# 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 |
| Adj | adjusted |
| Aggr | aggregate |
| Ahd | ahead |
| ARV | air release valve |
| Align | alignment |
| Al | alley |
| Alt | alternate |
| Alum | aluminum |
| ADA | Americans with Disabilities Act |
| & | and |
| Appr | approach |
| Approx | approximate |
| ACP | asbestos cement pipe |
| Asph | asphalt |
| AC | asphalt cement |
| Assmd | assumed |
| @ | at |
| Atten | attenuation |
| ATR | automatic traffic recorder |
| Ave | Avenue |
| Avg | average |
| ADT | average daily traffic |
| Bk | back |
| BF | back face |
| Balc | balcony |
| B Wire | barbed wire |
| Barr | barricade |
| Btry | battery |
| BI | beehive inlet |
| Beg | begin |
| BG | below grade |
| BM | bench mark |
| Bkwy | bikeway |
| Bit | bituminous |
| Blk | block |
| BH | bore hole |
| Bot | bottom |
| Blvd | Boulevard |
| Bndry | boundary |
| Brkwy | breakaway |
| Br | bridge |
| Bldg | building |
| Bus. | business |
| BV | butterfly valve |
| Byp | bypass |
| C Gdrl | cable guardrail |
| Calc | calculate |
| CIP | cast iron pipe |
| CB | catch basin |
| CRS | cationic rapid setting |
| C Gd | cattle guard |
| C To C | center to center |
| CL or ℄ | centerline |
| Ch | chain |
| Chnlk | chain-link |
| Ch Blk | channel block |
| Ch Ch | channel change |
| Chk | check |
| Chsld | chiseled |
| Cir | circle |
| Cl | class |
| Clnt | clean-out |
| Clr | clear |
| Cl&gr | clearing & grubbing |
| Comb. | combination |
| Coml | commercial |
| Compr | compression |
| CADD | computer aided drafting & design |
| Conc | concrete |
| CECB | concrete erosion control blanket |
| Cond | conductor |
| Const | construction |
| Cont | continuous |
| CSB | continuous split barrel sample |
| Contr | contraction |
| Contr | contractor |
| CP | control point |
| Coord | coordinate |
| Cor | corner |
| Corr | corrected |
| CAES | corrugated aluminum end section |
| CAP | corrugated aluminum pipe |
| CMES | corrugated metal end section |
| CMP | corrugated metal pipe |
| CPVCP | corrugated poly-vinyl chloride pipe |
| CSES | corrugated steel end section |
| CSFES | corrugated steel flared end section |
| CSP | corrugated steel pipe |
| CSTES | corrugated steel traversable end section |
| Co | County |
| Crse | course |
| Ct | Court |
| Xarm | cross arm |
| Xbuck | cross buck |
| Xsec | cross sections |
| Xing | crossing |
| Xrd | crossroad |
| Crn | crown |
| Culv | culvert |
| C&G | curb & gutter |
| CI | curb inlet |
| CR | curb ramp |
| C | cut |
| Dd Ld | dead load |
| Defl | deflection |
| Defm | deformed |
| Dlnt | delineate |
| Dlntr | delineator |
| Depr | depression |
| Desc | description |
| Det | detail |
| DWP | detectable warning panel |
| Dtr | detour |
| Dia or ø | diameter |
| Dir | direction |
| Dist | distance |
| DM | disturbed material |
| DB | ditch block |
| DG | ditch grade |
| Dbl | double |
| Dn | down |
| Dwg | drawing |
| Dr | drive |
| Drwy | driveway |
| DI | drop inlet |
| D | dry density |
| Ea | each |
| Esmt | easement |
| E | East |
| EB | Eastbound |
| Elast | elastomeric |
| EL | electric locker |
| E Mtr | electric meter |
| EVSE | electric vehicle supply equipment |
| Elec | electric/al |
| EDM | electronic distance meter |
| Elev or El | elevation |
| Ellipt | elliptical |
| Emb | embankment |
| Emuls | emulsion/emulsified |
| ES | end section |
| Engr | engineer |
| ESS | environmental sensor station |
| Eq | equal |
| Evgr | evergreen |
| Exc | excavation |
| Exst | existing |
| Exp | expansion |
| Expy | Expressway |
| E | external of curve |
| Extru | extruded |
| FOS | factor of safety |
| Fed | Federal |
| FP | feed point |
| Fn | fence |
| Fn P | fence post |
| FO | fiber optic |
| FD | field drive |
| F | fill |
| FAA | fine aggregate angularity |
| FH | fire hydrant |
| Fl | flange |
| Flrd | flared |
| FES | flared end section |
| F Bcn | flashing beacon |
| FA | flight auger sample |
| FL | flow line |
| Ftg | footing |
| FM | force main |
| Fnd | found |
| Fdn | foundation |
| Frac | fractional |
| Frwy | freeway |
| Frt | front |
| FF | front face |
| F Disp | fuel dispenser |
| FFP | fuel filler pipes |
| FLS | fuel leak sensor |
| Furn | furnish/ed |

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

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# NDDOT ABBREVIATIONS



| | |
|---|---|
| Galv | galvanized |
| Gar | garage |
| Gs L | gas line |
| G Reg | gas line regulator |
| GMV | gas main valve |
| G Mtr | gas meter |
| GSV | gas service valve |
| GVP | gas vent pipe |
| GV | gate valve |
| Ga | gauge |
| Gov | government |
| Grd | graded/grade |
| Grnd | ground |
| GWM | ground water monitor |
| Gdrl | guardrail |
| Gtr | gutter |
| | |
| H Plg | H piling |
| Hdwl | headwall |
| Ht | height |
| Hel | helical |
| HDPE | high density polyethylene |
| HM | high mast |
| HP | high pressure |
| HPS | high pressure sodium |
| HTCG | high tension cable guardrail |
| Hwy | highway |
| Hor | horizontal |
| HBP | hot bituminous pavement |
| HMA | hot mix asphalt |
| Hyd | hydrant |
| Ph | hydrogen ion content |
| | |
| Id | identification |
| Incl | inclinometer tube |
| IMH | inlet manhole |
| ID | inside diameter |
| Inst | instrument |
| Intchg | interchange |
| Intmdt | intermediate |
| Intscn | intersection |
| Inv | invert |
| IP | iron pipe |
| | |
| Jt | joint |
| Jct | junction |

| | |
|---|---|
| Ln | lane |
| Lg | large |
| Lat | latitude |
| Lt | left |
| Lens | lenses |
| Lvl | level |
| Lvlng | leveling |
| Lht | light |
| LP | light pole |
| Ltg | lighting |
| Liq | liquid |
| LL | liquid limit |
| Loc | location |
| Long. | longitude |
| Lp | loop |
| LD | loop detector |
| Lum | luminaire |
| | |
| Mb | mailbox |
| ML | main line |
| MH | manhole |
| Mkd | marked |
| Mkr | marker |
| Mkg | marking |
| MA | mast arm |
| Matl | material |
| Max | maximum |
| | |
| Meas | measure |
| Mdn | median |
| MD | median drain |
| MC | medium curing |
| MGS | Midwest Guardrail System |
| MM | mile marker |
| MP | mile post |
| Min | minimum |
| Misc | miscellaneous |
| Mon | monument |
| Mnd | mound |
| Mtbl | mountable |
| Mtd | mounted |
| Mtg | mounting |
| Mk | muck |
| | |
| Neop | neoprene |
| Ntwk | network |
| N | North |
| NE | Northeast |
| NW | Northwest |
| NB | Northbound |
| No. or # | number |

| | |
|---|---|
| Obsc | obscure(d) |
| Ocpd | occupied |
| Ocpy | occupy |
| O/s | offset |
| OC | on center |
| C | one dimensional consolidation |
| OC | organic content |
| Orig | original |
| O To O | out to out |
| OD | outside diameter |
| OH | overhead |
| | |
| PMT | pad mounted transformer |
| Pg | pages |
| Pntd | painted |
| Pr | pair |
| Pnl | panel |
| Pk | park |
| PSD | passing sight distance |
| Pvmt | pavement |
| Ped | pedestal |
| Ped | pedestrian |
| PPP | pedestrian pushbutton post |
| Pen. | penetration |
| Perf | perforated |
| Per. | perimeter |
| Perm | permanent |
| PL | pipeline |
| Pl | place |
| P&P | plan & profile |
| PL | plastic limit |
| Pl or ℄ | plate |
| Pt | point |
| PE | polyethylene |
| PVC | polyvinyl chloride |
| PCC | Portland Cement concrete |
| PP | power pole |
| Preempt | preemption |
| Prefab | prefabricated |
| Prfmd or Pref | preformed |
| Prep | preperation |
| Press. | pressure |
| PRV | pressure relief valve |
| Prestr | prestressed |
| Pvt | private |
| PD | private drive |
| Prod. | production/produce |
| Prog | programmed |
| Prop. | property |
| Ppsd | proposed |
| PB | pull box |

| | |
|---|---|
| Qty | quantity |
| Qtr | quarter |
| | |
| Rad or R | radius |
| RR | railroad |
| Rlwy | railway |
| Rsd | raised |
| RC | rapid curing |
| Rec | record |
| Rcy | recycle |
| RAP | recycled asphalt pavement |
| RPCC | recycled portland cement concrete |
| Ref | reference |
| R Mkr | reference marker |
| RM | reference monument |
| RP | reference point |
| Refl | reflectorized |
| RCB | reinforced concrete box |
| RCES | reinforced concrete end section |
| RCFES | reinforced concrete flared end section |
| RCP | reinforced concrete pipe |
| RCPS | reinforced concrete pipe sewer |
| RCTES | reinforced concrete traversable end section |
| Reinf | reinforcement |
| Res | reservation |
| Res | residence |
| Ret | retaining |
| Rev | reverse |
| Rt | right |
| R/W | right of way |
| Riv | river |
| Rd | road |
| Rdbd | road bed |
| Rdwy | roadway |
| RWIS | roadway weather information system |
| Rk | rock |
| Rt | route |

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

07-01-14

REVISIONS

| DATE | CHANGE |
|---|---|
| 08-03-15 | General Revisions |
| 04-23-18 | General Revisions |
| 12-18-20 | General Revisions |
| 08-16-22 | General Revisions |
| 04-14-25 | General Revisions |

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# NDDOT ABBREVIATIONS



| | |
|---|---|
| Salv | salvage(d) |
| San | sanitary sewer line |
| Sec | section |
| SL | section line |
| Sep | separation |
| Seq | sequence |
| Serv | service |
| Sht | sheet |
| Shtng | sheeting |
| Shldr | shoulder |
| Sw or Sdwk | sidewalk |
| SD | sight distance |
| SN | sign number |
| Sig | signal |
| Sgl | single |
| SRCP | slotted reinforced concrete pipe |
| SC | slow curing |
| SS | slow setting |
| Sm | small |
| S | South |
| SE | Southeast |
| SW | Southwest |
| SB | Southbound |
| Sp | spaces |
| Spcl | special |
| SA | special assembly |
| SP | special provisions |
| G | specific gravity |
| Spk | spike |
| SB | split barrel sample |
| SH | sprinkler head |
| SV | sprinkler valve |
| Sq | square |
| Stk | stake |
| Std | standard |
| N | standard penetration test |
| Std Specs | standard specifications |
| Stm L | steam line |
| SEC | steel encased concrete |
| SMA | stone matrix asphalt |
| SSD | stopping sight distance |
| SD | storm drain |
| St | street |
| SPP | structural plate pipe |
| SPPA | structural plate pipe arch |
| Str | structure |
| Subd | subdivision |
| Sub | subgrade |
| Sub Prep | subgrade preperation |
| Ss | subsoil |
| SS | supplement specification |
| Supp | supplemental |
| Surf | surfacing |
| Surv | survey |
| Sym | symmetrical |

| | |
|---|---|
| Tel | telephone |
| Tel B | Telephone Booth |
| Tel P | telephone pole |
| Tv | television |
| Temp | temperature |
| Temp | temporary |
| TBM | temporary bench mark |
| T | thinwall tube sample |
| Ts | topsoil |
| Traf | traffic |
| TSCB | traffic signal control box |
| Tr | trail |
| Transf | transformer |
| Trans | transition |
| TT | transmission tower |
| TES | traversable end section |
| Trans | transverse |
| Trtd | treated |
| Trmt | treatment |
| Qc | triaxial compression |
| TERO | tribal employment rights ordinance |
| Tpl | triple |
| Typ | typical |
| Qu | unconfined compressive strength |
| Ugrnd | underground |
| Util | utility |
| VG | valley gutter |
| Vap | vapor |
| Vert | vertical |
| VCP | vitrified clay pipe |
| Vol | volume |
| VSFS | vehicle speed feedback sign |
| Wkwy | walkway |
| W | water content |
| WGV | water gate valve |
| WL | water line |
| WM | water main |
| WMV | water main valve |
| W Mtr | water meter |
| WSV | water service valve |
| WW | water well |
| Wrng | wearing |
| WIM | weigh in motion |
| W | west |
| WB | westbound |
| Wrng | wiring |
| W/ | with |
| W/o | without |

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# NDDOT ABBREVIATIONS



## MEASUREMENTS

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

## SURVEY DESCRIPTIONS

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

## SOIL TYPES

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

07-01-14

REVISIONS

| DATE | CHANGE |
|---|---|
| 12-18-20 | Sheet Added - Continued from D-101-3 |
| 4-14-25 | General Revisions |

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# NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

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

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

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# LINE STYLES

D-101-20

## Existing Topography

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

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

## Proposed Topography

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

## Existing Utilities

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

## Proposed Utilities

- 24 Inch Pipe
- Reinforced Concrete Pipe
- Under Drain
- Edge Drain

## Traffic Utilities

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

## Sign Structures

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

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

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12 18 2020

# LINE STYLES

D-101-21

## Right Of Way

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

## Boundary Control

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

## Cross Sections and Typicals

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

## Geotechnical

- Geotextile Fabric Type D (D — D)
- Geogrid (Geo — Geo)
- Geotextile Fabric Type R (R — R)
- Geotextile Fabric Type R1 (R — R)
- Geotextile Fabric Type RR (RR — RR)
- Geotextile Fabric Type S (S — S)
- Subgrade Reinforcement

## Countours

- Failure Line
- Depression Contours
- Supplemental Contour

## Profile

- Subgrade, Subcut or Ditch Grade
- Topsoil Profile

## Striping

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

## Pavement Joints

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

## Bridge Details

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

## Erosion Control

- Limits of Const Transition Line
- Bale Check
- Rock Check
- Floating Silt Curtain (S — S)
- Silt Fence (SF — SF)
- Excavation Limits
- Fiber Rolls

## Environmental

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

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|---|---|
| 07-01-14 | |
| REVISIONS | |
| DATE | CHANGE |
| 09-23-16<br>12-18-20 | Added and Revised Items, Organized by Functional Groups<br>General Revisions |

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# SYMBOLS

D-101-30

North Arrow (Half Scale)

Alignment Data Point

Alignment Monument

Spot Elevation

Existing Miscellaneous Spot

Existing Access Control Arrow

Existing Benchmark

Reset USGS Marker

Iron Monument Found

Iron Pin R/W Monument

Property Corner

Iron Pin Reference Monument

Right of Way Marker (Exst, Ppsd, Reset)

Existing Federal Reference Corner

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

Existing Witness Corner

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

Existing Traverse PI Aerial Panel

Existing Reference Marker Point NGS

Existing EFB Misc

Existing Bush or Shrub

Existing Large Evergreen Tree

Existing Small Evergreen Tree

Existing Large Tree

Existing Small Tree

Existing Tree Trunk

Cairn or Stone Circle

Existing Artifact

Existing Satellite Dish

Existing Weather Station

Existing Windmill or Tower

Reinforced Pavement

CSB Continuous Split Barrel Sample

FA Flight Auger Sample

SB Split Barrel Sample

T Thinwall Tube Sample

N Standard Penetration Test

Incl Inclinometer Tube

Excavation Unit

Existing Ground Water Well Bore Hole

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# SYMBOLS

D-101-31

- Flexible Delineator
- Flexible Delineator Type A (Exst, Ppsd)
- Flexible Delineator Type B (Exst, Ppsd)
- Flexible Delineator Type C (Exst, Ppsd)
- Flexible Delineator Type D (Exst, Ppsd)
- Flexible Delineator Type E (Exst, Ppsd)
- Delineator Type A (Exst, Ppsd, Diamond Grade-Reset)
- Delineator Type B (Exst, Ppsd, Diamond Grade-Reset)
- Delineator Type C (Exst, Ppsd, Diamond Grade)
- Delineator Type D (Exst, Ppsd, Diamond Grade)
- Delineator Type E (Exst, Ppsd, Diamond Grade)
- Barricade (Type I, Type II, Type III}
- Arrow Panel (Caution Mode, Double Direction, Left Directional, Right Directional, Sequencing, Truck Mounted)
- Attenuation Device
- Truck Mounted Attenuator
- Delineator Drums
- Flagger
- Tubular Marker
- Traffic Cone
- Back to Back Vertical Panel Sign

- Highway Sign (Exst, Ppsd)
- Mile Post Type A (Exst-Ppsd-Reset)
- Mile Post Type B (Exst, Ppsd)
- Mile Post Type C (Exst, Ppsd)
- Object Marker Type I (Exst, Ppsd)
- Object Marker Type II (Exst, Ppsd)
- Object Marker Type III (Exst, Ppsd)
- Existing Reference Marker
- Road Closure Gate 18 Ft (Exst, Ppsd)
- Road Closure Gate 28 Ft (Exst, Ppsd)
- Road Closure Gate 40 Ft (Exst, Ppsd)
- Existing Railroad Battery Box
- Existing RR Profile Spot
- Existing Railroad Crossbuck
- Existing Railroad Frog
- Existing Mailbox (Private, Federal)

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| 07-01-14 | |
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| DATE | CHANGE |
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# SYMBOLS

D-101-32

- Existing Luminaire
- Luminaire LED
- Existing Light Standard Luminaire
- Relocate Light Standard
- Light Standard Light LED Luminaire
- Light Standard 35 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 50 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 70 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 100 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 150 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 200 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 250 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 310 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 400 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 700 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire
- Emergency Vehicle Detector
- Video Detection Camera

- High Mast Light Standard 3 Luminaire (Exst, Ppsd)
- High Mast Light Standard 4 Luminaire (Exst, Ppsd)
- High Mast Light Standard 5 Luminaire (Exst, Ppsd)
- High Mast Light Standard 6 Luminaire (Exst, Ppsd)
- High Mast Light Standard 7 Luminaire (Exst, Ppsd)
- High Mast Light Standard 8 Luminaire (Exst, Ppsd)
- High Mast Light Standard 9 Luminaire (Exst, Ppsd)
- High Mast Light Standard 10 Luminaire (Exst, Ppsd)
- Overhead Sign Structure Load Center (Exst, Ppsd)
- Traffic Signal Controller (Exst, Ppsd)
- Pad Mounted Traffic Signal Controller (Exst, Ppsd)
- Flashing Beacon (Exst, Ppsd)
- Concrete Foundation (Exst, Ppsd)
- Pipe Mounted Flasher (Exst, Ppsd)
- Pad Mounted Feed Point (Exst, Ppsd)
- Pipe Mounted Feed Point with Pad (Exst, Ppsd)
- Pole Mounted Feed Point (Exst, Ppsd)
- Junction Box (Exst, Ppsd)
- Existing Pedestrian Head with Number
- Existing Signal Head
- Pole Mounted Head
- Existing Lighting Standard Pole

- Existing Traffic Signal Standard
- Pull Box (Exst-Ppsd-Undefined)
- Intelligent Transportation Pull Box (Exst, Ppsd)
- Transformer (Exst, Ppsd)
- Power Pole (Exst-Ppsd-with Transformer)
- Wood Pole (Exst, Ppsd)
- Pedestrian Push Button Post (Exst, Ppsd)
- Existing Pole
- Existing Telephone Pole
- Existing Post
- Connection Conductor (Ground, Neutral, Phase 1, Phase 2)

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|---|---|
| 07-01-14 | |
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| DATE | CHANGE |
| 12-18-20 | General Revisions |

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# SYMBOLS

D-101-33

Existing Manhole (Electrical, Gas, Telephone)

Water Manhole (Exst, Exst with Valve)

Sanitary Sewer Manhole (Exst, Ppsd, Exst with Valve)

Sanitary Force Main Manhole (Exst, Ppsd, Exst with Valve)

Storm Drain Manhole (Exst, Ppsd, Exst with Inlet, Ppsd with Inlet)

Force Main Storm Drain Manhole (Exst, Exst with Valve)

Manhole (Ppsd, Ppsd 48 Inch, Exst Undefined)

Existing Water Appurtenance

Sprinkler Head (Exst, Ppsd)

Fire Hydrant (Exst, Ppsd)

Cleanout (Exst Sanitary, Underdrain)

Existing Catch Basin Inlet (Round, Square)

Existing Curb Inlet (Round, Square)

Existing Slotted Reinforced Concrete Pipe

Catch Basin (Riser 30 Inch, Beehive, Type A)

Inlet Mountable Curb (Type A, Type B)

Inlet Saddle Base (Type 1, Type 2)

Inlet Special (Catch Basin, Type 1, Type A)

Inlet (Tee, Type 1, Type 2, Type 2 Double)

Median Drain

Headwall (Exst, Ppsd, Ppsd Single with Vegitation Barrier,
Ppsd Double with Vegitation Barrier)

Cap or Stub
Exst Gas, Exst Sanitary, Exst Storm Drain, Ppsd Storm Drain, Exst Water

Existing Pedestal
Electrical, Telephone, Fiber Optic Telephone, TV, Fiber Optic TV, Undefined

Existing Pipe Vent
Gas, Fuel, Sanitary, Storm Drain, Water, Undefined

Valve
Exst Gas, Exst Water, Ppsd Water, Exst Undefined

Pump
Sanitary, Storm Drain, Exst Water

Corrugated Metal End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)

Reinforced Concrete End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)

Existing Utility Marker

Existing Meter

Existing Fuel Dispensers

Existing Fuel Filler Pipes

Existing Fuel Leak Sensors

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

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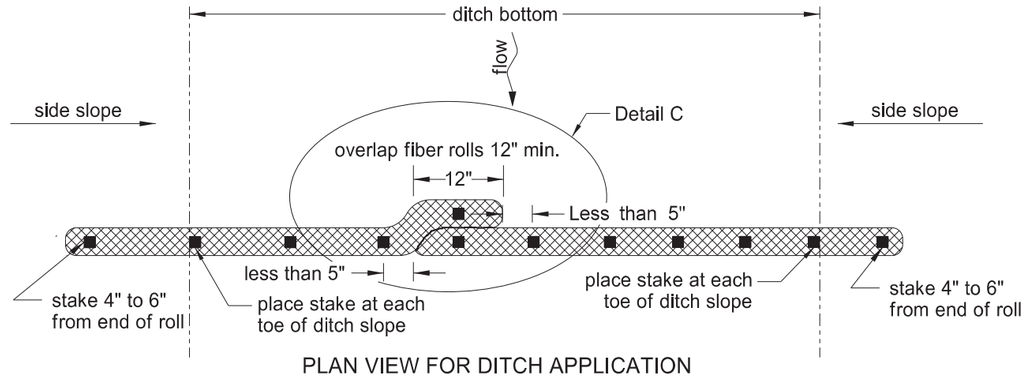
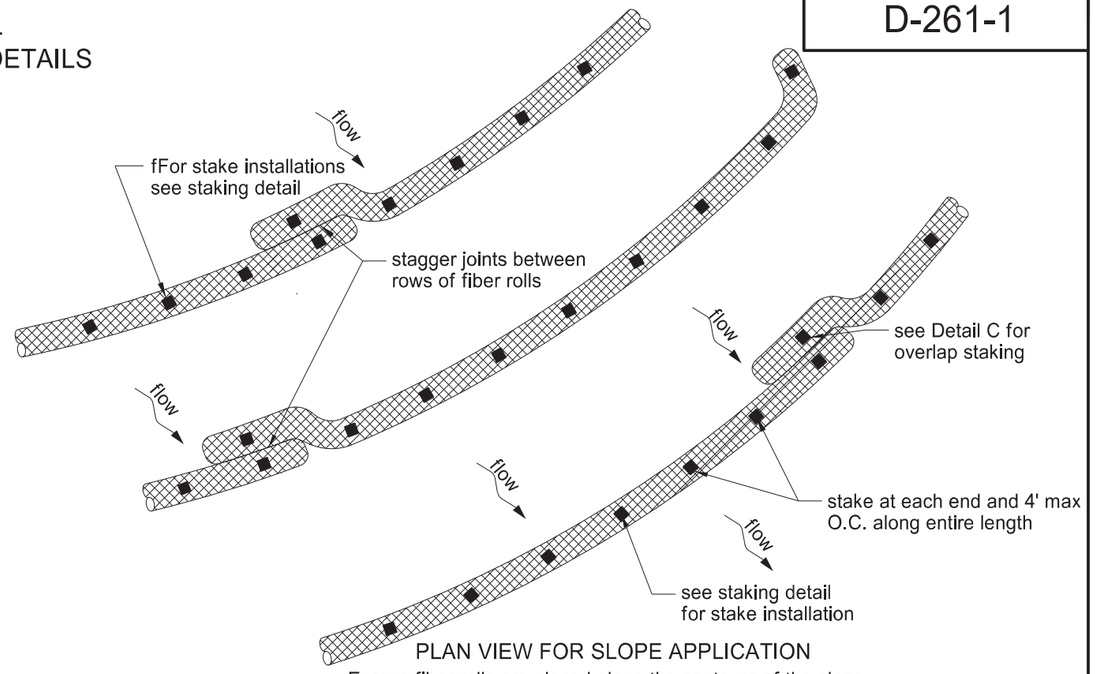
# EROSION CONTROL
# FIBER ROLL PLACEMENT DETAILS

D-261-1

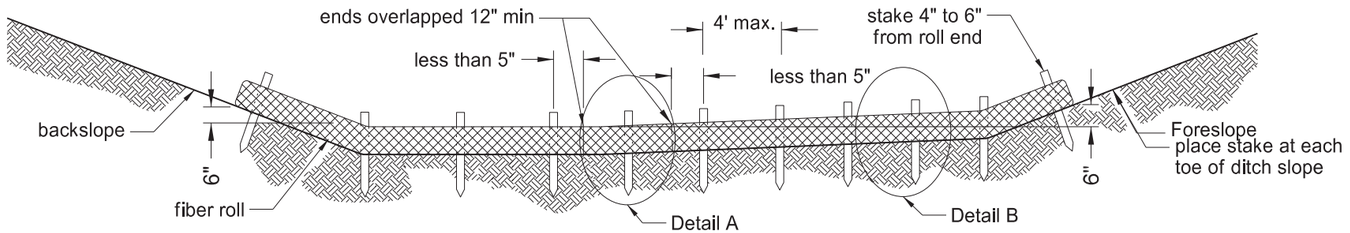



PLAN VIEW FOR DITCH APPLICATION

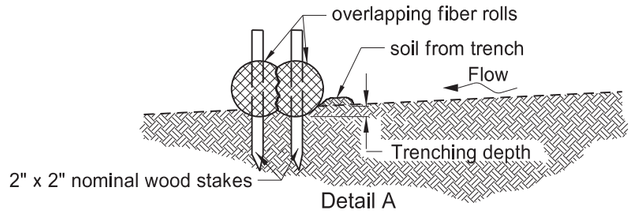



PLAN VIEW FOR SLOPE APPLICATION

Ensure fiber rolls are placed along the contours of the slope.

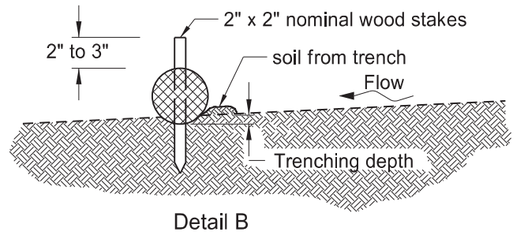



12 OR 20 INCH FIBER ROLL - DITCH BOTTOM




Detail A

FIBER ROLL OVERLAPPING STAKING DETAIL

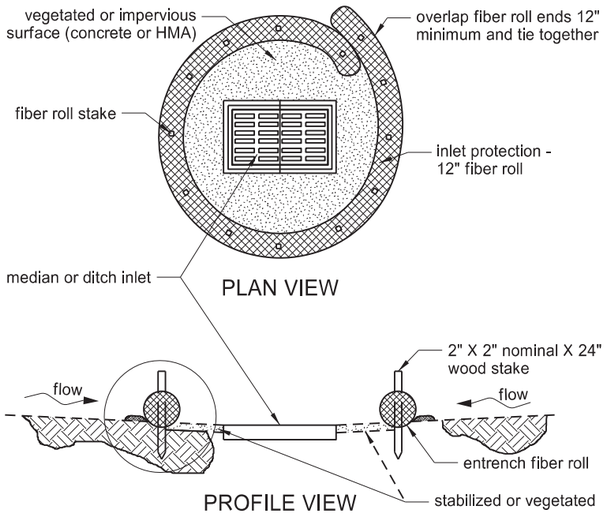



Detail B

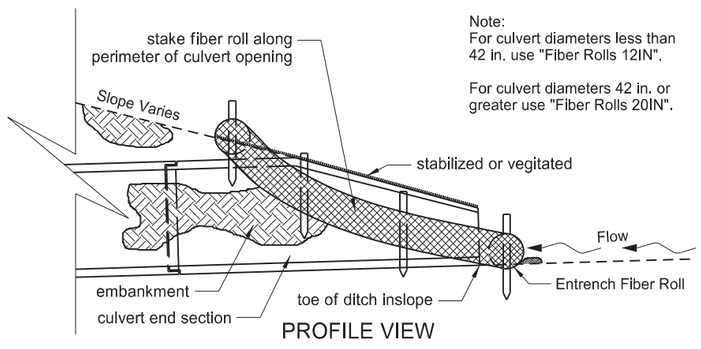
FIBER ROLL STAKING DETAIL

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

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

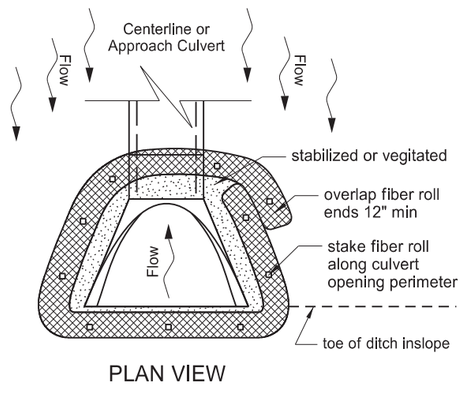



FIBER ROLL PROTECTION (MEDIAN OR DITCH INLET)




Note:
For culvert diameters less than 42 in. use "Fiber Rolls 12IN".

For culvert diameters 42 in. or greater use "Fiber Rolls 20IN".




FIBER ROLL PROTECTION (INLET OF CULVERT)

| 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 |
| 08-27-19 | New Design Engineer PE Stamp |
| 04-22-24 | Slope Plan View-overlap change |
| 03-13-25 | Added D-708-6 Culvert Inlet detail |
| 09-02-25 | Added D-708-6 Inlet detail |

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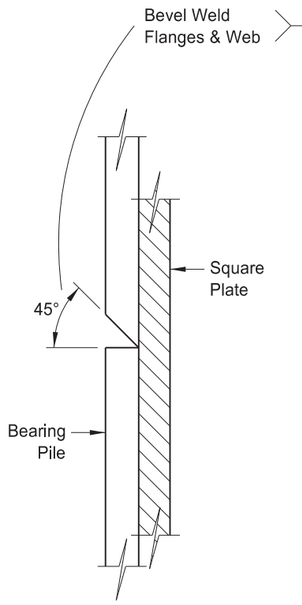
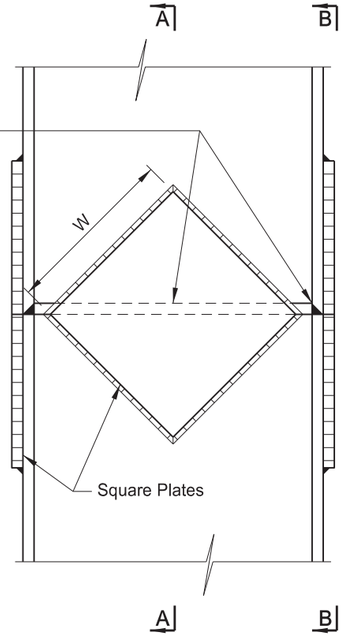
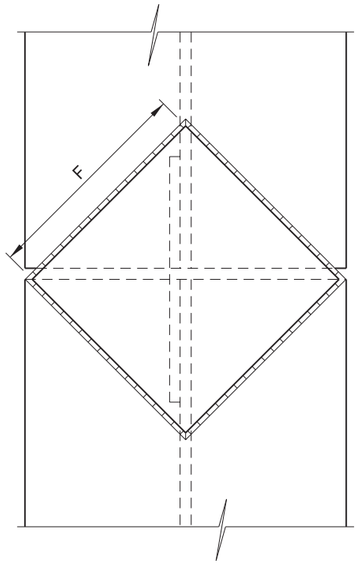
# PILE SPLICE DETAILS

D-622-1

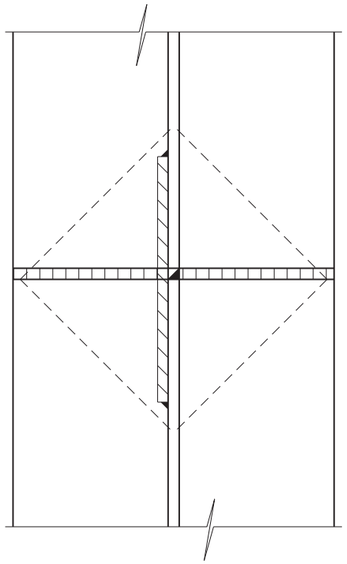



ENLARGED VIEW



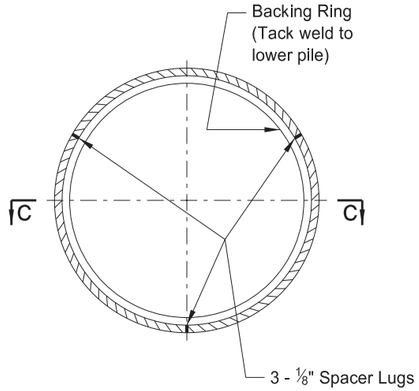




B-B

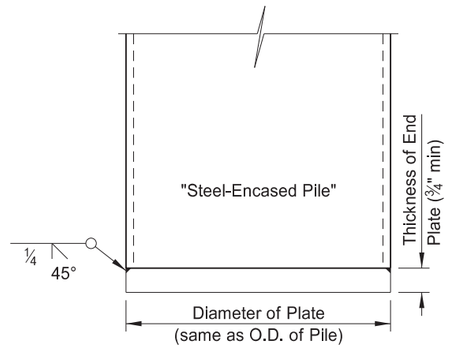


A-A

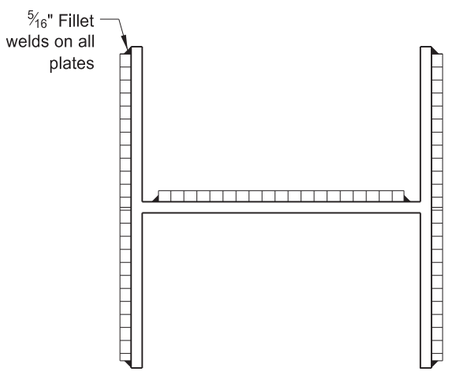
Flame scarf inside of both flanges and one side of web of upper section.




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

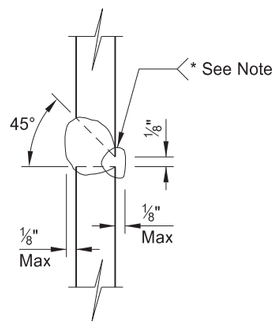



END PLATE DETAIL

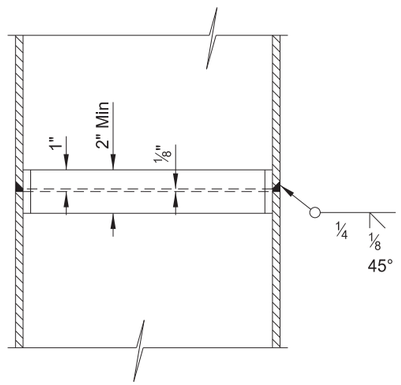



| PILE | 8" | 10" | 12" | 14" |
|---|---|---|---|---|
| "F" FLANGE | 5" | 6½" | 8" | 10" |
| "W" WEB | 4" | 5½" | 6½" | 8" |

H-PILE SPLICE DETAIL

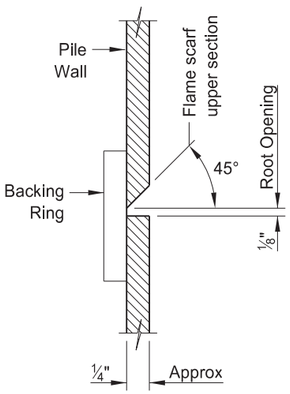



ALTERNATE H-PILE SPLICE DETAIL




C-C

STEEL-ENCASED CONCRETE PILE SPLICE DETAIL




ENLARGED VIEW

## NOTES:

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

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

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

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

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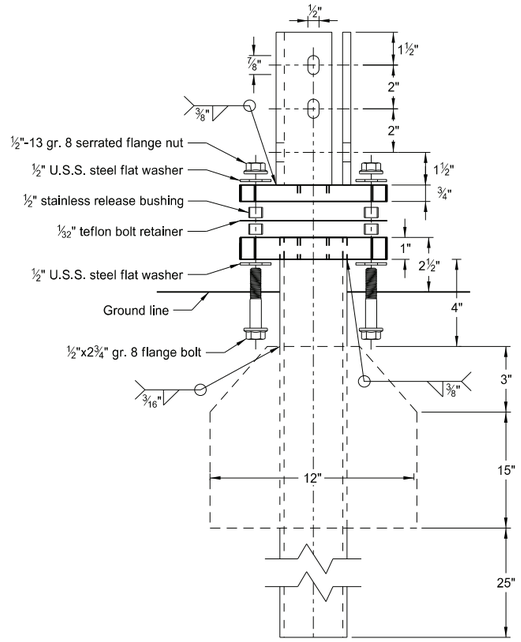
| 09/14/11 | |
| REVISIONS | |
| DATE | CHANGE |
| 09/03/19<br>02/23/24 | Updated Signature<br>Updated Signature<br>Revised notes & updated to active voice |

REGISTERED PROFESSIONAL ENGINEER
JASON R. THORENSON
PE - 5048
DATE
02/23/24
NORTH DAKOTA

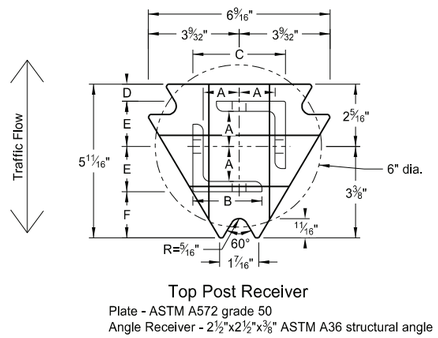
# BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

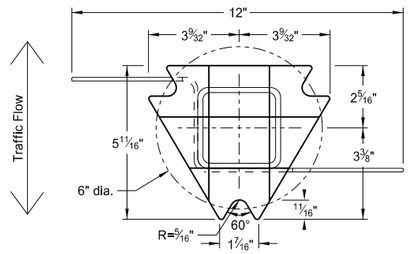



Multi-Directional
Slip Base Assembly

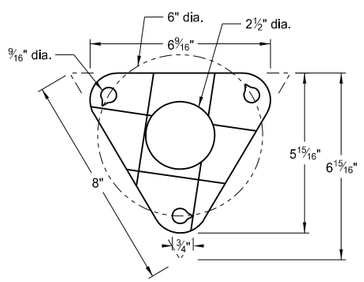
## Perforated Tube




Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2½"x2½"x⅜" ASTM A36 structural angle




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




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

Notes:

1. Torque slip base bolts as specified by manufacturer.
2. Use anchor with 43.9 KSI yield strength and 59.3 KSI tensile strength.
3. Provide 4" vertical clearance for anchor or breakaway base. Measure the 4"x60" measurement above and below post location and back and ahead of post.
4. In concrete sidewalk, use same anchor without wings.
5. Provide more than 7' between the first and fourth posts of a four post sign.

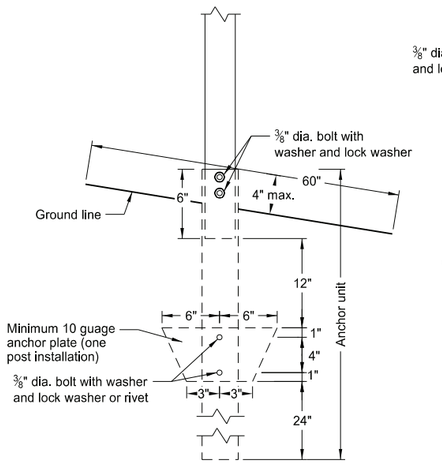
| Telescoping Perforated Tube | | | | | | |
|---|---|---|---|---|---|---|
| Number of Posts | Post Size in. | Wall Thick-ness Gauge | Sleeve Size in. | Wall Thick-ness Gauge | Slip Base | Anchor Size without Slip Base in. |
| 1 | 2 | 12 | | | No | 2¼ |
| 1 | 2¼ | 12 | | | No | 2½ |
| 1 | 2½ | 12 | | | (A) | 3 |
| 1 | 2½ | 10 | | | Yes | |
| 1 | 2¼ | 12 | 2 | 12 | Yes | |
| 1 | 2½ | 12 | 2¼ | 12 | Yes | |
| 2 | 2 | 12 | | | No | 2¼ |
| 2 | 2¼ | 12 | | | No | 2½ |
| 2 | 2½ | 12 | | | Yes | |
| 2 | 2½ | 12 | | | Yes | |
| 2 | 2¼ | 10 | 2 | 12 | Yes | |
| 2 | 2½ | 12 | 2¼ | 12 | Yes | |
| 3 & 4 | 2½ | 12 | | | Yes | |
| 3 & 4 | 2½ | 10 | | | Yes | |
| 3 & 4 | 2½ | 12 | 2¼ | 12 | Yes | |
| 3 & 4 | 2¼ | 12 | 2 | 12 | Yes | |
| 3 & 4 | 2½ | 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 |
| 1½ x 1½ | 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 |
| 2¼ x 2¼ | 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 |
| 2½ x 2½ | 0.105 | 12 | 3.141 | 0.804 | 0.803 | 0.643 |
| 2½ x 2½ | 0.135 | 10 | 4.006 | 0.979 | 1.010 | 0.785 |

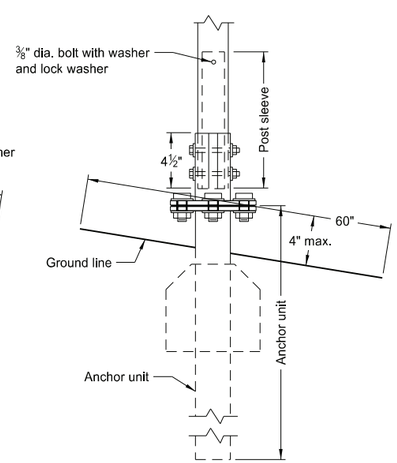
| Top Post Receiver Data Table | | | | | | |
|---|---|---|---|---|---|---|
| Square Post Sizes (B) | A | B | C | D | E | F |
| 2 3/16"x10 ga. | 1 9/64" | 2½" | 3 1/32" | 25/32" | 1 33/64" | 1 7/8" |
| 2½"x10 ga. | 1 9/32" | 2½" | 3 5/16" | ⅝" | 1 21/32" | 1¾" |

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

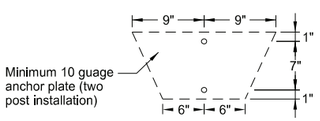
(B) For additional wind load, insert the 2 3/16"x10 ga. into 2½"x10 ga.




Anchor Unit and Post Assembly




Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly




| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 2-28-14 | |
| REVISIONS | |
| DATE | CHANGE |
| 9-27-17 | Updated to active voice |
| 10-03-19 | New Design Engr PE Stamp |
| 8-01-24 | Electronic Stamp/Signature |

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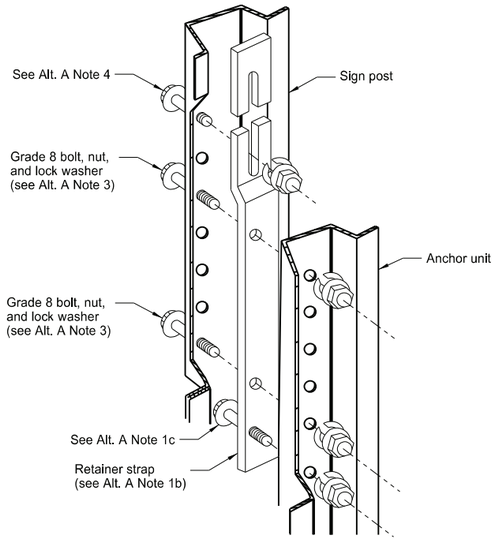
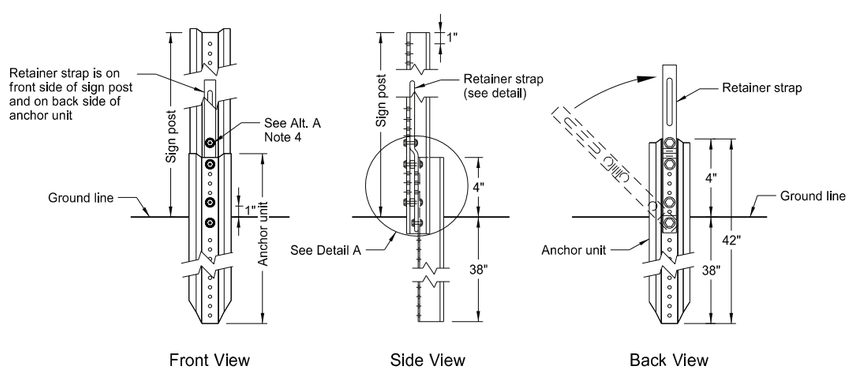
# BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

## U-Channel Post



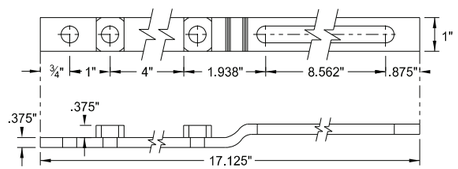

Detail A



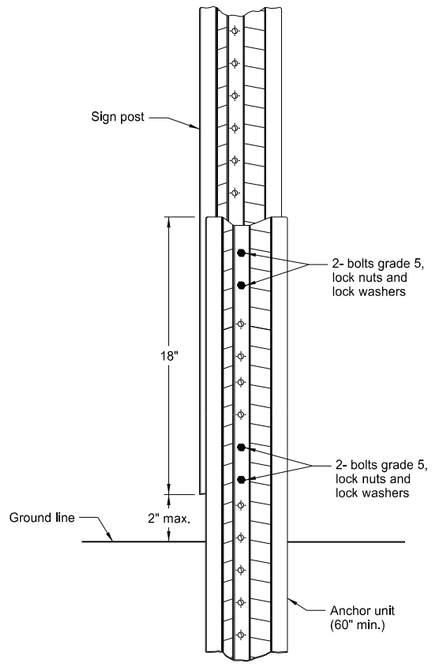

Front View | Side View | Back View

### Breakaway U-Channel Detail Alternate A

Install a maximum of 2 posts within 7'.

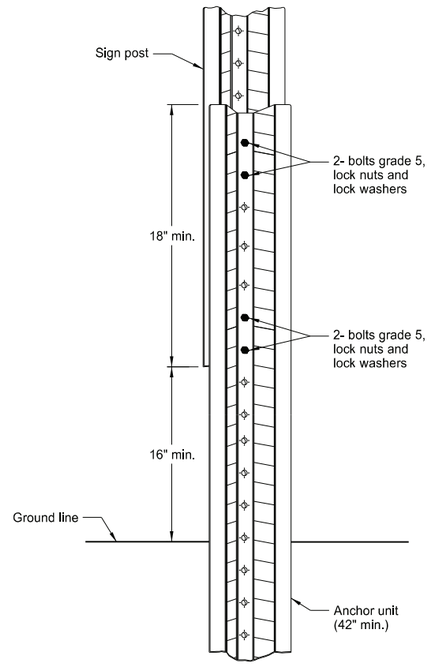



Retainer Strap Detail




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

Install a maximum of 3 posts within 7'.




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

Install a maximum of 3 posts within 7'.

Alternate A Steps of Installation:

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

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
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| 2-28-14 | |
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| 8-01-24 | Electronic Stamp/Signature |

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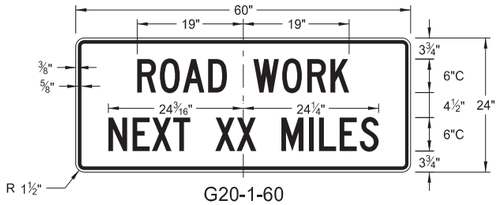
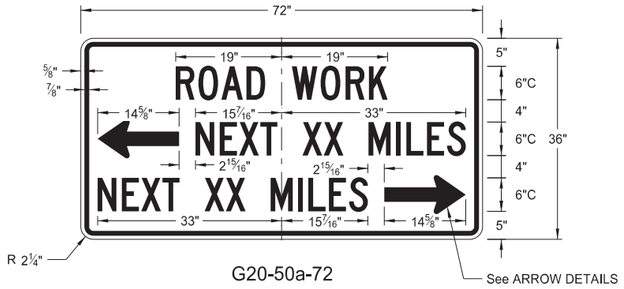
# CONSTRUCTION SIGN DETAILS
# TERMINAL AND GUIDE SIGNS

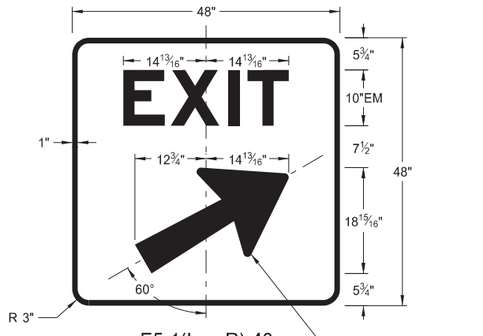




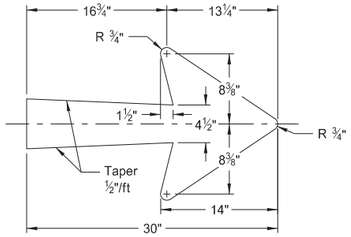

G20-1-60
Legend: black (non-refl)
Background: orange



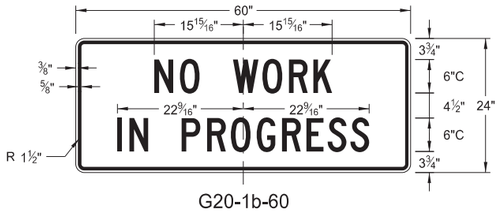

G20-50a-72
Legend: black (non-refl)
Background: orange



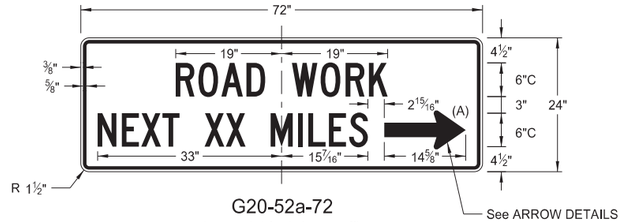

E5-1(L or R)-48
Legend: white
Background: green (orange optional)



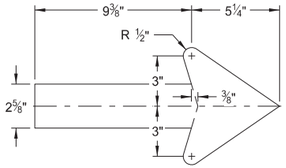

E5-1-48



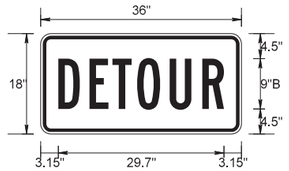

G20-1b-60
Legend: black (non-refl)
Background: orange



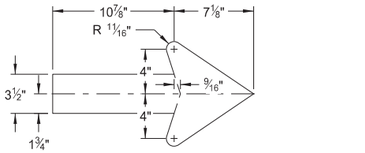

G20-52a-72
Legend: black (non-refl)
Background: orange



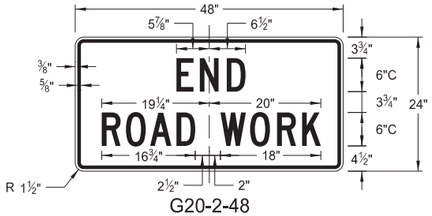
G20-50a-72
G20-52a-72



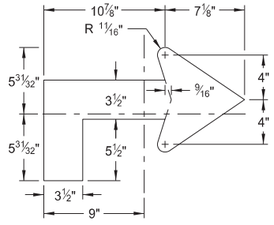

M4-8-36
Legend: black (non-refl)
Background: orange



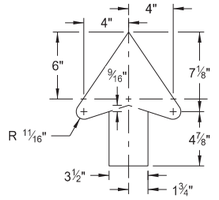

M4-9(L or R)-30
Right or Left



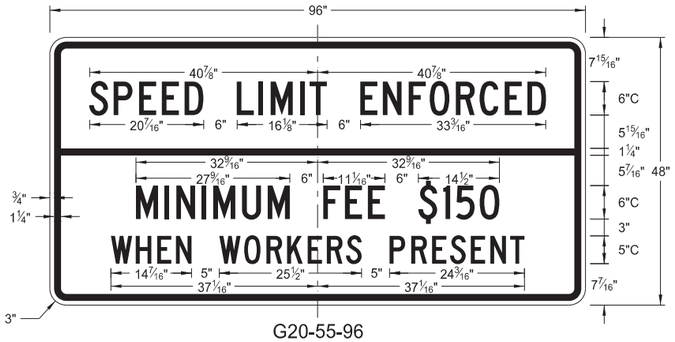

G20-2-48
Legend: black (non-refl)
Background: orange




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

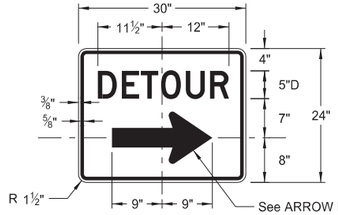



M4-9-30
Straight




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


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




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

## ARROW DETAILS

NOTES:

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

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

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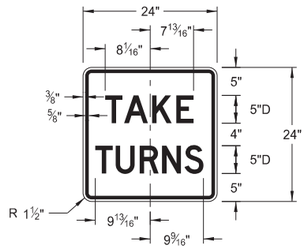
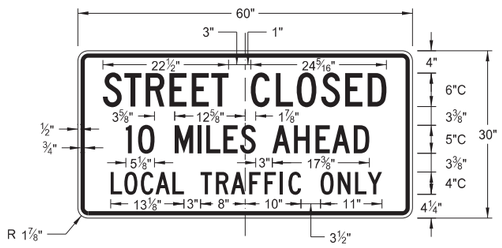
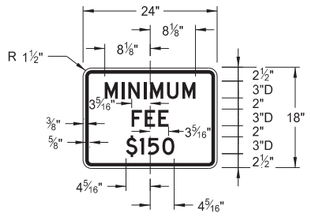
# CONSTRUCTION SIGN DETAILS
## REGULATORY SIGNS



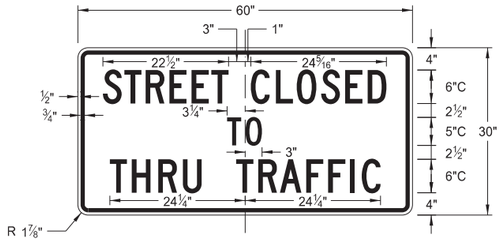

R1-50P-24
Legend: black (non-refl)
Background: white




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




R2-1aP-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

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

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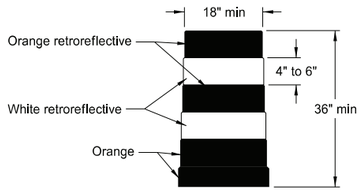
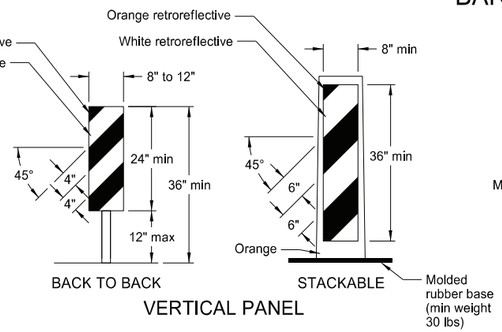
# BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



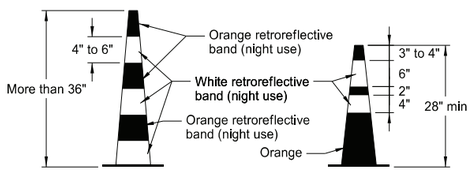

## DELINEATOR DRUM

Provide horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide for drum markings. Use a minimum of two orange and two white stripes with the top stripe being orange for each drum. Do not exceed 3" nonretroreflectorized spaces between the horizontal orange and white stripes. Avoid placement of stripes on drum ribs or indentations. Use closed top drums that will not allow collection of debris. Do not place ballast on the top of drum.



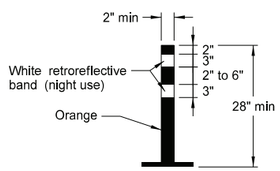

## VERTICAL PANEL

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



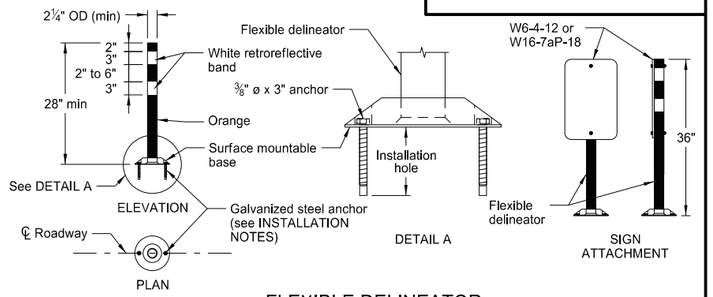

## TRAFFIC CONE

Provide retroreflectorization of cones more than 36" in height by alternating orange and white retroreflective stripes. Use a minimum of two orange and two white stripes for each cone with the top stripe being orange. Use maximum 3" nonretroreflectorized space between the orange and white stripes.




## TUBULAR MARKER

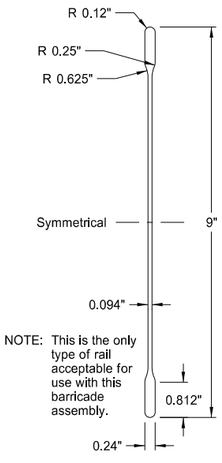
Provide retroreflectorization of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



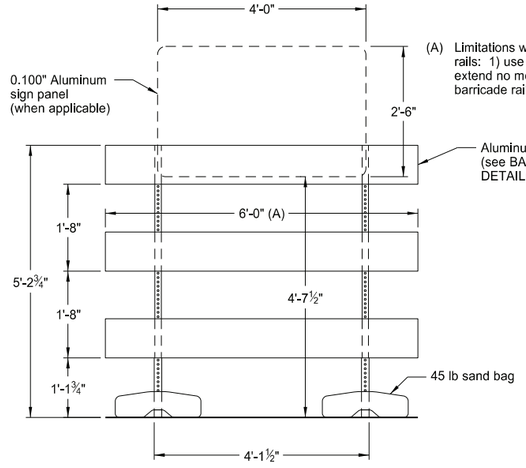

## FLEXIBLE DELINEATOR

INSTALLATION NOTES:

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

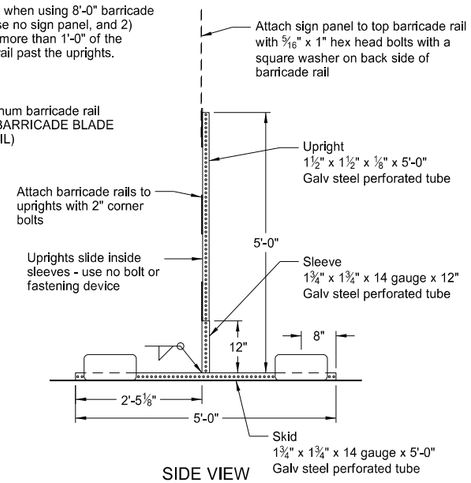



## BARRICADE BLADE DETAIL



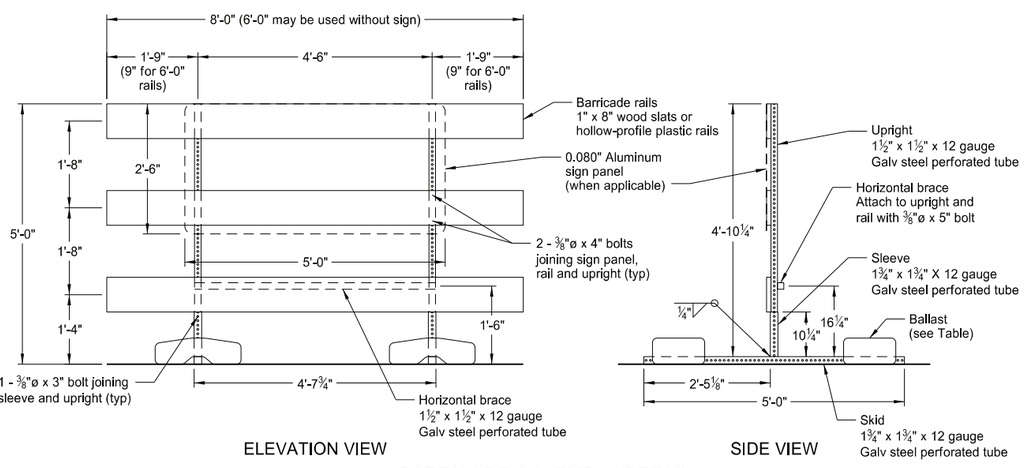

## ELEVATION VIEW

(A) Limitations when using 8'-0" barricade rails: 1) use no sign panel, and 2) extend no more than 1'-0" of the barricade rail past the uprights.



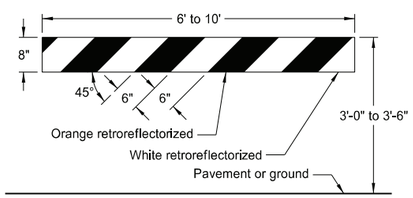

## SIDE VIEW

## BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

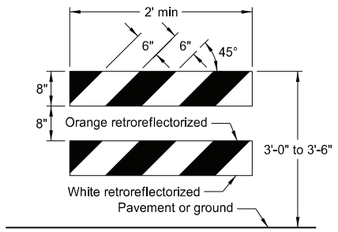



## BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

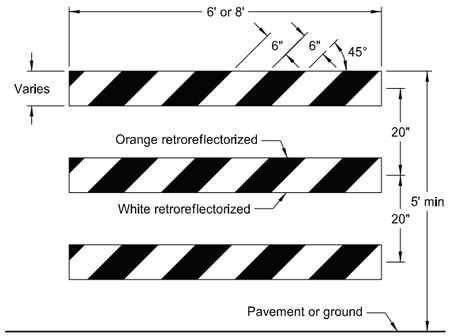
NOTE: For barricade markings use alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Place retroreflective sheeting on both sides of the rails with a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the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




## TYPE I BARRICADE

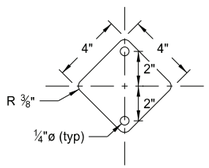


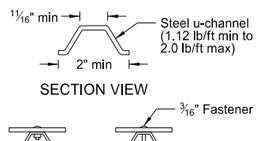

## TYPE II BARRICADE

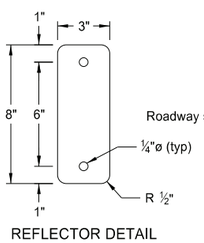



## TYPE III BARRICADE

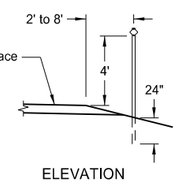
## BARRICADE RAIL DETAILS




## REFLECTOR DETAIL




## ELEVATION

## DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

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

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

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 10-3-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 9-27-17 | Updated to active voice |
| 11-01-19 | Revised details for Flexible Delineator |
| 8-01-24 | Electronic Stamp/Signature |

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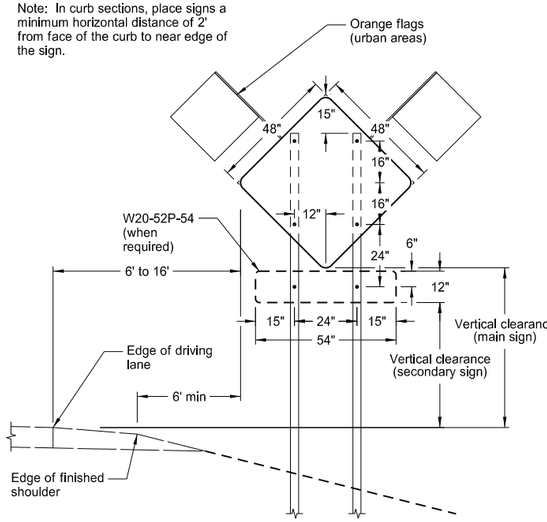
08/01/24

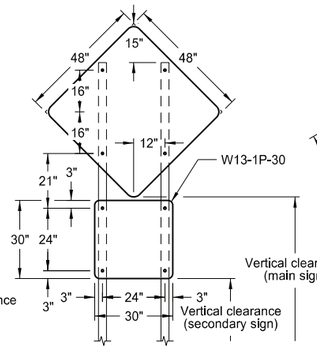
# CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

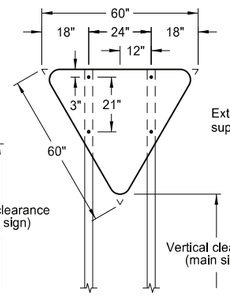
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



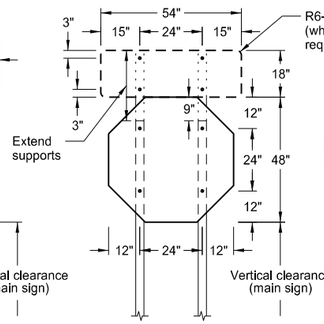

TYPICAL SECTION
(48" x 48" diamond warning sign shown)



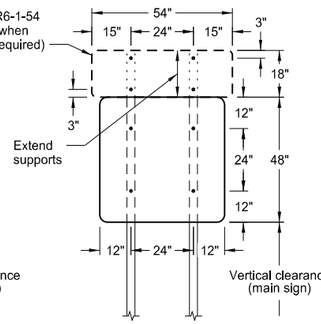

48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



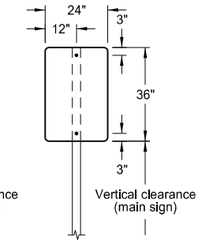

R1-2-60 - YIELD SIGN



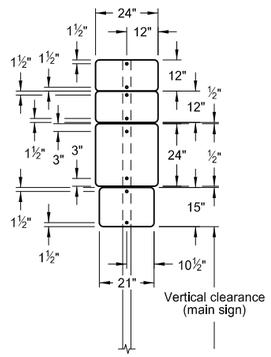

R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



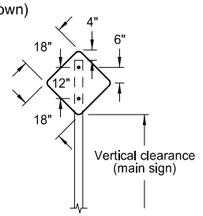

48" x 48" SIGN
(with R6-1-54 sign as required)



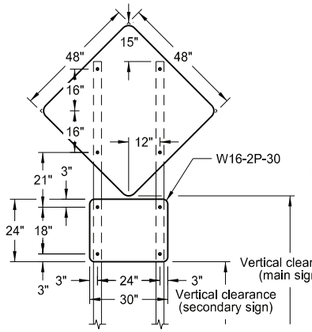

24" x 36" SIGN



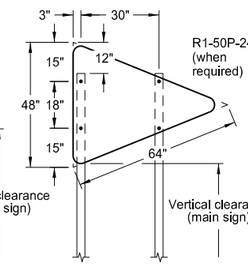

24" x 24"
ROUTE MARKER
ASSEMBLY



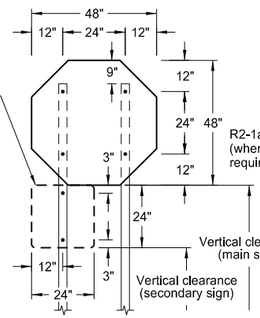

18" x 18"
DIAMOND SIGN



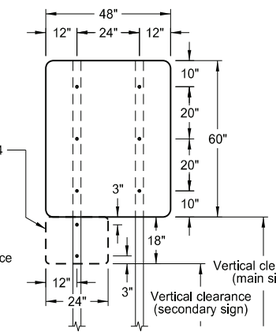

48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



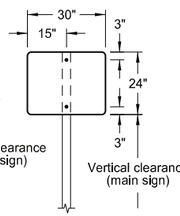

W14-3-64 - PENNANT SIGN



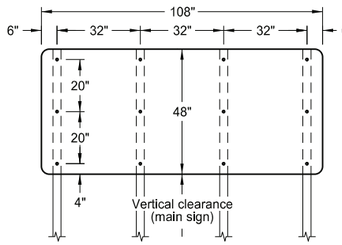

R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



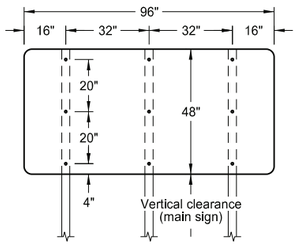

48" x 48" SIGN
(with R2-1aP-24 sign as required)



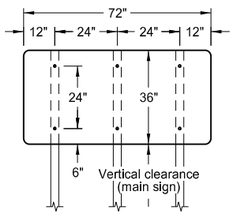

30" x 24" SIGN



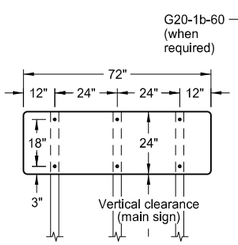

108" x 48" SIGN



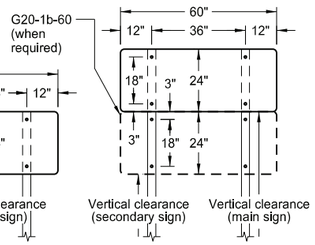

96" x 48" SIGN



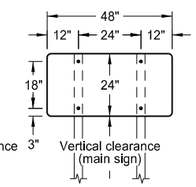

72" x 36" SIGN



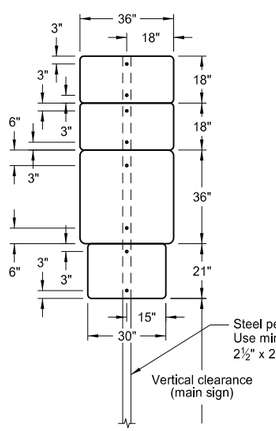

72" x 24" SIGN



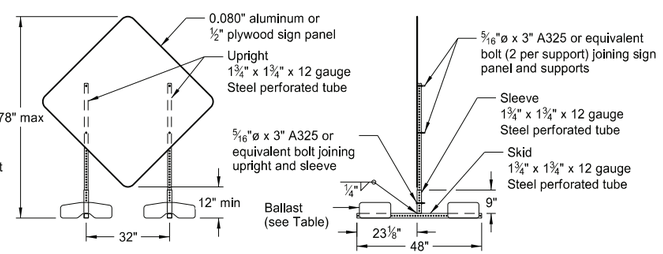

60" x 24" SIGN



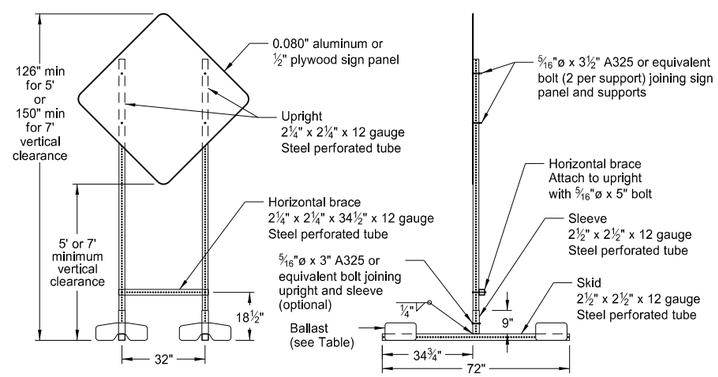

48" x 24" SIGN




36" x 36"
ROUTE MARKER
ASSEMBLY




PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT




PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

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

   Place signs over 50 square feet on 2½" x 2½" perforated tube supports as a minimum.

   Do not attach guy wires to sign supports. Attach wind beams behind sign panels when used with u-posts.

2. Sign Panels: Provide sign panels made of 0.100" aluminum, ½" plywood, or other approved material, except where noted. Punch all holes round for ⅜" bolts.

3. Alternate Messages: Install and remove alternate message signs on reflectorized plate (without borders) as required. (i.e. "Left" and "Right" message on lane closure sign)

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

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

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

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

   Provide a minimum clearance of 7'-0" from the ground at the post for signs with an area exceeding 50 square feet.

6. Portable Signs: Provide portable signs that meet the vertical clearance stated above when it is necessary to place signs within the pavement surface.

   Use of low-mounting height (minimum 12" vertical clearance) portable signs for 5 days or less, is allowed as long as the view of the sign is not obstructed. Time delays caused by unforseen circumstances, such as equipment breakdown, rain, subgrade failures, etc., will not accrue towards the 5 day period. Use of R9-8 through R9-11a series, W1-6 through W1-8 series, M4-10, and E5-1 is allowed for longer than 5 days.

   Restrict signs mounted on portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT details to a maximum surface area of 16 square feet.

MINIMUM BALLAST
(For each side of sign support base)

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

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

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

10-4-13

REVISIONS

| DATE | CHANGE |
|---|---|
| 11-14-13 | Revised Note 6 |
| 9-27-17 | Updated to active voice |
| 11-01-19 | Revised 60"x24" sign detail |
| 8-01-24 | Electronic Stamp/Signature |

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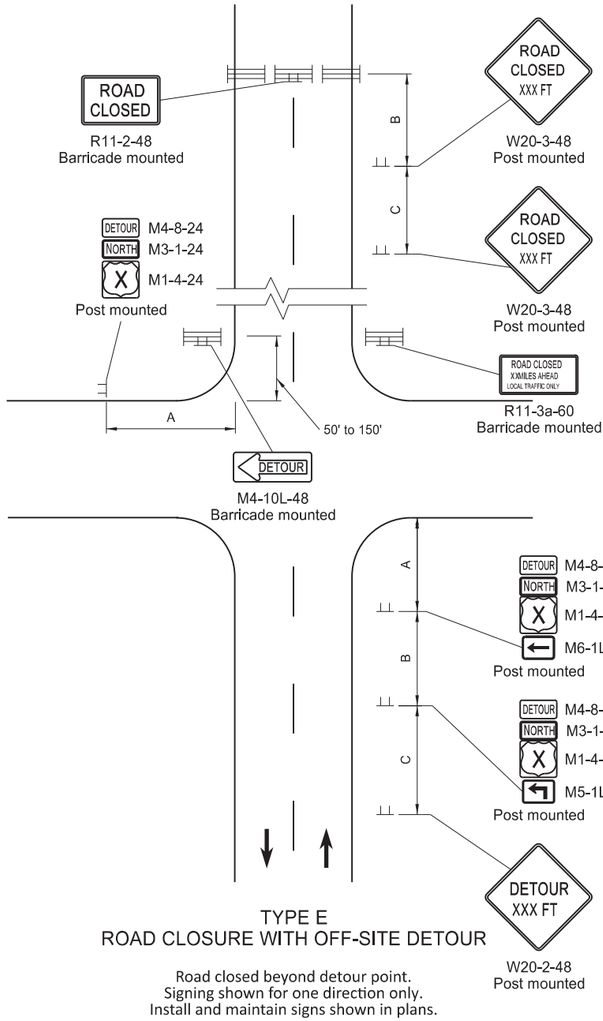
08/01/24

# ROAD CLOSURE AND LANE CLOSURE ON A TWO WAY ROAD LAYOUTS

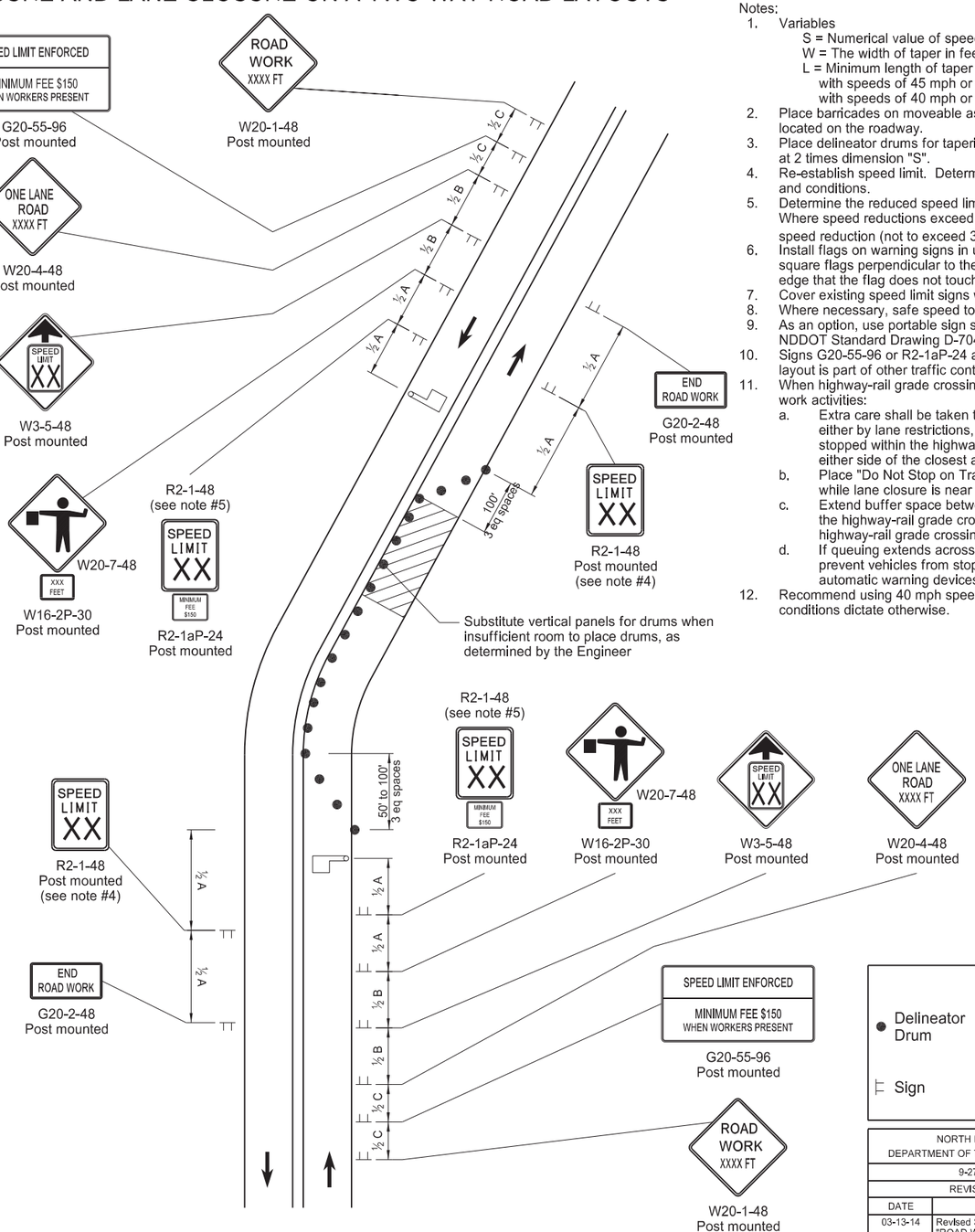
D-704-19




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

Road closed beyond detour point.
Signing shown for one direction only.
Install and maintain signs shown in plans.

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




## TYPE F
## LANE CLOSURE ON A TWO LANE ROAD USING FLAGGERS

Two lane highway with one lane closed.
Flagger at point visible to approaching traffic.

Notes:

1. Variables
   S = Numerical value of speed limit or 85th percentile.
   W = The width of taper in feet
   L = Minimum length of taper in feet. S x W for freeways, expressways, and roads with speeds of 45 mph or greater, or W x $S^2/60$ for urban, residential, and streets with speeds of 40 mph or less.
2. Place barricades on moveable assemblies and signs on portable assemblies when located on the roadway.
3. Place delineator drums for tapering traffic at 3 equal spaces and for tangents space them at 2 times dimension "S".
4. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
5. Determine the reduced speed limit based on the in place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place second speed limit sign at ½B.
6. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
7. Cover existing speed limit signs within a reduced speed zone.
8. Where necessary, safe speed to be determined by the Engineer.
9. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
10. Signs G20-55-96 or R2-1aP-24 are not required when pilot car operation is used, if this layout is part of other traffic control that contains this sign, or if work is less than 15 days.
11. When highway-rail grade crossings exist either within or in the vicinity of the roadway work activities:
    a. 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.)
    b. Place "Do Not Stop on Tracks" sign (R8-8-24) near cross buck in each direction while lane closure is near tracks.
    c. Extend buffer space between work zone and lane closure transition upstream of the highway-rail grade crossing to prevent flagging queue from extending across highway-rail grade crossing.
    d. If queuing extends across highway-rail crossing, provide flagger at crossing to prevent vehicles from stopping within the crossing (even when automatic warning devices are in place.)
12. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

KEY

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

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

| DATE | CHANGE |
|---|---|
| 03-13-14 | Revised Sign Cell "ROAD WORK XXX FT" |
| 08-17-17 | Update notes & sign numbers |
| 11-01-19 | Revised signs, sign #s, & notes |
| 12-08-21 | Switched order of Road Work XXX and Spd Limit Enforced & added Dollars At Work |
| 11-29-22 | Removed Dollars At Work |
| 06-30-25 | Legislative Changes |

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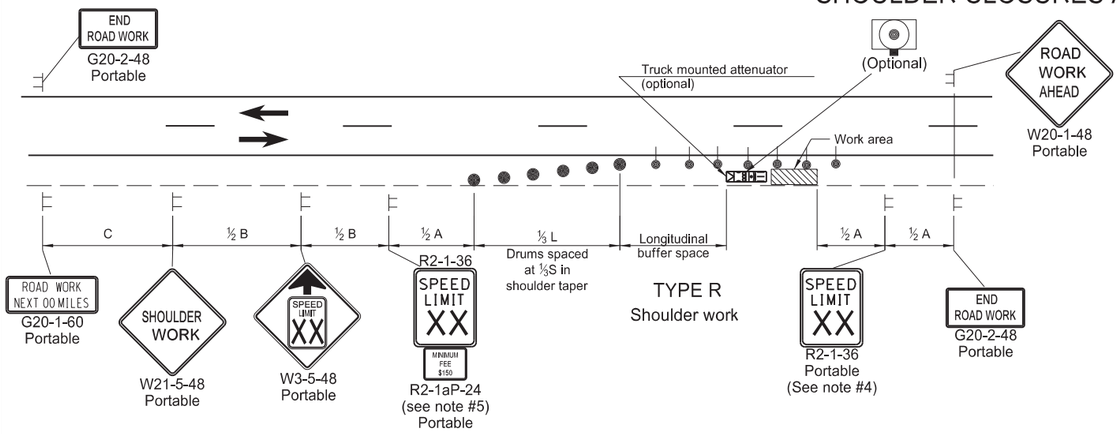
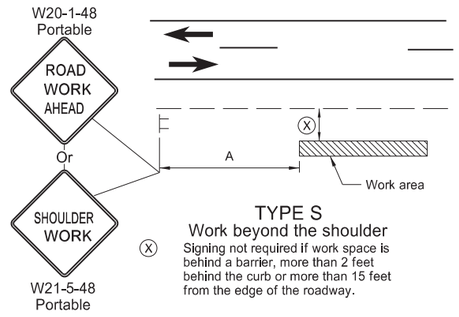
# SHOULDER CLOSURES AND BRIDGE PAINTING LAYOUTS

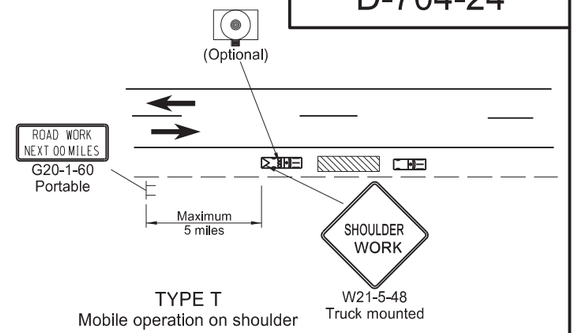
D-704-24



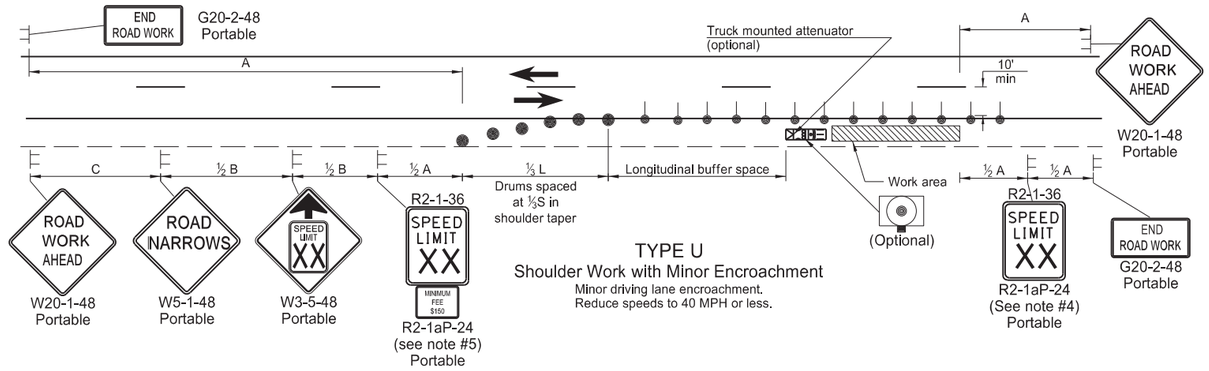

TYPE R
Shoulder work



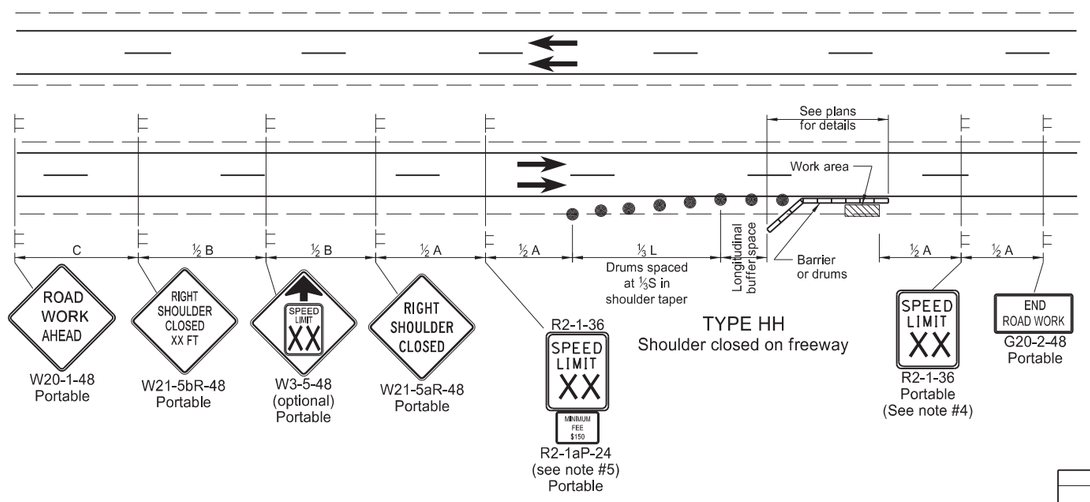

TYPE S
Work beyond the shoulder
Signing not required if work space is behind a barrier, more than 2 feet behind the curb or more than 15 feet from the edge of the roadway.



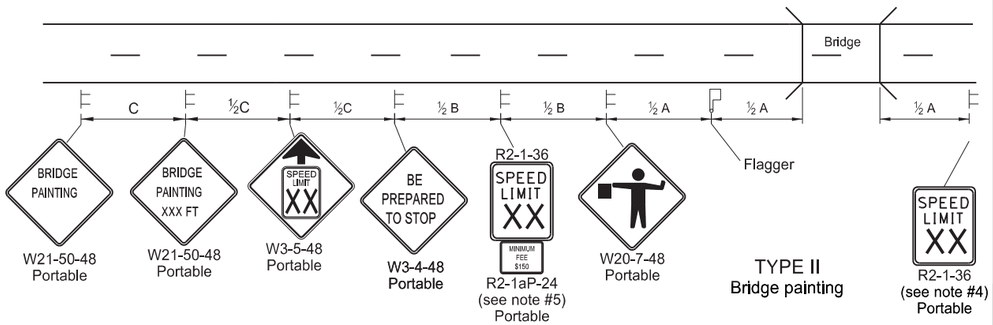

TYPE T
Mobile operation on shoulder




TYPE U
Shoulder Work with Minor Encroachment
Minor driving lane encroachment.
Reduce speeds to 40 MPH or less.




TYPE HH
Shoulder closed on freeway




TYPE II
Bridge painting

Notes
1. Variables
   S = Numerical value of speed limit or 85th percentile.
   W = The width of the taper in feet.
   L = Minimum length of taper, S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x $S^2$ /60 for urban, residential, and other streets with speeds of 40 mph or less.
2. Space delineator drums for tapering traffic at dimension "S". Space delineator drums or tubular markers for tangents at 2 times "S".
3. Sequencing Arrow Panels
   Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
   UseType B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
   Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
4. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
5. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½B.
6. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
7. Cover existing speed limit signs within a reduced speed zone.
8. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
9. Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

KEY

| | |
|---|---|
| Sign | Work area |
| Delineator Drum | Tubular Marker |
| Sequencing Arrow Panel (Caution Mode) | |

ADVANCE WARNING SIGN SPACING

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

Longitudinal Buffer Space

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

| DATE | CHANGE |
|---|---|
| 08-17-17 | Updated notes & revised signs |
| 11-01-19 | Revised drum spacing & signs nos |
| 08-01-24 | Electronic Stamp/Signature |
| 06-30-25 | Legislative Changes |

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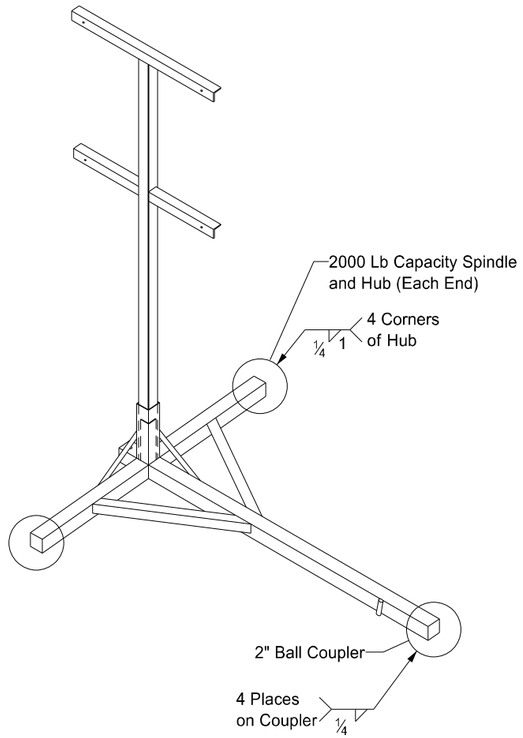
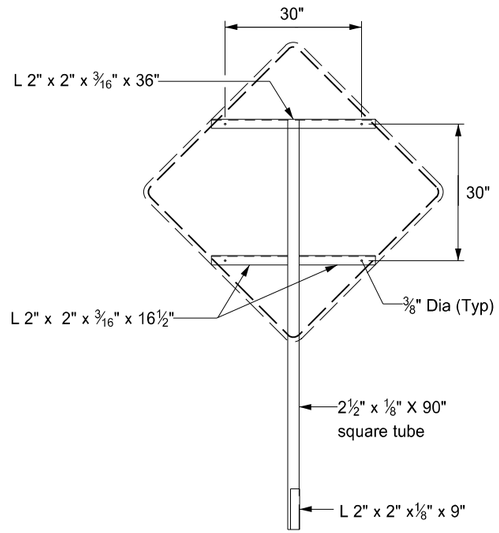
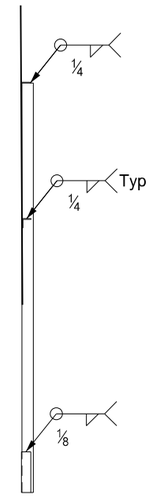
# PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50




FRONT

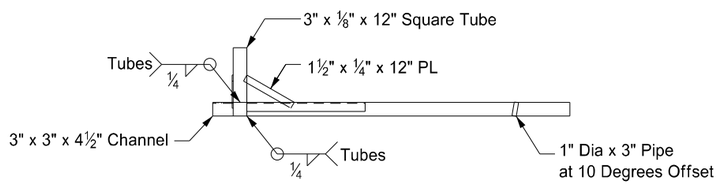


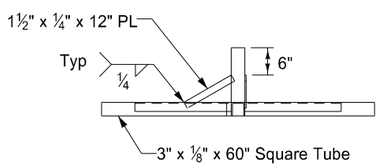

RIGHT

SIGN SUPPORT

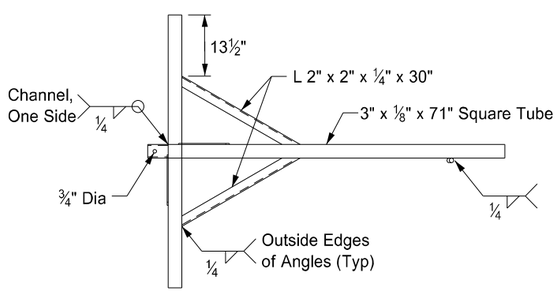
Notes:

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




RIGHT




TOP

TRAILER

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

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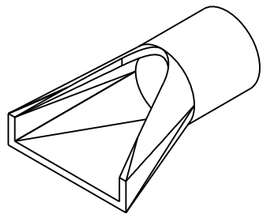
12 02 2020

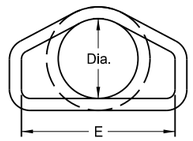
# REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS
## (Round Pipe)

D-714-1

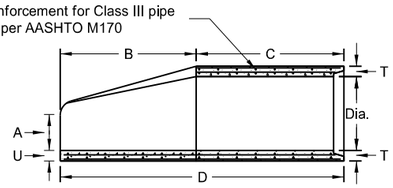
| FLARED END SECTION | | | | | | |
|---|---|---|---|---|---|---|
| TERMINAL DIMENSIONS | | | | | | |
| DIA | A | B | C | D | E | U |
| 12 | 0'-4" | 2'-0" | 4'-0⅞" | 6'-0⅞" | 2'-0" | 2" |
| 15 | 0'-6" | 2'-3" | 3'-10" | 6'-1" | 2'-6" | 2¼" |
| 18 | 0'-9" | 2'-3" | 3'-10" | 6'-1" | 3'-0" | 2½" |
| 21 | 0'-9" | 3'-0" | 3'-1" | 6'-1" | 3'-6" | 2¾" |
| 24 | 0'-9½" | 3'-7½" | 2'-6" | 6'-1½" | 4'-0" | 3" |
| 27 | 0'-10½" | 4'-0" | 2'-1½" | 6'-1½" | 4'-6" | 3¼" |
| 30 | 1'-0" | 4'-6" | 1'-7¾" | 6'-1¾" | 5'-0" | 3½" |
| 36 | 1'-3" | 5'-3" | 2'-9" | 8'-0" | 6'-0" | 4" |
| 42 | 1'-9" | 5'-3" | 2'-9" | 8'-0" | 6'-6" | 4½" |
| 48 | 2'-0" | 6'-0" | 2'-0" | 8'-0" | 7'-0" | 5" |
| 54 | 2'-3" | 5'-5" | 2'-9¼" | 8'-2¼" | 7'-6" | 5½" |
| 60 | 2'-11" | 5'-0" | 3'-3" | 8'-3" | 8'-0" | 5" |
| 66 | 2'-6" | 6'-0" | 2'-3" | 8'-3" | 8'-6" | 5½" |
| 72 | 3'-0" | 6'-6" | 1'-9" | 8'-3" | 9'-0" | 6" |
| 78 | 3'-0" | 7'-6" | 1'-9" | 9'-3" | 9'-6" | 6½" |
| 84 | 3'-0" | 7'-6½" | 1'-9" | 9'-3½" | 10'-0" | 6½" |
| 90 | 3'-5" | 7'-3½" | 2'-0" | 9'-3½" | 11'-0" | 6½" |



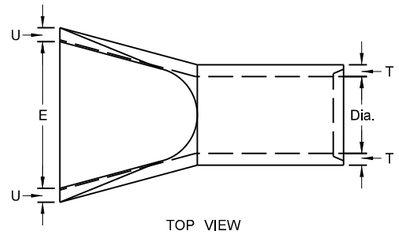
PERSPECTIVE




END VIEW




SIDE VIEW



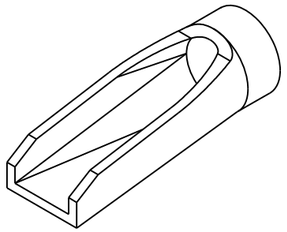

TOP VIEW

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

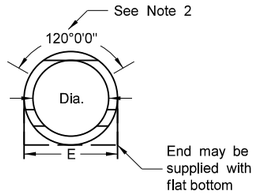
NOTES:

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.

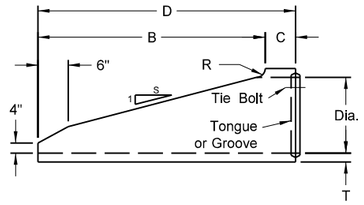
| TRAVERSABLE END SECTION | | | | | | |
|---|---|---|---|---|---|---|
| DIA | B | C | D | E | R | S |
| 15" | 4' | 9" | 4'-9" | 1'-7½" | 3" | 6 |
| 18" | 5'-9" | 9" | 6'-6" | 1'-11" | 3" | 6 |
| 24" | 6' | 1' | 7' | 2'-6" | 3" | 4 |
| 30" | 7'-6" | 1' | 8'-6" | 3'-1" | 3½" | 4 |
| 36" | 7'-3" | 15" |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



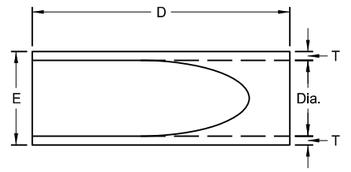
PERSPECTIVE




END VIEW




SIDE VIEW



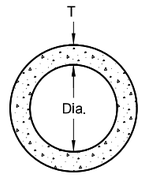

TOP VIEW

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

NOTES (Traversable End Section):

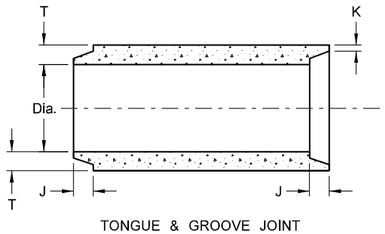
1. Manufactured in accordance with applicable portions of ASTM C76/AASHTO M170.
2. Reinforcement per Class III RCP with double reinforcement in the upper 120° of the full barrel portion.

| All Classifications of Round Concrete Pipe | | | | | |
|---|---|---|---|---|---|
| Internal Dia. of pipe in inches | Cross-Sectional Water Area | Weight per lin. foot of Pipe Std. Wall | Joint J Groove End Min./Max. | Joint K Tongue End Min. | Minimum Wall Thickness (T) |
| Dia | Sq. ft. | Lbs. | In. | In. | In. |
| 12 | 0.79 | 92 | 1⅛-2⅛ | ¾ | 2 |
| 15 | 1.23 | 127 | 1⅛-2¼ | ⅞ | 2¼ |
| 18 | 1.77 | 168 | 1⅛-2⅛ | 1 | 2½ |
| 21 | 2.40 | 214 | 1⅛-3⅛ | 1⅛ | 2¾ |
| 24 | 3.14 | 265 | 2¼-3¼ | 1⅛ | 3 |
| 27 | 3.98 | 322 | 2¼-4 | 1¼ | 3¼ |
| 30 | 4.91 | 384 | 3¼-4¼ | 1¼ | 3½ |
| 33 | 5.94 | 452 | 3¼-4¼ | 1½ | 3¾ |
| 36 | 7.07 | 524 | 3¼-4¼ | 1½ | 4 |
| 42 | 9.62 | 685 | 3¾-4¾ | 1¾ | 4½ |
| 48 | 12.57 | 685 | 3⅞-4¾ | 1⅞ | 5 |
| 54 | 15.90 | 1070 | 4⅛-5¼ | 2 | 5½ |
| 60 | 19.63 | 1296 | 4½-5½ | 2¼ | 6 |
| 66 | 23.76 | 1542 | 5-6 | 2⅝ | 6½ |
| 72 | 28.27 | 1810 | 5⅛-6¾ | 2⅞ | 7 |
| 78 | 33.18 | 2098 | 6¼-7¼ | 2⅞ | 7½ |
| 84 | 38.48 | 2410 | 5⅛-7¾ | 3⅜ | 8 |
| 90 | 44.18 | 2793 | 6¾-8½ | 3⅛ | 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 |

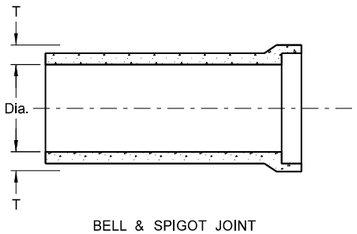



END VIEW

CIRCULAR PIPE

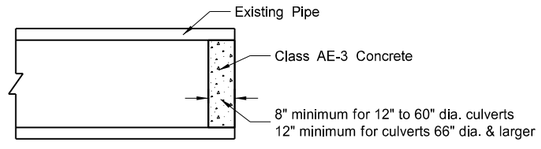



TONGUE & GROOVE JOINT




BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE




CONCRETE PIPE PLUG

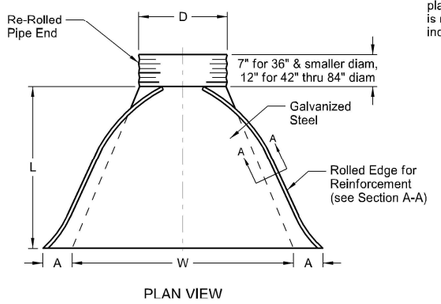
SEE STANDARD DRAWING D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

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

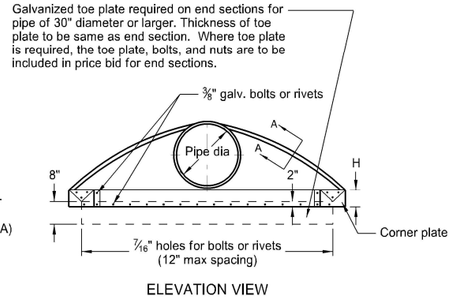
This document was originally issued and sealed by Jon Ketterling Registration Number PE-4684, on 9/18/19 and the original document is stored at the North Dakota Department of Transportation

# ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

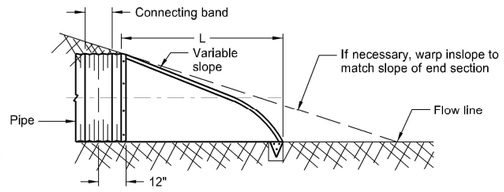
D-714-4



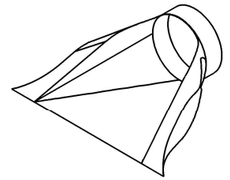

PLAN VIEW




ELEVATION VIEW




TYPICAL CROSS SECTION
(showing connector section)



PERSPECTIVE VIEW

| ** PIPE DIA. | GALVANIZED THICKNESS | END SECTION DIMENSIONS | | | | | APPROX. SLOPE | BODY |
|---|---|---|---|---|---|---|---|---|
| | | A | B | H | L | W | | |
| IN | IN | IN | IN | IN | IN | IN | RATE | PIECE |
| 15 | 0.064 - 0.079 | 7 | 8 | 6 | 26 | 30 | 2½:1 | 1 |
| 18 | 0.064 - 0.109 | 8 | 10 | 6 | 31 | 36 | 2½:1 | 1 |
| 24 | 0.064 - 0.109 | 10 | 13 | 6 | 41 | 48 | 2½:1 | 1 |
| 30 | 0.064 - 0.109 | 12 | 16 | 8 | 51 | 60 | 2½:1 | 1 or 2 |
| 36 | 0.064 - 0.109 | 14 | 19 | 9 | 60 | 72 | 2½:1 | 2 |
| 42 | 0.064 - 0.138 | 16 | 22 | 11 | 69 | 84 | 2½:1 | 2 |
| 48 | 0.064 - 0.168 | 18 | 27 | 12 | 78 | 90 | 2¼:1 | 2 |
| 54 | 0.064 - 0.168 | 18 | 30 | 12 | 84 | 102 | 2:1 | 2 |
| *60 | 0.064 - 0.168 | 18 | 33 | 12 | 87 | 114 | 1¾:1 | 3 |
| *66 | 0.064 - 0.168 | 18 | 36 | 12 | 87 | 120 | 1½:1 | 3 |
| *72 | 0.064 - 0.168 | 18 | 39 | 12 | 87 | 126 | 1½:1 | 3 |
| *78 | 0.064 - 0.168 | 18 | 42 | 12 | 87 | 132 | 1¼:1 | 3 |
| *84 | 0.064 - 0.168 | 18 | 45 | 12 | 87 | 138 | 1⅛:1 | 3 |

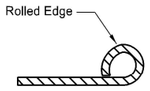
* These sizes have 0.109" sides and 0.138" center panels.

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

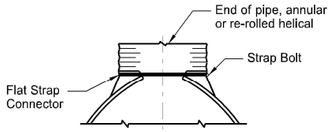
Manufacturers tolerances of above dimensions will be allowed.

Splices to be the lap riveted type.

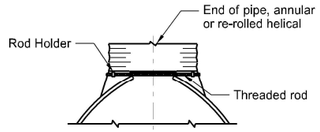
Multiple panel bodies shall have lap seams which are to be tightly joined with ⅜" dia. galv. bolts or rivets. Nuts to be torqued to 25 foot-lbs ±.



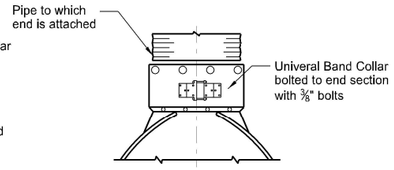

SECTION A-A




TYPE #1
For circular pipes with diameter 24" & smaller




TYPE #2
For circular pipes with diameter 30" through 36"

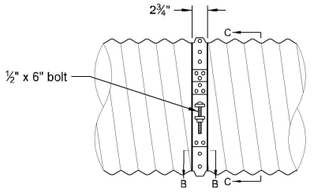



TYPE #3
For all pipe sizes

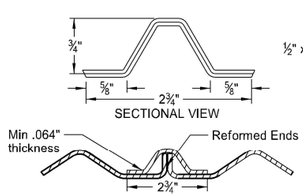
| COUPLING BAND DIMENSIONS | | | | |
|---|---|---|---|---|
| COUPLING TYPE | CORRUGATION PITCH x DEPTH | PIPE SIZE | COUPLING BAND LENGTH | MIN. BAND THICKNESS |
| Hat Band | 2⅔" x ½" | 12" - 48" | 2¾" | .064" |
| Annular Band | 2⅔" x ½" | 12" - 72" | 12" | .052" |
| | | 78" - 84" | 12" | .079" |
| | 3" x 1" | 48" - 120" | 14" | .052" |
| Hugger Band | 2⅔" x ½" Rerolled End | 12" - 72" | 10½" | .052" |
| | | 78" - 84" | 10½" | .079" |
| | 3" x 1" Rerolled End | 48" - 120" | 10½" | .052" |
| | 5" x 1" Rerolled End | 48" - 120" | 12" | .064" |

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 ¼" galv. angle for 60" through 72" dia. and 2½" x 2½" x ¼" galv. angle for 78" and 84" dia.. Angles to be attached by galv. ⅜" 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. ½" x 8" bolts may be used as a substitute for the ½" x 6" bolts shown in the details.
6. Coupling bands wider than 14" may be used if a minimum of four ½" bolts with maximum spacing of 5½" are used for the connection.
7. Length of spot welds shall be minimum ½".

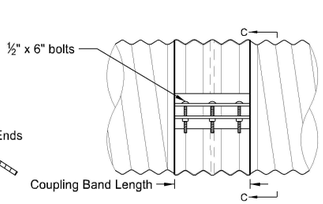



SIDE VIEW

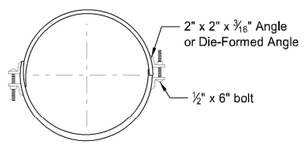



SECTION B-B

HAT BAND FOR FLANGED END PIPE

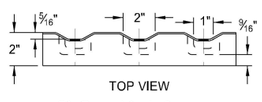



SIDE VIEW

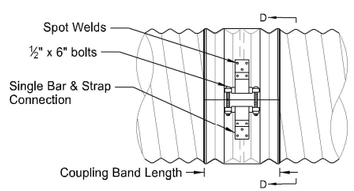



SECTION C-C
Angle Connection

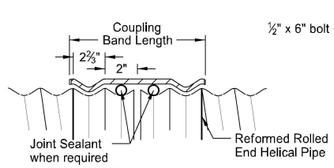
ANNULAR BAND




TOP VIEW
Die-Formed Angle Connector

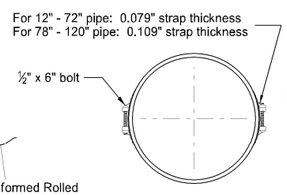



SIDE VIEW

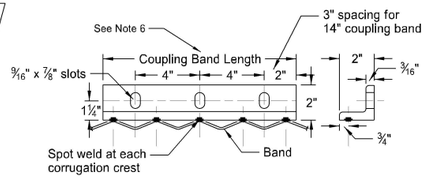



SECTIONAL VIEW

HUGGER COUPLING BAND

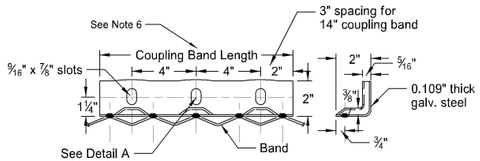



SECTION D-D
Bar & Strap Connection



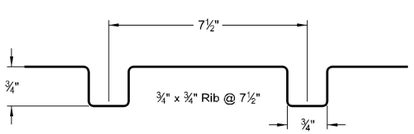

SIDE VIEW END VIEW

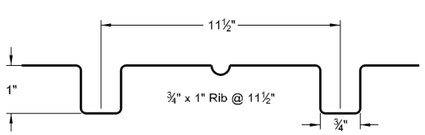
2" x 2" x 3/16" Angle Connector



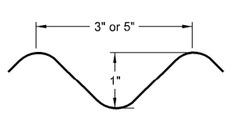

SIDE VIEW END VIEW

Die-Formed Angle Connector

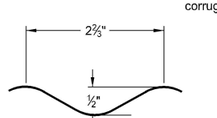


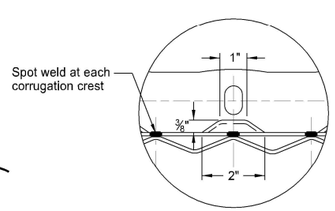

SPIRAL RIB CORRUGATIONS




3" x 1" CORRUGATIONS or
5" x 1" CORRUGATIONS




2⅔" x ½" CORRUGATIONS




Detail A

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

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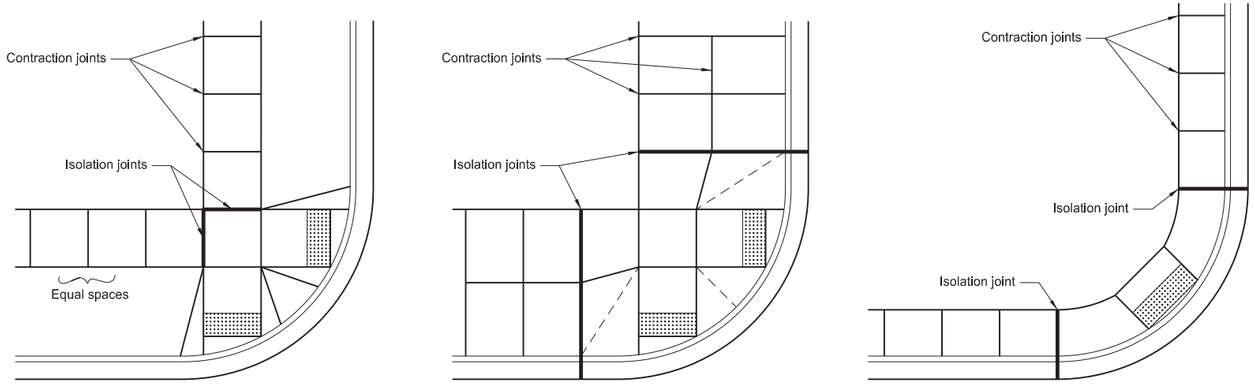
09/23/22

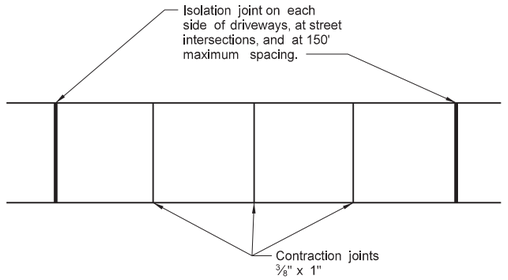
DocuSign

# SIDEWALK

D-750-2




Typical Joint Layouts




NOTES:

1. Curb ramp and detectable warning panel layouts for informational purposes only. See Standard Drawing D-750-3 for curb ramp and detectable warning panel details.
2. Joint Spacing: Vary transverse contraction joint spacing from 4' to 6' to create approximate square panels.

   Use longitudinal contraction joints when sidewalk width is 8' or greater, and space at half the sidewalk width.

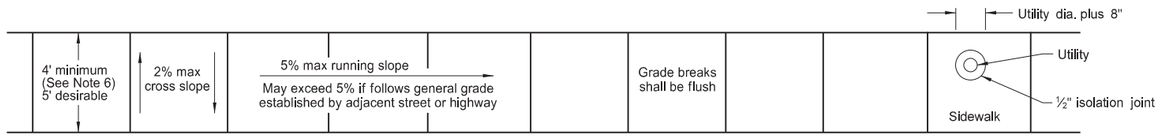
   Saw or groove contraction joints to a minimum depth of 1/3 the depth of the concrete.

   When sidewalk is adjacent to curb & gutter, vary the sidewalk joint spacing to match curb & gutter joints.

   Use isolation joints between separate concrete pours, or between old and new concrete.
3. Include all costs for labor, equipment, and material necessary to construct contraction and isolation joints in the price bid for sidewalk concrete.
4. Use 4" sidewalk concrete thickness unless otherwise specified.
5. Use 4" base material thickness unless otherwise specified. Include all costs for labor and materials necessary to place the base material in the price bid for "Salvage Base Course" or "Aggregate Base Course CL 5."

   Modify existing ground slope with landscaping as needed. If not possible, such as adjacent buildings, use a vertical curb as shown in the detail below. The Engineer will measure curb at the unit price bid for "Curb - Type I" per lineal foot.
6. Sidewalk Width & Grade: Provide a continuous 4' min clear width pedestrian access route with max 2% concrete cross slope, excluding flares. The width of the curb cannot be counted as part of the pedestrian access route.

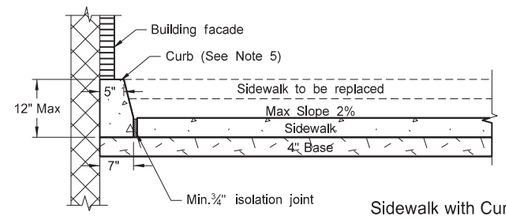
   When clear width of pedestrian access routes is less than 5.0', provide passing spaces at a maximum of 200' with a minimum size of 5.0' by 5.0'.



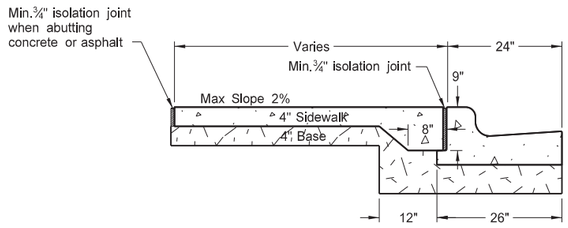

Sidewalk Width and Grade



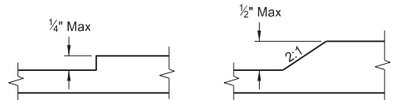

Utility Blockout



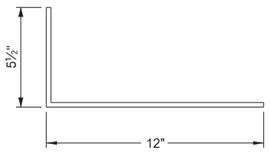

Sidewalk with Curb Detail
(Building face application)



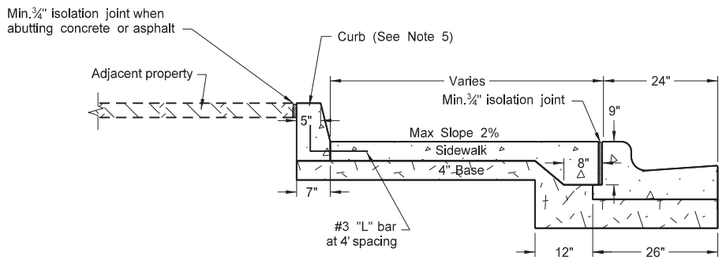

Sidewalk Detail
(Installed adjacent to curb and gutter)



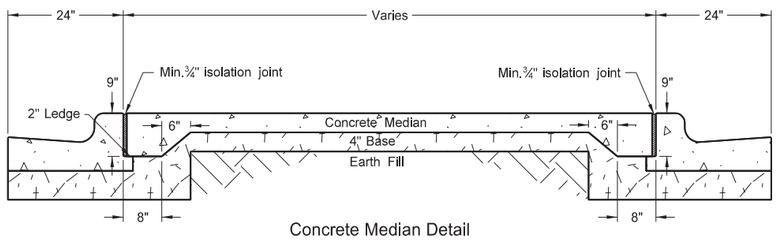

Vertical Discontinuities
(As needed for utility covers, vaults, grating, etc..)



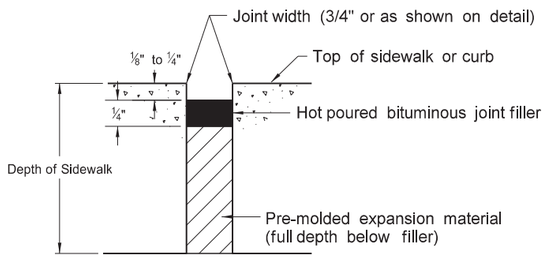

"L"Bar Detail
#3 Bar




Sidewalk with Curb Detail
(Adjacent property application)




Concrete Median Detail




Typical Isolation Joint Seal
(longitudinal and transverse)

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 11-26-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 10-17-17 | Updated to active voice. |
| 09-05-18 | Added sidewalk details for width & grade & passing lane requirements. |
| 08-27-19 | New Design Engineer PE Stamp. |
| 08-09-24 | Electronic Stamp/Signature. |

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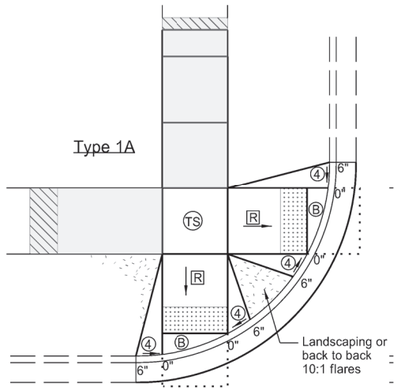
08/09/24

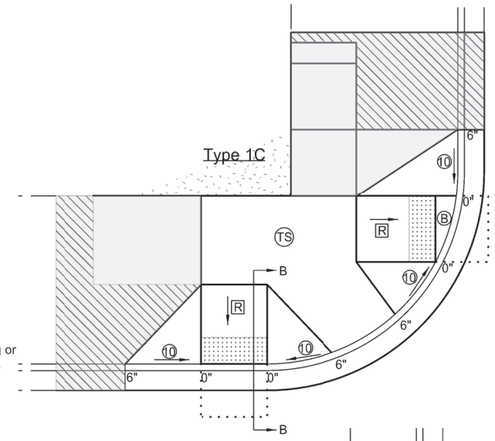
# CURB RAMP RETROFIT DETAILS

D-750-3

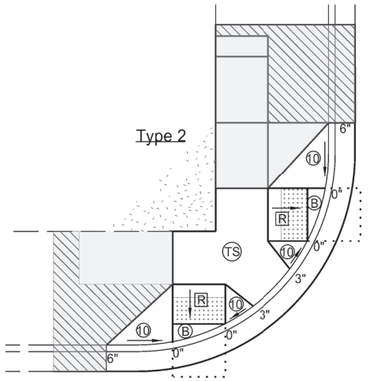
Type 1A



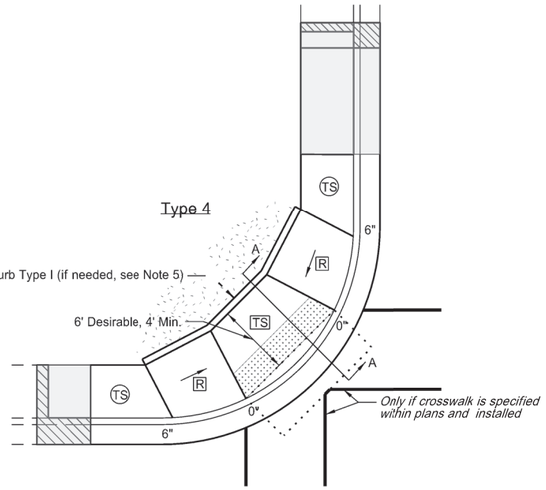

Type 1C



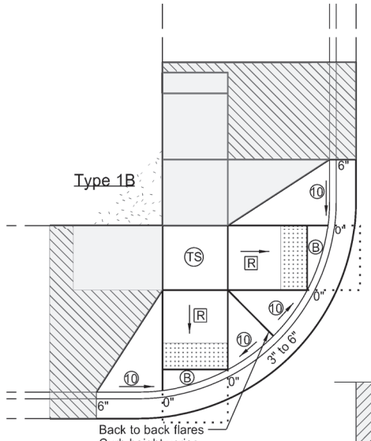

Type 2



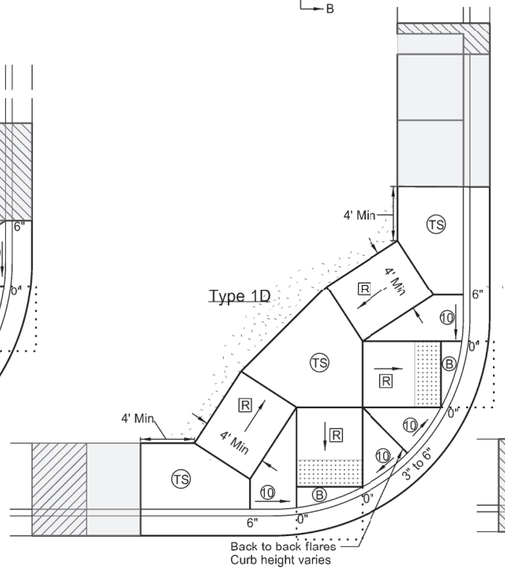

Type 4



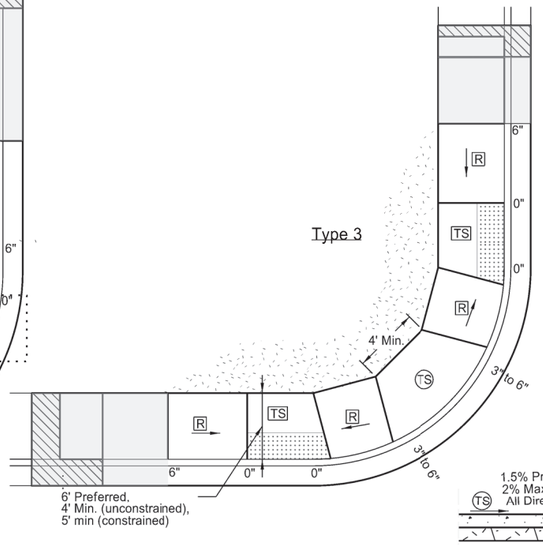

Type 1B




Type 1D




Type 3




5½"
12"
#3 "L" Bar

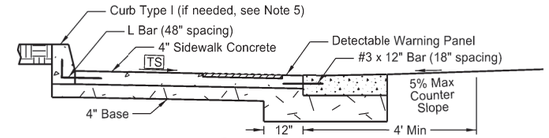
NOTES:

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

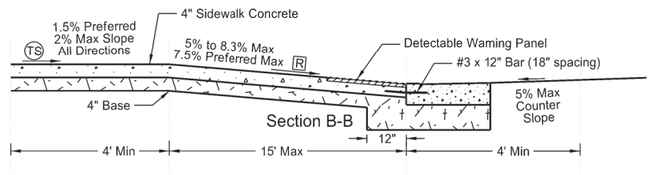
LEGEND:

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

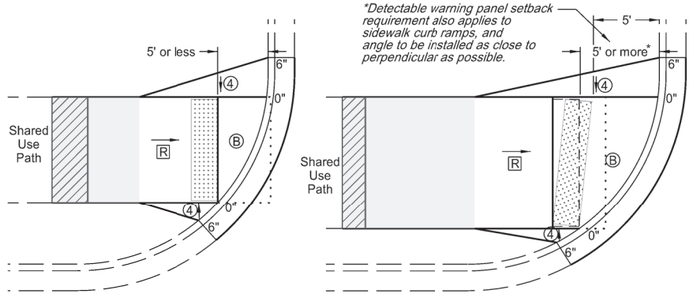
0", 3", or 6" : Curb Height.



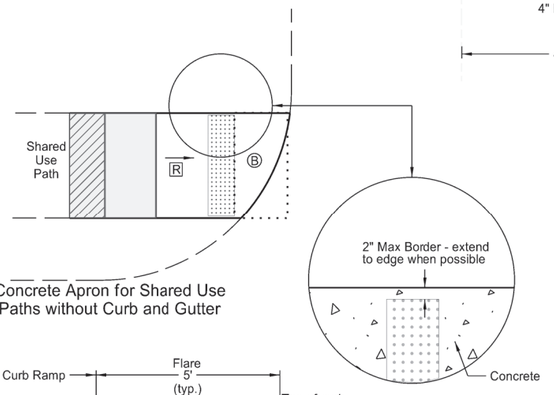

Section A-A




Section B-B

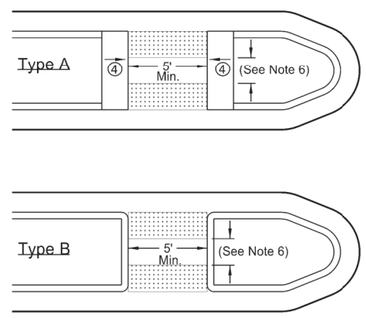


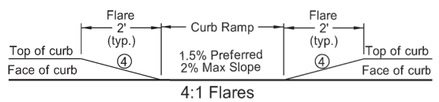

Concrete Apron for Shared Use Paths with Curb and Gutter



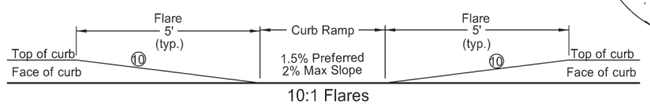

Concrete Apron for Shared Use Paths without Curb and Gutter

Median Refuge Islands (Cut-Through)




4:1 Flares
(To be used when flare is adjacent to landscaping)




10:1 Flares
(To be used when flare is adjacent to sidewalk)

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

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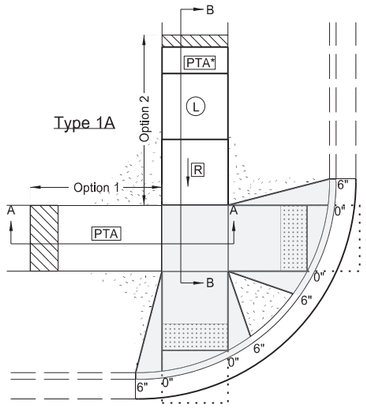
05 19 2021

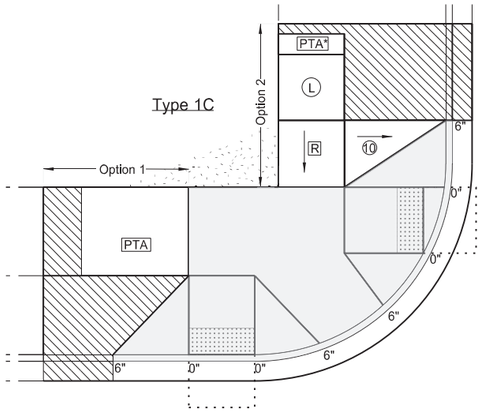
# CURB RAMP RETROFIT TRANSITIONAL AREA DETAILS

D-750-4

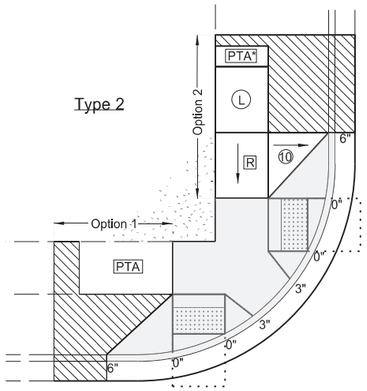
Type 1A



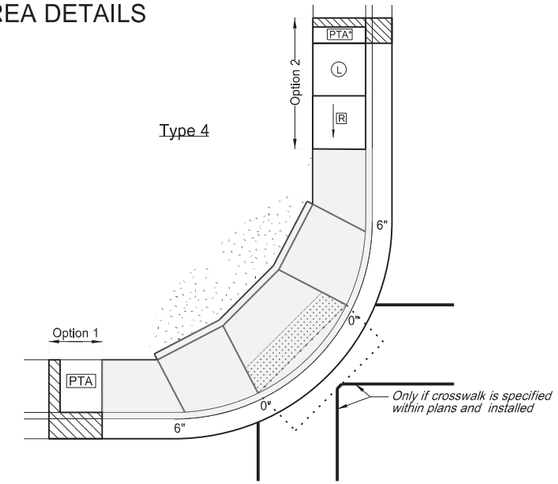

Type 1C



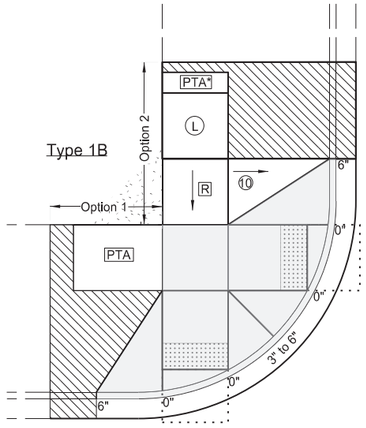

Type 2



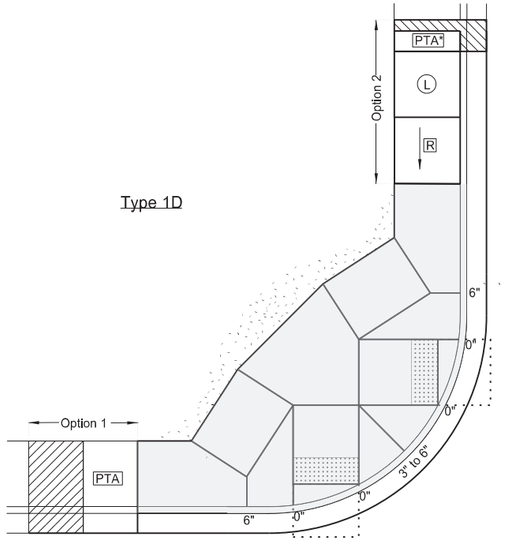

Type 4



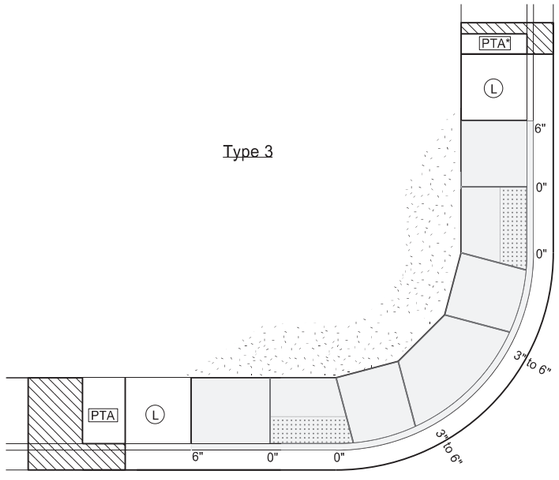

Type 1B

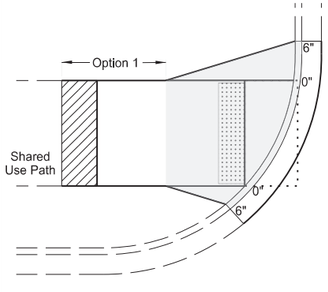


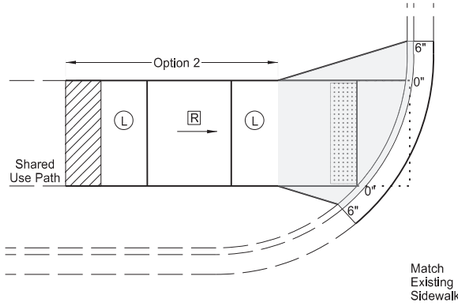

Type 1D



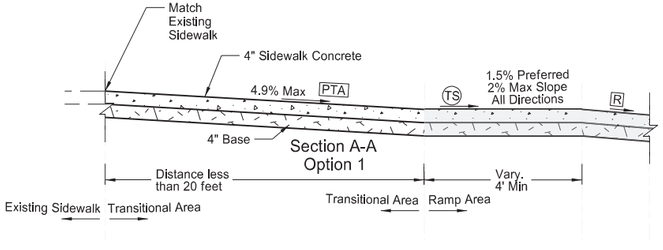

Type 3

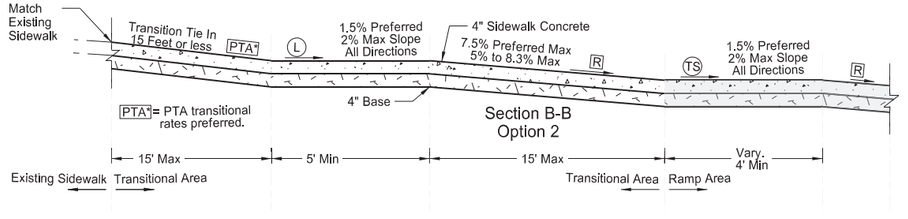



Transition Areas for Shared Use Paths




NOTES:

1. Curb Ramp Transitional Areas are to transition from the Curb Ramp area into the Existing Pedestrian Facility (EPF). Each layout shows example transitions. Use any combination for transitions from the Ramp Area into the EPF that allows for similar or gentler slopes to that of the existing condition, yet transitions in the shortest distance possible. In some cases, if grades allow, the Ramp area can immediately transition into the EPF and no transitional area is needed.
2. Option 1: Use this transition when existing running slope grades are less than 5%. Transition from the ramp area to the EPF using the Pedestrian Access Transition Area (PTA) transition rates and in less than 20 feet.
3. Option 2: Use this transition when existing running slopes are greater than 5% and option 1 is not able to be met.

   Add a ramp and a landing immediately after the ramp area. Then transition from the compliant landing into the EPF using the PTA rates (preferred), or in less than 15 feet (which ever is shorter).
4. Transitional Areas for Shared Use Paths can be concrete or asphalt.
5. See Curb Ramp Retrofit Details Standard D-750-3 for additional information.

LEGEND:

- : Detectable Warning Panel.
- : Landscaping.
- : Transitional tie-in to nearest joint, if needed.
- : Curb Ramp Retrofit Area (See Standard Drawing D750-3)
- : 4' long x width of EPF or 4' minimum Clear space outside traffic lanes of travel. 1.5% preferred cross slope 2% maximum cross slope 4.7% preferred running slope 5% maximum running slope
- PTA : Pedestrian Access Transition Area Running Slope less than 4.9%. Transition Cross Section at 1/2 percent per foot from the from Ramp Area to EPF.
- (L) (TS) : Turning Space/Landing Use at top of ramp or when changing directions. 1.5% preferred slope (2% maximum) all directions.
- R :Preferred Ramp Grade = 5% to 7.5%. Maximum Constructed Grade = 8.3%. Preferred Cross Slope = 1.5%. Maximum Constructed Cross Slope = 2% Maximum Length = 15 feet
- (10) : 10:1 maximum constructed slope.
- (4) : 4:1 maximum constructed slope.

0", 3", or 6" : Curb Height.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 05-19-21 | |
| REVISIONS | |
| DATE | CHANGE |

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ENGINEER
NORTH DAKOTA
05 19 2021

# PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

Notes:

1. Curbed Roadways: Use a 3' clearance from face of the curb except where right of way or sidewalk width is limited; Use a minimum 2' clearance. Increase the horizontal clearance if required to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.

2. Minimum vertical clearance: Provide at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane at the side of the road in rural districts. Provide at least 7' clearance to the bottom of the sign, where parking or pedestrian movements occur.

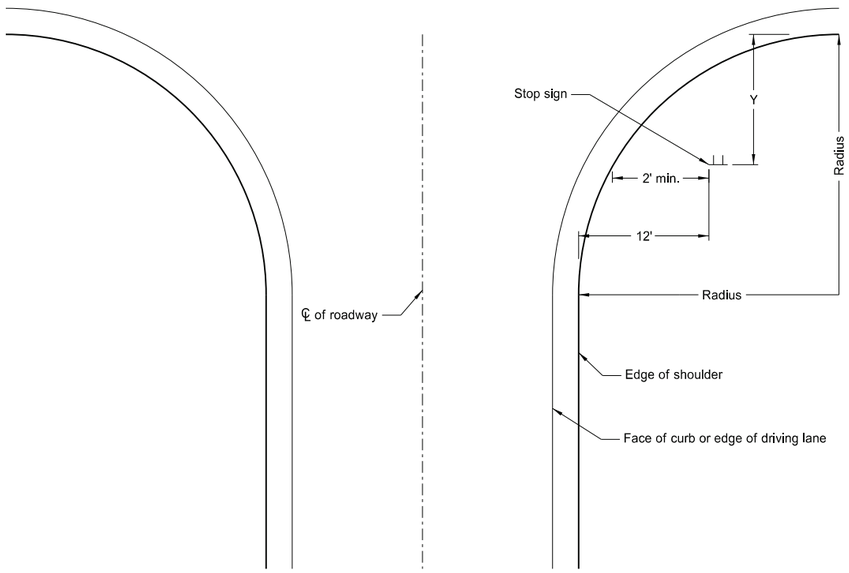
   Install signs on expressways a minimum height of 7'.

   Install adopt-a-highway signs on Freeways at least 7' above the edge of the driving lane.

   Maximum vertical clearance is 6" greater than the minimum vertical clearance.

3. Offset signs: Use a vertical clearance of 5' above the edge of the driving lane for signs placed 30 feet or more from the edge of the traveled way.

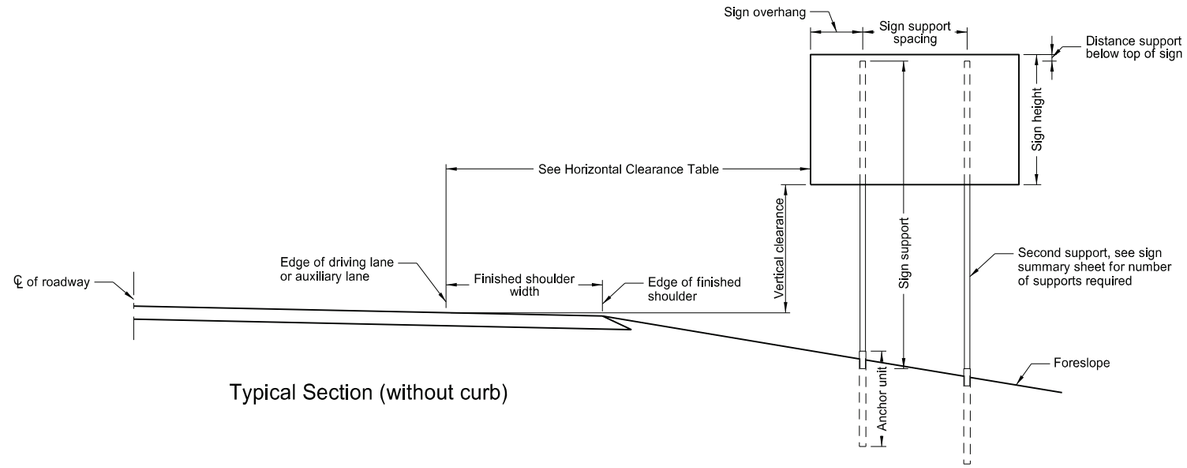
4. Provide a horizontal clearance from edge of shared use path to edge of sign of 3', except where width is limited. Provide a minimum clearance of 2'.




Stop Sign Location
Wide Throat Intersection

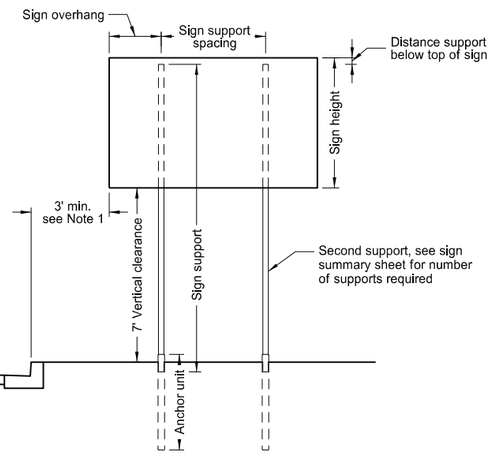
Use layout for the placement of "Stop" signs.

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



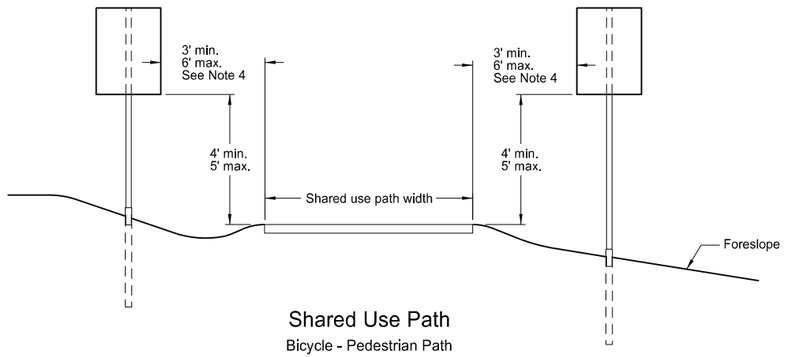

Typical Section (without curb)

| 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




Shared Use Path

Bicycle - Pedestrian Path

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 10-3-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 7-8-14 | Revised note 2, added note 4. |
| 8-30-18 | Updated notes to active voice. |
| 8-29-19 | New Design Engineer PE Stamp. |
| 8-05-24 | Electronic Stamp/Signature. |

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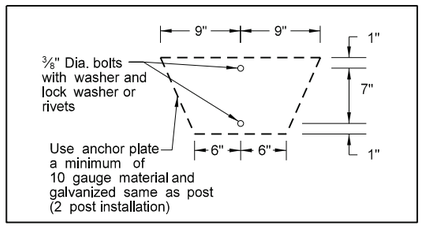
08/05/24

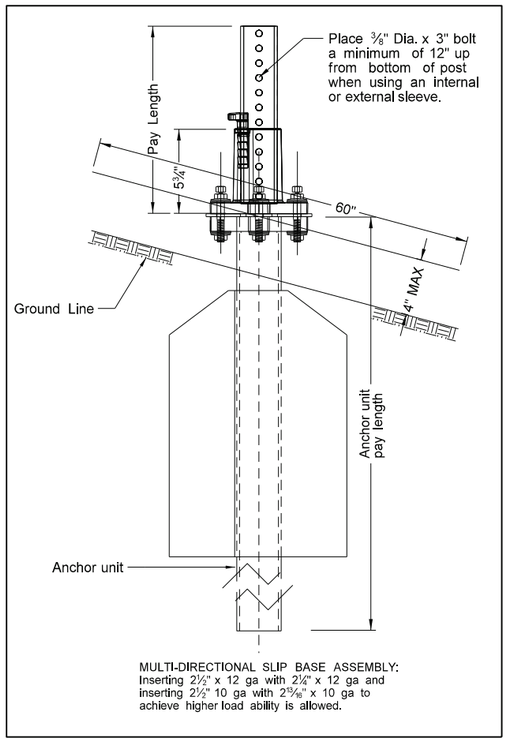
# Mounting Details Perforated Tube

D-754-24

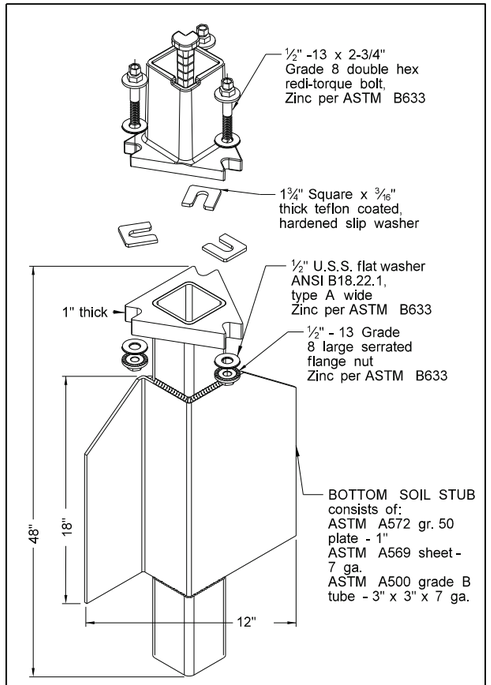
| Number of Posts | Telescoping Perforated Tube: Post Size In. | Wall Thick-ness Gauge | Sleeve Size In. | Wall Thick-ness Gauge | Slip Base | Anchor Size Without Slip Base In. | Anchor Wall Thick-ness Gauge |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 12 | | | No | 2¼ | 12 |
| 1 | 2¼ | 12 | | | No | 2½ | 12 |
| 1 | 2½ | 12 | | | (B) | 3(C) | 7 |
| 1 | 2½ | 10 | | | Yes | | 7 |
| 1 | 2¼ | 12 | 2½(D) | 12 | Yes | | 7 |
| 1 | 2½ | 12 | 2¼ | 12 | Yes | | 7 |
| 2 | 2½ | 10 | | | Yes | | 7 |
| 2 | 2¼ | 12 | 2½(D) | 12 | Yes | | 7 |
| 2 | 2½ | 12 | 2¼ | 12 | Yes | | 7 |
| 3 & 4 | 2½ | 12 | | | Yes | | 7 |
| 3 & 4 | 2½ | 10 | | | Yes | | 7 |
| 3 & 4 | 2½ | 12 | 2¼ | 12 | Yes | | 7 |
| 3 & 4 | 2¼ | 12 | 2½(D) | 12 | Yes | | 7 |
| 3 & 4 | 2½ | 10 | 2⅜16 | 10 | Yes | | 7 |

(B) - Provide a shim as specified by the manufacturer when placing 2½", 12 gauge posts in standard soils without breakaway bases. Provide breakaway base when placing the support in weak soils. The Engineer will determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2½" x 12 ga. x 18" minimum length external sleeve required.

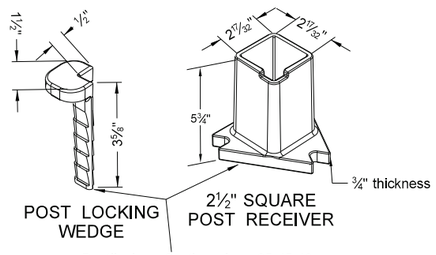


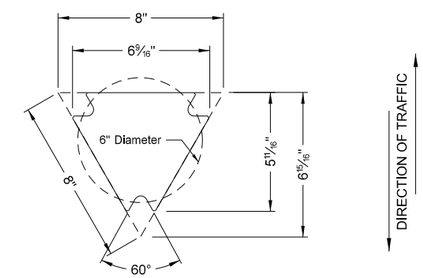




MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:
Inserting 2½" x 12 ga with 2¼" x 12 ga and inserting 2½" 10 ga with 2¹⁵⁄₁₆" x 10 ga to achieve higher load ability is allowed.




SLIP BASE FOR 2½" POST



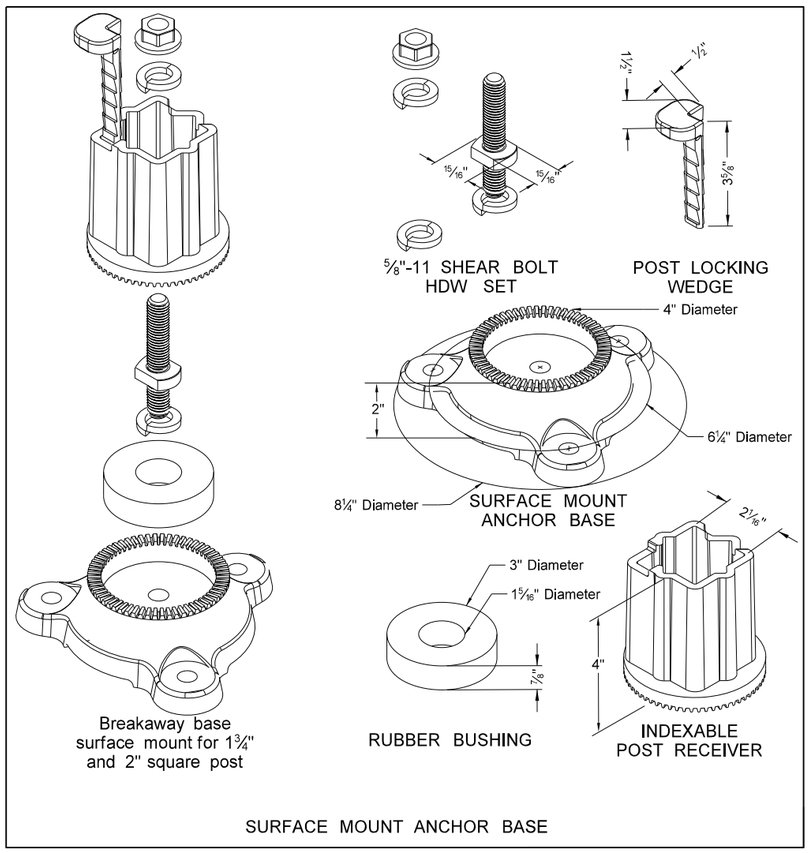

SLIP BASE DETAIL

| Properties of Telescoping Perforated Tubes: Tube Size In. | Wall Thickness in. | U.S. Standard Gauge | Weight Per Foot Lbs. | Moment of Inertia In.⁴ | Cross Sect. Area In.² | Section Modulud In.³ |
|---|---|---|---|---|---|---|
| 1½ x 1½ | 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 |
| 2¼ x 2¼ | 0.105 | 12 | 2.773 | 0.561 | 0.695 | 0.499 |
| 2⅜16 x 2⅜16 | 0.135 | 10 | 3.432 | 0.605 | 0.841 | 0.590 |
| 2½ x 2½ | 0.105 | 12 | 3.141 | 0.804 | 0.803 | 0.643 |
| 2½ x 2½ | 0.135 | 10 | 4.006 | 0.979 | 1.010 | 0.783 |

The 2 3⁄16" size 10 gauge is shown as 2.19" size on the plans; The 2½" size is shown as 2.51" size on the plans.

NOTE:

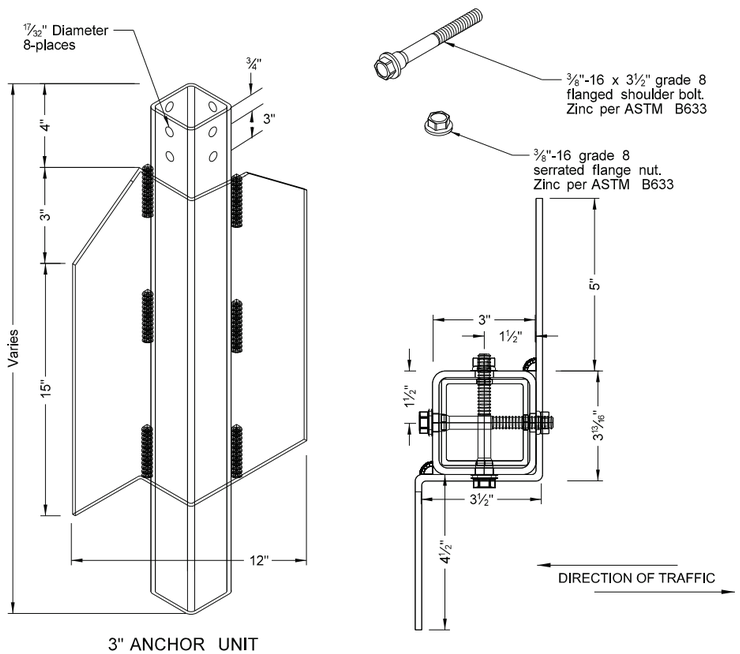
1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.
2. Provide 7 guage HRPO commmercial quality ASTM A569 and 3" x 3" x 7" guage ASTM A500 grade B anchor material with 43.9 KSI yield strength and 59.3 KSI tensile strength. Hot dip galvanize anchor per ASTM A123/153. Tolerances on anchor unit and slip base bottom assembly are +/- 0.005" unless otherwise noted.
3. Eliminate wings when anchor is used in concrete sidewalk.
4. Provide a minimum 8' distance between the first and fourth post on four post signs.
5. Install in accordance with manufacturers recommendation.
6. Use a minimum ½" diameter x 4" grade 8 concrete fastener for surface mount breakaway base.




SURFACE MOUNT ANCHOR BASE

## SHOULDER BOLT

Shimming agent to reduce tolerance between 3" anchor unit and 2½" post.
(use standard ⅜" diameter grade 8 bolt with proper shim)




3" ANCHOR UNIT

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 8-6-09 | |
| REVISIONS | |
| DATE | CHANGE |
| 8-30-18 | Updated notes to active voice & corrected max height of base. |
| 8-29-19 | New Design Engineer PE Stamp. |
| 8-05-24 | Electronic Stamp/Signature. |

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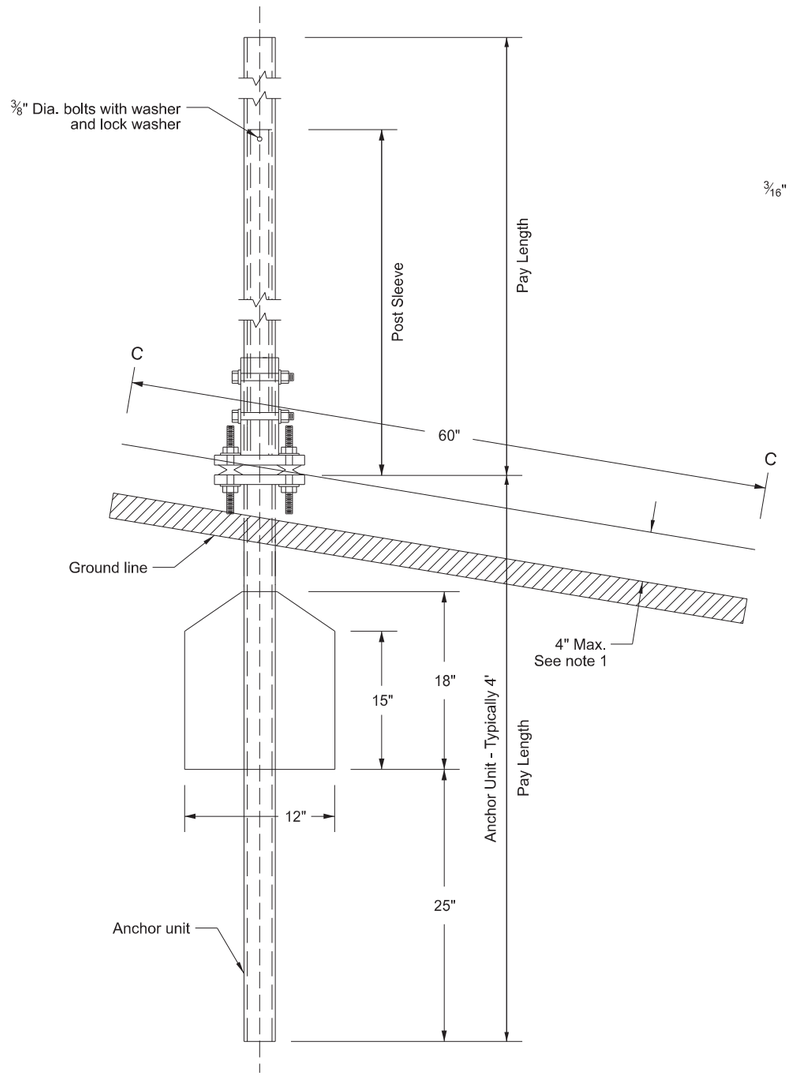
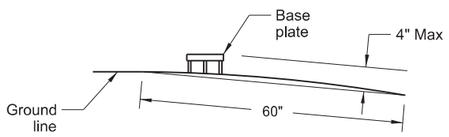
08/05/24

# D-754-24A

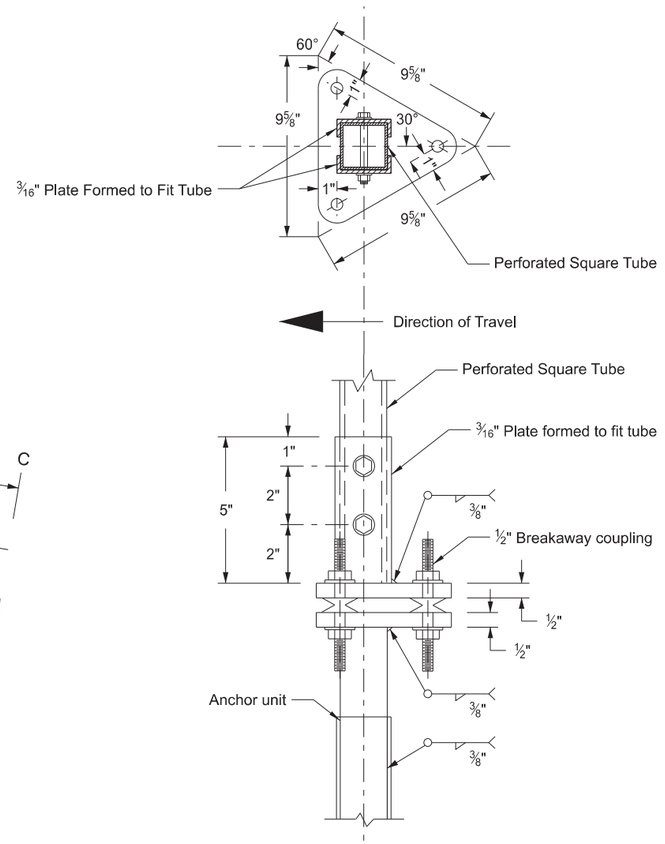


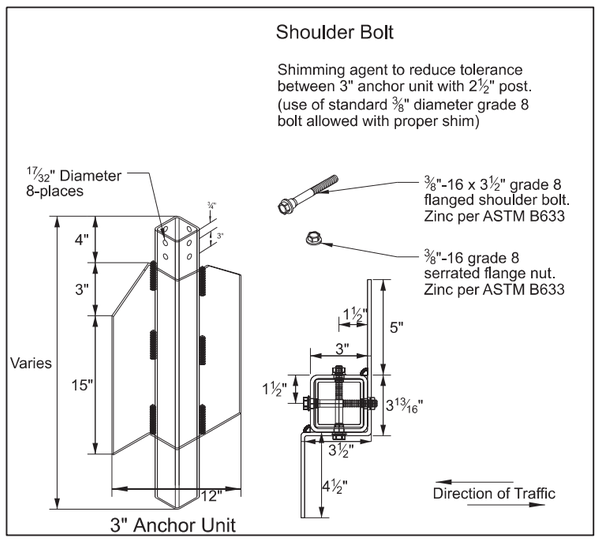

Section C-C

Max projection 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.

## Breakaway Coupler System for Perforated Tubes




Base Plate with Breakaway Coupler




3" Anchor Unit

Notes:

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

| Number of Posts | Telescoping Perforated Tube | | | | | | |
|---|---|---|---|---|---|---|---|
| | Post Size In. | Wall Thick-ness Gauge | Sleeve Size In. | Wall Thick-ness Gauge | Slip Base | Anchor Size Without Slip Base In. | Anchor Wall Thickness Guage |
| 1 | 2 | 12 | | | No | 2¼ | 12 |
| 1 | 2¼ | 12 | | | No | 2½ | 12 |
| 1 | 2½ | 12 | | | (B) | 3(C) | 7 |
| 1 | 2½ | 10 | | | Yes | | 7 |
| 1 | 2¼ | 12 | 2 | 12 | Yes | | 7 |
| 1 | 2½ | 12 | 2¼ | 12 | Yes | | 7 |
| 2 | 2½ | 10 | | | Yes | | 7 |
| 2 | 2¼ | 12 | 2 | 12 | Yes | | 7 |
| 2 | 2½ | 12 | 2¼ | 12 | Yes | | 7 |
| 3 & 4 | 2½ | 12 | | | Yes | | 7 |
| 3 & 4 | 2½ | 10 | | | Yes | | 7 |
| 3 & 4 | 2½ | 12 | 2¼ | 12 | Yes | | 7 |
| 3 & 4 | 2¼ | 12 | 2 | 12 | Yes | | 7 |
| 3 & 4 | 2½ | 10 | 2 3/16 | 10 | Yes | | 7 |

(B) - 2½" 12 gauge posts do not need breakaway bases unless support is placed in boggy, wet, or loose soil areas.

(C) - 3" anchor unit

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-3-2013

REVISIONS

| DATE | CHANGE |
|---|---|
| 08-30-18 | Updated notes to active voice. |
| 08-30-19 | New Design Engr PE Stamp. |
| 08-05-24 | Electronic Stamp/Signature. |
| 07-22-25 | Corrected "typo" in C-C note. |

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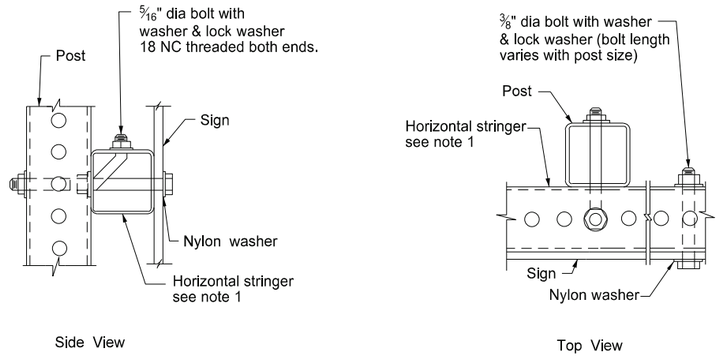
07/22/25

# Mounting Details Perforated Tube

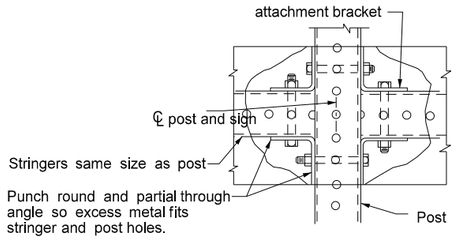
D-754-25




Side View

Top View

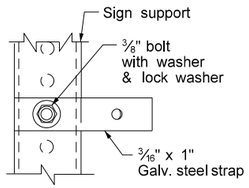
STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)



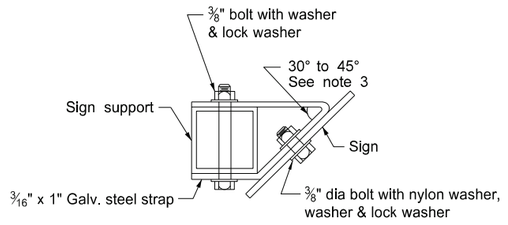

STREET NAME SIGNS AND ONE WAY SIGNS
SINGLE POST ASSEMBLY
ONE STRINGER OR BACK TO BACK MOUNTING

Note:

1. Horizontal stringers - Use perforated tubes or 1¾" x 3/16" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel z bar stringers.
2. Use minimum outside diameter 15/16" ±1/16" and 10 gauge thick metal washers on sign face.
3. Place No Parking signs with directional arrows at a 30 to 45 degree angle with the line of traffic flow. Turning the support to the correct angle for No Parking signs requiring the above angles is allowed. If the No Parking sign is placed with another sign that requires placement at a 90 degree angle with the line of traffic flow, use the detailed angle strap to mount the No Parking sign. Use flat washers and lock washers with all nylon washers.
4. Punching the sign backing and placing the bolt through the sign, the stringer and the post is allowed in lieu of using the bent bolt to attach the post to the stringer.
5. 4" vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.

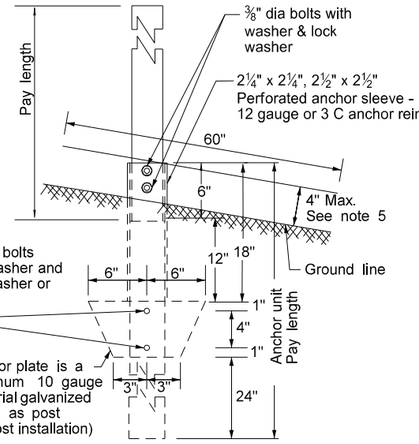



Side View




Top View

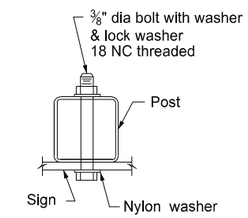
STRAP DETAIL



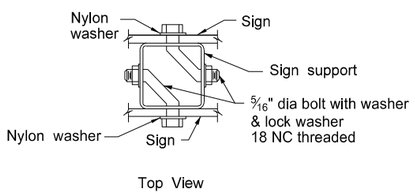

ANCHOR UNIT AND POST ASSEMBLY

| Number of Posts | Telescoping Perforated Tube | | | | | | |
|---|---|---|---|---|---|---|---|
| | Post Size In. | Wall Thick-ness Gauge | Sleeve Size In. | Wall Thick-ness Gauge | Slip Base | Anchor Size Without Slip Base In. | Anchor Wall Thick-ness Gauge |
| 1 | 2 | 12 | | | No | 2¼ | 12 |
| 1 | 2¼ | 12 | | | No | 2½ | 12 |
| 1 | 2½ | 12 | | | (B) | 3(C) | 7 |
| 1 | 2½ | 10 | | | Yes | | 7 |
| 1 | 2¼ | 12 | 2½(D) | 12 | Yes | | 7 |
| 1 | 2½ | 12 | 2¼ | 12 | Yes | | 7 |
| 2 | 2½ | 10 | | | Yes | | 7 |
| 2 | 2¼ | 12 | 2½(D) | 12 | Yes | | 7 |
| 2 | 2½ | 12 | 2¼ | 12 | Yes | | 7 |
| 3 & 4 | 2½ | 12 | | | Yes | | 7 |
| 3 & 4 | 2½ | 10 | | | Yes | | 7 |
| 3 & 4 | 2½ | 12 | 2¼ | 12 | Yes | | 7 |
| 3 & 4 | 2¼ | 12 | 2½(D) | 12 | Yes | | 7 |
| 3 & 4 | 2½ | 10 | 2 3/16 | 10 | Yes | | 7 |

(B) - When placing 2½", 12 gauge posts in standard soils without breakaway bases, provide a shim as specified by the manufacturer. Provide breakaway base when placing the support in weak soils. Engineer will determine if soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2½" x 12 ga. x 18" minimum length external sleeve required.

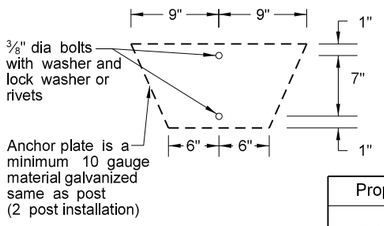



BOLT MOUNTING




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 $In.^3$ |
| 1½ x 1½ | 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 |
| 2¼ x 2¼ | 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 |
| 2½ x 2½ | 0.105 | 12 | 3.141 | 0.804 | 0.803 | 0.643 |
| 2½ x 2½ | 0.135 | 10 | 4.006 | 0.979 | 1.010 | 0.783 |

The 2 3/16" size 10 gauge is shown as 2.19" size on the plans.
The 2½" size is shown as 2.51" size on the plans.

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

8-6-09

REVISIONS

| DATE | CHANGE |
|---|---|
| 7-8-14 | Revised Note 3. |
| 8-30-18 | Updated notes to active voice. |
| 8-30-19 | New Design Engr PE Stamp. |
| 8-05-24 | Electronic Stamp/Signature. |

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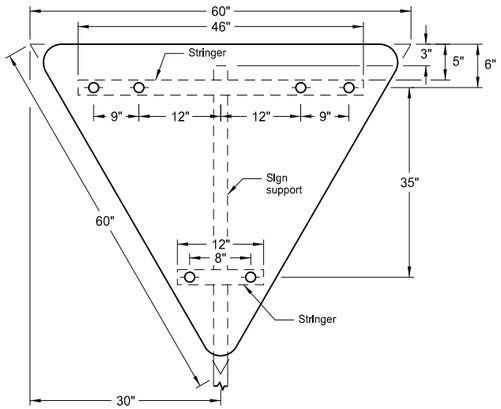
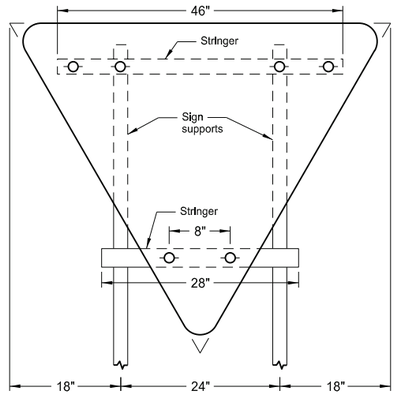
08/05/24

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

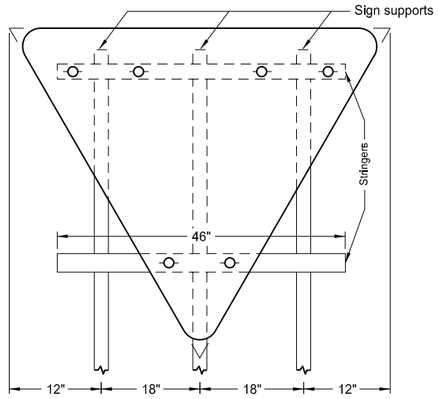
D-754-27




1 Post




2 Posts

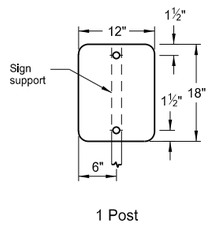



3 Posts

Assembly No. 6

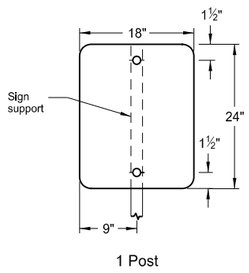
Notes:

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




1 Post

Assembly No. 7




1 Post

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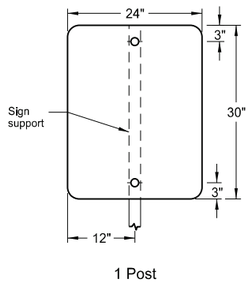


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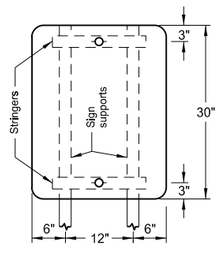
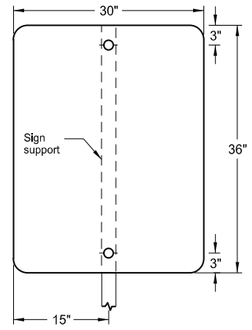
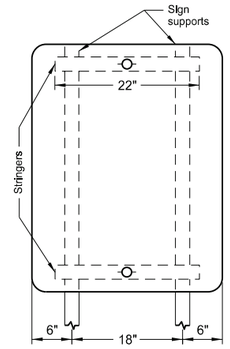



2 Posts

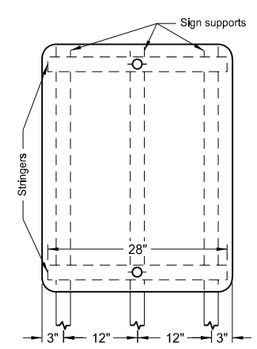
Assembly No. 9




1 Post

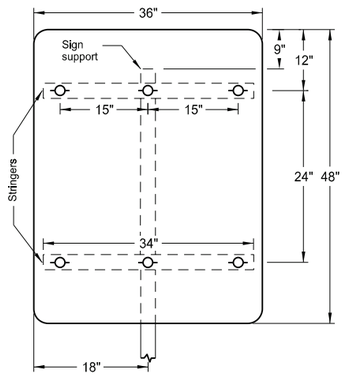



2 Posts

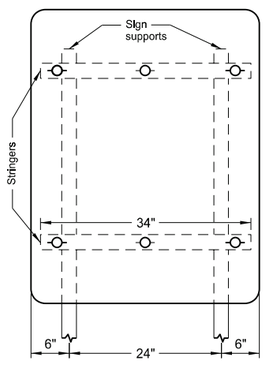



3 Posts

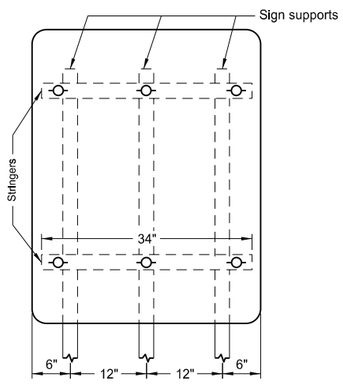
Assembly No. 10




1 Post




2 Posts




3 Posts

Assembly No. 11

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 12-1-10 | |
| REVISIONS | |
| DATE | CHANGE |
| 8-30-18 | Updated notes to active voice. |
| 8-30-19 | New Design Engineer PE Stamp. |
| 8-06-24 | Electronic Stamp/Signature. |

KIRK J. HOFF
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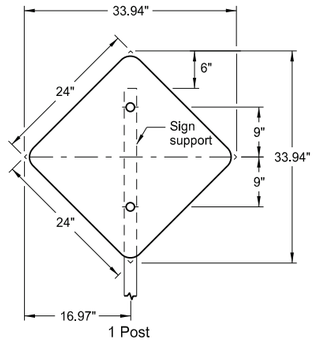
ENGINEER
NORTH DAKOTA

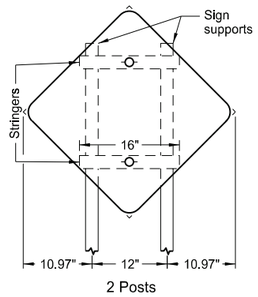
08/06/24

D-754-29

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

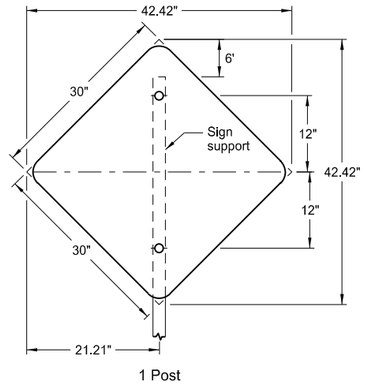



1 Post

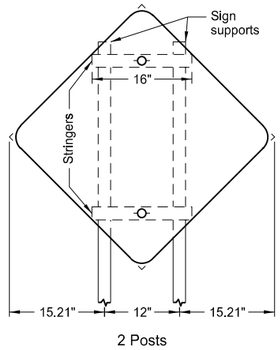



2 Posts

Assembly No. 18

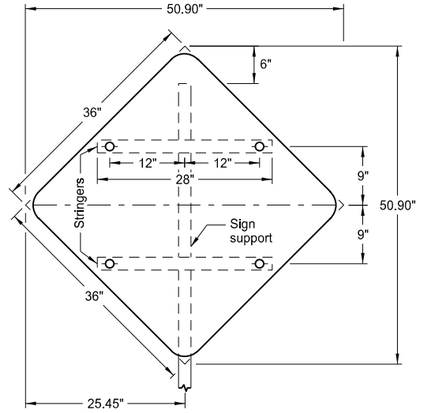



1 Post




2 Posts

Assembly No. 19

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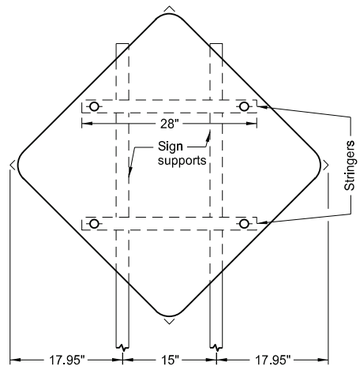
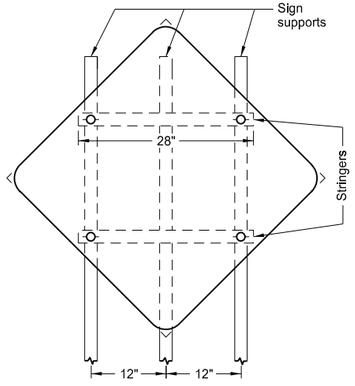
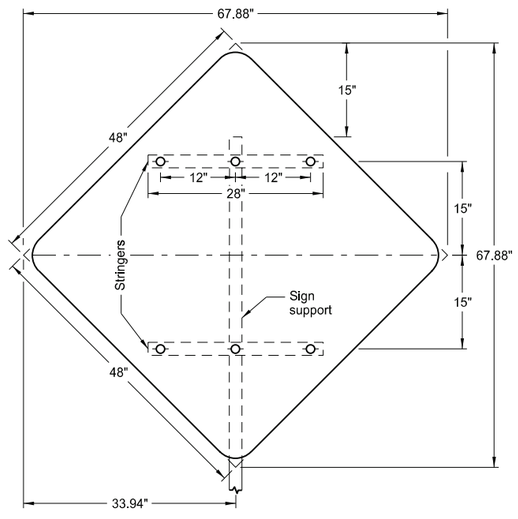



2 Posts

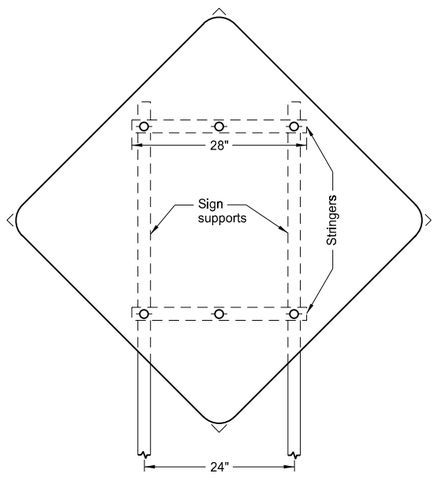



3 Posts

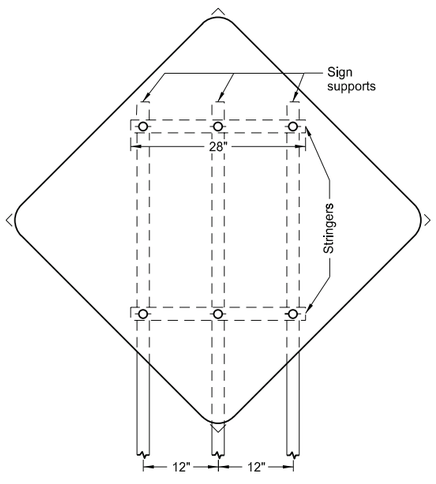
Assembly No. 20




1 Post




2 Posts




3 Posts

Assembly No. 21

Notes:

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

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 12-1-10 | |
| REVISIONS | |
| DATE | CHANGE |
| 8-30-18 | Updated notes to active voice. |
| 8-30-19 | New Design Engineer PE Stamp. |
| 8-06-24 | Electronic Stamp/Signature. |

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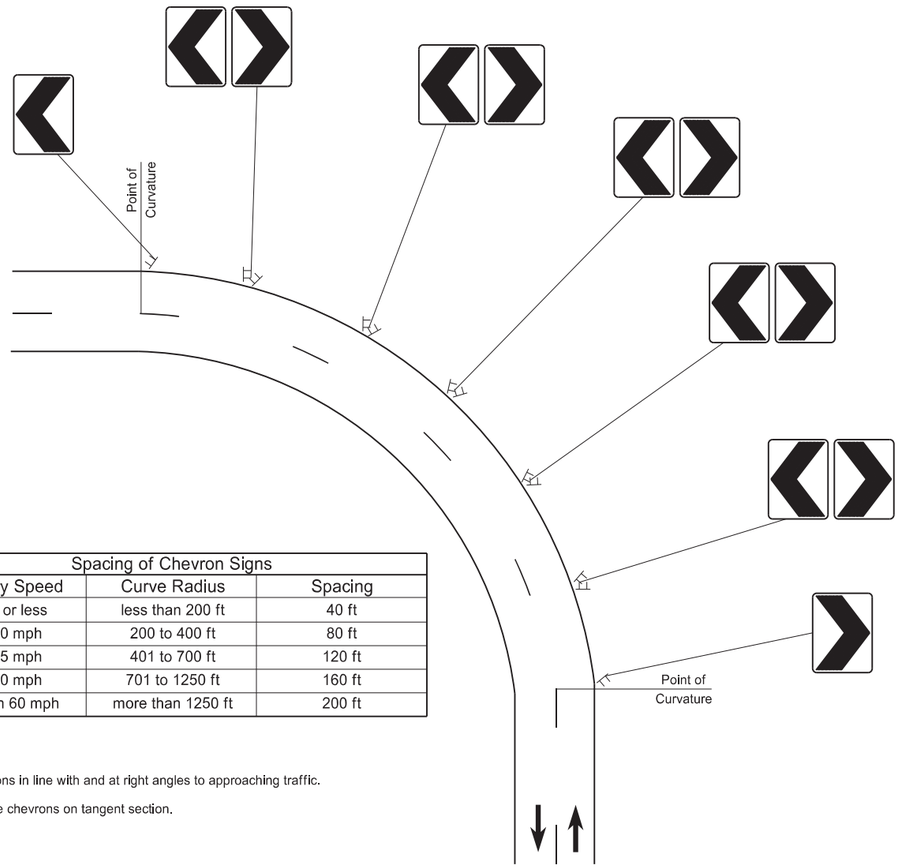
ENGINEER
NORTH DAKOTA

08/06/24

# CHEVRON INSTALLATION DETAILS

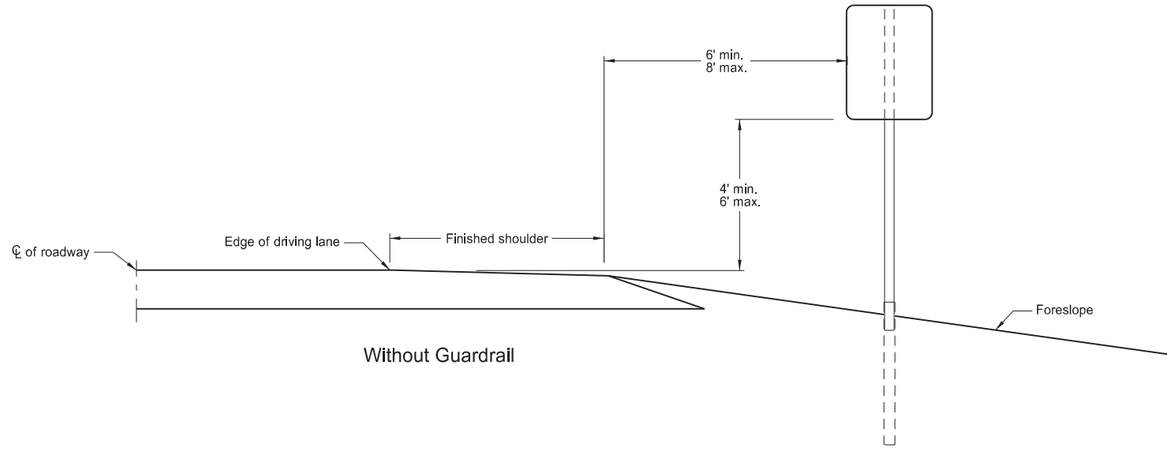
D-754-79



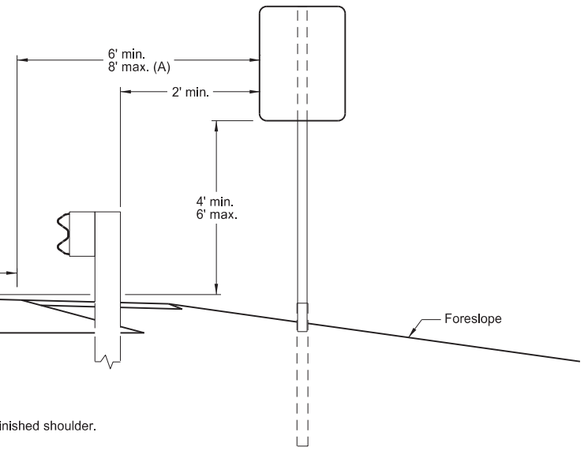

| Spacing of Chevron Signs | | |
|---|---|---|
| Advisory Speed | Curve Radius | Spacing |
| 15 mph or less | less than 200 ft | 40 ft |
| 20 to 30 mph | 200 to 400 ft | 80 ft |
| 35 to 45 mph | 401 to 700 ft | 120 ft |
| 50 to 60 mph | 701 to 1250 ft | 160 ft |
| more than 60 mph | more than 1250 ft | 200 ft |

Notes:

1. Align chevrons in line with and at right angles to approaching traffic.
2. Do not place chevrons on tangent section.

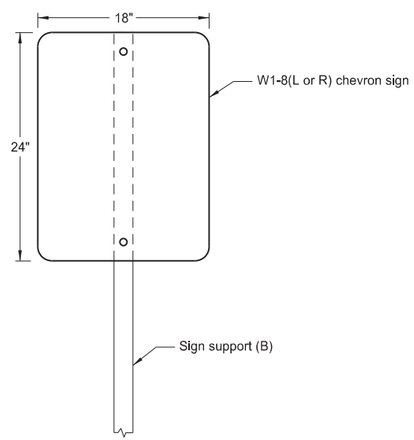



Without Guardrail



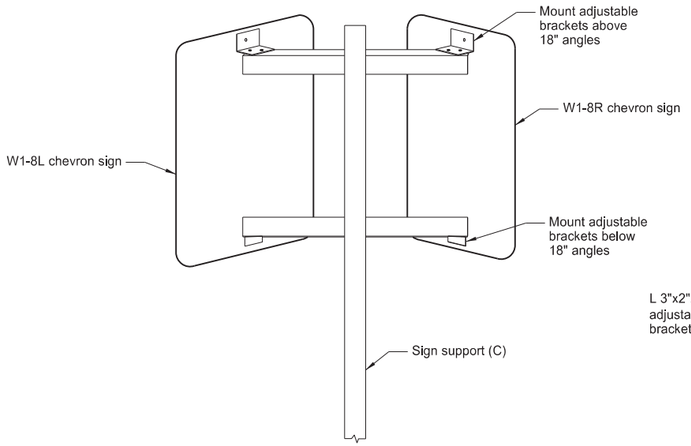

With Guardrail

(A) May exceed 8 feet when guardrail is more than 6 feet from finished shoulder.



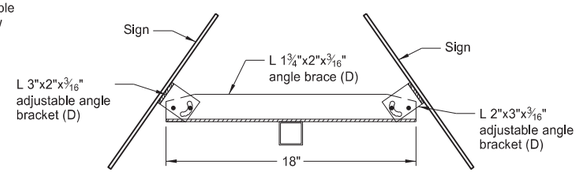

Chevron Single Sign Assembly

(B) Use 2x2x12ga. perforated tube single sign support and 2.25x2.25x12ga. perforated tube anchor unit.




Chevron Double Sign Assembly

(C) Use 2.25x2.25x12ga. perforated tube double sign support and 2.5x2.5x12ga. perforated tube anchor unit.




Top View

(D) Use aluminum or steel angles. Sizes are minimums, use larger sizes only when approved by the Engineer.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 10-10-13 | |
| REVISIONS | |
| DATE | CHANGE |
| 8-30-18 | Updated notes to active voice. |
| 9-05-19 | New Design Engineer PE Stamp. |
| 8-08-24 | Electronic Stamp/Signature. |

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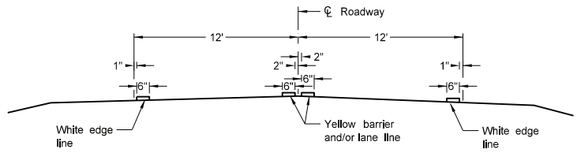
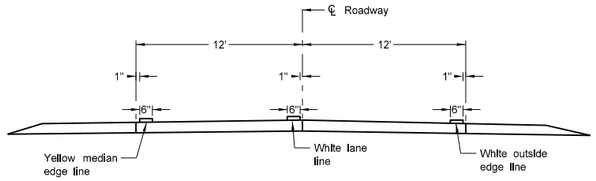
08/08/24

# PAVEMENT MARKING

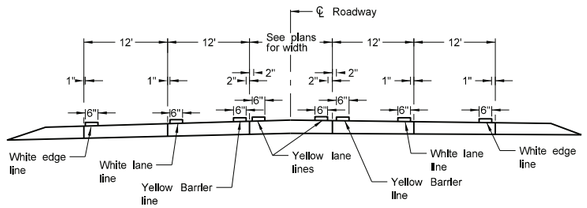
D-762-4



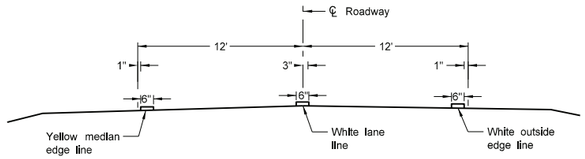

Two Lane Two Way
RURAL ROADWAY



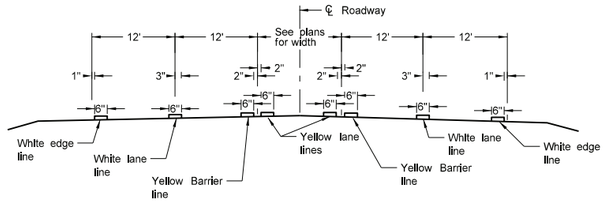

Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



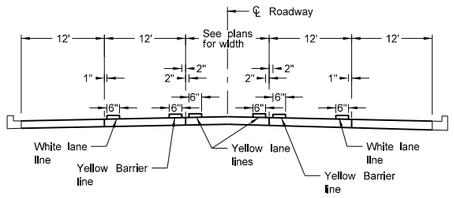

RURAL FIVE LANE ROADWAY
Concrete Section



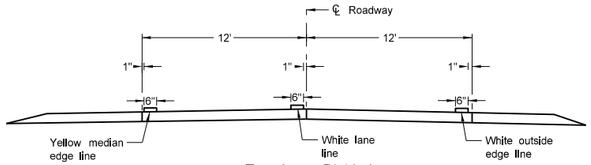

Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphat Section



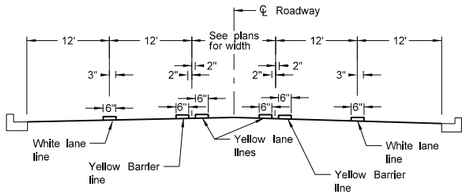

RURAL FIVE LANE ROADWAY
Asphalt Section



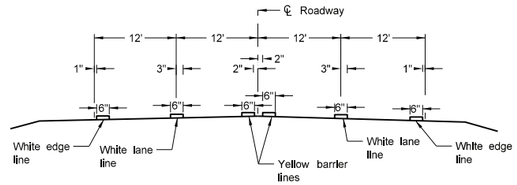

URBAN FIVE LANE SECTION
Concrete Section



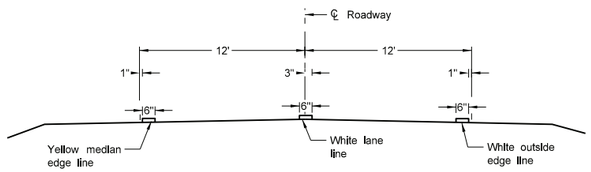

Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Concrete Section



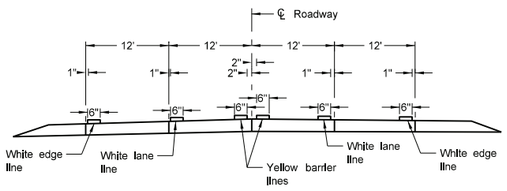

URBAN FIVE LANE SECTION
Asphalt Section



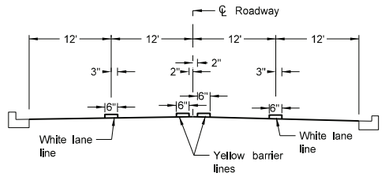

RURAL FOUR LANE ROADWAY
Asphalt Section



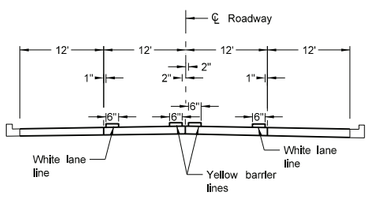

Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



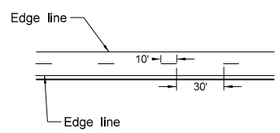

RURAL FOUR LANE ROADWAY
Concrete Section




URBAN FOUR LANE SECTION
Asphalt Section




URBAN FOUR LANE SECTION
Concrete Section




CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

NOTES:

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

   For section lines, county roads, and street approaches, stripe the radii and edge lines of the paved surface within the right of way except where curb and gutter is present.

2. Normal width line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph.

3. Use 4 or 6 inch wide pavement marking for all other roadways with speed limits < 40 mph.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 12-1-10 | |
| REVISIONS | |
| DATE | CHANGE |
| 10-17-17 | Updated to active voice. |
| 08-27-19 | New Design Engineer PE Stamp. |
| 11-22-23 | Revised pavement marking widths. |
| 07-09-24 | Modified Note 1. |

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07/09/24
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