

DESIGN DATA					
Traffic	Average Daily				Max Hour
Current 2013	Pass:	N/A	Trucks:	N/A	Total: <100 N/A
Forecast 2033	Pass:	N/A	Trucks:	N/A	Total: <100 N/A
Clear Zone Distance: 12'		Design Speed: 55			
Minimum Sight Distance (Non Passing): 495'		Bridges: HL-93			
Minimum Sight Distance (Safe Passing): N/A					
Sight Distance for No Passing Zone: N/A					
Pavement Design Life: N/A					

PCN 20132	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRO-0048(017)	1	1

TOWNER COUNTY

NORTH DAKOTA

Job 24

FEDERAL AID PROJECT BRO-0048(017)

STRUCTURE

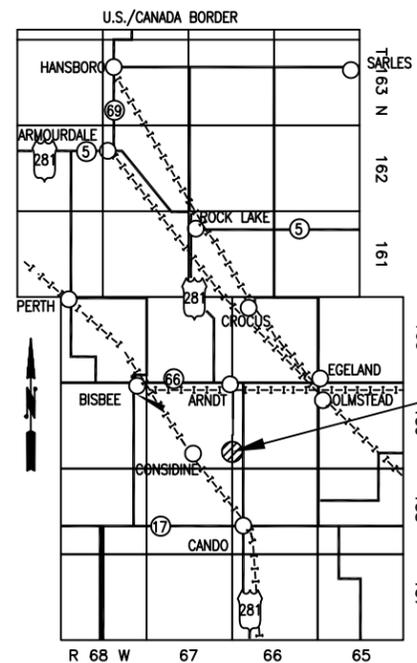
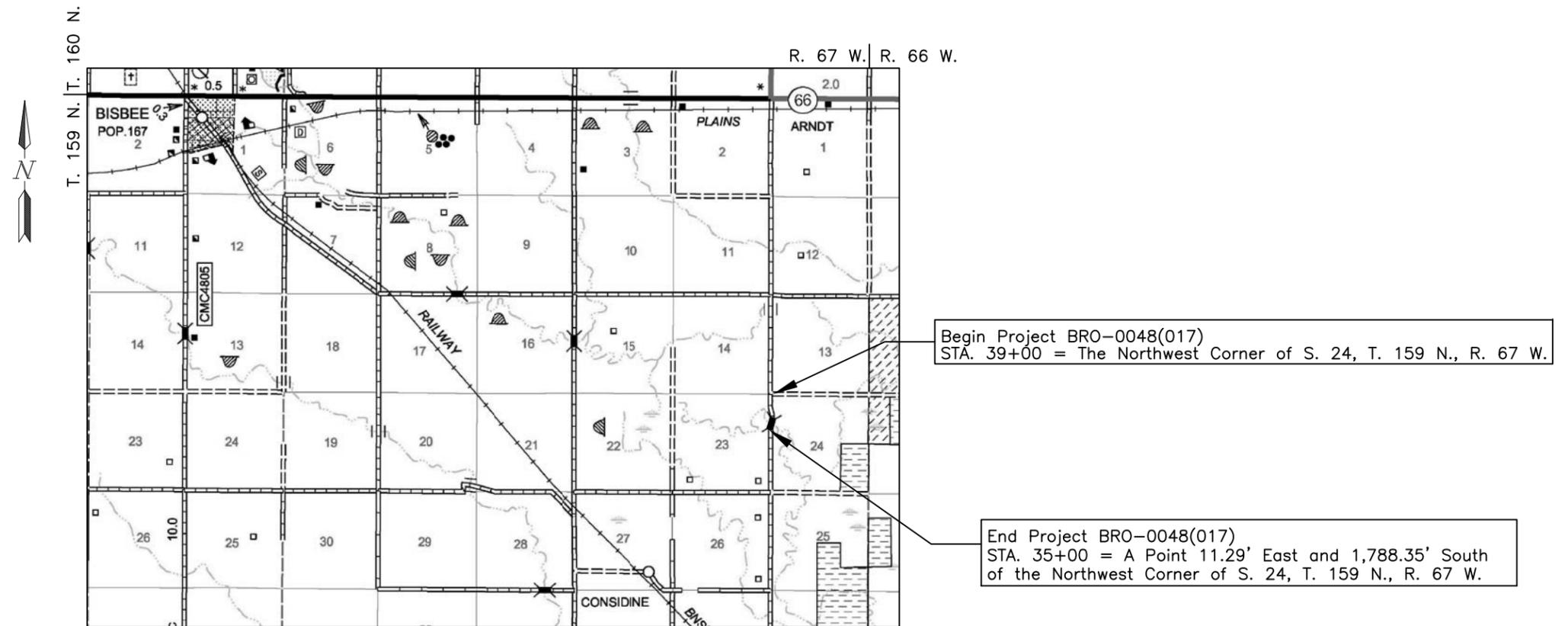
STRUCTURE #48-112-30.0
FHWA LIMITED INVOLVMENT

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.

LENGTH OF PROJECT		
PROJECT	MILES-GROSS	MILES-NET
BRO-0048(017)	0.075	0.075
TOTALS	0.075	0.075

THE PROJECT CONSISTS OF REMOVING THE EXISTING BRIDGE AND REPLACING IT WITH A TRIPLE 12 FT SPAN BY 8 FT HIGH PRECAST REINFORCED CONCRETE BOX CULVERT THE PROJECT IS LOCATED 5.5 MILES EAST AND 3.25 MILES SOUTH OF BISBEE, ND



SKETCH MAP OF TOWNER COUNTY

LOCATION MAP

SURVEYED & DESIGNED 2/01/2013

PS & E REVISIONS MADE 08/14/2013

Wold Engineering, P.C.
Consulting Engineers & Land Surveyors

915 East 11th Street ~ PO Box 237 ~ Bottineau, ND 58318
316 Eastdale Drive ~ PO Box 1277 ~ Bismarck, ND 58502
110 8th Avenue Southwest ~ Minot, ND 58701

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0048(017)	2	1

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D-704-9-11	Construction Sign Details
D-704-13	Barricade Details and Channelizing Devices
D-704-14	Construction Sign and Barricade Assembly Details
D-708-7	Erosion Control – Fiber Roll Staking Details
D-714-01	Reinforced Concrete Pipe Culvert and End Sections
D-714-04	Corrugated Steel Pipe Culverts and End Sections

LIST OF SPECIAL PROVISIONS (SP)

<u>SP #</u>	<u>Description</u>
SP 1266(08)	Permits and Environmental Considerations
SP 1010(08)	Temporary Erosion and Sediment Management Practices

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0048(017)	6	1

NOTES

100-P01 SCOPE OF WORK: The project consists of removing the existing bridge and installing a triple 12 feet span by 8 feet high by 48 feet long precast concrete box culvert and approximately 400 feet of approach road grading. The new precast reinforced concrete box culvert will be installed at Sta. 37+91.

100-P02 UTILITIES: Notice shall be given to the utility companies a minimum of 2 weeks prior to work on the project. Utilities that the engineer has been made aware of are shown on the plans. Other utilities may exist that are not shown. Power lines, telephone cables, rural water lines, and other utilities may be encountered on this project. The contractor shall be responsible to verify the locations and to notify all utility and pipeline companies to have the locations flagged and marked prior to beginning construction. Any charges by the utility companies for locates shall be paid by the contractor. The contractor will be liable for any costs resulting from damage to utilities or pipelines.

Utility companies will move or adjust conflicting facilities in conjunction with or prior to the highway construction. The contractor will not be responsible for costs associated with the moving or adjustment of utilities on the project right of way.

One-Call Service: 1-800-795-0555

107-P01 Haul Roads: All paved roads off the state system shall not be designated as haul roads. The contractor shall obtain approval from the local government agency before using any off system road as a haul road.

202-P01 REMOVAL OF STRUCTURE: The existing structure at Station 35+97 to 36+27 shall be removed. The existing structure, built in 1946, is a 30 foot single span bridge with steel beams and a concrete deck and abutments. The bridge has a clear roadway width of 16.5 feet.

The structure shall be removed by the contractor in accordance with Section 202 of the standard specifications. The bid item "REMOVAL OF STRUCTURE" shall include:

1. Remove and salvage the existing signs for Towner County. The Contractor shall remove the existing signs with care and stockpile as designated by the Engineer. The salvaged signs shall become the property of Towner County.
2. Remove all remaining bridge components. All materials removed shall become property of the contractor and shall be disposed of properly off the right-of-way.
3. Existing piling shall be cut-off a minimum of one foot below the proposed foundation fill limits and backfilled with foundation fill. All materials removed shall become property of the contractor and shall be disposed of properly off the right-of-way.

203-P01 BORROW-EXCAVATION: The Borrow Excavation shall be used to backfill the new box culvert. Thirty-five percent (35%) shrinkage was used to calculate quantity. The Contractor shall be responsible for obtaining areas to provide suitable "Borrow" material, and shall bear all costs of obtaining, opening and restoring the site, as per Std. Specs. Sec. 203.02 E.3. The final "Borrow" quantity is to be determined by cross sectioning before and after removal or by measured load count. Water may be required to compact the borrow-excavation and shall be incidental to "Borrow-Excavation". All necessary clearing and grubbing cost shall be included in price bid for "Borrow-Excavation".

Compaction of embankment material shall be in accordance with Standard Specifications, Section 203.02 H. the vibratory sheep's foot/pad foot/extended pad foot roller shall be used to obtain compaction on all embankment. On the final lift, the vibratory sheep's foot/pad foot/extended pad foot roller shall be used until the feet/pads ride up close to the surface of the embankment material. After this, the road top shall be compacted with a pneumatic roller until the surface is tightly bound and shows no sign of rutting or displacement under the compaction operations of traffic. Vibratory sheep's foot/pad foot/extended pad foot and pneumatic tired rollers of the type specified in Section 151 of the Standard Specifications shall be used.

The contractor shall remove and replace approximately 4" of topsoil over the excavation and embankment areas except the 28' roadbed.

All work as described above shall be included in the price bid for "Borrow-Excavation".

210-P01 CLASS 2 EXCAVATION-BOX CULVERT: "Class 2 Excavation-Box Culvert" shall include that excavation needed to install the precast box culvert, the foundation fill, and the riprap excavation (Approximately 301 C.Y.). Pay quantity shall be 1 Each. This material shall become the property of the Contractor and removed from the project unless approved for other uses by the Engineer.

210-P02 FOUNDATION FILL: The quantity for foundation fill was computed to a depth of 1.5' below the box culvert; however, this may vary depending on the soil conditions. If, in the opinion of the engineer, a suitable foundation exists under the culvert site, the foundation fill may be eliminated. If larger rock is required to stabilize the foundation it will be paid for as "foundation fill." The bed for the pre-cast sections shall consist of fine graded material (sand) approximately 4" in depth below the culvert. Grade rails shall be used to establish a uniform bed for the pre-cast sections. This material will be paid for as "Foundation Fill." Material will be accepted by Engineers Statement. No aggregate testing shall be required.

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NOTES

NOTES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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210-P03 CHANNEL EXCAVATION: "Channel Excavation" shall include that excavation needed to tie the inlet and outlet of the new RCB to the existing channel. The Contractor shall excavate the upstream and downstream channels to the right of way line as directed by the Engineer. This material shall be wasted unless approved for other uses by the Engineer. Final pay quantity for "Channel Excavation" shall be determined by field measurements or by measured load count.

210-P04 FOUNDATION PREPARATION: The bidders shall be aware of the possible inundated conditions at this site before the bid opening. The cost of any cofferdams and dewatering the excavation shall be included in the bid for "FOUNDATION PREPARATION."

302-P01 AGGREGATE SURFACE COURSE CLASS 13: Compaction of aggregate surface course shall be in accordance with Section 302.04. The dimensions shown for the aggregate surface course are approximate. Plan quantities shall be placed throughout except where the engineer authorizes a change. Water may be required to compact the aggregate surface course and shall be incidental to "Aggregate Surface Course CI 13". Material will be accepted by Engineers Statement. No aggregate testing shall be required.

708-P01 SEEDING TYPE B – CLASS II: Seeding will be measured by the acre for Type B Class II. Seeding shall cover the entire right-of-way (excluding the 28' roadbed), (approximately 1.2 acres).

708-P02 MULCHING: All seeded areas shall be stabilized with mulch after the completion of the seeding operation.

708-P03 RIPRAP: Final pay quantity for "Riprap-Loose Rock" shall be determined by field measurements in accordance with plan length, width, and depth, or by measured load count.

709-P01 GEOTEXTILE FABRIC – TYPE RR: Geotextile Fabric – Type RR shall be placed below all riprap.

CONTACT PERSON: Michael Rivinius, P.E.
(REGARDING PLAN SET) Wold Engineering, P.C.
316 Eastdale Drive
Bismarck, ND 58502
Phone: (701)258-9227

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NOTES

ENVIRONMENTAL COMMITMENTS

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0048(017)	6	3

ENVIRONMENTAL COMMITMENTS: Towner County, the North Dakota Department of Transportation, and the Federal Highway Administration have made several environmental commitments to various agencies and the public to secure approval of this project. The environmental commitments are as follows:

Commitment No. 1: Construction shall not affect the fish spawning and migration period between April 15th and June 1st.

Action taken/required: The contractor is not allowed to work in the channel between April 15 and June 1 for this project.

Commitment No. 2: Unavoidable wetland impacts will be minimized or mitigated either on-site or at an appropriate mitigation site. Approximately 0.09 jurisdictional acres of potential other waters will be impacted permanently and 0.09 jurisdictional acres of potential other waters will be temporarily impacted.

Action taken/required: Temporary and permanent impacts to potential other waters do not require mitigation. To minimize the overall impact to the channel, the proposed inverts of the box culvert and riprap are set 1 foot below the streambed elevation to allow for sedimentation of the box culvert floor and to allow passage of fish and other organisms.

POTENTIAL OTHER WATERS										
Number	Location	Long/Lat (Dec. Deg.)	Type	Size		Feature	USACE Jurisdictional*	Impacts to Potential Other Waters		
				Acres	Linear Feet			Acres		Linear Feet
								Temp	Perm	
POW - 1	Sec.23/24 , T159N, R67W	-99.254242 W 48.583083 N	Intermittent Stream	0.25	570	Natural	X	0.07	0.09	308
Totals				0.25	570			0.07	0.09	308

* A wetland Jurisdictional Determination was issued by the USACE on 12/07/2012; NWO-2012-2820-BIS.

Commitment No. 3: The contractor shall provide the ND Game & Fish Department a reasonable opportunity to inspect all vessels, motors, trailers, and construction equipment prior to these items being launched or placed into the waters of the state.

Action taken/required: A minimum of 72 hours notice must be provided for scheduling an inspection. The department's Nuisance Species Biologist, Mr. Fred Ryckman, can be contacted at 701-770-0920 for equipment inspections or any additional information regarding Aquatic Nuisance Species prevention protocols.

Commitment No. 4: All efforts will be made to avoid disturbances within the migratory bird nesting season (February 1 through July 15) in order to avoid impacts to migratory birds during the breeding/nesting season.

Action taken/required: The bridge shall not be removed before July 15 unless the contractor uses alternative measures to prevent migratory birds from nesting prior to construction. This may include clearing & grubbing or netting prior to the nesting season.

Required Permits

North Dakota Department of Health — *NDPDES Permit*
Status: To be obtained by the contractor prior to construction
Owner of permit shall be listed as Towner County

United States Army Corps of Engineers — *Nationwide Permit 23*
Status: Has been obtained for the project

ESTIMATED QUANTITIES

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
103	0100	CONTRACT BOND	L SUM	1
202	0104	REMOVAL OF STRUCTURE	EA	1
202	0170	REMOVAL OF CULVERTS-ALL TYPES & SIZES	LF	50
203	0140	BORROW-EXCAVATION	CY	1200
210	0109	CLASS 2 EXCAVATION-BOX CULVERT	EA	1
210	0126	CHANNEL EXCAVATION	CY	300
210	0201	FOUNDATION PREPARATION	EA	1
210	0210	FOUNDATION FILL	CY	238
302	0356	AGGREGATE SURFACE COURSE CL 13	TON	241
606	1208	12FT X 8FT PRECAST RCB CULVERT	LF	48
606	3208	DBL 12FT X 8FT PRECAST RCB CULVERT	LF	48
606	5208	12FT X 8FT PRECAST RCB END SECTION	EA	2
606	7208	DBL 12FT X 8FT PRECAST RCB END SECTION	EA	2
702	0100	MOBILIZATION	L SUM	1
704	1000	TRAFFIC CONTROL SIGNS	UNIT	390
704	1052	TYPE III BARRICADE	EA	10
708	1020	RIPRAP-LOOSE ROCK	CY	132
708	1430	FIBER ROLLS 12IN	LF	2015
708	1431	REMOVAL FIBER ROLLS 12IN	LF	816
708	2240	SEEDING-TYPE B-CL II	ACRE	1.2
708	5500	MULCHING	ACRE	1.2
709	0600	GEOTEXTILE FABRIC - TYPE RR	SY	198
714	4115	PIPE CONDUIT 36IN	LF	88

BASIS OF ESTIMATE

QUANTITY PER MILE	WIDTH	UNIT	DESCRIPTION
3,179	24'	TON	AGGR. SURF COURSE, CL. 13 (1.875 TON/C.Y.) ~ Mainline
			CL. 13 AGGR. ~ 42 TON PER SECTION LINE (0)
			CL. 13 AGGR. ~ 18 TON PER PRIVATE DRIVE (0)

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Quantities and Basis of Estimate

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0048(017)	11	1

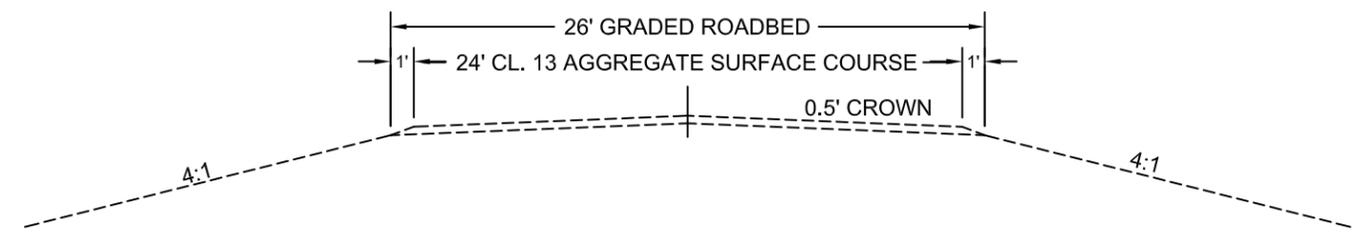
Begin Station / Location	Begin Offset	End Station / Location	End Offset	Length	Pipe Conduit Pay Size	Pipe Conduit Approach Pay Size	RCP Pay Size	Allowable Material	Required Diameter	Minimum Thickness	R1 Fabric (Pay Item)	(A) End Sections		Applicable Backfill Detail
												Begin	End	
				LF	IN	IN	IN		In	In	SY	EA	EA	
36+00	44'LT	5+22	44'RT	88	36		36	Reinforced Concrete Pipe - Class III (barrel length = 82 LF)	36			Y	Y	N/A
								Polymeric Coated Steel	36	0.064				

(A) Not paid for separately, to be included in the price bid for Pipe Conduit.

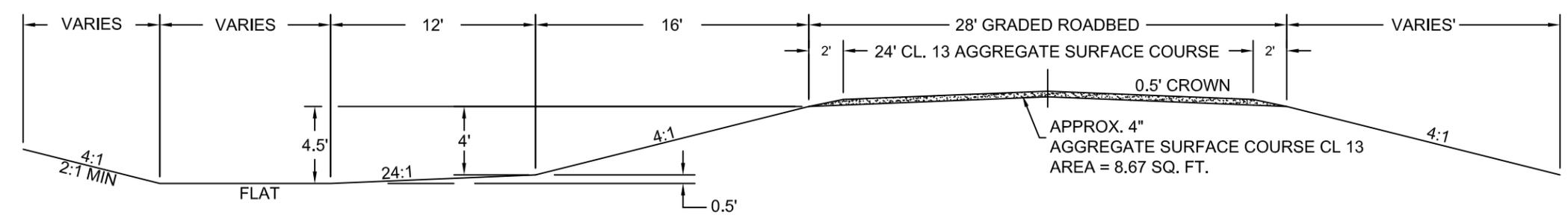
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Pipe List

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0048(017)	30	1



EXISTING TYPICAL SECTION



CUT

PROPOSED TYPICAL SECTION

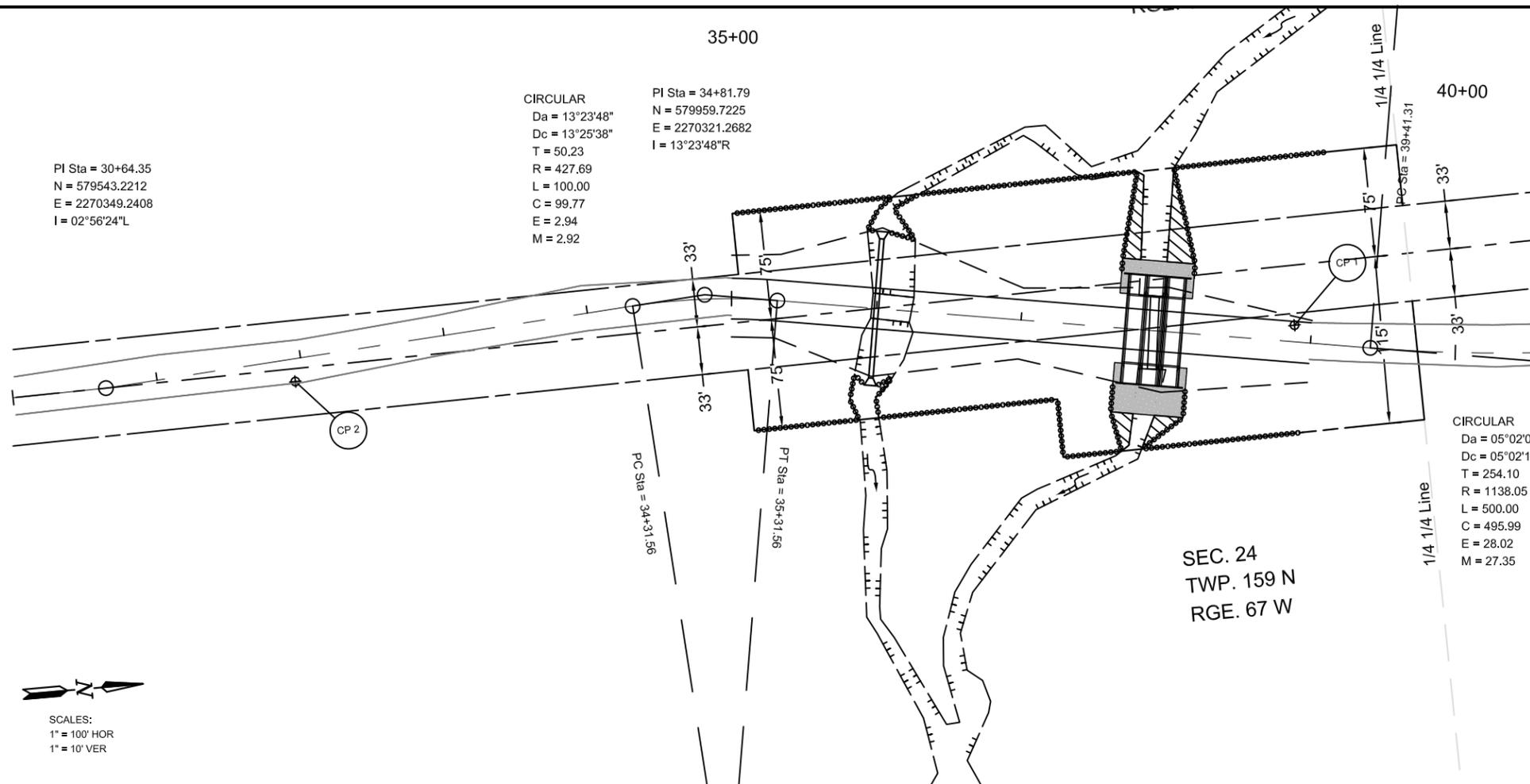
FILL

Note: A 50 foot transition from the existing typical section to the proposed typical section is required.

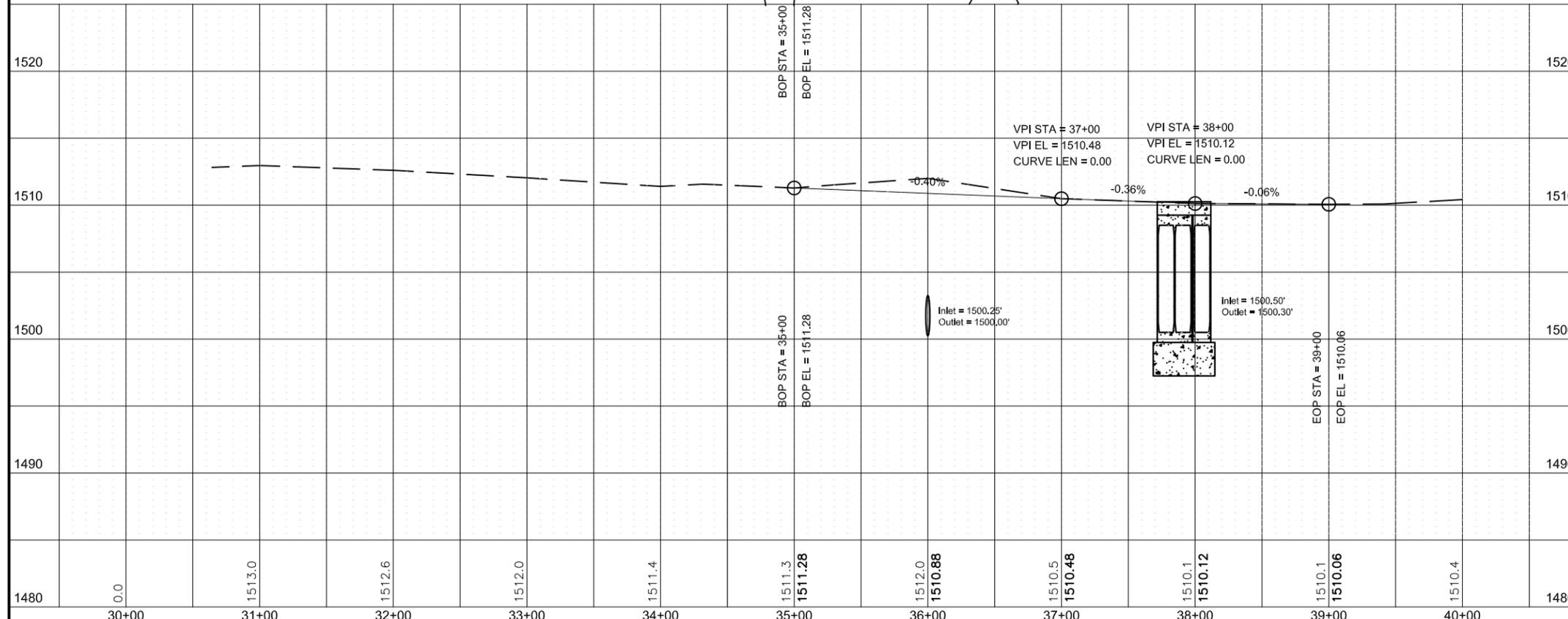
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Typical Section		
REVISED: 00/00/0000		
 Wold Engineering, P.C. Consulting Engineers & Land Surveyors BOTTINEAU - BISMARCK - MINOT		
DRAWN BY: MRR	CHECKED BY: MRR	DATE: 01/18/2013
© Wold Engineering, P.C. 2013		

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0048(017)	060	1



REMOVAL OF CULVERTS-ALL TYPES & SIZES	
STA. 37+91 ☒	50 LF
12FTX8FT PRECAST RCB CULVERT	
STA. 37+91 ☒	48 LF
DOUBLE 12FTX8FT PRECAST RCB CULVERT	
STA. 37+91 ☒	48 LF
12FTX8FT PRECAST RCB END SECTION	
STA. 37+91 ☒	2 EA
DOUBLE 12FTX8FT PRECAST RCB END SECTION	
STA. 37+91 ☒	2 EA
RIPRAP-LOOSE ROCK	
STA. 37+66 TO 38+16 LT	44 CY
STA. 37+66 TO 38+16 RT	88 CY
GEOTEXTILE FABRIC-TYPE RR	
STA. 37+66 TO 38+16 LT	66 SY
STA. 37+66 TO 38+16 RT	132 SY
PIPE CONDUIT 36IN	
STA. 36+00 ☒	88 LF
REMOVAL OF STRUCTURE	
Sta. 36+10 ☒	
Structure No. 48-112-30.0	
Deck: Concrete	
Beams: Steel	
Curb: Precast Concrete	
Rail: None	
Abutments: Concrete	
Overall Length: 30'	
Deck Width: 18'	

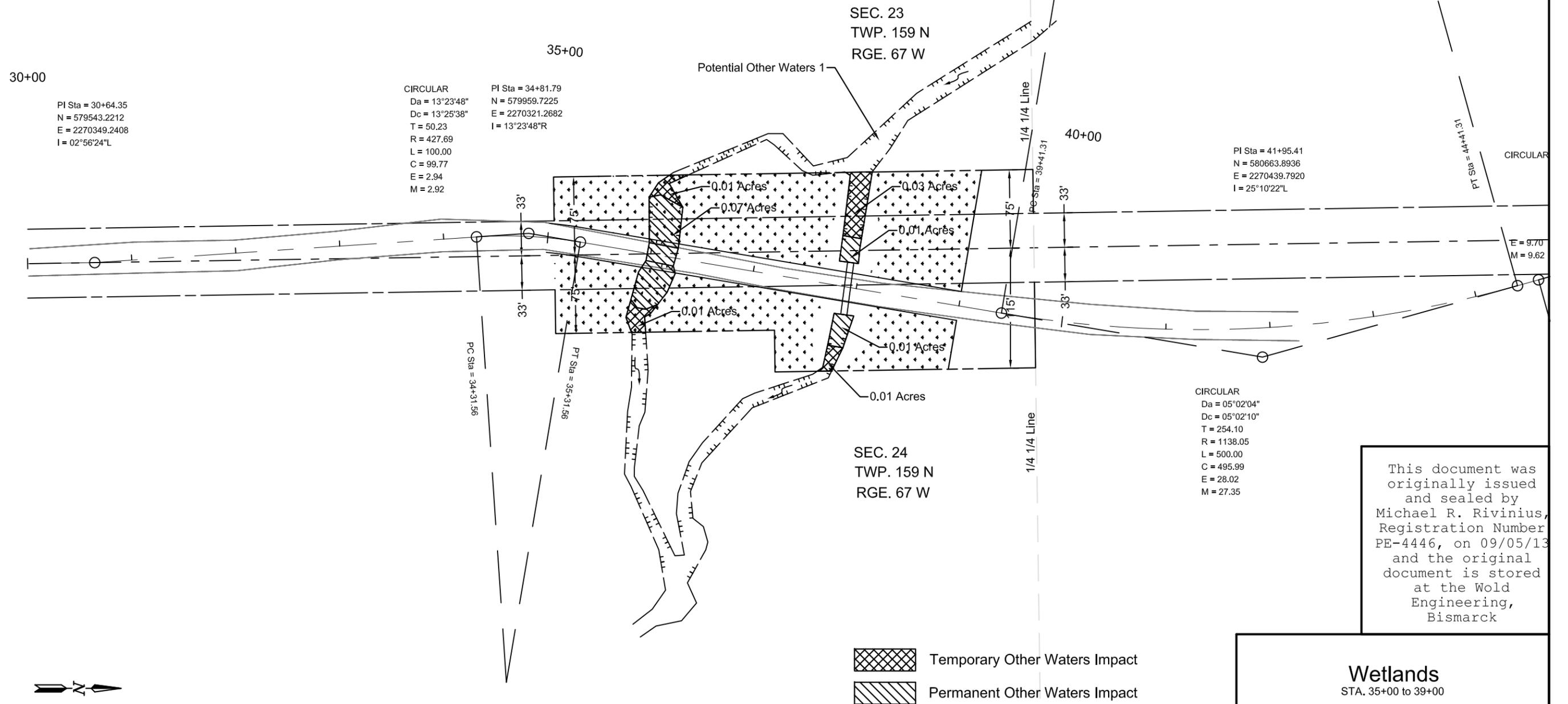


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PLAN & PROFILE
 STA. 35+00 TO 39+00

FILE:	060pp_001.dwg	0	50	100	150
		SCALE IN FEET			

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0048(017)	075	1



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Temporary Other Waters Impact

Permanent Other Waters Impact

SCALES:
1" = 100' HOR
1" = 10' VER

Wetlands
STA. 35+00 to 39+00

FILE: 075wl_001.dwg

0 100 200 300
SCALE IN FEET

FIBER ROLLS 12IN
 STA. 35+00 TO STA. 39+00 LT
 STA. 35+20 TO STA. 39+00 RT

400 LF
 416 LF

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0048(017)	075	2

30+00

PI Sta = 30+64.35
 N = 579543.2212
 E = 2270349.2408
 I = 02°56'24"L

CIRCULAR
 Da = 13°23'48"
 Dc = 13°25'38"
 T = 50.23
 R = 427.69
 L = 100.00
 C = 99.77
 E = 2.94
 M = 2.92

PI Sta = 34+81.79
 N = 579959.7225
 E = 2270321.2682
 I = 13°23'48"R

PC Sta = 34+31.58

PT Sta = 35+31.58

SEC. 23
 TWP. 159 N
 RGE. 67 W

40+00

PI Sta = 41+95.41
 N = 580663.8936
 E = 2270439.7920
 I = 25°10'22"L

CIRCULAR

E = 9.70
 M = 9.62

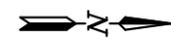
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 Da = 05°02'04"
 Dc = 05°02'10"
 T = 254.10
 R = 1138.05
 L = 500.00
 C = 495.99
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 M = 27.35

SEC. 24
 TWP. 159 N
 RGE. 67 W

1/4 1/4 Line

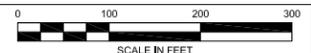
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Temporary Erosion Control
 STA. 35+00 to 39+00



SCALES:
 1" = 100' HOR
 1" = 10' VER

FILE: 075wl_002.dwg



FIBER ROLLS 12IN

STA. 35+00 LT TO STA. 36+05 LT	147 LF
STA. 36+23 LT TO STA. 37+72 LT	287 LF
STA. 37+97 LT TO STA. 39+00 LT	183 LF
STA. 35+20 RT TO STA. 35+95 RT	116 LF
STA. 36+04 RT TO STA. 37+76 RT	298 LF
STA. 37+90 RT TO STA. 39+00 RT	168 LF

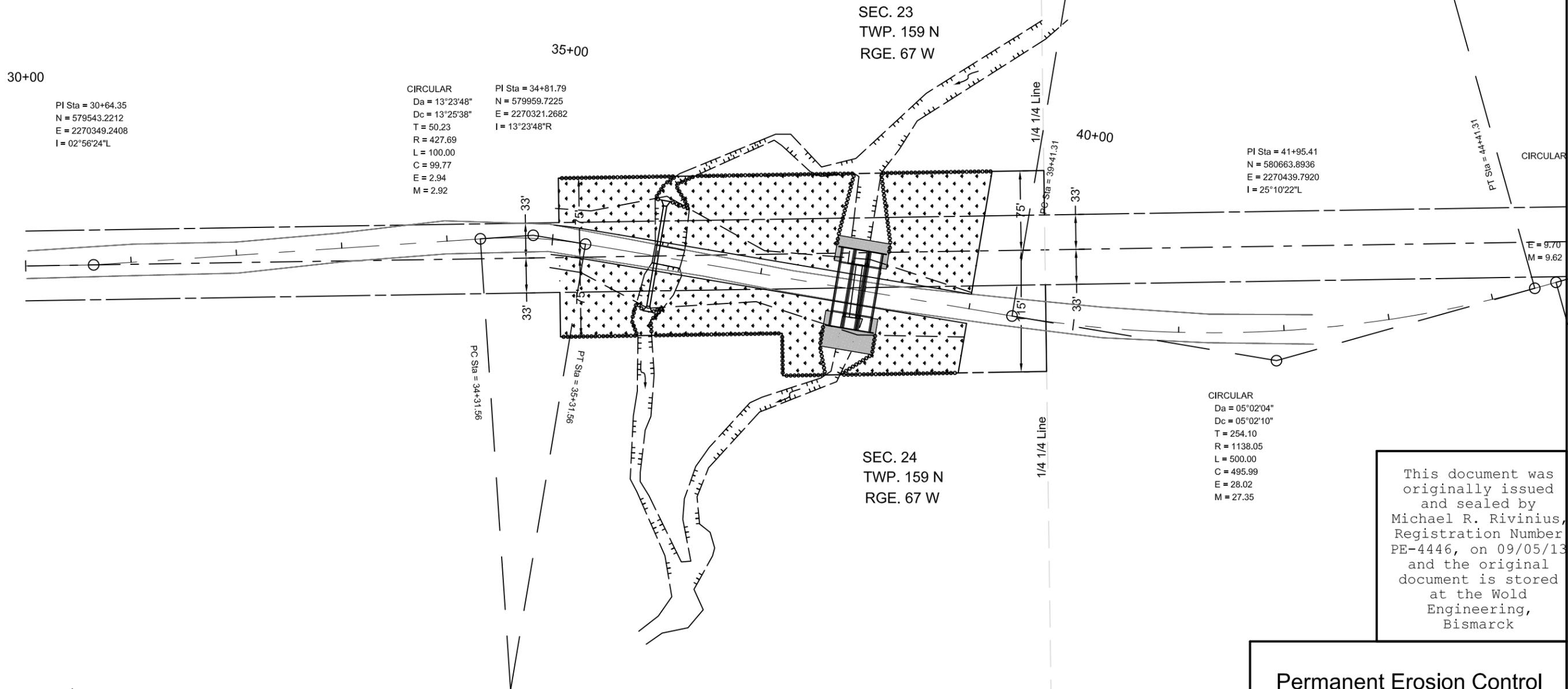
SEEDING-TYPE B-CL II

STA. 35+08 RT TO STA. 39+00 RT	0.7 Acres
STA. 35+08 LT TO STA. 39+00 LT	0.5 Acres

MULCHING

STA. 35+08 RT TO STA. 39+00 RT	0.7 Acres
STA. 35+08 LT TO STA. 39+00 LT	0.5 Acres

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0048(017)	075	3



PI Sta = 30+64.35
 N = 579543.2212
 E = 2270349.2408
 I = 02°56'24"L

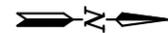
CIRCULAR
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 Dc = 13°25'38"
 T = 50.23
 R = 427.69
 L = 100.00
 C = 99.77
 E = 2.94
 M = 2.92

PI Sta = 34+81.79
 N = 579959.7225
 E = 2270321.2682
 I = 13°23'48"R

PI Sta = 41+95.41
 N = 580663.8936
 E = 2270439.7920
 I = 25°10'22"L

CIRCULAR
 Da = 05°02'04"
 Dc = 05°02'10"
 T = 254.10
 R = 1138.05
 L = 500.00
 C = 495.99
 E = 28.02
 M = 27.35

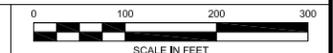
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SCALES:
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 1" = 10' VER

Permanent Erosion Control
 STA. 35+00 to 39+00

FILE: 075wl_003.dwg



HORIZONTAL ALIGNMENT				CURVE DATA		US PUBLIC LAND SURVEY DATA				SURVEY CONTROL POINTS					
PNT	STATION	NORTHING	EASTING	ARC DEFINITION		DESC.	SEC-TWP-RGE	NORTHING	EASTING	PNT	NORTHING	EASTING	ELEV	STATION	OFFSET
208	0+00	576479.25	2270397.40	Curve #1		SW SEC COR	24-159-68	576479.25	2270397.40	CP1	580362.68	2270377.52	1509.69	38+88.04	11.41 LT
207	26+43.87	579122.79	2270355.86	PI = 34+81.79 Simple Curve		W QTR COR	24-159-68	579122.79	2270355.86	CP2	579673.65	2270356.09	1511.85	31+94.03	15.57 RT
PI	30+64.35	579543.22	2270349.24	Delta = 13° 23' 48." (RT)		NW SEC COR	24-159-68	581766.32	2270314.23						
PI	34+81.79	579959.72	2270321.27	Dc = 13° 25' 38.00"											
BOP	35+00	579977.97	2270325.52	R = 427.69'											
EOP	39+00	580372.58	2270390.76	T = 50.23'											
PI	41+95.41	580663.89	2270439.79	L = 100.00'											
PI	46+13.09	581074.05	2270325.13												
204	53+03.79	581766.32	2270314.23	Curve #2											
				PI = 41+95.41 Simple Curve											
				Delta = 5° 02' 04." (LT)											
				Dc = 5° 02' 10.00"											
				R = 1,138.05'											
				T = 254.10'											
				L = 500.00'											
				Curve #3											
				PI = 46+13.09 Simple Curve											
				Delta = 4° 54' 19." (LT)											
				Dc = 4° 54' 25.00"											
				R = 1,168.02'											
				T = 150.83'											
				L = 300.00'											

All coordinates and measurements on this document derived from the US Foot definition.

INITIALIZING BENCH MARK CORS SYSTEM

NAVD-88
 NGVD-29

ENGLISH UNITS
 METRIC UNITS

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Survey Coordinate and Curve Data

REVISED: 00/00/0000


Wold Engineering, P.C.
 Consulting Engineers & Land Surveyors
 BOTTINEAU - BISMARCK - MINOT

DRAWN BY: JAB CHECKED BY: MRR DATE: 06/25/2013

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NOTES: ALL GPS CONTROL ARE #7 REBAR
 ALL CP CONTROL POINTS ARE #5 REBAR

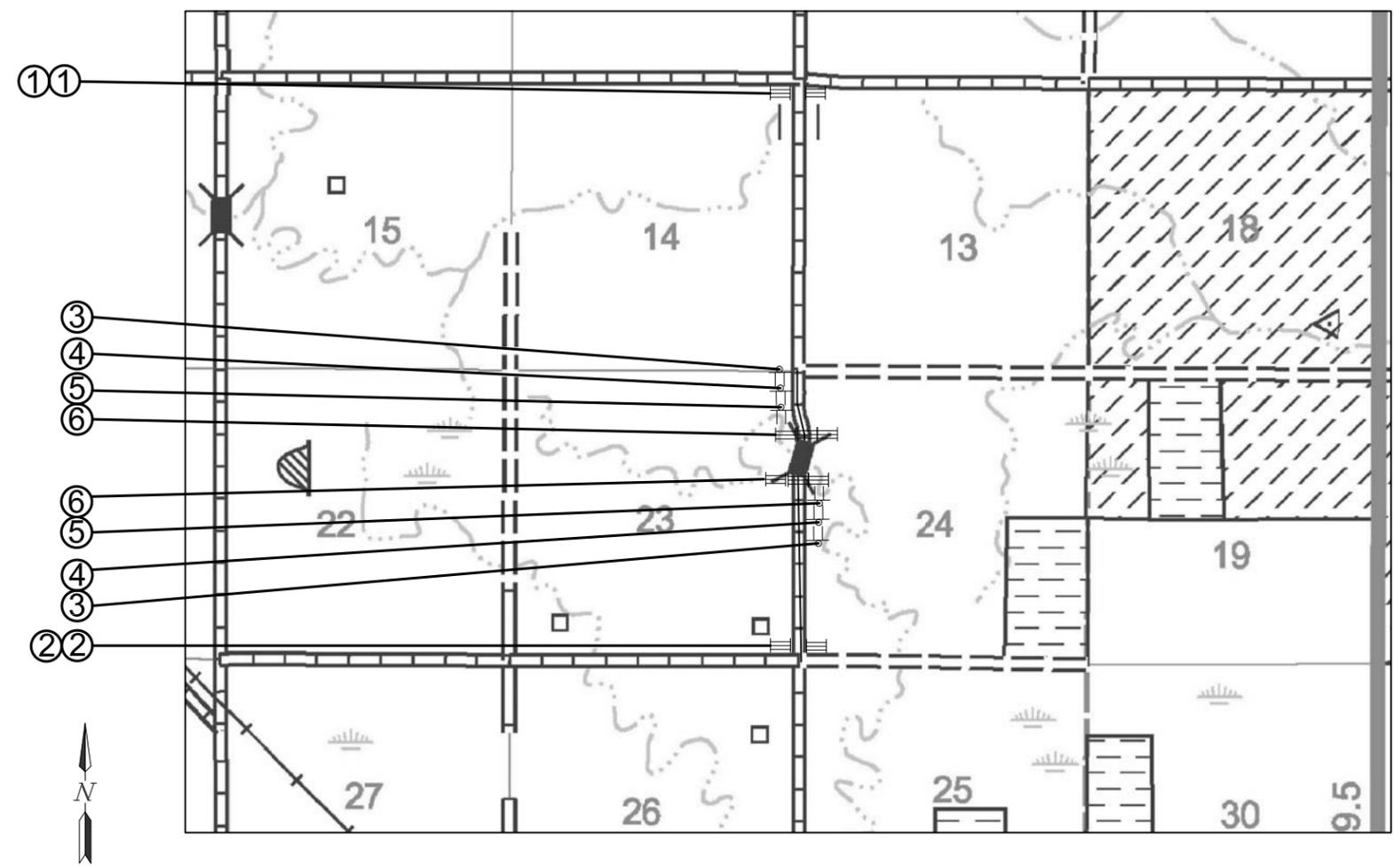
Date Survey Completed 1/14/13

Assumed Coordinates
 All coordinates on this sheet are ground coordinates. They are derived from the "North Dakota Coordinate System of 1983", NAD83(CORS), NORTH Zone Use Combination factor (cf) = 0.9999160 to convert Ground Distances to State Plane Distances. NGS OPUS Solution was used to establish state plane coordinates.

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0048(017)	100	2

LEGEND:

- ① ROAD CLOSED
1.24 MILE AHEAD
LOCAL TRAFFIC ONLY
R11-3a-60
BARRICADE POST MOUNTING
- ② ROAD CLOSED
0.64 MILE AHEAD
LOCAL TRAFFIC ONLY
R11-3a-60
BARRICADE POST MOUNTING
- ③  ROAD CLOSED AHEAD
W20-3-48
POST MOUNTING
500'
- ④  ROAD CLOSED 1000 FT
W20-3-48
POST MOUNTING
500'
- ⑤  ROAD CLOSED 500 FT
W20-3-48
POST MOUNTING
500'
- ⑥  ROAD CLOSED
R11-2-48
BARRICADE MOUNTING



Traffic Control Layout

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Work Zone Traffic Control

REVISED: 00/00/0000

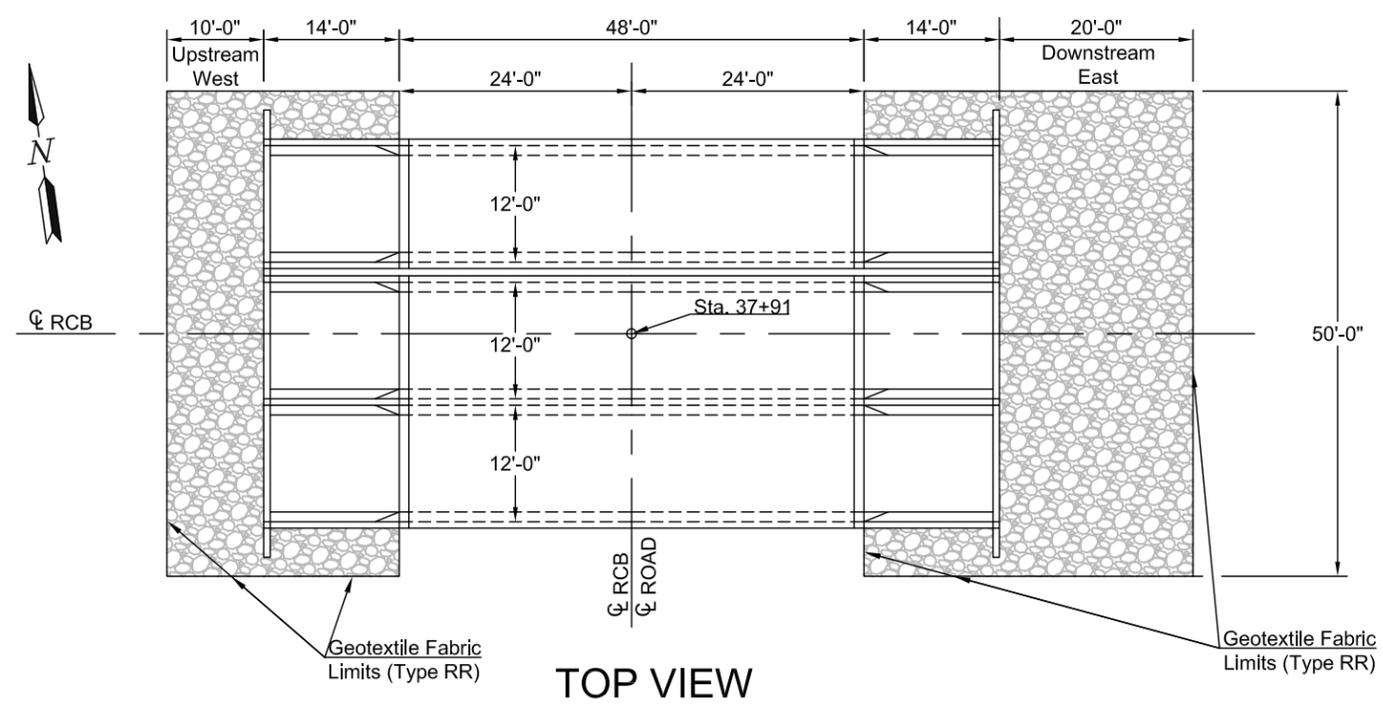


BOTTINEAU - BISMARCK - MINOT

DRAWN BY: JAB CHECKED BY: MRR DATE: 03/11/2013

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0048(017)	170	1



NOTES:

606 - Triple 12ft. x 8ft. Precast RCB Culvert
 Dimensions: Triple 12ft. span x 8ft. rise section

Fill: 0ft. to 2ft.

Design Load: HL-93

Total Length: 44ft./line + sloped ends = 48 ft. total barrel length

Weight: 56,525 lbs/6ft.

Tie Bolts: All sections shall be tied together with a minimum of 2 tie bolts per outside wall. The tie bolts shall be placed at third points of the outside walls. Cost of ties shall be included in price bid for "DBL 12FT X 8FT PRECAST RCB CULVERT" and "12FT X 8FT PRECAST RCB CULVERT". An alternate tie system using pre-cast tubes and an internal cable tie will be allowed but subject to review of shop detail drawings.

End Sections: The sloped end section shall be attached to the last barrel section and the cutoff wall. Holes shall be cast at 3' centers through the end section and into the cutoff wall to receive 3/4" diameter reinforcing bars. The end section shall be connected to the last barrel section by the use of galvanized u-bolts or another approved method.

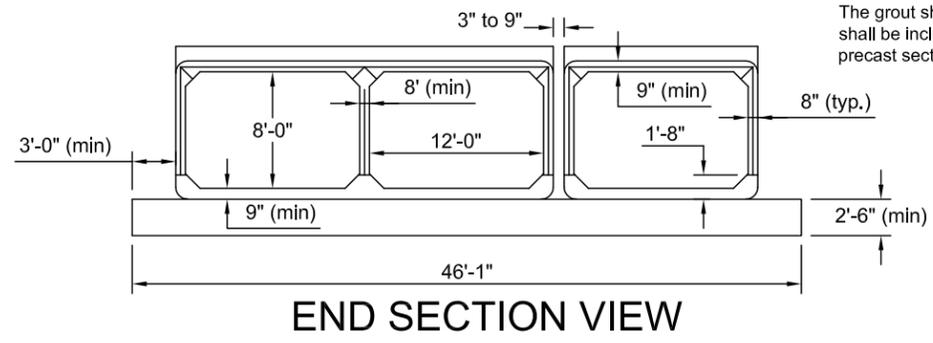
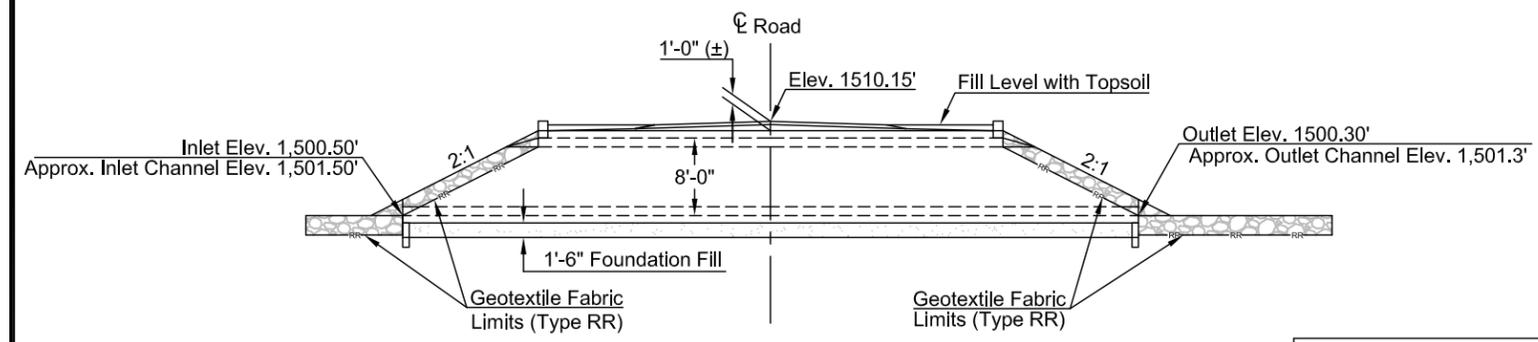
The "DBL 12FT X 8FT PRECAST RCB END SECTION" and "12FT X 8FT PRECAST RCB END SECTION" shall consist of the sloped end section, the cutoff wall, and the parapet.

Estimated Quantities
 Geotextile Fabric-Type RR: 198 SY
 Rip Rap-Loose Rocks: 132 CY

Single or Multiple Span Substitution
 The Contractor may substitute two single span precast box culverts sections for the double span precast box culverts sections shown in the plans. The contractor shall install the single span precast box culverts sections and multiple spans with a space between barrel lines of 3" to 9". This space shall be filled with grout with the following mix design:

MIX DESIGN	
3/4" minus Rock	800 lbs
Sand	2,300 lbs
Fly Ash	100 lbs
Cement	560 lbs
Air	5%
Slump	5" to 6"

The grout shall be fluid on placement to flow around and fill voids in the backfill area. The grout shall be included in price bid for precast sections. Payment shall be limited to the price bid for the precast sections.



HYDRAULIC DATA	
DRAINAGE AREA	119 sq. miles
STREAM SLOPE	0.00076 ft/ft
DESIGN FREQUENCY	15 year
DESIGN DISCHARGE	1,719 cfs
DESIGN HEADWATER STAGE	1,509.84'
DESIGN TAILWATER STAGE	1,509.17'
DESIGN VELOCITY	5.88 fps
100-YEAR FREQUENCY DISCHARGE	3,185 cfs
100-YEAR FREQUENCY HEADWATER	1,510.91'
OVERTOPPING STAGE	1,510.13'
OVERTOPPING DISCHARGE	1,891 cfs

For a box culvert with 9.0 inch thick roof, 9.0 inch thick floor and 8.0 inch thick walls, the following total factored moments would result from the application of the required loads:

LRFD Factored Design Moments and Minimum Reinforcing (Double Cell)			LRFD Factored Design Moments and Minimum Reinforcing (Single Cell)		
	Factored Design Moments	Minimum Reinforcing		Factored Design Moments	Minimum Reinforcing
Wall Moment	1,880 ft.-lbs.	0.192 in ² /ft	Wall Moment	1,139 ft.-lbs.	0.192 in ² /ft
Roof Moments			Roof Moments		
Corner	11,078 ft.-lbs.	0.306 in ² /ft	Corner	11,846 ft.-lbs.	0.328 in ² /ft
Bottom	23,797 ft.-lbs.	0.679 in ² /ft	Bottom	26,418 ft.-lbs.	0.759 in ² /ft
Top	26,716 ft.-lbs.	0.769 in ² /ft			
Floor Moments			Floor Moments		
Corner	7,662 ft.-lbs.	0.216 in ² /ft	Corner	10,207 ft.-lbs.	0.282 in ² /ft
Top	12,830 ft.-lbs.	0.356 in ² /ft	Top	17,593 ft.-lbs.	0.494 in ² /ft
Bottom	23,127 ft.-lbs.	0.659 in ² /ft			

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PRECAST BOX CULVERT

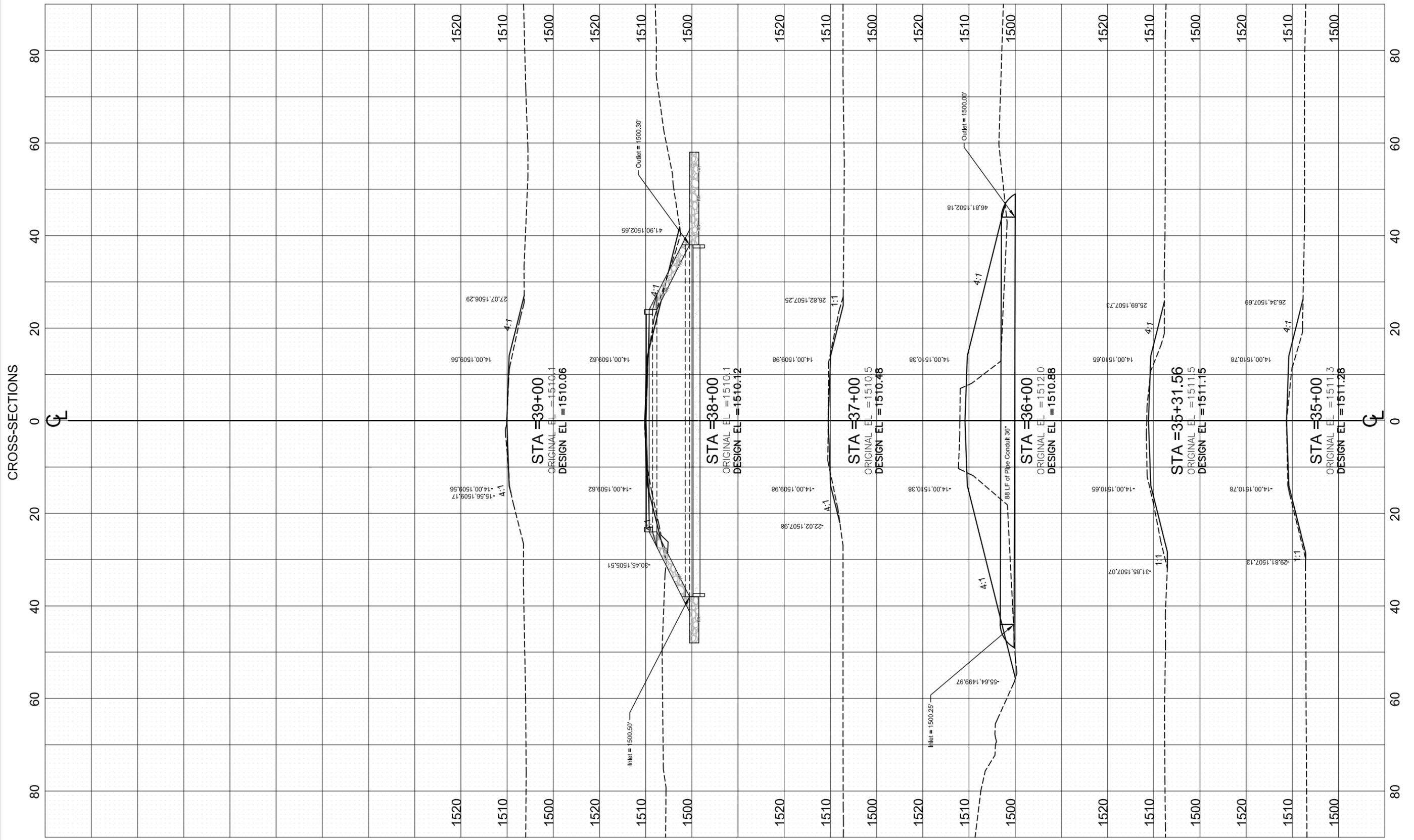
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 BOTTINEAU - BISMARCK - MINOT

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0048(017)	200	1



NDDOT ABBREVIATIONS

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
06-15-10	
REVISIONS	
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04-20-11 03-15-13	Added Items Added Items

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NDDOT ABBREVIATIONS

D-20-2

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
06-15-10	
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NDDOT ABBREVIATIONS

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
06-15-10	
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NDDOT UTILITY COMPANY ABBREVIATIONS

702COM 702 Communications
 ACCENT Accent Communications
 AGASSIZ WU Agassiz Water Users Incorporated
 All PI Alliance Pipeline
 ALL SEAS WU All Seasons Water Users Association
 AMOCO PI Amoco Pipeline Company
 AMRDA HESS Amerada Hess Corporation
 AT&T AT&T Corporation
 B PAW Bear Paw Energy Incorporated
 BASIN ELEC Basin Electric Cooperative Incorporated
 BEK TEL Bek Communications Cooperative
 BELLE PL Belle Fourche Pipeline Company
 BNSF Burlington Northern Santa Fe Railway
 BOEING Boeing
 BRNS RWD Barnes Rural Water District
 BURK-DIV ELEC Burke-Divide Electric Cooperative
 BURL WU Burleigh Water Users
 Cable One Cable One
 CABLE SERV Cable Services
 CAP ELEC Capital Electric Cooperative Incorporated
 CASS CO ELEC Cass County Electric Cooperative
 CASS RWU Cass Rural Water Users Incorporated
 CAV ELEC Cavalier Rural Electric Cooperative
 CBLCOM Cablecom Of Fargo
 CENEX PL Cenex Pipeline
 CENT PWR ELEC Central Power Electric Cooperative
 CONS TEL Consolidated Telephone
 CONT RES Continental Resource Inc
 CPR Canadian Pacific Railway
 D O E Department Of Energy
 DAK CARR Dakota Carrier Network
 DAK CENT TEL Dakota Central Telephone
 DAK RWD Dakota Rural Water District
 DGC Dakota Gasification Company
 DICKEY R NET Dickey Rural Networks
 DICKEY RWU Dickey Rural Water Users Association
 DICKEY TEL Dickey Telephone
 DNRR Dakota Northern Railroad
 DOME PL Dome Pipeline Company
 DVELEC Dakota Valley Electric Cooperative
 DVMW Dakota, Missouri Valley & Western
 ENBRDG Enbridge Pipelines Incorporated
 FALK MNG Falkirk Mining Company
 G FKS-TRL WD Grand Forks-trail Water District
 GETTY TRD & TRAN Getty Trading & Transportation
 GLDN W ELEC Golden West Electric Cooperative
 GRGS CO TEL Griggs County Telephone
 GT PLNS NAT GAS Great Plains Natural Gas Company
 HALS TEL Halstad Telephone Company
 INT-COMM TEL Inter-Community Telephone Company
 KANEB PL Kaneb Pipeline Company

KEM ELEC Kem Electric Cooperative Incorporated
 KOCH GATH SYS Koch Gathering Systems Incorporated
 LKHD PL Lakehead Pipeline Company
 LNGDN RWU Langdon Rural Water Users Incorporated
 LWR YELL R ELEC Lower Yellowstone Rural Electric
 MCKNZ CON McKenzie Consolidated Telcom
 MCKNZ WRD McKenzie County Water Resource District
 MCKNZ ELEC McKenzie Electric Cooperative
 MCLEOD Mcleod USA
 MCLN ELEC Mclean Electric Cooperative
 MCLN-SHRDN R WAT Mclean-Sheridan Rural Water
 MDU Montana-dakota Utilities
 MID-CONT CABLE Mid-Continent Cable
 MIDSTATE TEL Midstate Telephone Company
 MINOT CABLE Minot Cable Television
 MINOT TEL Minot Telephone Company
 MISS W W S Missouri West Water System
 MNKOTA PWR Minnkota Power
 MRE LBTY TEL Moore & Liberty Telephone
 MOR-GRAN-SOU ELEC Mor-gran-sou Electric Cooperative
 MOUNT-WILLI ELEC Mountrail-williams Electric Cooperative
 MUNICIPAL City Of '.....'
 MUNICIPAL City Water And Sewer
 N CENT ELEC North Central Electric Cooperative
 N VALL W DIST North Valley Water District
 ND PKS & REC North Dakota Parks And Recreation
 ND TEL North Dakota Telephone Company
 NDDOT North Dakota Department of Transportation
 NDSU SOIL SCI DEPT Ndsu Soil Science Department
 NEMONT TEL Nemont Telephone
 NODAK R ELEC Nodak Rural Electric Cooperative
 NOON FRMS TEL Noonan Farmers Telephone Company
 NPR Northern Plains Railroad
 NSP Northern States Power
 NTH PRAIR RW Northern Prairie Rural Water Association
 NTHN BRDR PL Northern Border Pipeline
 NTHN PLNS ELEC Northern Plains Electric Cooperative Incorporated
 NTHWSTRN REF Northwestern Refinery Company
 NW COMM Northwest Communication Cooperation
 OTTR TL PWR Otter Tail Power Company
 P L E M Prairielands Energy Marketing
 POLAR COM Polar Communications
 QWEST Qwest Communications
 R&T W SUPPLY R & T Water Supply Association
 RAMSEY R SEW Ramsey Rural Sewer Association
 RAMSEY RW Ramsey Rural Water Association
 RAMSEY UTIL Ramsey County Rural Utilities
 RED RIV TEL Red River Rural Telephone
 RESVTN TEL Reservation Telephone
 ROBRTS TEL Roberts Company Telephone
 R-RIDER ELEC Roughrider Electric Coop

RRVW Red River Valley & Western Railroad
 RSR ELEC R.S.R. Electric Cooperative
 S E W U South East Water Users Incorporated
 SCOTT CABLE Scott Cable Television Dickinson
 SHERDN ELEC Sheridan Electric Cooperative
 SHEYN VLY ELEC Sheyenne Valley Electric Cooperative
 SKYTECH Skyland Technologies Incorporated
 SLOPE ELEC Slope Electric Cooperative
 SLOPE ELEC Slope Electric Cooperative Incorporated
 SOURIS RIV TELCOM Souris River Telecommunications
 ST WAT COMM State Water Commission
 STATE LN WATER State Line Water Cooperative
 STUT RWU Stutsman Rural Water Users
 T M C Turtle Mountain Communications
 TCI TCI of North Dakota
 TRI-CNTY WU Tri-County Water Users Incorporated
 TRL CO RWU Traill County Rural Water Users
 UNTD TEL United Telephone
 UPPR SOUR WUA Upper Souris Water Users Association
 US SPRINT U.S. Sprint
 USAF MSL CABLE U.S.A.F. Missile Cable
 USW COMM U.S. West Communications
 VRNDRY ELEC Verendrye Electric Cooperative
 W RIV TEL West River Telephone Incorporated
 WEB W. E. B. Water Development Association
 WILLI RWA Williams Rural Water Association
 WILSTN BAS PL Williston Basin Interstate Pipeline Company
 WLSH RWD Walsh Water Rural Water District
 WOLVRTN TEL Wolverton Telephone
 XLENER Xcel Energy
 YSVR Yellowstone Valley Railroad

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
6-15-10	
REVISIONS	
DATE	CHANGE
04-20-11 03-15-13	Added Items Added Items

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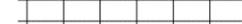
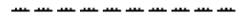
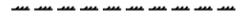
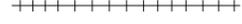
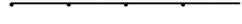
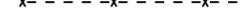
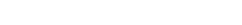
Line Styles

.....	Limits of Const Transition Line	—— s —— s ——	Floating Silt Curtain	—— ——— ———	Existing Aggregate (Cross Section View)	- - - - -	Existing Centerline
.....	Bale Check	—— ——— T ——	Existing Telephone Line	—— ——— ———	Existing Curb and Gutter (Cross Section View)	- - - - -	Supplemental Contour
.....	Rock Check	—— ——— TV ——	Existing TV Line	—— ——— ———	Existing Riprap	—— - - - - -	Right of Way
.....	Sight Distance Triangle Line	Void — void — void — v	Existing Assumed Ground (Not Surveyed)	—— ——— ———	Existing Underground Vault or Lift Station	—— - - - - -	Existing Right of Way
- - - - -	Small Hidden Object	Void — void — void — v	Tentative Ground Line	—— ——— ———	Tangent Line	—— - - - - -	Existing Right of Way Railroad
- - - - -	Dimension Leader	—— ——— w ——	Existing Water or Steam Line	- - - - -	Hidden Object	- - - - -	Failure Line
- - - - -	Existing Ground	=====	Existing Under Drain	—— ——— ———	Existing Dirt Surface	- - - - -	Existing Conditions
- - - - -	Existing Topsoil (Cross Section View)	=====	Under Drain	—— ——— ———	Existing Conduit	- - - - -	Existing Ground (Details)
—— ——— ———	Large Hidden Object	=====	Wall	—— ——— ———	Topsoil Profile	—— - - - - -	Existing Sixteenth Section Line
—— ——— ———	Edge Drain	=====	Existing Slotted Drain	- - - - -	Existing Conductor	- - - - -	Existing Right of Way Not State Owned
—— D —— D ——	Geotextile Fabric Type D	—— + —— + ——	Existing Cemetary Boundary	- - - - -	Conductor	- - - - -	Phantom Object
—— ——— E ——	Existing Electrical	—— ——— ———	Centerline Pavement Marking	- - - - -	Fiber Optic	- - - - -	Centerline Main
—— ——— FO ——	Existing Fiber Optic Line	=====	Barrier with Centerline Pavement Marking	- - - - -	Existing Loop Detector	-	Existing Guardrail Cable
—— ——— FO ——	Existing TV Fiber Optic	=====	Barrier Pavement Marking	- - - - -	Subgrade, Subcut or Ditch Grade	— . — . — . — .	Existing Guardrail Metal
—— ——— G ——	Existing Gas Pipe	- - - - -	Stripe 4 IN Dotted Extension White	—— ——— ———	Existing Asphalt Surface	—— . ——— . ——— .	Existing Edge of Water
—— Geo —— Geo ——	Geogrid	- - - - -	Stripe 8 IN Dotted Extension White	—— ——— ———	Existing Asphalt (Cross Section View)	- - - - -	Excavation Limits
—— ——— OH ——	Existing Overhead Utility Line	- - - - -	Stripe 8 IN Lane Drop	—— ——— ———	Existing Reinforcement Rebar	——	Existing Government Lot Line
—— ——— P ——	Existing Power	—— v v v v ——	Wetland Mitigation	—— ——— ———	Existing Tie Point Line	Existing Adjacent Block Lines
—— ——— PL ——	Existing Fuel Pipeline	- - - - -	Existing Box Culvert Bridge	—— ——— ———	Existing State or International Line	Existing Adjacent Lot Lines
—— ——— PL ——	Existing Undefined Above Ground Pipe Line	- - - - -	Existing Concrete Surface	—— ——— ———	Existing Quarter Section Line	Existing Adjacent Property Line
—— ——— R —— R ——	Geotextile Fabric Type R	- - - - -	Existing Drainage Structure	—— ——— ———	Existing County	Existing Adjacent Subdivision Lines
—— ——— R —— R ——	Geotextile Fabric Type R1	- - - - -	Easement	—— ——— ———	Existing Section Line		
—— REMOVE —— REMOVE ——	Remove Line	- - - - -	Existing Concrete	—— ——— ———	Existing Township		
—— RR —— RR ——	Geotextile Fabric Type RR	- - - - -	Existing Easement	—— ——— ———	Existing Railroad Centerline		
—— S —— S ——	Geotextile Fabric Type S	—— ——— ———	Existing Gravel Surface	—— - - - - -	Centerline		

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
4-20-11	
REVISIONS	
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Line Styles

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

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Symbols

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

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Symbols

D-20-31

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

NORTH DAKOTA	
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Symbols

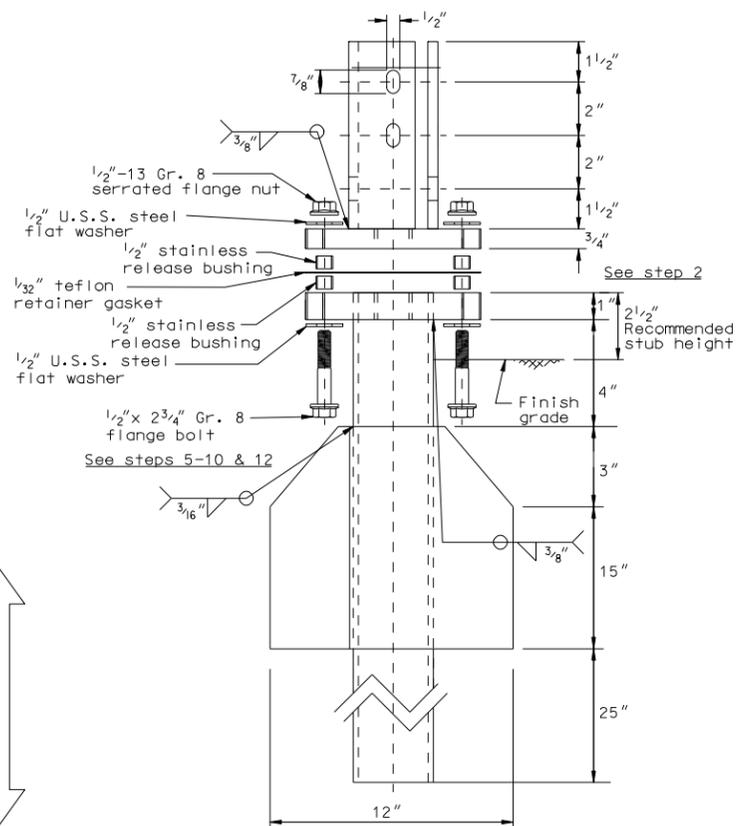
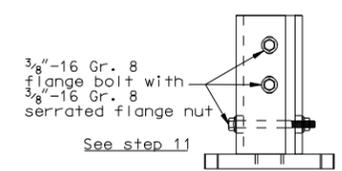
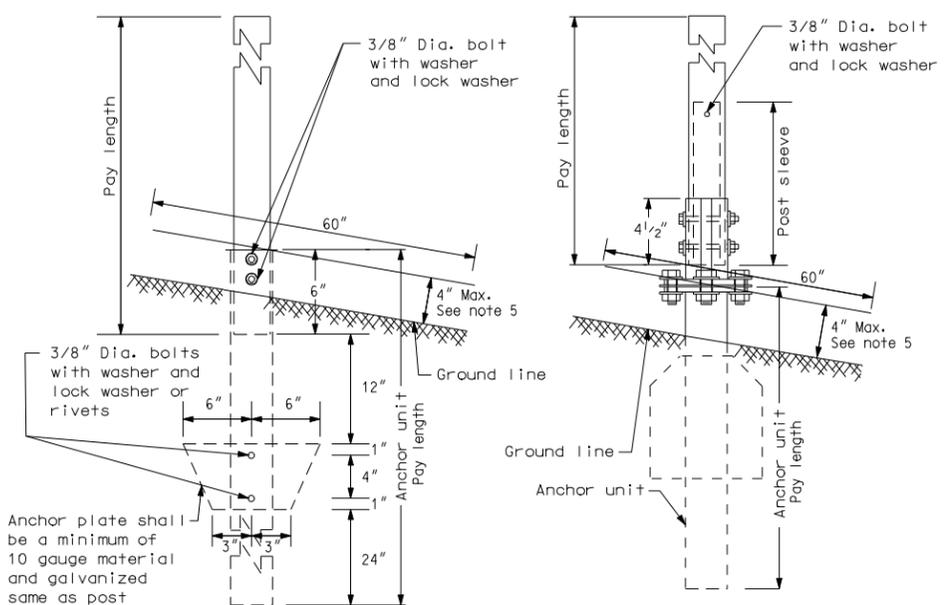
 Pad Mounted Feed Point  Pipe Mounted Feed Point with Pad  Pole Mounted Feed Point  Headwall  Double Headwall with Vegetation Barrier  Single Headwall with Vegetation Barrier  Pole Mounted Head  Sprinkler Head  Fire Hydrant  Inlet Type 1  Inlet Type 2  Double Inlet Type 2  Inlet Gate Type 2  Junction Box  High Mast Light Standard 10 Luminaire  High Mast Light Standard 3 Luminaire  High Mast Light Standard 4 Luminaire  High Mast Light Standard 5 Luminaire  High Mast Light Standard 6 Luminaire  High Mast Light Standard 7 Luminaire  High Mast Light Standard 8 Luminaire  High Mast Light Standard 9 Luminaire  Relocate Light Standard  Overhead Sign Structure Load Center  Light Standard 100 Watt High Pressure Sodium Vapor Luminaire	 Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire  Light Standard 150 Watt High Pressure Sodium Vapor Luminaire  Light Standard 175 Watt High Pressure Sodium Vapor Luminaire  Light Standard 200 Watt High Pressure Sodium Vapor Luminaire  Light Standard 250 Watt High Pressure Sodium Vapor Luminaire  Light Standard 310 Watt High Pressure Sodium Vapor Luminaire  Light Standard 35 Watt High Pressure Sodium Vapor Luminaire  Light Standard 400 Watt High Pressure Sodium Vapor Luminaire  Light Standard 50 Watt High Pressure Sodium Vapor Luminaire  Light Standard 70 Watt High Pressure Sodium Vapor Luminaire  Light Standard 700 Watt High Pressure Sodium Vapor Luminaire  Manhole  Manhole 48 Inch  Sanitary Force Main Manhole  Sanitary Sewer Manhole  Storm Drain Manhole  Storm Drain Manhole with Inlet  Reset Mile Post  Mile Post Type A  Mile Post Type B  Mile Post Type C  Right of Way Marker  Tubular Marker  Concrete Monument to Be Set  RW Property Monument to Be Set	 Object Marker Type I  Object Marker Type II  Object Marker Type III  Caution Mode Arrow Panel  Back to Back Vertical Panel Sign  Double Direction Arrow Panel  Left Directional Arrow Panel  Right Directional Arrow Panel  Sequencing Arrow Panel  Truck Mounted Arrow Panel  Power Pole  Wood Pole  Pedestrian Push Button Post  Property Corner  Pull Box  Intelligent Transportation Pull Box  Sanitary Pump  Storm Drain Pump  Reinforced Pavement  Reinforced Concrete End Section 15 Inch  Reinforced Concrete End Section 18 Inch  Reinforced Concrete End Section 24 Inch  Reinforced Concrete End Section 30 Inch  Reinforced Concrete End Section 36 Inch  Reinforced Concrete End Section 42 Inch	 Reinforced Concrete End Section 48 Inch  Reinforced Concrete End Section 54 Inch  Reset Right of Way Marker  Reset USGS Marker  Right of Way Markers  Riser 30 Inch  Continuous Split Barrel Sample  Flight Auger Sample  Split Barrel Sample  Thinwall Tube Sample  Highway Sign  SNOW GATE 18 FT  SNOW GATE 28 FT  SNOW GATE 40 FT  Standard Penetration Test  Transformer  Inclinometer Tube  Underdrain Cleanout  Excavation Unit  Water Valve
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4-20-11	
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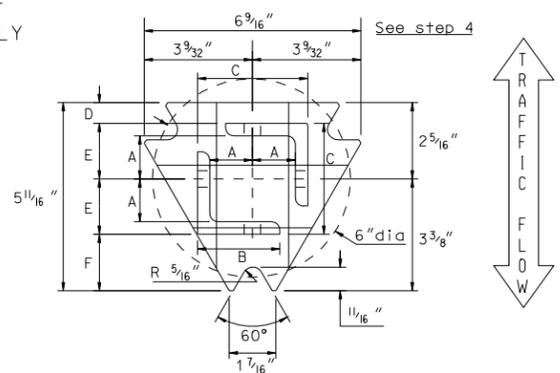
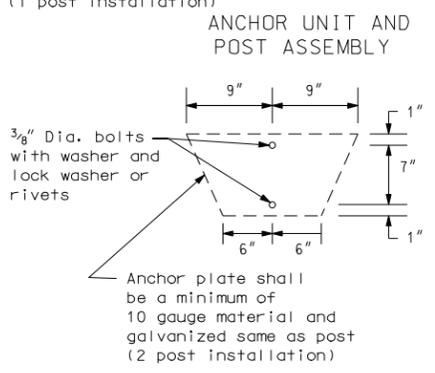
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BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

PERFORATED TUBE



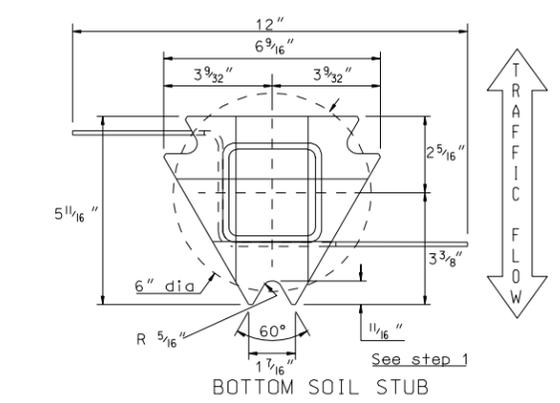
- Notes
1. Slip base bolts shall be torqued as specified by the manufacturer.
 2. The 2 3/16 inch size 10 gauge is shown as 2.19 inch size on the plans. The 2 1/2 inch size 10 gauge is shown as 2.51 inch size on the plans.
 3. Anchor for 2 inch, 2 1/4 inch, and 2 1/2 inch posts.
 4. Anchor material shall be 7 gauge H.R.P.O. Commercial quality ASTM A569 and 3 inch x 3 inch x 7 gauge ASTM A500 Grade B. Anchor shall have a yield strength of 43.9 KSI and tensile strength of 59.3 KSI. Anchor shall be hot dipped galvanized per ASTM A123/A153. All tolerances on anchor unit and slip base bottom assembly are ± 0.005 unless otherwise noted.
 5. 4 inch vertical clearance of anchor or breakaway base. The 4 inch x 60 inch measurement shall be made above and below post location and also back and ahead of post.
 6. When used in concrete sidewalk, anchor shall be the same except without the wings.
 7. Four post signs shall have over 8 feet between the first and fourth posts.



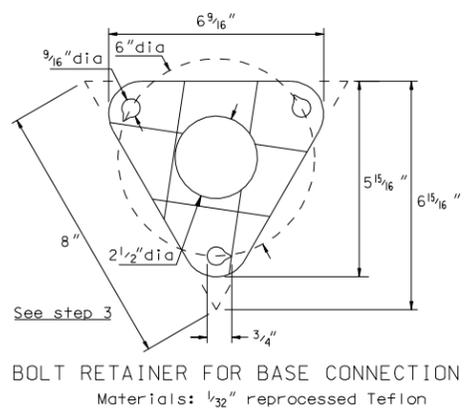
TOP POST RECEIVER
 Materials: Plate - ASTM A572 grade 50
 Angle receiver - 2 1/2 inch x 2 1/2 inch x 3/8 inch ASTM A36 structural angle

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

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



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



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

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

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

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

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

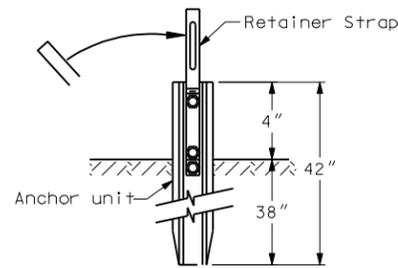
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-21-02	
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DATE	CHANGE
12-01-04	PE stamp added

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BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

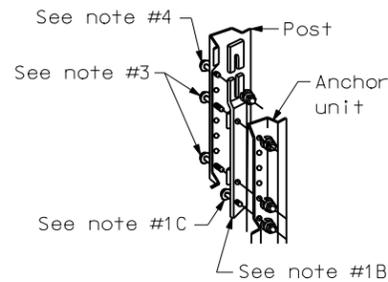
FLANGED CHANNEL



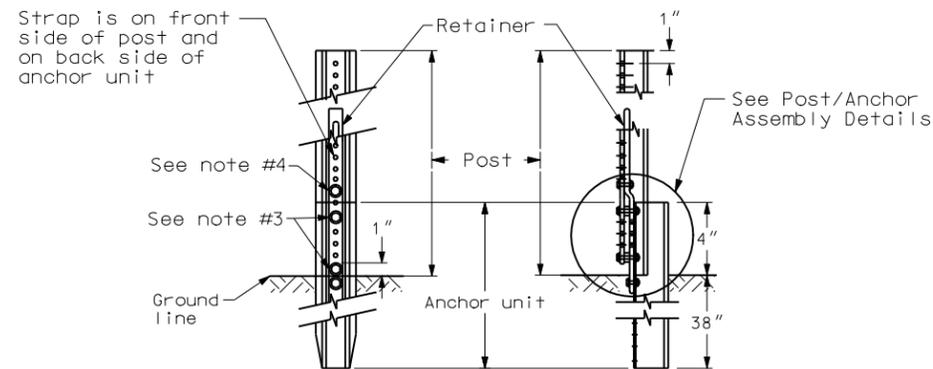
Anchor Unit & Strap Assembly Detail

STEPS OF INSTALLATION

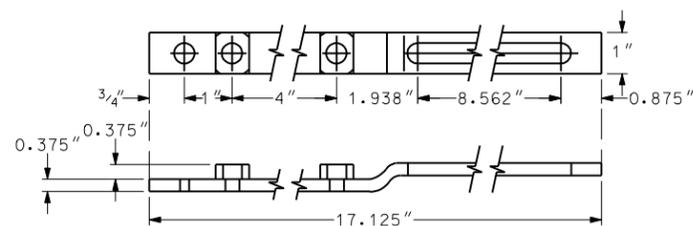
1. A) Drive anchor unit to within 12" of ground level.
B) Proper assembly established by lining up the top 3/4" slot of retainer spacer strap with top hole of anchor unit.
C) Assemble strap to back of anchor unit using 3/8"-16 UNC x 2.0" long bolt, lock washer and nut.
D) Rotate strap 90° to left.
2.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



Post/Anchor Assembly Details



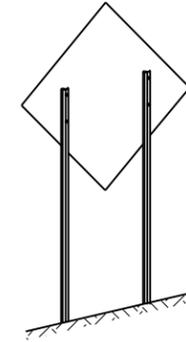
Front View Side View Sign Post Assembly Detail



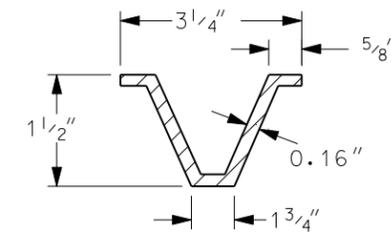
Retainer/Spacer Strap Detail

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

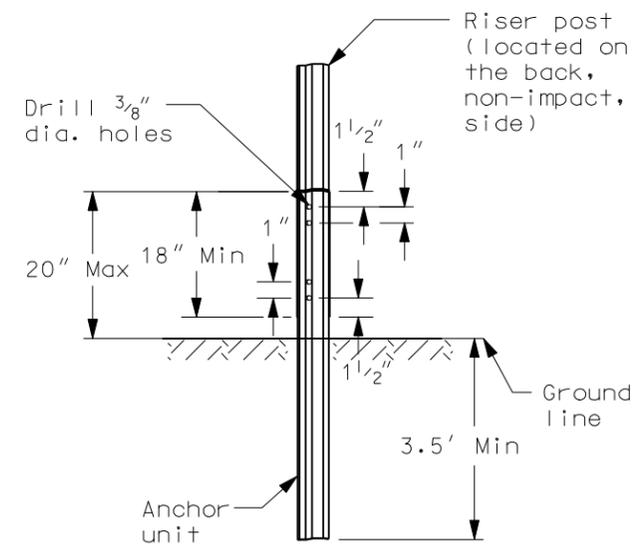
3 LB/FT U POSTS



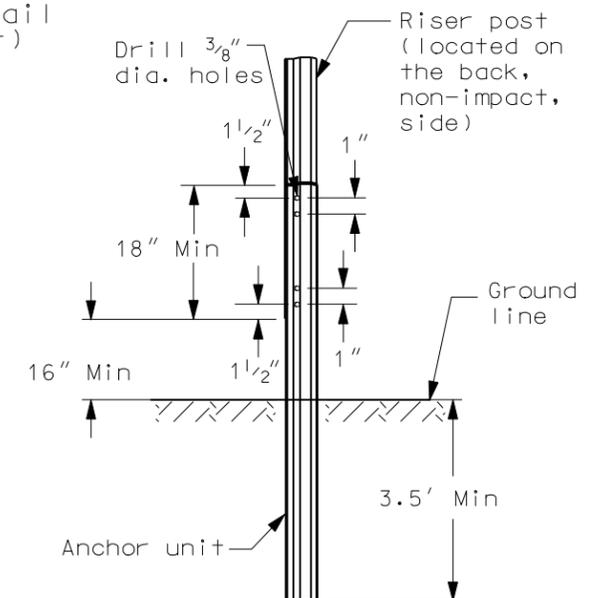
Typical Installation



U-Post Detail (3 lb/ft)



U-Channel Splice Option 1



U-Channel Splice Option 2

Notes

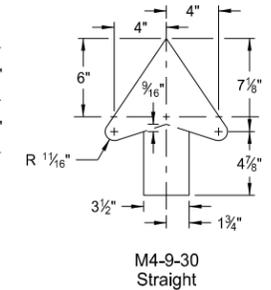
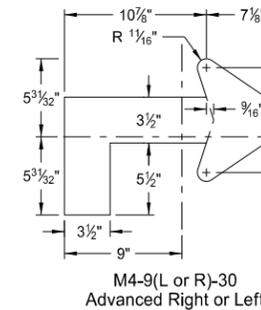
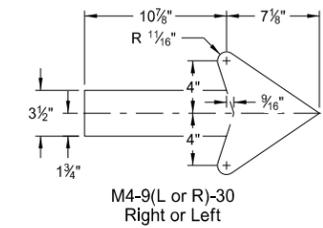
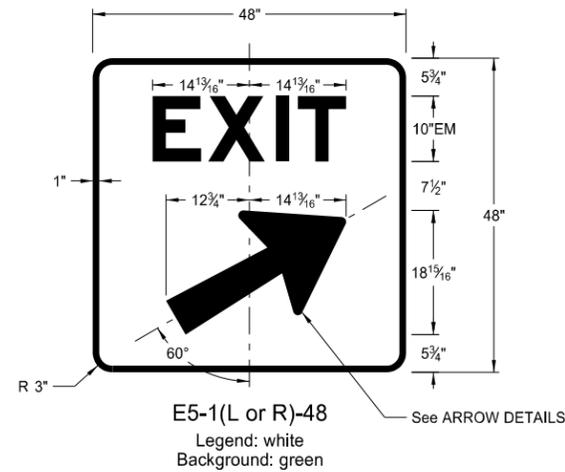
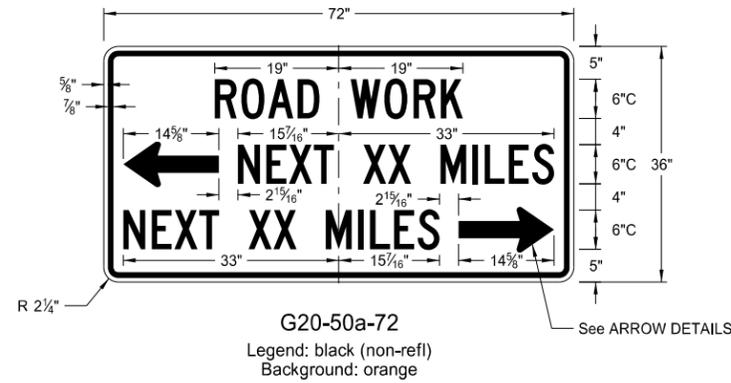
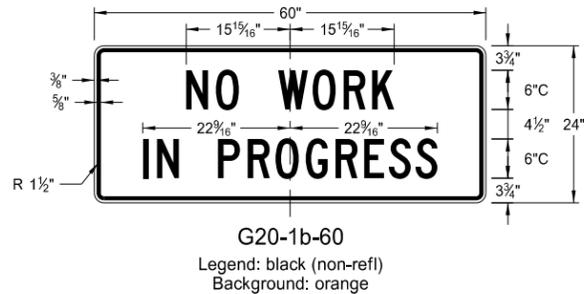
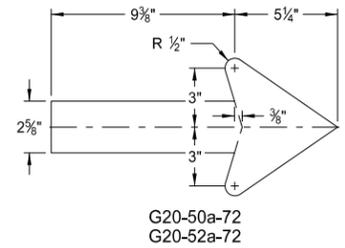
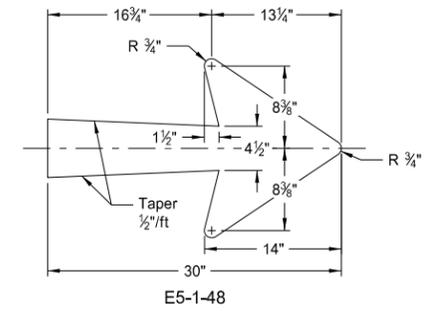
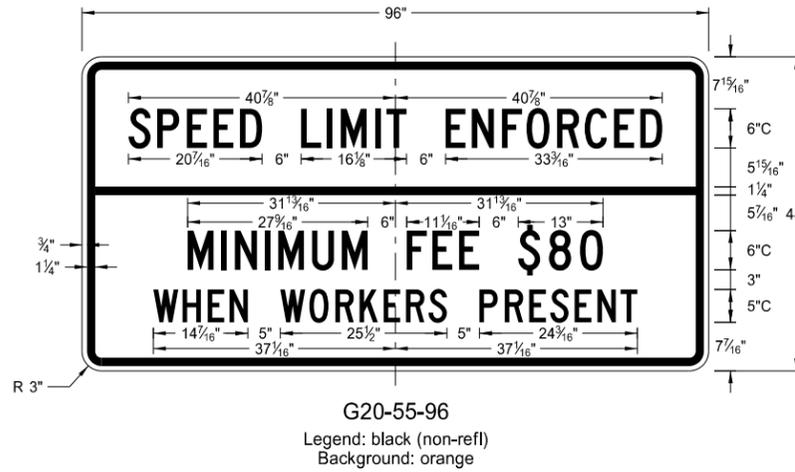
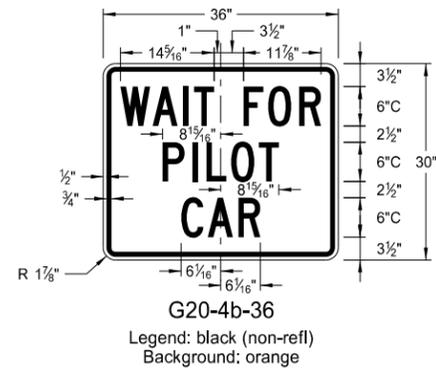
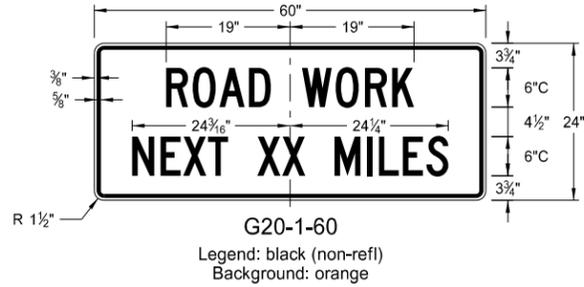
1. Use 3 lb/ft riser anchor units and risers
2. Driven riser posts shall be at least 7' long and embedded at least 3.5'.
3. A splice shall overlap a minimum of 18".
4. Use 4 bolts 5/16" diameter with washers and nuts. Two at top and two at bottom of splice.
5. Anchor unit for guy wires shall be no more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

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

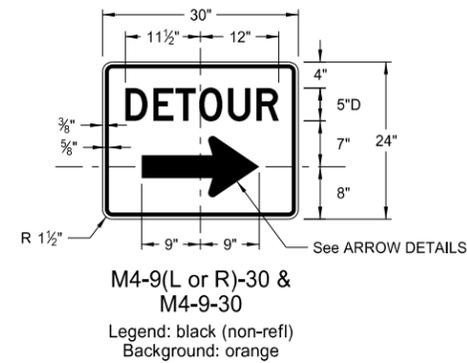
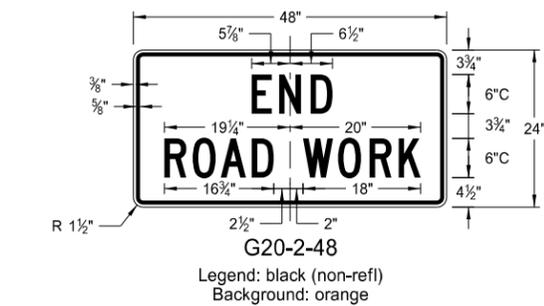
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CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS

D-704-9



ARROW DETAILS



NOTES:

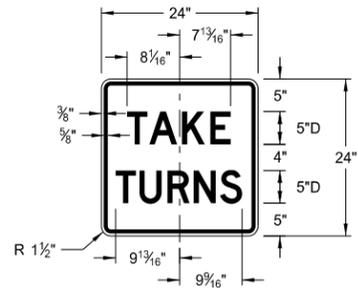
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

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

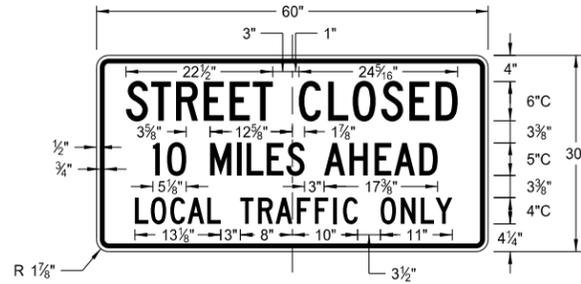
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 8/13/13 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS

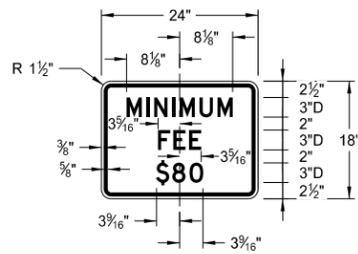
D-704-10



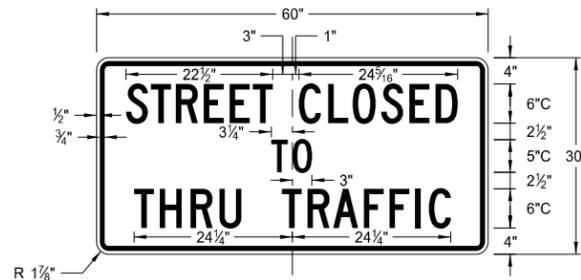
R1-50-24
Legend: black (non-refl)
Background: white



R11-3c-60
Legend: black (non-refl)
Background: white



R2-1a-24
Legend: black (non-refl)
Background: white



R11-4a-60
Legend: black (non-refl)
Background: white

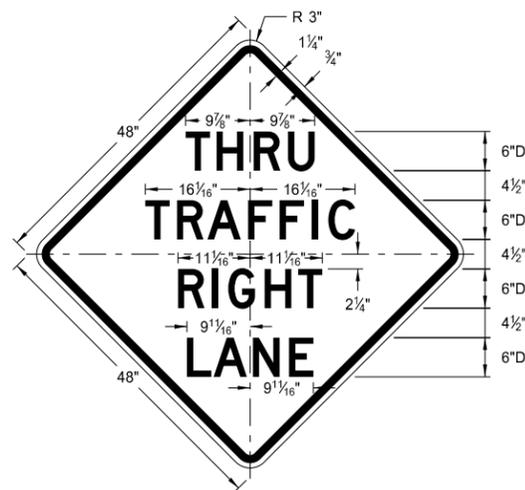


R11-2a-48
Legend: black (non-refl)
Background: white

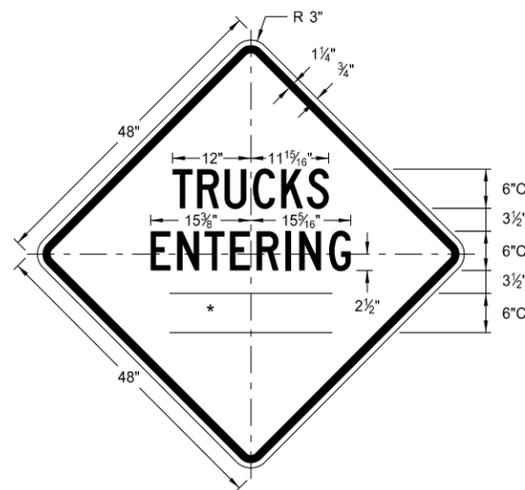
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE

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

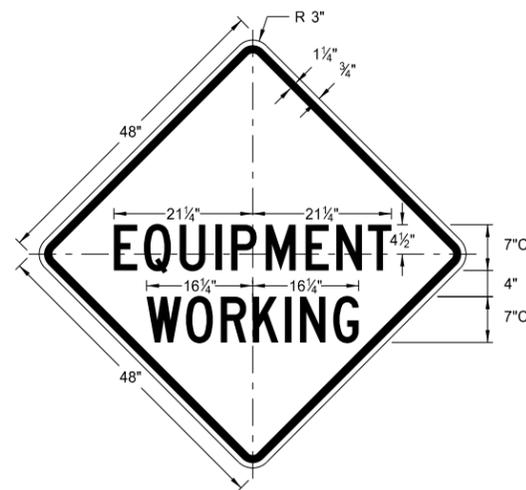
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



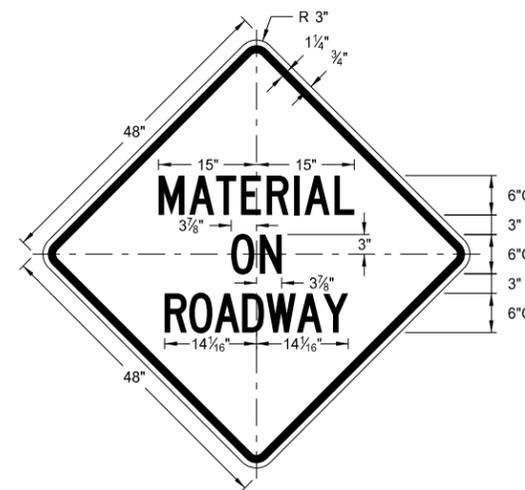
W5-8-48
Legend: black (non-refl)
Background: orange



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



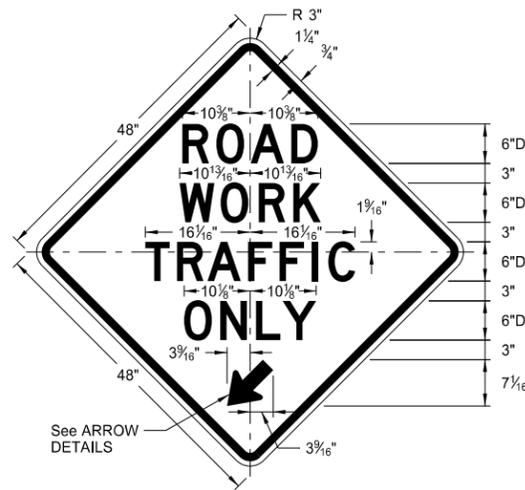
W20-51-48
Legend: black (non-refl)
Background: orange



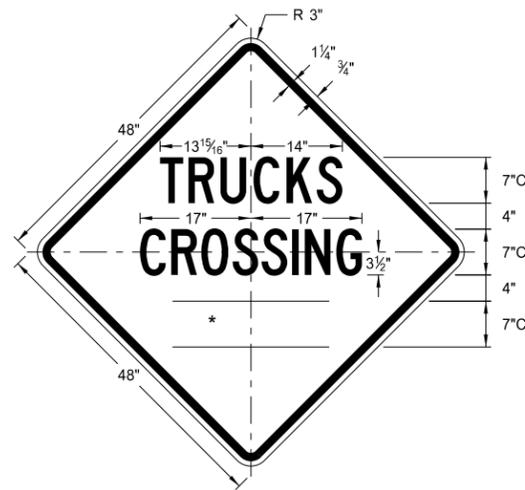
W21-51-48
Legend: black (non-refl)
Background: orange

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

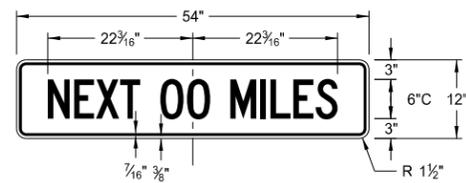
* DISTANCE MESSAGES



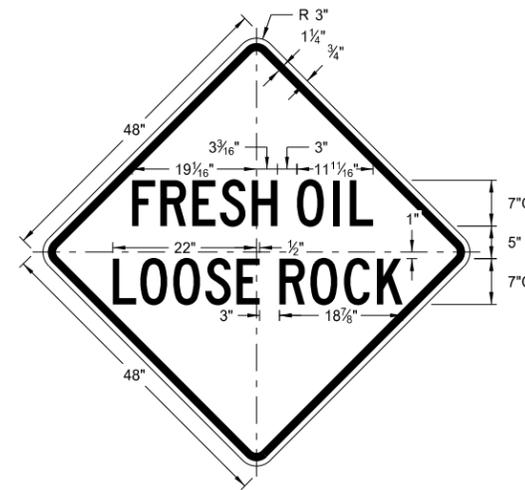
W5-9-48
Legend: black (non-refl)
Background: orange



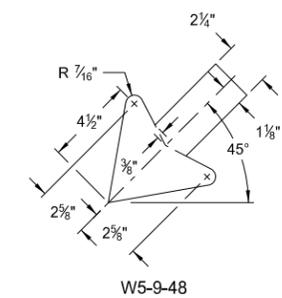
W8-55-48
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Background: orange



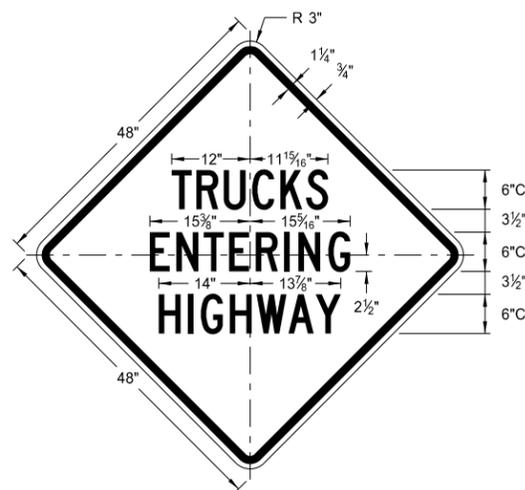
W20-52-54
Legend: black (non-refl)
Background: orange



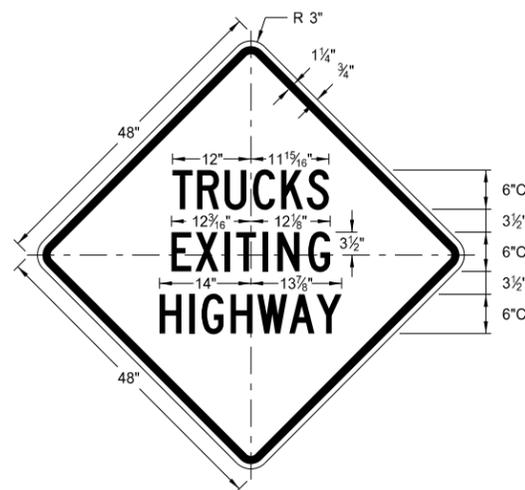
W22-8-48
Legend: black (non-refl)
Background: orange



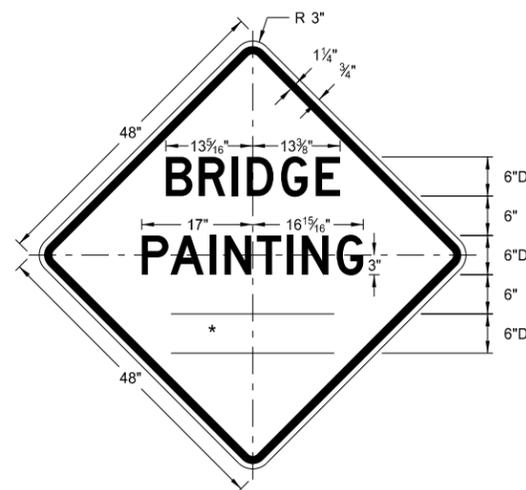
W5-9-48
ARROW DETAILS



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



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

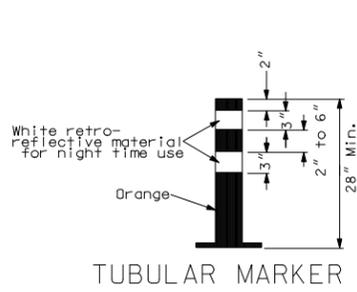


W21-50-48
Legend: black (non-refl)
Background: orange

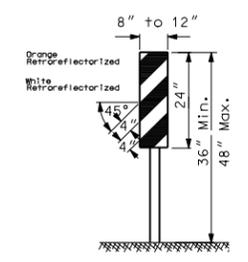
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE

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BARRICADE DETAILS AND CHANNELIZING DEVICES

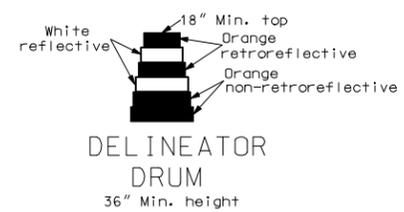


TUBULAR MARKER



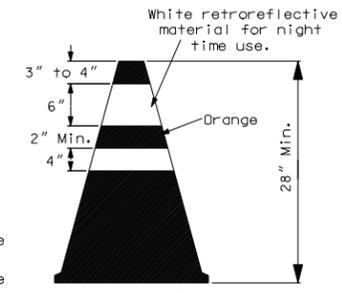
VERTICAL PANEL

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

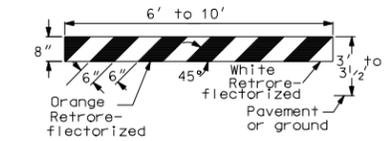


DELINEATOR DRUM

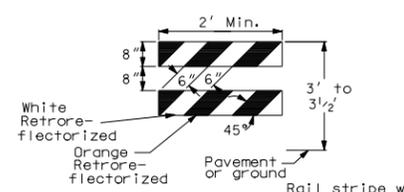
The markings on drums shall be orange and white stripes 4 to 6 inches wide. There shall be at least two orange and two white stripes. Where drums have ribs or indentations, there shall be no retroreflective sheeting in this area. This space shall be no more than 2 inches wide. The drum surface shall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



CONE

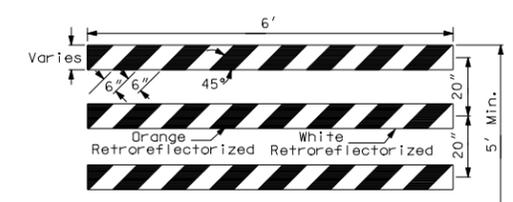


TYPE I BARRICADE



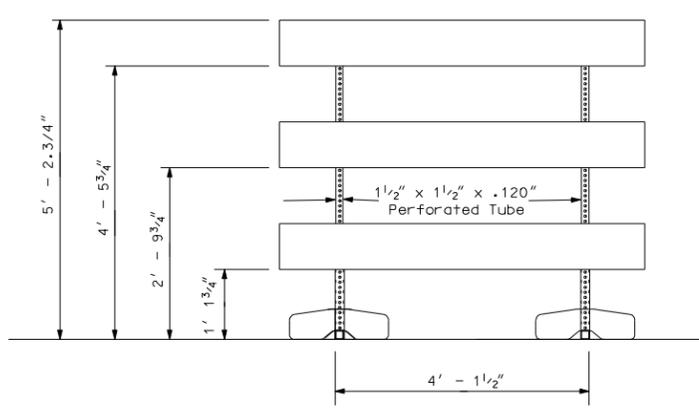
TYPE II BARRICADE

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

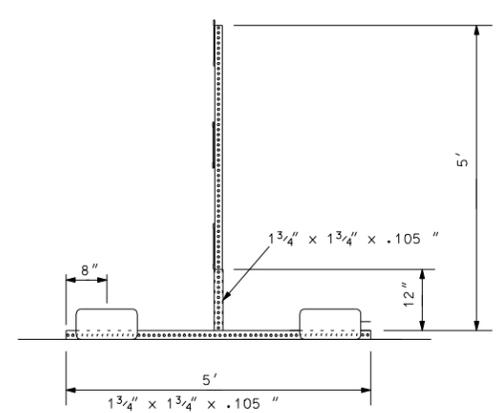


TYPE III BARRICADE

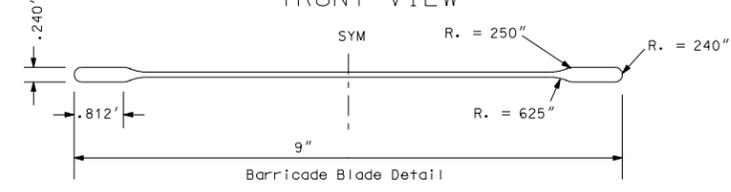
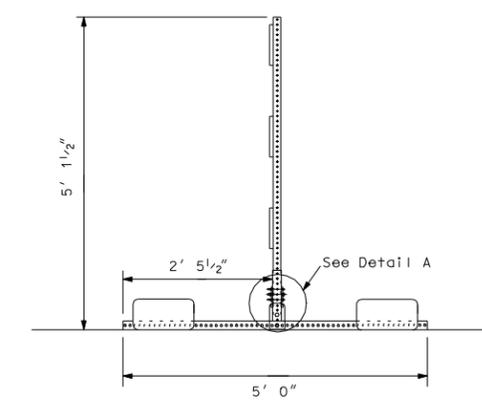
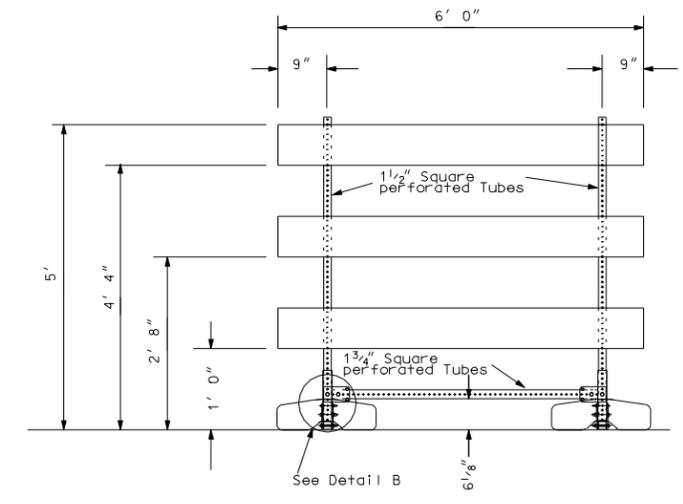
BARRICADES:
Number of retroreflective rail faces:
Type I - 2 (One each direction)
Type II - 4 (Two each direction)
Type III - 6 (Three in each direction)



FRONT VIEW



END VIEW



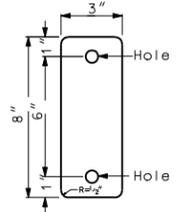
Ballast = 45lb sandbag at the end of each leg.
Barricade blade fastened to vertical supports with 2" corner bolts.
Vertical portion of leg is welded to horizontal portion on all four sides.
Masts slide inside vertical portion of legs. No bolts or fastenings devices used.

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



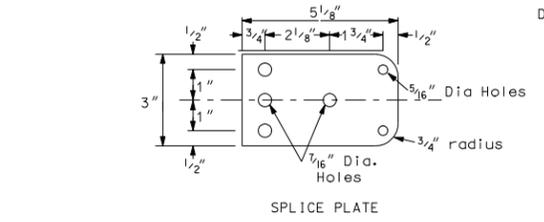
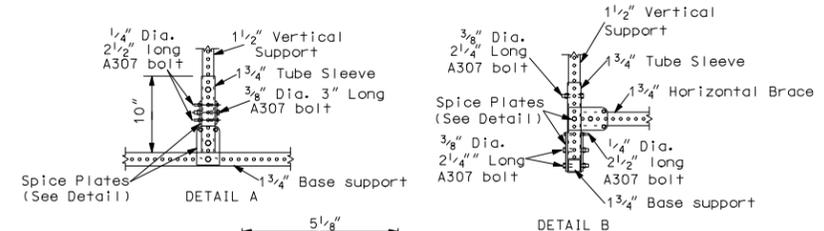
ACRYLIC PLASTIC REFLECTOR

Delineator reflector shall meet the requirements of section 894



DELINEATOR REFLECTOR

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



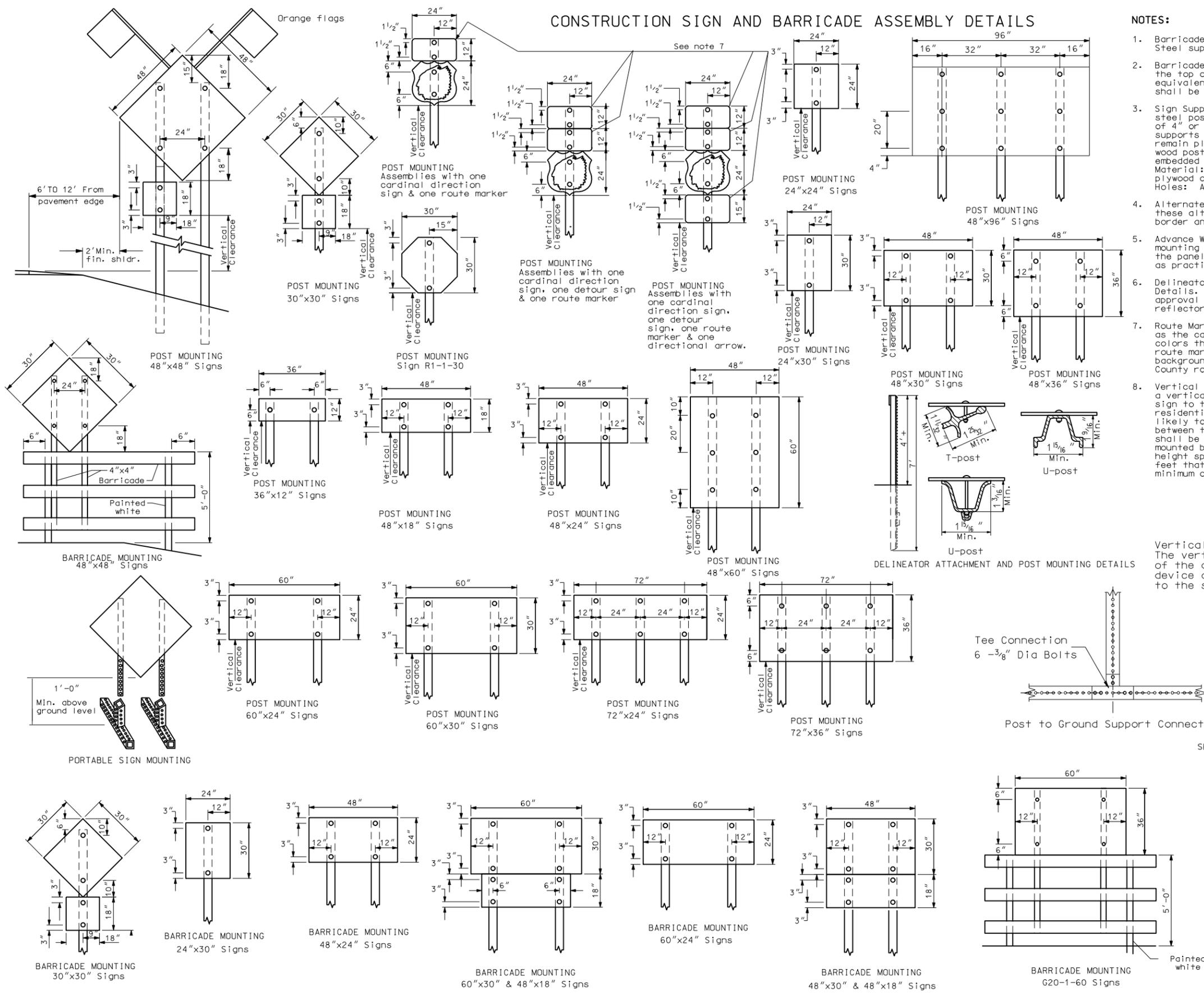
SPLICE PLATE

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

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

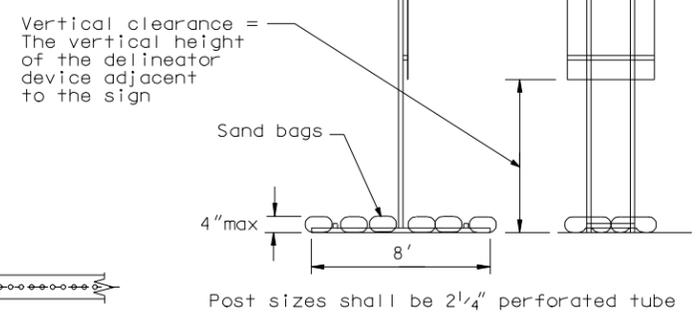
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CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS



NOTES:

1. Barricade and Sign Supports: Wooden supports shall be painted white. Steel supports shall be galvanized or painted.
2. Barricade Mounting Signs: The bottom of the sign shall be flush with the top of the top rail. Wood sign posts shall be 4"x4" min. SFS or equivalent steel posts. All barricade and barricade mounted signs shall be assembled with 3/8" bolts.
3. Sign Supports: Sign supports shall be 4"x4" min. SFS or equivalent steel post. The anchor for steel supports shall have a stub height of 4" or less. Wood posts more than 4"x4" shall be breakaway. Sign supports shall be imbedded to a sufficient depth so that signs will remain plumb throughout duration of project. It is suggested that wood posts have a min. depth of embedment of 5' and steel posts be imbedded a min. 3'-6". Material: All signs shall be 0.100" aluminum, 12 gauge steel, 1/2" plywood or other approved material. Holes: All holes to be punched round for 3/8" bolts.
4. Alternate Messages: The signs that have alternate messages may have these alternate messages placed on a reflectorized plate without a border and this plate installed and removed as required.
5. Advance Warning Flashing or Sequencing Arrow Panels: The minimum mounting height shall be 7 feet above the roadway to the bottom of the panel, except on vehicle mounted panels which shall be as high as practicable.
6. Delineator Posts: Typical fence post sections are shown in Attachment Details. Other types of metal fence posts may be substituted upon approval of the engineer. These substituted posts shall have reflectors attached similar to the ones shown.
7. Route Marker Auxiliary Signs: The route marker auxiliary signs such as the cardinal direction and directional arrows shall have background colors the same as the route marker they are used with (Interstate route markers, blue background, US and State route markers, white background, Interstate Business loop and spur, green background, and County route markers, blue background).
8. Vertical Clearance: Post mounted signs placed in rural areas shall have a vertical clearance of at least 5 feet measured from the bottom of the sign to the near edge of the driving lane. In business, commercial and residential districts where parking and/or pedestrian movement is likely to occur or where other obstructions to view, the distance between the bottom of the sign to the near edge of the driving lane shall be at least 7 feet. The height to the bottom of secondary signs mounted below another sign may be 1 foot less than the appropriate height specified. Large signs having an area exceeding 50 square feet that are installed on multiple breakaway posts shall be mounted a minimum of 7 feet above the ground.

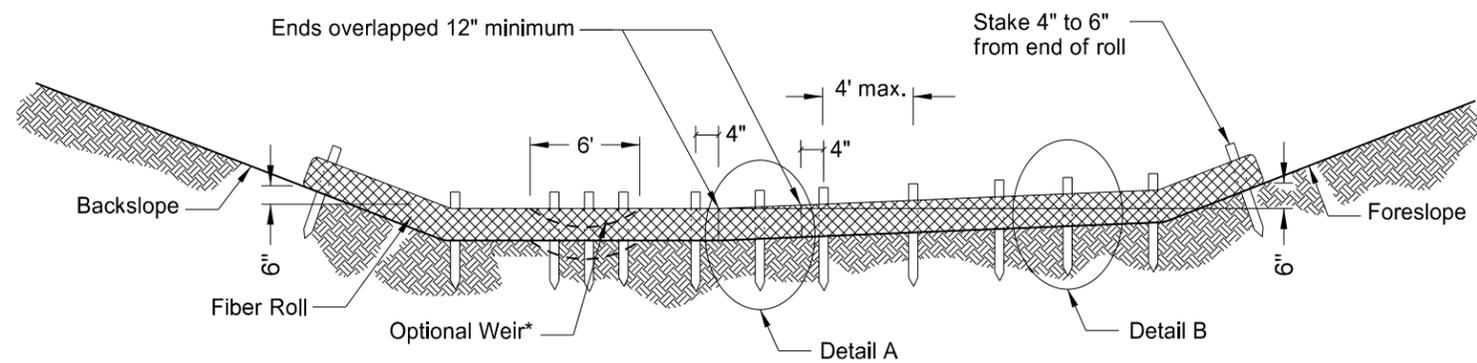


SKID MOUNTED SIGNS

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
07-04-96	Sign height
08-15-96	Note 8
07-10-97	Note revision
01-31-98	Note & portable sign
10-01-99	Skid mounted sign
02-07-03	Vertical clearance note
11-30-04	Third post added to some signs
12-01-04	PE stamp added

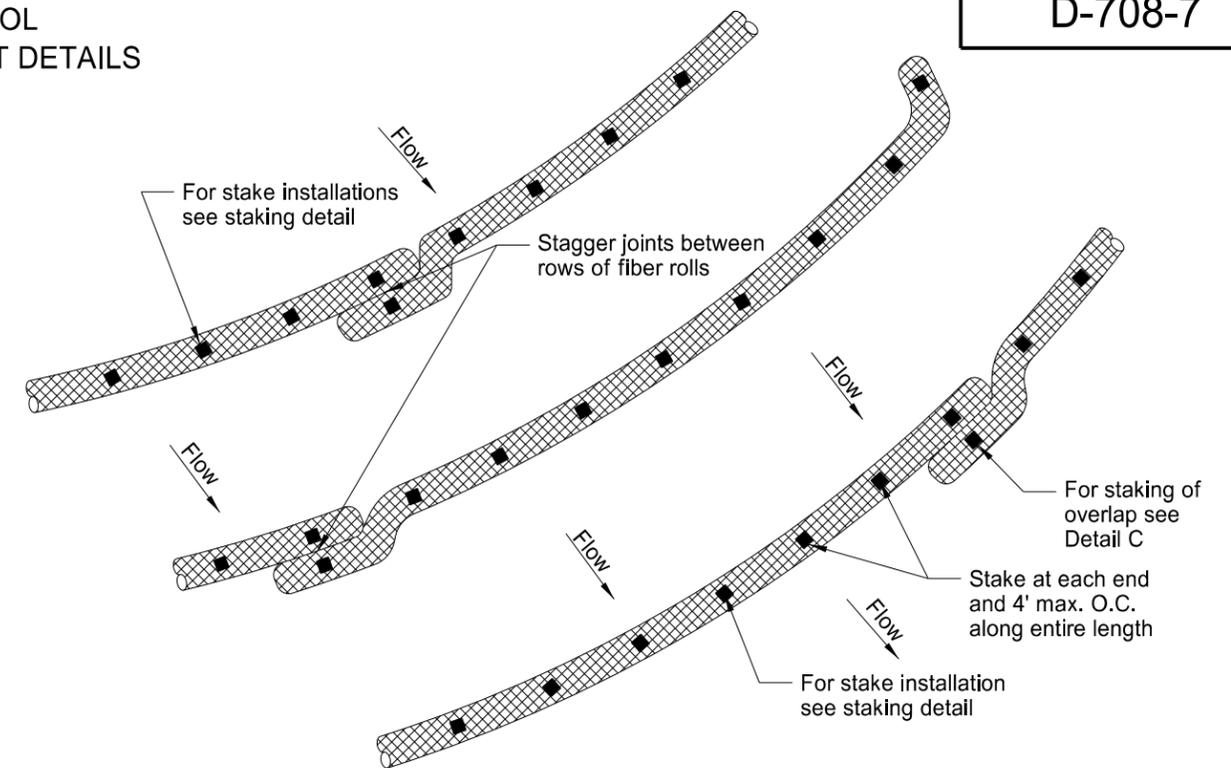
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EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

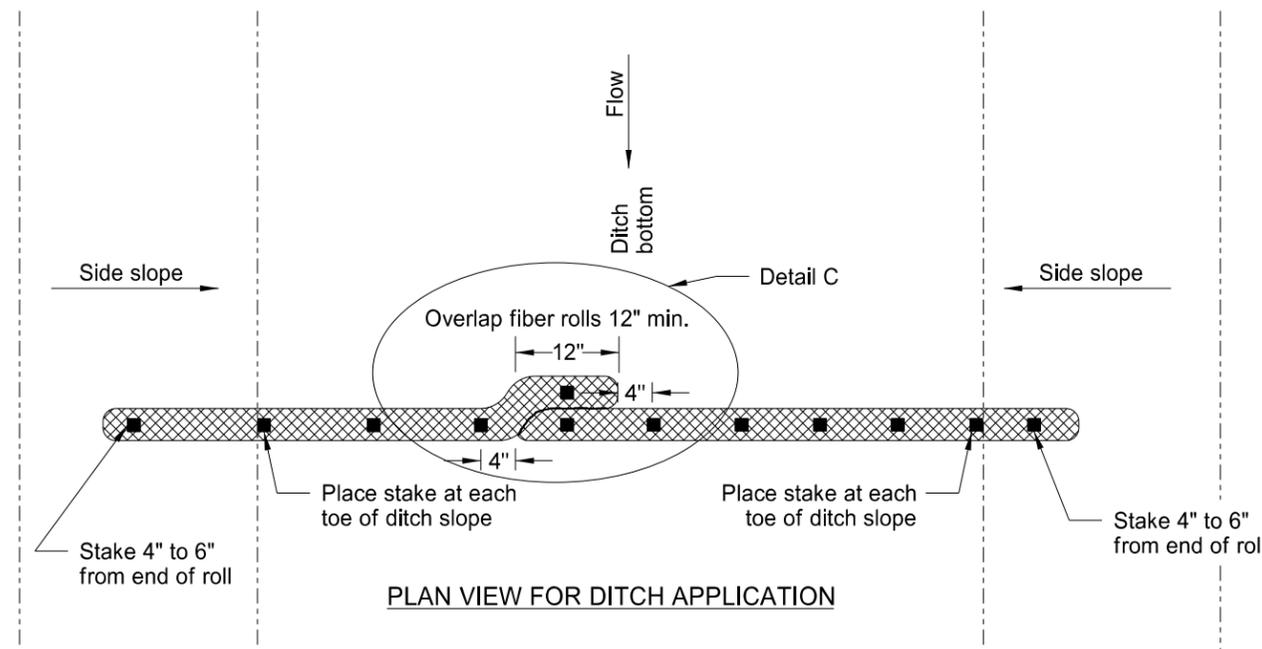


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

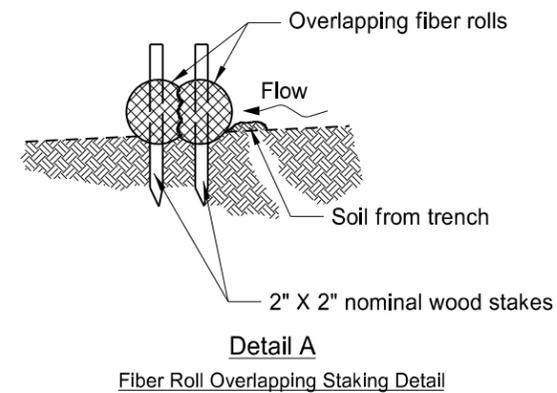
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



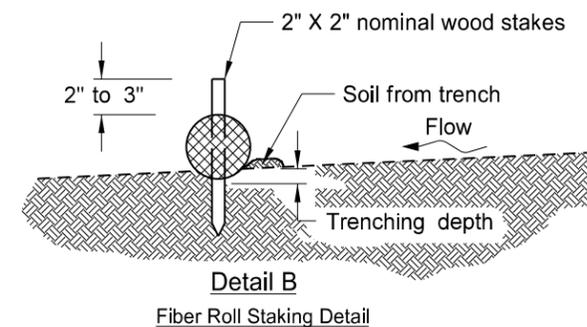
PLAN VIEW FOR SLOPE APPLICATION



PLAN VIEW FOR DITCH APPLICATION



Detail A
Fiber Roll Overlapping Staking Detail



Detail B
Fiber Roll Staking Detail

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

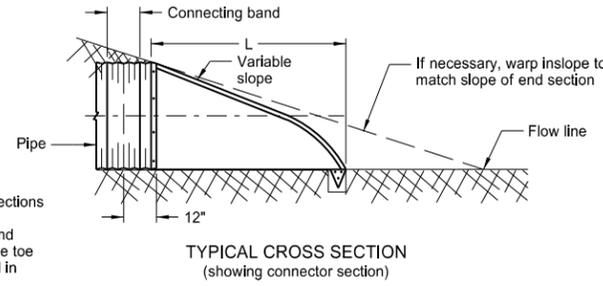
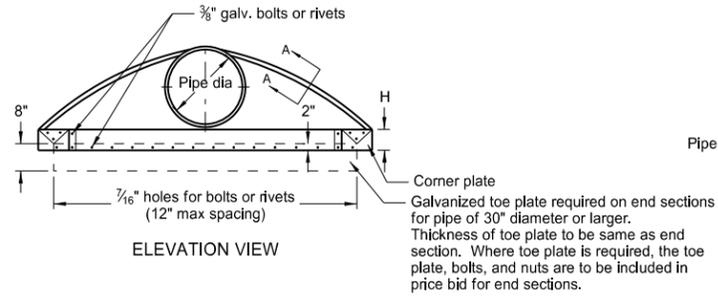
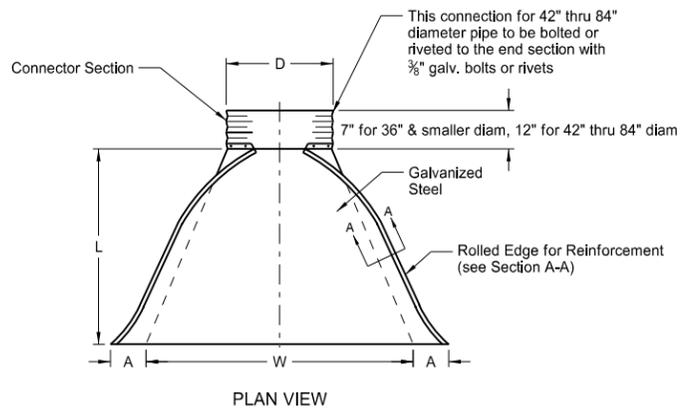
NOTE: Runoff must not be allowed to run under or around roll.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-18-10	
REVISIONS	
DATE	CHANGE
06-10-13	Added plan view for ditch and slope application, Added table with values for stake and trench dimensions.

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ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

D-714-4



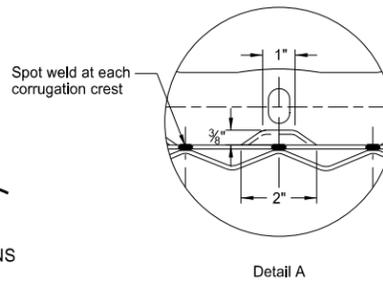
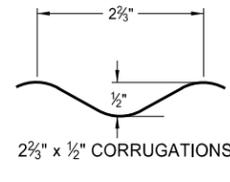
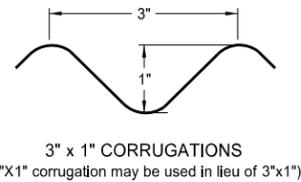
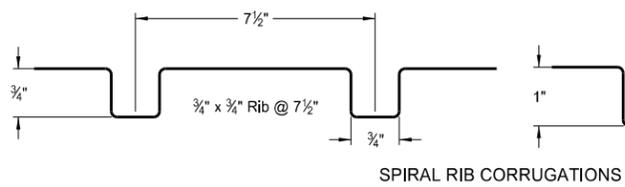
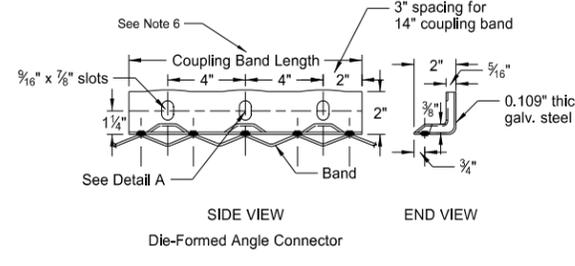
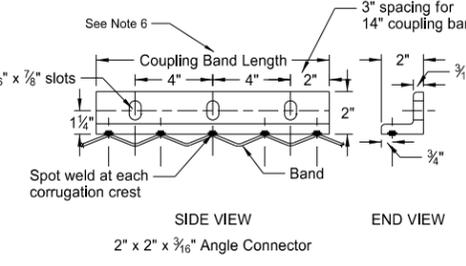
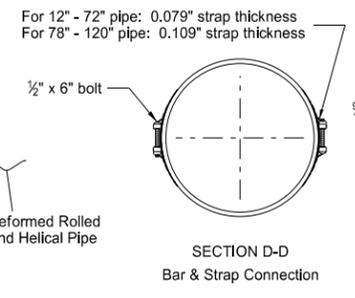
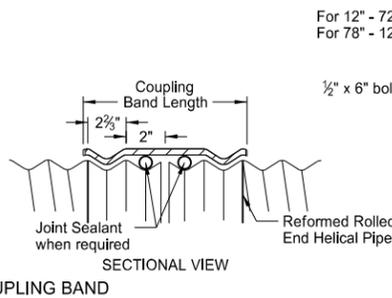
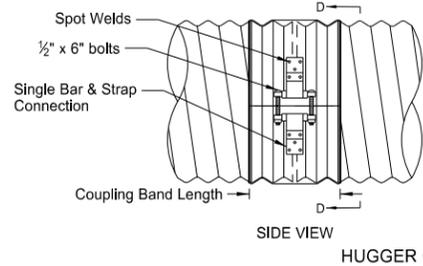
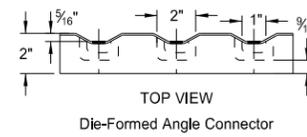
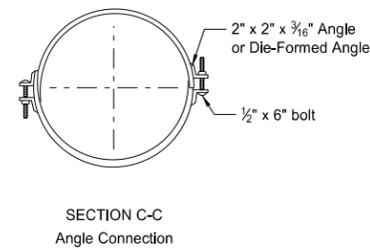
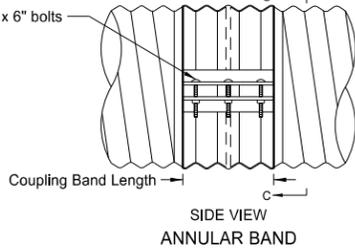
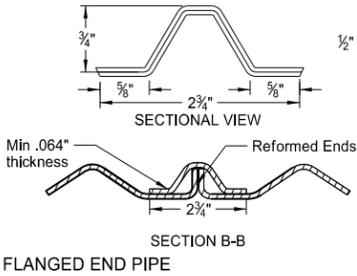
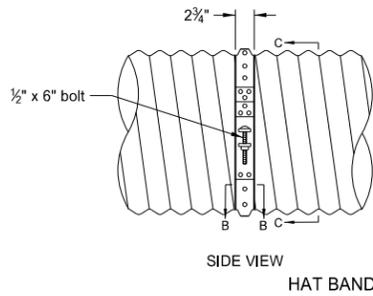
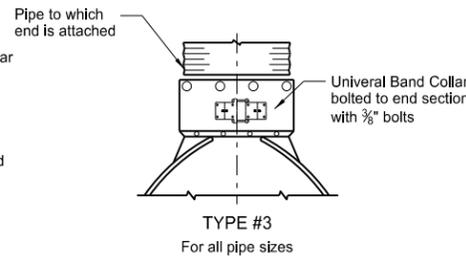
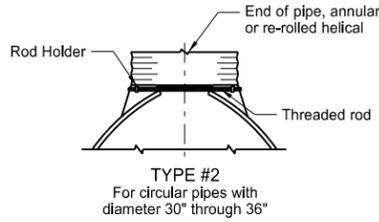
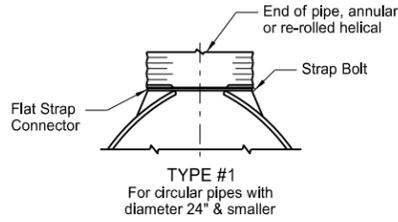
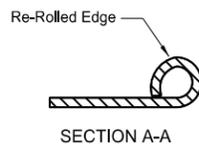
PIPE DIA. IN	GALV. THICK.	END SECTION DIMENSIONS					APPROX. SLOPE	BODY PIECE
		A IN	B IN	H IN	L IN	W IN		
15	0.064	7	8	6	26	30	2 1/2:1	1
18	0.064	8	10	6	31	36	2 1/2:1	1
24	0.064	10	13	6	41	48	2 1/2:1	1
30	0.079	12	16	8	51	60	2 1/2:1	1 or 2
36	0.079	14	19	9	60	72	2 1/2:1	2
42	0.109	16	22	11	69	84	2 1/2:1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

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

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

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

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



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

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