLY NO. 70

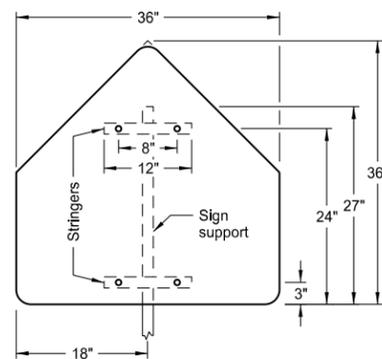


1 Post

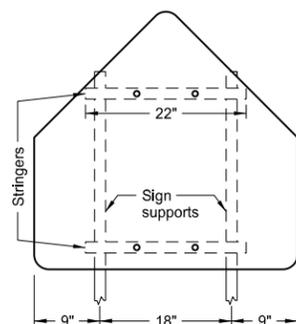


2 Posts

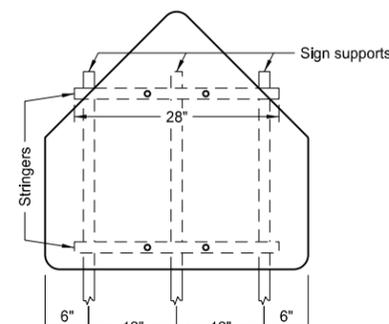
ASSEMBLY NO. 71



1 Post



2 Posts



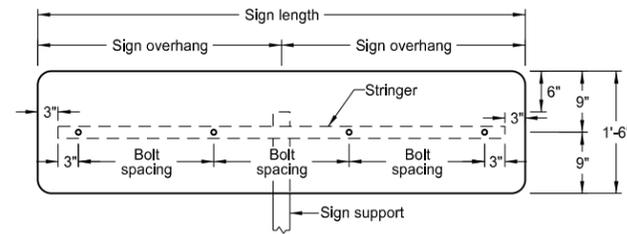
3 Posts

ASSEMBLY NO. 72

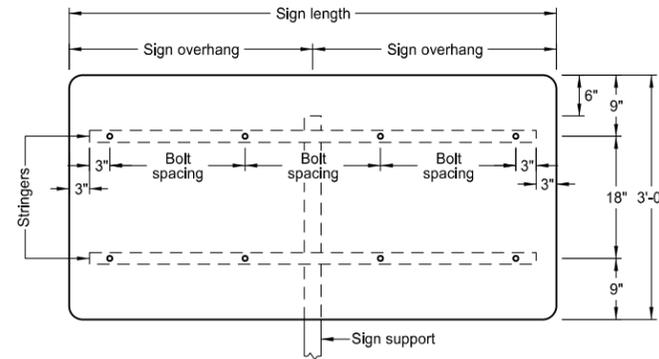
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| 8-22-12 | |
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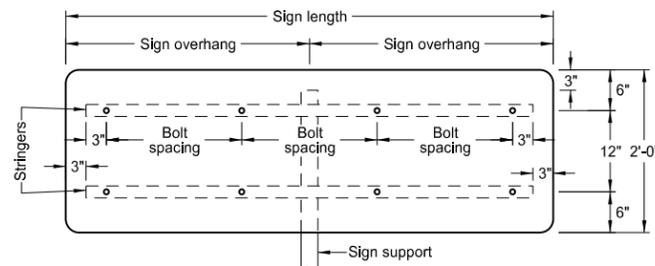
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS



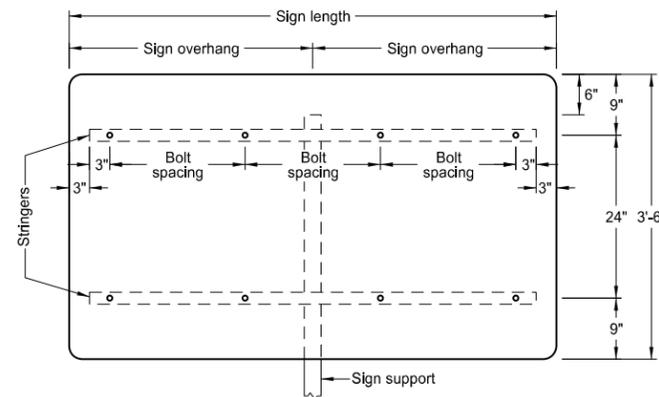
VARIES X 1'-6"



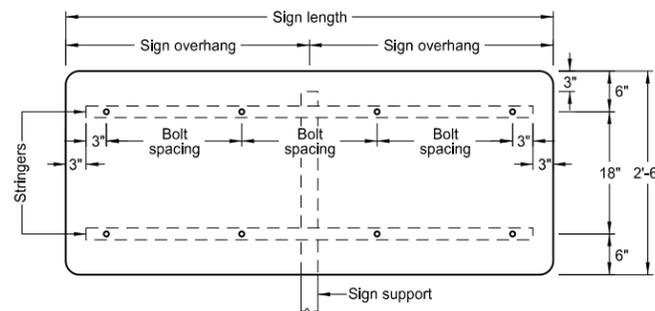
VARIES X 3'-0"



VARIES X 2'-0"



VARIES X 3'-6"



VARIES X 2'-6"

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

Notes:

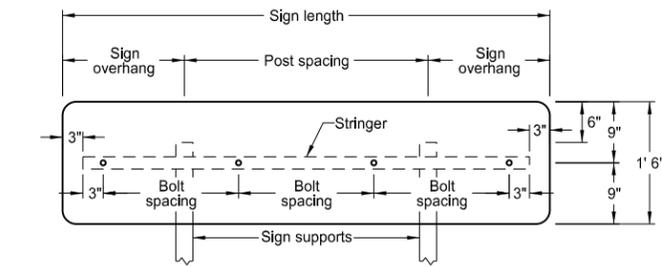
1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1½" x 1½".
3. All holes shall be punched round for ⅜" bolt.
4. Single stringer and single post signs shall have stringers attached to the post using the special stringer angle, shown on the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

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| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 9-25-12 | |
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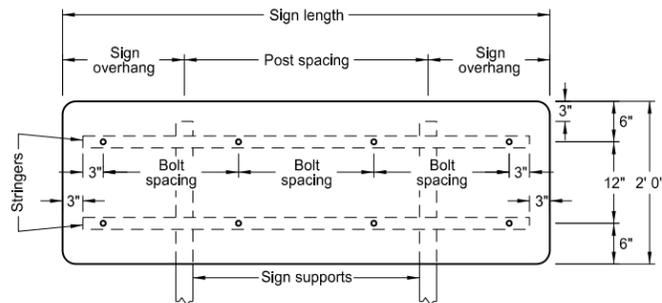
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS

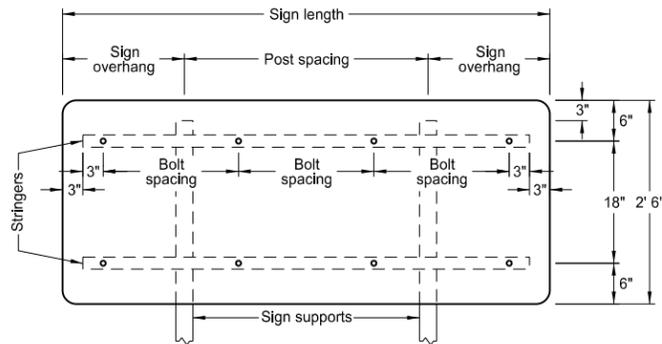
D-754-48



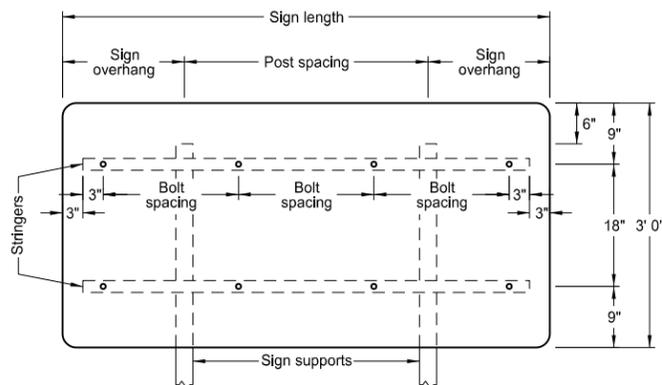
VARIES X 1'-6"



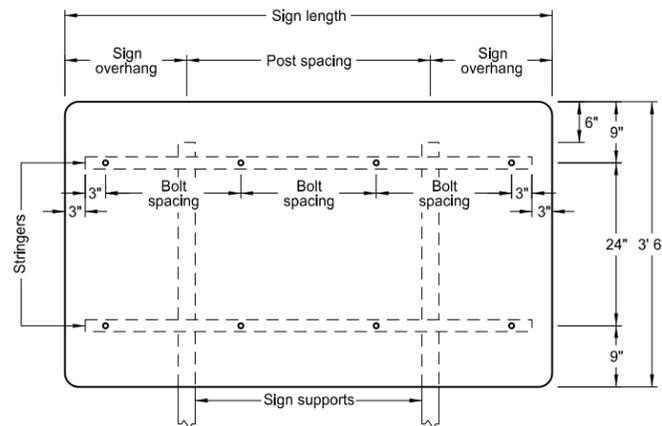
VARIES X 2'-0"



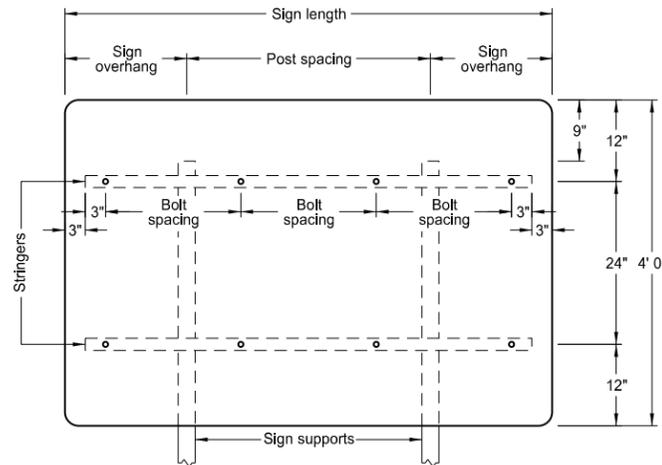
VARIES X 2'-6"



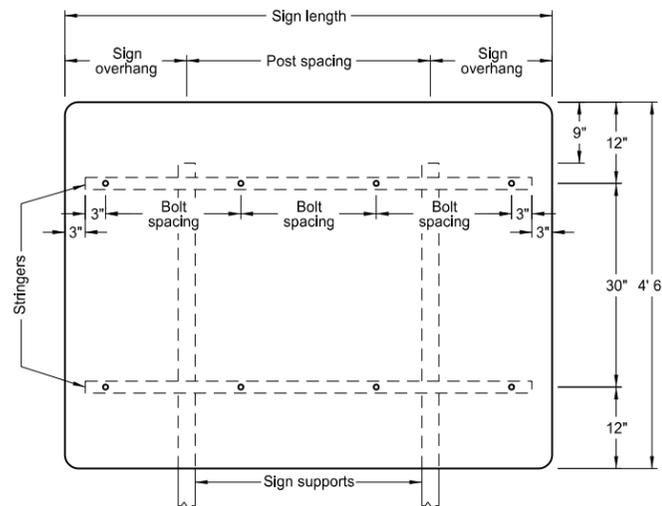
VARIES X 3'-0"



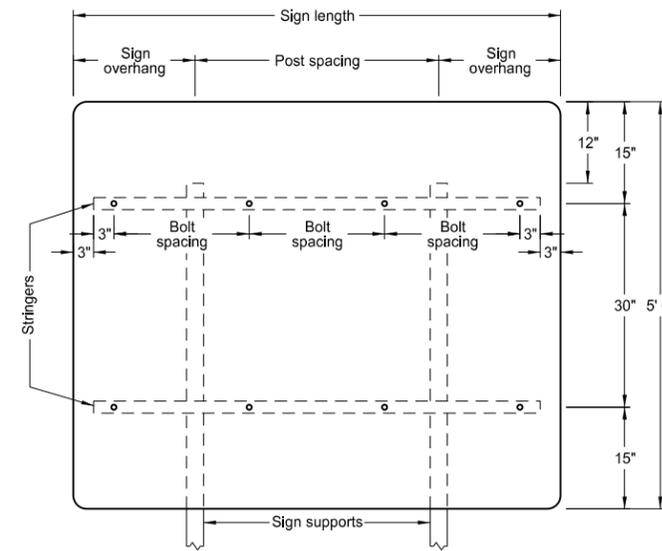
VARIES X 3'-6"



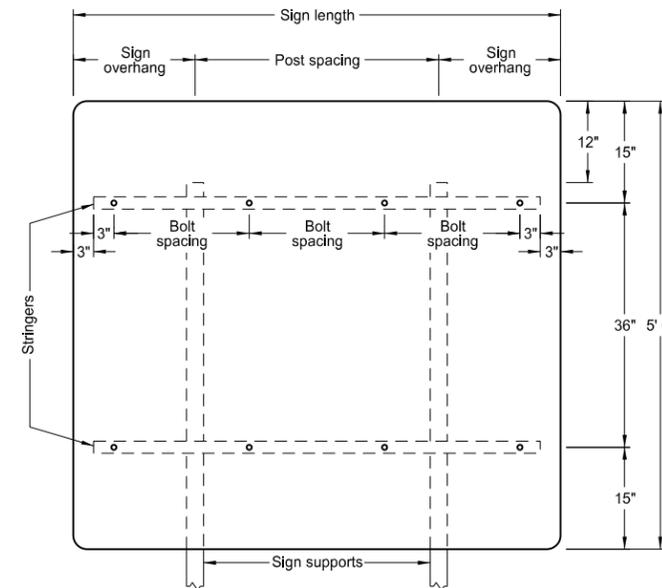
VARIES X 4'-0"



VARIES X 4'-6"



VARIES X 5'-0"



VARIES X 5'-6"

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

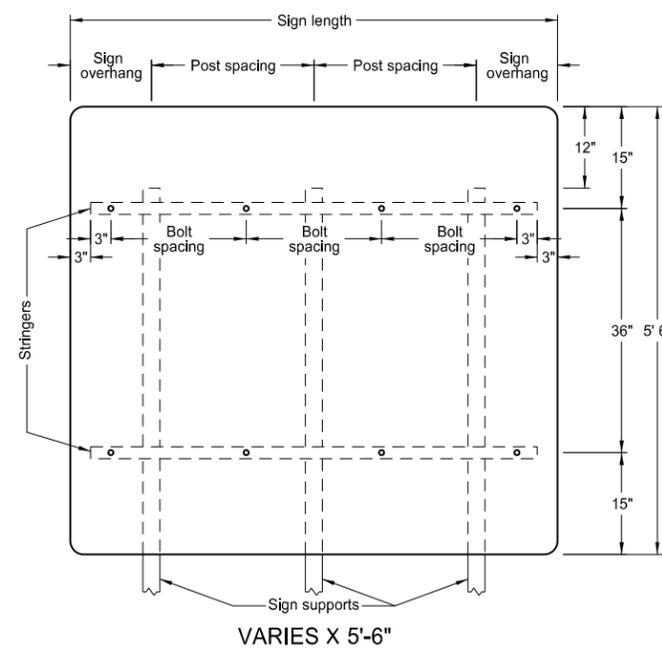
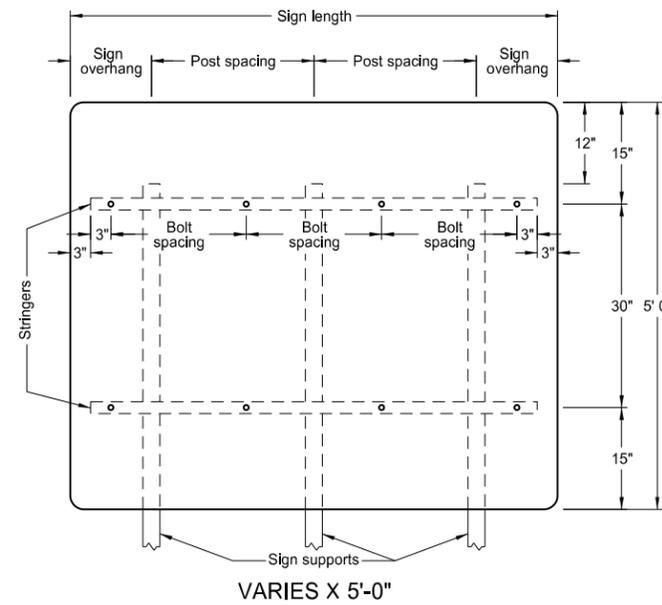
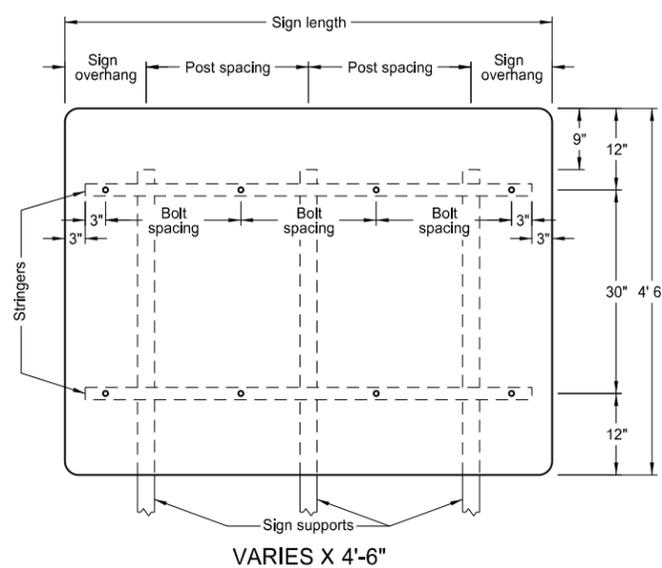
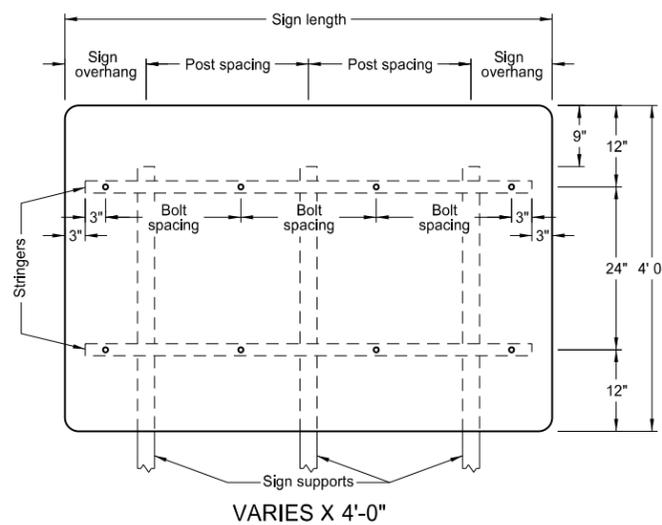
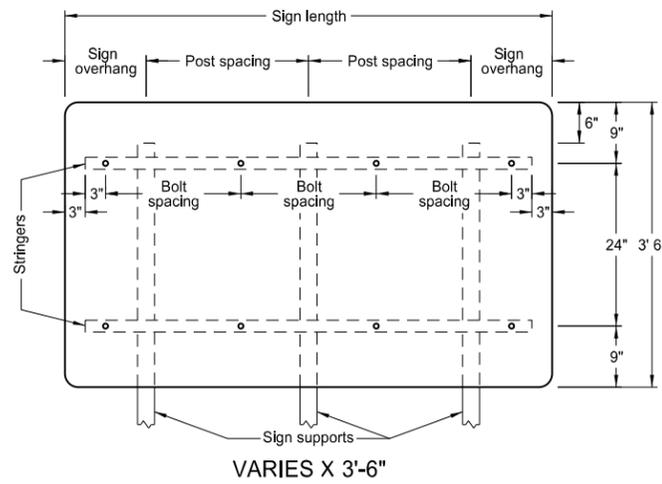
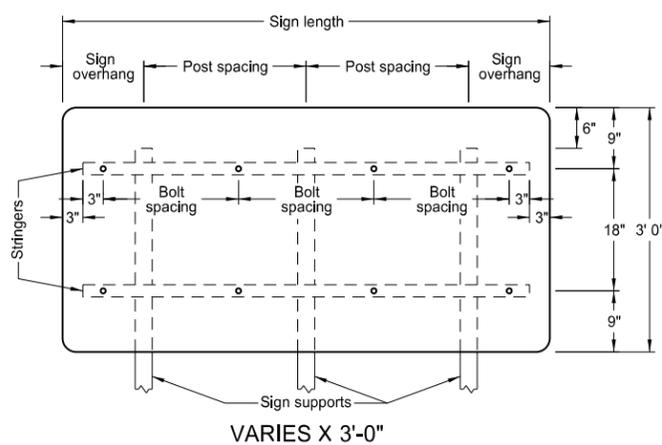
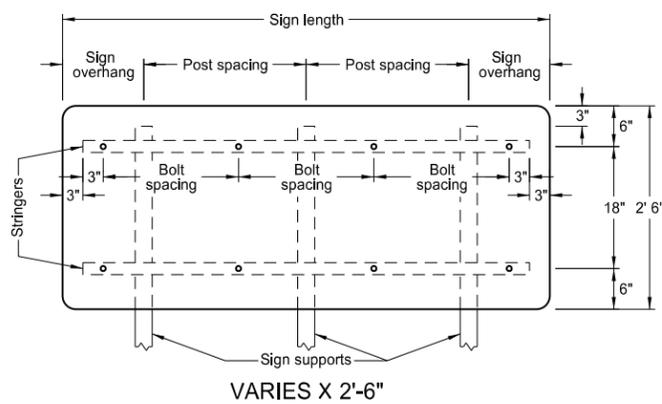
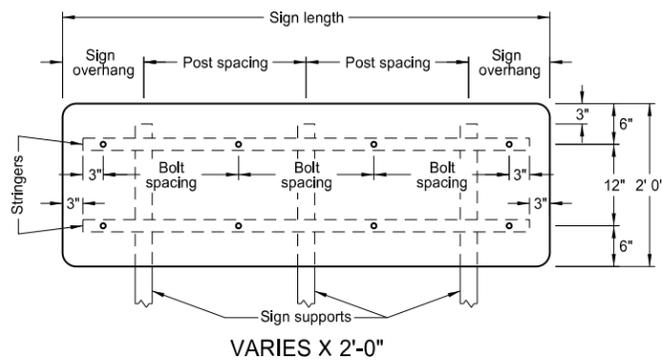
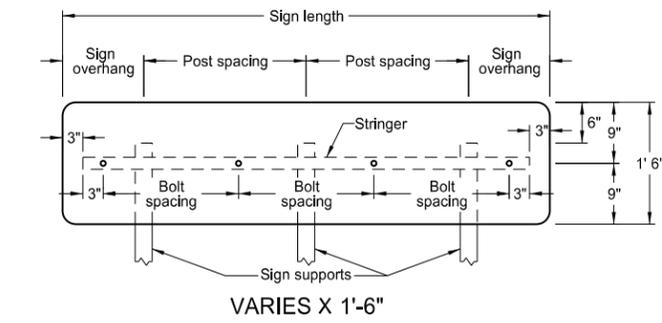
- Notes:
1. The minimum sign backing material thickness shall be 0.100 inch.
 2. Perforated square tube stringer shall be 1½" x 1½".
 3. All holes shall be punched round for ⅜" bolt.

| | |
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| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS

D-754-49



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

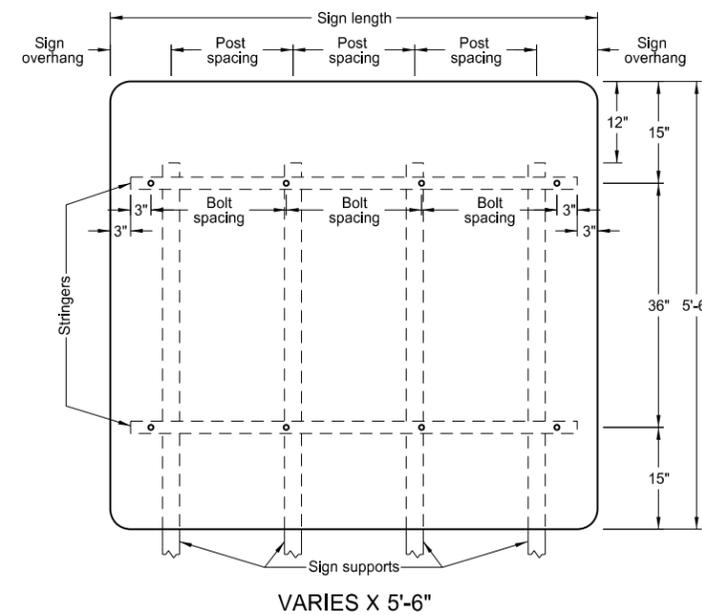
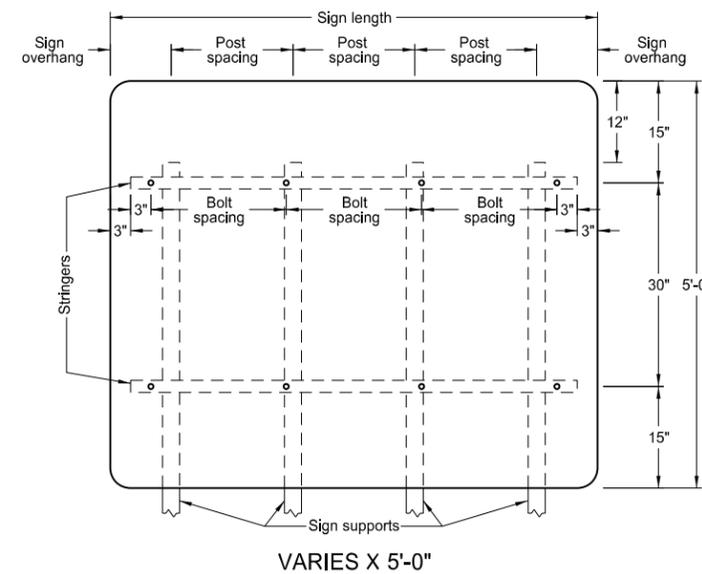
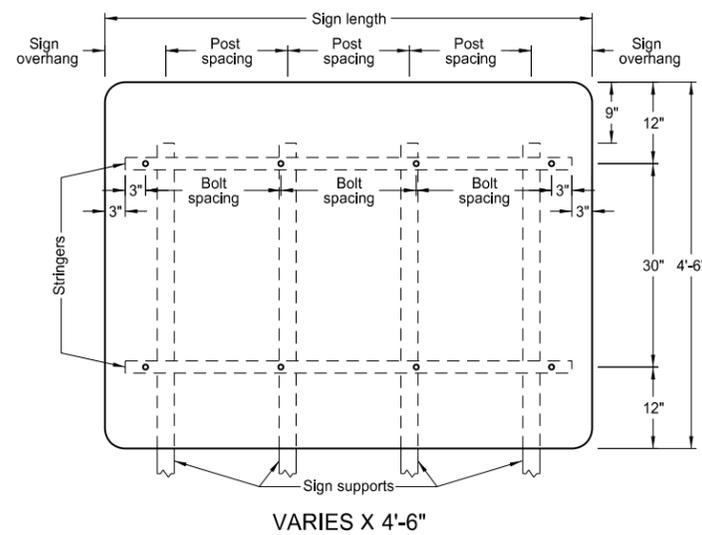
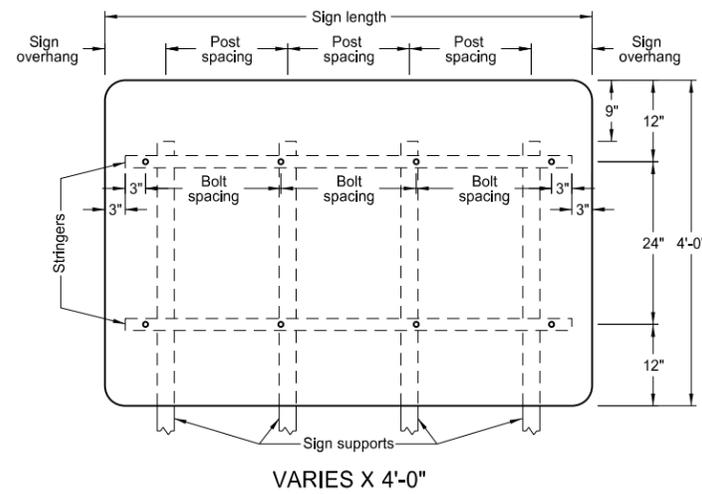
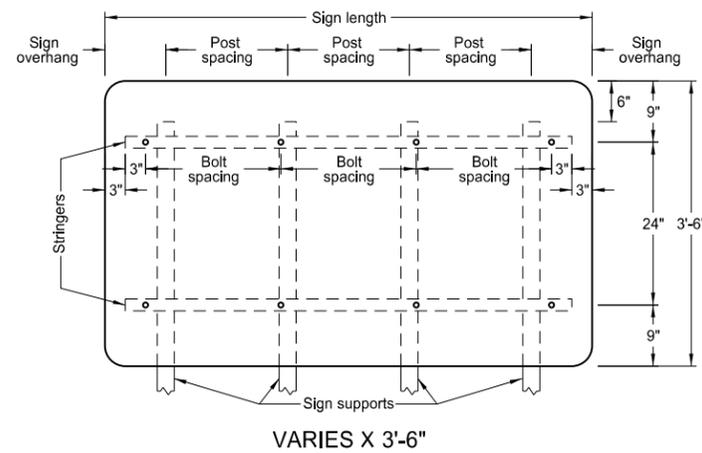
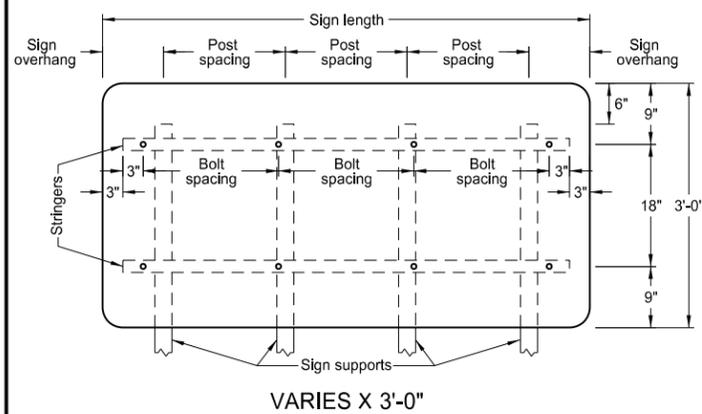
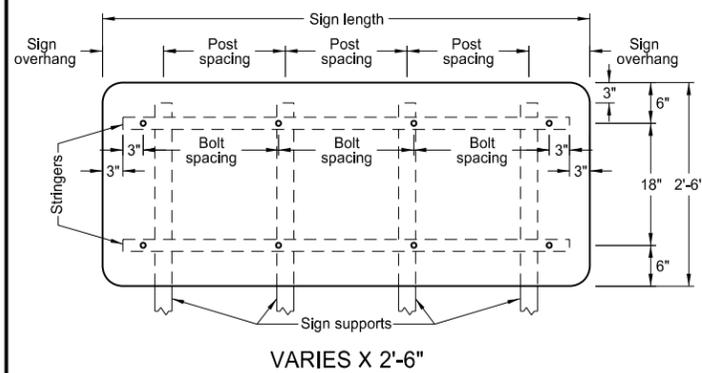
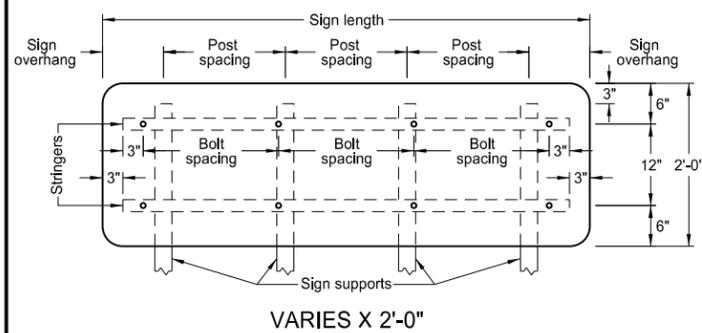
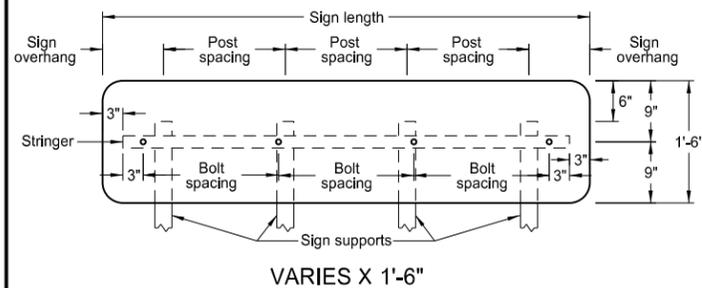
- Notes:
- The minimum sign backing material thickness shall be 0.100 inch.
 - Perforated square tube stringer shall be 1½" x 1½".
 - All holes shall be punched round for ⅜" bolt.

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| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 9-25-12 | |
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS

D-754-50



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

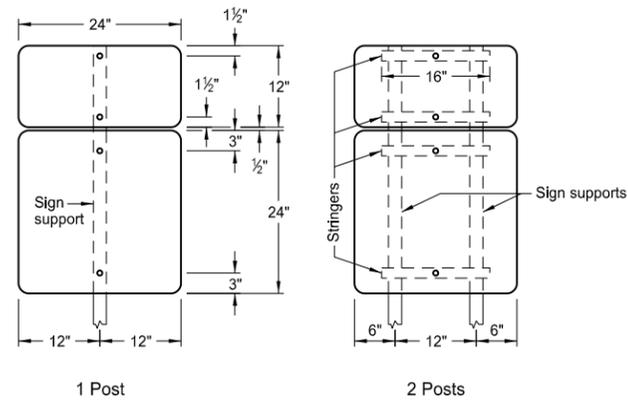
- Notes:
1. The minimum sign backing material thickness shall be 0.100 inch.
 2. Perforated square tube stringer shall be 1½" x 1½".
 3. All holes shall be punched round for ⅝" bolt.

| | |
|------------------------------|--------|
| NORTH DAKOTA | |
| DEPARTMENT OF TRANSPORTATION | |
| 9-25-12 | |
| REVISIONS | |
| DATE | CHANGE |
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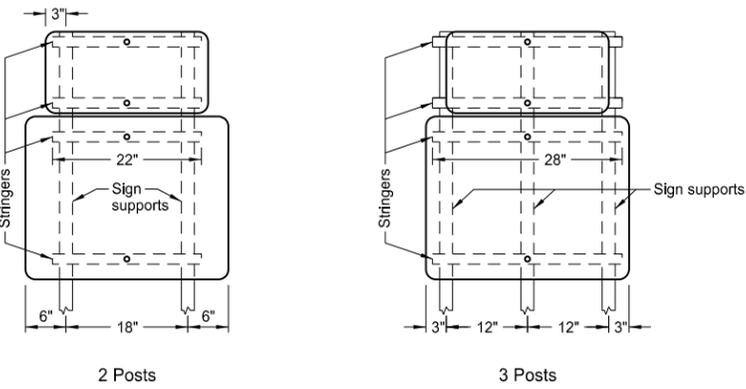
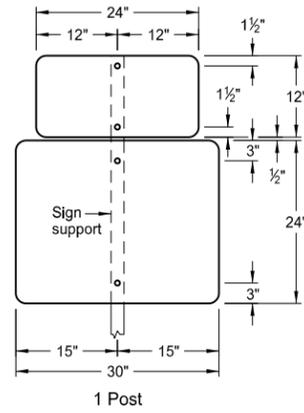
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Registration Number
PE-2930,
on 9/25/2012 and the original document is stored at the
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of Transportation

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

D-754-51

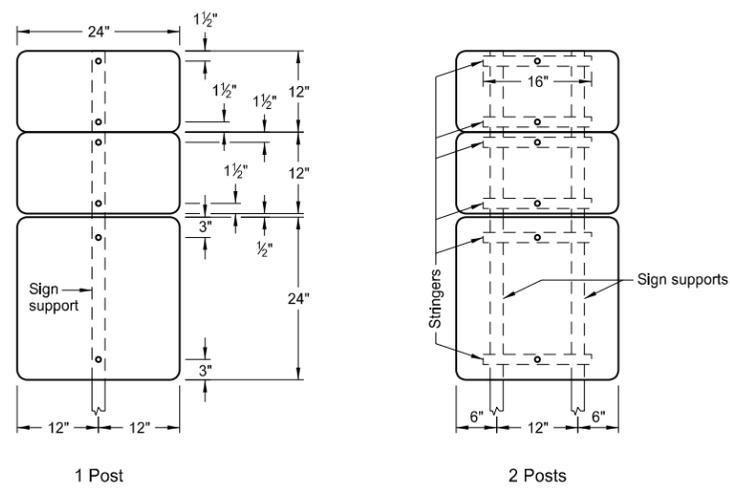


ASSEMBLY NO. 371

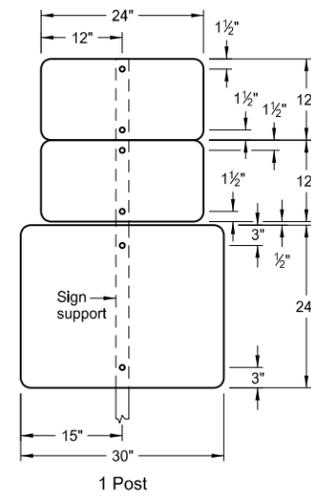
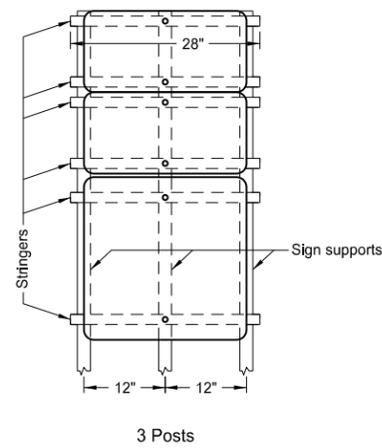


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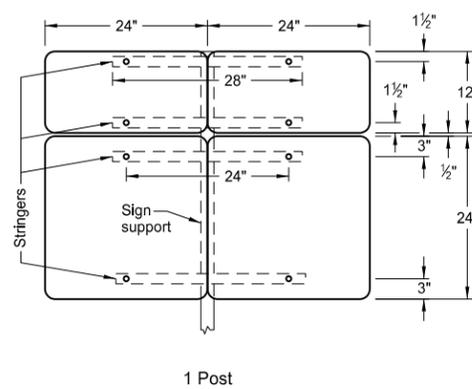
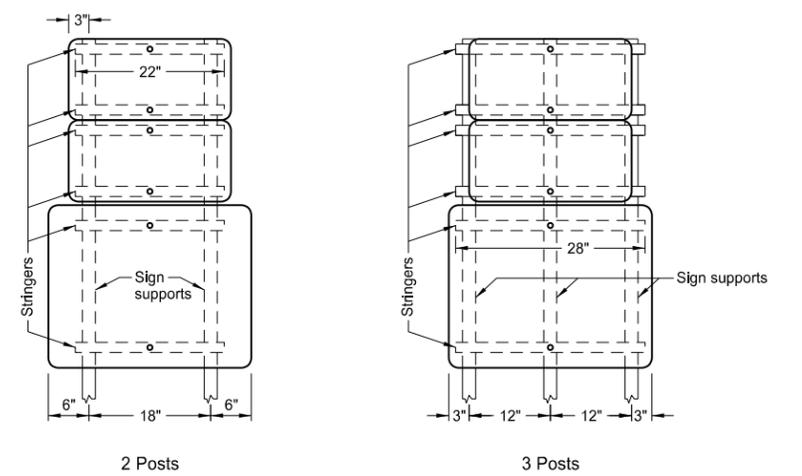
- Notes:
1. The minimum sign backing material thickness shall be 0.100 inch.
 2. Perforated square tube stringer shall be 1½"x1½".
 3. All holes shall be punched round for ⅜" bolt.



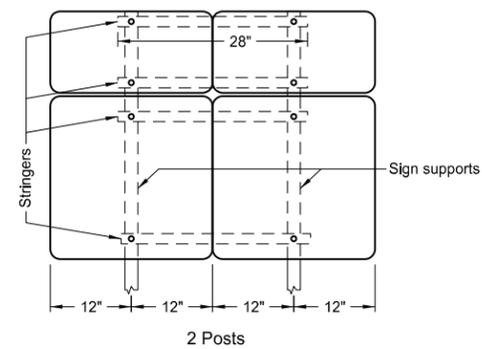
ASSEMBLY NO. 373



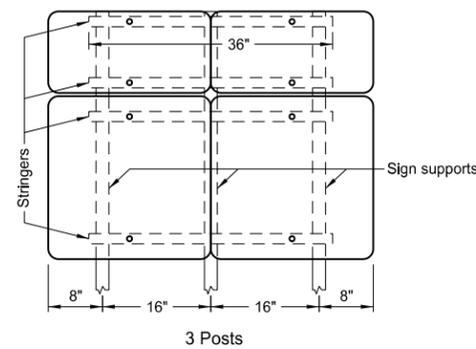
ASSEMBLY NO. 374



1 Post



2 Posts



3 Posts

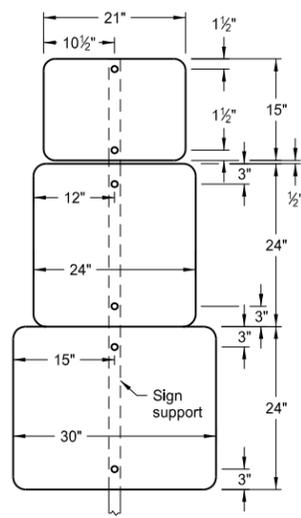
ASSEMBLY NO. 375

| | |
|---|--------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 8-22-12 | |
| REVISIONS | |
| DATE | CHANGE |
| | |

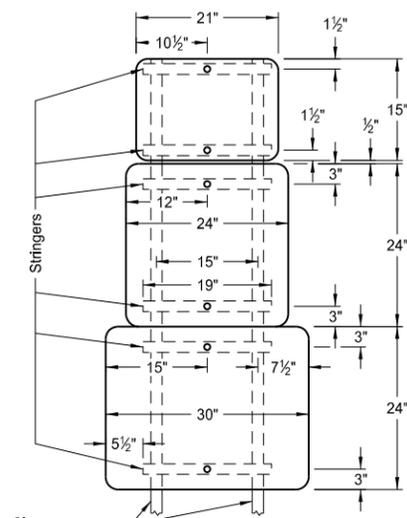
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

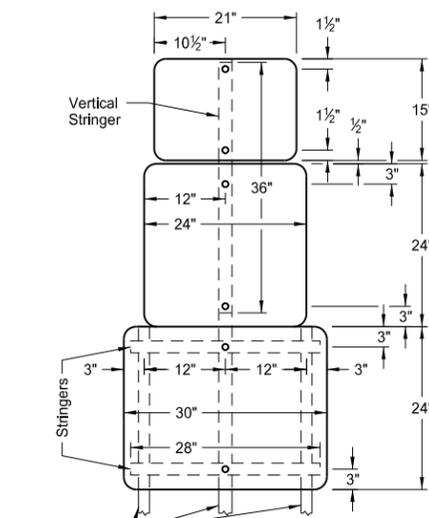
D-754-58



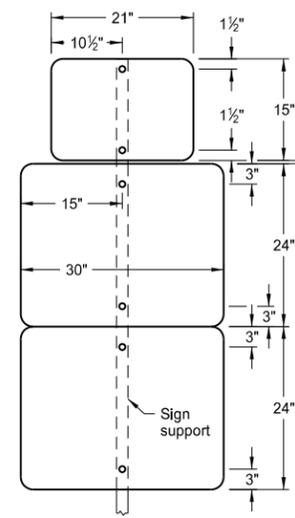
1 Post



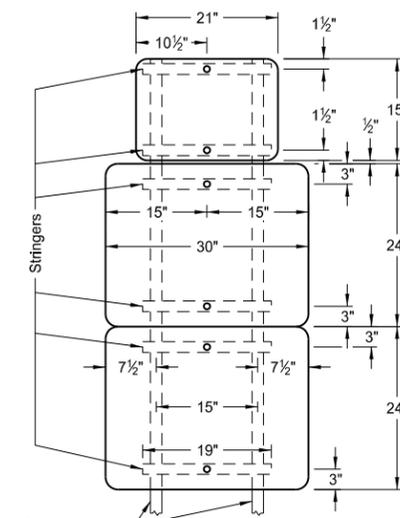
2 Posts
ASSEMBLY 396



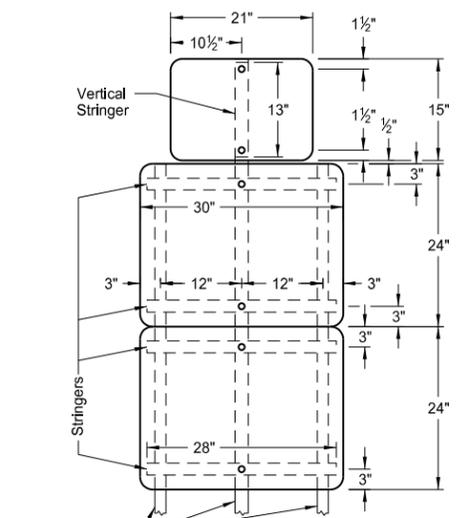
3 Posts



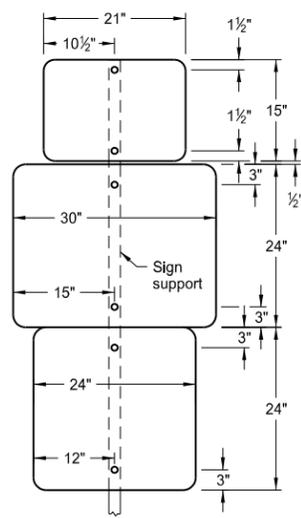
1 Post



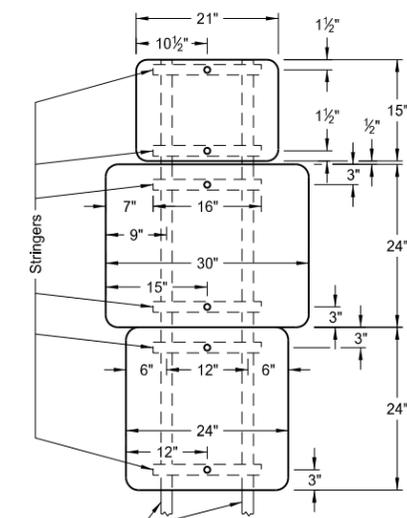
2 Posts
ASSEMBLY 397



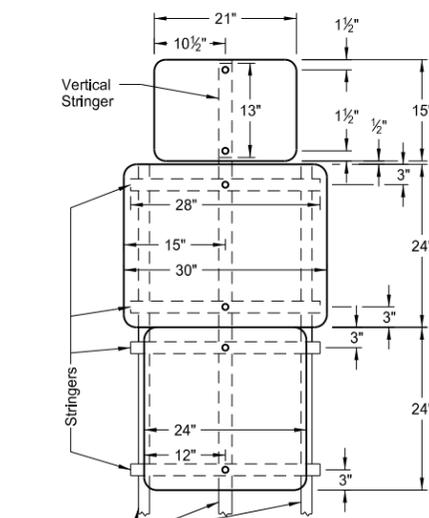
3 Posts



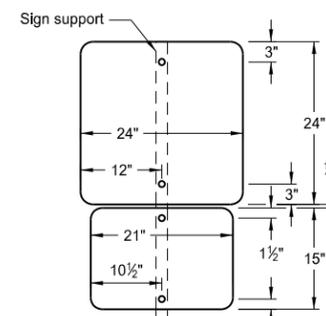
1 Post



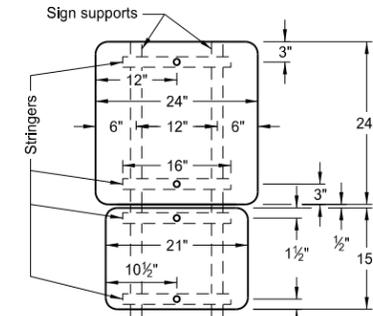
2 Posts
ASSEMBLY 398



3 Posts



1 Post



2 Posts

ASSEMBLY 399

Notes:

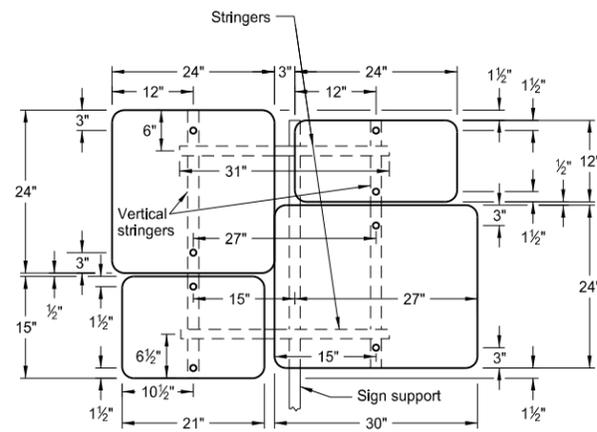
1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1 1/2"x1 1/2".
3. All holes shall be punched round for 3/8" bolt.

| | |
|--|--------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 8-22-12 | |
| REVISIONS | |
| DATE | CHANGE |
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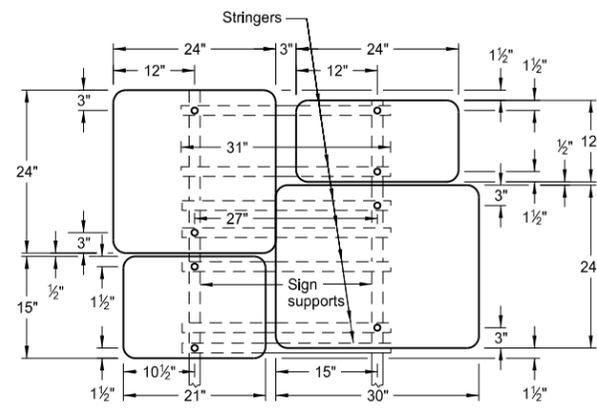
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

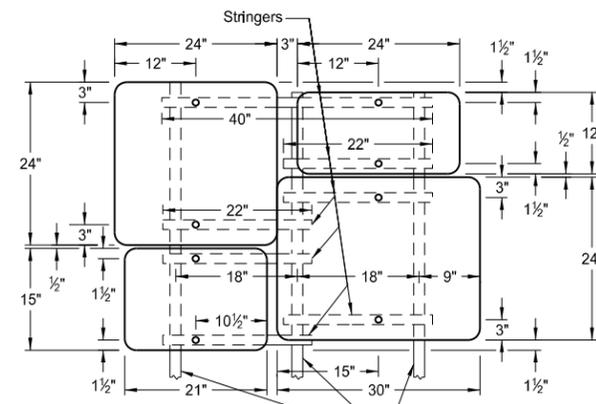
D-754-60



1 Post



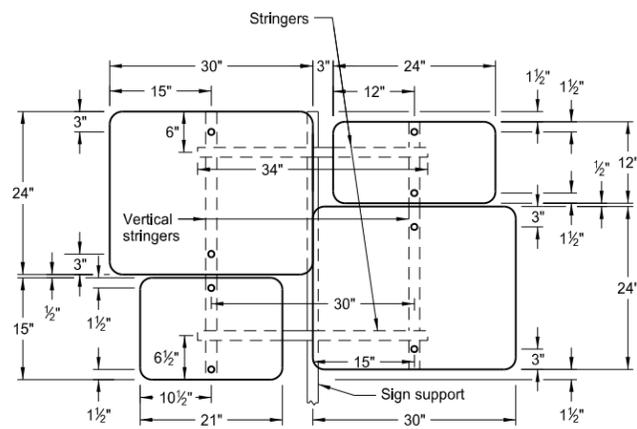
2 Posts



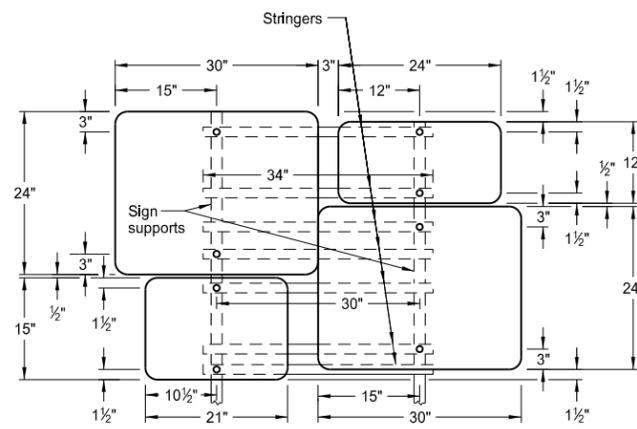
3 Posts

- 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.

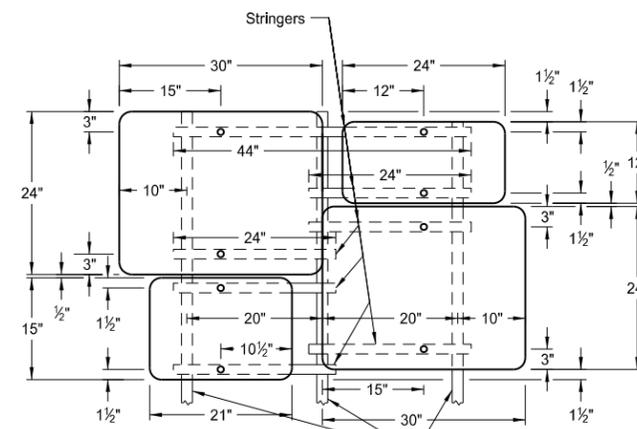
ASSEMBLY NO. 403



1 Post

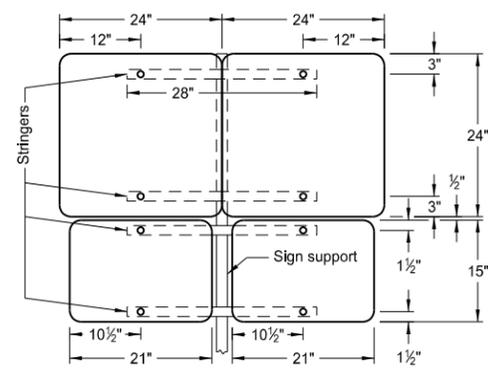


2 Posts

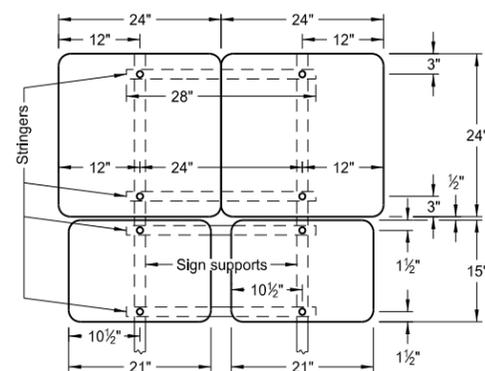


3 Posts

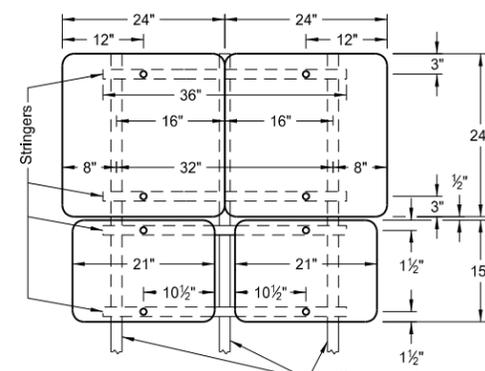
ASSEMBLY NO. 404



1 Post



2 Posts



3 Posts

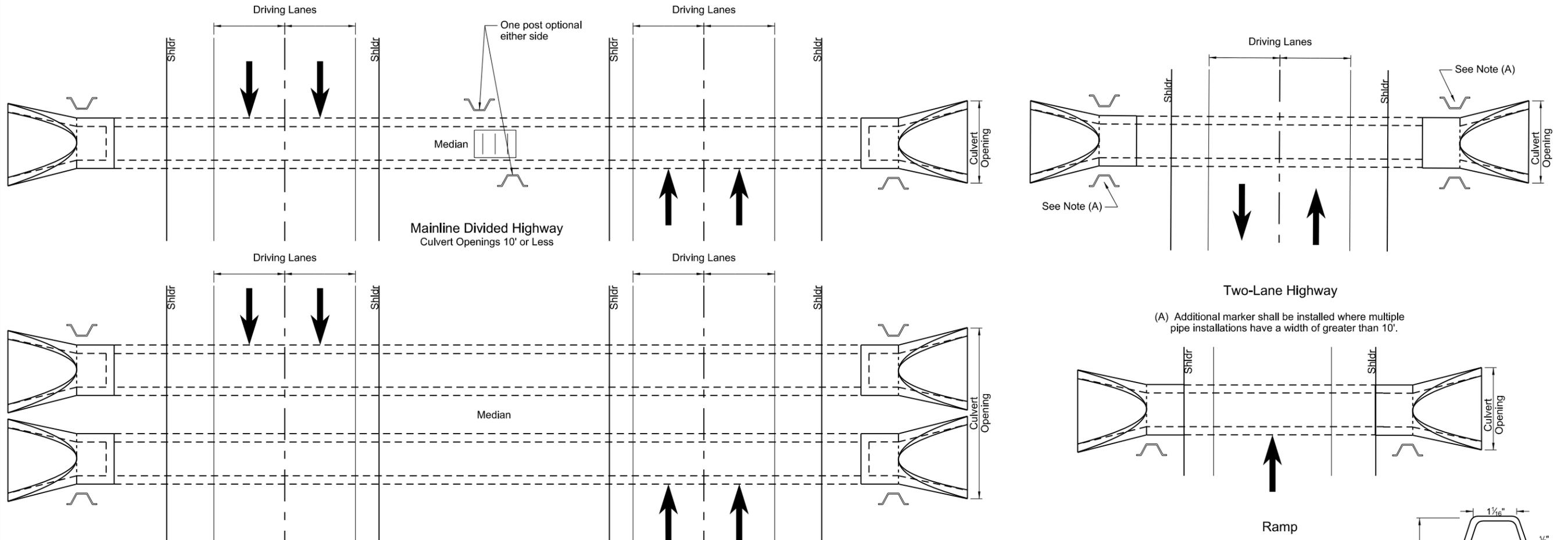
ASSEMBLY NO. 405

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|--|--------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 8-22-12 | |
| REVISIONS | |
| DATE | CHANGE |

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OBJECT MARKERS - CULVERTS

D-754-83

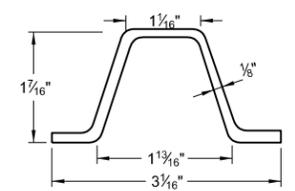


(A) Additional marker shall be installed where multiple pipe installations have a width of greater than 10'.

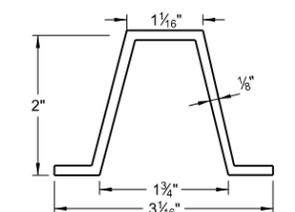
Post Location

Mainline Divided Highway Culvert Openings Greater than 10' Multiple Installations

Top 12 inches painted black



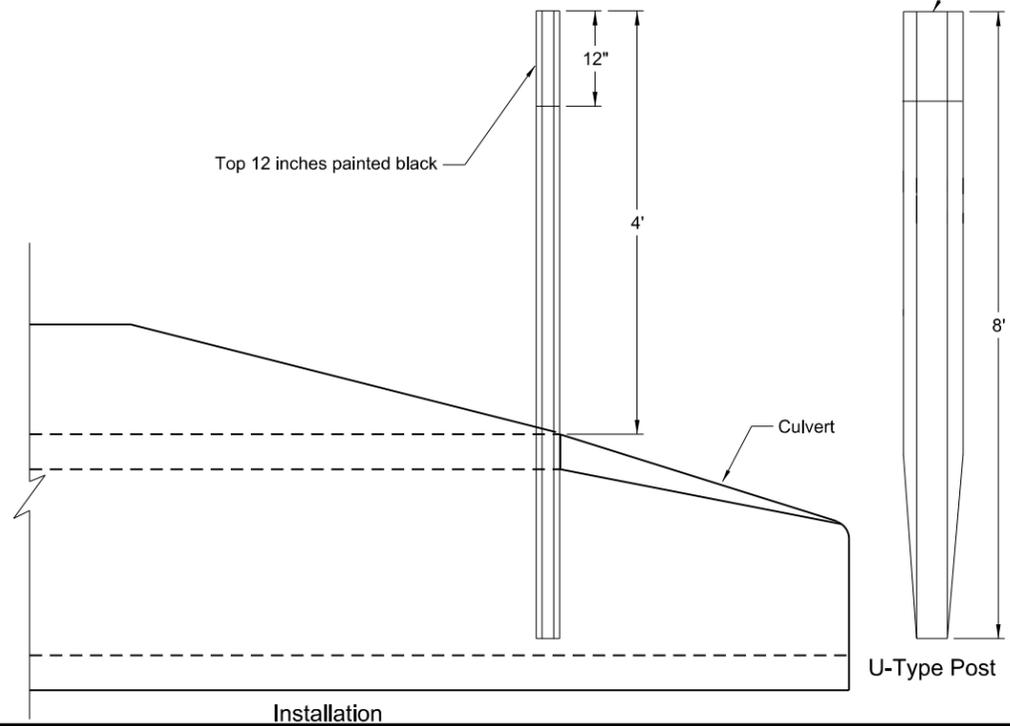
Steel Post Detail
Approx. 2.0 lbs/ft



Aluminum Post Detail
Approx. 0.88 lbs/ft

Notes:

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



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

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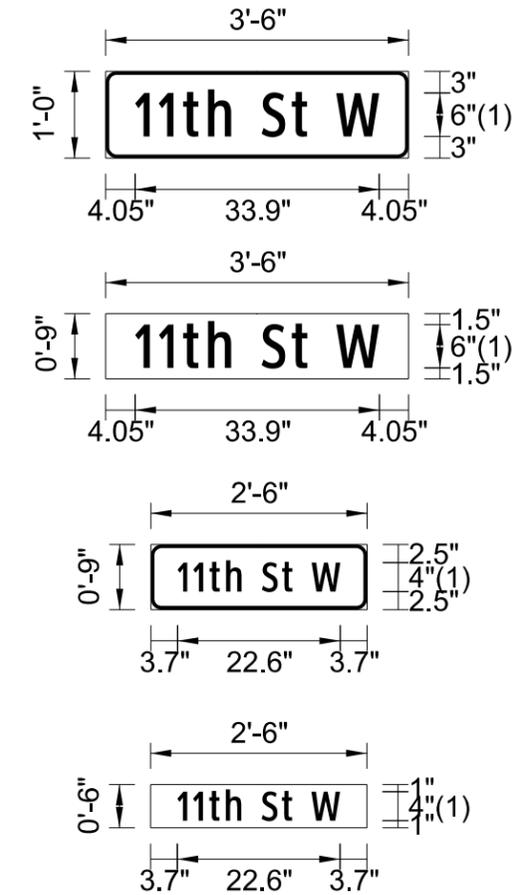
911 SIGN SUPPORT INFORMATION AND SIGN DETAILS

D-754-86

| THE POST INFORMATION FOR VARIOUS SIGN CONFIGURATIONS (60 INCH VERTICAL CLEARANCE) | | | | | | | | | | | | | |
|--|-----------------------|-----------------|---------------------|-----------------|-----------------|-------------------|--------|-----------|----------------|--------|----------------|----------------|------|
| ASSEMBLY NUMBER | STREET NAME SIGN SIZE | TOTAL SIGN AREA | MAXIMUM POST LENGTH | NUMBER OF POSTS | SUPPORT SIZE | SLEEVE LENGTH (A) | | | SLEEVE SIZE | ANCHOR | | BREAK-AWAY | |
| | | | | | | 1st LF | 2nd LF | 3rd LF | | NUMBER | LENGTH | | SIZE |
| | | | | | | Inches | SF | LF | | | | | |
| SA 1 | 24"x12" | 8.00 | 20.2 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 30"x12" | 10.00 | 16.4 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 36"x12" | 12.00 | 13.8 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 42"x12" | 14.00 | 14.7 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 48"x12" | 16.00 | 12.9 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 54"x12" | 18.00 | 15.2 | 1 | 2.25x2.25 12 ga | | | | | 1 | 4.0 | 2.5x2.5 12ga | |
| | 60"x12" | 20.00 | 13.7 | 1 | 2.25x2.25 12 ga | | | | | 1 | 4.0 | 2.5x2.5 12ga | |
| | 24"x9" | 6.00 | 24.1 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 30"x9" | 7.50 | 21.2 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 36"x9" | 9.00 | 17.7 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 42"x9" | 10.50 | 15.3 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 48"x9" | 12.00 | 13.5 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 54"x9" | 13.50 | 14.8 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 60"x9" | 15.00 | 13.4 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 24"x6" | 4.00 | 35.2 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 30"x6" | 5.00 | 28.3 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 36"x6" | 6.00 | 23.6 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 42"x6" | 7.00 | 22.3 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 48"x6" | 8.00 | 19.6 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| | 54"x6" | 9.00 | 17.5 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | |
| 60"x6" | 10.00 | 15.4 | 1 | 2x2 12 ga | | | | | 1 | 4.0 | 2.25x2.25 12ga | | |
| SA 2 | 24"x12" | 13.2 | 14.6 | 1 | 2.5x2.5 12 ga | | | | | 1 | 4.0 | 3x3 7 ga | |
| | 30"x12" | 15.2 | 16.3 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 36"x12" | 17.2 | 15.4 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 42"x12" | 19.2 | 14.7 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 48"x12" | 21.2 | 15.3 | 1 | 2.25x2.25 12 ga | 4.5 | | | 2x2 12 ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 54"x12" | 23.2 | 20.6 | 1 | 2.5x2.5 10 ga | 1.5 | | | 2.19x2.19 10ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 60"x12" | 25.2 | 16.7 | 1 | 2.5x2.5 12 ga | 3.9 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 24"x9" | 11.2 | 15.2 | 1 | 2.5x2.5 12 ga | | | | | 1 | 4.0 | 3x3 7 ga | |
| | 30"x9" | 12.7 | 14.5 | 1 | 2.5x2.5 12 ga | | | | | 1 | 4.0 | 3x3 7 ga | |
| | 36"x9" | 14.2 | 16.5 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 42"x9" | 15.7 | 15.8 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 48"x9" | 17.2 | 14.4 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 54"x9" | 18.7 | 15.1 | 1 | 2.25x2.25 12 ga | 4.2 | | | 2x2 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 60"x9" | 20.2 | 14.6 | 1 | 2.25x2.25 12 ga | 4.6 | | | 2x2 12 ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 24"x6" | 9.2 | 16.0 | 1 | 2.5x2.5 12 ga | | | | | 1 | 4.0 | 3x3 7 ga | |
| | 30"x6" | 10.2 | 15.5 | 1 | 2.5x2.5 12 ga | | | | | 1 | 4.0 | 3x3 7 ga | |
| | 36"x6" | 11.2 | 15.0 | 1 | 2.5x2.5 12 ga | | | | | 1 | 4.0 | 3x3 7 ga | |
| | 42"x6" | 12.2 | 13.7 | 1 | 2.5x2.5 12 ga | | | | | 1 | 4.0 | 3x3 7 ga | |
| | 48"x6" | 13.2 | 15.9 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 54"x6" | 14.2 | 15.4 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| 60"x6" | 15.2 | 14.9 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 | |
| SA 3 | 24"x12" | 13.9 | 16.1 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 30"x12" | 15.9 | 15.3 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 36"x12" | 17.9 | 15.9 | 1 | 2.25x2.25 12 ga | 4.4 | | | 2x2 12 ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 42"x12" | 19.9 | 15.2 | 1 | 2.25x2.25 12 ga | 4.8 | | | 2x2 12 ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 48"x12" | 21.9 | 15.1 | 1 | 2.5x2.5 12 ga | 5.1 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 54"x12" | 23.9 | 20.6 | 1 | 2.5x2.5 10 ga | 1.9 | | | 2.19x2.19 10ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 60"x12" | 25.9 | 16.0 | 1 | 2.5x2.5 12 ga | 4.7 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 24"x9" | 11.9 | 16.8 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 30"x9" | 13.4 | 16.1 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 36"x9" | 14.9 | 15.4 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 42"x9" | 16.4 | 14.8 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 48"x9" | 17.9 | 15.6 | 1 | 2.25x2.25 12 ga | 4.3 | | | 2x2 12 ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 54"x9" | 19.4 | 14.9 | 1 | 2.5x2.5 12 ga | 4.8 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 60"x9" | 20.9 | 20.6 | 1 | 2.5x2.5 10 ga | 1.6 | | | 2.19x2.19 10ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 24"x6" | 9.9 | 14.7 | 1 | 2.5x2.5 12 ga | | | | | 1 | 4.0 | 3x3 7 ga | |
| | 30"x6" | 10.9 | 14.3 | 1 | 2.5x2.5 12 ga | | | | | 1 | 4.0 | 3x3 7 ga | |
| | 36"x6" | 11.9 | 16.5 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 42"x6" | 12.9 | 16.0 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 48"x6" | 13.9 | 14.8 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 54"x6" | 14.9 | 14.4 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| 60"x6" | 15.9 | 15.3 | 1 | 2.25x2.25 12 ga | 4.2 | | | 2x2 12 ga | 1 | 4.0 | 3x3 7 ga | 1 | |

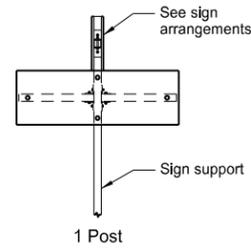
| THE POST INFORMATION FOR VARIOUS SIGN CONFIGURATIONS (60 INCH VERTICAL CLEARANCE) | | | | | | | | | | | | | |
|--|-----------------------|-----------------|---------------------|-----------------|-----------------|-------------------|--------|----------------|-----------------|--------|----------|------------|------|
| ASSEMBLY NUMBER | STREET NAME SIGN SIZE | TOTAL SIGN AREA | MAXIMUM POST LENGTH | NUMBER OF POSTS | SUPPORT SIZE | SLEEVE LENGTH (A) | | | SLEEVE SIZE | ANCHOR | | BREAK-AWAY | |
| | | | | | | 1st LF | 2nd LF | 3rd LF | | NUMBER | LENGTH | | SIZE |
| | | | | | | Inches | SF | LF | | | | | |
| SA 4 | 24"x12" | 15.5 | 15.1 | 1 | 2.25x2.25 12 ga | 4.7 | | | 2x2 12 ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 30"x12" | 17.5 | 15.1 | 1 | 2.5x2.5 12 ga | 4.9 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 36"x12" | 19.5 | 17.5 | 1 | 2.5x2.5 12 ga | 3.6 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 42"x12" | 21.5 | 16.8 | 1 | 2.5x2.5 12 ga | 4.1 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 48"x12" | 23.5 | 16.2 | 1 | 2.5x2.5 12 ga | 4.5 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 54"x12" | 25.5 | 15.6 | 1 | 2.5x2.5 12 ga | 4.9 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 60"x12" | 27.5 | 16.7 | 1 | 2.5x2.5 10 ga | 4.2 | | | 2.19x2.19 10ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 24"x9" | 13.5 | 14.3 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 30"x9" | 15.0 | 15.1 | 1 | 2.25x2.25 12 ga | 4.4 | | | 2x2 12 ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 36"x9" | 16.5 | 14.6 | 1 | 2.25x2.25 12 ga | 4.7 | | | 2x2 12 ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 42"x9" | 18.0 | 14.7 | 1 | 2.5x2.5 12 ga | 4.9 | | | 2.25x2.25 12 ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 48"x9" | 19.5 | 17.2 | 1 | 2.5x2.5 12 ga | 3.5 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 54"x9" | 21.0 | 15.8 | 1 | 2.5x2.5 12 ga | 4.3 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 60"x9" | 22.5 | 15.4 | 1 | 2.5x2.5 12 ga | 4.6 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 24"x6" | 11.5 | 14.7 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 30"x6" | 12.5 | 14.4 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 36"x6" | 13.5 | 14.0 | 1 | 2.5x2.5 10 ga | | | | | 1 | 4.0 | 3x3 7 ga | 1 |
| | 42"x6" | 14.5 | 15.0 | 1 | 2.25x2.25 12 ga | 4.2 | | | 2x2 12 ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 48"x6" | 15.5 | 14.5 | 1 | 2.5x2.5 12 ga | 4.6 | | | 2.25x2.25 12 ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 54"x6" | 16.5 | 14.1 | 1 | 2.5x2.5 12 ga | 4.9 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 |
| 60"x6" | 17.5 | 16.8 | 1 | 2.5x2.5 12 ga | 3.5 | | | 2.25x2.25 12ga | 1 | 4.0 | 3x3 7 ga | 1 | |
| SA 5 | 24"x12" | 21.3 | 17.2 | 2 | 2.5x2.5 10 ga | | | | | 2 | 4.0 | 3x3 7 ga | 2 |
| | 30"x12" | 23.3 | 16.7 | 2 | 2.5x2.5 10 ga | | | | | 2 | 4.0 | 3x3 7 ga | 2 |
| | 36"x12" | 25.3 | 16.3 | 2 | 2.5x2.5 10 ga | | | | | 2 | 4.0 | 3x3 7 ga | 2 |
| | 42"x12" | 27.3 | 17.3 | 2 | 2.25x2.25 12 ga | 4.2 | 4.6 | | 2x2 12ga | 2 | 4.0 | 3x3 7 ga | 2 |
| | 48"x12" | 29.3 | 16.9 | 2 | 2.25x2.25 12 ga | 4.5 | 5.0 | | 2x2 12 ga | 2 | 4.0 | 3x3 7 ga | 2 |
| | 54"x12" | 31.3 | 16.5 | 2 | 2.25x2.25 12 ga | 4.7 | 5.3 | | 2x2 12 ga | 2 | 4.0 | 3x3 7 ga | 2 |
| | 60"x12" | 33.3 | 17.5 | 3 | 2.5x2.5 12 ga | | | | | 3 | 4.0 | 3x3 7 ga | 3 |
| | 24"x9" | 19.3 | 15.6 | 1 | 2.5x2.5 10 ga | 4.9 | | | 2.19x2.19 10ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 30"x9" | 20.8 | 17.0 | 2 | 2.5x2.5 10 ga | | | | | 2 | 4.0 | 3x3 7 ga | 2 |
| | 36"x9" | 22.3 | 16.7 | 2 | 2.5x2.5 10 ga | | | | | 2 | 4.0 | 3x3 7 ga | 2 |
| | 42"x9" | 23.8 | 16.3 | 2 | 2.5x2.5 10 ga | | | | | 2 | 4.0 | 3x3 7 ga | 2 |
| | 48"x9" | 25.3 | 16.0 | 2 | 2.5x2.5 10 ga | | | | | 2 | 4.0 | 3x3 7 ga | 2 |
| | 54"x9" | 26.8 | 17.2 | 2 | 2.25x2.25 12 ga | 3.9 | 4.5 | | 2x2 12 ga | 2 | 4.0 | 3x3 7 ga | 2 |
| | 60"x9" | 28.3 | 16.8 | 2 | 2.25x2.25 12 ga | 4.2 | 4.8 | | 2x2 12 ga | 2 | 4.0 | 3x3 7 ga | 2 |
| | 24"x6" | 17.3 | 15.8 | 1 | 2.5x2.5 10 ga | 4.4 | | | 2.19x2.19 10ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 30"x6" | 18.3 | 15.5 | 1 | 2.5x2.5 10 ga | 4.5 | | | 2.19x2.19 10ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 36"x6" | 19.3 | 15.3 | 1 | 2.5x2.5 10 ga | 4.7 | | | 2.19x2.19 10ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 42"x6" | 20.3 | 15.1 | 1 | 2.5x2.5 10 ga | 4.9 | | | 2.19x2.19 10ga | 1 | 4.0 | 3x3 7 ga | 1 |
| | 48"x6" | 21.3 | 16.7 | 2 | 2.5x2.5 10 ga | | | | | 2 | 4.0 | 3x3 7 ga | 2 |
| | 54"x6" | 22.3 | 16.4 | 2 | 2.5x2.5 10 ga | | | | | 2 | 4.0 | 3x3 7 ga | 2 |
| 60"x6" | 23.3 | 16.8 | 2 | 2.25x2.25 12 ga | 3.8 | 4.4 | | 2x2 12 ga | 2 | 4.0 | 3x3 7 ga | 2 | |

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

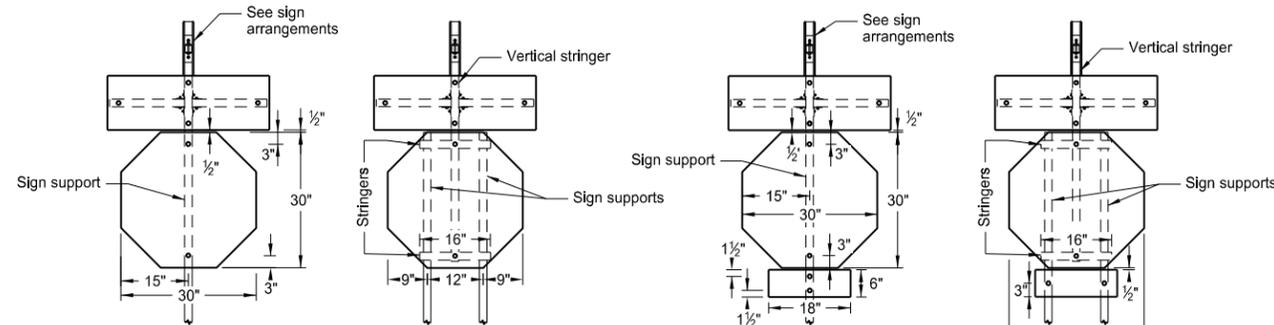


SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR STREET NAME SIGNS AND 911 SIGNS

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

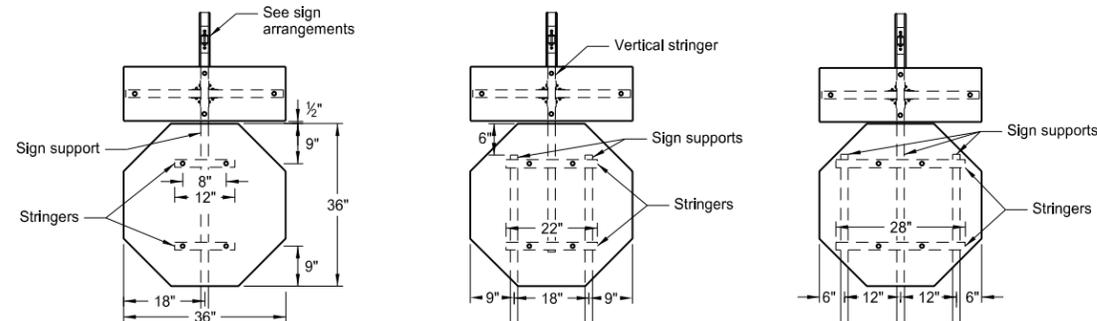


Special Assembly 1 (A, B, C, D or E)

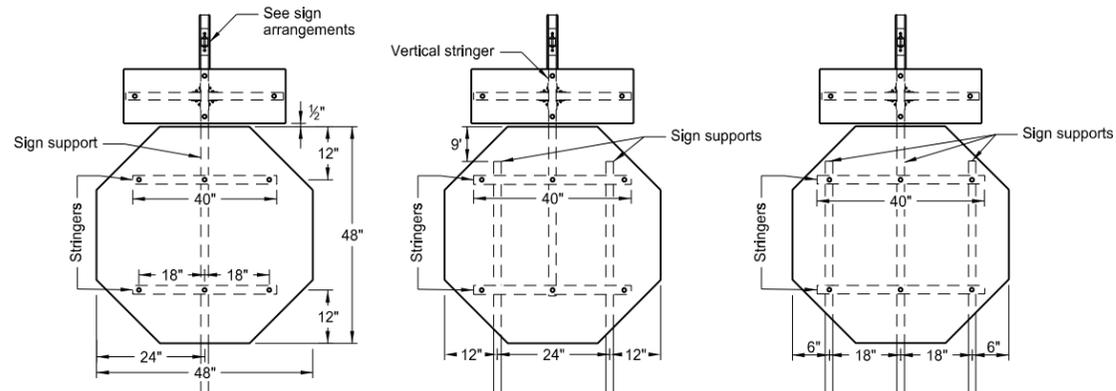


Special Assembly 2 (A, B, C, D or E)

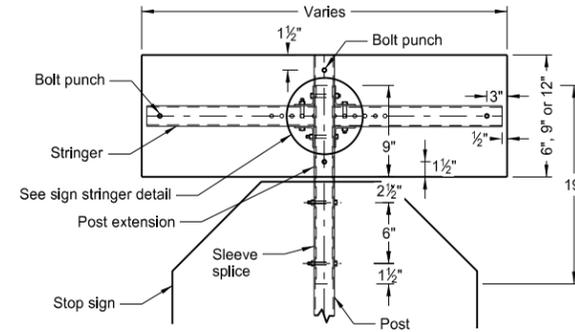
Special Assembly 3 (A, B, C, D or E)



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

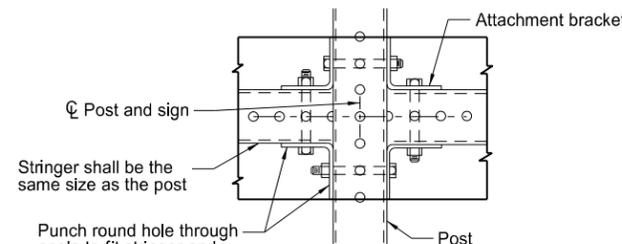


Special Assembly 5 (A, B, C, D or E)



Front View Sleeve Splice Detail

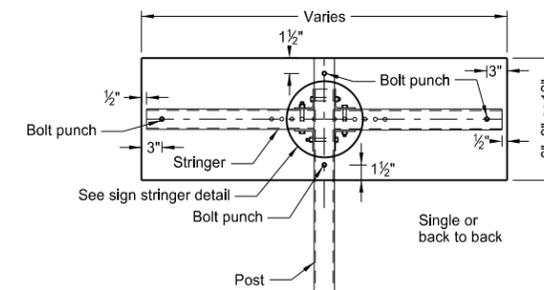
Note: The splice method may be used upon approval of the engineer.



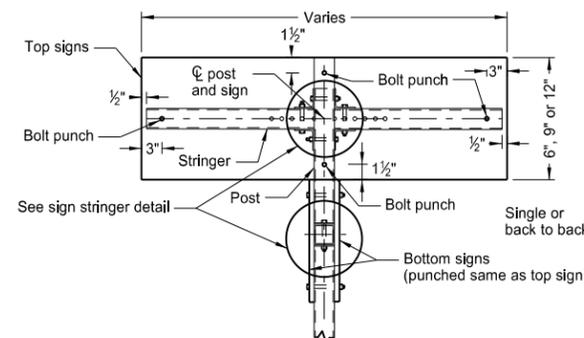
Sign Stringer Detail

Stringer shall be the same size as the post

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

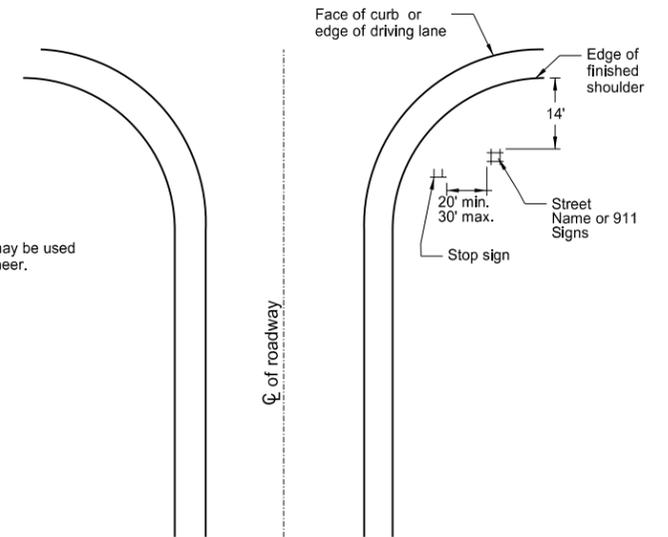


Detail A or B



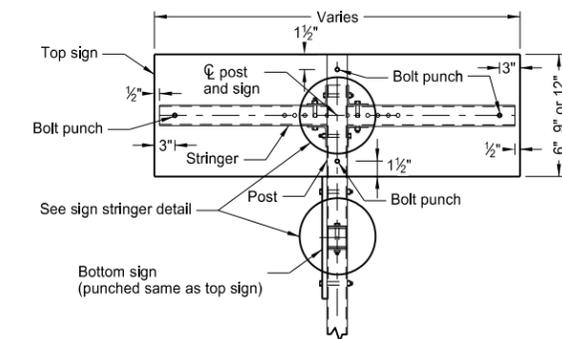
Detail D or E

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



Intersection Layout

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



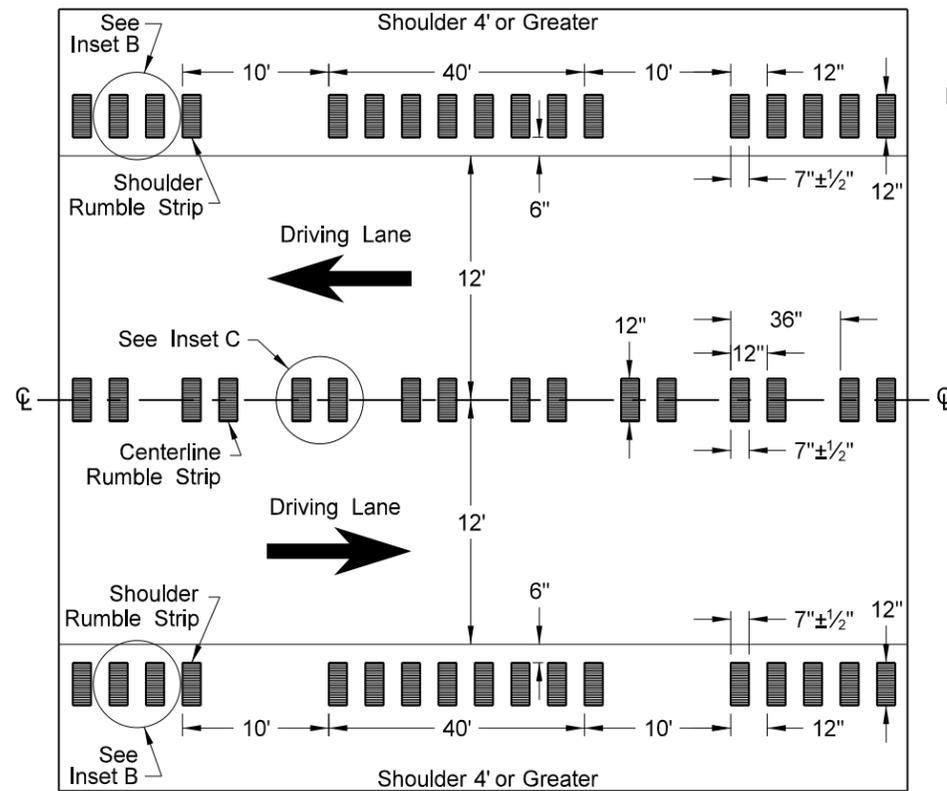
Detail C

Sign Arrangements

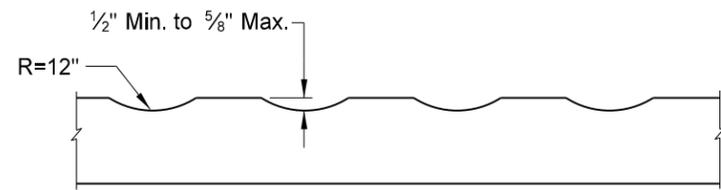
| | |
|--|--------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 10-3-13 | |
| REVISIONS | |
| DATE | CHANGE |
| | |

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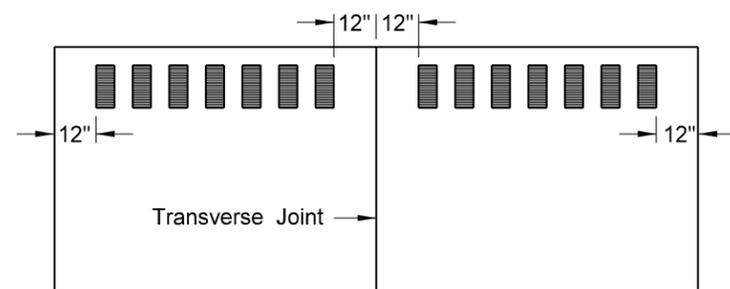
RUMBLE STRIPS
UNDIVIDED HIGHWAYS (SHOULDERS 4' OR GREATER)



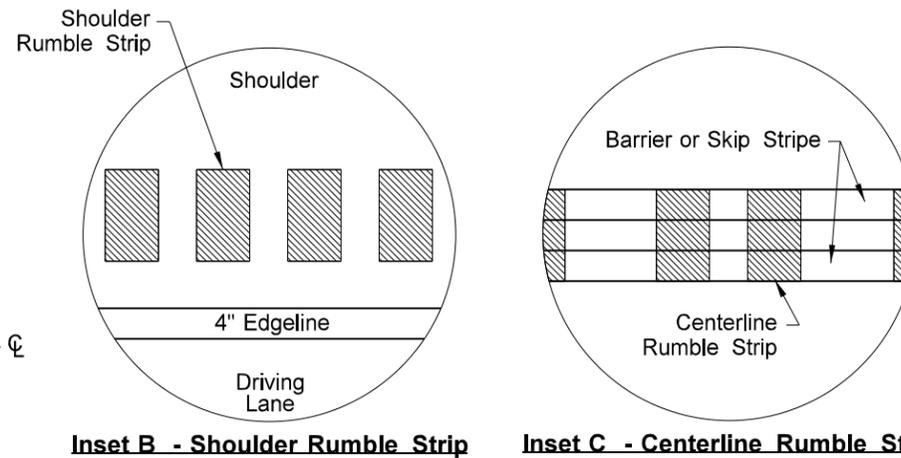
Undivided Highways (Shoulders 4' or Greater)



Profile of Rumble Strips - Bituminous and PCC Pavements



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

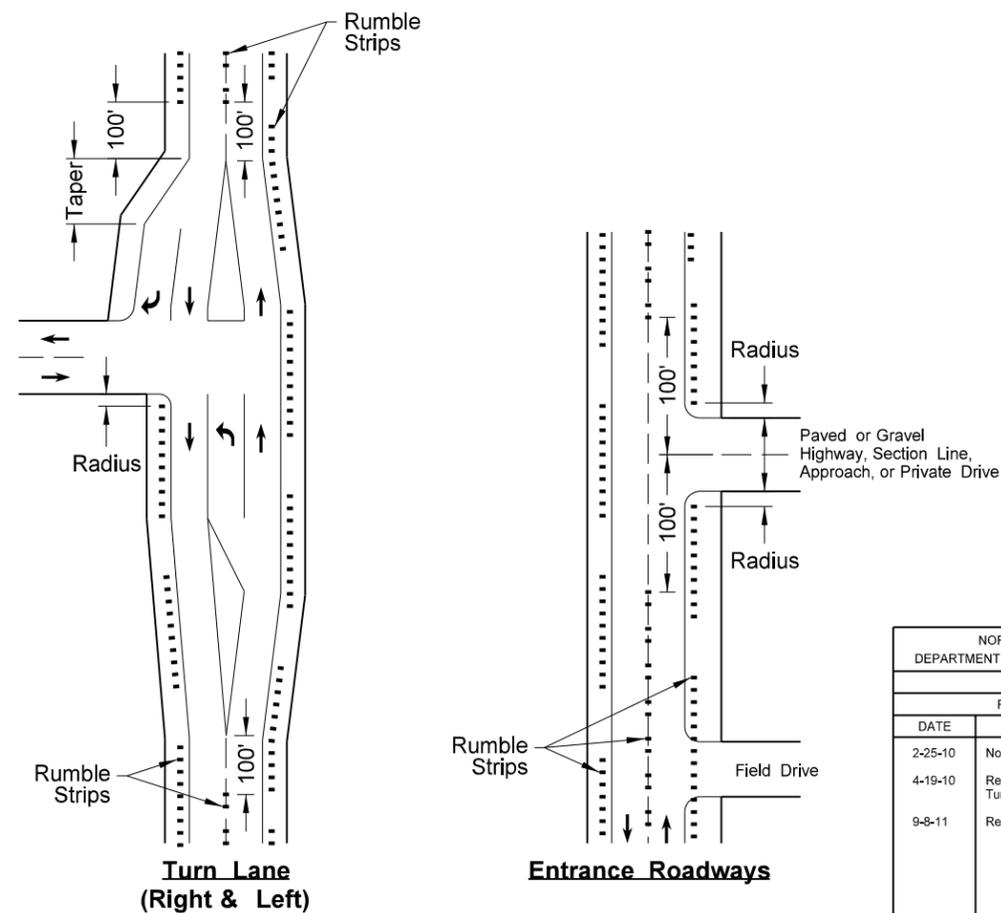


Inset B - Shoulder Rumble Strip

Inset C - Centerline Rumble Strip

NOTES:

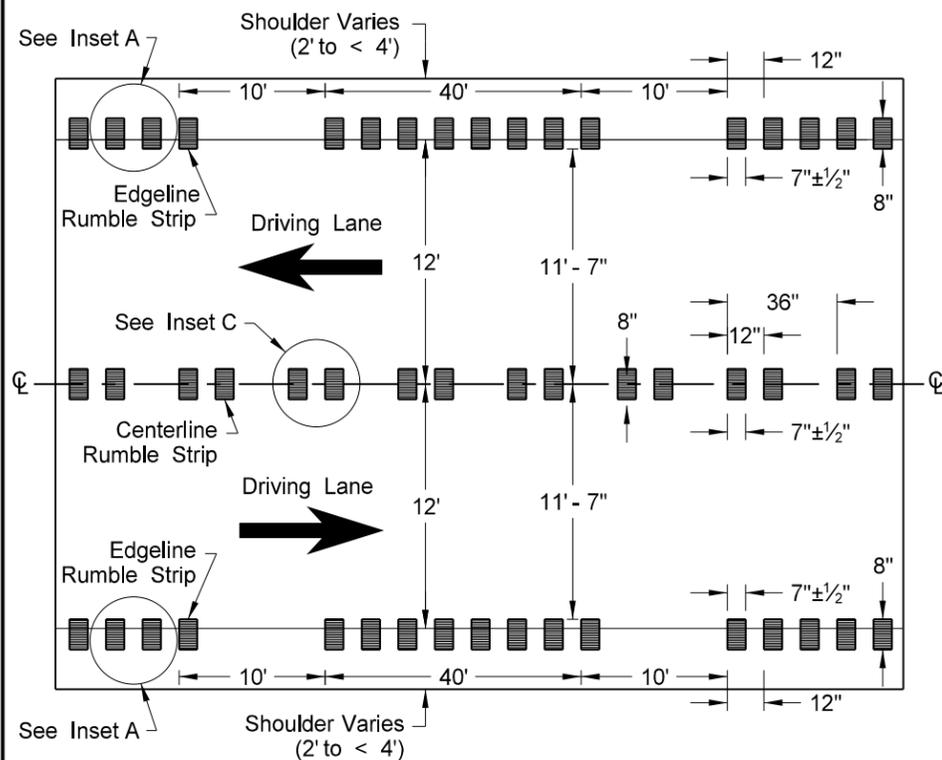
- 1) Discontinue shoulder rumble strips through the entire length of right turn lanes, 100' before right turn lane tapers, and at the radius of a paved or gravel highway, section line, approach, or private drive.
- 2) Discontinue centerline rumble strips through the entire length of left turn lanes, 100' before left turn lane tapers and median islands, and 100' before and after a paved or gravel highway, section line, approach, or private drive.



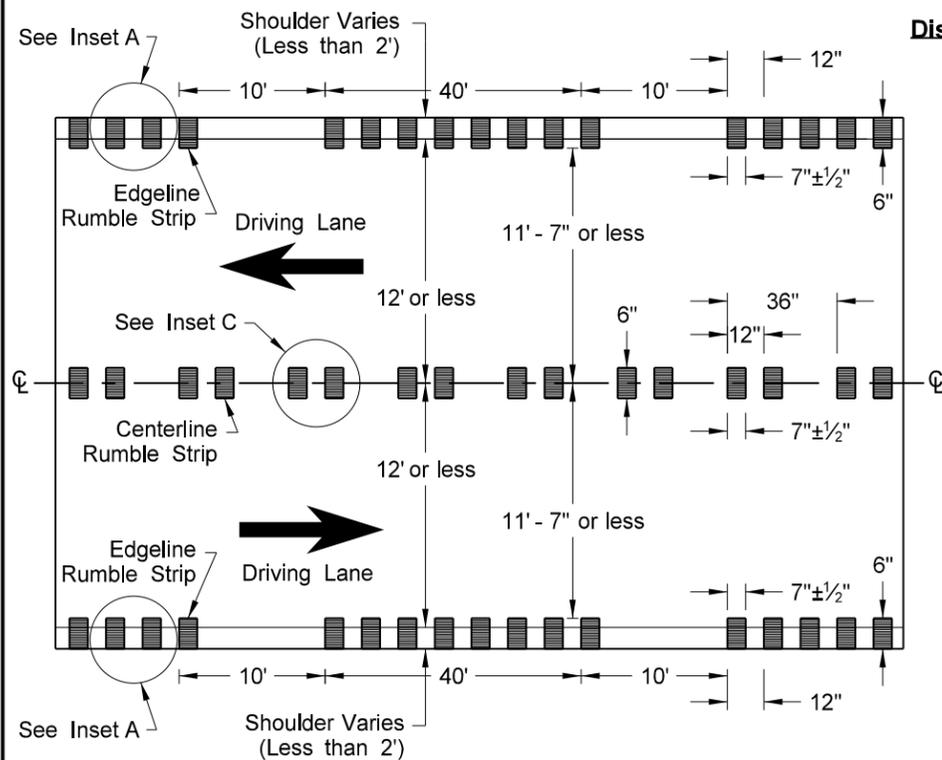
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|---|
| 12-29-09 | |
| REVISIONS | |
| DATE | CHANGE |
| 2-25-10 | Note 4 was added. |
| 4-19-10 | Revised Note 5, Note 6, and Turn Lane (Right & Left). |
| 9-8-11 | Revised Notes and D-760-3. |

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 Registration Number
 PE- 2930 ,
 on 9/8/11 and the original document is stored at the
 North Dakota Department
 of Transportation

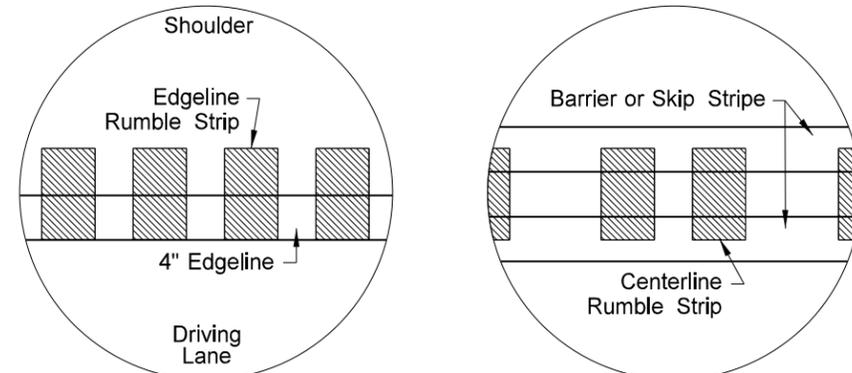
RUMBLE STRIPS
UNDIVIDED HIGHWAYS (SHOULDERS LESS THAN 4')



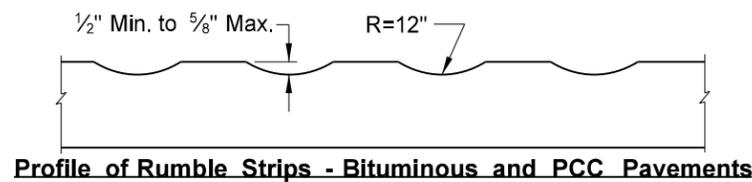
Undivided Highways (12' Driving Lanes & Shoulders 2' to < 4')



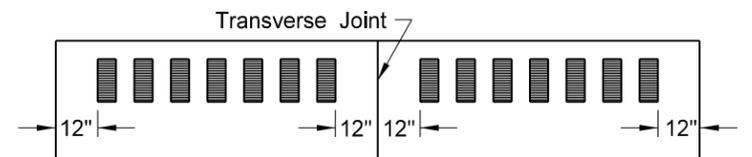
Undivided Highways (12' Driving Lanes or less & Shoulders Less than 2')



Inset A - Edgeline Rumble Strip Inset C - Centerline Rumble Strip



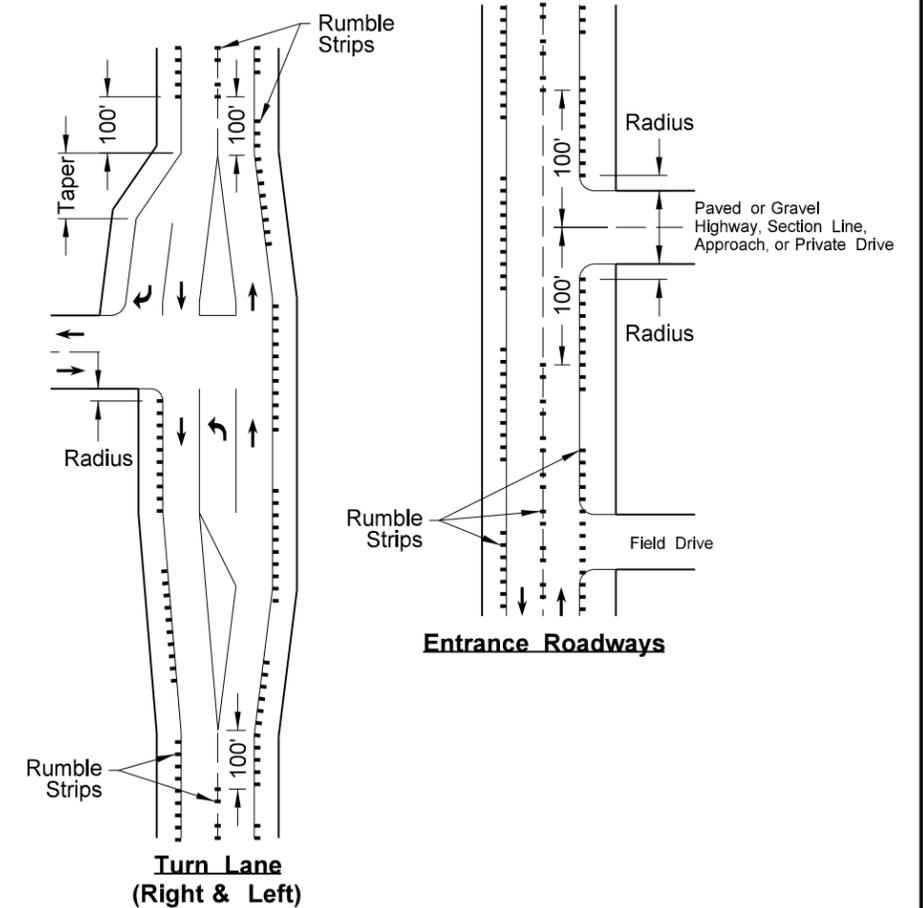
Profile of Rumble Strips - Bituminous and PCC Pavements



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

NOTES:

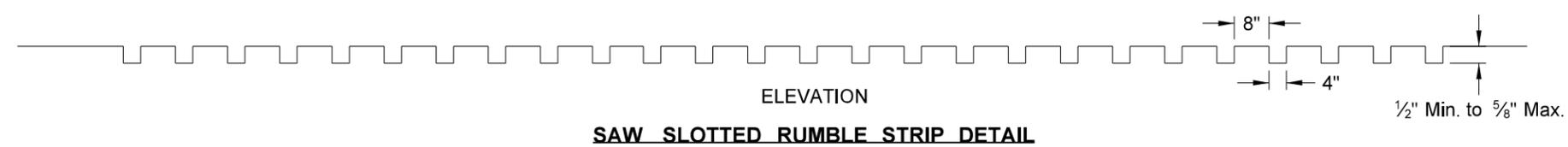
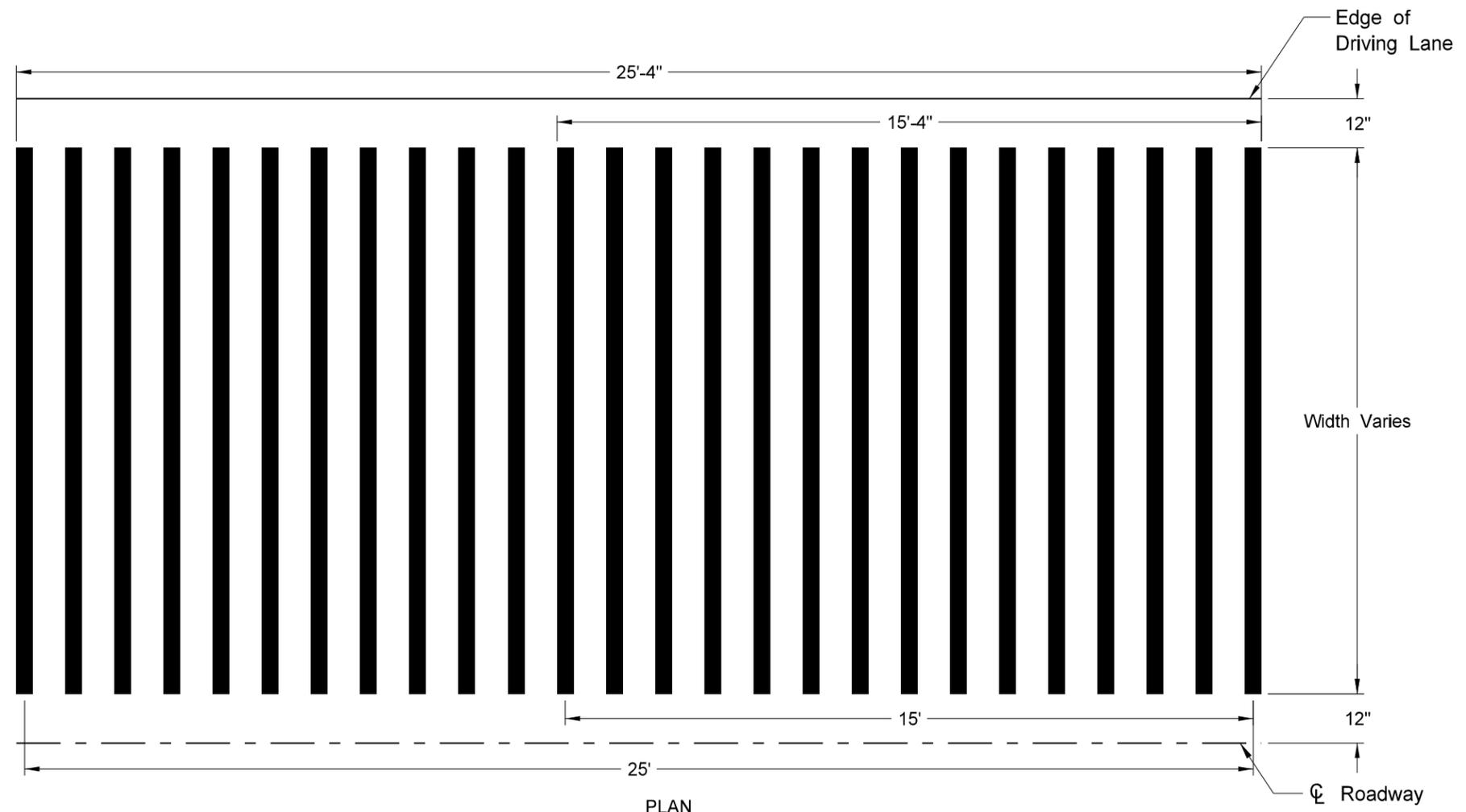
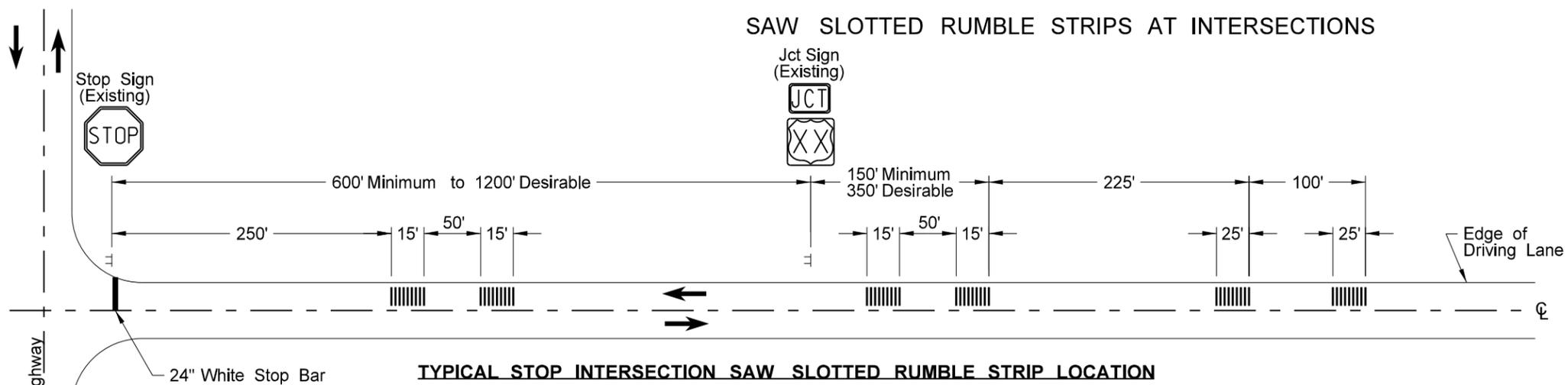
- 1) Discontinue edgeline rumble strips through the entire length of right turn lanes, 100' before right turn lane tapers, and at the radius of a paved or gravel highway, section line, approach, or private drive.
- 2) Discontinue centerline rumble strips through the entire length of left turn lanes, 100' before left turn lane tapers and median islands, 100' before and after a paved or gravel highway, section line, approach, or private drive.



| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|---|
| 12-29-09 | |
| REVISIONS | |
| DATE | CHANGE |
| 2-25-10 | Note 4 was added. |
| 4-19-10 | Revised Note 5, Note 6, and Turn Lane (Right & Left). |
| 9-8-11 | Revised Notes and D-760-4. |
| 1-26-12 | Revised details for rumble strip widths and dimensions. |

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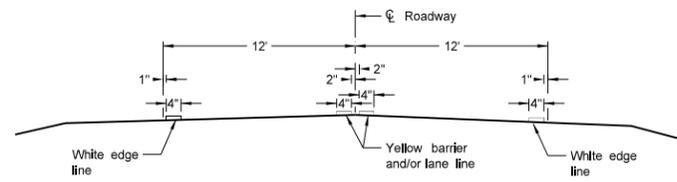
SAW SLOTTED RUMBLE STRIPS AT INTERSECTIONS



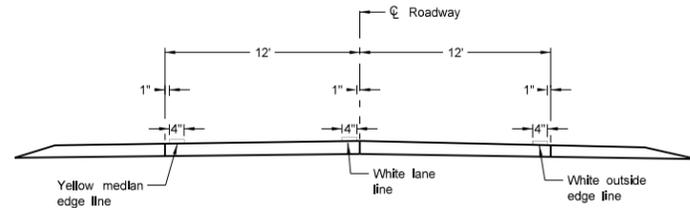
| | |
|--|----------------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 12-29-09 | |
| REVISIONS | |
| DATE | CHANGE |
| 2-22-10 | Saw Slotted width revised. |
| 2-25-10 | Note 7 was added. |
| 9-8-11 | Revised Notes and D-760-5. |
| 7-7-14 | Deleted Notes. |

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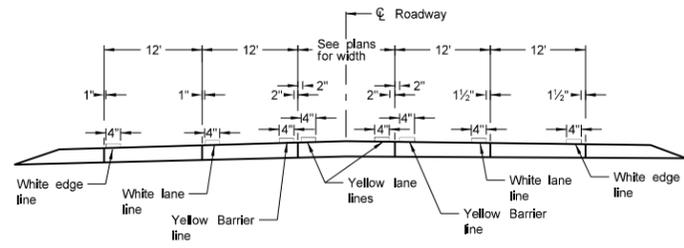
PAVEMENT MARKING



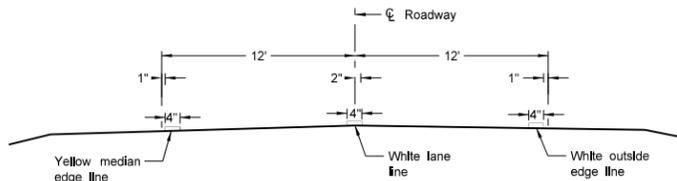
Two Lane Two Way
RURAL ROADWAY



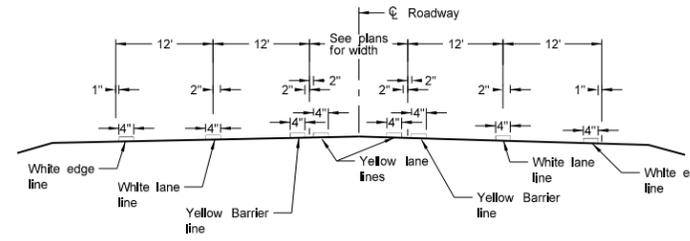
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



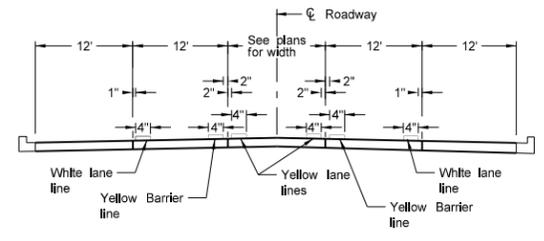
RURAL FIVE LANE ROADWAY
Concrete Section



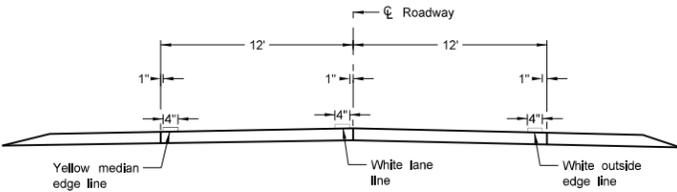
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



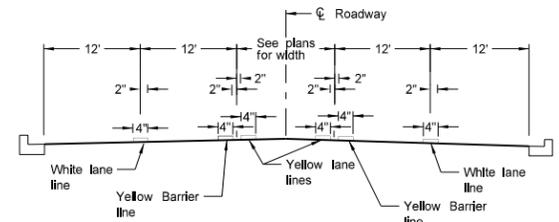
RURAL FIVE LANE ROADWAY
Asphalt Section



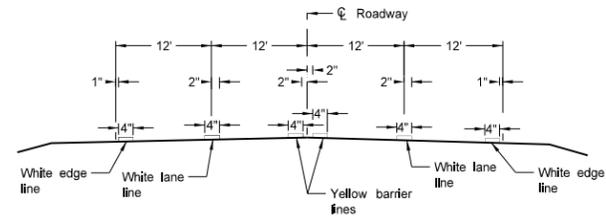
URBAN FIVE LANE SECTION
Concrete Section



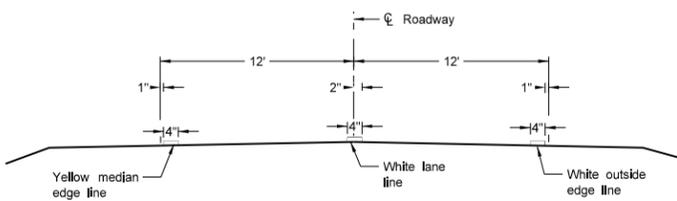
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



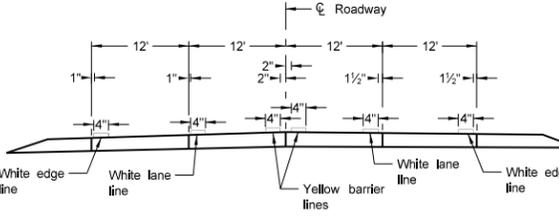
URBAN FIVE LANE SECTION
Asphalt Section



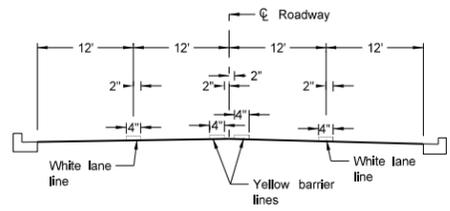
RURAL FOUR LANE ROADWAY
Asphalt Section



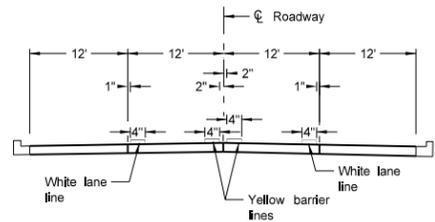
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



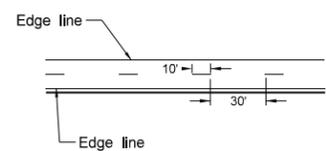
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



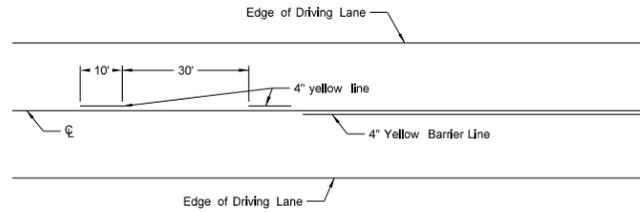
CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

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

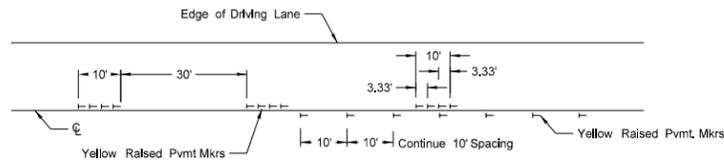
| | |
|--|--------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 12-1-10 | |
| REVISIONS | |
| DATE | CHANGE |
| | |

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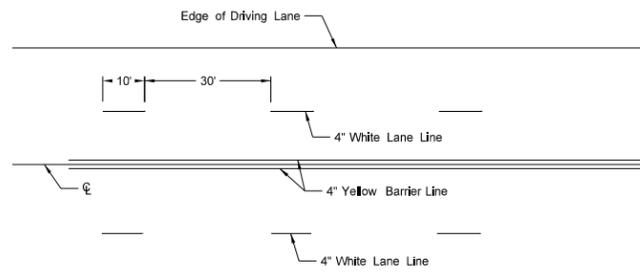
SHORT-TERM PAVEMENT MARKING



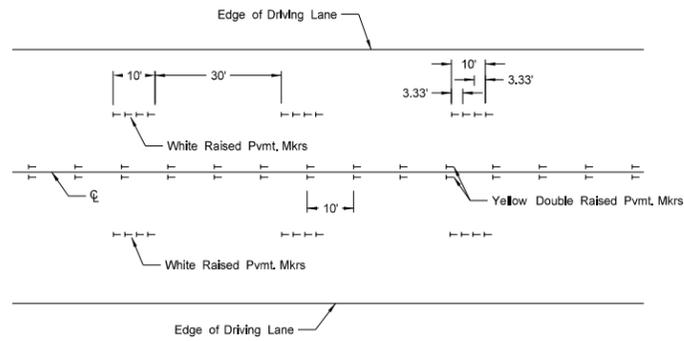
Painted or Tape Lines



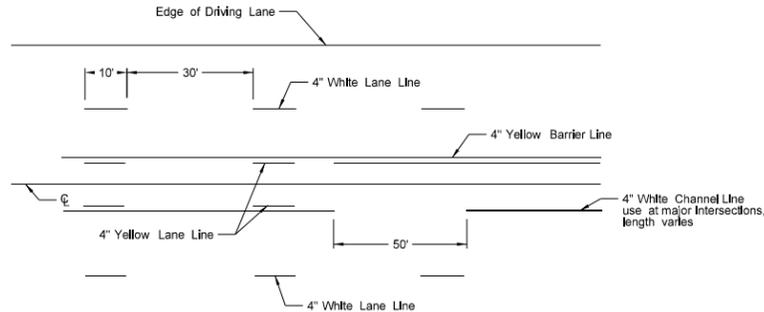
Raised Pavement Markers
TWO-LANE TWO-WAY ROADWAY



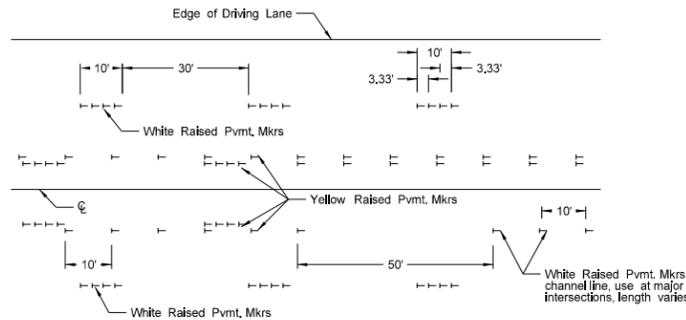
Painted or Tape Lines



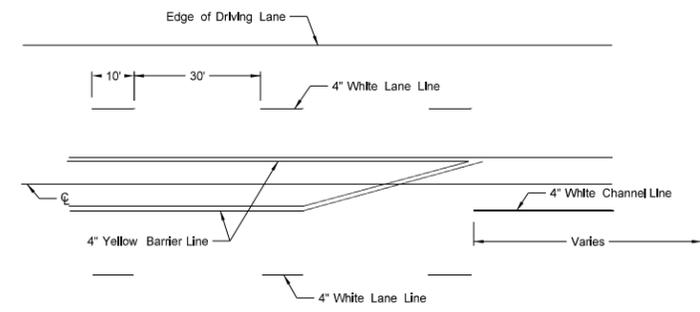
Raised Pavement Markers
FOUR LANE ROADWAY



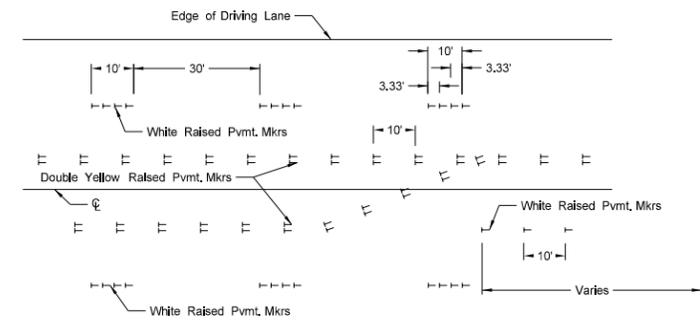
Painted or Tape Lines



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.

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| 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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MAILBOX LOCATION DETAILS

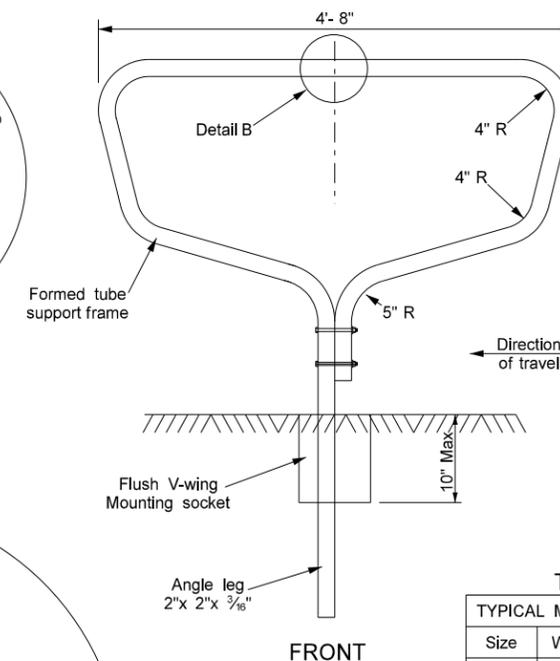
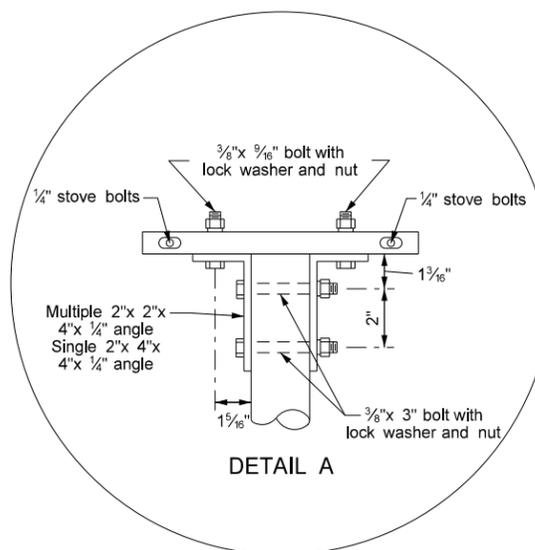
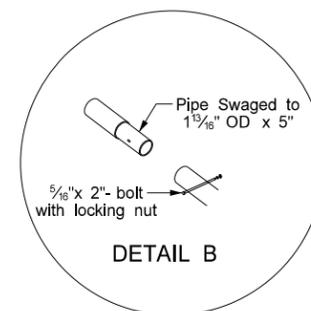
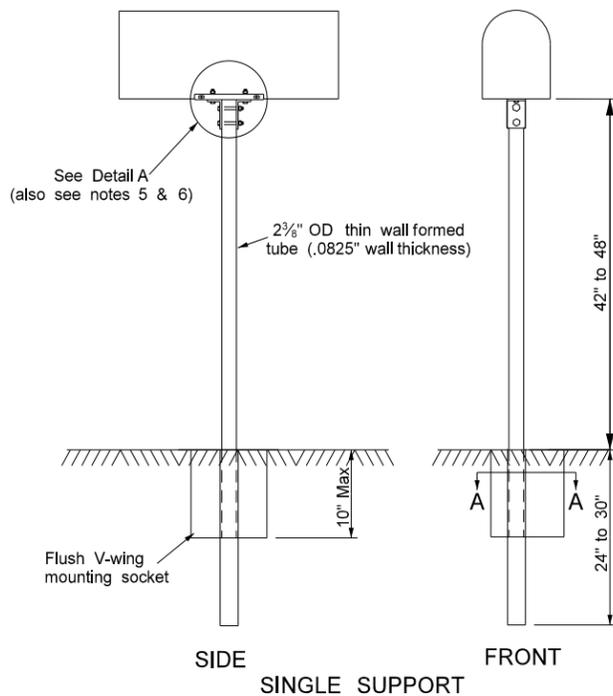
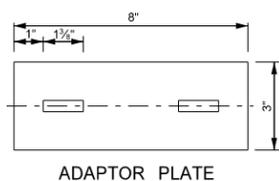
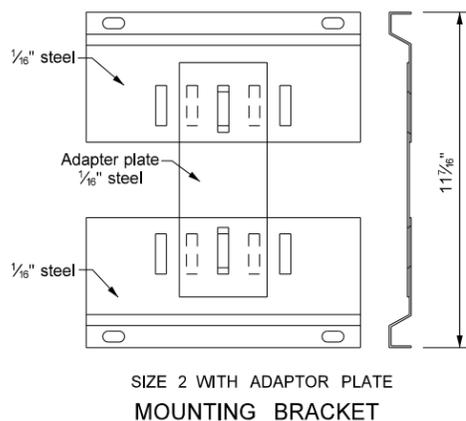
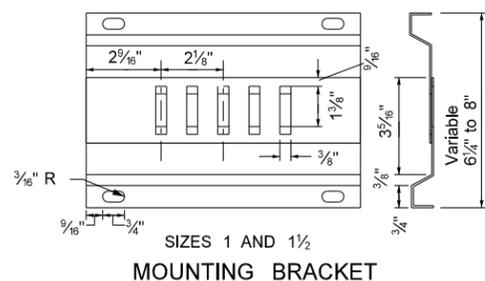
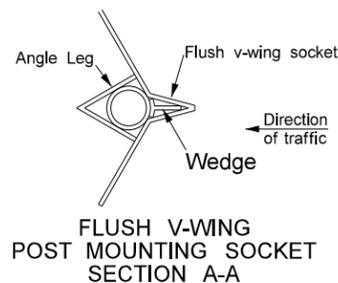
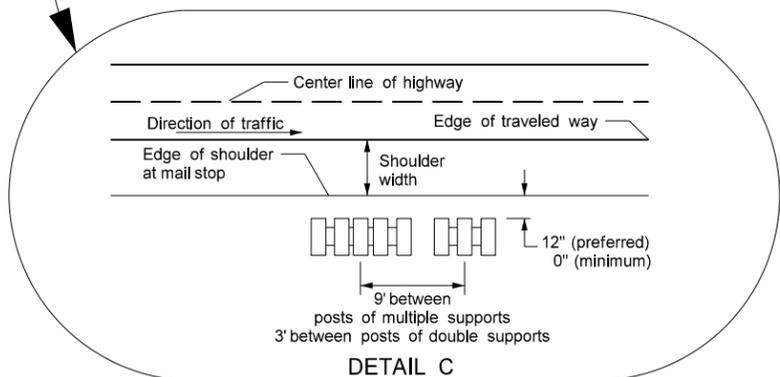
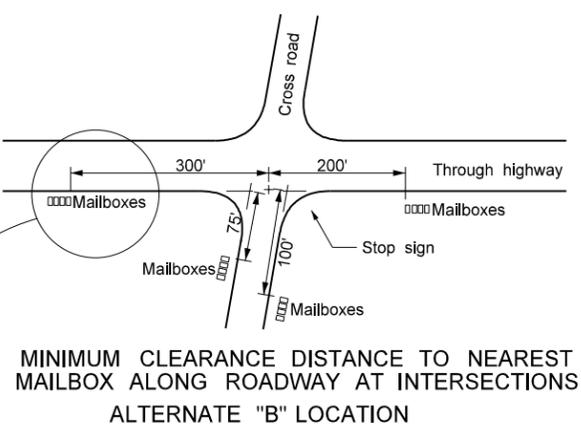
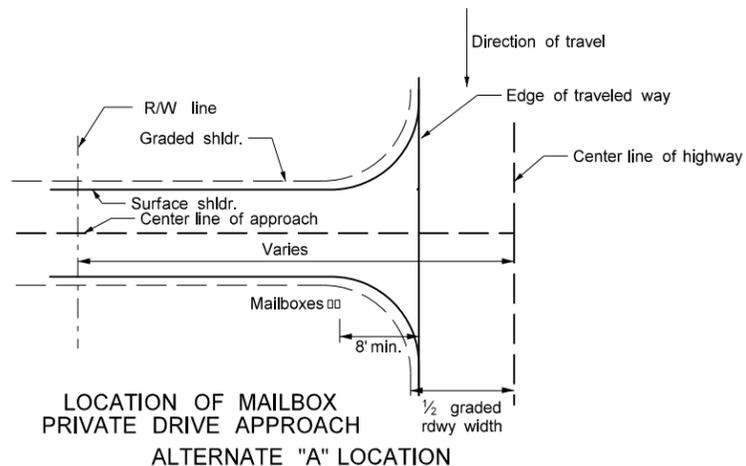


TABLE A
TYPICAL MAILBOX DIMENSIONS

| Size | Width | Height | Length |
|------|-------|--------|--------|
| 1 | 6.5" | 8.5" | 19" |
| 1A | 8" | 10.5" | 21" |
| 2 | 11.5" | 13.5" | 23.5" |

Notes:

- The mailbox support and hardware details shall consist of the "V-Loc Mailbox Support System" manufactured by:
Tapco
Traffic & Parking Control Co. Inc.
Any other equal support system meeting the requirements of NCHRP Report 350, which has been crash tested, and approved by the Federal Highway Administration may be used. Approved alternate mailbox assemblies shall be installed in the manner and arrangement crash tested.
- The preferred location for all mailboxes is the Alternate "A" location. However, the Engineer may approve the Alternate "B" location if warranted by existing field conditions.
- Postal regulations require that mailboxes must be located on the right-hand side of the road in the direction traveled by the carrier. Therefore, the Engineer shall contact the local carrier or postmaster before installing new mailboxes to verify the direction of travel.
- Mailboxes installed on private drive approaches must always be located on the downstream side of the approach.
- Install angle connection parallel to traffic flow for size 2 mailbox mounted on single posts.
- Size 2 mailbox mounted on multiple support requires 2 each, 3/8" by 3/4" bolts with lock washers and nuts to attach the adaptor plate to mounting bracket. The unit will then require 4 angle connections to attach to the formed tube support frame. See Detail A.
- Space multiple support frames a minimum of 4 feet apart. Space single support frames a minimum of 3 ft apart. Do not place more than five No. 1 mailboxes, three No. 2 mailboxes, or any combination of four No. 1-A and No. 2 mailboxes on multiple support frames.

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