

Job 3

FEDERAL AID BRO-0013(027)

KISSE BRIDGE

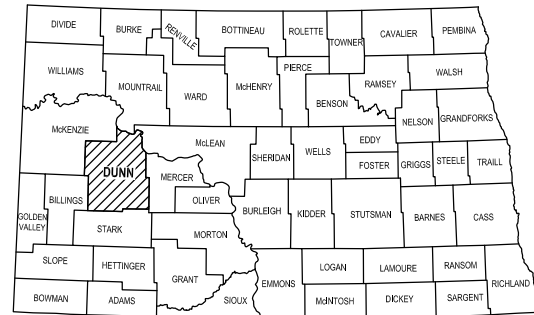
GRADING, STRUCTURE AND AGGREGATE SURFACING

STRUCTURE NO. 13-136.25.0

7 MILES NORTH OF HALLIDAY

DUNN COUNTY, NORTH DAKOTA

PCN 20680



STATE OF NORTH DAKOTA

DESIGN DATA					
TRAFFIC	PASS.	TRUCKS	TOTAL	EST 30th MAX HR.	ESAL'S
CURRENT 2015	-	-	<100	-	-
FORECAST 2035	-	-	<100	-	-
MINIMUM SIGHT DISTANCE (STOPPING)			DESIGN SPEED		
360 FEET			45 MPH		

LENGTH OF PROJECT

MILES (GROSS)	0.246	MILES (NET)	0.246
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GOVERNING SPECIFICATIONS:

2014 Standard Specifications adopted by the North Dakota Department of Transportation and the Supplemental Specifications effective on the date the project is advertised.

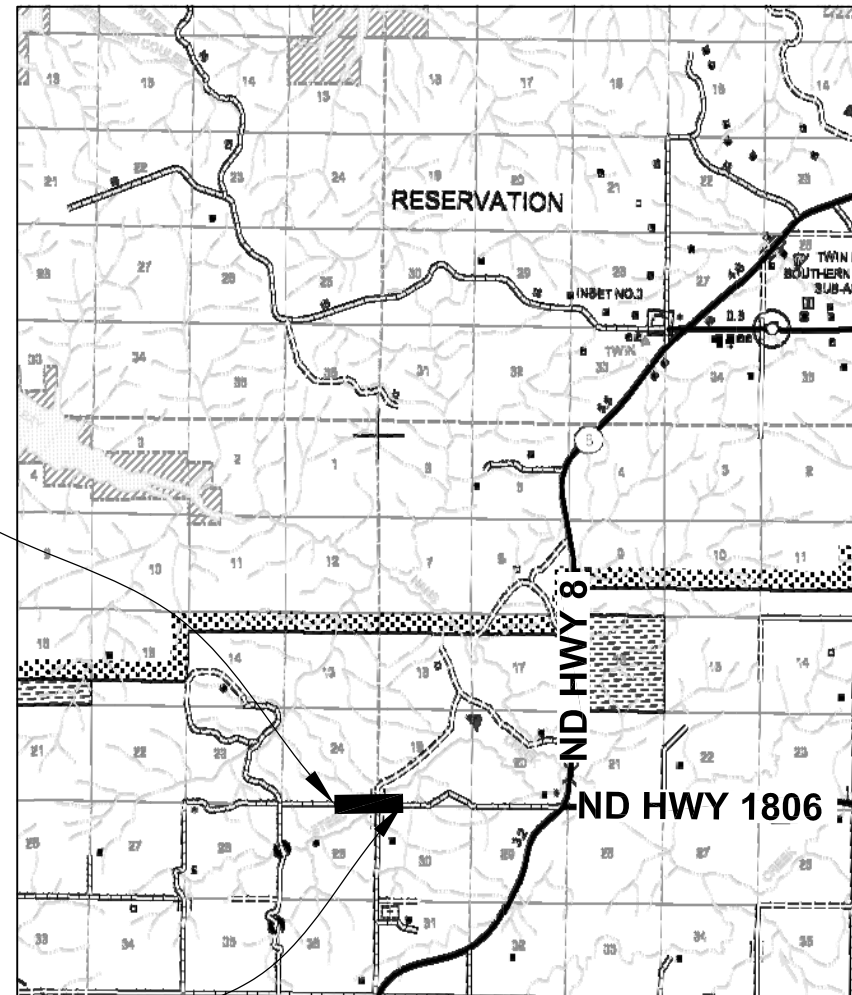


BEGIN PROJECT: BRO-0013(027)

Sta. 43+00.00 At 11.66' North and 966.33' West of the Northeast Corner of Section 25, Township 145 North, Range 92 West, 5th P.M., Dunn County, North Dakota.

END PROJECT: BRO-0013(027)

Sta. 56+00.00 At 52.04' North and 322.81' East of the Northwest Corner of Section 25, Township 145 North, Range 92 West, 5th P.M., Dunn County, North Dakota.



R. 92 W. | R. 91 W.

T. 145 N. | T. 146 N.

I hereby certify that the attached plans were prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the state of ND.

Jeremy Wood \s\ September 3, 2015

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BRO-0013(027)
DUNN COUNTY, ND
COVER SHEET

PROJECT NO. 1301110	DATE: 8/19/15	REVISED: N/A	PAGE NO. 1
------------------------	------------------	-----------------	---------------

TABLE OF CONTENTS

1	COVER SHEET
2	TABLE OF CONTENTS & LIST OF STANDARD DRAWINGS
3	PLAN NOTES
4	ENVIRONMENTAL COMMITMENTS
5	SUMMARY OF QUANTITIES
6	TYPICAL SECTIONS
7	PLAN & PROFILE SHEET
8	WETLANDS SHEET
9-11	TRAFFIC CONTROL
12-13	BOX CULVERT DETAILS
14-15	CROSS SECTIONS
16-28	NDDOT STANDARD DRAWINGS

LIST OF NDDOT STANDARD DRAWINGS

D-101-1,2,3	NDDOT Abbreviations
D-203-8	Section Line & Private Drive Approaches
D-255-2	Erosion Control Blanket Installation Detail
D-256-1	Erosion and Siltation Controls
D-261-1	Fiber Roll Placement Details
D-704-7,8	Breakaway Systems for Construction Zone Sign Perforated Tube
D-704-10	Construction Sign Details
D-704-13	Barricade Details and Channelizing Devices
D-704-14	Construction Sign and Barricade Assembly Details
D-704-19	Road Closure and Lane Closure on a Two Way Road Layouts
D-714-4	Round Corrugated Steel Pipe Culverts and End Sections
D-714-22	Concrete Pipe or Precast Concrete Box Culvert Ties
D-754-23	Perforated Tube Assembly Details
D-754-26	Sign Punching, Stringer & Supp Location Reg, Warn, & Guide Signs

LIST OF SPECIAL PROVISIONS

- SP-0003(14) Temporary Erosion and Sediment Best Management
- SP-0004(14) Federal Migratory Bird Practices Treaty Act
- SP-0181(14) Concrete Erosion Control Blanket
- SP-0182(14) Temporary Stream Diversions
- SP-5059(14) Permits and Environmental Considerations

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BRO-0013(027)
DUNN COUNTY, ND
TABLE OF CONTENTS

PROJECT NO. 1301110	DATE: 8/19/15	REVISED: N/A	PAGE NO. 2
------------------------	------------------	-----------------	---------------

PLAN NOTES

- 100-P01 FENCES:** The County will attend to the removal of existing fences and the installation of temporary fences to the new highway right-of-way line.
- 100-P02 PROTECT FISHERIES:** No work is allowed in the waterway from April 15th to June 1st to reduce the impact to spawning fish.
- 100-P03 SCOPE OF WORK:** This project consists of building a new Precast RCB Box Culvert and End Sections with an overall barrel length of 66 LF.
- 107-P01 HAZARDOUS MATERIAL:** The existing structural steel is painted with lead-based paint. Certain Contractor operations could expose employees to hazardous levels of lead. The Contractor shall plan accordingly and shall inform employees of the hazards of lead-based paint.
- 202-P01 REMOVAL OF STRUCTURE:** The existing structure is a single-span steel stringer bridge, 24.93 feet long with a clear roadway of 18 feet. The substructures are made of timber. All materials removed shall become the property of the Contractor and shall be disposed of properly off of the right of way.
- 203-010 SHRINKAGE:** 30 percent additional volume is included for shrinkage in earth embankment.
- 203-P01 COMMON EXCAVATION - TYPE C:** The Contractor will be required to complete the finish grading work around the existing facilities that are in the construction area. Any earth mounds that remain around the facilities shall be leveled. This work shall be included in the price for "Common Excavation - Type C".
- Any item designated for removal and salvage but later determined by the County to be non-salvageable based on its condition shall be considered Contractor's property and responsible for proper disposal. Any item designated for removal and salvage shall be stored in the right of way for the County. Disposal shall be included in the price bid for "Common Excavation - Type C".
- Payment for "Common Excavation - Type C" shall be paid for as plan quantity the same as Topsoil in Specification 203.05C.
- 203-P02 TOPSOIL:** Payment for "Topsoil" shall be plan quantity in accordance with Section 203.05C of the Standard Specifications.
- 251-P01 SEEDING:** Seeding Class III shall consist of the following seed mixture:

Species	Lbs. of PLS/Acre
Alfalfa	9
Western wheatgrass	4
Intermediate wheatgrass	5
Slender wheatgrass	2
Oats	10
Total	30

All disturbed areas shall be seeded and will be paid at plan quantity within the design road prism. Seeding for construction activities including; staging areas, stockpile areas, and any other disturbed areas outside of the road prism, shall be considered incidental.

- 255-P01 DITCH CHECK:** The ditch check shall be 2-feet high with side slopes of 1:1 and cut to drain in the center 6-inches lower in elevation than the sides. "Riprap Grade II" will be used as rock material in the ditch check. "Geosynthetic Material Type S2" will be used as the soil retention blanket; which is constructed by placing under the riprap and stapled by 8-inch landscape staples on the down-stream side of the ditch check.
- 302-P01 SALVAGE AGGREGATE:** The Salvage Aggregate is calculated at a depth of 4 inches and is included in the "Topsoil" quantity. The Salvage Aggregate will be handled the same as "Topsoil" as shown under Section 203.05C of the Standard Specifications.
- The aggregate on the existing road shall be removed and stockpiled for reuse. The Contractor shall use care while removing the aggregate to minimize contamination. The salvage aggregate will be spread evenly over the newly constructed roadway and used as temporary surfacing.
- 704-P01 TRAFFIC CONTROL:** Traffic control signing consists of two phases. During Phase 1, 2nd St NW shall be closed during culvert installation, station 50+25, for a period of seven consecutive calendar days. R11-2-48 "ROAD CLOSED" signs - barricade mounted shall be added for Phase 1. The contractor shall be assessed liquidated damages for additional time Phase 1 remains in effect according to Specification 108.07 B. After the culvert has been backfilled up to original grade and local traffic is allowed to pass safely, the project shall be signed according to Phase 2, removing R11-2-48 "ROAD CLOSED" signs - barricade mounted.
- 754-P01 REMOVAL OF SIGNS:** Signs and supports located within the right-of-way shall be removed and salvaged and shall remain the property of Dunn County. The cost for removing and salvaging the signs and reinstalling the street name signs shall be included in the price bid for other items.

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NORTHERN PLAINS
ENGINEERING

BRO-0013(027)
DUNN COUNTY, ND
PLAN NOTES

PROJECT NO. 1301110	DATE: 8/25/15	REVISED: N/A	PAGE NO. 3
------------------------	------------------	-----------------	---------------

ENVIRONMENTAL COMMITMENTS

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

Commitment No. 1: Fugitive dust emissions created during construction will be minimized.

Action Taken/Required: The contractor will implement BMP's, as appropriate, to control dust during construction. BMP's are shown in the plans and SWPPP and may include watering down the work area,

Commitment No. 2: Implement soil retention controls.

Action Taken/Required: The contractor will implement BMP's, as appropriate, to retain soil on the project.

Commitment No. 3: Unavoidable impacts to wetlands will be mitigated at a Dunn County approved mitigation site or bank.

Action Taken/Required: 0.093 acres of permanent impacts to EO11990 wetlands will require mitigation. Dunn County proposes to mitigate by compensation: 0.055 acres of EO 11990 at Schaper Easement Bank, 0.038 acres of EO 11990 at Kisse Easement Bank

Commitment No. 4: Protect fisheries resources.

Action Taken/Required: No work is allowed in the waterway from April 15th to June 1st to reduce the impact to spawning fish.

Commitment No. 5: Avoid impacts to cultural resources.

Action Taken/Required: A Class III Cultural Resources Inventory was conducted by Beaver Creek Archaeology and a "No Historic Properties Affected" determination was made. Then NDDOT and SHPO have both concurred with this determination. However, if cultural resources are found during construction, construction will be halted and the proper entities will be notified of the finding. Construction will not commence until proper procedures are followed.

Wetland Impact Table													
Wetland Number	Location	Cowardin Class.	Wetland Type	Wetland Size Ac.	Wetland Feature	USACE Jurisdictional Wetlands*	Wetland Impacts (acres)		Wetland Mitigation				
							Temp. Ac.	Perm. Ac.	Mitigation Required			Location; Acreage; Wetland#;	Onsite Mitigation Acres
									EO 11990	USACE	USFWS		
1a	Sec.36, T153N, R72W	PEMF	Fringe	0.36	Natural	Yes	0.038	0.055	Y	N	N	Schaper USFWS Easement Bank 0.055;(1:1)	
1b	Sec. 36, T153N, R72W	PEMF	Fringe	0.30	Natural	Yes	0.032	0.038	Y	N	N	Kisse USFWS Easement Bank 0.038;(1:1)	
Totals				0.66			0.07	0.09					0.00

Summary Impact Table			
Total Permanent Impact Summary		Temporary Impacts and additional informaton	
Wetland Type	Total (Acres)	Wetland Type	Total (Acres/Lf)
Natural/JD	0.09	Temporary JD	0.07
Natural/Non-JD	0.00	Non-JD Temporary	0.00
Artificial/JD	0.00	Permanent JD > 0.10	0.09
Artificial/Non-JD	0.00	Permanent OW	0.09 ac/ 97 ft.
Total	0.09	Temporary OW	0.03 ac/ 55 ft.

* A wetland Jurisdictional Determination was issued by the USACE on 8/6/2014; NWO-2014-1664-BIS.

** All impacts to natural wetlands (natural/jurisdictional and natural/non-jurisdictional), regardless of size, as well as impacts greater than 0.10 acre to artificial/jurisdictional wetlands require mitigation.

*** All artificial/non-jurisdictional, deep water (impacts greater than 6.6 feet), Other Waters less than 300 linear feet (determined by the USACE on a case by case), Preamble Wetlands, and temporary impacts do not require mitigation.

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BRO-0013(027)
DUNN COUNTY, ND
ENVIRONMENTAL COMMITMENTS

PROJECT NO. 1301110	DATE: 8/19/15	REVISED: N/A	PAGE NO. 4
------------------------	------------------	-----------------	---------------

BASIS OF ESTIMATE

WATER

50 MGal/Mi Dust Palliative
 10 Gal/CY Common Exc.
 60 MGal/Mi Aggr. Surface Course

AGGREGATE SURFACE COURSE CL 13 (Volume +25%)

5,133 TON/Mile
 37.5 TON/Section Line (1 Total)

TOPSOIL

4" Depth

SEEDING - CLASS III

Total Disturbed Area less Surfaced Area = 2.13 ACRES

SIGN SUPPORT LENGTHS

Assembly No. 1 (Single support)
 Posts shall be 2" perforated tube (12.0' Min.)
 Anchors shall be 2.25" tubing with anchor plate attached

FIBER ROLLS 12 IN

An additional 100 LF of fiber rolls have been included to be used at the discretion of the Engineer.

BOX CULVERT EXCAVATION

Width of 13' x Length of 98' x Depth of 2'

FOUNDATION FILL (Volume + 25%)

Width of 13' x Length of 98' x Depth of 2'

DITCH CHECK

Riprap Grade II = 15' x 4' x 2' Height
 Geosynthetic Material Type S2 = 15' X 6'

SUMMARY OF QUANTITIES

SPEC	CODE	DESCRIPTION	UNIT	TOTAL
103	0100	CONTRACT BOND	LSUM	1
202	0105	REMOVAL OF STRUCTURE	L SUM	1
202	127	REMOVE & SALVAGE CULVERT-ALL TYPES & SIZES	LF	72
203	0103	COMMON EXCAVATION - TYPE C	CY	6,846
203	0109	TOPSOIL	CY	1,627
210	0050	BOX CULVERT EXCAVATION	EA	1
210	0201	FOUNDATION PREPARATION	EA	1
210	0210	FOUNDATION FILL	CY	95
216	0100	WATER	MGAL	98
251	0350	SEEDING CLASS III	MILE	0.3
251	2001	TEMPORARY COVER CROP	MILE	0.3
253	0101	STRAW MULCH	ACRE	2.1
255	0300	CONCRETE EROSION CONTROL BLANKET	SY	29
256	0200	RIPRAP GRADE II	CY	88
261	0112	FIBER ROLLS 12IN	LF	540
261	0113	REMOVE FIBER ROLLS 12IN	LF	120
302	0356	AGGREGATE SURFACE COURSE CL 13	TON	1,302
606	0908	9FT X 8FT PRECAST RCB CULVERT	LF	66
606	4908	9FT X 8FT PRECAST RCB END SECTION	EA	2
702	0100	MOBILIZATION	L SUM	1
704	1000	TRAFFIC CONTROL SIGNS	UNIT	369
704	1052	TYPE III BARRICADE	EA	9
704	1081	VERTICAL PANELS-BACK TO BACK	EA	20
709	0151	GEOSYNTHETIC MATERIAL TYPE R1	SY	272
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	96
709	0162	GEOSYNTHETIC MATERIAL TYPE S2	SY	129
714	4105	PIPE CONDUIT 24IN	LF	128
754	0110	FLAT SHEETS FOR SIGNS-TYPE XI REFL SHEETING	SF	5.2
754	0112	FLAT SHEETS FOR SIGNS-TYPE IV REFL SHEETING	SF	3.9
754	0206	STEEL GALV POSTS-TELESCOPING PERFORATED TUBE	LF	25

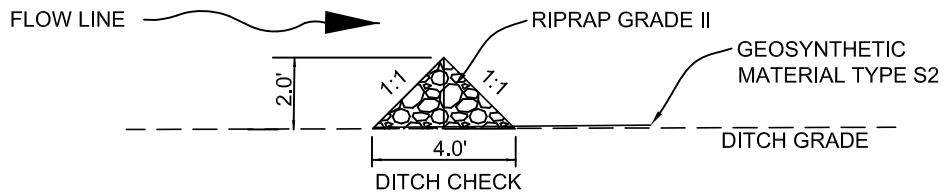
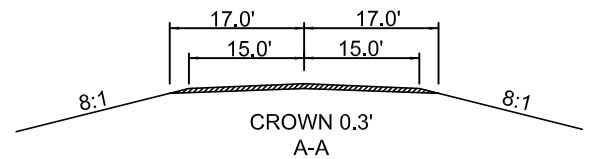
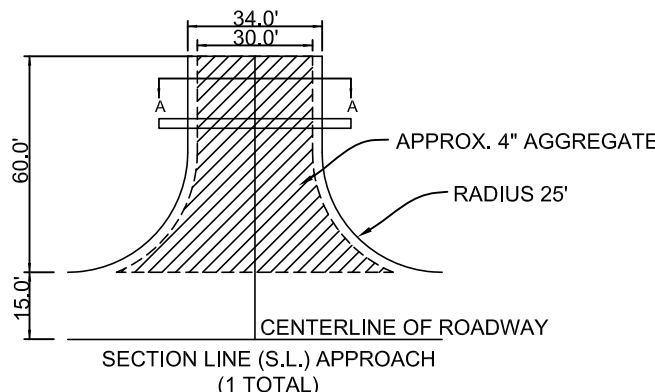
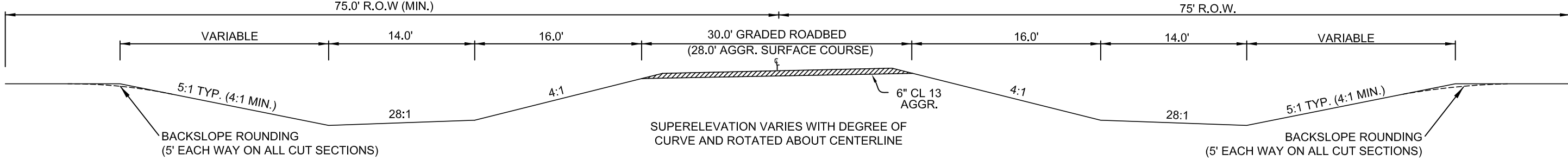
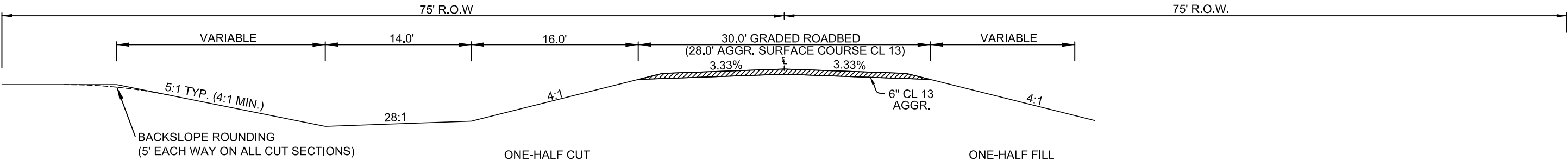
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BRO-0013(027)
DUNN COUNTY, ND
SUMMARY OF QUANTITIES

PROJECT NO. 1301110	DATE: 8/25/15	REVISED: N/A	PAGE NO. 5
------------------------	------------------	-----------------	---------------

TYPICAL SECTIONS



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**BRO-0013(027)
DUNN COUNTY, ND
TYPICAL SECTIONS**

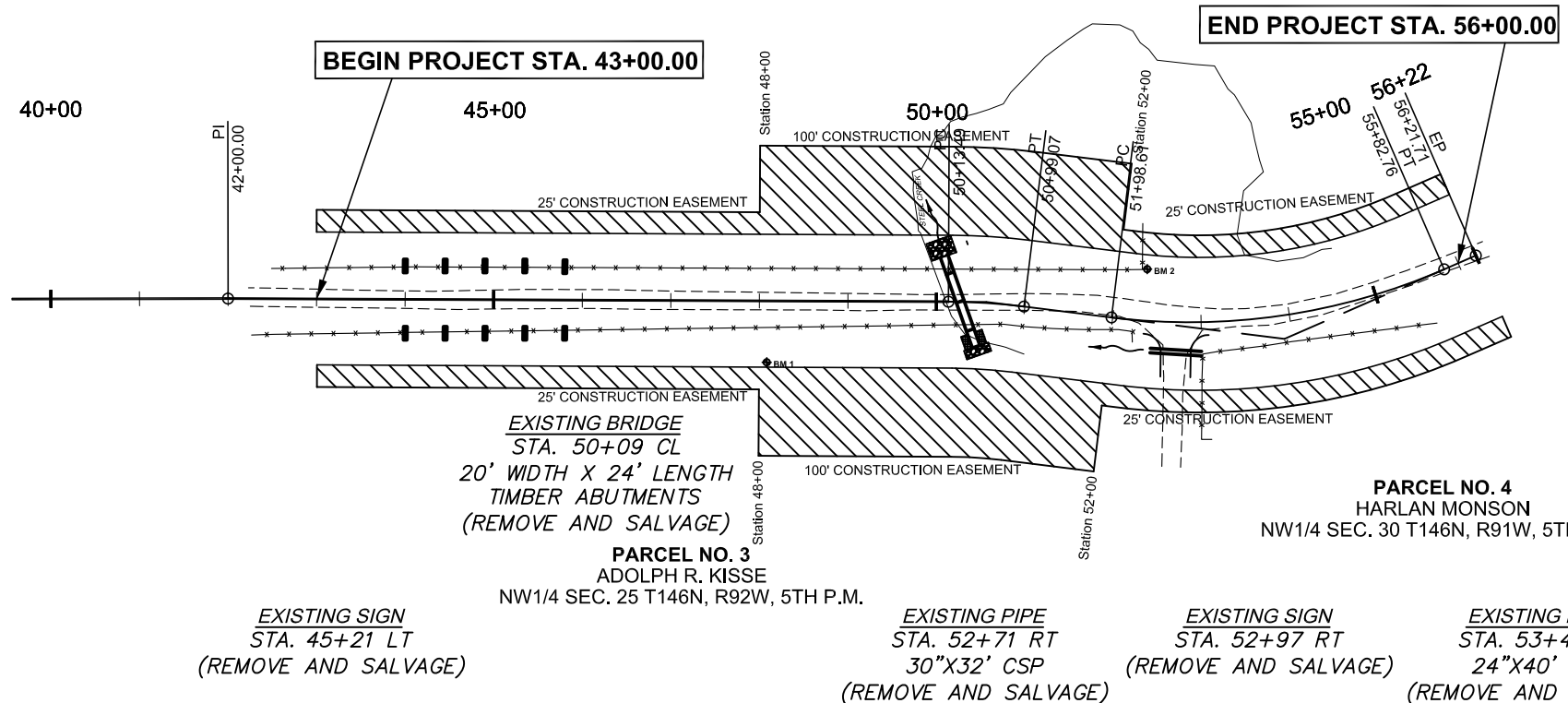
PROJECT NO. 1301110	DATE: 4/29/15	REVISED: N/A	PAGE NO. 6
------------------------	------------------	-----------------	---------------

BENCHMARK LIST

NO.	DESCRIPTION	LOCATION	ELEVATION
1	IRON REBAR	STA 48+08 ~ 69' RT.	2055.01
2	IRON REBAR	STA 52+35 ~ 58' LT.	2062.25

PARCEL NO. 1
 JAMES & LYNN SCHAPER
 SE1/4 SE1/4 SEC. 24 T146N, R92W, 5TH P.M.

PARCEL NO. 2
 CORY & JENNA STERN
 W1/2 W1/2 SEC. 19 T146N, R91W, 5TH P.M.



PARCEL NO. 3
 ADOLPH R. KISSE
 NW1/4 SEC. 25 T146N, R92W, 5TH P.M.

PARCEL NO. 4
 HARLAN MONSON
 NW1/4 SEC. 30 T146N, R91W, 5TH P.M.

EXISTING SIGN
 STA. 45+21 LT
 (REMOVE AND SALVAGE)

EXISTING PIPE
 STA. 52+71 RT
 30"X32' CSP
 (REMOVE AND SALVAGE)

EXISTING SIGN
 STA. 52+97 RT
 (REMOVE AND SALVAGE)

EXISTING PIPE
 STA. 53+48 CL
 24"X40' CSP
 (REMOVE AND SALVAGE)

FIBER ROLLS 12IN

STA. 51+50 RT & LT - 40 LF
 STA. 52+50 LT - 20 LF
 STA. 53+50 RT & LT - 40 LF
 STA. 54+50 RT - 20 LF
 STA. 51+20 to 52+80 RT - 60 LF
 STA. 49+70 to 50+30 LT - 60 LF
 STA. 53+00 to 56+00 LT - 300 LF

INSTALL DITCH CHECK (Detail Page 6)

STA. 44+00 RT & LT - 4.5 CY
 STA. 44+45 RT & LT - 4.5 CY
 STA. 44+90 RT & LT - 4.5 CY
 STA. 44+35 RT & LT - 4.5 CY
 STA. 44+80 RT & LT - 4.5 CY

INSTALL RIPRAP-GRADE II

STA. 50+25 - 32' RT. - 22 CY (29'X10'X2' DEPTH)
 STA. 50+25 - 34' LT. - 43 CY (29'X20'X2' DEPTH)

INSTALL GEOSYNTHETIC MATERIAL TYPE R1

STA. 50+25 CL. - 272 SY

INSTALL GEOSYNTHETIC MATERIAL TYPE RR

STA. 50+25 RT. - 32 SY
 STA. 50+25 LT. - 64 SY

INSTALL GEOSYNTHETIC MATERIAL TYPE S2

STA. 50+25 RT. - 29 SY

INSTALL PRECAST RCB CULVERT

STA. 50+25 9'X8' - 66 LF (SKEWED 20° RT. & AH.)

INSTALL PRECAST RCB END SECTION

STA. 50+25 9'X8' - 2 EA (SKEWED 20° RT. & AH.)

INSTALL PIPE CONDUIT 24IN

STA. 52+72 RT. DBL 24"X64' CSP

FLAT SHEETS FOR SIGNS-TYPE XI REFL SHEETING

STA. 45+20 - 30' RT. W1-4 - 5.2 SF

FLAT SHEETS FOR SIGNS-TYPE IV REFL SHEETING

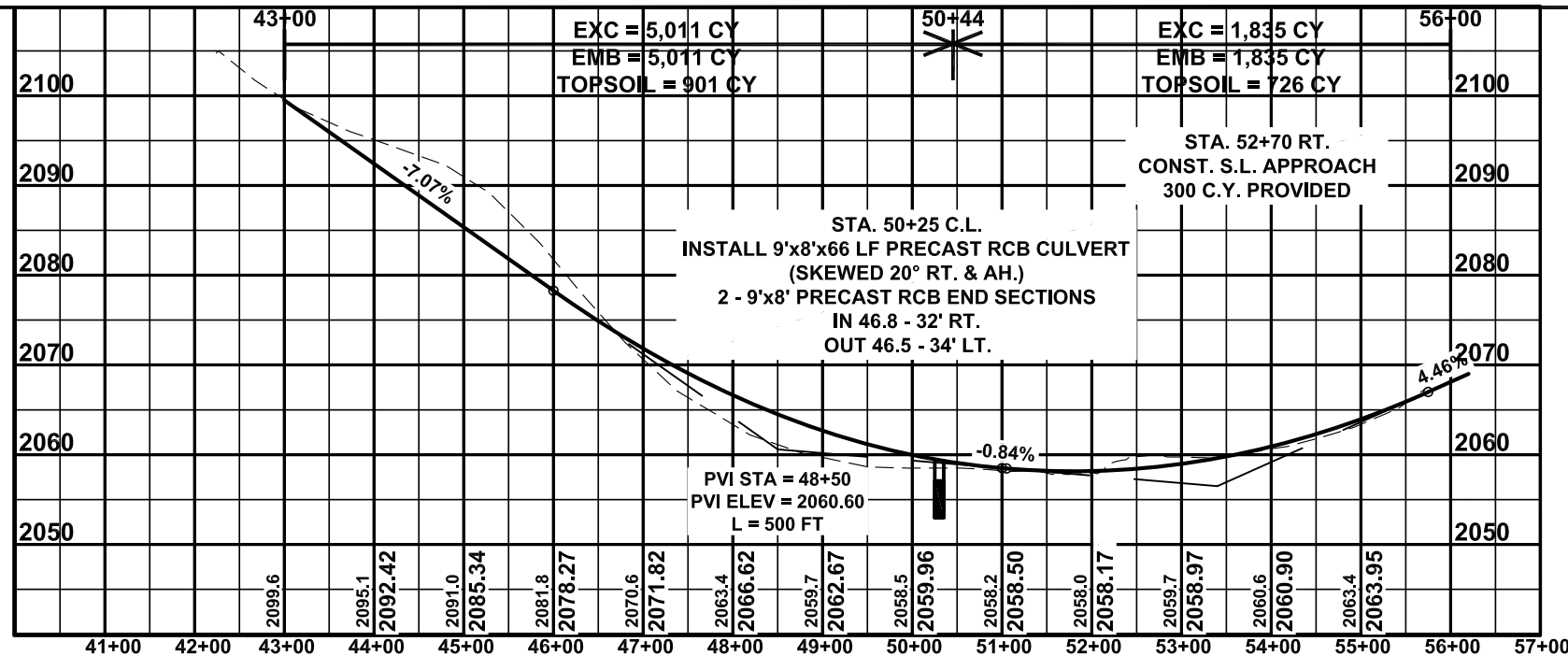
STA. 54+00 - 30' RT. R1-2 - 3.9 SF

CONCRETE EROSION CONTROL BLANKET

STA. 50+25, 32' RT - 29 SY (8'X32')

SUPERELEVATIONS

STA.	LT	CL	RT
49+00	62.38	62.67	62.17
50+00	60.35	59.96	59.46
51+00	58.97	58.50	58.32
52+00	57.97	58.17	58.66
53+00	58.45	58.97	59.49
54+00	60.35	60.90	61.45
55+00	63.37	63.95	64.53



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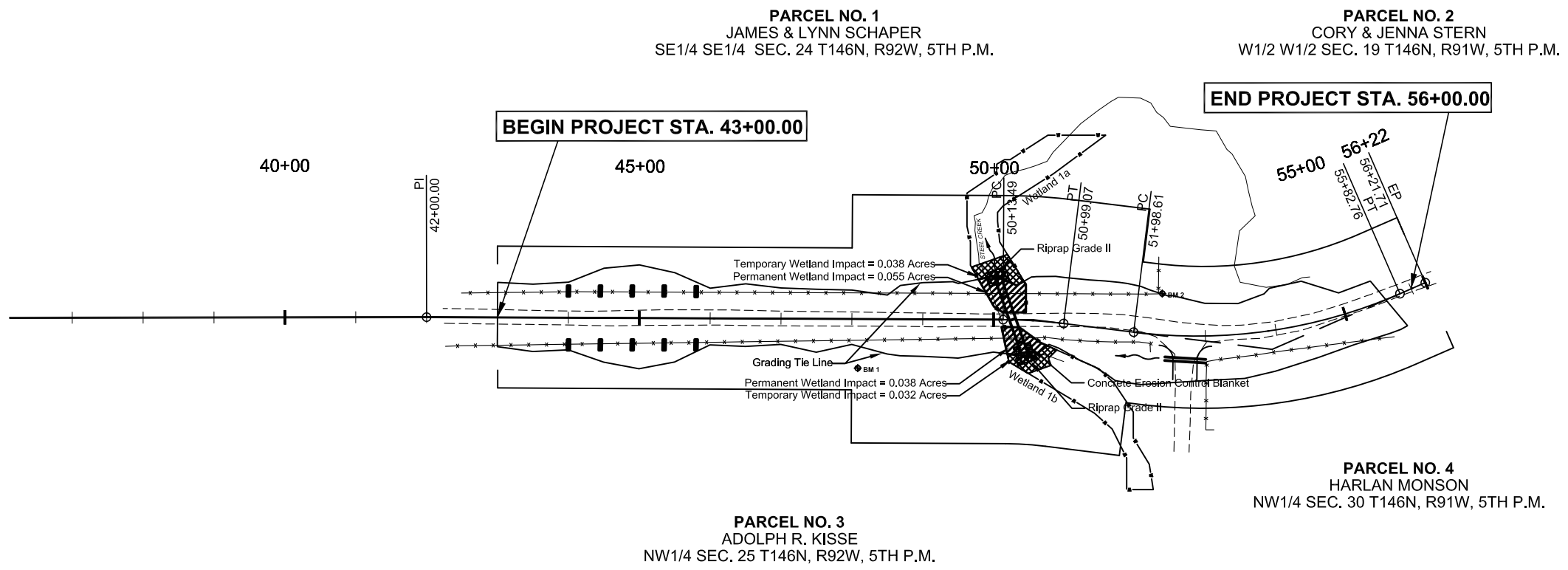


BRO-0013(027)
KISSE BRIDGE
 DUNN COUNTY, ND
PLAN & PROFILE SHEET

SCALE:
 1"=200' HORIZ.
 1"=20' VERT.

PROJECT NO. 1301110	DATE: 8/25/15	REVISED: N/A	PAGE NO. 7
------------------------	------------------	-----------------	---------------

WETLAND IMPACTS



SCALE:
1"=200' HORIZ.
1"=20' VERT.

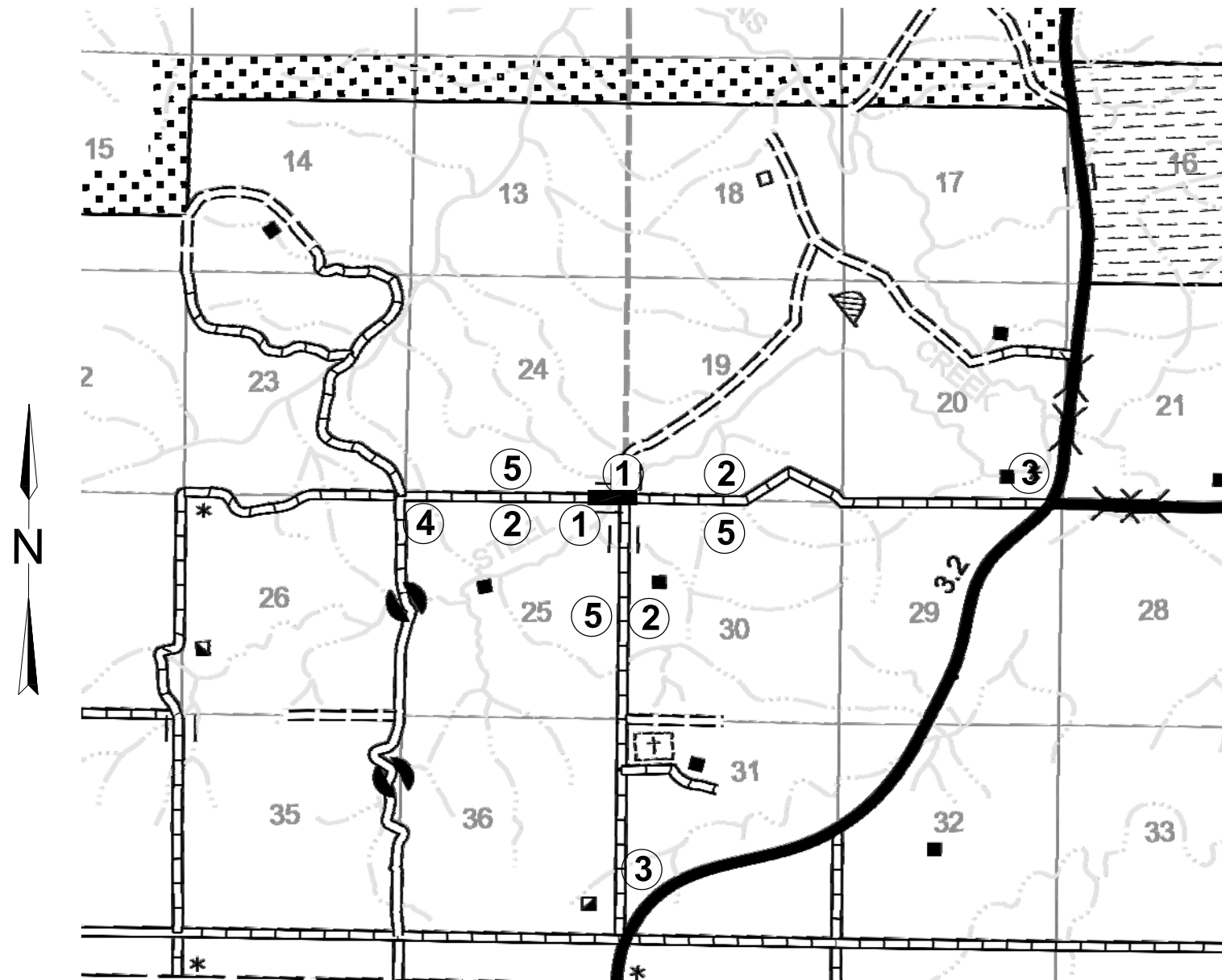
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DUNN COUNTY, ND
WETLAND SHEET

PROJECT NO. 1301110	DATE: 8/19/15	REVISED: N/A	PAGE NO. 8
------------------------	------------------	-----------------	---------------

CONSTRUCTION SIGN LAYOUT - PHASE 1



- ① R11-2-48 ROAD CLOSED
BARRICADE MOUNTED (3 EACH LOCATION)
- ② R11-3-60 ROAD CLOSED LOCAL TRAFFIC ONLY
BARRICADE MOUNTED
- ③ R11-3a-60 ROAD CLOSED 2 MI AHEAD LOCAL TRAFFIC ONLY
POST MOUNTED
- ④ R11-3a-60 ROAD CLOSED 0.5 MI AHEAD LOCAL TRAFFIC ONLY
POST MOUNTED
- ⑤ G20-2a-48 END ROAD WORK POST MOUNTED

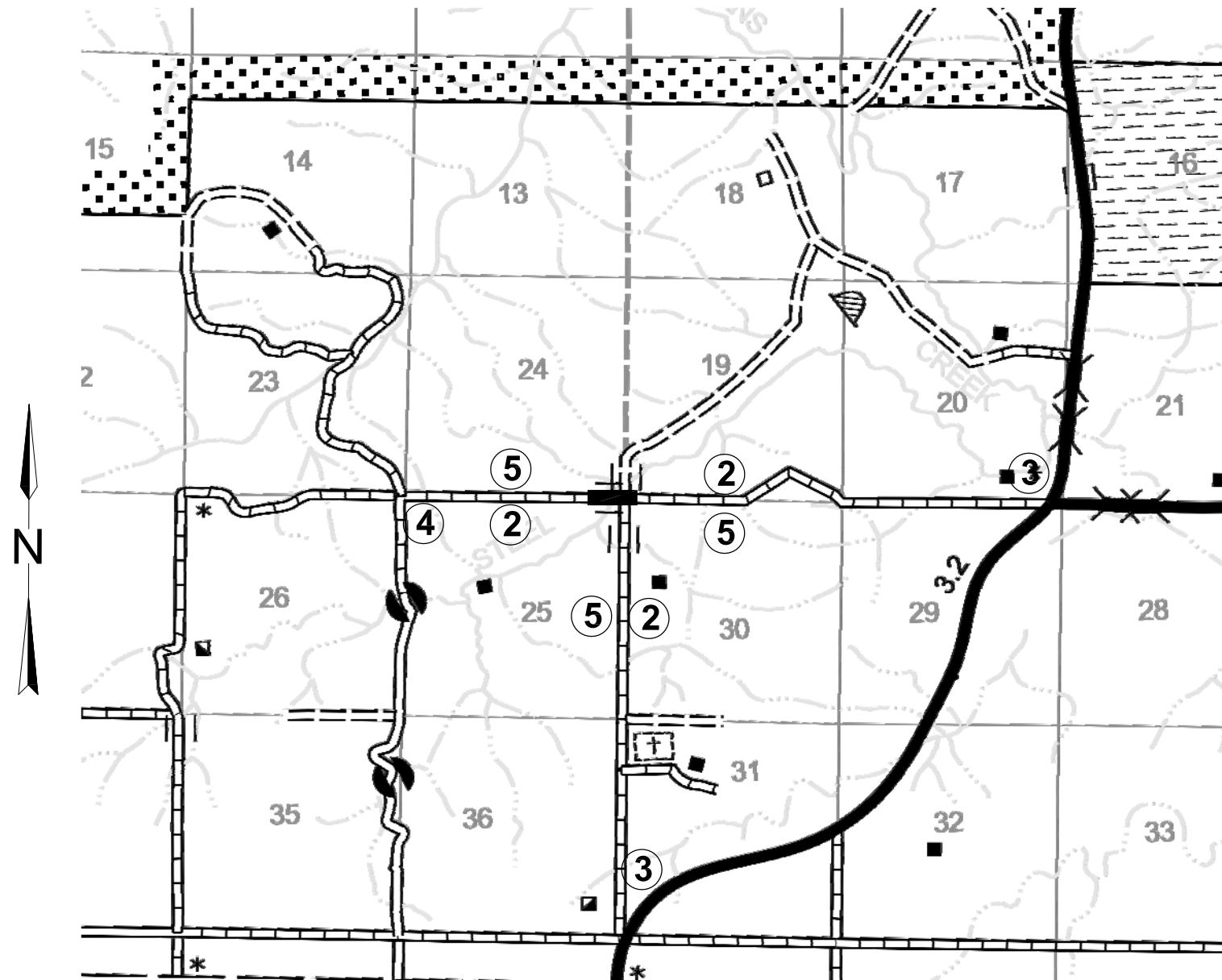
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BRO-0013(027)
DUNN COUNTY, ND
CONST. SIGN LAYOUT

PROJECT NO. 1301110	DATE: 8/25/15	REVISED: N/A	PAGE NO. 10
------------------------	------------------	-----------------	----------------

CONSTRUCTION SIGN LAYOUT - PHASE 2



- ① R11-2-48 ROAD CLOSED
BARRICADE MOUNTED (3 EACH LOCATION)
- ② R11-3-60 ROAD CLOSED LOCAL TRAFFIC ONLY
BARRICADE MOUNTED
- ③ R11-3a-60 ROAD CLOSED 2 MI AHEAD LOCAL TRAFFIC ONLY
POST MOUNTED
- ④ R11-3a-60 ROAD CLOSED 0.5 MI AHEAD LOCAL TRAFFIC ONLY
POST MOUNTED
- ⑤ G20-2a-48 END ROAD WORK POST MOUNTED

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BRO-0013(027)
DUNN COUNTY, ND
CONST. SIGN LAYOUT

PROJECT NO. 1301110	DATE: 8/25/15	REVISED: N/A	PAGE NO. 11
------------------------	------------------	-----------------	----------------

STRUCTURAL NOTES

606 PRECAST REINFORCED CONCRETE BOX CULVERT AND END SECTIONS:

The structure will be bid as a single cell 9'x8'x66' precast RCB with sloped ends. The culvert shall consist of 6' lengths.

The 9FTx8FT Precast RCB Culvert shall be 98'-0" long from end to end of the Box Culvert Sections at the floor and shall be designed to carry a HL93 live load with 2-6 feet of fill. The installation and design of the 9FTx8FT Precast RCB Culvert shall meet the requirements of Standard Specification Section 606 except as noted in these plans.

For a single barrel culvert with 8-inch thick walls, 8-inch thick floor and 8-inch thick roof, the following total factored moments would result from the applications of the required loads:

<u>Wall Moment</u>	<u>Single Cell</u>
Top Corner	-10,800 ft.-lbs.
Middle	2,420 ft.-lbs.
Bottom Corner	-10,530 ft.-lbs.

<u>Roof Moments</u>	
Corner	-4,290 ft.-lbs.
Bottom	13,670 ft.-lbs.

<u>Floor Moments</u>	
Corner	-4,290 ft.-lbs.
Top	13,650 ft.-lbs.

The minimum reinforcing provided for each joint and member shall be that which provides strength equal to the above moments.

The first barrel of each end section shall include a concrete parapet. The parapet shall be 1'x1' and shall be as long as the barrel section is wide. A 2'-0" deep concrete cutoff wall shall be placed at the end of the last end section barrel. The cutoff wall shall be 3'-0" wider than the out-to-out dimension of the box culvert. The "9FT x 8FT Precast RCB End Section" bid item shall consist of parapet, sloped end sections with hot galvanized tie bolts to connect barrel sections and a concrete cutoff wall. All other material and hardware shall conform to Section 834 of the Standard Specifications. The equipment, labor and materials necessary for installation shall be included in the unit price bid for "9FT x 8FT Precast RCB End Section."

All sections shall be tied together by an acceptable method shown in Standard Detail D-714-22. The ties should adequately hold the sections together under construction load and service load conditions. The sections shall be tied together with four galvanized steel U-bolts per joint unless otherwise noted.

All lifting and handling holes shall be plugged by an approved method after the culvert sections are installed. The cost of plugging the holes shall be included in the unit price bid for "9FT x 8FT Precast RCB Culvert."

Geosynthetic Material Type S2 shall be placed over the joints of the culvert in accordance with the Standard Specifications Section 606.04.E.3, and costs for material and installation shall be included in the price bid for "9FT x 8FT Precast RCB Culvert."

The contractor shall submit work drawings in accordance with the Standard Specifications Section 606.04.D to the engineer for review and written approval before manufacturing the "9FT x 8FT Precast RCB Culvert" and "9FT x 8FT Precast RCB End Section" sections. These work drawings shall also include the following:

- A. Layout showing Precast RCB Culvert placement and clearances
- B. Lintel Beam & Curb dimensions and method of attachment

Backfill shall be considered as all replaced excavation and new embankment adjustment to the culvert units and end sections. The project construction and material specifications for excavation for structures and roadway excavation and embankment construction shall apply.

No backfill shall be placed against any structural elements until they have been approved and inspected by the engineer.

Mechanical tampers or approved compacting equipment shall be used to compact all backfill and embankment immediately adjacent to each side of the culvert. The backfill within four feet of each side of the culvert shall be placed in lifts of eight inches or less (loose depth).

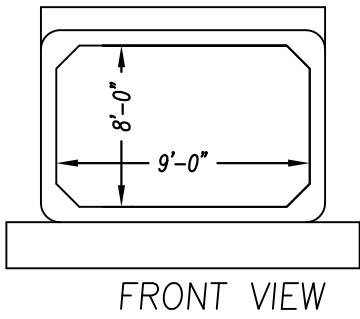
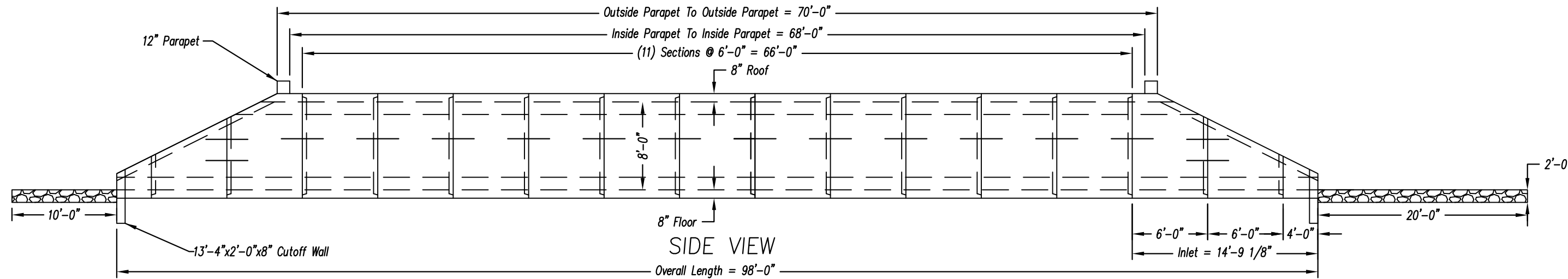
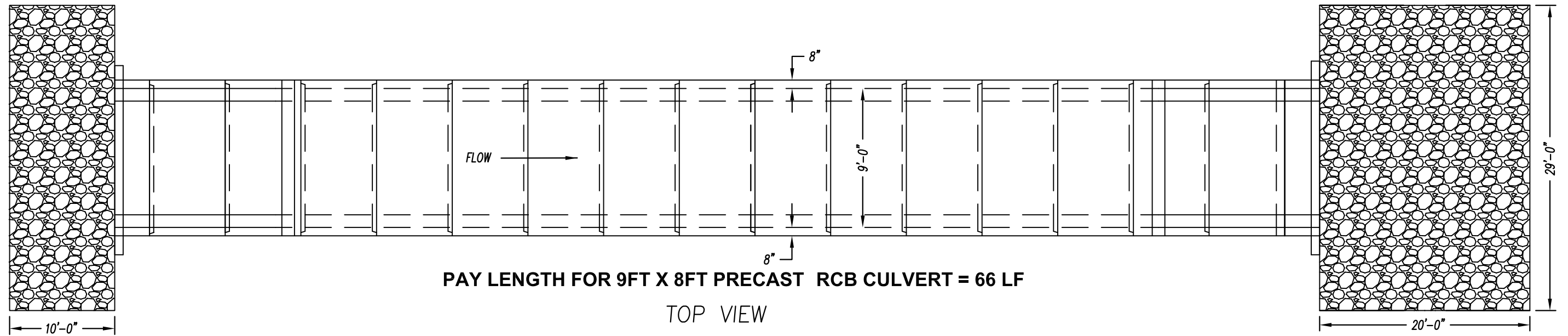
Threaded inserts with eye bolts shall be installed in the end sections on the inlet side for the installation of the Concrete Erosion Control Blanket.

The contractor will be required to use care and best practices in removing the existing bridge beams that are painted as it is not known if the paint is lead based. All visible deposits of waste will be recovered and removed to an approved site.

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NORTHERN PLAINS ENGINEERING			
BRO-0013(027) DUNN COUNTY, ND BOX CULVERT DETAILS			
PROJECT NO. 1301110	DATE: 4/29/15	REVISED: N/A	PAGE NO. 12

STRUCTURAL DETAIL



HYDRAULIC DATA

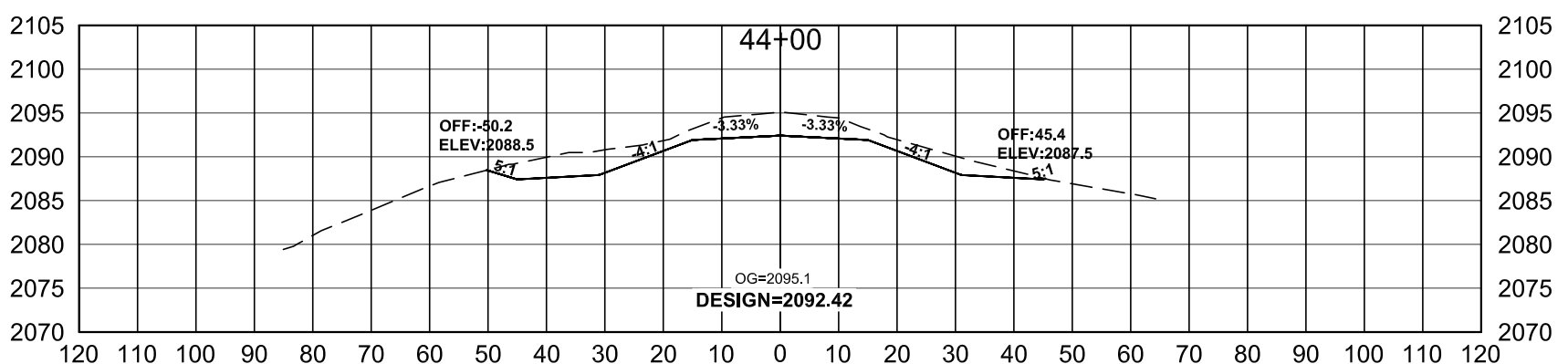
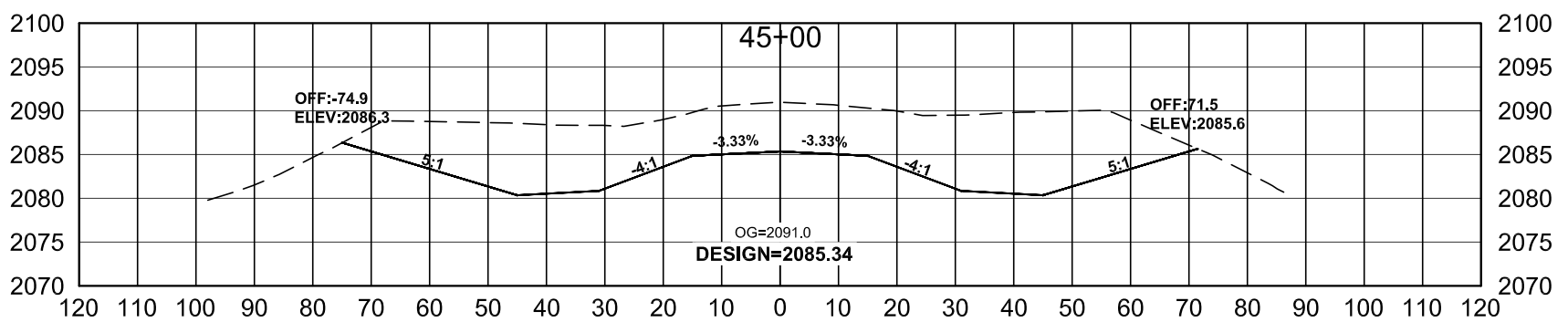
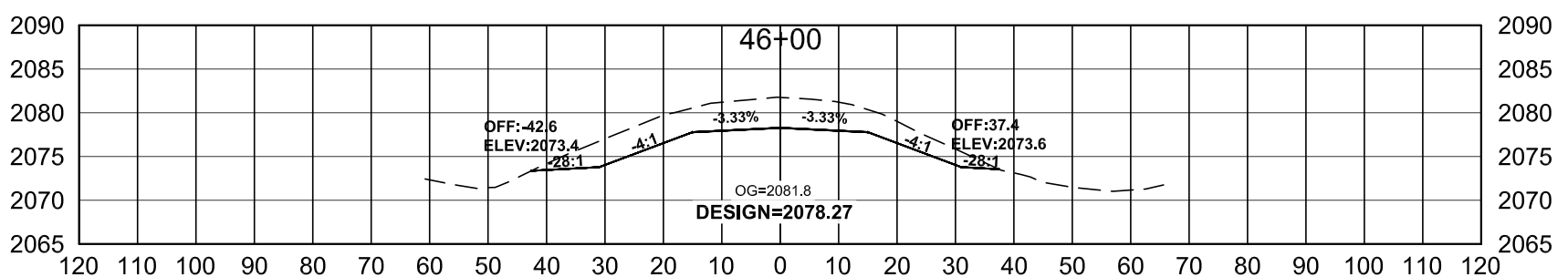
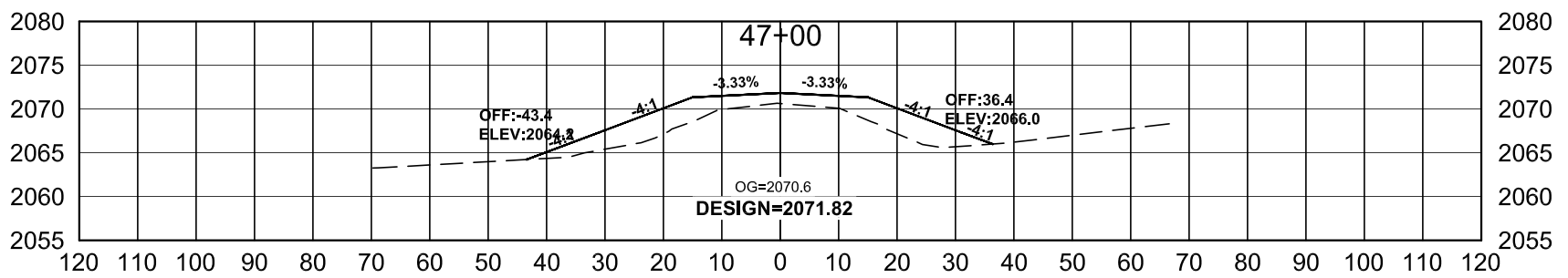
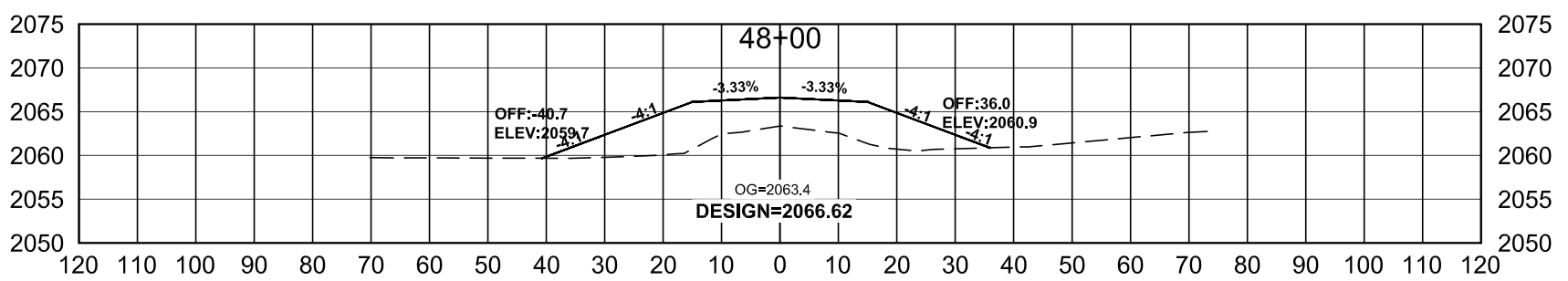
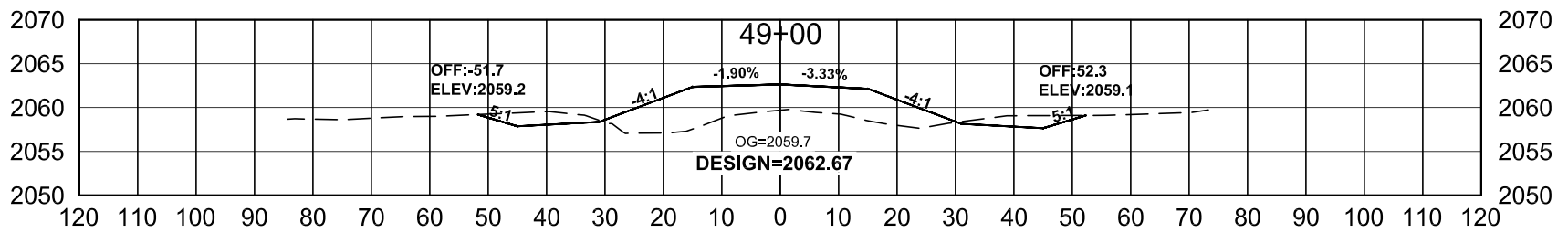
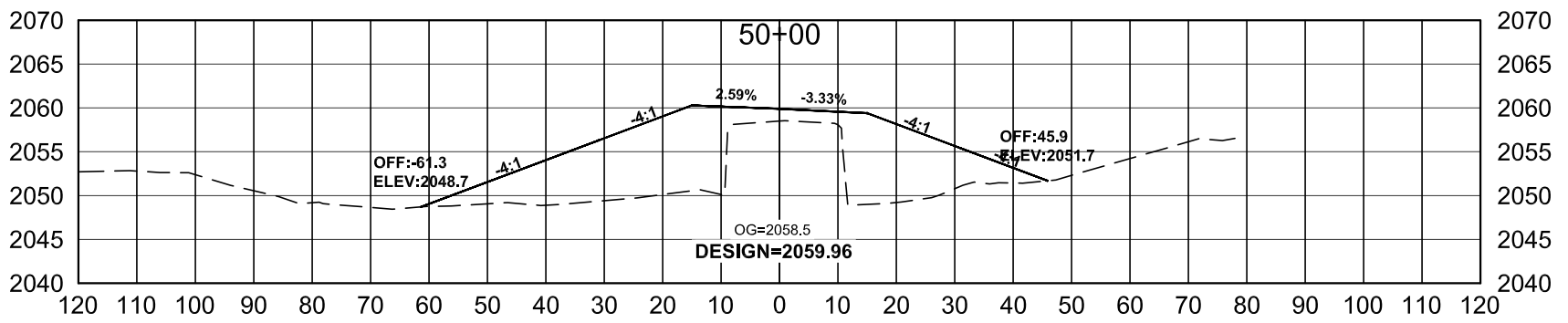
DRAINAGE AREA	5.2	SQ MI
STREAM GRADIENT	0.0098	FT/FT
DESIGN FREQUENCY	15	YR
DESIGN DISCHARGE	417	CFS
DESIGN HEADWATER STAGE	2054.8	FT
DESIGN TAILWATER STAGE	2059.8	FT
VELOCITY THROUGH CULVERT	9.0	FPS
100 - YEAR FREQUENCY DISCHARGE	870	CFS
100 - YEAR FREQUENCY HEADWATER	2058.6	FT
OVERTOPPING STAGE	2058.0	FT
OVERTOPPING DISCHARGE	691	CFS

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NORTHERN PLAINS
ENGINEERING

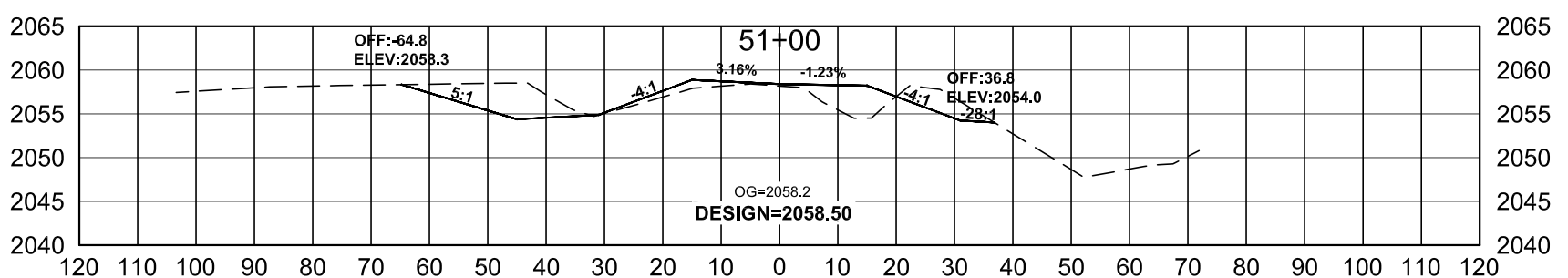
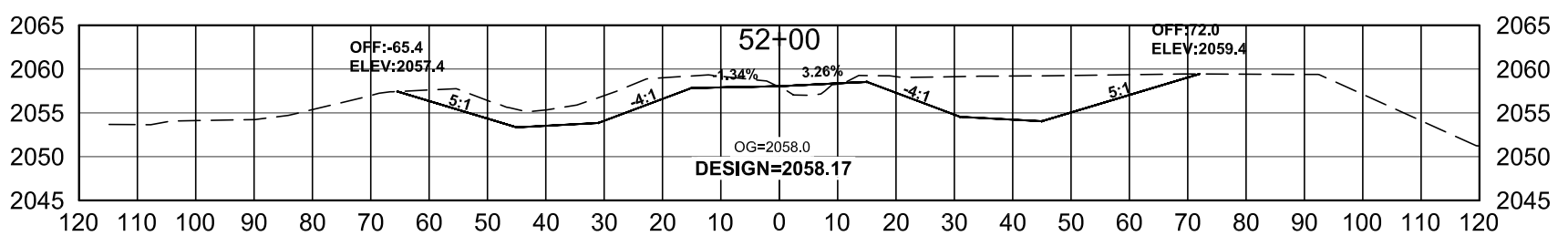
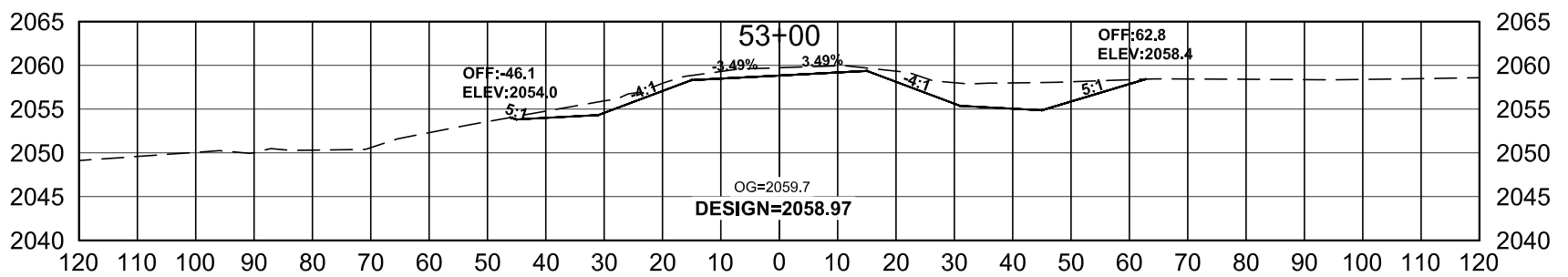
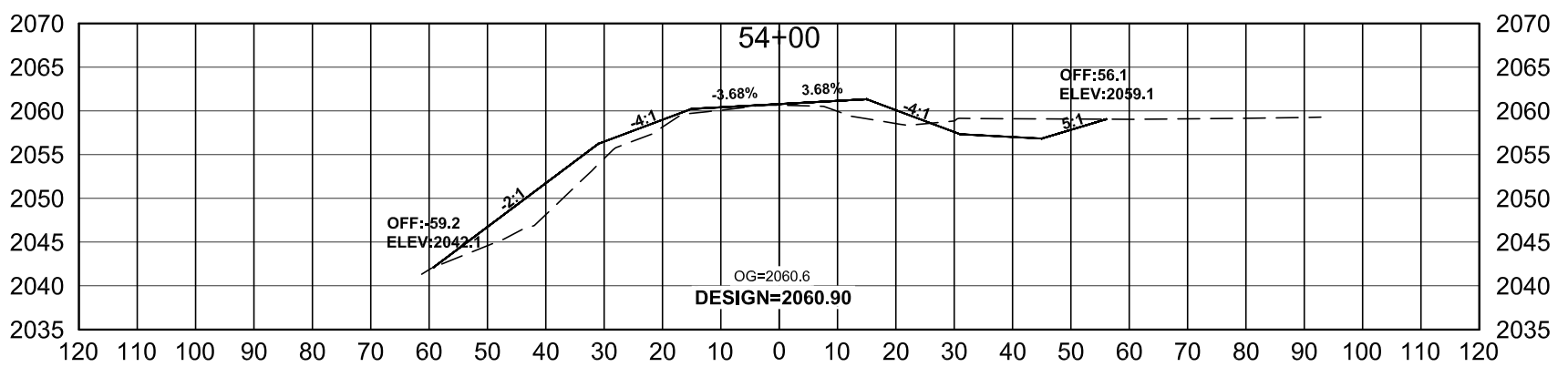
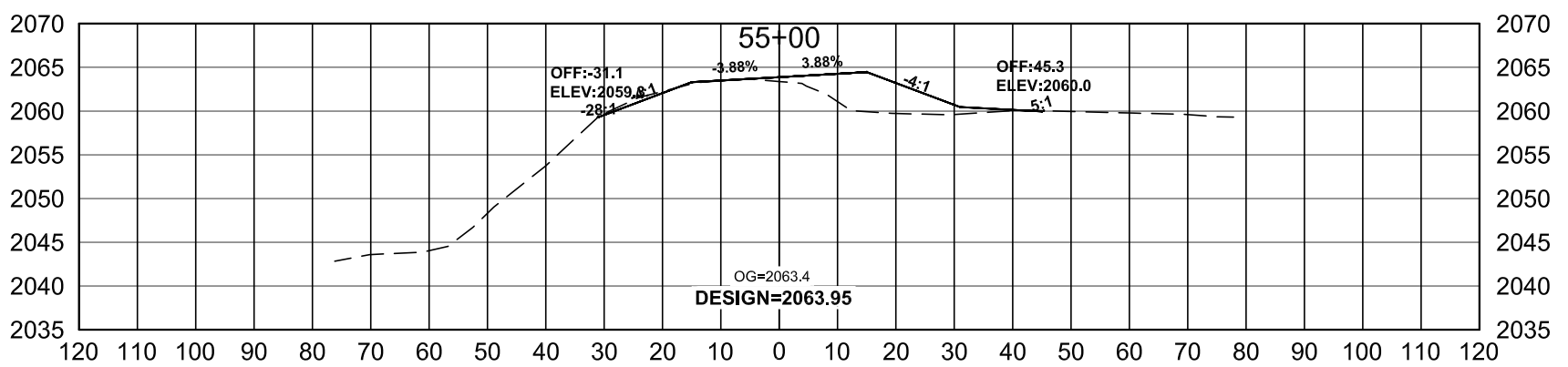
BRO-0013(027)
DUNN COUNTY, ND
BOX CULVERT DETAILS

PROJECT NO. 1301110	DATE: 4/30/15	REVISED: N/A	PAGE NO. 13
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STA 44+00 TO 43+00
TRANSITION TO EXISTING ROADWAY

STA 55+00 TO 56+00
TRANSITION TO EXISTING ROADWAY



NDDOT ABBREVIATIONS

? This is a special text character used in the labeling of existing features. It indicates a feature that has an unknown characteristic, potentially based on: lack of description, location accuracy or purpose.

Abn abandoned
 Abut abutment
 Ac acres
 Adj adjusted
 Aggr aggregate
 Ahd ahead
 ARV air release valve
 Align alignment
 Al alley
 Alt alternate
 Alum aluminum
 ADA Americans with Disabilities Act
 A ampere
 & and
 Appr approach
 Approx approximate
 ACP asbestos cement pipe
 Asph asphalt
 AC asphalt cement
 Assmd assumed
 @ at
 Atten attenuation
 ATR automatic traffic recorder
 Ave Avenue
 Avg average
 ADT average daily traffic
 Az azimuth
 Bk back
 BF back face
 Bs backsight
 Balc balcony
 B Wire barbed wire
 Barr barricade
 Btry battery
 Brg bearing
 BI beehive inlet
 Beg begin
 BM bench mark
 Bkwy bikeway
 Bit bituminous
 Blk block
 Bd Ft board feet
 BH bore hole
 BS both sides
 Bot bottom
 Blvd Boulevard
 Bndry boundary
 BC brass cap
 Brkwy breakaway
 Br bridge
 Bldg building

BV butterfly valve
 Byp bypass
 C Gdrl cable guardrail
 Calc calculate
 Cd candela
 CIP cast iron pipe
 CB catch basin
 CRS cationic rapid setting
 C Gd cattle guard
 C To C center to center
 Cl or C centerline
 Cm centimeter
 Ch chain
 Chnlk chain-link
 Ch Blk channel block
 Ch Ch channel change
 Chk check
 Chsld chiseled
 Cir circle
 Cl class
 Cl clay
 Cl F clay fill
 Cl Hvy clay heavy
 Cl Lm clay loam
 Clnt clean-out
 Clr clear
 Cl&gr clearing & grubbing
 Co S coal slack
 Comb. combination
 Coml commercial
 Compr compression
 CADD computer aided drafting & design
 Conc concrete
 Cond conductor
 Const construction
 Cont continuous
 CSB continuous split barrel sample
 Contr contraction
 Contr contractor
 CP control point
 Coord coordinate
 Cor corner
 Corr corrected
 CAES corrugated aluminum end section
 CAP corrugated aluminum pipe
 CMES corrugated metal end section
 CMP corrugated metal pipe
 CPVCP corrugated poly-vinyl chloride pipe
 CSES corrugated steel end section
 CSP corrugated steel pipe
 C coulomb
 Co County
 Crse course
 C Gr course gravel
 CS course sand

Ct Court
 Xarm cross arm
 Xbuck cross buck
 Xsec cross sections
 Xing crossing
 Xrd Crossroad
 Crn crown
 CF cubic feet
 M3 cubic meter
 M3/s cubic meters per second
 CY cubic yard
 Cy/mi cubic yards per mile
 Culv culvert
 C&G curb & gutter
 CI curb inlet
 CR curb ramp
 CS curve to spiral
 C cut
 Dd Ld dead load
 Defl deflection
 Defm deformed
 Deg or D degree
 DInt delineate
 DIntr delineator
 Depr depression
 Desc description
 Det detail
 DWP detectable warning panel
 Dtr detour
 Dia diameter
 Dir direction
 Dist distance
 DM disturbed material
 DB ditch block
 DG ditch grade
 Dbl double
 Dn down
 Dwg drawing
 Dr drive
 Drwy driveway
 DI drop inlet
 D dry density
 Ea each
 Esmt easement
 E East
 EB Eastbound
 Elast elastomeric
 EL electric locker
 E Mtr electric meter
 Elec electric/al
 EDM electronic distance meter
 Elev or El elevation
 Ellipt elliptical
 Emb embankment
 Emuls emulsion/emulsified

ES end section
 Engr engineer
 ESS environmental sensor station
 Eq equal
 Eq equation
 Evgr evergreen
 Exc excavation
 Exst existing
 Exp expansion
 Expy Expressway
 E external of curve
 Extru extruded
 FOS factor of safety
 F Fahrenheit
 FS far side
 F farad
 Fed Federal
 FP feed point
 Ft feet/foot
 Fn fence
 Fn P fence post
 FO fiber optic
 FB field book
 FD field drive
 F fill
 FAA fine aggregate angularity
 FS fine sand
 FH fire hydrant
 Fl flange
 Flrd flared
 FES flared end section
 F Bcn flashing beacon
 FA flight auger sample
 FL flow line
 Ftg footing
 FM force main
 Fs foresight
 Fnd found
 Fdn foundation
 Frac fractional
 Frwy freeway
 Frt front
 FF front face
 F Disp fuel dispenser

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE

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NDDOT ABBREVIATIONS

D-101-2

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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08-03-15	General Revisions

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NDDOT ABBREVIATIONS

D-101-3

Qty	quantity	SN	sign number	Tan	tangent	Wb	weber
Qtr	quarter	Sig	signal	T	tangent (semi)	WIM	weigh in motion
Rad or R	radius	Si Cl	silt clay	TS	tangent to spiral	W	west
RR	railroad	Si Cl Lm	silty clay loam	Tel	telephone	WB	westbound
Rlwy	railway	Si Lm	silty loam	Tel B	Telephone Booth	Wrng	wiring
Rsd	raised	Sgl	single	Tel P	telephone pole	W/	with
RTP	random traverse point	SC	slow curing	Tv	television	W/o	without
Rge or R	range	SS	slow setting	Temp	temperature	WC	witness corner
RC	rapid curing	Sm	small	Temp	temporary	WGS	world geodetic system
Rec	record	S	South	TBM	temporary bench mark	Z	zenith
Rcy	recycle	SE	South East	T	tesla		
RAP	recycled asphalt pavement	SW	South West	T	thinwall tube sample		
RPCC	recycled portland cement concrete	SB	Southbound	T/mi	tons per mile		
Ref	reference	Sp	spaces	Ts	topsoil		
R Mkr	reference marker	Spcl	special	Twp or T	township		
RM	reference monument	SA	special assembly	Traf	traffic		
Refl	reflectorized	SP	special provisions	TSCB	traffic signal control box		
RCB	reinforced concrete box	G	specific gravity	Tr	trail		
RCES	reinforced concrete end section	Spk	spike	Transf	transformer		
RCP	reinforced concrete pipe	SC	spiral to curve	TB	transit book		
RCPS	reinforced concrete pipe sewer	ST	spiral to tangent	Trans	transition		
Reinf	reinforcement	SB	split barrel sample	TT	transmission tower		
Res	reservation	SH	sprinkler head	Trans	transverse		
Ret	retaining	SV	sprinkler valve	Trav	traverse		
Rev	reverse	Sq	square	TP	traverse point		
Rt	right	SF	square feet	Trtd	treated		
R/W	right of way	Km2	square kilometer	Trmt	treatment		
Riv	river	M2	square meter	Qc	triaxial compression		
Rd	road	SY	square yard	TERO	tribal employment rights ordinance		
Rdbd	road bed	Stk	stake	Tpl	triple		
Rdwy	roadway	Std	standard	TP	turning point		
RWIS	roadway weather information system	N	standard penetration test	Typ	typical		
Rk	rock	Std Specs	standard specifications	Qu	unconfined compressive strength		
Rt	route	Sta	station	Ugrnd	underground		
Salv	salvage(d)	Sta Yd	station yards	USC&G	US Coast & Geodetic Survey		
Sd	sand	Stm L	steam line	USGS	US Geologic Survey		
Sdy Cl	sandy clay	SEC	steel encased concrete	Util	utility		
Sdy Cl Lm	sandy clay loam	SMA	stone matrix asphalt	VG	valley gutter		
Sdy Fl	sandy fill	SSD	stopping sight distance	Vap	vapor		
Sdy Lm	sandy loam	SD	storm drain	Vert	vertical		
San	sanitary sewer line	St	street	VC	vertical curve		
Sc	scoria	SPP	structural plate pipe	VCP	vitrified clay pipe		
Sec	seconds	SPPA	structural plate pipe arch	V	volt		
Sec	section	Str	structure	Vol	volume		
SL	section line	Subd	subdivision	Wkwy	walkway		
Sep	separation	Sub	subgrade	W	water content		
Seq	sequence	Sub Prep	subgrade preperation	WGV	water gate valve		
Serv	service	Ss	subsoil	WL	water line		
Sh	shale	SE	superelevation	WM	water main		
Sht	sheet	SS	supplement specification	WMV	water main valve		
Shtng	sheeting	Supp	supplemental	W Mtr	water meter		
Shldr	shoulder	Surf	surfacing	WSV	water service valve		
Sw	sidewalk	Surv	survey	WW	water well		
S	siemens	Sym	symmetrical	W	watt		
SD	sight distance	SI	systems international	Wrng	wearing		

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
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DATE	CHANGE
08-03-15	General Revisions

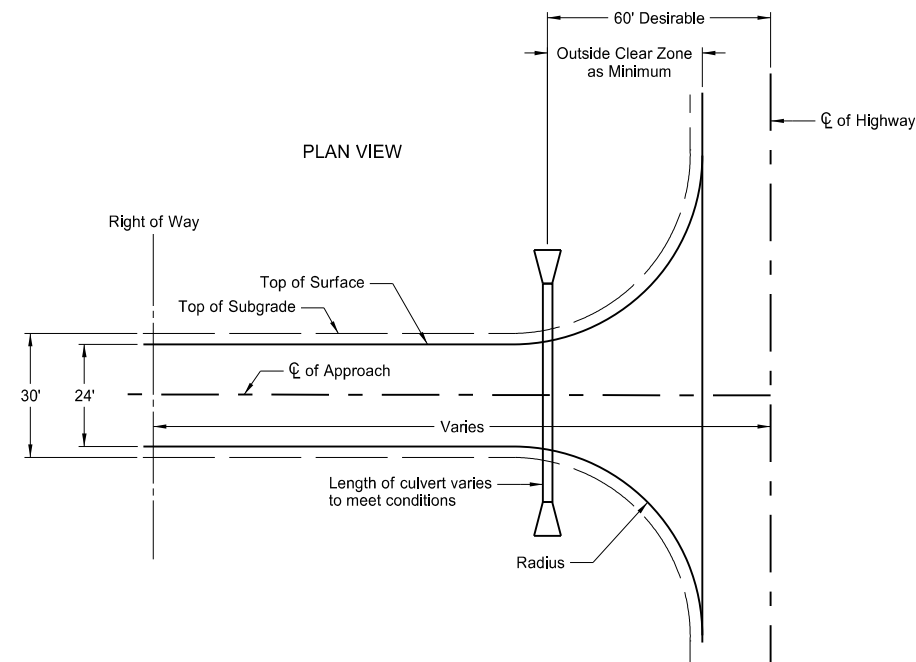
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STANDARD RURAL APPROACHES

D-203-8

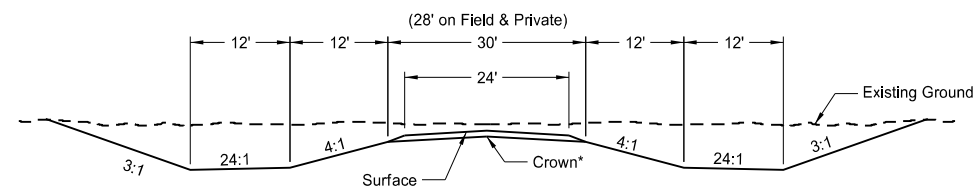
NOTES:

1. Max breakover between approach storage platform and highway shall not exceed 5%.
2. The approach slope shall be measured outside the area of mainline inslope influence.



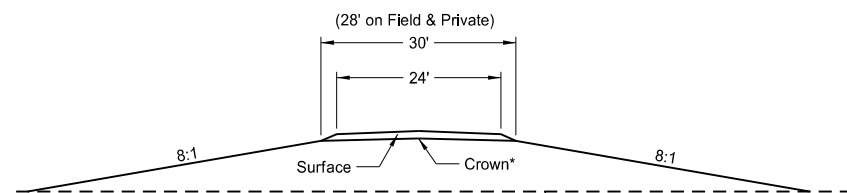
CRITERIA FOR RURAL APPROACH TYPES

	Field Drives	Private Drives	Low Volume Public Roads
Radius	R=24 ft	R=30 ft	R=40 ft
Maximum Grade	10%	7%	7%
Storage Platform	20 ft	24 ft	30 ft
Vertical Curve Length	10 ft	10 ft	Varies (Min. 20 mph)

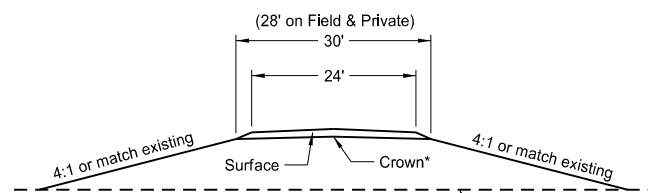


SECTION A-A

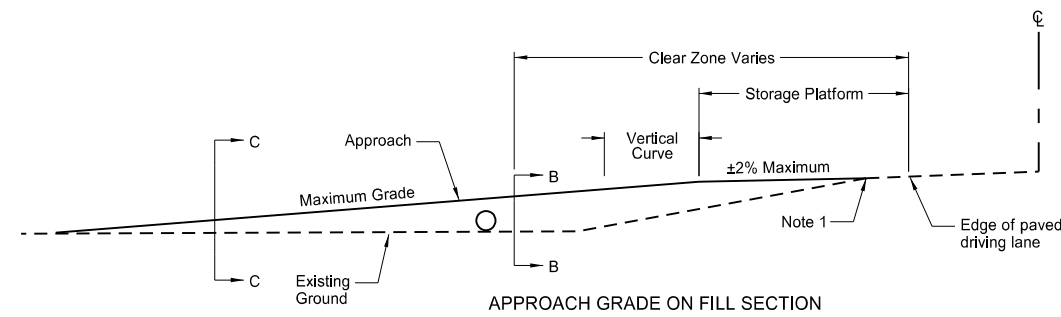
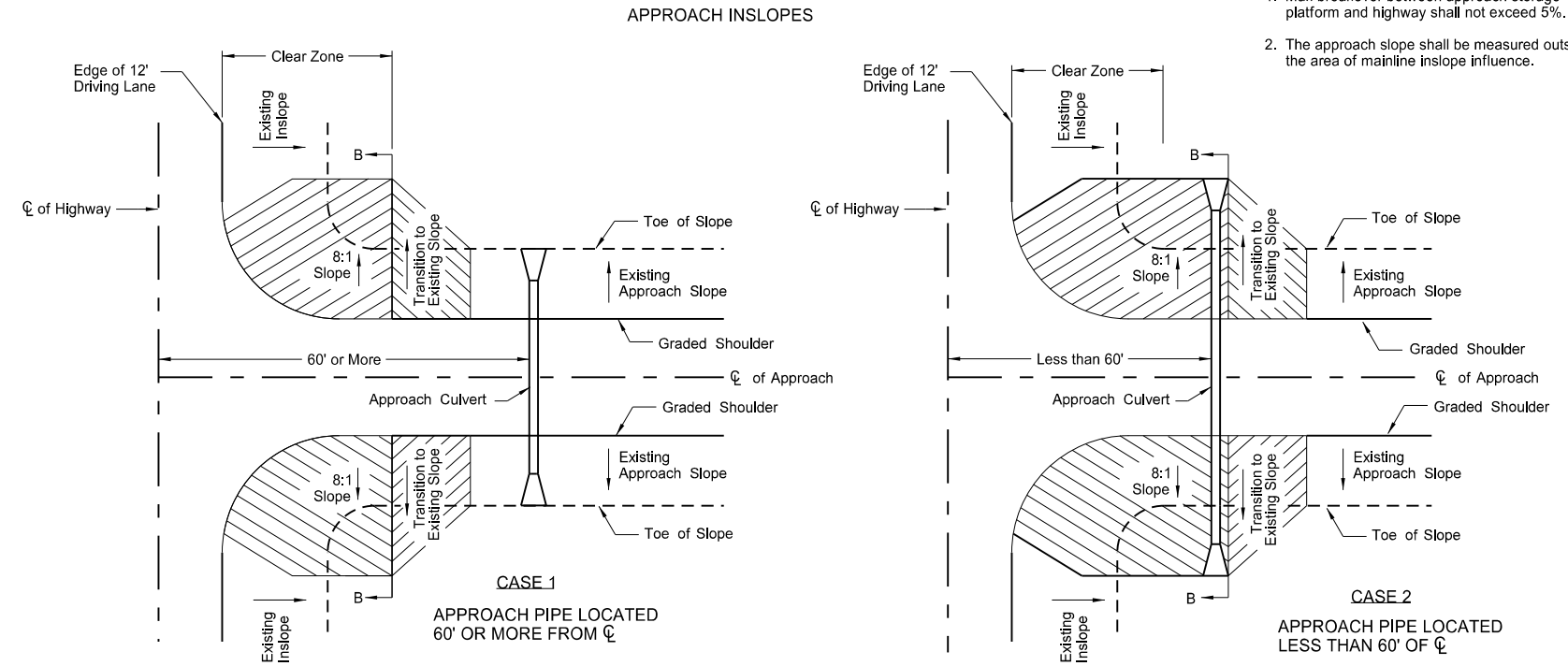
*2.1% crown for paved surface
*3.0% crown for gravel surface



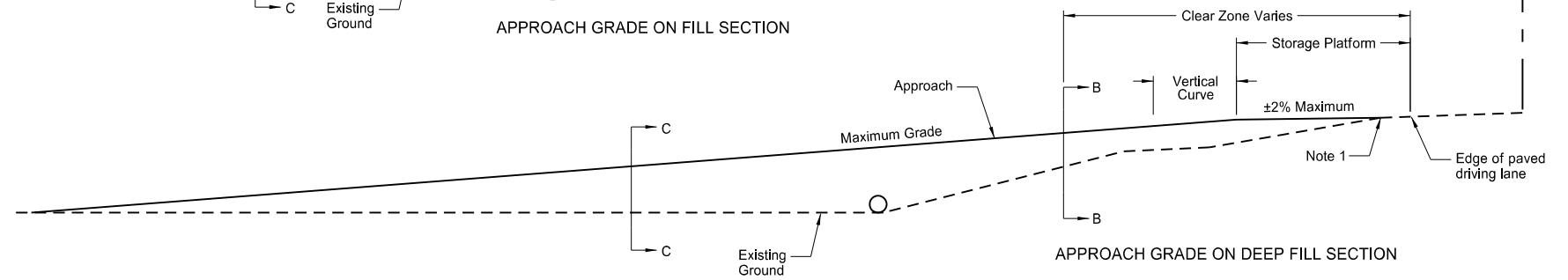
SECTION B-B



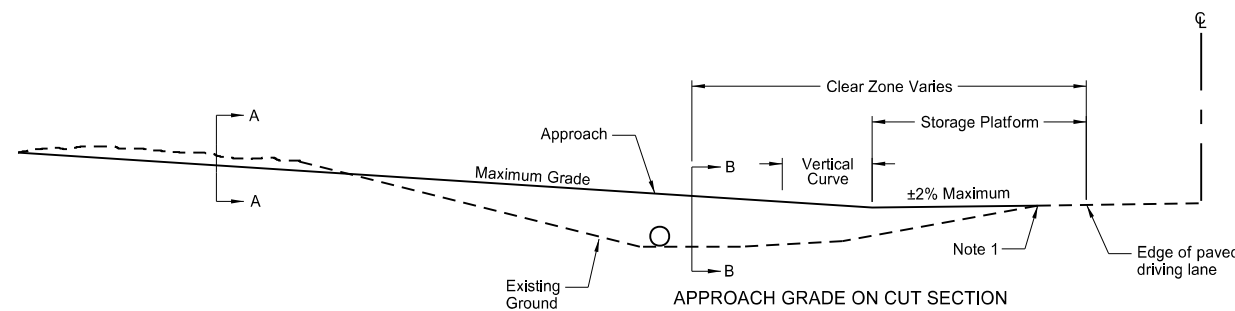
SECTION C-C



APPROACH GRADE ON FILL SECTION



APPROACH GRADE ON DEEP FILL SECTION

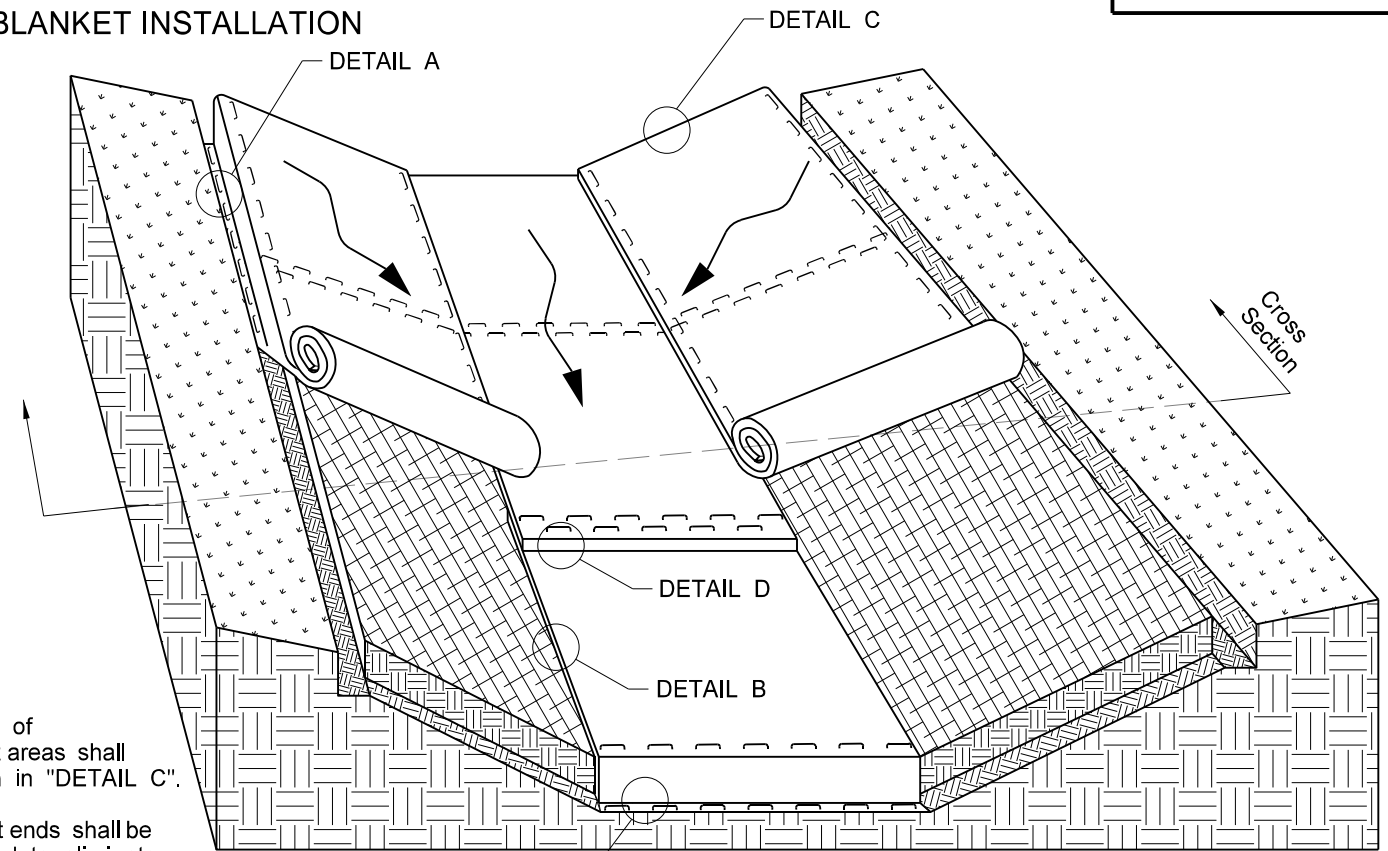
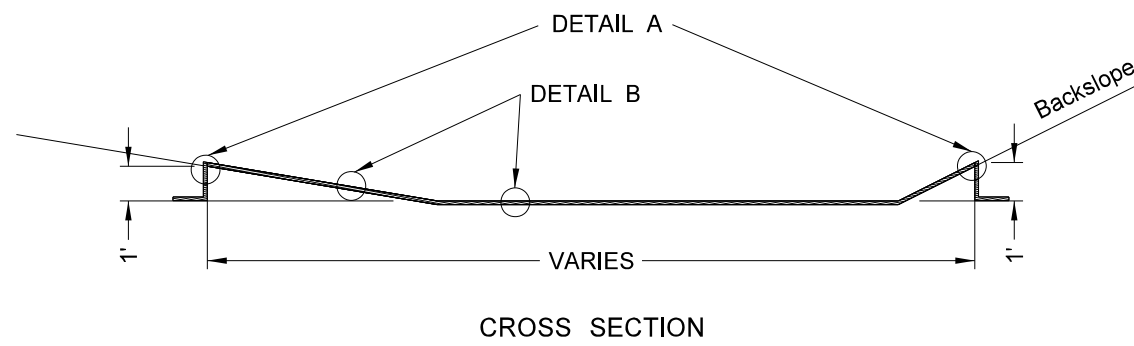


APPROACH GRADE ON CUT SECTION

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 2-25-14	
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DATE	CHANGE

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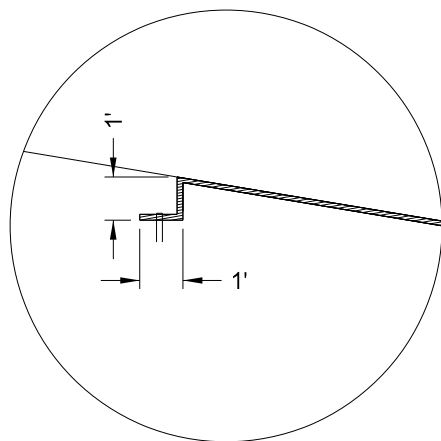
EROSION AND SILTATION CONTROL
EROSION CONTROL BLANKET INSTALLATION



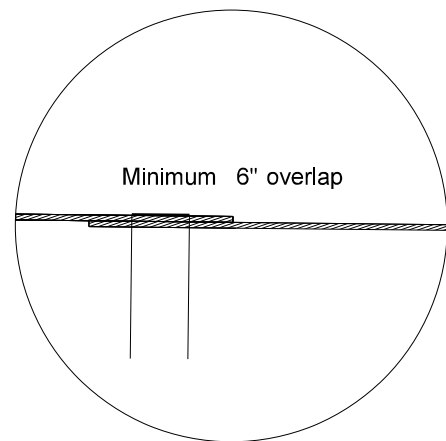
Notes:
Beginning and ending of erosion control blanket areas shall be installed as shown in "DETAIL C".

Erosion control blanket ends shall be entrenched and stapled to eliminate undermining on side slopes.

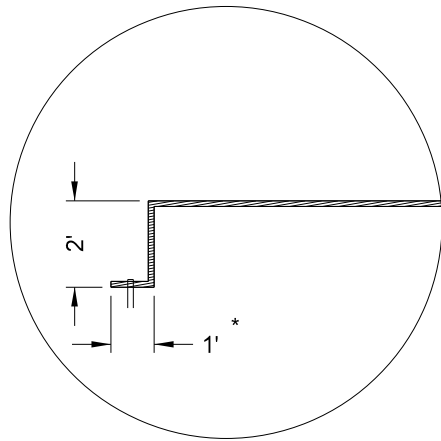
BLANKET LAYOUT
CHANNEL OR SLOPE INSTALLATION



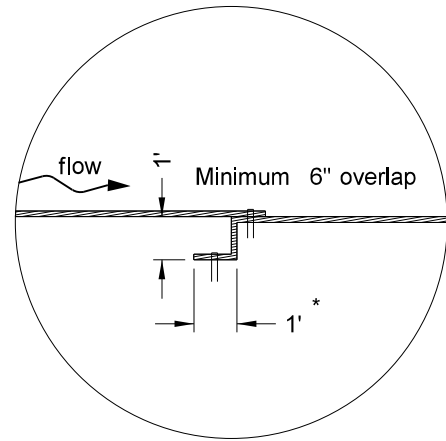
DETAIL A



DETAIL B



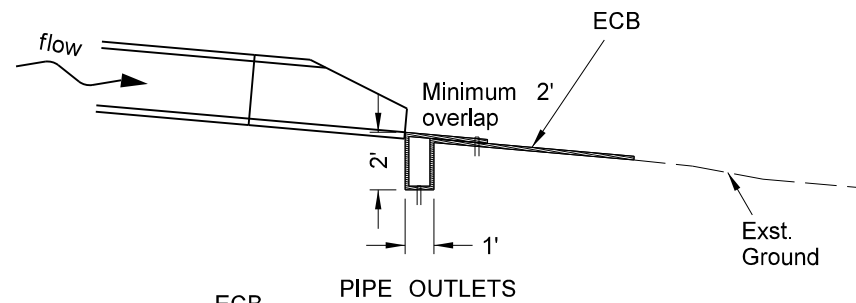
DETAIL C



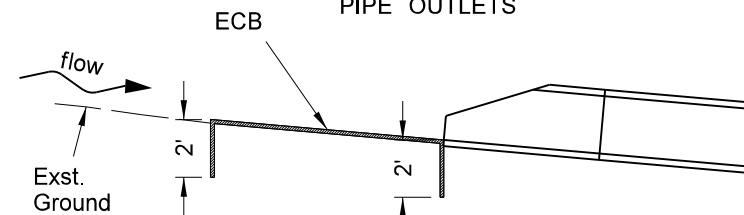
DETAIL D

* This tie may be placed ahead or back.

DETAILS
CHANNEL OR SLOPE INSTALLATION



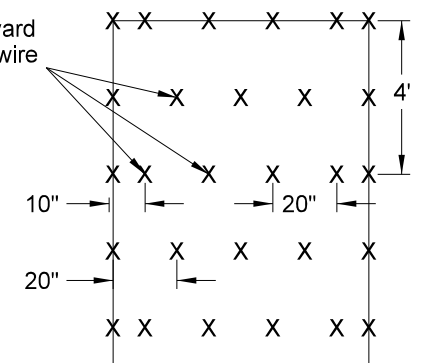
PIPE OUTLETS



PIPE INLETS

INSTALLATION AT PIPE ENDS

3.8 staples per square yard using 8-inch 11 gauge wire "u" staples.



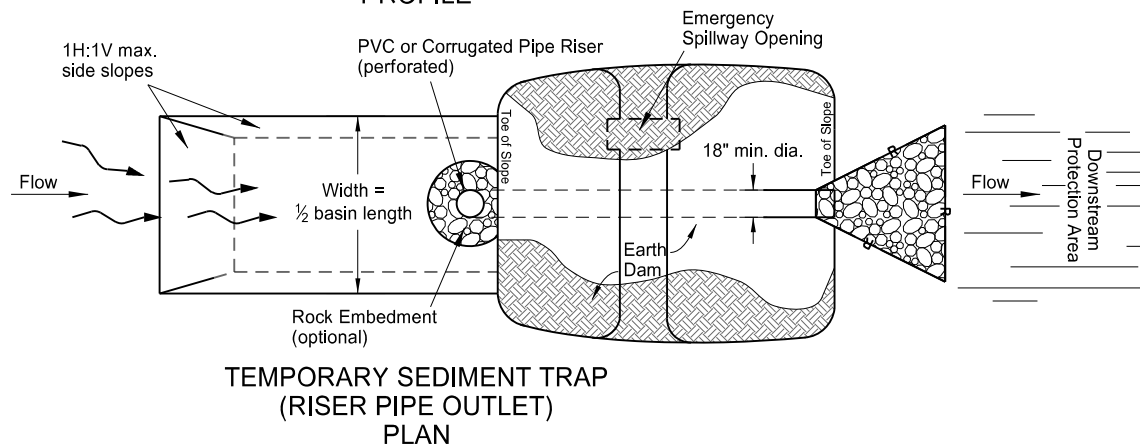
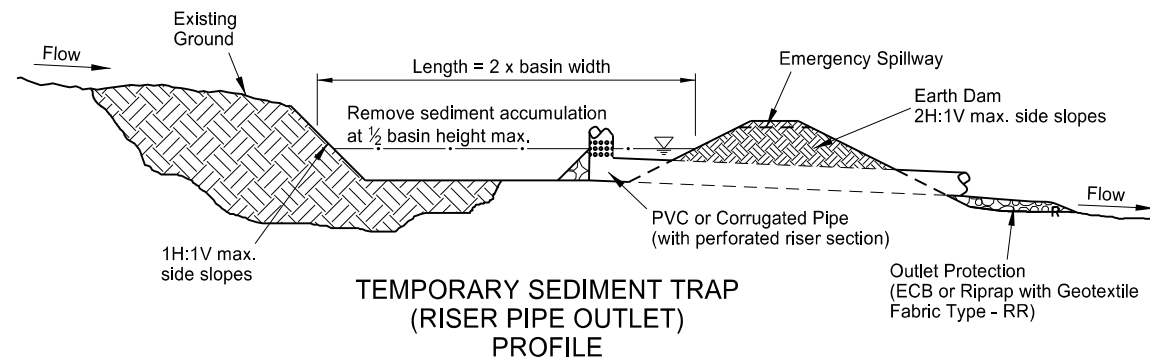
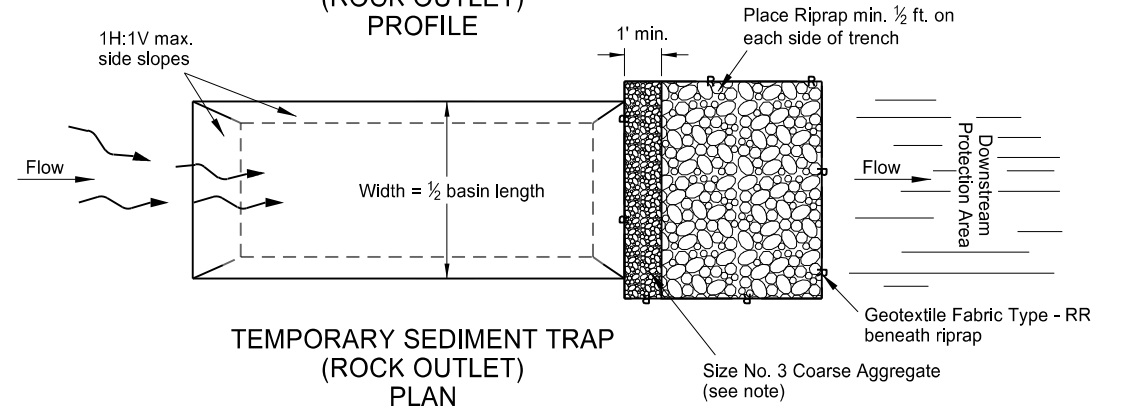
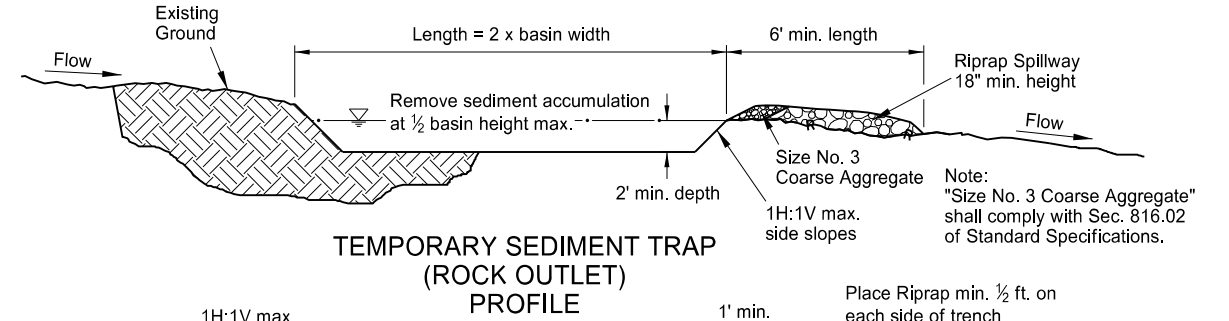
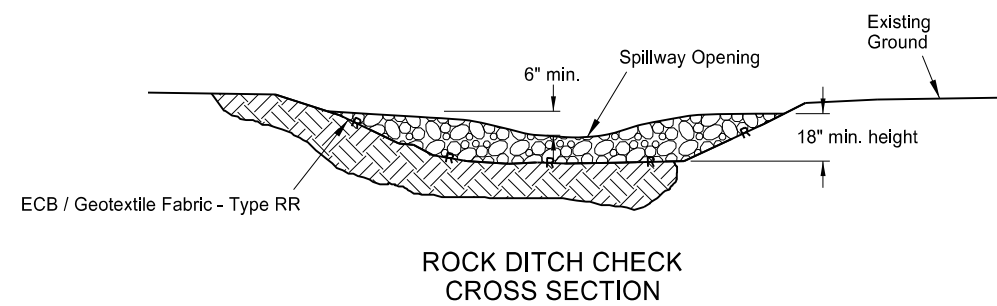
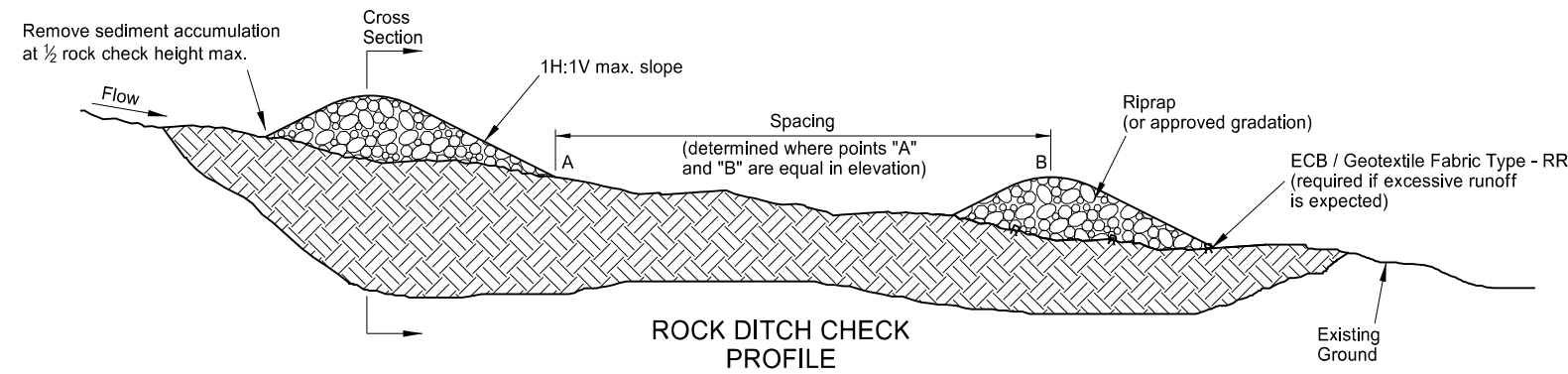
STAPLE PATTERN

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-5 to D-255-2.

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Registration Number
PE-2930,
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EROSION AND SILTATION CONTROLS

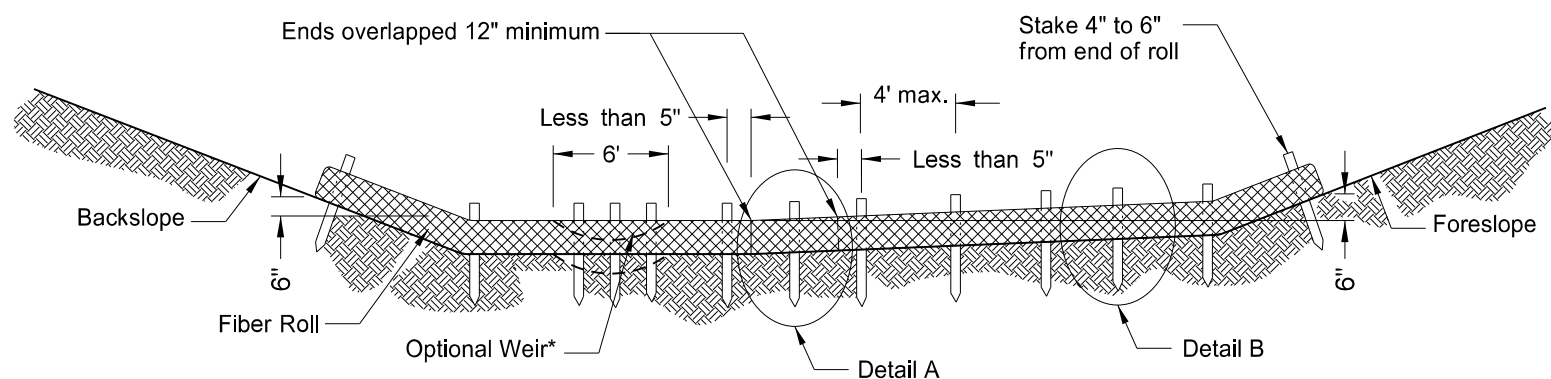
D-256-1



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-2 to D-256-1. Deleted silt fence details.

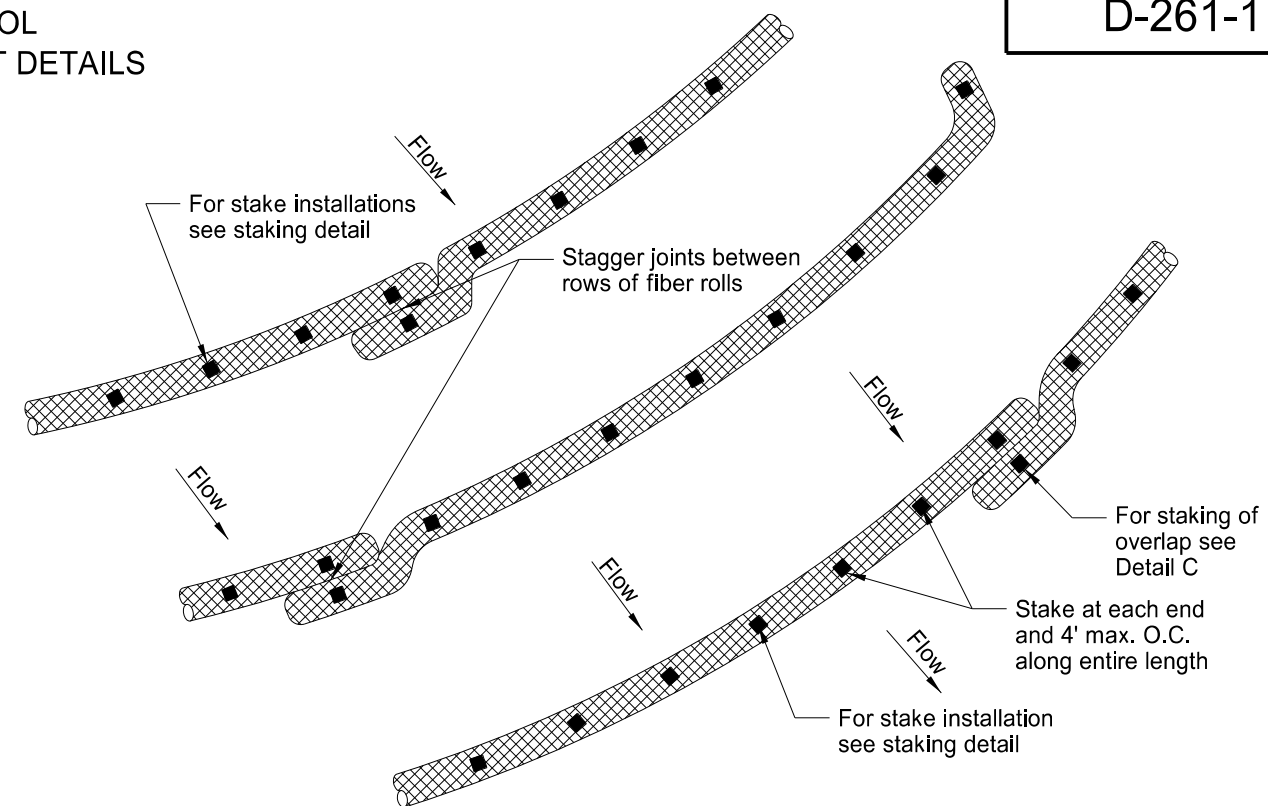
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EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

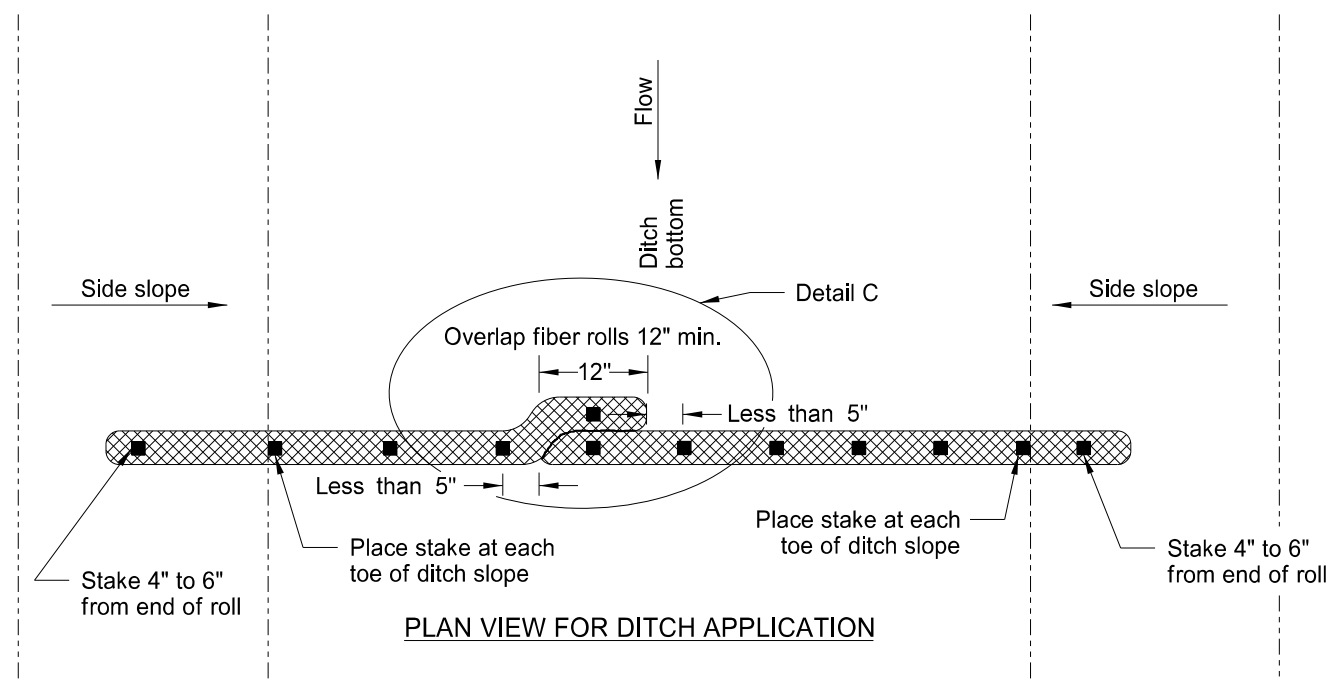


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

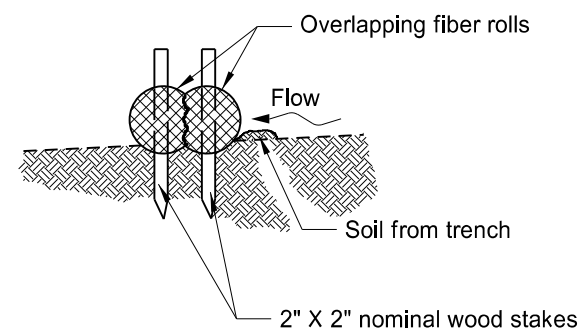
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



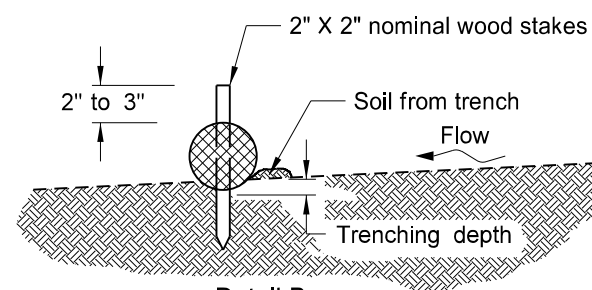
PLAN VIEW FOR SLOPE APPLICATION



PLAN VIEW FOR DITCH APPLICATION



Detail A
Fiber Roll Overlapping Staking Detail



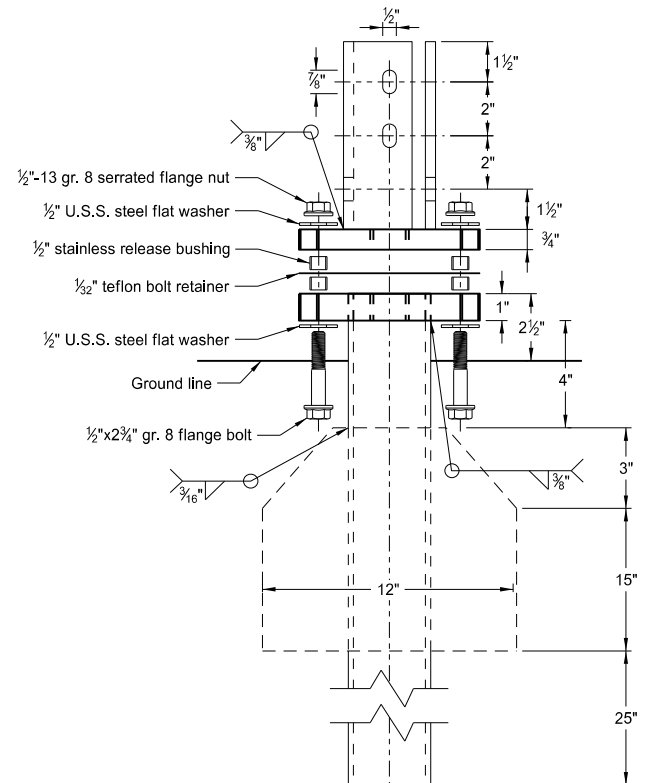
Detail B
Fiber Roll Staking Detail

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.

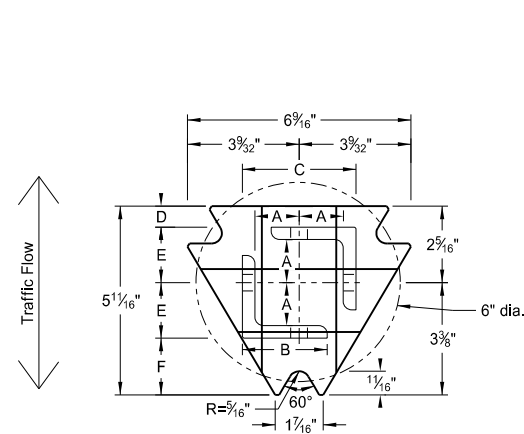
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-18-10	
REVISIONS	
DATE	CHANGE
06-10-13	Added plan view for ditch and slope application, Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.
06-26-14	Changed standard drawing number from D-708-7 to D-261-1

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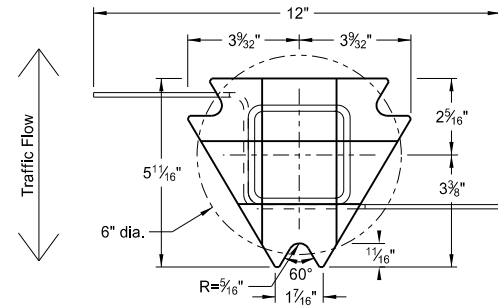


Multi-Directional Slip Base Assembly

Perforated Tube



Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2 1/2" x 2 1/2" x 3/8" ASTM A36 structural angle



Bottom Soil Stub
Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50

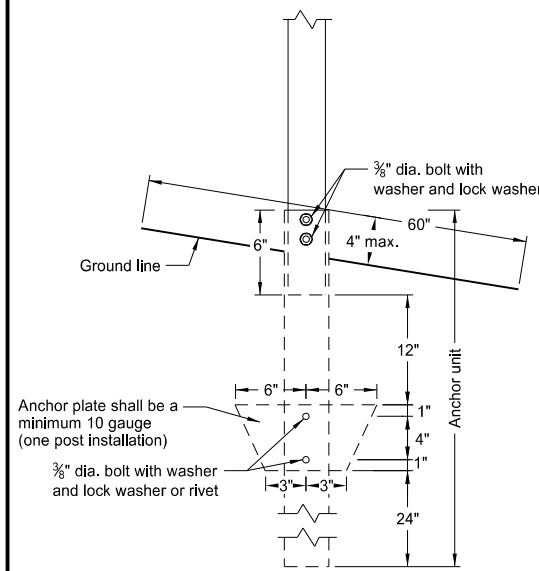
Notes:

1. Slip base bolts shall be torqued as specified by the manufacturer.
2. Anchor shall have a yield strength of 43.9 KSI and tensile strength of 59.3 KSI.
3. The 4" vertical clearance is required for the anchor or breakaway base. The 4"x60" measurement shall be made above and below post location and also back and ahead of the post.
4. When used in concrete sidewalk, anchor shall be same except without the wings.
5. Four post signs shall have over 7' between the first and the fourth posts.

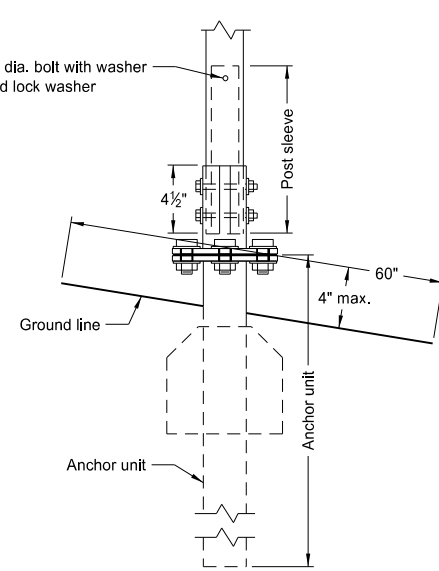
Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thickness Gauge	Sleeve Size in.	Wall Thickness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2 1/4
1	2 1/4	12			No	2 1/2
1	2 1/2	12			(A)	3
1	2 1/2	10			Yes	
1	2 1/4	12	2	12	Yes	
1	2 1/2	12	2 1/4	12	Yes	
2	2	12			No	2 1/4
2	2 1/4	12			No	2 1/2
2	2 1/2	12			Yes	
2	2 1/2	12			Yes	
2	2 1/4	10	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	

Properties of Telescoping Perforated Tube						
Tube Size in.	Wall Thickness in.	U.S. Standard Gauge	Weight per Foot lbs.	Moment of Inertia in. ⁴	Cross Sec. 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

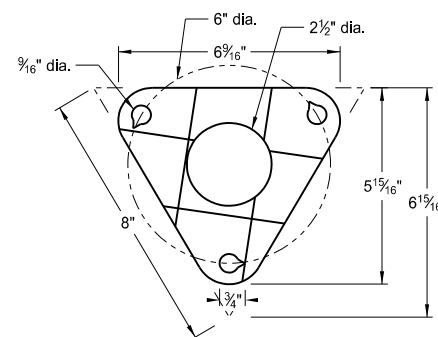
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2 3/16" x 10 ga.	1 9/64"	2 1/2"	3 1/32"	2 5/32"	1 33/64"	1 1/8"
2 1/2" x 10 ga.	1 9/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"



Anchor Unit and Post Assembly

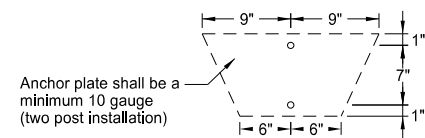


Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly



Bolt Retainer for Base Connection
Bolt Retainer - 1/32" Reprocessed Teflon

- (A) The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak.
(B) The 2 3/16" x 10 ga. may be inserted into 2 1/2" x 10 ga. for additional wind load.

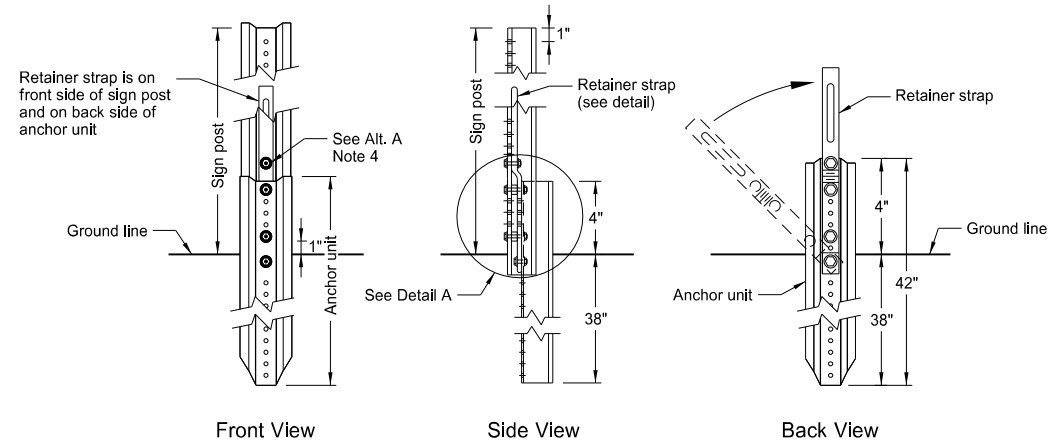
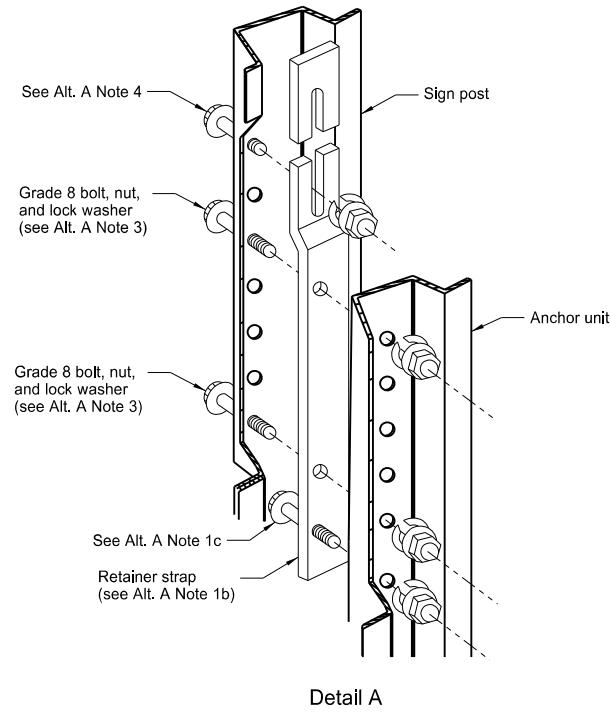


Anchor plate shall be a minimum 10 gauge (two post installation)

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE

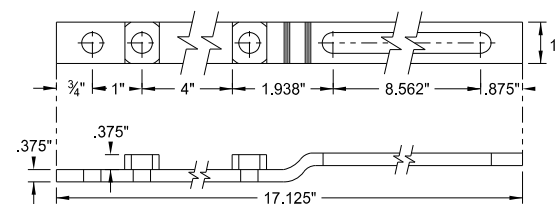
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U-Channel Post

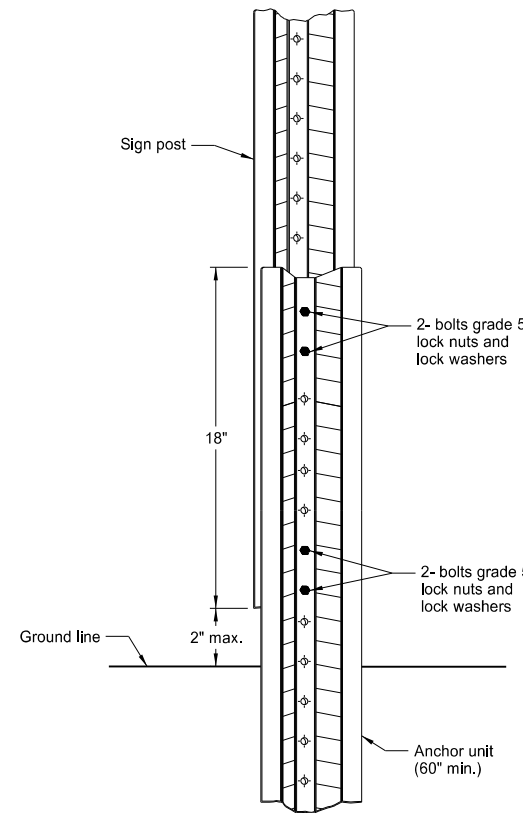


Breakaway U-Channel Detail Alternate A

A maximum of 2 posts shall be installed within 7'.

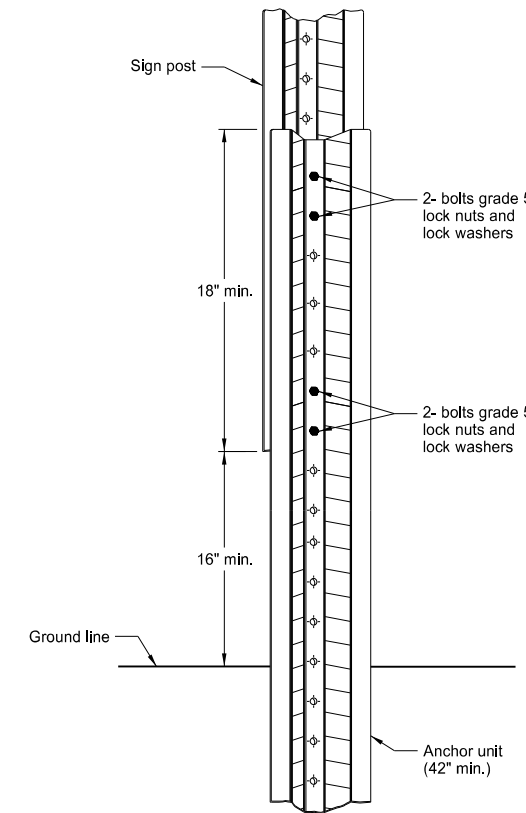


Retainer Strap Detail



Breakaway U-Channel Splice Detail Alternate B (2.5 and 3 lb/ft)

A maximum of 3 posts shall be installed within 7'.



Breakaway U-Channel Splice Detail Alternate C (2.5 and 3 lb/ft)

A maximum of 3 posts shall be installed within 7'.

Alternate A Steps of Installation:

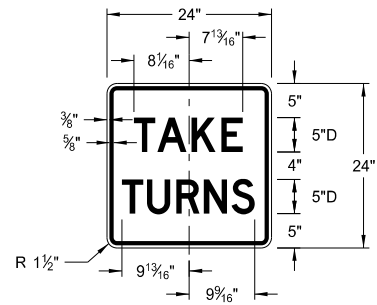
1. a) Drive anchor unit to within 12" of ground level.
b) Proper assembly established by lining up the bottom hole of retainer strap with the 6th hole from the top of the anchor unit.
c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
d) Rotate strap 90° to left.
2. a) Drive anchor unit to 4" above ground.
b) Rotate strap to vertical position.
3. a) Place 5/16"x2" bolt, lock washer and nut in bottom of sign post to facilitate alignment of sign post with proper hole in anchor unit.
b) Alternately tighten two connector bolts.
4. Complete assembly by tightening 5/16"x2" bolt (this fastens sign post to retainer strap).
5. The base post, strap and 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.

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2-28-14	
REVISIONS	
DATE	CHANGE

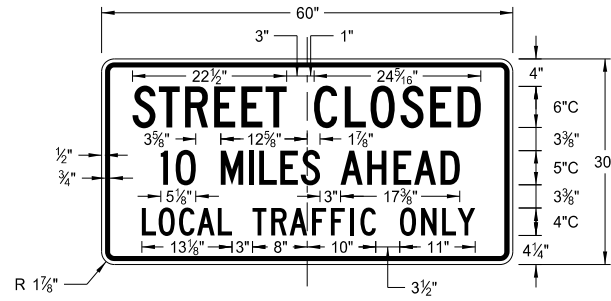
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CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS

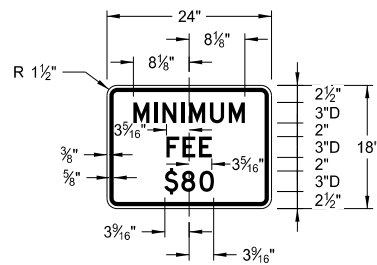
D-704-10



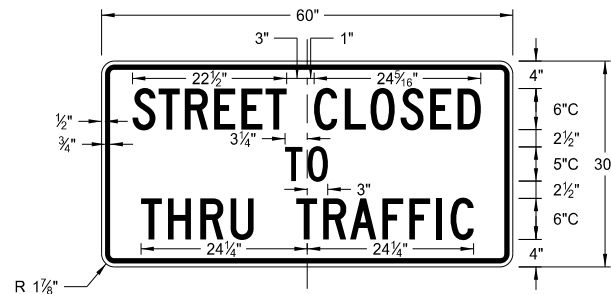
R1-50-24
Legend: black (non-refl)
Background: white



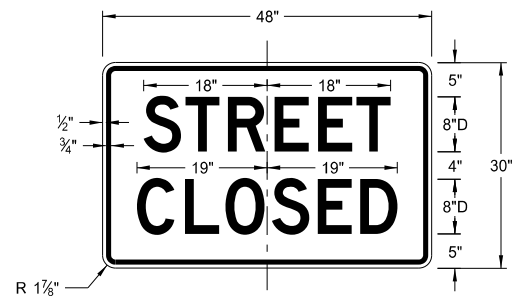
R11-3c-60
Legend: black (non-refl)
Background: white



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



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

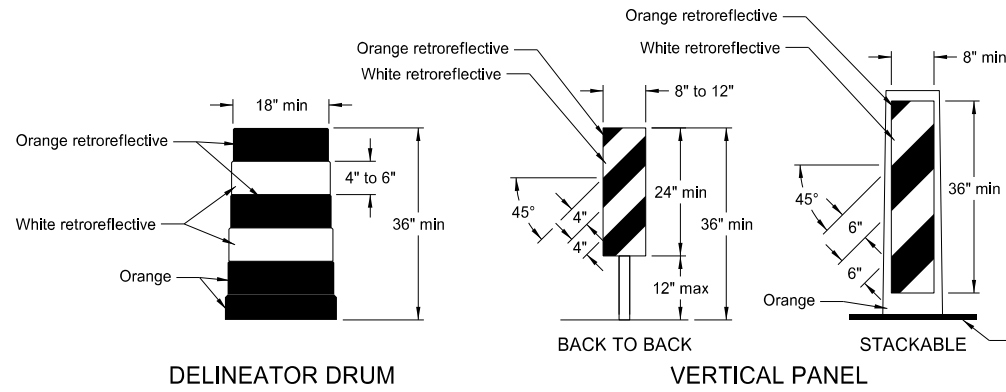


R11-2a-48
Legend: black (non-refl)
Background: white

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8-13-13	
REVISIONS	
DATE	CHANGE

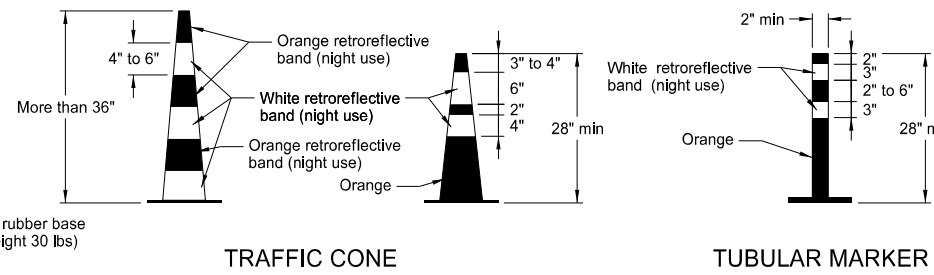
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BARRICADE AND CHANNELIZING DEVICE DETAILS



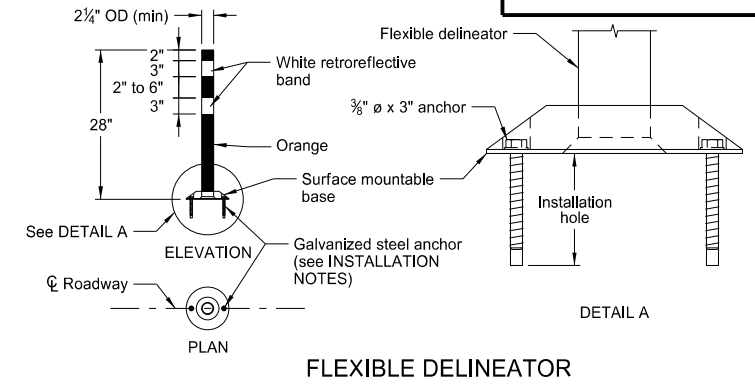
The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectORIZED spaces between the horizontal orange and white stripes shall not exceed 3" wide. Stripes shall not be placed on ribs or indentations in the drum. Drums shall have closed tops that will not allow collection of construction debris or other debris. Ballast shall not be placed on the top of a drum.

Markings for vertical panels shall be alternating orange and white retroreflective stripes, sloping downward in the direction vehicular traffic is to pass. Retroreflective sheeting shall be placed on both sides of panel and shall have a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective material on the vertical panel is 36 inches or more, a stripe width of 6 inches shall be used.



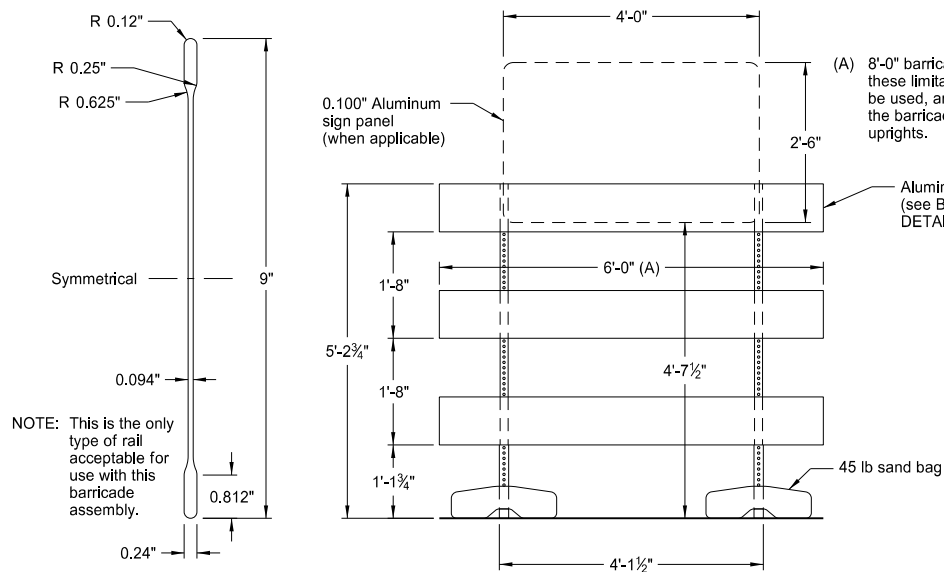
RetroreflectORIZATION of cones more than 36" in height shall be provided by alternating orange and white retroreflective stripes. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectORIZED space between the orange and white stripes shall not exceed 3" wide.

RetroreflectORIZATION of tubular markers more than 42" in height shall be provided by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



INSTALLATION NOTES:

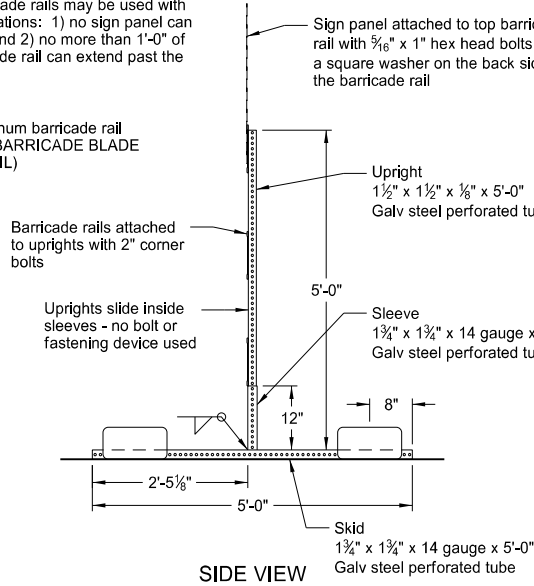
1. Drill installation holes to diameter and depth as required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, the contractor may use an 8" x 8" butyl pad or hot melt butyl. Butyl shall be removed as close as possible to pavement surface.



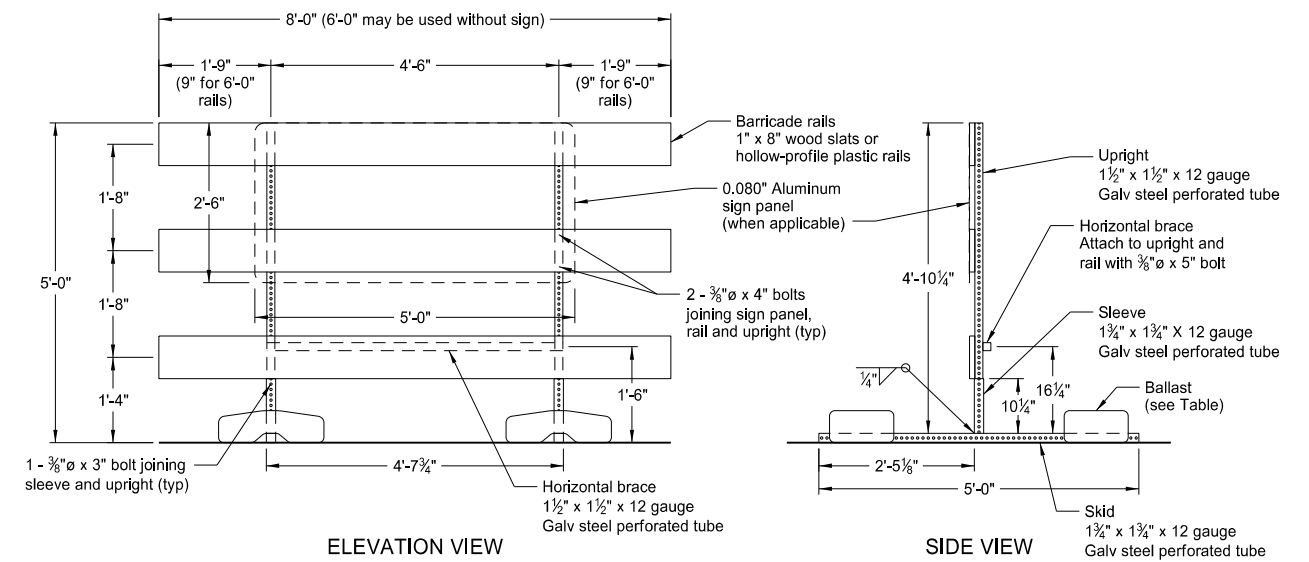
BARRICADE BLADE DETAIL

ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)



SIDE VIEW

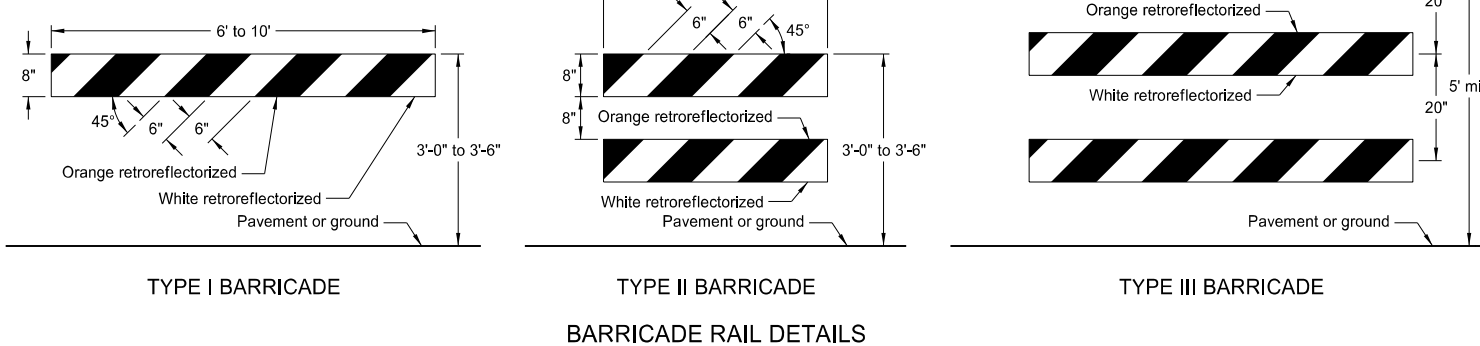


ELEVATION VIEW

SIDE VIEW

BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

NOTE: Markings for barricades shall be alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Retroreflective sheeting shall be placed on both sides of the rails and shall have a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the barricade length is less than 36", the rail stripe width shall be 4".

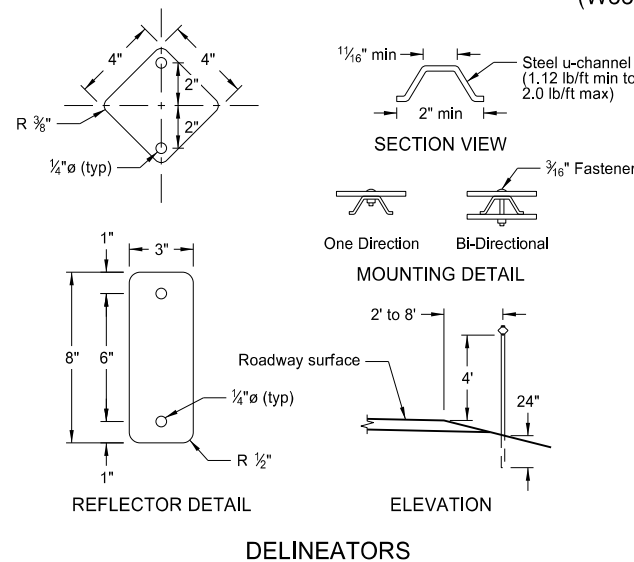


TYPE I BARRICADE

TYPE II BARRICADE

TYPE III BARRICADE

BARRICADE RAIL DETAILS



REFLECTOR DETAIL

ELEVATION

DELINEATORS

MINIMUM BALLAST (For each side of barricade support)

Without Sign	4 - 25 lb sandbags
With Sign	6 - 25 lb sandbags

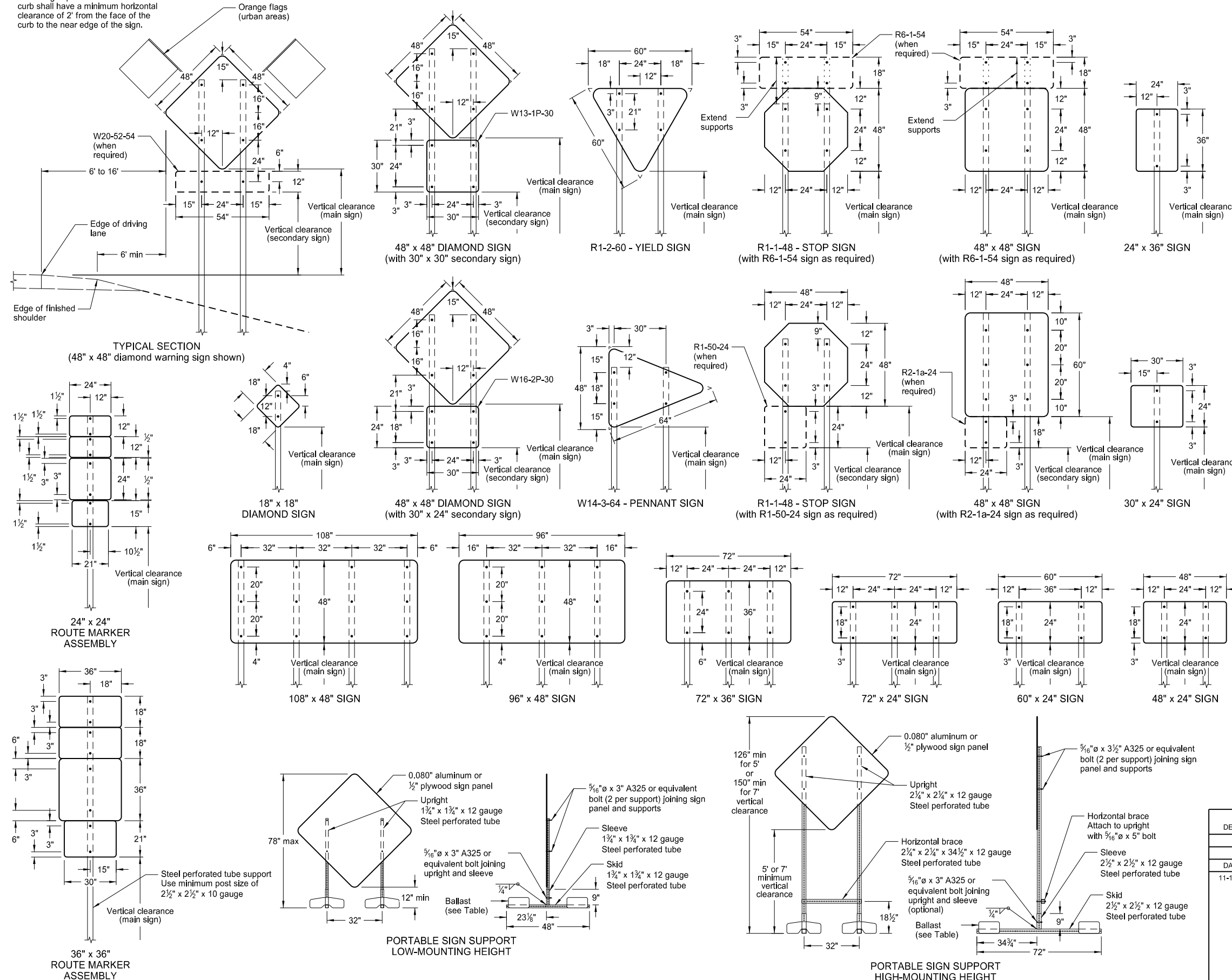
Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE

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CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



- NOTES:
- Sign Supports:** Supports shall be galvanized or painted. Minimum post sizes are 2.5 lb/ft u-channel or 2" x 2" x 12 gauge steel perforated tube, except where noted. When installing signs on u-channel, the minimum post size for assemblies containing a secondary sign is 3.0 lb/ft. Post sizes are based on a wind speed of 55 MPH.
Signs over 50 square feet should be installed on 2 1/2" x 2 1/2" perforated tube supports as a minimum.
Guy wires shall not be attached to sign supports. Wind beams may be attached to u-posts behind the sign panels.
 - Sign Panels:** Provide sign panels made of 0.100" aluminum, 1/2" plywood, or other approved material, except where noted. All holes to be punched round for 3/8" bolts.
 - Alternate Messages:** The signs that have alternate messages may have these alternate messages placed on a reflectorized plate (without a border) and installed and removed as required. (i.e. "Left" and "Right" message on a lane closure sign)
 - Route Marker Auxiliary Signs:** Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:
Interstate - white legend on blue background
Interstate Business Loop - white legend on green background
US and State - black legend on white background
County - yellow legend on blue background
 - Vertical Clearance:** Install signs with a vertical clearance of 5'-0" (see TYPICAL SECTION.) In areas where parking or pedestrian movements are likely or the view of the sign may be obstructed, install signs with a vertical clearance of 7'-0" from the top of the curb or from the near edge of the driving lane in absence of a curb.
The vertical clearance to secondary signs is 1'-0" less than the vertical clearance as stated above.
Large signs having an area exceeding 50 square feet shall have a minimum clearance of 7'-0" from the ground at the post.
 - Portable Signs:** Provide portable signs that meet the vertical clearance as stated above. Use portable signs when it is necessary to place signs within the pavement surface.
When portable signs are used for 5 days or less, low-mounting height (minimum 12" vertical clearance) sign supports may be used as long as the view of the sign is not obstructed. Time delays caused by unforeseen circumstances, such as equipment breakdown, rain, subgrade failures, etc., will not accrue towards the 5 day period. The R9-8 through R9-11a series, W1-5 through W1-8 series, M4-10, and E5-1 may be used for longer than 5 days.
Signs mounted to the portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT Details shall have a maximum surface area of 16 square feet.

MINIMUM BALLAST
(For each side of sign support base)

Sign Panel Mounting Height (ft)	Number of 25 lb sandbags for 4' x 4' sign panel
1'	6
5'	8
7'	10

Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-13	
REVISIONS	
DATE	CHANGE
11-14-13	Revised Note 6.

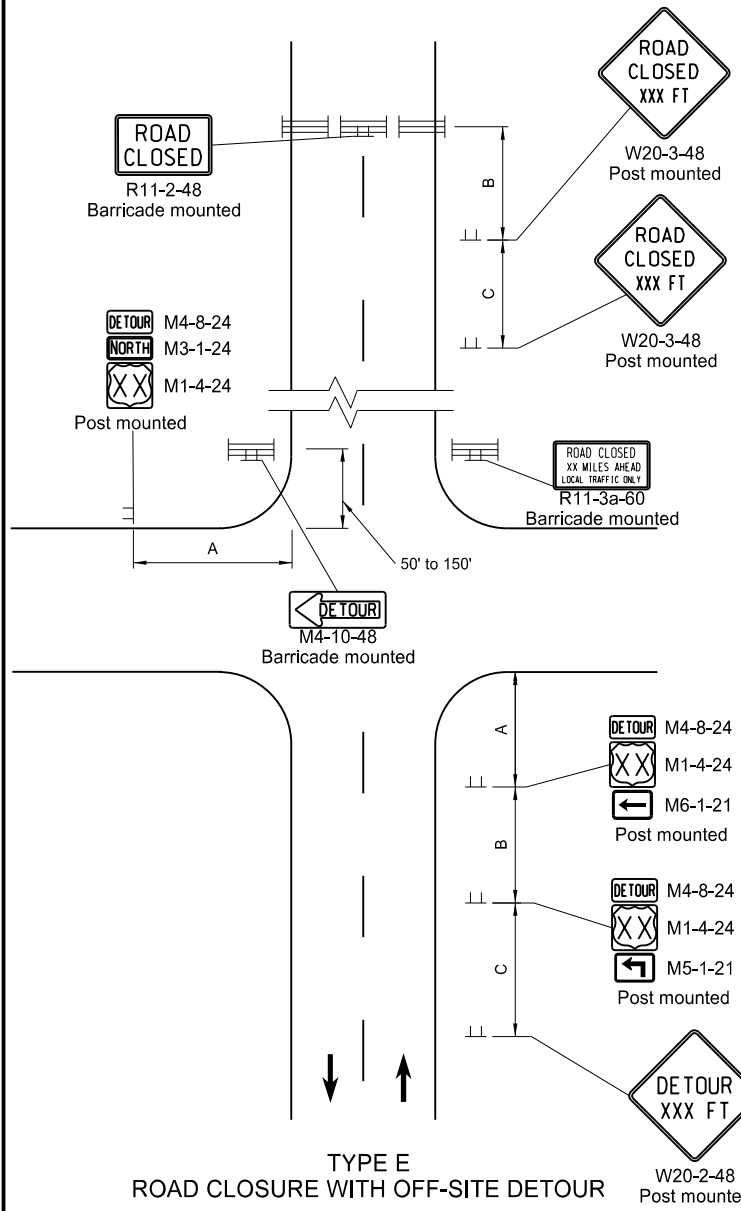
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ROAD CLOSURE AND LANE CLOSURE ON A TWO WAY ROAD LAYOUTS

D-704-19

Notes

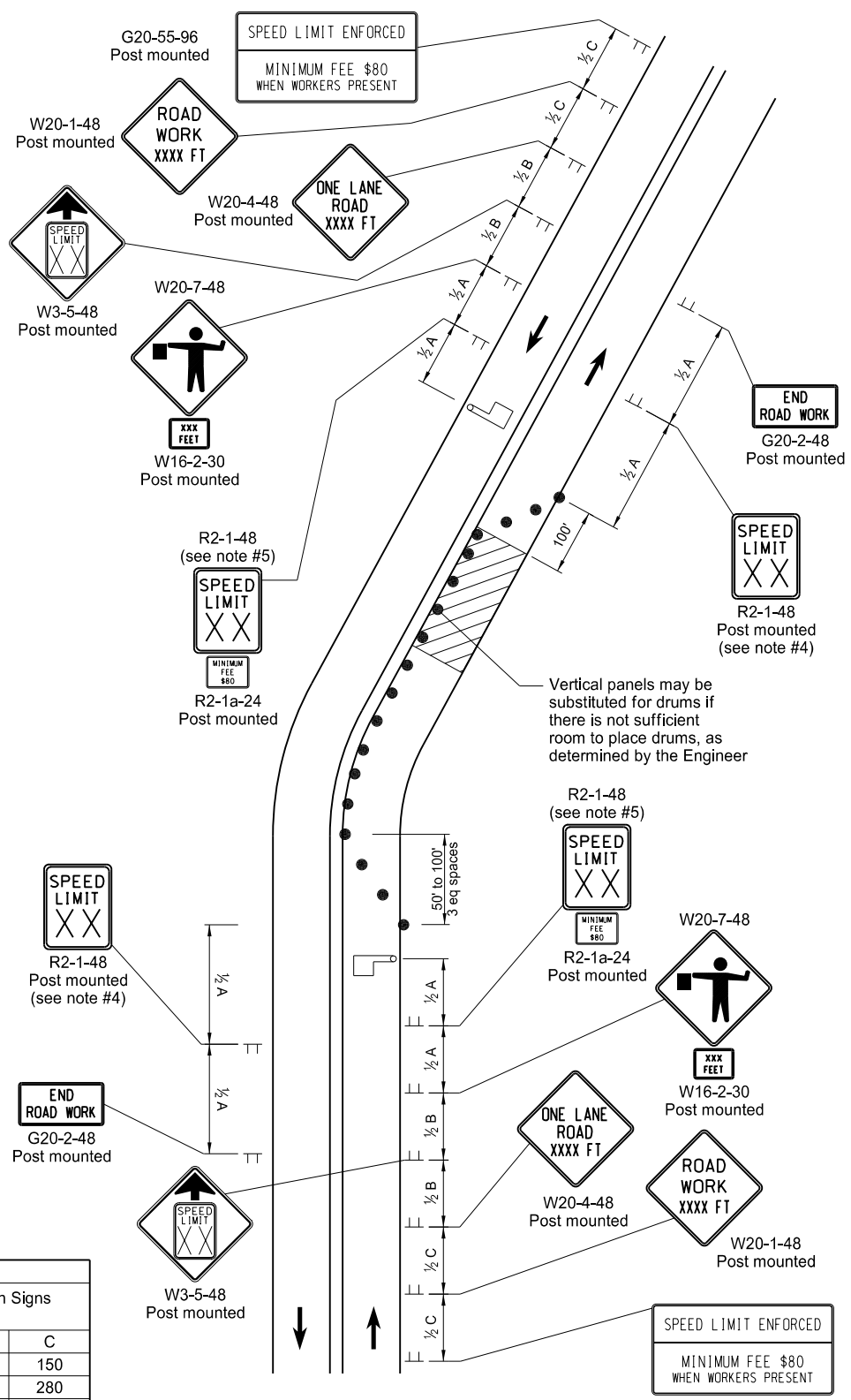
- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of taper
 - L = Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x S²/60 for urban, residential, and other streets with speeds of 40 mph or less.
- Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies.
- Delineator drums used for tapering traffic shall be placed at 3 equal spaces. Delineator drums for tangents shall be spaced at 2 times dimension "S".
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
- G20-55-96 or R2-1a-24 sign are not required when a pilot car operation is used, if this standard is part of other traffic control layouts, or the work is less than 15 days.
- When highway-rail grade crossings exist either within or in the vicinity of the roadway work activities:
 - Extra care shall be taken to minimize the probability of conditions being created, either by lane restrictions, flagging or other operations, where vehicles might be stopped within the highway-rail grade crossing (considered as being 15 feet on either side of the closest and farthest rail.)
 - A "Do Not Stop on Tracks" sign (R8-8-24) should be placed near the cross buck in each direction while the lane closure is in the vicinity of the tracks.
 - A buffer space between the work zone and the lane closure transition should be extended upstream of the highway-rail grade crossing so a queue created by the flagging operation will not extend across the highway-rail grade crossing.
 - If the queuing of vehicles across active rail tracks cannot be avoided, a flagger shall be provided at the highway-rail grade crossing to prevent vehicles from stopping within the highway-rail grade crossing, even if automatic warning devices are in place.



**TYPE E
ROAD CLOSURE WITH OFF-SITE DETOUR**

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

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



**TYPE F
LANE CLOSURE ON A TWO WAY ROAD USING FLAGGERS**

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

KEY

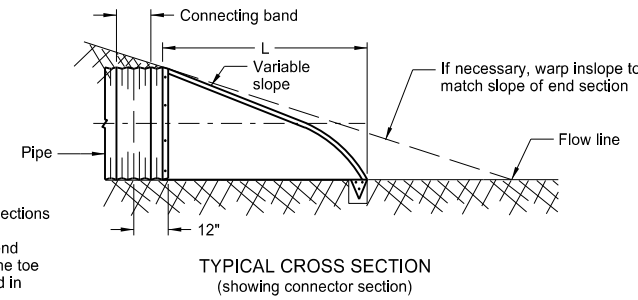
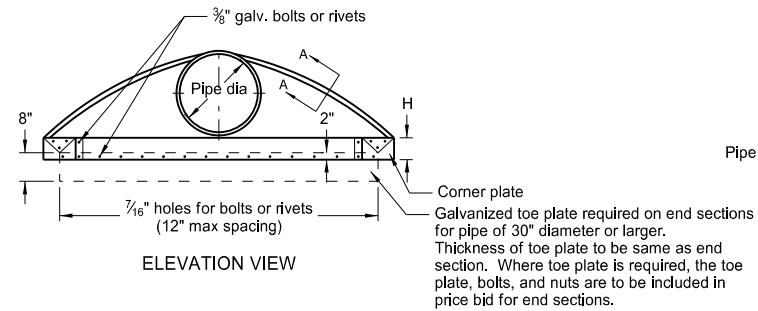
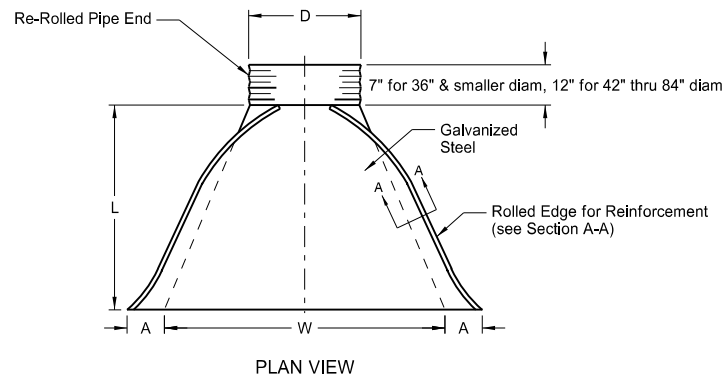
- Delineator Drum
- ▬ Sign
- ▬ Type III Barricade
- ▨ Work/Hazard Area
- ☞ Flagger

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
3-13-14	Revised Sign Cell "ROAD WORK XXX FT"

This document was originally issued and sealed by
Roger Weigel
 Registration Number
 PE-2930,
 on 03/13/14 and the original document is stored at the
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ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

D-714-4



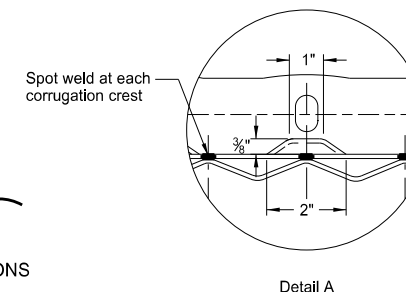
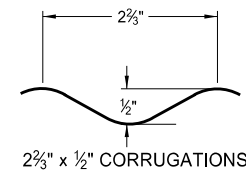
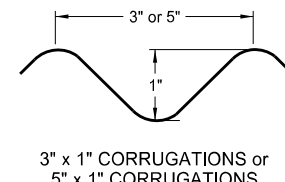
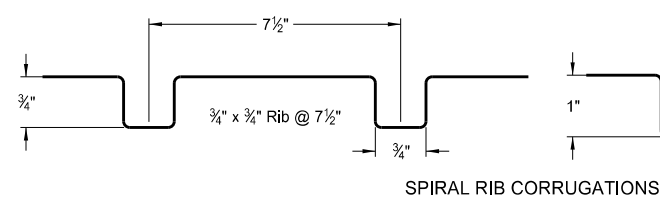
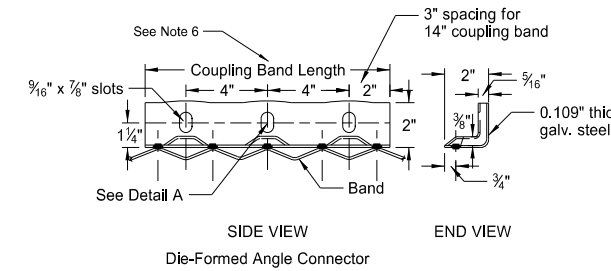
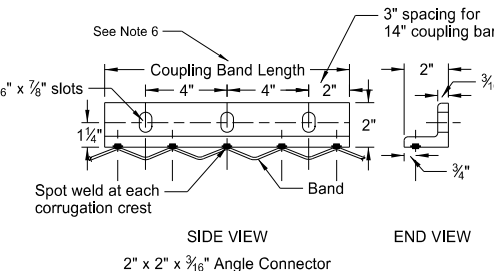
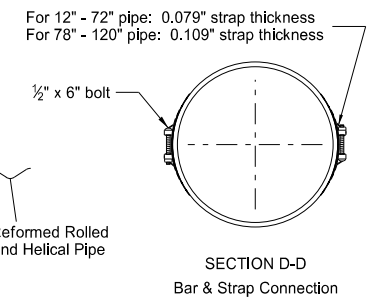
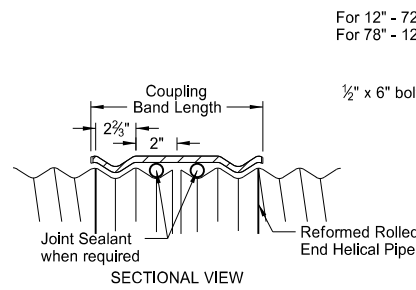
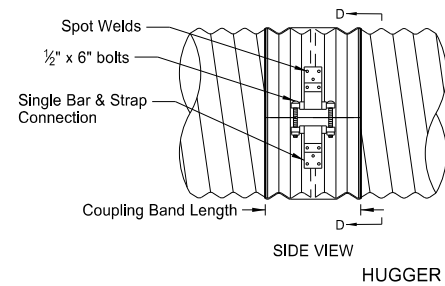
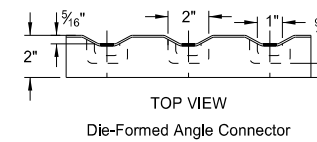
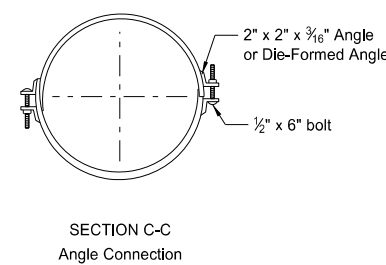
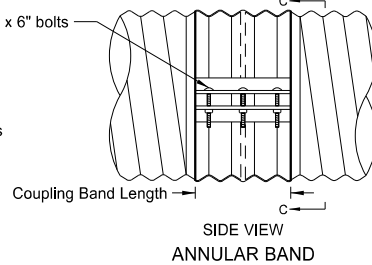
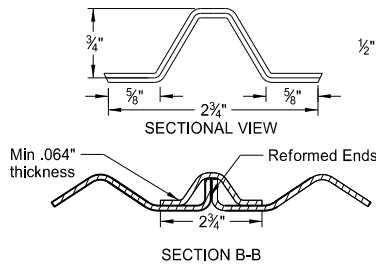
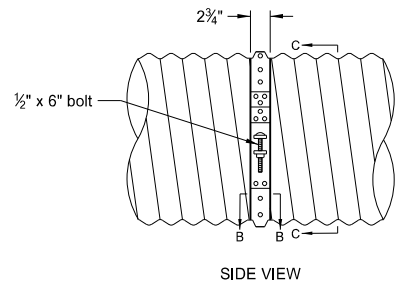
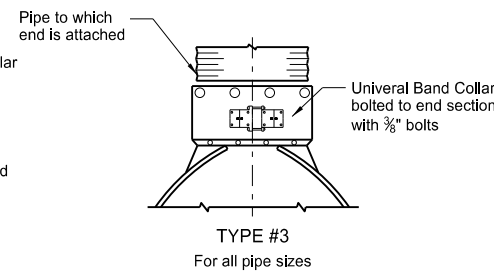
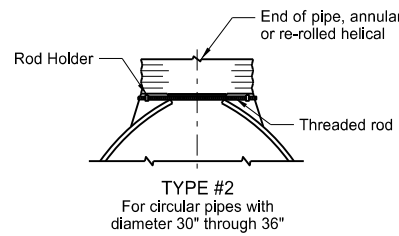
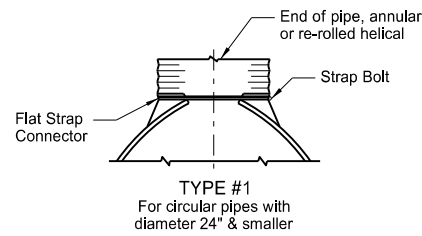
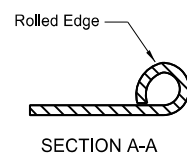
PIPE DIA. IN	GALV. THICK.	END SECTION DIMENSIONS					APPROX. SLOPE	BODY PIECE
		A IN	B IN	H IN	L IN	W IN		
15	0.064	7	8	6	26	30	2 1/2:1	1
18	0.064	8	10	6	31	36	2 1/2:1	1
24	0.064	10	13	6	41	48	2 1/2:1	1
30	0.079	12	16	8	51	60	2 1/2:1	1 or 2
36	0.079	14	19	9	60	72	2 1/2:1	2
42	0.109	16	22	11	69	84	2 1/2:1	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 ±.

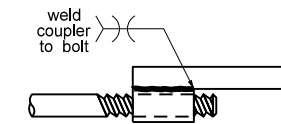
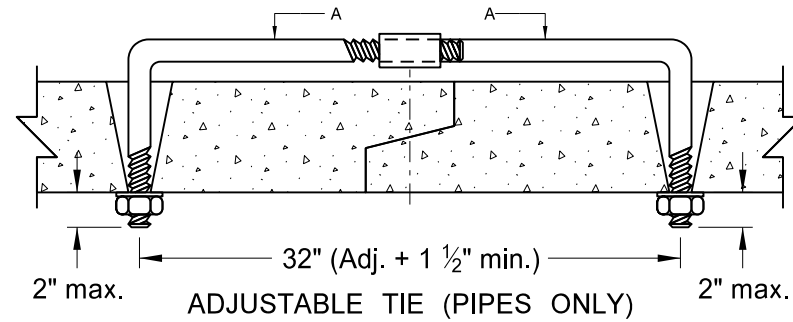
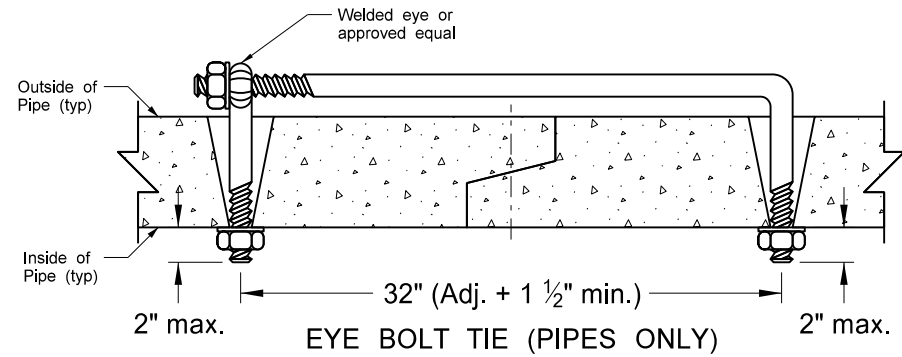
- NOTES:
1. Pipes and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
 2. Top edge of all end sections to have rolled edges for reinforcement (see Section A-A). The reinforced edges are to be supplemented with 2" x 2" x 1/4" galv. angle for 60" 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".



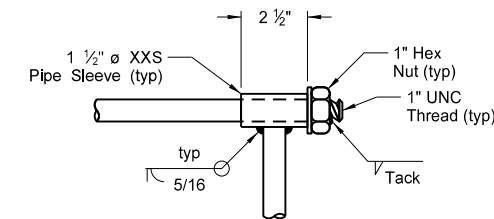
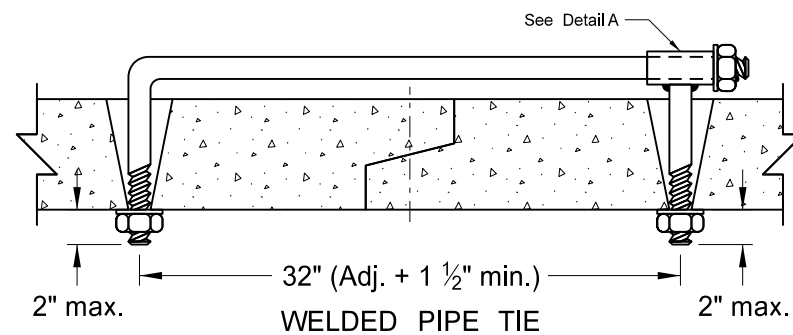
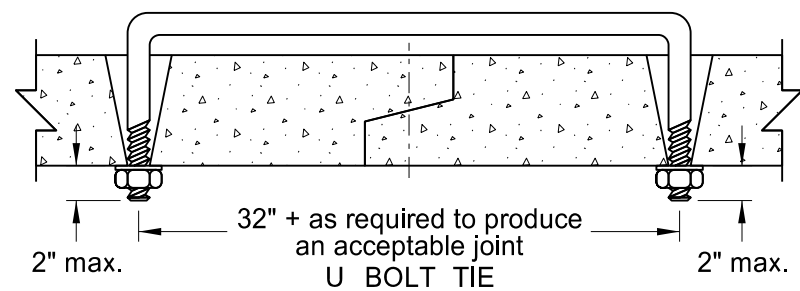
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
08-06-13	
REVISIONS	
DATE	CHANGE
01-07-14	End Section Plan View
02-27-14	3" x 1" Corrugation Detail

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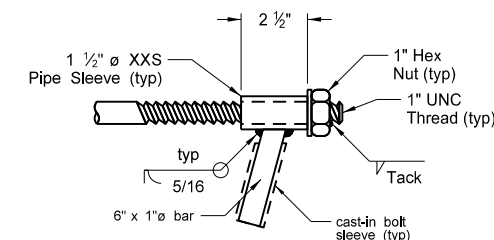
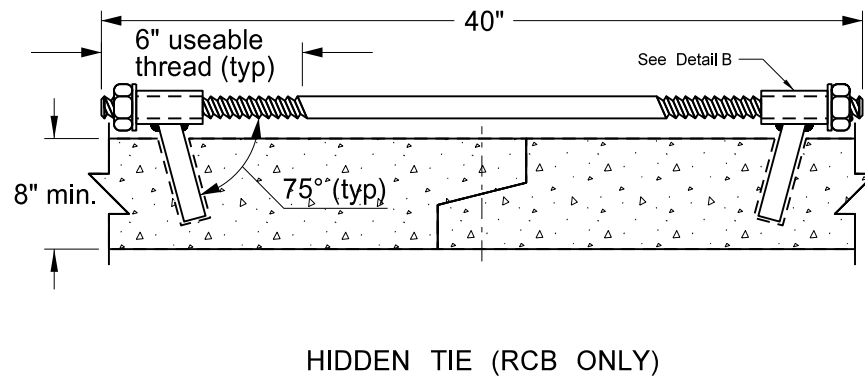
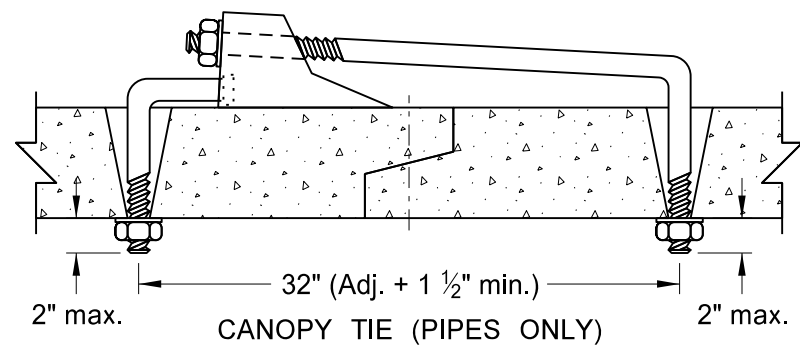
CONCRETE PIPE OR PRECAST CONCRETE BOX CULVERT TIES



SECTION A-A



DETAIL A

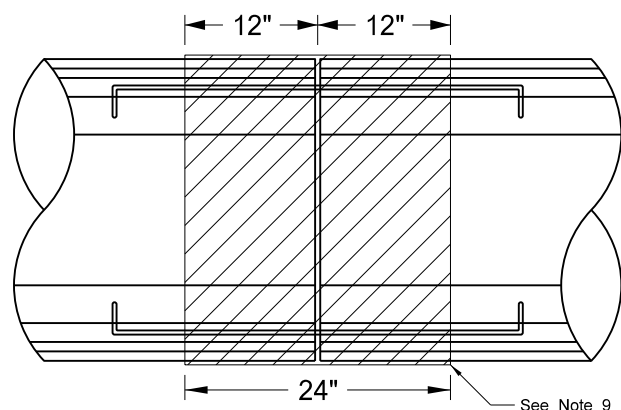


DETAIL B

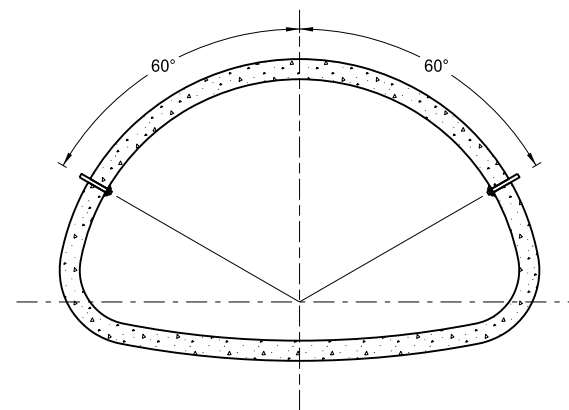
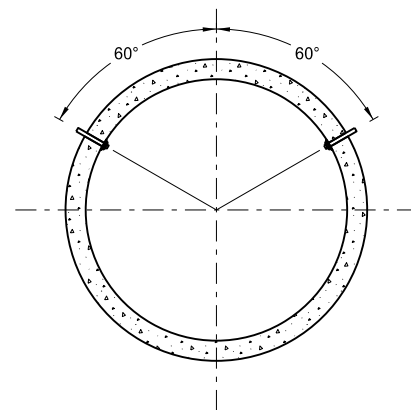
REQUIRED SIZE OF TIE BOLTS		
Pipe Size	Thread ϕ	XXS Pipe Sleeve Inner ϕ
18" - 24"	5/8" See note 2	3/4"
30" - 66"	3/4"	1"
72" - 78"	1"	1 1/4"
RCB		

NOTES:

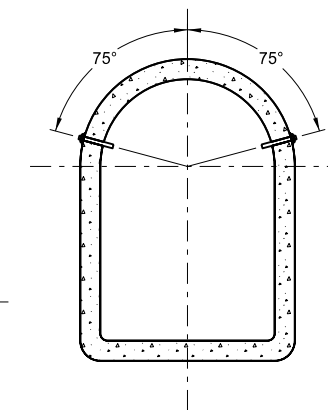
- The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
- Nuts and washers are not required on Jacked and Bored pipes or pipes with a 24" diameter or less. Where nuts and washers are not used, the tie bars shall be inserted and grouted into place.
- Ties are only for holding pipe or RCB sections together, not for pulling sections tight.
- Tie bolt assembly shall be hot dip galvanized in accordance with AASHTO M232.
- Holes in pipes to accommodate tie bolts can be precast or drilled. Tapered holes are permitted when precast. Holes shall have a diameter 1/4" larger than the diameter of the thread. Holes in precast RCB's shall contain cast-in bolt sleeves with an inside diameter of 1 1/4".
- The contractor has the option of selecting the type of tie bolt used from those shown.
- The cost of precasting or drilling the required holes and furnishing and installing the tie bolts shall be included in the price bid for the appropriate conduit or RCB pay item.
- All concrete culvert and storm sewer joints, including the end section joints, shall be tied unless otherwise specified.
- When joint wrap is specified in the plans, place wrap beneath ties. Overlap the joint by 12" in both directions.
- Tie bolts shall conform to ASTM A 36. Nuts shall be heavy hex and conform to ASTM A 563. Washers shall conform to ASTM F 436, Type 1. Welded pipe sleeves and cast-in bolt sleeves shall conform to ASTM A 53, Grade B.
- Cattle Pass and Jacked and Bored pipes shall have pipe ties inserted from the inside of the pipes and grouted into place. Jacked and bored pipes with a diameter of 24" or less do not require pipe ties.
- RCB tie locations shall be as shown on the plans.



PLAN VIEW



END VIEW



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
3-18-14	
REVISIONS	
DATE	CHANGE

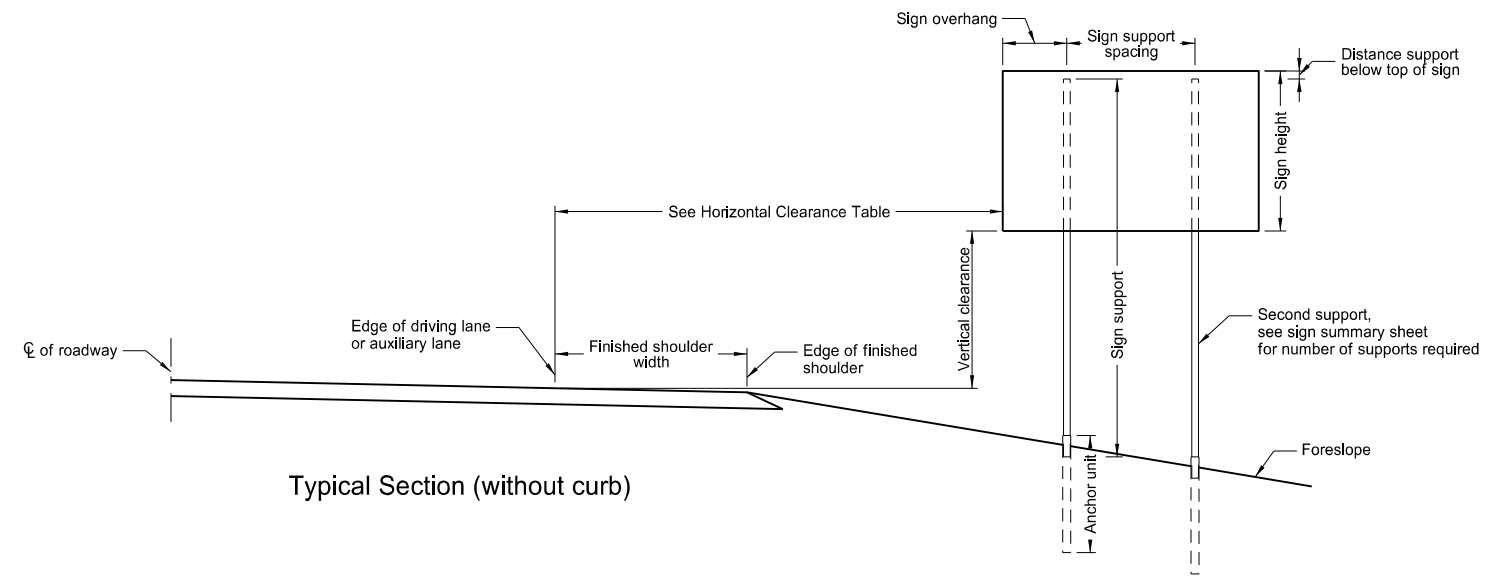
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PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

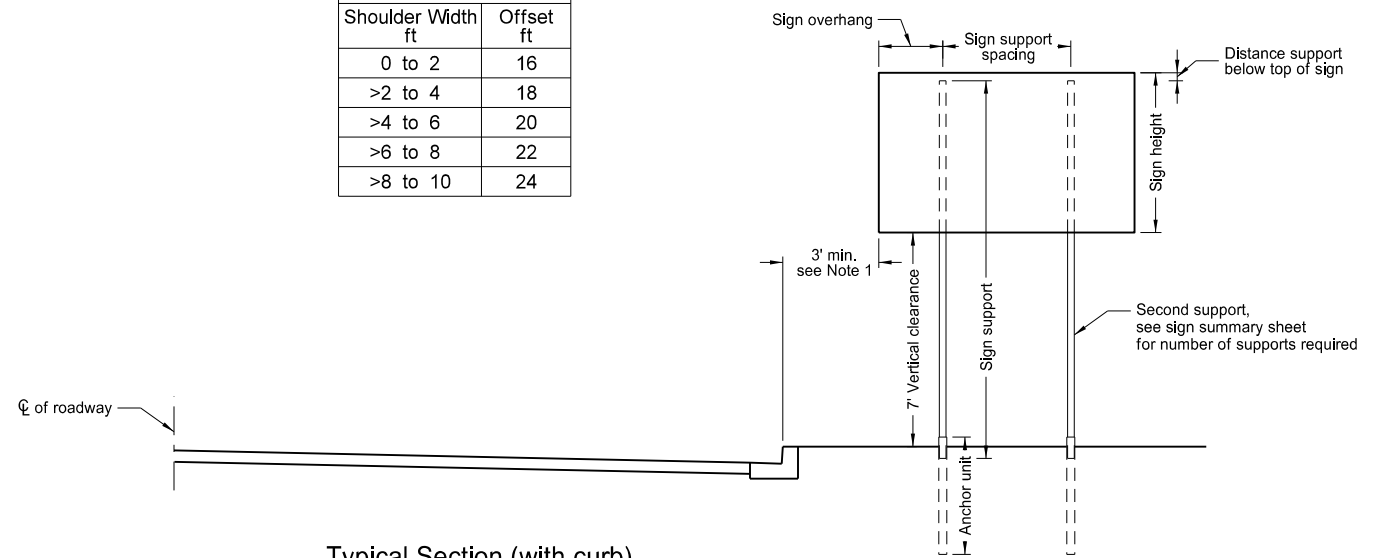
Notes:

1. Curbed Roadways: The clearance from the face of the curb should be 3' except where right of way or sidewalk width is limited, a minimum clearance of 2' shall be provided. The horizontal clearance may need to be increased to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.
2. Minimum vertical clearance: Signs installed at the side of the road in rural districts shall be at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least 7'.
- Signs on expressways shall be installed with a minimum height of 7'.
- Adopt-a-highway signs installed on Freeways shall be at least 7' above the edge of the driving lane.
- The vertical clearance shall have a maximum height of 6" above the vertical clearance specified above.
3. Offset signs: Where signs are placed at least 30 feet or more from the edge of the traveled way, the height to the bottom of such sign shall be 5' above the edge of the driving lane.
4. The clearance from edge of shared use path to edge of sign should be 3' except where width is limited, a minimum clearance of 2' shall be provided.

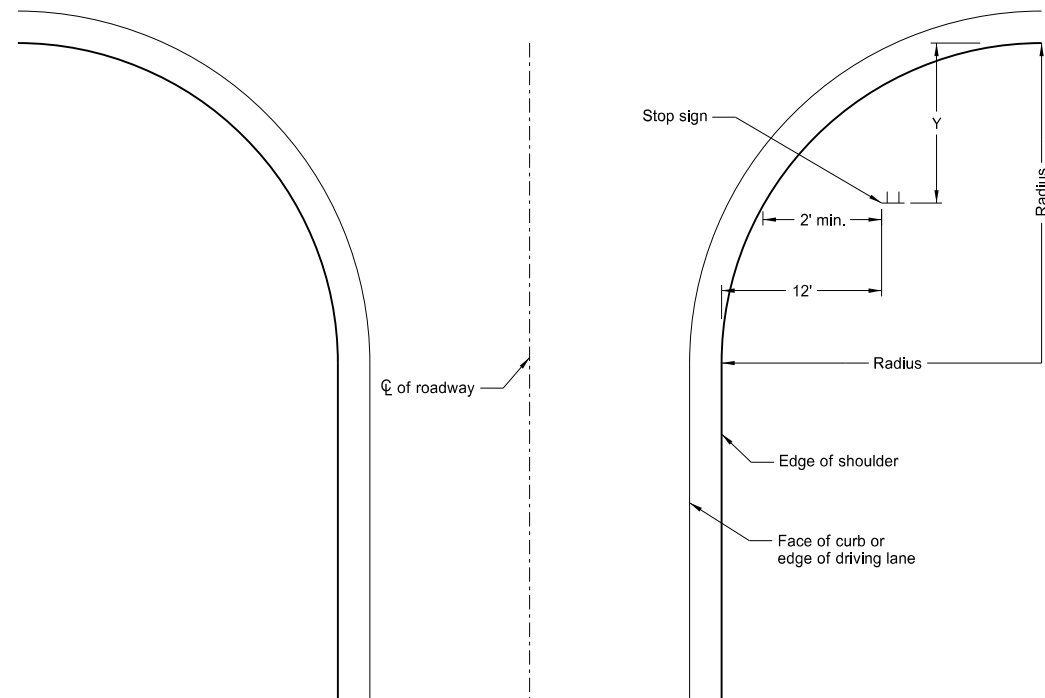


Typical Section (without curb)

Horizontal Clearance Table	
Shoulder Width ft	Offset ft
0 to 2	16
>2 to 4	18
>4 to 6	20
>6 to 8	22
>8 to 10	24



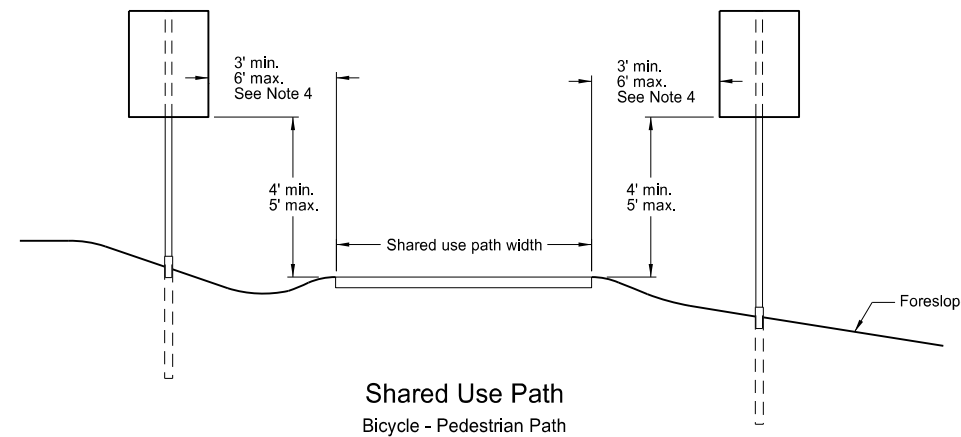
Typical Section (with curb)
Residential or Business District



Stop Sign Location
Wide Throat Intersection

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

Radius ft.	Y-max. ft.	Y-min. ft.
40	50	15
45	50	18
50	50	21
55	50	25
60	50	28
65	50	32
70	50	35
75	50	39
80	50	43

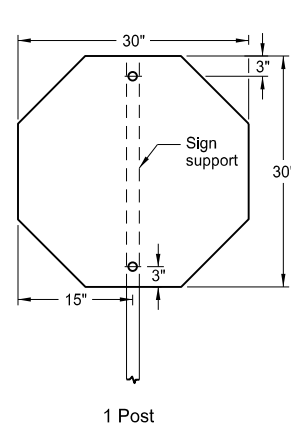


Shared Use Path
Bicycle - Pedestrian Path

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-8-14	Revised note 2, added note 4.

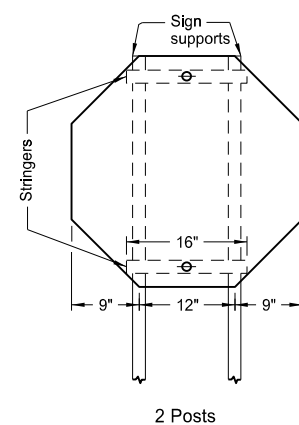
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 Registration Number
 PE-2930,
 on 7/8/14 and the original document is stored at the
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS

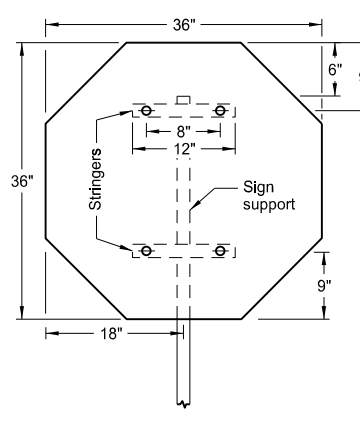


1 Post

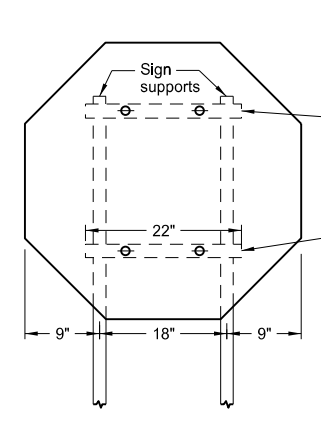
Assembly No. 1



2 Posts

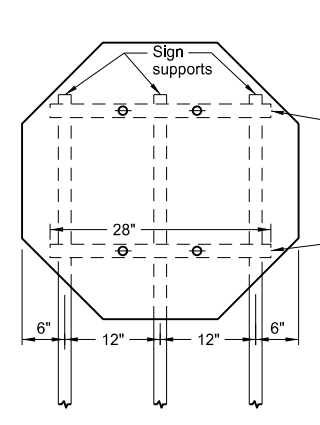


1 Post



2 Posts

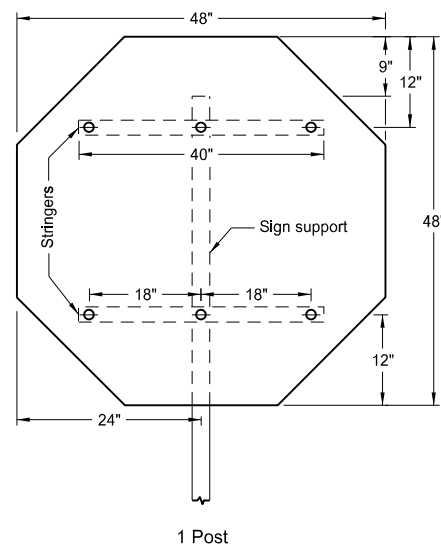
Assembly No. 2



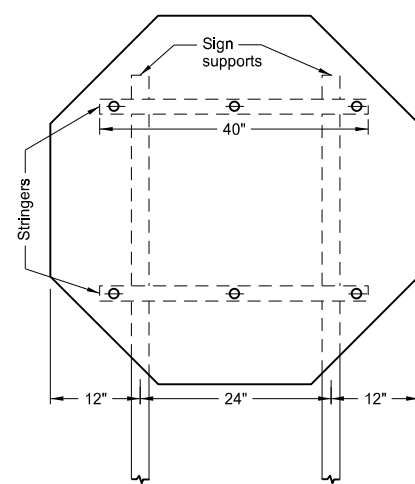
3 Posts

Notes:

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

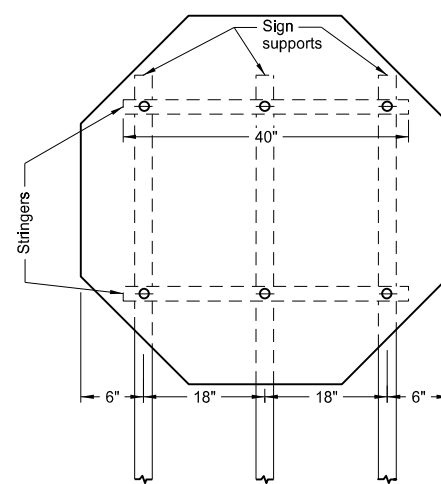


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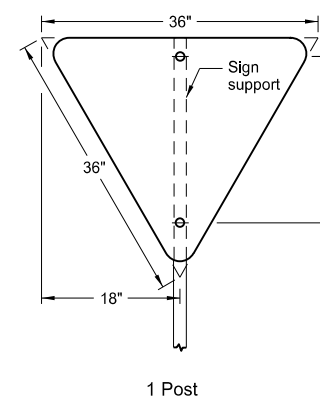


2 Posts

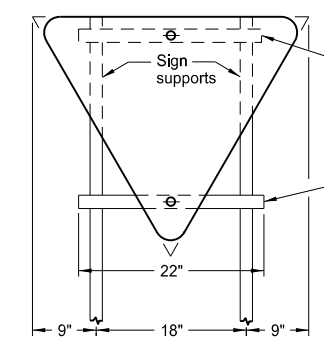
Assembly No. 3



3 Posts

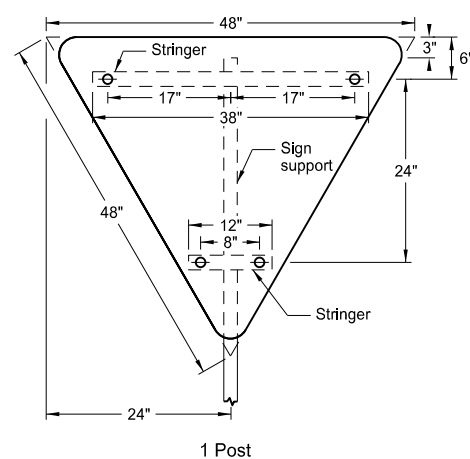


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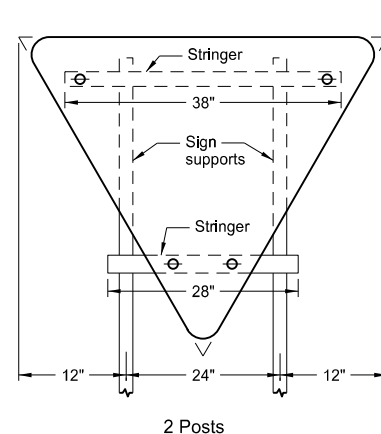


2 Posts

Assembly No. 4

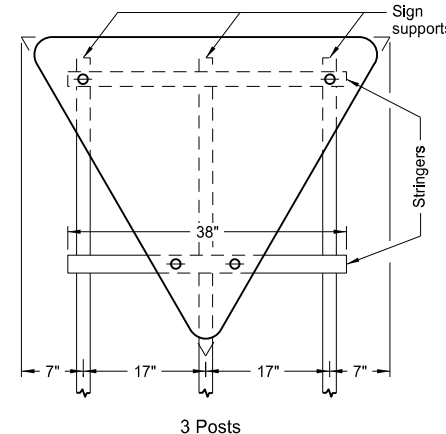


1 Post



2 Posts

Assembly No. 5



3 Posts

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

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