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| STATE | PROJ. NO. | SHEET NO. | TOTAL SHEETS |
| N.D. | CH1219 | 1 | 5 |



SKETCH MAP OF NORTH DAKOTA SHOWING COUNTIES

CASS COUNTY HIGHWAY DEPARTMENT

PLANS

FOR

COUNTY PROJECT NO. CH1219

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.

INDEX OF DRAWINGS

| | |
|--------|--|
| SHT. 1 | TITLE PAGE |
| SHT. 2 | GENERAL NOTES & ESTIMATE OF QUANTITIES |
| SHT. 3 | PLAN VIEW |
| SHT. 4 | SHEAR PILE WALL DETAILS |
| SHT. 5 | TRAFFIC CONTROL LAYOUT & TRAFFIC CONTROL DEVICES LIST |

DESIGN DATA

| | |
|--------------------------------------|---------------|
| TRAFFIC | AVERAGE DAILY |
| CURRENT TRAFFIC (2010) | 1471 |
| TRAFFIC FORECAST (2030) | 1794 |
| DESIGN SPEED | 40 MPH |
| MINIMUM SIGHT DISTANCE (NON-PASSING) | 305 FEET |

PROJECT CONSISTS OF INSTALLATION OF
 SHEAR PILE WALL AND
 INCLINOMETER CASING (BY OTHERS)

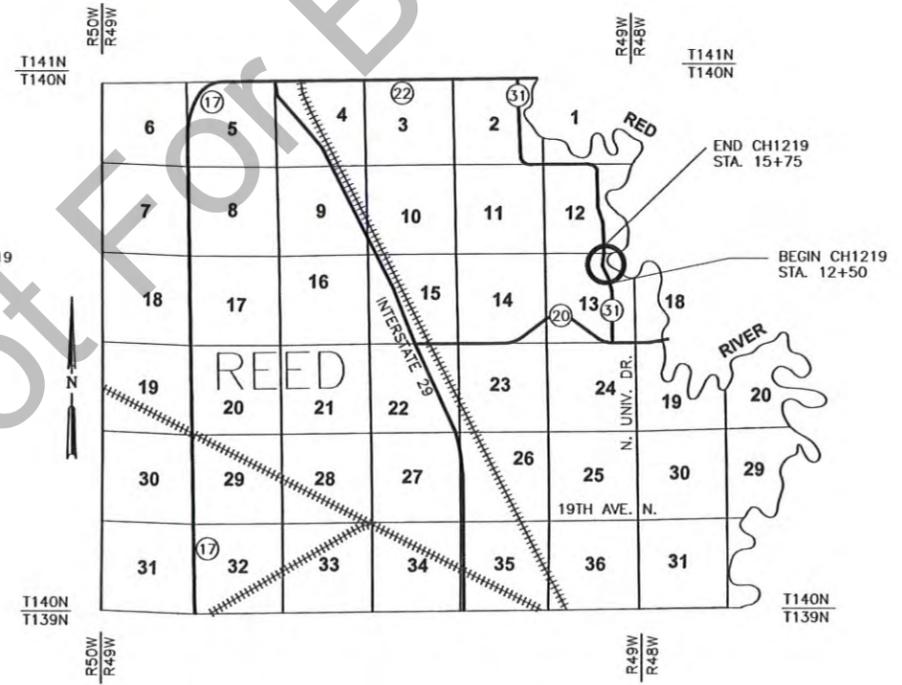
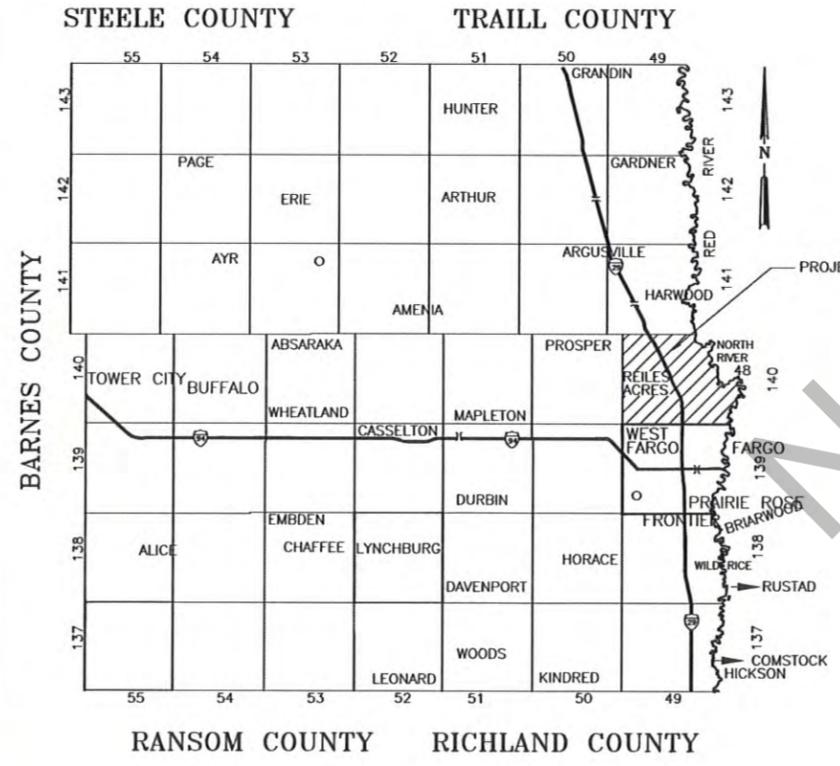
STANDARD DRAWINGS

| | |
|----------------------|--|
| D-704-7,8 | BREAKAWAY SYSTEMS FOR CONST. ZONE SIGNS |
| D-704-9,10,11,12,12A | CONSTRUCTION SIGNING DETAILS |
| D-704-13 | BARRICADE DETAILS |
| D-704-14 | CONST. SIGN & BARRICADE ASSEMBLY DETAILS |
| D-704-15,17,19,21 | CONST. SIGN & BARRICADE LOCATION DETAILS |
| D-708-2 | EROSION AND SILTATION CONTROLS BEAM GUARDRAIL GENERAL DETAILS |

THE STANDARD DRAWINGS ARE INCLUDED IN THE BACK OF THE PLANS

LENGTH OF PROJECT = 0.062 MILES

SURVEY JUNE, 2009
 DESIGN MARCH, 2013



APPROVED BY CASS COUNTY ENGINEER:
Jan P. Bern
 DATE: 4/4/13

Midwest Testing LABORATORY, INC.
 A Terracon COMPANY
 Fargo, N.D.
 P: (701) 282-9633
 F: (701) 282-9635

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GENERAL NOTES

REFERENCE GEOTECHNICAL REPORTS:

GEOTECHNICAL ENGINEERING REPORT, COUNTY ROAD 31 SLIDE REPAIR, CASS COUNTY, NORTH DAKOTA, PREPARED BY MIDWEST TESTING LABORATORY/TERRACON, PROJECT NO. M1125068. DATED JANUARY 22, 2013.

GEOTECHNICAL DESIGN REPORT, COUNTY ROAD 31 SLIDE REPAIR, CASS COUNTY, NORTH DAKOTA, PREPARED BY MIDWEST TESTING LABORATORY/TERRACON, PROJECT NO. M1135003. DATED MARCH 28, 2013.

- 622-P01 PILING SHALL BE DRIVEN WITH A STEAM, AIR, OR DIESEL HAMMER TO THE BOTTOM OF PILE ELEVATION SHOWN ON THE PLANS. CONTRACTOR SHALL BE RESPONSIBLE FOR SELECTING AN APPROPRIATE SIZED PILE HAMMER. THE MINIMUM FOOT-POUNDS OF ENERGY PER BLOW DEVELOPED BY STEAM, DIESEL, OR AIR HAMMER SHALL NOT BE LESS THAN 10,000 FOOT-POUNDS NOR LESS THAN TWO TIMES THE WEIGHT OF THE PILE IN POUNDS, WHICHEVER IS GREATER.
- 622-P02 PILE DRIVER LEADS SHALL BE USED FOR ALL TYPES OF HAMMERS. THEY SHALL ALLOW FREE MOVEMENT OF THE HAMMER AND RIGIDLY HOLD THE PILE IN CORRECT ALIGNMENT DURING THE DRIVING OPERATION. THE DRIVING OF PILING WITH FOLLOWERS IS NOT PERMITTED.
- 622-P03 STEEL-ENCASED CONCRETE PILES SHALL BE DRIVEN USING A STEEL COMBINATION DRIVING HEAD AND PILOT OF THE PROPER SIZE TO ENSURE PROPERLY DISTRIBUTED HAMMER BLOWS ON THE PILE SHELLS TO PREVENT DAMAGE. CLEARANCE BETWEEN THE PILOT RING AND THE PILE SHELL SHALL NOT EXCEED 1/4 INCH. A CUSHION BLOCK OF TIMBER SHALL BE USED BETWEEN THE HAMMER AND THE DRIVING HEAD. DIMENSIONS OF THE PILE SHELL SHALL BE AS SPECIFIED ON THE PLANS.
- 622-P04 PILE END ENCLOSURE PLATE SHALL BE CIRCULAR, NOT LESS THAN 3/4 INCH IN THICKNESS, AND NOT BE LARGER IN DIAMETER THAN THE OUTSIDE DIAMETER OF THE PILE SHELL.
- 622-P05 PILE SPLICES WILL NOT BE PERMITTED EXCEPT IN THE TOP 20 FEET OF THE PILE LENGTH.
- 622-P06 ADEQUATE LIGHTING SHALL BE PROVIDED FOR INSPECTION OF THE PILE SHELL THROUGHOUT ITS ENTIRE LENGTH. IMPROPERLY DRIVEN, BROKEN, AND DEFECTIVE PILE THAT IS NOT WATERTIGHT, SHOWS BENDS, KINKS, OR OTHER DEFORMATIONS SHALL BE REMOVED AND REPLACED OR REPAIRED BY AND AT THE CONTRACTOR'S EXPENSE. THE TOPS OF PILE SHELLS THAT ARE NOT FILLED WITH CONCRETE IMMEDIATELY AFTER DRIVING SHALL BE SEALED TEMPORARILY TO PREVENT THE ENTRANCE OF WATER OR FOREIGN SUBSTANCES.
- 622-P07 ALL PILE SHELLS SHALL BE COMPLETELY DRIVEN BEFORE ANY CONCRETE IS PLACED IN THE PILE SHELLS.
- 708-P01 SEEDING - TYPE B-CLASS V: THE SEEDING QUANTITIES ARE BASED ON SEEDING ALL OF THE DISTURBED TOPSOIL AREAS. ANY AREAS DISTURBED OUTSIDE OF DESIGNATED AREA FOR CONTRACTOR OPERATIONS OR STORAGE WILL BE SEEDED AT THE CONTRACTOR'S EXPENSE. PAYMENT SHALL BE ACTUAL ACRES SEEDED. SEEDING MIXTURE AND APPLICATION RATE SHALL BE AS FOLLOWS:
 A-1 PASTURE MIX
 MEADOW BROMEGRASS - 25%
 INTERMEDIATE WHEATGRASS - 25%
 CRESTED WHEATGRASS - 25%
 TETRAPLOID INT. RYEGRASS - 10%
 CREEPING ALFALFA - 15%

 80 LBS OF SEED AND 20 LBS OF RYE PER ACRE.
- 708-P02 MULCHING: ALL EXCAVATION AND EMBANKMENT AREAS SHALL BE STABILIZED WITH STRAW MULCH AFTER THE COMPLETION OF THE SEEDING OPERATIONS. MULCHING SHALL BE PLACED UNIFORMLY AT OVER THE SEEDED AREAS AT A RATE OF 2 TONS PER ACRE. APPROXIMATELY 10% OF THE SOIL SURFACE SHALL BE VISIBLE THROUGH THE MULCH BLANKET BEFORE THE MULCH TILLER (ANCHORING/PUNCHING) OPERATION. ALL COSTS FOR MULCHING/ANCHORING OPERATION TO BE INCLUDED IN THE PRICE BID FOR MULCHING. NO ADJUSTMENT TO UNIT PRICES WILL BE MADE FOR THE INCREASE OR DECREASE IN QUANTITIES.
- 708-P03 TEMPORARY EROSION CONTROL: TEMPORARY EROSION CONTROL HAS BEEN PROVIDED FOR PLACEMENT PRIOR TO DISTURBING THE TOPSOIL. LOCATIONS OF EROSION AND SITUATION CHECKS ARE SHOWN IN THE PLANS AND ARE TYPICALLY AT PIPE INLETS, WHERE DRAINAGE LEAVES THE RW, AND OTHER AREAS APPROVED BY THE ENGINEER (TO BE USED IN CONJUNCTION WITH SECTION 110 OF THE STANDARD SPECIFICATIONS).
- 764-P03 THE EXISTING GUARDRAIL AND FENCING WILL BE BY OTHERS.

| ESTIMATED QUANTITIES | | | | |
|----------------------|----------|-----------------------------------|-------|--------|
| SPEC. NO. | CODE NO. | ITEM | UNIT | TOTAL |
| 103 | 0100 | CONTRACT BOND | L SUM | 1 |
| 201 | 0330 | CLEARING AND GRUBBING | L SUM | 1 |
| 622 | 2052 | STEEL ENCASED CONC PILING 16INX.5 | LF | 12,880 |
| 702 | 0100 | MOBILIZATION | L SUM | 1 |
| 704 | 1000 | TRAFFIC CONTROL SIGNS | UNIT | 793 |
| 704 | 1052 | TYPE III BARRICADE | EA | 12 |
| 708 | 1430 | FIBER ROLLS 12IN | LF | 550 |
| 708 | 2280 | SEEDING - TYPE B - CLASS V | ACRE | 1.00 |
| 708 | 5500 | MULCHING | ACRE | 1.00 |

- 802-P01 THE PILES SHALL BE FILLED WITH CLASS AE3 CONCRETE MEETING SECTION 802. THE CONCRETE SHALL BE DEPOSITED IN ONE CONTINUOUS OPERATION AND THE RATE OF DEPOSITING SHALL BE MODERATED TO AVOID FORMATION OF AIR POCKETS. THE MINIMUM 28-DAY UNCONFINED COMPRESSIVE STRENGTH OF CONCRETE (F'c) SHALL BE 4000 PSI.
- 840-P01 CONCRETE AND STEEL END ENCLOSURE PLATES USED IN STEEL-ENCASED CONCRETE PILING WILL NOT BE MEASURED AS SEPARATE ITEMS.
- 840-P02 CYLINDRICAL PIPE SHELLS SHALL BE ELECTRIC WELDED STEEL PIPE OR SEAMLESS STEEL PIPE AND SHALL MEET ASTM A 252, GRADE 3 MODIFIED (MINIMUM YIELD STRESS = 50 KSI).
- 840-P03 END CLOSURE PLATES SHALL BE 3/4-INCH FLAT STEEL PLATE WELDED DIRECTLY TO THE PIPE AND SHALL NOT PROJECT BEYOND THE PERIMETER OF THE PILE. ALL COSTS ASSOCIATED WITH WELDING STEEL END CLOSURE PLATES SHALL BE INCLUDED IN THE BID ITEM STEEL ENCASED CONCRETE PILING 16INX.5.
- 920-P01 CONTRACTOR SHALL COORDINATE PILE CONCRETING OPERATIONS WITH COUNTY'S GEOTECHNICAL ENGINEER TO ALLOW INSTALLATION OF INCLINOMETER CASING IN THREE (3) PILES AS SHOWN ON THE PLANS.

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| | |
|---|---|
|  | <p>CASS COUNTY HIGHWAY DEPARTMENT</p> <p>COUNTY ROAD 31 SLOPE STABILIZATION</p> <p>GENERAL NOTES & ESTIMATE OF QUANTITIES</p> <p>PROJECT NO. CH1219 COUNTY ROAD 31 REED TOWNSHIP CASS COUNTY</p> |
|---|---|

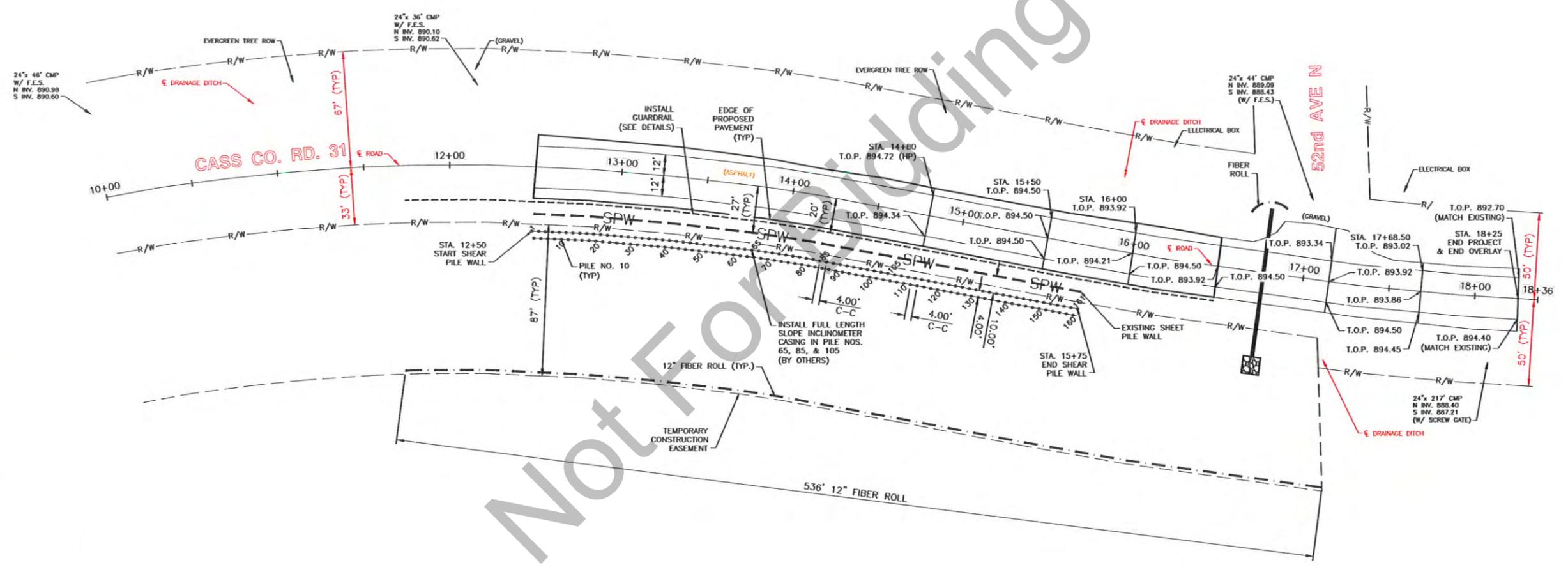
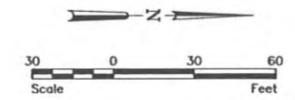
| STATE | PROJ. NO. | SHEET NO. | TOTAL SHEETS |
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| N.D. | CH1219 | 3 | 5 |

CURVE DATA

| ① | ② |
|------------------------------|------------------------------|
| $\Delta = 01^{\circ}35'03''$ | $\Delta = 41^{\circ}56'10''$ |
| T = 145.42' | T = 439.28' |
| L = 289.79' | L = 838.72' |
| D = 4'00" | D = 5'00" |

LEGEND

- WATER MAIN — W —
- GATE VALVE — G —
- UNDERGROUND ELECTRIC — UCE —
- UNDERGROUND TELEPHONE — UGT —
- UNDERGROUND FIBER OPTIC — FO —
- CABLE TV — CTV —
- CONFEROUS TREE — 
- SPOT ELEVATION — 
- T.O.P. — 
- 12" FIBER ROLL — 
- EXISTING SHEET PILE WALL — 



NOTES:

- CONTRACTOR TO COORDINATE INCLINOMETER, CASING INSTALLATION WITH COUNTY'S GEOTECHNICAL ENGINEER.
- ALL PILES SHALL BE INSTALLED TO ELEV. 800.00 (BOTTOM OF PILE)
- ALL STEEL SHELLS FOR SEC PILES SHALL BE 16INX.5, ASTM A252, GRADE 3 MODIFIED (MIN. YIELD STRESS = 50KSI)

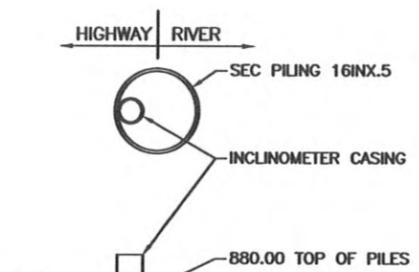


CASS COUNTY
HIGHWAY DEPARTMENT
COUNTY ROAD 31 SLOPE
STABILIZATION
PLAN VIEW

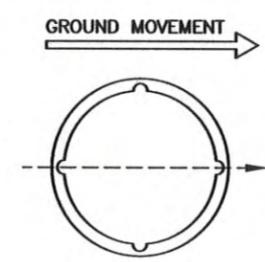
PROJECT NO. CH1219
COUNTY ROAD 31
REED TOWNSHIP
CASS COUNTY

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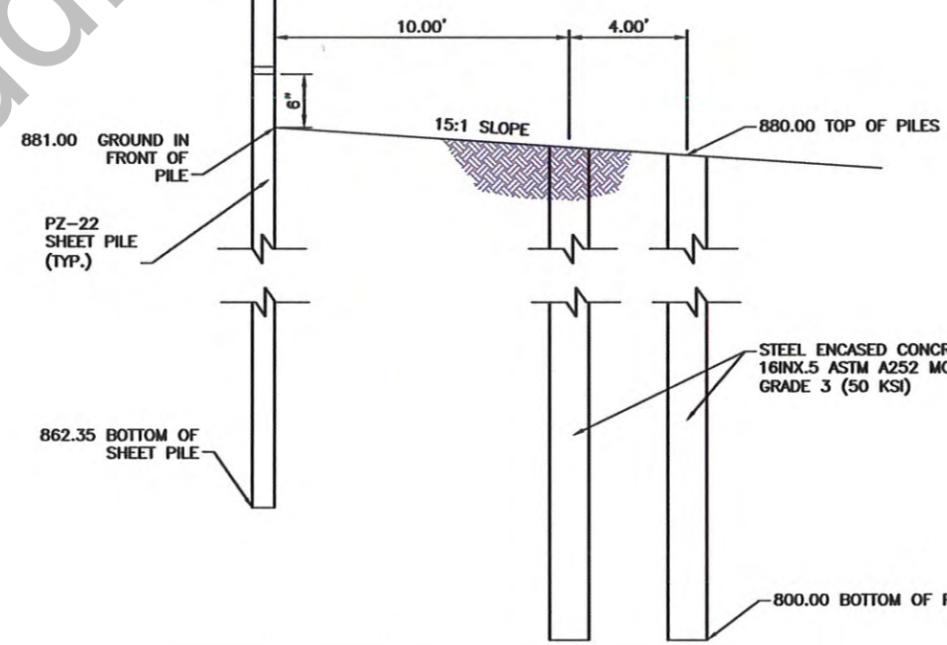
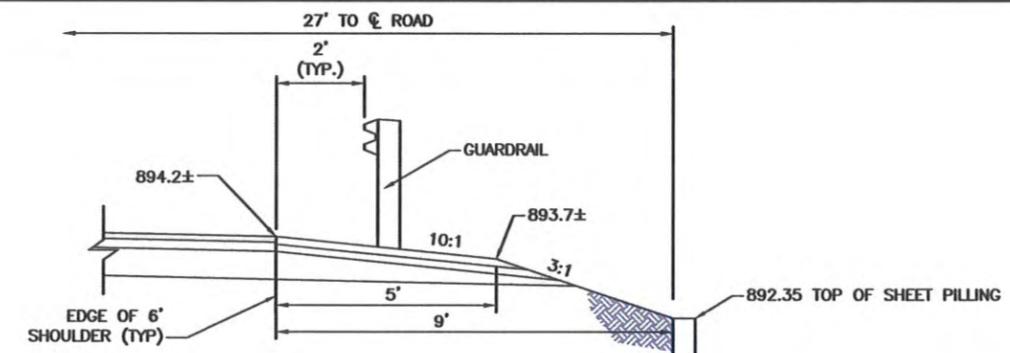


- NOTES:**
1. ASSEMBLE AND LOWER INCLINOMETER CASING INTO EMPTY PILE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
 2. ALIGN 90 DEGREE CASING GROOVE ORIENTATION PARALLEL TO AND PERPENDICULAR TO SHEET PILE WALL ALIGNMENT AVOIDING CASING TWIST.
 3. WEIGHT CASING WITH STEEL DRILL RODS (FULL LENGTH) TO HOLD CASING IN PLACE.
 4. PRIOR TO PLACING CONCRETE IN PILE SHELL, RECHECK INCLINOMETER GROOVE ORIENTATION.
 5. PLACE CONCRETE IN PILE SHELL PER SPECIFICATIONS.
 6. INSTALL PROTECTIVE CASING COVER/STAND PIPE WITH LOCKING CAP.



800.00 BOTTOM OF PILES

TYPICAL INCLINOMETER CASING INSTALLATION (BY OTHERS)
(FOR INFORMATION ONLY - NOT TO SCALE)



TYPICAL SHEAR PILE WALL SECTION
NOT TO SCALE

Not For Bidding



CASS COUNTY
HIGHWAY DEPARTMENT
COUNTY ROAD 31 SLOPE
STABILIZATION

SHEAR PILE WALL DETAILS

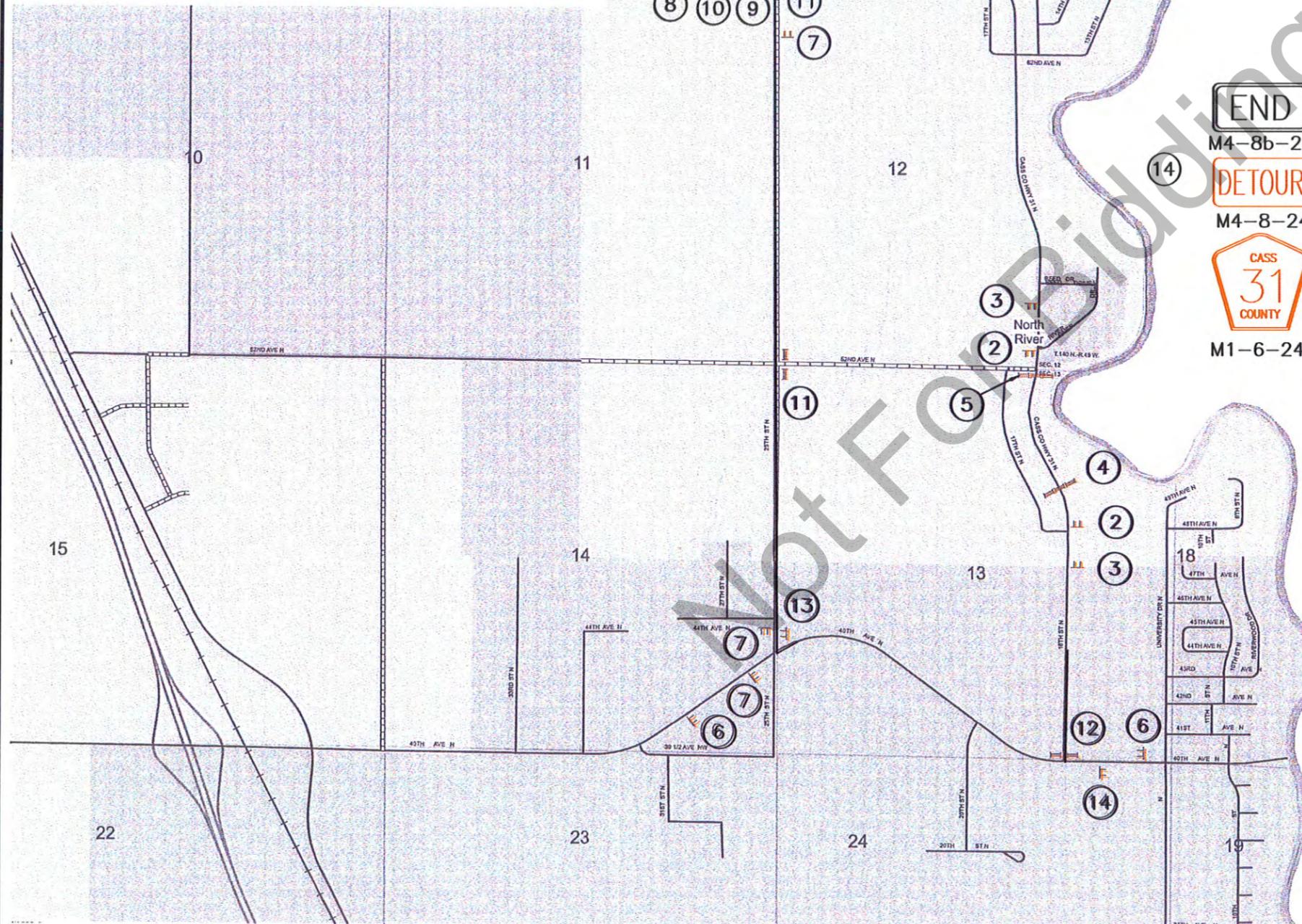
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CASS COUNTY ROAD 31
REED TOWNSHIP
CASS COUNTY

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| TRAFFIC CONTROL DEVICES LIST | | | | | |
|------------------------------|-----------|---|-------------------|----------------|-----------------|
| Sign Number | Sign Size | Description | Quantity Required | Units per Sign | Units Sub-total |
| M1-6-24 | 24"x24" | COUNTY ROUTE MARKER | 8 | 20 | 160 |
| M4-8-24 | 24"x12" | DETOUR (Mounted on route marker post) | 8 | 7 | 56 |
| M4-8b-24 | 24"x12" | END (Mounted on route marker post) | 2 | 7 | 14 |
| M4-10-48 | 48"x18" | DETOUR ARROW RIGHT or LEFT | 4 | 23 | 92 |
| M6-1-21 | 21"x15" | ARROW RT or LT (Mounted on route marker post) | 4 | 7 | 28 |
| R11-2-48 | 48"x30" | ROAD CLOSED | 2 | 28 | 56 |
| R11-3a-60 | 60"x30" | ROAD CLOSED MILES AHEAD LOCAL TRAFFIC ONLY | 3 | 31 | 93 |
| W16-9p-24 | 24"x12" | AHEAD (Mounted on route marker post) | 2 | 7 | 14 |
| W20-2-48 | 48"x48" | DETOUR AHEAD or FT. | 3 | 35 | 105 |
| W20-3-48 | 48"x48" | ROAD or STREET CLOSED AHEAD or FT. | 5 | 35 | 175 |
| Total Units: | | | | | 793 |
| Pay Item Description | | | | | |
| TRAFFIC CONTROL SIGNS | | | UNIT | Spec & Code | Quantity |
| TYPE III BARRICADES | | | EACH | 704-1052 | 12 |

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/>

TT POST-MOUNTED SIGN
F TYPE III BARRICADES



- ① ROAD CLOSED AHEAD W20-3-48
- ② ROAD CLOSED 500 FT W20-3-48
- ③ ROAD CLOSED 1000 FT W20-3-48
- ④ ROAD CLOSED R11-2-48
- ⑤ ROAD CLOSED R11-2-48
- ⑥ CASS 31 COUNTY M1-6-24
- ⑦ AHEAD W16-9p-24
- ⑧ DETOUR M4-8-24
- ⑨ CASS 31 COUNTY M1-6-24
- ⑩ DETOUR M4-8-24
- ⑪ DETOUR M4-8-24
- ⑫ DETOUR M4-8-24
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| STATE | PROJ. NO. | SHEET NO. | TOTAL SHEETS |
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| N.D. | CH1219 | 5 | 5 |

- ⑨ DETOUR 500 FT W20-2-48
- ⑩ DETOUR 1000 FT W20-2-48
- ⑪ ROAD CLOSED 1 MILE AHEAD LOCAL TRAFFIC ONLY R11-3a-60
- ⑪ DETOUR M4-10-48
- ⑫ ROAD CLOSED 1 MILE AHEAD LOCAL TRAFFIC ONLY R11-3a-60
- ⑫ DETOUR M4-10-48
- ⑬ DETOUR M4-8-24
- ⑬ CASS 31 COUNTY M1-6-24
- ⑬ DETOUR M6-1-21



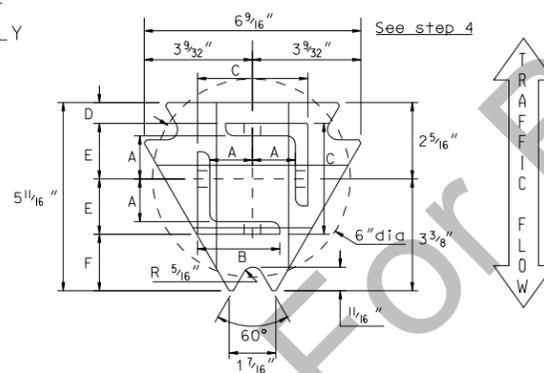
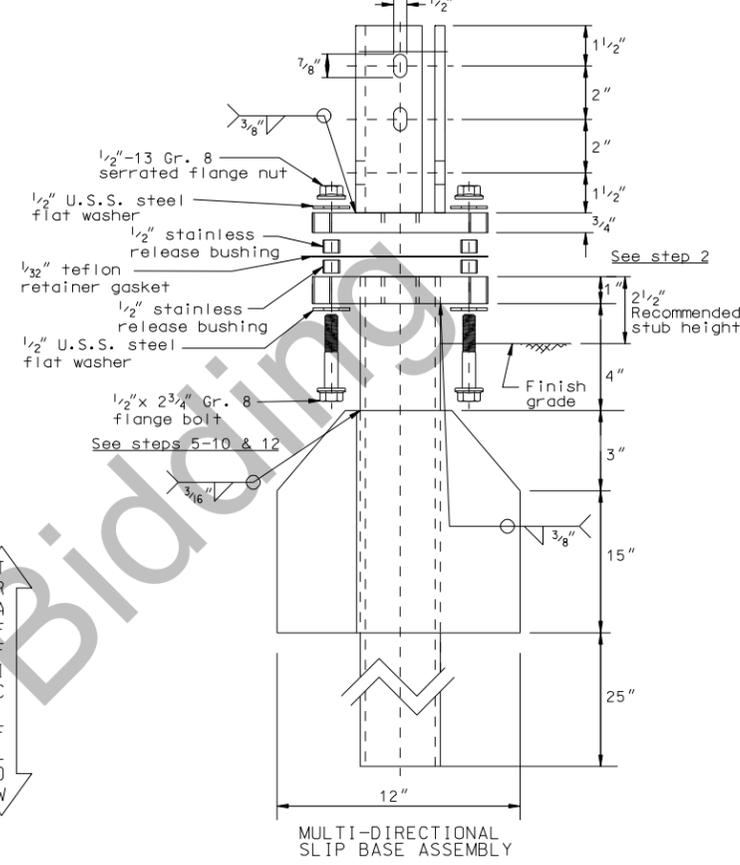
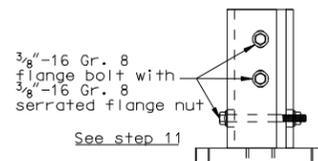
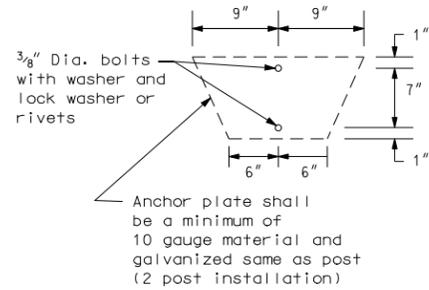
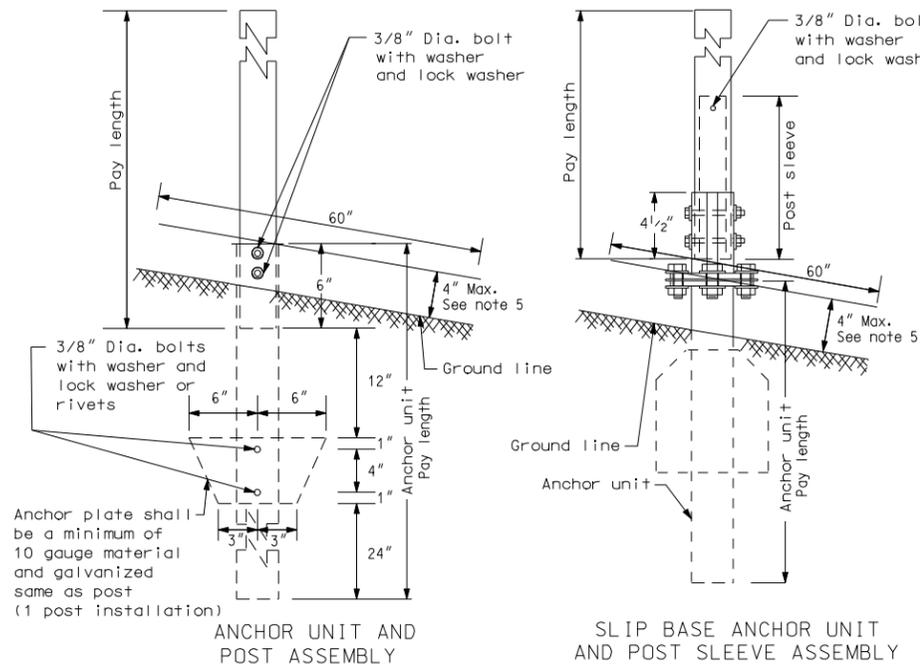
CASS COUNTY
HIGHWAY DEPARTMENT
COUNTY ROAD 31 SLOPE
STABILIZATION
DETOUR PLAN

PROJECT NO. CH1219
COUNTY ROAD 31
REED TOWNSHIP
CASS COUNTY

BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

PERFORATED TUBE

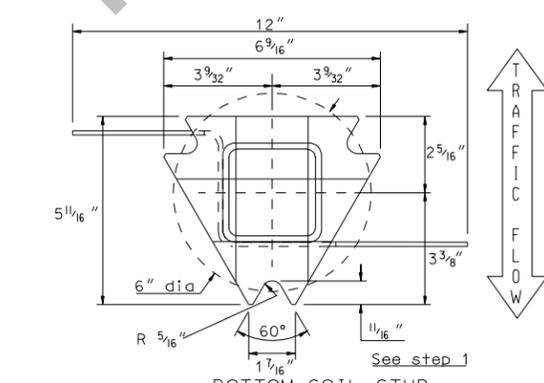
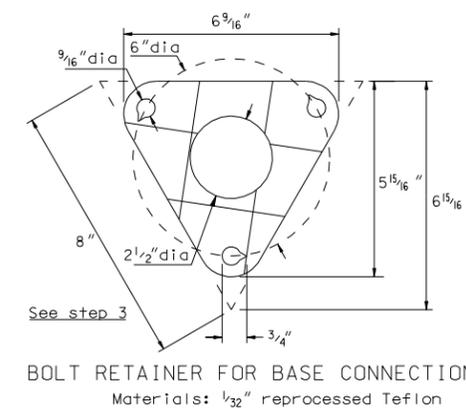
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TOP POST RECEIVER DATA TABLE

| Square Post Sizes | A | B | C | D | E | F |
|------------------------------|---------|--------|---------|---------|----------|--------|
| 2 3/16" x 10 Ga. Square Post | 1 3/64" | 2 1/2" | 3 1/32" | 2 5/32" | 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.



- Notes
- Slip base bolts shall be torqued as specified by the manufacturer.
 - 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.
 - Anchor for 2", 2 1/4", and 2 1/2" posts.
 - 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.
 - 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.
 - When used in concrete sidewalk, anchor shall be the same except without the wings.
 - Four post signs shall have over 8' between the first and fourth posts.

Telescoping Perforated Tube

| 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. *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. *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 |

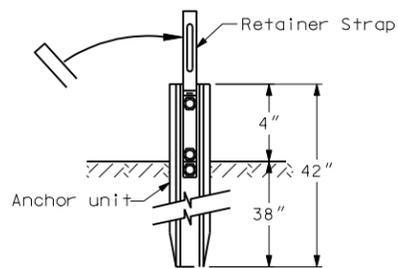
This document was originally issued and sealed by MARK S GAYDOS, Registration Number PE-4518, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

FLANGED CHANNEL

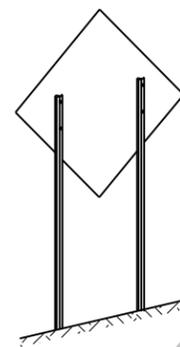
3 LB/FT U POSTS



Anchor Unit & Strap Assembly Detail

STEPS OF INSTALLATION

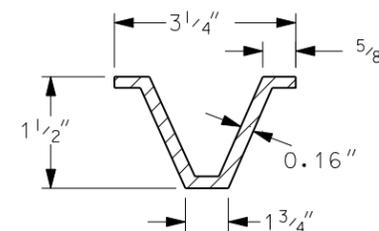
1. A) Drive anchor unit to within 12" of ground level.
B) Proper assembly established by lining up the top 3/4" slot of retainer spacer strap with top hole of anchor unit.
C) Assemble strap to back of anchor unit using 3/8"-16 UNC x 2.0" long bolt, lock washer and nut.
D) Rotate strap 90° to left.
2.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



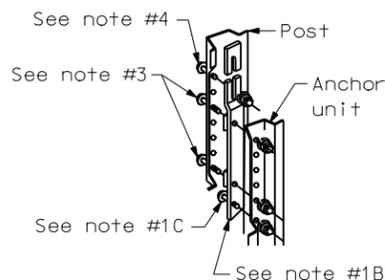
Typical Installation

Notes

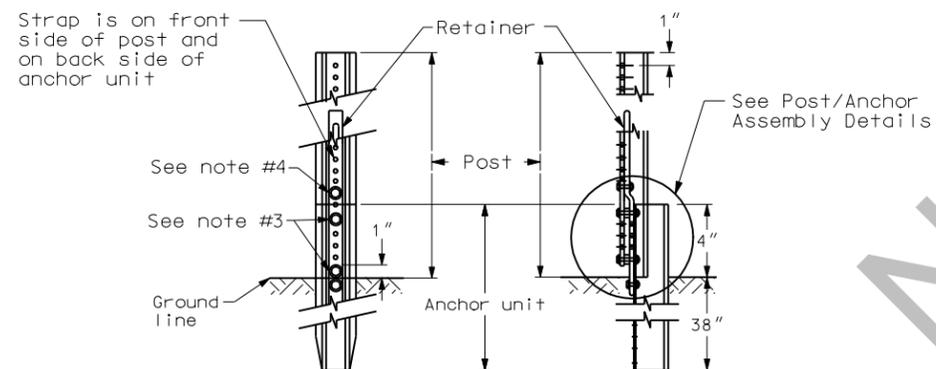
1. Use 3 lb/ft riser anchor units and risers
2. Driven riser posts shall be at least 7' long and embedded at least 3.5'.
3. A splice shall overlap a minimum of 18".
4. Use 4 bolts 5/16" diameter with washers and nuts. Two at top and two at bottom of splice.
5. Anchor unit for guy wires shall be no more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



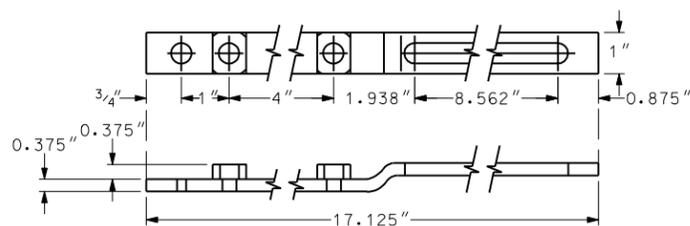
U-Post Detail (3 lb/ft)



Post/Anchor Assembly Details

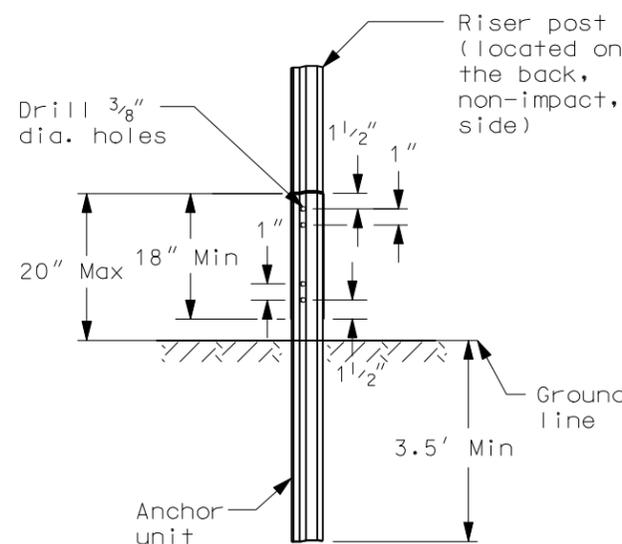


Front View Side View Sign Post Assembly Detail

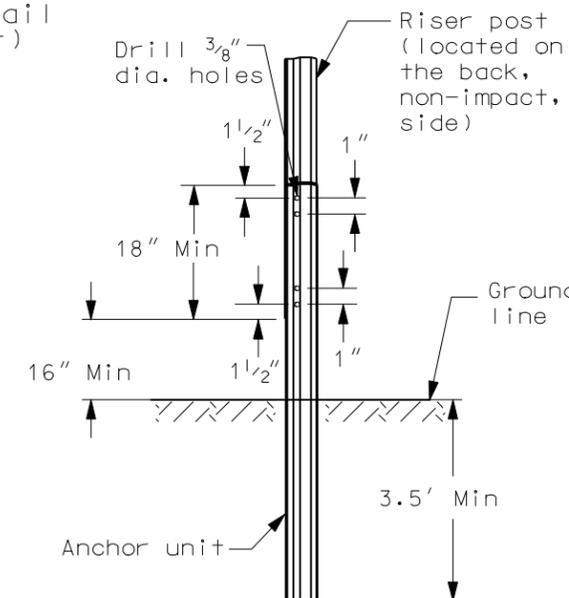


Retainer/Spacer Strap Detail

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



U-Channel Splice Option 1

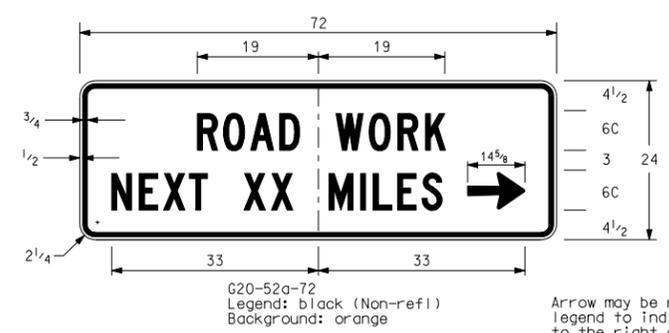
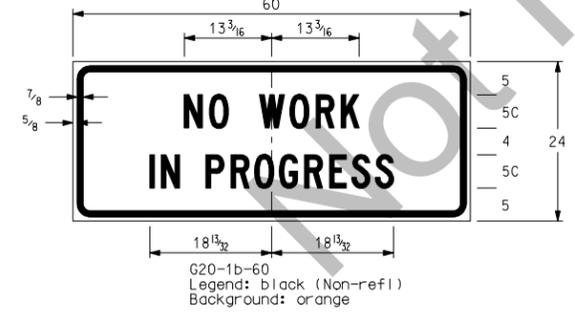
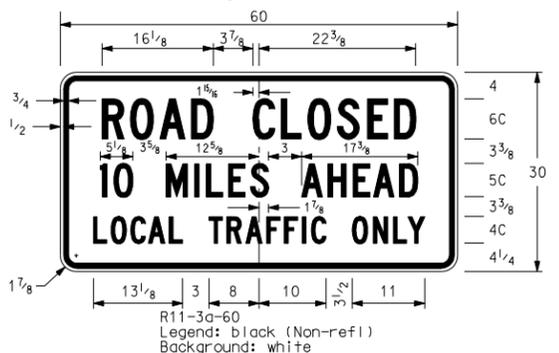
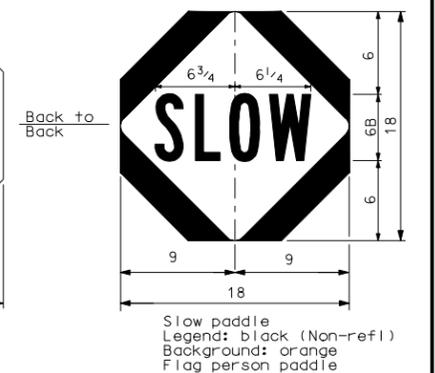
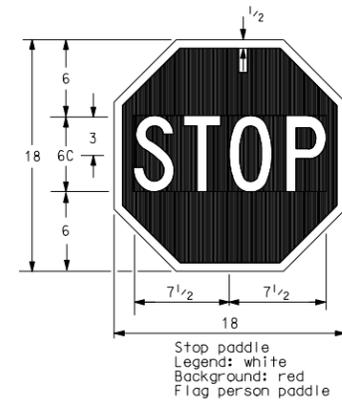
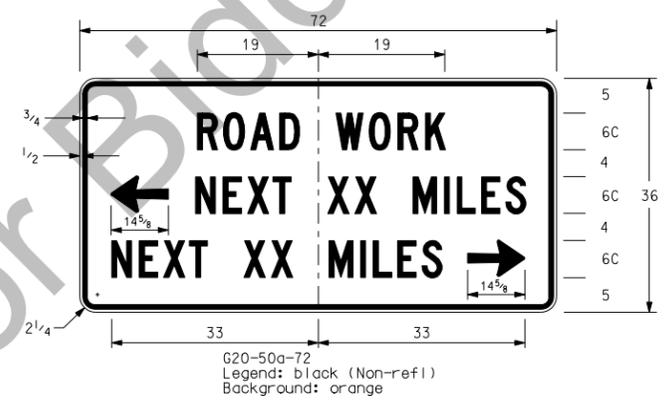
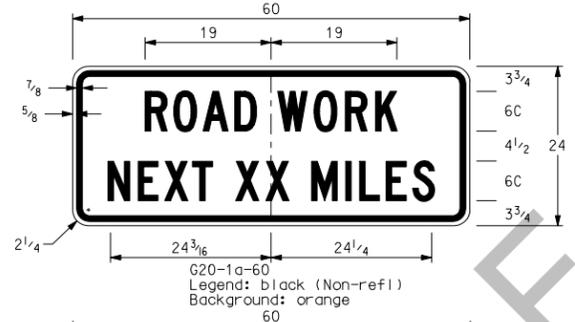
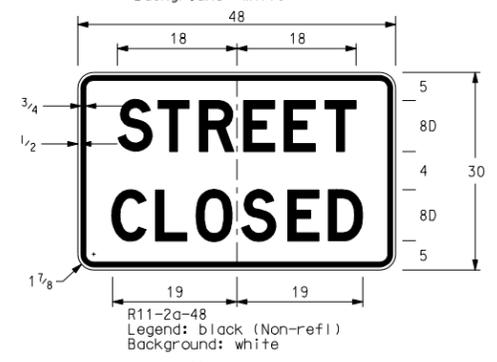
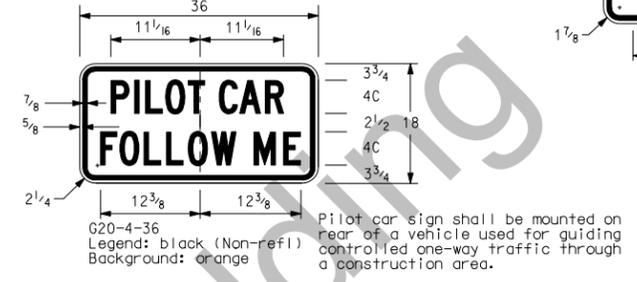
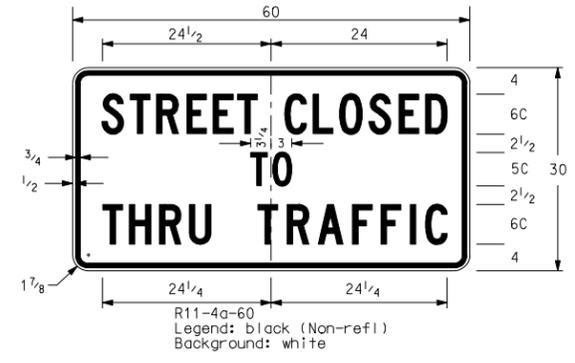
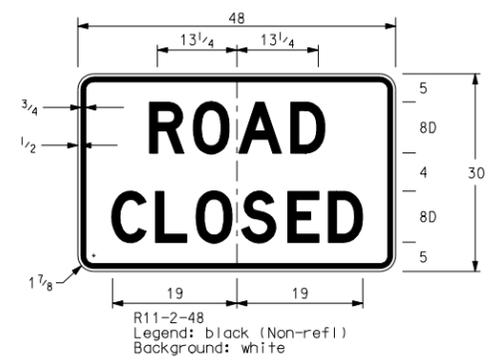
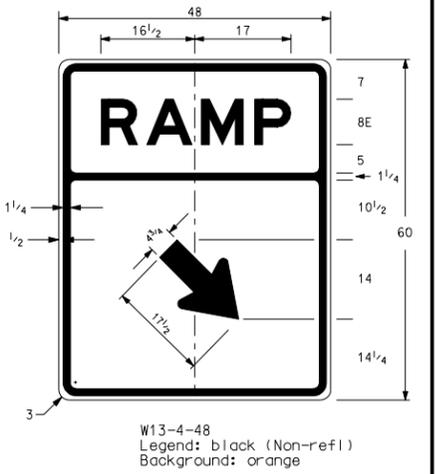
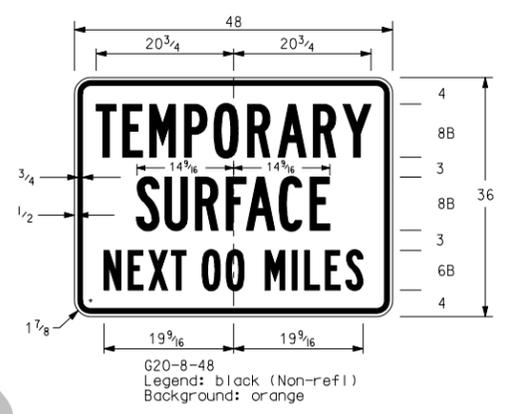
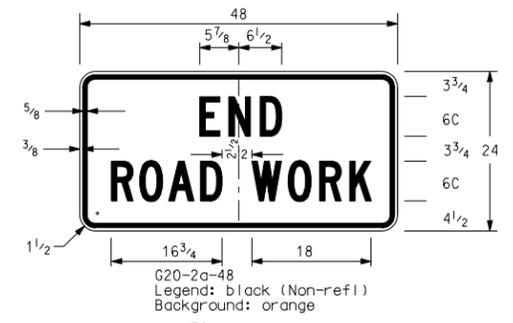
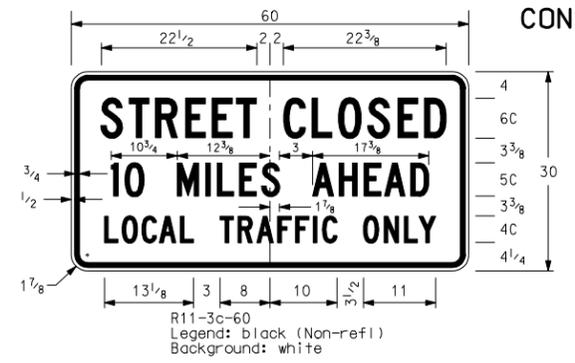
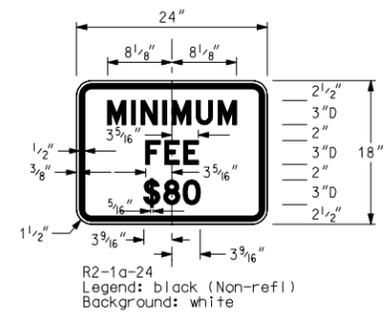


U-Channel Splice Option 2

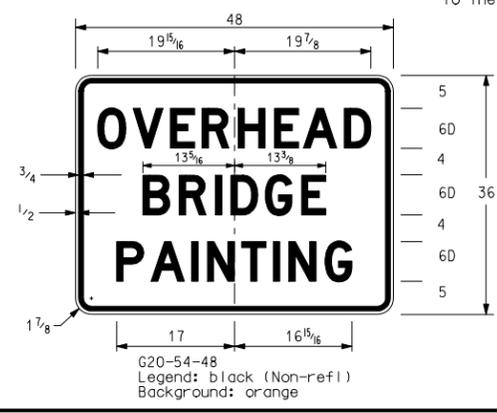
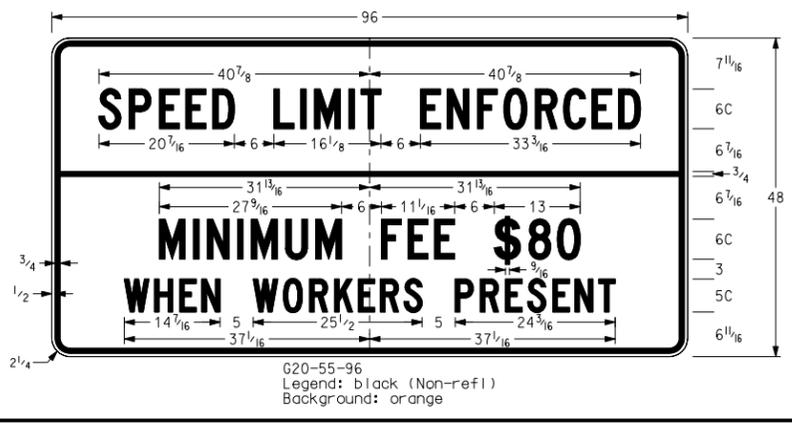
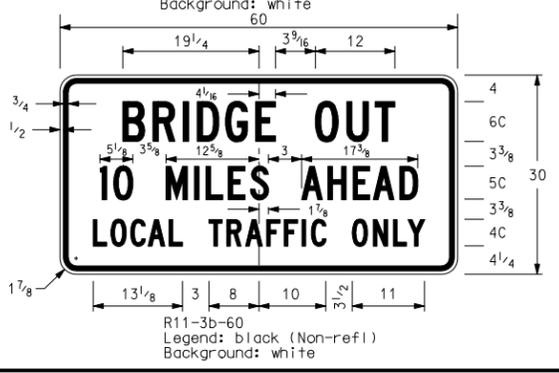
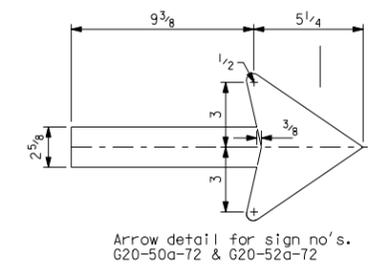
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|------------------------------|
| 07-28-93 | |
| REVISIONS | |
| DATE | CHANGE |
| 03-07-01 | Revised U-post details |
| 11-21-02 | Deleted perforated tube |
| 05-08-03 | Revised U-Channel splice |
| 12-01-04 | PE stamp added |
| 06-29-05 | Revised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

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CONSTRUCTION SIGN DETAILS



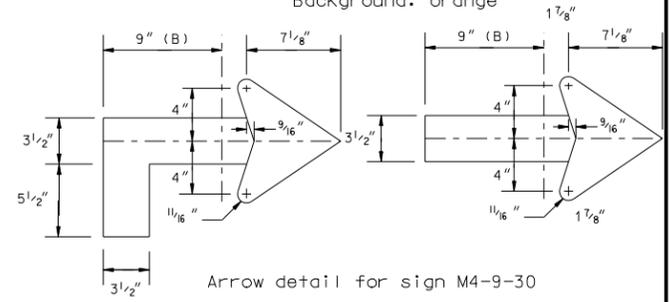
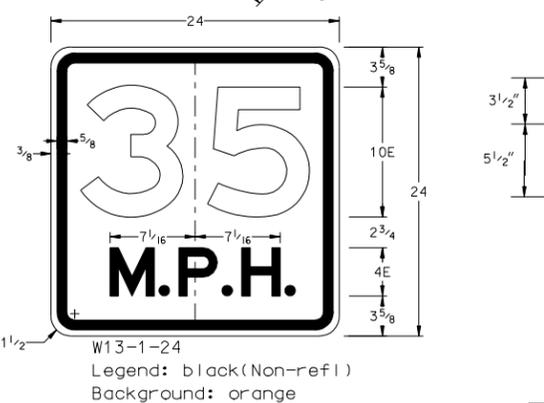
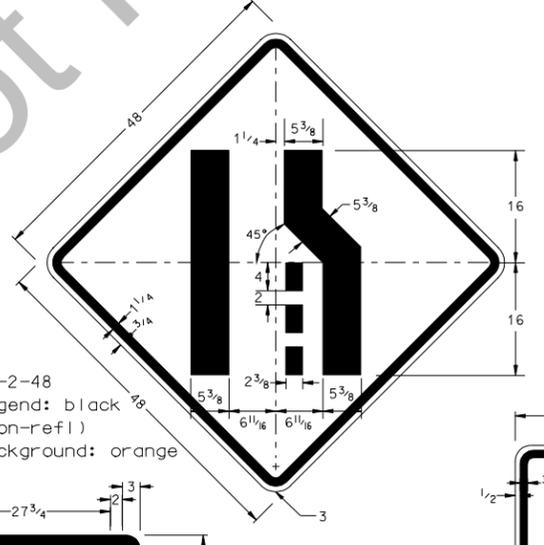
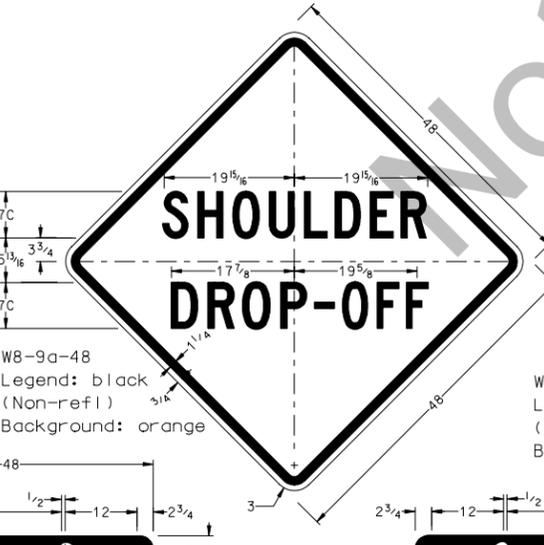
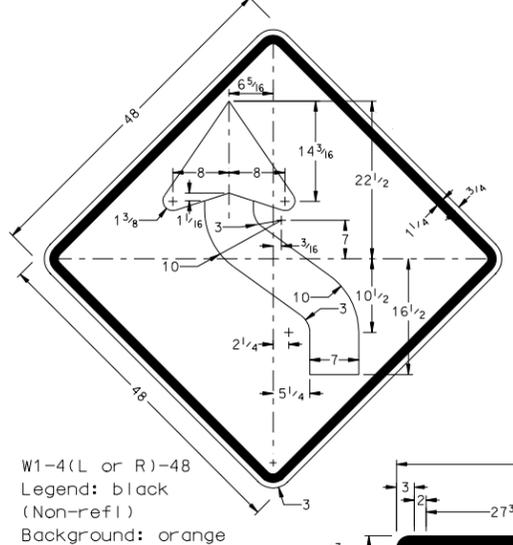
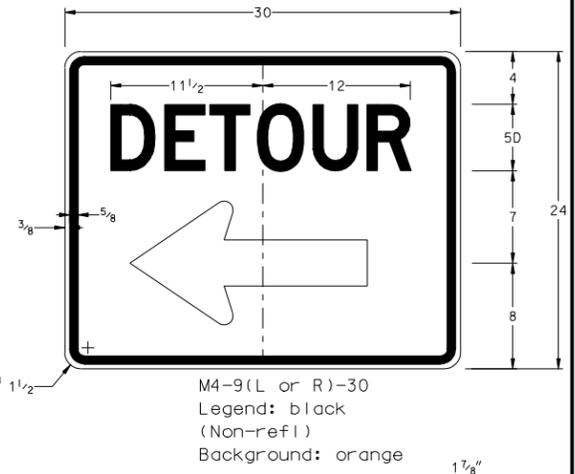
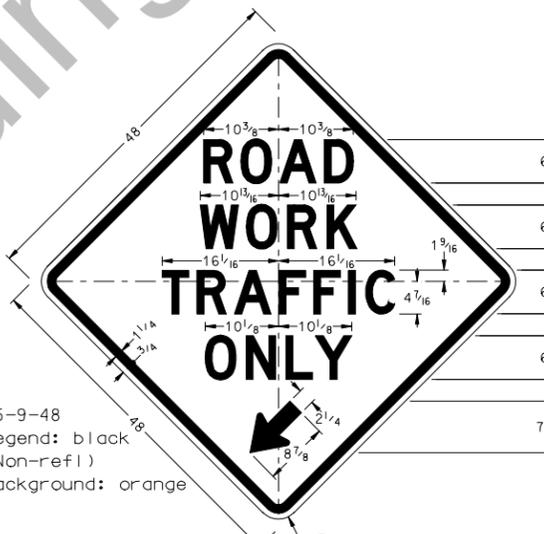
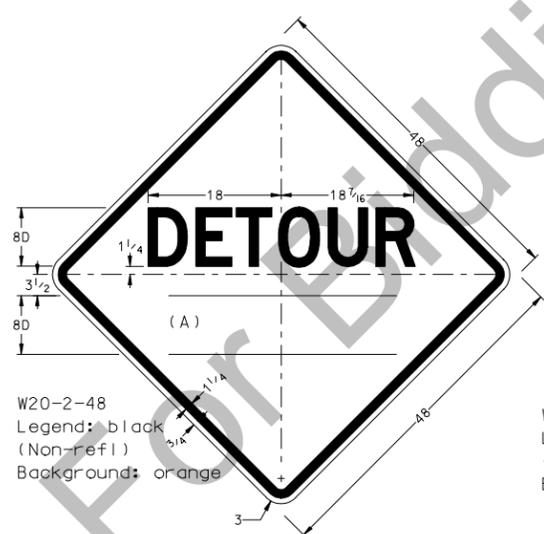
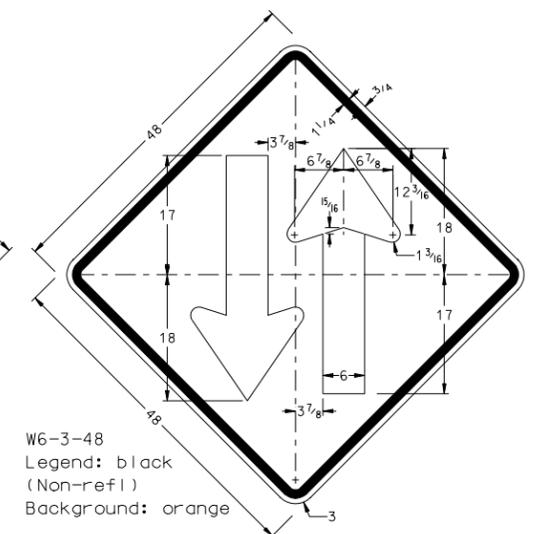
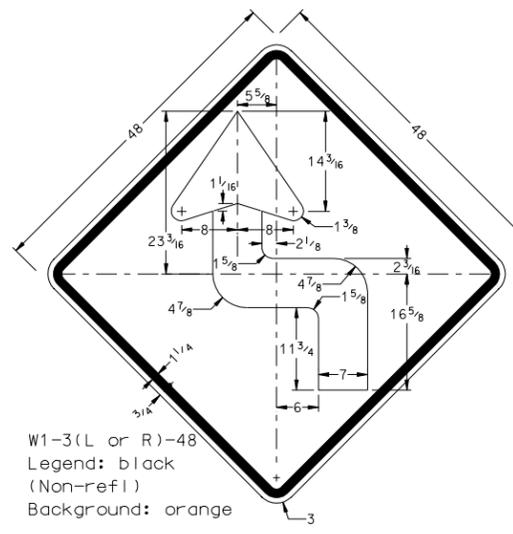
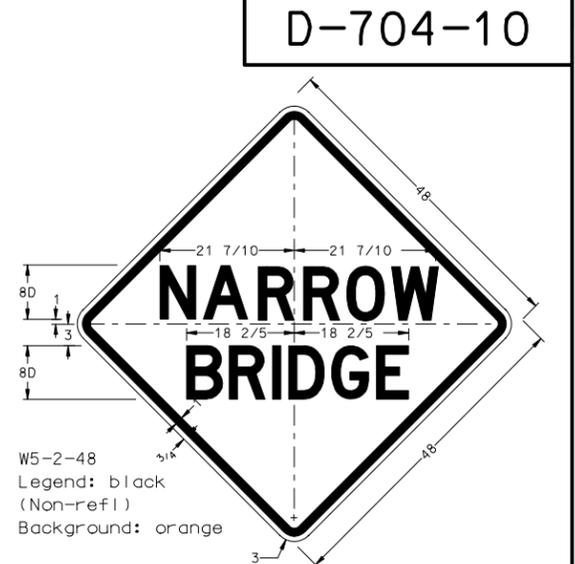
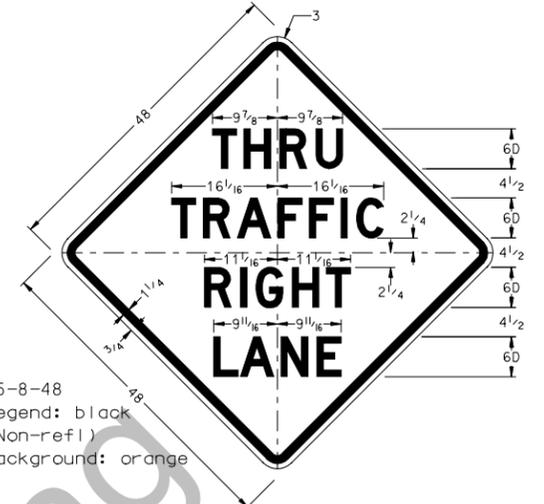
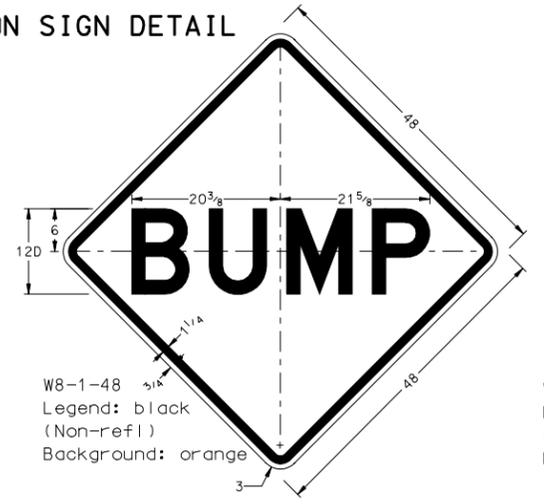
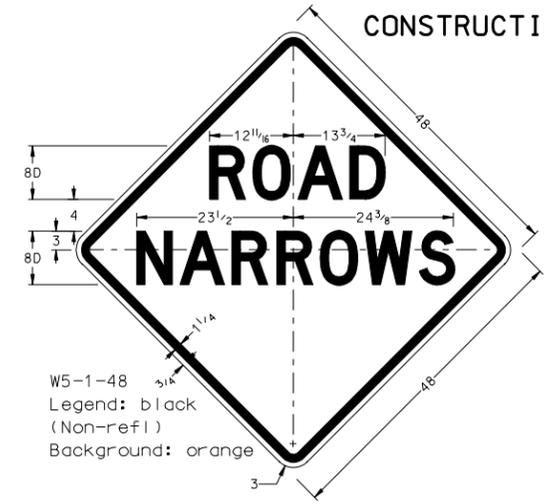
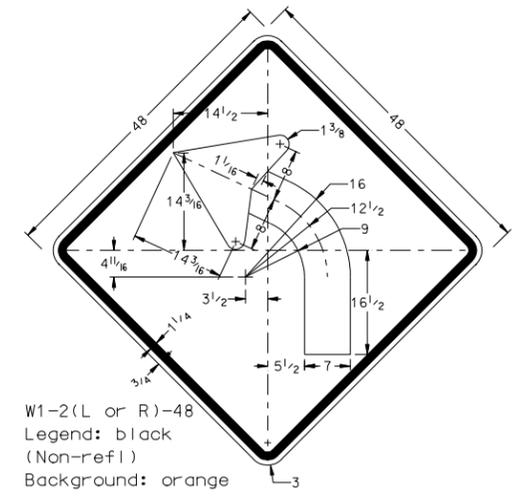
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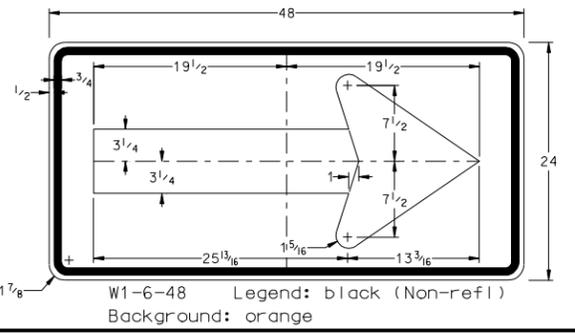
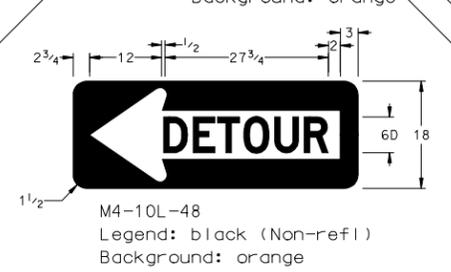
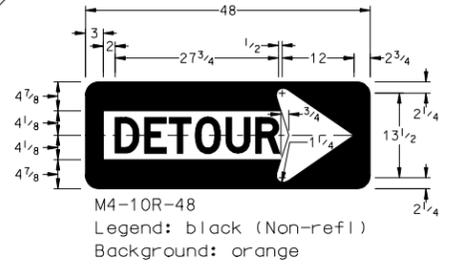
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|---|------------------------------------|
| 10-1-86 | |
| REVISIONS | |
| DATE | CHANGE |
| 05-01-92 | General revision |
| 07-26-95 | Added signs G20-1a, G20-50a, R2-1a |
| 03-04-96 | Remove G20-2-60 |
| 10-18-01 | G20-1b-60 |
| 01-30-03 | Pavement end sign |
| 07-25-04 | Revised Fee Sign |
| 04-01-04 | Revised G20-55-96 sign |
| 08-04-04 | Deleted W8-3-48, Added Slow paddle |
| 12-01-04 | PE stamp added |
| 07-11-05 | Revised G20-4 |

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CONSTRUCTION SIGN DETAIL



(A) See table on standard D-704-12 for messages and dimensions.
(B) Dimension shall be 3" when arrow is placed vertically.

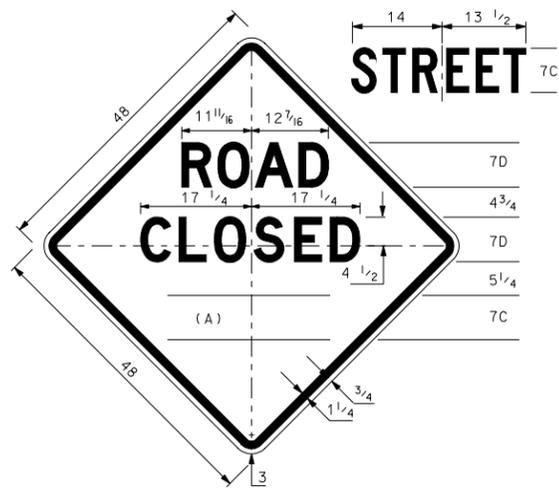


| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|------------------------|
| 10-1-86 | |
| REVISIONS | |
| DATE | CHANGE |
| 08-03-87 | Detour no. |
| 12-01-88 | Shoulder drop off |
| 05-01-88 | General revisions |
| 02-03-95 | W8-9a-48 |
| 03-04-96 | Remove W20-1-48 |
| 05-01-00 | W5-8-48, W5-9-48 |
| 11-07-00 | Add W5-2-48 |
| 01-06-04 | W4-9-30 to M4-9-30 |
| 08-04-04 | add arrow detail |
| 12-01-04 | General revisions |
| 07-11-05 | PE stamp added |
| | Revised W8-9a and W4-2 |

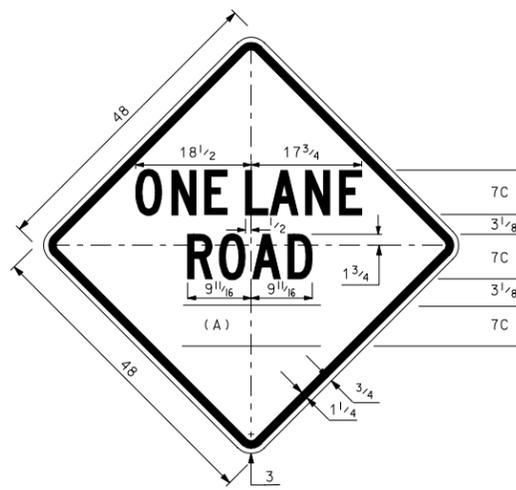
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CONSTRUCTION SIGN DETAIL

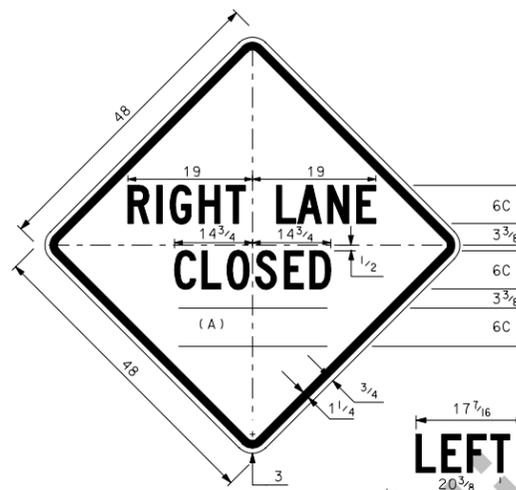
D-704-11



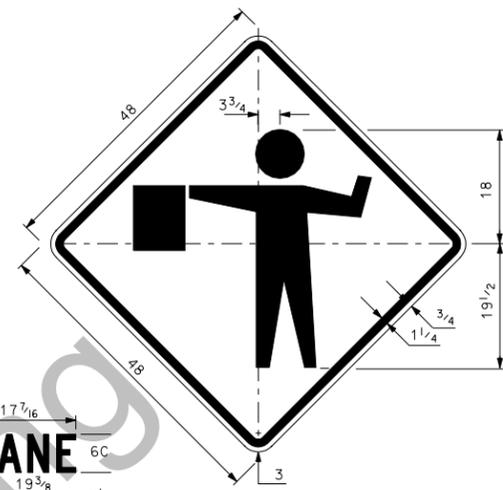
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Background: orange



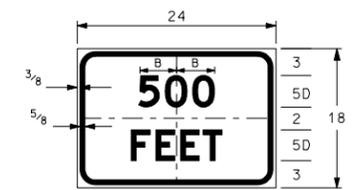
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W20-5-48
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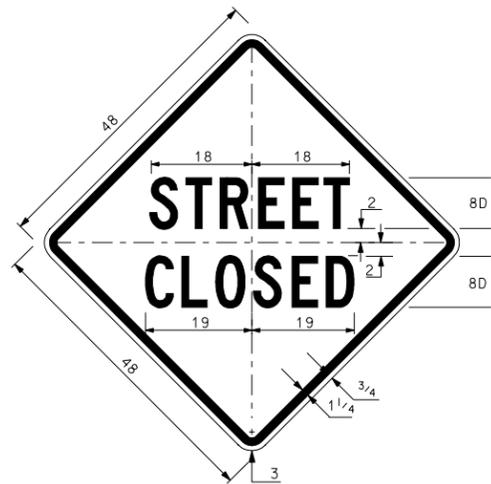
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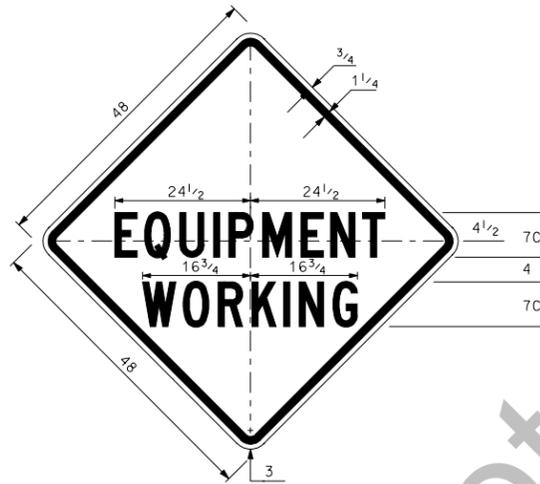
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| SIGN | DIMENSION B (INCHES) |
|-------|----------------------|
| 500' | 6 |
| 1000' | 7 3/8 |
| 1500' | 7 3/8 |

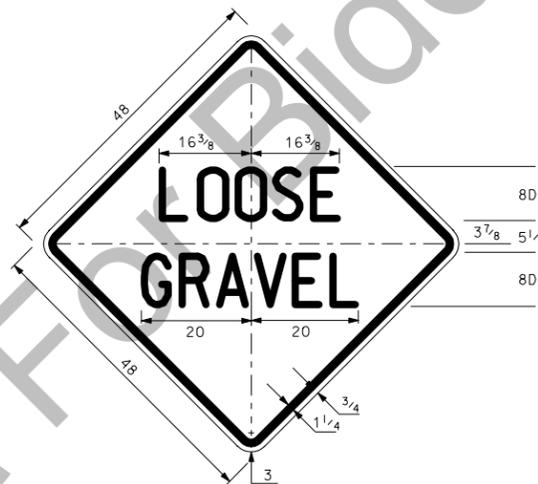
For use with W20-7a-48 & W21-1a-48



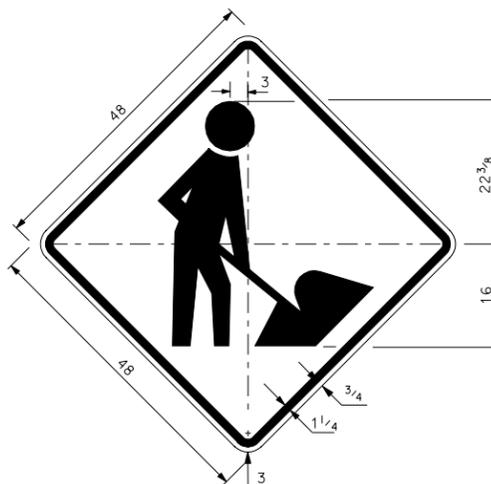
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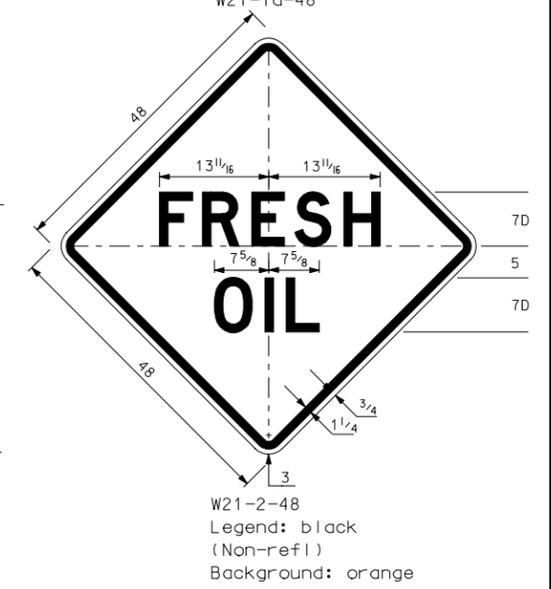
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W8-7-48
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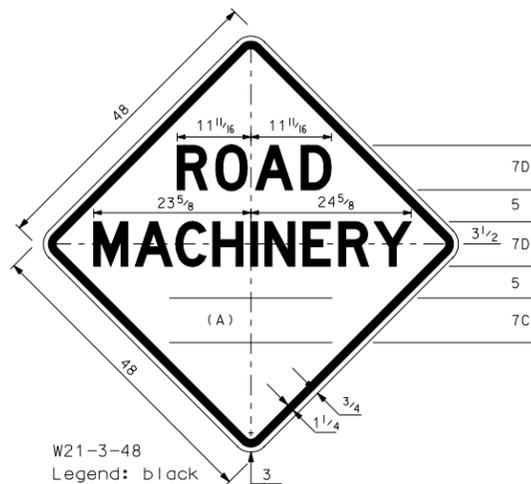
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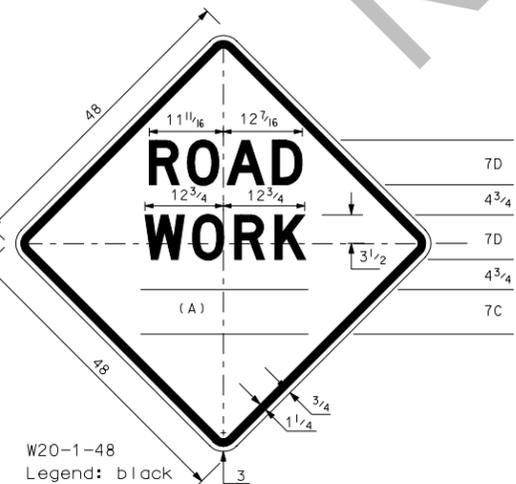
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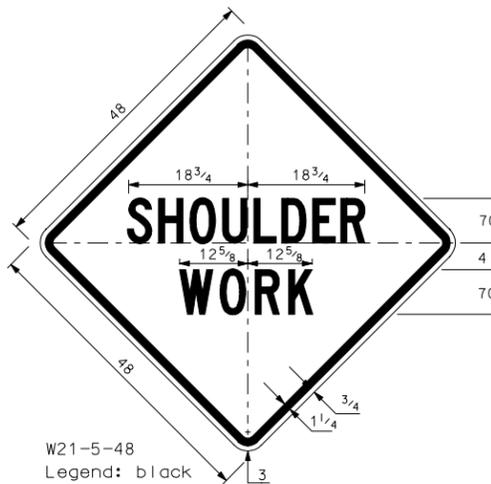
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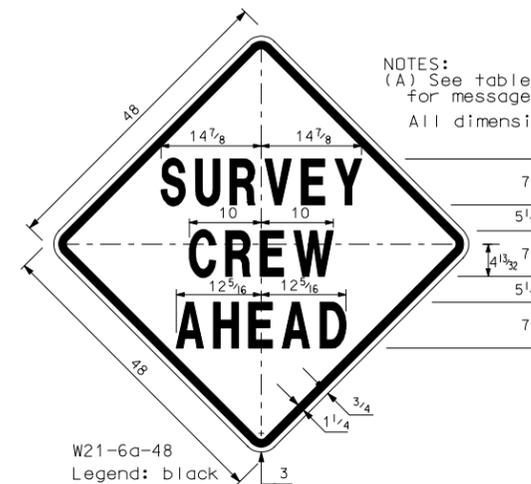
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W20-1-48
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W21-5-48
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Background: orange



W21-6a-48
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Background: orange

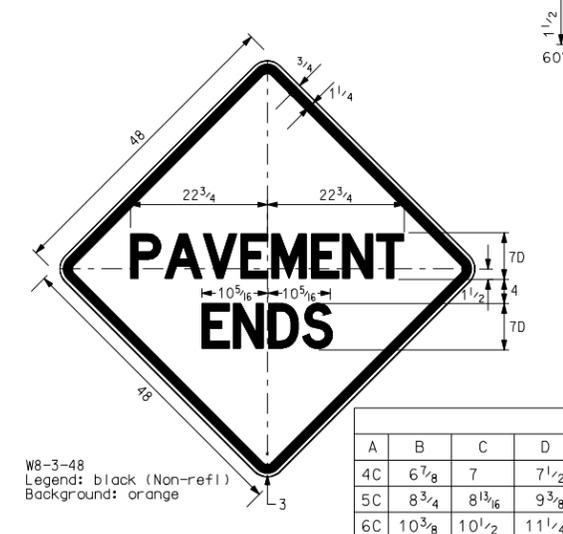
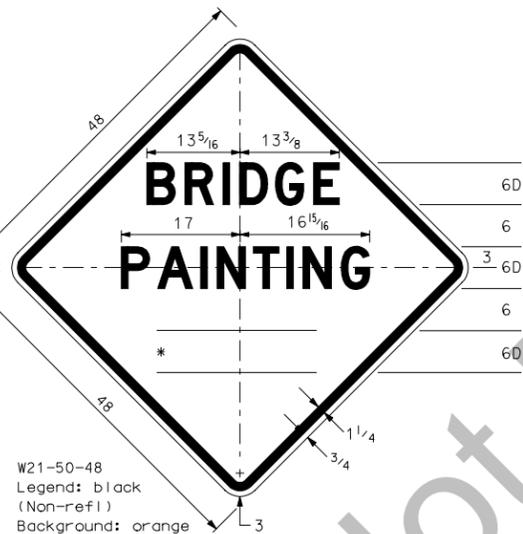
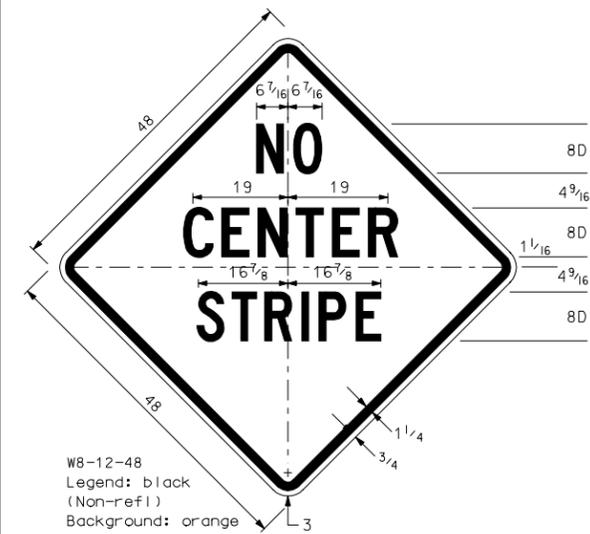
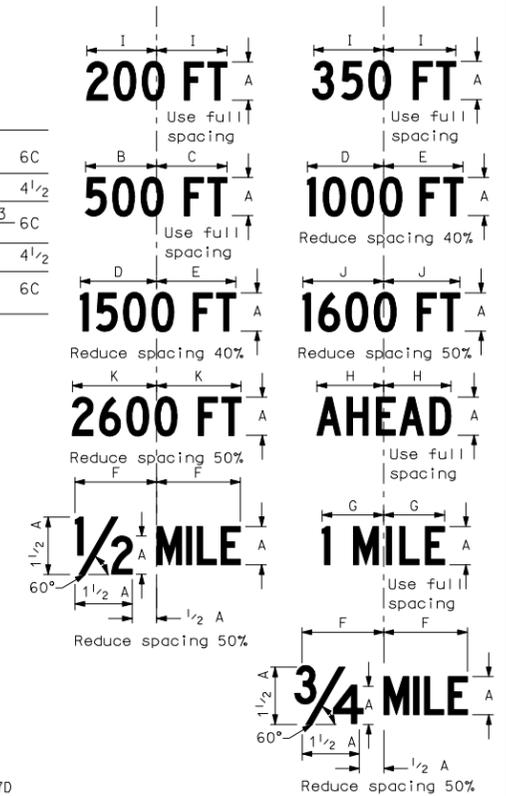
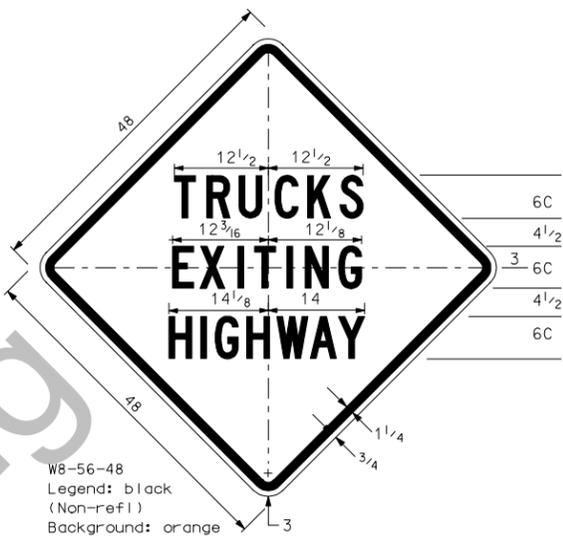
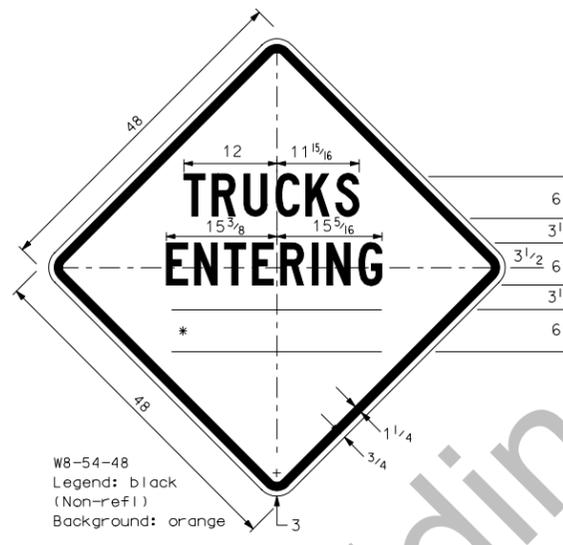
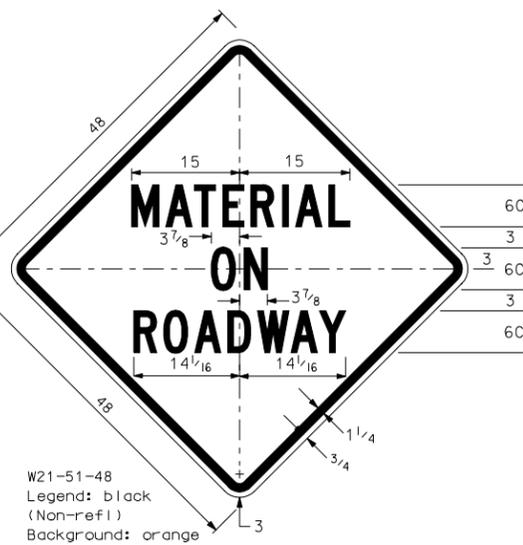
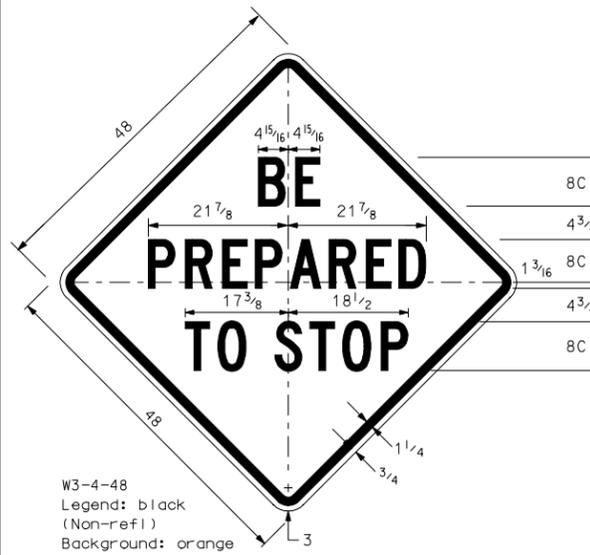
NOTES:
(A) See table on standard D-704-12 for messages and dimensions.
All dimensions are in inches

| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 10-1-86 | |
| REVISIONS | |
| DATE | CHANGE |
| 05-01-92 | General revisions |
| 06-09-95 | Chg 7D to 7C(Dwg) |
| | W20-3, W21-3 & W21-4 |
| 05-26-98 | Add W7-7-48 |
| 11-06-00 | Rev W20-52-54 |
| 01-25-01 | W21-6a-48 |
| 07-25-03 | Rev W21-4 to W20-1 |
| 08-05-04 | General revisions |
| 12-01-04 | PE stamp added |
| 07-11-05 | Revised W21-3, W20-1, W20-7a, W21-1a and W20-7k |

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CONSTRUCTION SIGN DETAIL

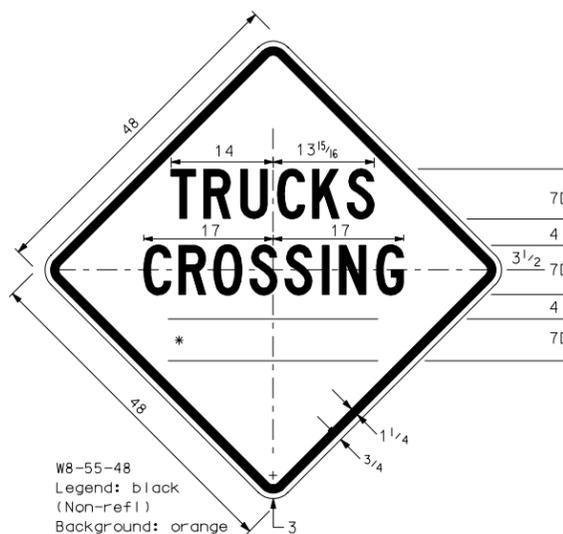
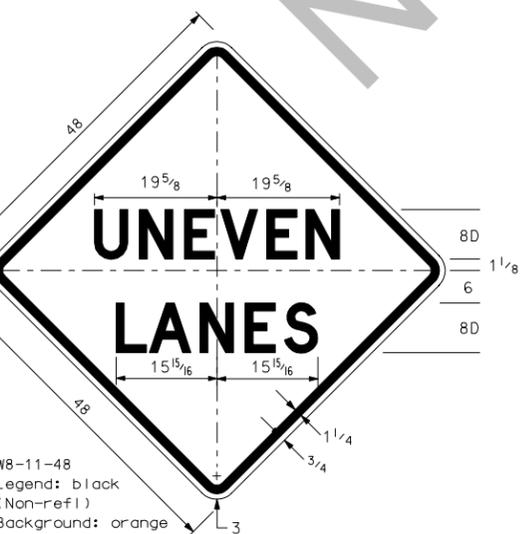
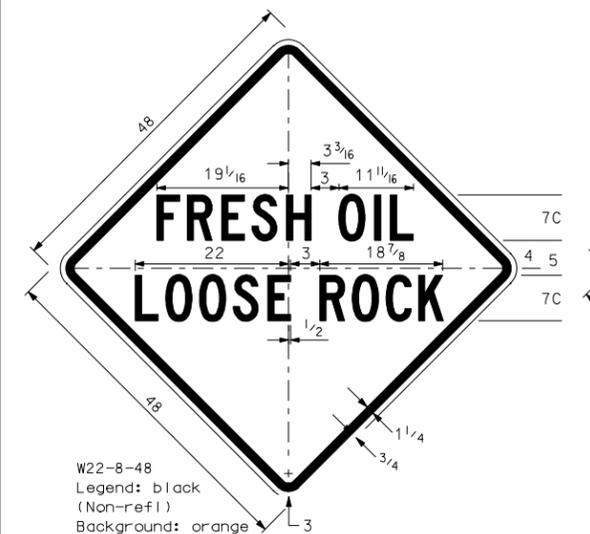
D-704-12



* DIMENSIONS (INCHES)

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

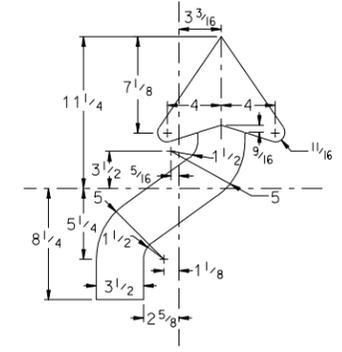
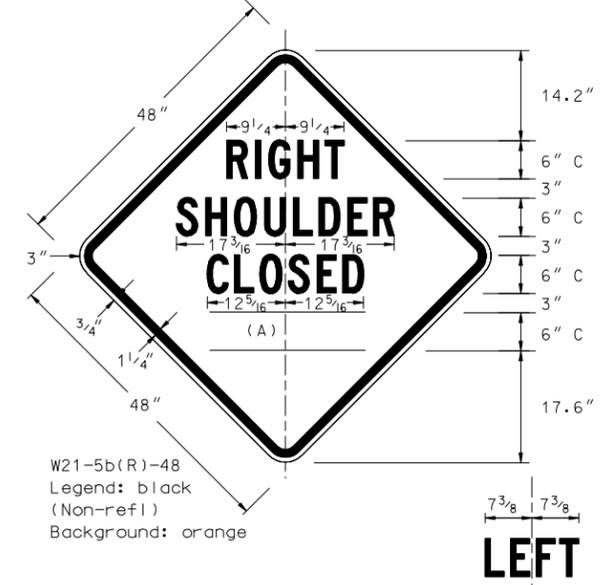
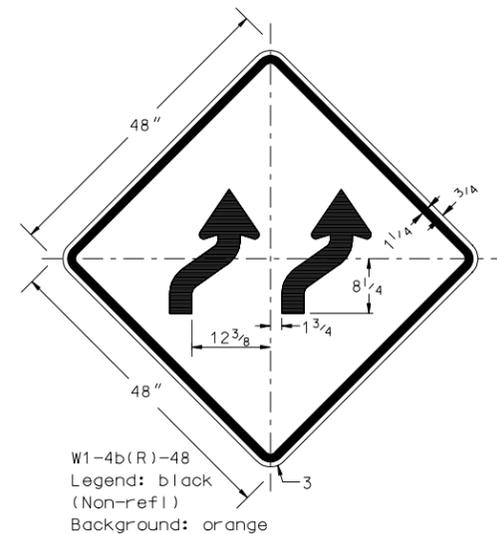
Standard signs that are shown in the construction sign and barricade location details shall be fabricated in the shape, color, and dimensions as shown in the standard signs layout booklet.



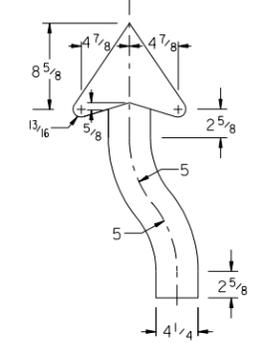
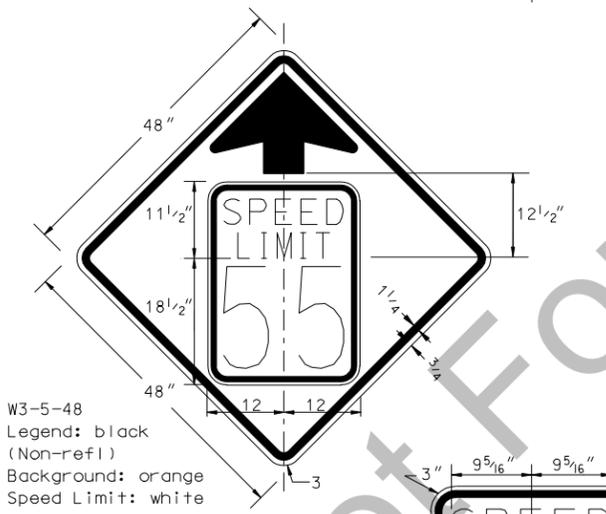
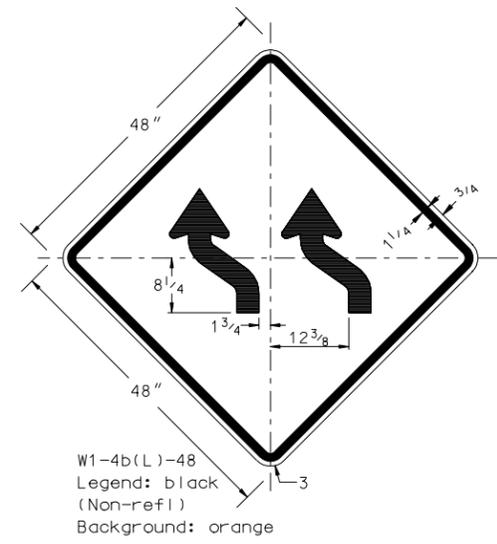
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|---|
| 10-1-86 | |
| REVISIONS | |
| DATE | CHANGE |
| 12-01-88 | Uneven pavement |
| 05-01-92 | General revisions |
| 01-24-95 | W8-12-48 |
| 02-03-95 | W8-11-48 |
| 06-15-95 | General revisions |
| 05-19-98 | Added 3/4 mile |
| 05-26-99 | Added W8-56-48 |
| 08-05-04 | Deleted slow paddle added W8-3-48 |
| 12-01-04 | PE stamp added |
| 07-11-05 | Changed W20-7b to W3-4, Revised W8-11 and W8-12 |

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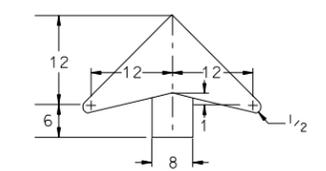
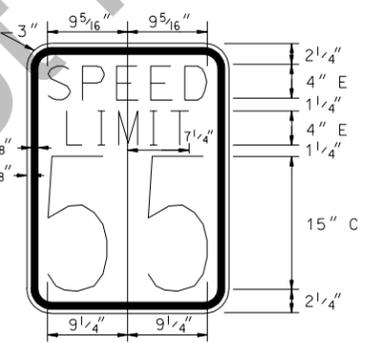
CONSTRUCTION SIGN DETAIL



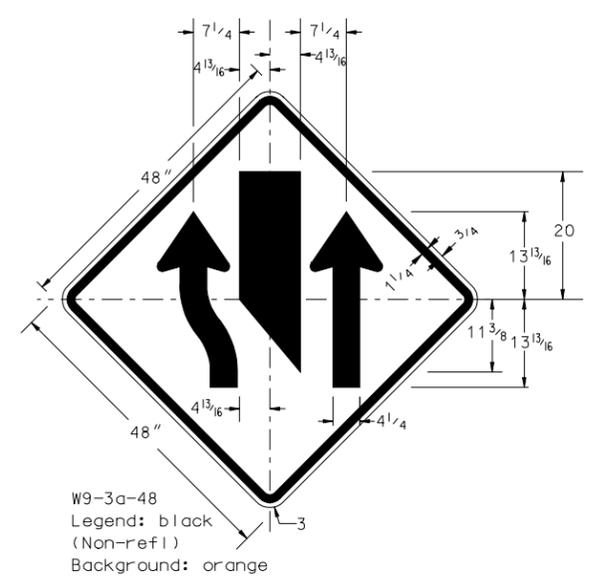
Arrow detail for sign M1-4b(R or L)-48



Arrow detail for sign M9-3a-48



Arrow detail for sign W3-5-48

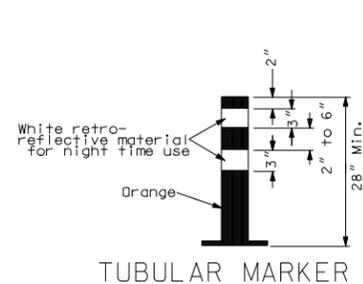


(A) See table on standard D-704-12 for messages and dimensions.

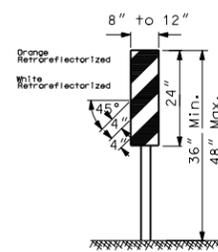
| | |
|---|-------------------|
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
| 11-12-02 | |
| REVISIONS | |
| DATE | CHANGE |
| 04-01-04 | Added W21-5b-48 |
| 08-06-04 | General revisions |
| 12-01-04 | PE stamp added |
| 06-14-05 | Added W3-5-48 |

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BARRICADE DETAILS AND CHANNELIZING DEVICES

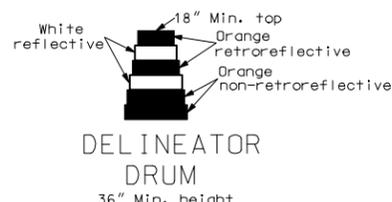


TUBULAR MARKER



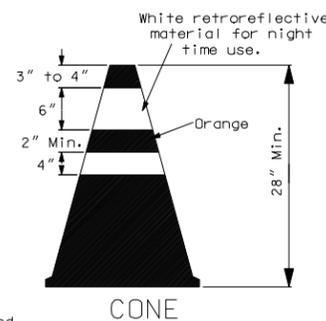
VERTICAL PANEL

(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"

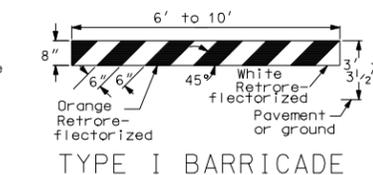


DELINEATOR DRUM
36" Min. height

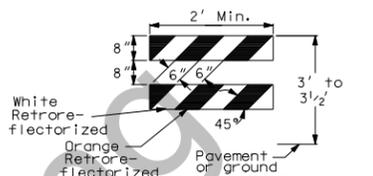
The markings on drums shall be orange and white stripes 4 to 6 inches wide. There shall be at least two orange and two white stripes. Where drums have ribs or indentations, there shall be no retroreflective sheeting in this area. This space shall be no more than 2 inches wide. The drum surface shall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



CONE

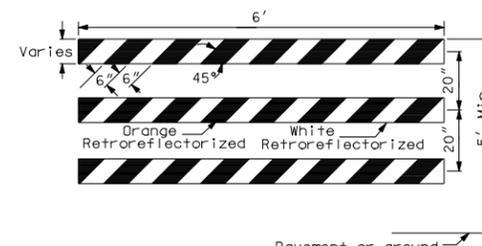


TYPE I BARRICADE



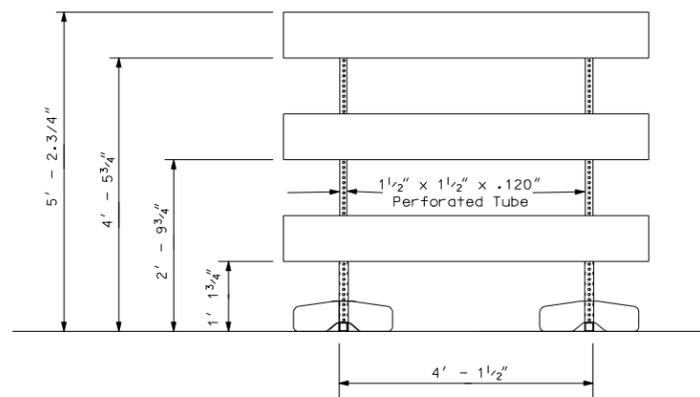
TYPE II BARRICADE

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

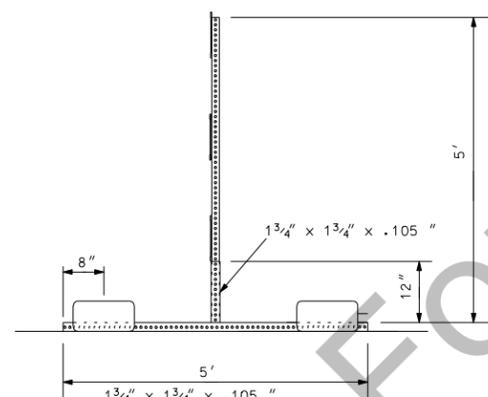


TYPE III BARRICADE

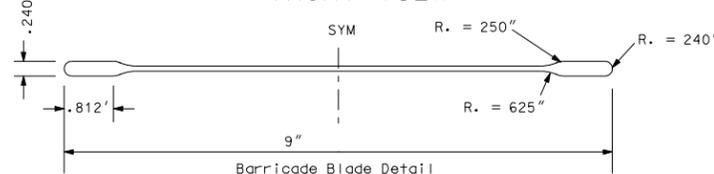
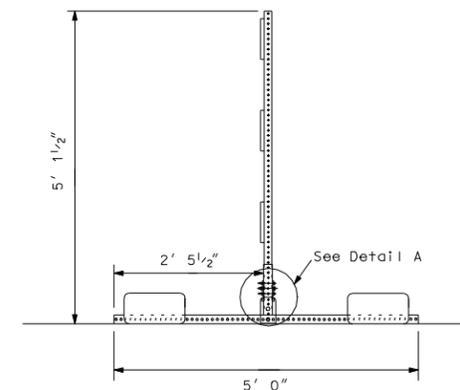
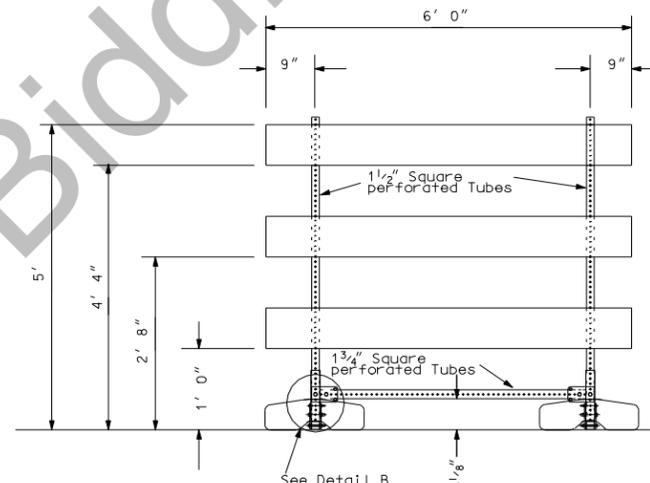
BARRICADES:
Number of retroreflectored rail faces:
Type I - 2 (One each direction)
Type II - 4 (Two each direction)
Type III - 6 (Three in each direction)



FRONT VIEW



END VIEW



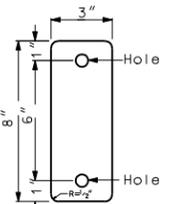
Ballast = 45lb sandbag at the end of each leg.
Barricade blade fastened to vertical supports with 2" corner bolts.
Vertical portion of leg is welded to horizontal portion on all four sides.
Masts slide inside vertical portion of legs. No bolts or fastenings devices used.

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



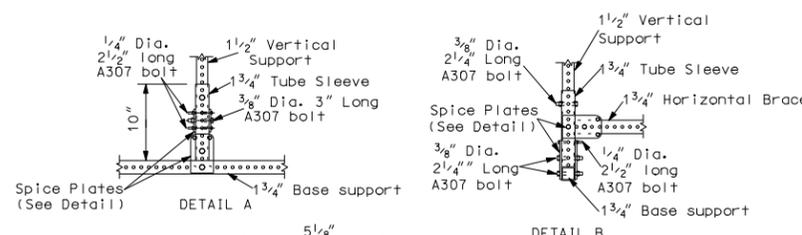
ACRYLIC PLASTIC REFLECTOR

Delineator reflector shall meet the requirements of section 894



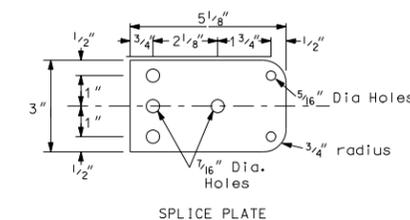
DELINEATOR REFLECTOR

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



DETAIL A

DETAIL B



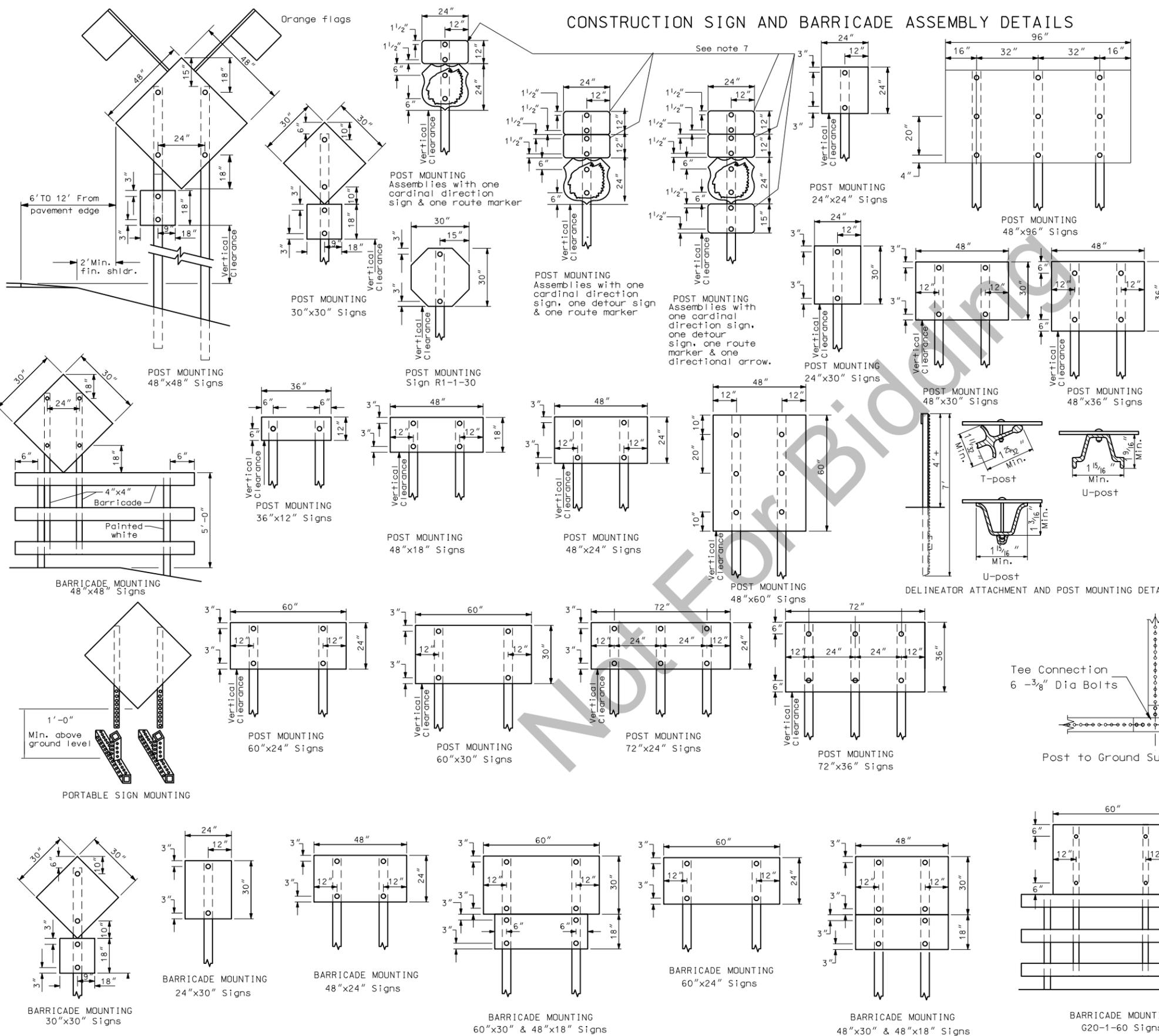
SPLICE PLATE

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

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

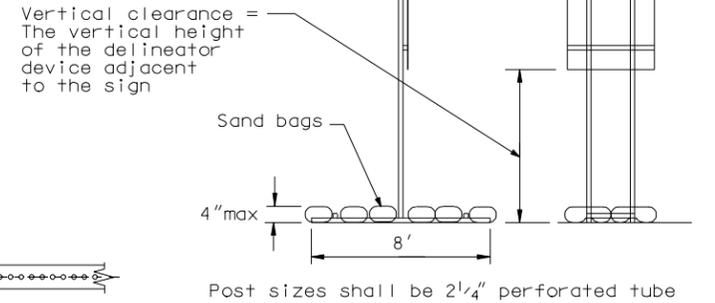
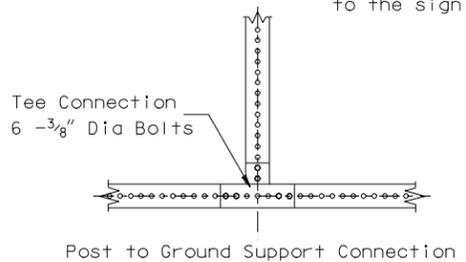
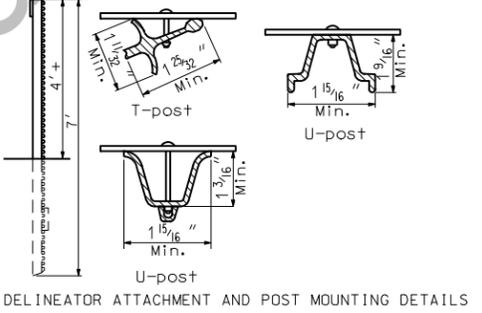
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CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS



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 imbedded a min. 3'-6". Material: All signs shall be 0.100" aluminum, 12 gauge steel, 1/2" 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.

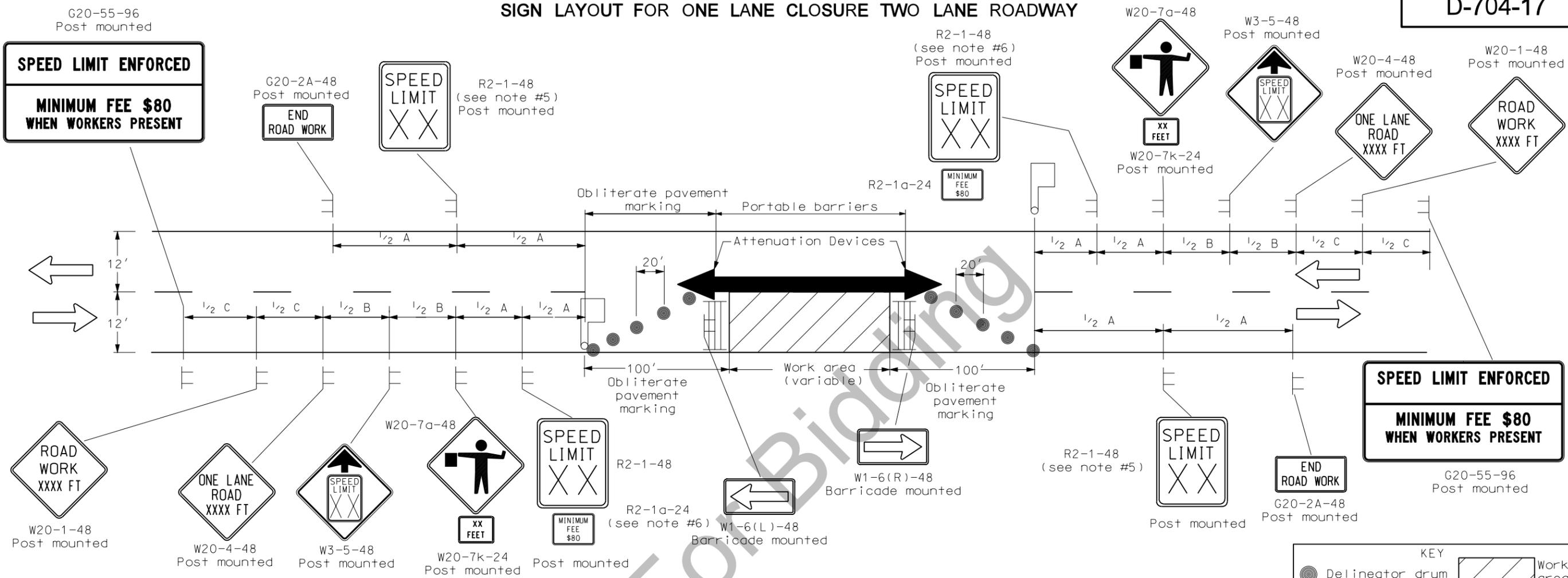


| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|--|--------------------------------|
| 10-1-86 | |
| REVISIONS | |
| DATE | CHANGE |
| 08-01-88 | Sign assembly |
| 05-01-92 | Sign assembly |
| 03-30-93 | Sign supports note |
| 03-04-96 | Sign height |
| 08-15-96 | Note 8 |
| 07-10-97 | Note revision |
| 01-31-98 | 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 |

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SIGN LAYOUT FOR ONE LANE CLOSURE TWO LANE ROADWAY

D-704-17



Notes

- Floodlights shall be provided to mark flagger stations at night. The lighting shall not create a disabling glare for drivers. Placement and elimination of potential glare can best be determined by driving through and observing the floodlighted area from each direction on the main roadway after lighting is set up.
- Barricade shown to be placed on roadway shall be on a movable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on the roadway shall be placed on skid mounted assembly.
- Delineator drums used for tapering traffic shall be spaced at 20 ft. center to center.
- Existing striping shall be removed as required. Delineators will only be used when inslope is 4:1 or better and roadway alignment is visible to approaching vehicles. Vertical panels shall be used where roadways have steep slopes and alignment is not visible to approaching vehicles. Delineators and vertical panels shall be installed back to back.
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
- Existing speed limit signs within a reduced speed zone shall be covered.
- G20-55-96 sign is not required if this standard is part of other traffic control layouts, or the work is less than 15 days.

KEY

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

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

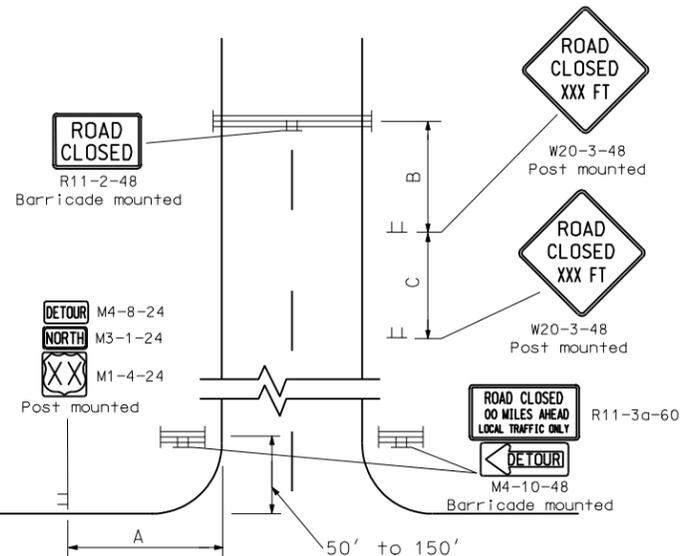
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|--|
| 10-1-86 | |
| REVISIONS | |
| DATE | CHANGE |
| 01-31-97 | Sign spacing |
| 10-01-99 | General revisions |
| 03-29-00 | Minor revisions |
| 01-05-01 | Revised note 3 |
| 07-19-02 | Reversed End Road Work & speed limit signs |
| 07-25-03 | Revised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

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CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

Notes

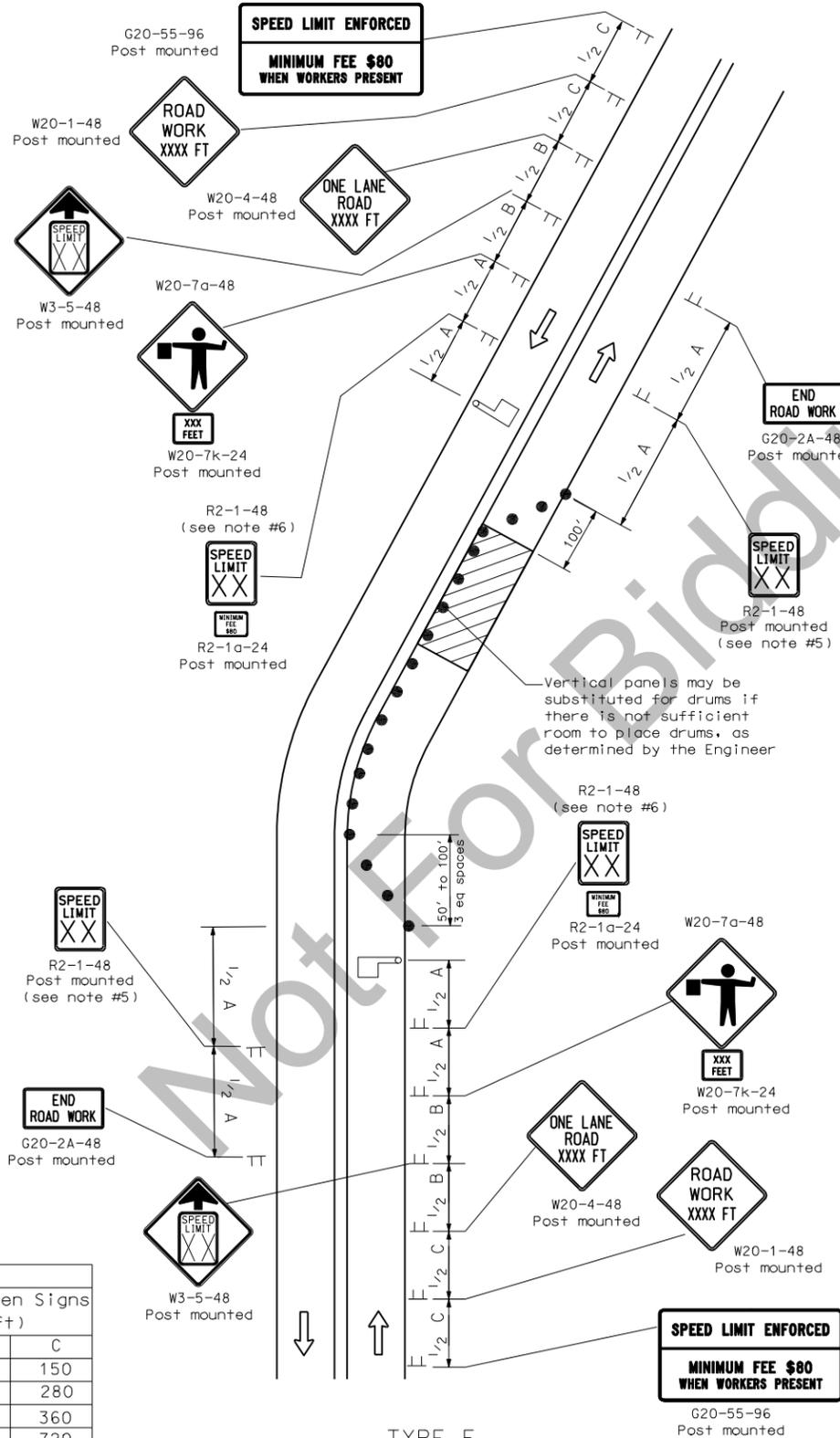
- Variables
 S = Numerical value of speed limit or 85th percentile.
 W = The width of taper
 L = Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x S²/60 for urban, residential, and other streets with speeds of 40 mph or less.
- Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on the roadway shall be placed on skid mounted assemblies.
- Delineator drums used for tapering traffic shall be placed at 3 equal spaces. Delineator drums for tangents shall be spaced at 2 times dimension "S".
- Sequencing Arrow Panels
 Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface. Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph and 750 ADT or less). Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less). Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 5000 ADT).
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
- G20-55-96 or R2-1a-24 sign are not required when a pilot car operation is used.



TYPE E
CONSTRUCTION SIGN LAYOUT

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

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



TYPE F
CONSTRUCTION SIGN LAYOUT

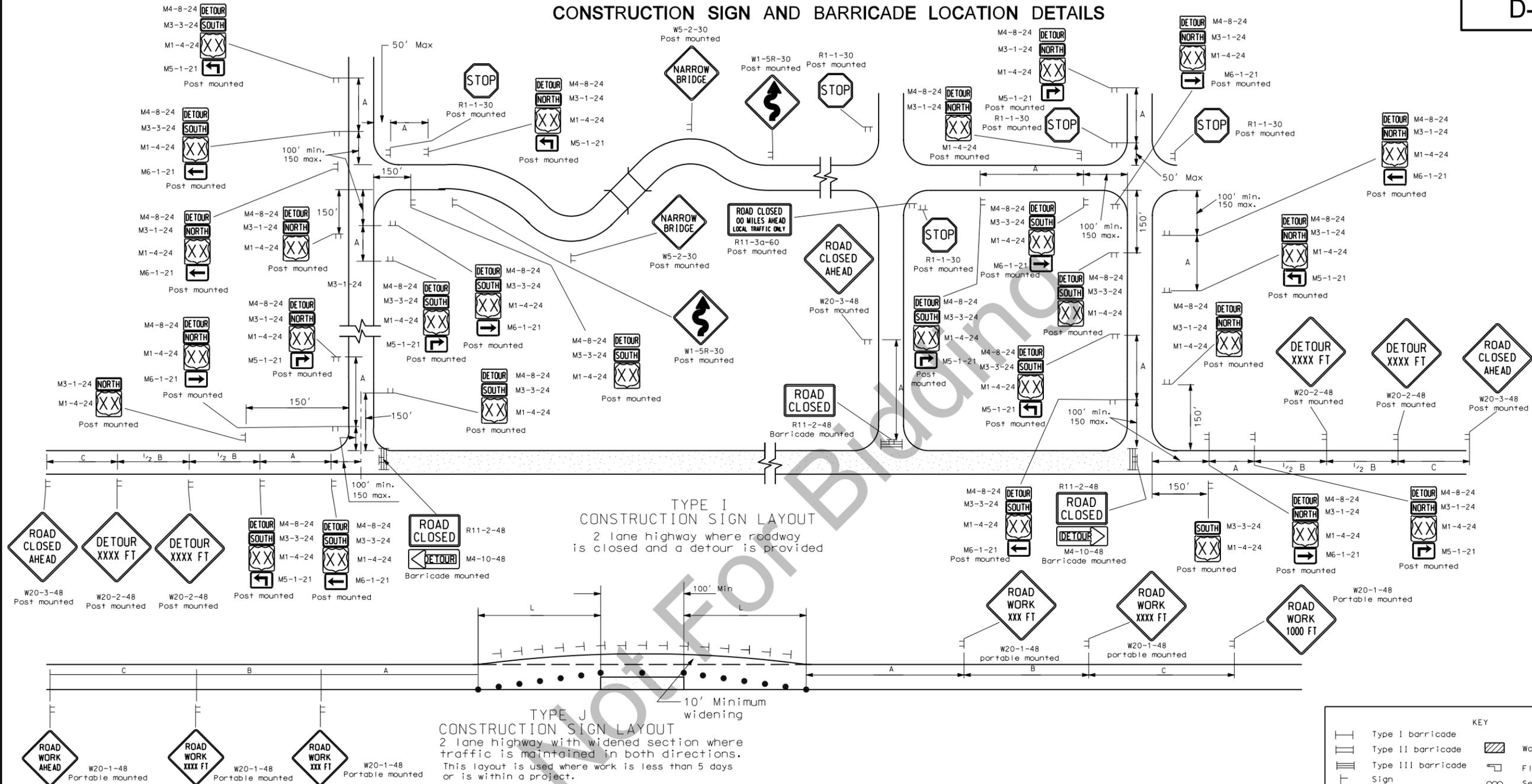
Two lane highway with one lane closed. Flagger is at a point where it is visible to approaching traffic.

| KEY | | |
|---------------------|--------------------|--------------------------|
| ● Delineator Drum | Type I Barricade | ⏏ Flagger |
| ┌ Type A Delineator | Type II Barricade | ∞ Sequencing Arrow Panel |
| └ Sign | Type III Barricade | ▨ Work/Hazard Area |
| ▲ Cone | | |

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

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CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS



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

- Notes**
- Variables
 - S=Numerical value of speed limit or 85th percentile. W=The width of taper.
 - L=Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x S² / 60 for urban, residential, and other streets with speeds of 40 mph or less.
 - 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 shall be placed on skid mounted assemblies.
 - Delineator drums, or cones used for tapering traffic shall be spaced at dimension "S". Delineator drums, or cones used for tangents shall be spaced at 2 times "S".
 - 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 shall be placed at 1/2 B.
 - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 - Existing speed limit signs within a reduced speed zone shall be covered.
 - Obliterated or covered payment marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.

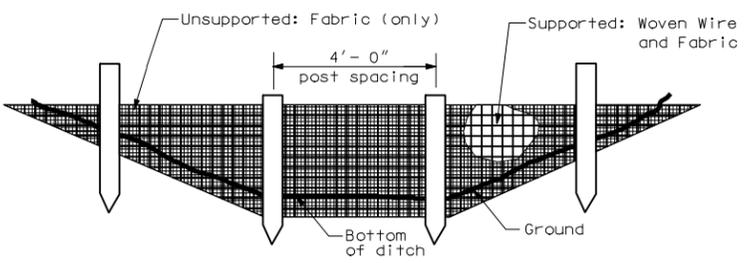
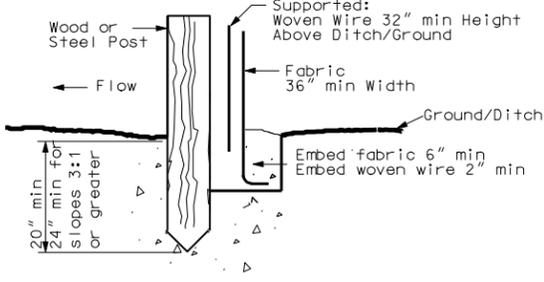
- All Route Markers shall be furnished by the state and shall be obtained and installed by the contractor unless noted otherwise in the plans.
- The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.

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

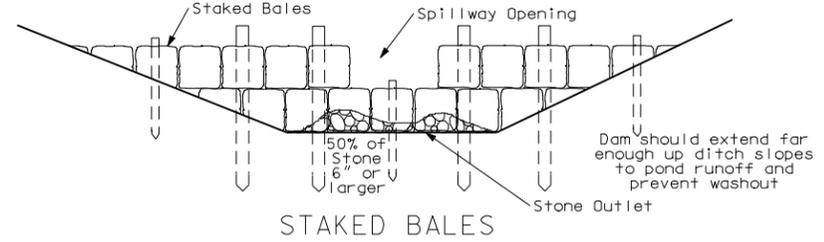
| NORTH DAKOTA DEPARTMENT OF TRANSPORTATION | |
|---|--------------------------------------|
| 10-1-86 | |
| REVISIONS | |
| DATE | CHANGE |
| 05-01-92 | General Revisions |
| 05-28-96 | W21-4-48 |
| 08-15-96 | Revise flag note |
| 10-01-99 | General Revisions |
| 11-15-99 | Add Width Taper in note |
| 01-05-01 | Revised note 3 |
| 04-02-02 | Type I submittal |
| 07-25-03 | Revised W21-4 to W20-1 |
| 04-01-04 | Rev. Warning sign spacing |
| 12-01-04 | PE stamp added |
| 06-29-05 | Rev. Adv. Warning Table, Rev. Note 4 |

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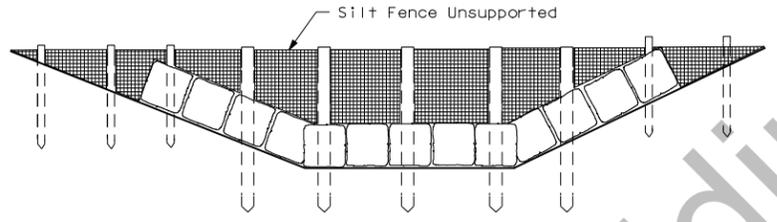
EROSION AND SILTATION CONTROLS



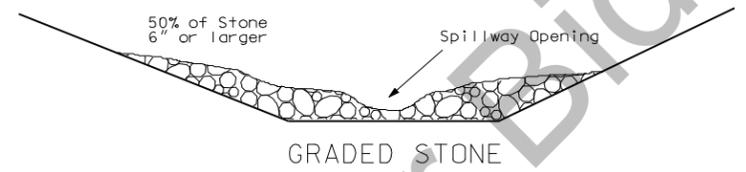
SILT FENCE
Supported and Unsupported



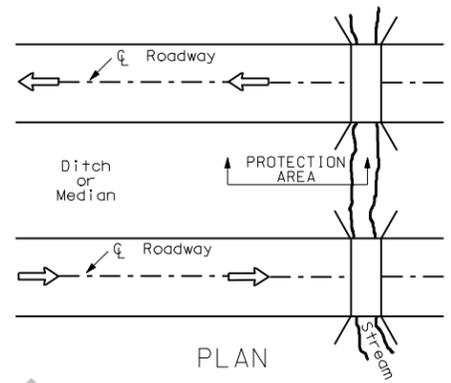
STAKED BALES



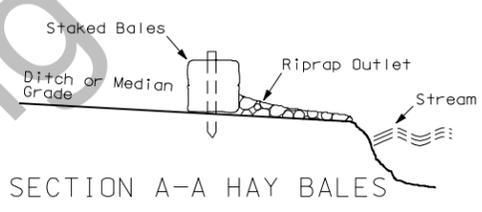
FENCE-BACKED BALES



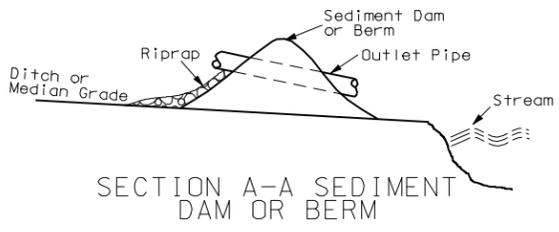
GRADED STONE
DITCH EROSION DAMS



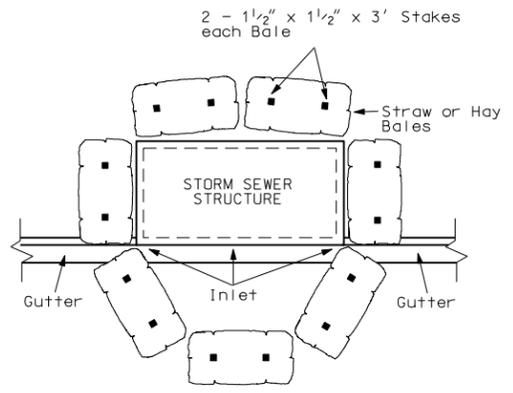
PLAN



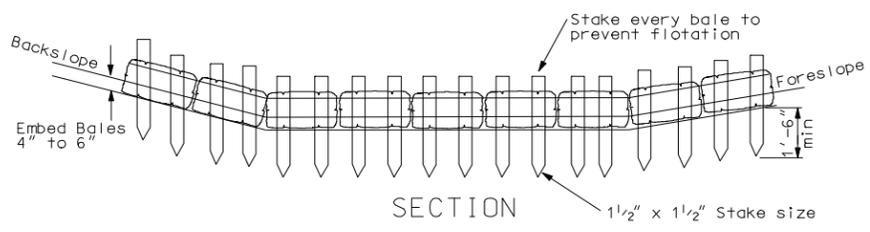
SECTION A-A HAY BALES



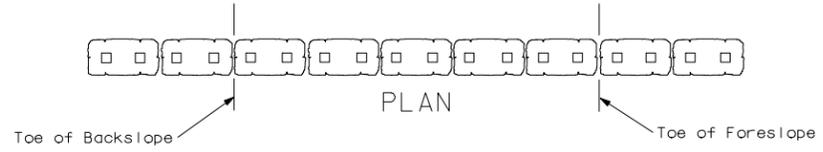
SECTION A-A SEDIMENT DAM OR BERM



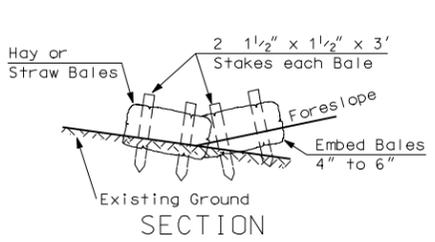
STORM SEWER INLET EROSION & SILTATION BARRIER



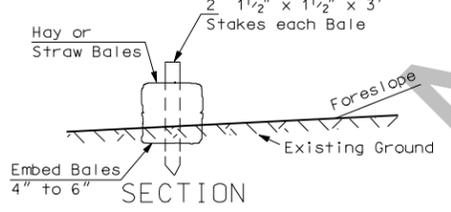
SECTION



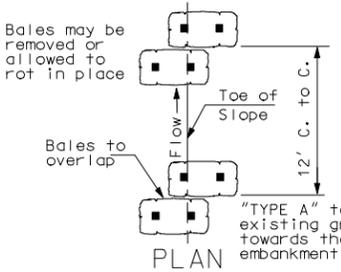
"TYPE A"



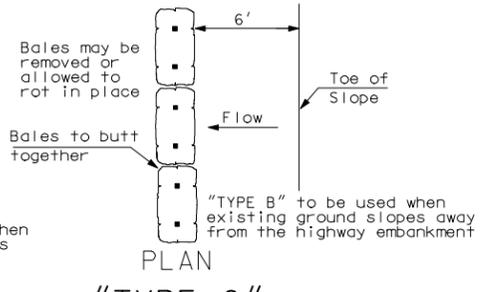
SECTION



SECTION

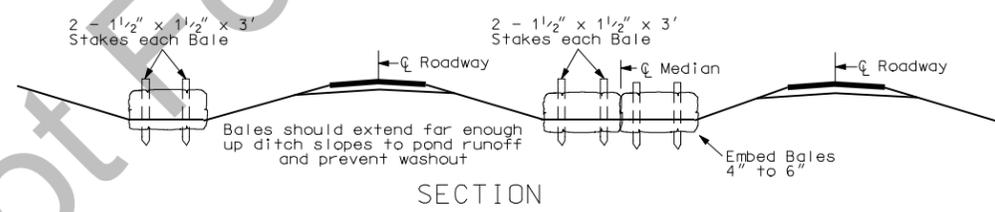


"TYPE B"

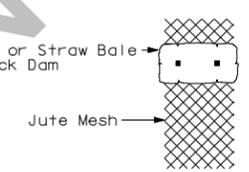


"TYPE C"

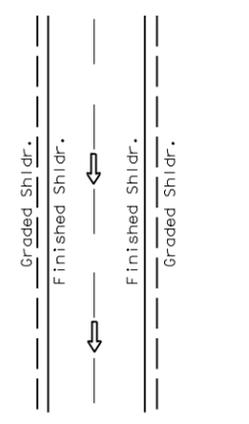
BALED HAY OR STRAW EROSION CHECKS



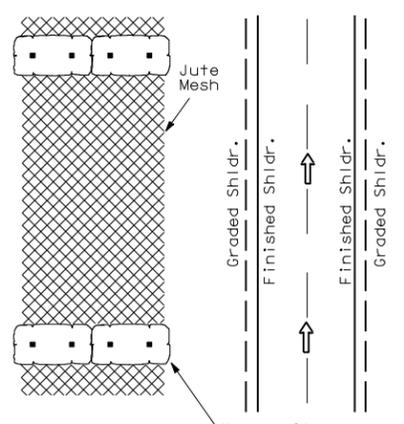
SECTION



ROADSIDE DITCH



PLAN



MEDIAN DITCH

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

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

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