JOB # 1

FHWA REGION	STATE	PROJECT	SHEET NO.
8	N.D.	F-FG-1-806 (015)069	1

NORTH DAKOTA

STATE HIGHWAY DEPARTMENT

MORTON COUNTY

F-FG-1-806(015)069

GRADING, SURFACING, SEWERS, STRUCTURAL, LIGHTING, SIGNALS, & INCIDENTALS.

DESIGN DATA

Hwy. #1806

Traffic	Average Daily			Est. 30th Max. Hr.
Current Traffic (1987)	9750 Pass.	450 Trucks	10,200 Total	1020
Traffic Forecast (2007)	14,400 Pass.	600 Trucks	15,000 Total	1500

Design Speed 35 MPH

Traffic Classification "M"

Minimum Sight Distance (Stopping) 250'

Bridge Cooper E-80 & Diesel Impact

Main Street

Current Traffic (1987) 19,000 Pass. 1000 Truck 20,000 Total 2000

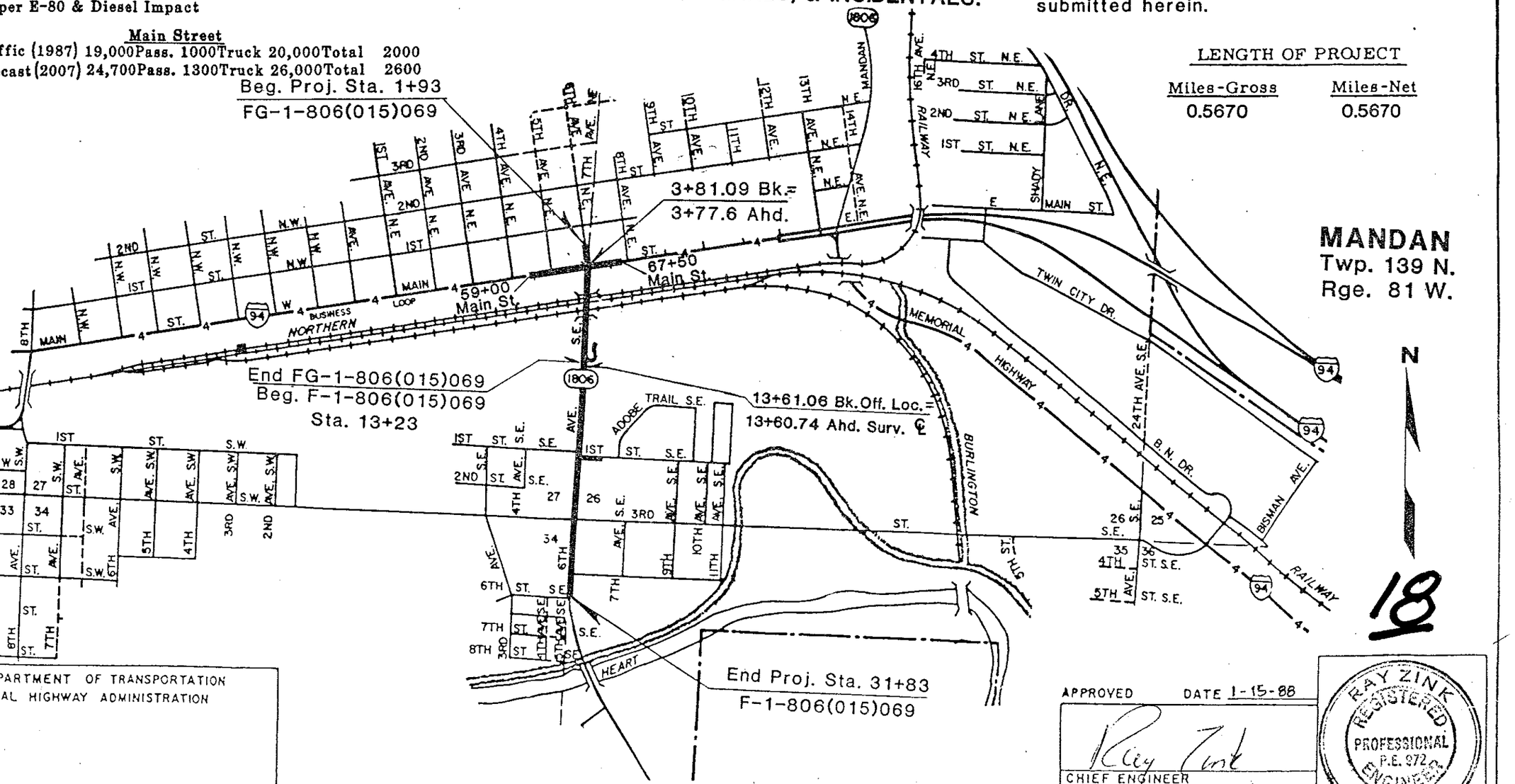
Traffic Forecast (2007) 24,700 Pass. 1300 Truck 26,000 Total 2600

GOVERNING SPECIFICATIONS

Standard Specifications adopted by the North Dakota State Highway Department, November 1986. Standard Drawings currently in effect, and other Contract Provisions submitted herein.

LENGTH OF PROJECT

Miles-Gross	Miles-Net
0.5670	0.5670



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED

DIVISION ADMINISTRATOR DATE

APPROVED DATE 1-15-88

Ray Zink

CHIEF ENGINEER
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

RAY ZINK REGISTERED PROFESSIONAL P.E. 972 ENGINEER NORTH DAKOTA

F-FG-1-806(015)069

NDDOT APPROVED ABBREVIATIONS

D-20-1

abn - abandoned
abut - abutment
ac - acres
adj - adjusted
aggr - aggregate
ahd - ahead
align - alignment
al - alley
alt - alternate
alum - aluminum
A - ampere
& - and
appr - approach
approx - approximate
ACP - asbestos cement pipe
asph - asphalt
AC - asphalt cement
@ - at
atten - attenuation
Ave - Avenue
avg - average
ADT - average daily traffic
az - azimuth
bk - back
BF - back face
bs - backsight
balc - balcony
barr - barricade
btry - battery
brg - bearing
BI - beehive inlet
beg - begin
BM - bench mark
bkwy - bikeway
bit - bituminous
blk - block
Bd Ft - board feet
bk - book/back
BH - bore hole
BS - both sides
Blvd - Boulevard
bot - bottom
bndry - boundary
BC - brass cap
brkwy - breakaway
br - bridge
bldg - building
BLM - Bureau of Land Management
BV - butterfly valve
byp - bypass
C Gdrl - cable guardrail
calc - calculate
cd - candela
CIP - cast iron pipe
CB - catch basin
CRS - cationic rapid setting
C Gd - cattle guard
C to C - center to center
CL or ℄ - centerline
cm - centimeter
ch - chain
Ch Blk - channel block
Ch Ch - channel change
chk - check
cir - circle
cl - class
cl - clay
Cl F - clay fill
Cl Hvy - clay heavy
Cl Lm - clay loam
clr - clear
Cl&Gr - clearing & grubbing
Co S - coal slack
comb - combination
coml - commercial
compr - compression
CADD - computer aided drafting & design
conc - concrete
cond - conductor
const - construction
cont - continuous
contr - contraction/contractor
CP - control point
coord - coordinate
cor - corner
corr - corrected
CAES - corrugated aluminum end section
CAP - corrugated aluminum pipe
CMES - corrugated metal end section
CMP - corrugated metal pipe
CPVCP-corrugated polyvinyl chloride pipe
CSES- corrugated steel end section
CSP - corrugated steel pipe
Co - County
Ct - Court
C - coulomb
crse - course
C Gr - course gravel
CS - course sand
XArm - cross arm
XBuck - cross buck
XSec - cross sections
Xing - crossing
crn - crown
CF - cubic feet
m3 - cubic meter
m3/s - cubic meters per second
CY - cubic yard
CY/Mi - cubic yards per mile
culv - culvert
C&G - curb & gutter
CI - curb inlet
CR - curb ramp
CS - curve to spiral
c - cut
Dd Ld - dead load
defl - deflection
defm - deformed
deg (or D) - degree
dlnt - delineate
dlntr - delineator
depr - depression
desc - description
det - detail
dtr - detour
dia - diameter
dir - direction
dist - distance
DM - disturbed material
DB - ditch block
DG - ditch grade
dbl - double
dn - down
drwg - drawing
dr - drive
drwy - driveway
DI - drop inlet
ea - each
esmt - easement
E - East
elast - elastomeric
elec - electrical
EDM - electronic distance meter
elev (or El) - elevation
ellipt - elliptical
emb - embankment
emuls - emulsion/emulsified
ES - end section
engr - engineer
eq - equal
eq - equation
exc - excavation
exst - existing
exp - expansion
Expy - Expressway
E - external of curve
extru - extruded
F - Fahrenheit
F - farad
FS - far side
Fed - Federal
FHWA-Federal Highway Administration
FP - feed point
ft - feet/foot
fn - fence
Fn P - fence post
FO - fiber optic
FB - field book
FD - field drive
f - fill
FS - fine sand
FH - fire hydrant
fl - flange
flrd - flared
FES - flared end section
F Bcn - flashing beacon
FL - flow line
ftg - footing
FM - force main
fs - foresight
fnd - found
fdn - foundation
frac - fractional
frwy - freeway
frt - front
FF - front face
F Disp - fuel dispenser
FFP - fuel filler pipes
FLS - fuel leak sensors
furn - furnish/ed
gal - gallon
galv - galvanized
Gs L - gas line
Gs V - gas valve
GVP - gas vent pipe
GV - gate valve
ga - gauge
geod - geodetic
GIS-Geographical Information System
G - giga
GPS - Global Positioning System
grd - graded/grade
gr - gravel
grnd - ground
GWM - ground water monitor
gdrl - guardrail
gtr - gutter
H Pig - H piling
hdwl - headwall
ha - hectare
ht - height
HI - height or instrument
hel - helical
H - henry
Hz - hertz
HM - high mast
HP - high pressure
HPS - high pressure sodium
hwy - highway
h or hr - hour(s)
hyd - hydrant
id - identification
in or " - inch
ID - inside diameter
inst - instrument
intchg - interchange
intmdt - intermediate
intsctn - intersection
inv - invert
I Pn - iron pin
IP - iron pipe
IM - iron monument
jt - joint
J - joule
jct - junction
K - kelvin
kN - kilo newton
kPa - kilo pascal
kg - kilogram
kg/m3 - kilogram per cubic meter
km - kilometer
K - Kip(s)
LS - Land Surveyor (licensed)
LSIT - Land Surveyor In Training
ln - lane
lat - latitude
lt - left
lens - lenses
lvl - level
LB - level book
lving - leveling
lht - light
LP - light pole
ltg - lighting
Lig Co - lignite coal
Lig Sl - lignite slack
LF - linear foot
liq - liquid
L - litre
lm - loam
LC - long chord
long. - longitude
lp - loop
LD - loop detector
lm - lumen
lum - luminaire.
L Sum - lump sum
lx - lux
ML - main line
M Hr - man hour
MH - manhole
mkd - marked
mkr - marker
mkg - marking
MA - mast Arm
matl - material
max - maximum
MC - meander corner
meas - measure
mdn - median
MD - median drain
MC - medium curing
M - mega
mer - meridian
m - meter
m/s - meters per second
M - mid ordinate of curve
mi - mile
MM - mile marker
MP - mile post
mL - milliliter
mm - millimeter
mm/hr - millimeter per hour
min - minimum
misc - miscellaneous
mon - monument
mnd - mound
mtbl - mountable
mtd - mounted
mtg - mounting
mk - muck
mun - municipal
NDDOT-ND DEPT OF TRANSPORTATION
n - nano
NGS - National Geodetic Survey
NS - near side
neop - neoprene
N - newton
N - North
NE - North East
NW - North West
No. or # - number
obsc - obscure(d)
obsn - observation
ocpd - occupied
ocpy - occupy
Off Loc - office location
o/s - offset
orig - original
O to O - out to out
OD - outside diameter
OH - overhead
PMT - pad mounted transformer
pg - pages
pntd - painted
pr - pair
pnl - panel
pk - park
PK - Parker-Kalon nail
Pa - pascal
PSD - passing sight distance
pvmt - pavement
ped - pedestal/pedestrian
PPP-pedestrian pushbutton post
pen - penetration
perf - perforated
per - perimeter
PL - pipeline
pl - place
P&P - plan and profile
pl - plate
pt - point
PCC - point of compound curve
PC - point of curve
PI - point of intersection
PRC-point of reverse curvature
PT - point of tangent
POC - point on curve
POT - point on tangent
PE - polyethylene
PVC - polyvinyl chloride
PCC - Portland Cement concrete
(or lb) - pound
PP - power pole
preempt - preemption
prefab - prefabricated
prfmd - preformed
prep - preparation
press. - pressure
PRV - pressure relief valve
prestr - prestressed
pvt - private
PD - private drive
prod - production/produce
prog - programmed
prop - property
Prop Ln - property line
ppsd - proposed
PB - pull box
qty - quantity
qtr - quarter
R (or rad) - radius
RR - railroad
rlwy - railway
rsd - raised
RTP - random travers point
R (or rge) - range
RC - rapid curing
rec - record
rcy - recycle
RPCC-recycled Portland cement concrete
ref - reference
RM - reference monument
refl - reflectorized
RCB - reinforced concrete box
RCES - reinforced concrete end section
RCP - reinforced concrete pipe
RCPS - reinforced concrete pipe sewer
reinf - reinforcement
res - reservation
ret - retaining
rev - reverse
rt - right
R/W - right of way
riv - river
rd - road
rdbd - roadbed
rdwy - roadway
rk - rock
rt (Rt) - route
salv - salvage(d)
sd - sand
Sdy Cl - sandy clay
Sdy Cl Lm - sandy clay loam
Sdy Fl - sandy fill
Sdy Lm - sandy loam
san - sanitary sewer line
sc - scoria
sec - seconds/section
SL - section line
sep - separation
seq - sequence
serv - service
sh - shale
sht - sheet
shtng - sheeting
shldr - shoulder
sw - sidewalk
S - siemens
SD - sight distance
sig - signal
Si Cl - silt clay
Si Lm - silt loam
Si Cl Lm - silty clay loam
sgl - signal
SC - slow curing
SS - slow setting
S - South
SE - South East
SW - South West
sp - spaces
spcl - special
Std Specs - Standard Specifications
SP - special provision
spk - spike
SC - spiral to curve
ST - spiral to tangent
SH - sprinkler head
SV - sprinkler valve
sq - square
SF - square feet
km2 - square kilometer
m2 - square meter
SY - square yard
stk - stake
std - standard
sta - station
Sta Yd - station yards
Stm L - steam line
SEC - steel encased concrete
SSD - stopping sight distance
SD - storm drain
st - street
SPP - structural plate pipe
SPPA - structural plate pipe arch
str - structure
subd - subdivision
sub - subgrade
Sub Prep - subgrade preparation
ss - subsoil
SE - superelevation
SS - supplemental specification
supp - supplemental
surf - surfacing
surv - survey
SI - System International
sym - symmetrical
tan - tangent
T - tangent (semi)
TS - tangent to spiral
tel - telephone
Tel P - telephone pole
tv - television
TBM - temporary bench mark
temp - temporary/temperature
T - tesla
T/Mi - tons per mile
ts - topsoil
T and TWP - township
traf - traffic
TSC - traffic signal controller
tr - trail
transf - transformer
TB - transit book
TT - transmission tower
trans - transverse/transition
trav - traverse
TP - traverse point
typ - typical
trtd - treated
trmt - treatment
tpl - triple
TP - turning point
ugrnd - underground
USC&G-US Coast & Geodetic Survey
USGS - US Geologic Survey
util - utility
VG - valley gutter
vap - vapor
vert - vertical
VC - vertical curve
VCP - vitrified clay pipe
vol - volt
V - volume
wkwy - walkway
WGV - water gate valve
WL - water line
WM - water main
WMV - water main valve
WSV - water service valve
W - watt
wrng - wearing/wiring
Wb - weber
W - West
w/ - with
w/o - without
WC - witness corner
WGS - World Geodetic System
z - zenith

3-1-96 REVISIONS	
DATE	CHANGE
1-27-97	Cont and CPVCP
5-5-97	Added Items

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

APPROVED: DESIGN ENGINEER

D-20-1

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LINESTYLE

D-20-2

- Existing Curb & Gutter
- Existing Mountable Curb
- Existing Valley Gutter
- Existing Curb
- Curb & Gutter
- Mountable Curb & Gutter
- Valley Gutter
- Curb
- SAN — Existing Sanitary Sewer
- SD FM — Existing Storm Force Main
- SD — Existing Storm Drain
- SAN FM — Existing San Force Main
- Existing Culvert-Rural/Urban
- PL — Pipeline
- T — Telephone Line
- E — Electrical Line
- G — Gas Line
- TV — Television Line
- W — Existing Water Line/Steam
- P — Power Line
- FO — Fiber Optic Line
- OH — Overhead Utility Line
- City Corporate Limits/Reservation Boundary
- Site Boundary
- Depression Contours
- Old R/W Lines
- Railroad R/W Line
- New R/W Lines

- RR Switch
- Railroad
- Traffic-Signal Mast Arm
- Overhead Sign Structure
- Double Micro Loop Detctor
- Single Micro Loop Detector
- Down Guy Wire
- Existing Fence
- Fence
- Retaining Wall
- Wall
- Existing Wall/Planter
- Existing Cable Guard Rail
- Existing Guard Rail
- GATE — GATE — Existing Gate
- Cemetery Boundary
- Tree Boundary
- Bush/Shrub Boundary
- Field Line
- Existing Berm/Dike/Ditch
- Subgrade Reinforcement
- Slotted Drain
- Centerline
- Undisturbed Groundline
- Flow Line
- Edge of Water

- Marsh/slough/wetland-Nondelineated
- Created Wetland
- Wetland-delineated
- Building — Building/Deck/Balcony
- Work Area/Ditch Block (shaded)
- Stairs (shaded)
- Tie Bar 18" @ 3' Center to Center
- Tie Bar 30" @ 4' Center to Center
- Three Cable Guardrail W/Post
- W-Beam Rail W/Post

3-1-96 REVISIONS	
DATE	CHANGE
6-20-96	GENERAL REVISION
8-15-96	ADD TIE BARS & GUARDRAIL

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

APPROVED: DESIGN ENGINEER

D-20-2

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SYMBOLS

- North Arrow
- Principal Point
- Inset Point
- R/W Monument
- Existing R/W Marker
- R/W Marker
- USG Benchmark
- NDDOT Benchmark
- Alignment Point
- 1/4 Section Corner
- Section Corner
- Property Pin
- Spot Elevation
- Existing Water Level
- Indicated Analyzed Sample
- Stone Circle/Cairn
- Productive Probe
- Artifact
- DTM Spot
- Unproductive Probe
- Excavation Unit
- Datum
- Well/Bore Hole/Ground Water Mon
- Bush/Shrub
- Evergreen Tree-Small
- Evergreen Tree - Large
- Tree- Large
- Tree - Small
- Tree Trunk
- RR Cross Buck
- RR Signal with Cross Arm
- Railroad Crossing Signal
- Railroad Battery Box
- Telephone Pole
- Telephone Pole to be Removed
- Telephone Pole to be Lowered
- Power Pole
- Power Pole to be Moved
- Power Pole to be Lowered
- Pole
- Private Mail Box
- Federal Mailbox
- Post
- Gas Vent Pipe
- Fuel Filler Pipes
- Fuel Leak Sensors
- Fuel Dispensers
- Existing Fire Hydrant
- Existing Sprinkler Head
- Cap/Stub
- Valve
- Pump
- Existing Manhole
- Existing Manhole W/Valve
- Existing Manhole W/Inlet
- Manhole W/Inlet
- Manhole
- San FM Manhole W/Valve
- Existing Catch Basin/Drop Inlet
- Catch Basin
- Curb Inlet
- Existing Curb Inlet
- Electrical Box
- Pedestal
- Existing Light Standard
- Existing Traffic Signals - Standard
- Existing Signal Head
- High Mast Lighting Pole
- Ped Head W/Number
- Feed Point - Pole Mounted
- Feed Point Pad Mounted
- Pad Mounted Transformer
- Pull Box
- Transmission Tower/Windmill
- Meter
- Transformer
- Concrete Foundation Lighting
- Down Guy Anchor
- Pedestrian Pushbotton Post
- Signal Head
- Traffic Signal Controller
- Conc. Found. Lighting Traffic Signals
- Flashing Beacon Sign Post Mount
- Traffic Signal Cont Working Slab
- Traffic Signal-Post Mounted
- Commercial Sign
- Highway Sign
- Truck Mounted Attenuation Device
- Flexible Delineator
- Double Arrow Directional Panel
- Right Directional Arrow Panel
- Left Directional Arrow Panel
- Caution Mode Panel
- Traffic Cones
- Sequencing Arrow Panel
- Flagger
- Type One Barricade
- Type II Barricade
- Type III Barricade
- Type A or B Delineator/Raised Pavement Marker
- Type D Delineator
- Back to Back Sign/Vertical Panel
- Delineator Drums
- Tubular Marker
- Attenuation Device
- 35 Watt High Press. Sodium Vap Lum
- 50 Watt High Press. Sodium Vap Lum
- 70 Watt High Press. Sodium Vap Lum
- 100 Watt High Press. Sodium Vap Lum
- 150 Watt High Press. Sodium Vap Lum
- 175 Watt High Press. Sodium Vap Lum
- 200 Watt High Press. Sodium Vap Lum
- 250 Watt High Press. Sodium Vap Lum
- 310 Watt High Press. Sodium Vap Lum
- 400 Watt High Press. Sodium Vap Lum
- 700 Watt High Press. Sodium Vap Lum
- 1000 Watt High Press. Sodium Vap Lum
- CSB Cont Split Barrel Samp
- SFA Flight Auger Sample
- Incl Inclinometer Tube
- SB Split Barrel Sample
- SPT Standard Penetration Test
- TW Thinwall Tube Sample

3-1-96 REVISIONS	
DATE	CHANGE
6-20-96	TYPE B & D DELINEATOR
5-12-97	ADDED ITEMS

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

APPROVED: DESIGN ENGINEER

D-20-3

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NDDOT UTILITY COMPANY APPROVED ABBREVIATIONS

D-20-4

AC – ACCENT COMMUNICATIONS
ACR FLOW WU – ACRO FLOW WATER USERS
ADA LND – ADA LAND CORPORATION
AGASSIZ WU – AGASSIZ WATER USERS INCORPORATED
ALL PL – ALLIANCE PIPELINE
ALL SEAS WU – ALL SEASONS WATER USERS INCORPORATED
AMRDA PET – AMERADA PETROLEUM CORPORATION
AMRCL OIL – AMERICAL OIL COMPANY
AMINOIL – AMINOIL USA
AMOCO PL – AMOCO PIPELINE COMPANY
AT&T – AT&T TELEPHONE
BRNS RWU – BARNES RURAL WATER USERS
BASIN ELEC – BASIN ELECTRIC COOPERATIVE INCORPORATED
B PEI – BEAR PAW ENERGY INC
BEK TEL – BEK TELEPHONE
BELLE P L – BELLE FOURCHE PIPE LINE COMPANY
BOEING – BOEING
BURK DIV ELEC – BURKE-DIVIDE ELECTRIC COOPERATIVE
BURL WU – BURLEIGH WATER USERS
BURM OIL/GAS – BURMAH OIL AND GAS COMPANY
CABLE SERV – CABLE SERVICES INC
CBLCOM – CABLECOM OF FARGO
CAP ELEC – CAPITAL ELECTRIC COOPERATIVE INCORPORATED
CASS CO ELEC – CASS COUNTY ELECTRIC COOPERATIVE
CASS RWU – CASS RURAL WATER USERS INCORPORATED
CAV ELEC – CAVALIER ELECTRIC COOPERATIVE
CENEX PL – CENEX PIPELINE COMPANY
CENT CTY CABLE – CENTRAL CITY CABLE TELEVISION
CENT PWR ELEC – CENTRAL POWER ELECTRIC COOPERATIVE
CHUCKS RAD & TV – CHUCK'S RADIO & TELEVISION
MUNICIPAL – CITY OF '.....'
MUNICIPAL – CITY WATER AND SEWER
CONOCO – CONOCO INC
CONS CRUDE OIL – CONSOLIDATED CRUDE OIL COMPANY
CONS TEL – CONSOLIDATED TELEPHONE
CONT OIL – CONTINENTAL OIL COMPANY
CONT PL – CONTINENTAL PIPELINE COMPANY
DAK CENT TEL – DAKOTA CENTRAL TELEPHONE
DAK WU – DAKOTA WATER USERS INCORPORATED
DARENCO – DARENCO
D O E – DEPARTMENT OF ENERGY
DICKEY CABLE – DICKEY RURAL CABLE TELEVISION
DICKEY R W U – DICKEY RURAL WATER USERS
DICKEY TEL – DICKEY TELEPHONE
DOME PL – DOME PIPELINE COMPANY
ECO ENG – ECOLOGICAL ENGINEERING
EDGE CABLE – EDGELEY CABLE TELEVISION
ELLEND CABLE – ELLENDALE CABLE TELEVISION
FALK MNG – FALKIRK MINING COMPANY
FLASH CABLE – FLASHER CABLE TELEVISION
G T E – GENERAL TELEPHONE AND ELECTRIC
GETTY TRD & TRAN – GETTY TRADING & TRANSPORTATION
G T C – GILBY TELEPHONE COMPANY
GLDN W ELEC – GOLDEN WEST ELECTRIC COOPERATIVE
G FKS-TRL WU – GRAND FORKS-TRAIL WATER USERS
GT NTHN PL – GREAT NORTHERN PIPELINE COMPANY
GT PLNS NAT GAS – GREAT PLAINS NATURAL GAS COMPANY
GRGS CO TEL – GRIGGS COUNTY TELEPHONE
HALS TEL – HALSTAD TELEPHONE
HARMON CABLE – HARMON CABLE TELEVISION
HUNT OIL – HUNT OIL COMPANY
INT-COMM TEL – INTER-COMMUNITY TELEPHONE
JMS VLY ELEC – JAMES VALLEY ELECTRIC COOPERATIVE
KANEB PL – KANEB PIPELINE COMPANY
KEM ELEC – KEM ELECTRIC COOPERATIVE
KERR-MC – KERR-MCGEE
KOCH GATH SYS – KOCH GATHERING SYSTEMS INCORPORATED
LKHD PL – LAKEHEAD PIPELINE COMPANY
LNGDN CABLE – LANGDON CABLE TELEVISION
LNGDN RWU – LANGDON RURAL WATER USERS INCORPORATED
LTING REQ – LIGHTING REQUESTS
LWR YELL R ELEC – LOWER YELLOWSTONE RURAL ELECTRIC
MCKNZ ELEC – MCKENZIE ELECTRIC COOPERATIVE
MCLN ELEC – MCLEAN ELECTRIC COOPERATIVE
MCLN-SHRDN WAT BRD – MCLEAN-SHERIDAN WATER BOARD
MID-CONT CABLE – MID-CONTINENT CABLE TELEVISION SYSTEM
MIDSTATE TEL – MIDSTATE TELEPHONE
MDWST CABLE – MIDWEST CABLE TELEVISION
MDWST NAT GAS – MIDWEST NATURAL GAS COMPANY
MNKOTA PWR COOP – MINNKOTA POWER COOPERATIVE
MINOT CABLE – MINOT CABLE TELEVISION
MINOT TEL – MINOT TELEPHONE COMPANY
MISS W W S – MISSOURI WEST WATER SYSTEM
MDU – MONTANA-DAKOTA UTILITIES
M & L TEL – MOORE AND LIBERTY TELEPHONE
MRHD P S D – MOOREHEAD PUBLIC SERVICE DEPARTMENT
MOR-GRAN-SOU ELEC – MOR-GRAN-SOU ELECTRIC COOPERATIVE
MOUNT-WILLI ELEC – MOUNTRAIL-WILLIAMS ELECTRIC COOPERATIVE
NDSU SOIL SCI DEPT – NDSU SOIL SCIENCE DEPARTMENT
NEMONT TEL – NEMONT TELEPHONE
NEW VIEW CABLE – NEW VIEW CABLE TELEVISION
NEWBURG PL – NEWBURG PIPELINE COMPANY
NODAK ELEC – NODAK ELECTRIC COOPERATIVE
NOON FRMS TEL – NOONAN FARMERS TELEPHONE COMPANY
N CENT ELEC – NORTH CENTRAL ELECTRIC COOPERATIVE
ND PKS & REC – NORTH DAKOTA PARKS AND RECREATION
ND TEL – NORTH DAKOTA TELEPHONE COMPANY
N VALL W ASSOC – NORTH VALLEY WATER ASSOCIATION
NTHN BRDR PL – NORTHERN BORDER PIPELINE
N PLS EL COOP – NORTHERN PLAINS ELECTRIC COOP INC
NTH PRAIR RW – NORTHERN PRAIRIE RURAL WATER ASSOCIATION
NSP – NORTHERN STATES POWER
NW COMM COOP – NORTHWEST COMMUNICATION COOPERATION
NTHNWSTRN REF – NORTHWESTERN REFINING COMPANY
OLVR-MERC ELEC – OLIVER-MERCER ELECTRIC COOPERATIVE
OTTR TL PWR – OTTER TAIL POWER COMPANY
PAN AM PET – PAN AMERICAN PETROLEUM CORPORATION
PETRO INC – PETROLEUM INCORPORATED
PHILLIPS PET – PHILLIPS PETROLEUM COMPANY
POLAR TEL – POLAR RURAL TELEPHONE
PORTAL PL – PORTAL PIPELINE COMPANY
P L E M –PRAIRIELANDS ENERGY MARK
R&T W SUPP – R & T WATER SUPPLY
RSR ELEC – R.S.R. ELECTRIC COOPERATIVE
RAMSEY R SEW – RAMSEY RURAL SEWER ASSOCIATION
RAMSEY RW – RAMSEY RURAL WATER ASSOCIATION
RD RIV ELEC – RED RIVER ELECTRIC COOPERATIVE
RD RIV TEL – RED RIVER TELEPHONE
REILES ACRES SAN SEW – REILES ACRES SANITARY SEWER
RESVTN TEL – RESERVATION TELEPHONE
RICH RWU – RICHLAND RURAL WATER USERS
ROBRTS TEL – ROBERTS COUNTY TELEPHONE
ROSVLT PL – ROOSEVELT PIPELINE COMPANY
S K M CABLE – S.K.M. CABLE TELEVISION
SCOTT CABLE – SCOTT CABLE TELEVISION DICKINSON
SERVICE PL – SERVICE PIPELINE COMPANY
SHELL PL – SHELL PIPELINE COMPANY
SHERDN CO ELEC – SHERIDAN COUNTY ELECTRIC COOPERATIVE
SHEYN VLY ELEC – SHEYENNE VALLEY ELECTRIC COOPERATIVE
SIGNL OIL & GAS – SIGNAL OIL & GAS COMPANY
SKELLY OIL – SKELLY OIL COMPANY
SLOPE ELEC – SLOPE ELECTRIC COOPERATIVE
SOURIS RIV TEL – SOURIS RIVER TELEPHONE
S E W U – SOUTH EAST WATER USERS
SQ BUT PWR – SQUARE BUTTE POWER COOPERATIVE
S T COM – STATELINE TELECMOMMUNICATIONS
STATE LN WATER – STATE LINE WATER COOPERATIVE
ST WAT COMM – STATE WATER COMMISSION
STUT RWU – STUTSMAN RURAL WATER USERS INCORPORATED
SUPERIOR OIL – SUPERIOR OIL COMPANY
S T V – SURREY TV
TCI – TCI OF NORTH DAKOTA
TEXACO PL – TEXACO PIPELINE INCORPORATED
TWNR CABLE – TOWNER CABLE TELEVISION INCORPORATED
TRL CO RWU – TRAIL COUNTY RURAL WATER COOPERATIVE
T T G – TRANS TEXAS GAS
TRENT RW – TRENTON RURAL WATER
TRI-CNTY WU – TRI-COUNTY WATER USERS INCORPORATED
T M C – TURTLE MOUNTAIN COMMUTATION
US SPRINT – U.S. SPRINT
USW COMM – U.S. WEST COMMUNICATIONS
USAF MSL CABLE – U.S.A.F. MISSILE CABLE
UNTD PWR – UNITED POWER ASSOCIATION
UNTD TEL – UNITED TELEPHONE COOPERATIVE
UPPR MISS G&T – UPPER MISSOURI GENERATION & TRANSMISSION
UPPR SOUR WUA – UPPER SOURIS WATER USERS ASSOCIATION
VELVA CABLE – VELVA CABLE TELEVISION
VRNDRY ELEC – VERENDRYE ELECTRIC COOPERATIVE
VKNG ELEC – VIKING ELECTRONICS INCORPORATED
WEB – W.E.B. WATER DEVELOPMENT ASSOCIATION
WALHLA CABLE – WALHALLA CABLE TELEVISION INCORPORATED
WLSH WU – WALSH WATER USERS INCORPORATED
WARREN PET – WARREN PETROLEUM COMPANY
WELLS CO WA – WELLS COUNTY WATER ASSOCIATION
W MARC CABLE – WEST MARC CABLE TELEVISION
W PLNS ELEC – WEST PLAINS ELECTRIC COOPERATIVE
W RIV TEL – WEST RIVER TELEPHONE
W GAS PROC – WESTERN GAS PROCESSORS LTD.
WSTN TERM – WESTERN TERMINAL COMPANY
WILLI BROS PL – WILLIAMS BROTHERS PIPELINE COMPANY
WILLI RWA – WILLIAMS RURAL WATER ASSOCIATION
WILSTN BAS PL – WILLISTON BASIN PIPELINE COMPANY
WILSTN GAS – WILLISTON GAS COMPANY
WOLVRTN TEL – WOLVERTON TELEPHONE
WYCO PL – WYCO PIPELINE COMPANY

3-1-96	
REVISIONS	
DATE	CHANGE
8-15-96	GENERAL REVISIONS
9-9-97	GENERAL REVISIONS

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

APPROVED: DESIGN ENGINEER

D-20-4

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FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	HEU-1-806-(032)069	2

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D-754-23 Assembly Details

D-754-24 Mounting Details Perforated Tube

D-754-27 Sign Punching, Stringer, and Support Location Details for Regulatory, Warning, and Guide Signs

D-754-80 Light Standard, Signal Standard, and Span Wire Mounted Sign Assembly Detail

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FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
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NOTES

105-030 UNDERGROUND UTILITIES: The contractor shall notify the local utility companies prior to the beginning of construction, so they may determine the location of all utilities in the project area. Subcutting or scarifying over utility lines may be eliminated if, in the opinion of the utility, a hazardous situation exists. Separate plans, if any, showing relocation or adjustment work to be performed by utility companies to accommodate highway construction will be made available to the contractor, upon request to the engineer.

704-P01 The traffic control shall be signed using the following layouts on the Standard Drawings:

Std D-704-24 Layout Type T for Pull Box and Conduit Installation
Std D-704-25 Layout Type W for Signal Standard Installation
Std D-704-25 Layout Type V and Type X for Loop Placement

754-050 SIGN SUPPORTS: The sign supports "Steel Galvanized Posts - Square Tube Perforated" were designed using a minimum yield strength of 55,000 psi and the design requirements of the "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals." The wind speed of 75 mph was used. The square telescoping steel posts shall have all holes punched completely. All metal shall be removed from the punched holes.

770-001 OVERHEAD LINES CLEARANCE: Minimum horizontal and vertical clearance between light and/or signal standards and power lines shall be as shown for the following power line voltages:

Power Line Voltage	Horizontal Clearance	Vertical Clearance
0-15,000	5'	6'
15,000-50,000	5'	7'
50,000 Plus	5'+0.033' per KV Over 50 KV	7'+0.033' per KV Over 50 KV

770-P01 RELOCATE LUMINAIRE: The item "Relocate Luminaire" shall consist of removing the existing luminaire from the removed light standard and installing it on the new light standard extension at the location shown on the plans.

The wires leading to the luminaire receptacle shall be disconnected. The luminaire shall be removed from the light standard and reinstalled on the light standard extension. The necessary connection shall be made to provide continuity.

The item "Relocate Luminaire" will be measured by the number of each luminaire relocated and accepted. The quantities measured will be paid for at the contract price and shall be full compensation for all labor, equipment, and materials necessary to complete the installation.

772-230 MICROLOOP PROBE: The item Microloop (single or double) probe set shall consist of furnishing and installing the microloop probes at the locations shown in the plans.

The microloop probe shall be a small, cylindrical, passive transducer of earth's vertical magnetic field intensity into inductance. It transforms changes in magnetic field intensity into inductance changes which can be sensed by loop detector units. Probes shall fit vertically in 1" holes and lead-in cable in 3/8" saw slot or in sand in the roadway base. Microloop probes can be connected in series with other microloop probes or conventional wire loops. The microloop probe shall operate under the following parameters: Earth's Vertical Magnetic Field (0.2 to 1.0 oersted), Inductance (20 microhenries to 25 microhenries per probe plus 20 microhenries per 100' of wire), DC Resistance (0.5 ohms per probe plus 3.2 ohms per 100' of wire) Transducer Gain (typically 3.5 microhenries per oersted at 0.4 OE ambient vertical field intensity), and Sensitivity with 2 probes (7.0 microhenries per oersted at 0.4 OE ambient vertical field intensity). The microloop probes shall operate at a temperature range of -35°F to +165°F (-37°C to +74°C) and at humidity of 0 to 100%. The microloop probes shall detect all motorized vehicles.

The item microloop (single-double) probes shall be measured by the number of single or double probes sets installed. The quantities measured will be paid for at the contract price and shall be full compensation for all labor, equipment, saw slot, conductors from probe to pull box, and materials to complete the installation of the microloops.

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NOTES

772-349 CONTROLLER MONITORING UNIT AND/OR COMMUNICATION MODULE: The volume density controller shall be provided with a communication hookup which provides a duplex data link with a central control computer. The communications hookup shall be IBM PC compatible.

A controller monitoring unit and/or communication module shall be installed in the controller. The monitor unit shall be installed and connected to the controller and conflict monitor so as to monitor conflict monitor flash, pre-emption status, cabinet door open, intersection display, and detector diagnostics. The unit shall be capable of providing a traffic map and of up loading and down loading information into the controller from a PC, central control computer or a laptop in the field, or a telephone line.

The controller monitoring unit and/or communications module shall be capable of initiating contact by dial-up telephone line, either directly from a PC, central control computer or a laptop, or through a system master controller with a PC central control computer to report failure conditions when they occur with computer in the monitor mode. Other events shall be logged and reported at preset intervals or on command from a central control computer or laptop computer.

The controller monitoring unit and/or communications module shall be capable of operating at an isolated intersection with an interconnect cable or a telephone link to a central control computer or a laptop computer. In the future, the unit shall be operated through a systems master controller by interconnect cable or telephone link from a central control computer.

The contractor shall notify the local telephone company to have the telephone lines installed and all necessary connections made, when the controller is ready to be placed into operation.

The cost of furnishing and installing the communications module and/or the controller monitoring unit, the telephone line, and connections shall not be bid separately, but shall be included in the price bid for the volume density controller. The contractor shall be responsible for the telephone service until final acceptance of the traffic signal system.

772-P01 PAINT: The traffic signal system components shall be painted in accordance with the following:

Transformer base - green
Mast arm - green
Signal head mounting hardware - green
Shaft - green
Signal housing - green
Pedestrian pushbutton post - green
Pedestrian pushbutton housing - green

The color green shall be 14066 of Federal Standard No. 595.

772-P02 REMOVE INTERIM TRAFFIC SIGNALS: The removed interim traffic signals shall become the property of the state and shall be delivered to the Bismarck District storage yard.

ESTIMATE OF QUANTITIES

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	HEU-1-806(032)069	5

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
103	0100	CONTRACT BOND	L SUM	1	1
702	0100	MOBILIZATION	L SUM	1	1
704	0100	FLAGGING	MHR	40	40
704	1100	TRAFFIC CONTROL	L SUM	1	1
754	0116	FLAT SHEET FOR SIGNS-TYPE 2 REFL SHEETING	SF	85	85
754	0206	STEEL GALV POSTS-TELESCOPING PERFORATED TUBE	LF	135	135
762	0120	PREFORMED PATTERNED PVMT MK MESSAGE	SF	74	74
762	1304	PREFORMED PATTERNED PVMT MK 4IN LINE	LF	3,050	3,050
762	1306	PREFORMED PATTERNED PVMT MK 6IN LINE	LF	420	420
762	1308	PREFORMED PATTERNED PVMT MK 8IN LINE	LF	396	396
762	1324	PREFORMED PATTERNED PVMT MK 24IN LINE	LF	104	104
770	0100	PULL BOX	EA	2	2
770	0210	CABLE TRENCH-TYPE I	LF	543	543
770	0330	2IN DIAMETER RIGID CONDUIT	LF	333	333
770	0504	UNDERGROUND CONDUCTOR NO4-TYPE RHW	LF	1,354	1,354
770	0505	UNDERGROUND CONDUCTOR NO6-TYPE RHW	LF	4,220	4,220
770	0605	UNDERGROUND CONDUCTOR NO6-TYPE THW	LF	2,787	2,787
770	4523	REVISE HIGHWAY LIGHTING FEED POINT	EA	1	1
770	4542	RELOCATE LUMINAIRE	EA	3	3
770	4560	REMOVE LIGHT STANDARD	EA	3	3
772	0020	CONCRETE FOUNDATION-TRAFFIC SIGNALS	EA	5	5
772	0100	PULL BOX	EA	8	8
772	0200	1IN DIAMETER RIGID CONDUIT	LF	368	368
772	0215	1.25IN DIAMETER RIGID CONDUIT	LF	36	36
772	0240	2IN DIAMETER RIGID CONDUIT	LF	500	500
772	0260	2.5IN DIAMETER RIGID CONDUIT	LF	190	190
772	0280	3.5IN DIAMETER RIGID CONDUIT	LF	64	64
772	0300	UNDERGROUND CONDUCTOR NO6-TYPE RHW	LF	98	98
772	0310	UNDERGROUND CONDUCTOR NO6-TYPE THW	LF	49	49
772	0325	DETECTOR LOOP-POLYETHYLENE CONDUIT PRE-WIRED	LF	906	906
772	0330	LOOP LEAD-IN CONDUCTOR	LF	1,515	1,515
772	0364	MICROLOOP DOUBLE PROBE SET	EA	8	8
772	0400	NO12 AWG 2 CONDUCTOR CABLE	LF	778	778
772	0401	NO12 AWG 3 CONDUCTOR CABLE	LF	96	96

ESTIMATE NUMBER: 2212 RUN DATE: 12/04/1997 TIME: 10:18:15

ESTIMATE OF QUANTITIES

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	HEU-1-806(032)069	6

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
772	0403	NO12 AWG 5 CONDUCTOR CABLE	LF	314	314
772	0410	NO12 AWG 12 CONDUCTOR CABLE	LF	486	486
772	0490	SAW SLOT	LF	285	285
772	0624	TYPE IV SIGNAL STD 24FT MA	EA	1	1
772	0902	COMBO 20FT MA SIG & LT STD-TYPE C	EA	1	1
772	0922	COMBO 22FT MA SIG & LT STD-TYPE C	EA	1	1
772	0982	COMBO 28FT MA SIG & LT STD-TYPE C	EA	1	1
772	1810	1-WAY 3 SEC HEAD W/12IN LENS-POST MTD	EA	4	4
772	1812	1-WAY 3 SEC HEAD W/12IN LENS-MA MTD	EA	6	6
772	2000	1-WAY 2 SEC HEAD PED SIGNAL-POST MOUNTED	EA	8	8
772	2200	PEDESTRIAN PUSHBUTTON POST	EA	3	3
772	2521	VOLUME DENSITY CONTR W/PED & EMER PRE-EMPTION	EA	1	1
772	2610	EMERGENCY VEHICLE PRE-EMPTION UNIT	EA	1	1
772	3135	REMOVE INTERIM TRAFFIC SIGNALS	EA	1	1

ESTIMATE NUMBER: 2212 RUN DATE: 12/04/1997 TIME: 10:18:15

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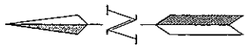
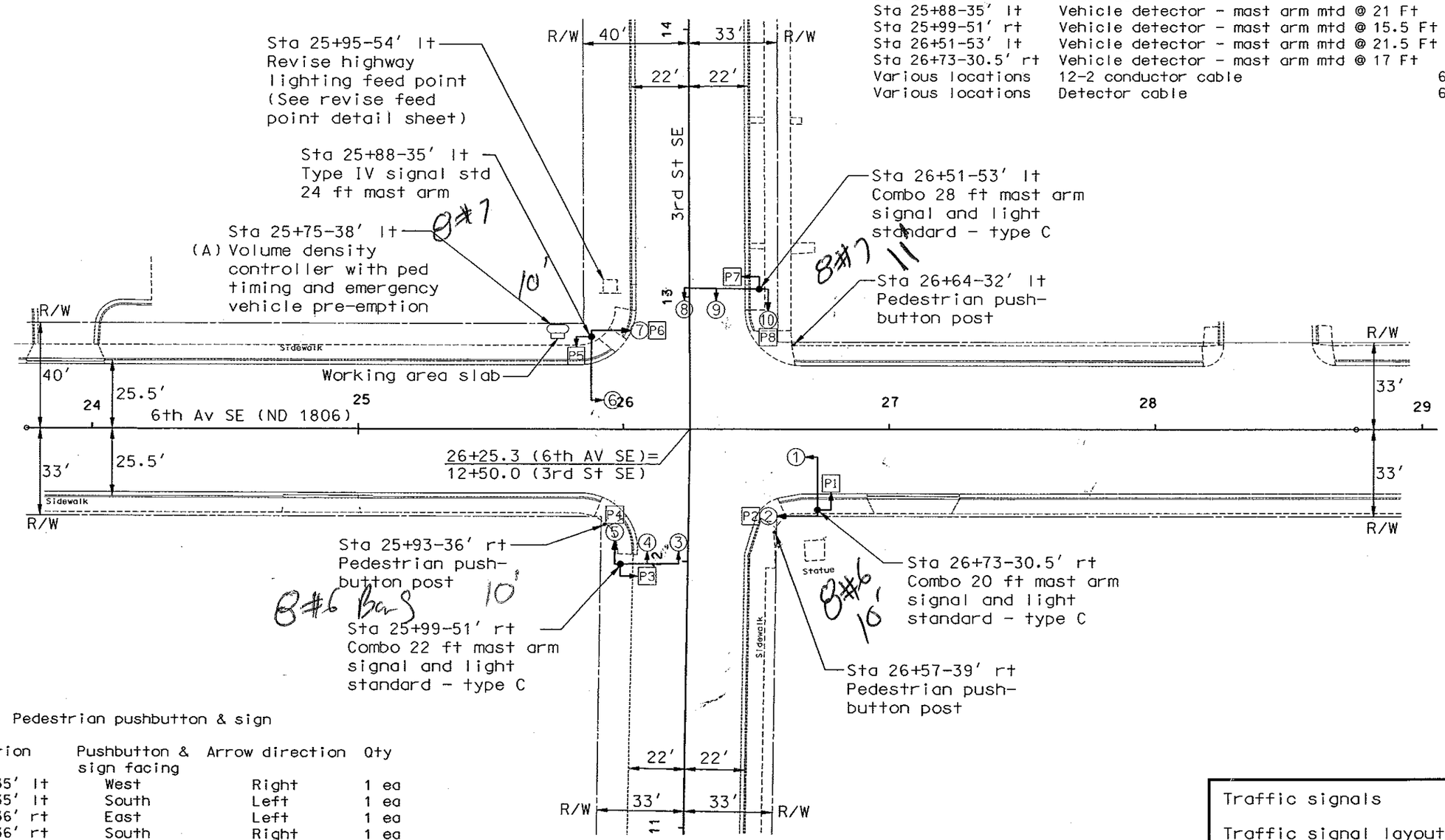
FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	7



Emergency vehicle pre-emption unit

Sta 25+75-38' lt	Phase selector	2 ea
Sta 25+88-35' lt	Vehicle detector - mast arm mtd @ 21 Ft	1 ea
Sta 25+99-51' rt	Vehicle detector - mast arm mtd @ 15.5 Ft	1 ea
Sta 26+51-53' lt	Vehicle detector - mast arm mtd @ 21.5 Ft	1 ea
Sta 26+73-30.5' rt	Vehicle detector - mast arm mtd @ 17 Ft	1 ea
Various locations	12-2 conductor cable	654 LF
Various locations	Detector cable	654 LF



Pedestrian pushbutton & sign

Station	Pushbutton & sign facing	Arrow direction	Qty
25+88-35' lt	West	Right	1 ea
25+88-35' lt	South	Left	1 ea
25+93-36' rt	East	Left	1 ea
25+93-36' rt	South	Right	1 ea
26+57-39' rt	East	Right	1 ea
26+57-39' rt	North	Left	1 ea
26+64-32' lt	West	Left	1 ea
26+64-32' lt	North	Right	1 ea

(A) Controller door shall face west with hinges on north side.

Traffic signals

Traffic signal layout

6th Av SE (ND 1806) & 3rd St SE

Mandan, ND

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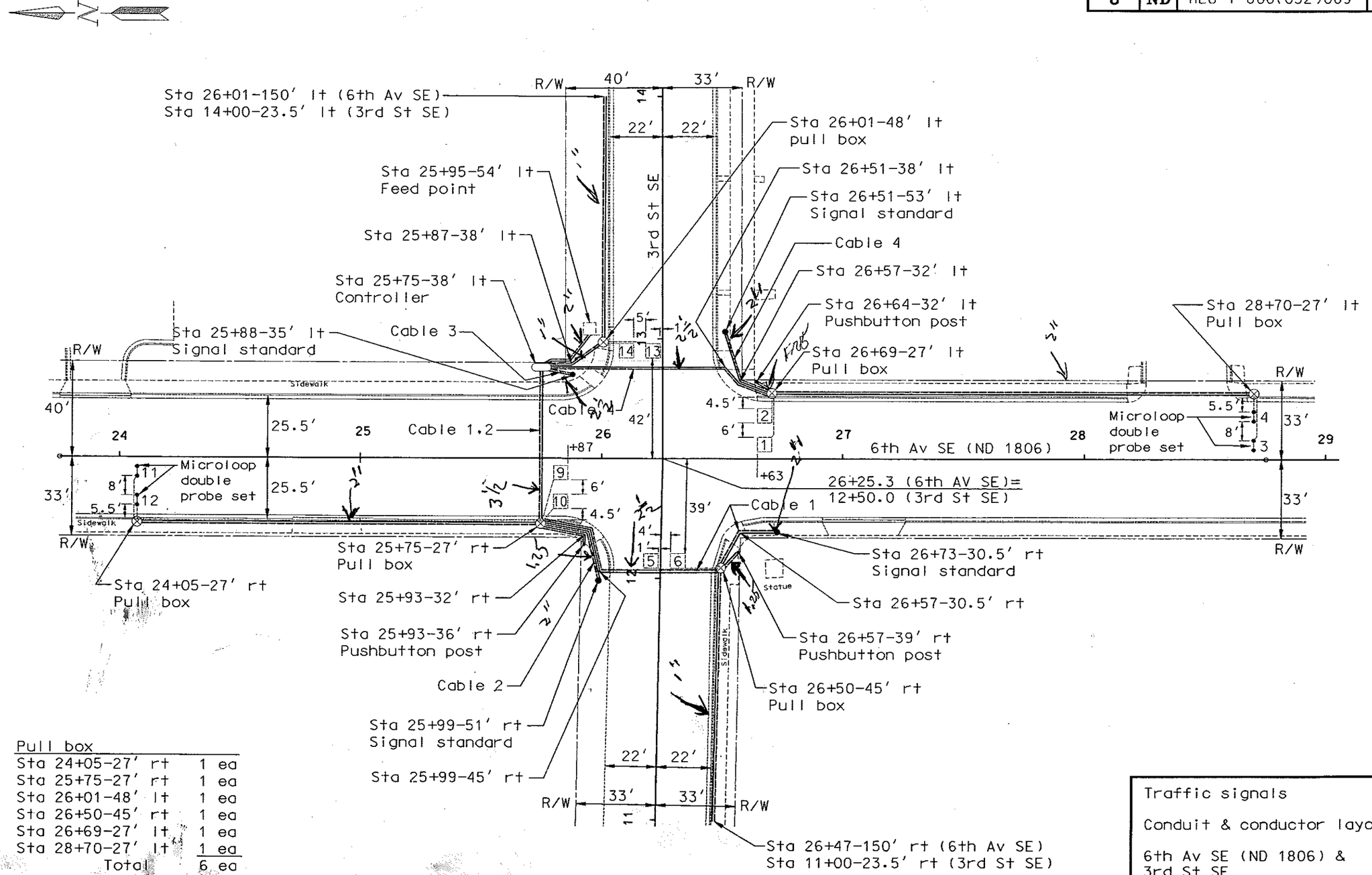
FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	8



Pull box	
Sta 24+05-27' rt	1 ea
Sta 25+75-27' rt	1 ea
Sta 26+01-48' lt	1 ea
Sta 26+50-45' rt	1 ea
Sta 26+69-27' lt	1 ea
Sta 28+70-27' lt	1 ea
Total	6 ea

Traffic signals

Conduit & conductor layout

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

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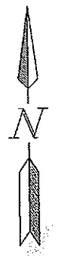
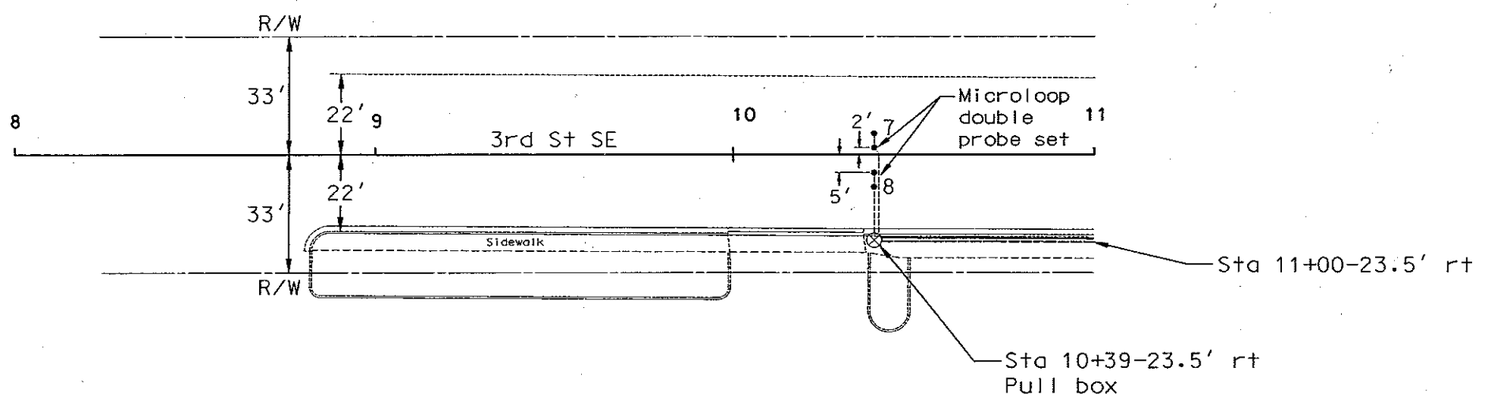
FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	9





Pull box	
Sta 10+39-23.5' rt	1 ea

Traffic signals

Conduit & conductor layout

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

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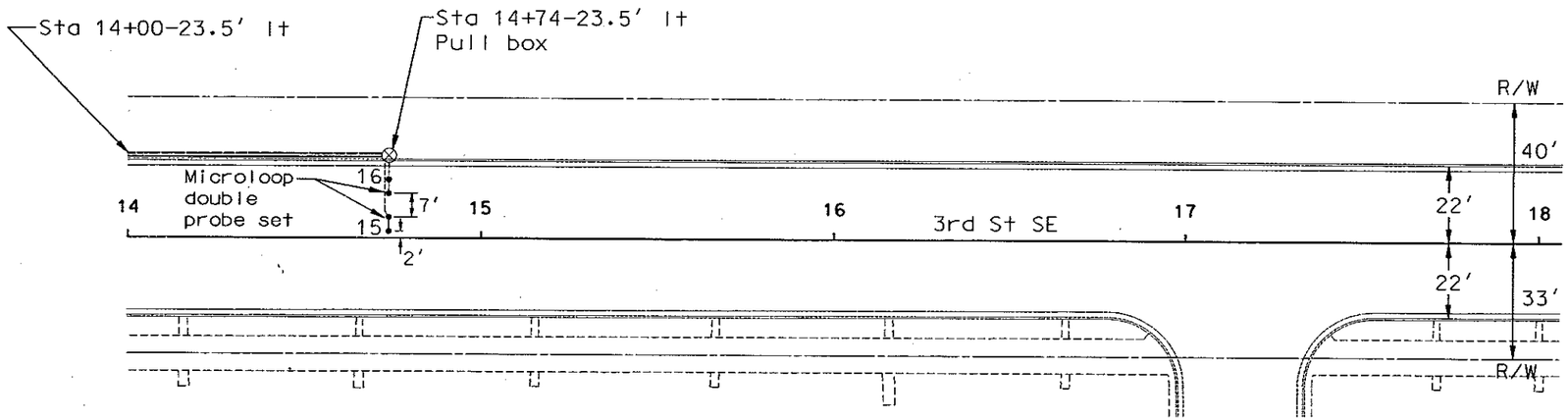
FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	10

N

Pull box
Sta 14+74-23.5' lt 1 ea



Traffic signals

Conduit & conductor layout

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

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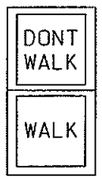
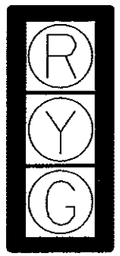
FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	11

SB Ø2 WB Ø8 NB Ø6 EB Ø4

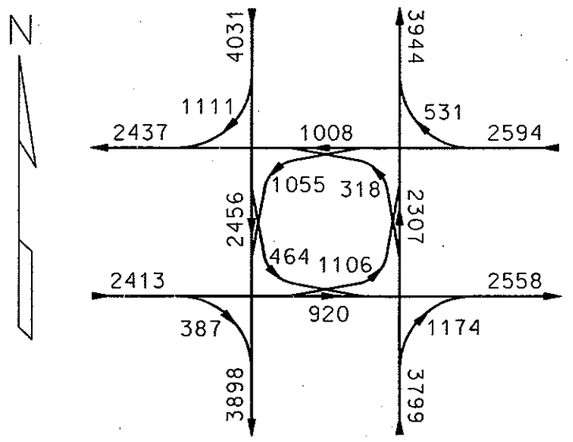
Conductors			Cable 1 (12-12)		Cable 2 (12-12)		Cable 3 (12-12)		Cable 4 (12-12)		CABLE 4	
	Base	Tracer	Head	Indication	Head	Indication	Head	Indication	Head	Indication	Head	Indication
1	Black			Spare		Spare		Spare		Spare	BK	
2	White			Neutral		Neutral		Neutral		Neutral	R	
3	Red		1, 2	Red	3, 4, 5	Red	6, 7	Red	8, 9, 10	Red	BLU	
4	Green			Ground		Ground		Ground		Ground	O	
5	Orange		1, 2	Yellow	3, 4, 5	Yellow	6, 7	Yellow	8, 9, 10	Yellow	Y	
6	Blue		1, 2	Green	3, 4, 5	Green	6, 7	Green	8, 9, 10	Green	BRN	
7	White	Black		Spare		Spare		Spare		Spare	R/BK	
8	Red	Black	Ø4 P1	Don't walk	Ø8 P4	Don't walk	Ø8 P5	Don't walk	Ø4 P8	Don't walk	BLU/BK	
9	Green	Black	Ø4 P1	Walk	Ø8 P4	Walk	Ø8 P5	Walk	Ø4 P8	Walk	O/BK	
10	Orange	Black	Ø2 P2	Don't walk	Ø1 P3	Don't walk	Ø6 P6	Don't walk	Ø6 P7	Don't walk	Y/BK	
11	Blue	Black	Ø2 P2	Walk	Ø2 P3	Walk	Ø6 P6	Walk	Ø6 P7	Walk	BRN/BK	
12	Black	White		Spare		Spare		Spare		Spare	BK	



Heads P1, P2, P3, P4, P5, P6, P7, & P8 (12" lenses)



Heads 1, 2, 3, 4, 5, 6, 7, 8, 9, & 10 (12" lenses)



Estimated 1997 ADT

Detector loops

Loop No.	Amplifier No.	No. of turns	Size	Type of loop	Conductor LF	Saw slot LF	Microloop dbl probe set ea
1	1	3	6'x 6'	Calling	120	39	-
2	1	3	6'x 6'	Calling	96	27	-
3	2	-	-	Passage	-	-	1
4	2	-	-	Passage	-	-	1
5	3	3	6'x 6'	Calling	136	47	-
6	3	3	6'x 6'	Calling	114	36	-
7	4	-	-	Passage	-	-	1
8	4	-	-	Passage	-	-	1
9	5	3	6'x 6'	Calling	122	40	-
10	5	3	6'x 6'	Calling	100	29	-
11	6	-	-	Passage	-	-	1
12	6	-	-	Passage	-	-	1
13	7	3	6'x 6'	Calling	120	39	-
14	7	3	6'x 6'	Calling	98	28	-
15	8	-	-	Passage	-	-	1
16	8	-	-	Passage	-	-	1
				Total	906	285	8

Traffic signals

Conductors, heads, detector loops, and traffic volumes

6th Av SE (ND 1806) &
3rd St SE
Mandan, ND

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FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	12

N

Head No.	Phase 1 R/W	Phase 1 Clear to Ø	Phase 2 R/W	Phase 2 Clear to Ø 4	6	8	Phase 3 R/W	Phase 3 Clear to Ø	Phase 4 R/W	Phase 4 Clear to Ø 6	8	2	Phase 5 R/W	Phase 5 Clear to Ø	Phase 6 R/W	Phase 6 Clear to Ø 8	2	4	Phase 7 R/W	Phase 7 Clear to Ø	Phase 8 R/W	Phase 8 Clear to Ø 2	4	6
1			G	Y	(C)	Y																		
2			G	Y	(C)	Y																		
3																					G	Y	(C)	Y
4																					G	Y	(C)	Y
5																					G	Y	(C)	Y
6															G	Y	(C)	Y						
7															G	Y	(C)	Y						
8									G	Y	(C)	Y												
9									G	Y	(C)	Y												
10									G	Y	(C)	Y												

Chart "A"	
On phase	Non-conflicting phase allowed to time concurrently
1	Future phase
2	6
3	Future phase
4	8
5	Future phase
6	2
7	Future phase
8	4

Blank squares denote a red indication.

(C) When one phase is on alone, any nonconflicting phase may start timing concurrently without a clearance interval. (See Chart "A")

(D) Only upon pedestrian actuation.

Traffic signals

Controller phasing

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

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Station	Conduit runs		Cable runs	
	Length	Size	Length	Type
24+05-27' rt to				
25+75-27' rt	169'	2"	176'	Loop lead-in [11,12]
10+39-23.5' rt to				
11+00-23.5' rt =				
26+47-150' rt to				
26+50-45' rt	165'	1"	172'	Loop lead-in [7,8]
26+73-30.5' rt to				
26+57-30.5' rt to				
26+50-45' rt	31'	2"	37'	Cable 1
			77'	12-2 conductor (B)
			77'	Detector cable (C)
26+57-39' rt to				
26+50-45' rt	8'	1.25"	34'	(2)12-2 conductor (A)
26+50-45' rt to				
25+99-45' rt to				
25+93-32' rt to				
25+75-27' rt	83'	2.5"	90'	Loop lead-in [5,6]
			84'	Loop lead-in [7,8]
			84'	Cable 1
			84'	(2)12-2 conductor (A)
			84'	12-2 conductor (B)
			84'	Detector cable (C)
25+99-51' rt to				
25+93-32' rt to				
25+75-27' rt	38'	2"	44'	Cable 2
			83'	12-2 conductor (B)
			83'	Detector cable (C)
25+93-36' rt to				
25+93-32' rt to				
25+75-27' rt	22'	1.25"	62'	(2)12-2 conductor (A)
25+75-27' rt to				
25+75-38' lt	64'	3.5"	74'	Loop lead-in [5,6]
			74'	Loop lead-in [7,8]
			80'	Loop lead-in [9,10]
			74'	Loop lead-in [11,12]
			74'	Cable 1
			74'	Cable 2
			296'	(4)12-2 conductor (A)
			148'	(2)12-2 conductor (B)
			148'	(2)Detector cable (C)

Station	Conduit runs		Cable runs	
	Length	Size	Length	Type
28+70-27' lt to				
26+69-27' lt	200'	2"	207'	Loop lead-in [3,4]
26+64-32' lt to				
26+69-27' lt	6'	1.25"	30'	(2)12-2 conductor (A)
26+51-53' lt to				
26+57-32' lt to				
26+69-27' lt	34'	2"	40'	Cable 4
			85'	12-2 conductor (B)
			85'	Detector cable (C)
26+69-27' lt to				
26+57-32' lt to				
26+51-38' lt to				
25+75-38' lt	96'	2.5"	112'	Loop lead-in [1,2]
			106'	Loop lead-in [3,4]
			106'	Cable 4
			212'	(2)12-2 conductor (A)
			106'	12-2 conductor (B)
			106'	Detector cable (C)
14+74-23.5' lt to				
14+00-23.5' lt =				
26+01-150' lt to				
26+01-48' lt	175'	1"	182'	Loop lead-in [15,16]
26+01-48' lt to				
25+87-38' lt to				
25+75-38' lt	28'	1"	45'	Loop lead-in [13,14]
			39'	Loop lead-in [15,16]
25+88-35' lt to				
25+75-38' lt	11'	2.5"	27'	Cable 3
			60'	(2)12-2 conductor (A)
			71'	12-2 conductor (B)
			71'	Detector cable (C)
25+95-54' lt to				
25+87-38' lt to				
25+75-38' lt	28'	2"	98'	(2) No. 6 RHW
			49'	(1) No. 6 THW

FHWA REGION	STATE	PROJECT NO.	SHEET NO.
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Note: The number in [brackets] indicates the loop to which this loop lead-in conductor is spliced.

(A) Pedestrian pushbutton conductor

(B) Emergency vehicle indicator light conductor

(C) Emergency vehicle detector cable

Note: The internal wiring in the signal standard for the emergency vehicle pre-emption is included in the emergency vehicle indicator light conductor and the emergency vehicle detector cable quantities.

Traffic signals

Conduit and cable runs

6th Av SE (ND 1806) & 3rd St SE

Mandan, ND

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FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	14

Quantities

	Concrete foundation - traffic signals	Pull box	1" Dia rigid conduit	1.25" Dia rigid conduit	2" Dia rigid conduit	2.5" Dia rigid conduit	3.5" Dia rigid conduit	Underground conductor No. 6 - type RHW	Underground conductor No. 6 - type THW	Detector loop - polyethylene conduit pre-wired	Loop lead-in conductor	Microloop double probe set	No. 12 AWG 2 conductor cable	No. 12 AWG 3 conductor cable	No. 12 AWG 5 conductor cable	No. 12 AWG 12 conductor cable	Saw slot	Type IV signal standard 24 foot mast arm	Combo 20 foot mast arm signal and light standard - type C	Combo 22 foot mast arm signal and light standard - type C	Combo 28 foot mast arm signal and light standard - type C	1-Way 3 section head with 12" lenses - post mounted	1-Way 3 section head with 12" lenses - mast arm mounted	1-Way 2 section head pedestrian signal - post mounted	Pedestrian push button post	Volume density controller W/ped timing and emer veh pre-emption	Emergency vehicle pre-emption unit	Revise highway lighting feed point							
	EA	EA	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA							
Sta 25+75-38' lt	1																									1									
Sta 25+88-35' lt	1													24(A)	61(A)			1				1	1	2											
Sta 25+93-36' rt																									1										
Sta 25+95-54' lt																											1								
Sta 25+99-51' rt	1													24(A)	92(A)					1		1	2	2											
Sta 26+51-53' lt	1													24(A)	104(A)						1	1	2	2											
Sta 26+57-39' rt																									1										
Sta 26+64-32' lt																									1										
Sta 26+73-30.5' rt	1													24(A)	57(A)				1			1	1	2											
Var. locations		8	368	36	500	190	64	98	49	906	1515	8	778			486	285										1								
Total	5	8	368	36	500	190	64	98	49	906	1515	8	778	96	314	486	285	1	1	1	1	4	6	8	3	1	1	1							

(A) Used for internal wiring of signal standards.

Traffic signals

Summary of quantities

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

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FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	15

		Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8
Basic intervals (or functions)									
Minimum initial			5.8		5.8		5.8		5.8
Passage time			5.0		4.7		5.6		5.0
Maximum (maximum green or ext. limit)			35		25		35		25
Yellow change			4.0		4.0		4.0		4.0
Red clearance			1.0		1.0		1.0		1.0
Walk			10.0		10.0		10.0		10.0
Pedestrian clearance			11.0		11.5		11.0		11.5
Volume density timing functions									
Variable initial timing options									
Added initial									
Minimum initial			5.8		5.8		5.8		5.8
Added initial per actuation			2.1		2.1		2.1		2.1
Actuations before added initial			2		2		2		2
Computed initial									
Minimum initial			5.8		5.8		5.8		5.8
Maximum initial			18.8		18.1		20.9		18.8
Actuations to reach maximum initial			7		6		8		7
Extensible initial									
Minimum initial			5.8		5.8		5.8		5.8
Maximum initial			18.8		18.1		20.9		18.8
Added initial per actuation			2.1		2.1		2.1		2.1
Time waiting gap reduction options									
Passage time			5.0		4.7		5.6		5.0
Minimum gap			1.4		1.4		1.4		1.4
Time to reduce to minimum gap			9.2		1.9		7.1		1.2
Reduce gap every			1.0		1.0		1.0		1.0
Reduce gap every second by			.4		1.7		.6		3.0
Reduce gap by			3.6		3.3		4.2		3.6
Locking memory			X		X		X		X
Non-locking memory									
Flashing-normal & conflict monitor			Y		R		Y		R
Start up phasing			G		R		G		R
Type of detector loop	Presence								
	Calling (A)		X		X		X		X
	Passage		X		X		X		X

(A) Calling loops shall place one call into the controller on the yellow or red interval. Calling loops shall be disconnected during the green interval.

Emergency vehicle pre-emption phasing			
Ø2 ↓	Ø4 →	Ø6 ↑	Ø8 ←
Phase 2	Phase 4	Phase 6	Phase 8
Southbound	Eastbound	Northbound	Westbound

Traffic signals

Controller settings

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

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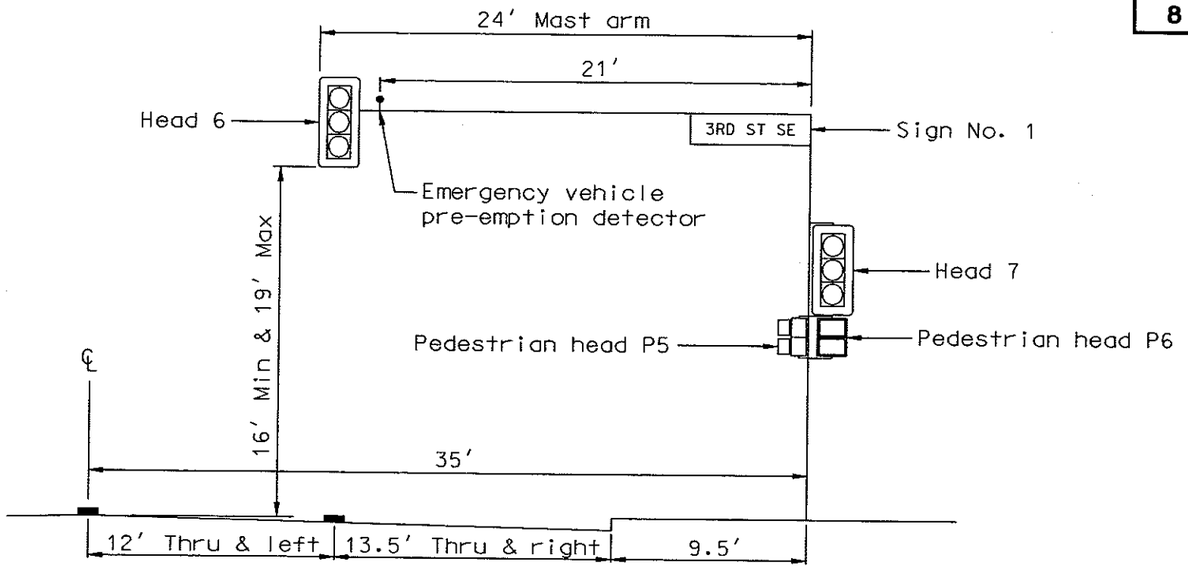
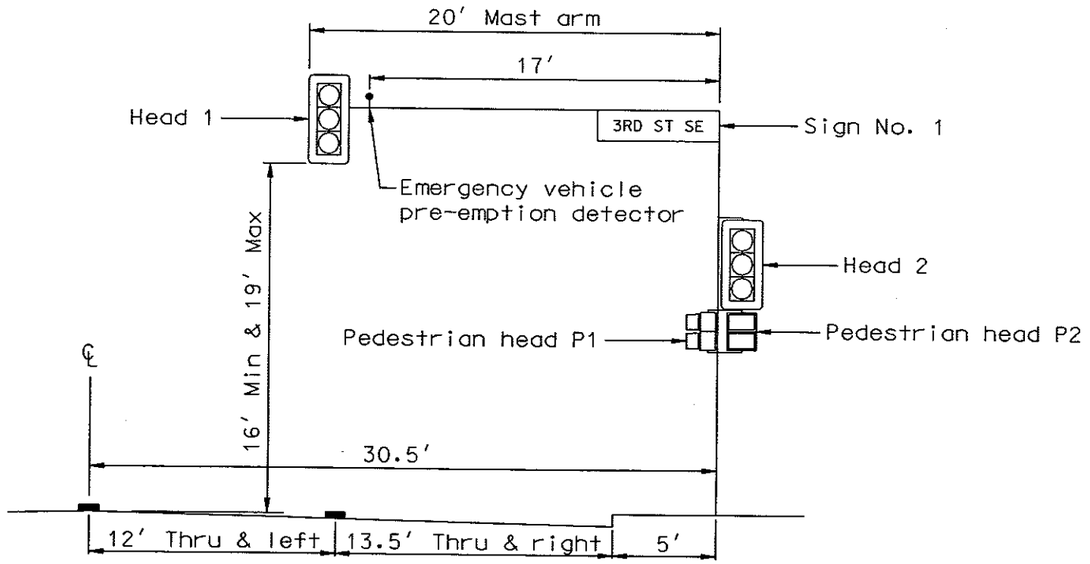
FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	16



Sta 25+88-35' lt
Northbound, south approach
Cross section



Sta 26+73-30.5' rt
Southbound, north approach
Cross section

Traffic signals

Signal head & mast arm locations

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

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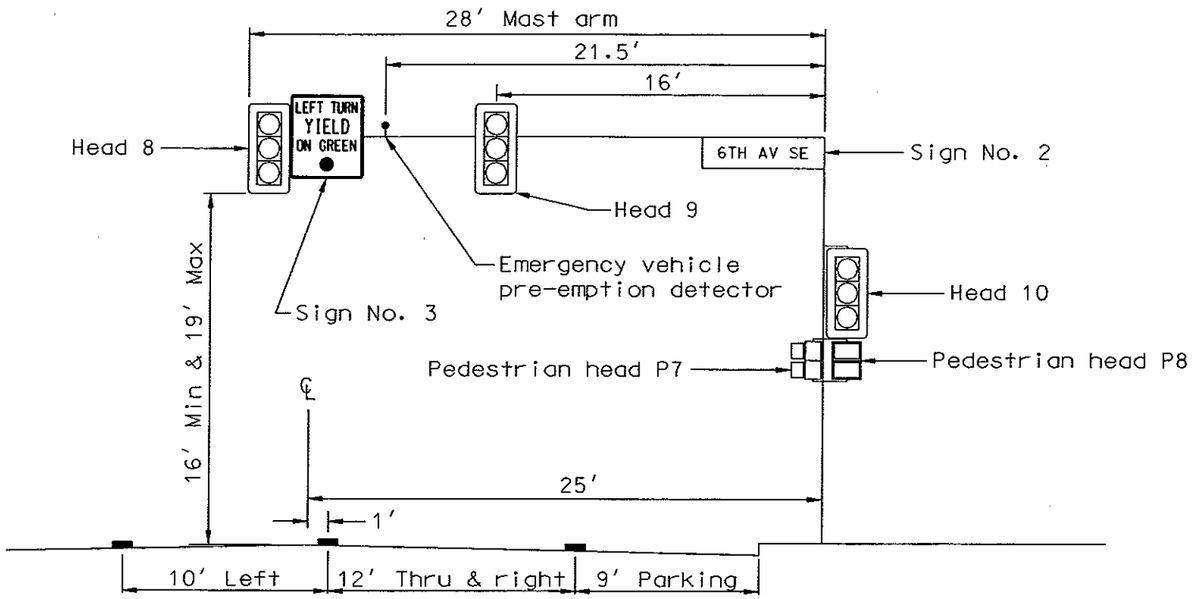
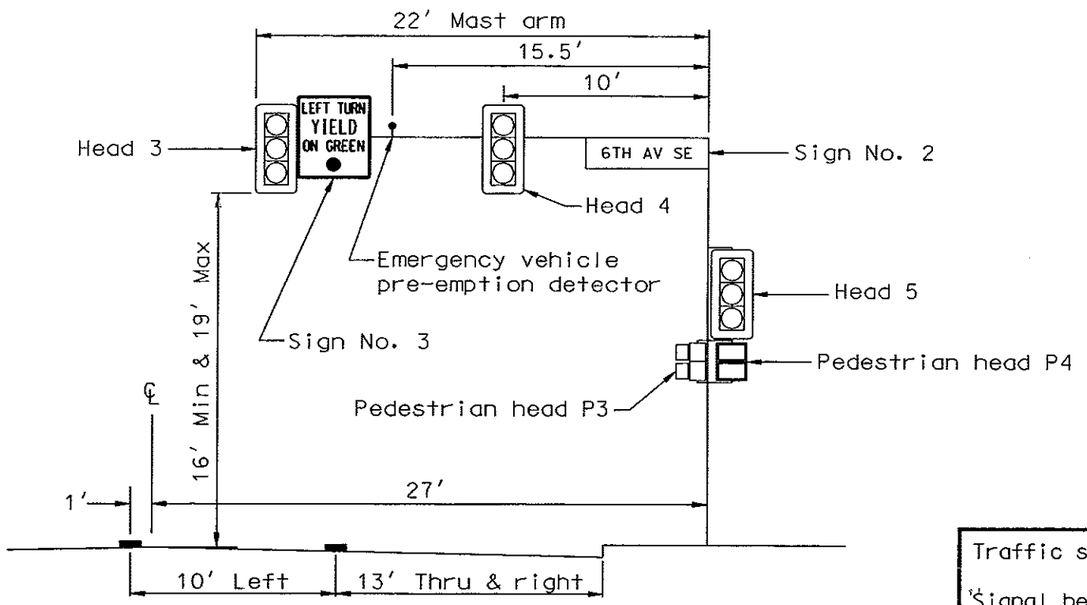
FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	17



Sta 26+51-53' lt
Eastbound, west approach
cross section



Sta 25+99-51' rt
Westbound, east approach
cross section

Traffic signals

Signal head & mast arm locations

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

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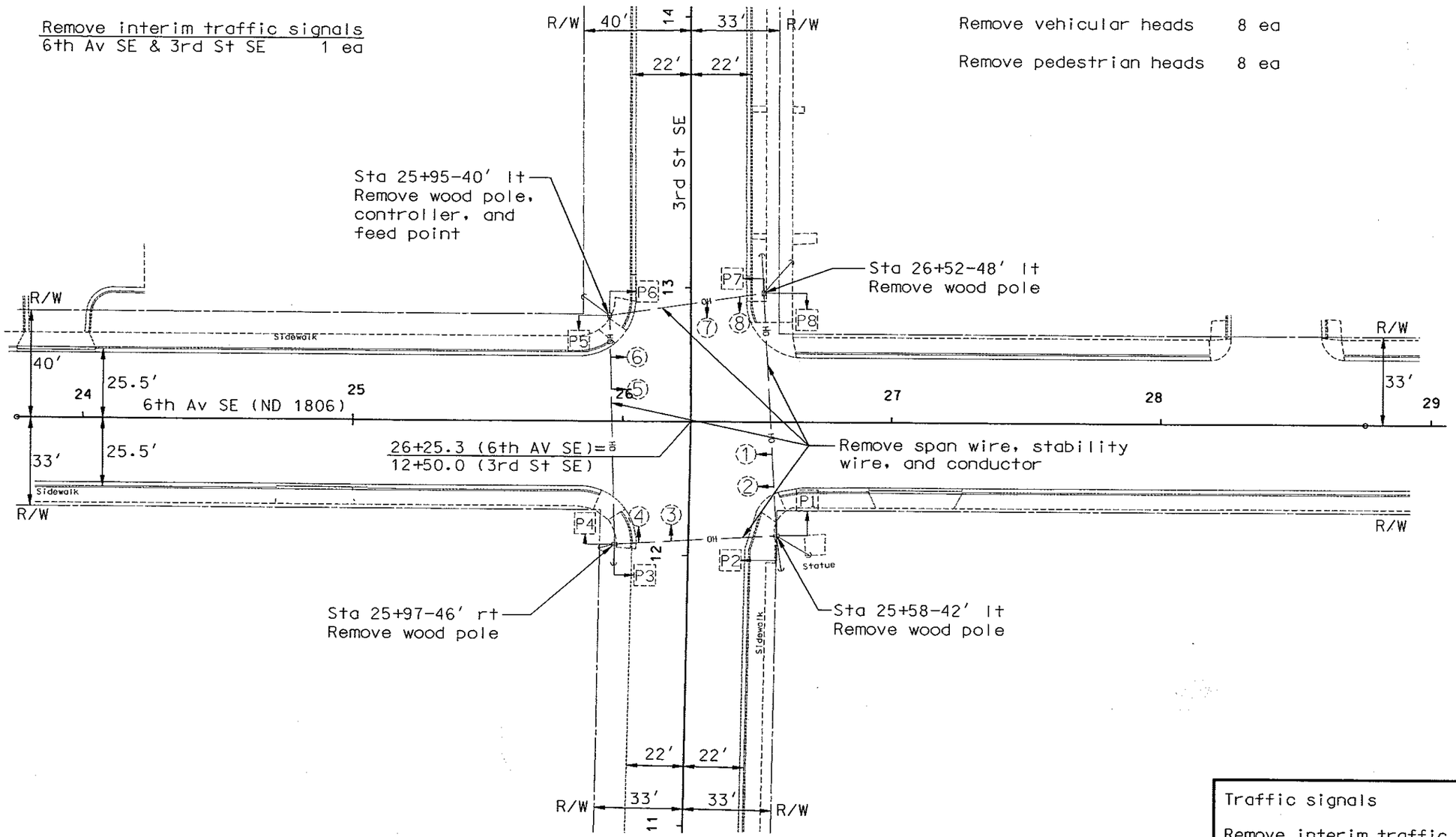
FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	18

Remove interim traffic signals
6th Av SE & 3rd St SE 1 ea

Remove vehicular heads 8 ea

Remove pedestrian heads 8 ea



Traffic signals

Remove interim traffic signals

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

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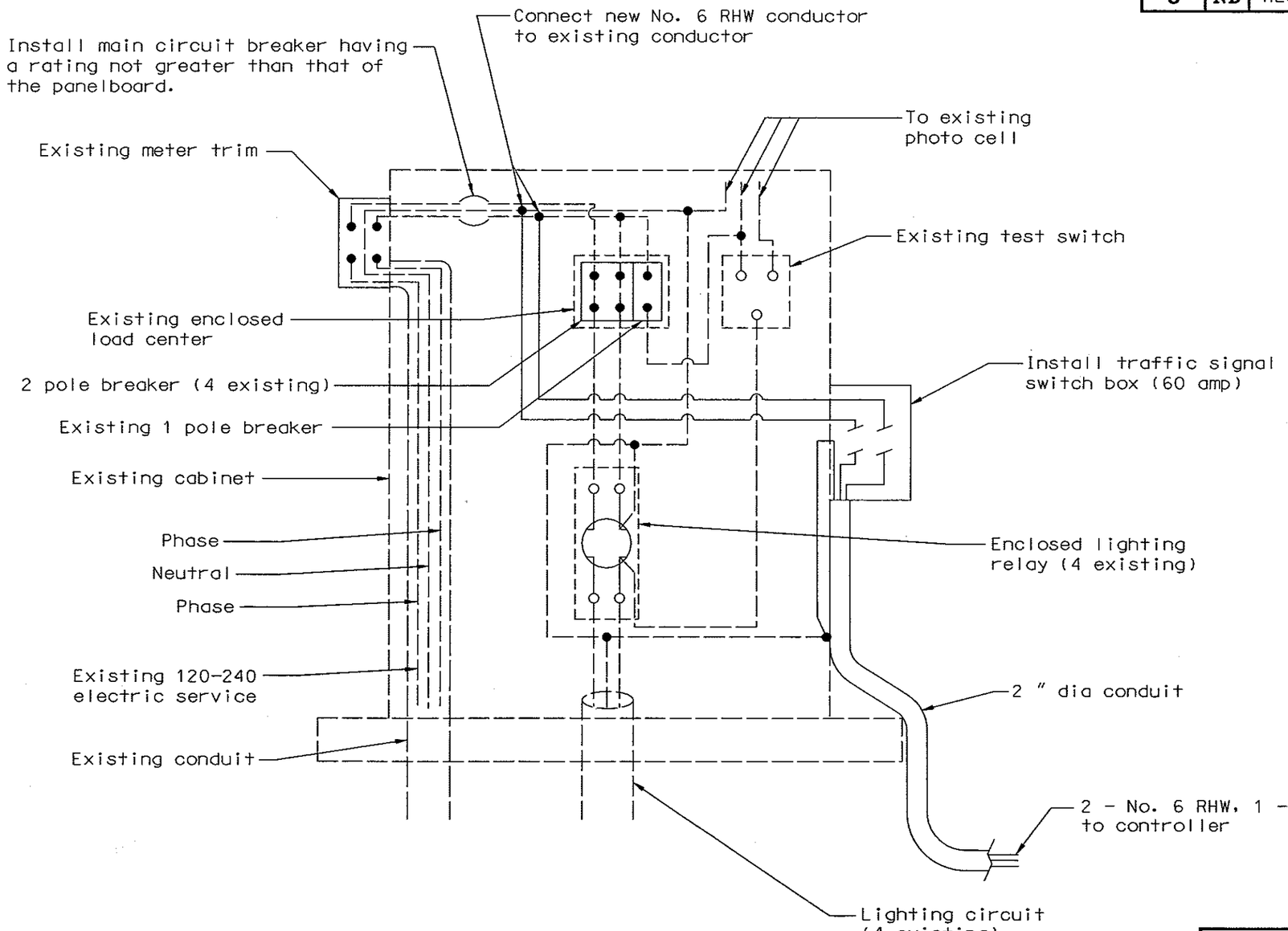
FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	19



Revise feed point detail
(Mount traffic signal switch box on existing lighting feed point cabinet sta 25+95-54' lt)

Traffic signals

Revise feed point detail

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

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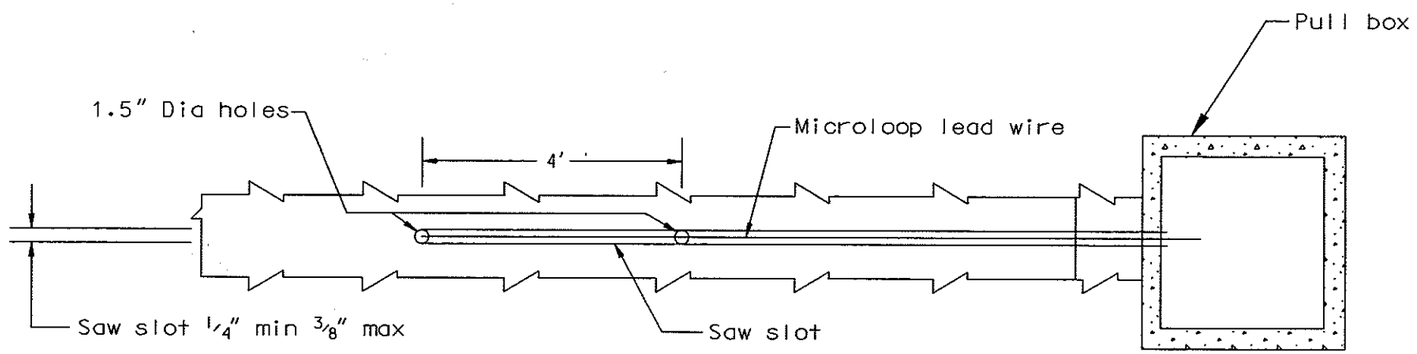
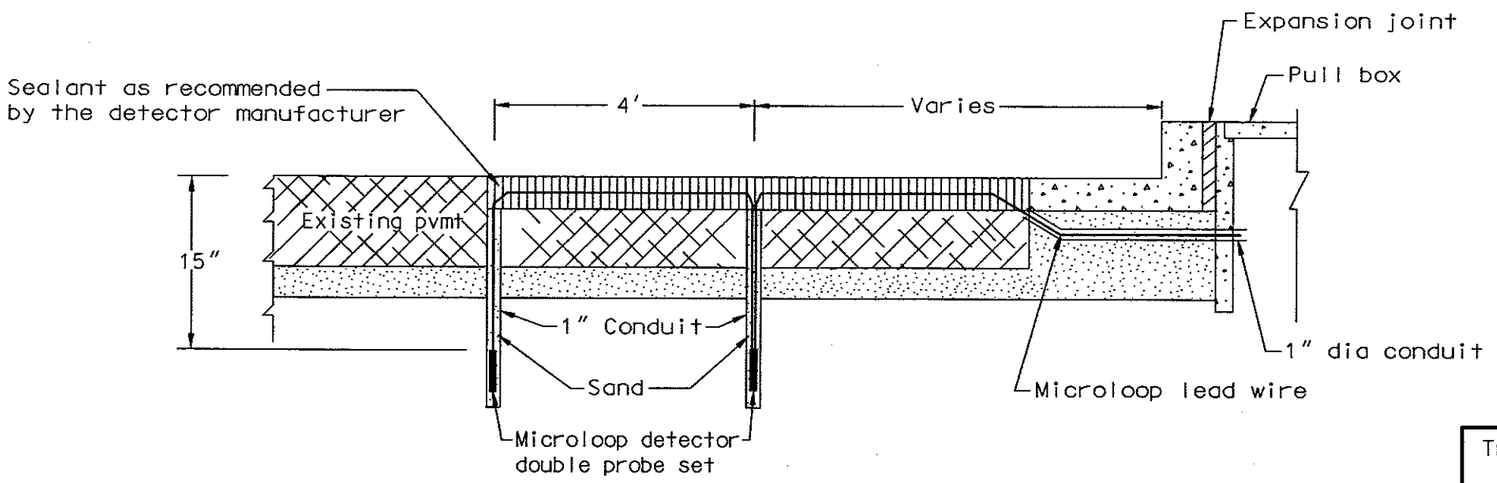
FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	20

Note: The contractor shall drill the 1.5" dia holes, cut the saw slot in the existing pavement, install the 1" conduit and microloop detectors. The 1" conduit is filled with sand, the saw slot sealed with sealant, and the microloops tested for continuity.

Note: The 1.5 inch dia holes shall be drilled a minimum of 2" below the bottom of the microloop detector probe.



Plan



Elevation

Traffic signals

Microloop detail

6th Av SE (ND 1806) & 3rd St SE

Mandan, ND

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FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	21

N

3rd St SE

13 14

26+25.3 (6th AV SE)=
12+50.0 (3rd St SE)

Electrical box
MDU E
USW COMM 10 Pr 600 Pr Tel locker
OH
Municipal
Sidewalk
MUNICIPAL
20"
SAN
15" RCP
21" RCP
SD
24 25 26 27 28 29
6th Av SE (ND 1806)
DCC CABLE
8"
MDU 4"
MDU 2" 4"
USW COMM 200 Pr 2-600 Pr 900 Pr
USW COMM 6 Pr
Tel ped
TV ped
WV
WSV
Statue
MDU ELECTRIC
MDU Service
MDU SERVICE
12 11

Traffic signals

Underground utility layout

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

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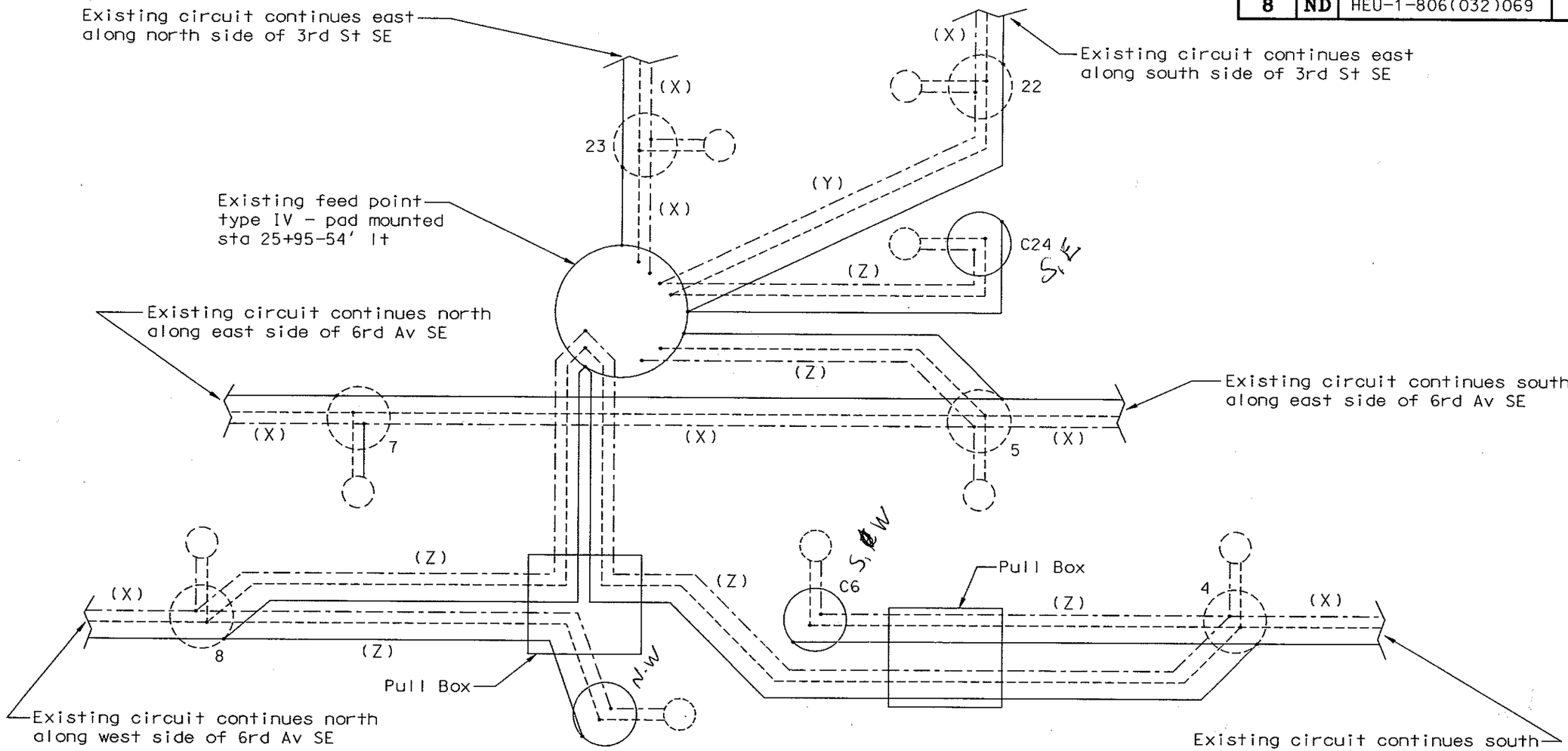
FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	22



Legend

Phase conductor
Phase conductor
Ground conductor

(X) Existing conductors
(Y) (2) No. 4 RHW, (1) No. 6 THW
(Z) (2) No. 6 RHW, (1) No. 6 THW

Existing HP sodium vapor luminaire 120v x 240v operated on 240v

Relocated HP sodium vapor luminaire 120v x 240v operated on 240v

Combo signal and light standard

Existing light standard

5 Light standard number

Lighting schematic

Existing feed point

Sta 25+95-54' lt

Mandan, ND

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FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	23

N

Remove light standard

Sta 26+02-50' rt	1 ea
Sta 26+50-59' lt	1 ea
Sta 26+77-30.5' rt	1 ea
Total	3 ea

Pull box

Sta 25+82-30.5' rt	1 ea
Sta 26+77-30.5' rt	1 ea
Total	2 ea

Relocate luminaire

From	To	
Sta 26+02-50' rt	Sta 25+99-51' rt	1 ea
Sta 26+50-59' lt	Sta 26+51-53' lt	1 ea
Sta 26+77-30.5' rt	Sta 26+73-30.5' rt	1 ea
	Total	3 ea

Sta 26+50-150' lt (6th Av SE)
Sta 14+00-25.5' rt (3rd St SE)

Existing conductor in place to remain

Sta 25+95-54' lt
Lighting feed point in place to remain

Sta 25+95-46' lt

Sta 25+82-33' lt

Existing conductor in place to remain

Sta 24+45-32.5' lt
Existing light standard in place to remain

Sta 26+49-54' lt

Sta 26+50-59' lt
Remove light standard

Sta 26+51-53' lt
Relocate luminaire from Sta 26+50-59' lt

Sta 26+00-54' lt

Existing conduit and conductor in place to remain

Sta 29+13-32.5' lt
Existing light standard in place to remain

R/W 40' 14 33' R/W
22' 22'
3rd St SE
13
Sidewalk
40' 25.5' 33'
24 25 26 27 28 29
6th Av SE (ND 1806)
26+25.3 (6th AV SE)= 12+50.0 (3rd St SE)
24

Sta 26+77-30.5' rt
Pull box (See note B)

Sta 26+77-30.5' rt
Remove light standard

Sta 26+73-30.5' rt
Relocate luminaire from sta 26+77-30.5' rt

Statue

Sta 22+13-30.5' rt
Existing light standard in place to remain

Existing conduit and conductor in place to remain

Sta 25+82-30.5' rt
Pull box (See note A)

Sta 25+93-30.5' rt

Sta 25+99-51' rt
Relocate luminaire from sta 26+02-50' rt

Existing conduit in place to remain

Sta 26+02-50' rt
Remove light standard

Sta 31+49-30.5' rt
Existing light standard in place to remain

Existing conduit in place to remain

12
Sidewalk
22' 22'
R/W 33' 33' R/W
11

Note B: The contractor shall locate the existing conduit at sta 26+77-30.5' rt and salvage a sufficient length to make the connection to the new pull box. The contractor shall be responsible for any damage to the existing conduit and shall replace any damaged conduit at his own expense.

Note A: The contractor shall locate the existing conduit at sta 25+82-30.5' rt. The contractor shall cut the conduit and install the pull box at sta 25+82-30.5' rt. Any existing conduit damaged by the contractor shall be replaced at his own expense.

Lighting layout

6th Av SE (ND 1806) & 3rd St SE

Mandan, ND

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	Station	Conduit runs		Cable trench	Cable runs	
		Length	Size	Length	Length	Type
NW ϕ	22+13-30.5' rt to				1492'	(4) No. 6 RHW
NW SB	25+82-30.5' rt	368'(A)	2"		746'	(2) No. 6 THW
NW SB	25+82-30.5' rt to				22'	(2) No. 6 RHW
NW signal	25+93-30.5' rt	11'	2"		11'	(1) No. 6 THW
	25+93-30.5' rt to				50'	(2) No. 6 RHW
	25+99-51' rt	20'	2"		25'	(1) No. 6 THW
NW SB	25+82-30.5' rt to				190'	(2) No. 6 RHW
SW SB	26+77-30.5' rt	94'	2"		95'	(1) No. 6 THW
SW signal	26+73-30.5' rt to				16'	(2) No. 6 RHW
SW SB	26+77-30.5' rt	3'	2"		8'	(1) No. 6 THW
SW SB	26+77-30.5' rt to				1904'	(4) No. 6 RHW
SW ϕ	31+49-30.5' rt	471'(A)	2"		952'	(2) No. 6 THW
NW PBox	25+82-30.5' rt to				256'	(4) No. 6 RHW
	25+82-33' lt	64'	2"		128'	(2) No. 6 THW
Feed point	25+82-33' lt to				72'	(4) No. 6 RHW
	25+95-46' lt	18'	2"		36'	(2) No. 6 THW
[illegible]	25+95-46' lt to				72'	(4) No. 6 RHW
F.P	25+95-54' lt			7'	36'	(2) No. 6 THW
F.P.	25+95-54' lt to				30'	(2) No. 4 RHW
	26+00-54' lt			4'	30'	(2) No. 6 RHW
					30'	(2) No. 6 THW
	26+00-54' lt to				98'	(2) No. 4 RHW
	26+49-54' lt	49'	2"		98'	(2) No. 6 RHW
					98'	(2) No. 6 THW
S.E. signal standard	26+49-54' lt to				18'	(2) No. 6 RHW
	26+51-53' lt			1'	9'	(1) No. 6 THW
F.P S.E. Light	26+49-54' lt to				192'	(2) No. 4 RHW
	26+50-150' lt			96'	96'	(1) No. 6 THW

FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	24

Quantities											
Pull box	Cable trench - type I	2" Dia rigid conduit	Underground conductor No. 4 - type RHW	Underground conductor No. 6 - type RHW	Underground conductor No. 6 - type THW	Relocate luminaire	Remove light standard				
EA	LF	LF	LF	LF	LF	EA	EA				
2	108	259	320	4220	2270	3	3				

Lighting quantities

6th Av SE (ND 1806 & 3rd St SE

Mandan, ND

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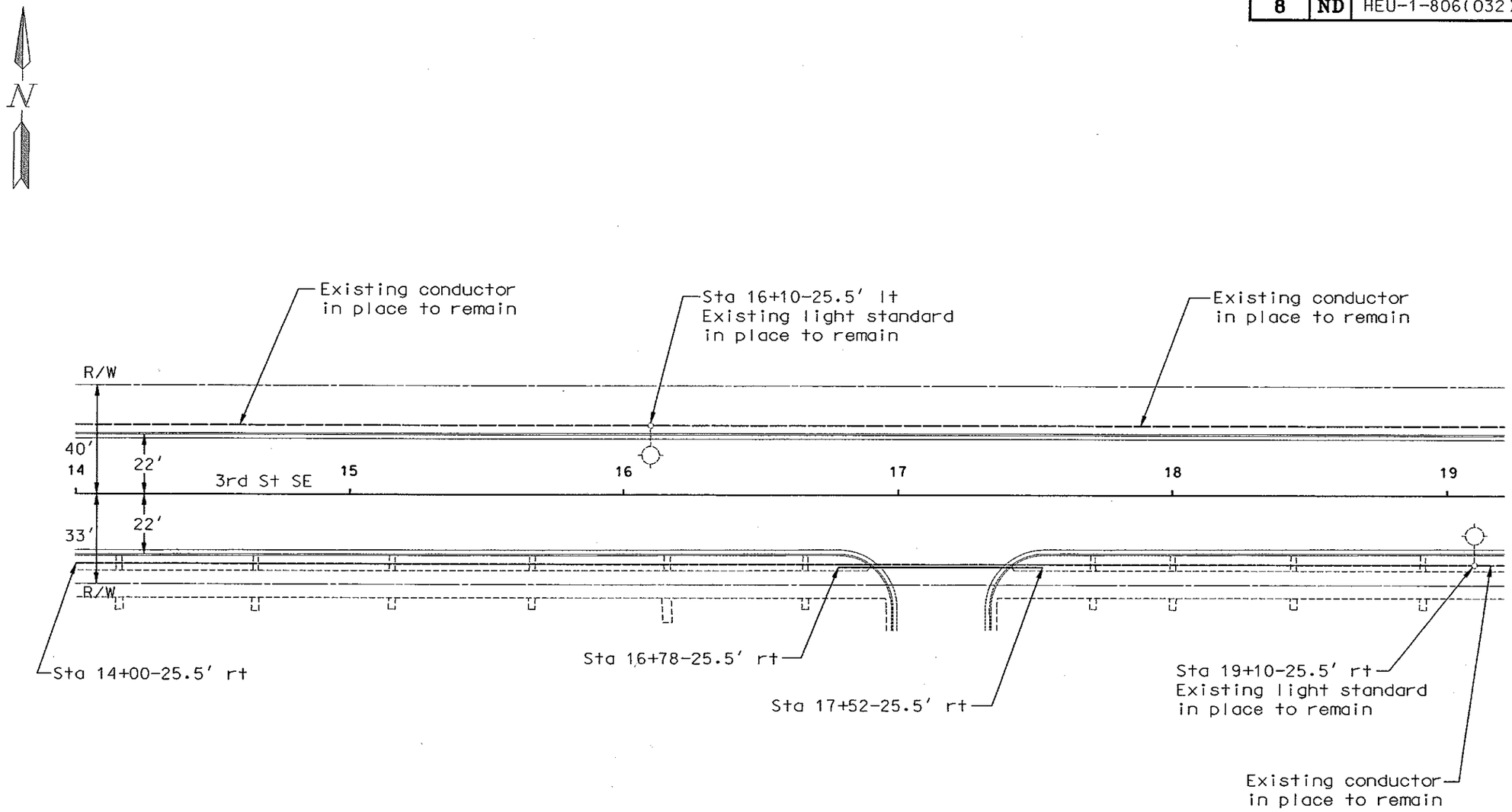
FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	25



Lighting layout

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

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FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	26

Station	Conduit runs		Cable trench	Cable runs	
	Length	Size	Length	Length	Type
14+00-25.5' rt to 16+78-25.5' rt			278'	556'	(2) No. 4 RHW
				278'	(1) No. 6 THW
16+78-25.5' rt to 17+52-25.5' rt	74'	2"		148'	(2) No. 4 RHW
				74'	(1) No. 6 THW
17+52-25.5' rt to 19+10-25.5' rt			157'	330'	(2) No. 4 RHW
				165'	(1) No. 6 THW

Quantities											
Cable trench - type I	2" Dia rigid conduit	Underground conductor No. 4 - type RHW	Underground conductor No. 6 - type THW								
LF	LF	LF	LF								
435	74	1034	517								

Lighting quantities

6th Av SE (ND 1806 &
3rd St SE

Mandan, ND

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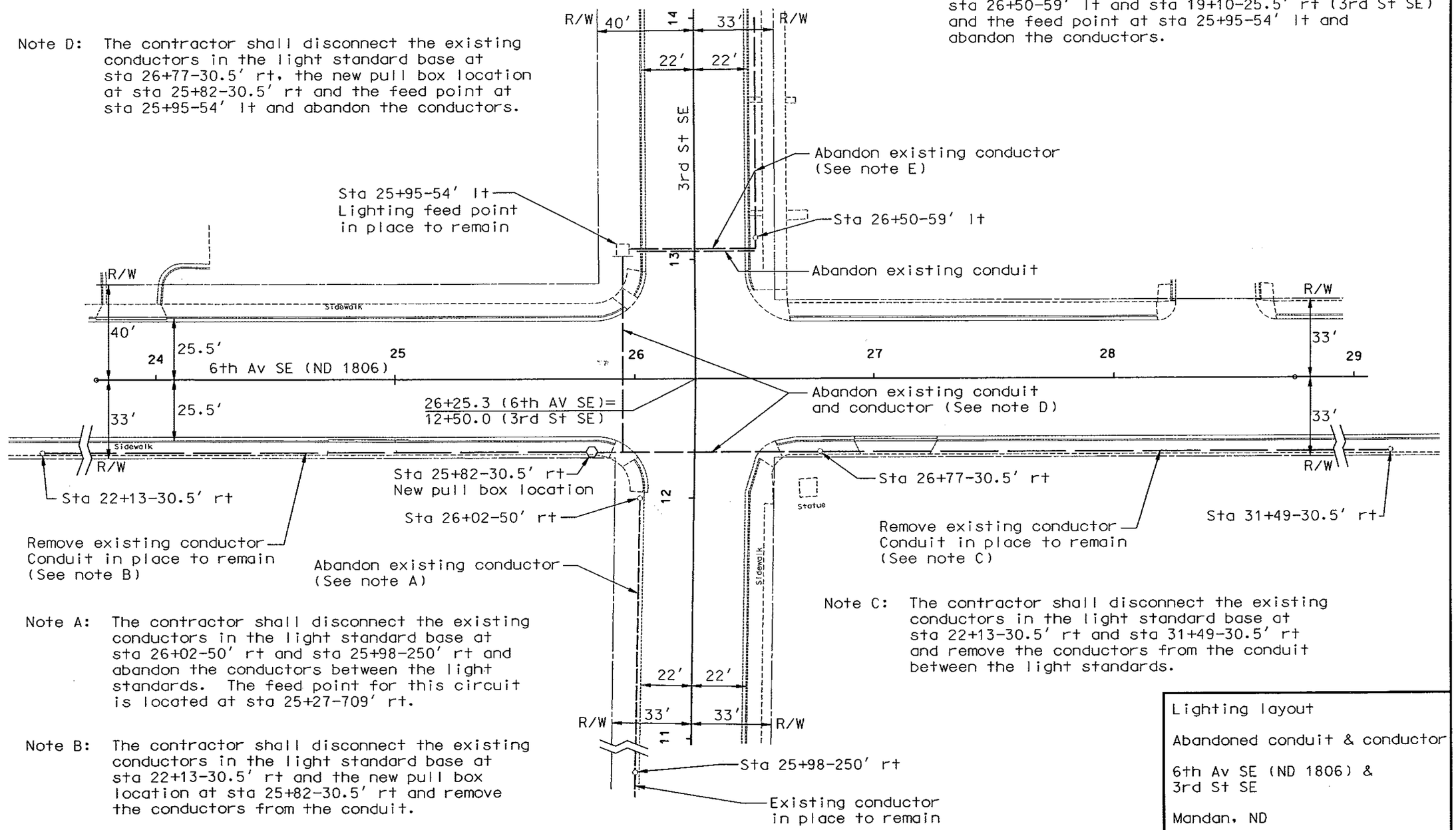
FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	27

Note D: The contractor shall disconnect the existing conductors in the light standard base at sta 26+77-30.5' rt, the new pull box location at sta 25+82-30.5' rt and the feed point at sta 25+95-54' lt and abandon the conductors.

Note E: The contractor shall disconnect the existing conductors in the light standard base at sta 26+50-59' lt and sta 19+10-25.5' rt (3rd St SE) and the feed point at sta 25+95-54' lt and abandon the conductors.



Note A: The contractor shall disconnect the existing conductors in the light standard base at sta 26+02-50' rt and sta 25+98-250' rt and abandon the conductors between the light standards. The feed point for this circuit is located at sta 25+27-709' rt.

Note B: The contractor shall disconnect the existing conductors in the light standard base at sta 22+13-30.5' rt and the new pull box location at sta 25+82-30.5' rt and remove the conductors from the conduit.

Note C: The contractor shall disconnect the existing conductors in the light standard base at sta 22+13-30.5' rt and sta 31+49-30.5' rt and remove the conductors from the conduit between the light standards.

Lighting layout

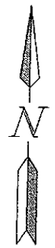
Abandoned conduit & conductor

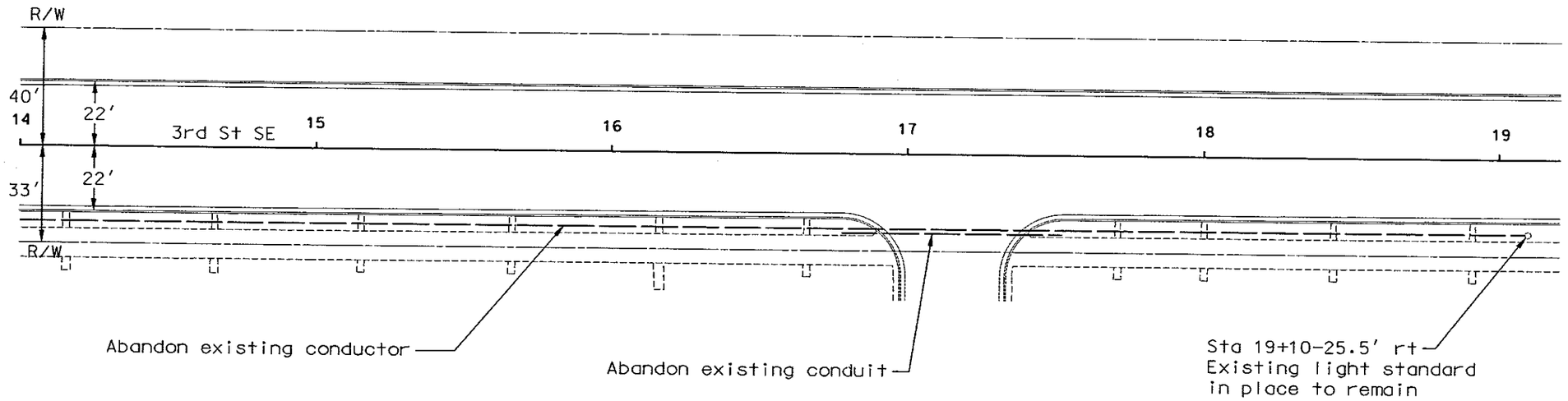
6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

...\d_traffi\llight3.dgn Dec. 03, 1997 08:33:00

FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	28





Lighting layout

Abandoned conduit & conductor

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

...\d_traffi\llight4.dgn Oct. 30, 1997 11:48:25

FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	29

SIGN SUMMARY - PERFORATED TUBE

STATION	ASSEMBLY NUMBER	SIGN FLAT TYPE 2	AREA SHEET TYPE 3A	SIGN SUPPORT POST LENGTHS 1ST	2ND	3RD	4TH	SIGN SUPPORT SLEEVE LENGTH SIZE	1ST	2ND	3RD	4TH	ANCHOR LNTH	ANCHOR SIZE	UNIT NO	TOTAL SUPPORT WEIGHT	RESET SIGN PAN	RESET SIGN SUP	BREAK-AWAY BASE	MAX. LNG. FOR SUP. SIZE
25+62 RT	S.A. A	3.00		10.3				2.00					4.0	2.25	1	35.86				19.0
25+72 LT	S.A. A	3.00		10.3				2.00					4.0	2.25	1	35.86				19.0
25+88 LT	SIGN 1	8.25		MAST ARM MOUNTED																
25+98 LT	S.A. A	3.00		10.3				2.00					4.0	2.25	1	35.86				19.0
25+99 RT	SIGN 2	9.00		MAST ARM MOUNTED																
25+99 RT	SIGN 3	14.00		MAST ARM MOUNTED																
26+51 LT	SIGN 3	14.00		MAST ARM MOUNTED																
26+51 LT	SIGN 2	9.00		MAST ARM MOUNTED																
26+51 LT	7 RS	1.50		8.8				2.00					4.0	2.25	1	32.23				36.0
26+55 RT	7 RS	1.50		8.8				2.00					4.0	2.25	1	32.23				36.0
26+73 RT	SIGN 1	8.25		MAST ARM MOUNTED																
26+79 RT	S.A. A	3.00		10.3				2.00					4.0	2.25	1	35.86				19.0
26+89 LT	S.A. A	3.00		10.3				2.00					4.0	2.25	1	35.86				19.0
14+50 LT	7 RS	1.50		8.8				2.00					4.0	2.25	1	32.23				36.0
16+00 LT	7 RS	1.50		8.8				2.00					4.0	2.25	1	32.23				36.0
17+50 LT	7 RS	1.50		8.8				2.00					4.0	2.25	1	32.23				36.0
SUBTOTAL NO 1		85.00	0.00	LENGTH ALL SIZES			95.0		LGTH ALL SZ				40.0			340.44	0	0		
SUBTOTAL NO 1		85.00	0.00	LENGTH ALL SIZES			95.0		LGTH ALL SZ				40.0			340.44	0	0		
TOTAL		85.00	0.00				95.0						40.0			340.44	0	0		

Basis of estimate
Vertical clearance 84"

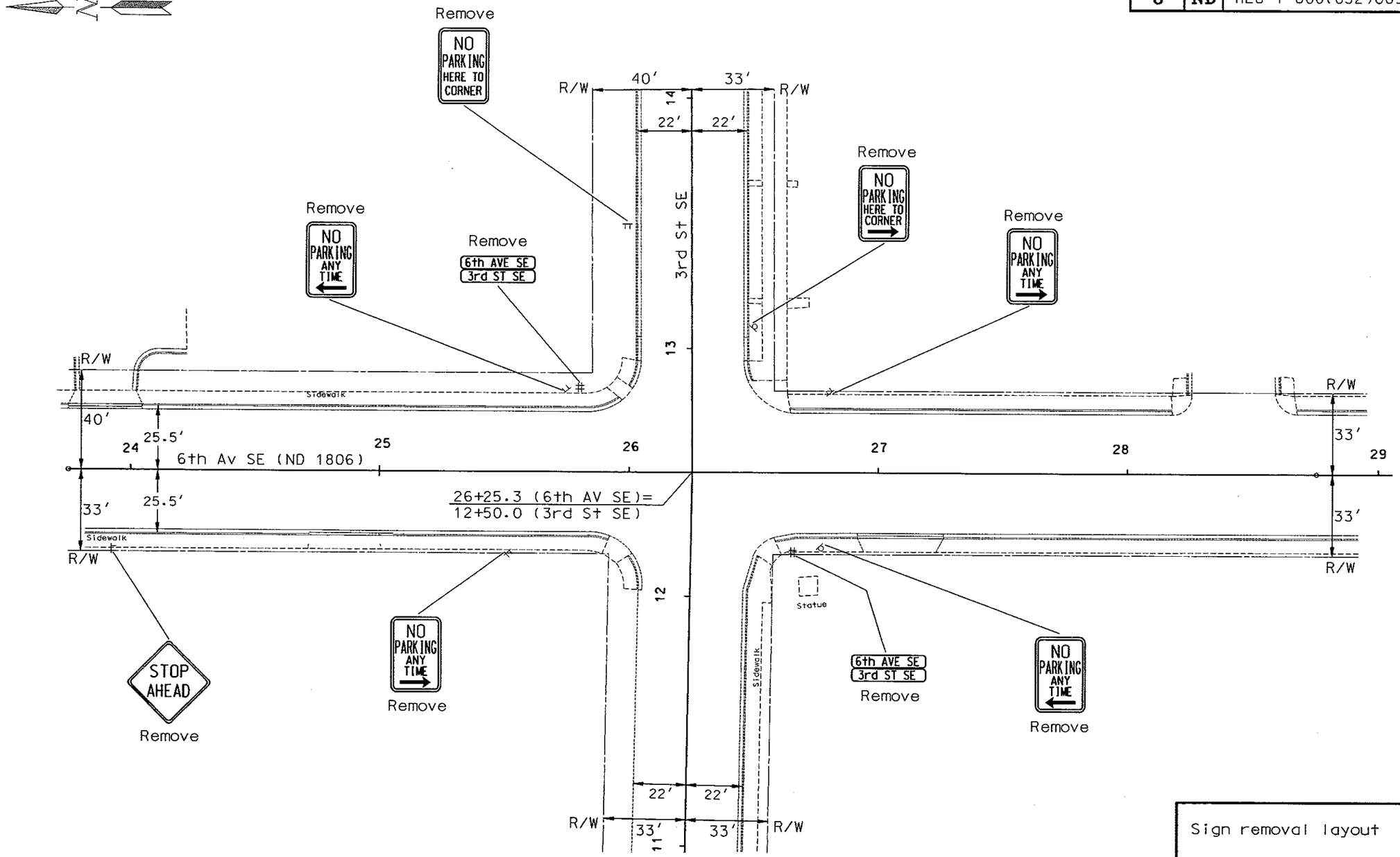
Sign summary

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

...\d_traffi\signsum.dgn Oct. 24, 1997 08:34:43

FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	30



Sign removal layout

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

...\d_traffi\lsign.dgn Dec. 04, 1997 08:59:54

FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	3/

Sta 25+98 lt (6th Av SE)
Sta 13+18 lt (3rd St SE)
Special assembly A

R7-11(L)-12 NO PARKING HERE TO CORNER

R7-1(R)-12 NO PARKING ANY TIME

Sta 25+72 lt
Special assembly A

R7-1(L)-12 NO PARKING ANY TIME

R7-11(R)-12 NO PARKING HERE TO CORNER

Sta 25+88 lt
Mast arm mounted
3RD ST SE Sign No. 1

Sta 26+51 lt
Mast arm mounted
LEFT TURN YIELD ON GREEN Sign No. 3

Sta 26+51 lt (6th Av SE)
Sta 13+08 rt (3rd St SE)
Assembly 7 RS

R7-11(R)-12 NO PARKING HERE TO CORNER

Sta 26+51 lt
Mast arm mounted
6TH AVE SE Sign No. 2

Sta 26+89 lt
Special assembly A

R7-11(L)-12 NO PARKING HERE TO CORNER

R7-1(R)-12 NO PARKING ANY TIME

R/W 40′ 33′ R/W
14
22′ 22′
3rd St SE
13
R/W
Sidewalk
40′
25.5′
24 25 26 27 28 29
6th Av SE (ND 1806)
33′ 25.5′
Sidewalk
R/W
33′
R/W

26+25.3 (6th AV SE)=
12+50.0 (3rd St SE)

12

Sign No. 2 6TH AVE SE
Sta 25+99 rt
Mast arm mounted

R7-11(L)-12 NO PARKING HERE TO CORNER

R7-1(R)-12 NO PARKING ANY TIME

Sta 25+62 rt
Special assembly A

Sign No. 3 LEFT TURN YIELD ON GREEN

Sta 25+99 rt
Mast arm mounted

22′ 22′
R/W 33′ 33 R/W
11

Statue
Sidewalk

3RD ST SE Sign No. 1
Sta 26+73 rt
Mast arm mounted

R7-1(L)-12 NO PARKING ANY TIME

R7-11(R)-12 NO PARKING HERE TO CORNER

Sta 26+79 rt
Special assembly A

R7-11(L)-12 NO PARKING HERE TO CORNER

Sta 26+55 rt (6th Av SE)
Sta 11+85 rt (3rd St SE)
Assembly 7 RS

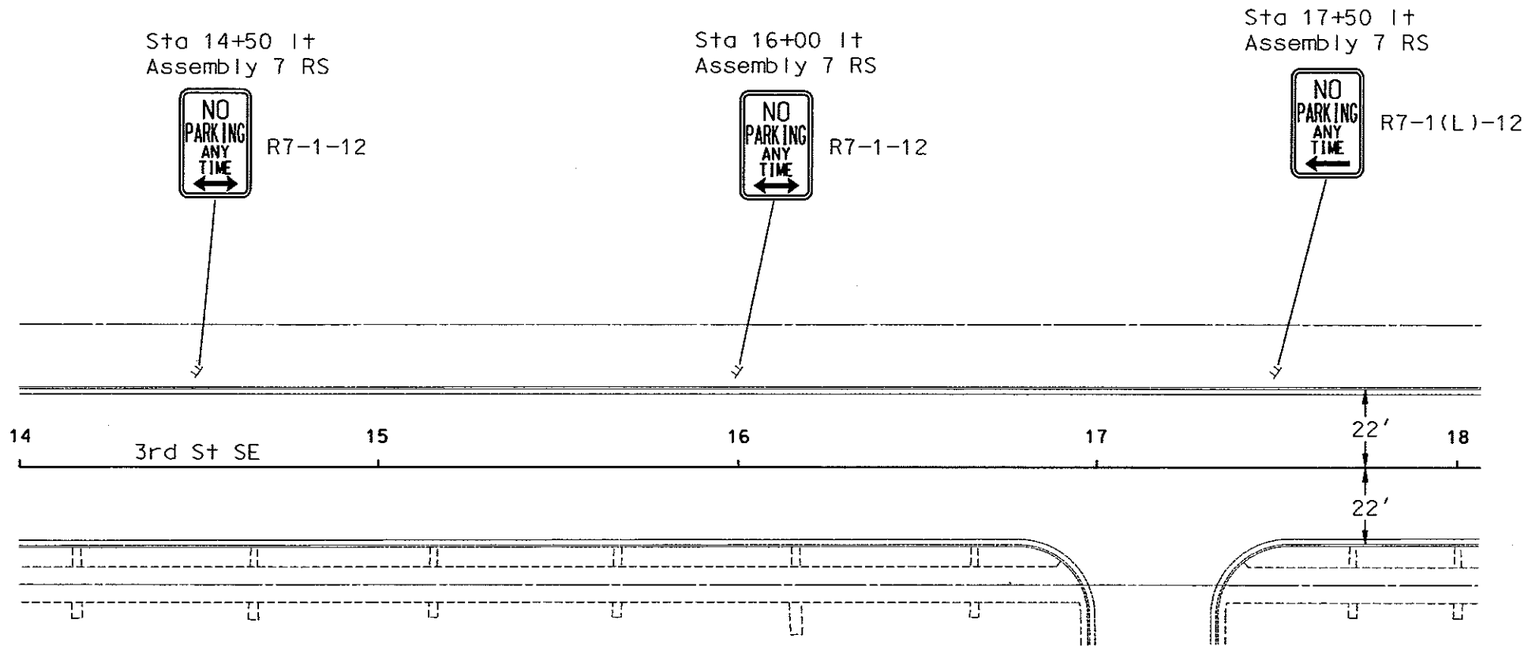
Signing layout

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

...\d_traffi\lsign1.dgn Dec. 03, 1997 08:34:16

FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	32



Signing layout

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

...\d_traffi\lsign3.dgn Oct. 17, 1997 08:43:30

FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	33

SIGN DETAIL

SIGN NUMBER	SIGN 1
WIDTH x HEIGHT	5'-6" x 1'-6"
BORDER WIDTH	1.25"
CORNER RADIUS	3.0"
MOUNTING	MAST ARM
BACKGROUND	TYPE: 2 REFL
	COLOR: GREEN
LEGEND/BORDER	TYPE: 3A REFL
	COLOR: WHITE

SYMBOL	X	Y	WID	HT

DIMENSIONS IN INCHES COORDINATES ARE TO LOWER LEFT CORNERS

Y FONT	LETTER POSITIONS (X)																HT LEN
6.0 EM	3	R	D	S	T	S	E										6.0
	7.7	14.0	20.4	31.1	37.2	47.6	53.9										50.6

Sign No. 1
Mast arm mounted
Sta 25+88 lt
Sta 26+73 rt

SIGN DETAIL

SIGN NUMBER	SIGN 2
WIDTH x HEIGHT	6'-0" x 1'-6"
BORDER WIDTH	1.25"
CORNER RADIUS	3.0"
MOUNTING	MAST ARM
BACKGROUND	TYPE: 2 REFL
	COLOR: GREEN
LEGEND/BORDER	TYPE: 3A REFL
	COLOR: WHITE

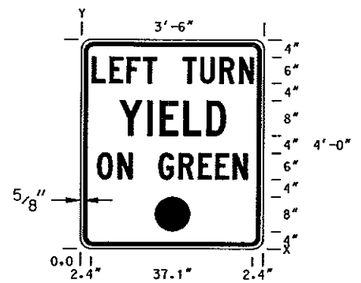
SYMBOL	X	Y	WID	HT

DIMENSIONS IN INCHES COORDINATES ARE TO LOWER LEFT CORNERS

Y FONT	LETTER POSITIONS (X)																HT LEN
6.0 EM	6	T	H	A	V	E	S	E									6.0
	7.5	13.8	19.5	30.3	36.7	43.4	53.8	60.1									57.0

Sign No. 2
Mast arm mounted
Sta 25+99 rt
Sta 26+51 lt

SIGN DETAIL



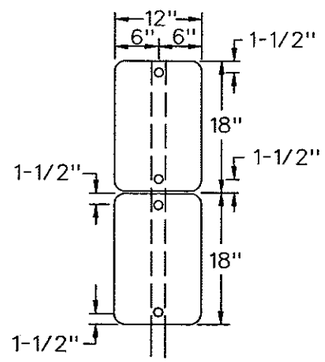
SIGN NUMBER	SIGN 3
WIDTH x HEIGHT	3'-6" x 4'-0"
BORDER WIDTH	0.875"
CORNER RADIUS	2.25"
MOUNTING	MAST ARM
BACKGROUND	TYPE: 2 REFL
	COLOR: WHITE
LEGEND/BORDER	TYPE: NON REFL
	COLOR: BLACK
CIRCULAR SYMBOL	TYPE: 3A REFL
	COLOR: GREEN

SYMBOL	X	Y	WID	HT

DIMENSIONS IN INCHES COORDINATES ARE TO LOWER LEFT CORNERS

Y FONT	LETTER POSITIONS (X)																HT LEN
38.0 C	L	E	F	T	T	U	R	N									6.0
	2.4	6.4	10.5	14.2	23.2	27.2	31.7	36.3									37.1
26.0 C	Y	I	E	L	D												8.0
	8.9	15.2	18.0	23.4	28.7												24.2
16.0 C	O	N	G	R	E	E	N										6.0
	3.8	8.5	17.8	22.3	26.9	30.9	34.9										34.4
4.0	●																8.0
	17.0																8.0

Sign No. 3
Mast arm mounted
Sta 25+99 rt
Sta 26+51 lt



Special assembly A
sta 25+62 rt, sta 25+72 lt
sta 25+98 lt, sta 26+79 rt,
and sta 26+89 lt

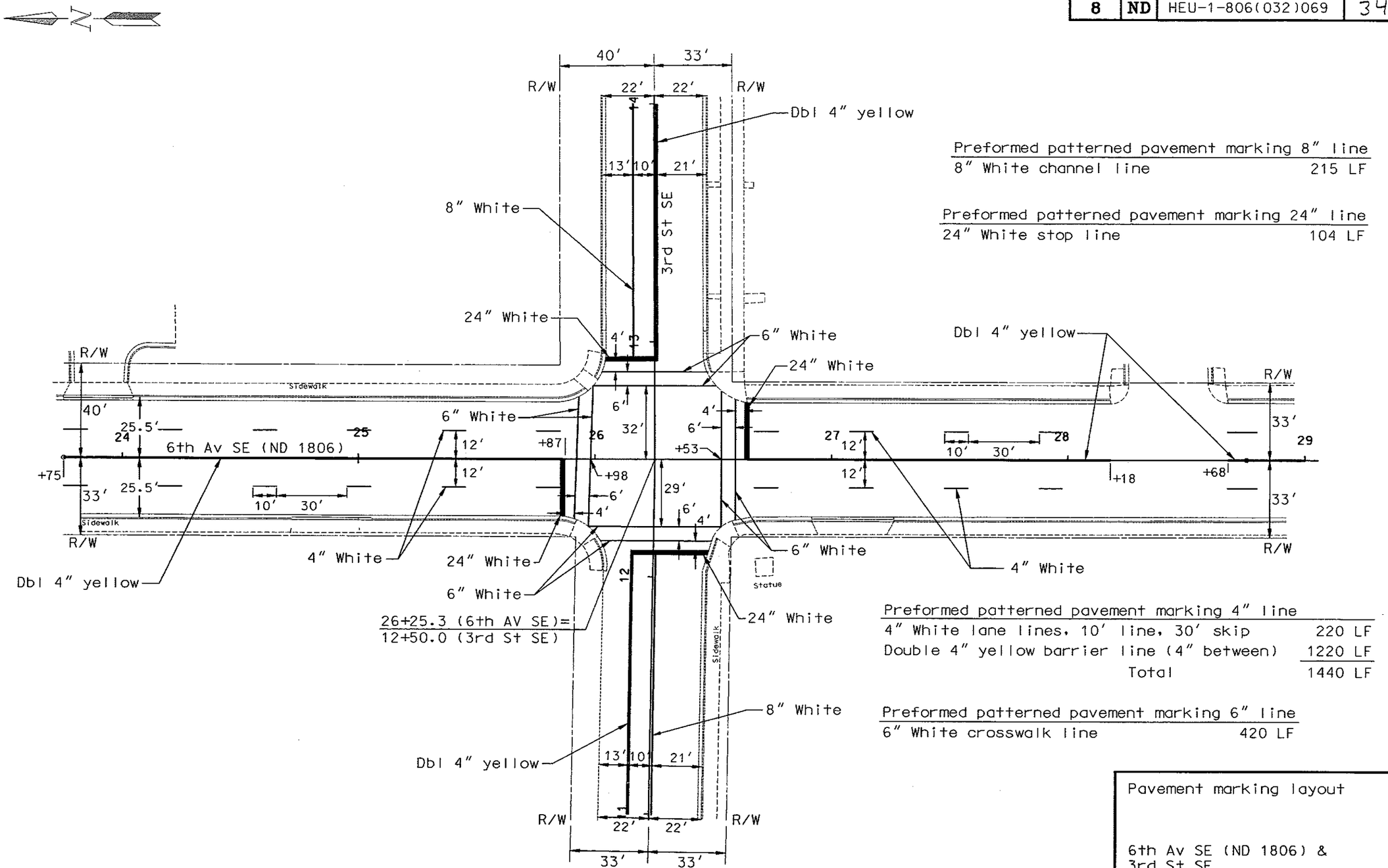
Sign detail and special assembly sheet

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

...\d_traffi\dsign1.dgn Oct. 23, 1997 15:13:54

FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	34



Preformed patterned pavement marking 8" line

8" White channel line	215 LF

Preformed patterned pavement marking 24" line

24" White stop line	104 LF

Preformed patterned pavement marking 4" line

4" White lane lines, 10' line, 30' skip	220 LF
Double 4" yellow barrier line (4" between)	1220 LF
Total	1440 LF

Preformed patterned pavement marking 6" line

6" White crosswalk line	420 LF

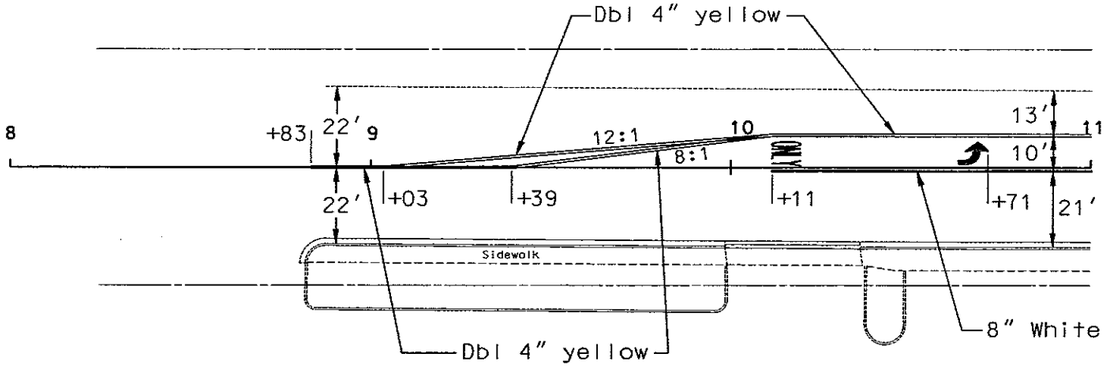
Pavement marking layout

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

...\d_traffi\lpvmt1.dgn Dec. 03, 1997 08:35:10

FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	35



Preformed patterned pavement marking 4" line	
Double 4" yellow barrier line (4" between)	652 LF

Preformed patterned pavement marking 8" line	
8" White channel line	89 LF

Preformed patterned pavement marking message	
Left arrow	15 SF
Only	22 SF
Total	37 SF

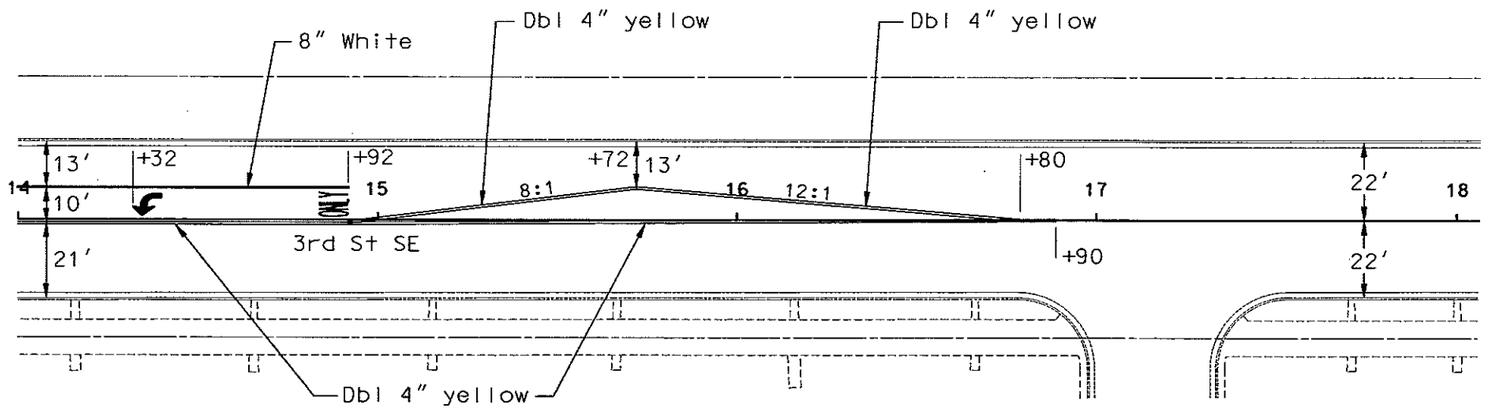
Pavement marking layout

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

...\d_traffi\lpvmt2.dgn Dec. 03, 1997 08:35:50

FHWA REGION	STATE	PROJECT NO.	SHEET NO.
8	ND	HEU-1-806(032)069	36



Preformed patterned pavement marking 4" line

Double 4" yellow barrier line (4" between)	958 LF

Preformed patterned pavement marking 8" line

8" White channel line	92 LF

Preformed patterned pavement marking message

Left arrow	15 SF
Only	22 SF
Total	37 SF

Pavement marking layout

6th Av SE (ND 1806) &
3rd St SE

Mandan, ND

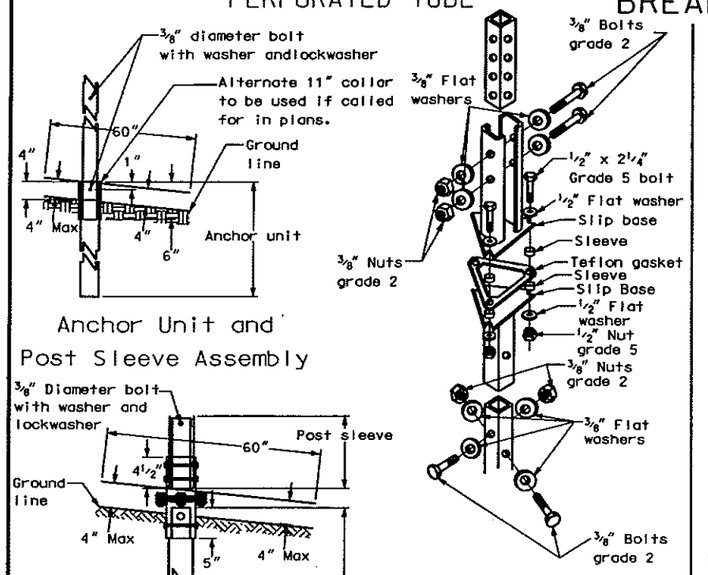
...\d_traffi\lpvmt3.dgn Dec. 03, 1997 08:36:26

BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

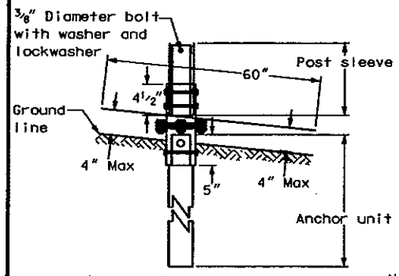
3 LB/FT U POSTS

D-704-8

PERFORATED TUBE



Anchor Unit and Post Sleeve Assembly



Slip Base Anchor Unit and Post Sleeve Assembly

Slip Base Assembly Details

Notes
1. Slip base bolts shall be tourqed as specified by the manufacturer.
2. The 2 3/16" size 10 gauge is shown as 2.19" size on the plans. The 2 1/2" size 10 gauge is shown as 2.51" size on the plans.

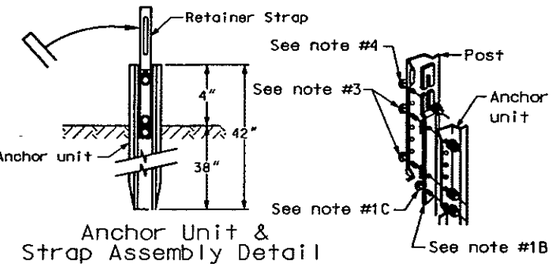
A – See Anchor for 2 1/2" 10 gauge posts detail.

B – The 2 1/2" 12 gauge posts do not need slip bases when placed in standard soils. The breakaway base is required when the support is placed in weak soils. Weak soils are defined as boggy, wet or loose soil areas. The Engineer shall determine if soils are weak.

NUMBER OF POSTS	TELESCOPING PERFORATED TUBE						
	POST SIZE	WALL THICKNESS GAUGE	SLEEVE SIZE	ANCHOR SIZE	WALL THICKNESS GAUGE	SLIP BASE
1	2	12		2 1/4	12	NO
1	2 1/4	12		2 1/2	12	NO
1	2 3/16	10		2 1/2	12	YES
1	2 1/2	12		A	3/16	B
1	2 1/2	10		A	3/16	YES
1	2 1/4	12	2	2 1/2	12	YES
1	2 1/2	12	2 1/4	2 1/2	12	YES
2	2	12		2 1/4	12	NO
2	2 1/4	12		2 1/2	12	NO
2	2 3/16	10		2 1/2	12	YES
2	2 1/2	12		2 1/2	12	YES
2	2 1/2	10		A	3/16	YES
2	2 1/4	12	2	2 1/2	12	YES
2	2 1/2	12	2 1/4	2 1/2	12	YES
3 & 4	2 1/2	12		2 1/2	12	YES
3 & 4	2 1/2	10		A	3/16	YES
3 & 4	2 1/2	12	2 1/4	2 1/2	12	YES
3 & 4	2 1/2	12	2	2 1/2	12	YES
3 & 4	2 1/2	10	2 3/16	A	3/16	YES

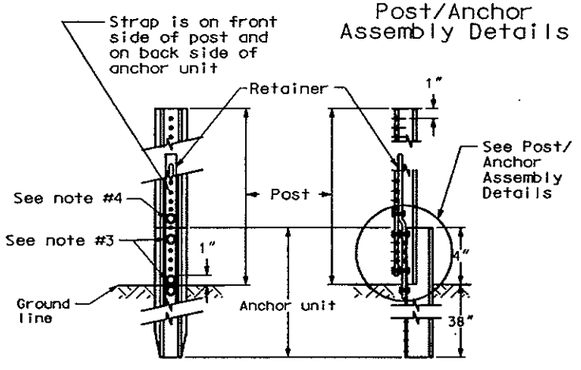
TELESCOPING PERFORATED TUBES						
TUBE SIZE IN.	WALL THICKNESS IN.	U.S. STANDARD GAUGE	WEIGHT PER FOOT LBS.	MOMENT OF INERTIA IN.4	CROSS SECT. AREA IN. SQ.	SECTION MODULUS IN.3
1 1/2 x 1 1/2	.105	12	1.702	.129	.380	.172
2 x 2	.105	12	2.416	.372	.590	.372
2 1/4 x 2 1/4	.105	12	2.773	.561	.695	.499
2 3/16 x 2 3/16	.135	10	3.432	.605	.841	.590
2 1/2 x 2 1/2	.105	12	3.141	.804	.803	.643
2 1/2 x 2 1/2	.135	10	4.008	.979	1.010	.785
4 x 4	.250	1/4	6.600	3.040	1.940	1.05

FLANGED CHANNEL



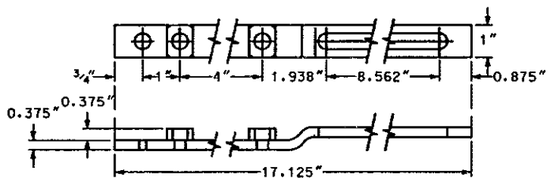
Anchor Unit & Strap Assembly Detail

Post/Anchor Assembly Details



Front View Side View

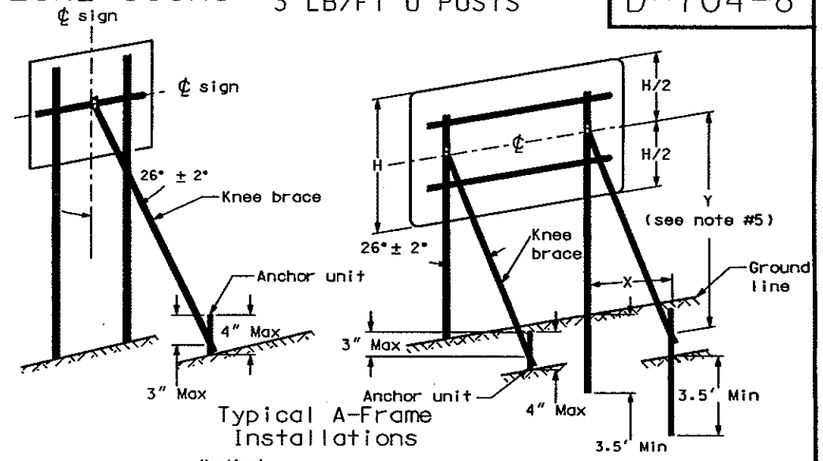
Sign Post Assembly Detail



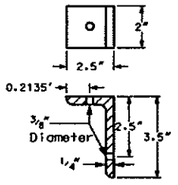
Retainer/Spacer Strap Detail

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

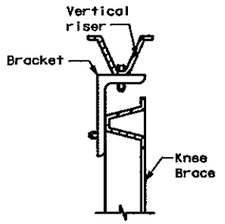
Notes
1. A) Drive anchor unit to within 12" of ground level.
   B) Proper assembly established by lining up the top 3/4" slot of retainer spacer strap with top hole of anchor unit.
   C) Assemble strap to back of anchor unit using 3/8"-16 UNC x 2.0" long bolt, lock washer & nut.
   D) Rotate strap 90° 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 & sign post at the bolts have full contact across the entire width.



Typical A-Frame Installations



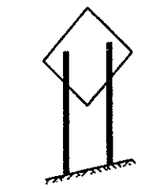
Steel A-frame bracket



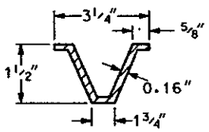
Section A-A

Notes
1. Use 3 lb/ft riser anchor units, risers, stringers, knee braces, lateral braces and knee brace anchor units.
2. Offset knee brace anchor unit 1' toward roadway relative to vertical post.
3. Use 5/16" bolts, washers and nuts for all connections. A splice shall overlap 12" minimum and have bolts in the top and bottom holes of the splice.
4. Driven riser anchor units shall be at least 7' long and embedded at least 3.5'. Bracing anchor units shall be no more than 4" above the ground and embedded at least 3.5'.
5. 0.5Y = X ± 6"

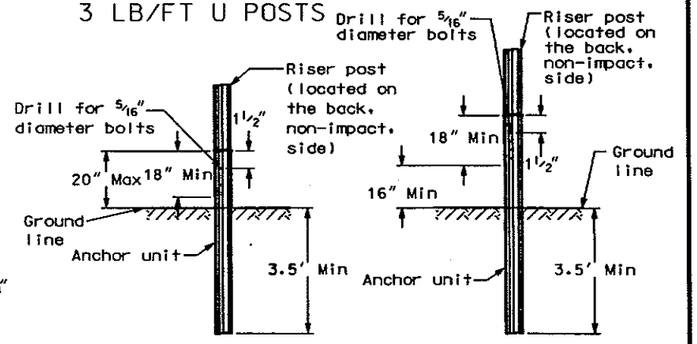
3 LB/FT U POSTS



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. Use 5/16" bolts, washers and nuts for all connections. A splice shall overlap 18" as a minimum.
4. Anchor unit for guy wires shall be no more than 4" above ground and embedded at least 3.5'.

7-28-93	
REVISIONS	
DATE	CHANGE
5-11-94	U-post
7-19-95	U-post splice
5-13-96	Table & option 1
7-3-97	U-post anchor unit

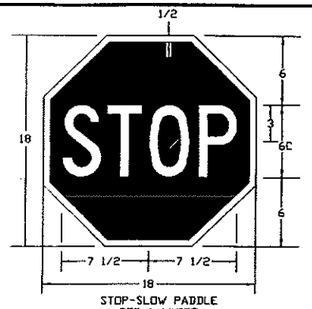
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

APPROVED: DESIGN ENGINEER

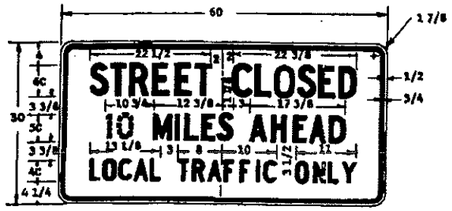
r:\support\desstd\d704-08.dgn Jul. 01, 1997 12:58:33

D-704-9

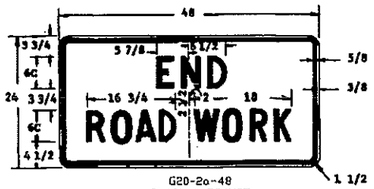
CONSTRUCTION SIGN DETAILS



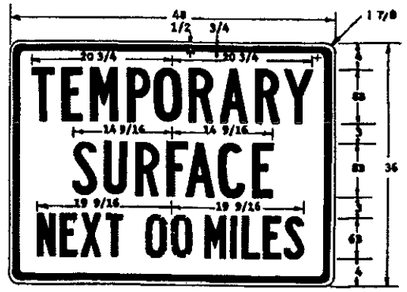
STOP-SLOW PADDLE
RED & WHITE
FLAGPERSON PADDLE



R11-3c-60
BLACK & WHITE

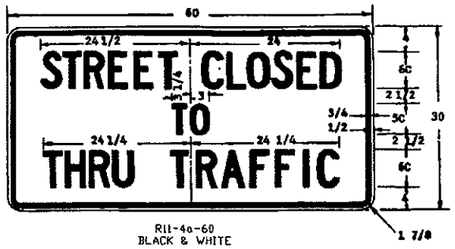


G20-2a-48
BLACK & ORANGE



G20-8-48
BLACK & ORANGE

R11-2-48
BLACK & WHITE



R11-4a-60
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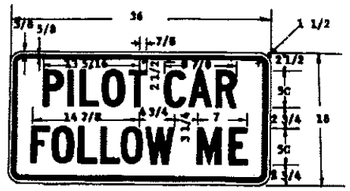
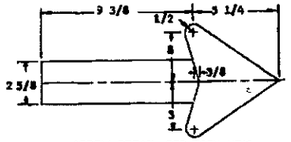


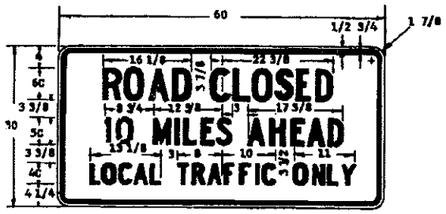
G20-4-36
BLACK & ORANGE

PILOT CAR SIGN SHALL BE MOUNTED ON REAR OF A VEHICLE USED FOR GUIDING CONTROLLED ONE-WAY TRAFFIC THROUGH A CONSTRUCTION AREA.

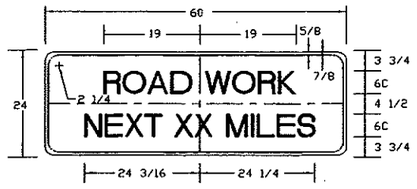


ARROW DETAIL FOR SIGN NO'S.
G20-50a-72 & G20-52a-72

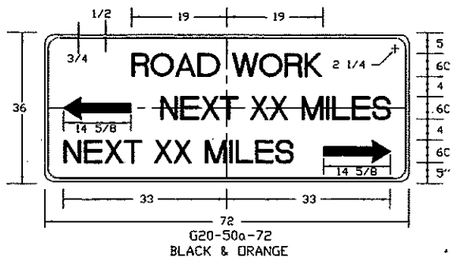
R11-2A-48
BLACK & WHITE



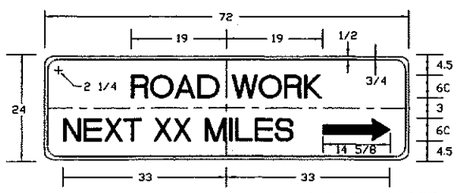
R11-3a-60
BLACK & WHITE



G20-1a-60
BLACK & ORANGE

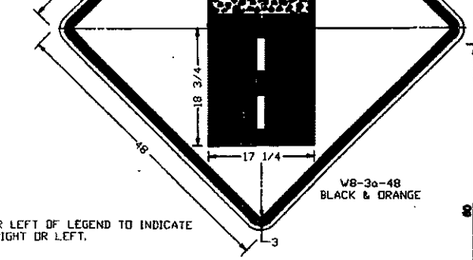


G20-50a-72
BLACK & ORANGE

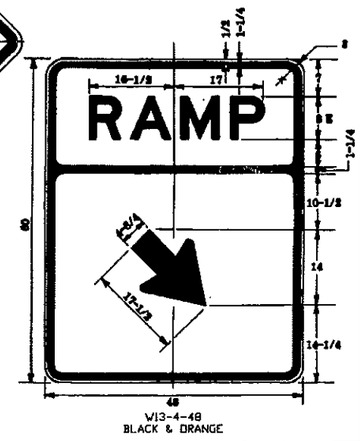


G20-52a-72
BLACK & ORANGE

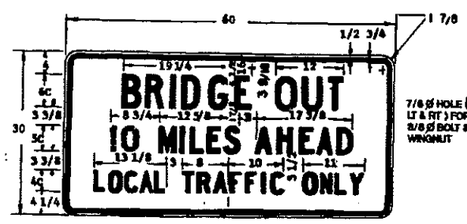
ARROW MAY BE RIGHT OR LEFT OF LEGEND TO INDICATE CONSTRUCTION TO THE RIGHT OR LEFT.



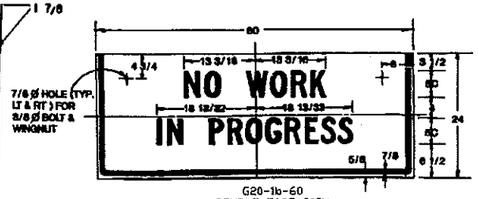
BLACK & ORANGE



W13-4-48
BLACK & ORANGE

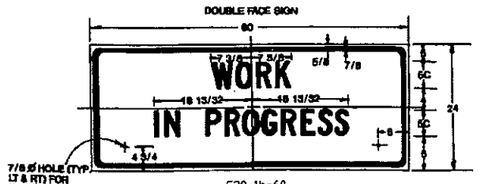


R11-3b-60
BLACK & WHITE



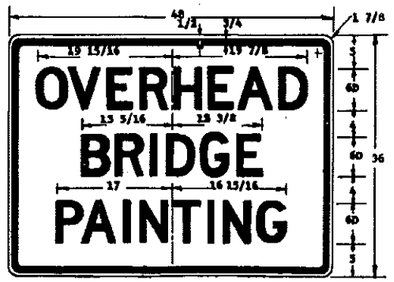
7/16 Ø HOLE (TYP. LT & RT) FOR 3/8 Ø BOLT & WINGNUT

G20-1b-60
DOUBLE FACE SIGN
LEGEND: BLACK (NON-REFL)
BACKGROUND: ORANGE

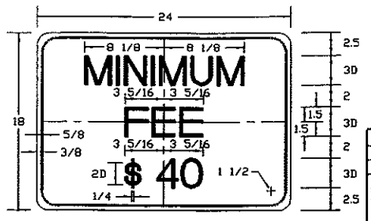


7/16 Ø HOLE (TYP. LT & RT) FOR 3/8 Ø BOLT & WINGNUT

G20-1b-60
LEGEND: BLACK (NON-REFL)
BACKGROUND: ORANGE



G20-54-48
BLACK & ORANGE



R2-1a-24
BLACK & WHITE

REVISIONS	
DATE	CHANGE
5-1-92	GENERAL REVISIONS
7-26-95	ADD SIGNS G20-1a, G20-50a, & R2-1a
3-4-96	REMOVE G20-2-60

10-1-86

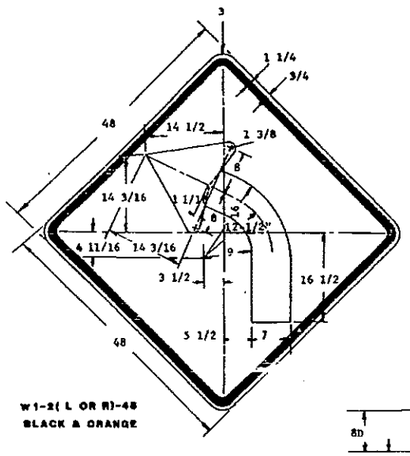
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

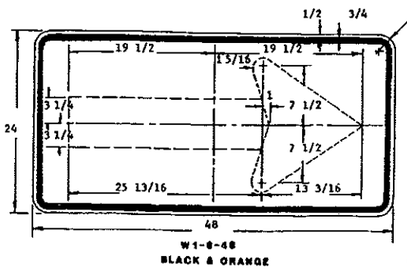
APPROVED: Daniel C. Lee
DESIGN ENGINEER

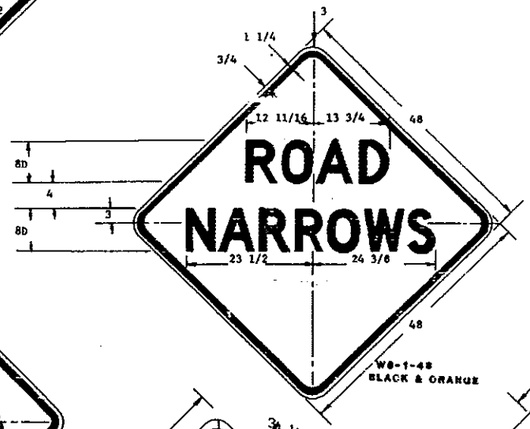
ED704-09 P=1"

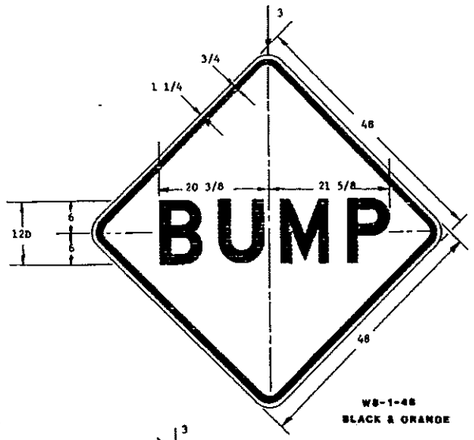
D-704-10

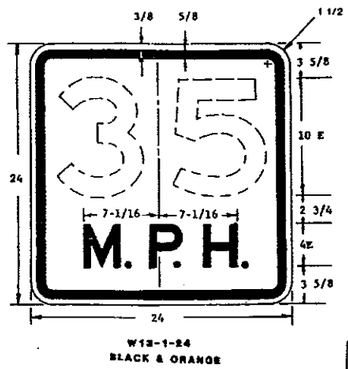
CONSTRUCTION SIGN DETAILS

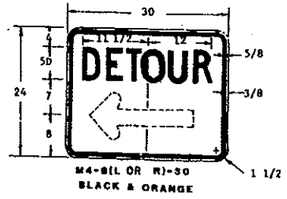


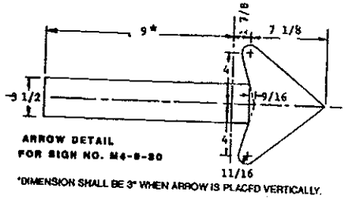




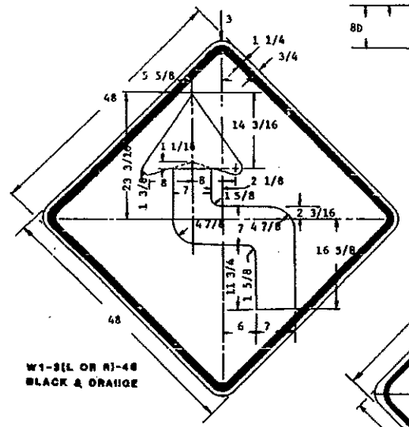


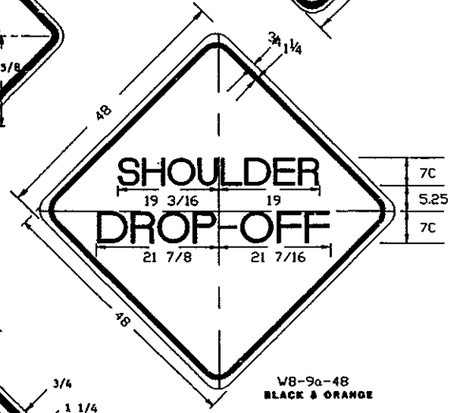


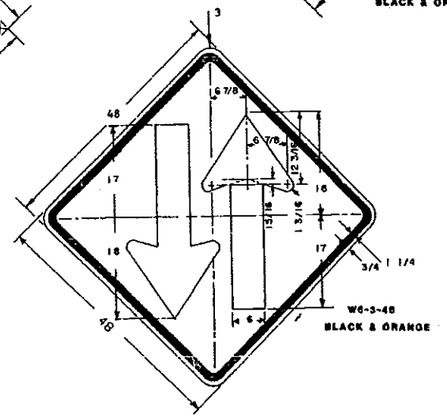


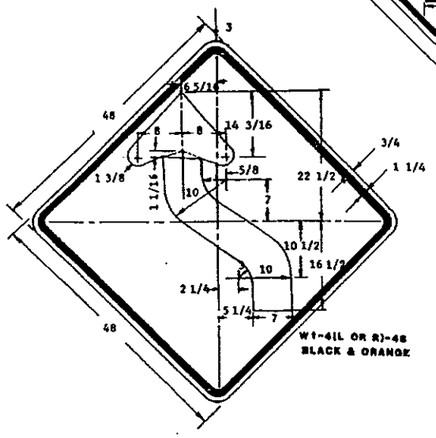


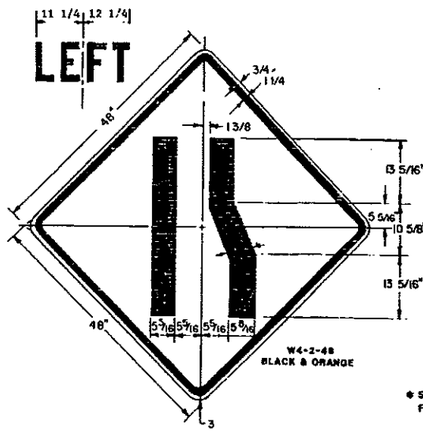
*DIMENSION SHALL BE 3" WHEN ARROW IS PLACED VERTICALLY.

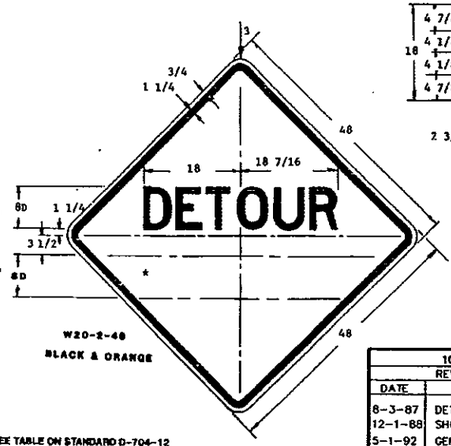




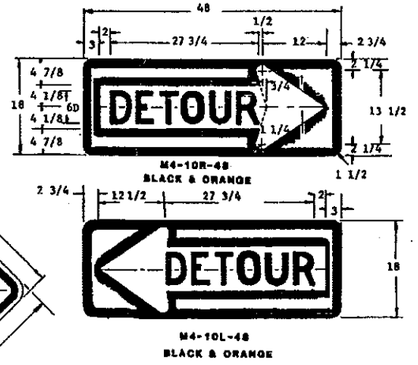








* SEE TABLE ON STANDARD D-704-12 FOR MESSAGES AND DIMENSIONS.



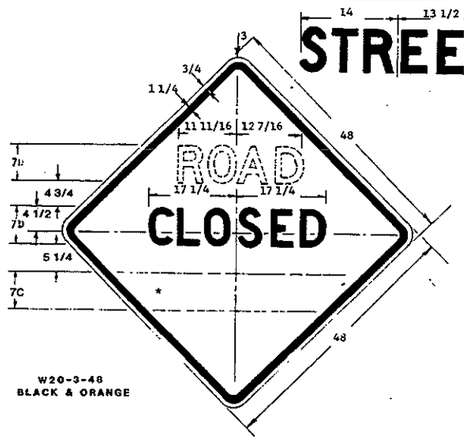
10-1-86 REVISIONS	
DATE	CHANGE
8-3-87	DETOUR NO.
12-1-88	SHOULDER DROP OFF
5-1-92	GENERAL REVISIONS
2-3-95	W8-9a-48
3-4-96	REMOVE W20-1-48

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
APPROVED: David K.O. Leer
DESIGN ENGINEER

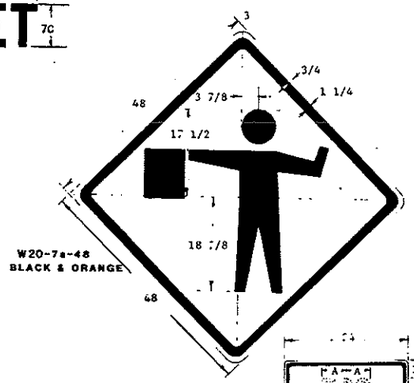
ED704-10 P=1'

CONSTRUCTION SIGN DETAILS

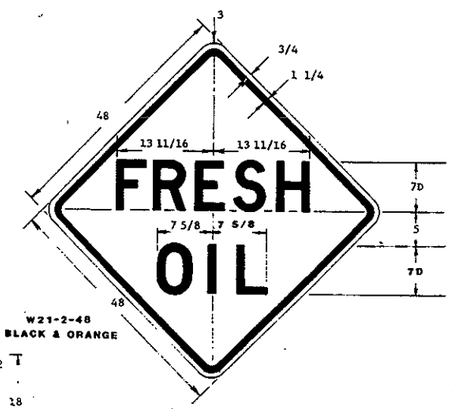
D-704-11



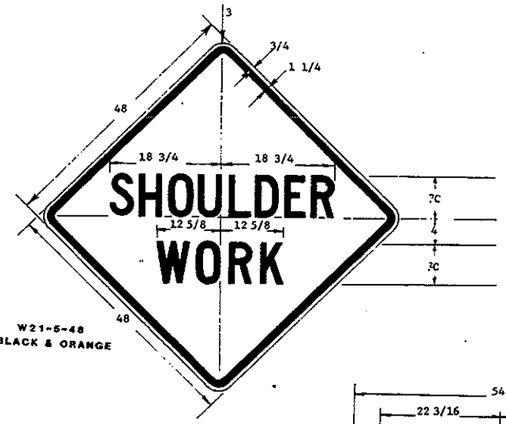
W20-3-48
BLACK & ORANGE



W20-7a-48
BLACK & ORANGE



W21-2-48
BLACK & ORANGE

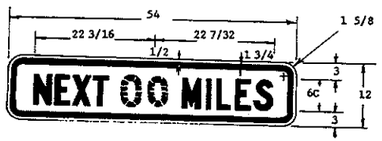


W21-5-48
BLACK & ORANGE

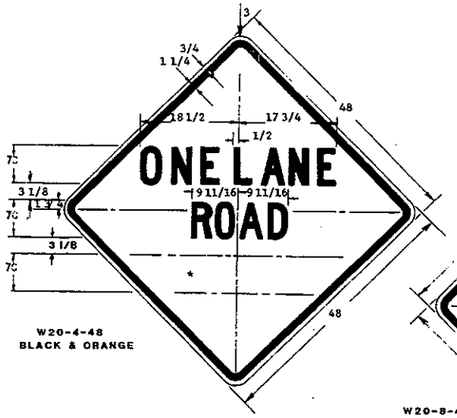
SIGN	DIMENSION A (INCHES)
500'	4 - 11/16
1000'	5 - 1/2
1500'	5 - 5/16

FOR USE WITH W20-7a-48 & W21-1a-48

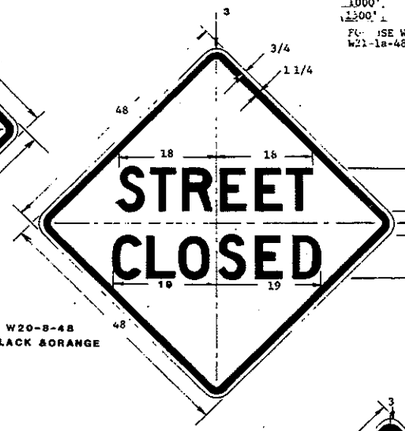
BLACK & ORANGE



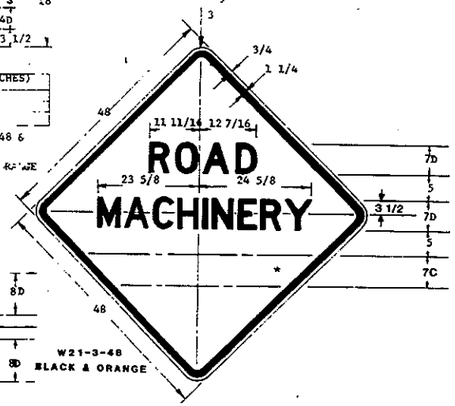
W20-52-54
BLACK & ORANGE



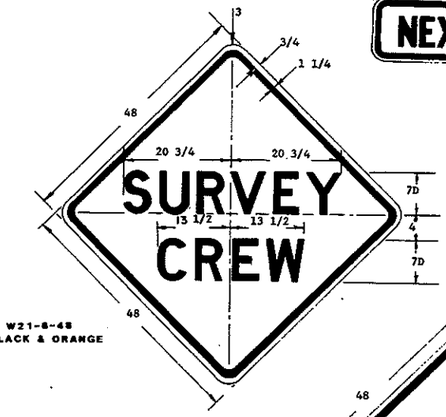
W20-4-48
BLACK & ORANGE



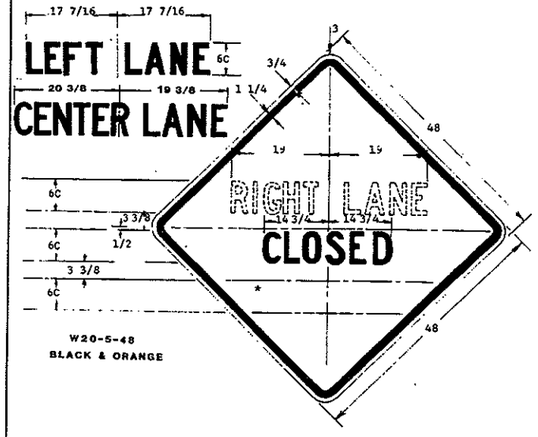
W20-8-48
BLACK &ORANGE



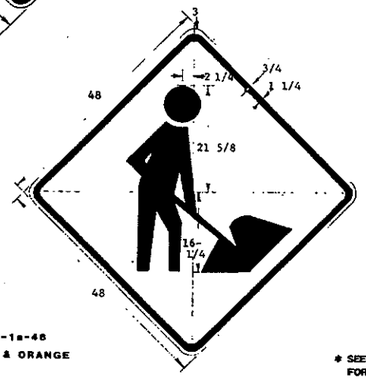
W21-3-48
BLACK & ORANGE



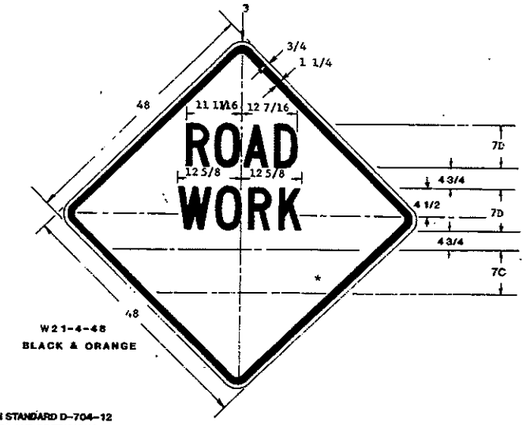
W21-6-48
BLACK & ORANGE



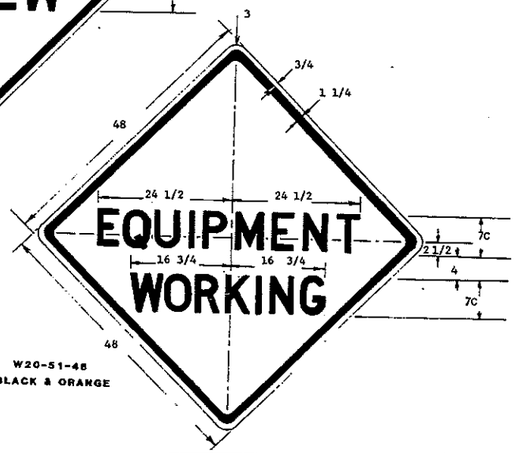
W20-5-48
BLACK & ORANGE



W21-1a-48
BLACK & ORANGE



W21-4-48
BLACK & ORANGE



W20-51-48
BLACK & ORANGE

* SEE TABLE ON STANDARD D-704-12 FOR MESSAGES AND DIMENSIONS.

10-1-86

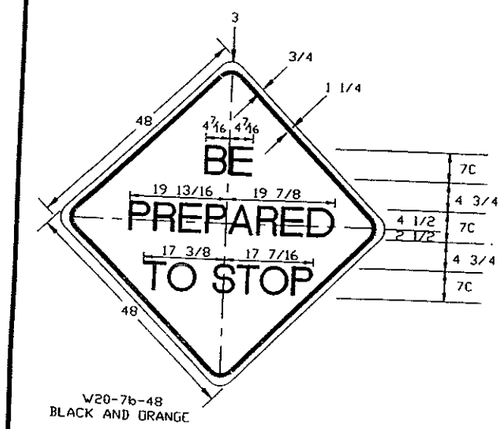
REVISIONS	
DATE	CHANGE
5-1-92	GENERAL REVISIONS
6-9-95	Chg 7D to 7C (Dwg W20-3, W21-3 & W21-4)

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

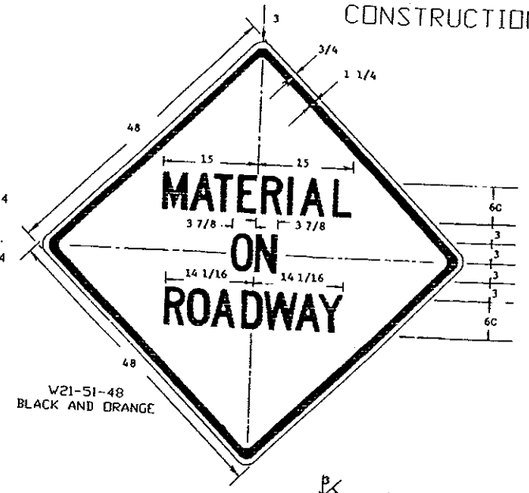
APPROVED: David K.O. Leer
DESIGN ENGINEER

CONSTRUCTION SIGN DETAILS

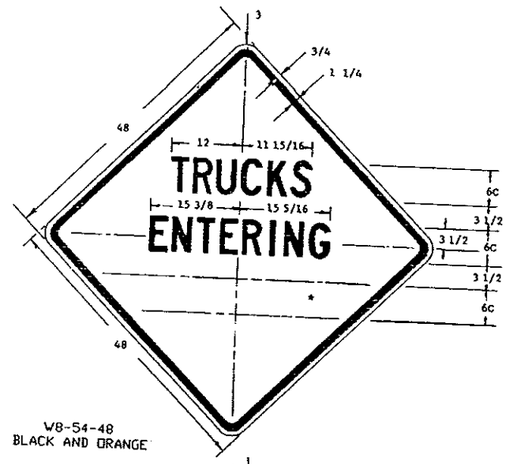
D-704-12



W20-7b-48
BLACK AND ORANGE



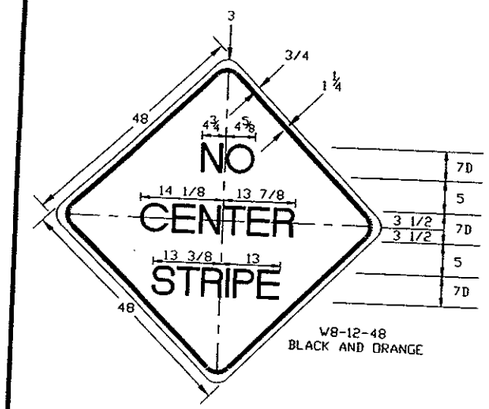
W21-51-48
BLACK AND ORANGE



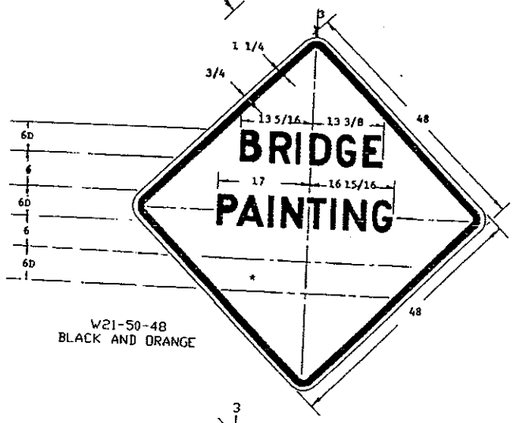
W8-54-48
BLACK AND ORANGE

B	C	D	E	F	G	H	I	J	K
500 FT USE FULL SPACING		1000 FT REDUCE SPACING 40%					200 FT USE FULL SPACING		
					1 MILE USE FULL SPACING		350 FT USE FULL SPACING		
1500 FT REDUCE SPACING 40%				1/2 MILE REDUCE SPACING 50%		AHEAD USE FULL SPACING		1600 FT REDUCE SPACING 50%	
							2600 FT REDUCE SPACING 50%		

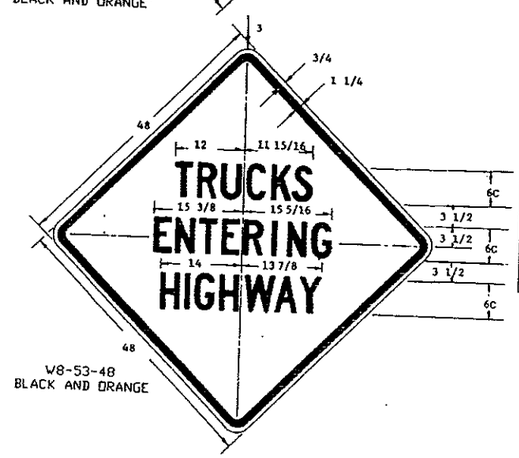
DIMENSIONS (INCHES)										
A	B	C	D	E	F	G	H	I	J	K
4C	6 7/8	7	7 1/2	8	8 5/16	6 1/16	7	8 5/16	9 1/8	9 3/4
5C	8 3/4	8 13/16	9 3/8	10	10 7/16	7 5/8	8 3/4	10 7/16	11 7/16	12 3/16
6C	10 3/8	10 1/2	11 1/4	12	12 1/2	9 1/8	10 1/2	12 1/2	13 3/4	14 5/8
7C	12	12 3/16	13 1/8	14	14 9/16	10 5/8	12 1/4	14 9/16	15	15 5/8
8C	13 3/4	14	15	16	16 5/8	12 1/8	14	16 3/4	18 1/4	19 1/2
4D	8 1/8	8 5/8	8 1/2	9	9	7 3/16	8 11/16	9 3/4	10 3/4	11 3/8
5D	10 3/16	10 13/16	11 5/8	11 1/4	11 1/4	9 1/2	10 7/8	12 1/8	13 1/4	14 1/4
6D	12 3/16	12 15/16	12 3/4	13 1/2	13 1/2	11 13/16	13 1/8	14 9/16	14 7/8	15 1/2
7D	14 1/4	15 1/8	14 7/8	15 3/4	15 3/4	13 1/16	15 1/2	15 1/8	15 1/2	16 7/8
8D	16 1/4	17 1/4	17	18	18	14 3/8	17 7/16	19 1/4	17 3/4	19 5/16



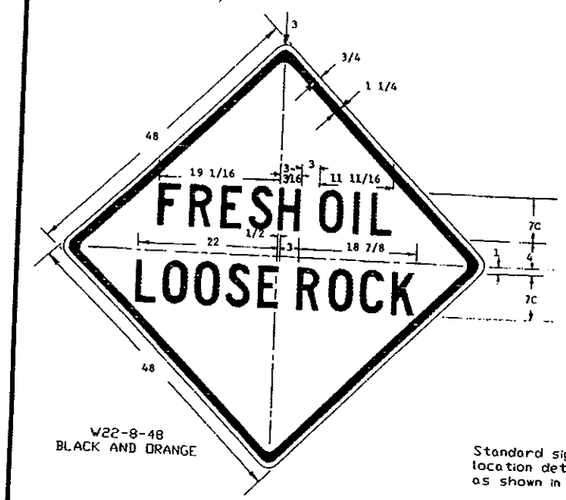
W8-12-48
BLACK AND ORANGE



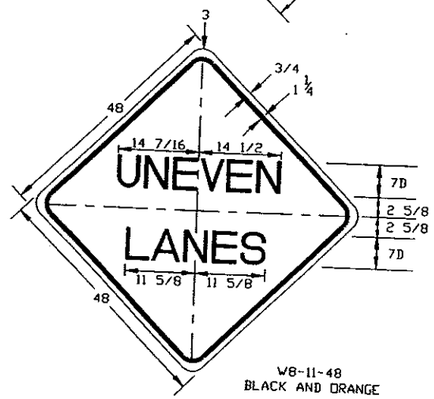
W21-50-48
BLACK AND ORANGE



W8-53-48
BLACK AND ORANGE

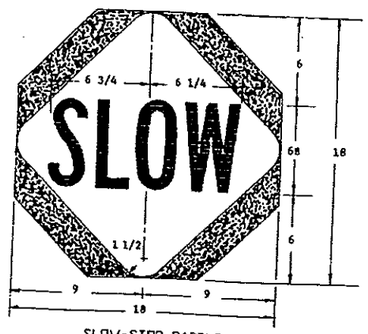


W22-8-48
BLACK AND ORANGE

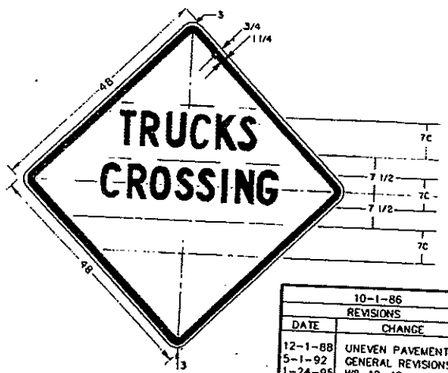


W8-11-48
BLACK AND ORANGE

Standard signs that are shown in the construction sign and barricade location details shall be fabricated in the shape, color, and dimensions as shown in the standard signs layout booklet.



SLOW-STOP PADDLE
BLACK & ORANGE
FLAGPERSON PADDLE



W8-55-48
BLACK AND ORANGE

10-1-86 REVISIONS	
DATE	CHANGE
12-1-88	UNEVEN PAVEMENT
5-1-92	GENERAL REVISIONS
1-24-95	W8-12-48
2-3-95	W-8-11-48
6-15-95	GENERAL REVISIONS

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

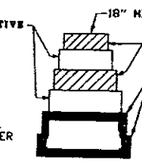
APPROVED David K.O. Leer
DESIGN ENGINEER

ED704-12 P=1'

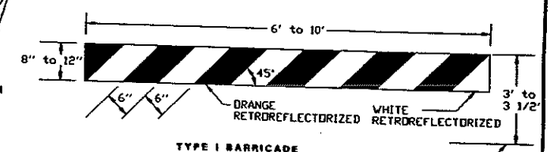
BARRICADE DETAILS

D-704-13

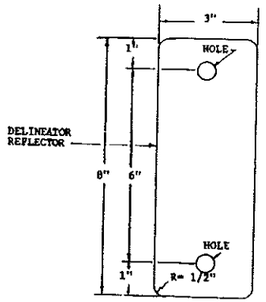
DELINEATOR DRUMS
THE MARKINGS ON DRUMS SHALL BE ORANGE AND WHITE STRIPES 4 TO 6 INCHES WIDE. THERE SHALL BE AT LEAST TWO ORANGE AND TWO WHITE STRIPES. WHERE DRUMS HAVE RIBS OR INDENTATIONS, THERE SHALL BE NO RETROREFLECTORIZED SHEETING IN THIS AREA. THIS SPACE SHALL BE NO MORE THAN 2 INCHES WIDE. THE DRUM SURFACE SHALL BE PREPARED AS RECOMMENDED BY THE SHEETING MANUFACTURER BEFORE RETROREFLECTIVE SHEETING IS APPLIED.



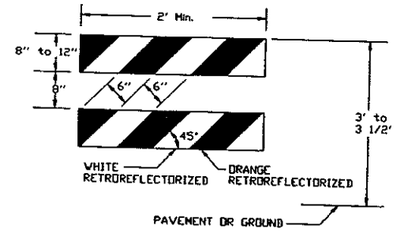
DELINEATOR DRUM
36" MIN. HEIGHT



TYPE I BARRICADE

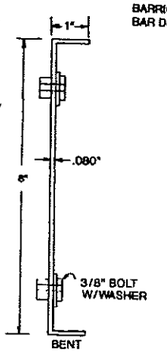


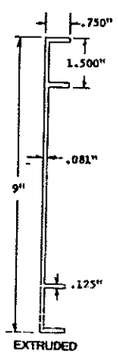
3" x 8" - 18 GAUGE GALVANIZED STEEL SHEETS OR .080" ALUMINUM PLATE WITH WHITE RETROREFLECTIVE SHEETING (TYPE 3A OR 3B) AS SPECIFIED IN SECTION 894 OF THE STANDARD SPECIFICATIONS.

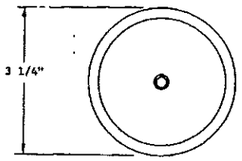


TYPE II BARRICADE

ALUMINUM BARRICADE BAR DETAIL

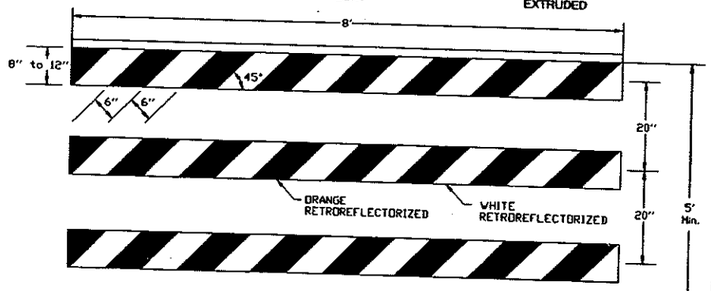




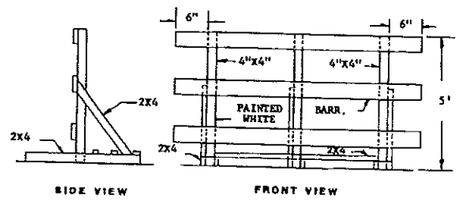


ACRYLIC PLASTIC REFLECTOR DELINEATOR REFLECTOR SHALL MEET THE REQUIREMENTS OF SECTION 894.

NOTE: VERTICAL PANELS USED ON THE EXPRESSWAYS OR OTHER HIGH SPEED ROADWAYS SHALL BE 12" BY 24".



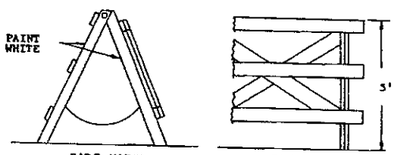
TYPE III BARRICADE



SIDE VIEW FRONT VIEW

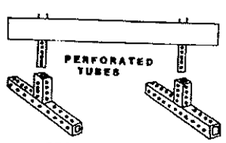
MOVABLE BARRICADE ASSEMBLY

NOTE: EACH MOVABLE BARRICADE SHALL BE WEIGHTED DOWN BY A SUFFICIENT NUMBER OF SAND BAGS SO THAT IT WILL NOT BE BLOWN OVER BY THE WIND UNLESS THE MOVABLE SUPPORTING STRUCTURE IS CONSTRUCTED IN SUCH A MANNER THAT THE WIND CANNOT BLOW IT OVER. WEIGHT USED SHALL BE APPROVED BY THE ENGINEER IN THE FIELD. THE STRIPES SHALL SLANT DOWNWARD TOWARD THE SIDE WHICH TRAFFIC IS TO PASS. BARRICADES USED AT THE BEGINNING OF A PROJECT SHALL FACE TRAFFIC ENTERING THAT PROJECT.

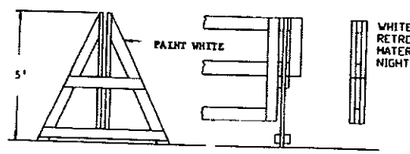


SIDE VIEW FRONT VIEW

HINGED BARRICADE ASSEMBLY

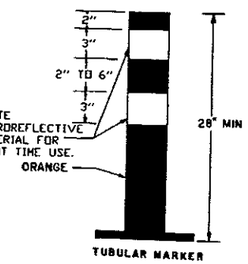


SECTIONAL BARRICADE

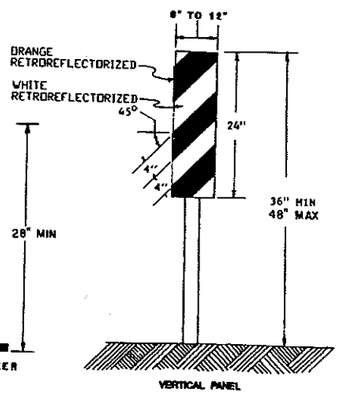


SIDE VIEW FRONT VIEW END VIEW

DEMOUNTABLE BARRICADE ASSEMBLY

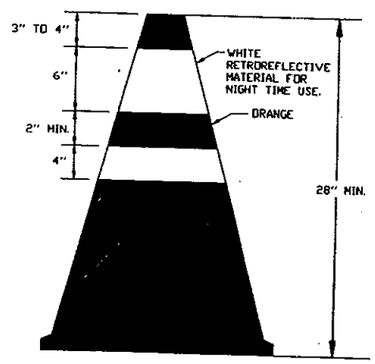


TUBULAR MARKER



VERTICAL PANEL

(RETROREFLECTIVE SHEETING SHALL BE PLACED ON BOTH SIDES)



CONE

BARRICADES: NUMBER OF RETROREFLECTORIZED RAIL FACES

TYPE I	TYPE II	TYPE III
2(One Each Direction)	4(Two Each Direction)	6(Facing in two Directions)

BARRICADE RAIL MATERIAL MAY BE 1" NOMINAL THICKNESS STANDARD LUMBER OR 3/4" PLYWOOD AND PREPARED AS RECOMMENDED BY THE SHEETING MANUFACTURER BEFORE RETROREFLECTIVE SHEETING IS APPLIED.

10-1-86

REVISIONS

DATE	CHANGE
8-3-87	TYPE SHEETING
10-1-87	DELINEATOR DRUM NOTE
6-9-88	BARRICADES TYPE III
5-1-92	GENERAL REVISIONS
6-10-93	GENERAL REVISIONS
9-23-93	VERTICAL PANEL
6-9-95	RETROREFLECTIVE SHEETING

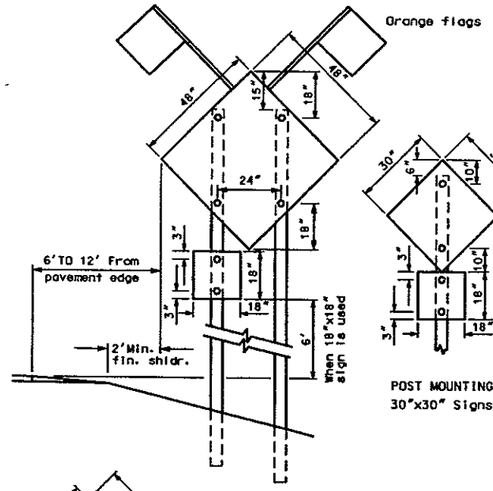
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

APPROVED: David K.O. Leer
DESIGN ENGINEER

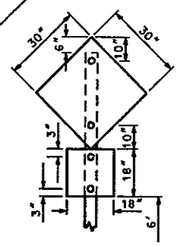
ED704-13 P=1'

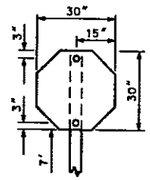
CONSTRUCTION SIGH AND BARRICADE ASSEMBLY DETAILS

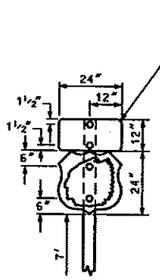
D-704-14

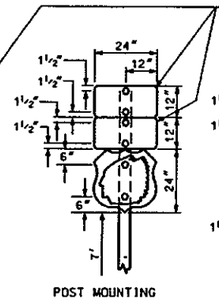


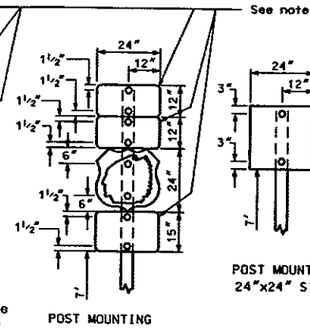
POST MOUNTING
48"x48" Signs


POST MOUNTING
30"x30" Signs

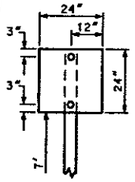

POST MOUNTING
Sign R1-1-30

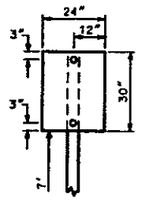

POST MOUNTING
Assemblies with one cardinal direction sign & one route marker

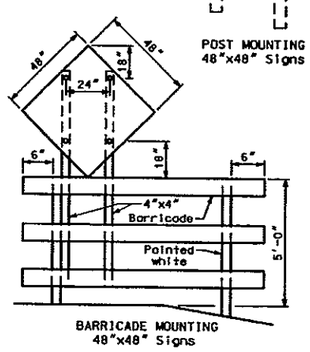

POST MOUNTING
Assemblies with one cardinal direction sign, one detour sign & one route marker



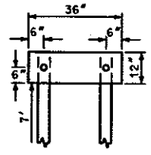
POST MOUNTING
Assemblies with one cardinal direction sign, one detour sign, one route marker & one directional arrow.

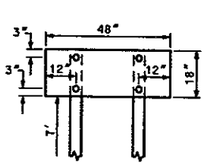

POST MOUNTING
24"x24" Signs

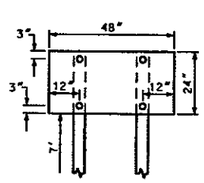

POST MOUNTING
24"x30" Signs

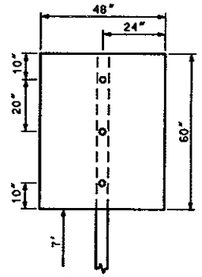


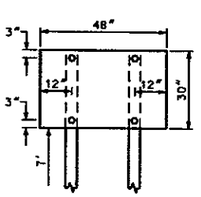
BARRICADE MOUNTING
48"x48" Signs

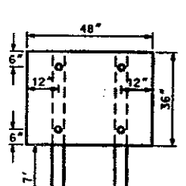

POST MOUNTING
36"x12" Signs

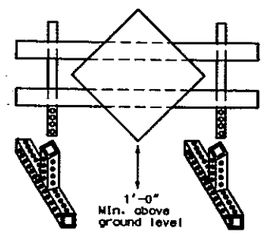

POST MOUNTING
48"x18" Signs


POST MOUNTING
48"x24" Signs

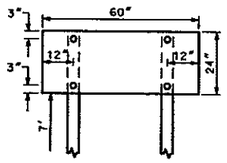

POST MOUNTING
48"x60" Signs

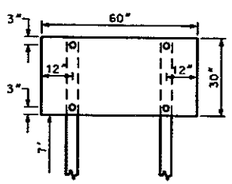

POST MOUNTING
48"x30" Signs

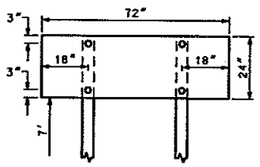

POST MOUNTING
48"x36" Signs

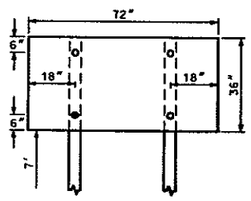


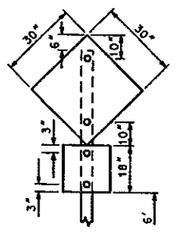
PORTABLE SIGN MOUNTING

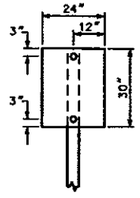

POST MOUNTING
60"x24" Signs

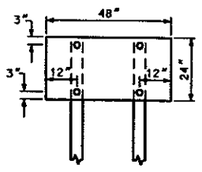

POST MOUNTING
60"x30" Signs

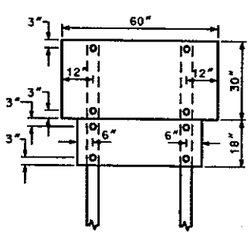

POST MOUNTING
72"x24" Signs

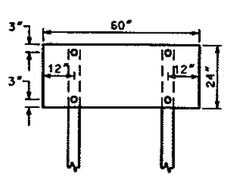

POST MOUNTING
72"x36" Signs

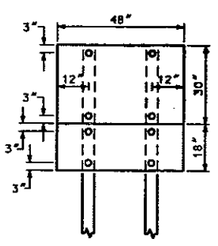

BARRICADE MOUNTING
30"x30" Signs

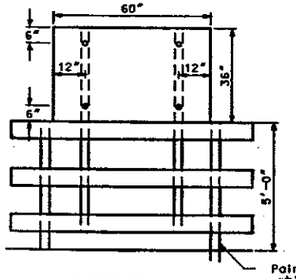

BARRICADE MOUNTING
24"x30" Signs


BARRICADE MOUNTING
48"x24" Signs

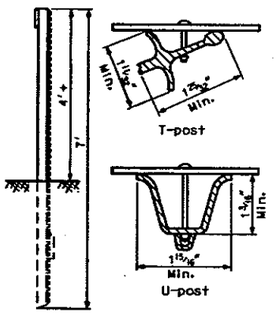

BARRICADE MOUNTING
60"x30" & 48"x18" Signs


BARRICADE MOUNTING
60"x24" Signs


BARRICADE MOUNTING
48"x30" & 48"x18" Signs



BARRICADE MOUNTING
G20-1-60 Signs



DELINEATOR ATTACHMENT AND POST MOUNTING DETAILS

NOTES:

1. In urban areas the vertical clearance shall be increased to 7 feet on all signs, except when supplemental signs are placed below main signs. The supplemental signs shall be placed at a 6'-0" minimum clearance.
2. Barricade and Sign Supports: Wooden supports shall be painted white. Steel supports shall be galvanized or painted.
3. Barricade Mounting Signs: The bottom of the sign shall be flush with the top of the top rail. Wood sign posts shall be 4"x4" min. SFS or equivalent steel posts. All barricades and barricade mounted signs shall be assembled with $\frac{3}{8}$" bolts.
4. Sign Supprts: Sign supports shall be 4"x4" min. SFS or equivalent steel post. The anchor for steel supports shall have a stub height of 4" or less. Wood posts more than 4"x4" shall be breakaway. Sign supports shall be imbedded to a sufficient depth so that signs will remain plumb throughout duration of project. It is suggested that wood posts have a min. depth of embedment of 5' and steel posts be embedded a min. 3'-6".
   Material: All signs shall be 0.100" aluminum, 12 gauge steel, $\frac{1}{2}$" plywood or other approved material.
   Holes: All holes to be punched round for $\frac{3}{8}$" bolts.
5. Alternate Messages: The signs that have alternate messages may have these alternate messages placed on a reflectorized plate without a border and this plate installed and removed as required.
6. Advance Warning Flashing or Sequencing Arrow Panels: The minimum mounting height shall be 7 feet above the roadway to the bottom of the panel, except on vehicle mounted panels which shall be as high as practicable.
7. Delineator Posts: Typical fence post sections are shown in Attachment Details. Other types of metal fence posts may be substituted upon approval of the engineer. These substituted posts shall have reflectors attached similar to the ones shown.
8. Route Marker Auxiliary Signs: The route marker auxiliary signs such as the cardinal direction and directional arrows shall have background colors the same as the route marker they are used with (Interstate route markers, blue background, US and State route markers, white background, Interstate Business loop and spur, green background, and County route markers, blue background).

10-1-86

REVISIONS	
DATE	CHANGE
8-1-88	Sign assembly
5-1-92	Sign assembly
9-30-93	Sign supports note
3-1-96	Sign height
8-15-96	Note 8
1-10-97	Note Revision

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

APPROVED: _____ DESIGN ENGINEER

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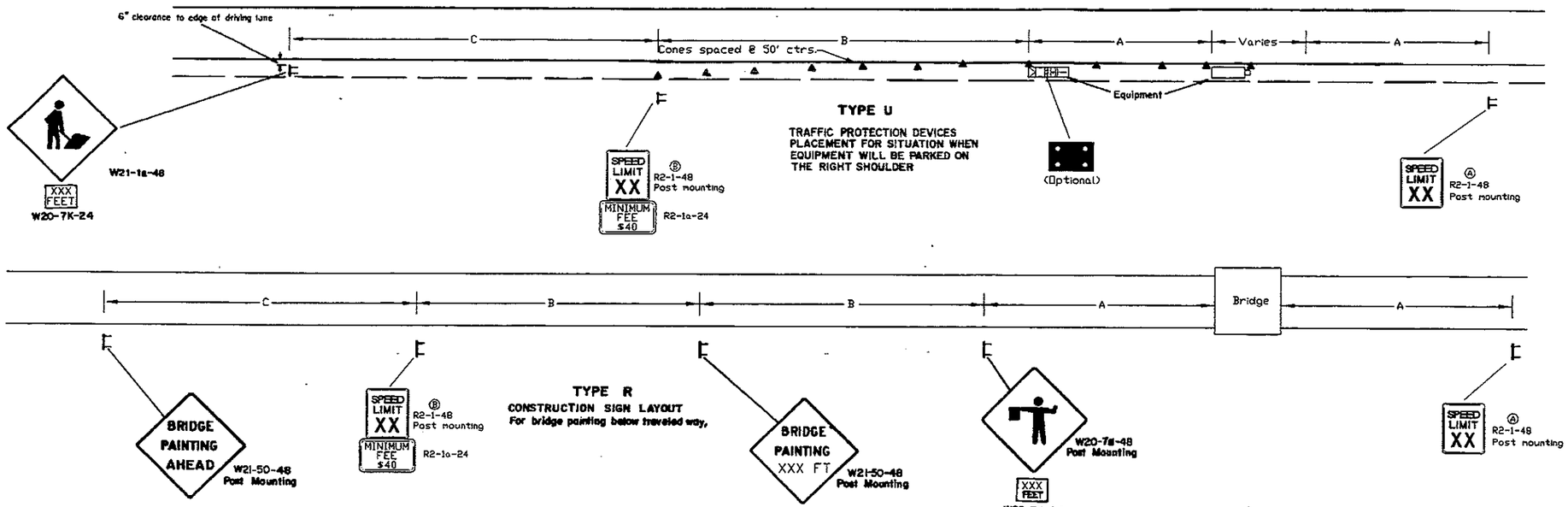
CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

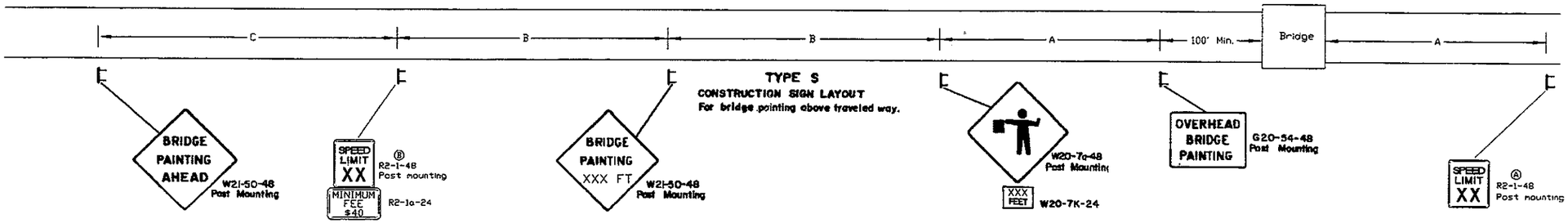
D-704-24



TYPE U

TRAFFIC PROTECTION DEVICES PLACEMENT FOR SITUATION WHEN EQUIPMENT WILL BE PARKED ON THE RIGHT SHOULDER

TYPE R
CONSTRUCTION SIGN LAYOUT
For bridge painting below traveled way.



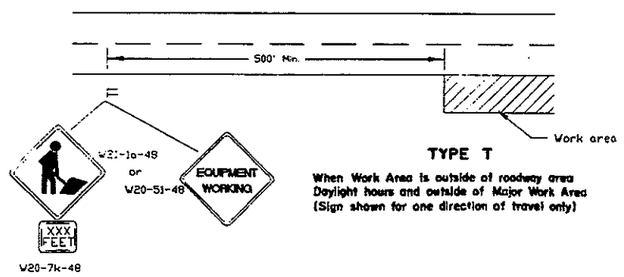
TYPE S
CONSTRUCTION SIGN LAYOUT
For bridge painting above traveled way.

Flags: When warning signs are in urban areas, flags shall be installed. These flags shall be 24 inch square mounted perpendicular to the edges of the diamond sign and at such a distance above the edge so that when flag is limp it will not touch the sign. Portable warning signs will not require flags. Rural areas will not require flags.

ADVANCE WARNING SIGN SPACING			
Road type	Distance between signs (Ft)		
	A	B	C
Urban - low speed (less than 40 mph)	200	200	200
Urban - high speed (40 mph or more)	350	350	350
Rural	500	500	500
Interstate/4-lane divided (Maintenance and surveying)	750	1000	1500
Interstate/4-lane divided (Construction)	1000	1600	2600

KEY

- TYPE I BARRICADE
- TYPE II BARRICADE
- TYPE III BARRICADE
- SIGN
- DELINEATOR DRUM
- CONES
- WORK AREA
- FLAGGER
- TYPE A DELINEATOR
- FLASHING ARROW PANEL CAUTION MODE



TYPE T

When Work Area is outside of roadway area Daylight hours and outside of Major Work Area (Sign shown for one direction of travel only)

Ⓐ The speed limit shall be re-established. The exact speed limit shall be determined in the field dependent on location and conditions

Ⓑ The speed limit shall be determined by the engineer in the field.

10-1-86	
REVISIONS	
DATE	CHANGE
8-3-87	NOTE
4-25-89	W 21 SIGN NO.
5-1-92	GENERAL REVISIONS
9-30-93	GENERAL REVISIONS
6-23-95	SPEED LIMIT
8-15-96	REVISE FLAG NOTE
9-3-96	70 MPH
1-31-97	SIGN SPACING

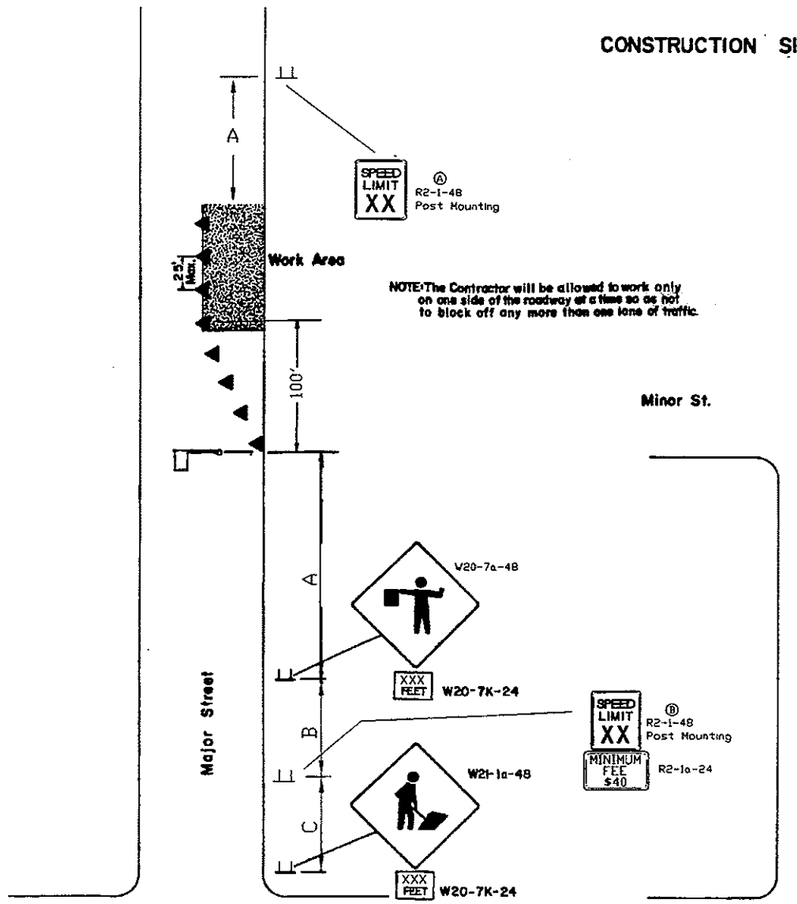
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

APPROVED: David K. Kuhn
DESIGN ENGINEER

ED704-24 Pg1

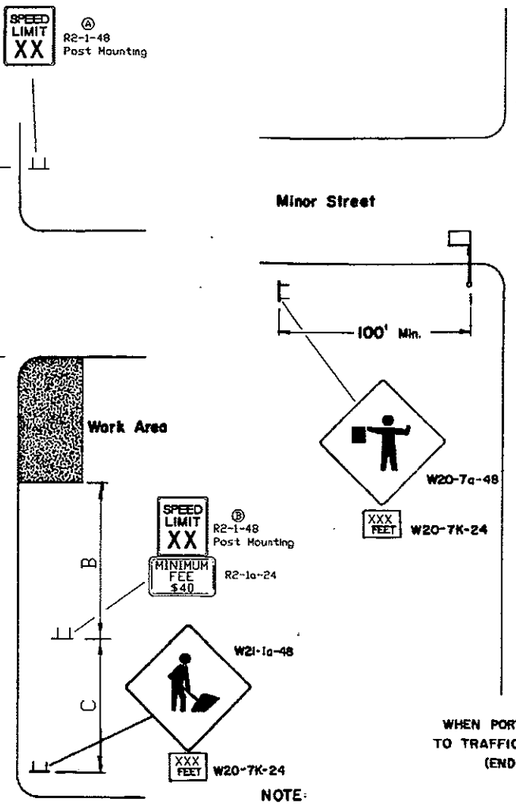
CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

D-704-25



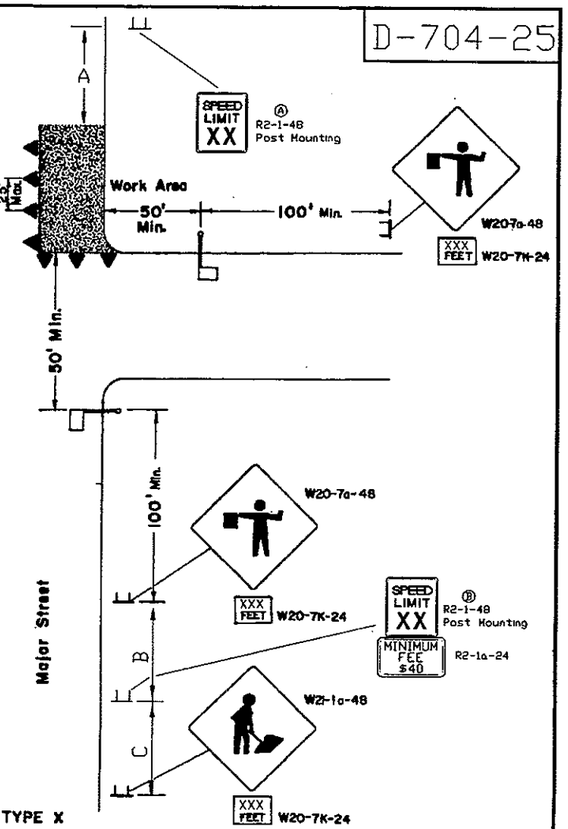
NOTE: The Contractor will be allowed to work only on one side of the roadway at a time so as not to block off any more than one lane of traffic.

TYPE V
WHEN PORTION OF ROADWAY IS CLOSED
TO TRAFFIC ONLY DURING DAYLIGHT HOURS
(MID BLOCK LOCATION)



NOTE:

TYPE W
WHEN WORK AREA IS OUTSIDE OF DRIVING
LANE AND NO CLOSURE IS NECESSARY



TYPE X
WHEN PORTION OF ROADWAY IS CLOSED
TO TRAFFIC ONLY DURING DAYLIGHT HOURS
(END BLOCK LOCATION)

ADVANCE WARNING SIGN SPACING			
Road type	Distance between signs (ft)		
	A	B	C
Urban - low speed (less than 40 mph)	200	200	200
Urban - high speed (40 mph or more)	350	350	350
Rural	500	500	500
Interstate/4-lane divided (Maintenance and surveying)	750	1000	1500
Interstate/4-lane divided (Construction)	1000	1600	2600

Where parking is present the signs shall be placed so they are entirely visible above the parked vehicles or placed at the edge of the parking area so they are visible to oncoming traffic

Flags: When warning signs are in urban areas, flags shall be installed. These flags shall be 24 inch square mounted perpendicular to the edges of the diamond sign and at such a distance above the edge so that when flag is limp it will not touch the sign. Portable warning signs will not require flags. Rural areas will not require flags.

KEY
- Cones
- Flagger
- Signs
- Work Area

Mounting- Signs shown to be placed on the roadway shall be placed on moveable assemblies.

Ⓐ The speed limit shall be re-established the exact speed limit shall be determined in the field dependent on location and conditions.

Ⓑ The speed limit shall be determined by the engineer in the field

10-1-86

REVISIONS	
DATE	CHANGE
8-3-87	NOTE
5-1-92	GENERAL REVISIONS
9-30-93	GENERAL REVISIONS
6-19-95	SPEED LIM'T
8-15-96	REVISE FLAG NOTE
9-3-96	70 MPH
1-31-97	SIGN SPACING

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
APPROVED: David K. Sorenson
DESIGN ENGINEER

ED704-25 P=1'

D-754-23

ASSEMBLY DETAILS

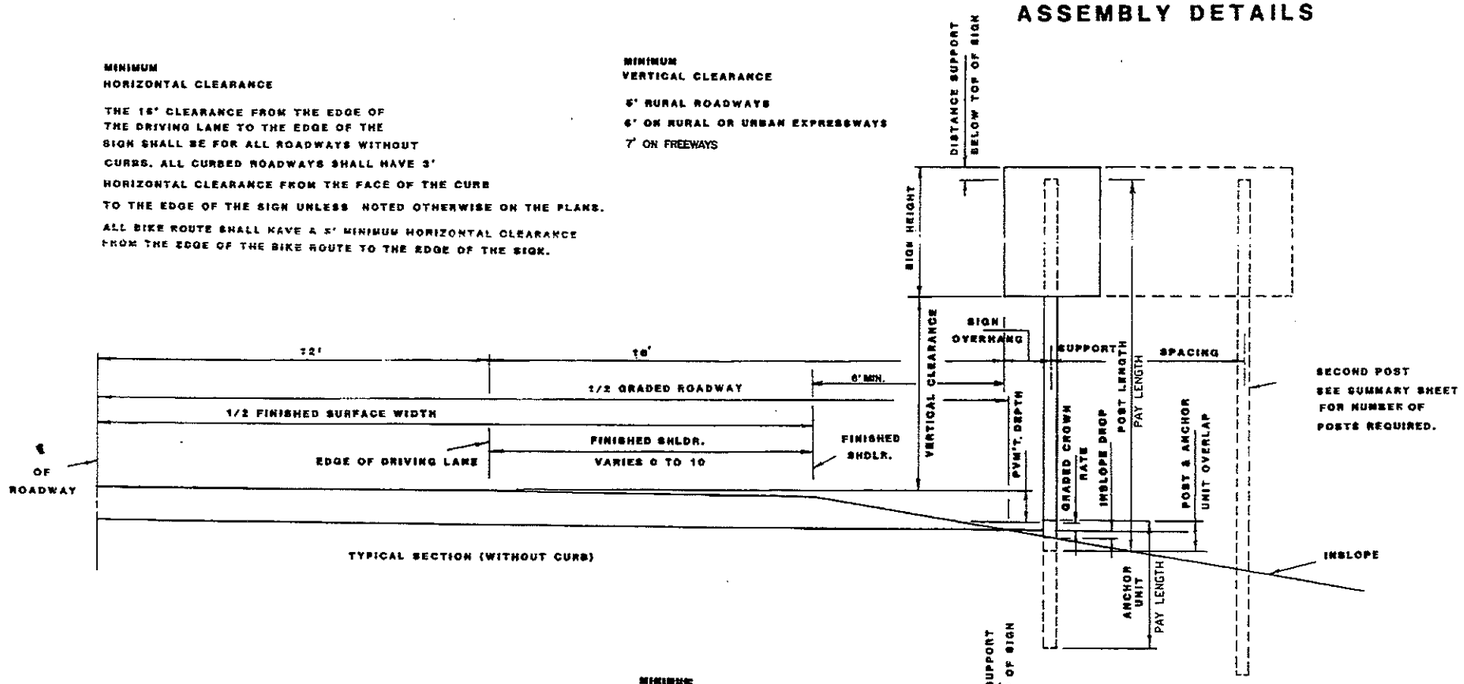
MINIMUM
HORIZONTAL CLEARANCE

THE 16' CLEARANCE FROM THE EDGE OF THE DRIVING LANE TO THE EDGE OF THE SIGN SHALL BE FOR ALL ROADWAYS WITHOUT CURBS. ALL CURBED ROADWAYS SHALL HAVE 3' HORIZONTAL CLEARANCE FROM THE FACE OF THE CURB TO THE EDGE OF THE SIGN UNLESS NOTED OTHERWISE ON THE PLANS.

ALL BIKE ROUTE SHALL HAVE A 5' MINIMUM HORIZONTAL CLEARANCE FROM THE EDGE OF THE BIKE ROUTE TO THE EDGE OF THE SIGN.

MINIMUM
VERTICAL CLEARANCE

5' RURAL ROADWAYS
6' ON RURAL OR URBAN EXPRESSWAYS
7' ON FREEWAYS

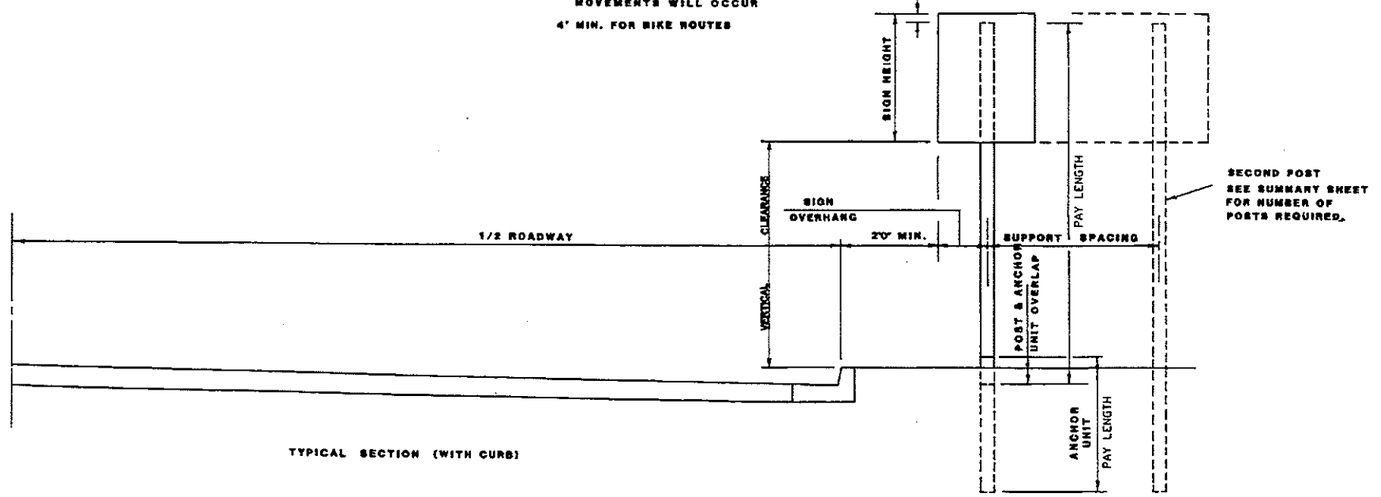


VERTICAL CLEARANCE

6' URBAN EXPRESSWAYS

7' IN RESIDENTIAL AND BUSINESS DISTRICTS WHERE PARKING AND / OR PEDESTRIAN MOVEMENTS WILL OCCUR

4' MIN. FOR BIKE ROUTES



NOTE

PAVEMENT DEPTH-THE PAVEMENT DEPTH USED TO DEVELOP SUMMARY SHEETS SHOULD BE THE ULTIMATE PAVEMENT DEPTH.

SEE PLANS FOR SIGN NUMBERS AND ASSEMBLY NUMBERS.

SIGN PUNCHING AND STRINGERS SHALL BE AS SHOWN ON STANDARDS.

HORIZONTAL CLEARANCE:

THE POST LENGTHS HAVE BEEN COMPUTED USING A HORIZONTAL CLEARANCE OF 16 FEET BETWEEN THE EDGE OF THE DRIVING LANE AND THE EDGE OF THE SIGN.

FOR AN ULTIMATE SHOULDER WIDTH OF 10 FEET, THE DISTRICTS HAVE THE OPTION OF SETTING THE SIGNS OUT TO 16 FEET CLEARANCE. IF THE CLEARANCE IS TO BE INCREASED TO 16 FEET, THE NECESSARY ADJUSTMENT IN SUPPORT LENGTH SHALL BE MADE IN THE FIELD.

10-1-86

REVISIONS	
DATE	CHANGE
8-1-88	FREEWAYS
9-4-90	MIN. OVERHANG FROM SHOULDER
5-1-92	GENERAL REVISIONS
9-3-92	MIN. CLEARANCE
9-8-95	PAY LENGTH

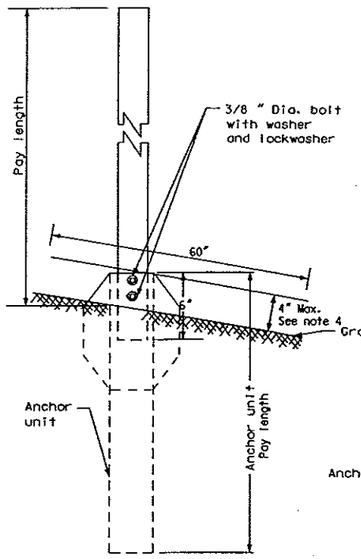
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

APPROVED: David K. O'Bar
Design Engineer

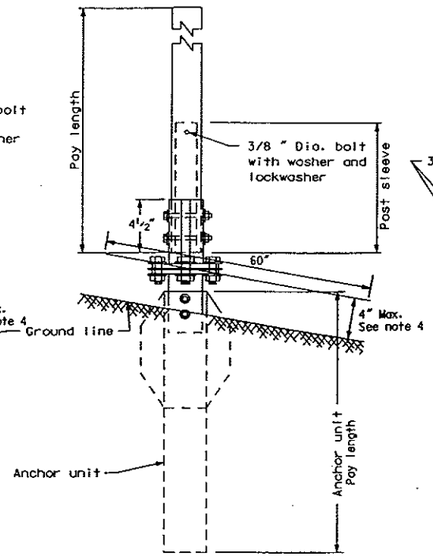
ED754-23 P=1'

MOUNTING DETAILS PERFORATED TUBE

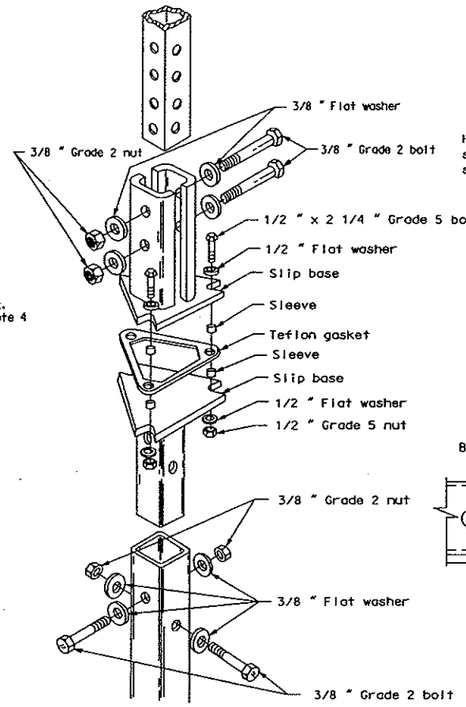
D-754-24



ANCHOR UNIT AND POST ASSEMBLY

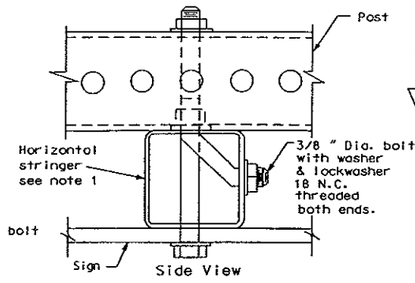


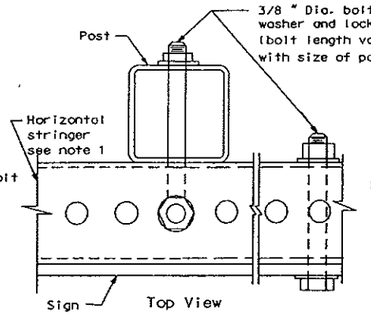
SLIP BASE ANCHOR UNIT AND POST SLEEVE ASSEMBLY



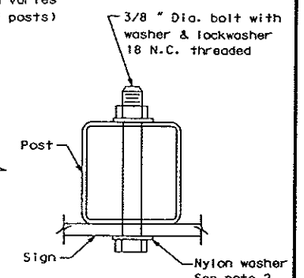
SLIP BASE ASSEMBLY DETAILS

Note: Slip base bolts shall be torqued as specified by the manufacturer.

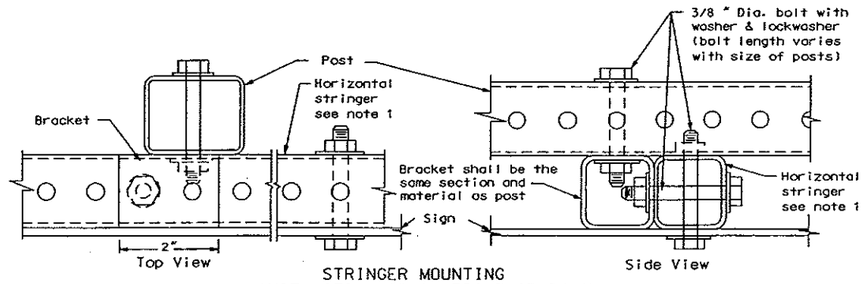




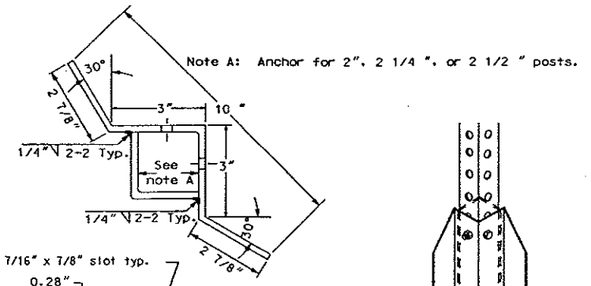
STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)

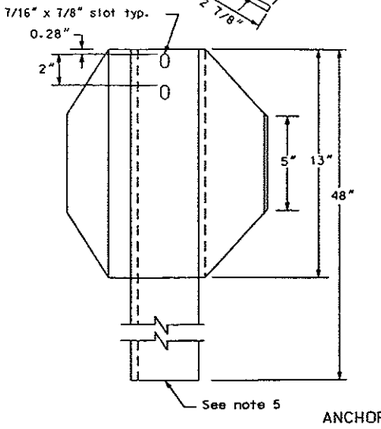


BOLT MOUNTING

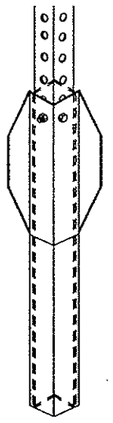


STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)
ALTERNATE





ANCHOR UNIT

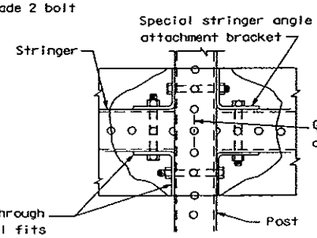


Number of Posts	Telescoping Perforated Tube				
	Post Size in.	Wall Thickness Gauge	Sleeve Size in.	Wall Thickness Gauge	Slip Base
1	2	12		12	No
1	2 1/4	12		12	No
1	2 1/2	12		3/16	B
1	2 1/2	10		3/16	Yes
1	2 1/4	12	2	12	Yes
1	2 1/2	12	2 1/4	12	Yes
2	2	12		12	No
2	2 1/4	12		12	No
2	2 1/2	12		12	Yes
2	2 1/2	10		3/16	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		12	Yes
3 & 4	2 1/2	10		3/16	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	3/16	Yes

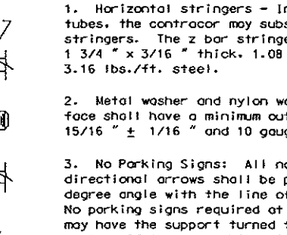
B - The 2 1/2 " 12 gauge posts do not need slip bases when placed in standard soils. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak.
Weak soils are defined as boggy, wet, or loose soil areas.

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

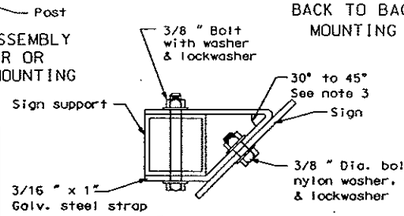
The 2 3/16 " size 10 gauge is shown as 2.19" size on the plans. The 2 1/2 " size 10 gauge is shown as 2.51" size on the plans.

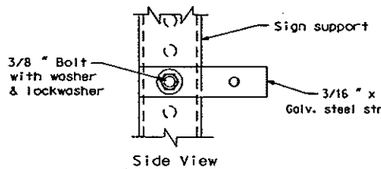


SINGLE POST ASSEMBLY
ONE STRINGER OR
BACK TO BACK MOUNTING



BACK TO BACK MOUNTING





Note:

1. Horizontal stringers - In lieu of perforated tubes, the contracor may substitute a bar stringers. The z bar stringers shall be 1 3/4 " x 3/16 " thick. 1.08 lbs./ft. aluminum or 3.16 lbs./ft. steel.

2. Metal washer and nylon washers used on sign face shall have a minimum outside diameter of 15/16 " ± 1/16 " and 10 gauge thickness.

3. No Parking Signs: All no parking signs with directional arrows shall be placed at a 30 to 45 degree angle with the line of traffic flow. No parking signs required at the above angles may have the support turned to the correct angle. If the no parking sign is placed with another sign that has to be placed at a 90 degree angle with the line of traffic flow, the detailed angle strap should be used to mount the no parking sign. Material used for the attachment strap shall be included in the price bid flat sheet for signs. Flat washers and lockwashers shall be used with all nylon washers.

4. 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.

5. Anchor material shall be 7 gauge(.179-.188) H.R.P.O. Commercial quality ASTM A569.

REVISIONS	
DATE	CHANGE
8-15-94	Anchor detail
3-20-95	Rev. 4x4 post
9-8-95	Pay length
2-20-96	Perforated tube table
5-13-96	B note
11-3-97	Anchor unit

10-1-86

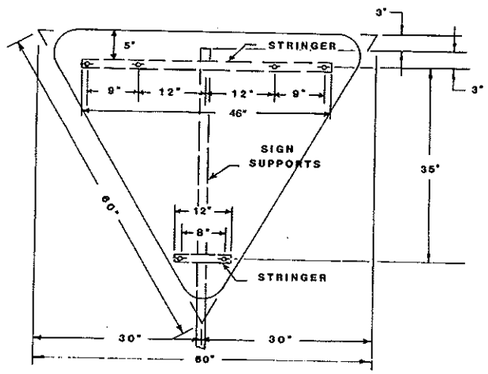
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

APPROVED: _____ DESIGN ENGINEER

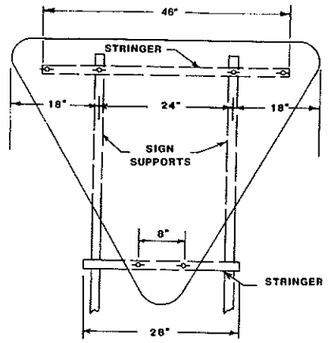
r:\support\desstd\d754-24.dgn Nov. 04, 1997 09:13:04

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

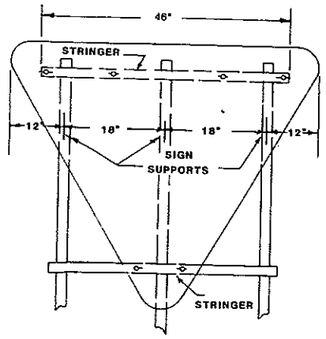
D-754-27



1 POST

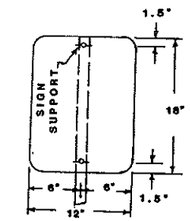


2 POSTS



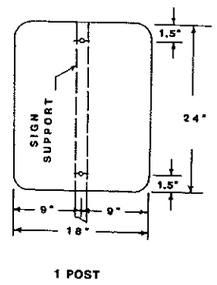
3 POSTS

ASSEMBLY NO. 6



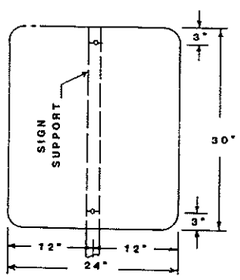
1 POST

ASSEMBLY NO. 7

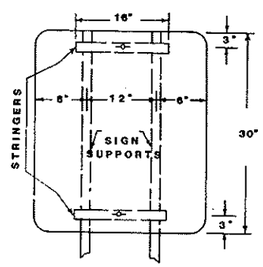


1 POST

ASSEMBLY NO. 8

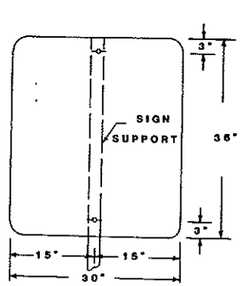


1 POST

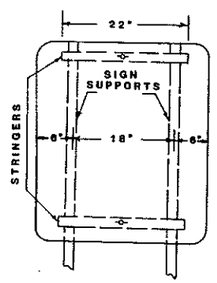


2 POSTS

ASSEMBLY NO. 9

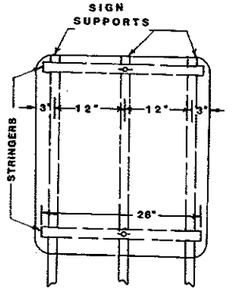


1 POST



2 POSTS

ASSEMBLY NO. 10



3 POSTS

NOTE:

Material:

Sign Backing: The sign backing material thickness shall be as follows.

Aluminum: Alumium Alloy 6061-T6 and 5052-H38 shall have the following minimum thickness: All signs shall be 0.100 inch.

Stringers:

Flange Channel: All stringers shall be flange channel 1.12# per foot and of the length shown.

Square Tube, Perforated: All stringers shall be square tube, perforated 1 1/2"X1 1/2" and of the length shown.

Holes:

Flange Channel: All holes shall be punched round for 3/8" diameter bolts.

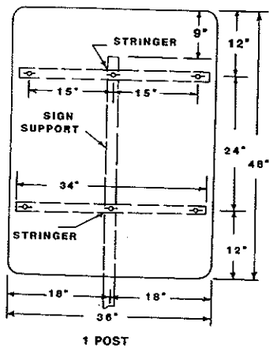
Square Tube, Perforated: All holes shall be punched round for 3/8" diameter bolts.

General:

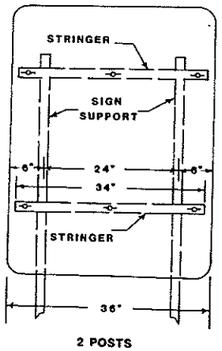
See plans for sign numbers to be used at each location .

See Std. D-754-24 square tube, perforated mounting details.

See Std. D-754-25 for flange channel mounting details.

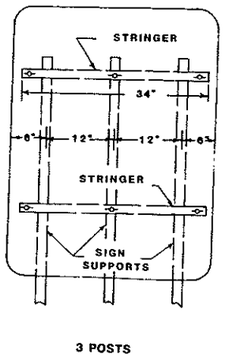


1 POST



2 POSTS

ASSEMBLY NO. 11



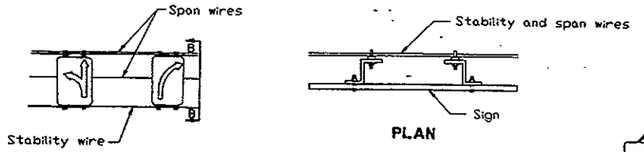
3 POSTS

10-1-86	
REVISIONS	
DATE	CHANGE
5-1-92	GENERAL REVISIONS
7-14-95	48" Stringer

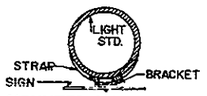
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
APPROVED: David K.D. Kaar
DESIGN ENGINEER

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

D-754-80

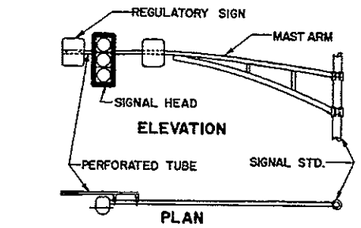


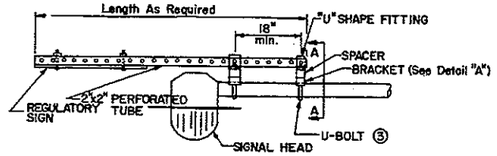
SPAN WIRE MOUNTED SIGN DETAIL



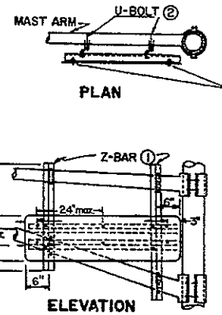
LT. STD. MOUNTED SIGN BRACKET DETAIL
(MAX. 24"x 30" SIGNS)

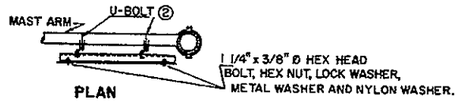
Bracket shall be of galv. steel consisting of strap & sign attachment bracket similar to the one shown in the detail. Cost of the bracket assembly to be included in the price bid for flat sheet signs. Punching shall be as shown on the Standard Drawings. The Engineer in the field shall determine the exact 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.





SIGN MOUNTED BEYOND END OF MAST ARM DETAIL





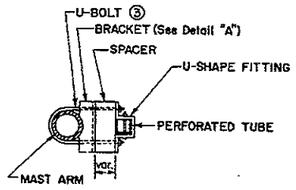
MAST ARM MOUNTED STREET NAME SIGN DETAIL

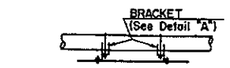
① Z-Bar - Use 1 3/4"x 3/16" Thick 1.08 Lbs./Ft Aluminum Alloy
In lieu of Z-Bar, two angles bolted together may be used or a channel. (1 3/4" x 1 3/4" x 3/16" angles) (1 3/4"x 2"x .188" Channels)

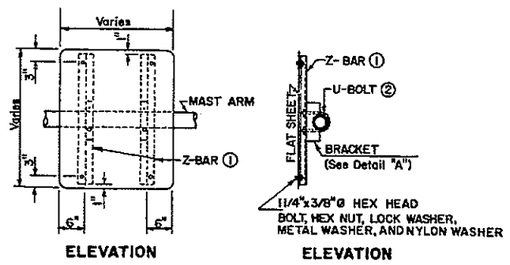
② 3/8" U-Bolt, Hex Nut, Lock Washer & Length depends on Dia. of Mast Arm

③ 3/8" U-Bolt, Hex Nut, Lock Washer & Length depends on Dia. of Mast Arm.
Paint Perforated Tube the same color and specification as Mast Arm.
2"x2" Maximum support length 9.9 ft.
2 1/2"x2 1/2" Maximum support length 12.6 ft.
2 1/2"x2 1/2" Maximum support length 15.7 ft.

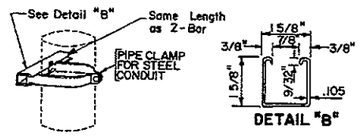
NOTE:
Metal washers and Nylon washers used on sign face shall have a minimum outside dia. of 15/16 inch ± 1/16 inch and 10 gauge thickness.



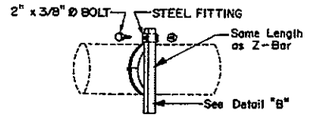




MAST ARM MOUNTED REGULATORY SIGN DETAIL

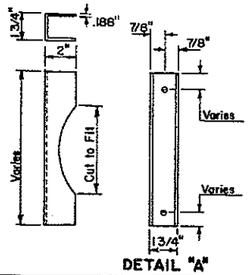


VERTICAL MOUNTING
Two (2) Clamps Required Per Sign



HORIZONTAL MOUNTING
Two (2) Clamps Required Per Sign

ALTERNATE CLAMP MOUNTING



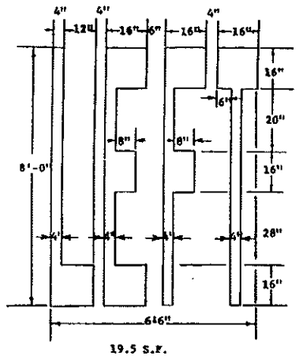
10-1-86 REVISIONS	
DATE	CHANGE
5-1-92	GENERAL REVISIONS
11-24-95	SPAN WIRE MOUNTING SIGN DETAIL

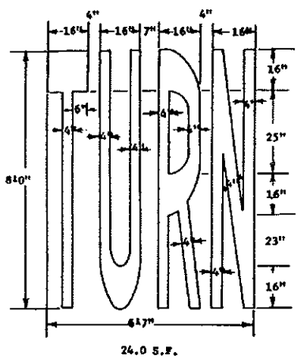
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

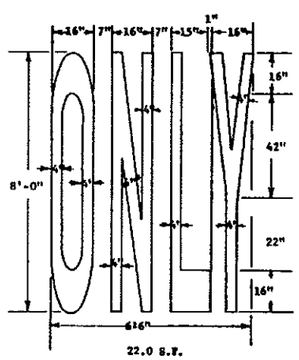
APPROVED David K.D. Loan
DESIGN ENGINEER

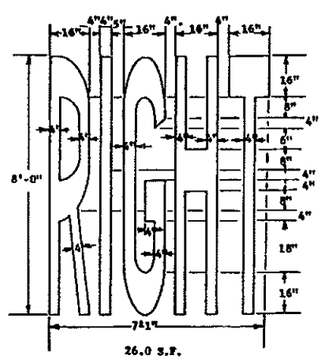
ED754-80 P=1"

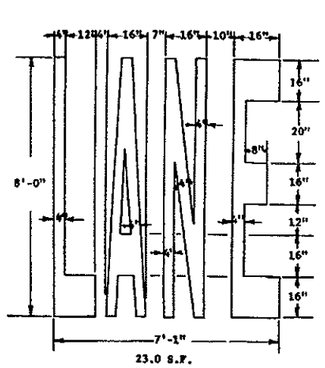
D-762-1

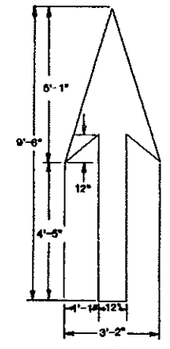


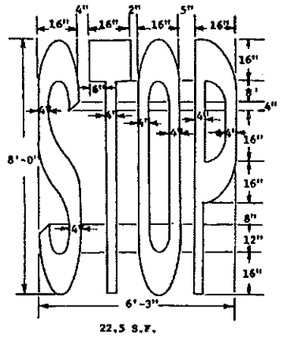


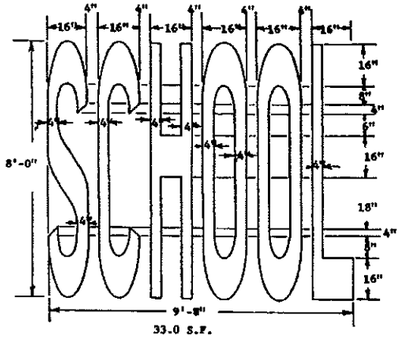


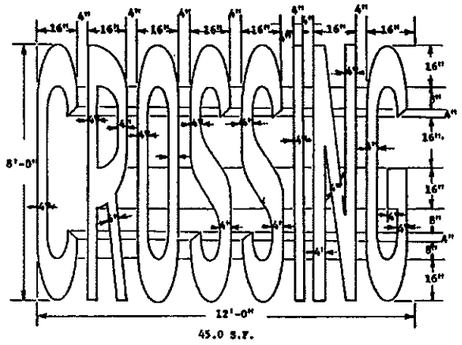


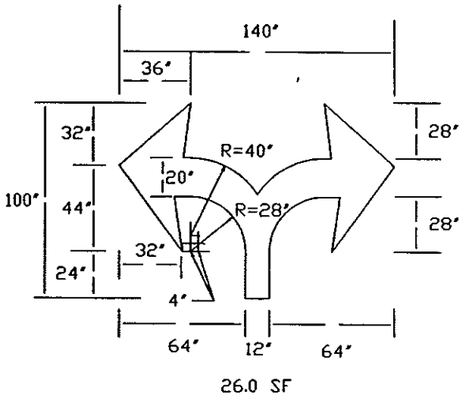


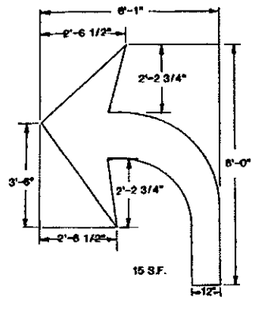


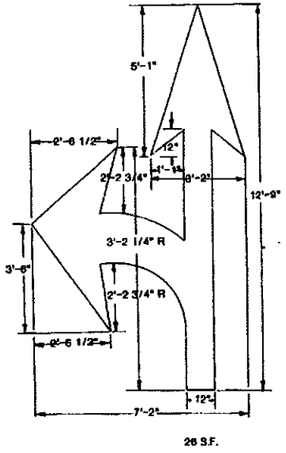




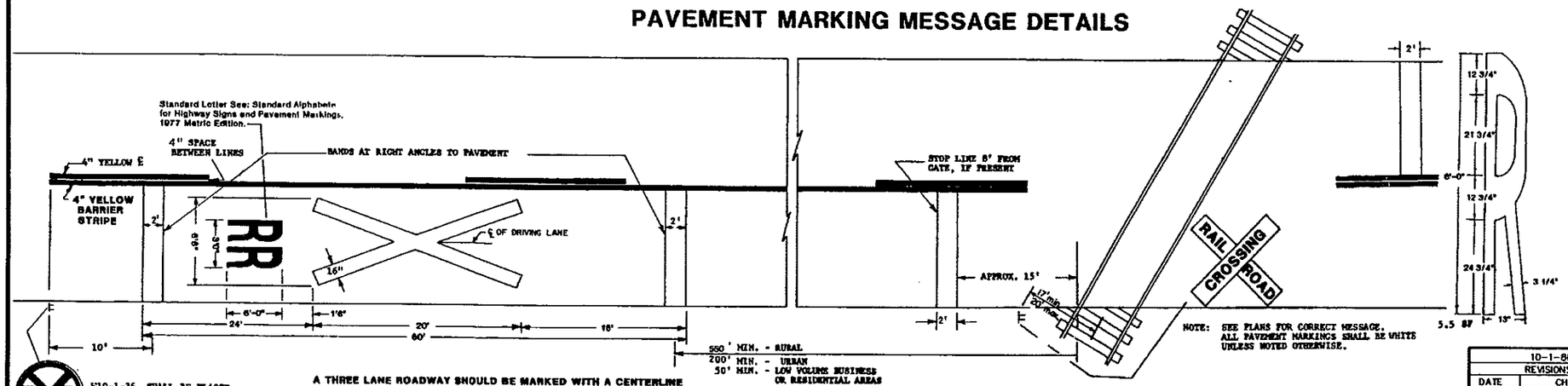








PAVEMENT MARKING MESSAGE DETAILS



W10-1-36 SHALL BE PLACED WITHIN 10'± OF LOCATION SHOWN

A THREE LANE ROADWAY SHOULD BE MARKED WITH A CENTERLINE FOR TWO-LANE APPROACH OPERATION ON THE APPROACH TO A CROSSING. ON MULTI-LANE ROADS, THE TRANSVERSE BANDS SHOULD EXTEND ACROSS ALL APPROACH LANES, AND INDIVIDUAL R X R SYMBOLS SHOULD BE USED IN EACH APPROACH LANE.

RAILROAD CROSS & 2 R'S 65.0 S.F.
3 BANDS 72.0 S.F.

NOTE: SEE PLANS FOR CORRECT MESSAGE. ALL PAVEMENT MARKINGS SHALL BE WHITE UNLESS NOTED OTHERWISE.

10-1-86

REVISIONS	
DATE	CHANGE
3-1-89	Arrows
7-2-90	Rail Road X & R
3-2-92	Arrows
7-21-93	RAILROAD R
8-1-94	GENERAL REVISIONS
11-27-95	DUAL ARROWS

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

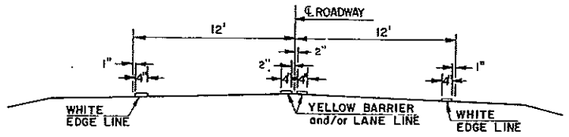
APPROVED David K. O. Leer
DESIGN ENGINEER

ED762-01 P=1"

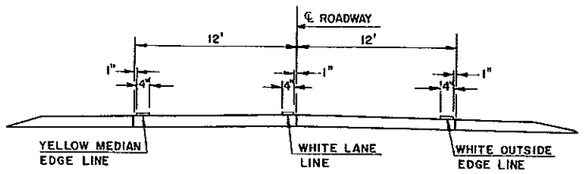
PAVEMENT MARKING

FHWA REGION	STATE	FED. AID PROJ NO.	SHEET NO.
8	N.D.		

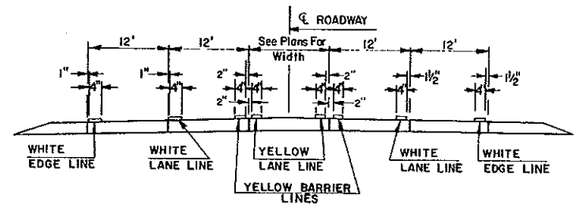
D-762-4



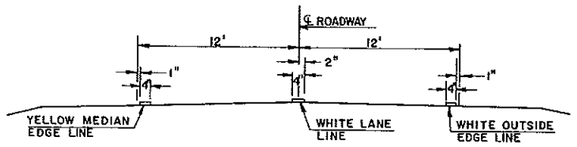
TWO LANE TWO WAY
RURAL ROADWAY



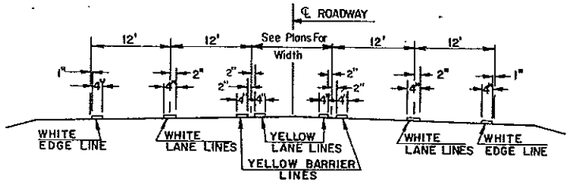
TWO LANE ROADWAY
INTERSTATE HIGHWAY
CONCRETE SECTION



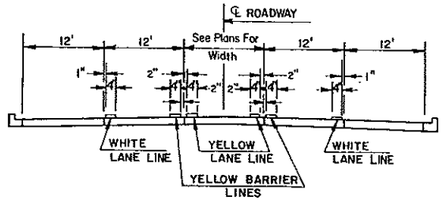
RURAL FIVE LANE ROADWAY
CONCRETE SECTION



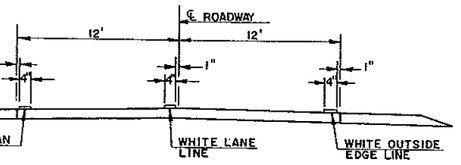
TWO LANE DIVIDED
RURAL ROADWAY
PRIMARY HIGHWAY
ASPHALT SECTION



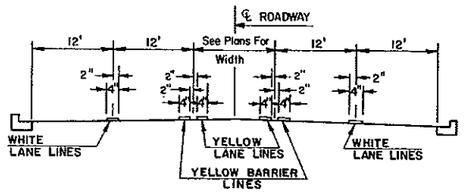
RURAL FIVE LANE ROADWAY
ASPHALT SECTION



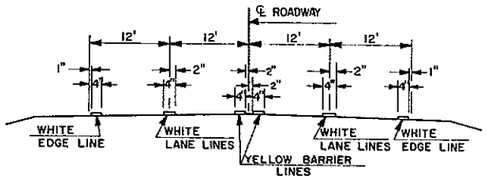
URBAN FIVE LANE SECTION
CONCRETE SECTION



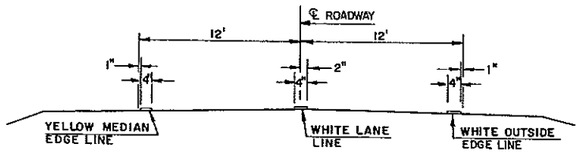
TWO LANE ROADWAY
PRIMARY HIGHWAY
CONCRETE SECTION



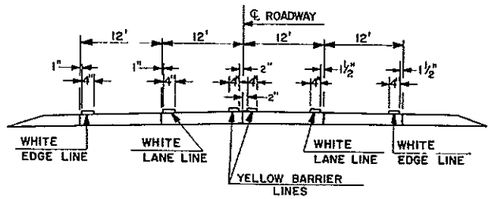
URBAN FIVE LANE SECTION
ASPHALT SECTION



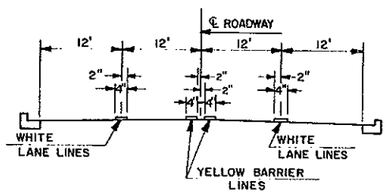
RURAL FOUR LANE ROADWAY
ASPHALT SECTION



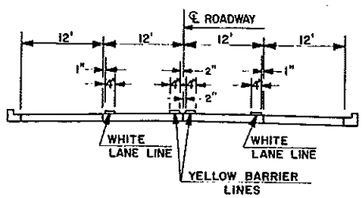
TWO LANE ROADWAY
INTERSTATE HIGHWAY
ASPHALT SECTION



RURAL FOUR LANE ROADWAY
CONCRETE SECTION



URBAN FOUR LANE SECTION
ASPHALT SECTION



URBAN FOUR LANE SECTION
CONCRETE SECTION

10-1-86	
REVISIONS	
DATE	CHANGE
3-1-89	Edge Line
8-1-94	GEN. REV.

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

APPROVED: David K. O'Leary
DESIGN ENGINEER

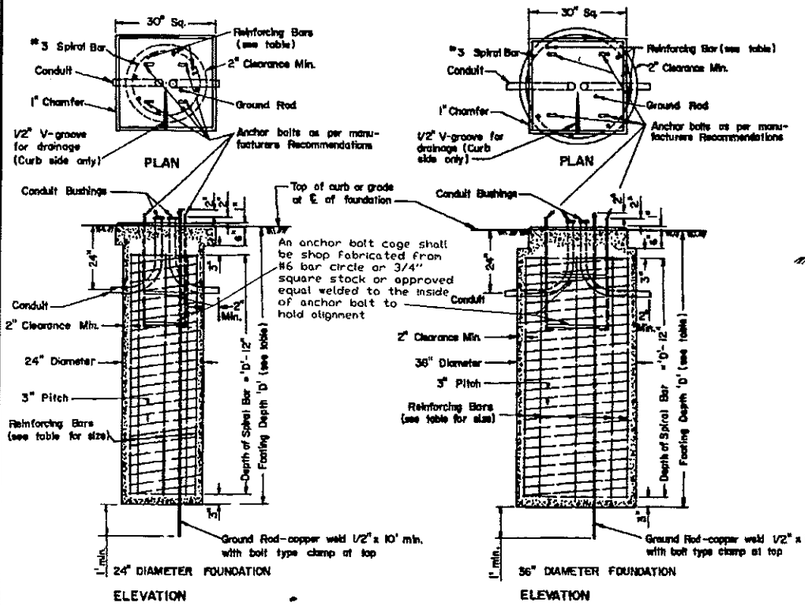
D-770-1

CONCRETE FOUNDATIONS (TRAFFIC SIGNALS & HIGHWAY LIGHTING)

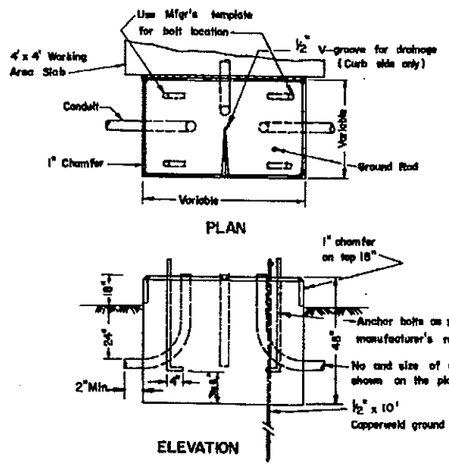
LIGHT & SIGNAL STANDARD FOUNDATION SELECTION TABLE				
Description	Reinforcing Bars Required	Footing Depth "D" 24" Diameter	Reinforcing Bars Required	Footing Depth "D" 36" Diameter
Light Standard				
30'-35' Mounting Height	8-#5	8'	8-#4	5'
36'-44' Mounting Height	8-#5	6'	8-#4	5'
45'-50' Mounting Height	8-#5	8'	8-#4	7'
Combination 30' Mounting Height				
0-25' Signal Mast Arm	8-#6	10'	8-#5	8'
26'-44' Signal Mast Arm	8-#6	10'	8-#5	8'
45'-50' Signal Mast Arm	8-#8	11'	8-#7	9'
Combination 40' Mounting Height				
0-25' Signal Mast Arm	8-#6	10'	8-#5	8'
26'-44' Signal Mast Arm	8-#7	11'	8-#6	9'
45'-50 Signal Mast Arm	8-#8	12'	8-#7	10'
Combination 50' Mounting Height				
0-25' Signal Mast Arm	8-#6	10'	8-#5	9'
26'-44' Signal Mast Arm	8-#8	12'	8-#7	10'
45'-50' Signal Mast Arm	8-#8	13'	8-#7	11'
Type IV Signal Standard	8-#7	10'	8-#8	9'
Type I, II, & III, X, XI, & XII Signal Std.	4-#5 ①	4'	4-#5 ①	3'

① No reinforcement is required if the anchor bolts extend to within 3" to 6" above the bottom of the foundation.

All reinforcing steel to be Grade 40 or 60.
If the contractor elects to use a 24" square foundation, the next size smaller reinforcement bars may be substituted for those shown in the table. No substitutions may be made for a 36" square foundation. #4 tie bars may be substituted for the spiral with the bars spaced at an equal space to a maximum of 12" c-c starting with first at the top of the reinforcing and the last at the bottom of the reinforcing. Round tie bars shall have a minimum of 12" lap.

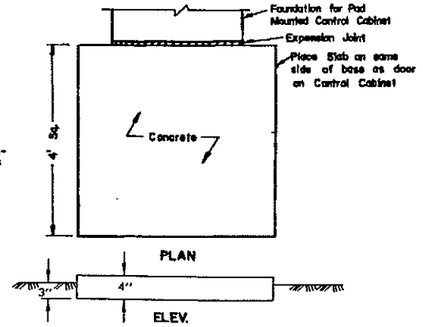


LIGHT & SIGNAL STANDARD FOUNDATION



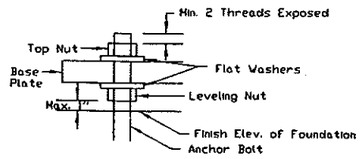
CONTROLLER CABINET FOUNDATION PAD MOUNT

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

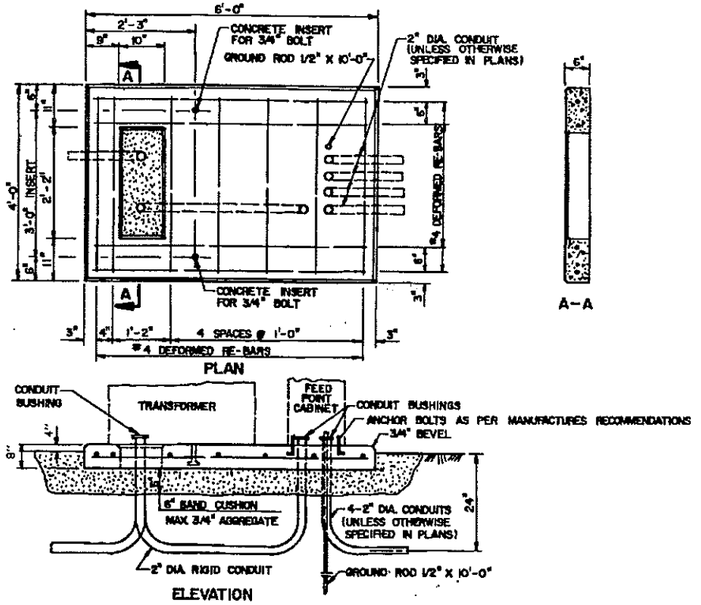


WORKING AREA SLAB

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 Foundations-Traffic Signals.

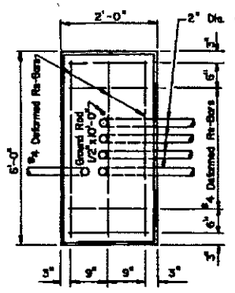


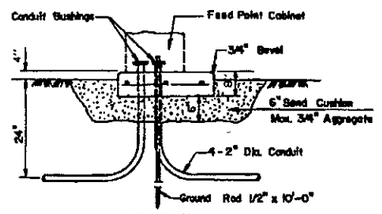
Anchor Bolt Detail



TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

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





FEED POINT CABINET FOUNDATION PAD MOUNT

The Feed Point Cabinet Foundation Pad Mount shall be bid as Concrete Foundations-Feed Point Pad-Type B

NOTES:

Light & Signal Standard Foundations:

See plans for conduit size, number of bends and correct positioning 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 location of foundations. The grade and exact location shall be established by the Engineer in the field.

Maximum anchor bolt circle for the 24" foundation shall not exceed 18". Maximum anchor bolt circle for the 36" foundation shall not exceed 30".

Pad Mounted Signal Control Cabinet Foundation:

See plans for the number of 90° bends per foundation and correct positioning.

Foundation for Pad Mounted Signal Control Cabinets 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 insure a watertight seal between the control cabinet and the foundation by caulking, except for V grove.

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:

Foundation shall have a wood float finish.

All conduits shown shall be installed. Conduit that is not used at this time shall be plugged.

Feed Point Cabinet Foundation Pad Mounted:

Foundation shall have wood float finish.

All conduits shown shall be installed. Conduit that is not used at this time shall be plugged.

10-1-86 REVISIONS	
DATE	CHANGE
5-5-92	Lt. Std. Mounting Ht.
6-16-94	Anchor Bolts & Leveling Nuts
10-10-94	Slab Revision
6-14-95	Footnote ① Revision
1-31-97	Foundation Depth

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

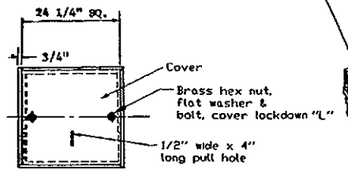
APPROVED: David R. Sorenson
DESIGN ENGINEER

ED770-01 P=1"

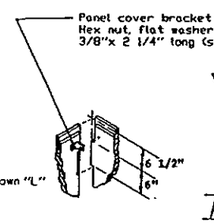
PULL BOX DETAILS

D-770-3

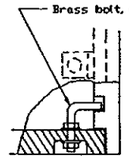
NOTE: Fiberglass pull box is composed of fiberglass skins and reinforced mortar structural elements in combination with polyurethane foan cells.



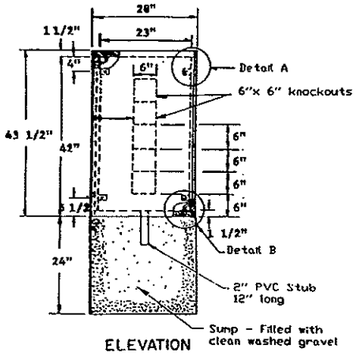
PLAN



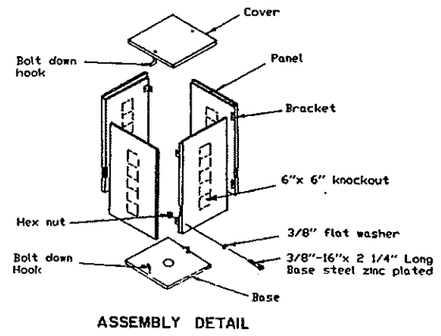
DETAIL — A



DETAIL — B

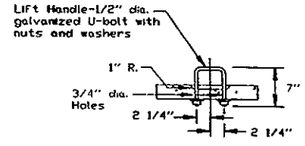


ELEVATION

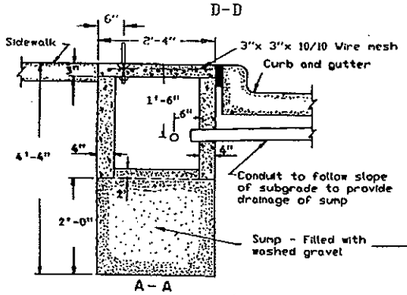


ASSEMBLY DETAIL

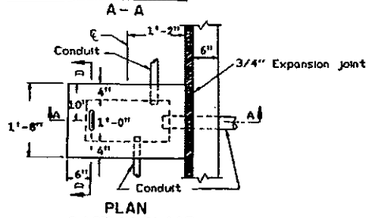
FIBERGLASS PULL BOX



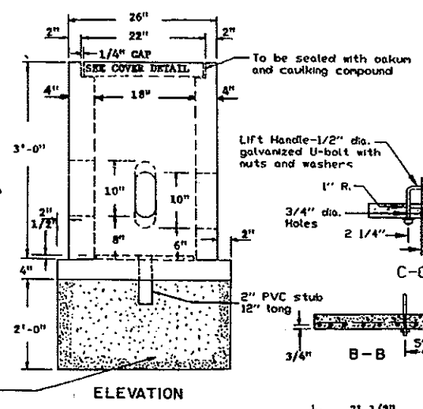
D-D



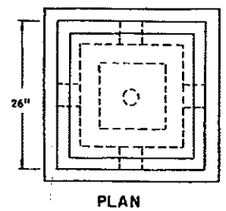
A-A



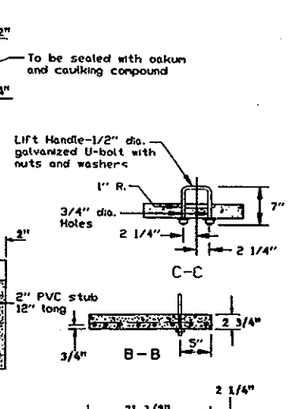
PLAN
CAST IN PLACE



ELEVATION

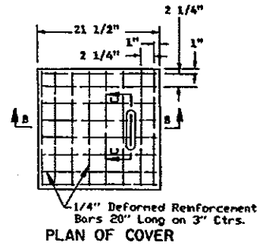


PLAN



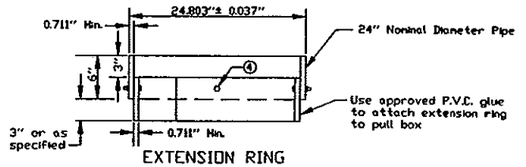
C-C

B-B

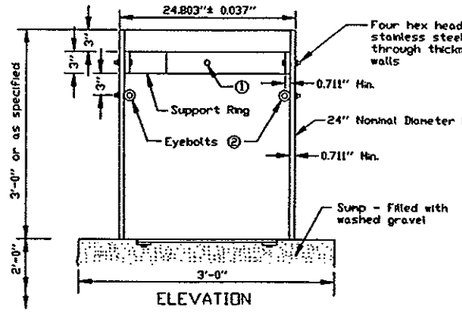


PLAN OF COVER

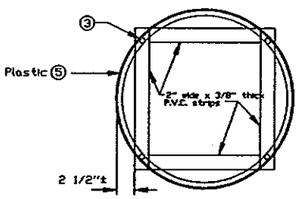
CONCRETE PULL BOX — PRECAST CONCRETE



EXTENSION RING
FUTURE ADJUSTMENT



ELEVATION



BOTTOM VIEW

PVC PULL BOX

PVC PULL BOX NOTES:

① Attach split 24" nominal diameter P.V.C. cover support ring with four 3/8" dia. x 2" long stainless steel hex head bolts with nuts at 90° apart.

② Two Type 2 Shoulder Eyebolts, 3/8" dia. x 1 1/4" shank length, with hex nuts 180° apart (For lifting pull box and supporting electric cable).

③ Four 1/4"x 1 1/4" long galvanized lag screws. Screw assembly together.

④ Attach split 24" nominal diameter P.V.C. cover support extension ring with four 3/8" dia. x 2" long stainless steel hex. head bolts with nuts at 90° apart.

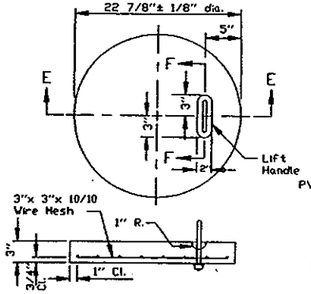
⑤ Bolt assembly together.

6. Conduit holes located in barrel section shall be sized no more than 1" larger than size of conduit being used.

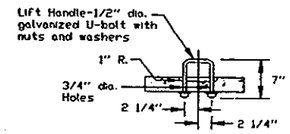
7. After pull box & conduit installation, all inside walls & cover shall be made water tight to the satisfaction of the Engineer.

8. P.V.C. pipe to meet requirements of ASTM F679T-1 or equal.

9. Hex head bolts and nuts shall be austenitic stainless steel. Other fasteners to be galvanized as per AASHTO M-232.



SECTION E-E

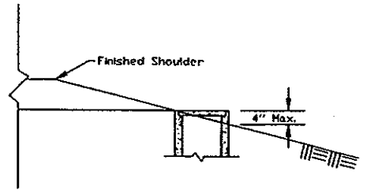


SECTION F-F

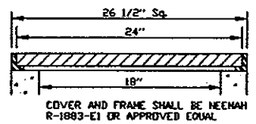
PVC PULL BOX NOTES:

Concrete cover shall be coated on top and sides with an approved epoxy coating. The epoxy protective coating shall be light grey, 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.

CONCRETE COVER

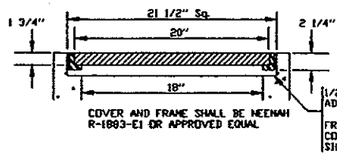


Typical Pull Box in Rural Section



COVER AND FRAME SHALL BE NEENAH R-1883-E1 OR APPROVED EQUAL

CAST IN PLACE CONCRETE PULL BOX COVER DETAIL

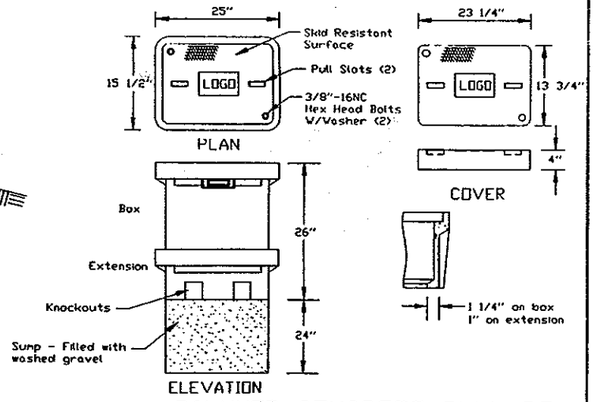


COVER AND FRAME SHALL BE NEENAH R-1883-E1 OR APPROVED EQUAL

1/2" STEEL SPACERS NECESSARY TO ADJUST COVER TO GRADE

FRAME TO BE SEALED WITH 2-1/4" CONTINUOUS BEADS OF HIGH QUALITY SILICONE SEALANT

PRECAST CONCRETE PULL BOX COVER DETAIL



ELEVATION

POLYMER CONCRETE PULL BOX

(Polymer concrete reinforced by a heavy weave fiberglass)

REVISIONS	
DATE	CHANGE
4-26-94	Add NEENAH Cover
10-11-94	Lift Handle & Polymer Concrete Pull Box
3-20-95	Add PVC Pull Box

10-1-86

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

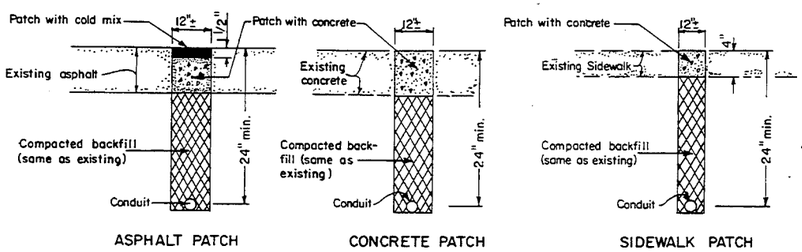
APPROVED: David K.D. Lee
DESIGN ENGINEER

ED770-03 P=1"

LIGHTING & SIGNAL DETAILS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.		

D-770-4



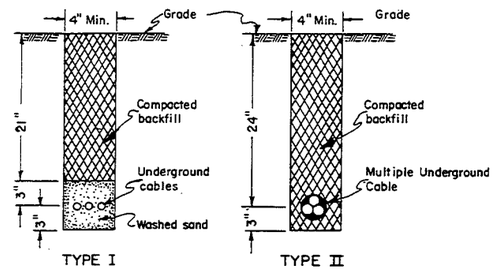
ASPHALT PATCH CONCRETE PATCH SIDEWALK PATCH

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.

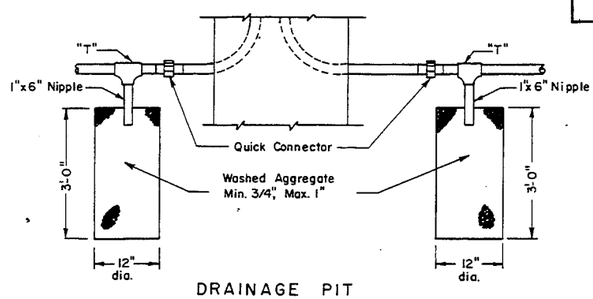
Immediately prior to pouring replacement concrete, all surfaces shall be painted with an approved epoxy compound.



TYPE I TYPE II

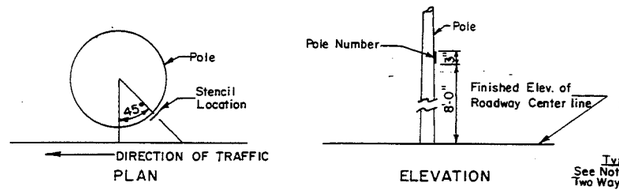
CABLE TRENCH

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)

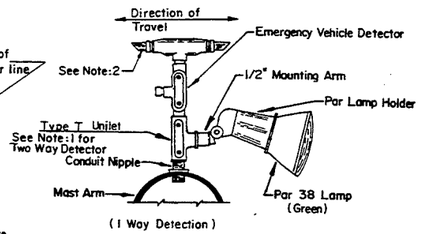


PLAN ELEVATION

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.

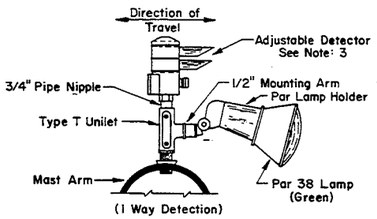


(1 Way Detection)

EMERGENCY VEHICLE DETECTOR DETAIL
(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.

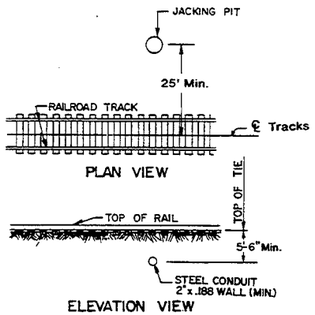


(1 Way Detection)

ALTERNATE EMERGENCY VEHICLE DETECTOR DETAIL (Adjustable)
(Location As Shown In Plans)

Notes:

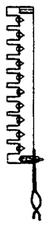
3. Two-way Detector shall have the detector lens rotated to face the direction of travel, and shall have Type X Unilet with two Par lamp holders and lamps (one in each direction).



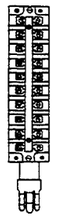
PLAN VIEW

ELEVATION VIEW

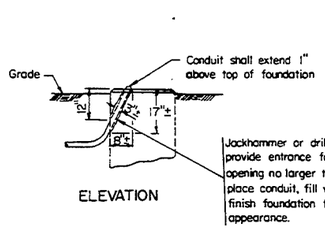
RAILROAD TRACK CONDUIT PLACEMENT



SIDE VIEW

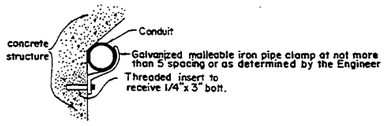


FRONT VIEW

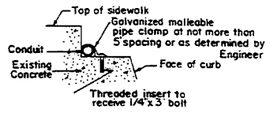


ELEVATION

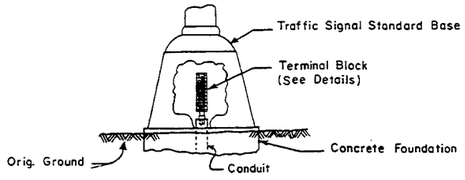
REVISE CONCRETE FOUNDATION



BRIDGE MOUNTED CONDUIT HANGER



CURB MOUNTED CONDUIT



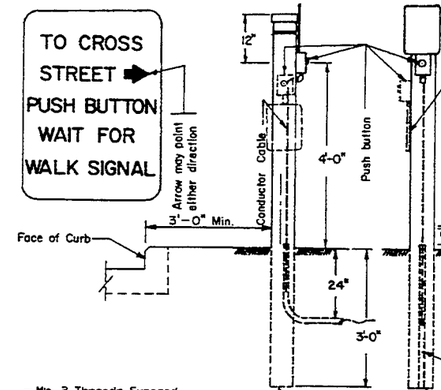
TERMINAL BLOCK
(Rigid Mounted)

10-1-86 REVISIONS		NORTH DAKOTA STATE HIGHWAY DEPARTMENT
DATE	CHANGES	
11-7-90	Track Clearance	APPROVED: David K.D. Fan DESIGN ENGINEER

TRAFFIC SIGNAL STANDARDS

D-772-2

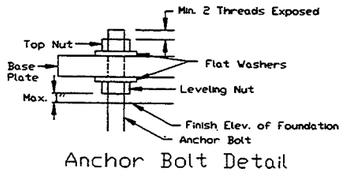
SIGN NO. R-10-4a
(0.081 Aluminum)
See Standard Sign Layout Booklet for dimensions and legend series.



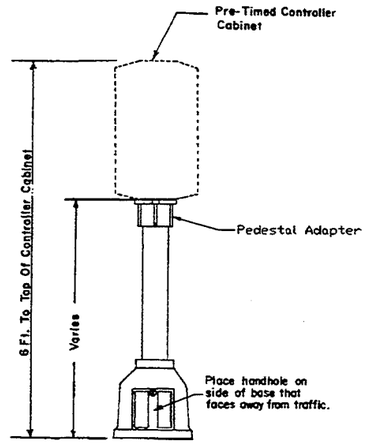
The positioning of sign & pushbutton & direction of arrow shall clearly indicate which crosswalk is actuated by the push button.

PEDESTRIAN PUSH BUTTON POST DETAILS

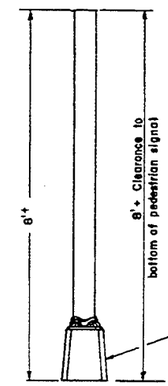
SIGNAL STANDARD MOUNTED PUSH BUTTON DECTECTOR



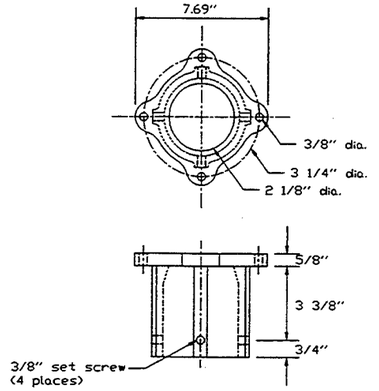
Anchor Bolt Detail



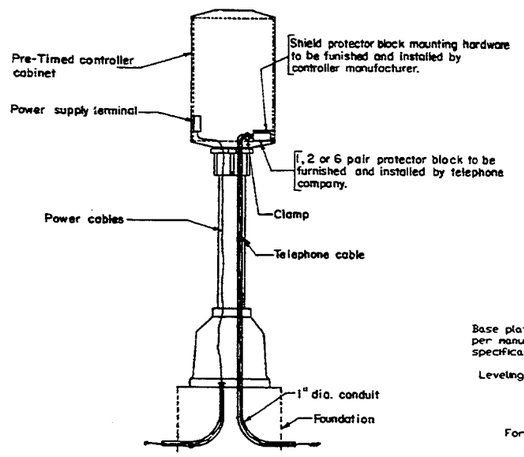
TYPE I



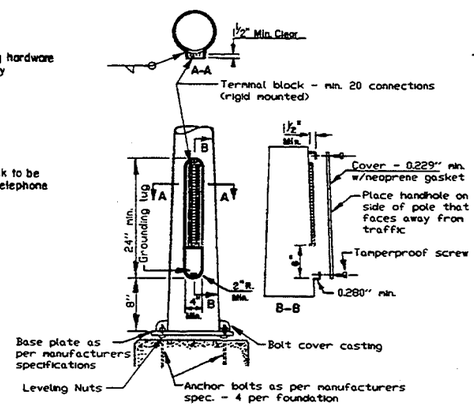
TYPE II



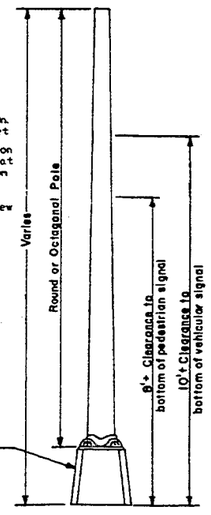
PEDESTAL ADAPTER DETAIL



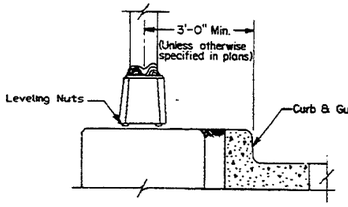
TELEPHONE INTERCONNECT SCHEMATICS DETAIL
(Control circuits not shown)

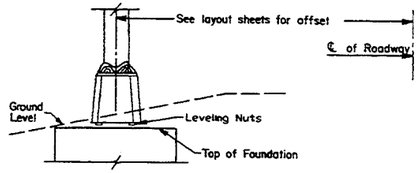


ALTERNATE SIGNAL STANDARD BASE
For Use Only With Type V, VI, & VII Signal Standards



TYPE V, VI, VII





SIGNAL STANDARD MIN. CLEARANCE DETAIL

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

Steel Standards: The C of the signal standard shall be a mininum 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.

10-1-86 REVISIONS	
DATE	CHANGE
12-1-88	Min. Clearance
6-16-94	Leveling Nuts
8-29-95	Delete Type III
11-27-95	Pedestal Adapter

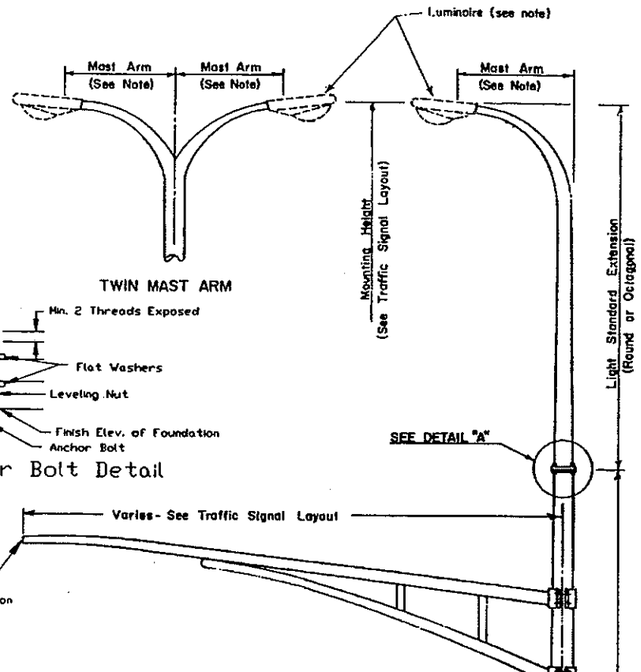
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

APPROVED: David K.O. Leer
DESIGN ENGINEER

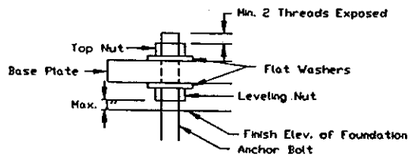
ED772-02 P=1'

TRAFFIC SIGNAL STANDARDS
(Mast Arm Type)

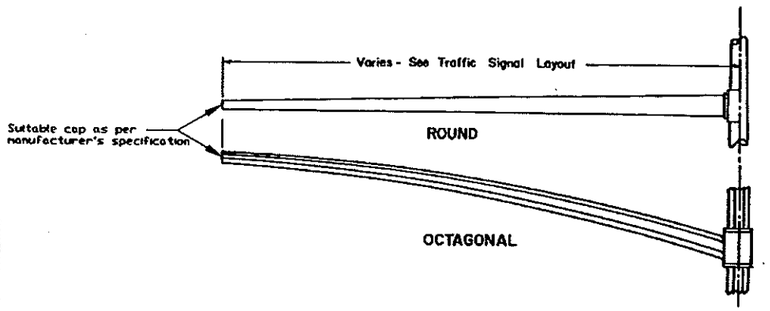
D-772-3



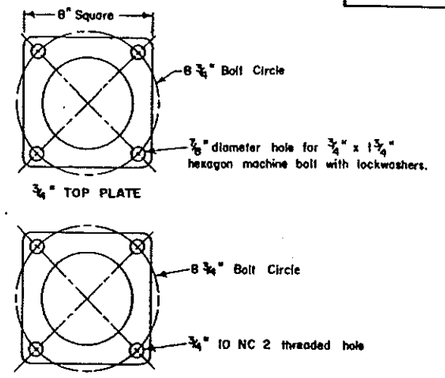
TWIN MAST ARM



Anchor Bolt Detail



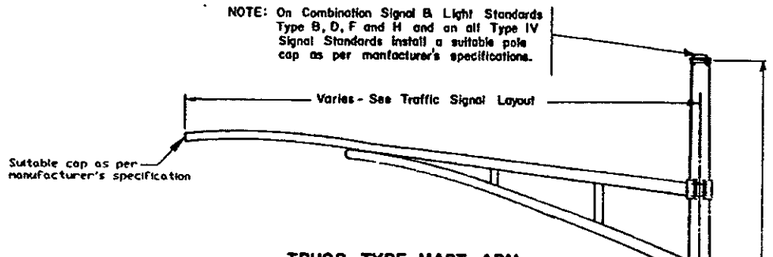
MONOTUBE TYPE MAST ARMS



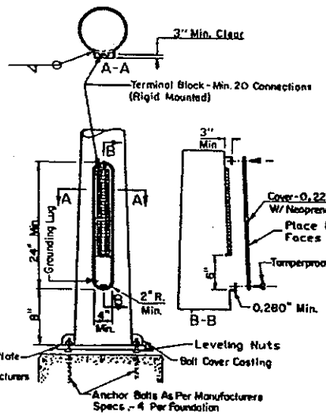
DETAIL "A"

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

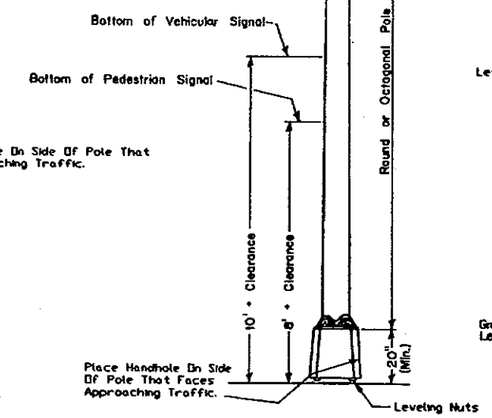
NOTE: On Combination Signal & Light Standards Type B, D, F and H and on all Type IV Signal Standards install a suitable pole cap as per manufacturer's specifications.



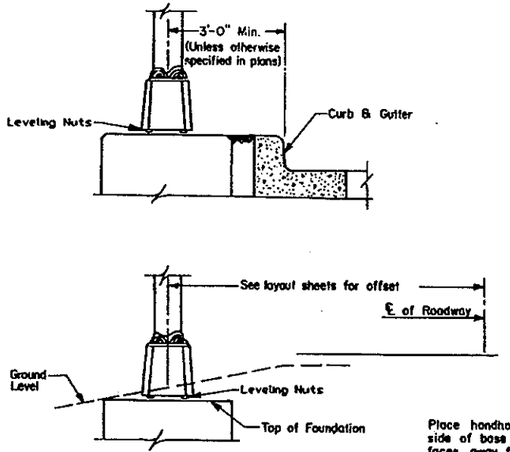
TRUSS TYPE MAST ARM



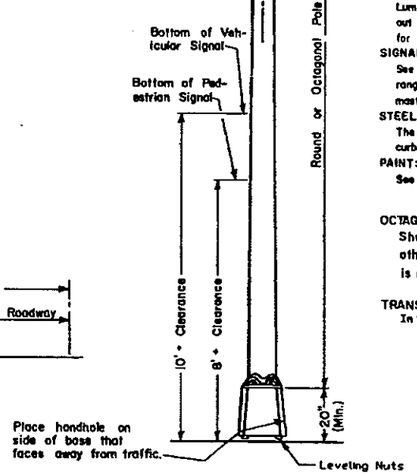
ALTERNATE SIGNAL STANDARD BASE
For Use Only With Type III & Combination Signal Standards



COMBINATION SIGNAL AND LIGHT STANDARD



SIGNAL STANDARD MIN. CLEARANCE DETAIL



TYPE IV SIGNAL STANDARD

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	60 ft.	Yes	Single
J	60 ft.	Yes	Twin

The Light Standard Extension for these signal standards shall be installed at a later date under a seperate 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 A123.

LUMINAIRE:
Luminaires shall be internal ballast - constant wattage 120 & 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 ℄ of the roadway to the bottom of mast arm mounted signal heads shall be 16 ft. minimum and 19 ft. maximum.

STEEL STANDARD:
The ℄ 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.

10-1-86

REVISIONS	
DATE	CHANGE
12-1-88	Min. Clearance
1-21-94	Add 50 ft.
6-16-94	Leveling Nuts
10-12-94	Handhole Location
5-28-96	Mast Arm Cap

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

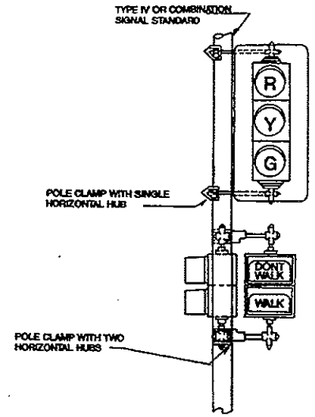
APPROVED: David K.D. Loer
DESIGN ENGINEER

ED772-03 P=1'

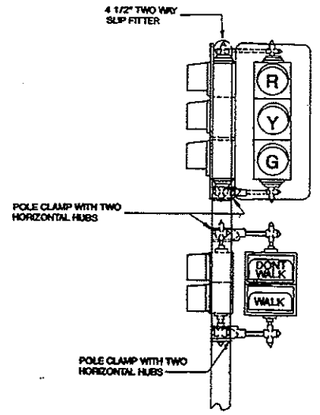
D-772-4

TRAFFIC SIGNAL HEAD MOUNTING

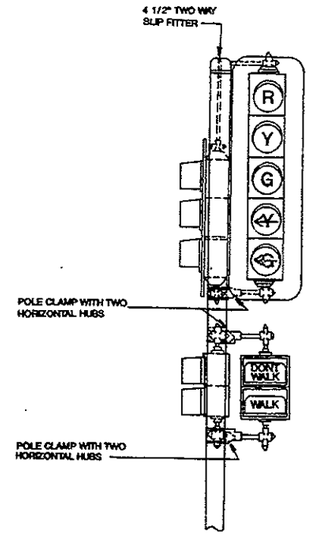
TYPE II
PEDESTAL MOUNTED
PEDESTRIAN



TYPE IV
POST MOUNTED - VEHICULAR
POST MOUNTED - PEDESTRIAN



TYPE V
POST MOUNTED - VEHICULAR
POST MOUNTED - PEDESTRIAN



TYPE VI
POST MOUNTED - VEHICULAR
POST MOUNTED - PEDESTRIAN

NOTES :

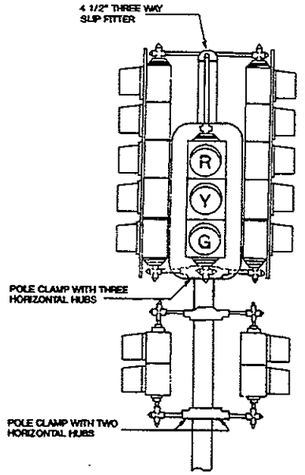
CLEARANCE: CLEARANCE FROM THE GROUND LINE OR SIDE-WALK TO THE BOTTOM OF POST OR PEDESTAL MOUNTED VEHICULAR SIGNAL HEADS SHALL BE 10 FT. MINIMUM, FROM PEDESTRIAN SIGNAL HEADS SHALL BE 8 FT. MINIMUM.

SIGNAL HEADS: SEE TRAFFIC SIGNAL LAYOUT FOR CORRECT MOUNTING POSITION, NUMBERS, SIZE AND ARRANGEMENT OF LENSES.

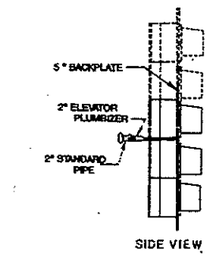
POLE CLAMPS: A POLE PLATE WITH SUITABLE BANDING MATERIAL AS APPROVED BY THE ENGINEER IN THE FIELD MAY BE SUBSTITUTED FOR THE POLE CLAMPS. WHERE TRAFFIC SIGNAL HEADS AND PEDESTRIAN SIGNAL HEADS ARE MOUNTED ONE ABOVE THE OTHER, ONE POLE CLAMP ASSEMBLY MAY BE USED.

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.

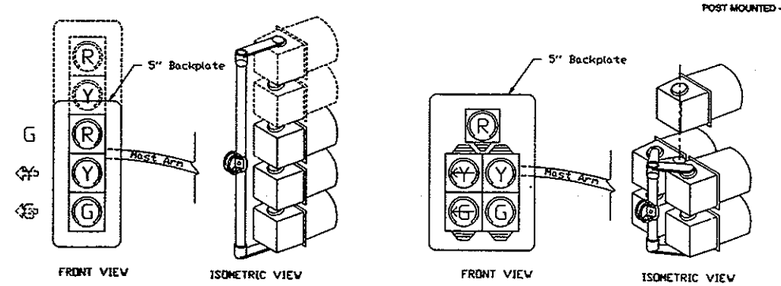
MOUNTING DETAILS: ALL SIGNAL HEADS SHOWN ARE VIEWED FROM DIRECTION OF TRAVEL.



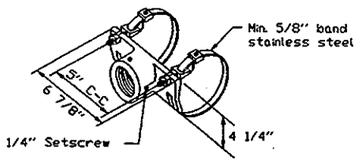
TYPE VII
POST MOUNTED - VEHICULAR
POST MOUNTED - PEDESTRIAN



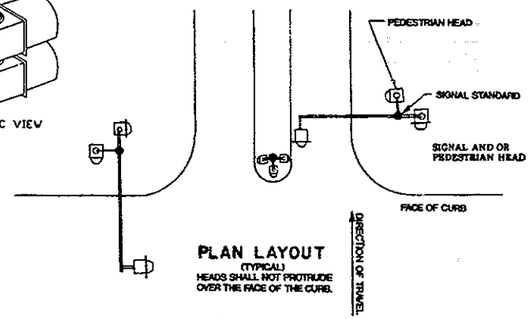
MID-SPAN MOUNTED
MAST ARM RIGID MOUNTED SIGNAL HEADS



END 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.

REVISIONS	
DATE	CHANGE
10-1-86	
5-23-94	Type II
10-19-94	Rev. Visors & Add 5-Section Head
8-1-95	5 Section Head End mounted Detail
8-29-95	Delete Type III
11-29-95	Mast Arm Mounting Bracket

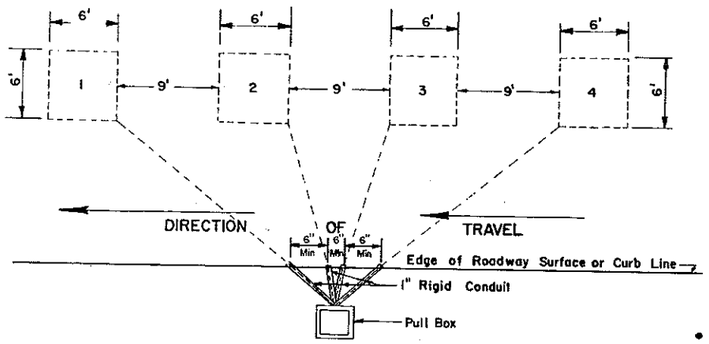
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

APPROVED: David K.D. Leer
DESIGN ENGINEER

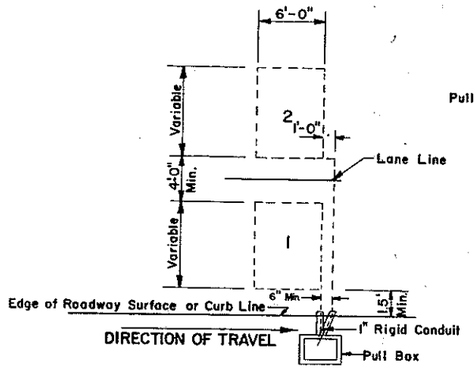
ED772-04 P=1"

LOOP DETECTORS
DETAILS

D-772-5

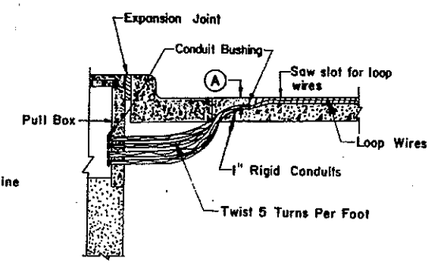


MULTIPLE LOOP DETECTOR DETAIL
(PRESENCE LOOPS)

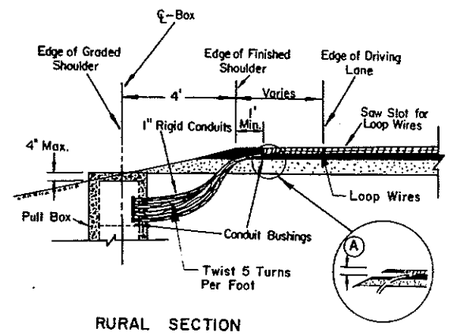


LOOP DETECTOR DETAIL
(PASSAGE OR CALLING)
(Number of Loops and Number of Turns as shown in the Plans)

Ⓐ 1" Concrete Surfacing Min.
2" Asphalt Surfacing Min.

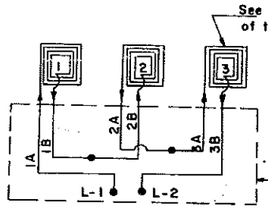


CURB SECTION

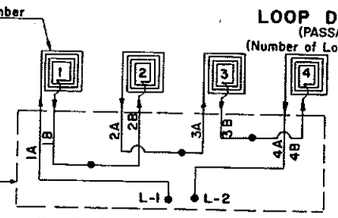


RURAL SECTION

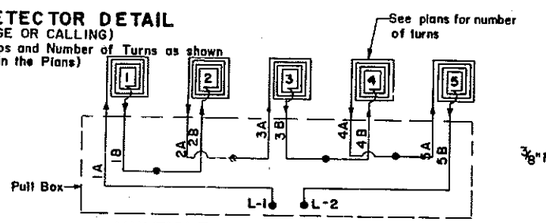
SAW SLOT TO PULL BOX DETAILS



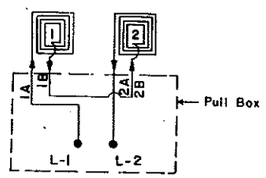
MULTIPLE LOOP CONNECTION
All conductors shall be labeled in the pull box as shown. (1A, 1B, 2A, etc.)
The loop connections shall be spliced in the pull box: 1A to L-1, 1B to 2B, 2A to 3A, and 3B to L-2



MULTIPLE LOOP CONNECTION
All conductors shall be labeled in the pull box as shown. (1A, 1B, 2A, etc.)
The loop connections shall be spliced in the pull box: 1A to L-1, 1B to 2B, 2A to 3A, 3B to 4B, and 4A to L-2

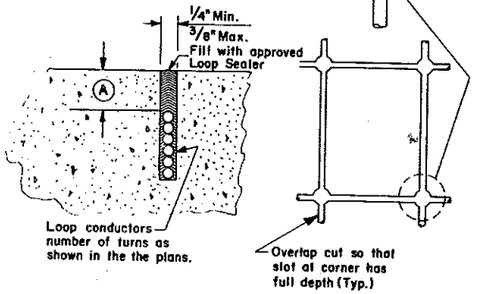


MULTIPLE LOOP CONNECTION
All conductors shall be labeled in the pull box as shown. (1A, 1B, 2A, etc.)
The loop connections shall be spliced in the pull box: 1A to L-1, 1B to 2B, 2A to 3A, 3B to 4B, 4A to 5A, and 5B to L-2

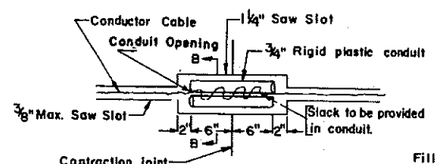


MULTIPLE LOOP CONNECTION
All conductors shall be labeled in the pull box as shown. (1A, 1B, 2A, etc.)
The loop connections shall be spliced in the pull box: 1A to L-1, 1B to 2B, and 2A to L2.

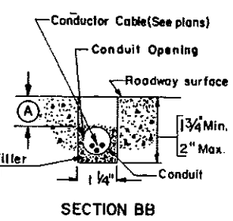
NOTES:
1. Each loop shall be saw cut in the roadway.
2. The number of turns, size of loop and size of conductor shall be as shown on the plans. The first loop dimension figure is the length in the direction of travel and the second dimension is the width across the traffic lane.
3. The lead routing shall be in separate slots to conduit leading to pull box to minimize interaction.



SAW SLOT DETAILS
Drill detector loop corners 2" deep then saw pavement slots to form loops. Dimensions and location shall be as shown in plans.



PLAN VIEW



SECTION BB

CONTRACTION JOINT DETAIL
(This detail shall also be used whenever a crack in the roadway is encountered.)

10-1-86 REVISIONS	
DATE	CHANGES
8-3-87	NOTE
11-20-89	RIGID CONDUIT AT CURB SPACING
12-8-89	MULTIPLE LOOP CONNECTION
9-3-91	SAW SLOT
10-12-94	Delete Loop Lead-in Lightning Prot

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
APPROVED: David K. O. Leer
DESIGN ENGINEER