DESIGN DATA				
Traffic	Average Daily			Max. Hr.
Current 2012	Pass: 525	Trucks: 245	Total: 770	80
Forecast 2032	Pass: 680	Trucks: 320	Total: 1000	100
Clear Zone Distance:		Design Speed: 65		
Minimum Sight Dist. for Stopping:		Bridges: HL-93		
Sight Dist. for No Passing Zone:				
Pavement Design Life (years)				
Design Accumulated One-way ESALs:				

	STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	19853	1	1

JOB #23
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

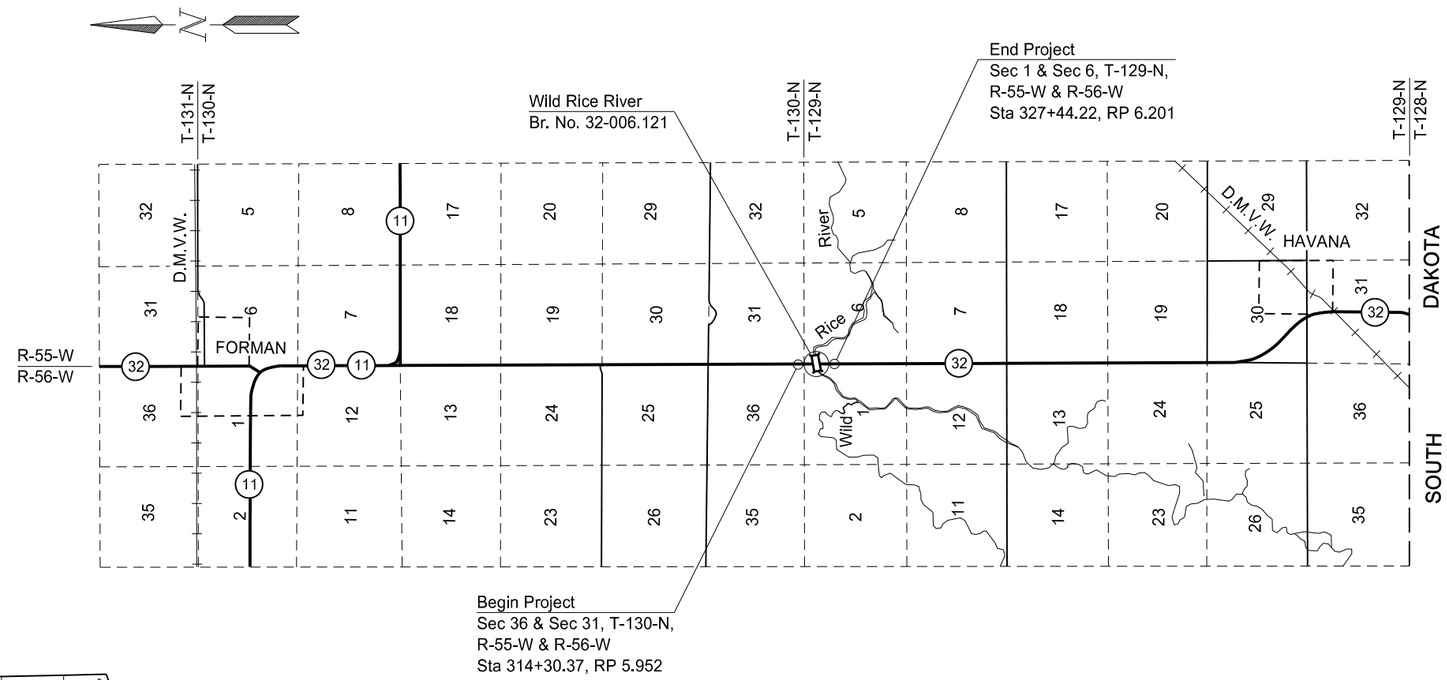
SS-8-032(033)006

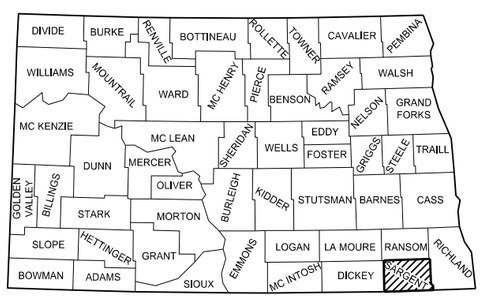
Sargent County
Wild Rice River ~ 4 Miles South of ND 11 East

Structural, Surfacing & Incidentals

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

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
SS-8-032(033)006	0.249	0.249





STATE COUNTY MAP

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 08/12/15

Terrence R. Udland
BRIDGE DIVISION

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8/12/2015 9:30:46 AM braschke R:\project\80032006.033\bridge\32-006.121\001TS_001_TITLE.dgn

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-032(033)006	2	1

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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-101-20, 21	Line Styles
D-101-30, 31, 32	Symbols
D-260-1	Erosion and Siltation Controls – Silt Fence
D-261-1	Erosion Control – Fiber Roll Placement Details
D-704-2	Traffic Control for Coring of Hot Bituminous Pavement
D-704-5	Contractor Sign Detail
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	Construction Sign Details – Terminal and Guide Signs
D-704-10	Construction Sign Details – Regulatory Signs
D-704-11	Construction Sign Details – Warning Signs
D-704-13	Barricade and Channelizing Device Details
D-704-14	Construction Sign Punching and Mounting Details
D-704-15	Road Closure Layouts
D-704-22	Construction Truck and Temporary Detour Layouts
D-704-27	Traffic Control Plan for Moving Operations
D-704-50	Portable Sign Support Assembly
D-714-1	Reinforced Concrete Pipe Culverts and End Sections (Round Pipe)
D-714-4	Round Corrugated Steel Pipe Culverts and End Sections
D-714-22	Concrete Pipe or Precast Concrete Box Culvert Ties
D-760-4	Rumble Strips Undivided Highways (Shoulders Less Than 4')
D-762-4	Pavement Marking
D-762-6	Short-Term Pavement Marking

LIST OF SPECIAL PROVISIONS (SP)

SP #	Description
SP 3(14)	Temporary Erosion and Sediment Best Management Practices
SP 4(14)	Federal Migratory Bird Treaty Act
SP 88(14)	Temporary Stream Diversions
SP 5034(14)	Permits and Environmental Considerations

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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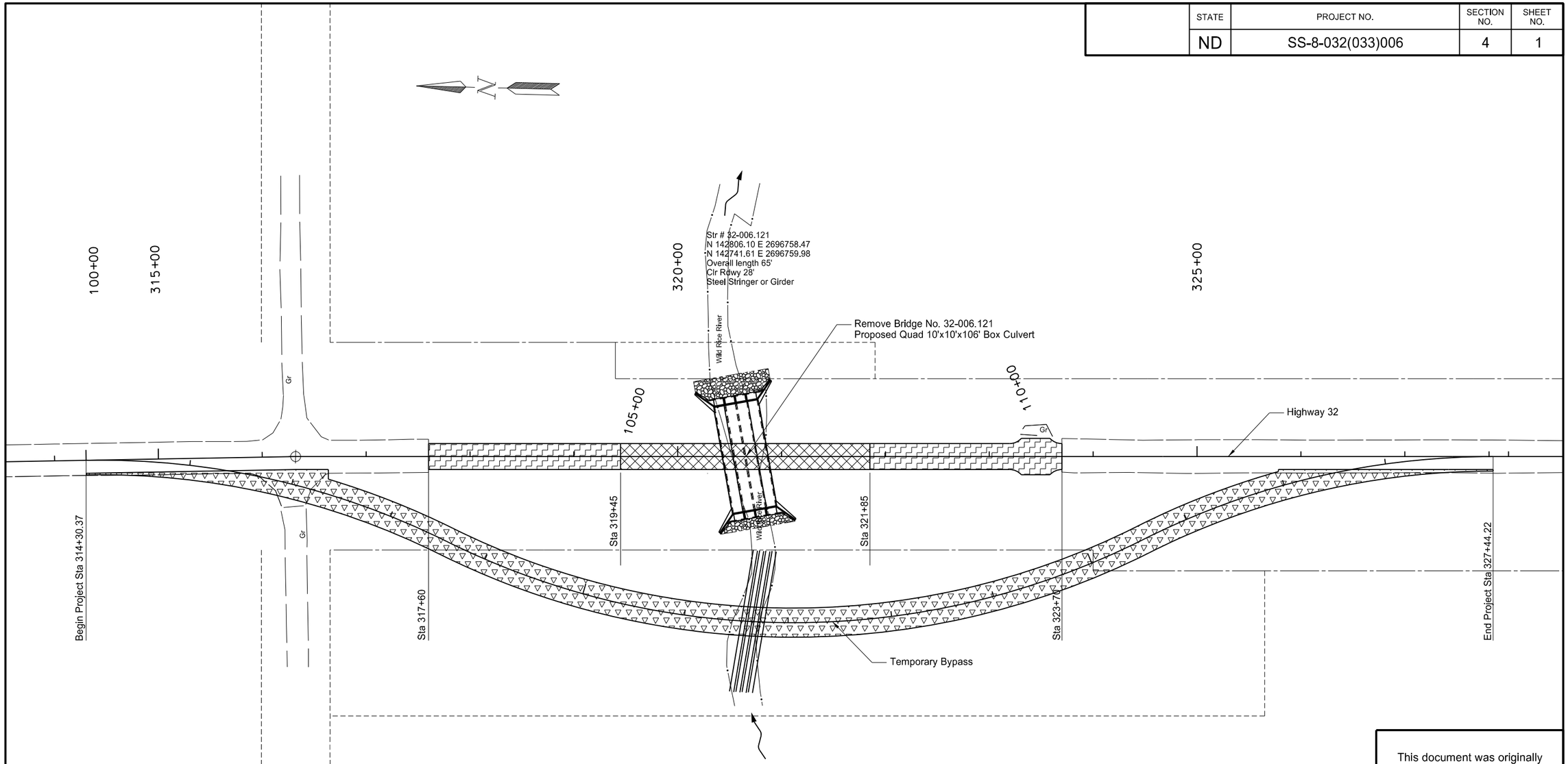

Reconstruction

2" Mill and 2" HBP Overlay

Temporary Bypass

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ND Highway 32

Scope of Work

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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NOTES

107-710 HAUL ROADS: Before submitting a proposal, contact the appropriate State, County, Township, or City officials to determine if there are any roadways that will be designated as "no haul routes".

202-P01 REMOVAL OF BITUMINOUS SURFACING: Sawing shall not be paid for separately but shall be included in the price bid for “Removal of Bituminous Surfacing”.

202-P02 BYPASS REMOVAL: Obtain approval before removing a temporary bypass. Restore the area impacted by the construction, use, and removal of the bypass to its original condition.

The existing section line roadway located within the limits of the temporary bypass shall be reshaped to its original cross-section following removal of the temporary bypass.

The Engineer will measure and pay for seeding and mulching and erosion control items as specified in the appropriate section of the Standard Specifications. Include all costs associated with the removal of the earth embankment, aggregate surfacing, riprap, RR fabric and pipe in the contract unit price for “Removal of Temporary Bypass”.

203-010 SHRINKAGE: 25 percent additional volume is included for shrinkage in earth embankment.

203-P01 BORROW-EXCAVATION: All borrow needed for the project shall be furnished by the Contractor.

203-P02 COMMON EXCAVATION: Payment for the bid items “Common Excavation–Type A” and “Common Excavation – Waste” will be paid at plan quantity.

253-P01 STRAW MULCH: The temporary bypass shall be straw mulch punched immediately after it is constructed to meet the requirements of the NDPDES permit. The temporary bypass will not require seeding.

256-P01 RIPRAP: The Contractor shall place riprap on the temporary bypass foreslopes as shown in Section 76 of the Plans. The riprap shall be in place while the temporary bypass is being used. All costs of labor, equipment and materials to furnish, haul and place the riprap shall be included in the price bid for “Riprap Grade II”.

The Contractor shall remove the riprap from the temporary bypass concurrent with removal of the temporary bypass. The Contractor may salvage the riprap used on the temporary bypass and place it at the ends of the box culvert at the locations designated on the plans. The salvaged riprap shall be clean and free of debris and the rocks shall meet the gradation requirements of Section 256 of the Standard Specifications.

Riprap removed and not salvaged shall become the property of the Contractor. All costs for removal and disposal of the riprap and RR fabric will be paid for as “Removal of Temporary Bypass”.

The total quantity for Riprap Grade II shown in the plans assumes no riprap from the temporary bypass will be salvaged for use at the ends of the box culvert.

411-P01 MILLING SECTIONS: At the beginning and end of the milling sections, the existing bituminous material shall be removed to form a straight vertical edge to allow placement of the 2 inch depth of surfacing. All material removed in these operations shall become the property of the Contractor.

430-P01 COMMERCIAL GRADE HOT MIX ASPHALT: The Hot Mix Asphalt shall be placed in accordance with Section 430.03F, with the following revisions:

- The Hot Mix Asphalt provided by the Contractor shall meet the requirements of Superpave FAA 44 shown in Section 430.03 C of the Standard Specifications
- Compaction shall meet the requirements of Section 430.04 I.3 "Ordinary Compaction".

The prime, blotter, asphalt cement and tack required for the bituminous pavement will not be measured for payment but shall be included in the price bid for "Commercial Grade Hot Mix Asphalt”.

704-P01 TRAFFIC CONTROL DEVICES: Traffic control for the structure replacement shall consist of a temporary bypass and a one lane closure with flagging. Traffic Control Devices shall comply with the following Standard Drawings:

D-704-5: Contractor sign is applicable.
D-704-7, 8, 9, 10, 11, 13, and 14 are applicable.
D-704-15 Layout Type A: For temporary roadway closure during the construction and removal of the temporary bypass.
D-704-15 Layout Type B: For the temporary bypass when the box culvert construction is taking place. The posted speed limit shall be 25 mph and a second speed limit 45 mph sign shall be installed since the speed reduction exceeded 30 mph.
D-704-22 Layouts Type K and L: For construction trucks entering from a borrow site, aggregate source, or a Contractor jobsite.
D-704-27: For pavement marking operations.
D-704-50: For portable sign support assembly

The required traffic control signs and devices are included in the “Traffic Control Devices List” and will be measured and paid for at the Contract Unit price for each device. Additional devices required to accommodate the Contractor’s operation shall be the Contractor’s responsibility.

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NOTES

704-P02 PROJECT PHASING: The traffic control details, as indicated on the plans, have been developed on the basis that this project will be constructed in three phases. The work zone traffic control summary list includes the required numbers of devices for each phase. The devices for the first phase shall be moved as required for the second phase and third phase.

Phase 1: The Contractor shall construct the temporary bypass. Traffic shall be maintained on ND Hwy 32 while the bypass is constructed. During working hours, the construction signing shall be in accordance with Standard Drawing D-704-15 Layout Type A with the proper use of flaggers. During non-working hours, terminal signing (Road Work Ahead W20-1-48 and End Road Work G20-2a-48) shall be left in place.

Phase 2: The traveling public shall be placed on the temporary bypass and the signing shall be in accordance with Standard Drawing D-704-15 Layout Type B. The temporary bypass shall be used while removing the existing bridge, constructing the proposed box culvert and replacing the roadway aggregate and HBP surfacing. The traffic shall remain on the temporary bypass until the aggregate and HBP on ND Hwy 32 is complete.

Phase 3: This phase shall include the removal of the temporary bypass. Traffic shall be maintained on ND Hwy 32 while the bypass is being removed. The construction signing shall be in accordance with Standard Drawing D-704-15 Layout Type A with the proper use of flaggers. During non-working hours, terminal signing (Road Work Ahead W20-1-48 and End Road Work G20-2a-48) shall be left in place.

714-P01 PIPE CONDUIT 48 IN - APPROACH: 4 lines of 48 inch pipe conduit have been provided in the plans to covey the flow of Wild Rice River through the temporary bypass. The waterway opening provided by the pipe conduit shown shall be the minimum waterway opening required at this location. Drainage pipe(s) providing a larger waterway opening may be used in lieu of the pipes shown subject to the following criteria and approval by the engineer. Due to the tight constrains of the river channel, pipe end sections are not required.

- Minimum cover requirements over the drainage pipe(s) shall be maintained without altering the vertical profile of the temporary bypass.
- Any drainage pipe(s) or structure(s) proposed for use by the Contractor shall be free of any structural defects and shall have sufficient structural capacity for use as a highway drainage structure.

Used pipe(s) may be used in lieu of new pipe(s) if they meet the criteria outlined above.

All costs for furnishing and installing the drainage system to convey the flows in Wild Rice River through the temporary bypass will be paid for as “Pipe Conduit 48IN – Approach”.

The drainage system used to convey the flows in Wild Rice River through the temporary bypass shall be removed concurrent with removal of the temporary bypass. All costs for removing the drainage system will be paid for as “Removal of Temporary Bypass”.

764-P01 REMOVE W-BEAM GUARDRAIL & POSTS: The removed W-beam guardrail materials which are not reset shall be delivered by the contractor to the NDDOT Maintenance Storage Yard in Forman, and neatly stacked at a location designated by the engineer. The address of the NDDOT Maintenance Storage Yard is:

Forman NDDOT
9106 Hwy 32
Forman, ND 58032-9770

The cost for delivery and stacking of the removed W-beam guardrail materials which are not to be reset shall not be paid for separately, but shall be included in the price bid for the item "Remove W-Beam Guardrail & Posts.”

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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ENVIRONMENTAL COMMITMENTS

ENVIRONMENTAL COMMITMENTS (EC): The North Dakota Department of Transportation and the Federal Highway Administration have made environmental commitments to secure approval of this project. The environmental commitments are as follows:

EC-1: Unavoidable impacts to wetlands will be mitigated onsite, adjacent to the project, or at a NDDOT approved mitigation site or bank.

ACTION REQUIRED /TAKEN: 0.12 acres of permanent impacts to jurisdictional waters and 0.00 acres of permanent impacts to *natural/non-jurisdictional* wetlands will require mitigation. The NDDOT proposes to mitigate 0.19 acres onsite. Temporary wetland impacts areas will be contoured to pre-construction conditions.

Wetland Impact Table

Wetland Number	Location	Cowardin Class.	Wetland Type	Wetland Size Ac.	Wetland Feature	USACE Jurisdictional Wetlands*	Wetland Impacts (acres)		USFWS Easement Impacts		Wetland Mitigation				
											Mitigation Required			Location; Acreage; Wetland#; Ratio	Onsite Mitigation Acres
							Temp. Ac.	Perm. Ac.	Temp.	Perm.	EO 11990	USACE	USFWS		
1	Sec.31, T130N, R55W & Sec. 36, T130N, R56W	PEMF	Basin	0.82	Natural	No	0.00	0.00			N	N	N	None	
2	Sec. 6, T129N, R55W & Sec. 1, T129N, T56W	PEMC	Basin	1.14	Natural	Yes	0.47	0.12			Y	Y	N	0.07; Wetland 3; 2:1	0.05 Box Culvert Lowered 1'
3	Sec.6, T129N, R55W & Sec. 1, T129N, R56W	PEMC	Basin	1.75	Natural	Yes	0.23	0.00			N	N	N	none	0.14
			Totals	**3.71**			**0.70**	**0.12**	**0.00**	**0.00**					**0.19**

* A wetland Jurisdictional Determination was issued by the USACE on 12/13/2012; NWO-2012-2732-BIS.

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

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

Other Waters Impact Table

Other Waters											Other Water Mitigation				
			Size				Impacts to Other Waters				Mitigation Required				
							Acres		Linear Feet						
Number	Location	Type	Acres	Linear Feet	Feature	USACE Jurisdictional*	Temp	Perm	Temp	Perm	EO 11990	USACE	USFWS	Location	Method
2A	Sec.19, T129N, R55W & Sec. 1, T129N, R56W	Riverine	2.89	300	Natural	Yes	0.11	0.09	187	117	Y	N	N	On Site	Box Culvert Lowered 1'
		Totals	**2.89**	**300**											

* A wetland Jurisdictional Determination was issued by the USACE on 12/13/2012; NWO-2012-2732-BIS.

ENVIRONMENTAL COMMITMENTS

Summary Impact Table			
Total Permanent Impact Summary		**Temporary Impacts and additional information**	
Wetland Type	**Total (Acres)**	**Wetland Type**	**Total (Acres/Lf)**
Natural/JD	0.12	**Temporary JD**	0.47
Natural/Non-JD	0.00	**Non-JD Temporary**	0.23
Artificial/JD	0.00	**Permanent JD > 0.10**	0.12
Artificial /Non-JD	0.00	**Permanent OW**	0.09 ac/117 ft.
Total	**0.12**	**Temporary OW**	0.11 ac/187 ft.

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

EC- 2: No construction or demolition activities will take place during the spawning season in the Wild Rice River from April 15 to June 1.

EC-3: The Contractor shall prevent the introduction of 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 (NDGFD) Administrative Rules 30-3-06 for compliance with ND Century Code Chapter 20.1-17 on Aquatic Nuisance Species (ANS). Contractor shall notify the NDGFD at least 72 hours prior to the placement IN or ON the waters of the State of North Dakota of any and all vehicles, vessels, pumps and equipment that will be used in the project, to allow the Department sufficient time to inspect any and all such equipment for ANS. The NDGFD ANS Coordinator, Fred Ryckman, shall be contacted by phone (701.770.0920) or e-mail fryckman@nd.gov for equipment inspections, or any additional information regarding ANS prevention protocol.

NOTIFICATIONS TO BE FILED BY CONTRACTOR:

- North Dakota Department of Health SFN 17987 Asbestos Notification of Demolition and Renovation for bridges and boxes.

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-032(033)006	8	1

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY	TOTAL
103	0100	CONTRACT BOND	L SUM	1	1
202	0105	REMOVAL OF STRUCTURE	L SUM	1	1
202	0135	REMOVAL OF BITUMINOUS SURFACING	TON	266	266
202	0350	REMOVAL OF TEMPORARY BYPASS	EA	1	1
203	0101	COMMON EXCAVATION-TYPE A	CY	1,384	1,384
203	0109	TOPSOIL	CY	2,939	2,939
203	0113	COMMON EXCAVATION-WASTE	CY	2,961	2,961
203	0121	TOPSOIL-WETLAND	CY	676	676
203	0140	BORROW-EXCAVATION	CY	11,110	11,110
210	0050	BOX CULVERT EXCAVATION	EA	1	1
210	0210	FOUNDATION FILL	CY	1,130	1,130
210	0405	FOUNDATION PREPARATION-BOX CULVERT	EA	1	1
216	0100	WATER	M GAL	206	206
251	0200	SEEDING CLASS II	ACRE	3.64	3.64
251	1000	WETLAND SEED	ACRE	0.83	0.83
251	2000	TEMPORARY COVER CROP	ACRE	5.43	5.43
253	0101	STRAW MULCH	ACRE	5.43	5.43
256	0200	RIPRAP GRADE II	CY	238	238
260	0200	SILT FENCE SUPPORTED	LF	1,734	1,734
260	0201	REMOVE SILT FENCE SUPPORTED	LF	1,734	1,734
261	0112	FIBER ROLLS 12IN	LF	1,125	1,125
262	0100	FLOTATION SILT CURTAIN	LF	110	110
262	0101	REMOVE FLOTATION SILT CURTAIN	LF	110	110
302	0120	AGGREGATE BASE COURSE CL 5	TON	2,258	2,258
411	0105	MILLING PAVEMENT SURFACE	SY	546	546
430	0500	COMMERCIAL GRADE HOT MIX ASPHALT	TON	394	394
702	0100	MOBILIZATION	L SUM	1	1
704	0100	FLAGGING	MHR	600	600
704	1000	TRAFFIC CONTROL SIGNS	UNIT	1,318	1,318
704	1052	TYPE III BARRICADE	EA	6	6
704	1060	DELINEATOR DRUMS	EA	14	14
704	1081	VERTICAL PANELS-BACK TO BACK	EA	49	49
704	1500	OBLITERATION OF PAVEMENT MARKING	SF	555	555

ESTIMATE NUMBER: 15821 RUN DATE: 08/17/2015 TIME: 10:21:39

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-032(033)006	8	2

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY	TOTAL
706	0500	AGGREGATE LABORATORY	EA	1	1
709	0100	GEOSYNTHETIC MATERIAL TYPE G	SY	665	665
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	435	435
714	4128	PIPE CONDUIT 48IN-APPROACH	LF	552	552
760	0005	RUMBLE STRIPS - ASPHALT SHOULDER	MILE	0.231	0.231
760	0007	RUMBLE STRIPS - ASPHALT CENTERLINE	MILE	0.112	0.112
762	0430	SHORT TERM 4IN LINE-TYPE NR	LF	500	500
762	1104	PVMT MK PAINTED 4IN LINE	LF	4,500	4,500
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS	LF	532.2	532.2
764	2081	REMOVE END TREATMENT & TRANSITION	EA	4	4
900	1000	TEMPORARY STREAM DIVERSION	EA	1	1
		ALTERNATE 'A' CAST-IN-PLACE BOX CULVERT			
602	1131	CLASS AE-3 CONCRETE-BOX CULVERT	CY	505.3	505.3
612	0114	REINFORCING STEEL-GRADE 60-BOX CULVERT	LBS	67,618	67,618
		ALTERNATE 'B' PRECAST BOX CULVERT			
606	3010	DBL 10FT X 10FT PRECAST RCB CULVERT	LF	212	212
606	7010	DBL 10FT X 10FT PRECAST RCB END SECTION	EA	2	2

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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BASIS OF ESTIMATE

Material
Aggregate Base Course CL 5 @ 1.875 Ton/CY

Commercial Grade Hot Mix Asphalt @ 2 Ton/CY

Riprap @ 1.7 Ton/CY

PG 58-28 Asphalt Cement @ 6.0%
(Not a pay item – to be included in the price bid for "Commercial Grade Hot Mix Asphalt")

Tack Coat @ 0.05 Gal/SY
(Not a pay item – to be included in the price bid for "Commercial Grade Hot Mix Asphalt")

Prime Coat @ 0.25 Gal/SY
(Not a pay item – to be included in the price bid for "Commercial Grade Hot Mix Asphalt")

Blotter Material CL 44 @ 15 lbs/SY
(Not a pay item – to be included in the price bid for "Commercial Grade Hot Mix Asphalt")

Water @ 20 Gals / Ton Aggregate Base Course CL 5
Water @ 10 Gals / CY Borrow
50 MGal for dust control

Earthwork

Location	Excavation (CY)	Pvmt Removal from Excavation Areas (CY)	Common Excavation - Type A (CY) Pay Item	Embankment (CY)	Borrow - Excavation (CY) Pay Item	Excavation Waste (CY) Pay Item
Temporary Bypass				11,110	*11,110	
Highway 32**	4,487	142	1,384			2,961
Totals	**4,487**	**142**	**1,384**	**11,110**	**11,110**	**2,961**

An additional volume of 25% is included for shrinkage in earth embankment
*This material will need to be removed and is paid for as "Removal of Temporary Bypass"
**This earthwork location includes guardrail embankment excavation, backfill over box, and wetland mitigation site excavation

Short Term 4 In Line – Type NR
One application: After completion of HBP, Rumble Strips and Rumble Strip Fog Seal
2000 Feet = 0.3788 mile
0.3788 mile (10' Line, 30' Skip) x 1,320 LF/Mile **= 500 LF**
- 1,320 LF/Mile for 10' Line, 30' Skip

Pavement MK Painted 4 In Line
2000' = 0.3788 mile
0.3788 mile (10' Line, 30' Skip) x 1,320 LF/Mile **= 500 LF**
- 1,320 LF/Mile for 10' Line, 30' Skip

0.3788 mile x 5,280 x 2 = **4,000 LF**
- 5280 LF/Mile for Outside Edge Lines

Rumble Strips
ND 32 – Lt & Rt Shoulders
Length = 185' + 240' + 185' = 0.1155 mile
0.1155 x 2 = **0.231 Mile**

ND 32 – Centerline
Length = 0.1155 mile x 1 = **0.112 Mile**

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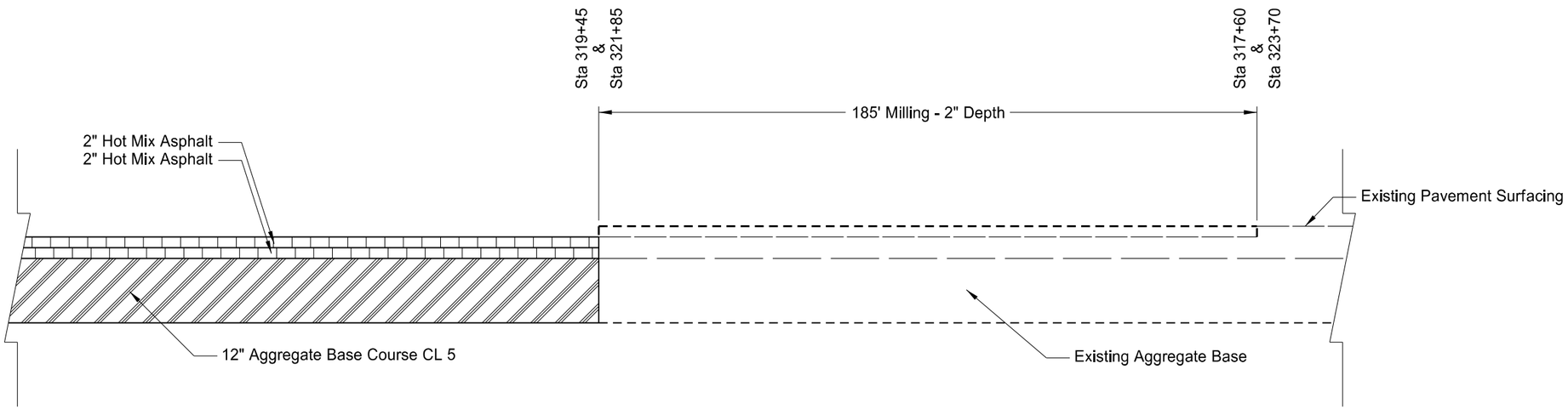
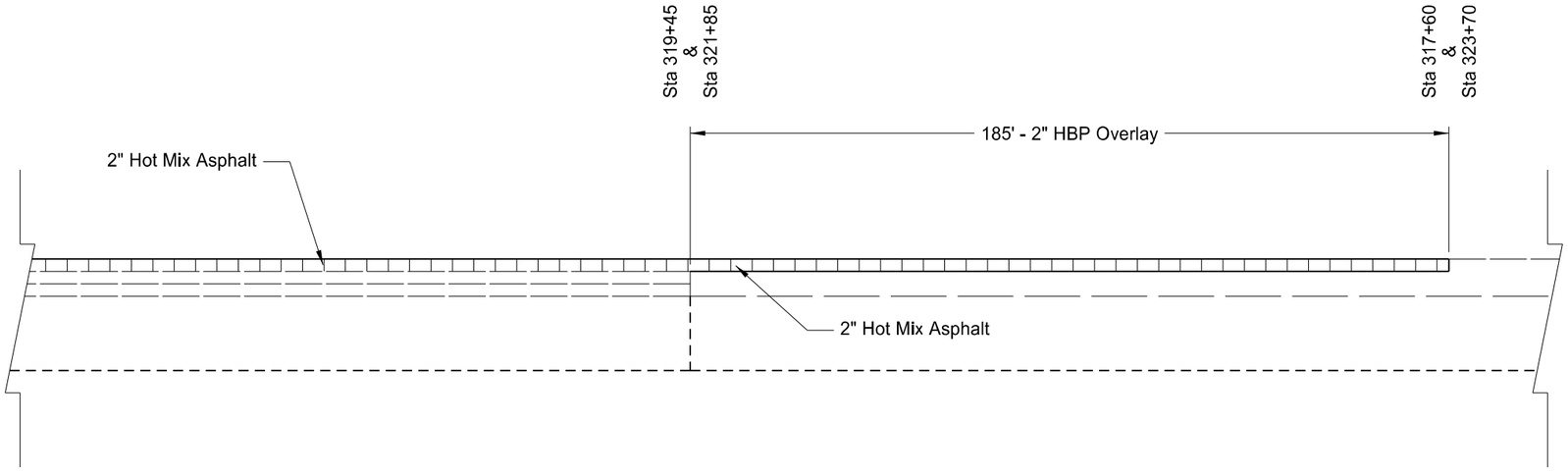
Basis of Estimate

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	20	1



Milling Transition



Paving Transition

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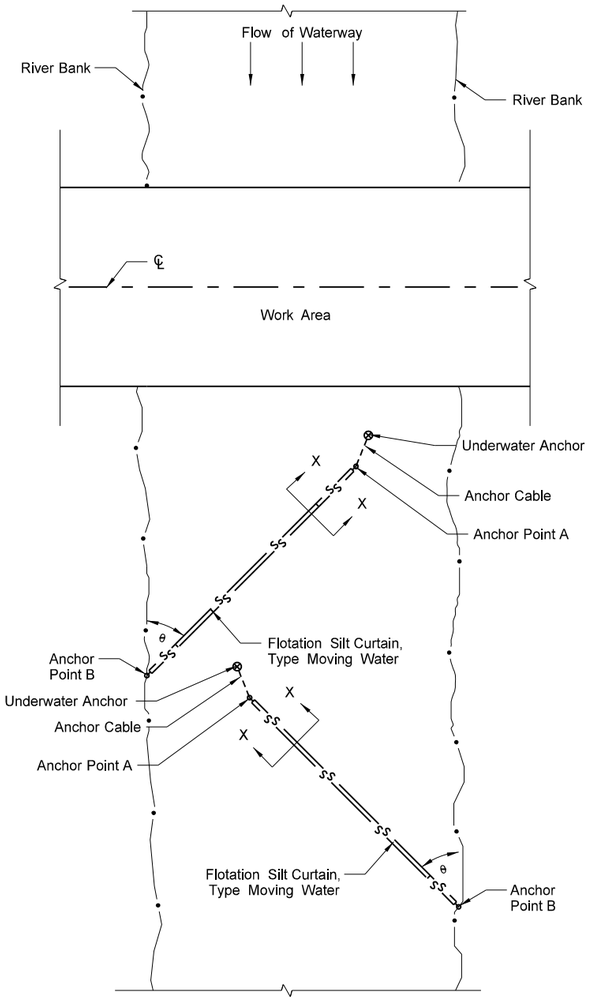
ND Highway 32

Milling & Paving Transition

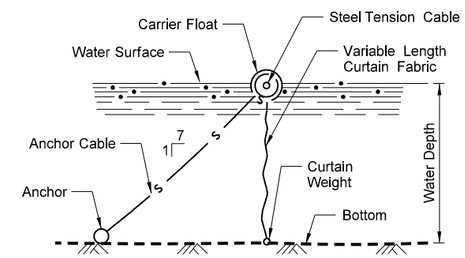
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	20	2



∠ θ	RIVER VELOCITY
45°	SLOW, LESS THAN 3 FT./SEC.
35°	MODERATE, 3 - 5 FT./SEC.

PLAN VIEW

FLOTATION SILT CURTAIN - TYPE MOVING WATER



SECTION X-X

FLOTATION SILT CURTAINS

Notes:

Use enough Anchors to Hold Silt Curtain in Place

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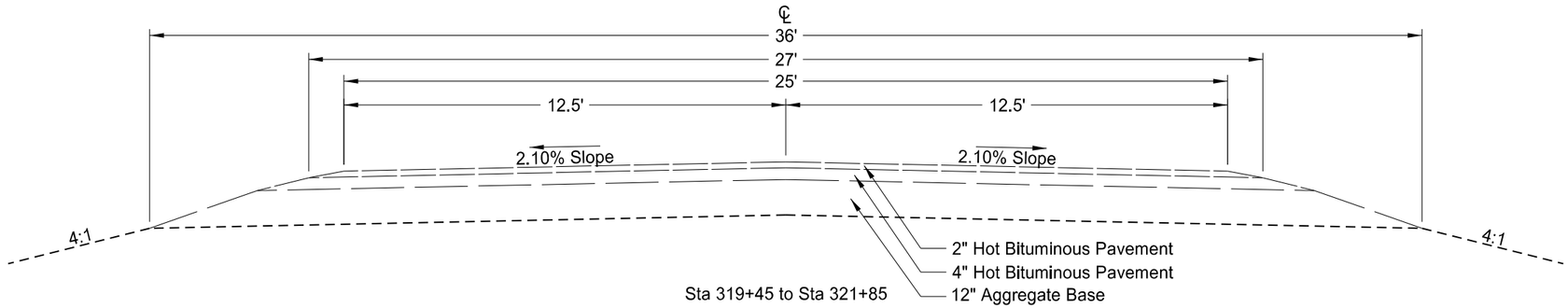
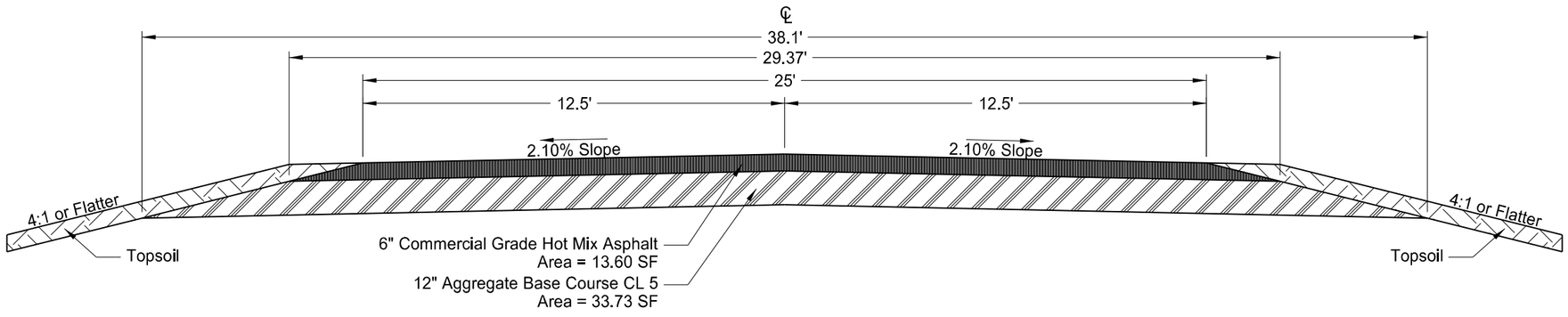
ND Highway 32

Temporary Erosion Control - Flotation Silt Curtain

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	30	1





Sta 319+45 to Sta 321+85

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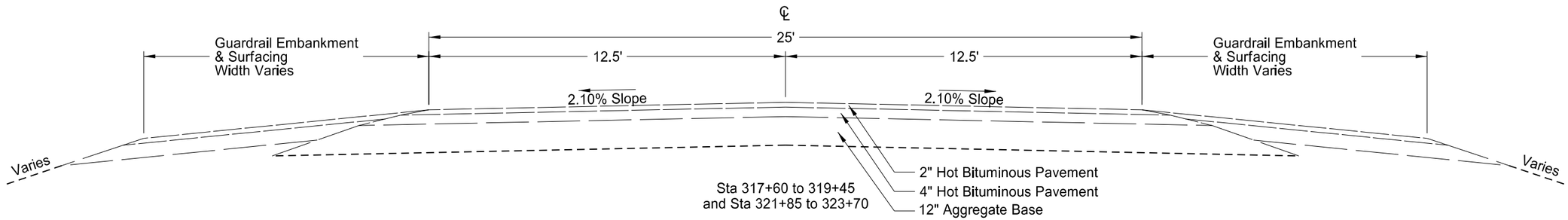
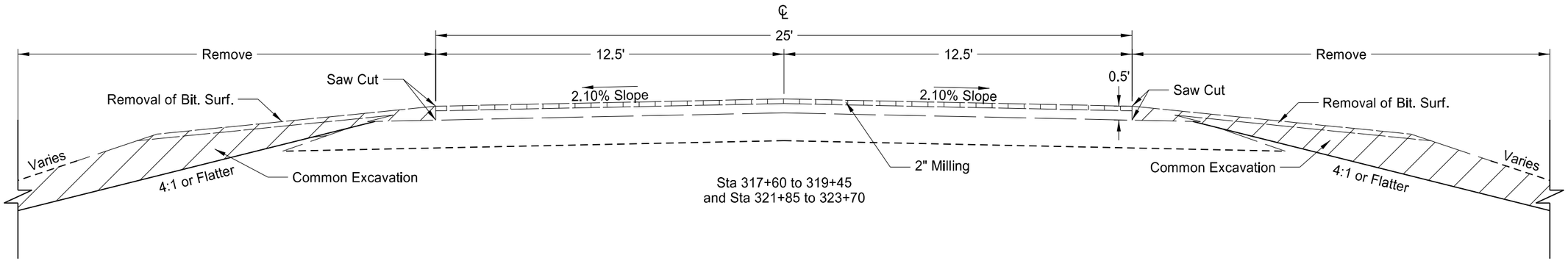
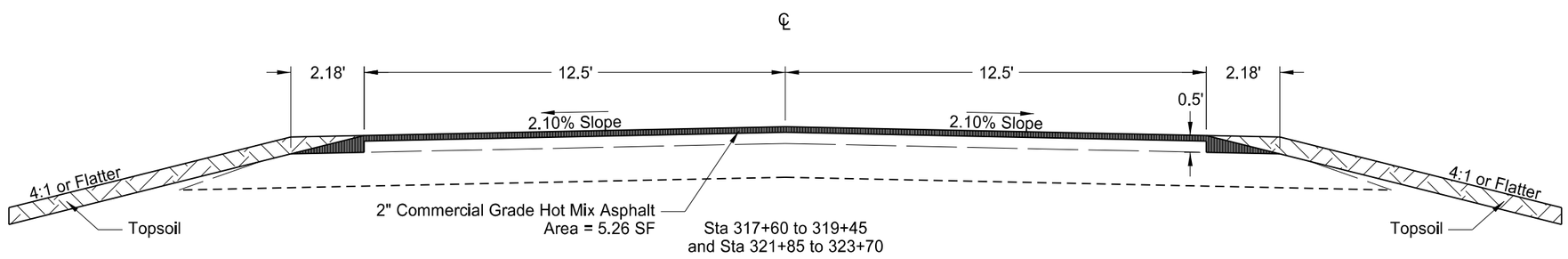
ND Highway 32

Reconstruction
Typical Sections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	30	2







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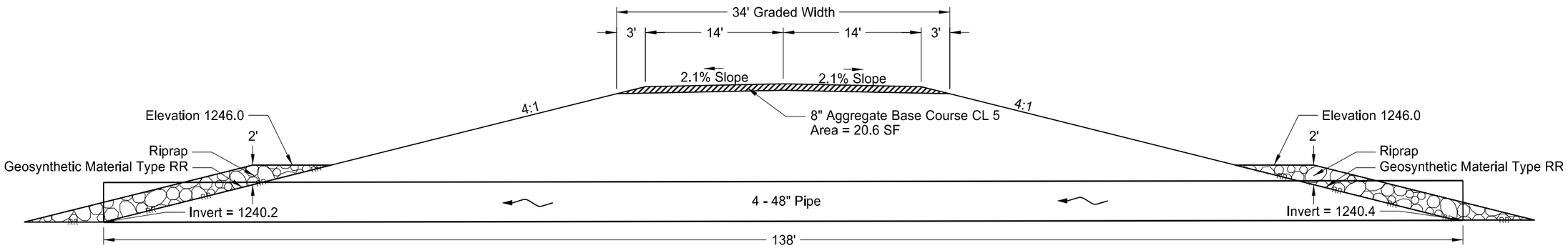
ND Highway 32

Mill & Overlay
Typical Sections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	30	3



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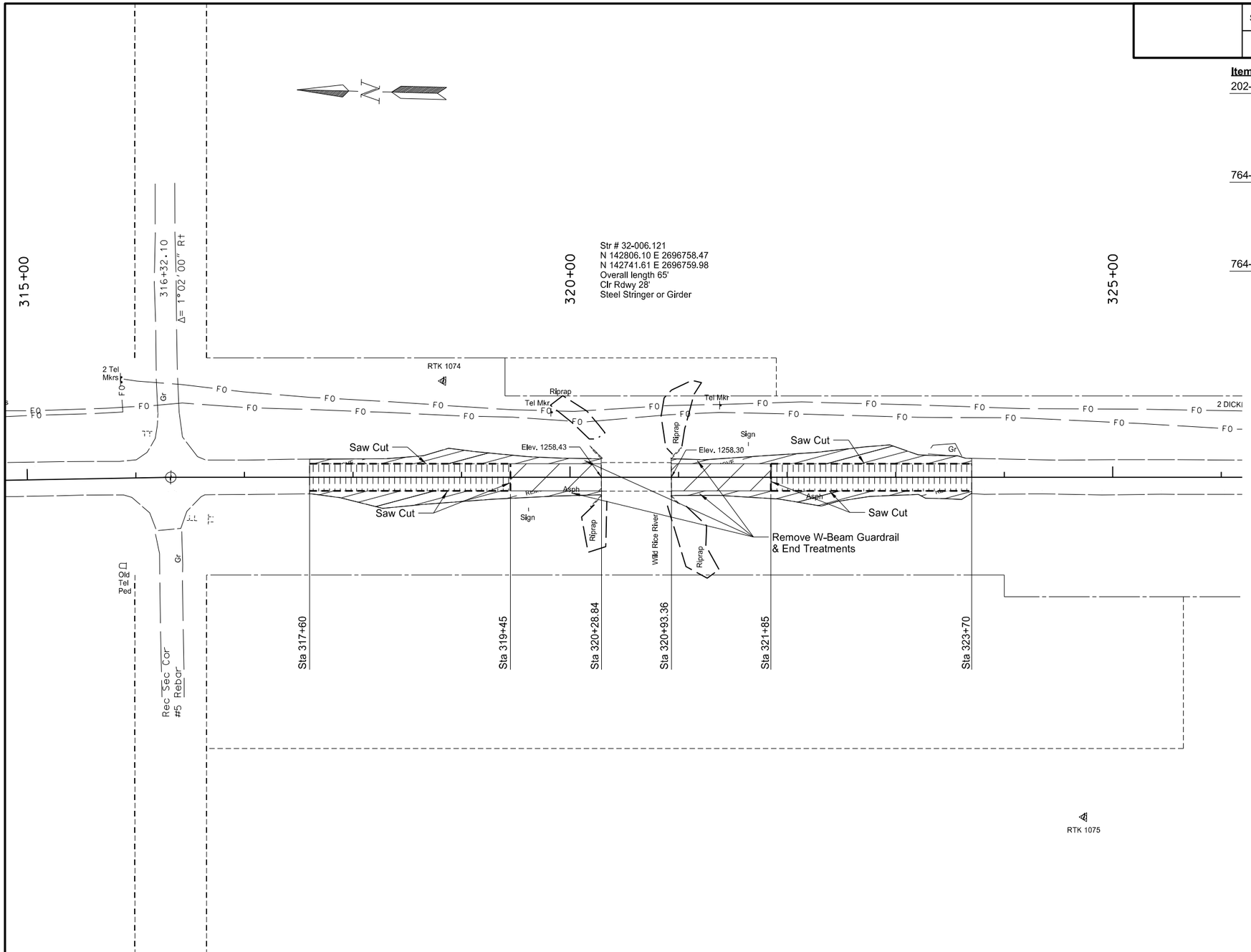
ND Highway 32

Temporary Bypass
Typical Section

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-032(033)006	40	1

Item	Description	Quantity	Unit
202-0135	REMOVAL OF BITUMINOUS SURFACING		
	Mainline Sta 319+45 to 320+28.84	80	TON
	Guardrail Surfacing Sta 317+60 to 320+28.84	48	TON
	Mainline Sta 320+93.36 to 321+85	88	TON
	Gurardrail Surfacing Sta 320+93.36 to 323+70	50	TON
764-0151	REMOVAL W-BEAM GUARDRAIL & POSTS		
	Sta 318+66.82 to 320+30.79 Rt	164.3	LF
	Sta 319+29.14 to 320+30.79 Lt	101.8	LF
	Sta 320+91.21 to 321+92.86 Rt	101.8	LF
	Sta 320+91.21 to 332+55.18 Lt	164.3	LF
764-2081	REMOVE END TREATMENT & TRANSITION		
	Sta 318+30.02 to 318+66.82 Rt	1	EA
	Sta 318+92.34 to 319+29.14 Lt	1	EA
	Sta 321+92.86 to 322+29.66 Rt	1	EA
	Sta 322+55.18 to 322+91.98 Lt	1	EA



Removal of Bituminous Surfacing
(Roadway Full Depth - 6"
Based on Existing Typical Section in
Section 30 of the Plans)

Removal of Bituminous Surfacing
(Guardrail Surfacing Full Depth
Based on 2" Depth)

2" Milling Pavement Surface
(See Section 20 & 30 of the Plans
Quantities in Section 60)

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ND Highway 32

Removals

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	51	1

Begin Station / Location	Begin Offset	End Station / Location	End Offset	Pipe Installation (Pay Item)			Allowable Material	Required Diameter	Steel Pipe Coatings	Steel Pipe Corrugations or Spiral Ribs	Steel Pipe Minimum Thickness	R1 Fabric (Pay Item)	(*) End Sections		Applicable Backfill Detail
				In	Bid Item	LF							Begin	End	
								In	Type		In	SY	EA	EA	
Sta 106+50.57 Temporary Bypass	68.66' Rt	Sta 106+64.91 Temporary Bypass	68.59' Lt	48	Pipe Conduit - Approach	138	Reinforced Concrete Pipe - Class III **(barrel length = 138 LF)**	48				N/A	N/A	N/A	N/A
							Corrugated Steel Pipe	48	Z, A, P	2	0.109				
							Spiral Rib Steel Pipe	48	Z, A, P	3/4, 1	0.109				
							High-Density Polyethylene	48							
Sta 106+56.10 Temporary Bypass	68.61' Rt	Sta 106+71.55 Temporary Bypass	68.53' Lt	48	Pipe Conduit - Approach	138	Reinforced Concrete Pipe - Class III **(barrel length = 138 LF)**	48				N/A	N/A	N/A	N/A
							Corrugated Steel Pipe	48	Z, A, P	2	0.109				
							Spiral Rib Steel Pipe	48	Z, A, P	3/4, 1	0.109				
							High-Density Polyethylene	48							
Sta 106+61.63 Temporary Bypass	68.55' Rt	Sta 106+78.20 Temporary Bypass	68.46' Lt	48	Pipe Conduit - Approach	138	Reinforced Concrete Pipe - Class III **(barrel length = 138 LF)**	48				N/A	N/A	N/A	N/A
							Corrugated Steel Pipe	48	Z, A, P	2	0.109				
							Spiral Rib Steel Pipe	48	Z, A, P	3/4, 1	0.109				
							High-Density Polyethylene	48							
Sta 106+67.17 Temporary Bypass	68.49' Rt	Sta 106+84.85 Temporary Bypass	68.38' Lt	48	Pipe Conduit - Approach	138	Reinforced Concrete Pipe - Class III **(barrel length = 138 LF)**	48				N/A	N/A	N/A	N/A
							Corrugated Steel Pipe	48	Z, A, P	2	0.109				
							Spiral Rib Steel Pipe	48	Z, A, P	3/4, 1	0.109				
							High-Density Polyethylene	48							

Coatings: **Z** = Zinc
A = Aluminum
P = Polymeric (over Zinc or Aluminum)

Corrugations: **2** = 2-2/3"x1/2"
3 = 3"x1"
5 = 5"x1"

Spiral Ribs: **3/4** = 3/4"x3/4"@7-1/2"
1 = 3/4"x1"@11-1/2"

(*) The price bid for "Pipe Conduit" bid items includes end sections. Pipe Extensions shall pay for end sections seperately.
FES = Flared End Section
TES = Traversable End Section

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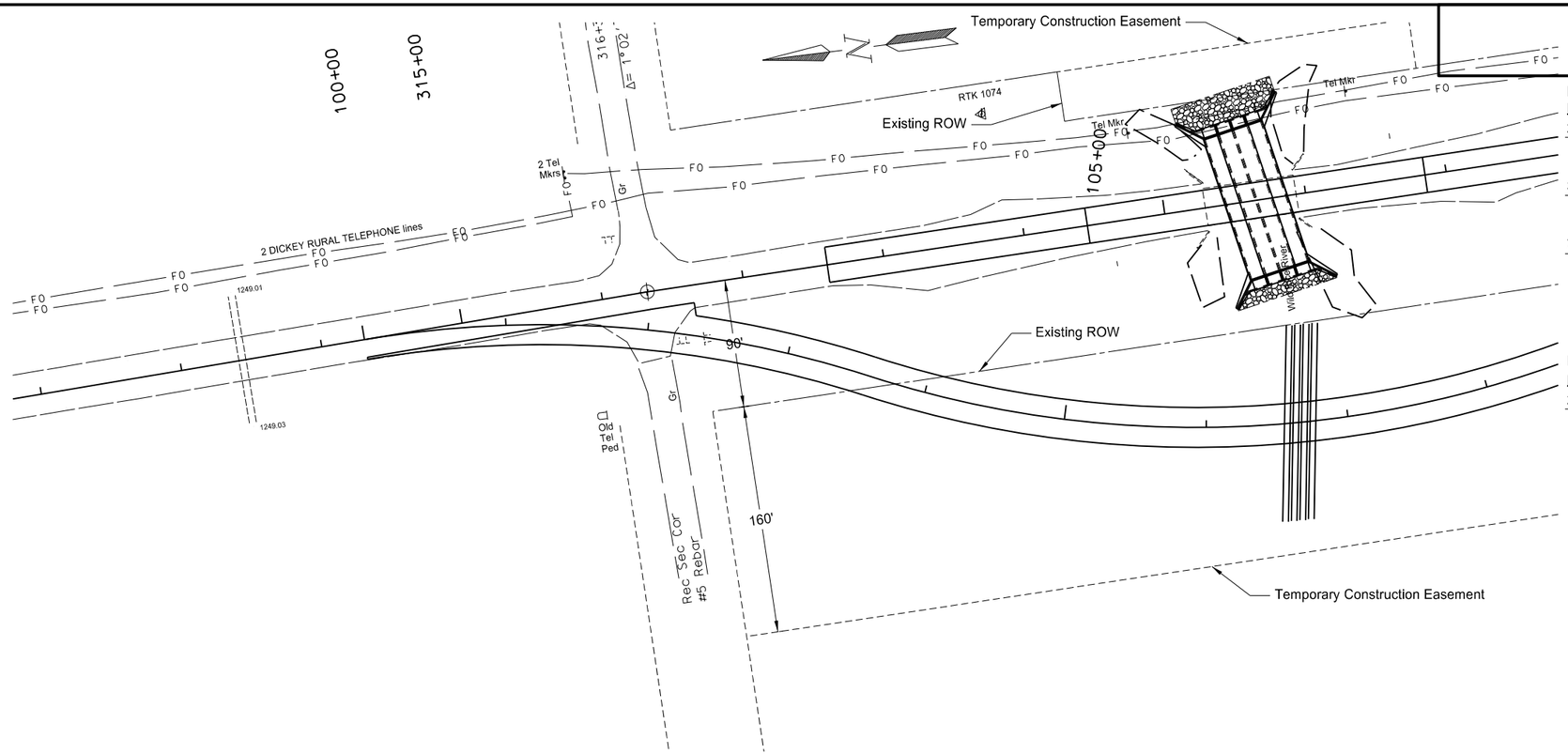
ND Highway 32

Allowable Pipe List

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-032(033)006	60	1

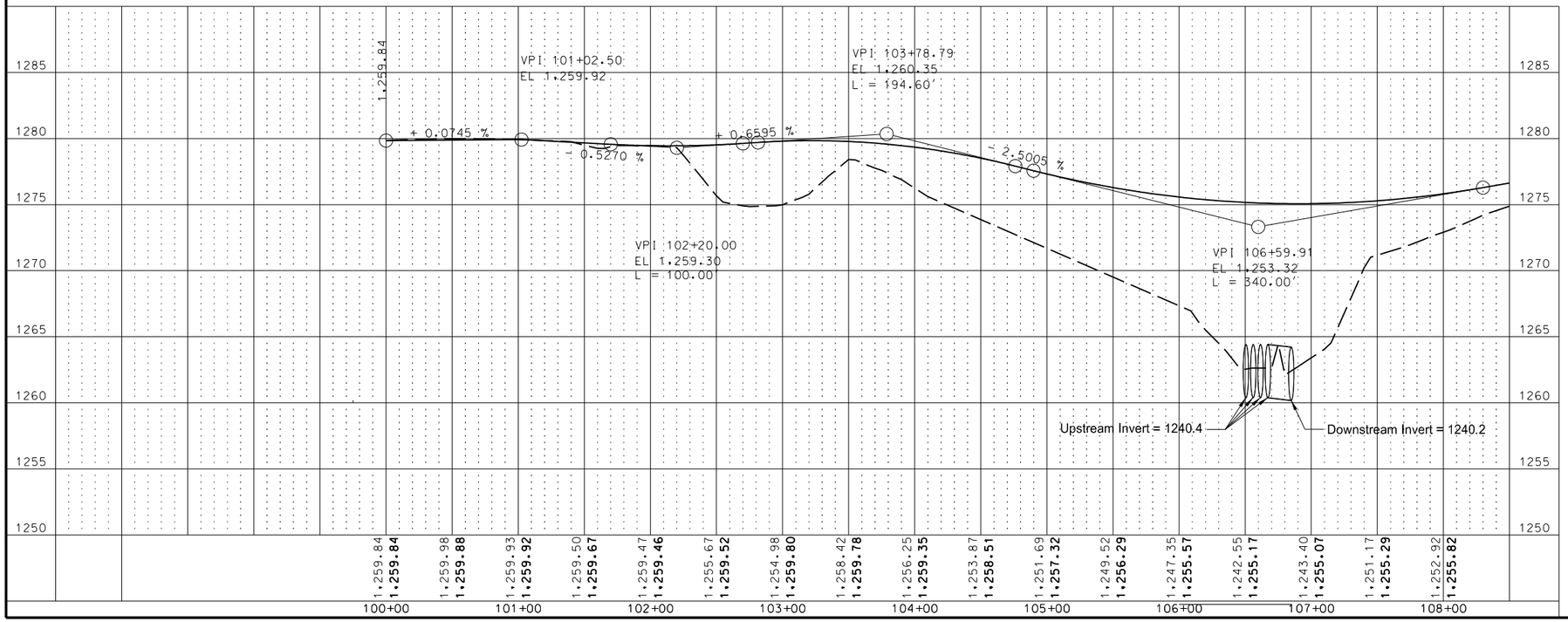


Installation of Temporary Bypass

Item	Description	Quantity	Unit
203-0140	BORROW - EXCAVATION		
	Temporary Bypass	11,110	CY
302-0120	AGGREGATE BASE COURSE CL 5		
	Temporary Bypass	1,695	TON
714-4128	PIPE CONDUIT 48IN-APPROACH		
	Sta 106+50.57 - 68.66 Rt to 106+64.91 - 68.59 Lt	138	LF
	Sta 106+56.10 - 68.61 Rt to 106+71.55 - 68.53 Lt	138	LF
	Sta 106+61.63 - 68.55 Rt to 106+78.20 - 68.46 Lt	138	LF
	Sta 106+67.17 - 68.49 Rt to 106+84.85 - 68.38 Lt	138	LF

Removal of Temporary Bypass

Item	Description	Quantity	Unit
202-0350	REMOVAL OF TEMPORARY BYPASS		
	Remove earth, aggregate, and pipe	1	EA



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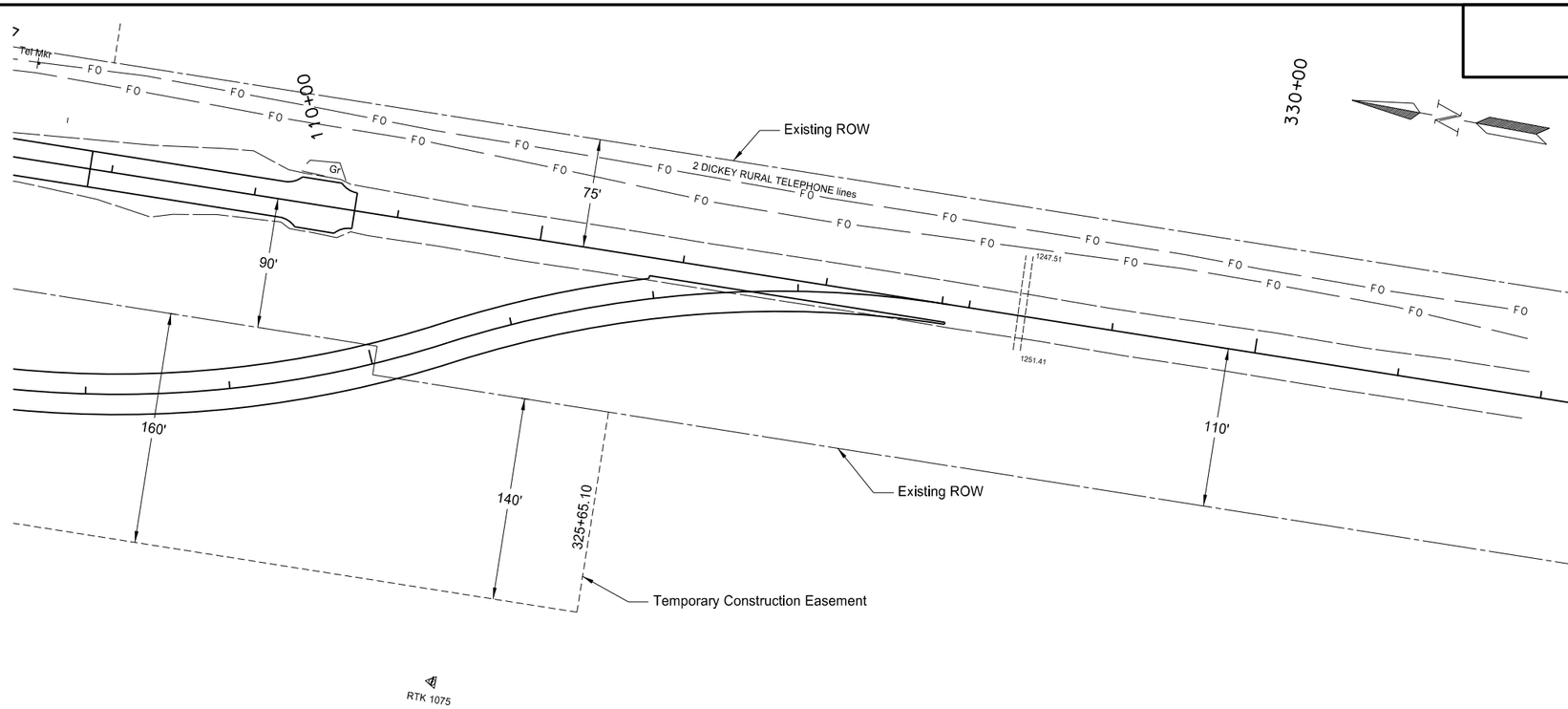
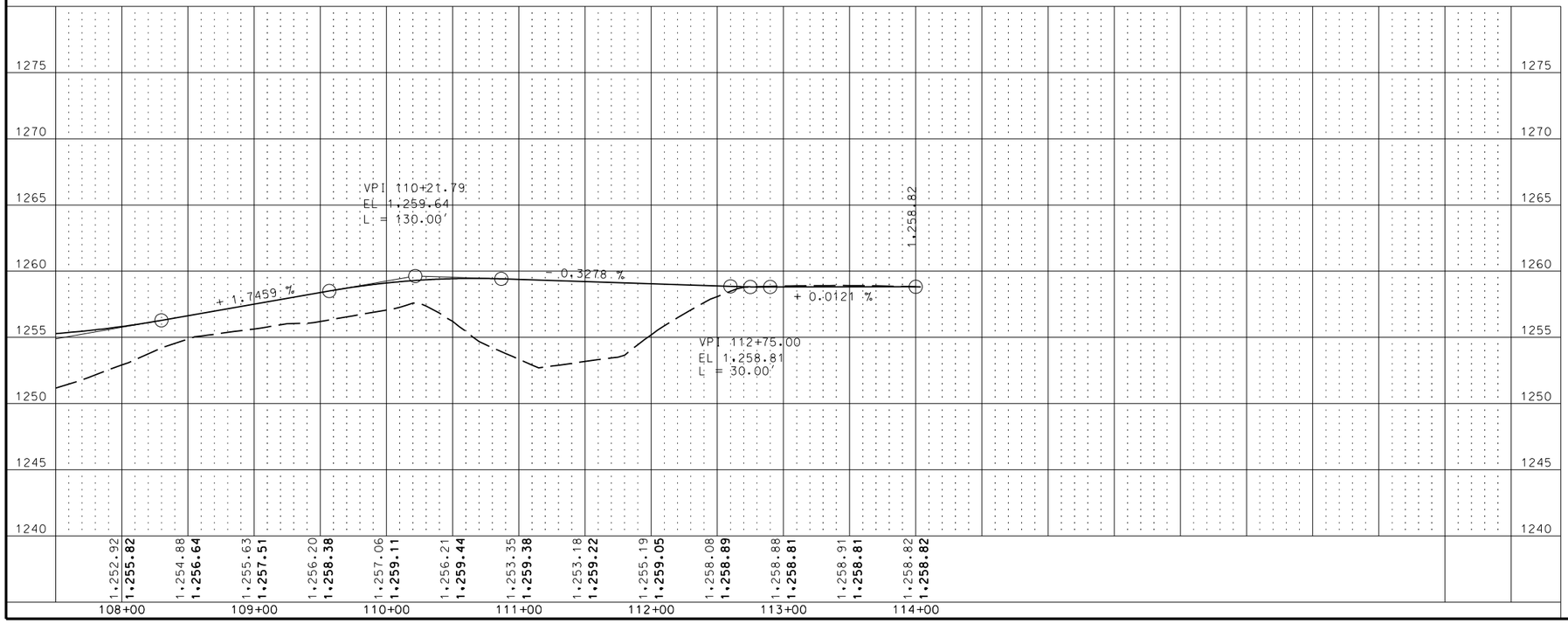
ND Highway 32

Plan & Profile
Temporary Bypass

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	60	2





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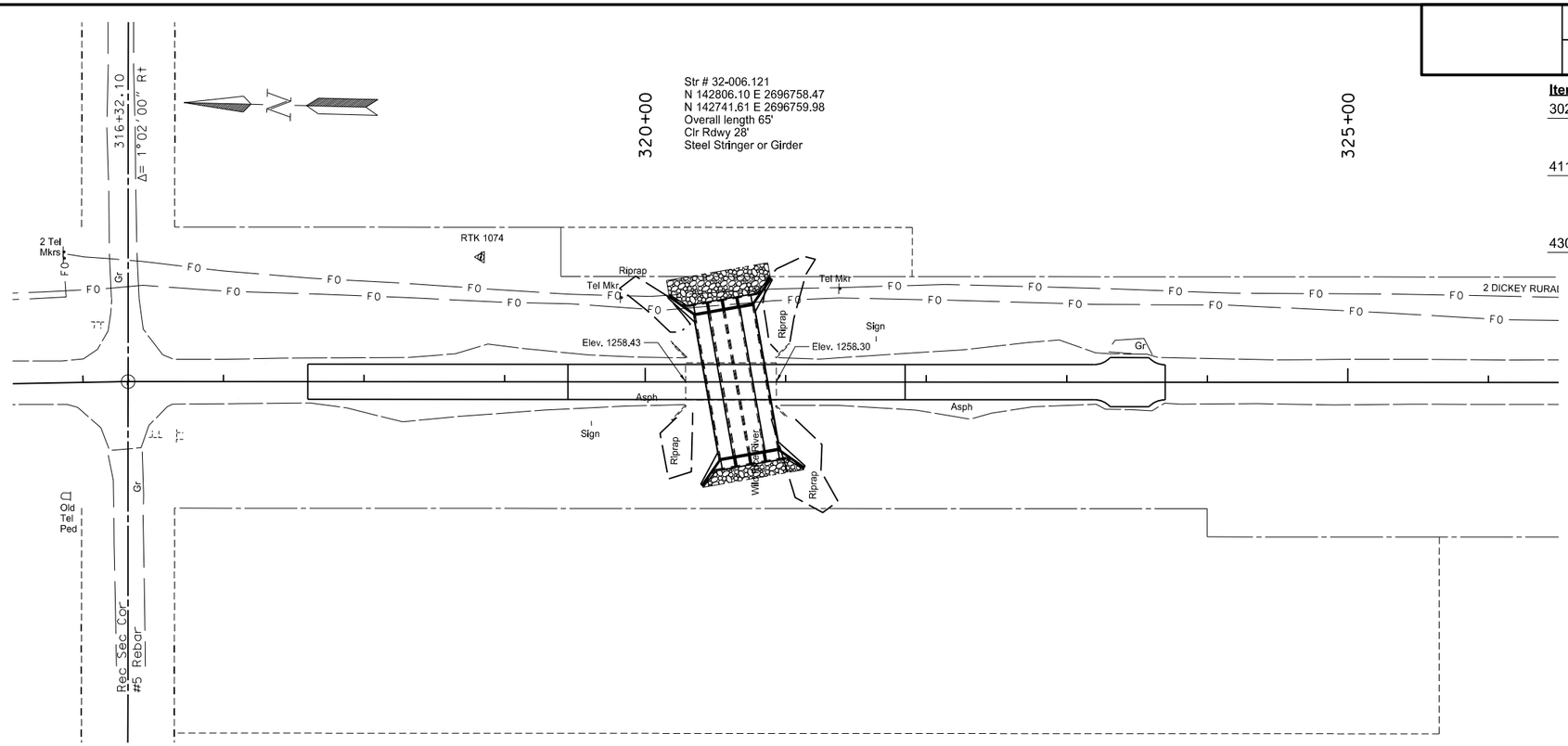
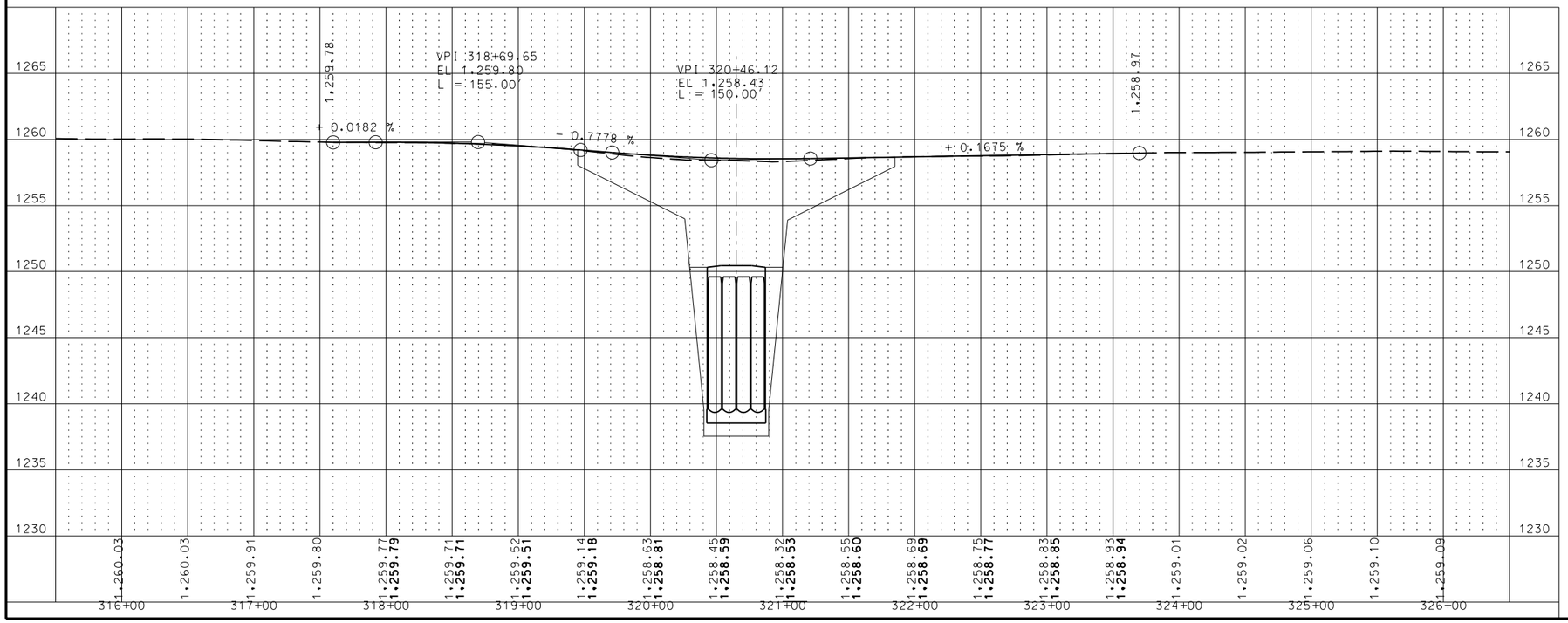
ND Highway 32

Plan & Profile
Temporary Bypass

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	60	3





Item	Description	Quantity	Unit
302-0120	AGGREGATE BASE COURSE CL 5		
	Sta 319+45 to Sta 321+85 (12")	563	TON
411-0105	MILLING PAVEMENT SURFACE		
	Sta 317+60 to 319+45 (2")	257	SY
	Sta 321+85 to 323+70 (2")	289	SY
430-0500	COMMERCIAL GRADE HOT MIX ASPHALT		
	Sta 317+60 to 319+45 (2")	72	TON
	Sta 319+45 to Sta 321+85 (6")	242	TON
	Sta 321+85 to 323+70 (2")	80	TON

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ND Highway 32

Plan & Profile

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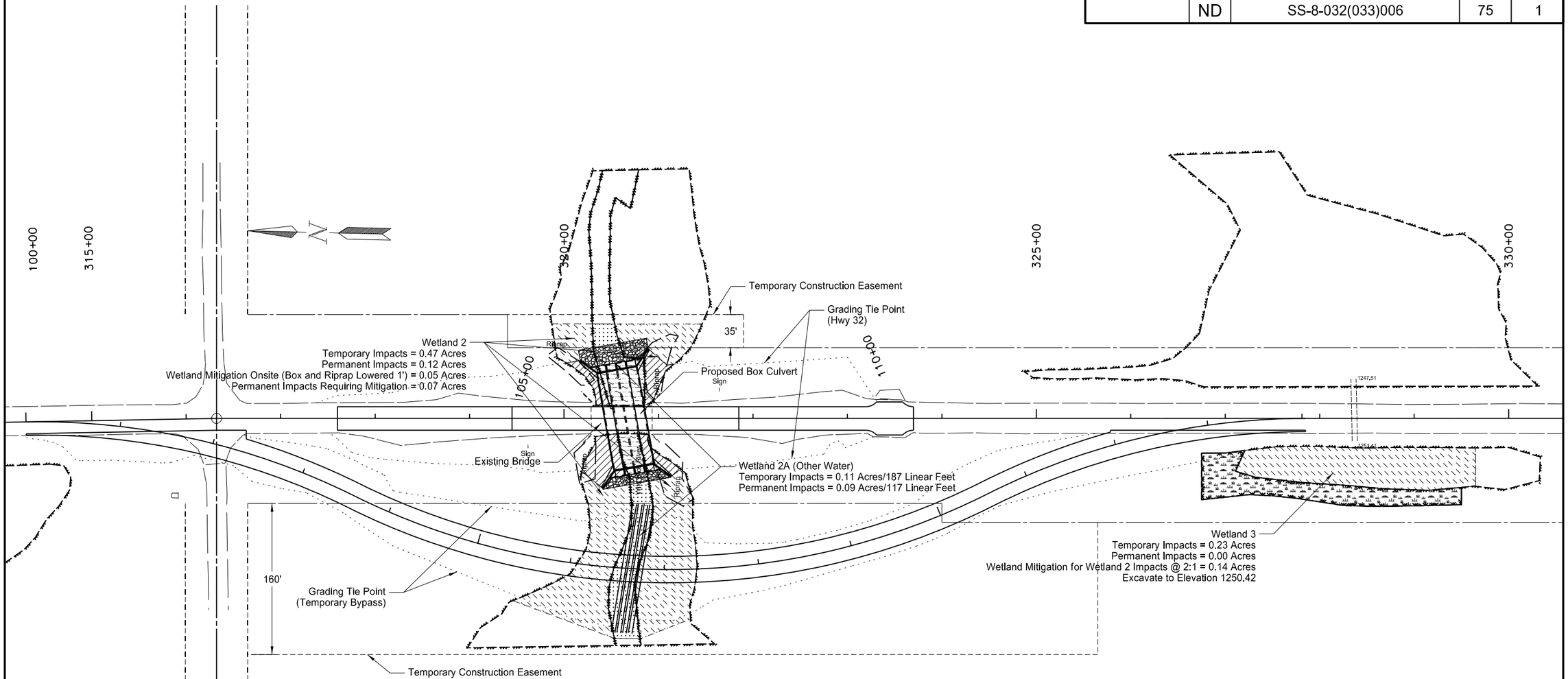
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	75	1



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ND Highway 32

Wetland Impacts

Permanet Wetland Impact

Temporary Wetland Impact

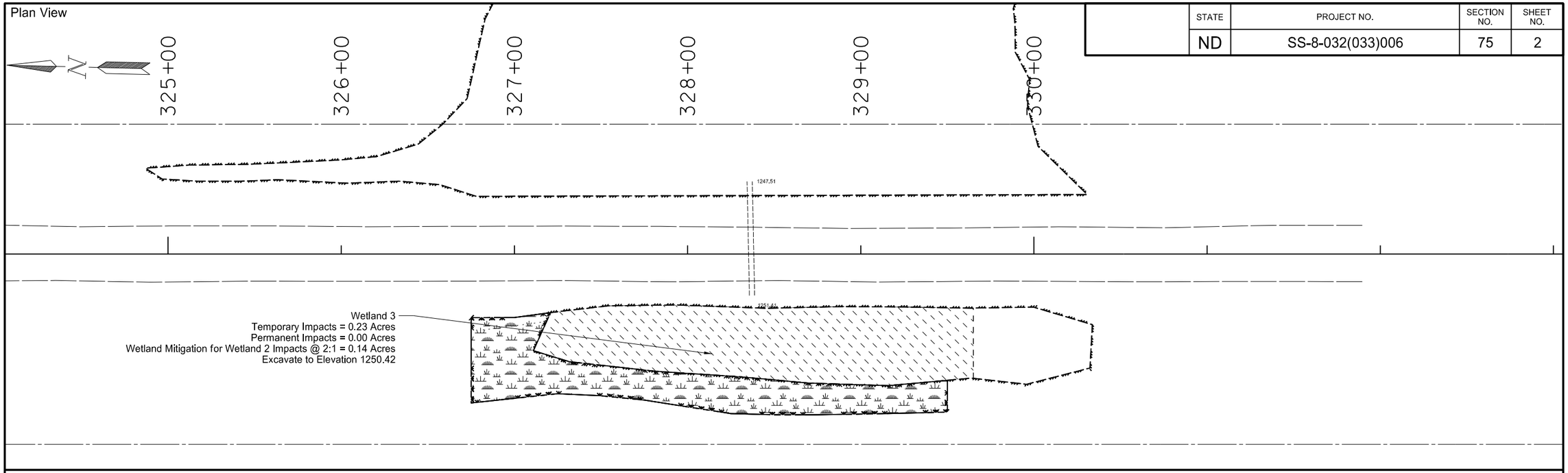
Permanent Other Water Impacts

Temporary Other Water Impacts

Wetland Mitigation

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-032(033)006	75	2

Plan View



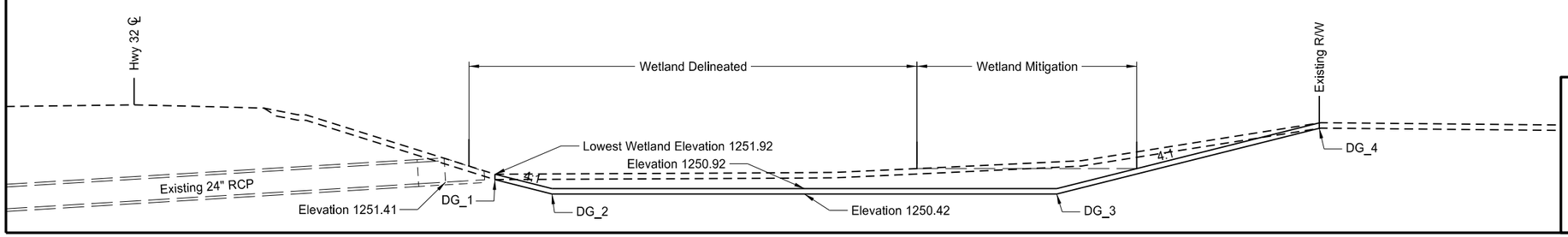
Blue Top Report

Station	Point	Offset	Elevation	North	East
326+75.00	DG_1	36.515	1252.58	2696737.905	142159.241
	DG_2	45.142	1250.42	2696729.28	142159.028
	DG_3	77.742	1250.42	2696696.691	142158.223
	DG_4	110	1258.49	2696664.442	142157.426
327+00.00	DG_1	36.692	1252.52	2696738.345	142134.245
	DG_2	45.09	1250.42	2696729.95	142134.037
	DG_3	75.17	1250.42	2696699.879	142133.294
	DG_4	110	1259.13	2696665.06	142132.434
327+25.00	DG_1	35.208	1252.61	2696740.446	142109.289
	DG_2	43.954	1250.42	2696731.703	142109.073
	DG_3	73.241	1250.42	2696702.424	142108.35
	DG_4	110	1259.61	2696665.677	142107.442
327+50.00	DG_1	33.793	1252.66	2696742.478	142084.331
	DG_2	42.767	1250.42	2696733.507	142084.11
	DG_3	73.85	1250.42	2696702.434	142083.342
	DG_4	110	1259.46	2696666.294	142082.449

Station	Point	Offset	Elevation	North	East
327+75.00	DG_1	32.747	1252.56	2696744.142	142059.365
	DG_2	41.32	1250.42	2696735.571	142059.153
	DG_3	75.966	1250.42	2696700.936	142058.297
	DG_4	110	1258.93	2696666.912	142057.457
328+00.00	DG_1	31.778	1252.44	2696745.727	142034.397
	DG_2	39.868	1250.42	2696737.64	142034.197
	DG_3	79.983	1250.42	2696697.537	142033.206
	DG_4	110	1257.92	2696667.529	142032.465
328+25.00	DG_1	31.685	1252.09	2696746.438	142009.406
	DG_2	38.362	1250.42	2696739.763	142009.242
	DG_3	84.479	1250.42	2696693.66	142008.102
	DG_4	110	1256.80	2696668.147	142007.472
328+50.00	DG_1	33.661	1251.744	2696745.08	141984.365
	DG_2	38.956	1250.42	2696739.786	141984.234
	DG_3	85.698	1250.42	2696693.059	141983.08
	DG_4	110	1256.496	2696668.764	141982.48

Station	Point	Offset	Elevation	North	East
328+75.00	DG_1	33.865	1251.748	2696745.493	141959.368
	DG_2	39.178	1250.42	2696740.182	141959.237
	DG_3	85.024	1250.42	2696694.35	141958.104
	DG_4	110	1256.675	2696669.382	141957.487
329+00.00	DG_1	34.07	1251.753	2696745.906	141934.37
	DG_2	39.4	1250.42	2696740.577	141934.239
	DG_3	84.322	1250.42	2696695.67	141933.129
	DG_4	110	1256.84	2696669.999	141932.495
329+25.00	DG_1	34.463	1251.81	2696746.13	141909.368
	DG_2	40.025	1250.42	2696740.57	141909.231
	DG_3	83.72	1250.42	2696696.888	141908.152
	DG_4	110	1256.99	2696670.617	141907.503
329+50.00	DG_1	35.02	1251.914	2696746.191	141884.362
	DG_2	40.997	1250.42	2696740.216	141884.215
	DG_3	83.176	1250.42	2696698.05	141883.173
	DG_4	110	1257.126	2696671.234	141882.51

Typical Section



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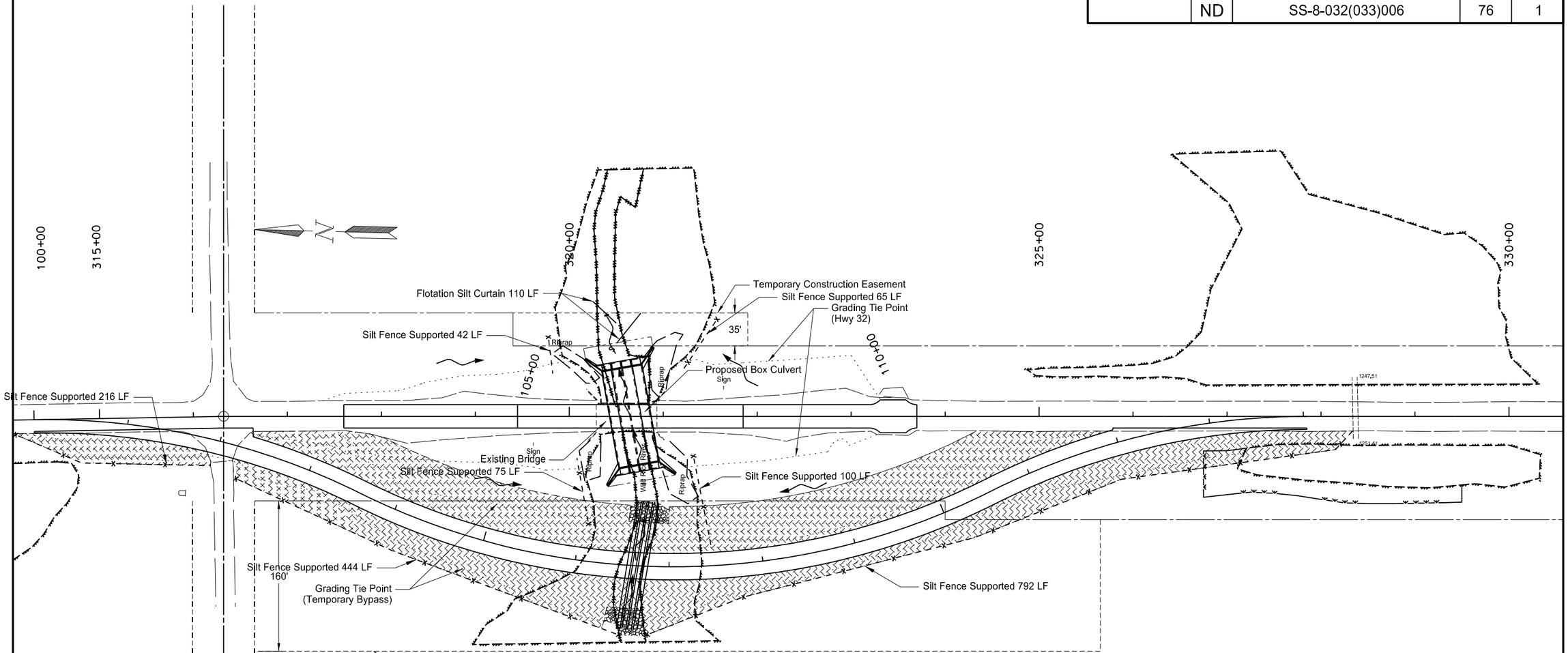
ND Highway 32

Wetland Mitigation

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	76	1



Item	Description	Quantity	Unit
251-2000	TEMPORARY COVER CROP		
	Temporary Bypass	1.79	ACRE
253-0101	STRAW MULCH		
	Temporary Bypass	1.79	ACRE
256-0200	RIPRAP GRADE II		
	Temporary Bypass East (2' Thickness)	56	CY
	Temporary Bypass West (2' Thickness)	67	CY
260-0200	SILT FENCE SUPPORTED		
	Temporary Bypass East	175	LF
	Temporary Bypass West	1,452	LF
	Hwy 32 East	107	LF
260-0201	REMOVE SILT FENCE SUPPORTED		
	Temporary Bypass East	175	LF
	Temporary Bypass West	1,452	LF
	Hwy 32 East	107	LF
262-0100	FLOTATION SILT CURTAIN		
	Wild Rice River	110	LF
262-0101	REMOVE SILT FENCE CURTAIN		
	Wild Rice River	110	LF
709-0155	GEOSYNTHETIC MATERIAL TYPE RR		
	Riprap Temporary Bypass East	94	SY
	Riprap Temporary Bypass West	111	SY

Straw Mulch & Temporary Cover Crop

Riprap Grade II

Silt Fence Supported

Flotation Silt Curtain

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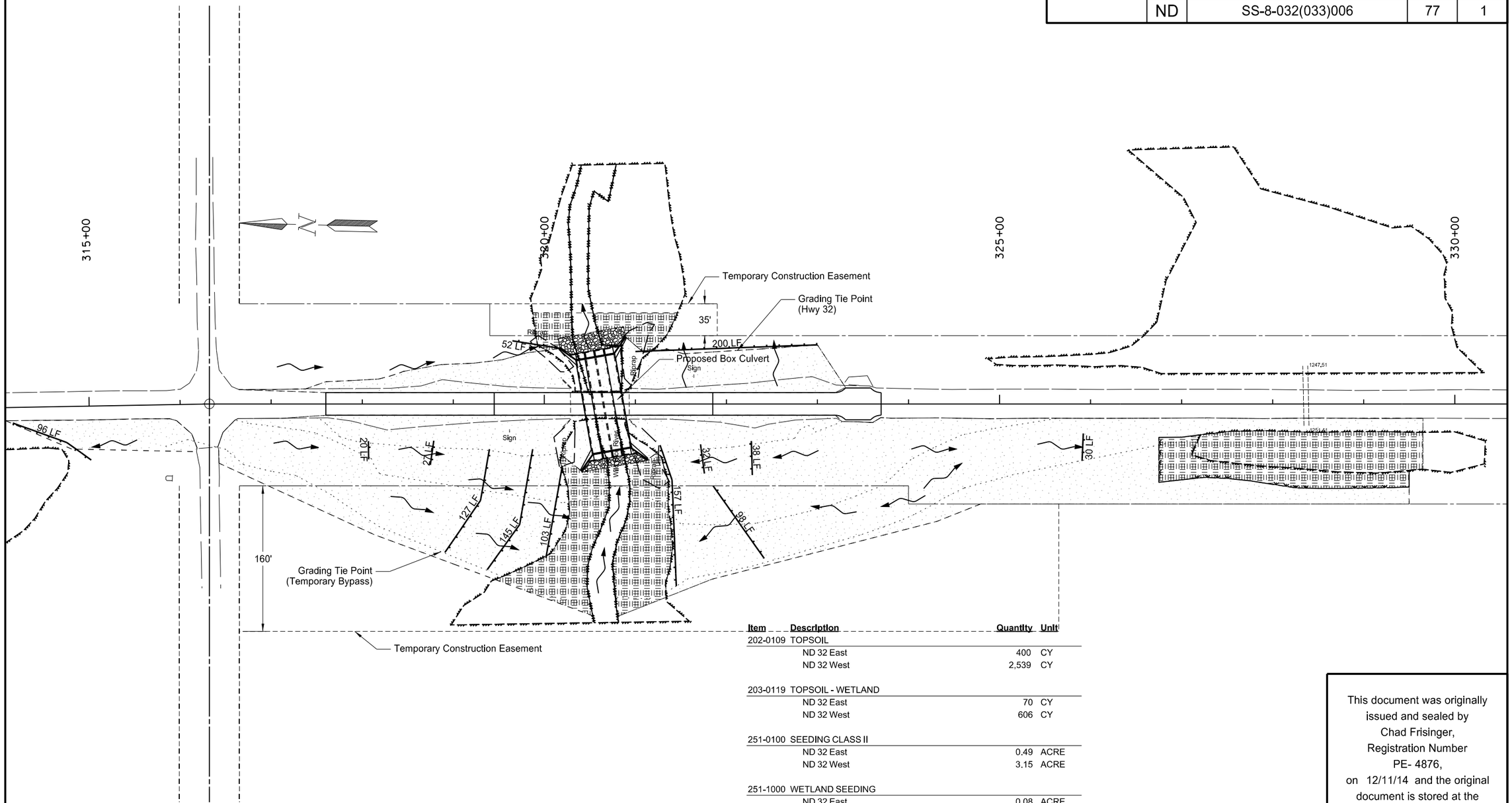
ND Highway 32

Temporary Erosion Control

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	77	1



Item	Description	Quantity	Unit
202-0109	TOPSOIL		
	ND 32 East	400	CY
	ND 32 West	2,539	CY
203-0119	TOPSOIL - WETLAND		
	ND 32 East	70	CY
	ND 32 West	606	CY
251-0100	SEEDING CLASS II		
	ND 32 East	0.49	ACRE
	ND 32 West	3.15	ACRE
251-1000	WETLAND SEEDING		
	ND 32 East	0.08	ACRE
	ND 32 West	0.75	ACRE
251-2000	TEMPORARY COVER CROP		
	ND 32 East	0.49	ACRE
	ND 32 West	3.15	ACRE
253-0101	STRAW MULCH		
	ND 32 East	0.49	ACRE
	ND 32 West	3.15	ACRE
261-0112	FIBER ROLLS 12IN		
	ND 32 East	252	LF
	ND 32 West	873	LF

Topsoil, Seeding & Mulching

Topsoil - Wetland & Seeding

Riprap

Fiber Roll - 12 IN

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ND Highway 32

Permanent Erosion Control

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - Hwy 32, 4 miles S of ND 11 East

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-032(033)006	81	1

HORIZONTAL ALIGNMENT

PNT	STATION	NORTHING	EASTING
ND 32 (SCL32)			
Beg	306+32.10	144,201.81	2,696,705.93
Sec Cor	316+32.10	143,202.73	2,696,748.65
Sec Cor	370+86.13	137,750.36	2,696,883.36

CURVE DATA

ARC DEFINITION

US PUBLIC LAND SURVEY DATA

DESC.	SEC-TWP-RGE	NORTHING	EASTING
NW Cor	Sec 6 T-129-N R-55-W	143202.73	2696748.65
SW Cor	Sec 6 T-129-N R-55-W	137750.36	2696883.36

SURVEY CONTROL POINTS

PNT	NORTHING	EASTING	ELEV	STATION	OFFSET	CONTROL POINT DESCRIPTION
						PRIMARY CONTROL
GPS 1	140395.37	2696878.23	1267.66	344+42	60' Lt	
GPS 2	150070.78	2696387.10	1275.89	N\A	N\A	#5 Rebar - No cap
						SECONDARY CONTROL
RTK 1074	142953.96	2696843.52	1265.25	318+83	89' Lt	
RTK 1075	142353.74	2696456.37	1248.47	324+74	313' Rt	

NOTES: Sheet 1 of 1

Date Survey Completed 7/3/13

☐ Assumed Coordinates

☒ All coordinates on this sheet are Sargent County ground coordinates. They are derived from the "North Dakota Coordinate System of 1983", NAD83(CORS96).South Zone Combination Factor (cf) = 0.9999595

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

INITIALIZING BENCH MARK
NDGPS Stations (OPUS)

☒ NAVD-88
☐ NGVD-29

☒ GEOID 09 ☐ _____
☐ GEOID 12A

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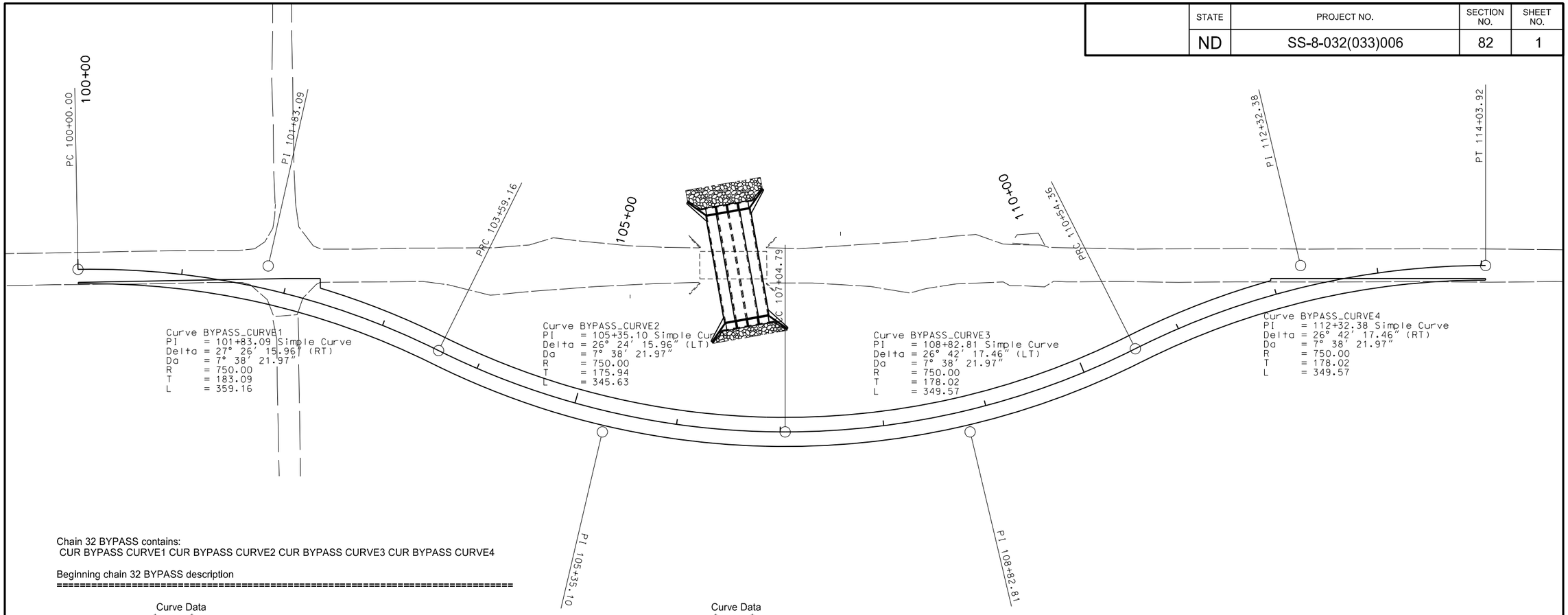
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	82	1



Chain 32 BYPASS contains:
CUR BYPASS CURVE1 CUR BYPASS CURVE2 CUR BYPASS CURVE3 CUR BYPASS CURVE4

Beginning chain 32 BYPASS description

==========

Curve Data
———

Curve BYPASS CURVE1
P.I. Station 101+83.09 N 143,221.3440 E 2,696,747.8543
Delta = 27° 26' 15.96" (RT)
Degree = 7° 38' 21.97"
Tangent = 183.0922
Length = 359.1595
Radius = 750.0000
External = 22.0251
Long Chord = 355.7375
Mid. Ord. = 21.3967
P.C. Station 100+00.00 N 143,404.2690 E 2,696,740.0321
P.T. Station 103+59.16 N 143,055.3915 E 2,696,670.5076
C.C. N 143,372.2268 E 2,695,990.7169
Back = S 2° 26' 54.94" E
Ahead = S 24° 59' 21.02" W
Chord Bear = S 11° 16' 13.04" W

Curve Data
———

Curve BYPASS CURVE2
P.I. Station 105+35.10 N 142,895.9203 E 2,696,596.1816
Delta = 26° 24' 15.96" (LT)
Degree = 7° 38' 21.97"
Tangent = 175.9415
Length = 345.6332
Radius = 750.0000
External = 20.3606
Long Chord = 342.5828
Mid. Ord. = 19.8224
P.C. Station 103+59.16 N 143,055.3915 E 2,696,670.5076
P.T. Station 107+04.79 N 142,720.0325 E 2,696,600.5271
C.C. N 142,738.5563 E 2,697,350.2983
Back = S 24° 59' 21.02" W
Ahead = S 1° 24' 54.94" E
Chord Bear = S 11° 47' 13.04" W

Curve Data
———

Curve BYPASS CURVE3
P.I. Station 108+82.81 N 142,542.0695 E 2,696,604.9238
Delta = 26° 42' 17.46" (LT)
Degree = 7° 38' 21.97"
Tangent = 178.0172
Length = 349.5657
Radius = 750.0000
External = 20.8373
Long Chord = 346.4101
Mid. Ord. = 20.2740
P.C. Station 107+04.79 N 142,720.0325 E 2,696,600.5271
P.T. Station 110+54.36 N 142,385.0652 E 2,696,688.8272
C.C. N 142,738.5563 E 2,697,350.2983
Back = S 1° 24' 54.94" E
Ahead = S 28° 07' 12.40" E
Chord Bear = S 14° 46' 03.67" E

Curve Data
———

Curve BYPASS CURVE4
P.I. Station 112+32.38 N 142,228.0608 E 2,696,772.7305
Delta = 26° 42' 17.46" (RT)
Degree = 7° 38' 21.97"
Tangent = 178.0172
Length = 349.5657
Radius = 750.0000
External = 20.8373
Long Chord = 346.4101
Mid. Ord. = 20.2740
P.C. Station 110+54.36 N 142,385.0652 E 2,696,688.8272
P.T. Station 114+03.92 N 142,050.0979 E 2,696,777.1273
C.C. N 142,031.5741 E 2,696,027.3561
Back = S 28° 07' 12.40" E
Ahead = S 1° 24' 54.94" E
Chord Bear = S 14° 46' 03.67" E

==========
Ending chain 32 BYPASS description

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ND Highway 32

Alignment Description
Temporary Bypass

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-032(033)006	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED BY PHASE NO. 1	2	3		TOTAL AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
D3-36	36"x6"	STREET NAME SIGN (Sign and installation only)						6	
G20-1-60	60"x24"	ROAD WORK NEXT __ MILES						34	
G20-1b-60	60"x24"	WORK IN PROGRESS/ NO WORK IN PROGRESS (Sign and installation only)						26	
G20-2-48	**48"x24"**	**END ROAD WORK**	**2**	**2**	**2**		**2**	**19**	**38**
G20-4-36	36"x18"	PILOT CAR FOLLOW ME (Mounted to back of pilot car)						18	
G20-10-108	**108"x48"**	**CONTRACTOR SIGN**	**2**	**2**	**2**		**2**	**64**	**128**
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**	**2**	**2**	**2**		**2**	**59**	**118**
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)						10	
M1-4-24	24"x24"	U.S. ROUTE MARKER (Post and installation only)						10	
M1-5-24	24"x24"	STATE ROUTE MARKER (Post and installation only)						10	
M3-1-24	24"x12"	NORTH (Mounted on route marker post)						7	
M3-2-24	24"x12"	EAST (Mounted on route marker post)						7	
M3-3-24	24"x12"	SOUTH (Mounted on route marker post)						7	
M3-4-24	24"x12"	WEST (Mounted on route marker post)						7	
M4-8-24	24"x12"	DETOUR (Mounted on route marker post)						7	
M4-9-30	30"x24"	DETOUR ARROW RIGHT or LEFT/AHD AND RT or LT						15	
M4-10-48	48"x18"	DETOUR ARROW RIGHT or LEFT						23	
M5-1-21	21"x15"	ARROW AHD AND RT or LT(Mounted on route marker post)						7	
M5-2-21	21"x15"	ARROW AHD UP & RT or LT (Mounted on route marker post)						7	
M6-1-21	21"x15"	ARROW RT or LT (Mounted on route marker post)						7	
M6-2-21	21"x15"	ARROW UP & RT or LT (Mounted on route marker post)						7	
M6-3-21	21"x15"	ARROW AHD (Mounted on route marker post)						7	
R1-1-48	**48"x48"**	**STOP**	**4**	**4**	**4**		**4**	**32**	**128**
R1-1a-18	**18"x18"**	**STOP and SLOW PADDLE Back to Back**	**2**		**2**		**2**	**5**	**10**
R1-2-60	60"x60"	YIELD						29	
R2-1-48	**48"x60"**	**SPEED LIMIT __**		**6**			**6**	**39**	**234**
R2-1a-24	**24"x18"**	**MINIMUM FEE $80 (Mounted on Speed Limit post)**		**2**			**2**	**10**	**20**
R3-7-48	48"x48"	LEFT or RIGHT LANE MUST TURN LEFT or RIGHT						35	
R4-1-48	48"x60"	DO NOT PASS						39	
R4-7-48	48"x60"	KEEP RIGHT SYMBOL						39	
R5-1-48	48"x48"	DO NOT ENTER						35	
R6-1-36	36"x12"	ONE WAY RIGHT or LEFT						13	
R7-1-12	12"x18"	NO PARKING						11	
R10-6-24	24"x36"	STOP HERE ON RED						16	
R11-2-48	**48"x30"**	**ROAD CLOSED**		**2**			**2**	**28**	**56**
R11-2a-48	48"x30"	STREET CLOSED						28	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY						31	
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY						31	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC						31	
W1-3-48	48"x48"	RIGHT or LEFT SHARP REVERSE CURVE ARROW						35	
W1-4-48	**48"x48"**	**RIGHT or LEFT REVERSE CURVE ARROW**		**4**			**4**	**35**	**140**
W1-4b-48	48"x48"	DOUBLE RIGHT or LEFT REVERSE CURVE ARROW						35	
W1-6-48	**48"x24"**	**LARGE ARROW**		**1**			**1**	**26**	**26**
W3-1-48	48"x48"	STOP AHEAD SYMBOL						35	
W3-3-48	48"x48"	SIGNAL AHEAD SYMBOL						35	
W3-4-48	**48"x48"**	**BE PREPARED TO STOP**	**2**		**2**		**2**	**35**	**70**
W3-5-48	**48"x48"**	**SPEED REDUCTION AHEAD**		**2**			**2**	**35**	**70**
W4-2-48	48"x48"	RIGHT or LEFT LANE TRANSITION SYMBOL						35	
W5-1-48	48"x48"	ROAD NARROWS						35	
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE						35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW						35	
W6-3-48	48"x48"	TWO WAY TRAFFIC SYMBOL						35	
W8-1-48	48"x48"	BUMP						35	
W8-3-48	48"x48"	PAVEMENT ENDS						35	
W8-7-48	48"x48"	LOOSE GRAVEL						35	
W8-9a-48	48"x48"	SHOULDER DROP-OFF						35	
W8-11-48	48"x48"	UNEVEN LANES						35	
W8-12-48	48"x48"	NO CENTER STRIPE						35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY						35	
W8-54-48	**48"x48"**	**TRUCKS ENTERING AHEAD or __ FT.**	**2**	**2**	**2**		**2**	**35**	**70**
W8-55-48	**48"x48"**	**TRUCKS CROSSING AHEAD or __ FT.**	**2**	**2**	**2**		**2**	**35**	**70**
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	
W14-3-48	48"x36"	NO PASSING ZONE						23	
W20-1-48	**48"x48"**	**ROAD WORK AHEAD or _FT or _ MILE**	**2**	**2**	**2**		**2**	**35**	**70**
W20-2-48	48"x48"	DETOUR AHEAD or __ FT						35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or __ FT.						35	
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or __ FT.						35	
W20-5-48	48"x48"	RIGHT or LEFT LANE CLOSED AHEAD or __FT.						35	
W20-7a-48	**48"x48"**	**FLAGGING SYMBOL**	**2**		**2**		**2**	**35**	**70**
W20-7k-24	24"x18"	__ FEET (Mounted on warning sign post)						10	
W20-8-48	48"x48"	STREET CLOSED						35	
W20-51-48	48"x48"	EQUIPMENT WORKING						35	
W20-52-54	54"x12"	NEXT __ MILES (Mounted on warning sign post)						12	
W21-1a-48	48"x48"	WORKERS SYMBOL						35	
W21-2-48	48"x48"	FRESH OIL						35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __FT						35	

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED BY PHASE NO. 1	2	3		TOTAL AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
W21-5-48	48"x48"	SHOULDER WORK						35	
W21-5a-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED						35	
W21-5b-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT.						35	
W21-6a-48	48"x48"	SURVEY CREW AHEAD						35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT.						35	
W21-51-48	48"x48"	MATERIAL ON ROADWAY						35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK						35	
	24"x24"	TAKE TURNS (6" D letters) (Mounted on stop sign post)						11	

SPECIAL SIGNS

SPEC & CODE

704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS 1318**

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY BY PHASE NO. 1	2	3		TOTAL QUANTITY
704-0100	**FLAGGING**	MHR	**300**		**300**		**600**
704-1041	ATTENUATION DEVICE-TYPE B-55	EACH					
704-1043	ATTENUATION DEVICE-TYPE B-65	EACH					
704-1044	ATTENUATION DEVICE-TYPE B-70	EACH					
704-1050	TYPE I BARRICADES	EACH					
704-1051	TYPE II BARRICADES	EACH					
704-1052	**TYPE III BARRICADES**	EACH		**6**			**6**
704-1060	**DELINEATOR DRUMS**	EACH		**14**			**14**
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		**49**			**49**
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH					
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH					
704-1087	SEQUENCING ARROW PANEL - TYPE C	EACH					
704-1088	SEQUENCING ARROW PANEL - TYPE C - CROSSOVER	EACH					
704-1095	TYPE B FLASHERS	EACH					
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF					
704-3510	PRECAST CONCRETE MED BARRIER - STATE FURNISHED	EACH					
762-0200	RAISED PAVEMENT MARKERS	EACH					
762-0420	SHORT TERM 4IN LINE - TYPE R	LF					
762-0430	SHORT TERM 4IN LINE - TYPE NR	LF					
762-1500	**OBLITERATION OF PVMT MK**	SF		**555**			**555**
772-2110	FLASHING BEACON - POST MOUNTED	EACH					

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

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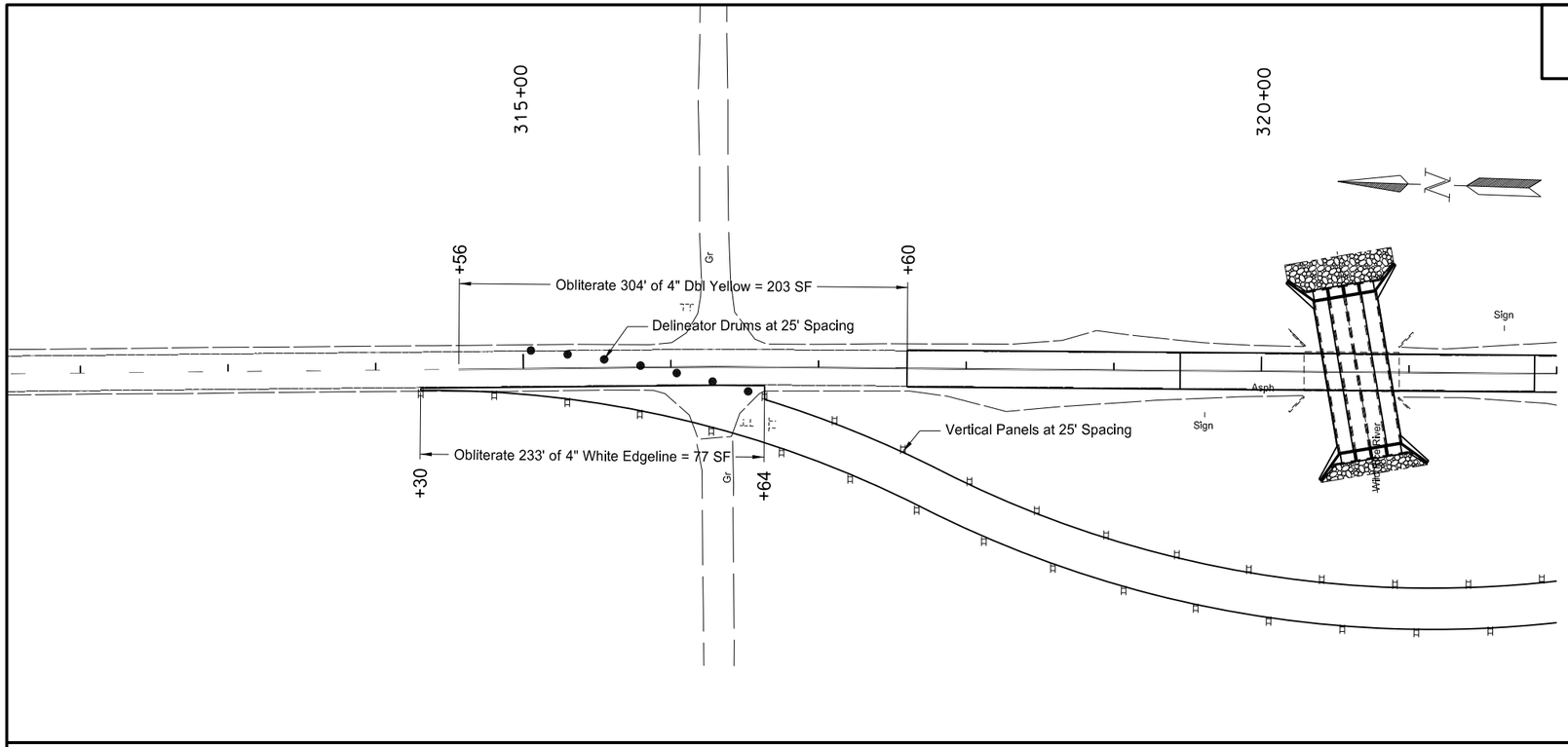
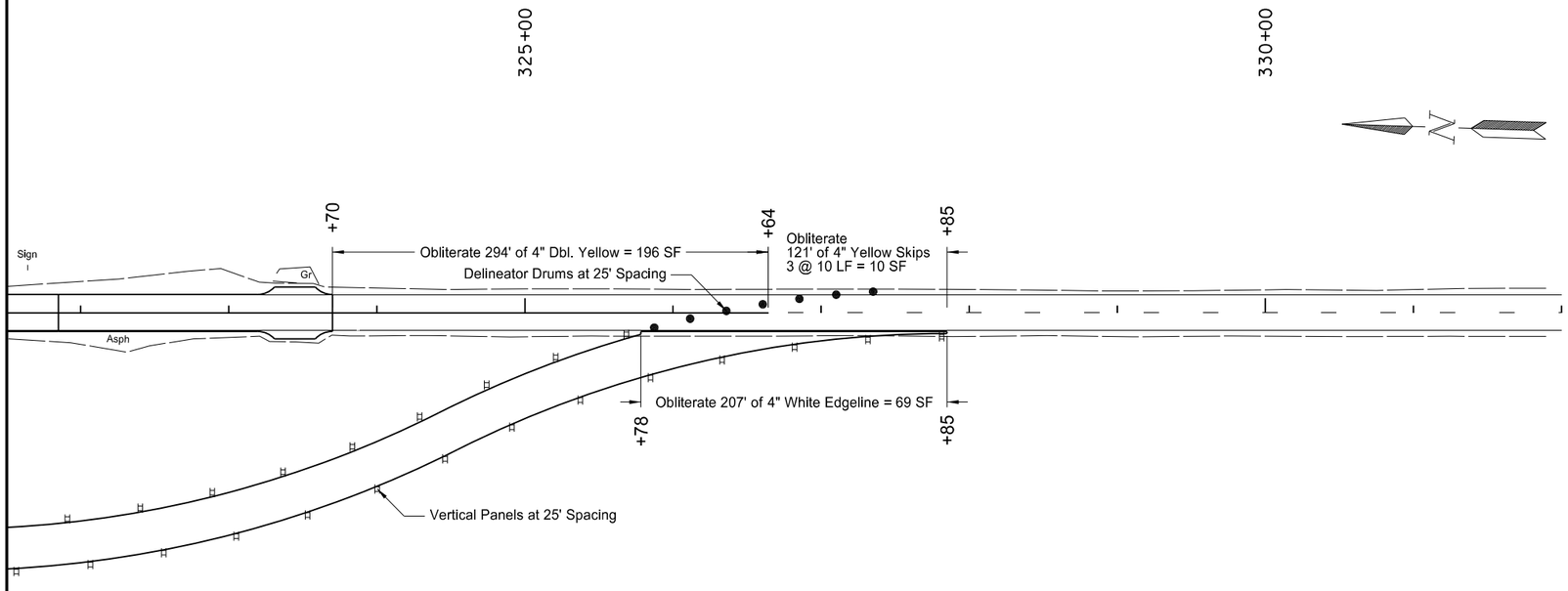
Traffic Control Devices List

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-032(033)006	100	2





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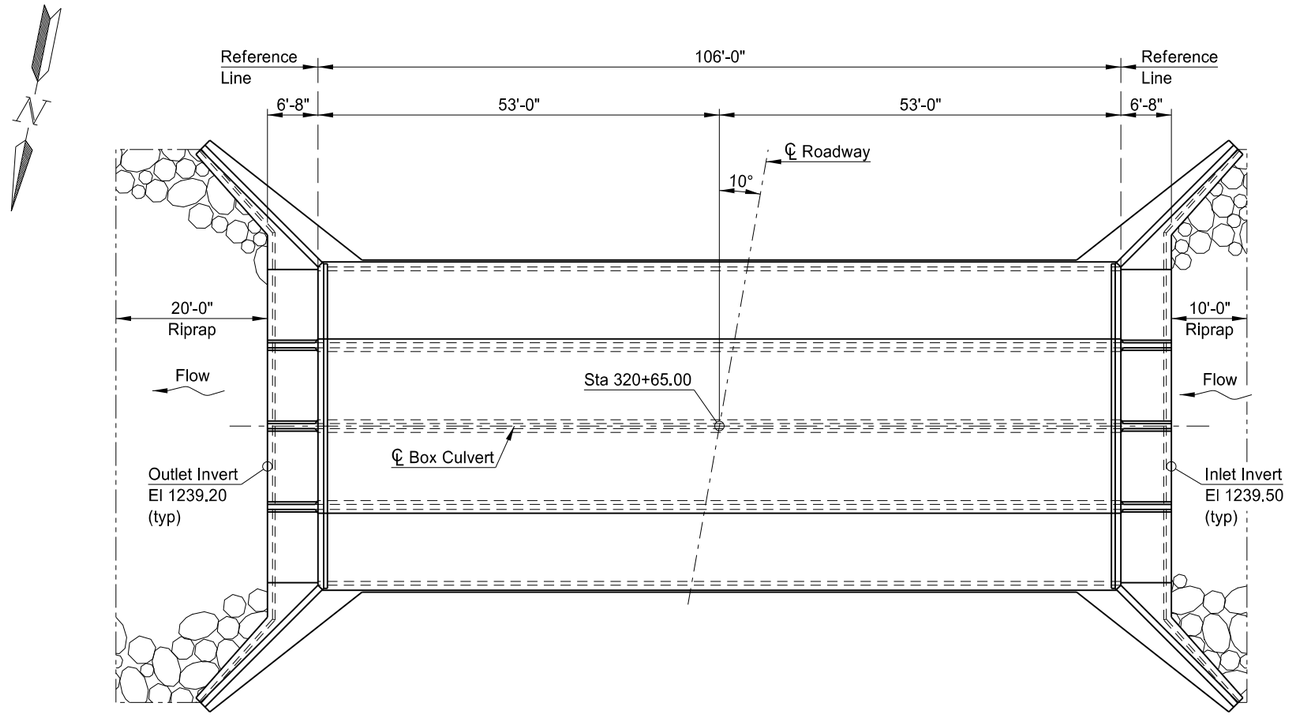
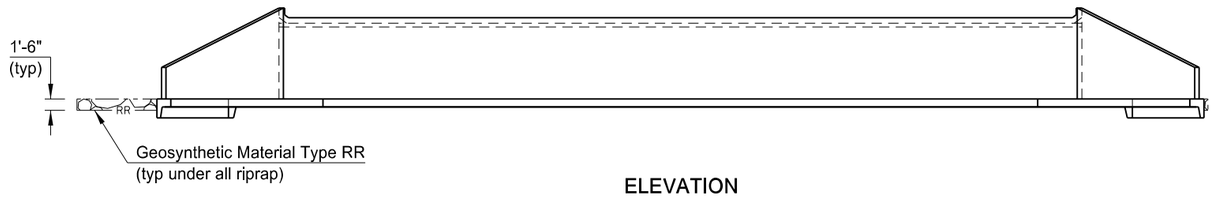
ND Highway 32
Work Zone Traffic Control
Obliteration of Pavement Marking

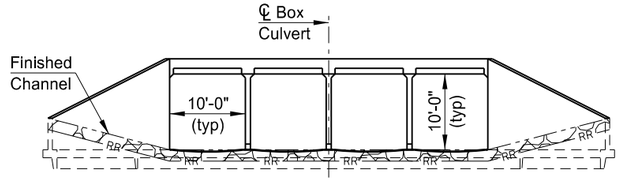
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	170	1



PLAN



ELEVATION



END VIEW

DESIGN STRENGTHS:

f'c = 3,000 psi ~ Class AE-3 Concrete
fy = 60,000 psi ~ Reinforcing Steel

Load & Resistance Factor Design

HYDRAULIC DATA:

Drainage Area	260.56	sq mi
Stream Gradient	0.0006	ft/ft
Design Frequency	50	yr
Design Discharge	3065.8	cfs
Design Headwater Stage	1250.99	ft
Design Tailwater Stage	1249.62	ft
Velocity Through Culvert	8.52	fps
100-Year Frequency Discharge	4113.8	cfs
100-Year Frequency Headwater	1253.13	ft
Overtopping Stage	1258.35	ft
Overtopping Discharge	6539.3	cfs

BOX CULVERT BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
202	0105	REMOVAL OF STRUCTURE	L SUM	1
210	0050	BOX CULVERT EXCAVATION	EA	1
210	0210	FOUNDATION FILL	CY	1,130
210	0405	FOUNDATION PREPARATION-BOX CULVERT	EA	1
256	0200	RIPRAP GRADE II	CY	115
602	1131	CLASS AE-3 CONCRETE-BOX CULVERT	CY	505.3
612	0114	REINFORCING STEEL-GRADE 60-BOX CULVERT	LBS	67,618
709	0100	GEOSYNTHETIC MATERIAL TYPE G	SY	665
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	230

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SPECIAL PROVISIONS	
SP 4(14)	MIGRATORY BIRD TREATY ACT

HL-93 DESIGN LOADING

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
WILD RICE RIVER
4 MILES SOUTH OF ND 11 EAST

REINFORCED CONCRETE
QUADRUPLE BOX CULVERT LAYOUT

CLEAR SPAN 4 x 10' CLEAR HEIGHT 10'
MAXIMUM FILL 10'

PROJECT: SS-8-032(033)006
STATION: 320+65.00
SARGENT COUNTY

08/17/15 — DATE
Terrence R. Udland — BRIDGE ENGINEER

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-032(033)006	170	2

NOTES

100 SCOPE OF WORK: Work at this site consists of removing an existing structure and building a new quadruple barrel 10' x 10' x 106'-0" reinforced concrete box culvert.

202 REMOVAL OF STRUCTURE: The existing structure is a single span steel girder bridge, 65'-0" long with a clear roadway width of 28'-0". The substructures are made of concrete and supported on timber piling. Remove the old concrete abutments from a previous bridge located in the channel to an elevation of 1236. Include all work required to remove the bridge and old abutments from a previous structure in the contract unit price for “Removal of Structure.”

Submit SFN 17987 “Asbestos Notification of Demolition and Renovation” to the North Dakota Department of Health 10 days before beginning removal of concrete.

210 ORDINARY BACKFILL: Compact material as specified in Section 203.04 E.2.a.

602 CONCRETE: Provide aggregate for concrete that meets the requirements of Section 802.01 C.2, “Coarse Aggregate” and Section 802.01 C.3, “Fine Aggregate.”

602 CONCRETE: Cast the following elements of each section in one continuous run:

1. Floor slab and wing footings
2. Each intermediate wall up to the bottom of fillets
3. Each sidewall up to the bottom of fillets with its adjacent wings complete to the top
4. Roof slab and parapets

Allow the concrete in the walls to set at least two hours before the roof slab is poured.

602 CURING CONCRETE: Wet cure all concrete surfaces not covered by forms. Cover the concrete with a double thickness of burlap. Maintain surface moisture between the final finish and placement of burlap by periodic applications of a light fog spray of water. Keep the burlap continuously moist until the end of the curing period.

612 REINFORCING STEEL: When the distance between end bars is not evenly divisible by bar spacing, adjust the odd distance by a few irregular spaces near the center, not at the ends of the culvert.

Dimensions of bent bars are given out to out. All bends conform to CRSI Standards unless indicated otherwise.

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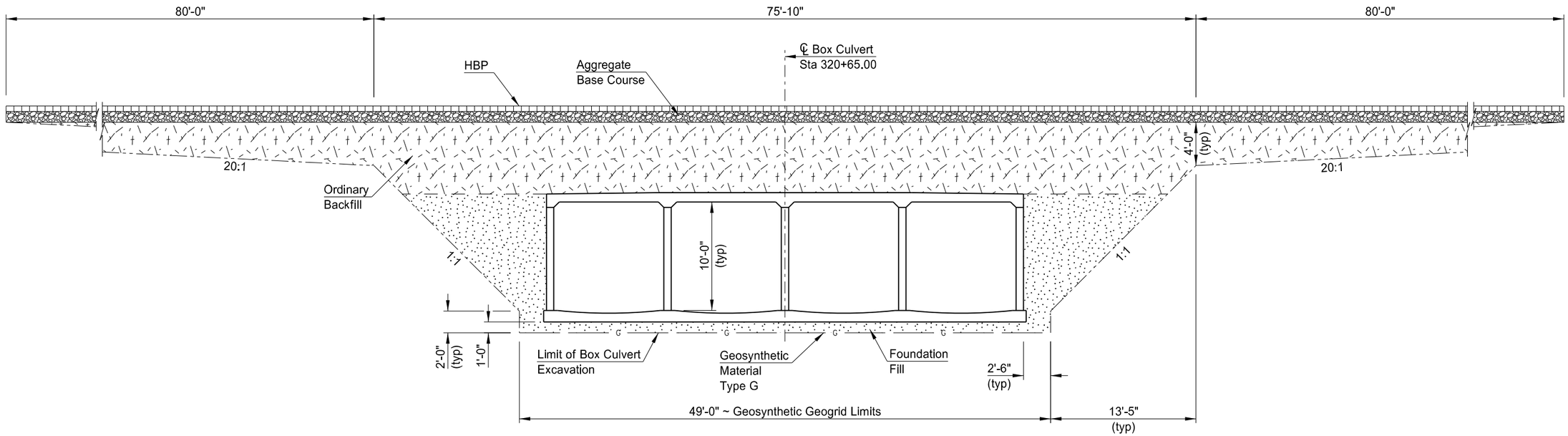
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	170	3



(SHOWING SECTION ALONG ℄ ROADWAY)

GEOSYNTHETIC GEOGRID PLACEMENT AND FOUNDATION FILL
THROUGH EXISTING EMBANKMENT

NOTES:

Provide a 1'-0" minimum depth of foundation fill under the floor. Remove and replace all unsound material under the box with foundation fill. The Engineer will determine the depth required.

Extend the geosynthetic material and foundation fill to the end of the apron.

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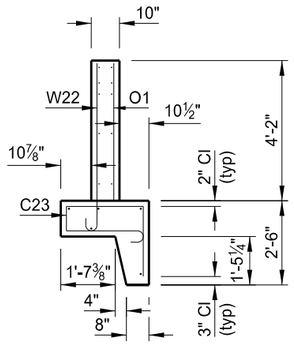
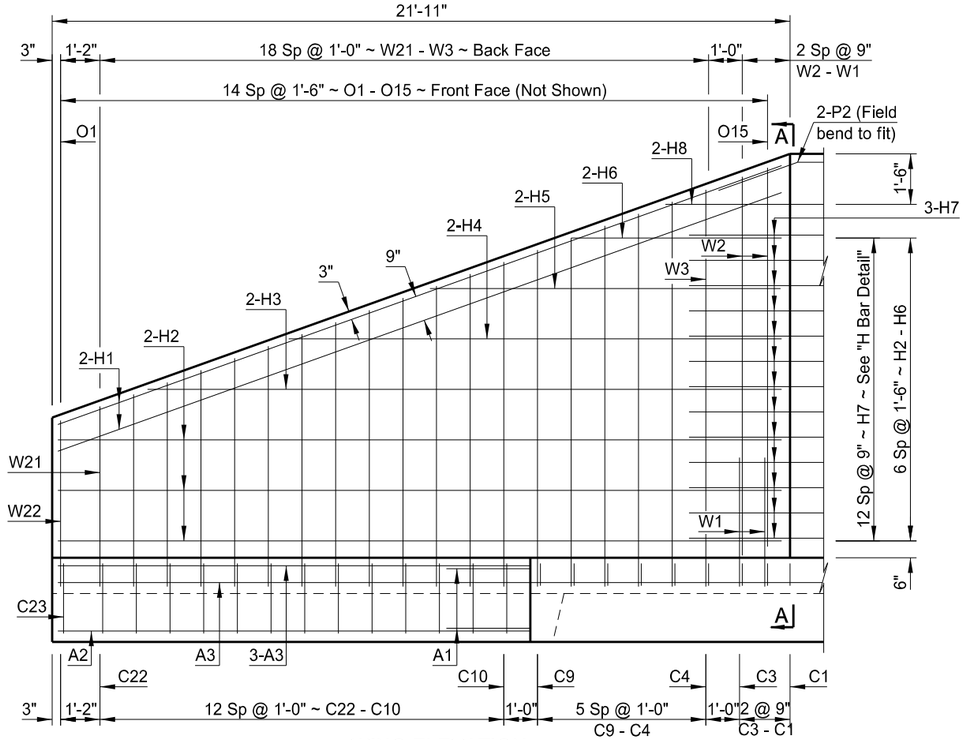
WILD RICE RIVER
4 MILES SOUTH OF ND 11 EAST

EXCAVATION & FOUNDATION FILL DETAIL

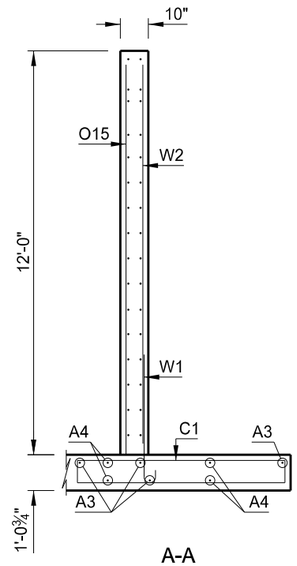
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	170	4



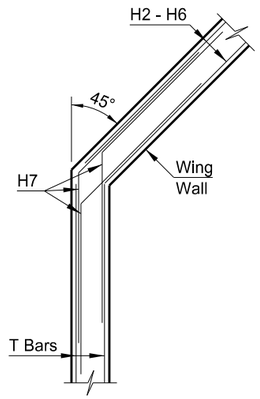
END VIEW



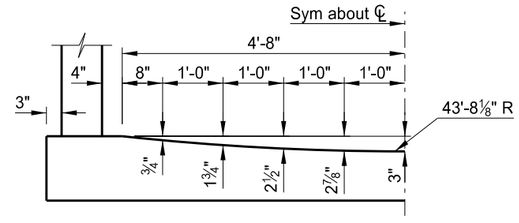
WING ELEVATION



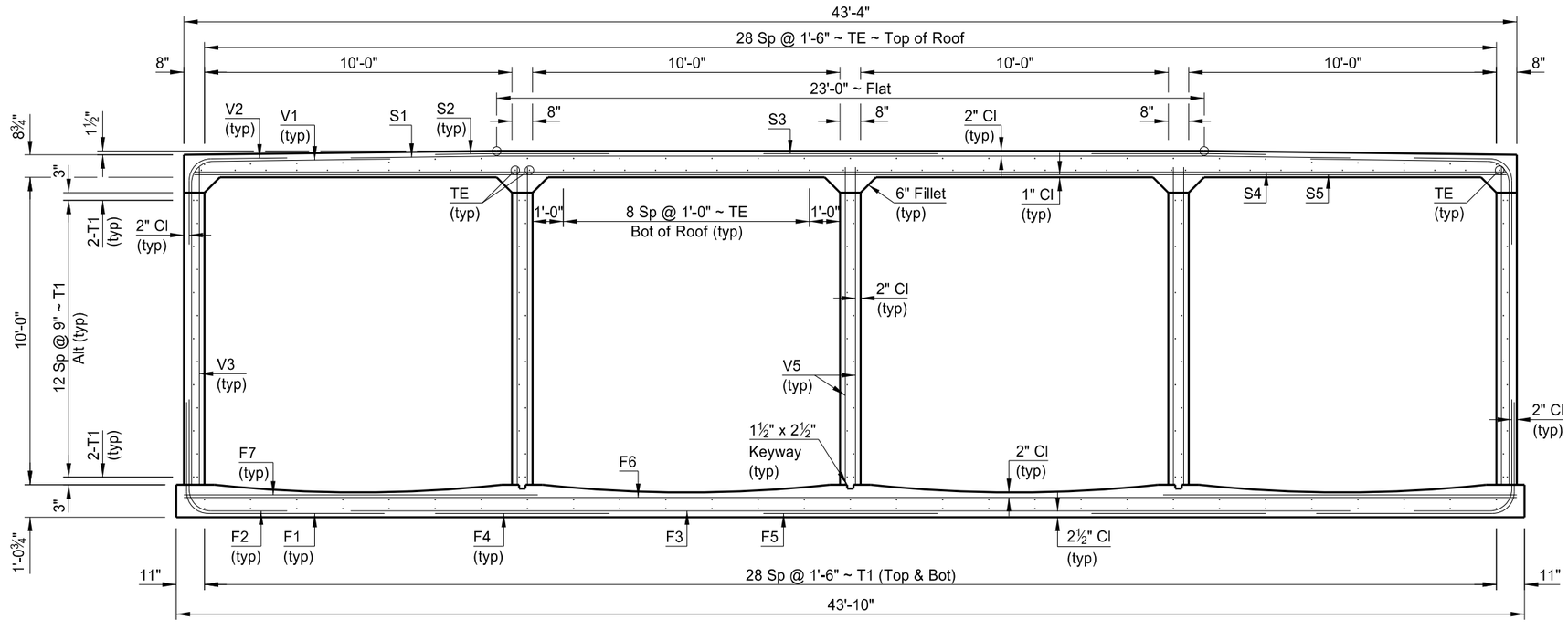
A-A



H BAR DETAIL



CURVED FLOOR OFFSETS



SECTION OF BARREL

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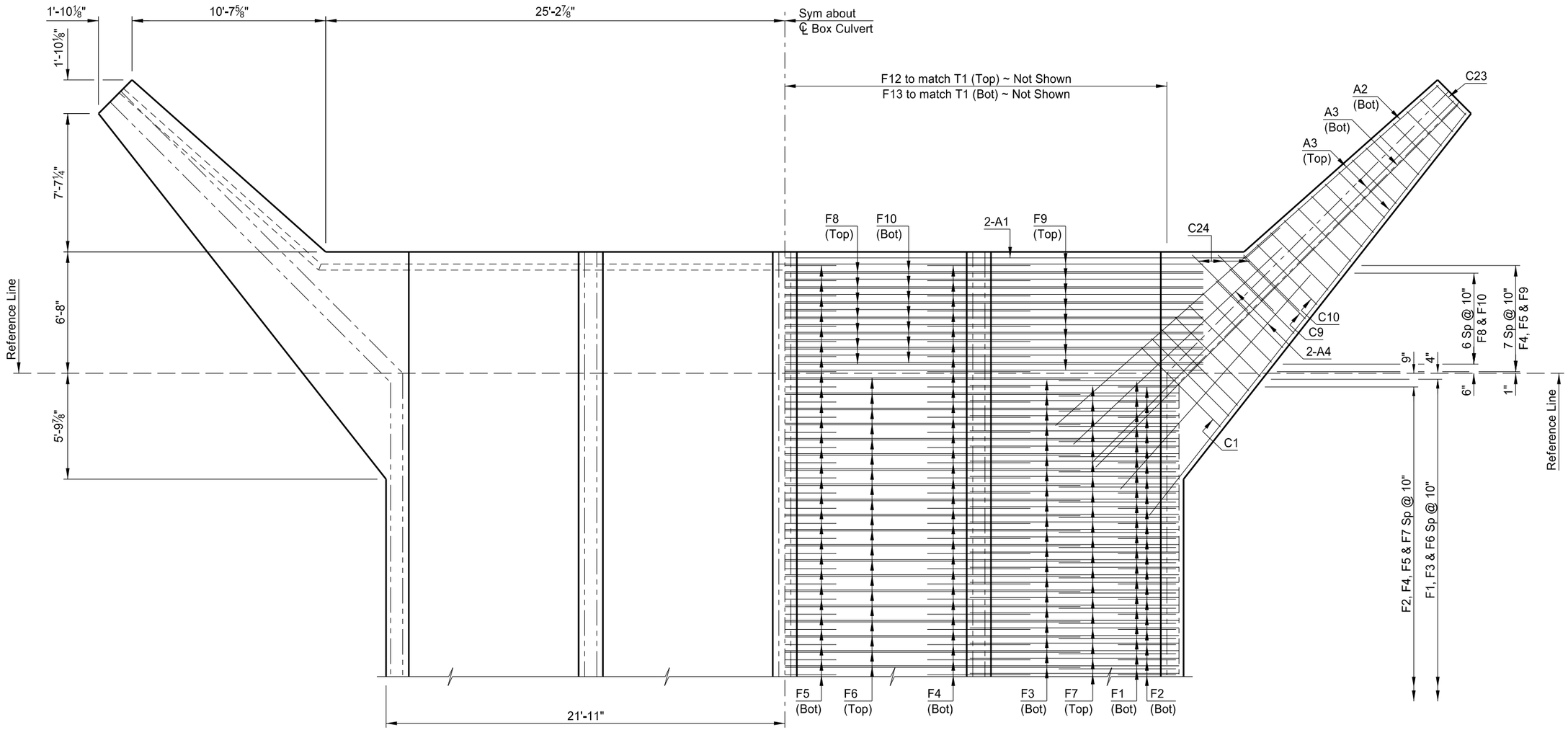
WILD RICE RIVER
4 MILES SOUTH OF ND 11 EAST

BARREL SECTION & WING DETAILS

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	170	5



(SHOWING DIMENSIONS) (SHOWING REINFORCING)

FLOOR PLAN

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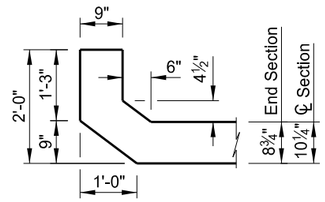
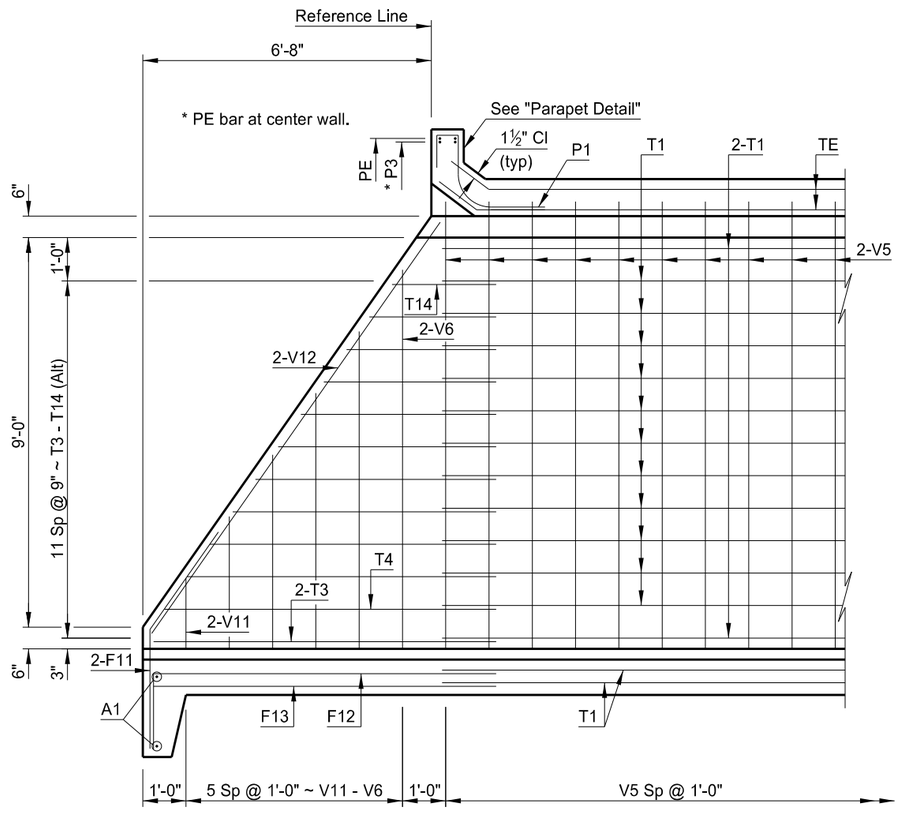
WILD RICE RIVER
4 MILES SOUTH OF ND 11 EAST

FLOOR DETAIL

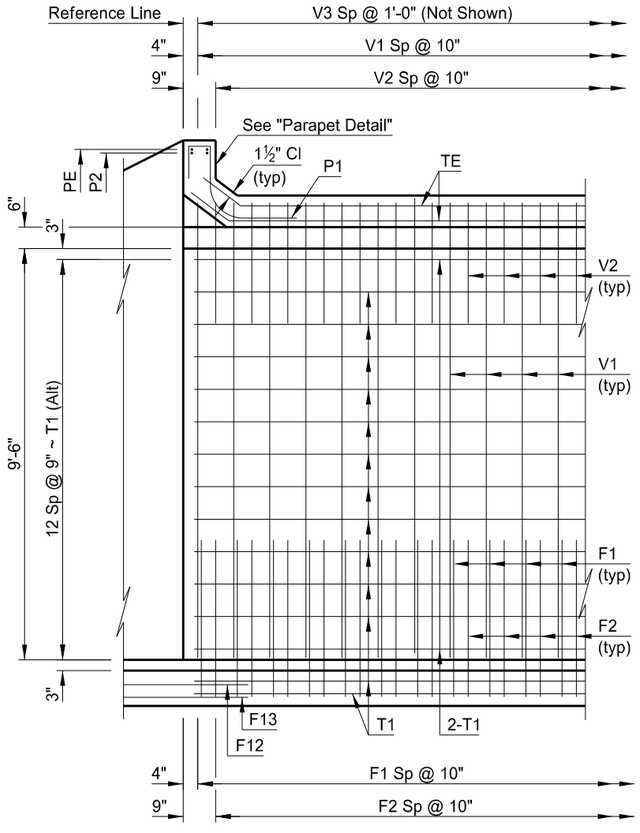
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	170	6



PARAPET DETAIL



INNER WALL



OUTER WALL

LONGITUDINAL SECTIONS

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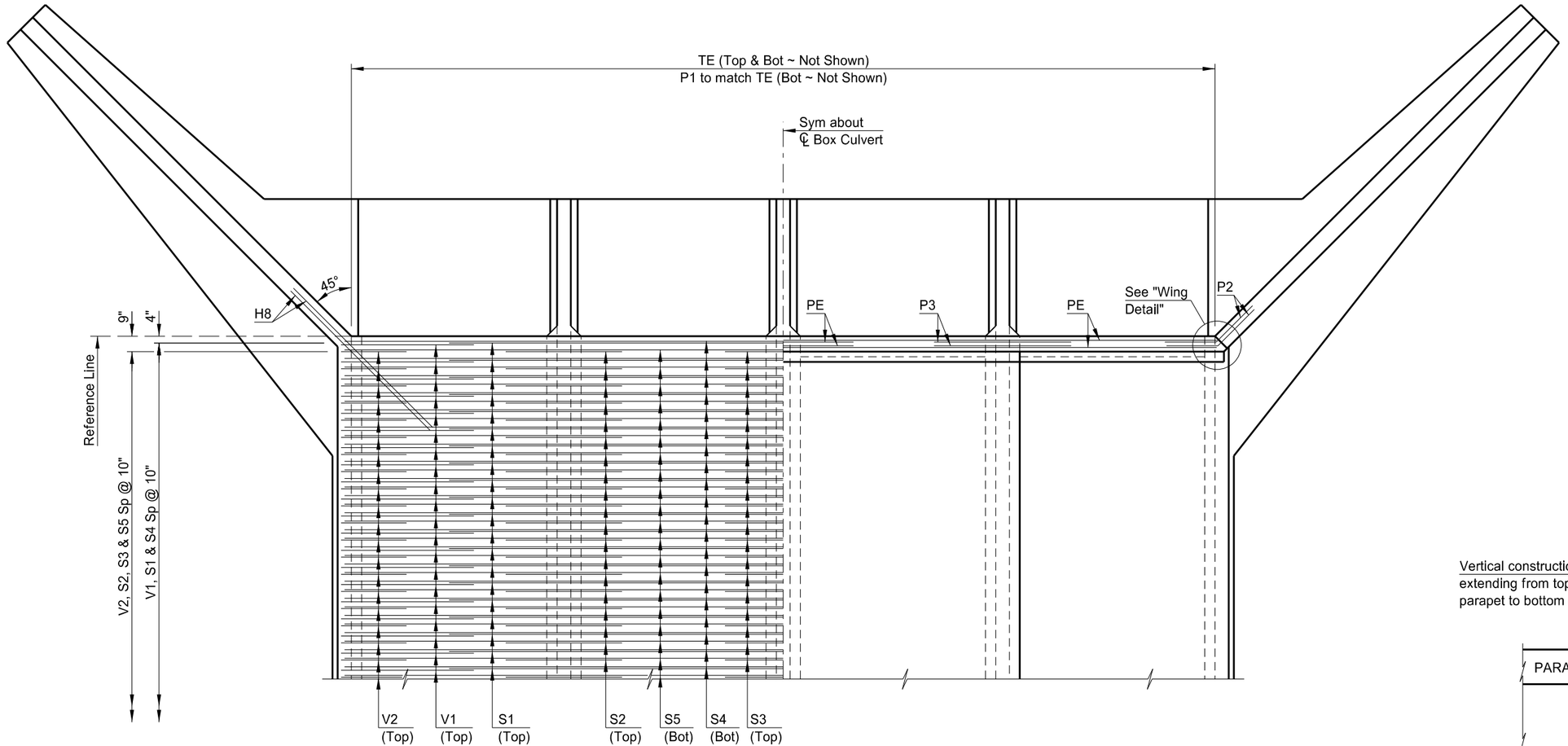
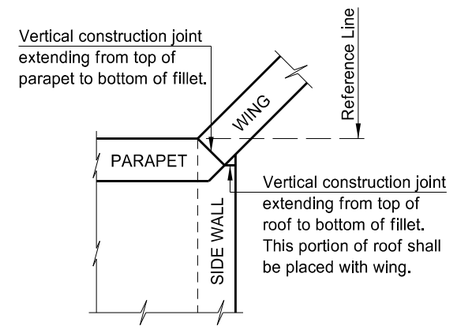
WILD RICE RIVER
4 MILES SOUTH OF ND 11 EAST

WALL DETAILS &
PARAPET DETAIL

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	170	7



ROOF PLAN



WING DETAIL

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WILD RICE RIVER
4 MILES SOUTH OF ND 11 EAST

ROOF DETAILS

BAR LIST (CONSTANT)				
MARK	SIZE	NO.	LENGTH	SHAPE
W1	7	8	4'-8"	BENT
W2	6	8	11'-3"	STR.
W3	7	4	12'-7"	BENT
W4	7	4	12'-3"	BENT
W5	7	4	11'-10"	BENT
W6	7	4	11'-6"	BENT
W7	7	4	11'-2"	BENT
W8	7	4	10'-10"	BENT
W9	6	4	10'-3"	BENT
W10	6	4	9'-11"	BENT
W11	6	4	9'-7"	BENT
W12	5	4	9'-1"	BENT
W13	5	4	8'-9"	BENT
W14	5	4	8'-5"	BENT
W15	4	4	8'-0"	BENT
W16	4	4	7'-7"	BENT
W17	4	4	7'-3"	BENT
W18	4	4	6'-11"	BENT
W19	4	4	6'-6"	BENT
W20	4	4	6'-2"	BENT
W21	4	4	5'-10"	BENT
W22	4	4	5'-5"	BENT
C1	6	4	14'-4"	BENT
C2	6	4	14'-0"	BENT
C3	6	4	13'-10"	BENT
C4	5	4	13'-4"	BENT
C5	5	4	13'-0"	BENT
C6	5	4	12'-8"	BENT
C7	5	4	12'-4"	BENT
C8	5	4	12'-0"	BENT
C9	5	4	11'-8"	BENT
C10	5	4	12'-8"	BENT
C11	5	4	12'-2"	BENT
C12	5	4	11'-10"	BENT
C13	4	4	11'-5"	BENT
C14	4	4	11'-1"	BENT
C15	4	4	10'-9"	BENT
C16	4	4	10'-5"	BENT
C17	4	4	10'-1"	BENT
C18	4	4	9'-7"	BENT
C19	4	4	9'-3"	BENT
C20	4	4	8'-11"	BENT
C21	4	4	8'-7"	BENT
C22	4	4	8'-3"	BENT
C23	4	4	7'-9"	BENT
C24	4	12	6'-5"	BENT
H1	7	16	22'-10"	STR.
H2	4	24	21'-6"	STR.
H3	4	8	18'-10"	STR.
H4	4	8	14'-7"	STR.
H5	4	8	10'-5"	STR.
H6	4	8	6'-3"	STR.
H7	4	156	6'-0"	BENT
H8	6	8	9'-7"	STR.
O1-O15	4	4 SETS	117'-6"	STR.
A1	6	8	28'-9"	BENT
A2	6	4	14'-2"	STR.
A3	6	16	28'-2"	STR.
A4	6	16	15'-9"	STR.
P1	4	88	4'-7"	BENT
P2	6	8	5'-0"	BENT
P3	6	8	6'-8"	STR.
PE	6	8	24'-6"	STR.

BAR LIST (CONSTANT)				
MARK	SIZE	NO.	LENGTH	SHAPE
V6	4	12	8'-9"	STR.
V7	4	12	7'-4"	STR.
V8	4	12	5'-10"	STR.
V9	4	12	4'-5"	STR.
V10	4	12	3'-0"	STR.
V11	4	12	1'-7"	STR.
V12	6	12	11'-7"	STR.
F8	5	14	46'-0"	STR.
F9	4	16	46'-0"	STR.
F10	5	14	46'-0"	STR.
F11	6	12	5'-6"	BENT
F12	4	58	9'-8"	BENT
F13	4	58	7'-11"	STR.
T3	4	12	7'-11"	STR.
T4-T14	4	6 SETS	55'-0"	STR.

BAR LIST (VARIABLE)				
MARK	SIZE	NO.	LENGTH	SHAPE
V1	4	256	16'-8"	BENT
V2	5	252	5'-8"	BENT
V3	4	214	10'-4"	STR.
V5	4	642	10'-4"	STR.
F1	4	256	9'-9"	BENT
F2	5	252	6'-6"	BENT
F3	5	128	32'-6"	STR.
F4	5	284	5'-8"	STR.
F5	5	142	5'-8"	STR.
F6	5	128	43'-4"	STR.
F7	4	252	11'-6"	STR.
S1	5	128	32'-6"	STR.
S2	6	252	5'-8"	STR.
S3	5	126	5'-8"	STR.
S4	4	128	42'-8"	STR.
S5	4	126	42'-8"	STR.
T1	4	133	106'-9"	STR.
TE	4	73	107'-4"	BENT

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
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NOTE:

Unless construction requirements dictate otherwise, the Contractor has the option to construct the box culvert using construction joints or as one continuous unit. If construction joints are used, the longitudinal bar lengths may be adjusted, but a minimum lap length of 1'-3" must be maintained.

CONCRETE FORMULAS	
ENTIRE FLOOR	"L" x 1.49434 + 43.13149 = 201.5 CY
TWO OUTSIDE WALLS & FOUR WINGS	"L" x 0.46914 + 21.56725 = 71.3 CY
INSIDE WALLS	"L" x 0.70370 + 5.18519 = 79.8 CY
ENTIRE ROOF	"L" x 1.42258 + 1.94881 = 152.7 CY
TOTAL	"L" x 4.08976 + 71.83273 = 505.3 CY

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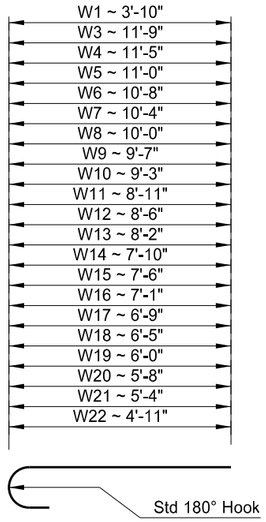
QUANTITIES	
CLASS AE-3 CONCRETE	505.3 CY
REINFORCING STEEL	67,618 LBS

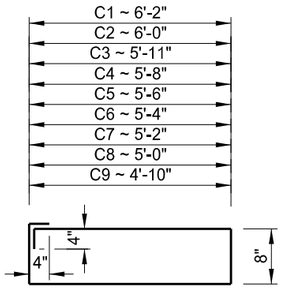
WILD RICE RIVER
4 MILES SOUTH OF ND 11 EAST

REINFORCING BAR LIST

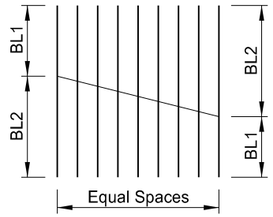
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	170	9



W1, W3 - W22



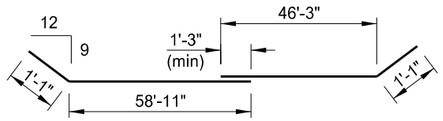
C1 - C9



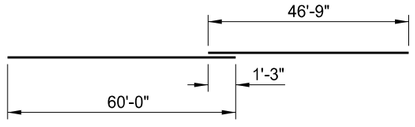
2 SETS SHOWN

MARK	LENGTH 1 SET	BL1	BL2	SPACES
O1-O15	117'-6"	4'-1"	11'-7"	14
T4-T14	55'-0"	2'-4"	7'-8"	10

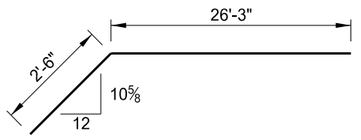
BAR CUTTING DETAILS



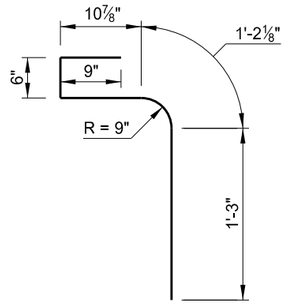
TE



T1



A1



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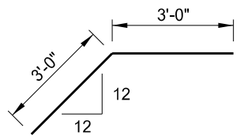
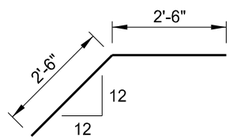


H7



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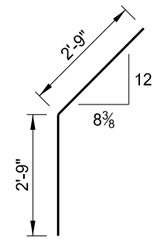

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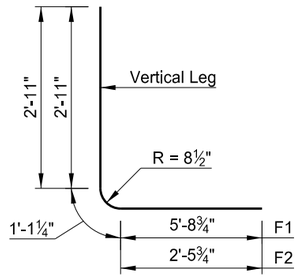
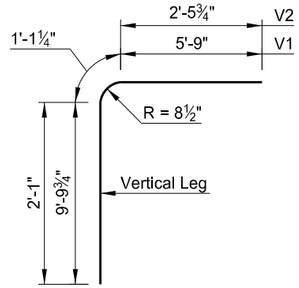
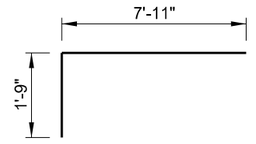


F1 & F2



V1 & V2



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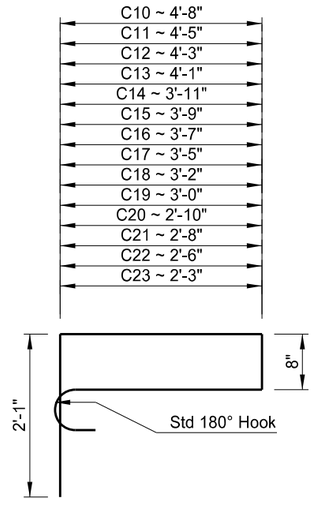
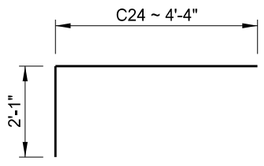


C10 - C23



C24

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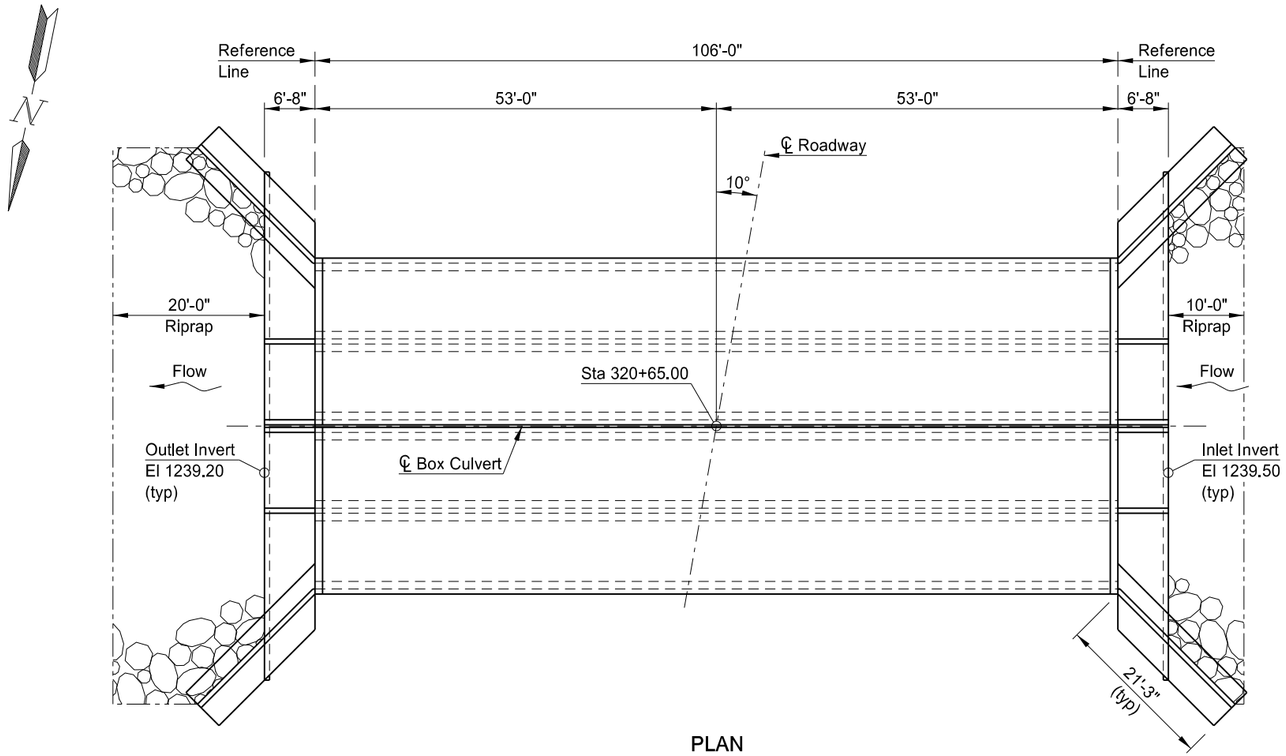
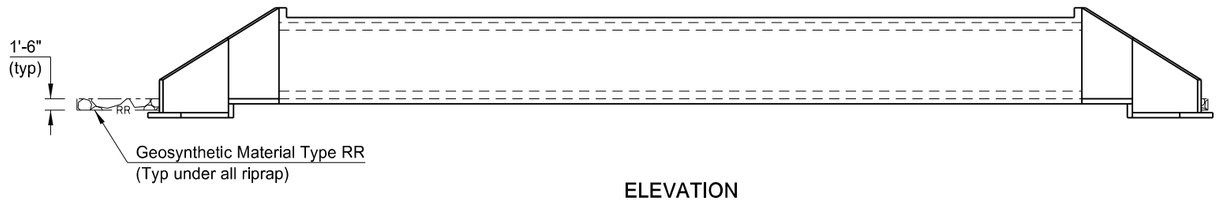
WILD RICE RIVER
4 MILES SOUTH OF ND 11 EAST

BAR DETAILS

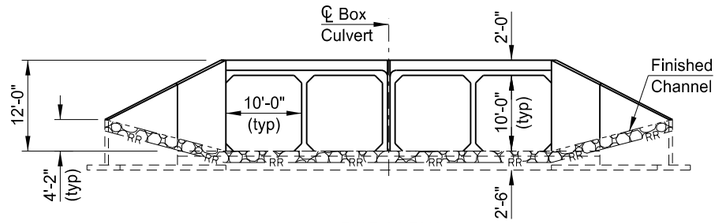
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	170	10



PLAN



ELEVATION



END VIEW

For a single barrel box culvert with 8" thick roof, 8" floor and 8" walls, the following total factored moments and shears would result from the application of the required loads:

FACTORED DESIGN MOMENTS (SINGLE)		FACTORED DESIGN SHEARS (SINGLE)	
WALL MOMENT	1,119 ft-lbs	WALL SHEAR	5,444 lbs
ROOF MOMENTS		ROOF SHEARS	
CORNER	14,661 ft-lbs	CORNER	9,351 lbs
BOTTOM	19,651 ft-lbs	FLOOR SHEARS	
FLOOR MOMENTS		CORNER	12,608 lbs
CORNER	18,122 ft-lbs		
TOP	21,247 ft-lbs		

For a double barrel box culvert with 8" thick roof, 8" floor and 8" walls, the following total factored moments and shears would result from the application of the required loads:

FACTORED DESIGN MOMENTS (DOUBLE)		FACTORED DESIGN SHEARS (DOUBLE)	
WALL MOMENT	2,597 ft-lbs	WALL SHEAR	5,358 lbs
ROOF MOMENTS		ROOF SHEARS	
CORNER	12,927 ft-lbs	CORNER	7,969 lbs
BOTTOM	14,829 ft-lbs	WALL	10,734 lbs
TOP	27,676 ft-lbs	FLOOR SHEARS	
FLOOR MOMENTS		CORNER	10,972 lbs
CORNER	15,462 ft-lbs	WALL	13,635 lbs
TOP	15,303 ft-lbs		
BOTTOM	29,668 ft-lbs		

HYDRAULIC DATA:

Drainage Area	260.56	sq mi
Stream Gradient	0.0006	ft/ft
Design Frequency	50	yr
Design Discharge	3065.8	cfs
Design Headwater Stage	1250.99	ft
Design Tailwater Stage	1249.62	ft
Velocity Through Culvert	8.52	fps
100-Year Frequency Discharge	4113.8	cfs
100-Year Frequency Headwater	1253.13	ft
Overtopping Stage	1258.35	ft
Overtopping Discharge	6539.3	cfs

BOX CULVERT BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
202	0105	REMOVAL OF STRUCTURE	L SUM	1
210	0050	BOX CULVERT EXCAVATION	EA	1
210	0210	FOUNDATION FILL	CY	1,130
210	0405	FOUNDATION PREPARATION-BOX CULVERT	EA	1
256	0200	RIPRAP GRADE II	CY	115
606	3010	DBL 10FT X 10FT PRECAST RCB CULVERT	LF	212
606	7010	DBL 10FT X 10FT PRECAST RCB END SECTION	EA	2
709	0100	GEOSYNTHETIC MATERIAL TYPE G	SY	665
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	230

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SPECIAL PROVISIONS	
SP 4(14)	MIGRATORY BIRD TREATY ACT

STANDARD DRAWINGS
D-714-22

HL-93 DESIGN LOADING

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
WILD RICE RIVER
4 MILES SOUTH OF ND 11 EAST

PRECAST CONCRETE
QUADRUPLE BOX CULVERT LAYOUT

CLEAR SPAN 4 x 10' CLEAR HEIGHT 10'
MAXIMUM FILL 10'

PROJECT: SS-8-032(033)006
STATION: 320+65.00
SARGENT COUNTY

08/17/15 — DATE
Terrence R. Udland — BRIDGE ENGINEER

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-8-032(033)006	170	11

NOTES

100 SCOPE OF WORK: Work at this site consists of removing an existing structure and building a new quadruple barrel 10' x 10' x 106'-0" precast concrete box culvert.

105 WORK DRAWINGS: Submit work drawings for the precast concrete box culvert to the Engineer for review. Use the following minimum text sizes on all work drawing sheets.

Dimensions and Notes =	0.08"
Detail Subtitles =	0.09"
Detail Titles =	0.10"

202 REMOVAL OF STRUCTURE: The existing structure is a single span steel girder bridge, 65'-0" long with a clear roadway width of 28'-0". The substructures are made of concrete and supported on timber piling. Remove the old concrete abutments from a previous bridge located in the channel to an elevation of 1236. Include all work required to remove the bridge and old abutments from a previous structure in the contract unit price for "Removal of Structure."

Submit SFN 17987 "Asbestos Notification of Demolition and Renovation" to the North Dakota Department of Health 10 days before beginning removal of concrete.

210 ORDINARY BACKFILL: Compact material as specified in Section 203.04 E.2.a.

606 PRECAST SECTION: Tie the barrel sections together with prestressing strands or 1"ϕ 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.

Payment for "Dbl 10Ft X 10Ft Precast RCB End Section" includes the apron, cutoff wall, parapet and wingwalls. Attach the apron to the last barrel section, the wingwalls and the cutoff wall. Attach the wingwalls to the last barrel section. Provide a welded tie type system for the connections of the apron to the box and wingwalls. Connect the wingwalls 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.

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 or double 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 Aggregate	2600 lbs
Water	70 gals

For the 12" cap, use a weatherproof and freeze/thaw resistant, non-shrink cement grout material such as SikaGrout® 212, BASF Masterflow® 928, Euclid NS Grout, or an approved equal which complies with ASTM C1107.

Include the controlled density backfill in the price bid for "Dbl 10Ft X 10Ft Precast RCB Culvert."

606 DESIGN REQUIREMENTS: Provide reinforcing clear cover that meets the requirements of Section 12.11.4.4 of the AASHTO LRFD Bridge Design Specifications, Seventh Edition.

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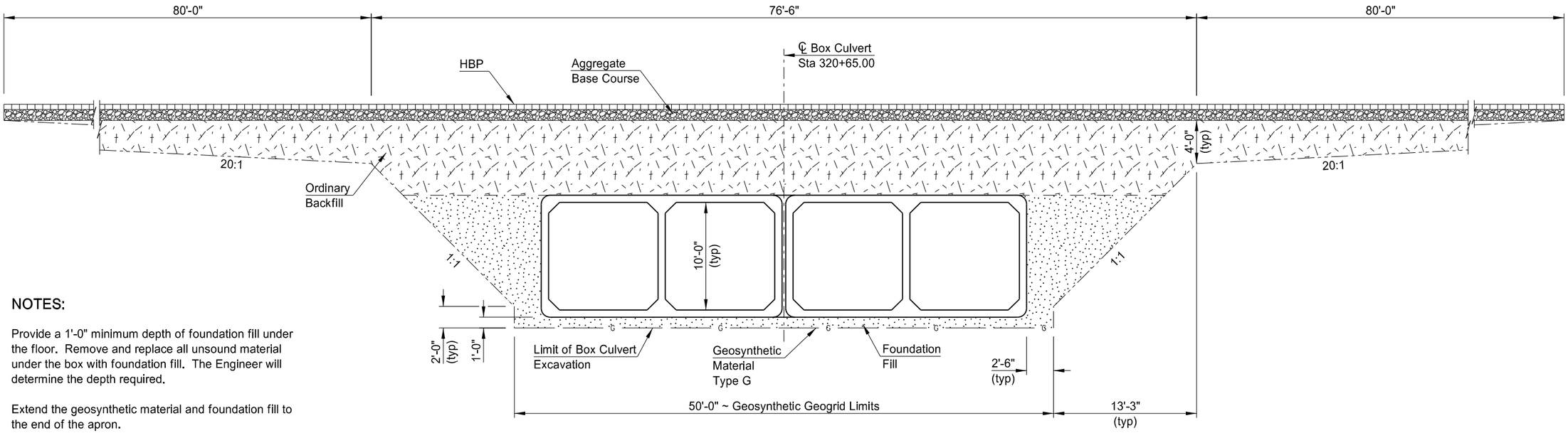
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	SS-8-032(033)006	170	12



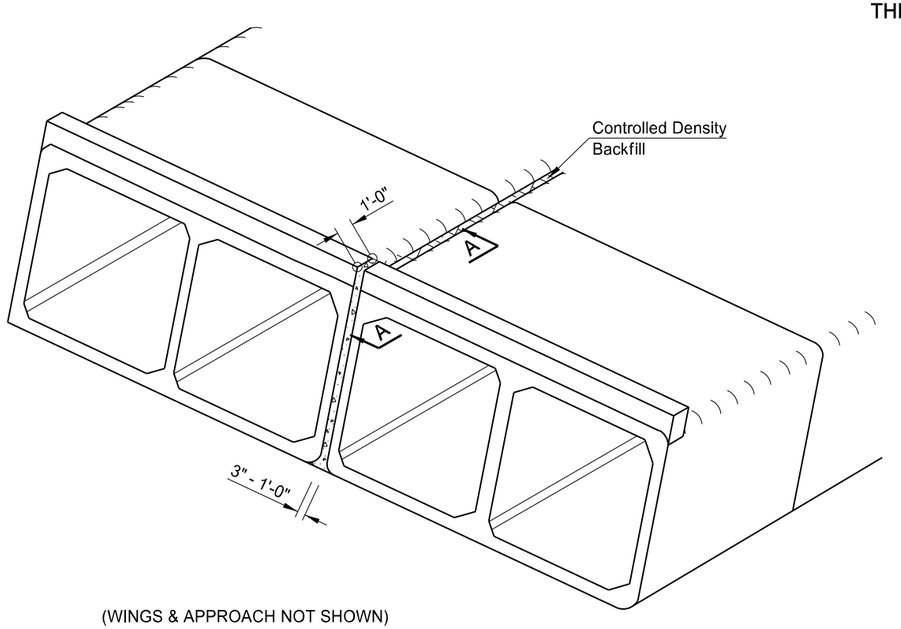
(SHOWING SECTION ALONG ℄ ROADWAY)

GEOSYNTHETIC GEOGRID PLACEMENT AND FOUNDATION FILL THROUGH EXISTING EMBANKMENT

NOTES:

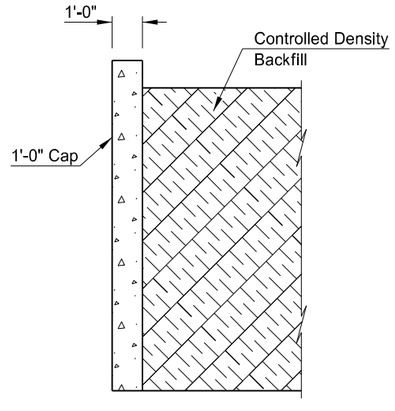
Provide a 1'-0" minimum depth of foundation fill under the floor. Remove and replace all unsound material under the box with foundation fill. The Engineer will determine the depth required.

Extend the geosynthetic material and foundation fill to the end of the apron.



(WINGS & APPROACH NOT SHOWN)

MULTIPLE CELL INSTALLATION



SECTION A-A

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

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WILD RICE RIVER
4 MILES SOUTH OF ND 11 EAST

EXCAVATION & FOUNDATION FILL DETAIL

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

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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
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

D-101-3

Qty	quantity
Qtr	quarter
Rad or R	radius
RR	railroad
Rlwy	railway
Rsd	raised
RTP	random traverse point
Rge or R	range
RC	rapid curing
Rec	record
Rcy	recycle
RPCC	recycled Portland cement concrete
Ref	reference
R Mkr	reference marker
RM	reference monument
Refl	reflectorized
RCB	reinforced concrete box
RCES	reinforced concrete end section
RCP	reinforced concrete pipe
RCPS	reinforced concrete pipe sewer
Reinf	reinforcement
Res	reservation
Ret	retaining
Rev	reverse
Rt	right
R/W	right of way
Riv	river
Rd	road
Rdbd	road bed
Rdwy	roadway
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
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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D-101-20

Line Styles

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

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D-101-21

Line Styles

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

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-101-30

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

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-101-31

- 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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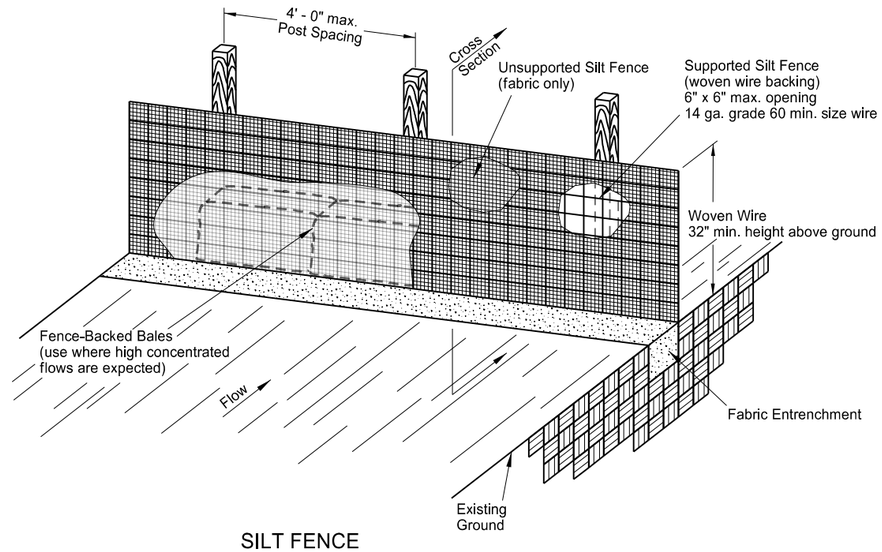
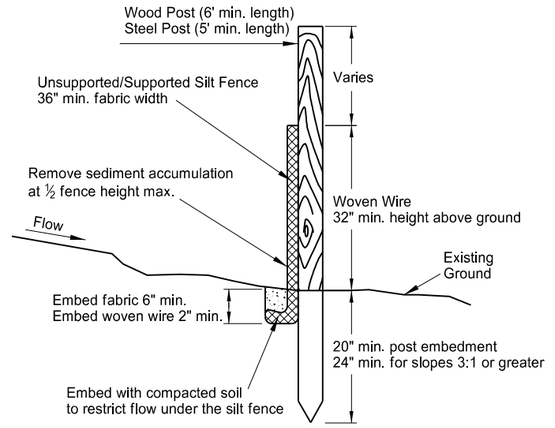
EROSION AND SILTATION CONTROLS - SILT FENCE

D-260-1



SILT FENCE
SUPPORTED AND UNSUPPORTED



SILT FENCE
CROSS SECTION

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Standard drawing resulted from splitting standard D-708-2.

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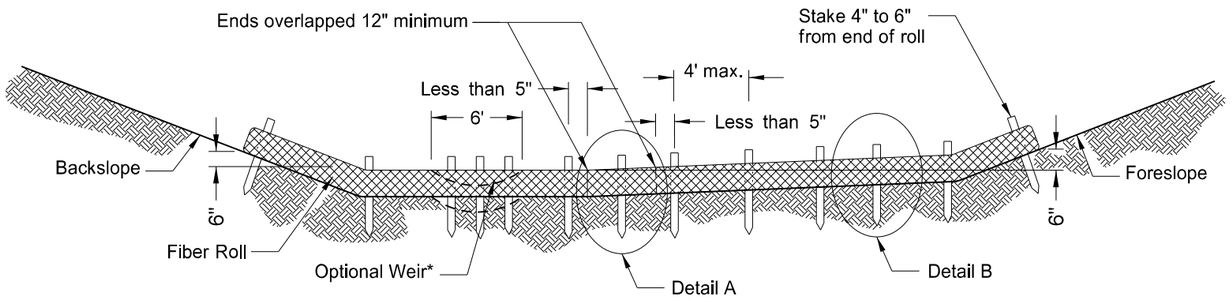
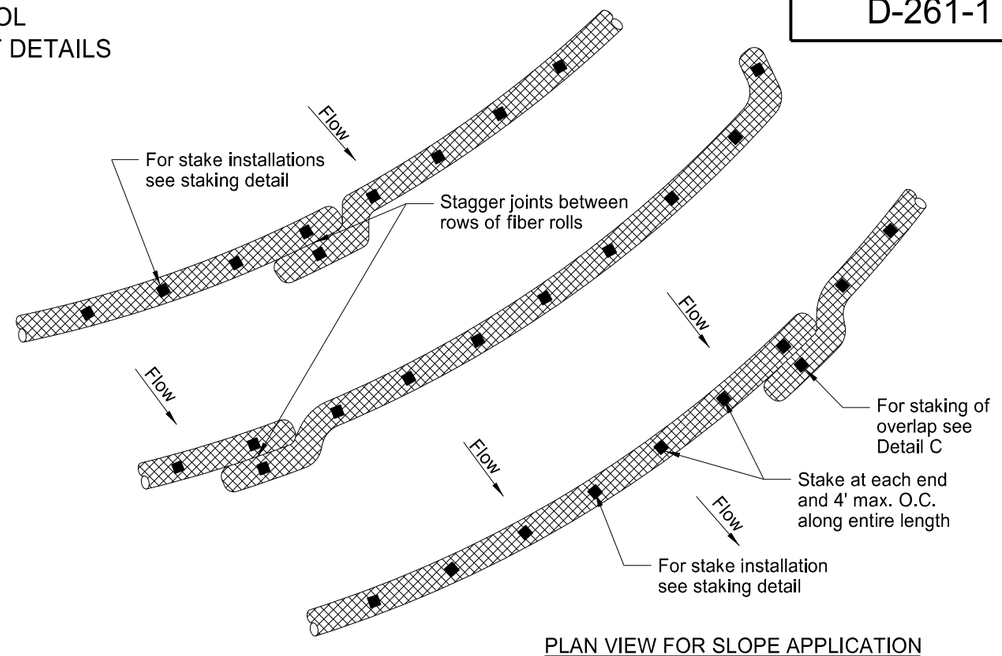
D-261-1

EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

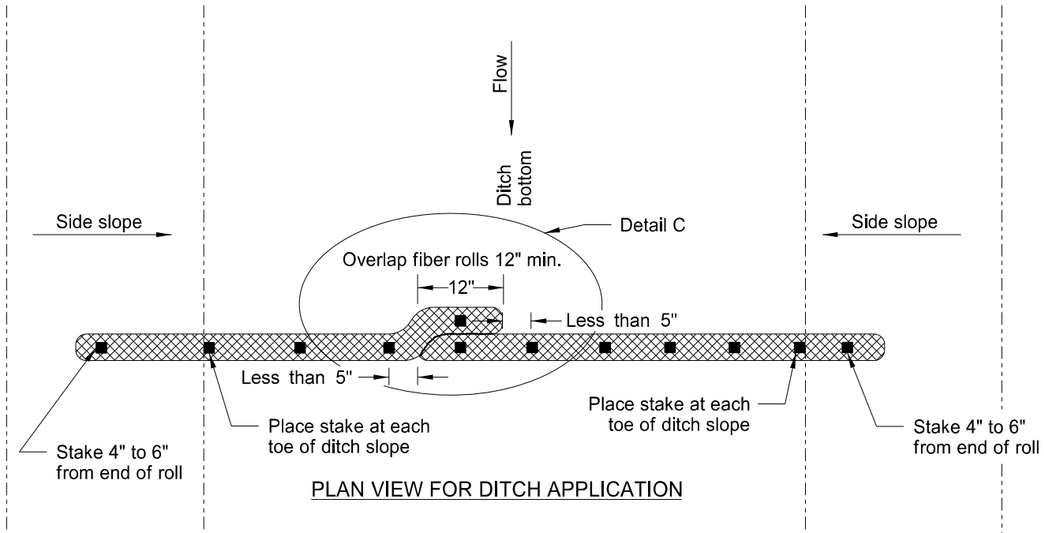


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

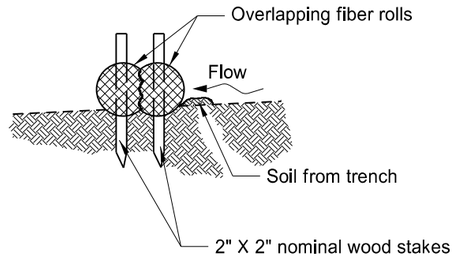
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



PLAN VIEW FOR SLOPE APPLICATION

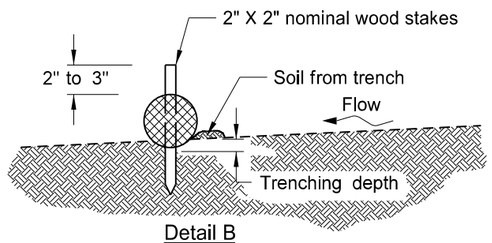


PLAN VIEW FOR DITCH APPLICATION



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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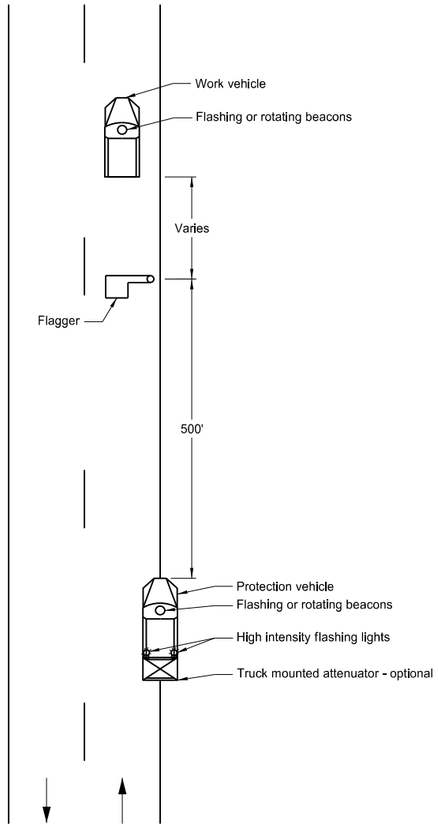
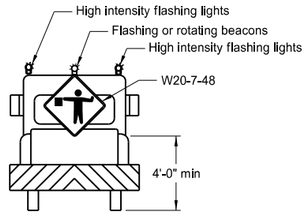
TRAFFIC CONTROL FOR CORING OF HOT BITUMINOUS PAVEMENT

D-704-2

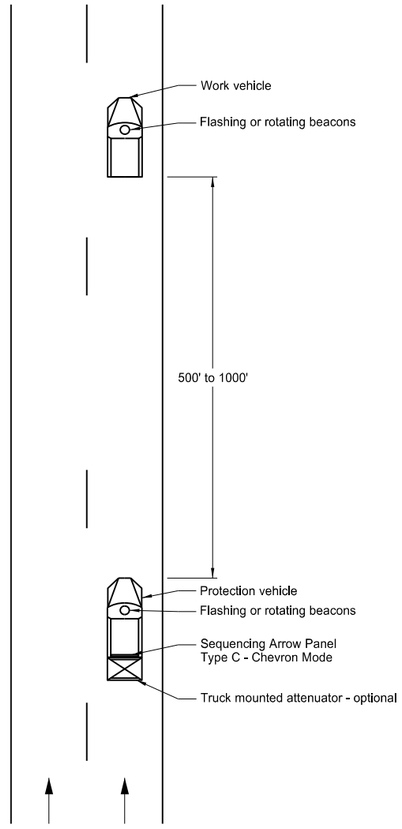
Two Lane, Two Way Roadways

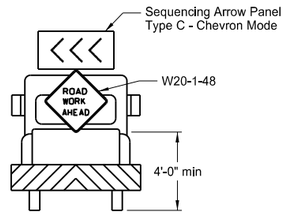




Typical Protection Vehicle

Multilane Roadways





Typical Protection Vehicle

Notes:

1. The working vehicle shall display a 360 degree rotating, flashing, oscillating or strobe light.
2. The shadow vehicle shall display a 360 degree rotating, flashing, oscillating or strobe light. The shadow vehicle for Multilane Roadway shall also have a sequencing arrow panel Type C operated in the chevron mode.
3. This application is for use during daylight hours and in areas of good visibility only.
4. Two lane, two way roadway, a flagger shall be used to protect the work area and warn oncoming traffic.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE

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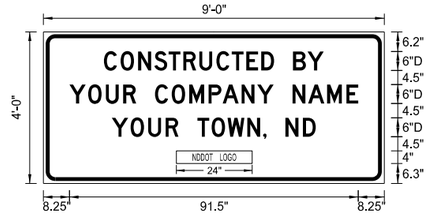
CONSTRUCTION SIGN DETAIL

D-704-5

SIGN NUMBER	G20-10-108
WIDTH x HEIGHT	9'-0" x 4'-0"
BORDER WIDTH	1.25" (inset 0.75")
CORNER RADIUS	3"
MOUNTING	Ground
BACKGROUND	TYPE: IV Reflective
	COLOR: Fluorescent Orange
LEGEND/BORDER	TYPE: Non-Refl
	COLOR: Black

SYMBOL	X	Y	WID	HT	ANGLE
	42.1	6.2	24	4	0

STATION(S): AREA: 36.0 Sq.Ft.



Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITION (X)																			LENGTH	SIZE	SERIES
C	O	N	S	T	R	U	C	T	E	D		B	Y						69.7	6	D 2000
19.2	24.5	30	35.1	39.7	44.3	49.4	54.8	59.7	64.3	69	73.1	79.1	83.7								
Y	O	U	R		C	O	M	P	A	N	Y		N	A	M	E			91.5	6	D 2000
8.3	14.2	19.8	25.3	29.4	35.4	40.7	46.2	52.4	56.8	62.8	67.8	72.9	78.9	83.9	89.9	96					
Y	O	U	R		T	O	W	N	,		N	D							64.6	6	D 2000
21.7	27.6	33.2	38.7	42.8	48.8	53.3	58.4	64.6	69.6	70.7	76.7	82.2									

Notes:

1. Sign shall be placed a distance of ½A following the End Road Work (G20-2a-48) sign. There shall be a maximum of 2 signs per project.
2. Sign shall be post mounted.
3. Sign required on rural projects with a 30 day or longer duration and it is not required on seal coat projects or other short duration projects.
4. Sign shall not be placed in urban areas or within city limits.

Advance Warning Sign Spacing (A)			
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	
8-22-12	
REVISIONS	
DATE	CHANGE
7-18-14	Revise sheeting to type IV

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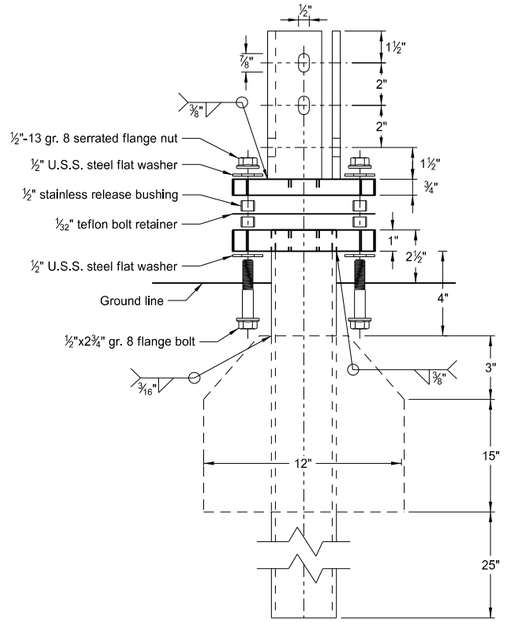
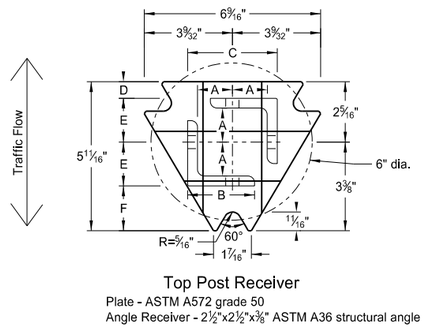
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

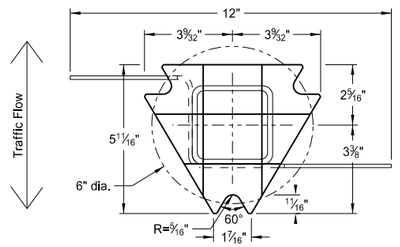


Multi-Directional
Slip Base Assembly

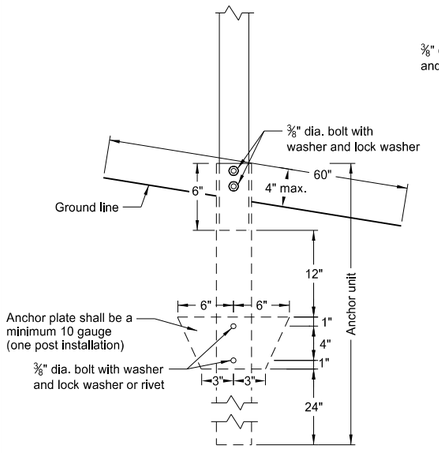
Perforated Tube



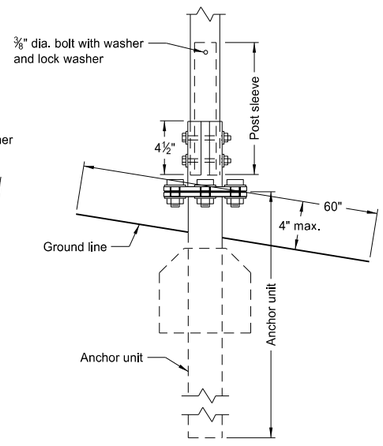
Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2½"x2½"x⅜" ASTM A36 structural angle



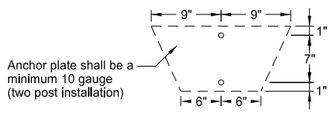
Bottom Soil Stub
Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50

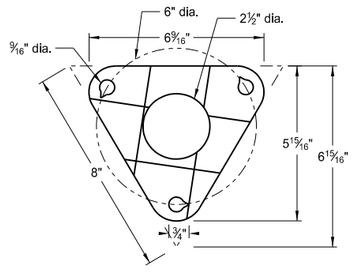


Anchor Unit and Post Assembly



Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly





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

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.

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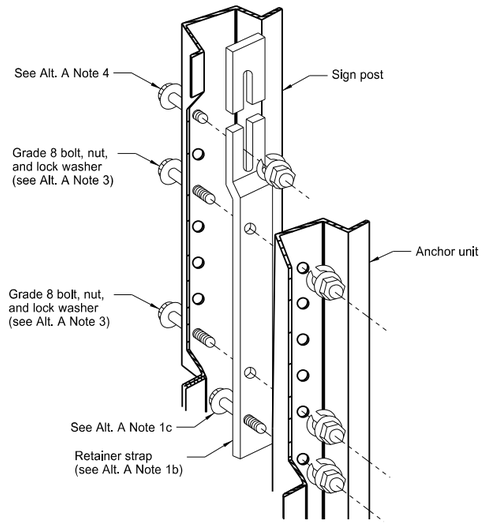
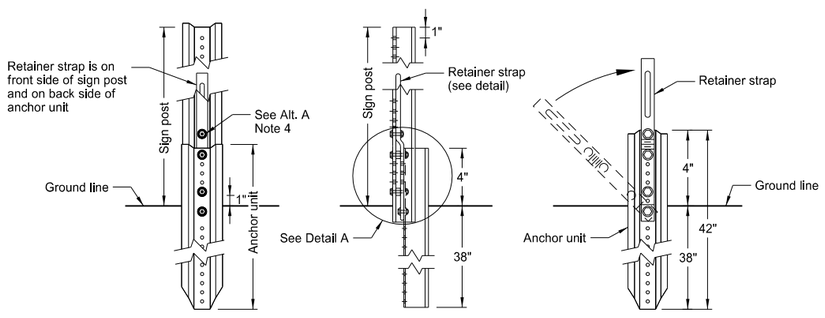
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

U-Channel Post



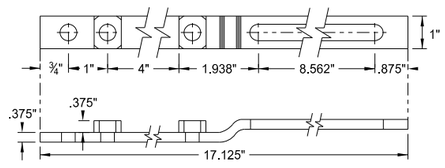
Detail A



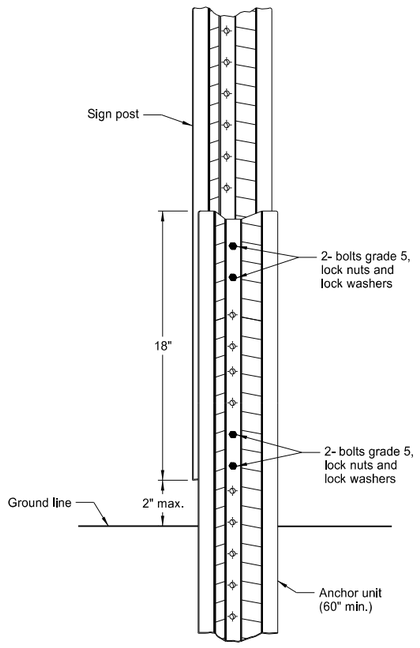
Front View | Side View | Back View

Breakaway U-Channel Detail
Alternate A

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

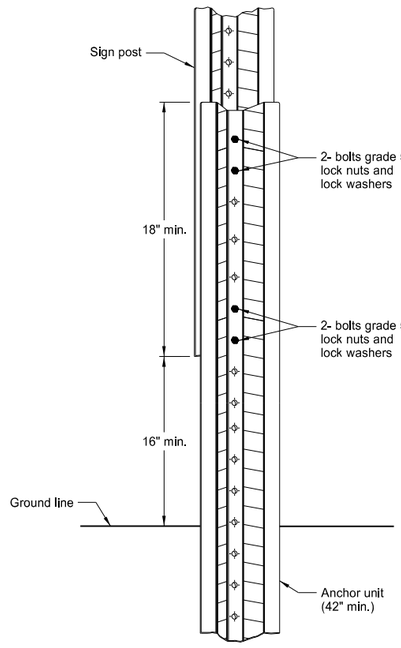


Retainer Strap Detail



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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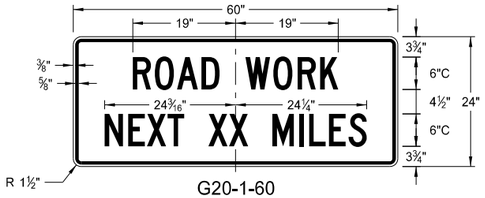
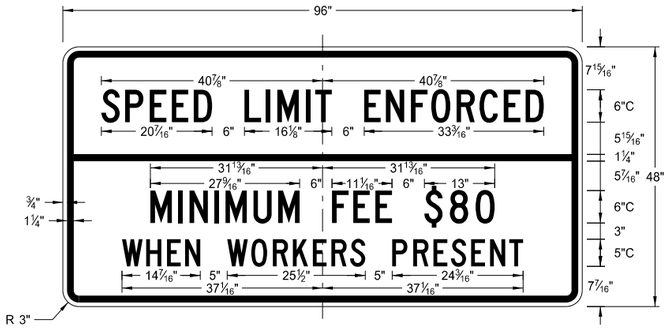
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



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

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



G20-55-96
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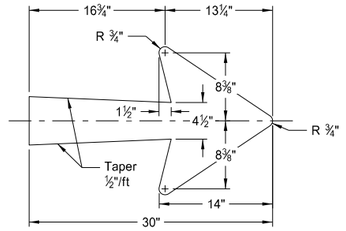
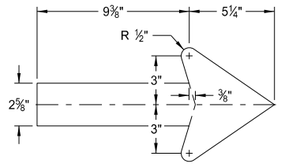
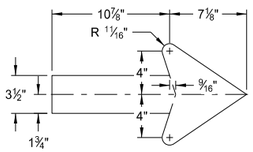
Background: orange



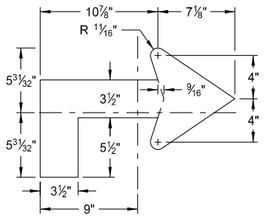
E5-1-48



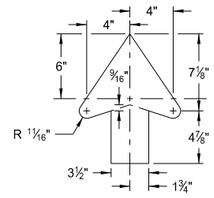
G20-50a-72
G20-52a-72



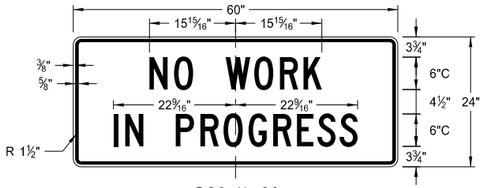
M4-9(L or R)-30
Right or Left



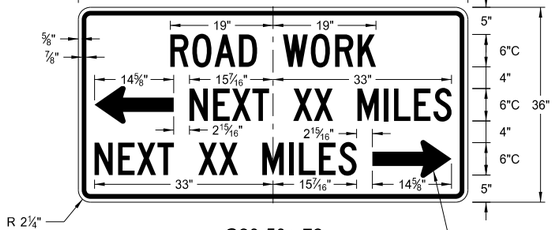
M4-9(L or R)-30
Advanced Right or Left



M4-9-30
Straight

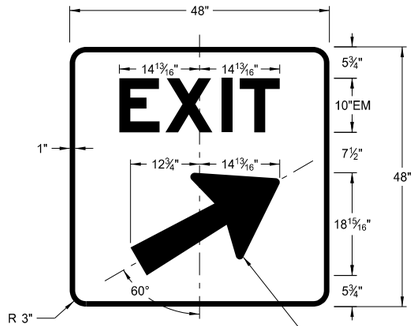


G20-1b-60
Legend: black (non-refl)
Background: orange



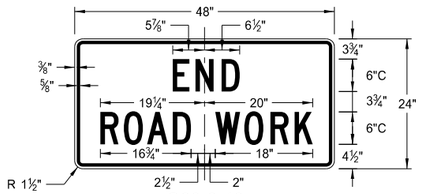
G20-50a-72
Legend: black (non-refl)
Background: orange

See ARROW DETAILS



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

See ARROW DETAILS



G20-2-48
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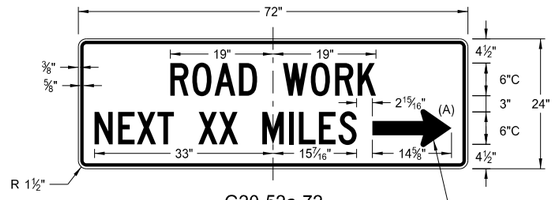
Background: orange



G20-52a-72
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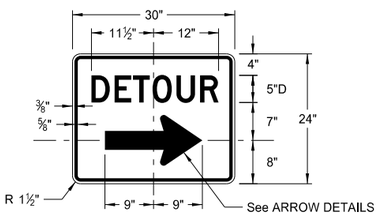
Background: orange

See ARROW DETAILS



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

See ARROW DETAILS

ARROW DETAILS

NOTES:

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

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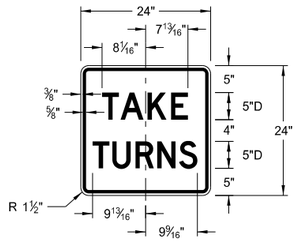
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



R1-50-24
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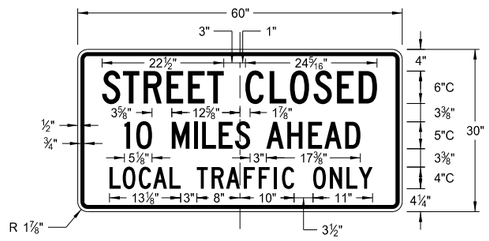
Background: white



R11-3c-60
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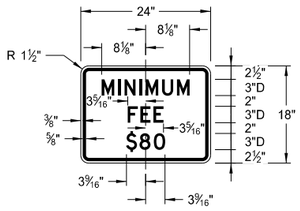

R2-1a-24
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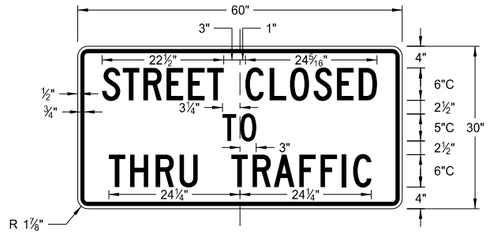
Background: white



R11-4a-60
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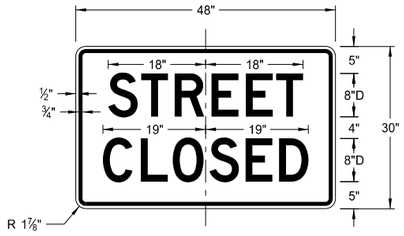
Background: white



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

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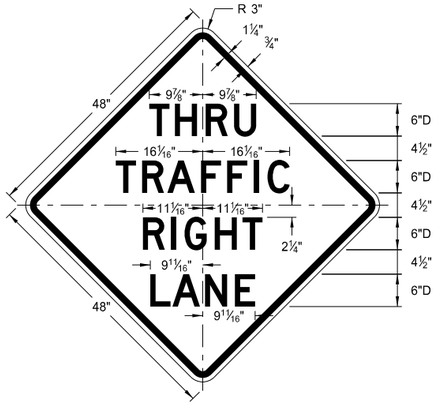
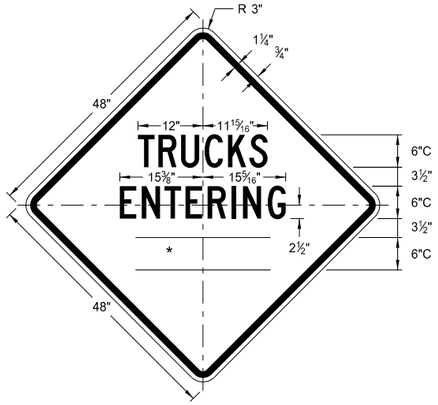
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



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



W8-54-48
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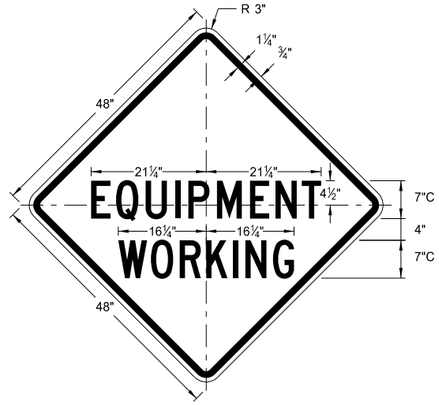
Background: orange



W20-51-48
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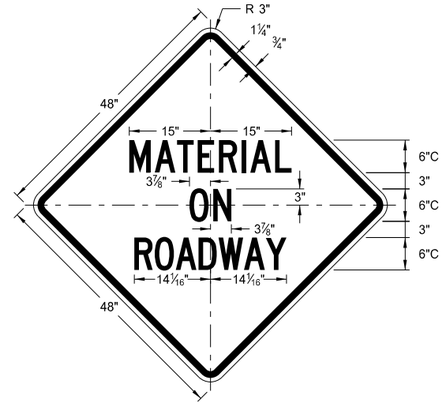
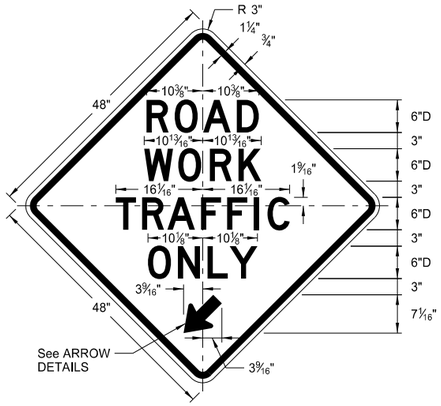
Background: orange



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



W5-9-48
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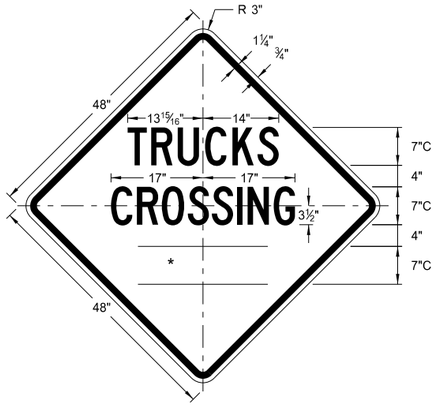
Background: orange



W8-55-48
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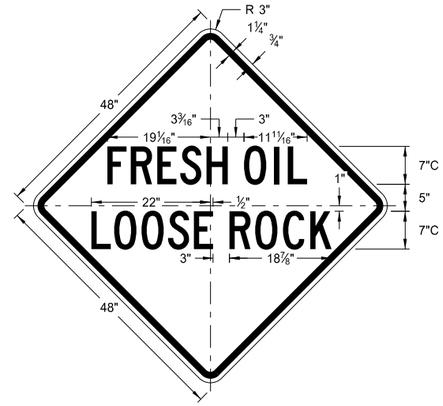
Background: orange

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



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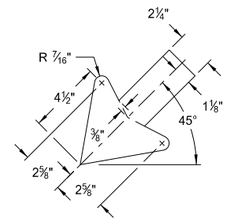
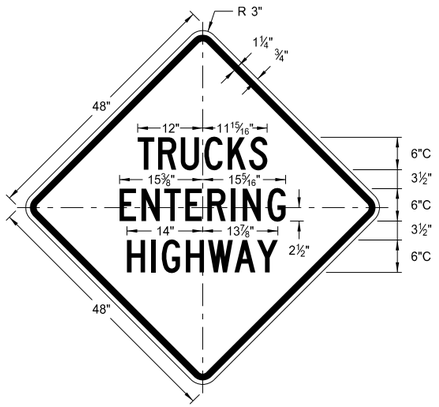
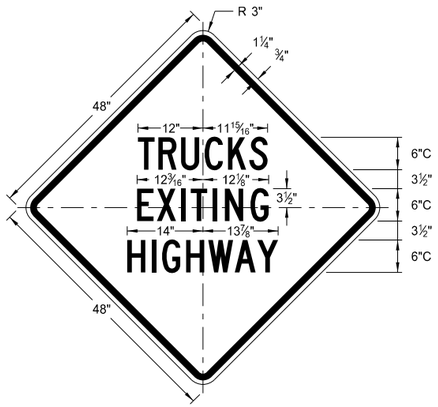


W5-9-48

ARROW DETAILS



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



W8-56-48
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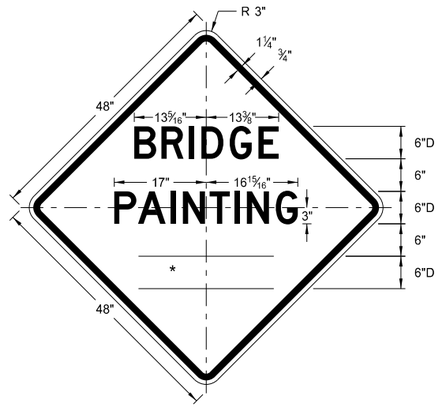
Background: orange



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

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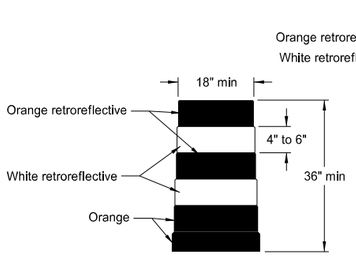
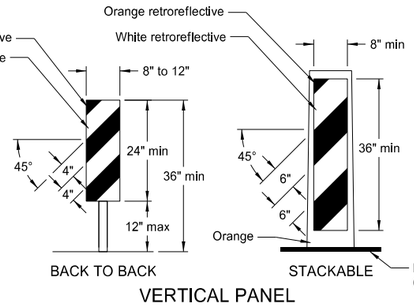
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



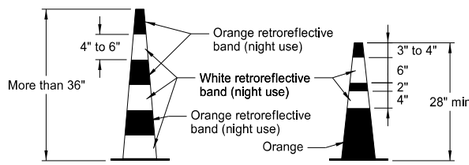
DELINEATOR DRUM

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.



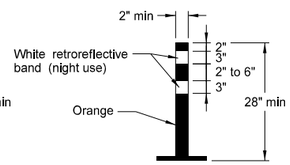
VERTICAL PANEL

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.



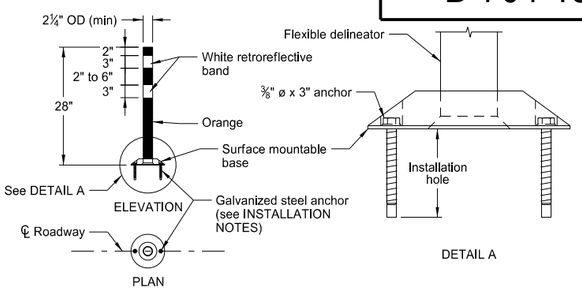
TRAFFIC CONE

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

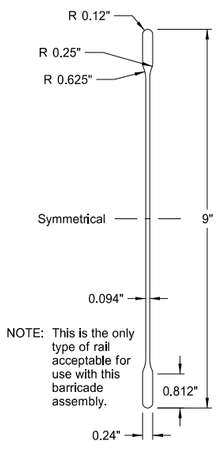
Retroreflectorization of tubular markers more than 42" in height shall be provided by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

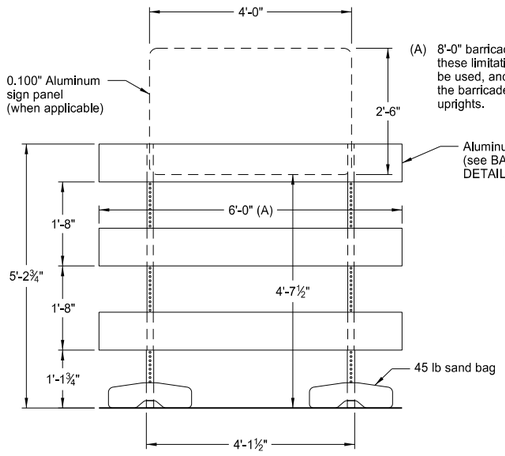
INSTALLATION NOTES:

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.



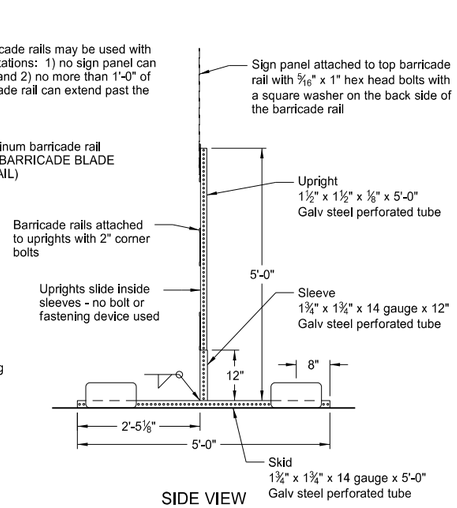
NOTE: This is the only type of rail acceptable for use with this barricade assembly.

BARRICADE BLADE DETAIL



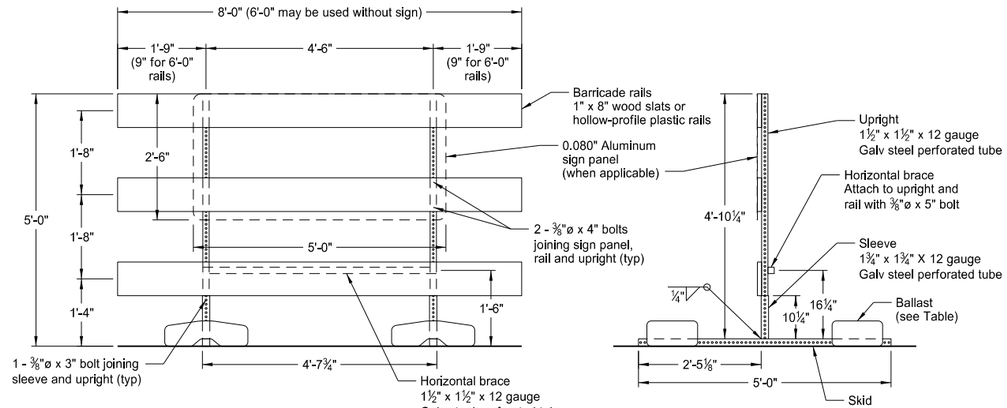
(A) 8'-0" barricade rails may be used with these limitations: 1) no sign panel can be used, and 2) no more than 1'-0" of the barricade rail can extend past the uprights.

ELEVATION VIEW



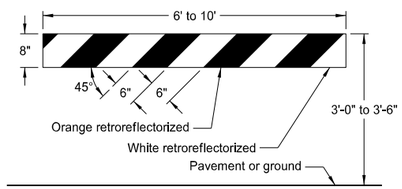
SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Aluminum Barricade Rails)

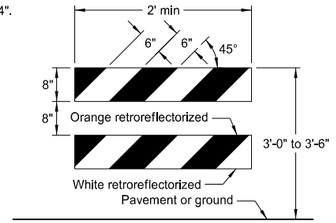


BARRICADE ASSEMBLY DETAIL
(Wood or Plastic Rails)

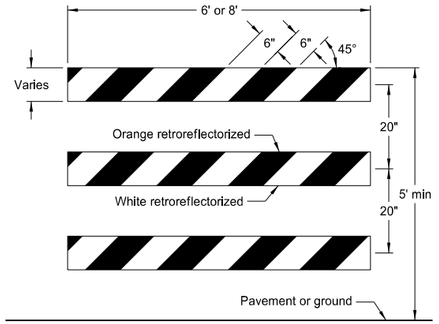
NOTE: Markings for barricades shall be alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Retroreflective sheeting shall be placed on both sides of the rails and shall have a minimum of 270 square inches of visible retroreflective area facing vehicular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



TYPE I BARRICADE

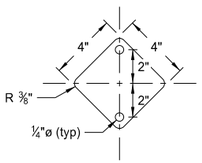


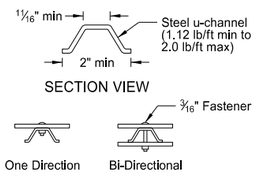
TYPE II BARRICADE

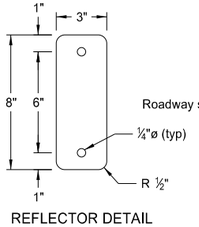


TYPE III BARRICADE

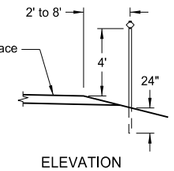
BARRICADE RAIL DETAILS







REFLECTOR DETAIL



ELEVATION

DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
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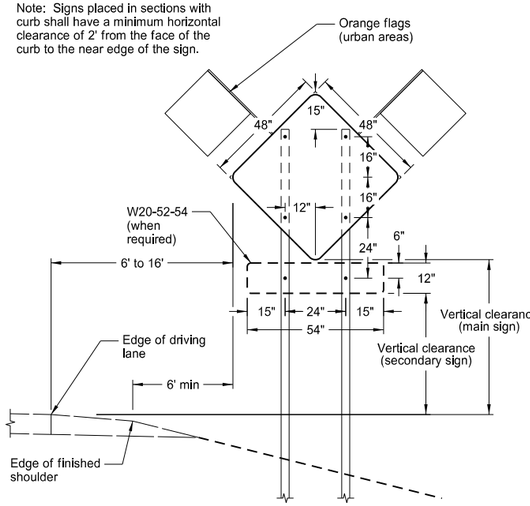
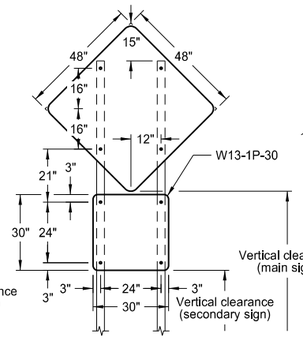
CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

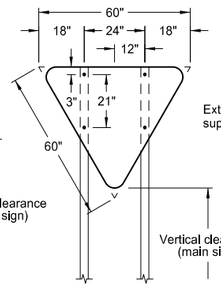
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



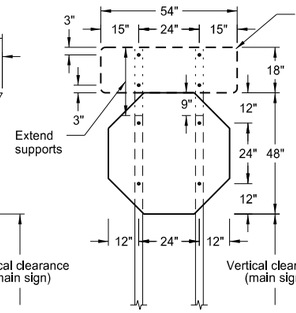
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



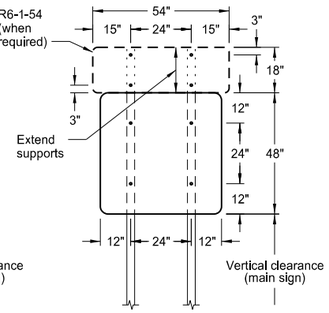
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



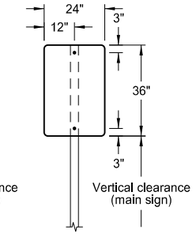
R1-2-60 - YIELD SIGN



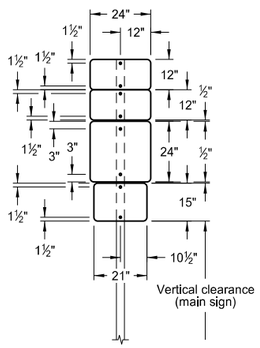
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



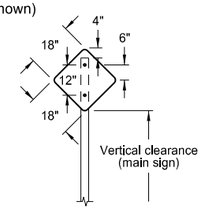
48" x 48" SIGN
(with R6-1-54 sign as required)



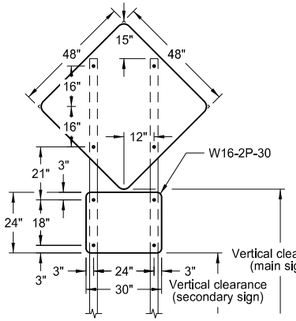
24" x 36" SIGN



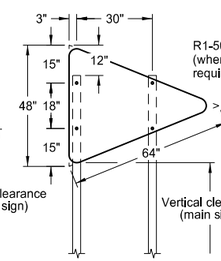
24" x 24"
ROUTE MARKER
ASSEMBLY



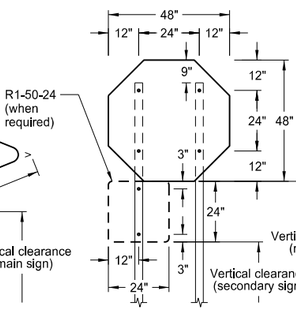
18" x 18"
DIAMOND SIGN



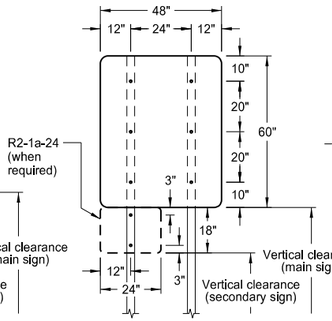
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



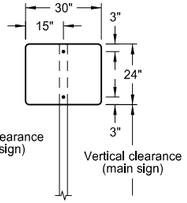
W14-3-64 - PENNANT SIGN



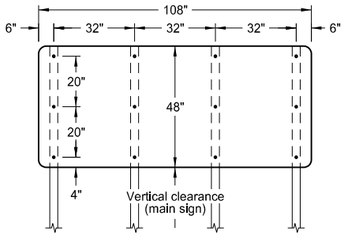
R1-1-48 - STOP SIGN
(with R1-50-24 sign as required)



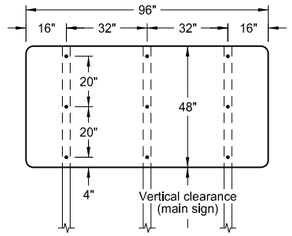
48" x 48" SIGN
(with R2-1a-24 sign as required)



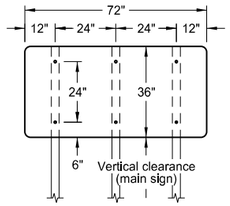
30" x 24" SIGN



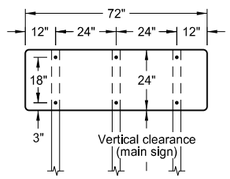
108" x 48" SIGN



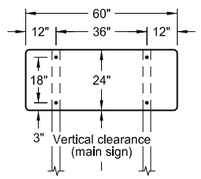
96" x 48" SIGN



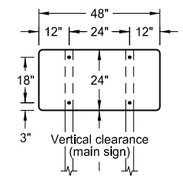
72" x 36" SIGN



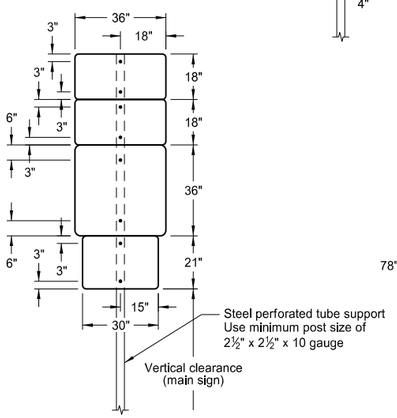
72" x 24" SIGN



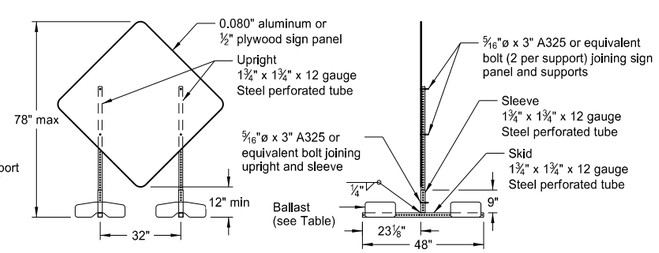
60" x 24" SIGN



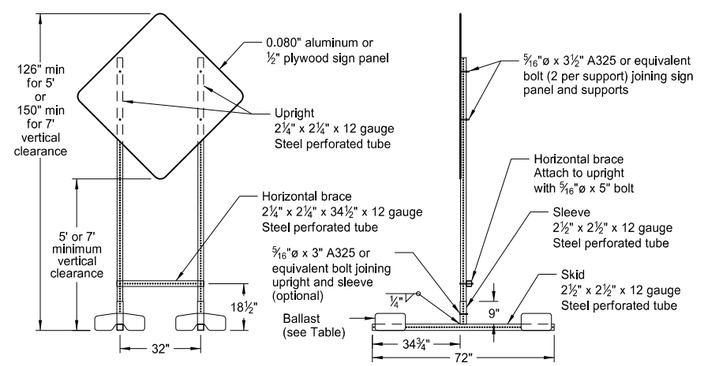
48" x 24" SIGN



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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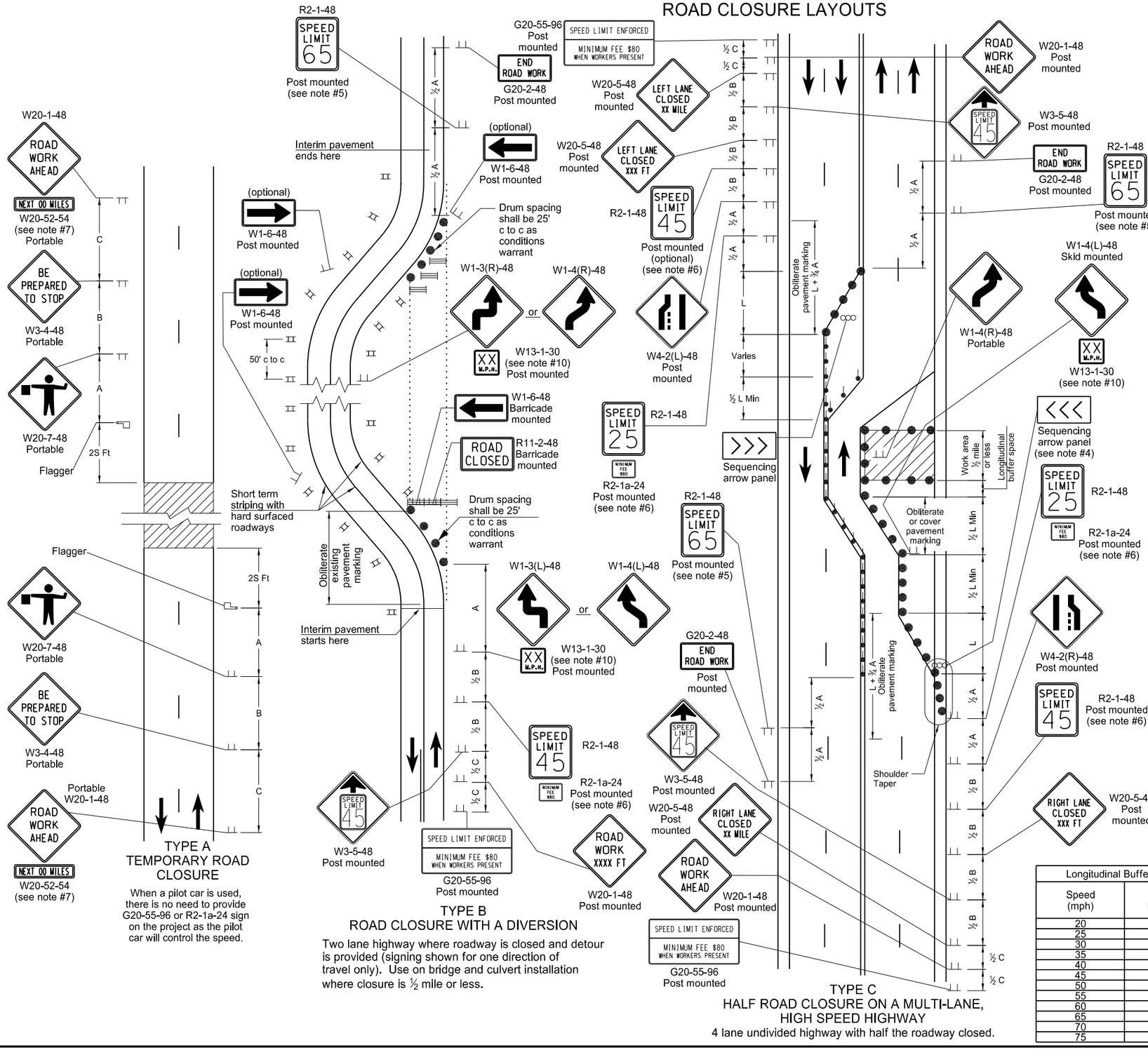
ROAD CLOSURE LAYOUTS

D-704-15



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

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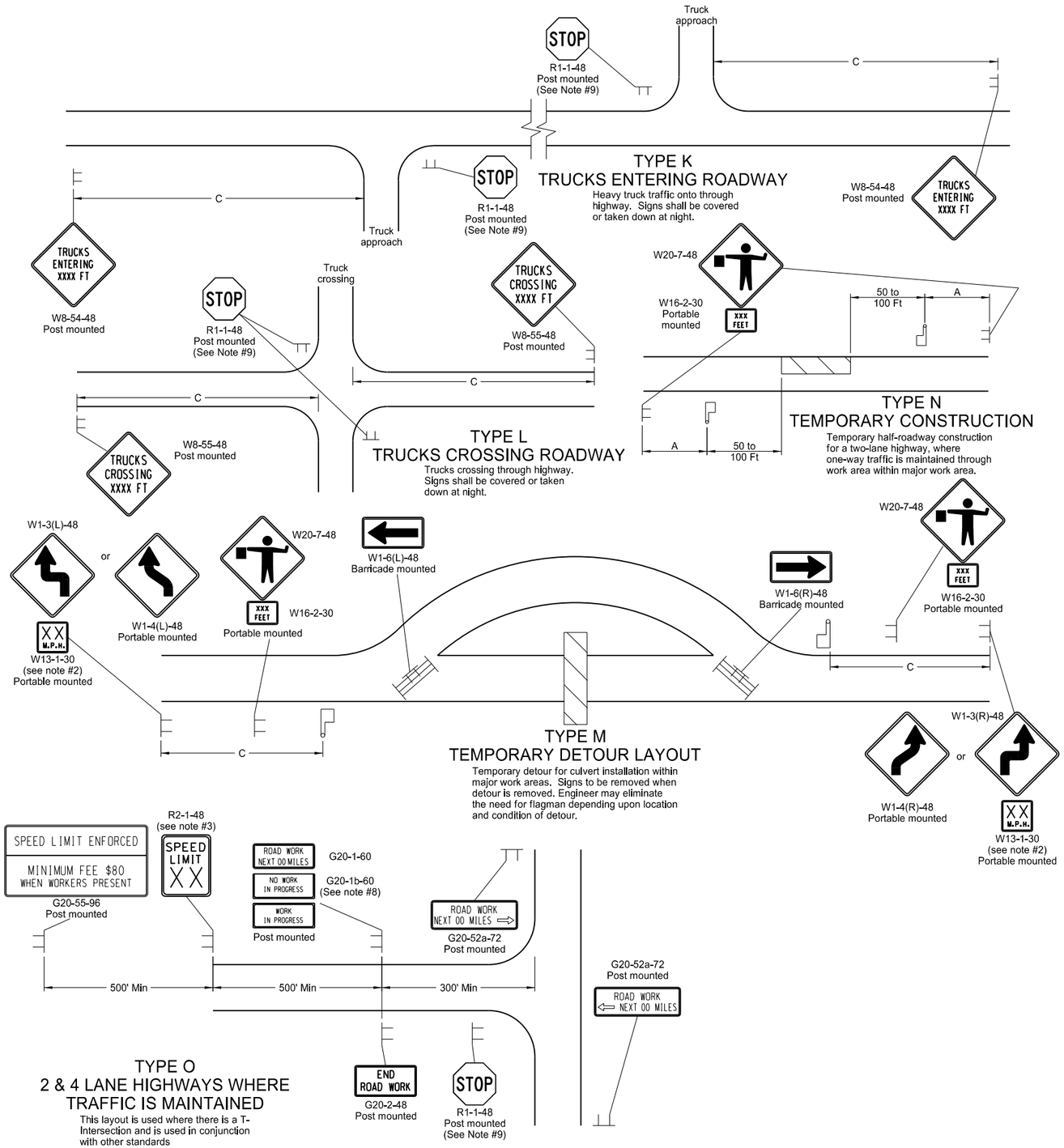
CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

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

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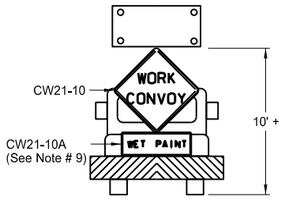
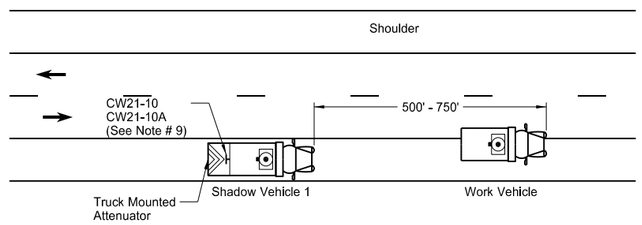
TRAFFIC CONTROL PLAN FOR MOVING OPERATIONS

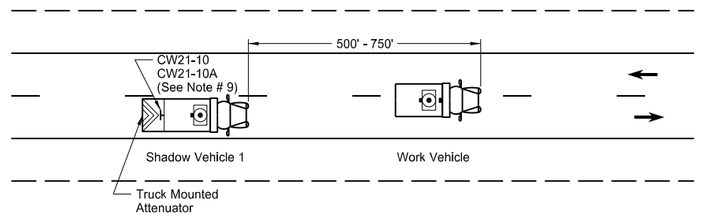
D-704-27



Typical Shadow Vehicle 1
Two-Way Roaday



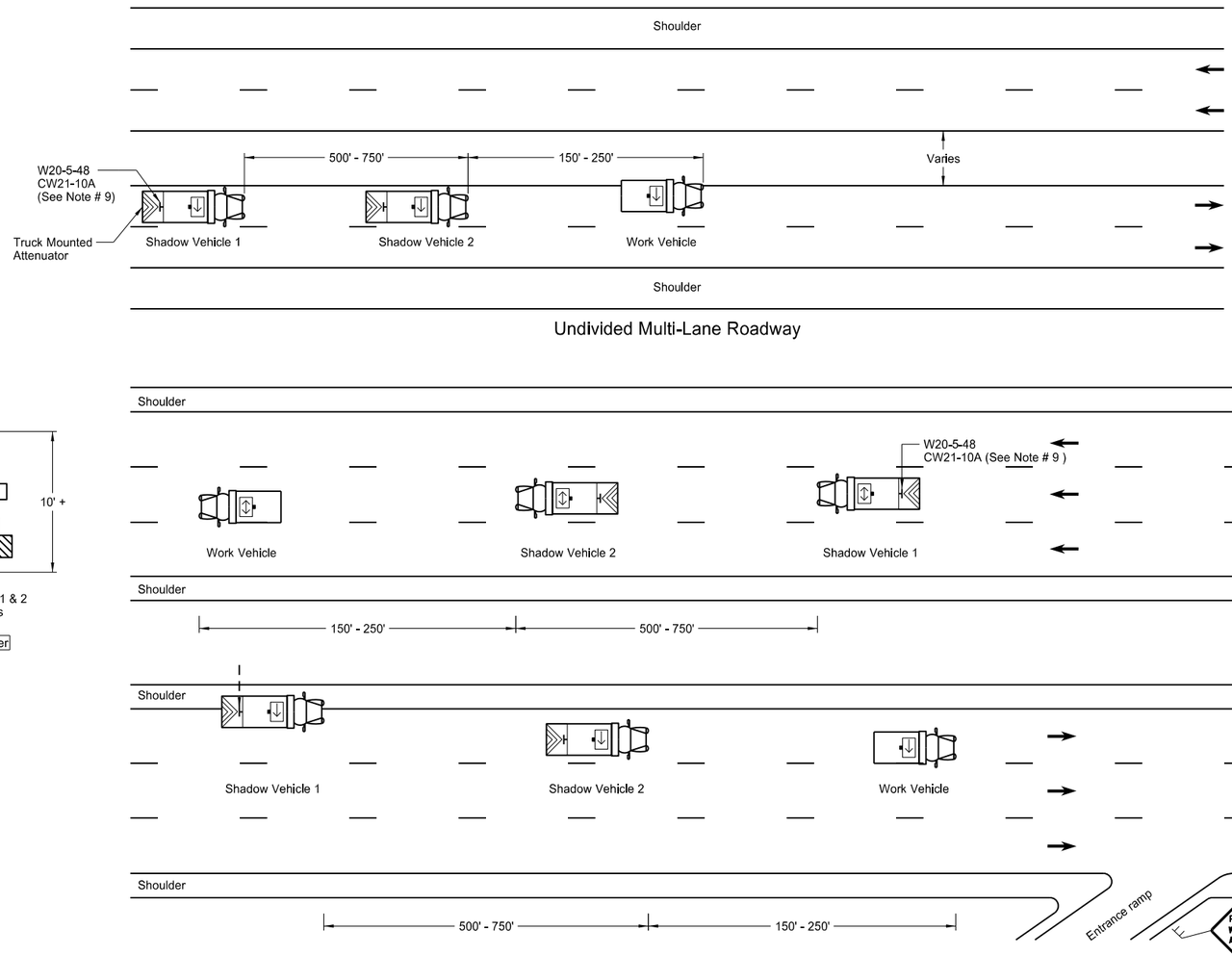
Two-Way Roadway with Paved Shoulders



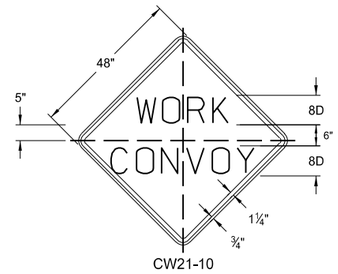
Two-Way Roadway without Paved Shoulders

Notes

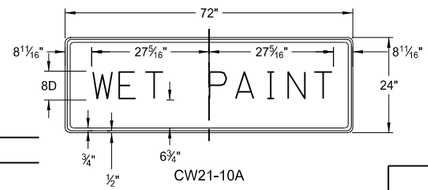
1. If the contractor chooses to place more vehicles in the convoy than are shown, these vehicles shall have the truck mounted attenuator and shall be at the contractor's expense.
2. Shadow and work vehicles shall display yellow rotating beacons or strobe lights unless otherwise stated elsewhere in the plans.
3. Flashing arrow panels shall be Type B or Type C. The panel operation shall be controlled from inside the vehicle.
4. Each vehicle shall have two-way electronic communication capability.
5. When work convoys must change lanes, shadow vehicle 1 should change lanes first to shadow other convoy vehicles.
6. Vehicle spacing between the shadow vehicle 1 and shadow vehicle 2 will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the trail vehicle in time to slow down and/or change lanes as they approach the shadow vehicle.
7. Sign Colors
   Letters = Black
   Border = Black
   Background = Orange
8. Shadow vehicle 2 may be used as the paint tender vehicle.
9. Sign CW21-10A shall only be used during a painting operation.
10. On two lane - two way roadways, the work and shadow vehicles should pull over periodically to allow motor vehicle traffic to pass.



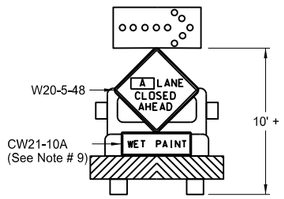
Sign Details



CW21-10



CW21-10A



Typical Shadow Vehicle 1 & 2
Multi-Lane Highways

A = Left Right Center

KEY

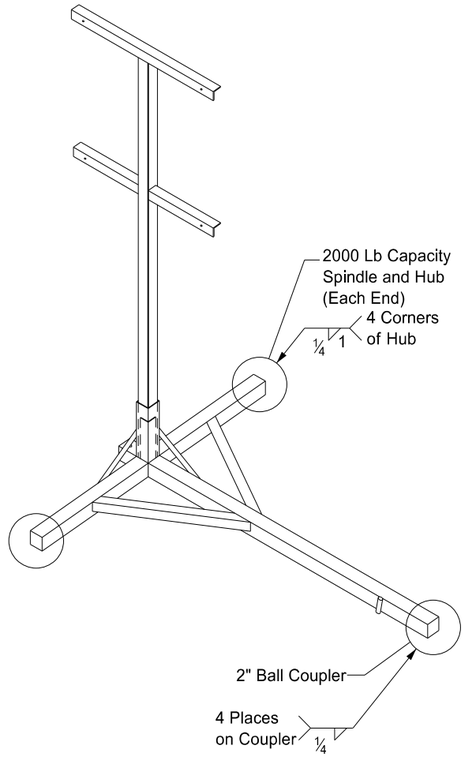
- Sign
- Truck mounted attenuator
- Flashing arrow panels:
  - Right directional
  - Left directional
  - Double arrow directional
  - Caution Mode

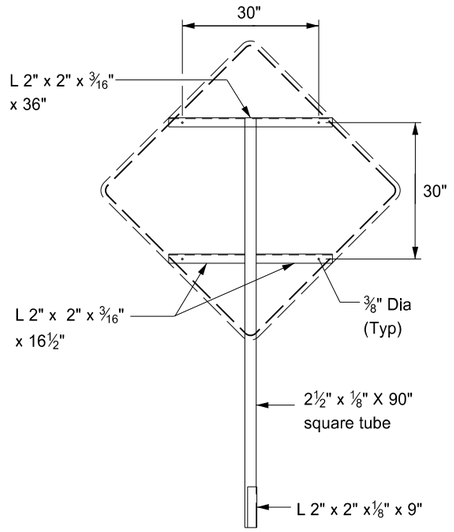
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
6-18-14	Removed shadow vehicle 2 on two lane roadways

This document was originally issued and sealed by Roger Weigel Registration Number PE- 2930, on 06/18/14 and the original document is stored at the North Dakota Department of Transportation

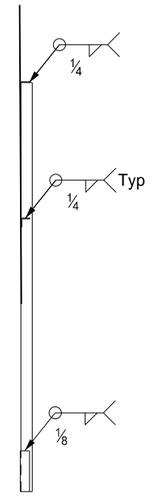
PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



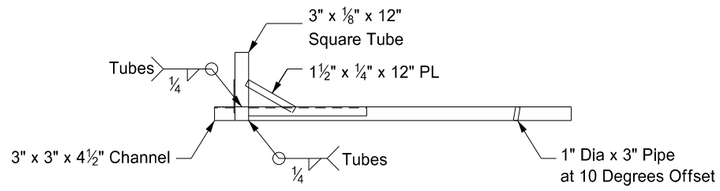


FRONT

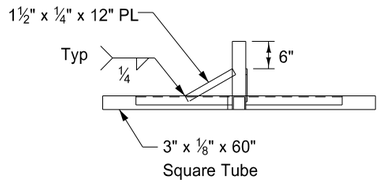


RIGHT

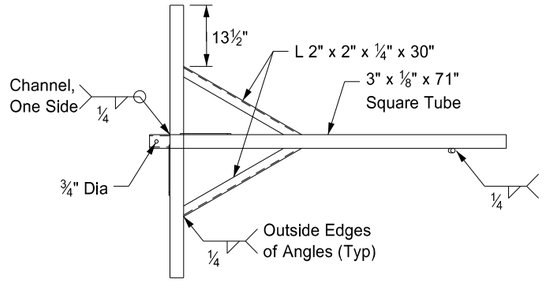
SIGN SUPPORT



FRONT



RIGHT



TOP

TRAILER

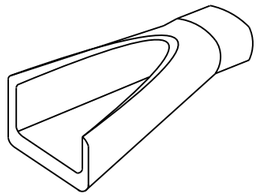
Notes:

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

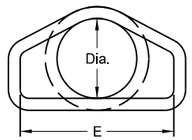
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE

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

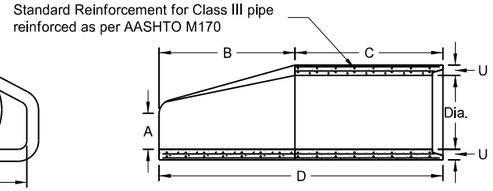
REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS
(Round Pipe)



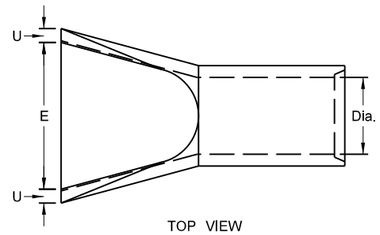
PERSPECTIVE



END VIEW



SIDE VIEW



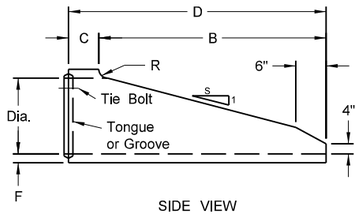
TOP VIEW

REINFORCED CONCRETE PIPE - FLARED END SECTION

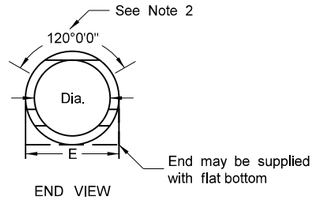
Reinforcement to be equivalent to Class III RCP

FLARED END SECTION						
TERMINAL DIMENSIONS						
DIA	A	B	C	D	E	U
12	0'-4"	2'-0"	4'-0⅞"	6'-0⅞"	2'-0"	2"
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2¼"
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2½"
21	0'-9"	3'-0"	3'-1"	6'-1"	3'-6"	2¾"
24	0'-9½"	3'-7½"	2'-6"	6'-1½"	4'-0"	3"
27	0'-10½"	4'-0"	2'-1½"	6'-1½"	4'-6"	3¼"
30	1'-0"	4'-6"	1'-7¾"	6'-1¾"	5'-0"	3½"
36	1'-3"	5'-3"	2'-9"	8'-0"	6'-0"	4"
42	1'-9"	5'-3"	2'-9"	8'-0"	6'-6"	4½"
48	2'-0"	6'-0"	2'-0"	8'-0"	7'-0"	5"
54	2'-3"	5'-5"	2'-9¼"	8'-2¼"	7'-6"	5½"
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	5"
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	5½"
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	6"
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	6½"
84	3'-0"	7'-6½"	1'-9"	9'-3½"	10'-0"	6½"
90	3'-5"	7'-3½"	2'-0"	9'-3½"	11'-0"	6½"

TRAVERSABLE END SECTION							
DIA	B	C	D	E	F	R	S
15"	4'	9"	4'-9"	1'-7½"	2¼"	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	2½"	3"	6
24"	6'	1'	7'	2'-6"	3"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3½"	3½"	4
36"	7'-3"	15"	8'-6"	3'-8"	4"	3"	4



SIDE VIEW



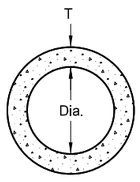
END VIEW

NOTES (Traversable End Section):

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

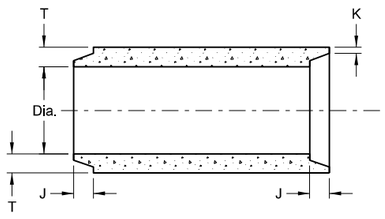
REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION

Reinforcement to be equivalent to Class III RCP

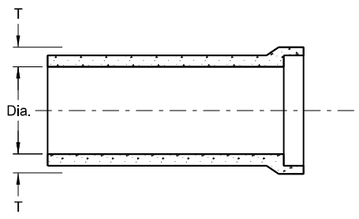


END VIEW

CIRCULAR PIPE

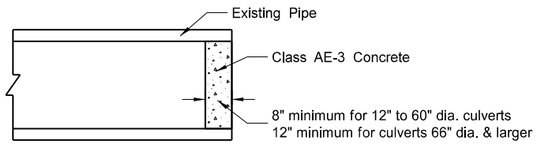


TONGUE & GROOVE JOINT



BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE



CONCRETE PIPE PLUG

All Classifications of Round Concrete Pipe					
Internal Dia of pipe in Inches	Cross-Sectional Water Area	Weight per lin. foot of Pipe Std. Wall	Joint J Groove End Min./Max.	Joint K Tongue End Min.	Minimum Wall Thickness (T)
Dia	Sq. ft.	Lbs.	In.	In.	In.
12	0.79	92	1⅛-2⅛	¾	2
15	1.23	127	1¾-2¾	⅞	2¼
18	1.77	168	1⅞-2⅛	1	2½
21	2.40	214	1⅞-3⅛	1⅛	2¾
24	3.14	265	2⅛-3¾	1⅛	3
27	3.98	322	2¾-4	1¼	3¼
30	4.91	384	3¼-4¼	1¼	3½
33	5.94	452	3¼-4¼	1½	3¾
36	7.07	524	3½-4¼	1½	4
42	9.62	685	3¾-4¾	1¾	4½
48	12.57	685	3⅞-4¾	1⅞	5
54	15.90	1070	4⅛-5½	2	5½
60	19.63	1296	4½-5½	2¼	6
66	23.76	1542	5-6	2⅝	6½
72	28.27	1810	5⅝-6¾	2⅞	7
78	33.18	2098	6¼-7¼	2⅞	7½
84	38.48	2410	5⅝-7¾	3⅜	8
90	44.18	2793	6¾-8½	3⅛	8½
96	50.27	3092	7-8¾	3½	9
102	56.75	3466	7-8¾	3½	9½
108	63.62	3864	7¼-8½	3¾	10

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

NOTES:

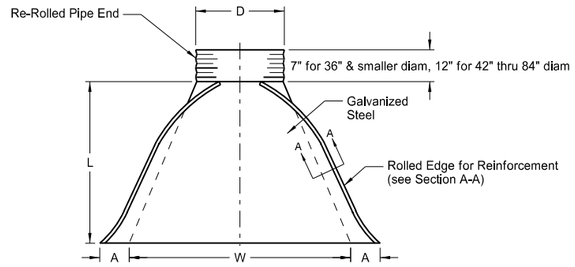
1. All reinforcing steel shall meet AASHTO M170 requirements.
2. All circular, longitudinal, and elliptical reinforcement shall be assembled and securely fastened in cage fashion so as to maintain reinforcement in exact shape and correct positions within the forms.
3. Laying length of pipe: 12" to 66"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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-12-14	
REVISIONS	
DATE	CHANGE

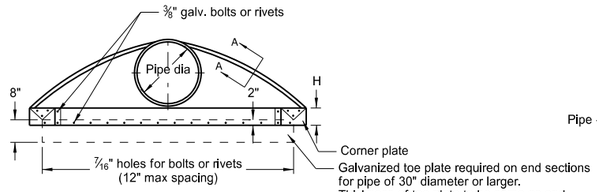
This document was originally issued and sealed by Terrence R. Udland, Registration Number PE-2674, on 05/12/14 and the original document is stored at the North Dakota Department of Transportation

ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

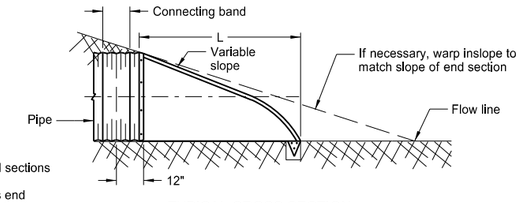
D-714-4



PLAN VIEW



ELEVATION VIEW



TYPICAL CROSS SECTION
(showing connector section)

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

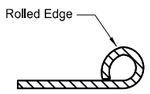
* These sizes have 0.109" sides and 0.138" center panels.

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

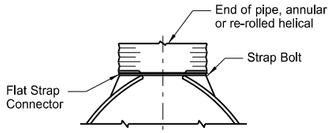
Manufacturers tolerances of above dimensions will be allowed.

Splices to be the lap riveted type.

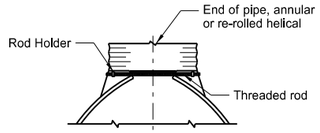
Multiple panel bodies shall have lap seams which are to be tightly joined with ⅜" dia. galv. bolts or rivets. Nuts to be torqued to 25 foot-lbs ±.



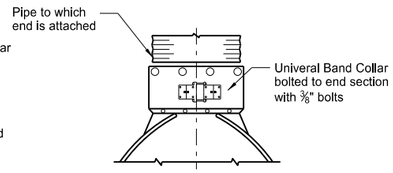
SECTION A-A



TYPE #1
For circular pipes with diameter 24" & smaller



TYPE #2
For circular pipes with diameter 30" through 36"

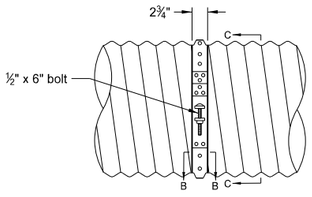


TYPE #3
For all pipe sizes

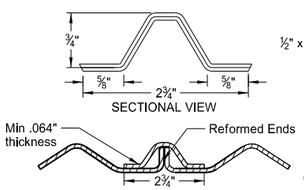
COUPLING BAND DIMENSIONS				
COUPLING TYPE	CORRUGATION PITCH x DEPTH	PIPE SIZE	COUPLING BAND LENGTH	MIN. BAND THICKNESS
Hat Band	2⅔" x ½"	12" - 48"	2¾"	.064"
Annular Band	2⅔" x ½"	12" - 72"	12"	.052"
		78" - 84"	12"	.079"
	3" x 1"	48" - 120"	14"	.052"
Hugger Band	2⅔" x ½" Rerolled End	12" - 72"	10½"	.052"
		78" - 84"	10½"	.079"
	3" x 1" Rerolled End	48" - 120"	10½"	.052"
	5" x 1" Rerolled End	48" - 120"	12"	.064"

NOTES:

1. Pipes and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
2. Top edge of all end sections to have rolled edges for reinforcement (see Section A-A). The reinforced edges are to be supplemented with 2" x 2" x ¼" galv. angle for 60" through 72" dia. and 2½" x 2½" x ¼" galv. angle for 78" and 84" dia.. Angles to be attached by galv. ⅜" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
3. Elongated pipes shall be factory preformed so that the vertical diameter shall be 5% greater and the horizontal diameter 5% less than a circular pipe.
4. Coupling bands shall be two-piece for pipes larger than 36" as shown in Section C-C & D-D details. For pipes 36" and smaller, a one-piece band is acceptable.
5. ½" x 8" bolts may be used as a substitute for the ½" x 6" bolts shown in the details.
6. Coupling bands wider than 14" may be used if a minimum of four ½" bolts with maximum spacing of 5½" are used for the connection.
7. Length of spot welds shall be minimum ½".

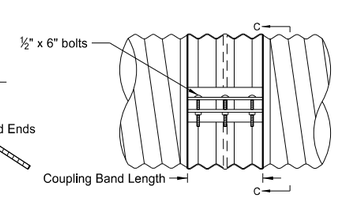


SIDE VIEW

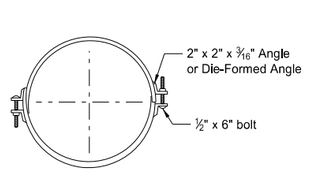


SECTION B-B

HAT BAND FOR FLANGED END PIPE

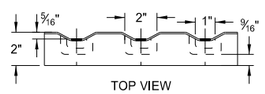


SIDE VIEW

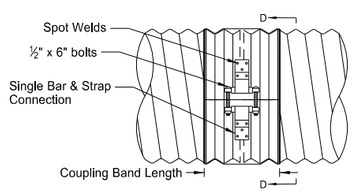


SECTION C-C
Angle Connection

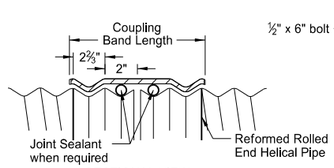
ANNULAR BAND



TOP VIEW
Die-Formed Angle Connector

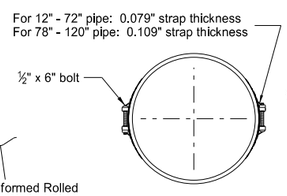


SIDE VIEW

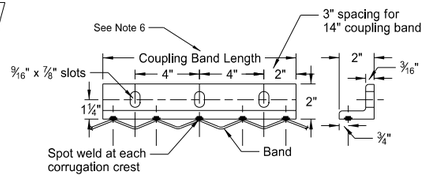


SECTIONAL VIEW

HUGGER COUPLING BAND



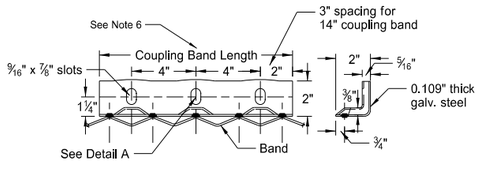
SECTION D-D
Bar & Strap Connection



SIDE VIEW

END VIEW

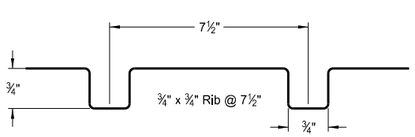
2" x 2" x 3/16" Angle Connector

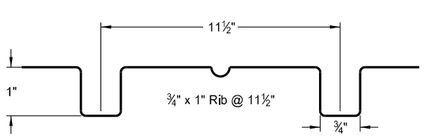


SIDE VIEW

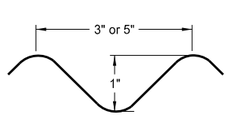
END VIEW

Die-Formed Angle Connector

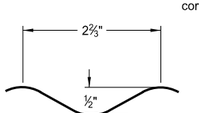




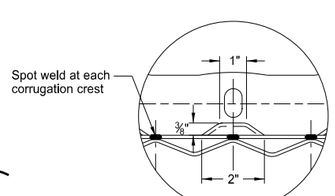
SPIRAL RIB CORRUGATIONS



3" x 1" CORRUGATIONS or
5" x 1" CORRUGATIONS



2⅔" x ½" CORRUGATIONS



Detail A

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

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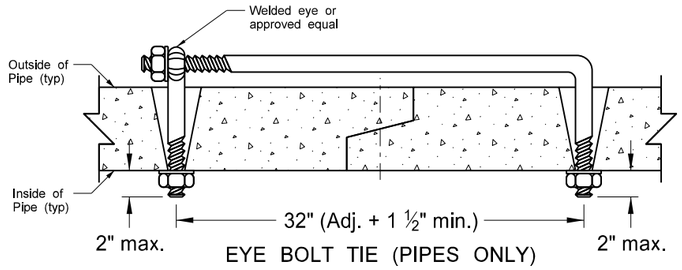
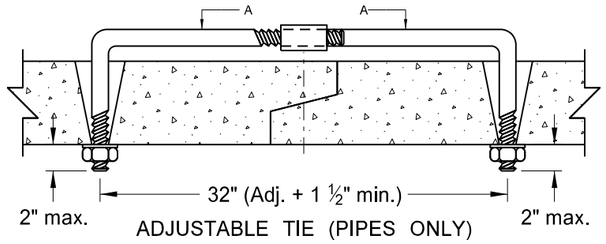
CONCRETE PIPE OR PRECAST CONCRETE BOX CULVERT TIES

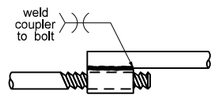
D-714-22



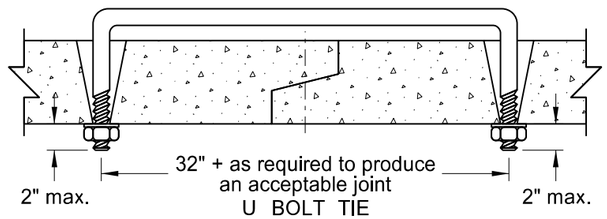
EYE BOLT TIE (PIPES ONLY)



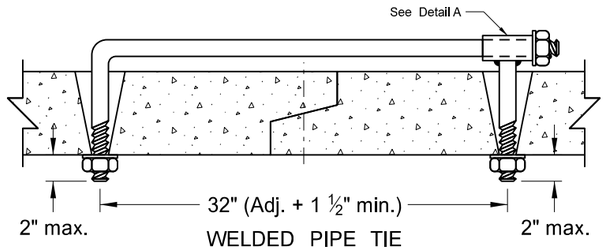
ADJUSTABLE TIE (PIPES ONLY)



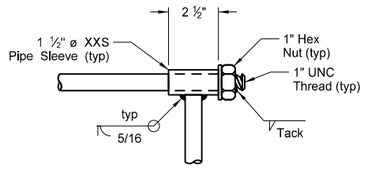
SECTION A-A



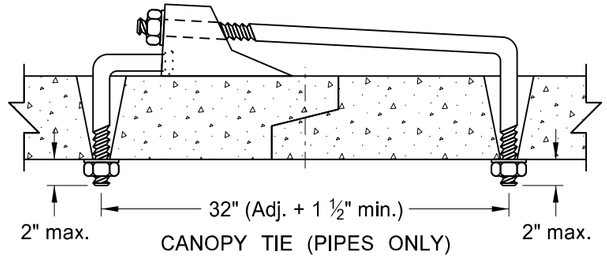
U BOLT TIE



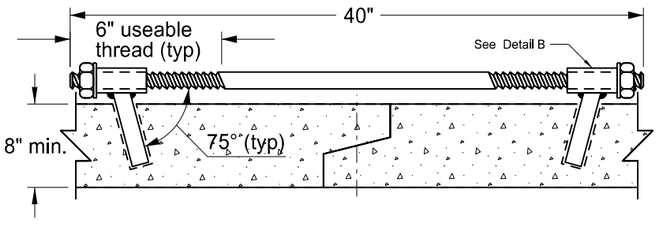
WELDED PIPE TIE



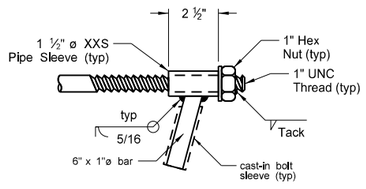
DETAIL A



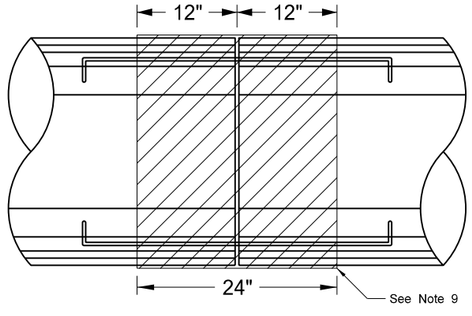
CANOPY TIE (PIPES ONLY)



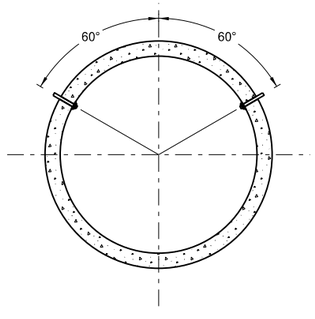
HIDDEN TIE (RCB ONLY)

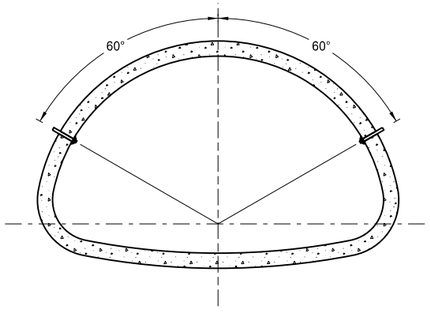


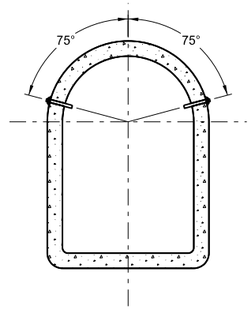
DETAIL B



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		

NOTES:

1. The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
2. 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.
3. Ties are only for holding pipe or RCB sections together, not for pulling sections tight.
4. Tie bolt assembly shall be hot dip galvanized in accordance with AASHTO M232.
5. 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".
6. The contractor has the option of selecting the type of tie bolt used from those shown.
7. The cost of precasting or drilling the required holes and furnishing and installing the tie bolts shall be included in the price bid for the appropriate conduit or RCB pay item.
8. All concrete culvert and storm sewer joints, including the end section joints, shall be tied unless otherwise specified.
9. When joint wrap is specified in the plans, place wrap beneath ties. Overlap the joint by 12" in both directions.
10. Tie bolts shall conform to ASTM A 36. Nuts shall be heavy hex and conform to ASTM A 563. Washers shall conform to ASTM F 436, Type 1. Welded pipe sleeves and cast-in bolt sleeves shall conform to ASTM A 53, Grade B.
11. 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.
12. RCB tie locations shall be as shown on the plans.

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

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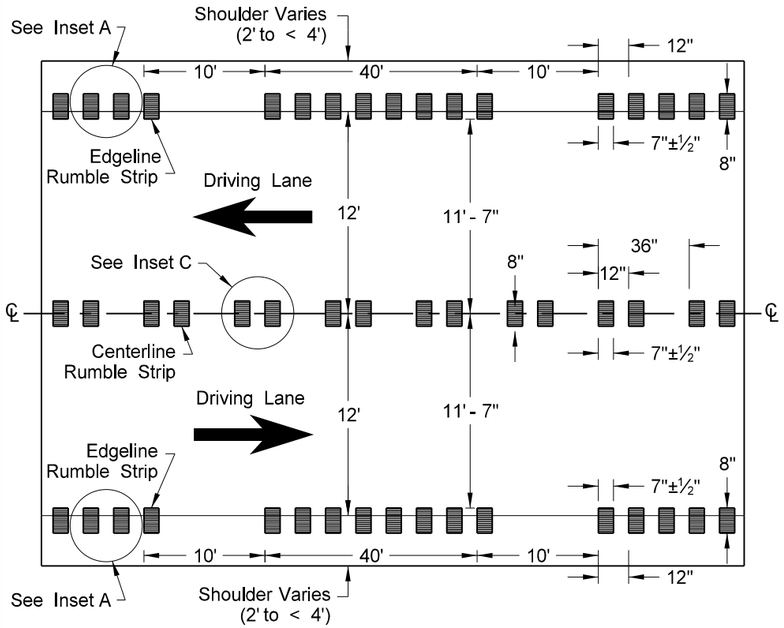
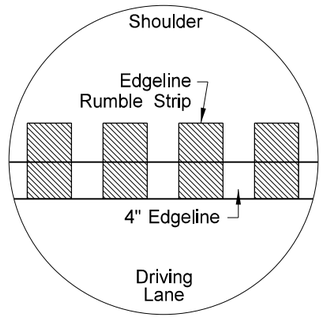
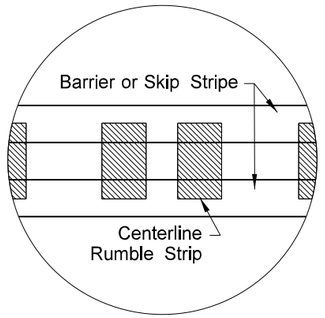
RUMBLE STRIPS
UNDIVIDED HIGHWAYS (SHOULDERS LESS THAN 4')



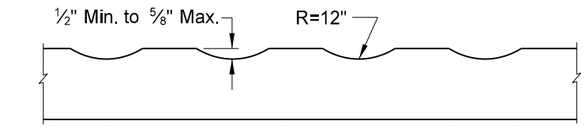
Undivided Highways (12' Driving Lanes & Shoulders 2' to < 4')



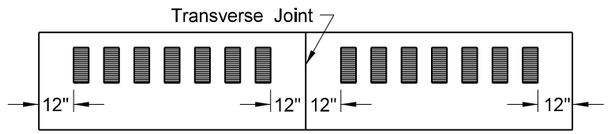
Inset A - Edgeline Rumble Strip



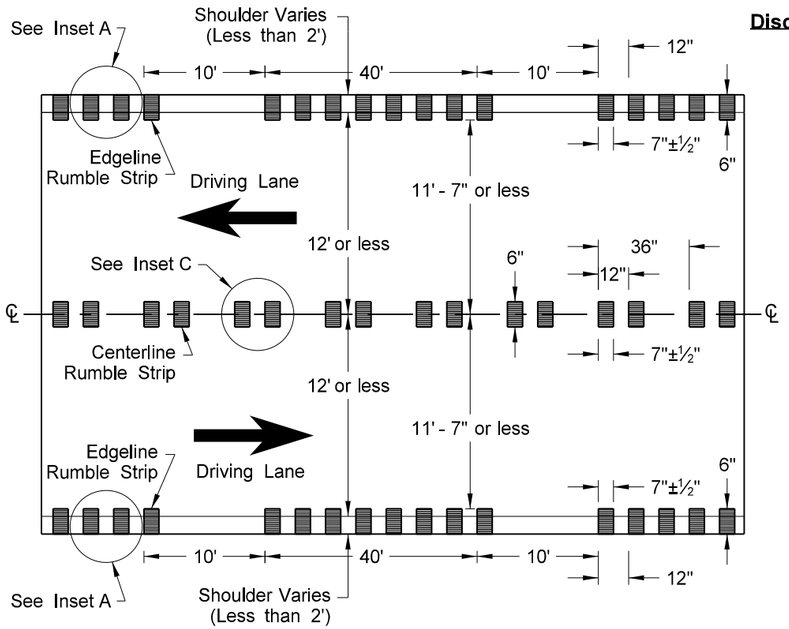
Inset C - Centerline Rumble Strip



Profile of Rumble Strips - Bituminous and PCC Pavements



Discontinue rumble strip approx. 12" on both sides of PCC transverse joint

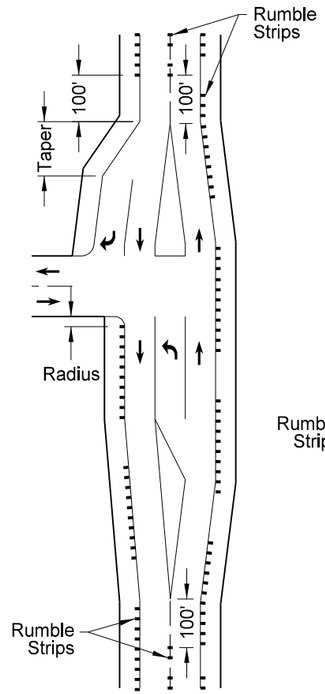


Undivided Highways (12' Driving Lanes or less & Shoulders Less than 2')

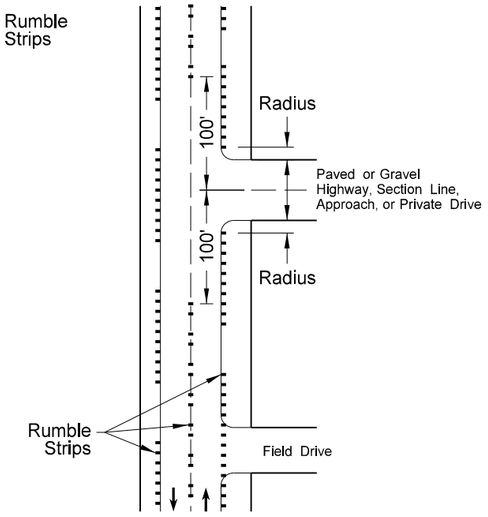
NOTES:

1) Discontinue edgeline rumble strips through the entire length of right turn lanes, 100' before right turn lane tapers, and at the radius of a paved or gravel highway, section line, approach, or private drive.

2) Discontinue centerline rumble strips through the entire length of left turn lanes, 100' before left turn lane tapers and median islands, 100' before and after a paved or gravel highway, section line, approach, or private drive.



Turn Lane
(Right & Left)



Entrance Roadways

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-29-09	
REVISIONS	
DATE	CHANGE
2-25-10	Note 4 was added.
4-19-10	Revised Note 5, Note 6, and Turn Lane (Right & Left).
9-8-11	Revised Notes and D-760-4.
1-26-12	Revised details for rumble strip widths and dimensions.

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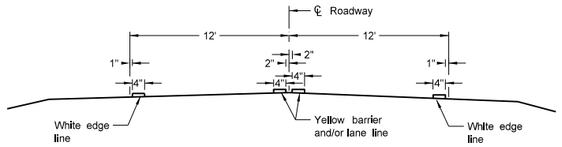
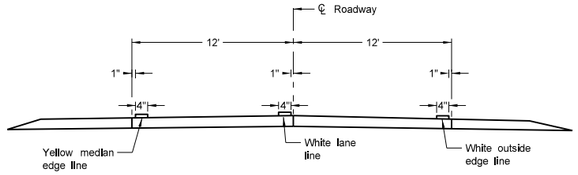
PAVEMENT MARKING

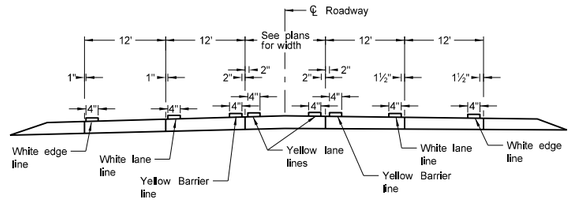
D-762-4



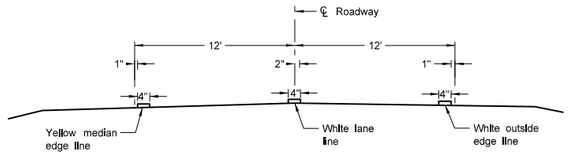
Two Lane Two Way
RURAL ROADWAY



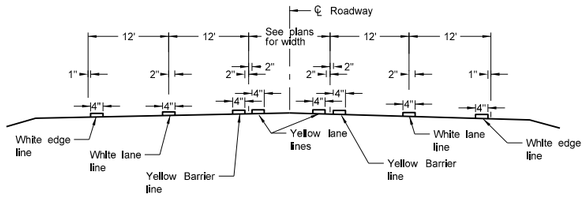
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



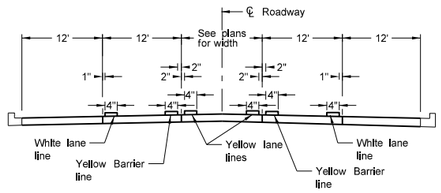
RURAL FIVE LANE ROADWAY
Concrete Section



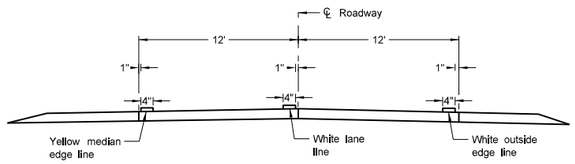
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



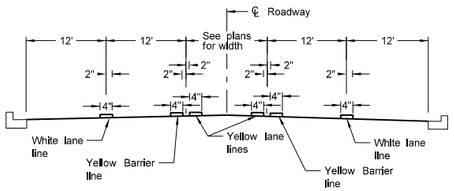
RURAL FIVE LANE ROADWAY
Asphalt Section



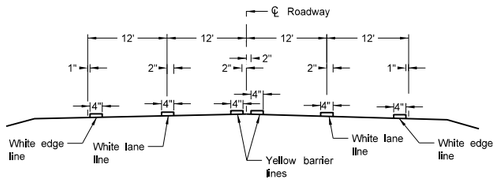
URBAN FIVE LANE SECTION
Concrete Section



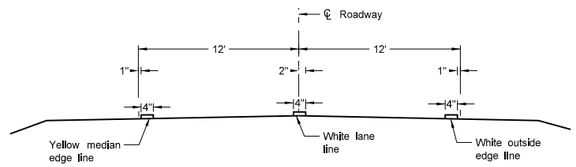
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



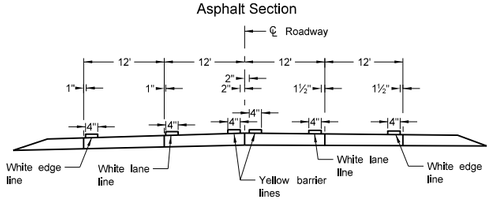
URBAN FIVE LANE SECTION
Asphalt Section



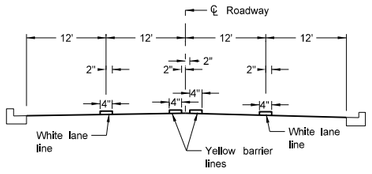
RURAL FOUR LANE ROADWAY
Asphalt Section



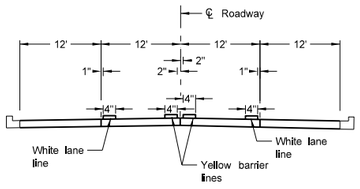
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



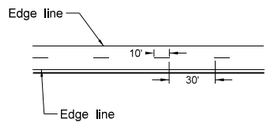
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

NOTES:

1. Edge lines shall be continued through private drives and field drives and broken for intersections.

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

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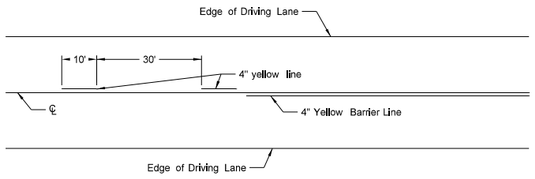
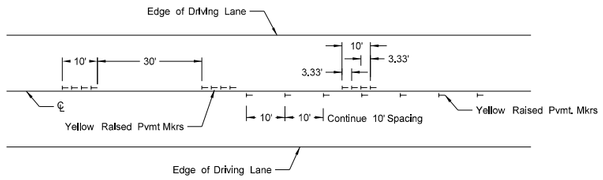
SHORT-TERM PAVEMENT MARKING

D-762-6

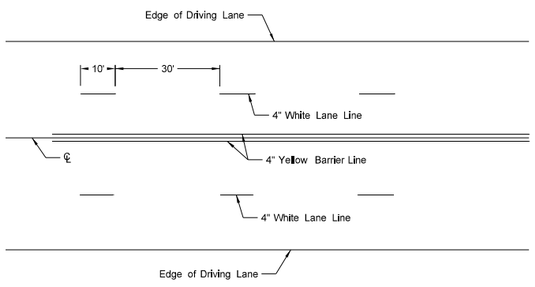


Painted or Tape Lines

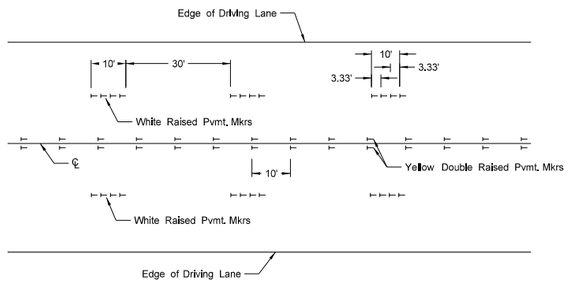


Raised Pavement Markers

TWO-LANE TWO-WAY ROADWAY

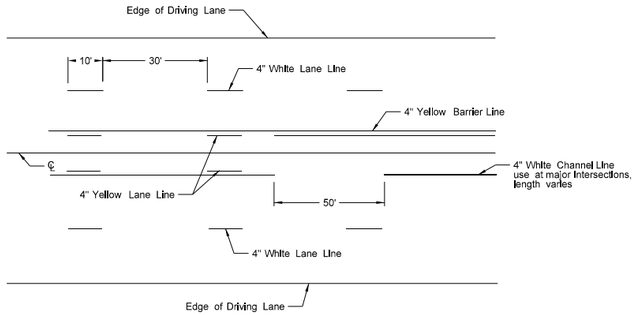


Painted or Tape Lines

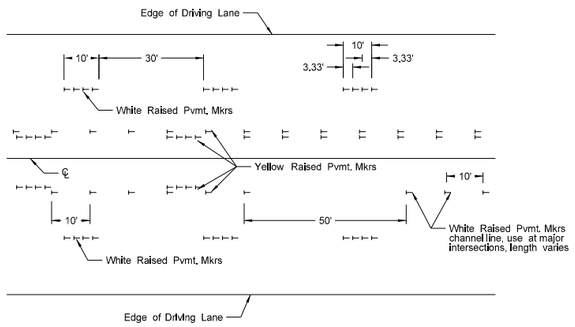


Raised Pavement Markers

FOUR LANE ROADWAY

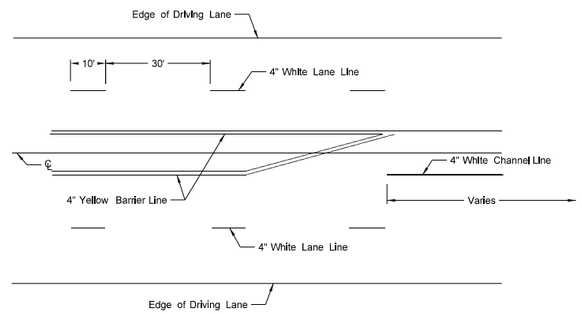


Painted or Tape Lines

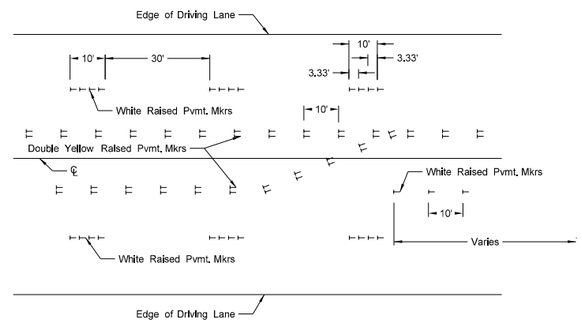


Raised Pavement Markers

FIVE LANE ROADWAY TWO WAY LEFT TURN



Painted or Tape Lines



Raised Pavement Markers

FIVE LANE ROADWAY WITH MARKED ISLANDS

NOTES:

1. Two-lane two-way roadways shall have no passing zones placed as shown. No passing zone signs may be placed in lieu of short term no passing zone pavement markings. These signs will be allowed to remain in place for three days, at which time the short term no passing zone pavement marking shall be placed.

2. Short term center line stripe (paint) on top lift shall be carefully placed with exact spacing so that the permanent stripe will match when applied.

3. Raised markers and tape markings shall be removed after permanent pavement marking has been installed. Removed markings shall become the property of the contractor.

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

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation