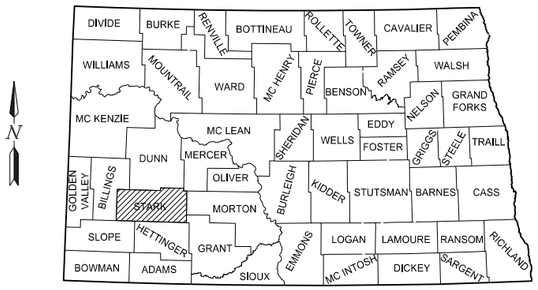
	STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
	ND	BRO-0045(053)	20221	1	1



STATE COUNTY MAP

JOB #33
STARK COUNTY
NORTH DAKOTA

FEDERAL AID PROJECT
BRO-0045(053)

FHWA LIMITED INVOLVEMENT
115TH AVE SW
REMOVAL OF STRUCTURE, PRECAST RCB, AND INCIDENTALS
STRUCTURE NO. 45-117-04.0

GOVERNING SPECIFICATIONS

Standard Specifications for Road and Bridge Construction
adopted by the North Dakota Department of Transportation October 2008;
Standard Drawings currently in effect; and other Contract Provisions submitted herein.

DESIGN DATA

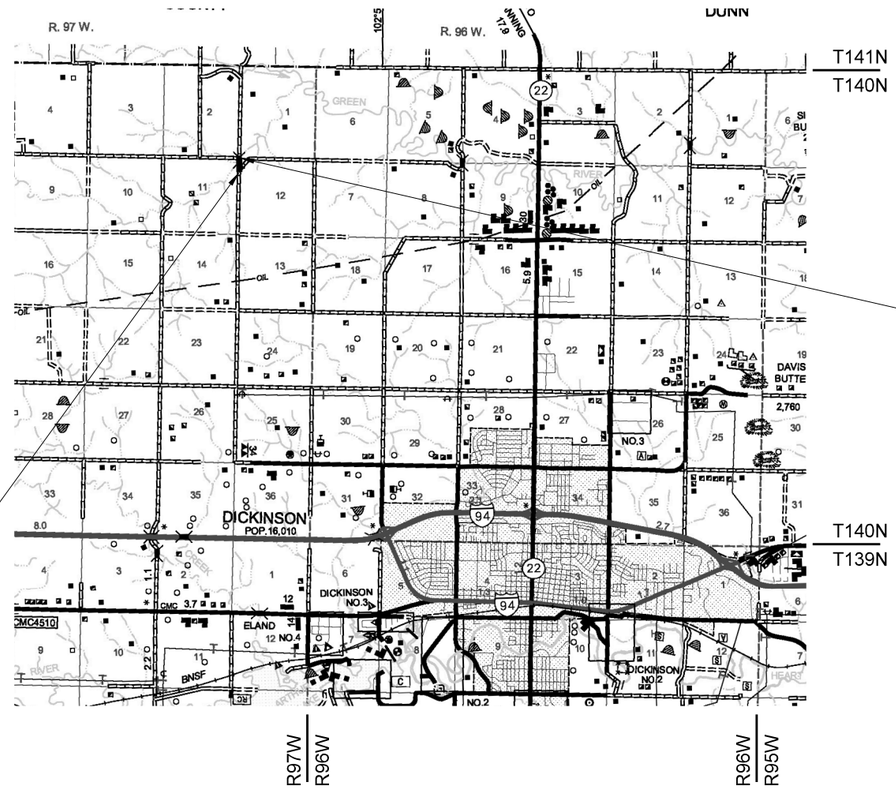
Traffic ~ BRO-0045(053)		Average Daily			Est. 30th Max. Hr.
		Passenger	Trucks	Total	
Current Traffic	2013	<100	-	<100	-
Forecast Traffic	2033	<100	-	<100	-

Clear Zone Distance:	14 Feet
Design Speed:	50 MPH
Minimum Sight Dist. for Stopping:	425 Feet
Structure Design Loading:	HL93

PROJECT LENGTH

Project	Gross Miles	Net Miles
BRO-0045(053)	0.161	0.161

This project consists of Removal of Structure, the Installation of a 16' x 10' x 56' Precast Reinforced Concrete Box Culvert, and 0.161 miles of grading located 6 miles east and 7 miles north of South Heart, North Dakota on 115th Ave SW.



BEGIN PROJECT
Sta 44+00.00
A point 881.11 feet south and 0.71 feet east of the Northwest Corner of Section 11, Township 140 N, Range 97 W of the 5th P.M.,
Stark County, North Dakota

END PROJECT
Sta 52+50.00
A point 31.11 feet south and 0.02 feet east of the Northwest Corner of Section 11, Township 140 N, Range 97 W of the 5th P.M.,
Stark County, North Dakota

SURVEY FIELD BOOK: M-1046 PGS 13-18

DESIGNERS

Jon Zumwalt, EI

Tim Kelly, PE

Andrew Krebs, PE

Shawn Mayfield, PE

Any questions regarding these plans can be directed to:

Andrew Krebs, P.E.
Kadrmas, Lee & Jackson, Inc.
P.O. Box 290
Dickinson, ND 58602-0290
(701) 483-1284 Phone

This document was originally issued and sealed by Andrew J. Krebs Registration Number PE-7876 on December 16, 2013, and the original documents are stored at Kadrmas, Lee & Jackson Inc., Dickinson, ND 58601

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.

Andrew J. Krebs /s/

ANDREW J. KREBS, P.E.
KADRMAS, LEE & JACKSON, INC.

DATE 12/16/2013 REGISTRATION NUMBER PE-7876

P.O. BOX 290
DICKINSON, ND 58602-0290
(701) 483-1284, FAX (701) 483-2795

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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LIST OF STANDARD DRAWINGS

STANDARD NO.	DESCRIPTION
D-20-1, 2 & 3	NDDOT Abbreviations
D-20-10	NDDOT Utility Company Abbreviations
D-20-20 & 21	Linestyles
D-20-30, 31 & 32	Symbols
D-704-7 & 8	Breakaway Systems for Construction Zone Signs
D-704-9	Construction Sign Details – Terminal and Guide Signs
D-704-10	Construction Sign Details – Regulatory Signs
D-704-11	Construction Sign Details – Warning Signs
D-704-13	Barricade Details and Channelizing Devices
D-704-14	Construction Sign and Barricade Assembly Details
D-704-15, 22	Construction Sign and Barricade Location Details
D-704-30	Windrow Marking
D-704-50	Portable Sign Support Assembly
D-708-7	Erosion Control Fiber Roll Staking Details
D-714-1	Reinforced Concrete Pipe Culvert and End Sections
D-714-4	Corrugated Steel Pipe Culverts and End Sections
D-714-22	Concrete Pipe Ties

LIST OF SPECIAL PROVISIONS (SP)

SP #	Description
SP 1010(08)	Temporary Erosion and Sediment Best Management Practices
SP 1262(08)	Permits and Environmental Considerations

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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PLAN NOTES

GENERAL NOTES

100-P01 **FENCES:** The County will attend to the removal of existing fences to the new highway right-of-way line.

100-P02 **STAGING AREAS:** The contractor shall avoid all wetlands outside the construction limits with staging areas and ancillary construction activities. Refer to Section 75, Sheet 1.

105-P01 **UTILITIES:** Utilities, including pipelines that the Engineer has been made aware of, are shown on the plans. The Contractor will be responsible to verify the locations and to notify all utility and pipeline companies to have the locations flagged and marked prior to beginning construction. The Contractor will be liable for any costs resulting from damage to utilities or pipelines. The Contractor will not be responsible to relocate utilities.

109-P01 **PROGRESS ESTIMATES:** Section 109.05A – Add the following to the 2nd paragraph.

A. Until a Request to Sublet Agreement is approved, no work shall be performed under the contract by the Subcontractor.
B. If the Contractor or Subcontractor(s) is delinquent by four (4) weeks in the submission of payrolls, no further Progress Estimates will be issued until all delinquent payrolls are received.
C. If a material is to be accepted by certification and the certification has not been approved by the Engineer, the material will not be included for payment. When the certification has been received and approved by the Engineer it will be included in the following estimate.

SECTION 200

200-010 **SHRINKAGE:** 25 percent additional volume is included for shrinkage in earth embankment.

202-P01 **REMOVED ITEMS:** Any item designated for removal but not to remain County property, shall be considered the property of the Contractor. Said Contractor's property shall be disposed of in approved inert waste disposal site as per Section 107.10 of the Specifications. This disposal shall be included in the price bid for "Removal of Structure". The following removal and salvage items shall remain county property and are expected to be removed without further damage to those items:

A. All pipe culverts (temporary bypass pipe culverts will remain property of the contractor)
B. All signs and hazard markers
C. All remove and salvage items will be reviewed by the Field Engineer. If the Engineer determines that the item is not salvageable based on the condition, it becomes the contractor's property.
D. Bridge components (refer to Section 170 Sheet 2)

203-P01 **COMMON EXCAVATION:** Payment for Common Excavation – Type C shall be contract quantity as per Section 203.03B of the Standard Specifications.

203-P02 **TOPSOIL:** The existing topsoil (not being classified as topsoil wetland) within the areas of roadway widening and temporary bypass shall be salvaged. Removal of topsoil is based upon a 4" depth. The topsoil shall be removed to its full depth and stockpiled. Upon completion of the roadway widening and temporary bypass removal, the topsoil shall be spread evenly over the areas to be seeded. Wetlands should not be filled in when spreading the topsoil and drainage to the wetlands should not be altered. All topsoil work associated with the temporary bypass shall be included in the price bid for "Temporary Bypass."

203-P03 **TOPSOIL – WETLAND:** Topsoil shall be stripped to a depth of 6 inches from all permanent and temporary impacts in Wetland 1. The wetland topsoil shall be stockpiled separately from the other topsoil. The Wetland 1 mitigation area shall be excavated an additional 6 inches, and filled a depth of 6 inches with the stockpiled topsoil from the impacted wetlands. All associated costs for the wetland mitigation shall include any necessary manipulating and drying of the material, and shall be included in the price bid for "Topsoil – Wetland."

Stockpiled topsoil from the impacted Wetland 1 to the proposed wetland mitigation site will be used as the seed source for the establishment of wetland vegetation. Furnish Class IV seed mixture as a cover crop over the mitigation area after placing the 6 inches of topsoil. All associated costs for seeding the restoration area shall be included in the price bid for "Topsoil – Wetland."

203-P04 **BACKSLOPE ROUNDING:** Backslope rounding will be required on all cut sections as shown on the Typical Section. This shall be included in the bid item "Common Excavation – Type C."

203-P05 **BORROW-EXCAVATION:** All borrow shall be Contractor-Furnished. Density and moisture requirements shall be the same as Common Excavation-Type C. Borrow material shall consist of approved natural compactable soil. The soil shall not be saturated or contain organic material.

SECTION 300

302-P01 **SALVAGE AGGREGATE COURSE:**

a. The Aggregate Course on the existing roadway shall be removed and stockpiled for reuse. The material shall be used as surfacing for the temporary bypass. Upon completion of the newly constructed mainline roadbed, the Aggregate Course on the temporary bypass shall be salvaged and used as a traffic surface gravel on the mainline roadbed. The salvaged aggregate shall not be used as foundation fill.

b. The salvage material is included in the topsoil quantity. The salvaging, stockpiling, respreading and laying of the salvage material shall be included in the price bid for "Topsoil."

302-P02 **AGGREGATE SURFACE COURSE:** County forces will haul, lay, & compact all additional aggregate surfacing required to obtain the 6" aggregate surfacing on the mainline roadway section, as noted on the Typical Sections. The contractor shall coordinate his operation with Stark County so that the surfacing can be placed within 48 hours after the finished grading is complete. The county is available to haul Aggregate Surface Course from Monday through Thursday only.

The Contractor is responsible for all roadway maintenance from the project start through final acceptance. The only exception is if the County does not begin delivery of aggregate surface course within the 48 hours notice period, not including Friday through Sunday. The contact is Al Heiser at (701) 290-8429.

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BRO-0045(053)

115th Ave SW

KLJ

Plan Notes

Stark County, N.D.

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JTZ	AK	3312123

PLAN NOTES

SECTION 700

704-P01 **TRAFFIC CONTROL DEVICES LIST**: The Traffic Control devices list has been developed using the following layouts on the Standard Drawing for traffic control:

- D-704-15, Type B for temporary bypass during bridge installation.
- D-704-22, Type K or L for trucks hauling.
- D-704-30 for installation of surfacing. Contractor is to provide vertical panels and other construction signs for use by the County.
- D-704-7, 8, 9, 10, 11, 13, & 14 are applicable.

706-P01 **FIELD LABORATORY:** The Field Laboratory will be provided by the County at a location to be determined.

708-P01 **SEEDING:** Seeding Type B – Cl. V shall consist of the following mixture:

Species	Lbs. of PLS/Acre
Fairway Crested Wheatgrass	10
Western Wheatgrass	8
Slender Wheatgrass	2
TOTAL	**20**

708-P02 **EROSION CONTROL:** Fiber rolls have been provided for temporary and permanent erosion control. The temporary erosion control has been provided for placement prior to disturbing the topsoil or as indicated by the engineer. The Contractor shall preserve the temporary erosion control throughout the project. If the Contractor damages the erosion control due to negligence, the Contractor shall repair it at his own expense. Removal and disposal of the fiber rolls shall be included in the price bid for “Removal Fiber Rolls 12IN.”

Permanent erosion control has been provided such that as construction progresses, fiber rolls shall be placed within the construction limits. Locations are shown in the erosion control plan.

An additional 300 LF of Fiber Rolls – 12IN has been provided for locations to be determined by the Engineer in the field. All costs for labor, equipment, and materials necessary to complete this work shall be included in the price bid for "Fiber Rolls 12IN."

710-P01 **TEMPORARY BYPASS:** The pipe layout, alignment, profile, and width of the temporary bypass shall be constructed according to Section 30 Sheet 1, Section 55 Sheet 1, Section 60 Sheet 2, and Section 200 Sheets 6-11. All material required to construct the temporary bypass shall be included in the price bid for “Temporary Bypass.”

The salvaged aggregate course from the mainline shall be used as surfacing for the temporary bypass. Any additional aggregate surface course material required shall be CL 13 as specified in Section 816.03 B of the Standard Specifications.

The aggregate surface course shall be hauled, placed, laid and compacted by the contractor in two (2) equal depth lifts.

The Contractor shall apply water on the aggregate surface course to help prevent dust during construction.

Upon completion of the structure and roadway subgrade, the aggregate surface course shall be salvaged and laid and compacted by the Contractor as a traffic surface gravel on the newly constructed mainline roadbed. The temporary bypass shall be removed in its entirety. All fill material shall be removed and disposed of in an area that meets Sections 107.04 & 107.10 of the Supplemental Specifications. All disturbed wetlands shall be restored to their natural conditions. All costs associated with installing, maintaining, and removing the temporary bypass shall be included in the price bid for “Temporary Bypass.”

714-P01 **PIPE CULVERT INSTALLATION:** Delete Sections 714.03 A.7 & 714.04 A of the Supplemental Standard Specifications and refer to the original October 2008 version of Standard Specifications for Road and Bridge Construction for these sections.

714-P02 **VOID AREAS:** Flared end sections shall have no void areas underneath them. The material used under flared end sections shall be leveled and compacted to grade prior to setting all flared end sections.

754-P01 **SIGNING:** Stark County will install any permanent signs that have been removed due to construction activities and need to be reset. All signs, including posts, designated for removal on Section 60 Sheet 1 shall be removed, salvaged, and stockpiled by the Contractor. All work associated with sign removal shall be included in the price bid for “Removal of Structure.” The contact is Al Heiser at (701) 290-8429. Any signs or posts damaged by the Contractor shall be replaced at his own expense.

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BRO-0045(053)

115th Ave SW

KLJ

Plan Notes

Stark County, N.D.

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ENVIRONMENTAL COMMITMENTS

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

Commitment No. 1: Unavoidable impacts to wetlands will be mitigated onsite, adjacent to the project, or at a NDDOT approved mitigation site or bank. Approximately 0.01 natural/jurisdictional, 0.00 natural/non-jurisdictional, 0.00 artificial/jurisdictional, and 0.00 artificial/non-jurisdictional acres of wetlands will be impacted permanently, and 0.07 acres will be impacted temporarily.

Action Taken/Required: 0.01 acres of permanent impacts to wetlands will be mitigated onsite.

Wetland Number	Location	Cowardin Class.	Wetland Type	Wetland Size (Acres)	Wetland Feature	USACE Jurisdictional Wetlands*	Wetland Impacts (acres)		USFWS Easement Impacts		Wetland Mitigation			
							Temp.	Perm.	Temp.	Perm.	Mitigation Required		Location	Onsite Mitigation Acres
											11990	USACE		
1	Sec.11, T140N, R97W	PEMC	drainage	0.34	Natural	Yes	0.07	0.01	0	0	Yes	No	Onsite	0.01
		Totals		**0.34**			**0.07**	**0.01**	**0**	**0**				**0.01**

*A wetland Jurisdictional Determination was issued by the USACE on 2/27/2013; NWO-2013-0348-BIS

Total Permanent Impact Summary		Additional Impact Info for 404 Permit	
Wetland Type	**Total (Acres)**	**Wetland Type**	**Total (Acres/Lf)**
Natural/Non-JD	0	Permanent JD ≥ 0.10	**0**
Artificial /Non-JD	0	Temporary JD	**0**
Natural /JD	0.01	POW	**0**
Artificial /JD	0		
Totals	**0.01**		

Commitment No. 2: Ensure structures do not act as a barrier, preventing the movement of fish and other aquatic organisms in the stream channel.

Action Taken/Required: The RCBC is designed to drop the bottom of the box, as well as the top of the riprap, one foot below the existing grade of the stream channel.

Commitment No. 3: Fishery resources within the Green River tributary are protected during the construction phase of the project.

Action Taken/Required: Construction activities shall not occur within the channel between April 15 through June 1 timeframe.

Commitment No. 4: Active migratory bird nests with eggs or chicks are protected by the Federal Migratory Bird Treaty Act. All efforts will be made to avoid demolition on bridges or box culverts with active nesting and within the migratory bird nesting season (February 1 through July 15).

Action Taken/Required: The contractor shall not remove the existing structure prior to July 15 unless the contractor uses measures to prevent migratory birds from nesting prior to the nesting season.

Commitment No. 5: Erosion control devices will be used as needed during construction.

Action Taken/Required: The contractor shall install and maintain erosion control devices. The contractor is required to obtain a NDPDES Permit from the North Dakota Department of Heath prior to construction.

Commitment No. 6: Fugitive dust emissions created during construction will be minimized.

Action Taken/Required: The contractor shall implement BMPs, such as water as a palliative, to control dust during construction as appropriate.

ENVIRONMENTAL COMMITMENTS

Commitment No. 7: Disturbed areas will be re-seeded with a seed mixture similar to the surrounding vegetation.

Action Taken/Required: The contract documents require that the contractor re-seed disturbed areas with an appropriate seed mixture.

Commitment No. 8: Existing drainage patterns will be maintained.

Action Taken/Required: The plan specifications and drawings maintain existing drainage patterns.

Commitment No. 9: The existing channel alignment and bank contours will be maintained.

Action Taken/Required: The plan specifications and drawings maintain the existing channel alignment and transition the new bank contours to the existing bank contours.

Commitment No. 10: The North Dakota Game & Fish Department aquatic nuisance species guidelines will be followed.

Action Taken/Required: The contractor shall provide the Department a reasonable opportunity to inspect all vehicles, vessels, pumps and equipment that will be used in the project prior to being placed in the waters of the state. A minimum of 72 hours notice must be provided to the Department for scheduling an inspection. The Department's ANS Biologist, Mr. Fred Ryckman, is to be contacted at the Riverdale Office (701-770-0920) for equipment inspections or any additional information regarding ANS prevention protocols.

Commitment No. 11: As a result of the proposed project, one utility, a CenturyLink underground telephone line, would be impacted and would need to be relocated. In addition, a Consolidated Telecom fiber optic telecommunications cable, an underground Roughrider Electric electrical line, and a Southwest Water Authority water line are within the project corridor and may be impacted.

Action Taken/Required: All utility companies have been notified by letter and relocations shall be conducted as necessary. The Contractor is not responsible for relocating utilities.

Commitment No. 12: The contractor shall not initiate work at the borrow site in conjunction with the authorized activity until approval is received from the United States Army Corp of Engineers (USACE).

Action Taken/Required: In addition to Section 107.04 of the Standard Specifications, the contractor shall be responsible for ensuring that the US Army Corps of Engineers-ND Regulatory Office (1513 South 12th Street, Bismarck, ND 58504; Attention Patsy Crooke, Phone: 701-255-0015) is notified, and approves of, the location of any borrow site that will be used on this project.

Permits Required:

- North Dakota Department of Health – NDPDES permit (to be obtained by the contractor prior to construction, with Stark County as the owner.)
- The Pre-construction Notification, NWO-2013-0348-BIS, has been submitted by Stark County and approved by the USACE on February 27, 2013.
- Stark County – Non-building Floodplain Development Permit (has been obtained by County)

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SUMMARY OF QUANTITIES

Spec	Code	Description	Unit	Total Quantities
103	0100	CONTRACT BOND	LSUM	1
202	0105	REMOVAL OF STRUCTURE	LSUM	1
202	0170	REMOVAL OF CULVERTS-ALL TYPES & SIZES	LF	80
203	0103	COMMON EXCAVATION-TYPE C	CY	2,173
203	0109	TOPSOIL	CY	1,074
203	0121	TOPSOIL-WETLAND	CY	55
203	0140	BORROW-EXCAVATION	CY	4,214
210	0109	CLASS 2 EXCAVATION-BOX CULVERT	EA	1
210	0201	FOUNDATION PREPARATION	EA	1
210	0210	FOUNDATION FILL	CY	114
216	0100	WATER	MGAL	144
606	1610	16FT X 10FT PRECAST RCB CULVERT	LF	56
606	5610	16FT X 10FT PRECAST RCB END SECTION	EA	2
702	0100	MOBILIZATION	LSUM	1
704	1000	TRAFFIC CONTROL SIGNS	UNIT	1,081
704	1052	TYPE III BARRICADE	EA	6
704	1060	DELINEATOR DRUMS	EA	10
704	1081	VERTICAL PANELS-BACK TO BACK	EA	32
708	1020	RIPRAP-LOOSE ROCK	CY	186
708	1430	FIBER ROLLS 12IN	LF	2,340
708	1431	REMOVAL FIBER ROLLS 12IN	LF	800
708	2281	SEEDING-TYPE B-CL V	MILE	0.2
708	5201	TEMPORARY COVER CROP CL VI	MILE	0.2
709	0600	GEOTEXTILE FABRIC-TYPE RR	SY	279
709	0701	GEOTEXTILE FABRIC-TYPE R1	SY	302
710	0200	TEMPORARY BYPASS	LSUM	1
714	4099	PIPE CONDUIT 18IN-APPROACH	LF	60
714	4106	PIPE CONDUIT 24IN-APPROACH	LF	102

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BRO-0045(053)

115th Ave SW

KLJ

Summary of Quantities

Stark County, N.D.

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BASIS OF ESTIMATE

Topsoil
4” depth

Topsoil-Wetland
6” depth

Class 2 Excavation-Box Culvert
Limits as shown on Plans and Specifications

Foundation Fill - (Volume +25%)
RCB Culvert: 2.0’ Depth; Limits same as Class 2 Excavation-Box Culvert

Water
10 Gal/CY Common Excavation & Borrow Excavation
50 MGal for Dust Palliative
30 MGal for Aggregate Surface Course

Aggregate Surface Course - (Volume +25%) (For Information Only)
3,178 CY/Mile Mainline
20 CY/Field Drives
40 CY/Section Line & Private Drives

Riprap-Loose Rock
2’ Depth Length and Width as shown on the plans

Seeding – Type B – Cl V
Entire disturbed area except the newly constructed roadbed
Minimum 2.6 acres to Maximum 3.5 acres

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Basis of Estimate

Stark County, N.D.

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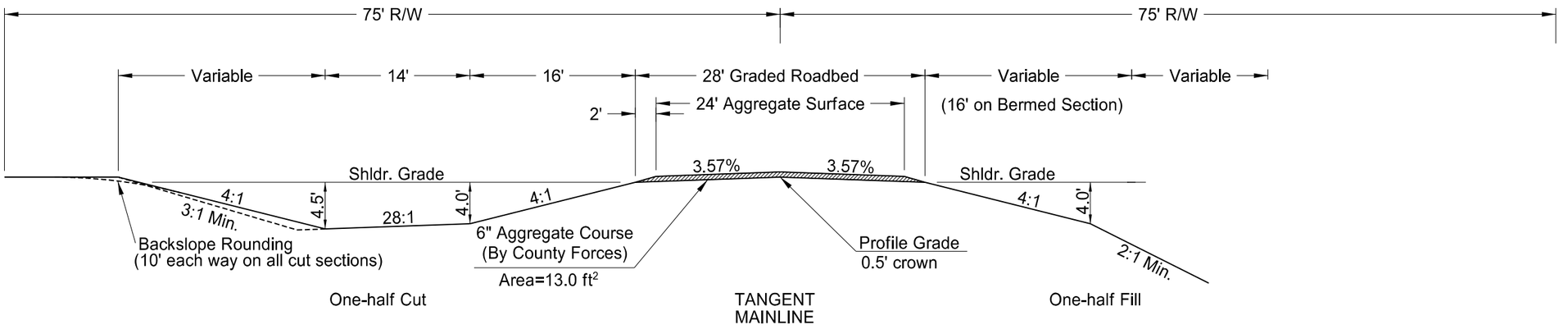
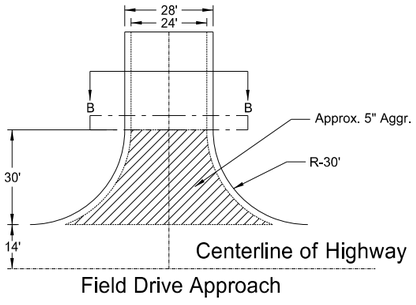
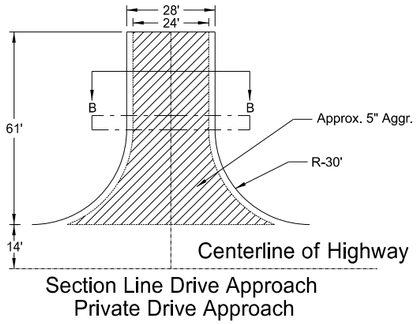
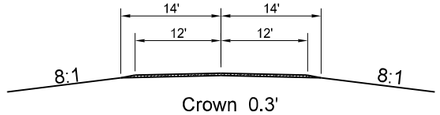




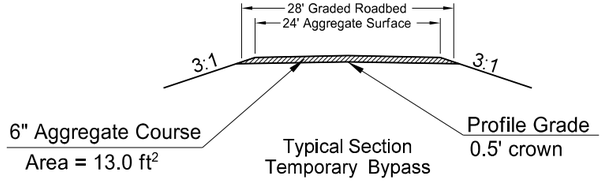
Field Drive Approach



Section Line Drive Approach
Private Drive Approach



Crown 0.3'
B-B



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28' Roadway
Typical Sections

Stark County, N.D.

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Begin Station / Location	Begin Offset	End Station / Location	End Offset	Length	Pipe Conduit Pay Size	Pipe Conduit Approach Pay Size	Allowable Material	Required Diameter	Minimum Thickness	R1 Fabric (Pay Item)	(A) End Sections		(A) Bedding	Applicable Backfill Detail
											Begin	End		
				LF				In	In	SY	EA	EA	CY	
45+68	44' Lt	46+28	44' Lt	60		18	Reinforced Concrete Pipe - Class III **(barrel length = 52 LF)**	18			Y	Y		
							Zinc coated Steel (2-2/3" x 1/2" Ribs)	18	0.064					
							Aluminum Coated Steel (Type 2)	18	0.060					
							Polymeric Coated Steel (over zinc or aluminum coated steel)	18	0.064					
							High Density Polyethylene (HDPE)	18						
45+52	44' Rt	46+54	44' Rt	102		24	Reinforced Concrete Pipe - Class III **(barrel length = 96 LF)**	24			Y	Y		
							Zinc coated Steel (2-2/3" x 1/2" Ribs)	24	0.064					
							Aluminum Coated Steel (Type 2)	24	0.060					
							Polymeric Coated Steel (over zinc or aluminum coated steel)	24	0.064					
							High-Density Polyethylene (HDPE)	24						

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

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115th Ave SW

KLJ

Allowable Pipe List

Stark County, N.D.

DRWN. BY	CHK'D. BY	PROJECT NO.
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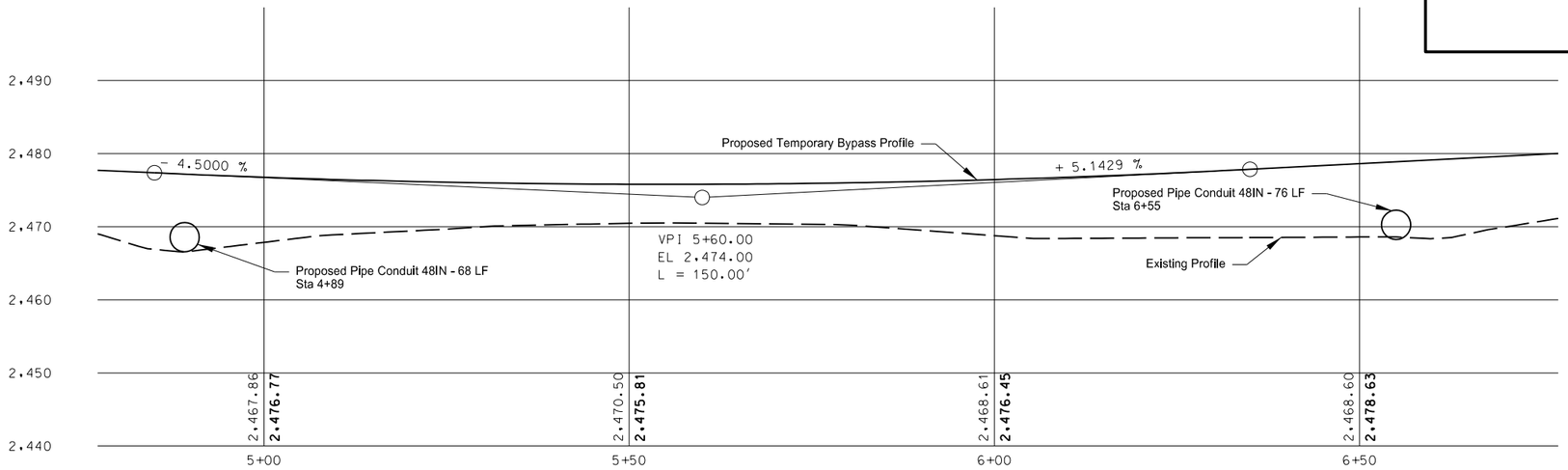
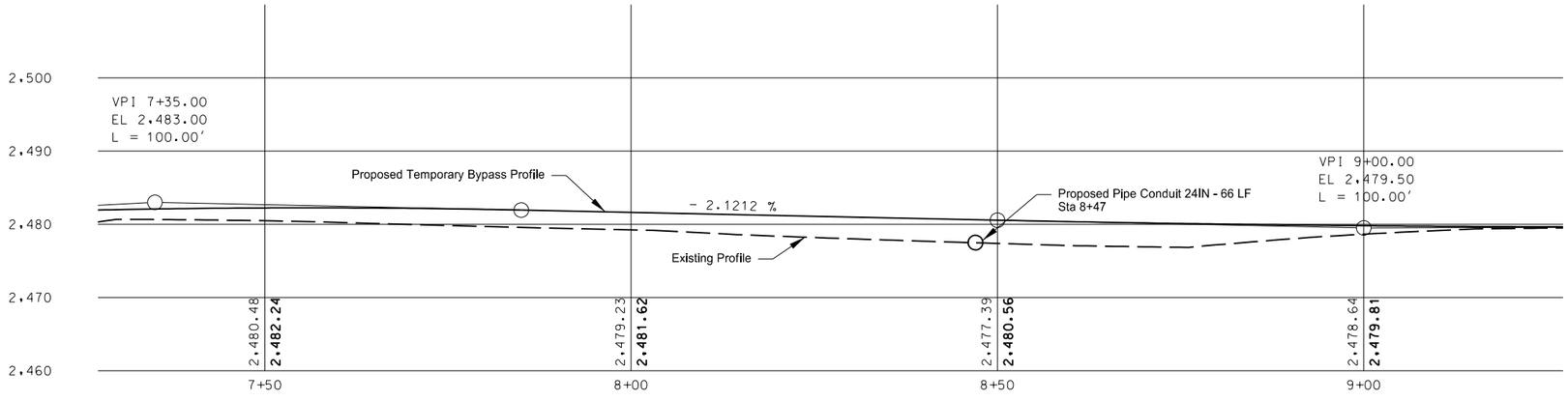
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRO-0045(053)	55	1





Begin Station / Location	Begin Offset	End Station / Location	End Offset	(A) Length	(A) Optional Length Without End Sections	(A) Pipe Conduit Pay Size	R1 Fabric (Pay Item)	(A) End Sections		(A) Bedding	Applicable Backfill Detail
								Begin	End		
				LF	LF		SY	EA	EA	CY	
4+80	32' Lt	5+02	32' Rt	68	Barrel Length = 80 LF	48		Y	Y		
6+73	32' Lt	6+30	30' Rt	76	Barrel Length = 90 LF	48		Y	Y		
8+26	25' Rt	8+72	21' Lt	66	Barrel Length = 74 LF	24		Y	Y		

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

The contractor has the option of installing end sections or using the additional length of pipe without end sections.

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BRO-0045(053)

115th Ave SW

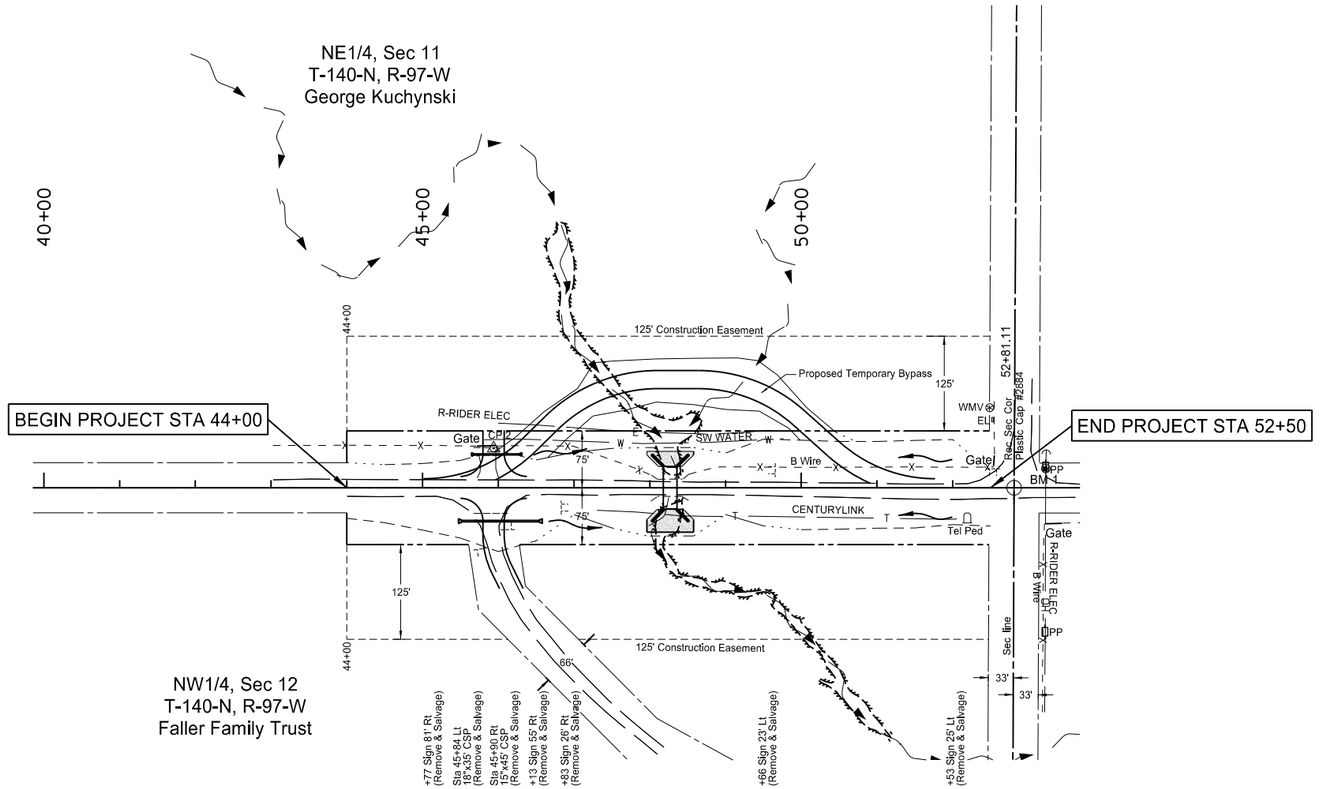
KLJ

Temporary Bypass Pipe Layout

Stark County, N.D.

DRWN. BY	CHK'D. BY	PROJECT NO.
JTZ	AK	3312123

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRO-0045(053)	60	1



16FT X 10FT PRECAST RCB CULVERT
Sta 48+27 CI — 56 LF

16FT X 10FT PRECAST RCB END SECTION
Sta 48+27 Rt & Lt — 2 Ea

RIPRAP-LOOSE ROCK
Sta 48+27 Lt (945 SF x 2' D) — 70 CY
Sta 48+27 Rt (1566 SF x 2' D) — 116 CY

PIPE CONDUIT 18IN-APPROACH
Sta 45+68 to 46+28 Lt — 60 LF

PIPE CONDUIT 24IN-APPROACH
Sta 45+52 to 46+54 Rt — 102 LF

BENCHMARK

NO.	DESCRIPTION	LOCATION	ELEVATION
CP 2	Rebar	45+93.8 - 52.0' Lt	2483.16
1	Rebar	53+23.0 - 25.0' Lt	2479.34

SCALE
Horizontal 1"=200'
Vertical 1"=20'

SURVEY COMPLETED USING NAVD 88 DATUM

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BRO-0045(053)
115th Ave SW

KLJ

Plan & Profile
Sta 44+00 to 52+50

Stark County, N.D.

DRWN. BY	CHK'D. BY	PROJECT NO.
JTZ	AK	3312123

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRO-0045(053)	60	2

NE1/4, Sec 11
T-140-N, R-97-W
George Kuchynski

NW1/4, Sec 12
T-140-N, R-97-W
Faller Family Trust

Curve TEMP1
PI = 2+83.11
Delta = 44° 28' 22.49" (LT)
Da = 28° 38' 52.40"
R = 200.00
T = 81.77
L = 155.24

Curve TEMP2
PI = 4+78.73
Delta = 44° 28' 22.49" (RT)
Da = 28° 38' 52.40"
R = 200.00
T = 81.77
L = 155.24

Curve TEMP3
PI = 6+82.39
Delta = 41° 51' 47.78" (RT)
Da = 28° 38' 52.40"
R = 200.00
T = 76.50
L = 146.13

Curve TEMP4
PI = 8+89.59
Delta = 41° 51' 47.78" (LT)
Da = 28° 38' 52.40"
R = 200.00
T = 76.50
L = 146.13

BEGIN TEMPORARY BYPASS STA 2+00

END TEMPORARY BYPASS STA 9+82.72

Equation:
Sta 45+00.00 Mainline =
Sta 2+00.00 Temporary Bypass

Equation:
Sta 9+82.72 Temporary Bypass =
Sta 52+00.00 Mainline

125' Construction Easement

125' Construction Easement

R-RIDER ELEC

CP 2

SW WATER

B.Wire

CENTURYLINK

Tel Ped

Gate

Gate

WMV

ELI

Rec. Sec Cor #2684
Plastic Cap

BM 1

Sec line

PC 2+01.34

PT 5+52.21

PC 6+05.89

PI 6+82.39

PT 7+52.02

PC 3+56.97

PI 4+78.73

PT 3+56.59

PC 8+17.09

PI 8+89.59

PT 9+59.22

PI 2+83.11

PT 3+56.59

125'

75'

66'

33'

44+00

45+00

50+00

52+81.11

VPI 2+60.00
EL 2,487.50
K = 105
L = 100.00'

VPI 5+60.00
EL 2,474.00
K = 16
L = 150.00'

VPI 7+35.00
EL 2,483.00
K = 14
L = 100.00'

VPI 9+00.00
EL 2,479.50
K = 40
L = 100.00'

2,491.40
-3.5455 %
-4.5000 %
+5.1429 %
-2.1212 %
+0.362
2,479.80

2,492.96	2,489.78	**2,489.63**	2,483.79	**2,485.70**	2,478.66	**2,481.20**	2,467.86	**2,476.77**
1+00	2+00		3+00		4+00		5+00	

2,468.77	**2,476.45**	2,476.47	**2,481.12**	2,479.23	**2,481.62**	2,478.64	**2,479.81**	
6+00		7+00		8+00		9+00		

2525 2520 2515 2510 2505 2500 2495 2490 2485 2480 2475 2470 2465 2460 2455 2450

SCALE
Horizontal 1"=200'
Vertical 1"=20'

SURVEY COMPLETED USING NAVD 88 DATUM

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BRO-0045(053)

115th Ave SW

KLJ

Plan & Profile
Temporary Bypass
Sta 2+00.00 to 9+82.72
Stark County, N.D.

DRWN. BY	CHK'D. BY	PROJECT NO.
JTZ	AK	3312123

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0045(053)	75	1

Permanent Wetland Impact

Temporary Wetland Impact

Proposed Wetland Mitigation

Permanent Wetland Impacts:
Wetland 1 = 0.01 Acres

Temporary Wetland Impacts:
Wetland 1 = 0.07 Acres

Proposed Wetland Mitigation
Wetland 1 = 0.01 Acres

NE1/4, Sec 11
T-140-N, R-97-W
George Kuchynski

NW1/4, Sec 12
T-140-N, R-97-W
Faller Family Trust

45+00

50+00

44+00

Delineated Wetland 1

125' Construction Easement

Construction Limits (Temporary Bypass)

Proposed Temporary Bypass

Proposed R/W

Const Limits

Existing R/W

125'

Existing Pipe
(To be Removed)

Proposed 18"x 60'
Pipe Conduit

75'

33'

33'

Existing Roadway

Existing Pipe
(To be Removed)

Wetland 1
Permanent Impacts
(0.01 Acres)

Proposed 24"x 102'
Pipe Conduit

Wetland 1
Temporary Impacts
(0.07 Acres)

Wetland Mitigation
(0.01 Acres)

Proposed 16'x10'x56' Precast RCB Culvert
& End Sections

Delineated Wetland 1

Rec. Sec Cor
Plastic Cap #2884
52+81.11

Sec line

OH

Scale: 1" = 100'

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BRO-0045(053)

115th Ave SW

KLJ

Proposed Wetland 1
Impacts & Mitigation

Stark County, N.D.

DRWN. BY	CHK'D. BY	PROJECT NO.
JTZ	AK	3312123

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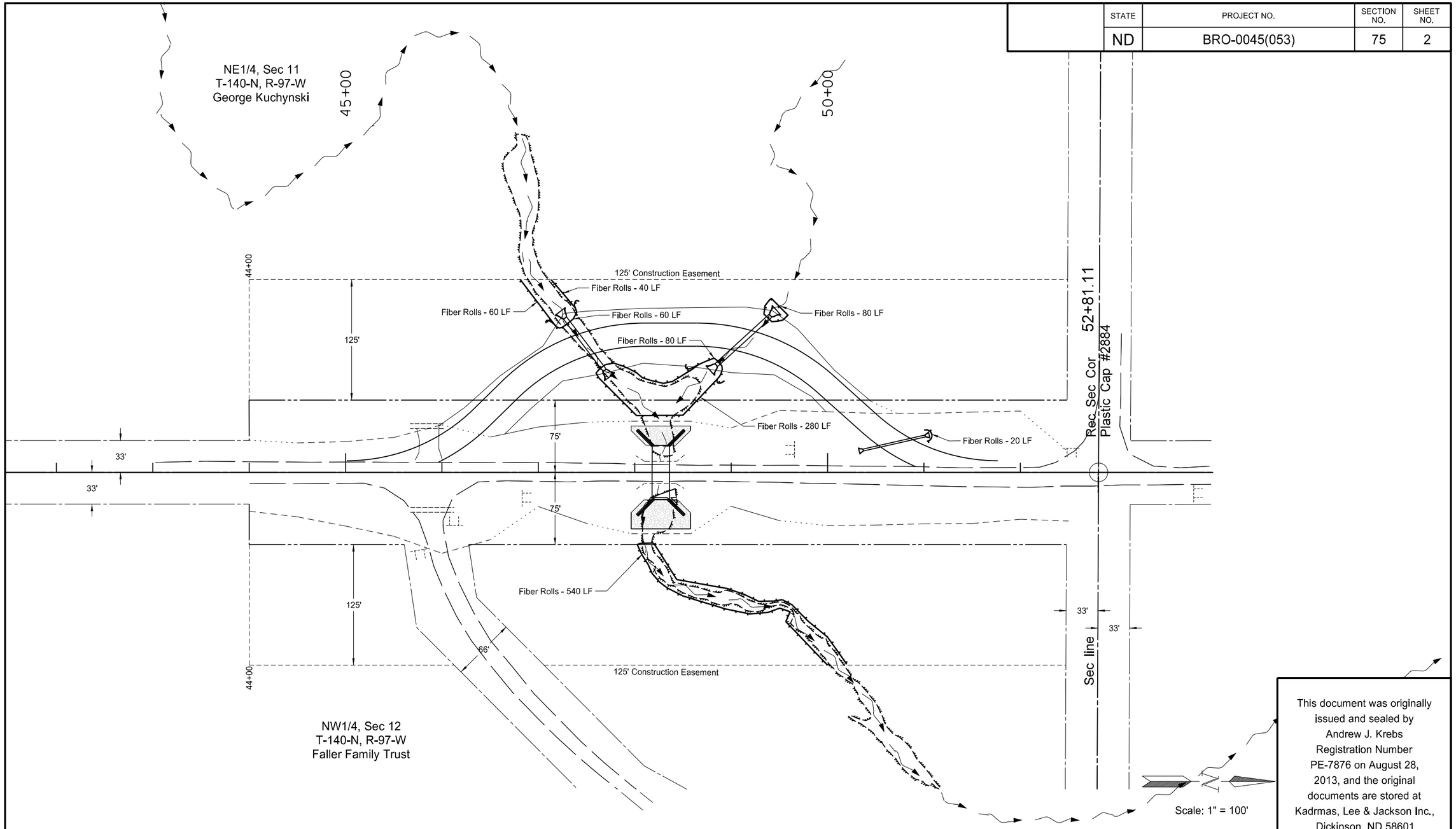
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0045(053)	75	2



FIBER ROLLS 12IN

Sta 46+81 to 47+16 Lt	60 LF
Sta 47+08 to 47+42 Lt	60 LF
Sta 47+13 to 47+38 Lt	40 LF
Sta 47+59 to 48+86 Lt	280 LF
Sta 48+03 to 50+20 Rt	540 LF
Sta 48+53 to 48+93 Lt	80 LF
Sta 49+34 to 49+59 Lt	80 LF
Sta 51+00 to 51+08 Lt	20 LF

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BRO-0045(053)

115th Ave SW

KLJ

Temporary Erosion Control

Stark County, N.D.

DRWN. BY	CHK'D. BY	PROJECT NO.
JTZ	AK	3312123

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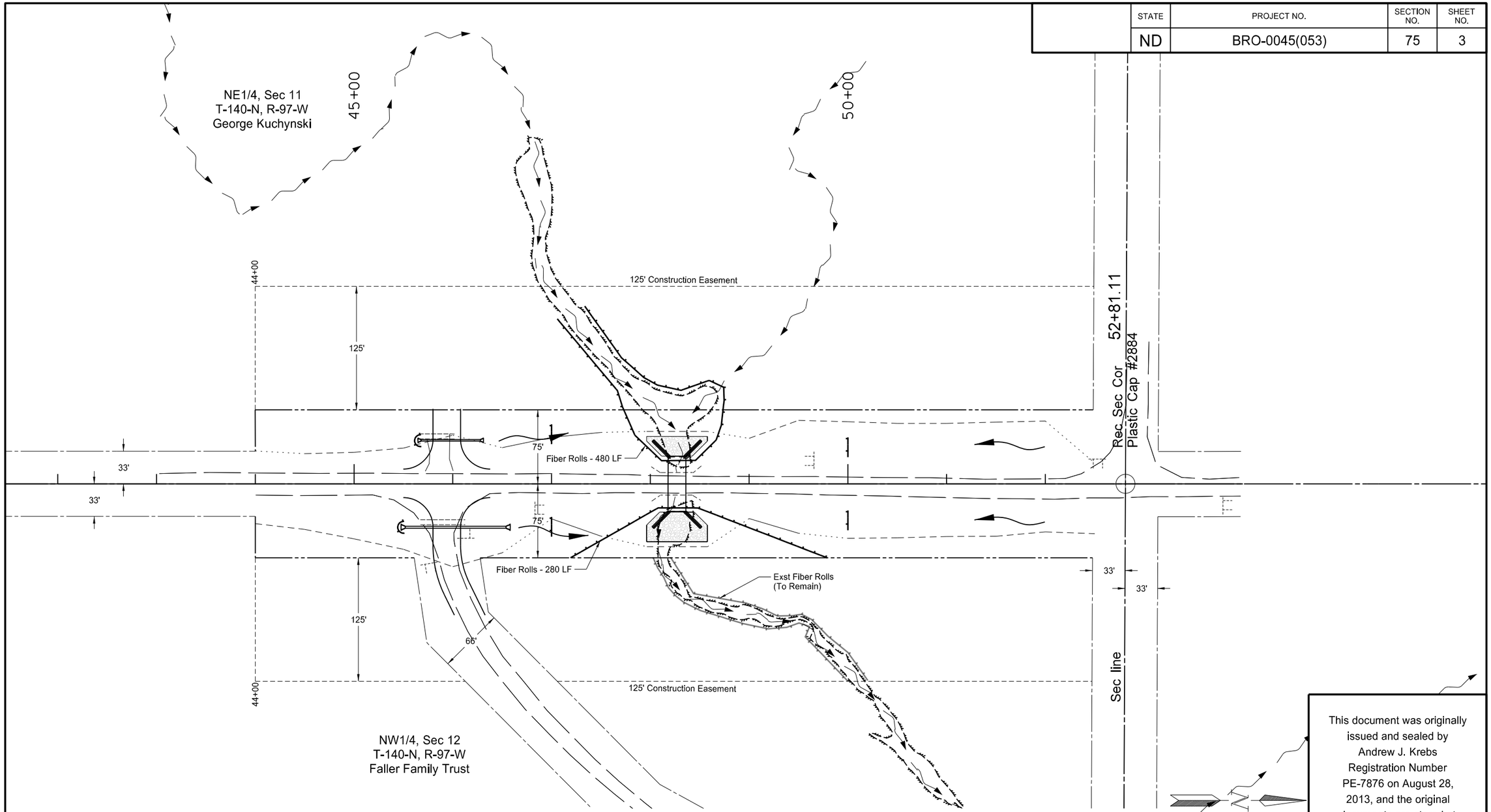
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRO-0045(053)	75	3



Scale: 1" = 100'

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FIBER ROLLS 12IN

Sta 45+52 Rt	20 LF
Sta 45+68 Lt	20 LF
Sta 47+00 Rt & Lt	40 LF
Sta 47+19 to 49+79 Rt	280 LF
Sta 47+06 to 48+74 Lt	480 LF
Sta 50+00 Rt & Lt	40 LF

BRO-0045(053)

115th Ave SW

KLJ

Permanent Erosion Control

Stark County, N.D.

DRWN. BY	CHK'D. BY	PROJECT NO.
JTZ	AK	3312123

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ALIGNMENT SURVEY COORDINATE DATA - 115TH AVE SW

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0045(053)	81	1

HORIZONTAL ALIGNMENT - 115TH AVE SW

POINT	STATION	NORTHING	EASTING	LATITUDE	LONGITUDE
Sec Cor	00+00.00	44,725.88	57,926.38	46°56'54.95772" N	102°52'23.68160" W
Sec Cor	52+81.11	50,006.99	57,930.62	46°57'47.07758" N	102°52'23.58968" W

HORIZONTAL ALIGNMENT - TEMPORARY BYPASS

POINT	STATION	NORTHING	EASTING	LATITUDE	LONGITUDE
POT	1+50.00	49,175.88	57,929.95	46°57'38.87527" N	102°52'23.60414" W
PC	2+01.34	49,227.22	57,929.99	46°57'39.38198" N	102°52'23.60325" W
PI	2+83.11	49,308.99	57,930.06	46°57'40.18895" N	102°52'23.60183" W
PT	3+56.58	49,367.38	57,872.82	46°57'40.76547" N	102°52'24.42656" W
PC	3+96.97	49,396.22	57,844.55	46°57'41.05020" N	102°52'24.83389" W
PI	4+78.73	49,454.61	57,787.32	46°57'41.62672" N	102°52'25.65863" W
PT	5+52.21	49,536.38	57,787.38	46°57'42.43369" N	102°52'25.65722" W
PC	6+05.89	49,590.07	57,787.43	46°57'42.96353" N	102°52'25.65629" W
PI	6+82.39	49,666.57	57,787.49	46°57'43.71850" N	102°52'25.65497" W
PT	7+52.02	49,723.50	57,838.58	46°57'44.28016" N	102°52'24.91804" W
PC	8+13.09	49,768.94	57,879.38	46°57'44.72853" N	102°52'24.32976" W
PI	8+89.59	49,825.88	57,930.47	46°57'45.29018" N	102°52'23.59283" W
PT	9+59.22	49,902.37	57,930.54	46°57'46.04516" N	102°52'23.59150" W

SURVEY CONTROL POINTS

POINT	NORTHING	EASTING	ELEVATION	LATITUDE	LONGITUDE
CP 1	50,000.00	50,000.00	2,589.67	46°57'47.02449" N	102°54'17.91448" W
CP 2	49,319.73	57,878.06	2,483.16	46°57'40.29514" N	102°52'24.35140" W

NOTES: All coordinates and measurements on this document derived from US Survey Foot definition.
NAD 83(96)
Derived from OPUS Solution

☐ Assumed Coordinates

☒ All coordinates on this sheet are Local.

This document was originally issued and sealed by Margaret E. Washko Registration Number LS-8346 on August 27, 2013, and the original documents are stored at Kadrmas, Lee & Jackson Inc., Dickinson, ND 58601

BRO-0045(053)

115th Ave SW

KLJ

Alignment Survey Coordinate Data

Stark County, N.D.

DRWN. BY	CHK'D. BY	PROJECT NO.
AK	MEW	3312123

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRO-0045(053)	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
D3-36	36"x6"	STREET NAME SIGN (Sign and installation only)		6	
G20-1a-60	60"x24"	ROAD WORK NEXT __ MILES		34	
G20-1b-60	60"x24"	WORK IN PROGRESS/ NO WORK IN PROGRESS (Sign and installation only)		26	
G20-2a-48	**48"x24"**	**END ROAD WORK**	**2**	**19**	**38**
G20-4-36	36"x18"	PILOT CAR FOLLOW ME		18	
G20-10-108	108"x48"	CONTRACTOR SIGN		64	
G20-50a-72	**72"x36"**	**ROAD WORK NEXT __ MILES RT & LT ARROWS**	**1**	**37**	**37**
G20-52a-72	**72"x24"**	**ROAD WORK NEXT __ MILES RT or LT ARROW**	**1**	**30**	**30**
G20-55-96	**96"x48"**	**SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT**	**2**	**59**	**118**
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)		10	
M1-4-24	24"x24"	U.S. ROUTE MARKER (Post and installation only)		10	
M1-5-24	24"x24"	STATE ROUTE MARKER (Post and installation only)		10	
M3-1-24	24"x12"	NORTH (Mounted on route marker post)		7	
M3-2-24	24"x12"	EAST (Mounted on route marker post)		7	
M3-3-24	24"x12"	SOUTH (Mounted on route marker post)		7	
M3-4-24	24"x12"	WEST (Mounted on route marker post)		7	
M4-8-24	24"x12"	DETOUR (Mounted on route marker post)		7	
M4-9-30	30"x24"	DETOUR ARROW RIGHT or LEFT/AHD AND RT or LT		15	
M4-10-48	48"x18"	DETOUR ARROW RIGHT or LEFT		23	
M5-1-21	21"x15"	ARROW AHD AND RT or LT(Mounted on route marker post)		7	
M5-2-21	21"x15"	ARROW AHD UP & RT or LT (Mounted on route marker post)		7	
M6-1-21	21"x15"	ARROW RT or LT (Mounted on route marker post)		7	
M6-2-21	21"x15"	ARROW UP & RT or LT (Mounted on route marker post)		7	
M6-3-21	21"x15"	ARROW AHD (Mounted on route marker post)		7	
R1-1-48	**48"x48"**	**STOP**	**1**	**32**	**32**
R1-1a-18	18"x18"	STOP and SLOW PADDLE Back to Back		5	
R1-2-60	60"x60"	YIELD		29	
R2-1-48	**48"x60"**	**SPEED LIMIT __**	**2**	**39**	**78**
R2-1a-24	**24"x18"**	**MINIMUM FEE $80 (Mounted on Speed Limit post)**	**2**	**10**	**20**
R3-7-48	48"x48"	LEFT or RIGHT LANE MUST TURN LEFT or RIGHT		35	
R4-1-48	48"x60"	DO NOT PASS		39	
R4-7-48	48"x60"	KEEP RIGHT SYMBOL		39	
R5-1-48	48"x48"	DO NOT ENTER		35	
R6-1-36	36"x12"	ONE WAY RIGHT or LEFT		13	
R7-1-12	12"x18"	NO PARKING		11	
R10-6-24	24"x36"	STOP HERE ON RED		16	
R11-2-48	**48"x30"**	**ROAD CLOSED**	**2**	**28**	**56**
R11-2a-48	48"x30"	STREET CLOSED		28	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY		31	
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY		31	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC		31	
W1-3-48	48"x48"	RIGHT or LEFT SHARP REVERSE CURVE ARROW		35	
W1-4-48	**48"x48"**	**RIGHT or LEFT REVERSE CURVE ARROW**	**4**	**35**	**140**
W1-4b-48	48"x48"	DOUBLE RIGHT or LEFT REVERSE CURVE ARROW		35	
W1-6-48	**48"x24"**	**LARGE ARROW**	**8**	**26**	**208**
W3-1-48	48"x48"	STOP AHEAD SYMBOL		35	
W3-3-48	48"x48"	SIGNAL AHEAD SYMBOL		35	
W3-4-48	48"x48"	BE PREPARED TO STOP		35	
W3-5-48	**48"x48"**	**SPEED REDUCTION AHEAD**	**2**	**35**	**70**
W4-2-48	48"x48"	RIGHT or LEFT LANE TRANSITION SYMBOL		35	
W5-1-48	48"x48"	ROAD NARROWS		35	
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE		35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW		35	
W6-3-48	48"x48"	TWO WAY TRAFFIC SYMBOL		35	
W8-1-48	48"x48"	BUMP		35	
W8-3-48	48"x48"	PAVEMENT ENDS		35	
W8-7-48	48"x48"	LOOSE GRAVEL		35	
W8-9a-48	48"x48"	SHOULDER DROP-OFF		35	
W8-11-48	48"x48"	UNEVEN LANES		35	
W8-12-48	48"x48"	NO CENTER STRIPE		35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY		35	
W8-54-48	**48"x48"**	**TRUCKS ENTERING AHEAD or __ FT.**	**2**	**35**	**70**
W8-55-48	48"x48"	TRUCKS CROSSING AHEAD or __ FT.		35	
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY		35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL		35	
W12-2-48	48"x48"	LOW CLEARANCE SYMBOL		35	
W13-1-24	**24"x24"**	**__ MPH ADVISORY SPEED PLATE (Mounted on warning sign post)**	**4**	**11**	**44**
W13-4-48	48"x60"	RAMP ARROW		39	
W14-3-48	48"x36"	NO PASSING ZONE		23	
W20-1-48	**48"x48"**	**ROAD WORK AHEAD or _FT or _ MILE**	**2**	**35**	**70**
W20-2-48	48"x48"	DETOUR AHEAD or __ FT		35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or __ FT.		35	
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or __ FT.		35	
W20-5-48	48"x48"	RIGHT or LEFT LANE CLOSED AHEAD or __ FT.		35	
W20-7a-48	48"x48"	FLAGGING SYMBOL		35	
W20-7k-24	24"x18"	__ FEET (Mounted of warning sign post)		10	
W20-8-48	48"x48"	STREET CLOSED		35	
W20-51-48	48"x48"	EQUIPMENT WORKING		35	
W20-52-54	54"x12"	NEXT __ MILES (Mounted on warning sign post)		12	
W21-1a-48	48"x48"	WORKERS SYMBOL		35	
W21-2-48	48"x48"	FRESH OIL		35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT		35	
W21-5-48	48"x48"	SHOULDER WORK		35	
W21-5a-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED		35	
W21-5b-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT.		35	
W21-6a-48	48"x48"	SURVEY CREW AHEAD		35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT.		35	
W21-51-48	**48"x48"**	**MATERIAL ON ROADWAY**	**2**	**35**	**70**
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK		35	
	24"x24"	TAKE TURNS (6" D letters) (Mounted on stop sign post)		11	

SPECIAL SIGNS

SPEC & CODE

704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS**	**1081**

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	FLAGGING	MHR	
704-1041	ATTENUATION DEVICE-TYPE B-55	EACH	
704-1043	ATTENUATION DEVICE-TYPE B-65	EACH	
704-1044	ATTENUATION DEVICE-TYPE B-70	EACH	
704-1050	TYPE I BARRICADES	EACH	
704-1051	TYPE II BARRICADES	EACH	
704-1052	**TYPE III BARRICADES**	**EACH**	**6**
704-1060	**DELINEATOR DRUMS**	**EACH**	**10**
704-1065	TRAFFIC CONES	EACH	
704-1067	TUBULAR MARKERS	EACH	
704-1070	DELINEATOR	EACH	
704-1072	FLEXIBLE DELINEATORS	EACH	
704-1081	**VERTICAL PANELS - BACK TO BACK**	**EACH**	**32**
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH	
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH	
704-1087	SEQUENCING ARROW PANEL - TYPE C	EACH	
704-1088	SEQUENCING ARROW PANEL - TYPE C - CROSSOVER	EACH	
704-1095	TYPE B FLASHERS	EACH	
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF	
704-3510	PRECAST CONCRETE MED BARRIER - STATE FURNISHED	EACH	
762-0200	RAISED PAVEMENT MARKERS	EACH	
762-0420	SHORT TERM 4IN LINE - TYPE R	LF	
762-0430	SHORT TERM 4IN LINE - TYPE NR	LF	
762-1500	OBLITERATION OF PVMT MK	SF	
772-2110	FLASHING BEACON - POST MOUNTED	EACH	

NOTE:
If additional signs are required, units will be calculated using the formula from Section III-19.06 of the Design Manual.
http://www.dot.nd.gov/

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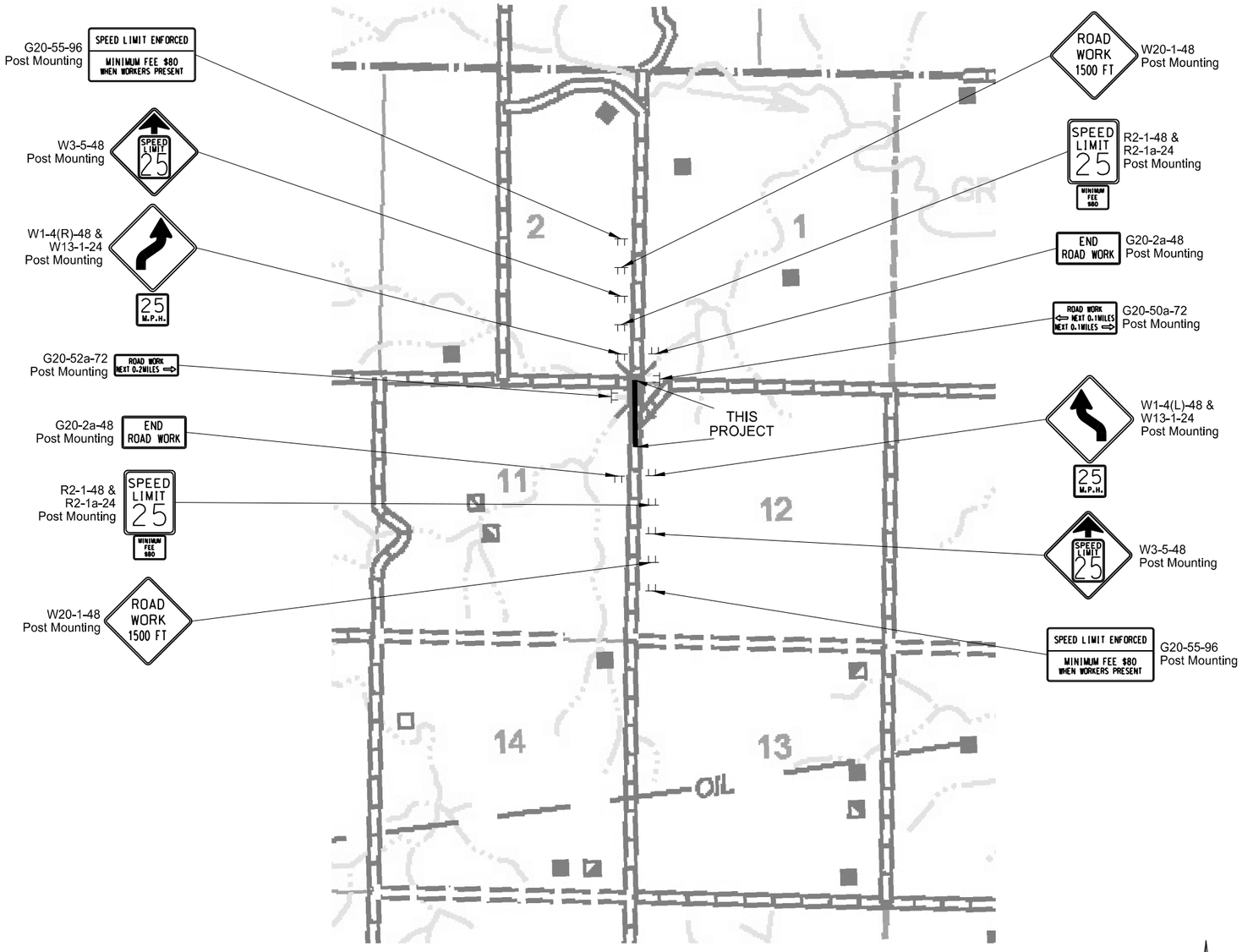
Traffic Control Devices List

Work Zone Traffic Control

Stark County, N.D.

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRO-0045(053)	100	2



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BRO-0045(053)

115th Ave SW

KLJ

Work Zone Traffic Control

Stark County, N.D.

DRWN. BY	CHK'D. BY	PROJECT NO.
JTZ	AK	3312123

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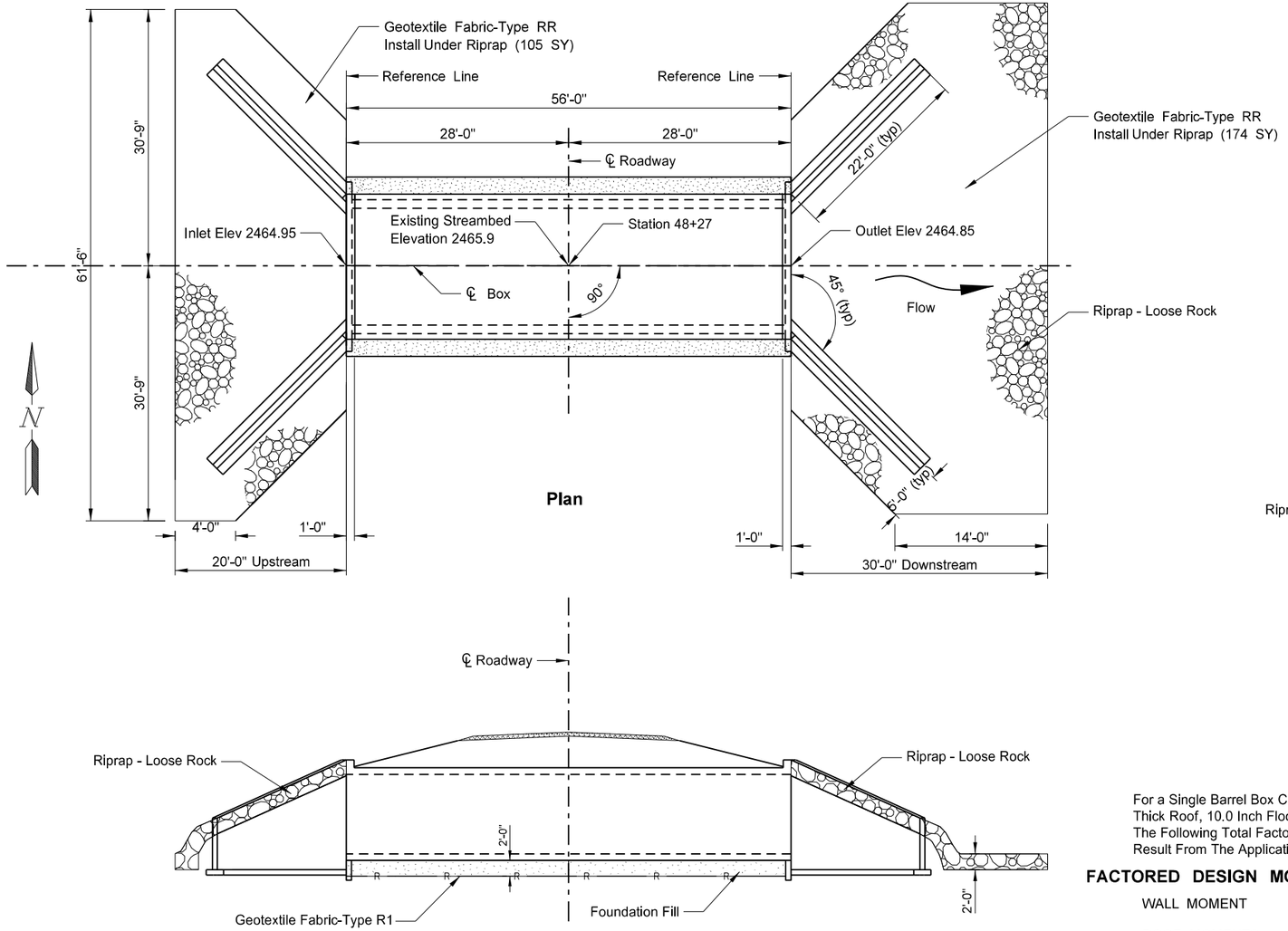
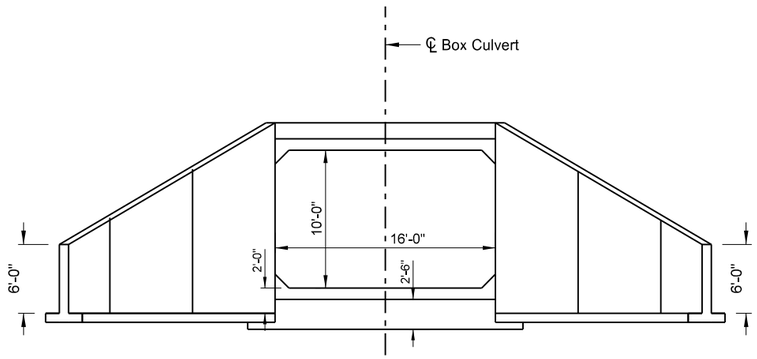
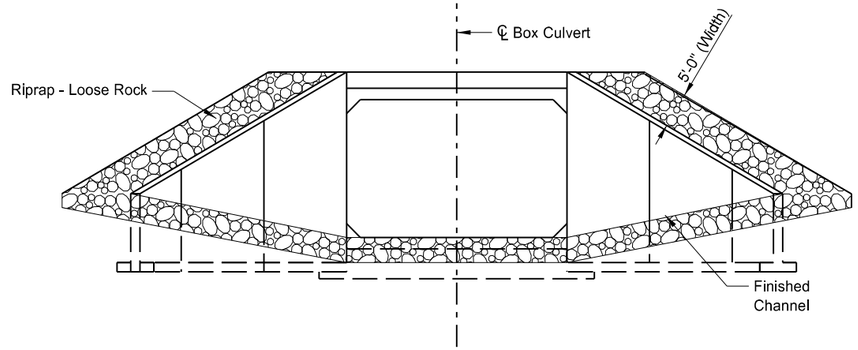
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRO-0045(053)	170	1





End View
(Showing Dimensions)



End View
(Showing Finished Section)

For a Single Barrel Box Culvert With 10.0 Inch Thick Roof, 10.0 Inch Floor And 8.0 Inch Walls, The Following Total Factored Moments Would Result From The Application of the Required Loads

FACTORED DESIGN MOMENTS (SINGLE)

WALL MOMENT	0	ft.-lbs.
ROOF MOMENTS		
CORNER	-21,041	ft.-lbs.
BOTTOM	47,992	ft.-lbs.
FLOOR MOMENTS		
CORNER	-20,275	ft.-lbs.
TOP	38,687	ft.-lbs.

HYDRAULIC DATA

DRAINAGE AREA	10.9	sq. mi.
STREAM GRADIENT	0.006	ft/ft
DESIGN FREQUENCY	15	year
DESIGN DISCHARGE	620	cfs
DESIGN HEADWATER STAGE	2472.0	ft
DESIGN TAILWATER STAGE	2469.9	ft
VELOCITY THROUGH CULVERT	9.55	fps
100-YEAR FREQUENCY DISCHARGE	1312	cfs
100-YEAR FREQUENCY HEADWATER	2475.9	ft
OVERTOPPING STAGE	2478.8	ft
OVERTOPPING DISCHARGE	1906	cfs

Note:
The invert elevations shown represent an elevation 1 foot below the existing streambed.

STRUCTURAL QUANTITIES ONLY

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
202	0105	REMOVAL OF STRUCTURE	L SUM	1
210	0109	CLASS 2 EXCAVATION-BOX CULVERT	EA	1
210	0201	FOUNDATION PREPARATION	EA	1
210	0210	FOUNDATION FILL	CY	114
606	1610	16FT X 10FT PRECAST RCB CULVERT	LF	56
606	5610	16FT X 10FT PRECAST RCB END SECTION	EA	2
708	1020	RIPRAP-LOOSE ROCK	CY	186
709	0600	GEOTEXTILE FABRIC-TYPE RR	SY	279
709	0701	GEOTEXTILE FABRIC-TYPE R1	SY	302

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BRO-0045(053)

115th Ave SW

KLJ

16ft X 10ft Precast Box Culvert Layout - Sta 48+27

Stark County, N.D.

DRWN. BY	CHK'D. BY	PROJECT NO.
JTZ	SMM	3312123

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRO-0045(053)	170	2

STRUCTURAL NOTES

100 **SCOPE OF WORK:** Work at this site consists of removing the existing structure and installing a new 16' x 10' x 56' precast concrete box culvert.

202 **REMOVAL OF STRUCTURE:** The existing structure, built in 1985, is a steel stringer bridge, 33'-0" long with a clear roadway width of 22 feet. The roadway consists of aggregate surfacing with a top width of approximately 24.0 feet.

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

A. Remove and salvage steel stringers, steel piling, and timber decking components. All other bridge components shall be removed in their entirety.
B. Existing piling shall be cut-off a minimum of one foot below the proposed foundation fill limits.
C. Salvage the hazard markers.
D. Stockpile stringers, piling, decking, and salvaged markers in the county right of way. The county is responsible for hauling the materials from the site.

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

210 **FOUNDATION FILL:** Foundation fill shall be paid for according to the limits called out in the Basis of Estimate and Standard Specifications and adding 25% for shrinkage. If foundation fill is placed beyond the depth shown in the plans, the pay quantity will be determined by computation using plan dimensions and adding 25% for shrinkage. The backfill shall be placed in layers of not more than 6 inches, moistened or dried as required, and thoroughly compacted with mechanical tamping equipment.

Delete Section 210.0 B.2 and add the following:

2. Foundation Fill. Foundation fill material shall be any granular material, other than scoria or shale, with less than 35% passing the No. 200 sieve.

210 **CLASS 2 EXCAVATION-BOX CULVERT:** All excavation required to build the box culvert shall be included in the unit price bid for "CLASS 2 EXCAVATION-BOX CULVERT." Class 2 Excavation-Box Culvert shall be performed according to Section 210 of the standard specifications. All labor and materials required to place the ordinary backfill within the limits shown on Section 170, Sheet 3 shall be included in the unit price bid for "CLASS 2 EXCAVATION-BOX CULVERT."

The suitability of material from on-site excavations for use as ordinary backfill will be determined by the engineer. Embankment constructed from channel excavated material will not be measured for separate payment but will be included in the price bid for "CLASS 2 EXCAVATION-BOX CULVERT." If the channel excavated material is deemed not suitable for ordinary backfill, it shall become property of the contractor and disposed of outside of the road right-of-way, not adjacent to the construction site, and at a site approved by the engineer. All costs associated with excavation, hauling, depositing and leveling the waste material shall be included in the unit price bid for "CLASS 2 EXCAVATION-BOX CULVERT."

606 **PRECAST REINFORCED CONCRETE BOX CULVERT AND END SECTIONS:** The barrel sections shall be tied together with prestressing strands or galvanized tie-bolts. If strands are used, there shall be a minimum four ½" diameter strands. Prestressing cables shall be corrosion protected and their ends grouted. If tie-bolts are used, the four tie-bolts will be located at the third points of the outside walls.

The "16FT X 10FT PRECAST RCB END SECTION" shall consist of all apron, wingwall, cutoff wall, and parapet components required to build the single cell end sections.

Seven ¾" diameter threaded inserts and steel eye bolts (28 total) shall be installed along top and end faces of each wingwall to provide anchorage for fencing. A 3"x3"x3/8" hot dipped galvanized angle, as shown in Section 170 sheet 3 of the plans, shall also be included at each wingwall. Anchorage locations and specifications shall be shown on the shop drawings for approval by the Engineer. All costs associated with the threaded inserts, steel eye bolts, and galvanized angles shall be included in the price bid for "16FT x 10FT PRECAST RCB END SECTION."

708 **RIPRAP - LOOSE ROCK:** "RIPRAP-LOOSE ROCK" will be paid according to designated length, width, and depth as shown on the plans unless otherwise designated by the engineer in the field.

Broken concrete shall not be used as riprap. Any excavation required to place the riprap shall be included in the price bid for "RIPRAP-LOOSE ROCK."

709 **GEOTEXTILE FABRIC - TYPE R1:** Reinforcement fabric shall be placed parallel to the roadway centerline. If more than one piece of fabric is used to meet the required roadway length, then the joint must be sewn. Adjacent strips of fabric shall be overlapped 30". All fabric must be taut and pinned with a six inch (min) pin, peg, or staple every 15' along all edges and on all corners prior to placing fill on the fabric.

DESIGN LOADS:

A. HL93 Loading
B. 5' Fill Height

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BRO-0045(053)

115th Ave SW

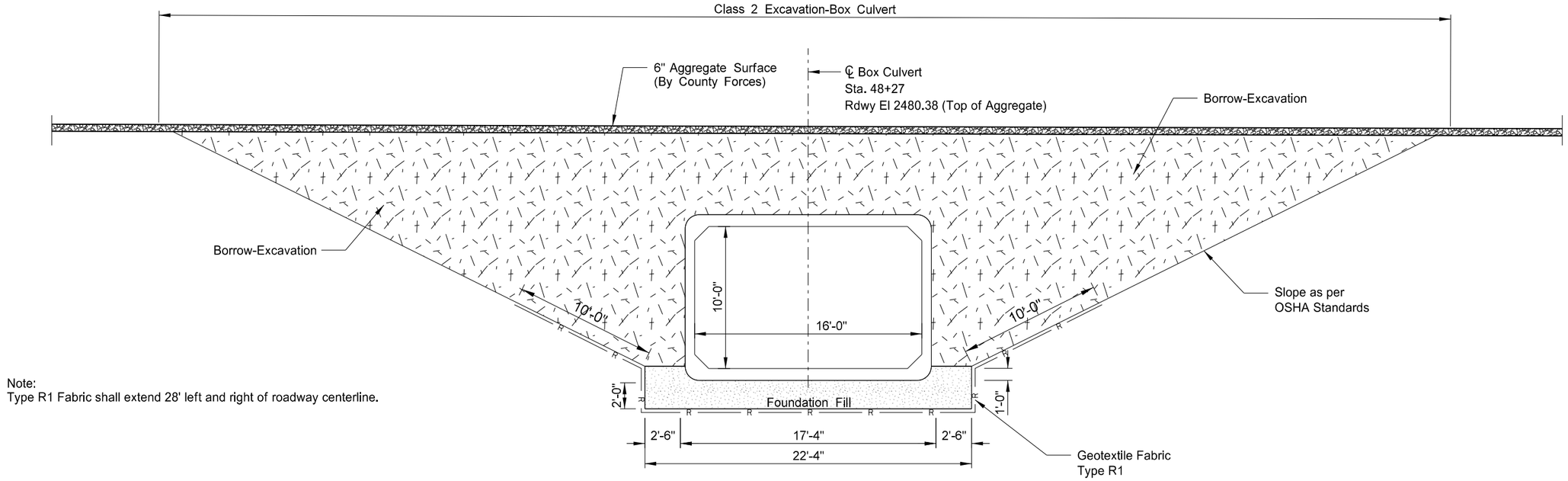
KLJ

Structural Notes

Stark County, N.D.

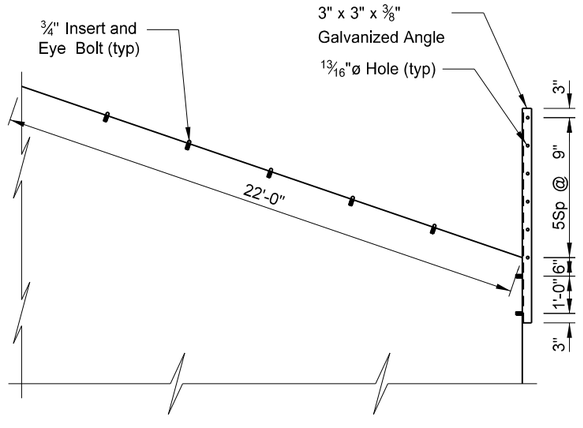
DRWN. BY	CHKD. BY	PROJECT NO.
JTZ	SMM	3312123

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRO-0045(053)	170	3



Note:
Type R1 Fabric shall extend 28' left and right of roadway centerline.

Box Culvert Excavation and Backfill



Wingwall Insert and Angle Detail
(Typical - Four Wingwalls)

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BRO-0045(053)

115th Ave SW

16ft x 10ft Backfill
Detail Sta 48+27

Stark County, N.D.

DRWN. BY	CHK'D. BY	PROJECT NO.
JTZ	SMM	3312123

NDDOT ABBREVIATIONS

D-20-1

Abn	abandoned
Abut	abutment
Ac	acres
Adj	adjusted
Aggr	aggregate
Ahd	ahead
ARV	air release valve
Align	alignment
Al	alley
Alt	alternate
Alum	aluminum
A	ampere
&	and
Appr	approach
Approx	approximate
ACP	asbestos cement pipe
Asph	asphalt
AC	asphalt cement
Assmd	assumed
@	at
Atten	attenuation
Ave	Avenue
Avg	average
ADT	average daily traffic
Az	azimuth
Bk	back
BF	back face
Bs	backsight
Balc	balcony
B Wire	barbed wire
Barr	barricade
Btry	battery
Brg	bearing
BI	beehive inlet
Beg	begin
BM	bench mark
Bkwy	bikeway
Bit	bituminous
Blk	block
Bd Ft	board feet
BH	bore hole
BS	both sides
Bot	bottom
Blvd	Boulevard
Bndry	boundary
BC	brass cap
Brkwy	breakaway
Br	bridge
Bldg	building
BLM	Bureau of Land Management
BV	butterfly valve
Byp	bypass
C Gdrl	cable guardrail
Calc	calculate
Cd	candela
CIP	cast iron pipe
CB	catch basin
CRS	cationic rapid setting
C Gd	cattle guard
C To C	center to center
Cl or ℄	centerline
Cm	centimeter
Ch	chain
Chnlk	chain-link
Ch Blk	channel block
Ch Ch	channel change
Chk	check
Chsld	chiseled
Cir	circle
Cl	class
Cl	clay
Cl F	clay fill
Cl Hvy	clay heavy
Cl Lm	clay loam
Clnt	clean-out
Clr	clear
Cl&gr	clearing & grubbing
Co S	coal slack
Comb.	combination
Coml	commercial
Compr	compression
CADD	computer aided drafting & design
Conc	concrete
Cond	conductor
Const	construction
Cont	continuous
CSB	continuous split barrel sample
Contr	contraction
Contr	contractor
CP	control point
Coord	coordinate
Cor	corner
Corr	corrected
CAES	corrugated aluminum end section
CAP	corrugated aluminum pipe
CMES	corrugated metal end section
CMP	corrugated metal pipe
CPVCP	corrugated poly-vinyl chloride pipe
CSES	corrugated steel end section
CSP	corrugated steel pipe
C	coulomb
Co	County
Crse	course
C Gr	course gravel
CS	course sand
Ct	Court
Xarm	cross arm
Xbuck	cross buck
Xsec	cross sections
Xing	crossing
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
Dlnt	delineate
Dlntr	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
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
FHWA	Federal Highway Administration
FP	feed point
Ft	feet/foot
Fn	fence
Fn P	fence post
FO	fiber optic
FB	field book
FD	field drive
F	fill
FAA	fine aggregate angularity
FS	fine sand
FH	fire hydrant
Fl	flange
Flrd	flared
FES	flared end section
F Bcn	flashing beacon
FA	flight auger sample
FL	flow line

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
06-15-10	
REVISIONS	
DATE	CHANGE
04-20-11	Added Items

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NDDOT ABBREVIATIONS

D-20-2

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

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

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NDDOT ABBREVIATIONS

D-20-3

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

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06-15-10	
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04-20-11	Added Items

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NDDOT UTILITY COMPANY ABBREVIATIONS

D-20-10

702COM	702 Communications
ACCENT	Accent Communications
AGASSIZ WU	Agassiz Water Users Incorporated
All PI	Alliance Pipeline
ALL SEAS WU	All Seasons Water Users Association
AMOCO PI	Amoco Pipeline Company
AMRDA HESS	Amerada Hess Corporation
AT&T	AT&T Corporation
B PAW	Bear Paw Energy Incorporated
BASIN ELEC	Basin Electric Cooperative Incorporated
BEK TEL	Bek Communications Cooperative
BELLE PL	Belle Fourche Pipeline Company
BNSF	Burlington Northern Santa Fe Railway
BOEING	Boeing
BRNS RWD	Barnes Rural Water District
BURK-DIV ELEC	Burke-Divide Electric Cooperative
BURL WU	Burleigh Water Users
Cable One	Cable One
CABLE SERV	Cable Services
CAP ELEC	Capital Electric Cooperative 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 PWR ELEC	Central Power Electric Cooperative
CONS TEL	Consolidated Telephone
CONT RES	Continental Resource Inc
CPR	Canadian Pacific Railway
D O E	Department Of Energy
DAK CARR	Dakota Carrier Network
DAK CENT TEL	Dakota Central Telephone
DAK RWD	Dakota Rural Water District
DGC	Dakota Gasification Company
DICKEY R NET	Dickey Rural Networks
DICKEY RWU	Dickey Rural Water Users Association
DICKEY TEL	Dickey Telephone
DNRR	Dakota Northern Railroad
DOME PL	Dome Pipeline Company
DVELEC	Dakota Valley Electric Cooperative
DVMW	Dakota, Missouri Valley & Western
ENBRDG	Enbridge Pipelines Incorporated
FALK MNG	Falkirk Mining Company
G FKS-TRL WD	Grand Forks-traill Water District
GETTY TRD & TRAN	Getty Trading & Transportation
GLDN W ELEC	Golden West Electric Cooperative
GRGS CO TEL	Griggs County Telephone
GT PLNS NAT GAS	Great Plains Natural Gas Company
HALS TEL	Halstad Telephone Company
INT-COMM TEL	Inter-Community Telephone Company
KANEB PL	Kaneb Pipeline Company
KEM ELEC	Kem Electric Cooperative Incorporated
KOCH GATH SYS	Koch Gathering Systems Incorporated
LKHD PL	Lakehead Pipeline Company
LNGDN RWU	Langdon Rural Water Users Incorporated
LWR YELL R ELEC	Lower Yellowstone Rural Electric
MCKNZ CON	McKenzie Consolidated Telcom
MCKNZ WRD	McKenzie County Water Resource District
MCKNZ ELEC	McKenzie Electric Cooperative
MCLEOD	Mcleod USA
MCLN ELEC	Mclean Electric Cooperative
MCLN-SHRDN R WAT	Mclean-Sheridan Rural Water
MDU	Montana-dakota Utilities
MID-CONT CABLE	Mid-Continent Cable
MIDSTATE TEL	Midstate Telephone Company
MINOT CABLE	Minot Cable Television
MINOT TEL	Minot Telephone Company
MISS W W S	Missouri West Water System
MNKOTA PWR	Minnkota Power
MOR-GRAN-SOU ELEC	Mor-gran-sou Electric Cooperative
MOUNT-WILLI ELEC	Mountrail-williams Electric Cooperative
MUNICIPAL	City Of '.....'
MUNICIPAL	City Water And Sewer
N CENT ELEC	North Central Electric Cooperative
N VALL W DIST	North Valley Water District
ND PKS & REC	North Dakota Parks And Recreation
ND TEL	North Dakota Telephone Company
NDDOT	North Dakota Department of Transportation
NDSU SOIL SCI DEPT	Ndsu Soil Science Department
NEMONT TEL	Nemont Telephone
NODAK R ELEC	Nodak Rural Electric Cooperative
NOON FRMS TEL	Noonan Farmers Telephone Company
NPR	Northern Plains Railroad
NSP	Northern States Power
NTH PRAIR RW	Northern Prairie Rural Water Association
NTHN BRDR PL	Northern Border Pipeline
NTHN PLNS ELEC	Northern Plains Electric Cooperative Incorporated
NTHWSTRN REF	Northwestern Refinery Company
NW COMM	Northwest Communication Cooperation
OTTR TL PWR	Otter Tail Power Company
P L E M	Prairielands Energy Marketing
POLAR COM	Polar Communications
QWEST	Qwest Communications
R&T W SUPPLY	R & T Water Supply Association
RAMSEY R SEW	Ramsey Rural Sewer Association
RAMSEY RW	Ramsey Rural Water Association
RAMSEY UTIL	Ramsey County Rural Utilities
RED RIV TEL	Red River Rural Telephone
RESVTN TEL	Reservation Telephone
ROBRTS TEL	Roberts Company Telephone
R-RIDER ELEC	Roughrider Electric Coop
RRVW	Red River Valley & Western Railroad
RSR ELEC	R.S.R. Electric Cooperative
S E W U	South East Water Users Incorporated
SCOTT CABLE	Scott Cable Television Dickinson
SHERDN ELEC	Sheridan Electric Cooperative
SHEYN VLY ELEC	Sheyenne Valley Electric Cooperative
SKYTECH	Skyland Technologies Incorporated
SLOPE ELEC	Slope Electric Cooperative
SLOPE ELEC	Slope Electric Cooperative Incorporated
SOURIS RIV TELCOM	Souris River Telecommunications
ST WAT COMM	State Water Commission
STATE LN WATER	State Line Water Cooperative
STUT RWU	Stutsman Rural Water Users
T M C	Turtle Mountain Communications
TCI	TCI of North Dakota
TRI-CNTY WU	Tri-County Water Users Incorporated
TRL CO RWU	Traill County Rural Water Users
UNTD TEL	United Telephone
UPPR SOUR WUA	Upper Souris Water Users Association
US SPRINT	U.S. Sprint
USAF MSL CABLE	U.S.A.F. Missile Cable
USW COMM	U.S. West Communications
VRNDRY ELEC	Verendrye Electric Cooperative
W RIV TEL	West River Telephone Incorporated
WEB	W. E. B. Water Development Association
WILLI RWA	Williams Rural Water Association
WILSTN BAS PL	Williston Basin Interstate Pipeline Company
WLSH RWD	Walsh Water Rural Water District
WOLVRTN TEL	Wolverton Telephone
XLENER	Xcel Energy
YSVR	Yellowstone Valley Railroad

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

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Line Styles

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

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Line Styles

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

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Symbols

D-20-30

North Arrow (Half Scale)

Truck Mounted Attenuator

Type I Barricade

Type II Barricade

Type III Barricade

Catch Basin

Cairn or Stone Circle

Video Detection Camera

Storm Drain Cap or Stub

Corrugated Metal End Section 18 Inch

Corrugated Metal End Section 24 Inch

Corrugated Metal End Section 30 Inch

Corrugated Metal End Section 36 Inch

Corrugated Metal End Section 42 Inch

Corrugated Metal End Section 48 Inch

Concrete Foundation

Ground Connection Conductor

Neutral Connection Conductor

Phase 1 Connection Conductor

Phase 2 Connection Conductor

Traffic Cone

Signal Controller

Pad Mounted Signal Controller

Alignment Data Point

Emergency Vehicle Detector

Attenuation Device

Diamond Grade Delineator Type A

Diamond Grade Delineator Type B

Diamond Grade Delineator Type C

Diamond Grade Delineator Type D

Diamond Grade Delineator Type E

Flexible Delineator

Flexible Delineator Type A

Flexible Delineator Type B

Flexible Delineator Type C

Flexible Delineator Type D

Flexible Delineator Type E

Delineator Type A

Delineator Type A Reset

Delineator Type B

Delineator Type B Reset

Delineator Type C

Delineator Type D

Delineator Type E

Delineator Drums

Spot Elevation

Existing Access Control Arrow

Existing Artifact

Existing Flashing Beacon

Existing Benchmark

Existing Railroad Battery Box

Existing Bush or Shrub

Existing Gas Cap or Stub

Existing Sanitary Cap or Stub

Existing Storm Drain Cap or Stub

Existing Water Cap or Stub

Existing Sanitary Cleanout

Existing Concrete Foundation

Existing Traffic Signal Controller

Existing Pad Mounted Signal Controller

Existing Sixteenth Section Corner

Existing Quarter Section Corner

Existing Section Corner

Existing Railroad Crossbuck

Existing Satellite Dish

Existing Fuel Dispensers

Existing Flexible Delineator Type A

Existing Flexible Delineator Type B

Existing Flexible Delineator Type C

Existing Flexible Delineator Type D

Existing Flexible Delineator Type E

Existing Delineator Type A

Existing Delineator Type B

Existing Delineator Type C

Existing Delineator Type D

Existing Delineator Type E

Existing EFB Misc

Existing Flashing Beacon

Existing Pipe Mounted Flasher

Existing Pad Mounted Feed Point

Existing Pipe Mounted Feed Point with Pad

Existing Pole Mounted Feed Point

Existing Railroad Frog

Existing Snow Gate 18

Existing Snow Gate 28

Existing Snow Gate 40

Existing Headwall

Existing Pedestrian Head with Number

Existing Signal Head

Existing Sprinkler Head

Existing Fire Hydrant

Existing Catch Basin Drop Inlet

Existing Curb Inlet

Existing Manhole Inlet

Existing Junction Box

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Symbols

D-20-31

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

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Symbols

D-20-32

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

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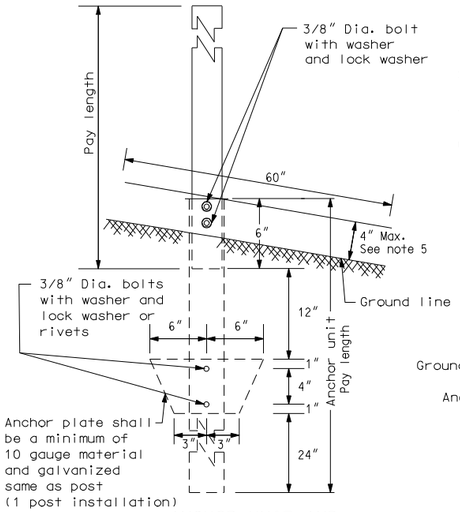
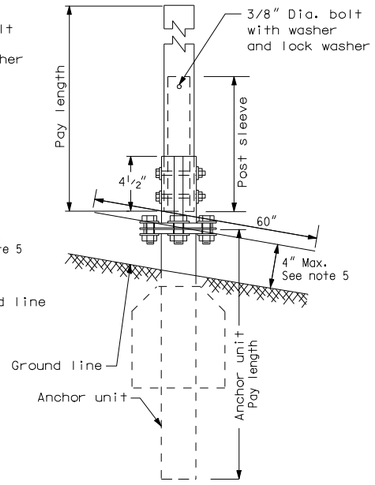
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

PERFORATED TUBE

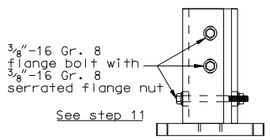
D-704-7

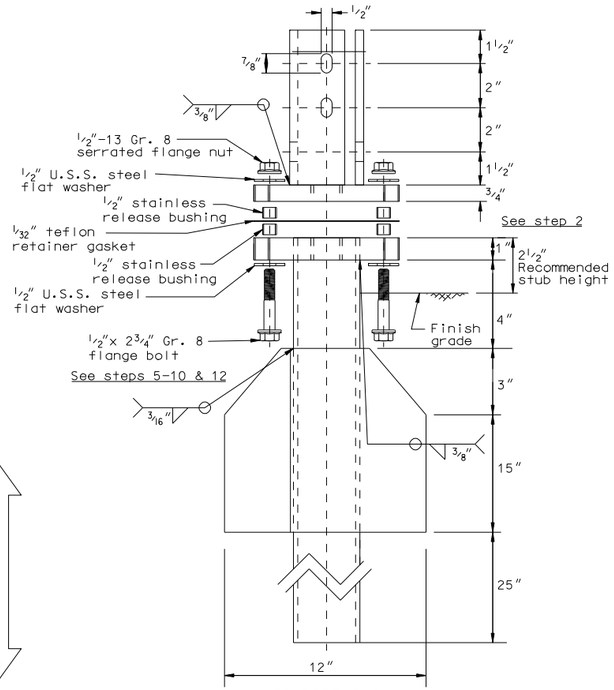


ANCHOR UNIT AND POST ASSEMBLY

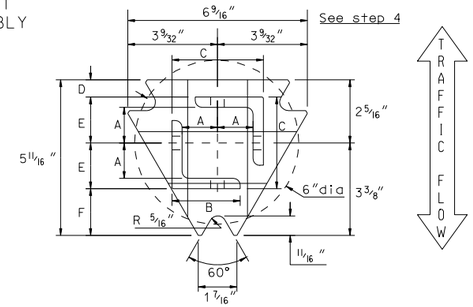


SLIP BASE ANCHOR UNIT AND POST SLEEVE ASSEMBLY





MULTI-DIRECTIONAL SLIP BASE ASSEMBLY

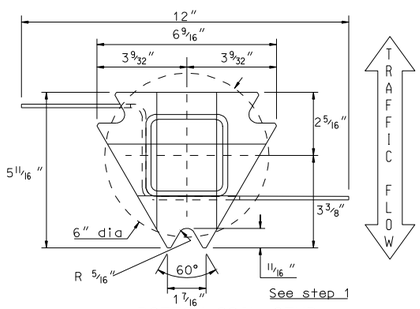


TOP POST RECEIVER

Materials: Plate - ASTM A572 grade 50
Angle receiver - $2\frac{1}{2}$"x $2\frac{1}{2}$"x $\frac{3}{8}$" ASTM A36 structural angle

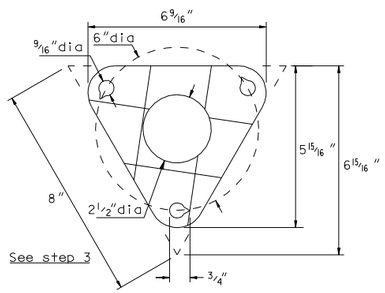
TOP POST RECEIVER DATA TABLE						
Square Post Sizes	A	B	C	D	E	F
2 3/16" x 10 Ga. Square Post	1 9/64"	2 1/2"	3 1/32"	25/32"	1 33/64"	1 7/8"
2 1/2" x 10 Ga. Square Post	1 9/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"

$2\frac{3}{16}$" x 10 gauge may be inserted into $2\frac{1}{2}$" x 10 gauge for additional wind load.



BOTTOM SOIL STUB

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



BOLT RETAINER FOR BASE CONNECTION

Materials: 1/32" reprocessed Teflon

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

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

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

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

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

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

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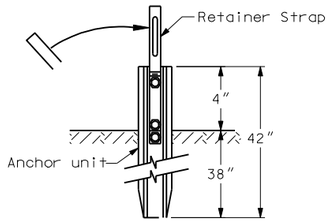
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

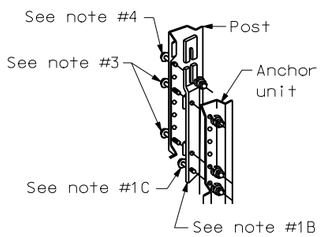
FLANGED CHANNEL



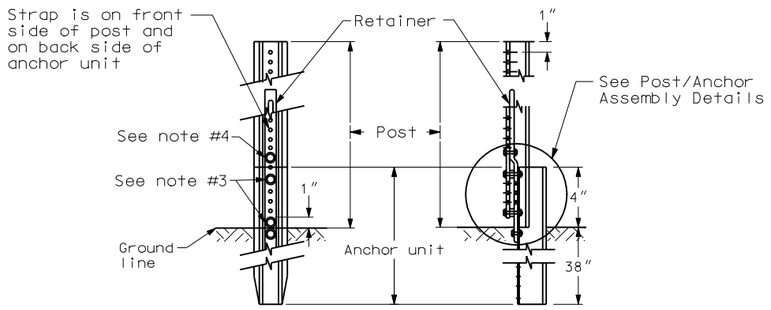
Anchor Unit &
Strap Assembly Detail

STEPS OF INSTALLATION

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

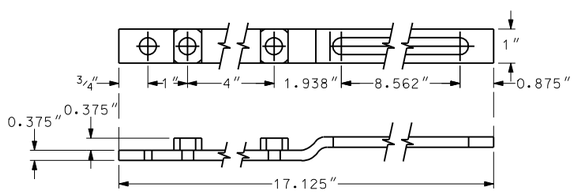


Post/Anchor
Assembly Details



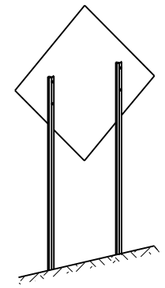
Front View Side View

Sign Post Assembly Detail

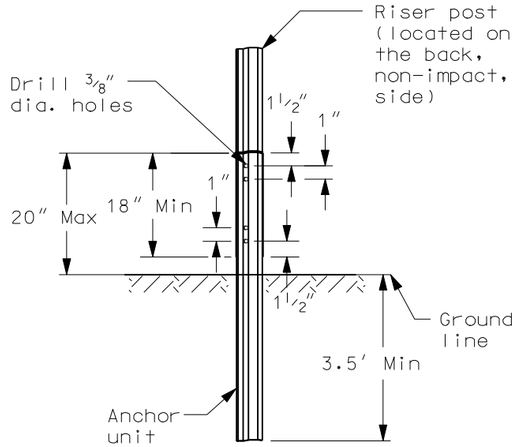


Retainer/Spacer Strap Detail

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



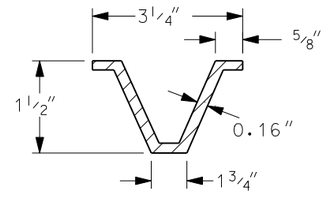
Typical
Installation



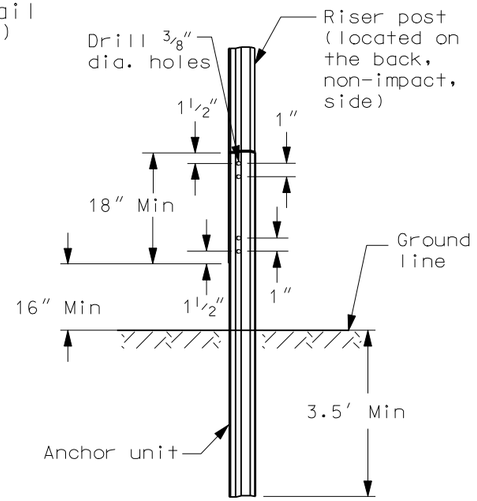
U-Channel Splice
Option 1

3 LB/FT U POSTS

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



U-Post Detail
(3 lb/ft)



U-Channel Splice
Option 2

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

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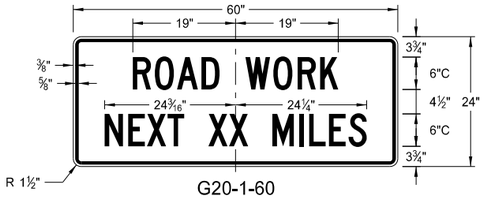
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



G20-1-60
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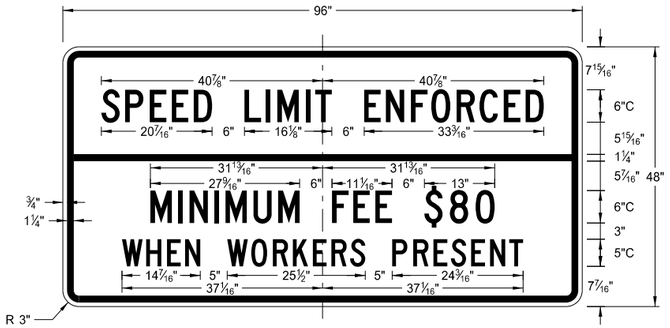
Background: orange

G20-4b-36
Legend: black (non-refl)
Background; orange



G20-55-96
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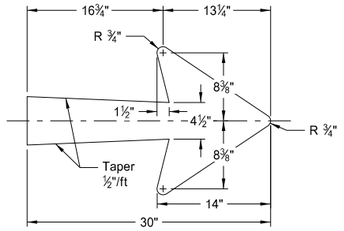
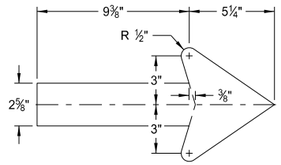
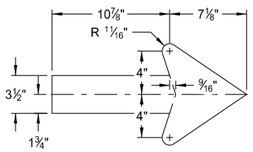
Background: orange



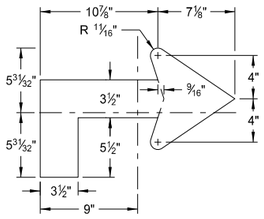
E5-1-48



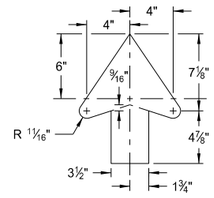
G20-50a-72
G20-52a-72



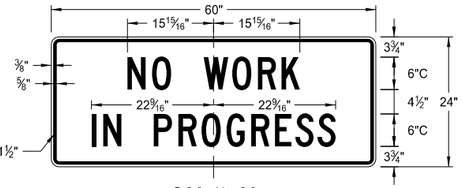
M4-9(L or R)-30
Right or Left



M4-9(L or R)-30
Advanced Right or Left



M4-9-30
Straight



G20-1b-60
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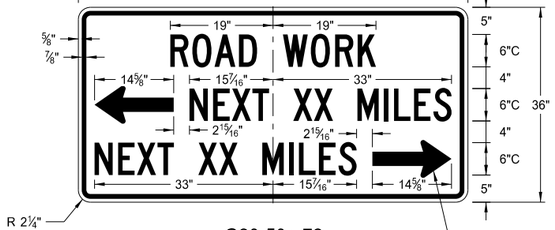
Background: orange



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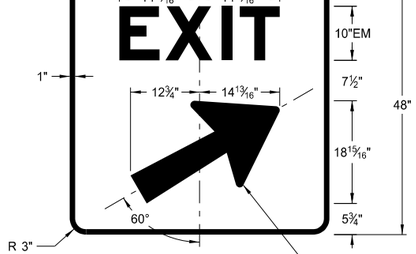
Background: orange



E5-1(L or R)-48
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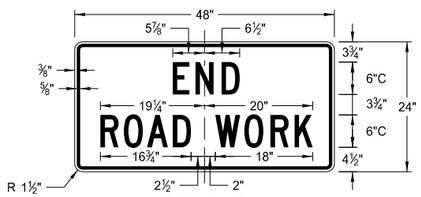
Background: green



G20-2-48
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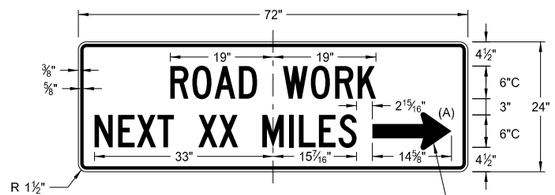
Background: orange



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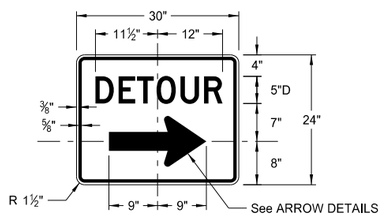
Background: orange



M4-9(L or R)-30 &
M4-9-30
Legend: black (non-refl)
Background: orange

ARROW DETAILS

NOTES:

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

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

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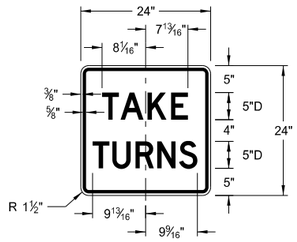
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



R1-50-24
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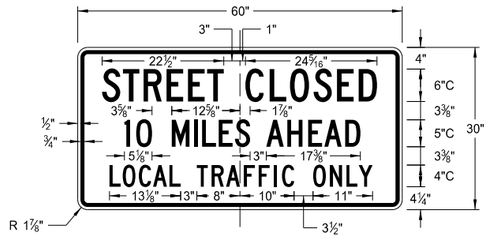

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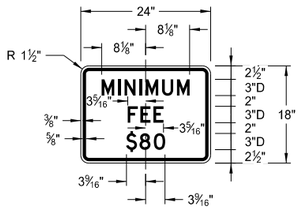

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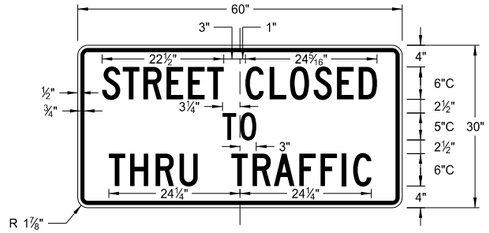

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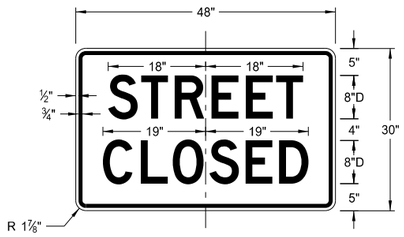

R11-2a-48
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8-13-13	
REVISIONS	
DATE	CHANGE

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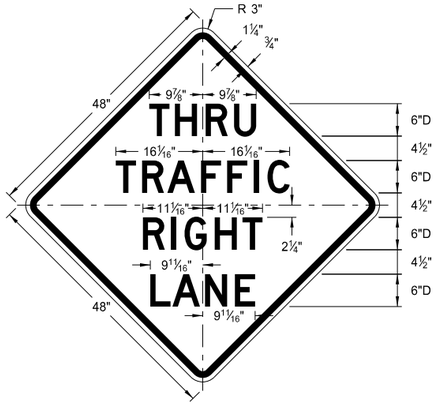
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



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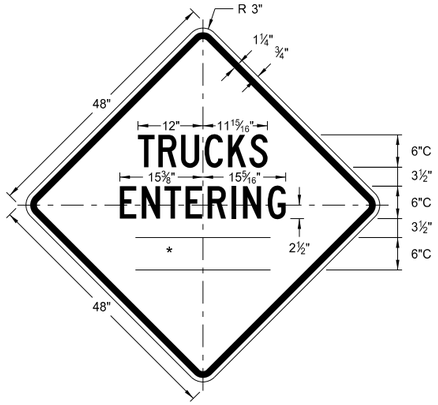
Background: orange



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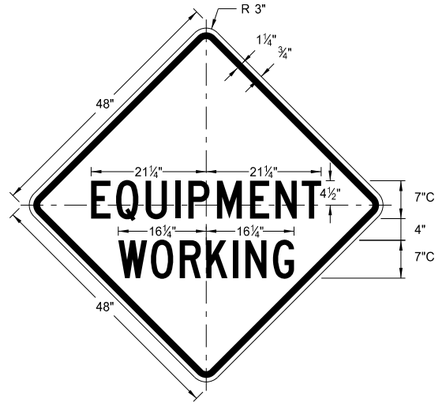

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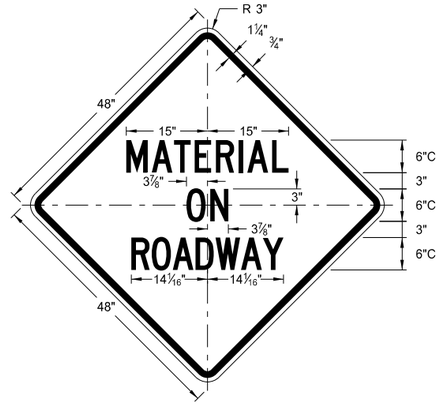
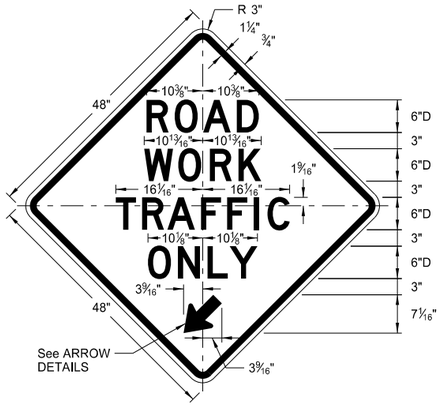


W21-51-48
Legend: black (non-refl)
Background: orange

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

* DISTANCE MESSAGES



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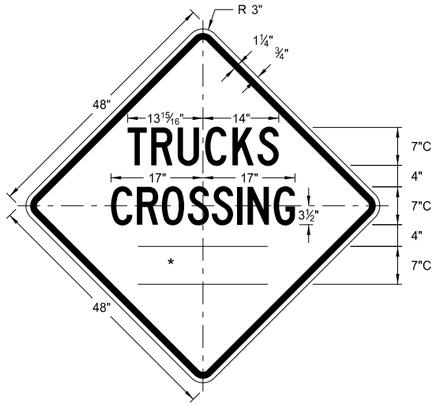

W8-55-48
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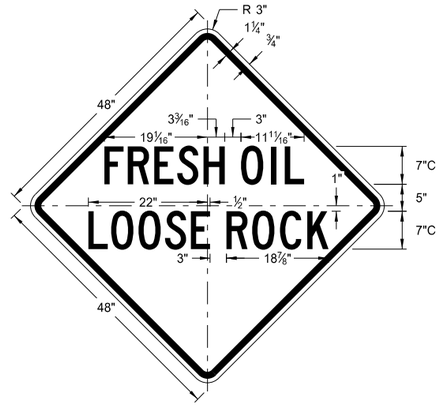
Background: orange

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



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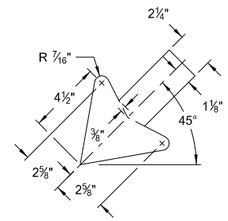
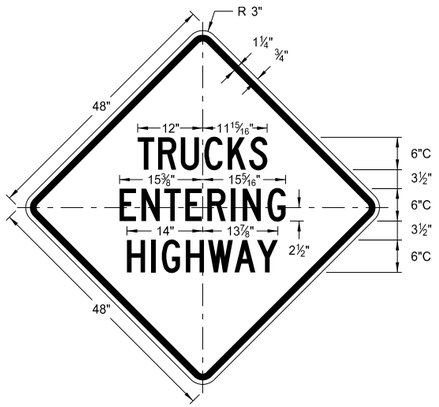


W5-9-48

ARROW DETAILS



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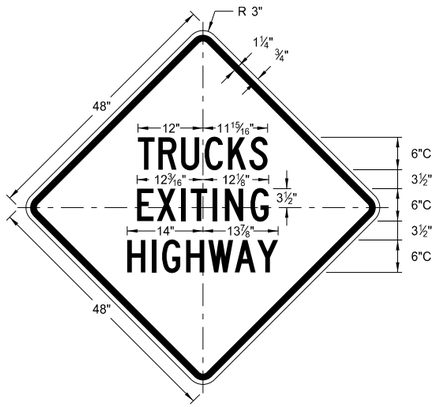

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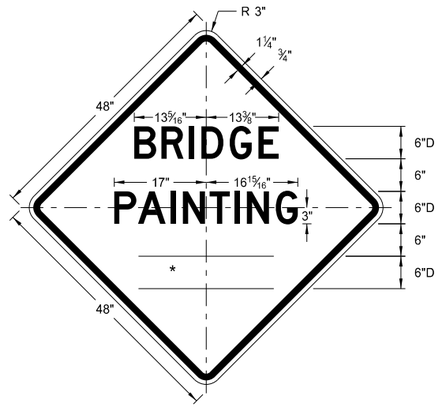

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Legend: black (non-refl)
Background: orange

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

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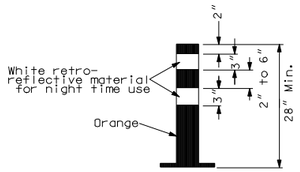
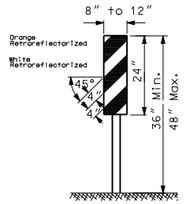
BARRICADE DETAILS AND CHANNELIZING DEVICES



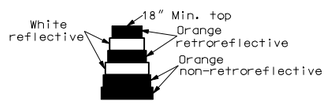
TUBULAR MARKER



VERTICAL PANEL

(Retroreflective sheeting shall be placed on both sides)

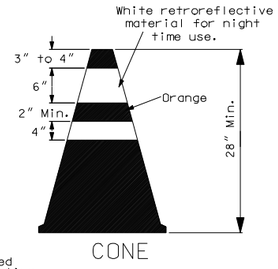
NOTE: Vertical panels used on the expressways or other high speed roadways shall be 12" by 24"



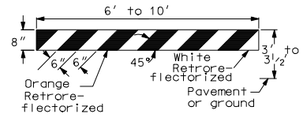
DELINEATOR DRUM

36" Min. height

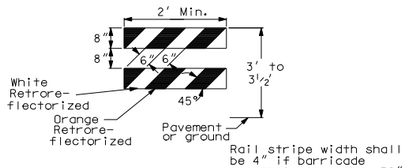
The markings on drums shall be orange and white stripes 4 to 6 inches wide. There shall be at least two orange and two white stripes. Where drums have ribs or indentations, there shall be no retroreflectorized sheeting in this area. This space shall be no more than 2 inches wide. The drum surface shall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



CONE

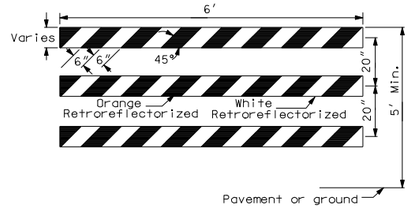


TYPE I BARRICADE



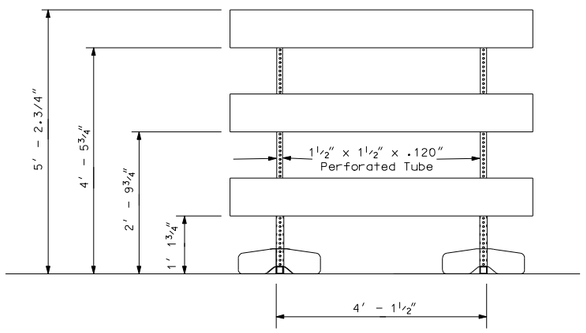
TYPE II BARRICADE

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

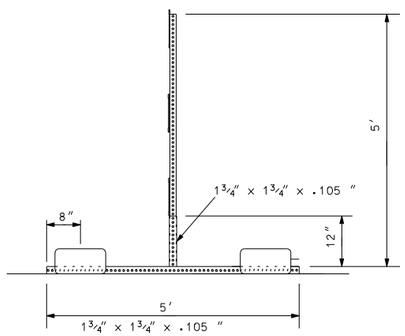


TYPE III BARRICADE

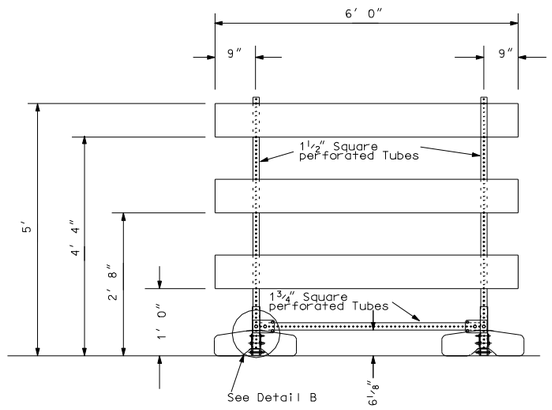
BARRICADES:
Number of retroreflectorized rail faces:
Type I - 2 (One each direction)
Type II - 4 (Two each direction)
Type III- 6 (Three in each direction)

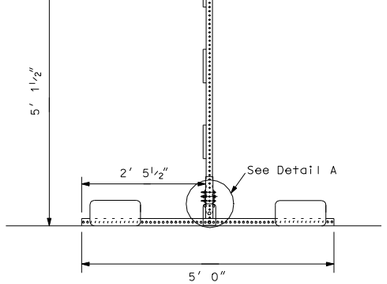


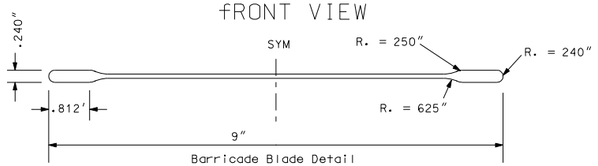
FRONT VIEW



END VIEW







Barricade Blade Detail

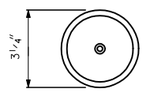
Ballast = 45lb sandbag at the end of each leg.

Barricade blade fastened to vertical supports with 2" corner bolts.

Vertical potion of leg is welded to horizontal portion on all four sides.

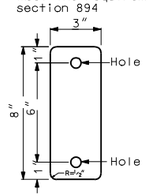
Masts slide inside vertical portion of legs. No bolts or fastenings devices used.

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



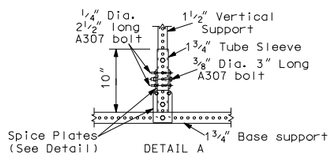
ACRYLIC PLASTIC REFLECTOR

Delineator reflector shall meet the requirements of section 894

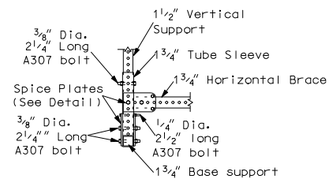


DELINEATOR REFLECTOR

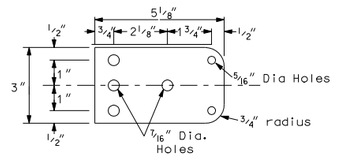
3"x8"- 18 Gauge galvanized steel sheet or 0.080" aluminum plate with white retroreflective sheeting (Type 3A or 3B) as specified in section 894 of the Standard Specifications.



DETAIL A



DETAIL B



SPLICE PLATE

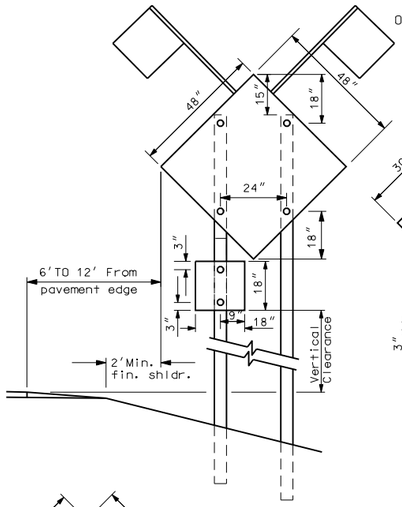
BARRICADE ASSEMBLY DETAIL
(Use when Plastic I-Beam w/ 1½" Hollow Core Flanges or 1" x 8" x72" wood boards.

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

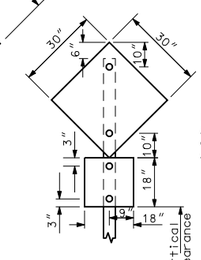
This document was originally issued and sealed by MARK S GAYDOS Registration Number PE-4518, on 06/29/05 and the original document is stored at the North Dakota Department of Transportation

D-704-14

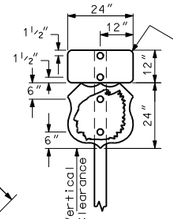
CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS



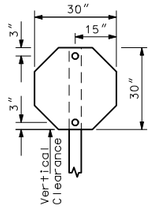
POST MOUNTING
48"x48" Signs



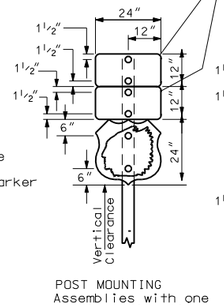
POST MOUNTING
30"x30" Signs



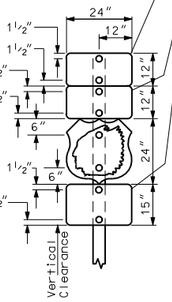
POST MOUNTING
Assemblies with one cardinal direction sign & one route marker



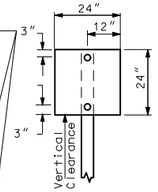
POST MOUNTING
Sign R1-1-30



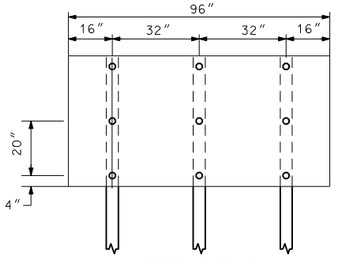
POST MOUNTING
Assemblies with one cardinal direction sign, one detour sign & one route marker



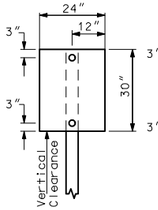
POST MOUNTING
Assemblies with one cardinal direction sign, one detour sign, one route marker & one directional arrow.



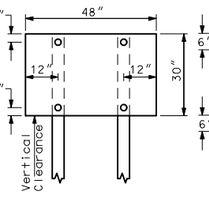
POST MOUNTING
24"x24" Signs



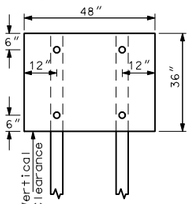
POST MOUNTING
48"x96" Signs



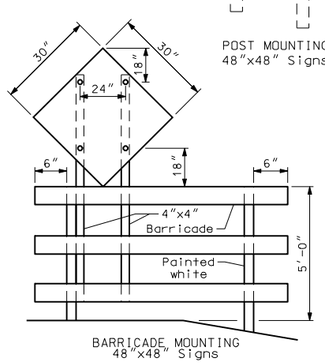
POST MOUNTING
24"x30" Signs



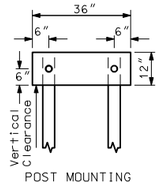
POST MOUNTING
48"x30" Signs



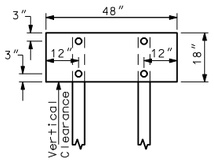
POST MOUNTING
48"x36" Signs



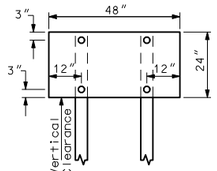
BARRICADE MOUNTING
48"x48" Signs



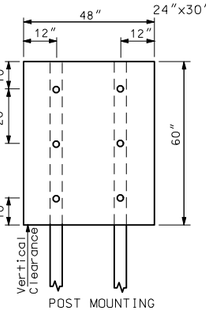
POST MOUNTING
36"x12" Signs



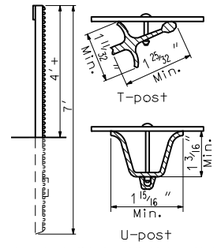
POST MOUNTING
48"x18" Signs



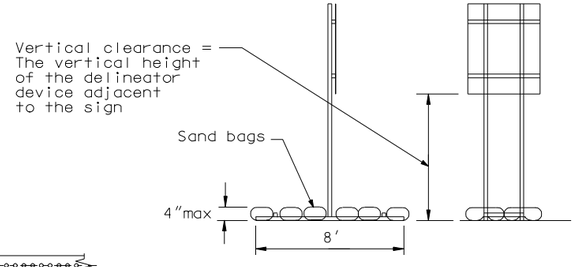
POST MOUNTING
48"x24" Signs



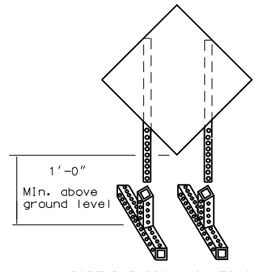
POST MOUNTING
48"x60" Signs



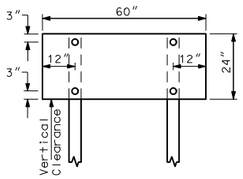
DELINEATOR ATTACHMENT AND POST MOUNTING DETAILS



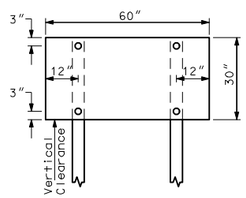
SKID MOUNTED SIGNS



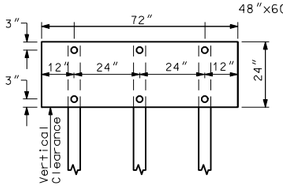
PORTABLE SIGN MOUNTING



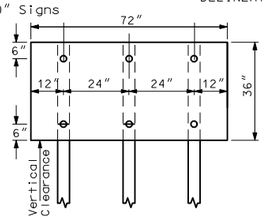
POST MOUNTING
60"x24" Signs



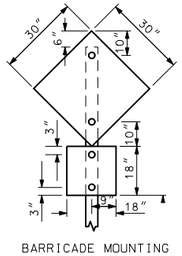
POST MOUNTING
60"x30" Signs



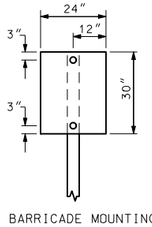
POST MOUNTING
72"x24" Signs



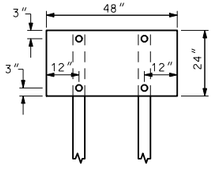
POST MOUNTING
72"x36" Signs



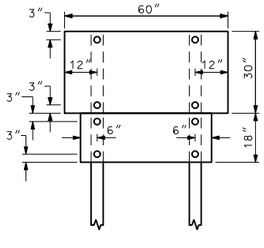
BARRICADE MOUNTING
30"x30" Signs



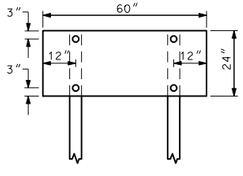
BARRICADE MOUNTING
24"x30" Signs



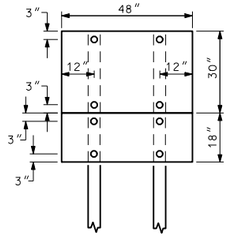
BARRICADE MOUNTING
48"x24" Signs



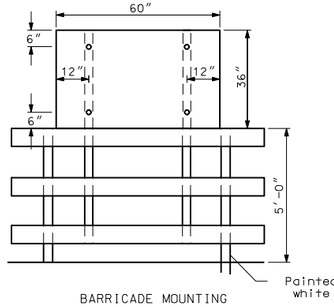
BARRICADE MOUNTING
60"x30" & 48"x18" Signs



BARRICADE MOUNTING
60"x24" Signs



BARRICADE MOUNTING
48"x30" & 48"x18" Signs



BARRICADE MOUNTING
G20-1-60 Signs

NOTES:

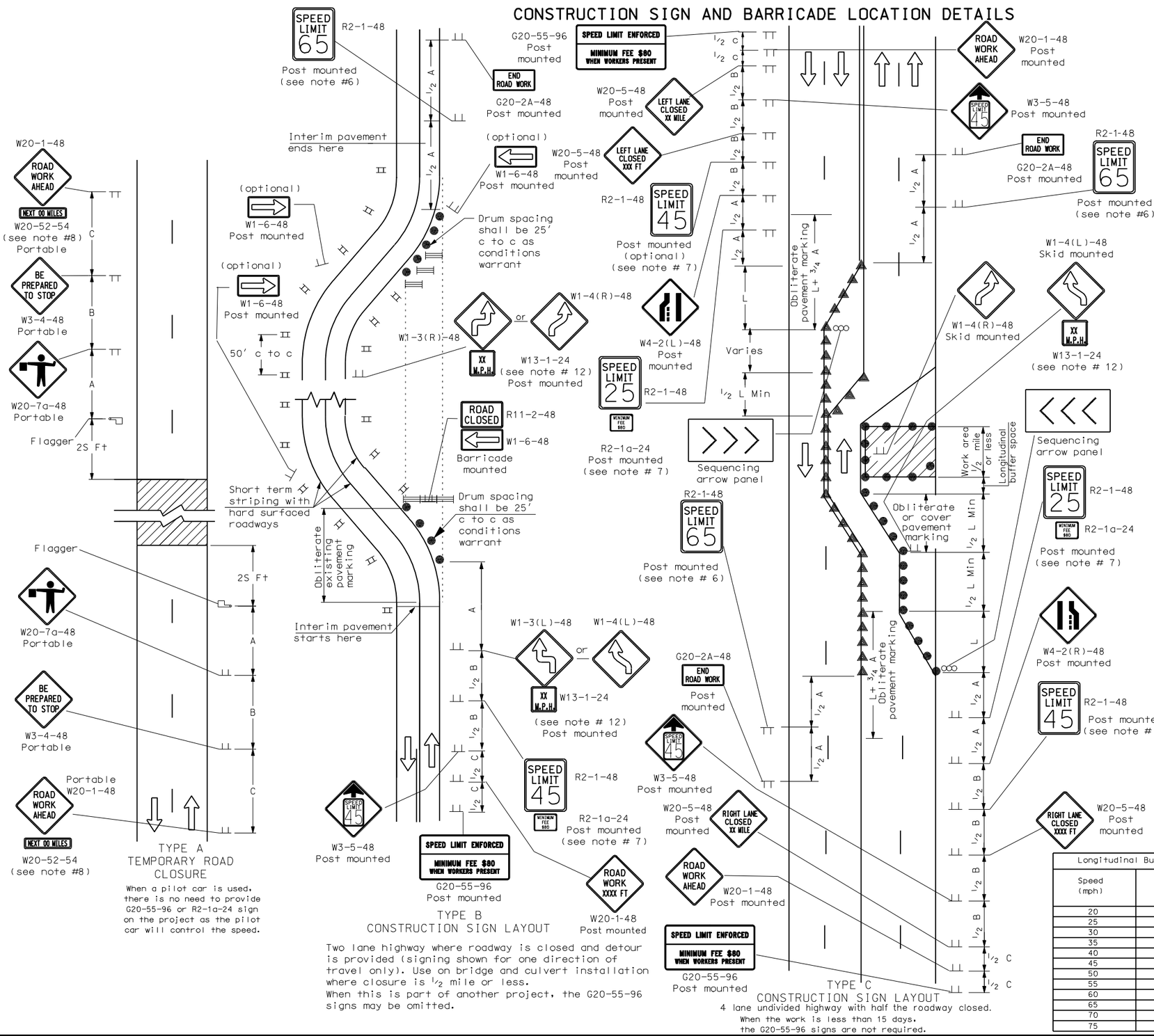
1. Barricade and Sign Supports: Wooden supports shall be painted white. Steel supports shall be galvanized or painted.
2. Barricade Mounting Signs: The bottom of the sign shall be flush with the top of the top rail. Wood sign posts shall be 4"x4" min. SFS or equivalent steel posts. All barricades and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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
08-01-88	Sign assembly
05-01-92	Sign assembly
03-30-93	Sign supports note
03-04-96	Sign height
08-15-96	Note 8
07-10-97	Note revision
07-31-98	Note & portable sign
10-01-99	Skid mounted sign
02-07-03	Vertical clearance note
11-30-04	Third post added to some signs
12-01-04	PE stamp added

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

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

D-704-15



Notes

1. 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 $S^2/60$ for urban, residential, and other streets with speeds of 40 mph or less.
2. Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on roadway shall be placed on skid mounted assemblies.
3. Delineator drums, barricades or cones used for tapering traffic shall be spaced at the dimension "S". Delineator drums or cones used for tangents shall be spaced at 2 times dimension "S".
4. Existing striping shall be removed as required. Delineators will only be used when foreslope is 1V:4H or better and roadway alignment is visible to approaching vehicles. Vertical panels shall be used where roadways has steep slopes and alignment is not visible to approaching vehicles. Delineators and vertical panels shall be installed back to back.
5. Sequencing Arrow Panels
   Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface.
   Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph and 750 ADT or less).
   Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less).
   Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 5000 ADT).
6. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
7. 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.
8. Use when work area is 1 mile or longer.
9. 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.
10. Existing speed limit signs within a reduced speed zone shall be covered.
11. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
12. Where necessary, safe speed to be determined by the Engineer.
13. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.

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

KEY

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

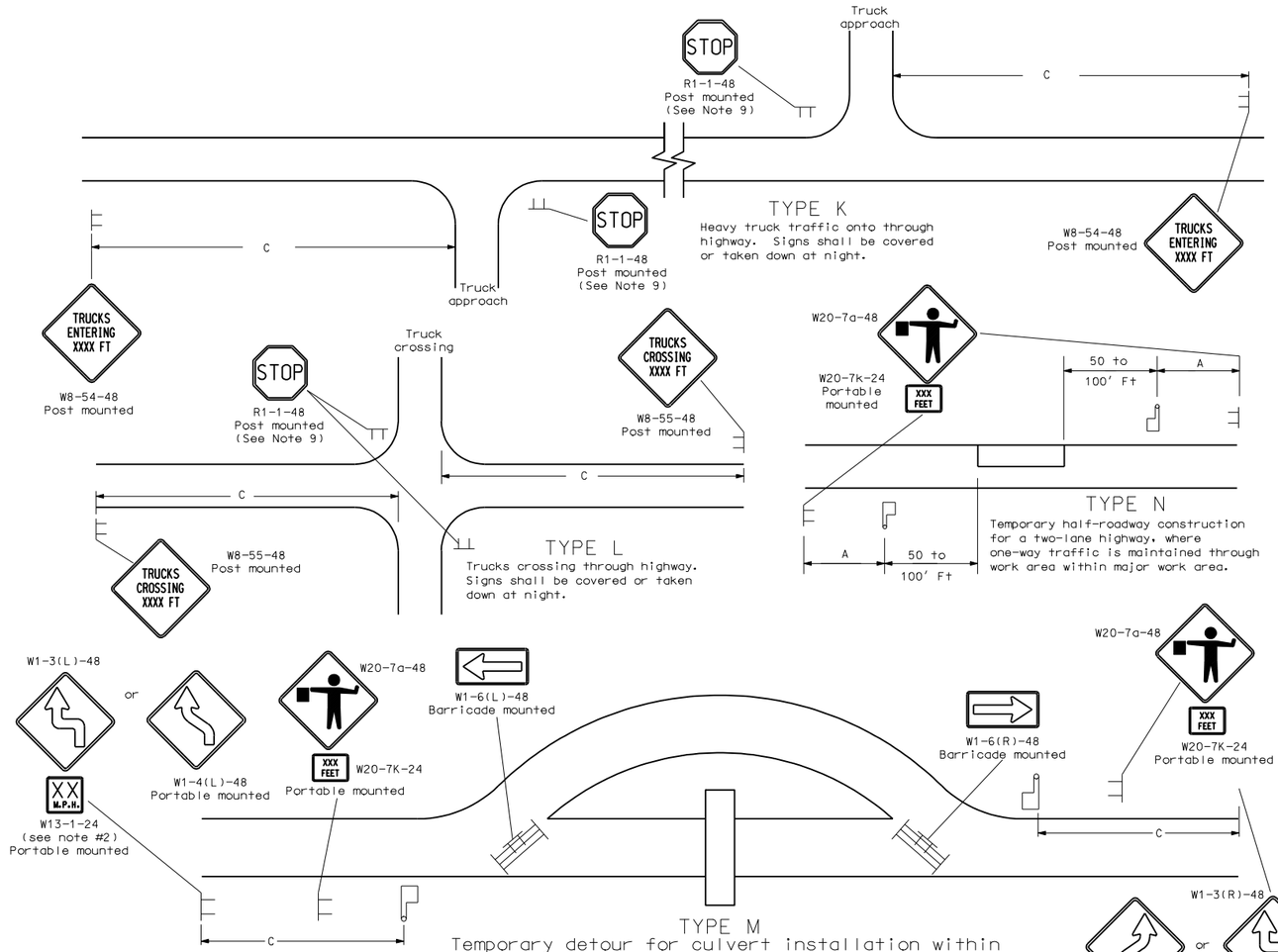
10-1-86

REVISIONS

DATE	CHANGE
01-05-01	Revised note 3
07-19-02	Reversed End Road Work & Speed Signs
07-25-03	Revised R2-1, R2-1a and W20-1
04-01-04	Change Fee Sign, Warning & Buffer Spacing
12-18-03	Relocated reverse curve
12-01-04	PE stamp added
06-29-05	Revised W4-2, Replaced R2-5a with W3-5, Rev. Adv. Warning Table, Rev. Note 7.
07-05-05	Changed W20-7b to W3-4

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

D-704-22



Notes

1. Barricade shown to be placed on roadway shall be on a moveable assembly. on the top of the top barricade bar. Sign shown to be placed on the roadway Sign to be mounted on barricades shall be mounted with the sign bottom shall be placed on skid mounted assemblies.
2. Where necessary, safe speed to be determined by the Engineer.
3. 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.
4. 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.
5. Existing speed limit signs within a reduced speed zone shall be covered.
6. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
7. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
8. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
9. If existing stop sign is in place, a 48" stop sign is not required.

KEY

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

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
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Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-1-86

REVISIONS

DATE	CHANGE
09-30-93	General revisions
06-21-95	General revisions
08-15-96	Revise flag note
10-01-99	General revisions
02-02-00	W8-55-48
10-17-02	Deleted Work In Progress Sign
07-25-03	Revised R2-1a
04-01-04	Revised fee sign & Warning sign spacing. Revised note 3
12-01-04	PE stamp added
02-14-05	Added note 9 and revised stop sign size
06-29-05	Rev. Adv. Warning Table. Rev. Note 3

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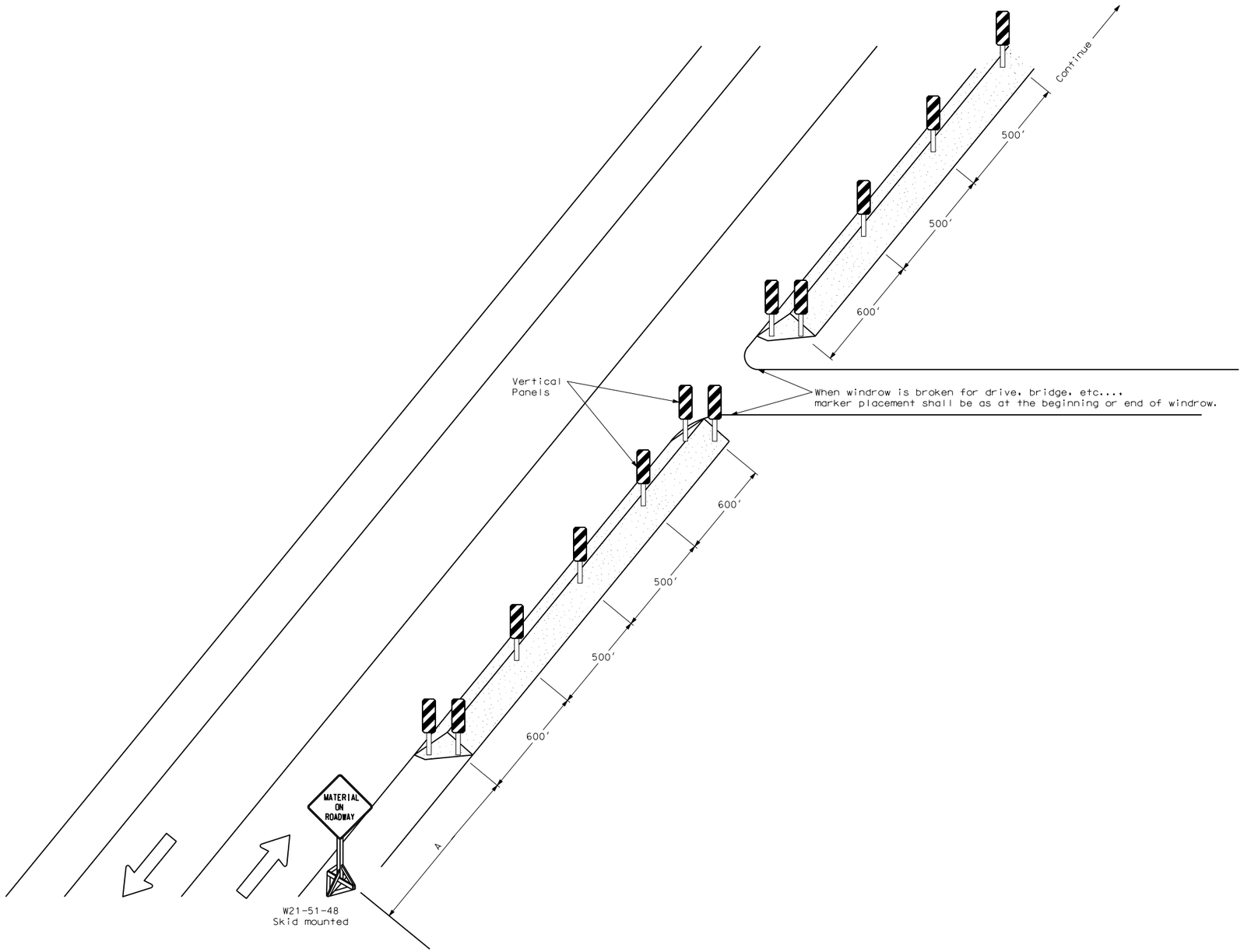
WINDROW MARKING

D-704-30

Notes

The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.



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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-1-86

REVISIONS

DATE	CHANGE
05-01-92	General revisions
10-01-99	General revisions
12-01-04	PE stamp added
06-29-05	Rev. Adv. Warning Table

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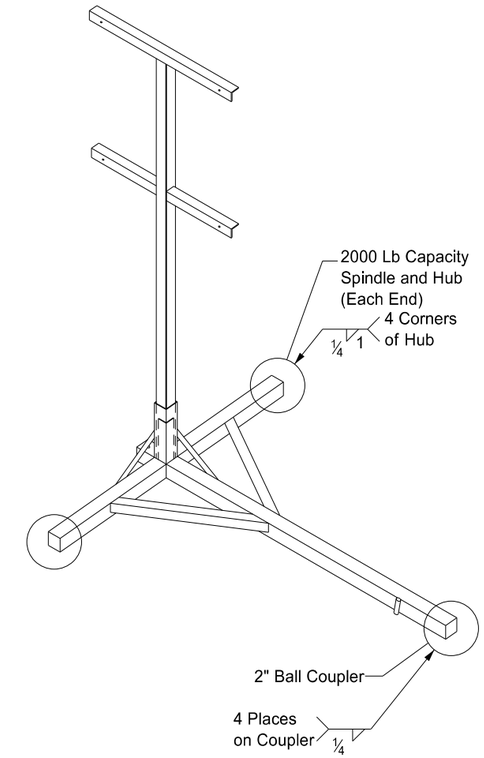
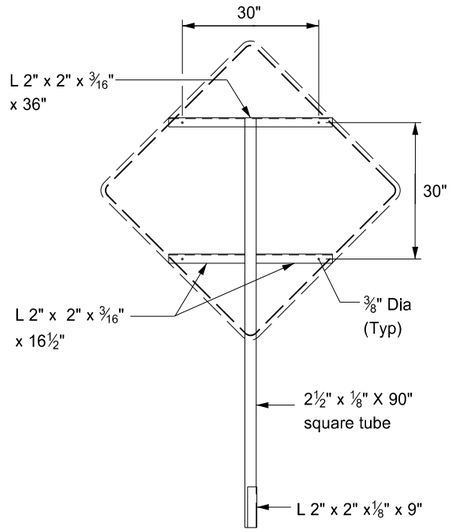
11/24/2008 1:02:50 PM R:\SUPPORT\DESSTD\D704-30.DGN

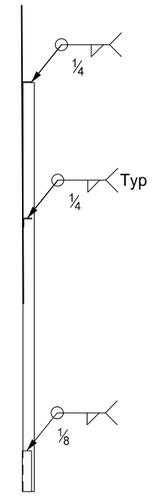
PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



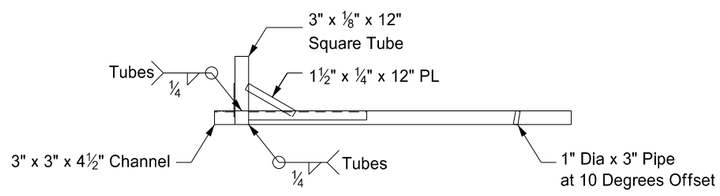


FRONT

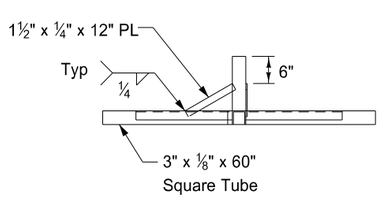


RIGHT

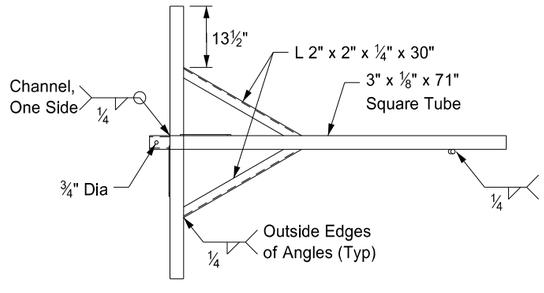
SIGN SUPPORT



FRONT



RIGHT



TOP

TRAILER

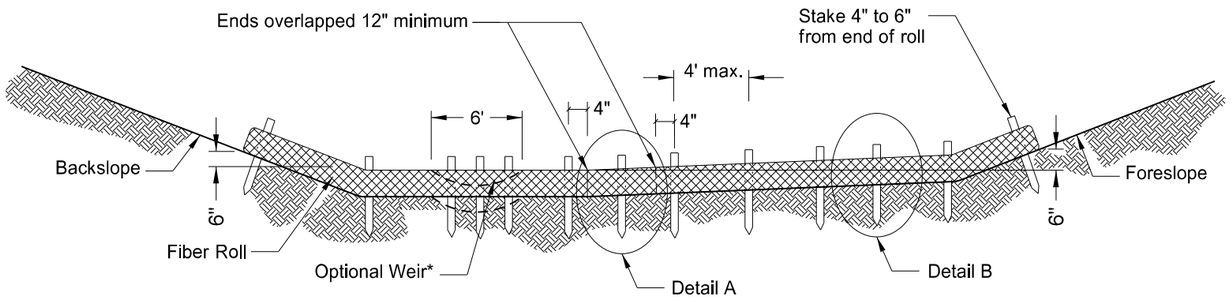
Notes:

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.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE

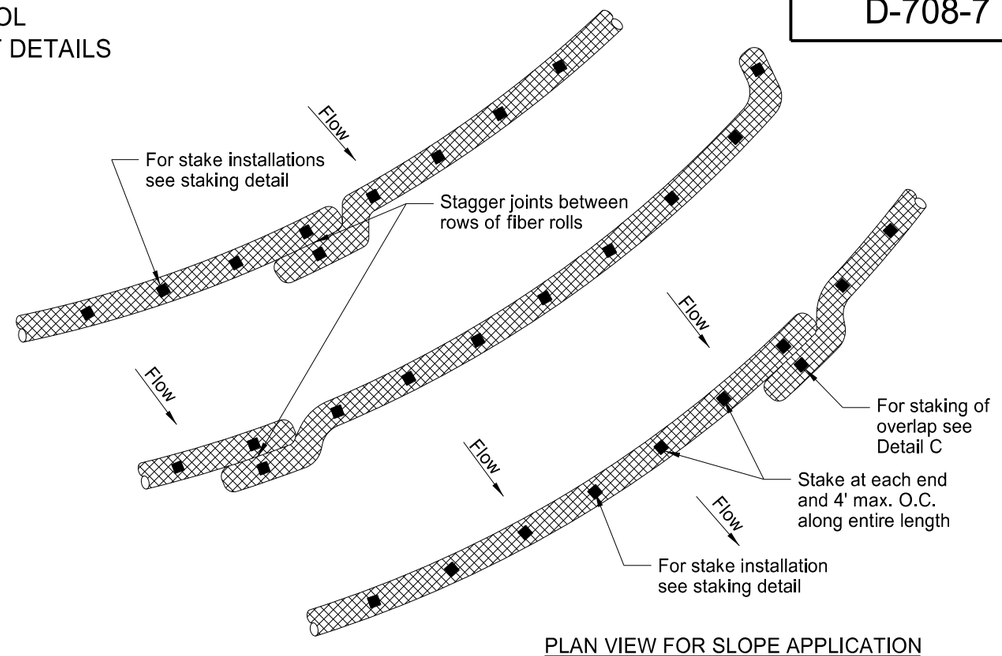
This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 11/23/10 and the original document is stored at the North Dakota Department of Transportation

EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

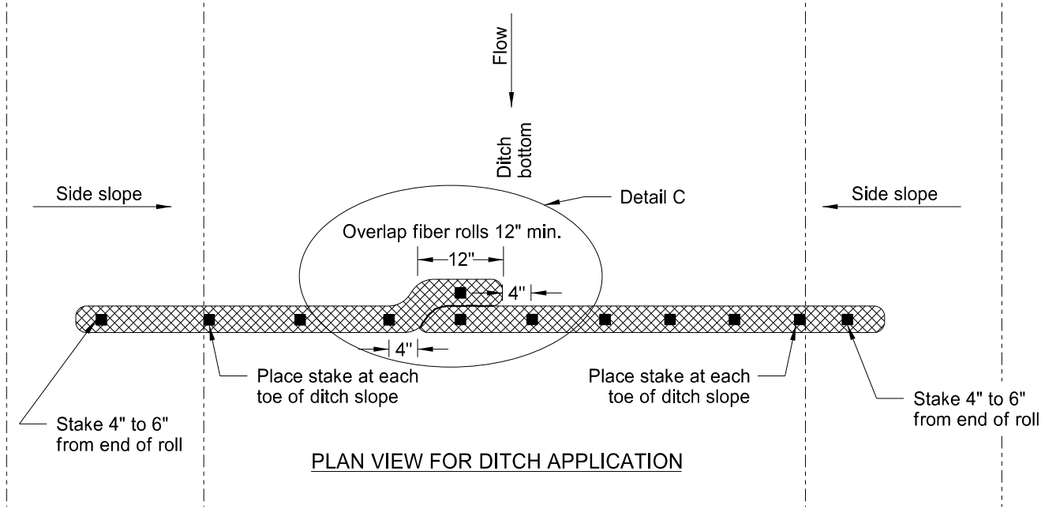


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

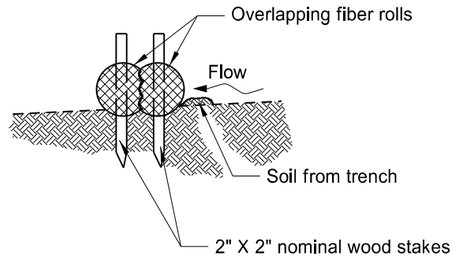
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



PLAN VIEW FOR SLOPE APPLICATION

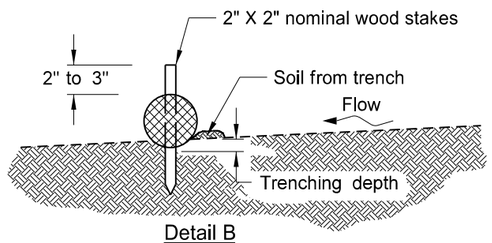


PLAN VIEW FOR DITCH APPLICATION



Detail A

Fiber Roll Overlapping Staking Detail



Detail B

Fiber Roll Staking Detail

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

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

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

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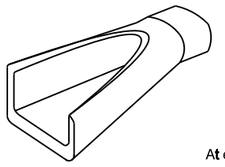
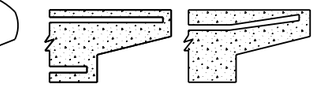
REINFORCED CONCRETE PIPE CULVERT AND END SECTIONS

D-714-01

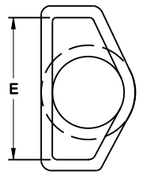


PERSPECTIVE

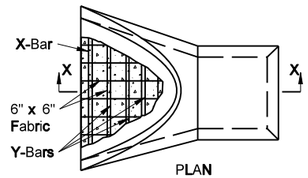


ARRANGEMENT FOR REINFORCEMENT

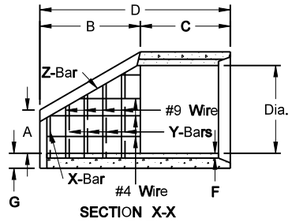
At end of 36" to 106" pipe. At end of 12" to 33" pipe.



END VIEW



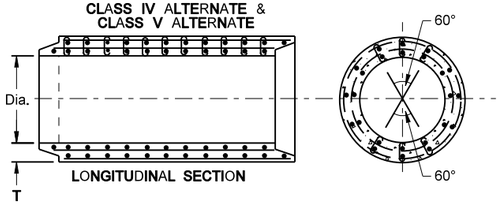
PLAN



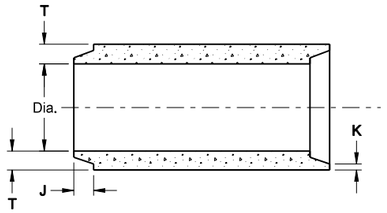
SECTION X-X
END SECTION

Equivalent to Class III Pipe

CLASS IV ALTERNATE &
CLASS V ALTERNATE



LONGITUDINAL SECTION



END SECTION

TERMINAL DIMENSIONS								REINFORCING STEEL		
DIA	A	B	C	D	E	F	G	X	Y	Z
12	0'-4"	2'-0"	4'-0⅛"	6'-0⅛"	2'-0"	2"	2"	2-1/4" x 2'	6-1/4"x 2' @ 6"c.c.	2-1/4"x 4'
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2¼"	2¼"	2-1/4" x 2½'	6-1/4"x 2½' @ 6"c.c.	2-3/8"x 4'
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2½"	2½"	2-3/8" x 3'	6-1/4"x 3' @ 6"c.c.	2-3/8"x 4'
21	0'-9"	3'-0"	3'-1½"	6'-1½"	3'-6"	2¾"	2¾"	2-3/8" x 3½'	8-1/4"x 3½' @ 6"c.c.	2-3/8"x 5'
24	0'-9½"	3'-7½"	2'-6"	6'-1½"	4'-0"	3"	3"	2-1/2" x 4'	8-3/8"x 4' @ 8"c.c.	2-3/8"x 6'
27	0'-10½"	4'-1½"	2'-0"	6'-1½"	4'-6"	3¼"	3¼"	2-1/2 " x 5'	8-3/8"x 5' @ 9"c.c.	2-3/8"x 6'
30	1'-0"	4'-6"	1'-7½"	6'-1¾"	5'-0"	3½"	3½"	2-1/2 " x 5'	12-3/8"x 5' @ 8"c.c.	2-1/2"x 6'
36	1'-3"	5'-3"	2'-10¼"	8'-1¾"	6'-0"	4"	4"	2-1/2 " x 6'	12-3/8"x 6' @ 6"c.c.	2-1/2"x 8'
42	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	4½"	4½"	2-1/2" x 7'	12-1/2"x 7' @ 9"c.c.	2-1/2"x 8'
48	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"	5"	5"	2-1/2" x 8'	16-1/2"x 8' @ 8"c.c.	2-1/2"x 8'
54	2'-3"	5'-5"	2'-9¼"	8'-2¼"	7'-6"	5½"	5½"	2-1/2" x 8'	16-1/2"x 8' @ 7"c.c.	2-1/2"x 8'
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	6"	5"	2-1/2" x 9'	16-1/2"x 9' @ 6"c.c.	2-1/2"x 9'
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	6½"	5½"	2-1/2" x 9'	22-1/2"x 9' @ 6"c.c.	2-1/2"x 9'
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	7"	6"	2-1/2" x 10'	24-1/2"x 10' @ 6"c.c.	2-1/2"x 9'
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	7½"	6½"	2-1/2" x 10'	28-1/2"x 10' @ 6"c.c.	2-1/2"x 10'
84	3'-0"	7'-6½"	1'-9"	9'-3½"	10'-0"	8"	6½"	4-1/2" x 10'	28-1/2"x 10' @ 6"c.c.	4-1/2"x 10'
90	3'-5"	7'-3½"	2'-0"	9'-3½"	11'-0"	8½"	6½"	4-1/2" x 11'	28-1/2"x 11' @ 6"c.c.	4-1/2"x 10'

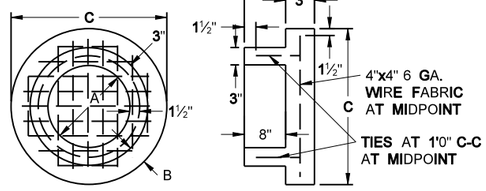
		All Classifications of Round Concrete Pipe				CLASS IV ALTERNATE								CLASS V ALTERNATE							
						D-LOAD TO PRODUCE A 0.01 INCH CRACK															
						2000								3000							
						3000								D-LOAD TO PRODUCE ULTIMATE LOAD							
							5000 P.S.I.								3750 5000 P.S.I.						
Internal Dia. of pipe in inches	Cross-Sectional Water Area	Weight per lin. ft. of Reinforced Conc. Pipe Std. Wall	Joint I, Groove End Min./Max.	Joint K, Tongue End Min.	Minimum Wall Thickness (T)	Inner Cage	Ellip Cage	Outer Cage	Shear Steel			Height of Fill Normal Backfill		Inner Cage	Ellip Cage	Outer Cage	Shear Steel			Height of Fill Normal Backfill	
						Ai	Ae	Ao	N	S	Ar			Ai	Ae	Ao	N	S	Ar		
Dia	Sq. ft.	Lbs.	In.	In.	In.	Sq.in	Sq.in	Sq.in	No.	In.	Sq.in	Ft.		Sq.in	Sq.in	Sq.in	No.	In.	Sq.in	Ft.	
12	0.79	92	1⅛-2⅜	¾	2																
15	1.23	127	1¼-2¼	⅞	2¼																
18	1.77	168	1⅜-2⅛	1	2½																
21	2.40	214	1⅜-3⅛	1⅛	2¾																
24	3.14	265	2¾-3¾	1⅛	3																
27	3.98	322	2½-4	1¼	3¼																
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	3½-4¾	1⅞	5									.66	.33	.50	8	4	.22	24-35	
54	15.90	1070	4⅛-5¼	2	5½									.74	.37	.56	9	4	.22	24-35	
60	19.63	1296	4½-5½	2¼	6	.54	.27	.41	7	6	.22	16-24		.82	.41	.62	7	6	.22	24-35	
66	23.76	1542	5-6	2⅝	6½	.60	.30	.45	8	6	.22	16-24		.88	.44	.66	8	6	.22	24-35	
72	28.27	1810	5⅛-6¾	2⅞	7	.64	.32	.48	8	6	.23	16-24		.96	.48	.72	8	6	.23	24-35	
78	33.18	2098	6¼-7¼	2⅞	7½	.70	.35	.53	9	6	.25	16-24		1.04	.52	.78	9	6	.25	24-35	
84	38.48	2410	5⅛-7¾	3⅛	8	.76	.38	.57	10	6	.28	16-24		1.12	.56	.84	10	6	.28	24-35	
90	44.18	2793	6¾-8½	3⅛	8½	.82	.43	.62	11	6	.31	16-24		1.20	.65	.90	11	6	.31	24-35	
96	50.27	3092	7-8¼	3½	9	.88	.46	.66	11	6	.34	16-24		1.32		.99	11	8	.34	24-35	
102	56.75	3466	7-8¼	3½	9½	.94	.52	.71	12	6	.37	16-24		1.42		1.07	12	8	.37	24-35	
108	63.62	3864	7¼-8½	3¾	10	1.02	.57	.76	12	6	.40	16-24									

Ai, Ae, Ao = Minimum circumferential reinforcement required in square inches per lineal foot of pipe.
Ar = Minimum radial reinforcement required in square inches per square foot of pipe.
N = Minimum number of rows of radial reinforcement at top and bottom of pipe.
S = Maximum circumferential spacing of rows of radial reinforcing.

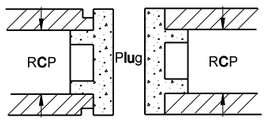
SEE STANDARD D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

REINFORCED CONCRETE PIPE PLUG

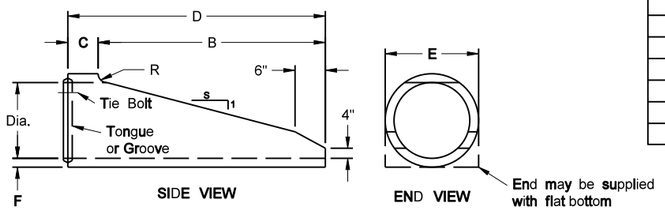
CONCRETE PIPE PLUG			
DIMENSIONS (in inches)			
PIPE DIAMETER	A	B	C
15	8	2.25	19.5
18	11	3.0	23.0
21	14	3.25	26.5
24	17	3.50	30.0
27	20	3.75	33.5
30	23	4.0	37.0
33	26	4.25	40.5
36	29	4.50	44.0
42	35	5.0	51.0
48	41	5.50	58.0



CONCRETE SHALL CONFORM TO STRENGTH REQUIREMENTS FOR REINFORCED CONCRETE PIPE CULVERTS, CL. II.



TRAVERSABLE END SECTION



SIDE VIEW

END VIEW

TRAVERSABLE END SECTION							
DIA	B	C	D	E	F	R	S
15"	4'	9"	4'-9"	1'-7½"	2¼"	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'-6"	15"	7'-3"	3'-8"	4"	3"	4

NOTES (Traversable End Section):

1. Manufactured in accordance with applicable portions of ASTM C76/AASHTO M170.
2. Reinforcement per class II RCP with double reinforcement in the upper 120° of the full barrel portion.

NOTES:

1. All reinforcement shall be electrically welded cold drawn steel wire fabric.
2. Circular reinforcement shall lap in accordance to AASHTO M170.
3. 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.
4. Laying length of pipe: 12" to 66" (incl.) = not less than 4 feet
   66" to 108" (incl.) = not less than 6 feet
5. Joints shall be sealed with rubber gaskets or with sealer approved by the engineer whenever pipe are specified for storm drain or sanitary sewers.
6. Welded steel wire fabric may be substituted for the reinforcing steel bars but must match the area of steel provided by the bars and the lap of the fabric must be in accordance with AASHTO specifications
7. All Reinforcing Steel shall meet AASHTO M170 requirements.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-1-86

REVISIONS

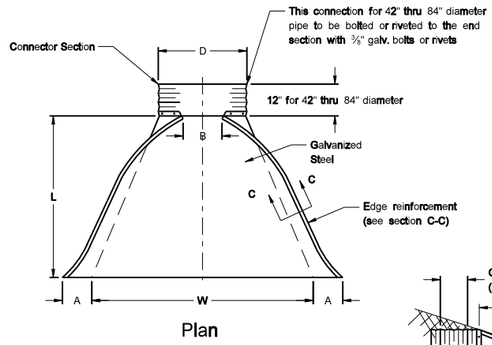
DATE	CHANGE
11-05-86	Note added
07-17-87	Added pipe plug detail
09-01-88	Reinforcement cage
03-10-95	General revisions
12-23-98	Note # 6, 30° FES
12-01-04	PE stamp added
12-08-08	Major Revisions

This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674 , on 12/18/2008 and the original document is stored at the North Dakota Department of Transportation

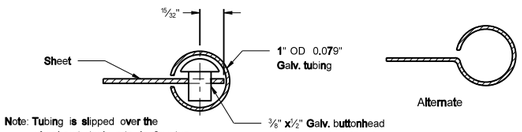
12/22/2008 9:26:18 AM R:\SUPPORT\DESSTD\D714-01.dgn

CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS
(Round pipe)

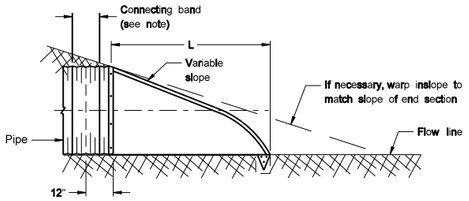
D-714-04



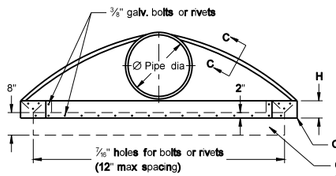
Plan



SECTION C-C



TYPICAL CROSS SECTION
(Showing connector section)

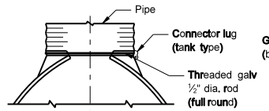


ELEVATION

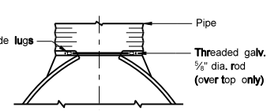
Galvanized toe plate required on end sections for pipe of 30" diameter or larger. Thickness of toe plate to be same as end section. Where toe plate is needed, the toe plate, bolts and nuts are to be included in price bid for end sections.

NOTES:

1. Pipe and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
2. Top edge of all end sections to have tubing reinforcement or rolled tube reinforcement (See section C-C). The tubing is to be supplemented with 2" x 2" x ¼" galv. angle for 60" through 72" dia. and 2½" x 2½" x ¼" galv. angle for 78" and 84" dia.. Angles to be attached by galv. ⅜" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
3. Elongated pipe shall be factory preformed so that the vertical diameter shall be 5% greater and the horizontal diameter 5% less than a circular pipe.

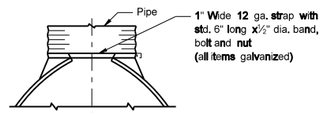


15", 18" and 24" only



30" and 36" only

ROD CONNECTION DETAILS



15", 18" and 24" only

STRAP CONNECTION DETAIL

	WATERWAY AREA, SQ FT			
PIPE DIA, IN	2 2/3" x ½"	3" x 1" (5" x 1")	¾" x ¾" Rib @ 7 ½"	¾" x 1" Rib @ 11 ½"
15	1.2		1.2	1.2
18	1.8		1.8	1.8
24	3.1		3.1	3.1
30	4.9		4.9	4.9
36	7.1	7.1	7.1	7.1
42	9.6	9.6	9.6	9.6
48	12.6	12.6	12.6	12.6
54	15.9	15.9	15.9	15.9
60	19.6	19.6	19.6	19.6
66	23.8	23.8	23.8	23.8
72	28.3	28.3	28.1	28.1
78	33.2	33.2	33.2	33.2
84	38.5	38.5	38.5	38.5
90		44.2	44.2	
96		50.3		
102		56.7		
108		63.6		
114		70.9		
120		78.5		

PIPE DIA.	GALV. THICK.	END SECTION DIMENSIONS					APPROX. SLOPE	BODY
		A	B	H	L	W		
IN	IN	IN	IN	IN	IN	IN	RATE	PIECE
15	0.064	7	8	6	26	30	2½:1	1
18	0.064	8	10	6	31	36	2½:1	1
24	0.064	10	13	6	41	48	2½:1	1
30	0.079	12	16	8	51	60	2½:1	1 or 2
36	0.079	14	19	9	60	72	2½:1	2
42	0.109	16	22	11	69	84	2½:1	2
48	0.109	18	27	12	78	90	2¼:1	2
54	0.109	18	30	12	84	102	2:1	2
* 60	0.109	18	33	12	87	114	1¾:1	3
* 66	0.109	18	36	12	87	120	1½:1	3
* 72	0.109	18	39	12	87	126	1 1/3 :1	3
* 78	0.109	18	42	12	87	132	1¼:1	3
* 84	0.109	18	45	12	87	138	1 1/6 :1	3

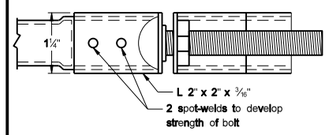
* These sizes have 0.138" center panels.

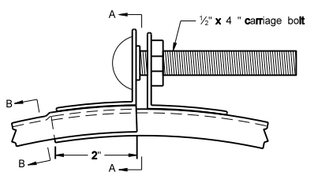
* * Pipe diameter is equal to dimension "D" of end section.

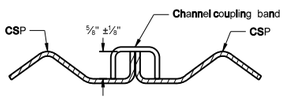
Manufacturers tolerances of above dimensions will be allowed.

Splices to be the lap rivated type.

Multiple panel bodies shall have lap seams which are to be tightly joined with ⅜" dia. galv. bolts or rivets. Nuts to be torqued to 25 foot-lbs ±.

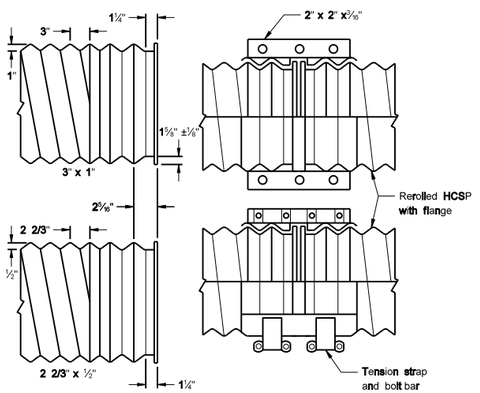






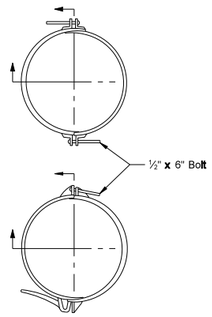
SECTION B-B

Channel coupling band for use on flanged end C.S.P.
(Channel coupling bands shall be two piece)

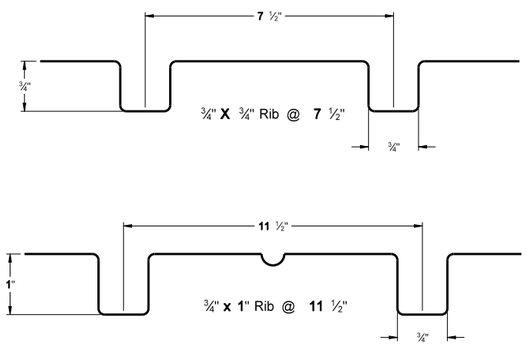


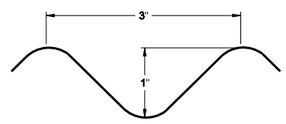
SPIRAL C.S.P

Reformed to accept flange, annular, dimple and hugger couplers

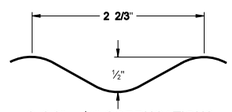


WING CHANNEL COUPLING BAND

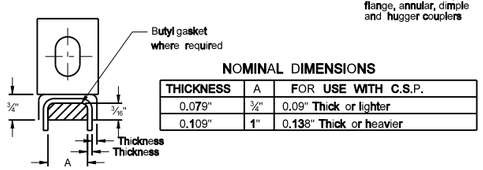




3" x 1" CORRUGATIONS
(5"x1" Corrugation may be used in lieu of 3" x 1")



2 2/3" x ½" CORRUGATIONS

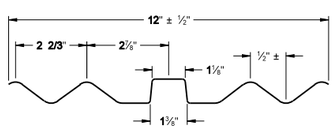


SECTION A-A

NOMINAL DIMENSIONS

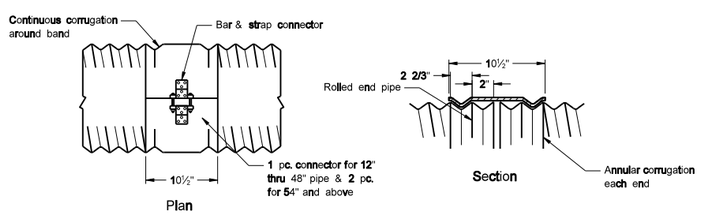
THICKNESS	A	FOR USE WITH C.S.P.
0.079"	¾"	0.09" Thick or lighter
0.109"	1"	0.138" Thick or heavier

CORRUGATED STEEL PIPE FLANGE BAND DETAILS



CROSS SECTION OF WING CHANNEL COUPLING BAND

WING CHANNEL COUPLING BAND FOR ANNULAR C.S.P. OR REFORMED H.C.S.P.



CONNECTING BAND DETAILS FOR HELICAL, WELDED-SEAM CULVERT

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
04-28-89	Toe plate note
12-06-95	Corrugation
07-02-03	Revised note
12-01-04	PE Stamp added
12-08-08	Removed min/max fill info and added 2 rib types

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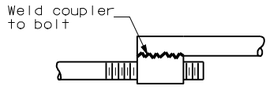
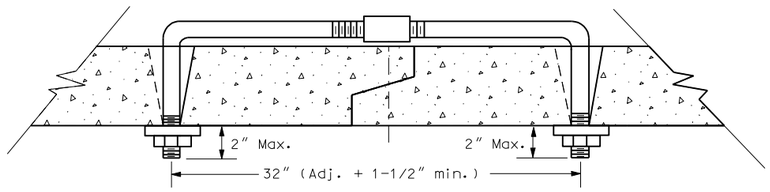
D-714-22

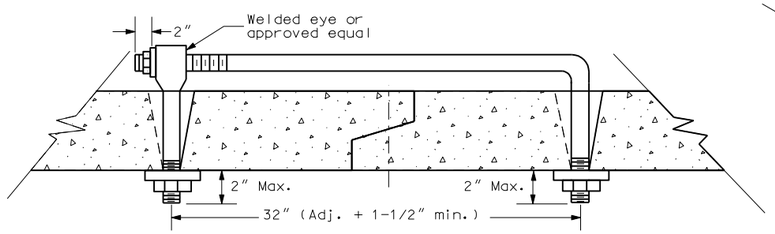
CONCRETE PIPE TIES



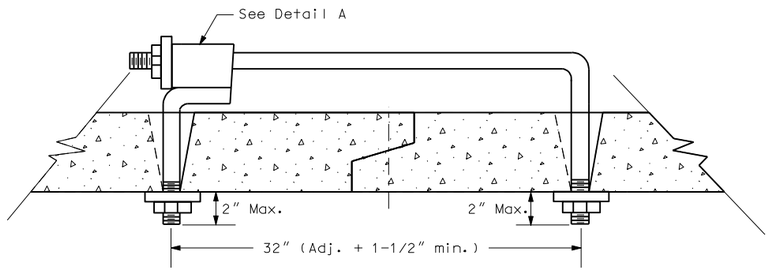
TOP VIEW



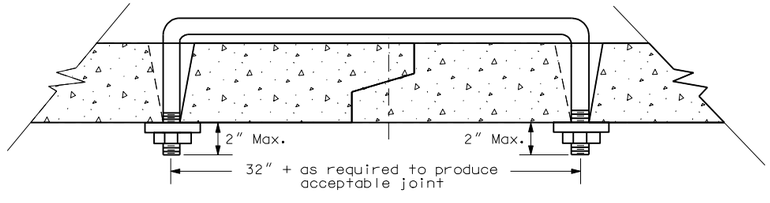
ADJUSTABLE TIE



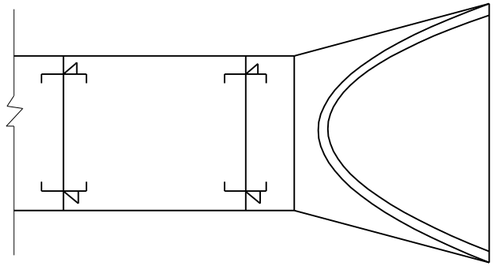
EYE BOLT TIE

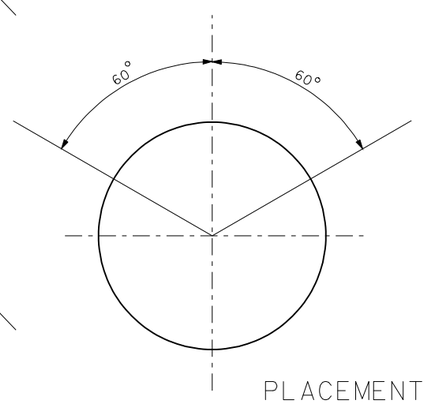


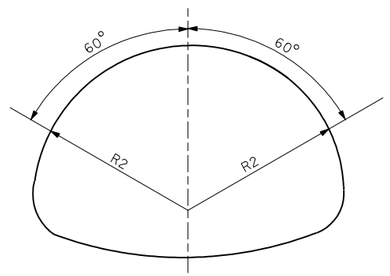
WELDED PIPE TIE



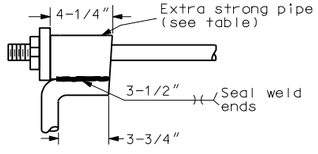
U BOLT TIE





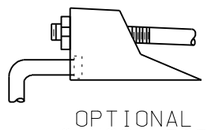


PLACEMENT OF HOLES



DETAIL A

Thread Dia.	E.S. Pipe I.D.
5/8"	3/4"
3/4"	1"
1"	1-1/4"



OPTIONAL CANOPY TIE

REQUIRED SIZE OF TIE BOLTS					
Pipe Size (Inches)	Thread Dia.	Pipe Size (Inches)	Thread Dia.	Pipe Size (Inches)	Thread Dia.
12	5/8" (See note 2)	30	3/4"	72	1"
15		33		78	
18		36		84	
21		42		90	
24		48		96	
27		54		102	
		60		108	
		66		120	
				132	

NOTES:

1. Pipe size listed is inside diameter of round pipe or equivalent diameter of pipe arch.
2. Nuts and washers are not required on inside of 21" diameter pipe or less.
3. Ties to be used only to hold pipe sections together, not for pulling sections tight.
4. Tie bolts shall be painted after fabrication with one coat of zinc chromate iron oxide paint. Threaded portion of rods do not have to be painted.
5. Holes in pipe to accommodate the tie bolts can be precast or drilled. Tapered holes will be permitted when precast. When existing pipe are extended or salvaged and relayed, the contractor will be required to drill the necessary holes.
6. The contractor has the option of selecting the type of tie bolt to be used. The type selected shall be approved by the engineer.
7. The cost of precasting or drilling the required holes and furnishing and installing the tie bolts shall be included in the price bid for reinforced concrete pipe culverts.
8. All concrete pipe joints will be tied including the end section joints. Tie bolts are not required on storm sewer pipe unless specifically noted in the plans.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
12-09-94	Notes
06-26-03	Layout revisions
12-01-04	PE Stamp added

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