DESIGN DATA				
WALLE TOWNSHIP ROAD - SECTIONS 2 / 11, T150, R50W				
TRAFFIC	AVERAGE DAILY			MAX HR
CURRENT YEAR: 2018	PASS:	TRUCKS:	TOTAL: 60	
FORECAST YEAR: 2038	PASS:	TRUCKS:	TOTAL: 150	
CLEAR ZONE DISTANCE: 18 FT		DESIGN SPEED: 55 MPH		
MINIMUM SIGHT DIST. FOR STOPPING: 495 FT		BRIDGES: HL 93 LIVE LOADING		

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0018(035)	21648	1	1

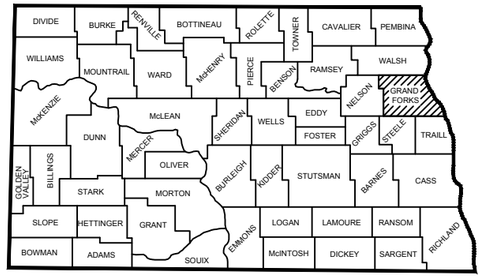
JOB # 7

Grand Forks County

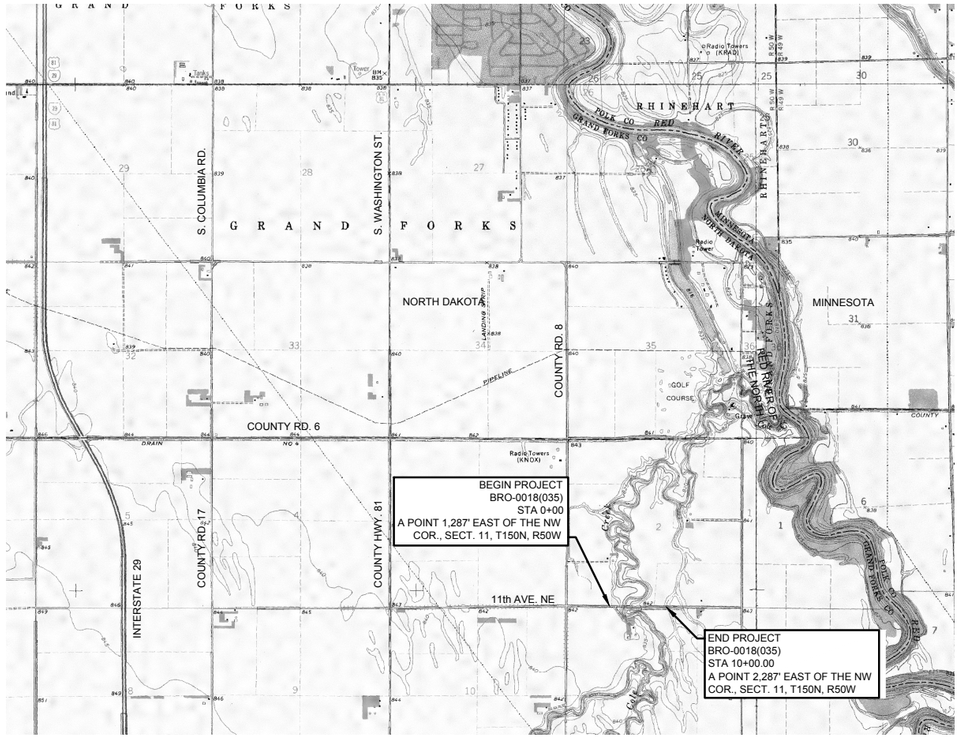
BRO-0018 (035)

Grand Forks County
Walle Township Bridge over Cole Creek - Sections 2 / 11, T150, R50W
1 Mile S & 1 Mile E of Intersection of CMC 1824 & CMC 1837

REMOVAL OF STRUCTURE, DOUBLE 14'x14'x72' PRECAST RC BOX CULVERT,
GRADING, AGGREGATE SURFACE & INCIDENTALS
STRUCTURE NO. 18-142-25.0



STATE OF NORTH DAKOTA



Section 2 / 11, T150N, R50W

GOVERNING SPECIFICATIONS:

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

DESCRIPTION	NET MILES	GROSS MILES
	NET MILES	
BRO-0018 (035)	0.189	0.189

Surveyed Date:	April, 2017
Designed Date:	August, 2017
PS&E Corrections Made:	August, 2017

DESIGNERS

MARK LAMBRECHT, PE, PLS

BRIAN GADDIE, PE

REBECCA MASZK

GRAND FORKS COUNTY

APPROVED DATE 09/01/2017

Nicholas J. West /S/
Nicholas J. West
PE - 5961
County Engineer

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

APPROVED DATE 09/01/2017

MARK A. LAMBRECHT /S/
ADVANCED ENGINEERING AND
ENVIRONMENTAL SERVICES, INC.
PE - 2511

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AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
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LIST OF STANDARD DRAWINGS

Standard No.	Description
D-101-1,2,3	NDDOT Abbreviations
D-101-10	NDDOT Utility Company and Organization Abbreviations
D-101-30, 31, 32	Symbols
D-203-8	Standard Rural Approaches
D-255-2	Erosion and Siltation Control - Erosion Control Blanket Installation
D-260-1	Erosion and Siltation Controls - Silt Fence
D-261-1	Fiber Roll Placement Details
D-704-7	Breakaway Systems for Construction Zone Signs - Perforated Tube
D-704-8	Breakaway Systems For Construction Zone Signs - U Channel Post
D-704-9,10,11	Construction Sign Details
D-704-13	Barricade Details and Channelizing Details
D-704-14	Construction Sign and Barricade Assembly Details
D-704-15,21,22,23	Construction Sign and Barricade Location Details
D-708-6	Erosion and Siltation Controls - Median or Ditch Inlet Protection
D-714-4	Rounded Corrugated Steel Pipe Culverts and End Sections
D-714-22	Concrete Pipe, Cattle Pass, or Precast Concrete Box Culvert Ties

SPECIAL PROVISIONS

SP No.	Description
SP 0003(14)	TEMPORARY EROSION AND SEDIMENT BEST MANAGEMENT PRACTICES
SP 0004(14)	FEDERAL MIGRATORY BIRD TREATY ACT
SP 527(14)	TEMPORARY WATER DIVERSION
SP 5173(14)	PERMITS AND ENVIRONMENTAL CONSIDERATIONS

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REV'D. Scale: None

BRO-0018 (035)
GRAND FORKS COUNTY, NORTH DAKOTA
Structure No. 18-142-25.0

TABLE OF CONTENTS & LIST OF STD DRAWINGS

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R. Maszk	M. Lambrecht	P13064-2017	August, 2017

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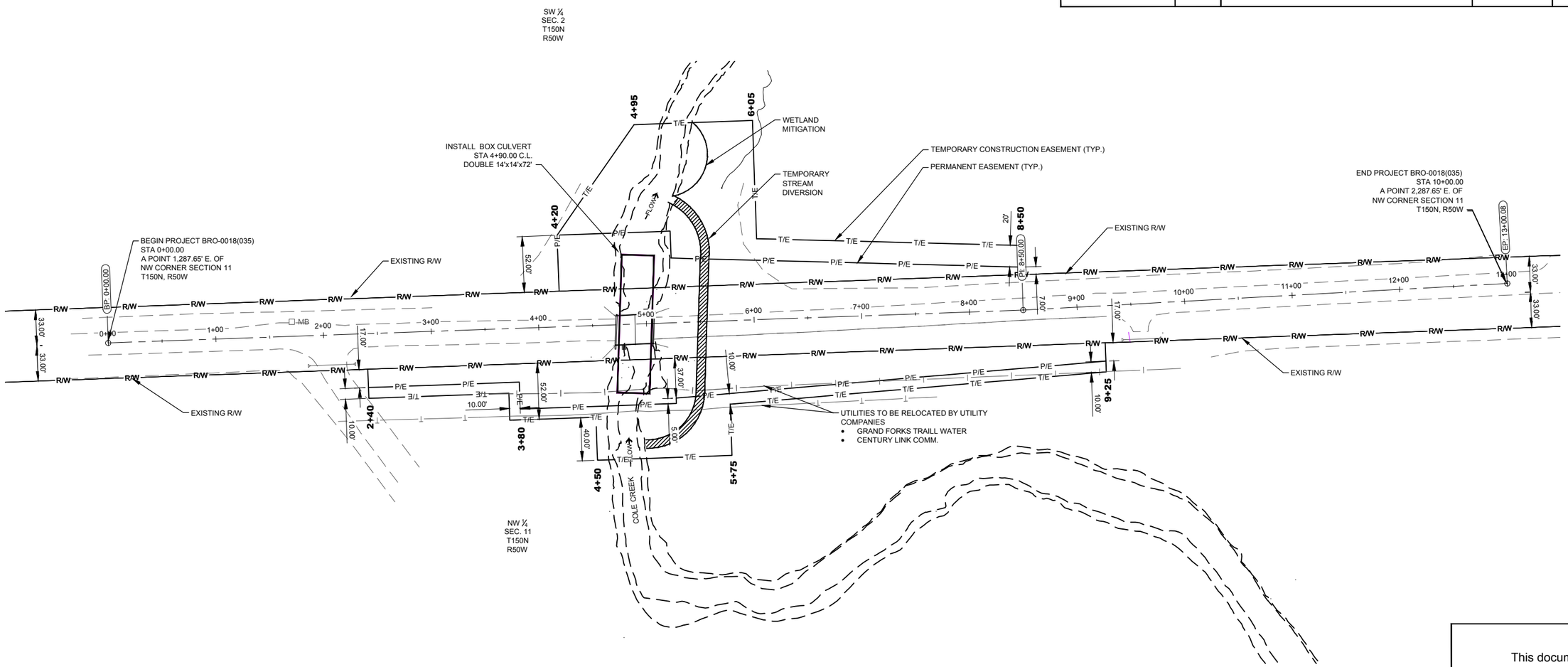

NORTH

0 50

Scale in Feet

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REV'D.

BRO-0018(035)
GRAND FORKS COUNTY, NORTH DAKOTA
Structure No. 18-142-25.0

SCOPE OF WORK

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
R. Maszk	M. Lambrecht	P13064-2017	AUGUST, 2017

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PLAN NOTES

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
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100-P01 UTILITIES: Utilities that the Engineer has been made aware of are shown on the plans. Other utilities may exist that are not shown. Underground utility locations are approximate. The actual locations and elevations are unknown. The Contractor shall be liable for any costs resulting from damage to utilities or pipelines.

Utility companies will move or adjust conflicting facilities that are not designated for relocation in the plan documents. Coordinate work with utility companies affected by the project.

Grand Forks Traill Water District will lower or relocate their rural water pipeline crossing of Cole Creek before June 1, 2018.

Century Link will lower or relocate their communications line crossing Cole Creek before June 1, 2018.

Nodak Electric power lines are not in conflict with the project.

100-P02 EROSION CONTROL: Bid items for erosion control, such as Silt Fence and Fiber Rolls are included for use in conjunction with the Contractor's SWPPP. These quantities may be revised or eliminated depending on the Contractor's operation. An estimated quantity has been set up for each item.

100-P03 PLAN SCALE: Plan sheets indicate a specific scale. Be aware that during reproduction operation, the plan sheets may have been distorted (reduced or increased) and may no longer scale properly at the indicated scale.

100-P04 CONSTRUCTION LIMITS: The Contractor's operation is limited to area within the temporary construction easement. Any damage or disturbance beyond easement or right-of-way lines shall be restored to existing conditions or better.

100-P05 SURVEY CONTROL: Horizontal survey control is North Dakota State Plane, North Zone. Vertical control is NAVD 1988 datum.

107-P01 HAUL ROADS: Contractor shall use the route consisting of County Road 6 to County Road 8 to 11th Ave. NE for all hauling of all Borrow, Aggregate, and Box Culvert materials to the project site. During Borrow and Aggregate material hauling operations, Contractor shall blade the haul roads as necessary to maintain driving surface in like condition to existing, a minimum of twice per day. Cost of haul road maintenance shall be included in unit bid price for “Borrow Excavation”.

Contractor shall also have a water truck available at all times of hauling for dust control. Payment for water for dust control shall be at unit bid price for “Water”.

108-P01 CONTRACT COMPLETION: All work on the project shall be completed within 30 calendar days after commencement of work on-site, or by the Contract Completion Date, whichever is earlier.

203-010 SHRINKAGE: 30 Percent additional volume is included for shrinkage in earth embankment.

203-385 AVERAGE HAUL: No average haul has been computed for this project.

203-P01 BORROW EXCAVATION: The Contractor shall be responsible for obtaining areas to provide suitable Borrow material, and shall bear all costs for obtaining, opening, and restoring the site. The bid price for “Borrow Excavation” includes all royalties, utility and fence adjustments, environmental and cultural clearances, erosion control measures, site restoration, and all other costs associated with obtaining, transporting, and placing Borrow material. Borrow material shall be Class 3 aggregate or soil materials of Unified Soil Classification System (USCS) classes GW, GP, GC, SW, SP, SC, CL, or CH. Liquid limit of CL or CH soils shall be less than 60. Where specifically indicated on drawings as "Clay Cap", use Class CL or CH soil.

203-P02 COMPACTION CONTROL: Construct all embankment with Compaction Control, Type B, except backfill of Temporary Stream Diversion beneath roadway, which shall be Type A Compaction Control as specified in Section 203.04 E.2.b., ND T 99.

203-P03 BENCHING ON WIDENING SECTIONS: Bench all inslopes, regardless of rate of slope, unless otherwise directed by the Engineer. Bench deep enough to provide sufficient width to permit placing, spreading, and compacting equipment to operate. Compact each bench thoroughly before placing additional embankment. Include costs for benching in the bid price for earthwork items.

203-P04 TOPSOIL: The quantity of topsoil to be removed, salvaged, and respread is based on an assumed topsoil depth of 6 inches in both wetland and upland areas. Additional wetland topsoil may be conserved for replacement from Common Excavation or Box Culvert Excavation in wetland areas. Make arrangements for topsoil storage areas if sufficient room is not available within the right of way and temporary easements. Respread topsoil evenly over the areas to be seeded. The bid item “Topsoil” includes all labor, material, and equipment associated with stripping, stockpiling, and respreading existing topsoil.

251-P01 SEEDING: All disturbed areas within the right of way and temporary easements shall receive “Seeding, Class II”, except wetland areas which shall receive “Wetland Seed Mix”.

Seed Temporary Cover Crop with Class II seed.

704-P01 MAINTAINING ACCESS: The Contractor is responsible for providing access to residential and field approaches at all times.

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REV'D. Scale: 1" = 20' Hor.

BRO-0018 (035)
GRAND FORKS COUNTY, NORTH DAKOTA
Structure No. 18-142-25.0

PLAN NOTES

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
R. Maszk	M. Lambrecht	P13064-2017	August, 2017

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	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
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ENVIRONMENTAL COMMITMENTS

- Grand Forks 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.

  Action taken/required: Permanent impacts to natural jurisdictional wetlands require mitigation. 0.05 acres of Wetland Impacts will be mitigated onsite at Wetland 1 at a 1:1 ratio. Refer to sheet 6-3 for Wetland Impact Table.

- **Commitment No. 2:** The Contractor shall prevent the introduction of aquatic nuisance species (ANS) into North Dakota waters, or transport of aquatic vegetation to or from any waters of the state, or transport of any aquatic vegetation into the state.

  Action taken/required: The Contractor shall follow the North Dakota Game and Fish Department's (NDGF) Administrative Rules 30-3-06 for compliance with ND Century Code Chapter 20.1-17 on ANS. The Contractor shall notify NDGF at least 72 hours prior to the placement in or on the waters of the State of North Dakota any vehicles, vessels, pumps, and equipment that will be used in the project, to allow the NDGF sufficient time to inspect any and all such equipment for ANS. The NDGF ANS Biologist, Jessica Howell, shall be contacted by phone at (701)368-8368 for equipment inspection and any additional information regarding ANS prevention protocol.

- **Commitment No. 3:** The Contractor shall take steps to prevent construction debris from falling into the waterway.

  Action taken/required: The Contractor will minimize debris falling into the waterway to the maximum extent practicable. Any debris that falls into the waterway will be retrieved.

- **Commitment No. 4:** The structure shall not act a a barrier to the movement of fish and other aquatic organisms in the stream channel under any flow conditions.

  Action taken/required: The box culvert and associated rip rap will be sunk approximately one foot below the existing grade of the stream bed, as shown in the plans.

- **Commitment No. 5:** Any disturbed streambeds, banks, or areas associated with the proposed project activities will be restored with a native grass mixture.

  Action taken/required: Contractor shall use the specified native grass mixture for restoration.

- **Commitment No. 6:** Construction activities will not occur in the water body between April 15 and June 1 in order to protect the fisheries resource.

  Action taken/required: Contractor shall not conduct any construction work within the Cole Creek channel during the period specified.

- **Commitment No. 7:** Hazardous materials, including lead based paint, may be present on the steel girders of the bridge.

  Action taken/required: Contractor shall carefully remove steel components without release of paint materials. The salvaged steel shall become the property of Grand Forks County for disposal or recycling. Handling and disposal of hazardous materials shall be performed in conformance with requirements of the North Dakota Department of Health and North Dakota Department of Transportation specifications.

- **Commitment No. 8:** Extra care will be taken to prevent siltation, spills or fugitive dust from leaving the project site and entering the water body.

  Action: The Contractor shall obtain a Construction Stormwater (NPDES) permit from the North Dakota Department of Health and identify, install, and maintain appropriate best management practices to prevent pollutants from leaving the site and discharging to Cole Creek.

The following environmental permits will be required for this project:

- United States Army Corps of Engineers - Section 404 Permit (Will be obtained by Owner)

- North Dakota Department of Health - NPDES Permit (Construction Stormwater, to be obtained by Contractor) The Owner shall be listed as Grand Forks County.

- Walle Township - Floodplain Development Permit (Has been obtained by Owner)

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REV'D. Scale: None

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GRAND FORKS COUNTY, NORTH DAKOTA
Structure No. 18-142-25.0

ENVIRONMENTAL COMMITMENTS

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	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
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SUMMARY OF QUANTITIES

SPEC	CODE	Item	Quantity	Unit
103	0100	Contract Bond	1	LSUM
201	0330	Clearing & Grubbing	1	LSUM
202	0105	Removal of Structure	1	LSUM
203	0102	Common Excavation-Type B	1,159	CY
203	0109	Topsoil	1,474	CY
203	0140	Borrow Excavation	13,668	CY
210	0050	Box Culvert Excavation	1	EA
210	0210	Foundation Fill	1,080	CY
210	0405	Foundation Preparation - Box Culvert	1	EA
216	0100	Water	220	MGAL
251	0200	Seeding - Cl II	2.0	ACRE
251	1000	Wetland Seed	0.1	ACRE
251	2000	Temporary Cover Crop	2.1	ACRE
251	3000	Fertilizer	2.1	ACRE
253	0201	Hydraulic Mulch	1.9	ACRE
253	0300	Bonded Fiber Matrix	790	SY
255	0102	ECB, TYPE 2	420	SY
256	0100	Riprap Grade I	40	CY
256	0200	Riprap Grade II	140	CY
256	0701	Remove and Replace Riprap	190	CY
260	0100	Silt Fence Unsupported	245	LF
260	0101	Remove Silt Fence Unsupported	245	LF
261	0112	Fiber Rolls 12 in	665	LF
261	0113	Remove Fiber Roll 12 in	665	LF
302	0356	Aggregate Surface Course Cl 13	2,100	TON
606	3414	DBL 14FT X 14FT Precast RCB Culvert	72	LF
606	7414	DBL 14FT X 14FT Precast RCB End Sect	2	EA
702	0100	Mobilization	1	LSUM
704	0100	Flagging	20	MHR
704	1000	Traffic Control Signs	850	Unit
704	1052	Type III Barricade	10	EA
709	0151	Geosynthetic Material Type R1	1,030	SY
709	0155	Geosynthetic Material Type RR	820	SY
714	5015	Pipe Corr Steel .064 IN 18 IN	50	LF
714	5810	End Sect. Corr Steel .064 IN 18 IN	2	EA
766	0120	Reset Mailbox	1	EA
900	1000	Temporary Stream Diversion	1	EA

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GRAND FORKS COUNTY, NORTH DAKOTA
Structure No. 18-142-25.0

SUMMARY OF QUANTITIES

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BASIS OF ESTIMATE

Common Excavation (CY):

Quantities are based on the lines and grades as shown on the cross sections. Excavation quantities are in-place volume and calculated by average end area method. Common Excavation includes 510 CY of excavation in Wetland Mitigation area. Common Excavation shall be a plan quantity pay item and no separate measurement will be made.

Topsoil (CY):

The bid quantity for Topsoil includes stripping of 6 inches of topsoil from all disturbed areas except road surface. Topsoil shall be spread uniformly over all finished areas. The bid quantity includes 87 CY for stripping and replacement in wetland mitigation area. Topsoil shall be a plan quantity pay item and no separate measurement will be made.

Borrow Excavation (CY):

Borrow Excavation shall be Contractor Furnished Borrow. Quantity shall be determined from initial and final measurements of the borrow area as described in 203.05.B. Plan quantity is determined as embankment quantity from cross sections plus 30 percent shrinkage, less on-site excavation.

Water:

50 M Gal for Dust Palliative
40 Gal/CY for Aggregate Surface
40 Gal/CY for Foundation Fill
10 Gal/CY for Embankment

Aggregate Surface Course CL 13 (CY):

Aggregate Surface of New Construction	
-6" Depth, 20' Top Width, 2' Sloughs @ 1.875 Tons/CY	4,033 Tons/Mile
Field Approach	10 Tons Each
Haul Road Restoration	
-1" Depth, 24' Width @ 1.875 Tons/CY	733 Tons/Mile

Rip Rap - Loose Rock (CY) :

Quantity is based on length and width as shown on the plans. Depth shall be 1'-6" or 2 feet as shown on drawings. Quantity is based on CY in place.

Flagging (MHR):

An estimate of 20 MHR of flagging has been provided in the quantities to be used when authorized by Engineer.

EARTHWORK SUMMARY

EXCAVATION QUANTITIES

COMMON EXCAVATION - TYPE B (PLAN QUANTITY PAY ITEM)	1,159 CY
TOPSOIL REMOVAL (6-INCH THICKNESS) (PLAN QUANTITY PAY ITEM)	1,474 CY
TOTAL EXCAVATION	2,633 CY

FILL QUANTITIES

EMBANKMENT	11,405 CY
SHRINKAGE (30% OF EMBANKMENT)	3,422 CY
TOPSOIL REPLACEMENT	1,474 CY
TOTAL FILL	16,301 CY

EXCAVATION SUMMARY

TOTAL EXCAVATION	2,633 CY
TOTAL FILL	16,301 CY
DIFFERENCE = BORROW EXCAVATION (PAY ITEM)	13,668 CY

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BASIS OF ESTIMATE

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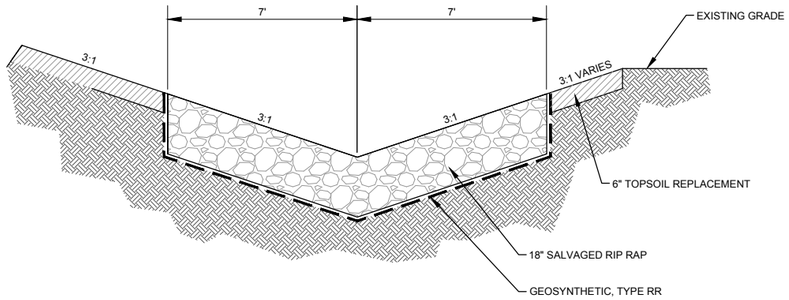
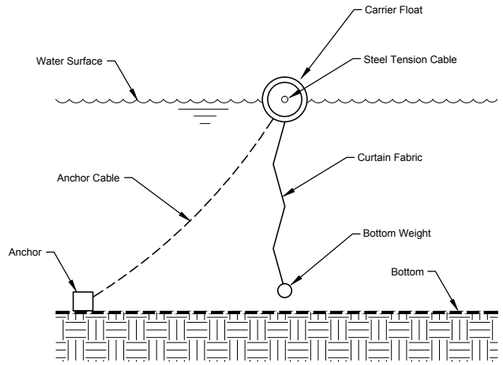
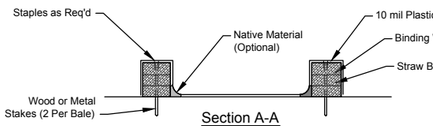


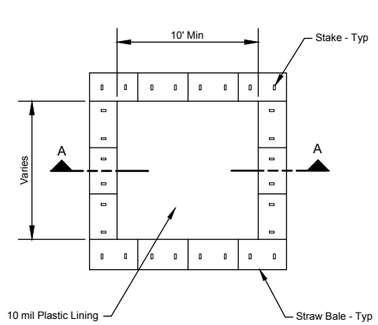
TYPICAL SECTION RIP RAP LINED DITCH
STA. 2+40 TO 4+80 RT. - REMOVE AND REPLACE RIP RAP
STA. 5+08 TO 5+60 RT. - RIP RAP GRADE I



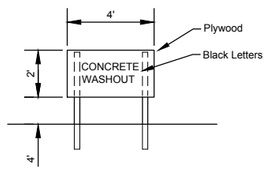
Detail - Flotation Silt Curtain



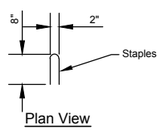
Section A-A



Plan View



Detail - Sign



Plan View

Detail - Concrete Washout

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DETAILS

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R. Maszk	M. Lambrecht	P13064-2017	August, 2017

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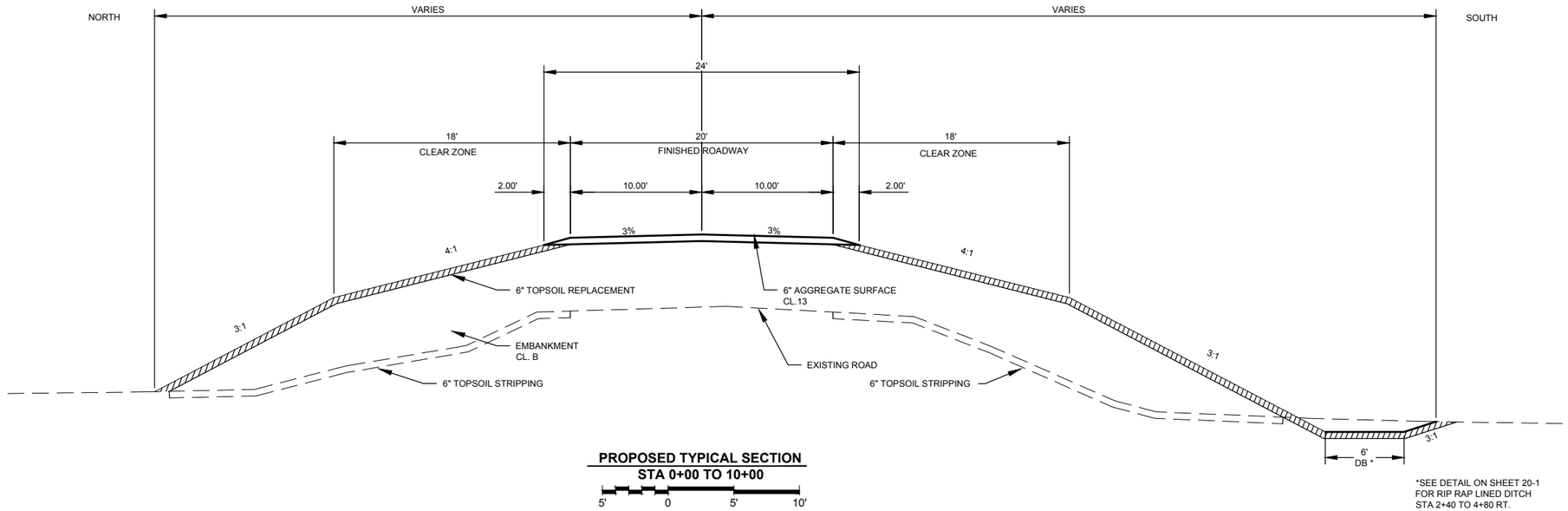
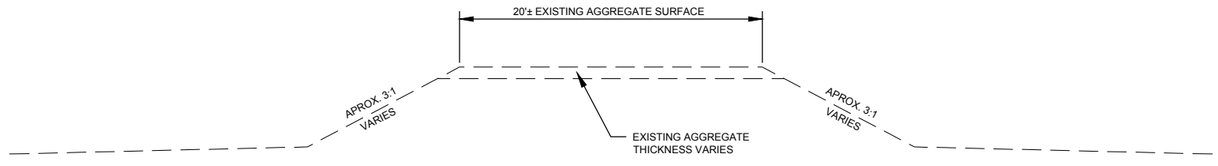


PROPOSED TYPICAL SECTION
STA 0+00 TO 10+00

5' 0 5' 10'

*SEE DETAIL ON SHEET 20-1
FOR RIP RAP LINED DITCH
STA 2+40 TO 4+80 RT.



EXISTING TYPICAL SECTION
STA 0+00 TO 10+00

5' 0 5' 10'

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REV'D.

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Structue No. 18-142-25.0

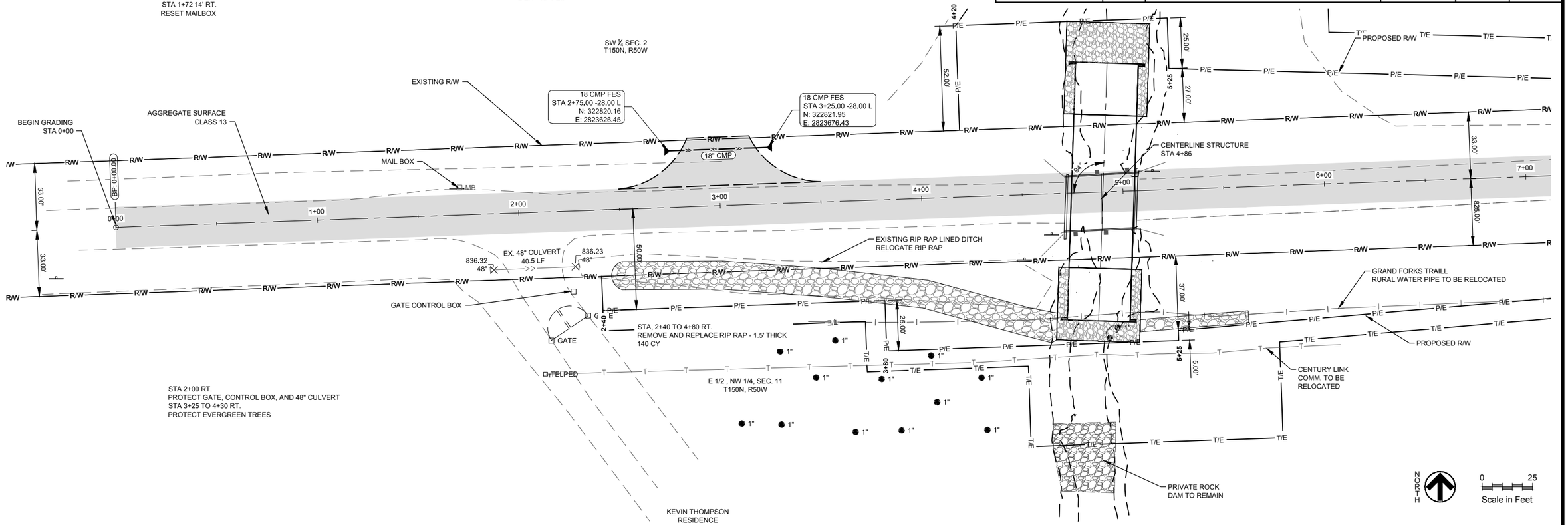
TYPICAL SECTIONS

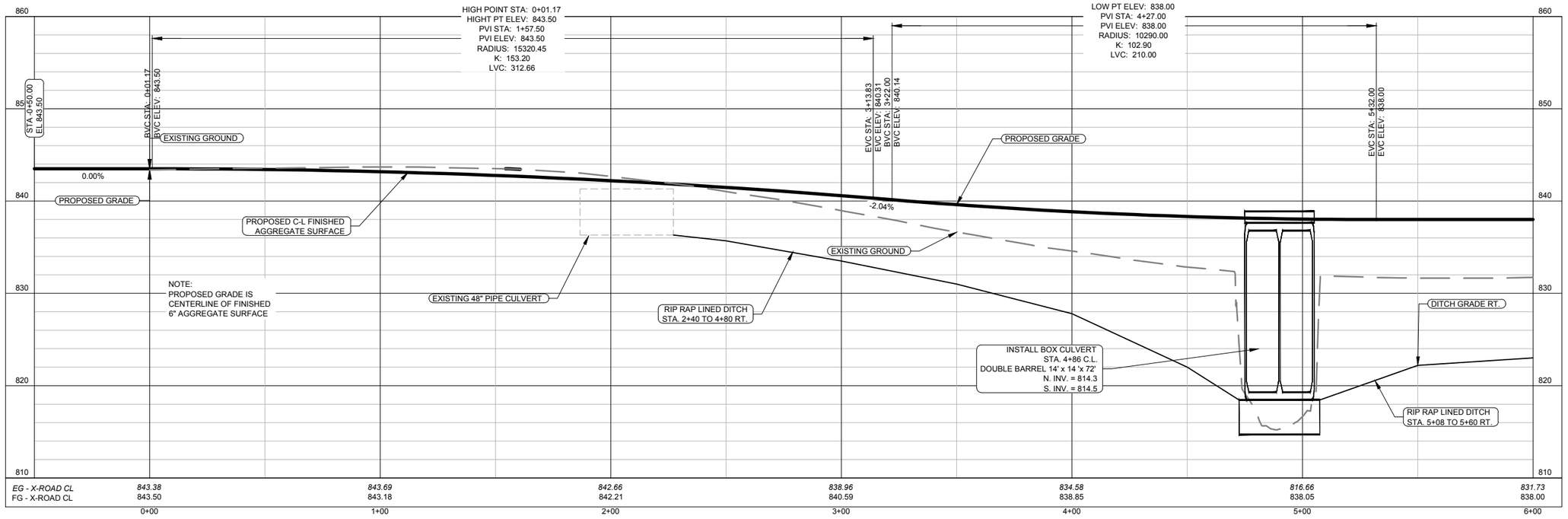
DRWN. BY	CHK'D BY	PROJECT NO.	DATE
R. Maszk	M. Lambrecht	P13064-2017	AUGUST, 2017

File: W:\GIGF County Highway Dept\13064-2017-000\CAD Dwgs\01-Civil\Plan Sheets\CS-DTL-Typical Section.dwg

AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0018(035)	21648	60	1



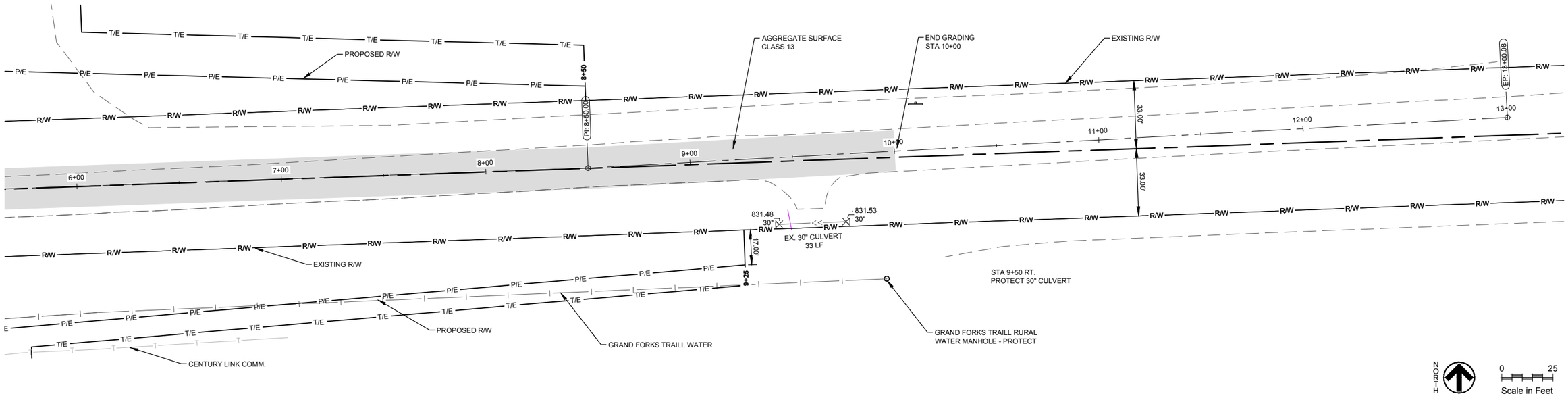


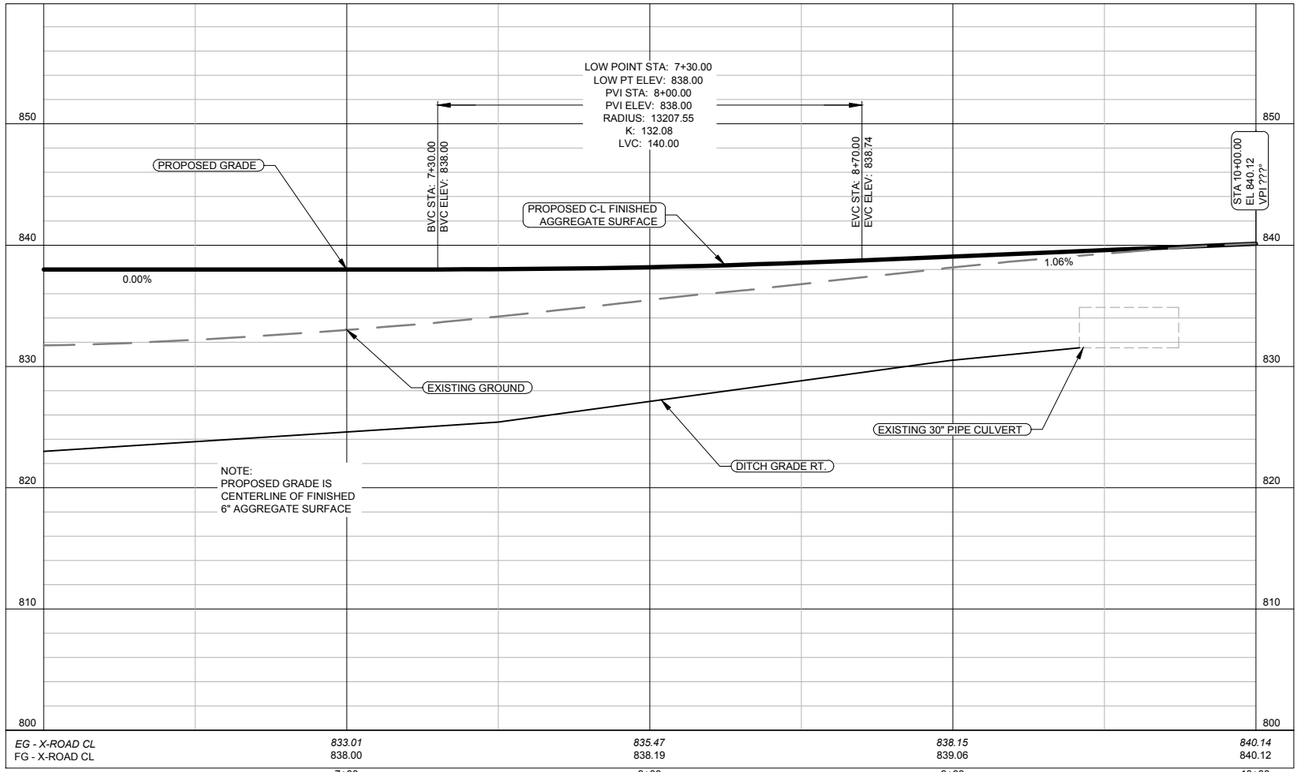
ROAD PLAN AND PROFILE

This document was originally issued and sealed by Mark A. Lambrecht Registration Number PE- 2511 on 09/01/17 and the original document is stored at the Grand Forks County Highway Department Grand Forks, North Dakota

File: W:\GJF County Highway Dept\13064-2017-000\CAD Dwgs\01-Civil\Plan Sheets\CS-ROAD-PLAN PROFILE.dwg

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0018(035)	21648	60	2





ROAD PLAN AND PROFILE

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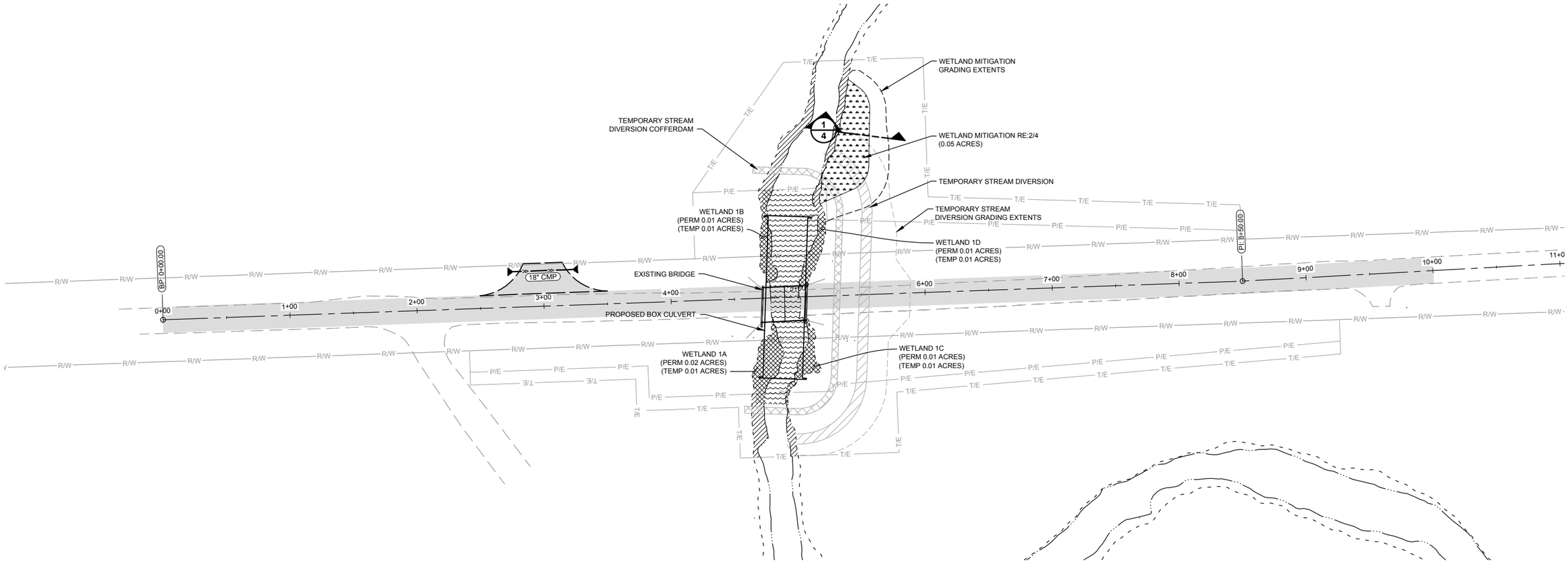
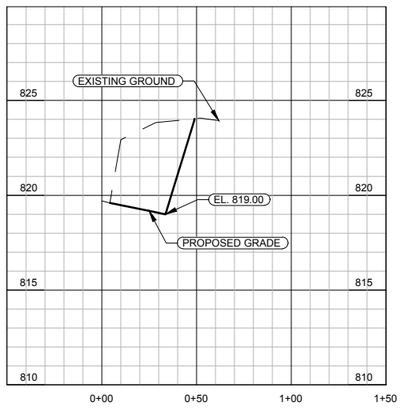
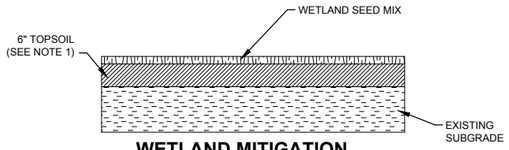
File: W:\GJGF County Highway Dept\13064-2017-000\CAD Dwgs\01-Civil\Plan Sheets\CS-ROAD-PLAN PROFILE.dwg

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0018(035)	21648	75	1





WETLAND MITIGATION X-SECTION
1 / 4
1" = 40' HORIZONTAL, 1" = 4' VERTICAL



WETLAND MITIGATION TYPICAL RESTORATION SECTION
2 / 4
NOT TO SCALE

NOTE:

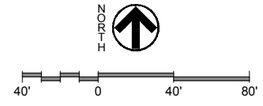
1. CONTRACTOR SHALL SALVAGE TOPSOIL FROM PERMANENT WETLAND IMPACT AREAS AND REUSE FOR WETLAND MITIGATION AREA.
2. TOPSOIL SHALL BE 6" DEPTH MINIMUM.

LEGEND

R/W	RIGHT-OF-WAY
P/E	PERMANENT EASEMENT
T/E	TEMPORARY EASEMENT
	DELINEATED WETLAND
	OWUS LIMITS
	TEMPORARY WETLAND IMPACTS
	PERMANENT WETLAND IMPACTS
	PERMANENT OWUS IMPACTS
	MITIGATED WETLAND

SUMMARY OF WETLAND MITIGATION QUANTITIES

ITEM	QUANTITY	UNIT
COMMON EXCAVATION - TYPE B	510	CY
TOPSOIL	87	CY



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REV'D.

BRO-0018(035)
GRAND FORKS COUNTY, NORTH DAKOTA
Structure No. 18-142-25.0

WETLAND IMPACTS AND MITIGATION

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
B. Gaddie	M. Lambrecht	P13064-2017	AUGUST, 2017

File: W:\G\GF County Highway Dept\13064-2017-000\CAD Dwgs\01-Civil\Plan Sheets\CS-SITE-WETLAND MITIGATION.dwg

AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0018(035)	21648	75	2

Wetland Impact Table

Wetland Number	Location	Type	Wetland Feature	USACE Jurisdictional Wetlands1	Wetland Impacts Acre(s)		USFWS Easement Impacts Acre(s)		Wetland Mitigation						
									Mitigation Required			Onsite			
					Temp.	Perm.	Temp.	Perm.	EO 11990	USACE	USFWS	Mitigation Location; Ratio	Acre(s)	Constructed Site #	Constructed Size Acre(s)
1a	Sec.11, T150N, R50W	Riverine	Natural	Yes	0.01	0.02	0.00	0.00	Y	N	N	Site 1; (1:1)	0.02	Site 1	0.02
1b	Sec. 2, T150N, R50W	Riverine	Natural	Yes	0.01	0.01	0.00	0.00	Y	N	N	Site 1; (1:1)	0.01	Site 1	0.01
1c	Sec.11, T150N, R50W	Riverine	Natural	Yes	0.01	0.01	0.00	0.00	Y	N	N	Site 1; (1:1)	0.01	Site 1	0.01
1d	Sec.2, T150N, R50W	Riverine	Natural	Yes	0.01	0.01	0.00	0.00	Y	N	N	Site 1; (1:1)	0.01	Site 1	0.01
				Totals	**0.04**	**0.05**							**0.05**		**0.05**

Other Waters Impact Table

Other Waters											Other Water Mitigation				
			Size				Impacts to Other Waters				Mitigation Required				
							Acre(s)		Linear Feet					Mitigation Location; ratio	Method
Number	Location	Type	Acre(s)	Linear Feet	Feature	USACE Jurisdictional1	Temp	Perm	Temp	Perm	EO 11990	USACE	USFWS		
OW 1	Sec.2 & 11, T150N, R50W	Tributary	0.11	208	Natural	Yes	0.02	0.09	40.00	168.00	N	N	N	NA	NA
		Totals	**0.11**	**208**			**0.02**	**0.09**	**40.00**	**168.00**					

1 A wetland Jurisdictional Determination was issued by the USACE on 7/11/2017; NWO-2017-0815-BIS.

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

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

Impact Summary Table

Permanent Impact Summary		Temporary Impacts and additional information	
Wetland Type	Total (Acres)	Wetland Type	Total (Acres/Lf)
Natural/JD	0.05	Temporary JD	0.04
Natural/Non-JD	0.00	Non-JD Temporary	0.00
Artificial/JD	0.00	Permanent JD > 0.10	0.00
Artificial /Non-JD	0.00	Permanent OW	0.09 ac/168 ft.
Total	**0.05**	Temporary OW	0.02 ac/40 ft.

Mitigation Summary Table

	Location	Onsite Acre(s)	11990 Bank Acre(s)	USACE/11990 Bank Acre(s)	USFWS Bank Acre(s)
USACE Only	Not Applicable				
EO 11990 Only	Onsite	0.05	0.00		
USACE/11990	Not Applicable				
USFWS	Not Applicable				
	Total	0.05	0	0	0

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REV'D. Scale: None

BRO-0018(035)
GRAND FORKS COUNTY, NORTH DAKOTA
Structure No. 18-142-25.0

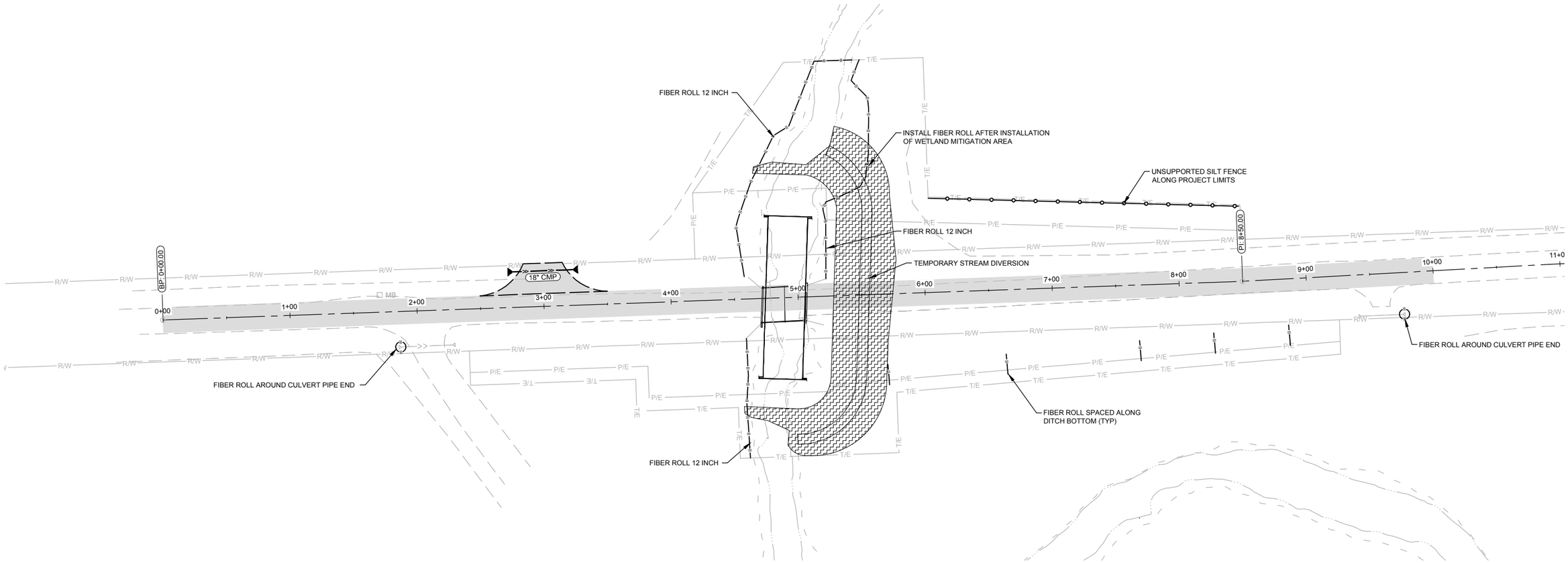
WETLAND IMPACT TABLE

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
R. Maszk	M. Lambrecht	P13064-2017	August, 2017

File: W:\G\GF County Highway Dept\13064-2017-000\CAD Dwgs\01-Civil\Plan Sheets\CS-DTL-DETAIL.dwg

AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0018(035)	21648	76	1



SUMMARY OF TEMPORARY EROSION CONTROL QUANTITIES

ITEM	QUANTITY	UNIT
SILT FENCE UNSUPPORTED	245	LF
REMOVE SILT FENCE UNSUPPORTED	245	LF
FIBER ROLLS 12 IN	665	LF
REMOVE FIBER ROLLS 12 IN	665	LF
TEMPORARY COVER CROP	2.1	ACRE

LEGEND

- SILT FENCE UNSUPPORTED
- FIBER ROLL 12 INCH
- FLOTATION SILT CURTAIN
- GEOSYNTHETIC MATERIAL TYPE R1
- DELINEATED OWUS
- DELINEATED WETLAND

NORTH

40' 0 40' 80'

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REV'D.

BRO-0018(035
GRAND FORKS COUNTY, NORTH DAKOTA
Structure No. 18-142-25.0

TEMPORARY EROSION CONTROL PLAN

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
R. Maszk	M. Lambrecht	P13064-2017	AUGUST, 2017

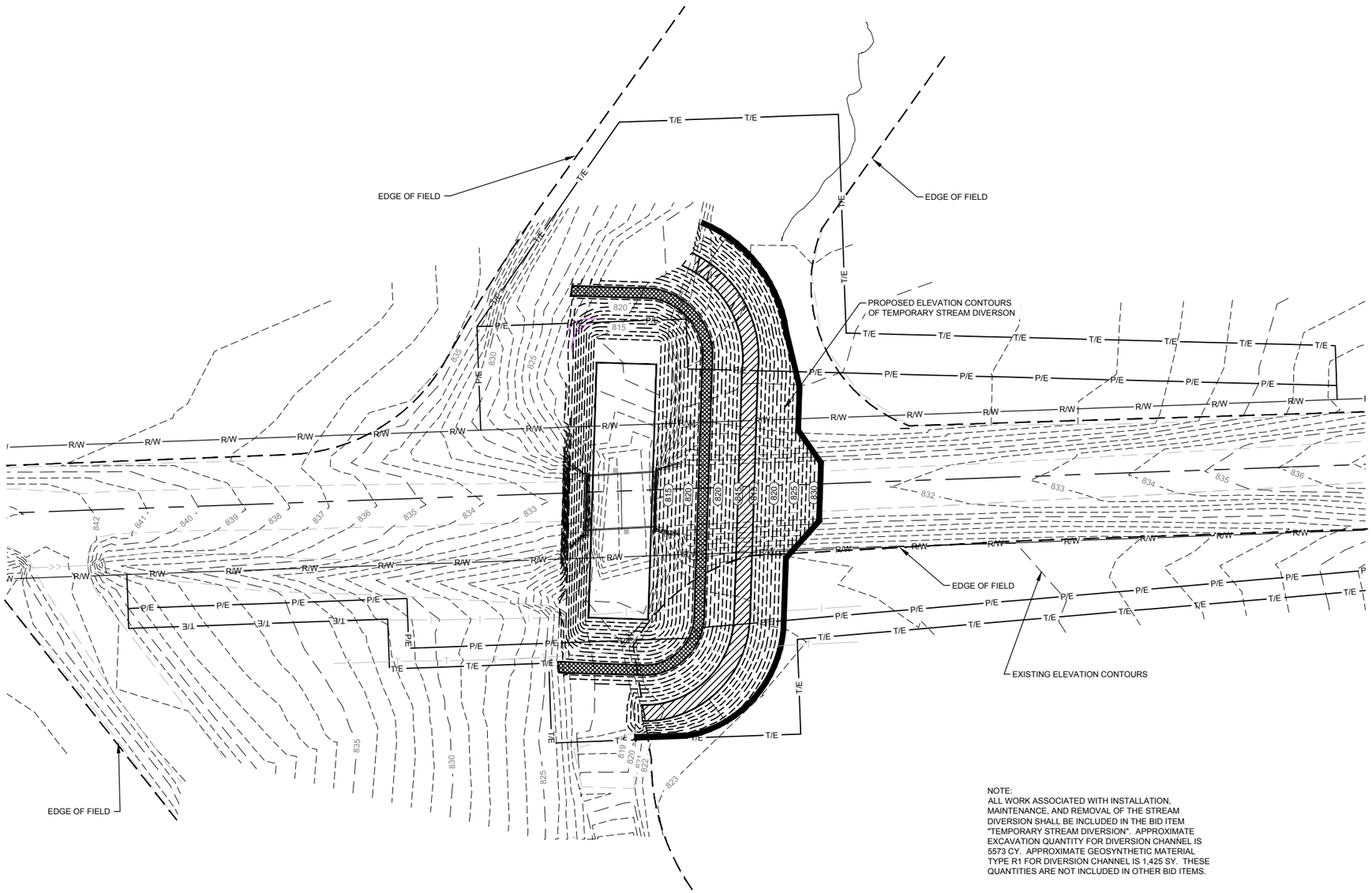
File: W:\G\GF County Highway Dept\13064-2017-000\CAD Dwgs\01-Civil\Plan Sheets\CS-SITE-SWPPP.dwg

AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

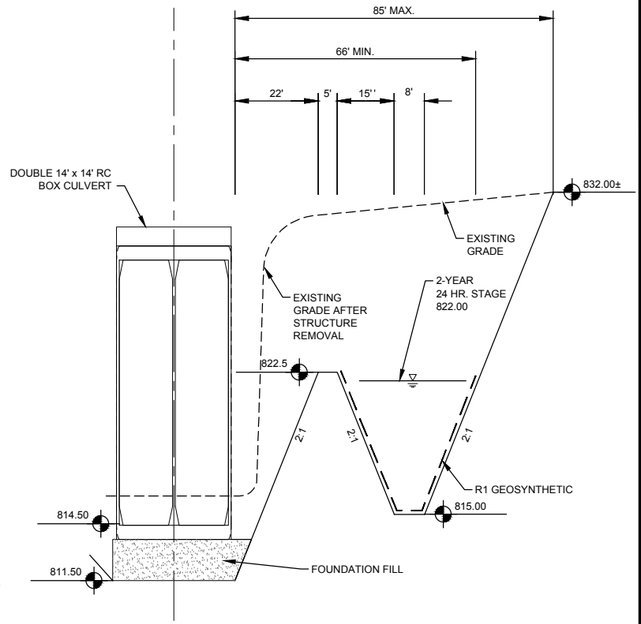
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0018(035)	21648	76	2

LEGEND

- DIVERSION CHANNEL BOTTOM
- TOP OF DIVERSION EMBANKMENT
- TOP OF DIVERSION CHANNEL SLOPE



TEMPORARY STREAM DIVERSION



TEMPORARY STREAM DIVERSION SECTION AT ROAD CENTERLINE

NOT TO SCALE

NOTE:
ALL WORK ASSOCIATED WITH INSTALLATION, MAINTENANCE, AND REMOVAL OF THE STREAM DIVERSION SHALL BE INCLUDED IN THE BID ITEM "TEMPORARY STREAM DIVERSION". APPROXIMATE EXCAVATION QUANTITY FOR DIVERSION CHANNEL IS 5573 CY. APPROXIMATE GEOSYNTHETIC MATERIAL TYPE R1 FOR DIVERSION CHANNEL IS 1,425 SY. THESE QUANTITIES ARE NOT INCLUDED IN OTHER BID ITEMS.

NORTH
0 30
Scale in Feet

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REV'D.

BRO-0018(035)
GRAND FORKS COUNTY, NORTH DAKOTA
Structure No. 18-142-25.0

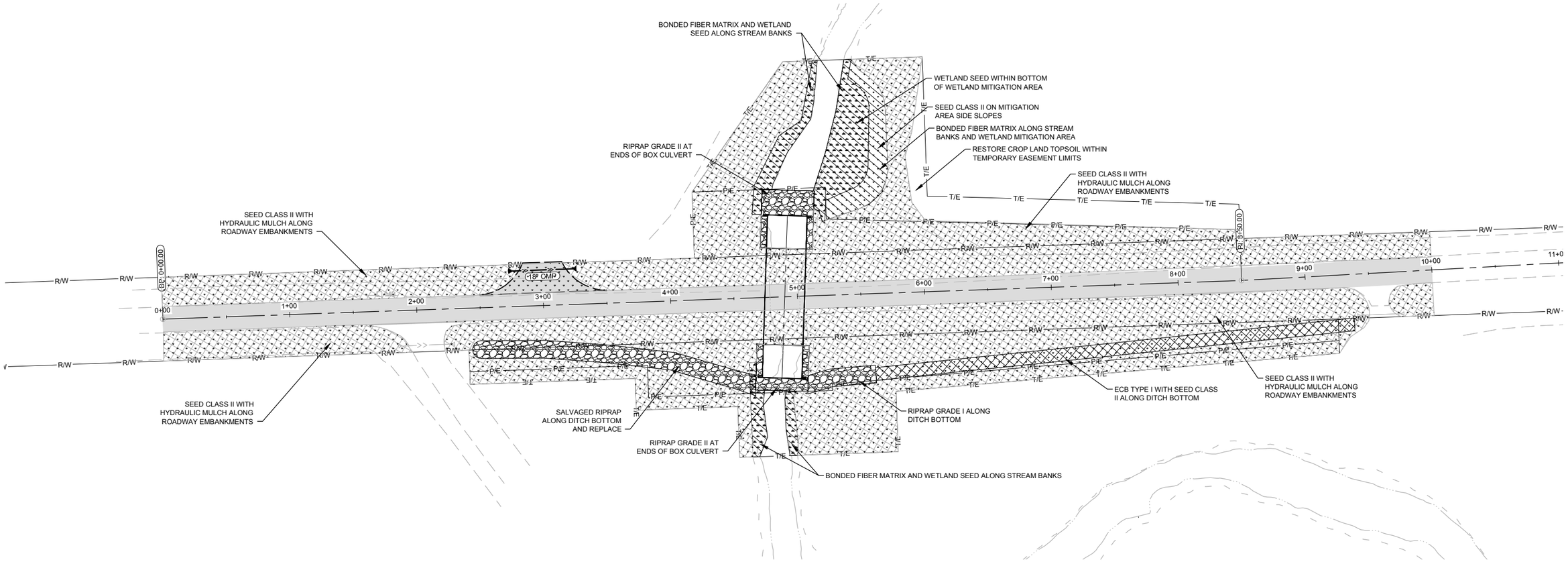
TEMPORARY STREAM DIVERSION

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
R. Maszk	M. Lambrecht	P13064-2017	August, 2017

File: W:\GGF County Highway Dept\13064-2017-000\CAD Dwgs\01-Civil\Plan Sheets\CS-SITE-STREAM DIVERSION.dwg

AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0018(035)	21648	77	1



SUMMARY OF PERMANENT EROSION CONTROL QUANTITIES

ITEM	QUANTITY	UNIT
SEEDING - CLASS II	2.0	AC
WETLAND SEED	0.1	AC
FERTILIZER	2.1	AC
HYDRAULIC MULCH	1.9	AC
BONDED FIBER MATRIX	790	SY
EROSION CONTROL BLANKET - TYPE 2	420	SY
RIPRAP, GRADE I	40	CY
REMOVE AND REPLACE RIPRAP	190	CY
GEOSYNTHETIC TYPE RR	530	SY

LEGEND

- SEEDING - CLASS II
- SEEDING - WETLAND
- RIPRAP - GRADE I
- HYDRAULIC MULCH
- BONDED FIBER MATRIX
- EROSION CONTROL BLANKET - TYPE 2

NORTH

40' 0 40' 80'

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REV'D.

BRO-0018(035)
GRAND FORKS COUTNY, NORTH DAKOTA
Structure No. 18-142-25.0

PERMANENT EROSION CONTROL PLAN

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
R. Maszk	M. Lambrecht	P13064-2017	AUGUST, 2017

File: W:\G\GF County Highway Dept\13064-2017-000\CAD Dwgs\01-Civil\Plan Sheets\CS-SITE-SWPPP.dwg

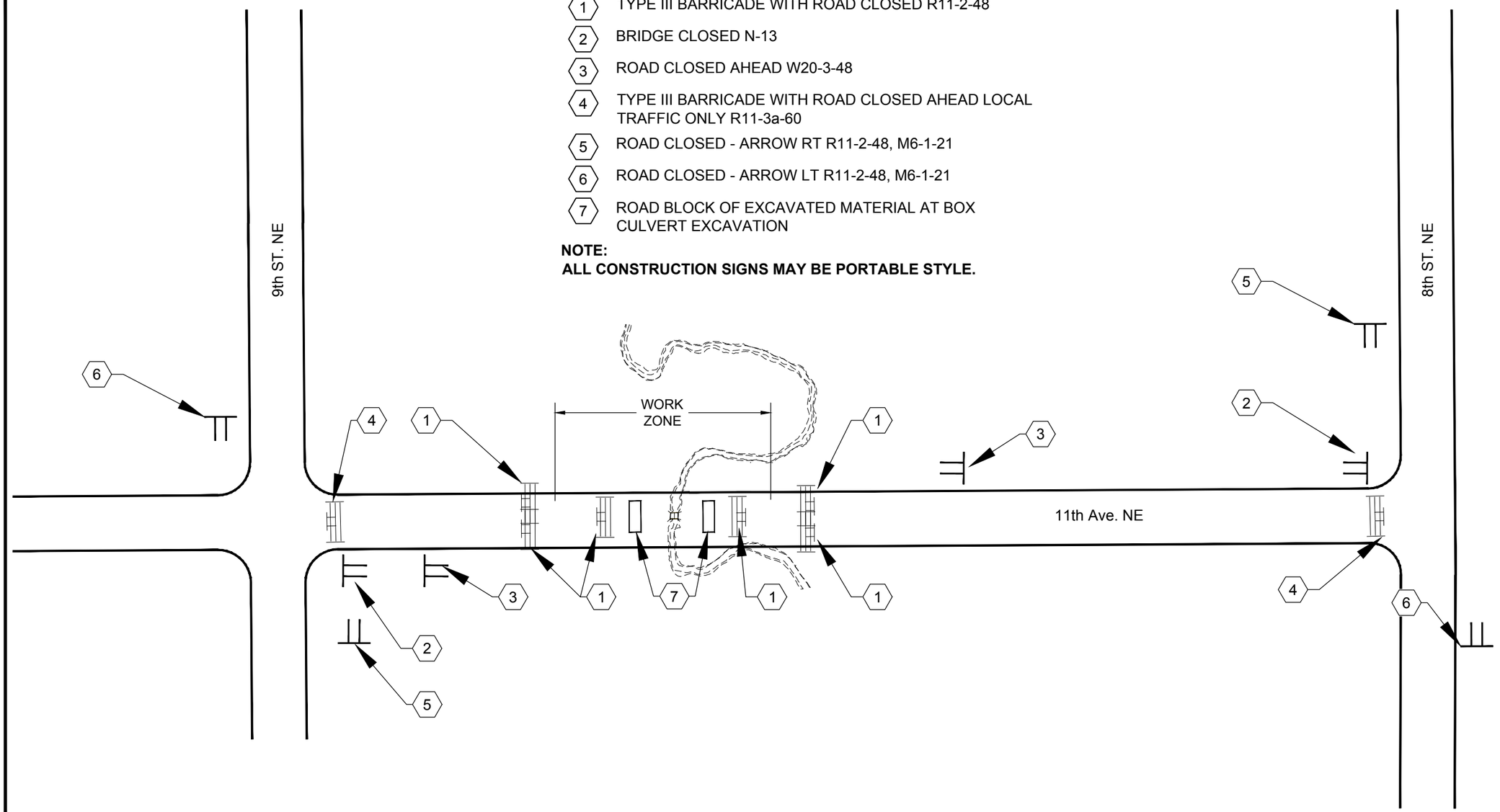
AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

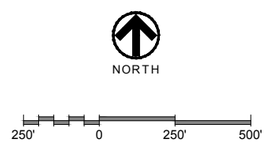
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0018(035)	19970	100	1

CONSTRUCTION SIGNS

1. TYPE III BARRICADE WITH ROAD CLOSED R11-2-48
2. BRIDGE CLOSED N-13
3. ROAD CLOSED AHEAD W20-3-48
4. TYPE III BARRICADE WITH ROAD CLOSED AHEAD LOCAL TRAFFIC ONLY R11-3a-60
5. ROAD CLOSED - ARROW RT R11-2-48, M6-1-21
6. ROAD CLOSED - ARROW LT R11-2-48, M6-1-21
7. ROAD BLOCK OF EXCAVATED MATERIAL AT BOX CULVERT EXCAVATION

NOTE:
ALL CONSTRUCTION SIGNS MAY BE PORTABLE STYLE.





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REV'D.

BRO-0018(035)
GRAND FORKS COUNTY, NORTH DAKOTA
Structure No. 18-142-25.0

CONSTRUCTION SIGN LAYOUT

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
R. Maszk	M. Lambrecht	P13064-2017	April, 2013

File: W:\GIGF County Highway Dept\13064-2017-000\CAD Dwgs\00-General\Plan Sheets\GI-CVR-COVER_SHEET.dwg

AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0018(035)	19970	100	2

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		19	
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		37	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW		30	
G20-55-96	96"x48"	SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT		59	
M1-1-36	36"x36"	ROUTE MARKER (Post and installation only)		10	
M1-4-24	24"x24"	ROUTE MARKER (Post and installation only)		10	
M1-5-24	24"x24'	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)	4	7	28
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	2	32	64
R1-1a-18	18"x18"	STOP and SLOW PADDLE Back to Back	2	5	10
R1-2-60	60"x60"	YIELD		29	
R2-1-48	48"x60"	SPEED LIMIT __45MPH		39	
R2-1-48	48"x60"	SPEED LIMIT __20MPH		39	
R2-1a-24	24"x18"	MINIMUM FEE $80 (Mounted on Speed Limit post)		10	
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	10	28	280
R11-2a-48	48"x30"	STREET CLOSED		28	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY	2	31	62
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		35	
W1-4b-48	48"x48"	DOUBLE RIGHT or LEFT REVERSE CURVE ARROW		35	
W1-6-48	48"x24"	LARGE ARROW		26	
W3-1a-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	2	35	70
W3-5-48	48"x48"	SPEED REDUCTION AHEAD		35	
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 STIPE		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)		11	
W13-4-48	48"x60"	RAMP ARROW		39	
W14-3-64	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	2	35	70
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	2	35	70
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"	MEN WORKING 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	

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
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		35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK		35	
	24"x24"	TAKE TURNS (6" D letters)(Mounted on stop sign post)		11	
N-13	48"x30"	BRIDGE CLOSED	2	28	56

SPECIAL SIGNS

M6-1-21	24"X24"	ROUTE MARKER (Post and installation only)			

SPEC & CODE

704-100	TRAFFIC CONTROL SIGNS	TOTAL UNITS	850

SPEC & CODE	Description		UNIT	QUANTITY
704-0100	FLAGGING		MHR	20
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	10
704-1060	DELINEATOR DRUMS		EACH	
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	
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 ME 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	

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REV'D.

BRO-0018(035)
GRAND FORKS COUNTY, NORTH DAKOTA
Structure No. 18-142-25.0

AE2S

TRAFFIC CONTROL DEVICES LIST

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
R. Maszk	M. Lambrecht	P13064-2017	April, 2013

File: W:\G\GF County Highway Dept\13064-2017-000\CAD Dwgs\00-General\Plan Sheets\GI-CVR-COVER_SHEET.dwg

AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-6-986(110)114	19970	170	1

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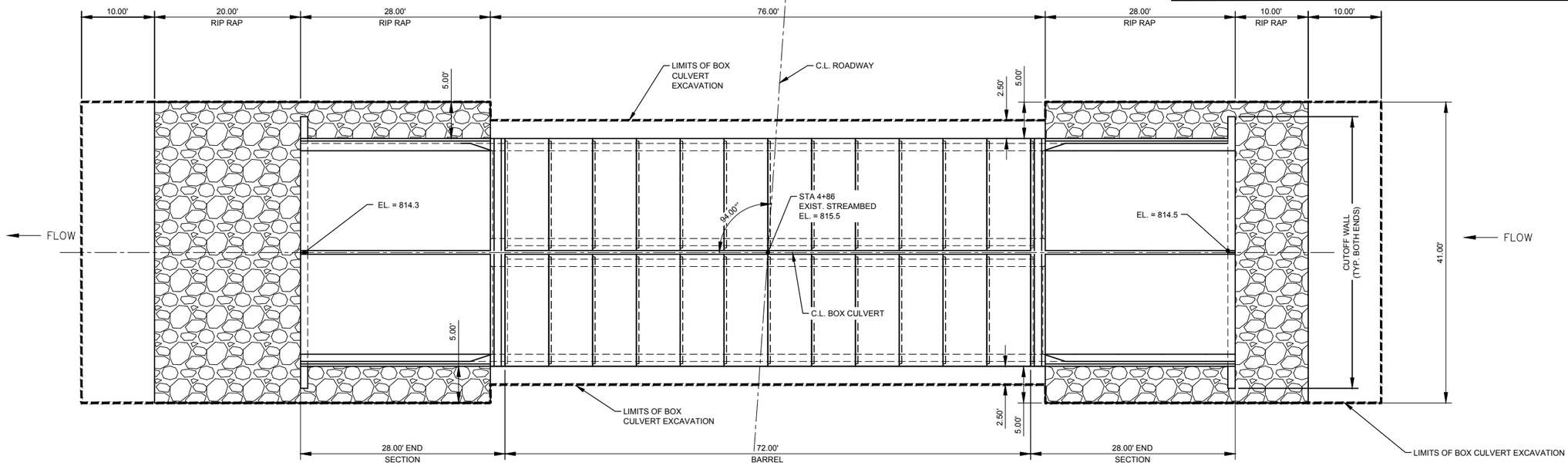
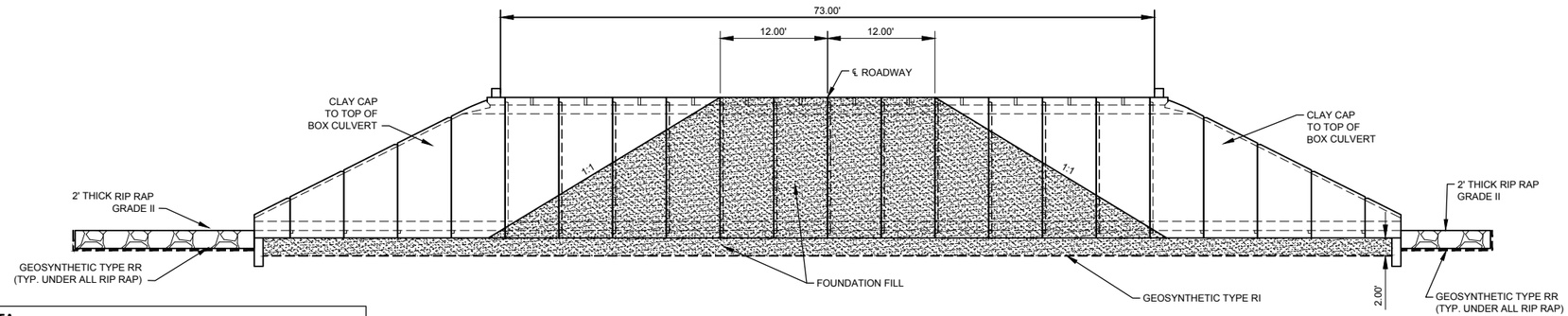
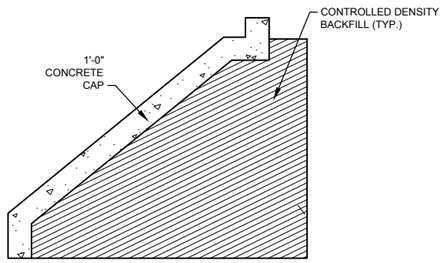


PLAN VIEW

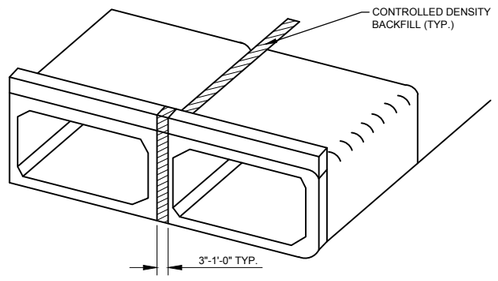


ELEVATION VIEW

HYDRAULIC DATA		
Drainage Area		**151 Sq. Mi.**
Stream Gradient		**0.0009 Ft./Ft.**
Design Frequency		**15-Year**
Design Discharge		**1,800 C.F.S**
Design Headwater Stage		**826.4 Ft.**
Design Tailwater Stage		**825.25 Ft.**
Velocity Through Culvert		**5.4 F.P.S.**
Average Velocity of Flow in Natural Channel (15-Year)		**4.0 F.P.S.**
100-year Frequency Discharge		**3710 C.F.S.**
100-year Frequency Headwater		**829.9 Ft.**
Overtopping Stage	*	**838.0 Ft.**
Overtopping Discharge	*	**OVER 100-YEAR EVENT**
Structure Selection		**Double 14' X 14'X 72' RCB**
Upstream Invert: 814.50 **Downstream Invert: 814.30**		
Notes: The structure invert elevations shown represent an elevation one foot below existing structure streambed.		
*Overtopping Stage is approx. 100 Year Stage of Red River Backwater.		



NOTE:
THE INTENT OF THIS DRAWING TO SHOW ONLY THE PLACEMENT OF THE CONTROLLED DENSITY BACKFILL BETWEEN ADJACENT BARRELS.



MULTIPLE CELL INSTALLATION

STRUCTURAL QUANTITIES ONLY

SPEC	CODE	Item	Quantity	Unit
202	0105	Removal of Structure	1	LSUM
210	0050	Box Culvert Excavation	1	EA
210	0210	Foundation Fill	1,080	CY
210	0405	Foundation Preparation - Box Culvert	1	EA
256	0200	Riprap, Grade II	140	CY
606	3414	DBL 14FT X 14FT Precast RCB Culvert	72	LF
606	7414	DBL 14FT X 14FT Precast RCB End Sect	2	EA
709	0151	Geosynthetic Material Type R1	1,030	SY
709	0155	Geosynthetic Material Type RR	290	SY

REV'D.

BRO-0018(035)
GRAND FORKS COUNTY, NORTH DAKOTA
Structure No. 18-142-25.0

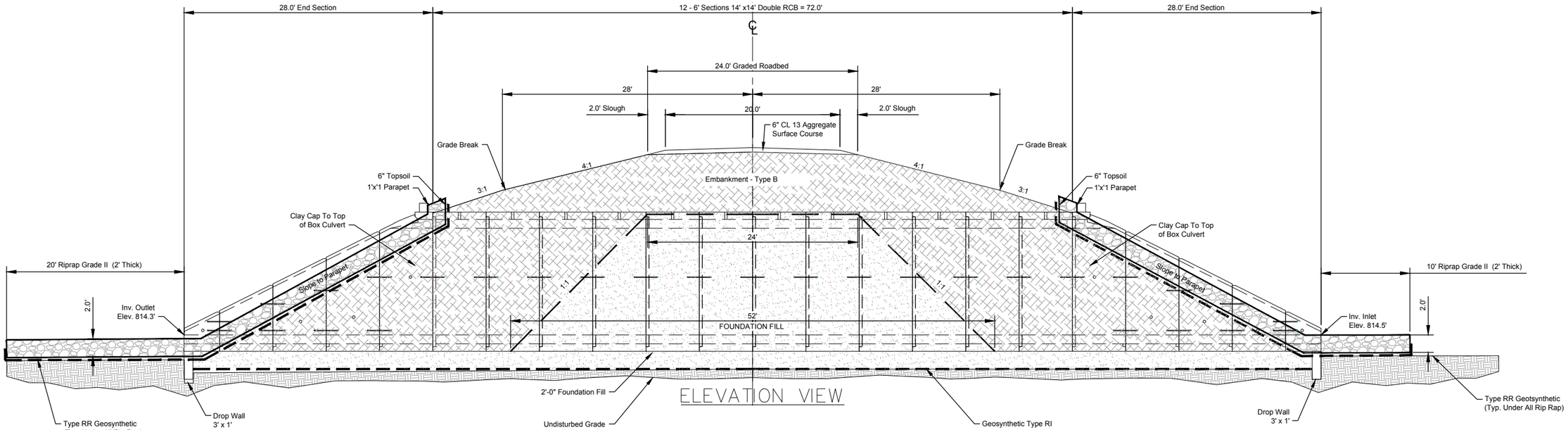
BOX CULVERT LAYOUT

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
R. Maszk	M. Lambrecht	P13064-2017	August, 2017

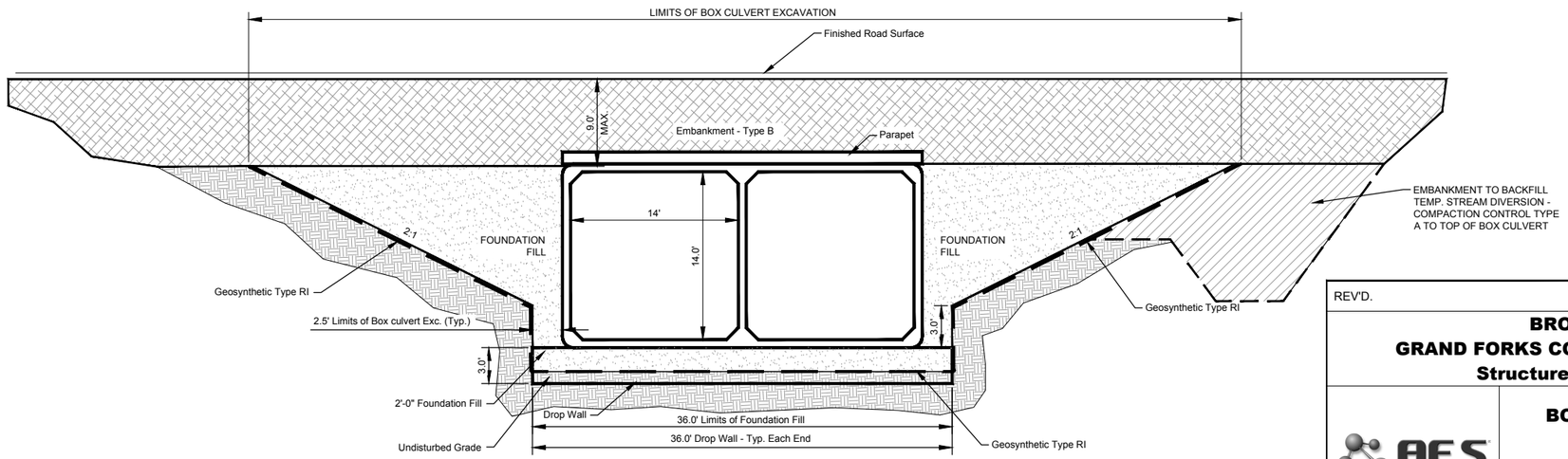
File: W:\G\GF County Highway Dept\13064-2017-000\CAD Dwgs\01-Civil\Plan Sheets\CS-DTL- HANCOCK culvert 14x14 detail.dwg

AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-6-986(110)114	19970	170	2



SECTION VIEW - 14' X 14' DOUBLE RCB



SECTION VIEW - 14' X 14' DOUBLE RCB
12' RT. TO 12' LT. OF C.L. ROAD

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REV'D.

Scale: 1" = 20' Hor.

BRO-0018(035)
GRAND FORKS COUNTY, NORTH DAKOTA
Structure No. 18-142-25.0

BOX CULVERT EXCAVATION AND BACKFILL

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
R. Maszk	M. Lambrecht	P13064-2017	April, 2017

File: W:\G\GF County Highway Dept\13064-2017-000\CAD Dwgs\01-Civil\Plan Sheets\CS-DTL-Box Culvert Details.dwg

AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

STRUCTURAL NOTES

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-6-986(110)114	19970	170	3

100-P01 SCOPE OF WORK: Work at this site consists of removing an existing 37' long bridge and building a new double barrel 14' x 14'x 72' precast concrete box culvert.

105-P01 WORK DRAWINGS: Submit work drawings for the precast concrete box culvert and end sections to the Engineer of Record for review.

107-P01 HAZARDOUS MATERIALS: The existing structural steel is painted with lead-based paint. Remove and dispose of any loose and peeling paint found on the existing structural steel according to the North Dakota Department of Health's management of lead-based paint debris.

202-P01 REMOVAL OF STRUCTURE: The existing structure is a single span bridge, 37-feet long and 28-feet wide. Superstructure consists of steel girders, wood plank deck, and steel bridge railings. Substructure consists of timber piling and wood plank backwalls and wing walls.

Steel girders, wood plank deck, steel bridge railing, and object markers shall be removed and salvaged in good condition and delivered to the Grand Forks County Highway Department maintenance yard at 1700 North Columbia Road in Grand Forks, ND. County will unload materials at maintenance yard. Remaining structural materials shall be removed from the site for disposal by Contractor.

The lump sum bid item, “Removal of Structure” shall include all work required to remove the bridge and salvage designated items.

210-P02 FOUNDATION FILL: Use CL 3 or CL 5 as specified in Section 816 “Aggregates”, or Salvaged Base Course as specified in Section 817 of the Standard Specifications. Place foundation fill in layers of not more than 6 inches, moisten or dry as required, and thoroughly compact with mechanical tamping equipment to meet requirements of Section 210.04 B.3, ND T99. The quantity for foundation fill was based on a depth of two feet below the box culvert; however, the quantity may vary depending on soil conditions and resulting depth of box culvert excavation. Payment for “Foundation Fill” will be based on in-place volume measured and will not be adjusted for shrinkage or compaction.

606-P01 PRECAST REINFORCED CONCRETE BOX CULVERT AND END SECTIONS: Tie the barrel sections together with prestressing strands or 1" Ø tie bolts as shown on Standard Drawing D-714-22. Use a minimum of 6 - 0.5" diameter 270K strands for double box sections and 4 - 0.5" diameter 270K strands for single box sections, with one strand in each corner. Stress prestressing strands from opposite ends to a force of 20 kips. Use corrosion protected prestressing cables with their ends grouted. If tie bolts are used, place two ties per exterior wall at each joint located at third points of the wall clear height. Ties shall be loose to allow minor movement of sections.

Payment for "Dbl 14Ft x 14Ft Precast RCB End Section" includes the end section segments, parapet, and cutoff wall. Connect the end section to the last barrel section by the use of tie bolts, steel-bolted plates or other approved method so the inside corner surface is smooth. Connect end section segments by similar methods.

Use ASTM A36 steel for bolts, plates, angles, and studs. Use heavy hex nuts meeting the requirements of ASTM A563 and washers meeting ASTM F436, Type 1. Provide welded pipe sleeves meeting the requirements of ASTM A53, Grade B. Galvanize hardware and structural steel according to Section 854.

Welders are to meet the requirements of Section 105.06 D. Galvanize field welds according to Section 854.02

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

Separate single cell precast units may be used as alternates to a multi cell culvert. Provide a minimum distance of 3" between separate precast units and a maximum distance of 1'-0". Fill this gap with a controlled density backfill. Use a controlled density backfill consisting of cement, water, pozzolanic materials, and fillers. Use a material that is fluid on placement to flow around and fill voids in the backfill area. Use a material that is able to support normal loads after 6 hours and have a compressive strength in the range of 75 psi to 125 psi at 28 days. If the mix design shown is used, no further testing will be required. The mix design yields approximately one cubic yard of flowable mortar.

MIX DESIGN	
Cement	100 lbs
Fly Ash	300 lbs
Fine Aggregte	2600 lbs
Water	70 gals

For the 12" cap, use Class AE-3 concrete. Concrete may be substituted for controlled density fill for the entire volume between box culverts.Include the controlled density backfill and materials used for the 12" cap in the price bid for "Dbl 14Ft x 14Ft Precast RCB Culvert".

Comply with North Dakota Department of Health requirements for disposal of concrete truck washout water. If performed on-site, use Concrete Washout Detail shown on Section 20, Sheet 1.

754-P01 OBJECT MARKERS: Grand Forks County forces will furnish and install new object markers at completion of construction.

DESIGN LOADS

A. HL-93 LOADING

B. MAXIMUM FILL HEIGHT = 9 FEET

C. DESIGN MOMENTS AND SHEARS

For a single barrel box culvert with a 10" thick roof, 11" floor, and 9" walls, the following total factored moments and shears would result from the application of the required loads:

FACTORED DESIGN MOMENTS (SINGLE)			
	WALL MOMENT	10,550	ft-lbs
	ROOF MOMENTS		
	CORNER	21,810	ft-lbs
	BOTTOM	28,610	ft-lbs
	FLOOR MOMENTS		
	CORNER	20,825	ft-lbs
	TOP	35,770	ft-lbs

FACTORED DESIGN SHEARS (SINGLE)			
	WALL SHEARS	5,460	lbs
	ROOF SHEARS		
	CORNER	14,130	lbs
	FLOOR SHEARS		
	CORNER	14,950	lbs
	END SECTION WALL MOMENT	15,000	ft-lbs

For a double barrel box culvert with a 10" thick roof, 11" floor, and 9" walls, the following total factored moments and shears would result from the application of the required loads:

FACTORED DESIGN MOMENTS (DOUBLE)			
	WALL MOMENT	15,555	ft-lbs
	ROOF MOMENTS		
	CORNER	13,860	ft-lbs
	BOTTOM	21,100	ft-lbs
	TOP	46,610	ft-lbs
	FLOOR MOMENTS		
	CORNER	16,130	ft-lbs
	TOP	20,660	ft-lbs
	BOTTOM	46,940	ft-lbs

FACTORED DESIGN SHEARS (DOUBLE)			
	WALL SHEARS	5,435	lbs
	ROOF SHEARS		
	CORNER	11,870	lbs
	WALL	4,060	lbs
	FLOOR SHEARS		
	CORNER	13,000	lbs
	WALL	5,435	lbs
	END SECTION WALL MOMENT	15,000	ft-lbs

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REV'D.

Scale: 1" = 20' Hor.

GRAND FORKS COUNTY - REPLACEMENT OF WALLE TWP. BRIDGE OFER COLE CREEK
Bridge No. 18-142-25.0

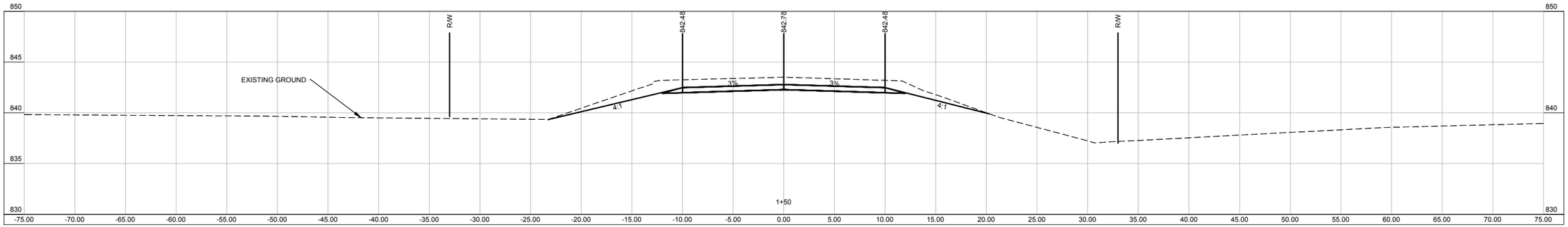
STRUCTURAL NOTES

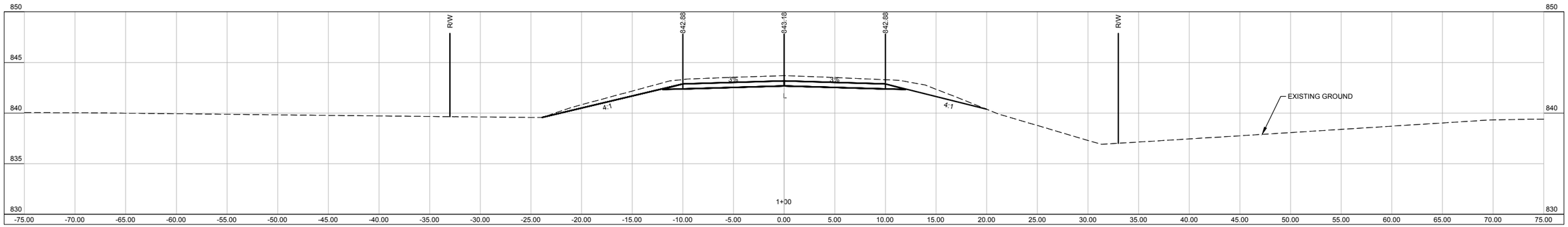
DRWN. BY	CHK'D BY	PROJECT NO.	DATE
R. Maszk	M. Lambrecht	P13064-2017	April, 2013

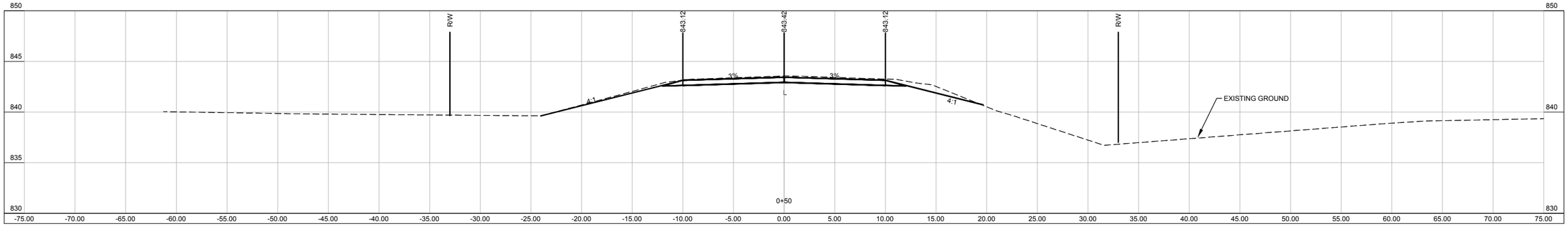
File: W:\G\GF County Highway Dept\13064-2017-000\CAD Dwgs\01-Civil\Plan Sheets\CS-DTL-Box Culvert Details.dwg

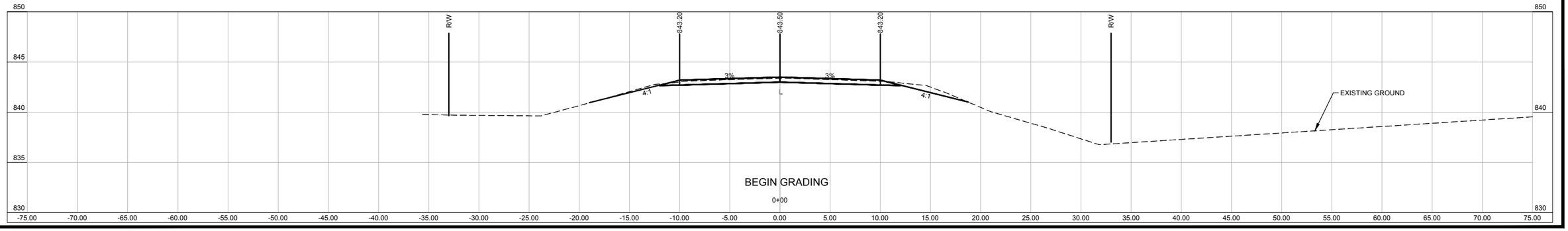
AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0018(035)	21648	200	1









ROAD CROSS SECTIONS

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
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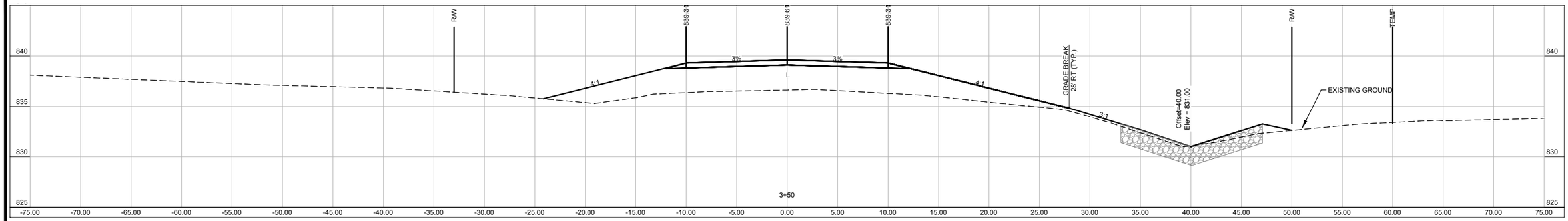

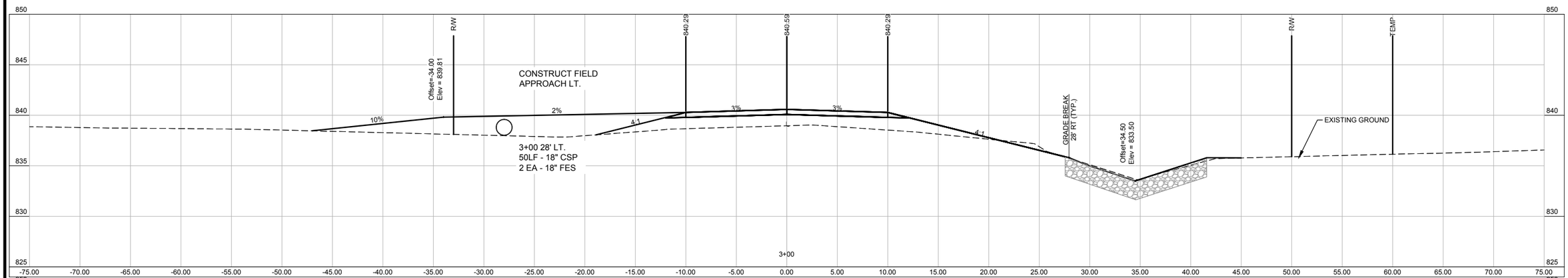

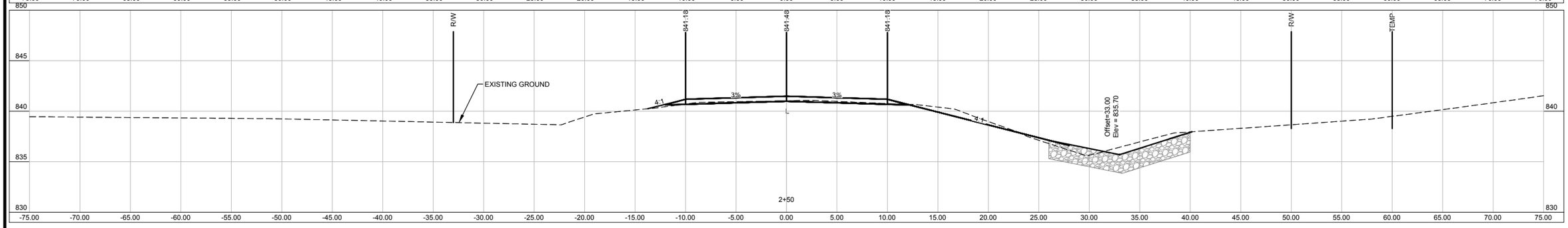

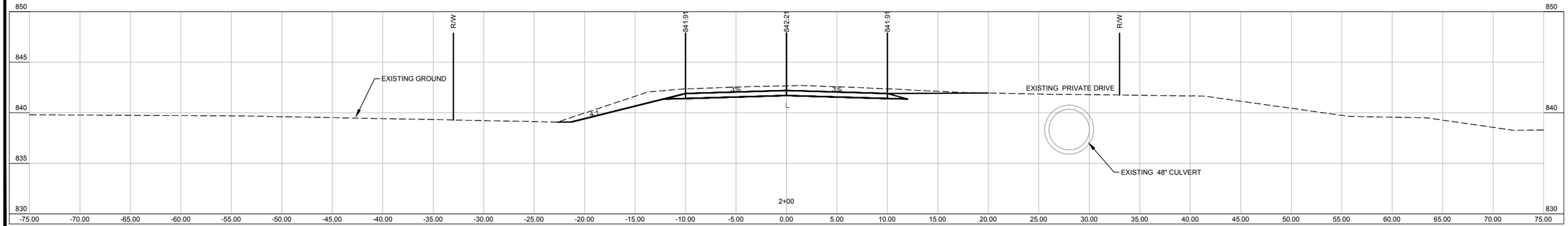

ROAD CROSS SECTIONS

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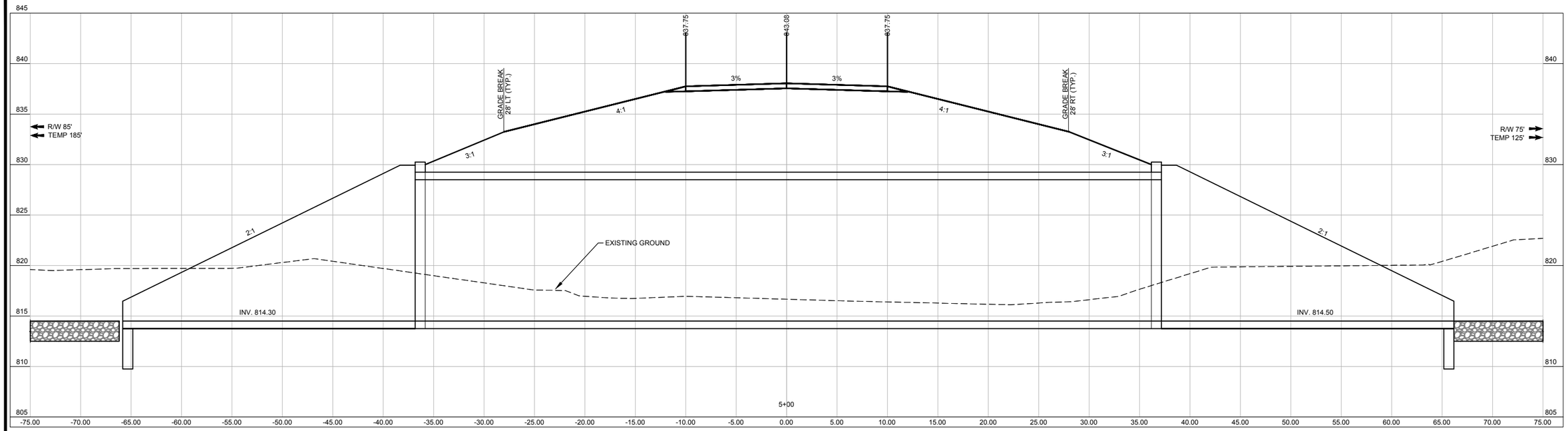

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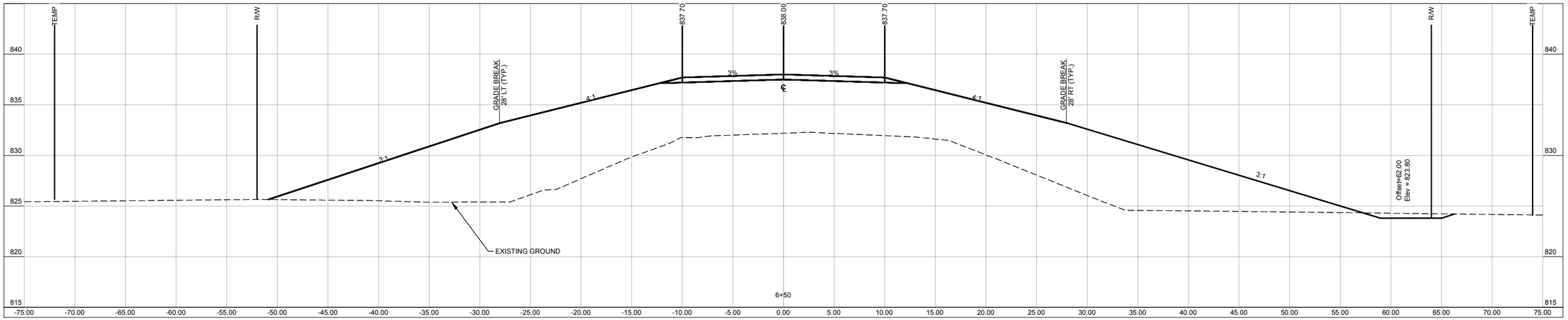

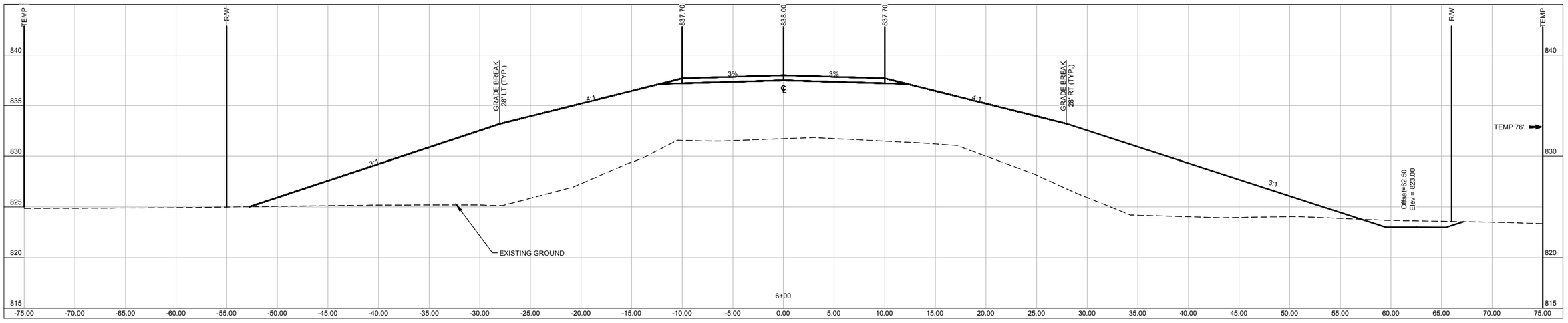

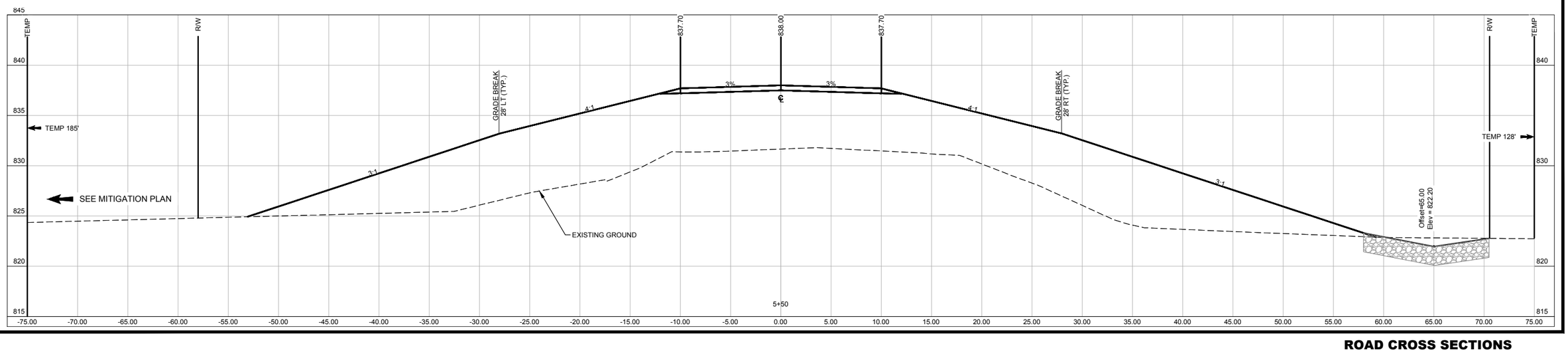

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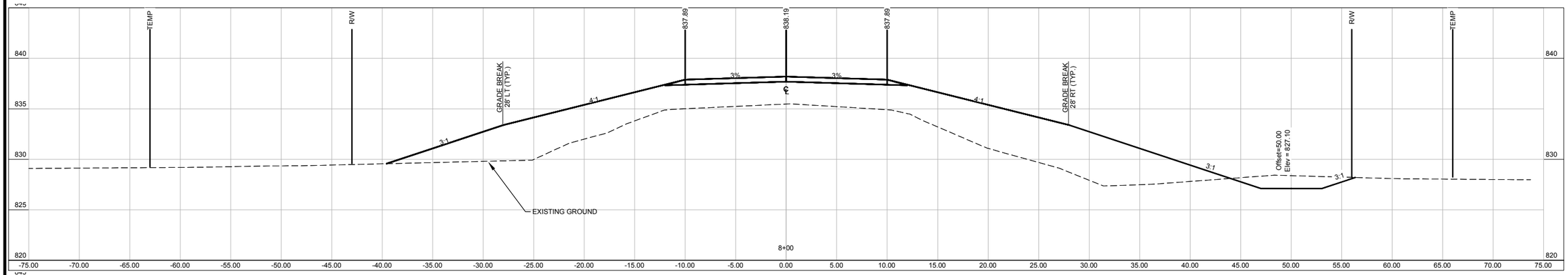

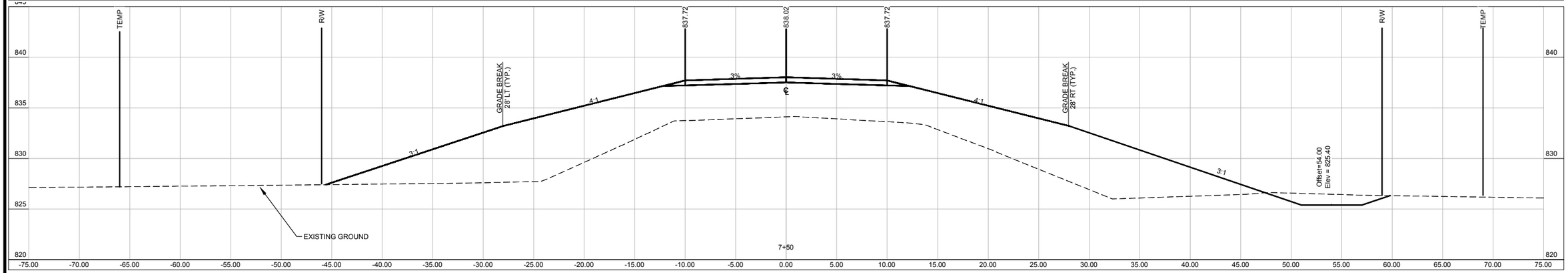

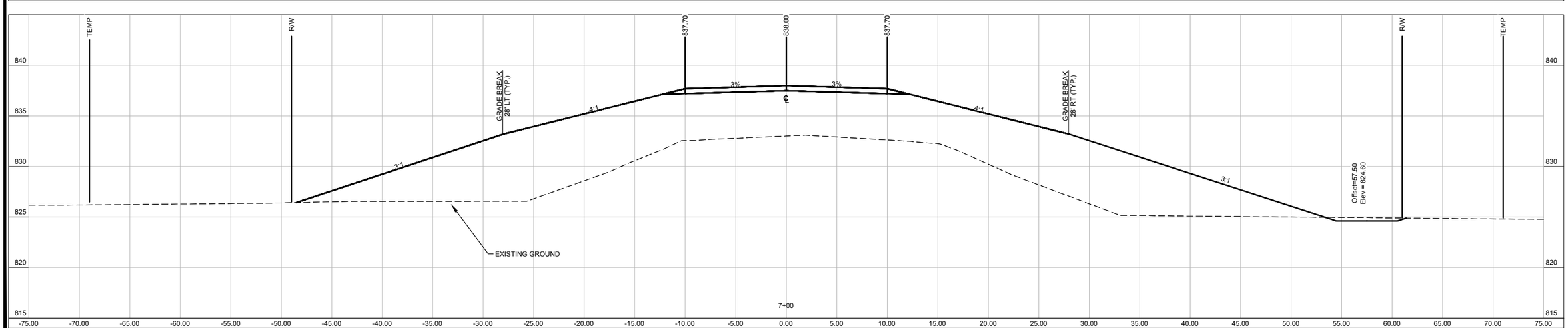

ROAD CROSS SECTIONS

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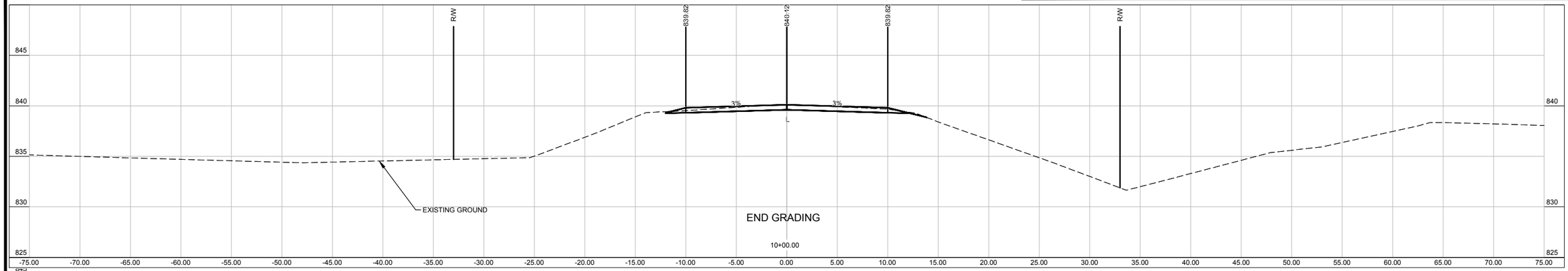

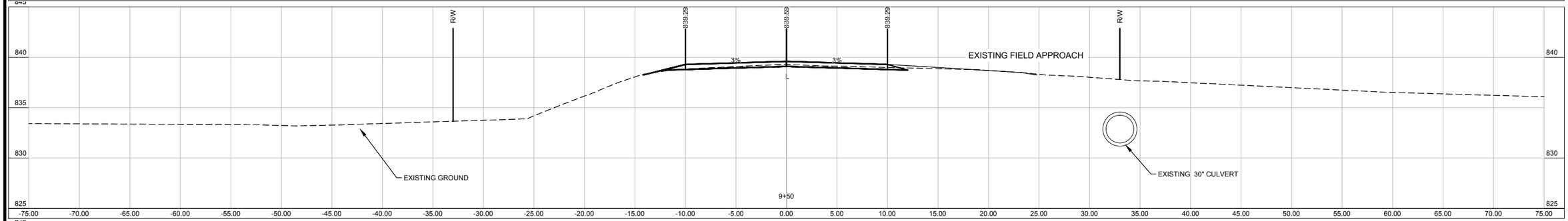

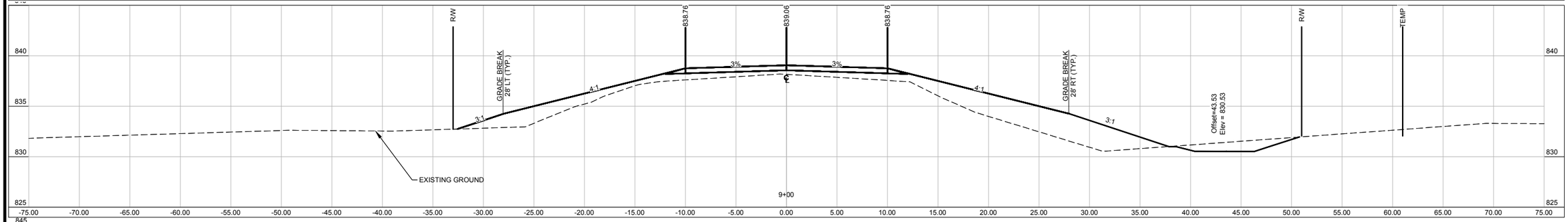

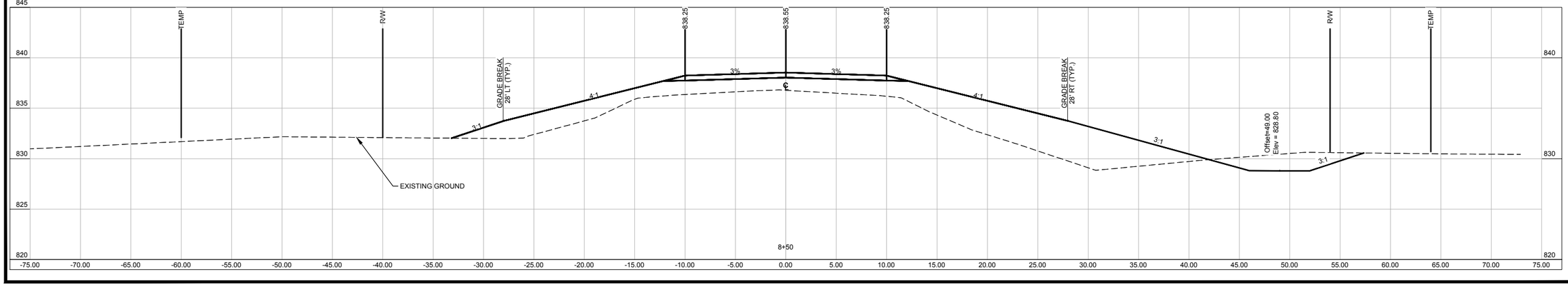

ROAD CROSS SECTIONS

NDDOT ABBREVIATIONS

D-101-1

?	This is a special text character used in the labeling of existing features. It indicates a feature that has an unknown characteristic, potentially based on: lack of description, location accuracy or purpose.
Abn	abandoned
Abut	abutment
Ac	acres
Adj	adjusted
Aggr	aggregate
Ahd	ahead
ARV	air release valve
Align	alignment
Al	alley
Alt	alternate
Alum	aluminum
ADA	Americans with Disabilities Act
A	ampere
&	and
Appr	approach
Approx	approximate
ACP	asbestos cement pipe
Asph	asphalt
AC	asphalt cement
Assmd	assumed
@	at
Atten	attenuation
ATR	automatic traffic recorder
Ave	Avenue
Avg	average
ADT	average daily traffic
Az	azimuth
Bk	back
BF	back face
Bs	backsight
Balc	balcony
B Wire	barbed wire
Barr	barricade
Btry	battery
Brg	bearing
BI	beehive inlet
Beg	begin
BM	bench mark
Bkwy	bikeway
Bit	bituminous
Blk	block
Bd Ft	board feet
BH	bore hole
BS	both sides
Bot	bottom
Blvd	Boulevard
Bndry	boundary
BC	brass cap
Brkwy	breakaway
Br	bridge
Bldg	building
BV	butterfly valve
Byp	bypass
C Gdrl	cable guardrail
Calc	calculate
Cd	candela
CIP	cast iron pipe
CB	catch basin
CRS	cationic rapid setting
C Gd	cattle guard
C To C	center to center
Cl or ℄	centerline
Cm	centimeter
Ch	chain
Chnlk	chain-link
Ch Blk	channel block
Ch Ch	channel change
Chk	check
Chsld	chiseled
Cir	circle
Cl	class
Cl	clay
Cl F	clay fill
Cl Hvy	clay heavy
Cl Lm	clay loam
Clnt	clean-out
Clr	clear
Cl&gr	clearing & grubbing
Co S	coal slack
Comb.	combination
Coml	commercial
Compr	compression
CADD	computer aided drafting & design
Conc	concrete
Cond	conductor
Const	construction
Cont	continuous
CSB	continuous split barrel sample
Contr	contraction
Contr	contractor
CP	control point
Coord	coordinate
Cor	corner
Corr	corrected
CAES	corrugated aluminum end section
CAP	corrugated aluminum pipe
CMES	corrugated metal end section
CMP	corrugated metal pipe
CPVCP	corrugated poly-vinyl chloride pipe
CSES	corrugated steel end section
CSP	corrugated steel pipe
C	coulomb
Co	County
Crse	course
C Gr	course gravel
CS	course sand
Ct	Court
Xarm	cross arm
Xbuck	cross buck
Xsec	cross sections
Xing	crossing
Xrd	Crossroad
Crn	crown
CF	cubic feet
M3	cubic meter
M3/s	cubic meters per second
CY	cubic yard
Cy/mi	cubic yards per mile
Culv	culvert
C&G	curb & gutter
CI	curb inlet
CR	curb ramp
CS	curve to spiral
C	cut
Dd Ld	dead load
Defl	deflection
Defm	deformed
Deg or D	degree
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
ESS	environmental sensor station
Eq	equal
Eq	equation
Evgr	evergreen
Exc	excavation
Exst	existing
Exp	expansion
Expy	Expressway
E	external of curve
Extru	extruded
FOS	factor of safety
F	Fahrenheit
FS	far side
F	farad
Fed	Federal
FP	feed point
Ft	feet/foot
Fn	fence
Fn P	fence post
FO	fiber optic
FB	field book
FD	field drive
F	fill
FAA	fine aggregate angularity
FS	fine sand
FH	fire hydrant
Fl	flange
Flrd	flared
FES	flared end section
F Bcn	flashing beacon
FA	flight auger sample
FL	flow line
Ftg	footing
FM	force main
Fs	foresight
Fnd	found
Fdn	foundation
Frac	fractional
Frwy	freeway
Frt	front
FF	front face
F Disp	fuel dispenser

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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NDDOT ABBREVIATIONS

D-101-2

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
HMA	hot mix asphalt
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
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
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

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NDDOT ABBREVIATIONS

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
RAP	recycled asphalt pavement
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
RWIS	roadway weather information system
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
SN	sign number
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
SA	special assembly
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
SMA	stone matrix asphalt
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
WIM	weigh in motion
W	west
WB	westbound
Wrng	wiring
W/	with
W/o	without
WC	witness corner
WGS	world geodetic system
Z	zenith

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

702COM	702 Communications
ACCENT	Accent Communications
AGASSIZ WU	Agassiz Water Users Incorporated
AGC	Assiociated General Contractors of America
All PI	Alliance Pipeline
ALL SEAS WU	All Seasons Water Users Association
AMOCO PI	Amoco Pipeline Company
AMRDA HESS	Amerada Hess Corporation
AT&T	AT&T Corporation
B PAW	Bear Paw Energy Incorporated
BAKER ELEC	Baker Electric
BASIN ELEC	Basin Electric Cooperative Incorporated
BEK TEL	Bek Communications Cooperative
BELLE PL	Belle Fourche Pipeline Company
BLM	Bureau of Land Management
BNSF	Burlington Northern Santa Fe Railway
BOEING	Boeing
BRNS RWD	Barnes Rural Water District
BURK-DIV ELEC	Burke-Divide Electric Cooperative
BURL WU	Burleigh Water Users
Cable One	Cable One
CABLE SERV	Cable Services
CAP ELEC	Capital Electric Cooperative Incorporat
CASS CO ELEC	Cass County Electric Cooperative
CASS RWU	Cass Rural Water Users Incorporated
CAV ELEC	Cavalier Rural Electric Cooperative
CBLCOM	Cablecom Of Fargo
CENEX PL	Cenex Pipeline
CENT PL WATER DIST	Central Pipe Line Water District
CENT PWR ELEC	Central Power Electric Cooperative
COE	Corps of Engineers
CONS TEL	Consolidated Telephone
CONT RES	Continental Resource Inc
CPR	Canadian Pacific Railway
D O E	Department Of Energy
DAK CARR	Dakota Carrier Network
DAK CENT TEL	Dakota Central Telephone
DAK RWD	Dakota Rural Water District
DGC	Dakota Gasification Company
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
ENVENTIS	Enventis Telephone
FALK MNG	Falkirk Mining Company
FHWA	Federal Highway Administration
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
IDEA1	Idea1
INT-COMM TEL	Inter-Community Telephone Company
KANEB PL	Kaneb Pipeline Company
KEM ELEC	Kem Electric Cooperative Incorporated
KOCH GATH SYS	Koch Gathering Systems Incorporated
LKHD PL	Lakehead Pipeline Company
LNGDN RWU	Langdon Rural Water Users Incorporated
LWR YELL R ELEC	Lower Yellowstone Rural Electric
MCKNZ CON	McKenzie Consolidated Telcom
MCKNZ ELEC	McKenzie Electric Cooperative
MCKNZ WRD	McKenzie County Water Resource District
MCLEOD	McLeod USA
MCLN ELEC	McLean Electric Cooperative
MCLN-SHRDN R WAT	McLean-Sheridan Rural Water
MDU	Montana-dakota Utilities
MID-CONT CABLE	Mid-Continent Cable
MIDSTATE TEL	Midstate Telephone Company
MINOT CABLE	Minot Cable Television
MINOT TEL	Minot Telephone Company
MISS W W S	Missouri West Water System
MNKOTA PWR	Minnkota Power
MOR-GRAN-SOU ELEC	Mor-gran-sou Electric Cooperative
MOUNT-WILLI ELEC	Mountrail-williams Electric Cooperative
MRE LBTY TEL	Moore & Liberty Telephone
MUNICIPAL	City Water And Sewer
MUNICIPAL	City Of '.....'
N CENT ELEC	North Central Electric Cooperative
N VALL W DIST	North Valley Water District
ND PKS & REC	North Dakota Parks And Recreation
ND TEL	North Dakota Telephone Company
NDDOT	North Dakota Department of Transportation
NDSU SOIL SCI DEPT	NDSU Soil Science Department
NEMONT TEL	Nemont Telephone
NODAK R ELEC	Nodak Rural Electric Cooperative
NOON FRMS TEL	Noonan Farmers Telephone Company
NPR	Northern Plains Railroad
NSP	Northern States Power
NTH PRAIR RW	Northern Prairie Rural Water Association
NTHN BRDR PL	Northern Border Pipeline
NTHN PLNS ELEC	Northern Plains Electric Cooperative Incorporated
NTHWSTRN REF	Northwestern Refinery Company
NW COMM	Northwest Communication Cooperation
ONEOK	Oneok gas
OSHA	Occupational Safety and Health Administration
OTTR TL PWR	Otter Tail Power Company
P L E M	Prairielands Energy Marketing
POLAR COM	Polar Communications
PVT ELEC	Private Electric
QWEST	Qwest Communications
R&T W SUPPLY	R & T Water Supply Association
RAMSEY R SEW	Ramsey Rural Sewer Association
RAMSEY RW	Ramsey Rural Water Association
RAMSEY UTIL	Ramsey County Rural Utilities
RED RIV TEL	Red River Rural Telephone
RESVTN TEL	Reservation Telephone
ROBRTS TEL	Roberts Company Telephone
R-RIDER ELEC	Roughrider Electric Coop
RRVW	Red River Valley & Western Railroad
RSR ELEC	R.S.R. Electric Cooperative
S E W U	South East Water Users Incorporated
SCOTT CABLE	Scott Cable Television Dickinson
SHERDN ELEC	Sheridan Electric Cooperative
SHEYN VLY ELEC	Sheyenne Valley Electric Cooperative
SKYTECH	Skyland Technologies Incorporated
SLOPE ELEC	Slope Electric Cooperative Incorporated
SOURIS RIV TELCOM	Souris River Telecommunications
ST WAT COMM	State Water Commission
STATE LN WATER	State Line Water Cooperative
STER ENG	Sterling Energy
STUT RWU	Stutsman Rural Water Users
SW PL PRJ	Southwest Pipeline Project
T M C	Turtle Mountain Communications
TCI	TCI of North Dakota
TESORO HGH PLNS PL	Tesoro High Plains Pipeline
TRI-CNTY WU	Tri-County Water Users Incorporated
TRL CO RWU	Traill County Rural Water Users
UNTD TEL	United Telephone
UPPR SOUR WUA	Upper Souris Water Users Association
US SPRINT	U.S. Sprint
USAF MSL CABLE	U.S.A.F. Missile Cable
USFWS	US Fish and Wildlife Service
USW COMM	U.S. West Communications
VRNDRY ELEC	Verendrye Electric Cooperative
W RIV TEL	West River Telephone Incorporated
WEB	W. E. B. Water Development Association
WILLI RWA	Williams Rural Water Association
WILSTN BAS PL	Williston Basin Interstate Pipeline Company
WLSH RWD	Walsh Water Rural Water District
WOLVRTN TEL	Wolverton Telephone
XLENER	Xcel Energy
YSVR	Yellowstone Valley Railroad

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Symbols

D-101-30

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-101-31

- 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
- Iron Monument Found
- Iron Pin R/W Monument
- 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

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

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930 , on 07/01/14 and the original document is stored at the North Dakota Department of Transportation

Symbols

D-101-32

- 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
- Alignment Monument
- Iron Pin Reference Monument
- 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

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

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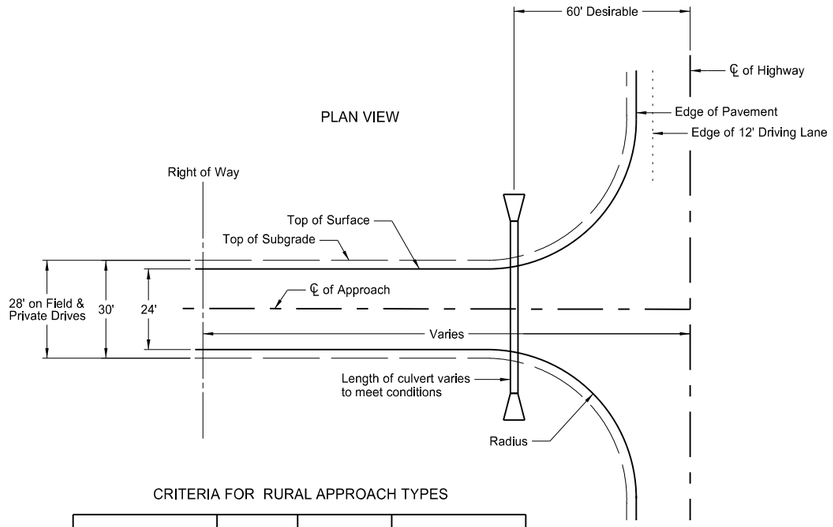
STANDARD RURAL APPROACHES

D-203-8

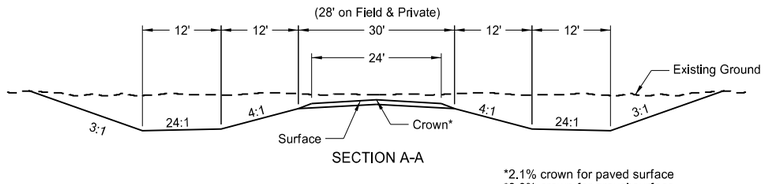
NOTES:

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



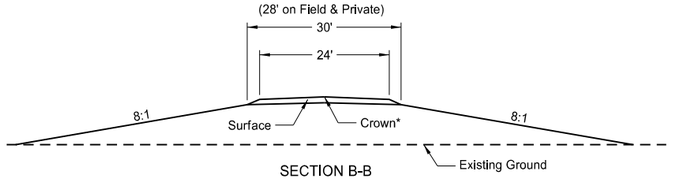
CRITERIA FOR RURAL APPROACH TYPES

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

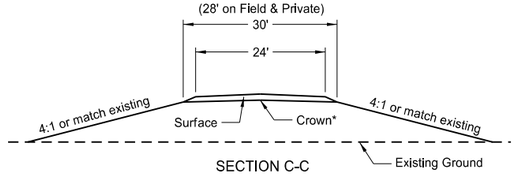


SECTION A-A

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

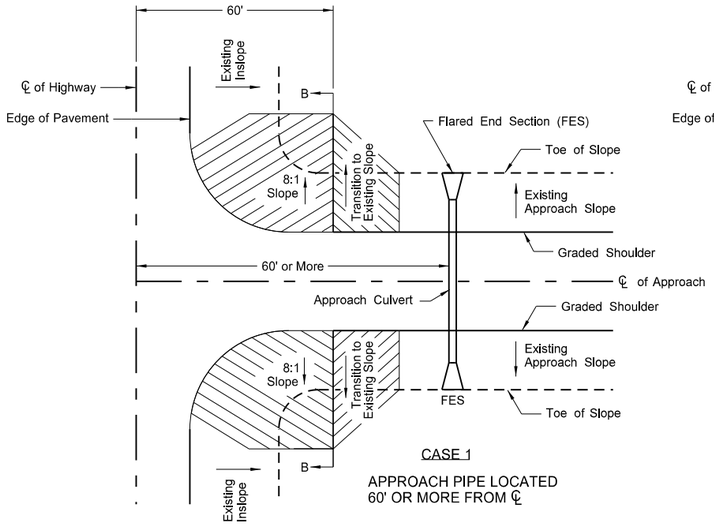


SECTION B-B



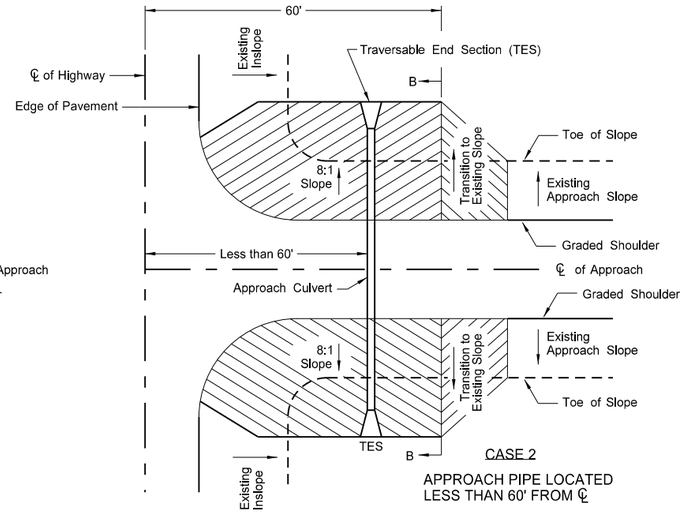
SECTION C-C

APPROACH INSLOPES



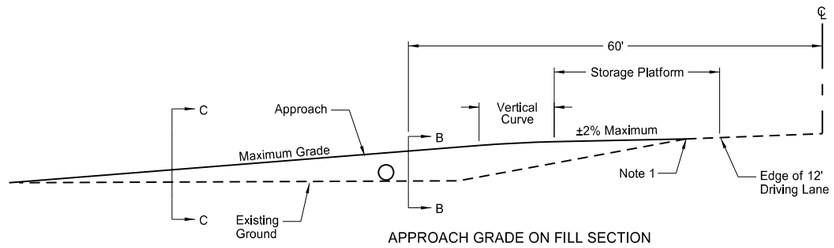
CASE 1

APPROACH PIPE LOCATED 60' OR MORE FROM ℄

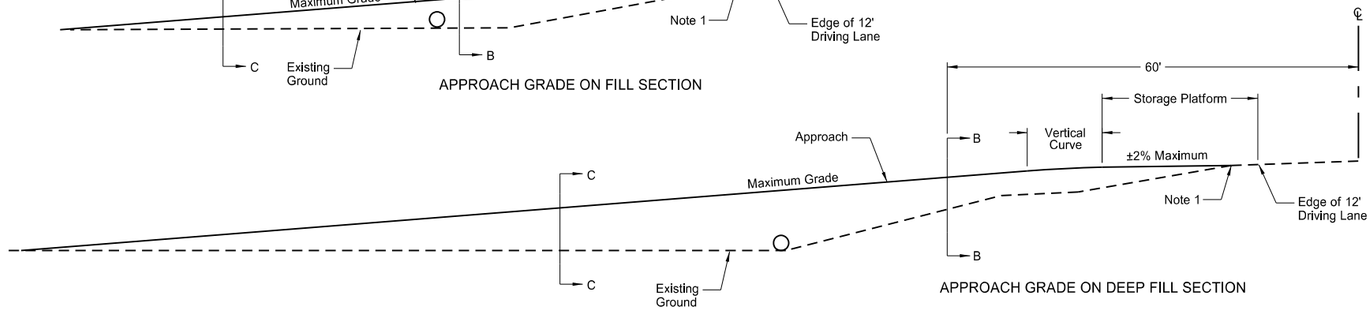


CASE 2

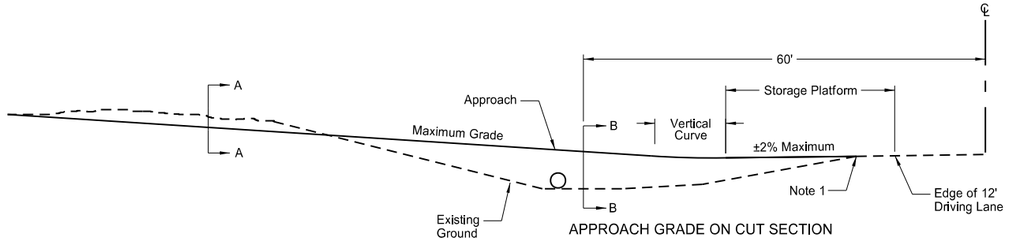
APPROACH PIPE LOCATED LESS THAN 60' FROM ℄



APPROACH GRADE ON FILL SECTION



APPROACH GRADE ON DEEP FILL SECTION



APPROACH GRADE ON CUT SECTION

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

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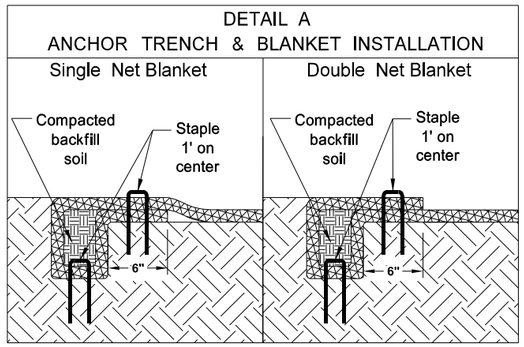
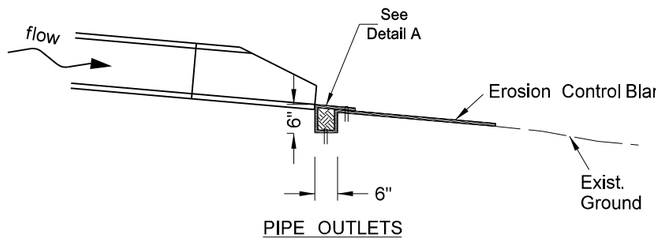
D-255-2

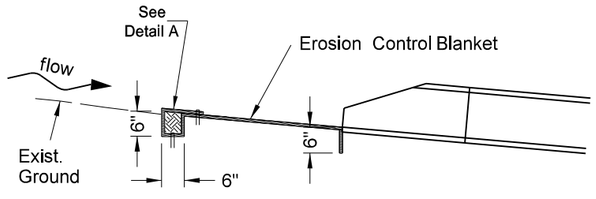
EROSION AND SILTATION CONTROL
EROSION CONTROL BLANKET INSTALLATION



NOTE:
If a Single Net Blanket is used the side with the netting should be on the top once the blanket is installed.

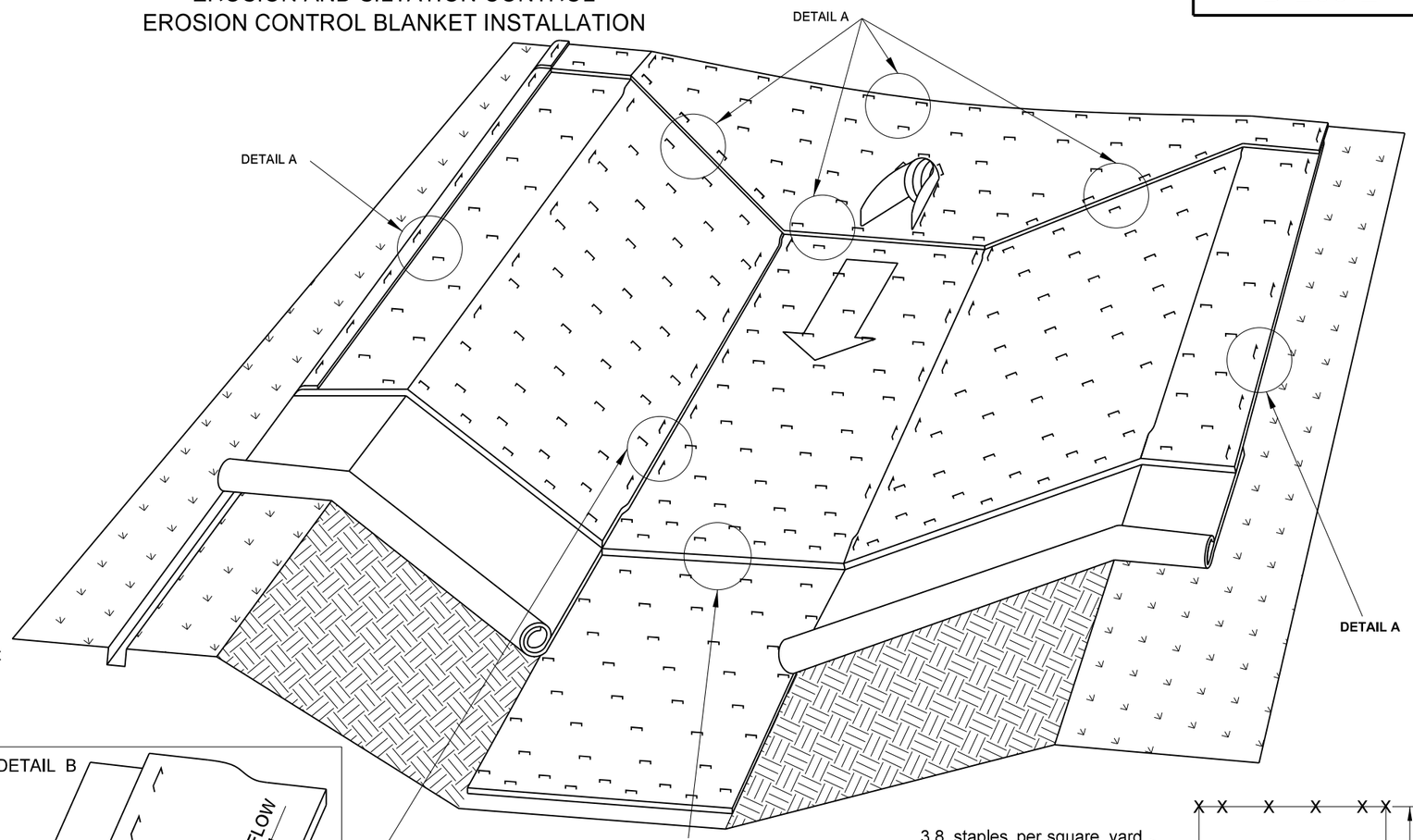


PIPE OUTLETS

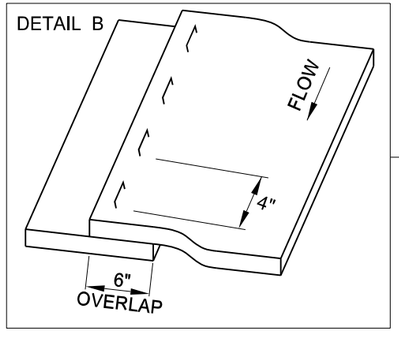


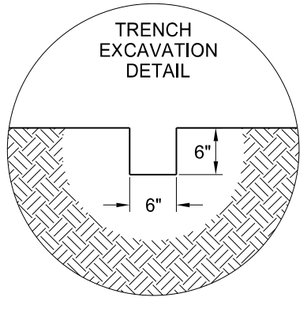
PIPE INLETS

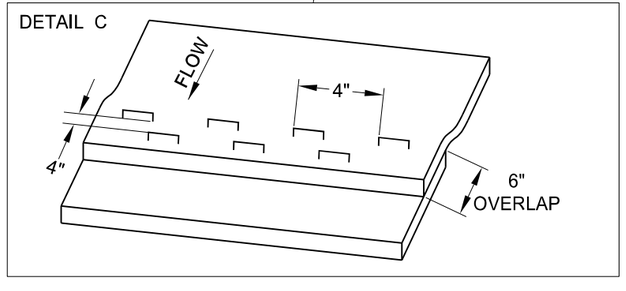
INSTALLATION AT PIPE ENDS



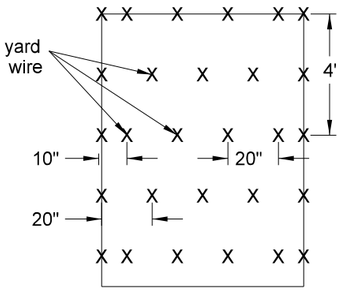
BLANKET LAYOUT
CHANNEL OR SLOPE INSTALLATION







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



STAPLE PATTERN

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-709-5 to D-255-2.
07-27-15	Changed installation details such as trench depth and overlap dimensions.

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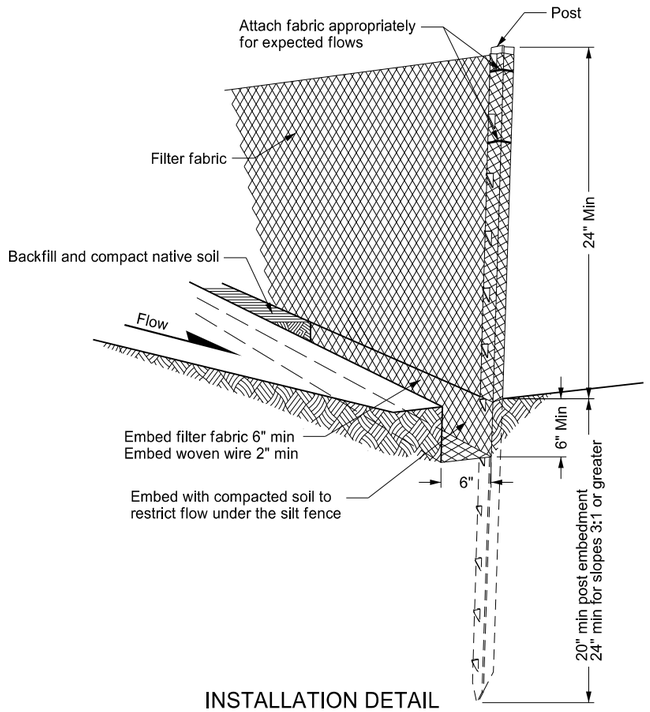
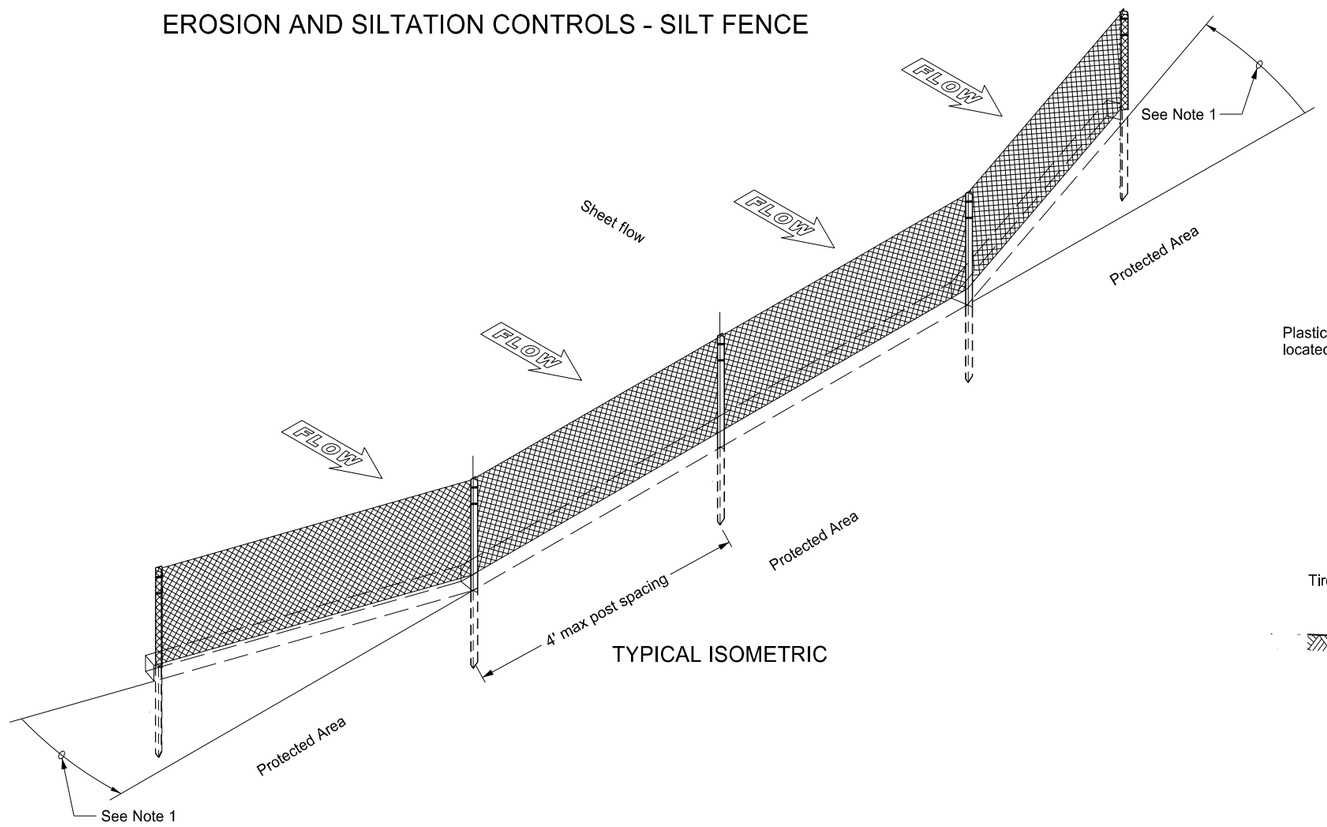
EROSION AND SILTATION CONTROLS - SILT FENCE

D-260-1

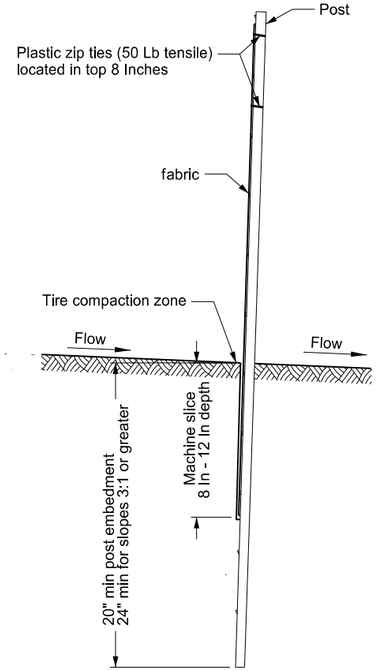


INSTALLATION DETAIL

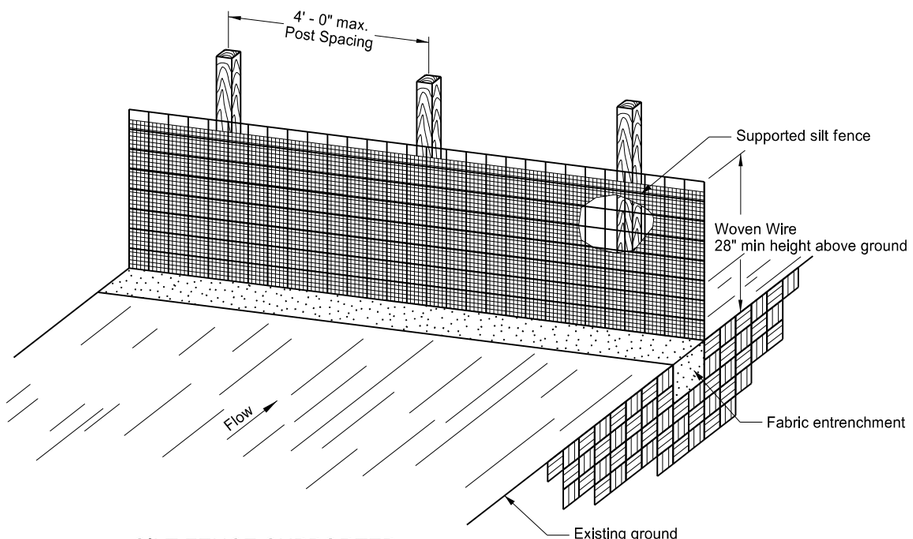
Minimize disturbance of ground around trench and smooth surface after excavation to avoid concentrating flows. Compact to prevent undercutting flows.



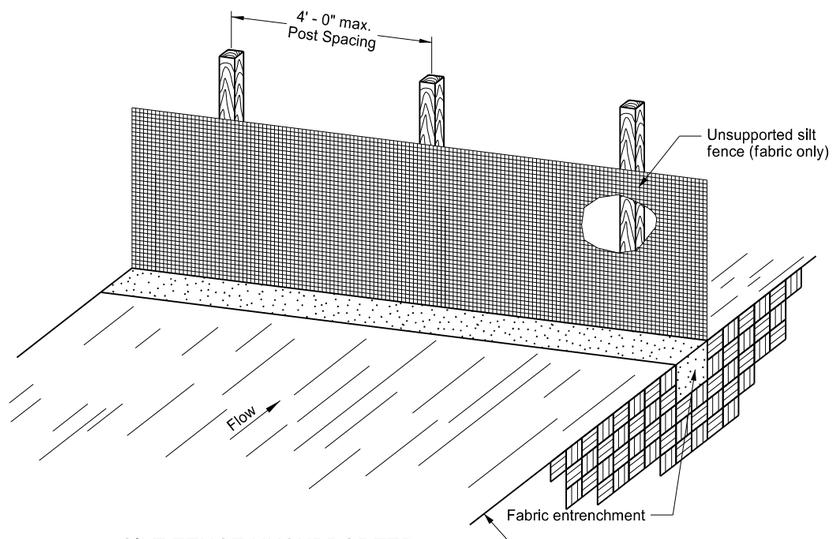
TYPICAL ISOMETRIC



MACHINE SLICED SILT FENCE



SILT FENCE SUPPORTED



SILT FENCE UNSUPPORTED

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

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

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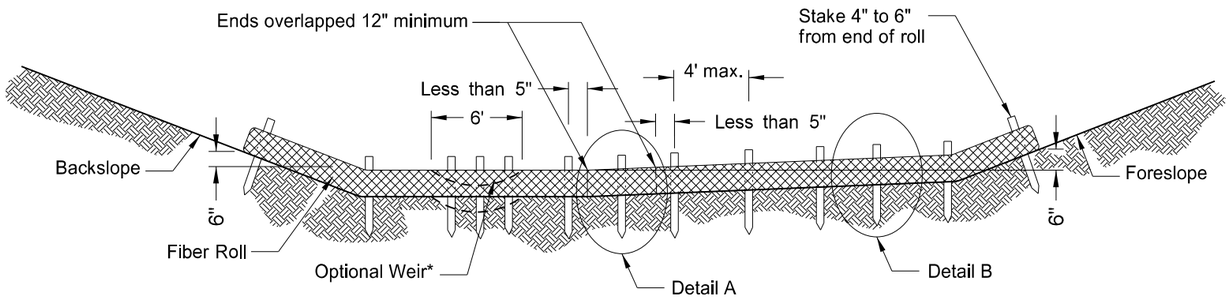
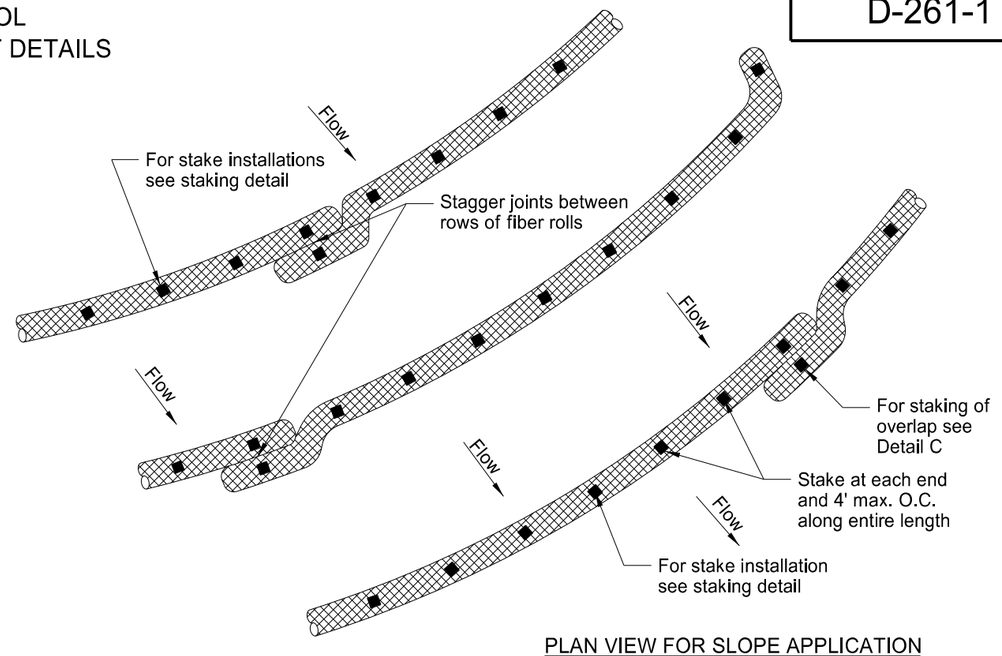
D-261-1

EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

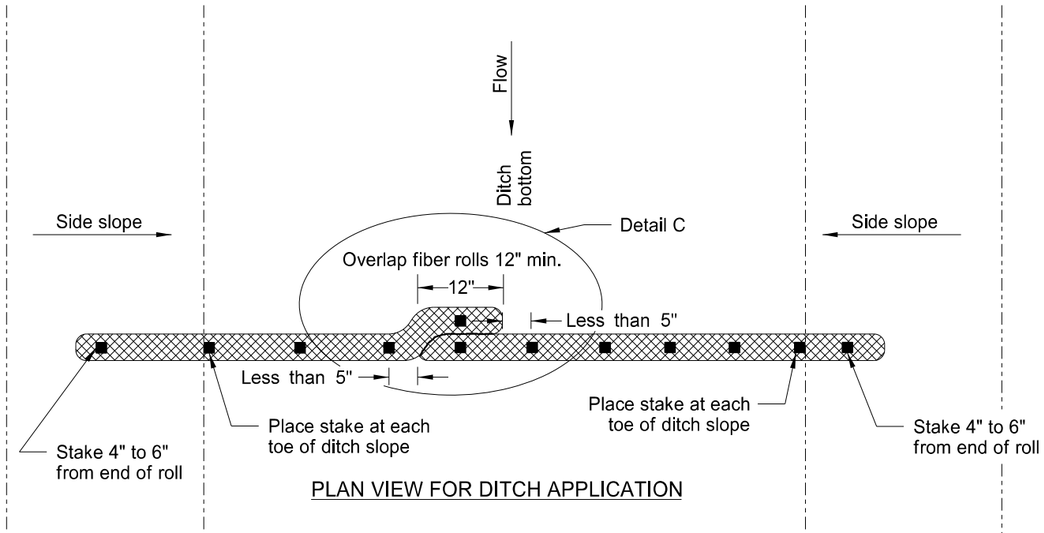


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

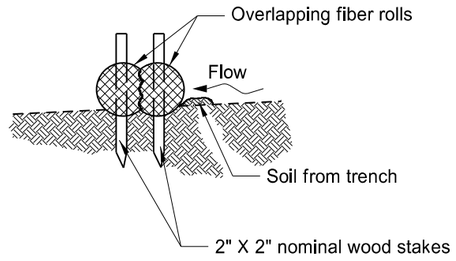
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



PLAN VIEW FOR SLOPE APPLICATION

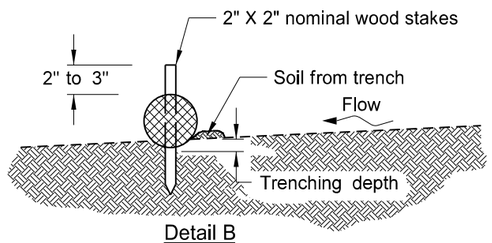


PLAN VIEW FOR DITCH APPLICATION



Detail A

Fiber Roll Overlapping Staking Detail



Detail B

Fiber Roll Staking Detail

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

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

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

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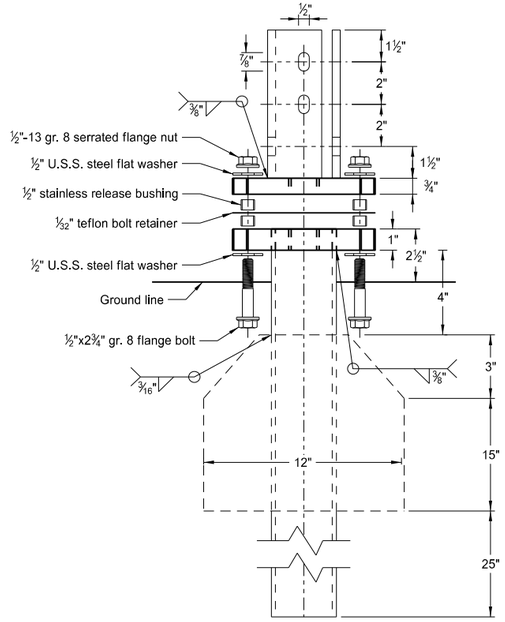
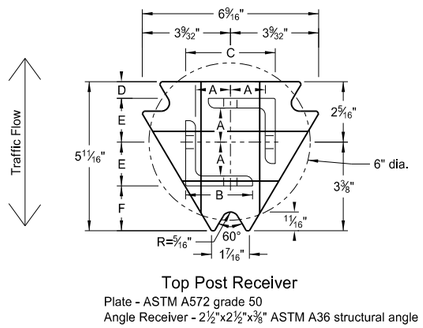
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

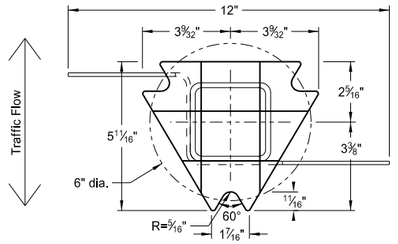


Multi-Directional
Slip Base Assembly

Perforated Tube



Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2½"x2½"x⅜" ASTM A36 structural angle



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

Notes:

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

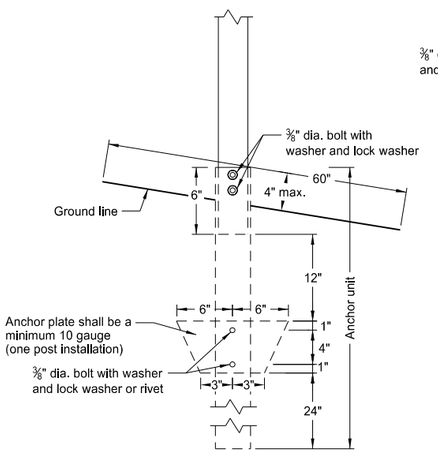
Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thick-ness Gauge	Sleeve Size in.	Wall Thick-ness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2¼
1	2¼	12			No	2½
1	2½	12			(A)	3
1	2½	10			Yes	
1	2¼	12	2	12	Yes	
1	2½	12	2¼	12	Yes	
2	2	12			No	2¼
2	2¼	12			No	2½
2	2½	12			Yes	
2	2½	12			Yes	
2	2¼	10	2	12	Yes	
2	2½	12	2¼	12	Yes	
3 & 4	2½	12			Yes	
3 & 4	2½	10			Yes	
3 & 4	2½	12	2¼	12	Yes	
3 & 4	2¼	12	2	12	Yes	
3 & 4	2½	10	2³⁄₁₆	10	Yes	

Properties of Telescoping Perforated Tube						
Tube Size in.	Wall Thickness in.	U.S. Standard Gauge	Weight per Foot lbs.	Moment of Inertia $in.^4$	Cross Sec. Area $in.^2$	Section Modulus $in.^3$
1½ x 1½	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
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2³⁄₁₆ x 2³⁄₁₆	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.785

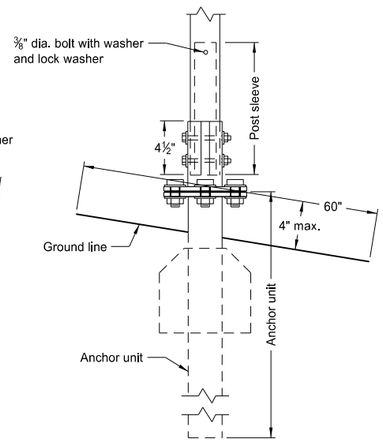
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2³⁄₁₆"x10 ga.	1⁹⁄₆₄"	2½"	3¹⁄₃₂"	25⁄₃₂"	1³³⁄₆₄"	1⅞"
2½"x10 ga.	1⁹⁄₃₂"	2½"	3⁵⁄₁₆"	⅝"	1²¹⁄₃₂"	1¾"

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

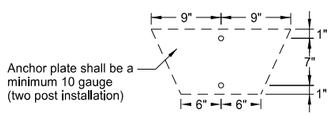
(B) The 2³⁄₁₆"x10 ga. may be inserted into 2½"x10 ga. for additional wind load.

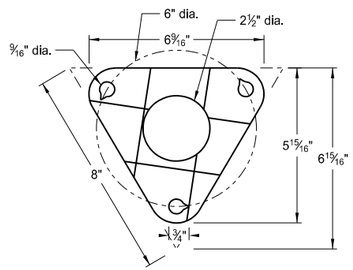


Anchor Unit and Post Assembly



Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly





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

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

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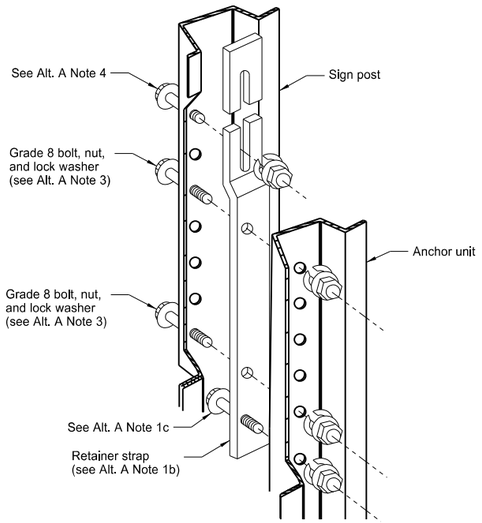
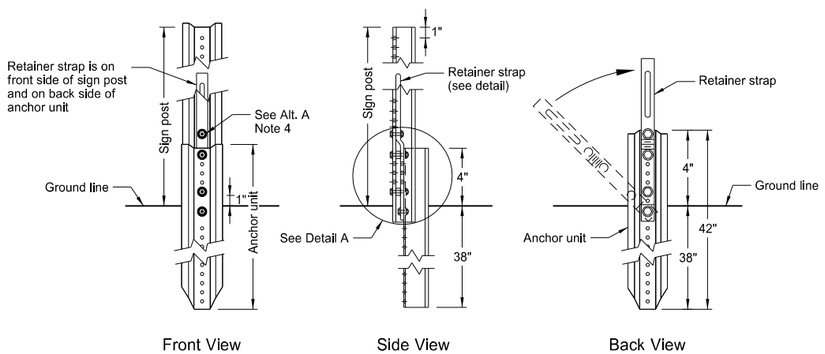
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

U-Channel Post



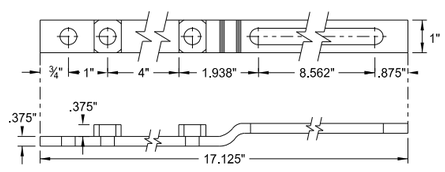
Detail A



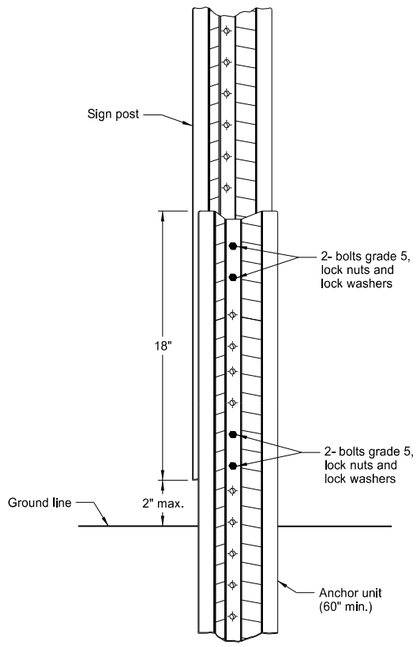
Front View Side View Back View

Breakaway U-Channel Detail
Alternate A

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

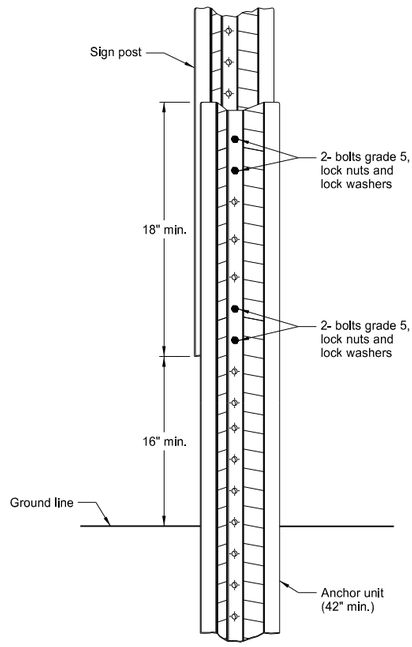


Retainer Strap Detail



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

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



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

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

Alternate A Steps of Installation:

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

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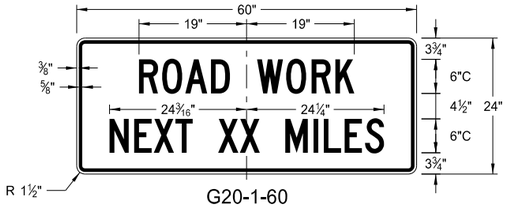
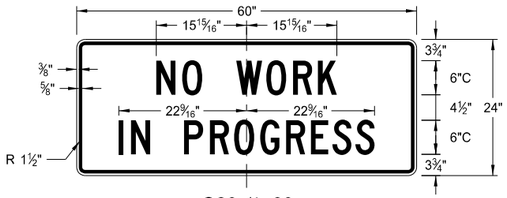
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



G20-1-60
Legend: black (non-refl)
Background: orange



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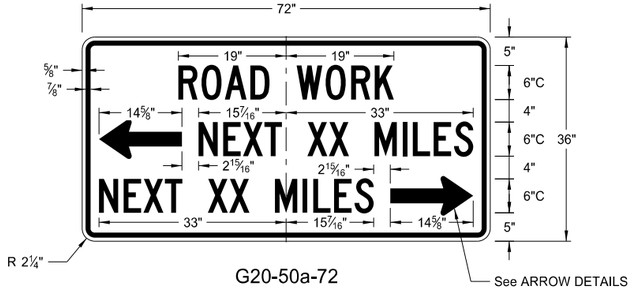

G20-50a-72
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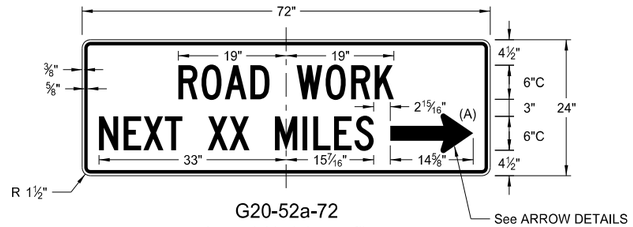
Background: orange



G20-52a-72
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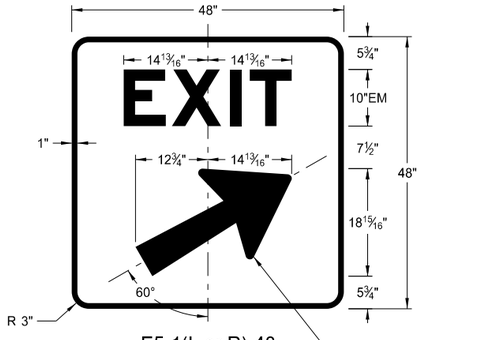
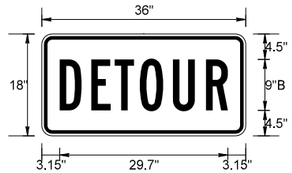
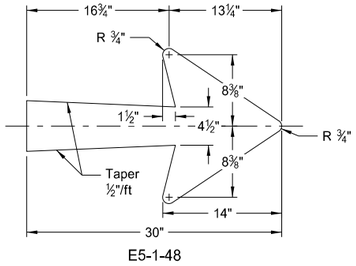
Background: orange



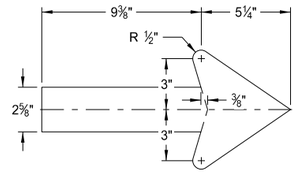
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



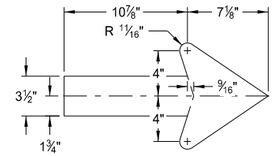
M4-8-36
Legend: black (non-refl)
Background: orange



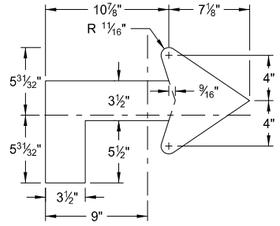
E5-1-48



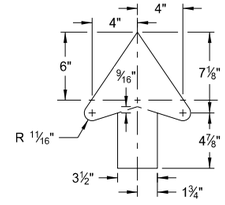
G20-50a-72
G20-52a-72



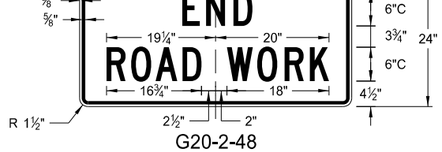
M4-9(L or R)-30
Right or Left



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

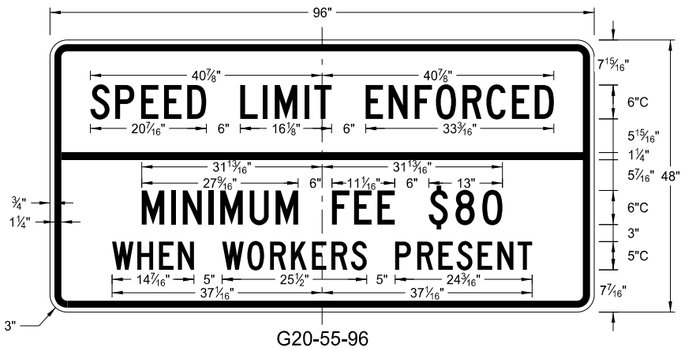


M4-9-30
Straight



G20-2-48
Legend: black (non-refl)
Background: orange

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



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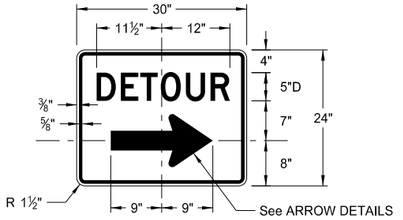
Background: orange



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
8-17-17	Added sign & background color

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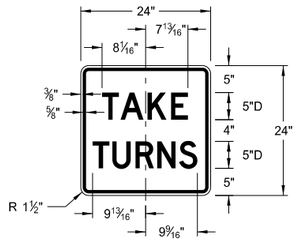
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



R1-50-24
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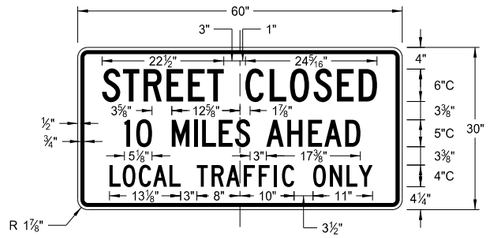
Background: white



R11-3c-60
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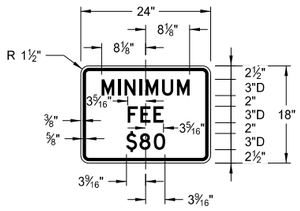
Background: white



R2-1a-24
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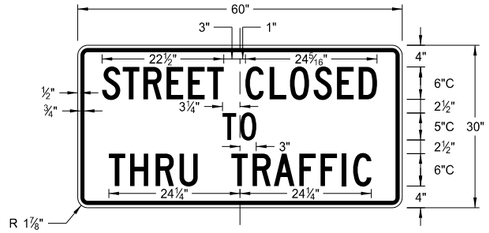
Background: white



R11-4a-60
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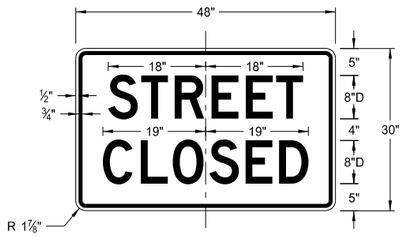

R11-2a-48
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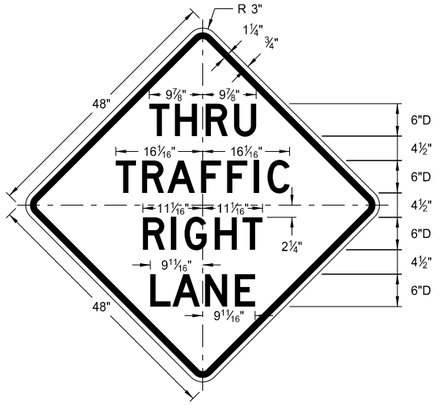
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



W5-8-48
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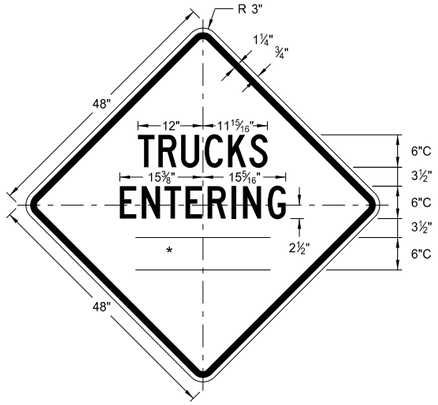
Background: orange



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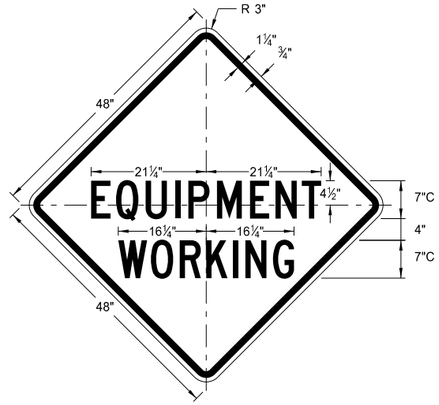
Background: orange



W20-51-48
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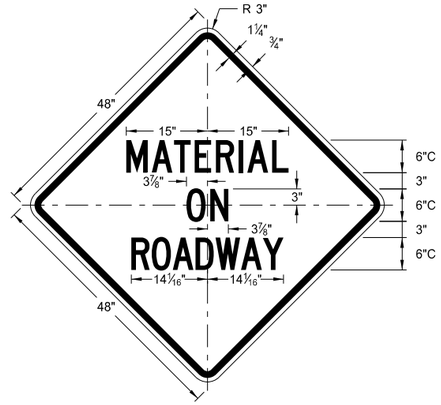
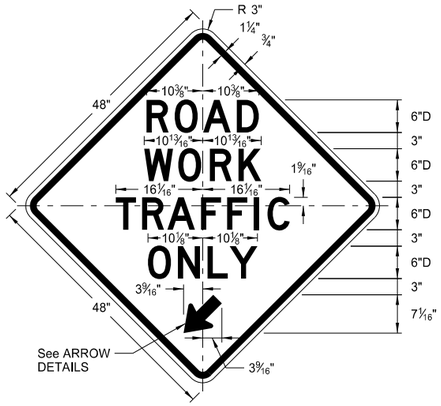
Background: orange



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

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

* DISTANCE MESSAGES



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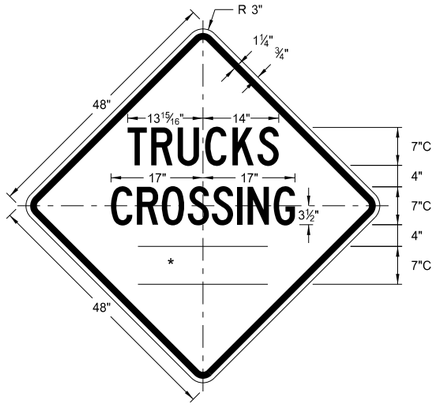

W8-55-48
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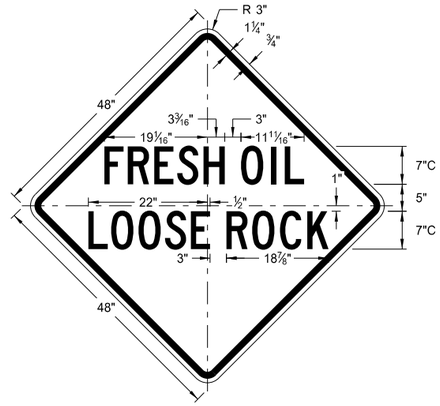
Background: orange

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



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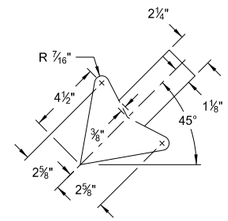
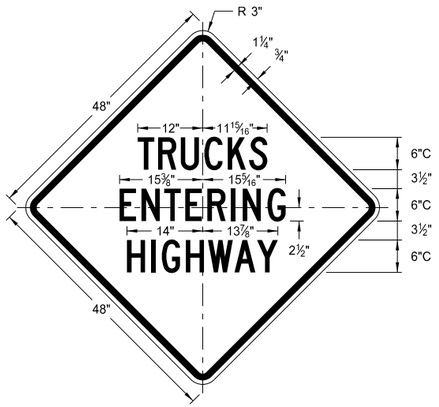


W5-9-48

ARROW DETAILS



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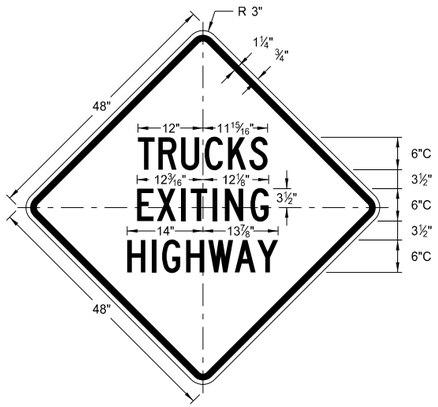

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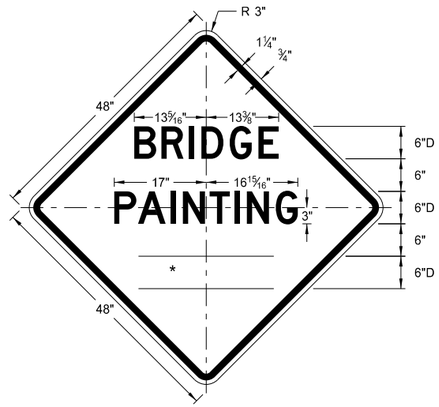
Background: orange



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

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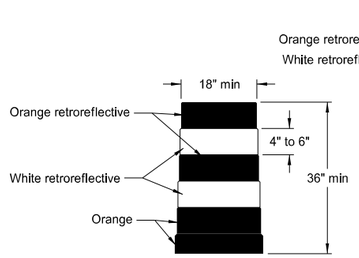
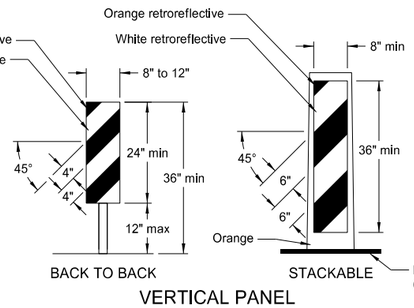
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



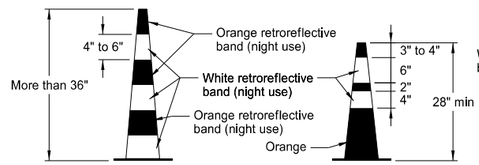
DELINEATOR DRUM

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



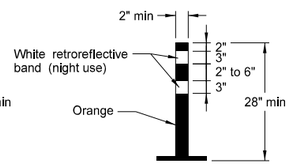
VERTICAL PANEL

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



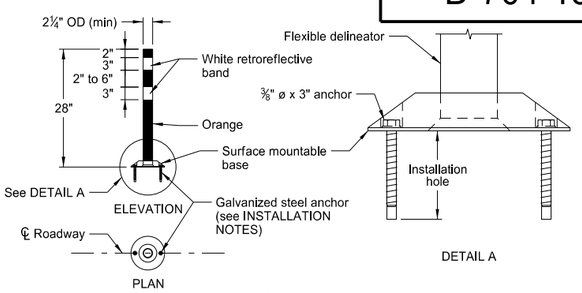
TRAFFIC CONE

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



TUBULAR MARKER

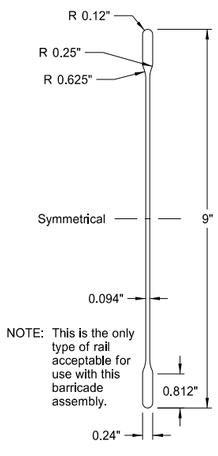
Retroreflectorization of tubular markers more than 42" in height shall be provided by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



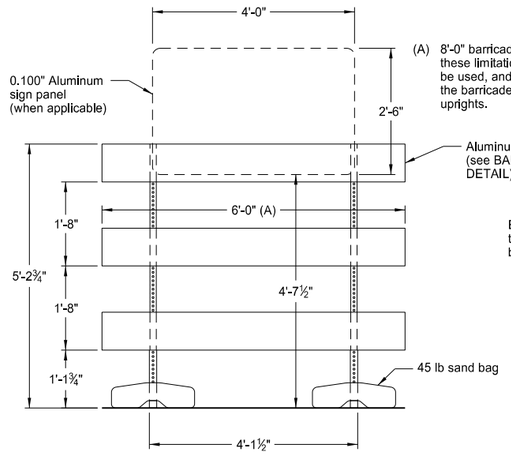
FLEXIBLE DELINEATOR

INSTALLATION NOTES:

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

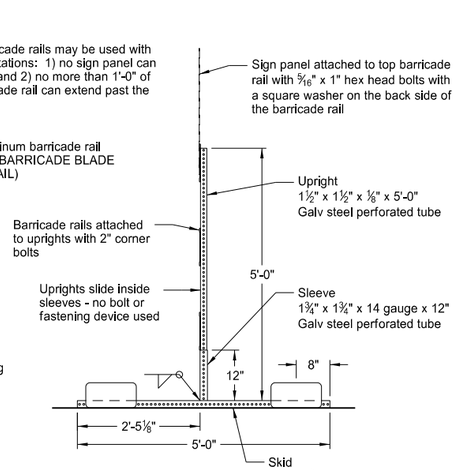


BARRICADE BLADE DETAIL



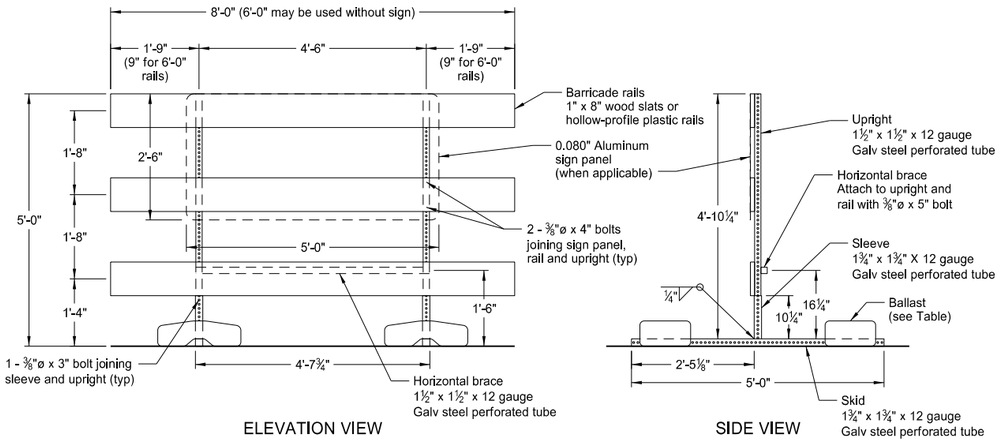
ELEVATION VIEW

(A) 8'-0" barricade rails may be used with these limitations: 1) no sign panel can be used, and 2) no more than 1'-0" of the barricade rail can extend past the uprights.



SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Aluminum Barricade Rails)

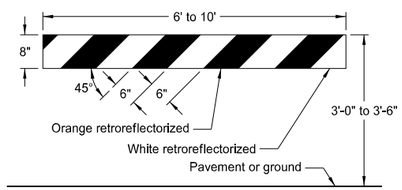


ELEVATION VIEW

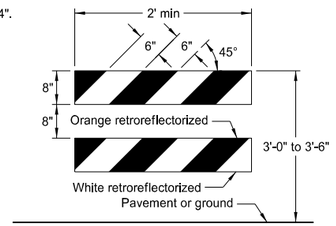
SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Wood or Plastic Rails)

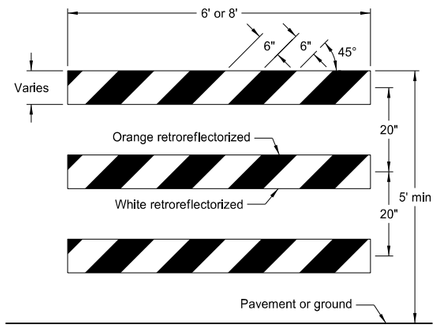
NOTE: Markings for barricades shall be alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Retroreflective sheeting shall be placed on both sides of the rails and shall have a minimum of 270 square inches of visible retroreflective area facing vehicular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



TYPE I BARRICADE

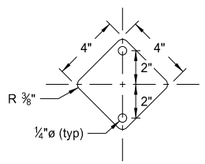


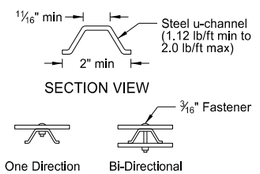
TYPE II BARRICADE

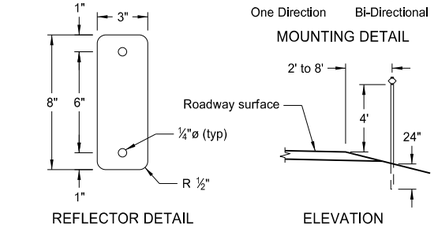


TYPE III BARRICADE

BARRICADE RAIL DETAILS







DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

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

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

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

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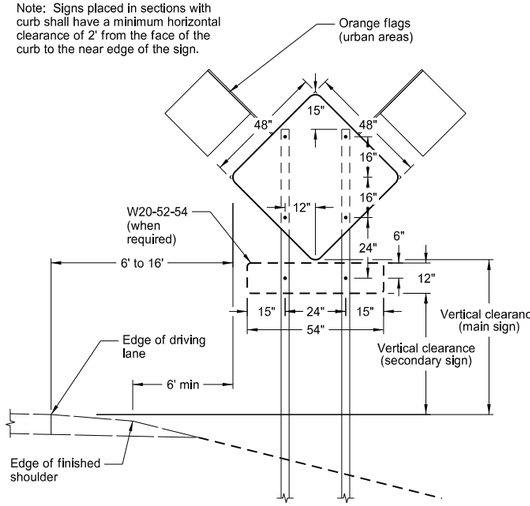
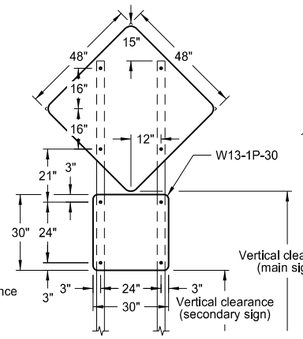
CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

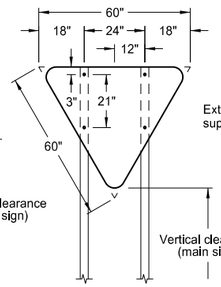
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



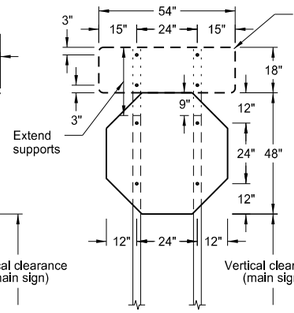
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



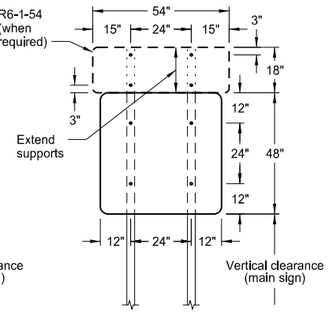
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



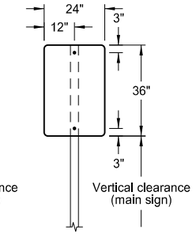
R1-2-60 - YIELD SIGN



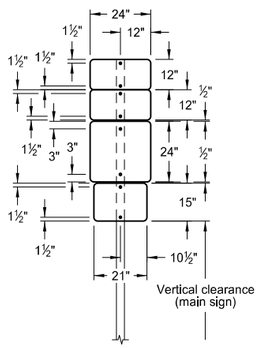
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



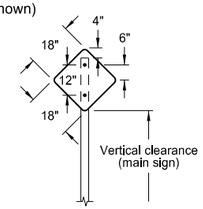
48" x 48" SIGN
(with R6-1-54 sign as required)



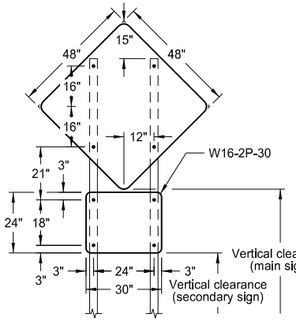
24" x 36" SIGN



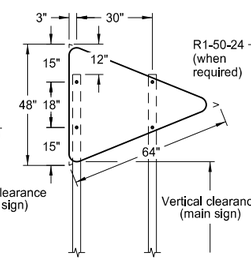
24" x 24"
ROUTE MARKER
ASSEMBLY



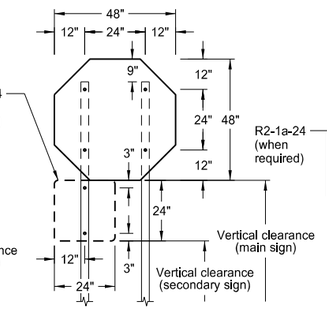
18" x 18"
DIAMOND SIGN



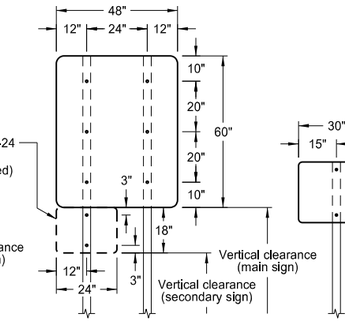
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



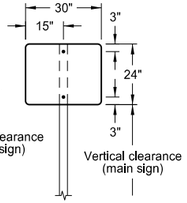
W14-3-64 - PENNANT SIGN



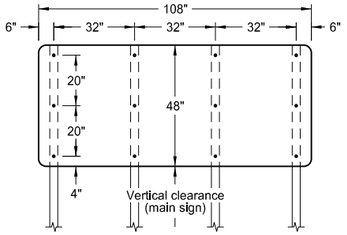
R1-1-48 - STOP SIGN
(with R1-50-24 sign as required)



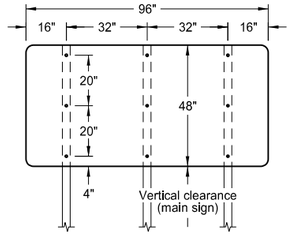
48" x 48" SIGN
(with R2-1a-24 sign as required)



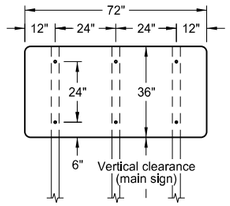
30" x 24" SIGN



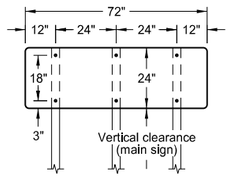
108" x 48" SIGN



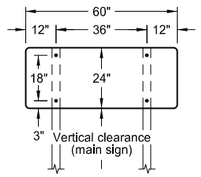
96" x 48" SIGN



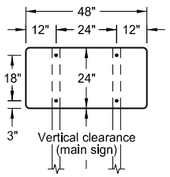
72" x 36" SIGN



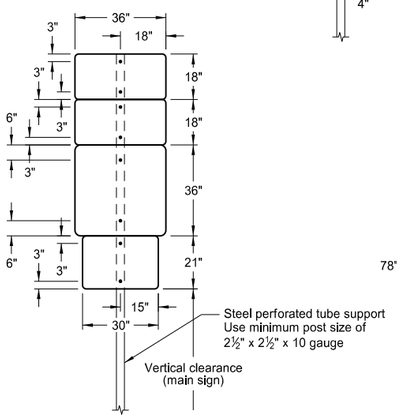
72" x 24" SIGN



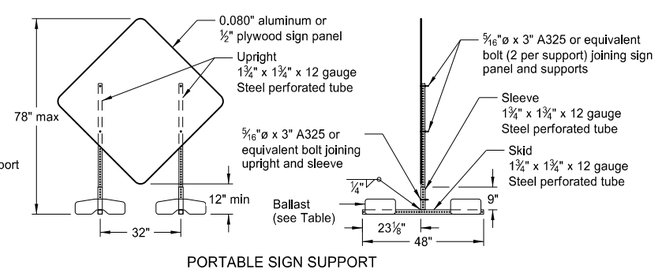
60" x 24" SIGN



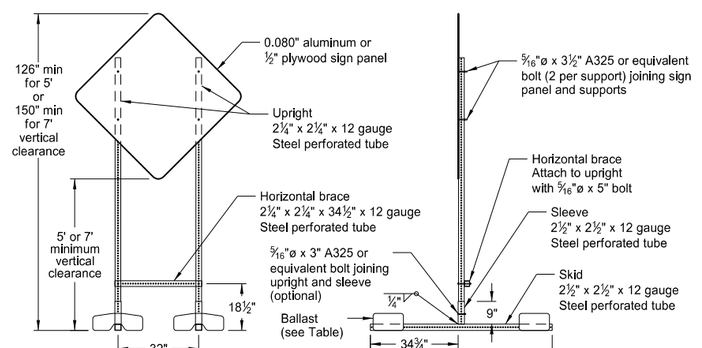
48" x 24" SIGN



36" x 36"
ROUTE MARKER
ASSEMBLY



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

1. Sign Supports: Supports shall be galvanized or painted. Minimum post sizes are 2.5 lb/ft u-channel or 2" x 2" x 12 gauge steel perforated tube, except where noted. When installing signs on u-channel, the minimum post size for assemblies containing a secondary sign is 3.0 lb/ft. Post sizes are based on a wind speed of 55 MPH.

   Signs over 50 square feet should be installed on 2½" x 2½" perforated tube supports as a minimum.

   Guy wires shall not be attached to sign supports. Wind beams may be attached to u-posts behind the sign panels.

2. Sign Panels: Provide sign panels made of 0.100" aluminum, ½" plywood, or other approved material, except where noted. All holes to be punched round for ⅜" bolts.

3. Alternate Messages: The signs that have alternate messages may have these alternate messages placed on a reflectorized plate (without a border) and installed and removed as required. (i.e. "Left" and "Right" message on a lane closure sign)

4. Route Marker Auxiliary Signs: Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:

   Interstate - white legend on blue background
   Interstate Business Loop - white legend on green background
   US and State - black legend on white background
   County - yellow legend on blue background

5. Vertical Clearance: Install signs with a vertical clearance of 5'-0" (see TYPICAL SECTION.) In areas where parking or pedestrian movements are likely or the view of the sign may be obstructed, install signs with a vertical clearance of 7'-0" from the top of the curb or from the near edge of the driving lane in absence of a curb.

   The vertical clearance to secondary signs is 1'-0" less than the vertical clearance as stated above.

   Large signs having an area exceeding 50 square feet shall have a minimum clearance of 7'-0" from the ground at the post.

6. Portable Signs: Provide portable signs that meet the vertical clearance as stated above. Use portable signs when it is necessary to place signs within the pavement surface.

   When portable signs are used for 5 days or less, low-mounting height (minimum 12" vertical clearance) sign supports may be used as long as the view of the sign is not obstructed. Time delays caused by unforseen circumstances, such as equipment breakdown, rain, subgrade failures, etc., will not accrue towards the 5 day period. The R9-8 through R9-11a series, W1-6 through W1-8 series, M4-10, and E5-1 may be used for longer than 5 days.

   Signs mounted to the portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT Details shall have a maximum surface area of 16 square feet.

MINIMUM BALLAST
(For each side of sign support base)

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

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

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

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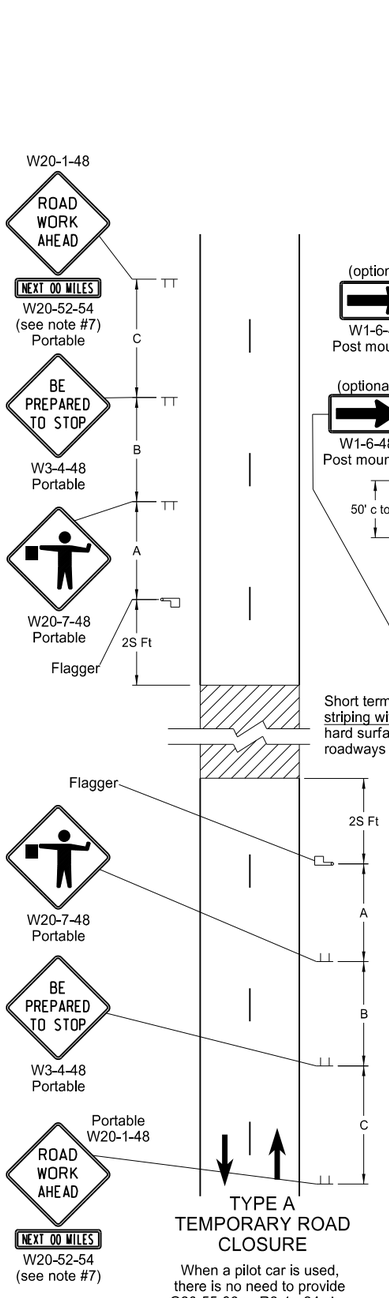
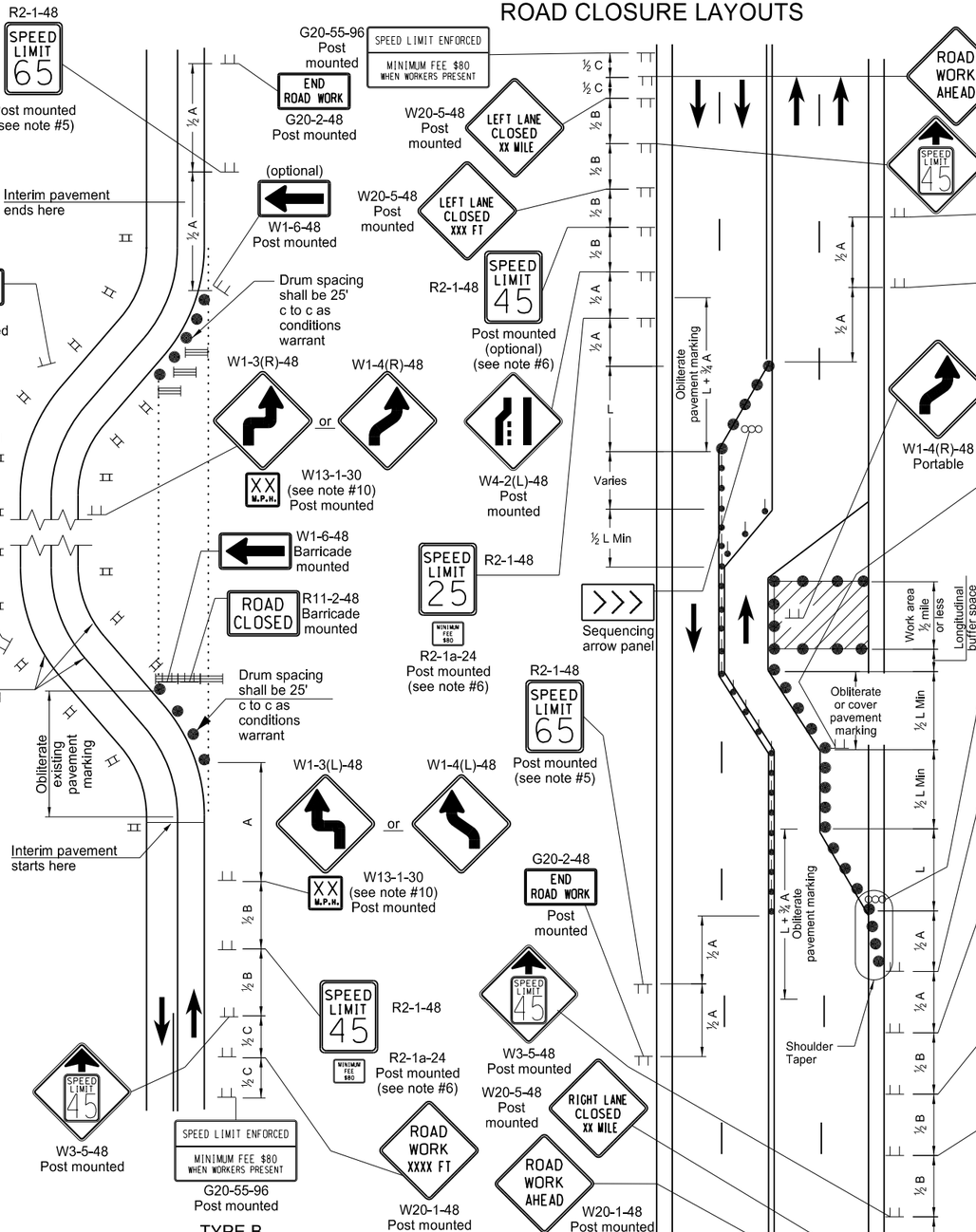
ROAD CLOSURE LAYOUTS

D-704-15



TYPE A
TEMPORARY ROAD CLOSURE

When a pilot car is used, there is no need to provide G20-55-96 or R2-1a-24 sign on the project as the pilot car will control the speed.



TYPE B
ROAD CLOSURE WITH A DIVERSION

Two lane highway where roadway is closed and detour is provided (signing shown for one direction of travel only). Use on bridge and culvert installation where closure is ½ mile or less.

TYPE C
HALF ROAD CLOSURE ON A MULTI-LANE, HIGH SPEED HIGHWAY

4 lane undivided highway with half the roadway closed.

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. Barricades placed on roadway shall be on a moveable assembly. Signs 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. 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. See Shoulder Closure Standard Drawing.
   Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
   Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
   Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
5. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
6. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at ½ B.
7. Use when work area is 1 mile or longer.
8. 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.
9. Existing speed limit signs within a reduced speed zone shall be covered.
10. Where necessary, safe speed to be determined by the Engineer.
11. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
12. G20-55-96 sign is not required if this standard is part of other traffic control layouts, or the work is less than 15 days.

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 III barricade
- Sign
- Delineator drum
- Tubular markers
- Work area
- Flagger
- Sequencing arrow panel
- 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

9-27-13

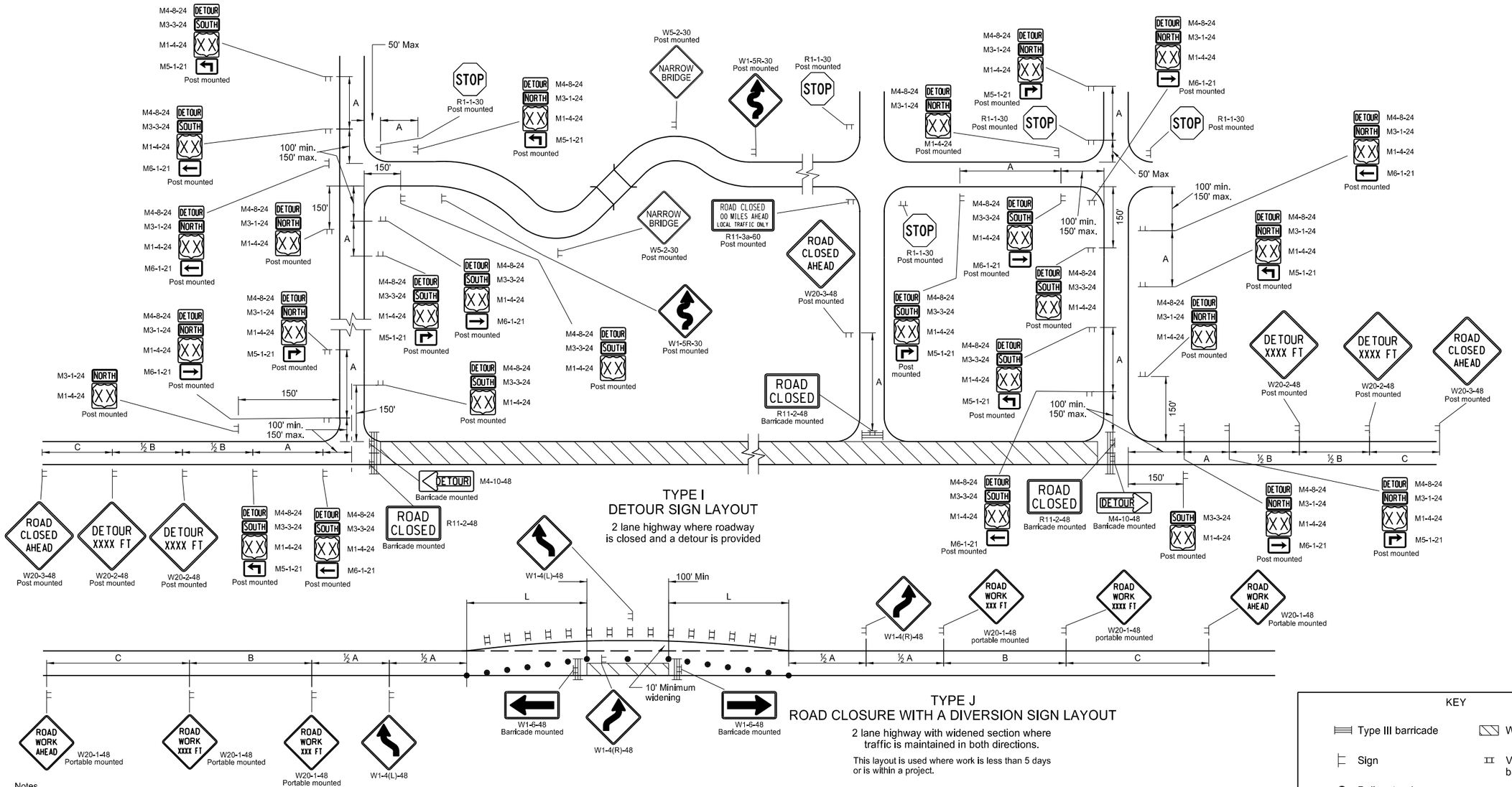
REVISIONS

DATE	CHANGE

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 09/27/13 and the original document is stored at the North Dakota Department of Transportation

DETOUR AND ROADWAY DIVERSION SIGN LAYOUTS

D-704-21



KEY

- Type III barricade
- Work area
- Sign
- Vertical panels back to back
- Delineator drum

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. Barricades placed on roadway shall be on a moveable assembly. Signs placed on roadway shall be placed on skid mounted assemblies.
3. Delineator drums and vertical panels used for tapering traffic shall be spaced at dimension "S". Delineator drums, tubular markers and vertical panels used for tangents shall be spaced at 2 times "S".
4. 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 shall be placed at ½ B.
5. 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.
6. Existing speed limit signs within a reduced speed zone shall be covered.
7. Obliterated or covered payment marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
8. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
9. A W24-1-48 sign may be used in place of the double reverse curve signs if the tangent between tapers is less than 600'.

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

DATE	CHANGE

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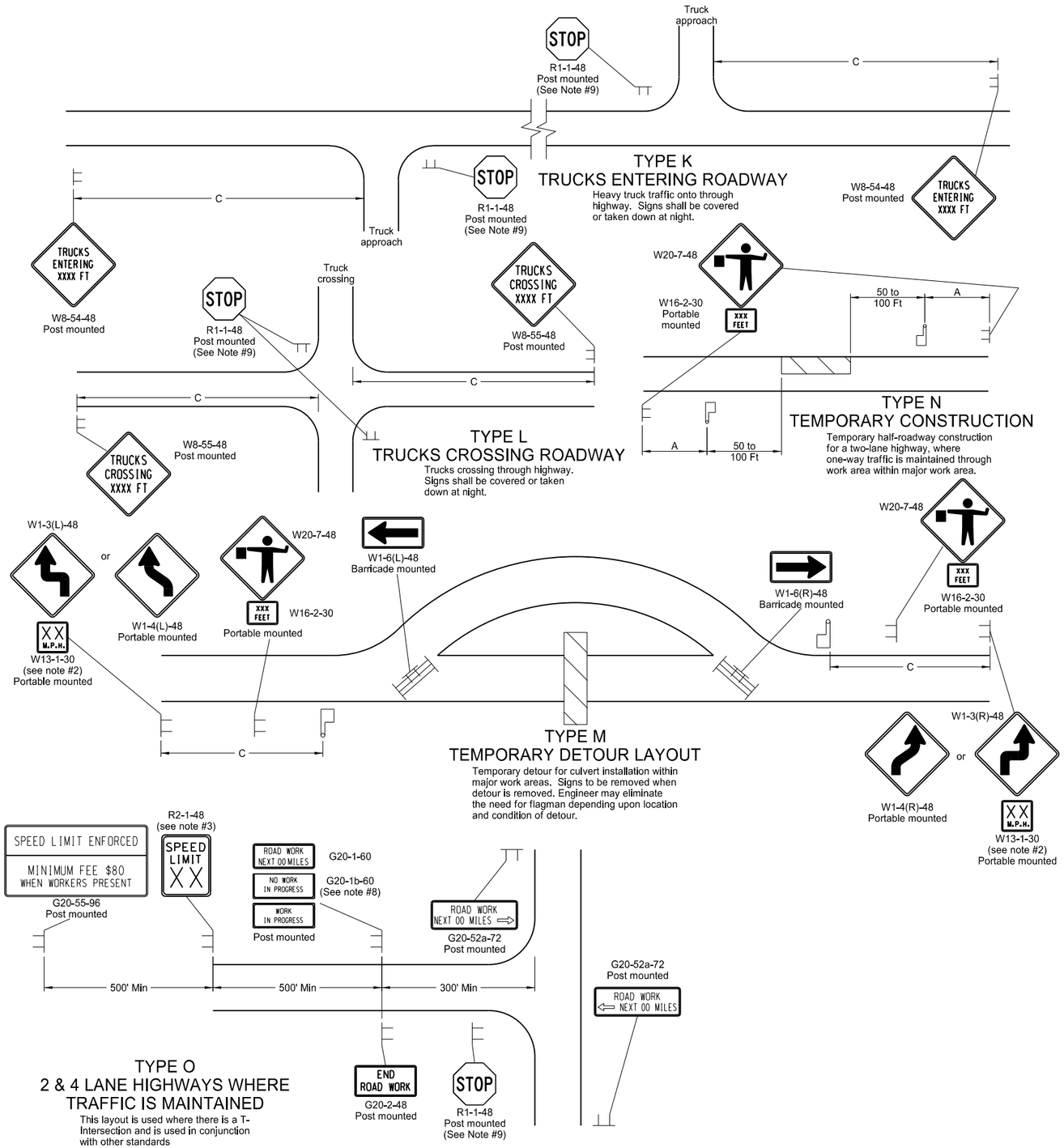
CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

D-704-22



Notes

1. Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway 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 ½ 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 signs in accordance with the NDDOT Standard Specifications.
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.
10. G20-55-96 sign is not required if this standard is part of other traffic control layouts with this sign or the work is less than 15 days.

KEY

Type III barricade — Work area

Sign — Flagger

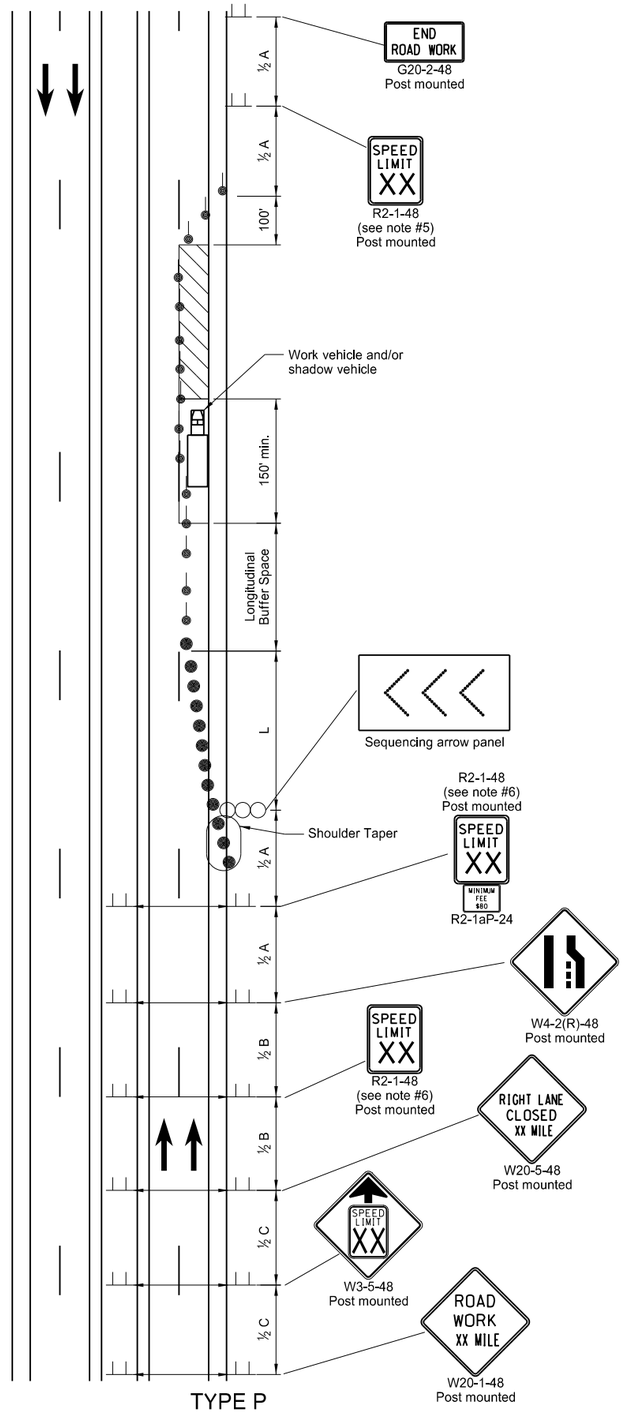
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 09/27/13 and the original document is stored at the North Dakota Department of Transportation

SHORT TERM URBAN DETOUR AND LANE CLOSURE ON A DIVIDED HIGHWAY LAYOUTS

D-704-23

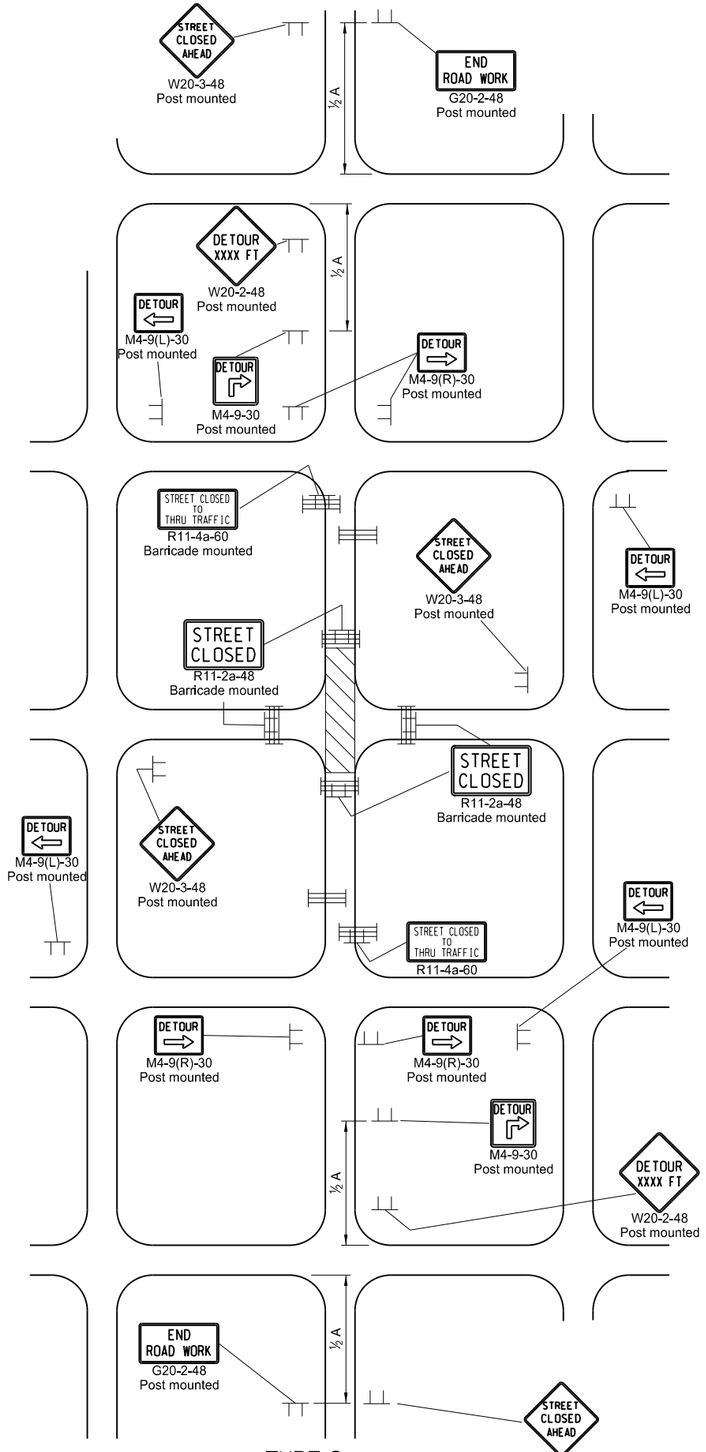


TYPE P

STATIONARY LANE CLOSURE ON A DIVIDED HIGHWAY

4 lane divided roadway where ½ of roadway is closed.

Short-term (more than 1 hour within a single daylight period.)



TYPE Q

DETOUR FOR A CLOSED STREET

Where city streets are used for detouring traffic.

Urban projects do not require the G20-55-96 and R2-1aP-24 signs.

Notes

1. Variables
   - S = Numerical value of speed limit or 85th percentile.
   - W = The width of taper in feet
   - L = Minimum length of taper, 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. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
3. Space delineator drums for tapering traffic at dimension "S". Space delineator drums or tubular markers for tangents at 2 times "S".
4. Place Sequencing Arrow Panels at the beginning of taper. Where shoulder width does not provide sufficient room, move panel closer to the work area and place on roadway surface.
   - Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
   - Use Type B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
   - Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
5. Re-established speed limit. Determine exact speed limit in the field, dependent on location and conditions.
6. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½ B.
7. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
8. Cover existing speed limit signs within a reduced speed zone.
9. Covered (when approved by engineer) or obliterated payment marking measured as as Obliteration of Pavement Marking.
10. Change intersection control on detour for Type Q when determined necessary by the engineer.
11. Engineer to determine safe speed where necessary. When parking is present, place signs so they are entirely visible above parked vehicles or at the edge of the parking area so they are visible to oncoming traffic.
12. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Specifications.
13. Recommend using 40 mph speed limit in vicinity of workers for Layout Type P, unless location and conditions dictate otherwise.

KEY

Type III barricade	Work area
Sign	Sequencing arrow panel
Delineator Drum	Tubular Markers

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

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

9-27-13

REVISIONS

DATE	CHANGE
8-17-17	Removed Speed limit signs, & updated notes & sign numbers.

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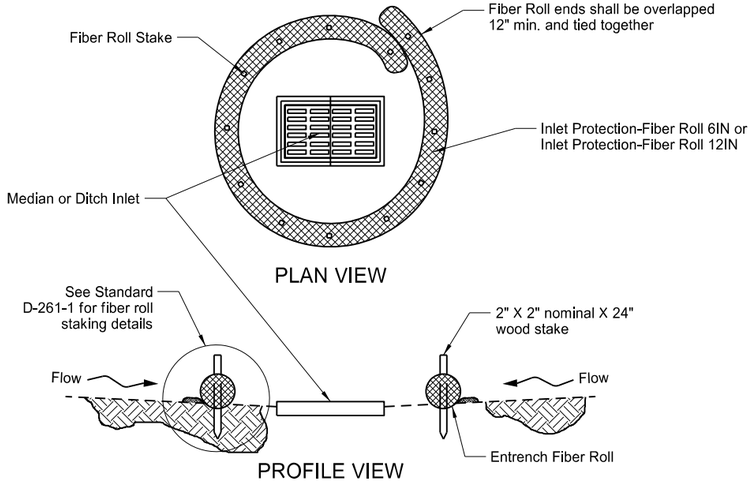
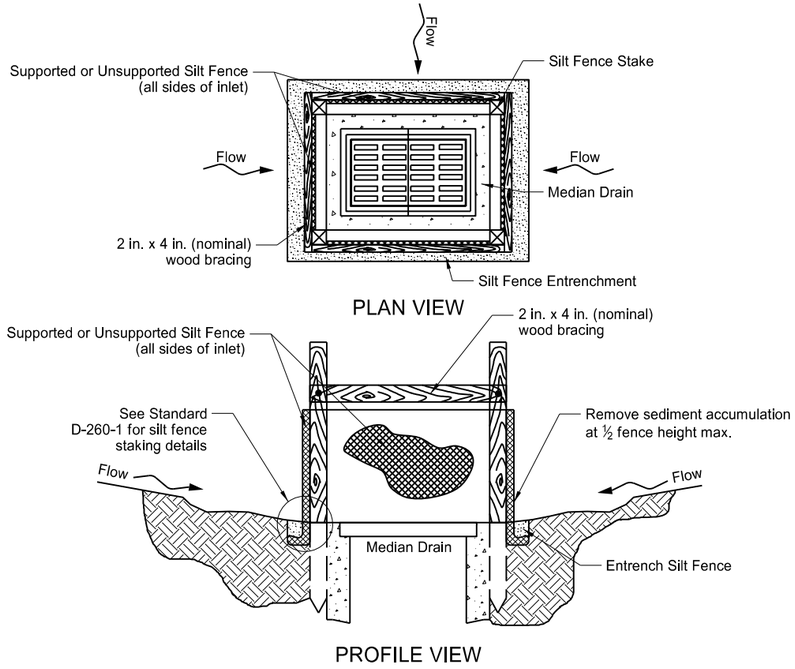
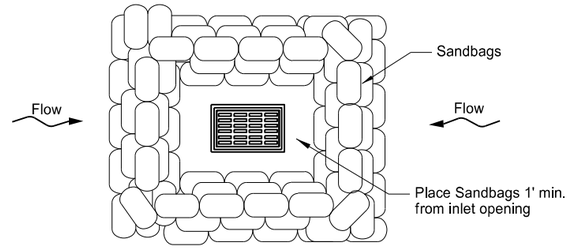
EROSION AND SILTATION CONTROLS
MEDIAN OR DITCH INLET PROTECTION



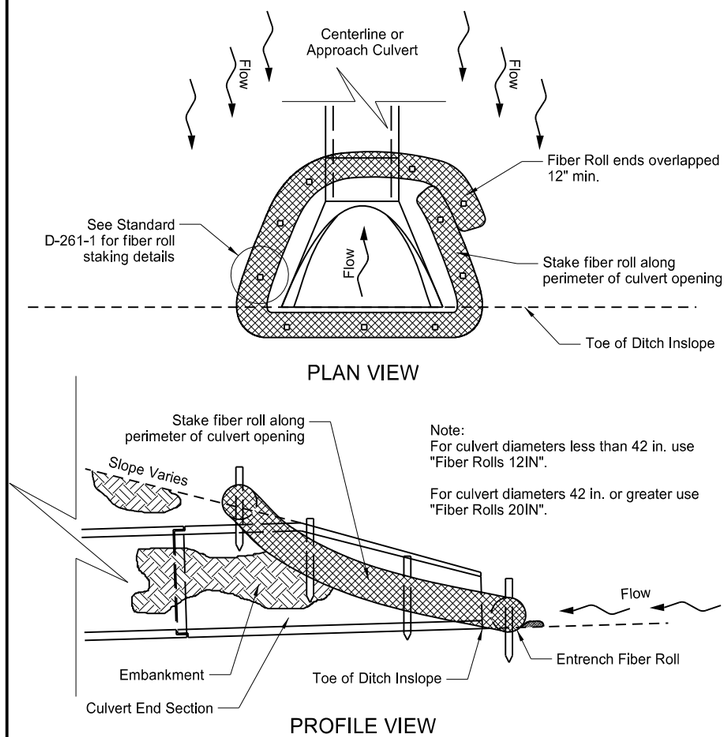
FIBER ROLL PROTECTION (MEDIAN OR DITCH INLET)



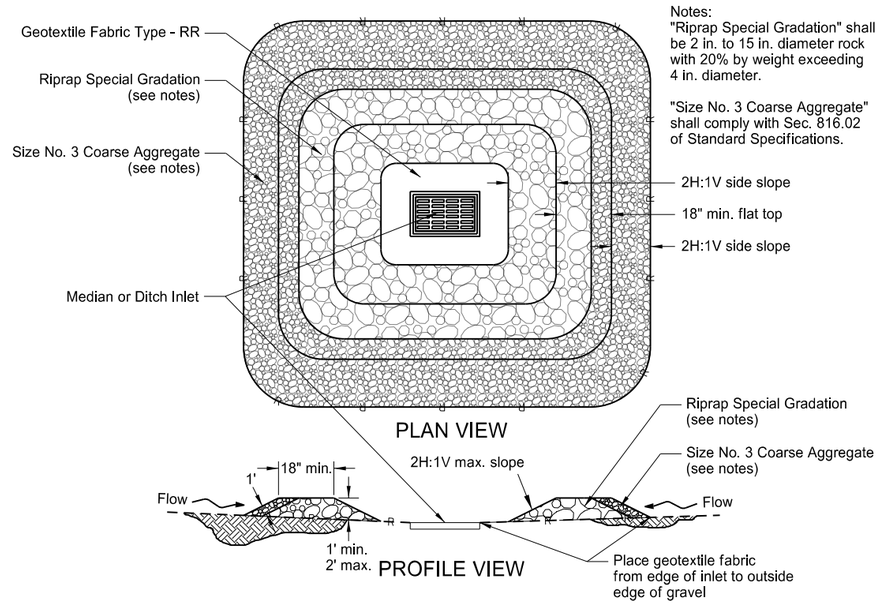
SILT FENCE PROTECTION (MEDIAN OR DITCH INLET)



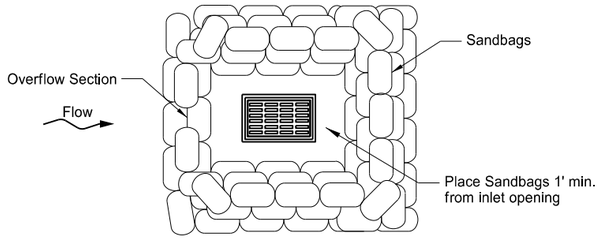
SANDBAG PROTECTION (LOW POINT)



FIBER ROLL PROTECTION (INLET OF CULVERT)



GRAVEL INLET PROTECTION (MEDIAN OR DITCH INLET)



SANDBAG PROTECTION (ON SLOPE)

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

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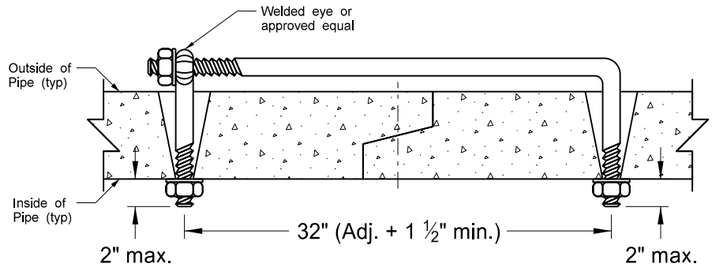
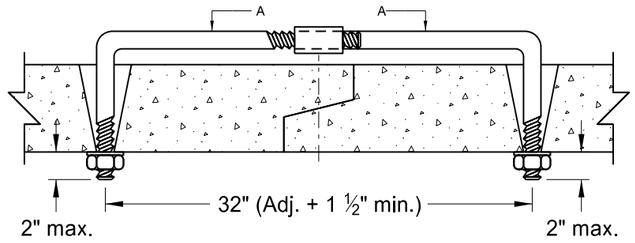
CONCRETE PIPE, CATTLE PASS, OR PRECAST CONCRETE BOX CULVERT TIES

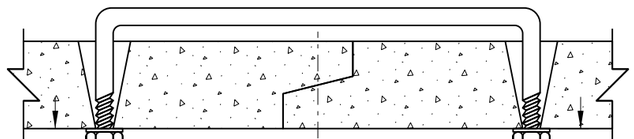
D-714-22



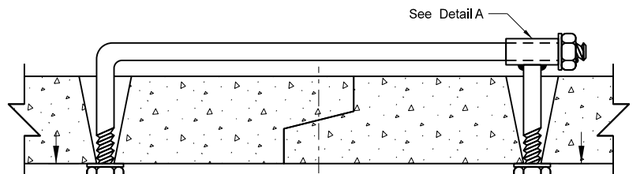
EYE BOLT TIE (PIPES ONLY)



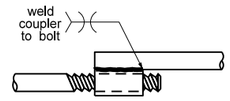
ADJUSTABLE TIE (RCB AND PIPES ONLY)



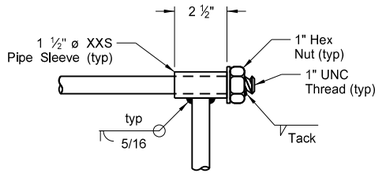
U BOLT TIE (RCB, PIPES, OR CATTLE PASSES)



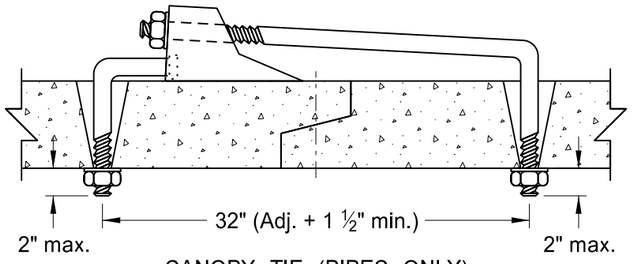
WELDED TIE (RCB AND PIPES ONLY)



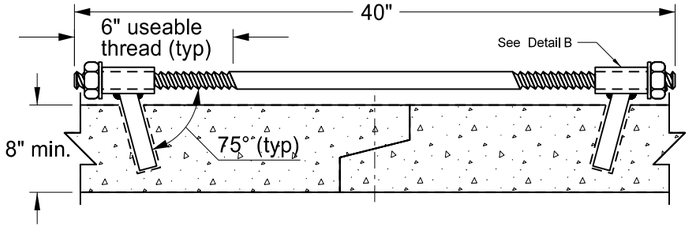
SECTION A-A



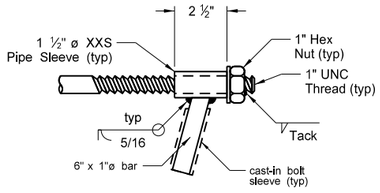
DETAIL A



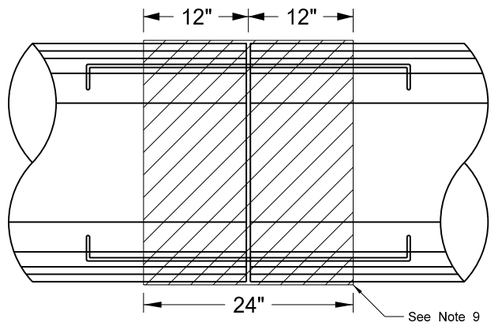
CANOPY TIE (PIPES ONLY)



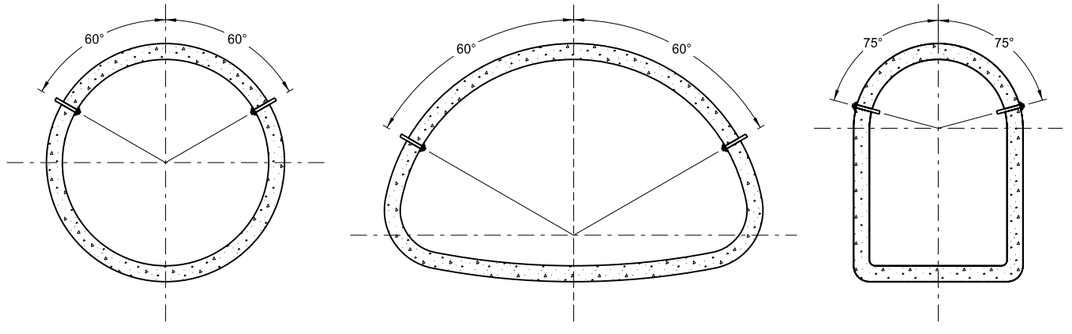
HIDDEN TIE (RCB ONLY)



DETAIL B



PLAN VIEW



END VIEW

REQUIRED SIZE OF TIE BOLTS		
Pipe Size	Thread ø	XXS Pipe Sleeve Inner ø
18" - 24"	⅝" See note 2	¾"
30" - 66"	¾"	1"
72" - 78"	1"	1 ¼"
RCB/Cattle Pass		

NOTES:

1. The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
2. Cattle Pass and Jacked and Bored pipes shall have pipe ties inserted from the inside of the pipes and grouted into place. Jacked and bored pipes with a diameter of 24" or less do not require pipe ties.
3. Nuts and washers are not required on Jacked and Bored pipes or pipes with a 24" diameter or less. Where nuts and washers are not used, the tie bars shall be inserted and grouted into place.
4. Ties are only for holding pipe or RCB sections together, not for pulling sections tight.
5. Tie bolt assembly shall be hot dip galvanized in accordance with AASHTO M232.
6. Holes in pipes to accommodate tie bolts can be precast or drilled. Tapered holes are permitted when precast. Holes shall have a diameter ¼" larger than the diameter of the thread. Holes in precast RCB's shall contain cast-in bolt sleeves with an inside diameter of 1 ¼".
7. The contractor has the option of selecting the type of tie bolt used from those shown.
8. The cost of precasting or drilling the required holes and furnishing and installing the tie bolts shall be included in the price bid for the appropriate conduit or RCB pay item.
9. All centerline and approach RCP culvert joints shall be tied. Storm drain systems shall have the first three joints including the end section of all free ends tied. Free ends are defined as any storm drain end which does not terminate at an inlet or manhole. Outfall culverts with end sections which drain adjacent ditches are examples of free ends.
10. Place joint wrap prior to installing ties. Overlap the joint by 12" in both directions.
11. Tie bolts shall conform to ASTM A 36. Nuts shall be be heavy hex and conform to ASTM A 563. Washers shall conform to ASTM F 436, Type 1. Welded pipe sleeves and cast-in bolt sleeves shall conform to ASTM A 53, Grade B.
12. RCB tie locations shall be as shown on the plans.

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

This document was originally issued and sealed by Jonathan David Ketterling, Registration Number PE-4684, on 6/6/2017 and the original document is stored at the North Dakota Department of Transportation