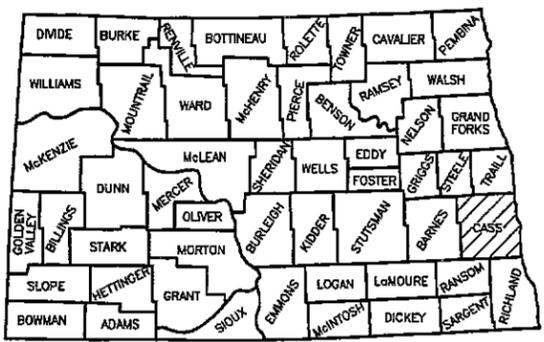


STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
N.D.	FL1005 - SITE 84	1	13



SKETCH MAP OF NORTH DAKOTA
SHOWING COUNTIES

CASS COUNTY HIGHWAY DEPARTMENT

PLANS

FOR

COUNTY PROJECT NO. FL1005 - SITE 84

BRIDGE NO. 9-120-35.0

STRUCTURE

PROJECT CONSISTS OF REPLACEMENT OF BRIDGE
WITH A DOUBLE CELL PRECAST
REINFORCED 10'x14' CONCRETE BOX CULVERT,
GRAVEL, MINOR GRADING, ROAD REALIGNMENT & 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.

INDEX OF DRAWINGS

SHT. 1	TITLE PAGE
SHT. 2-3	GENERAL NOTES
SHT. 4	ESTIMATE OF QUANTITIES & BASIS OF ESTIMATE
SHT. 5	TYPICAL SECTIONS
SHT. 6	CONCRETE PAVING DETAILS
SHT. 7-8	PLAN AND PROFILE
SHT. 9	PRECAST REINF. CONC. BOX CULVERT
SHT. 10-13	CROSS SECTIONS

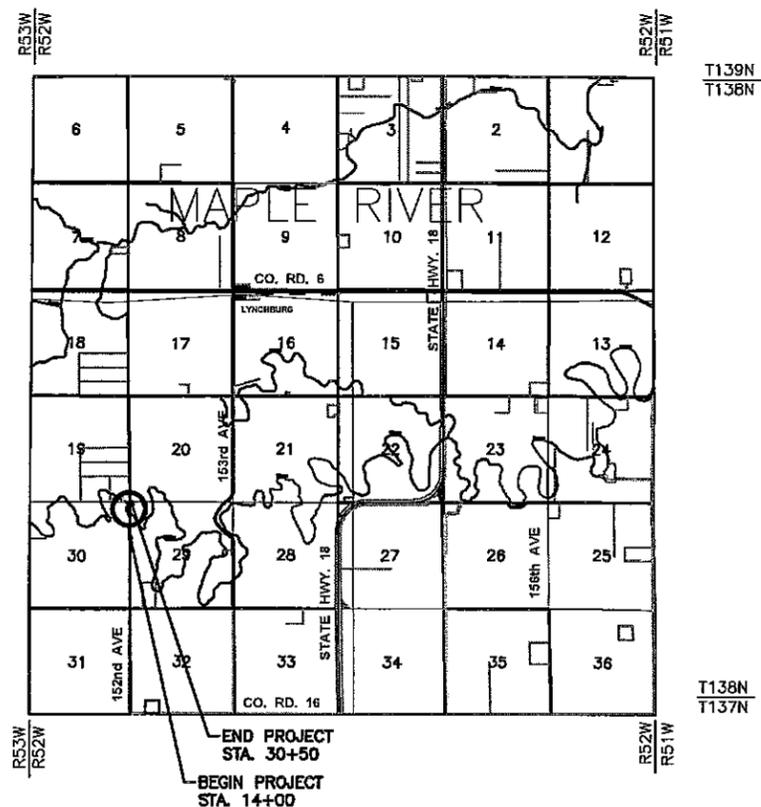
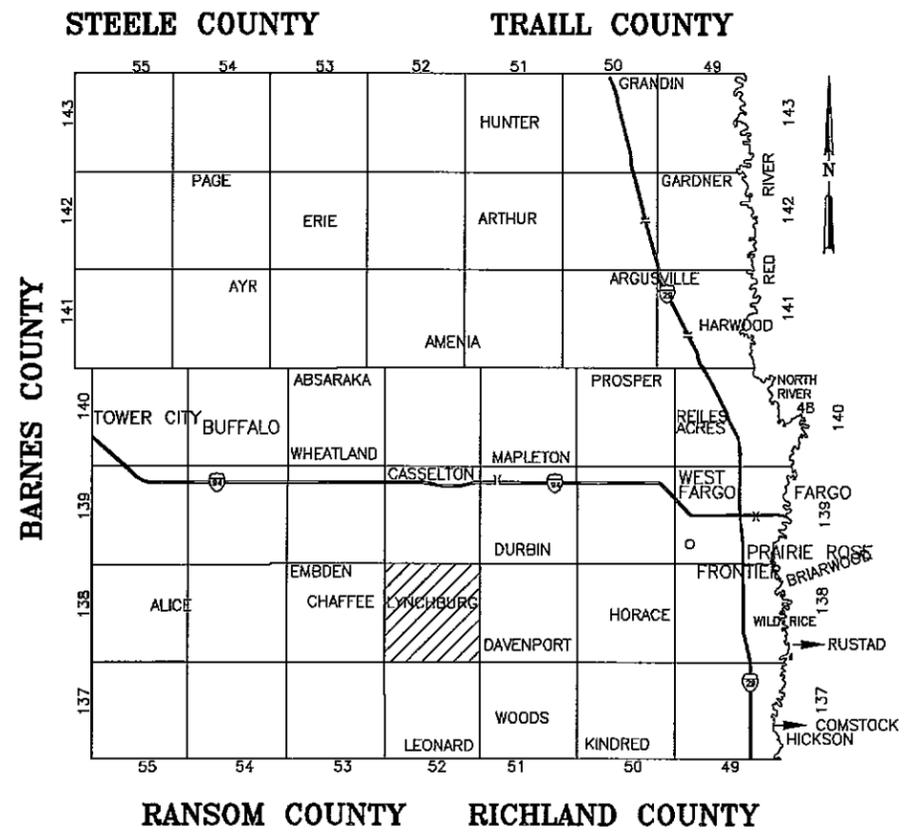
STANDARD DRAWINGS

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
D-754-23	ASSEMBLY DETAILS
D-754-24,25	MOUNTING DETAILS PERFORATED TUBE
D-754-27,29	SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATOR, WARNING, AND GUIDE SIGNS

THE STANDARD DRAWINGS ARE INCLUDED IN THE BACK OF THE PLANS

LENGTH OF PROJECT = 0.313 MILES

SURVEY DESIGN DECEMBER, 2011
FEBRUARY, 2012



This document was originally issued and sealed by
Jeremy L. McLaughlin,
Registration Number PE-4883,
on 06/08/2012 and the original document is stored at the Cass County Highway Department.

APPROVED BY CASS COUNTY ENGINEER:

_____/S/ Jason P. Benson
JASON P. BENSON N.D. REG. NO. _____
DATE: 06/08/2012

	Houston Engineering Inc.	Fargo
	P: 701.237.5065 F: 701.237.5101	

Z:\6005\6005_10_0006_0001\cass\cass\Plan\Sheet 01.dwg - Layout1 - 6/11/2012 5:28 PM - (jbenner)

100-P01 INDIVIDUAL ITEMS: THE COST OF THOSE ITEMS SHOWN ON PLANS BUT NOT LISTED IN THE ESTIMATE OF QUANTITIES SHALL BE INCLUDED IN THE UNIT PRICE BID FOR VARIOUS PAY ITEMS.

100-P02 COMPACTION: COMPACTION REQUIREMENTS FOR EMBANKMENT AND SUBGRADE PREP SHALL BE PER 203.02G OF THE STANDARD SPECIFICATIONS.

105-P01 UTILITIES: THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING ANY UTILITY RELOCATION NECESSARY DURING CONSTRUCTION. THE CONTRACTOR WILL BE RESPONSIBLE FOR VERIFYING UTILITY LOCATIONS, CONTACTING THE UTILITY COMPANIES, AND HAVING UTILITIES MARKED AND FLAGGED PRIOR TO CONSTRUCTION. FOR THE STATE OF NORTH DAKOTA, THE LOCATE NUMBER IS 1-800-795-0555. UTILITY LOCATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE ONLY. ACTUAL LOCATIONS SHALL BE VERIFIED BY THE CONTRACTOR.

107-P01 HAUL ROADS: SECTION 107.05 B OF THE STANDARD SPECIFICATIONS ADDRESSES THE USE OF PUBLIC ROADS FOR HAULING MATERIALS TO THE PROJECT. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO INVESTIGATE THE SUITABILITY OF ROUTES WITH THE GOVERNMENTAL AGENCY OR POLITICAL SUBDIVISION HAVING ROADWAY AUTHORITY PRIOR TO SUBMITTING THE BID.

202-P01 DISPOSAL OF CONCRETE: CONCRETE SHALL BE HAULED TO AN INERT DISPOSAL SITE APPROVED BY THE COUNTY.

203-P01 SCARIFYING AND RECOMPACTION OF EMBANKMENT AREAS: UNDER ALL EMBANKMENT AREAS (EXCLUDING CHANNEL EMBANKMENT), AN ADDITIONAL 12" (BEYOND TOPSOIL STRIPPING) SHALL BE SCARIFIED AND RECOMPACTED. THIS WORK SHALL BE INCLUDED IN THE BID ITEM FOR "SUBGRADE PREPERATION-TYPE A".

203-P02 EMBANKMENT CONSTRUCTION: ALL CHANNEL AND ROADWAY EMBANKMENT SHALL BE COMPACTED TO THE REQUIREMENTS OF SECTIONS 203.02 F AND 203.02 G.

THE SUITABILITY OF MATERIAL FROM ON-SITE EXCAVATIONS FOR USE IN EMBANKMENTS WILL BE DETERMINED BY THE FIELD ENGINEER. EMBANKMENT CONSTRUCTED FROM MATERIAL EXCAVATED ON-SITE WILL NOT BE MEASURED FOR SEPARATE PAYMENT, BUT WILL BE CONSIDERED INCLUDED IN THE BID ITEM FOR CHANNEL EXCAVATION OR "COMMON EXCAVATION-TYPE A". EMBANKMENT SHALL INCLUDE THE CONSTRUCTION OF THE CHANNEL APPROACHES, ROADWAY, DIKES, AND WASTE. IF MATERIAL IS NOT SUITABLE FOR THE ROADBED ITSELF, IT MAY BE USED ON SLOPE AREAS.

203-P03 TOPSOIL: ALL DISTURBED EMBANKMENT AREAS SHALL REQUIRE REMOVAL AND REPLACEMENT OF THE TOPSOIL (UP TO 6" MAXIMUM DEPTH). REMOVED TOPSOIL SHALL BE STOCKPILED ON THE RIGHT OF WAY AT DESIGNATED OF ACCEPTABLE LOCATIONS OUTSIDE THE GRADING LIMITS AND RESPREAD PRIOR TO SEEDING.

203-P04 SUBCUT AREAS: IN AREAS WHERE THE EXISTING ROADBED WILL BE WIDENED, THE SUBGRADE SHALL BE CUT 12" BELOW FINISHED EARTH GRADE. THE EXPOSED SUBGRADE SHALL THEN BE SCARIFIED AND RECOMPACTED. COST SHALL BE INCLUDED IN PRICE BID FOR SUBGRADE PREPARATION.

210-P01 CHANNEL EXCAVATION: MATERIAL EXCAVATED FROM THE CHANNEL MAY BE USED IN TRANSITION AREAS FOR EMBANKMENT, BUT NOT IN THE PROPOSED ROADBED UNLESS DIRECTED OTHERWISE BY THE ENGINEER IN THE FIELD. IF THE MATERIAL IS NOT SUITABLE FOR SLOPE AREAS, THE CONTRACTOR SHALL WASTE THE MATERIAL.

DISPOSAL OF EXCESS EXCAVATED OR WASTE MATERIALS SHALL BE IN AREAS ARRANGED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER IN THE FIELD. PLAN QUANTITY SHALL BE PAY QUANTITY.

210-P02 FOUNDATION PREPARATION: THE LUMP SUM PAY ITEM FOR "FOUNDATION PREPARATION" SHALL INCLUDE THOSE ITEMS LISTED IN SECTION 210.04 B OF THE STANDARD SPECIFICATIONS, FOR THE AREA BETWEEN STATIONS 25+90 AND 26+20 UNLESS PAID FOR SEPARATELY. ROOTS OR OTHER VEGETATION MORE THAN 1" INCH THICKNESS BELOW THE FINISHED SURFACE OF EXCAVATED SECTIONS SHALL BE REMOVED TO A DEPTH OF 6" BELOW THE FINISHED SURFACE.

302-P01 AGGREGATE BASE COURSE: AGGREGATE BASE COURSE SHALL MEET THE GRADATION REQUIREMENTS FOR A CLASS 5 MATERIAL.

302-P02 STABILIZATION AGGREGATE: STABILIZATION AGGREGATE USED UNDER THE BOX CULVERTS SHALL BE PAID FOR AS "AGGREGATE FOR SUBGRADE REINFORCEMENT". LEVELING COURSE SHALL BE INCLUDED IN THE QUANTITY FOR AGGREGATE BASE COURSE.

704-P01 TRAFFIC CONTROL: TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH STANDARD D-704-21 TYPE I, AND MUTCD.

708-P01 SEEDING: ALL DISTURBED AREAS SHALL BE RESEEDED AS DIRECTED BY THE ENGINEER.
THE CLASS OF SEED AND THE MINIMUM AMOUNT OF SEED PER ACRE SHALL BE AS FOLLOWS:

TYPE B-CLASS V

GRASS SPECIES	LBS/ACRE
SWITCHGRASS	4
GREEN NEEDLEGRASS	16
SIDEOATS GRAMMA	16
SLENDER WHEATGRASS	8
OATS*	28
WESTERN WHEAT GRASS	<u>28</u>
	100

*IF FALL SEEDING IS PLANNED, 20 POUNDS OF RYE WILL BE SUBSTITUTED FOR OATS.

708-P02 RIPRAP: RIPRAP HAS BEEN PROVIDED TO BE PLACED AS DIRECTED BY THE ENGINEER. SAND AND/OR GEOTEXTILE FABRIC WILL NOT BE A PAY ITEM, BUT SHALL BE INCLUDED IN THE BID FOR RIPRAP.

708-P03 RIPRAP: RIPRAP SHALL BE PLACED ON PREPARED SLOPES. EXACT PLACEMENT LIMITS SHALL BE DETERMINED BY THE ENGINEER IN THE FIELD. NO SALVAGED CONCRETE WILL BE ALLOWED AS RIPRAP.

710-P01 DETOUR: THE BRIDGE WILL BE CLOSED DURING CONSTRUCTION. NO OFFICIAL DETOUR WILL BE MARKED. TEMPORARY LOCAL ACCESS SHALL BE MAINTAINED AT ALL TIMES.

754-P01 SIGNS AND DELINEATORS: ANY EXISTING SIGNS AND DELINEATOR POSTS WILL BE REMOVED AND RESET BY THE CONTRACTOR. THIS ITEM OF WORK IS NOT A SEPARATE PAY ITEM BUT SHALL BE INCLUDED IN THE PAY ITEM FOR TRAFFIC CONTROL SIGNS. ALL SIGNS MUST BE IN PLACE PRIOR TO RE-OPENING OF THE ROADWAY.

754-P02 SIGNS AND DELINEATORS: ALL NEW SIGNS, INCLUDING INSTALLATION SHALL BE PAID FOR UNDER BID ITEMS "FLAT SHEET FOR SIGNS-TYPE 3A REFL SHEETING" AND "STEEL GALV POSTS -TELESCOPING PERFORATED TUBE"

<p>This document was originally issued and sealed by Jeremy L. McLaughlin Registration Number PE- 4833, on 06/08/2012 and the original document is stored at the Cass County Highway Department</p>	<p>CASS COUNTY HIGHWAY DEPARTMENT MAPLE RIVER BRIDGE NO. 9-120-35.0 GENERAL NOTES PROJECT NO. FL1005 - SITE 84 TOWNSHIP ROAD SOUTHEAST OF CHAFFEE CASS COUNTY</p>
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STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
N.D.	FL1005 - SITE B4	3	13

AT BRIDGE LOCATION ON THE EAST SECTION LINE OF SECTION 30 AND SECTION 19, MAPLE RIVER TOWNSHIP, CASS COUNTY, NORTH DAKOTA, A PRECAST DOUBLE 10'X 14' RCB SHALL BE BUILT. NO CAST-IN-PLACE ALTERNATE OR SUBSTITUTE SIZES OF PRECAST UNITS SHALL BE ALLOWED. THE BOX SHALL BE PLACED PERPENDICULAR TO THE MAINLINE CENTERLINE. THE LENGTH OF THE CULVERT SHALL BE CONSIDERED FROM OUTSIDE FACE OF THE BOX TO OUTSIDE FACE OF THE BOX AT OPPOSITE END. IT SHALL BE DESIGNED FOR TRAFFIC DIRECTLY ON TOP OF THE BOX.

THE INSTALLATION OF THE PRECAST RCB SHALL SATISFY THE APPLICABLE PORTIONS OF SECTION 606 OF THE "NORTH DAKOTA STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION." EXCEPT AS NOTED IN THESE PLANS.

THE DESIGN AND MANUFACTURE OF THE PRECAST RCB SHALL SATISFY THE APPLICABLE PORTIONS OF "AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS" AND NDDOT DESIGN MANUAL WITH HL93 LIVE LOADING APPLIED DIRECTLY TO THE TOP OF THE BOX CULVERT.

THE PRECAST RCB SHALL BE COMPRISED OF BARREL SECTIONS AND END SECTIONS. THE CONCRETE USED TO MAKE THE SECTIONS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI.

THE BARREL SECTIONS SHALL NOT BE ANY SHORTER THAN 4 FEET LONG. THE MINIMUM THICKNESS OF THE BARREL PARTS ARE 10 INCHES FOR THE ROOF, 8 INCHES ON THE FLOOR, AND 10 INCHES FOR THE WALLS. ANY HAUNCH OR FILLET AT THE INSIDE CORNERS OF THE BARREL SHALL NOT EXCEED A TRIANGULAR SHAPE WITH 12 INCH HORIZONTAL AND 12 INCH VERTICAL LEGS. THE BARREL SECTIONS JOINTS SHALL BE TONGUE AND GROOVE.

THE END SECTIONS INCLUDE A REINFORCED CONCRETE CUTOFF WALL BELOW THE FLOOR. THE CUTOFF WALLS SHALL BE PLACED UNDER THE END OF THE APRON AND SHALL BE A MINIMUM OF 8 INCHES THICK, 3'-6" FEET DEEP, AND 3 FEET LONGER THAN THE BARREL SECTION IS WIDE. HOLES SHALL BE CAST AT 3' CENTERS THROUGH THE FLOOR OF EACH END SECTION AND INTO THE CUTOFF WALLS TO RECEIVE 3/4" DIAMETER DOWELS. THEN THE VOID SHALL BE FILLED WITH GROUT. THE SLOPE OF THE END SECTIONS SHALL NOT BE ANY STEEPER THAN 2 TO 1, MEASURED PERPENDICULAR TO THE CENTERLINE OF THE ROADWAY. THE END OF THE SECTION SHALL NOT BE HIGHER THAN 2'-8" ABOVE THE FLOOR. EXTRA STRONG CONNECTION SHALL BE USED FOR THE END SECTIONS.

ALL THE RCB SECTIONS SHALL BE TIED TOGETHER BY AN ACCEPTABLE METHOD. THE TIES SHOULD ADEQUATELY HOLD THE SECTIONS TOGETHER UNDER CONSTRUCTION LOAD AND SERVICE LOAD CONDITIONS. THE SECTIONS SHALL BE TIED TOGETHER WITH STEEL CABLES OR GALVANIZED STEEL U-BOLTS. IF U-BOLTS ARE USED, THE FOUR U-BOLTS WILL BE LOCATED AT THE THIRD POINTS OF THE OUTSIDE WALLS. ALL HARDWARE SHALL EITHER BE HOT-DIPPED GALVANIZED ACCORDING TO SECTION 854 OF THE "NORTH DAKOTA STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" OR MECHANICALLY GALVANIZED ACCORDING TO AASHTO 298. ALL LIFTING AND HANDLING HOLES SHALL BE PLUGGED BY AN APPROVED METHOD AFTER THE CULVERT SECTIONS ARE INSTALLED. THE COST OF PLUGGING THE HOLES SHALL BE INCLUDED IN THE PRICE BID FOR THE BOX CULVERT.

THE TOP AND TWO SIDE SURFACES OF EACH BARREL SECTION JOINT SHALL BE WRAPPED WITH A GEOTEXTILE FABRIC THAT PREVENTS SOIL FROM LEAKING THROUGH THE JOINT. IN ADDITION, AN APPROVED EPOXY SEALANT SHALL BE PLACED AT EACH INTERIOR JOINT LOCATION. THE EPOXY SHALL EXTEND ACROSS THE BOTTOM OF EACH JOINT AND EXTEND UP 1/3 OF THE BOX CULVERT HEIGHT AT EACH SIDE. THE GEOTEXTILE FABRIC SHALL BE A MINIMUM OF 24 INCHES WIDE AND SHALL MEET THE REQUIREMENTS OF GEOTEXTILE SEPARATION FABRIC OF SECTION 709 OF THE "NORTH DAKOTA SUPPLEMENTAL SPECIFICATIONS." GEOTEXTILE FABRIC SHALL ALSO BE REQUIRED AT THE OUTSIDE OF EACH CUTOFF WALL VERTICAL JOINT, IF MORE THAN ONE UNIT IS USED. A GROOVE SHOULD BE MADE IN THE BEDDING 1" DEEP AND 2"-3" WIDE IN FRONT OF EACH JOINT TO PREVENT SAND FROM BEING PUSHED INTO THE JOINT DURING INSTALLATION.

THE BOX CULVERTS SHALL BE BACKFILLED EQUALLY ON BOTH SIDES OF THE BOX TO AVOID UNEVEN LOADING TO ONE SIDE OF THE CULVERT.

THE COSTS OF PROVIDING AND INSTALLING THE TIES, EPOXY SEALANT, AND THE GEOTEXTILE FABRIC SHALL BE INCIDENTAL TO THE PRECAST RCB.

THE CONTRACTOR SHALL SUBMIT SIGNED CALCULATIONS AND SHOP DRAWINGS TO THE CONSTRUCTION ENGINEER FOR APPROVAL BEFORE THE MANUFACTURE OF THE RCB SECTIONS. THESE SHOP DRAWINGS SHALL SHOW A MINIMUM OF THE FOLLOWING:

- A. LAYOUT SHOWING RCB PLACEMENT AND CLEARANCES.
- B. TYPE AND STRENGTH OF CONCRETE AND REINFORCING STEEL.
- C. ALL CONCRETE AND REINFORCING DIMENSIONS.
- D. REINFORCING STEEL CLEARANCES.
- E. METHOD OF TYING SECTIONS TOGETHER.
- F. METHOD OF COVERING THE JOINTS.
- G. INSTALLATION AND HANDLING INSTRUCTIONS.

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CASS COUNTY
HIGHWAY DEPARTMENT
MAPLE RIVER
BRIDGE NO. 9-120-35.0

GENERAL NOTES

PROJECT NO. FL1005 - SITE 84
TOWNSHIP ROAD
SOUTHEAST OF CHAFFEE
CASS COUNTY

BASIS OF ESTIMATE

MATERIAL

AGGREGATE SURFACE COURSE CLASS 5
 SELECT BACKFILL
 SHRINKAGE FOR BORROW
 AGGREGATE FOR SUBGRADE REINFORCEMENT
 SEEDING
 TOPSOIL QUANTITY BASED ON 6" DEPTH

BASIS OF ESTIMATE

1.875 TON/CY
 1.875 TON/CY
 COMPACTED VOLUME IN PLACE PLUS 30%
 1.875 TON/CY
 ALL DISTURBED AREAS OUTSIDE OF ROADBED

WATER FOR COMPACTION (NOT A PAY ITEM)

EMBANKMENT 10 GAL/CY
 AGGREGATE SURFACE COURSE CLASS 5 20 GAL/TON

EARTHWORK

COMMON EXCAVATION 5,991 CY
 ESTIMATED FILL 4,153 CY
 ASSUMED 30% SHRINKAGE ON COMMON EXCAVATION

4,153 CY X 1.3 = 5,399 CY

5,991 CY - 5,399 CY = 592 CY COMMON EXCAVATION WASTE*

*DOES NOT INCLUDE CHANNEL EXCAVATION

ESTIMATED QUANTITIES				
SPEC. NO.	CODE NO.	ITEM	UNIT	TOTAL
103	0100	CONTRACT BOND	L SUM	1
201	0330	CLEARING AND GRUBBING	L SUM	1
203	0109	TOPSOIL (P)	CY	1725
203	0101	COMMON EXCAVATION-TYPE A (P)	CY	5991
203	0113	COMMON EXCAVATION-WASTE	CY	592
210	0127	CHANNEL EXCAVATION	L SUM	1
210	0201	FOUNDATION PREPARATION	EA	1
230	0300	SUBGRADE PREPARATION - TYPE A	STA	19
302	0107	AGGREGATE FOR SUBGRADE REINFORCEMENT	TON	195
302	0120	AGGREGATE BASE COURSE CL 5	TON	1588
550	0107	GIN REINFORCED CONCRETE PAVEMENT CL YE (P)	SY	463
606	3410	DBL 14FTx10FT PRECAST RCB CULVERT (P)	LF	52
606	7410	DBL 14FTx10FT PRECAST RCB END SECTION (P)	EA	2
702	0100	MOBILIZATION	L SUM	1
704	1100	TRAFFIC CONTROL	L SUM	1
708	1020	RIPRAP-LOOSE ROCK	CY	245
708	1100	SLOPE PROTECTION CONCRETE (P)	SY	208
708	2280	SEEDING - TYPE B CLASS V(P)	ACRE	2.5
708	5500	MULCHING (P)	ACRE	2.5
709	0701	GEOTEXTILE FABRIC - TYPE R1	SY	910
714	5015	PIPE CORRUGATED STEEL 0.064 IN 18IN	LF	48
714	5810	END SECTION CORRUGATED STEEL 0.064 IN 18 IN	EA	2
754	0117	FLAT SHEET FOR SIGNS-TYPE 3A REFL SHEETING	SF	66
754	0206	STEEL GALV POSTS-TELESCOPING PERFORATED TUBE	LF	100

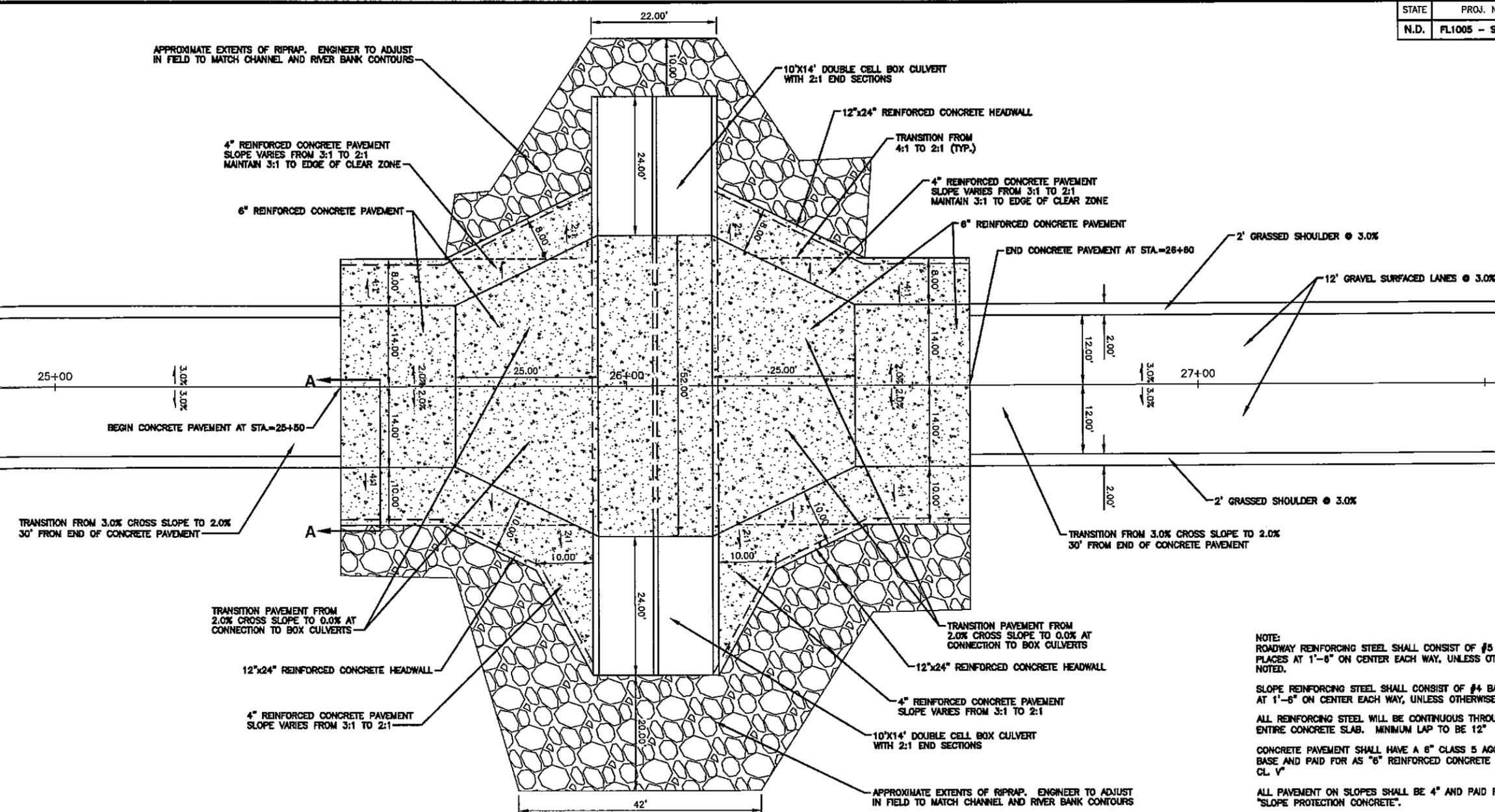
(P) PLAN QUANTITY EQUALS PAY QUANTITY

NOTES:

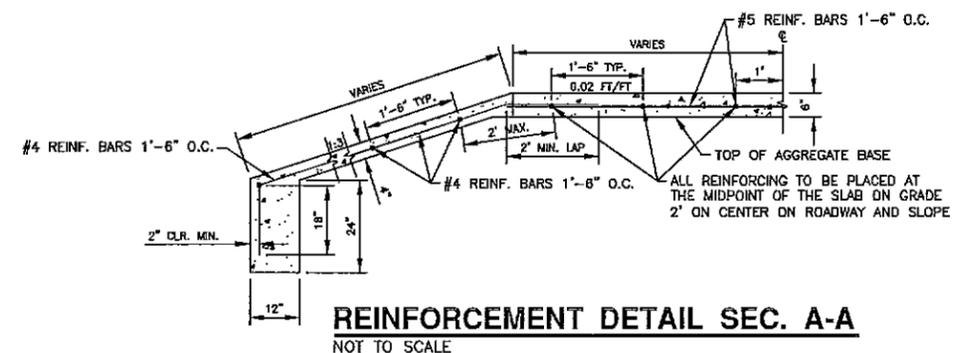
- AGGREGATE BASE COURSE CL 5 PER SPEC AND CODE 302-0120 SHALL BE USED AS SURFACE COURSE. PLAN QUANTITY IS COMPACTED VOLUME.
- WHERE A SPEC AND CODE ITEM DESCRIPTION IS FOLLOWED BY A (P), THE PLAN QUANTITY SHALL BE THE FINAL PAY QUANTITY.

CASS COUNTY
 HIGHWAY DEPARTMENT
 MAPLE RIVER
 BRIDGE NO. 9-120-35.0
 ESTIMATE OF QUANTITIES
 & BASIS OF ESTIMATE
 PROJECT NO. FL1005 - SITE 84
 TOWNSHIP ROAD
 SOUTHEAST OF CHAFFEE
 CASS COUNTY

STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
N.D.	FL1005 - SITE 84	6	13



NOTE:
ROADWAY REINFORCING STEEL SHALL CONSIST OF #5 BARS PLACED AT 1'-6" ON CENTER EACH WAY, UNLESS OTHERWISE NOTED.
SLOPE REINFORCING STEEL SHALL CONSIST OF #4 BARS PLACED AT 1'-6" ON CENTER EACH WAY, UNLESS OTHERWISE NOTED.
ALL REINFORCING STEEL WILL BE CONTINUOUS THROUGHOUT THE ENTIRE CONCRETE SLAB. MINIMUM LAP TO BE 12"
CONCRETE PAVEMENT SHALL HAVE A 6" CLASS 5 AGGREGATE BASE AND PAID FOR AS "6" REINFORCED CONCRETE PAVEMENT CL. V"
ALL PAVEMENT ON SLOPES SHALL BE 4" AND PAID FOR AS "SLOPE PROTECTION CONCRETE".
RIPRAP MAT SHALL BE 24" IN THICKNESS AND PLACED ON GEOTEXTILE FABRIC OR SAND PER NDDOT STANDARD SPECIFICATIONS.



REINFORCEMENT DETAIL SEC. A-A
NOT TO SCALE

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CASS COUNTY HIGHWAY DEPARTMENT
MAPLE RIVER
BRIDGE NO. 9-120-35.0
CONCRETE PAVING DETAILS
PROJECT NO. FL1005 - SITE 84
TOWNSHIP ROAD
SOUTHEAST OF CHAFFEE
CASS COUNTY

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STA 22+00 LT
INSTALL 24"x30"
END SPEED ZONE
REGULATORY SIGN



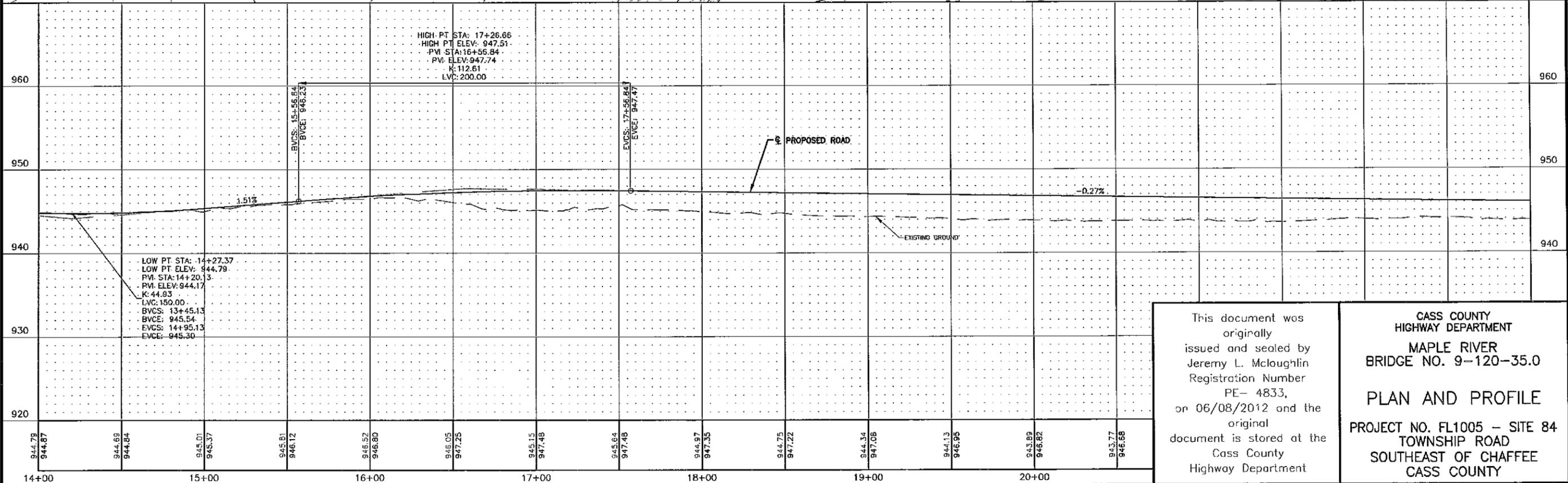
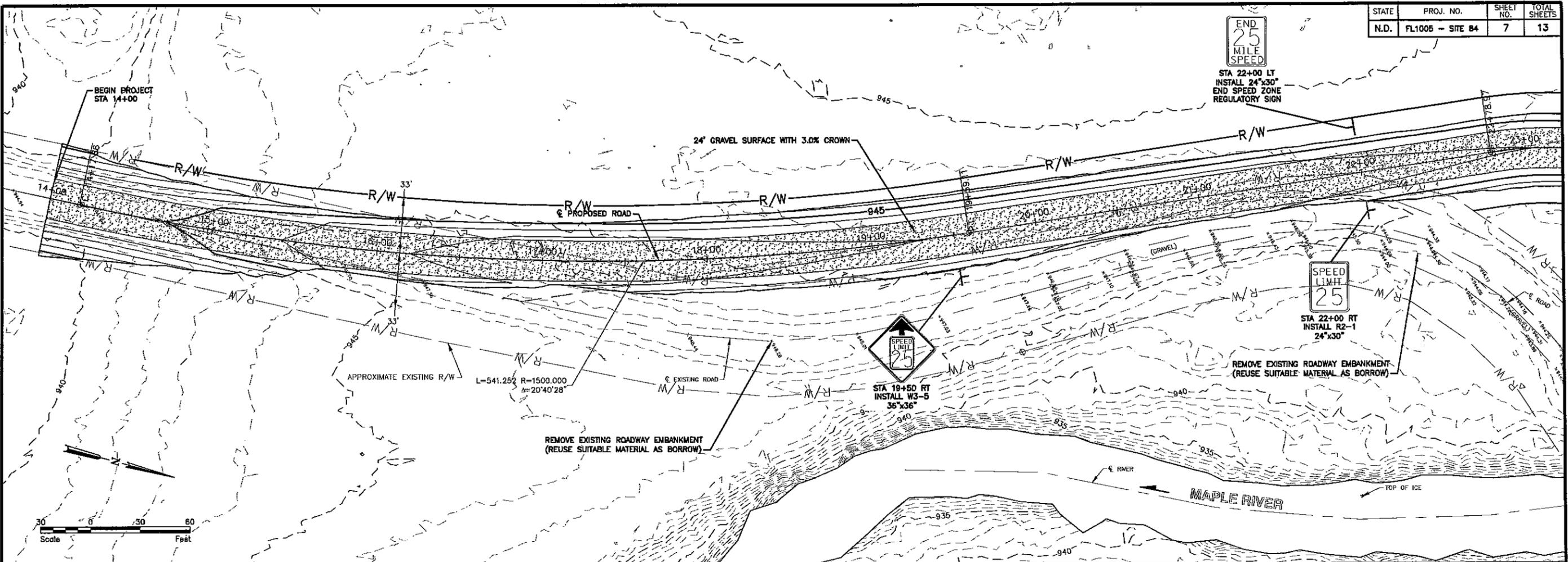
STA 22+00 RT
INSTALL R2-1
24"x30"

REMOVE EXISTING ROADWAY EMBANKMENT
(REUSE SUITABLE MATERIAL AS BORROW)



STA 18+50 RT
INSTALL W3-5
36"x36"

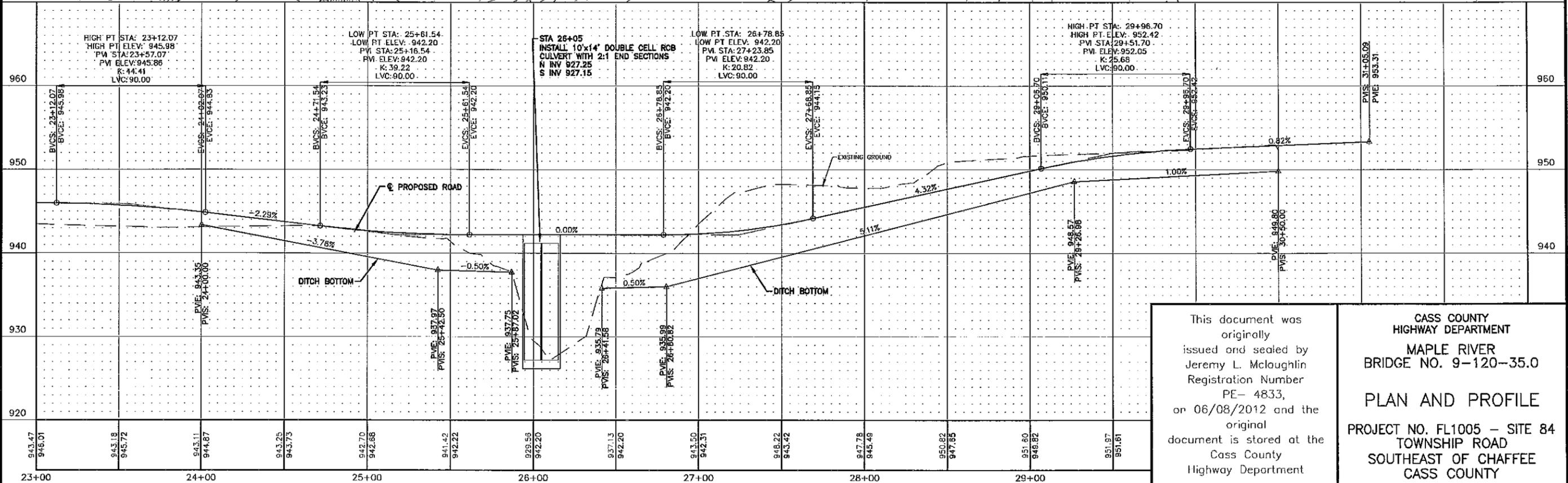
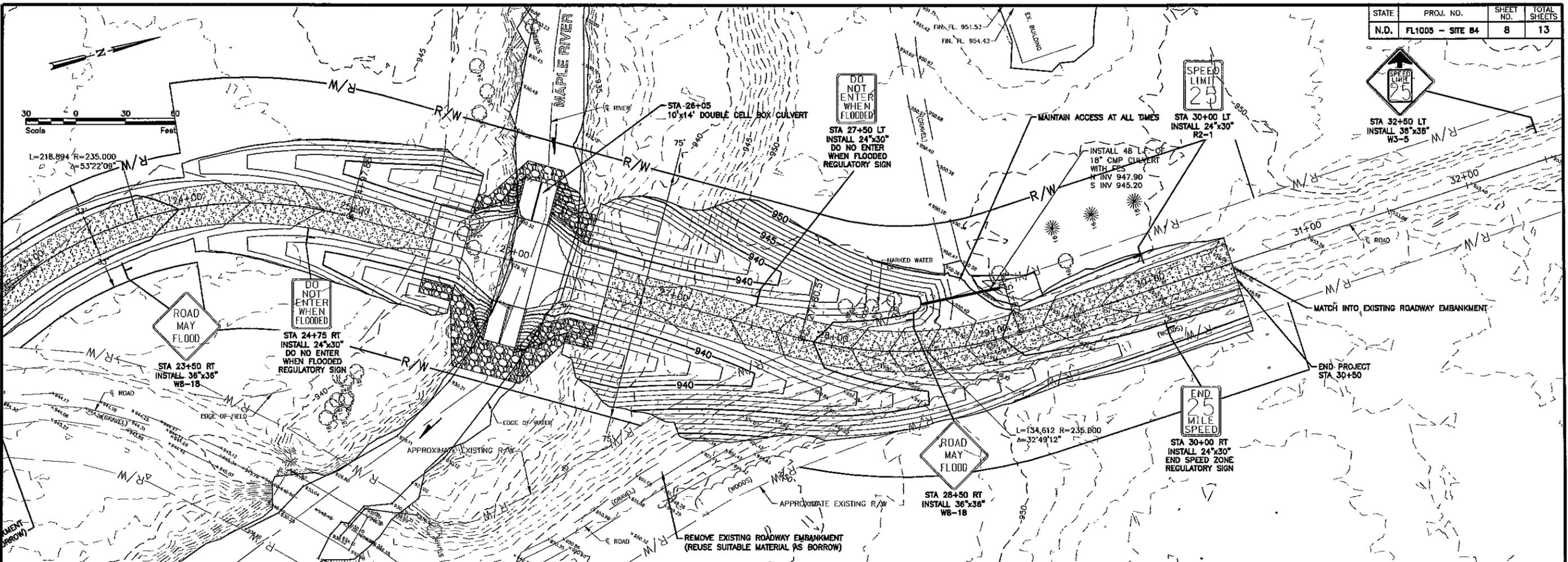
REMOVE EXISTING ROADWAY EMBANKMENT
(REUSE SUITABLE MATERIAL AS BORROW)



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CASS COUNTY
HIGHWAY DEPARTMENT
MAPLE RIVER
BRIDGE NO. 9-120-35.0
PLAN AND PROFILE
PROJECT NO. FL1005 - SITE B4
TOWNSHIP ROAD
SOUTHEAST OF CHAFFEE
CASS COUNTY

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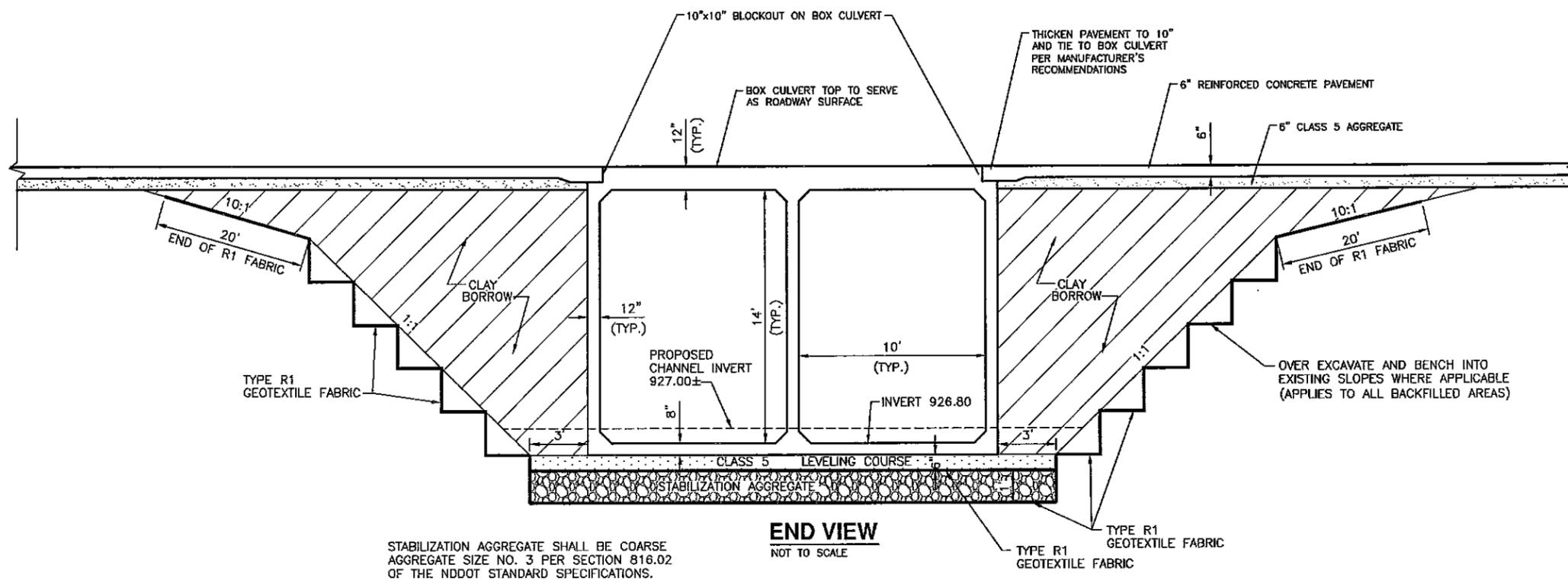


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CASS COUNTY HIGHWAY DEPARTMENT
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 PLAN AND PROFILE
 PROJECT NO. FL1005 - SITE 84
 TOWNSHIP ROAD
 SOUTHEAST OF CHAFFEE
 CASS COUNTY

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STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
N.D.	FL1005 - SITE 84	9	13

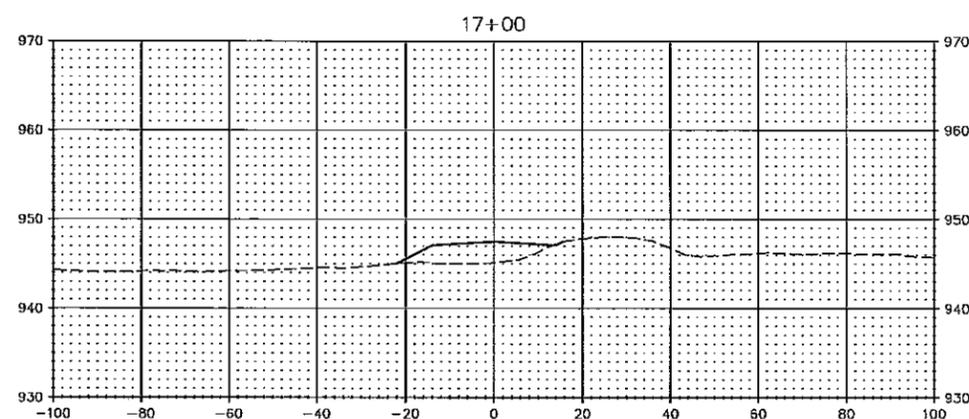
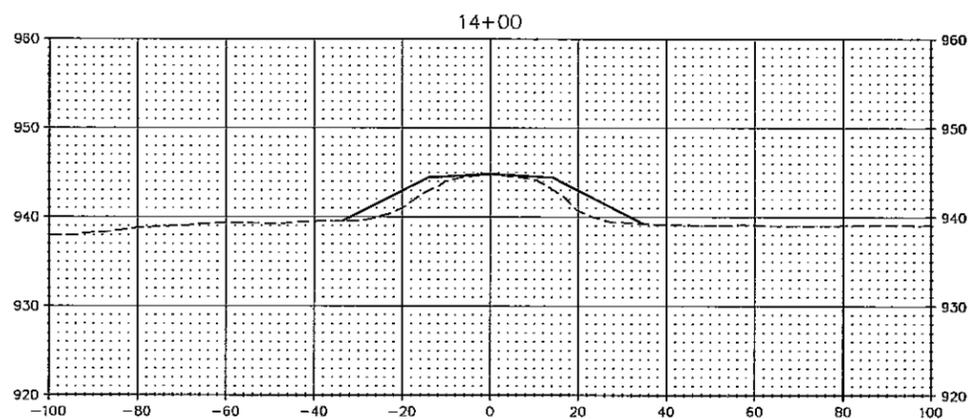
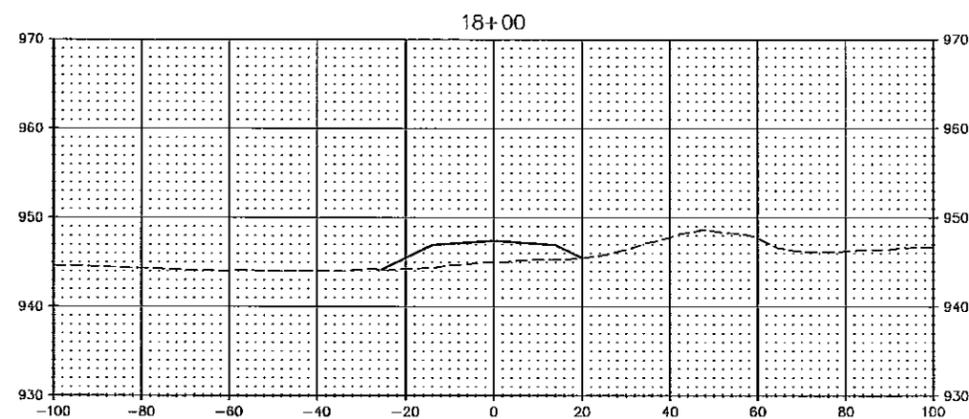
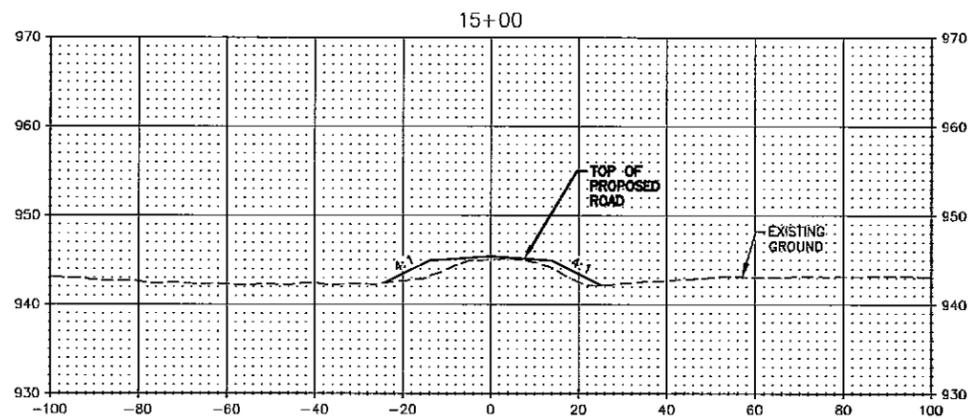
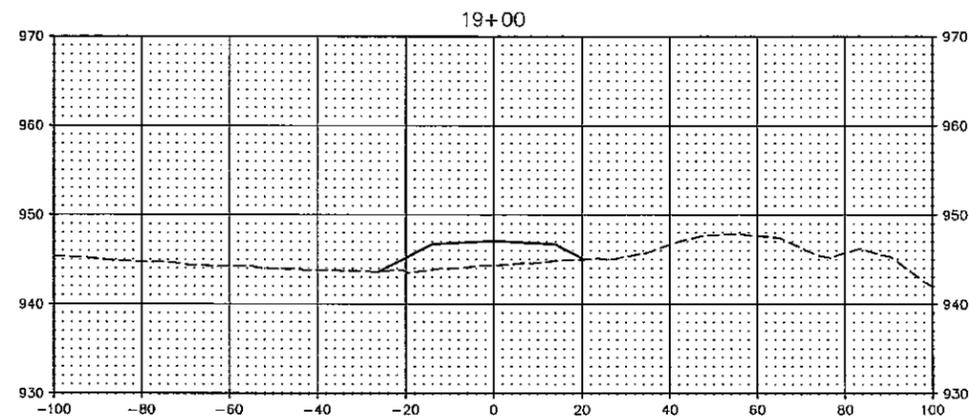
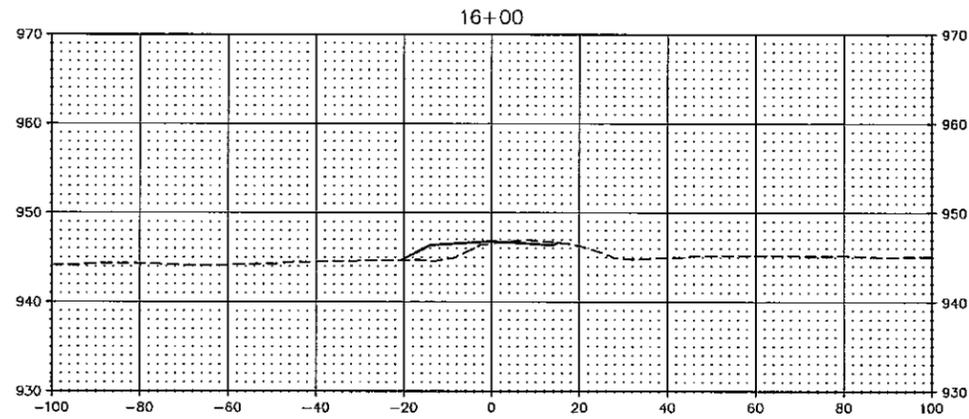


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**CASS COUNTY
 HIGHWAY DEPARTMENT**
 MAPLE RIVER
 BRIDGE NO. 9-120-35.0
 PRECAST REINFORCED
 CONC. BOX CULVERT
 PROJECT NO. FL1005 - SITE 84
 TOWNSHIP ROAD
 SOUTHEAST OF CHAFFEE
 CASS COUNTY

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STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
N.D.	FL1005 - SITE 84	10	13

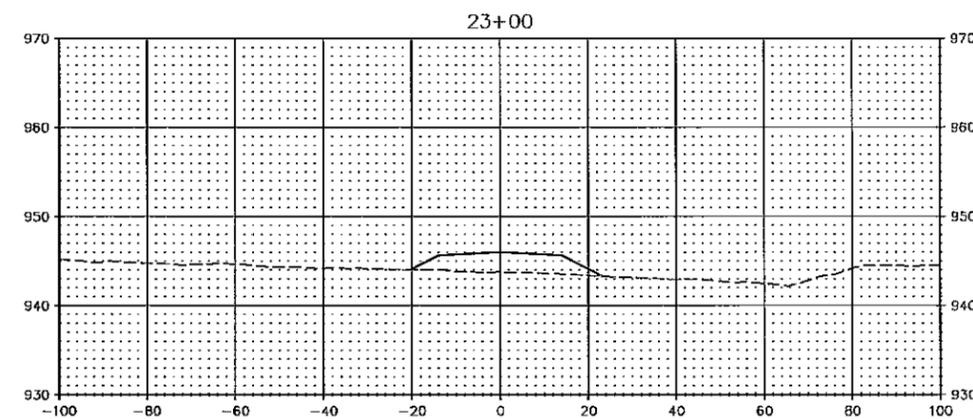
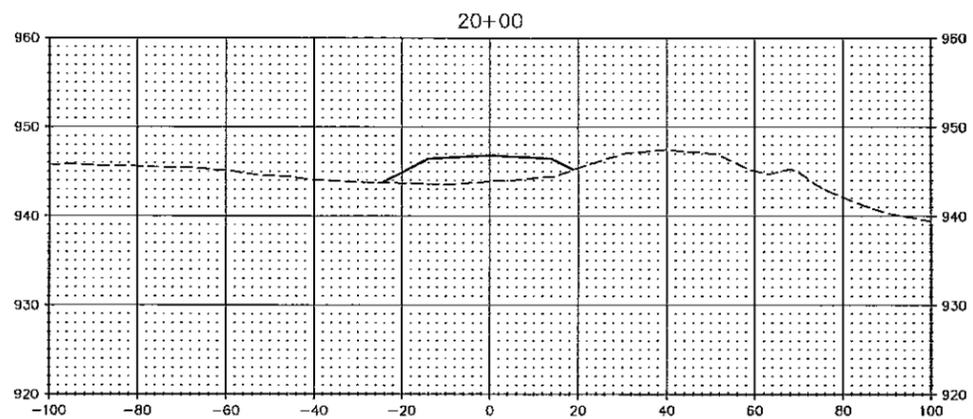
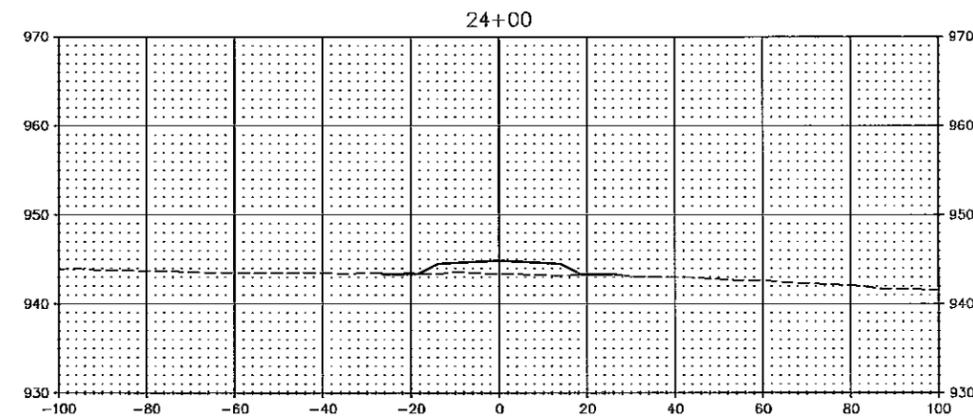
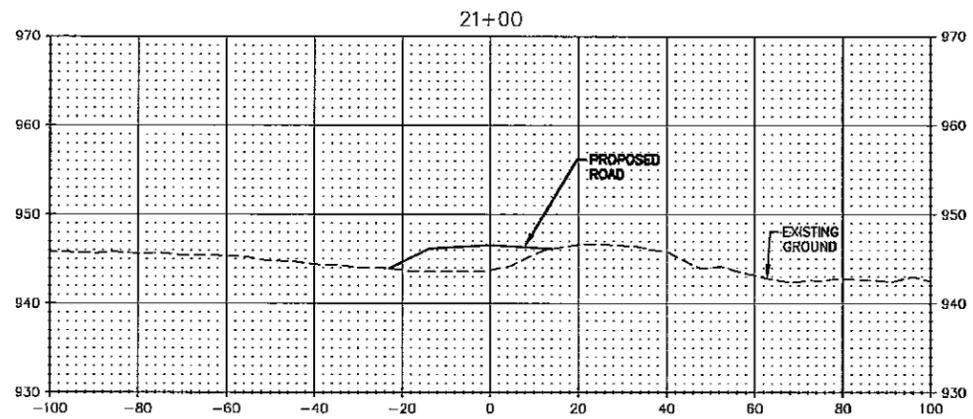
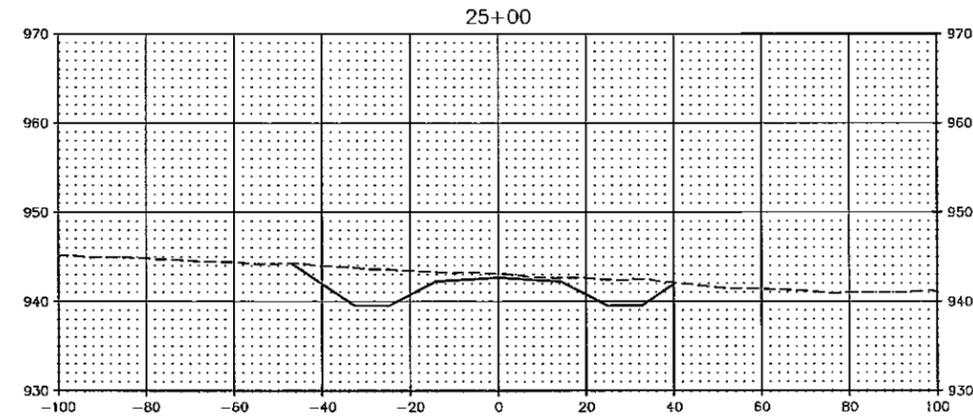
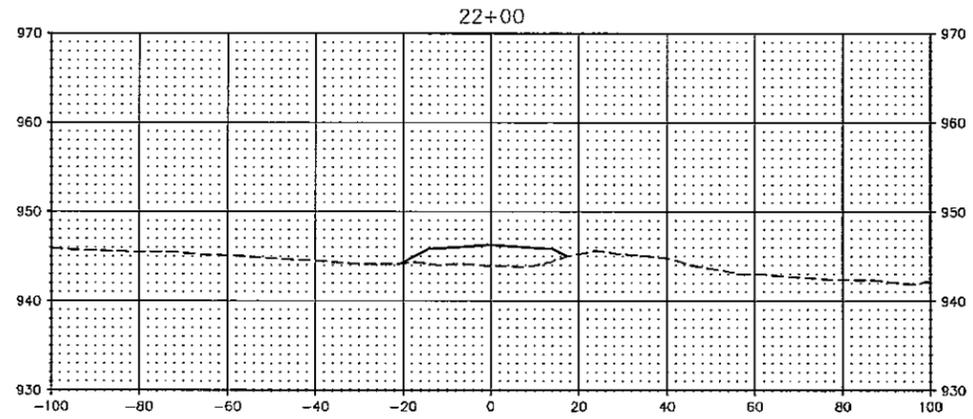


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CASS COUNTY
 HIGHWAY DEPARTMENT
 MAPLE RIVER
 BRIDGE NO. 9-120-35.0

 CROSS SECTIONS
 PROJECT NO. FL1005 - SITE 84
 TOWNSHIP ROAD
 SOUTHEAST OF CHAFFEE
 CASS COUNTY

STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
N.D.	FL1005 - SITE 84	11	13



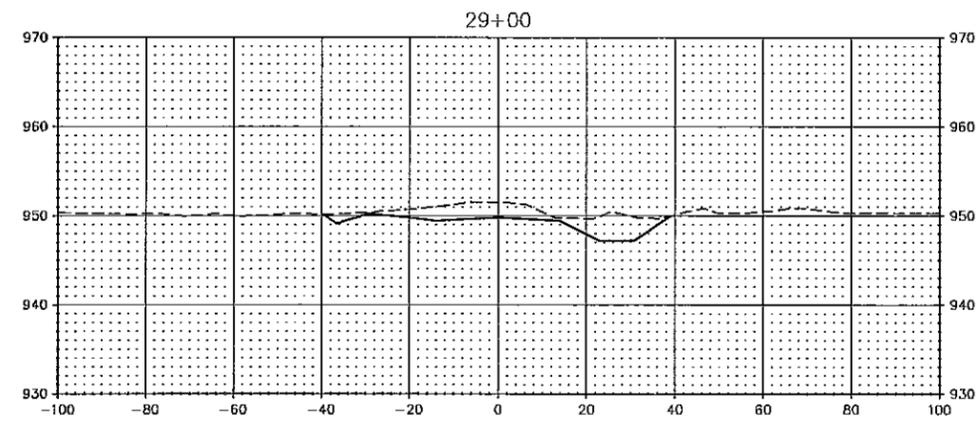
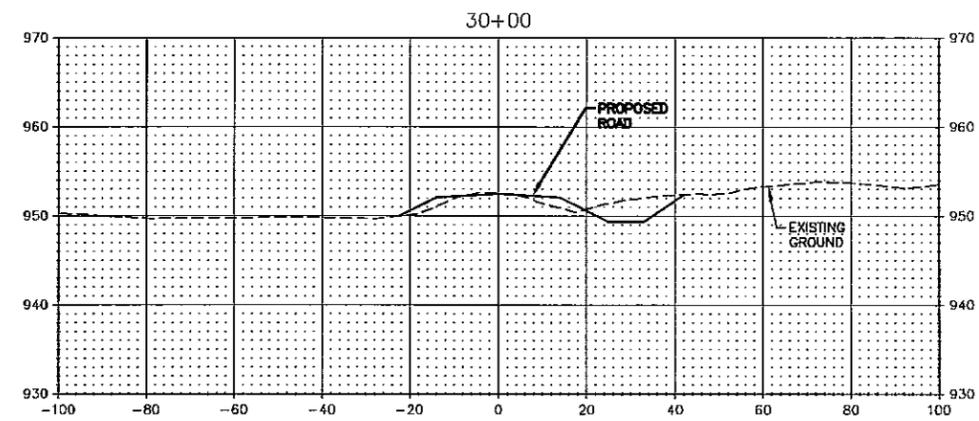
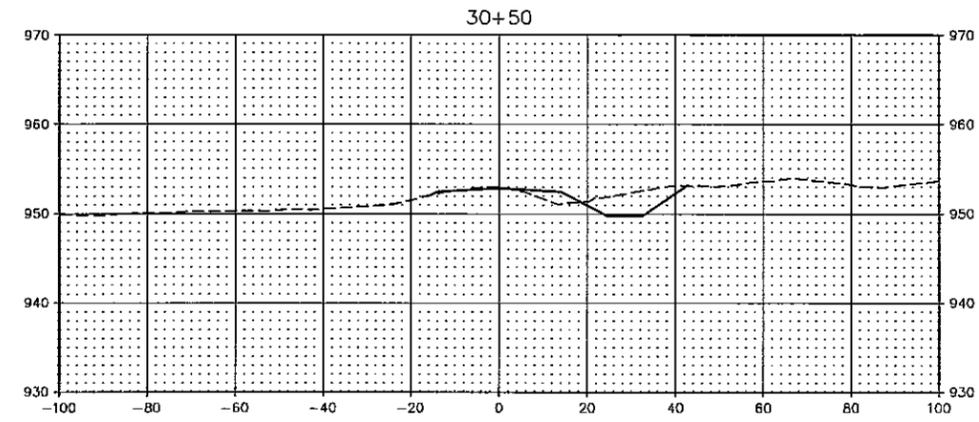
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CASS COUNTY
HIGHWAY DEPARTMENT
MAPLE RIVER
BRIDGE NO. 9-120-35.0

CROSS SECTIONS
PROJECT NO. FL1005 - SITE 84
TOWNSHIP ROAD
SOUTHEAST OF CHAFFEE
CASS COUNTY

STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
N.D.	FL1005 - SITE 84	13	13



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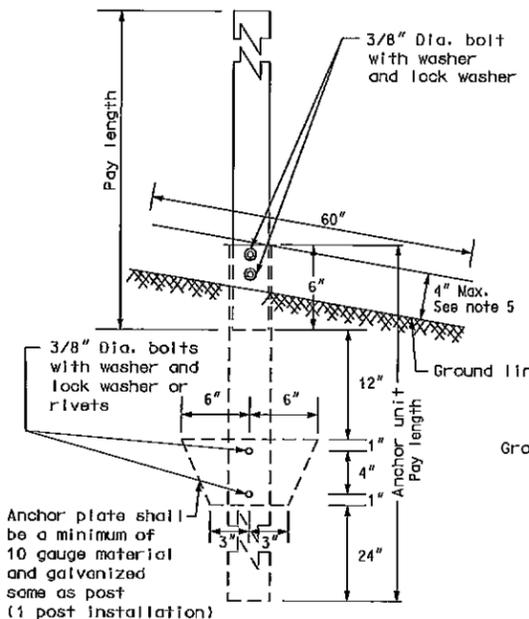
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CASS COUNTY
HIGHWAY DEPARTMENT
MAPLE RIVER
BRIDGE NO. 9-120-35.0

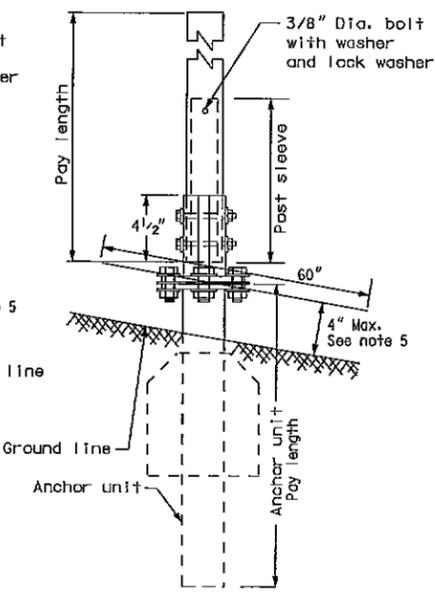
CROSS SECTIONS
PROJECT NO. FL1005 - SITE 84
TOWNSHIP ROAD
SOUTHEAST OF CHAFFEE
CASS COUNTY

BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

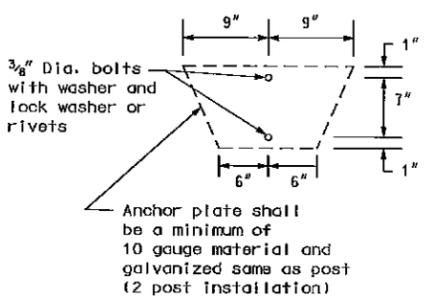
D-704-7



ANCHOR UNIT AND POST ASSEMBLY

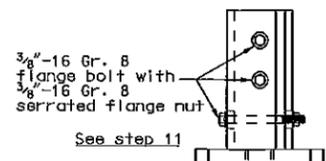


SLIP BASE ANCHOR UNIT AND POST SLEEVE ASSEMBLY

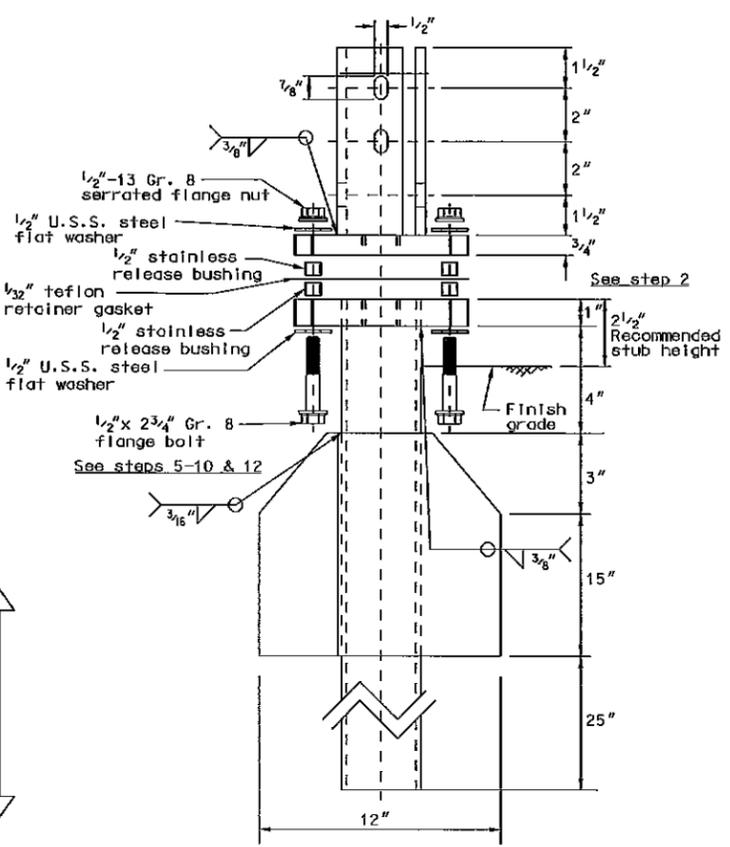


Anchor plate shall be a minimum of 10 gauge material and galvanized same as post (2 post installation)

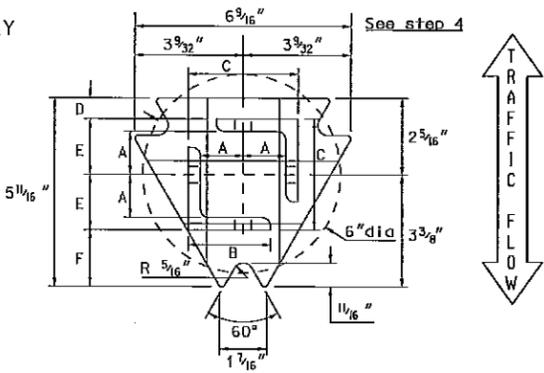
PERFORATED TUBE



See step 11



MULTI-DIRECTIONAL SLIP BASE ASSEMBLY

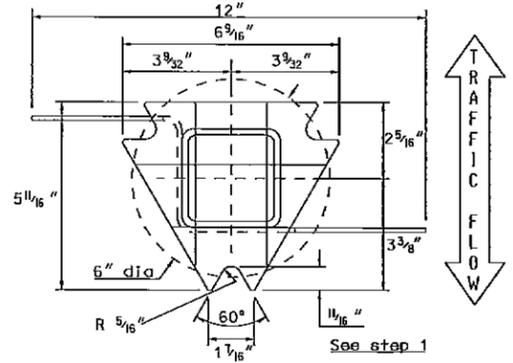


TOP POST RECEIVER

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

Square Post Sizes	TOP POST RECEIVER DATA TABLE					
	A	B	C	D	E	F
2 3/16" x 10 Ga. Square Post	1 3/16"	2 1/2"	3 1/32"	2 3/32"	1 3/16"	1 7/8"
2 1/2" x 10 Ga. Square Post	1 3/32"	2 1/2"	3 5/16"	5/8"	1 23/32"	1 3/4"

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



BOTTOM SOIL STUB

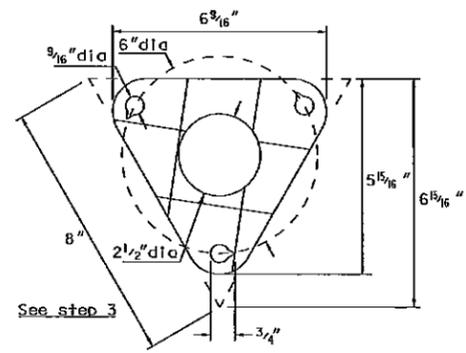
Materials: Tube - 3" x 3" x 7 gauge ASTM A500 Gr B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A 569
Plate - ASTM A572 grade 50

- Notes
- 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.

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 1/4	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 1/4	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.



BOLT RETAINER FOR BASE CONNECTION

Materials: 1/2" reprocessed Teflon

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

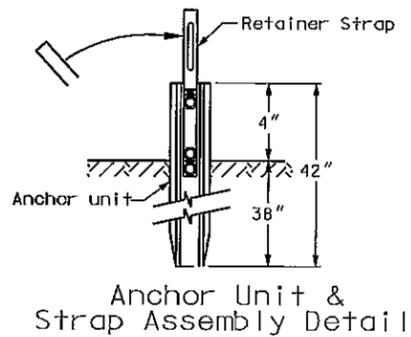
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BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

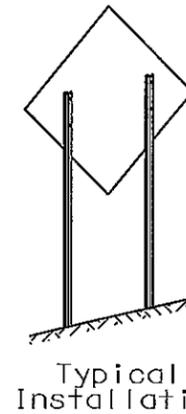
FLANGED CHANNEL

3 LB/FT U POSTS

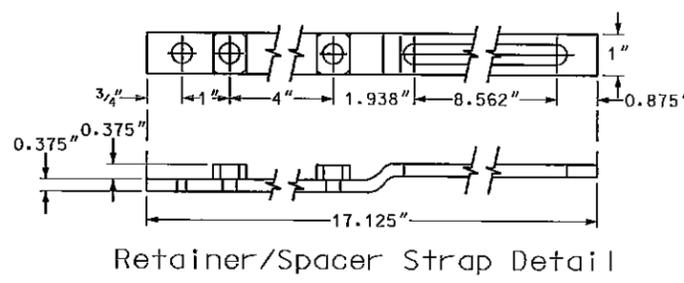
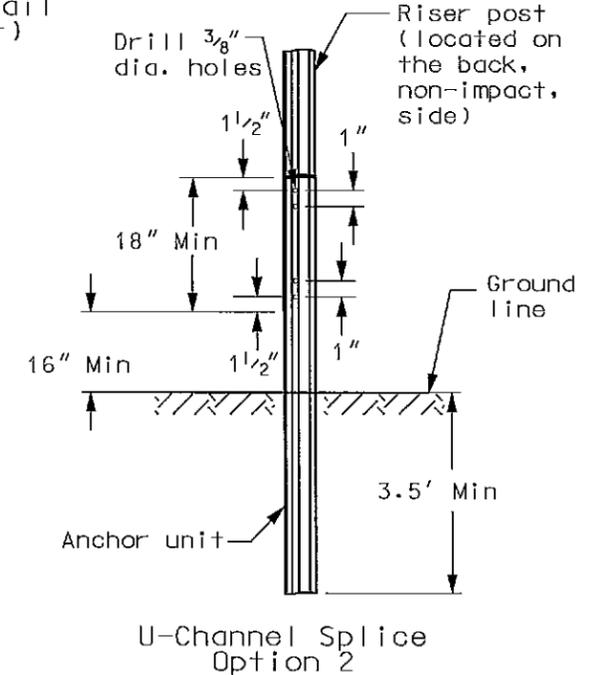
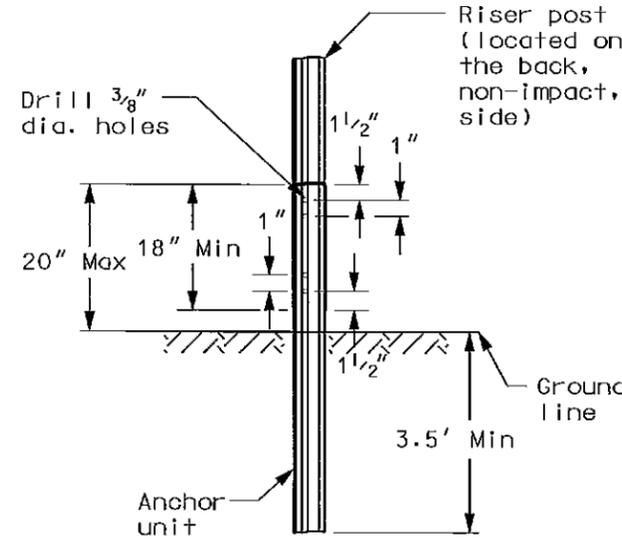
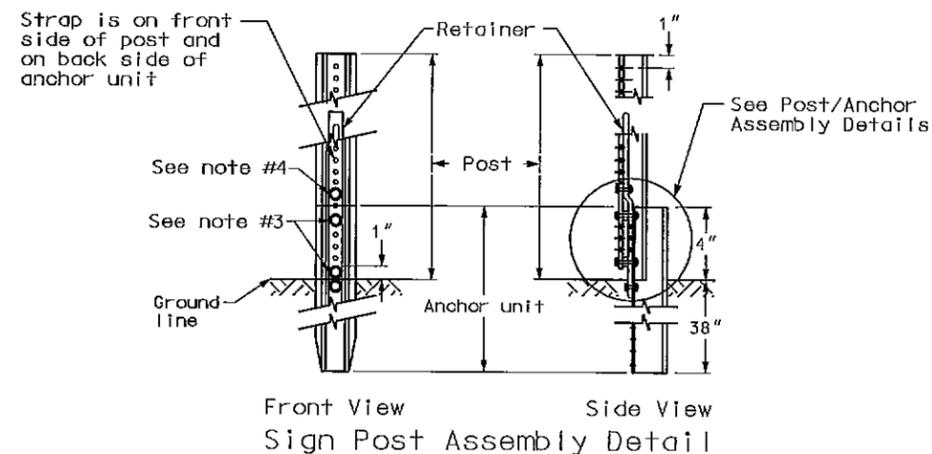
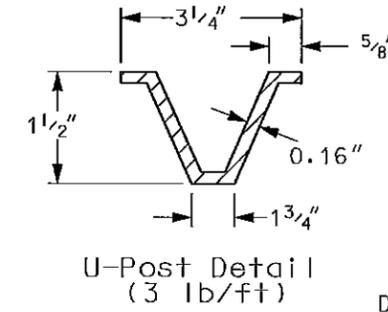
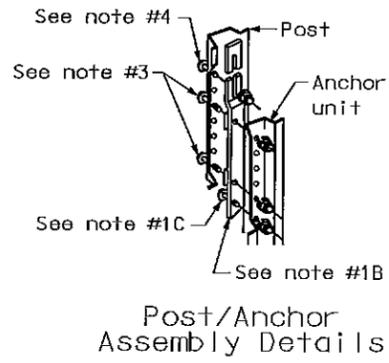


STEPS OF INSTALLATION

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.



- 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'.

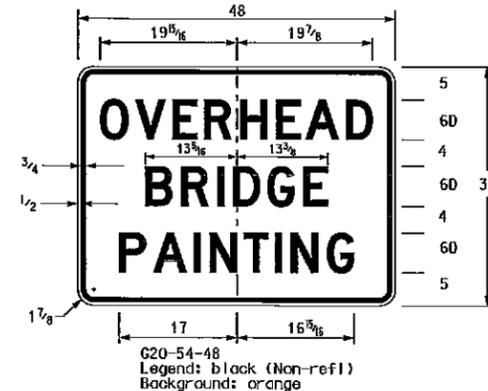
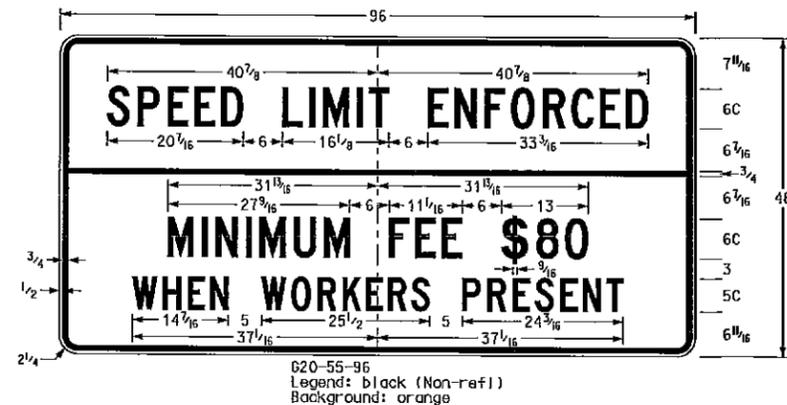
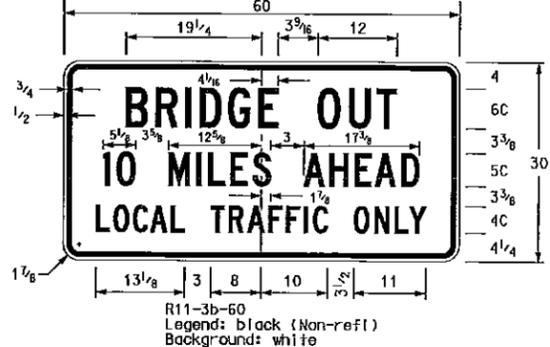
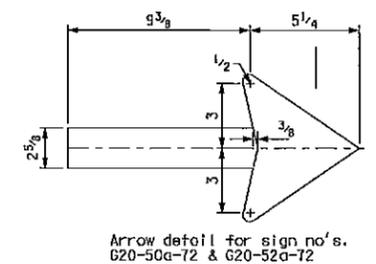
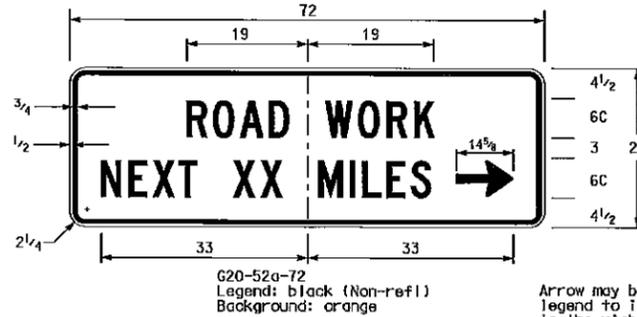
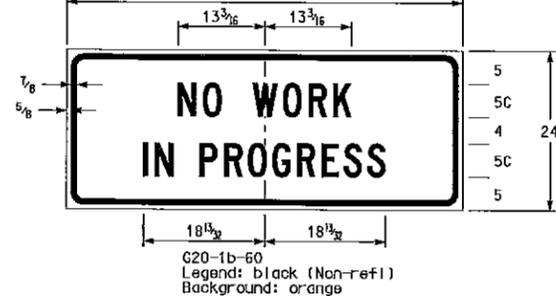
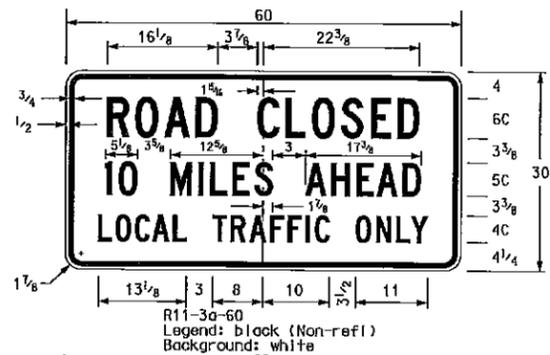
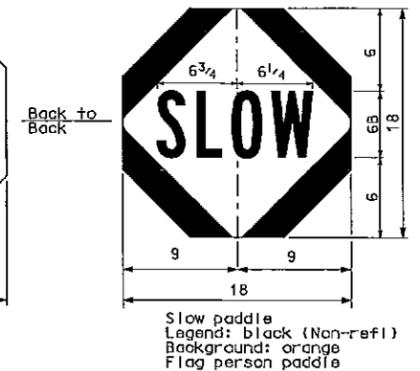
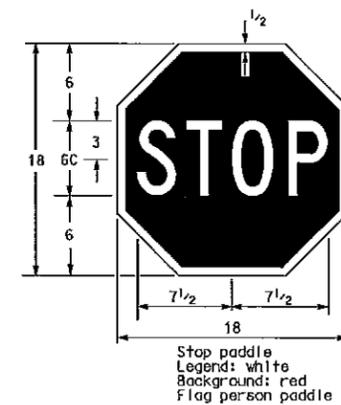
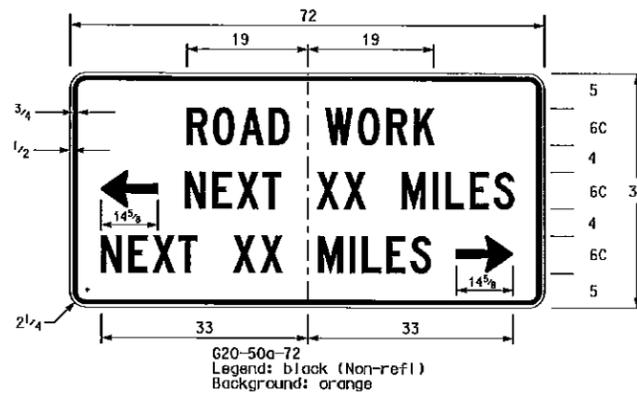
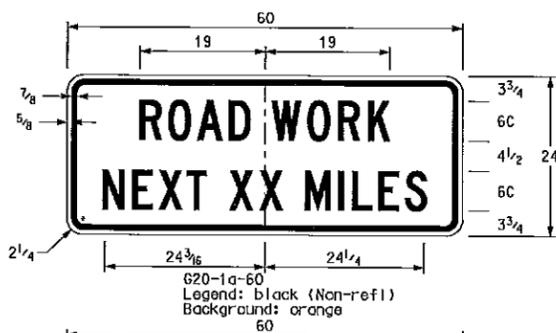
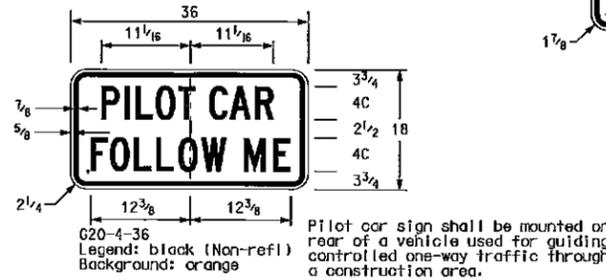
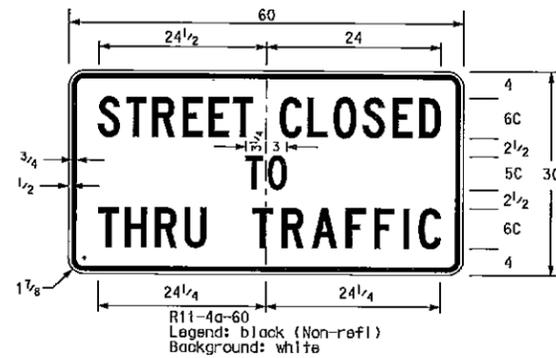
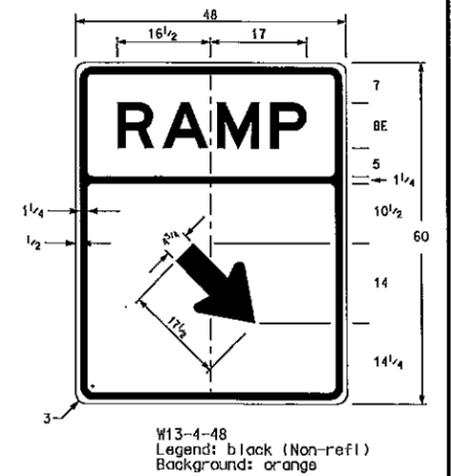
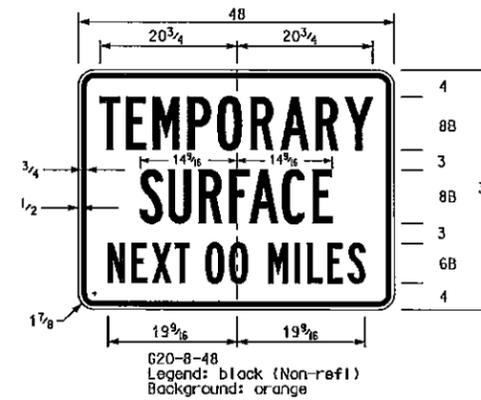
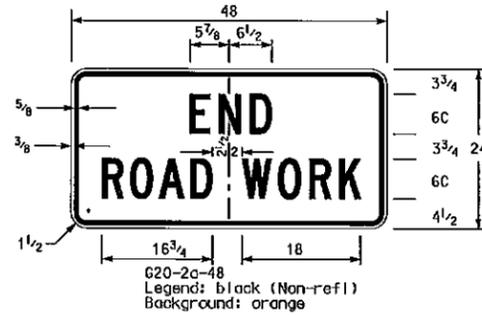
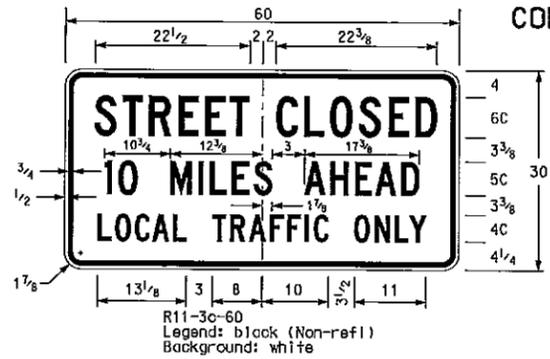
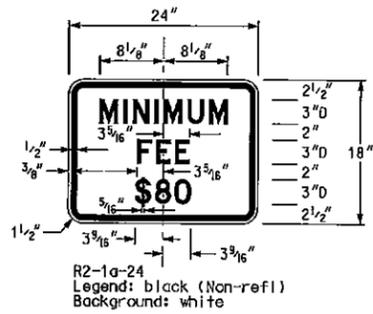


CHANNEL SIZE IN.	WALL THICKNESS IN.	WEIGHT PER FOOT LBS.	MOMENT OF INERTIA IN. 4.	GROSS SECTION AREA IN. 2.	SECTION MODULUS IN. 3.
1.516 x 3.125"	.116	2.00	.179	.590	.225
1.532 x 3.125"	.124	2.25	.201	.648	.254
1.562 x 3.125"	.132	2.50	.233	.748	.289
1.578 x 3.125"	.140	2.75	.271	.819	.329
1.750 x 3.500"	.150	3.00	.372	.918	.403
1.750 x 3.500"	.175	4.00	.500	1.190	.580

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

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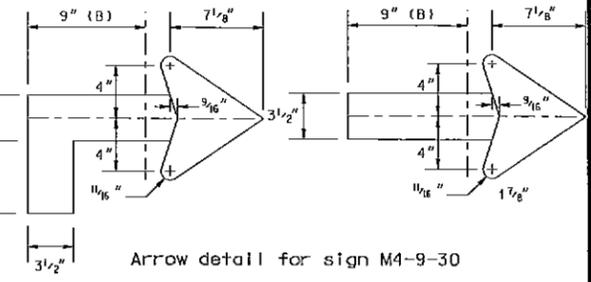
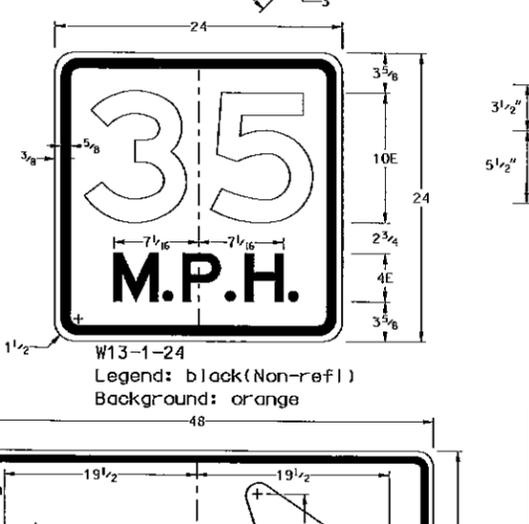
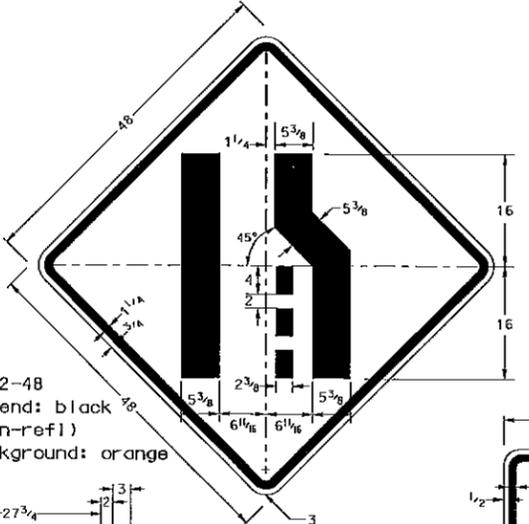
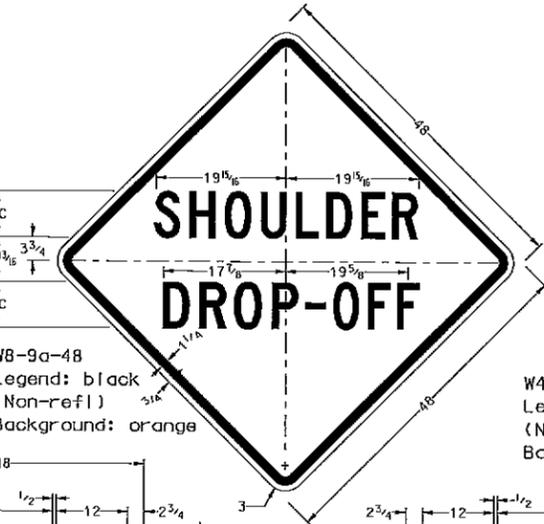
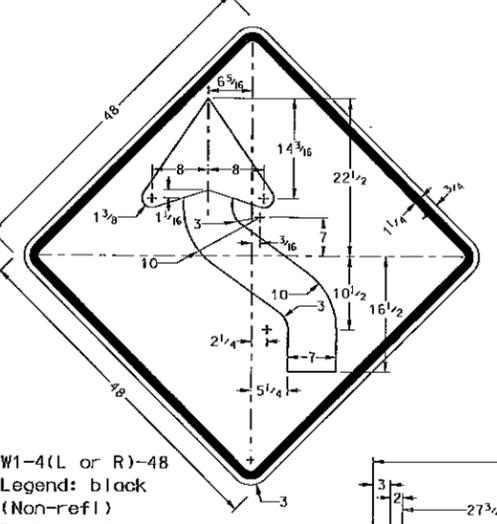
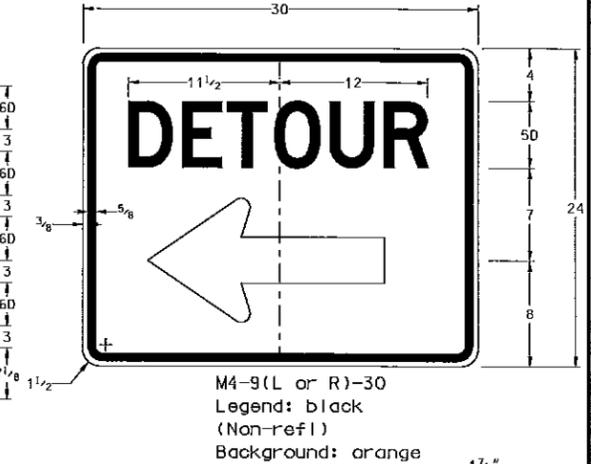
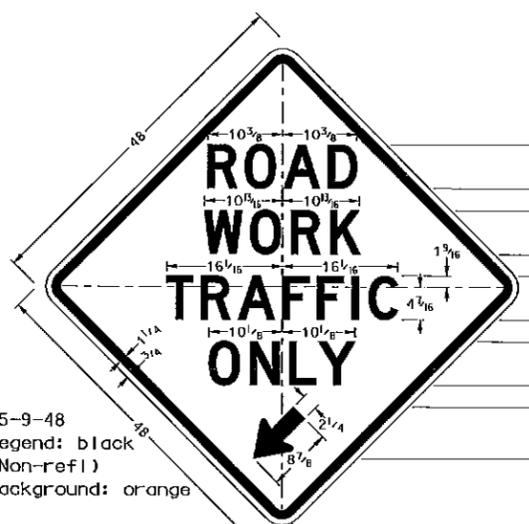
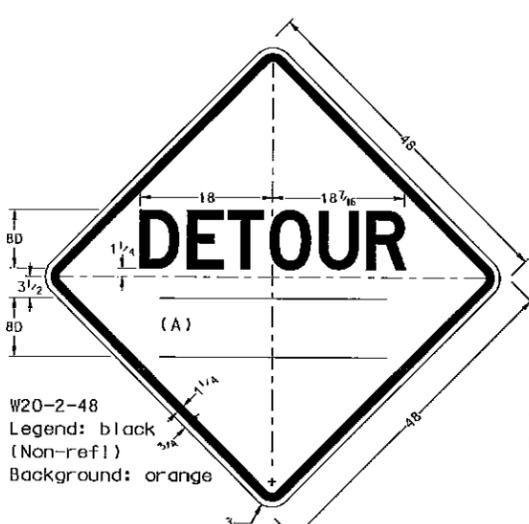
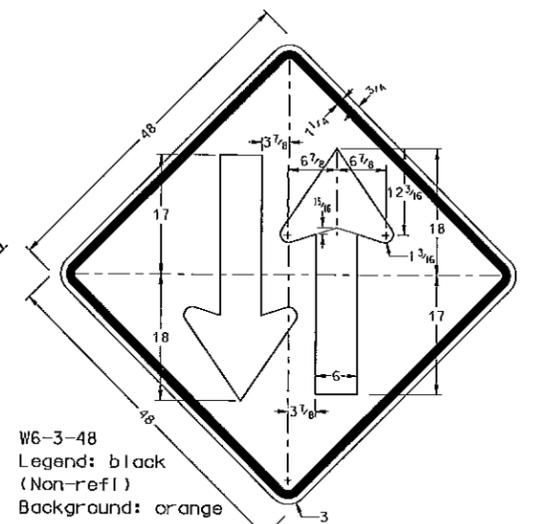
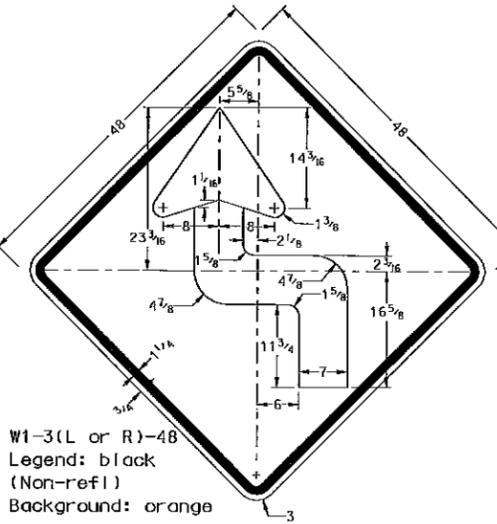
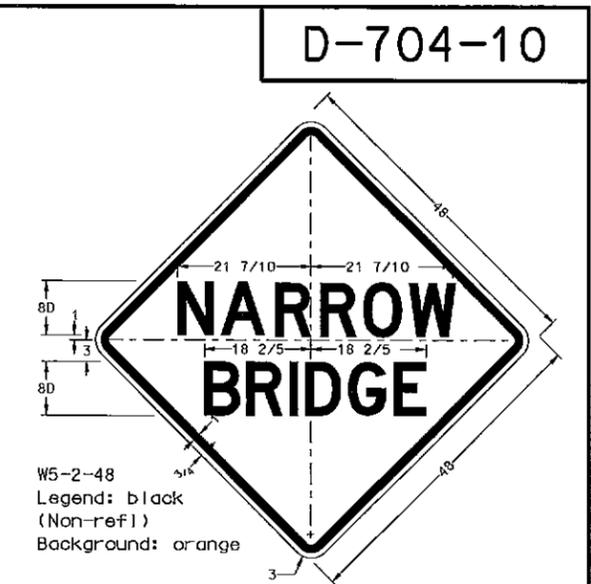
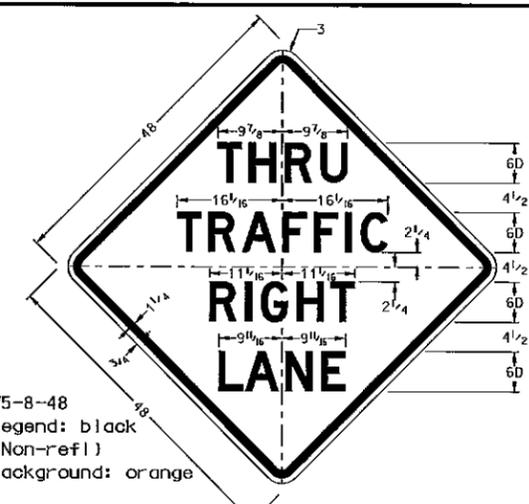
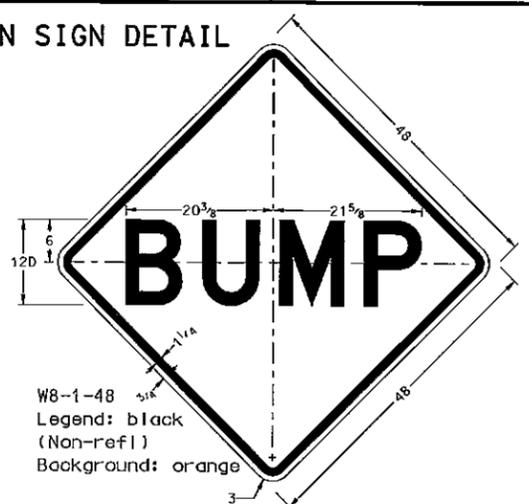
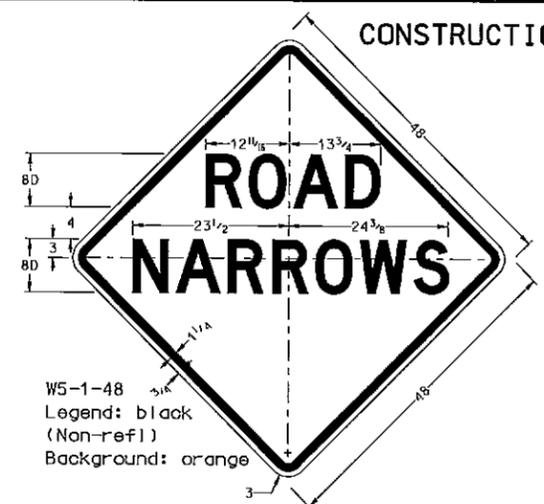
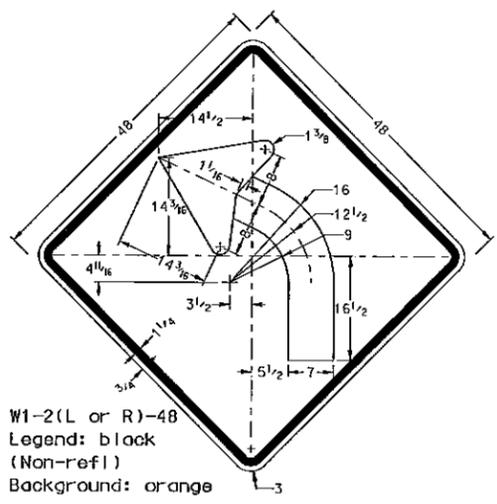
CONSTRUCTION SIGN DETAILS



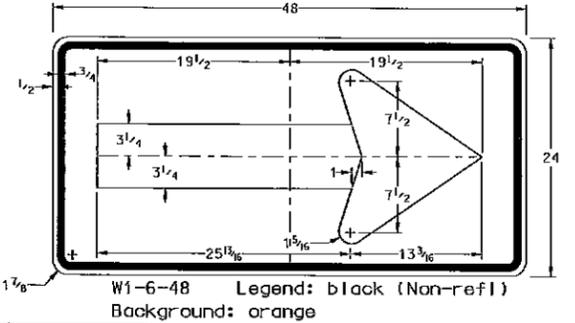
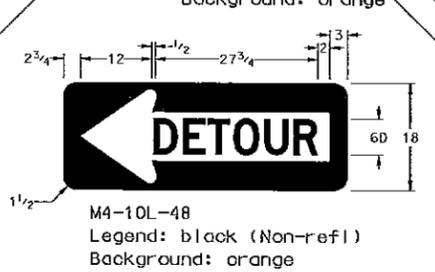
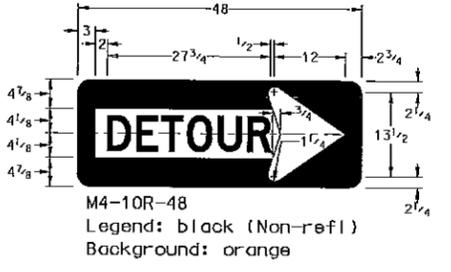
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
05-01-92	General revision
07-26-95	Added signs G20-1a, G20-50a, R2-1a
03-04-96	Remove G20-2-60
10-18-01	G20-1b-60
01-30-03	Pavement end sign
07-25-04	Revised Fee Sign
04-01-04	Revised G20-55-96 sign
08-04-04	Deleted W8-3-48, Added 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.

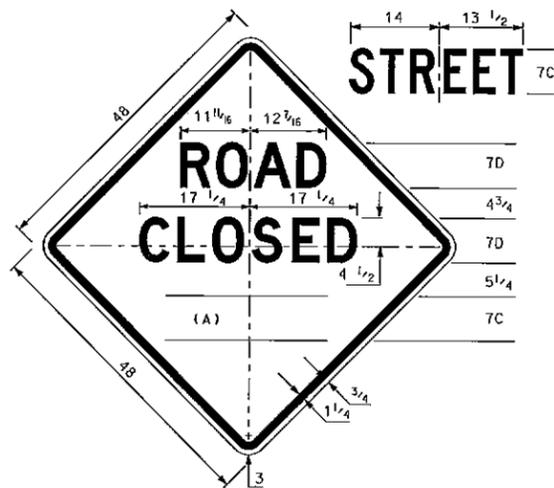


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
08-03-87	Detour no.
12-01-88	Shoulder drop off
05-01-88	General revisions
02-03-95	WB-9a-48
03-04-96	Remove W20-1-48
05-01-00	W5-8-48, W5-9-48
11-07-00	Add W5-2-48
01-06-04	W4-9-30 to M4-9-30
08-04-04	add arrow detail
12-01-04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

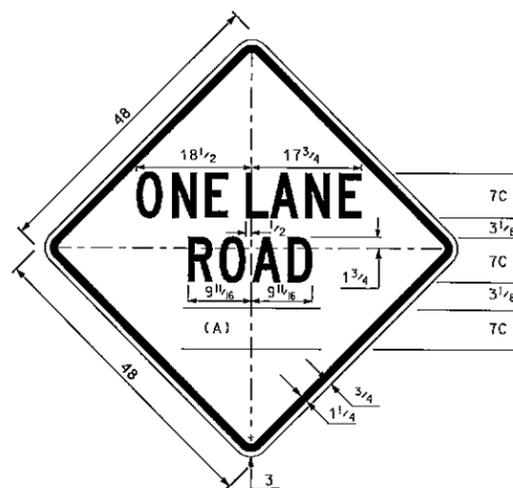
This document was originally issued and sealed by Mark S Gaydos, Registration Number PE-4518, on 07/11/05 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN DETAIL

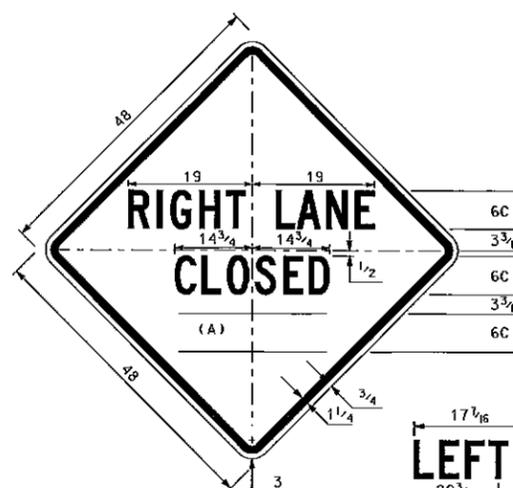
D-704-11



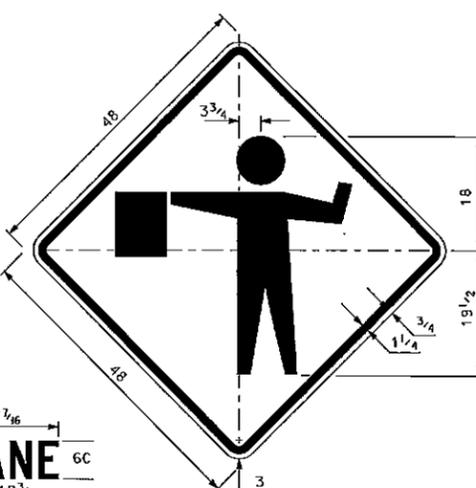
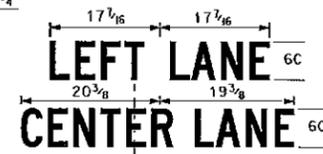
W20-3-48
Legend: black
(Non-refl)
Background: orange



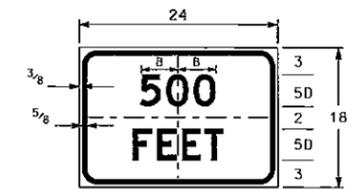
W20-4-48
Legend: black
(Non-refl)
Background: orange



W20-5-48
Legend: black
(Non-refl)
Background: orange



W20-7a-48
Legend: black
(Non-refl)
Background: orange



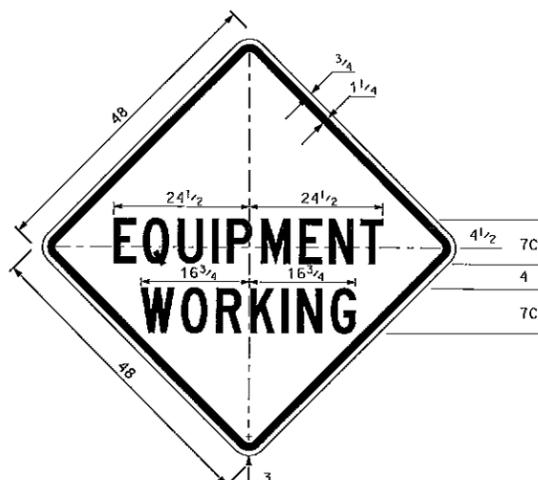
W20-7k-24
Legend: black
(Non-refl)
Background: orange

SIGN	DIMENS (ON B (INCHES))
500'	6
1000'	7 3/8
1500'	7 3/8

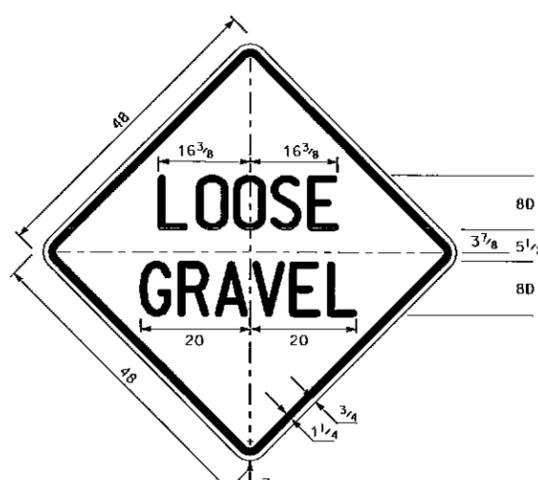
For use with
W20-7a-48 &
W21-1a-48



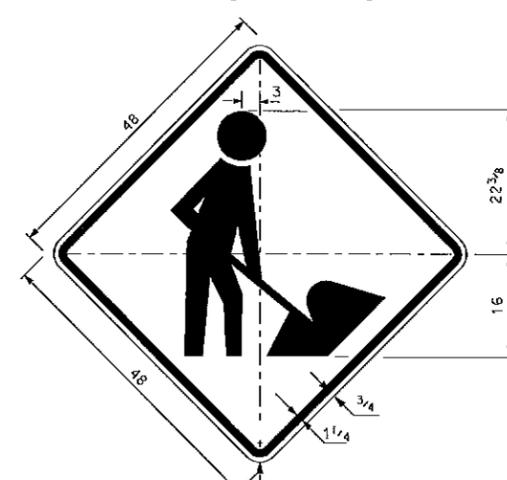
W20-8-48
Legend: black
(Non-refl)
Background: orange



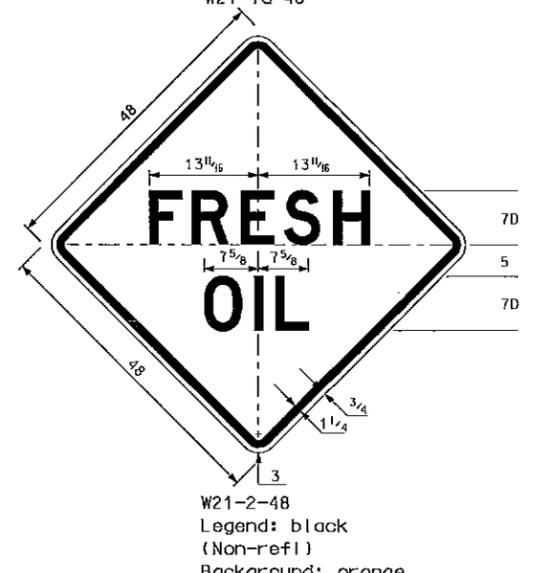
W20-51-48
Legend: black
(Non-refl)
Background: orange



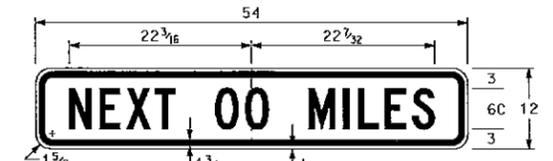
W8-7-48
Legend: black
(Non-refl)
Background: orange



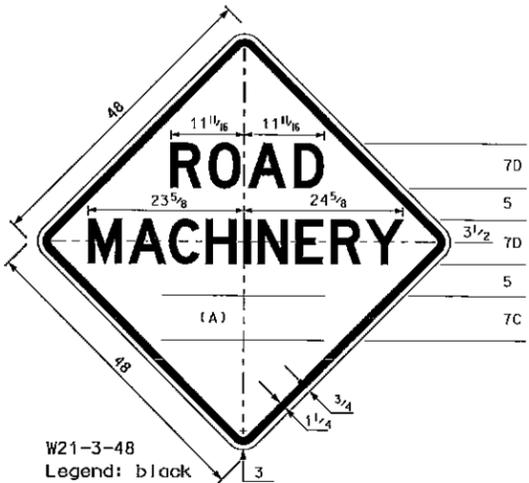
W21-1a-48
Legend: black
(Non-refl)
Background: orange



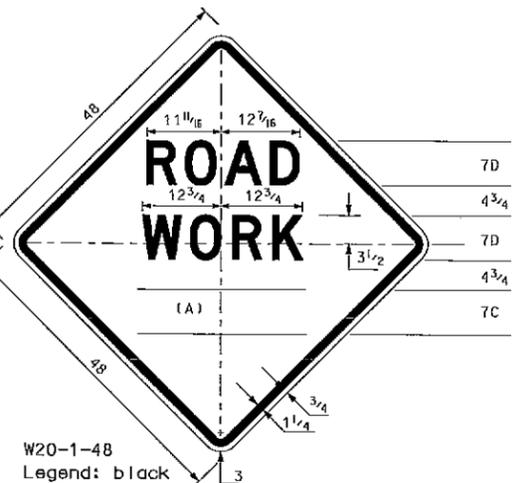
W21-2-48
Legend: black
(Non-refl)
Background: orange



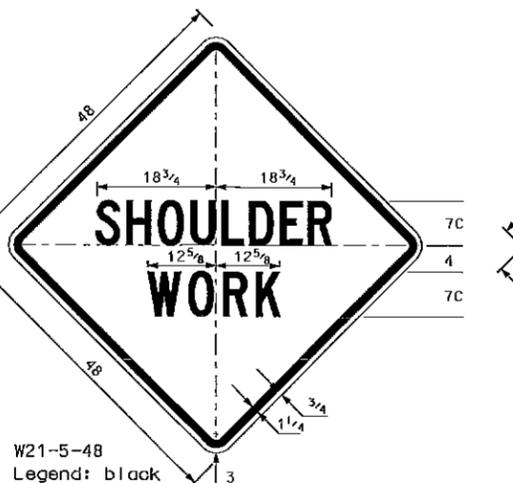
W20-52-54
Legend: black
(Non-refl)
Background: orange



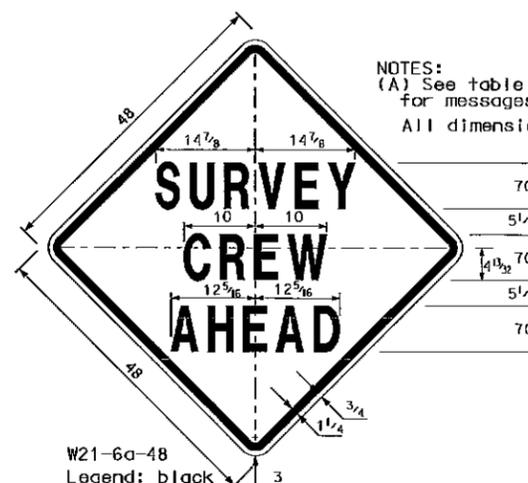
W21-3-48
Legend: black
(Non-refl)
Background: orange



W20-1-48
Legend: black
(Non-refl)
Background: orange



W21-5-48
Legend: black
(Non-refl)
Background: orange



W21-6a-48
Legend: black
(Non-refl)
Background: orange

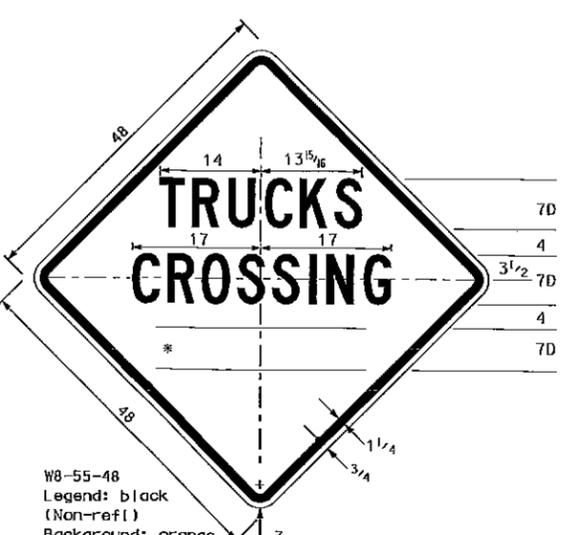
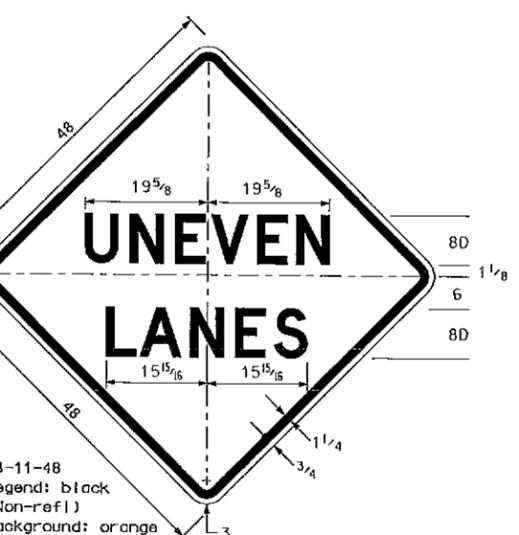
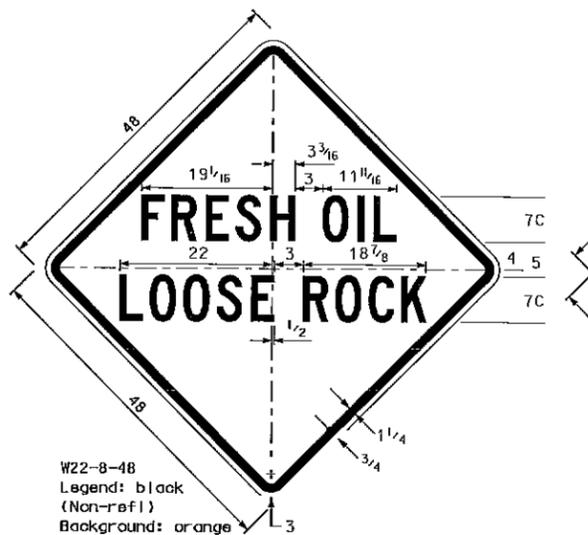
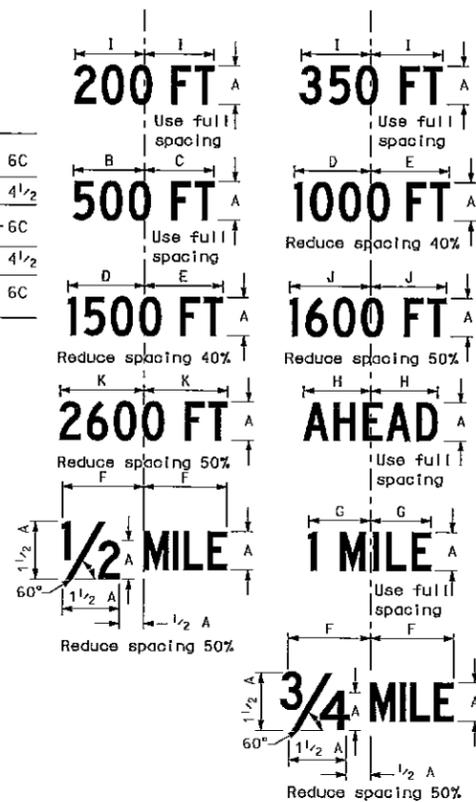
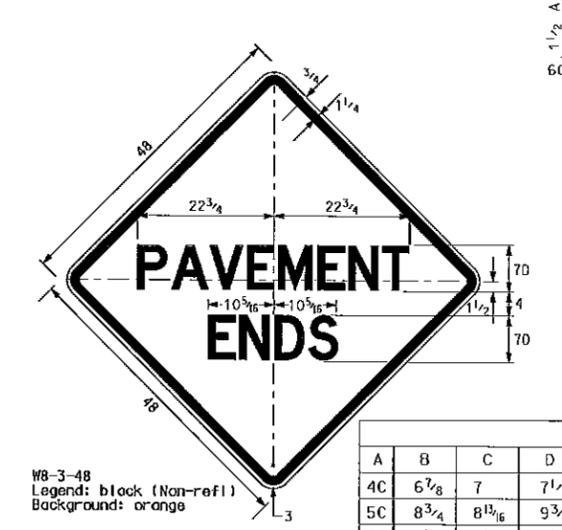
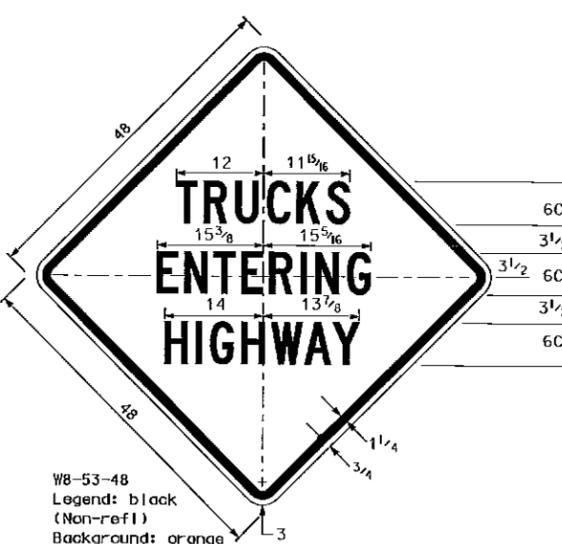
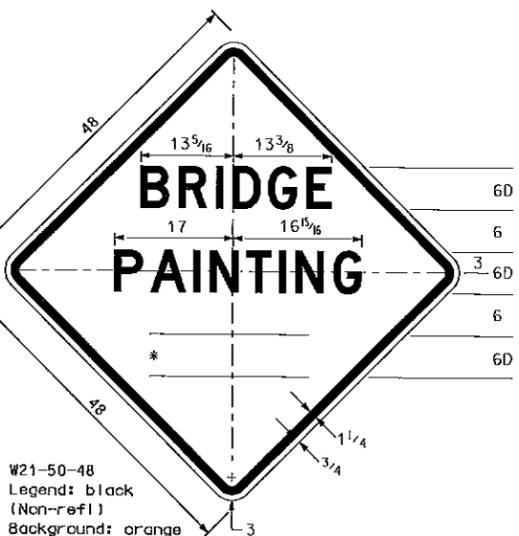
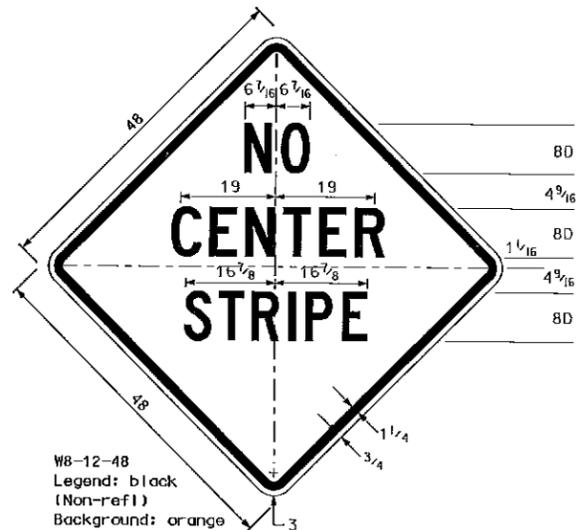
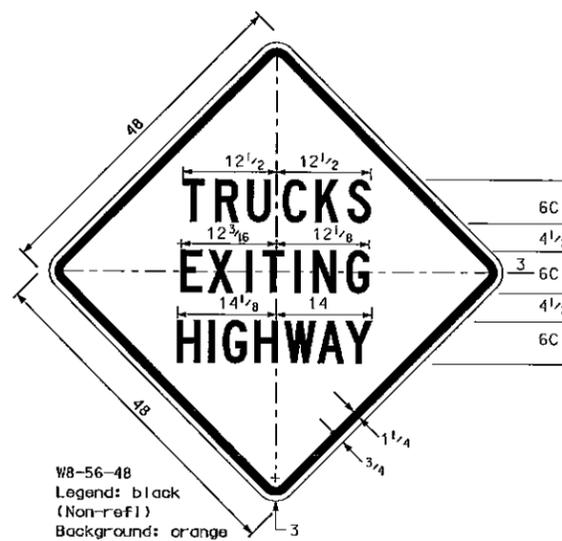
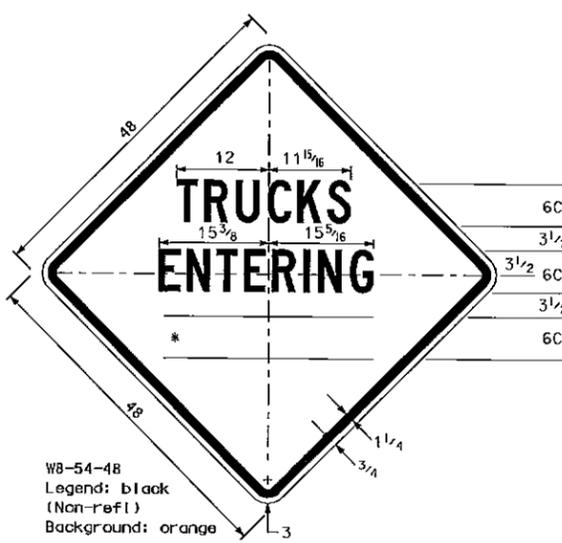
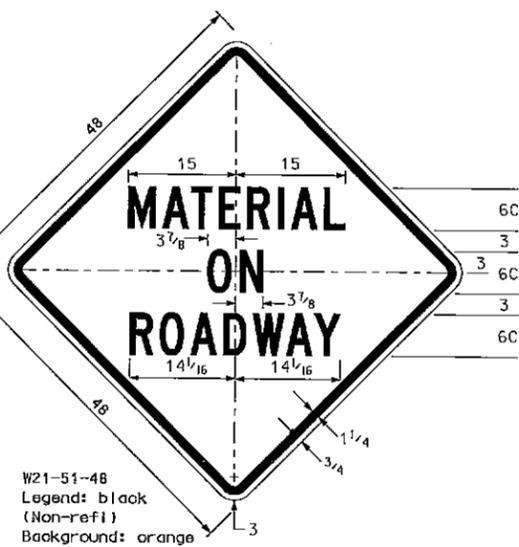
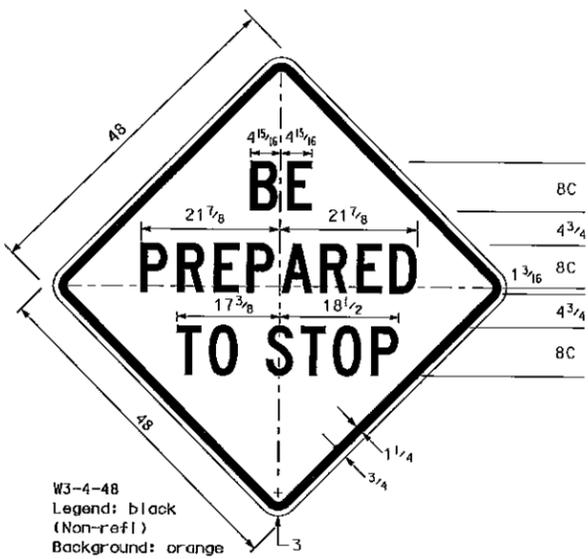
NOTES:
(A) See table on standard D-704-12 for messages and dimensions.
All dimensions are in inches

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)

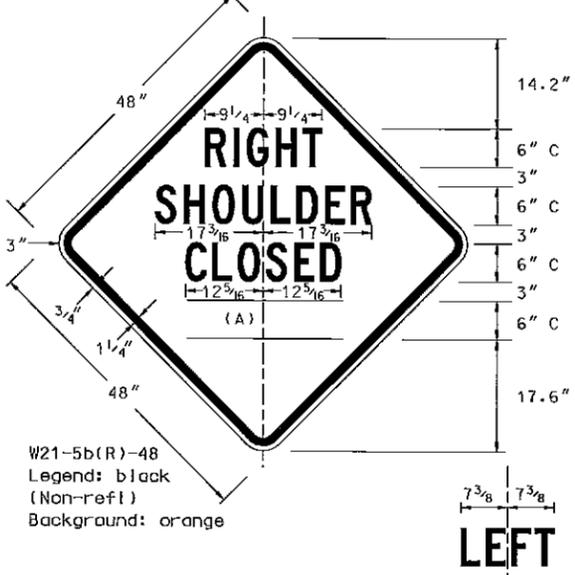
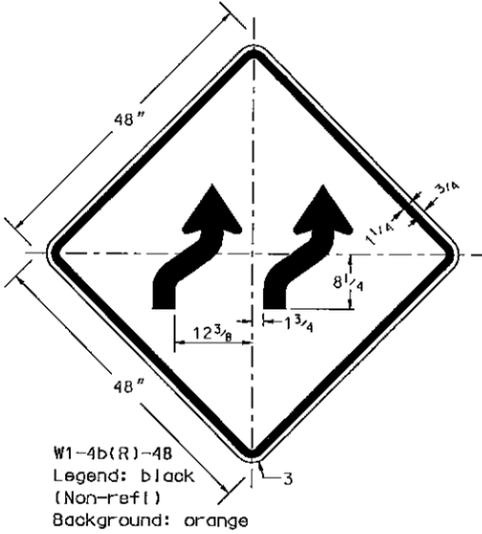
A	B	C	D	E	F	G	H	I	J	K
4C	6 1/8	7	7 1/2	8	8 5/16	6 1/16	7	8 5/16	9 1/8	9 3/4
5C	8 3/4	8 15/16	9 3/8	10	10 7/16	7 5/8	8 3/4	10 1/16	11 1/16	12 3/16
6C	10 3/8	10 1/2	11 1/4	12	12 1/2	9 1/8	10 1/2	12 1/2	13 3/4	14 5/8
7C	12	12 3/16	13 1/8	14	14 3/16	10 3/8	12 1/4	14 3/16	15	15 5/8
8C	13 3/4	14	15	16	16 5/8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

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.

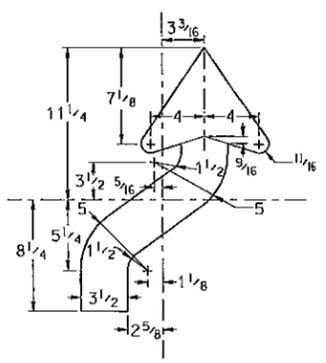
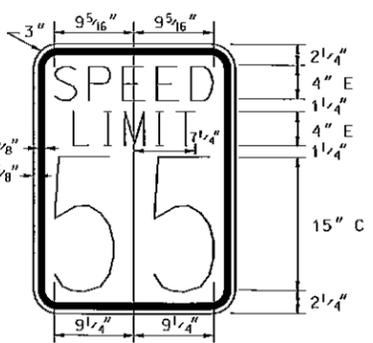
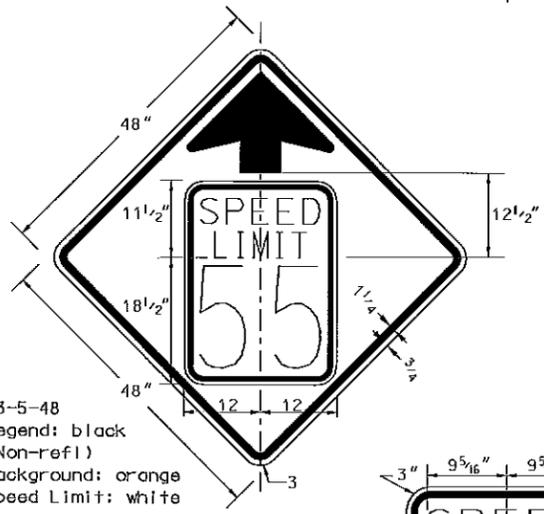
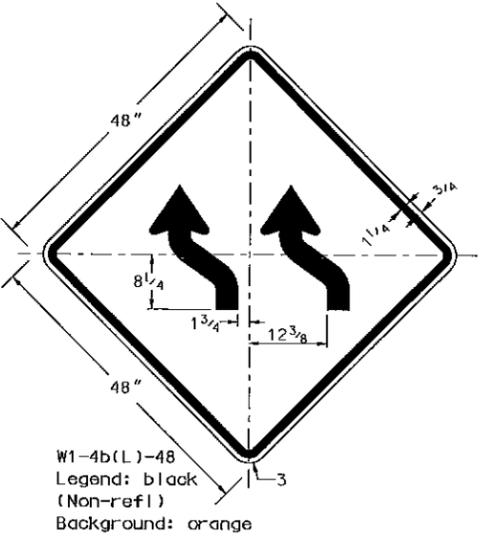
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-B6	
REVISIONS	
DATE	CHANGE
12-01-88	Uneven pavement
05-01-92	General revisions
01-24-95	W8-12-48
02-03-95	W8-11-48
06-15-95	General revisions
05-19-98	Added 3/4 mile
05-26-99	Added W8-56-48
08-05-04	Deleted slow paddle added W8-3-48 PE stamp added
12-01-04	Changed W20-7b to W3-4
07-11-05	Revised W8-11 and W8-12

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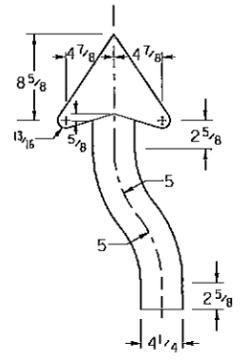
CONSTRUCTION SIGN DETAIL



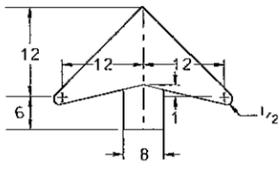
LEFT



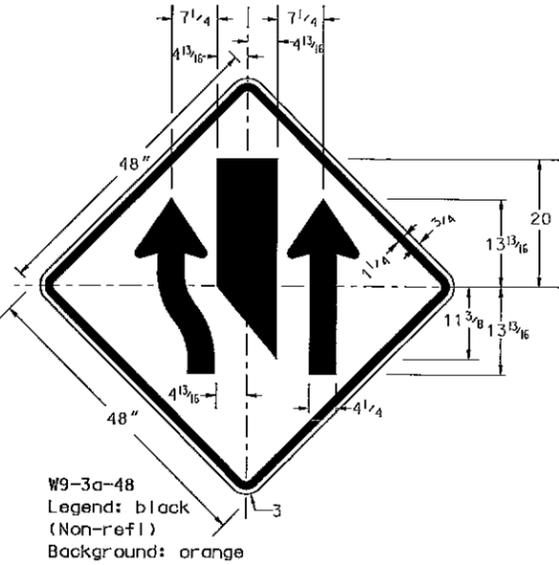
Arrow detail for sign M1-4b(R or L)-48



Arrow detail for sign M9-3a-48



Arrow detail for sign W3-5-48



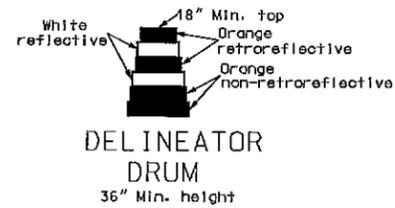
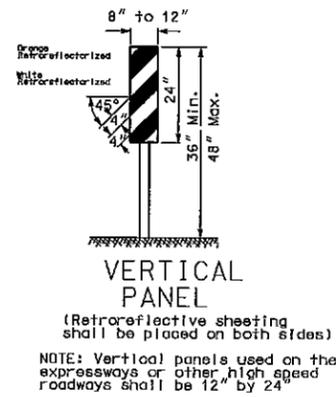
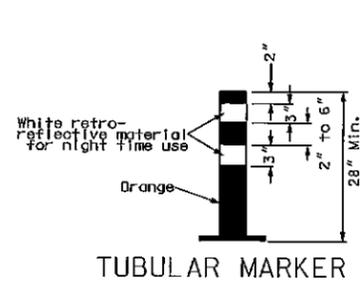
(A) See table on standard D-704-12 for messages and dimensions.

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

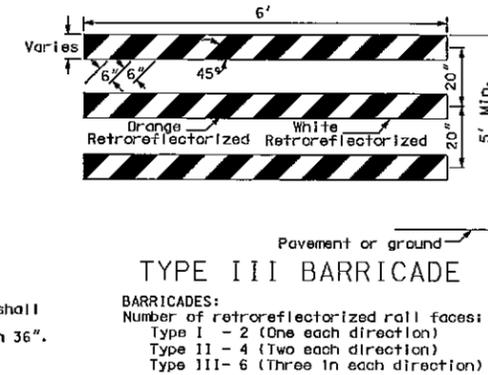
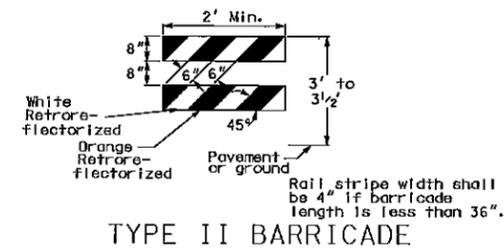
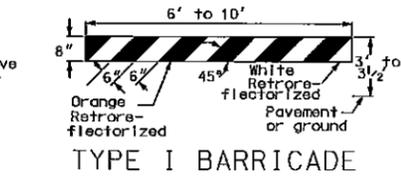
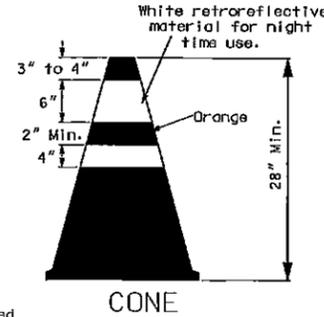
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BARRICADE DETAILS AND CHANNELIZING DEVICES

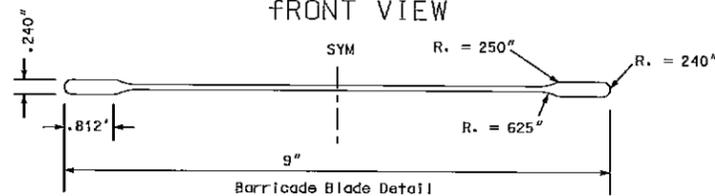
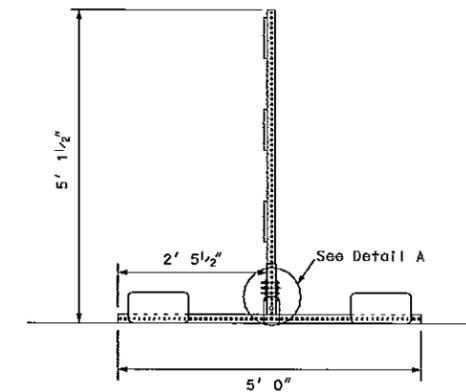
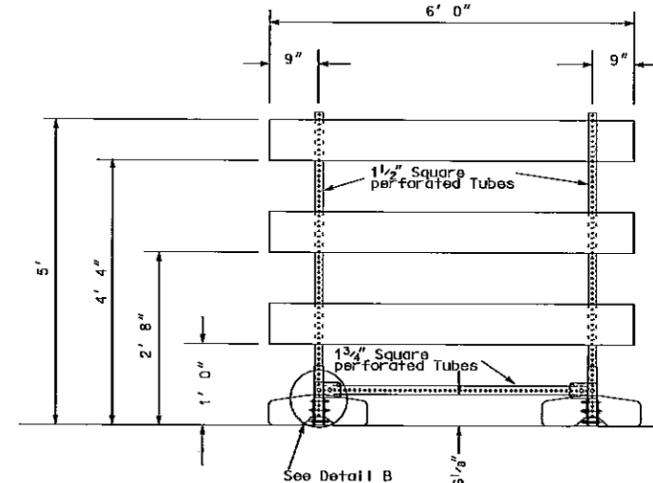
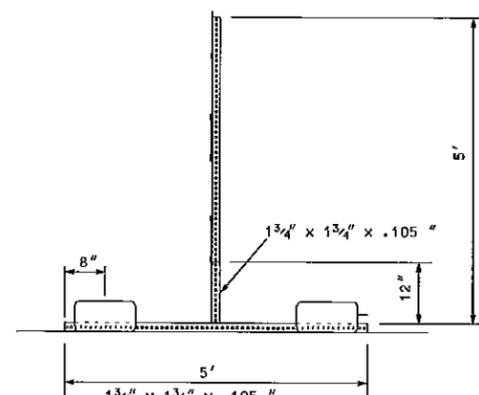
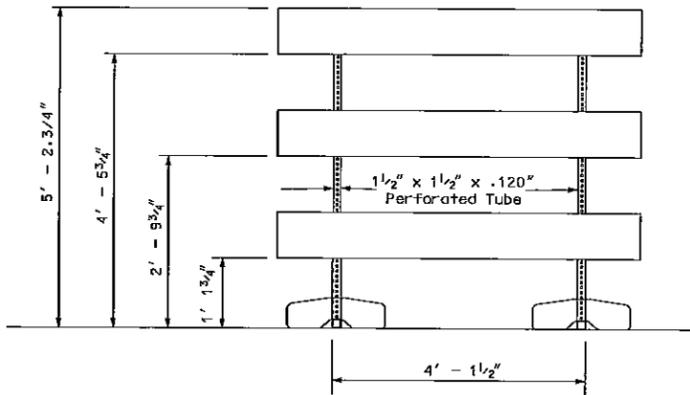
D-704-13



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

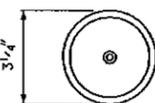


BARRICADES:
Number of retro-reflective rail faces:
Type I - 2 (One each direction)
Type II - 4 (Two each direction)
Type III - 6 (Three in each direction)

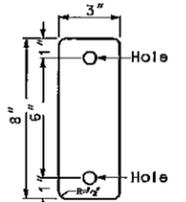


Ballast = 45lb sandbag at the end of each leg.
Barricade blade fastened to vertical supports with 2" corner bolts.
Vertical portion of leg is welded to horizontal portion on all four sides.
Masts slide inside vertical portion of legs. No bolts or fastenings devices used.

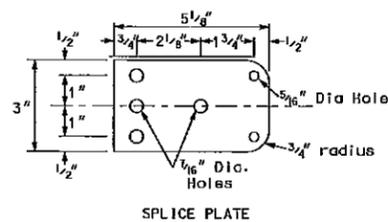
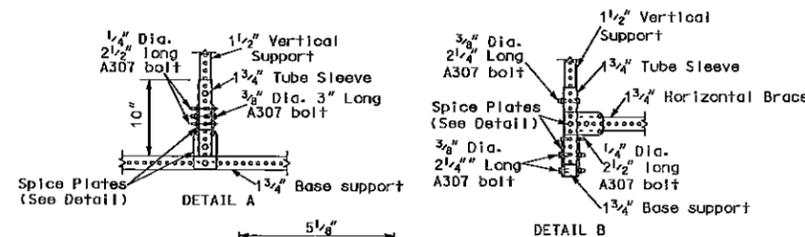
BARRICADE ASSEMBLY DETAIL
(Use when aluminum blade as detailed above)



Delineator reflector shall meet the requirements of section 894



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



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

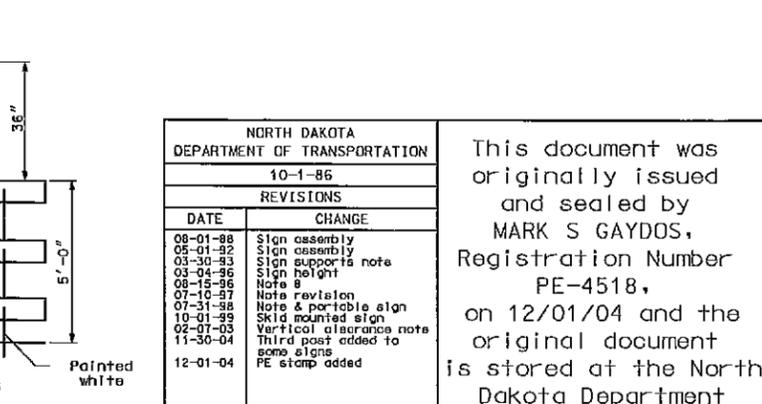
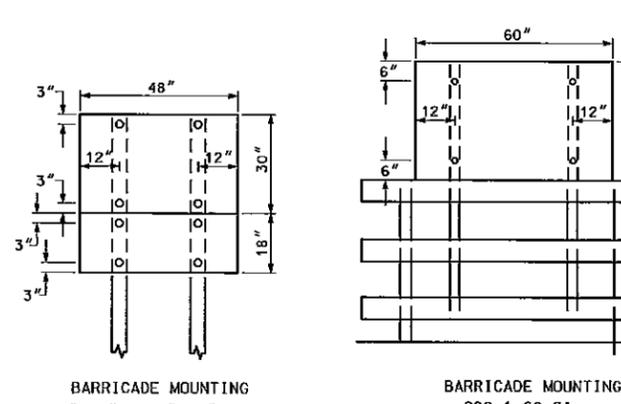
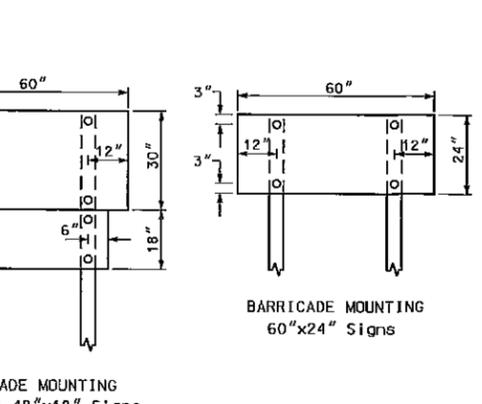
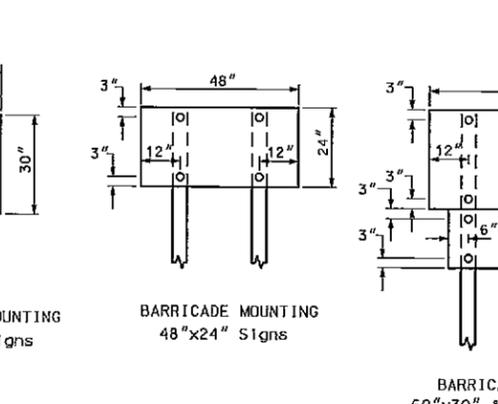
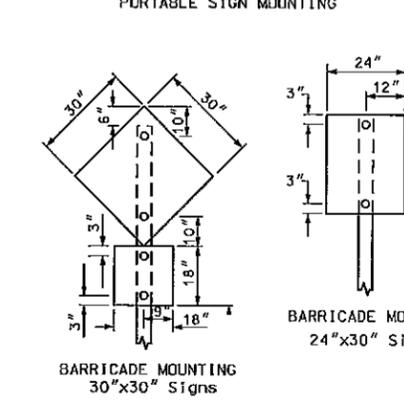
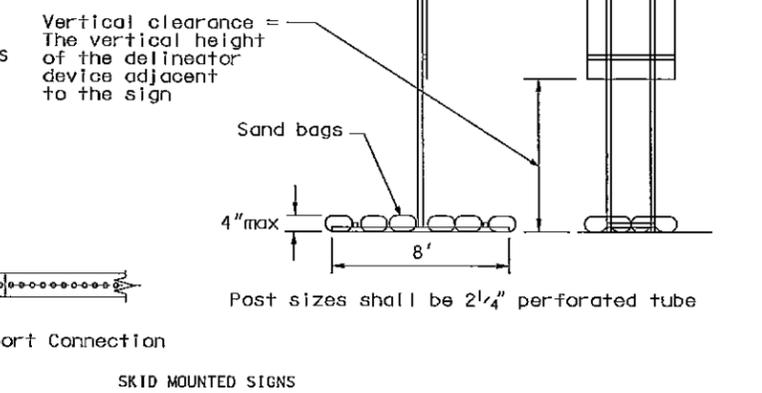
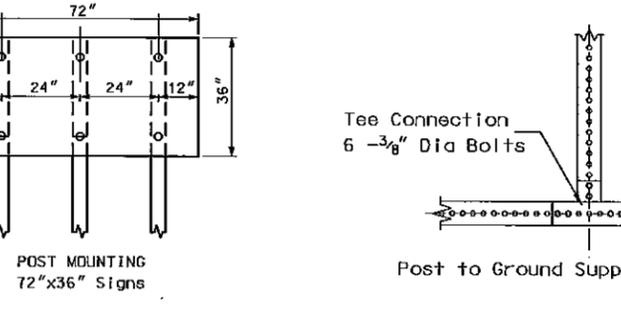
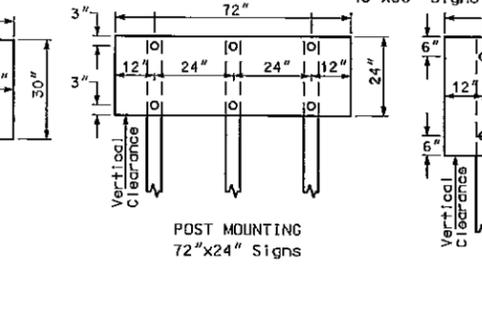
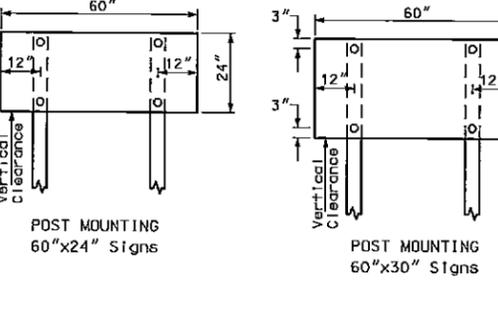
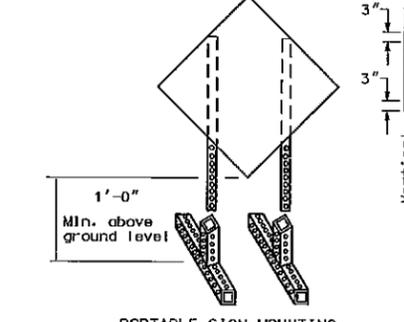
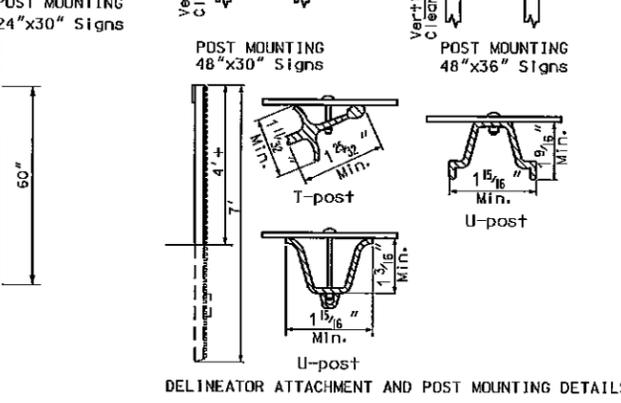
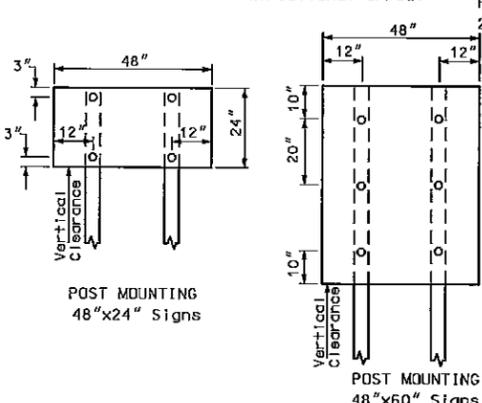
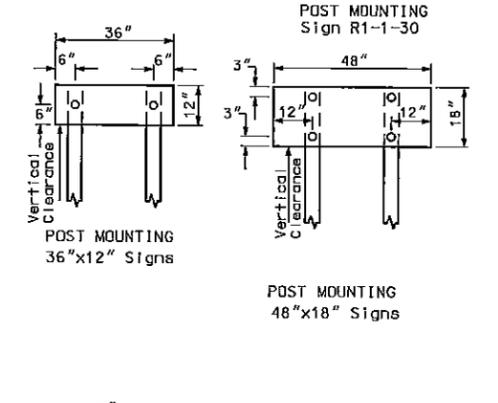
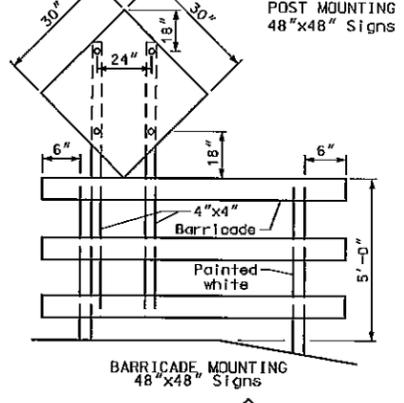
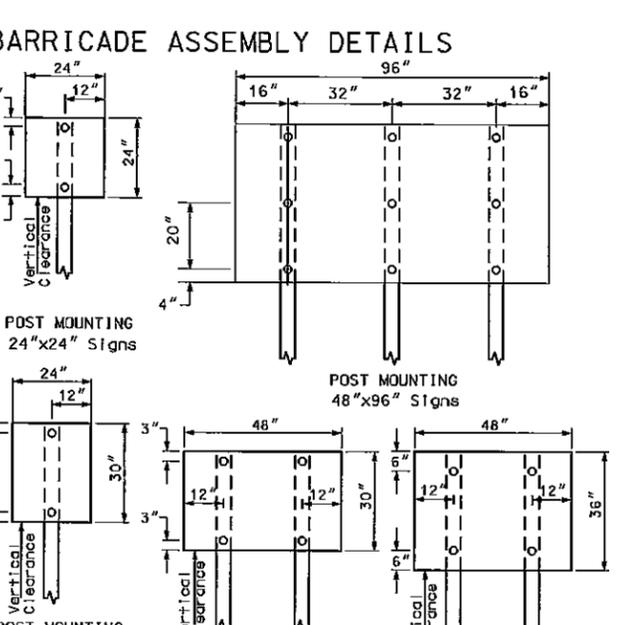
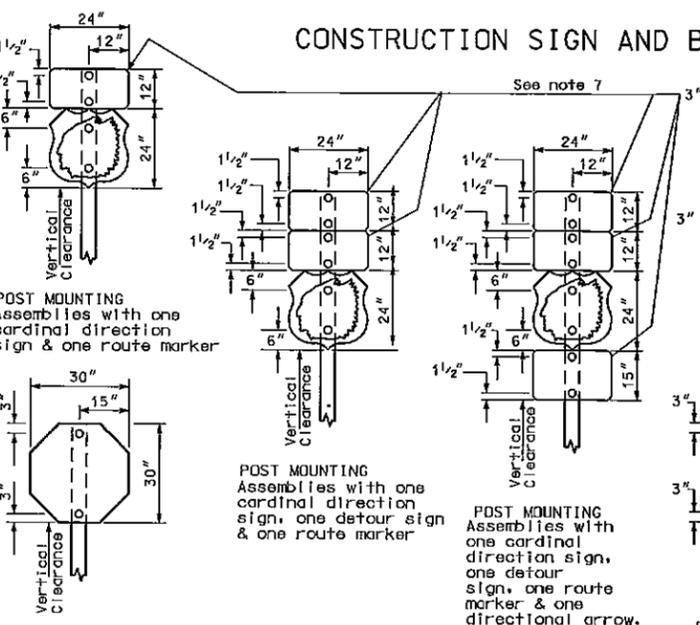
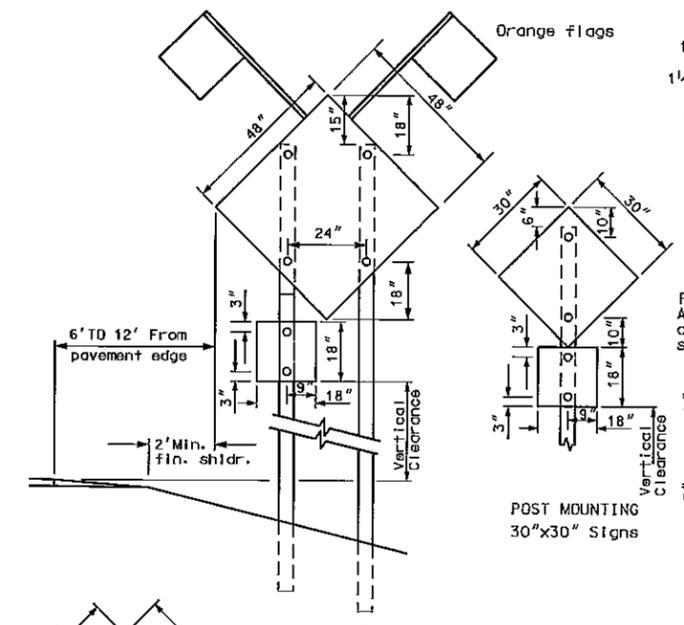
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
08-03-87	Type sheeting
10-01-87	Delineator drum note
06-08-88	Barricade type III
06-01-92	General revision
06-10-93	General revision
09-23-93	Vertical panel
06-09-95	Reflective sheeting
03-01-02	Barricade type III assembly details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

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

CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS

NOTES:

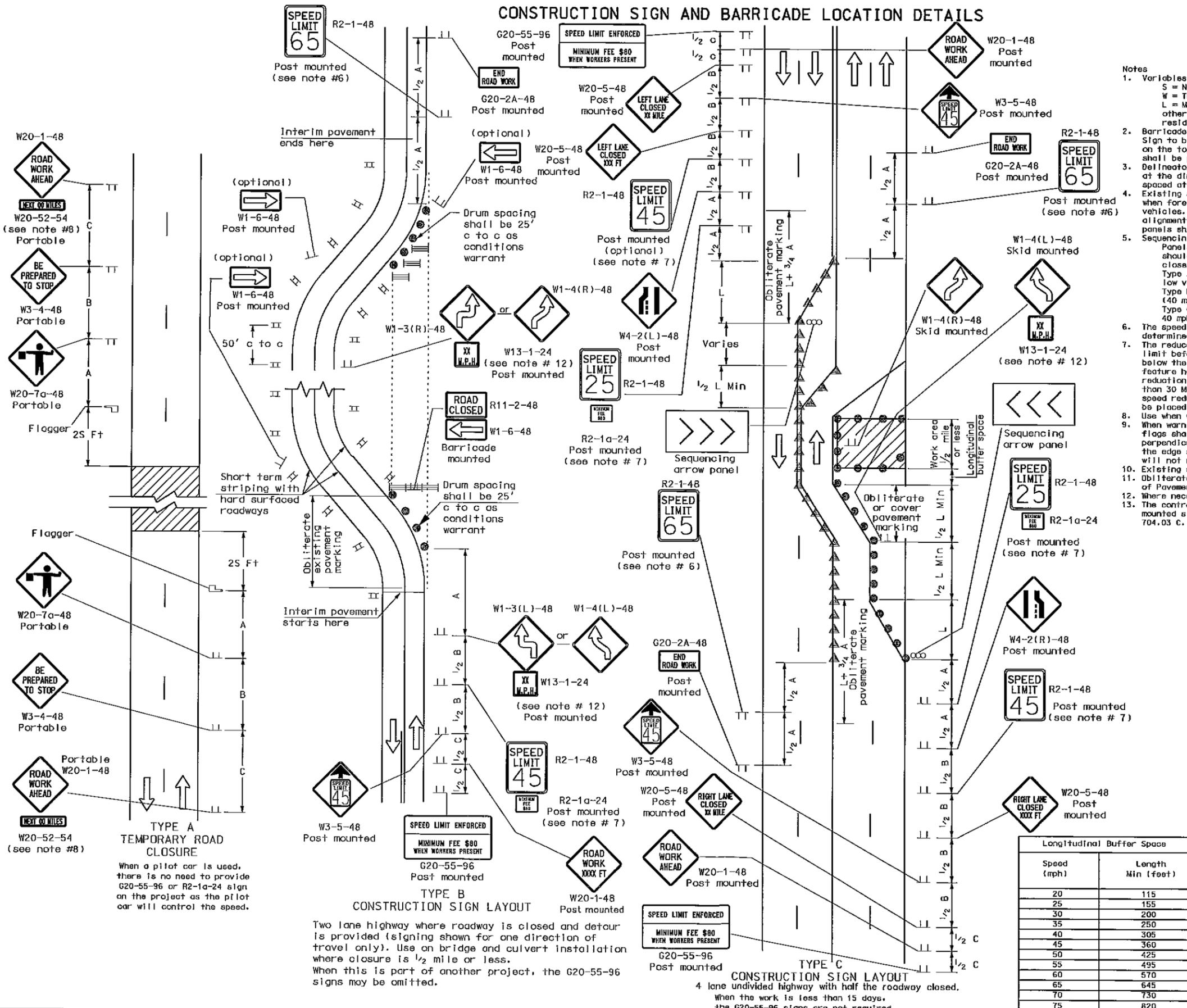
1. Barricade and Sign Supports: Wooden supports shall be painted white. Steel supports shall be galvanized or painted.
2. Barricade Mounting Signs: The bottom of the sign shall be flush with the top of the top rail. Wood sign posts shall be 4"x4" min. SFS or equivalent steel posts. All barricades and 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 embedded 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
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



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

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

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

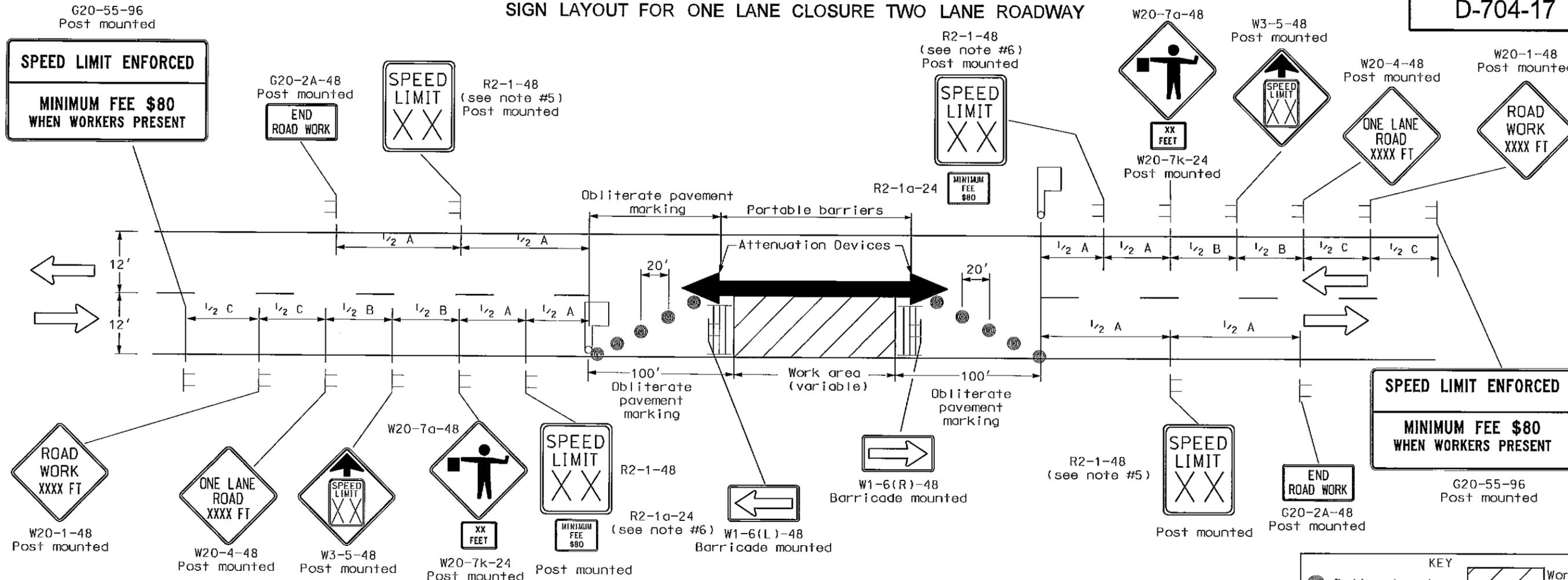
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 10-1-86 REVISIONS

DATE	CHANGE
01-05-01	Revised note 3
07-19-02	Revised 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 Relocated reverse curve
12-18-03	PE stamp added
12-01-04	Revised W4-2, Replaced R2-5a with W3-5, Rev. Adv. Warning Table, Rev. Note 7.
06-23-05	Changed W20-7b to W3-4
07-05-05	

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

SIGN LAYOUT FOR ONE LANE CLOSURE TWO LANE ROADWAY

D-704-17



Notes

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

KEY

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

Road Type	ADVANCE WARNING SIGN SPACING		
	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 65 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

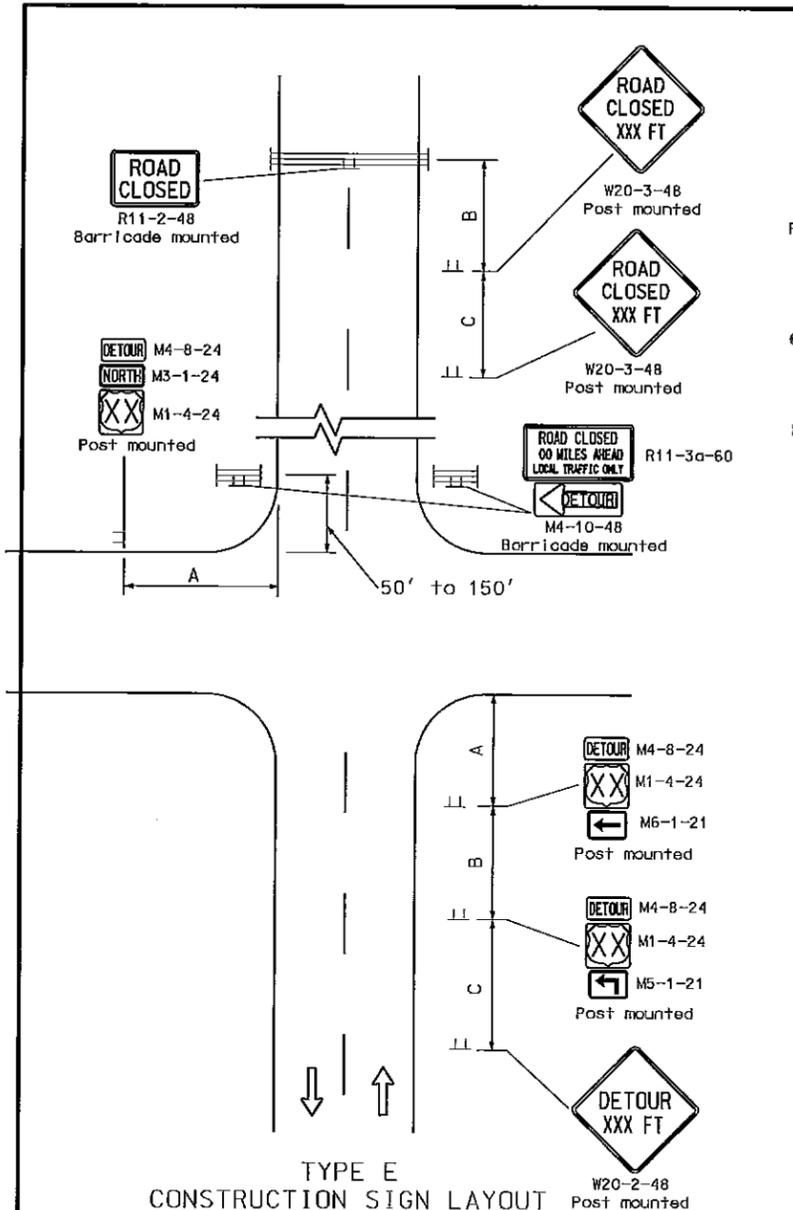
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-88	
REVISIONS	
DATE	CHANGE
01-31-97	Sign spacing
10-01-99	General revisions
03-29-00	Minor revisions
01-05-01	Revised note 3
07-19-02	Reversed End Road Work & speed limit signs
07-25-03	Revised R2-1a and W20-1
04-01-04	Rev. Fee sign & Warning Sign Spacing, rev note 6, add note 12
12-01-04	PE Stamp added
06-29-05	Replaced R2-5a with W3-5, Rev. Adv. Warning Table, Rev. Note 6

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

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

Notes

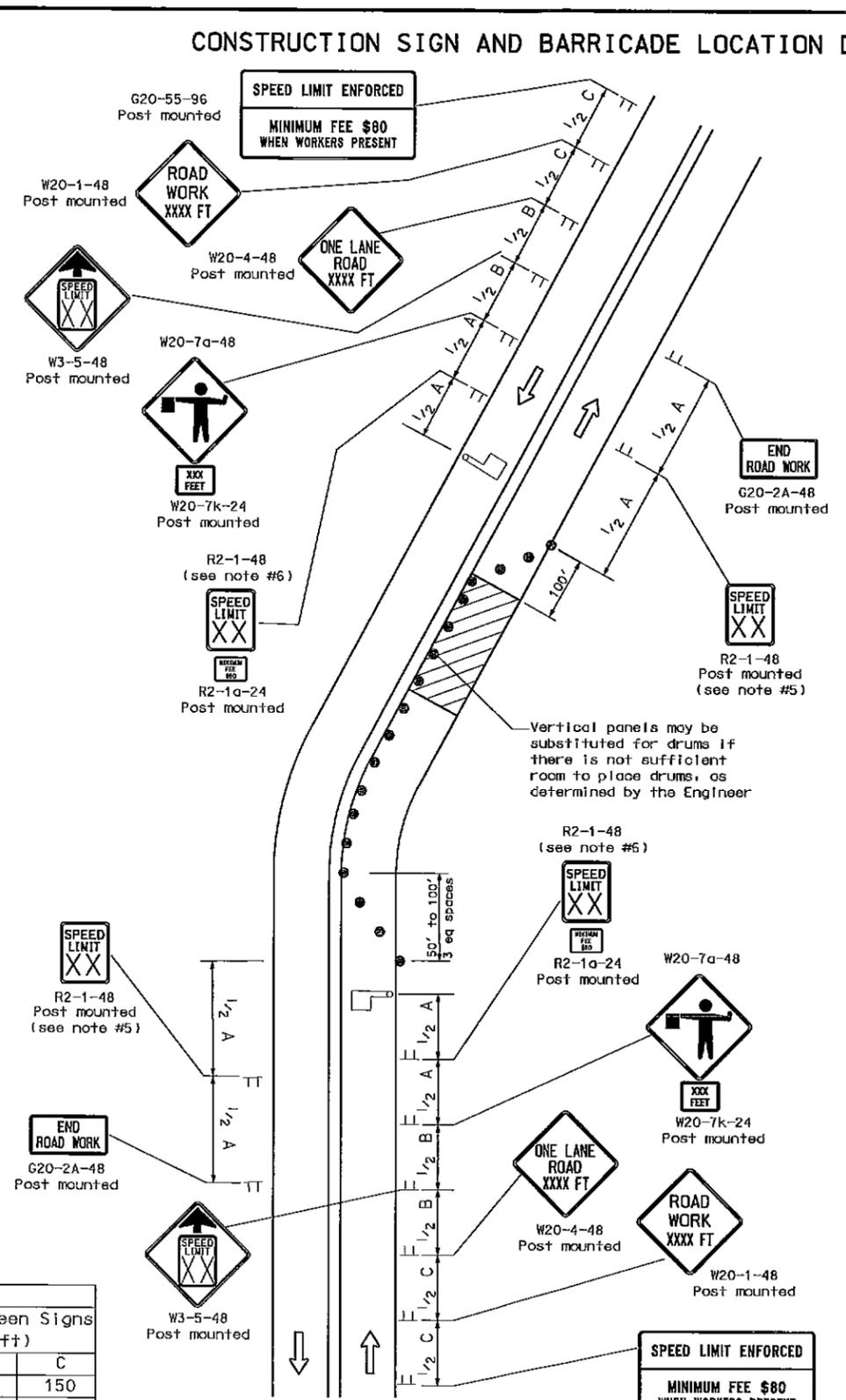
- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of taper
 - L = Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2/60$ for urban, residential, and other streets with speeds of 40 mph or less.
- Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. 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.

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

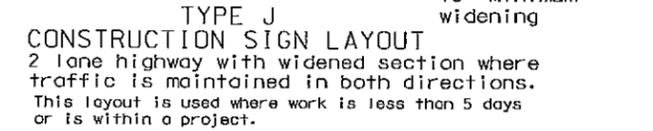
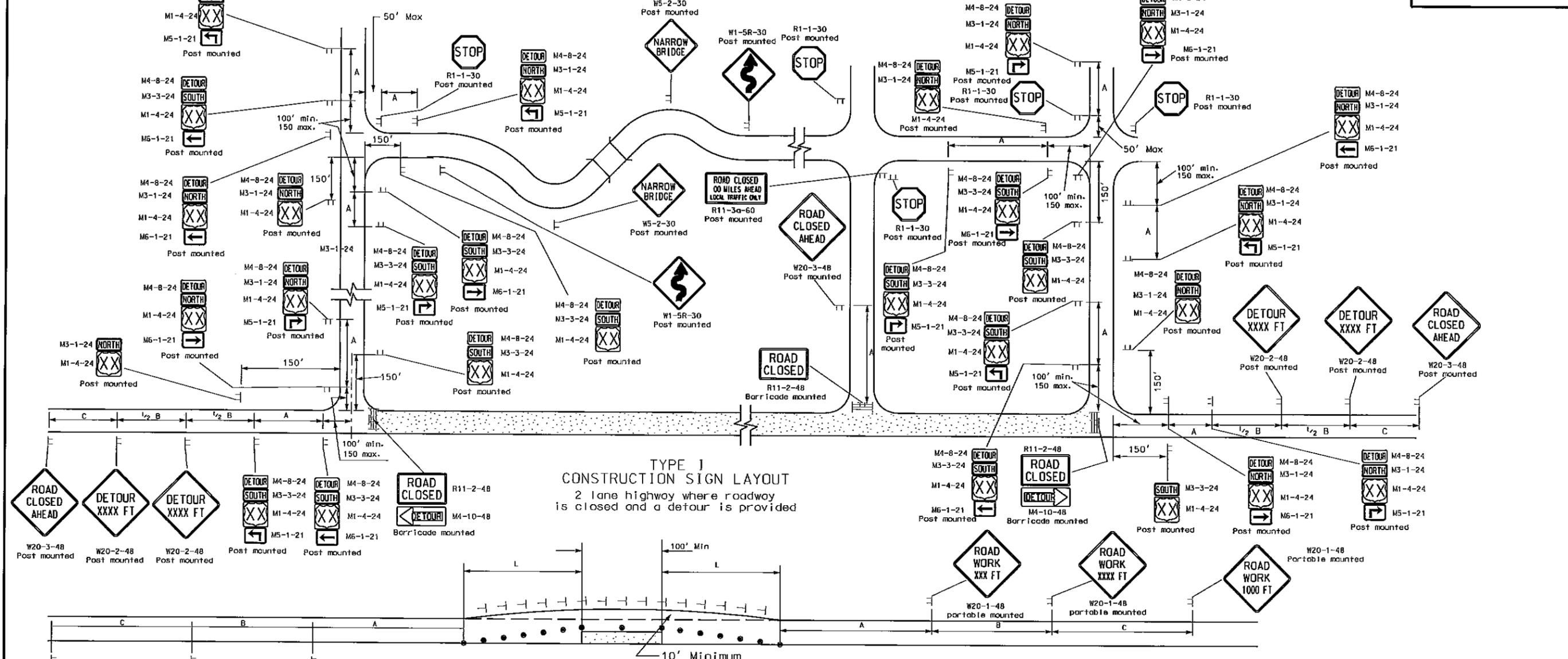
Two lane highway with one lane closed. Flagger is at a point where it is visible to approaching traffic.

KEY		
●	Delineator Drum	Flagger
┆	Type A Delineator	Sequencing Arrow Panel
┆	Sign	Work/Hazard Area
▲	Cone	
┆	Type I Barricade	
┆	Type II Barricade	
┆	Type III Barricade	

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

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

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS



KEY

[Symbol]	Type I barricade	[Symbol]	Work area
[Symbol]	Type II barricade	[Symbol]	Flogger
[Symbol]	Type III barricade	[Symbol]	Sequencing arrow panel
[Symbol]	Sign	[Symbol]	Type A delineator or vertical panels back to back
[Symbol]	Delineator drum		
[Symbol]	Cones		

- Notes
- Variables
S=Numerical value of speed limit or 85th percentile. W=The width of taper.
L=Minimum length of taper, or $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2 / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
 - Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. 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 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.

- 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.

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

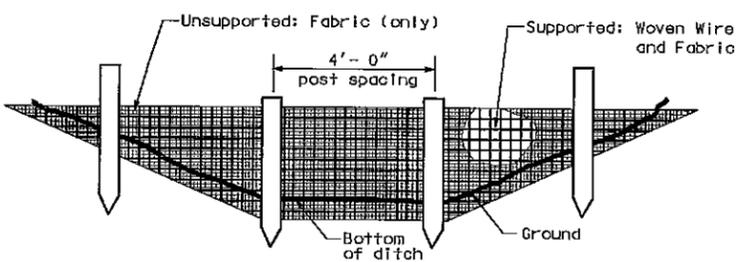
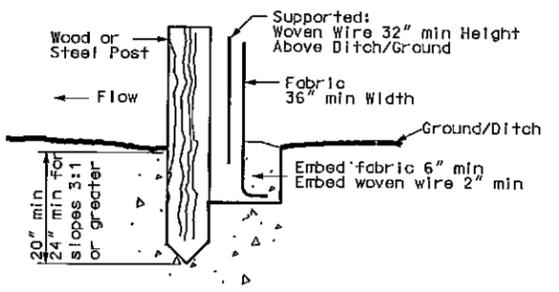
REVISIONS

DATE	CHANGE
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 subtitle
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

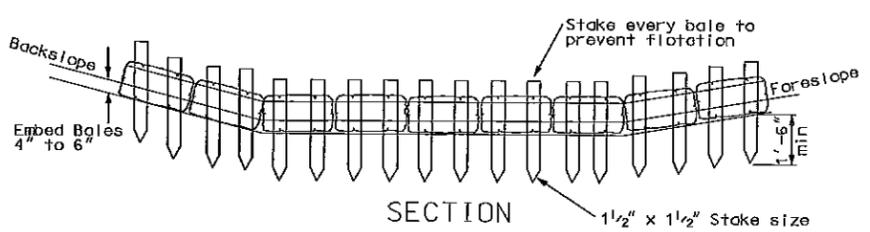
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MARK S. GAYDOS
 Registration Number
PE-4518,
 on 06/29/05 and the original document is stored at the
 North Dakota Department
 of Transportation

EROSION AND SILTATION CONTROLS

D-708-2



SILT FENCE
Supported and Unsupported

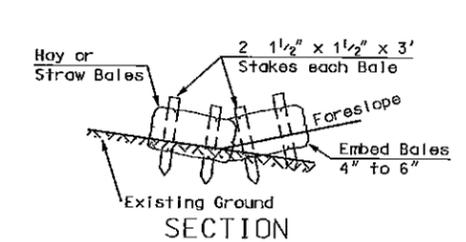


SECTION

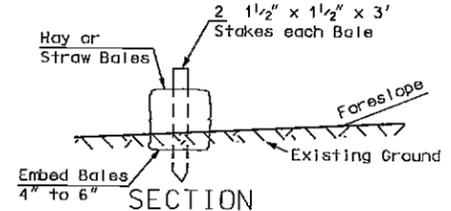


PLAN

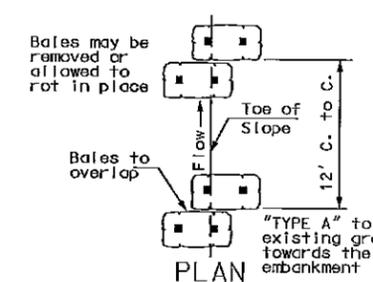
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SECTION

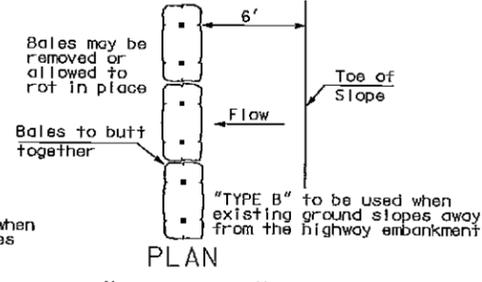


SECTION



PLAN

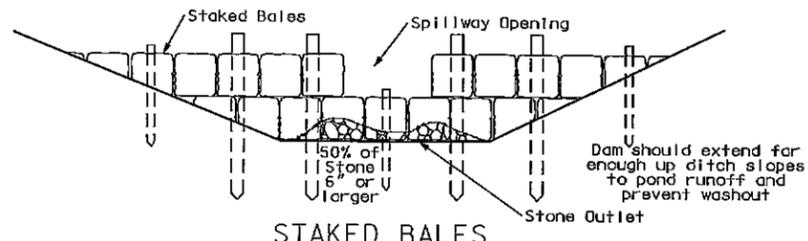
"TYPE B"



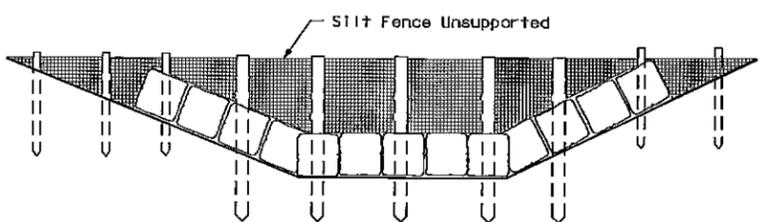
PLAN

"TYPE C"

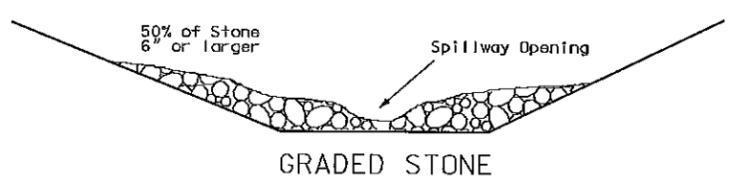
BALED HAY OR STRAW EROSION CHECKS



STAKED BALES

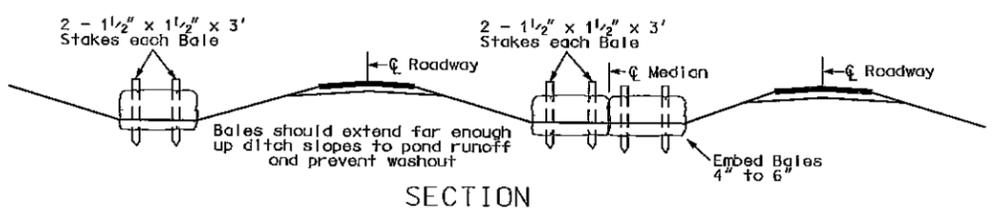


FENCE-BACKED BALES



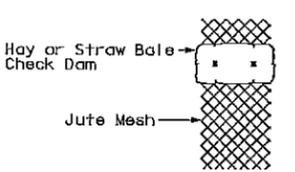
GRADED STONE

DITCH EROSION DAMS

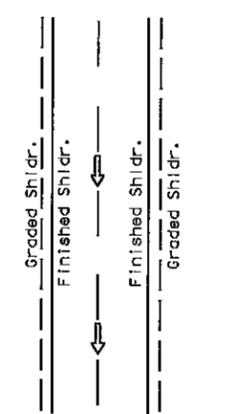


SECTION

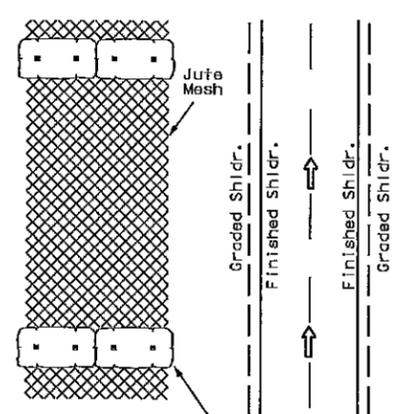
MEDIAN OR DITCH PROTECTION AT STREAM CROSSING



ROADSIDE DITCH



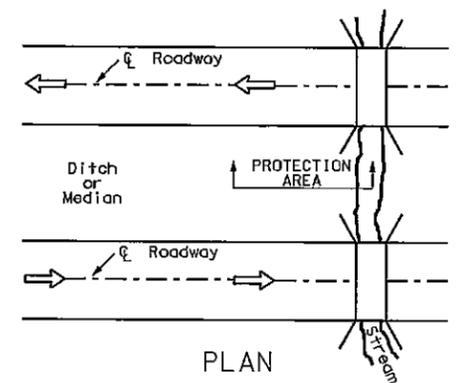
PLAN



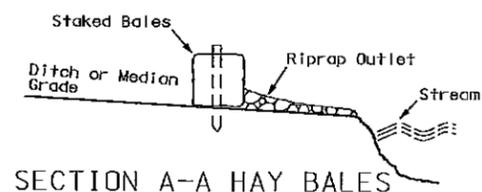
MEDIAN DITCH

Hay or Straw Bale Check Dam

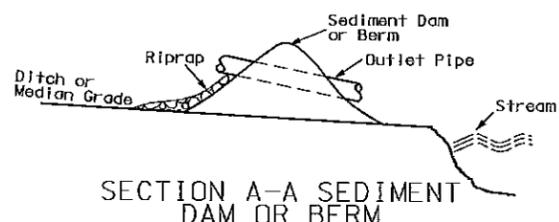
STONE, JUTE, MESH, OR SOD DITCH & MEDIAN EROSION CONTROL



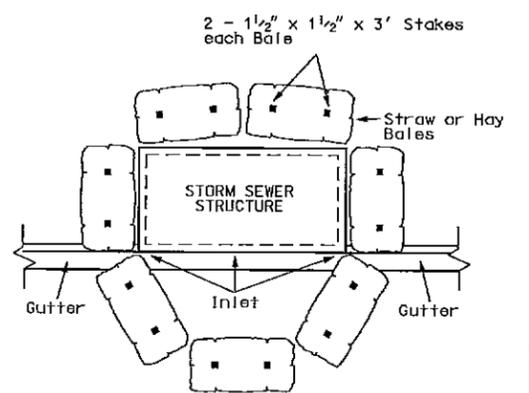
PLAN



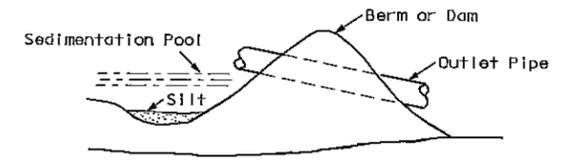
SECTION A-A HAY BALES



SECTION A-A SEDIMENT DAM OR BERM



STORM SEWER INLET EROSION & SILTATION BARRIER



SMALL SEDIMENT DAM OR BERM

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

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

NOTES:

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

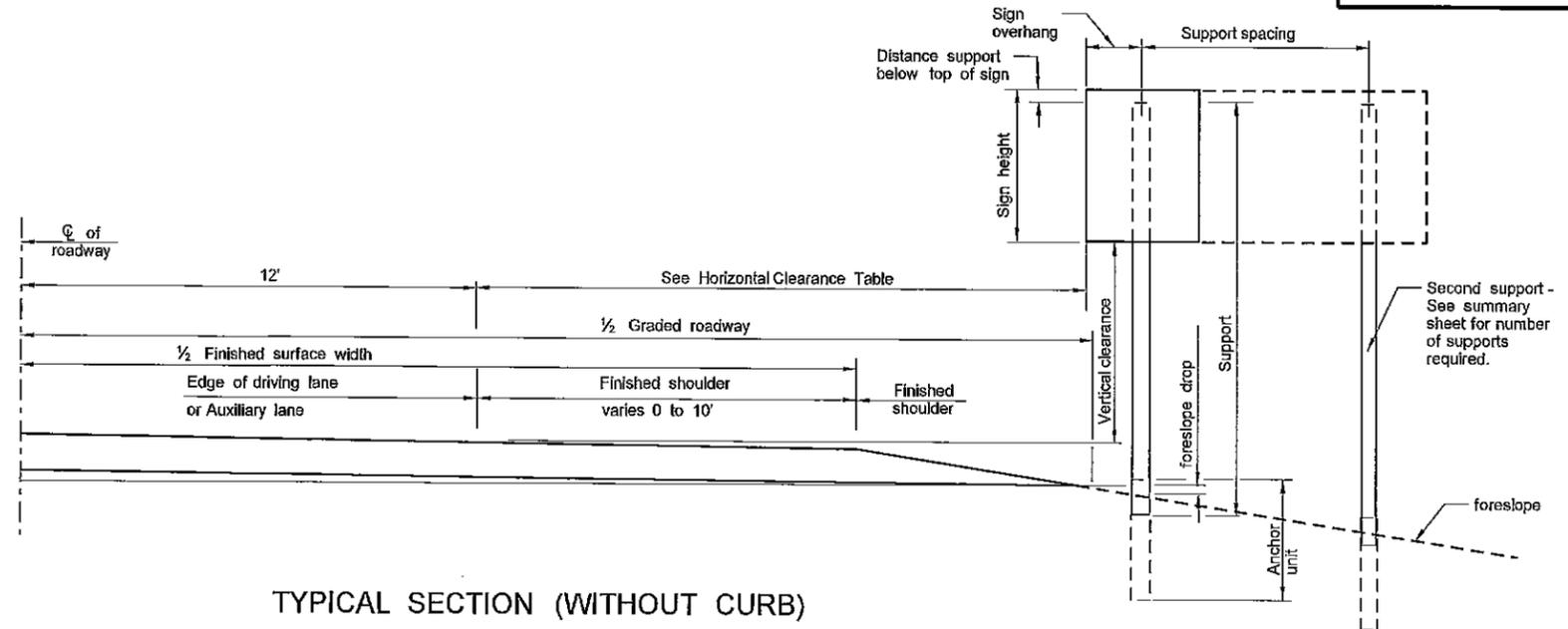
2. Minimum Vertical clearance: Signs installed at the side of the road in rural districts shall be at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least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

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

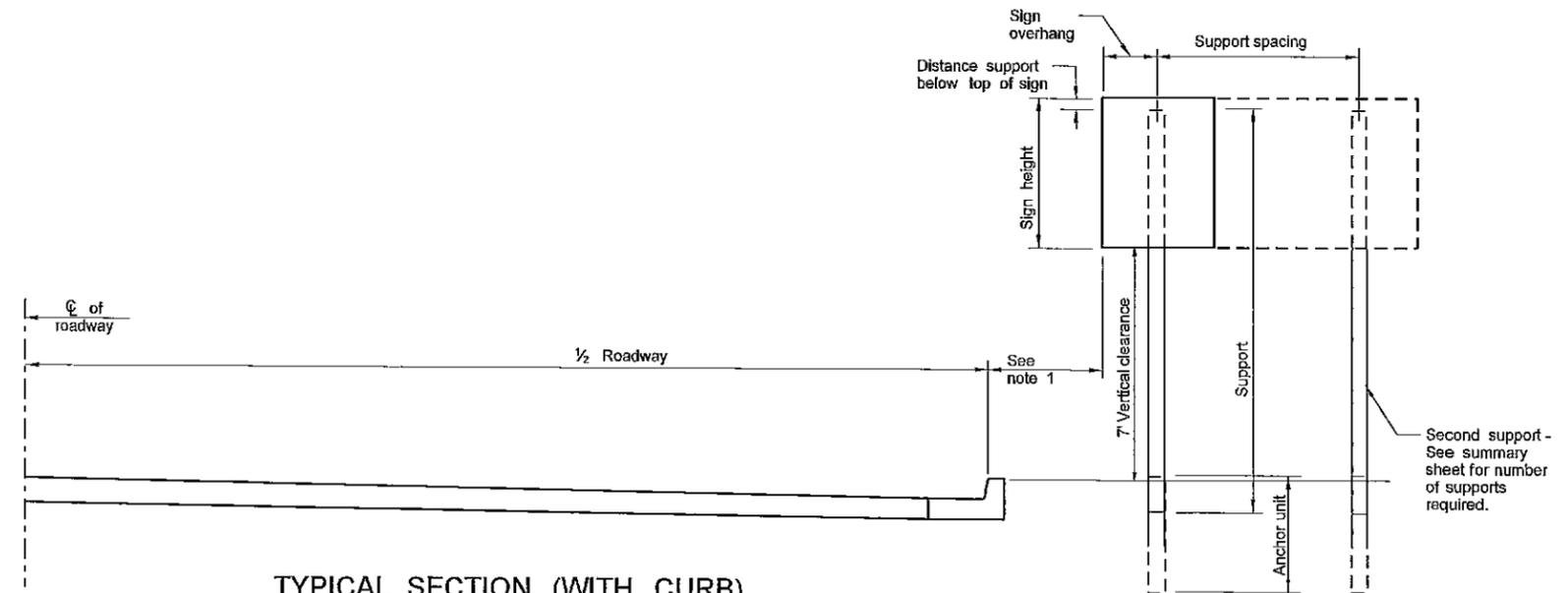
The vertical clearance shall have a maximum height of 6" above the vertical clearance specified above.

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

ASSEMBLY DETAILS

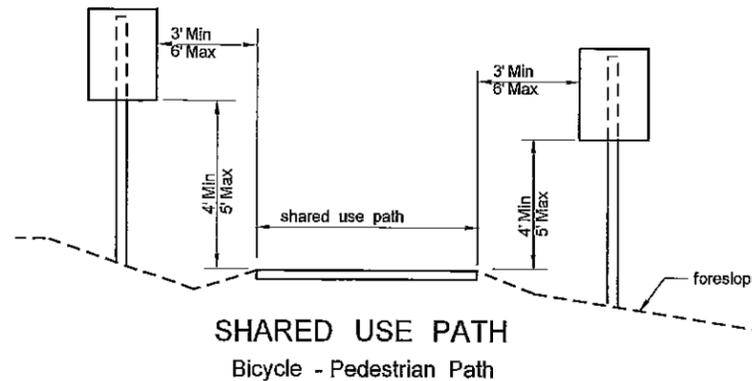


TYPICAL SECTION (WITHOUT CURB)



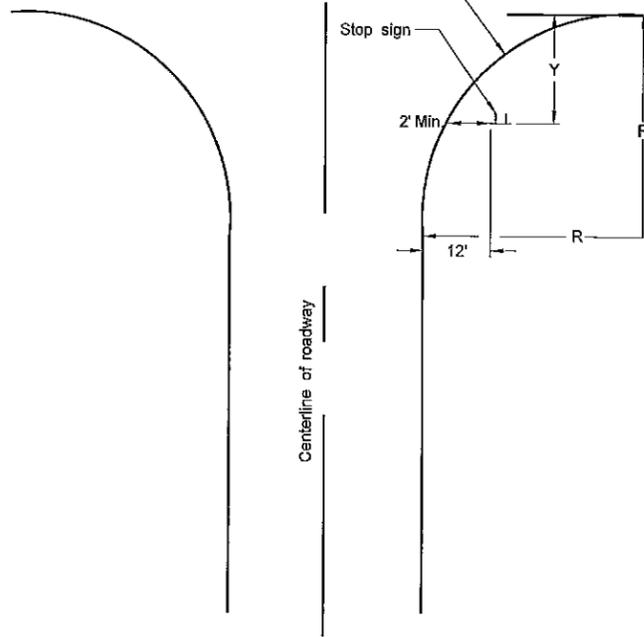
TYPICAL SECTION (WITH CURB)

Residential or Business District



SHARED USE PATH
Bicycle - Pedestrian Path

Face of curb or edge of driving lane



STOP SIGN LOCATION
WIDE THROAT INTERSECTION

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

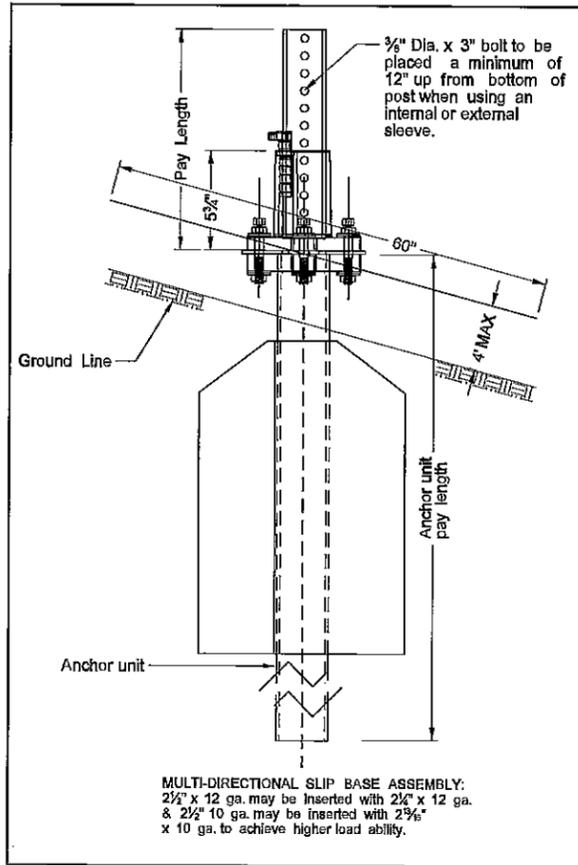
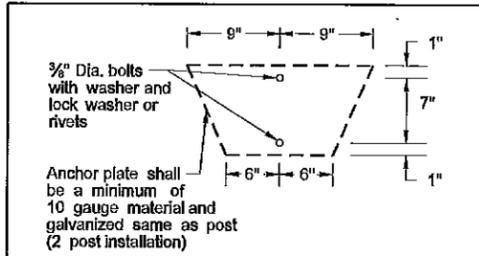
R=Radius	Y-Max	Y-Min
40'	50'	15'
45'	50'	18'
50'	50'	21'
55'	50'	25'
60'	50'	28'
65'	50'	32'
70'	50'	35'
75'	50'	39'
80'	50'	43'

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

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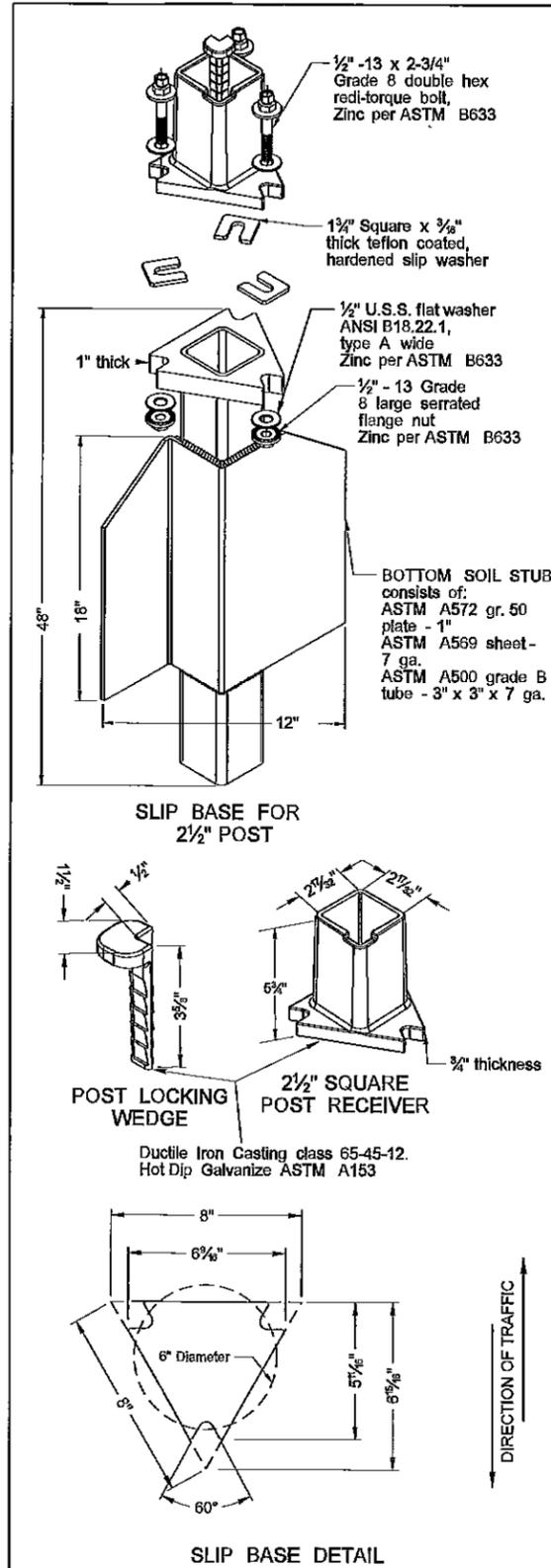
Telescoping Perforated Tube							
Number of Posts	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/2	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/2	12	2 1/2(D)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

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



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

Mounting Details Perforated Tube

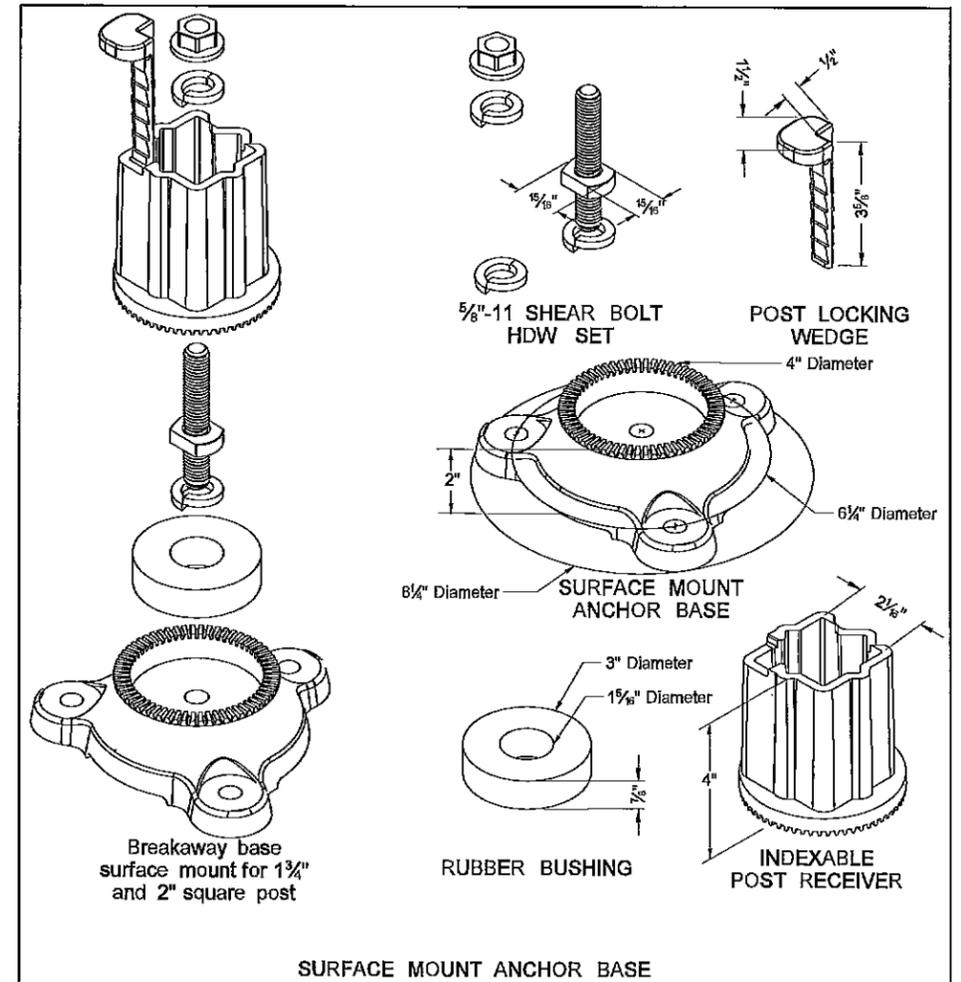


Properties of Telescoping Perforated Tubes							
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. Area In. ²	Section Modulus In. ³	
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172	
2 x 2	0.105	12	2.416	0.372	0.590	0.372	
2 1/4 x 2 1/4	0.105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

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

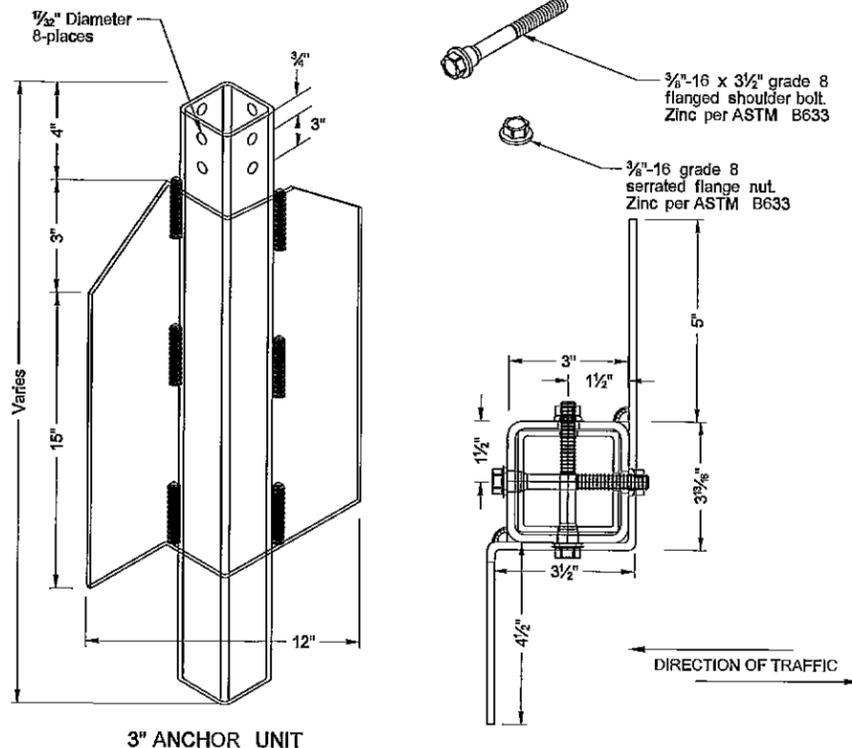
NOTE:

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



SHOULDER BOLT

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



3" ANCHOR UNIT

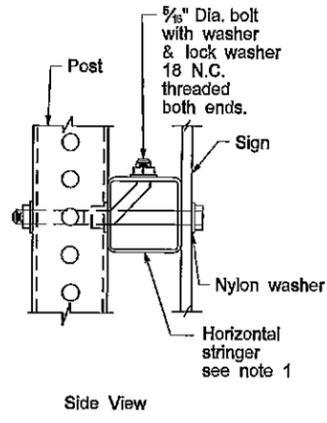
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE

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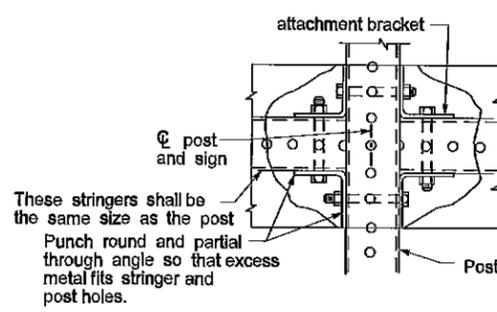
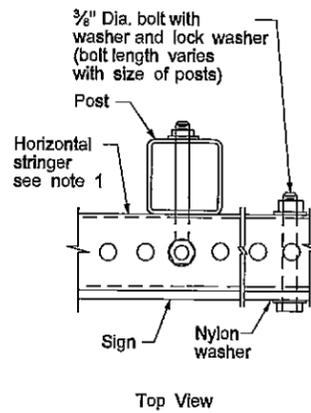
Mounting Details Perforated Tube

Note:

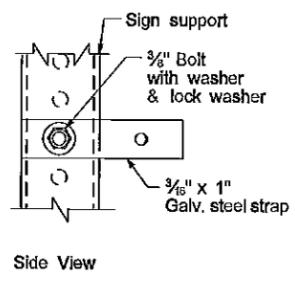
- Horizontal stringers - In lieu of perforated tubes, the contractor may substitute z bar stringers. The z bar stringers shall be 1 3/4" x 3/16" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel.
- Metal washers used on sign face shall have a minimum outside diameter of 5/16" ± 1/16" and 10 gauge thickness.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



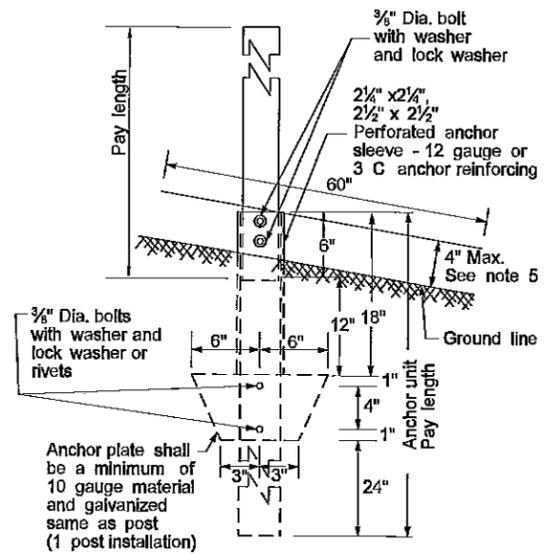
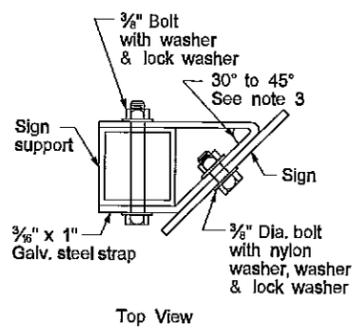
STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)



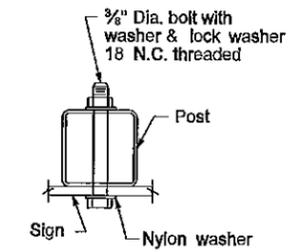
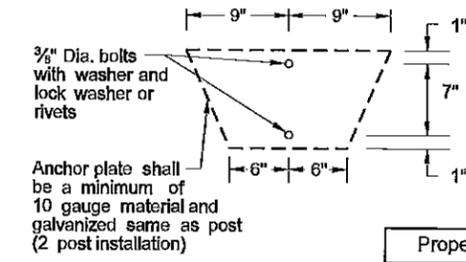
STREET NAME SIGNS
AND ONE WAY SIGNS
SINGLE POST ASSEMBLY
ONE STRINGER OR
BACK TO BACK MOUNTING



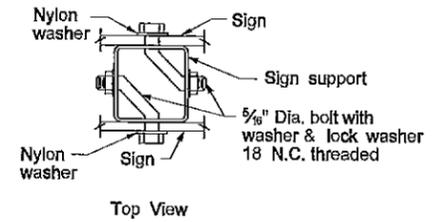
STRAP DETAIL



ANCHOR UNIT AND
POST ASSEMBLY



BOLT MOUNTING



BACK TO BACK
MOUNTING

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

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

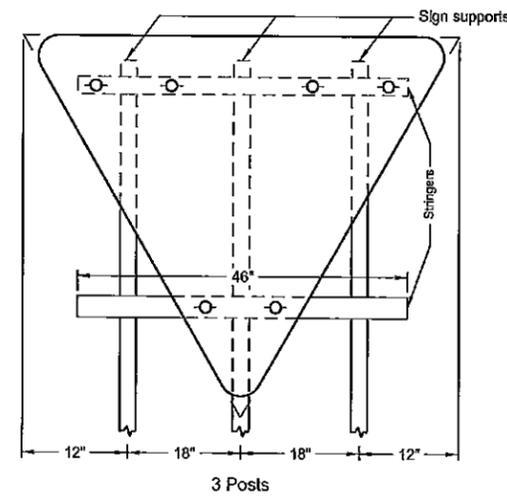
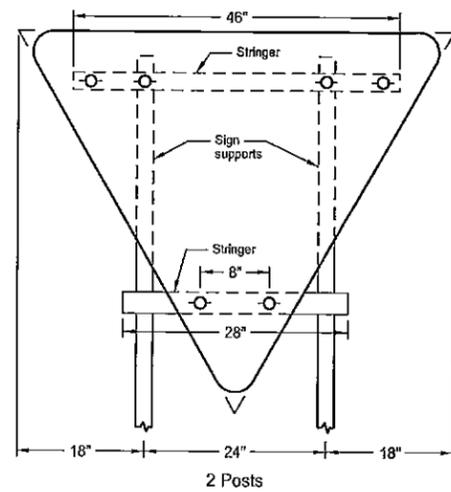
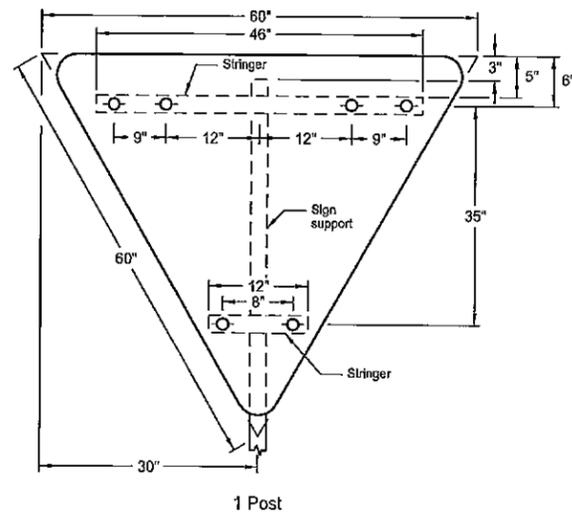
Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. area In. ²	Section Modulus In. ³
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2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 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	0.843
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.783

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

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

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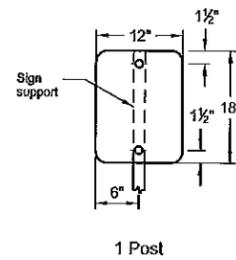
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



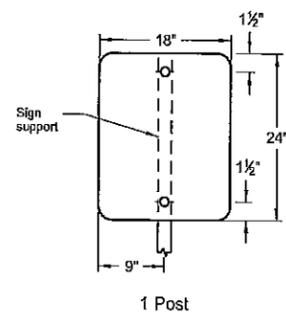
Assembly No. 6

Notes:

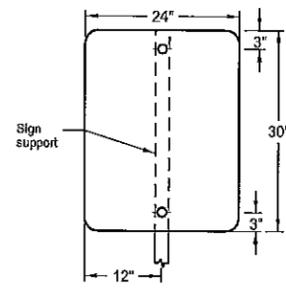
1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1 1/2" x 1 1/2".
4. All holes shall be punched round for 3/8" bolt.



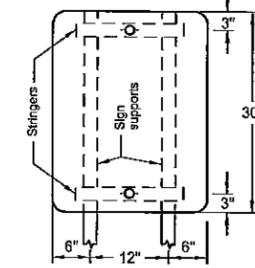
Assembly No. 7



Assembly No. 8

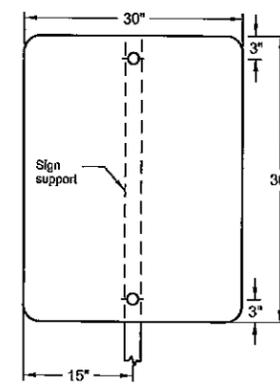


1 Post

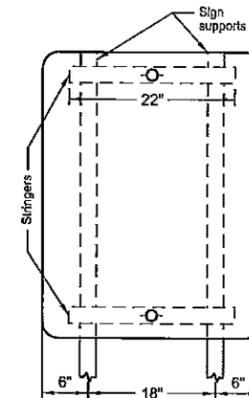


2 Posts

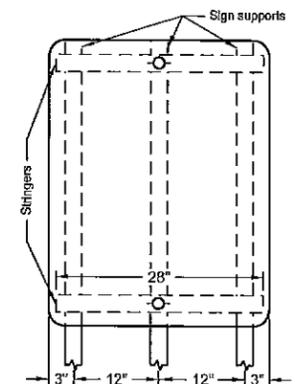
Assembly No. 9



1 Post

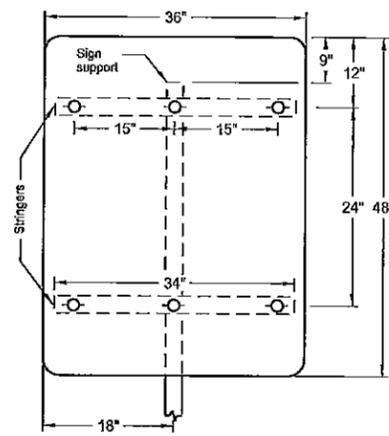


2 Posts

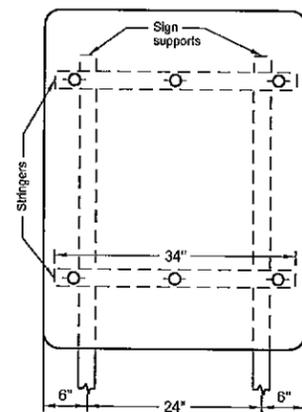


3 Posts

Assembly No. 10

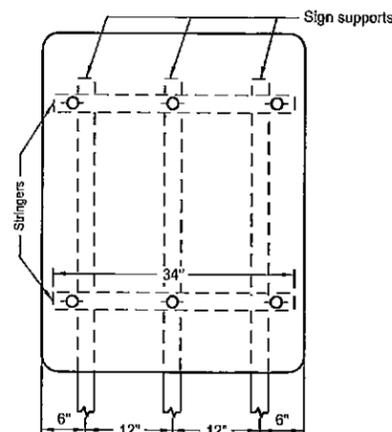


1 Post



2 Posts

Assembly No. 11

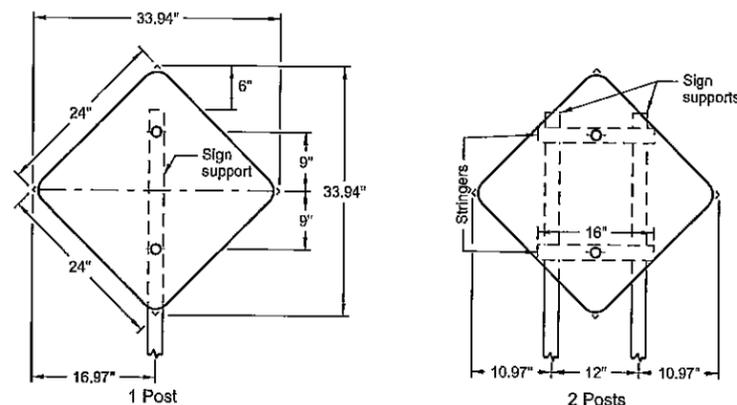


3 Posts

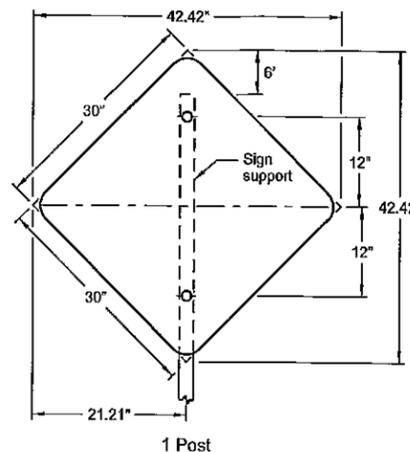
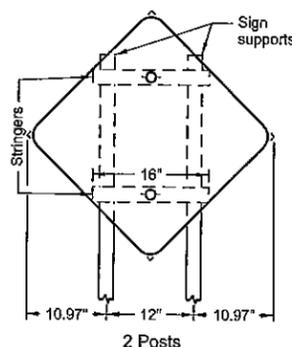
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

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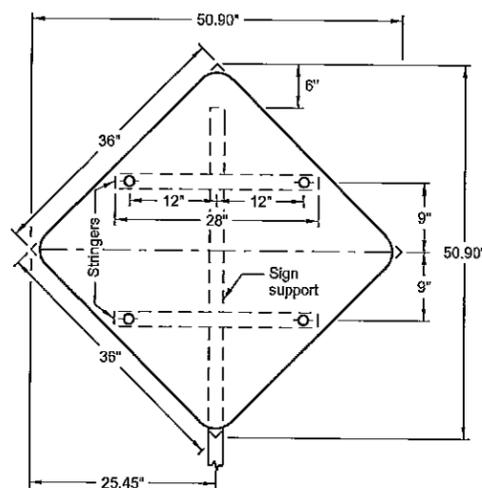
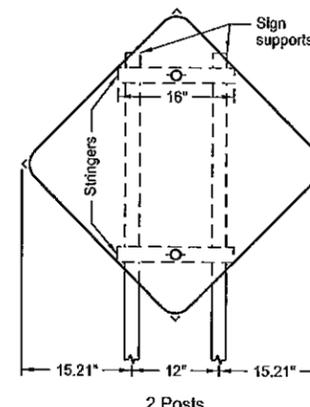
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



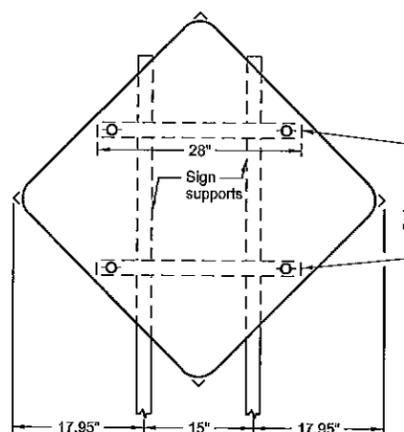
Assembly No. 18



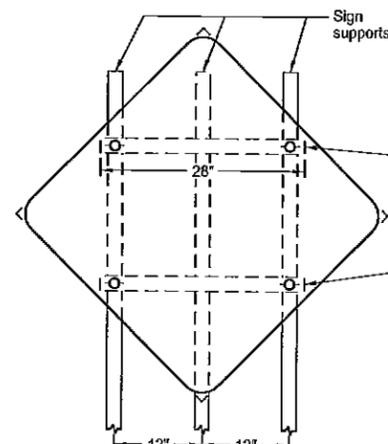
Assembly No. 19



1 Post

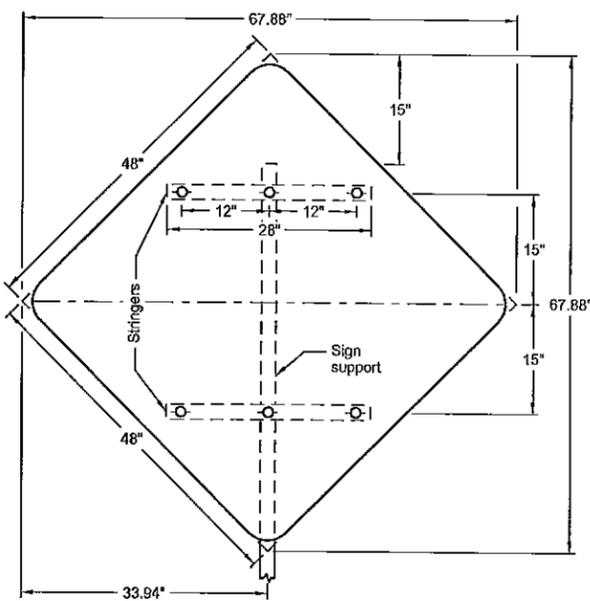


2 Posts

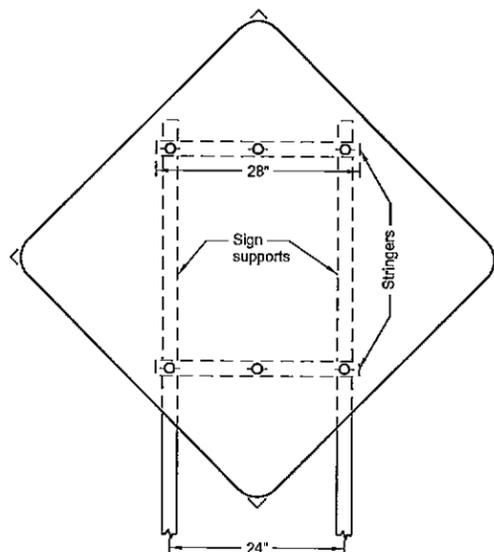


3 Posts

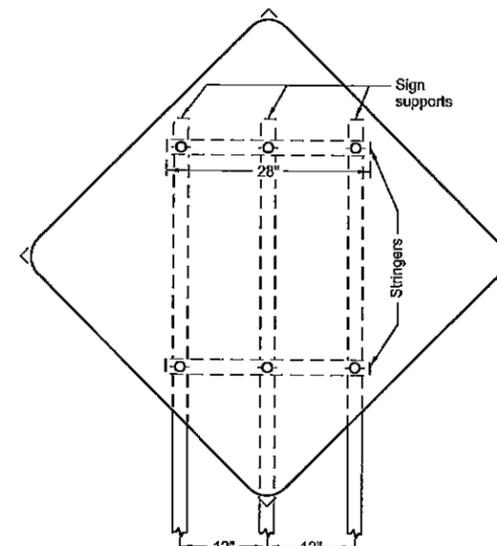
Assembly No. 20



1 Post



2 Posts
Assembly No. 21



3 Posts

Notes:

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

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

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