

NDDOT ABBREVIATIONS

|        |                            |                  |                                     |          |                          |            |                                |
|--------|----------------------------|------------------|-------------------------------------|----------|--------------------------|------------|--------------------------------|
| Abn    | abandoned                  | BV               | butterfly valve                     | Co       | County                   | EL         | electric locker                |
| Abut   | abutment                   | Byp              | bypass                              | Crse     | course                   | E Mtr      | electric meter                 |
| Ac     | acres                      | C Gdrl           | cable guardrail                     | C Gr     | course gravel            | Elec       | electric/al                    |
| Adj    | adjusted                   | Calc             | calculate                           | CS       | course sand              | EDM        | electronic distance meter      |
| Aggr   | aggregate                  | Cd               | candela                             | Ct       | Court                    | Elev or El | elevation                      |
| Ahd    | ahead                      | CIP              | cast iron pipe                      | Xarm     | cross arm                | Ellipt     | elliptical                     |
| ARV    | air release valve          | CB               | catch basin                         | Xbuck    | cross buck               | Emb        | embankment                     |
| Align  | alignment                  | CRS              | cationic rapid setting              | Xsec     | cross sections           | Emuls      | emulsion/emulsified            |
| Al     | alley                      | C Gd             | cattle guard                        | Xing     | crossing                 | ES         | end section                    |
| Alt    | alternate                  | C To C           | center to center                    | Xrd      | Crossroad                | Engr       | engineer                       |
| Alum   | aluminum                   | Cl or $\text{C}$ | centerline                          | Crn      | crown                    | ESS        | Environmental Sensor Station   |
| A      | ampere                     | Cm               | centimeter                          | CF       | cubic feet               | Eq         | equal                          |
| &      | and                        | Ch               | chain                               | M3       | cubic meter              | Eq         | equation                       |
| Appr   | approach                   | Chnlk            | chain-link                          | M3/s     | cubic meters per second  | Evgr       | evergreen                      |
| Approx | approximate                | Ch Blk           | channel block                       | CY       | cubic yard               | Exc        | excavation                     |
| ACP    | asbestos cement pipe       | Ch Ch            | channel change                      | Cy/mi    | cubic yards per mile     | Exst       | existing                       |
| Asph   | asphalt                    | Chk              | check                               | Culv     | culvert                  | Exp        | expansion                      |
| AC     | asphalt cement             | Chsld            | chiseled                            | C&G      | curb & gutter            | Expy       | Expressway                     |
| Assmd  | assumed                    | Cir              | circle                              | CI       | curb inlet               | E          | external of curve              |
| @      | at                         | Cl               | class                               | CR       | curb ramp                | Extru      | extruded                       |
| Atten  | attenuation                | Cl               | clay                                | CS       | curve to spiral          | FOS        | factor of safety               |
| ATR    | Automatic Traffic Recorder | Cl F             | clay fill                           | C        | cut                      | F          | Fahrenheit                     |
| Ave    | Avenue                     | Cl Hvy           | clay heavy                          | Dd Ld    | dead load                | FS         | far side                       |
| Avg    | average                    | Cl Lm            | clay loam                           | Defl     | deflection               | F          | farad                          |
| ADT    | average daily traffic      | Clnt             | clean-out                           | Defm     | deformed                 | Fed        | Federal                        |
| Az     | azimuth                    | Clr              | clear                               | Deg or D | degree                   | FHWA       | Federal Highway Administration |
| Bk     | back                       | Cl&gr            | clearing & grubbing                 | DInt     | delineate                | FP         | feed point                     |
| BF     | back face                  | Co S             | coal slack                          | DIntr    | delineator               | Ft         | feet/foot                      |
| Bs     | backsight                  | Comb.            | combination                         | Depr     | depression               | Fn         | fence                          |
| Balc   | balcony                    | Coml             | commercial                          | Desc     | description              | Fn P       | fence post                     |
| B Wire | barbed wire                | Compr            | compression                         | Det      | detail                   | FO         | fiber optic                    |
| Barr   | barricade                  | CADD             | computer aided drafting & design    | DWp      | detectable warning panel | FB         | field book                     |
| Btry   | battery                    | Conc             | concrete                            | Dtr      | detour                   | FD         | field drive                    |
| Brg    | bearing                    | Cond             | conductor                           | Dia      | diameter                 | F          | fill                           |
| BI     | beehive inlet              | Const            | construction                        | Dir      | direction                | FAA        | fine aggregate angularity      |
| Beg    | begin                      | Cont             | continuous                          | Dist     | distance                 | FS         | fine sand                      |
| BM     | bench mark                 | CSB              | continuous split barrel sample      | DM       | disturbed material       | FH         | fire hydrant                   |
| Bkwy   | bikeway                    | Contr            | contraction                         | DB       | ditch block              | FI         | flange                         |
| Bit    | bituminous                 | Contr            | contractor                          | DG       | ditch grade              | Flrd       | flared                         |
| Blk    | block                      | CP               | control point                       | Dbl      | double                   | FES        | flared end section             |
| Bd Ft  | board feet                 | Coord            | coordinate                          | Dn       | down                     |            |                                |
| BH     | bore hole                  | Cor              | corner                              | Dwg      | drawing                  |            |                                |
| BS     | both sides                 | Corr             | corrected                           | Dr       | drive                    |            |                                |
| Bot    | bottom                     | CAES             | corrugated aluminum end section     | Drwy     | driveway                 |            |                                |
| Bldv   | Boulevard                  | CAP              | corrugated aluminum pipe            | DI       | drop inlet               |            |                                |
| Bndry  | boundary                   | CMES             | corrugated metal end section        | D        | dry density              |            |                                |
| BC     | brass cap                  | CMP              | corrugated metal pipe               | Ea       | each                     |            |                                |
| Brkwy  | breakaway                  | CPVCP            | corrugated poly-vinyl chloride pipe | Esmt     | easement                 |            |                                |
| Br     | bridge                     | CSES             | corrugated steel end section        | E        | East                     |            |                                |
| Bldg   | building                   | CSP              | corrugated steel pipe               | EB       | Eastbound                |            |                                |
| BLM    | Bureau of Land Management  | C                | coulomb                             | Elast    | elastomeric              |            |                                |

|  |                            |
|--|----------------------------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                            |
| 06-15-10                                     |                            |
| REVISIONS                                    |                            |
| DATE   | CHANGE                     |
| 04-20-11<br>03-15-13                         | Added Items<br>Added Items |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 3/15/13 and the original document is stored at the North Dakota Department of Transportation

NDDOT ABBREVIATIONS

D-20-2

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

|  |                            |
|--|----------------------------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                            |
| 06-15-10                                     |                            |
| REVISIONS                                    |                            |
| DATE   | CHANGE                     |
| 04-20-11<br>03-15-13                         | Added Items<br>Added Items |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 3/15/13 and the original document is stored at the North Dakota Department of Transportation

NDDOT ABBREVIATIONS

|          |                                   |           |                                    |           |                            |       |                                    |
|----------|-----------------------------------|-----------|------------------------------------|-----------|----------------------------|-------|------------------------------------|
| PT       | point of tangent                  | Rdbd      | road bed                           | M2        | square meter               | TP    | traverse point                     |
| POC      | point on curve                    | Rdwy      | roadway                            | SY        | square yard                | Trtd  | treated                            |
| POT      | point on tangent                  | RWIS      | Roadway Weather Information System | Stk       | stake                      | Trmt  | treatment                          |
| PE       | polyethylene                      | Rk        | rock                               | Std       | standard                   | Qc    | triaxial compression               |
| PVC      | polyvinyl chloride                | Rt        | route                              | N         | standard penetration test  | TERO  | Tribal Employment Rights Ordinance |
| PCC      | Portland Cement concrete          | Salv      | salvage(d)                         | Std Specs | Standard Specifications    | Tpl   | triple                             |
| Lb or #  | pounds                            | Sd        | sand                               | Sta       | station                    | TP    | turning point                      |
| PP       | power pole                        | Sdy Cl    | sandy clay                         | Sta Yd    | station yards              | Typ   | typical                            |
| Preempt  | preemption                        | Sdy Cl Lm | sandy clay loam                    | Stm L     | steam line                 | Qu    | unconfined compressive strength    |
| Prefab   | prefabricated                     | Sdy Fl    | sandy fill                         | SEC       | steel encased concrete     | Ugrnd | underground                        |
| Prfmd    | performed                         | Sdy Lm    | sandy loam                         | SSD       | stopping sight distance    | USC&G | US Coast & Geodetic Survey         |
| Prep     | preparation                       | San       | sanitary sewer line                | SD        | storm drain                | USGS  | US Geologic Survey                 |
| Press.   | pressure                          | Sc        | scoria                             | St        | street                     | Util  | utility                            |
| PRV      | pressure relief valve             | Sec       | seconds                            | SPP       | structural plate pipe      | VG    | valley gutter                      |
| Prestr   | prestressed                       | Sec       | section                            | SPPA      | structural plate pipe arch | Vap   | vapor                              |
| Pvt      | private                           | SL        | section line                       | Str       | structure                  | Vert  | vertical                           |
| PD       | private drive                     | Sep       | separation                         | Subd      | subdivision                | VC    | vertical curve                     |
| Prod.    | production/produce                | Seq       | sequence                           | Sub       | subgrade                   | VCP   | vitrified clay pipe                |
| Prog     | programmed                        | Serv      | service                            | Sub Prep  | subgrade preparation       | V     | volt                               |
| Prop.    | property                          | Sh        | shale                              | Ss        | subsoil                    | Vol   | volume                             |
| Prop Ln  | property line                     | Sht       | sheet                              | SE        | superelevation             | Wkwy  | walkway                            |
| Ppsd     | proposed                          | Shtng     | sheeting                           | SS        | supplement specification   | W     | water content                      |
| PB       | pull box                          | Shldr     | shoulder                           | Supp      | supplemental               | WGV   | water gate valve                   |
| Qty      | quantity                          | Sw        | sidewalk                           | Surf      | surfacing                  | WL    | water line                         |
| Qtr      | quarter                           | S         | siemens                            | Surv      | survey                     | WM    | water main                         |
| Rad or R | radius                            | SD        | sight distance                     | Sym       | symmetrical                | WMV   | water main valve                   |
| RR       | railroad                          | Sig       | signal                             | SI        | Systems International      | W Mtr | water meter                        |
| Rlwy     | railway                           | Si Cl     | silt clay                          | Tan       | tangent                    | WSV   | water service valve                |
| Rsd      | raised                            | Si Cl Lm  | silty clay loam                    | T         | tangent (semi)             | WW    | water well                         |
| RTP      | random traverse point             | Si Lm     | silty loam                         | TS        | tangent to spiral          | W     | watt                               |
| Rge or R | range                             | Sgl       | single                             | Tel       | telephone                  | Wrng  | wearing                            |
| RC       | rapid curing                      | SC        | slow curing                        | Tel B     | Telephone Booth            | Wb    | weber                              |
| Rec      | record                            | SS        | slow setting                       | Tel P     | telephone pole             | WIM   | weigh in motion                    |
| Rcy      | recycle                           | Sm        | small                              | Tv        | television                 | W     | West                               |
| RPCC     | recycled Portland cement concrete | S         | South                              | Temp      | temperature                | WB    | Westbound                          |
| Ref      | reference                         | SE        | South East                         | Temp      | temporary                  | Wrng  | wiring                             |
| R Mkr    | reference marker                  | SW        | South West                         | TBM       | temporary bench mark       | W/    | with                               |
| RM       | reference monument                | SB        | Southbound                         | T         | tesla                      | W/o   | without                            |
| Refl     | reflectorized                     | Sp        | spaces                             | T         | thinwall tube sample       | WC    | witness corner                     |
| RCB      | reinforced concrete box           | Spcl      | special                            | T/mi      | tons per mile              | WGS   | World Geodetic System              |
| RCES     | reinforced concrete end section   | SP        | special provisions                 | Ts        | topsoil                    | Z     | zenith                             |
| RCP      | reinforced concrete pipe          | G         | specific gravity                   | Twp or T  | township                   |       |                                    |
| RCPS     | reinforced concrete pipe sewer    | Spk       | spike                              | Traf      | traffic                    |       |                                    |
| Reinf    | reinforcement                     | SC        | spiral to curve                    | TSCB      | traffic signal control box |       |                                    |
| Res      | reservation                       | ST        | spiral to tangent                  | Tr        | trail                      |       |                                    |
| Ret      | retaining                         | SB        | split barrel sample                | Transf    | transformer                |       |                                    |
| Rev      | reverse                           | SH        | sprinkler head                     | TB        | transit book               |       |                                    |
| Rt       | right                             | SV        | sprinkler valve                    | Trans     | transition                 |       |                                    |
| R/W      | right of way                      | Sq        | square                             | TT        | transmission tower         |       |                                    |
| Riv      | river                             | SF        | square feet                        | Trans     | transverse                 |       |                                    |
| Rd       | road                              | Km2       | square kilometer                   | Trav      | traverse                   |       |                                    |

|  |                            |
|--|----------------------------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                            |
| 06-15-10                                     |                            |
| REVISIONS                                    |                            |
| DATE   | CHANGE                     |
| 04-20-11<br>03-15-13                         | Added Items<br>Added Items |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 3/15/13 and the original document is stored at the North Dakota Department of Transportation

NDDOT UTILITY COMPANY ABBREVIATIONS

702COM 702 Communications  
 ACCENT Accent Communications  
 AGASSIZ WU Agassiz Water Users Incorporated  
 All PI Alliance Pipeline  
 ALL SEAS WU All Seasons Water Users Association  
 AMOCO PI Amoco Pipeline Company  
 AMRDA HESS Amerada Hess Corporation  
 AT&T AT&T Corporation  
 B PAW Bear Paw Energy Incorporated  
 BASIN ELEC Basin Electric Cooperative Incorporated  
 BEK TEL Bek Communications Cooperative  
 BELLE PL Belle Fourche Pipeline Company  
 BNSF Burlington Northern Santa Fe Railway  
 BOEING Boeing  
 BRNS RWD Barnes Rural Water District  
 BURK-DIV ELEC Burke-Divide Electric Cooperative  
 BURL WU Burleigh Water Users  
 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 Incorporated  
 CAV ELEC Cavalier Rural Electric Cooperative  
 CBLCOM Cablecom Of Fargo  
 CENEX PL Cenex Pipeline  
 CENT PWR ELEC Central Power Electric Cooperative  
 CONS TEL Consolidated Telephone  
 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 RWU Dickey Rural Water Users Association  
 DICKEY TEL Dickey Telephone  
 DNRR Dakota Northern Railroad  
 DOME PL Dome Pipeline Company  
 DVELEC Dakota Valley Electric Cooperative  
 DVMW Dakota, Missouri Valley & Western  
 ENBRDG Enbridge Pipelines Incorporated  
 FALK MNG Falkirk Mining Company  
 G FKS-TRL WD Grand Forks-trail Water District  
 GETTY TRD & TRAN Getty Trading & Transportation  
 GLDN W ELEC Golden West Electric Cooperative  
 GRGS CO TEL Griggs County Telephone  
 GT PLNS NAT GAS Great Plains Natural Gas Company  
 HALS TEL Halstad Telephone Company  
 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  
 LNGDN RWU Langdon Rural Water Users Incorporated  
 LWR YELL R ELEC Lower Yellowstone Rural Electric  
 MCKNZ CON McKenzie Consolidated Telcom  
 MCKNZ WRD McKenzie County Water Resource District  
 MCKNZ ELEC McKenzie Electric Cooperative  
 MCLEOD Mcleod USA  
 MCLN ELEC Mclean Electric Cooperative  
 MCLN-SHRDN R WAT Mclean-Sheridan Rural Water  
 MDU Montana-dakota Utilities  
 MID-CONT CABLE Mid-Continent Cable  
 MIDSTATE TEL Midstate Telephone Company  
 MINOT CABLE Minot Cable Television  
 MINOT TEL Minot Telephone Company  
 MISS W W S Missouri West Water System  
 MNKOTA PWR Minnkota Power  
 MRE LBTY TEL Moore & Liberty Telephone  
 MOR-GRAN-SOU ELEC Mor-gran-sou Electric Cooperative  
 MOUNT-WILLI ELEC Mountrail-williams Electric Cooperative  
 MUNICIPAL City Of '.....'  
 MUNICIPAL City Water And Sewer  
 N CENT ELEC North Central Electric Cooperative  
 N VALL W DIST North Valley Water District  
 ND PKS & REC North Dakota Parks And Recreation  
 ND TEL North Dakota Telephone Company  
 NDDOT North Dakota Department of Transportation  
 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  
 NTH PRAIR RW Northern Prairie Rural Water Association  
 NTHN BRDR PL Northern Border Pipeline  
 NTHN PLNS ELEC Northern Plains Electric Cooperative Incorporated  
 NTHWSTRN REF Northwestern Refinery Company  
 NW COMM Northwest Communication Cooperation  
 OTTR TL PWR Otter Tail Power Company  
 P L E M Prairielands Energy Marketing  
 POLAR COM Polar Communications  
 QWEST Qwest Communications  
 R&T W SUPPLY R & T Water Supply Association  
 RAMSEY R SEW Ramsey Rural Sewer Association  
 RAMSEY RW Ramsey Rural Water Association  
 RAMSEY UTIL Ramsey County Rural Utilities  
 RED RIV TEL Red River Rural Telephone  
 RESVTN TEL Reservation Telephone  
 ROBRTS TEL Roberts Company Telephone  
 R-RIDER ELEC Roughrider Electric Coop

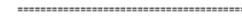
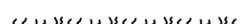
RRVW Red River Valley & Western Railroad  
 RSR ELEC R.S.R. Electric Cooperative  
 S E W U South East Water Users Incorporated  
 SCOTT CABLE Scott Cable Television Dickinson  
 SHERDN ELEC Sheridan Electric Cooperative  
 SHEYN VLY ELEC Sheyenne Valley Electric Cooperative  
 SKYTECH Skyland Technologies Incorporated  
 SLOPE ELEC Slope Electric Cooperative  
 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  
 STUT RWU Stutsman Rural Water Users  
 T M C Turtle Mountain Communications  
 TCI TCI of North Dakota  
 TRI-CNTY WU Tri-County Water Users Incorporated  
 TRL CO RWU Traill County Rural Water Users  
 UNTD TEL United Telephone  
 UPPR SOUR WUA Upper Souris Water Users Association  
 US SPRINT U.S. Sprint  
 USAF MSL CABLE U.S.A.F. Missile Cable  
 USW COMM U.S. West Communications  
 VRNDRY ELEC Verendrye Electric Cooperative  
 W RIV TEL West River Telephone Incorporated  
 WEB W. E. B. Water Development Association  
 WILLI RWA Williams Rural Water Association  
 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<br>DEPARTMENT OF TRANSPORTATION |                            |
| 6-15-10                                      |                            |
| REVISIONS                                    |                            |
| DATE   | CHANGE                     |
| 04-20-11<br>03-15-13                         | Added Items<br>Added Items |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 3/15/13 and the original document is stored at the North Dakota Department of Transportation



Line Styles

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

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 4-20-11                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 4/20/11 and the original document is stored at the North Dakota Department of Transportation

Symbols

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

| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
|--|--------|
| 4-20-11                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 4/20/11 and the original document is stored at the North Dakota Department of Transportation

Symbols

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

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 4-20-11                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 4/20/11 and the original document is stored at the North Dakota Department of Transportation

# Symbols

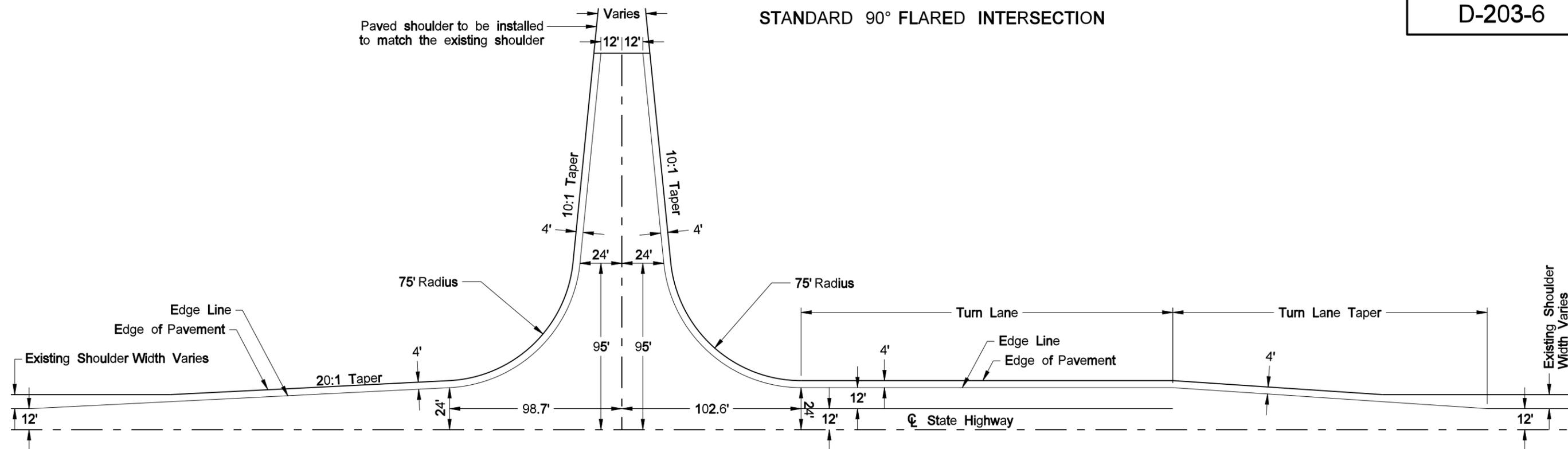
D-20-32

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

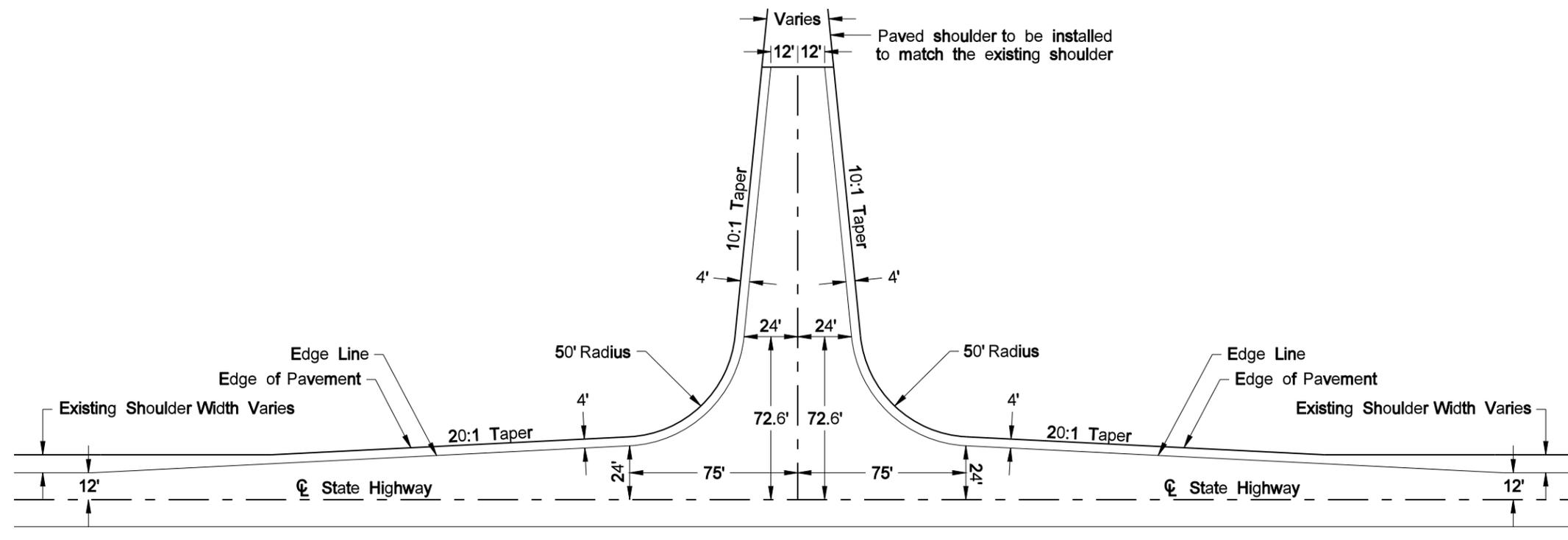
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 4-20-11                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by  
**Roger Weigel,**  
 Registration Number  
**PE-2930,**  
 on **4/20/11** and the original document is stored at the  
 North Dakota Department  
 of Transportation

STANDARD 90° FLARED INTERSECTION



Type B  
90° Flared Intersection with Turn Lane



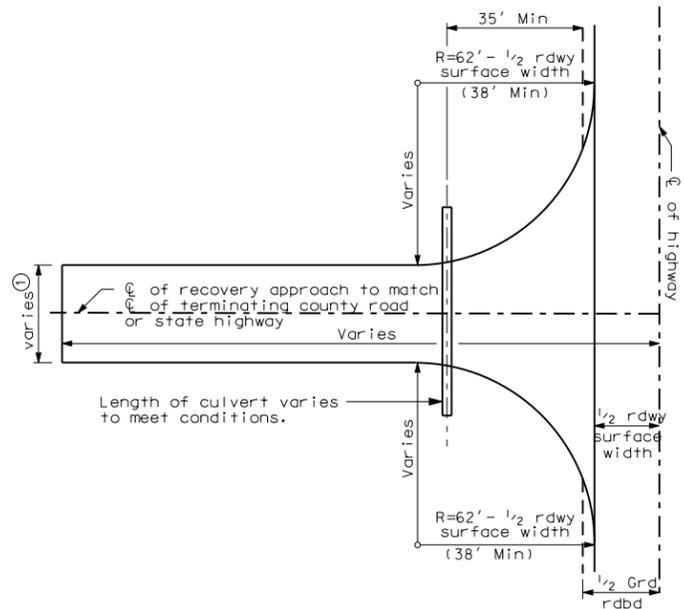
Type A  
90° Flared Intersection

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 5-19-09                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

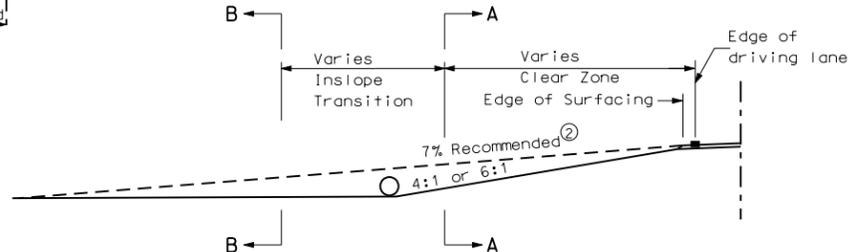
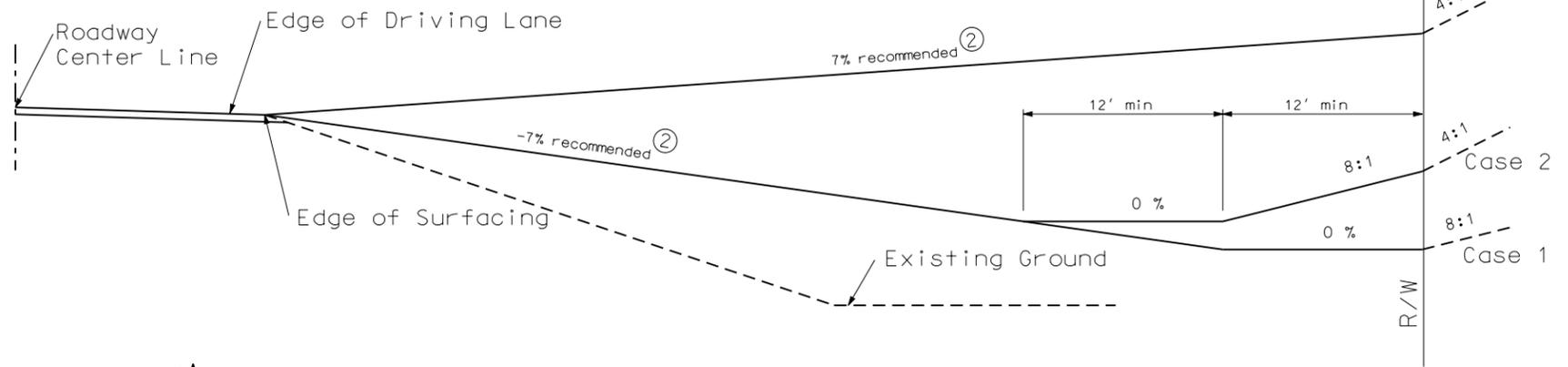
This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 5/19/09 and the original document is stored at the North Dakota Department of Transportation

# RECOVERY APPROACHES AT T-INTERSECTIONS

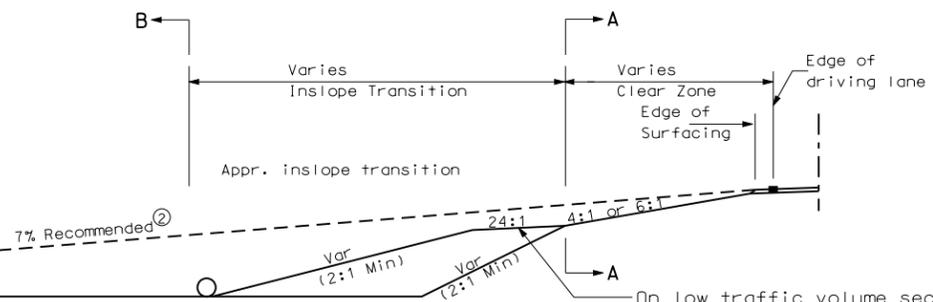
D-203-7



PLAN VIEW RECOVERY APPROACH

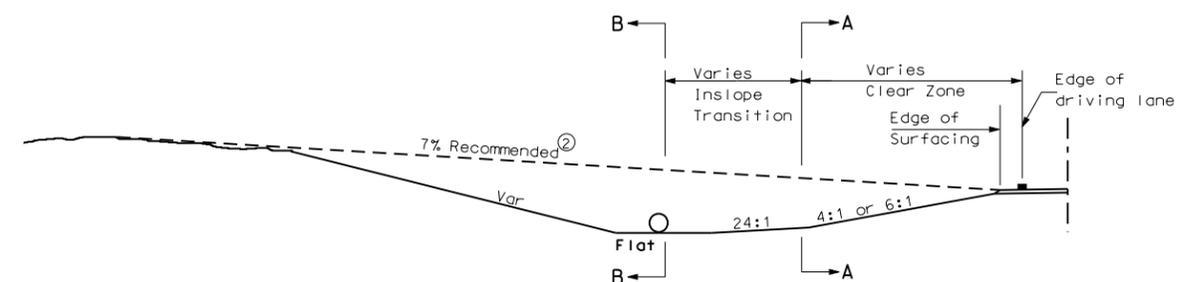


RECOVERY APPROACH GRADE ON FILL SECTION 12 FEET OR LESS

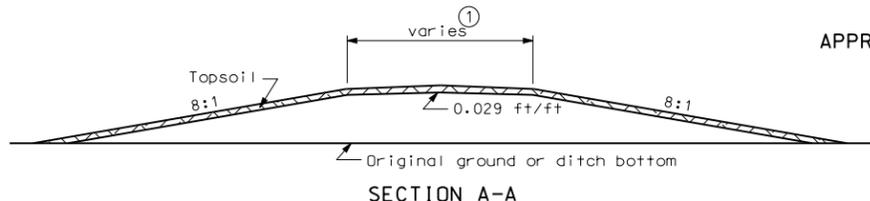


RECOVERY APPROACH GRADE ON FILL SECTION OVER 12 FEET

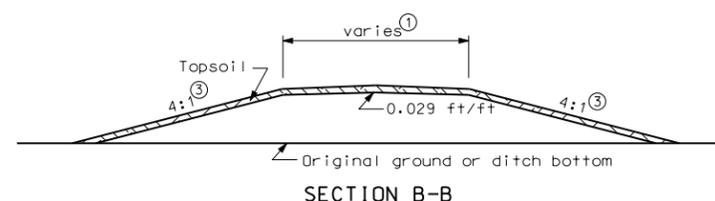
On low traffic volume secondary projects the secondary slope is omitted and the inslope is steepened beyond the 24' line on fill sections over 8' in height.



APPROACH GRADE ON CUT SECTION



SECTION A-A



SECTION B-B

- Case 1. Ties into existing back slope and within existing right of way. Existing Back Slope is 8:1 or flatter.
- Case 2. Ties into existing back slope and within existing right of way. Existing Back Slope is 4:1 or flatter.
- Case 3. Ties into existing back slope and within existing right of way. Existing Back Slope is 4:1 or flatter.

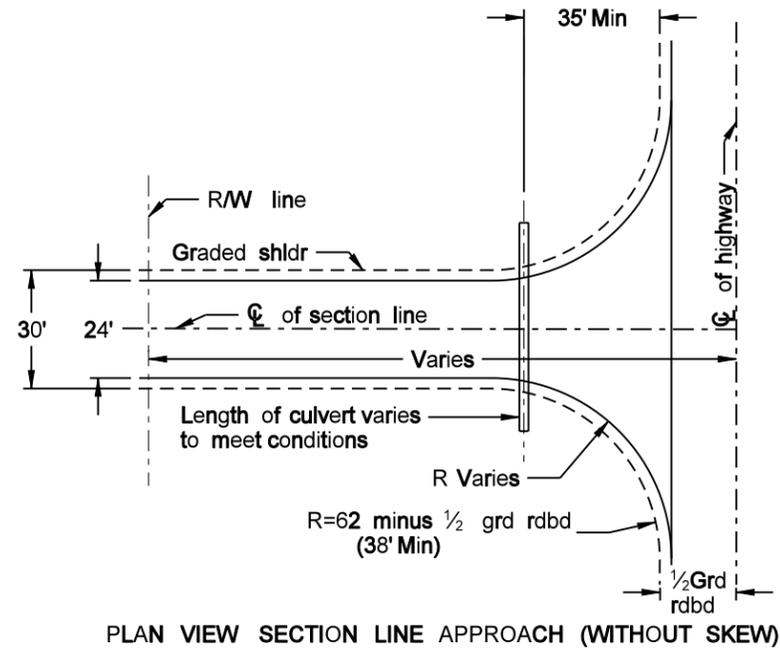
### FOOT NOTES

- ① width of recovery approach to match width of terminating county road or state highway
- ② 10% Max
- ③ 3:1 Slope - 20' to 30' fill  
2:1 Slope on fills over 30'

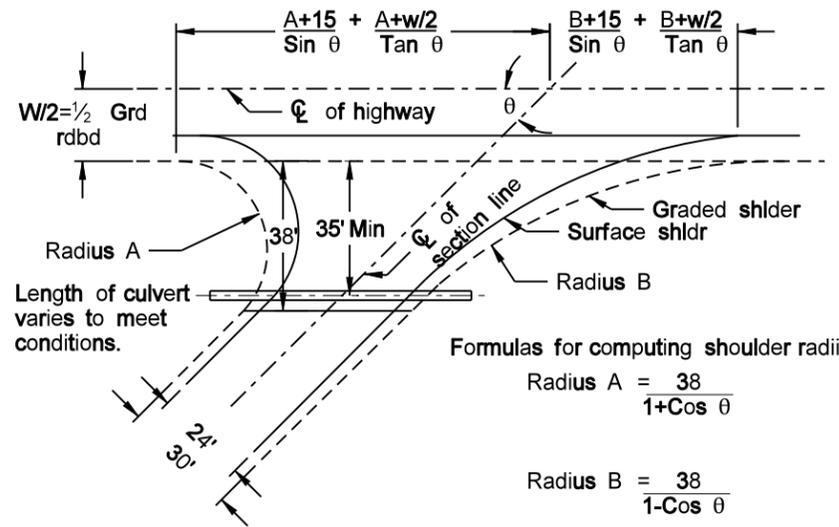
|  |                |
|--|----------------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                |
| 06-03-03                                     |                |
| REVISIONS                                    |                |
| DATE   | CHANGE         |
| 12-01-04                                     | PE Stamp added |

This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE- 4518**, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

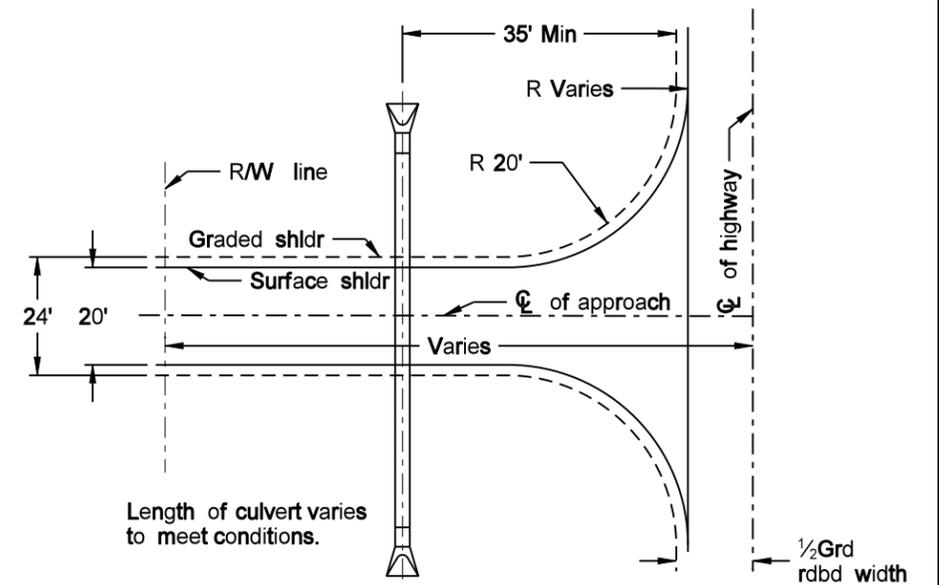
SECTION LINE & PRIVATE DRIVE APPROACHES  
(RURAL)



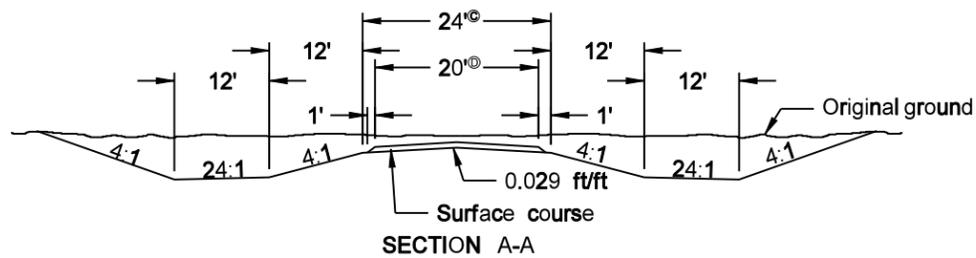
PLAN VIEW SECTION LINE APPROACH (WITHOUT SKEW)



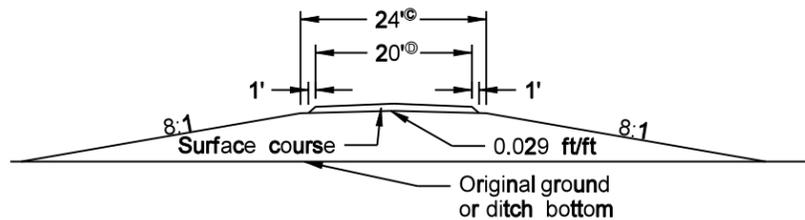
PLAN VIEW SECTION LINE APPROACH (SKEWED)



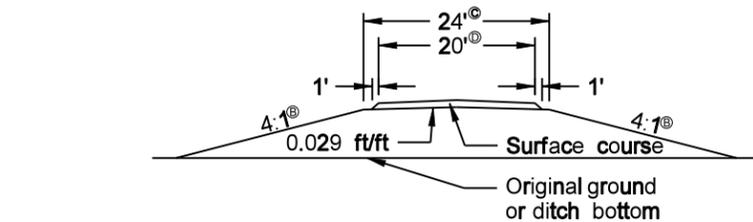
PLAN VIEW PRIVATE DRIVE APPROACH



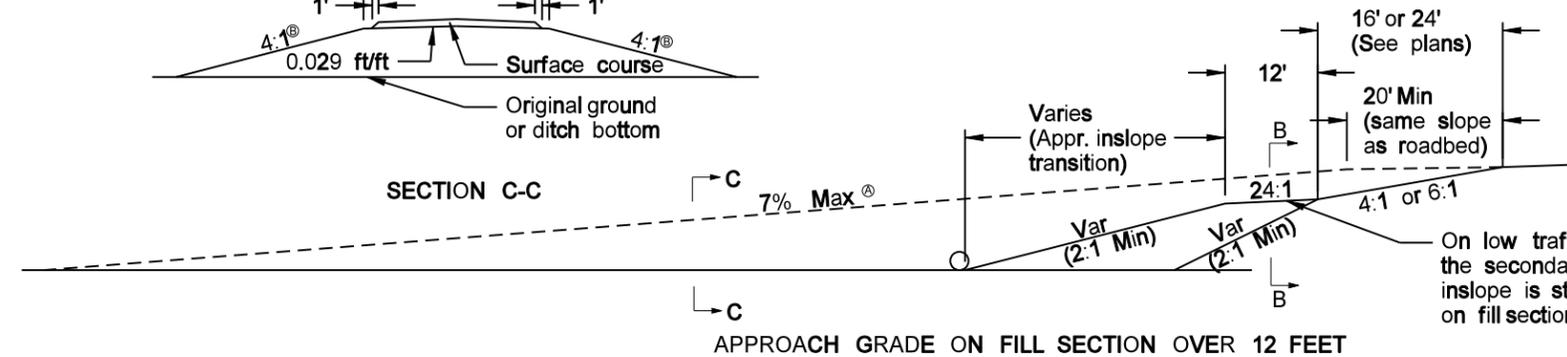
SECTION A-A



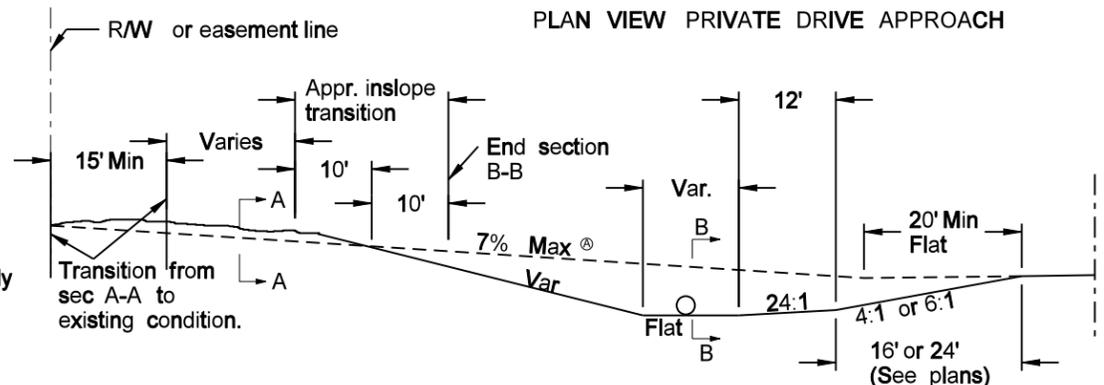
SECTION B-B



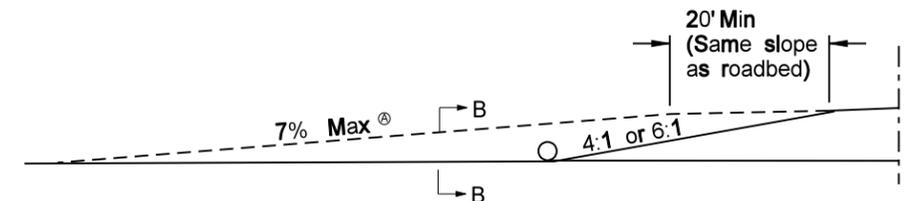
SECTION C-C



APPROACH GRADE ON FILL SECTION OVER 12 FEET



APPROACH GRADE ON CUT SECTION



APPROACH GRADE ON FILL SECTION 12 FEET OR LESS

- NOTES:
1. Dimensions shown for surfacing are for aggregate surface course or bituminous surface constructed with grading contract.
  2. Approach grades and typical sections apply to both private drives and section line approaches.
  3. Pipes shall be installed per Manufacturer's recommendations. Deflection testing may be performed at the discretion of the Engineer.

- FOOT NOTES
- (A) 10% Max on field drives
  - (B) 3:1 Slope - 20' to 30' fill
  - (C) 2:1 Slope on fills over 30'
  - (D) 30' on sec. line approaches
  - (E) 24' on sec line approaches

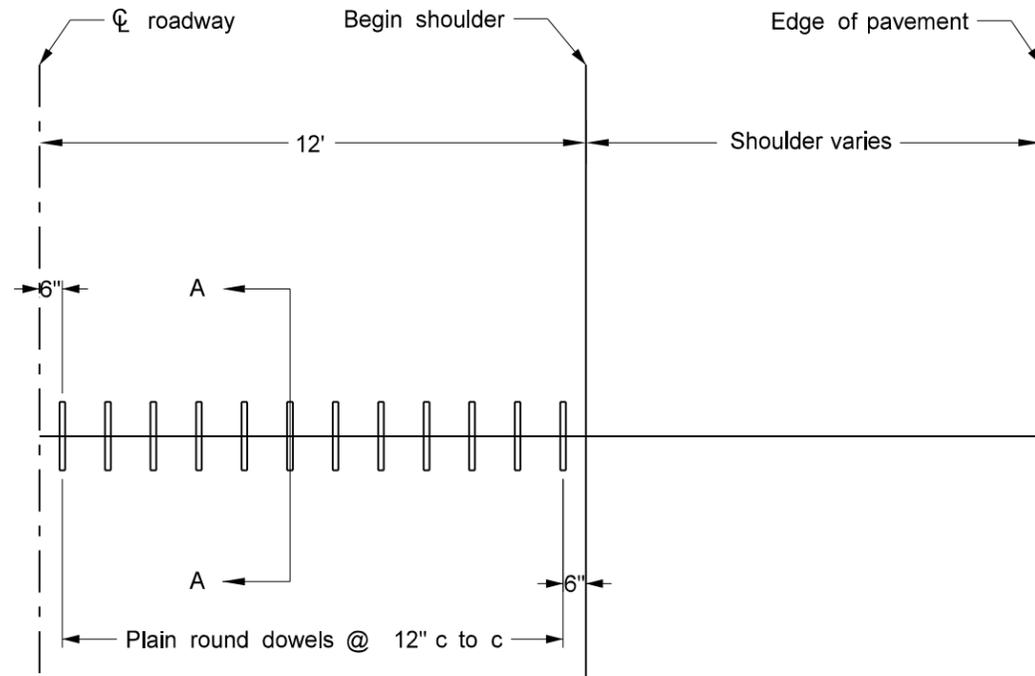
On low traffic volume secondary projects the secondary slope is omitted and the inslope is steepened beyond the 24' line on fill sections over 8' in height

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                               |
|---|-------------------------------|
| 10-1-86                                   |                               |
| REVISIONS                                 |                               |
| DATE                                      | CHANGE                        |
| 06-03-03                                  | Revised roadway crown         |
| 12-01-04                                  | PE Stamp added                |
| 04-05-06                                  | General revisions             |
| 12-08-08                                  | Format revisions/added Note 3 |

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930 , on 12/08/2008 and the original document is stored at the North Dakota Department of Transportation



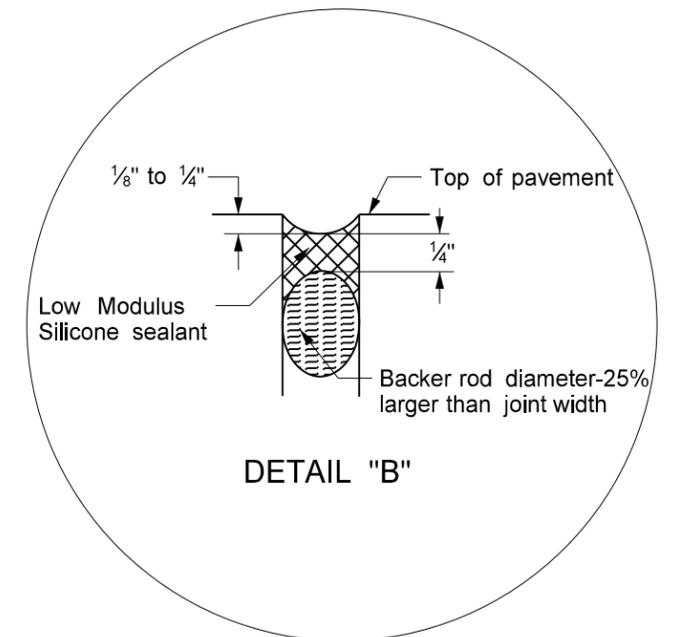
TRANSVERSE CONTRACTION JOINT DETAILS



CONTRACTION JOINT DOWEL ASSEMBLY  
(1/2 roadway shown)

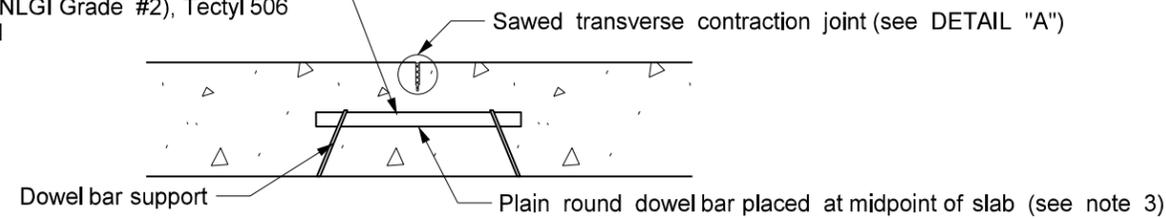
Notes

1. The joint seal details apply to both doweled and non-doweled (plain) transverse joints.
2. T = Thickness of pavement.
3. Dowels  
 Pavement 10" or less: 1 1/4" X 18" plain round  
 Pavement greater than 10": 1 1/2" X 18" plain round
4. B = T/4 + 1/4" for AE or YE non-doweled concrete pavement  
 or T/3 for high early or doweled concrete pavement

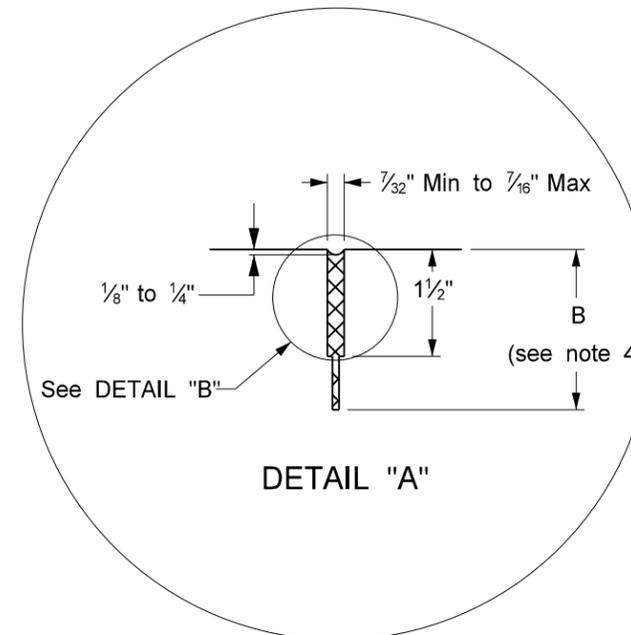


DETAIL "B"

Coat entire dowel bar length with Multipurpose Lithium Grease (NLGI Grade #2), Tectyl 506 or approved equal



SECTION A-A

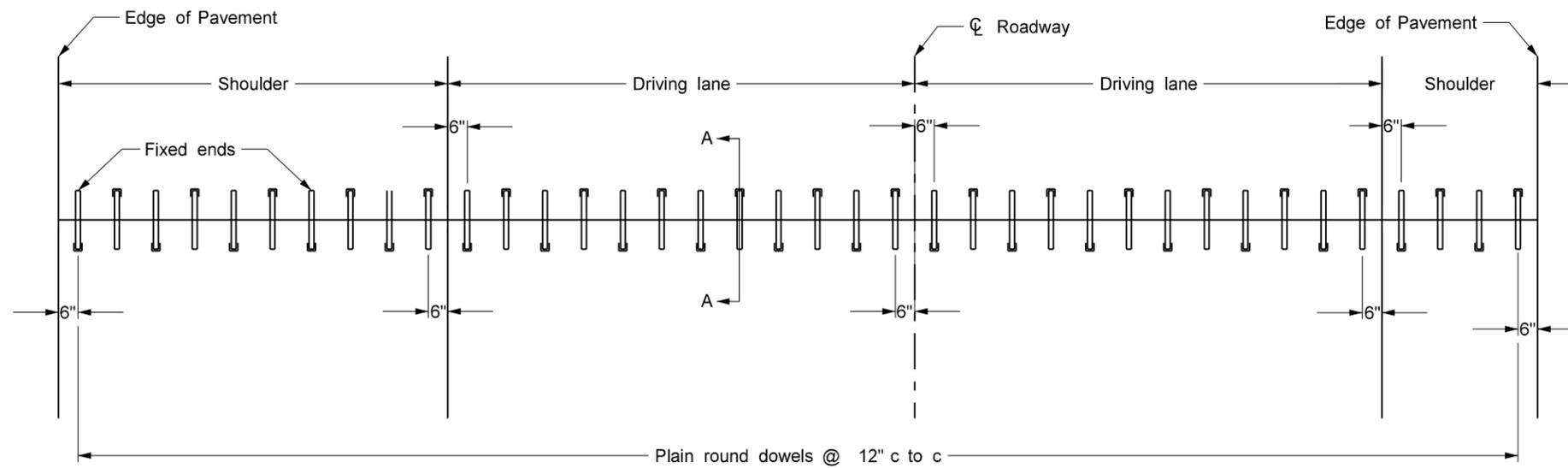


DETAIL "A"

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 9-15-2010                                    |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930 , on 9/15/2010 and the original document is stored at the North Dakota Department of Transportation

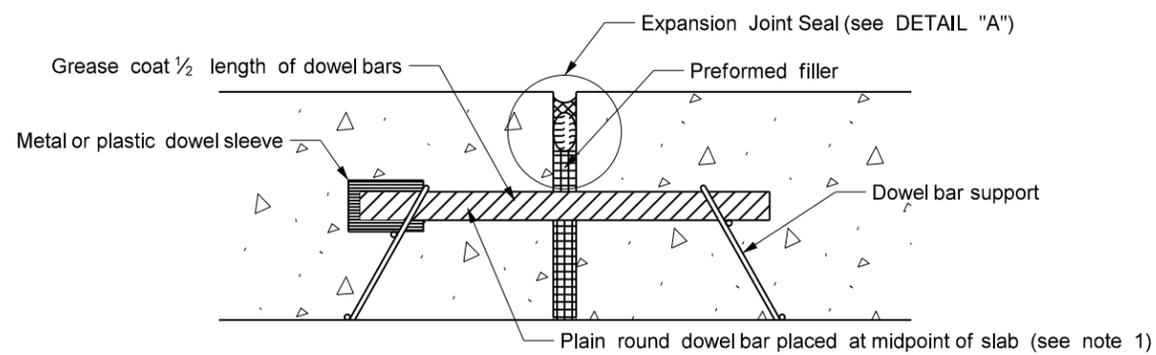
TRANSVERSE EXPANSION JOINT DETAIL



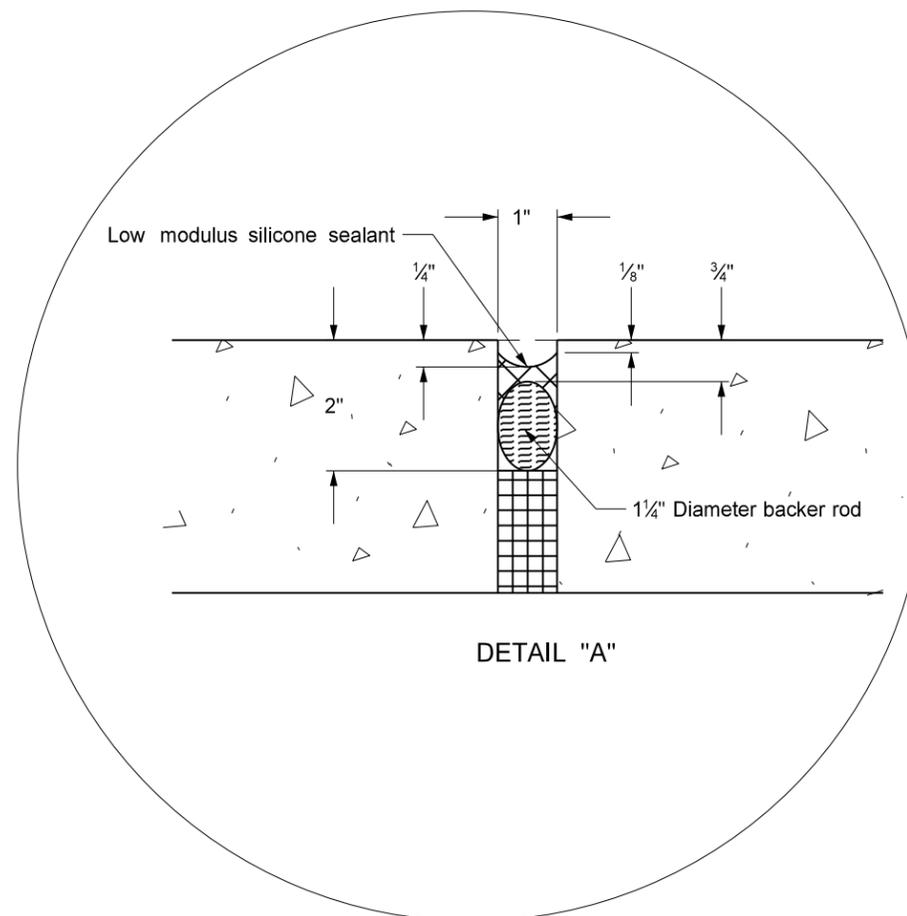
Notes

- 1. Dowels
  - Pavement thickness 10" or less: 1 1/4" X 18" plain round
  - Pavement thickness greater than 10": 1 1/2" X 18" plain round

DOWELED EXPANSION JOINT ASSEMBLY



SECTION A-A



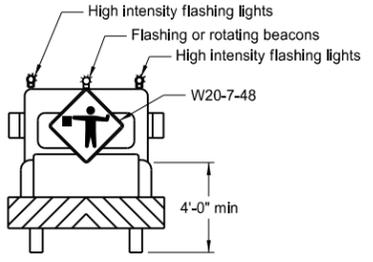
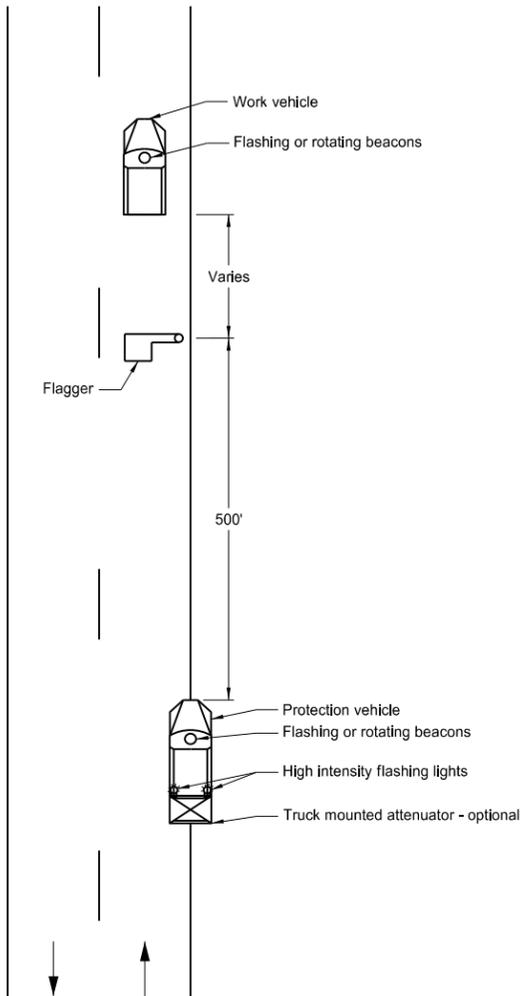
DETAIL "A"

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 9-15-2010                                    |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930 , on 9/15/2010 and the original document is stored at the North Dakota Department of Transportation

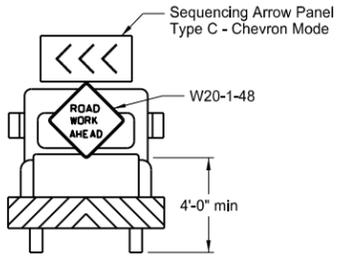
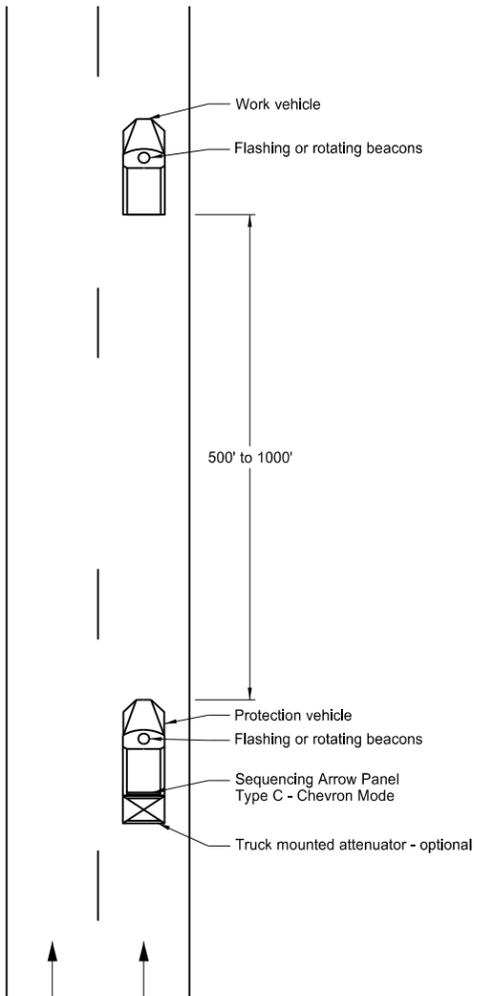


Two Lane, Two Way Roadways



Typical Protection Vehicle

Multilane Roadways



Typical Protection Vehicle

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

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 9-25-12                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 9/25/2012 and the original document is stored at the North Dakota Department of Transportation

WORK ZONE BUSINESS SIGN DETAILS

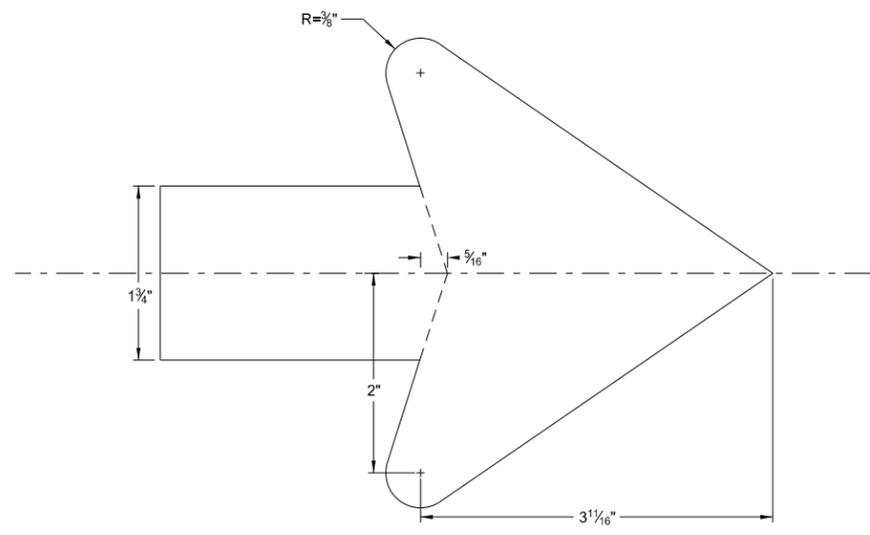
D-704-4

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

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

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

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



|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 9-25-12                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 9/25/2012 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN DETAIL

D-704-5

|                       |  |                    |     |                          |       |
|-----------------------|--|--------------------|-----|--------------------------|-------|
| <b>SIGN NUMBER</b>    | G20-10-108                                       | <b>STATION(S):</b> |     | <b>AREA:</b> 36.0 Sq.Ft. |       |
| <b>WIDTH x HEIGHT</b> | 9'-0" x 4'-0"                                    |                    |     |                          |       |
| <b>BORDER WIDTH</b>   | 1.25" (Inset 0.75")                              |                    |     |                          |       |
| <b>CORNER RADIUS</b>  | 3"   |                    |     |                          |       |
| <b>MOUNTING</b>       | Ground   |                    |     |                          |       |
| <b>BACKGROUND</b>     | TYPE: 3A Reflective<br>COLOR: Fluorescent Orange |                    |     |                          |       |
| <b>LEGEND/BORDER</b>  | TYPE: Non-Refl<br>COLOR: Black                   |                    |     |                          |       |
| <b>SYMBOL</b>         |  |                    |     |                          |       |
|                       | X  | Y                  | WID | HT                       | ANGLE |
|                       | 42.1   | 6.2                | 24  | 4                        | 0     |
|                       |  |                    |     |                          |       |
|                       |  |                    |     |                          |       |
|                       |  |                    |     |                          |       |
|                       |  |                    |     |                          |       |
|                       |  |                    |     |                          |       |

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

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

Notes:

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

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

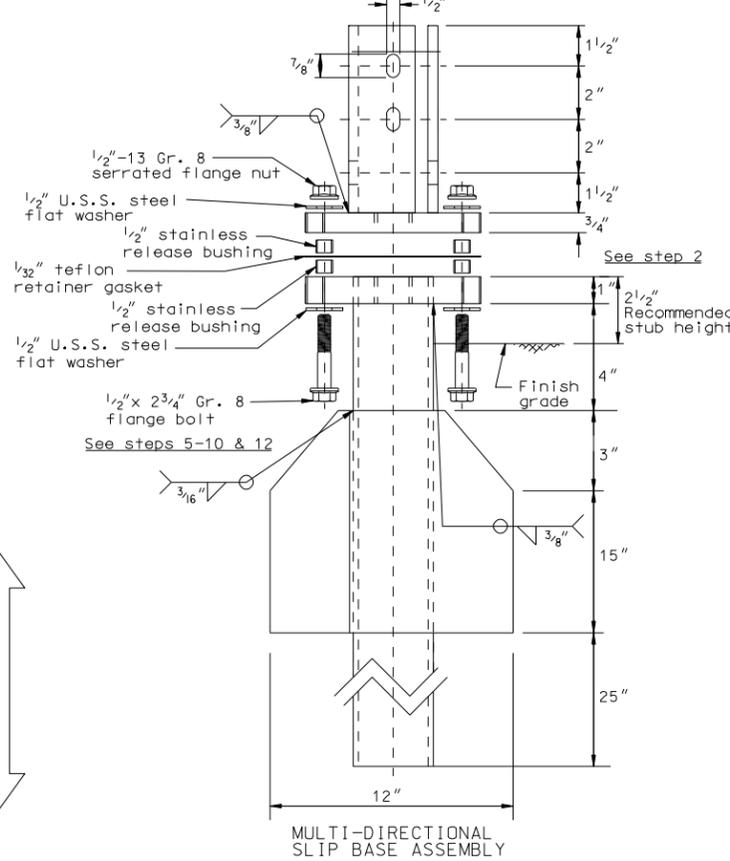
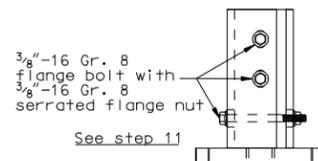
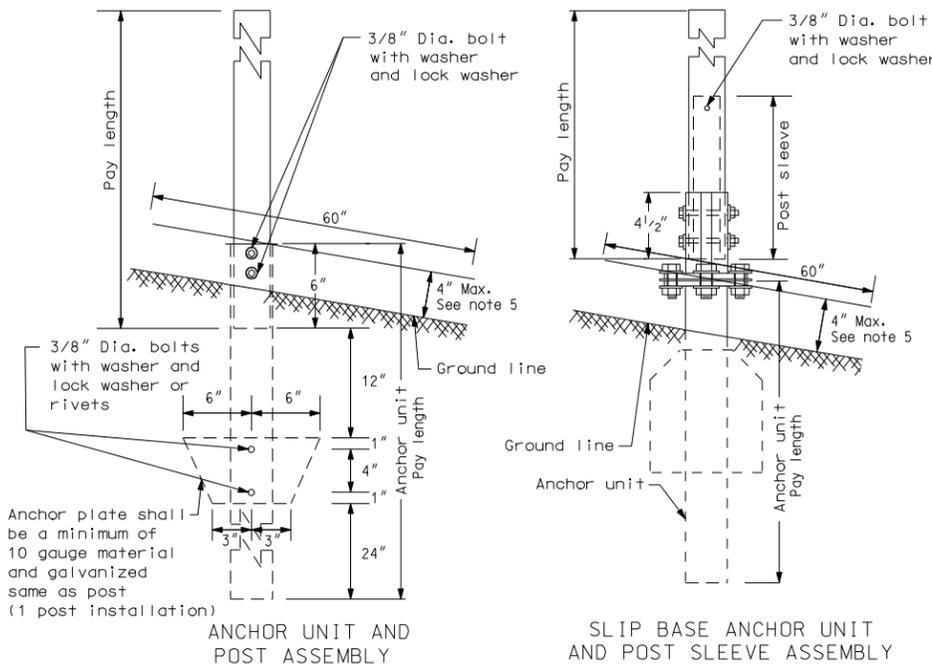
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 8-22-12                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by  
 Roger Weigel  
 Registration Number PE- 2930,  
 on 8/22/12 and the original document is stored at the North Dakota Department of Transportation

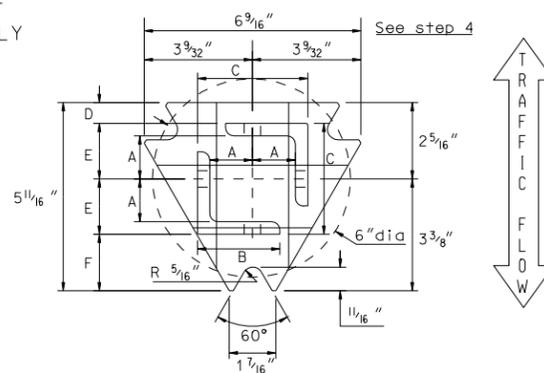
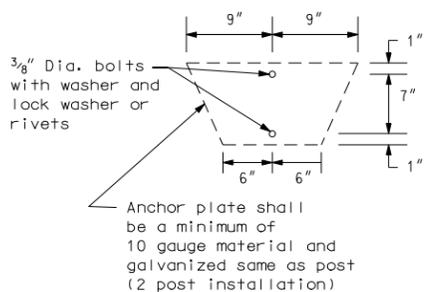
# BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

## PERFORATED TUBE



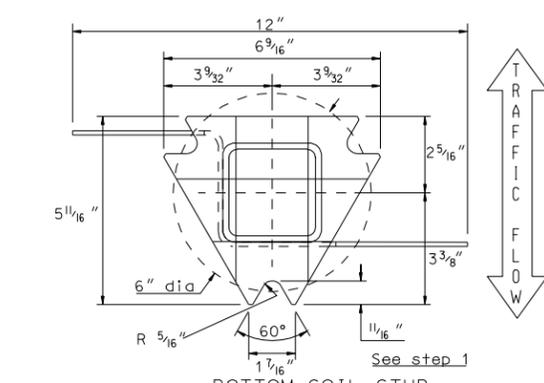
- Notes
- Slip base bolts shall be torqued as specified by the manufacturer.
  - The 2 3/16 inch size 10 gauge is shown as 2.19 inch size on the plans. The 2 1/2 inch size 10 gauge is shown as 2.51 inch size on the plans.
  - Anchor for 2 inch, 2 1/4 inch, and 2 1/2 inch posts.
  - Anchor material shall be 7 gauge H.R.P.O. Commercial quality ASTM A569 and 3 inch x 3 inch x 7 gauge ASTM A500 Grade B. Anchor shall have a yield strength of 43.9 KSI and tensile strength of 59.3 KSI. Anchor shall be hot dipped galvanized per ASTM A123/A153. All tolerances on anchor unit and slip base bottom assembly are ± 0.005 unless otherwise noted.
  - 4 inch vertical clearance of anchor or breakaway base. The 4 inch x 60 inch measurement shall be made above and below post location and also back and ahead of post.
  - When used in concrete sidewalk, anchor shall be the same except without the wings.
  - Four post signs shall have over 8 feet between the first and fourth posts.



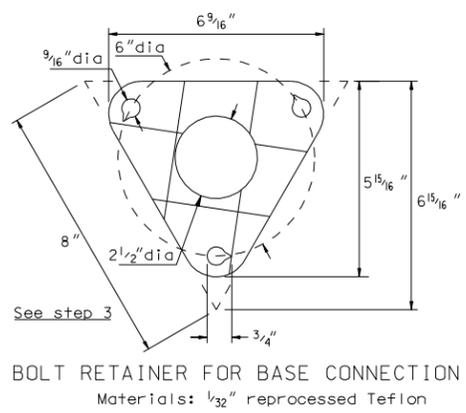
TOP POST RECEIVER  
Materials: Plate - ASTM A572 grade 50  
Angle receiver - 2 1/2 inch x 2 1/2 inch x 3/8 inch ASTM A36 structural angle

| TOP POST RECEIVER DATA TABLE     |             |            |             |             |             |            |
|----------------------------------|-------------|------------|-------------|-------------|-------------|------------|
| Square Post Sizes                | A           | B          | C           | D           | E           | F          |
| 2 3/16 inch x 10 Ga. Square Post | 1 3/64 inch | 2 1/2 inch | 3 1/32 inch | 2 5/32 inch | 1 3/64 inch | 1 7/8 inch |
| 2 1/2 inch x 10 Ga. Square Post  | 1 3/32 inch | 2 1/2 inch | 3 5/16 inch | 5/8 inch    | 1 2/32 inch | 1 3/4 inch |

2 3/16 inch x 10 gauge may be inserted into 2 1/2 inch x 10 gauge for additional wind load.



BOTTOM SOIL STUB  
Materials: Tube - 3 inch x 3 inch x 7 gauge ASTM A500 Gr B tube  
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A 569  
Plate - ASTM A572 grade 50



BOLT RETAINER FOR BASE CONNECTION  
Materials: 1/32 inch reprocessed Teflon

| MULTI-DIRECTIONAL SLIP BASE ASSEMBLY |  |
|--------------------------------------|--|
| STEP                                 | INSTALLATION PROCEDURE   |
| 1.                                   | Install bottom soil anchor stub plumb and squared up with road, with point of plate facing oncoming traffic.   |
| 2.                                   | Depth of imbedment to leave 2 1/2 inch from grade to top of anchor plate.  |
| 3.                                   | Place teflon bolt retainer gasket on top of bottom plate (make sure that notches in holes are pointing counter clockwise).   |
| 4.                                   | Place top post receiver on to retainer gasket, properly indexed so that angle receivers are squared up with road.  |
| 5.                                   | Slide 1 each 1/2 inch flat washer on to 1 each inverted 1/2 inch - 13 gr. 8 flange bolt, followed by 1 each stainless steel release bushing.   |
| 6.                                   | Insert above bolt with washer and bushing up through notched points of top and bottom plates, passing through hole in gasket.  |
| 7.                                   | Slide second bushing down on to above bolt until it rests on top of gasket followed by second washer.  |
| 8.                                   | Complete by threading 1/2 inch - 13 gr. 8 serrated flange nut snugly down against top of washer.   |
| 9.                                   | Repeat steps 5,6,7 & 8 at the two remaining notched triangle points.   |
| 10.                                  | Insert sign post into angle receivers on top half until post(s) bottom out.<br>*NOTE: Where higher wind load is desired, insert the next size smaller square post inside bottom of main upright post (Minimum of 48 inch, not to exceed beyond bottom edge of sign).                     |
| 11.                                  | Secure posts into receivers using 3 each 3/8 inch - 16 gr. 8 flange bolts and 3 each 3/8 inch - 16 serrated flange nuts in receiver slots (top 2 bolts should be parallel to highway) do not tighten nuts until all bolts are in place.  |
| 12.                                  | After all sub-assembly hardware is tightened, then torque the three 1/2 inch - 13 nuts to 42 ft-lbs, in a circular pattern until all bolt assemblies reach the required torque.<br>*NOTE: On multi-leg installations, be sure that all anchors are squared and lined up with each other. |

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

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

| Telescoping Perforated Tubes |                    |                     |                      |                         |                        |                       |
|------------------------------|--------------------|---------------------|----------------------|-------------------------|------------------------|-----------------------|
| Tube Size In.                | Wall Thickness In. | U.S. Standard Gauge | Weight Per Foot Lbs. | Moment of Inertia In. 4 | Cross Sect. Area In. 2 | Section Modulus In. 3 |
| 1 1/2 x 1 1/2                | 0.105              | 12                  | 1.702                | 0.129                   | 0.380                  | 0.172                 |
| 2 x 2                        | 0.105              | 12                  | 2.416                | 0.372                   | 0.590                  | 0.372                 |
| 2 1/4 x 2 1/4                | 0.105              | 12                  | 2.773                | 0.561                   | 0.695                  | 0.499                 |
| 2 3/16 x 2 3/16              | 0.135              | 10                  | 3.432                | 0.605                   | 0.841                  | 0.590                 |
| 2 1/2 x 2 1/2                | 0.105              | 12                  | 3.141                | 0.804                   | 0.803                  | 0.643                 |
| 2 1/2 x 2 1/2                | 0.135              | 10                  | 4.006                | 0.979                   | 1.010                  | 0.785                 |
| 4 x 4                        | 0.250              | 1/4                 | 6.600                | 3.040                   | 1.940                  | 1.050                 |

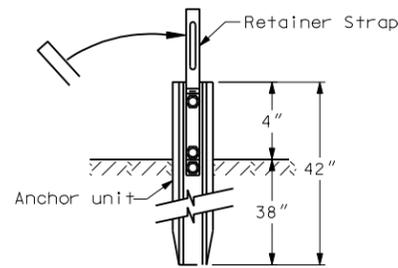
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                |
|---|----------------|
| 11-21-02                                  |                |
| REVISIONS                                 |                |
| DATE                                      | CHANGE         |
| 12-01-04                                  | PE stamp added |

This document was originally issued and sealed by MARK S GAYDOS, Registration Number PE-4518, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

# BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

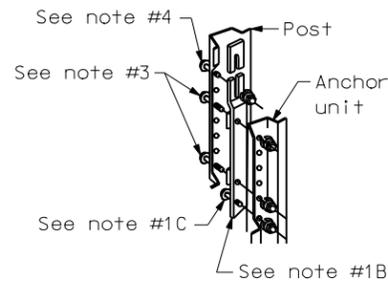
## FLANGED CHANNEL



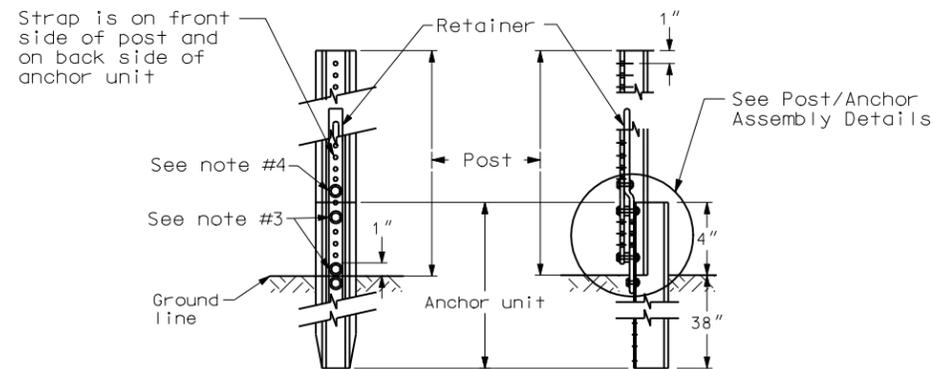
Anchor Unit & Strap Assembly Detail

### STEPS OF INSTALLATION

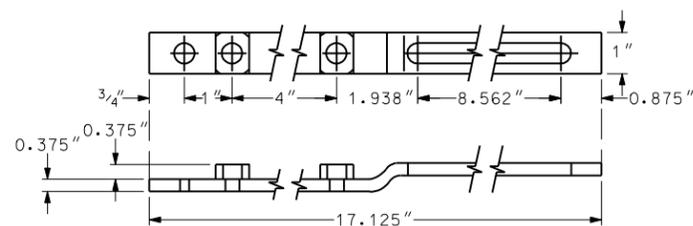
1. A) Drive anchor unit to within 12" of ground level.  
B) Proper assembly established by lining up the top 3/4" slot of retainer spacer strap with top hole of anchor unit.  
C) Assemble strap to back of anchor unit using 3/8"-16 UNC x 2.0" long bolt, lock washer and nut.  
D) Rotate strap 90° to left.
2. A) Drive anchor unit to 4" dimension.  
B) Rotate strap to vertical position.
3. A) Place 3/8"-16 UNC x 2" bolt, lock washer & nut in bottom of sign post to facilitate alignment of sign post with proper hole in anchor unit (this coincides with the bottom 3/4" slot in the strap).  
B) Alternately tighten two connector bolts.
4. A) Complete assembly by tightening 3/8"-16 UNC x 2" long retainer bolt (this fastens sign post to retainer spacer strap).
5. The base post, strap & sign post shall be properly nested. Proper nesting occurs when all flat surfaces of the base post, strap and sign post at the bolts have full contact across the entire width.



Post/Anchor Assembly Details



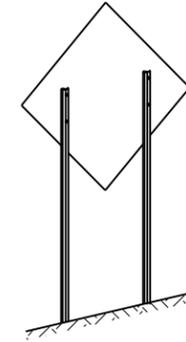
Front View Side View Sign Post Assembly Detail



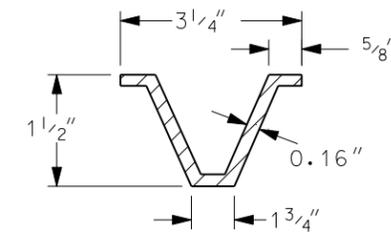
Retainer/Spacer Strap Detail

| CHANNEL SIZE IN. | WALL THICKNESS IN. | WEIGHT PER FOOT LBS. | MOMENT OF INERTIA IN. 4 | CROSS SECT. AREA IN. SQ. | SECTION MODULUS IN. 3 |
|------------------|--------------------|----------------------|-------------------------|--------------------------|-----------------------|
| 1.516 x 3.125"   | .116               | 2.00                 | .179                    | .590                     | .225                  |
| 1.532 x 3.125"   | .124               | 2.25                 | .201                    | .648                     | .254                  |
| 1.562 x 3.125"   | .132               | 2.50                 | .233                    | .748                     | .289                  |
| 1.578 x 3.125"   | .140               | 2.75                 | .271                    | .819                     | .329                  |
| 1.750 x 3.500"   | .150               | 3.00                 | .372                    | .918                     | .403                  |
| 1.750 x 3.500"   | .175               | 4.00                 | .500                    | 1.190                    | .560                  |

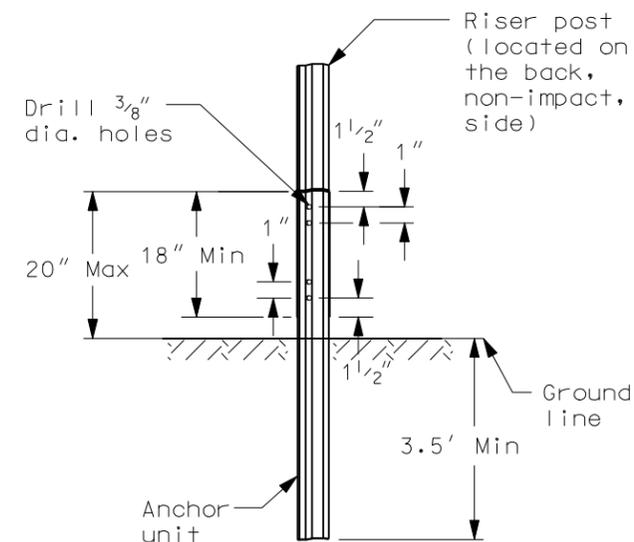
## 3 LB/FT U POSTS



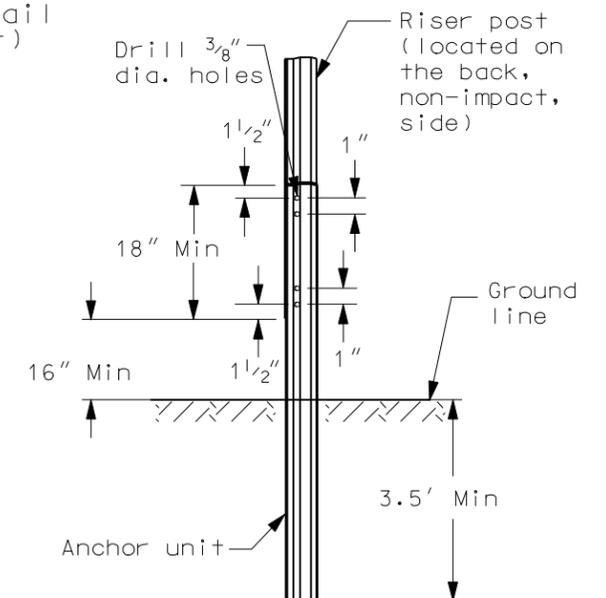
Typical Installation



U-Post Detail (3 lb/ft)



U-Channel Splice Option 1



U-Channel Splice Option 2

### Notes

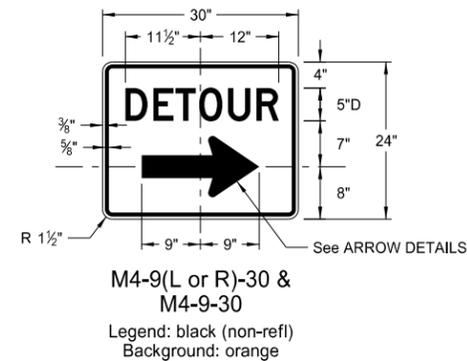
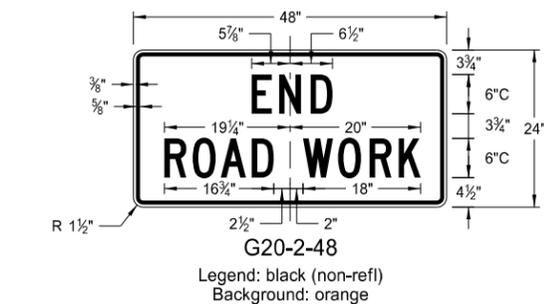
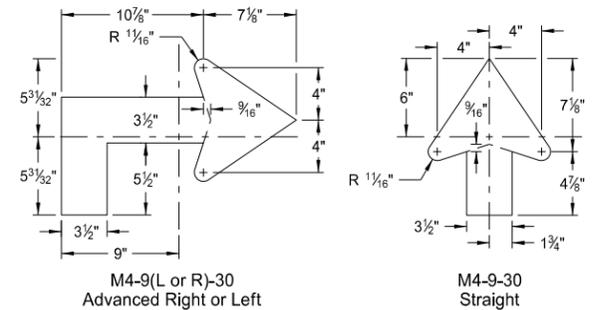
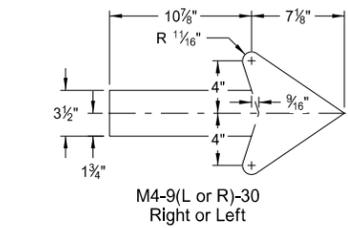
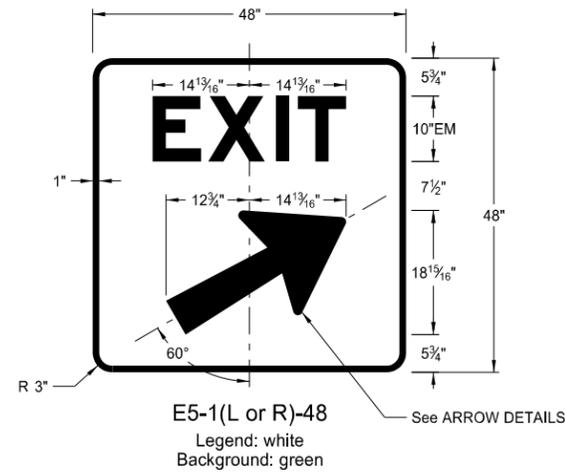
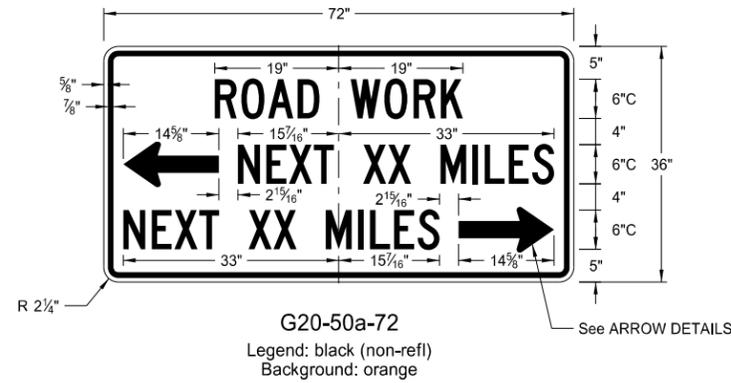
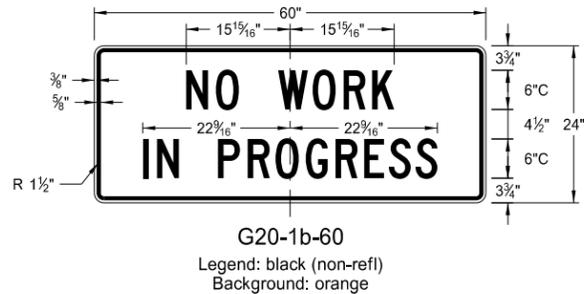
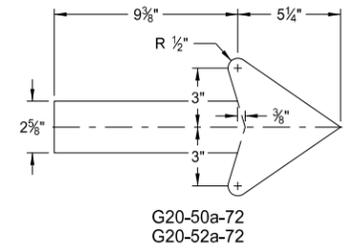
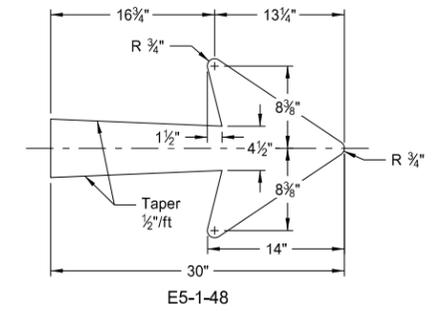
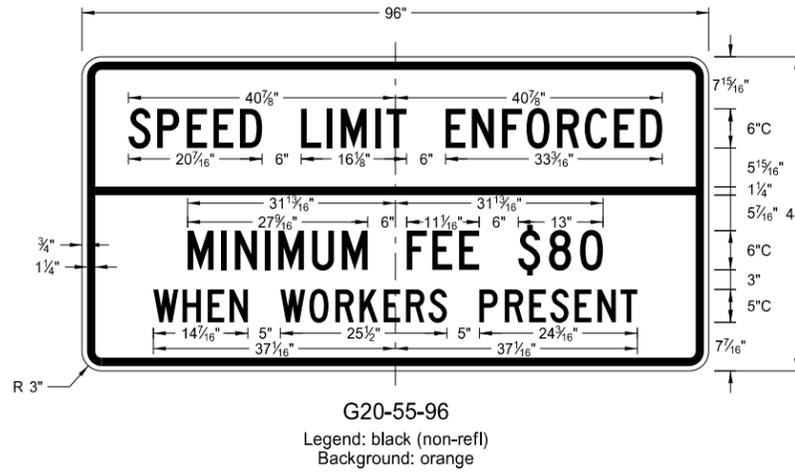
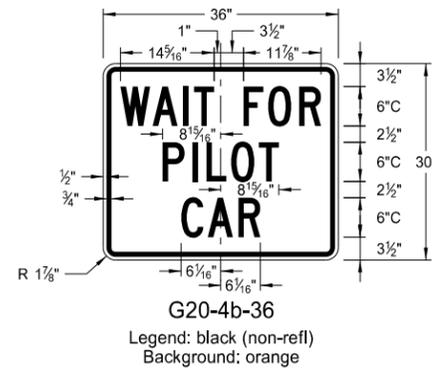
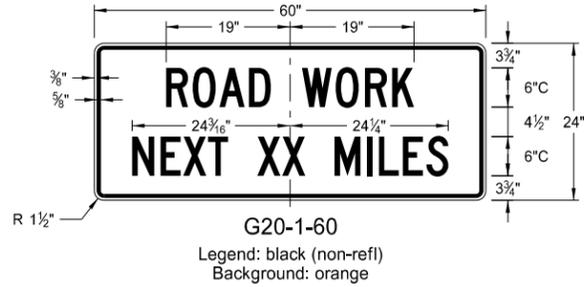
1. Use 3 lb/ft riser anchor units and risers
2. Driven riser posts shall be at least 7' long and embedded at least 3.5'.
3. A splice shall overlap a minimum of 18".
4. Use 4 bolts 5/16" diameter with washers and nuts. Two at top and two at bottom of splice.
5. Anchor unit for guy wires shall be no more than 4" above ground and embedded at least 3.5'.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                              |
|---|------------------------------|
| 07-28-93                                  |                              |
| REVISIONS                                 |                              |
| DATE                                      | CHANGE                       |
| 03-07-01                                  | Revised U-post details       |
| 11-21-02                                  | Deleted perforated tube      |
| 05-08-03                                  | Revised U-Channel splice     |
| 12-01-04                                  | PE stamp added               |
| 06-29-05                                  | Revised flanged channel note |

This document was originally issued and sealed by MARK S GAYDOS Registration Number PE-4518, on 06/29/05 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN DETAILS  
 TERMINAL AND GUIDE SIGNS

D-704-9



ARROW DETAILS

NOTES:

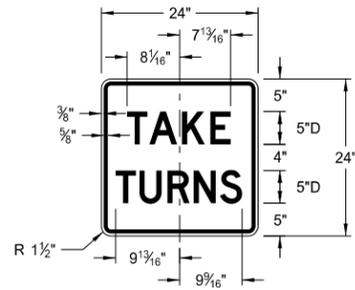
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 8-13-13                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 8/13/13 and the original document is stored at the North Dakota Department of Transportation

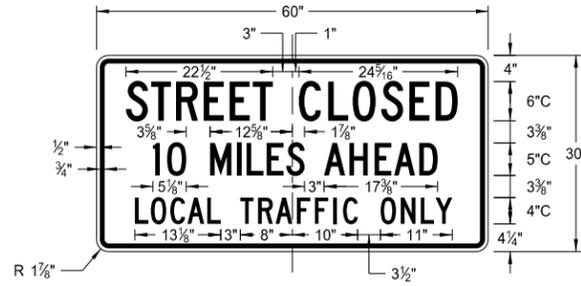
CONSTRUCTION SIGN DETAILS  
REGULATORY SIGNS

D-704-10



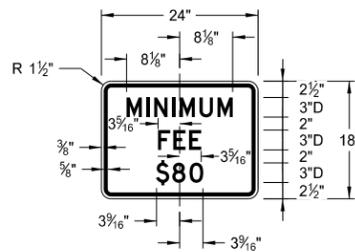
R1-50-24

Legend: black (non-refl)  
Background: white



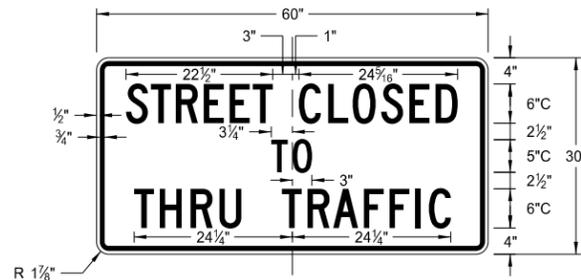
R11-3c-60

Legend: black (non-refl)  
Background: white



R2-1a-24

Legend: black (non-refl)  
Background: white



R11-4a-60

Legend: black (non-refl)  
Background: white



R11-2a-48

Legend: black (non-refl)  
Background: white

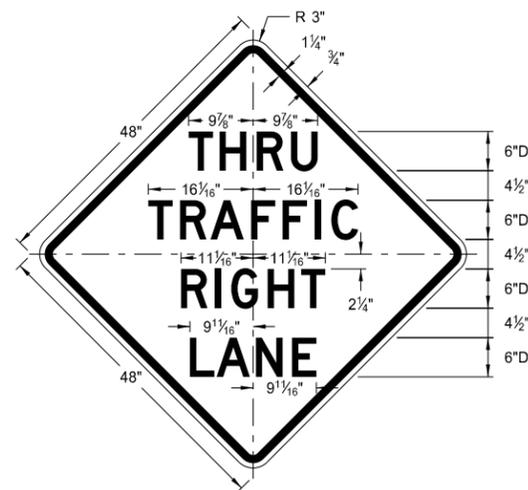
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 8-13-13                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 8/13/13 and the original document is stored at the North Dakota Department of Transportation

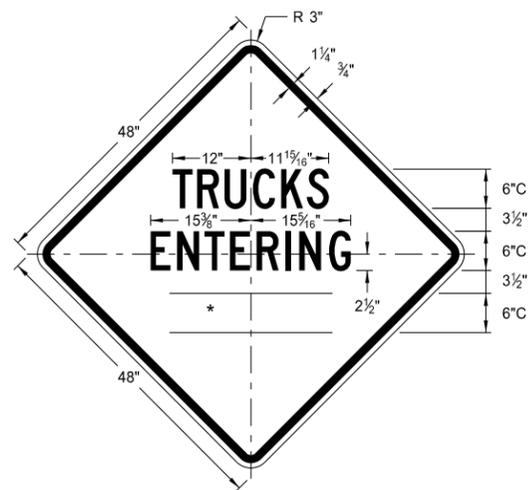
CONSTRUCTION SIGN DETAILS  
WARNING SIGNS

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

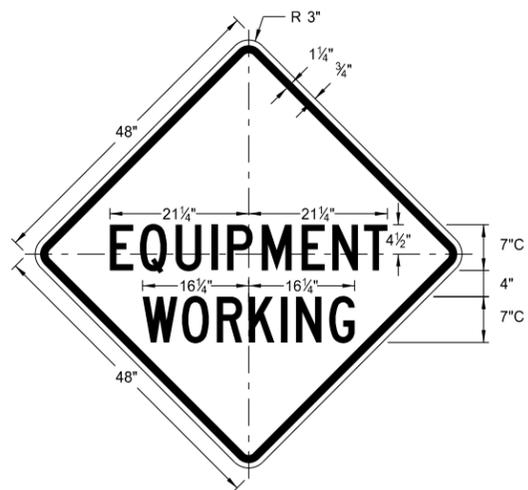
\* DISTANCE MESSAGES



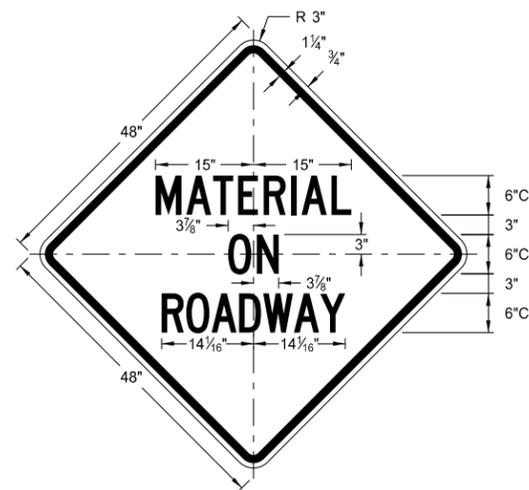
W5-8-48  
Legend: black (non-refl)  
Background: orange



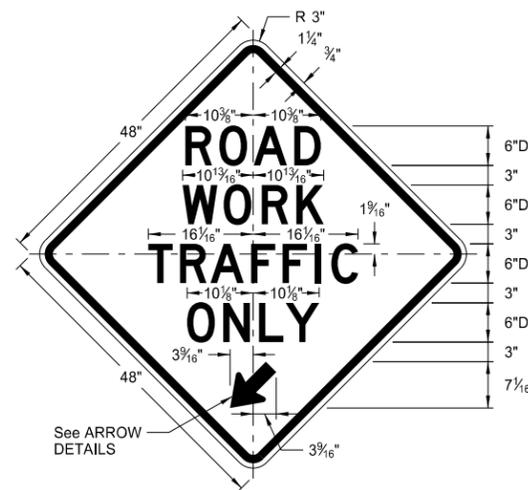
W8-54-48  
Legend: black (non-refl)  
Background: orange



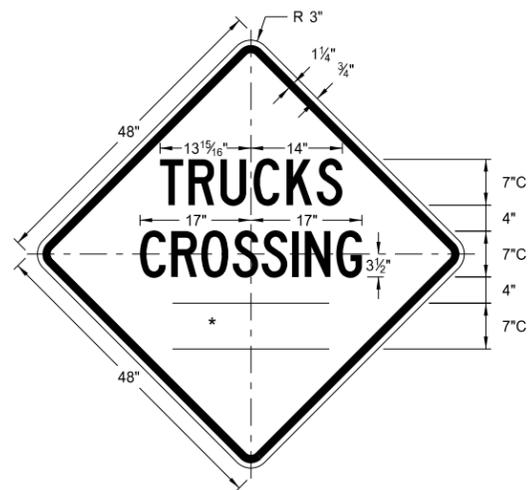
W20-51-48  
Legend: black (non-refl)  
Background: orange



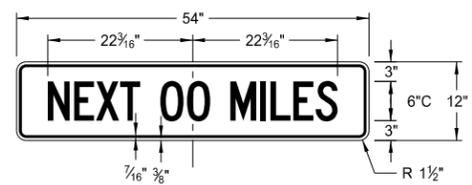
W21-51-48  
Legend: black (non-refl)  
Background: orange



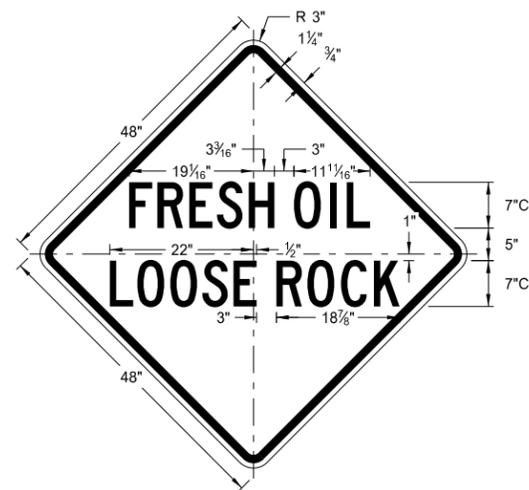
W5-9-48  
Legend: black (non-refl)  
Background: orange



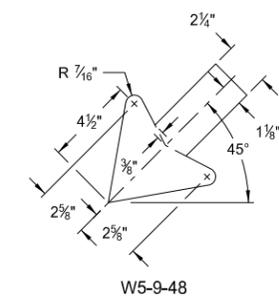
W8-55-48  
Legend: black (non-refl)  
Background: orange



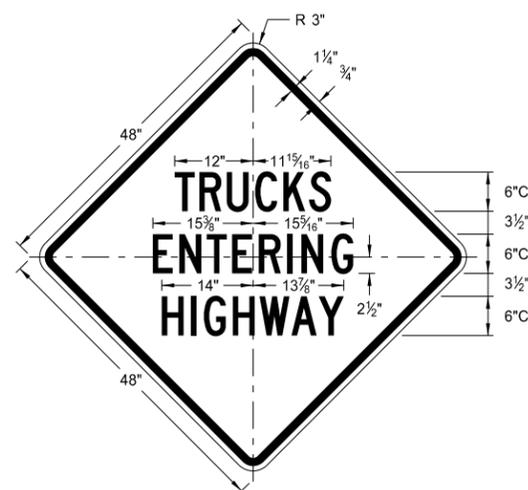
W20-52-54  
Legend: black (non-refl)  
Background: orange



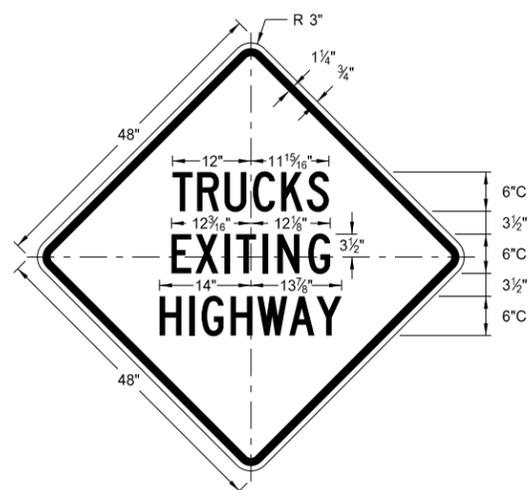
W22-8-48  
Legend: black (non-refl)  
Background: orange



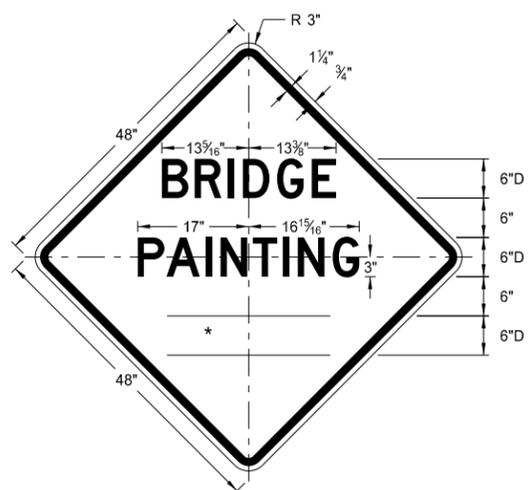
W5-9-48  
ARROW DETAILS



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



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

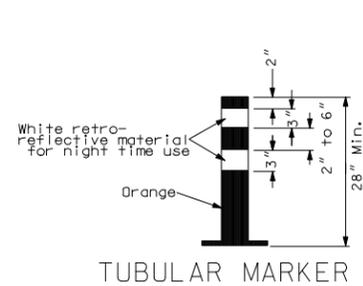


W21-50-48  
Legend: black (non-refl)  
Background: orange

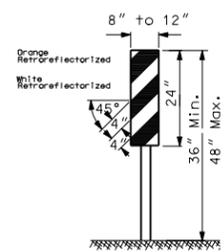
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
|--|--------|
| 8-13-13                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 8/13/13 and the original document is stored at the North Dakota Department of Transportation

# BARRICADE DETAILS AND CHANNELIZING DEVICES

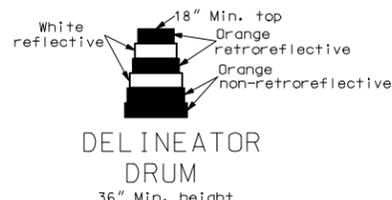


TUBULAR MARKER



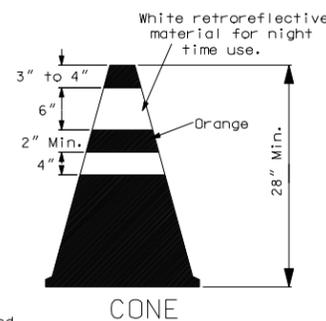
VERTICAL PANEL

(Retro-reflective sheeting shall be placed on both sides)  
NOTE: Vertical panels used on the expressways or other high speed roadways shall be 12" by 24"

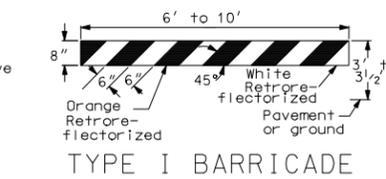


DELINEATOR DRUM  
36" Min. height

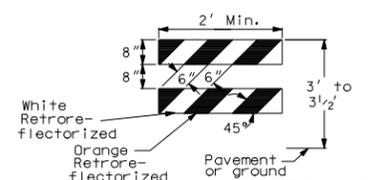
The markings on drums shall be orange and white stripes 4 to 6 inches wide. There shall be at least two orange and two white stripes. Where drums have ribs or indentations, there shall be no retro-reflective sheeting in this area. This space shall be no more than 2 inches wide. The drum surface shall be prepared as recommended by the sheeting manufacturer before retro-reflective sheeting is applied.



CONE

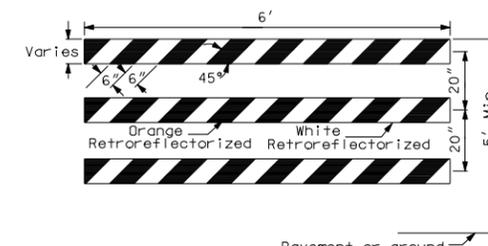


TYPE I BARRICADE



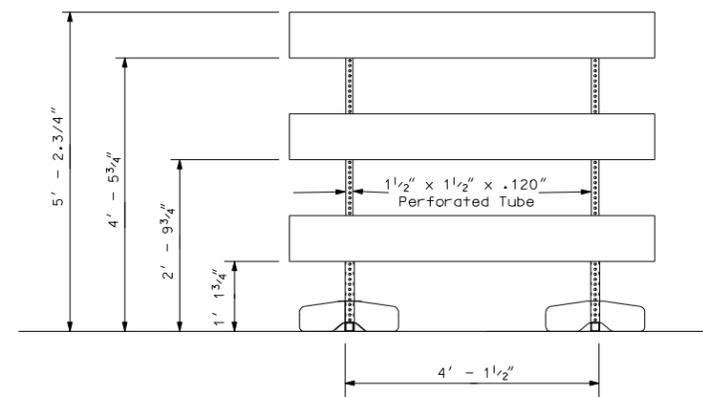
TYPE II BARRICADE

Rail stripe width shall be 4" if barricade length is less than 36".

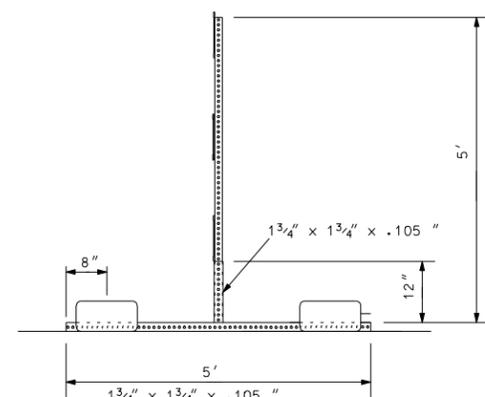


TYPE III BARRICADE

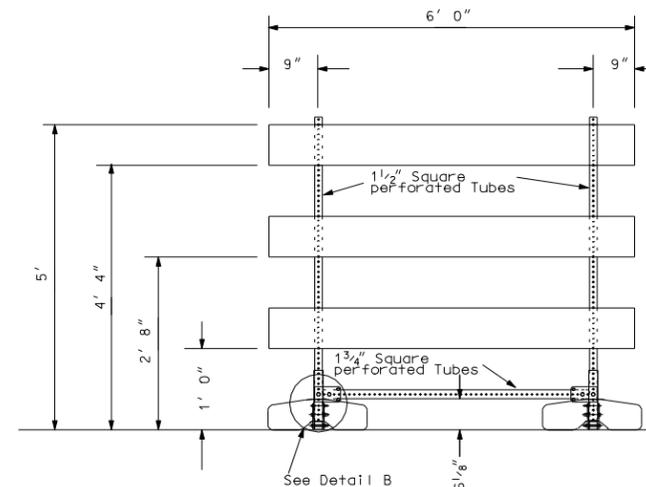
BARRICADES:  
Number of retro-reflective rail faces:  
Type I - 2 (One each direction)  
Type II - 4 (Two each direction)  
Type III - 6 (Three in each direction)



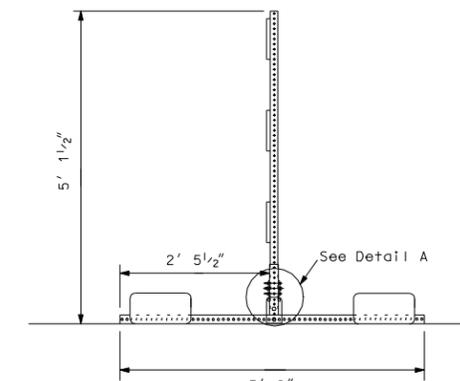
FRONT VIEW



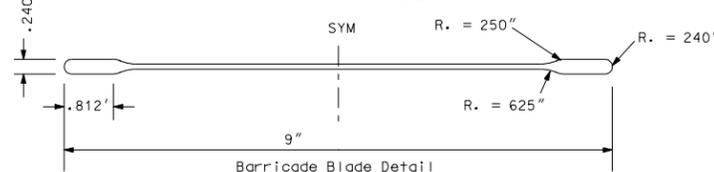
END VIEW



See Detail B



See Detail A



Barricade Blade Detail

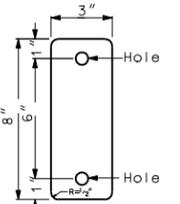
Ballast = 45lb sandbag at the end of each leg.  
Barricade blade fastened to vertical supports with 2" corner bolts.  
Vertical portion of leg is welded to horizontal portion on all four sides.  
Masts slide inside vertical portion of legs. No bolts or fastenings devices used.

BARRICADE ASSEMBLY DETAIL  
(Use when aluminum blade as detailed above)



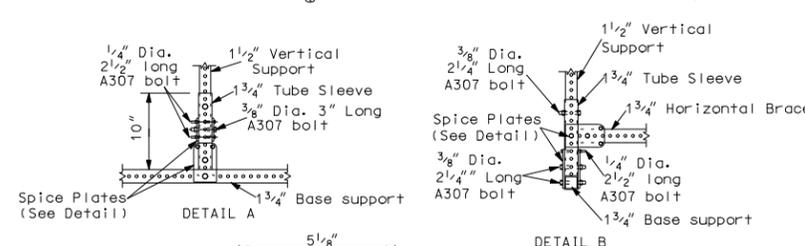
ACRYLIC PLASTIC REFLECTOR

Delineator reflector shall meet the requirements of section 894



DELINEATOR REFLECTOR

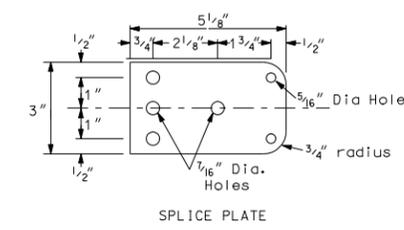
3"x8"-18 Gauge galvanized steel sheet or 0.080" aluminum plate with white retro-reflective sheeting (Type 3A or 3B) as specified in section 894 of the Standard Specifications.



Splice Plates (See Detail)

DETAIL A

DETAIL B



SPLICE PLATE

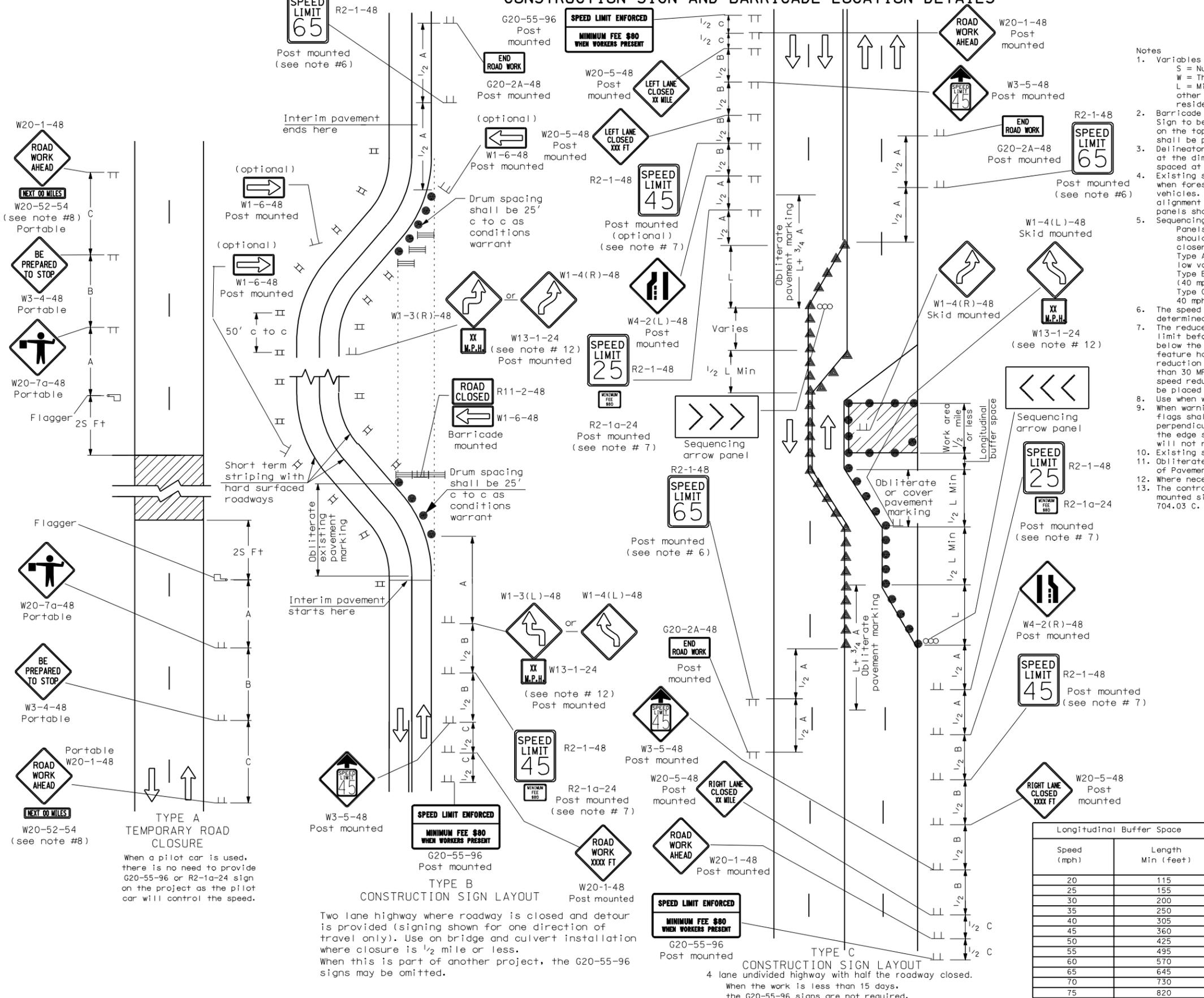
BARRICADE ASSEMBLY DETAIL  
(Use when Plastic I-Beam w/ 1 1/2" Hollow Core Flanges or 1" x 8" x 72" wood boards.)

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                                     |
|---|-------------------------------------|
| 10-1-86                                   |                                     |
| REVISIONS                                 |                                     |
| DATE                                      | CHANGE                              |
| 08-03-87                                  | Type sheeting                       |
| 10-01-87                                  | Delineator drum note                |
| 06-08-88                                  | Barricade type III                  |
| 06-01-92                                  | General revision                    |
| 06-10-93                                  | General revision                    |
| 09-23-93                                  | Vertical panel                      |
| 06-09-95                                  | Reflective sheeting                 |
| 03-01-02                                  | Barricade type III assembly details |
| 04-01-02                                  | Type III barricade                  |
| 12-01-04                                  | PE stamp added                      |
| 06-29-05                                  | Revised Type II barricade stripe    |

This document was originally issued and sealed by MARK S GAYDOS Registration Number PE-4518, on 06/29/05 and the original document is stored at the North Dakota Department of Transportation



CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS



- Notes
- Variables
    - S = Numerical value of speed limit or 85th percentile.
    - W = The width of taper.
    - L = Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x S<sup>2</sup>/60 for urban, residential, and other streets with speeds of 40 mph or less.
  - Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on roadway shall be placed on skid mounted assemblies.
  - Delineator drums, barricades or cones used for tapering traffic shall be spaced at the dimension "S". Delineator drums or cones used for tangents shall be spaced at 2 times dimension "S".
  - Existing striping shall be removed as required. Delineators will only be used when foreslope is 1V:4H or better and roadway alignment is visible to approaching vehicles. Vertical panels shall be used where roadways has steep slopes and alignment is not visible to approaching vehicles. Delineators and vertical panels shall be installed back to back.
  - Sequencing Arrow Panels
    - Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface.
    - Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph and 750 ADT or less).
    - Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less).
    - Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 5000 ADT).
  - The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
  - The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
  - Use when work area is 1 mile or longer.
  - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
  - Existing speed limit signs within a reduced speed zone shall be covered.
  - Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
  - Where necessary, safe speed to be determined by the Engineer.
  - The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 c.

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

KEY

|  |                    |  |   |
|--|--------------------|--|---|
|  | Type I barricade   |  | Work area   |
|  | Type II barricade  |  | Flagger   |
|  | Type III barricade |  | Sequencing arrow panel                            |
|  | Sign               |  | Type A delineator or vertical panels back to back |
|  | Delineator drum    |  |   |
|  | Cones              |  |   |

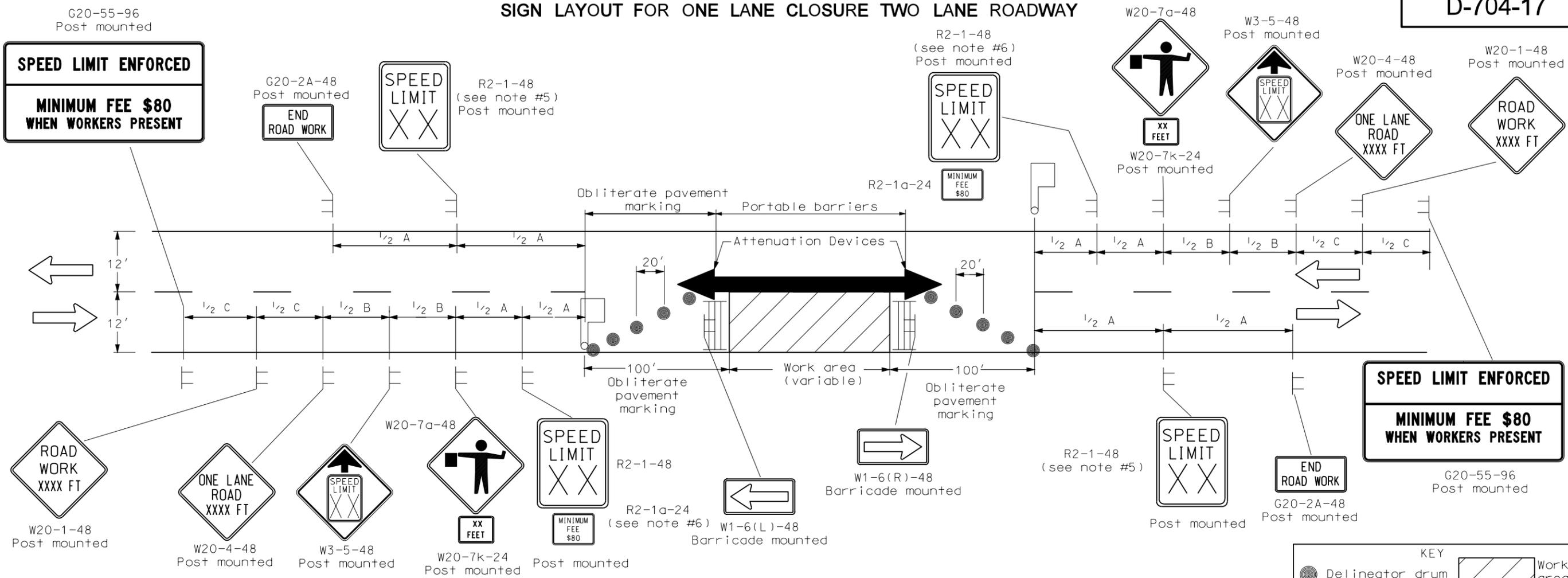
| Speed (mph) | Length Min (feet) |
|-------------|-------------------|
| 20          | 115               |
| 25          | 155               |
| 30          | 200               |
| 35          | 250               |
| 40          | 305               |
| 45          | 360               |
| 50        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

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |  |
|---|--|
| 10-1-86                                   |  |
| REVISIONS                                 |  |
| DATE                                      | CHANGE   |
| 01-05-01                                  | Revised note 3   |
| 07-19-02                                  | Reversed End Road Work & Speed Signs   |
| 07-25-03                                  | Revised R2-1, R2-1a and W20-1  |
| 04-01-04                                  | Change Fee Sign, Warning & Buffer Spacing  |
| 12-18-03                                  | Relocated reverse curve  |
| 12-01-04                                  | PE stamp added   |
| 06-29-05                                  | Revised W4-2, Replaced R2-5a with W3-5, Rev. Adv. Warning Table, Rev. Note 7, Changed W20-7b to W3-4 |
| 07-05-05                                  |  |

This document was originally issued and sealed by Mark S Gaydos Registration Number PE-4518, on 07/05/05 and the original document is stored at the North Dakota Department of Transportation

# SIGN LAYOUT FOR ONE LANE CLOSURE TWO LANE ROADWAY

**D-704-17**



**Notes**

1. Floodlights shall be provided to mark flagger stations at night. The lighting shall not create a disabling glare for drivers. Placement and elimination of potential glare can best be determined by driving through and observing the floodlighted area from each direction on the main roadway after lighting is set up.
2. Barricade shown to be placed on roadway shall be on a movable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on the roadway shall be placed on skid mounted assembly.
3. Delineator drums used for tapering traffic shall be spaced at 20 ft. center to center.
4. Existing striping shall be removed as required. Delineators will only be used when inslope is 4:1 or better and roadway alignment is visible to approaching vehicles. Vertical panels shall be used where roadways have steep slopes and alignment is not visible to approaching vehicles. Delineators and vertical panels shall be installed back to back.
5. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
6. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
7. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
8. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.

9. Where necessary, safe speed to be determined by the Engineer.
10. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
11. Existing speed limit signs within a reduced speed zone shall be covered.
12. G20-55-96 sign is not required if this standard is part of other traffic control layouts, or the work is less than 15 days.

**KEY**

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

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

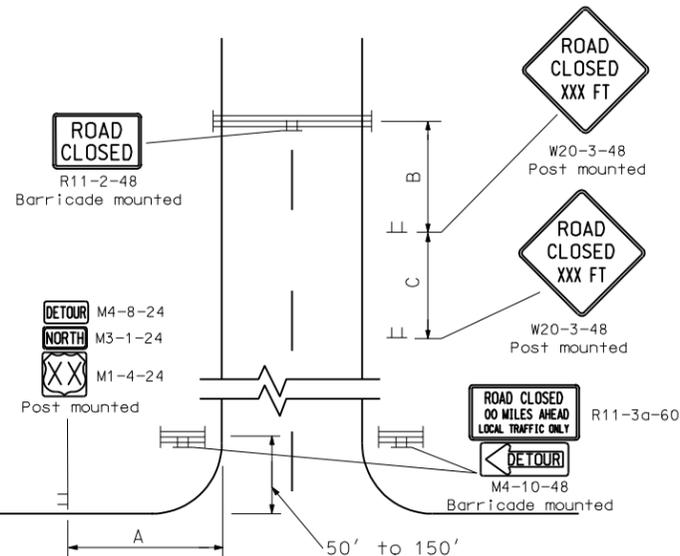
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |  |
|---|--|
| 10-1-86                                   |  |
| REVISIONS                                 |  |
| DATE                                      | CHANGE   |
| 01-31-97                                  | Sign spacing   |
| 10-01-99                                  | General revisions  |
| 03-29-00                                  | Minor revisions  |
| 01-05-01                                  | Revised note 3   |
| 07-19-02                                  | Reversed End Road Work & speed limit signs                     |
| 07-25-03                                  | Revised R2-1a and W20-1  |
| 04-01-04                                  | Rev. fee sign & Warning Sign Spacing, rev note 6, add note 12  |
| 12-01-04                                  | PE Stamp added   |
| 06-29-05                                  | Replaced R2-5a with W3-5, Rev. Adv. Warning Table, Rev. Note 6 |

This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE- 4518**, on **06/29/05** and the original document is stored at the **North Dakota Department of Transportation**

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

Notes

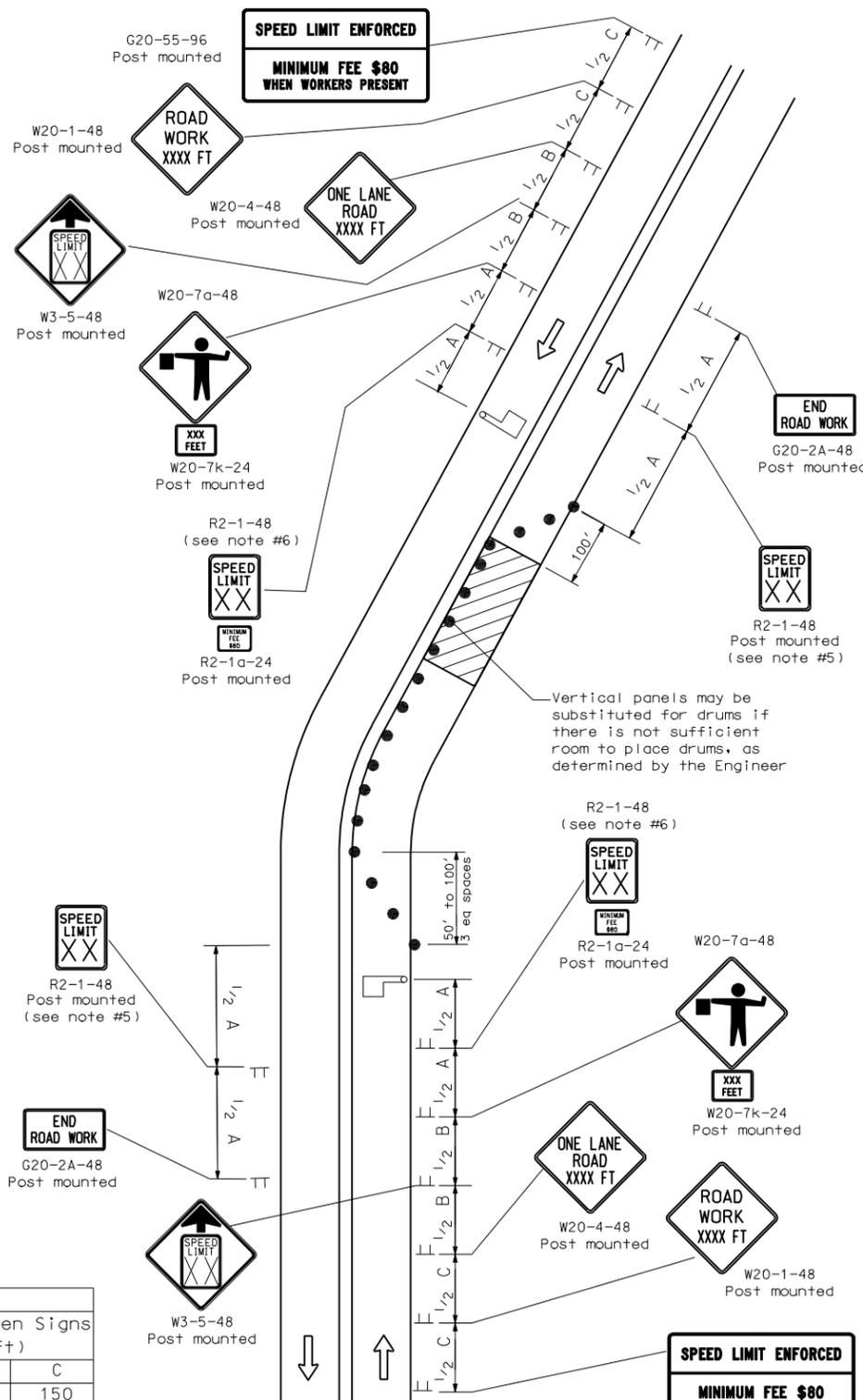
- Variables  
 S = Numerical value of speed limit or 85th percentile.  
 W = The width of taper  
 L = Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x S<sup>2</sup>/60 for urban, residential, and other streets with speeds of 40 mph or less.
- Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on the roadway shall be placed on skid mounted assemblies.
- Delineator drums used for tapering traffic shall be placed at 3 equal spaces. Delineator drums for tangents shall be spaced at 2 times dimension "S".
- Sequencing Arrow Panels  
 Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface. Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph and 750 ADT or less). Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less). Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 5000 ADT).
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
- G20-55-96 or R2-1a-24 sign are not required when a pilot car operation is used.



TYPE E  
CONSTRUCTION SIGN LAYOUT

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

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



TYPE F  
CONSTRUCTION SIGN LAYOUT

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

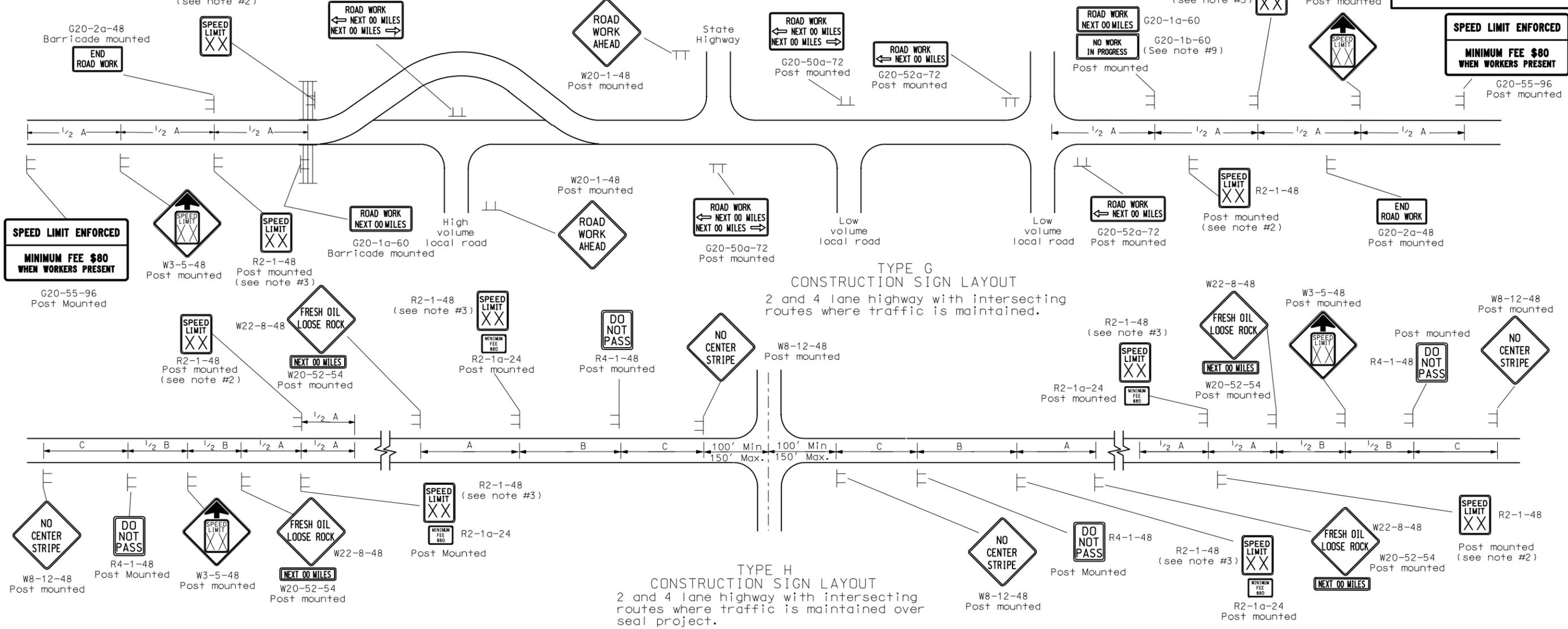
KEY

- Delineator Drum
- ┌ Type A Delineator
- ┐ Sign
- ▲ Cone
- ┌ Type I Barricade
- ┌ Type II Barricade
- ┌ Type III Barricade
- ┐ Flagger
- ∞ Sequencing Arrow Panel
- ▨ Work/Hazard Area

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |   |
|---|---|
| 10-1-86                                   |   |
| REVISIONS                                 |   |
| DATE                                      | CHANGE  |
| 07-19-02                                  | Reversed End Road Work & Speed Limit Signs                        |
| 07-25-03                                  | Revised R2-1a and W20-1   |
| 01-16-04                                  | Revised type F  |
| 04-01-04                                  | Revised fee sign & warning sign spacing. Rev. note 6, add note 12 |
| 12-01-04                                  | PE stamp added  |
| 06-29-05                                  | Added W3-5 to type F, Rev. Adv. Warning Table, Rev. Note 6        |
| 04-05-06                                  | Showed signing for opposite direction                             |
| 02-16-07                                  | Added W3-5-48 to opposite direction of Type F layout              |

This document was originally issued and sealed by MARK S GAYDOS Registration Number PE-4518, on 02/16/2007 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS



- Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on the roadway shall be placed on skid mounted assemblies.
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 MPH below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 MPH. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Sign no. R2-1-48, R2-1a-24, R4-1-48, W22-8-48, W20-52-54, and W8-12-48 shall be placed just after all important intersections and every five miles in either direction. Sign no W8-12-48 shall be placed when traffic volumes are 750 ADT or less. No short term markings are placed when this condition exists.

- The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
- Type H construction sign traffic control shall have the speed limit signs covered or removed once the loose aggregate has been removed.
- The contractor shall install the G20-1b-60 sign when work is suspended for winter.
- The layouts show the signs needed before work begins. The requirements at the actual work areas will require the use of other standards. If the speed limit is reduced in the work areas, the speed limit signs shall have the R2-1a-24 sign placed below.

KEY

|  |                    |  |   |
|--|--------------------|--|---|
|  | Type I barricade   |  | Work area   |
|  | Type II barricade  |  | Flagger   |
|  | Type III barricade |  | Sign  |
|  | Delineator drum    |  | Sequencing arrow panel                            |
|  | Cones              |  | Type A delineator or vertical panels back to back |

ADVANCE WARNING SIGN SPACING

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 10-1-86

REVISIONS

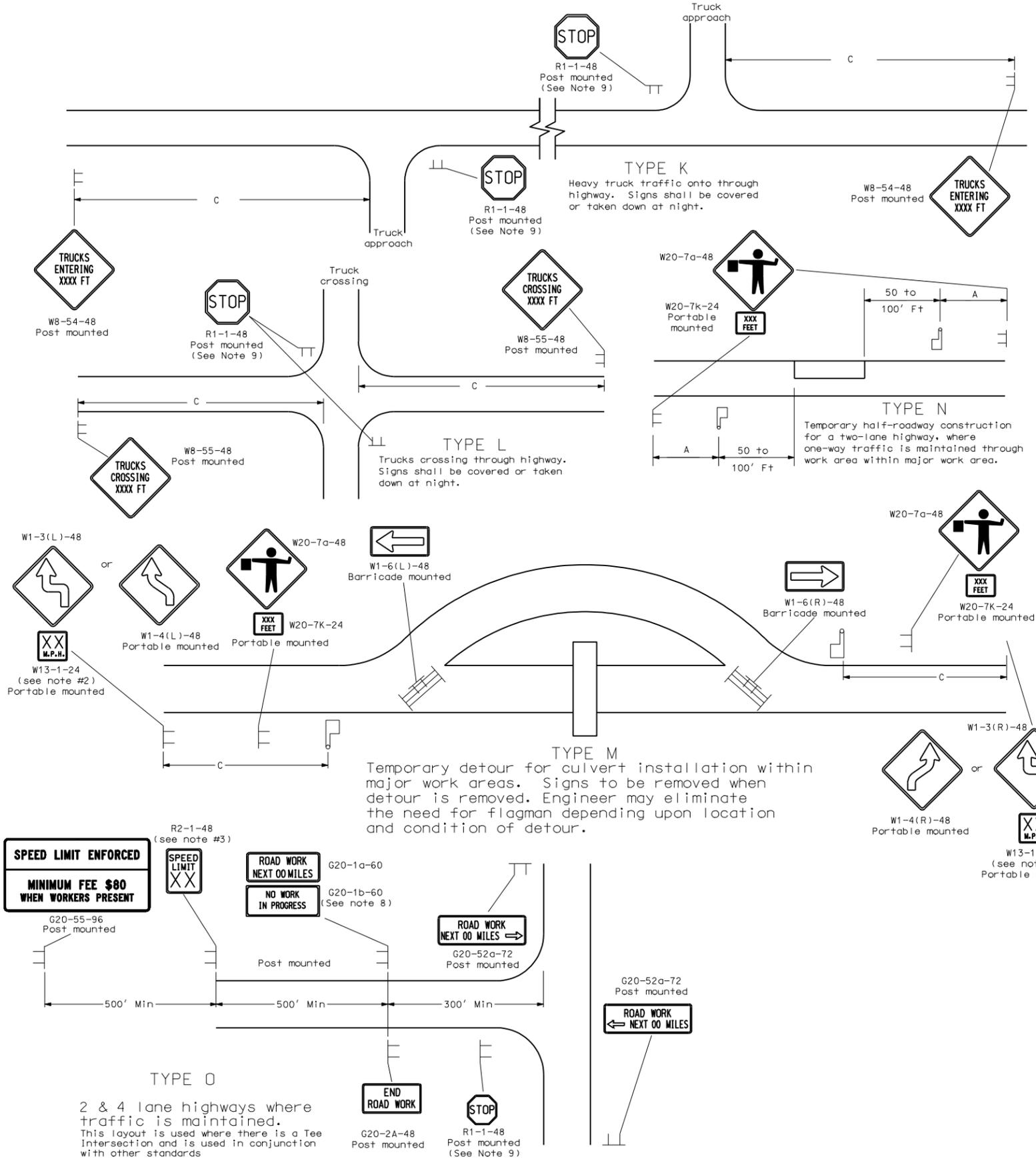
| DATE     | CHANGE  |
|----------|---|
| 08-15-96 | Revise flag note  |
| 10-01-99 | General revisions   |
| 10-18-01 | Added note 8 & 9  |
| 07-19-02 | Rev. end road work & speed limit sign                                 |
| 07-25-03 | Rev. R2-1a & W20-1  |
| 04-01-04 | Rev. Fee sign & warning sign spacing Rev note 3, add note 10          |
| 12-01-04 | PE Stamp added  |
| 06-29-05 | Added W3-5 to Type H and Type G, Rev. Adv. Warning Table, Rev. Note 3 |
| 04-05-06 | Corrected sign W3-5   |

This document was originally issued and sealed by MARK S. GAYDOS, Registration Number PE-4518, on 04/05/06 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

Notes

1. Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be placed on top of the top barricade bar. Sign shown to be placed on the roadway shall be placed on skid mounted assemblies.
2. Where necessary, safe speed to be determined by the Engineer.
3. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
4. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
5. Existing speed limit signs within a reduced speed zone shall be covered.
6. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
7. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
8. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
9. If existing stop sign is in place, a 48" stop sign is not required.



KEY

|  |                    |  |   |
|--|--------------------|--|---|
|  | Type I barricade   |  | Work area   |
|  | Type II barricade  |  | Flagger   |
|  | Type III barricade |  | Sequencing arrow panel                            |
|  | Sign               |  | Type A delineator or vertical panels back to back |
|  | Delineator drum    |  |   |
|  | Cones              |  |   |

ADVANCE WARNING SIGN SPACING

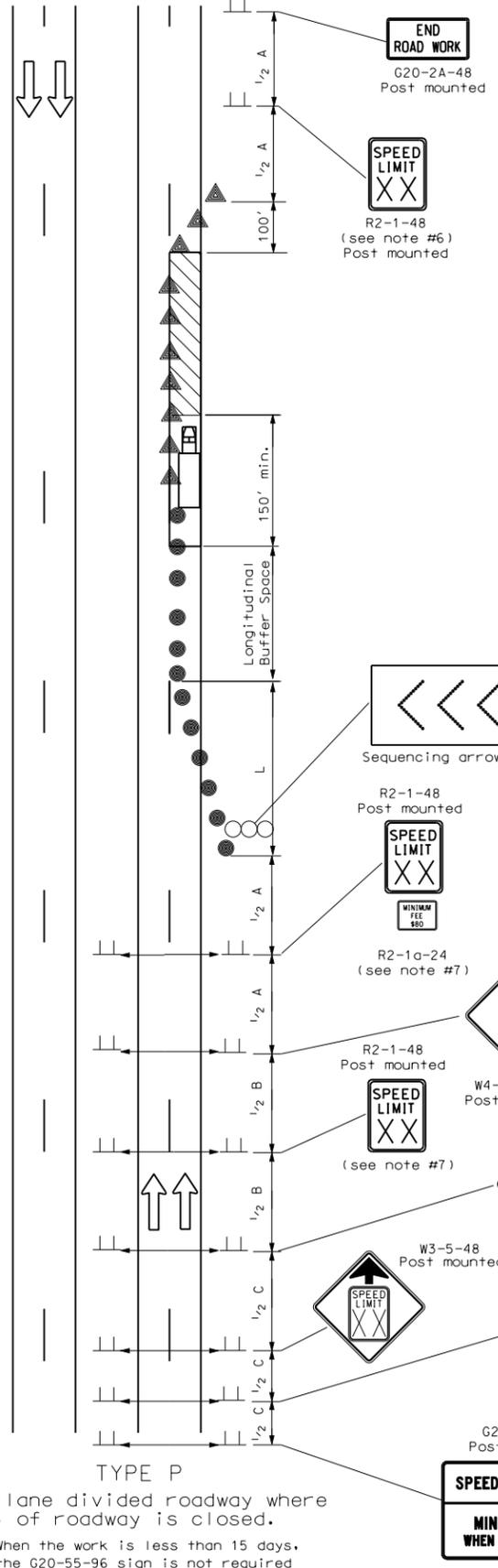
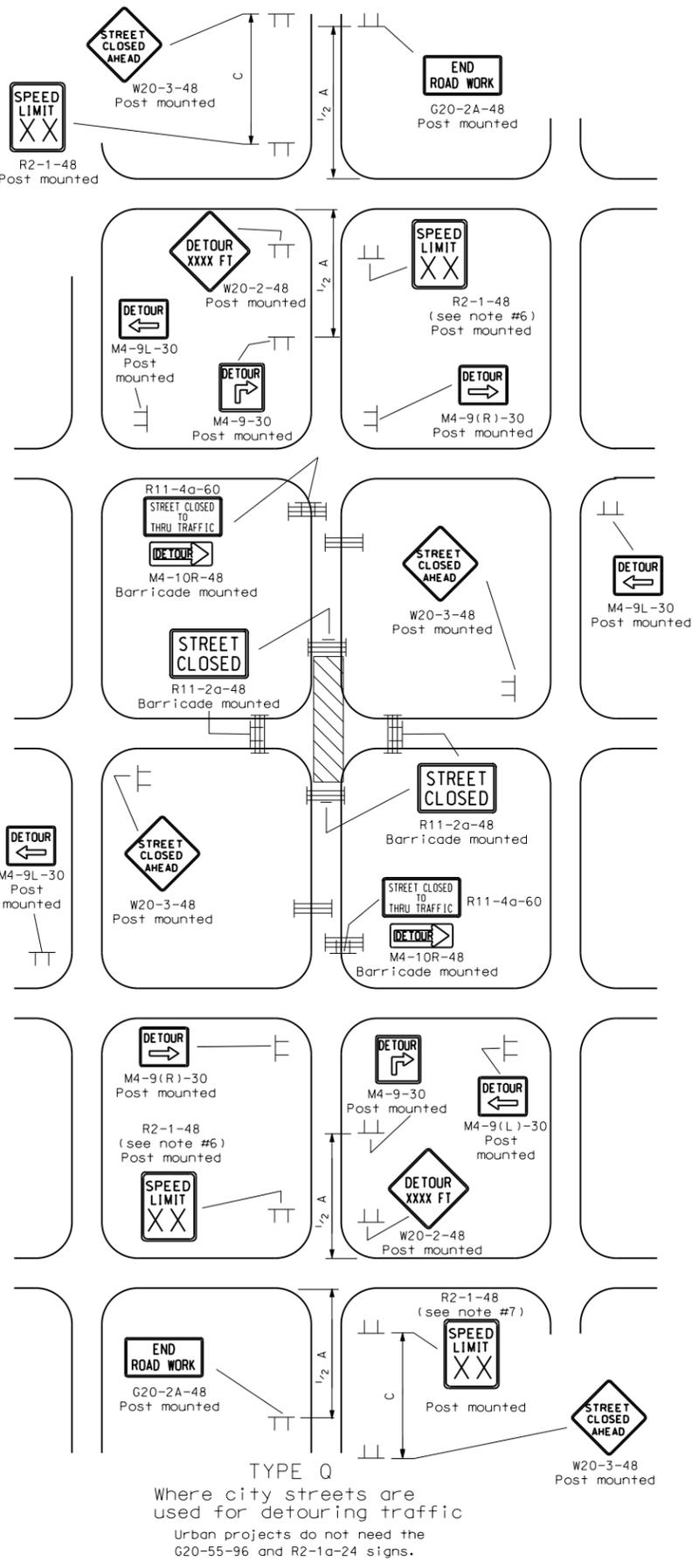
| Road Type   | Distance Between Signs Min. (ft) |      |      |
|---|----------------------------------|------|------|
|   | A                                | B    | C    |
| Urban - Low Speed (30 mph or less)                    | 150                              | 150  | 150  |
| Urban - Low Speed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

NORTH DAKOTA  
DEPARTMENT OF TRANSPORTATION  
10-1-86

| REVISIONS |  |
|-----------|--|
| DATE      | CHANGE                                   |
| 09-30-93  | General revisions                        |
| 06-21-95  | General revisions                        |
| 08-15-96  | Revise flag note                         |
| 10-01-99  | General revisions                        |
| 02-02-00  | W8-55-48 Deleted Work In Progress Sign   |
| 10-17-02  | Revised R2-1a                            |
| 07-25-03  | Revised fee sign & Warning sign spacing. |
| 04-01-04  | Revised note 3                           |
| 12-01-04  | PE stamp added.                          |
| 02-14-05  | Added note 9 and revised stop sign size  |
| 06-29-05  | Rev. Adv. Warning Table, Rev. Note 3     |

This document was originally issued and sealed by Mark S Gaydos Registration Number PE-4518, on 06/29/05 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS



- Notes
- Variables  
 S = Numerical value of speed limit or 85th percentile.  
 W = The width of taper  
 L = Minimum length of taper, or  $S \times W$  for freeways, expressways, and all other roads with speeds of 45 mph or greater, or  $W \times S^2 / 60$  for urban, residential, and other streets with speeds of 40 mph or less.
  - Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Signs shown to be placed on the roadway shall be placed on skid mounted assemblies.
  - Delineator drums, or cones used for tapering traffic shall be spaced at dimension "S". Delineator drums, or cones used for tangents shall be spaced at 2 times "S".
  - Existing striping shall be removed as required. Delineator will only be used when in slope is 4:1 or better and roadway alignment is visible to approaching vehicles. Vertical panels shall be used where roadways has steep slopes and not visible to approaching vehicles. Delineators and vertical panels shall be installed back to back.
  - Sequencing Arrow Panels  
 Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room the panel should be moved closer to the work area so that it can be placed on the roadway surface.  
 Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph and 750 ADT or less).  
 Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph 5000 ADT or less).  
 Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 5000 ADT).  
 The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
  - The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
  - Use when work area is 1 mile or longer.
  - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
  - Existing speed limit signs within a reduced speed zone shall be covered.
  - Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
  - Intersection control for Type Q may have to be changed on detour. The Engineer in the field shall determine what control is necessary.
  - Where necessary, safe speed to be determined by the Engineer. When parking is present, signs shall be placed so they are entirely visible above parked vehicles or placed at the edge of the parking area so they are visible to oncoming traffic. These signs may be skid mounted when placed on the roadway surface.
  - The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.

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

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

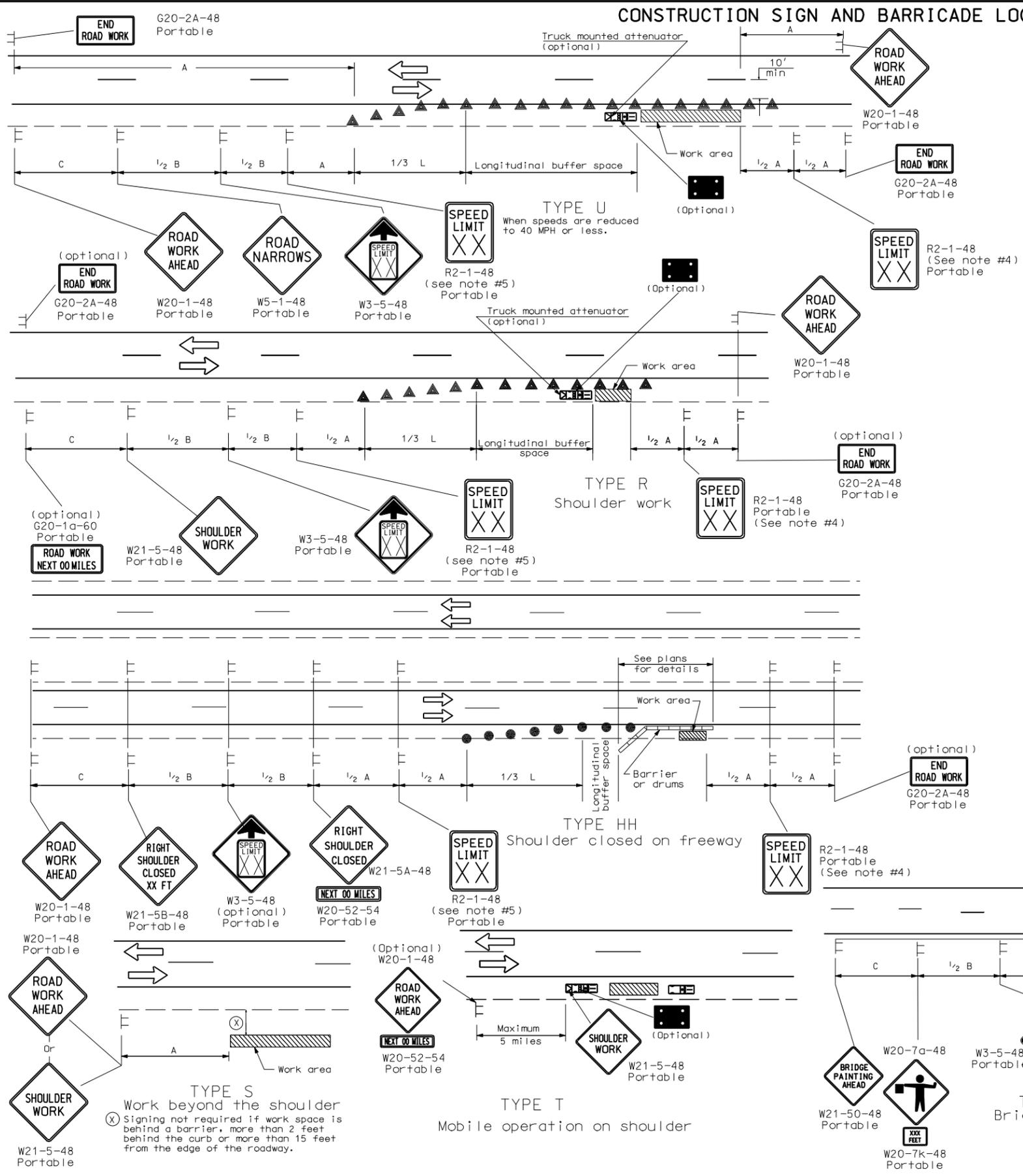
|  |                    |  |   |
|--|--------------------|--|---|
|  | Type I barricade   |  | Work area   |
|  | Type II barricade  |  | Flagger   |
|  | Type III barricade |  | Sequencing arrow panel                            |
|  | Sign               |  | Type A delineator or vertical panels back to back |
|  | Delineator drum    |  |   |
|  | Cones              |  |   |

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |  |
|---|--|
| 10-1-86                                   |  |
| REVISIONS                                 |  |
| DATE                                      | CHANGE   |
| 09-03-96                                  | 70 MPH Sign spacing                                  |
| 01-31-97                                  | General revisions                                    |
| 10-01-99                                  | Add Taper Width to note                              |
| 11-15-99                                  | Revised note 3                                       |
| 01-05-01                                  | Revised End Road Work & Speed Limit Signs            |
| 07-19-02                                  | Revised R2-1a and W20-1                              |
| 07-25-03                                  | Rev. fee sign & warning & buffer spacing. Rev note 7 |
| 04-01-04                                  | General revisions                                    |
| 09-15-04                                  | PE Stamp added                                       |
| 12-01-04                                  | Revised W4-2, Replaced R2-5a with W3-5.              |
| 06-29-05                                  | Rev. Adv. Warning Table. Rev. Note 7                 |

This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE- 4518**, on 06/29/05 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

- Notes
- Variables  
 S = Numerical value of speed limit or 85th percentile.  
 W = The width of the taper.  
 L = Minimum length of taper, or  $S \times W$  for freeways, expressways, and all other roads with speeds of 45 mph or greater, or  $W \times S^2/60$  for urban, residential, and other streets with speeds of 40 mph or less.
  - Delineator drums, or cones used for tapering traffic shall be spaced at dimension "S". Delineator drums, or cones used for tangents shall be spaced at 2 times "S".
  - Sequencing Arrow Panels  
 Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph and 750 ADT or less).  
 Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less).  
 Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 5000 ADT).  
 The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
  - The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at  $1/2 B$ .
  - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
  - Existing speed limit signs within a reduced speed zone shall be covered.
  - The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.



| 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               |

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

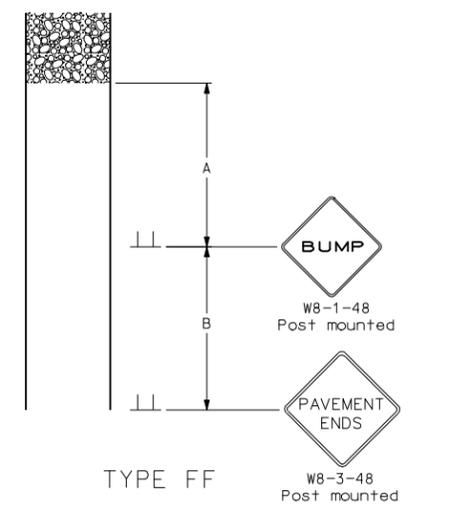
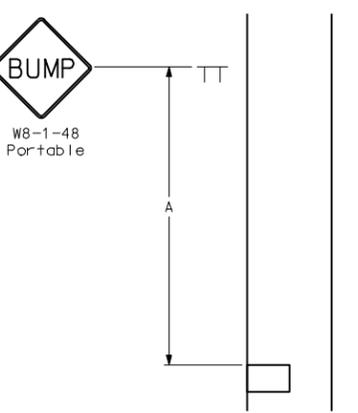
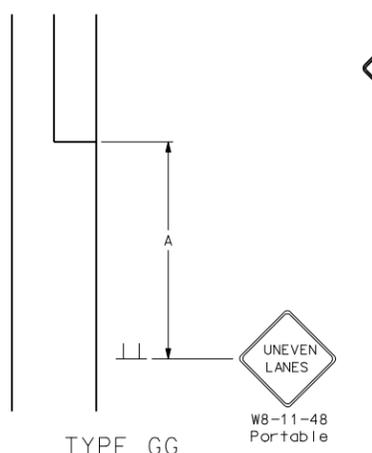
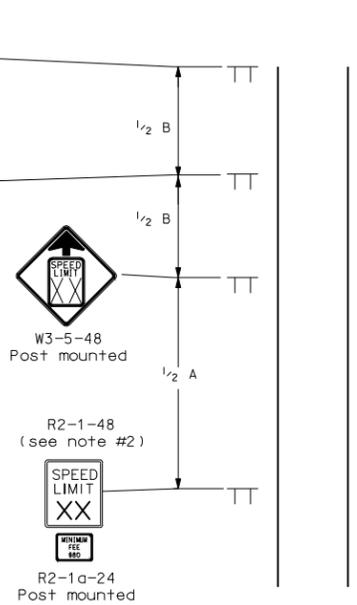
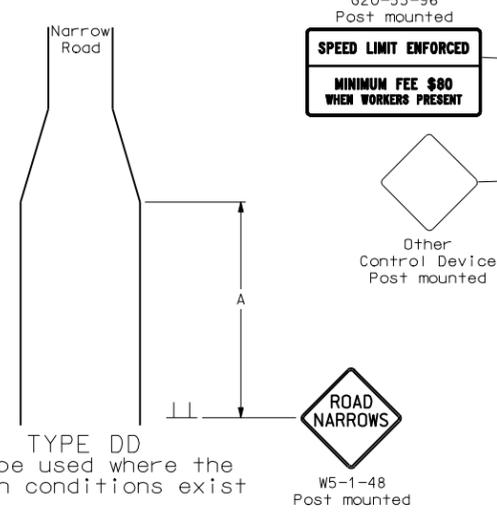
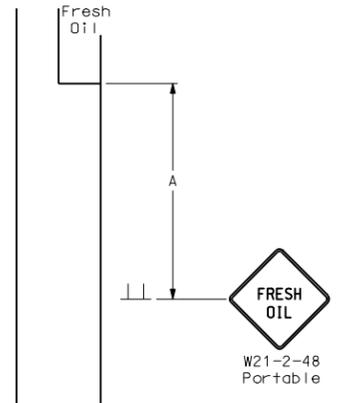
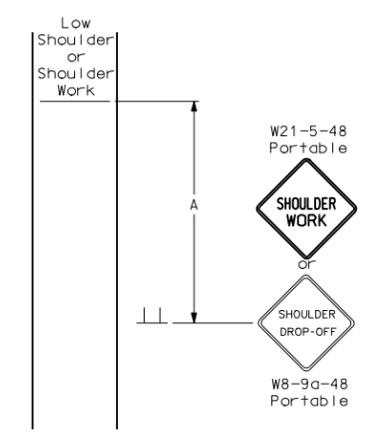
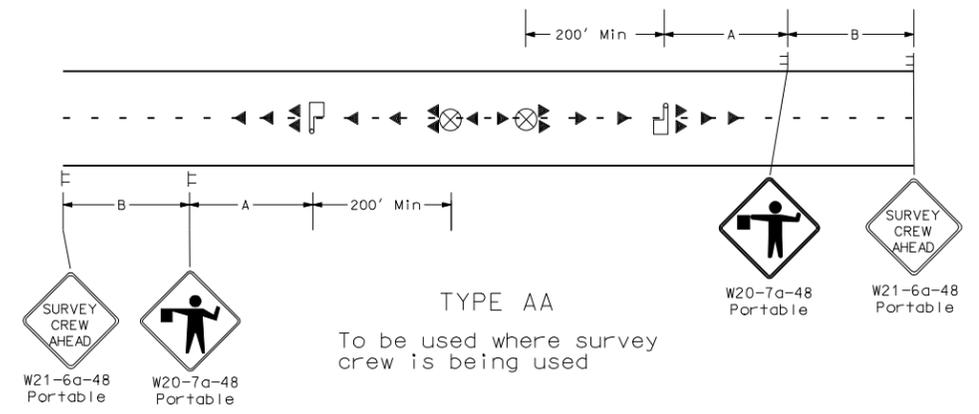
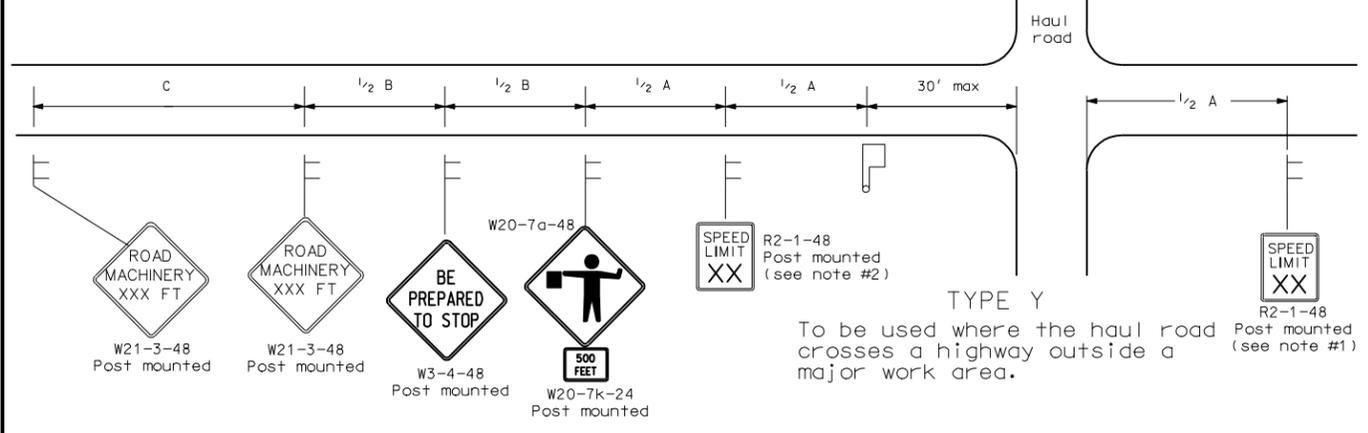
**KEY**

- Type I barricade
- Type II barricade
- Type III barricade
- Sign
- Delineator drum
- Cones
- Work area
- Flagger
- Sequencing arrow panel
- Type A delineator or vertical panels back to back

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 10-1-86 |   |
|---|---|
| REVISIONS   |   |
| DATE  | CHANGE  |
| 10-01-99  | General revisions   |
| 10-04-99  | Type HH barrier   |
| 11-15-99  | Add taper width & note  |
| 03-15-01  | Revised note 2  |
| 07-19-02  | Reversed End Road Work & Speed Limit signs                    |
| 07-25-03  | Revised R2-1a and W20-1                                       |
| 04-01-04  | Removed fee sign & rev warning & buffer spacing rev note 5    |
| 12-01-04  | PE Stamp added  |
| 06-29-05  | Replaced R2-5a with W3-5 Rev. Adv. Warning Table, Rev. Note 5 |

This document was originally issued and sealed by Mark S Gaydos Registration Number PE-4518, on 06/29/05 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS



- Notes
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
  - The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
  - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
  - Existing speed limit signs within a reduced speed zone shall be covered.
  - The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
  - G20-55-96 or R2-1a-24 signs are not required if this standard is part of other traffic control layouts, or the work is less than 5 days.

KEY

|  |                    |  |   |
|--|--------------------|--|---|
|  | Type I barricade   |  | Work area   |
|  | Type II barricade  |  | Flagger   |
|  | Type III barricade |  | Sequencing arrow panel                            |
|  | Sign               |  | Type A delineator or vertical panels back to back |
|  | Delineator drum    |  |   |
|  | Cones              |  |   |

ADVANCE WARNING SIGN SPACING

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 10-1-86

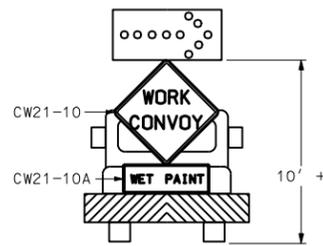
REVISIONS

| DATE     | CHANGE   |
|----------|--|
| 09-03-96 | 70 mph   |
| 01-31-97 | Sign spacing   |
| 10-01-99 | General Revision   |
| 07-19-02 | Revised spacing of Speed Limit Signs                           |
| 01-30-03 | Pavement end sign  |
| 07-25-03 | Revised R2-1a  |
| 04-01-04 | Rev. fee sign & warning sign spacing. Add note 6               |
| 12-01-04 | PE Stamp added   |
| 06-29-05 | Replaced R2-5a with W3-5, Rev. Adv. Warning Table, Rev. Note 2 |
| 07-05-05 | Changed W20-7b to W3-4   |

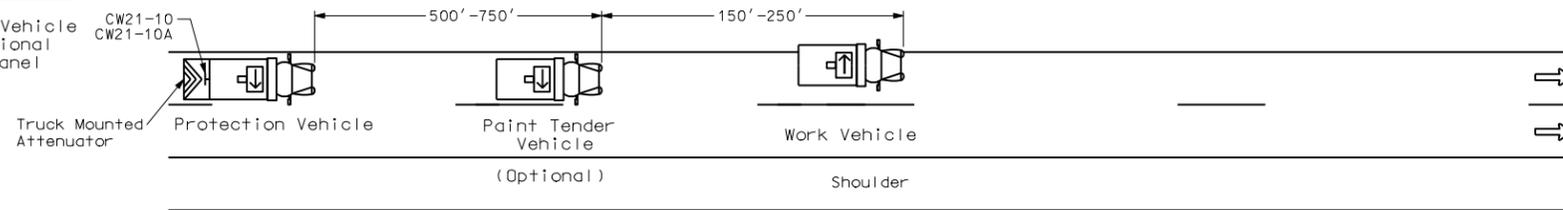
This document was originally issued and sealed by Mark S Gaydos Registration Number PE-4518, on 07/05/05 and the original document is stored at the North Dakota Department of Transportation

# TRAFFIC CONTROL PLAN FOR MOVING OPERATIONS ON CONVENTIONAL HIGHWAYS (Pavement Marking)

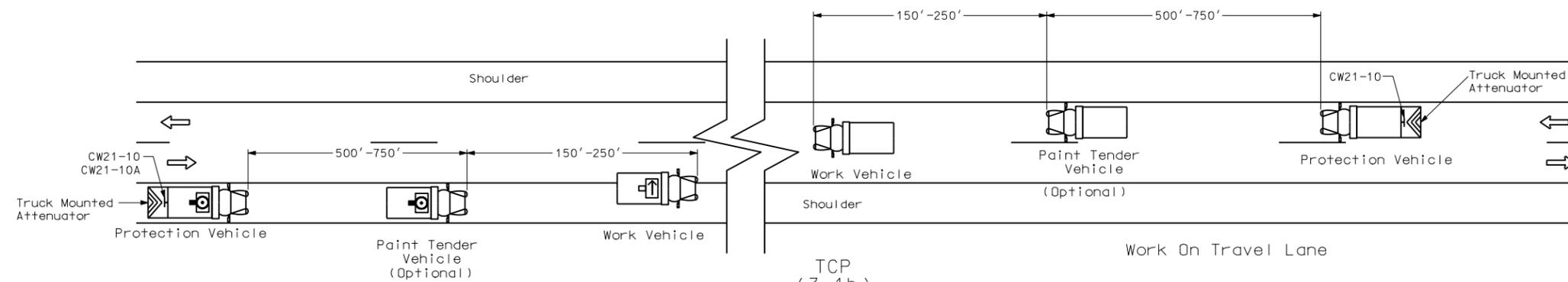
D-704-27



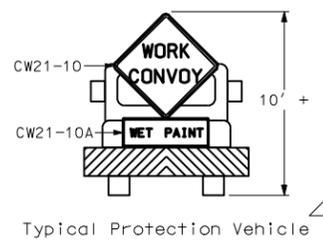
Typical Protection Vehicle with Right Directional Flashing Arrow Panel



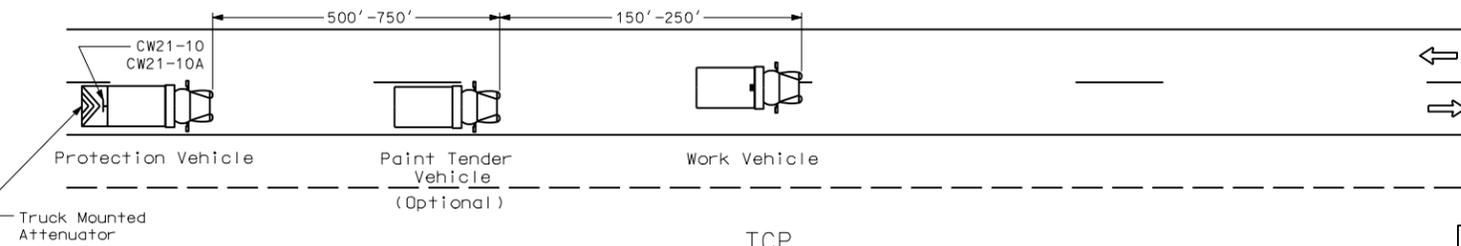
TCP  
(3-1a)  
Undivided Multi-lane Roadway



TCP  
(3-1b)  
Two-Way Roadway with Paved Shoulders



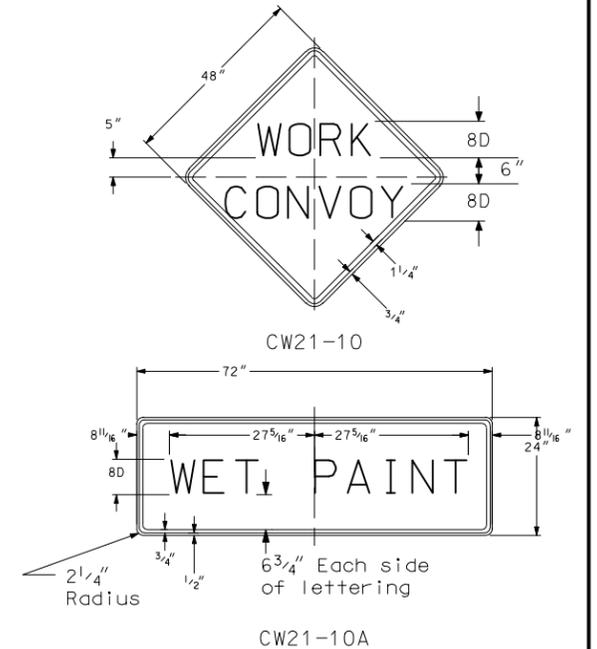
Typical Protection Vehicle



TCP  
(3-1c)  
Two-Way Roadway without Paved Shoulders

- Notes
1. If the contractor chooses to place more vehicles in the convoy than are shown, these vehicles shall have the truck mounted attenuator and shall be at the contractor's expense.
  2. All traffic control devices shall be in accordance with the "Manual on Uniform Traffic Control Devices" (MUTCD), latest edition.
  3. The use of yellow rotating beacons or strobe lights on vehicles is required unless otherwise stated elsewhere in the plans.
  4. Flashing arrow panels shall be Type B or Type C. The panel operation shall be controlled from inside the vehicle.
  5. Each vehicle shall have two-way radio communication capability.
  6. When work convoys must change lanes, the protection vehicle should change lanes first to shadow other convoy vehicles.
  7. Vehicle spacing between the protection vehicle and paint tender vehicle will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the protection vehicle in time to slow down and/or change lanes as they approach the trail vehicle.
  8. Sign Colors  
Letters = Black  
Border = Black  
Background = Orange

### Sign Details

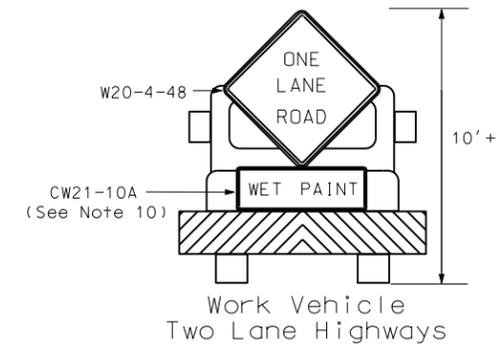
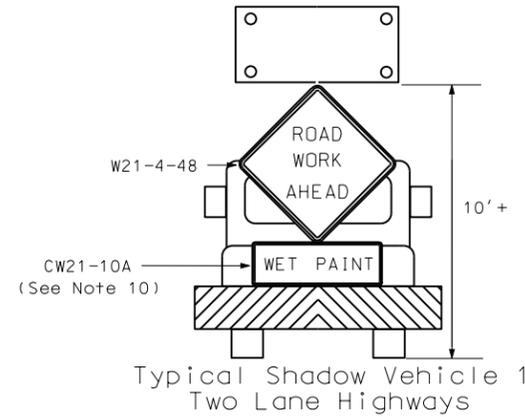
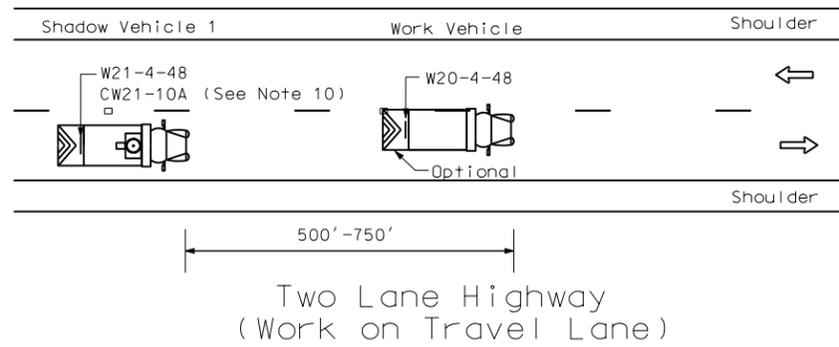


| KEY |                          |
|-----|--------------------------|
|     | Truck mounted attenuator |
|     | Flashing arrow panels:   |
|     | Right directional        |
|     | Left directional         |
|     | Double arrow directional |
|     | Caution Mode             |

| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                     |
|--|---------------------|
| 01-22-92                                     |                     |
| REVISIONS                                    |                     |
| DATE   | CHANGE              |
| 02-24-93                                     | General             |
| 03-15-95                                     | General             |
| 06-21-95                                     | Remove caution mode |
| 10-01-99                                     | General Revisions   |
| 07-25-00                                     | General Revisions   |
| 12-01-04                                     | PE Stamp added      |

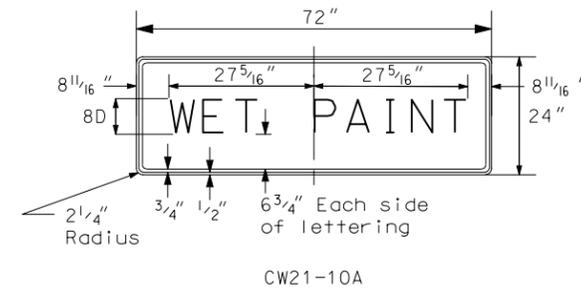
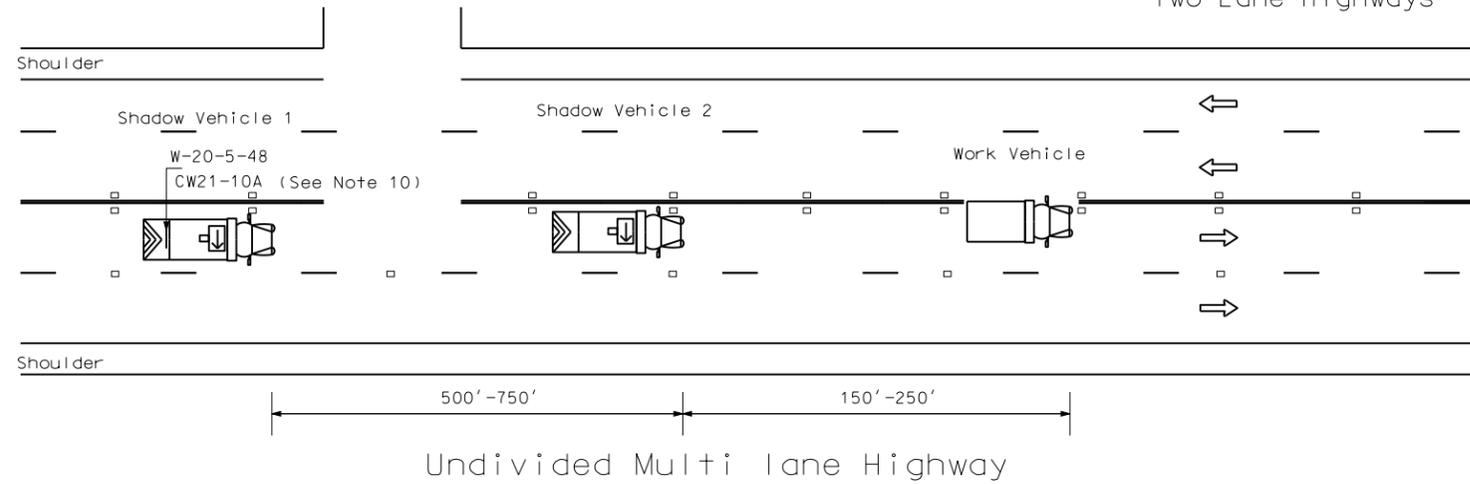
This document was originally issued and sealed by MARK S GAYDOS, Registration Number PE-4518, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

TRAFFIC CONTROL FOR MOBILE OPERATIONS



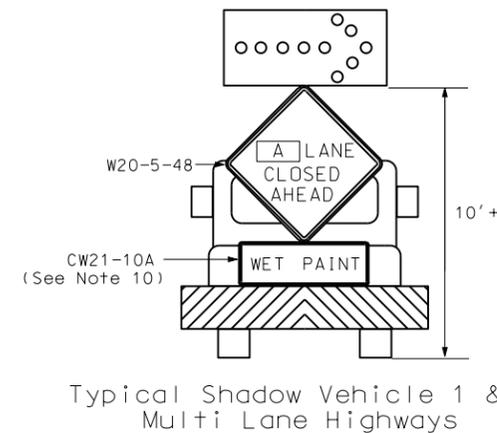
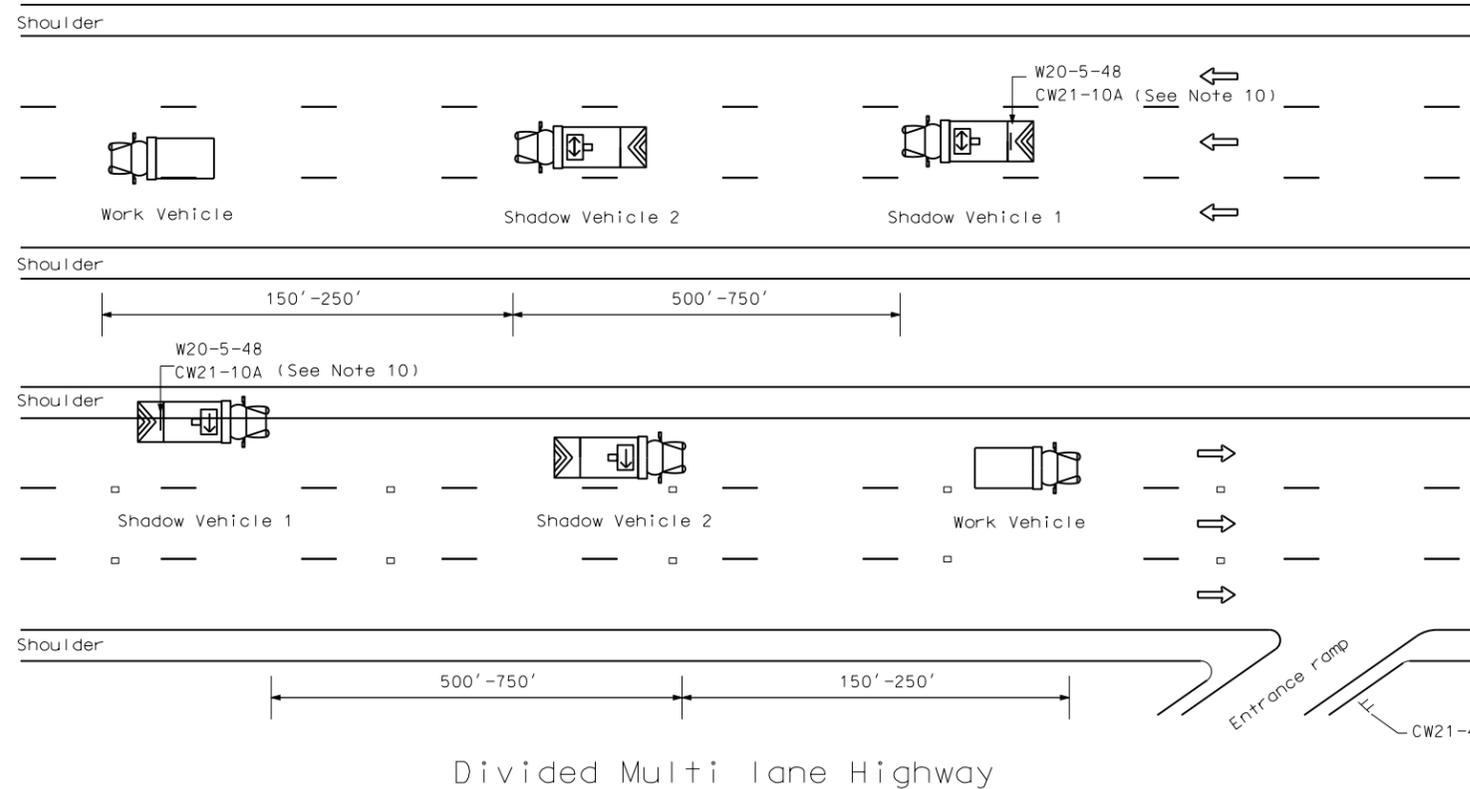
- Notes
1. If the contractor chooses to place more vehicles in the convoy than are shown, these vehicles shall have the truck mounted attenuator and shall be at the contractor's expense.
  2. All traffic control devices shall be in accordance with the "Manual on Uniform Traffic Control Devices" (MUTCD),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

Sign Details



KEY

|                             |                          |
|-----------------------------|--------------------------|
| A = [Left] [Right] [Center] |                          |
|                             | Truck mounted attenuator |
|                             | Flashing arrow panels:   |
|                             | Right directional        |
|                             | Left directional         |
|                             | Double arrow directional |
|                             | Caution Mode             |



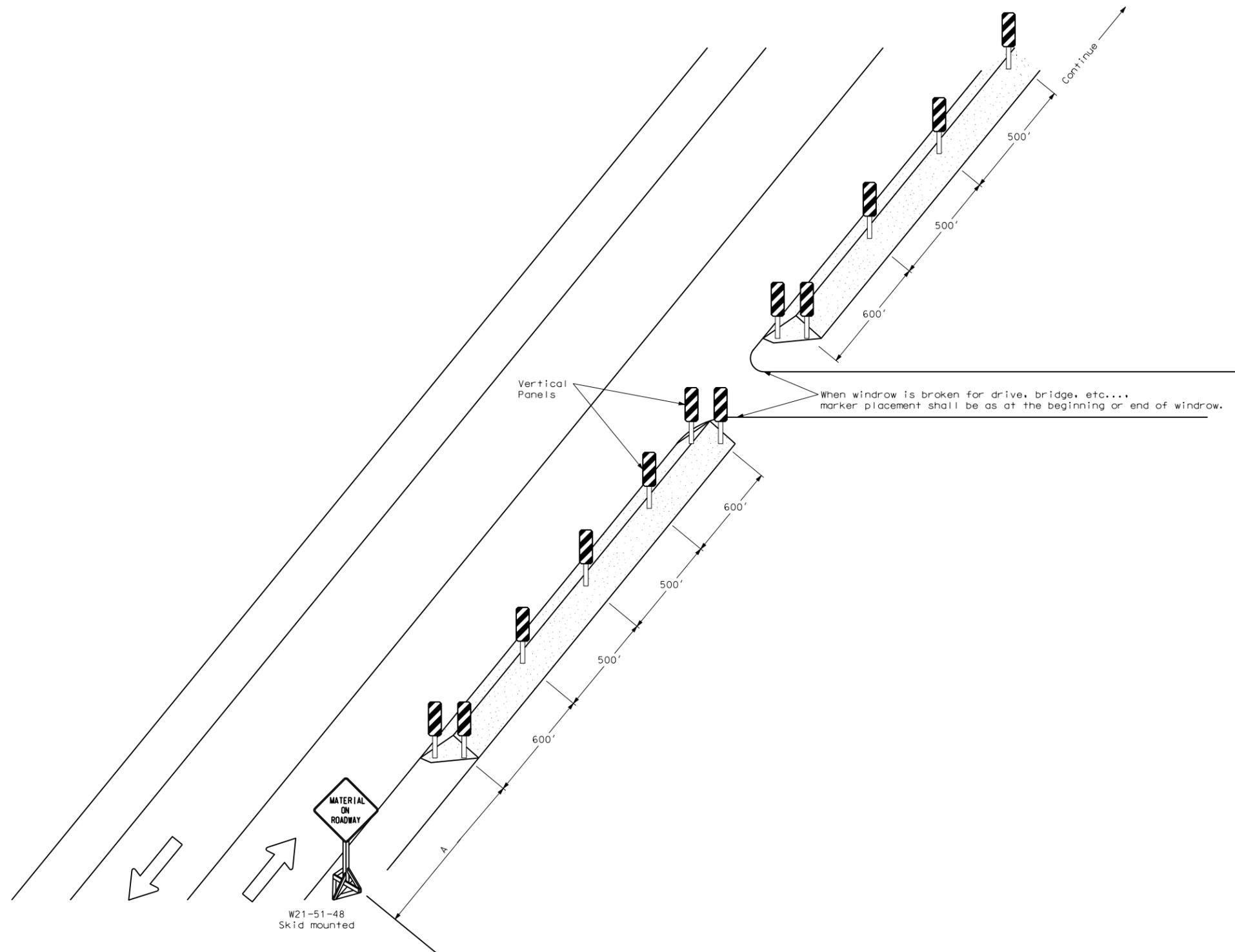
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                     |
|--|---------------------|
| 01-22-92                                     |                     |
| REVISIONS                                    |                     |
| DATE   | CHANGE              |
| 02-24-93                                     | General             |
| 06-21-95                                     | Remove arrow panels |
| 06-04-99                                     | W21-4-48 sign       |
| 10-01-99                                     | General revisions   |
| 07-25-00                                     | General revisions   |
| 05-24-02                                     | Major revisions     |
| 12-01-04                                     | PE Stamp added      |

This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE-4518**, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

# WINDROW MARKING

D-704-30

Notes  
The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.

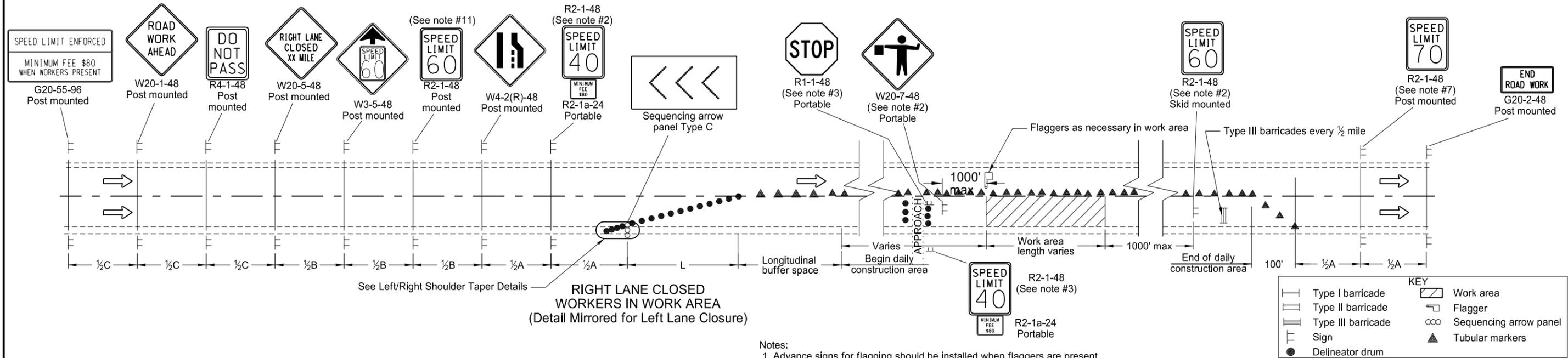


| Road Type   | ADVANCE WARNING SIGN SPACING     |      |      |
|---|----------------------------------|------|------|
|   | Distance Between Signs Min. (ft) |      |      |
|   | A                                | B    | C    |
| Urban - Low Speed (30 mph or less)                    | 150         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

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                         |
|---|-------------------------|
| 10-1-86                                   |                         |
| REVISIONS                                 |                         |
| DATE                                      | CHANGE                  |
| 05-01-92                                  | General revisions       |
| 10-01-99                                  | General revisions       |
| 12-01-04                                  | PE stamp added          |
| 06-29-05                                  | Rev. Adv. Warning Table |

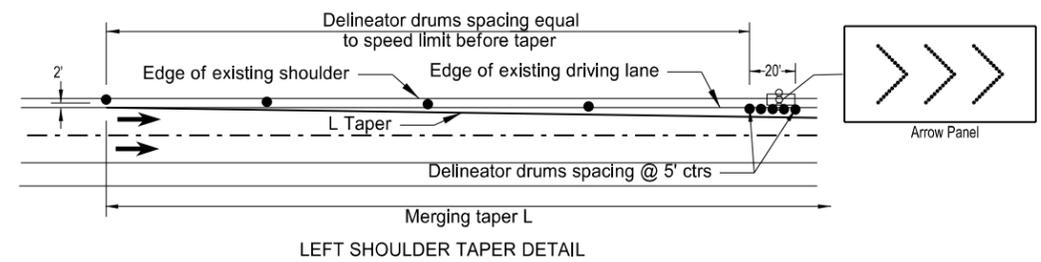
This document was originally issued and sealed by  
**MARK S. GAYDOS**  
Registration Number  
**PE- 4518** ,  
on **06/29/05** and the original document is stored at the  
**North Dakota Department of Transportation**

SIGN LAYOUT FOR ONE LANE CLOSURE

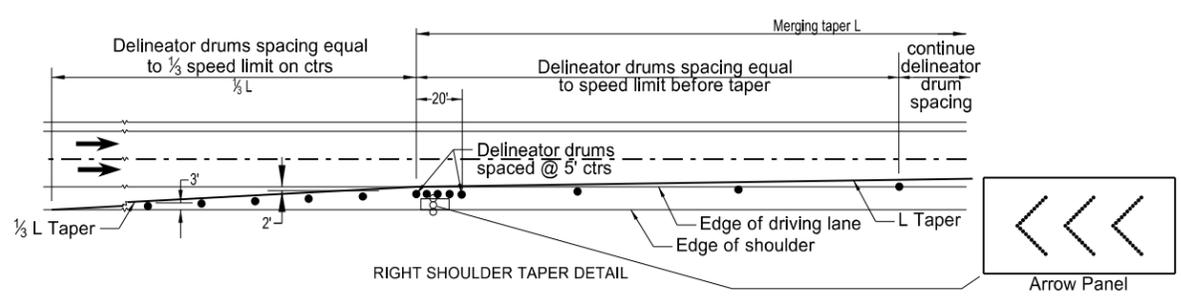


RIGHT LANE CLOSED  
WORKERS IN WORK AREA  
(Detail Mirrored for Left Lane Closure)

- Notes:
- Advance signs for flagging should be installed when flaggers are present.
  - The advanced flagger sign and the speed limit signs shall be moved as the work area moves through the construction zone. When the work area is not visible from the flagger, the flagger station shall be placed so the work area is visible. The 40 mph speed limit sign shall be spaced at 1/2 A in advance of the flagger sign. The 60 mph speed limit sign shall also be moved. Upon completion of the work day or when workers are not present, the 40 mph speed limit and the Minimum Fee \$80 signs shall be covered or removed. The exact speed limit shall be determined in the field, dependent on location and conditions.
  - Approaches: When the work area encompasses an approach, the approach shall be controlled by installing a 40 mph speed limit sign. If this approach is on the side of the lane closure, the existing stop sign shall be covered and a new portable stop sign shall be installed. When the main line 40 mph speed zone is moved past the approach, the approach speed limit sign shall be removed.
  - Variables:  
S=Numerical value of speed limit or 85th percentile  
W=The width of taper.  
L=Minimum length of taper, or SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater, or (WxSxS)/60 for urban, residential, and other streets with speeds of 40 mph or less.
  - Delineator drums, used for tapering traffic shall be spaced at the dimension "S". Tubular markers used for tangents shall be spaced at 2 times dimension "S".
  - Sequencing arrow panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface.  
Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).  
Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).  
Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
  - The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
  - Existing speed limit signs within a reduced speed zone shall be covered.
  - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
  - The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 mph. Where speed limits are to be reduced more than 30 mph, a second speed limit sign shall be installed with the desired speed reduction, but shall not exceed 30 mph. The second speed limit sign shall be placed at 1/2 B.
  - The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Specifications.
  - Sign G20-55-96 is not required if this standard is part of other traffic control layouts or the work is less than 15 days.



LEFT SHOULDER TAPER DETAIL



RIGHT SHOULDER TAPER DETAIL

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

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

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

| NORTH DAKOTA                 |        |
|------------------------------|--------|
| DEPARTMENT OF TRANSPORTATION |        |
| 9-26-2012                    |        |
| REVISIONS                    |        |
| DATE                         | CHANGE |
|                              |        |

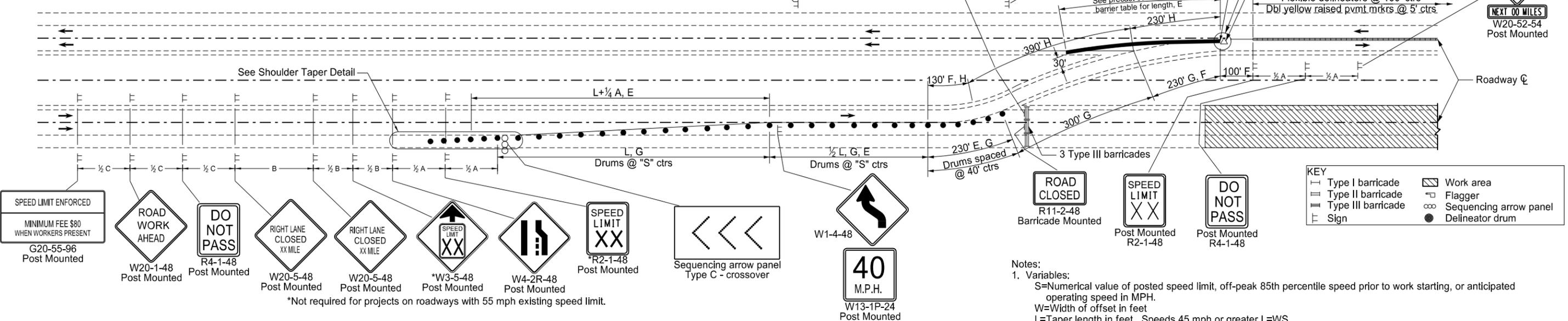
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 9/26/2012 and the original document is stored at the North Dakota Department of Transportation

TRAFFIC CONTROL SYSTEM  
 MEDIAN CROSSOVER (800 FT TRANSITION)  
 55 MPH SPEED LIMIT OR GREATER

ADVANCE WARNING SIGN SPACING

| Road Type   | Minimum Distance Between Signs (ft) |       |       |
|---|-------------------------------------|-------|-------|
|   | A                                   | B     | C     |
| Rural - High Speed (over 50 mph to 65 mph)            | 720                                 | 720   | 720   |
| Urban Expressway and Freeway (55 mph to 60 mph)       | 850                                 | 1,350 | 2,200 |
| Rural Expressway and Freeway (70 mph to 75 mph)       | 1,000                               | 1,500 | 2,640 |
| Interstate/4-Lane Divided (Maintenance and Surveying) | 750                                 | 1,000 | 1,500 |

LEGEND  
 E Obliteration of pavement marking (10' line, 30' skip, centerline)  
 F Obliteration of pavement marking (edge lines)  
 G Raised pavement markers (white) 5' ctrs.  
 H Raised pavement markers (yellow) 5' ctrs.



KEY

|                      |                          |
|----------------------|--------------------------|
| — Type I barricade   | ▨ Work area              |
| — Type II barricade  | ⊞ Flagger                |
| — Type III barricade | ⊞ Sequencing arrow panel |
| — Sign               | ● Delineator drum        |

- Notes:
- Variables:  
 S=Numerical value of posted speed limit, off-peak 85th percentile speed prior to work starting, or anticipated operating speed in MPH.  
 W=Width of offset in feet  
 L=Taper length in feet. Speeds 45 mph or greater L=WS.
  - Signs and barricades shown to be placed on roadway shall be placed on moveable assemblies. Signs to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar.
  - Signs R4-1-48, W6-3-48, and W20-52-54 shall be installed at one mile increments and after each interchange.
  - The speed limit sign shall be placed only if the crossover is over 1 mile from an interchange exit ramp.
  - Sequencing Arrow Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so it can be placed on the roadway surface. Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater).
  - Existing speed limit signs within a reduced speed zone shall be covered.
  - Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the Engineer.
  - The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
  - When placing traffic control devices, speed reductions will be necessary. These reduced speed areas shall have "Minimum Fee \$80" signs placed below the speed limit signs. Place "Work Zone Speed Limit Enforced" sign in advance of the project at the time traffic control devices are installed.
  - Junction box shall be waterproof and attached to skid or vertical brace assembly. Size to be determined by contractor.

SPEED LIMIT SIGNING

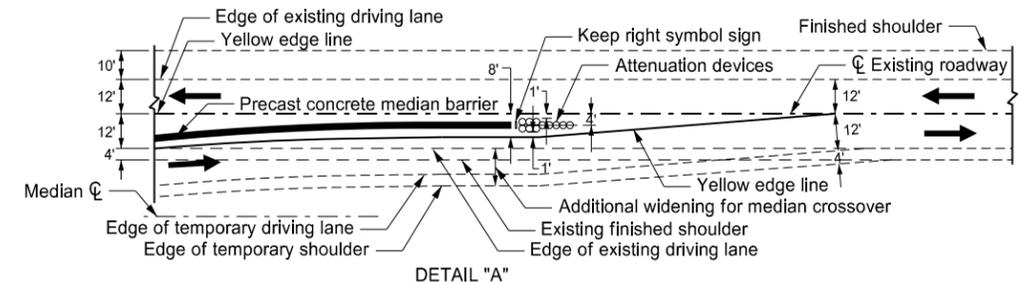
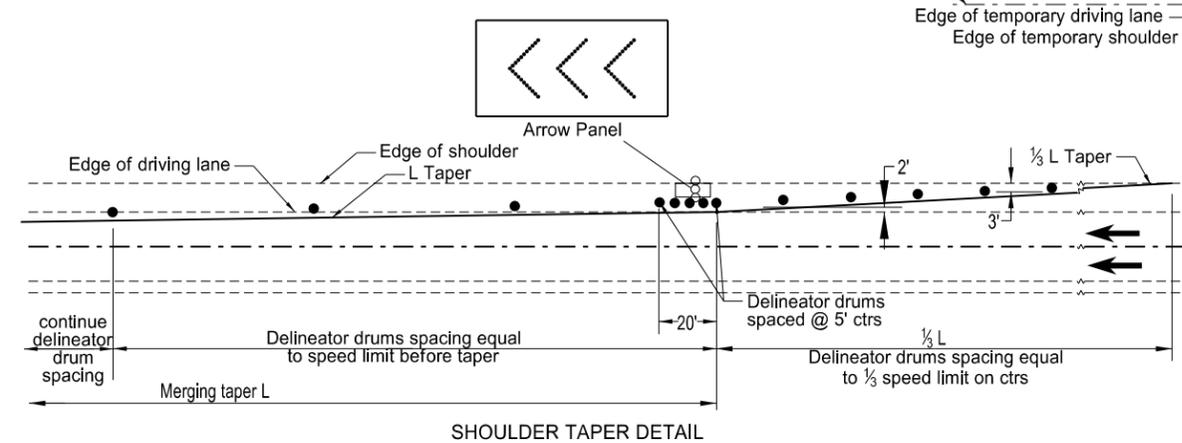
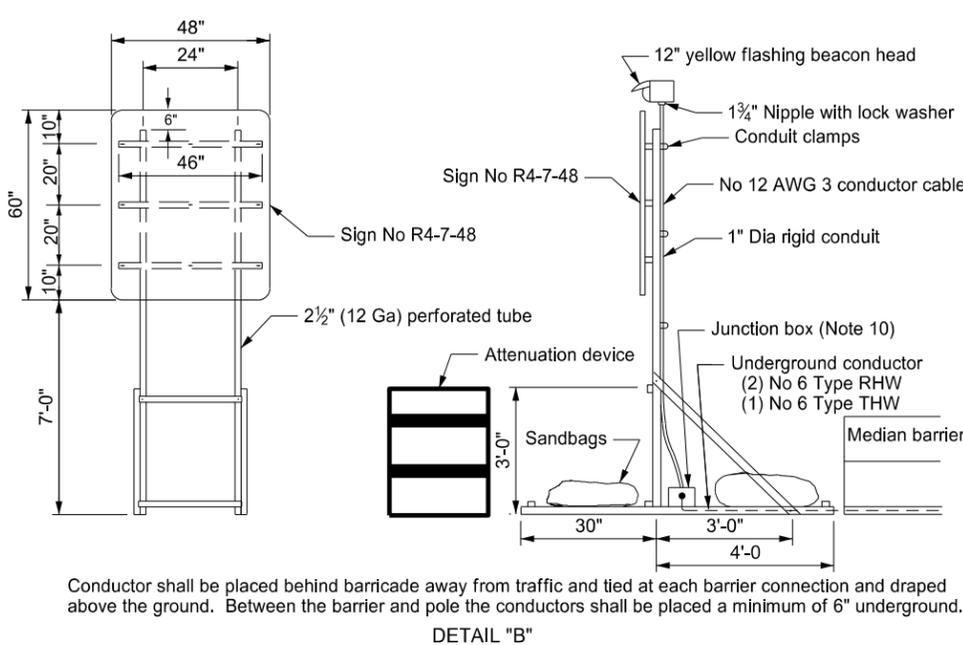
| ROADWAY EXISTING SPEED LIMIT | SPEED LIMIT TO BE USED | XX | YY |
|------------------------------|------------------------|----|----|
| 55                           | 50                     | 55 |    |
| 60                           | 50                     | 60 |    |
| 65                           | 55                     | 65 |    |
| 70                           | 60                     | 70 |    |
| 75                           | 65                     | 75 |    |

CROSSOVER QUANTITY SUMMARY

|  | ROADWAY EXISTING SPEED LIMIT                |             |             |             |             |
|--|---|-------------|-------------|-------------|-------------|
|  | 55 MPH                                      | 60 MPH      | 65 MPH      | 70 MPH      | 75 MPH      |
| TYPE III BARRICADES                      | 3 Each                                      | 3 Each      | 3 Each      | 3 Each      | 3 Each      |
| FLASHING BEACON                          | 1 Each                                      | 1 Each      | 1 Each      | 1 Each      | 1 Each      |
| DELINEATOR DRUMS                         | 25 Each                                     | 25 Each     | 25 Each     | 25 Each     | 25 Each     |
| SEQUENCING ARROW PANEL TYPE C-CROSSOVER  | 1 Each                                      | 1 Each      | 1 Each      | 1 Each      | 1 Each      |
| PORTABLE PRECAST CONCRETE MEDIAN BARRIER | See "PRECAST CONCRETE MEDIAN BARRIER TABLE" |             |             |             |             |
| ATTENUATION DEVICES                      | 1-Type B-55                                 | 1-Type B-60 | 1-Type B-65 | 1-Type B-70 | 1-Type B-75 |
| RAISED PAVEMENT MARKERS (YELLOW)         | 351 Each                                    | 397 Each    | 397 Each    | 415 Each    | 415 Each    |
| RAISED PAVEMENT MARKERS (WHITE)          | 151 Each                                    | 163 Each    | 163 Each    | 163 Each    | 163 Each    |
| OBLITERATION OF PAVEMENT MARKING         | 357 SF                                      | 523 SF      | 523 SF      | 413 SF      | 413 SF      |

PRECAST CONCRETE MEDIAN BARRIER TABLE

| Roadway C to roadway C | Number | median barrier length |
|------------------------|--------|-----------------------|
| 75'                    | 48     | 480'                  |
| 84'                    | 44     | 440'                  |
| 104'                   | 43     | 430'                  |

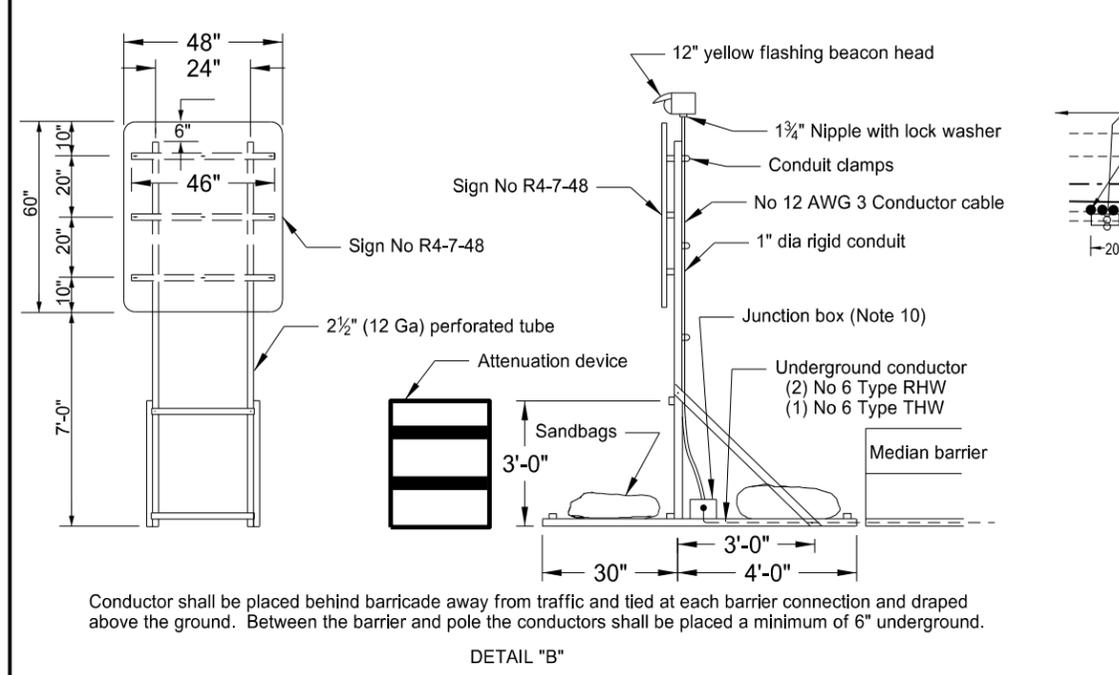
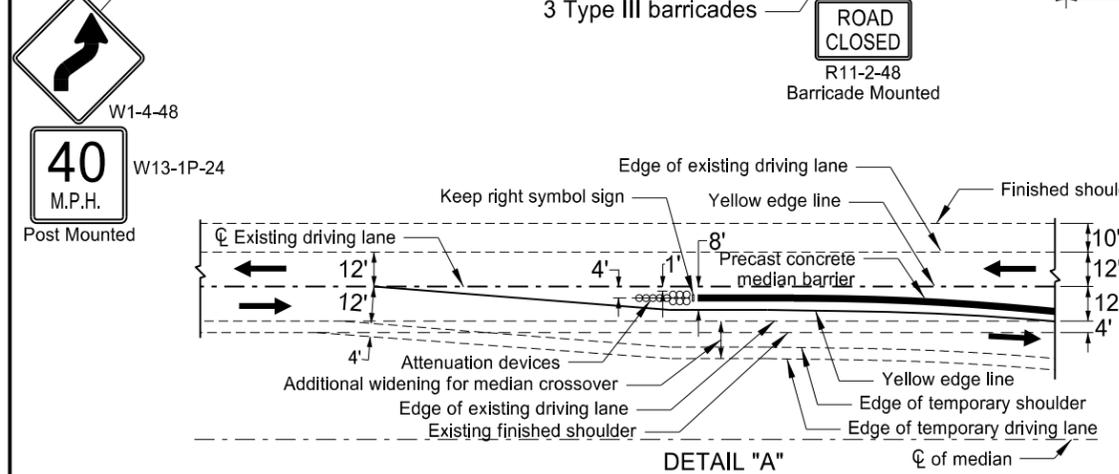
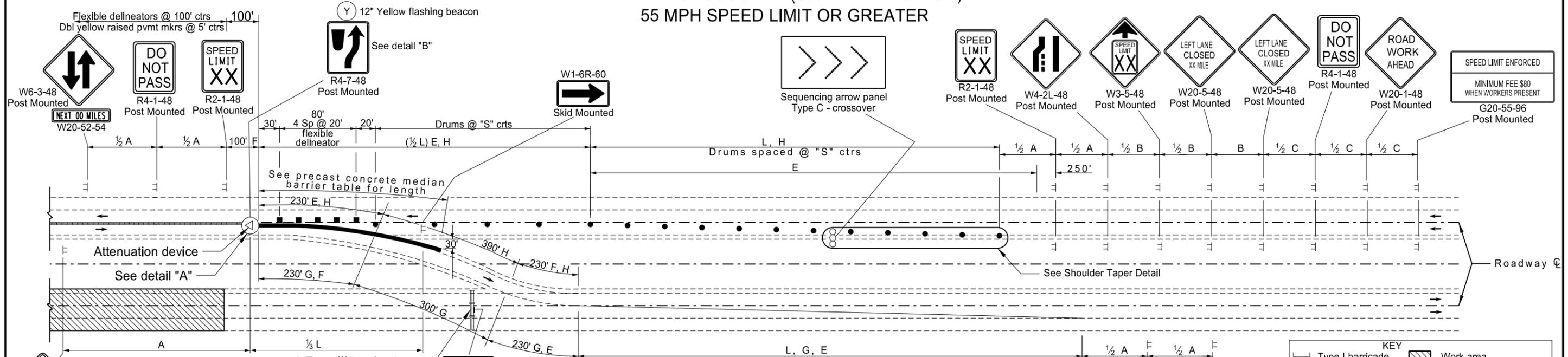


NORTH DAKOTA  
 DEPARTMENT OF TRANSPORTATION  
 9-7-2012  
 REVISIONS

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

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 9/7/12 and the original document is stored at the North Dakota Department of Transportation

TRAFFIC CONTROL SYSTEM  
 MEDIAN CROSSOVER (800 FT TRANSITION)  
 55 MPH SPEED LIMIT OR GREATER

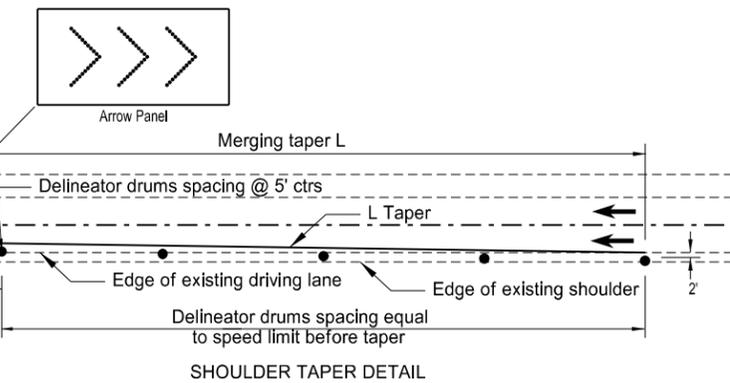


ADVANCE WARNING SIGN SPACING

| ROAD TYPE   | Minimum Distance Between Signs (ft) |       |       |
|---|-------------------------------------|-------|-------|
|   | A                                   | B     | C     |
| Rural - High Speed (over 50 mph to 65 mph)            | 720                                 | 720   | 720   |
| Urban Expressway and Freeway (55 mph to 60 mph)       | 850                                 | 1,350 | 2,200 |
| Rural Expressway and Freeway (70 mph to 75 mph)       | 1,000                               | 1,500 | 2,640 |
| Interstate/4-Lane Divided (Maintenance and Surveying) | 750                                 | 1,000 | 1,500 |

ROADWAY EXISTING SPEED LIMIT TO BE USED

| ROADWAY EXISTING SPEED LIMIT | XX | YY |
|------------------------------|----|----|
| 55                           | 50 | 55 |
| 60                           | 50 | 60 |
| 65                           | 55 | 65 |
| 70                           | 60 | 70 |
| 75                           | 65 | 75 |



CROSSOVER QUANTITY SUMMARY

|   | ROADWAY EXISTING SPEED LIMIT                |             |             |             |             |
|---|---|-------------|-------------|-------------|-------------|
|   | 55 MPH                                      | 60 MPH      | 65 MPH      | 70 MPH      | 75 MPH      |
| TYPE III BARRICADES                       | 3 Each                                      | 3 Each      | 3 Each      | 3 Each      | 3 Each      |
| FLASHING BEACON                           | 1 Each                                      | 1 Each      | 1 Each      | 1 Each      | 1 Each      |
| FLEXIBLE DELINEATORS                      | 5 Each                                      | 5 Each      | 5 Each      | 5 Each      | 5 Each      |
| DELINEATOR DRUMS                          | 17 Each                                     | 17 Each     | 17 Each     | 17 Each     | 17 Each     |
| SEQUENCING ARROW PANELS TYPE C-CROSSOVER  | 1 Each                                      | 1 Each      | 1 Each      | 1 Each      | 1 Each      |
| PORTABLE PRECAST CONCRETE MEDIAN BARRIERS | See "PRECAST CONCRETE MEDIAN BARRIER TABLE" |             |             |             |             |
| ATTENUATION DEVICES                       | 1-Type B-55                                 | 1-Type B-60 | 1-Type B-65 | 1-Type B-70 | 1-Type B-75 |
| RAISED PAVEMENT MARKERS (Yellow)          | 350 Each                                    | 398 Each    | 398 Each    | 415 Each    | 415 Each    |
| RAISED PAVEMENT MARKERS (White)           | 285 Each                                    | 319 Each    | 319 Each    | 331 Each    | 331 Each    |
| OBLITERATION OF PAVEMENT MARKING          | 519 SF                                      | 507 SF      | 507 SF      | 410 SF      | 410 SF      |

- Notes:
- Variables:  
 S=Numerical value of posted speed limit, off-peak 85th percentile speed prior to work starting, or anticipated operating speed in MPH.  
 W=Width of offset in feet  
 L=Taper length in feet. Speeds 45 mph or greater L=WS.
  - Signs and barricades shown to be placed on roadway shall be placed on a moveable assemblies. Signs to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar.
  - Signs R4-1-48, W6-3-48, and W20-52-54 shall be installed at one mile increments and after each interchange.
  - The speed limit sign shall be placed only if the crossover is over 1 mile from an interchange exit ramp.
  - Sequencing Arrow Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface.  
 Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater)
  - Existing speed limit signs within a reduced speed zone shall be covered.
  - Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the Engineer.
  - The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
  - When placing traffic control devices, speed reductions will be necessary. These reduced speed areas shall have "Minimum Fee \$80" signs placed below the speed limit signs. Place "Work Zone Speed Limit Enforced" sign in advance of the project at the time traffic control devices are installed.
  - Junction box shall be waterproof and attached to skid or vertical brace assembly. Size to be determined by the contractor.

KEY

- Type I barricade
- Type II barricade
- Type III barricade
- Sign
- Work area
- Flagger
- Sequencing arrow panel
- Delineator drum
- Flexible Delineator

LEGEND

- E Obliteration of pavement marking (10' line, 30' skip, C)
- F Obliteration of pavement marking (edge lines)
- G Raised pavement markers (white) 5' ctrs
- H Raised pavement markers (yellow) 5' ctrs

PRECAST CONCRETE MEDIAN BARRIER TABLE

| Roadway C to roadway C | Number-median barrier length |
|------------------------|------------------------------|
| 75'                    | 37 - 370'                    |
| 84'                    | 36 - 360'                    |
| 104'                   | 36 - 360'                    |

NORTH DAKOTA  
 DEPARTMENT OF TRANSPORTATION  
 5-31-12

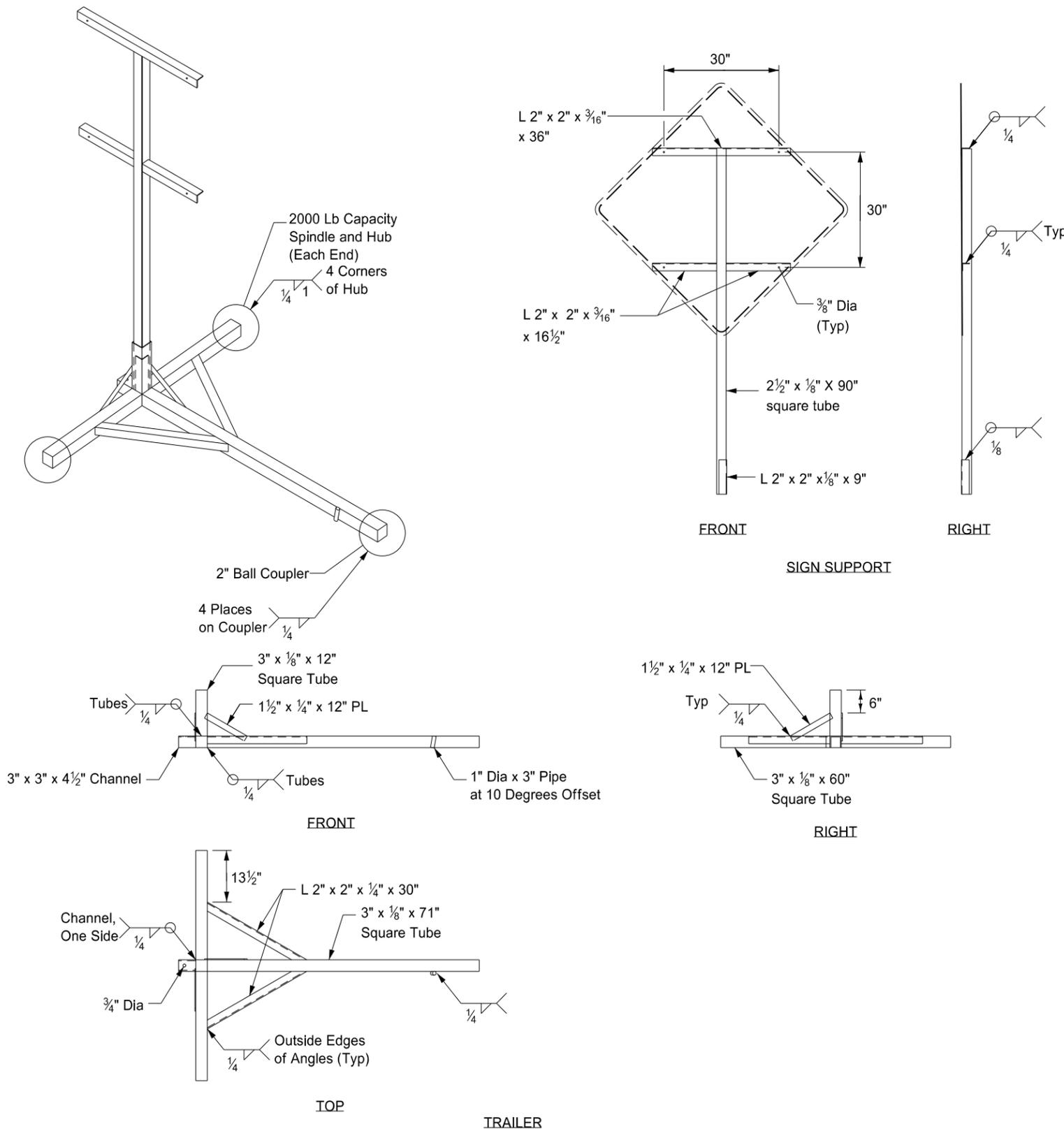
REVISIONS

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

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 5/31/12 and the original document is stored at the North Dakota Department of Transportation

PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



Notes:

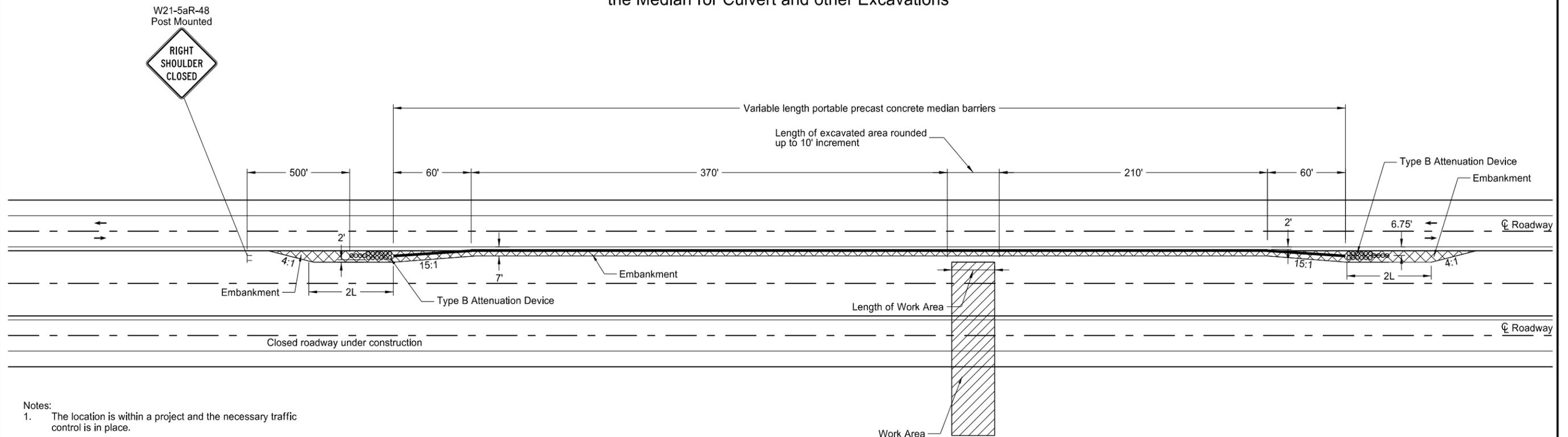
- ① The maximum weight of the assembly is 250 pounds.
- ② Use a 14" wheel and tire.
- ③ Automotive and equipment axle assemblies may not be used for trailer-mounted sign supports.
- ④ Other NCHRP 350 crash tested assemblies are acceptable.

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 11-23-10                                     |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 11/23/10 and the original document is stored at the North Dakota Department of Transportation.

### CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

Two-way, Two-lane Operation with Excavation in  
the Median for Culvert and other Excavations



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

L = length of attenuation device

**KEY**

- Flagger
- Sign
- Emabankment
- Work Area
- Attenuation Device
- Precast Concrete Median Barriers

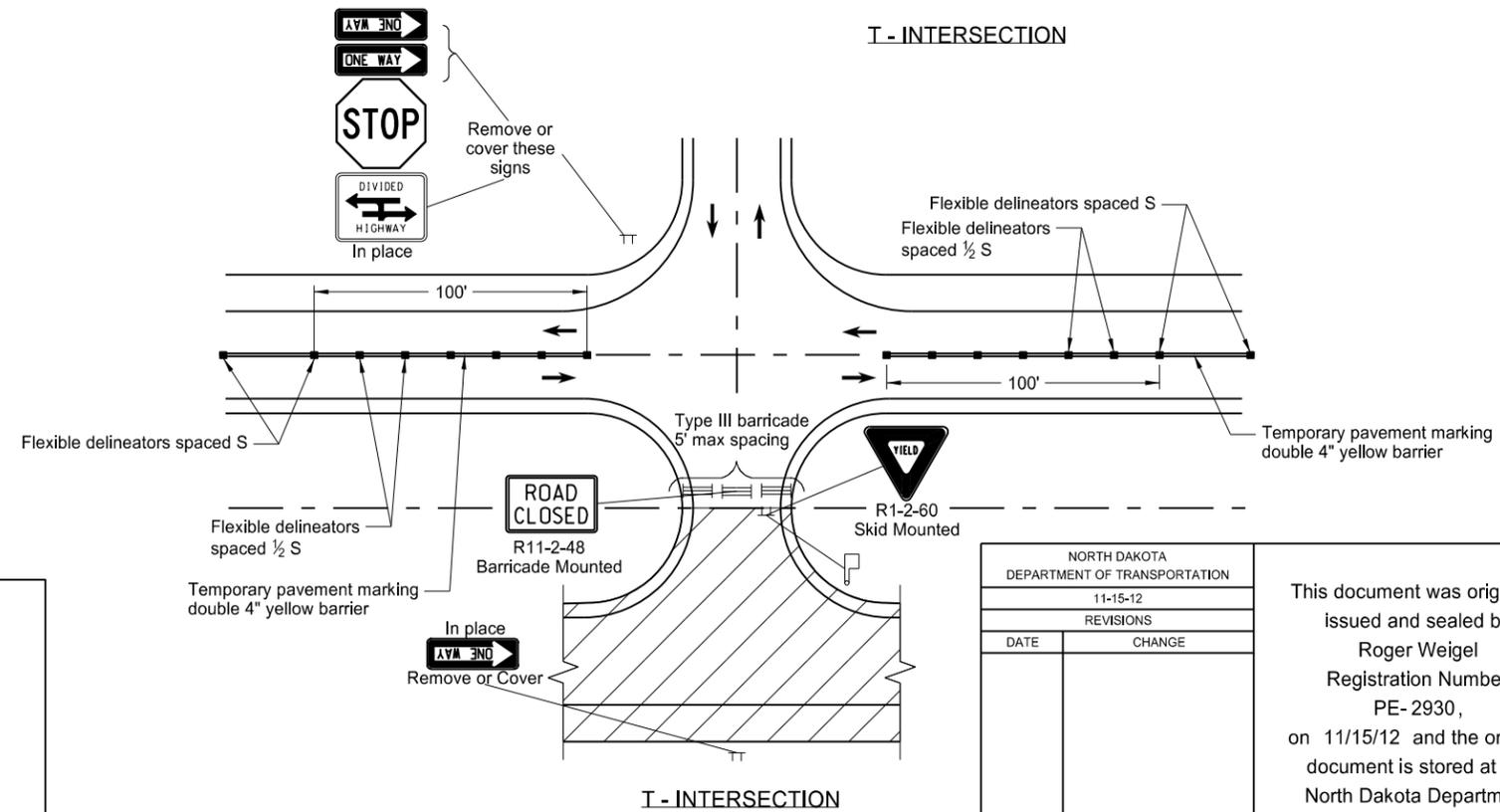
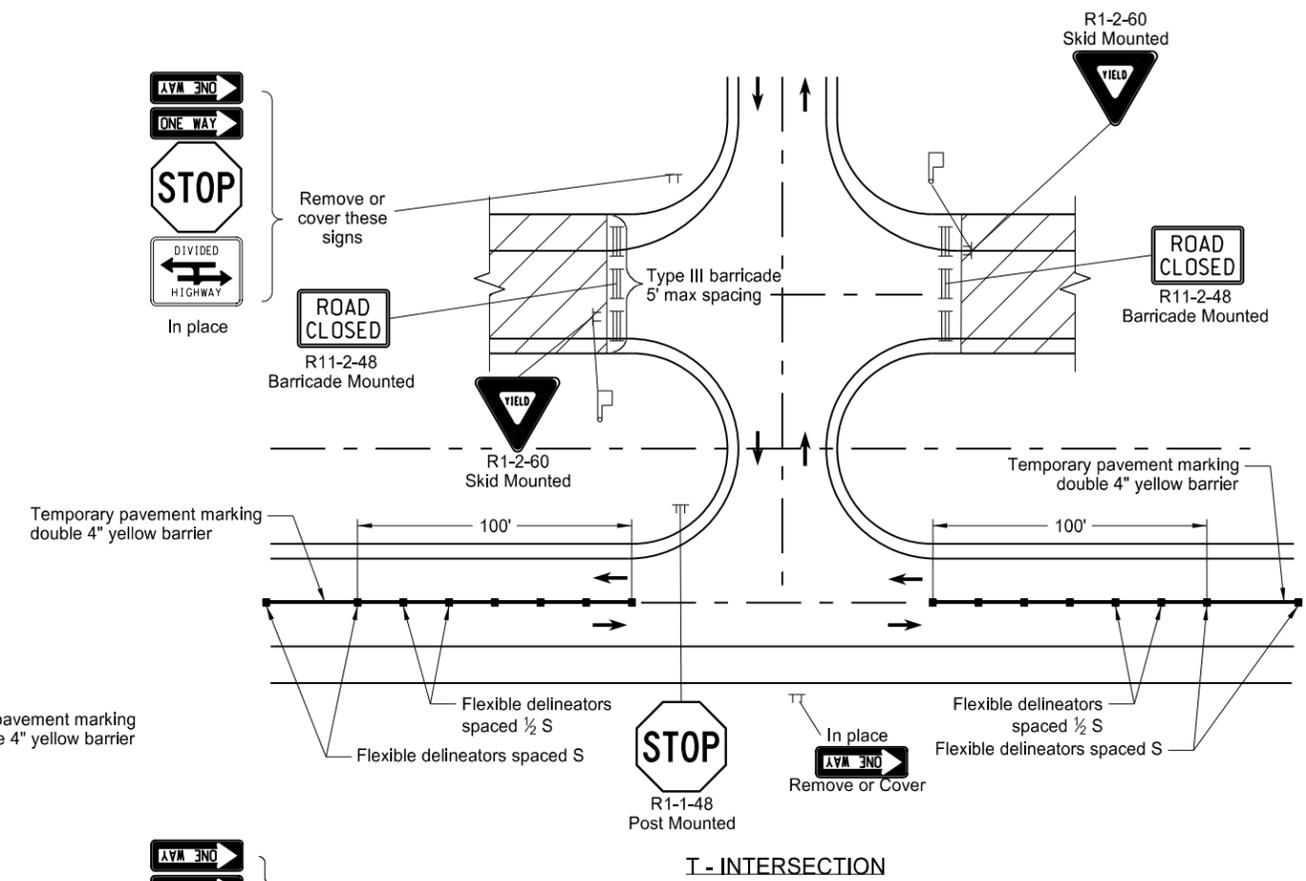
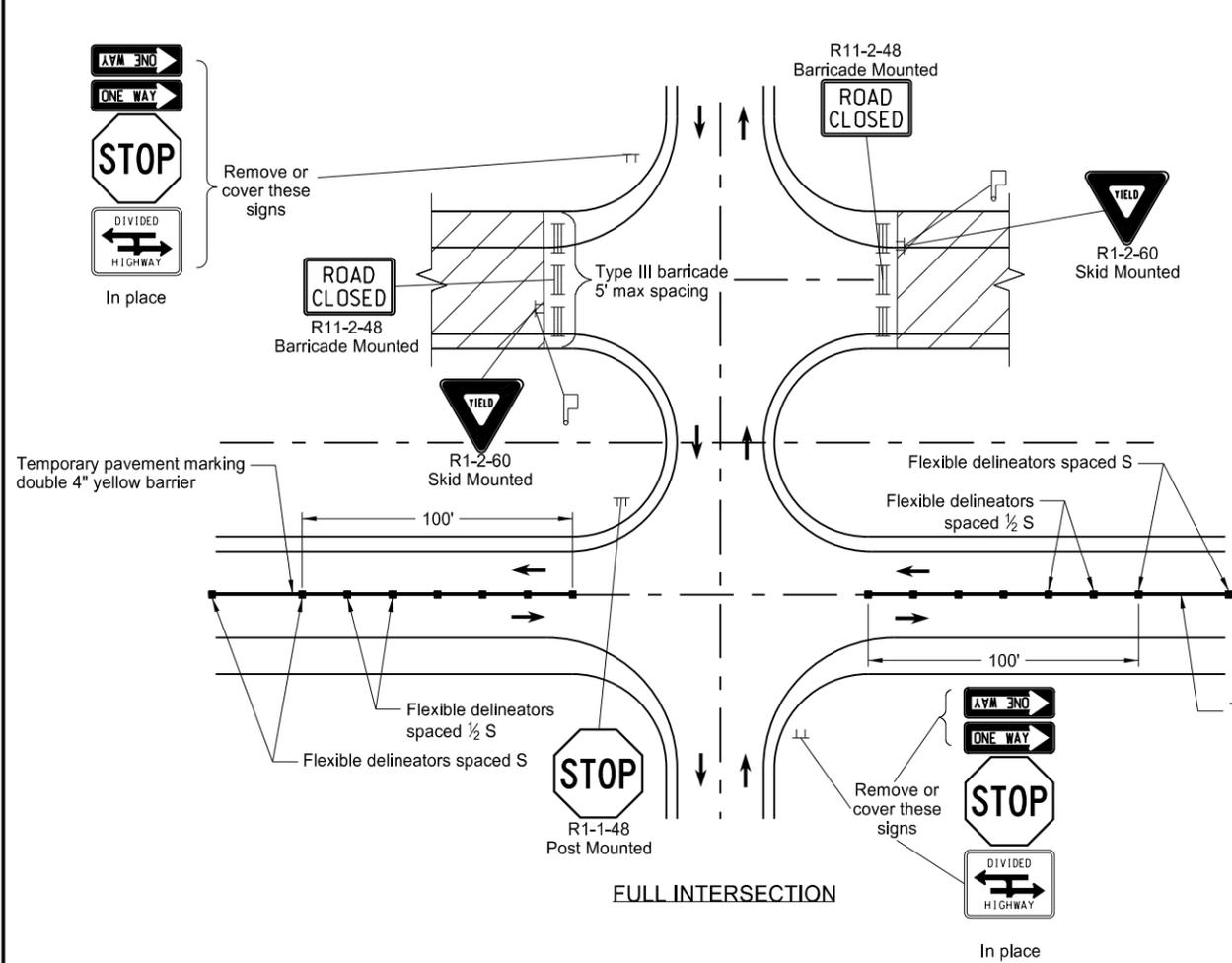
| ADVANCE WARNING SIGN SPACING                          |                                  |      |      |
|---|----------------------------------|------|------|
| Road Type   | Distance Between Signs Min. (ft) |      |      |
|   | A                                | B    | C    |
| Urban - Low Speed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

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 11-26-12                                     |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by  
**Roger Weigel**  
Registration Number  
PE-2930,  
on 11/26/12 and the original document is stored at the North Dakota Department of Transportation

# ONE ROAD CLOSURE FOUR-LANE DIVIDED HIGHWAY FOR ACCESS TO TWO-WAY TWO-LANE ROADWAY

D-704-63



- Notes:
- Standard spacing for the flexible delineators is equal to the speed limit "S" established for the two lane two way roadway.
  - Roadway under construction is expected to be closed to all traffic. If the contractor chooses to use the roadway under construction for access via the cross road or chooses to use the roadway under construction as a haul road, the traffic control shall be provided as follows: Low volume crossings shall have yield signs placed for Contractor's traffic. High volume crossroads shall have a yield sign and a flagger provided for Contractor's traffic. The public traffic on the crossroads shall not be stopped for Contractor's traffic. The Engineer shall determine which cross roads are low or high volume.
  - Type of short term pavement markings shall be as shown on the plans.
  - When the contractor wishes to move the barricades to gain access to the closed roadway, the barricades shall be positioned in a location that will not interfere with the sight distance of the haul vehicles. Barricades shall be placed in their original position at the end of the work day.

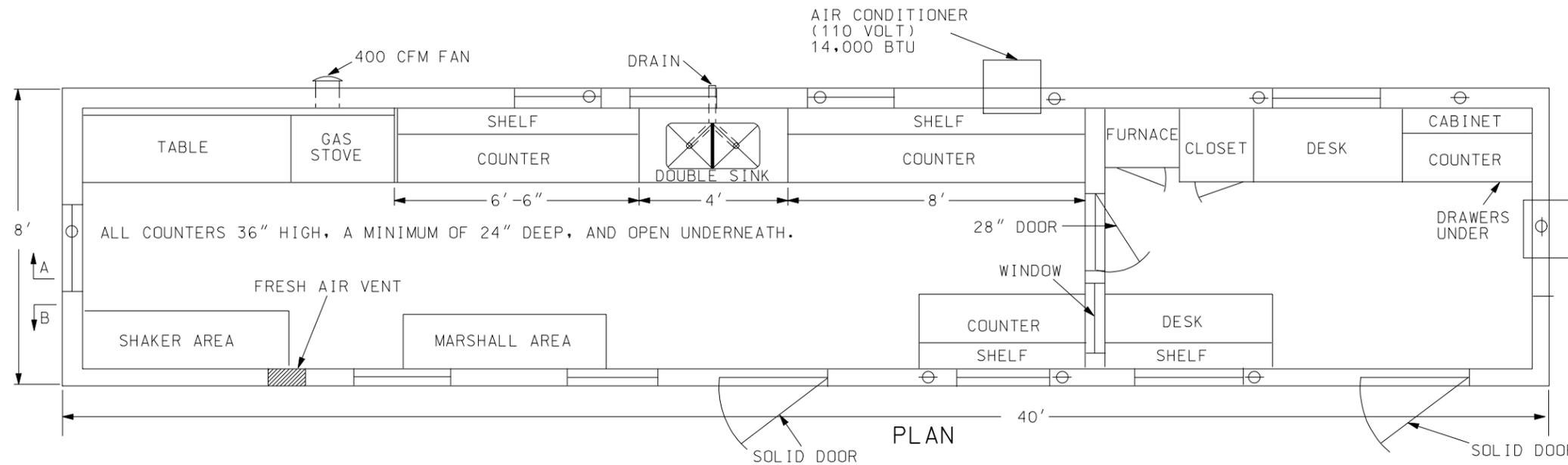
| KEY |                        |
|-----|------------------------|
| ▨   | Work Area              |
| ☐   | Flagger                |
| =   | Type III Barricade     |
| T   | Sign                   |
| •   | Tubular Markers        |
| ↔   | Sequencing Arrow Panel |

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 11-15-12                                     |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by  
**Roger Weigel**  
 Registration Number  
**PE-2930**,  
 on 11/15/12 and the original document is stored at the  
 North Dakota Department  
 of Transportation

# TYPE C FIELD LABORATORY

D-706-1



AIR CONDITIONER (110 VOLT) 8,000 BTU

**NOTES:**

There shall be a minimum of 6 exterior ventilated casement or double hung windows. The minimum total area of opening shall be 34 square feet. The number, size, and location of windows may be adjusted to fit conditions. Suggested locations are shown on drawing.

The sink shall be double compartment stainless steel. Each compartment shall be a minimum of 16"x14"x10" deep. The sink shall be drained to an outside wasteline. A trap is not required. Water service lines shall be copper or plastic having a diameter of 1/2 inch.

The lab shall be equipped with an exhaust fan capable of removing inside air at a rate of 400 CFM.

The fresh air vent shall be hinged to open or close manually.

24" x 48" table shall be provided capable of holding a 200 lb. masonry saw. The table shall have a minimum clearance of 36" overhead.

The water supply tank shall have a capacity of 500 gallons.

Steps shall be provided for each of two entrance doors. Steps for each area shall be made of, or covered with, a material providing for a non-slip surface. They shall be heavy duty steps that are capable of withstanding heavy loadings and extensive use.

The pressure tank on the pump shall be 20 gallon capacity.

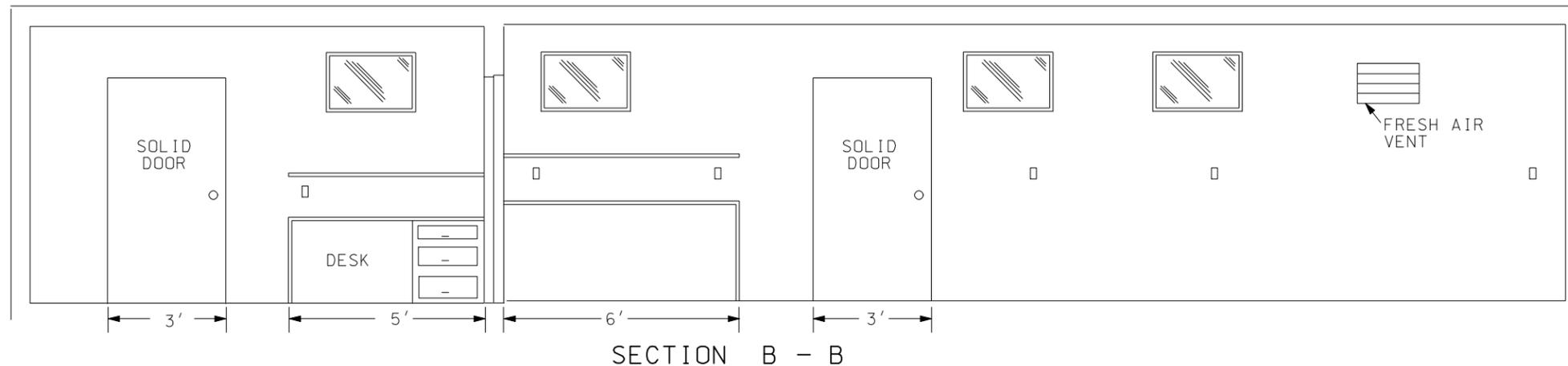
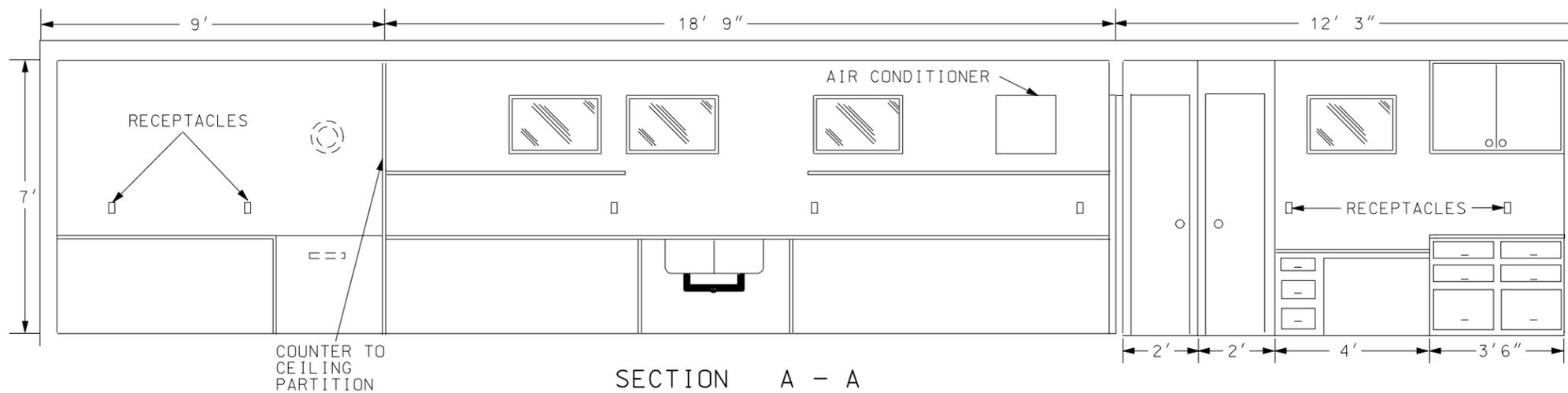
Locks, latches, and hinges for main doors shall be heavy duty type to withstand the intense use in service.

The wall between the office and the work area shall be properly insulated to prevent the transmission of heat & noise.

The floor beneath the marshall area shall be heavily reinforced.

The lab shall be equipped with steel cable tie downs and ground anchors at each corner of the lab.

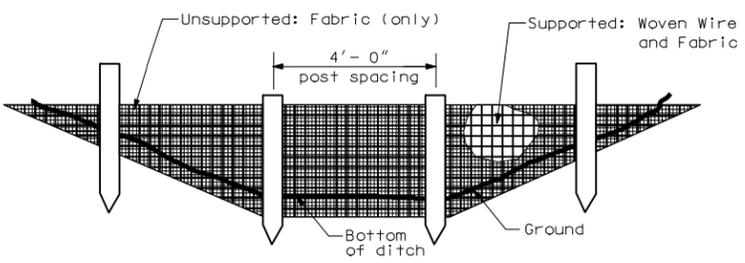
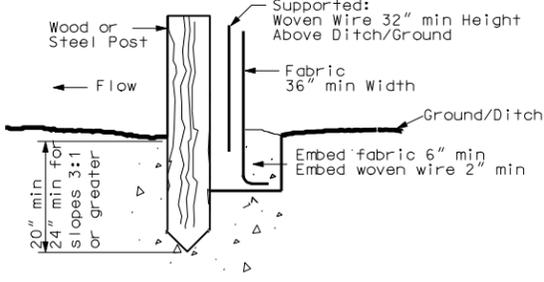
Electrical service entrance shall be wired for 100 amps, and have separate circuits for air conditioners. Convenience outlets shall have a minimum spacing of 4 feet in counter areas.



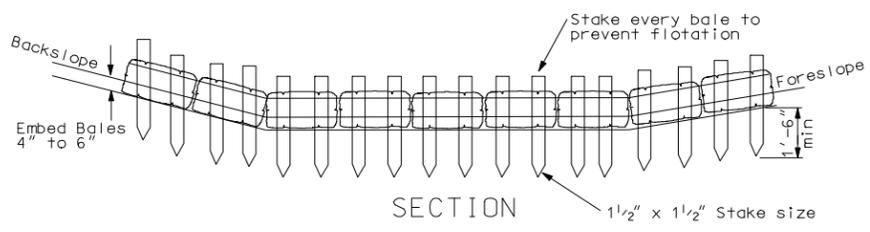
|  |                   |
|--|-------------------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                   |
| 10-1-86                                      |                   |
| REVISIONS                                    |                   |
| DATE   | CHANGE            |
| 05-05-88                                     | Drawing and notes |
| 06-20-03                                     | General revisions |
| 12-01-04                                     | PE Stamp added    |

This document was originally issued and sealed by MARK S GAYDOS, Registration Number PE-4518, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

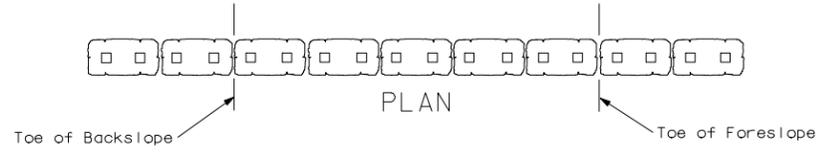
# EROSION AND SILTATION CONTROLS



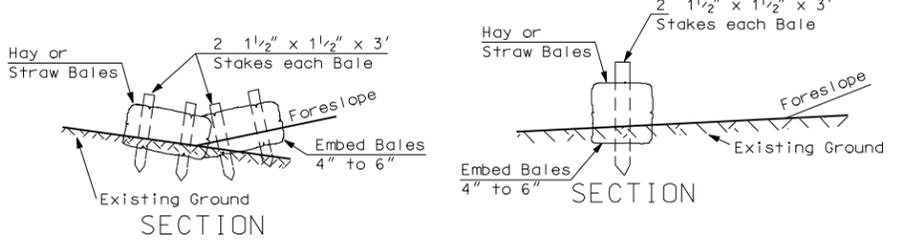
**SILT FENCE**  
Supported and Unsupported



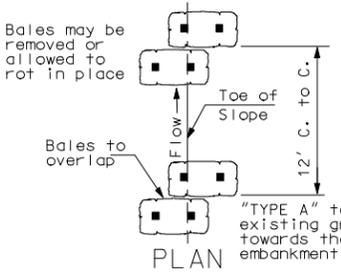
SECTION



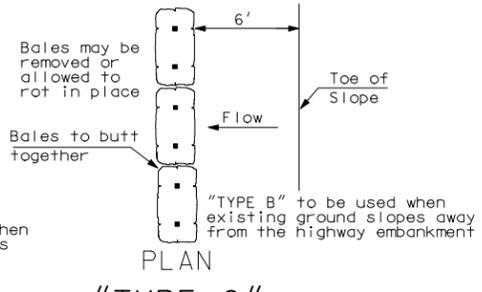
"TYPE A"



SECTION

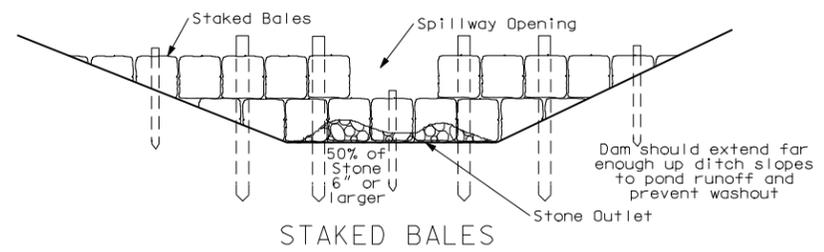


"TYPE B"

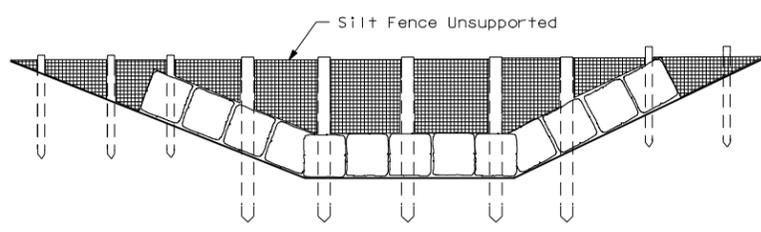


"TYPE C"

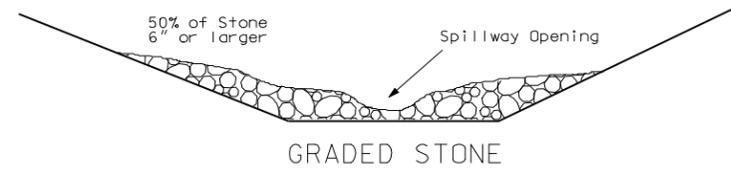
**BALED HAY OR STRAW EROSION CHECKS**



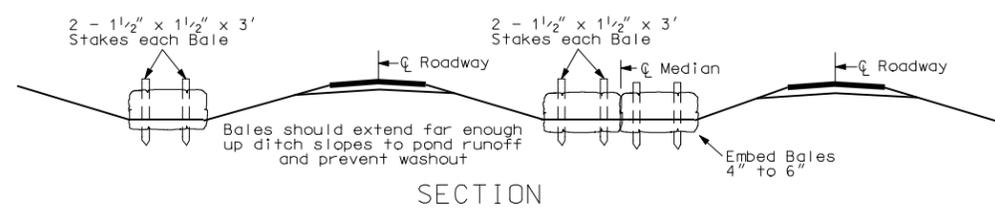
STAKED BALES



FENCE-BACKED BALES

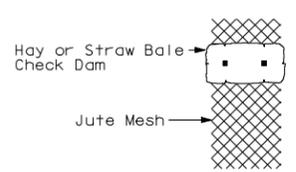


DITCH EROSION DAMS

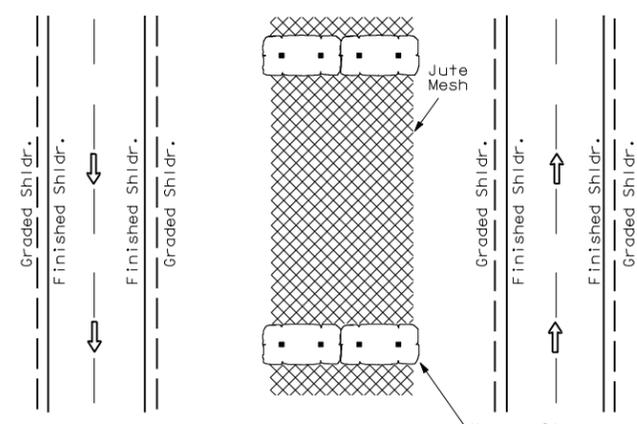


SECTION

**MEDIAN OR DITCH PROTECTION AT STREAM CROSSING**



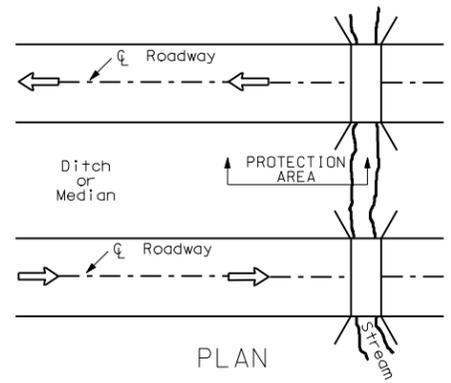
ROADSIDE DITCH



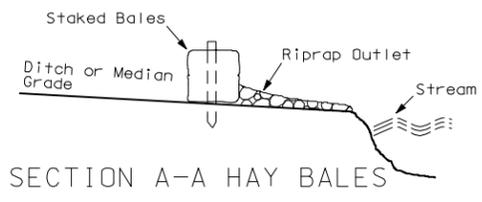
PLAN

MEDIAN DITCH

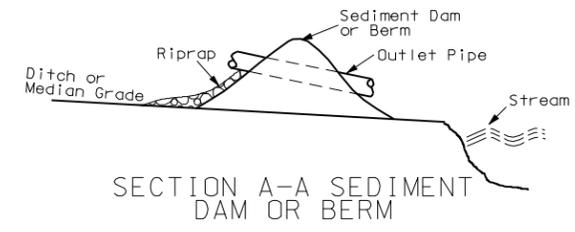
**STONE, JUTE, MESH, OR SOD DITCH & MEDIAN EROSION CONTROL**



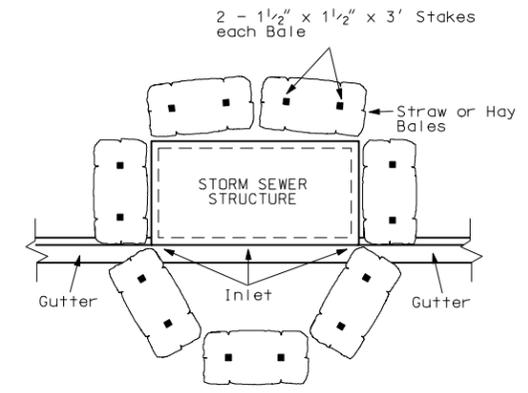
PLAN



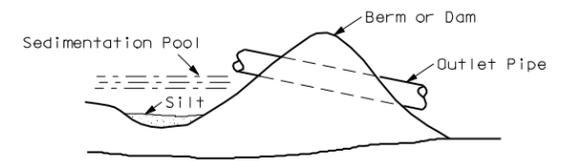
SECTION A-A HAY BALES



SECTION A-A SEDIMENT DAM OR BERM



**STORM SEWER INLET EROSION & SILTATION BARRIER**



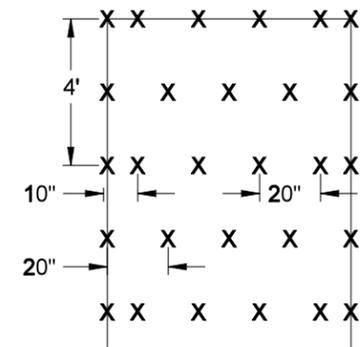
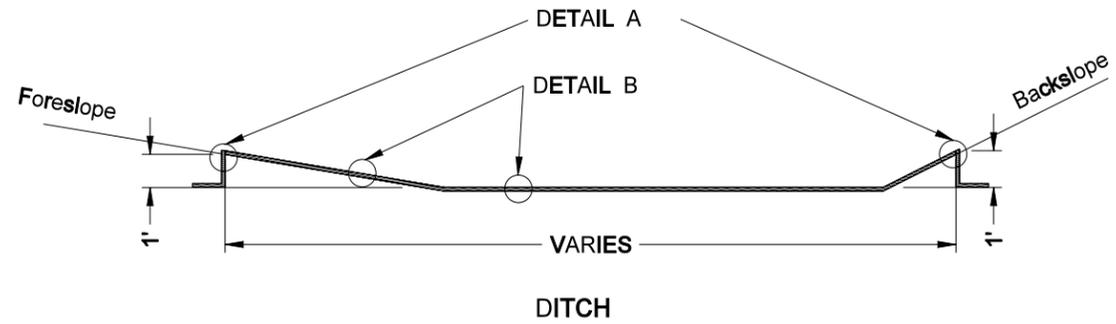
**SMALL SEDIMENT DAM OR BERM**

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                        |
|---|------------------------|
| 10-1-86                                   |                        |
| REVISIONS                                 |                        |
| DATE                                      | CHANGE                 |
| 09-04-92                                  | Ditch check            |
| 09-16-92                                  | Sediment cont. fencing |
| 01-31-95                                  | General revisions      |
| 10-09-02                                  | Sediment fence         |
| 01-24-04                                  | Silt fence             |
| 02-06-04                                  | Rev silt fence details |
| 12-01-04                                  | PE Stamp added         |

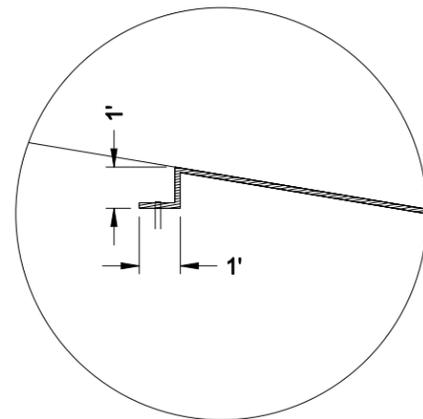
This document was originally issued and sealed by **MARK S GAYDOS**, Registration Number **PE-4518**, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

# EROSION AND SILTATION CONTROL BLANKET INSTALLATION

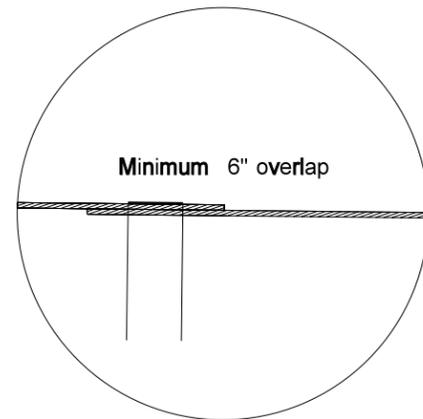
D-708-5



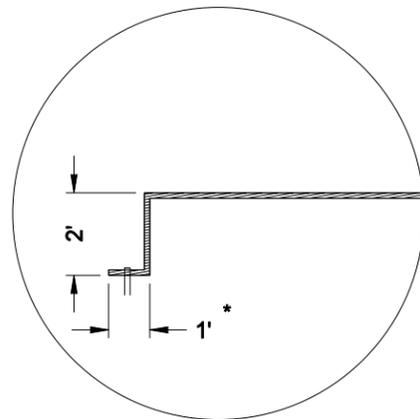
**STAPLE PATTERN:** 3.8 staples per square yard using 8-inch 11 gauge wire "u" staples.



DETAIL A

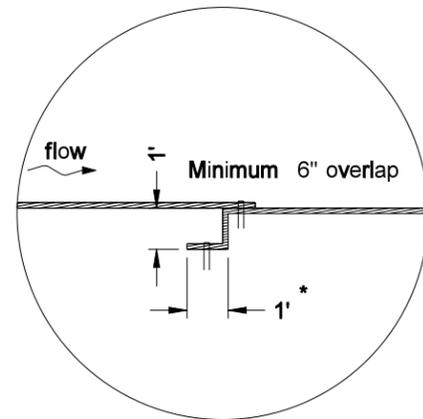


DETAIL B

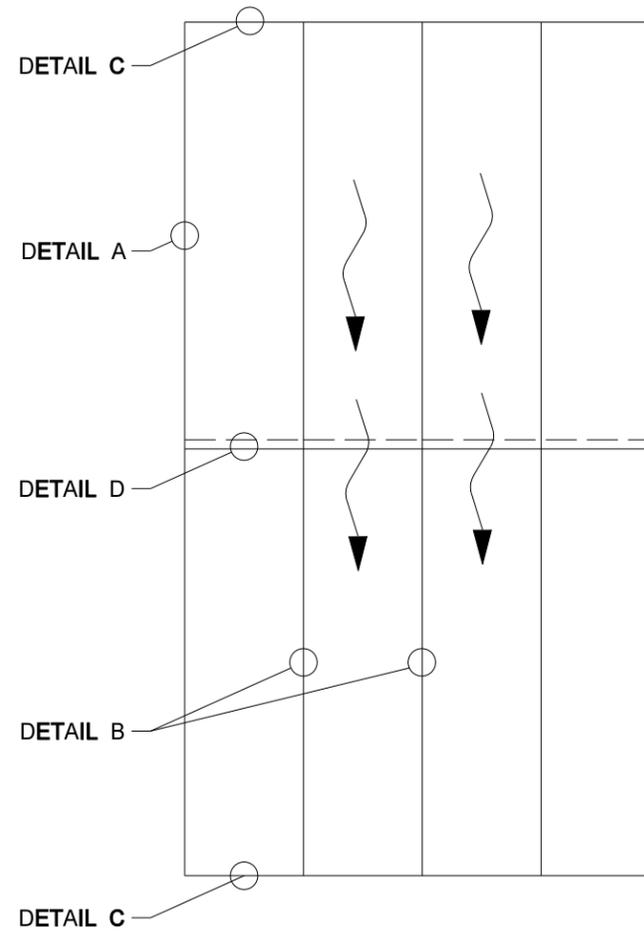


DETAIL C

\* This tie may be placed ahead or back.

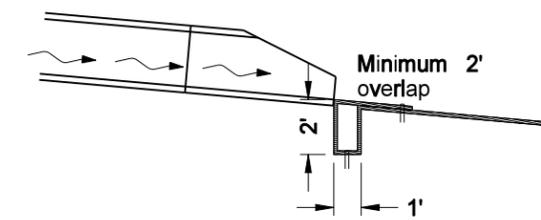


DETAIL D

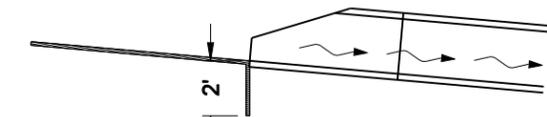


BLANKET LAYOUT

Note: Beginning and ending of erosion control blanket areas shall be installed as DETAIL C.



PIPE OUTLETS



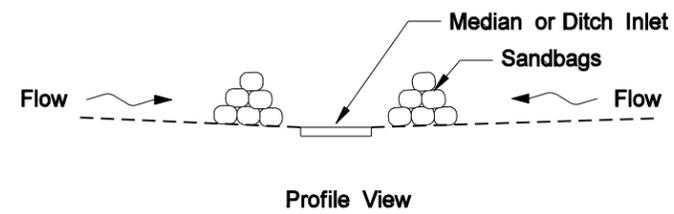
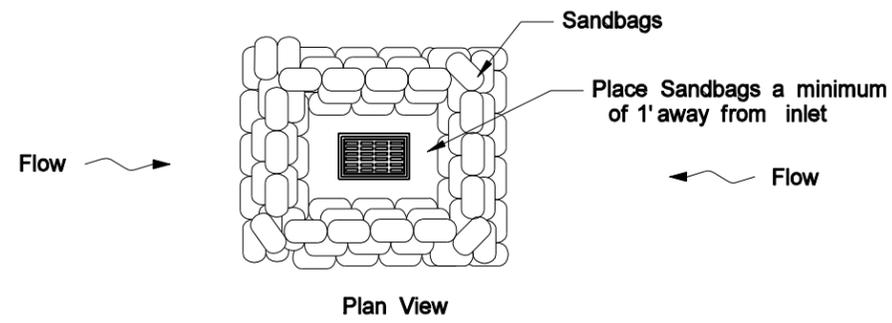
PIPE INLETS  
INSTALLATION AT PIPE ENDS

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 12-13-06                                     |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

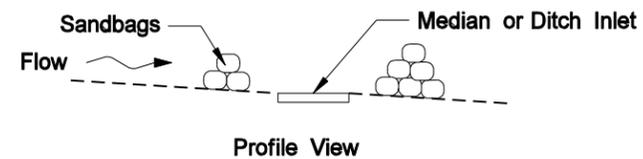
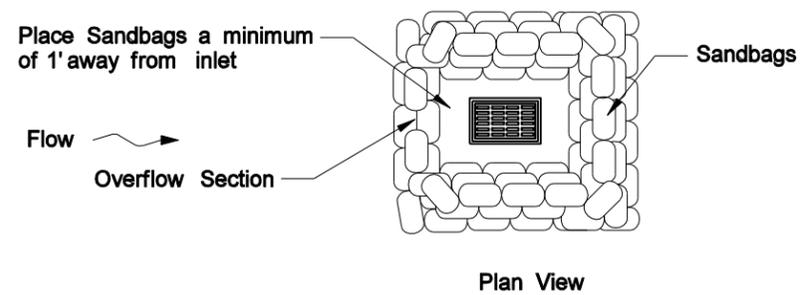
This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number PE- 4518 , on 12/13/06 and the original document is stored at the North Dakota Department of Transportation

EROSION CONTROL  
MEDIAN OR DITCH INLET PROTECTION

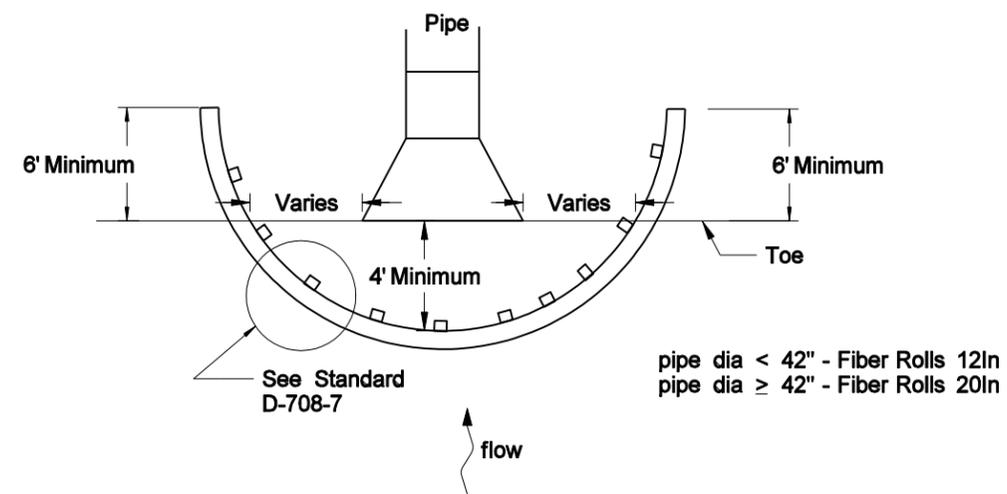
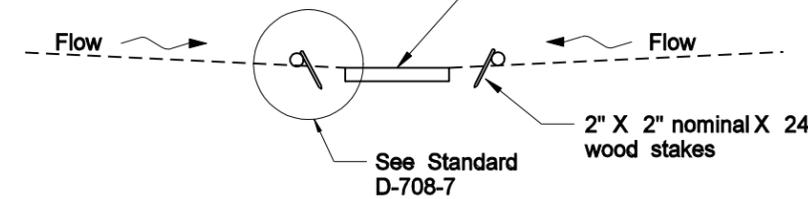
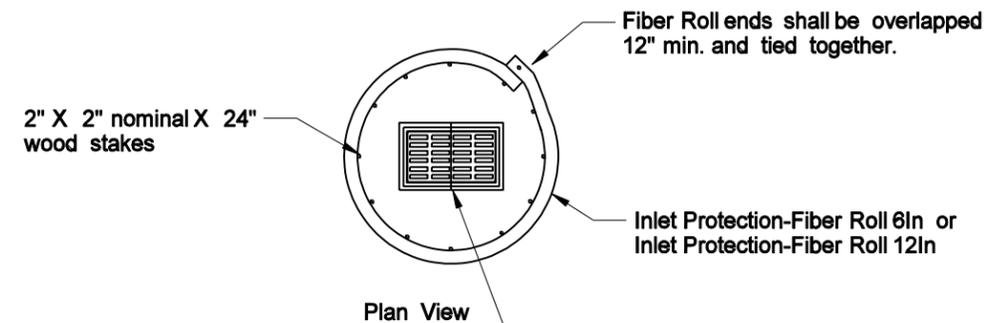
D-708-6



SANDBAG PROTECTION  
LOW POINT



SANDBAG PROTECTION  
ON SLOPE



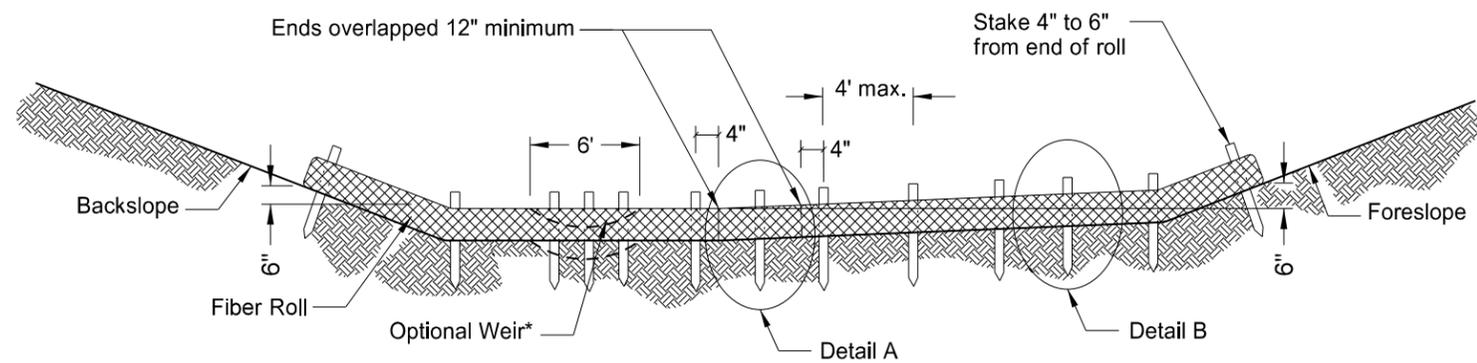
FIBER ROLL PROTECTION  
INLET OF PIPE END

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 12-13-06                                     |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |

|          |  |
|----------|--|
| 12-14-07 | Added 12" Fiber roll overlap, option of butting fiber roll ends removed. |
|----------|--|

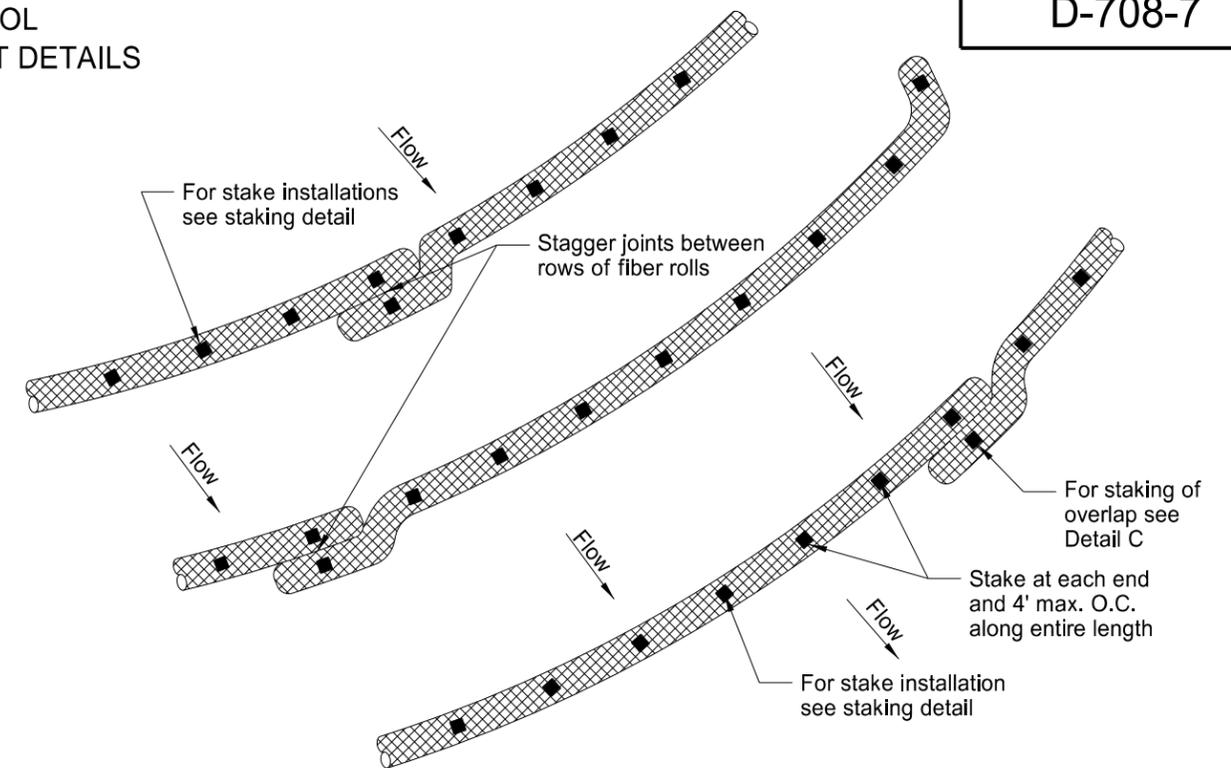
This document was originally issued and sealed by MARK S GAYDOS Registration Number PE-4518, on 12/14/07 and the original document is stored at the North Dakota Department of Transportation

EROSION CONTROL  
FIBER ROLL PLACEMENT DETAILS

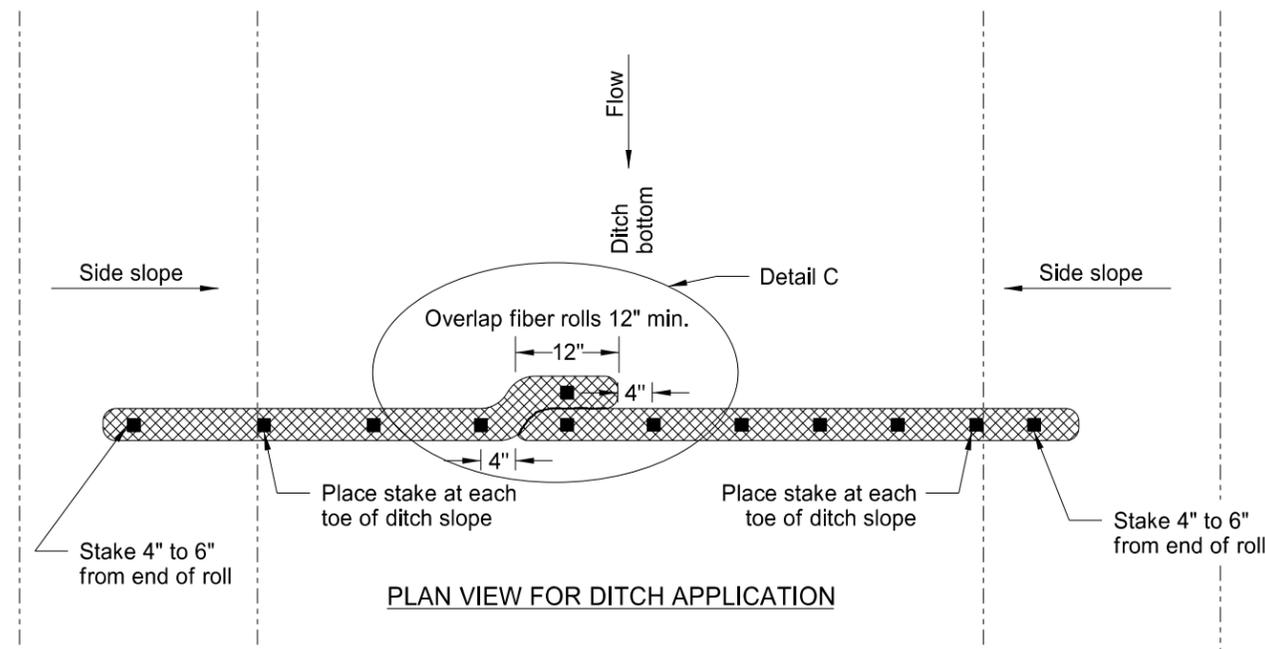


\*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back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

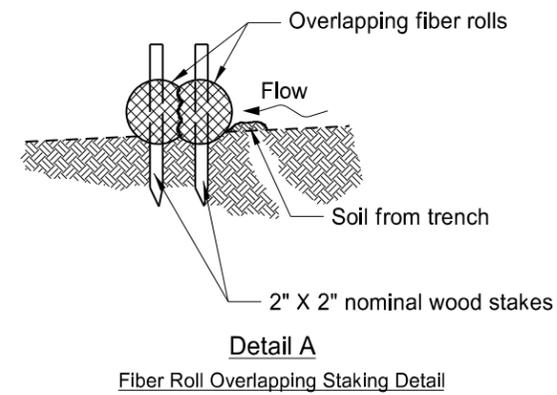
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



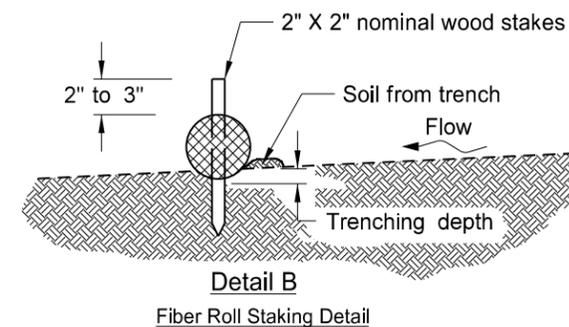
PLAN VIEW FOR SLOPE APPLICATION



PLAN VIEW FOR DITCH APPLICATION



Detail A  
Fiber Roll Overlapping Staking Detail



Detail B  
Fiber Roll Staking Detail

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

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

|  |   |
|--|---|
| NORTH DAKOTA<br>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. |

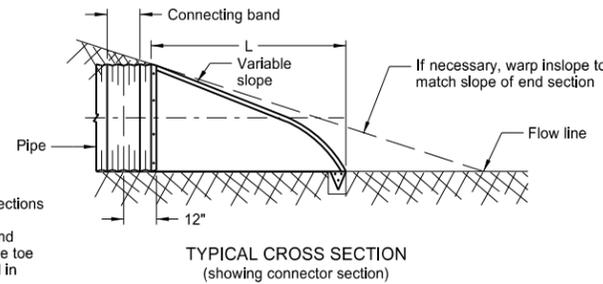
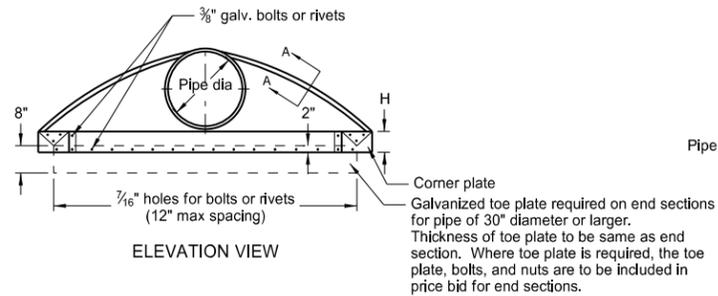
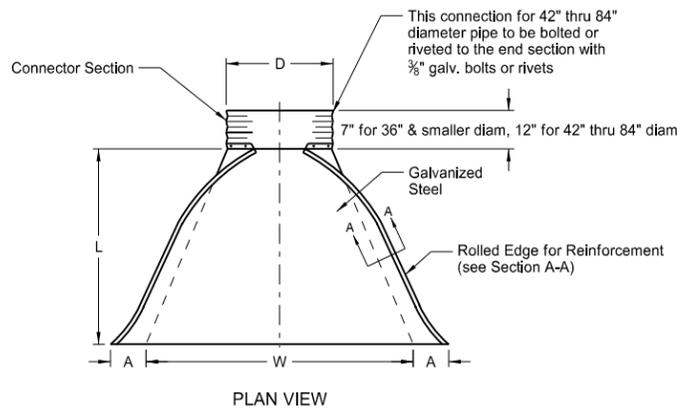
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 06/10/13 and the original document is stored at the North Dakota Department of Transportation





# ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

D-714-4



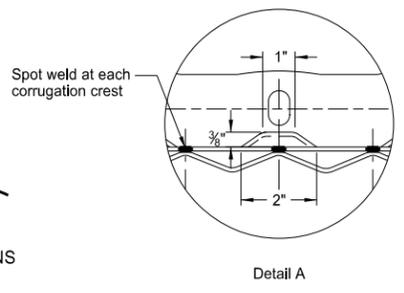
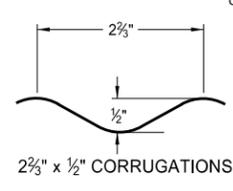
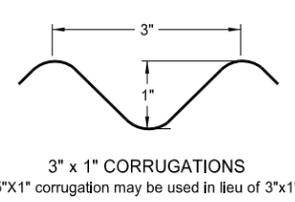
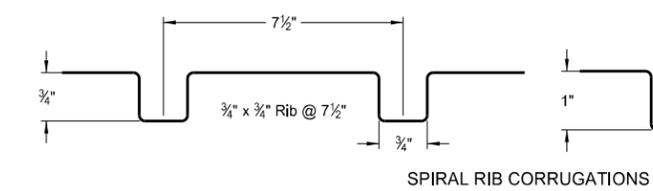
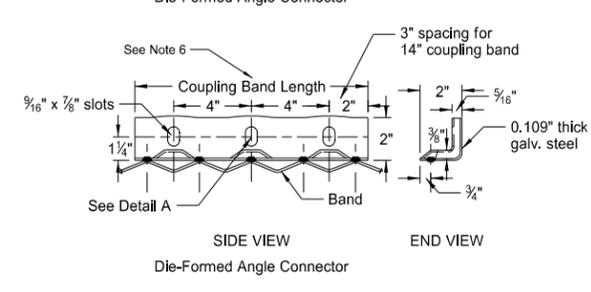
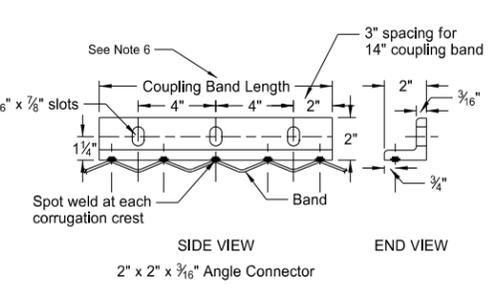
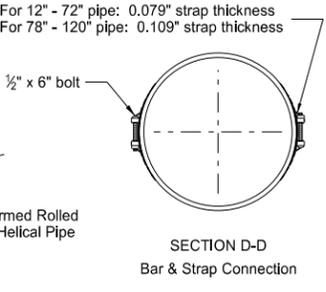
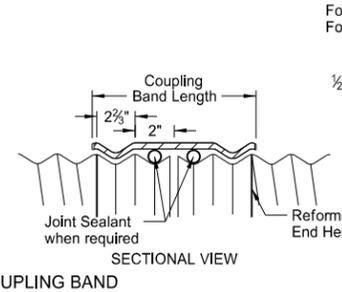
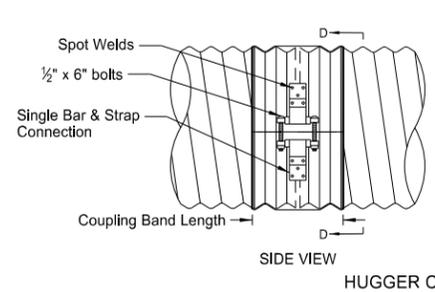
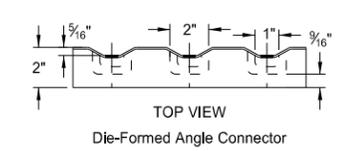
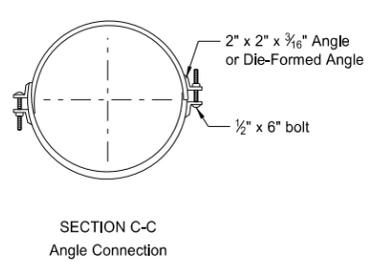
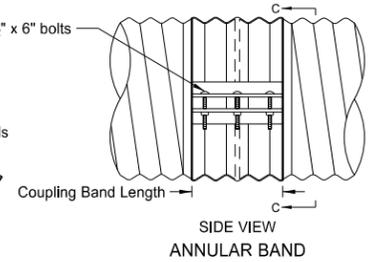
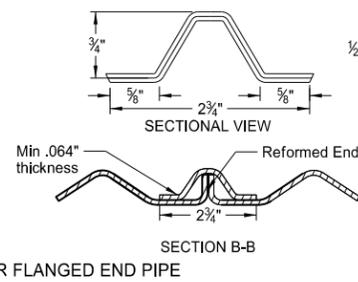
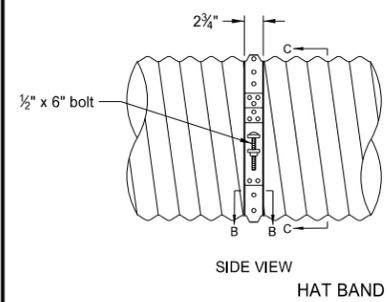
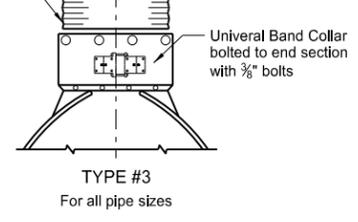
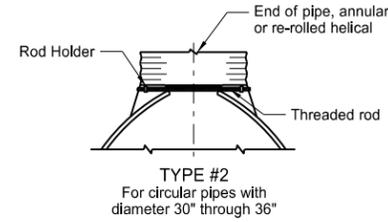
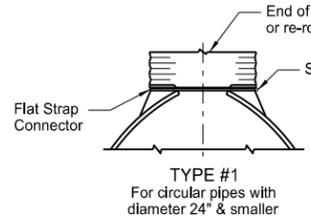
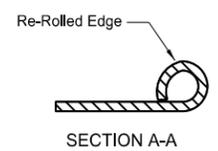
| PIPE DIA. IN | GALV. THICK. | END SECTION DIMENSIONS |      |      |      |      | APPROX. SLOPE | BODY PIECE |
|--------------|--------------|------------------------|------|------|------|------|---------------|------------|
|              |              | A IN                   | B IN | H IN | L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

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

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

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

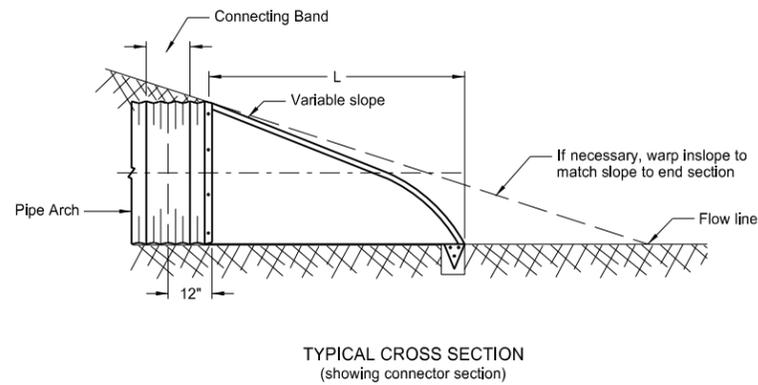
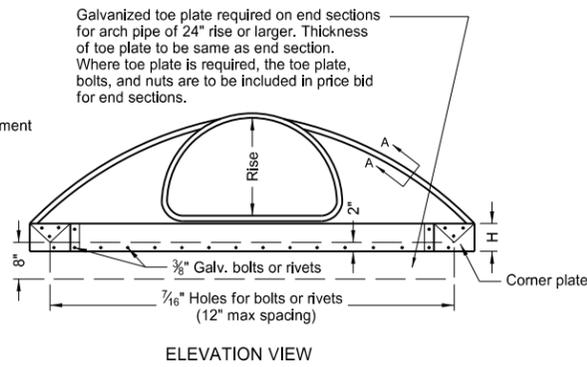
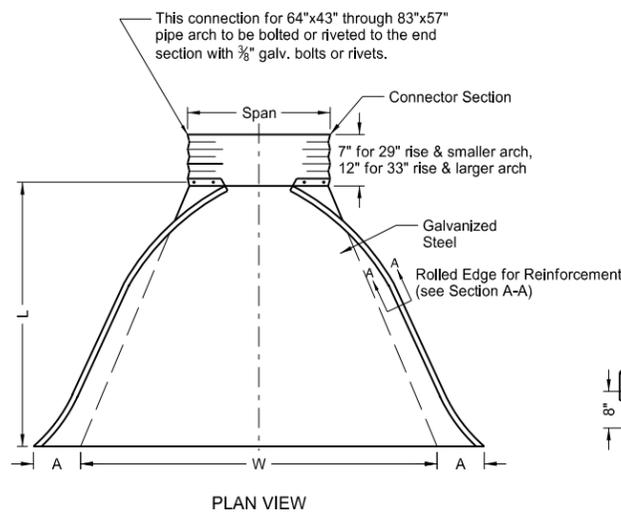
| COUPLING BAND DIMENSIONS |                            |            |                      |                     |
|--------------------------|----------------------------|------------|----------------------|---------------------|
| COUPLING TYPE            | CORRUGATION PITCH x DEPTH  | PIPE SIZE 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



|   |        |
|---|--------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |        |
| 08-06-13                                  |        |
| REVISIONS                                 |        |
| DATE                                      | CHANGE |
|   |        |

This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674 , on 08/06/2013 and the original document is stored at the North Dakota Department of Transportation

# CORRUGATED STEEL PIPE ARCH CULVERTS AND END SECTIONS



| PIPE ARCH DIMENSION |      | GALV. THICK. | END SECTION DIMENSIONS |    |    |    |     | APPROX. SLOPE RATE | BODY PIECE |
|---------------------|------|--------------|------------------------|----|----|----|-----|--------------------|------------|
| SPAN                | RISE |              | A                      | B  | H  | L  | W   |                    |            |
| 17                  | 13   | 0.064        | 7                      | 9  | 6  | 19 | 30  | 2 1/2:1            | 1          |
| 21                  | 15   | 0.064        | 7                      | 10 | 6  | 23 | 36  | 2 1/2:1            | 1          |
| 24                  | 18   | 0.064        | 8                      | 12 | 6  | 28 | 42  | 2 1/2:1            | 1          |
| 28                  | 20   | 0.064        | 9                      | 14 | 6  | 32 | 48  | 2 1/2:1            | 1          |
| 35                  | 24   | 0.079        | 10                     | 16 | 6  | 39 | 60  | 2 1/2:1            | 1 or 2     |
| 42                  | 29   | 0.079        | 12                     | 18 | 8  | 46 | 75  | 2 1/2:1            | 1 or 2     |
| 49                  | 33   | 0.109        | 13                     | 21 | 9  | 53 | 85  | 2 1/2:1            | 2          |
| 57                  | 38   | 0.109        | 18                     | 26 | 12 | 63 | 90  | 2 1/2:1            | 2          |
| 64                  | 43   | 0.109        | 18                     | 30 | 12 | 70 | 102 | 2 1/2:1            | 2          |
| * 71                | 47   | 0.109        | 18                     | 33 | 12 | 77 | 114 | 2 1/2:1            | 3          |
| * 77                | 52   | 0.109        | 18                     | 36 | 12 | 77 | 126 | 2:1                | 3          |
| * 83                | 57   | 0.109        | 18                     | 39 | 12 | 77 | 138 | 2:1                | 3          |

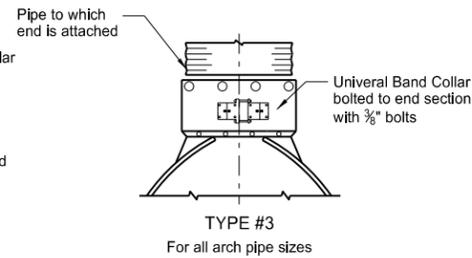
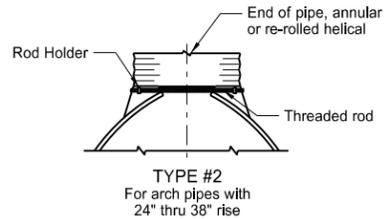
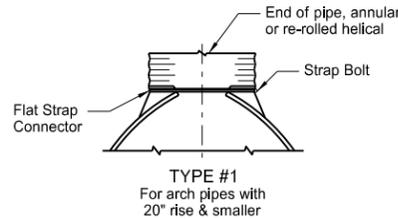
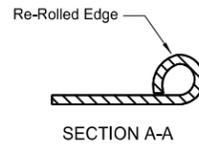
① These sizes have 0.109" sides and 0.138" center panels.

Manufacturers tolerances of above dimensions will be allowed.

Splices to be the lap riveted type.

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

① Applicable to equivalent sizes of 3"x1" corrugations.



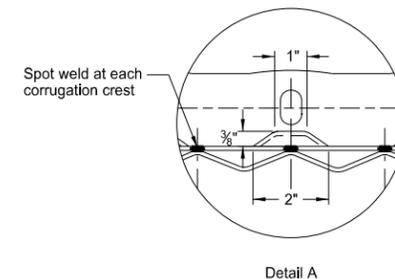
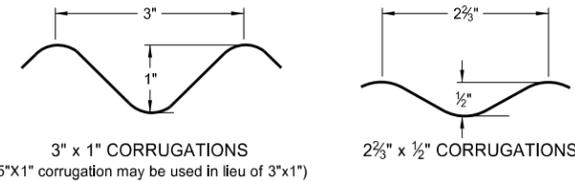
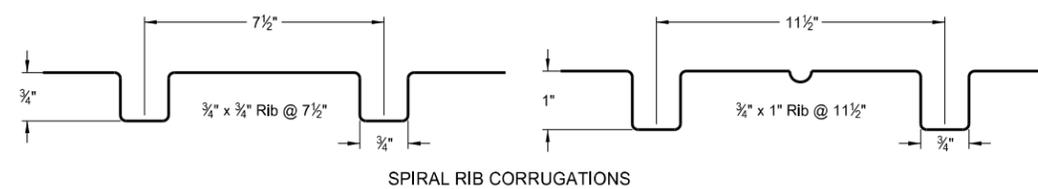
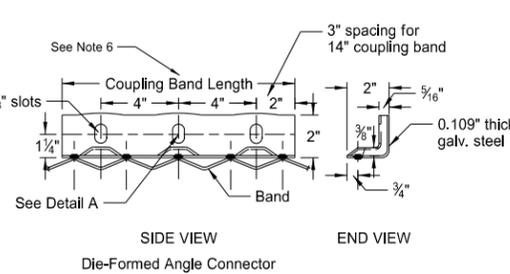
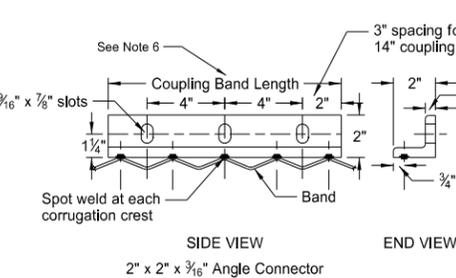
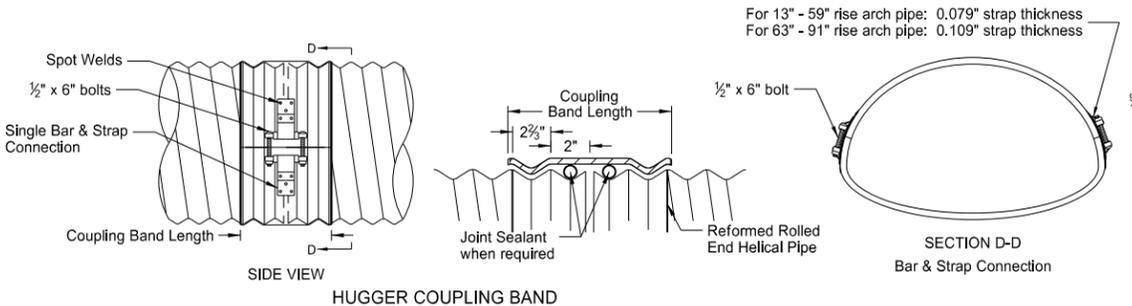
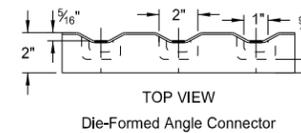
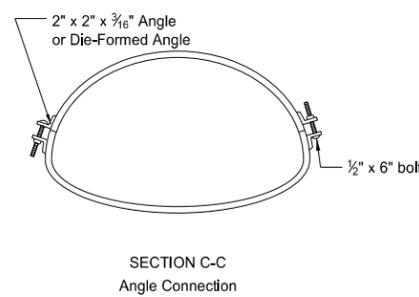
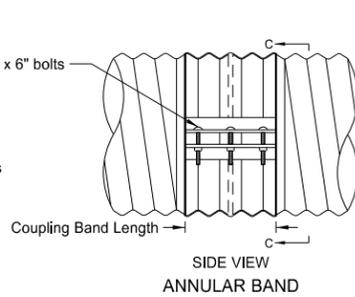
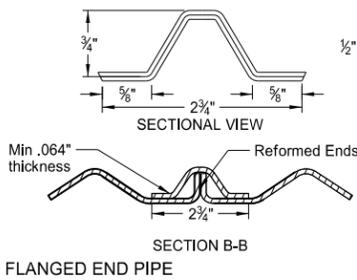
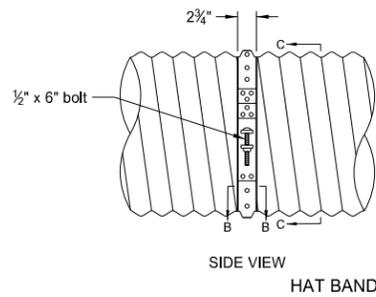
| 2 1/2" x 1 1/2" CORRUGATIONS |      |                  |
|------------------------------|------|------------------|
| SPAN                         | RISE | EQUIV. PIPE DIA. |
| 17                           | 13   | 15               |
| 21                           | 15   | 18               |
| 24                           | 18   | 21               |
| 28                           | 20   | 24               |
| 35                           | 24   | 30               |
| 42                           | 29   | 36               |
| 49                           | 33   | 42               |
| 57                           | 38   | 48               |
| 64                           | 43   | 54               |
| 71                           | 47   | 60               |
| 77                           | 52   | 66               |
| 83                           | 57   | 72               |

| 3" x 1" CORRUGATIONS |      |                  |
|----------------------|------|------------------|
| SPAN                 | RISE | EQUIV. PIPE DIA. |
| 53                   | 41   | 48               |
| 60                   | 46   | 54               |
| 66                   | 51   | 60               |
| 73                   | 55   | 66               |
| 81                   | 59   | 72               |
| 87                   | 63   | 78               |
| 95                   | 67   | 84               |
| 103                  | 71   | 90               |
| 112                  | 75   | 96               |
| 117                  | 79   | 102              |
| 128                  | 83   | 108              |
| 137                  | 87   | 114              |
| 142                  | 91   | 120              |

| COUPLING BAND DIMENSIONS |                           |                      |                      |                     |
|--------------------------|---------------------------|----------------------|----------------------|---------------------|
| COUPLING TYPE            | CORRUGATION PITCH x DEPTH | ARCH PIPE RISE       | COUPLING BAND LENGTH | MIN. BAND THICKNESS |
| Hat Band                 | 2 3/8" x 1/2"             | 13" - 38"            | 2 3/4"               | .064"               |
|                          |                           | 41" - 91"            | 14"                  | .052"               |
| Annular Band             | 2 3/8" x 1/2"             | 13" - 57"            | 10 1/2"              | .052"               |
|                          |                           | 63" - 67"            | 10 1/2"              | .079"               |
| Hugger Band              | 3" x 1" Rerolled End      | 41" - 91"            | 10 1/2"              | .052"               |
|                          |                           | 5" x 1" Rerolled End | 12"                  | .064"               |
|                          |                           | 41" - 91"            | 12"                  | .064"               |

NOTES:

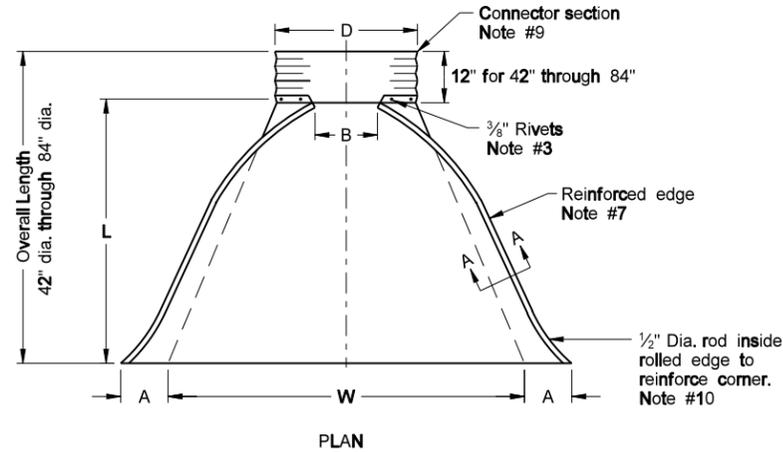
- Pipe and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
- Top edge of all end sections to have rolled edges for reinforcement (see Section A-A). The reinforced edges are to be supplemented with 2" x 2" 3/16" galv. angle for 77"x52" and 83"x57" sizes. Angles are to be attached by galv. 3/8" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
- Coupling bands shall be two-piece for all arch pipes.
- 1/2" x 8" bolts may be used as a substitute for the 1/2" x 6" bolts shown in the details.
- Coupling bands wider than 14" may be used if a minimum of four 1/2" bolts with maximum spacing of 5 1/2" are used for the connection
- Length of spot welds shall be minimum 1/2".



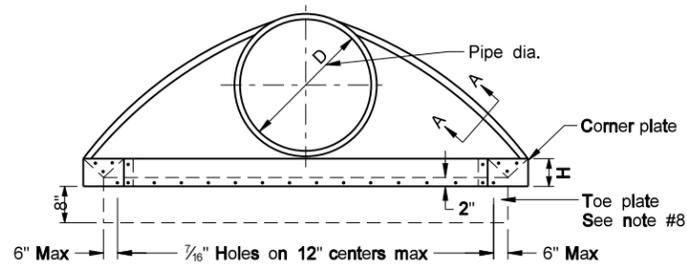
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |        |
|---|--------|
| 08-06-13                                  |        |
| REVISIONS                                 |        |
| DATE                                      | CHANGE |
|   |        |

This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674 , on 08/06/2013 and the original document is stored at the North Dakota Department of Transportation

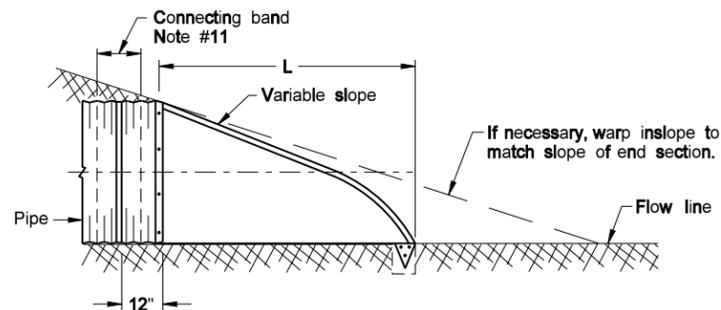
### CORRUGATED ALUMINUM PIPE CULVERT AND END SECTIONS (ROUND PIPE)



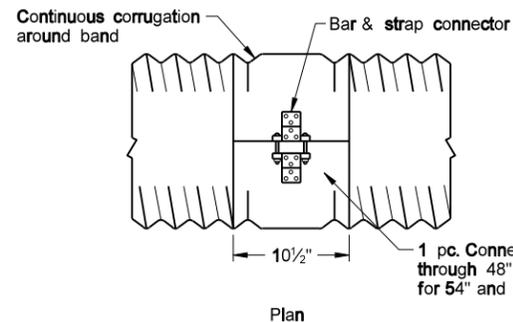
PLAN



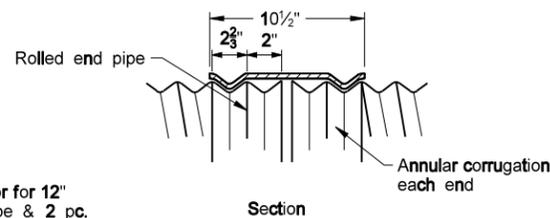
ELEVATION



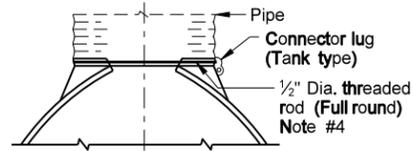
TYPICAL CROSS SECTION  
(Showing connector section)



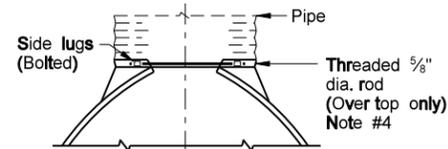
CONNECTING BAND DETAILS FOR HELICAL, WELDED-SEAM CULVERT



SECTION A-A



Sizes 18" & 24" only



Sizes 30" & 36" only

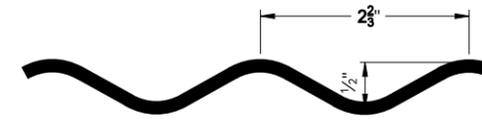
ROD CONNECTION DETAIL

| 1/2" Dia. threaded rod |        |
|------------------------|--------|
| Pipe size              | Length |
| 18"                    | 65"    |
| 24"                    | 83"    |

2 1/2" Threaded length both ends. 1/2"-13 UNC thread.

| 5/8" Dia. threaded rod |         |
|------------------------|---------|
| Pipe size              | Length  |
| 30"                    | 22 1/4" |
| 36"                    | 25 5/8" |

1 3/4" Thread length both ends. 5/8"-11 UNC thread



2 2/3" x 1/2" CORRUGATIONS

| * * PIPE DIA. | WATERWAY AREA SQ FT | GALV. THICK. | END SECTION DIMENSIONS |    |    |    |     | APPROX. SLOPE RATE | BODY PIECE |
|---------------|---------------------|--------------|------------------------|----|----|----|-----|--------------------|------------|
|               |                     |              | A                      | B  | H  | L  | W   |                    |            |
|               |                     |              | IN                     | IN | IN | IN | IN  |                    |            |
| 18            | 1.8                 | 0.060        | 8                      | 10 | 6  | 31 | 36  | 2 1/2:1            | 1          |
| 24            | 3.1                 | 0.060        | 10                     | 13 | 6  | 41 | 48  | 2 1/2:1            | 1          |
| 30            | 4.9                 | 0.075        | 12                     | 16 | 8  | 51 | 60  | 2 1/2:1            | 1 or 2     |
| 36            | 7.1                 | 0.075        | 14                     | 19 | 9  | 60 | 72  | 2 1/2:1            | 2          |
| 42            | 9.6                 | 0.105        | 16                     | 22 | 11 | 69 | 84  | 2 1/2:1            | 2          |
| 48            | 12.6                | 0.105        | 18                     | 27 | 12 | 78 | 90  | 2 1/2:1            | 2          |
| 54            | 16.0                | 0.105        | 18                     | 30 | 12 | 84 | 102 | 2 :1               | 2          |
| * 60          | 19.6                | 0.105        | 18                     | 33 | 12 | 87 | 114 | 1 3/4:1            | 3          |
| * 66          | 23.8                | 0.105        | 18                     | 36 | 12 | 87 | 120 | 1 1/2:1            | 3          |
| * 72          | 28.3                | 0.105        | 18                     | 39 | 12 | 87 | 126 | 1 1/3:1            | 3          |
| * 78          | 33.2                | 0.105        | 18                     | 42 | 12 | 87 | 132 | 1 1/4:1            | 3          |
| * 84          | 38.5                | 0.105        | 18                     | 45 | 12 | 87 | 138 | 1 1/6:1            | 3          |

\* These sizes have 0.135" thick center panels.

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

Manufacturers tolerances of above dimensions will be allowed.

78" and 84" diameter pipe shall be 5% vertically elongated.

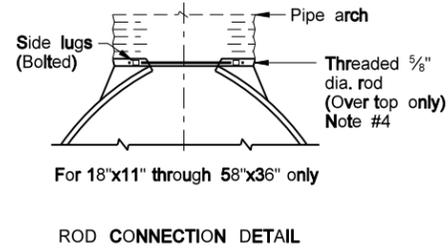
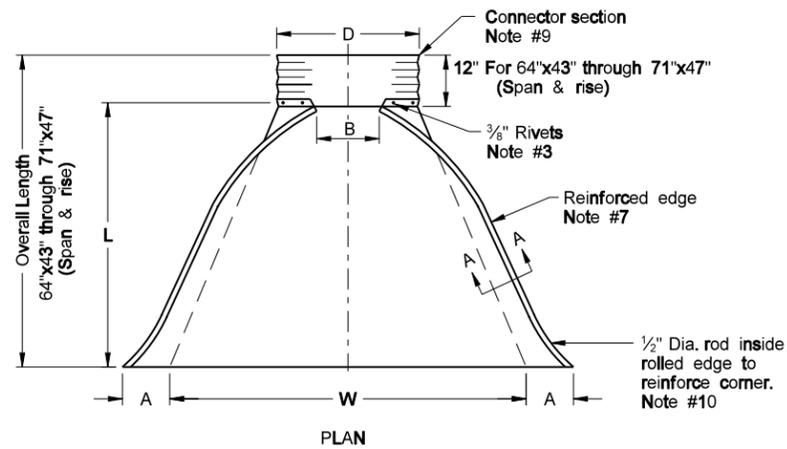
**NOTES:**

- End sections shall be made from aluminum alloy 3004-0, clad 5% each side with alloy 7072.
- Corner plate shall be the same material and thickness as end section.
- Rivets shall be aluminum alloy 6053-T4.
- Threaded rods shall be aluminum alloy 6061-T6.
- Connector & side lugs, bolts, and nuts shall be hot-dipped galvanized steel.
- Multiple panel bodies shall have 2" lap seams which are to be tightly joined with 3/8" diameter rivets spaced 6" c. to c.
- Top edge of all end sections to have rolled edge reinforcement (See section A-A). The rolled edge is to be supplemented with 2"x2"x1/4" aluminum alloy angle for 60" through 72" diameter and 2 1/2"x2 1/2"x1/4" angle for 78" and 84" diameter. Angles to be attached by 3/8" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
- Aluminum alloy toe plate required on end sections for pipe of 30" diameter or larger. Thickness of toe plate to be same as end section. Where toe plate is needed, the toe plate, nuts, and bolts are to be included in price bid for end sections.
- Connector section, when specified, shall be corrugated aluminum alloy pipe culvert.
- Reinforcement for edge of end section shall be alloy 6063-F.
- Pipe and connection bands shall conform to applicable sections of NDDOT Standard specifications and to AASHTO M-196 and M-211.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                           |
|---|---------------------------|
| 10-1-86                                   |                           |
| REVISIONS                                 |                           |
| DATE                                      | CHANGE                    |
| 04-28-89                                  | Toe plate note            |
| 06-25-03                                  | Revised layout            |
| 12-01-04                                  | PE Stamp added            |
| 12-08-08                                  | Removed min/max fill info |

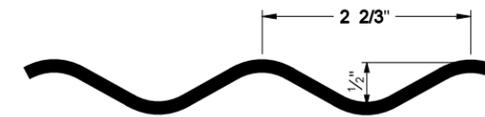
This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674, on 12/08/2008 and the original document is stored at the North Dakota Department of Transportation

### CORRUGATED ALUMINUM PIPE ARCH CULVERTS AND END SECTIONS



| 5/8" Dia. threaded rod<br>Pipe size | Length-in. |
|-------------------------------------|------------|
| 18"x11"                             | 14 3/8     |
| 22"x13"                             | 16         |
| 25"x16"                             | 17 1/2     |
| 29"x18"                             | 19         |
| 36"x22"                             | 22 1/4     |
| 43"x27"                             | 25 3/8     |
| 50"x31"                             | 28 1/2     |
| 58"x36"                             | 31 5/8     |

1 3/4" Thread length both ends. 5/8"-11 UNC thread



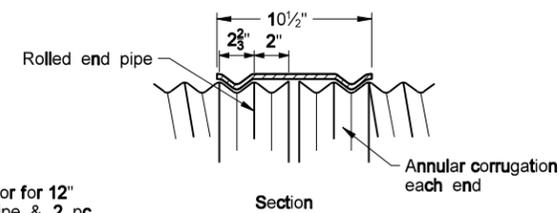
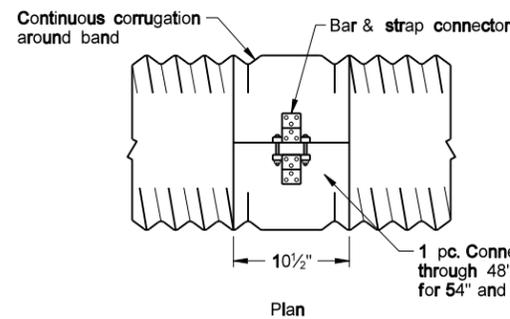
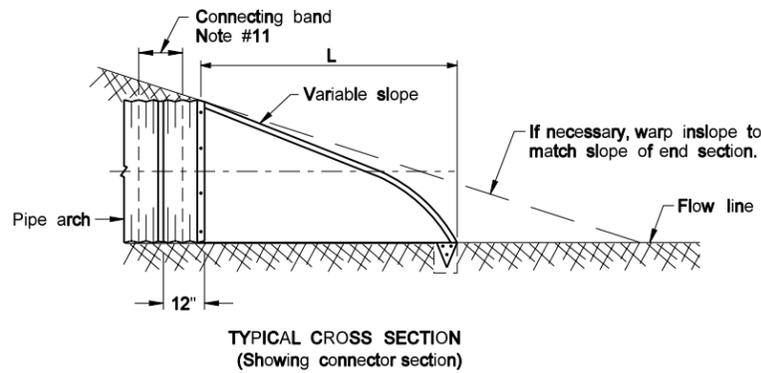
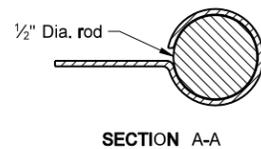
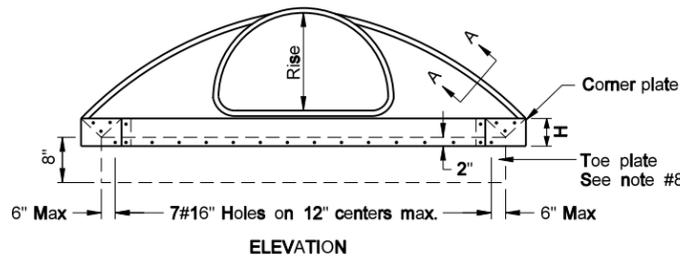
2 2/3" x 1/2" CORRUGATIONS

| PIPE ARCH DIMENSION<br>SPAN<br>IN | RISE<br>IN | GALV. THICK. | END SECTION DIMENSIONS |         |         |         |         | APPROX. SLOPE RATE | BODY PIECE |
|-----------------------------------|------------|--------------|------------------------|---------|---------|---------|---------|--------------------|------------|
|                                   |            |              | A<br>IN                | B<br>IN | H<br>IN | L<br>IN | W<br>IN |                    |            |
| 17                                | 13         | 0.060        | 7                      | 9       | 6       | 19      | 30      | 2 1/2:1            | 1          |
| 21                                | 15         | 0.060        | 7                      | 10      | 6       | 23      | 36      | 2 1/2:1            | 1          |
| 24                                | 18         | 0.060        | 8                      | 12      | 6       | 28      | 42      | 2 1/2:1            | 1          |
| 28                                | 20         | 0.060        | 9                      | 14      | 6       | 32      | 48      | 2 1/2:1            | 1          |
| 35                                | 24         | 0.075        | 10                     | 16      | 6       | 39      | 60      | 2 1/2:1            | 1 or 2     |
| 42                                | 29         | 0.075        | 12                     | 18      | 8       | 47      | 75      | 2 1/2:1            | 1 or 2     |
| 49                                | 33         | 0.105        | 13                     | 21      | 9       | 53      | 85      | 2 1/2:1            | 2          |
| 57                                | 38         | 0.105        | 18                     | 26      | 12      | 63      | 90      | 2 1/2:1            | 2          |
| 64                                | 43         | 0.105        | 18                     | 30      | 12      | 70      | 102     | 2 1/2:1            | 2          |
| * 71                              | 47         | 0.105        | 18                     | 33      | 12      | 77      | 114     | 2 1/2:1            | 3          |

\* These sizes have 0.135" thick center panels. Manufacturers tolerances of above dimensions will be allowed.

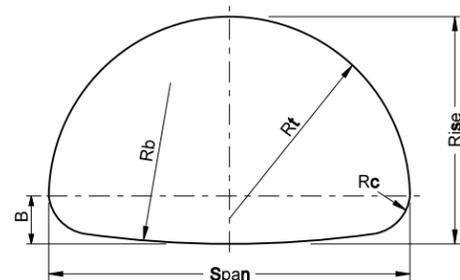
**END SECTION NOTES:**

- End sections shall be made in accordance with specifications AASHTO M-196
- Corner plate shall be the same material and thickness as end section.
- Rivets shall be aluminum alloy 6053-T4.
- Threaded rods shall be aluminum alloy 6061-T6.
- Side lugs, bolts, and nuts shall be hot-dipped galvanized steel.
- Multiple panel bodies shall have 2" lap seams which are to be tightly joined with 3/8" diameter rivets spaced 6" c. to c.
- Top edge of all end sections to have rolled edge reinforcement (See section A-A).
- Aluminum alloy toe plate required on end sections for pipe arch of 29" rise or larger. Thickness of toe plate to be same as end section. Where toe plate is needed, toe plate, nuts, and bolts are to be included in price bid for end sections.
- Connector section, when specified, shall be corrugated aluminum alloy pipe arch culvert.
- Reinforcement for edge of end section shall be alloy 6063-F.
- Connection bands shall conform to AASHTO M-196.



**RIVETED OR HELICAL FABRICATION**

| DIA. OF EQUAL PIPE<br>IN | SPAN<br>IN | RISE<br>IN | WATER-WAY<br>SQ. FT. | LAYOUT DIMENSIONS |          |          |          |
|--------------------------|------------|------------|----------------------|-------------------|----------|----------|----------|
|                          |            |            |                      | B<br>IN           | Rc<br>IN | Rt<br>IN | Rb<br>IN |
| 15                       | 18         | 11         | 1.1                  | 4 1/2             | 3 1/2    | 10 1/16  | 19 1/8   |
| 18                       | 22         | 13         | 1.6                  | 4 3/4             | 4        | 11 1/8   | 37 1/16  |
| 21                       | 25         | 16         | 2.2                  | 5 1/4             | 4        | 12 3/4   | 33 1/2   |
| 24                       | 29         | 18         | 2.8                  | 5 1/2             | 4 1/2    | 14 3/4   | 55       |
| 30                       | 36         | 22         | 4.4                  | 6 1/4             | 5        | 18 1/4   | 73 1/4   |
| 36                       | 43         | 27         | 6.4                  | 7                 | 5 1/2    | 21 1/16  | 91 1/16  |
| 42                       | 50         | 31         | 8.7                  | 8                 | 6        | 25 1/8   | 97 1/4   |
| 48                       | 58         | 36         | 11.4                 | 9 1/4             | 7        | 29 1/8   | 115 1/16 |
| 54                       | 65         | 40         | 14.3                 | 10 1/2            | 8        | 32 3/4   | 129 3/16 |
| 60                       | 72         | 44         | 17.6                 | 11 1/4            | 9        | 36 5/16  | 142 5/16 |



**PIPE ARCH CULVERT NOTES:**

All dimensions are measured from the inside crests of the corrugations. A tolerance of plus or minus one inch will be permissible in span, rise, and B. The dimension B shall be measured vertically from a horizontal line drawn across the widest portion of the arch.

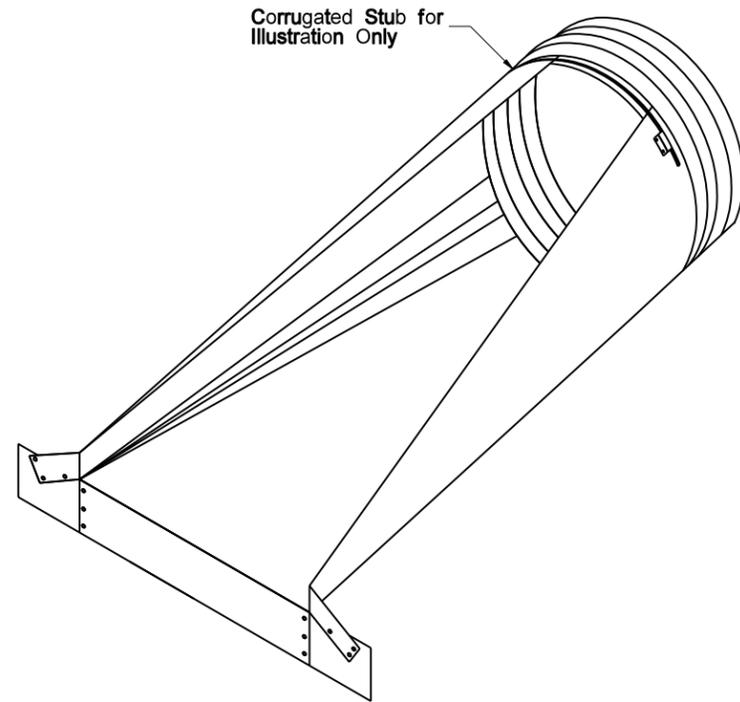
The lapped longitudinal seams shall be factory riveted and shall be staggered so as to alternate on each side of the center of the top of the arch by approximately fifteen percent of the periphery.

Pipe arch culverts shall conform to the applicable requirements of AASHTO M-196 or M219-66.

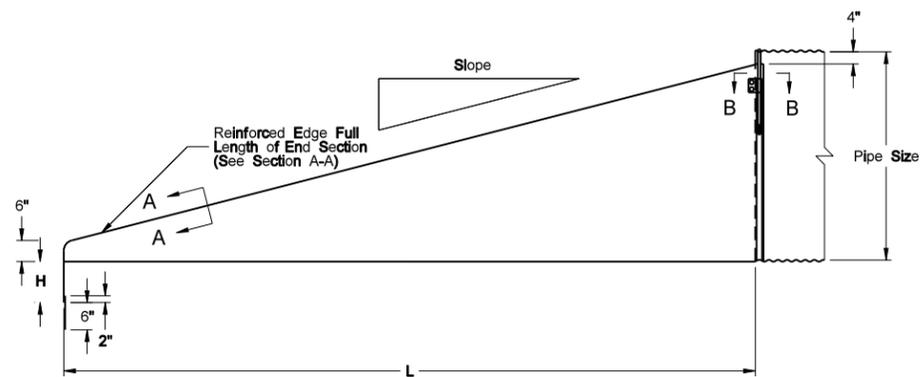
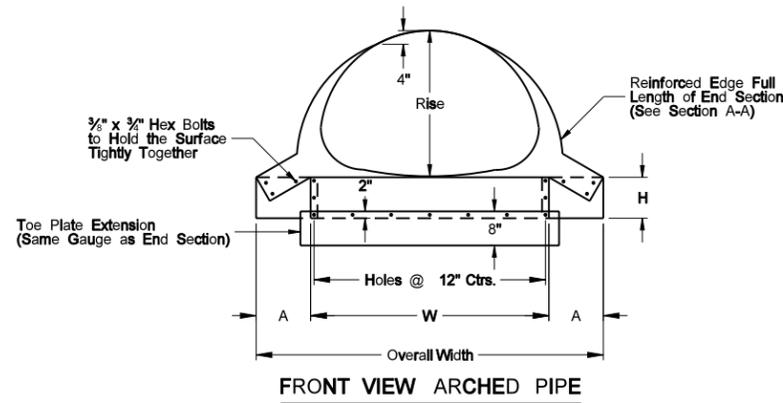
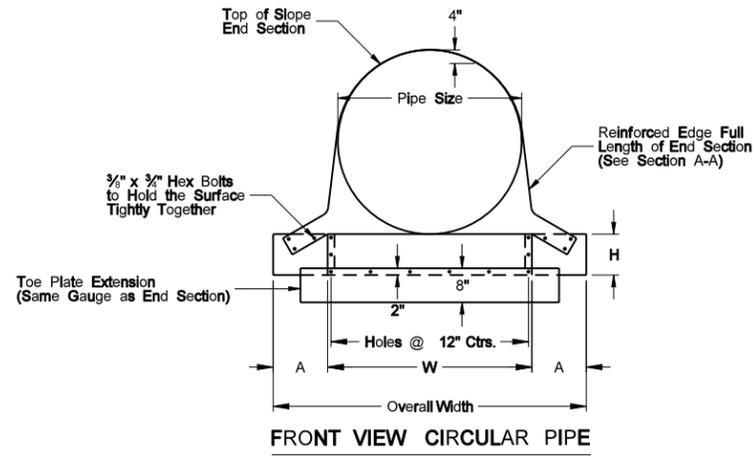
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                           |
|--|---------------------------|
| 10-1-86                                      |                           |
| REVISIONS                                    |                           |
| DATE   | CHANGE                    |
| 04-28-89                                     | Toe plate note            |
| 06-25-03                                     | Revised layout            |
| 12-01-04                                     | PE Stamp added            |
| 12-08-08                                     | Removed min/max fill info |

This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674, on 12/08/2008 and the original document is stored at the North Dakota Department of Transportation

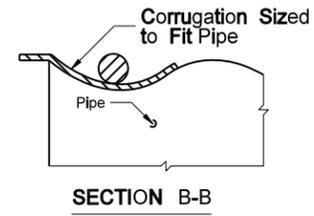
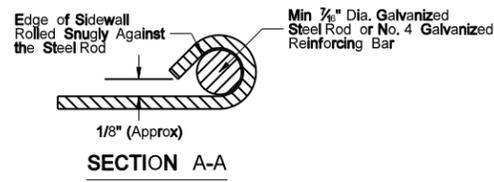
TRAVERSABLE END SECTIONS FOR CORRUGATED STEEL PIPE CULVERTS



ISOMETRIC VIEW



SIDE VIEW



TRAVERSABLE END SECTIONS FOR CIRCULAR PIPES

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

TRAVERSABLE END SECTIONS FOR ARCHED PIPES

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

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

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

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

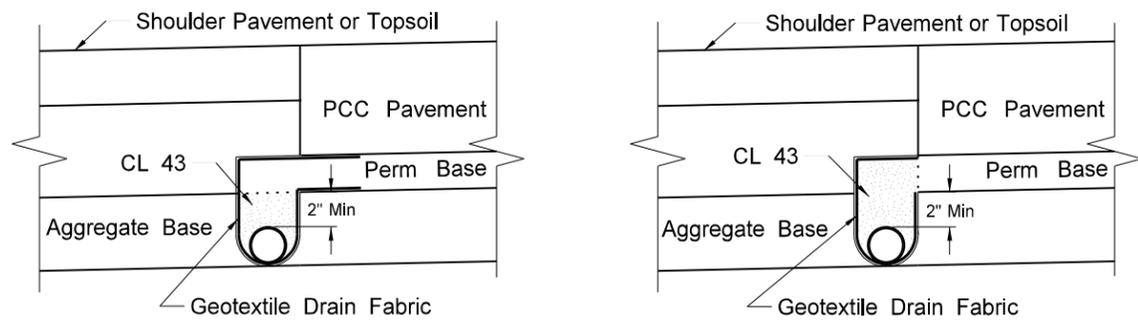
For arched pipe end sections (21" X 15" through 28" X 20"), rod type connection to corrugated steel pipe, using 1/2" diameter rod shall be used.

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 07-23-09                                     |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |

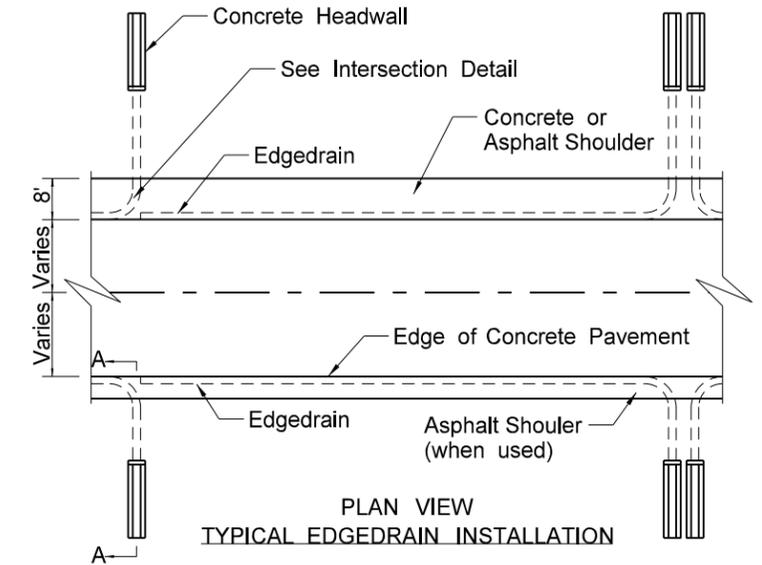
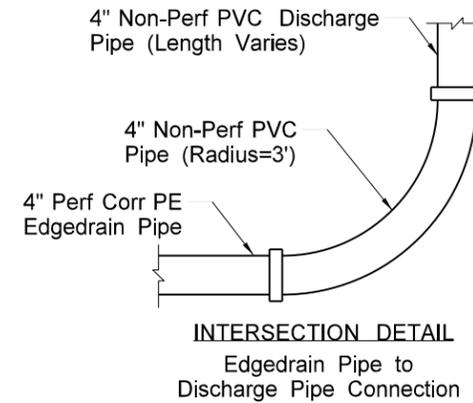
This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674 , on 07/23/09 and the original document is stored at the North Dakota Department of Transportation

EDGEDRAIN DETAILS

D-714-18



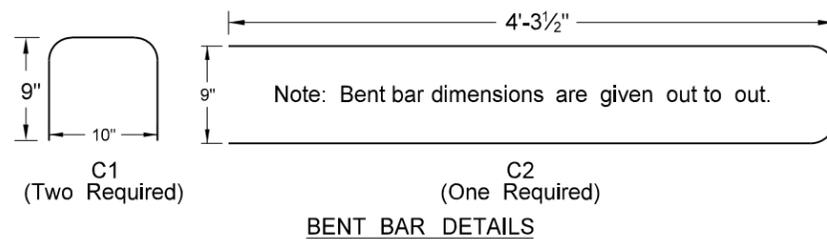
Option #1: Trench before permeable base is placed  
Option #2: Trench after permeable base is placed  
**TRENCH WRAP DETAILS**



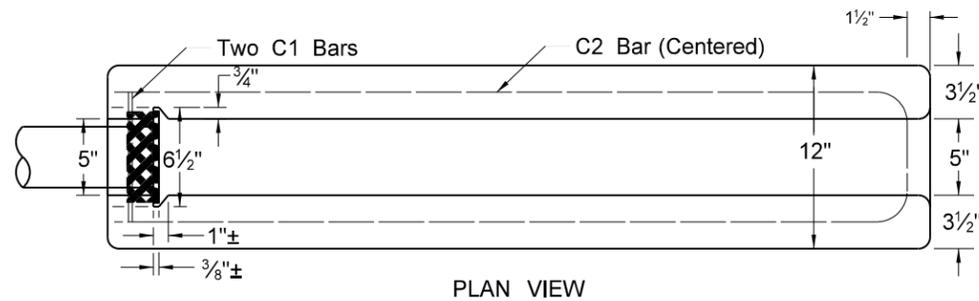
**SUPERELEVATED CURVES:** The edgeline, outlets, and headwalls shall be omitted from the high side of superelevated curves.

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

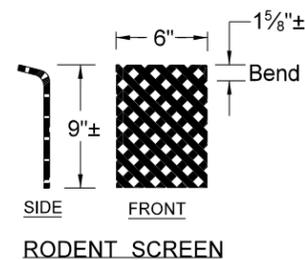
**REINFORCING BARS:** Reinforcing bars shall be No. 4 deformed steel bars.



**BENT BAR DETAILS**

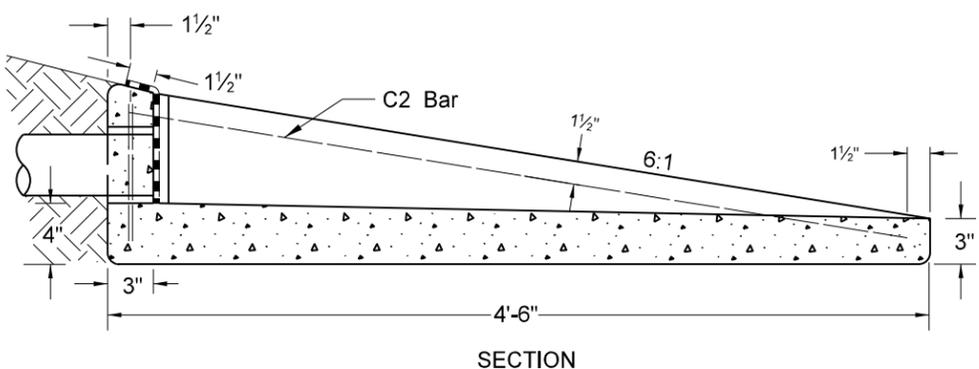


**PLAN VIEW**

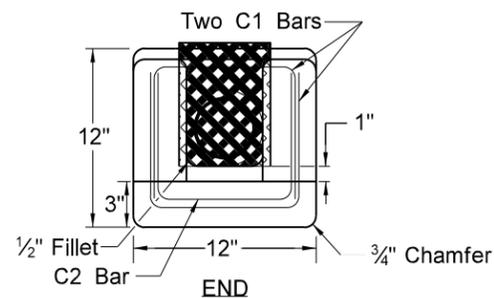


**RODENT SCREEN**

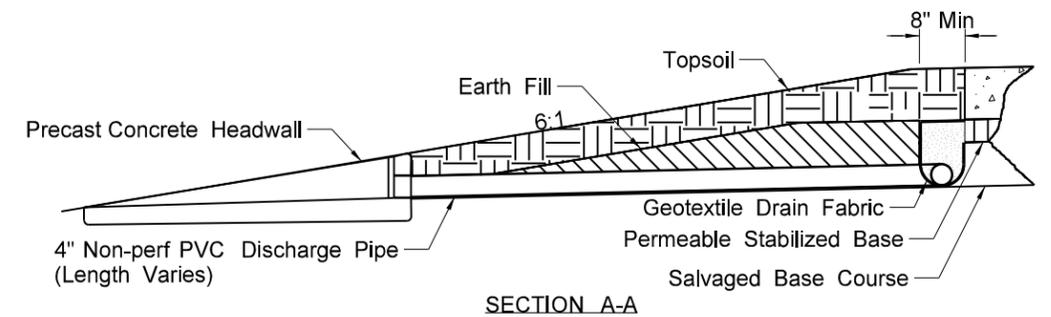
Dimensions are approximate to allow bend and a snug fit in headwall slot



**SECTION PRECAST CONCRETE HEADWALL**



**END**



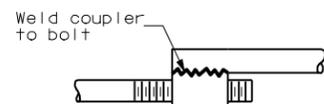
**SECTION A-A**

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

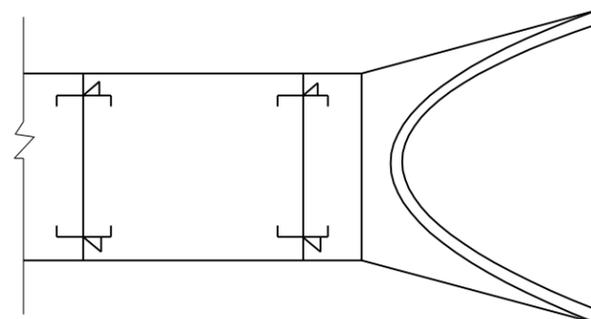
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 10-27-2010                                   |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

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

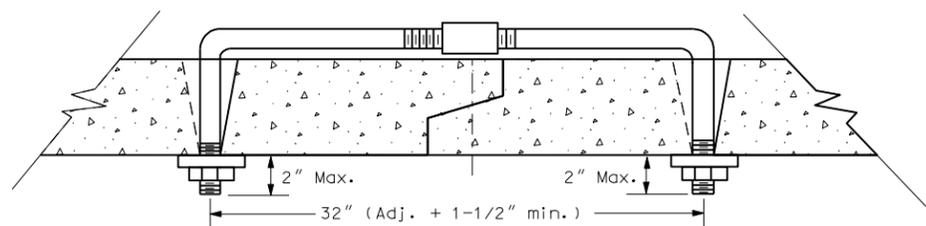
# CONCRETE PIPE TIES



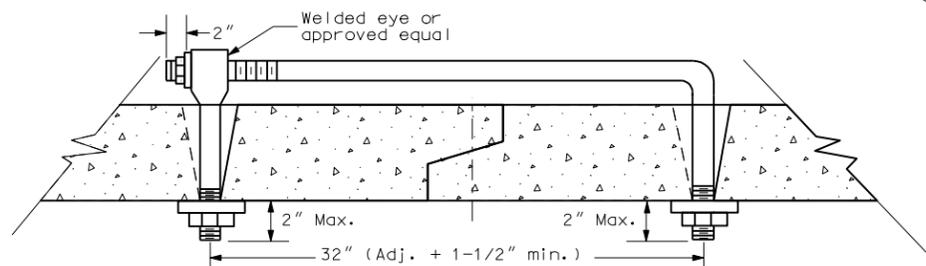
TOP VIEW



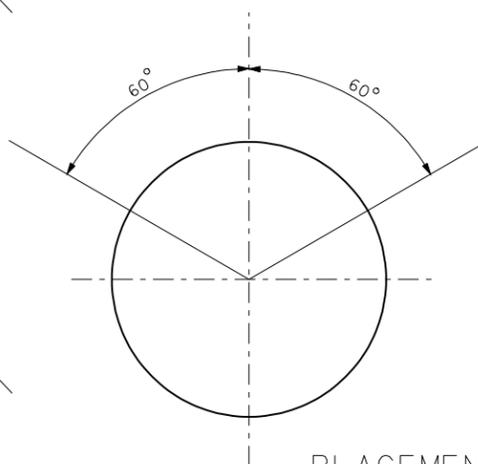
| REQUIRED SIZE OF TIE BOLTS |                      |                    |             |                    |             |
|----------------------------|----------------------|--------------------|-------------|--------------------|-------------|
| Pipe Size (Inches)         | Thread Dia.          | Pipe Size (Inches) | Thread Dia. | Pipe Size (Inches) | Thread Dia. |
| 12                         | 5/8"<br>(See note 2) | 30                 | 3/4"        | 72                 | 1"          |
| 15                         |                      | 33                 |             | 78                 |             |
| 18                         |                      | 36                 |             | 84                 |             |
| 21                         |                      | 42                 |             | 90                 |             |
| 24                         |                      | 48                 |             | 96                 |             |
| 27                         |                      | 54                 |             | 102                |             |
|                            |                      | 60                 |             | 108                |             |
|                            |                      | 66                 |             | 120                |             |
|                            |                      |                    | 132         |                    |             |



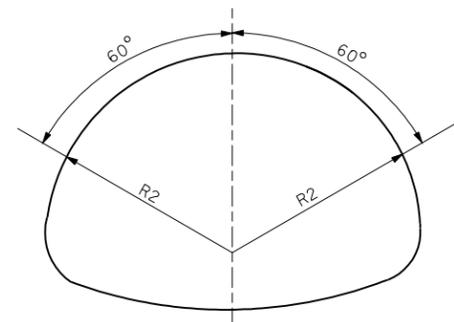
ADJUSTABLE TIE



EYE BOLT TIE

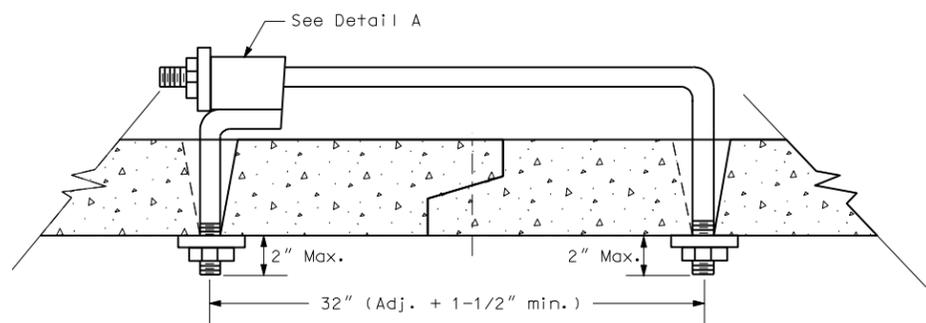


PLACEMENT OF HOLES

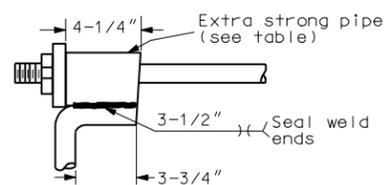


NOTES:

1. Pipe size listed is inside diameter of round pipe or equivalent diameter of pipe arch.
2. Nuts and washers are not required on inside of 21" diameter pipe or less.
3. Ties to be used only to hold pipe sections together, not for pulling sections tight.
4. Tie bolts shall be painted after fabrication with one coat of zinc chromate iron oxide paint. Threaded portion of rods do not have to be painted.
5. Holes in pipe to accommodate the tie bolts can be precast or drilled. Tapered holes will be permitted when precast. When existing pipe are extended or salvaged and relayed, the contractor will be required to drill the necessary holes.
6. The contractor has the option of selecting the type of tie bolt to be used. The type selected shall be approved by the engineer.
7. The cost of precasting or drilling the required holes and furnishing and installing the tie bolts shall be included in the price bid for reinforced concrete pipe culverts.
8. All concrete pipe joints will be tied including the end section joints. Tie bolts are not required on storm sewer pipe unless specifically noted in the plans.

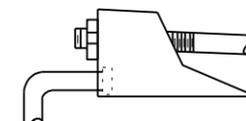


WELDED PIPE TIE

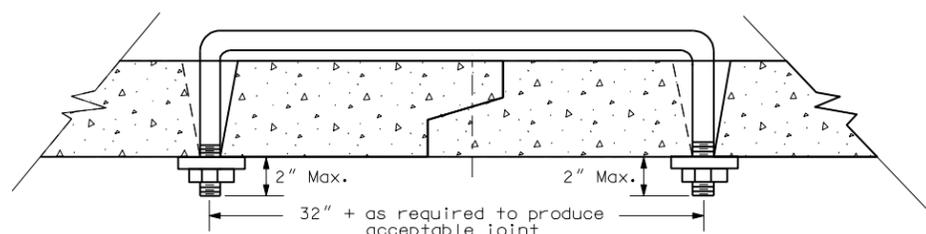


DETAIL A

| Thread Dia. | E.S. Pipe I.D. |
|-------------|----------------|
| 5/8"        | 3/4"           |
| 3/4"        | 1"             |
| 1"          | 1-1/4"         |



OPTIONAL CANOPY TIE

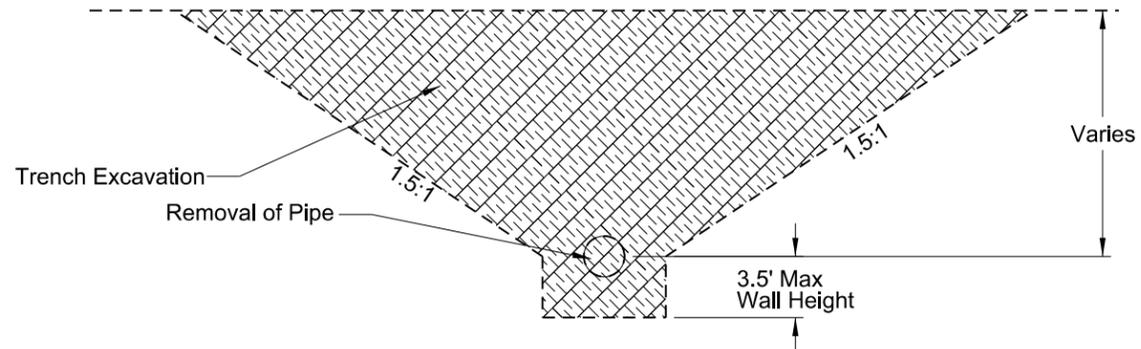


U BOLT TIE

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                  |
|---|------------------|
| 10-1-86                                   |                  |
| REVISIONS                                 |                  |
| DATE                                      | CHANGE           |
| 12-09-94                                  | Notes            |
| 06-26-03                                  | Layout revisions |
| 12-01-04                                  | PE Stamp added   |

This document was originally issued and sealed by MARK S GAYDOS, Registration Number PE-4518, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

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



EXCAVATION DETAIL

Pay Items

- 1) Pipe\*
- 2) Reinforcement Fabric - Type R1
- 3) Removal of Pipe (if required)

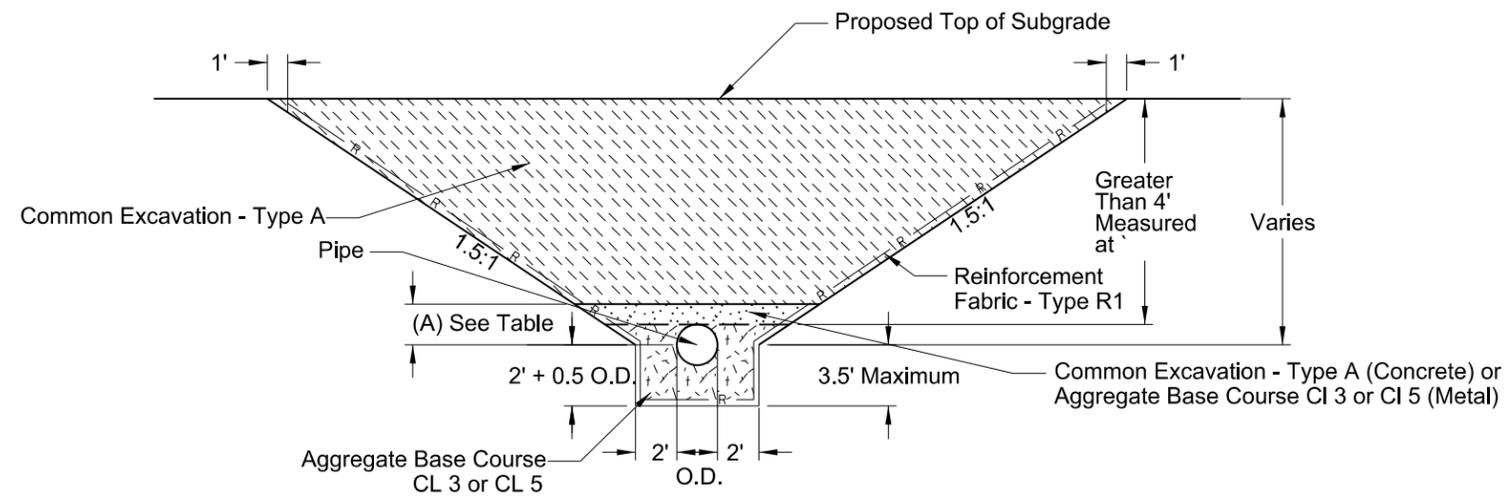
\*Included in Pipe Pay Item

- 1) Pipe
- 2) Trench excavation
- 3) Aggregate Base Course CL 3 or CL 5
- 4) Common Excavation - Type A

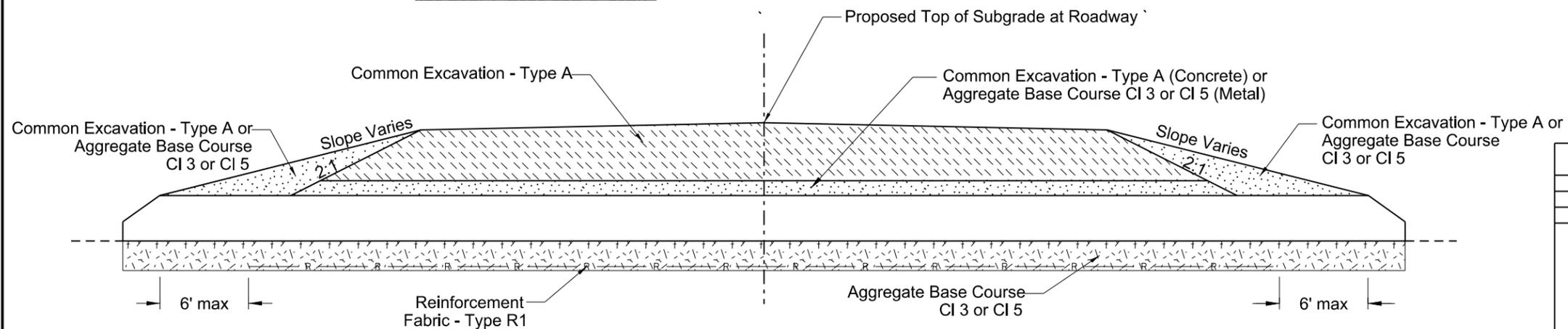
NOTES:

- 1) This drawing applies to new/replaced mainline and paved intersection roadways (including ramps). It does not include pipes in approaches.

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



INSTALLATION DETAIL

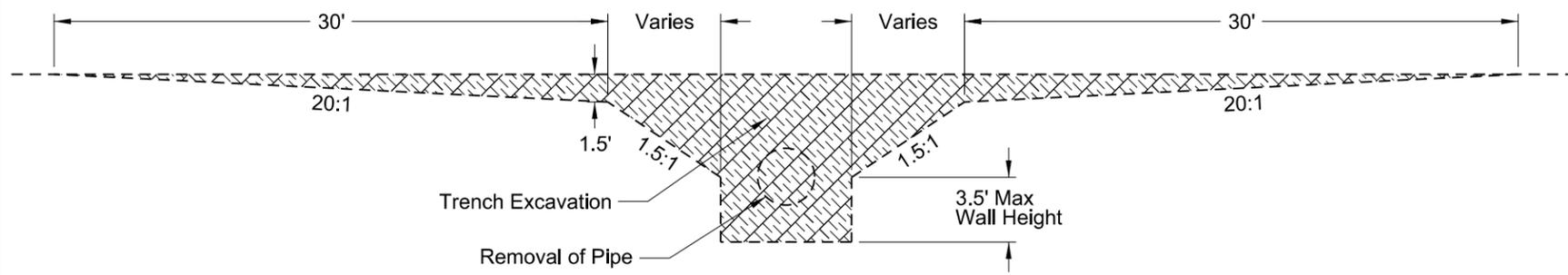


CROSS SECTION

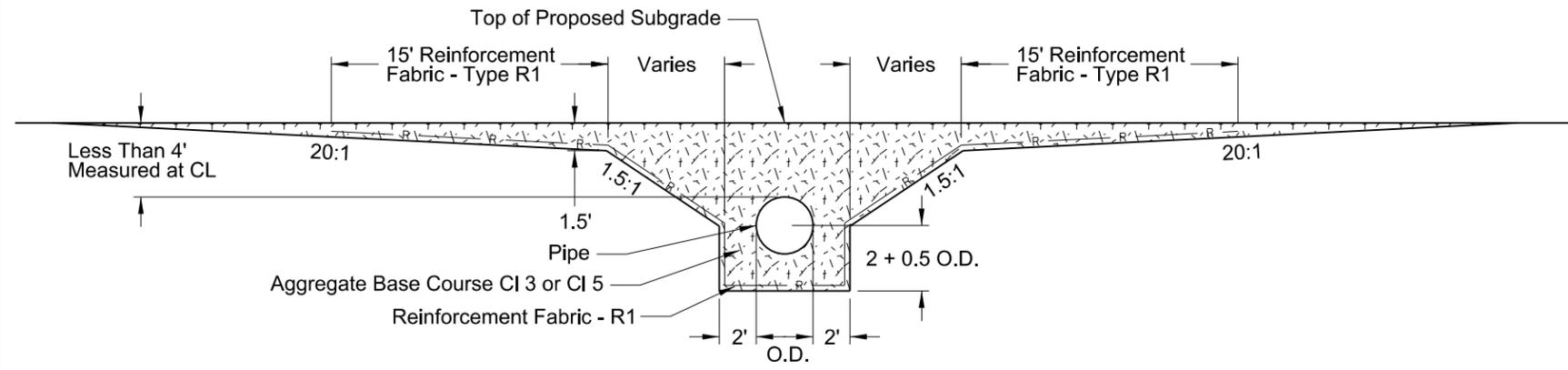
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 7-26-13                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by  
 Ron Horner,  
 Registration Number  
 PE-2087,  
 on 7/26/13 and the original document is stored at the  
 North Dakota Department  
 of Transportation

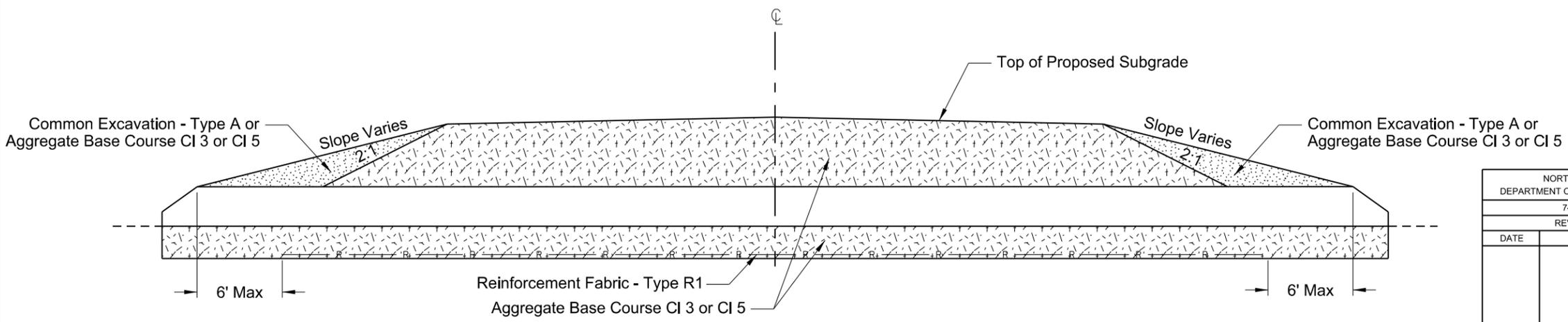
TRANSVERSE MAINLINE PIPE EXCAVATION AND INSTALLATION DETAIL FOR PIPES  
4 FEET OR LESS BELOW THE TOP OF THE PROPOSED SUBGRADE



EXCAVATION DETAIL - PROFILE VIEW



INSTALLATION DETAIL - PROFILE VIEW



CROSS SECTION

Pay Items

- 1) Pipe\*
- 2) Reinforcement Fabric - Type R1
- 3) Removal of Pipe (if required)

\*Included in Pipe Pay Item

- 1) Pipe
- 2) Trench Excavation
- 3) Aggregate Base Course CI 3 or CI 5
- 4) Common Excavation - Type A

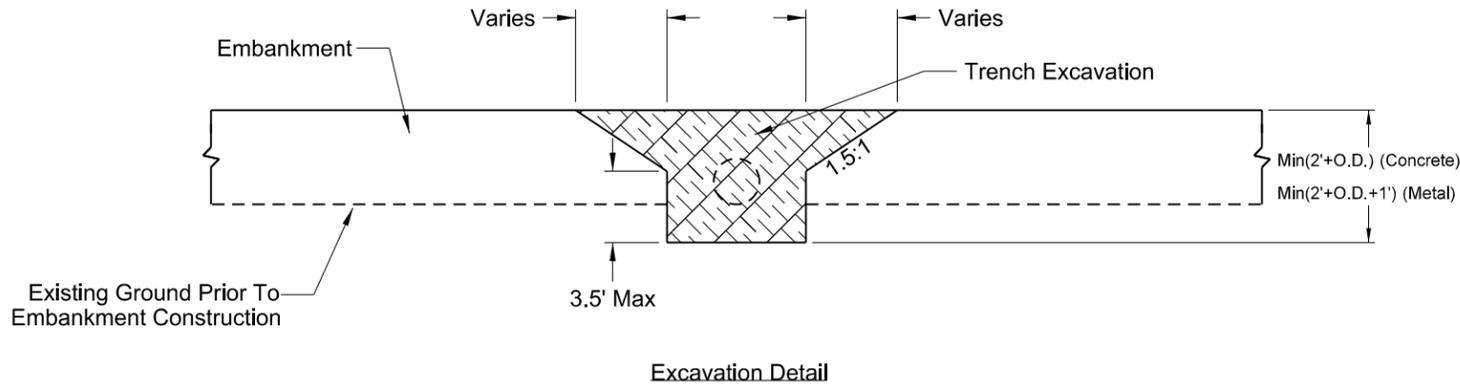
NOTES:

- 1) This drawing applies to new/replaced mainline and paved intersection roadway pipes only (including ramps). It does not include pipes in approaches.

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 7-26-13                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by  
Ron Horner,  
Registration Number  
PE-2087,  
on 7/26/13 and the original document is stored at the  
North Dakota Department  
of Transportation

TRANSVERSE MAINLINE PIPE EXCAVATION AND INSTALLATION DETAIL FOR PIPES INSTALLED IN NEW EMBANKMENT AREAS

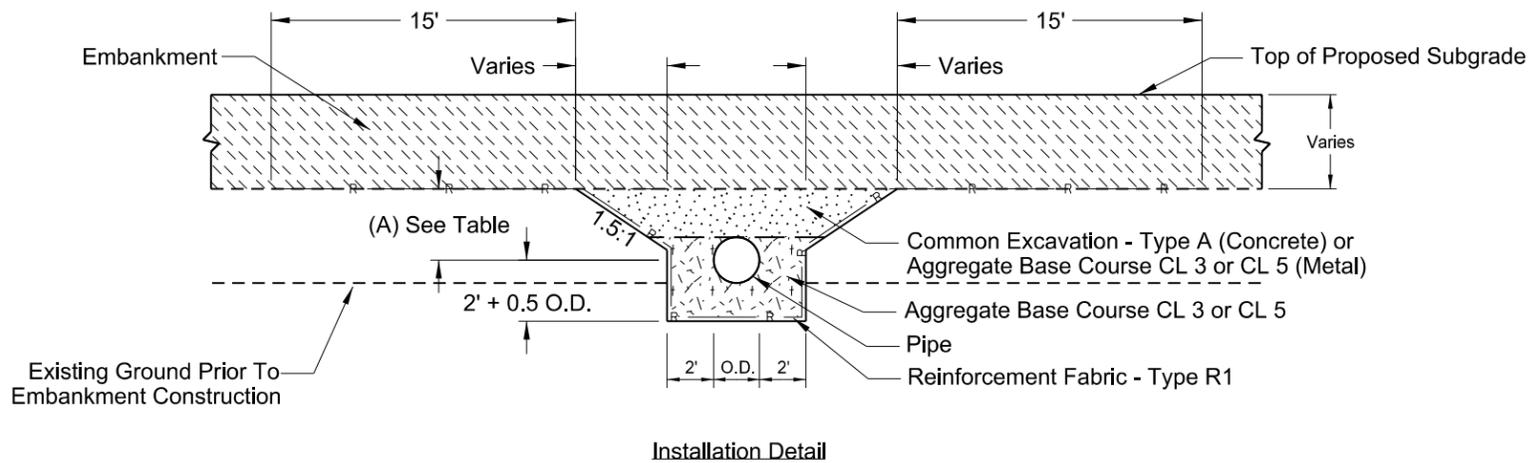


- Pay Items
- 1) Pipe\*
  - 2) Reinforcement Fabric - Type R1

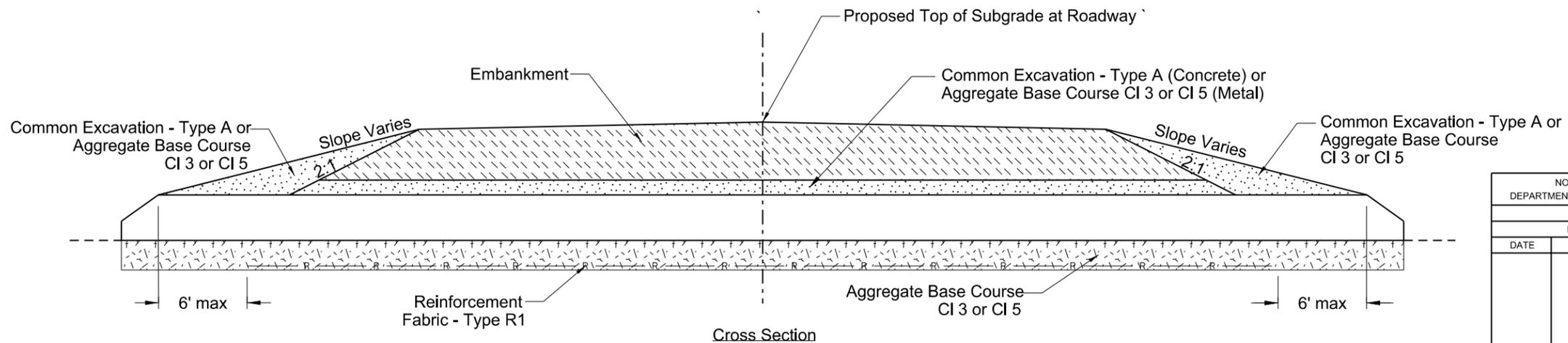
- \*Included in Pipe Pay Item
- 1) Pipe
  - 2) Trench excavation
  - 3) Aggregate base course CL 3 or CL 5
  - 4) Common Excavation - Type A

NOTES:

- 1) This drawing applies to new/extended mainline and paved intersection roadway pipes only (including ramps). It does not include pipes in approaches



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

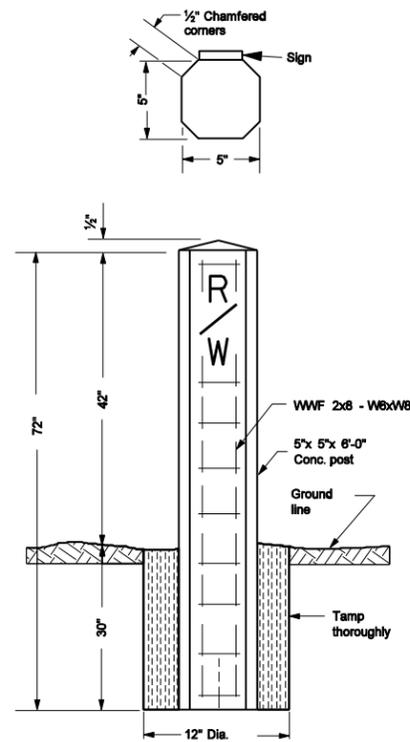


| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
|--|--------|
| 7-26-13                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

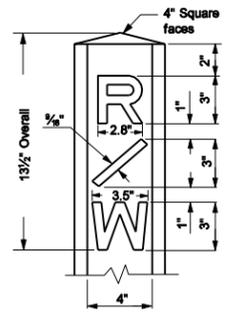
This document was originally issued and sealed by  
 Ron Horner,  
 Registration Number  
 PE-2087,  
 on 7/26/13 and the original document is stored at the  
 North Dakota Department  
 of Transportation

STANDARD MONUMENTS AND RIGHT OF WAY MARKERS

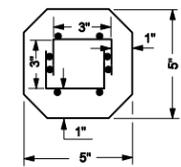
D-720-1



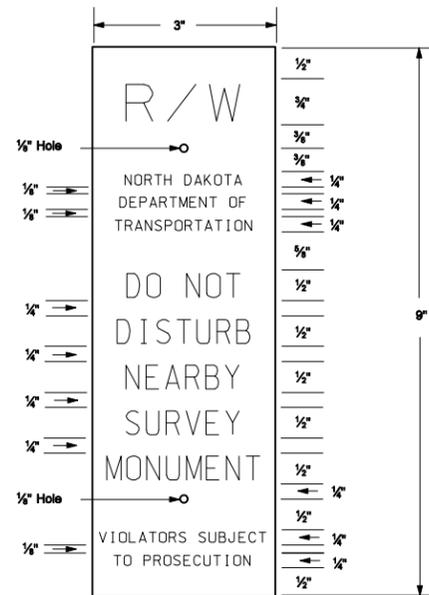
MARKER DETAIL  
CONCRETE RIGHT OF WAY MARKER DETAILS



MARKING DETAIL  
Incised letters (1/4" min.)  
3" high on one side.  
Series "F" letters.



REINFORCING DETAIL



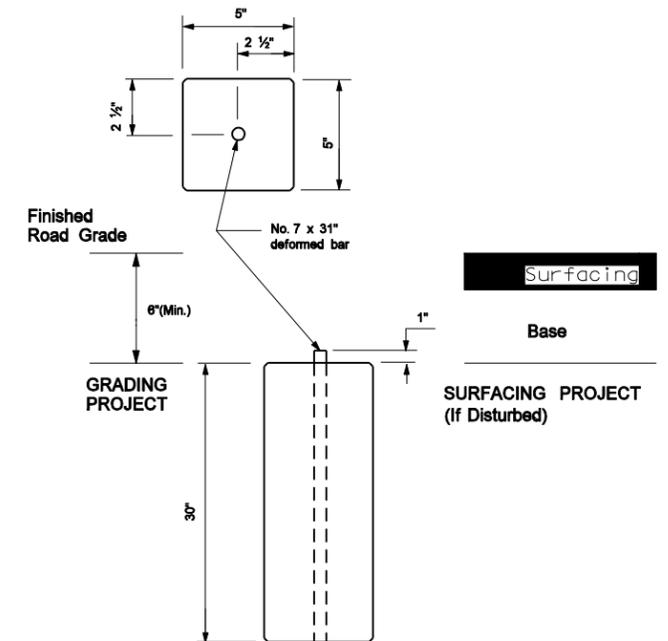
SIGN DETAIL

Black letters on orange background. 40 Gauge stamped aluminum plate. Baked enamel finish. Silk screen graphics. One color print. Sign shall be attached by drilling two holes in the face of the post (side facing the private owner, away from the Department of Transportation right of way). Put inserts into the holes and mount the sign with #4 vandal proof screws. Sign shall be installed 2" from top of post.

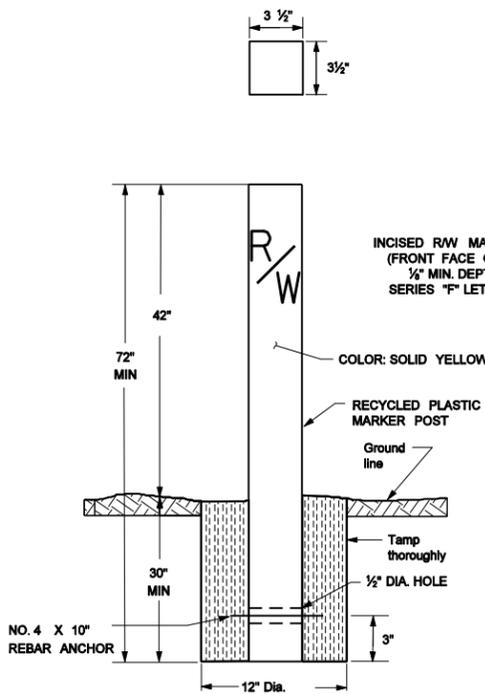
NOTES

The construction and installation of precast concrete alignment monuments and right of way markers (witness posts) shall conform to Section 720 of the Standard Specifications. The markers shall be placed on the right of way line 12" from the iron pin as shown in the details. All markers shall be installed with the letter side facing the project. A 3" x 9" sign (see details on this sheet) will be attached to the back side of the markers.

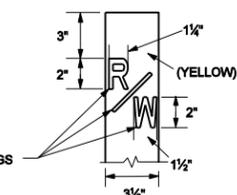
IRON MONUMENTS (PINS):  
Iron pins (1" x 24") will be furnished and placed by the NDDOT (or surveying consultant personnel working on highway projects) on the Right of Way line at section lines, right of way breaks, curve points, and near the mid point of each mile. The iron pins will also be placed on the centerline alignment curve points and POT's (see diagram below). The pins at the mid point can be eliminated if the curve points or right of way breaks are in the immediate vicinity.



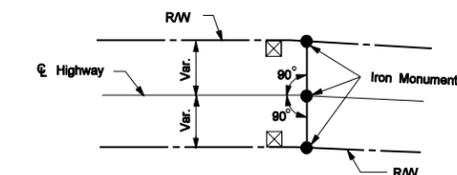
PRECAST CONCRETE ALIGNMENT MONUMENT



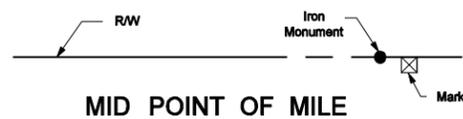
MARKER DETAIL  
RECYCLED PLASTIC RIGHT OF WAY MARKER DETAILS



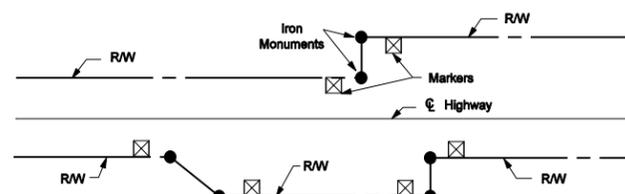
MARKING DETAIL



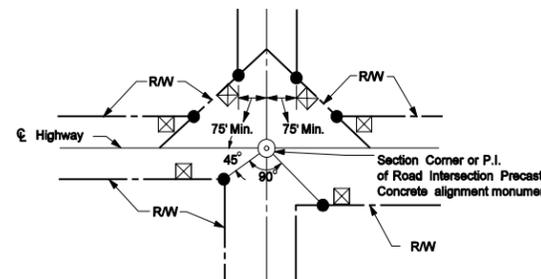
CURVE POINTS (PC, PT, TS, SC, CS, ST, etc.)



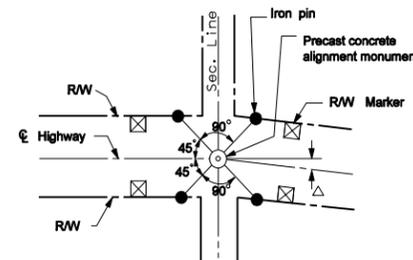
MID POINT OF MILE



MARKERS AT R/W BREAKS



FLARED R/W BREAKS



SECTION CORNERS, QUARTER CORNERS, SECTION LINE CROSSINGS, & P.I.'s

KEY

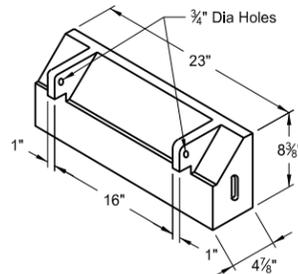
- Iron Monument (pin)
- ⊠ R/W Marker (witness post)
- ⊙ Precast Concrete Alignment Monument

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |  |
|---|--|
| 10-1-88                                   |  |
| REVISIONS                                 |  |
| DATE                                      | CHANGE                                       |
| 12-16-87                                  | Note change                                  |
| 05-01-90                                  | Steel post note                              |
| 09-03-96                                  | Sign detail                                  |
| 08-05-98                                  | Revised notes                                |
| 10-26-98                                  | General revisions                            |
| 12-23-98                                  | Note Revisions                               |
| 12-05-00                                  | Add plastic R/W marker, Rev. note            |
| 02-18-03                                  | Revised notes                                |
| 12-01-04                                  | PE Stamp added                               |
| 11-28-05                                  | Revised monument to pin                      |
| 02-14-07                                  | Added "witness posts"                        |
| 08-06-07                                  | Removed beveled edges on plastic r/w markers |

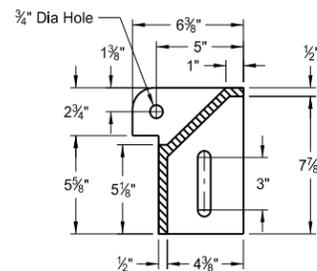
This document was originally issued and sealed by **MARK S GAYDOS** Registration Number **PE- 4518**, on **08/06/07** and the original document is stored at the North Dakota Department of Transportation

INLET - TYPE I

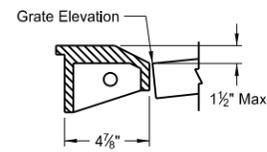
D-722-1



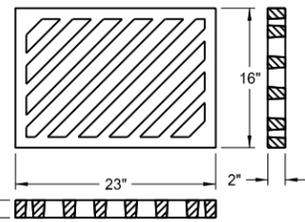
ISOMETRIC  
(Grate Style "D" & "L")



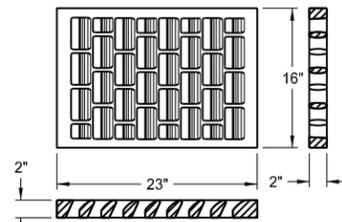
CURB BOX  
(Grate Style "D" & "L")



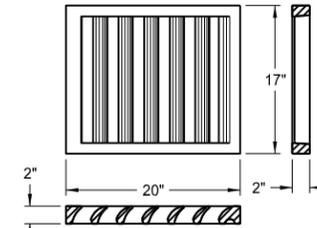
CURB PLATE  
(Grate Style "D" & "L")



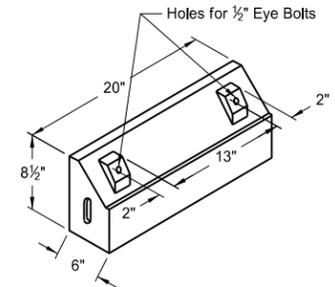
GRATE STYLE "D"  
(Waterway Area = 1.1 SF)



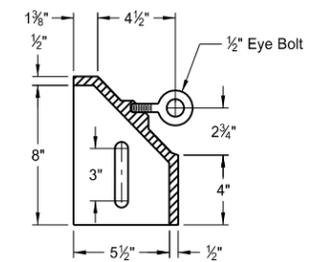
GRATE STYLE "L"  
(Waterway Area = 0.9 SF)



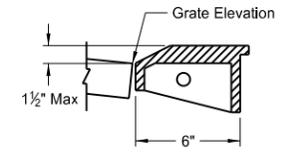
GRATE STYLE "V"  
(Waterway Area = 1.3 SF)



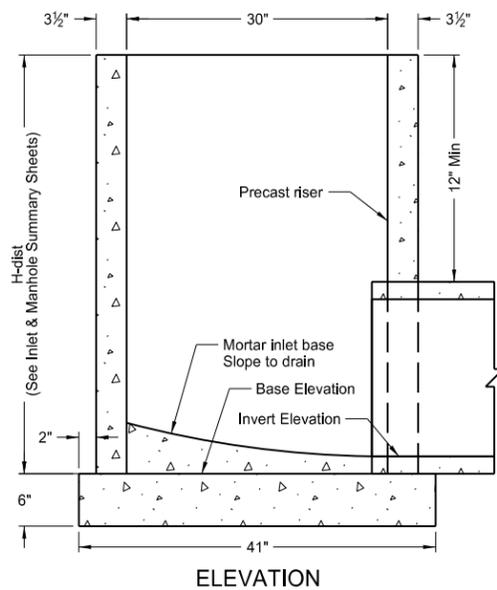
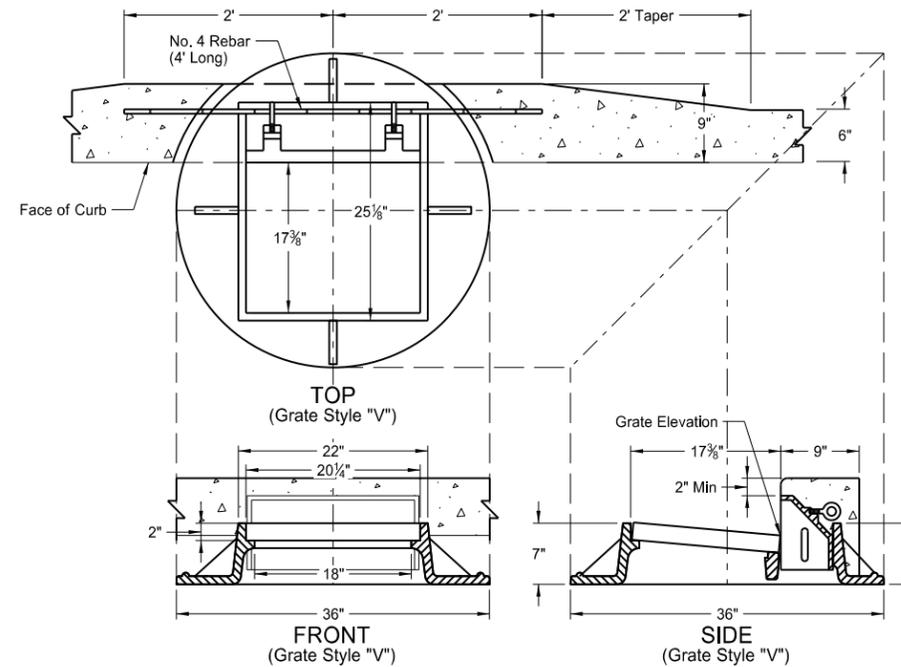
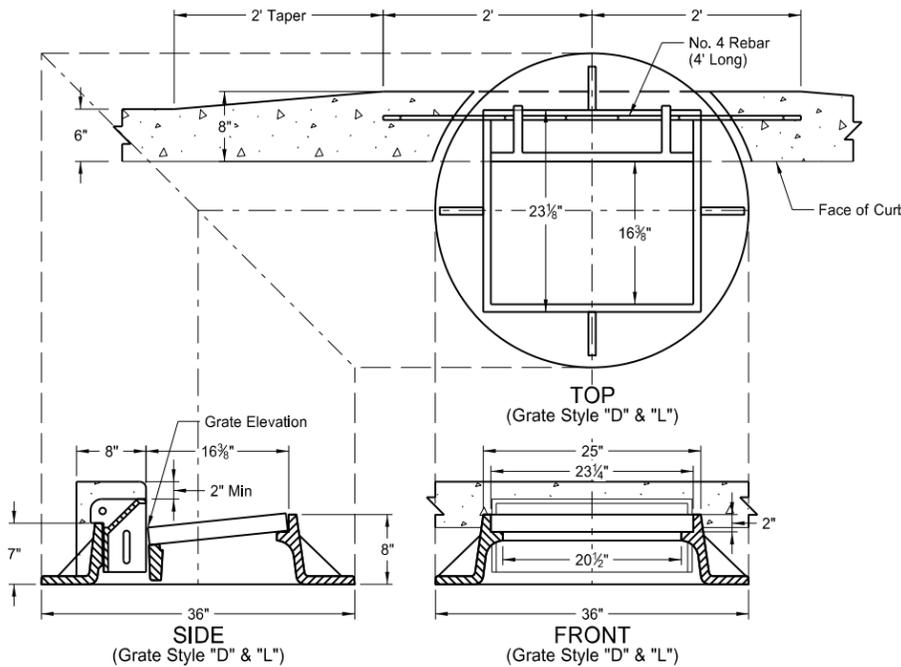
ISOMETRIC  
(Grate Style "V")



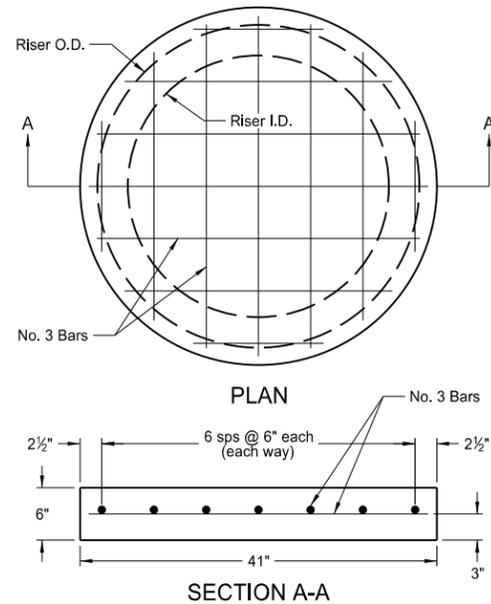
CURB BOX  
(Grate Style "V")



CURB PLATE  
(Grate Style "D" & "L")



ELEVATION



SECTION A-A

NOTES:

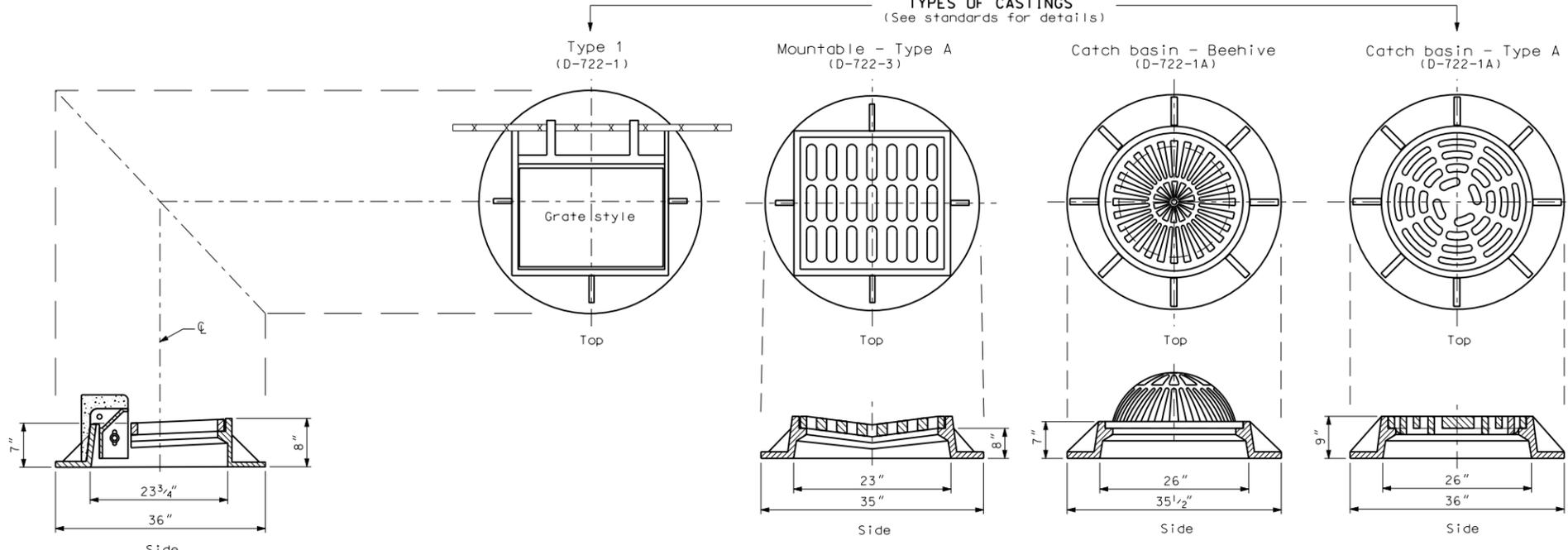
1. Other castings, similar in dimension, may be used if the casting conforms to the riser section and has a grate style as specified in the plans which meets or exceeds the waterway area listed. If modifications to the inlet are required to facilitate similar castings the contractor must receive written approval from the Engineer.
2. Castings shall be manufactured in accordance with AASHTO M306-09. Metal used in the manufacture of castings shall conform to AASHTO M105 Class 35B.
3. The contractor shall have the option of using precast or cast-in-place bases. Class of concrete shall be AE. The aggregate size shall be approved by the engineer in the field. Construction shall be in accordance with section 722.03 of the Standard Specifications.
4. Precast concrete risers shall be constructed in accordance with AASHTO M199.
5. On projects with P.C.C. pavement all inlet risers shall be constructed 4 to 5 inches below final elevation and adjusted to final grade after paving. Adjustment may be done with adjusting rings, masonry or cast-in-place concrete. All costs for this adjustment shall be included in the price bid for the inlet.
6. All reinforcing steel shall be Grade 60 steel.
7. Curb plates shall be used in lieu of curb boxes when curb height at inlet location is 4" or less.

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 05-14-13                                     |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 5-14-13 and the original document is stored at the North Dakota Department of Transportation

INLET - SHALLOW

TYPES OF CASTINGS  
(See standards for details)

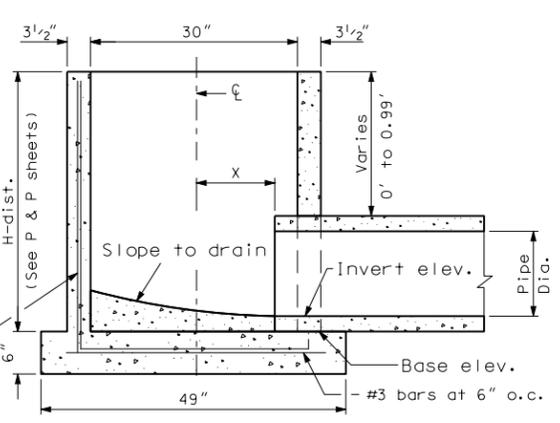


NOTES:

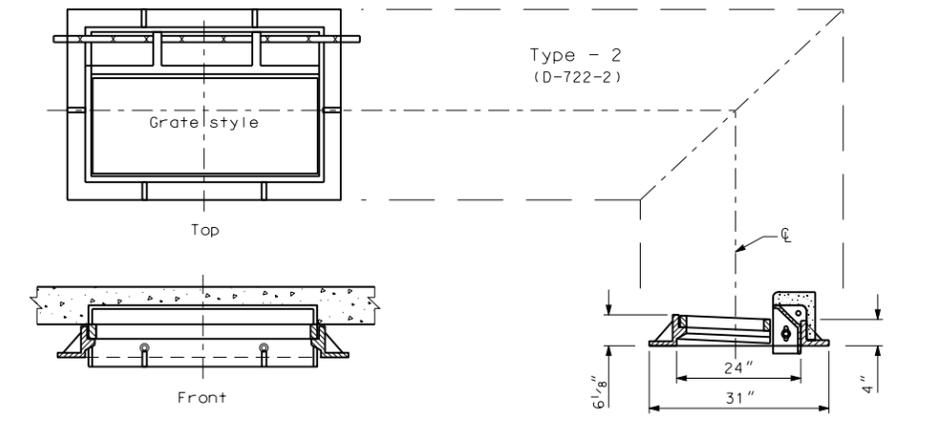
1. Other castings, similar in dimension and of equal or greater weight than that shown, may be used if accepted by the engineer in writing. The type of casting and grate style shall be as specified on the plans and included in the price bid for "Inlet - Shallow, (casting type)".
2. Metal used in the manufacture of castings shall conform to AASHTO M-105, Class 35B.
3. The precast integrated risers with base shall be constructed in accordance with AASHTO M-199.
4. On projects with P.C.C pavement all inlet risers or barrels shall be constructed 4 to 5 inches below final elevation and adjusted to final grade after the paving. Adjustment may be done with adjusting rings, masonry, or cast-in-place. All costs for this adjustment shall be included in the price bid for the inlet.

PAY ITEMS

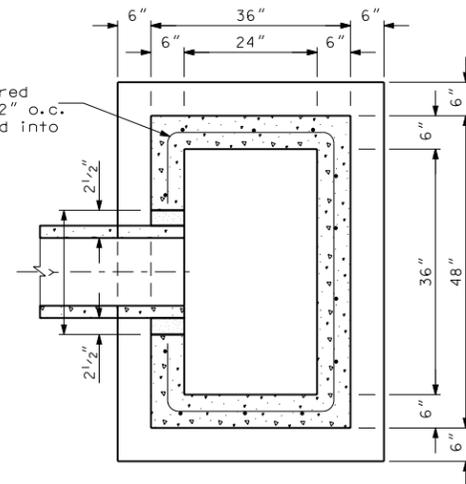
- Inlet - Shallow, Type 1 . . . . . Ea.
- Inlet - Shallow, Type 2 . . . . . Ea.
- Inlet - Shallow, Catch basin - Type A . . . . . Ea.
- Inlet - Shallow, Catch basin - 6 in. beehive . . Ea.
- Inlet - Shallow, Catch basin - 9 in. beehive . . Ea.
- Inlet - Shallow, Mountable - Type A . . . . . Ea.
- Inlet - Shallow, Mountable - Type B . . . . . Ea.



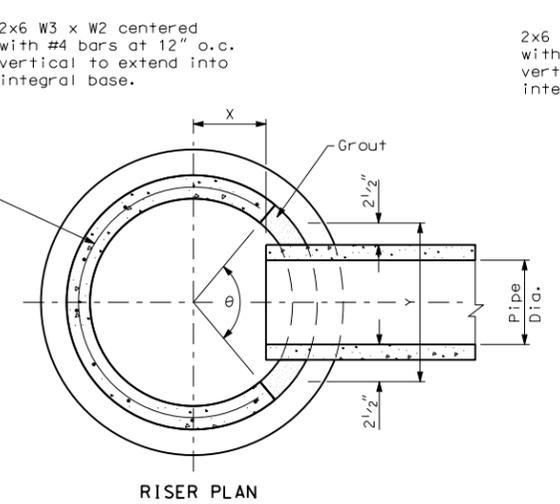
RISER ELEVATION



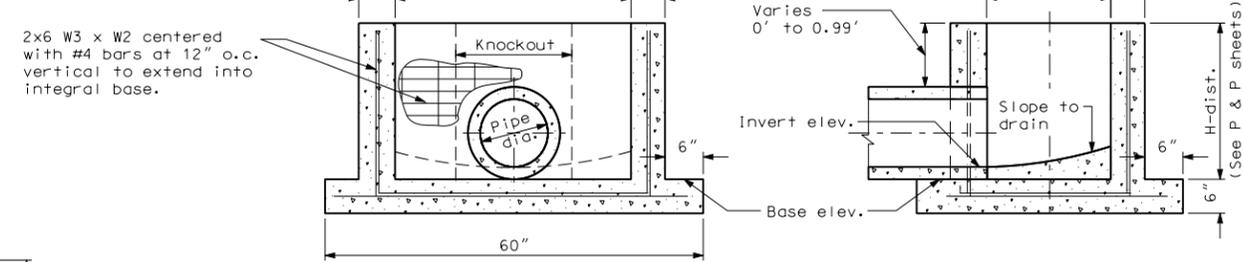
RISER ELEVATIONS



RISER PLAN



RISER PLAN



PRECAST RISERS WITH BASE

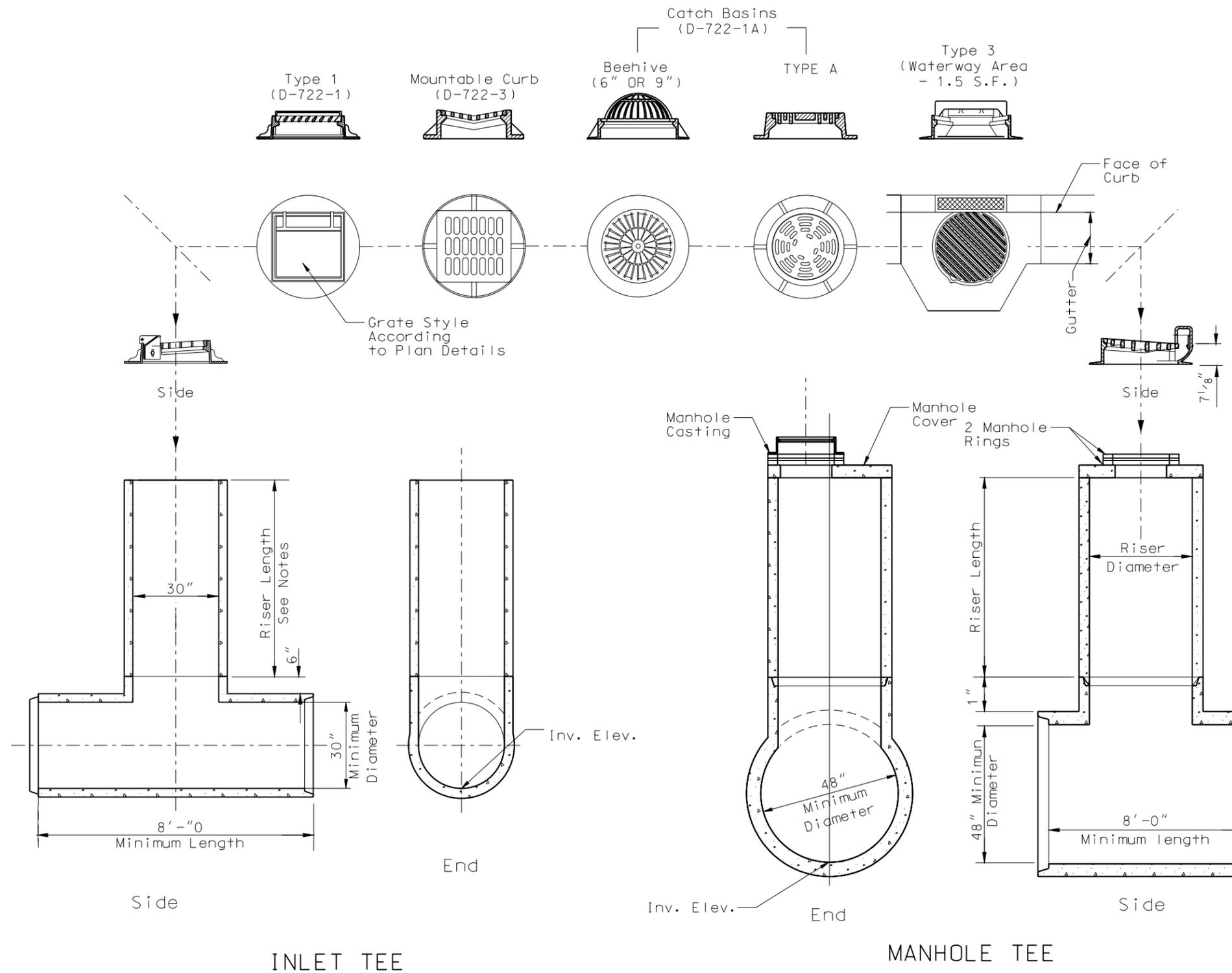
| PIPE DIA. IN. | KNOCKOUT ANGLE (θ) Deg. | KNOCKOUT LENGTH ft | X ft | Y ft |
|---------------|-------------------------|--------------------|------|------|
| 12"           | 88.85                   | 2.16               | 0.89 | 1.75 |
| 15"           | 109.5                   | 2.67               | 0.72 | 2.04 |
| 18"           | 137.9                   | 3.36               | 0.45 | 2.33 |

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                 |
|---|-----------------|
| 12-01-89                                  |                 |
| REVISIONS                                 |                 |
| DATE                                      | CHANGE          |
| 11-01-90                                  | Note 4 added    |
| 03-01-94                                  | Added pay item  |
| 10-30-00                                  | Added wire mesh |
| 12-01-04                                  | PE Stamp added  |

This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE- 4518** , on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

INLET / MANHOLE T-SECTION

D-722-1E



Manhole Tee's

All costs for labor, equipment and material necessary to construct Manhole Tees shall be included in the pay items: "Manhole Tee - (size)".

The contract unit price bid for "Manhole Tee - (size)" shall include:

1. Manhole Tee.
2. Manhole casting or other type of inlet casting.
3. Precast concrete manhole cover.
4. Concrete adjusting manhole rings.

The item "Manhole Riser - (size)" shall include the furnishing & installing of the required length of riser & cast iron steps. Manhole steps shall conform to std. D-722-5.

Inlet Tee's

All costs for labor, equipment and material necessary to construct Inlet Tees shall be included in the pay item: "Inlet Tee - (size)".

The contract unit price bid for "Inlet Tee - (size)" shall include:

1. Inlet casting. The type of casting and grate style shall be as specified on the plans and included in the price bid for "Inlet Tee - (size)".

Metal used in the manufacture of castings shall conform to AASHTO M-105, Class 35B.

2. Inlet riser length as specified in the plans.

Precast risers or barrels shall be constructed in accordance with AASHTO M199.2.

The Inlet Tee shall be included in the cost of the pipe trunkline.

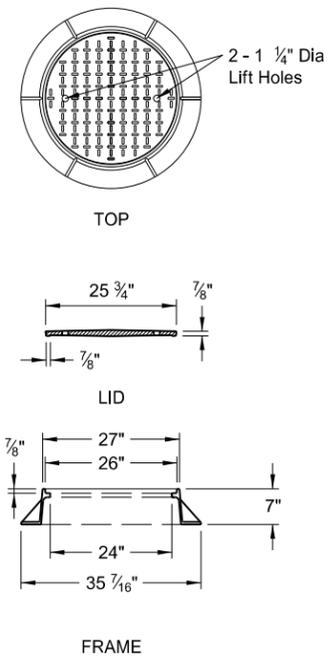
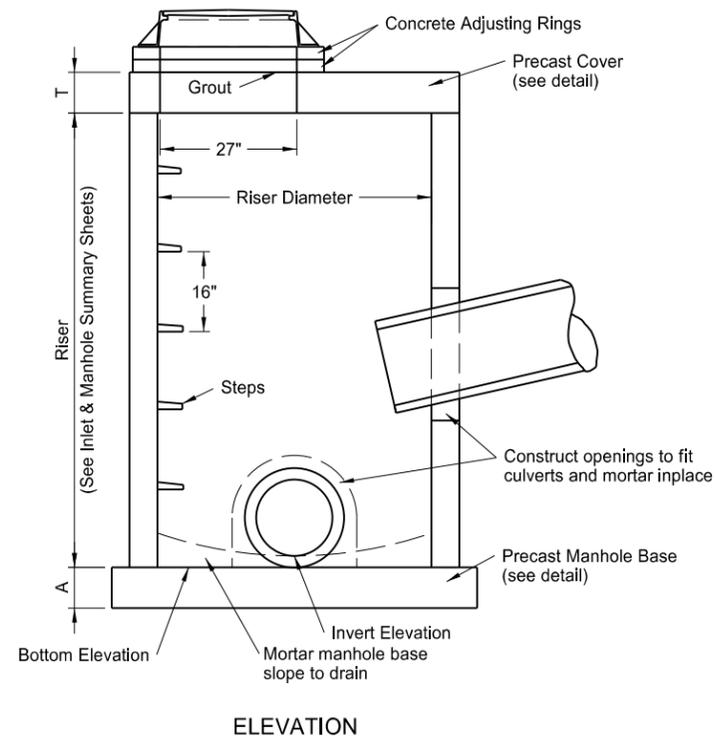
|  |                |
|--|----------------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                |
| 08-19-03                                     |                |
| REVISIONS                                    |                |
| DATE   | CHANGE         |
| 12-01-04                                     | PE Stamp added |

This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE- 4518** , on **12/01/04** and the original document is stored at the **North Dakota Department of Transportation**



# MANHOLE DETAILS

D-722-5



## PRECAST MANHOLE COVERS

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

\* - Reinforcement listed shall be placed in each direction.

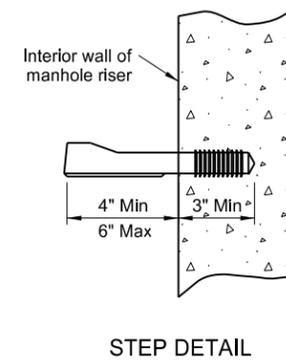
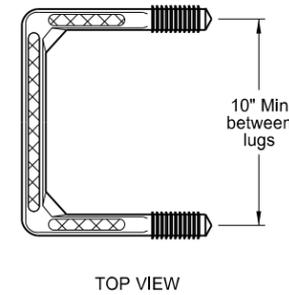
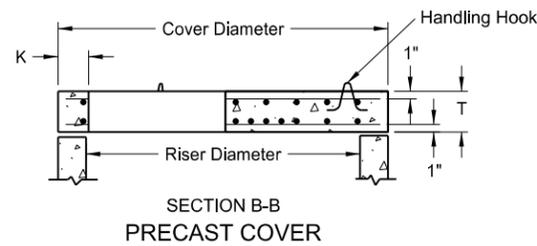
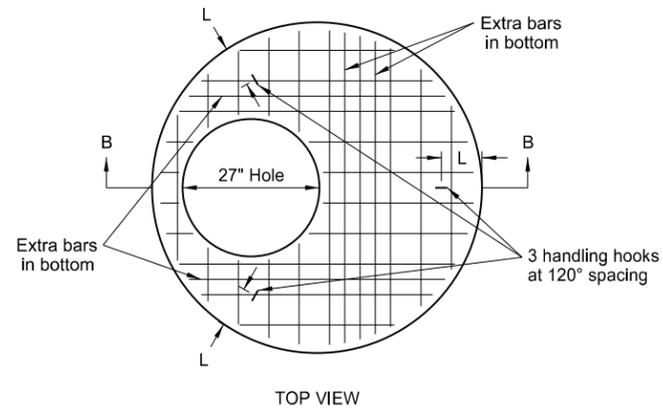
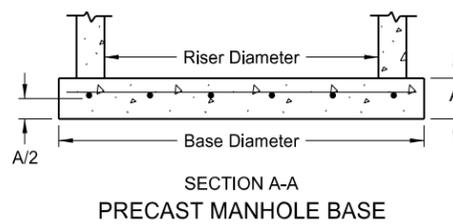
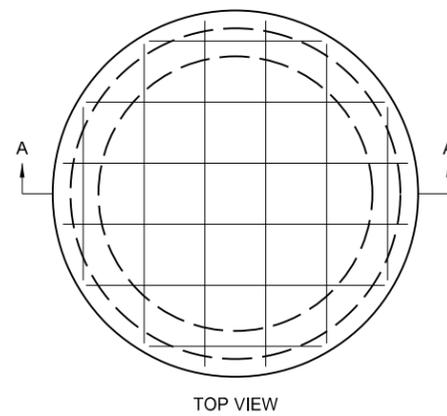
## MANHOLE BASES

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

\* - Reinforcement listed shall be placed in each direction.

### NOTES:

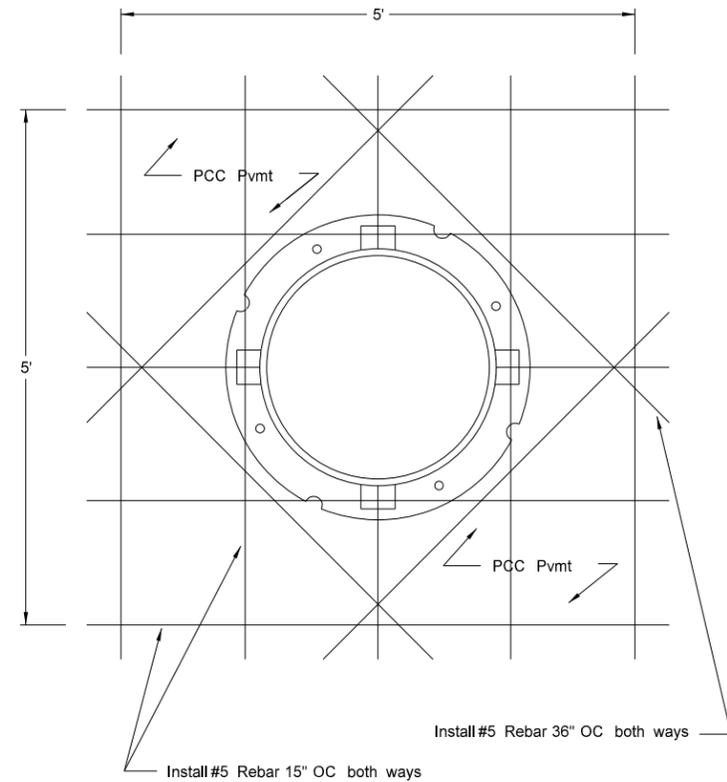
- The contractor shall have the option of using precast or cast-in-place bases. Class of concrete shall be AE. The aggregate size shall be approved by the engineer in the field. Construction shall be in accordance with section 722.03 of the Standard Specifications.
- Precast concrete manholes, risers and steps shall conform to AASHTO M199.
- Precast concrete bases and covers shall be reinforced as shown in the table for the corresponding riser diameter.
- All reinforcing steel shall be Grade 60 steel.
- Bottoms of manhole risers shall be cut or precast square to fit the manhole base. Grout joint between base and riser with cement mortar.
- The contractor may construct the manhole lower than plan grade and bring the casting to grade using precast adjusting rings in a manner satisfactory to the engineer in the field.
- Manhole steps shall be corrosion resistant and shall have a minimum vertical load resistance of 800 pounds and a minimum horizontal pull-out resistance of 400 pounds. Configuration of the steps shall be approved by the Engineer.
- Precast concrete manhole covers shown are designed for an HS-20 wheel load and a maximum fill height of 15'-0". Special design required for heavier wheel loads and/or greater fill heights.
- Other castings, similar in dimension, may be used if the casting conforms to the manhole cover and has a lid style as specified. If modifications to the manhole cover are required to facilitate similar castings the contractor must receive written approval from the engineer.
- Castings shall be manufactured in accordance with AASHTO M306-09. Metal used in the manufacture of castings shall conform to AASHTO M105 Class 35B.



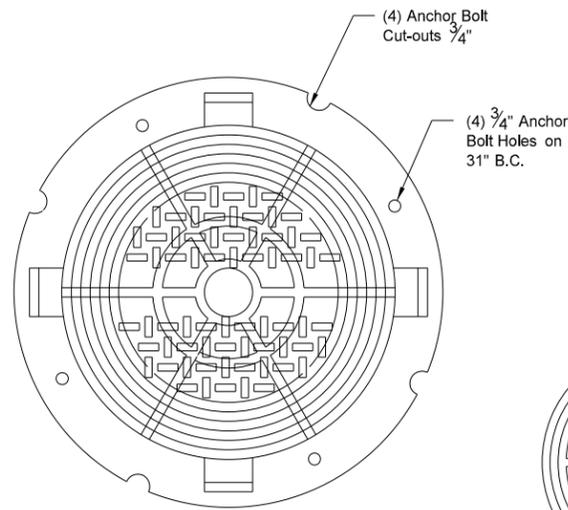
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 05-14-2013                                   |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by  
**Roger Weigel,**  
 Registration Number  
 PE-2930,  
 on 5-14-13 and the original document is stored at the North Dakota Department of Transportation

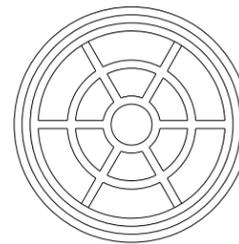
FLOATING MANHOLE CASTING



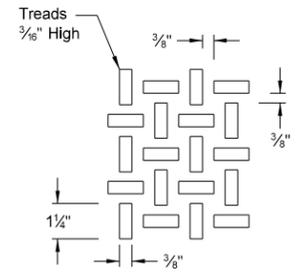
PLAN VIEW



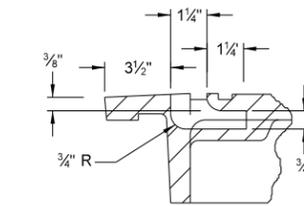
MATERIAL: Cast Gray Iron ASTM A-48, Class 35B  
 FINISH: No Paint  
 WEIGHT: Approximately 642 Lb/Unit



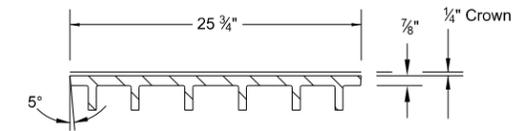
BOTTOM DETAIL  
 LID ONLY



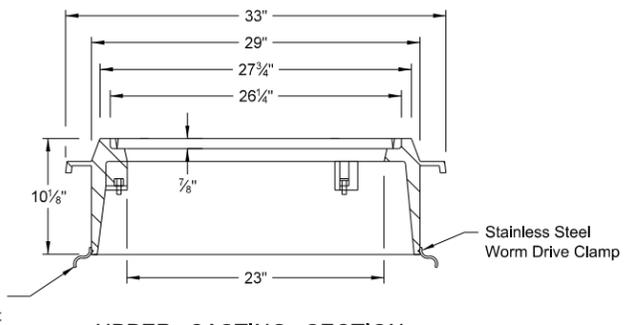
SURFACE DETAIL



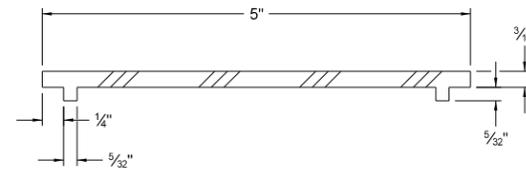
CONCEALED PICK DETAIL



LID SECTION

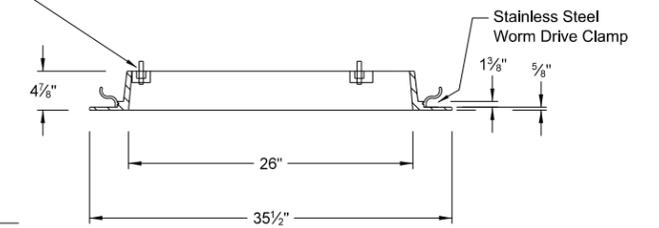


UPPER CASTING SECTION

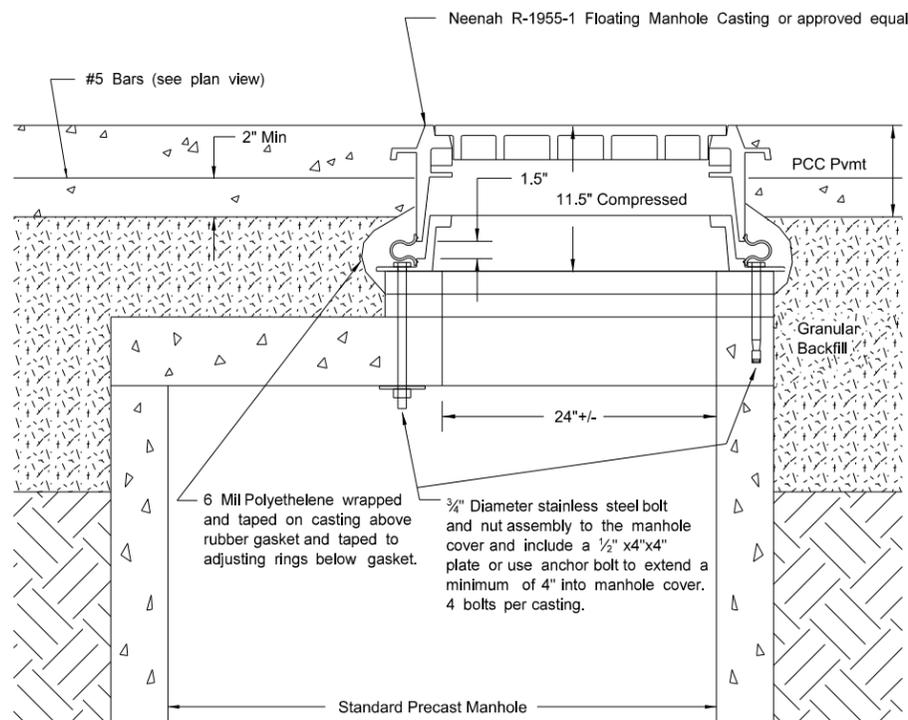


SECTION OF EXTRUDED NEOPRENE GASKET

(3) 5/8"-11 x 5/2" Grade 8 Steel Hex Bolts, Nuts W/ (2) Washers Ea Zinc Plated



LOWER CASTING SECTION



ELEVATION VIEW OF CONNECTION TO STANDARD PRECAST MANHOLE -TYPICAL

NOTES:

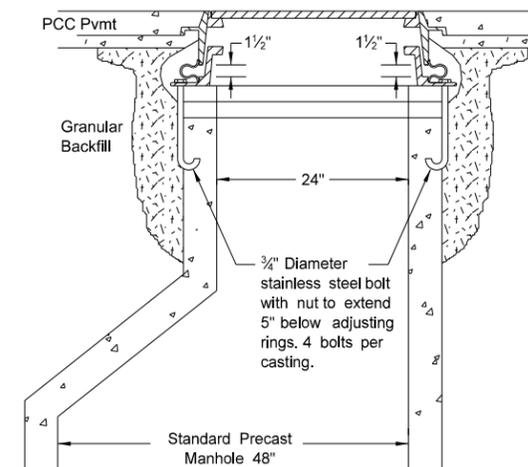
Bed frame in mortar, install precast two-inch rings, and plaster inside and out with mortar.

When installing an existing box out, drill #5 rebar into existing pavement 6" deep - 15" OC - bars to be 20" long.

Length of anchor bolts to vary with number of adjusting rings.

Installation cost at existing locations shall be included in price bid for manhole castings.

Installation cost at new manhole locations shall be included in the price bid for manholes.

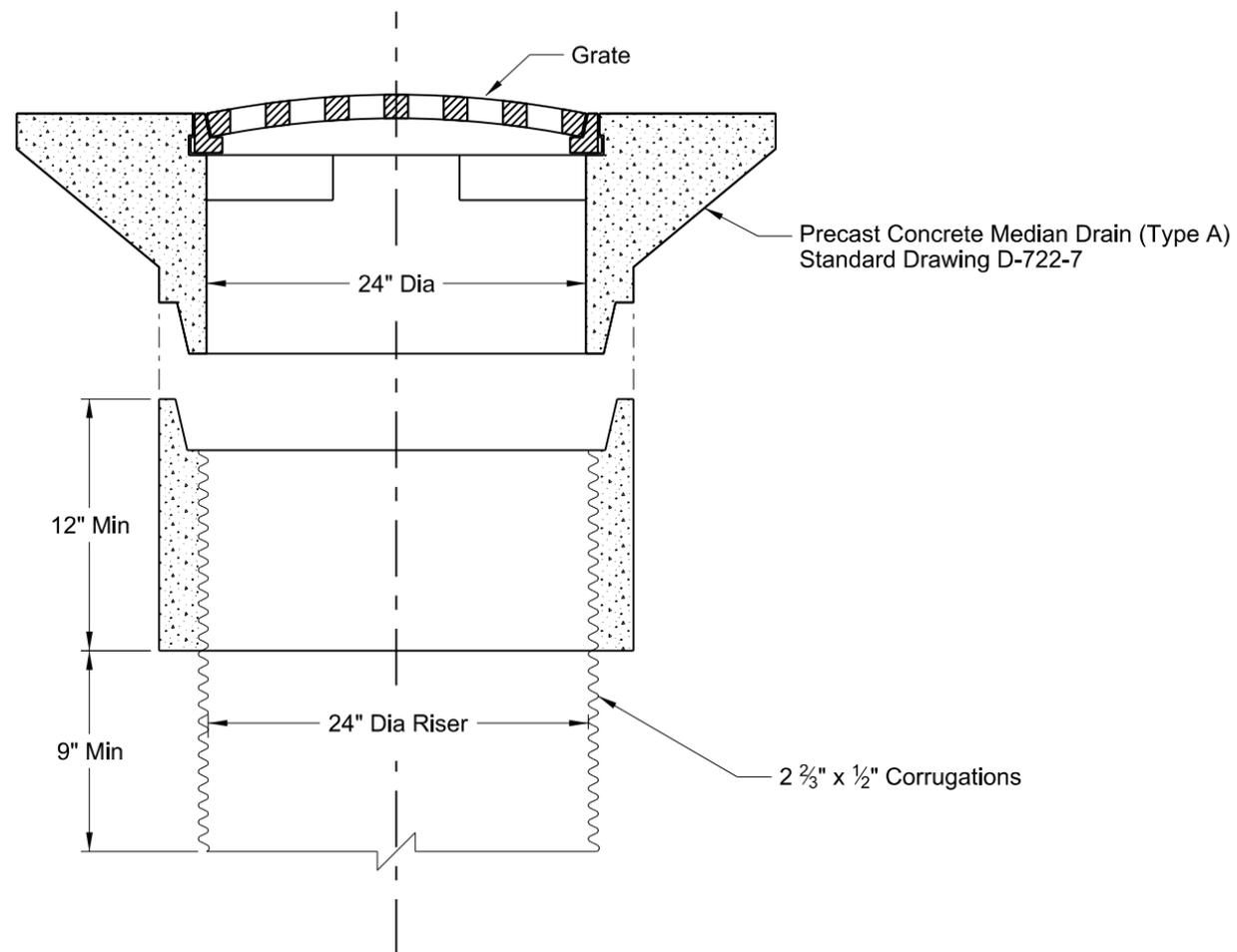


ELEVATION VIEW OF CONNECTION TO CONICAL MANHOLE - TYPICAL

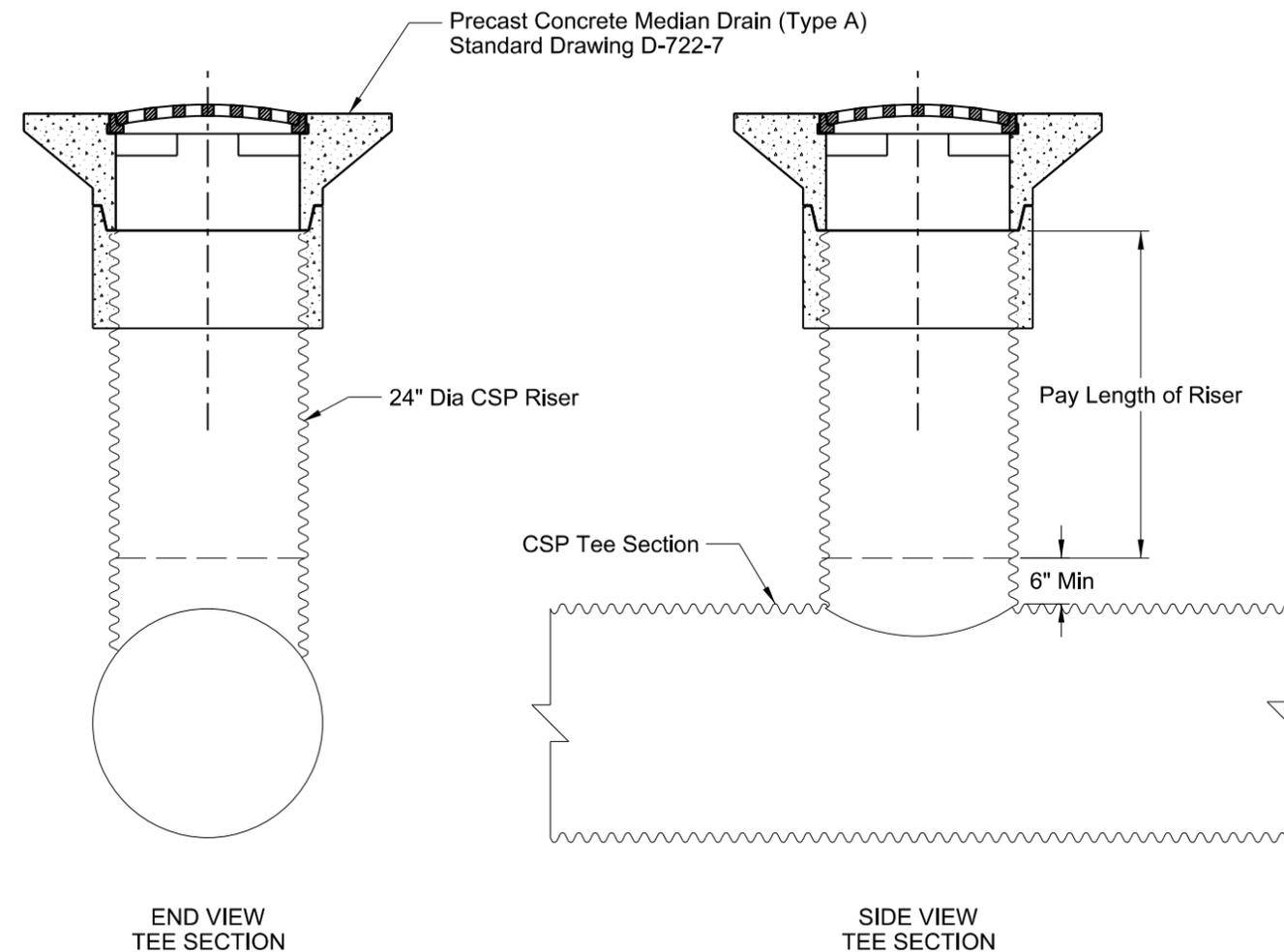
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 07-19-2010                                   |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |

This document was originally issued and sealed by  
**ROGER WEIGEL**  
 Registration Number  
 PE-2930,  
 on 7-19-10 and the original document is stored at the  
 North Dakota Department  
 of Transportation

MEDIAN DRAIN AND RISER DETAILS  
FOR CORRUGATED STEEL PIPE CULVERTS



RCP TO CSP TRANSITION



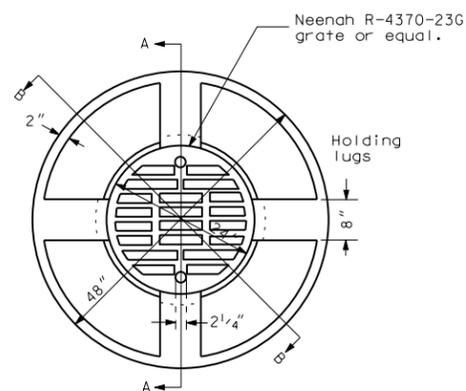
NOTES:

1. Precast Concrete Median Drain (Type A) shall be a separate pay item.
2. The RCP to CSP Transition shall be included in the price bid for the CSP Riser.
3. RCP is Class 2 per ASTM C76 / AASHTO M170.

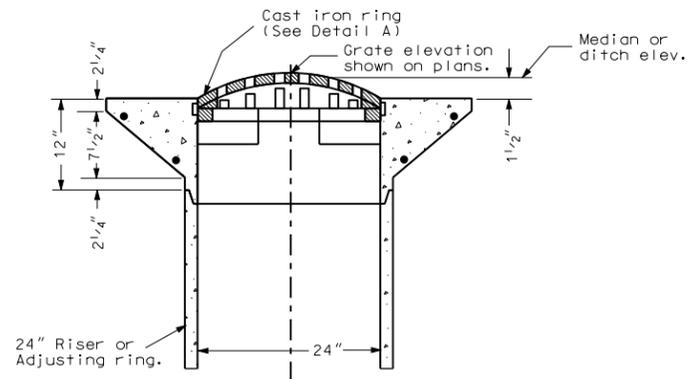
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 07-22-2010                                   |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 07/22/2010 and the original document is stored at the North Dakota Department of Transportation.

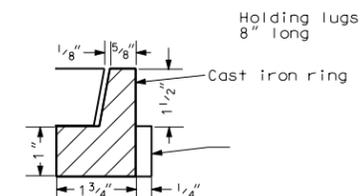
PRECAST CONCRETE MEDIAN DRAIN



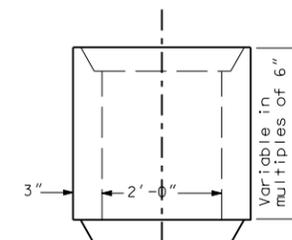
PLAN VIEW



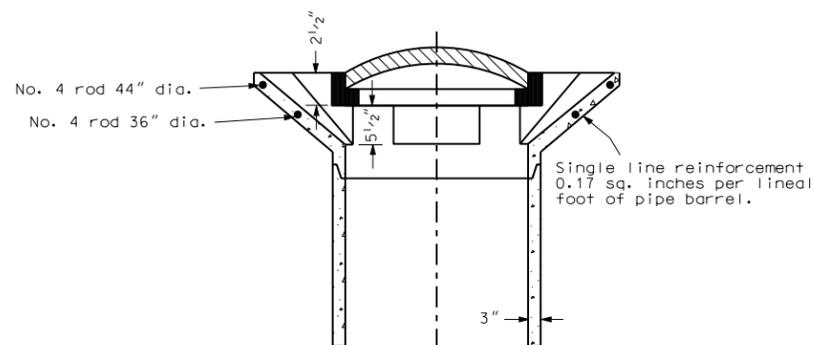
SECTION A-A



DETAIL A



RISER SECTION

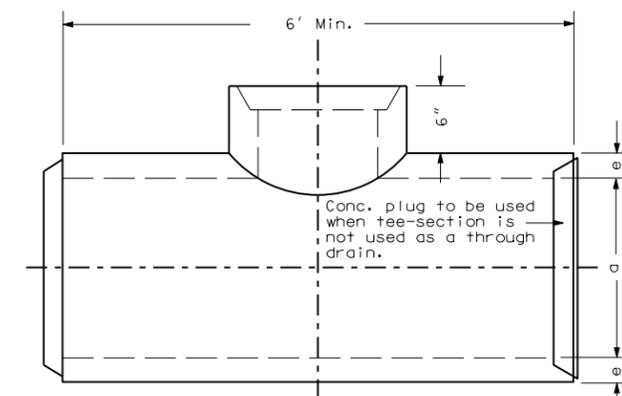


TYPE A

SECTION B-B

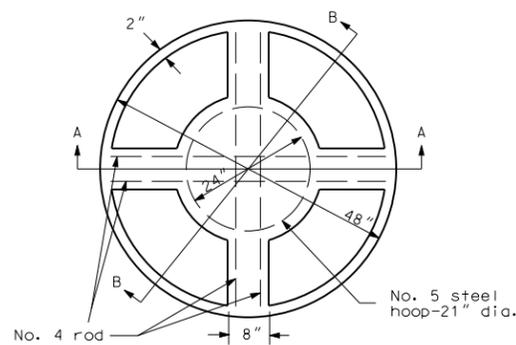


ADJUSTING RING

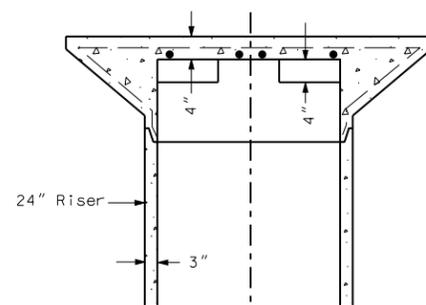


SIDE VIEW

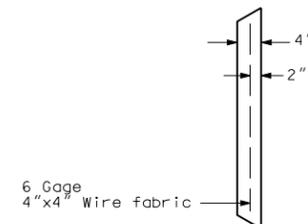
a = Diameter of drainage pipe  
e = Wall thickness of drainage pipe



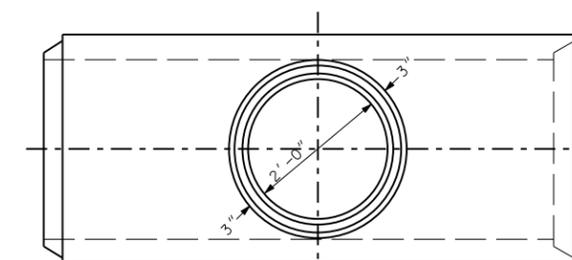
PLAN VIEW



SECTION A-A



CONC. PLUG



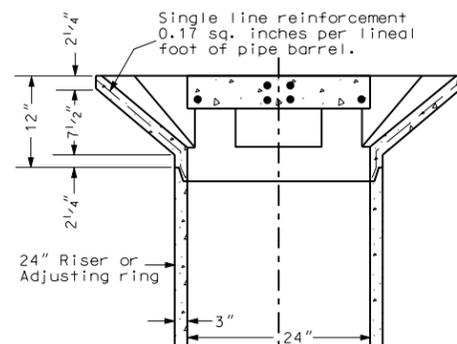
PLAN VIEW

Reinforcement in above sections shall be in accordance with Standard Specifications.

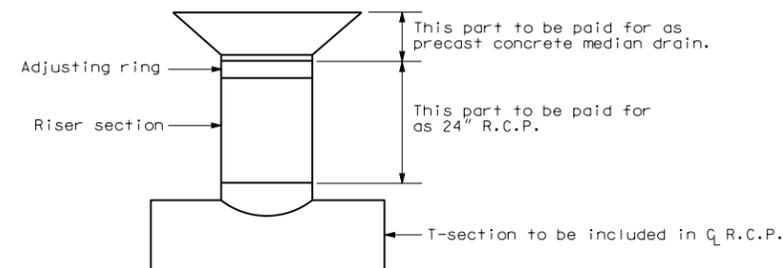
T - SECTION



TYPE B



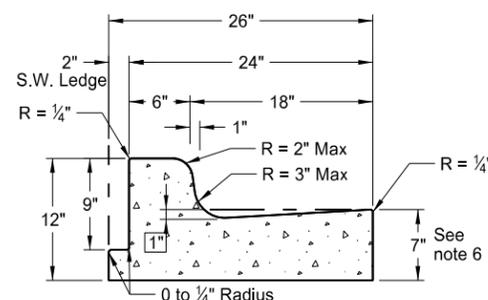
SECTION B-B



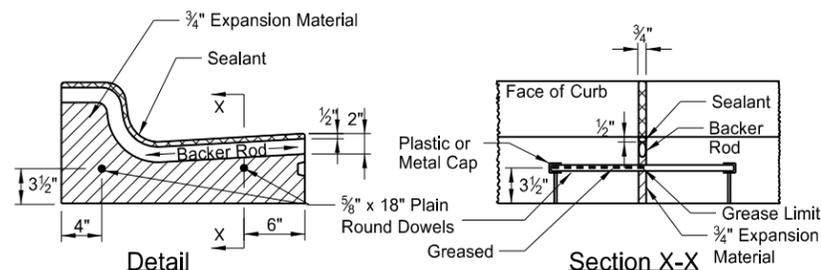
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                 |
|--|-----------------|
| 10-1-86                                      |                 |
| REVISIONS                                    |                 |
| DATE   | CHANGE          |
| 06-26-03                                     | Layout revision |
| 12-01-04                                     | PE Stamp added  |

This document was originally issued and sealed by  
**MARK S. GAYDOS**  
Registration Number  
PE- 4518 ,  
on 12/01/04 and the original document is stored at the  
North Dakota Department  
of Transportation

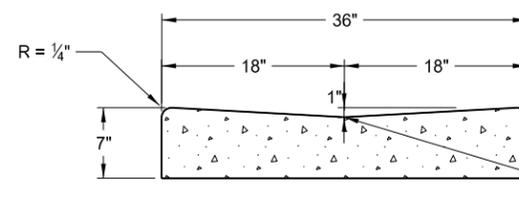
Curb & Gutter and Valley Gutter



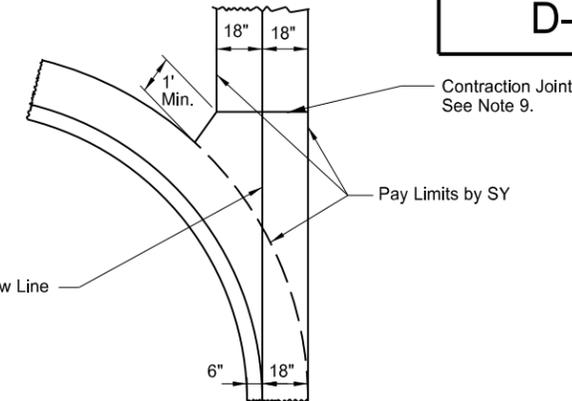
**Curb & Gutter Type 1 (Sec. A & B)**  
Adjacent to Concrete Sidewalk,  
Median, or Parking Lot.  
(Sec. A shown. See Sec B for  
additional details.)



**Isolation Joint**



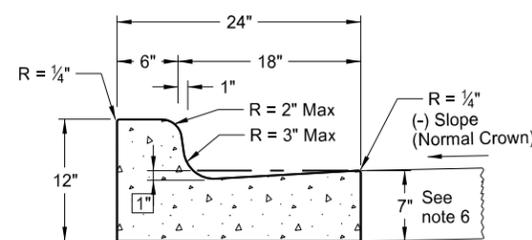
**36" Concrete Valley Gutter Detail**



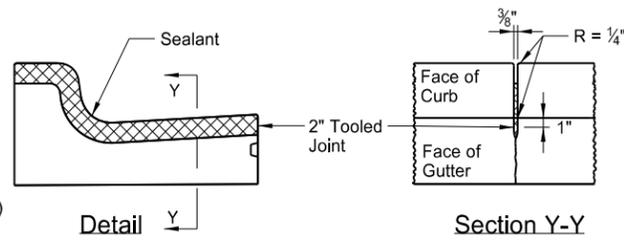
**36" Concrete Valley Gutter Plan**

**NOTES:**

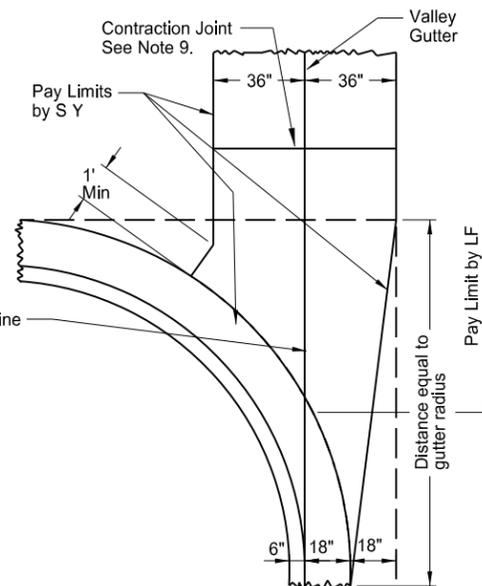
1. Curb and Gutter Type 1 (Sec. A & B) to be used. Section "A" to be used with (-) pavement slopes and section "B" to be used with (+) pavement slopes.
2. Contraction Joints: Tool the Curb & Gutter 2" as shown on the contraction joint details.
3. Isolation Joints: Isolation joint material shall be 3/4"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



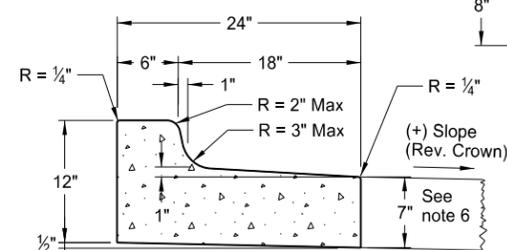
**Curb & Gutter Type 1 (Sec. A)**



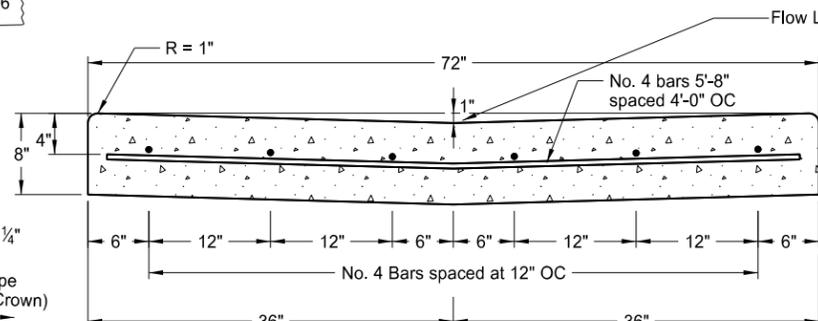
**Contraction Joint**



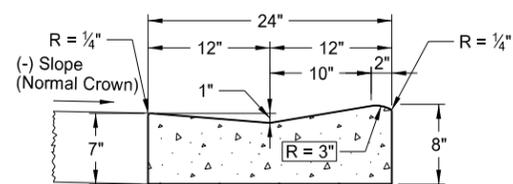
**72" Concrete Valley Gutter Plan**



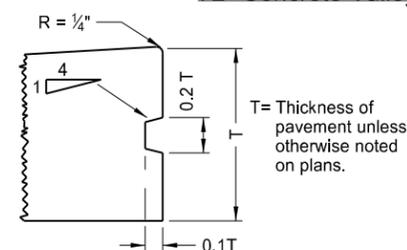
**Curb & Gutter Type 1 (Sec. B)**



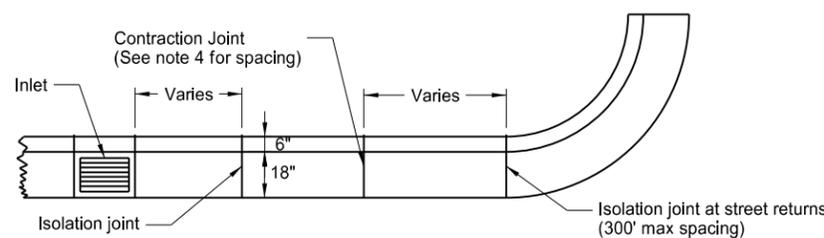
**72" Concrete Valley Gutter Detail**



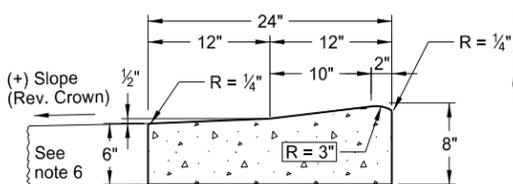
**Mountable Curb & Gutter Type 1 (Sec. A)**



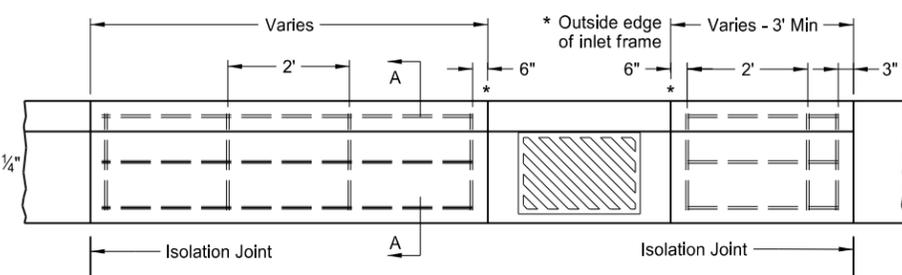
**Keyway Detail for Curb & Gutter**  
(To be used with PCC Pavement and Drives)



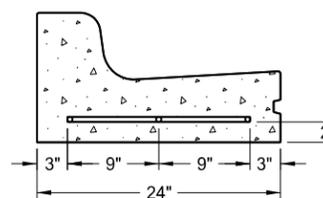
**Joint Location Detail**



**Mountable Curb & Gutter Type 1 (Sec. B)**



**Curb & Gutter Reinforcing at Inlets**



**Section A-A**

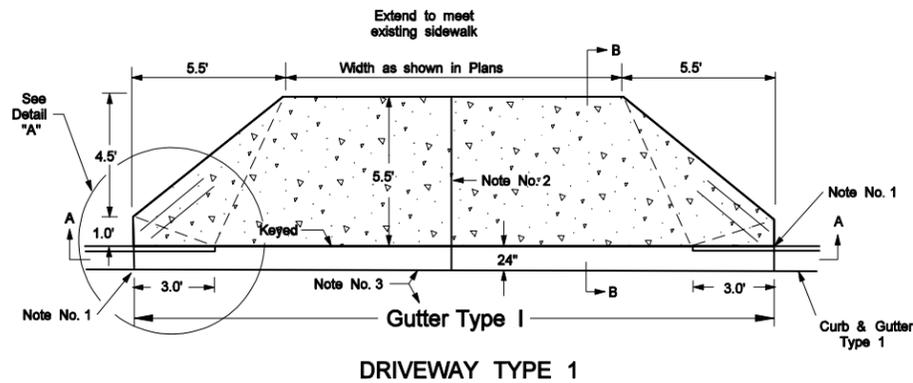
NOTE: All bars shall be #4 deformed reinforcing bars. Splices will not be permitted. Reinforcing bars at inlet locations will not be paid for separately, but shall be included in the price bid for "Curb and Gutter - Type 1." This includes inlets located on radii. The reinforcement shall be extended to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

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 8-7-2013                                     |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

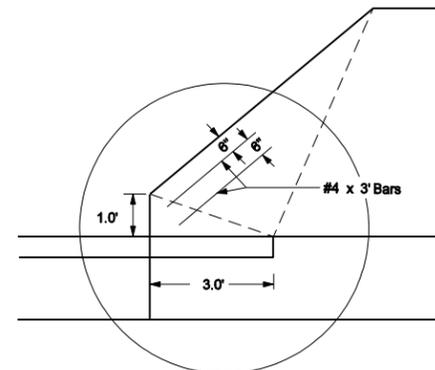
This document was originally issued and sealed by  
Roger Weigel  
Registration Number  
PE-2930,  
on 08/07/2013 and the original document is stored at the  
North Dakota Department  
of Transportation

# CONCRETE DRIVEWAY TYPE 1 (URBAN)

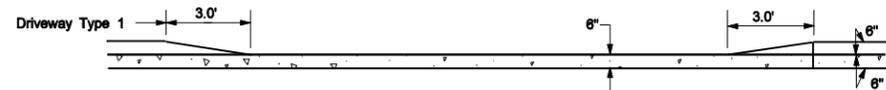
D-750-1



DRIVEWAY TYPE 1



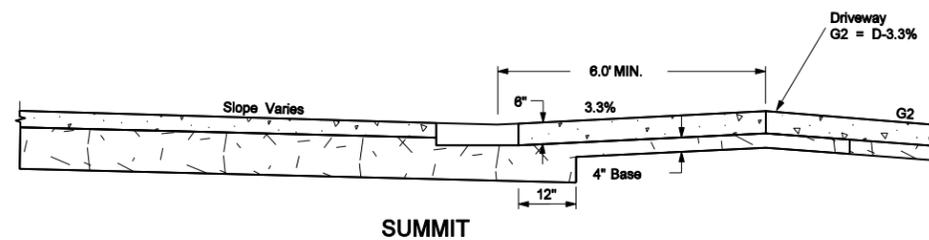
DETAIL "A"



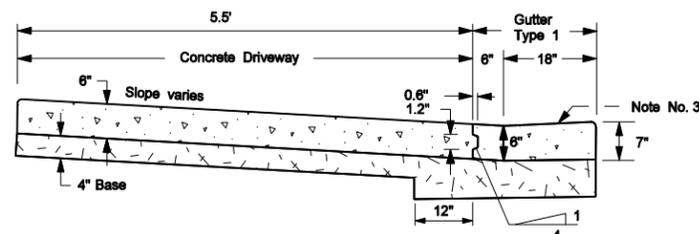
6" SECTION A-A



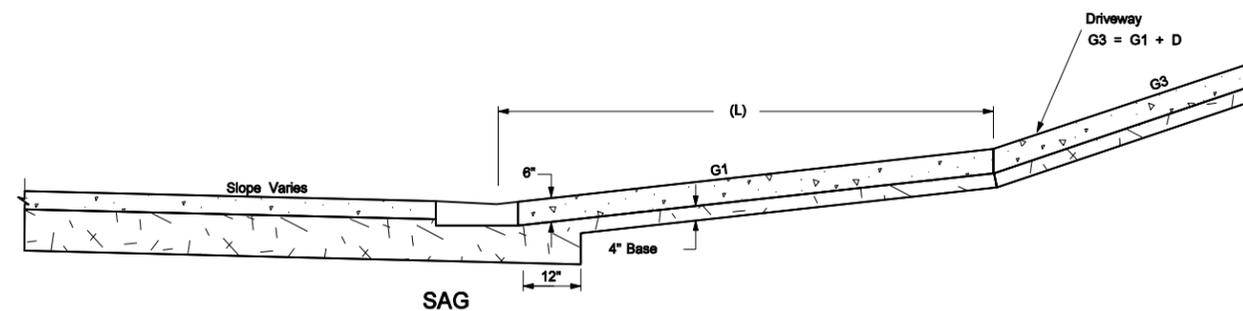
8" SECTION A-A



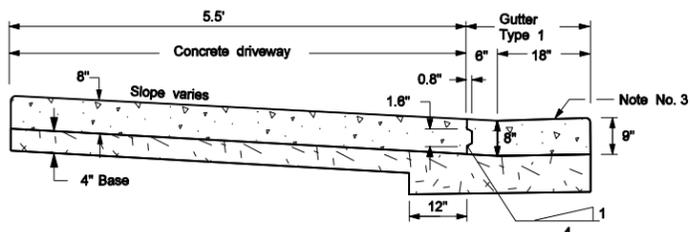
SUMMIT



6" SECTION B-B  
CONCRETE DRIVEWAY DETAILS



SAG



8" SECTION B-B  
CONCRETE DRIVEWAY DETAILS

**NOTES:**

1. On bituminous pavements place a 3/4" isolation joint full depth and the same shape as the curb and gutter. On PCC Pavements the curb and gutter joints match those of the pavement.
2. Joint spacing: The driveway joint spacing shall match the curb and gutter or P.C.C. Pavement joint spacing. (See Standard Drawing D-748-1). The joint may be a keyed construction joint, a sawed, or a grooved joint. The joint depth shall be a minimum of 1/3 the depth of the concrete.
3. Gutter-Type 1 shall be paid for at the unit price bid for "Curb and Gutter-Type 1".
4. 6" Driveway to be used unless otherwise specified.
5. All joints shall be sealed. The joint sealant shall be low modulus silicone. The sealant shall be installed and tooled in accordance with the manufacturer's recommendations
6. All costs for labor, equipment, and material necessary to construct and seal joints shall be included in the price bid for the driveway.
7. 4" base material shall be placed under the concrete driveway. All labor and materials necessary to place the base material shall be included in the price bid for Salvage Base Course or Aggregate Base Course CL 5.

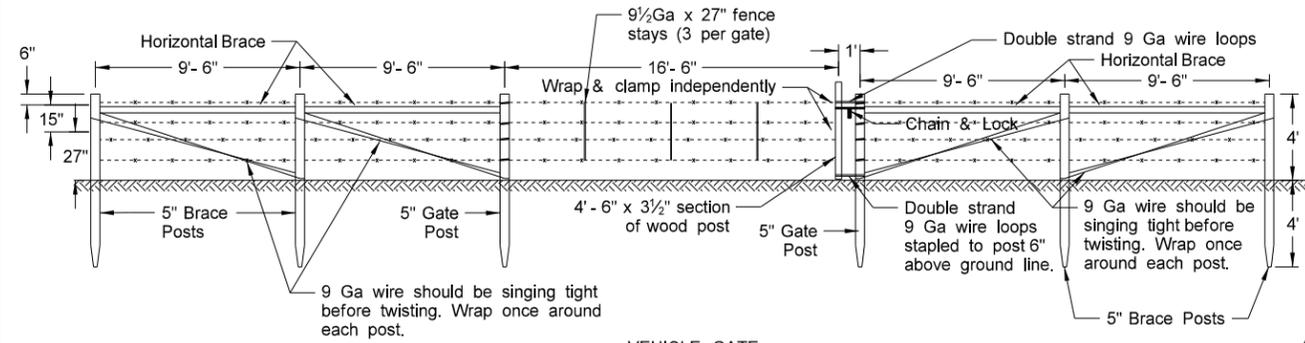
| Driveway ADT | Grade G1  |  | Dimension (L) ft. |         | Grade Changes (D) |  |
|--------------|-----------|--|-------------------|---------|-------------------|--|
|              | Desirable | Maximum                                | Desirable         | Minimum | Desirable         | Maximum   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

| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION<br>10-1-88 |  |
|---|--|
| REVISIONS   |  |
| DATE  | CHANGE   |
| 03-01-88  | Keyed ft dimension                                     |
| 07-01-88  | Type 1 taper & quant.                                  |
| 05-01-91  | Note 2, 5 & 6  |
| 08-08-92  | Note 1   |
| 09-15-93  | Note 5   |
| 11-15-93  | isolation joint  |
| 10-24-94  | Rev summit & sag                                       |
| 08-16-97  | Rev note 5   |
| 01-24-04  | Add base & note 7                                      |
| 05-12-04  | added 2% to sag det.                                   |
| 12-01-04  | PE Stamp added+  |
| 08-12-07  | Revised to show Type 1 only & Removed Quantities table |

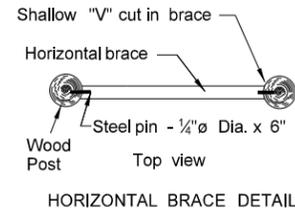
This document was originally issued and sealed by Mark S Gaydos, Registration Number PE- 4518 , on 09/12/07 and the original document is stored at the North Dakota Department of Transportation

# STANDARD BARBED WIRE FENCE

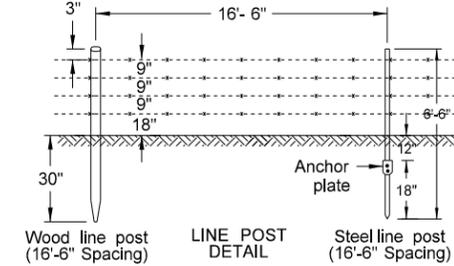
D-752-1



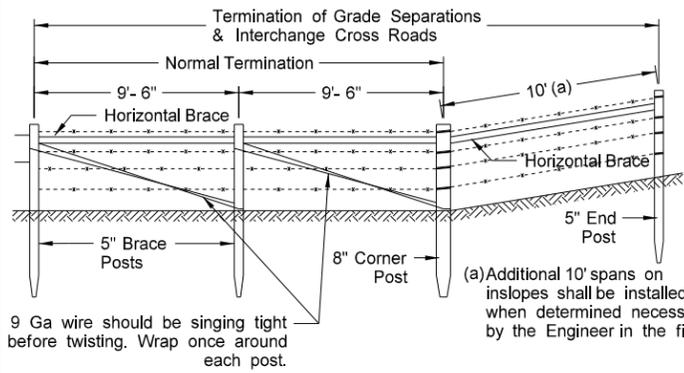
VEHICLE GATE



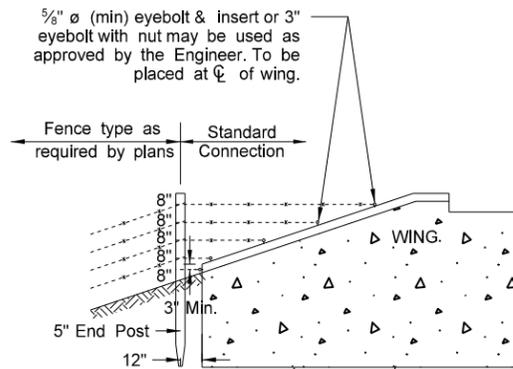
HORIZONTAL BRACE DETAIL



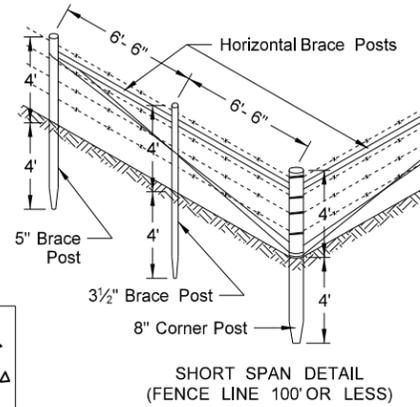
LINE POST DETAIL



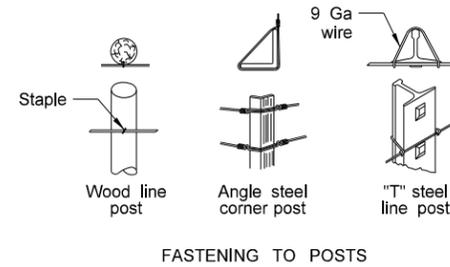
FENCE TERMINAL



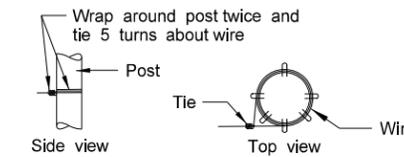
DETAIL FOR TYING FENCE TO WINGS OF ABUTMENTS



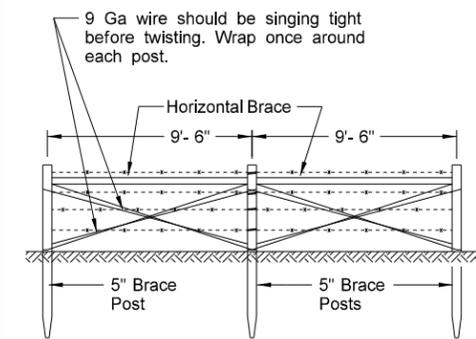
SHORT SPAN DETAIL (FENCE LINE 100' OR LESS)



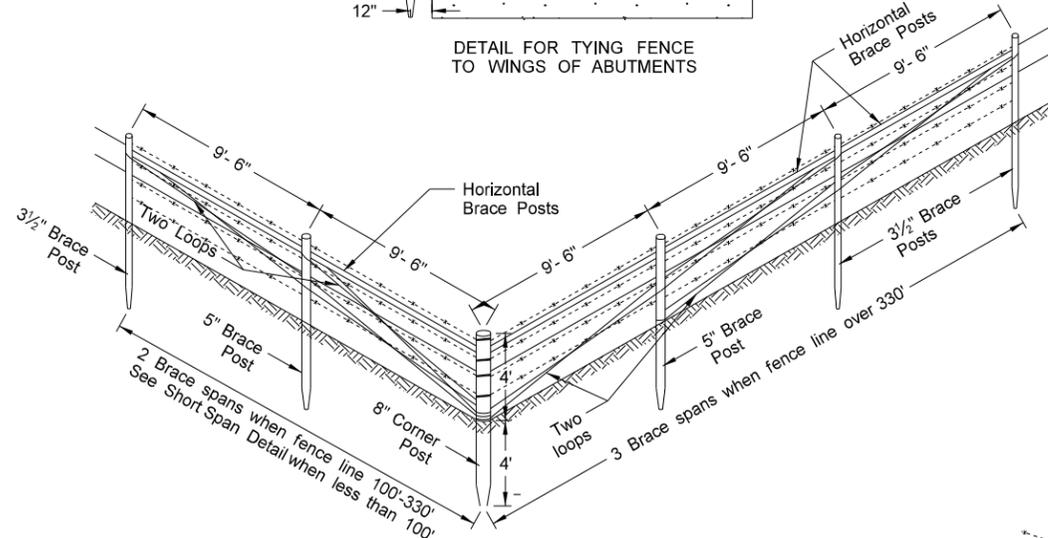
FASTENING TO POSTS



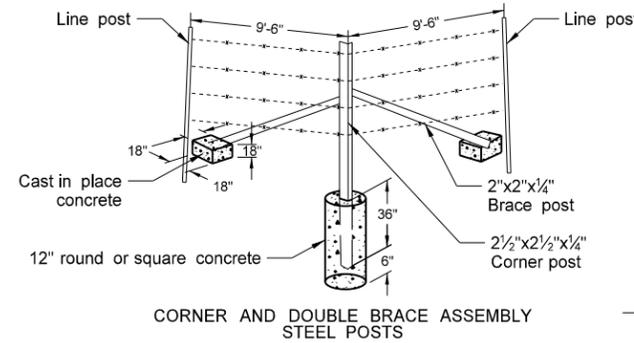
WRAP-AROUND DETAIL



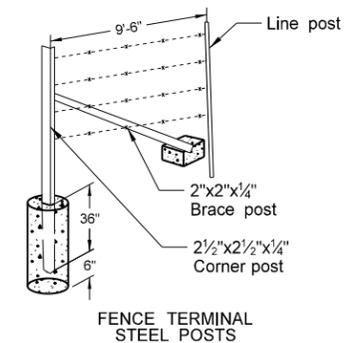
DOUBLE BRACE ASSEMBLY



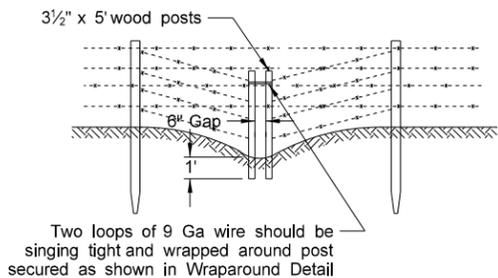
CORNER ASSEMBLY



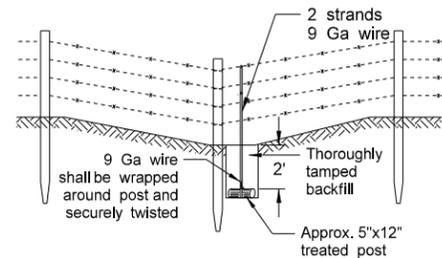
CORNER AND DOUBLE BRACE ASSEMBLY STEEL POSTS



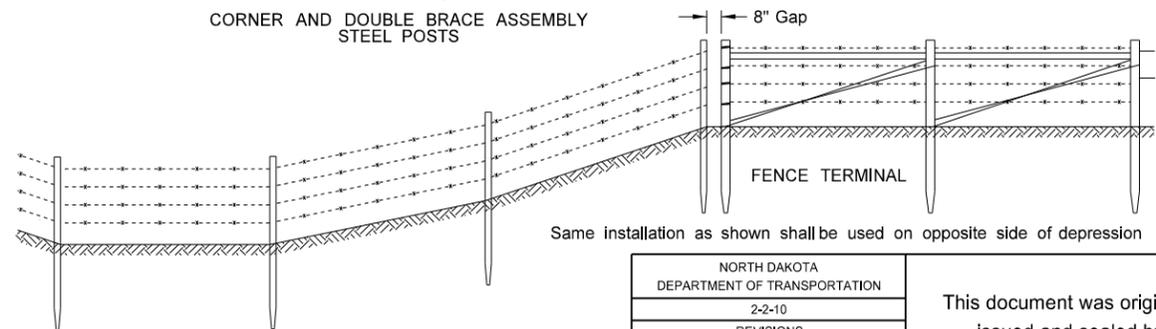
FENCE TERMINAL STEEL POSTS



BREAK-AWAY FENCE FOR NARROW DEPRESSIONS SUBJECT TO FLOODING



DETAIL FOR ANCHORING FENCES IN DEPRESSIONS\*  
\*Locations shall be determined in the field and included in price bid for fencing. Other methods of anchoring the fence may be used if approved by the Engineer.



FENCING FOR WIDE DEPRESSIONS

**NOTES**

1. No deduction in measured pay length of cable fence will be made for gates, corner assemblies, double brace assemblies, fence terminals, or depression fencing. Abutment fencing shall be included in the price bid for fencing bid items.
2. Double brace assemblies shall be installed at locations shown on the plans or established by the Engineer. The distance between adjacent fence terminals, corner assemblies, or double brace assemblies shall not exceed 1,320 feet.
3. Cost of furnishing and installing inserts and eyebolts shall be included in the unit price bid for fencing bid items. Eyebolts shall be galvanized according to AASHTO designation M-30; inserts of corrosion resistant material need not be galvanized. Concrete inserts shall be of such design that, when installed in the concrete, will be capable of developing the full strength of the 5/8" diameter threaded eyebolt.
4. The type of posts to be used, either wood or steel, shall be determined by the contractor unless otherwise specified in the plans.

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

|   |                               |
|---|-------------------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                               |
| 2-2-10                                    |                               |
| REVISIONS                                 |                               |
| DATE                                      | CHANGE                        |
| 10-02-12                                  | Notes, steel assemblies/posts |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 10/2/2012 and the original document is stored at the North Dakota Department of Transportation

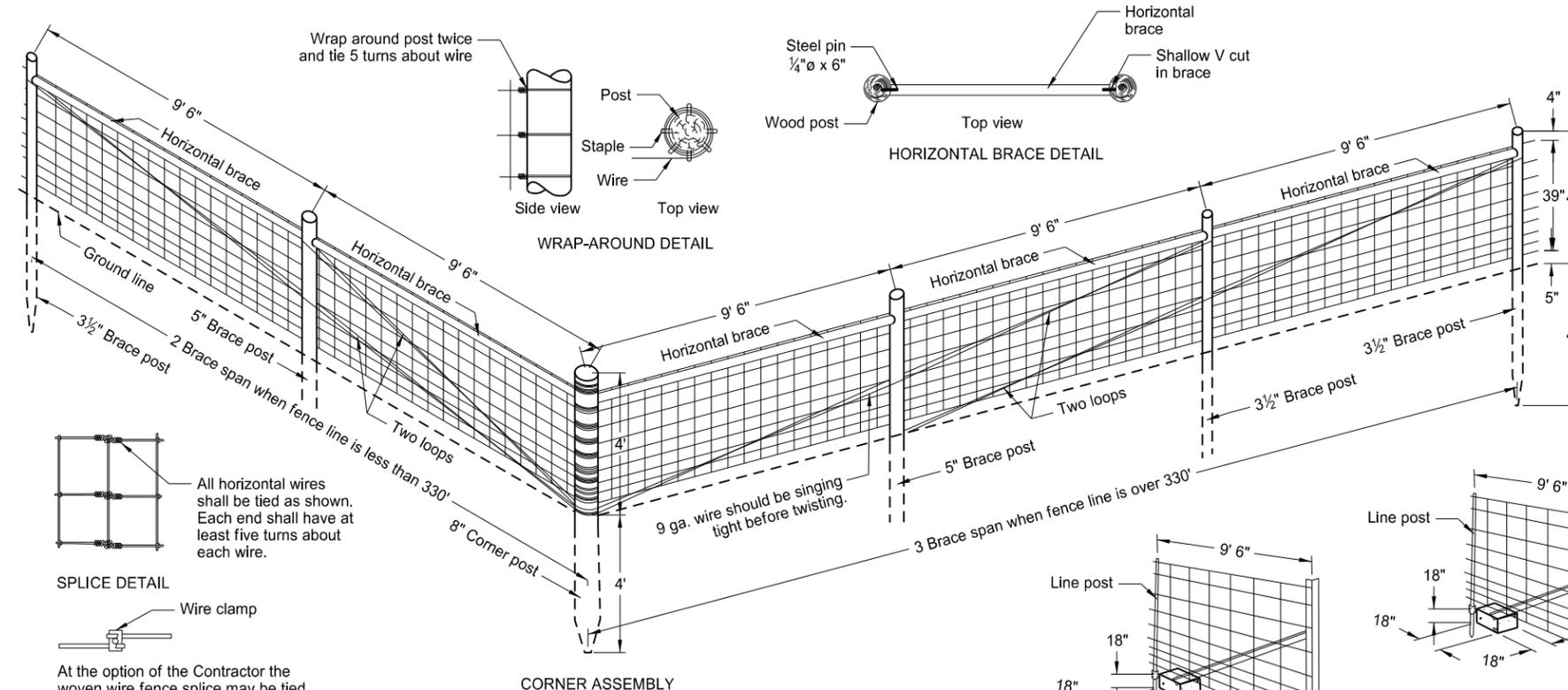
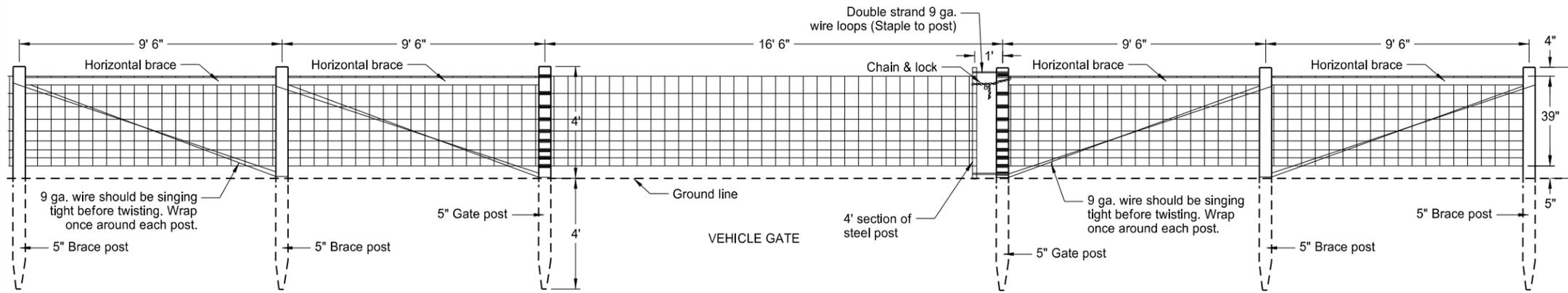


# STANDARD WOVEN WIRE FENCE

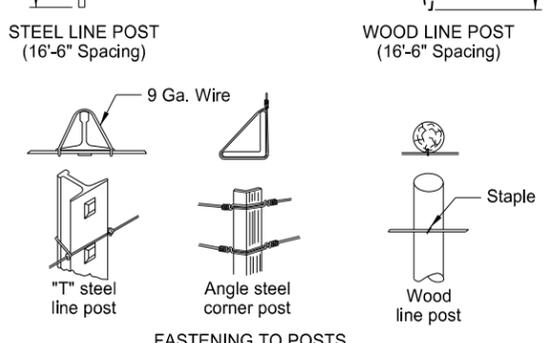
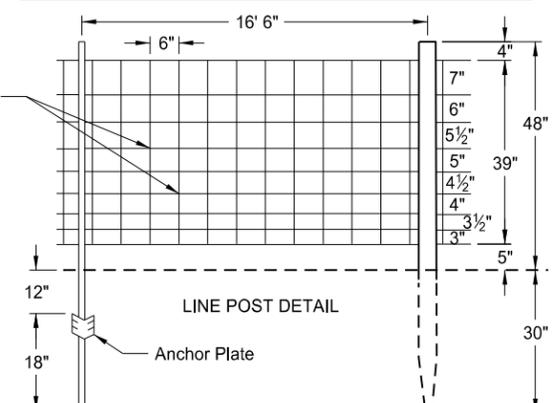
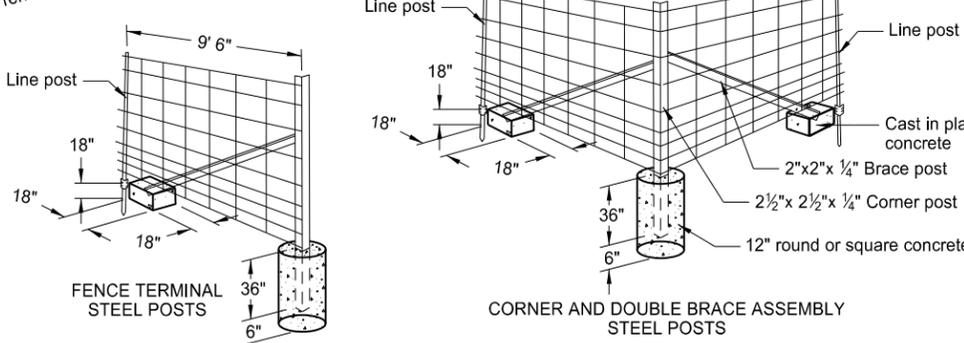
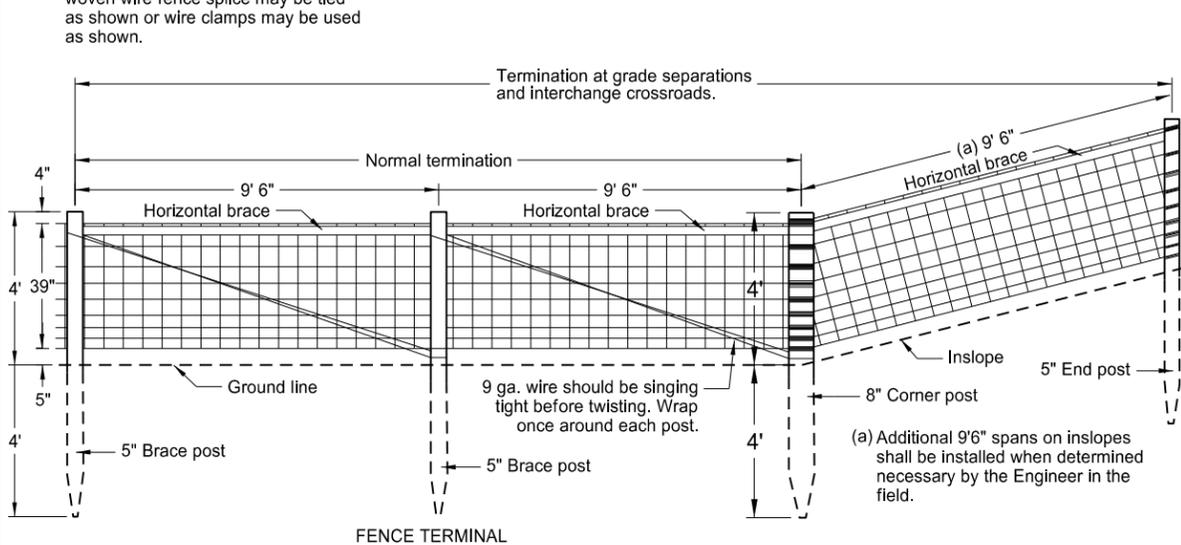
D-752-3

### NOTES

- No deduction in measured pay length of woven wire fence will be made for gates, corner assemblies, double brace assemblies or fence terminals.
- Double Brace Assembly shall be installed at locations shown on the plans or established by the Engineer. The distance between adjacent fence terminals, corner assemblies or double brace assemblies shall not exceed 1320 feet.
- Top wire of the woven wire fence shall be stapled separately. Intermediate wires shall be stapled not more than 10" apart. Bottom wire shall be stapled.
- If in the opinion of the Engineer in the field the change in grade is so sharp that woven wire will not conform to the grade, a double brace shall be installed.
- The type of posts to be used, either wood or steel, shall be determined by the contractor unless otherwise specified in the plans.



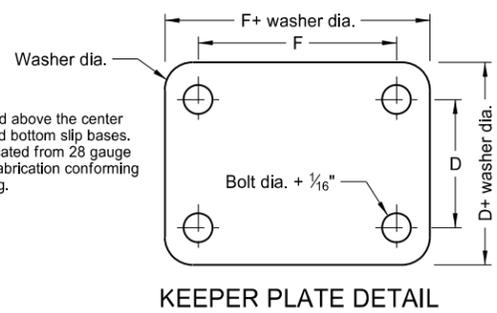
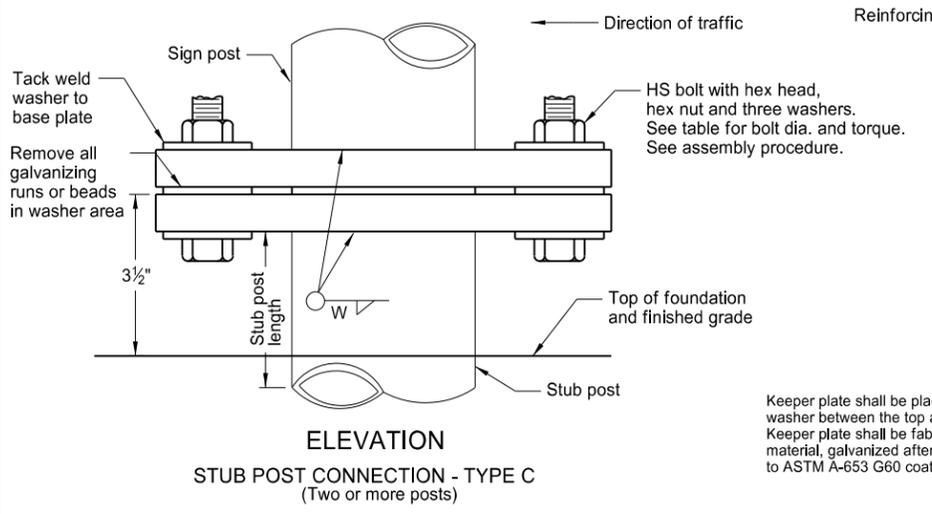
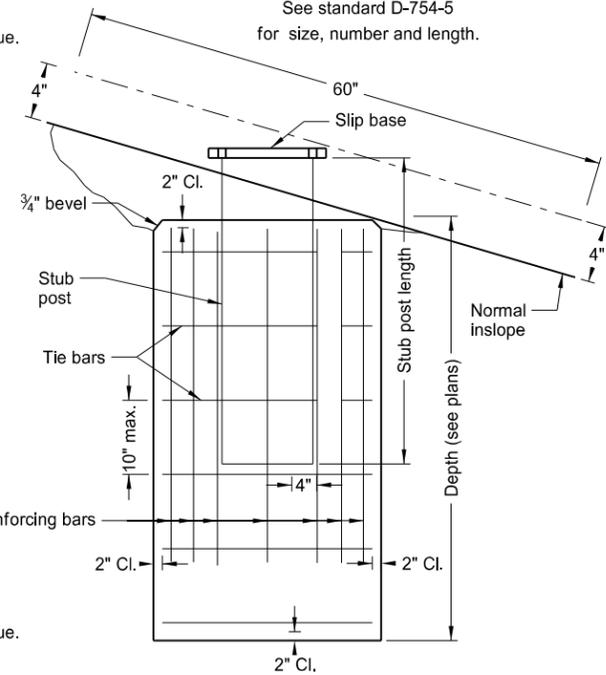
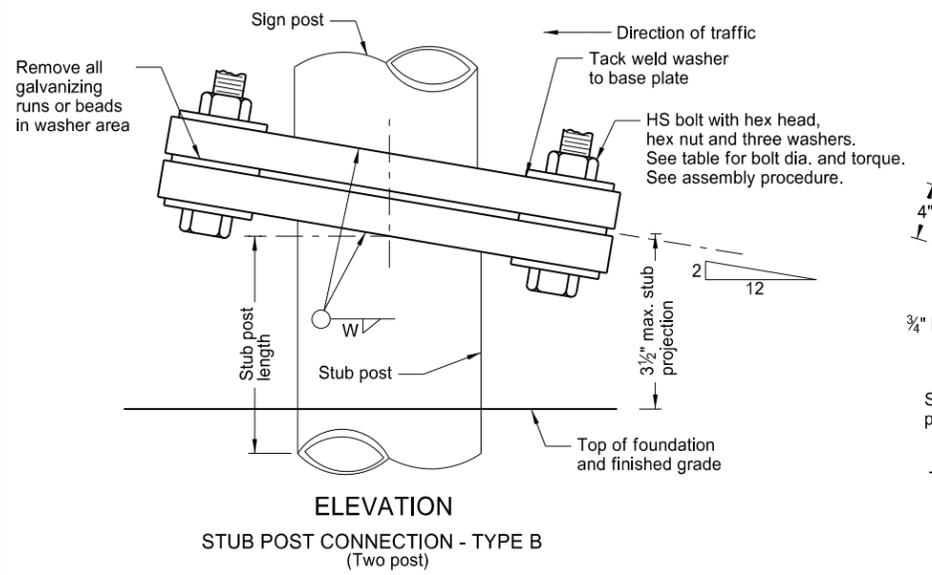
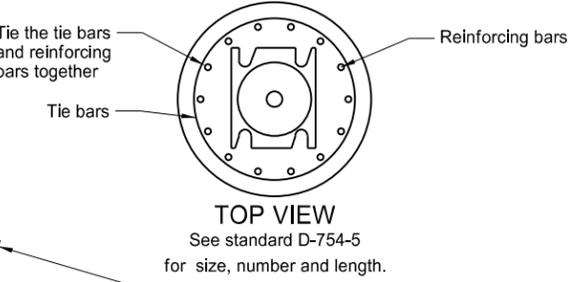
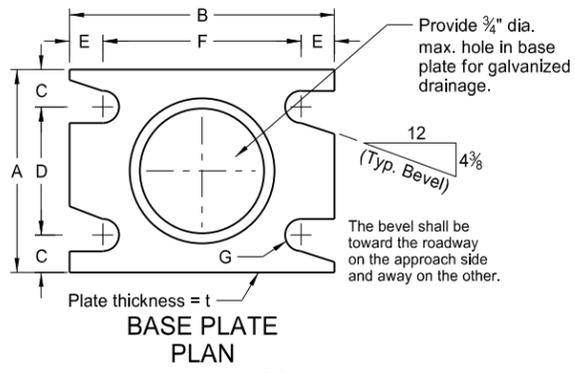
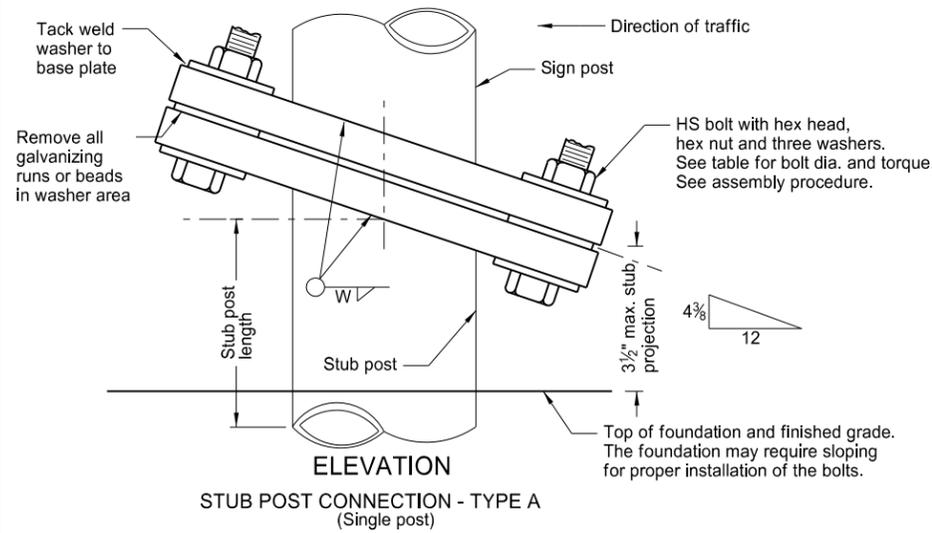
| USE OF POST      | Treated wood |             | Steel                       |                 |                |
|------------------|--------------|-------------|-----------------------------|-----------------|----------------|
|                  | Post dia.    | Post length | Post length         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



|  |        |   |
|--|--------|---|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        | This document was originally issued and sealed by<br><b>Roger Weigel,</b><br>Registration Number<br>PE-2930,<br>on 10/2/2012 and the original document is stored at the<br>North Dakota Department<br>of Transportation |
| 10-02-12                                     |        |   |
| DATE   | CHANGE |   |

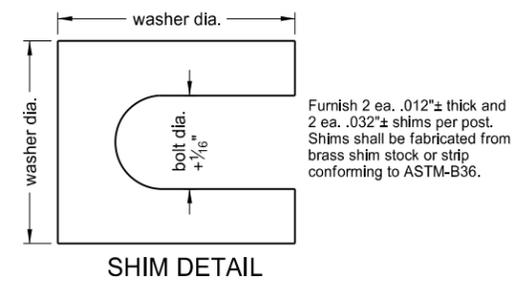


**BREAK-AWAY BASE AND FOUNDATION DETAILS  
STUB POST CONNECTION (PIPE)**



| ROUND METAL POSTS    |                      |                     |                    |                       |                                   |                                      |                      |
|----------------------|----------------------|---------------------|--------------------|-----------------------|-----------------------------------|--------------------------------------|----------------------|
| DIMENSIONS           |                      |                     |                    | PROPERTIES            |                                   |                                      |                      |
| NOMINAL DIAMETER IN. | OUTSIDE DIAMETER IN. | INSIDE DIAMETER IN. | WALL THICKNESS IN. | WEIGHT PER FOOT POUND | MOMENT OF INERTIA IN <sup>4</sup> | CROSS SECTIONAL AREA IN <sup>2</sup> | SECTION DIAMETER IN. |
| STEEL POSTS          |                      |                     |                    |                       |                                   |                                      |                      |
| 3 1/2                | 4.000                | 3.548               | .226               | 9.11                  | 4.788                             | 2.680                                | 2.394                |
| 4                    | 4.500                | 4.026               | .237               | 10.79                 | 7.233                             | 3.174                                | 3.215                |
| 5                    | 5.563                | 5.047               | .258               | 14.62                 | 15.16                             | 4.300                                | 5.449                |
| 6                    | 6.625                | 6.065               | .280               | 18.97                 | 28.14                             | 5.581                                | 8.495                |
| 8                    | 8.625                | 8.071               | .277               | 24.70                 | 63.35                             | 7.265                                | 14.69                |
| 10                   | 10.750               | 10.192              | .279               | 31.20                 | 125.9                             | 9.178                                | 23.42                |
| 12                   | 12.750               | 12.090              | .330               | 43.77                 | 248.5                             | 12.88                                | 38.98                |
| 12                   | 12.750               | 12.000              | .375               | 49.56                 | 279.3                             | 14.58                                | 43.81                |
| ALUMINUM POSTS       |                      |                     |                    |                       |                                   |                                      |                      |
| 3 1/2                | 4.000                | 3.548               | .226               | 3.151                 | 4.788                             | 2.680                                | 2.394                |
| 4                    | 4.500                | 4.026               | .237               | 3.733                 | 7.232                             | 3.174                                | 3.214                |
| 5                    | 5.563                | 5.047               | .258               | 5.057                 | 15.16                             | 4.300                                | 5.451                |
| 6                    | 6.625                | 6.065               | .280               | 6.564                 | 28.14                             | 5.581                                | 8.496                |
| 8                    | 8.625                | 8.071               | .277               | 8.543                 | 63.35                             | 7.265                                | 14.69                |
| 10                   | 10.750               | 10.192              | .279               | 10.79                 | 125.8                             | 9.178                                | 23.41                |
| 10                   | 10.750               | 10.136              | .307               | 11.84                 | 137.4                             | 10.072                               | 25.57                |
| 10                   | 10.750               | 10.020              | .365               | 14.00                 | 160.7                             | 11.908                               | 29.90                |
| 12                   | 12.750               | 12.090              | .330               | 15.14                 | 248.5                             | 12.88                                | 38.98                |
| 12                   | 12.750               | 12.000              | .375               | 17.14                 | 279.3                             | 14.579                               | 43.81                |
| 12                   | 12.750               | 11.750              | .500               | 22.63                 | 361.5                             | 19.242                               | 56.71                |

| BASE DATA TABLE            |                               |             |         |         |         |         |         |         |         |        |         |                  |
|----------------------------|-------------------------------|-------------|---------|---------|---------|---------|---------|---------|---------|--------|---------|------------------|
| NOMINAL PIPE SIZE DIAMETER | BOLT SIZE (DIAMETER X LENGTH) | TORQUE SIZE | A       | B       | C       | D       | E       | F       | G       | t      | W       | STUB POST LENGTH |
| STEEL                      |                               |             |         |         |         |         |         |         |         |        |         |                  |
| 3 1/2"                     | 1/2"x2 1/2"                   | 12          | 5 1/2"  | 8 3/8"  | 1 3/16" | 3 7/8"  | 1 3/16" | 6 3/4"  | 9/32"   | 3/4"   | 3/8"    | 1'-6"            |
| 4"                         | 5/8"x2 3/4"                   | 29          | 5 1/2"  | 8 3/4"  | 1"      | 3 1/2"  | 1"      | 6 3/4"  | 1 1/32" | 1"     | 7/16"   | 1'-6"            |
| 5"                         | 3/4"x3 1/2"                   | 46          | 6 1/2"  | 10"     | 1 1/8"  | 4 1/4"  | 1 1/8"  | 7 3/4"  | 1 3/32" | 1"     | 7/16"   | 2'-0"            |
| 6"                         | 1"x4 1/4"                     | 61          | 7 1/2"  | 11 3/4" | 1 3/8"  | 4 3/4"  | 1 3/8"  | 9"      | 1 7/32" | 1 1/4" | 7/16"   | 2'-0"            |
| 8"                         | 1"x4 1/4"                     | 61          | 9 1/2"  | 13 1/4" | 1 3/8"  | 6 3/4"  | 1 3/8"  | 10 1/2" | 1 1/32" | 1 1/4" | 7/16"   | 2'-6"            |
| 10"                        | 1"x4 1/4"                     | 61          | 11 3/4" | 15 1/4" | 1 3/8"  | 9"      | 1 3/8"  | 12 1/2" | 1 7/32" | 1 1/4" | 1/2"    | 3'-0"            |
| 12"                        | 1 1/4"x5"                     | 135         | 13 3/4" | 18"     | 1 5/8"  | 10 1/2" | 1 5/8"  | 14 3/4" | 2 1/32" | 1 1/2" | 1/2"    | 3'-0"            |
| ALUMINUM                   |                               |             |         |         |         |         |         |         |         |        |         |                  |
| 3 1/2"                     | 1/2"x2 1/2"                   | 12          | 5 1/2"  | 8 3/8"  | 1 3/16" | 3 7/8"  | 1 3/16" | 6 3/4"  | 9/32"   | 3/4"   | 3/8"    | 1'-6"            |
| 4"                         | 5/8"x2 3/4"                   | 29          | 5 1/2"  | 8 3/4"  | 1"      | 3 1/2"  | 1"      | 6 3/4"  | 1 1/32" | 1"     | 7/16"   | 1'-6"            |
| 5"                         | 3/4"x3 1/2"                   | 46          | 6 1/2"  | 10"     | 1 1/8"  | 4 1/4"  | 1 1/8"  | 7 3/4"  | 1 3/32" | 1"     | 1/2"    | 2'-0"            |
| 6"                         | 1"x4 1/4"                     | 61          | 7 1/2"  | 11 3/4" | 1 3/8"  | 4 3/4"  | 1 3/8"  | 9"      | 1 7/32" | 1 1/4" | 1/2"    | 2'-0"            |
| 8"                         | 1"x4 1/4"                     | 61          | 9 1/2"  | 13 1/4" | 1 3/8"  | 6 3/4"  | 1 3/8"  | 10 1/2" | 1 7/32" | 1 1/4" | 1/2"    | 2'-6"            |
| 10"                        | 1"x4 3/4"                     | 61          | 11 3/4" | 15 1/4" | 1 3/8"  | 9"      | 1 3/8"  | 12 1/2" | 1 7/32" | 1 1/4" | 7/16"   | 3'-0"            |
| 12"                        | 1 1/4"x5 1/2"                 | 135         | 13 3/4" | 18"     | 1 5/8"  | 10 1/4" | 1 5/8"  | 14 3/4" | 2 1/32" | 1 3/4" | 1 1/16" | 3'-0"            |



Notes:  
Keeper Plate - A keeper plate shall be used.

Aluminum Base Plate Washers - When the base plate is fabricated from aluminum, the washers shown as tack welded to base shall be aluminum.

Fuse Joint Cuts - Steel posts may be cut after galvanizing and cut surface treated with an approved method meeting ASTM A780 or the cut may be galvanized after fabrication. Aluminum posts will not require treatment.

Vertical clearance of breakaway base - The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.

Foundation data obtained from standard D-754-5. Foundation shall be formed 6" into ground. Forms shall be removed.

**ASSEMBLY PROCEDURE**

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

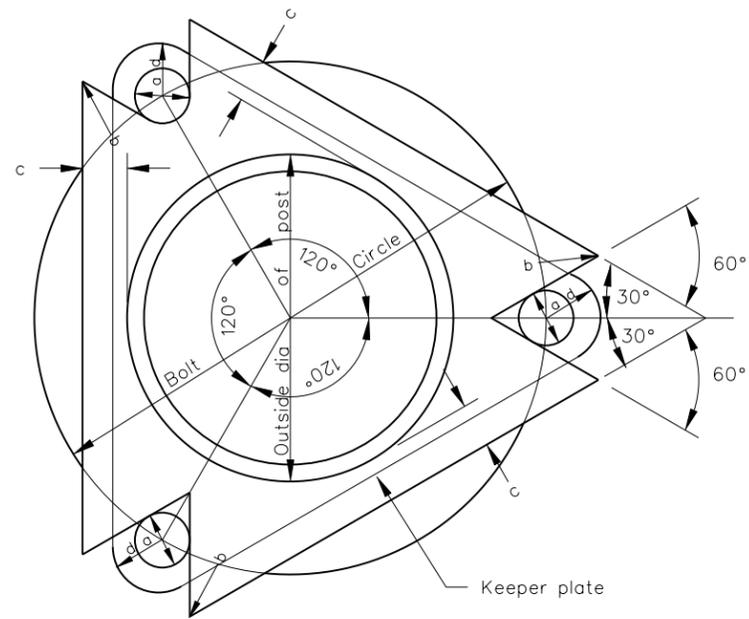
| FOUNDATION DIAMETER | POST SIZE |
|---------------------|-----------|
| 1'-4"               | 3 1/2"x4" |
| 1'-9"               | 5"        |
| 1'-9"               | 6"        |
| 2'-0"               | 8"        |
| 2'-4"               | 10"       |
| 2'-6"               | 12"       |

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |        |
|---|--------|
| REVISIONS                                 |        |
| DATE                                      | CHANGE |
|   |        |

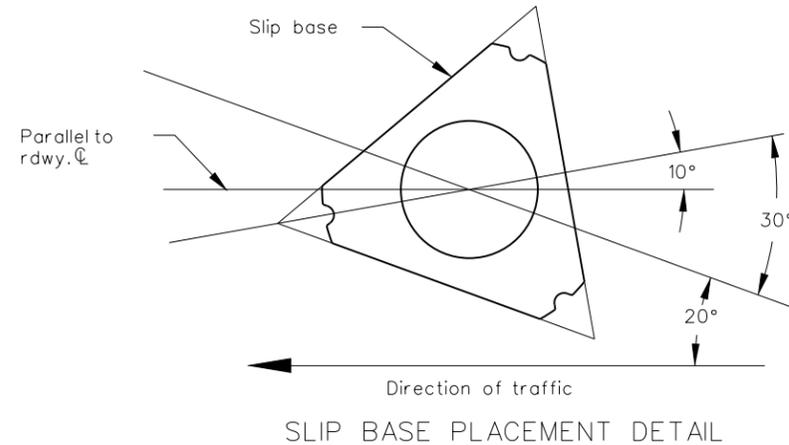
This document was originally issued and sealed by  
Roger Weigel  
Registration Number  
PE-2930,  
on 11/21/11 and the original document is stored at the  
North Dakota Department  
of Transportation

# MULTI-DIRECTIONAL BREAK AWAY BASE

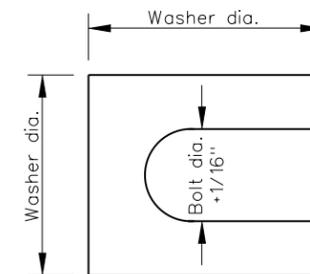
D-754-4



PLAN



SLIP BASE PLACEMENT DETAIL



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

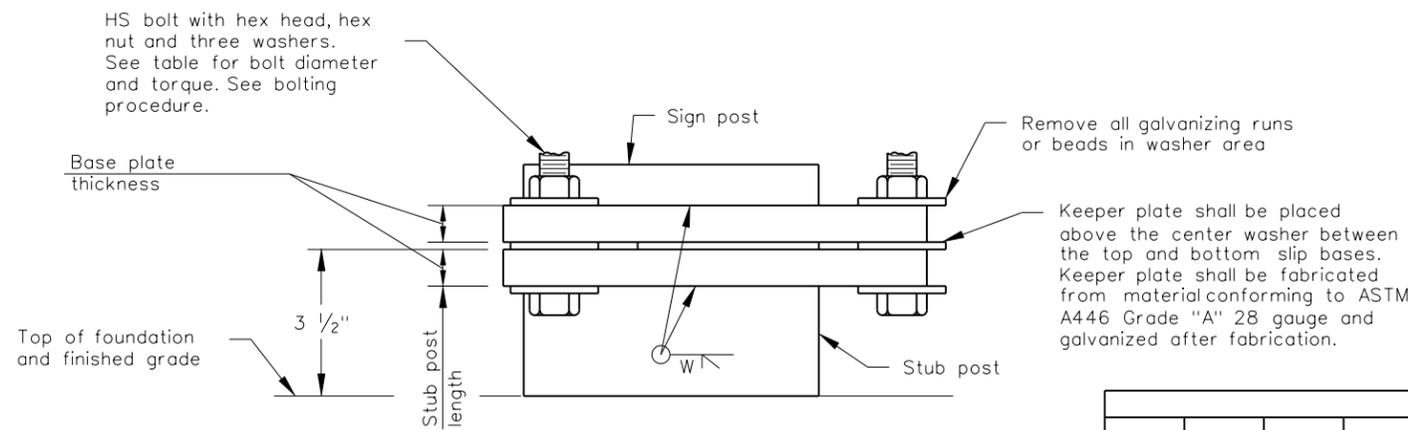
SHIM DETAIL

NOTES:

Foundations shall be similar to those shown on the break away and foundation details except for the type of slip base, in lieu of stub post shown, the anchor bolt connection shown on the break away and foundation details may be used.

Assembly Procedure

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



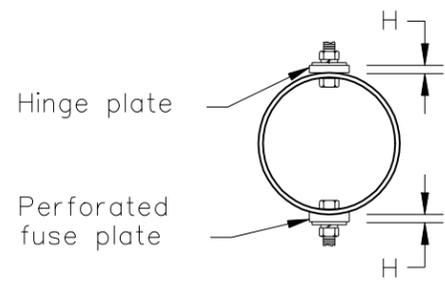
ELEVATION  
MULTI. DIRECTION SIGN POST  
TYPE D

| MULTI-DIRECTIONAL SLIP BASE |                   |             |          |          |          |               |                      |       |                           |          |                  |
|-----------------------------|-------------------|-------------|----------|----------|----------|---------------|----------------------|-------|---------------------------|----------|------------------|
| NOMINAL POST DIA.           | OUTSIDE POST DIA. | BOLT CIRCLE | a Radius | b Radius | c Radius | BOLT SIZE     | BASE PLATE THICKNESS | w     | BASE BOLT TORQUE Ft. lbs. | d Radius | STUB POST LENGTH |
| STEEL                       |                   |             |          |          |          |               |                      |       |                           |          |                  |
| 3 1/2"                      | 4"                | 7"          | 1 1/16"  | 1/8"     | 1 1/8"   | 1" x 4"       | 1 1/4"               | 5/16" | 55                        | 1 1/8"   | 1'-6"            |
| 4"                          | 4.5"              | 7 1/2"      | 1 1/16"  | 1/8"     | 1 1/8"   | 1" x 4 1/2"   | 1 1/2"               | 3/8"  | 98                        | 1 1/8"   | 1'-6"            |
| 5"                          | 5.563"            | 9 1/2"      | 1 5/16"  | 1/8"     | 1 1/8"   | 1 1/4" x 5"   | 1 1/2"               | 3/8"  | 167                       | 1 3/8"   | 2'-0"            |
| ALUMINUM                    |                   |             |          |          |          |               |                      |       |                           |          |                  |
| 3 1/2"                      | 4"                | 7"          | 13/16"   | 1/8"     | 7/8"     | 3/4" x 3 1/2" | 1"                   | 5/16" | 43                        | 7/8"     | 1'-6"            |
| 4"                          | 4.5"              | 7 1/2"      | 13/16"   | 1/8"     | 3/4"     | 3/4" x 4"     | 1 1/4"               | 5/16" | 76                        | 7/8"     | 1'-6"            |
| 5"                          | 5.563"            | 9 1/2"      | 1 1/16"  | 1/8"     | 1 1/8"   | 1" x 4"       | 1 1/4"               | 5/16" | 98                        | 1 1/8"   | 2'-0"            |
| 6"                          | 6.625"            | 10 1/4"     | 1 1/16"  | 1/8"     | 3/4"     | 1" x 4 1/2"   | 1 1/2"               | 3/8"  | 134                       | 1 1/8"   | 2'-0"            |
| 8"                          | 8.625"            | 12 1/2"     | 1 5/16"  | 1/8"     | 3/4"     | 1 1/4" x 5"   | 1 1/2"               | 1/2"  | 189                       | 1 3/8"   | 2'-6"            |

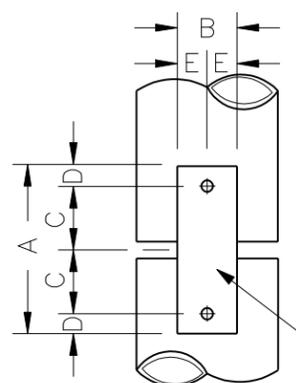
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                        |
|---|------------------------|
| 07-15-94                                  |                        |
| REVISIONS                                 |                        |
| DATE                                      | CHANGE                 |
| 06-20-95                                  | Notes                  |
| 08-14-95                                  | Stub post dimension    |
| 03-07-01                                  | Layout revision        |
| 03-05-03                                  | Welding symbol         |
| 08-09-04                                  | Revised elevation view |
| 12-01-04                                  | PE Stamp added         |

This document was originally issued and sealed by  
**MARK S. GAYDOS**  
Registration Number  
**PE- 4518** ,  
on 12/01/04 and the original document is stored at the  
North Dakota Department  
of Transportation

HINGE PLATE DETAILS  
PERFORATED FUSE PLATE DETAILS

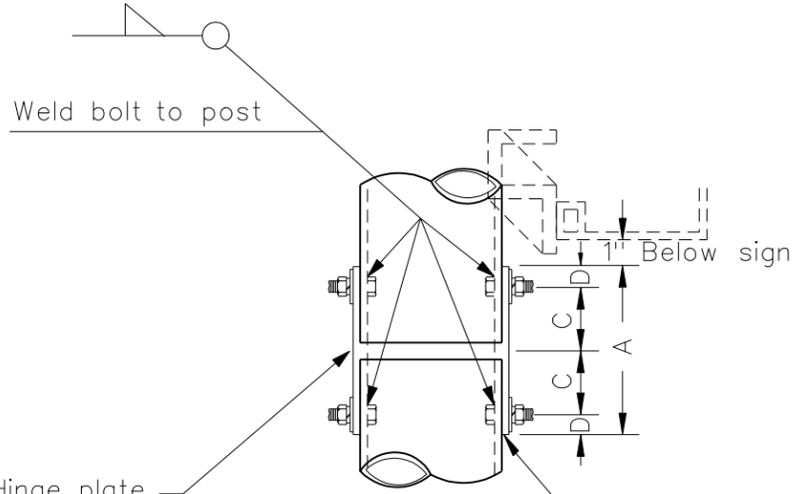


TOP VIEW



BACK VIEW

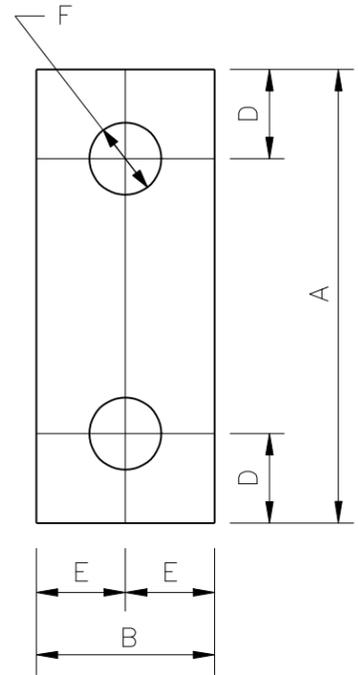
Hinge plate thickness = H



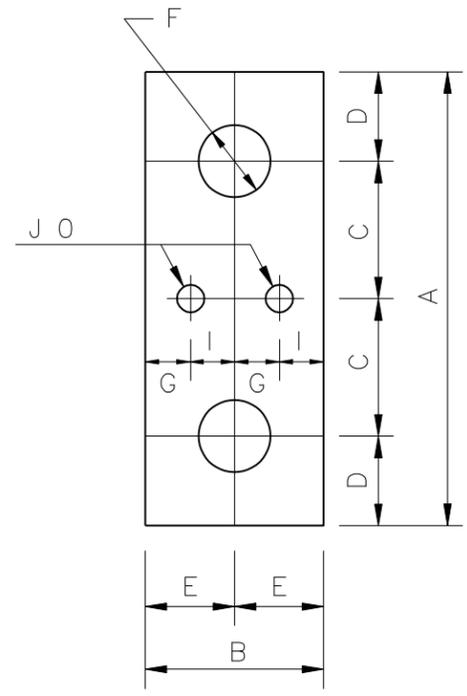
Perforated fuse plate thickness = H

Direction of traffic  
BACK VIEW

HINGE PLATE DETAIL  
ALUMINUM OR STEEL POSTS  
FOR 2 OR MORE POST SIGNS



HINGE PLATE



PERFORATED FUSE PLATE

NOTES:  
Assembly Procedure

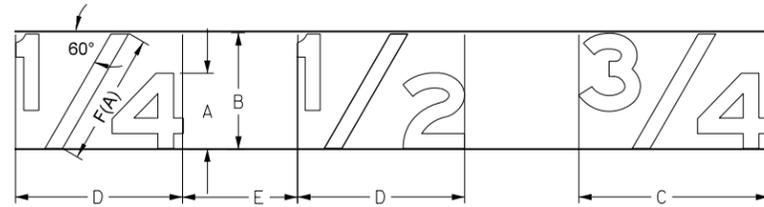
1. Assemble hinge plate to post with bolts and with one flat washer and lock washer under nut.
2. Tighten all bolts the maximum possible with 12" to 15" wrench.

| DIMENSION<br>NOM.<br>PIPE SIZE | FUSE AND HINGE PLATE DATA |        |        |          |        |        |         |        |      |        |       |
|--------------------------------|---------------------------|--------|--------|----------|--------|--------|---------|--------|------|--------|-------|
|                                | BOLT SIZE                 | A      | B      | C        | D      | E      | F       | G      | H    | I      | J     |
| 3 1/2"                         | 1/2" Ø x 1-1/2"           | 5"     | 1-3/4" | 1-11/16" | 13/16" | 7/8"   | 9/16"   | 15/32" | 1/4" | 13/32" | 7/16" |
| 4"                             | 5/8" Ø x 1-1/2"           | 5-3/4" | 2"     | 1-7/8"   | 1"     | 1"     | 11/16"  | 17/32" | 3/8" | 15/32" | 9/16" |
| 5"                             | 5/8" Ø x 1-3/4"           | 5-3/4" | 2"     | 1-7/8"   | 1"     | 1"     | 11/16"  | 9/16"  | 1/2" | 7/16"  | 5/8"  |
| 6"                             | 3/4" Ø x 2-1/4"           | 6-1/4" | 2-1/4" | 2"       | 1-1/8" | 1-1/8" | 13/16"  | 5/8"   | 1/2" | 1/2"   | 5/8"  |
| 8"                             | 1" Ø x 2-1/2"             | 7-1/4" | 2-3/4" | 2-1/4"   | 1-3/8" | 1-3/8" | 1-1/16" | 7/8"   | 1/2" | 1/2"   | 7/16" |
| 10"                            | 1-1/4" Ø x 2-3/4"         | 8-1/4" | 3-1/4" | 2-1/2"   | 1-5/8" | 1-5/8" | 1-5/16" | 5/8"   | 1/2" | 11/16" | 3/4"  |
| 12"                            | 1-1/4" Ø x 3"             | 8-1/4" | 3-1/4" | 2-1/2"   | 1-5/8" | 1-5/8" | 1-5/16" | 1"     | 1/2" | 5/8"   | 1/2"  |

| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                                      |
|--|--------------------------------------|
| 07-15-94                                     |                                      |
| REVISIONS                                    |                                      |
| DATE   | CHANGE                               |
| 06-20-95                                     | Notes                                |
| 03-07-01                                     | Layout revisions                     |
| 10-12-01                                     | Weld bolt to post                    |
| 03-25-04                                     | Removed locktite & added lock washer |
| 12-01-04                                     | PE Stamp added                       |

This document was originally issued and sealed by MARK S GAYDOS, Registration Number PE-4518, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

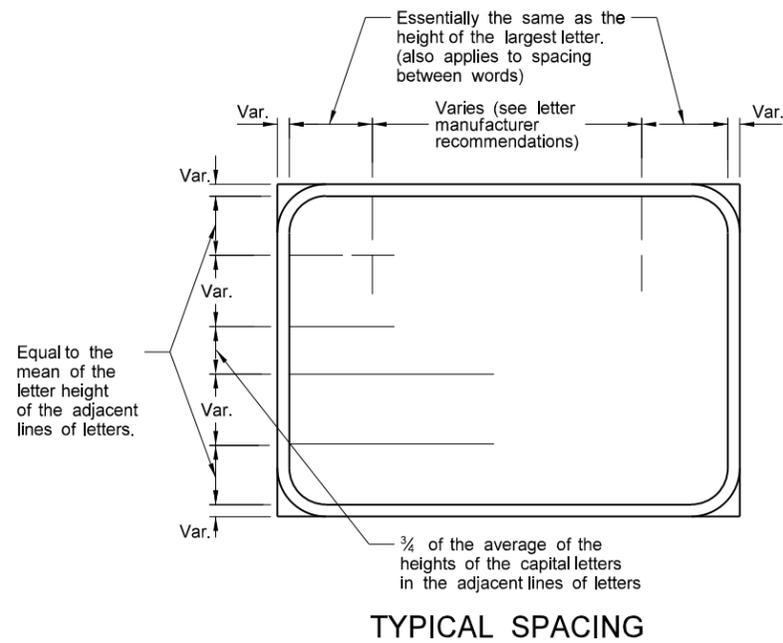
LETTER AND ARROW DETAILS FOR VARIABLE LENGTH SIGNS



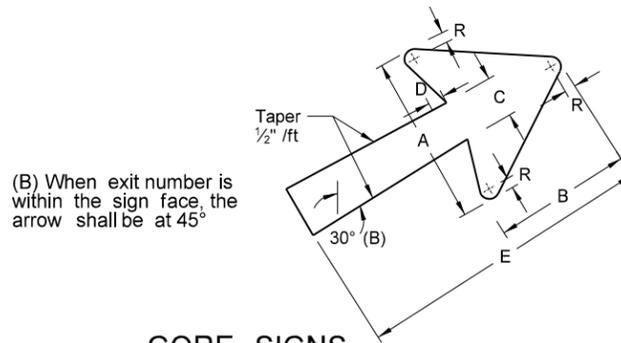
SIZE OF THE FRACTION IS DETERMINED AS FOLLOWS:

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

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

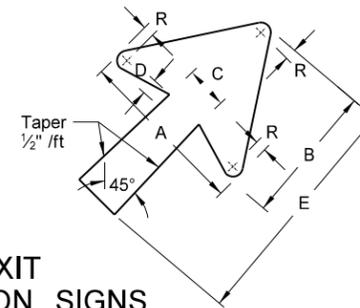


TYPICAL SPACING



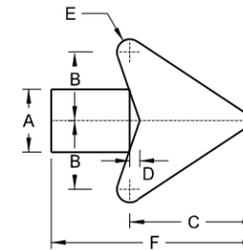
GORE SIGNS

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



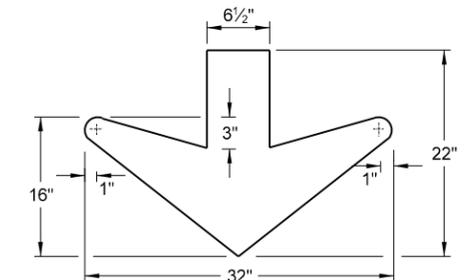
EXIT DIRECTION SIGNS

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



DISTANCE AND DESTINATION SIGNS

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

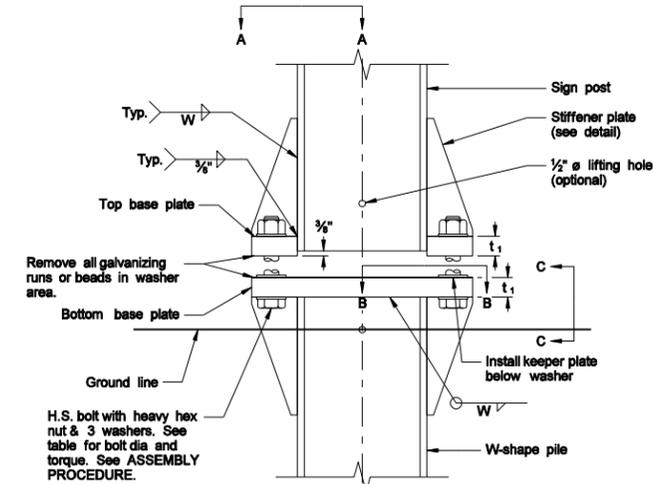


DOWN ARROW

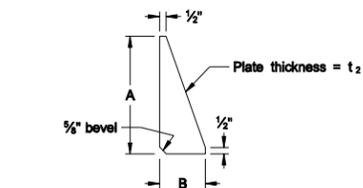
|   |        |
|---|--------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |        |
| 8-3-11                                    |        |
| REVISIONS                                 |        |
| DATE                                      | CHANGE |
|   |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 08/03/11 and the original document is stored at the North Dakota Department of Transportation

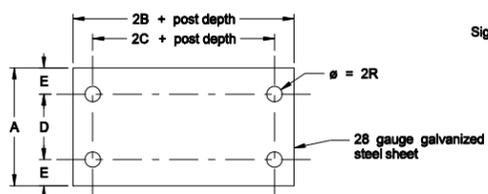
STRUCTURAL DETAILS  
W-SHAPE SUPPORTS



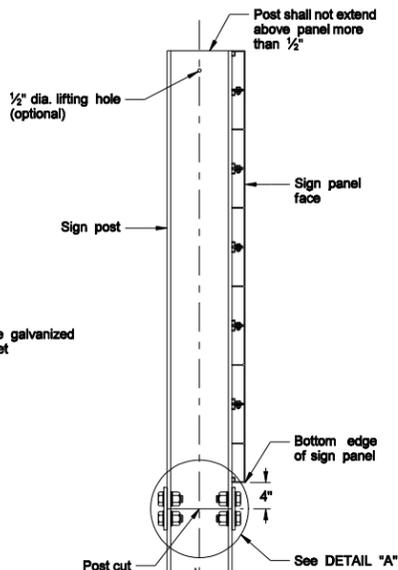
SIGN POST ELEVATION



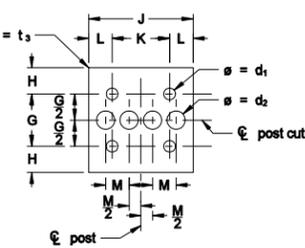
STIFFENER PLATE DETAIL



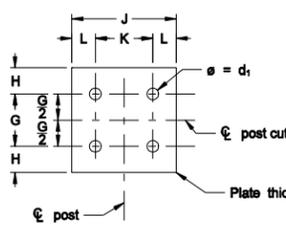
KEEPER PLATE



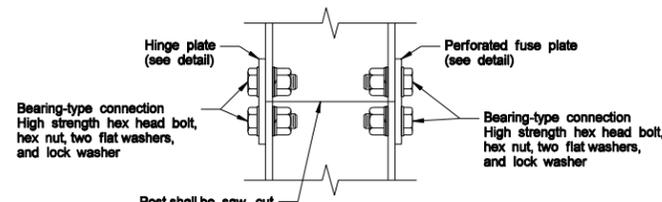
FUSE JOINT  
(SIDE VIEW)



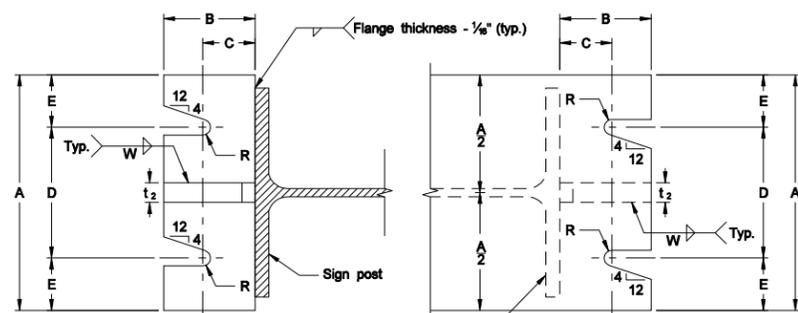
PERFORATED FUSE  
PLATE DETAIL



HINGE PLATE  
DETAIL



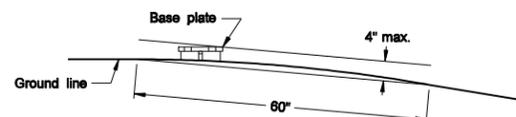
DETAIL "A"



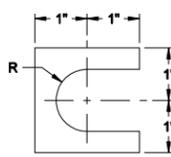
SECTION A-A

SECTION B-B

Sections shown are for installations on right shoulder and in gore. Installations on the left shoulder shall have the plate slot bevels reversed.

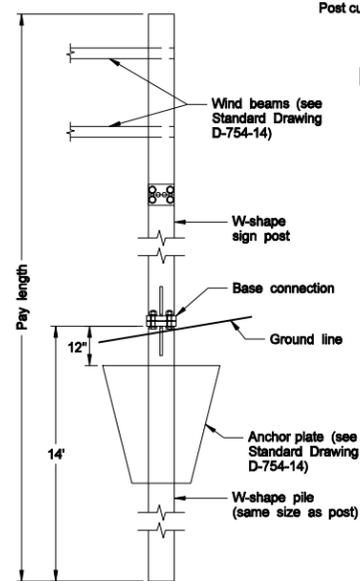


SECTION C-C

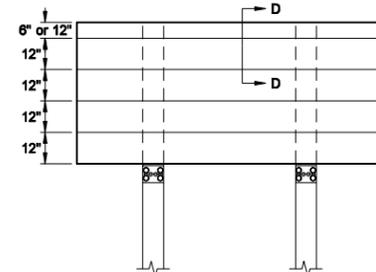


SHIM DETAIL

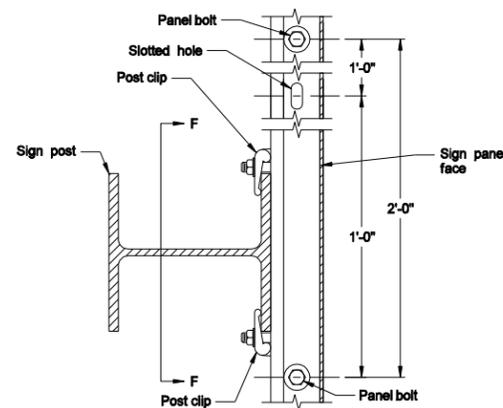
Furnish 2 - .012± thick and 2 - .032± thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.



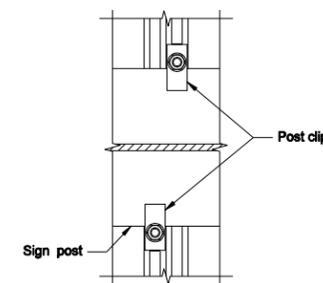
SIGN SUPPORT DETAIL



TYPICAL PANEL MOUNTING

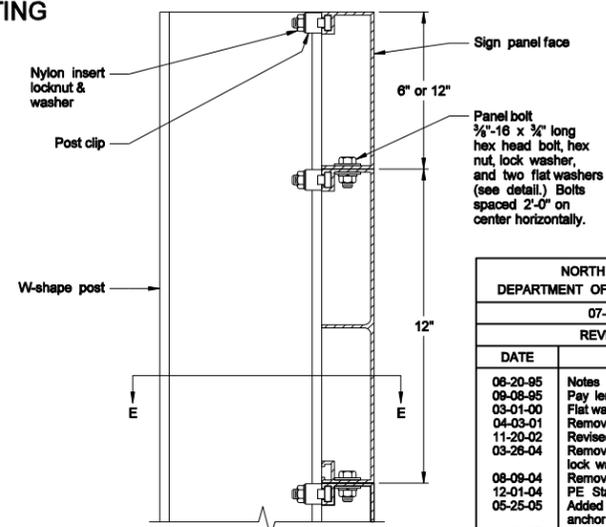


SECTION E-E

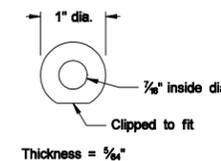


SECTION F-F

Note: Post clips shall be installed on both sides of each post at each panel joint as indicated.



SECTION D-D



FLAT WASHER DETAIL

NOTES:

Structural steel shall conform to Section 894.05 B.6 of the Standard Specifications. High strength bolts shall conform to ASTM A-325.

Refer to "Sign Summary" sheet for specific data on each individual sign installation.

Perforated fuse plate shall be installed on side of post facing traffic.

All posts shall be saw cut. Plates may be sheared or flame cut using a mechanically guided cutting torch in accordance with Section 754.03 E.6.b of the Standard Specifications. Edge preparation shall be in accordance with Section 754.03 E.6.c of the Standard Specifications.

ASSEMBLY PROCEDURE:

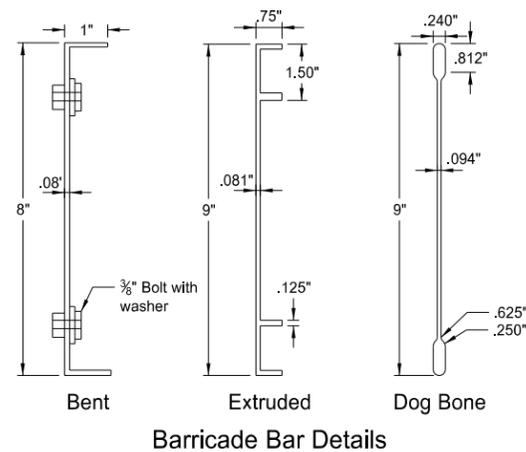
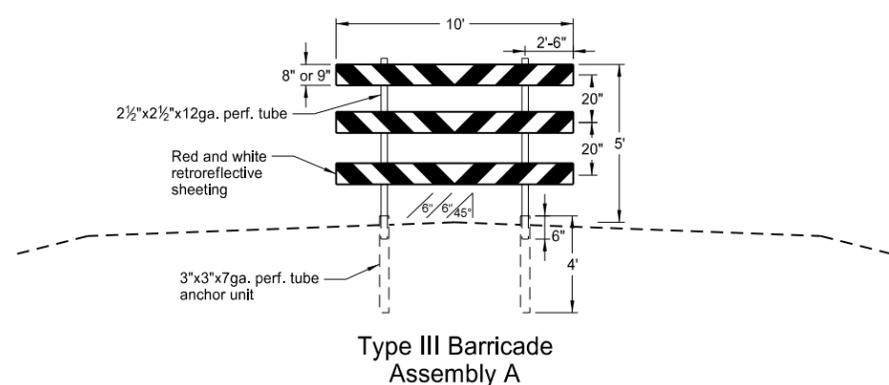
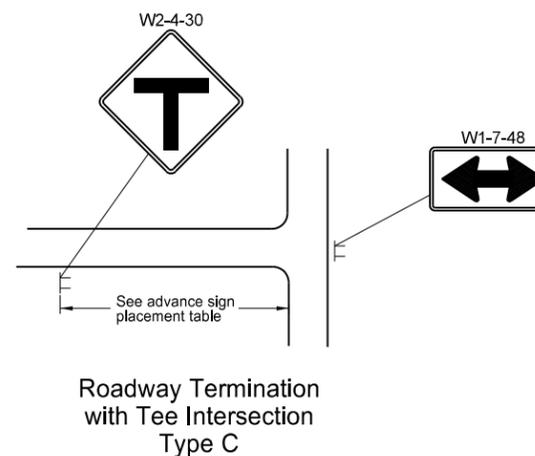
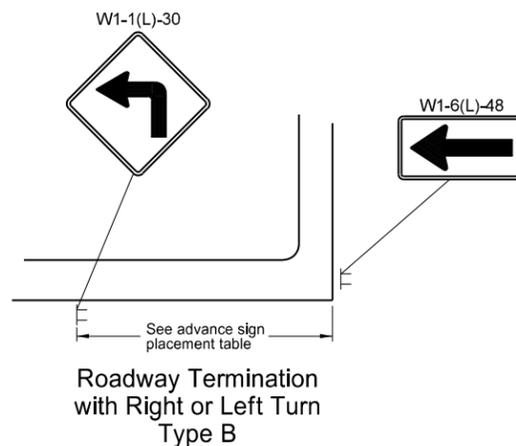
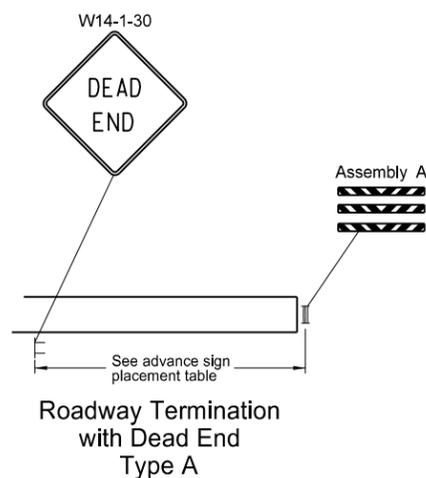
1. Assemble base plates together with bolts and with one flat washer between top base plate and the keeper plate.
2. Shim as required to plumb post.
3. Tighten all base connection bolts the maximum possible with 12" to 15" wrench to bed washers and shims and to clean bolt threads.
4. Loosen each bolt in turn and retighten in a systematic order to the prescribed torque (see table.)
5. Assemble perforated fuse and hinge plates to post with bolts and with one flat washer and lock washer under nut. Tighten all bolts the maximum possible with a 12" to 15" wrench to bed washers and shims and to clean bolt threads. Loosen, and retighten bolts in a systematic order.

| W-SHAPE POST AND PILE SIZE | BASE CONNECTION DIMENSIONS            |    |        |        |        |        |                |                |       |       | FUSE AND HINGE PLATE DIMENSIONS |        |        |        |        |        |                |                |                |           |
|----------------------------|---------------------------------------|----|--------|--------|--------|--------|----------------|----------------|-------|-------|---------------------------------|--------|--------|--------|--------|--------|----------------|----------------|----------------|-----------|
|                            | BOLT SIZE AND TORQUE                  | A  | B      | C      | D      | E      | t <sub>1</sub> | t <sub>2</sub> | W     | R     | G                               | H      | J      | K      | L      | M      | d <sub>1</sub> | d <sub>2</sub> | t <sub>3</sub> | BOLT DIA. |
| W4x13                      | 3/4" ø x 3 1/2"<br>Torque = 600 in-lb | 6" | 2 1/2" | 1 1/2" | 3 1/2" | 1 1/4" | 1"             | 1/2"           | 1/4"  | 5/32" | 2"                              | 1 1/4" | 4"     | 2 1/4" | 7/8"   | 1"     | 1 1/8"         | 3/4"           | 3/8"           | 5/8"      |
| W5x16                      | 3/4" ø x 3 1/2"<br>Torque = 600 in-lb | 6" | 2 1/2" | 1 1/2" | 3 1/2" | 1 1/4" | 1"             | 1/2"           | 1/4"  | 5/32" | 2 1/2"                          | 1 1/4" | 5"     | 2 3/4" | 1 1/8" | 1 1/8" | 1 1/8"         | 7/8"           | 3/8"           | 3/4"      |
| W6x20                      | 7/8" ø x 4 1/4"<br>Torque = 800 in-lb | 8" | 3"     | 1 3/4" | 4"     | 2"     | 1 1/4"         | 1/2"           | 1/4"  | 5/32" | 2 1/2"                          | 1 1/4" | 6"     | 3 1/2" | 1 1/4" | 1 3/8" | 1 3/8"         | 1 1/8"         | 3/8"           | 3/4"      |
| W8x24                      | 7/8" ø x 4 1/4"<br>Torque = 800 in-lb | 8" | 3"     | 1 3/4" | 4"     | 2"     | 1 1/4"         | 1/2"           | 1/4"  | 5/32" | 2 1/2"                          | 1 1/2" | 6 1/2" | 3 1/2" | 1 1/2" | 1 1/2" | 1 5/8"         | 1 1/8"         | 1/2"           | 7/8"      |
| W8x28                      | 1" ø x 5"<br>Torque = 1000 in-lb      | 8" | 3"     | 2"     | 4"     | 2"     | 1 1/2"         | 3/4"           | 5/16" | 7/32" | 2 1/2"                          | 1 1/2" | 6 1/2" | 3 1/2" | 1 1/2" | 1 5/8" | 1 1/8"         | 1 1/8"         | 1/2"           | 1"        |
| W8x31                      | 1 1/8" ø x 5"<br>Torque = 1200 in-lb  | 9" | 3 1/2" | 2"     | 5"     | 2"     | 1 1/2"         | 3/4"           | 5/16" | 9/32" | 3"                              | 1 1/4" | 8"     | 5 1/2" | 1 1/4" | 2"     | 1 1/8"         | 1 1/2"         | 1/2"           | 1"        |
| W10x39                     | 1 1/8" ø x 5"<br>Torque = 1200 in-lb  | 9" | 3 1/2" | 2"     | 5"     | 2"     | 1 1/2"         | 3/4"           | 5/16" | 9/32" | 3"                              | 1 1/4" | 8"     | 5 1/2" | 1 1/4" | 1 7/8" | 1 1/8"         | 1 1/8"         | 1/2"           | 1 1/8"    |

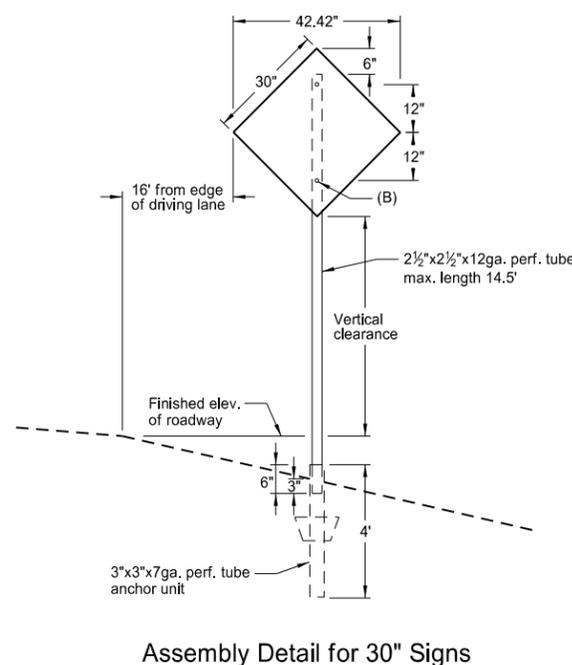
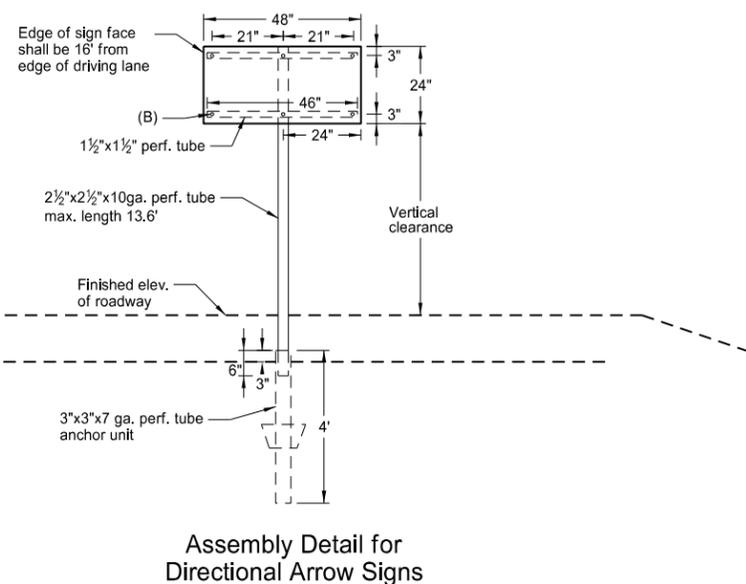
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION<br>07-15-94 |   |
|--|---|
| REVISIONS  |   |
| DATE   | CHANGE                                  |
| 06-20-95   | Notes                                   |
| 09-08-95   | Pay length                              |
| 03-01-00   | Flat washers                            |
| 04-03-01   | Remove splice plate                     |
| 11-20-02   | Revised note                            |
| 03-26-04   | Removed lock tile and added lock washer |
| 06-09-04   | Removed stub post                       |
| 12-01-04   | PIE Stamp added                         |
| 05-25-05   | Added wind beams and anchor plates      |
| 04-23-07   | Revised details and notes               |

This document was originally issued and sealed by MARK S GAYDOS, Registration Number PE- 4518 , on 04/23/07 and the original document is stored at the North Dakota Department of Transportation

BARRICADE AND ADVANCE SIGNS  
FOR FORWARD ROADWAY TERMINATION



| Advance Sign Placement Table (A) |                  |
|----------------------------------|------------------|
| Posted or 85th Percentile Speed  | Minimum Distance |
| 0 to 40 mph                      | 125 ft           |
| 45 mph                           | 175 ft           |
| 50 mph                           | 250 ft           |
| 55 mph                           | 325 ft           |
| 60 mph                           | 400 ft           |
| 65 mph                           | 475 ft           |
| 70 mph                           | 550 ft           |
| 75 mph                           | 650 ft           |



Notes:  
Barricade Rails: Rails shall be 8" or 9" x 120". Barricade rail shall be fabricated from anodized aluminum and shall be attached to the perforated tube posts with 3/8" diameter bolts placed between the reinforcing ribs, two bolts per post.

Barricade Supports: Barricade supports shall be made of material as specified for sign supports.

Method of Measurement: The number of each location completed, in place, and accepted by the engineer.

Basis of Payment: The number of locations. The unit price bid for each location shall be full compensation for furnishing, delivering, and installing all necessary signs and barricades at each location shown on the plans or directed by the engineer.

Vertical Clearance: 5' minimum, 7' residential and business districts where parking and/or pedestrian movements will occur.

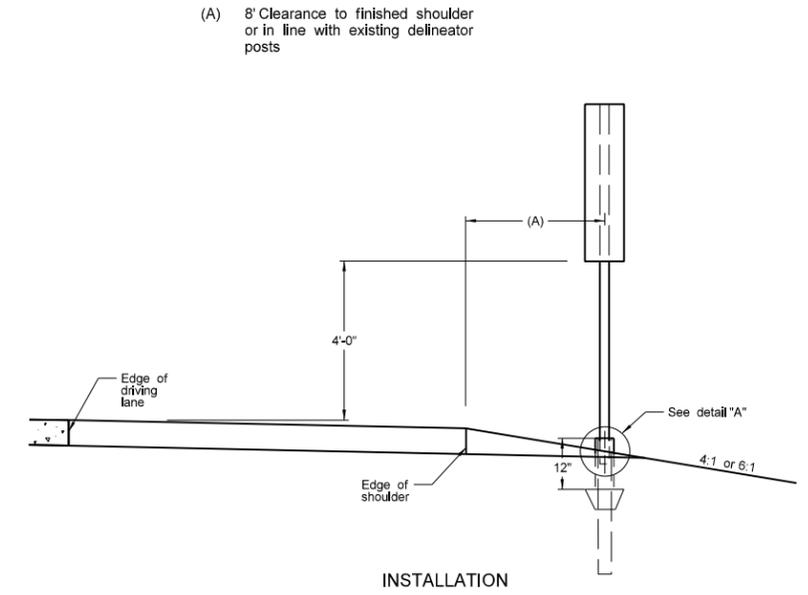
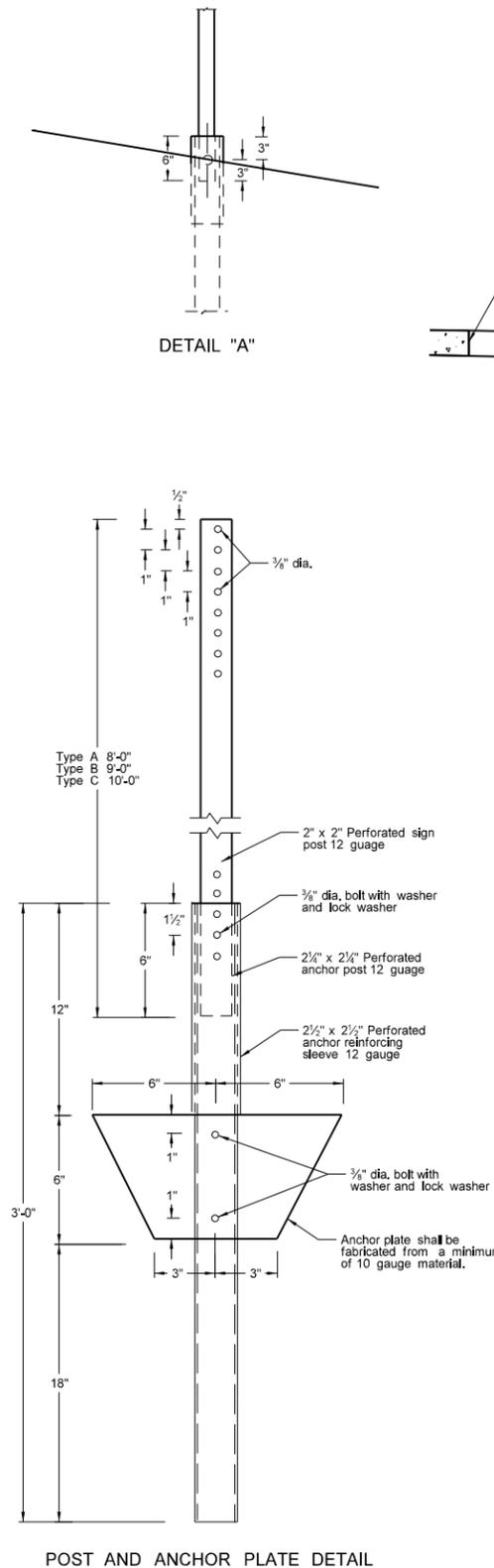
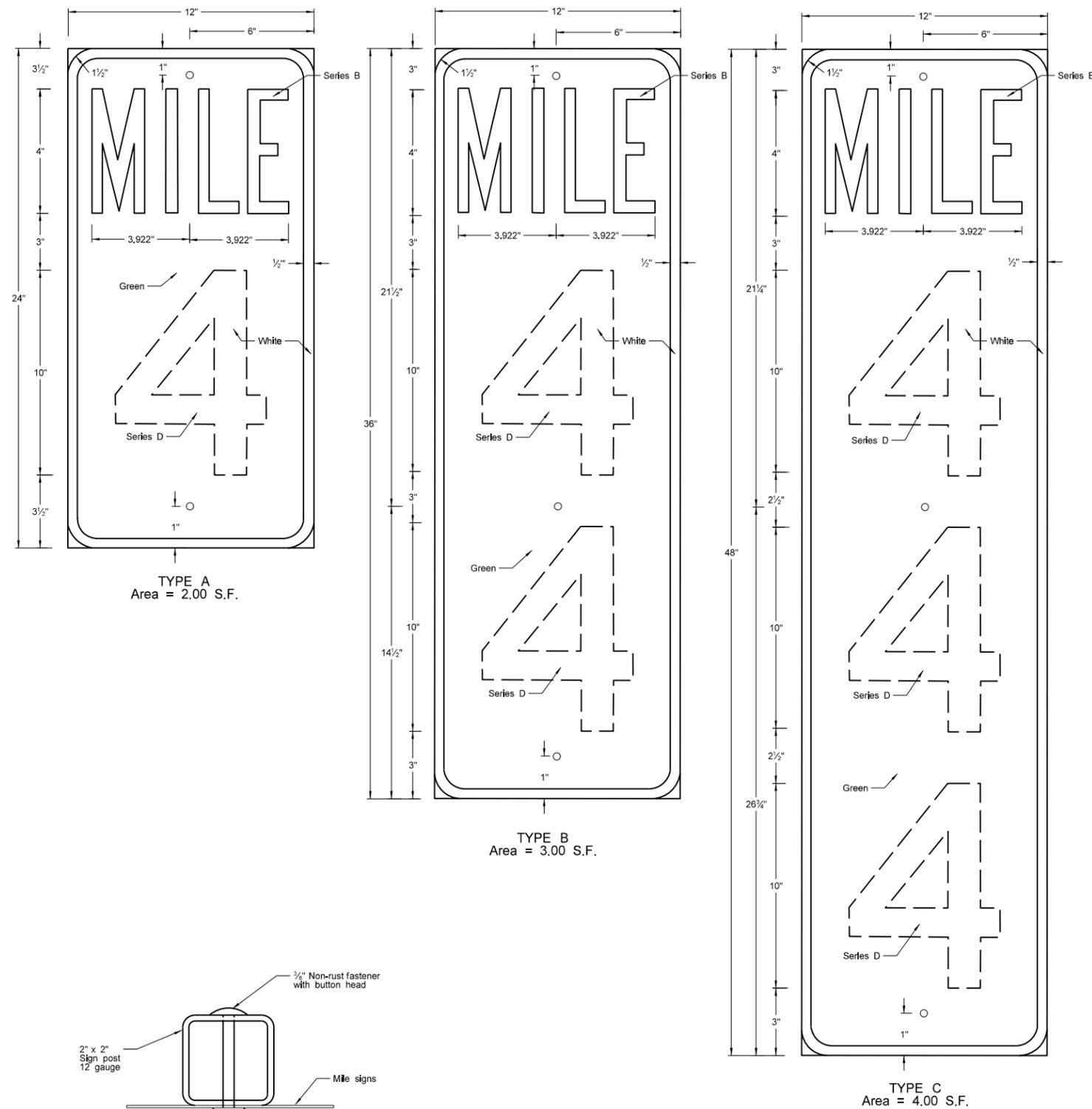
(A) If roadway termination is 1/2 mile or less from a section line road, the advanced warning sign shall be placed just after the section line road.  
(B) Holes to be punched round for 3/8" fasteners.

| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
|--|--------|
| 9-25-12                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

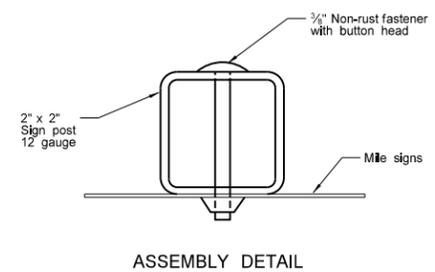
This document was originally issued and sealed by  
Roger Weigel,  
Registration Number  
PE- 2930,  
on 9/25/2012 and the original document is stored at the  
North Dakota Department  
of Transportation

(EXPRESSWAY-FREEWAY USE) MILE POSTS

D-754-20



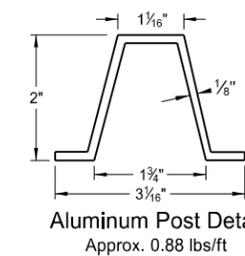
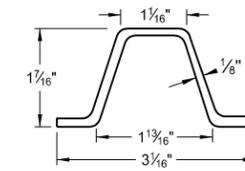
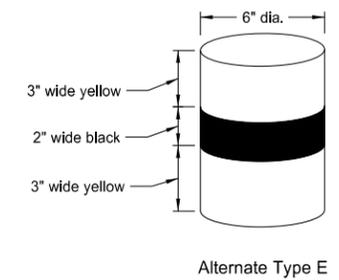
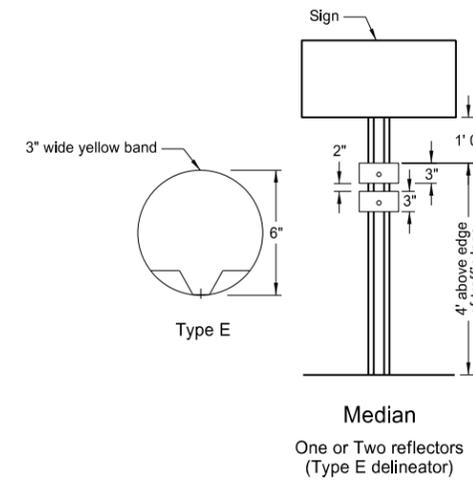
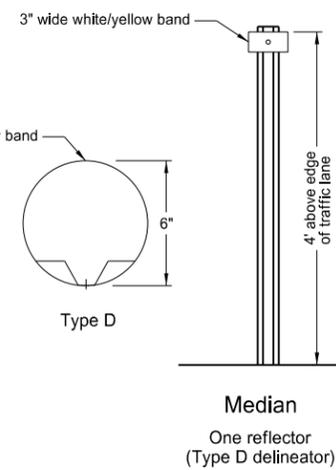
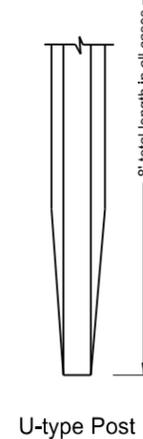
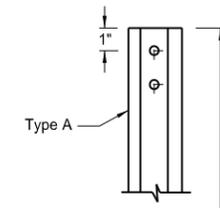
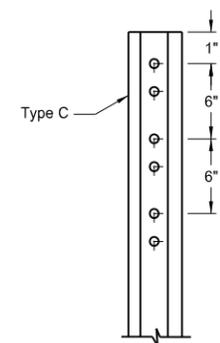
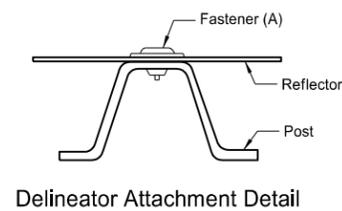
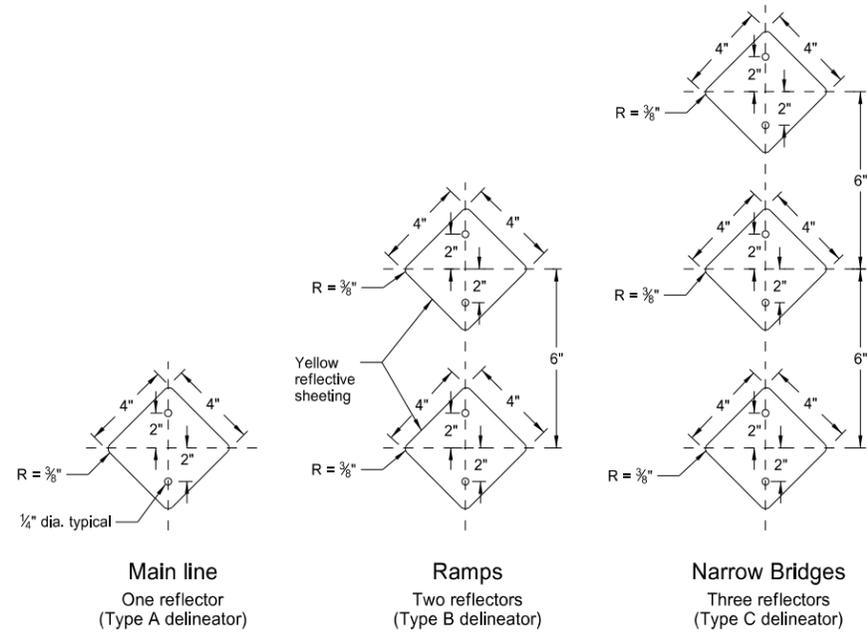
**NOTES:**  
 Installation: Posts shall be installed along right shoulder in line with delineators.  
 Mile Sign Backing: Backing shall be fabricated of 0.080 aluminum. Sheeting shall conform to section 894.01 of the Standard Specifications.  
 Posts: Posts shall conform to section 894.05 of the Standard Specifications.  
 Fasteners: The mile signs shall be attached to the post by tension pin type fastener or other suitable vandal resistant non-rust fastener.  
 Reflective Sheeting: Sheeting shall conform to section 894.02 (Type IIIA) of the Standard Specifications.  
 Numbers: Numbers shall be of the series shown and may be screened or applied copy. Screening and reflective sheeting for applied copy shall conform to section 754 & 894 of the Standard Specifications.



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

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

REFLECTORIZED DELINEATORS



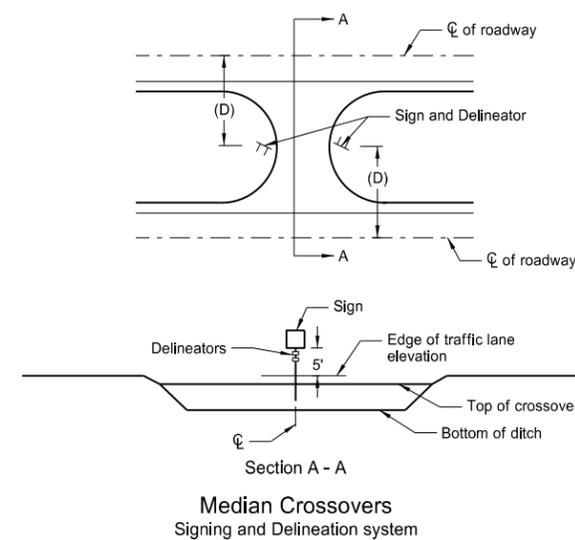
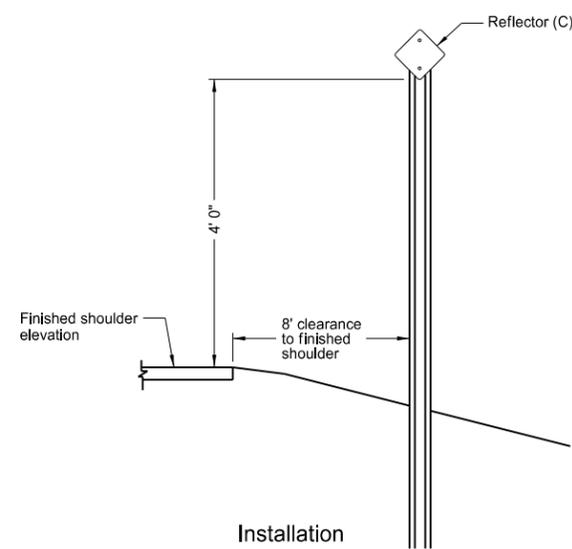
Delineator Details  
Type A, B, and C

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

Type E

- Type E:** Two yellow bands with a 2" spacing between bands.
- Alternate Type E:** One unit band consisting of two yellow stripes separated by a 2" black stripe.
- Material:** Reflective material shall be Type IX.

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

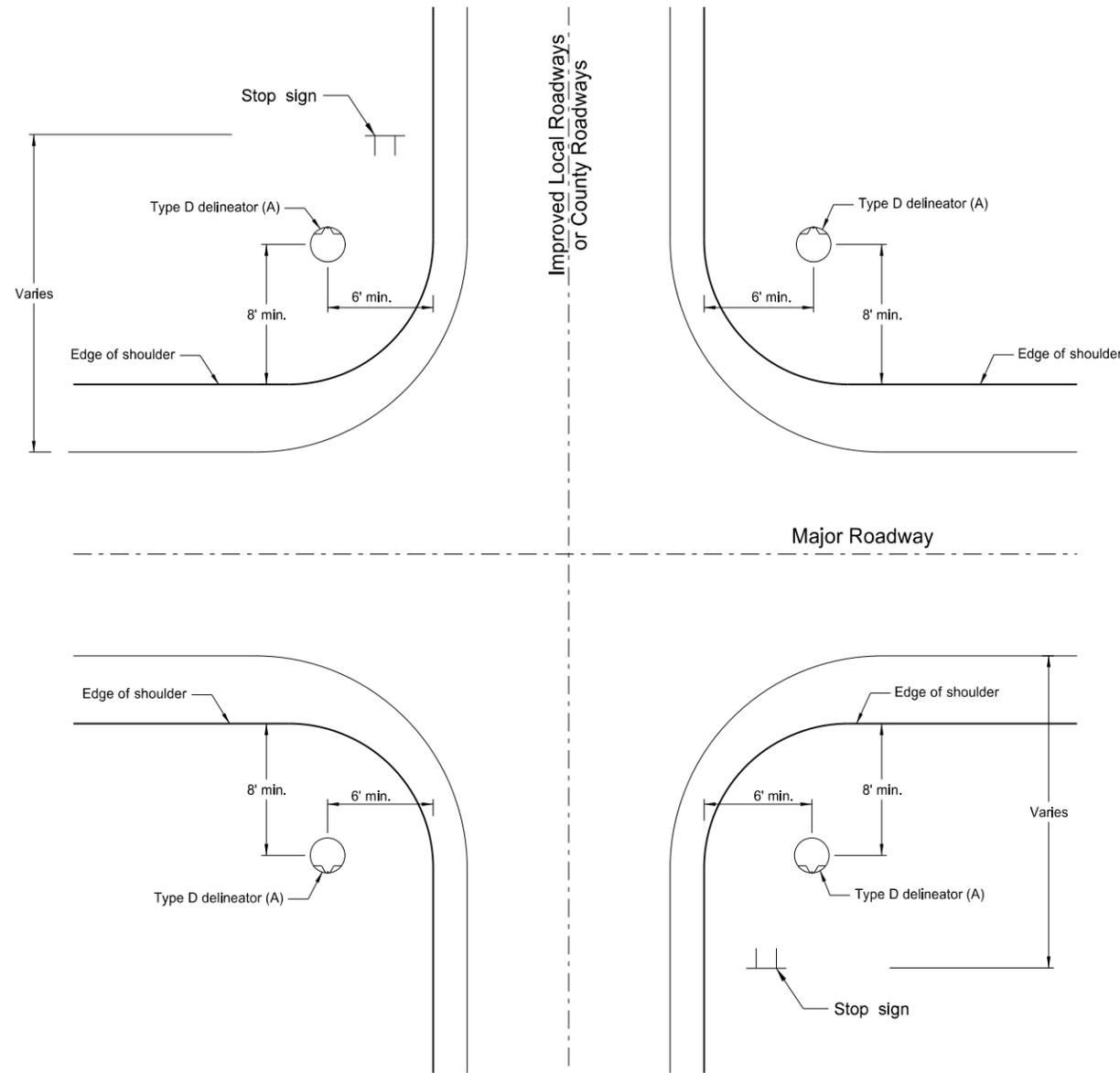


|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 9-25-12                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 9/25/2012 and the original document is stored at the North Dakota Department of Transportation

# APPROACH DELINEATION

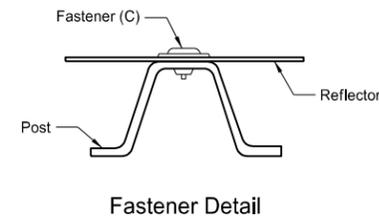
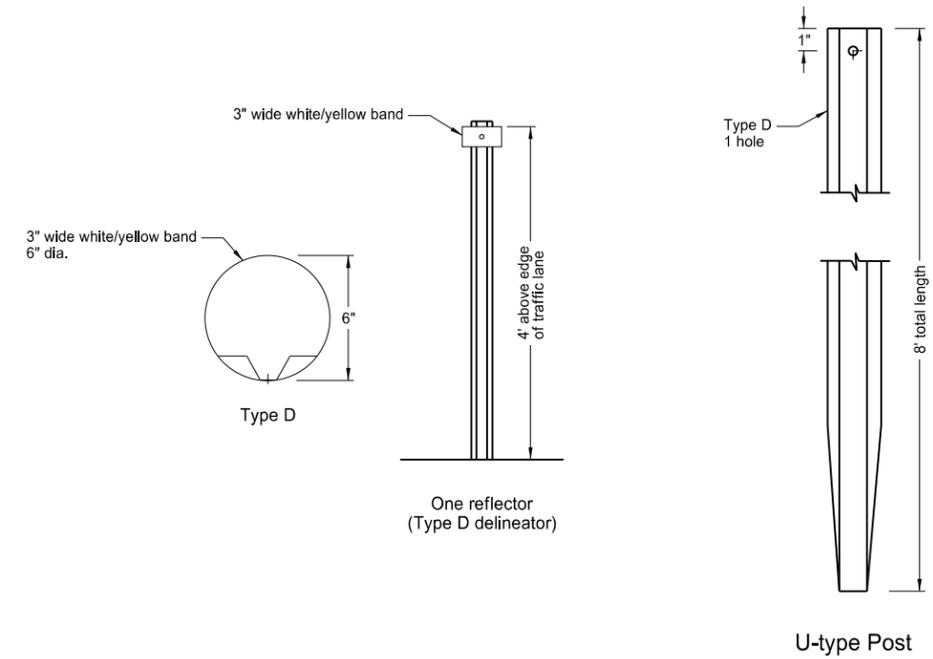
D-754-22C



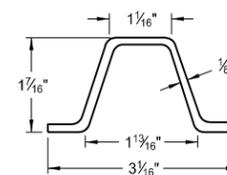
(A) Delineators shall be installed as shown in the plan layout. When a stop sign is present, a delineator may be placed on the stop sign post at the height shown for the delineator. The opposite delineator shall be placed directly across from the stop sign.

(B) Contractor may drill only those holes required to attach reflectors on the post or provide posts with holes the entire length at 1" centers.

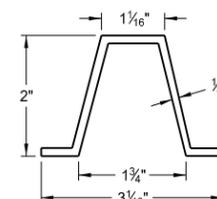
(C) The fastener shall be 3/8" dia. with flat washer having a min. outside dia. of 1 3/16". Fasteners shall be tension pin type or other non-rust vandal resistant fastener.



Fastener Detail



Steel Post Detail  
(approx. 2 lb/ft)



Aluminum Post Detail  
(approx. 0.88 lb/ft)

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

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 8/22/12 and the original document is stored at the North Dakota Department of Transportation.

NOTES:

1. Curbed Roadways: The clearance from the face of the curb should be 3' except where right of way or sidewalk width is limited, a minimum clearance of 2' shall be provided. The horizontal clearance may need to be increased to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.

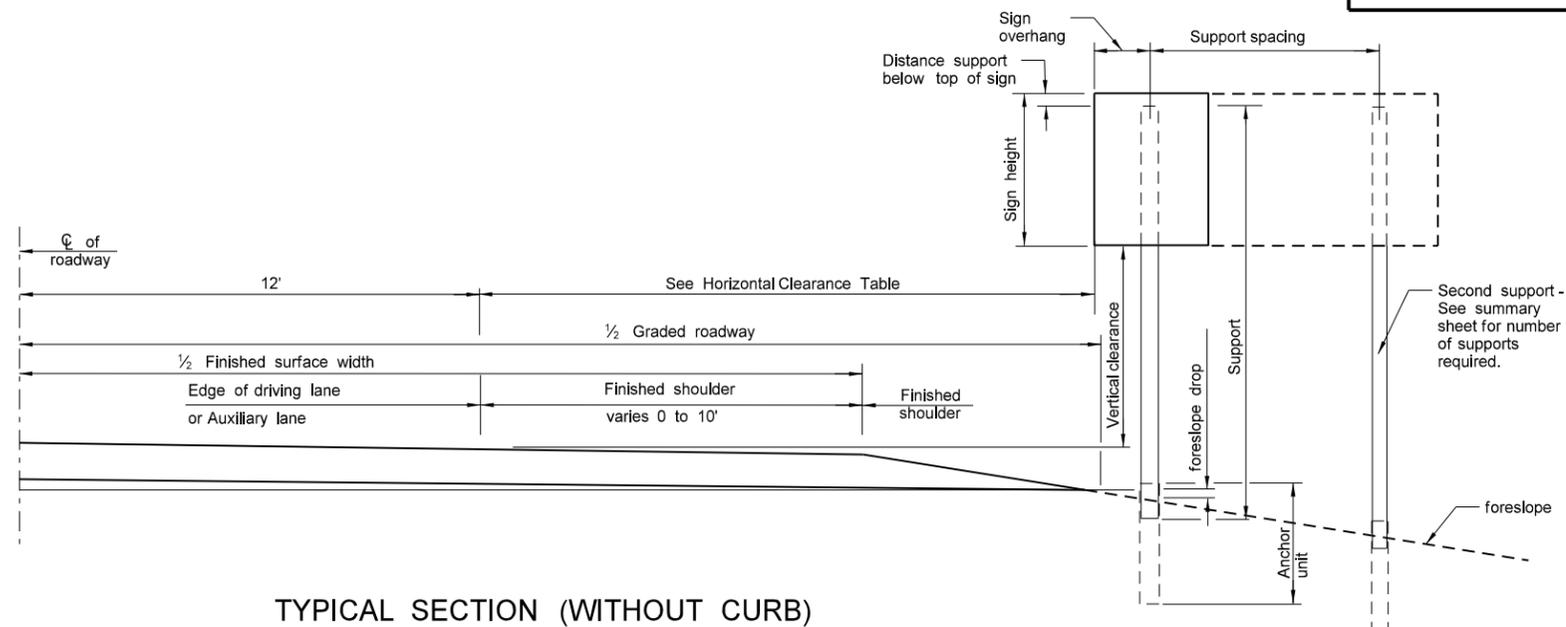
2. Minimum Vertical clearance: Signs installed at the side of the road in rural districts shall be at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least 7'.

Directional signs on expressways and freeways shall be installed with a minimum height of 7'. If the secondary sign is mounted below another sign, the major sign shall be installed at least 8' and the secondary sign shall be installed at least 5' above the edge of the driving lane. All route signs, warning signs, and regulatory signs on expressways and freeways shall be at least 7' above the edge of the driving lane. Where signs are placed at least 30 feet or more from the edge of the traveled way, the height to the bottom of such sign shall be 5' above the edge of the driving lane.

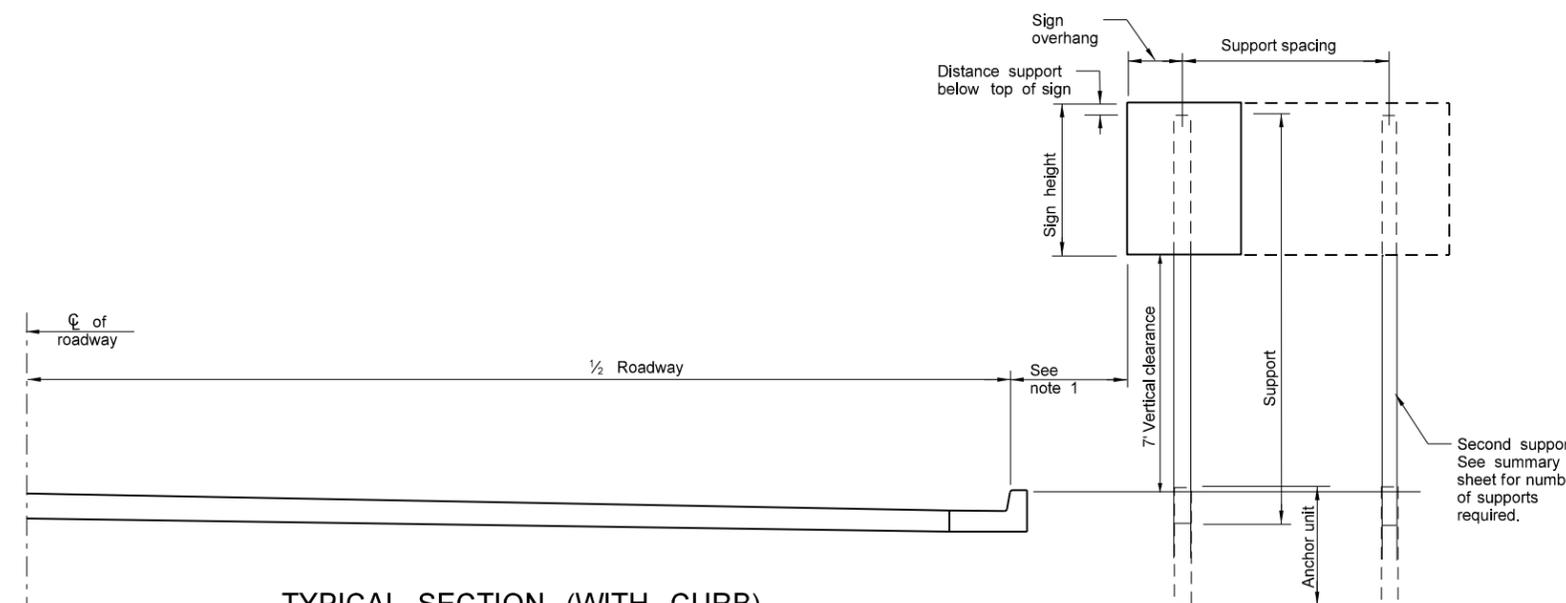
The vertical clearance shall have a maximum height of 6" above the vertical clearance specified above.

| HORIZONTAL CLEARANCE TABLE |           |
|----------------------------|-----------|
| SHOULDER WIDTH ft          | OFFSET ft |
| 0 to 2                     | 16        |
| >2 to 4                    | 18        |
| >4 to 6                    | 20        |
| >6 to 8                    | 22        |
| >8 to 10                   | 24        |

ASSEMBLY DETAILS

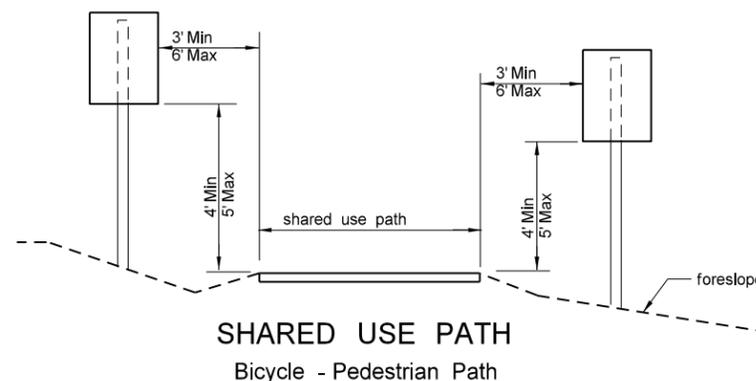


TYPICAL SECTION (WITHOUT CURB)



TYPICAL SECTION (WITH CURB)

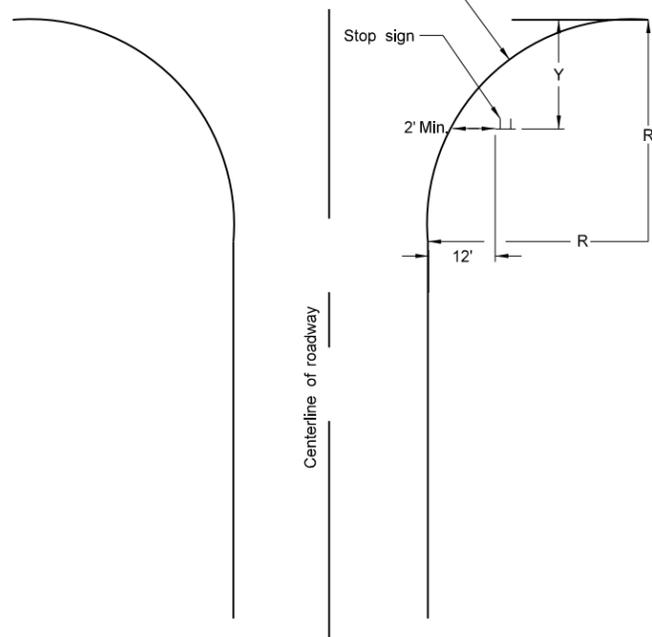
Residential or Business District



SHARED USE PATH

Bicycle - Pedestrian Path

Face of curb or edge of driving lane



STOP SIGN LOCATION WIDE THROAT INTERSECTION

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

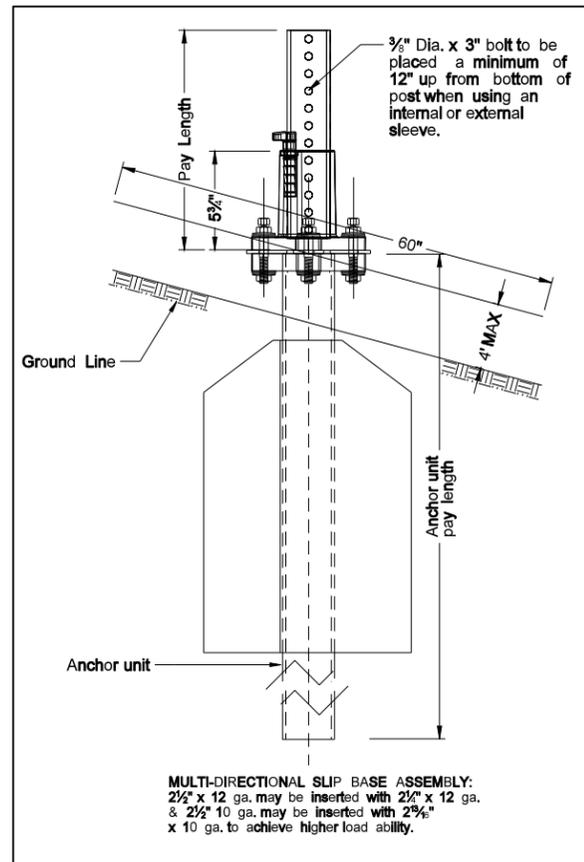
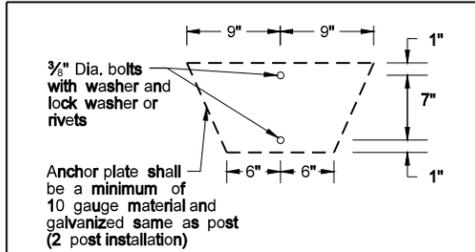
| R=Radius | Y-Max | Y-Min |
|----------|-------|-------|
| 40'      | 50'   | 15'   |
| 45'      | 50'   | 18'   |
| 50'      | 50'   | 21'   |
| 55'      | 50'   | 25'   |
| 60'      | 50'   | 28'   |
| 65'      | 50'   | 32'   |
| 70'      | 50'   | 35'   |
| 75'      | 50'   | 39'   |
| 80'      | 50'   | 43'   |

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

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

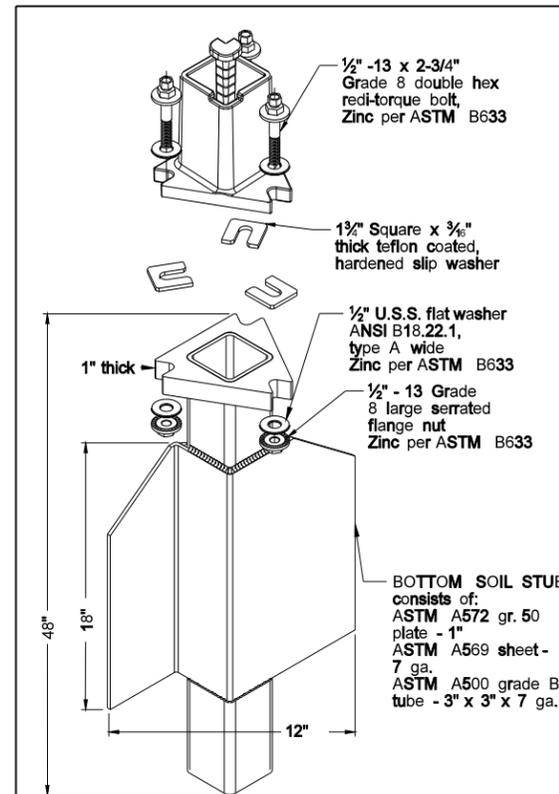
| Number of Posts | Telescoping Perforated Tube |                      |                 |                      |           |                                   |                             |
|-----------------|-----------------------------|----------------------|-----------------|----------------------|-----------|-----------------------------------|-----------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

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

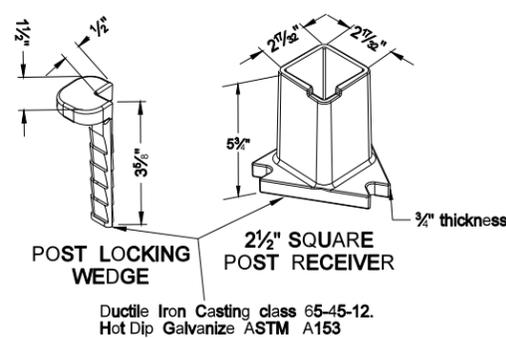


MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:  
 2 1/2" x 12 ga. may be inserted with 2 1/2" x 12 ga. & 2 1/2" 10 ga. may be inserted with 2 3/8" x 10 ga. to achieve higher load ability.

Mounting Details Perforated Tube



SLIP BASE FOR 2 1/2" POST



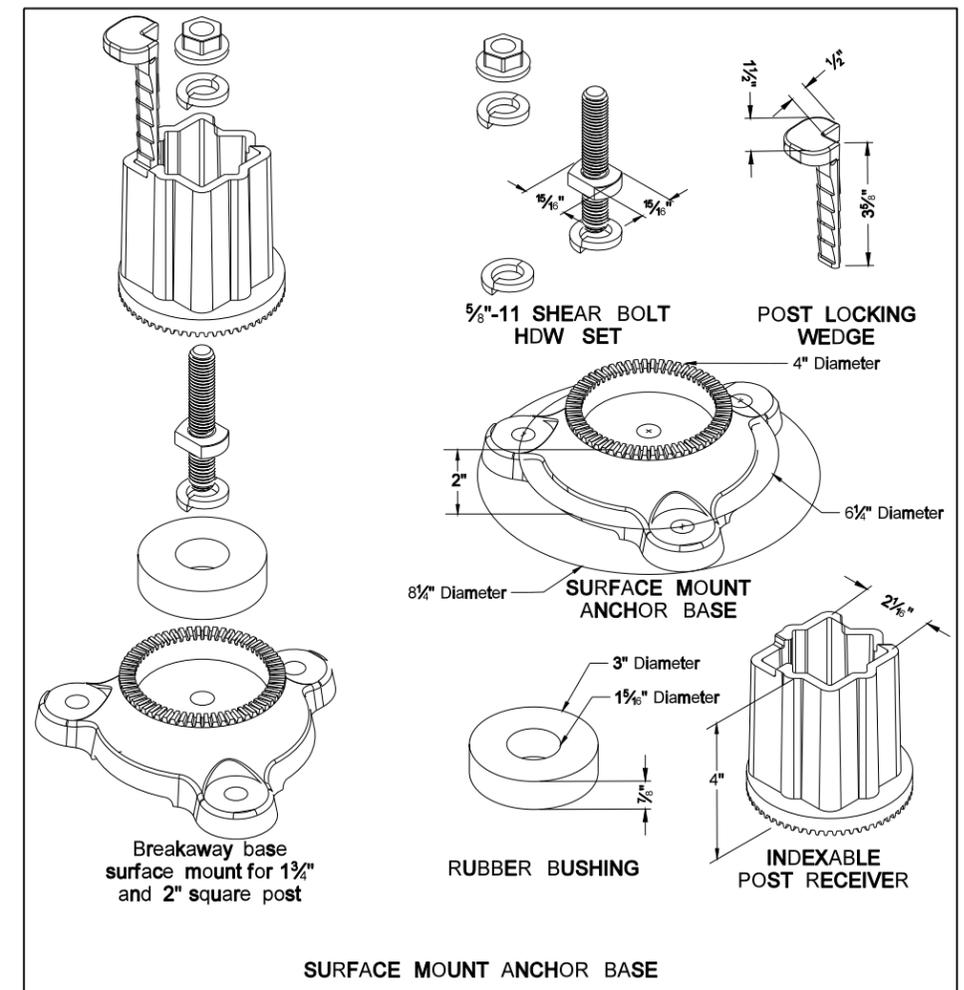
SLIP BASE DETAIL

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

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

NOTE:

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



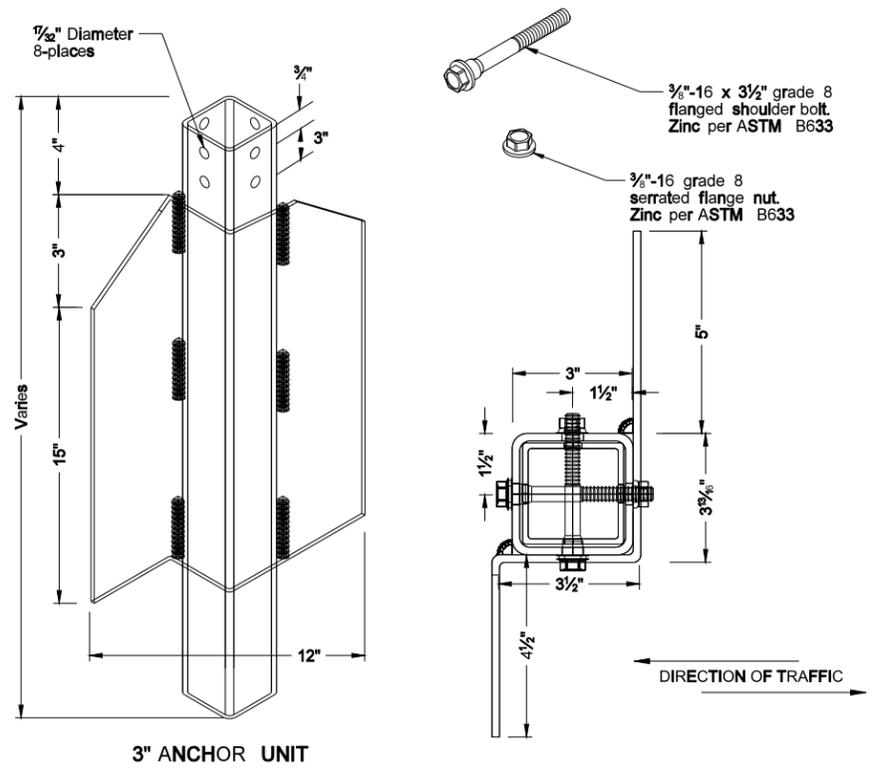
SURFACE MOUNT ANCHOR BASE

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

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 08/06/09 and the original document is stored at the North Dakota Department of Transportation

SHOULDER BOLT

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

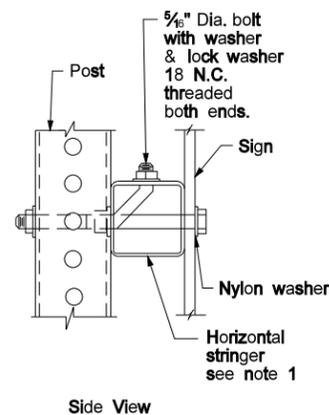


3" ANCHOR UNIT

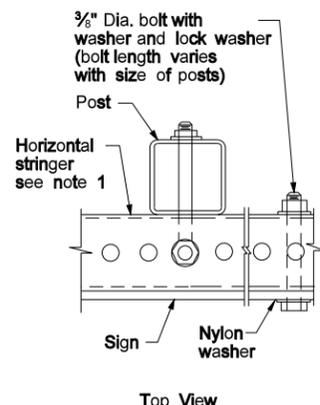
Mounting Details Perforated Tube

Note:

- Horizontal stringers - In lieu of perforated tubes, the contractor may substitute z bar stringers. The z bar stringers shall be 1 1/2" x 3/16" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel.
- Metal washers used on sign face shall have a minimum outside diameter of 5/8" ± 1/16" and 10 gauge thickness.
- No Parking Signs: All no parking signs with directional arrows shall be placed at a 30 to 45 degree angle with the line of traffic flow. No parking signs required at the above angles may have the support turned to the correct angle. If the no parking sign is placed with another sign that has to be placed at a 90 degree angle with the line of traffic flow, the detailed angle strap should be used to mount the no parking sign. Flat washers and lock washers shall be used with all nylon washers. Material used for the attachment strap shall be included in the price bid for "Flat sheet for signs."
- In lieu of using the bent bolt to attach the post to the stringer, the contractor may choose to punch the sign backing and place the bolt through the sign, the stringer and the post.
- 4" vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.

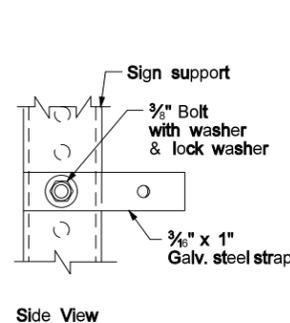


Side View

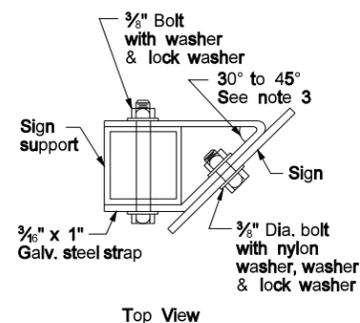


Top View

STRINGER MOUNTING  
(WITH STRINGER IN FRONT OF POST)

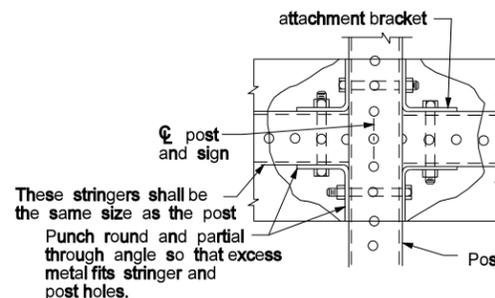


Side View



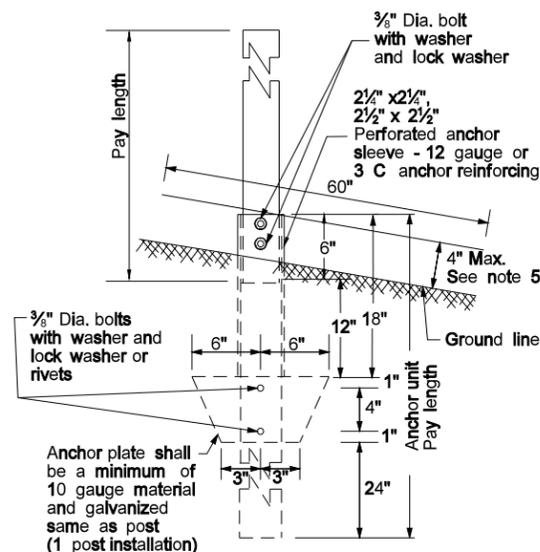
Top View

STRAP DETAIL

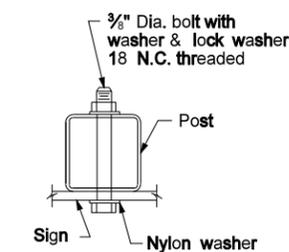
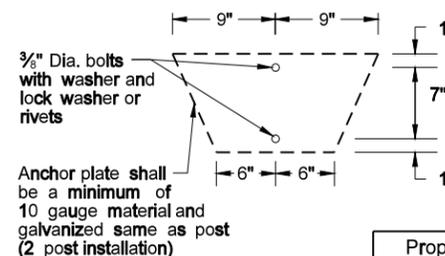


These stringers shall be the same size as the post. Punch round and partial through angle so that excess metal fits stringer and post holes.

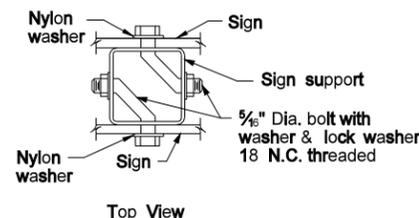
STREET NAME SIGNS  
AND ONE WAY SIGNS  
SINGLE POST ASSEMBLY  
ONE STRINGER OR  
BACK TO BACK MOUNTING



ANCHOR UNIT AND  
POST ASSEMBLY



BOLT MOUNTING



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. <sup>4</sup> | Gross Sect. area In. <sup>2</sup> | Section Modulus In. <sup>3</sup> |
| 1 1/2 x 1 1/2                              | 0.105              | 12                  | 1.702                | 0.129                              | 0.380                             | 0.172                            |
| 2 x 2                                      | 0.105              | 12                  | 2.416                | 0.372                              | 0.590                             | 0.372                            |
| 2 1/4 x 2 1/4                              | 0.105              | 12                  | 2.773                | 0.561                              | 0.695                             | 0.499                            |
| 2 3/8 x 2 3/8                              | 0.135              | 10                  | 3.432                | 0.605                              | 0.841                             | 0.590                            |
| 2 1/2 x 2 1/2                              | 0.105              | 12                  | 3.141                | 0.804                              | 0.803                             | 0.643                            |
| 2 1/2 x 2 1/2                              | 0.135              | 10                  | 4.006                | 0.979                              | 1.010                             | 0.783                            |

The 2 1/4" size 10 gauge is shown as 2.19" size on the plans.  
The 2 1/2" size is shown as 2.51" size on the plans.

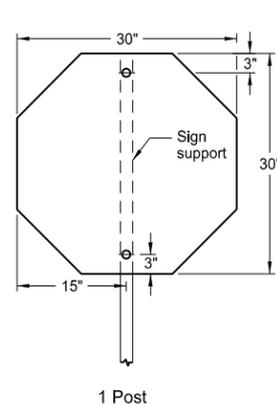
| Number of Posts | Telescoping Perforated Tube |                      |                 |                      |           |                                   |                             |
|-----------------|-----------------------------|----------------------|-----------------|----------------------|-----------|-----------------------------------|-----------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

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

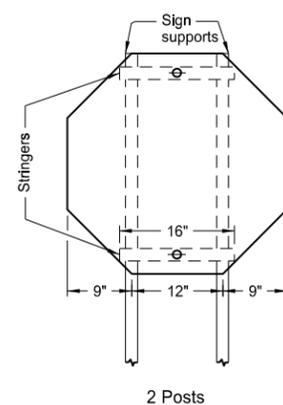
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 8-6-09                                       |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 08/06/09 and the original document is stored at the North Dakota Department of Transportation

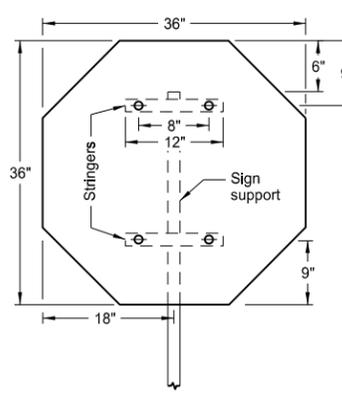
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS



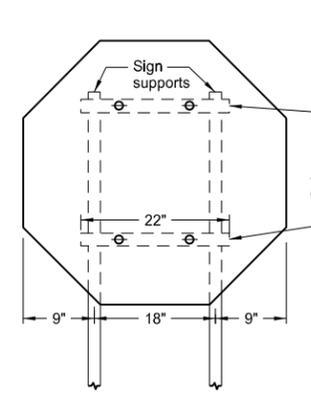
1 Post



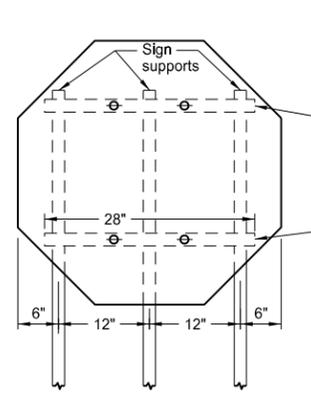
2 Posts



1 Post



2 Posts



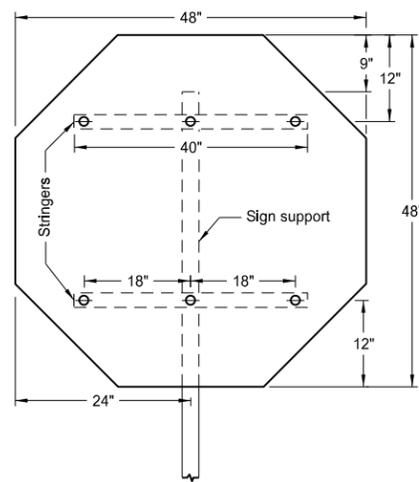
3 Posts

Assembly No. 1

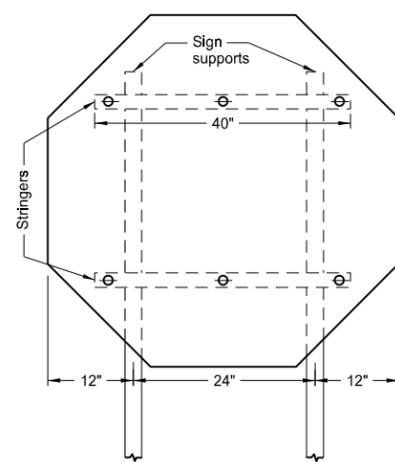
Assembly No. 2

Notes:

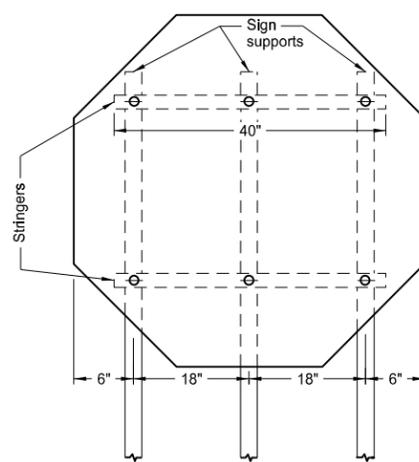
1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1½" x 1½".
4. All holes shall be punched round for ⅜" bolt.



1 Post

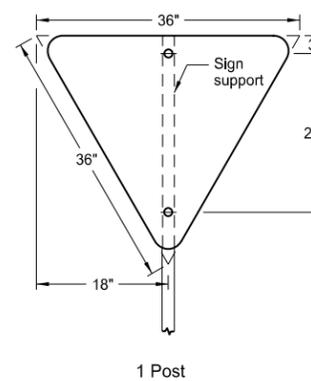


2 Posts

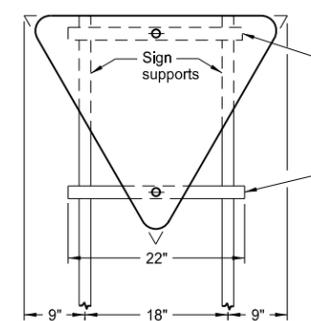


3 Posts

Assembly No. 3

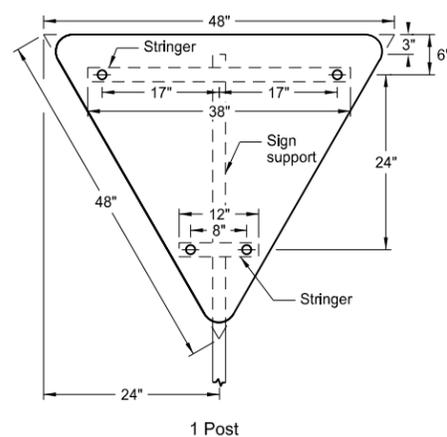


1 Post

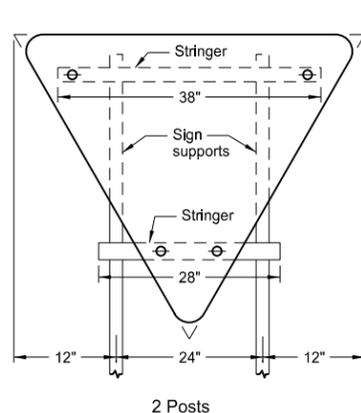


2 Posts

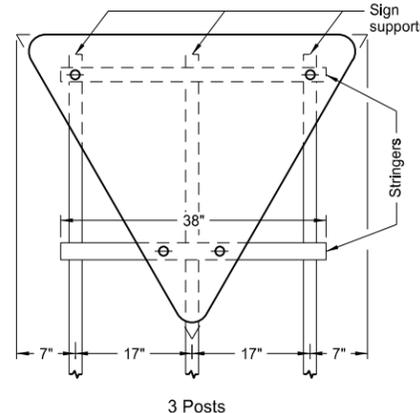
Assembly No. 4



1 Post



2 Posts



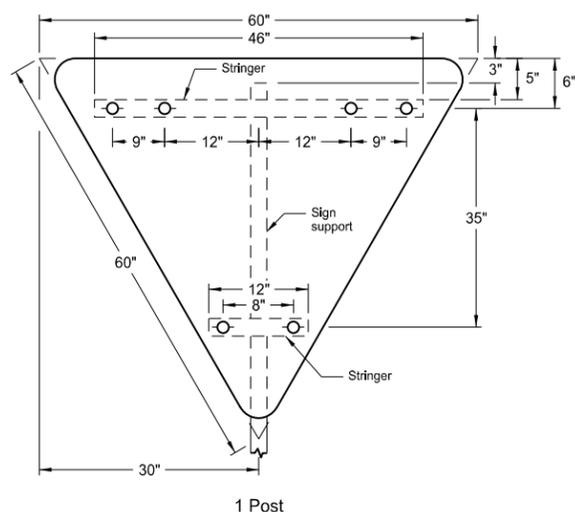
3 Posts

Assembly No. 5

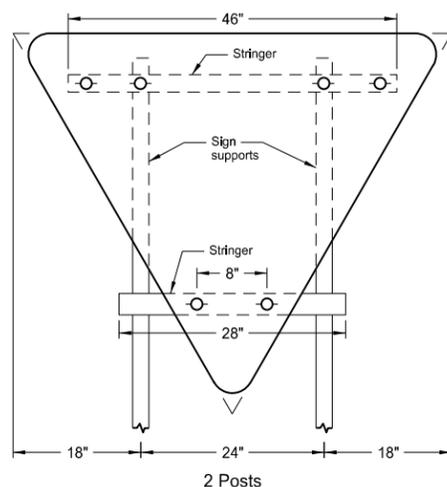
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 12-1-10                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

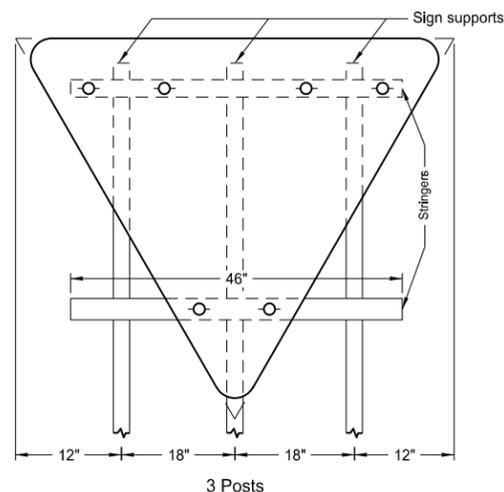
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION  
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



1 Post



2 Posts

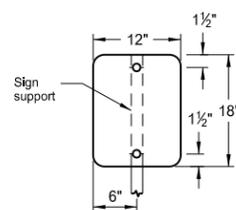


3 Posts

Assembly No. 6

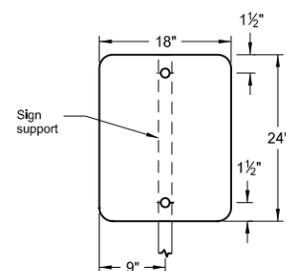
Notes:

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



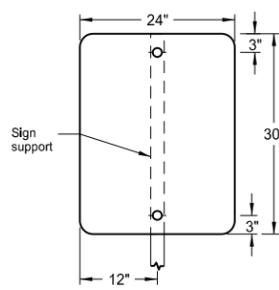
1 Post

Assembly No. 7



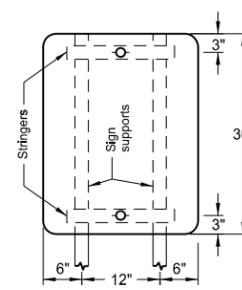
1 Post

Assembly No. 8

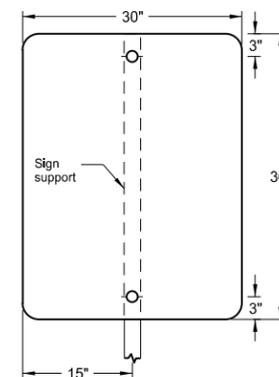


1 Post

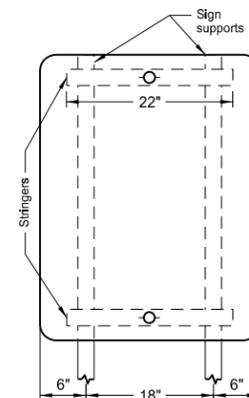
Assembly No. 9



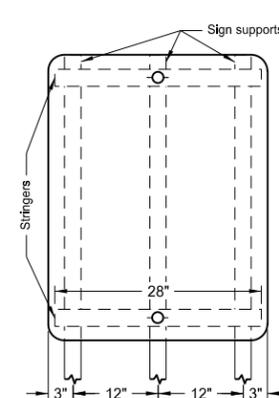
2 Posts



1 Post

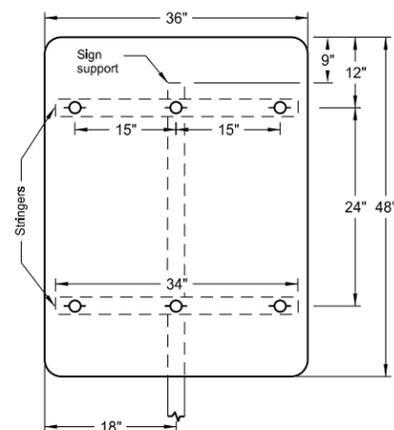


2 Posts

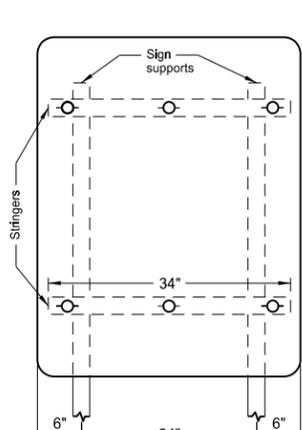


3 Posts

Assembly No. 10

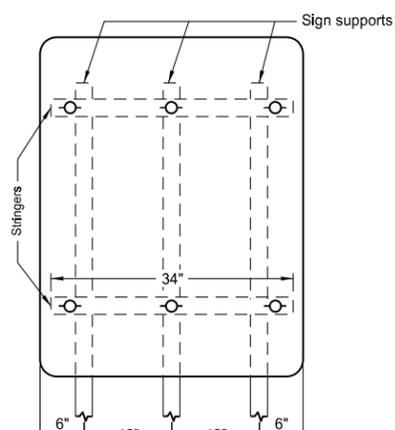


1 Post



2 Posts

Assembly No. 11

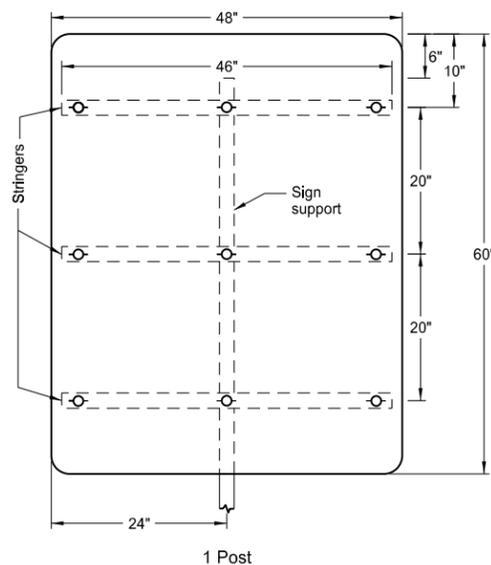


3 Posts

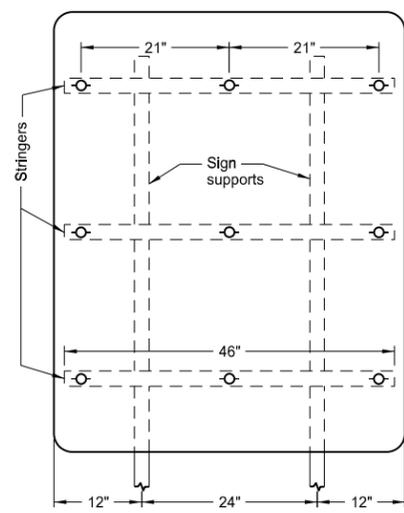
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 12-1-10                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

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

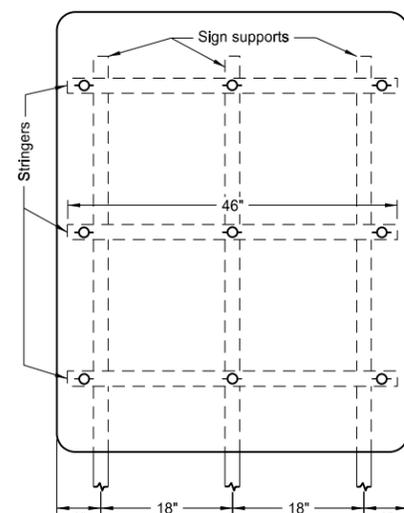


1 Post

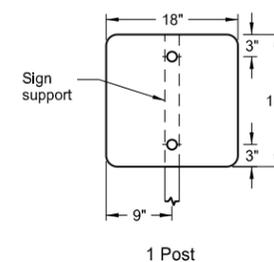


2 Posts

Assembly No. 12

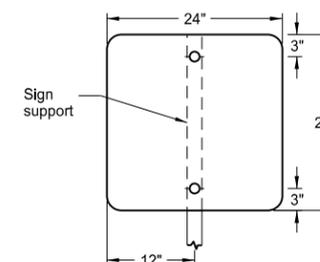


3 Posts



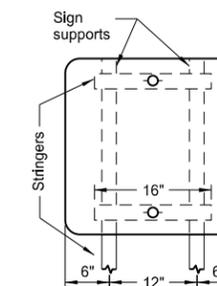
1 Post

Assembly No. 13

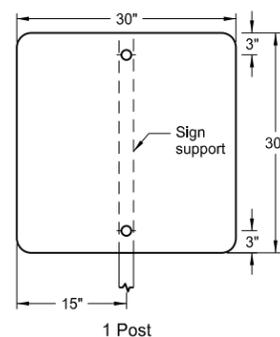


1 Post

Assembly No. 14

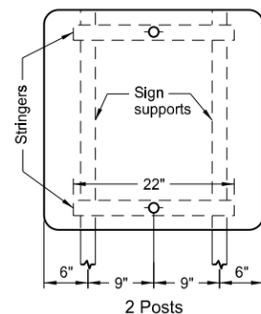


2 Posts

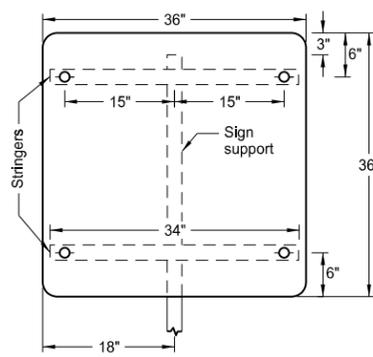


1 Post

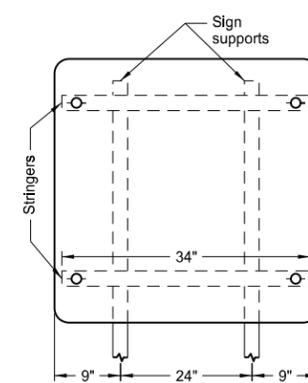
Assembly No. 15



2 Posts

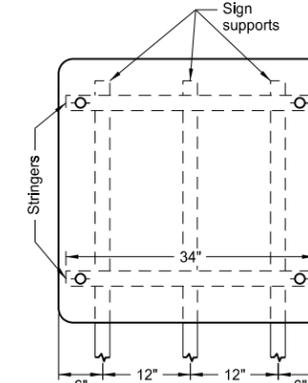


1 Post

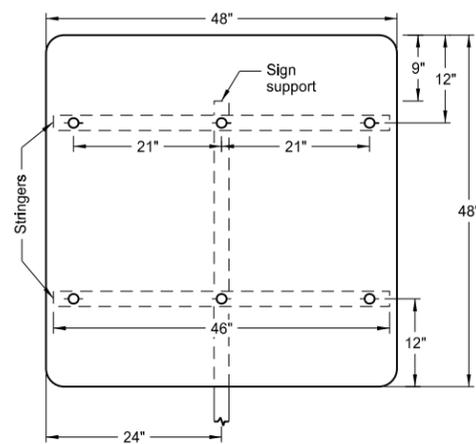


2 Posts

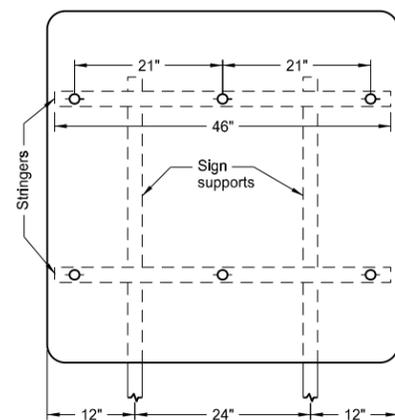
Assembly No. 16



3 Posts

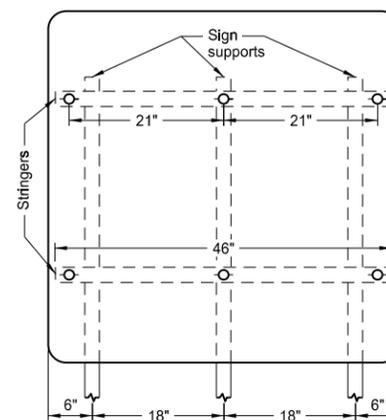


1 Post



2 Posts

Assembly No. 17



3 Posts

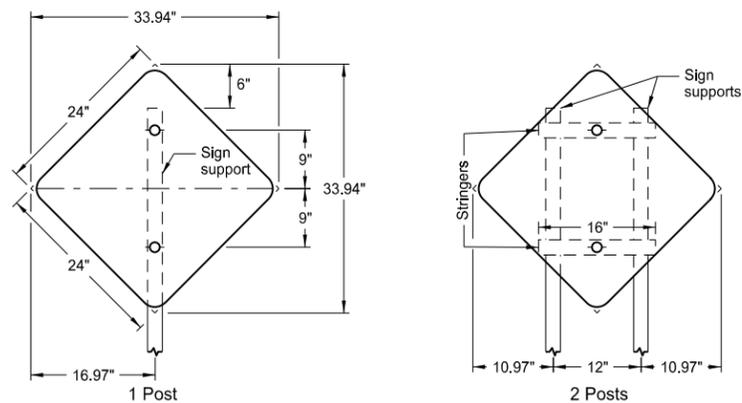
Notes:

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

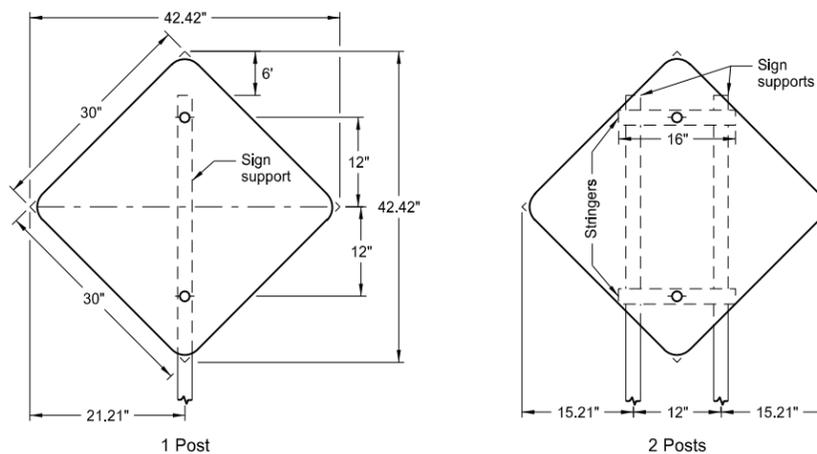
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 12-1-10                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

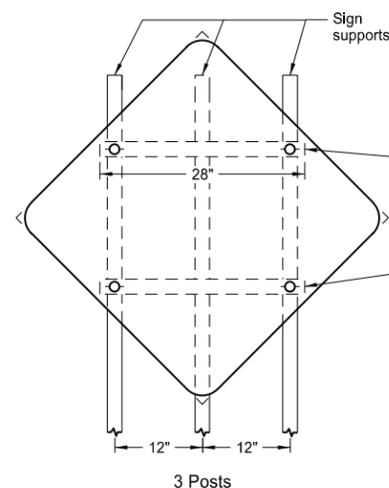
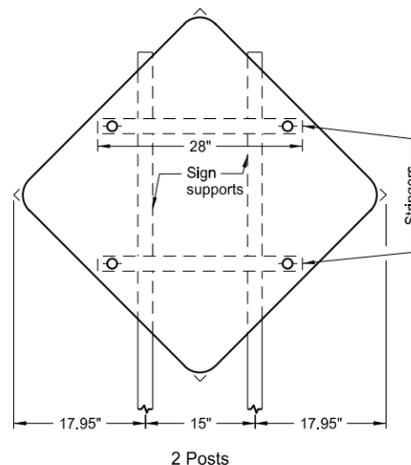
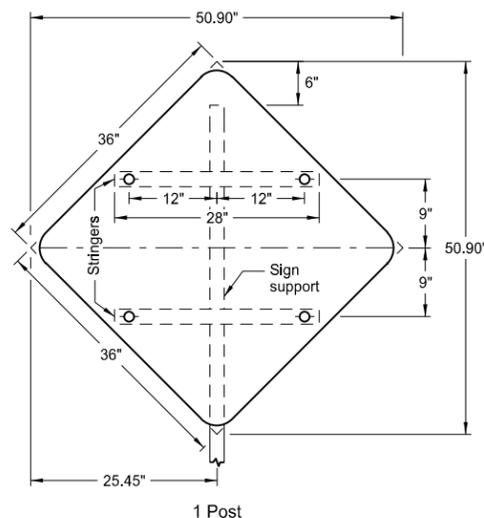
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION  
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



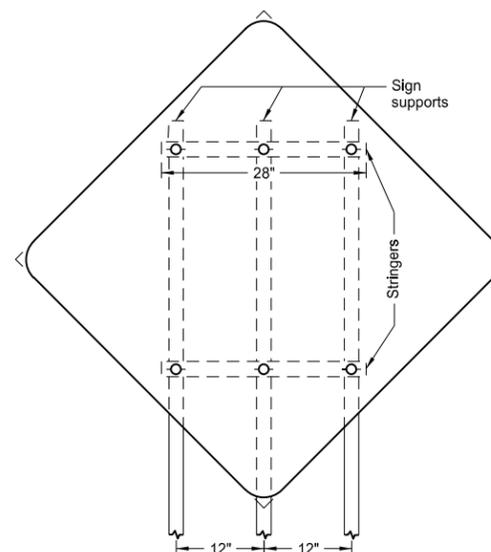
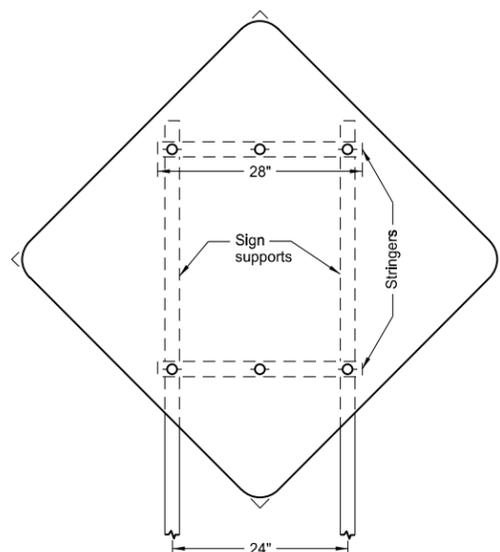
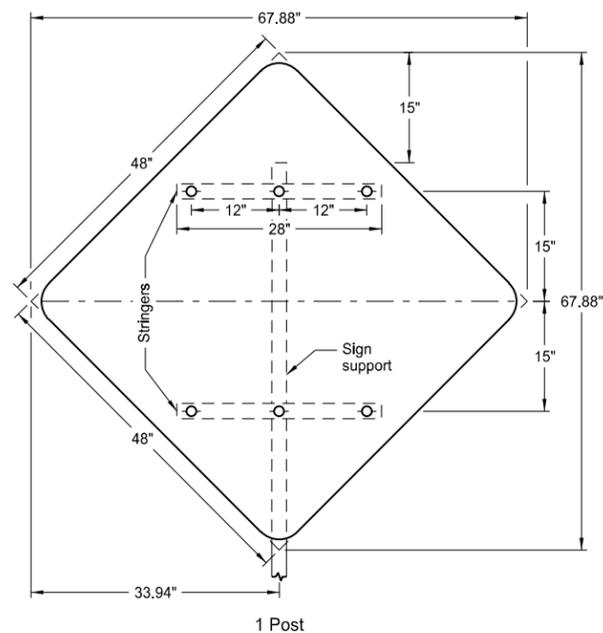
Assembly No. 18



Assembly No. 19



Assembly No. 20



Assembly No. 21

Notes:

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

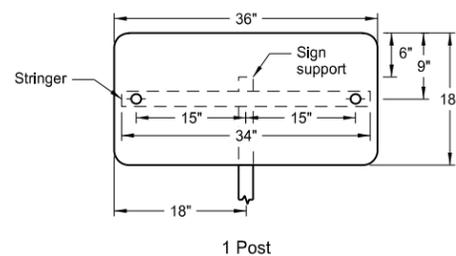
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 12-1-10                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

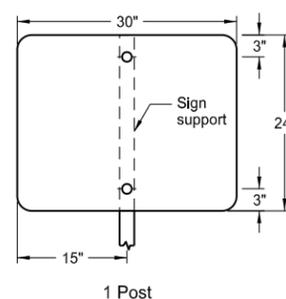
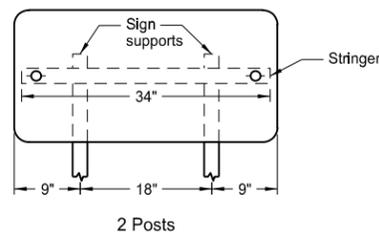
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION  
DETAILS REGULATORY, WARNING AND GUIDE SIGNS

Notes:

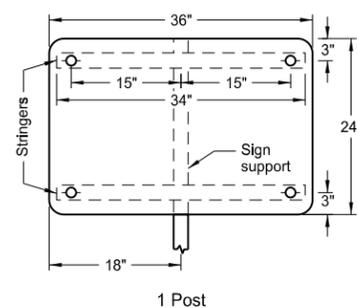
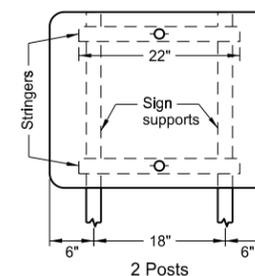
1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1½" x 1½".
4. All holes shall be punched round for ⅜" bolt.



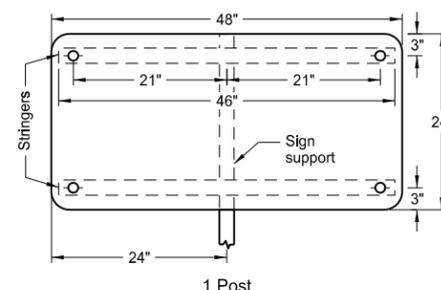
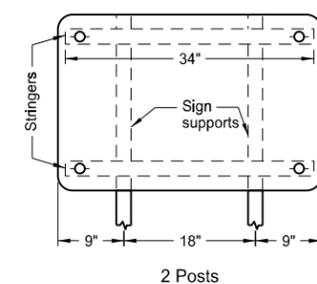
Assembly No. 31



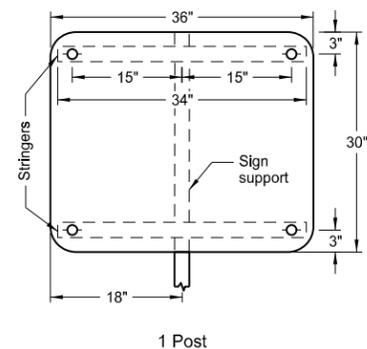
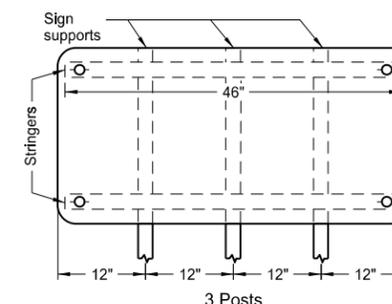
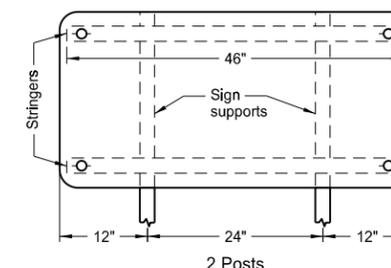
Assembly No. 32



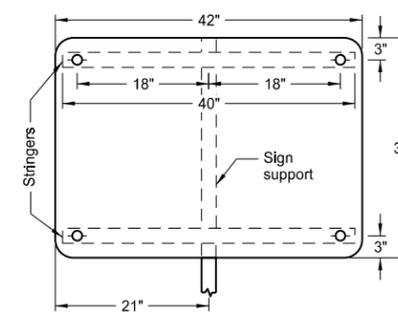
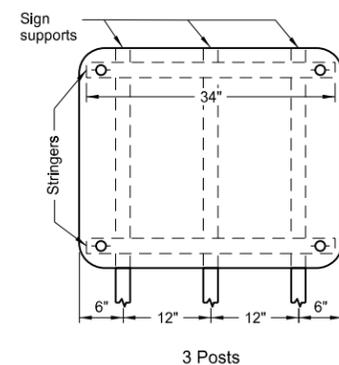
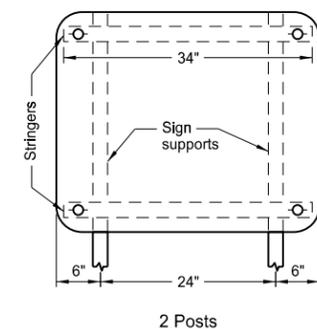
Assembly No. 33



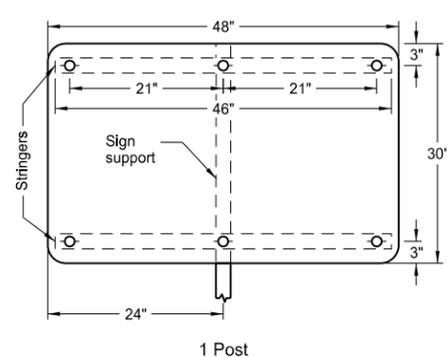
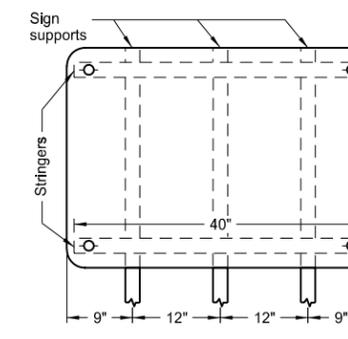
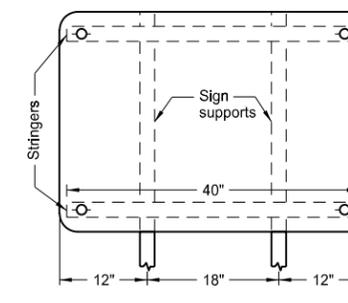
Assembly No. 34



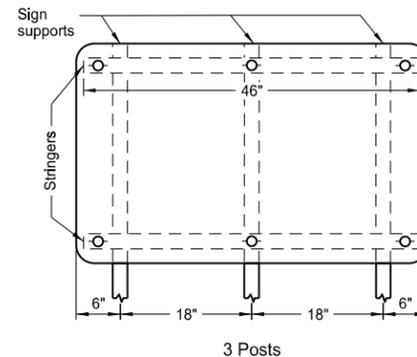
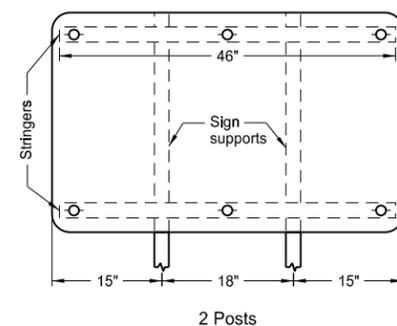
Assembly No. 35



Assembly No. 36



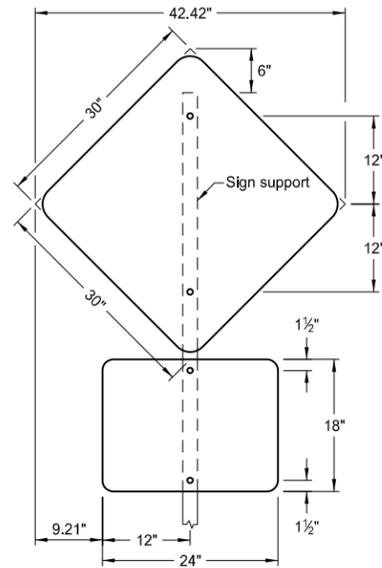
Assembly No. 37



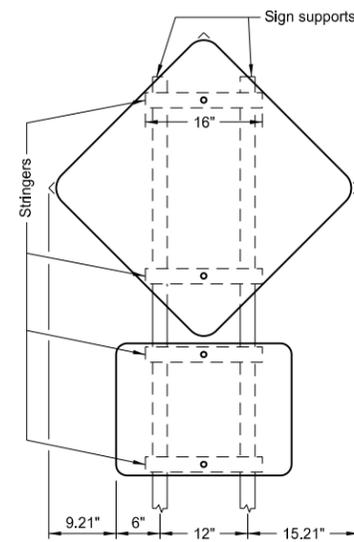
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 12-1-10                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

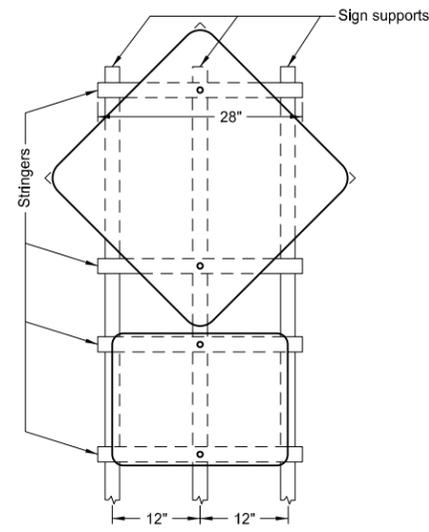
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS  
REGULATORY, WARNING AND GUIDE SIGNS



1 Post



2 Posts

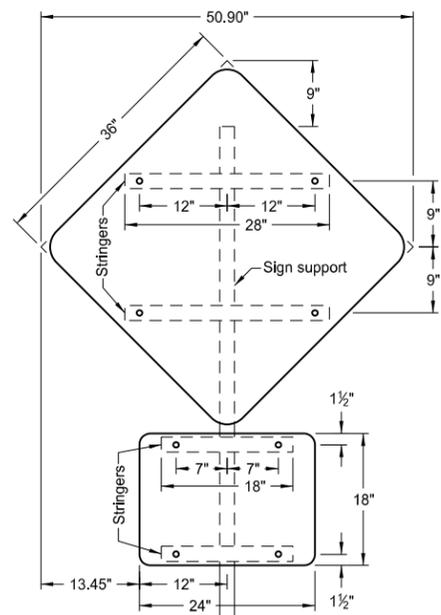


3 Posts

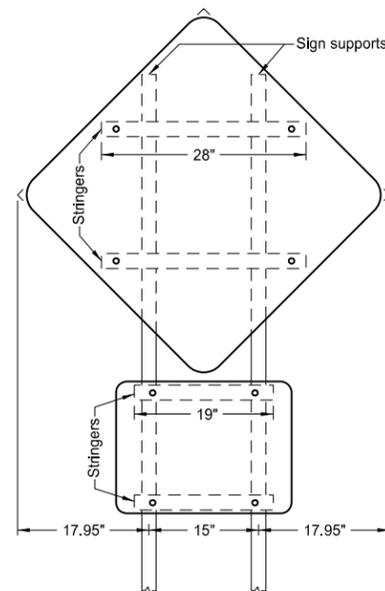
ASSEMBLY NO. 56

Notes:

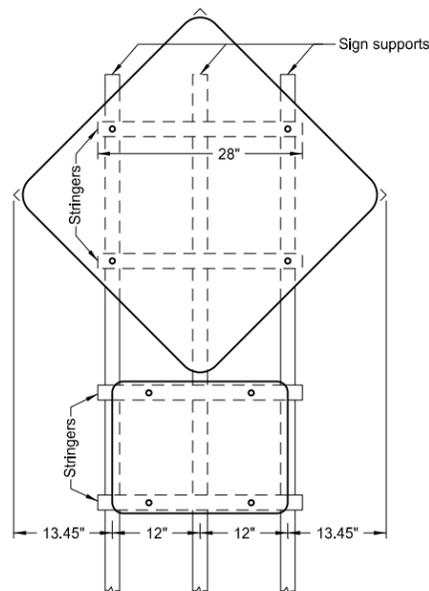
1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1 1/2"x1 1/2".
3. All holes shall be punched round for 3/8" bolt.



1 Post



2 Posts



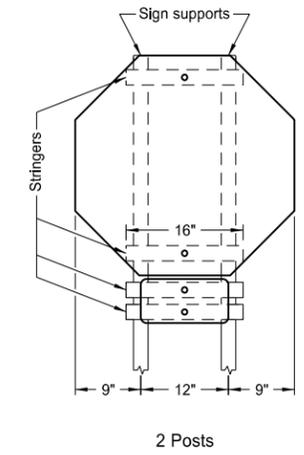
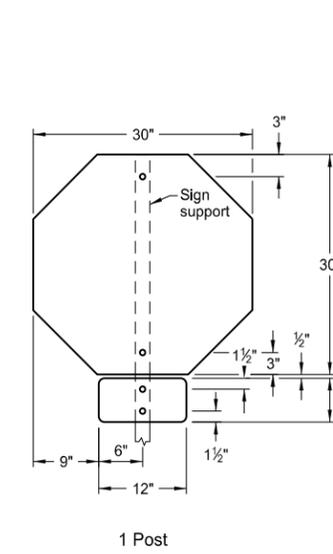
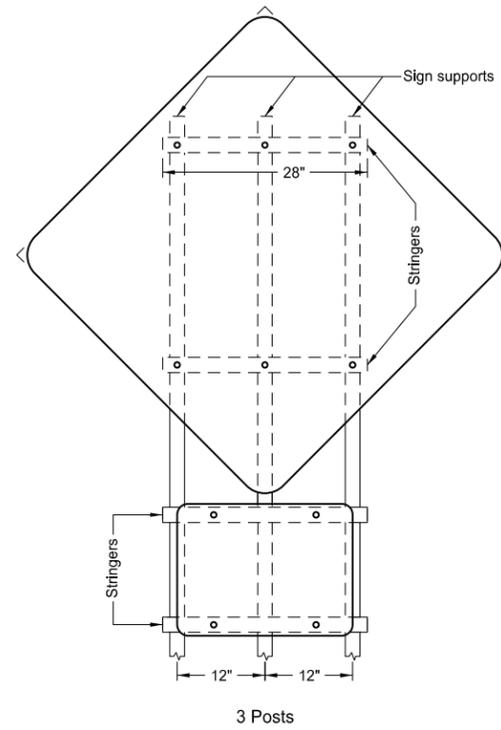
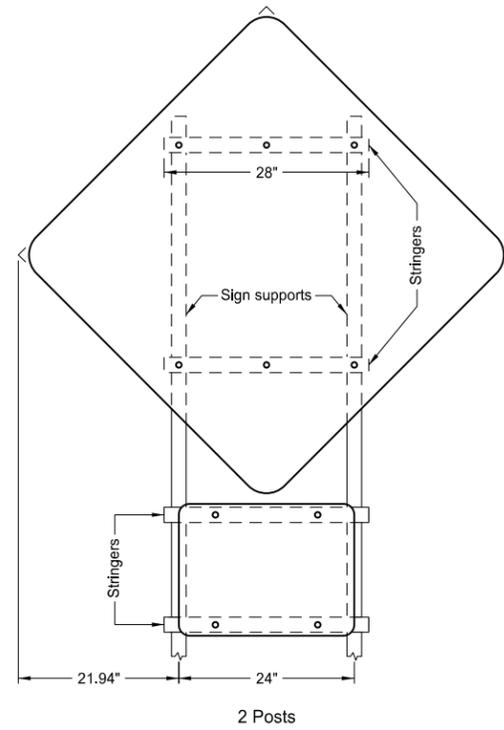
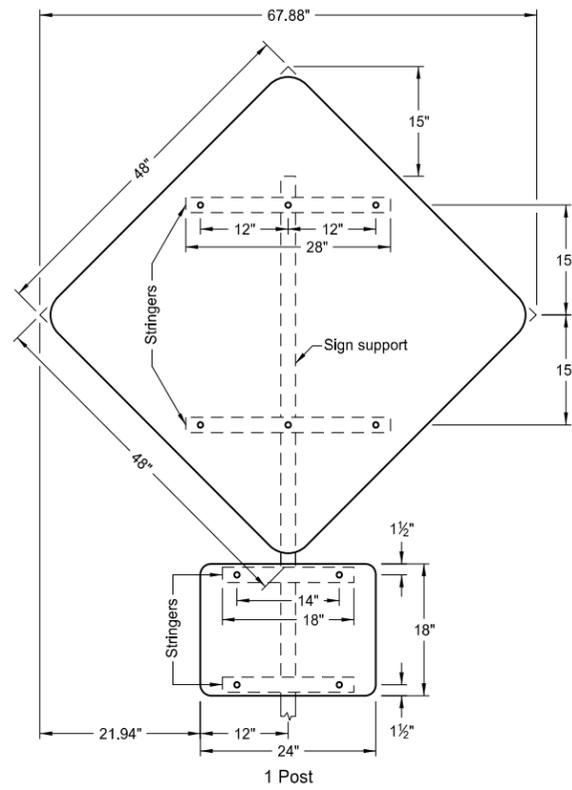
3 Posts

ASSEMBLY NO. 57

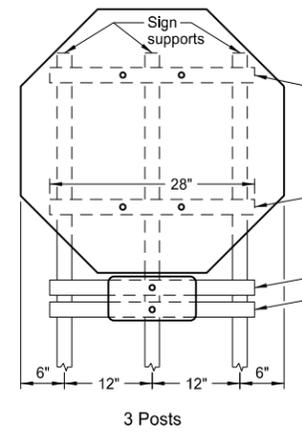
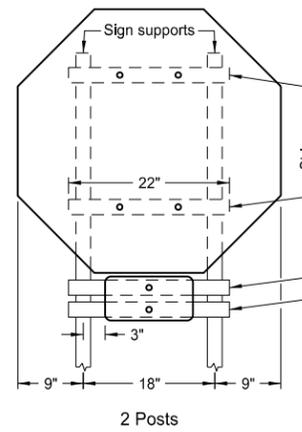
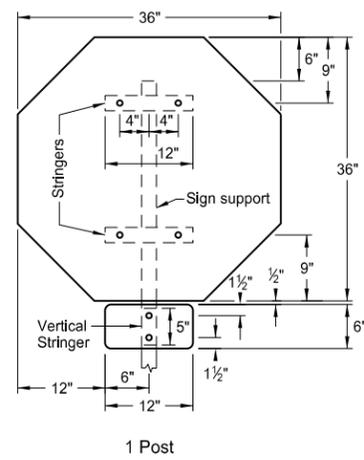
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 8-22-12                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 8/22/12 and the original document is stored at the North Dakota Department of Transportation

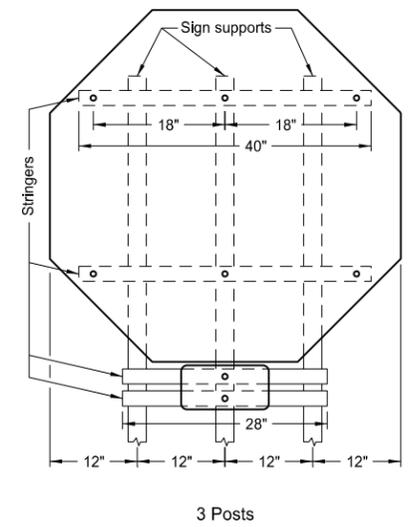
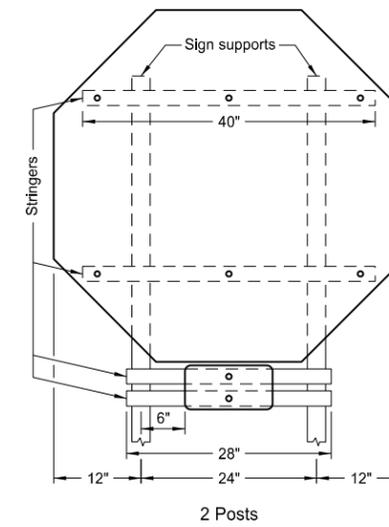
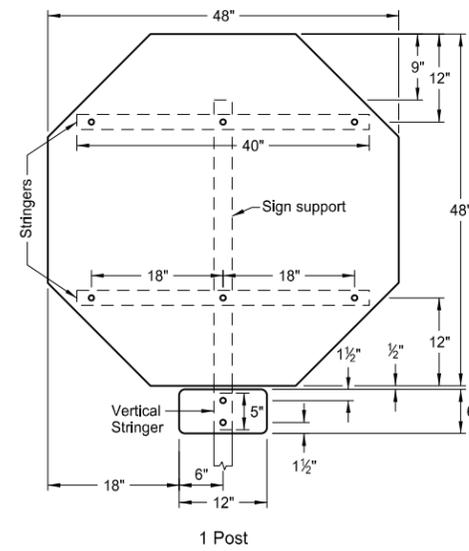
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS  
REGULATORY, WARNING AND GUIDE SIGNS



ASSEMBLY NO. 59



ASSEMBLY NO. 60



ASSEMBLY NO. 61

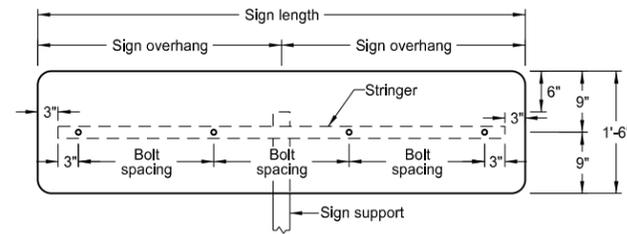
Notes:

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

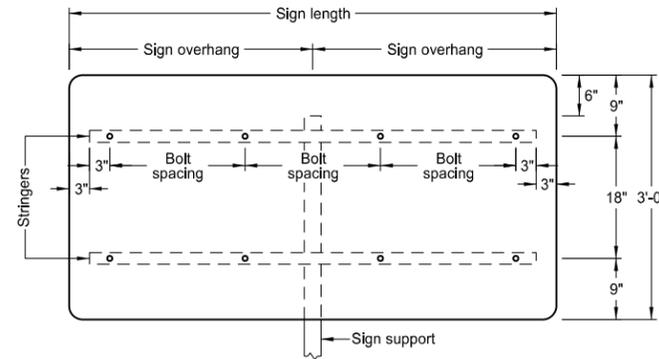
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 8-22-12                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 8/22/12 and the original document is stored at the North Dakota Department of Transportation

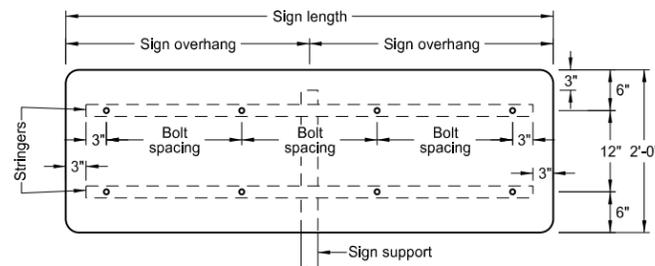
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS



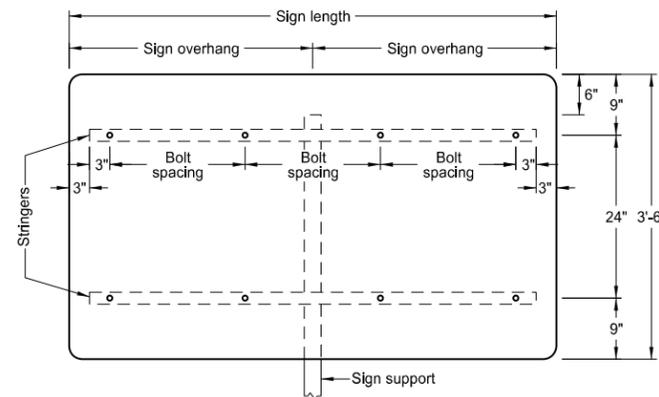
VARIES X 1'-6"



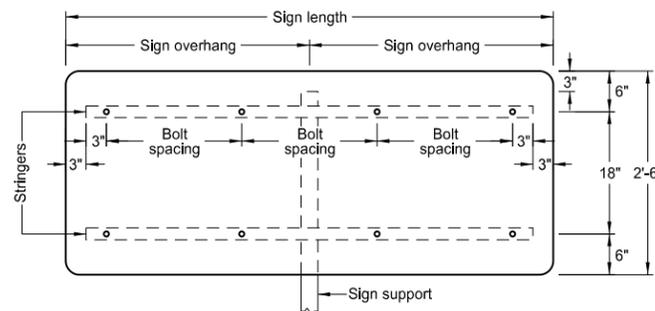
VARIES X 3'-0"



VARIES X 2'-0"



VARIES X 3'-6"



VARIES X 2'-6"

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

Notes:

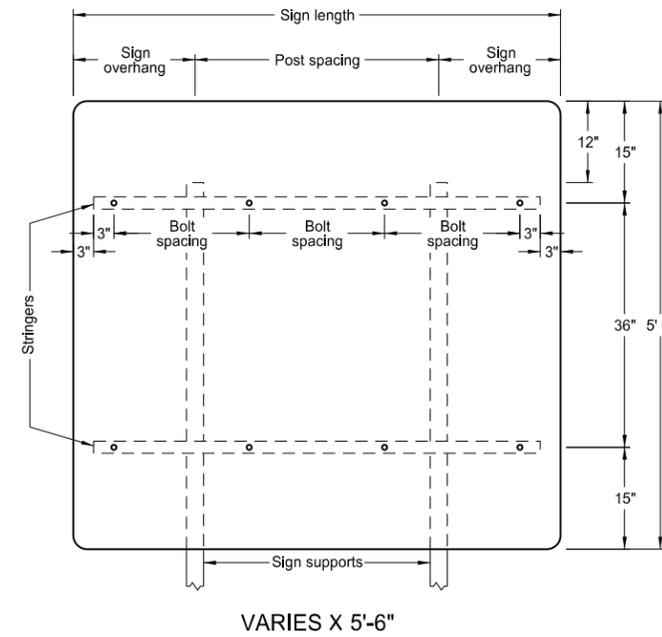
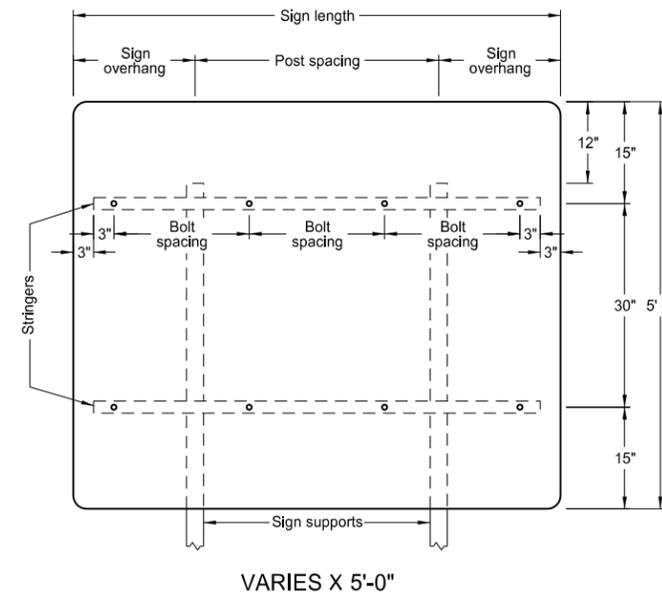
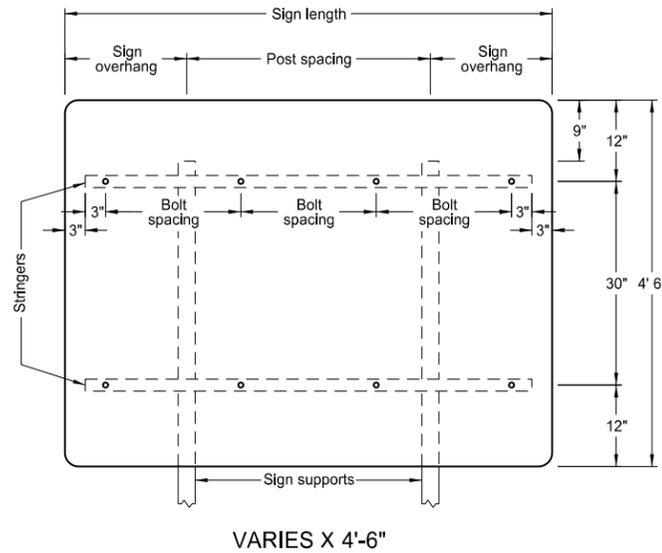
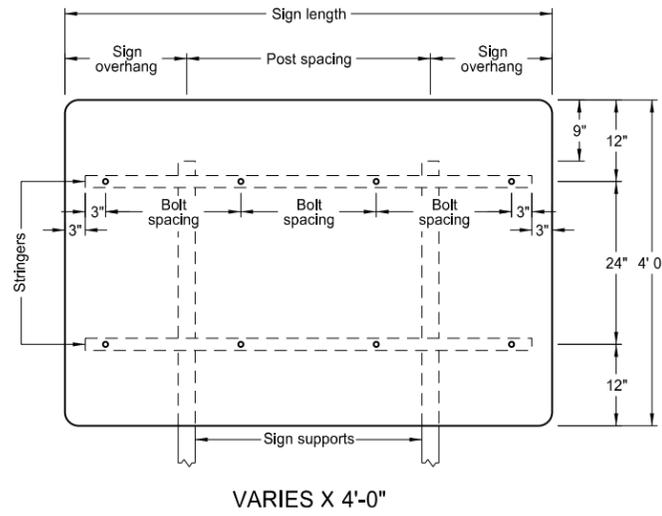
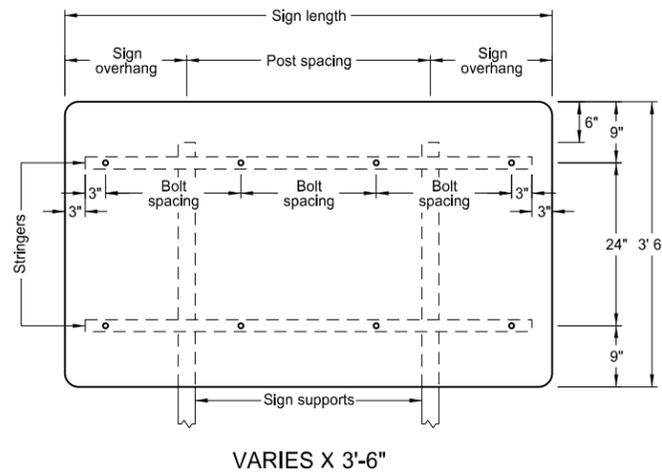
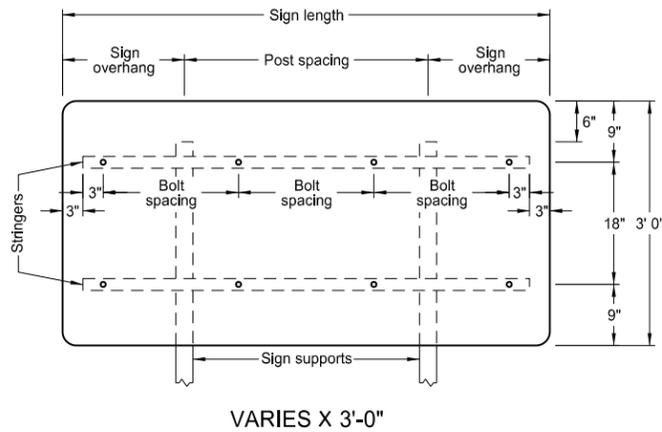
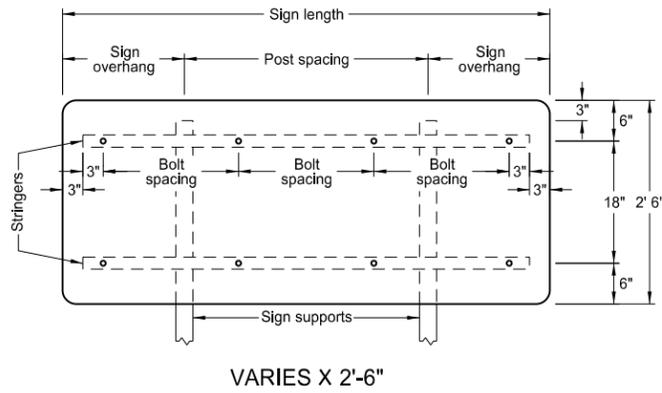
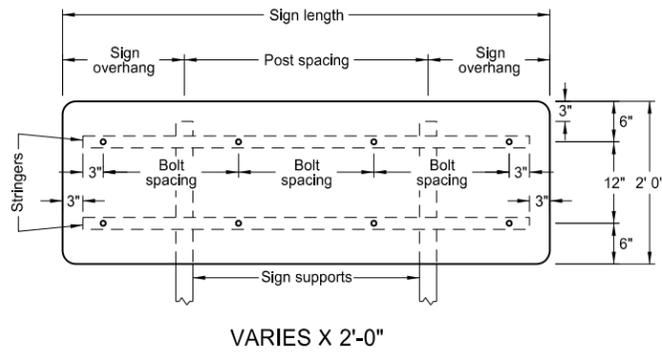
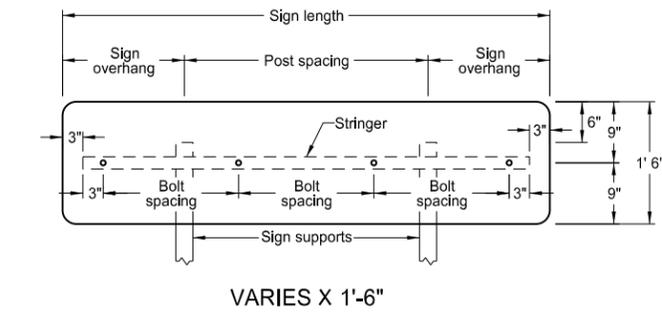
1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1½" x 1½".
3. All holes shall be punched round for ⅜" bolt.
4. Single stringer and single post signs shall have stringers attached to the post using the special stringer angle, shown on the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

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 9-25-12                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by  
 Roger Weigel,  
 Registration Number  
 PE-2930,  
 on 9/25/2012 and the original document is stored at the North Dakota Department of Transportation

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

**D-754-48**



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

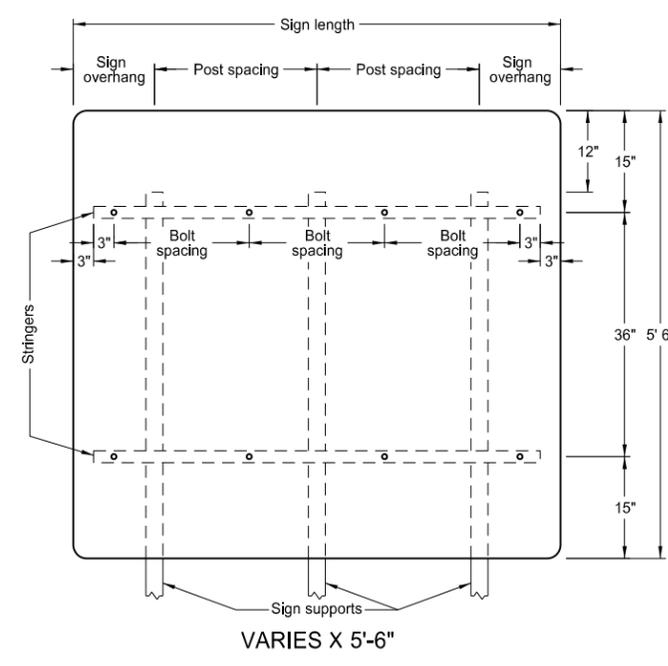
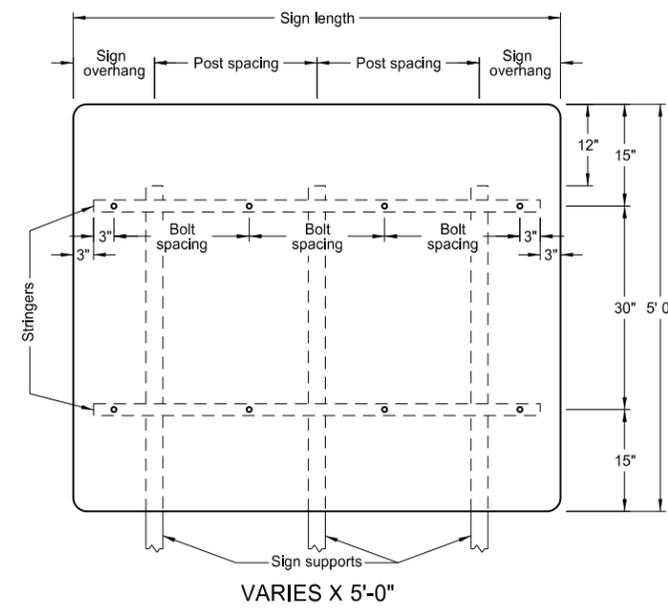
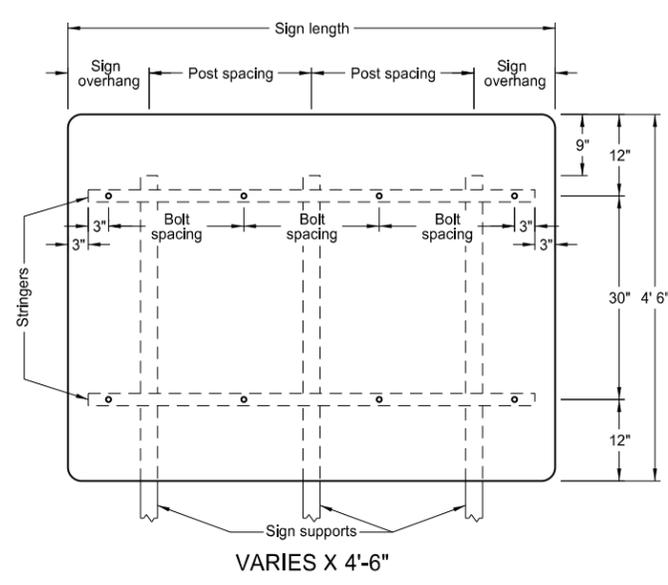
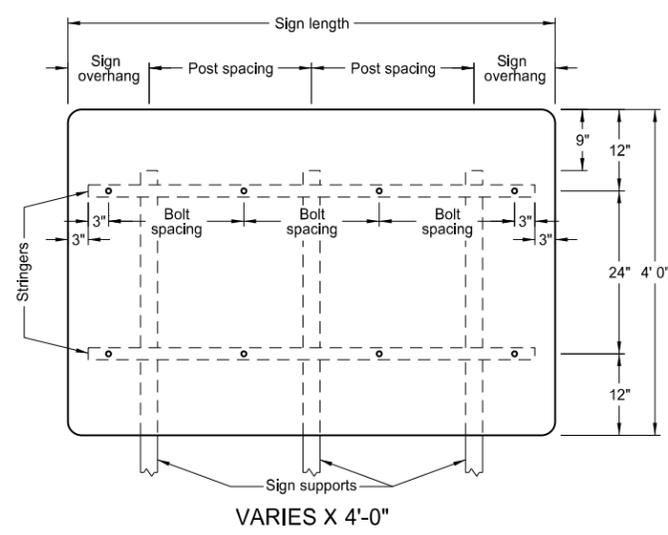
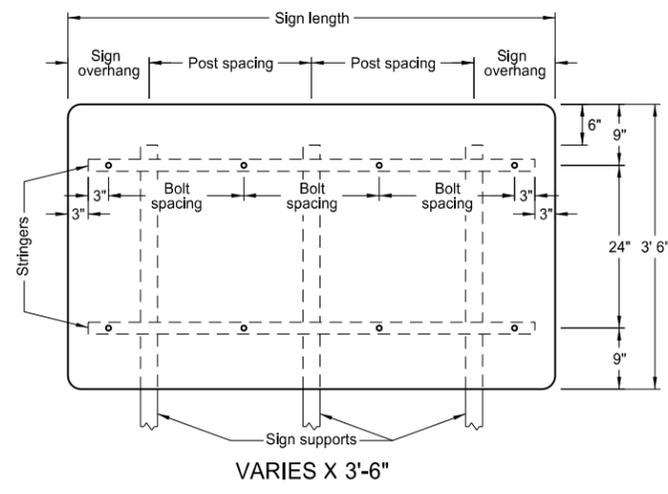
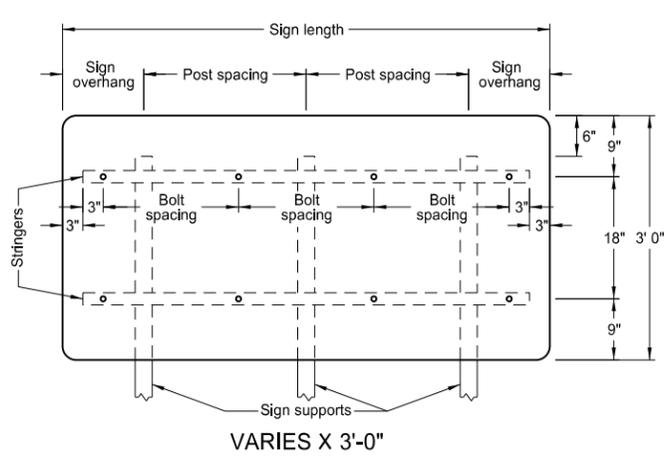
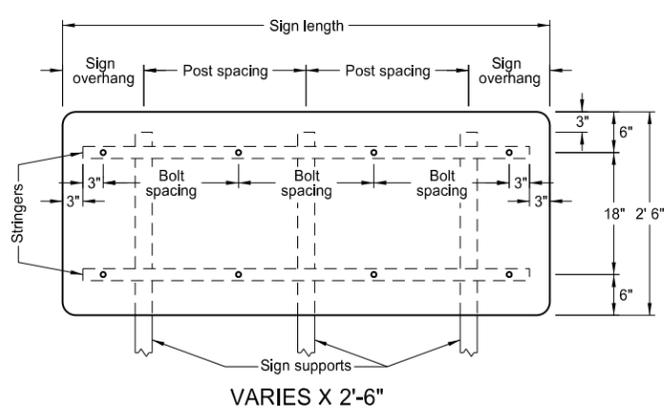
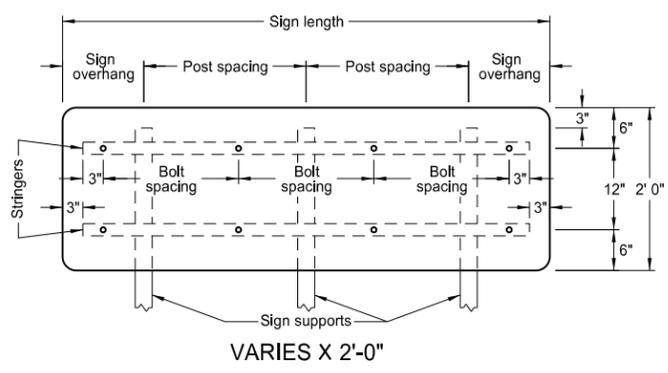
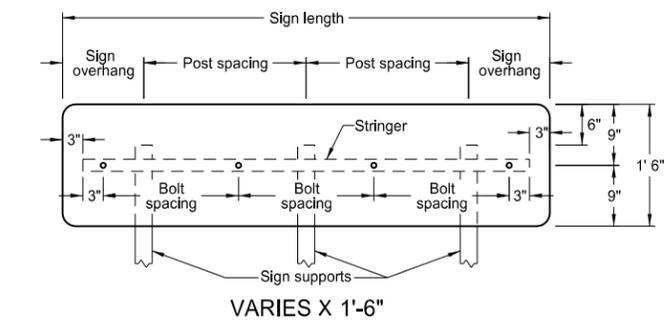
- Notes:
1. The minimum sign backing material thickness shall be 0.100 inch.
  2. Perforated square tube stringer shall be 1½" x 1½".
  3. All holes shall be punched round for ⅜" bolt.

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 9-25-12                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by  
**Roger Weigel,**  
Registration Number  
**PE-2930,**  
on 9/25/2012 and the original document is stored at the North Dakota Department of Transportation

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

D-754-49



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

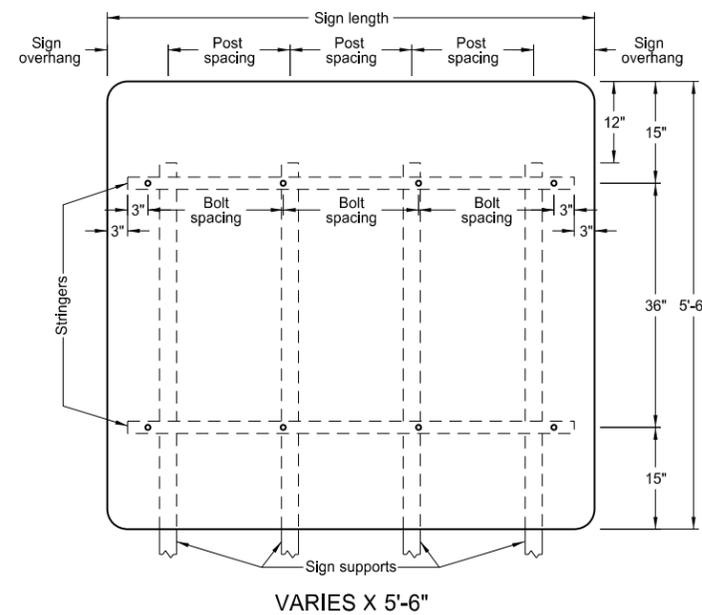
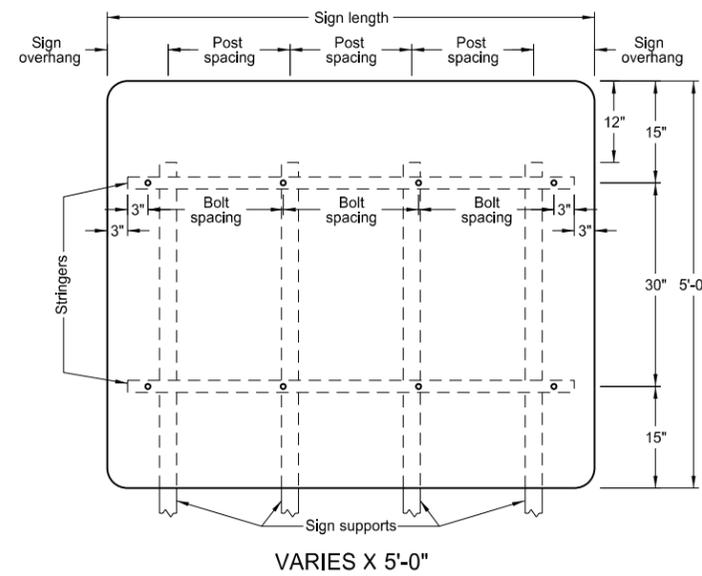
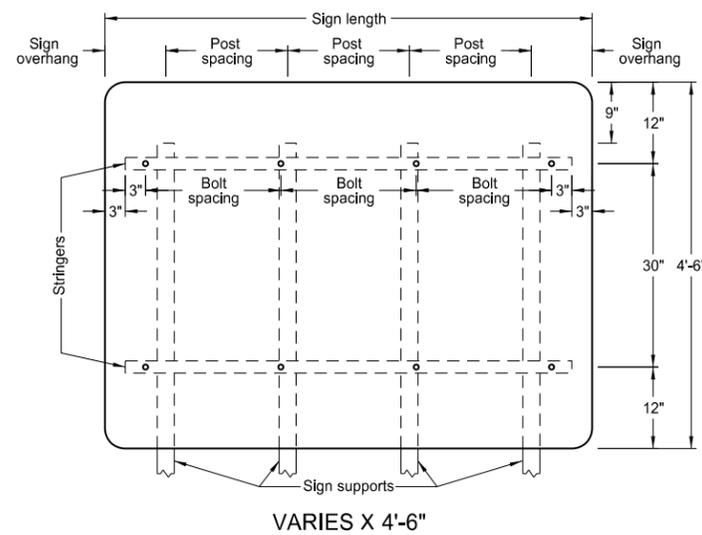
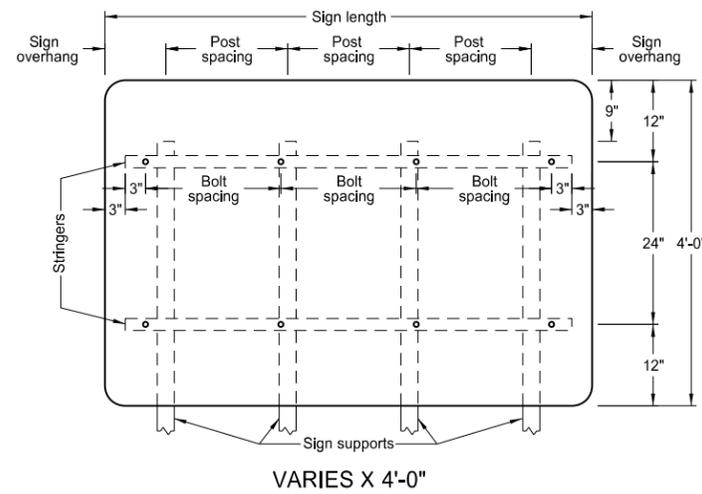
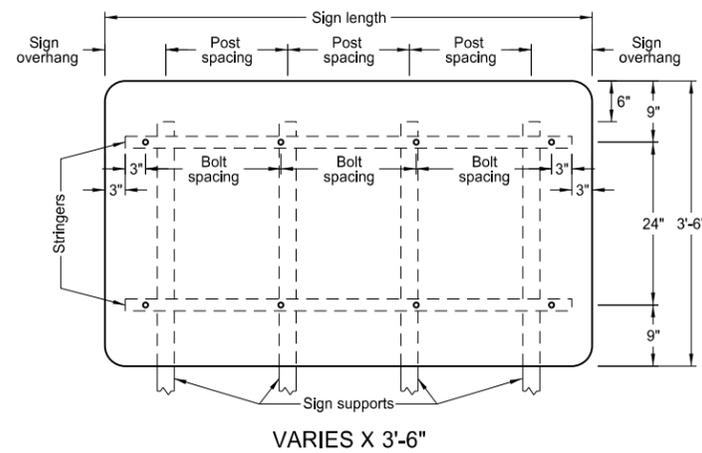
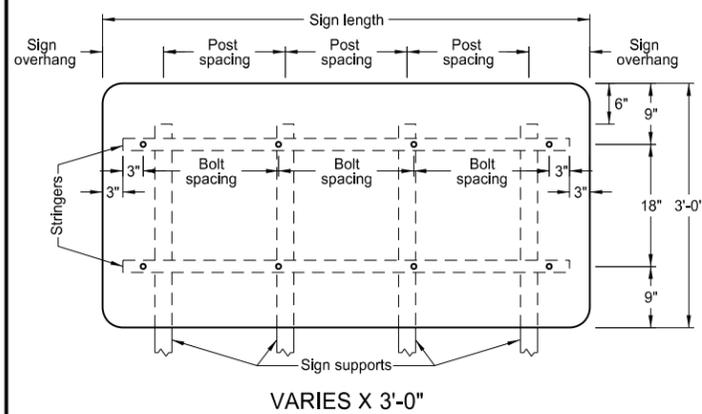
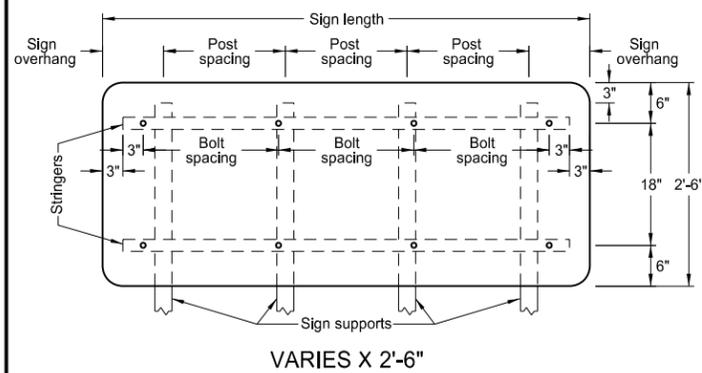
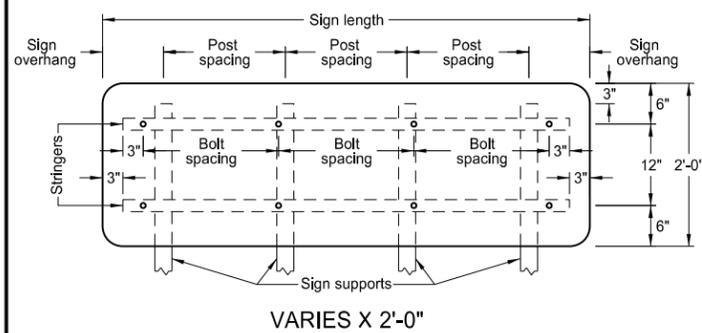
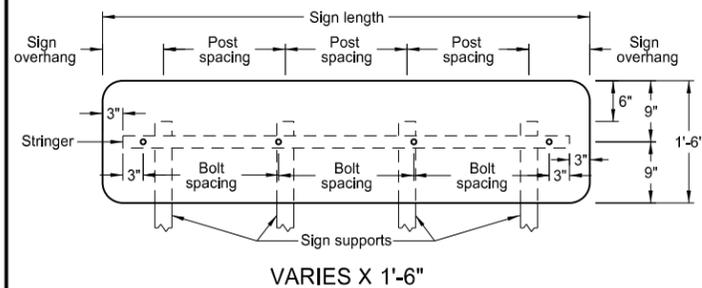
- Notes:
- The minimum sign backing material thickness shall be 0.100 inch.
  - Perforated square tube stringer shall be 1½" x 1½".
  - All holes shall be punched round for ⅜" bolt.

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 9-25-12                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by  
**Roger Weigel,**  
Registration Number  
PE-2930,  
on 9/25/2012 and the original document is stored at the North Dakota Department of Transportation

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

**D-754-50**



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

**Notes:**

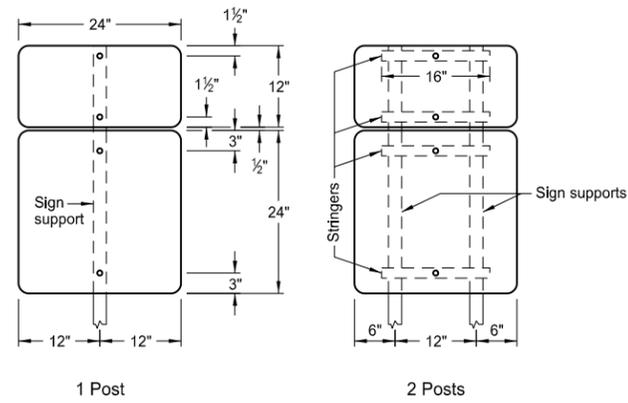
1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1½" x 1½".
3. All holes shall be punched round for ⅝" bolt.

|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 9-25-12                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

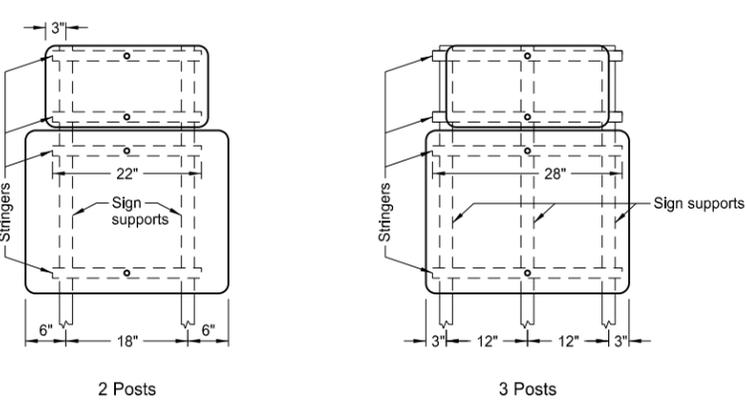
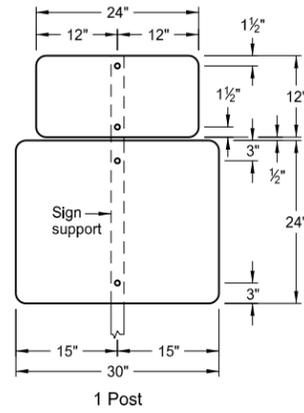
This document was originally issued and sealed by  
**Roger Weigel,**  
Registration Number  
**PE-2930,**  
on 9/25/2012 and the original document is stored at the North Dakota Department of Transportation

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

D-754-51

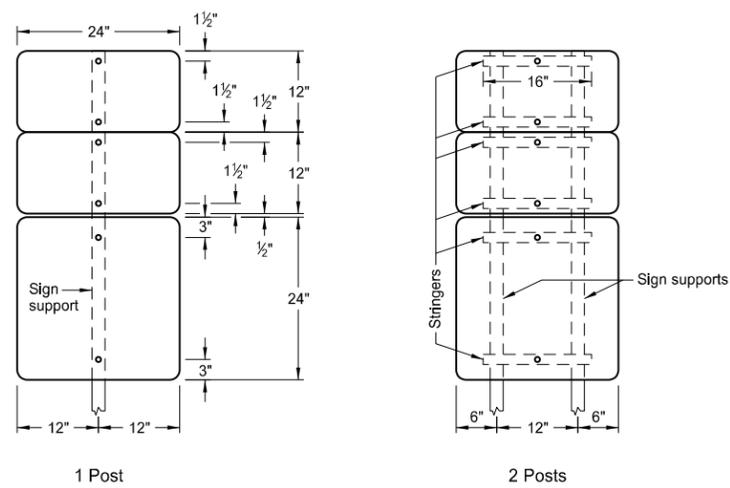


ASSEMBLY NO. 371

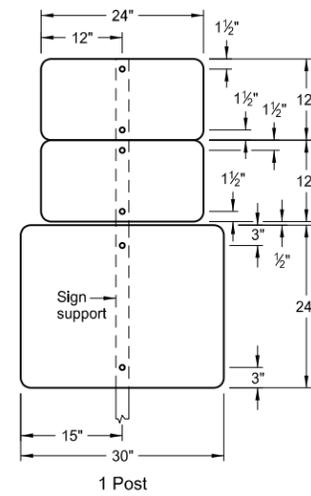
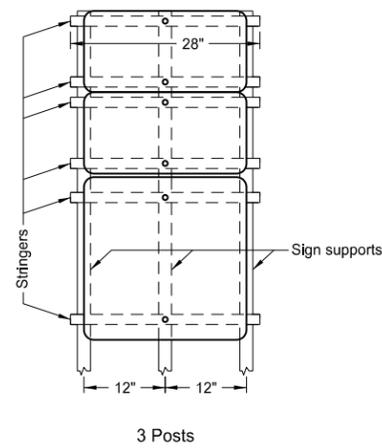


ASSEMBLY NO. 372

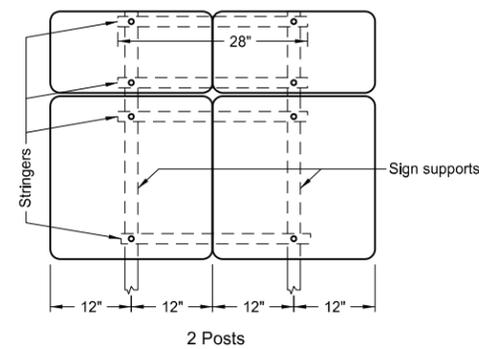
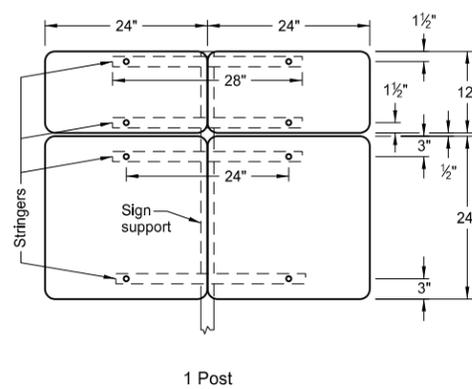
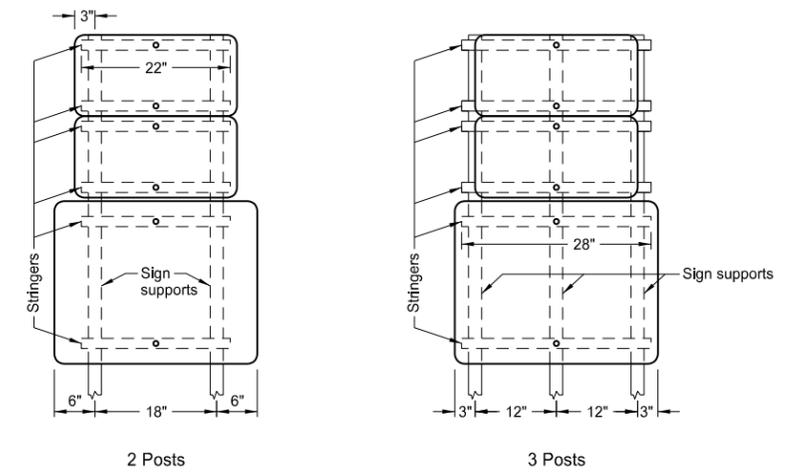
- Notes:
1. The minimum sign backing material thickness shall be 0.100 inch.
  2. Perforated square tube stringer shall be 1 1/2"x1 1/2".
  3. All holes shall be punched round for 3/8" bolt.



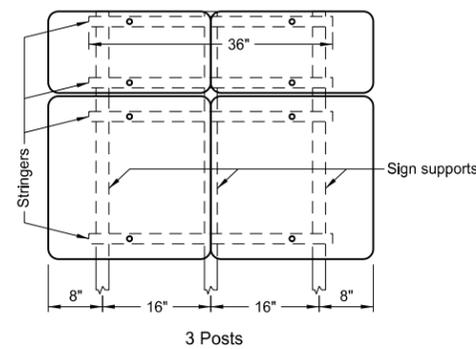
ASSEMBLY NO. 373



ASSEMBLY NO. 374



ASSEMBLY NO. 375



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

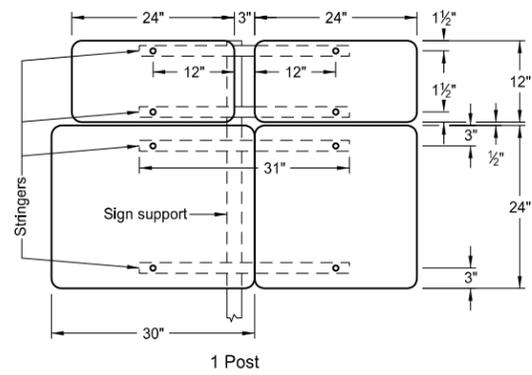
This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 8/22/12 and the original document is stored at the North Dakota Department of Transportation

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

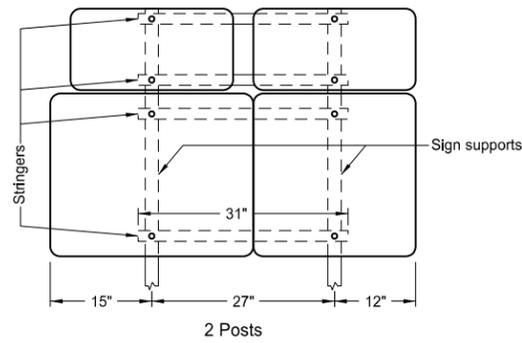
D-754-52

Notes:

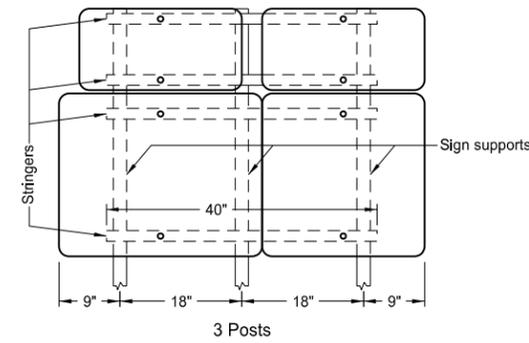
1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1½"x1½".
3. All holes shall be punched round for ⅜" bolt.



1 Post

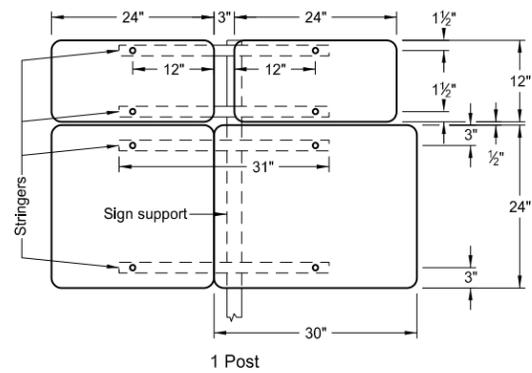


2 Posts

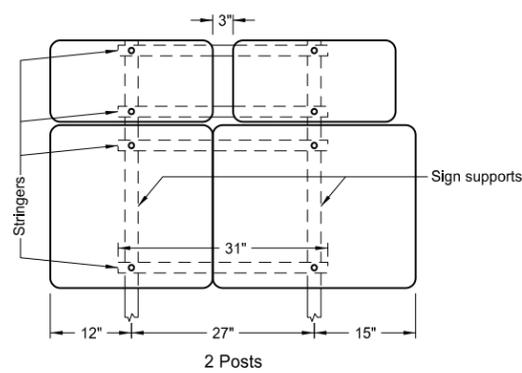


3 Posts

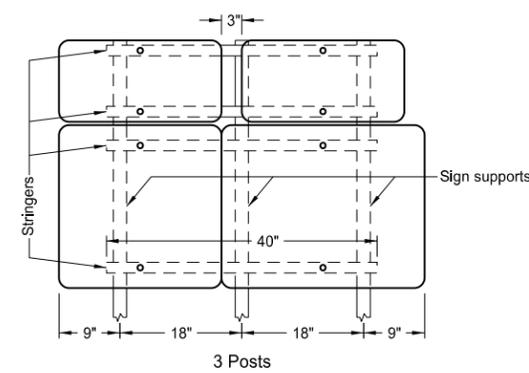
ASSEMBLY NO. 376



1 Post

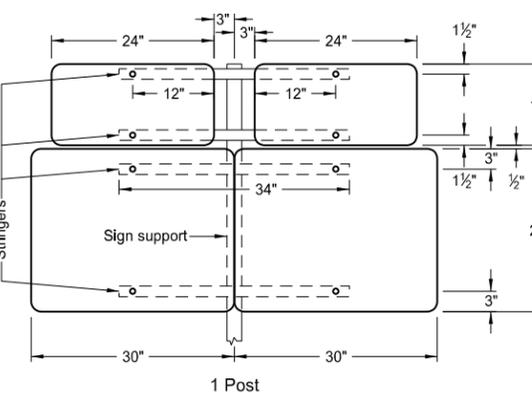


2 Posts

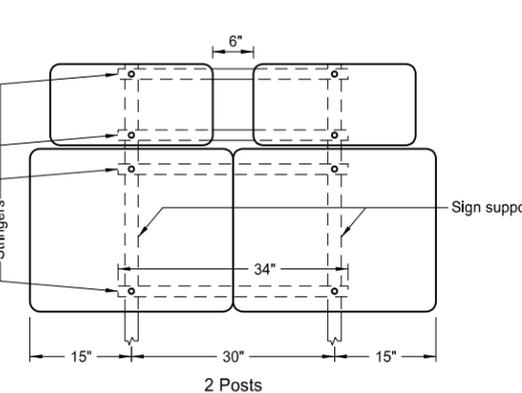


3 Posts

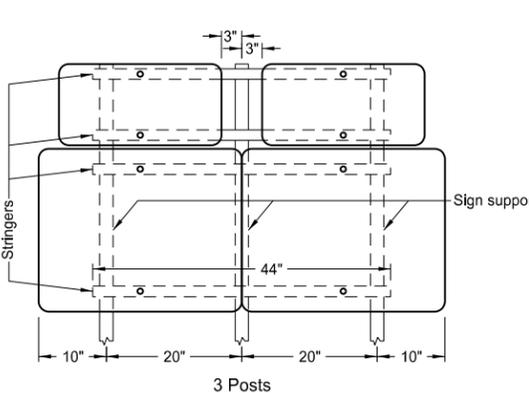
ASSEMBLY NO. 377



1 Post



2 Posts



3 Posts

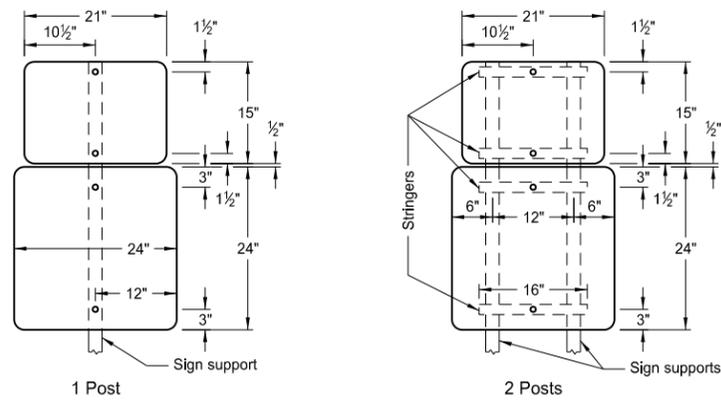
ASSEMBLY NO. 378

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

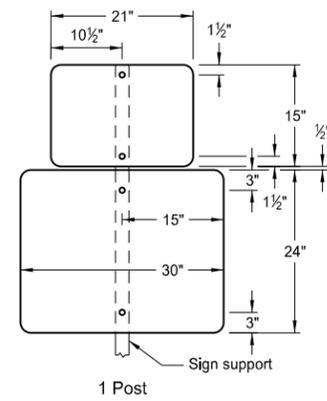
This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 8/22/12 and the original document is stored at the North Dakota Department of Transportation

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

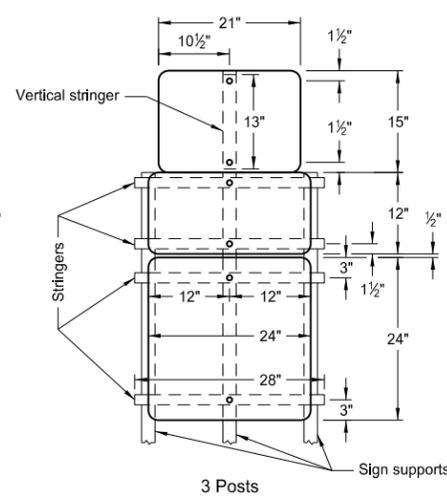
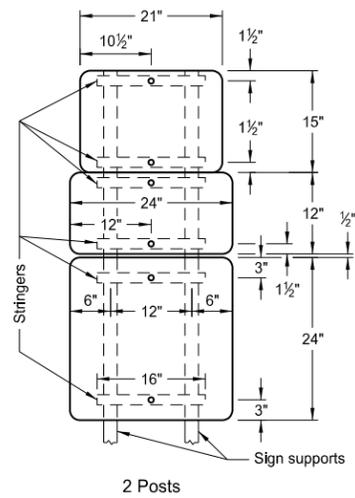
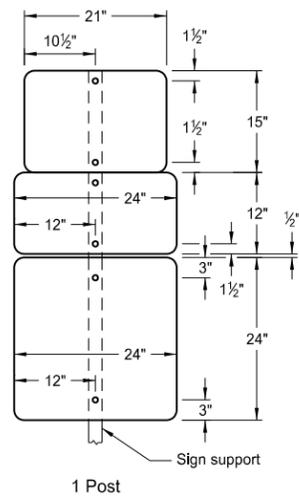
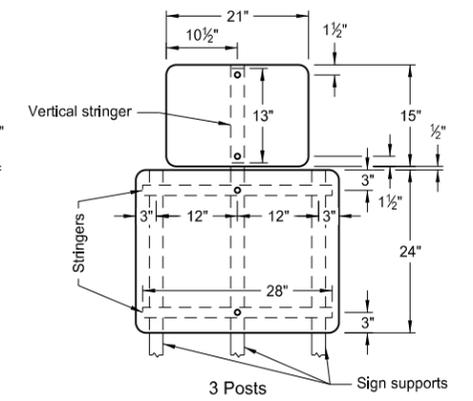
D-754-57



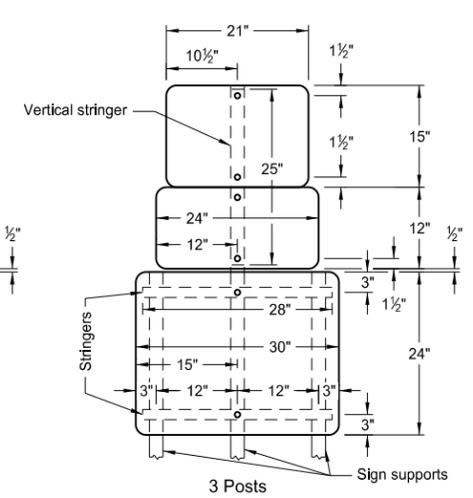
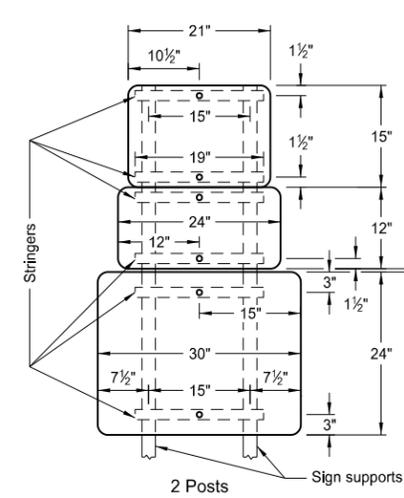
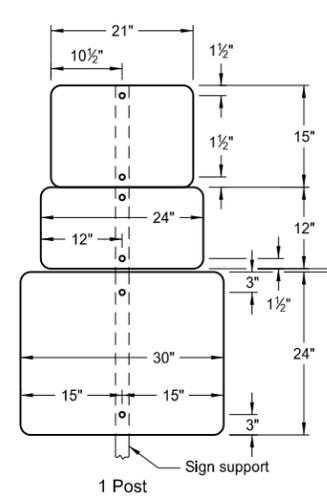
ASSEMBLY 391



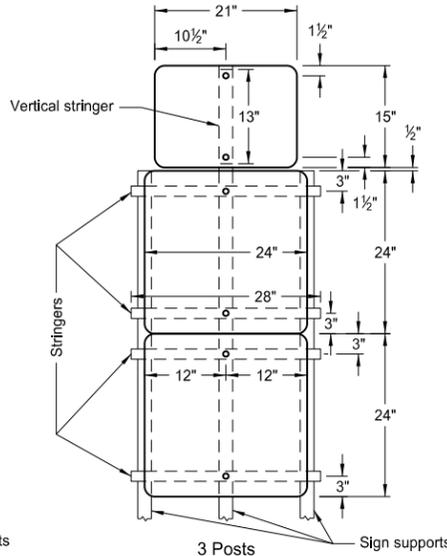
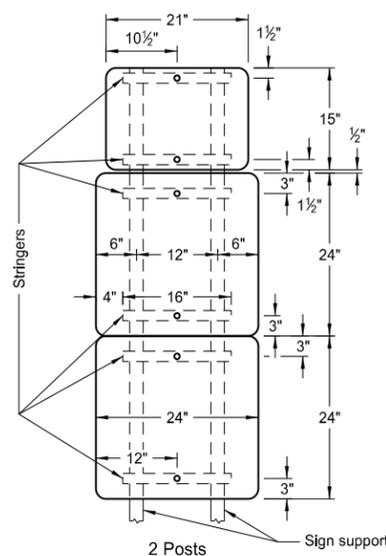
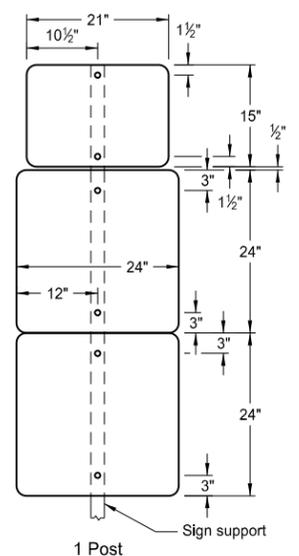
ASSEMBLY 392



ASSEMBLY 393



ASSEMBLY 394



ASSEMBLY 395

Notes:

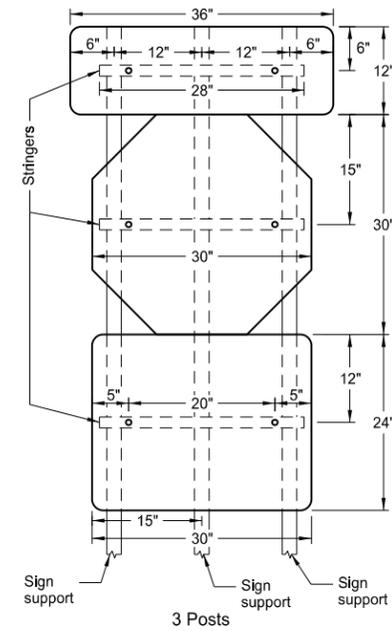
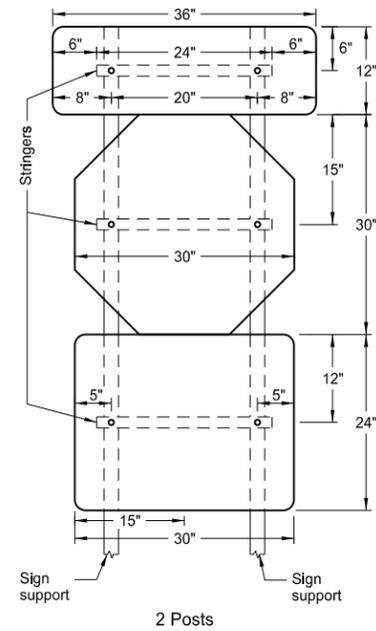
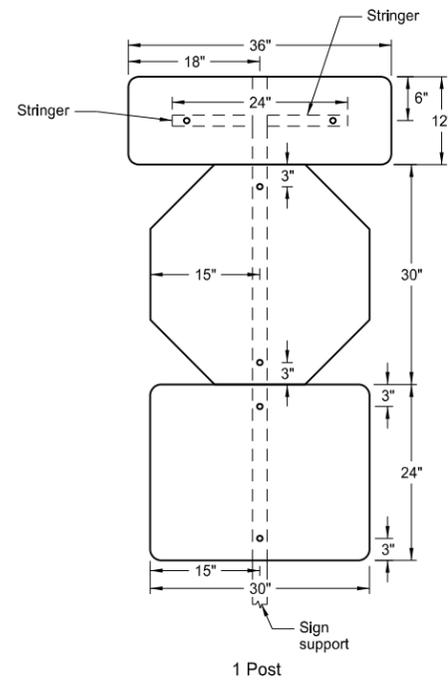
1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1 1/2"x1 1/2".
3. All holes shall be punched round for 3/8" bolt.

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

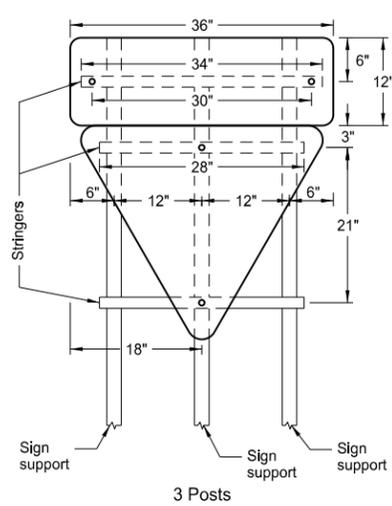
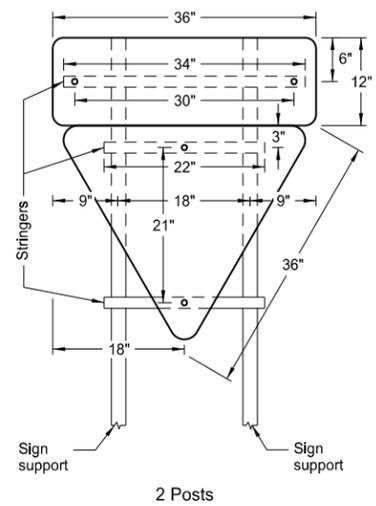
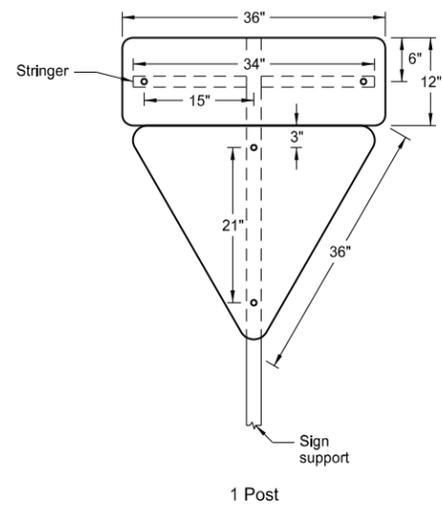
This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 8/22/12 and the original document is stored at the North Dakota Department of Transportation

**SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS -  
DIVIDED HIGHWAY CONTROL SIGNS**

**D-754-77**



**ASSEMBLY NO. 445 & 449**



**ASSEMBLY NO. 446 & 450**

**Notes:**

1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1½"x1½".
3. All holes shall be punched round for ⅜" bolt.
4. Assemblies 445 and 446 have single one way signs.  
Assemblies 449 and 450 have back to back one way signs.

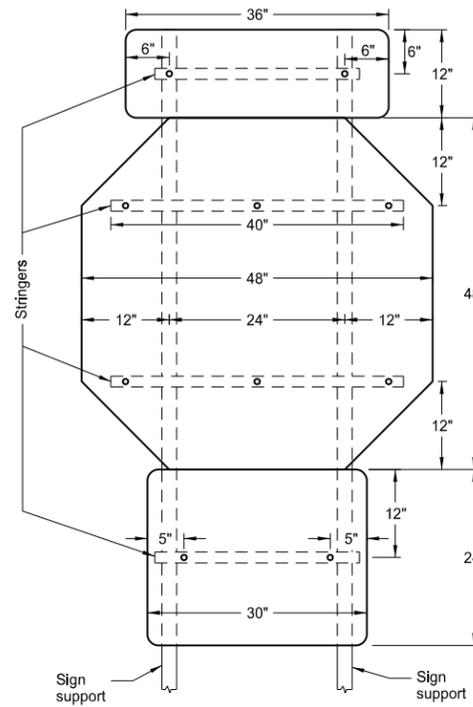
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 8-22-12                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by  
Roger Weigel  
Registration Number  
PE-2930,  
on 8/22/12 and the original document is stored at the North Dakota Department of Transportation

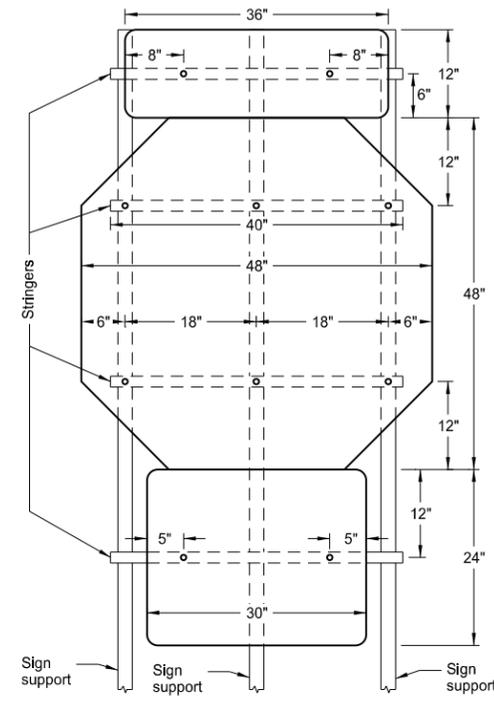
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS -  
DIVIDED HIGHWAY CONTROL SIGNS

Notes:

1. The minimum sign backing material thickness shall be 0.100 inch.
2. Perforated square tube stringer shall be 1½"x1½".
3. All holes shall be punched round for ⅜" bolt.
4. Assemblies 447 and 448 have single one way signs.  
Assemblies 451 and 452 have back to back one way signs.

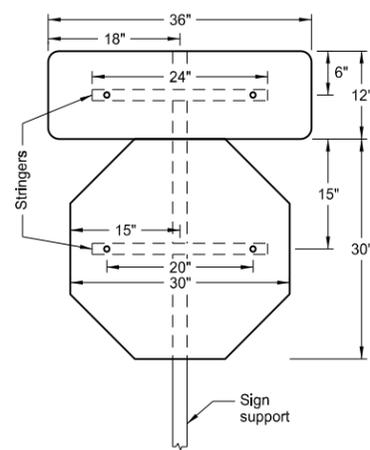


2 Posts

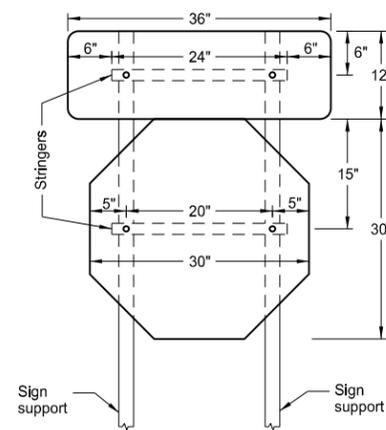


3 Posts

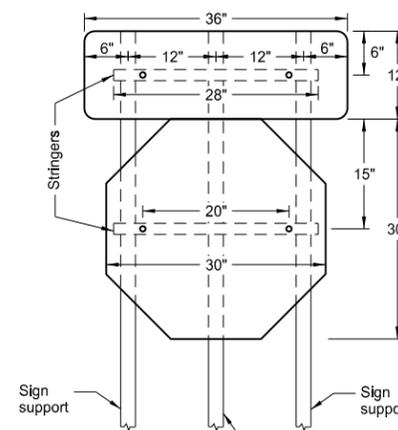
ASSEMBLY NO. 447 & 451



1 Post



2 Posts



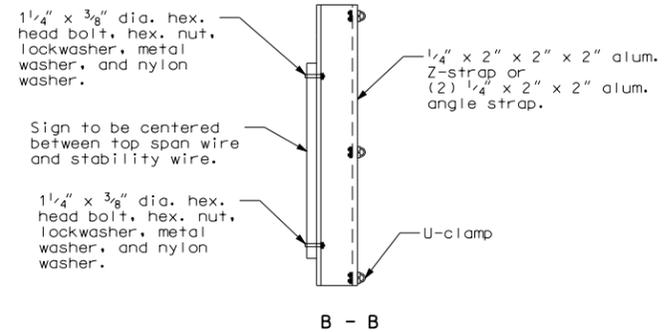
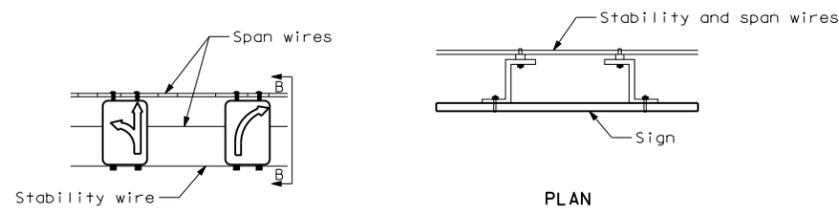
3 Posts

ASSEMBLY NO. 448 & 452

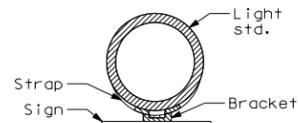
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 8-22-12                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |

This document was originally issued and sealed by  
Roger Weigel  
Registration Number  
PE-2930,  
on 8/22/12 and the original document is stored at the  
North Dakota Department  
of Transportation

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

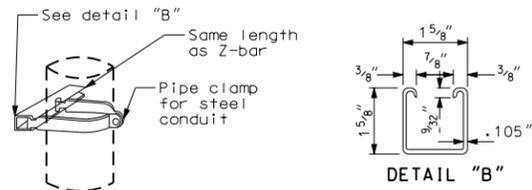


**SPAN WIRE MOUNTED SIGN DETAIL**



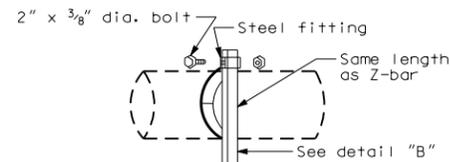
**LT. STD. MOUNTED SIGN BRACKET DETAIL**  
(Max. 24" x 30" signs)

Bracket shall be of galv. steel consisting of strap & sign attachment bracket similar to the one shown in the detail. Cost of the bracket assembly to be included in the price bid for flat sheet signs. Punching shall be as shown on the Standard Drawings. The Engineer in the field shall determine the exact location of the light standard for sign attachment. There shall be a 7' vertical clearance to the bottom of all signs mounted on light standards.



**VERTICAL MOUNTING**

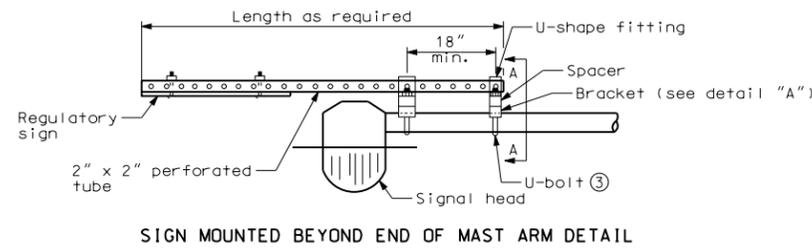
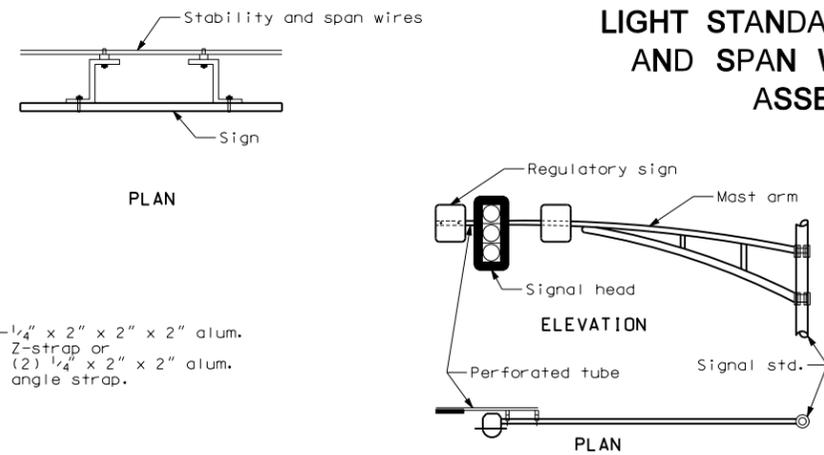
Two (2) clamps required per sign



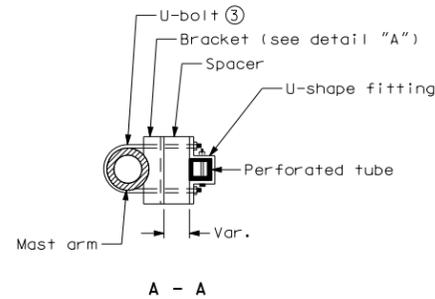
**HORIZONTAL MOUNTING**

Two (2) clamps required per sign

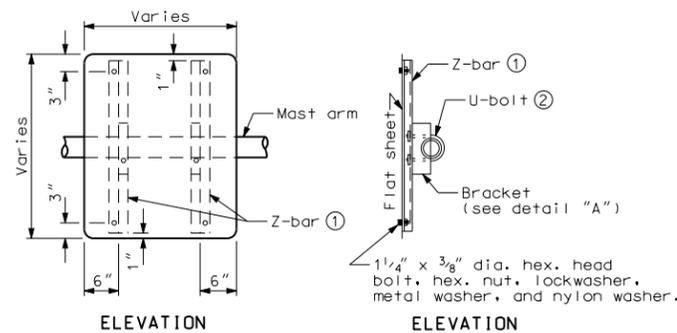
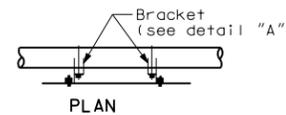
**ALTERNATE CLAMP MOUNTING**



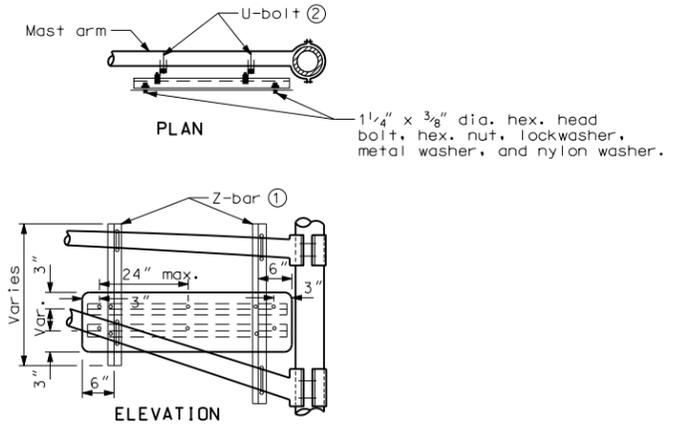
**SIGN MOUNTED BEYOND END OF MAST ARM DETAIL**



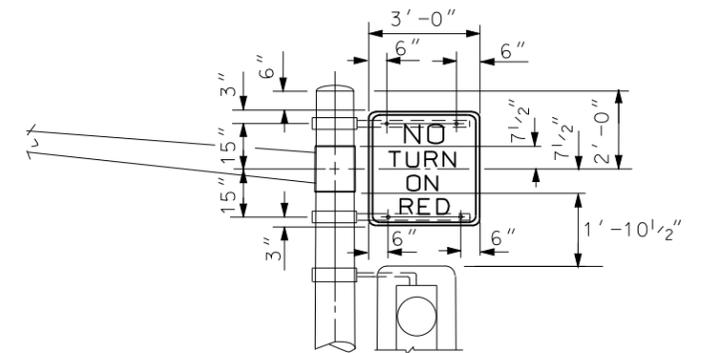
**A - A**



**MAST ARM MOUNTED REGULATORY SIGN DETAIL**



**MAST ARM MOUNTED STREET NAME SIGN DETAIL**



**SIGN ATTACHMENT DETAIL SIGNAL STANDARD MOUNTED**

- ① Z-bar - Use 1 3/4" x 3/16" thick 1.08 lbs./ft. aluminum alloy. In lieu of Z-bar, two angles bolted together may be used or a channel. (1 3/4" x 1 3/4" x 3/16" angles) (1 3/4" x 2" x .188" channels)
- ② 3/8" U-bolt, hex. nut, lockwasher, & length depends on dia. of mast arm.
- ③ 3/8" U-bolt, hex. nut, lockwasher, & length depends on dia. of mast arm. Paint perforated tube the same color and specification as mast arm. 2" x 2" maximum support length 9.9 ft. 2 1/4" x 2 1/4" maximum support length 12.6 ft. 2 1/2" x 2 1/2" maximum support length 15.7 ft.

Note:

Metal washers and nylon washers used on sign face shall have a minimum outside dia. of 1 5/16" ± 1/16" and 10 gauge thickness.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                                |
|---|--------------------------------|
| 10-1-86                                   |                                |
| REVISIONS                                 |                                |
| DATE                                      | CHANGE                         |
| 05-01-92                                  | General revisions              |
| 11-24-95                                  | Span wire mounting sign detail |
| 10-13-00                                  | Sign attachment detail         |
| 12-01-04                                  | PE Stamp added                 |

This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE- 4518**, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

# 911 SUPPORT INFORMATION AND SIGN DETAILS

**D-754-86**

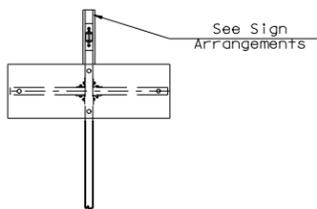
Note: See Standard Drawing D-754-87 for sign punching, stringer and support location details.

| THE POST INFORMATION FOR VARIOUS SIGN CONFIGURATIONS<br>(60 INCH VERTICAL CLEARANCE) |                       |                 |                     |                 |                |               |     |     |                |        |        |                |            |   |
|--|-----------------------|-----------------|---------------------|-----------------|----------------|---------------|-----|-----|----------------|--------|--------|----------------|------------|---|
| ASSEMBLY NUMBER  | STREET NAME SIGN SIZE | TOTAL SIGN AREA | MAXIMUM POST LENGTH | NUMBER OF POSTS | SUPPORT SIZE   | SLEEVE LENGTH |     |     | SLEEVE SIZE    | ANCHOR |        | BREAK-AWAY     |            |   |
|  |                       |                 |                     |                 |                | 1ST           | 2ND | 3RD |                | NUMBER | LENGTH |                | SIZE       |   |
|  |                       |                 |                     |                 |                | LF            | LF  | LF  |                |        |        |                |            |   |
| Inches   | SF                    | LF              |                     |                 |                |               |     |     |                |        |        |                |            |   |
| SA 1   | 24" x 12"             | 8.00            | 20.2                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 30" x 12"             | 10.00           | 16.4                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 36" x 12"             | 12.00           | 13.8                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 42" x 12"             | 14.00           | 14.7                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 48" x 12"             | 16.00           | 12.9                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 54" x 12"             | 18.00           | 15.2                | 1               | 2.25X2.25 12ga |               |     |     |                | 1      | 4.0    | 2.5x2.5 12ga   |            |   |
|  | 60" x 12"             | 20.00           | 13.7                | 1               | 2.25X2.25 12ga |               |     |     |                | 1      | 4.0    | 2.5x2.5 12ga   |            |   |
|  | 24" x 9"              | 6.00            | 24.1                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 30" x 9"              | 7.50            | 21.3                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 36" x 9"              | 9.00            | 17.7                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 42" x 9"              | 10.50           | 15.3                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 48" x 9"              | 12.00           | 13.5                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 54" x 9"              | 13.50           | 14.9                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 60" x 9"              | 15.00           | 13.4                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 24" x 6"              | 4.00            | 35.2                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 30" x 6"              | 5.00            | 28.3                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 36" x 6"              | 6.00            | 23.6                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 42" x 6"              | 7.00            | 22.3                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 48" x 6"              | 8.00            | 19.6                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 54" x 6"              | 9.00            | 17.5                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | 60" x 6"              | 10.00           | 15.4                | 1               | 2 x 2 12 ga    |               |     |     |                | 1      | 4.0    | 2.25X2.25 12ga |            |   |
|  | SA 2                  | 24" x 12"       | 13.18               | 14.5            | 1              | 2.5x2.5 12ga  |     |     |                |        | 1      | 4.0            | 3 X 3 7 ga |   |
|  |                       | 30" x 12"       | 15.18               | 16.3            | 1              | 2.5x2.5 10ga  |     |     |                |        | 2      | 4.0            | 3 X 3 7 ga | 1 |
|  |                       | 36" x 12"       | 17.18               | 15.4            | 1              | 2.5x2.5 10ga  |     |     |                |        | 1      | 4.0            | 3 X 3 7 ga | 1 |
| 42" x 12"  |                       | 19.18           | 14.7                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
| 48" x 12"  |                       | 21.18           | 15.3                | 1               | 2.25X2.25 12ga | 4.0           |     |     | 2 x 2 12 ga    | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
| 54" x 12"  |                       | 23.18           | 14.4                | 1               | 2.5x2.5 12ga   | 4.7           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
| 60" x 12"  |                       | 25.18           | 16.7                | 1               | 2.5x2.5 12ga   | 3.4           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
| 24" x 9"   |                       | 11.18           | 15.2                | 1               | 2.5x2.5 12ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     |            |   |
| 30" x 9"   |                       | 12.68           | 14.5                | 1               | 2.5x2.5 12ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     |            |   |
| 36" x 9"   |                       | 14.18           | 13.9                | 1               | 2.5x2.5 12ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     |            |   |
| 42" x 9"   |                       | 15.68           | 15.8                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
| 48" x 9"   |                       | 17.18           | 14.4                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
| 54" x 9"   |                       | 18.68           | 13.8                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
| 60" x 9"   |                       | 20.18           | 14.6                | 1               | 2.25X2.25 12ga | 4.1           |     |     | 2 x 2 12 ga    | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
| 24" x 6"   |                       | 9.18            | 16.0                | 1               | 2.5x2.5 12ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     |            |   |
| 30" x 6"   |                       | 10.18           | 15.5                | 1               | 2.5x2.5 12ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     |            |   |
| 36" x 6"   |                       | 11.18           | 15.0                | 1               | 2.5x2.5 12ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     |            |   |
| 42" x 6"   |                       | 12.18           | 13.7                | 1               | 2.5x2.5 12ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     |            |   |
| 48" x 6"   |                       | 13.18           | 15.9                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
| 54" x 6"   |                       | 14.18           | 15.4                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
| 60" x 6"   |                       | 15.18           | 14.9                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
| SA 3   |                       | 24" x 12"       | 13.93               | 16.1            | 1              | 2.5x2.5 10ga  |     |     |                |        | 1      | 4.0            | 3 X 3 7 ga | 1 |
|  |                       | 30" x 12"       | 15.93               | 15.3            | 1              | 2.5x2.5 10ga  |     |     |                |        | 1      | 4.0            | 3 X 3 7 ga | 1 |
|  |                       | 36" x 12"       | 17.93               | 14.6            | 1              | 2.5x2.5 10ga  |     |     |                |        | 1      | 4.0            | 3 X 3 7 ga | 1 |
|  | 42" x 12"             | 19.93           | 15.2                | 1               | 2.25X2.25 12ga | 4.4           |     |     | 2 x 2 12 ga    | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 48" x 12"             | 21.93           | 15.1                | 1               | 2.5x2.5 12ga   | 4.6           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 54" x 12"             | 23.93           | 20.6                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 60" x 12"             | 25.93           | 16.0                | 1               | 2.5x2.5 12ga   | 4.3           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 24" x 9"              | 11.93           | 14.1                | 1               | 2.5x2.5 12ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 30" x 9"              | 13.43           | 16.1                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 36" x 9"              | 14.93           | 15.4                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 42" x 9"              | 16.43           | 14.8                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 48" x 9"              | 17.93           | 14.3                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 54" x 9"              | 19.43           | 14.3                | 1               | 2.25X2.25 12ga | 4.6           |     |     | 2 x 2 12 ga    | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 60" x 9"              | 20.93           | 14.4                | 1               | 2.5x2.5 12ga   | 4.7           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 24" x 6"              | 9.93            | 14.7                | 1               | 2.5x2.5 12ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     |            |   |
|  | 30" x 6"              | 10.93           | 14.3                | 1               | 2.5x2.5 12ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     |            |   |
|  | 36" x 6"              | 11.93           | 13.9                | 1               | 2.5x2.5 12ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     |            |   |
|  | 42" x 6"              | 12.93           | 16.0                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 48" x 6"              | 13.93           | 14.8                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 54" x 6"              | 14.93           | 14.4                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |
|  | 60" x 6"              | 15.93           | 14.0                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga     | 1          |   |

| THE POST INFORMATION FOR VARIOUS SIGN CONFIGURATIONS<br>(60 INCH VERTICAL CLEARANCE) |                       |                 |                     |                 |                |               |     |     |                |        |        |            |            |   |
|--|-----------------------|-----------------|---------------------|-----------------|----------------|---------------|-----|-----|----------------|--------|--------|------------|------------|---|
| ASSEMBLY NUMBER  | STREET NAME SIGN SIZE | TOTAL SIGN AREA | MAXIMUM POST LENGTH | NUMBER OF POSTS | SUPPORT SIZE   | SLEEVE LENGTH |     |     | SLEEVE SIZE    | ANCHOR |        | BREAK-AWAY |            |   |
|  |                       |                 |                     |                 |                | 1ST           | 2ND | 3RD |                | NUMBER | LENGTH |            | SIZE       |   |
|  |                       |                 |                     |                 |                | LF            | LF  | LF  |                |        |        |            |            |   |
| Inches   | SF                    | LF              |                     |                 |                |               |     |     |                |        |        |            |            |   |
| SA 4   | 24" x 12"             | 15.46           | 15.1                | 1               | 2.25X2.25 12ga | 4.3           |     |     | 2 x 2 12 ga    | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 30" x 12"             | 17.46           | 14.5                | 1               | 2.25X2.25 12ga |               |     |     | 2 x 2 12 ga    | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 36" x 12"             | 19.46           | 17.5                | 1               | 2.5x2.5 12ga   | 3.1           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 42" x 12"             | 21.46           | 16.8                | 1               | 2.5x2.5 12ga   | 3.6           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 48" x 12"             | 23.46           | 16.2                | 1               | 2.5x2.5 12ga   | 4.0           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 54" x 12"             | 25.46           | 15.6                | 1               | 2.5x2.5 12ga   | 4.4           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 60" x 12"             | 27.46           | 17.2                | 2               | 2.5x2.5 12ga   |               |     |     |                | 2      | 4.0    | 3 X 3 7 ga | 2          |   |
|  | 24" x 9"              | 13.46           | 14.3                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 30" x 9"              | 14.96           | 15.1                | 1               | 2.25X2.25 12ga | 4.0           |     |     | 2 x 2 12 ga    | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 36" x 9"              | 16.46           | 14.6                | 1               | 2.25X2.25 12ga | 4.3           |     |     | 2 x 2 12 ga    | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 42" x 9"              | 17.96           | 14.1                | 1               | 2.25X2.25 12ga | 4.6           |     |     | 2 x 2 12 ga    | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 48" x 9"              | 19.46           | 17.2                | 1               | 2.5x2.5 12ga   | 3.0           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 54" x 9"              | 20.96           | 15.8                | 1               | 2.5x2.5 12ga   | 3.9           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 60" x 9"              | 22.46           | 15.4                | 1               | 2.5x2.5 12ga   | 4.2           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 24" x 6"              | 11.46           | 14.7                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 30" x 6"              | 12.46           | 14.4                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 36" x 6"              | 13.46           | 14.0                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 42" x 6"              | 14.46           | 13.7                | 1               | 2.5x2.5 10ga   |               |     |     |                | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 48" x 6"              | 15.46           | 13.9                | 1               | 2.25X2.25 12ga | 4.4           |     |     | 2 x 2 12 ga    | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 54" x 6"              | 16.46           | 14.1                | 1               | 2.5x2.5 12ga   | 4.4           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | 60" x 6"              | 17.46           | 16.8                | 1               | 2.5x2.5 12ga   | 3.0           |     |     | 2.25X2.25 12ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
|  | SA 5                  | 24" x 12"       | 21.25               | 17.2            | 2              | 2.5x2.5 10ga  |     |     |                |        | 2      | 4.0        | 3 X 3 7 ga | 2 |
|  |                       | 30" x 12"       | 23.25               | 16.7            | 2              | 2.5x2.5 10ga  |     |     |                |        | 2      | 4.0        | 3 X 3 7 ga | 2 |
|  |                       | 36" x 12"       | 25.25               | 15.9            | 2              | 2.5x2.5 10ga  |     |     |                |        | 2      | 4.0        | 3 X 3 7 ga | 2 |
| 42" x 12"  |                       | 27.25           | 15.9                | 2               | 2.5x2.5 10ga   |               |     |     |                | 2      | 4.0    | 3 X 3 7 ga | 2          |   |
| 48" x 12"  |                       | 29.25           | 16.9                | 2               | 2.25X2.25 12ga | 4.0           | 4.5 |     | 2 x 2 12 ga    | 2      | 4.0    | 3 X 3 7 ga | 2          |   |
| 54" x 12"  |                       | 31.25           | 16.5                | 2               | 2.25X2.25 12ga | 4.3           | 4.8 |     | 2 x 2 12 ga    | 2      | 4.0    | 3 X 3 7 ga | 2          |   |
| 60" x 12"  |                       | 33.25           | 16.1                | 2               | 2.25X2.25 12ga | 4.5           | 5.1 |     | 2 x 2 12 ga    | 2      | 4.0    | 3 X 3 7 ga | 2          |   |
| 24" x 9"   |                       | 19.25           | 15.5                | 1               | 2.5x2.5 10ga   | 4.7           |     |     | 2.19x2.19 10ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
| 30" x 9"   |                       | 20.75           | 15.2                | 1               | 2.5x2.5 10ga   | 4.8           |     |     | 2.19x2.19 10ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
| 36" x 9"   |                       | 22.25           | 16.7                | 2               | 2.5x2.5 10ga   |               |     |     |                | 2      | 4.0    | 3 X 3 7 ga | 2          |   |
| 42" x 9"   |                       | 23.75           | 16.3                | 2               | 2.5x2.5 10ga   |               |     |     |                | 2      | 4.0    | 3 X 3 7 ga | 2          |   |
| 48" x 9"   |                       | 25.25           | 16.0                | 2               | 2.5x2.5 10ga   |               |     |     |                | 2      | 4.0    | 3 X 3 7 ga | 2          |   |
| 54" x 9"   |                       | 26.75           | 15.7                | 2               | 2.5x2.5 10ga   |               |     |     |                | 2      | 4.0    | 3 X 3 7 ga | 2          |   |
| 60" x 9"   |                       | 28.25           | 16.8                | 2               | 2.25X2.25 12ga | 3.7           | 4.3 |     | 2 x 2 12 ga    | 2      | 4.0    | 3 X 3 7 ga | 2          |   |
| 24" x 6"   |                       | 17.25           | 15.7                | 1               | 2.5x2.5 10ga   | 4.2           |     |     | 2.19x2.19 10ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
| 30" x 6"   |                       | 18.25           | 15.5                | 1               | 2.5x2.5 10ga   | 4.3           |     |     | 2.19x2.19 10ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
| 36" x 6"   |                       | 19.25           | 15.3                | 1               | 2.5x2.5 10ga   | 4.4           |     |     | 2.19x2.19 10ga | 1      | 4.0    | 3 X 3 7 ga | 1          |   |
| 42" x 6"   |                       | 20.25           | 15.1                | 1               | 2.5x2.5 10ga   | 4.5           |     |     | 2.19x2.19 10ga | 1      |        |            |            |   |

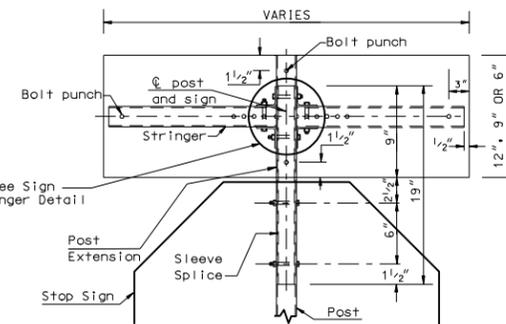
**SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS FOR STREET NAME SIGNS AND 911 SIGNING**

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



1 Post

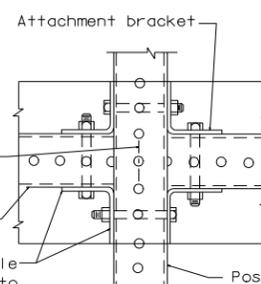
SPECIAL ASSEMBLY 1 (A,B,C,D or E)



FRONT VIEW

SLEEVE SPLICE DETAIL

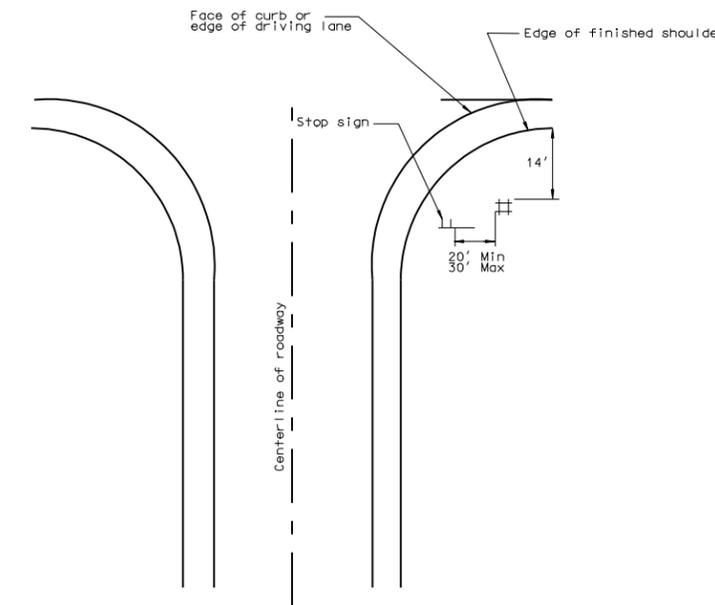
Note: The splice method may be used upon approval of the engineer.



SIGN STRINGER DETAIL

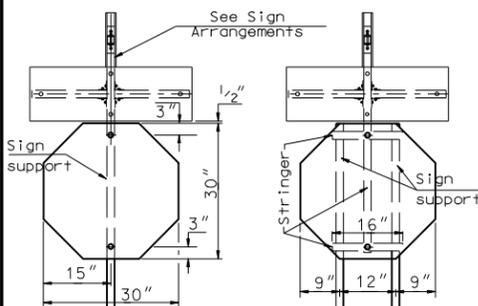
Stringers shall be the same size as the post  
Punch round hole through angle to fit stringer and post holes.

SIGN ARRANGEMENTS



INTERSECTION LAYOUT

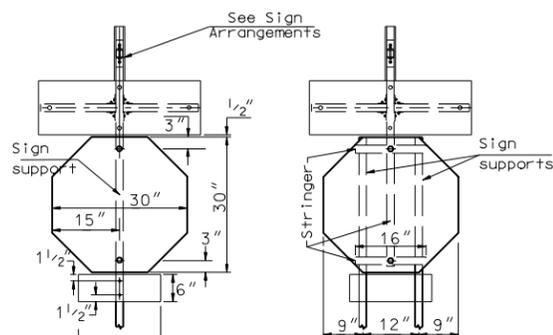
Note: This layout is to be used for street name signs or 911 signs that are used with Special Assembly 1 only.



1 Post

2 Posts

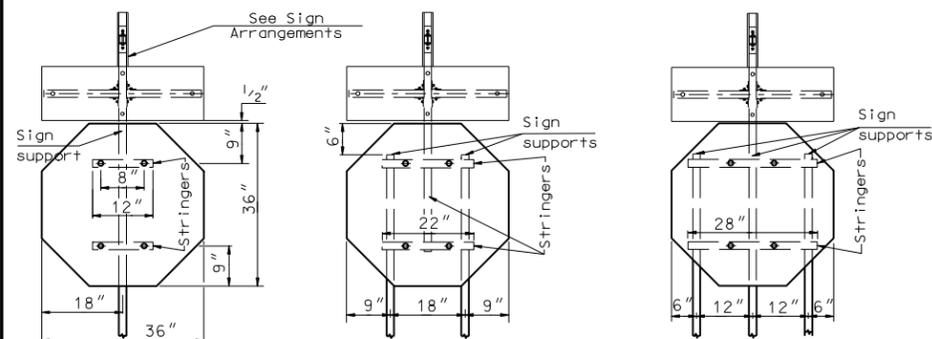
SPECIAL ASSEMBLY 2 (A,B,C,D or E)



1 Post

2 Posts

SPECIAL ASSEMBLY 3 (A,B,C,D or E)

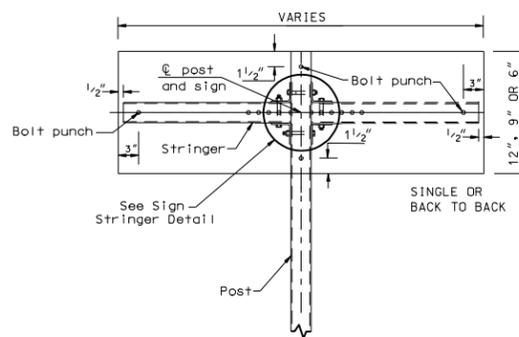


1 Post

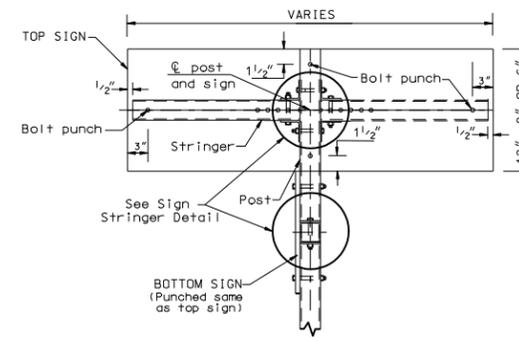
2 Posts

3 Posts

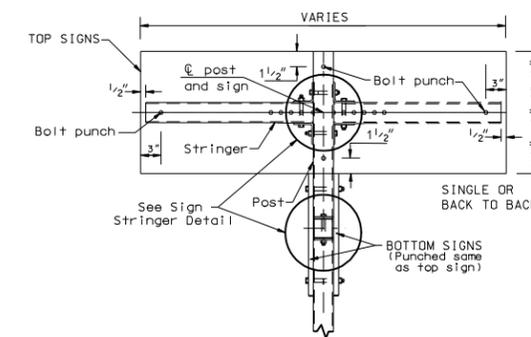
SPECIAL ASSEMBLY 4 (A,B,C,D or E)



DETAIL A or B



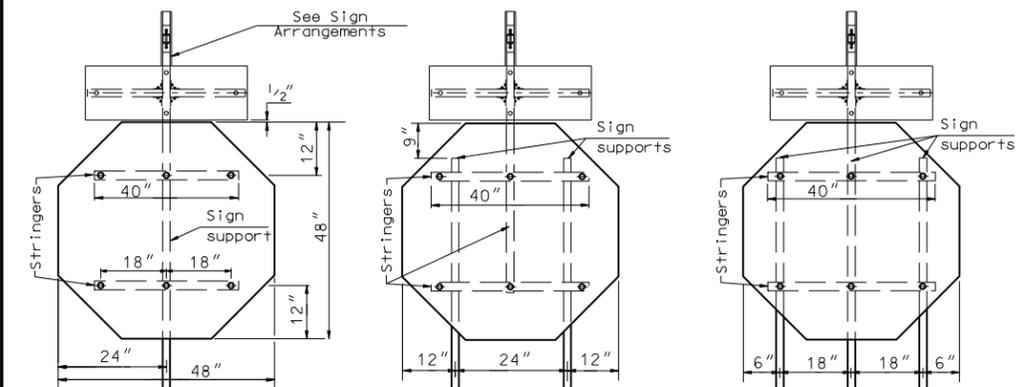
DETAIL C



DETAIL D or E

DETAIL

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



1 Post

2 Posts

3 Posts

SPECIAL ASSEMBLY 5 (A,B,C,D or E)

|  |        |   |
|--|--------|---|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        | This document was originally issued and sealed by<br><b>Roger Weigel,</b><br>Registration Number<br><b>PE- 2930 ,</b><br>on 07/10/08 and the original document is stored at the<br>North Dakota Department<br>of Transportation |
| 07-10-08                                     |        |   |
| REVISIONS                                    |        |   |
| DATE   | CHANGE |   |

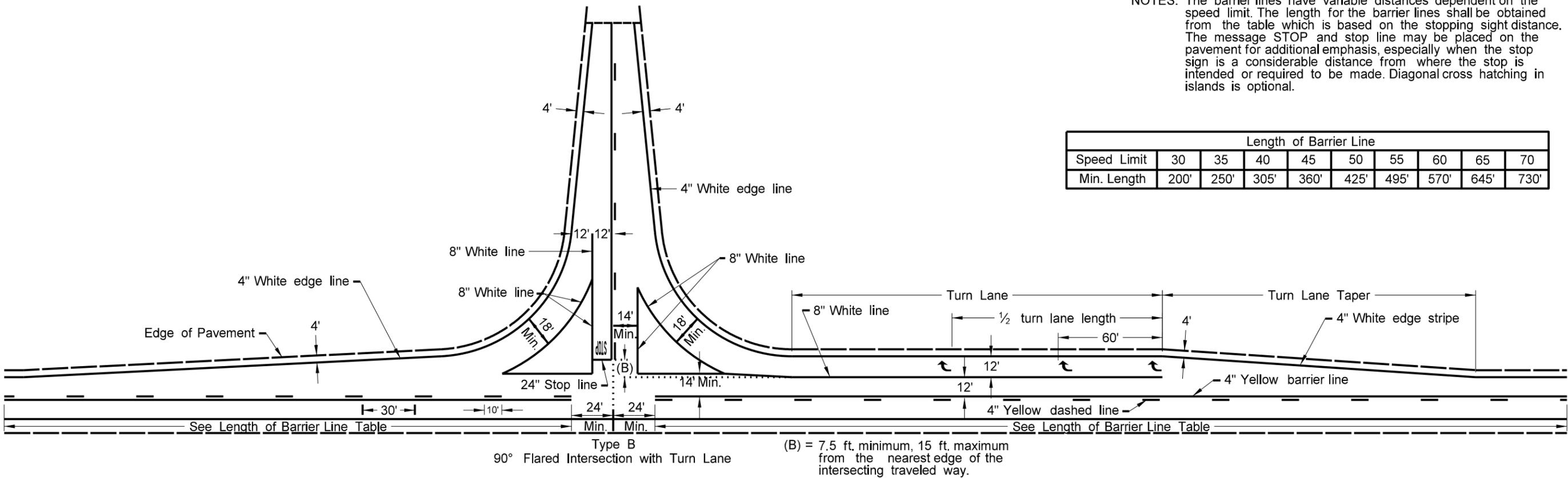


PAVEMENT MARKING FOR STANDARD 90° FLARED INTERSECTION

D-762-3

NOTES: The barrier lines have variable distances dependent on the speed limit. The length for the barrier lines shall be obtained from the table which is based on the stopping sight distance. The message STOP and stop line may be placed on the pavement for additional emphasis, especially when the stop sign is a considerable distance from where the stop is intended or required to be made. Diagonal cross hatching in islands is optional.

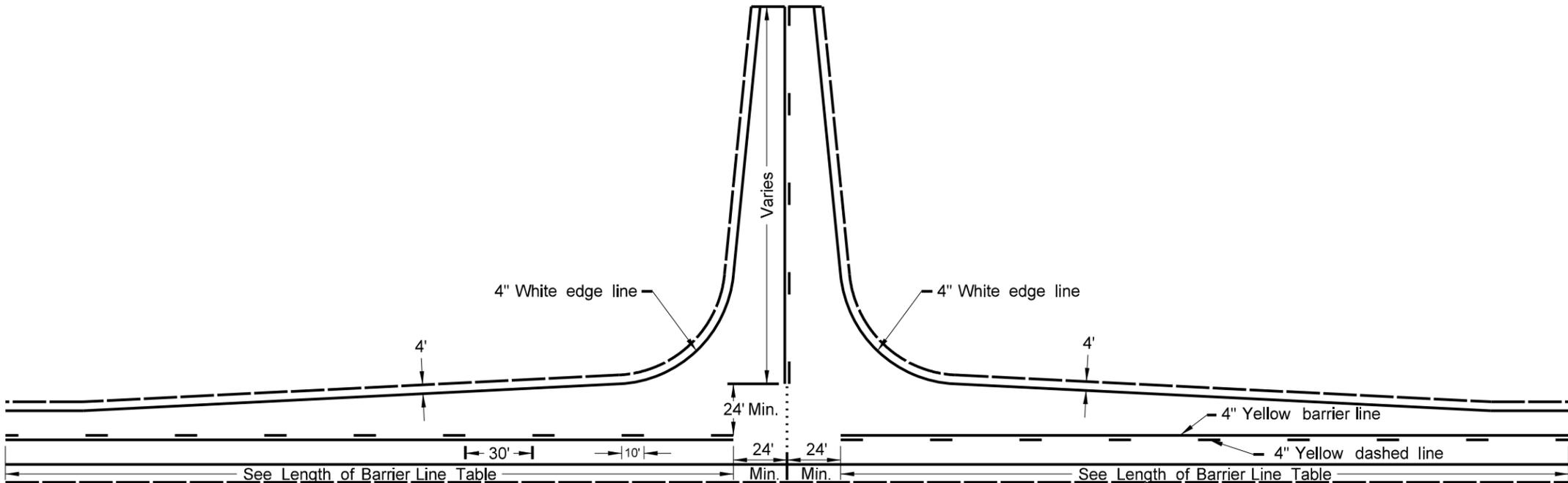
| Length of Barrier Line |      |      |      |      |      |      |      |      |      |
|------------------------|------|------|------|------|------|------|------|------|------|
| Speed Limit            | 30   | 35   | 40   | 45   | 50   | 55   | 60   | 65   | 70   |
| Min. Length            | 200' | 250' | 305' | 360' | 425' | 495' | 570' | 645' | 730' |



Type B  
90° Flared Intersection with Turn Lane  
(B) = 7.5 ft. minimum, 15 ft. maximum from the nearest edge of the intersecting traveled way.

Legend

- 4" Line
- 8" Line
- 24" Line

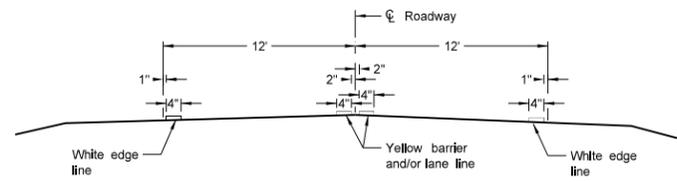


Type A  
90° Flared Intersection

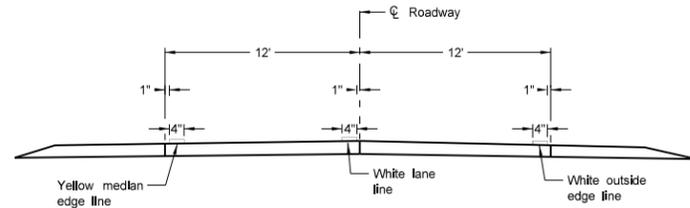
|  |                            |
|--|----------------------------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                            |
| 6-9-09                                       |                            |
| REVISIONS                                    |                            |
| DATE   | CHANGE                     |
| 9-24-09                                      | Barrier Stripe Correction  |
| 9-21-11                                      | Revised Turn Lane Markings |

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 9/21/11 and the original document is stored at the North Dakota Department of Transportation

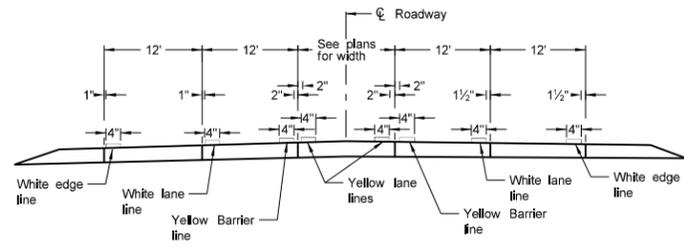
PAVEMENT MARKING



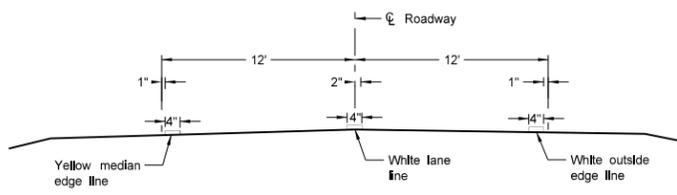
Two Lane Two Way  
RURAL ROADWAY



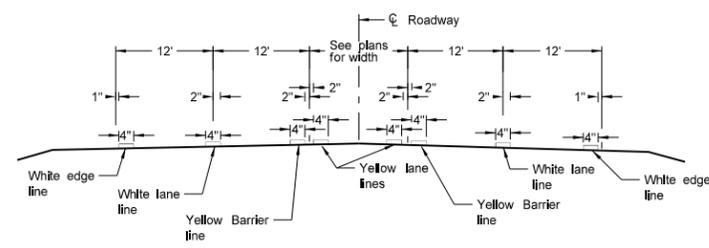
Two Lane Roadway  
INTERSTATE HIGHWAY  
Concrete Section



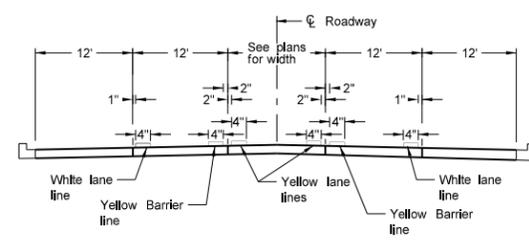
RURAL FIVE LANE ROADWAY  
Concrete Section



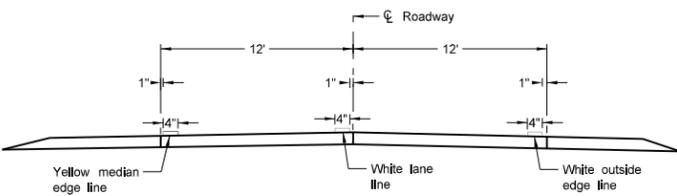
Two Lane Divided  
Rural Roadway  
PRIMARY HIGHWAY  
Asphalt Section



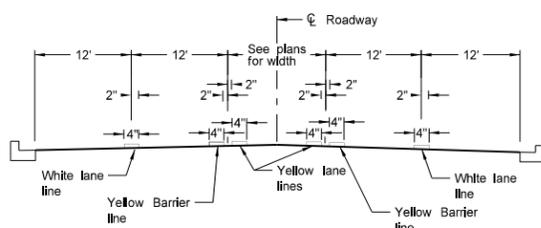
RURAL FIVE LANE ROADWAY  
Asphalt Section



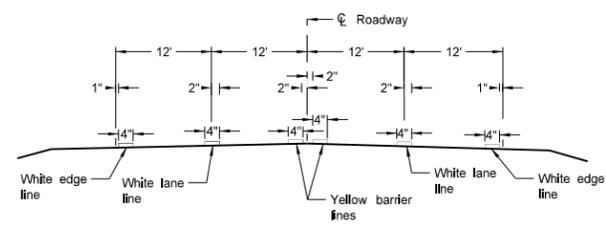
URBAN FIVE LANE SECTION  
Concrete Section



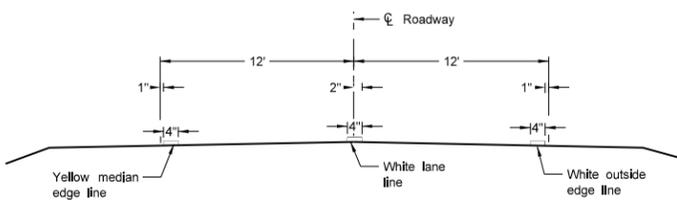
Two Lane Roadway  
PRIMARY HIGHWAY  
Concrete Section



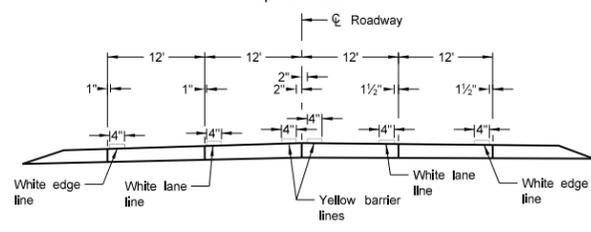
URBAN FIVE LANE SECTION  
Asphalt Section



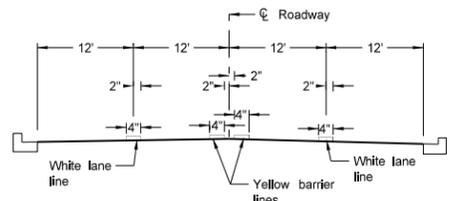
RURAL FOUR LANE ROADWAY  
Asphalt Section



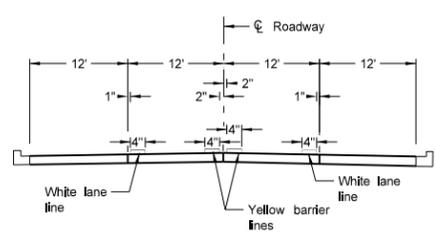
Two Lane Roadway  
INTERSTATE HIGHWAY  
Asphalt Section



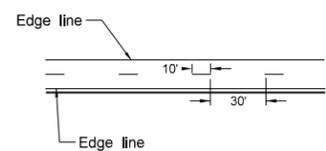
RURAL FOUR LANE ROADWAY  
Concrete Section



URBAN FOUR LANE SECTION  
Asphalt Section



URBAN FOUR LANE SECTION  
Concrete Section



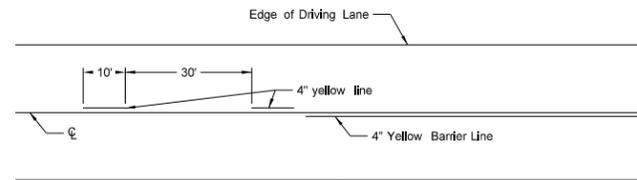
CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

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

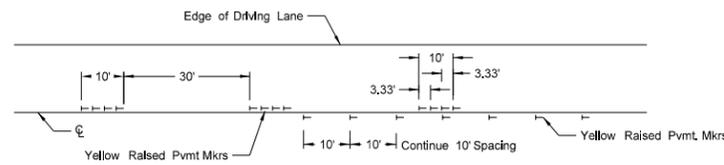
|  |        |
|--|--------|
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |        |
| 12-1-10                                      |        |
| REVISIONS                                    |        |
| DATE   | CHANGE |
|  |        |

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

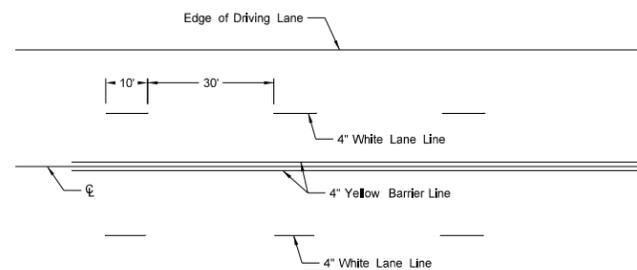
SHORT-TERM PAVEMENT MARKING



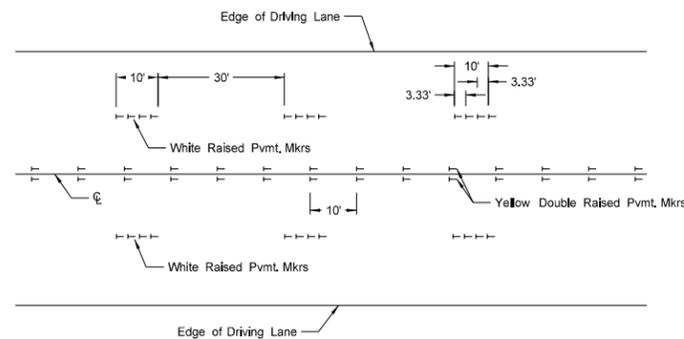
Painted or Tape Lines



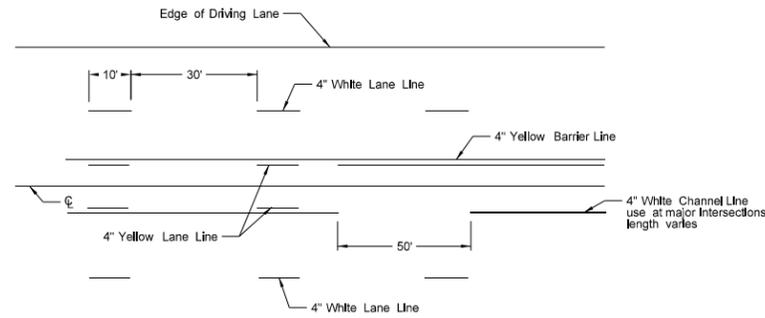
Raised Pavement Markers  
TWO-LANE TWO-WAY ROADWAY



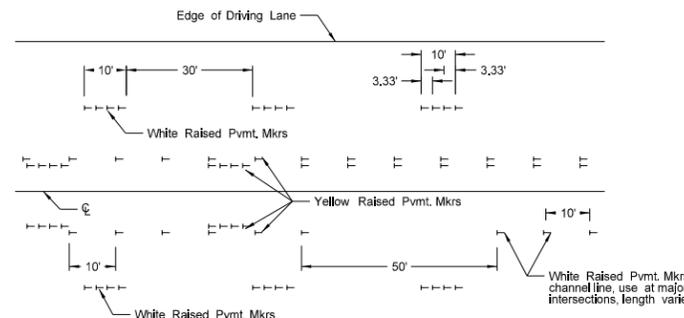
Painted or Tape Lines



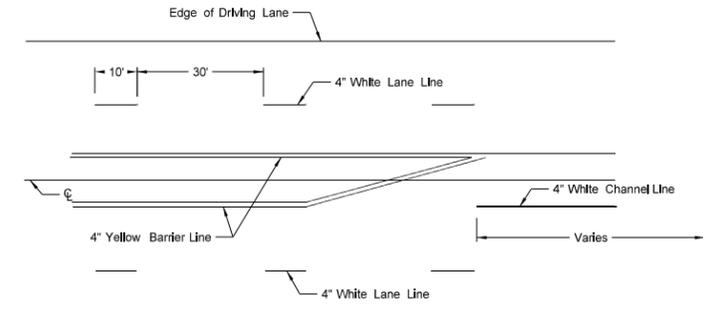
Raised Pavement Markers  
FOUR LANE ROADWAY



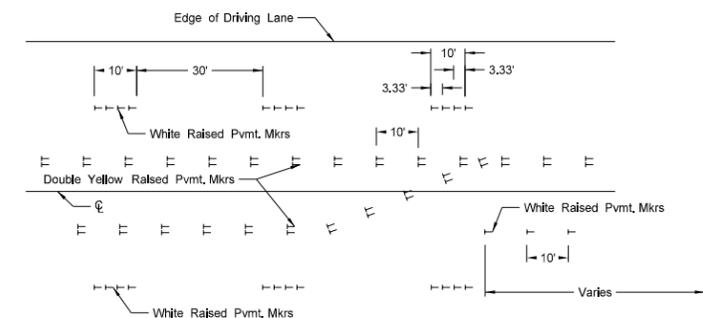
Painted or Tape Lines



Raised Pavement Markers  
FIVE LANE ROADWAY TWO WAY LEFT TURN



Painted or Tape Lines



Raised Pavement Markers  
FIVE LANE ROADWAY WITH MARKED ISLANDS

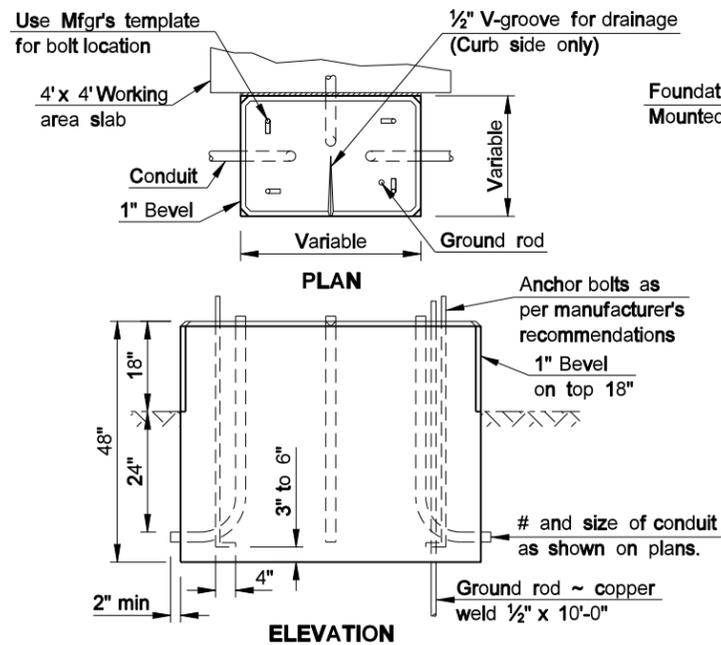
NOTES:

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

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

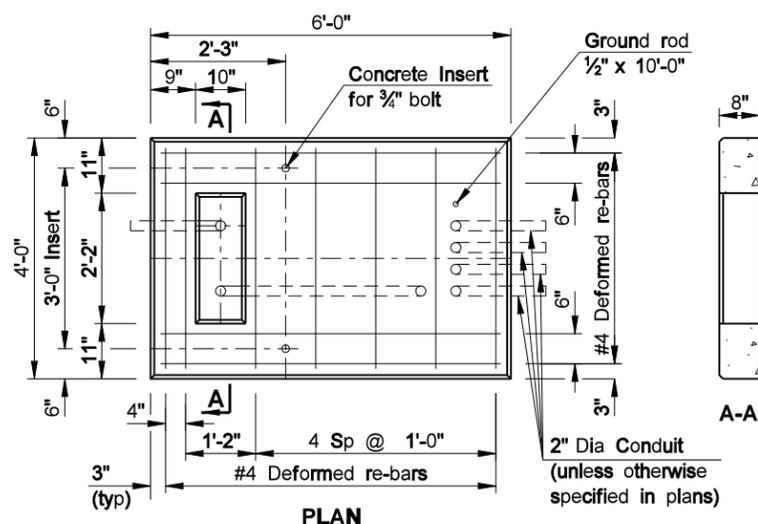
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

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

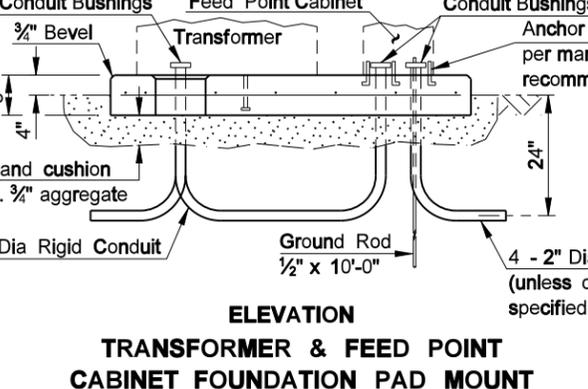


**CONTROLLER CABINET FOUNDATION PAD MOUNT**

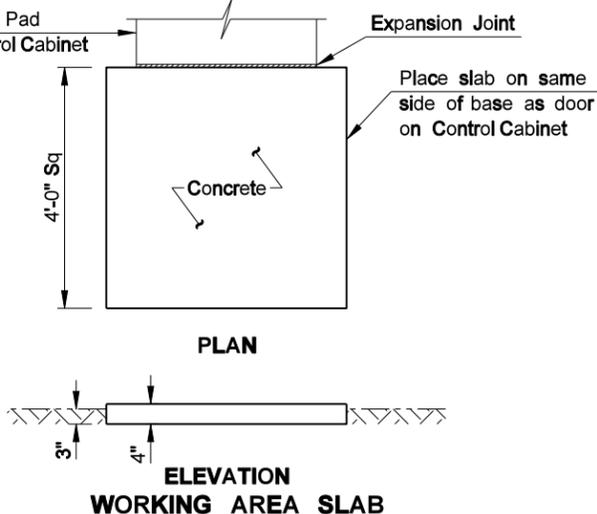
The Controller Cabinet Foundation shall be bid as Concrete Foundation - Traffic Signals.



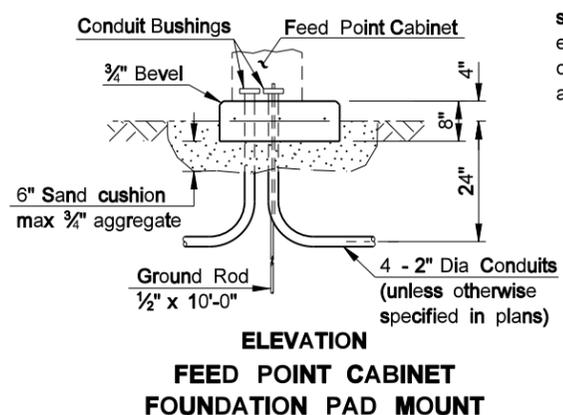
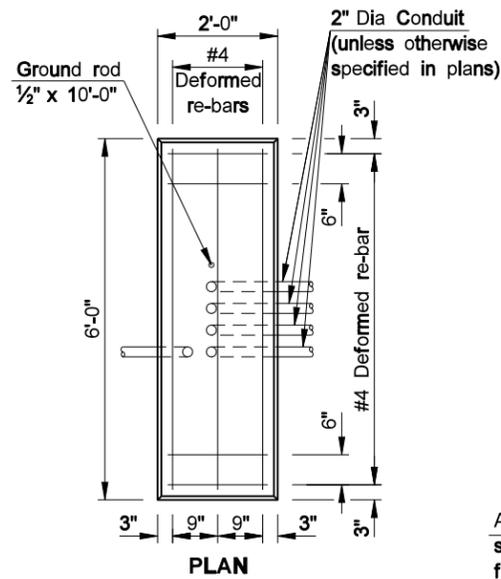
**TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT**



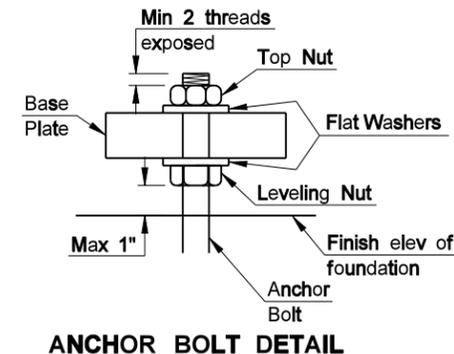
The Transformer & Feed Point Cabinet Foundation Pad Mount shall be bid as Concrete Foundation ~ Feed Point ~ Type A.



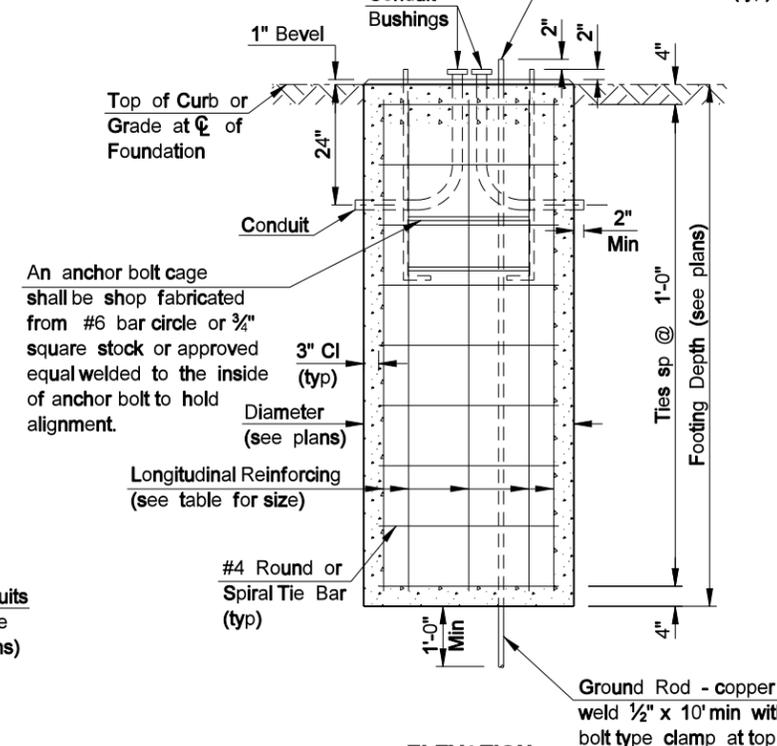
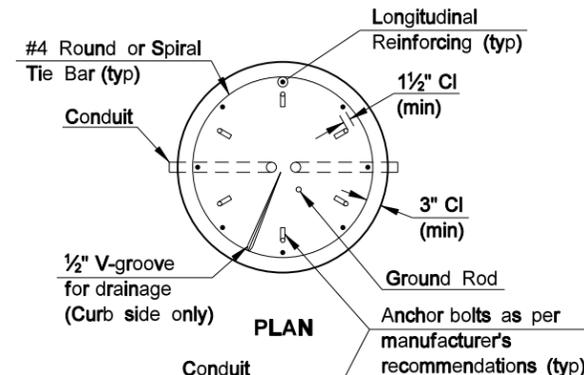
The Working Area Slab shall be installed where shown on the plans and shall not be bid separately but shall be included in the price bid for Concrete Foundation - Traffic Signals.



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



**ANCHOR BOLT DETAIL**



**LIGHT & SIGNAL STANDARD FOUNDATION**

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

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

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

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

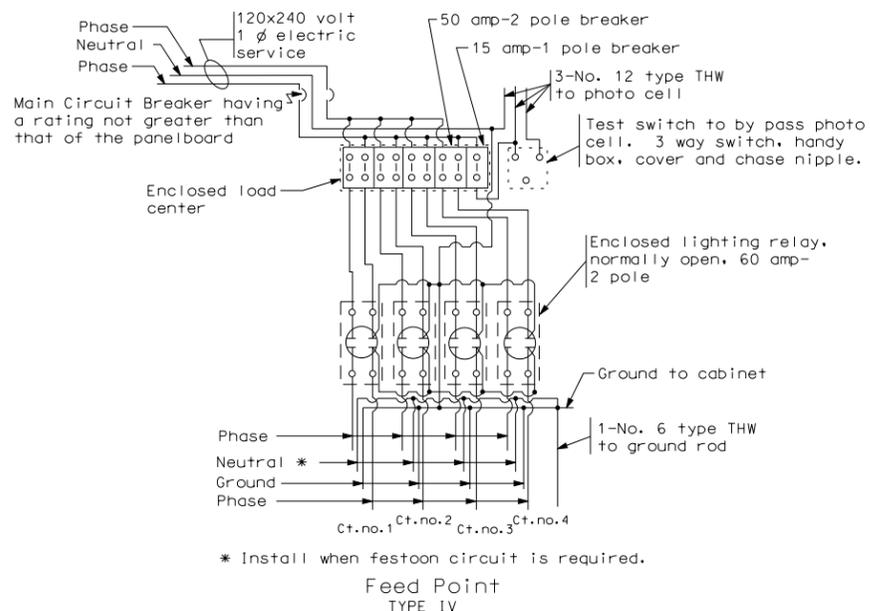
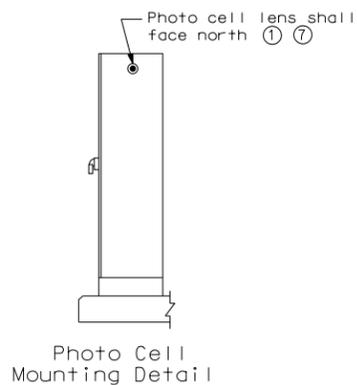
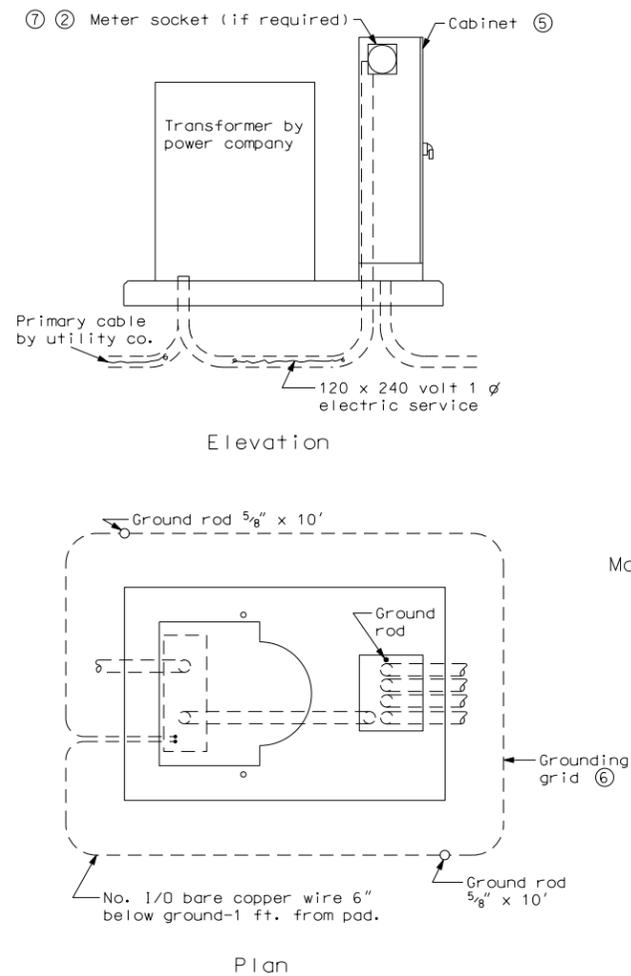
**FEED POINT CABINET FOUNDATION PAD MOUNTED:** The foundation shall have a wood float finish. All conduits shown shall be installed. Conduit that is not used at this time shall be plugged with an expandable plug.

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

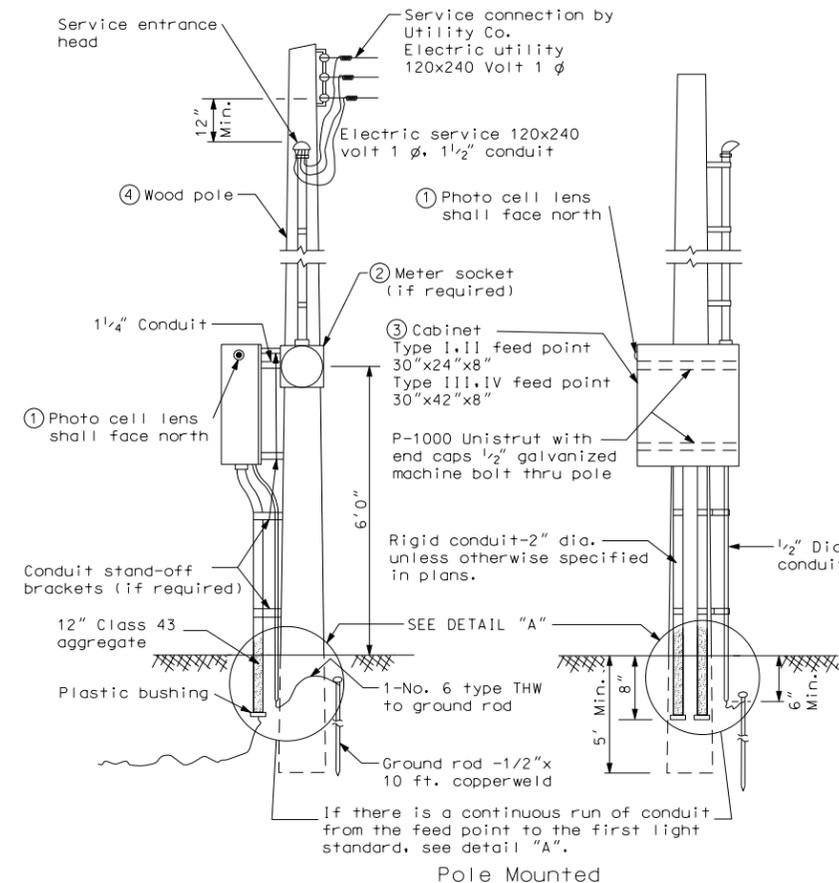
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |        |
|---|--------|
| 6-15-10                                   |        |
| REVISIONS                                 |        |
| DATE                                      | CHANGE |
|   |        |

This document was originally issued and sealed by Terrence R. Udland Registration Number PE- 2674 , on 6/15/10 and the original document is stored at the North Dakota Department of Transportation

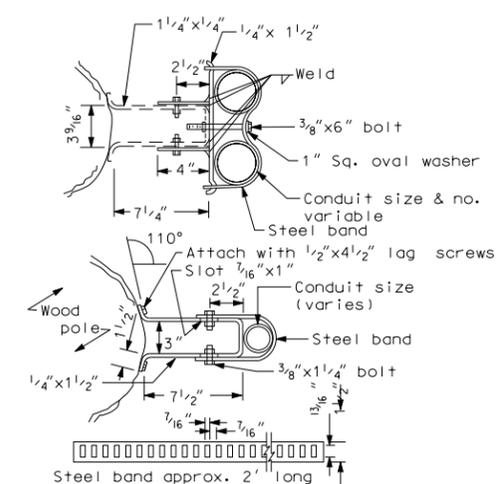
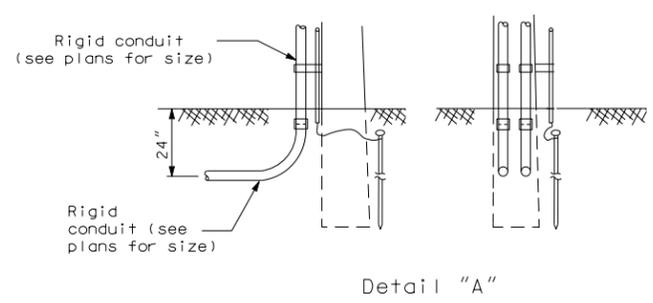
**FEED POINTS  
(ROADWAY LIGHTING)**



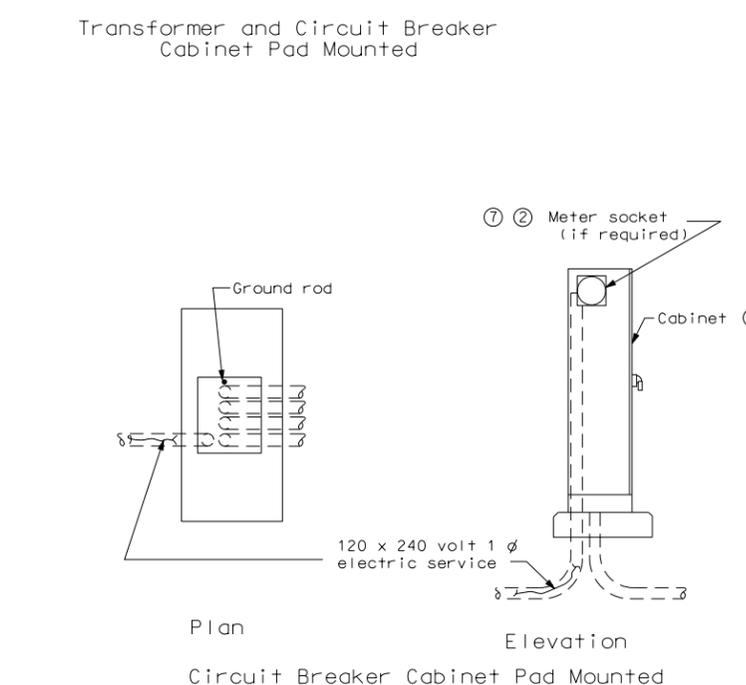
Type 1 feed point is similar to type IV except only one electrical circuit, one 50 amp-2 pole breaker and one lighting relay, normally open, shall be installed. Type II feed point is similar to type IV except only two electrical circuit, two 50 amp-2 pole breaker and two lighting relays, normally open, shall be installed. Type III feed point is similar to type IV except only three electrical circuits, three 50 amp-2 pole breakers and three lighting relays, normally open, shall be installed.



- NOTES:**
- PHOTO CELL: The electrical contractor shall furnish and install the photoelectric cell.
  - METER SOCKET: The contractor shall install the meter socket and trim if the meter is required by local utility company. Meter to be furnished and installed by utility company.
  - CABINET: Cabinet shall be N.E.M.A. 12 rating with lock drip shield and 1/2" plywood backing, stainless steel hardware. Paint plywood with 2 coats of oil base gray. Cabinet shall be shop coated with one coat of primer & have two coats of exterior gray enamel.
  - WOOD POLE: Minimum 20 ft. Class VII full length penta pressure treated wood pole. (if required, see layout sheets)
  - CABINET: Cabinet shall be 56" high x 26" wide x 14" deep. Minimum 12 ga. steel with provisions for padlock. Cabinet shall be weatherproof. Cabinet shall have one shop coat of primer and two field coats of exterior dark green enamel.
  - GROUNDING GRID: The grounding grid shall have a ground resistance not to exceed 25 ohms. This shall be obtained by one or more 5/8"x10' copperweld ground rods in parallel or series at two corners. Minimum distance between ground unit assemblies shall be 6'0".
  - METER LOCATION: The meter (if required) shall not be mounted on the same side of the cabinet as the photo-cell is mounted.



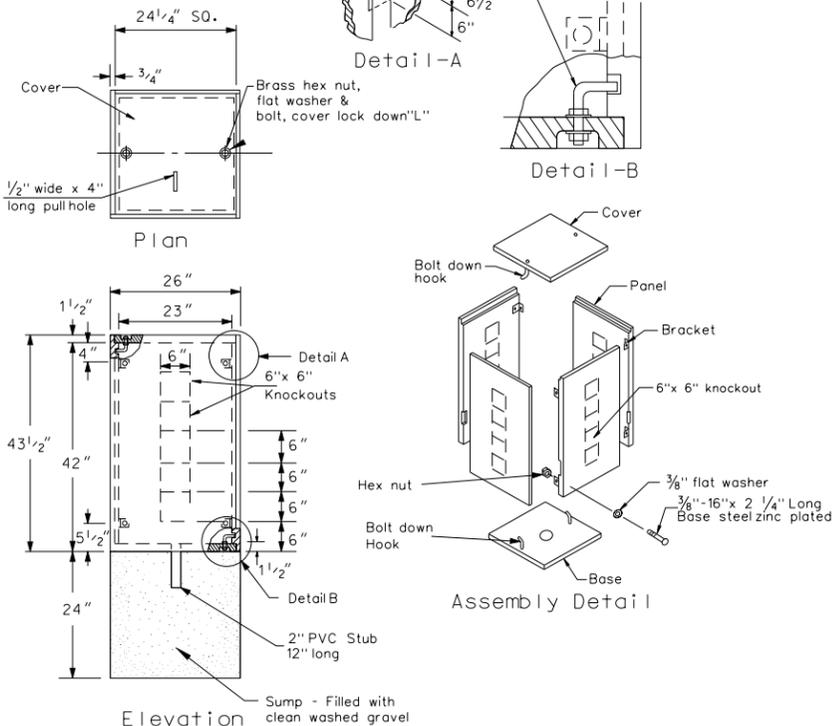
The conduit standoff brackets may be omitted if not required by the local utility company.



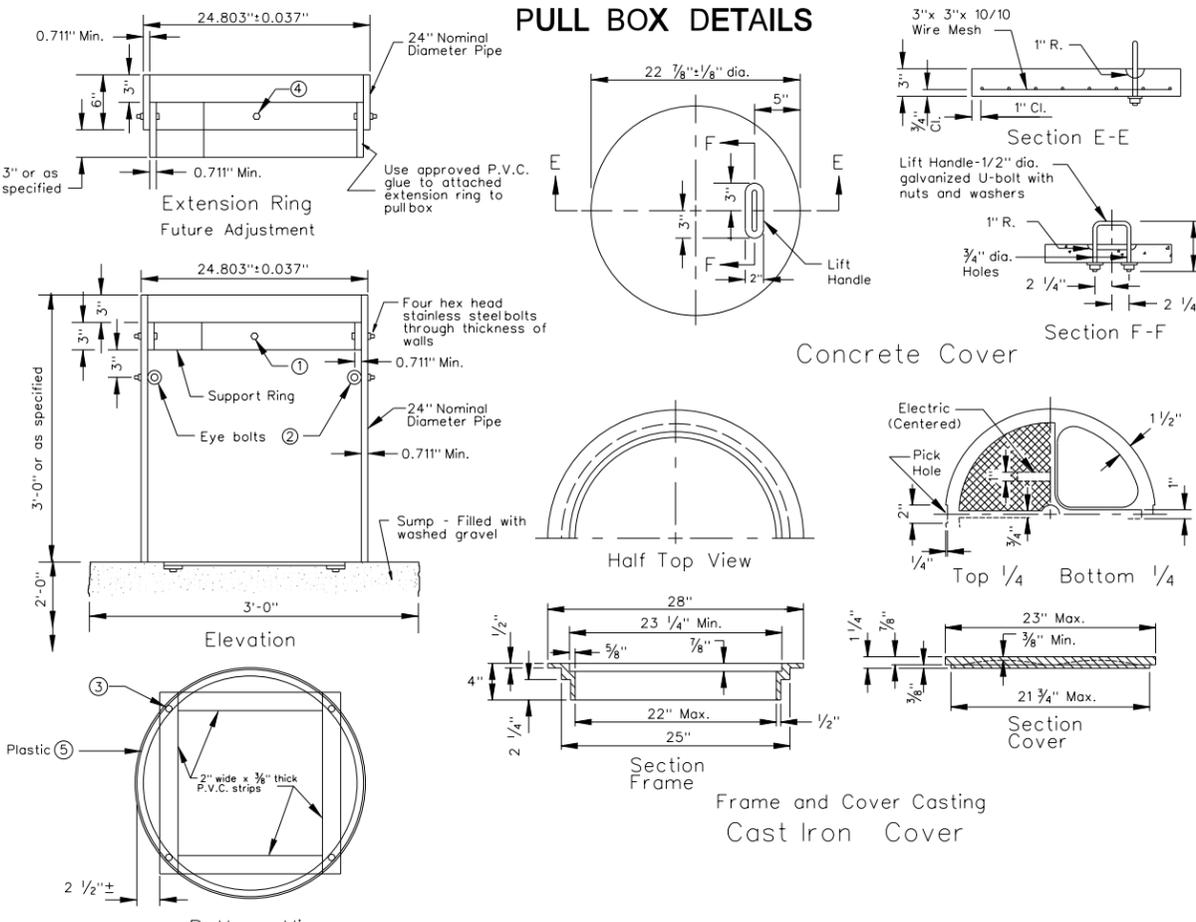
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                 |
|--|-----------------|
| 10-1-86                                      |                 |
| REVISIONS                                    |                 |
| DATE   | CHANGE          |
| 01-28-91                                     | Cabinet note    |
| 03-20-91                                     | Conduit         |
| 09-01-92                                     | Feed point      |
| 06-19-03                                     | Minor revisions |
| 12-01-04                                     | PE Stamp added  |

This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE- 4518**, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

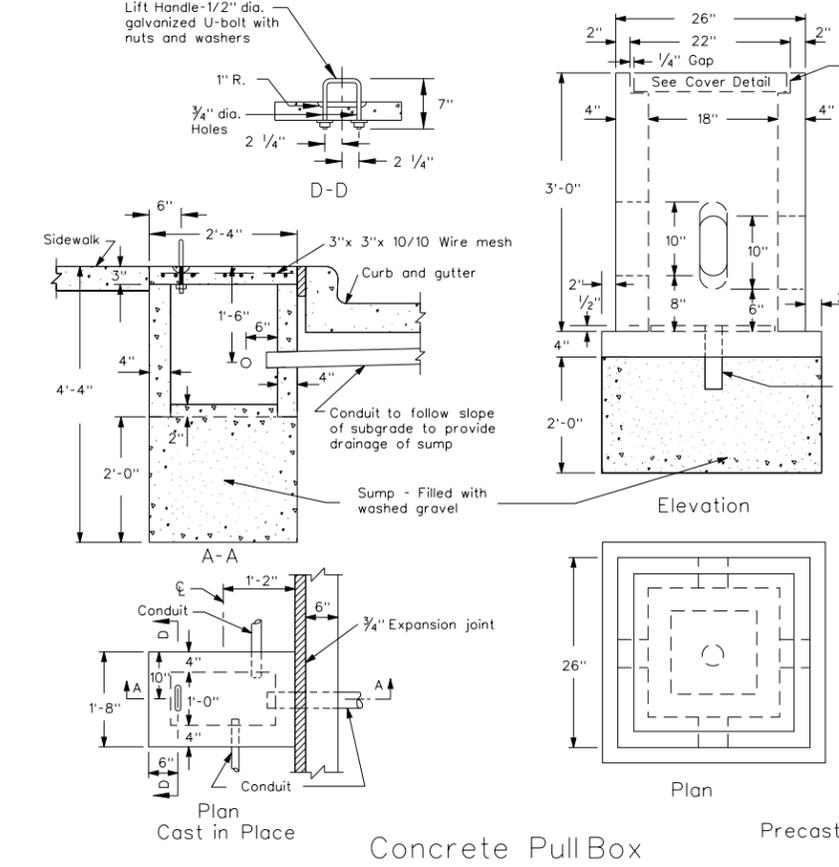
NOTE: Fiberglass pullbox is composed of fiberglass skins and reinforced mortar structural elements in combination with polyurethane foam cells.



Fiberglass Pull Box



PVC Pull Box

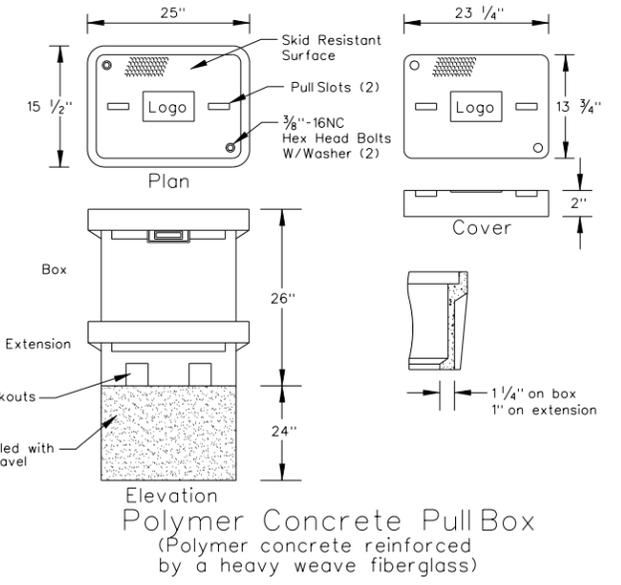


Concrete Pull Box

Precast Concrete

Precast Concrete Pull Box Cover Detail

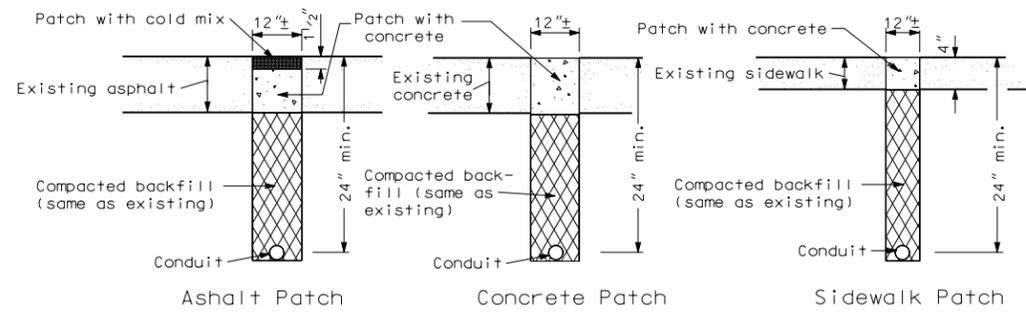
- PVC PULL BOX NOTES:**
- Attach split 24" nominal diameter PVC cover support ring with four 3/8" dia. x 2" long stainless steel hex head bolts with nuts at 90 degrees apart.
  - Two type 2 shoulder eye bolts, 3/8" dia. x 1 1/4" shank length with hex nuts 180 degrees apart (for lifting pull box and supporting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



| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                          |
|---|--------------------------|
| 10-1-86                                   |                          |
| REVISIONS                                 |                          |
| DATE                                      | CHANGE                   |
| 04-26-94                                  | Add NEENAH cover         |
| 10-11-94                                  | Lift handle & polymer    |
| 03-20-95                                  | Concrete pull box        |
|   | Add PVC pull box         |
| 05-28-99                                  | Pull box cover thickness |
| 06-08-99                                  | Rural pull box detail    |
| 09-14-99                                  | Added cast iron cover    |
| 12-01-04                                  | PE Stamp added           |

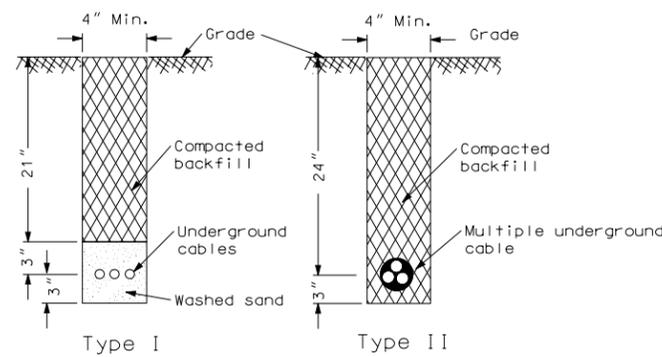
This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE- 4518**, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

**LIGHTING AND SIGNAL DETAILS**



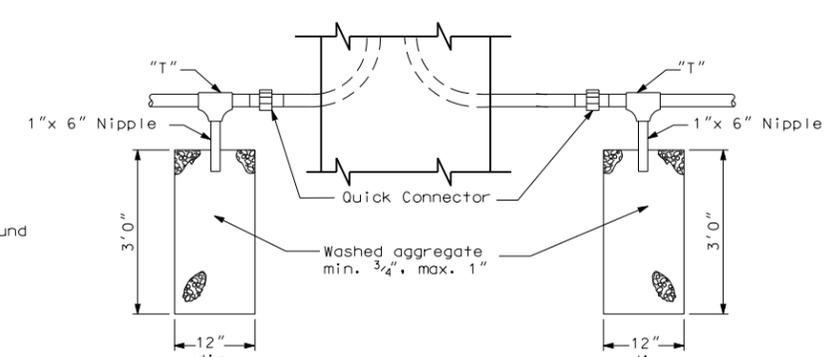
Surface Patch Details

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



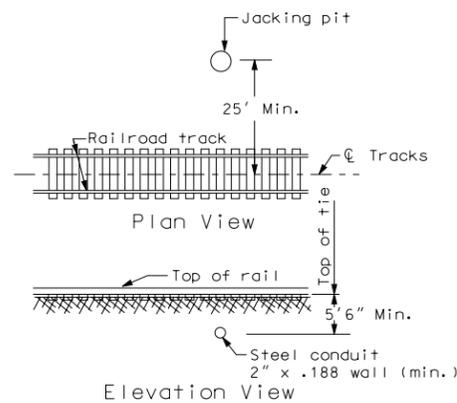
Cable Trench

The entire area which is disturbed by the trenching shall be sodded, or as directed by the Engineer. The cost shall be included in the price bid for "Cable Trench."

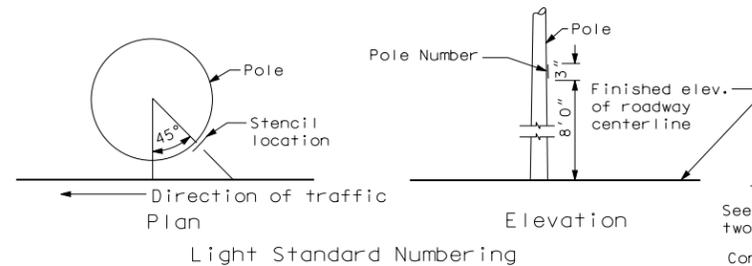


Drainage Pit

Drainage pits shall be installed in both ends of the conduit runs. Except where conduit slopes enough for drainage to one end. (To be used for Traffic Signal Conduit Runs Only)

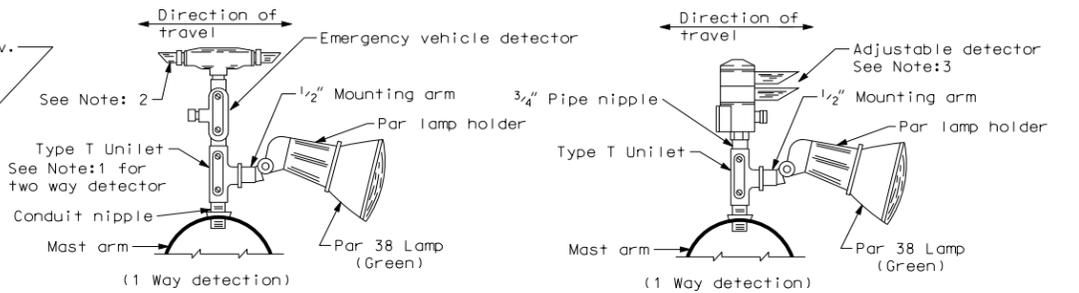


Railroad Track Conduit Placement



Light Standard Numbering

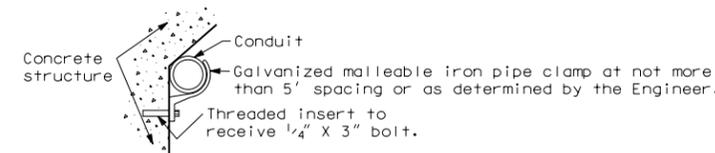
Note:  
Pole Numbering: The contractor shall stencil on each light standard the pole number in black paint on the roadway side of the pole, or adhesive coated plastic such as Scotch cal. Manufactured by 3M as approved by the Engineer. See layout sheets for pole numbers.



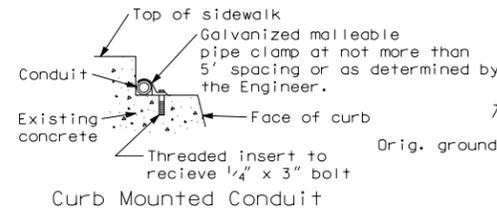
Emergency Vehicle Detector Detail (Location as shown in plans)

Alternate Emergency Vehicle Detector Detail (Adjustable) (Location as shown in plans)

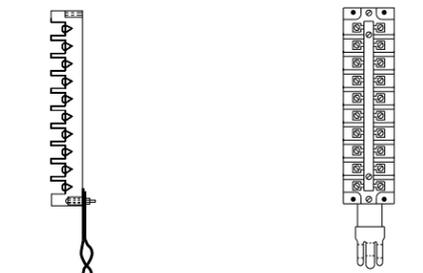
Notes:  
1. Two-way Detector shall have Type X Unilet with two Par lamp holders and lamps (one in each direction).  
2. One-way Detector shall have the unused end plugged with metal pipe plug.  
3. Two-way Detector shall have the detector lens rotated to face the direction of travel, and shall have Type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



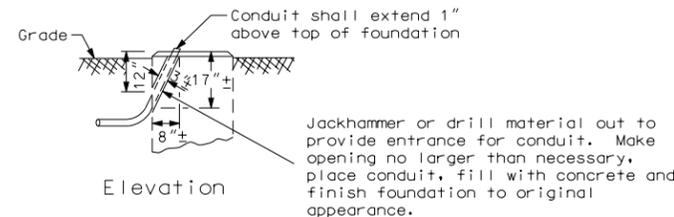
Bridge Mounted Conduit Hanger



Curb Mounted Conduit



Terminal Block (Rigid Mounted)

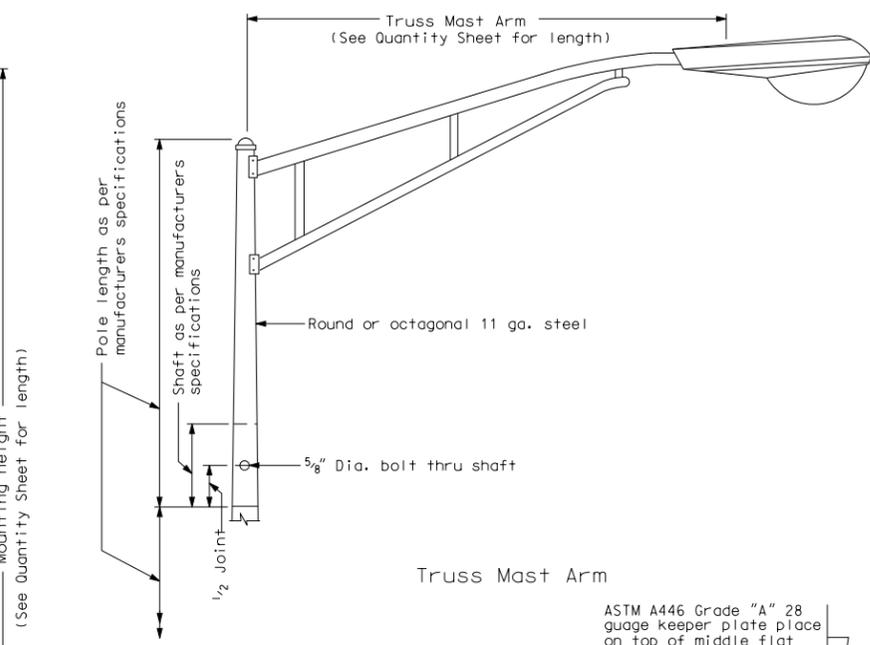
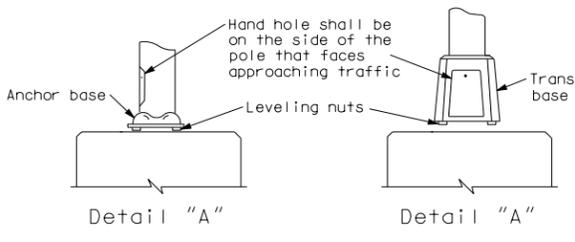
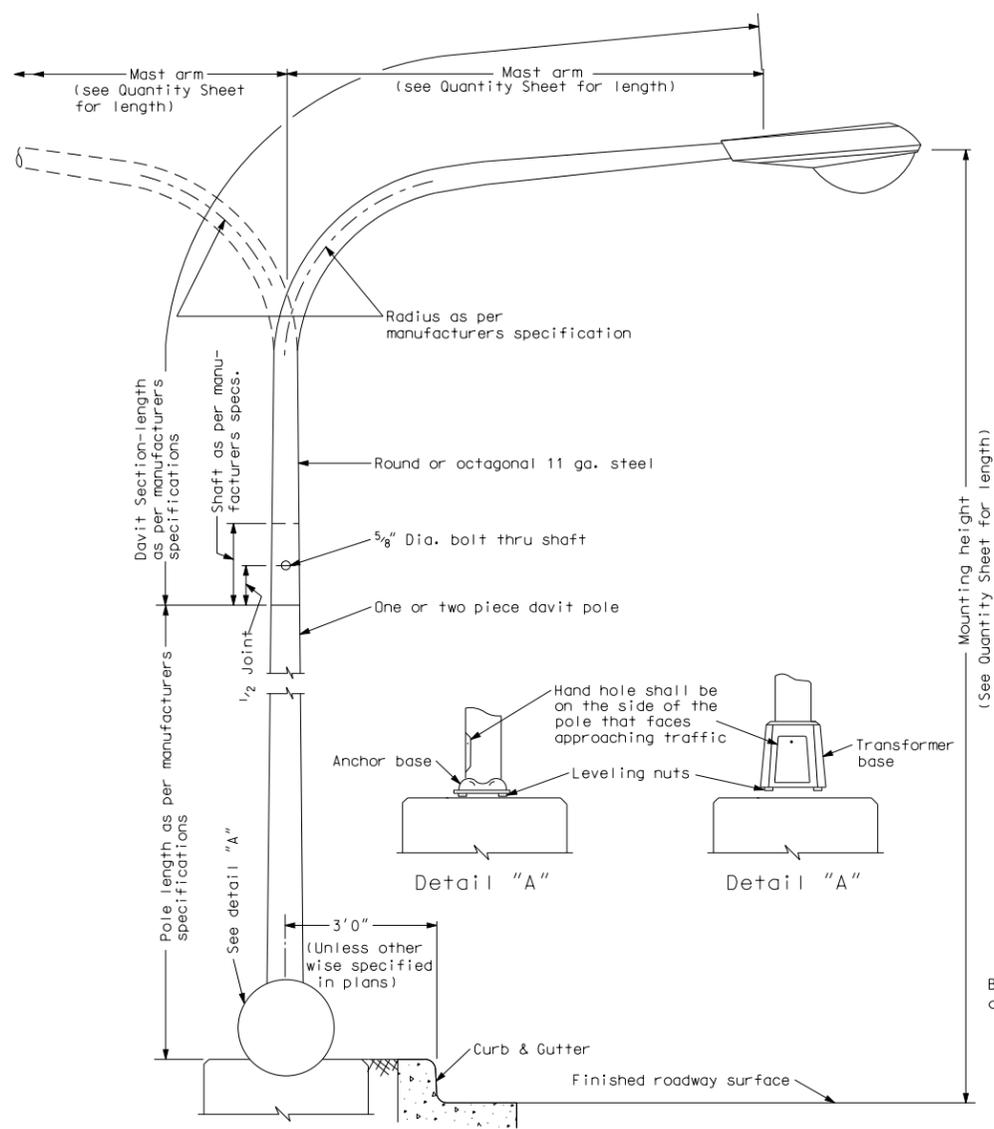


Revise Concrete Foundation

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                 |
|---|-----------------|
| 10-1-86                                   |                 |
| REVISIONS                                 |                 |
| DATE                                      | CHANGE          |
| 11-07-90                                  | Track clearance |
| 06-19-03                                  | Minor revisions |
| 12-01-04                                  | PE Stamp added  |

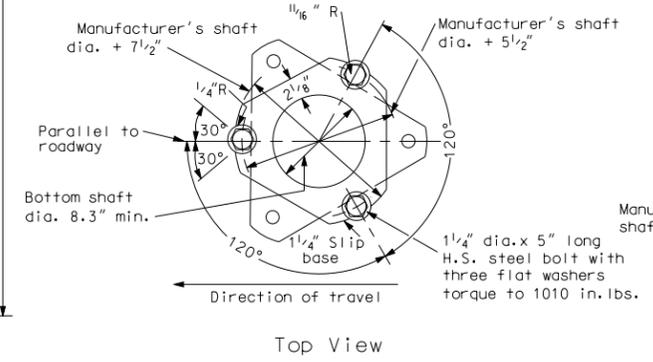
This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE- 4518**, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

LIGHT STANDARD DETAILS

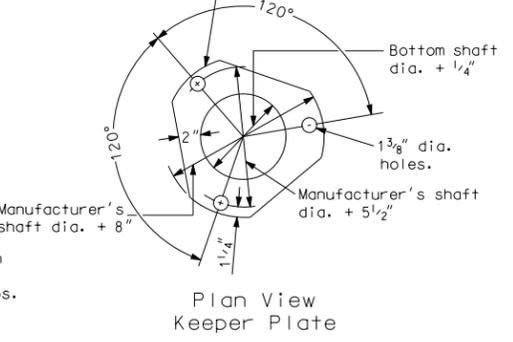


Truss Mast Arm

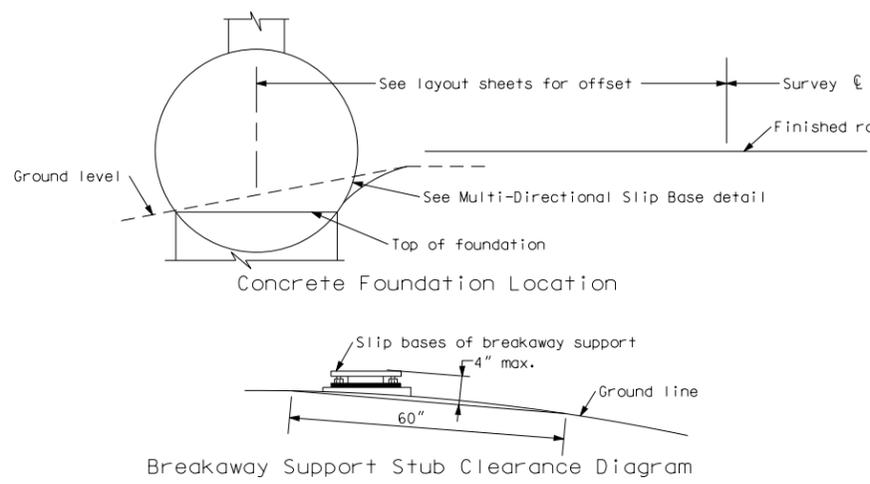
ASTM A446 Grade "A" 28 gauge keeper plate place on top of middle flat washer. Keeper plate shall be galvanized after fabrication.



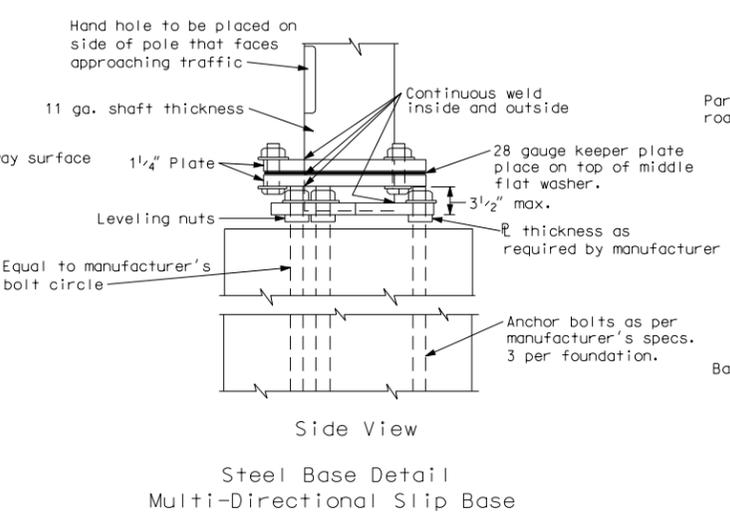
Top View



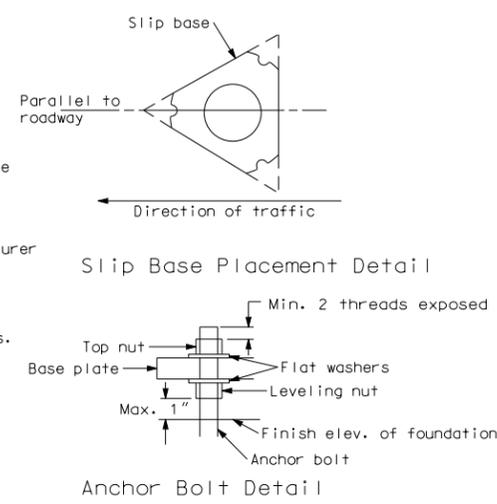
Plan View Keeper Plate



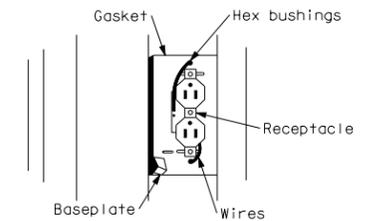
Breakaway Support Stub Clearance Diagram



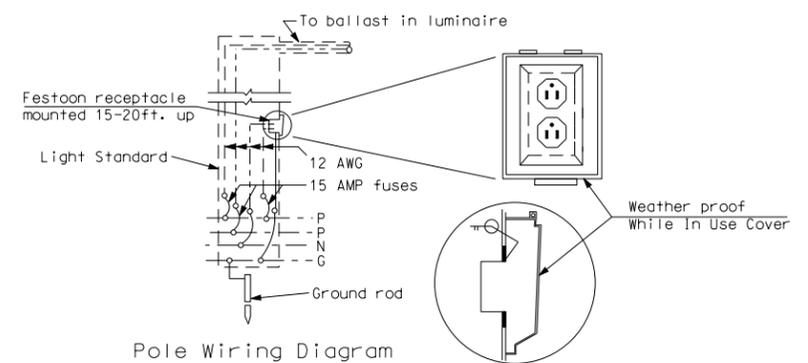
Steel Base Detail Multi-Directional Slip Base



Anchor Bolt Detail



Optional - Festoon receptacle mounted on multi-sided pole.



Pole Wiring Diagram

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

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

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

Mast Arm: See quantity sheet for length.

Luminaire: Shall be internal ballast-constant wattage 120 x 240 voltage. See layout sheets for type of luminaire, wattage, I.E.S. distribution, and operating system.

Fusing: Fusing in base, see specifications.

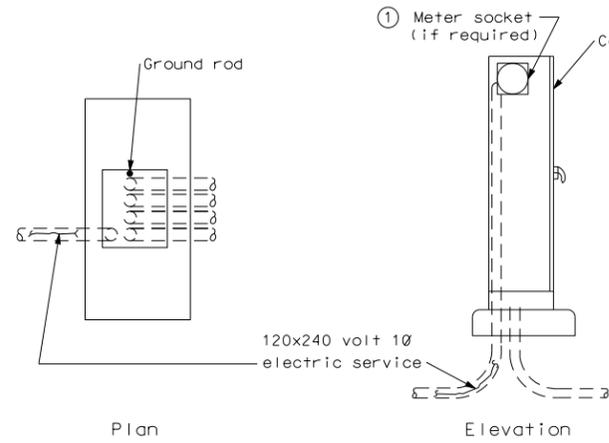
- Slip Base Bolt Torque Procedure:
1. Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and to clean bolt threads, then loosen.
  2. Retighten bolts with a systematic order to prescribed torque.
  3. Loosen each bolt and retighten to prescribed torque in same order as initial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

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                         |
|---|-------------------------|
| 10-1-86                                   |                         |
| REVISIONS                                 |                         |
| DATE                                      | CHANGE                  |
| 11-13-02                                  | Location note added     |
| 08-21-03                                  | Rev. festoon receptacle |
| 12-01-04                                  | PE Stamp added          |

This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE- 4518**, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

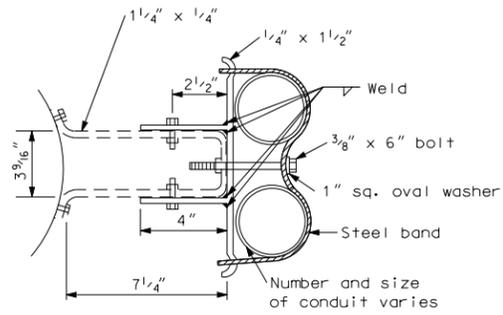
# FEED POINT - TRAFFIC SIGNALS

D-772-1



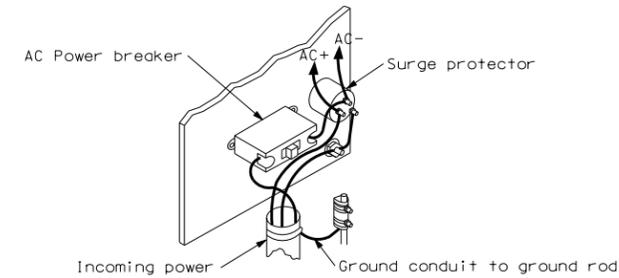
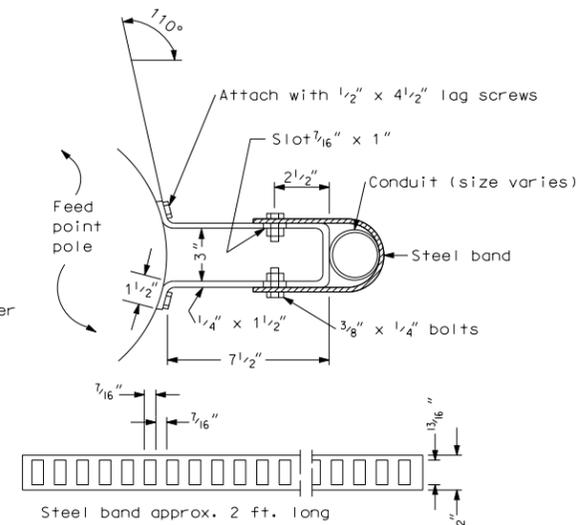
Circuit Breaker Cabinet Pad Mounted

Cabinet shall be 56" high x 26" wide x 14" deep. Minimum 12 ga. steel with provisions for padlock. Cabinet shall be weatherproof. Cabinet shall have one shop coat of primer and two field coats of exterior dark green enamel.

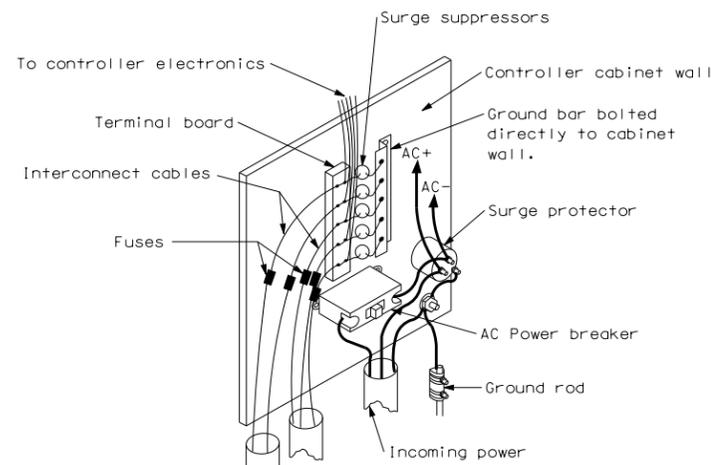


Conduit Standoff Bracket

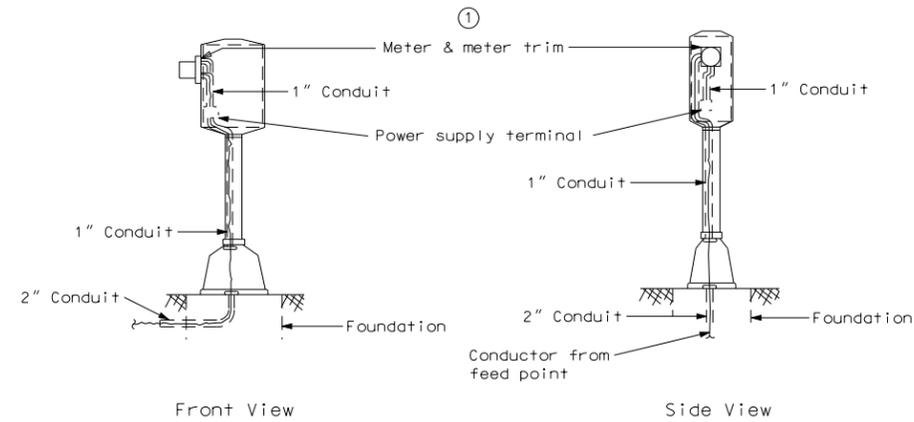
The conduit standoff brackets may be omitted if not required by the local utility company.



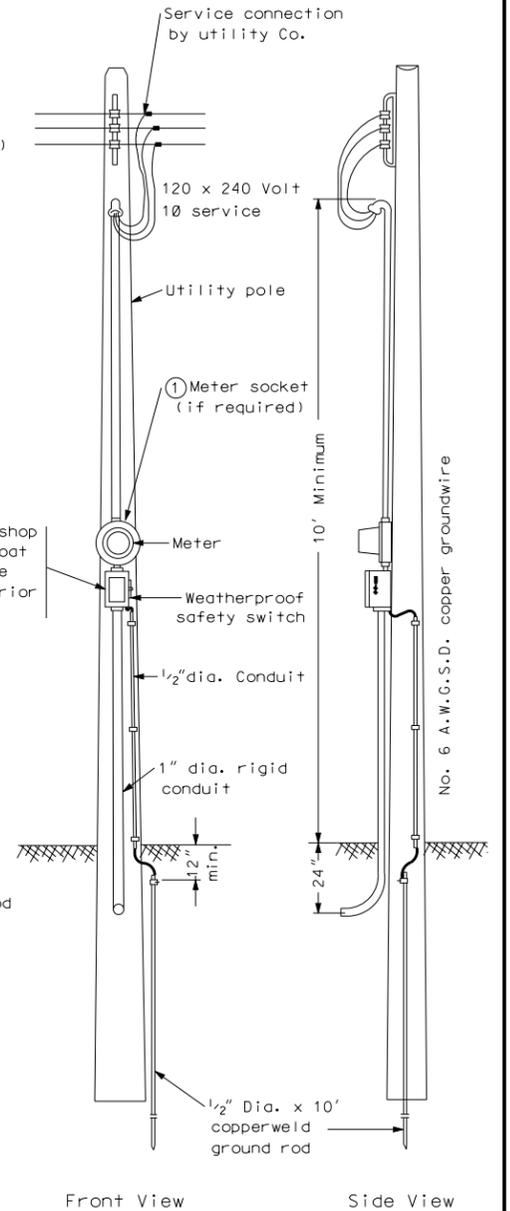
Feed Point Cabinet Lightning Protection



Controller Cabinet Interconnect & Power Cable Lightning Protection



Meter Mounting Detail  
Pre-Timed Controller Cabinet Mounting



Front View Side View

NOTE: Traffic signal controller shall be operated on 120 volts.

① METER SOCKET: The contractor shall install the meter socket and trim if meter is required by local utility company. Meter to be furnished and installed by utility company.

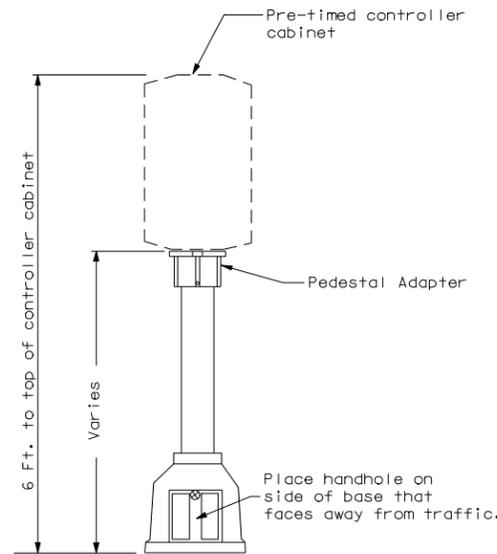
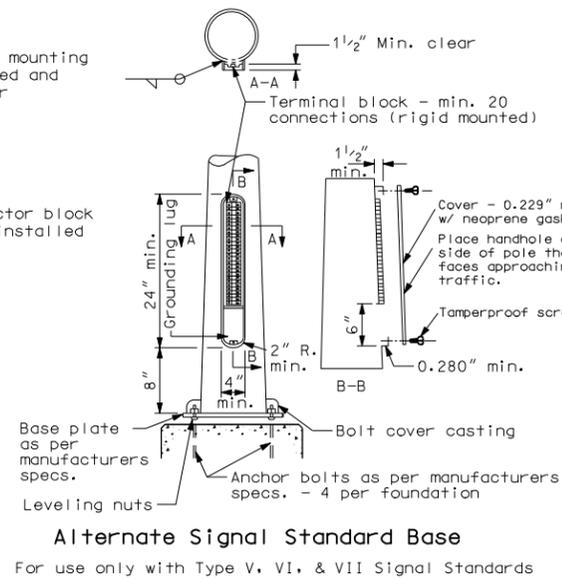
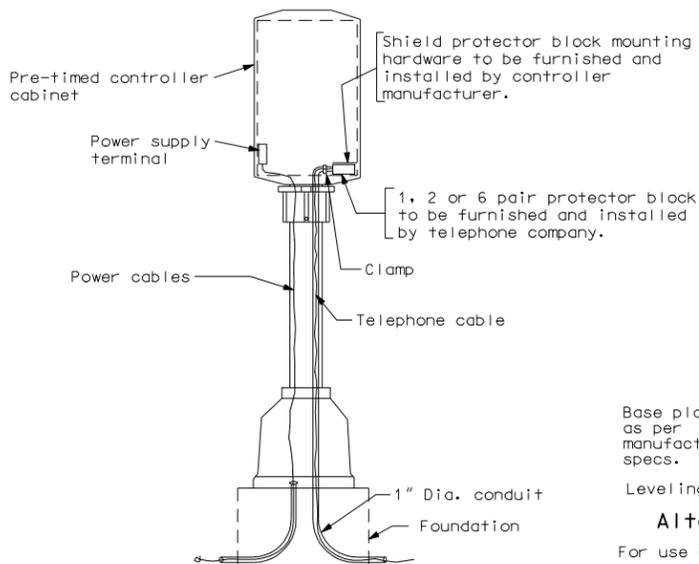
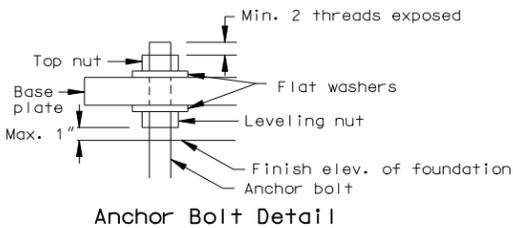
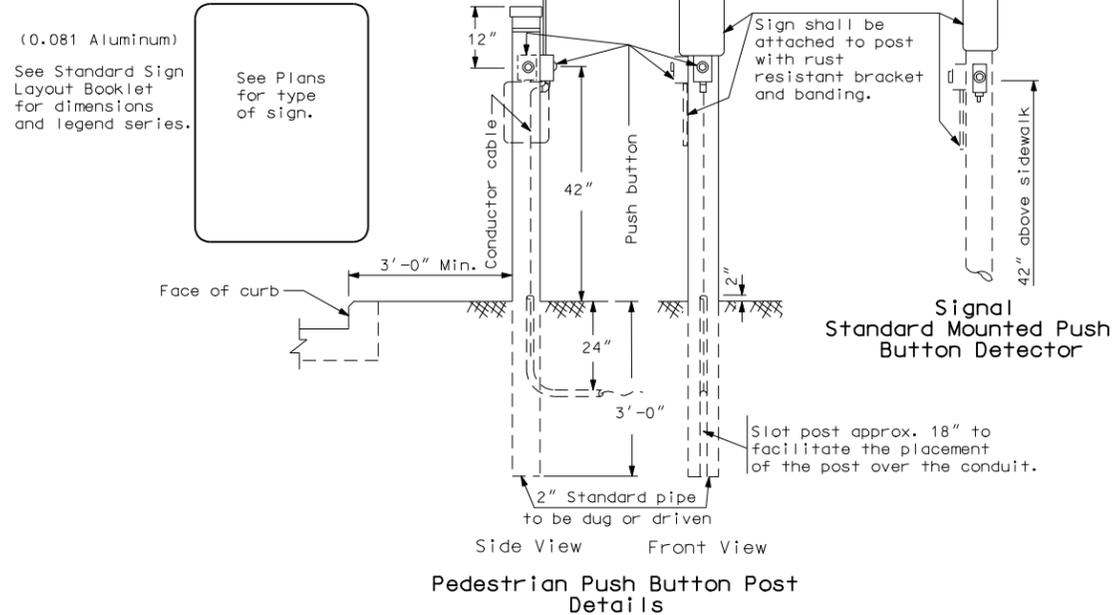
| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION |                 |
|--|-----------------|
| 10-1-86                                      |                 |
| REVISIONS                                    |                 |
| DATE   | CHANGE          |
| 01-28-91                                     | Cabinet note    |
| 06-18-03                                     | Minor revisions |
| 12-01-04                                     | PE Stamp added  |

This document was originally issued and sealed by  
**MARK S. GAYDOS**  
Registration Number  
**PE- 4518** ,  
on 12/01/04 and the original document is stored at the  
North Dakota Department  
of Transportation

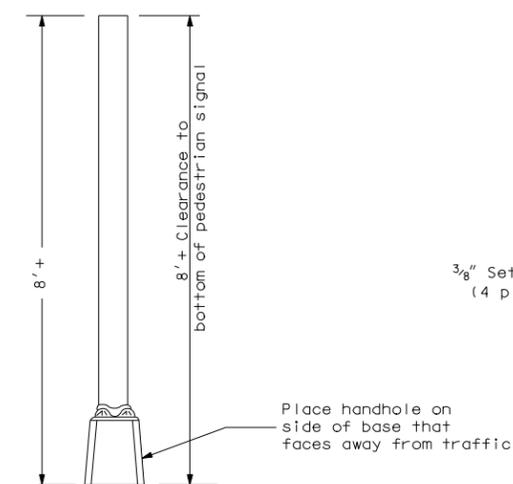
# TRAFFIC SIGNAL STANDARDS

D-772-2

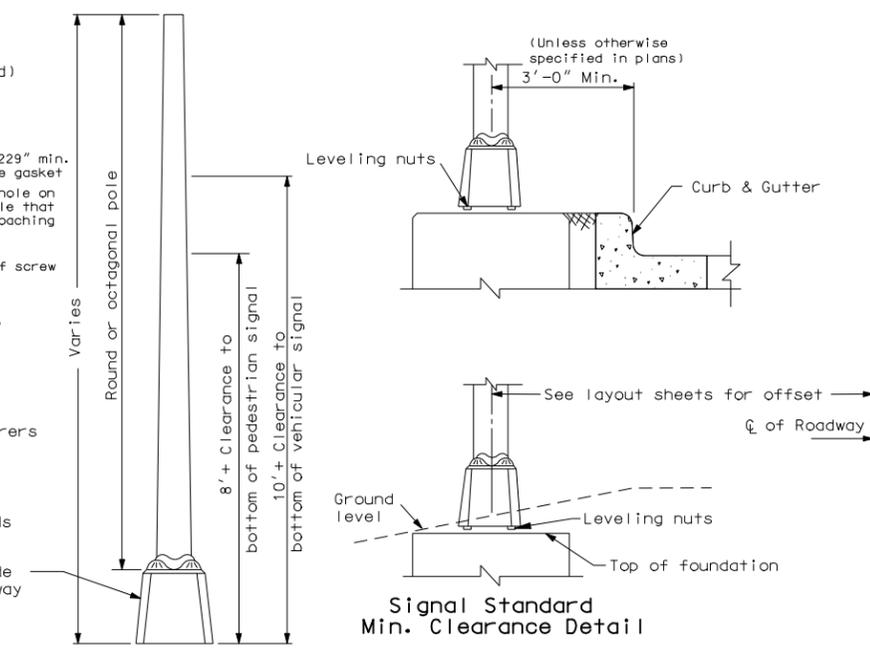
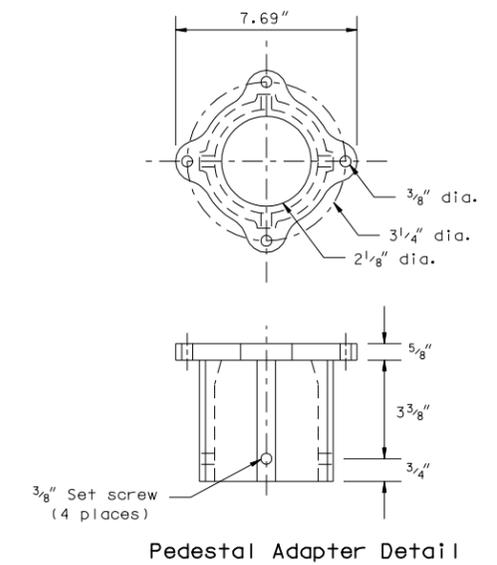
The positioning of the sign & pushbutton & direction of arrow shall clearly indicate which crosswalk is actuated by the push button. The type of sign will depend on the jurisdiction they are to be placed in.



Type I



Type II



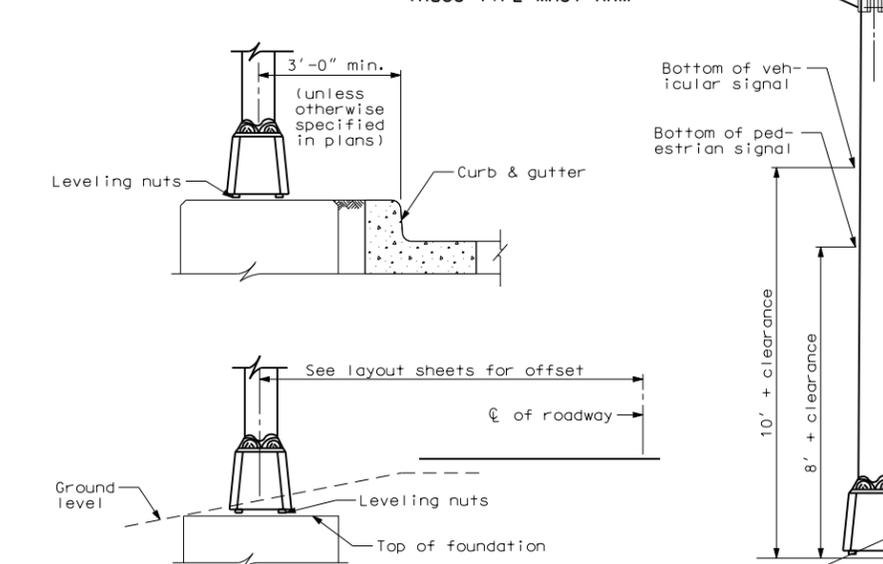
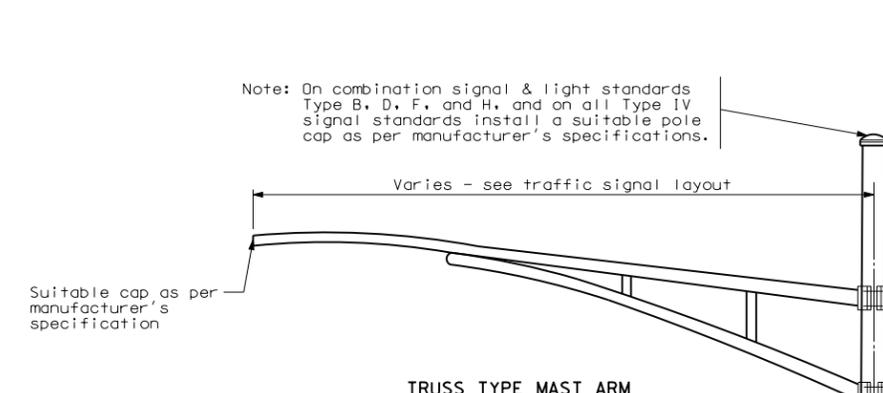
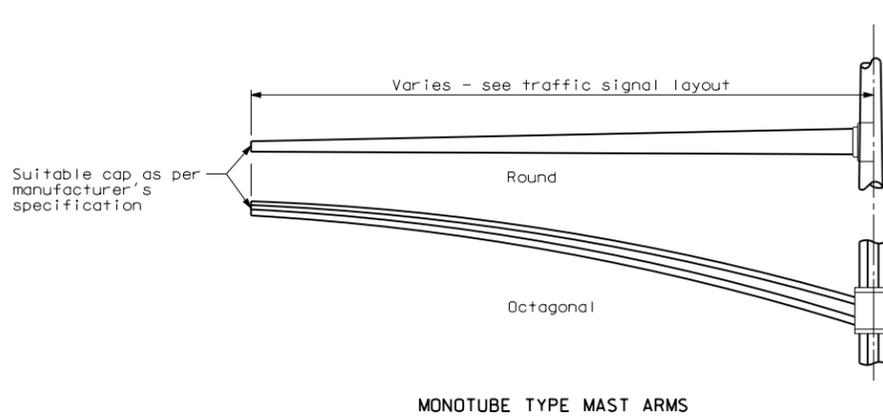
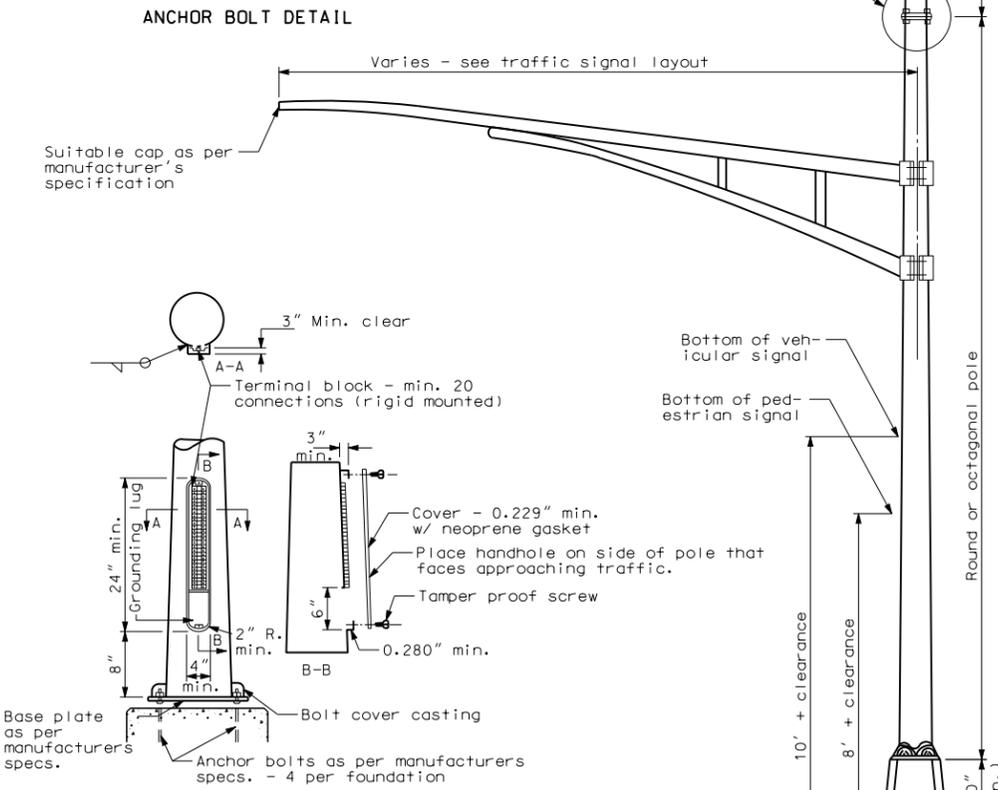
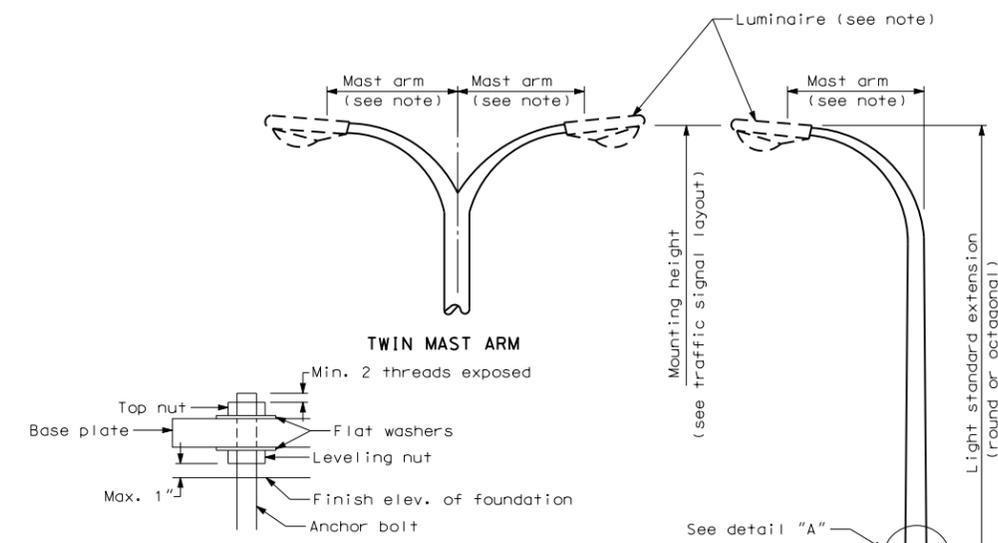
Type V, VI, VII

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

| NORTH DAKOTA<br>DEPARTMENT OF TRANSPORTATION<br>10-1-86 |                      |
|---|----------------------|
| REVISIONS   |                      |
| DATE  | CHANGE               |
| 12-01-88  | Min. Clearance       |
| 06-16-94  | Leveling nuts        |
| 08-29-95  | Delete Type III      |
| 11-27-95  | Pedestal adapter     |
| 12-15-00  | Pushbutton height    |
| 12-01-04  | PE Stamp added       |
| 04-24-06  | Pedestrian sign rev. |

This document was originally issued and sealed by MARK S. GAYDOS, Registration Number PE-4518, on 04/24/06 and the original document is stored at the North Dakota Department of Transportation

TRAFFIC SIGNAL STANDARDS  
(MAST ARM TYPE)



**Notes: COMBINATION SIGNAL AND LIGHT STANDARD:**

| Signal Standard Type | Luminaire Mounting Height | Install Light Standard Extension and Luminaire | Luminaire Mast Arm |
|----------------------|---------------------------|--|--------------------|
| A                    | 30 ft.                    | yes  | single             |
| B                    | 30 ft.                    | *  | single             |
| C                    | 40 ft.                    | yes  | single             |
| D                    | 40 ft.                    | *  | single             |
| E                    | 30 ft.                    | yes  | twin               |
| F                    | 30 ft.                    | *  | twin               |
| G                    | 40 ft.                    | yes  | twin               |
| H                    | 40 ft.                    | *  | twin               |
| I                    | 50 ft.                    | yes  | single             |
| J                    | 50 ft.                    | yes  | twin               |

\* The light standard extension for these signal standards shall be installed at a later date under a separate contract.

**Light standard extension:**  
The mast arm shall be 6 ft., unless otherwise noted on the plans. The light standard extension shall be galvanized. Galvanizing shall be in accordance with ASTM A 123.

**Luminaire:**  
Luminaires shall be internal ballast - constant wattage 120 x 240 voltage. See layout sheets for type of luminaire, wattage, and I.E.S. distribution. See note sheet for operating voltage.

**Signal head:**  
See traffic signal layout for correct mounting position, number, size, and arrangement of lenses. Clearance from the centerline of the roadway to the bottom of mast arm mounted signal heads shall be 17 ft. minimum and 19 ft. maximum.

**Steel standard:**  
The centerline of the signal standard shall be a minimum of 3 ft. from the face of the curb unless shown otherwise on the layout sheets.

**Paint:**  
See note sheet for required color of paint.

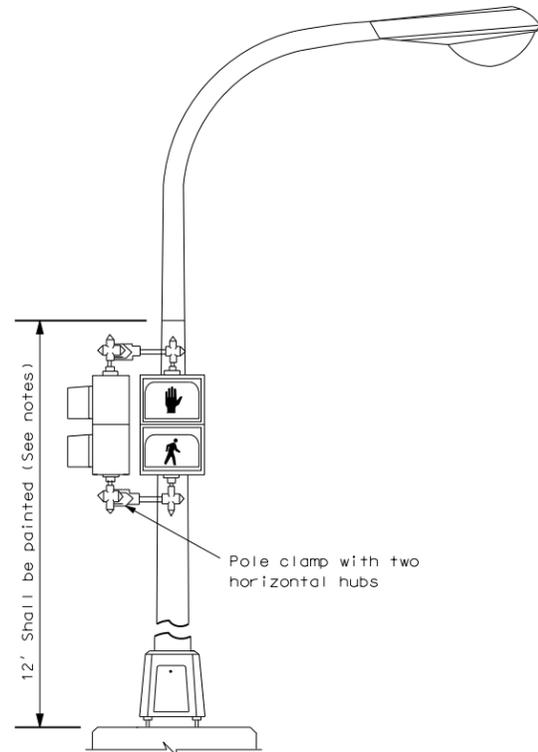
**Octagonal poles:**  
Shall have a means that will not allow the mast arm to be rotated by wind forces other than friction. This means shall be so fabricated so that the mast arm is rotatable. This feature shall be approved by the Engineer.

**Transformer base:**  
In lieu of the transformer base the contractor may use the alternate signal standard base.

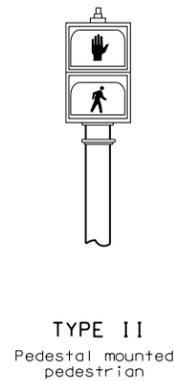
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                     |
|---|---------------------|
| 10-1-86                                   |                     |
| REVISIONS                                 |                     |
| DATE                                      | CHANGE              |
| 12-01-88                                  | Min clearance       |
| 01-21-94                                  | Add 50 ft.          |
| 06-16-94                                  | Leveling nuts       |
| 10-12-94                                  | Handhole location   |
| 05-28-96                                  | Mast arm cap        |
| 06-28-99                                  | Signal head mt. ht. |
| 12-01-04                                  | PE Stamp added      |

This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE- 4518**, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

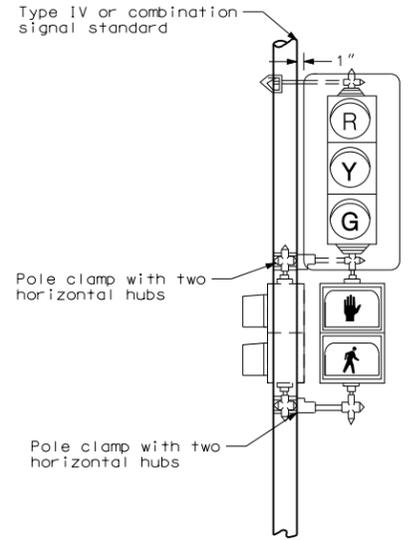
TRAFFIC SIGNAL HEAD MOUNTING



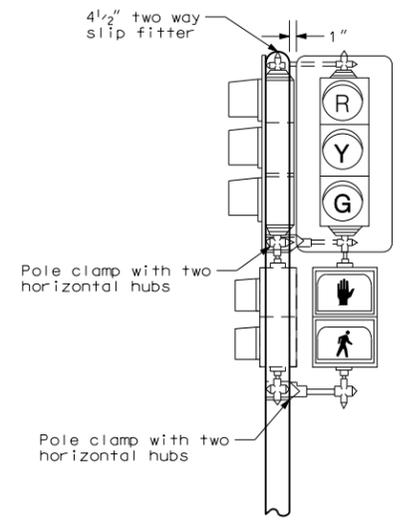
LIGHT STANDARD MOUNTED PEDESTRIAN SIGNAL HEAD



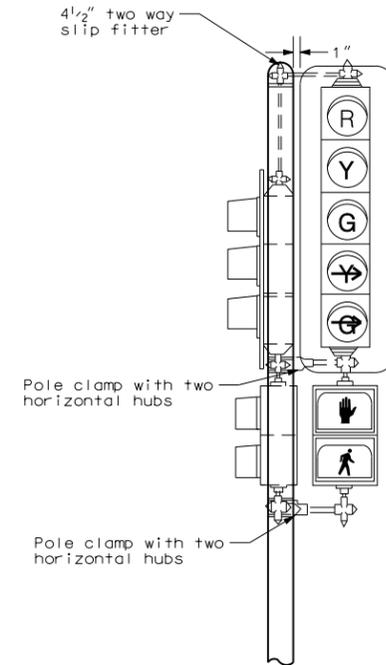
TYPE II Pedestal mounted pedestrian



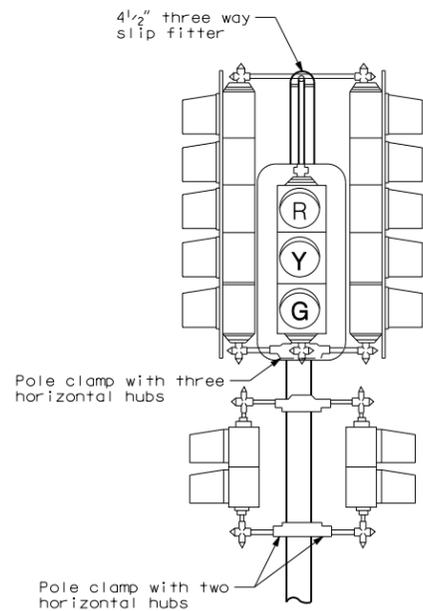
TYPE IV Post mounted - vehicular Post mounted - pedestrian



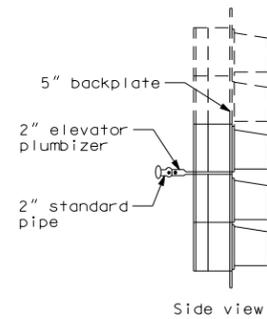
TYPE V Post mounted - vehicular Post mounted - pedestrian



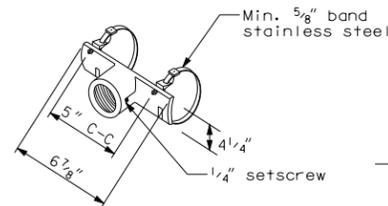
TYPE VI Post mounted - vehicular Post mounted - pedestrian



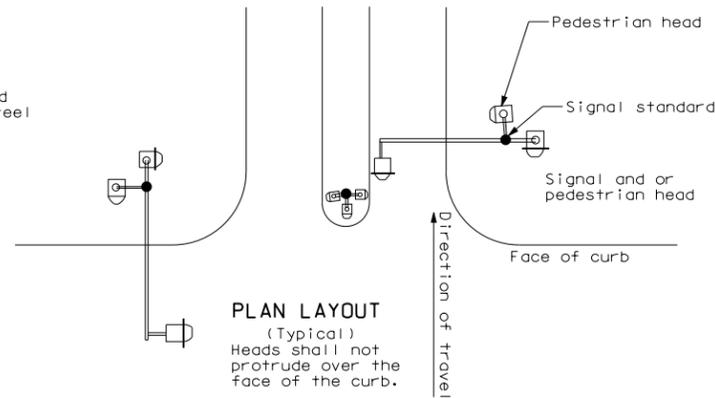
TYPE VII Post mounted - vehicular Post mounted - pedestrian



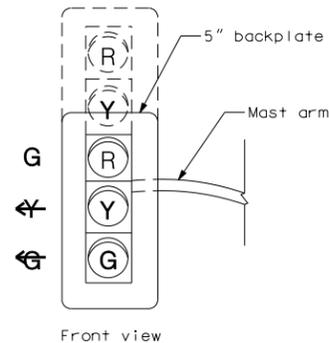
MID-SPAN MOUNTED MAST ARM RIGID MOUNTED SIGNAL HEADS



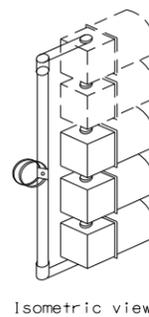
MAST ARM SIGNAL HEAD BRACKET



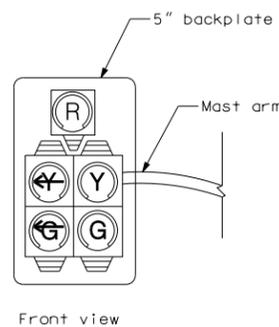
PLAN LAYOUT (Typical) Heads shall not protrude over the face of the curb.



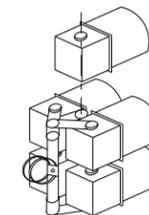
END MOUNTED MAST ARM RIGID MOUNTED SIGNAL HEADS



Isometric view



Front view



Isometric view

Notes:

Clearance: Clearance from the ground line or sidewalk to the bottom of post or pedestal mounted vehicular signal heads shall be 10 ft. minimum, from pedestrian signal heads shall be 8 ft. minimum.

Signal Heads: See traffic signal layout for correct mounting position, numbers, size, and arrangement of lenses.

Pole Clamps: A pole plate with suitable banding material, as approved by the engineer in the field, may be substituted for the pole clamps. Where traffic signal heads and pedestrian signal heads are mounted one above the other, one pole clamp assembly may be used.

Paint: Signal housing shall be painted yellow. Back plates shall be painted dull black. Pole clamps and signal head mounting hardware shall be painted the same color as the signal standard shaft.

When pedestrian heads are light standard mounted, the lower 12 feet shall be painted the same color as the other traffic signal standards.

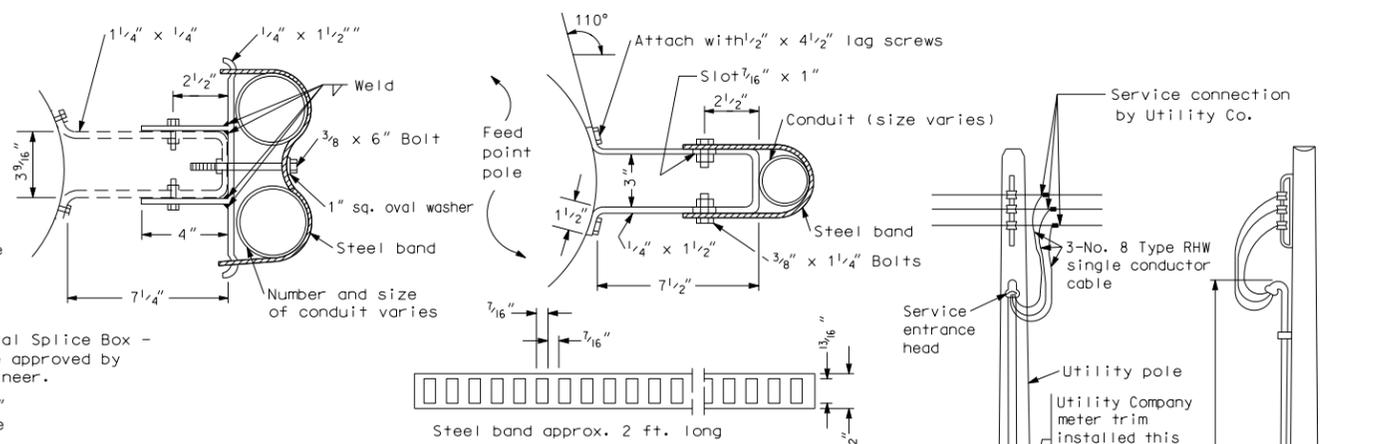
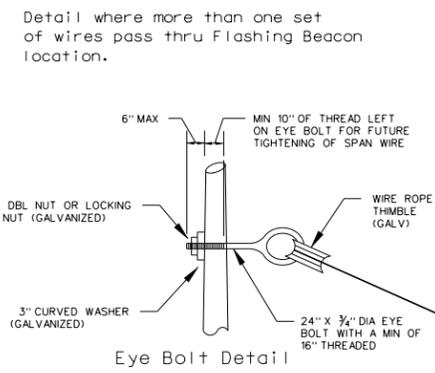
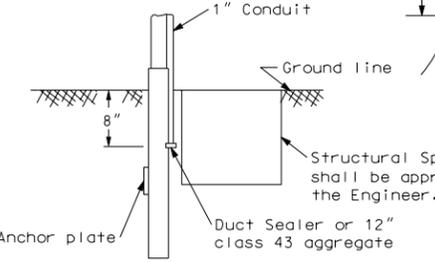
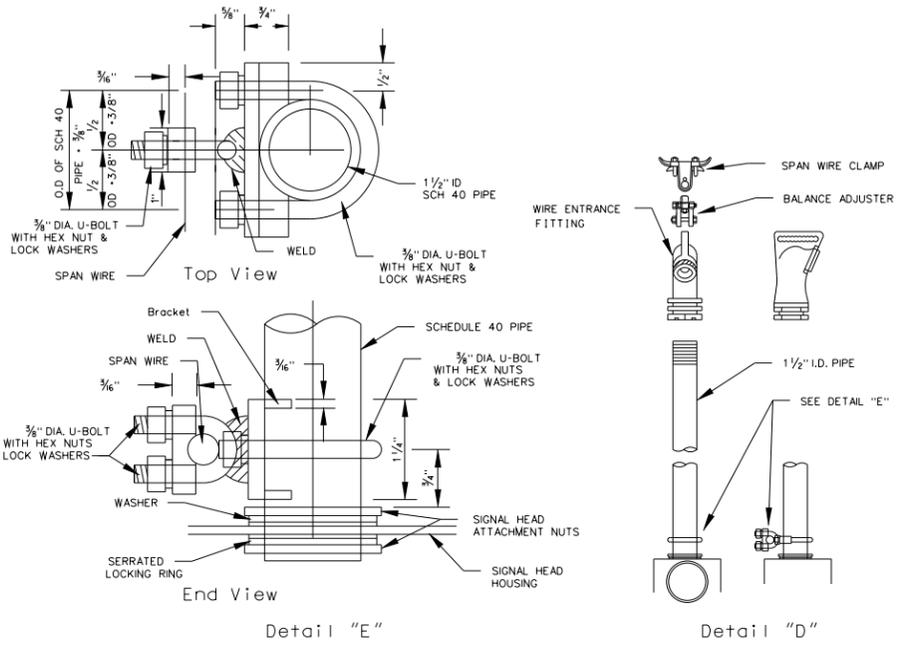
Mounting Details: All signal heads shown are viewed from direction of travel.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                                   |
|---|-----------------------------------|
| 10-1-86                                   |                                   |
| REVISIONS                                 |                                   |
| DATE                                      | CHANGE                            |
| 05-23-94                                  | Type II                           |
| 10-19-94                                  | Rev. visors & add 5-section head  |
| 08-01-95                                  | 5-section head end mounted detail |
| 08-29-95                                  | Delete Type III                   |
| 11-29-95                                  | Mast arm mounting bracket         |
| 08-14-01                                  | Added pedestrian symbols          |
| 05-12-03                                  | Added Lt Std Mt ped head          |
| 09-29-04                                  | Revised head mounting             |
| 12-01-04                                  | PE Stamp added                    |
| 10-31-06                                  | Removed pedestrian word messages  |

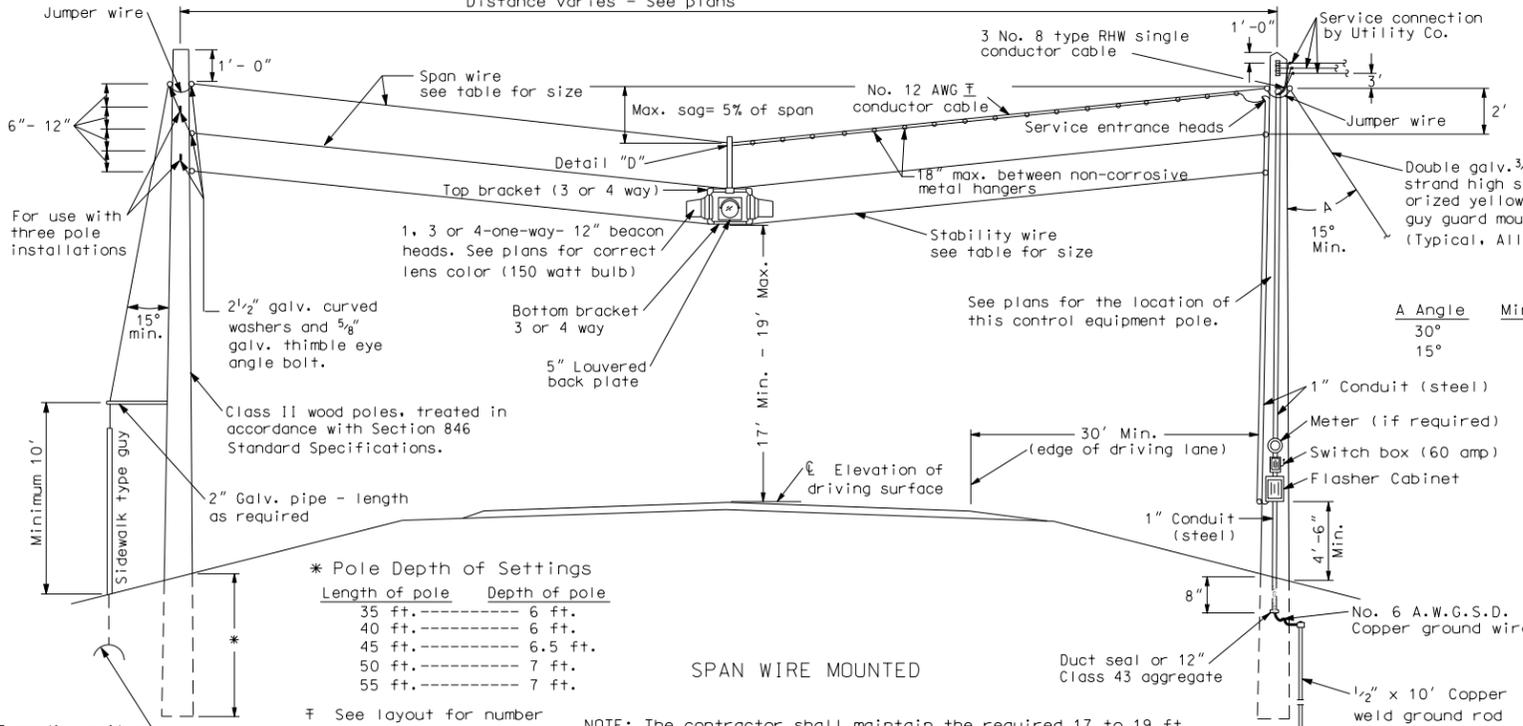
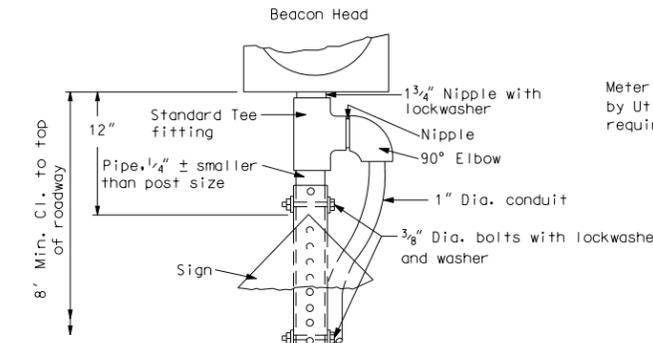
This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE- 4518** , on **10/31/06** and the original document is stored at the **North Dakota Department of Transportation**

| Number of Beacon Heads Per Span | SPAN LENGTHS & SIZE OF SPAN WIRE      |                     |                                       |                     |                                       |                     |                                       |                     |
|---------------------------------|---------------------------------------|---------------------|---------------------------------------|---------------------|---------------------------------------|---------------------|---------------------------------------|---------------------|
|                                 | 3/8" Span wire<br>1/8" Stability wire |                     | 3/8" Span wire<br>3/8" Stability wire |                     | 1/2" Span wire<br>1/2" Stability wire |                     | 5/8" Span wire<br>5/8" Stability wire |                     |
|                                 | Max. Length                           | Extra High Strength |
| 1                               | 140'                                  | 170'                | 150'                                  | 180'                | 160'                                  | 195'                | 170'                                  | 210'                |
| 2                               | 110'                                  | 140'                | 130'                                  | 160'                | 150'                                  | 185'                | 160'                                  | 200'                |
| 3                               | 85'                                   | 115'                | 110'                                  | 140'                | 140'                                  | 170'                | 160'                                  | 195'                |
| 4                               | 68'                                   | 90'                 | 90'                                   | 120'                | 125'                                  | 160'                | 150'                                  | 185'                |

FLASHING BEACON



CONDUIT STANDOFF BRACKET  
(To be used when required by local utility company)

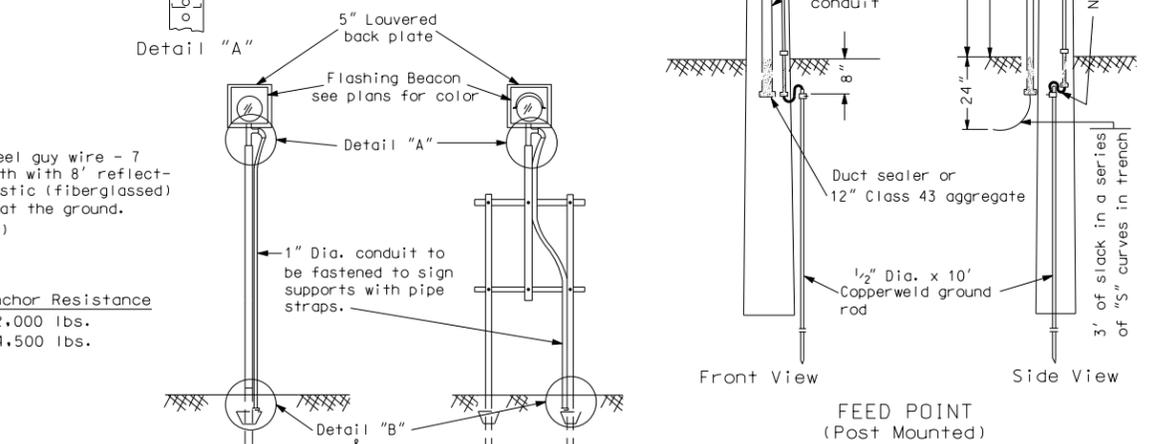


\* Pole Depth of Settings

| Length of pole | Depth of pole |
|----------------|---------------|
| 35 ft.         | 6 ft.         |
| 40 ft.         | 6 ft.         |
| 45 ft.         | 6.5 ft.       |
| 50 ft.         | 7 ft.         |
| 55 ft.         | 7 ft.         |

† See layout for number

NOTE: The contractor shall maintain the required 17 to 19 ft. flashing beacon height over the roadway for a minimum period of 90 calendar days after installation unless written permission is granted by the Engineer to waive the 90 day requirement. The cost of maintaining the signal head elevation shall not be bid separately but shall be included in the price bid for flashing beacon.



NOTE: Flasher shall be operated on 120 volts.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION |                        |
|---|------------------------|
| 10-1-86                                   |                        |
| REVISIONS                                 |                        |
| DATE                                      | CHANGE                 |
| 08-01-90                                  | Depth of pole          |
| 05-01-92                                  | General revisions      |
| 09-07-95                                  | Back plates & detail D |
| 08-15-96                                  | Add span wire          |
| 06-18-03                                  | Minor revisions        |
| 12-01-04                                  | PE Stamp added         |

This document was originally issued and sealed by **MARK S. GAYDOS** Registration Number **PE- 4518**, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation