| STATE | PROJECT NO. | PCN | SECTION NO. | SHEET NO. |
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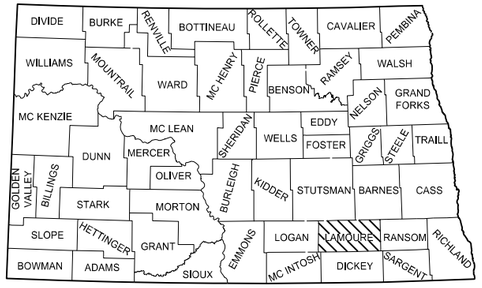
| ND | SC-2335(056) | 19872 | 1 | 1 |

JOB #6




STATE COUNTY MAP

# LAMOURE COUNTY, NORTH DAKOTA
# PLANS FOR FEDERAL AID PROJECT
# SC-2335(056)

**FHWA LIMITED INVOLVEMENT**
**LAMOURE COUNTY HIGHWAY 61 (CMC 2335)**
**HOT BITUMINOUS PAVEMENT & INCIDENTALS**

## GOVERNING SPECIFICATIONS

Standard Specifications for Road and Bridge Construction
adopted by the North Dakota Department of Transportation October 2008;
Standard Drawings currently in effect; and other Contract Provisions submitted herein.

## PROJECT LENGTH

| Project | Gross Miles | Net Miles |
|---|---|---|
| SC-2335(056) | 6.555 | 6.555 |

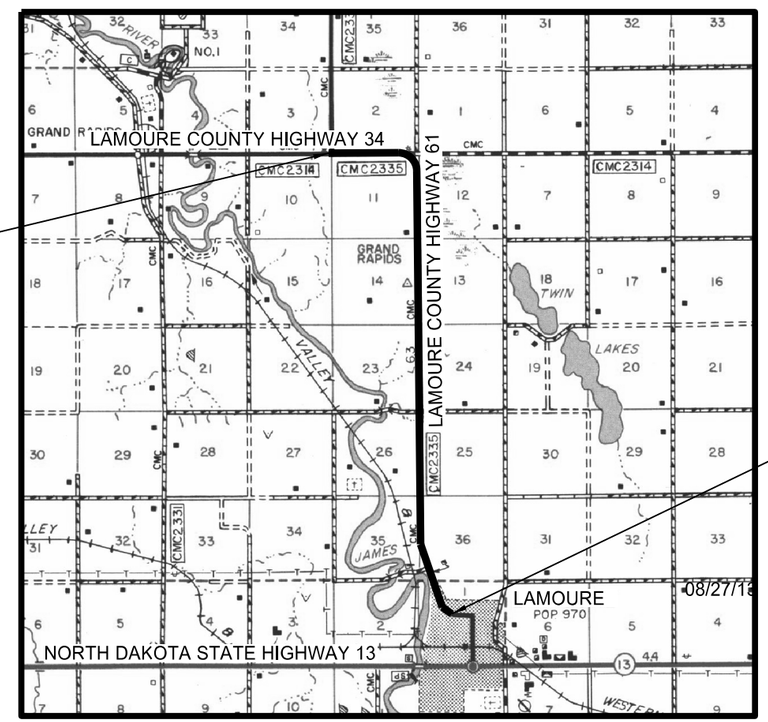
## DESIGN DATA

| Traffic ~ SC-2335(056) | | Average Daily | | | Est. 30th Max. Hr. |
|---|---|---|---|---|---|
| | | Passenger | Trucks | Total | |
| Current Traffic | 2013 | 375 | 30 | 405 | 40 |
| Forecast Traffic | 2033 | 410 | 35 | 445 | 45 |

Design Speed: 55 MPH
Minimum Sight Dist. for Stopping: 495 Feet

Project is Located on LaMoure County Highway 61 and Highway 34, beginning in LaMoure, North Dakota and continuing North approximately 6.5 miles.

END PROJECT SC-2335(056)
Sta. 358+60 = A Point Approximately 90 Feet West of the Southwest Corner of Sec. 2, Twp. 134 N., Rge. 61 W.




BEGIN PROJECT SC-2335(056)
Sta. 12+50 = A Point Approximately 2,050 Feet South and 2,640 Feet West of the Southeast Corner of Sec. 36, Twp. 134 N., Rge. 61 W.

PS&E Corrections Made: August 2013
Surveyed & Designed Date: April 2013

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CERTIFICATION

I HEREBY CERTIFY THAT THESE PLANS WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION, AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF NORTH DAKOTA.

Matt Lange /s/
KADRMAS, LEE & JACKSON, INC.

DATE 08/27/13 REGISTRATION NUMBER PE-6870


KLJ
1010 4th AVENUE SW
P.O. BOX 937
VALLEY CITY, ND 58072-0937
(701) 845-4980, FAX (701) 845-0252


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## TABLE OF CONTENTS


| SECTION NO. | SHEET NO. | DESCRIPTION |
|---|---|---|
| 1 | 1 | Title Sheet |
| 2 | 1 | Table of Contents & List of Standard Drawings |
| 4 | 1 | Scope of Work |
| 6 | 1-2 | Plan Notes |
| 8 | 1 | Estimate of Quantities |
| 10 | 1 | Basis of Estimate, Pavement Marking & Mailboxes |
| 20 | 1 | General Details |
| 30 | 1 | Typical Section |
| 100 | 1 | Traffic Control Devices List |
| 100 | 2 | Traffic Control Signing Layout |
| 110 | 1 | Sign Summary Perforated Tube |
| 110 | 2 | Signing & Guardrail Layout |


## LIST OF STANDARD DRAWINGS

| STANDARD NO. | DESCRIPTION |
|---|---|
| D-704-2 | Traffic Control for Coring of Hot Bituminous Pavement |
| D-704-7 & 8 | Breakaway Systems for Construction Zone Signs |
| D-704-9 | Construction Sign Details Terminal and Guide Signs |
| D-704-11 | Construction Sign Details Warning Signs |
| D-704-13 | Barricade Details and Channelizing Devices |
| D-704-14 | Construction Sign and Barricade Assembly Details |
| D-704-15, 20, 22, & 26 | Construction Sign and Barricade Location Details |
| D-704-27 | Traffic Control Plan for Moving Operations on Conventional Highways (Pavement Marking) |
| D-704-28 | Traffic Control for Mobile Operations |
| D-704-50 | Portable Sign Support Assembly |
| D-706-1 | Type C Field Laboratory |
| D-754-23 | Assembly Details |
| D-754-27 | Sign Punching, Stringer, and Support Location Details Regulatory, Warning, and Guide Signs |
| D-762-4 | Pavement Marking |
| D-762-6 | Short-Term Pavement Marking |
| D-764-32 | Three Cable Guardrail |
| D-764-33A | Three Cable Guardrail at Obstructions 45 MPH Design Length of Need Tables |
| D-766-01 | Mailbox Location Details |

## SPECIAL PROVISIONS

| SP# | DESCRIPTION |
|---|---|
| SP 559(08) | Permanent Pavement Marking Monitoring System |
| SP 1101(08) | Split Sampling and Testing Requirements for Aggregate Base |
| SP 1275(08) | Weather Limitations for Hot Bituminous Mix |


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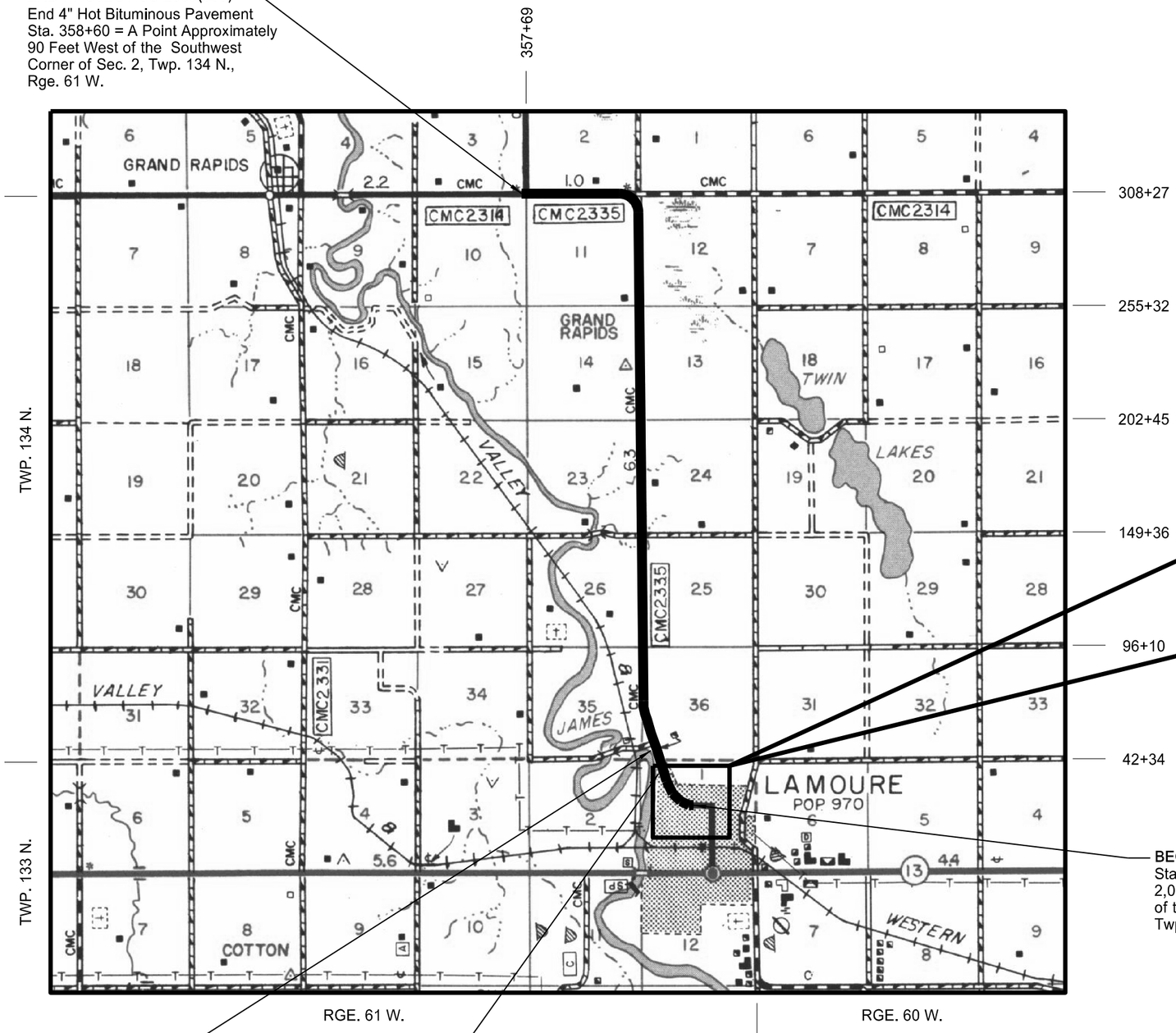
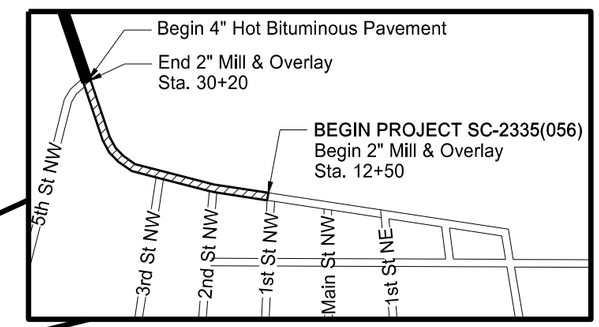
| ND | SC-2335(056) | 4 | 1 |

**END PROJECT SC-2335(056)**
End 4" Hot Bituminous Pavement
Sta. 358+60 = A Point Approximately
90 Feet West of the Southwest
Corner of Sec. 2, Twp. 134 N.,
Rge. 61 W.

4" Hot Bituminous Pavement & Incidentals

2" Mill & Overlay & Incidentals




**BEGIN PROJECT SC-2335(056)**
Sta. 12+50 = A Point Approximately
2,050 Feet South and 2,640 Feet West
of the Southeast Corner of Sec. 36,
Twp. 134 N., Rge. 61 W.

End Remove & Replace
3-Cable Guardrail
Sta. 49+28

Begin Remove & Replace
3-Cable Guardrail
Sta. 40+28

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SC-2335(056)
*LAMOURE COUNTY, NORTH DAKOTA*

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SCOPE OF WORK

| DRWN. BY | CHK'D. BY | PROJECT NO. |
|---|---|---|
| AB | MTL | 5313101 |

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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SC-2335(056) | 6 | 1 |

# PLAN NOTES

**100-P01** **CONSTRUCTION ACTIVITIES:** Work activities shall be conducted during daylight hours only and construction activities shall be scheduled to accommodate traffic before dark. Both lanes shall be opened during non-work hours and 1 lane open during working hours.

**100-P02** **DIMENSIONS:** Thicknesses shown on the typical sections for surfacing are approximate. It is intended that the plan tonnage provided by the basis of estimate will be used uniformly throughout the project unless otherwise authorized by the Engineer.

**107-P01** **HAUL ROADS:** The Contractor shall contact the appropriate Tribal, State, County, Township or City officials to determine if there are any No Haul Routes or Restricted Routes prior to preparing a bid for this project. The gross vehicle weight on all county and township roads shall not exceed 80,000 pounds unless approved by the local agency.

**203-P01** **COMMON EXCAVATION-WASTE:** The location and actual quantity of "COMMON EXCAVATION-WASTE" shall be determined in the field by the Engineer (see Subgrade Repair Detail on Sheet 1 Section 20). The unit price bid for "COMMON EXCAVATION-WASTE" shall govern regardless of the quantity used. An increase or decrease from plan quantity will not be accepted as a reason to negotiate any pay adjustment under this bid item. The bid item "COMMON EXCAVATION-WASTE" may be eliminated at the discretion of the Engineer.

Existing asphalt shall be cut leaving a vertical edge. The cost to cut a vertical edge and remove, load, haul, and dispose of the existing materials off the right of way in accordance with all requirements of the North Dakota Department of Health, shall be included in the price bid for "COMMON EXCAVATION-WASTE".

**302-P01** **AGGREGATE BASE COURSE CL 5:** A quantity of "AGGREGATE BASE COURSE CL 5" has been provided for subgrade repair for the mill and overlay section (station 12+50 to 30+20). The location and actual quantity of "AGGREGATE BASE COURSE CL 5" shall be determined in the field by the engineer (see Subgrade Repair Detail on Sheet 1 Section 20). The unit price bid for "AGGREGATE BASE COURSE CL 5" shall govern regardless of the quantity used. An increase or decrease from plan quantity will not be accepted as a reason to negotiate any pay adjustment under this bid item. The bid item "AGGREGATE BASE COURSE CL 5" may be eliminated at the discretion of the Engineer.

**302-P02** **RESHAPE AGGREGATE BASE COURSE:** The Contractor shall reshape the existing aggregate base course to the required typical section. Any additional aggregate required for shaping will be paid for at the unit price bid for "AGGREGATE BASE COURSE CL 5".

**401-P01** **FOG COAT:** Pavement placed after September 15 will receive a fog seal with a SS1H or CSS1H emulsified asphalt at a rate of 0.10 gal/sy. The fog seal shall be applied immediately after the final rolling while the pavement is still warm. The bitumen will be paid for at the unit price bid for "SS1H OR CSS1H OR MS1 EMULSIFIED ASPHALT". If the Contractor fails to have bitumen available to provide the fog seal, the Engineer may require the Contractor to cease paving operations and place the wearing course in the next construction season with liquidated damages applied until project completion.

**401-P02** **PRIME COAT:** The prime coat may be eliminated at the discretion of the Engineer in the field based on site conditions and the Contractor's operation.

**408-P01** **MIX DESIGN:** The Contractor shall develop and submit a mix design for the material for the Hot Bituminous Pavement CL 29. The second and third paragraphs of Standard Specification 408.04 A shall be deleted in their entirety. The aggregate source and bitumen target percentage shall be shown on the mix design.

The mix design shall meet the provisions of Section 408.04 B with the following revisions:

1) The laboratory mix shall meet all three of the properties – percent VMA, Fines/Asphalt Ratio, and Film Thickness – in addition to all of the other specified properties for Class 29 mix.

The cost for the mix design work shall be included in the price bid for "HOT BITUMINOUS PAVEMENT CL 29". Additional mix designs shall be provided if there are any changes in aggregate sources, asphalt sources, or operations.

**408-P02** **HOT BITUMINOUS PAVEMENT CL 29 – MAINLINE:** The 1st and 2nd lifts of HBP shall not be placed on the same day. If the Contractor chooses to pave both lanes in the same day, the Contractor shall exercise extreme care not to mark or tear the new driving surface and shall keep all loaded trucks off the newly placed hot bituminous pavement. Any damage to the newly paved surface shall be repaired at the Contractor's expense.

**408-P03** **HOT BITUMINOUS PAVEMENT CL 29 – PATCHING:** Within the mill and overlay segment (station 12+50 to 30+20), pavement surface areas showing signs of failure shall be repaired as per the Subgrade Repair Detail (see Sheet 1 Section 20). Existing irregularities in the roadway surface shall be cleaned, tacked, filled with hot bituminous pavement and compacted in a separate operation prior to placement of the next lift of pavement. A quantity of hot bituminous pavement has been provided for the patching and is included in the plan quantity. The patching shall be compacted with a minimum of one self-propelled pneumatic roller which shall meet NDDOT Standard Specification 151.02 B. All hot bituminous mix and asphalt cement required for the patching shall be measured and paid for by the ton of "HOT BITUMINOUS PAVEMENT CL 29" and "PG 58-28 ASPHALT CEMENT". This shall be considered full payment for performing this work.

The location and actual quantity of Hot Bituminous Pavement used for subgrade repair and patching will be determined in the field by the Engineer. The unit price bid will govern regardless of quantity used and an increase or decrease in plan quantity will not be accepted as a reason to negotiate any pay adjustment.

**408-P04** **COMPACTION:** The compaction requirements for the Hot Bituminous Pavement CL 29 1st and 2nd lifts between Stations 30+20 and 358+60 shall be as per NDDOT Standard Specification 408.04 I.3 (Specified Density). Compaction requirements for the mill and overlay (station 12+50 to 30+20) shall be in accordance with Section 408.04 I.2 (Ordinary Compaction). The compaction equipment used shall include not less than two vibratory rollers.

**408-P05** **ACCEPTANCE:** Acceptance of the Hot Bituminous Pavement CL 29 1st and 2nd lifts shall be in accordance with Section 408.05 of the Specifications with the following revisions:

- The first paragraph of Section 408.05 shall be removed.
- The beginning of the third paragraph of Section 408.05 A.1 shall be revised to say the following: "If any test in a lot results in the variance of any one or more sieves from the JMF gradation target value by more than the tolerances listed below, a deduction on the entire lot will be applied."

All of the hot bituminous pavement used over the entire width of the 1st and 2nd lifts, shall be included in the tonnage quantity when determining the payment adjustment.

**411-P01** **MILLING PAVEMENT SURFACE:** Payment for milling shall be by the square yard based on the top width of 24 feet. Sloughs if present, will not be measured for payment but shall be incidental to the bid item "MILLING PAVEMENT SURFACE". The milled material shall be stockpiled within the City of LaMoure on 7th Street SE. The Contractor shall coordinate with the LaMoure County Highway Superintendent Lauren Worrel who can be contacted at 701-408-9030.

**411-P02** **TEMPORARY ASPHALT WEDGES:** The Contractor shall place temporary asphalt or milled material wedges at the milled taper locations to allow for the smooth passage of vehicles. All costs for labor, materials, and equipment to install and remove the wedges shall be included in the unit price bid for "MILLING PAVEMENT SURFACE".

**704-P01** **CONSTRUCTION SIGNING:** The Contractor shall furnish the necessary signing as shown on Standard Drawings D-704-15, 20, 22, and 26 under layouts Type A, G, K, N, O, EE and GG as required by construction operations.

The required traffic control signs and devices are included in the "Traffic Control Devices List" and will be measured and paid at the contract unit price for each device. Additional devices required to accommodate the Contractor's operation shall be the Contractor's responsibility.

**704-252** **TRAFFIC CONTROL FOR UNEVEN PAVEMENT:** The Contractor has the option of making the paving lanes even at the end of each day's paving operation or signing for the uneven pavement and providing the following devices: Install "Uneven Lanes" signs (Sign No. W8-11-48) and a supplemental plate (Sign No. W20-52-54), identifying the distance, on the right shoulder (both directions) in advance of the beginning of the uneven pavement and at major intersections. A major intersection shall be defined as a CMC, state, U.S. highway, or Interstate ramp. Install "Do Not Pass" signs (Sign No. R4-1-48) on the right shoulder (both directions) between the uneven lanes sign and the beginning of the uneven pavement and at major intersections. Install tubular markers spaced at two times the posted speed limit on the centerline where uneven

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**SC-2335(056)**
*LAMOURE COUNTY, NORTH DAKOTA*

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**PLAN NOTES**

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| TO | ML | 5313101 |



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# PLAN NOTES

pavement exists. These traffic control devices shall be left in place until the lanes are even.

These signs and tubular markers are included in the "Traffic Control Devices List" and will be measured and paid for at the contract unit price for each device. No extra compensation will be allowed for relocation due to work progression.

**709-P01** **GEOTEXTILE FABRIC-TYPE R1:** The location and actual quantity of "GEOTEXTILE FABRIC-TYPE R1" shall be determined in the field by the Engineer (see Subgrade Repair Detail on Section 20, Sheet 1). The unit price bid for "GEOTEXTILE FABRIC-TYPE R1" shall govern regardless of the quantity used. An increase or decrease from plan quantity will not be accepted as a reason to negotiate any pay adjustment under this bid item. The bid item "GEOTEXTILE FABRIC-TYPE R1" may be eliminated at the discretion of the Engineer.

**762-P01** **SHORT TERM PAVEMENT MARKING:** The quantity for short term striping is based on three applications (prime, 1st lift, and 2nd lift). Payment for additional applications, if required, shall be at the unit price bid for the respective bid item.

**764-P01** **REMOVE & REPLACE GUARDRAIL:** The existing Three Cable Guardrail will be removed and shall become the property of the Contractor. The new guardrail shall be installed in accordance with the Standard Specifications.

**894-100** **RETROREFLECTIVE SHEETING:** Provide Type IV retroreflective sheeting that meets ASTM D 4956, Type IV. Provide Type XI retroreflective sheeting that meets ASTM D 4956, Type XI.

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**PLAN NOTES**

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| ND | SC-2335(056) | 8 | 1 |

# ESTIMATE OF QUANTITIES

| SPEC | CODE | ITEM DESCRIPTION | UNIT | TOTAL |
|---|---|---|---|---|
| 103 | 0100 | CONTRACT BOND | L SUM | 1 |
| 203 | 0113 | COMMON EXCAVATION-WASTE | CY | 204 |
| 216 | 0100 | WATER | M GAL | 983 |
| 302 | 0120 | AGGREGATE BASE COURSE CL 5 | TON | 255 |
| 302 | 0407 | RESHAPE AGGREGATE BASE COURSE | STA | 328.4 |
| 401 | 0100 | MC70 OR 250 LIQUID ASPHALT | GAL | 27,367 |
| 401 | 0150 | SS1H OR CSS1H OR MS1 EMULSIFIED ASPHALT | GAL | 11,010 |
| 401 | 0160 | BLOTTER MATERIAL CL 44 | TON | 821 |
| 408 | 0185 | HOT BITUMINOUS PAVEMENT CL 29 | TON | 23,568 |
| 408 | 0445 | PG 58-28 ASPHALT CEMENT | TON | 1,530 |
| 408 | 9605 | CORED SAMPLE-BITUMINOUS PAVEMENT | EA | 139 |
| 411 | 0105 | MILLING PAVEMENT SURFACE | SY | 3,414 |
| 702 | 0100 | MOBILIZATION | L SUM | 1 |
| 704 | 0100 | FLAGGING | MHR | 525 |
| 704 | 1000 | TRAFFIC CONTROL SIGNS | UNIT | 991 |
| 704 | 1052 | TYPE III BARRICADE | EA | 4 |
| 704 | 1067 | TUBULAR MARKERS | EA | 333 |
| 704 | 1185 | PILOT CAR | HR | 265 |
| 706 | 0300 | FIELD LABORATORY-TYPE C | EA | 1 |
| 709 | 0701 | GEOTEXTILE FABRIC-TYPE R1 | SY | 612 |
| 754 | 0110 | FLAT SHEET FOR SIGNS-TYPE XI REFL SHEETING | SF | 15.0 |
| 754 | 0206 | STEEL GALV POSTS-TELESCOPING PERFORATED TUBE | LF | 48.5 |
| 762 | 0430 | SHORT TERM 4IN LINE-TYPE NR | LF | 48,570 |
| 762 | 1104 | PVMT MK PAINTED 4IN LINE | LF | 16,190 |
| 764 | 0115 | 3-CABLE GUARDRAIL | LF | 900 |
| 764 | 2020 | REMOVE 3-CABLE GUARDRAIL & POSTS | LF | 900 |
| 766 | 0100 | MAILBOX-ALL TYPES | EA | 3 |

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*LAMOURE COUNTY, NORTH DAKOTA*

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**ESTIMATE OF QUANTITIES**

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# BASIS OF ESTIMATE

| MAINLINE | | DRIVES | | | |
|---|---|---|---|---|---|
| QUANTITY PER MILE | WIDTH | PRIVATE & SECTION DRIVES (4/5) | FIELD DRIVES (19) | UNIT | DESCRIPTION |
| 150 | - | - | - | M GAL | Water for Dust Palliative & Reshaping Aggregate Base |
| 4,400 | 30’ | - | - | GAL | MC70 or 250 Liquid Asphalt (0.25 Gal/SY) |
| 880 | 30’ | - | - | GAL | SS1H or CSS1H or MS1 Emulsified Asphalt for 1st Lift (0.05 Gal/SY) |
| 821 | 28’ | 7 | 5 | GAL | SS1H or CSS1H or MS1 Emulsified Asphalt for 2nd Lift (0.05 Gal/SY) |
| 132 | 30’ | - | - | TON | Blotter Material Class 44 (15 Lbs/SY) |
| 2,200 | 26’ | 5 | 3 | TON | Hot Bituminous Pavement Class 29 for 1st Lift (2.0 Tons/CY) |
| 1,450 | 26’ | 5 | 3 | TON | Hot Bituminous Pavement Class 29 for 2nd Lift (2.0 Tons/CY) |
| 143 | 26’ | 0.3 | 0.2 | TON | PG 58-28 Asphalt Cement for 1st Lift (6.5% Hot Bit. Pavement) |
| 94 | 26’ | 0.3 | 0.2 | TON | PG 58-28 Asphalt Cement for 2nd Lift (6.5% Hot Bit. Pavement) |
| 9,387 | 16’ | - | - | SY | Milling Pavement Surface (2.0” Tapering to 0”) |
| 80 | - | - | - | MHR | Flagging |
| 40 | - | - | - | HR | Pilot Car |
| 1,320 LF plus NPZ | - | - | - | LF | Pavement Marking |
| 2 Cores/2,000’/Lane/Lift Plus 1 Full Depth/Mile | 26’ | | | EA | Cored Sample-Bituminous Pavement |

# PAVEMENT MARKING

| DESCRIPTION | UNIT | QUANTITY PER LOCATION | DESCRIPTION | UNIT | QUANTITY PER LOCATION |
|---|---|---|---|---|---|
| **4” Yellow No Passing Zone (Solid Line)** | | | **4” Yellow Center Lines (10’ Line, 30’ Skip)** | | |
| Sta. 178+32 to Sta. 186+92 RT | LF | 860 | Sta. 20+00 to Sta. 301+00 | LF | 7,030 |
| Sta. 189+65 to Sta. 195+77 LT | LF | 612 | Sta. 313+67 to Sta. 358+60 | LF | 1,130 |
| Sta. 199+66 to Sta. 206+13 RT | LF | 647 | **Total** | **LF** | **8,160** |
| Sta. 206+76 to Sta. 212+04 LT | LF | 528 | | | |
| Sta. 273+18 to Sta. 277+70 LT | LF | 452 | **Total Yellow Pavement Marking Paint** | **LF** | **16,190** |
| Sta. 282+46 to Sta. 286+47 LT | LF | 401 | | | |
| Sta. 291+09 to Sta. 298+07 RT | LF | 698 | | | |
| Sta. 301+00 to Sta. 313+67 LT & RT | LF | 2,534 | | | |
| Sta. 319+16 to Sta. 326+04 RT | LF | 688 | | | |
| Sta. 326+32 to Sta. 332+42 LT | LF | 610 | | | |
| **Total** | **LF** | **8,030** | | | |

# MAILBOX-ALL TYPES

| STATION | DESCRIPTION |
|---|---|
| 173+63 | Type 2 |
| 255+00 | Type 2 |
| 325+97 | Type 2 |

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*LAMOURE COUNTY, NORTH DAKOTA*

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**BASIS OF ESTIMATE, PAVEMENT MARKING & MAILBOXES**

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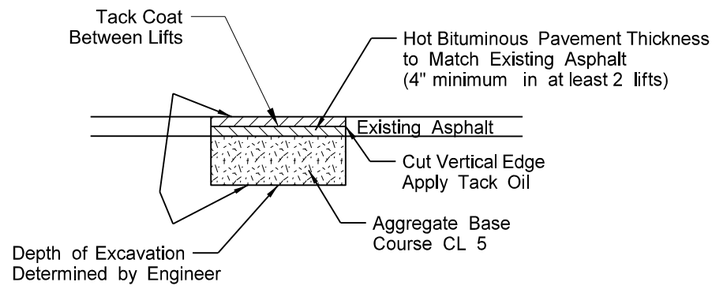
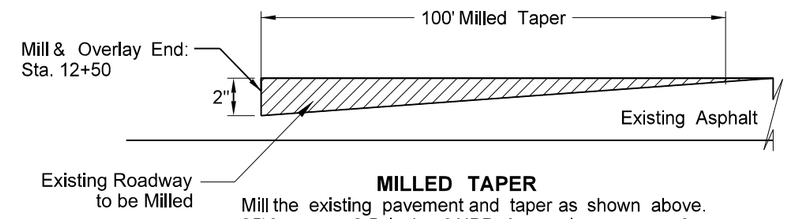
| ND | SC-2335(056) | 20 | 1 |



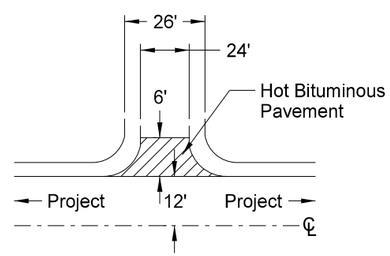

**SUBGRADE REPAIR**
**(MILL & OVERLAY PORTION ONLY)**

1.) Subgrade Repair at depths of 1 foot or greater shall be excavated to the full width of the lane and tapered at a ratio of 20:1 on the ends.
2.) Each lift of hot bituminous pavement shall cure overnight before installation of the next course.

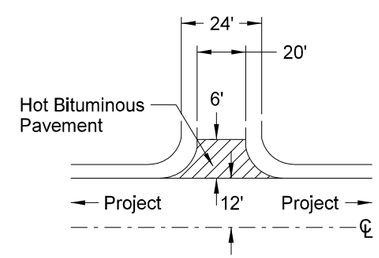



**MILLED TAPER**

Mill the existing pavement and taper as shown above. 25' for every 0.5 inch of HBP. A wearing course of 2.0" shall be placed matching the roadway surface elevation at the ends of the overlay.




**PRIVATE AND SECTION DRIVES**




**FIELD DRIVES**

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GENERAL DETAILS

| DRWN. BY | CHK'D. BY | PROJECT NO. |
|---|---|---|
| ZV | JL | 5313101 |

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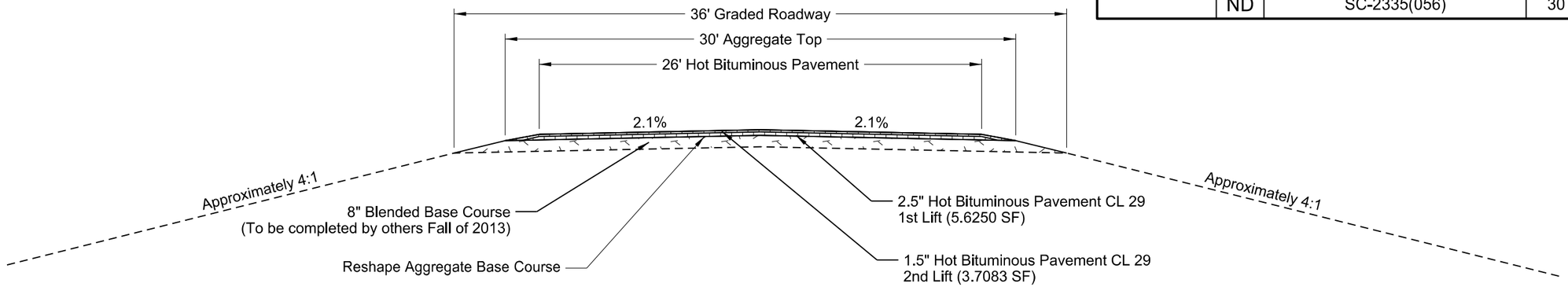
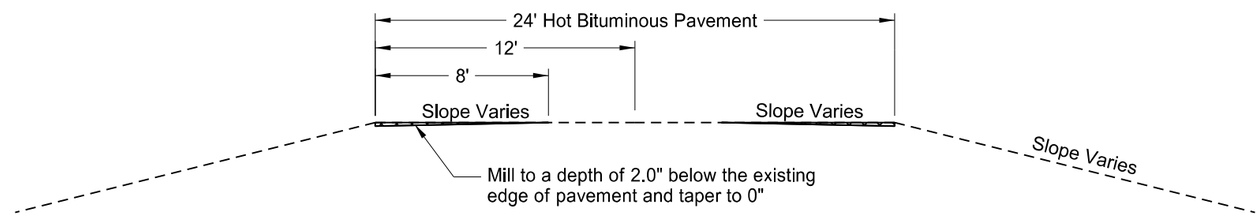
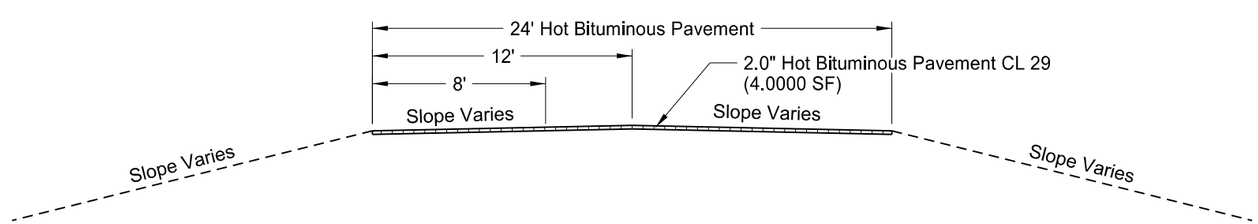
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SC-2335(056) | 30 | 1 |




**PROPOSED TYPICAL SECTION**
**STA 30+20 TO STA 358+60**




**MILLING TYPICAL SECTION**
**STA 12+50 TO STA 30+20**




**PROPOSED TYPICAL SECTION**
**STA 12+50 TO STA 30+20**

This document was originally issued and sealed by Matt Lange, Registration Number PE- 6870, on 08/27/13 and the original document is stored at the office of Kadrmas, Lee & Jackson.

SC-2335(056)
*LAMOURE COUNTY, NORTH DAKOTA*

KLJ

TYPICAL SECTION

| DRWN. BY | CHK'D. BY | PROJECT NO. |
|---|---|---|
| TO | MTL | 5313101 |

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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SC-2335(056) | 100 | 1 |

| SIGN NUMBER | SIGN SIZE | DESCRIPTION | AMOUNT REQUIRED | UNITS PER AMOUNT | UNITS SUB TOTAL |
|---|---|---|---|---|---|
| D3-36 | 36"x6" | STREET NAME SIGN (Sign and installation only) | | 6 | |
| **G20-1a-60** | **60"x24"** | **ROAD WORK NEXT __ MILES** | **2** | **34** | **68** |
| G20-1b-60 | 60"x24" | WORK IN PROGRESS/ NO WORK IN PROGRESS (Sign and installation only) | | 26 | |
| **G20-2a-48** | **48"x24"** | **END ROAD WORK** | **2** | **19** | **38** |
| **G20-4-36** | **36"x18"** | **PILOT CAR FOLLOW ME** | **1** | **18** | **18** |
| G20-10-108 | 108"x48" | CONTRACTOR SIGN | | 64 | |
| **G20-50a-72** | **72"x36"** | **ROAD WORK NEXT __ MILES RT & LT ARROWS** | **4** | **37** | **148** |
| **G20-52a-72** | **72"x24"** | **ROAD WORK NEXT __ MILES RT or LT ARROW** | **1** | **30** | **30** |
| G20-55-96 | 96"x48" | SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT | | 59 | |
| M1-1-36 | 36"x36" | INTERSTATE ROUTE MARKER (Post and installation only) | | 10 | |
| M1-4-24 | 24"x24" | U.S. ROUTE MARKER (Post and installation only) | | 10 | |
| M1-5-24 | 24"x24" | STATE ROUTE MARKER (Post and installation only) | | 10 | |
| M3-1-24 | 24"x12" | NORTH (Mounted on route marker post) | | 7 | |
| M3-2-24 | 24"x12" | EAST (Mounted on route marker post) | | 7 | |
| M3-3-24 | 24"x12" | SOUTH (Mounted on route marker post) | | 7 | |
| M3-4-24 | 24"x12" | WEST (Mounted on route marker post) | | 7 | |
| M4-8-24 | 24"x12" | DETOUR (Mounted on route marker post) | | 7 | |
| M4-9-30 | 30"x24" | DETOUR ARROW RIGHT or LEFT/AHD AND RT or LT | | 15 | |
| M4-10-48 | 48"x18" | DETOUR ARROW RIGHT or LEFT | | 23 | |
| M5-1-21 | 21"x15" | ARROW AHD AND RT or LT(Mounted on route marker post) | | 7 | |
| M5-2-21 | 21"x15" | ARROW AHD UP & RT or LT (Mounted on route marker post) | | 7 | |
| M6-1-21 | 21"x15" | ARROW RT or LT (Mounted on route marker post) | | 7 | |
| M6-2-21 | 21"x15" | ARROW UP & RT or LT (Mounted on route marker post) | | 7 | |
| M6-3-21 | 21"x15" | ARROW AHD (Mounted on route marker post) | | 7 | |
| **R1-1-48** | **48"x48"** | **STOP** | **1** | **32** | **32** |
| **R1-1a-18** | **18"x18"** | **STOP and SLOW PADDLE Back to Back** | **2** | **5** | **10** |
| R1-2-60 | 60"x60" | YIELD | | 29 | |
| R2-1-48 | 48"x60" | SPEED LIMIT __ | | 39 | |
| R2-1a-24 | 24"x18" | MINIMUM FEE $80 (Mounted on Speed Limit post) | | 10 | |
| R3-7-48 | 48"x48" | LEFT or RIGHT LANE MUST TURN LEFT or RIGHT | | 35 | |
| **R4-1-48** | **48"x60"** | **DO NOT PASS** | **2** | **39** | **78** |
| R4-7-48 | 48"x60" | KEEP RIGHT SYMBOL | | 39 | |
| R5-1-48 | 48"x48" | DO NOT ENTER | | 35 | |
| R6-1-36 | 36"x12" | ONE WAY RIGHT or LEFT | | 13 | |
| R7-1-12 | 12"x18" | NO PARKING | | 11 | |
| R10-6-24 | 24"x36" | STOP HERE ON RED | | 16 | |
| R11-2-48 | 48"x30" | ROAD CLOSED | | 28 | |
| R11-2a-48 | 48"x30" | STREET CLOSED | | 28 | |
| R11-3a-60 | 60"x30" | ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY | | 31 | |
| R11-3c-60 | 60"x30" | STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY | | 31 | |
| R11-4a-60 | 60"x30" | STREET CLOSED TO THRU TRAFFIC | | 31 | |
| W1-3-48 | 48"x48" | RIGHT or LEFT SHARP REVERSE CURVE ARROW | | 35 | |
| W1-4-48 | 48"x48" | RIGHT or LEFT REVERSE CURVE ARROW | | 35 | |
| W1-4b-48 | 48"x48" | DOUBLE RIGHT or LEFT REVERSE CURVE ARROW | | 35 | |
| W1-6-48 | 48"x24" | LARGE ARROW | | 26 | |
| W3-1-48 | 48"x48" | STOP AHEAD SYMBOL | | 35 | |
| W3-3-48 | 48"x48" | SIGNAL AHEAD SYMBOL | | 35 | |
| **W3-4-48** | **48"x48"** | **BE PREPARED TO STOP** | **2** | **35** | **70** |
| W3-5-48 | 48"x48" | SPEED REDUCTION AHEAD | | 35 | |
| W4-2-48 | 48"x48" | RIGHT or LEFT LANE TRANSITION SYMBOL | | 35 | |
| W5-1-48 | 48"x48" | ROAD NARROWS | | 35 | |
| W5-8-48 | 48"x48" | THRU TRAFFIC RIGHT LANE | | 35 | |
| W5-9-48 | 48"x48" | ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW | | 35 | |
| W6-3-48 | 48"x48" | TWO WAY TRAFFIC SYMBOL | | 35 | |
| **W8-1-48** | **48"x48"** | **BUMP** | **2** | **35** | **70** |
| W8-3-48 | 48"x48" | PAVEMENT ENDS | | 35 | |
| W8-7-48 | 48"x48" | LOOSE GRAVEL | | 35 | |
| W8-9a-48 | 48"x48" | SHOULDER DROP-OFF | | 35 | |
| **W8-11-48** | **48"x48"** | **UNEVEN LANES** | **2** | **35** | **70** |
| W8-12-48 | 48"x48" | NO CENTER STRIPE | | 35 | |
| **W8-53-48** | **48"x48"** | **TRUCKS ENTERING HIGHWAY** | **2** | **35** | **70** |
| W8-54-48 | 48"x48" | TRUCKS ENTERING AHEAD or __ FT. | | 35 | |
| W8-55-48 | 48"x48" | TRUCKS CROSSING AHEAD or __ FT. | | 35 | |
| W8-56-48 | 48"x48" | TRUCKS EXITING HIGHWAY | | 35 | |
| W9-3a-48 | 48"x48" | CENTER LANE CLOSED SYMBOL | | 35 | |
| W12-2-48 | 48"x48" | LOW CLEARANCE SYMBOL | | 35 | |
| W13-1-24 | 24"x24" | __ MPH ADVISORY SPEED PLATE (Mounted on warning sign post) | | 11 | |
| W13-4-48 | 48"x60" | RAMP ARROW | | 39 | |
| W14-3-48 | 48"x36" | NO PASSING ZONE | | 23 | |
| **W20-1-48** | **48"x48"** | **ROAD WORK AHEAD or _FT or _ MILE** | **3** | **35** | **105** |
| W20-2-48 | 48"x48" | DETOUR AHEAD or __ FT | | 35 | |
| W20-3-48 | 48"x48" | ROAD or STREET CLOSED AHEAD or __ FT. | | 35 | |
| **W20-4-48** | **48"x48"** | **ONE LANE ROAD AHEAD or __ FT.** | **2** | **35** | **70** |
| W20-5-48 | 48"x48" | RIGHT or LEFT LANE CLOSED AHEAD or __ FT. | | 35 | |
| **W20-7a-48** | **48"x48"** | **FLAGGING SYMBOL** | **2** | **35** | **70** |
| **W20-7k-24** | **24"x18"** | **__ FEET (Mounted on warning sign post)** | **2** | **10** | **20** |
| W20-8-48 | 48"x48" | STREET CLOSED | | 35 | |
| W20-51-48 | 48"x48" | EQUIPMENT WORKING | | 35 | |
| **W20-52-54** | **54"x12"** | **NEXT __ MILES (Mounted on warning sign post)** | **2** | **12** | **24** |
| W21-1a-48 | 48"x48" | WORKERS SYMBOL | | 35 | |
| W21-2-48 | 48"x48" | FRESH OIL | | 35 | |
| W21-3-48 | 48"x48" | ROAD MACHINERY AHEAD or __ FT | | 35 | |

| SIGN NUMBER | SIGN SIZE | DESCRIPTION | AMOUNT REQUIRED | UNITS PER AMOUNT | UNITS SUB TOTAL |
|---|---|---|---|---|---|
| W21-5-48 | 48"x48" | SHOULDER WORK | | 35 | |
| W21-5a-48 | 48"x48" | RIGHT or LEFT SHOULDER CLOSED | | 35 | |
| W21-5b-48 | 48"x48" | RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT. | | 35 | |
| W21-6a-48 | 48"x48" | SURVEY CREW AHEAD | | 35 | |
| W21-50-48 | 48"x48" | BRIDGE PAINTING AHEAD or __ FT. | | 35 | |
| W21-51-48 | 48"x48" | MATERIAL ON ROADWAY | | 35 | |
| W22-8-48 | 48"x48" | FRESH OIL LOOSE ROCK | | 35 | |
| | 24"x24" | TAKE TURNS (6" D letters) (Mounted on stop sign post) | | 11 | |

**SPECIAL SIGNS**

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |

**SPEC & CODE**

| | | | |
|---|---|---|---|
| **704-1000** | **TRAFFIC CONTROL SIGNS** | **TOTAL UNITS** | **991** |

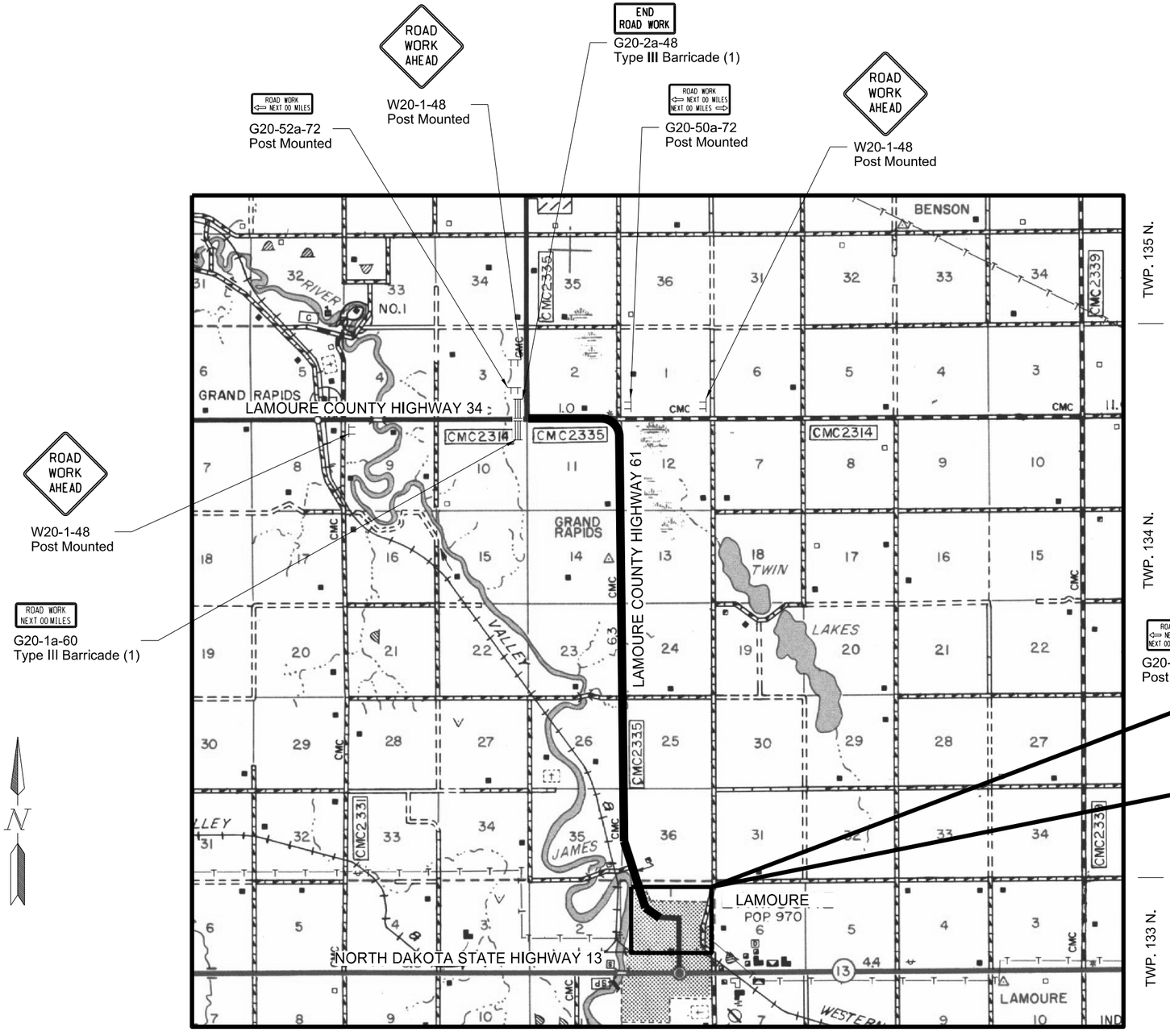
| SPEC & CODE | DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|
| **704-0100** | **FLAGGING** | **MHR** | **525** |
| 704-1041 | ATTENUATION DEVICE-TYPE B-55 | EACH | |
| 704-1043 | ATTENUATION DEVICE-TYPE B-65 | EACH | |
| 704-1044 | ATTENUATION DEVICE-TYPE B-70 | EACH | |
| 704-1050 | TYPE I BARRICADES | EACH | |
| 704-1051 | TYPE II BARRICADES | EACH | |
| **704-1052** | **TYPE III BARRICADES** | **EACH** | **4** |
| 704-1060 | DELINEATOR DRUMS | EACH | |
| 704-1065 | TRAFFIC CONES | EACH | |
| **704-1067** | **TUBULAR MARKERS** | **EACH** | **333** |
| 704-1070 | DELINEATOR | EACH | |
| 704-1072 | FLEXIBLE DELINEATORS | EACH | |
| 704-1080 | STACKABLE VERTICAL PANELS | EACH | |
| 704-1081 | VERTICAL PANELS - BACK TO BACK | EACH | |
| 704-1085 | SEQUENCING ARROW PANEL - TYPE A | EACH | |
| 704-1086 | SEQUENCING ARROW PANEL - TYPE B | EACH | |
| 704-1087 | SEQUENCING ARROW PANEL - TYPE C | EACH | |
| 704-1088 | SEQUENCING ARROW PANEL - TYPE C - CROSSOVER | EACH | |
| 704-1095 | TYPE B FLASHERS | EACH | |
| **704-1185** | **PILOT CAR** | **HR** | **265** |
| 704-3501 | PORTABLE PRECAST CONCRETE MED BARRIER | LF | |
| 704-3510 | PRECAST CONCRETE MED BARRIER - STATE FURNISHED | EACH | |
| 762-0200 | RAISED PAVEMENT MARKERS | EACH | |
| 762-0420 | SHORT TERM 4IN LINE - TYPE R | LF | |
| **762-0430** | **SHORT TERM 4IN LINE - TYPE NR** | **LF** | **48570** |
| 762-1500 | OBLITERATION OF PVMT MK | SF | |
| 772-2110 | FLASHING BEACON - POST MOUNTED | EACH | |

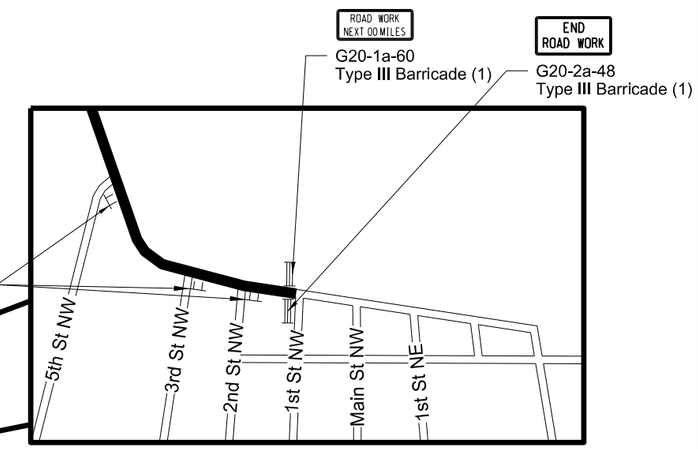
NOTE:
If additional signs are required, units will be calculated using the formula from Section III-19.06 of the Design Manual.
http://www.dot.nd.gov/

This document was originally issued and sealed by Matt Lange, Registration Number PE-6870, on 8/27/13 and the original document is stored at the office of Kadrmas, Lee & Jackson.

Traffic Control Devices List

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SC-2335(056) | 100 | 2 |

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SC-2335(056)
*LAMOURE COUNTY, NORTH DAKOTA*

KLJ

TRAFFIC CONTROL SIGNING LAYOUT

| DRWN. BY | CHK'D. BY | PROJECT NO. |
|---|---|---|
| MAL | MTL | 5313101 |

The sign layout as shown is for general information purposes only. The contractor will be required to conform to MUTCD and the Standard Drawings when installing the traffic control signing.

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| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| N.D. | SC-2335(056) | 110 | 1 |

| Sta/RP | Sign No. | Assembly No. | Flat Sheet For Signs IV SF | Flat Sheet For Signs XI SF | Sign Support Length 1st LF | Sign Support Length 2nd LF | Sign Support Length 3rd LF | Sign Support Length 4th LF | Support Size | Max Post Len LF | Sleeve Length 1st LF | Sleeve Length 2nd LF | Sleeve Length 3rd LF | Sleeve Length 4th LF | Sleeve Size | Anchor EA | Anchor LF | Anchor Size | Reset Sign Panel EA | Reset Sign Support EA | Break-Away EA | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30+50 Rt | R2-1 | 9 | | 5.0 | 12.2 | | | | 2.25 x 2.25 12 ga | 15.0 | | | | | | 1 | 4 | 2.5 x 2.5 12 ga | | | | |
| 50+60 Lt | R2-1 | 9 | | 5.0 | 12.2 | | | | 2.25 x 2.25 12 ga | 15.0 | | | | | | 1 | 4 | 2.5 x 2.5 12 ga | | | | |
| 50+60 Rt | R2-1 | 9 | | 5.0 | 12.2 | | | | 2.25 x 2.25 12 ga | 15.0 | | | | | | 1 | 4 | 2.5 x 2.5 12 ga | | | | |
| **Sub Total** | | | 0.0 | 15.0 | | **Total** | 36.5 | | | | | | | | | **Total** | 12 | | 0 | 0 | 0 | |
| **Grand Total** | | | 0.0 | 15.0 | | **Total** | 36.5 | | | | | | | | | **Total** | 12 | | 0 | 0 | 0 | |

Basis of Estimate
Sign Support Lengths

The sign support lengths have been calculated using the following vertical clearances:

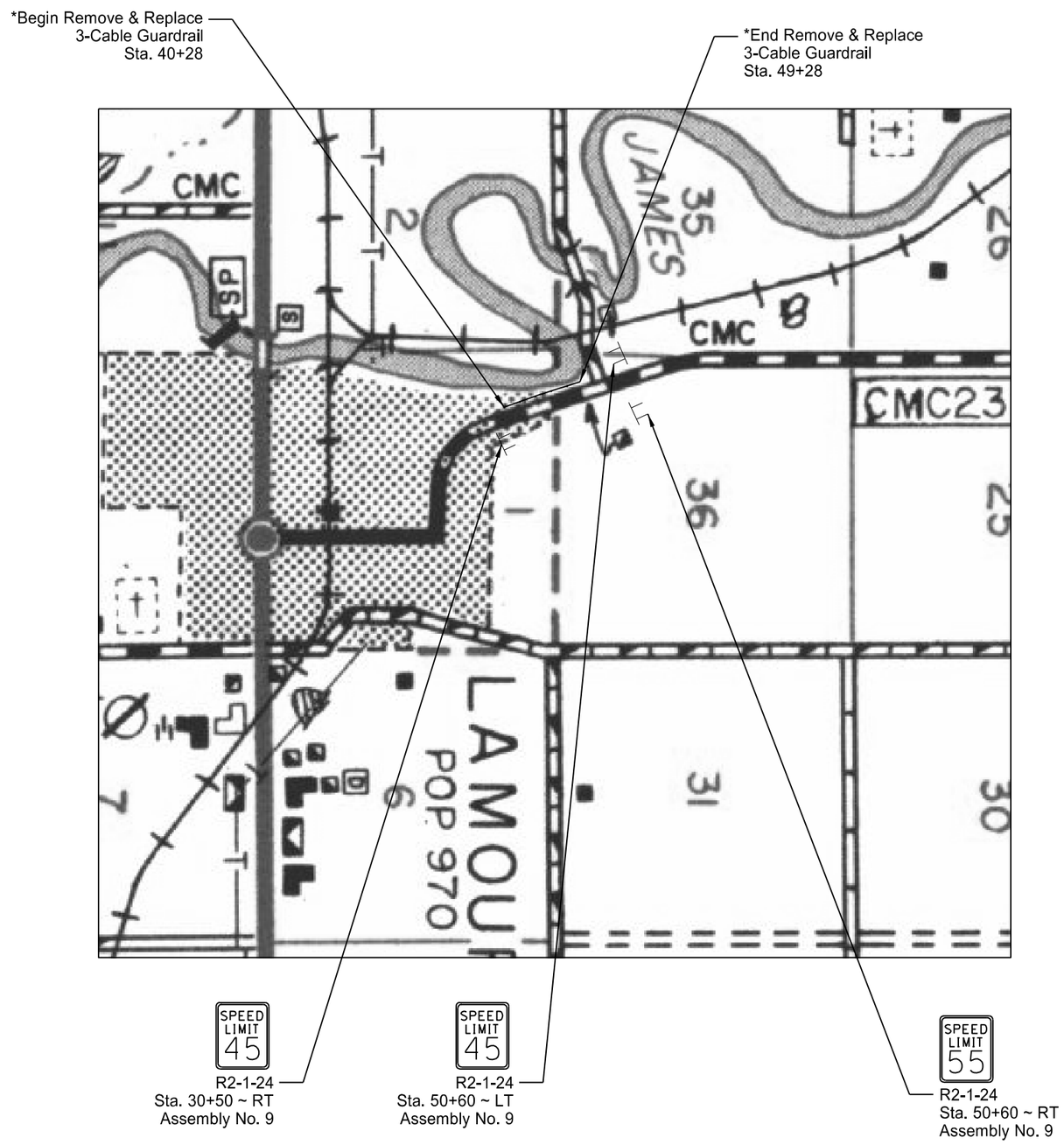
Rural Roadway - 60"

This document was originally issued and sealed by Matt Lange Registration Number PE-6870, on 08/27/13 and the original document is stored at the office of Kadrmas, Lee & Jackson.

Sign Summary
Perforated Tube

Hot Bituminous Pavement & Incidentals

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
|---|---|---|---|
| ND | SC-2335(056) | 110 | 2 |

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*Note: See Standard Drawings D-764-32 & D-764-33A for installation details.
An offset of 8 feet from the edge of the driving lane was used to determine the guardrail length.

SC-2335(056)
*LAMOURE COUNTY, NORTH DAKOTA*

KLJ

SIGNING & GUARDRAIL LAYOUT

| DRWN. BY | CHK'D. BY | PROJECT NO. |
|---|---|---|
| JL | MTL | 5313101 |

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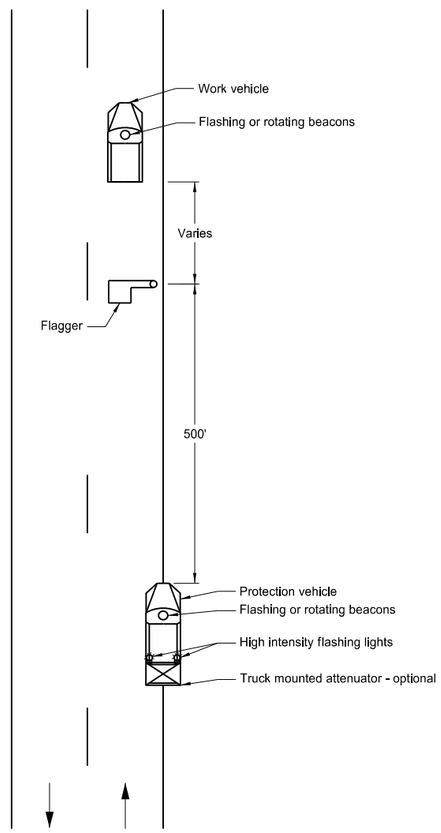
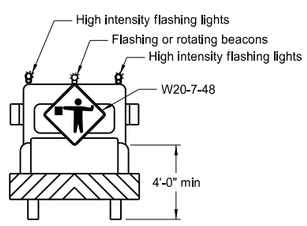
# TRAFFIC CONTROL FOR CORING OF HOT BITUMINOUS PAVEMENT

D-704-2

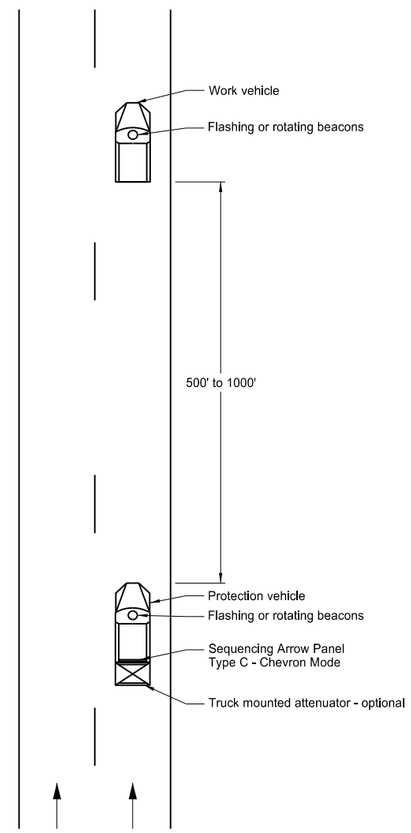
## Two Lane, Two Way Roadways

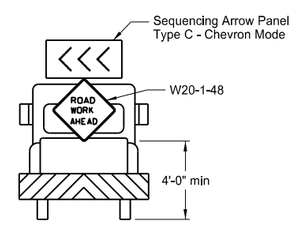



Typical Protection Vehicle

## Multilane Roadways




Typical Protection Vehicle

Notes:

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

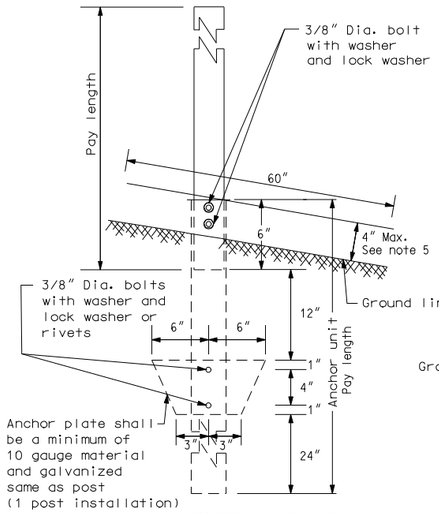
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 9-25-12 | |
| REVISIONS | |
| DATE | CHANGE |

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

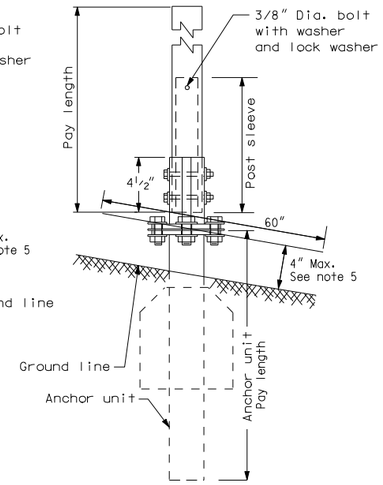
# BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

## PERFORATED TUBE

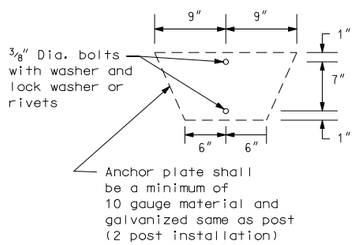
D-704-7

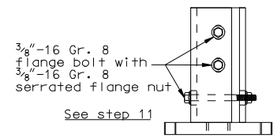


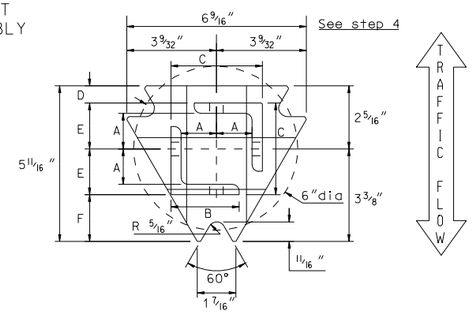

ANCHOR UNIT AND POST ASSEMBLY




SLIP BASE ANCHOR UNIT AND POST SLEEVE ASSEMBLY



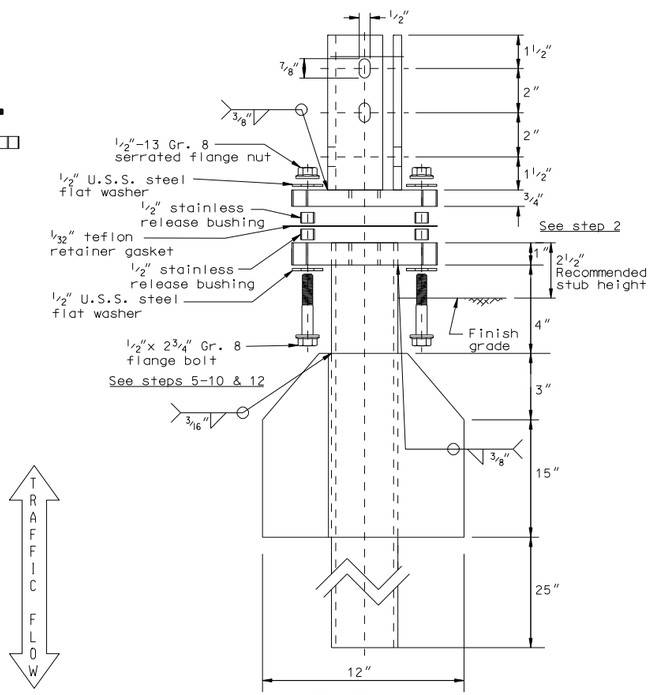




TOP POST RECEIVER

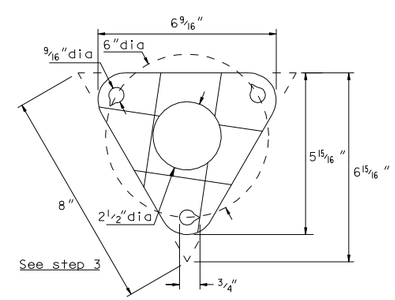
Materials: Plate - ASTM A572 grade 50
Angle receiver - 2 1/2"x 2 1/2"x 3/8" ASTM A36 structural angle

| TOP POST RECEIVER DATA TABLE | | | | | | |
|---|---|---|---|---|---|---|
| Square Post Sizes | A | B | C | D | E | F |
| 2 3/16" x 10 Ga. Square Post | 1 9/64" | 2 1/2" | 3 1/32" | 25/32" | 1 33/64" | 1 7/8" |
| 2 1/2" x 10 Ga. Square Post | 1 9/32" | 2 1/2" | 3 5/16" | 5/8" | 1 21/32" | 1 3/4" |

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

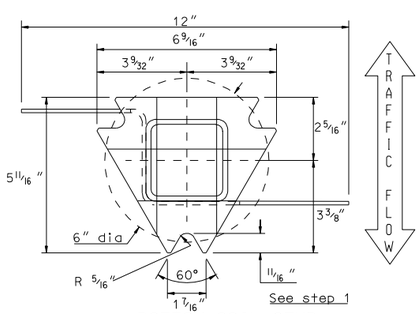



MULTI-DIRECTIONAL SLIP BASE ASSEMBLY




BOLT RETAINER FOR BASE CONNECTION

Materials: 1/32" reprocessed Teflon




BOTTOM SOIL STUB

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

Notes
1. Slip base bolts shall be torqued 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.
3. Anchor for 2", 2 1/4", and 2 1/2" posts.
4. Anchor material shall be 7 gauge H.R.P.O. Commercial quality ASTM A569 and 3"x 3"x 7 gauge ASTM A500 Grade B. Anchor shall have a yield strength of 43.9 KSI and tensile strength of 59.3 KSI. Anchor shall be hot dipped galvanized per ASTM A123/A153. All tolerances on anchor unit and slip base bottom assembly are ± 0.005 unless otherwise noted.
5. 4" vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.
6. When used in concrete sidewalk, anchor shall be the same except without the wings.
7. Four post signs shall have over 8' between the first and fourth posts.

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

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

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

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

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

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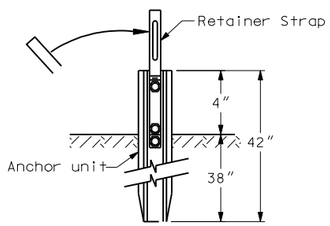
# BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

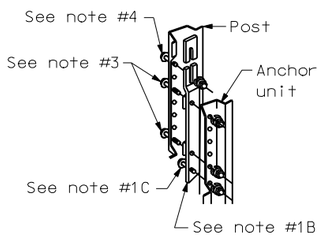
## FLANGED CHANNEL



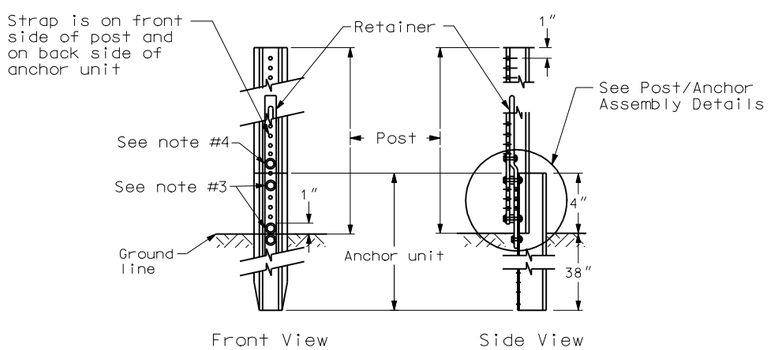

Anchor Unit & Strap Assembly Detail

STEPS OF INSTALLATION

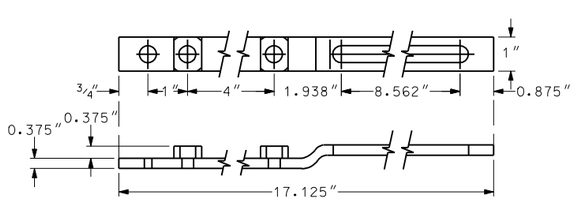
1. A) Drive anchor unit to within 12″ of ground level.
   B) Proper assembly established by lining up the top ¾″ slot of retainer spacer strap with top hole of anchor unit.
   C) Assemble strap to back of anchor unit using ⅜″-16 UNC x 2.0″ long bolt, lock washer and nut.
   D) Rotate strap 90° to left.
2. A) Drive anchor unit to 4″ dimension.
   B) Rotate strap to vertical position.
3. A) Place ⅜″-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 ¾″ slot in the strap).
   B) Alternately tighten two connector bolts.
4. A) Complete assembly by tightening ⅜″-16 UNC x 2″ long retainer bolt (this fastens sign post to retainer spacer strap).
5. The base post, strap & sign post shall be properly nested. Proper nesting occurs when all flat surfaces of the base post, strap and sign post at the bolts have full contact across the entire width.




Post/Anchor Assembly Details



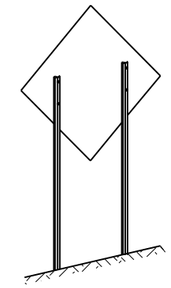

Sign Post Assembly Detail




Retainer/Spacer Strap Detail

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

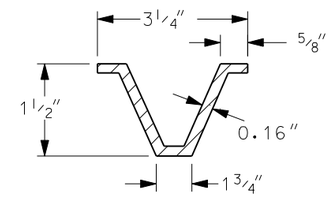
## 3 LB/FT U POSTS



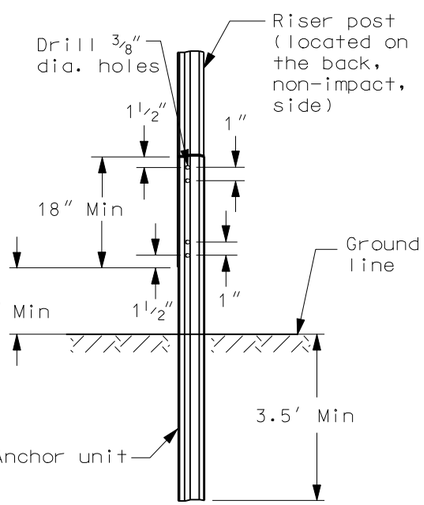
Typical Installation

Notes

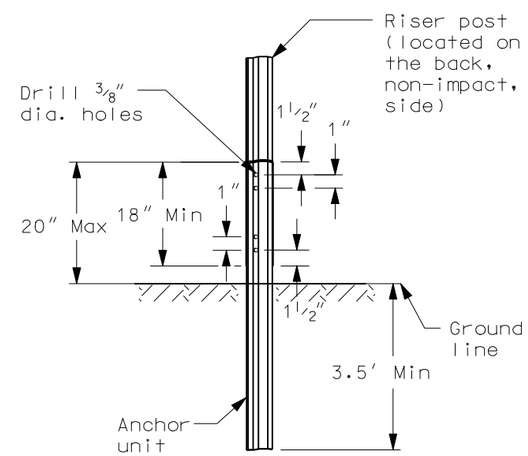
1. Use 3 lb/ft riser anchor units and risers
2. Driven riser posts shall be at least 7′ long and embedded at least 3.5′.
3. A splice shall overlap a minimum of 18″.
4. Use 4 bolts ⅝″ diameter with washers and nuts. Two at top and two at bottom of splice.
5. Anchor unit for guy wires shall be no more than 4″ above ground and embedded at least 3.5′.




U-Post Detail (3 lb/ft)




U-Channel Splice Option 2




U-Channel Splice Option 1

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

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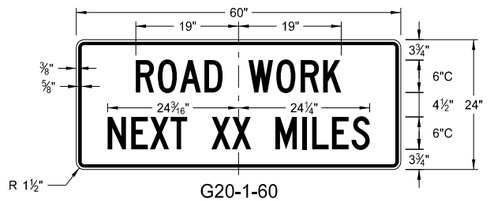
# CONSTRUCTION SIGN DETAILS
## TERMINAL AND GUIDE SIGNS




G20-1-60
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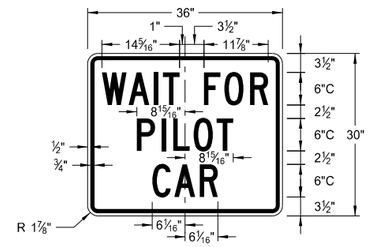
Background: orange

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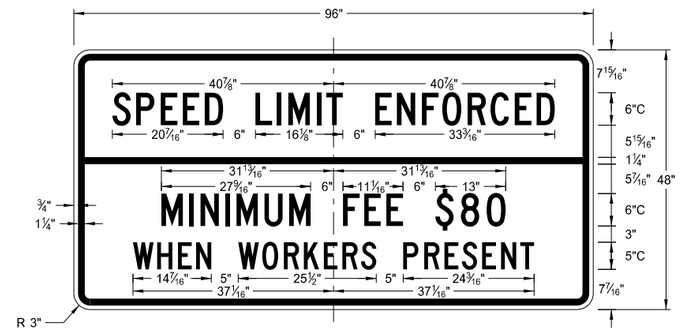


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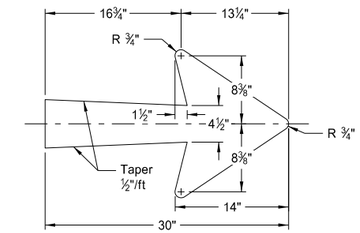
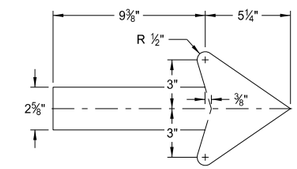



E5-1-48

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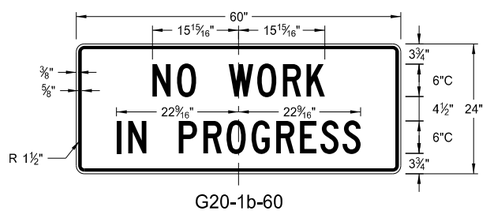
G20-52a-72

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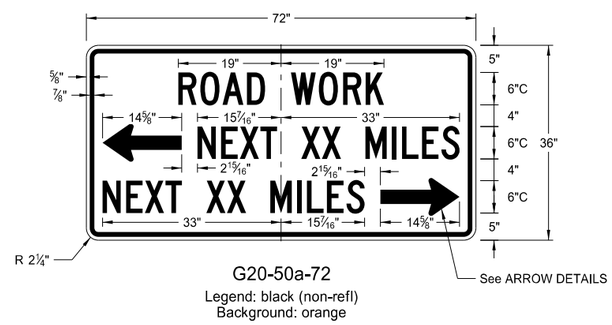


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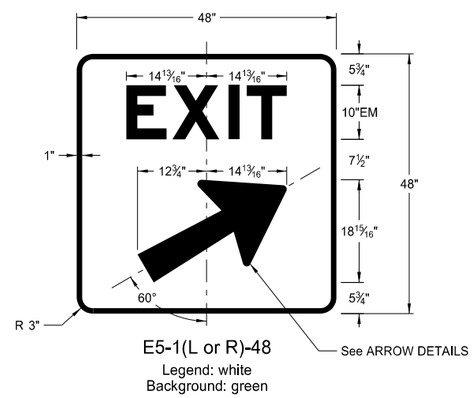


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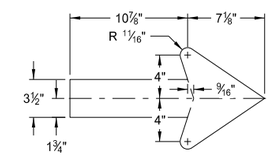
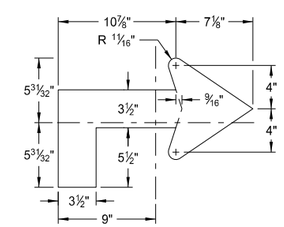



M4-9(L or R)-30
Right or Left

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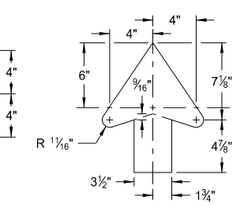
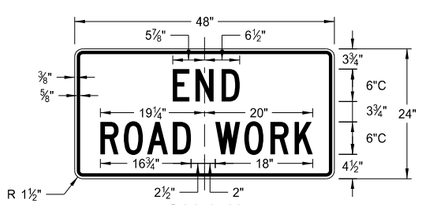
Advanced Right or Left




M4-9-30
Straight

ARROW DETAILS

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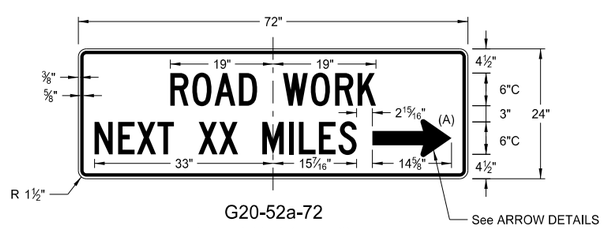


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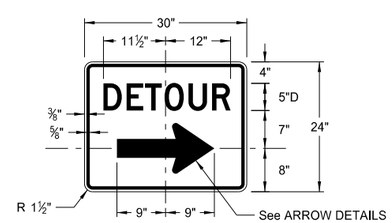


M4-9(L or R)-30 &
M4-9-30
Legend: black (non-refl)
Background: orange

NOTES:

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

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

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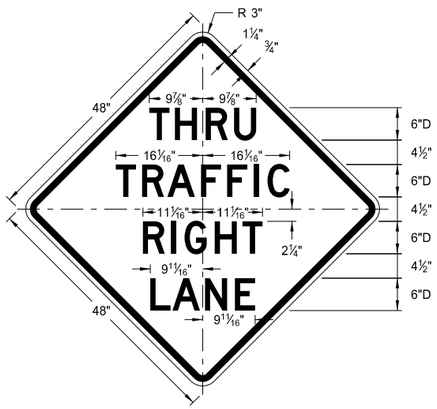
D-704-11

# CONSTRUCTION SIGN DETAILS
## WARNING SIGNS

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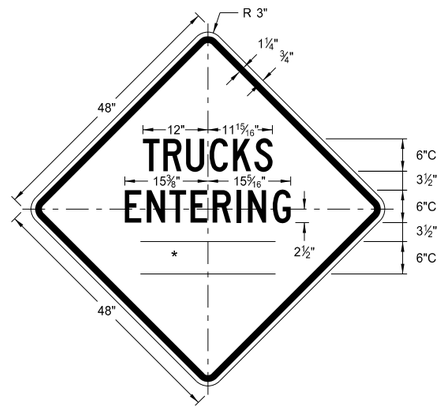


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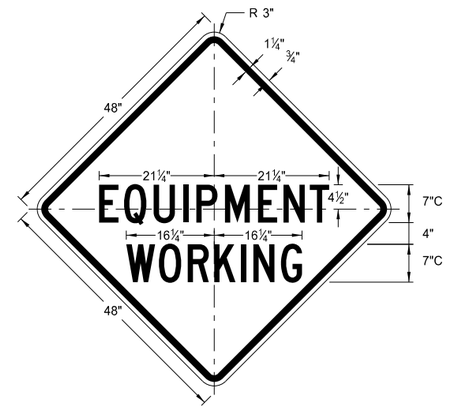


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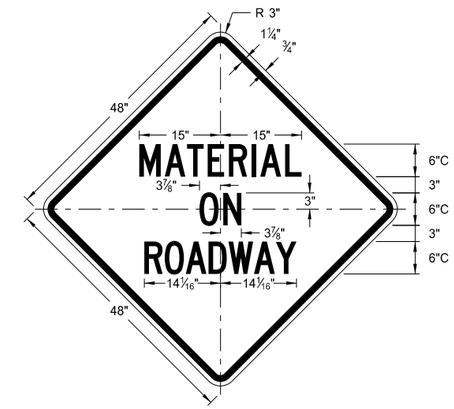


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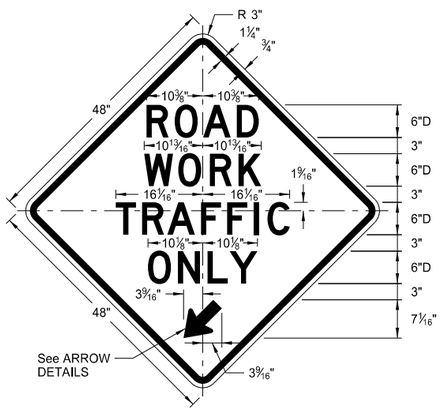
Background: orange

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

* DISTANCE MESSAGES

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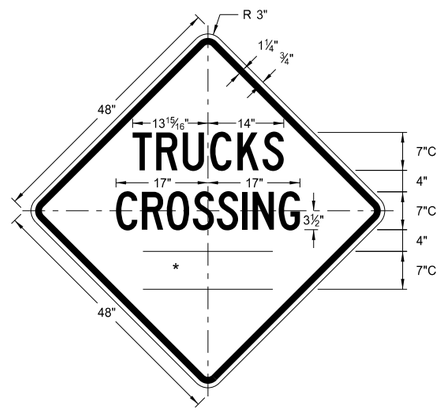


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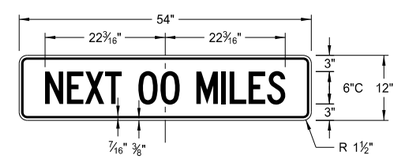


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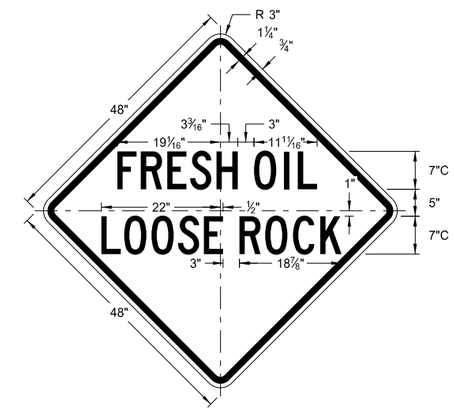


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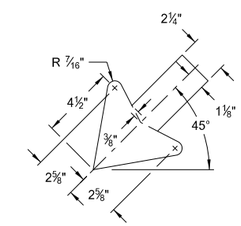
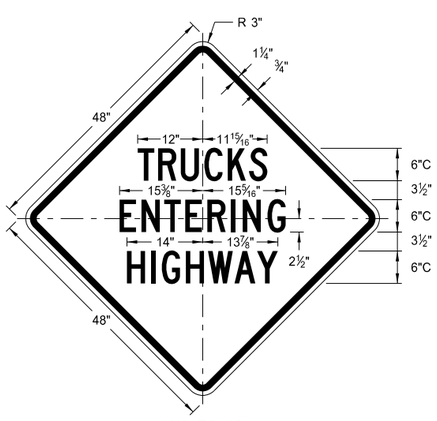



W5-9-48

ARROW DETAILS

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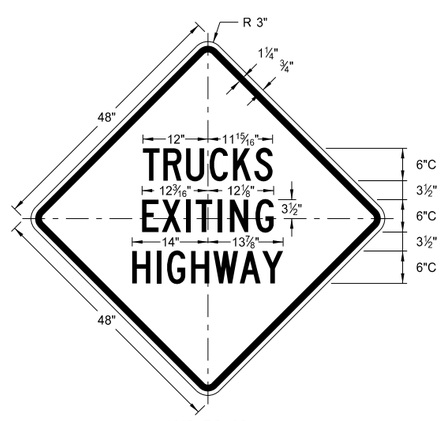


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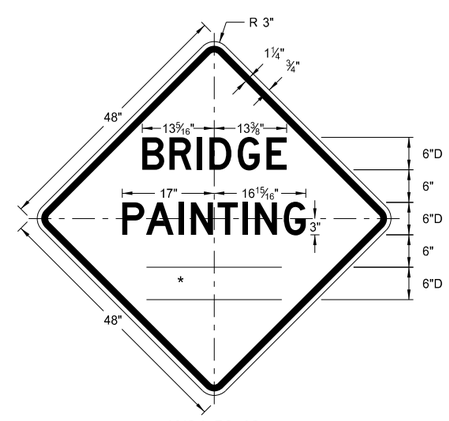


W21-50-48
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Background: orange

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

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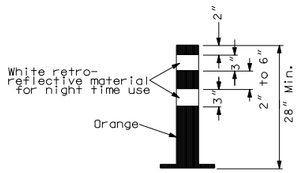
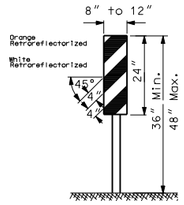
# BARRICADE DETAILS AND CHANNELIZING DEVICES

D-704-13



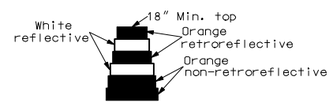

TUBULAR MARKER




VERTICAL PANEL

(Retroreflective sheeting shall be placed on both sides)

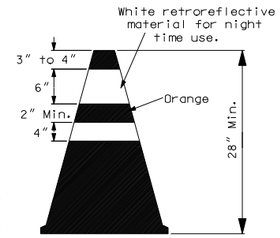
NOTE: Vertical panels used on the expressways or other high speed roadways shall be 12" by 24"



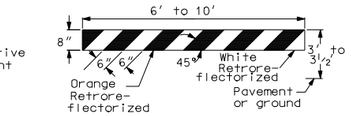

DELINEATOR DRUM

36" Min. height

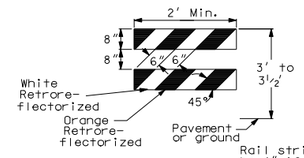
The markings on drums shall be orange and white stripes 4 to 6 inches wide. There shall be at least two orange and two white stripes. Where drums have ribs or indentations, there shall be no retroreflectorized sheeting in this area. This space shall be no more than 2 inches wide. The drum surface shall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




CONE

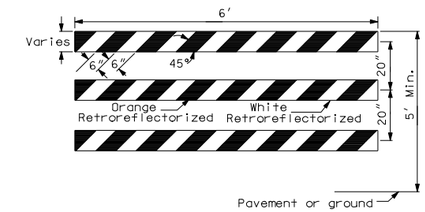



TYPE I BARRICADE



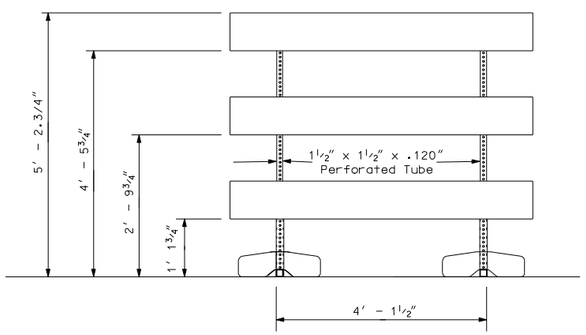

Rail stripe width shall be 4" if barricade length is less than 36".

TYPE II BARRICADE

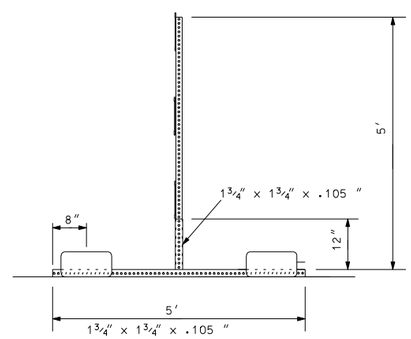



TYPE III BARRICADE

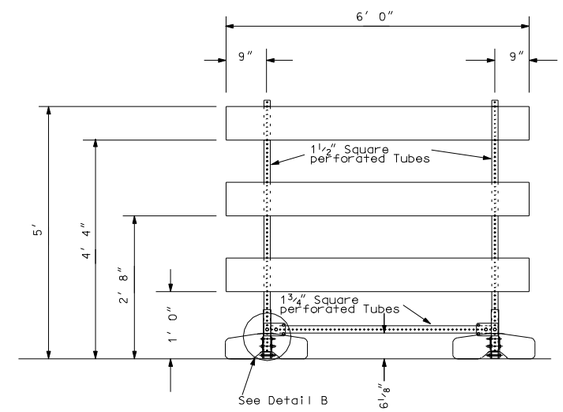
BARRICADES:
Number of retroreflectorized rail faces:
Type I - 2 (One each direction)
Type II - 4 (Two each direction)
Type III- 6 (Three in each direction)

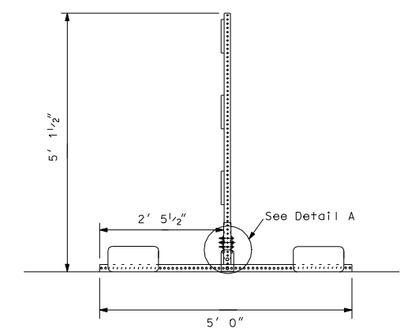


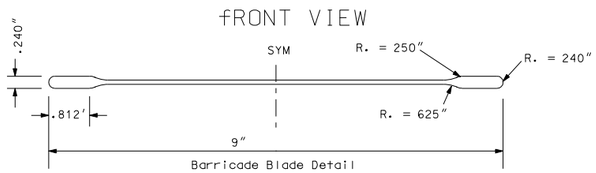

FRONT VIEW




END VIEW




Barricade Blade Detail

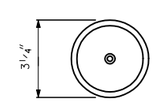
Ballast = 45lb sandbag at the end of each leg.

Barricade blade fastened to vertical supports with 2" corner bolts.

Vertical potion of leg is welded to horizontal portion on all four sides.

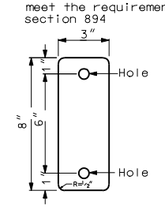
Masts slide inside vertical portion of legs. No bolts or fastenings devices used.

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



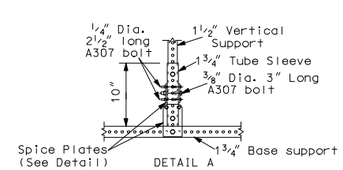

ACRYLIC PLASTIC REFLECTOR

Delineator reflector shall meet the requirements of section 894

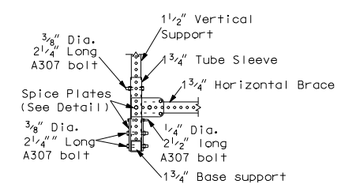



DELINEATOR REFLECTOR

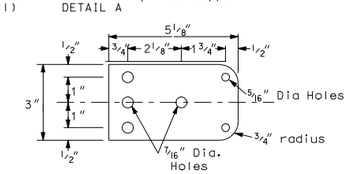
3"x8"- 18 Gauge galvanized steel sheet or 0.080" aluminum plate with white retroreflective sheeting (Type 3A or 3B) as specified in section 894 of the Standard Specifications.




DETAIL A




DETAIL B




SPLICE PLATE

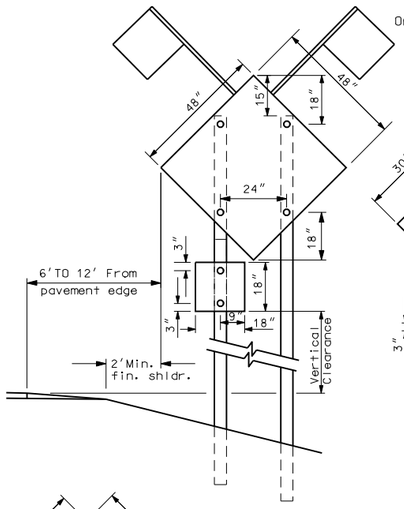
BARRICADE ASSEMBLY DETAIL
(Use when Plastic I-Beam w/ 1½" Hollow Core Flanges or 1" x 8" x72" wood boards.

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

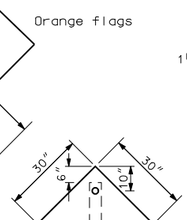
This document was originally issued and sealed by MARK S GAYDOS Registration Number PE-4518, on 06/29/05 and the original document is stored at the North Dakota Department of Transportation

# CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS

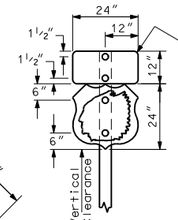
D-704-14



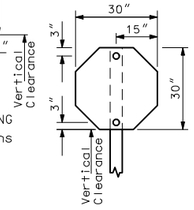

POST MOUNTING 48"x48" Signs




POST MOUNTING 30"x30" Signs

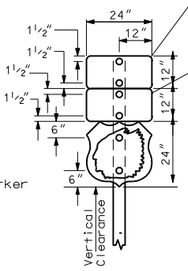



POST MOUNTING Assemblies with one cardinal direction sign & one route marker

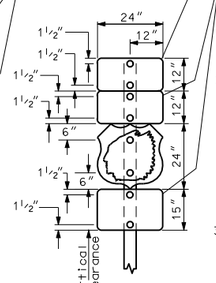



POST MOUNTING Sign R1-1-30

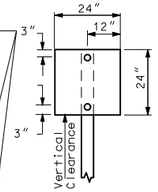
See note 7



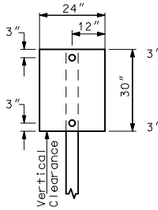

POST MOUNTING Assemblies with one cardinal direction sign, one detour sign & one route marker



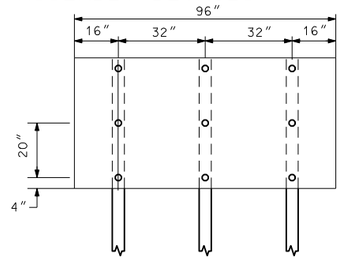

POST MOUNTING Assemblies with one cardinal direction sign, one detour sign, one route marker & one directional arrow.



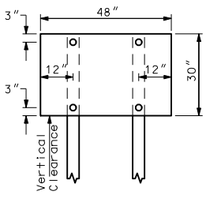

POST MOUNTING 24"x24" Signs



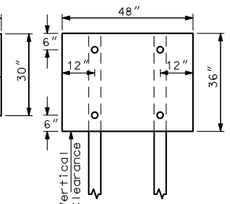

POST MOUNTING 24"x30" Signs



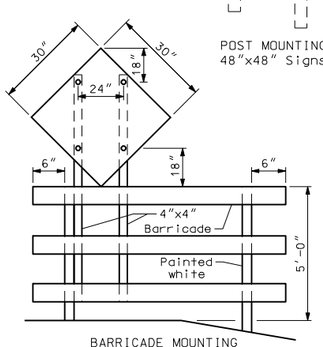

POST MOUNTING 48"x96" Signs



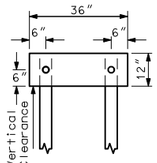

POST MOUNTING 48"x30" Signs



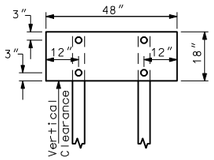

POST MOUNTING 48"x36" Signs



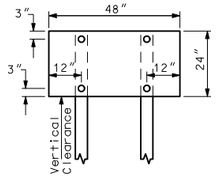

BARRICADE MOUNTING 48"x48" Signs



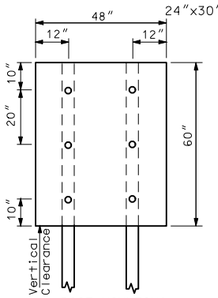

POST MOUNTING 36"x12" Signs



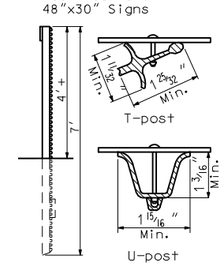

POST MOUNTING 48"x18" Signs



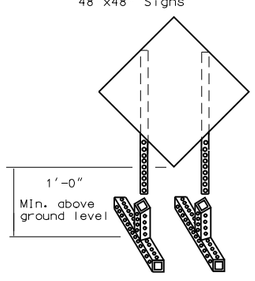

POST MOUNTING 48"x24" Signs



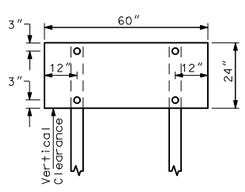

POST MOUNTING 48"x60" Signs



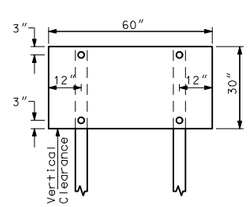

DELINEATOR ATTACHMENT AND POST MOUNTING DETAILS



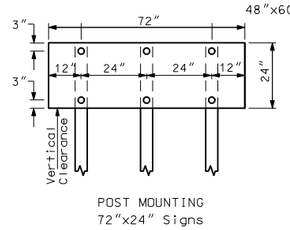

PORTABLE SIGN MOUNTING



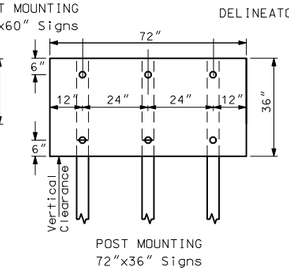

POST MOUNTING 60"x24" Signs



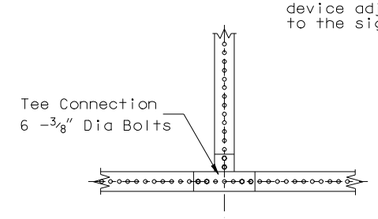

POST MOUNTING 60"x30" Signs



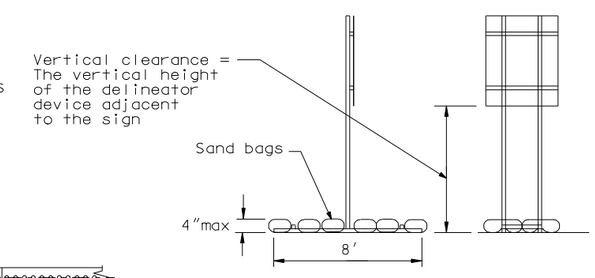

POST MOUNTING 72"x24" Signs




POST MOUNTING 72"x36" Signs

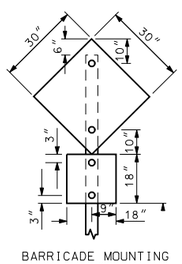



Post to Ground Support Connection

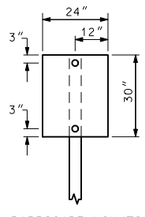



Post sizes shall be 2¼" perforated tube

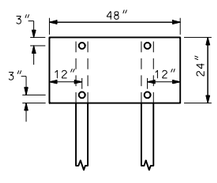
SKID MOUNTED SIGNS



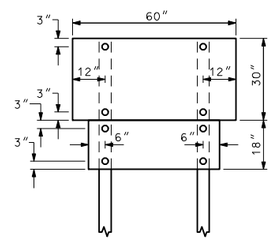

BARRICADE MOUNTING 30"x30" Signs



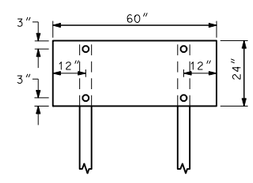

BARRICADE MOUNTING 24"x30" Signs



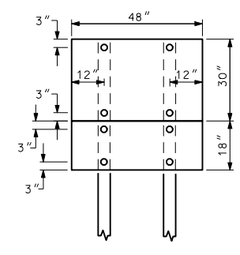

BARRICADE MOUNTING 48"x24" Signs



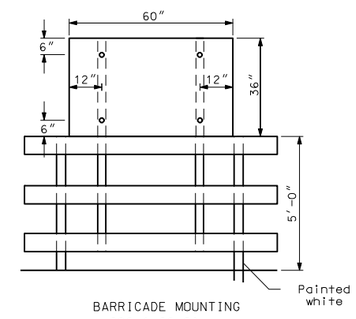

BARRICADE MOUNTING 60"x30" & 48"x18" Signs




BARRICADE MOUNTING 60"x24" Signs




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




BARRICADE MOUNTING G20-1-60 Signs

## NOTES:

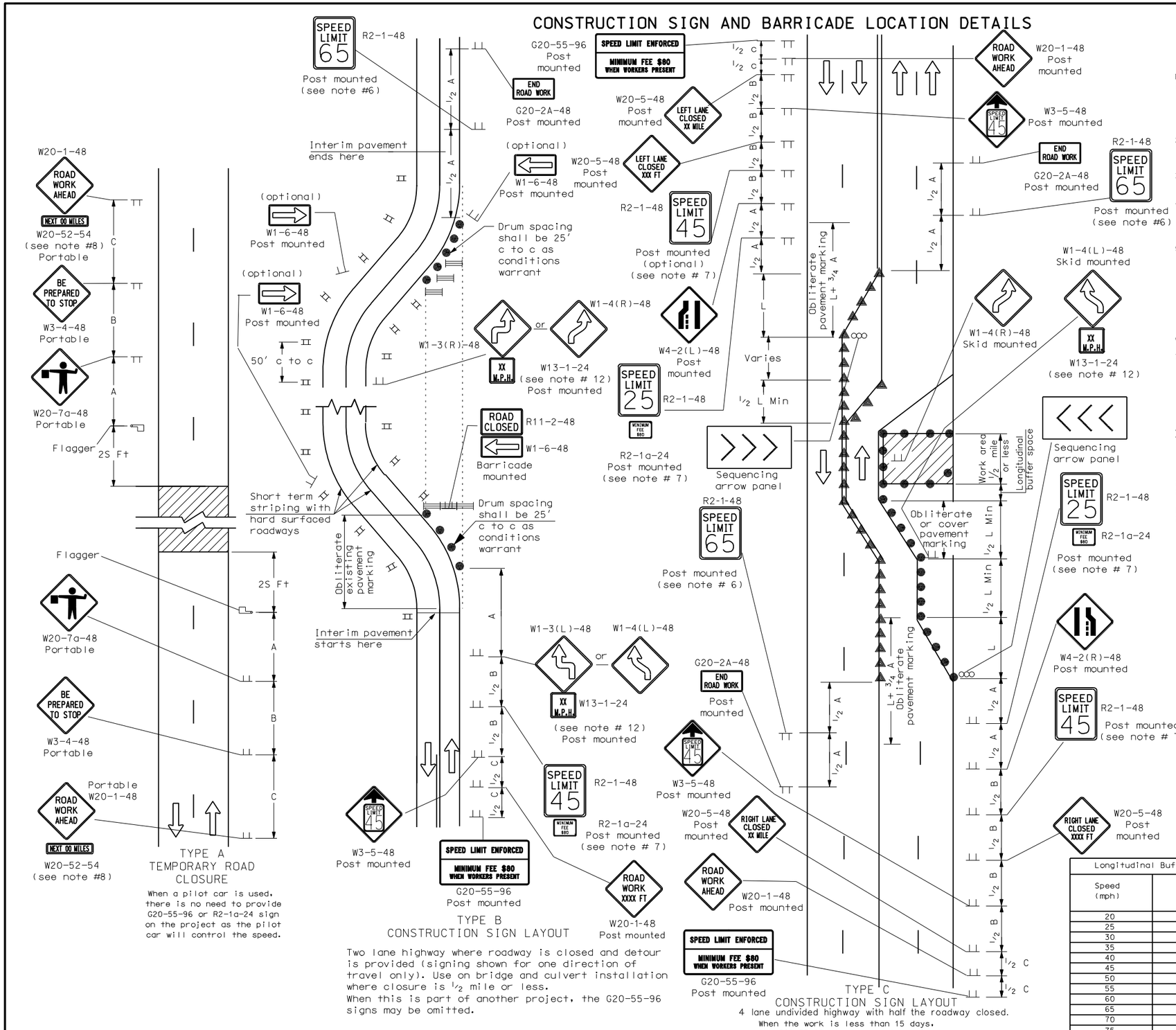
1. Barricade and Sign Supports: Wooden supports shall be painted white. Steel supports shall be galvanized or painted.
2. Barricade Mounting Signs: The bottom of the sign shall be flush with the top of the top rail. Wood sign posts shall be 4"x4" min. SFS or equivalent steel posts. All barricades and barricade mounted signs shall be assembled with 3/8" bolts.
3. Sign Supports: 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, ½" plywood or other approved material.
   Holes: All holes to be punched round for 3/8" bolts.
4. 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.
5. 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.
6. 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.
7. 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).
8. Vertical Clearance: Post mounted signs placed in rural areas shall have a vertical clearance of at least 5 feet measured from the bottom of the sign to the near edge of the driving lane. In business, commercial and residential districts where parking and/or pedestrian movement is likely to occur or where other obstructions to view, the distance between the bottom of the sign to the near edge of the driving lane shall be at least 7 feet. The height to the bottom of secondary signs mounted below another sign may be 1 foot less than the appropriate height specified. Large signs having an area exceeding 50 square feet that are installed on multiple breakaway posts shall be mounted a minimum of 7 feet above the ground.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 10-1-86 | |
| REVISIONS | |
| DATE | CHANGE |
| 08-01-88 | Sign assembly |
| 05-01-92 | Sign assembly |
| 03-30-93 | Sign supports note |
| 03-04-96 | Sign height |
| 08-15-96 | Note 8 |
| 07-10-97 | Note revision |
| 07-31-98 | Note & portable sign |
| 10-01-99 | Skid mounted sign |
| 02-07-03 | Vertical clearance note |
| 11-30-04 | Third post added to some signs |
| 12-01-04 | PE stamp added |

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

# CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

D-704-15




Notes

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

ADVANCE WARNING SIGN SPACING

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

KEY

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

Longitudinal Buffer Space

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-1-86

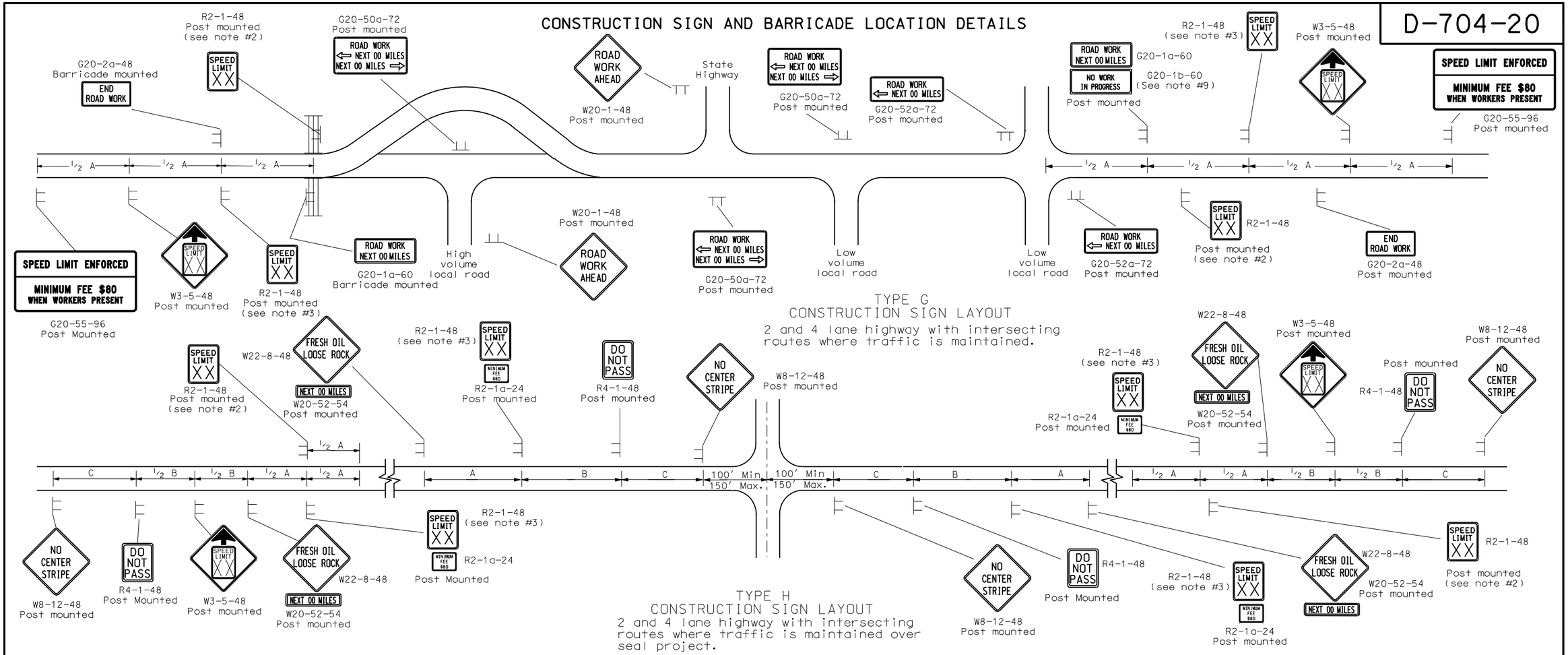
REVISIONS

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

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

# CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

**D-704-20**




## TYPE G
## CONSTRUCTION SIGN LAYOUT

2 and 4 lane highway with intersecting routes where traffic is maintained.

## TYPE H
## CONSTRUCTION SIGN LAYOUT

2 and 4 lane highway with intersecting routes where traffic is maintained over seal project.

1. Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on the roadway shall be placed on skid mounted assemblies.
2. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
3. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 MPH below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 MPH. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at ½ B.
4. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
5. Existing speed limit signs within a reduced speed zone shall be covered.
6. Sign no. R2-1-48, R2-1a-24, R4-1-48, W22-8-48, W20-52-54, and W8-12-48 shall be placed just after all important intersections and every five miles in either direction. Sign no W8-12-48 shall be placed when traffic volumes are 750 ADT or less. No short term markings are placed when this condition exists.
7. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
8. Type H construction sign traffic control shall have the speed limit signs covered or removed once the loose aggregate has been removed.
9. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
10. The layouts show the signs needed before work begins. The requirements at the actual work areas will require the use of other standards. If the speed limit is reduced in the work areas, the speed limit signs shall have the R2-1a-24 sign placed below.

**KEY**

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

**ADVANCE WARNING SIGN SPACING**

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

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

10-1-86

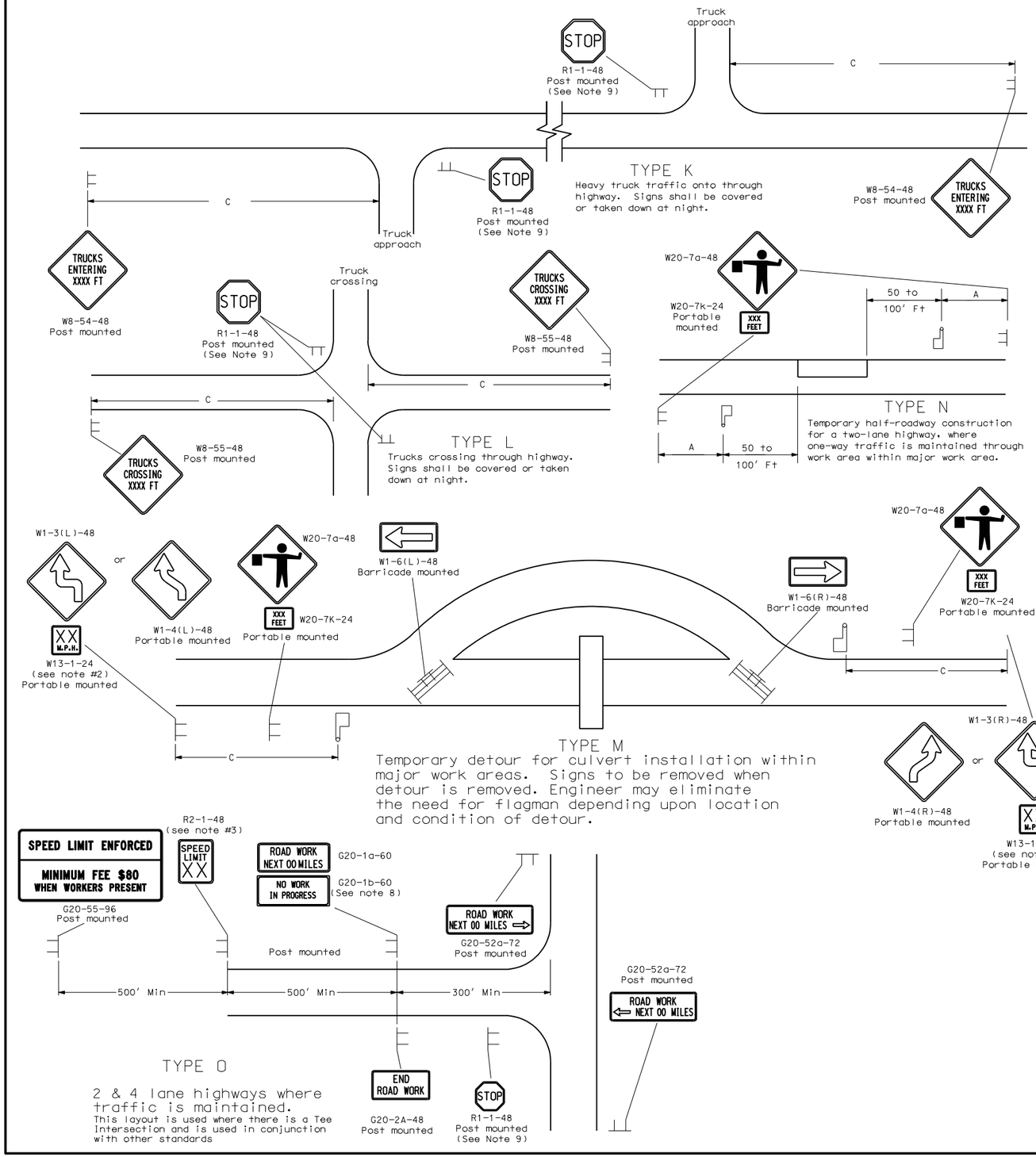
REVISIONS

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

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

# CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

D-704-22




Notes

1. Barricade shown to be placed on roadway shall be on a moveable assembly. on the top of the top barricade bar. Sign shown to be placed on the roadway Sign to be mounted on barricades shall be mounted with the sign bottom shall be placed on skid mounted assemblies.
2. Where necessary, safe speed to be determined by the Engineer.
3. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at ½ B.
4. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
5. Existing speed limit signs within a reduced speed zone shall be covered.
6. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
7. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
8. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
9. If existing stop sign is in place, a 48" stop sign is not required.

KEY

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-1-86

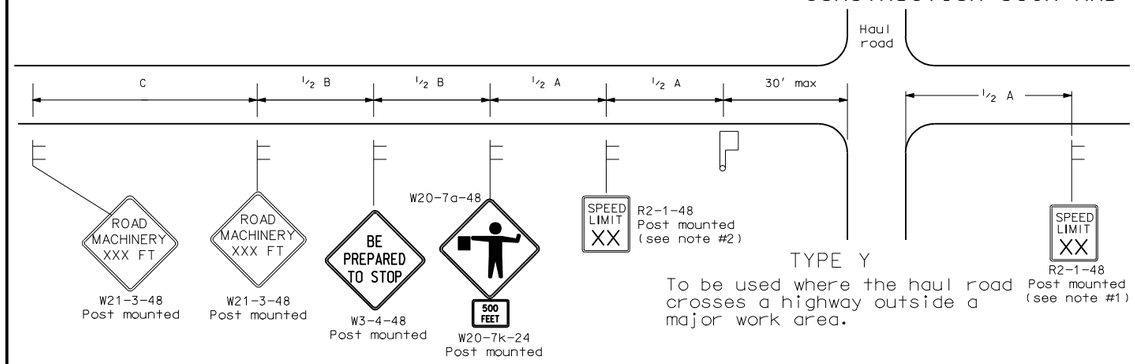
REVISIONS

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

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

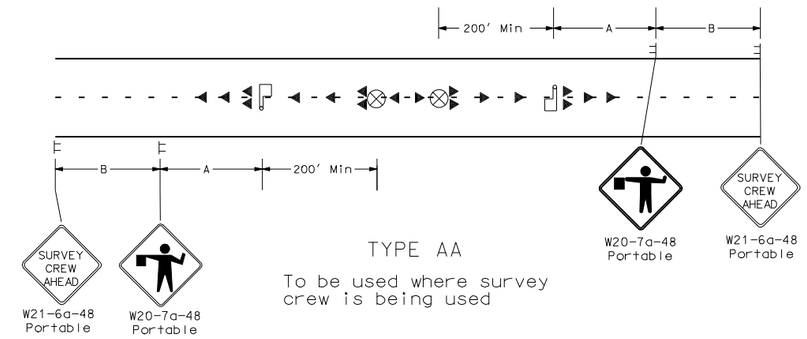
# CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

D-704-26



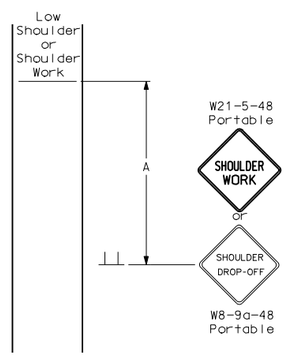

TYPE Y

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



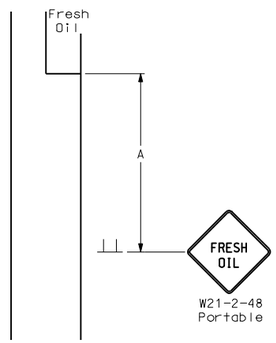

TYPE AA

To be used where survey crew is being used



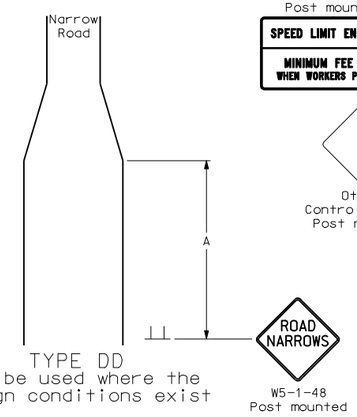

TYPE BB

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



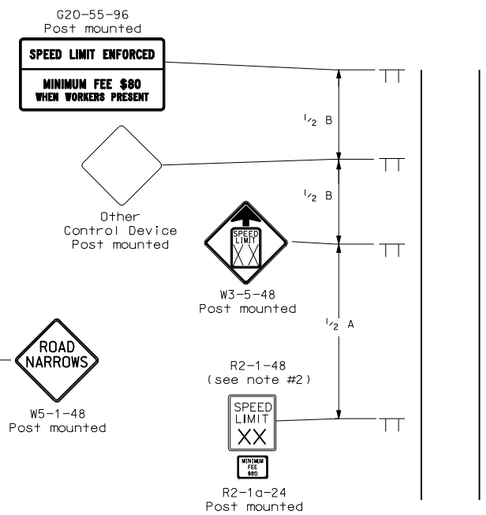

TYPE CC

To be used where the sign conditions exist




TYPE DD

To be used where the sign conditions exist

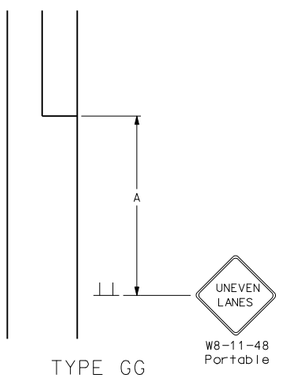



TYPE Z

To be used where speed zone is needed

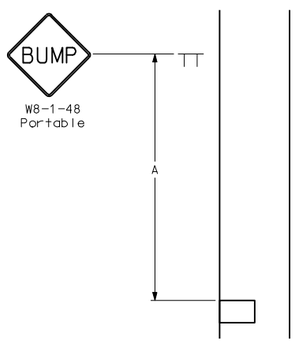
Notes

1. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
2. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at ½ B.
3. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
4. Existing speed limit signs within a reduced speed zone shall be covered.
5. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
6. G20-55-96 or R2-1a-24 signs are not required if this standard is part of other traffic control layouts, or the work is less than 5 days.



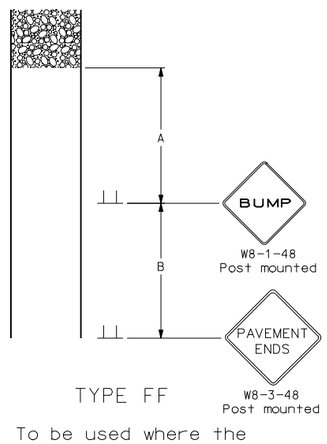

TYPE GG

To be used where a difference of elevation between lanes exist




TYPE EE

To be used where the sign conditions exist




TYPE FF

To be used where the sign conditions exist

KEY

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-1-86

REVISIONS

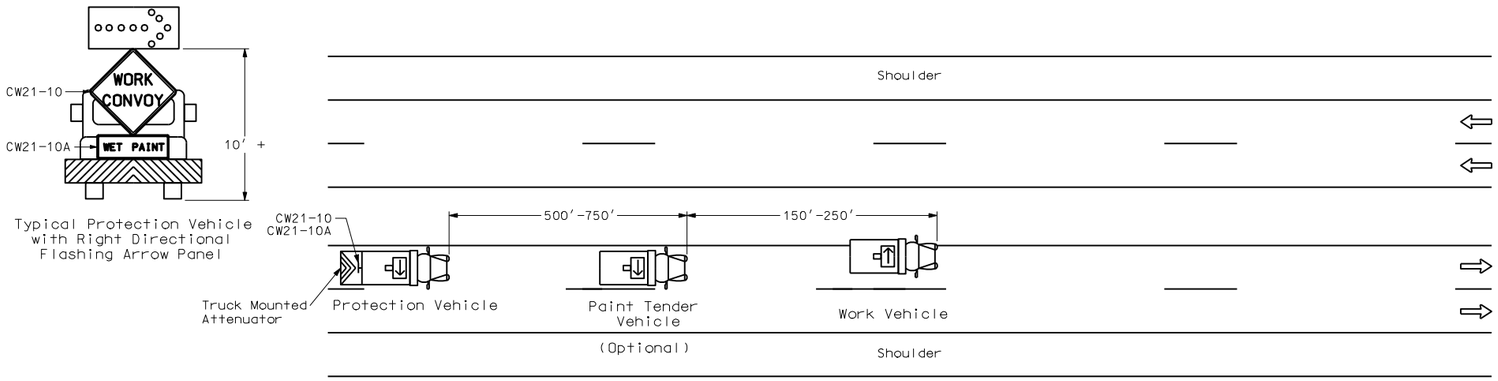
| DATE | CHANGE |
|---|---|
| 09-03-96 | 70 mph |
| 01-31-97 | Sign spacing |
| 10-01-99 | General Revision |
| 07-19-02 | Revised spacing of Speed Limit Signs |
| 01-30-03 | Pavement end sign |
| 07-25-03 | Revised R2-1a |
| 04-01-04 | Rev. fee sign & warning sign spacing. Add note 6 |
| 12-01-04 |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

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

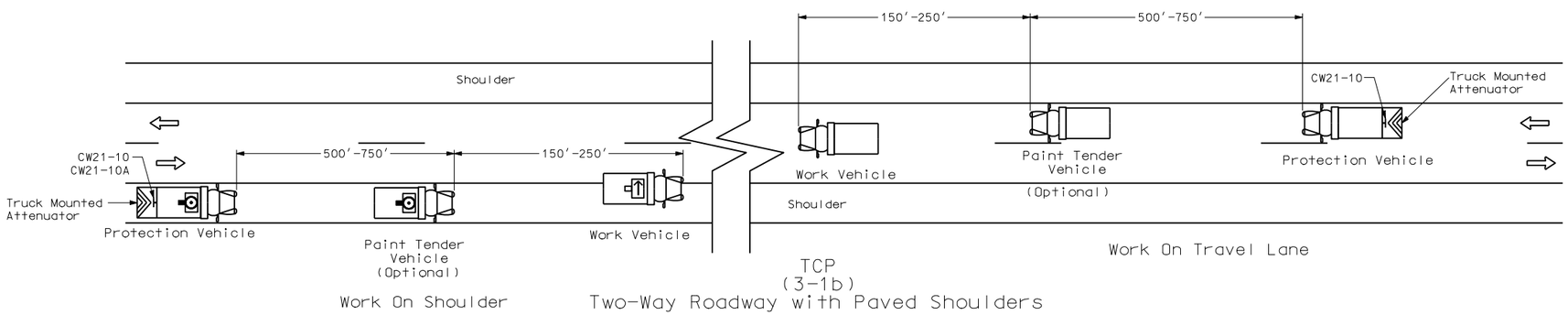
# TRAFFIC CONTROL PLAN FOR MOVING OPERATIONS ON CONVENTIONAL HIGHWAYS

(Pavement Marking)

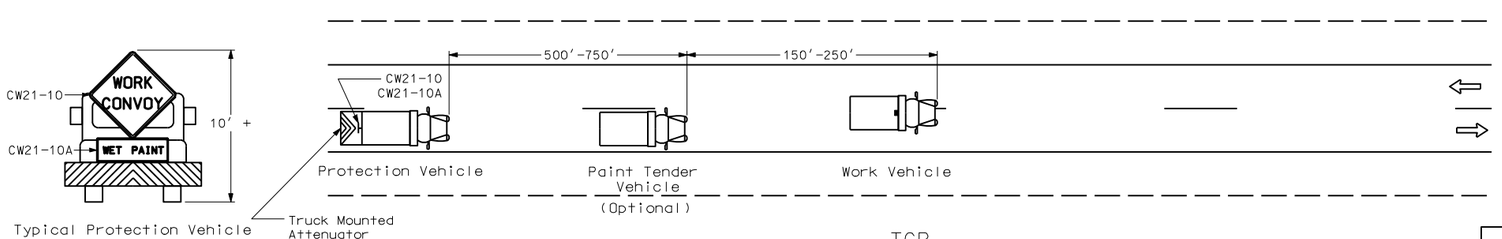
D-704-27




TCP
(3-1a)
Undivided Multi lane Roadway




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

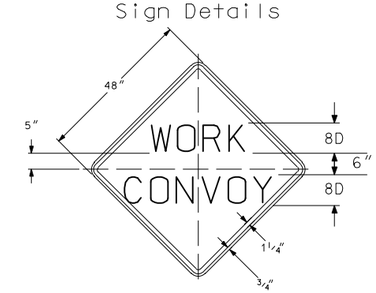



TCP
(3-1c)
Two-Way Roadway without Paved Shoulders

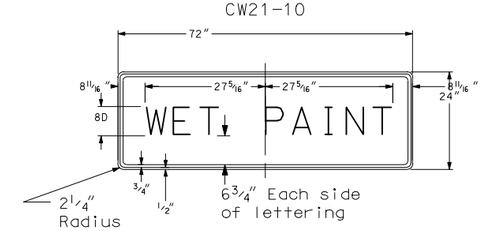
Notes

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

Sign Details




CW21-10




CW21-10A

KEY

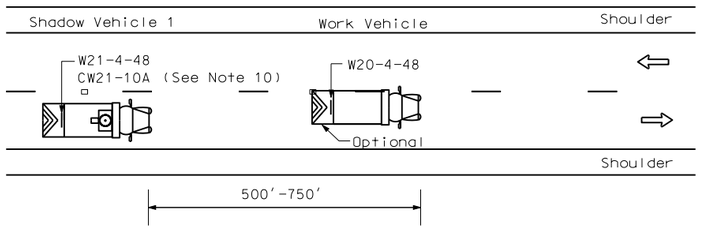
- Truck mounted attenuator
- Flashing arrow panels:
  - Right directional
  - Left directional
  - Double arrow directional
  - Caution Mode

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

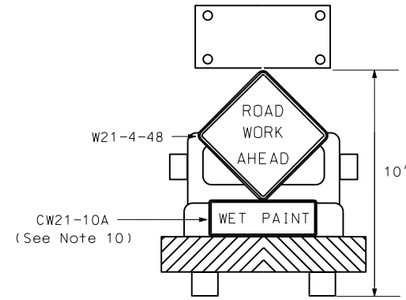
This document was originally issued and sealed by MARK S GAYDOS, Registration Number PE-4518, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

# TRAFFIC CONTROL FOR MOBILE OPERATIONS

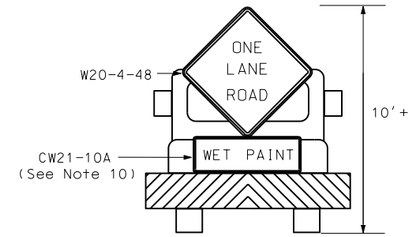
D-704-28




Two Lane Highway
(Work on Travel Lane)



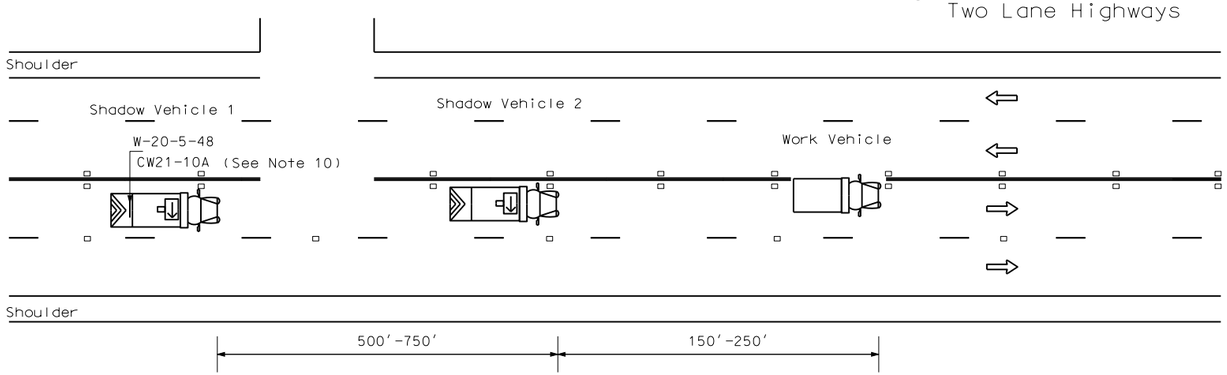

Typical Shadow Vehicle 1
Two Lane Highways




Work Vehicle
Two Lane Highways

Notes

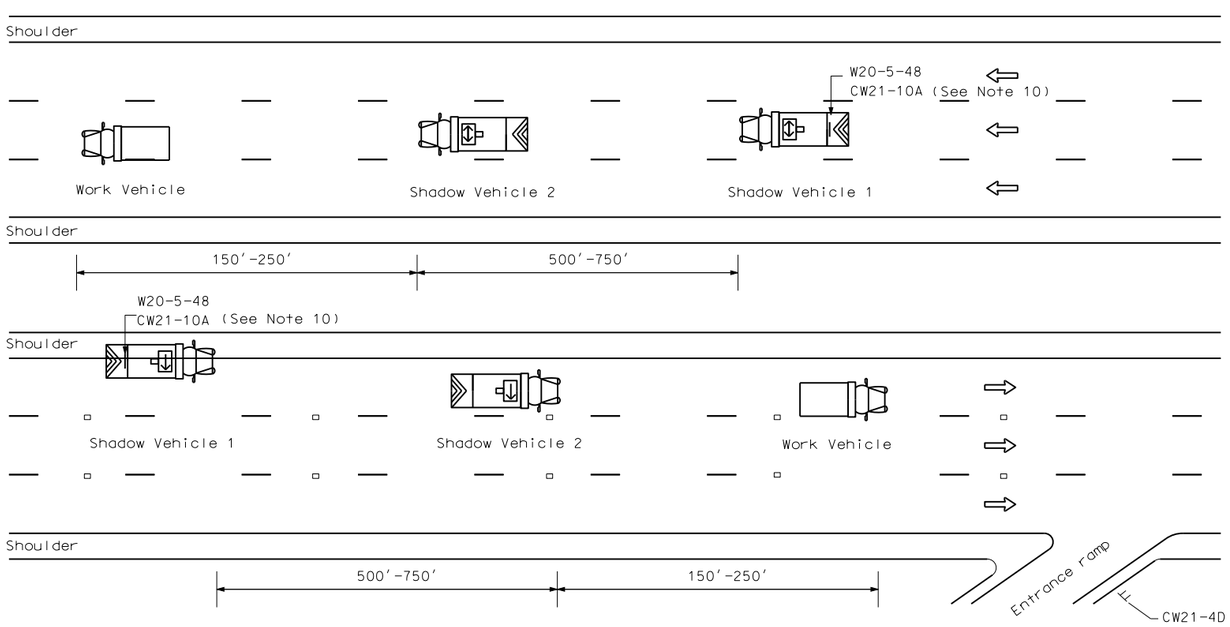
1. If the contractor chooses to place more vehicles in the convoy than are shown, these vehicles shall have the truck mounted attenuator and shall be at the contractors expense.
2. All traffic control devices shall be in accordance with the "Manual on Uniform Traffic Control Devices" (MUTCD), latest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



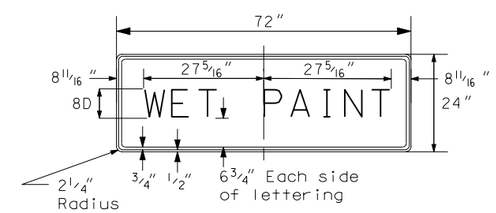

Undivided Multi lane Highway

Sign Details

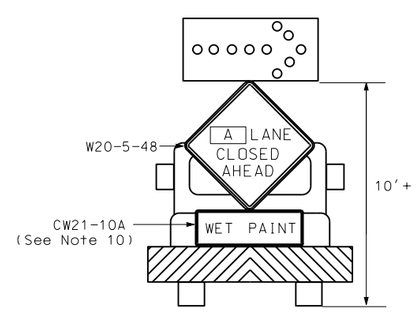
W20-5-48




Divided Multi lane Highway




CW21-10A




Typical Shadow Vehicle 1 & 2
Multi Lane Highways

KEY

A = Left Right Center

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

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

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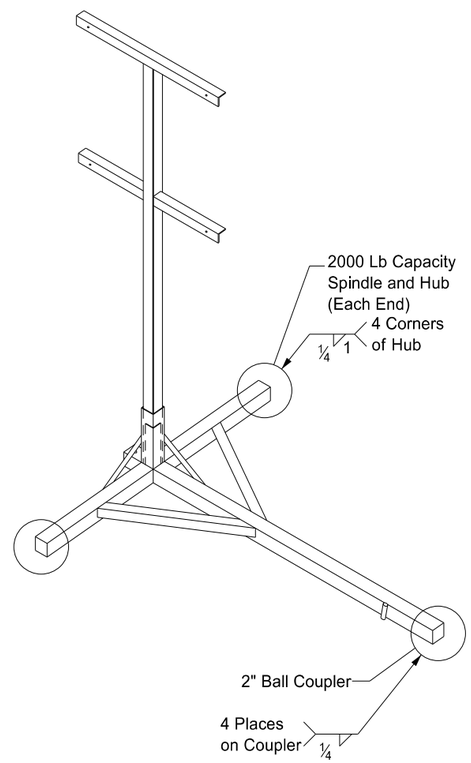
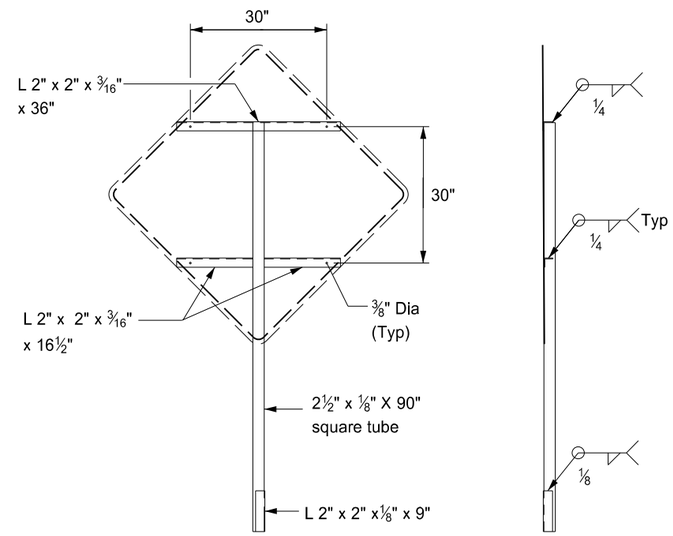
# PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50

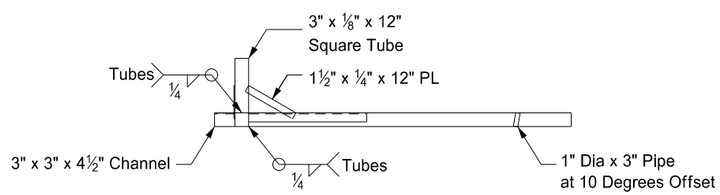


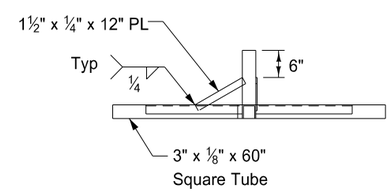

FRONT

RIGHT

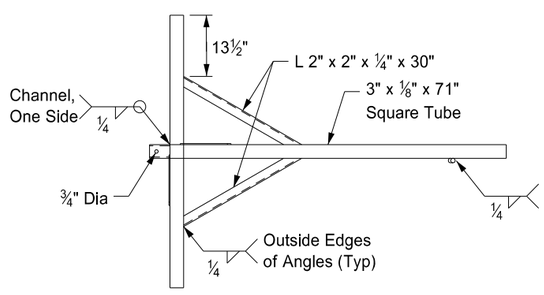
SIGN SUPPORT




FRONT




RIGHT




TOP

TRAILER

Notes:

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

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

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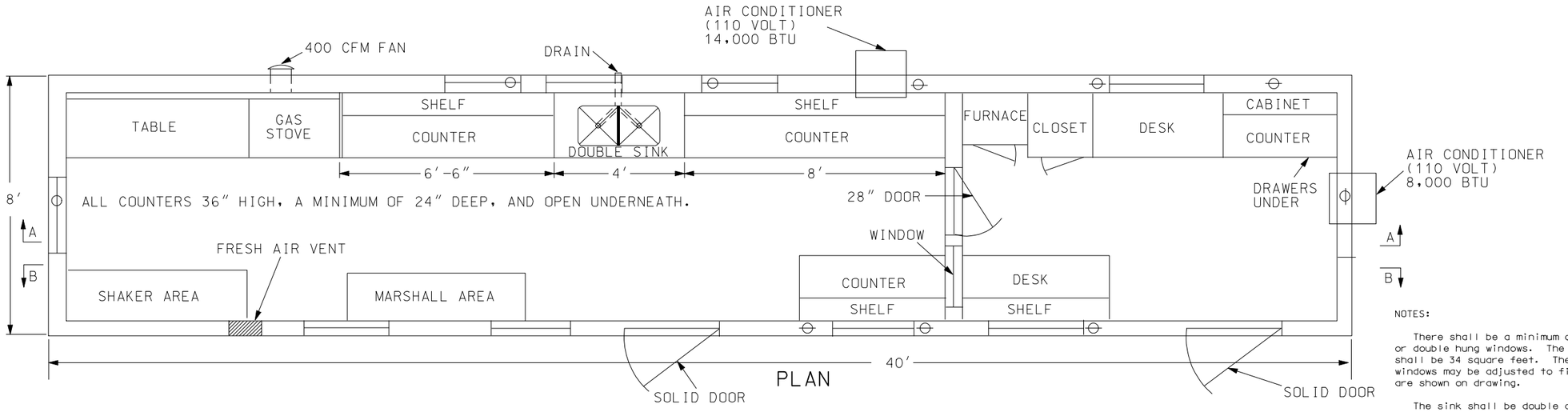
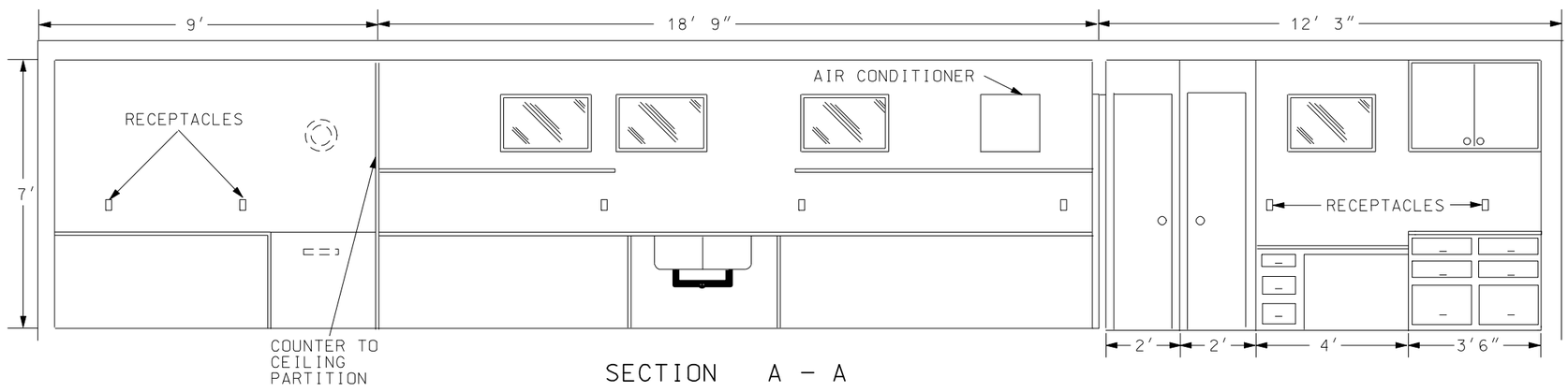
# TYPE C FIELD LABORATORY

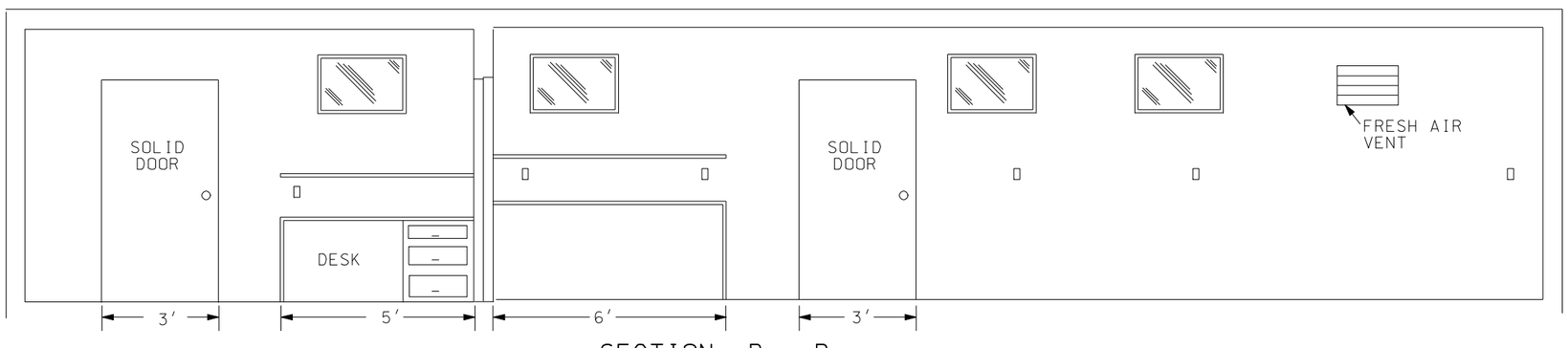
D-706-1




PLAN




SECTION A - A




SECTION B - B

NOTES:

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

The sink shall be double compartment stainless steel. Each compartment shall be a minimum of 16"x14"x10" deep. The sink shall be drained to an outside wasteline. A trap is not required. Water service lines shall be copper or plastic having a diameter of ½ inch.

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

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

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

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

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

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

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

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

The floor beneath the marshall area shall be heavily reinforced.

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

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

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

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D-754-23

NOTES:

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

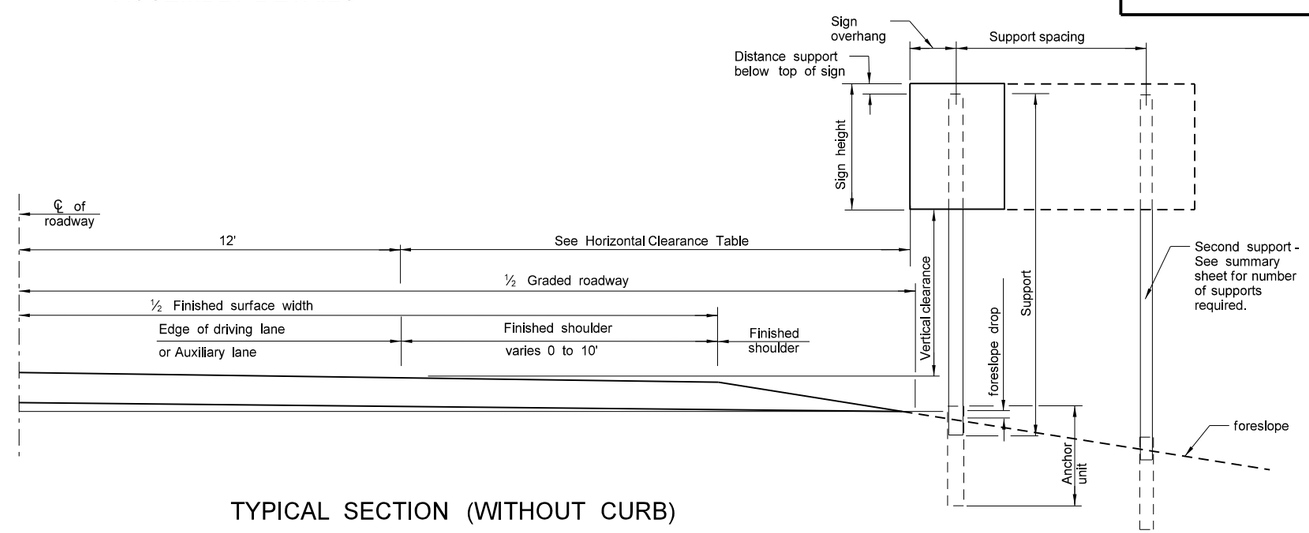
2. Minimum Vertical clearance: Signs installed at the side of the road in rural districts shall be at least 5' measured from the bottom of the sign to the edge of the driving lane or auxillary lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least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

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

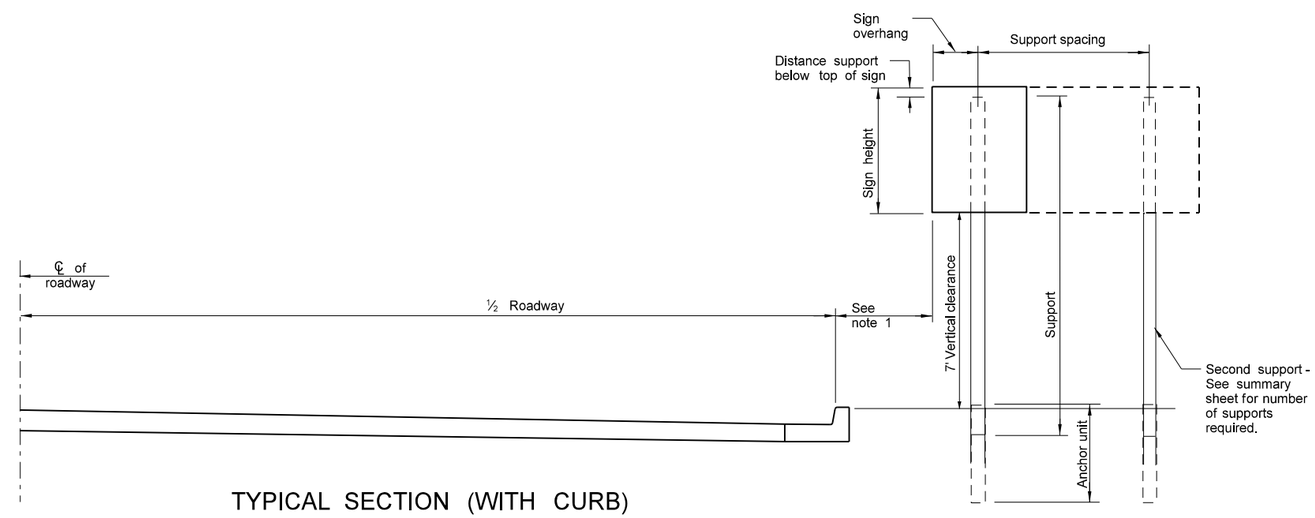
The vertical clearance shall have a maximum height of 6" above the vertical clearance specified above.

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

## ASSEMBLY DETAILS

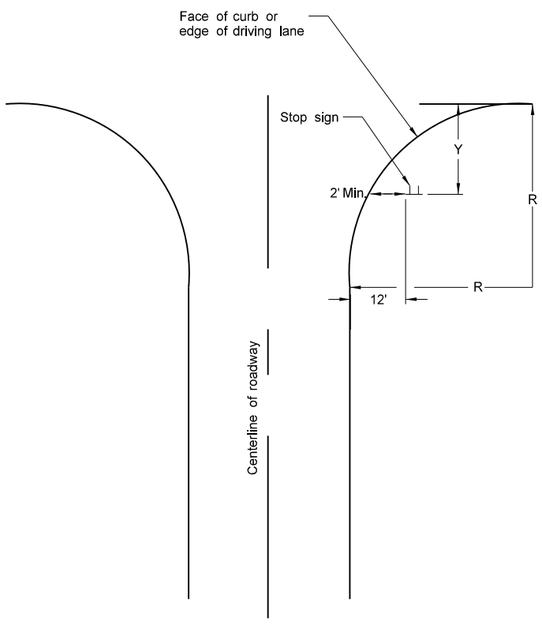



TYPICAL SECTION (WITHOUT CURB)




TYPICAL SECTION (WITH CURB)

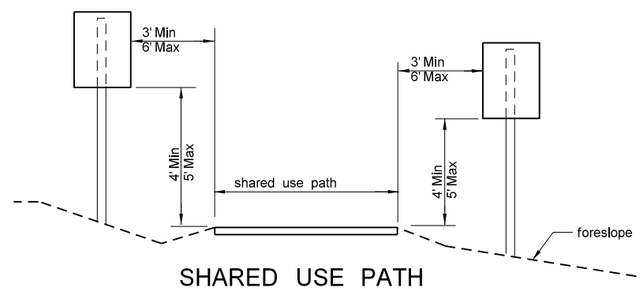
Residential or Business District




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

STOP SIGN LOCATION
WIDE THROAT INTERSECTION

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




SHARED USE PATH

Bicycle - Pedestrian Path

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

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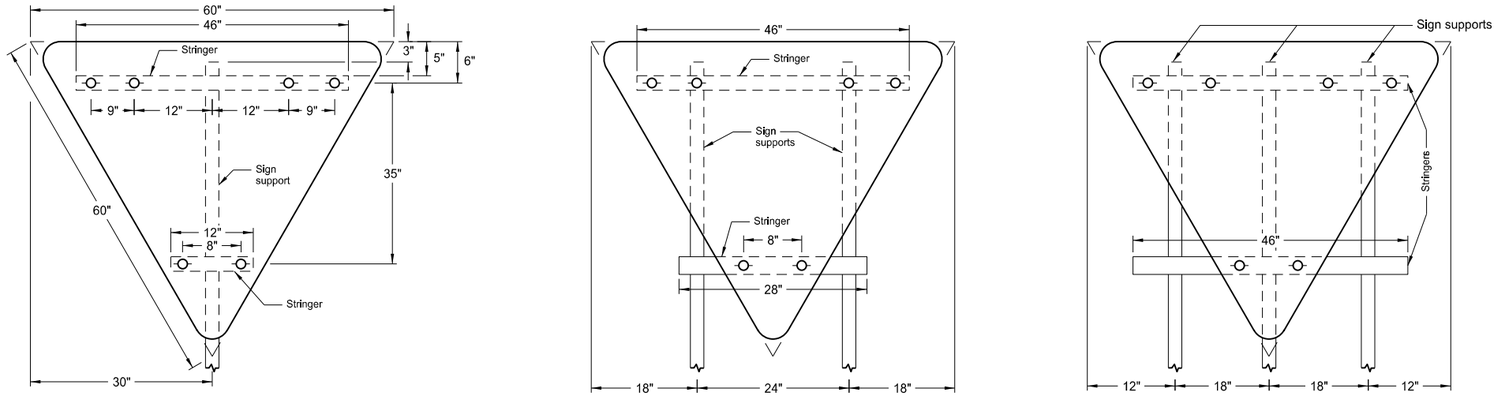
# SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS

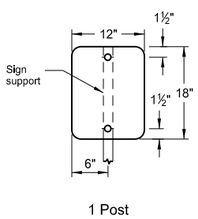
D-754-27



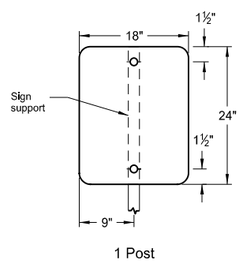

Assembly No. 6

Notes:

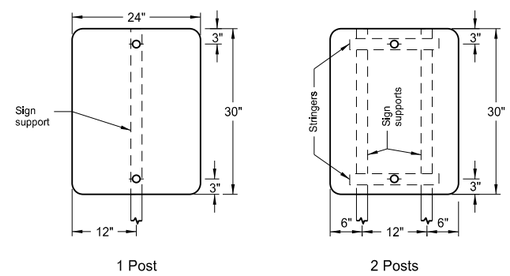
1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1½" x 1½".
4. All holes shall be punched round for ⅜" bolt.



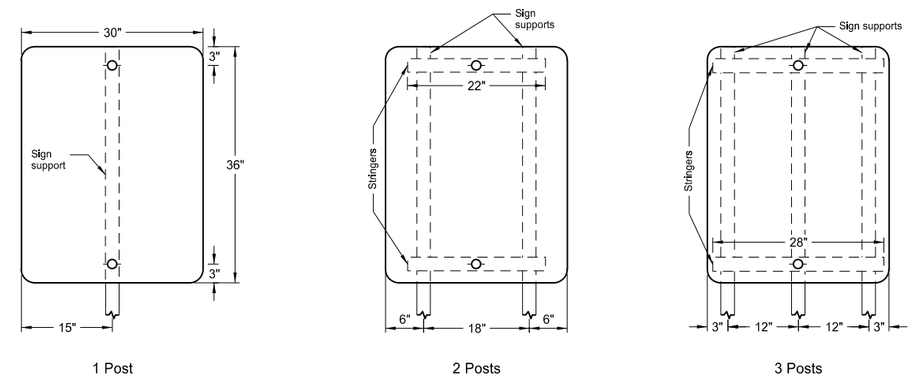

Assembly No. 7



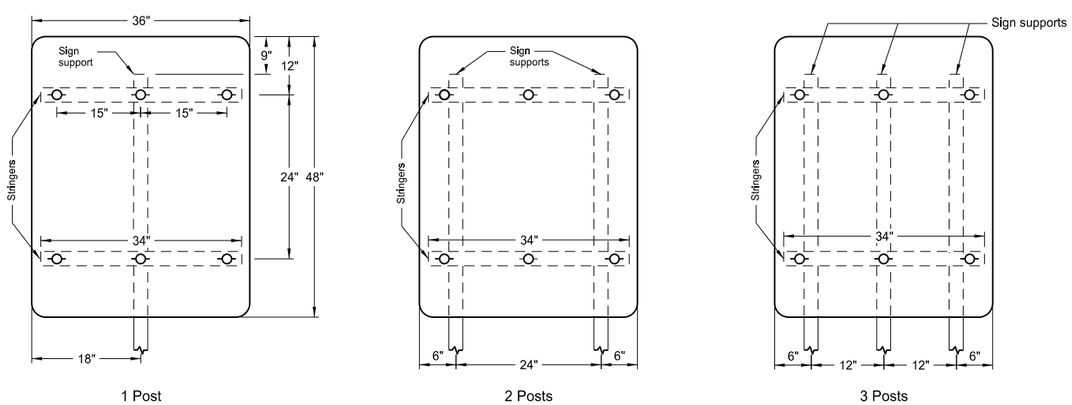

Assembly No. 8




Assembly No. 9




Assembly No. 10




Assembly No. 11

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

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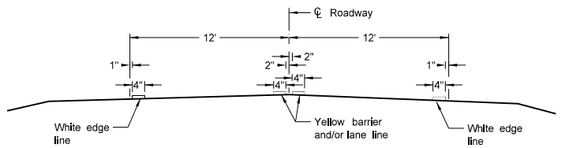
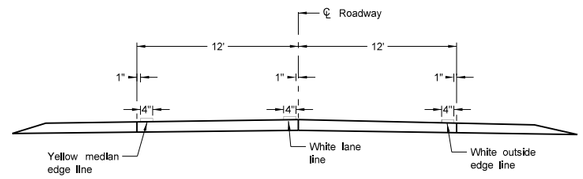
# PAVEMENT MARKING

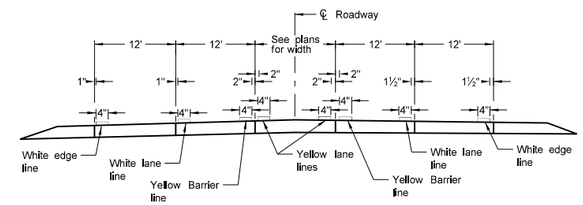
D-762-4



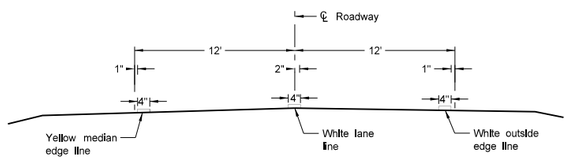

Two Lane Two Way
RURAL ROADWAY



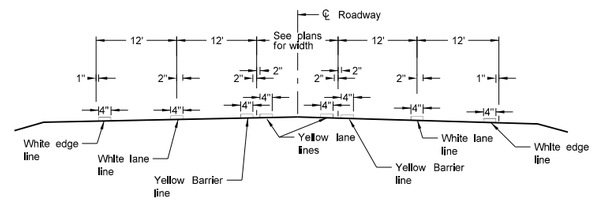

Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



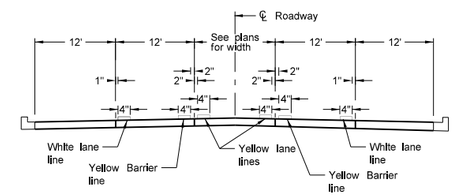

RURAL FIVE LANE ROADWAY
Concrete Section



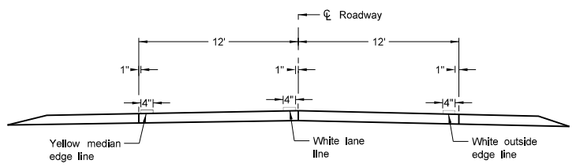

Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



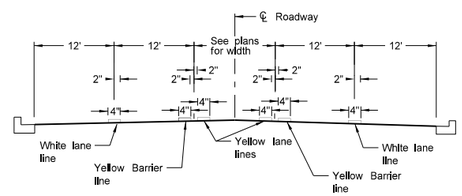

RURAL FIVE LANE ROADWAY
Asphalt Section



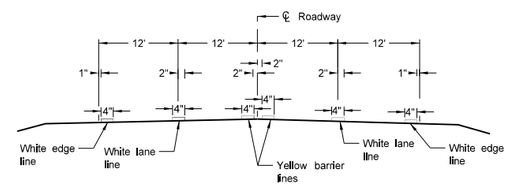

URBAN FIVE LANE SECTION
Concrete Section



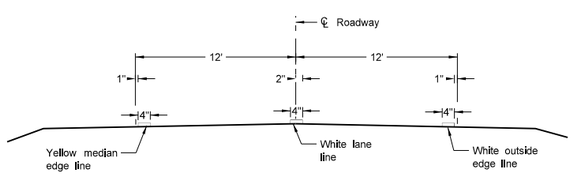

Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



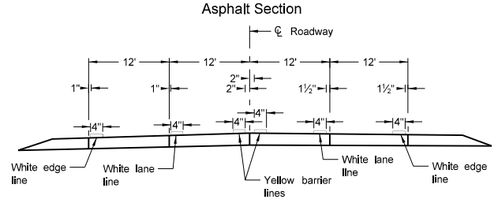

URBAN FIVE LANE SECTION
Asphalt Section



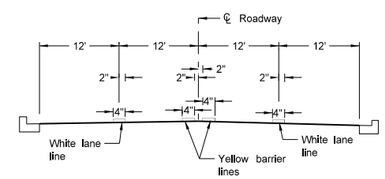

RURAL FOUR LANE ROADWAY
Asphalt Section



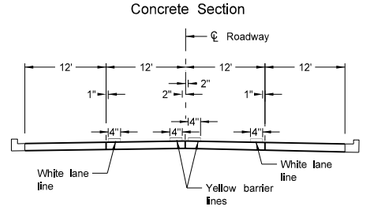

Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



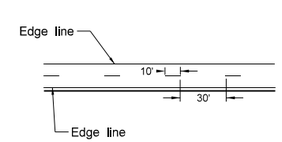

RURAL FOUR LANE ROADWAY
Concrete Section




URBAN FOUR LANE SECTION
Asphalt Section




URBAN FOUR LANE SECTION
Concrete Section




CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

NOTES:

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

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

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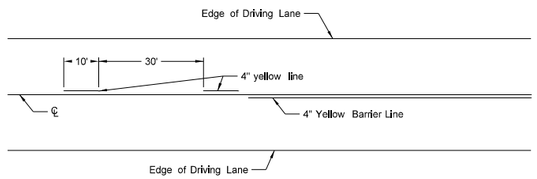
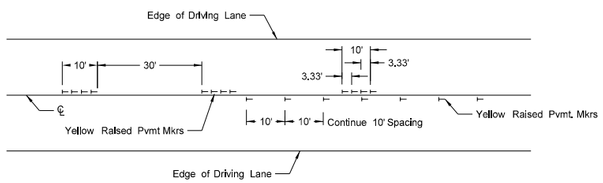
# SHORT-TERM PAVEMENT MARKING

D-762-6

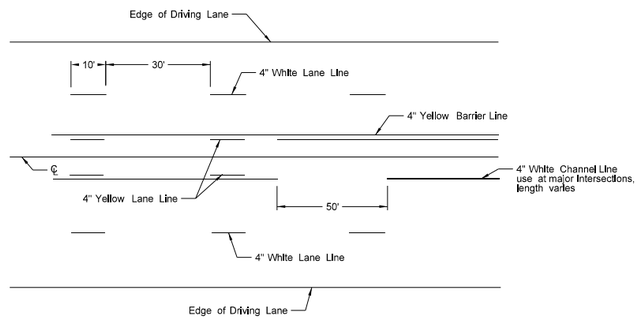



Painted or Tape Lines

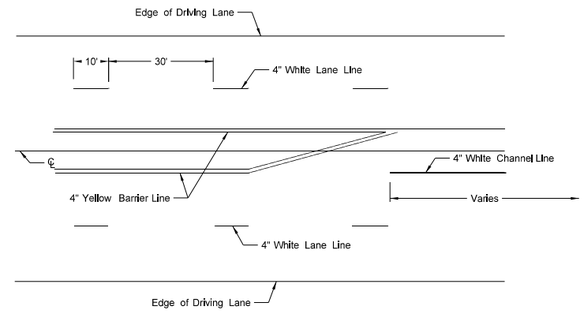



Raised Pavement Markers

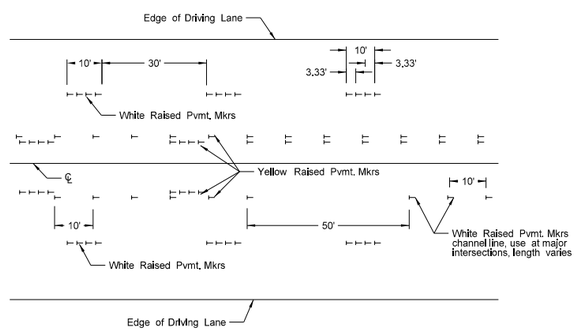
TWO-LANE TWO-WAY ROADWAY




Painted or Tape Lines

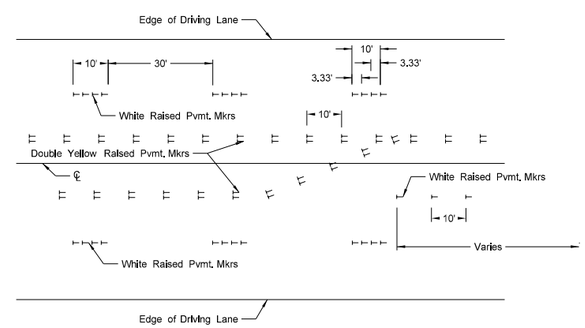



Painted or Tape Lines



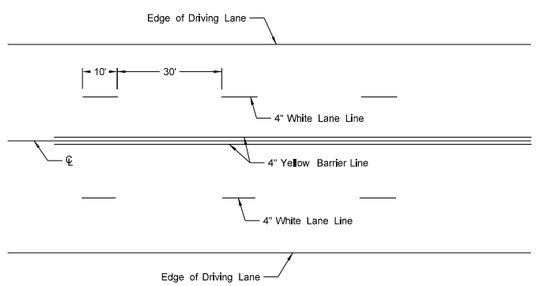

Raised Pavement Markers

FIVE LANE ROADWAY TWO WAY LEFT TURN

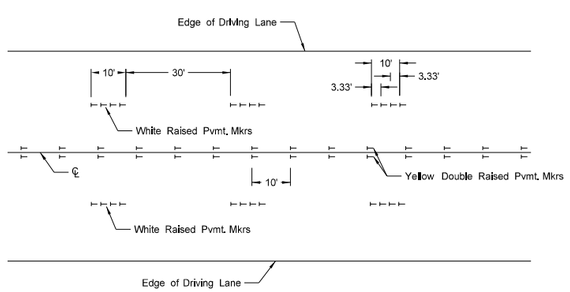



Raised Pavement Markers

FIVE LANE ROADWAY WITH MARKED ISLANDS




Painted or Tape Lines




Raised Pavement Markers

FOUR LANE ROADWAY

NOTES:

1. Two-lane two-way roadways shall have no passing zones placed as shown. No passing zone signs may be placed in lieu of short term no passing zone pavement markings. These signs will be allowed to remain in place for three days, at which time the short term no passing zone pavement marking shall be placed.

2. Short term center line stripe (paint) on top lift shall be carefully placed with exact spacing so that the permanent stripe will match when applied.

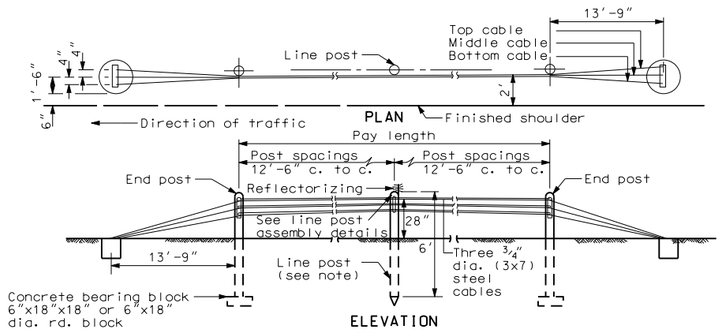
3. Raised markers and tape markings shall be removed after permanent pavement marking has been installed. Removed markings shall become the property of the contractor.

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

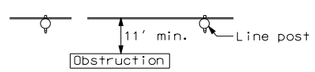
This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

# THREE CABLE GUARDRAIL

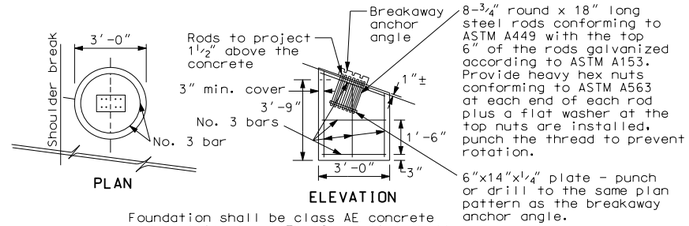
D-764-32




ASSEMBLY WITH END ANCHORAGES

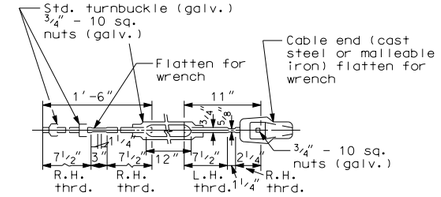



Note: Line post may be pointed to facilitate driving, but they shall have the additional length of the point (6'-0" plus point length).

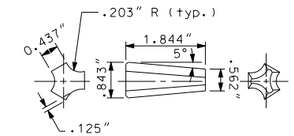



Foundation shall be class AE concrete and cast in place. The foundation shall be formed 6 inches into the ground and the top surface rubbed finshed with the edges chamfered.

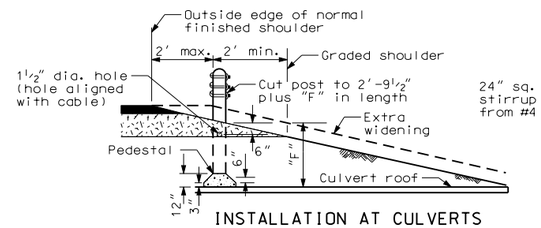
CONCRETE ANCHOR




STEEL TURNBUCKLE CABLE END ASSEMBLY
Minimum tensile strength - 25,000 lbs.

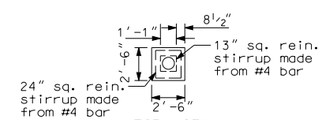



WEDGE DETAIL

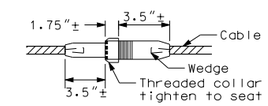



INSTALLATION AT CULVERTS
(WHEN USED)

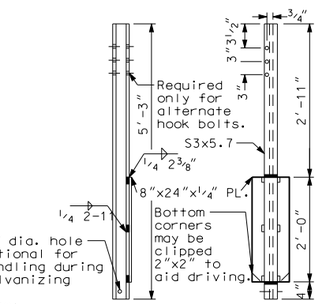
Detail of concrete pedestal for posts to be used over culverts or footings when dimension "F" is less than 3'-8". When Z or round posts are used and the pedestal required the post hole in the pedestal shall be varied as required by the post shape.




TOP VIEW PEDESTAL



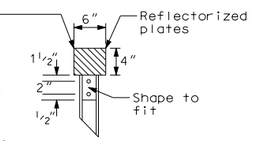

CABLE SPLICE ASSEMBLY




Note:
All holes 3/8" except as noted.

STRUCTURAL SHAPE LINE POST (STEEL)

.80" aluminum plate. Place Type IIIA or IV reflective sheeting in accordance with Std. Spec. Sec. 764 & 862. Reflective sheeting shall be placed on both sides except on divided highways in which case it shall be placed on one side facing oncoming traffic on that roadway.




REFLECTORIZED PLATE ATTACHMENT FOR STRUCTURAL SHAPE LINE POST (STEEL)

Notes: Reflectorized Plates: Reflector plates shall be on first and last posts. Spacing in-between at 25' centers on guardrail less than 250' in length and at 50' centers for guardrail over 250' in length. The reflector shall be the same color as the pavement marking adjacent to that reflector unless noted otherwise on the plans.

Intermediate anchors shall be equally spaced at intervals not to exceed 1000 ft. on tangents and the outside of horizontal curves. Do not use cable guardrail on the inside of curves sharper than 4°. On the inside of curves 4° or flatter, intermediate anchors shall be spaced at intervals not to exceed:

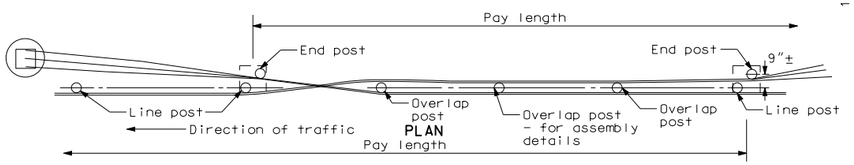
| DEGREE OF CURVE (> MEASUREMENT) | DISTANCE BETWEEN INTERMEDIATE ANCHORS |
|---|---|
| 4° | 150 ft. |
| 3° | 175 ft. |
| 2° | 215 ft. |
| 1° | 300 ft. |
| 30 minutes | 430 ft. |
| 15 minutes | 600 ft. |

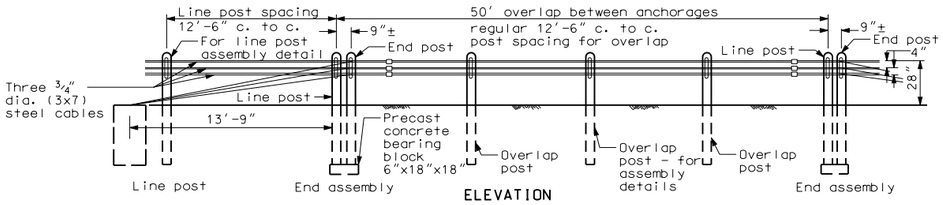
For intermediate curves, interpolate between values listed above.

The pay length shall be from end post to end post. The end posts, hardware, and blocks for the intermediate anchorage assembly shall be included in the price bid for "3 cable guardrail".

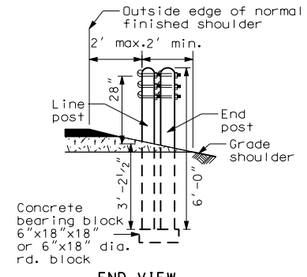
Wood posts shall be furnished and installed.

The steel post spacing shall be revised to 16' center to center. The last post space will be adjusted to 16'-0", lengthening the overall paylength by the increased length.

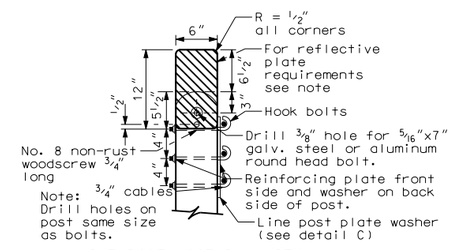


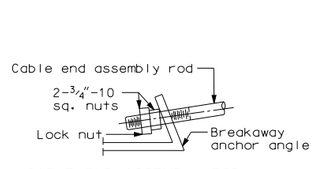

ASSEMBLY WITH INTERMEDIATE ANCHORAGES



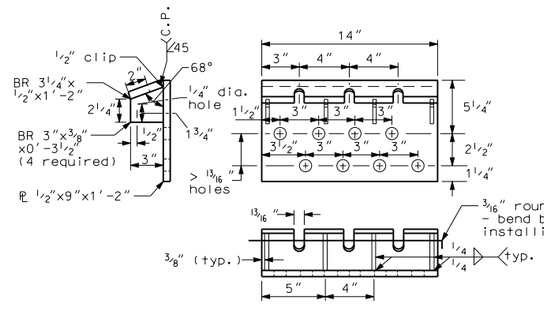

END VIEW



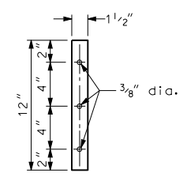

LINE POST ASSEMBLY WITH REFLECTORIZING DETAIL



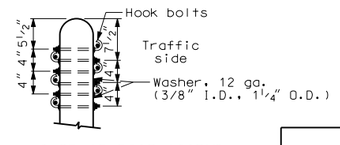

CABLE END ASSEMBLY ROD
BREAKAWAY ANCHOR ANGLE CONN.



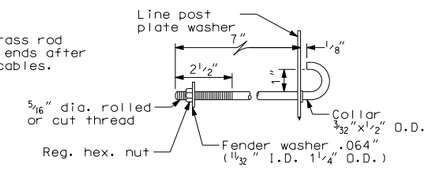

BREAKAWAY ANCHOR ANGLE



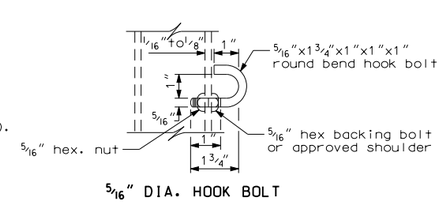

LINE POST PLATE WASHER 1/8"x1 1/2"x12" DETAIL C




OVERLAP POST ASSEMBLY




HOOK BOLT




5/16" DIA. HOOK BOLT

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 10-1-86 | |
| REVISIONS | |
| DATE | CHANGE |
| 03-21-94 | General revisions |
| 06-27-94 | General revisions |
| 08-29-95 | General revisions |
| 11-25-96 | Remove cable end assembly detail |
| 06-15-98 | Concrete foundation |
| 12-01-04 | PE Stamp added |

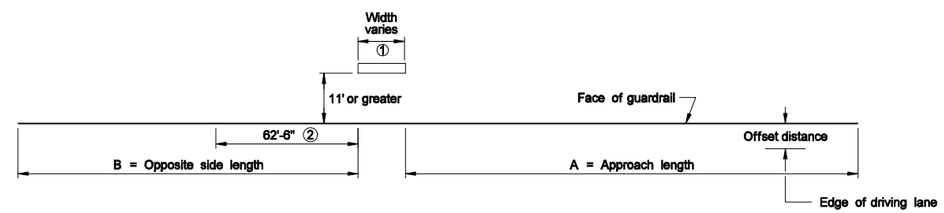
This document was originally issued and sealed by MARK S. GAYDOS Registration Number PE- 4518, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

# THREE CABLE GUARDRAIL AT OBSTRUCTIONS
## 45 MPH DESIGN
## LENGTH OF NEED TABLES

**D-764-33A**

### LENGTH OF NEED TABLE 45 MPH DESIGN SPEED

| DESIGN TRAFFIC VOLUME | GUARDRAIL OFFSET DISTANCE | TWO WAY ROADWAYS | | | | | | | | | | DIVIDED HIGHWAY | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TOTAL THREE CABLE LENGTH ① | | | | | | | | | | TOTAL THREE CABLE LENGTH ① | | | | | | | |
| | | A | B | 0' - 12.5' Obstruction width | 12.5' - 25' Obstruction width | 25' - 37.5' Obstruction width | 37.5' - 50' Obstruction width | 50' - 62.5' Obstruction width | 62.5' - 75' Obstruction width | 75' - 87.5' Obstruction width | 87.5' - 100' Obstruction width | A | B | 0' - 12.5' Obstruction width | 12.5' - 25' Obstruction width | 25' - 37.5' Obstruction width | 37.5' - 50' Obstruction width | 50' - 62.5' Obstruction width | 62.5' - 75' Obstruction width | 75' - 87.5' Obstruction width | 87.5' - 100' Obstruction width |
| | | FT | FT | FT | FT | FT | FT | FT | FT | FT | FT | FT | FT | FT | FT | FT | FT | FT | FT | FT | FT |
| Under 750 ADT | 12 | 62.5 | 62.5 | 137.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 62.5 | 62.5 | 137.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 |
| | 11 | 62.5 | 62.5 | 137.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 62.5 | 62.5 | 137.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 |
| | 10 | 62.5 | 62.5 | 137.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 62.5 | 62.5 | 137.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 |
| | 9 | 62.5 | 62.5 | 137.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 62.5 | 62.5 | 137.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 |
| | 8 | 75.0 | 62.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 75.0 | 62.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 |
| | 7 | 87.5 | 62.5 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 87.5 | 62.5 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 |
| | 6 | 112.5 | 62.5 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 112.5 | 62.5 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 |
| | 5 | 125.0 | 62.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 125.0 | 62.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 |
| | 4 | 137.5 | 62.5 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 137.5 | 62.5 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 |
| | 3 | 162.5 | 62.5 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 162.5 | 62.5 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 |
| | 2 | 175.0 | 62.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 175.0 | 62.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 |
| | 1 | 187.5 | 62.5 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 187.5 | 62.5 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 |
| | 0 | 212.5 | 62.5 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 212.5 | 62.5 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 |
| 750 - 1500 ADT | 12 | 62.5 | 62.5 | 137.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 62.5 | 62.5 | 137.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 |
| | 11 | 75.0 | 62.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 75.0 | 62.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 |
| | 10 | 87.5 | 62.5 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 87.5 | 62.5 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 |
| | 9 | 100.0 | 62.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 100.0 | 62.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 |
| | 8 | 112.5 | 62.5 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 112.5 | 62.5 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 |
| | 7 | 125.0 | 62.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 125.0 | 62.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 |
| | 6 | 137.5 | 62.5 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 137.5 | 62.5 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 |
| | 5 | 150.0 | 62.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 150.0 | 62.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 |
| | 4 | 162.5 | 62.5 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 162.5 | 62.5 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 |
| | 3 | 175.0 | 62.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 175.0 | 62.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 |
| | 2 | 200.0 | 62.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 200.0 | 62.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 |
| | 1 | 212.5 | 62.5 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 212.5 | 62.5 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 |
| | 0 | 225.0 | 62.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 | 225.0 | 62.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 |
| 1500 - 2000 ADT | 12 | 75.0 | 62.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 75.0 | 62.5 | 150.0 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 |
| | 11 | 87.5 | 62.5 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 87.5 | 62.5 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 |
| | 10 | 100.0 | 62.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 100.0 | 62.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 |
| | 9 | 112.5 | 62.5 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 112.5 | 62.5 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 |
| | 8 | 125.0 | 62.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 125.0 | 62.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 |
| | 7 | 137.5 | 62.5 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 137.5 | 62.5 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 |
| | 6 | 150.0 | 62.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 150.0 | 62.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 |
| | 5 | 162.5 | 62.5 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 162.5 | 62.5 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 |
| | 4 | 175.0 | 62.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 175.0 | 62.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 |
| | 3 | 187.5 | 62.5 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 187.5 | 62.5 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 |
| | 2 | 200.0 | 62.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 200.0 | 62.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 |
| | 1 | 212.5 | 62.5 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 212.5 | 62.5 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 |
| | 0 | 225.0 | 75.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 | 400.0 | 225.0 | 62.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 |
| 2000 - 6000 ADT | 12 | 87.5 | 62.5 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 87.5 | 62.5 | 162.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 |
| | 11 | 100.0 | 62.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 100.0 | 62.5 | 175.0 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 |
| | 10 | 112.5 | 62.5 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 112.5 | 62.5 | 187.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 |
| | 9 | 125.0 | 62.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 125.0 | 62.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 |
| | 8 | 137.5 | 62.5 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 137.5 | 62.5 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 |
| | 7 | 150.0 | 62.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 150.0 | 62.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 |
| | 6 | 175.0 | 62.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 175.0 | 62.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 |
| | 5 | 187.5 | 62.5 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 187.5 | 62.5 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 |
| | 4 | 200.0 | 62.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 200.0 | 62.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 |
| | 3 | 212.5 | 62.5 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 212.5 | 62.5 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 |
| | 2 | 225.0 | 62.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 | 225.0 | 62.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 |
| | 1 | 237.5 | 75.0 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 | 400.0 | 412.5 | 237.5 | 62.5 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 | 400.0 |
| | 0 | 250.0 | 87.5 | 350.0 | 362.5 | 375.0 | 387.5 | 400.0 | 412.5 | 425.0 | 437.5 | 250.0 | 62.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 | 400.0 | 412.5 |
| OVER 6000 ADT | 12 | 125.0 | 62.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 125.0 | 62.5 | 200.0 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 |
| | 11 | 137.5 | 62.5 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 137.5 | 62.5 | 212.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 |
| | 10 | 150.0 | 62.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 150.0 | 62.5 | 225.0 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 |
| | 9 | 162.5 | 62.5 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 162.5 | 62.5 | 237.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 |
| | 8 | 175.0 | 62.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 175.0 | 62.5 | 250.0 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 |
| | 7 | 187.5 | 62.5 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 187.5 | 62.5 | 262.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 |
| | 6 | 200.0 | 62.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 200.0 | 62.5 | 275.0 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 |
| | 5 | 212.5 | 62.5 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 212.5 | 62.5 | 287.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 |
| | 4 | 225.0 | 75.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 | 400.0 | 225.0 | 62.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 |
| | 3 | 225.0 | 87.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 | 400.0 | 412.5 | 225.0 | 62.5 | 300.0 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 |
| | 2 | 237.5 | 100.0 | 350.0 | 362.5 | 375.0 | 387.5 | 400.0 | 412.5 | 425.0 | 437.5 | 237.5 | 62.5 | 312.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 | 400.0 |
| | 1 | 250.0 | 112.5 | 375.0 | 387.5 | 400.0 | 412.5 | 425.0 | 437.5 | 450.0 | 462.5 | 250.0 | 62.5 | 325.0 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 | 400.0 | 412.5 |
| | 0 | 262.5 | 125.0 | 400.0 | 412.5 | 425.0 | 437.5 | 450.0 | 462.5 | 475.0 | 487.5 | 262.5 | 62.5 | 337.5 | 350.0 | 362.5 | 375.0 | 387.5 | 400.0 | 412.5 | 425.0 |




THREE CABLE GUARDRAIL DIMENSION LAYOUT

NOTES:

① The width of the obstruction shall be rounded up to the nearest 12'-6" length.

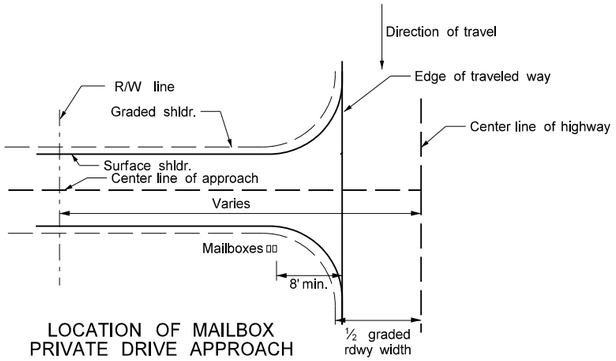
② The 62'-6" dimension is the minimum length beyond an obstruction that may be placed.

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 01-04-07 | |
| REVISIONS | |
| DATE | CHANGE |
| 02-16-07 | Revised table |

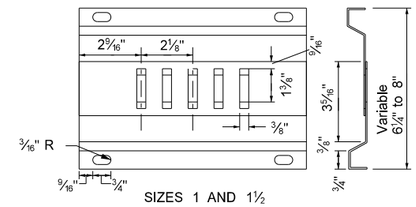
This document was originally issued and sealed by MARK S GAYDOS Registration Number PE- 4518 , on 02/16/2007 and the original document is stored at the North Dakota Department of Transportation

# MAILBOX LOCATION DETAILS

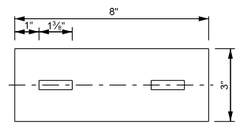
D-766-1



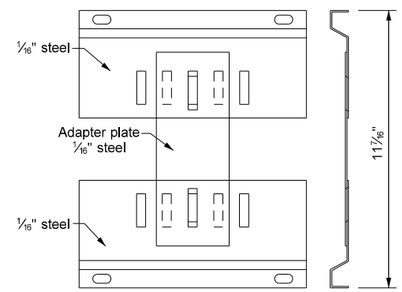

LOCATION OF MAILBOX
PRIVATE DRIVE APPROACH
ALTERNATE "A" LOCATION




SIZES 1 AND 1½
MOUNTING BRACKET




ADAPTOR PLATE




SIZE 2 WITH ADAPTOR PLATE
MOUNTING BRACKET

Notes:

1. The mailbox support and hardware details shall consist of the "V-Loc Mailbox Support System" manufactured by:

   Tapco
   Traffic & Parking Control Co. Inc.

   Any other equal support system meeting the requirements of NCHRP Report 350, which has been crash tested, and approved by the Federal Highway Administration may be used. Approved alternate mailbox assemblies shall be installed in the manner and arrangement crash tested.

2. The preferred location for all mailboxes is the Alternate "A" location. However, the Engineer may approve the Alternate "B" location if warranted by existing field conditions.

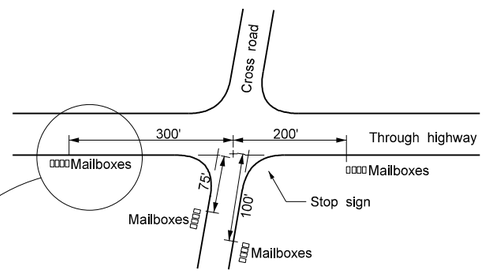
3. Postal regulations require that mailboxes must be located on the right-hand side of the road in the direction traveled by the carrier. Therefore, the Engineer shall contact the local carrier or postmaster before installing new mailboxes to verify the direction of travel.

4. Mailboxes installed on private drive approaches must always be located on the downstream side of the approach.

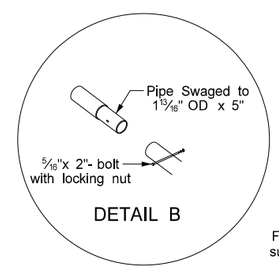
5. Install angle connection parallel to traffic flow for size 2 mailbox mounted on single posts.

6. Size 2 mailbox mounted on multiple support requires 2 each, 3/8" by 9/16" bolts with lock washers and nuts to attach the adapter plate to mounting bracket. The unit will then require 4 angle connections to attach to the formed tube support frame. See Detail A.

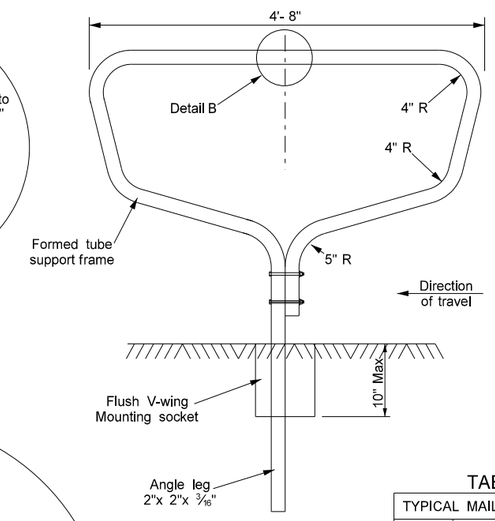
7. Space multiple support frames a minimum of 4 feet apart. Space single support frames a minimum of 3 ft apart. Do not place more than five No. 1 mailboxes, three No. 2 mailboxes, or any combination of four No. 1-A and No. 2 mailboxes on multiple support frames.



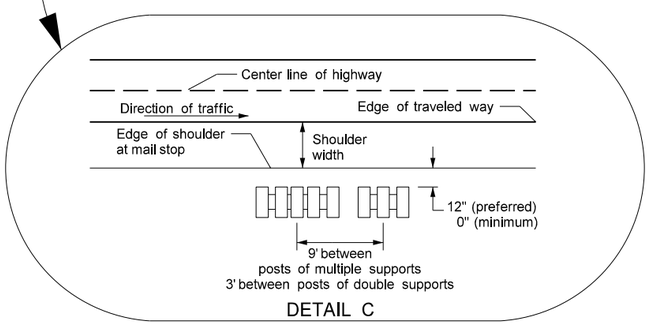

MINIMUM CLEARANCE DISTANCE TO NEAREST
MAILBOX ALONG ROADWAY AT INTERSECTIONS
ALTERNATE "B" LOCATION




DETAIL B



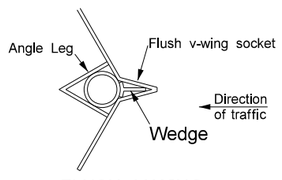

FRONT



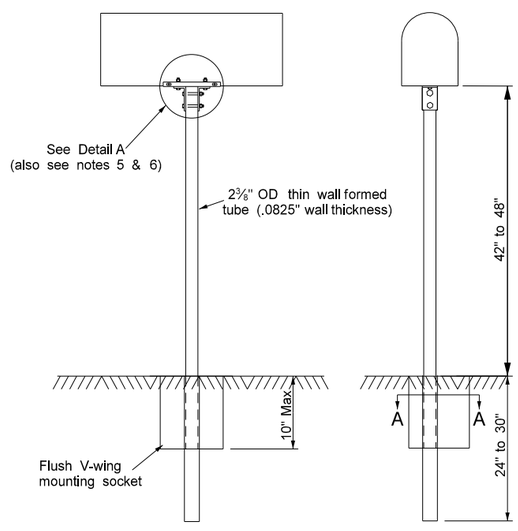

DETAIL C

TABLE A

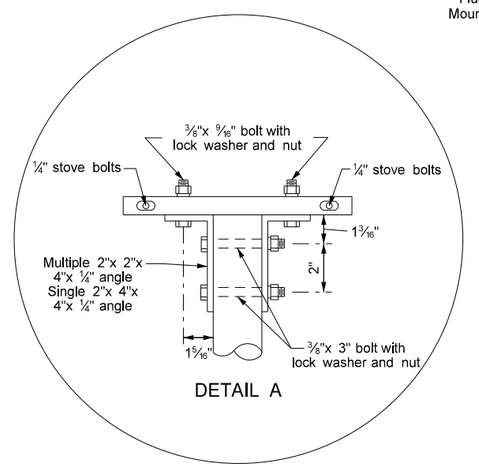
| TYPICAL MAILBOX DIMENSIONS | | | |
|---|---|---|---|
| Size | Width | Height | Length |
| 1 | 6.5" | 8.5" | 19" |
| 1A | 8" | 10.5" | 21" |
| 2 | 11.5" | 13.5" | 23.5" |




FLUSH V-WING
POST MOUNTING SOCKET
SECTION A-A




SIDE
FRONT
SINGLE SUPPORT




DETAIL A

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

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