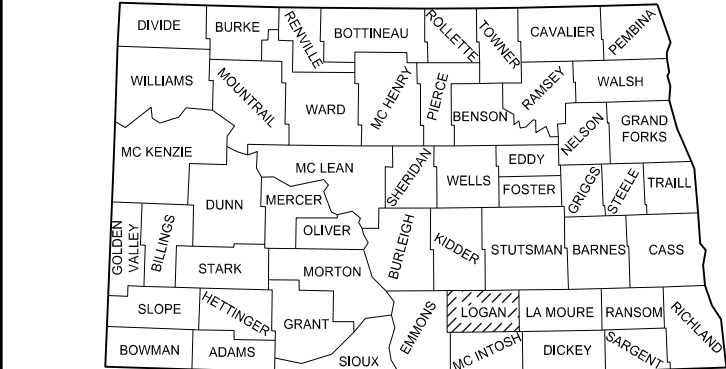


DESIGN DATA				
Traffic	Average Daily			Max.Hr.
Current 2018	Pass:	Trucks:	Total: <100	
Forecast 2038	Pass:	Trucks:	Total: <100	
Clear Zone Distance: 18 feet		Design Speed: 55 MPH		
Minimum Sight Dist. for Stopping: 495		Bridges: HL-93		
Minimum Sight Dist. for Safe Passing: N/A				
Sight Dist. for No Passing Zone: N/A				
Pavement Design Life: N/A				



STATE COUNTY MAP

DESIGNERS
Shawn Mayfield, PE
Jared Loegering, PE

**BEGIN PROJECT BRC-CNOC-2416(069)**  
Sta. 14+00 = A Point Approximately  
84 Feet West and 2,085 Feet South  
of the Northwest Corner of Sec. 33,  
Twp. 134 N., Rge. 71 W.

JOB #9

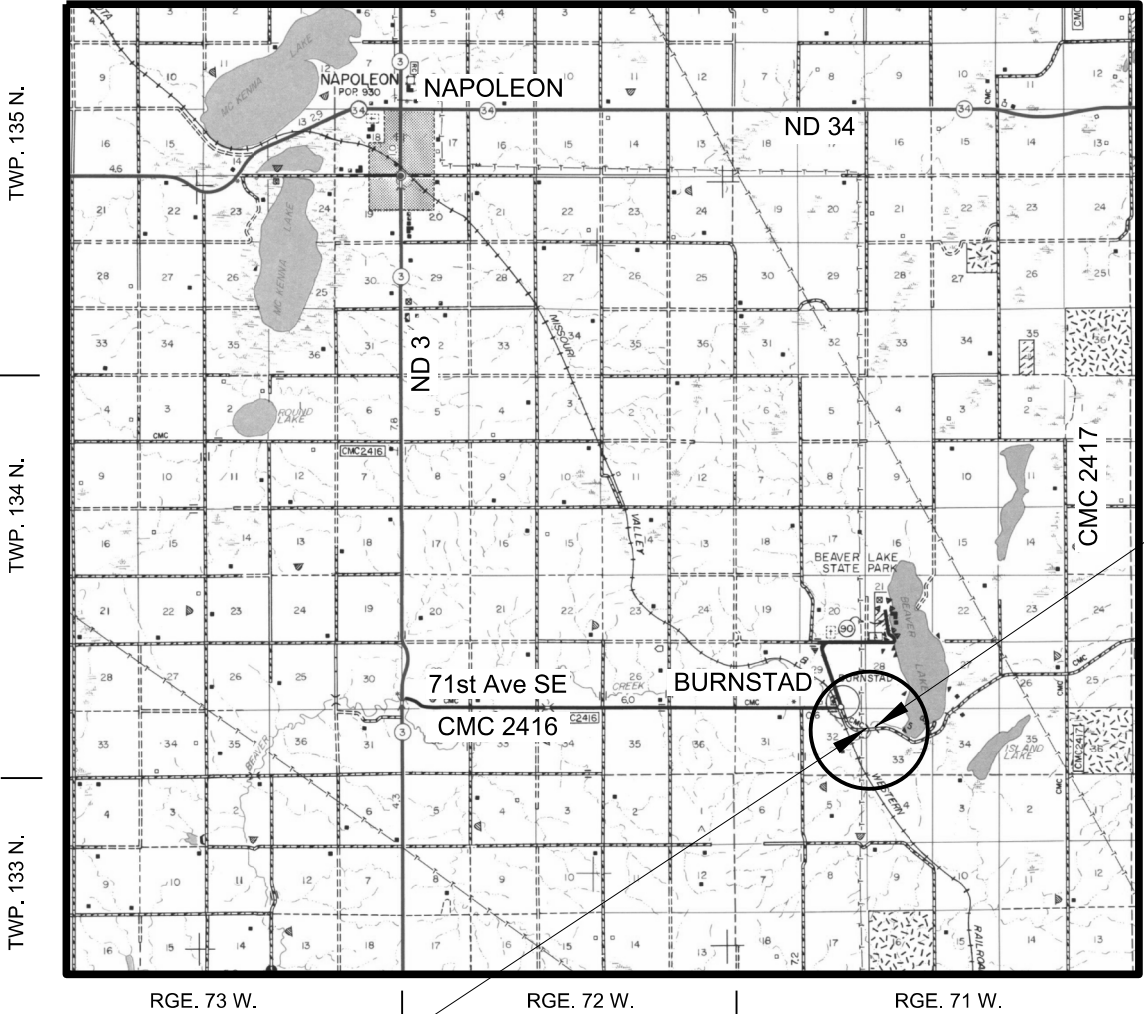
LOGAN COUNTY

BRC-CNOC-2416(069)

Logan County

0.5 Miles South & 0.5 Miles East of Burnstad

Grading, Structure Replacement & Incidentals  
Structure #24-115-18.0



**END PROJECT BRC-CNOC-2416(069)**

Sta. 20+00 = A Point Approximately  
514 Feet East and 2,026 Feet South  
of the Northwest Corner of Sec. 33,  
Twp. 134 N., Rge. 71 W.

PS&E Corrections Made

August 2017

Surveyed & Designed Date

August 2017

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issued and sealed by  
Jennie L. Krause,  
Registration Number  
PE-6683,  
on 09/01/17 and the original  
document is stored at the  
Logan County Courthouse.

CERTIFICATION

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

Jennie L. Krause /s/

Kadrams, Lee & Jackson, INC.

DATE 09/01/17

REGISTRATION NUMBER PE-6683

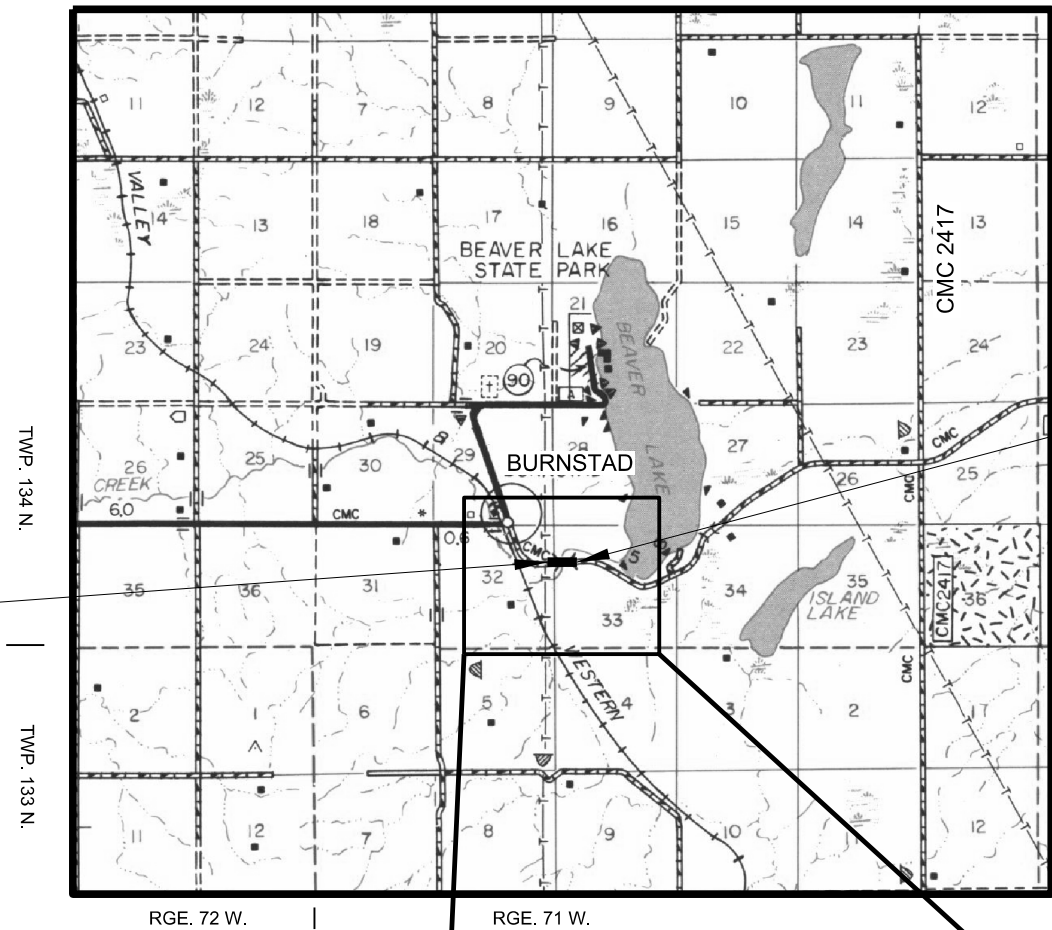


4585 Coleman Street  
P.O. BOX 1157  
Bismarck, ND 58502-1157  
(701) 355-8400, FAX (855) 288-8055

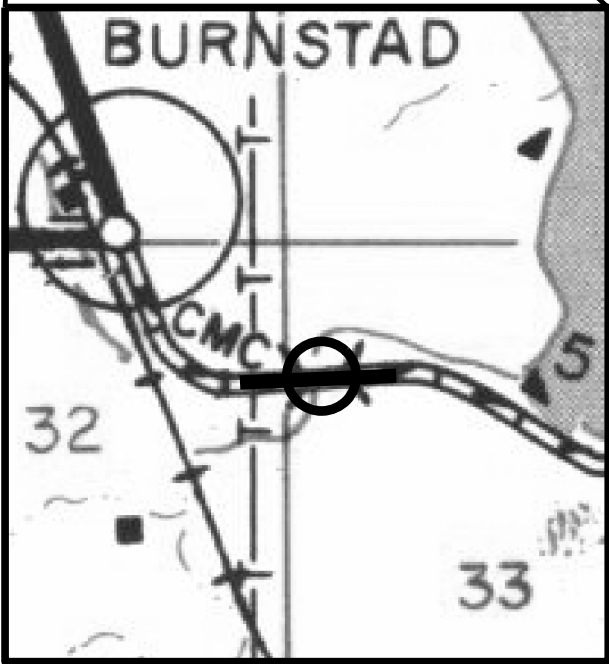
TABLE OF CONTENTS						STATE	PROJECT NO.	SECTION NO.	SHEET NO.
						ND	BRC-CNOC-2416(069)	2	1
PLAN SECTIONS			LIST OF STANDARD DRAWINGS						
Section	Page(s)	Description	Number	Description					
1	1	Title Sheet	D-101-1, 2,3	NDDOT Abbreviations					
2	1	Table of Contents	D-101-10	NDDOT Utility Company and Organization Abbreviations					
4	1	Scope of Work	D-101-20, 21	Line Styles					
6	1	Plan Notes	D-101-30, 31,32	Symbols					
6	2	Environmental Notes	D-203-8	Standard Rural Approaches					
8	1	Estimate of Quantities	D-260-1	Erosion And Siltation Controls - Silt Fence					
10	1	Basis of Estimate, Earthwork, & Summaries	D-261-1	Erosion Control - Fiber Roll Placement Details					
20	1-3	General Details	D-622-1	Pile Splice Details					
30	1	Typical Sections	D-704-7	Breakaway Systems For Construction Zone Signs - Perforated Tube					
51	1	Allowable Pipe List	D-704-8	Breakaway Systems For Construction Zone Signs - U-Channel Post					
60	1-2	Plan & Profile	D-704-10	Construction Sign Details - Regulatory Signs					
75	1-4	Wetland Impacts	D-704-13	Barricade And Channelizing Device Details					
76	1	Temporary Erosion Control	D-704-14	Construction Sign Punching And Mounting Details					
77	1	Permanent Erosion Control	D-704-19	Road Closure And Lane Closure On A Two Way Road Layouts					
80	1	Fencing	D-704-24	Shoulder Closures And Bridge Painting Layouts					
81	1	Survey Coordinate & Curve Data	D-704-50	Portable Sign Support Assembly					
100	1-2	Work Zone Traffic Control	D-708-6	Erosion And Siltation Controls - Median Or Ditch Inlet Protection					
130	1-2	Guardrail	D-714-1	Reinforced Concrete Pipe Culverts And End Sections (Round Pipe)					
170	1-11	Bridges and Box Culverts	D-714-4	Round Corrugated Steel Pipe Culverts And End Sections					
200	1-13	Cross Sections	D-714-22	Concrete Pipe Or Precast Concrete Box Culvert Ties					
			D-752-1	Standard Barbed Wire Fence					
			D-764-1	W-Beam Guardrail General Details					
			D-764-6	Flared Energy Absorbing Terminal					
			D-764-22	Typical Grading At Bridge Ends With W-Beam Guardrail					
SPECIAL PROVISIONS									
Number	Description								
SP 003(14)	Temporary Erosion and Sediment Best Management Practices								
SP 004(14)	Federal Migratory Bird Treaty Act								
SP 550(14)	Temporary Stream Diversion								
SP 551(14)	Conditions of Contract Award								
SP 552(14)	Prefabricated Vehicular Bridge								
SP 5179(14)	Permits and Environmental Considerations								

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-CNOC-2416(069)	4	1

**BEGIN PROJECT BRC-CNOC-2416(069)**  
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**BRC-CNOC-2416(069)**  
LOGAN COUNTY, NORTH DAKOTA



SCOPE OF WORK

DRAWN BY	CHECKED BY	PROJECT NO.
JUL	JK	1317101

PLAN NOTES		STATE	PROJECT NO.	SECTION NO.	SHEET NO.
		ND	BRC-CNOC-2416(069)	6	1
100-P01	<b>BIDDING OPTIONS:</b> Project BRC-CNOC-2416(069) is set up to be bid with a box culvert option and a bridge option. All sheets for both options are included in the plans. The option will be chosen by Logan County after the bid opening.				
100-P02	<b>UTILITIES:</b> Utilities that the Engineer has been made aware of are shown on the plans. Other utilities may exist that are not shown. Underground utility locations are approximate and not all utilities are shown on the plans. The actual locations and elevations are unknown. The Contractor will be liable for any costs resulting from damage to utilities or pipelines.				
202-P01	<b>REMOVAL OF STRUCTURE:</b> The existing structure is a 26' long by 22.1' wide concrete tee beam bridge. Include all costs for removing and disposing of the structure in the price bid for "REMOVAL OF STRUCTURE".				
203-P01	<b>COMMON EXCAVATION-TYPE A:</b> "COMMON EXCAVATION-TYPE A" will be paid at plan quantity.				
203-P02	<b>TOPSOIL:</b> "TOPSOIL" will be paid at plan quantity.				
203-P03	<b>BORROW-EXCAVATION:</b> No existing material will be allowed to be placed within the roadbed. All material placed within the roadbed prism 1:1s must come from an approved borrow source. Material excavated from the structure removal and installation of the box culvert or bridge options can be used to construct the inslopes of the roadway. Any excess material will be used to flatten the inslopes.				
203-P04	<b>BENCHING ON WIDENING SECTIONS:</b> Bench all inslopes, regardless of rate of slope, unless otherwise directed by the Engineer. Bench deep enough to provide sufficient width to permit placing, spreading, and compacting equipment to operate. Compact each bench thoroughly before placing additional embankment. Include costs for benching in the price bid for earthwork items.				
210-P01	<b>BOX CULVERT EXCAVATION &amp; CHANNEL EXCAVATION:</b> All suitable excess "BOX CULVERT EXCAVATION" and "CHANNEL EXCAVATION" material will be used as fill within the scour hole located on the north side of the existing structure. See cross section sheets 3 and 10 for location of the scour hole. The excess material will be placed for the purpose of creating a stable base for the installation of the foundation fill, structure components, riprap and fabrics. The Contractor will place the excess material in accordance with Section 203.04 E.4 of the Standard Specifications. The Contractor will dewater the scour area in its entirety to facilitate this work. All preparation work, dewatering and any work associated with placing and compacting the excess material will be include in the price bid for "BOX CULVERT EXCAVATION" for Option A and "CHANNEL EXCAVATION" for Option B.				
262-P01	<b>FLOTATION SILT CURTAIN:</b> Install the "FLOTATION SILT CURTAIN" on the water prior to removal of the existing structure and the stripping of any topsoil in the adjacent area (see Sheet 1 Section 20). Place the flotation silt curtain at a distance that allows for sufficient area to construct the project without placing material against the flotation silt curtain. The silt curtain will not be paid for twice.				
704-P01	<b>TRAFFIC CONTROL FOR STRUCTURE REPLACEMENT:</b> The Contractor will be allowed to close the roadway for 21 consecutive days for the box culvert option and 56 consecutive days for the bridge option. If the removal and installation are not completed in the allotted time, liquidated damages in the amount of \$1,500/day will be deducted from the money due to the Contractor. Coordinate scheduling with the Engineer and the County to ensure the least amount of downtime and disruption to traffic.				
714-P01	<b>PIPE CONDUIT – 24IN APPROACH:</b> Provide 24-inch wide bands for the 24IN approach pipe and include the costs in the pipe conduit bid item.				
756-P01	<b>FENCE REMOVE &amp; RESET:</b> There is electric fence along the project shown in section 80 of the plans. Remove and reset the electric fence. Include all costs associated to remove and reset the electric fence in the price bid for "FENCE REMOVE & RESET".				
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			<div><div><div>BRC-CNOC-2416(069)</div><div>LOGAN COUNTY, NORTH DAKOTA</div></div><div><div></div><div><div>PLAN NOTES</div><div><div>DRWN. BY JLJ</div><div>CHKD. BY JK</div><div>PROJECT NO. 1317101</div></div></div></div></div>		



ENVIRONMENTAL NOTES

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-CNOC-2416(069)	6	2

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

**EN-1:** No construction or demolition activities will take place during the spawning season on Beaver Creek from April 15<sup>th</sup> to June 1<sup>st</sup>.

*Action Taken/Required:* The spawning season is from April 15<sup>th</sup> to June 1<sup>st</sup>. No construction or demolition shall take place in the channel between those dates.

**EN-2:** Temporary impacts within wetlands and other waters would occur and are incorporated into the plans for this project.

*Action Taken/Required:* Temporary fills would be removed and sedimentation in wetlands and other waters would be removed. Wetland would be restored to preconstruction conditions.

**EN-3:** The Contractor shall take steps to prevent construction debris from falling into the waterway.

*Action Taken/Required:* The Contractor will minimize debris falling into the water way to the maximum extent practicable. Any debris that falls into the waterway will be retrieved.


**EN-4:** The Contractor shall prevent the introduction of aquatic nuisance species (ANS) into North Dakota waters, or transport of aquatic vegetation to or from any waters of the state, or transport of any aquatic vegetation into the state.

*Action Taken/Required:* The Contractor will follow the North Dakota Game and Fish Department's (NDGF) Administrative Rules 30-3-06 for compliance with ND Century Code Chapter 20.1-17 on ANS. The Contractor will notify NDGF at least 72 hours prior to the placement IN or ON the waters of the State of North Dakota of any and all vehicles, vessels, pumps and equipment that will be used in the project, to allow the NDGF sufficient time to inspect any and all such equipment for ANS. The NDGF ANS Coordinator shall be contacted by phone at (701) 770-0920 for equipment inspections, or any additional information regarding ANS prevention protocol.

**EN-5:** Active migratory bird nests with eggs or chicks are protected by the Migratory Bird Treaty Act.

*Action Taken/Required:* NDDOT's special provision, SP 0004(14) for compliance with the Federal Regulation shall be followed.

**NOTIFICATIONS TO BE FILED BY CONTRACTOR:** North Dakota Department of Health SFN 17987 Asbestos Notification of Demolition and Renovation for bridges and boxes.

BRC-CNOC-2416(069) LOGAN COUNTY, NORTH DAKOTA		
	ENVIRONMENTAL NOTES	
	DRWN. BY JLJ	CHKD. BY JK PROJECT NO. 1317101

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-CNOC-2416(069)	8	1

ESTIMATE OF QUANTITIES

BASE BID

SPEC	CODE	ITEM	UNIT	QUANTITY
103	0100	CONTRACT BOND	L SUM	1
202	0105	REMOVAL OF STRUCTURE	L SUM	1
202	0174	REMOVAL OF PIPE ALL TYPES AND SIZES	LF	44
202	0312	REMOVE EXISTING FENCE	LF	360
216	0100	WATER	M GAL	57
251	0200	SEEDING CLASS II	ACRE	1.04
251	1000	WETLAND SEED	ACRE	0.20
251	2000	TEMPORARY COVER CROP	ACRE	1.24
253	0101	STRAW MULCH	ACRE	2.48
260	0200	SILT FENCE SUPPORTED	LF	825
260	0201	REMOVE SILT FENCE SUPPORTED	LF	825
261	0112	FIBER ROLLS 12IN	LF	1135
261	0113	REMOVE FIBER ROLLS 12IN	LF	25
262	0100	FLOTATION SILT CURTAIN	LF	285
262	0101	REMOVE FLOTATION SILT CURTAIN	LF	285
702	0100	MOBILIZATION	L SUM	1
704	1000	TRAFFIC CONTROL SIGNS	UNIT	616
704	1052	TYPE III BARRICADE	EA	6
714	4106	PIPE CONDUIT 24IN - APPROACH	LF	48
752	0110	FENCE BARBED WIRE 3 STRAND-STEEL POST	LF	380
752	0922	FENCE REMOVE & RESET	LF	310
752	0980	FENCE ANCHORS	EA	2
752	2100	VEHICLE GATE	EA	1
752	2995	CORNER ASSEMBLY-WOOD POST	EA	8
752	3995	DOUBLE BRACE ASSEMBLY-WOOD POST	EA	1

OPTION A - BOX CULVERT

SPEC	CODE	ITEM	UNIT	QUANTITY
203	0101	COMMON EXCAVATION-TYPE A	CY	243
203	0109	TOPSOIL	CY	412
203	0140	BORROW-EXCAVATION	CY	1,849
210	0050	BOX CULVERT EXCAVATION	EA	1
210	0210	FOUNDATION FILL	CY	265
210	0405	FOUNDATION PREPARATION-BOX CULVERT	EA	1
256	0200	RIPRAP GRADE II	CY	174
302	0356	AGGREGATE SURFACE COURSE CL 13	TON	371
606	3209	DBL 12FT X 9FT PRECAST RCB CULVERT	LF	58
606	7209	DBL 12FT X 9FT PRECAST RCB END SECTION	EA	2
709	0151	GEOSYNTHETIC MATERIAL TYPE R1	SY	382
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	262
900	1000	TEMPORARY STREAM DIVERSION	EA	1

OPTION B - BRIDGE

SPEC	CODE	ITEM	UNIT	QUANTITY
203	0101	COMMON EXCAVATION-TYPE A	CY	261
203	0109	TOPSOIL	CY	378
203	0140	BORROW-EXCAVATION	CY	797
210	0111	CLASS 2 EXCAVATION	L SUM	1
210	0127	CHANNEL EXCAVATION	L SUM	1
210	0201	FOUNDATION PREPARATION	EA	1
210	0210	FOUNDATION FILL	CY	420
256	0200	RIPRAP GRADE II	CY	198
302	0356	AGGREGATE SURFACE COURSE CL 13	TON	506
602	1130	CLASS AE-3 CONCRETE	CY	182.0
612	0115	REINFORCING STEEL-GRADE 60	LB	14,264
622	0040	STEEL PILING HP 12 X 53	LF	1120
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	298
764	0131	W-BEAM GUARDRAIL	LF	250
764	0145	W-BEAM GUARDRAIL END TERMINAL	EA	4
930	9740	VEHICULAR BRIDGE-PRE-FAB	EA	1

BRC-CNOC-2416(069)  
LOGAN COUNTY, NORTH DAKOTA



ESTIMATE OF QUANTITIES

DRAWN BY JJL	CHKD BY JK	PROJECT NO. 1317101
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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-CNOC-2416(069)	10	1

BASIS OF ESTIMATE

MAINLINE (0.114 Miles)		GUARDRAIL EMBANKMENT SURFACING (OPTION B ONLY)		
QUANTITY PER MILE	TOP WIDTH	QUANTITY	UNIT	DESCRIPTION
-	-	-	M GAL	Water (10 Gal/CY of Embankment & 20 Gal/Ton of Aggregate Surface Course & 40 Gal/CY of Foundation Fill & 10 M GAL for Dust Palliative)
3,179	24'	135	TON	Aggregate Surface Course CL 13 (1.875 Ton/CY)

APPROACH QUANTITIES

STA	OFFSET	TIE-OUT (FT)	TYPE	EMBANKMENT (CY)	AGGREGATE SURFACE COURSE CL 13 (TON)
14+92	LT	47	Field	110	9

EARTHWORK SUMMARY

OPTION A - BOX CULVERT			
EMBANKMENT <sup>1</sup> (CY)	APPROACH EMBANKMENT <sup>1</sup> (CY)	COMMON EXCAVATION (CY)	BORROW REQUIRED (CY)
1,982	110	243	1,849

1) Volume includes 35% for shrinkage and losses.

OPTION B - BRIDGE			
EMBANKMENT <sup>1</sup> (CY)	APPROACH EMBANKMENT <sup>1</sup> (CY)	COMMON EXCAVATION (CY)	BORROW REQUIRED (CY)
948	110	261	797

1) Volume includes 35% for shrinkage and losses.

TOPSOIL SUMMARY

OPTION A - BOX CULVERT		
TOPSOIL EXCAVATION <sup>1</sup> (CY)	TOPSOIL EMBANKMENT <sup>2</sup> (CY)	EXCESS TOPSOIL <sup>3</sup> (CY)
412	382	30


- 1) Excavation depth is based upon removing 6" of topsoil.
- 2) Embankment depth is based upon replacing 4" of topsoil.  
Volume includes 25% for shrinkage.
- 3) Excess topsoil shall be wasted on-site within the right of way.

OPTION B - BRIDGE		
TOPSOIL EXCAVATION <sup>1</sup> (CY)	TOPSOIL EMBANKMENT <sup>2</sup> (CY)	EXCESS TOPSOIL <sup>3</sup> (CY)
378	240	138

- 1) Excavation depth is based upon removing 6" of topsoil.
- 2) Embankment depth is based upon replacing 4" of topsoil.  
Volume includes 25% for shrinkage.
- 3) Excess topsoil shall be wasted on-site within the right of way.

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LOGAN COUNTY, NORTH DAKOTA



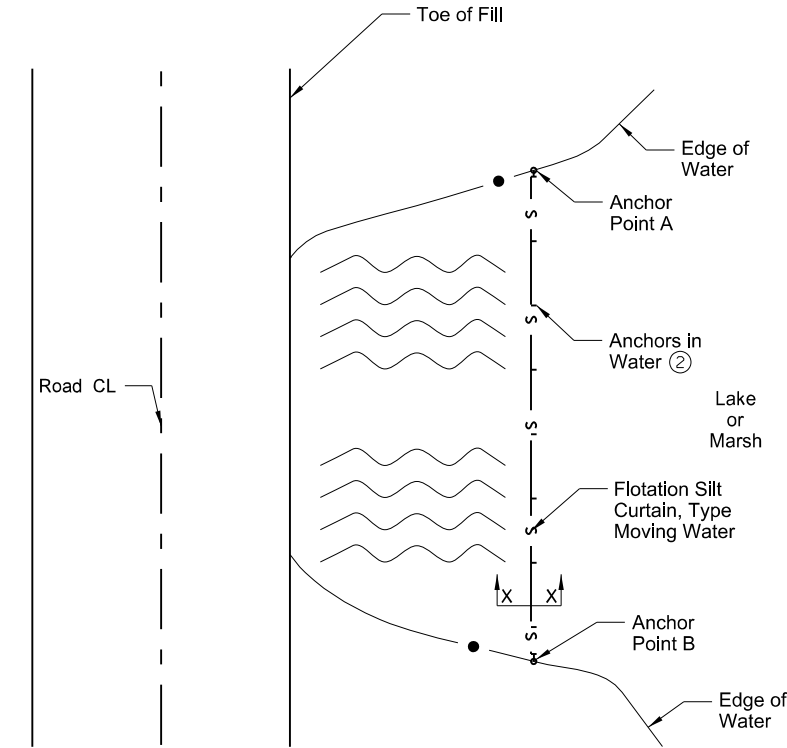
BASIS OF ESTIMATE,  
APPROACH QUANTITIES,  
EARTHWORK & TOPSOIL  
SUMMARY

DRAWN BY  
JUL

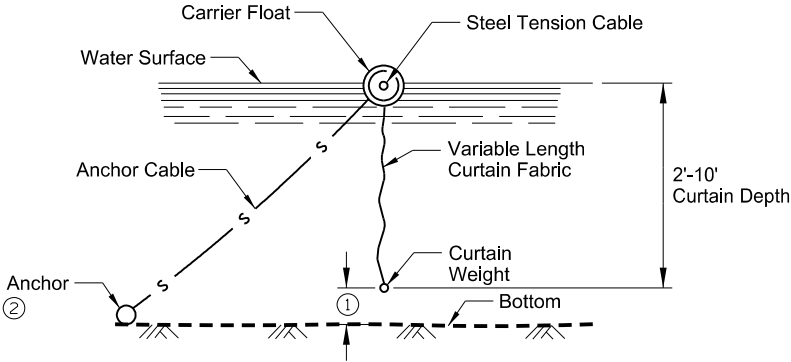
CHKD BY  
JK

PROJECT NO.  
1317101

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-CNOC-2416(069)	20	1



PLAN VIEW  
FLOTATION SILT CURTAIN-TYPE MOVING WATER



SECTION X-X

NOTES:

- ① Curtain 1 foot from bottom.
- ② Contractor to supply and install sufficient quantity of anchors to hold the silt curtain in place.

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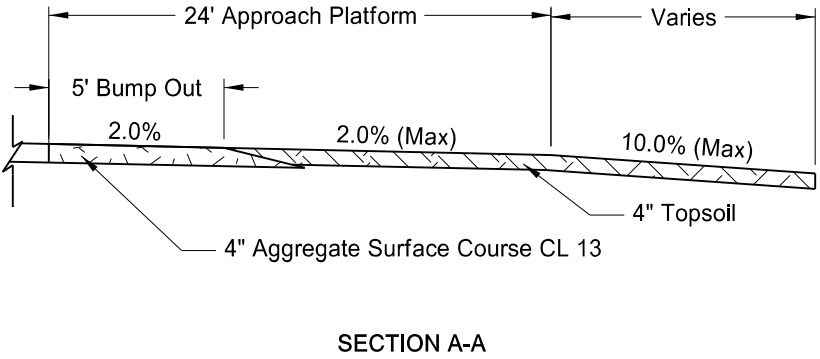
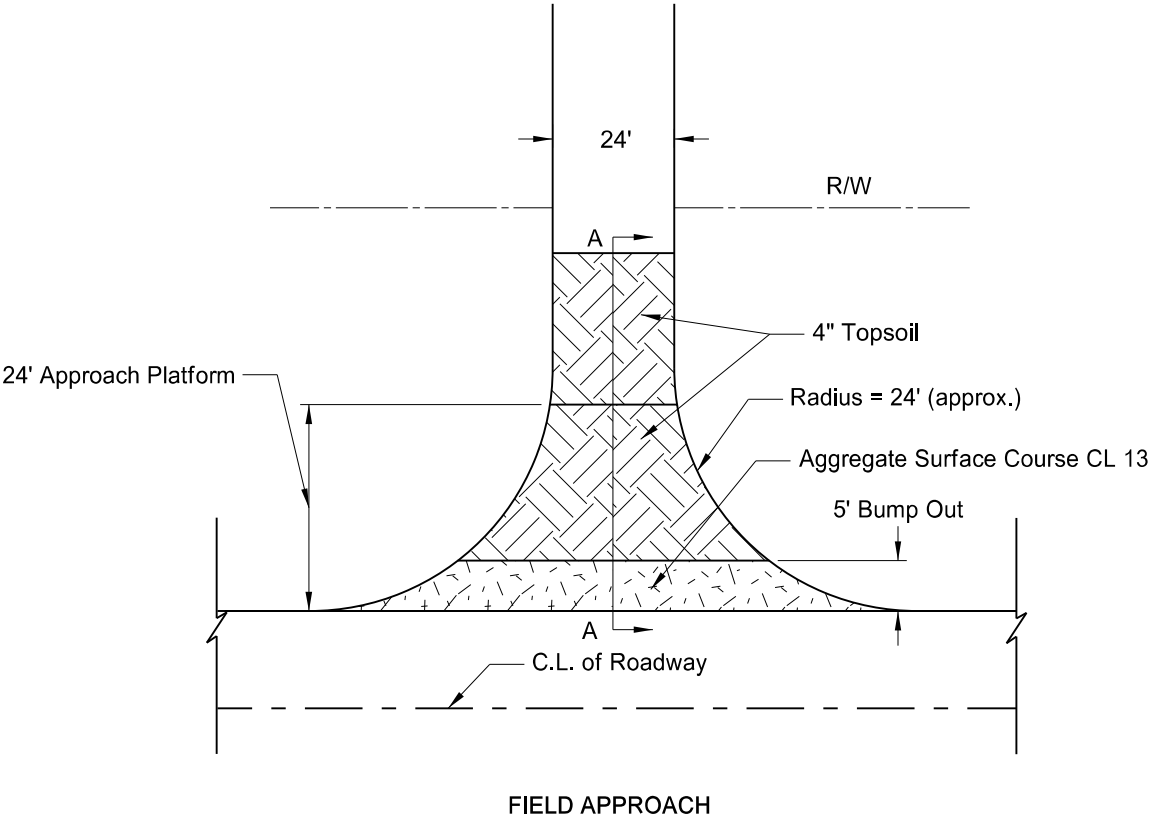
BRC-CNOC-2416(069)  
LOGAN COUNTY, NORTH DAKOTA



FLOTATION SILT  
CURTAIN DETAIL

DRAWN BY: JUL  
CHKD. BY: JK  
PROJECT NO.: 1317101

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-CNOC-2416(069)	20	2



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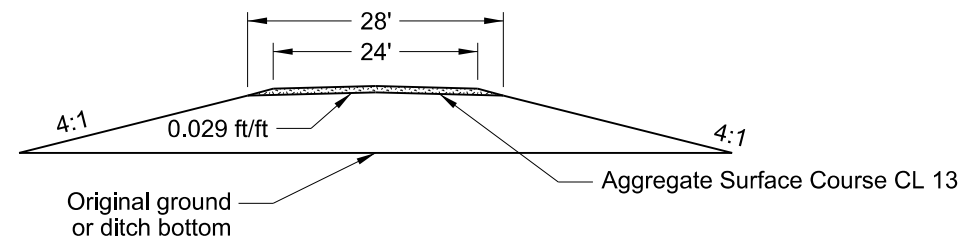
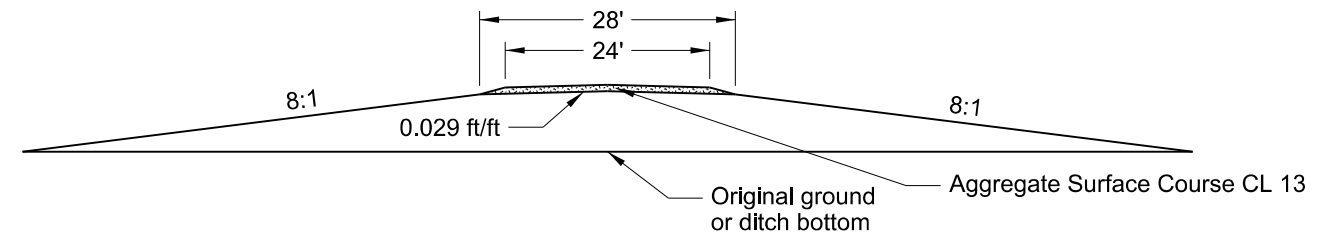
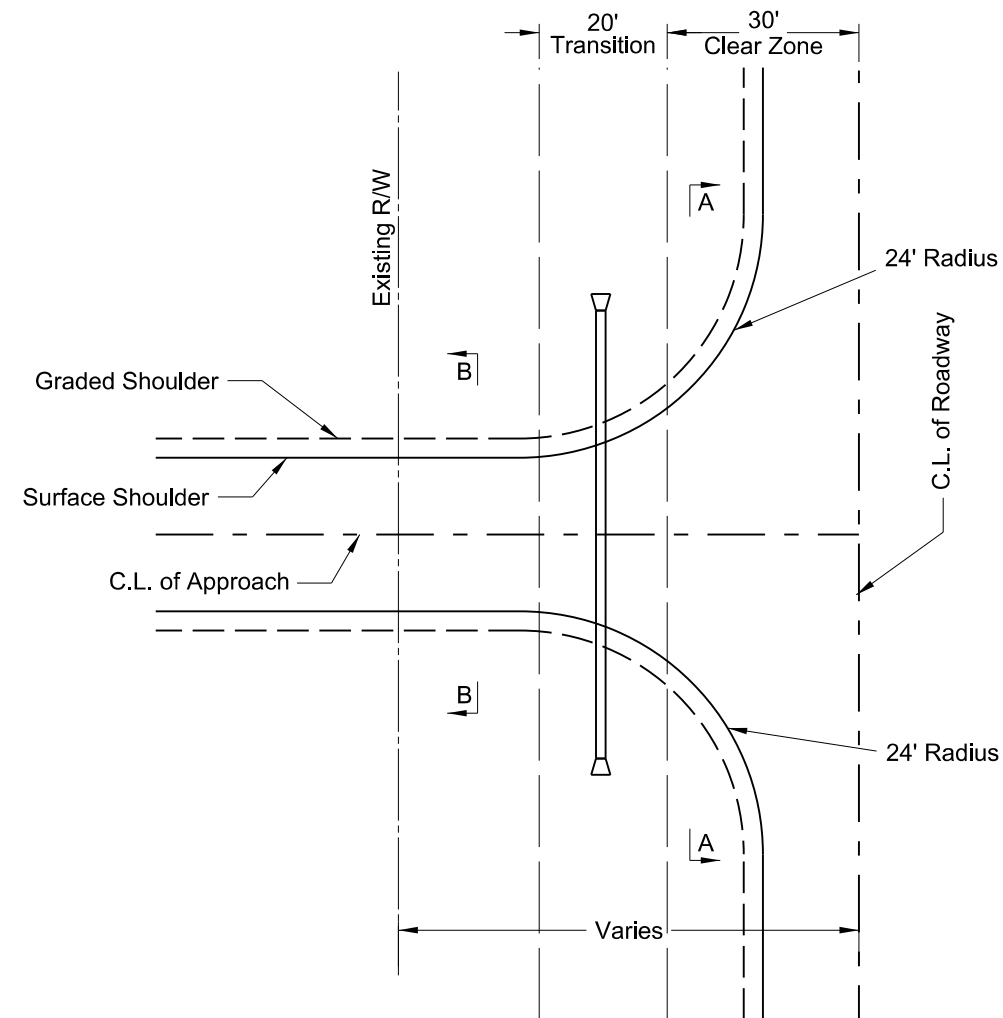


APPROACH DETAILS

DRAWN BY: JJL  
CHKD. BY: JK  
PROJECT NO.: 1317101

Drawing not to scale

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-CNOC-2416(069)	20	3



See Section 20 Sheet 2 for Surfacing Details.

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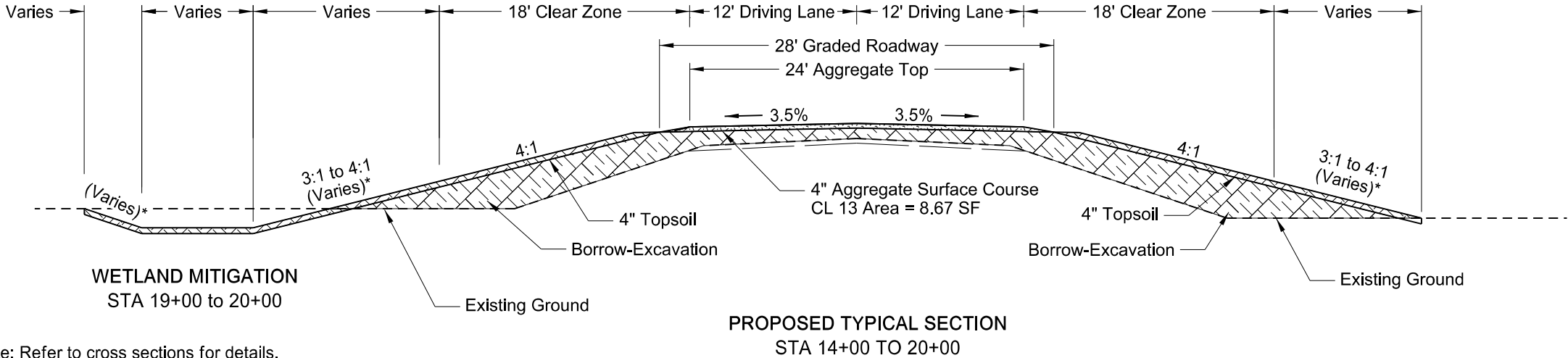
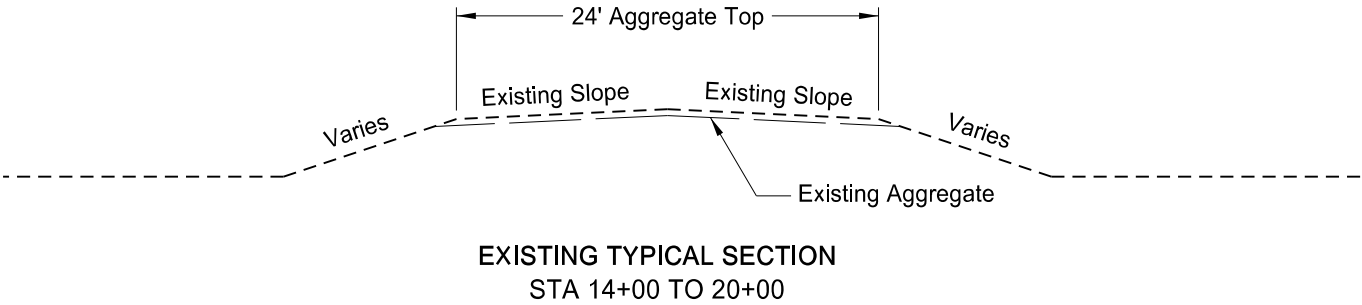
BRC-CNOC-2416(069)  
LOGAN COUNTY, NORTH DAKOTA



APPROACH INSLOPE  
DETAILS

DRAWN BY JUL	CHKD BY JK	PROJECT NO. 1317101
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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-CNOC-2416(069)	30	1



\*Note: Refer to cross sections for details.

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BRC-CNOC-2416(069)

LOGAN COUNTY, NORTH DAKOTA

KLJ

TYPICAL SECTIONS

DRAWN BY

JJL

CHECKED BY

JK

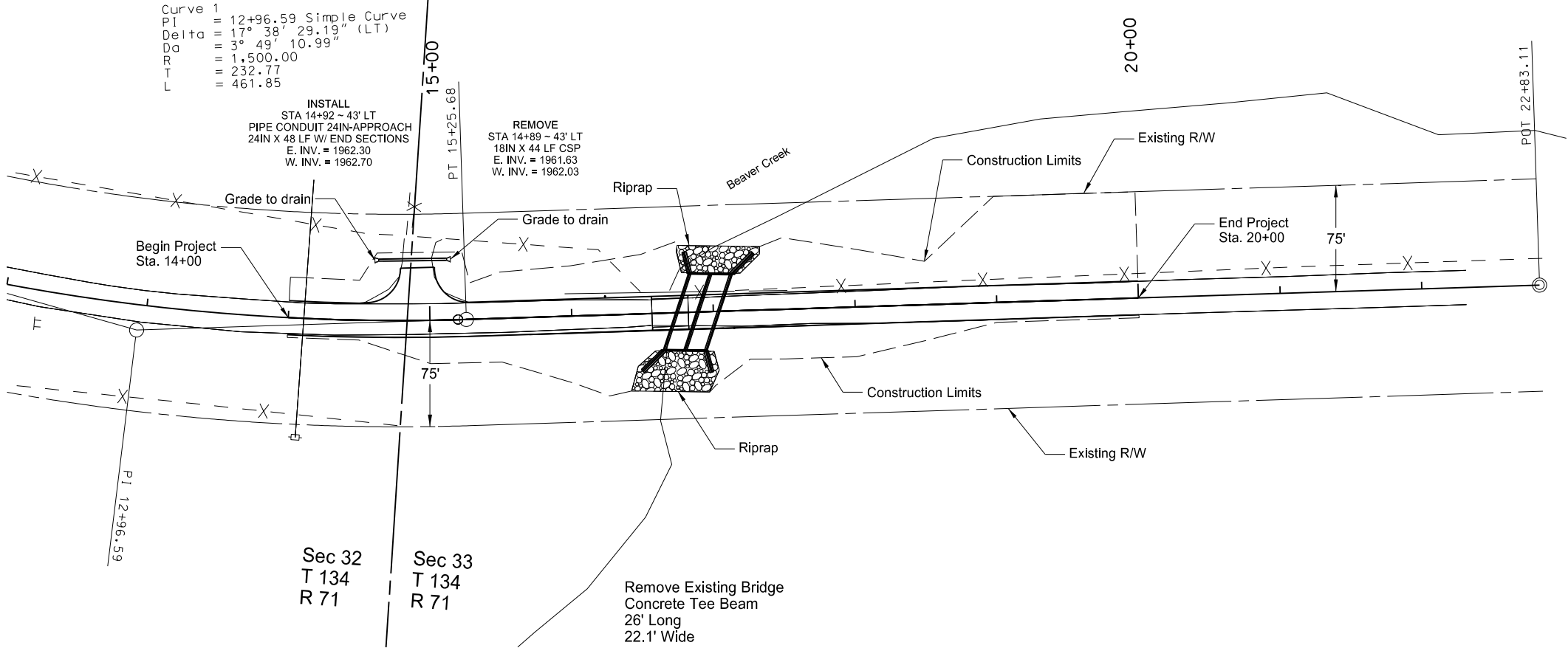
PROJECT NO.

1317101

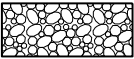




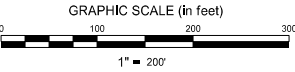
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-CNOC-2416(069)	60	1



REMOVAL OF PIPE ALL TYPES AND SIZES	
STA 14+89 ~ 43' LT	44 LF
RIPRAP GRADE II	
STA 16+45 to STA 17+03 ~ RT	105 CY
STA 16+75 to STA 17+34 ~ LT	69 CY
	174 CY
GEOSYNTHETIC MATERIAL TYPE RR	
STA 16+45 to STA 17+03 ~ RT	158 SY
STA 16+75 to STA 17+34 ~ LT	104 SY
	262 SY
PIPE CONDUIT 24IN - APPROACH	
STA 14+64 to STA 15+12 ~ 43' LT	48 LF



RIPRAP GRADE II



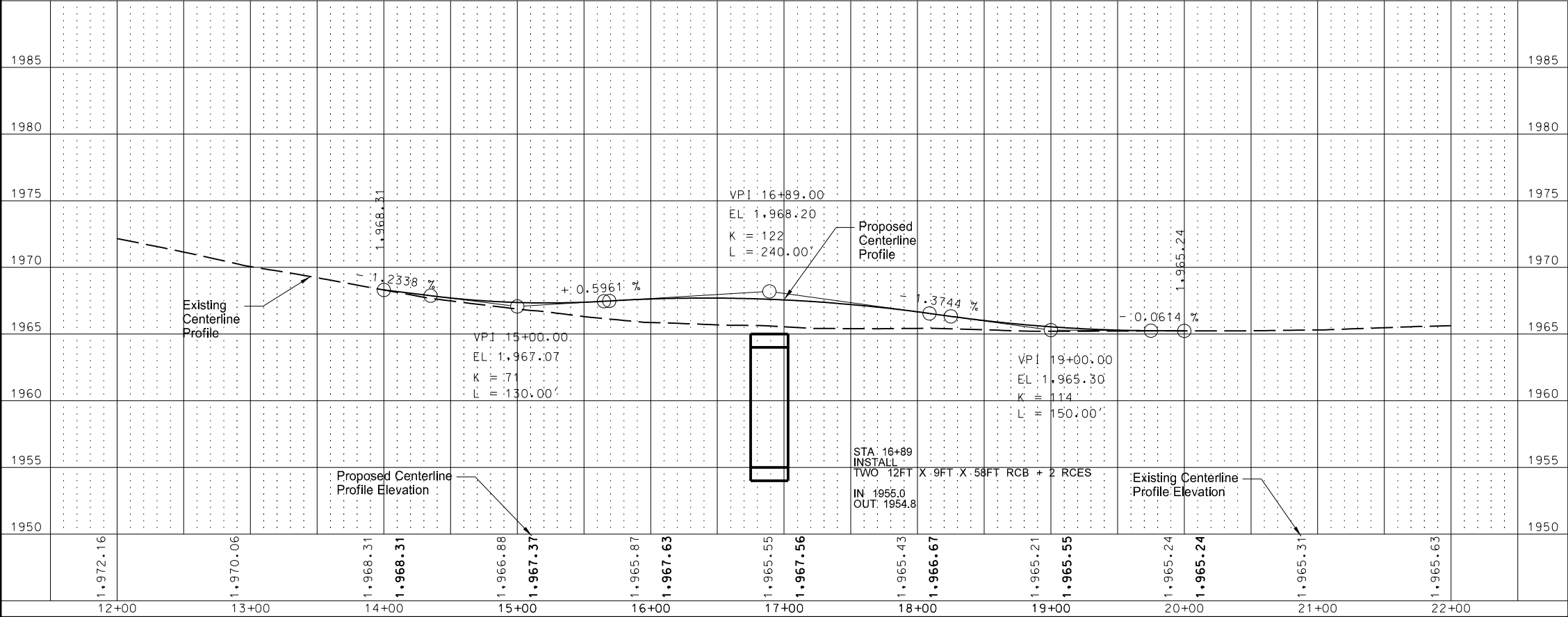
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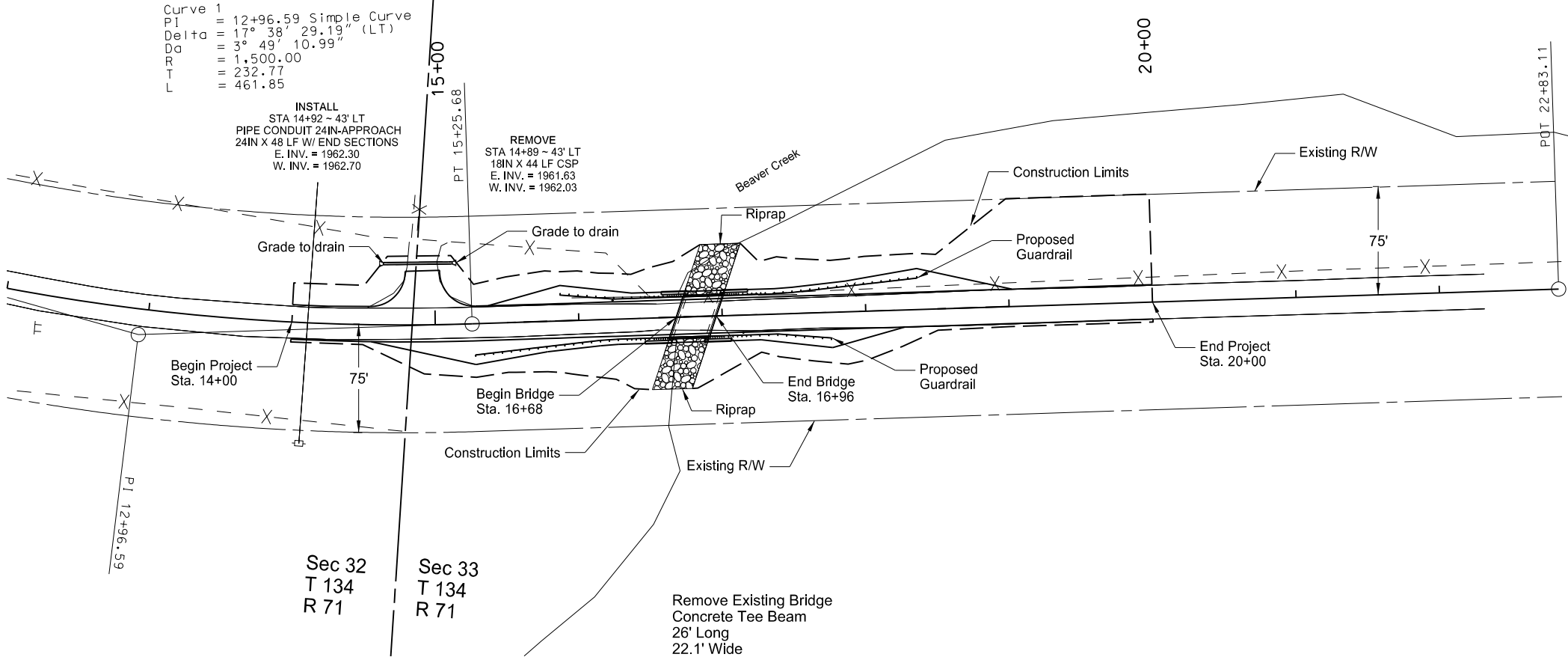


PLAN & PROFILE  
OPTION A - BOX CULVERT  
STA 14+00 TO STA 20+00

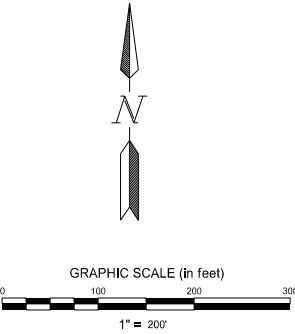
DRAWN BY JUL	CHECKED BY JK	PROJECT NO. 1317101
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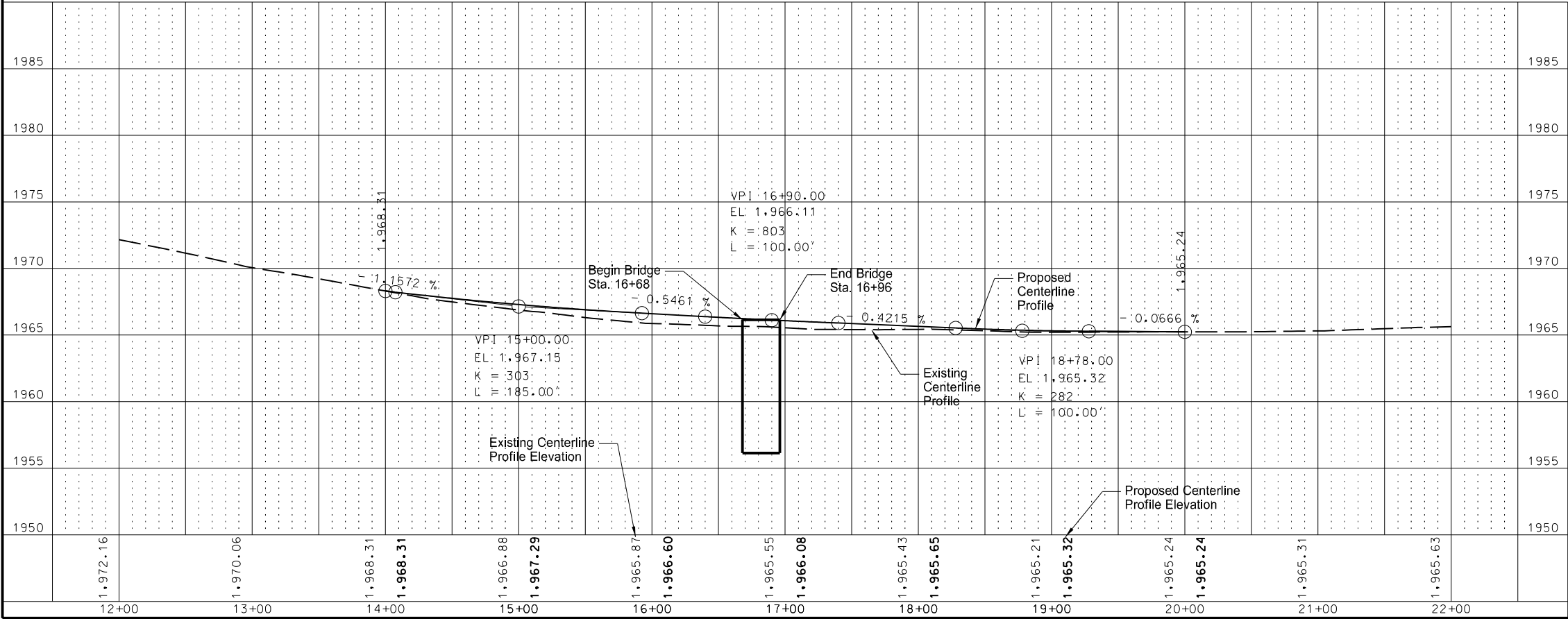
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-CNOC-2416(069)	60	2



REMOVAL OF PIPE ALL TYPES AND SIZES STA 14+89 ~ 43' LT	44 LF
RIPRAP GRADE II STA 16+50 to STA 16+91 ~ RT STA 16+74 to STA 17+14 ~ LT	99 CY 99 CY 198 CY
GEOSYNTHETIC MATERIAL TYPE RR STA 16+50 to STA 16+91 ~ RT STA 16+74 to STA 17+14 ~ LT	149 SY 149 SY 298 SY
PIPE CONDUIT 24IN - APPROACH STA 14+64 to STA 15+12 ~ 43' LT	48 LF



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**PLAN & PROFILE  
OPTION B - BRIDGE  
STA 14+00 TO STA 20+00**

DRAWN BY: JKL  
CHKD BY: JK  
PROJECT NO.: 1317101

WETLAND IMPACT TABLES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-CNOC-2416(069)	75	1

Wetland Impact Table Option A																
Wetland Number	Location	Cowardin Class.	Wetland Type	Wetland Size Ac.	Wetland Feature	USACE Jurisdictional Wetlands*	Wetland Impacts (acres)		USFWS Easement Impacts		Wetland Mitigation					
							Temp. Ac.	Perm. Ac.	Temp.	Perm.	Mitigation Required**/***			Location; Acreage; Wetland#; Ratio	Onsite Mitigation Acres	
EO 11990	USACE	USFWS														
#1a	Sec 32 & 33 T134N, R71W	PEMC	Fringe	0.25	Natural	Yes	0.04	0.02	NA	NA	0.02	NA	NA	Onsite; 0.03; Wetland 1d; 1:1	0.03	
#1b	Sec 33 T134N, R71W	PEMC	Fringe	0.02	Natural	Yes	0.00	0.00	NA	NA	0.00	NA	NA	NA	NA	
#1c	Sec 33 T134N, R71W	PEMC	Fringe	0.20	Natural	Yes	0.05	0.02	NA	NA	0.02	NA	NA	Onsite; 0.02; Wetland 1d; 1:1	0.02	
#1d	Sec 33 T134N, R71W	PEMC	Fringe	0.07	Natural	Yes	0.03	0.01	NA	NA	0.01	NA	NA	Onsite; 0.01; Wetland 1d; 1:1	0.01	
#2a	Sec 33 T134N, R71W	PEMA	Ditch	0.02	Artificial	Yes	0.00	0.01	NA	NA	NA	NA	NA	NA	NA	
			Totals	0.56			0.12	0.06	0.00	0.00					0.06	

\* A jurisdictional determination was received from the USACE on August 7, 2017 (NWO-2010-02300-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.

Other Waters Impact Table Option A															
Other Waters										Other Water Mitigation					
Number	Location	Type	Size		Feature	USACE Jurisdictional*	Impacts to Other Waters				Mitigation Required			Location	Method
			Acres	Linear Feet			Acres		Linear Feet		EO 11990	USACE	USFWS		
							Temp	Perm	Temp	Perm					
OW1e	Sec 33 T163N, R57W	Beaver Creek	0.92	427.46	Natural	Yes	0.14	0.14	70	190	NA	NA	NA	NA	NA
Totals			0.92	427.46			0.14	0.14	70	190					

\* A jurisdictional determination was received from the USACE on August 7, 2017 (NWO-2010-02300-BIS).

Summary Impact Table Option A			
Total Permanent Impact Summary		Temporary Impacts and additional information	
Wetland Type	Total (Acres)	Wetland Type	Total (Acres/Lf)
Natural/JD	0.05	Temporary JD	0.12
Natural/Non-JD	0.00	Non-JD Temporary	0.00
Artificial/JD	0.01	Permanent JD > 0.10	0.00
Artificial /Non-JD	0.00	Permanent OW	0.14 acres/190 lf
Total	0.06	Temporary OW	0.14 acres/70 lf

Compensation Requirements by Agency and Water Type		
Water Type	USACE Mitigation	EO 11990 Mitigation
Natural/JD Wetland	> 0.1 acre	All
Natural/Non-JD Wetland	No mitigation required	All
Artificial/JD Wetland	> 0.1 acre	No mitigation required
Artificial/Non-JD Wetland	No mitigation required	No mitigation required
Deep Water (> than 6.6 feet)	No mitigation required	No mitigation required
Other Water	> 300 linear feet	No mitigation required
Preamble	No mitigation required	No mitigation required

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LOGAN COUNTY, NORTH DAKOTA



WETLAND IMPACT TABLES  
OPTION A  
BOX CULVERT

DRWN. BY JLJ	CHKD. BY JK	PROJECT NO. 1317101
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WETLAND IMPACT TABLES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-CNOC-2416(069)	75	2

Wetland Impact Table Option B																
Wetland Number	Location	Cowardin Class.	Wetland Type	Wetland Size Ac.	Wetland Feature	USACE Jurisdictional Wetlands*	Wetland Impacts (acres)		USFWS Easement Impacts		Wetland Mitigation					
							Temp. Ac.	Perm. Ac.	Temp.	Perm.	Mitigation Required**/**			Location; Acreage; Wetland#; Ratio	Onsite Mitigation Acres	
											EO 11990	USACE	USFWS			
#1a	Sec 32 & 33 T134N, R71W	PEMC	Fringe	0.25	Natural	Yes	0.00	0.02	NA	NA	0.02	NA	NA	Onsite; 0.02; Wetland 1d; 1:1	0.02	
#1b	Sec 33 T134N, R71W	PEMC	Fringe	0.02	Natural	Yes	0.00	0.00	NA	NA	0.00	NA	NA	NA	NA	
#1c	Sec 33 T134N, R71W	PEMC	Fringe	0.20	Natural	Yes	0.00	0.01	NA	NA	0.01	NA	NA	Onsite; 0.01; Wetland 1d; 1:1	0.02	
#1d	Sec 33 T134N, R71W	PEMC	Fringe	0.07	Natural	Yes	0.03	0.01	NA	NA	0.01	NA	NA	Onsite; 0.01; Wetland 1d; 1:1	0.02	
#2a	Sec 33 T134N, R71W	PEMA	Ditch	0.02	Artificial	Yes	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	
			Totals	0.56			0.03	0.04	0.00	0.00					0.06	

\* A jurisdictional determination was received from the USACE on August 7, 2017 (NWO-2010-02300-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.

Other Waters Impact Table Option B															
Other Waters										Other Water Mitigation					
Number	Location	Type	Size		Feature	USACE Jurisdictional*	Impacts to Other Waters				Mitigation Required			Location	Method
			Acres	Linear Feet			Acres Temp	Perm	Linear Feet Temp	Perm	EO 11990	USACE	USFWS		
OW1e	Sec 33 T163N, R57W	Beaver Creek	0.92	427.46	Natural	Yes	0.00	0.09	0	135	NA	NA	NA	NA	NA
Totals			0.92	427.46			0.00	0.09	0	135					


\* A jurisdictional determination was received from the USACE on August 7, 2017 (NWO-2010-02300-BIS).

Summary Impact Table Option B			
Total Permanent Impact Summary		Temporary Impacts and additional information	
Wetland Type	Total (Acres)	Wetland Type	Total (Acres/Lf)
Natural/JD	0.04	Temporary JD	0.03
Natural/Non-JD	0.00	Non-JD Temporary	0.00
Artificial/JD	0.00	Permanent JD > 0.10	0.00
Artificial /Non-JD	0.00	Permanent OW	0.09 acres/135 lf
Total	0.04	Temporary OW	0.00 acres/0 lf

Compensation Requirements by Agency and Water Type		
Water Type	USACE Mitigation	EO 11990 Mitigation
Natural/JD Wetland	> 0.1 acre	All
Natural/Non-JD Wetland	No mitigation required	All
Artificial/JD Wetland	> 0.1 acre	No mitigation required
Artificial/Non-JD Wetland	No mitigation required	No mitigation required
Deep Water (> than 6.6 feet)	No mitigation required	No mitigation required
Other Water	> 300 linear feet	No mitigation required
Preamble	No mitigation required	No mitigation required

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LOGAN COUNTY, NORTH DAKOTA



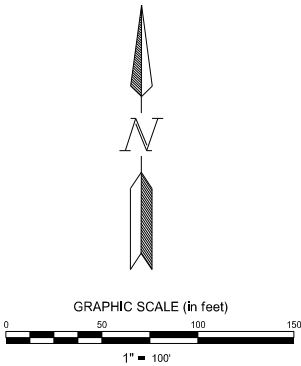
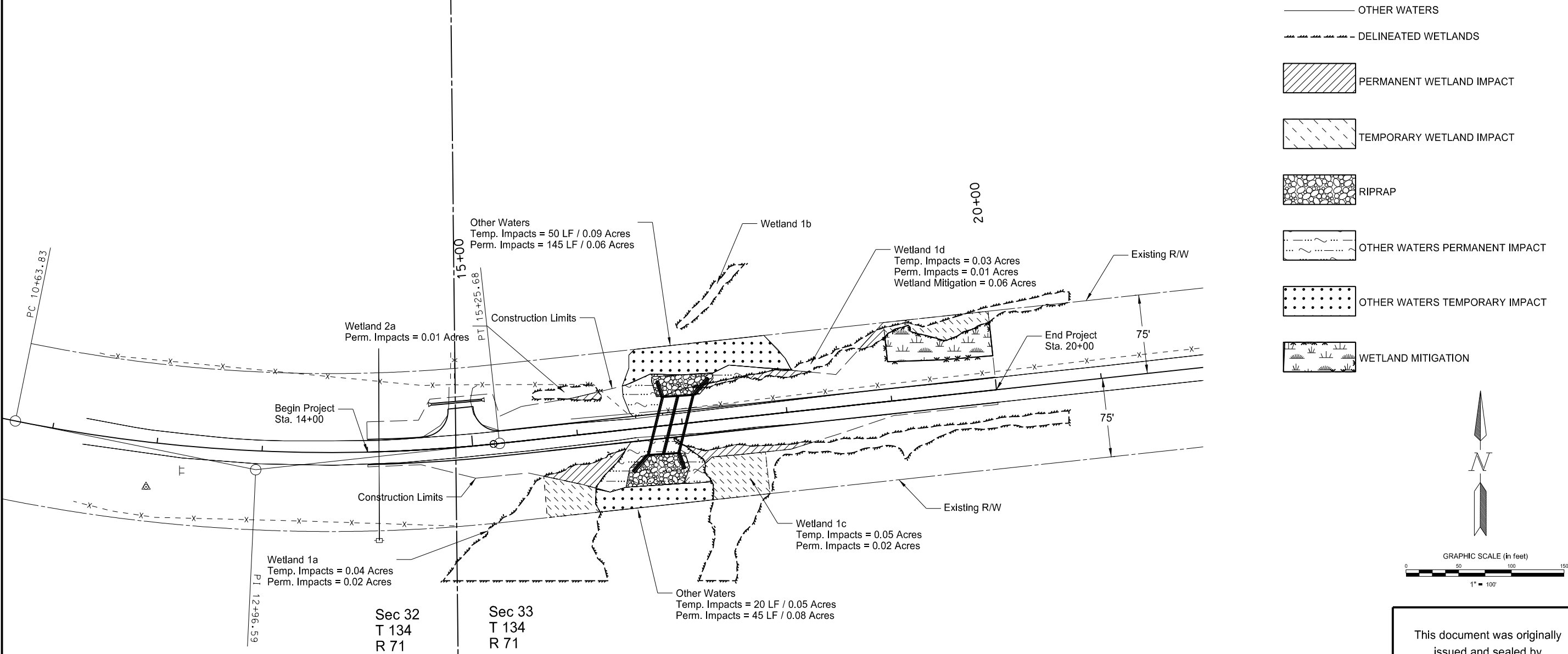
WETLAND IMPACT TABLES  
OPTION B  
BRIDGE

DRWN. BY  
JLJ

CHKD. BY  
JK

PROJECT NO.  
1317101

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-CNOC-2416(069)	75	3



Note: The intent of the wetland mitigation is to excavate the area 1' below the existing wetland. See cross sections for details.

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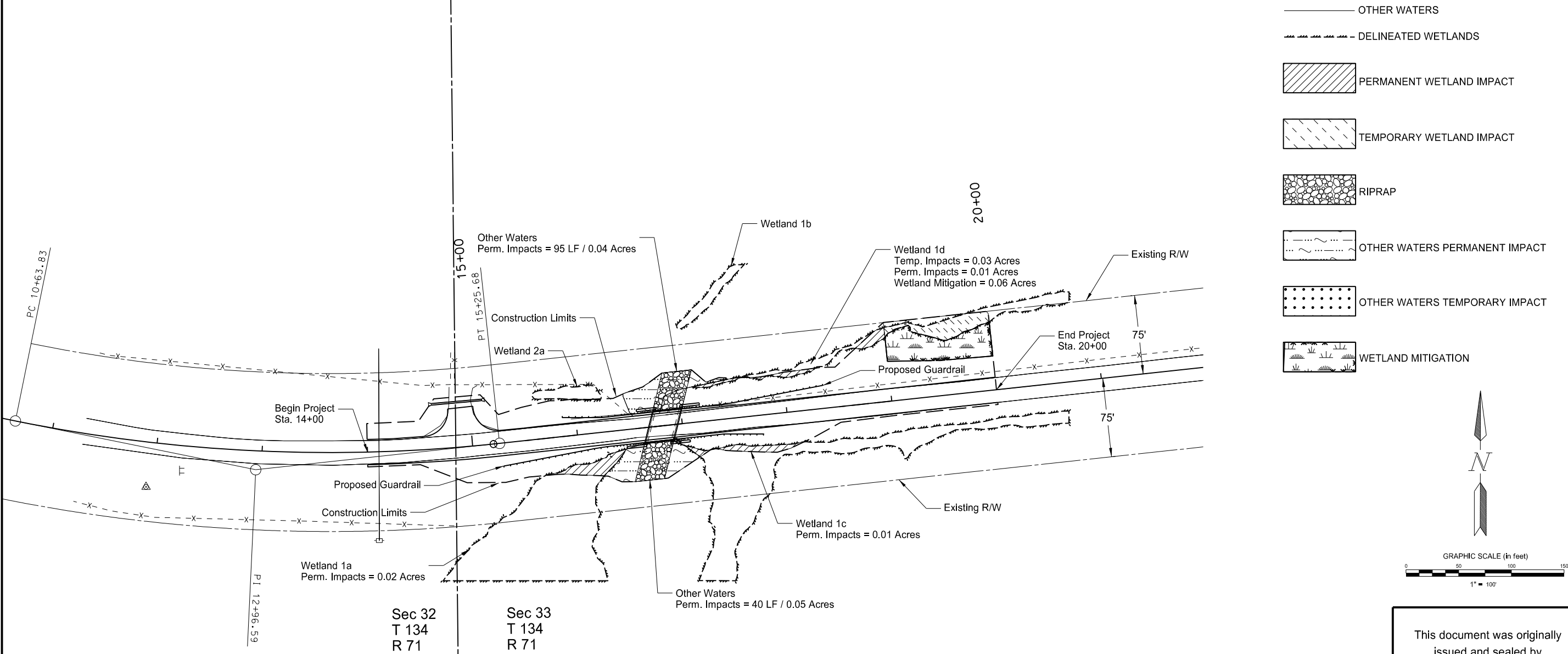
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LOGAN COUNTY, NORTH DAKOTA



WETLAND IMPACTS  
OPTION A - BOX CULVERT  
STA 14+00 to 20+00

DRAWN BY JUL	CHKD. BY JK	PROJECT NO. 1317101
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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-CNOC-2416(069)	75	4



Note: The intent of the wetland mitigation is to excavate the area 1' below the existing wetland. See cross sections for details.

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LOGAN COUNTY, NORTH DAKOTA



WETLAND IMPACTS  
OPTION B - BRIDGE  
STA 14+00 to 20+00

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-CNOC-2416(069)	76	1

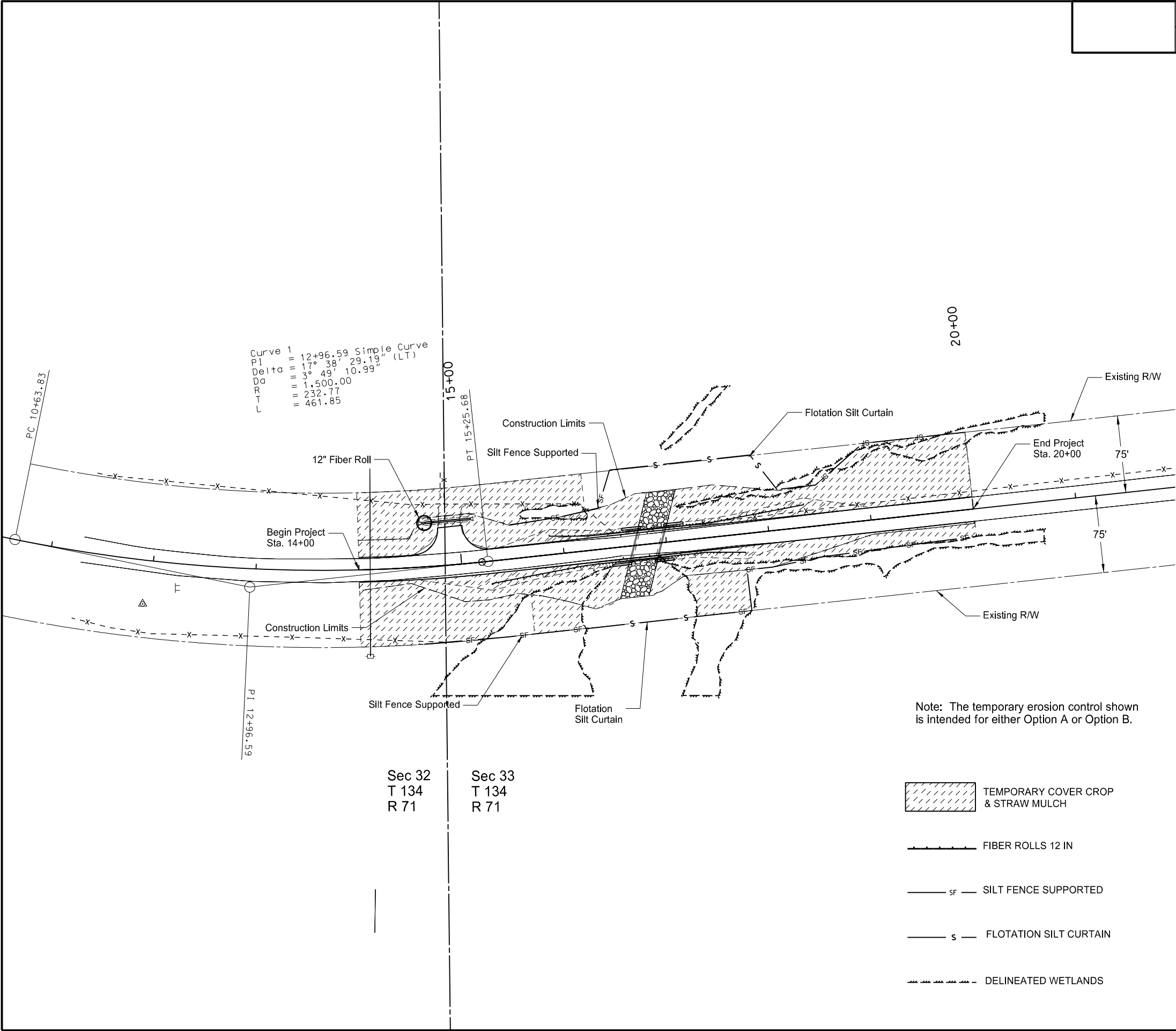
TEMPORARY COVER CROP	
STA 14+00 to STA 20+00 ~ RT	0.53 ACRES
STA 14+00 to STA 20+00 ~ LT	0.71 ACRES
	1.24 ACRES

STRAW MULCH	
STA 14+00 to STA 20+00 ~ RT	0.53 ACRES
STA 14+00 to STA 20+00 ~ LT	0.71 ACRES
	1.24 ACRES

SILT FENCE SUPPORTED/REMOVE SILT FENCE SUPPORTED	
STA 14+50 to STA 16+15 ~ RT	165 LF
STA 15+50 to STA 16+50 ~ LT	130 LF
STA 17+20 to STA 20+00 ~ RT	320 LF
STA 18+15 to STA 20+00 ~ LT	210 LF
	825 LF

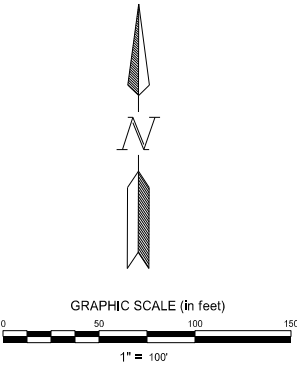
FIBER ROLLS 12 IN/REMOVE FIBER ROLLS 12 IN	
STA 14+65 ~ LT	25 LF

FLOTATION SILT CURTAIN/REMOVE FLOTATION SILT CURTAIN	
STA 16+50 to STA 18+15 ~ LT	180 LF
STA 16+15 to STA 17+20 ~ RT	105 LF
	285 LF




Note: The temporary erosion control shown is intended for either Option A or Option B.

- TEMPORARY COVER CROP & STRAW MULCH
- FIBER ROLLS 12 IN
- SF SILT FENCE SUPPORTED
- S FLOTATION SILT CURTAIN
- DELINEATED WETLANDS



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LOGAN COUNTY, NORTH DAKOTA



**TEMPORARY EROSION CONTROL**  
STA 14+00 to 20+00

DRAWN BY  
JUL

CHKD BY  
JK

PROJECT NO.  
1317101

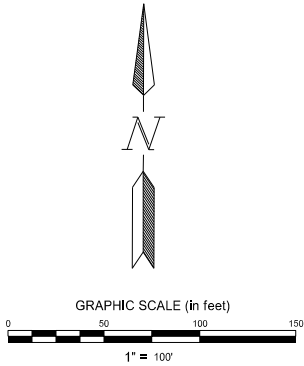
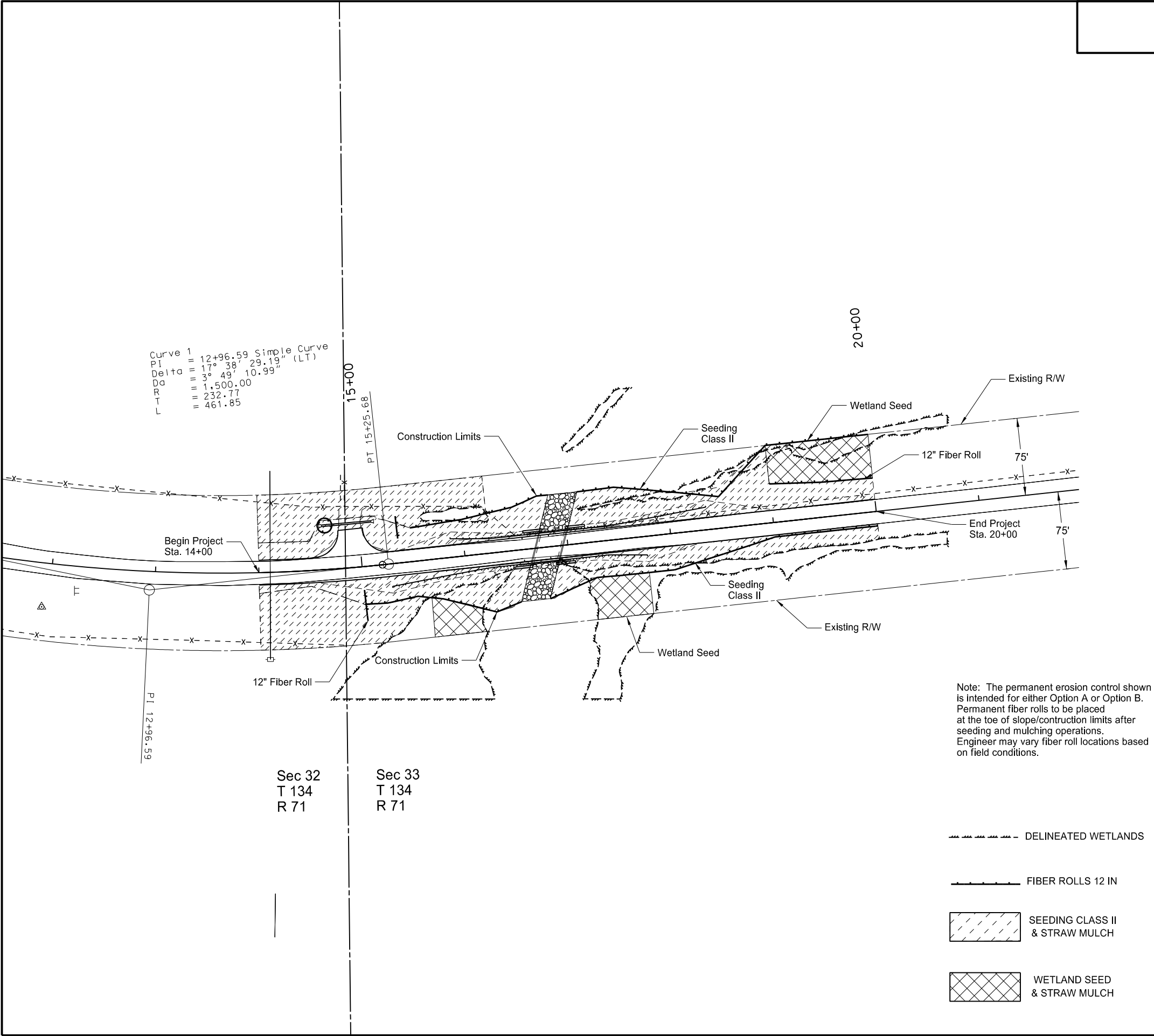
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-CNOC-2416(069)	77	1

SEEDING CLASS II	
STA 14+00 to STA 20+00 ~ RT	0.43 ACRES
STA 14+00 to STA 20+00 ~ LT	<u>0.61 ACRES</u>
	1.04 ACRES

WETLAND SEED	
STA 14+00 to STA 20+00 ~ RT	0.10 ACRES
STA 14+00 to STA 20+00 ~ LT	<u>0.10 ACRES</u>
	0.20 ACRES


STRAW MULCH	
STA 14+00 to STA 20+00 ~ RT	0.53 ACRES
STA 14+00 to STA 20+00 ~ LT	<u>0.71 ACRES</u>
	1.24 ACRES

FIBER ROLLS 12 IN	
STA 14+65 ~ LT	25 LF
STA 15+00 ~ RT	30 LF
STA 15+20 ~ LT	30 LF
STA 15+00 to STA 16+50 ~ RT	155 LF
STA 15+50 to STA 16+85 ~ LT	140 LF
STA 16+75 to STA 20+00 ~ RT	325 LF
STA 17+15 to STA 20+00 ~ LT	305 LF
STA 19+00 to STA 20+00 ~ LT	<u>100 LF</u>
	1110 LF



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LOGAN COUNTY, NORTH DAKOTA



**PERMANENT  
EROSION CONTROL  
STA 14+00 to 20+00**

DRAWN BY  
JUL

CHKD. BY  
JK

PROJECT NO.  
1317101

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRC-CNOC-2416(069)	80	1

REMOVE EXISTING FENCE  
STA 13+30 to STA 16+50 ~ LT 360 LF

FENCE BARBED WIRE 3 STRAND-STEEL POST  
STA 13+30 to STA 16+85 ~ LT 380 LF

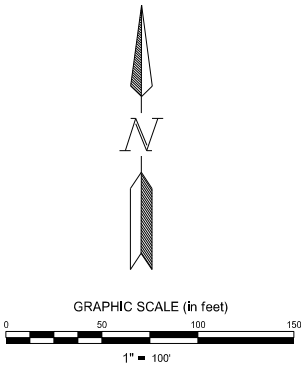
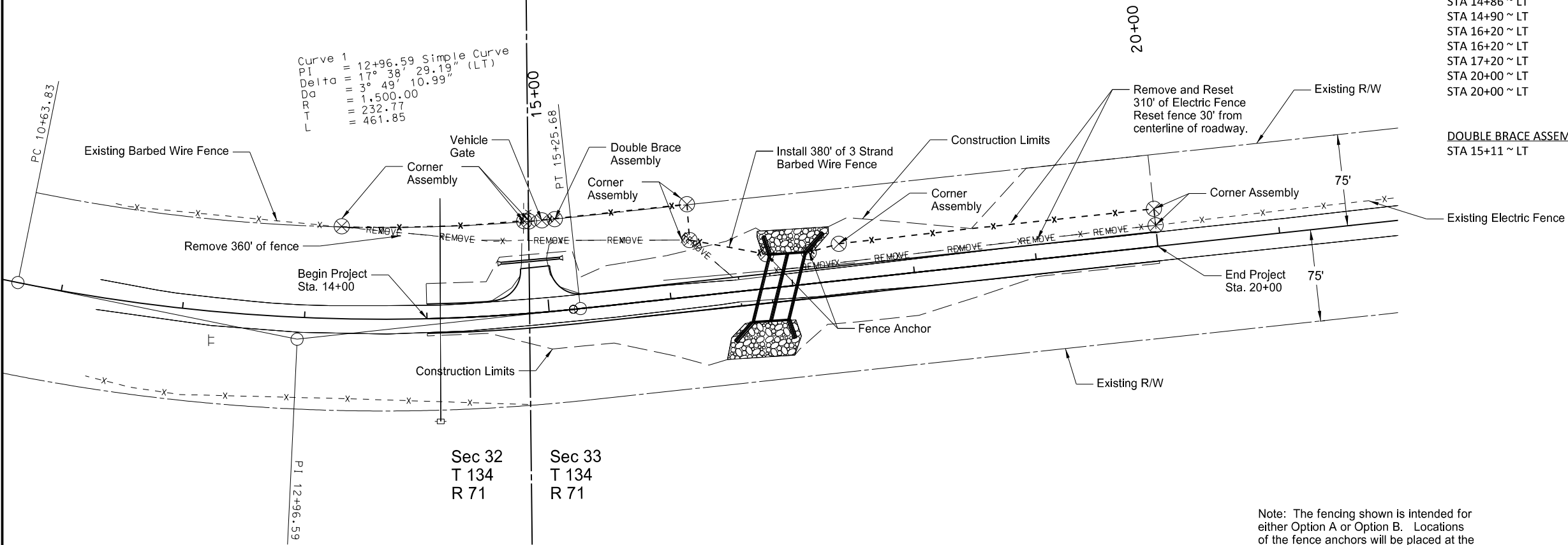
FENCE REMOVE & RESET  
STA 17+00 to STA 20+00 ~ LT 310 LF

FENCE ANCHORS  
STA 16+85 ~ LT 1 EA  
STA 17+00 ~ LT 1 EA  
2 EA

VEHICLE GATE  
STA 15+00 ~ LT 1 EA

CORNER ASSEMBLY-WOOD POST  
STA 13+30 ~ LT 1 EA  
STA 14+86 ~ LT 1 EA  
STA 14+90 ~ LT 1 EA  
STA 16+20 ~ LT 1 EA  
STA 16+20 ~ LT 1 EA  
STA 17+20 ~ LT 1 EA  
STA 20+00 ~ LT 1 EA  
STA 20+00 ~ LT 1 EA  
8 EA

DOUBLE BRACE ASSEMBLY-WOOD POST  
STA 15+11 ~ LT 1 EA



Note: The fencing shown is intended for either Option A or Option B. Locations of the fence anchors will be placed at the discretion of the Engineer.

- REMOVE — REMOVE EXISTING FENCE
- X — — — FENCE
- ⊗ CORNER ASSEMBLIES, VEHICLE GATES  
DOUBLE BRACE ASSEMBLIES & FENCE ANCHORS

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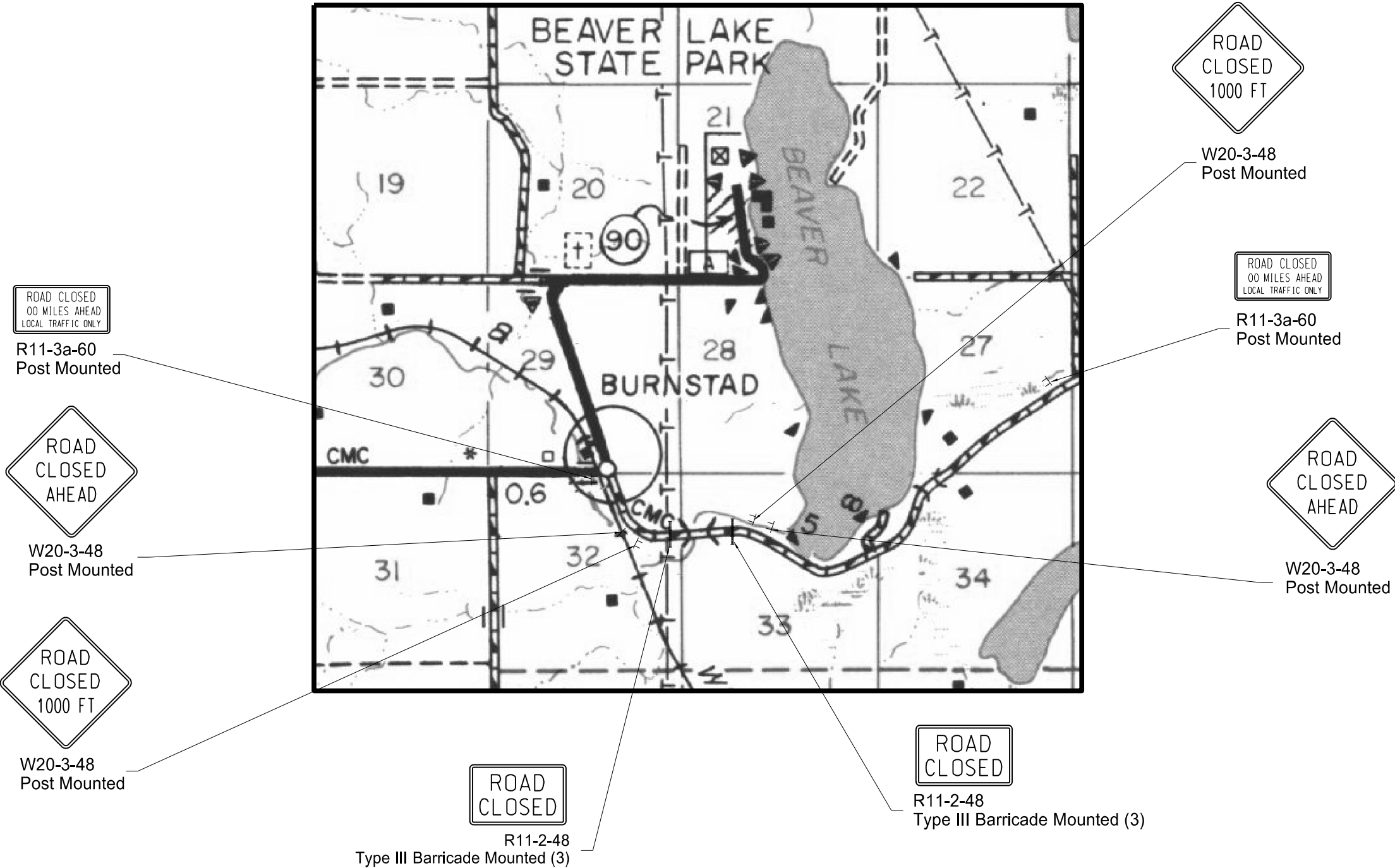
FENCING  
STA 14+00 to 20+00

DRAWN BY: JKL  
CHKD BY: JK  
PROJECT NO.: 1317101





STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-CNOC-2416(069)	100	2



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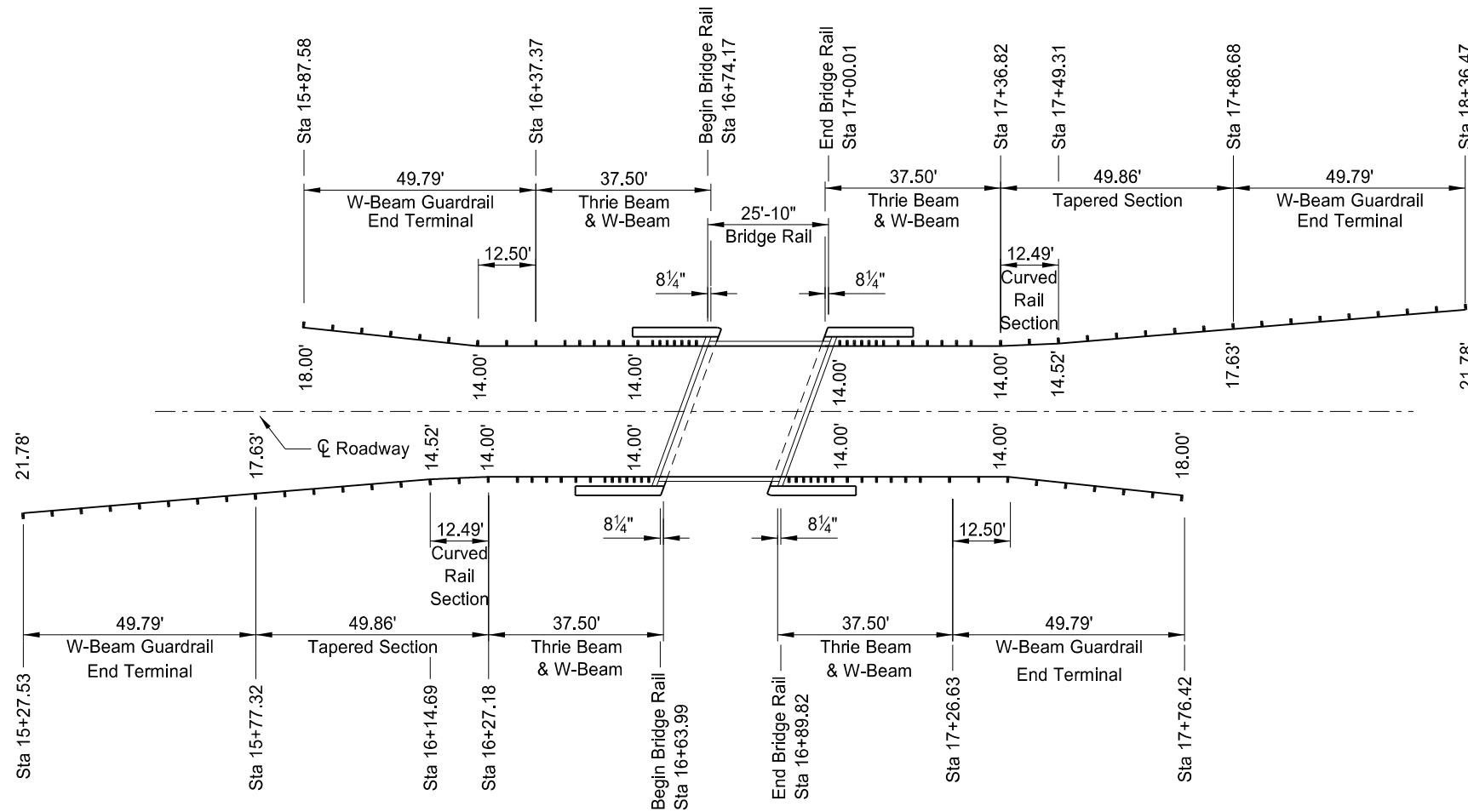
TRAFFIC CONTROL  
SIGNING LAYOUT

DRWN. BY	CHRD. BY	PROJECT NO.
JUL	JK	1317101

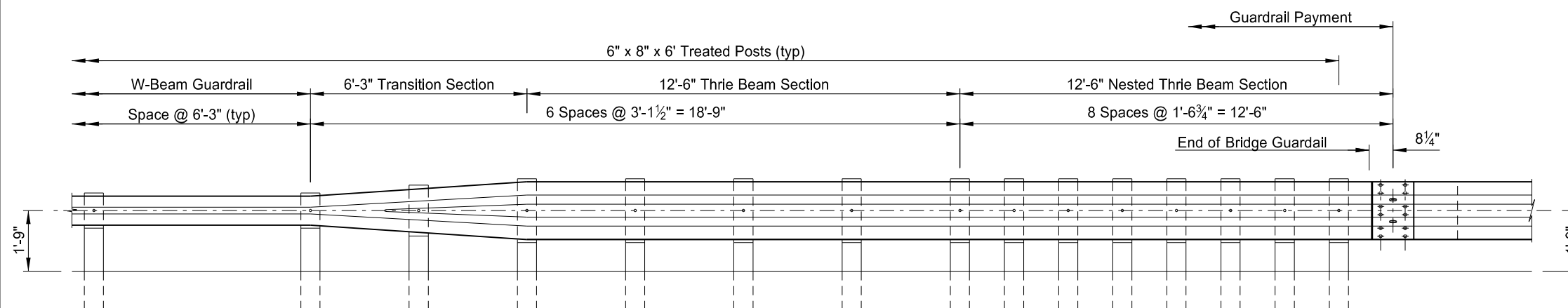
The sign layout as shown is for general information purposes only. The contractor will be required to conform to MUTCD and The Standard Drawings when installing the traffic control signing.

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRC-CNOC-2416(069)	130	1

OPTION B



GUARDRAIL PLAN



INSIDE ELEVATION OF RAIL  
(Typical at Four Locations)

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GUARDRAIL LAYOUT  
DETAILS

DRAWN BY BJJ	CHECKED BY JG	PROJECT NO. 1317101
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	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-CNOC-2416(069)	130	2

OPTION B

GENERAL NOTES

Use #10 or #12 U.S. Standard Gauge for the Rail Element except where specific gauge is required, such as at end terminal or bullnose sections.

Galvanize steel rail elements. Galvanize all post rail fittings and anchor bolts in accordance with Standard Specifications.

Furnish guardrail parts under this specification that are interchangeable with similar parts regardless of the source or manufacturer.

When radius is less than 150', rails are to be shop curved.

Lap all guardrail splices, including special end shoes, in the direction of traffic. Where traffic is temporarily carried in the direction opposite of the final configuration, lap the rail splices in the direction of the permanent traffic.

Use bridge rail transition consisting of one 25'-0" Thrie beam section, one 12'-6" Thrie beam section nested in back of 25'-0" section, and one Thrie beam to W-beam transition section, posts located as shown on Section 130, Sheet 1, and all associated hardware. For the remainder of the guardrail use W-beam with 6'-3" post spacing and furnish in either 12'-6" or 25'-0" sections.

Include all material and work required for this construction in the unit price bid items: "W-BEAM GUARDRAIL" and "W-BEAM GUARDRAIL END TERMINAL".


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to be used  
or only.

QUANTITIES

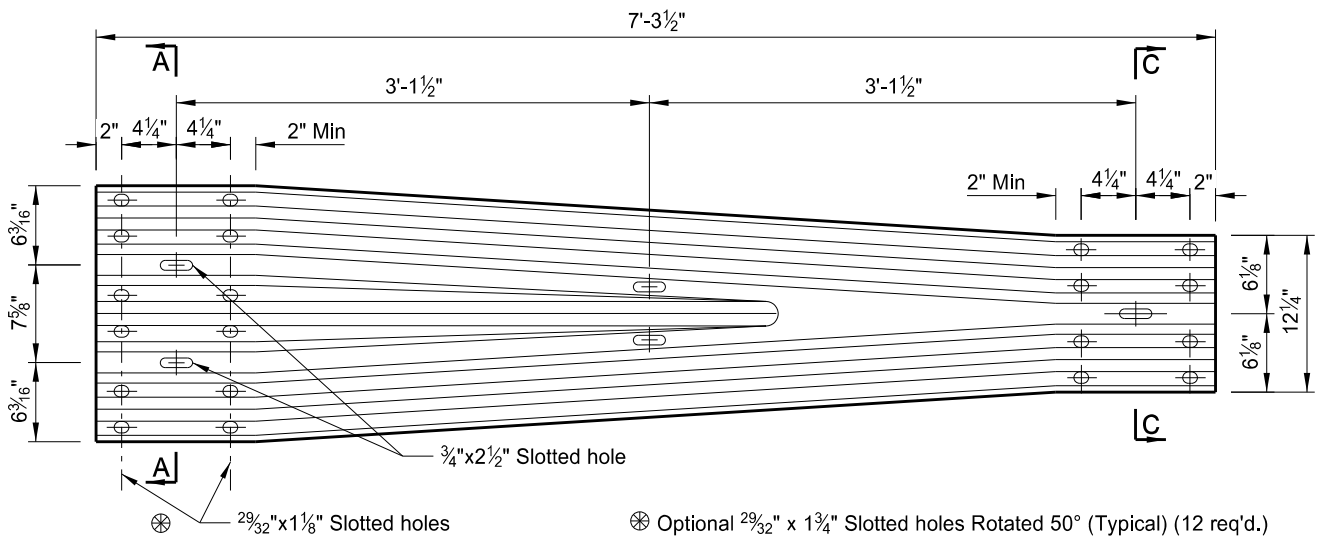
W-BEAM GUARDRAIL	250.0 LF
W-BEAM GUARDRAIL END TERMINAL	4 EA

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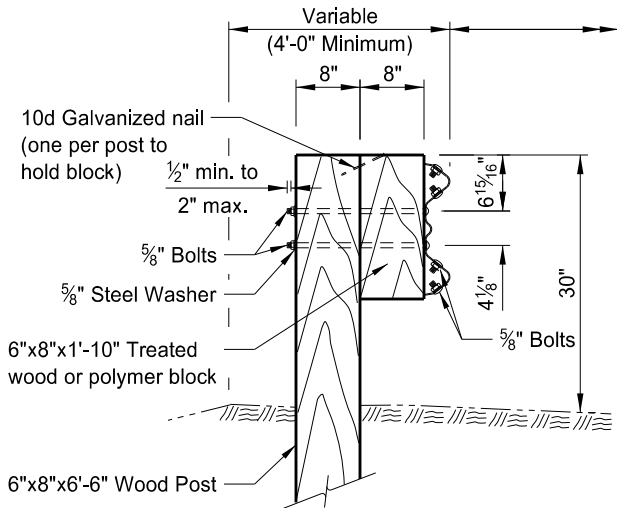


GUARDRAIL TRANSITION  
DETAILS

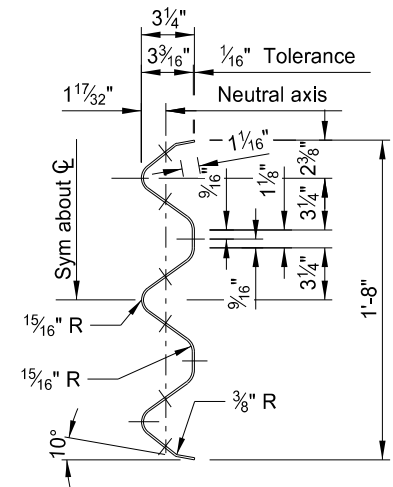
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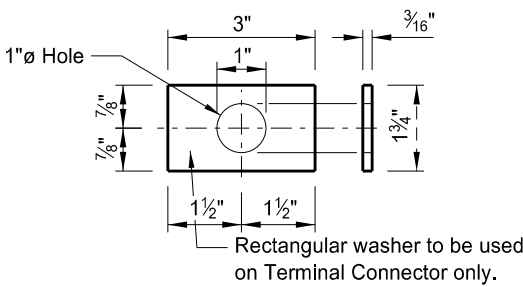
ELEVATION  
TRANSITION SECTION  
(From Thrie Beam to W-Beam rail)



SECTION C-C (Wood Post)



SECTION A-A THRU RAIL ELEMENT  
TYPICAL THRIE BEAM



RECTANGULAR WASHER  
(Other approved washer may be used)



STRUCTURAL NOTES

STATE

ND

PROJECT NUMBER

BRC-CNOC-2416(069)

SECTION NO.

170

SHEET NO.

2

OPTION A

100

SCOPE OF WORK: Work at this site consists of installing a new double barrel 12' x 9' x 58' precast reinforced concrete box culvert.

210

FOUNDATION FILL: Use CL 5 as specified in Section 816, "Aggregates." Notify the Engineer if the Contractor elects to use a coarse rock material under the box culvert as replacement for a portion of the CL 5 material. The replacement of the CL 5 material with coarse rock under the box culvert is subject to the approval of the Engineer. No additional payment will be made for the substitution of the CL 5. All CL 5 and coarse rock used will be paid at the unit price bid for "FOUNDATION FILL".

210

CHANNEL EXCAVATION: Dispose of any unsuitable or excess channel excavation material at a location outside the right-of-way determined by the Contractor and acceptable to the Engineer. Include all costs associated with excavating, hauling, depositing, and leveling the material in the unit price bid for "BOX CULVERT EXCAVATION".

606

PRECAST REINFORCED CONCRETE BOX CULVERT AND END SECTIONS: Tie all barrel sections together with prestressing strands or 1" galvanized tie-bolts as shown on Standard Drawing D-714-22. If strands are used, use a minimum of six ½" diameter 270K strands for double box sections through each joint placed at each outside corner and the center wall of the double box sections. Protect prestressing cables against corrosion and grout their ends. If tie-bolts are used, the joints will require two ties per exterior wall located at the third points of the wall clear height.

Two lines of single cell culverts may be used in lieu of the double cell. Include all costs for the single cell culverts in the unit price bid "DBL 12FT X 9FT PRECAST RCB CULVERT".

The "DBL 12FT X 9FT PRECAST RCB END SECTION" bid item consists of the cutoff wall, parapet, and wingwalls. Attach the wingwalls to the last barrel section by the use of tie bolts, steel-bolted plates, or another approved method so the inside corner surface is smooth. After backfilling, wingwall sections are to be in line. If the wingwall sections are not in line or not installed to angles shown in the plans, remove and reset the wingwalls to be in proper alignment. Any foundation fill not shown in plans that is required to facilitate the installation of the wingwalls is to be included in price bid for "DBL 12FT X 9FT PRECAST RCB END SECTION".

All bolts, plates, angles, and studs are to meet ASTM A36. Nuts are to be a heavy hex in conformance with ASTM A563 and washers shall be ASTM F436, Type 1. Welded pipe sleeves are to conform to ASTM A53, Grade B. Welders are required to be properly certified for all shop and field welds. Coat all field welds with galvanizing paint. Galvanize all hardware according to AASHTO M 232. Galvanize structural steel after fabrication according to AASHTO M 111.

Cast holes at 3'-0" centers through the last barrel section and into the cutoff wall to receive ¾" ø reinforcing bars. Cast holes in the last barrel section at 1'-0" centers for ½" ø reinforcing bars to attach the parapet. Cast the parapet against the section. Install the bars according to the manufacturer's recommendation, with a high strength adhesive specifically intended for concrete anchorage, in accordance with Section 806.02 of the NDDOT Standard Specifications.

If single cell units will be used, the distance between separate precast units is to be a minimum of 6" and a maximum of 1'-0". Fill this gap with controlled density backfill. The controlled density backfill is to be a blend of cement, water, pozzolanic materials, and fillers. The material must be able to support normal loads after 6 hours and have a compressive strength in the range of 75 psi to 125 psi at 28 days. If the mix design shown is used, no further testing will be required. The mix design yields approximately one cubic yard of flowable mortar.

MIX DESIGN

Cement

100 lbs

Fly Ash

300 lbs

Fine Aggregate

2600 lbs

Water

70 gals

The 1'-0" cap consists of a weatherproof and freeze/thaw resistant material such as Sikagrout R 212, BASF MasterflowR 928, Euclid NS Grout, or an approved equal which complies with ASTM C1107.

Measurement and Payment: Controlled density backfill will not be measured separately but is included in the price bid for "DBL 12FT X 9FT PRECAST RCB CULVERT".

DESIGN LOADS:

A. HL-93 Loading

B. Maximum Fill Height = 2'

WORK DRAWINGS: Submit the following work drawings to the Engineer of Record:

DBL 12FT X 9FT PRECAST RCB CULVERT

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BRC-CNOC-2416(069)

LOGAN COUNTY, NORTH DAKOTA

Structure #24-115-18.0

KLJ

STRUCTURAL NOTES

DRAWN BY

DW

CHECKED BY

SD

PROJECT NO.

1317101

8/30/2017

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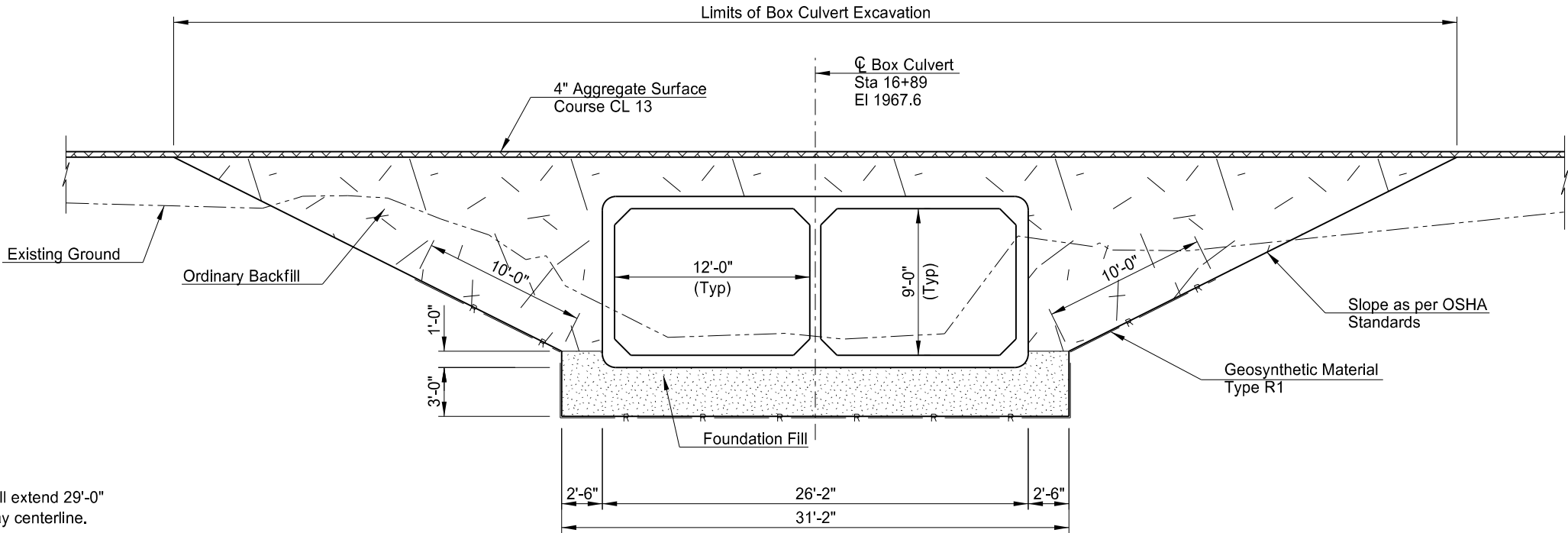
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KLJ 2017

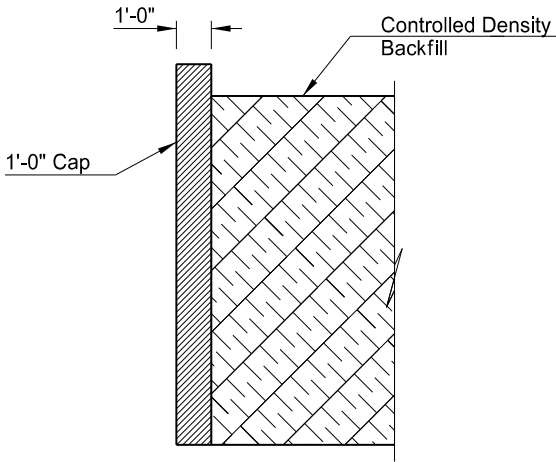
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-CNOC-2416(069)	170	3

OPTION A



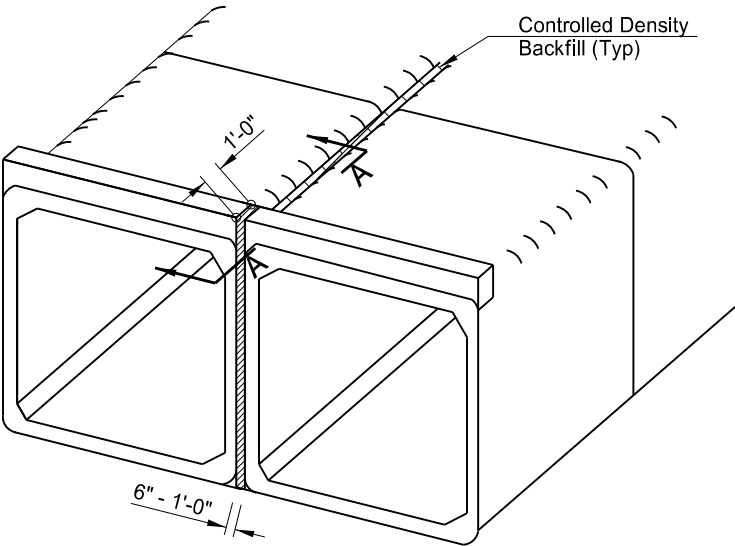
\* Type R1 Material shall extend 29'-0" left and right of roadway centerline.

BOX CULVERT EXCAVATION AND BACKFILL



SECTION A-A

The intent of this drawing is to show only the placement of the controlled density backfill between adjacent barrels. The representation of the number of barrels is arbitrary.



MULTIPLE CELL INSTALLATION  
(Wings & Apron Not Shown)

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BRC-CNOC-2416(069)  
LOGAN COUNTY, NORTH DAKOTA  
Structure #24-115-18.0

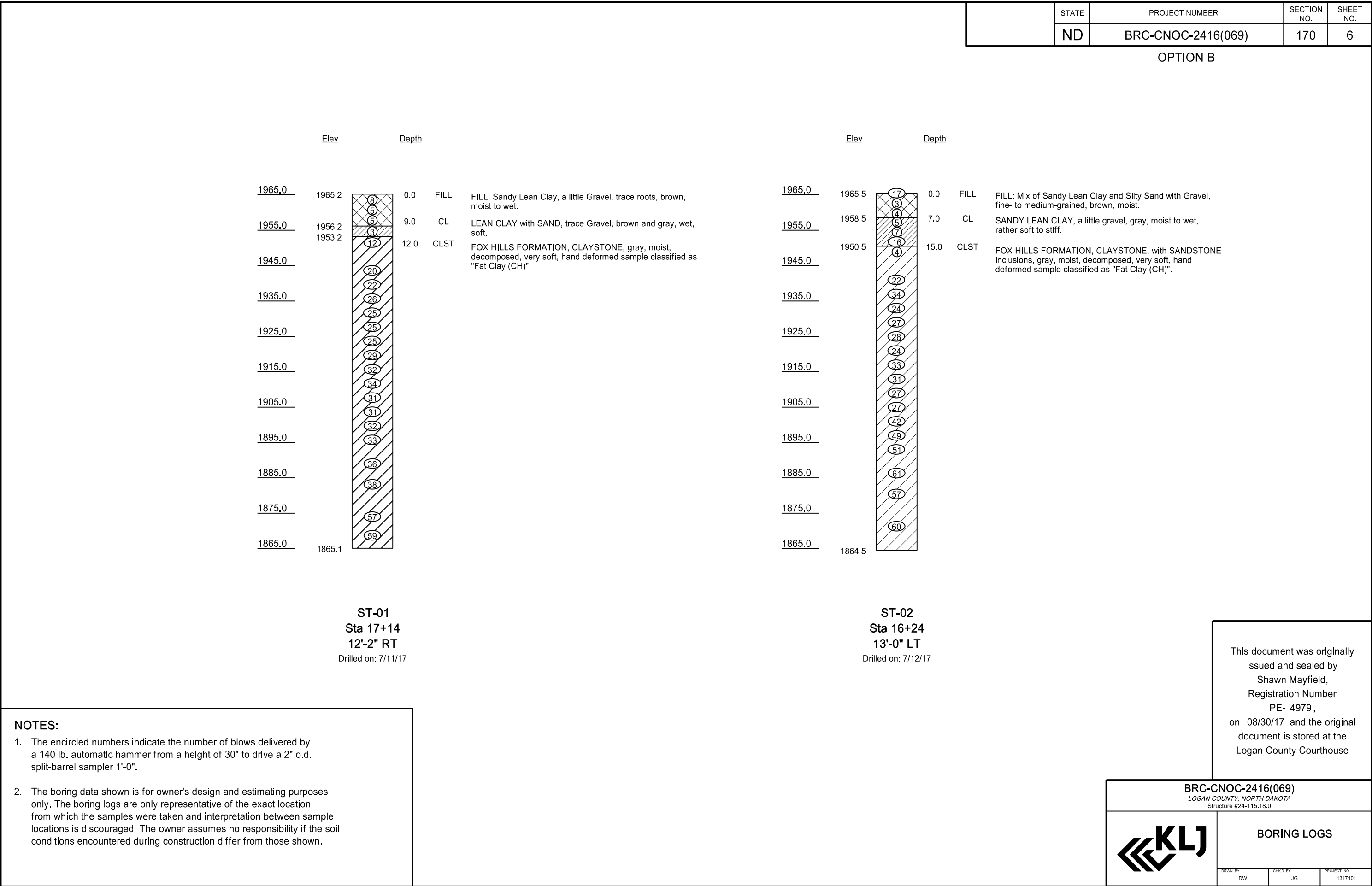


EXCAVATION &  
BACKFILL DETAILS

DRAWN BY DW	CHECKED BY SD	PROJECT NO. 1317101
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STRUCTURAL NOTES				STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
				ND	BRC-CNOC-2416(069)	170	5
OPTION B							
100	SCOPE OF WORK: This project consists of building a new single span prefabricated steel bridge with an overall bridge length of 28'-0" and a clear roadway width of 28'-0".			WORK DRAWINGS: Submit the following work drawings to the Engineer of Record:			
105	WORK DRAWINGS: Submit the work drawings to the Engineer for review. Use the following minimum text sizes on all work drawing sheets:  Dimensions and Notes = 0.08" Detail Subtitles = 0.09" Detail Titles = 0.10"			1. Vehicular Bridge - Pre-Fab			
210	EXCAVATION: Include the excavation costs at the abutments, as shown in the "Detail at Abutment" in the lump sum bid item "Class 2 Excavation".						
210	CHANNEL EXCAVATION: Dispose of any unsuitable or excess channel excavation material at a location outside the right-of-way determined by the Contractor and acceptable to the Engineer. Include all costs associated with excavating, hauling, depositing, and leveling the material in the unit price bid item "Channel Excavation".						
210	FOUNDATION FILL: Provide foundation fill that meets the requirements of Section 816.02, Class 5 and compact in accordance with Section 302.04 B. Only plan quantity of foundation fill will be paid.						
602	CONCRETE: Provide aggregate for concrete that meets the requirements of Section 802.01 C.2 "Coarse Aggregate" and Section 802.01 C.3, "Fine Aggregate".						
602	CURING CONCRETE: Wet cure all concrete surfaces not covered by forms. Cover the concrete with a double thickness of burlap. Maintain surface moisture between the final finish and burlap by periodic applications of a light fog spray of water. Keep the burlap continuously moist until the end of the curing period.						
602	SURFACE FINISH: Apply Surface Finish "C" to the top face of the abutment wings, and all exposed vertical faces of the abutments and abutment wings. Surface Finish "D" (excluding sandblasting) may be substituted for Surface Finish "C" at the Contractor's expense.						
612	REINFORCING STEEL: Dimensions for bent bars are given out to out and to tangent intersections unless otherwise noted. Follow the CRSI Manual of Standard Practice for fabrications and tolerances.						
622	PILING: Drive piling with a diesel hammer with a rated energy and ram weight (minimum of 2,750 pounds) of at least 51,441 foot-pound-tons computed by the formula:  W(E-18,018) + 0.571E  W = Weight of the ram (tons) E = Rated hammer energy  Run the hammer at an energy that produces a penetration at bearing between ½" and 3" in the last 10 blows.						
930	VEHICULAR BRIDGE - PRE-FAB: Include all costs associated with design, fabrication, delivery and installation in the unit price bid item "Vehicular Bridge - Pre-Fab". Refer to Special Provision SP552(14) for design details.						
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				BRC-CNOC-2416(069) LOGAN COUNTY, NORTH DAKOTA Structure #24-115.18.0			
				STRUCTURAL NOTES			
				DRAWN BY DW		CHECKED BY JG	





	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRC-CNOC-2416(069)	170	7

OPTION B

PILE COORDINATES

	PILE	NORTHING	EASTING
ABUT 1	1	261,122.63	2,189,947.26
	4	261,093.50	2,189,940.09
	5	261,121.79	2,189,950.66
	8	261,092.66	2,189,943.49
ABUT 2	1	261,126.23	2,189,972.67
	4	261,097.10	2,189,965.50
	5	261,125.40	2,189,976.07
	8	261,096.27	2,189,968.90

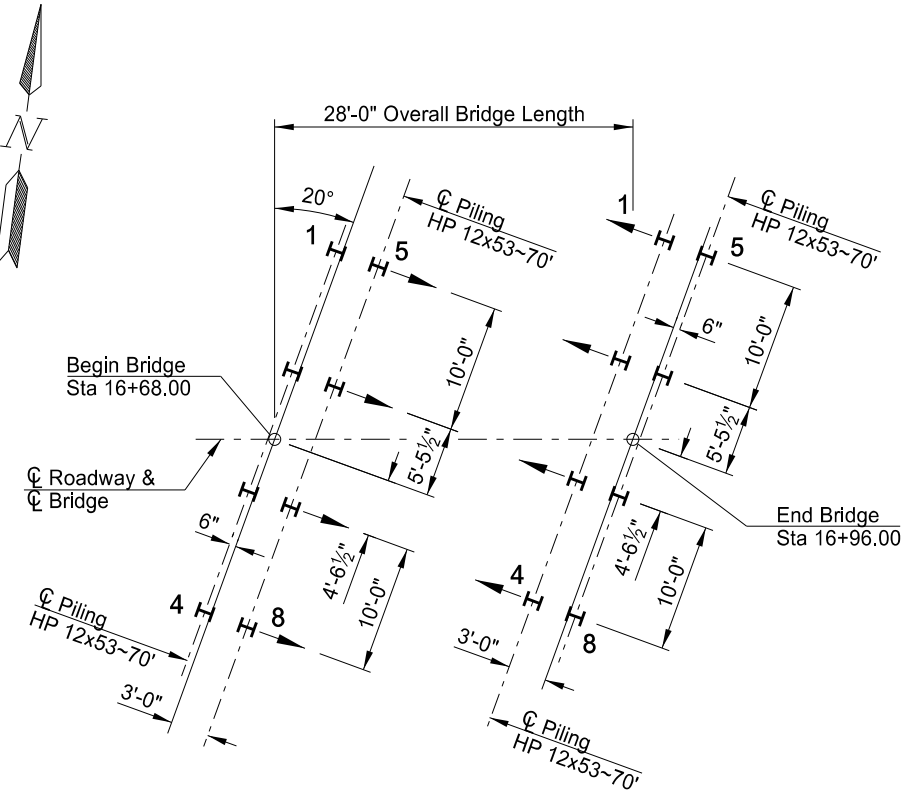
ABUTMENT PLAN

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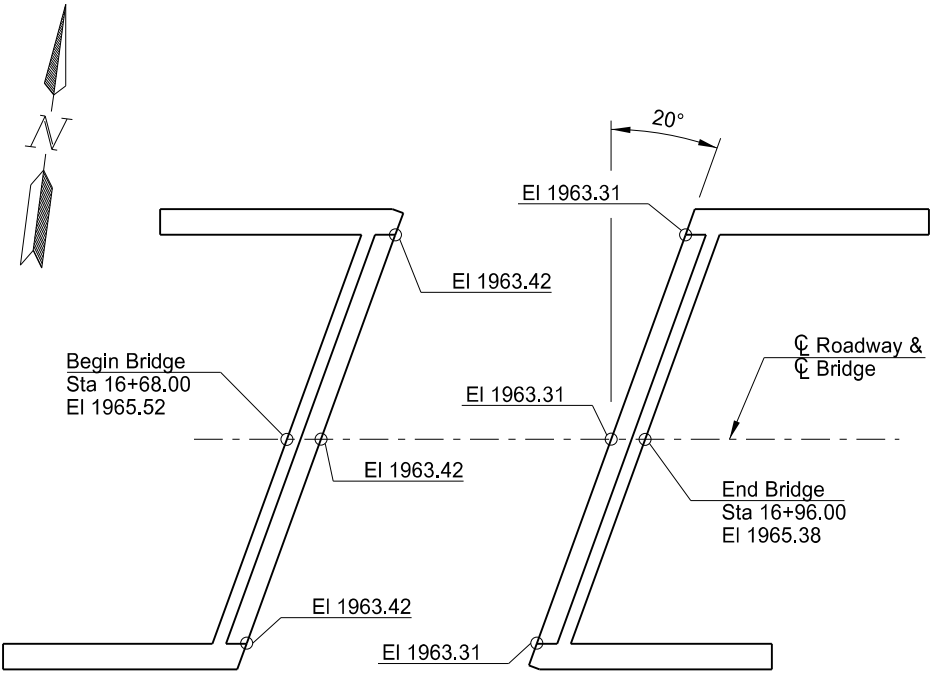
BRC-CNOC-2416(069)  
LOGAN COUNTY, NORTH DAKOTA  
Structure #24-115.18.0

KLJ  
PILING LAYOUT & BEARING ELEVATIONS

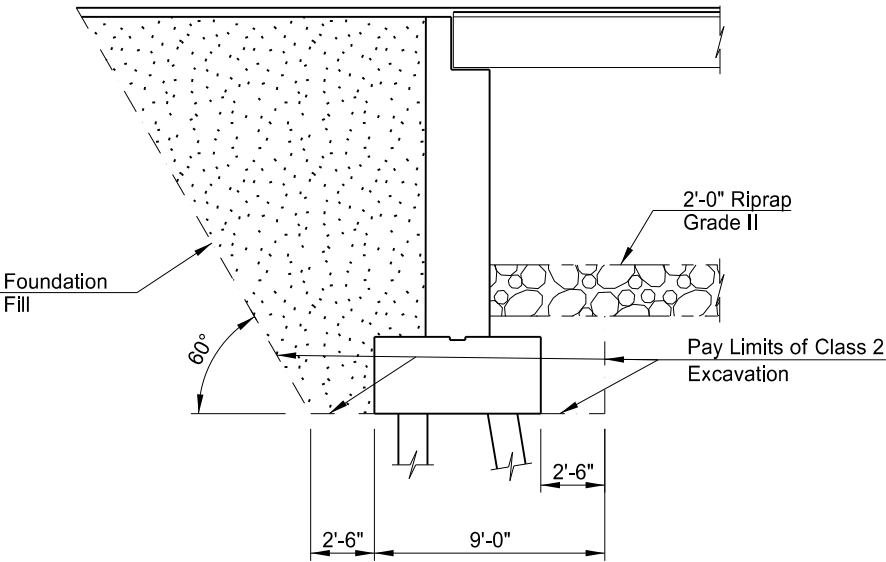
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CHECKED BY: JG  
PROJECT NO.: 1317101



Drive the HP 12x53 Pile to 130 tons.  
PILING LAYOUT



(Elevations shown are to top of finished concrete.)  
BEARING ELEVATIONS



DETAIL AT ABUTMENT

NOTES:

For double acting or single acting diesel hammers, calculate the safe bearing value of piles by the following formula:

$$P = \frac{4.5E}{S + 0.2} \times \frac{W + 0.2M}{W + M}$$

Where:

P = Safe bearing value, in pounds.  
W = Weight of striking parts (ram), in pounds.  
M = Weight of parts being driven, in pounds. Includes pile weight, anvil (if any), driving cap, etc.  
E = Energy per blow, in foot-pounds.  
S = Average penetration of pile in inches per blow for last ten blows.

For single acting hammers, calculate E by multiplying observed stroke (ft) and W (lbs).

Arrow indicates direction of pile batter. Pile batter is 2:12 at locations shown





STATE

ND

PROJECT NUMBER

BRC-CNOC-2416(069)

SECTION NO.

170

SHEET NO.

10

OPTION B

D-D

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QUANTITIES		(ONE ABUTMENT)
CLASS AE-3 CONCRETE	91.0	CY
REINFORCING STEEL GR 60	7,132	LBS

BRC-CNOC-2416(069)  
LOGAN COUNTY, NORTH DAKOTA  
Structure #24-115.18.0

ABUTMENT DETAILS  
(SHOWING REINFORCING)

DRWN BY  
DW

CHKD BY  
JG

PROJECT NO.  
1317101

STEM PLAN  
(5D100 & 5J100 Omitted for Clarity)

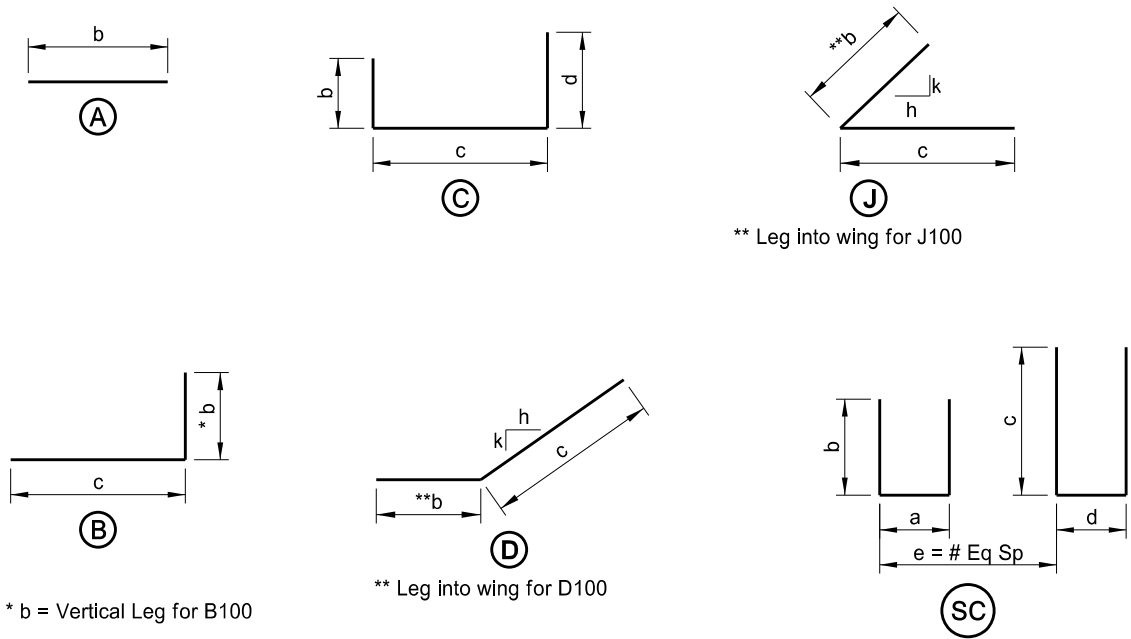
STEM ELEVATION

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BILL OF REINFORCING STEEL, GRADE 60													
LETTER PREFIX OF BAR MARK DENOTES SHAPE ~ SEE BAR DETAILS													
LOCA-TION	SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS								
					a	b	c	d	e	f	g	h	k
ABUTMENTS	7	A100	18	39'-3"		39'-3"							
	6	A101	18	39'-3"		39'-3"							
	5	A102	4	39'-3"		39'-3"							
	5	A103	52	33'-8"		33'-8"							
	5	A104	2	10'-1"		10'-1"							
	5	A105	6	12'-2"		12'-2"							
	5	B100	220	5'-5"		3'-9"	1'-8"						
	5	C100	160	9'-6"		1'-8"	6'-2"	1'-8"					
	5	C101	20	38'-1"		18'-8"	1'-6"	17'-11"					
	5	C102	20	26'-0"		12'-2"	1'-8"	12'-2"					
	5	C103	108	22'-4"		10'-1"	2'-2"	10'-1"					
	5	C104	108	6'-7"		3'-9"	8"	2'-2"					
	5	D100	26	5'-6"		1'-8"	3'-10"					12	4.4
	5	D101	8	19'-10"		4'-4"	15'-6"					12	6.7
	5	J100	26	5'-6"		1'-8"	3'-10"					4.4	12
	5	SC100	4	253'-2"	1'-8"	4'-6"	11'-11"	1'-8"	13				
	5	SC101	4	175'-0"	1'-6"	6'-4"	17'-2"	1'-6"	6				

- NOTES:
1. All dimensions are out to out of bars.
  2. Nominal length of each bent bar or cut bar is the sum total of the detailing dimensions for that bar, unless otherwise noted.



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LOGAN COUNTY, NORTH DAKOTA  
Structure #24-115.18.0



REINFORCING BAR LIST & DETAILS

DRAWN BY: DW, CHECKED BY: JG, PROJECT NO.: 1317101

?	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	BV	butterfly valve
Abut	abutment	Byp	bypass
Ac	acres	C Gdrl	cable guardrail
Adj	adjusted	Calc	calculate
Aggr	aggregate	Cd	candela
Ahd	ahead	CIP	cast iron pipe
ARV	air release valve	CB	catch basin
Align	alignment	CRS	cationic rapid setting
Al	alley	C Gd	cattle guard
Alt	alternate	C To C	center to center
Alum	aluminum	Cl or $\text{C}_L$	centerline
ADA	Americans with Disabilities Act	Cm	centimeter
A	ampere	Ch	chain
&	and	Chnlk	chain-link
Appr	approach	Ch Blk	channel block
Approx	approximate	Ch Ch	channel change
ACP	asbestos cement pipe	Chk	check
Asph	asphalt	Chsld	chiseled
AC	asphalt cement	Cir	circle
Assmd	assumed	Cl	class
@	at	Cl	clay
Atten	attenuation	Cl F	clay fill
ATR	automatic traffic recorder	Cl Hvy	clay heavy
Ave	Avenue	Cl Lm	clay loam
Avg	average	Clnt	clean-out
ADT	average daily traffic	Clr	clear
Az	azimuth	Cl&gr	clearing & grubbing
Bk	back	Co S	coal slack
BF	back face	Comb.	combination
Bs	backsight	Coml	commercial
Balc	balcony	Compr	compression
B Wire	barbed wire	CADD	computer aided drafting & design
Barr	barricade	Conc	concrete
Btry	battery	Cond	conductor
Brg	bearing	Const	construction
BI	beehive inlet	Cont	continuous
Beg	begin	CSB	continuous split barrel sample
BM	bench mark	Contr	contraction
Bkwy	bikeway	Contr	contractor
Bit	bituminous	CP	control point
Blk	block	Coord	coordinate
Bd Ft	board feet	Cor	corner
BH	bore hole	Corr	corrected
BS	both sides	CAES	corrugated aluminum end section
Bot	bottom	CAP	corrugated aluminum pipe
Blvd	Boulevard	CMES	corrugated metal end section
Bndry	boundary	CMP	corrugated metal pipe
BC	brass cap	CPVCP	corrugated poly-vinyl chloride pipe
Brkwy	breakaway	CSES	corrugated steel end section
Br	bridge	CSP	corrugated steel pipe
Bldg	building	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
		FI	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	Lvlng	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	preformed
Ha	hectare	Lig Sl	lignite slack	N	North	Prep	preperation
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	
07-01-14	
REVISIONS	
DATE	CHANGE
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	
REVISIONS	
DATE	CHANGE
08-03-15	General Revisions

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

702COM 702 Communications  
ACCENT Accent Communications  
AGASSIZ WU Agassiz Water Users Incorporated  
AGC Associated General Contractors of America  
All PI Alliance Pipeline  
ALL SEAS WU All Seasons Water Users Association  
AMOCO PI Amoco Pipeline Company  
AMRDA HESS Amerada Hess Corporation  
AT&T AT&T Corporation  
B PAW Bear Paw Energy Incorporated  
BAKER ELEC Baker Electric  
BASIN ELEC Basin Electric Cooperative Incorporated  
BEK TEL Bek Communications Cooperative  
BELLE PL Belle Fourche Pipeline Company  
BLM Bureau of Land Management  
BNSF Burlington Northern Santa Fe Railway  
BOEING Boeing  
BRNS RWD Barnes Rural Water District  
BURK-DIV ELEC Burke-Divide Electric Cooperative  
BURL WU Burleigh Water Users  
Cable One Cable One  
CABLE SERV Cable Services  
CAP ELEC Capital Electric Cooperative Incorporat  
CASS CO ELEC Cass County Electric Cooperative  
CASS RWU Cass Rural Water Users Incorporated  
CAV ELEC Cavalier Rural Electric Cooperative  
CBLCOM Cablecom Of Fargo  
CENEX PL Cenex Pipeline  
CENT PL WATER DIST Central Pipe Line Water District  
CENT PWR ELEC Central Power Electric Cooperative  
COE Corps of Engineers  
CONS TEL Consolidated Telephone  
CONT RES Continental Resource Inc  
CPR Canadian Pacific Railway  
D O E Department Of Energy  
DAK CARR Dakota Carrier Network  
DAK CENT TEL Dakota Central Telephone  
DAK RWD Dakota Rural Water District  
DGC Dakota Gasification Company  
DICKY R NET Dickey Rural Networks  
DICKY RWU Dickey Rural Water Users Association  
DICKY TEL Dickey Telephone  
DNRR Dakota Northern Railroad  
DOME PL Dome Pipeline Company  
DVELEC Dakota Valley Electric Cooperative  
DVMW Dakota, Missouri Valley & Western  
ENBRDG Enbridge Pipelines Incorporated  
ENVENTIS Enventis Telephone  
FALK MNG Falkirk Mining Company  
FHWA Federal Highway Administration  
G FKS-TRL WD Grand Forks-trail Water District  
GETTY TRD & TRAN Getty Trading & Transportation  
GLDN W ELEC Golden West Electric Cooperative  
GRGS CO TEL Griggs County Telephone

GT PLNS NAT GAS Great Plains Natural Gas Company  
HALS TEL Halstad Telephone Company  
IDEA1 Idea1  
INT-COMM TEL Inter-Community Telephone Company  
KANEB PL Kaneb Pipeline Company  
KEM ELEC Kem Electric Cooperative Incorporated  
KOCH GATH SYS Koch Gathering Systems Incorporated  
LKHD PL Lakehead Pipeline Company  
LNGDN RWU Langdon Rural Water Users Incorporated  
LWR YELL R ELEC Lower Yellowstone Rural Electric  
MCKNZ CON McKenzie Consolidated Telcom  
MCKNZ ELEC McKenzie Electric Cooperative  
MCKNZ WRD McKenzie County Water Resource District  
MCLEOD McLeod USA  
MCLN ELEC McLean Electric Cooperative  
MCLN-SHRDN R WAT McLean-Sheridan Rural Water  
MDU Montana-dakota Utilities  
MID-CONT CABLE Mid-Continent Cable  
MIDSTATE TEL Midstate Telephone Company  
MINOT CABLE Minot Cable Television  
MINOT TEL Minot Telephone Company  
MISS W W S Missouri West Water System  
MNKOTA PWR Minnkota Power  
MOR-GRAN-SOU ELEC Mor-gran-sou Electric Cooperative  
MOUNT-WILLI ELEC Mountrail-williams Electric Cooperative  
MRE LBTY TEL Moore & Liberty Telephone  
MUNICIPAL City Water And Sewer  
MUNICIPAL City Of '.....'  
N CENT ELEC North Central Electric Cooperative  
N VALL W DIST North Valley Water District  
ND PKS & REC North Dakota Parks And Recreation  
ND TEL North Dakota Telephone Company  
NDDOT North Dakota Department of Transportation  
NDSU SOIL SCI DEPT NDSU Soil Science Department  
NEMONT TEL Nemont Telephone  
NODAK R ELEC Nodak Rural Electric Cooperative  
NOON FRMS TEL Noonan Farmers Telephone Company  
NPR Northern Plains Railroad  
NSP Northern States Power  
NTH PRAIR RW Northern Prairie Rural Water Association  
NTHN BRDR PL Northern Border Pipeline  
NTHN PLNS ELEC Northern Plains Electric Cooperative Incorporated  
NTHWSTRN REF Northwestern Refinery Company  
NW COMM Northwest Communication Cooperation  
ONEOK Oneok gas  
OSHA Occupational Safety and Health Administration  
OTTR TL PWR Otter Tail Power Company  
P L E M Prairielands Energy Marketing  
POLAR COM Polar Communications  
PVT ELEC Private Electric  
QWEST Qwest Communications  
R&T W SUPPLY R & T Water Supply Association  
RAMSEY R SEW Ramsey Rural Sewer Association  
RAMSEY RW Ramsey Rural Water Association  
RAMSEY UTIL Ramsey County Rural Utilities

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

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Existing Topography

	Existing Ground Void
	Existing Cemetary Boundary
	Existing Box Culvert Bridge
	Existing Concrete Surface
	Existing Drainage Structure
	Existing Gravel Surface
	Existing Riprap
	Existing Dirt Surface
	Existing Asphalt Surface
	Existing Tie Point Line
	Existing Railroad Centerline
	Existing Guardrail Cable
	Existing Guardrail Metal
	Existing Edge of Water
	Existing Fence
	Existing Railroad
	Existing Field Line
	Exst Flow
	Existing Curb
	Existing Valley Gutter
	Existing Driveway Gutter
	Existing Curb and Gutter
	Existing Mountable Curb and Gutter

	Existing 3-Cable w Posts
	Site Boundary
	Existing Berm, Dike, Pit, or Earth Dam
	Existing Ditch Block
	Existing Tree Boundary
	Existing Brush or Shrub Boundary
	Existing Retaining Wall
	Existing Planter or Wall
	Existing W-Beam Guardrail with Posts
	Existing Railroad Switch
	Gravel Pit - Borrow Area
	Existing Wet Area-Vegetation Break

Proposed Topography

	3-Cable w Posts
	Flow
	Fence
	Remove Line
	Wall
	Retaining Wall (Plan View)
	W-Beam w Posts

Existing Utilities

	Existing Electrical
	Existing Fiber Optic Line
	Existing TV Fiber Optic
	Existing Gas Pipe
	Existing Overhead Utility Line
	Existing Power
	Existing Fuel Pipeline
	Existing Undefined Above Ground Pipe Line
	Existing Sanitary Sewer
	Existing Sanitary Force Main
	Existing Storm Drain
	Existing Storm Drain Force Main
	Existing Culvert
	Existing Telephone Line
	Existing TV Line
	Existing Water or Steam Line
	Existing Under Drain
	Existing Slotted Drain
	Existing Conduit
	Existing Conductor
	Existing Down Guy Wire Down Guy
	Existing Underground Vault or Lift Station

Proposed Utilities

	24 Inch Pipe
	Reinforced Concrete Pipe
	Under Drain
	Edge Drain

Traffic Utilities

	Conductor
	Fiber Optic
	Existing Loop Detector
	Existing Double Micro Loop Detector
	Micro Loop Detector Double
	Existing Micro Loop Detector
	Micro Loop Detector
	Signal Head with Mast Arm
	Existing Signal Head with Mast Arm

Sign Structures

	Existing Overhead Sign Structure
	Existing Overhead Sign Structure Cantilever
	Overhead Sign Structure Cantilever

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Line Styles

Right Of Way

	Easement
	Existing Easement
	Right of Way
	Existing Right of Way
	Existing Right of Way Railroad
	Existing Right of Way Not State Owned
	Existing Government Lot Line
	Existing Adjacent Block Lines
	Existing Adjacent Lot Lines
	Existing Adjacent Property Line
	Existing Adjacent Subdivision Lines
	Sight Distance Triangle Line
	Dimension Leader

Boundary Control

	Existing City Corporate Limits or Reservation Boundary
	Existing State or International Line
	Existing Township
	Existing County
	Existing Section Line
	Existing Quarter Section Line
	Existing Sixteenth Section Line
	Existing Centerline
	Tangent Line

Cross Sections and Typicals

	Existing Ground
	Existing Topsoil (Cross Section View)
	Existing Ground Void (Not Surveyed)
	Existing Concrete
	Existing Aggregate (Cross Section View)
	Existing Curb and Gutter (Cross Section View)
	Existing Asphalt (Cross Section View)
	Existing Reinforcement Rebar

Geotechnical

	Geotextile Fabric Type D
	Geogrid
	Geotextile Fabric Type R
	Geotextile Fabric Type R1
	Geotextile Fabric Type RR
	Geotextile Fabric Type S
	Subgrade Reinforcement

Failure Line

Countours

	Depression Contours
	Supplemental Contour

Profile

	Subgrade, Subcut or Ditch Grade
	Topsoil Profile

Striping

	Centerline Pavement Marking
	Barrier with Centerline Pavement Marking
	Barrier Pavement Marking
	Stripe 4 IN Dotted Extension White
	Stripe 8 IN Dotted Extension White
	Stripe 8 IN Lane Drop

Pavement Joints

	Doweled Joint
	Tie Bar 30 Inch 4 Foot Center to Center
	Tie Bar 18 Inch 3 Foot Center to Center
	Tie Bar at Random Spacing

Bridge Details

	Hidden Object
	Small Hidden Object
	Large Hidden Object
	Phantom Object
	Centerline Main
	Centerline
	Existing Ground (Details)
	Existing Conditions
	Sheet Piling

Erosion Control

	Limits of Const Transition Line
	Bale Check
	Rock Check
	Floating Silt Curtain
	Silt Fence
	Excavation Limits
	Fiber Rolls

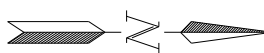























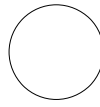






































































Environmental

	Wetland Mitigation
	Existing Wetland Easement USFWS
	Existing Wetland Jurisdictional
	Existing Wetland
	Tree Row

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



























































































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Symbols

	North Arrow (Half Scale)		Attenuation Device		Existing Railroad Battery Box		Existing Delineator Type E														
	Truck Mounted Attenuator		Diamond Grade Delineator Type A		Existing Bush or Shrub		Existing EFB Misc														
	Type I Barricade		Diamond Grade Delineator Type B		Existing Gas Cap or Stub		Existing Flashing Beacon														
	Type II Barricade		Diamond Grade Delineator Type C		Existing Sanitary Cap or Stub		Existing Pipe Mounted Flasher														
	Type III Barricade		Diamond Grade Delineator Type D		Existing Storm Drain Cap or Stub		Existing Pad Mounted Feed Point														
	Catch Basin		Diamond Grade Delineator Type E		Existing Water Cap or Stub		Existing Pipe Mounted Feed Point with Pad														
	Cairn or Stone Circle		Flexible Delineator		Existing Sanitary Cleanout		Existing Pole Mounted Feed Point														
	Video Detection Camera		Flexible Delineator Type A		Existing Concrete Foundation		Existing Railroad Frog														
	Storm Drain Cap or Stub		Flexible Delineator Type B		Existing Traffic Signal Controller		Existing Snow Gate 18														
	Corrugated Metal End Section 18 Inch		Flexible Delineator Type C		Existing Pad Mounted Signal Controller		Existing Snow Gate 28														
	Corrugated Metal End Section 24 Inch		Flexible Delineator Type D		Existing Sixteenth Section Corner		Existing Snow Gate 40														
	Corrugated Metal End Section 30 Inch		Flexible Delineator Type E		Existing Quarter Section Corner		Existing Headwall														
	Corrugated Metal End Section 36 Inch		Delineator Type A		Existing Section Corner		Existing Pedestrian Head with Number														
	Corrugated Metal End Section 42 Inch		Delineator Type A Reset		Existing Railroad Crossbuck		Existing Signal Head														
	Corrugated Metal End Section 48 Inch		Delineator Type B		Existing Satellite Dish		Existing Sprinkler Head														
	Concrete Foundation		Delineator Type B Reset		Existing Fuel Dispensers		Existing Fire Hydrant														
	Ground Connection Conductor		Delineator Type C		Existing Flexible Delineator Type A		Existing Catch Basin Drop Inlet														
	Neutral Connection Conductor		Delineator Type D		Existing Flexible Delineator Type B		Existing Curb Inlet														
	Phase 1 Connection Conductor		Delineator Type E		Existing Flexible Delineator Type C		Existing Manhole Inlet														
	Phase 2 Connection Conductor		Delineator Drums		Existing Flexible Delineator Type D		Existing Junction Box														
	Traffic Cone		Spot Elevation		Existing Flexible Delineator Type E	<table><tr><th colspan="2">NORTH DAKOTA DEPARTMENT OF TRANSPORTATION</th></tr><tr><th colspan="2">07-01-14</th></tr><tr><th colspan="2">REVISIONS</th></tr><tr><th>DATE</th><th>CHANGE</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> <div>This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 07/01/14 and the original document is stored at the North Dakota Department of Transportation</div>		NORTH DAKOTA DEPARTMENT OF TRANSPORTATION		07-01-14		REVISIONS		DATE	CHANGE						
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION																					
07-01-14																					
REVISIONS																					
DATE	CHANGE																				
	Signal Controller		Existing Access Control Arrow		Existing Delineator Type A																
	Pad Mounted Signal Controller		Existing Artifact		Existing Delineator Type B																
	Alignment Data Point		Existing Flashing Beacon		Existing Delineator Type C																
	Emergency Vehicle Detector		Existing Benchmark		Existing Delineator Type D																

Symbols






























































































D-101-31

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

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

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Symbols

	Pad Mounted Feed Point		Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire		Object Marker Type I		Reinforced Concrete End Section 48 Inch										
	Pipe Mounted Feed Point with Pad		Light Standard 150 Watt High Pressure Sodium Vapor Luminaire		Object Marker Type II		Reinforced Concrete End Section 54 Inch										
	Pole Mounted Feed Point		Light Standard 175 Watt High Pressure Sodium Vapor Luminaire		Object Marker Type III		Reset Right of Way Marker										
	Headwall		Light Standard 200 Watt High Pressure Sodium Vapor Luminaire		Caution Mode Arrow Panel		Reset USGS Marker										
	Double Headwall with Vegetation Barrier		Light Standard 250 Watt High Pressure Sodium Vapor Luminaire		Back to Back Vertical Panel Sign		Right of Way Markers										
	Single Headwall with Vegetation Barrier		Light Standard 310 Watt High Pressure Sodium Vapor Luminaire		Double Direction Arrow Panel		Riser 30 Inch										
	Pole Mounted Head		Light Standard 35 Watt High Pressure Sodium Vapor Luminaire		Left Directional Arrow Panel		Continuous Split Barrel Sample										
	Sprinkler Head		Light Standard 400 Watt High Pressure Sodium Vapor Luminaire		Right Directional Arrow Panel		Flight Auger Sample										
	Fire Hydrant		Light Standard 50 Watt High Pressure Sodium Vapor Luminaire		Sequencing Arrow Panel		Split Barrel Sample										
	Inlet Type 1		Light Standard 70 Watt High Pressure Sodium Vapor Luminaire		Truck Mounted Arrow Panel		Thinwall Tube Sample										
	Inlet Type 2		Light Standard 700 Watt High Pressure Sodium Vapor Luminaire		Power Pole		Highway Sign										
	Double Inlet Type 2		Manhole		Wood Pole		SNOW GATE 18 FT										
	Inlet Grate Type 2		Manhole 48 Inch		Pedestrian Push Button Post		SNOW GATE 28 FT										
	Junction Box		Sanitary Force Main Manhole		Property Corner		SNOW GATE 40 FT										
	High Mast Light Standard 10 Luminaire		Sanitary Sewer Manhole		Pull Box		Standard Penetration Test										
	High Mast Light Standard 3 Luminaire		Storm Drain Manhole		Intelligent Transportation Pull Box		Transformer										
	High Mast Light Standard 4 Luminaire		Storm Drain Manhole with Inlet		Sanitary Pump		Inclinometer Tube										
	High Mast Light Standard 5 Luminaire		Reset Mile Post		Storm Drain Pump		Underdrain Cleanout										
	High Mast Light Standard 6 Luminaire		Mile Post Type A		Reinforced Pavement		Excavation Unit										
	High Mast Light Standard 7 Luminaire		Mile Post Type B		Reinforced Concrete End Section 15 Inch		Water Valve										
	High Mast Light Standard 8 Luminaire		Mile Post Type C		Reinforced Concrete End Section 18 Inch	<table><tr><th colspan="2">NORTH DAKOTA DEPARTMENT OF TRANSPORTATION</th></tr><tr><th colspan="2">07-01-14</th></tr><tr><th colspan="2">REVISIONS</th></tr><tr><th>DATE</th><th>CHANGE</th></tr><tr><td></td><td></td></tr></table>	NORTH DAKOTA DEPARTMENT OF TRANSPORTATION		07-01-14		REVISIONS		DATE	CHANGE			
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION																	
07-01-14																	
REVISIONS																	
DATE	CHANGE																
	High Mast Light Standard 9 Luminaire		Right of Way Marker		Reinforced Concrete End Section 24 Inch												
	Relocate Light Standard		Tubular Marker		Reinforced Concrete End Section 30 Inch												
	Overhead Sign Structure Load Center		Alignment Monument		Reinforced Concrete End Section 36 Inch												
	Light Standard 100 Watt High Pressure Sodium Vapor Luminaire		Iron Pin Reference Monument		Reinforced Concrete End Section 42 Inch												

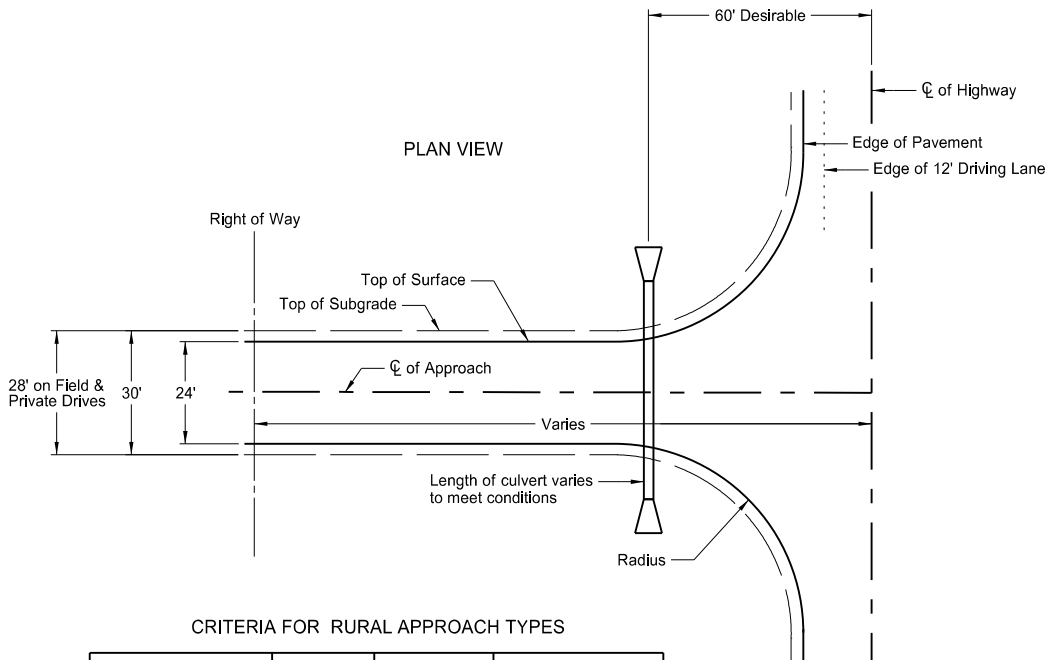
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE

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STANDARD RURAL APPROACHES

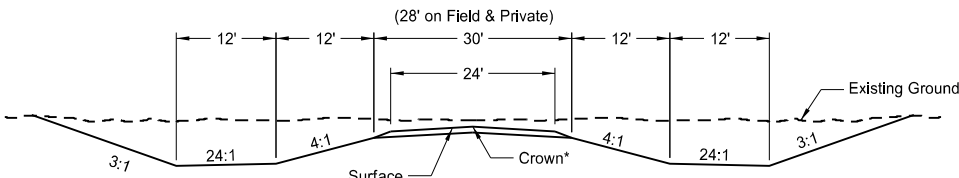
D-203-8

- NOTES:
1. 5% Max Rollover between approach storage platform and highway.

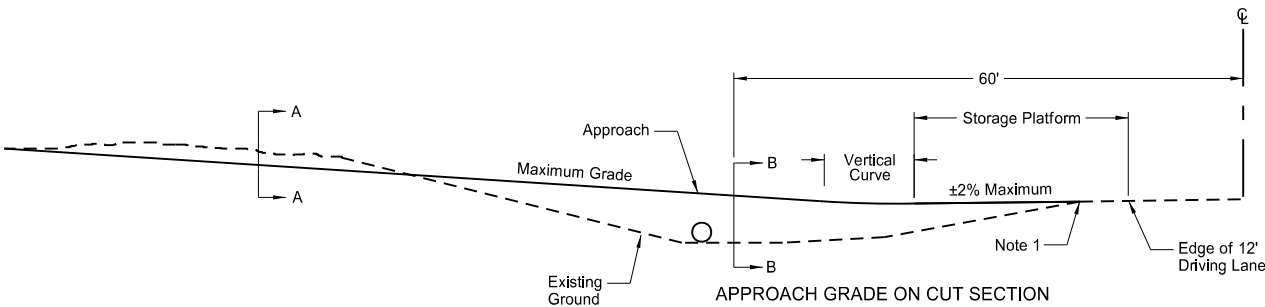
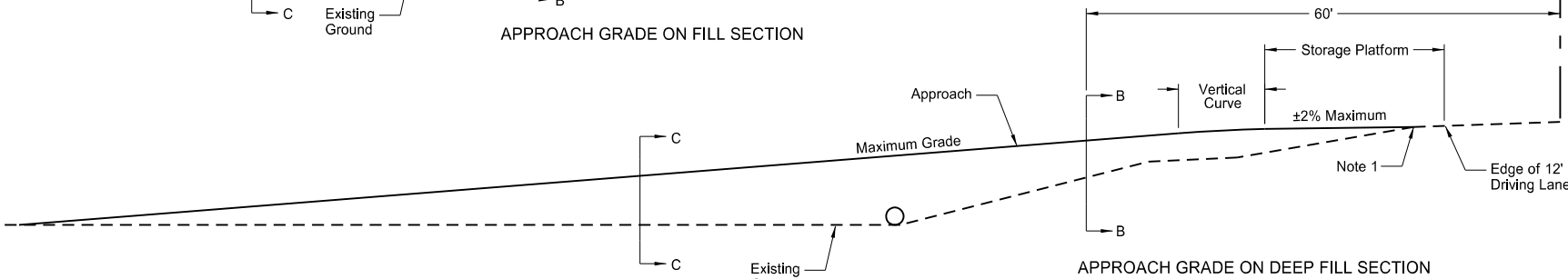
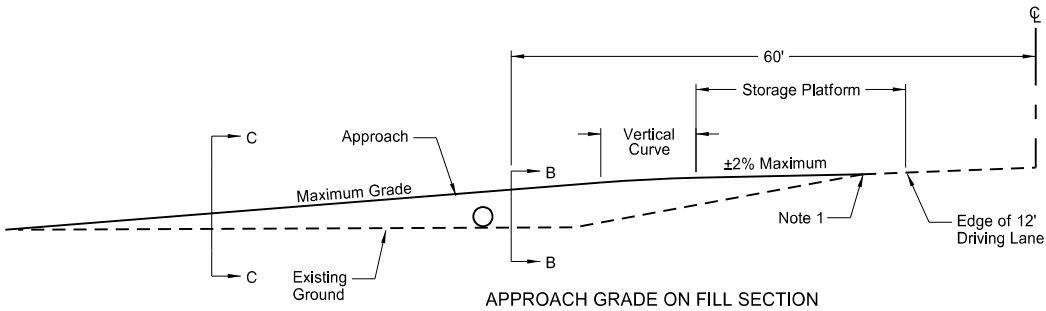
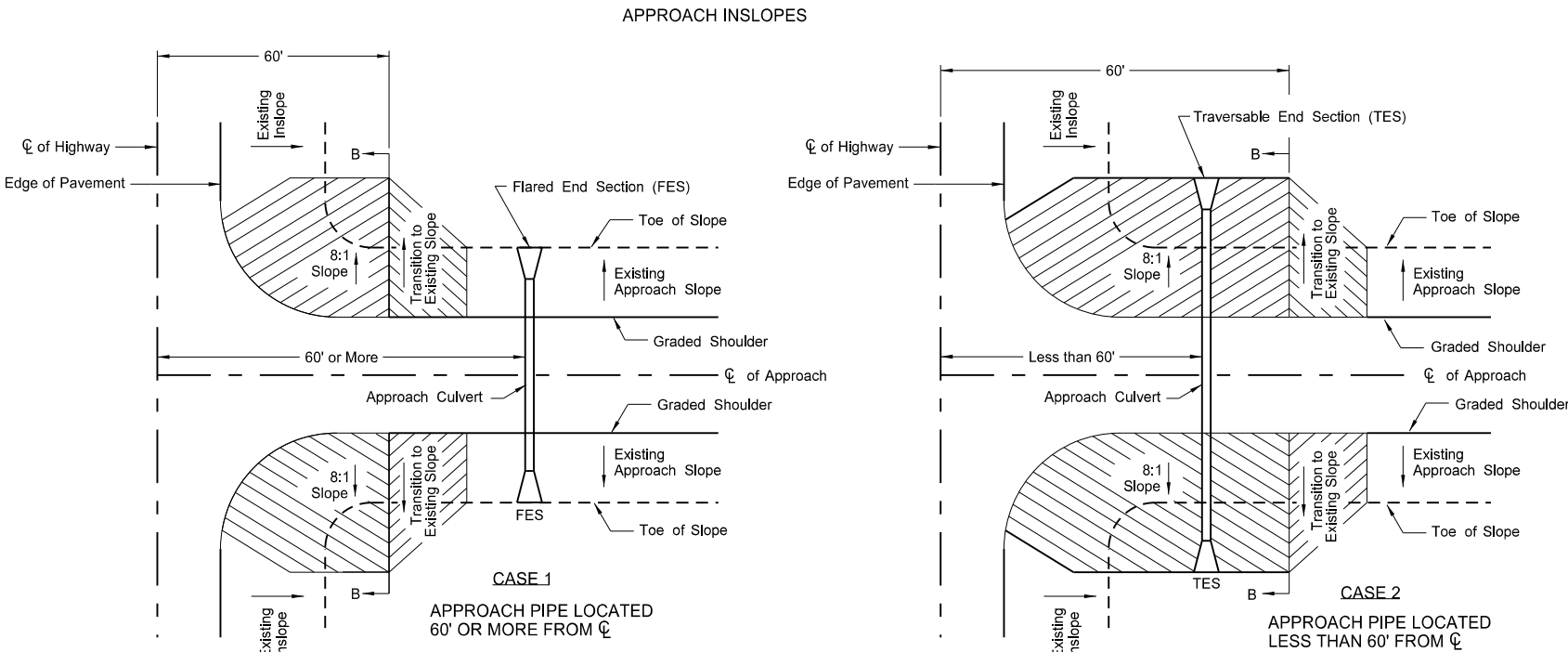
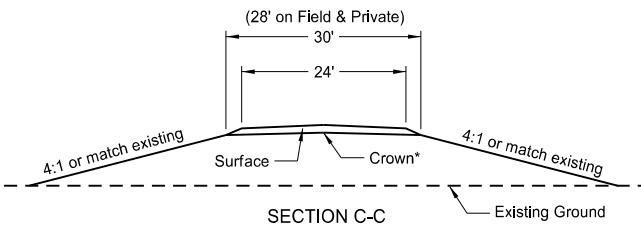
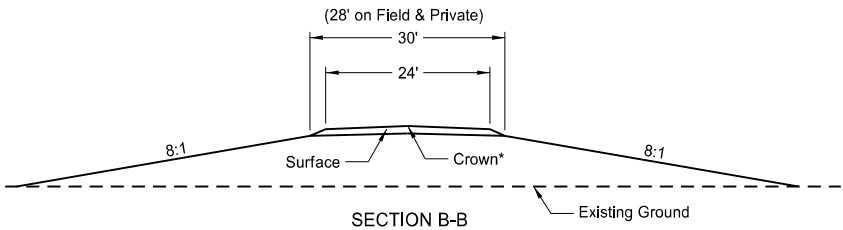


CRITERIA FOR RURAL APPROACH TYPES

	Field Drives	Private Drives	Low Volume Public Roads
Radius	R=40 ft	R=40 ft	R=50 ft
Maximum Grade	10%	7%	7%
Storage Platform	24 ft	24 ft	50 ft
Vertical Curve Length	10 ft	10 ft	Varies (Min. 20 mph)



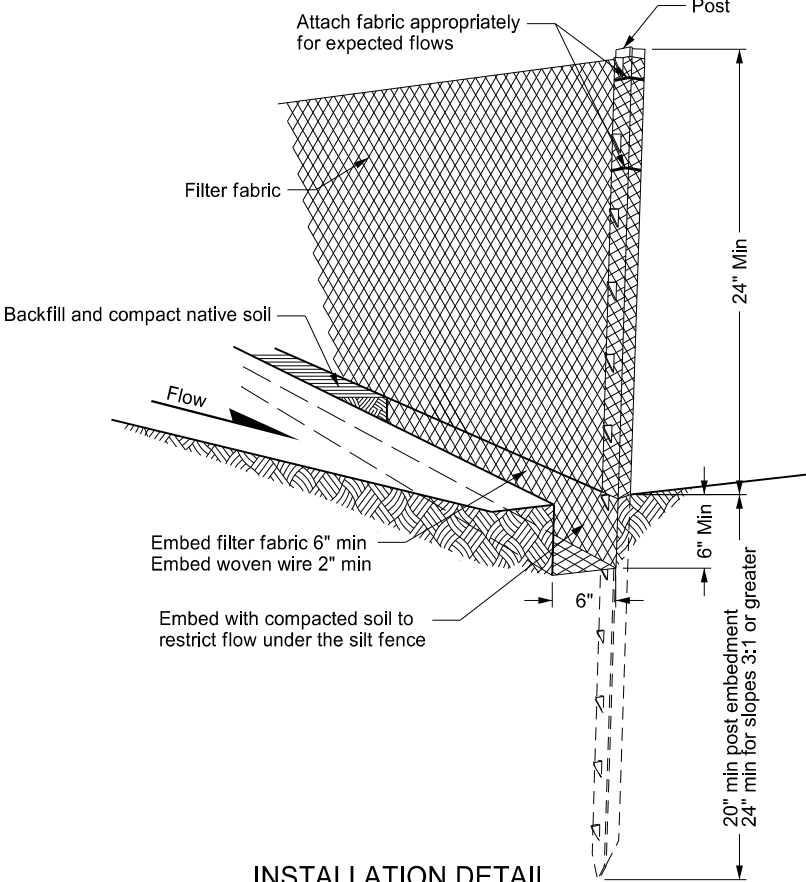
\*2.1% crown for paved surface  
\*3.0% crown for gravel surface



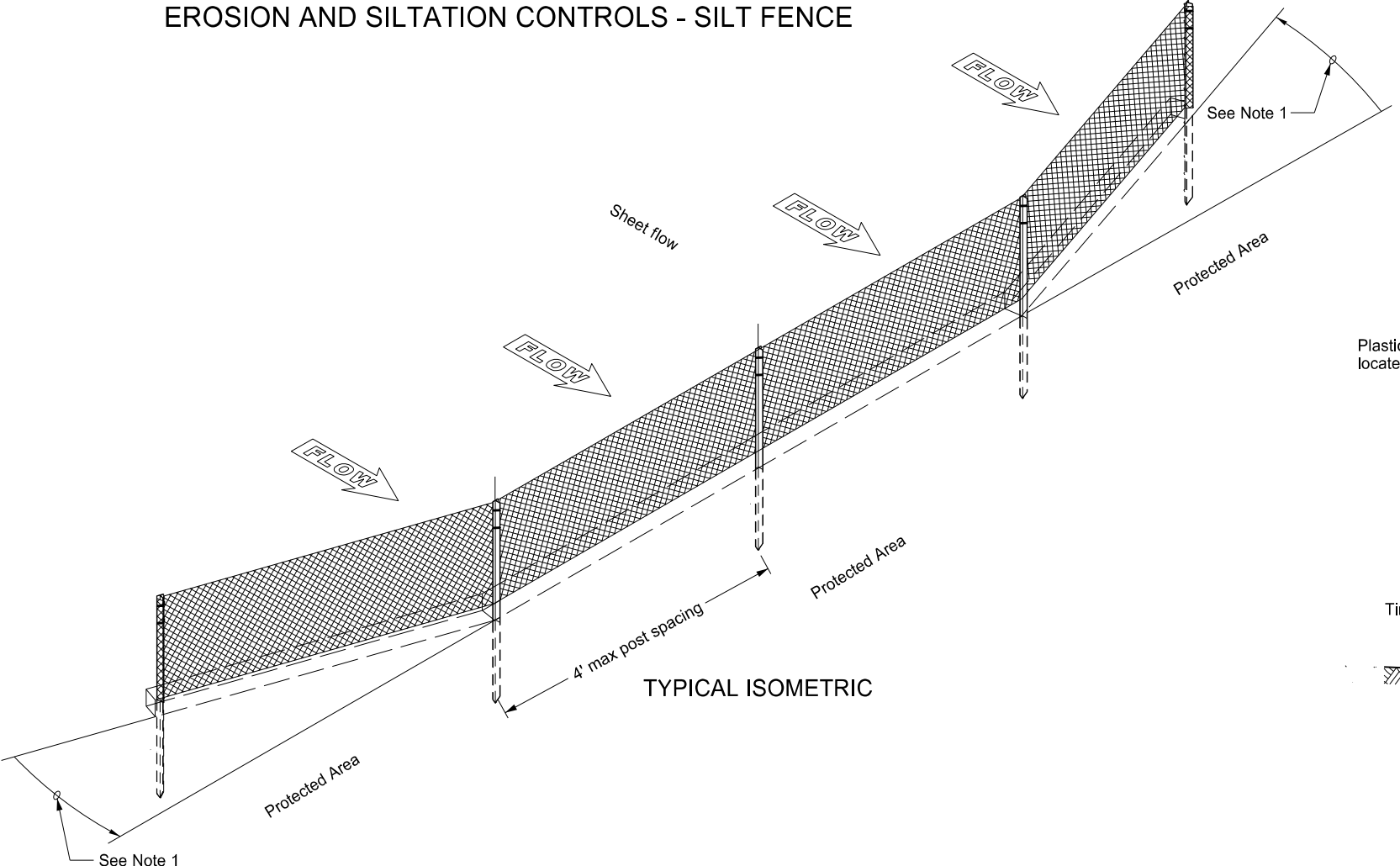
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-25-14	
REVISIONS	
DATE	CHANGE
6-30-2017	Revised Radius, Storage Platform, Inslope dimensions, and Note 1.

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PE-2930,  
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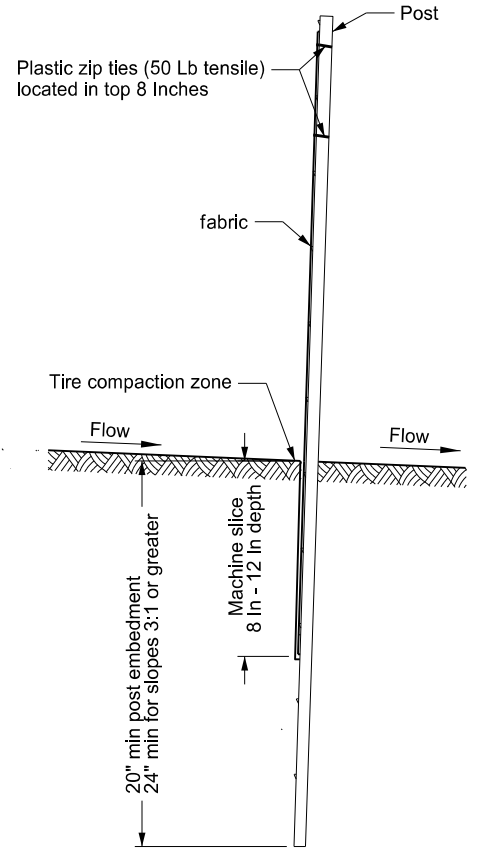
EROSION AND SILTATION CONTROLS - SILT FENCE



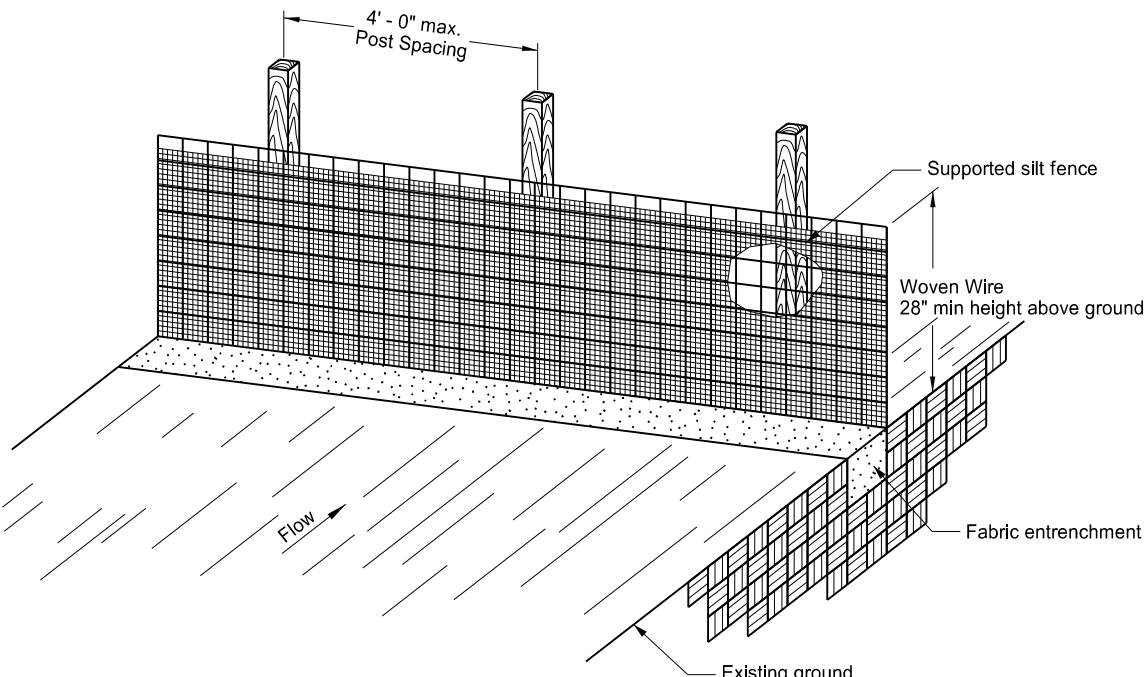
INSTALLATION DETAIL



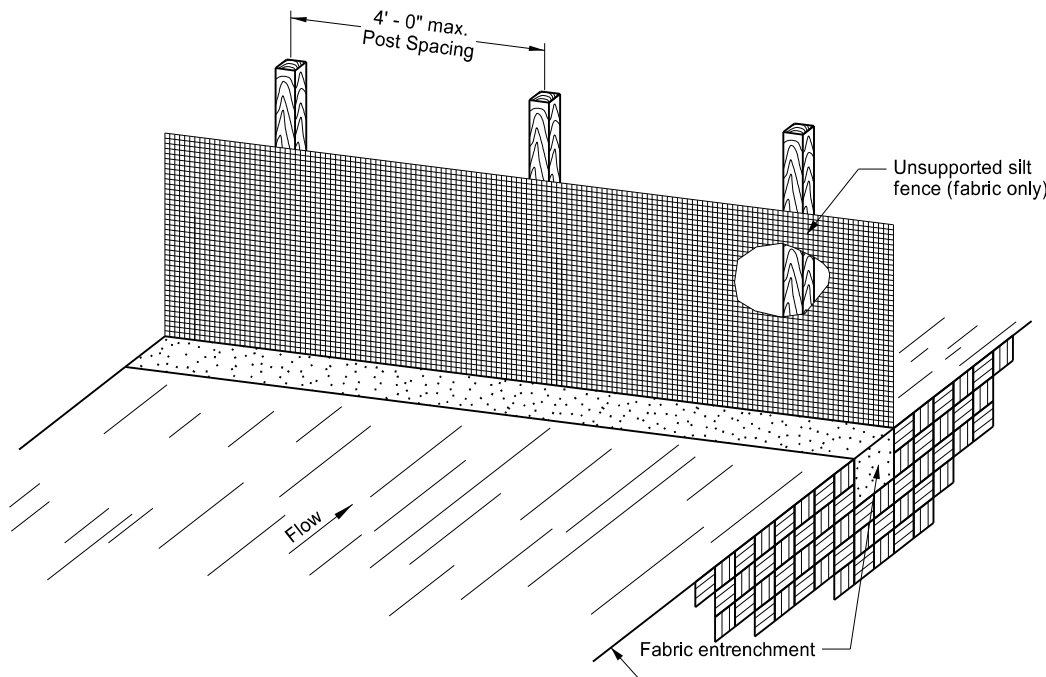
TYPICAL ISOMETRIC



MACHINE SLICED SILT FENCE



SILT FENCE SUPPORTED



SILT FENCE UNSUPPORTED

- NOTES:
1. Install the ends of the silt fence to point slightly upslope to prevent sediment from flowing around the ends of the fence.
  2. Place splices outside low spots.
  3. Install silt fencing parallel to contour lines.
  4. Do not embed silt fence when placed in standing water.
  5. Silt fence material does not need to reach the top of woven wire support.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Standard drawing resulted from splitting standard D-708-2.
06-27-16	Revised details & added new ones.

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# EROSION CONTROL FIBER ROLL PLACEMENT DETAILS

D-261-1

\*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

Detail A  
Fiber Roll Overlapping Staking Detail

Detail B  
Fiber Roll Staking Detail

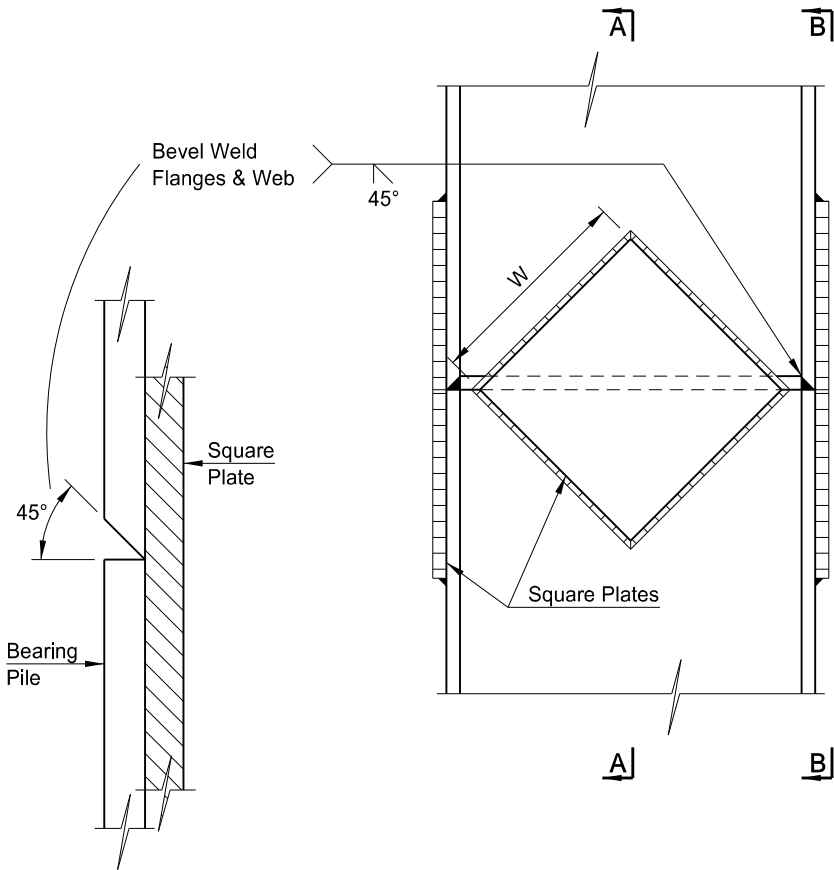
FIBER ROLL DIAMETER	NOMINAL STAKE SIZE	MINIMUM STAKE LENGTH	MINIMUM TRENCH DEPTH	MAXIMUM TRENCH DEPTH
6"	2" x 2"	18"	2"	2"
12"	2" x 2"	24"	2"	3"
20"	2" x 2"	36"	3"	5"

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

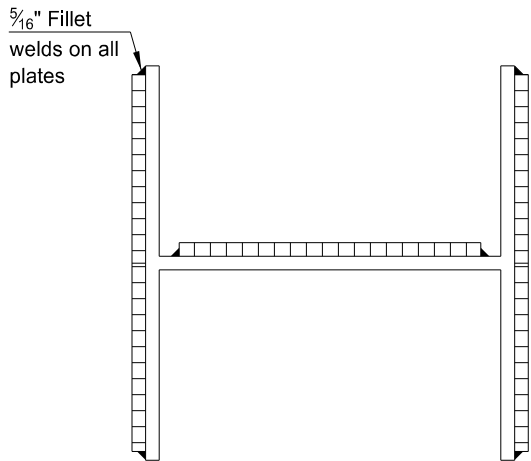
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-18-10	
REVISIONS	
DATE	CHANGE
06-10-13	Added plan view for ditch and slope application. Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.
06-26-14	Changed standard drawing number from D-708-7 to D-261-1.

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PILE SPLICE DETAILS

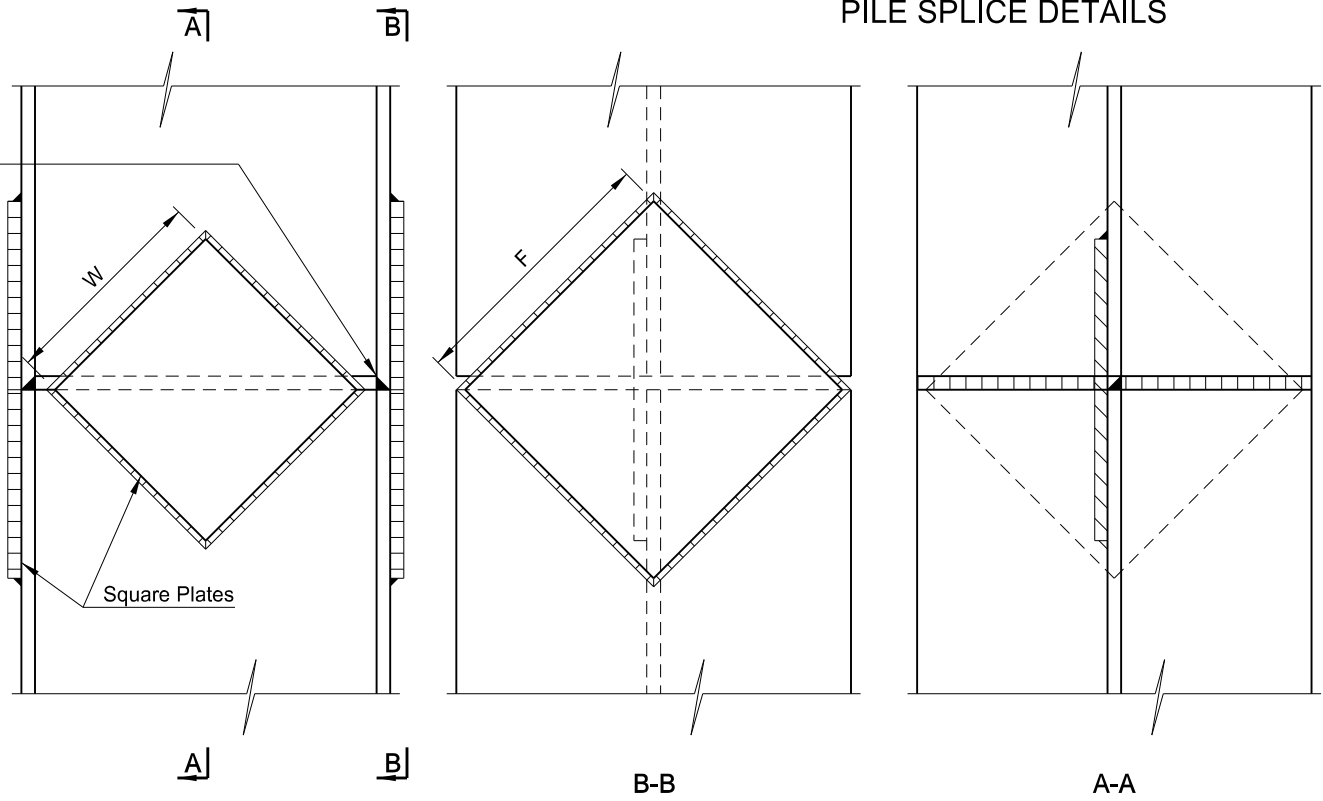


ENLARGED VIEW

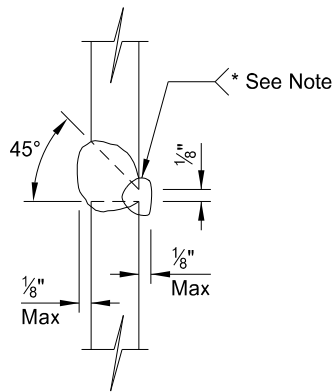


PILE	8"	10"	12"	14"
"F" FLANGE	5"	6½"	8"	10"
"W" WEB	4"	5½"	6½"	8"

H-PILE SPLICE DETAIL



Flame scarf inside of both flanges and one side of web of upper section.



ALTERNATE H-PILE SPLICE DETAIL

NOTES:

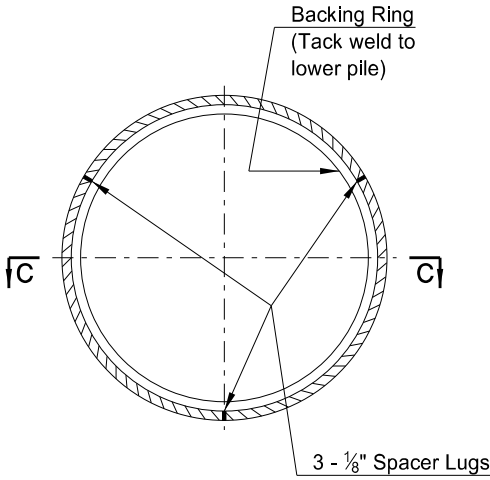
Steel H-Pile may be spliced with complete penetration groove welds in both flanges and web in lieu of using the reinforcing plates.

AWS classification E70XX Low Hydrogen Electrodes shall be used.

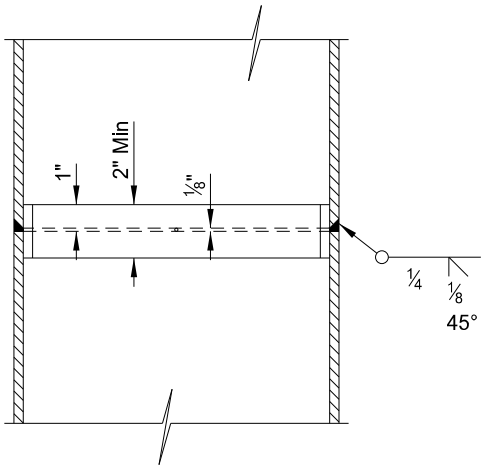
\* Welds made without the use of backing material shall have the root gouged to sound metal and welded from the second side.

All welding shall conform to the current AASHTO/AWS D1.5 Bridge Welding Code.

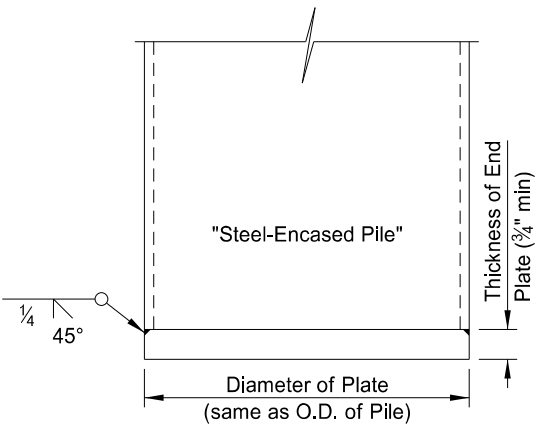
The thickness of the steel square plates shall at a minimum be as thick as the flanges and web of the pile being spliced.



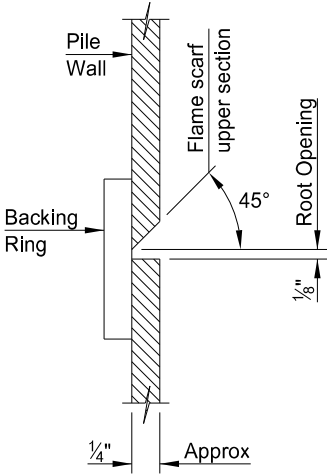
Backing Ring may be made from pile cut-offs or other material of a like quality.



STEEL-ENCASED CONCRETE PILE SPLICE DETAIL



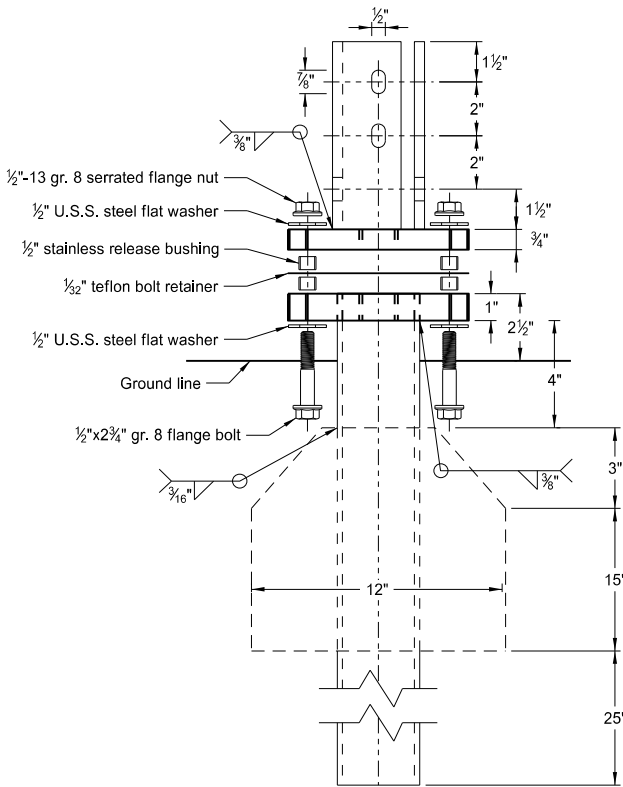
END PLATE DETAIL



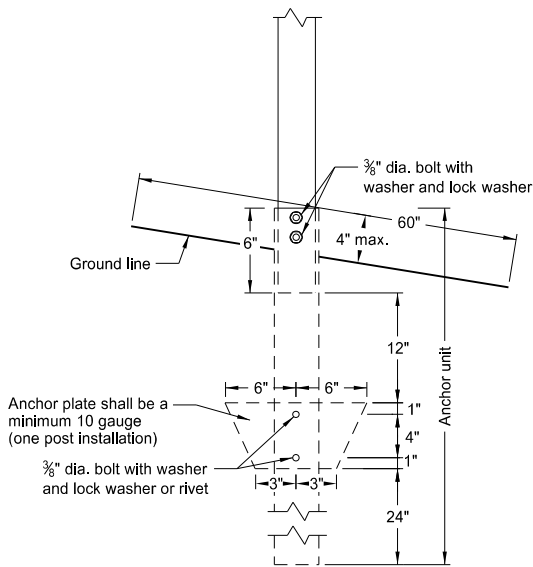
ENLARGED VIEW

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09/14/11	
REVISIONS	
DATE	CHANGE

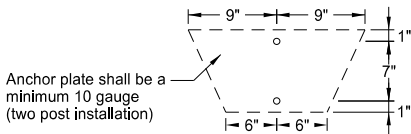
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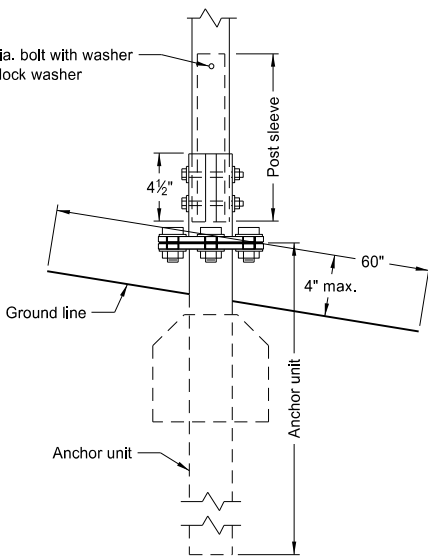
Multi-Directional Slip Base Assembly



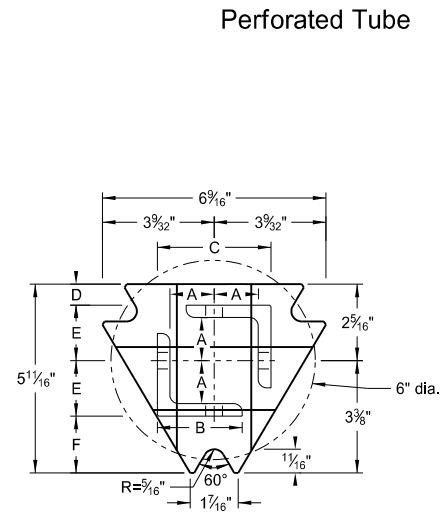
Anchor Unit and Post Assembly



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

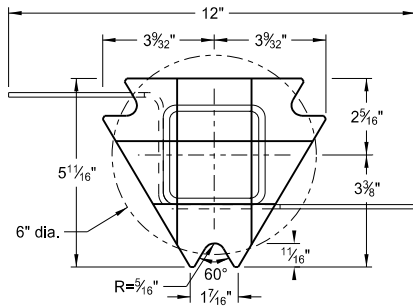


Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly



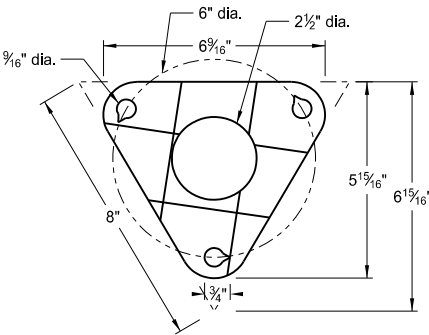
Top Post Receiver

Plate - ASTM A572 grade 50  
Angle Receiver - 2 1/2"x2 1/2"x3/8" 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



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

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. <sup>4</sup>	Cross Sec. Area in. <sup>2</sup>	Section Modulus in. <sup>3</sup>
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"x10 ga.	1 9/64"	2 1/2"	3 1/32"	2 5/32"	1 33/64"	1 7/8"
2 1/2"x10 ga.	1 9/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"

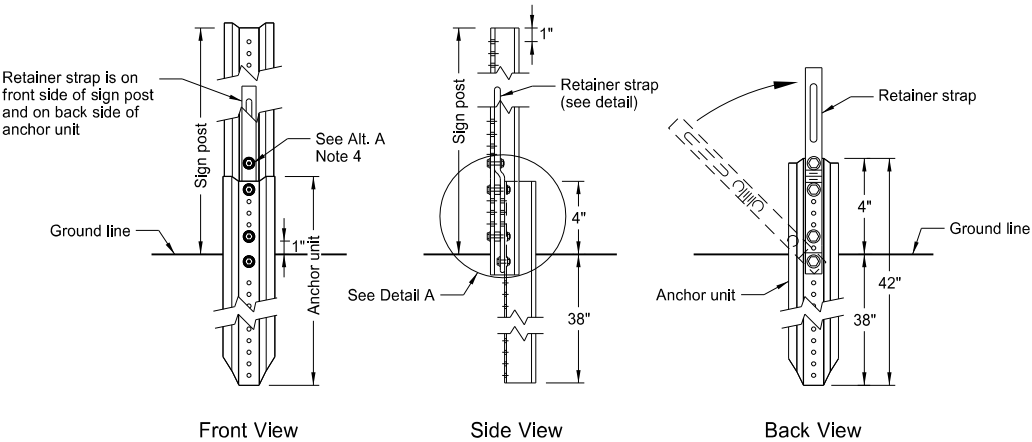
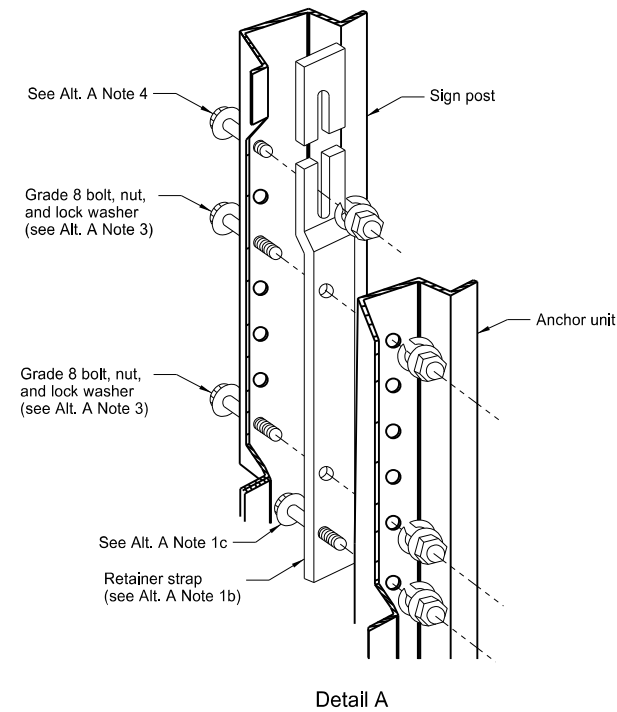
(A) The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak.

(B) The 2 3/16"x10 ga. may be inserted into 2 1/2"x10 ga. for additional wind load.

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

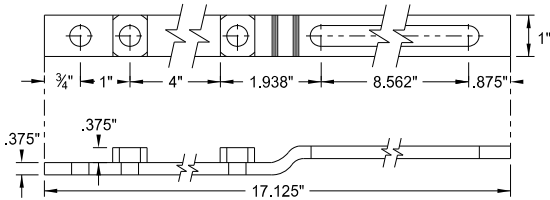
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U-Channel Post

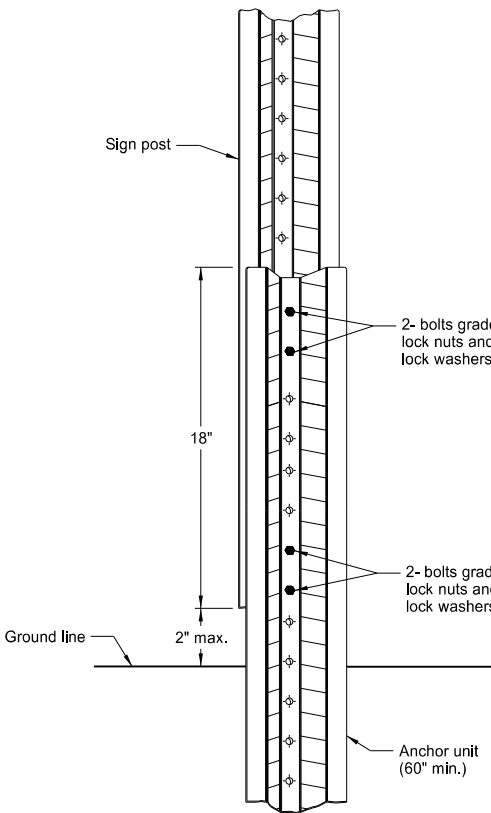


Breakaway U-Channel Detail Alternate A

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

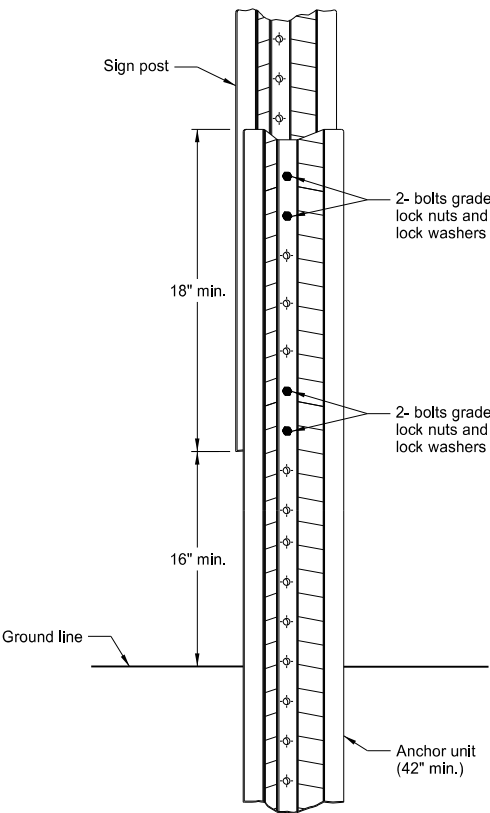


Retainer Strap Detail



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:

- 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.
- a) Drive anchor unit to 4" above ground.  
b) Rotate strap to vertical position.
- 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.
- Complete assembly by tightening 5/16"x2" bolt (this fastens sign post to retainer strap).
- 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	
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D-704-10

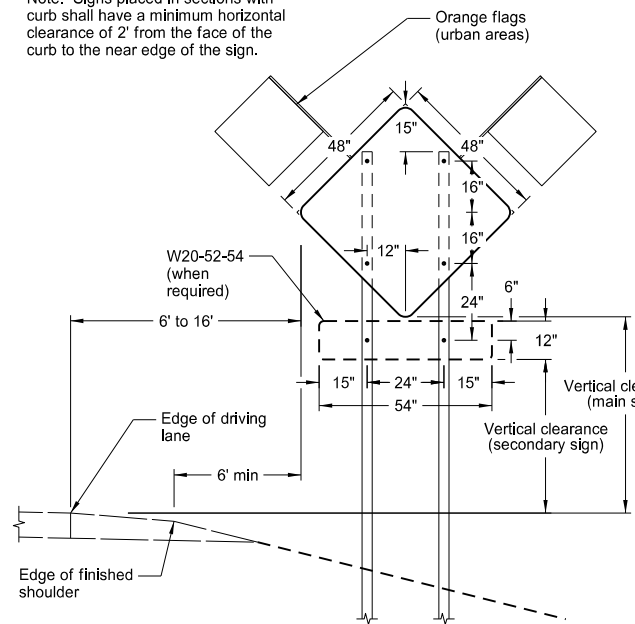
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE

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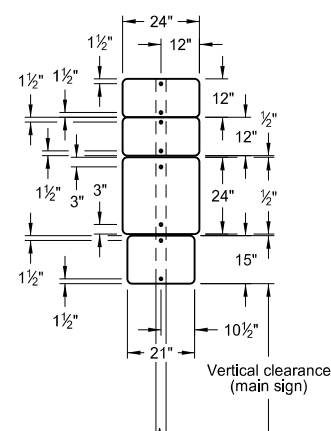


## CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

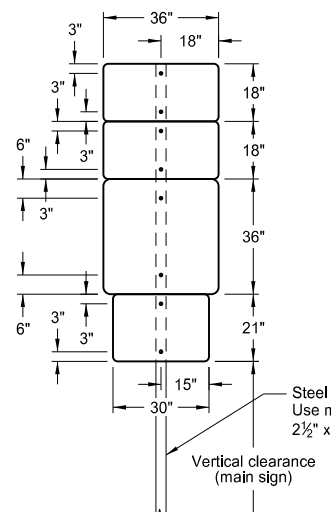
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



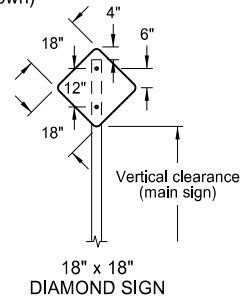
TYPICAL SECTION  
(48" x 48" diamond warning sign shown)



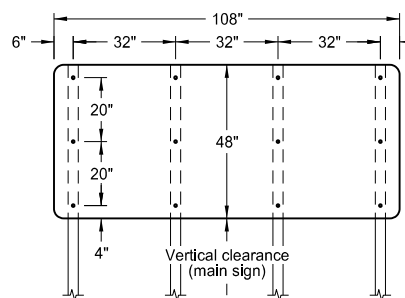
24" x 24" ROUTE MARKER ASSEMBLY



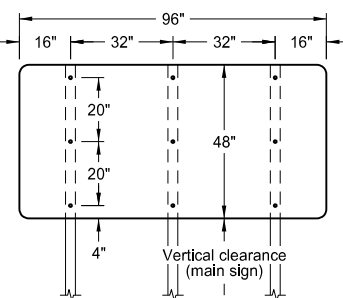
36" x 36" ROUTE MARKER ASSEMBLY



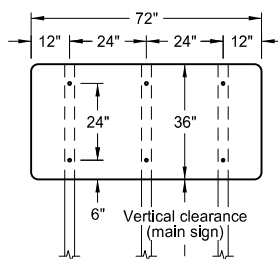
18" x 18" DIAMOND SIGN



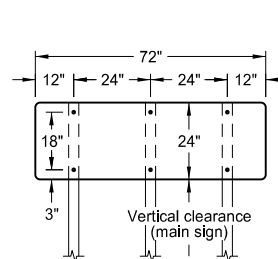
108" x 48" SIGN



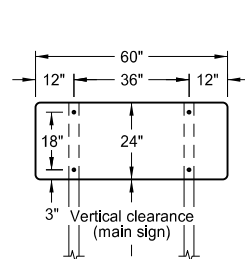
96" x 48" SIGN



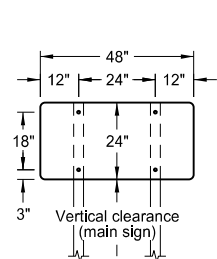
72" x 36" SIGN



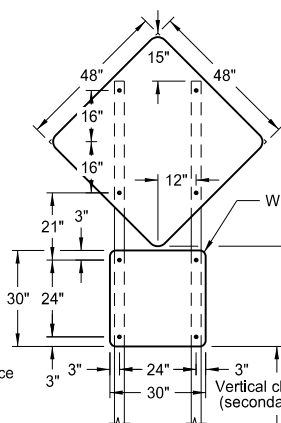
72" x 24" SIGN



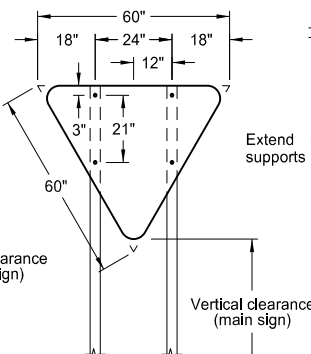
60" x 24" SIGN



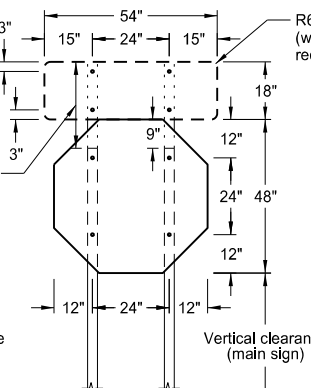
48" x 24" SIGN



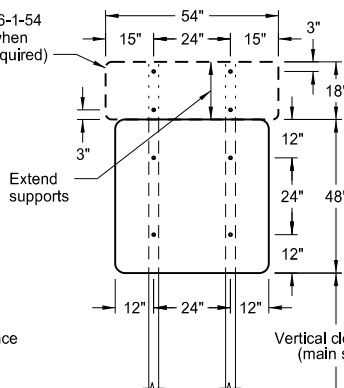
48" x 48" DIAMOND SIGN  
(with 30" x 30" secondary sign)



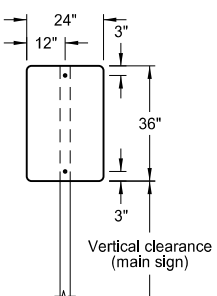
R1-2-60 - YIELD SIGN



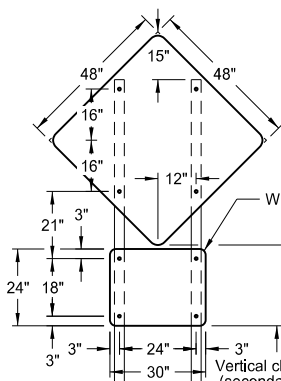
R1-1-48 - STOP SIGN  
(with R6-1-54 sign as required)



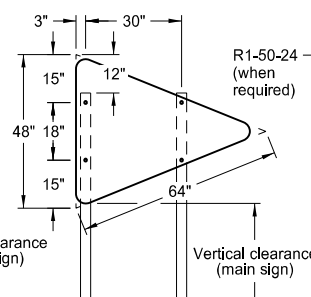
48" x 48" SIGN  
(with R6-1-54 sign as required)



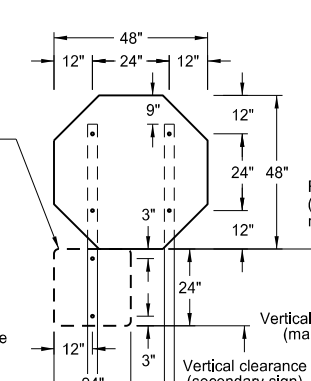
24" x 36" SIGN



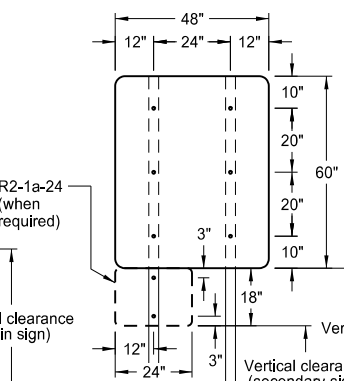
48" x 48" DIAMOND SIGN  
(with 30" x 24" secondary sign)



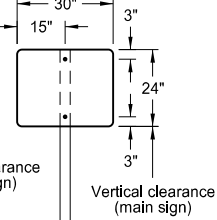
W14-3-64 - PENNANT SIGN



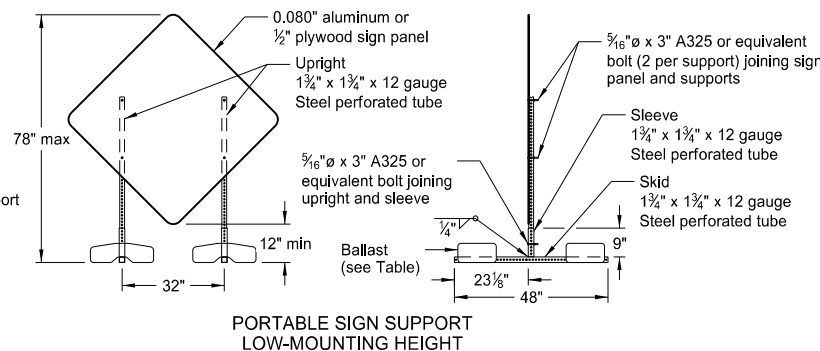
R1-1-48 - STOP SIGN  
(with R1-50-24 sign as required)



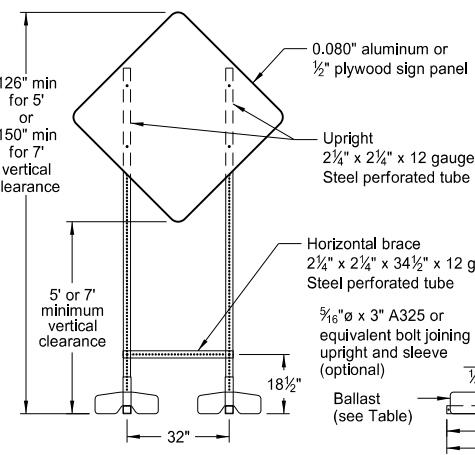
48" x 48" SIGN  
(with R2-1a-24 sign as required)



30" x 24" SIGN



PORTABLE SIGN SUPPORT  
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT  
HIGH-MOUNTING HEIGHT

## NOTES:

1. 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.

2. 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.
3. 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)

4. 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

5. 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.

6. 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, W1-6 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

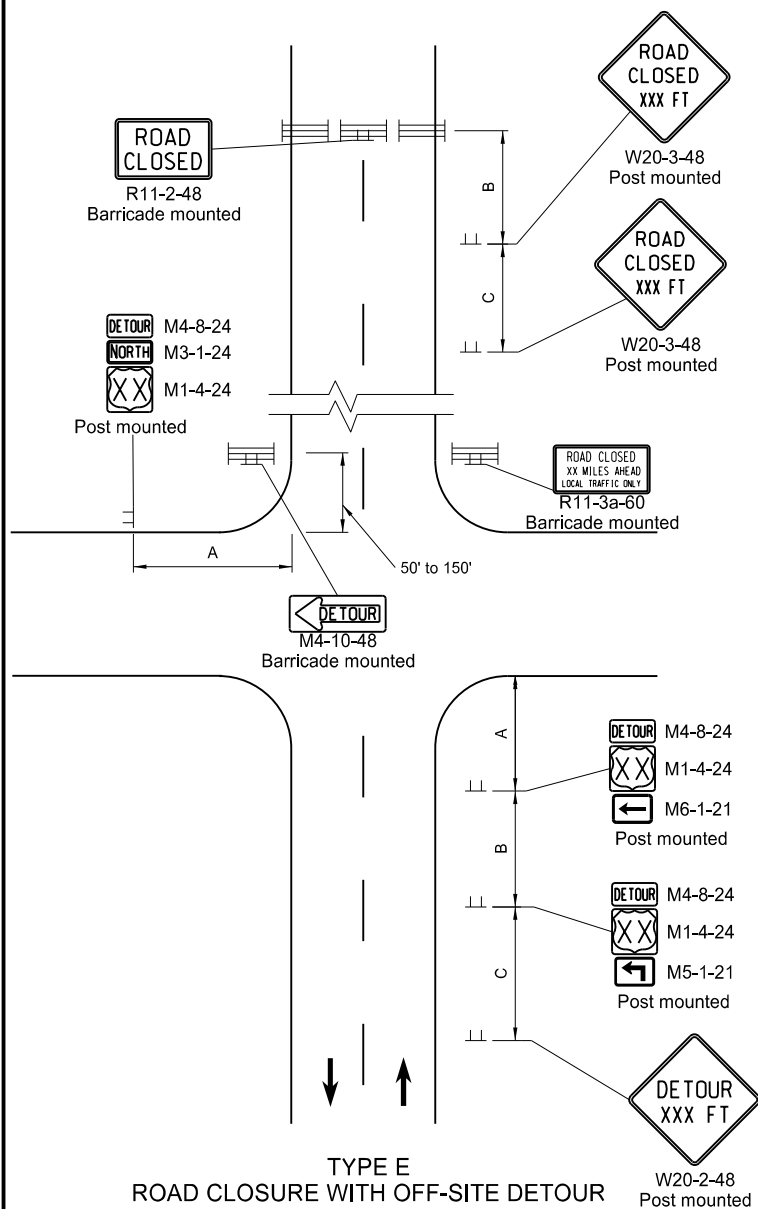
Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

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

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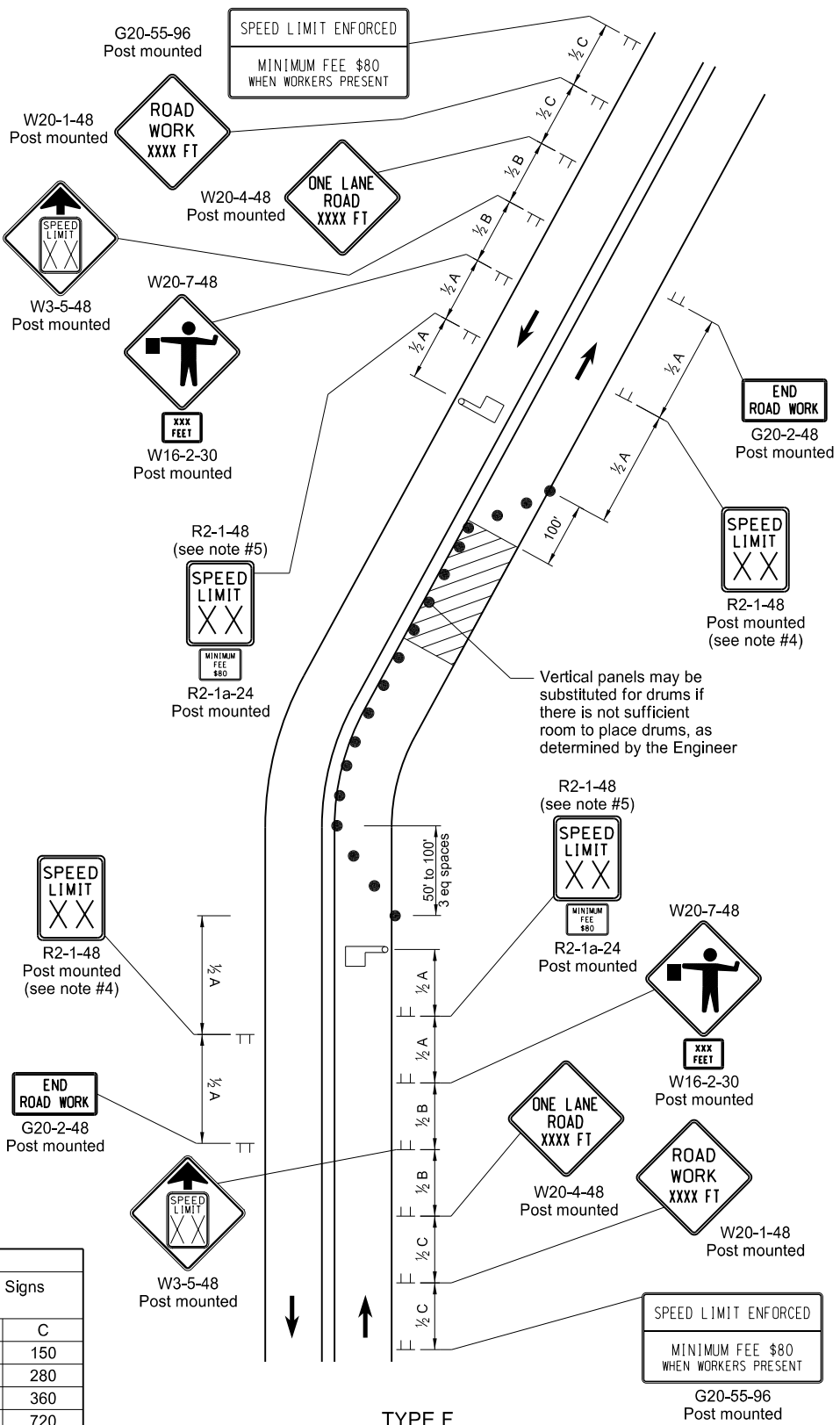
ROAD CLOSURE AND LANE CLOSURE ON A TWO WAY ROAD LAYOUTS

D-704-19



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.

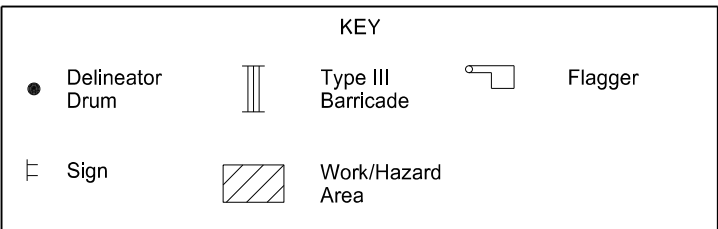
Road Type	ADVANCE WARNING SIGN SPACING		
	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway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



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

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 S<sup>2</sup>/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.



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

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SHOULDER CLOSURES AND BRIDGE PAINTING LAYOUTS

D-704-24

- Notes
- Variables  
S = Numerical value of speed limit or 85th percentile.  
W = The width of the taper.  
L = Minimum length of taper, or  $S \times W$  for freeways, expressways, and all other roads with speeds of 45 mph or greater, or  $W \times S^2 / 60$  for urban, residential, and other streets with speeds of 40 mph or less.
  - Delineator drums used for tapering traffic shall be spaced at dimension "S".  
Delineator drums or tubular markers used for tangents shall be spaced at 2 times "S".
  - Sequencing Arrow Panels  
Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).  
Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).  
Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
  - The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
  - The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at  $\frac{1}{2}B$ .
  - 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.
  - The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.

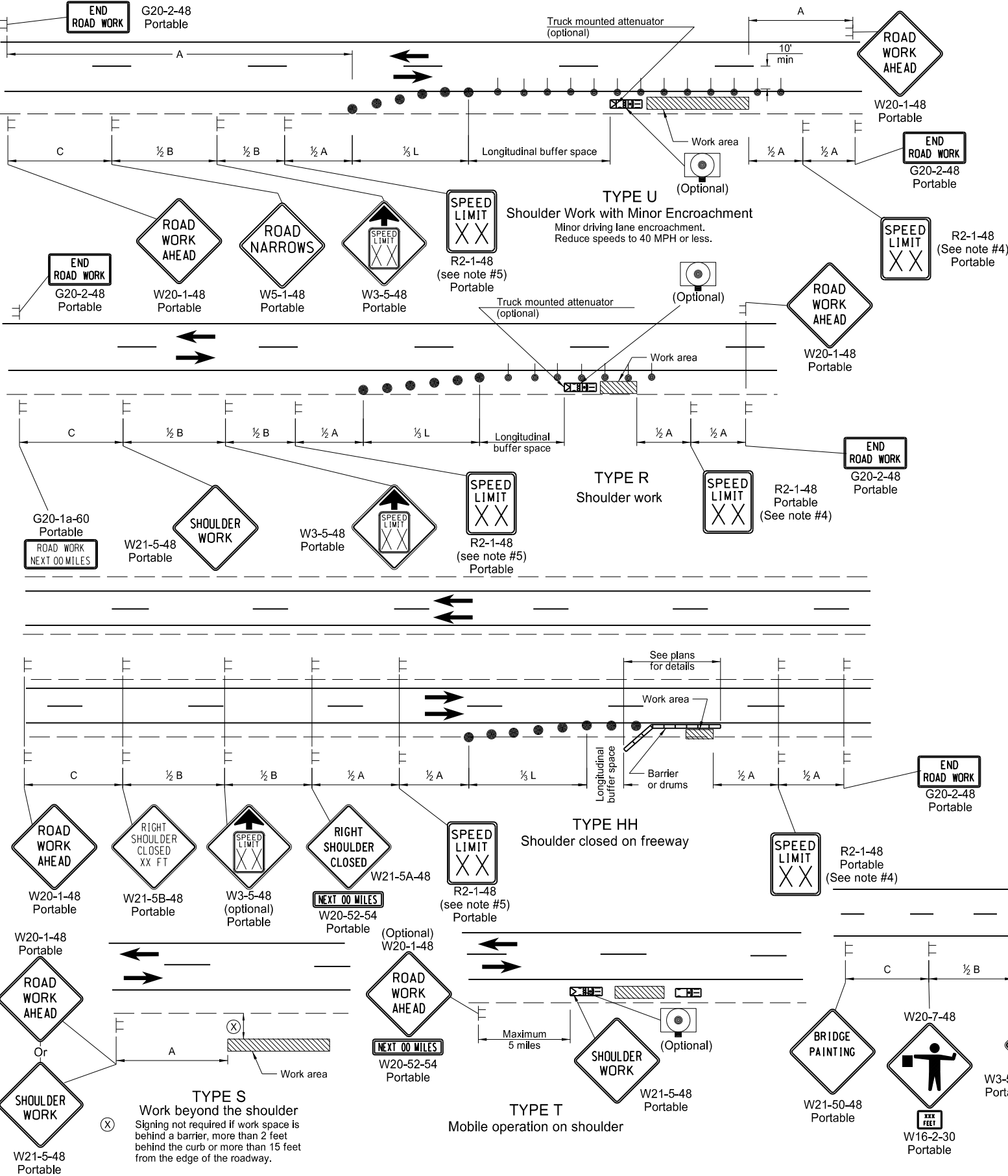
Longitudinal Buffer Space	
Speed (mph)	Length Min (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

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

KEY	
	Sign
	Delineator Drum
	Sequencing Arrow Panel (Caution Mode)
	Work area
	Tubular Marker

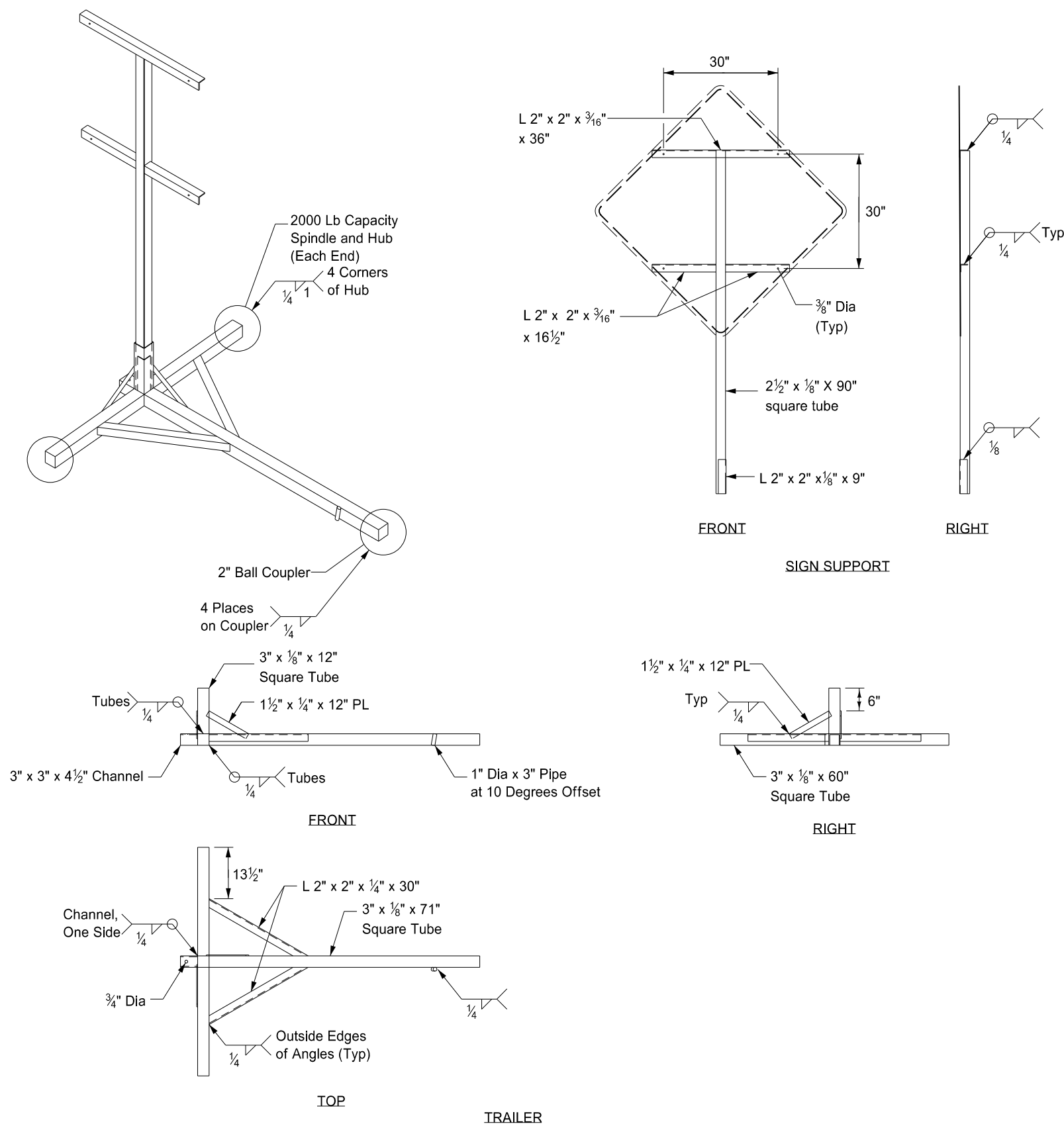
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9-27-13	
REVISIONS	
DATE	CHANGE

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PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



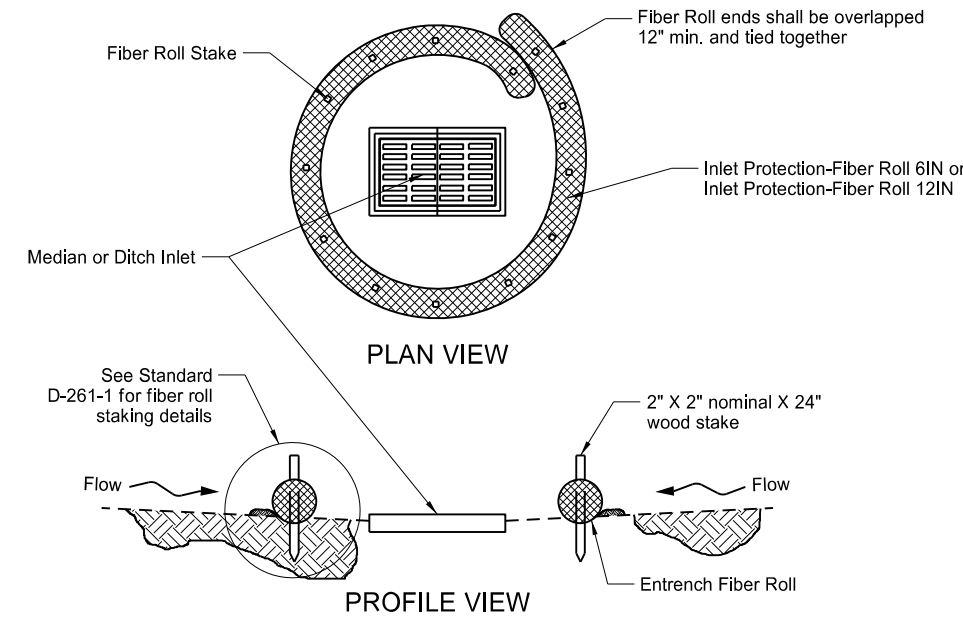
Notes:

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

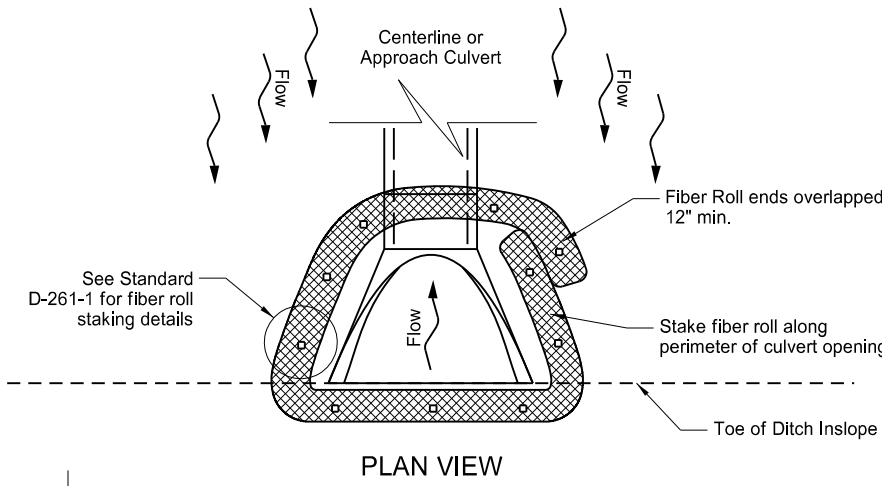
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11-23-10	
REVISIONS	
DATE	CHANGE

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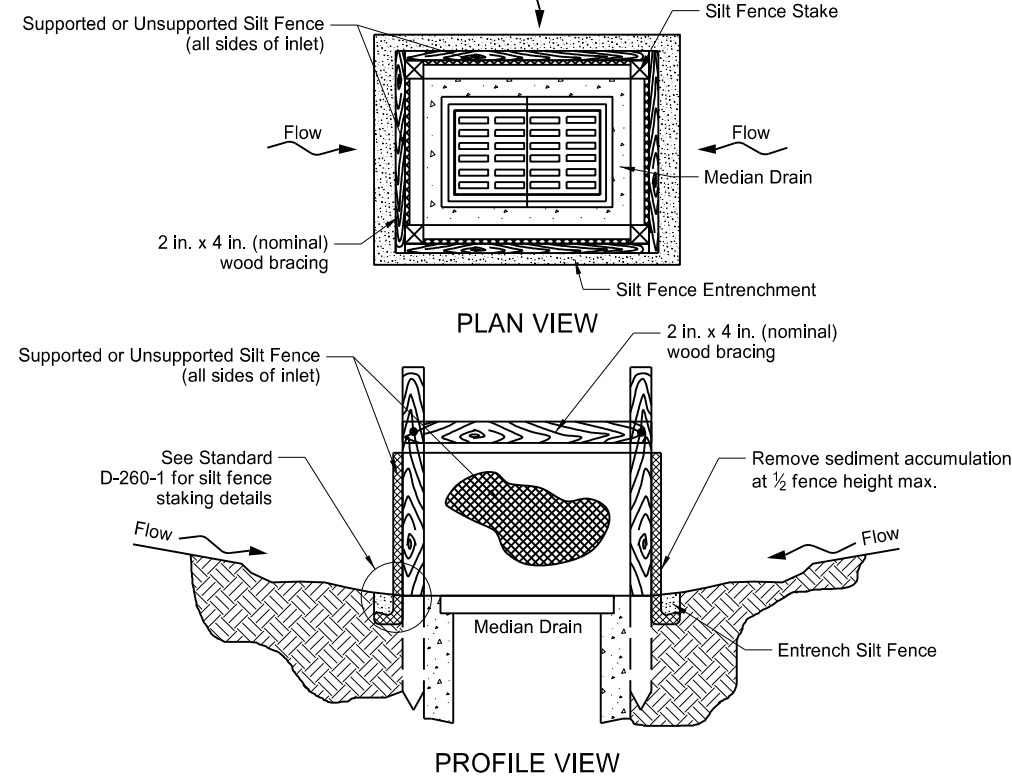
EROSION AND SILTATION CONTROLS  
MEDIAN OR DITCH INLET PROTECTION



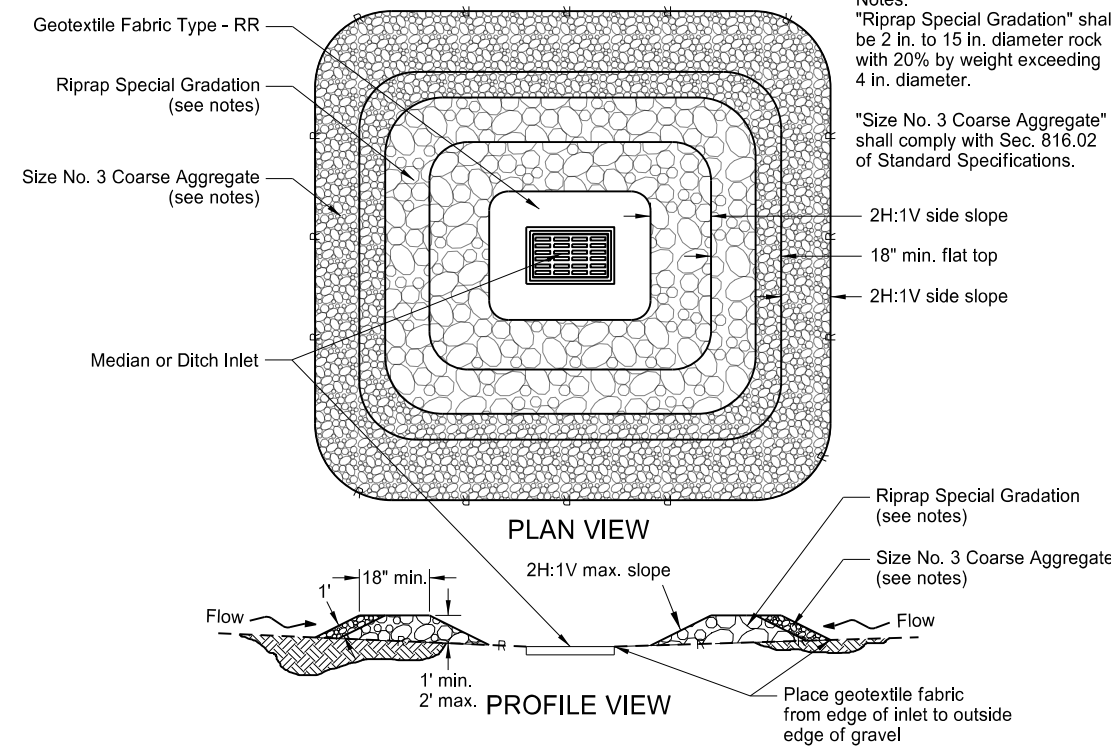
FIBER ROLL PROTECTION  
(MEDIAN OR DITCH INLET)



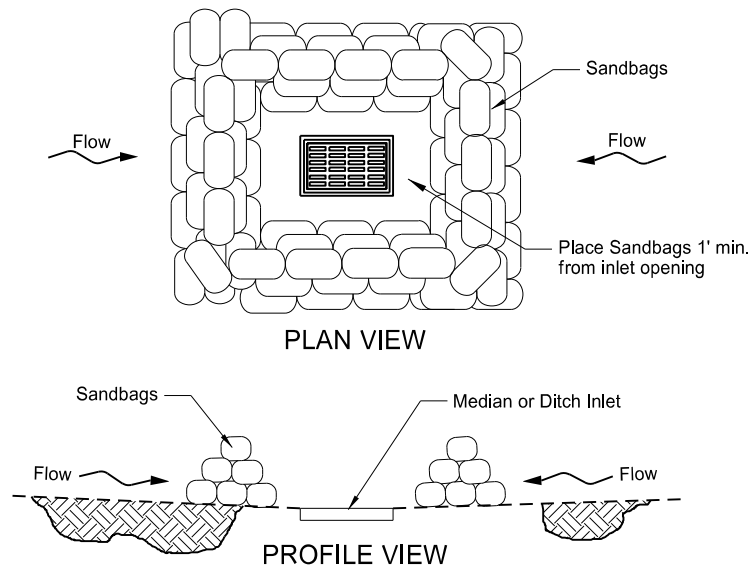
FIBER ROLL PROTECTION  
(INLET OF CULVERT)



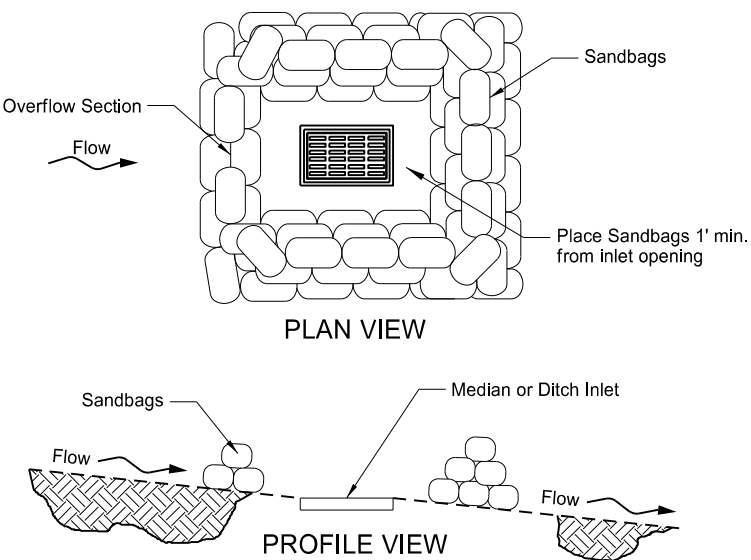
SILT FENCE PROTECTION  
(MEDIAN OR DITCH INLET)



GRAVEL INLET PROTECTION  
(MEDIAN OR DITCH INLET)



SANDBAG PROTECTION  
(LOW POINT)

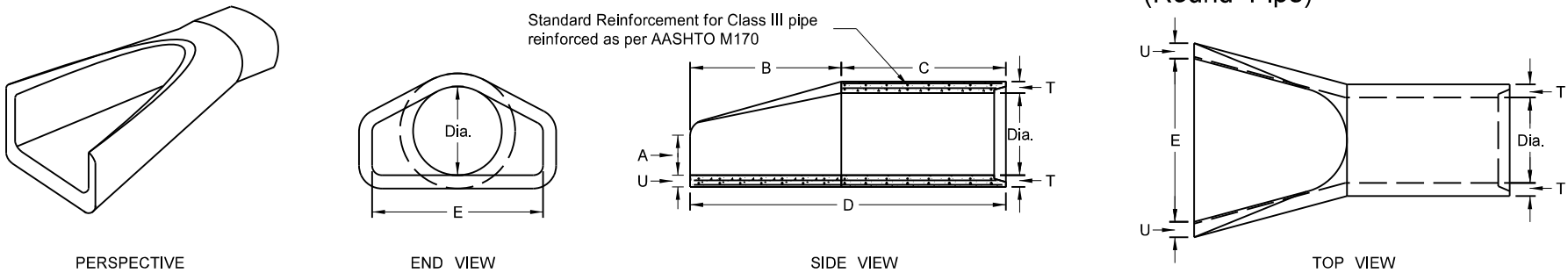


SANDBAG PROTECTION  
(ON SLOPE)

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Updated reference to standard drawing number for fiber roll staking details.
10-01-14	Updated reference to standard drawing number for silt fence.

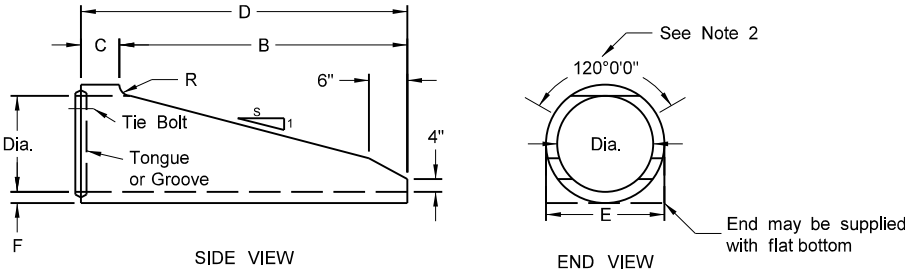
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North Dakota Department  
of Transportation

REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS  
(Round Pipe)



REINFORCED CONCRETE PIPE - FLARED END SECTION  
Reinforcement to be equivalent to Class III RCP

TRAVERSABLE END SECTION							
DIA	B	C	D	E	F	R	S
15"	4"	9"	4'-9"	1'-7½"	2½"	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	2½"	3"	6
24"	6"	1'	7"	2'-6"	3"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3½"	3½"	4
36"	7'-3"	15"	8'-6"	3'-8"	4"	3"	4

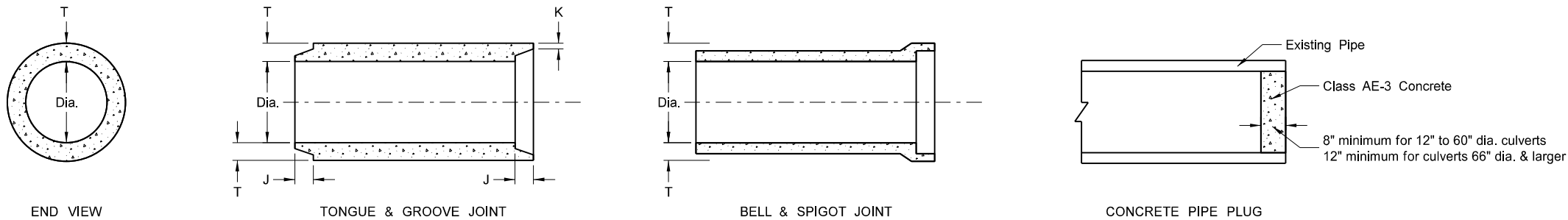


REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION  
Reinforcement to be equivalent to Class III RCP

- NOTES (Traversable End Section):
1. Manufactured in accordance with applicable portions of ASTM C76/AASHTO M170.
  2. Reinforcement per Class III RCP with double reinforcement in the upper 120° of the full barrel portion.

FLARED END SECTION						
TERMINAL DIMENSIONS						
DIA	A	B	C	D	E	U
12	0'-4"	2'-0"	4'-0⅞"	6'-0⅞"	2'-0"	2"
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2½"
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2½"
21	0'-9"	3'-0"	3'-1"	6'-1"	3'-6"	2½"
24	0'-9½"	3'-7½"	2'-6"	6'-1½"	4'-0"	3"
27	0'-10½"	4'-0"	2'-1½"	6'-1½"	4'-6"	3½"
30	1'-0"	4'-6"	1'-7¾"	6'-1¾"	5'-0"	3½"
36	1'-3"	5'-3"	2'-9"	8'-0"	6'-0"	4"
42	1'-9"	5'-3"	2'-9"	8'-0"	6'-6"	4½"
48	2'-0"	6'-0"	2'-0"	8'-0"	7'-0"	5"
54	2'-3"	5'-5"	2'-9¼"	8'-2¼"	7'-6"	5½"
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	5"
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	5½"
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	6"
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	6½"
84	3'-0"	7'-6½"	1'-9"	9'-3½"	10'-0"	6½"
90	3'-5"	7'-3½"	2'-0"	9'-3½"	11'-0"	6½"

All Classifications of Round Concrete Pipe						
Internal Dia. of Pipe in Inches	Cross-Sectional Water Area	Weight per Lin. Foot of Pipe Std. Wall	Joint J Groove End Min./Max.	Joint K Tongue Min.	Minimum Wall Thickness (T)	
Dia	Sq. ft.	Lbs.	In.	In.	In.	
12	0.79	92	1⅞-2⅞	¾	2	
15	1.23	127	1¾-2¾	⅞	2½	
18	1.77	168	1⅞-2⅞	1	2½	
21	2.40	214	1⅞-3⅞	1⅞	2½	
24	3.14	265	2¾-3¾	1⅞	3	
27	3.98	322	2¾-4	1¼	3½	
30	4.91	384	3¼-4¼	1¼	3½	
33	5.94	452	3¼-4¼	1½	3¾	
36	7.07	524	3¼-4¼	1½	4	
42	9.62	685	3¾-4¾	1¾	4½	
48	12.57	685	3¾-4¾	1⅞	5	
54	15.90	1070	4½-5½	2	5½	
60	19.63	1296	4½-5½	2¼	6	
66	23.76	1542	5-6	2⅞	6½	
72	28.27	1810	5½-6¾	2⅞	7	
78	33.18	2098	6¼-7¼	2⅞	7½	
84	38.48	2410	5½-7¾	3⅞	8	
90	44.18	2793	6¾-8½	3⅞	8½	
96	50.27	3092	7-8¼	3½	9	
102	56.75	3466	7-8¼	3½	9½	
108	63.62	3864	7¼-8½	3¾	10	



CIRCULAR PIPE

JOINTS FOR REINFORCED CONCRETE PIPE

- NOTES:
1. All reinforcing steel shall meet AASHTO M170 requirements.
  2. All circular, longitudinal, and elliptical reinforcement shall be assembled and securely fastened in cage fashion so as to maintain reinforcement in exact shape and correct positions within the forms.
  3. Laying length of pipe: 12" to 66" (incl.) = not less than 4 feet  
66" to 108" (incl.) = not less than 6 feet
  4. Joints shall be sealed with rubber gaskets or with sealer approved by the engineer whenever pipe are specified for storm drain or sanitary sewers.
  5. For Class IV and Class V reinforced concrete pipe and end section sizes which do not have reinforcement specified by AASHTO M170, shop drawings and design calculations shall be prepared and sealed by a Professional Engineer and submitted for the Engineer's review.

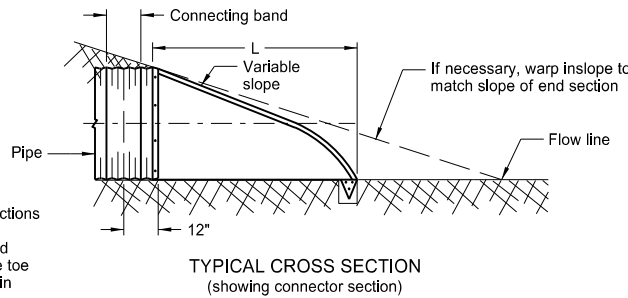
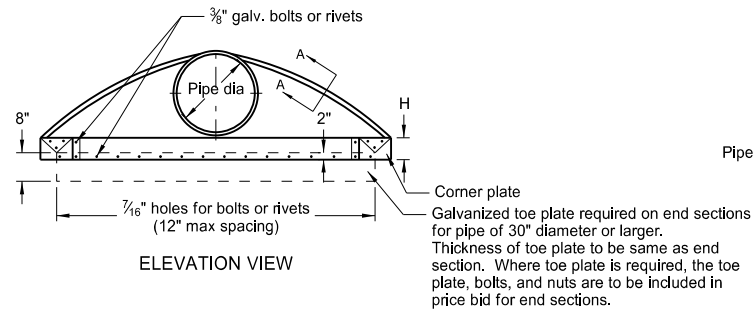
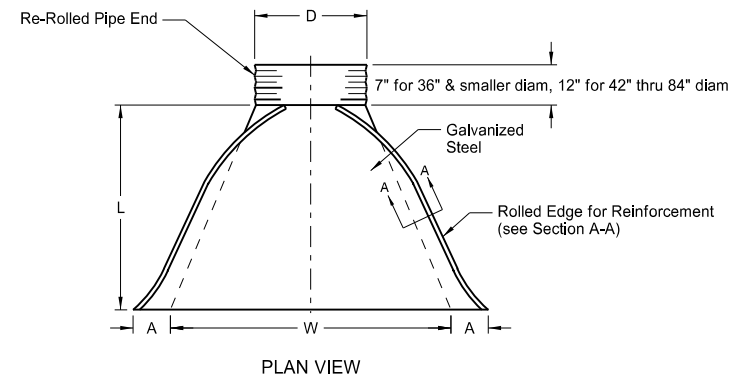
SEE STANDARD DRAWING D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-12-14	
REVISIONS	
DATE	CHANGE
01-21-15 11-21-16	Revised Note 5 Revised End Section Dimensions

This document was originally issued and sealed by  
Jon Ketterling  
Registration Number  
PE- 4684 ,  
on 11/21/16 and the original document is stored at the  
North Dakota Department  
of Transportation

ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

D-714-4



PIPE DIA.	GALV. THICK.	END SECTION DIMENSIONS					APPROX. SLOPE RATE	BODY PIECE
		A	B	H	L	W		
IN	IN	IN	IN	IN	IN	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 1/4:1	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.

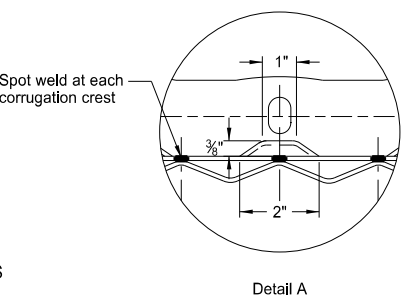
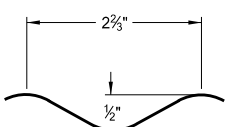
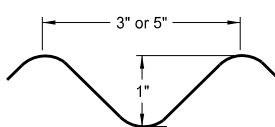
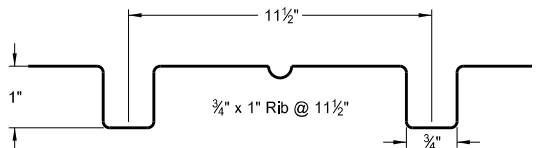
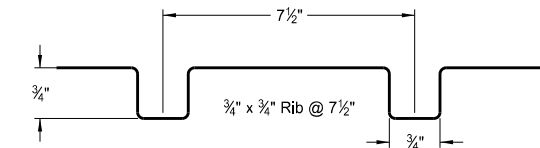
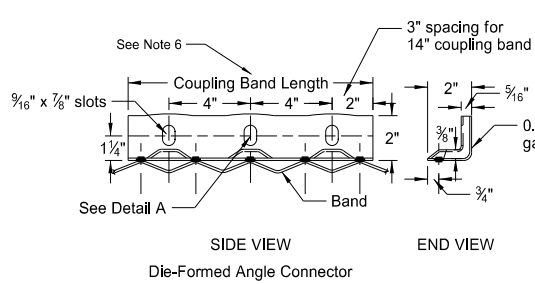
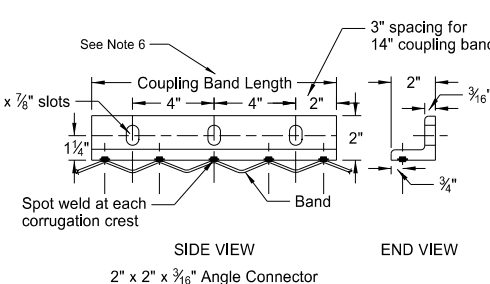
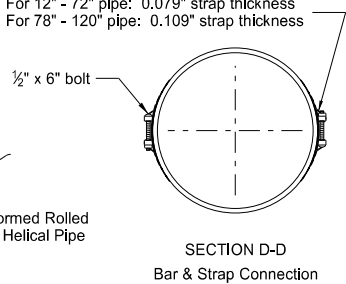
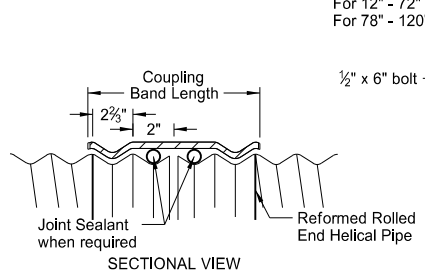
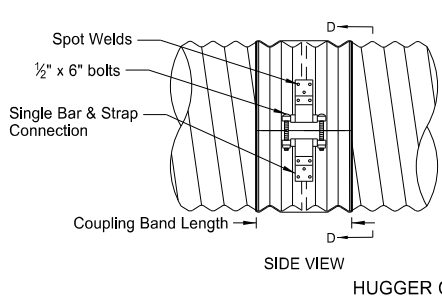
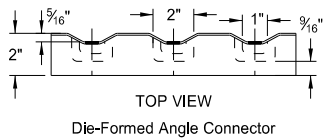
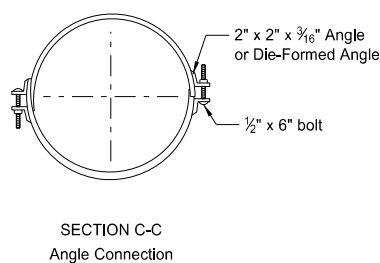
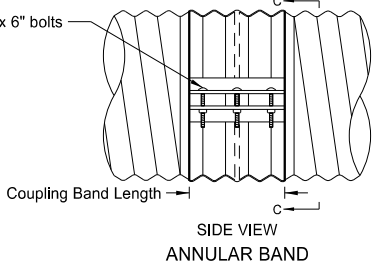
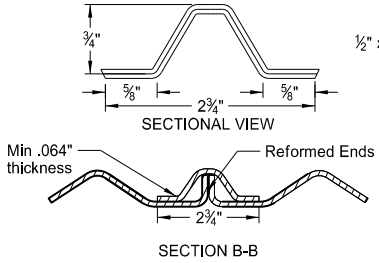
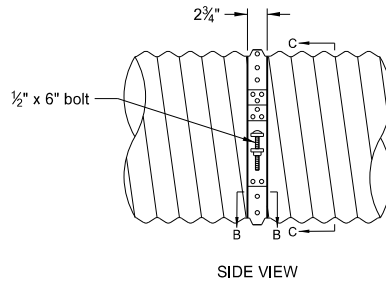
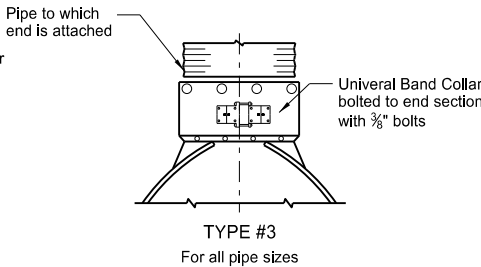
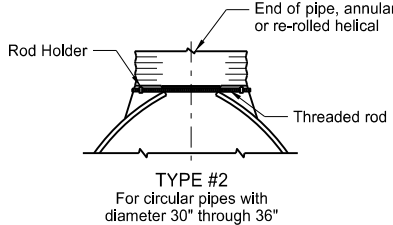
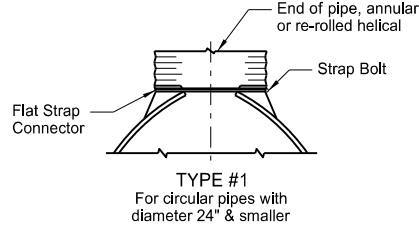
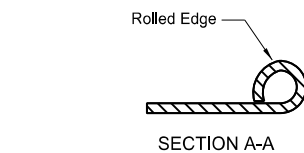
Splices to be the lap riveted type.

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:

- Pipes and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
- 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.
- 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.
- 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.
- 1/2" x 8" bolts may be used as a substitute for the 1/2" x 6" bolts shown in the details.
- 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.
- Length of spot welds shall be minimum 1/2".

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

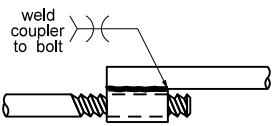
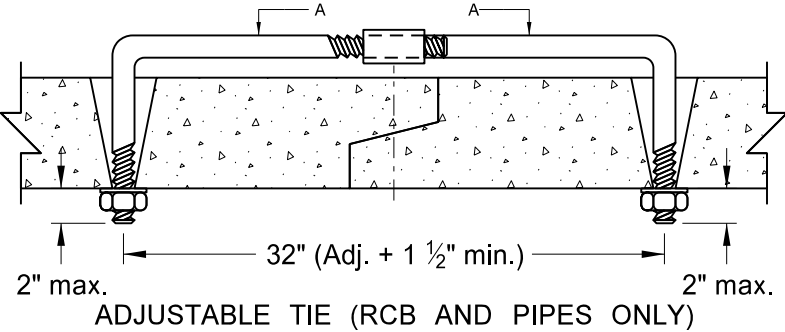
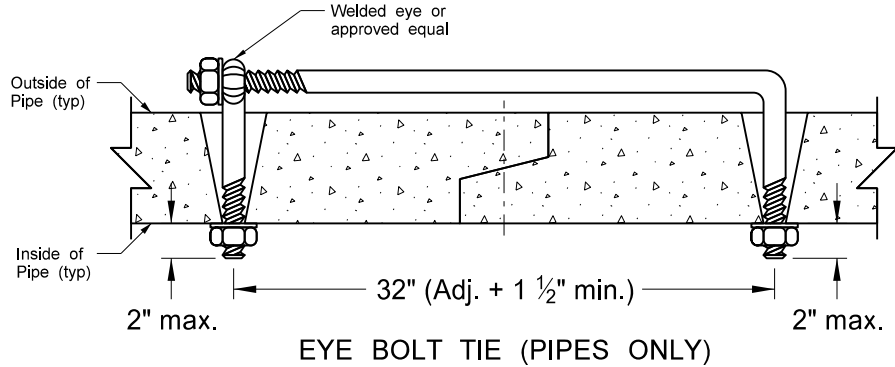


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
08-06-13	
REVISIONS	
DATE	CHANGE
01-07-14	End Section Plan View
02-27-14	3" x 1" Corrugation Detail

This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674 , on 02/27/2014 and the original document is stored at the North Dakota Department of Transportation

CONCRETE PIPE, CATTLE PASS, OR  
PRECAST CONCRETE BOX CULVERT TIES

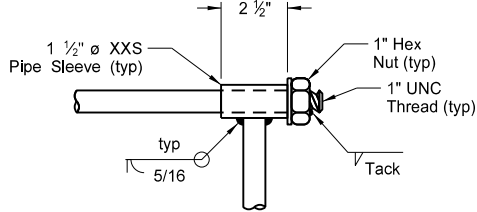
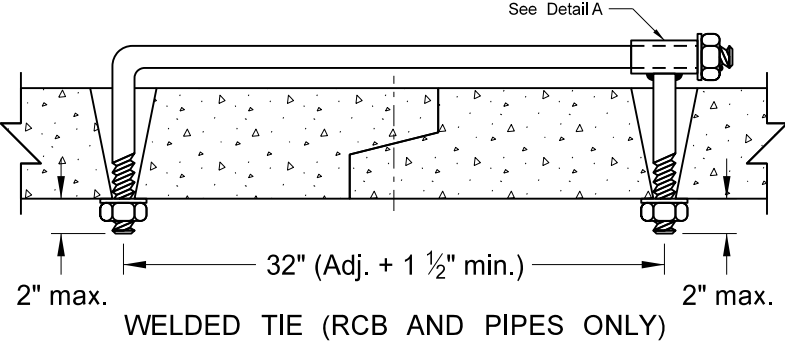
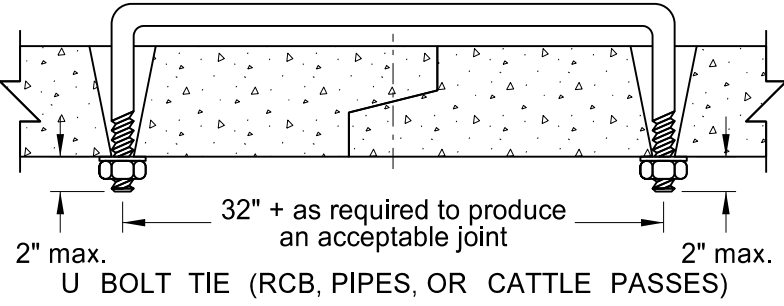
D-714-22



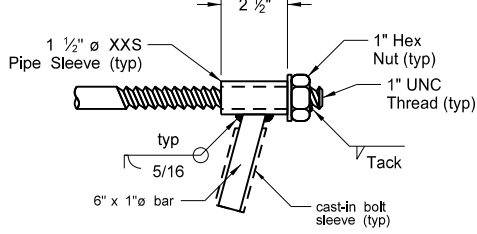
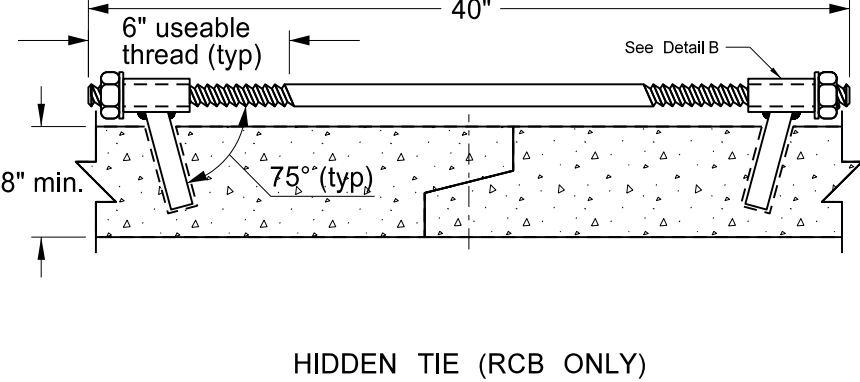
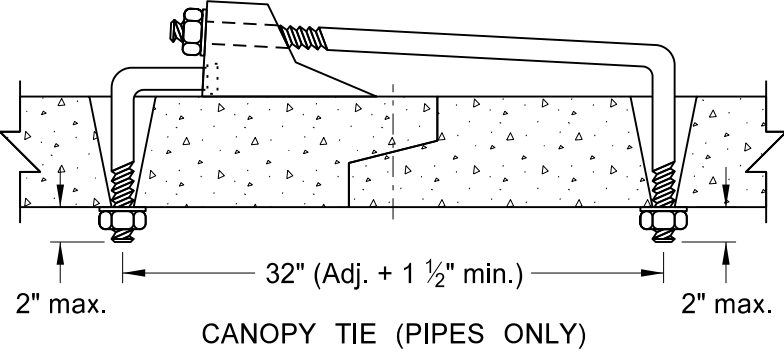
SECTION A-A

REQUIRED SIZE OF TIE BOLTS		
Pipe Size	Thread $\phi$	XXS Pipe Sleeve Inner $\phi$
18" - 24"	$\frac{5}{8}$ " See note 2	$\frac{3}{4}$ "
30" - 66"	$\frac{3}{4}$ "	1"
72" - 78"	1"	1 $\frac{1}{4}$ "
RCB/Cattle Pass		

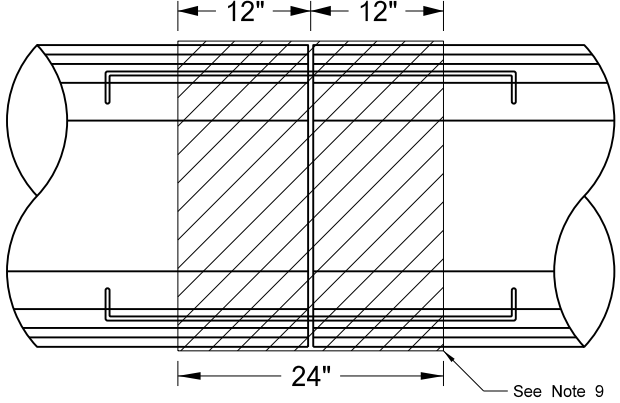
- NOTES:
- The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
  - Cattle Pass and Jacked and Bored pipes shall have pipe ties inserted from the inside of the pipes and grouted into place. Jacked and bored pipes with a diameter of 24" or less do not require pipe ties.
  - 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  $\frac{1}{4}$ " larger than the diameter of the thread. Holes in precast RCB's shall contain cast-in bolt sleeves with an inside diameter of 1  $\frac{1}{4}$ ".
  - 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 centerline and approach RCP culvert joints shall be tied. Storm drain systems shall have the first three joints including the end section of all free ends tied. Free ends are defined as any storm drain end which does not terminate at an inlet or manhole. Outfall culverts with end sections which drain adjacent ditches are examples of free ends.
  - Place joint wrap prior to installing 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.
  - RCB tie locations shall be as shown on the plans.



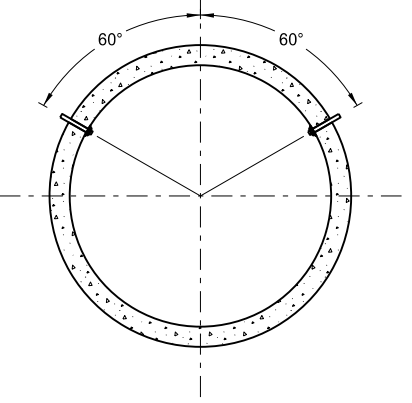
DETAIL A



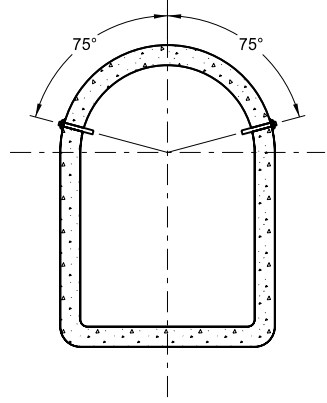
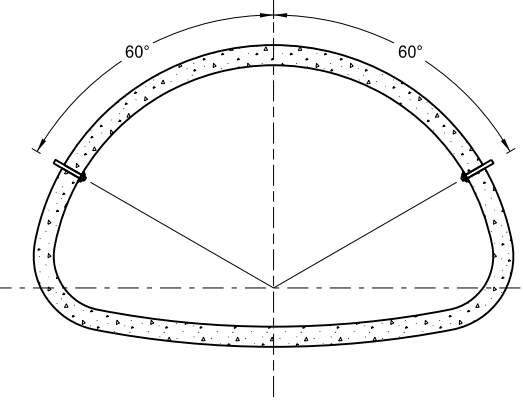
DETAIL B



PLAN VIEW



END VIEW

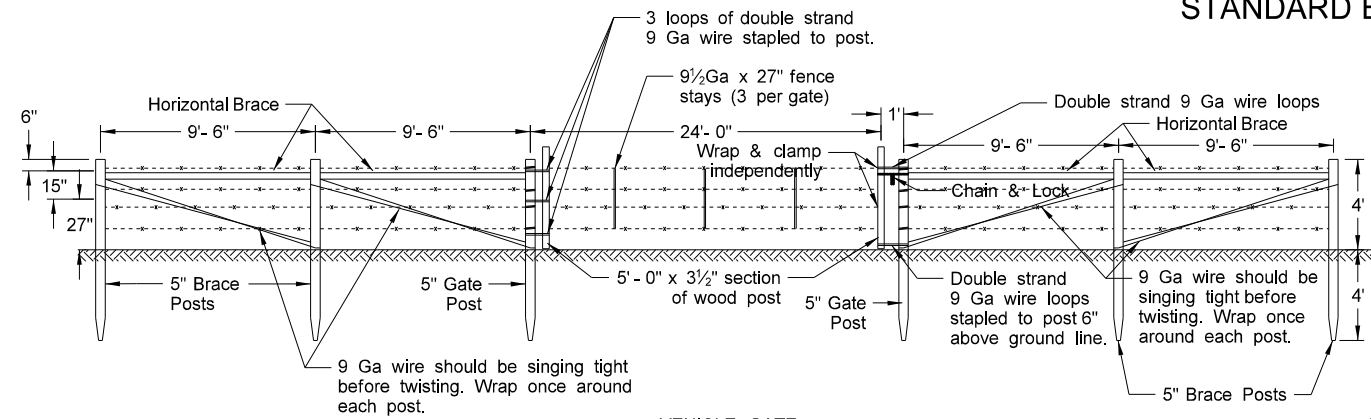


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
3-18-14	
REVISIONS	
DATE	CHANGE
7-21-15 6-6-17	Note 8 Notes 2-11, Table, Title, Labels

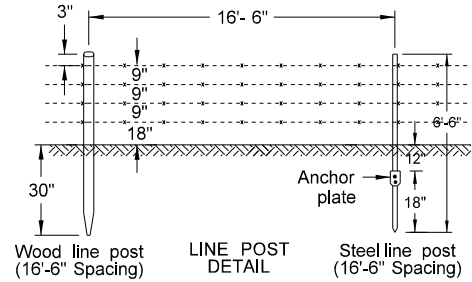
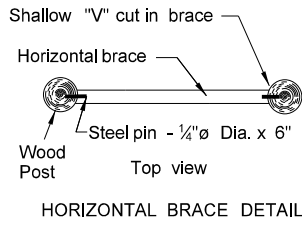
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STANDARD BARBED WIRE FENCE

D-752-1

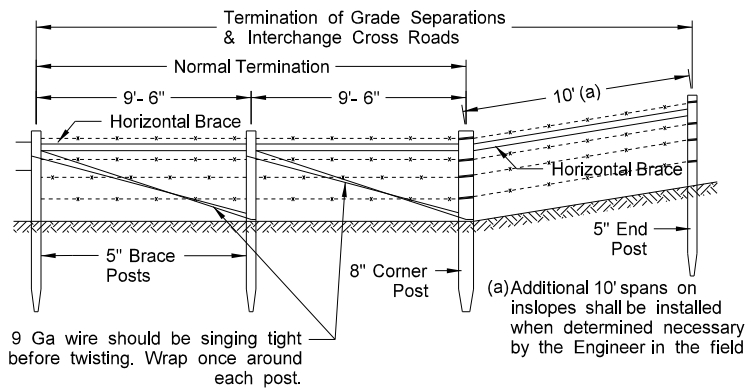


VEHICLE GATE

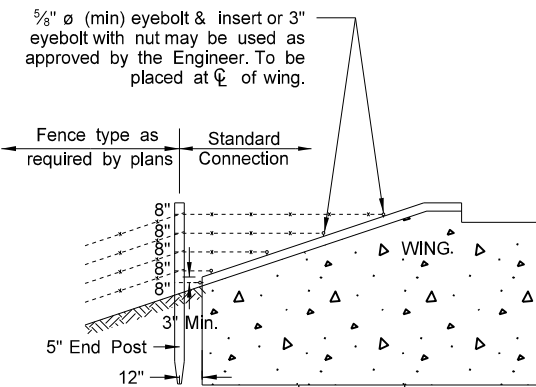


NOTES

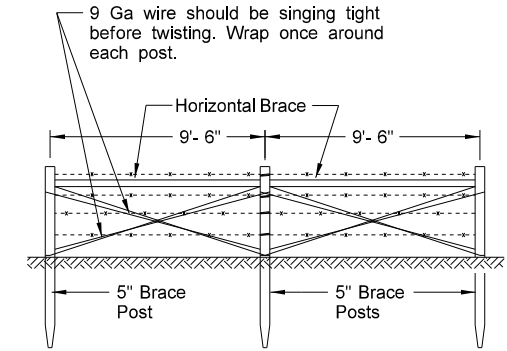
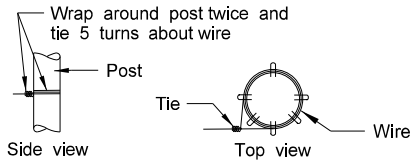
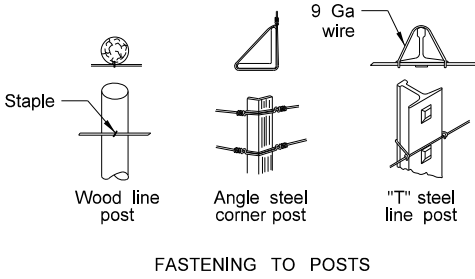
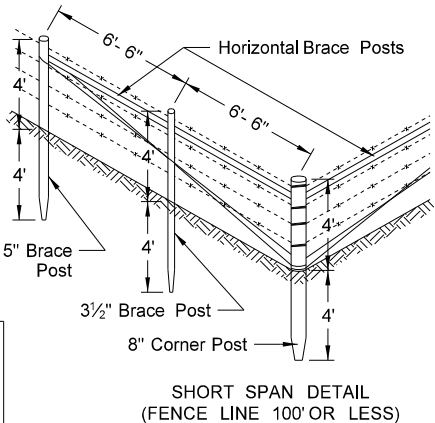
1. No deduction in measured pay length of cable fence will be made for gates, corner assemblies, double brace assemblies, fence terminals, or depression fencing. Abutment fencing shall be included in the price bid for fencing bid items.
2. Double brace assemblies shall be installed at locations shown on the plans or established by the Engineer. The distance between adjacent fence terminals, corner assemblies, or double brace assemblies shall not exceed 1,320 feet.
3. Cost of furnishing and installing inserts and eyebolts shall be included in the unit price bid for fencing bid items. Eyebolts shall be galvanized according to AASHTO designation M-30; inserts of corrosion resistant material need not be galvanized. Concrete inserts shall be of such design that, when installed in the concrete, will be capable of developing the full strength of the 5/8" diameter threaded eyebolt.
4. The type of posts to be used, either wood or steel, shall be determined by the contractor unless otherwise specified in the plans.



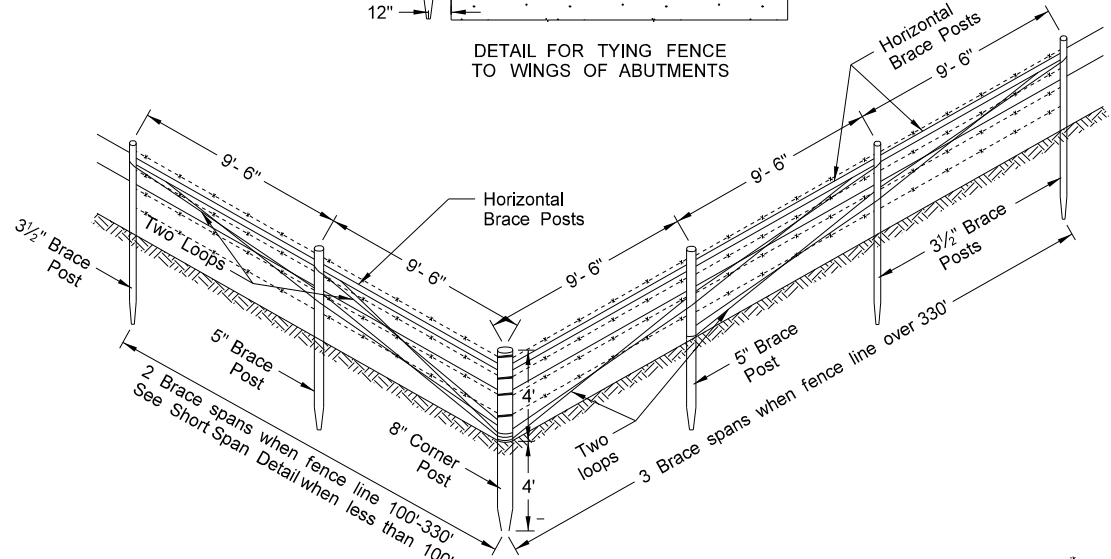
FENCE TERMINAL



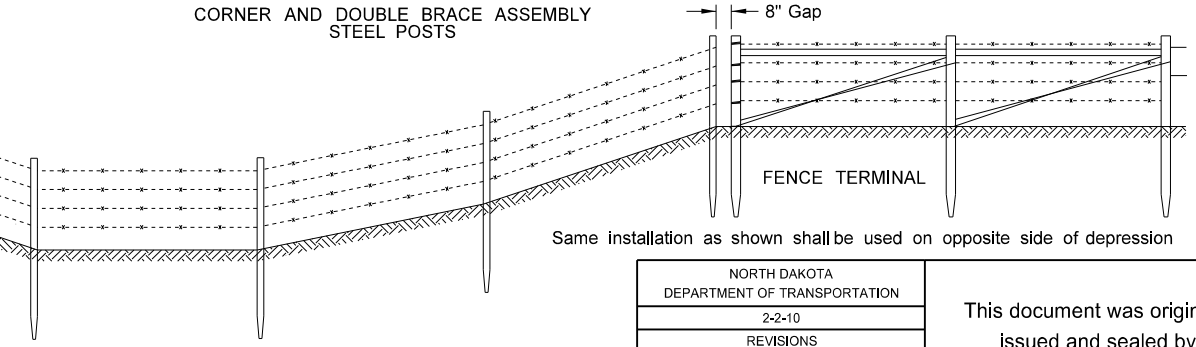
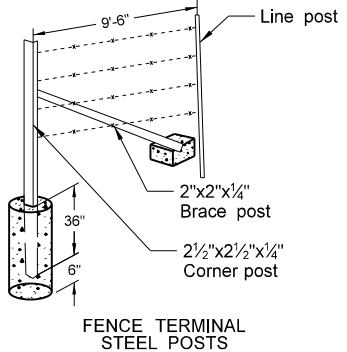
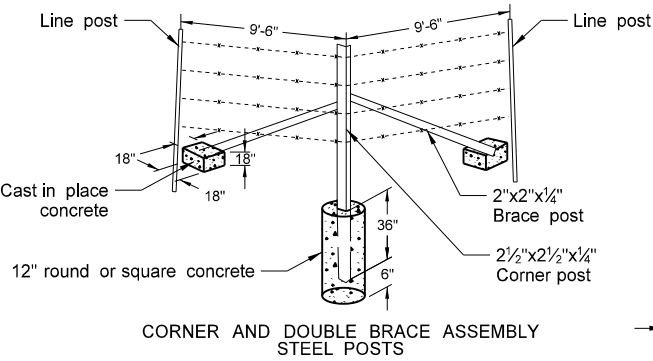
DETAIL FOR TYING FENCE TO WINGS OF ABUTMENTS



DOUBLE BRACE ASSEMBLY

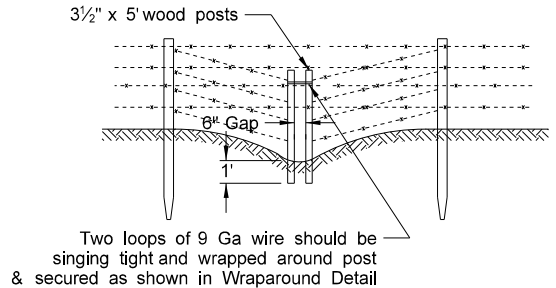


CORNER ASSEMBLY

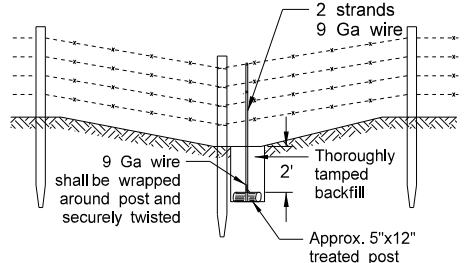


Same installation as shown shall be used on opposite side of depression

FENCING FOR WIDE DEPRESSIONS



BREAK-AWAY FENCE FOR NARROW DEPRESSIONS SUBJECT TO FLOODING



DETAIL FOR ANCHORING FENCES IN DEPRESSIONS\*  
\*Locations shall be determined in the field and included in price bid for fencing. Other methods of anchoring the fence may be used if approved by the Engineer.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-2-10	
REVISIONS	
DATE	CHANGE
10-02-12	Notes, steel assemblies/posts
11-25-13	Revised Vehicle Gate

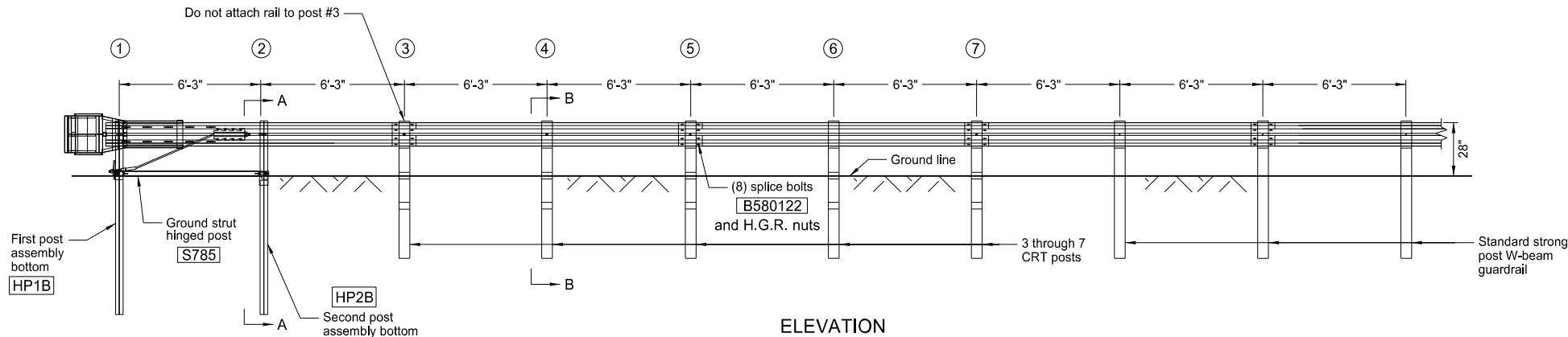
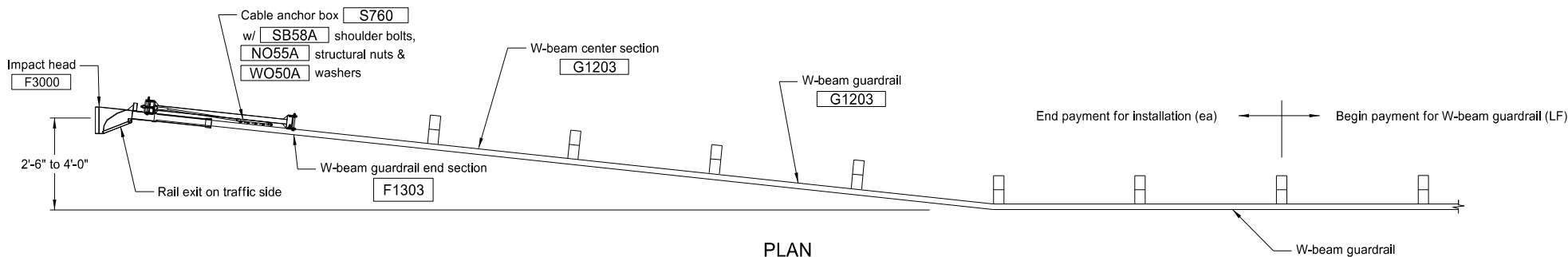
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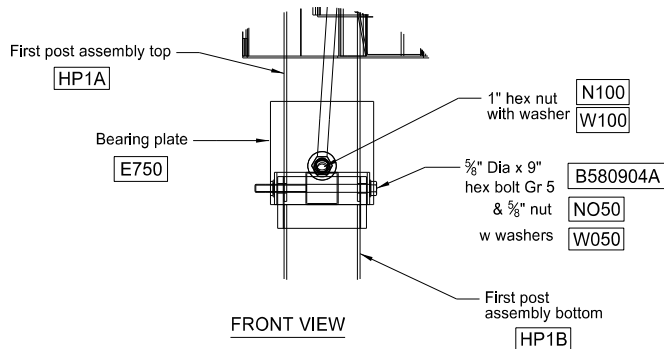
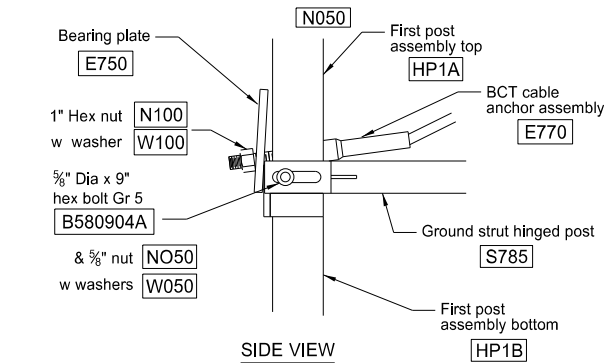
FLARED ENERGY ABSORBING TERMINAL

D-764-6

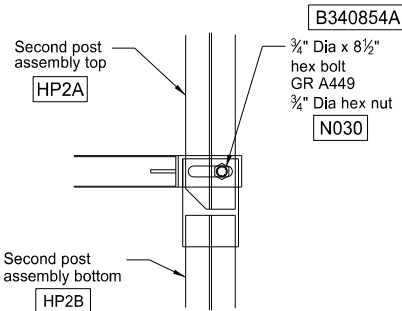


GENERAL NOTES

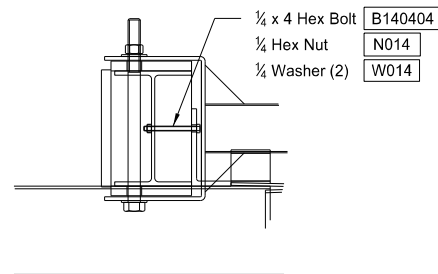
1. Wood posts are required with the Flared Energy Absorbing Terminal except posts #1 and #2.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The lower sections of the posts shall not protrude more than 4 inches above the ground (measured along a 60 inch cord). Site grading may be necessary to meet this requirement.
4. Lower post sections shall not be driven with the upper post attached. If the the post is placed in a drilled hole, the backfill material must be satisfactory compacted to prevent settlement.
5. When rock is encountered during excavation, a 12" diameter post hole 20" deep may be used if approved by the Engineer. Granular material will be placed in the bottom of the hole approximately 2 1/2" deep to provide drainage. The soil tubes shall be field cut to length, placed in the hole and back filled with adequately compacted material excavated from the hole.
6. The breakaway cable assembly shall be taut. A locking device (vice grips or channel lock pliers) should be used to prevent cable from twisting when tightening nuts.
7. The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when wood shrinks. The nail shall be 20 penny and galvanized.
8. The Flared Energy Absorbing Terminal shall be flared only when the approach guardrail is parallel with the roadway. When the approach guardrail is flared at 16:1 to 10:1, the Flared Energy Absorbing Terminal shall have only the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, the Flared Energy Absorbing Terminal shall be turned parallel to the roadway.



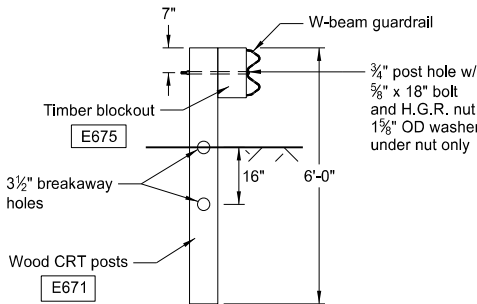
POST #1 CONNECTION DETAILS



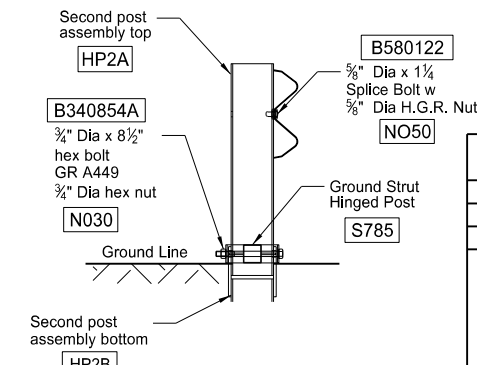
SIDE VIEW DETAIL OF POST #2



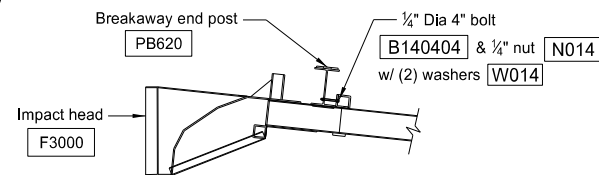
IMPACT HEAD CONNECTION DETAIL



SECTION B-B  
POST 3 THRU 7



SECTION A-A  
at Post #2



IMPACT HEAD CONNECTING DETAIL

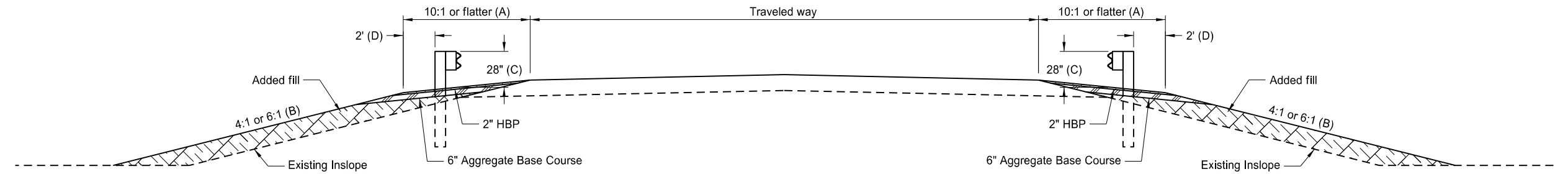
ITEM #	QTY	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA
G1203	2	W-BEAM GUARDRAIL, 12 GA
HP1A	1	FIRST POST ASSEMBLY TOP
HP1B	1	FIRST POST ASSEMBLY BOTTOM
HP2A	1	SECOND POST ASSEMBLY TOP
HP2B	1	SECOND POST ASSEMBLY BOTTOM
P671	5	WOOD CRT POST
P675	5	TIMBER BLOCKOUT OR RECYCLED EQUIVALENT
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
S785	1	GROUND STRUT HINGED POST
HARDWARE (ALL DIMENSIONS IN INCHES)		
B140404	2	1/4 Dia x 4 HEX BOLT
WO14	4	1/4 WASHER
N014	2	1/4 HEX NUT
B580122	17	5/8 Dia x 1 1/4 SPLICE BOLT
B581802	4	5/8 Dia x 10 H.G.R. BOLT (POSTS 3 THRU 6)
B580904A	1	5/8 Dia x 9 HEX BOLT GR 5
WO50	5	5/8 WASHER
N050	22	5/8 Dia H.G.R. NUT
B340854A	1	3/4 Dia x 8 1/2 HEX BOLT GR A449
N030	1	3/4 Dia HEX NUT
N100	2	1 ANCHOR CABLE HEX NUT
W100	2	1 ANCHOR CABLE WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N055A	8	1/2 A325 STRUCTURAL NUT
WO50A	16	1 1/16 OD x 3/16 ID A325 STR. WASHER

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-11-13	
REVISIONS	
DATE	CHANGE

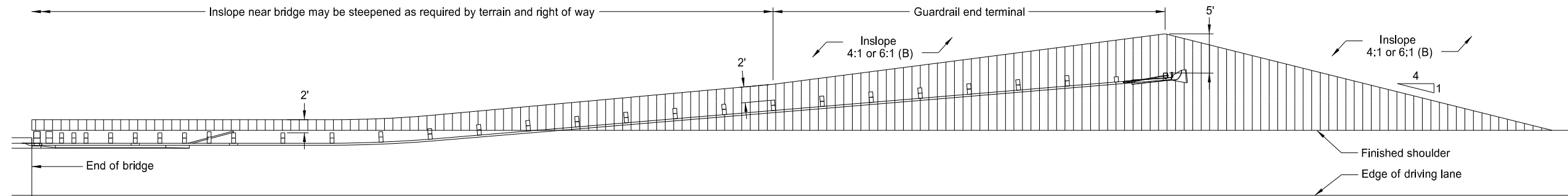
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TYPICAL GRADING AT BRIDGE ENDS  
WITH W-BEAM GUARDRAIL

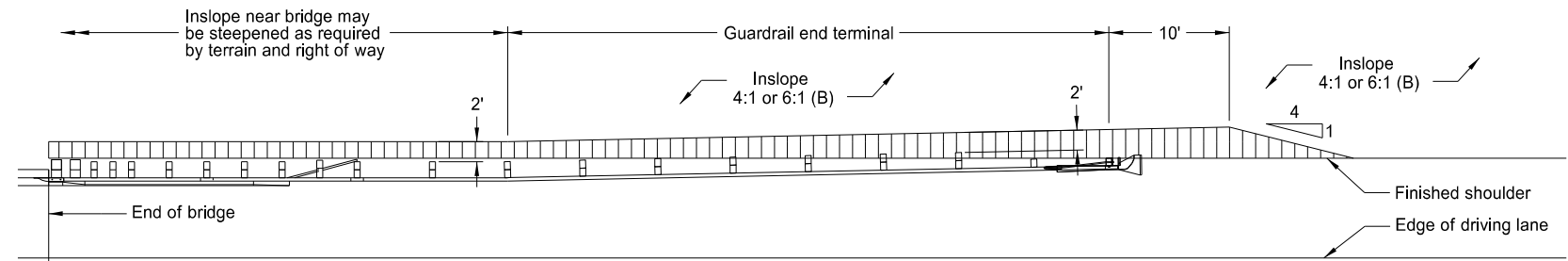
D-764-22



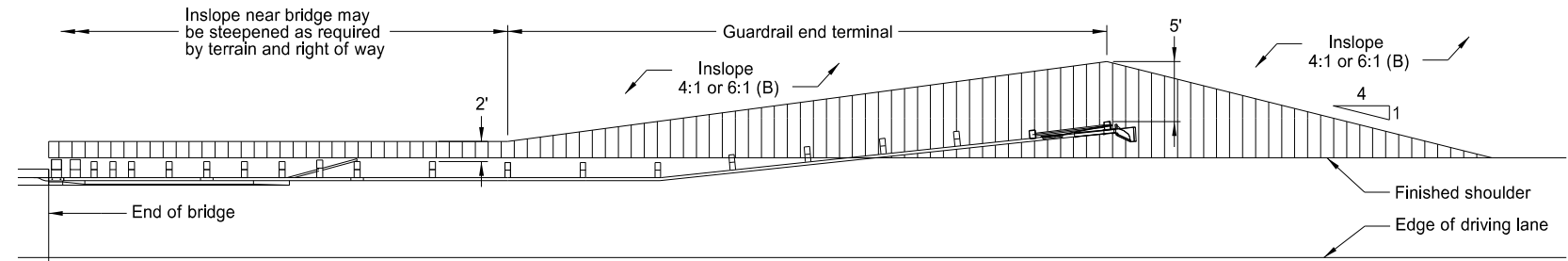
TYPICAL SECTION



PLAN LAYOUT  
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT  
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL



PLAN LAYOUT  
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

- (A) Slope flatter than 10:1 may be required to provide proper guardrail height.
- (B) Where normal inslope is 4:1 the added fill shall be 4:1. Where normal inslope is 6:1 the added fill shall be 6:1.
- (C) Measured from top of guardrail to top of surfacing at front face of guardrail.
- (D) Dimension at end terminals may vary per Plan Layouts shown on this sheet.

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

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