DESIGN DATA - ND 31 (RP 12.802)				
Traffic	Average Daily			
Current 2010	Pass: 155	Trucks: 30	Total: 185	
Forecast 2030	Pass: 190	Trucks: 40	Total: 230	
Clear Zone Distance: 26 ft.		Design Speed: 65		
Minimum Sight Dist. for Stopping: 645 ft.		Bridges: HL-93		
Sight Dist. for No Passing Zone: 1,100 ft.				
Pavement Design Life 20 (years)				
Design Accumulated One-way Flexible ESALs: 80,370				

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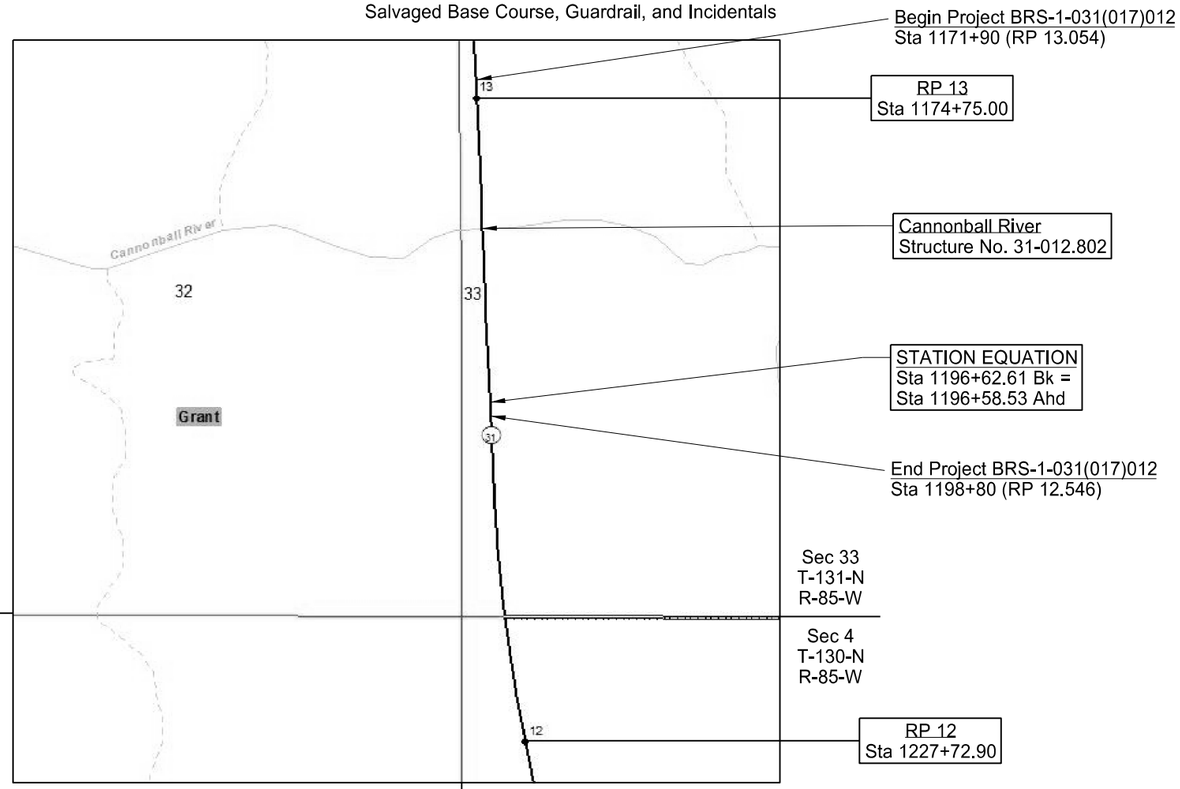
JOB #43
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

BRS-1-031(017)012

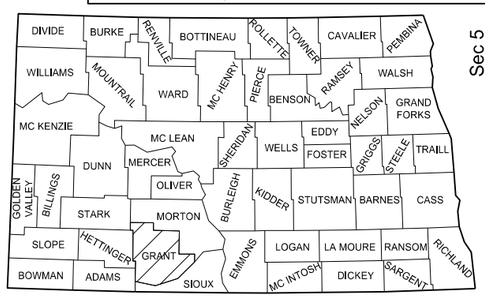
FHWA Limited Involvement
Grant County
13 Miles North of SD Border
Roadway Realignment to the East,
Structure Replacement, Hot Bituminous Pavement,
Salvaged Base Course, Guardrail, and Incidentals

GOVERNING SPECIFICATIONS:
Standard Specifications adopted by the North Dakota Department of Transportation October 2008; Standard Drawings currently in effect; and other Contract Provisions submitted herein.

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
BRS-1-031(017)012	0.510	0.510



NOTE: All stationing is based off of PR31 chain, unless otherwise noted.



STATE COUNTY MAP

DESIGNERS

Darell Arne /s/

Douglas A. Schumaker /s/

APPROVED DATE 8-27-2013

Roger Weigel /s/
for OFFICE OF PROJECT DEVELOPMENT
ND DEPARTMENT OF TRANSPORTATION

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 8-27-13

James Douglas Rath /s/
NDDOT DESIGN DIVISION

This document was originally issued and sealed by James Douglas Rath, Registration Number PE- 4288, on 08/27/13 and the original document is stored at the North Dakota Department of Transportation

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Special Provisions

SP 1010(08)Temporary Erosion and Sediment Best Management Practices
SP 1101(08)Split Sampling and Testing Requirements for Aggregate Base
SP 1225(08) Permits and Environmental Considerations
SP 1275(08) Weather Limitations for Hot Bituminous Mix

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LIST OF STANDARD DRAWINGS

Standard No.	Description
D-20-1	NDDOT Abbreviations
D-20-2	NDDOT Abbreviations
D-20-3	NDDOT Abbreviations
D-20-10	NDDOT Utility Company Abbreviations
D-20-20	Line Styles
D-20-21	Line Styles
D-20-30	Symbols
D-20-31	Symbols
D-20-32	Symbols
D-203-8	Section Line and Private Drive Approaches (Rural)
D-622-1	Pile Splice Details
D-704-1	Attenuation Device
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
D-704-9	Construction Sign Details
D-704-10	Construction Sign Details
D-704-11	Construction Sign Details
D-704-13	Barricade Details and Channelizing Devices
D-704-14	Construction Sign and Barricade Assembly Details
D-704-15	Construction Sign and Barricade Location Details
D-704-16	Typical Construction Signal Layout
D-704-17	Sign Layout for One Lane Closure Two Lane Roadway
D-704-19	Construction Sign and Barricade Location Details
D-704-22	Construction Sign and Barricade Location Details
D-704-26	Construction Sign and Barricade Location Details
D-704-27	Traffic Control Plan for Moving Operations on Conventional Highways (Pavement Marking)
D-704-50	Portable Sign Support Assembly
D-704-56	Mobile Operation (Grinding Shoulder Rumble Strips)
D-708-2	Erosion and Siltation Controls
D-708-4	Bridge Approach Slab Drainage Detail
D-708-5	Erosion and Siltation Control Blanket Installation
D-708-6	Erosion Control Median or Ditch Inlet Protection
D-708-7	Erosion Control Fiber Roll Placement Details
D-714-1	Reinforced Concrete Pipe Culvert and End Sections
D-714-4	Corrugated Steel Pipe Culverts and End Sections (Round Pipe)
D-714-6	Corrugated Aluminum Pipe Culverts and End Sections (Round Pipe)
D-714-22	Concrete Pipe Ties
D-714-26	Transverse Centerline Pipe Backfill for Pipes 4 Feet or Less Below the Proposed Base
D-720-1	Standard Right of Way Markers and Monuments
D-748-1	Curb & Gutter and Valley Gutter
D-754-83	Object Markers - Culverts
D-760-3	Rumble Strips Undivided Highways (Shoulders 4’ or Greater)
D-762-4	Pavement Marking
D-762-6	Short Term Pavement Marking
D-764-1	Beam Guardrail – General Details
D-764-2C	Flared Energy Absorbing Terminal for Steel Breakaway System
D-764-3	W-Beam Transition to Concrete Jersey Barrier with Approach Curb
D-764-8A	Guardrail at Bridge Ends 65 mph Design Speed
D-764-12A	Typical Grading at Bridge Ends with Flared W-Beam Gdrl 65 mph Design Speed
D-764-29	Short Term End Treatment for Bridges (Attenuation Device Method)
D-764-30	Short Term End Treatment for Bridges (Guardrail Method)
D-900-1	Bridge Bench Marks

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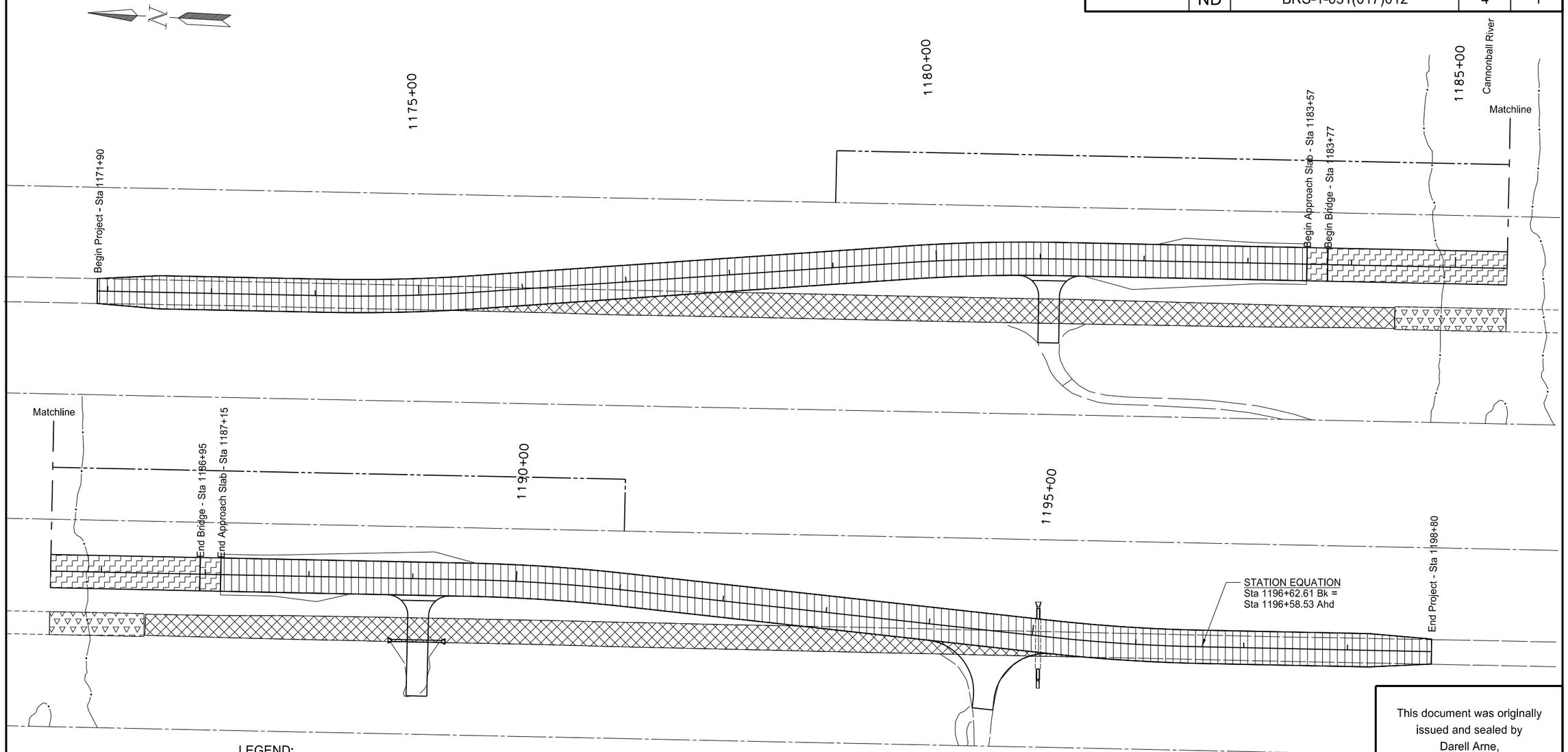

LEGEND:

Removal of Existing ND 31 (Pavement and Base)

Removal of Existing Structure No. 31-012.802

Roadway Realigning to the East - 50' at Bridge
(3.5" Superpave FAA 40, 12" Salvaged Base Course, and Earthwork)

New Structure and Approach Slabs

Other Work
Guardrail Installation
Culvert Replacements & Extensions

This document was originally issued and sealed by Darell Arne, Registration Number PE- 6523, on 8/20/13 and the original document is stored at the North Dakota Department of Transportation

SCOPE OF WORK

ND 31 - 13 Miles North of SD Border

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NOTES

100-P01 FENCING: Fence that is to be removed for construction purposes and relocated after project completion is the responsibility of the property owner. The Contractor shall contact the property owner at least three weeks prior to beginning construction for working out a schedule of removing the fence before construction begins and its relocation after construction ends. Property owner's name and contact information can be obtained from the project Engineer.

105-P01 ACCESS: During all phases of construction access should be maintained to and from the adjacent properties.

107-P01 HAUL ROADS: No paved roads off the state system will be used as haul roads unless the Contractor obtains written approval from the local government agency or agencies and the Engineer. The Engineer will determine what government agency or agencies approvals are appropriate.

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

201-P01 CLEARING AND GRUBBING: The Contractor shall remove all obstructions along this project in accordance to all laws and requirements as may be mandated by a federal, state, or local agency. The obstructions to be removed shall include, but are not limited to the tree stumps, shrubs, hedges, brush, and any other extraneous materials within the right of way as directed by the Engineer in the field. All material shall become property of the Contractor and disposed of outside of NDDOT right of way. All cost associated with labor, equipment, removals, and disposal of materials shall be included in the price bid for “Clearing & Grubbing.”

The Contractor shall backfill voids with Engineer-approved material placed in 12” loose thickness lifts and compacted. The area shall be graded to drain. All costs for providing the suitable material, placing, and compacting shall be included in the lump sum price for “Clearing and Grubbing.”

Large trees, 10 inches and greater in diameter, designated for removal, are paid for as “Removal of Trees 10IN.”

202-P01 ABUTTING PAVEMENT: Where the new pavement will abut existing pavement, a full-depth vertical saw cut shall be made along the entire length of the butt joint. The material to be removed shall then be removed without disturbing the material that is designated to remain. The new pavement shall be placed so as to match the existing pavement and so as to provide a satisfactory surface profile.

The areas to be sawed are shown on the removal sheets. Sawing shall be paid as "Saw Bituminous Surfacing - Full Depth."

202-P02 REMOVAL OF BITUMINOUS SURFACING: The tonnage of “Removal of Bituminous Surfacing” is based on the existing typical section as shown in Section 30. The tonnage includes the entire bituminous surfacing and the aggregate base, except the bottom two inches of aggregate base to prevent contamination. The bottom two inches of aggregate base shall be paid for as “Common Excavation – Type A.”

All bituminous pavement and aggregate paid for as “Removal of Bituminous Surfacing” has been deducted from the excavation quantity.

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

203-P02 EXCESS EXCAVATION: The Contractor is required to use available common excavation for embankment areas within the project limits. Any excess excavation that remains after the project is complete shall become the property of the Contractor. All excess excavation shall be disposed of off the highway right-of-way at a site selected by the Contractor and approved by the Engineer. Disposal in wetland areas will not be approved. All costs for hauling and disposing of any excess excavation shall not be paid for separately, but shall be included in the price bid for “Common Excavation – Type A”. Common excavation limits are as shown on Section 200, Cross Section Sheets.

203-P03 TOPSOIL: The existing topsoil shall be removed and salvaged. Removal is based upon a 4” depth. Upon completion of the grading operation, the topsoil shall be spread evenly over disturbed areas and seeded.

Measurement for all topsoil shall be according to Section 203.03 G (Contract Quantity Payment) of the Standard Specifications.

401-P01 BLOTTER MATERIAL CL 44: The blotter material required for this project will not be measured for payment but shall be included in the price bid for "MC70 or 250 Liquid Asphalt." Based on 15 LBS/SY approximately 68 tons will be required.

408-P01 HOT BITUMINOUS PAVEMENT: The 3.5” hot bituminous pavement shall be paver laid in two lifts with the top lift being two inches.

408-P02 CONTRACTOR MIX DESIGN: The final mix design shall be Contractor-developed mix design as per NDDOT Standard Specification 410.04B and submitted 10 days prior to beginning hot bituminous pavement production. The following aggregate and mix design properties are required:

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Test	Criteria	Reference
Course Aggregate Angularity	75% min.	NDDOT Field Sampling and Testing Manual
Fine Aggregate Angularity	40% min.	AASHTO T 304
Gyratory Effort, # Gyrations	N_{ini}=7, N_{des}=75, $_{max}$=115	AASHTO R 35
Voids Filled With Asphalt	65-78%	AASHTO M323, T 166
$\%G_{mm}$ @ N_{ini}	89% max	AASHTO M 323, T 166

In addition to the previous table, Superpave FAA 40 shall also conform to section 408 of the North Dakota Standard Specifications.

411-P01 MILLED TAPERS: This project shall require milling transitions at the beginning and end of the project. All costs associated with labor, materials, and equipment for milling, hauling and stockpiling the material will be included in the price bid for "Milling Bituminous Pavement."

411-P02 TEMPORARY WEDGES: The Contractor shall place temporary gravel or milled material wedges at the vertical edge drop-off to allow for a smooth passage of vehicles. All costs associated with labor, materials, and equipment for temporary wedge placement shall be included in the price bid for "Milling Bituminous Pavement."

704-016 TRAFFIC CONTROL SUPERVISOR: Traffic control supervisor shall be provided on this project.

704-450 LANE CLOSURE - SIGNAL CONTROL/FLAGGING CONTROL: At the location(s) shown in the plans, the contractor shall install a "Signal Controlled" lane closure for two-lane roadways as shown on Standard D-704-16. In lieu of providing a traffic signal system during the time one-lane traffic is maintained, the contractor may install a "Flagging Controlled" lane closure for two-lane roadways as shown on Standard D-704-17. The traffic signal system shall be similar to the one shown, and any modifications shall be approved by the engineer prior to the preconstruction conference.

The contractor shall be responsible for obtaining the electrical source to operate the traffic signals. The contractor shall make arrangement with the utility company or provide generators for electrical service. Solar powered traffic signals may be used. The contractor shall be responsible for all costs of providing the electrical source and any costs required to operate and maintain the traffic signal. The generator shall be placed at least 60 feet from the roadway centerline unless the generator and signal are part of a trailer-mounted unit.

If the contractor chooses to use the utility company, the poles and all equipment shall be placed at least 60 feet from the roadway centerline. The power conductors shall be placed a minimum of 6 inches below the ground.

Upon completion of the project and the traffic is returned to the closed roadway, all equipment shall be removed.

The cost of furnishing, installing, and providing power to the traffic signal shall be included in the price bid for "Lane Closure - Signal Control/Flagging Control."

The cost of providing the traffic signal system or continuous 24-hour flagging during the time one-lane traffic is maintained shall be included in the price bid for "Lane Closure - Signal Control/Flagging Control."

The traffic control devices shall be installed as shown on Standards D-704-16 or 17, depending on the method selected. The traffic control devices will be measured and paid for at the contract unit price for each device. For bidding purposes, devices as shown on Standard D-704-16 are included in the "Traffic Control Devices List."

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

1. Standard D-704-2 for coring bituminous pavement.
2. Standard D-704-5, Contractor Sign, is applicable.
3. Standards D-704-7, 8, 9, 10, 11, 13, 14, and 50 are applicable.
4. Standard D-704-15, Layout B for shifting two-way traffic to the proposed roadway (Phase 4 construction).
5. Standards D-704-16 or 17 for a one lane closure with signal control or flagging control (Phase 2 and Phase 3 construction).
6. Standard D-704-19, Layout F for one lane closure.
7. Standards D-704-22 and D-704-26, Layouts K, L, and Y for construction trucks hauling material.
8. Standard D-704-26, Layout Type BB, CC, DD, EE, FF, and GG as needed.
9. Standard D-704-27 for pavement marking.
10. Standard D-704-56 for grinding rumble strips.

704-P02 CONSTRUCTION PHASING: This project will be constructed in four phases. During Phase 1 two-way traffic will be maintained on the existing roadway. Phase 1 will consist of constructing the new bridge, bridge approach slabs, and portion of the roadway which will not impact the embankment of the existing roadway.

During phases two and three, interim traffic signals will control traffic movements through the construction zone.

In Phase 2 single-lane traffic will be maintained on the southbound lane with the use of interim traffic signals. Phase 2 will consist of removing the existing material and constructing tie-ins for the northbound lane. Place embankment, salvaged base course, prime, blotter, and temporary guardrail. Open the northbound lane to traffic.

In Phase 3 single lane traffic will be maintained on the northbound lane with the use of interim traffic signals. Phase 3 will consist of removing the existing material and constructing tie-ins for the southbound lane. Place embankment, salvaged base course, prime, blotter, and temporary guardrail.

In Phase 4 two-way traffic will be maintained on the newly constructed roadway. The new roadway will be paved using a flagging operation with pilot car. See Standard D-704-15 Type A for advanced warning sign layout and spacing. All remaining existing roadway embankment will be removed and reshaped as shown in the cross sections.

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NOTES

No changes to the construction sequencing will be made without written approval by the Engineer. No additional compensation will be made for changes to the construction sequencing.

704-P03 TRAFFIC CONTROL PHASING: Once the Phase 2 work begins in the tie-in areas the Contractor will be allowed 15 calendar days to complete his work in Phases 2 and 3 to the point where both traffic lanes are open to traffic.

704-P04 TRAFFIC CONTROL IN GUARDRAIL INSTALLATION AREAS: Delineator drums are required for marking areas of guardrail installation, as per spec. 764.03A. An additional quantity of 28 delineator drums has been added to the work zone traffic control devices list for this purpose.

708-P01 MULCHING: All seeded areas shall be stabilized with mulch after the completion of the permanent seeding operation and as needed during the term of the project as specified in the NDPDES Construction Permit.

720-P01 RIGHT OF WAY MARKERS: The station and offset listed on the Section 60 plan and profile sheets for Right of Way Markers is the location of the iron pin. The Right of Way Markers shall be offset from the iron pin as detailed and noted on Standard D-720-1. The northings and eastings of the iron pin are shown in Section 82 of the plan sheets.

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NOTES

SECTION 100

764-P01 W-BEAM GUARDRAIL: At the existing Cannonball River Bridge the existing guardrail shall remain in place through Phase 1 of construction.

Before phase 2 is in place the W-beam guardrail and W-beam guardrail end terminals shall be installed at the new bridge, as shown in Section 100 of the plans. This guardrail shall remain in place until it is necessary to remove for paving. The guardrail shall be removed and reset in the permanent guardrail installation shown in Section 130.

SECTION 110

764-P02 W-BEAM GUARDRAIL: Two signs and 4 objects markers along with their supports shall be removed. All material, equipment and cost to remove shall not be bid separately but shall be included in the price bid for ”W-Beam Guardrail”.

SECTION 130

748-P01 CURB & GUTTER – TYPE 1 SPECIAL: Twenty lineal feet of curb and gutter is required along each side of the roadway at the ends of the bridge approach slabs, at the Cannonball River Bridge, as shown in the plans.

The curb and gutter shall be Type 1 as shown on Standard Drawing D-748-1, except the last 3 feet of curb and gutter, at the end nearest the approach slab, shall be transitioned to match the shape of the jersey barrier and the end of the curb furthest from the bridge approach slab shall be tapered from a 6” curb height to 0” curb height in 3 feet, as shown on Standard Drawing D-764-3.

All costs for constructing the curb and gutter as described above, shall be included in the price bid for the item “Curb & Gutter – Type 1 Special.”

764-P03 REMOVE END TREATMENT & TRANSITION: The removed end treatment and transition shall become the property of the contractor.

The item "Remove End Treatment & Transition" shall be measured by the number removed.

The cost of removing the end treatment and transition, and disposing of the material shall be included in the price bid for the item "Remove End Treatment and Transition."

764-P04 REMOVE W-BEAM GUARDRAIL & POSTS: The removed W-beam guardrail and posts that are not reset shall become the property of the contractor.

The item "Remove W-Beam Guardrail & Posts" shall be measured by the linear foot of guardrail removed.

The cost of removing the guardrail and posts, and disposing of these materials shall be included in the price bid for the item "Remove W-Beam Guardrail & Posts."

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ENVIRONMENTAL COMMITMENTS

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

COMMITMENT NO. 1: 0.12 acres of Potential Other Waters will be permanently impacted and 0.54 acres of Potential Other Waters will be temporary impacted.

ACTION TAKEN/REQUIRED: 0.00 acres of permanent impacts to potential other waters will require mitigation since permanent impacts are less than 200 linear feet, therefore no mitigation is required..

POTENTIAL OTHER WATERS											POW MITIGATION			
			Size				Impacts to Potential Other Waters				Mitigation Required			
							Acres		Linear Feet					
Number	Location	Type	Acres	Linear Feet	Feature	USACE Jurisdictional*	Temp	Perm	Temp	Perm	11990	USACE	Location	Method
OW - 1	Sec.33, T131N, R85W	Cannonball River	1.33	450	Natural	Yes	0.54	0.12	250.00	100.00	N	N	NA	NA
		Totals	**1.33**	**450**			**0.54**	**0.12**	**250.00**	**100.00**				

* A wetland Jurisdictional Determination was issued by the USACE on 9/03/2010; NWO-2004-60128-BIS.

Total Permanent Impact Summary		Additional Impact Info for 404 Permit	
Wetland Type	Total (Acres)	Wetland Type	Total (Acres or Lf)
Natural/Non-JD	0.00	Permanent JD ≥ 0.10	**0.00**
Artificial /Non-JD	0.00	Temporary JD	**0.00**
Natural /JD	0.00	POW	**100 LF**
Artificial /JD	0.00		
Totals	**0.00**		

COMMITMENT NO. 2: No construction or demolition activities are to take place in the Cannonball River Channel from April 15 to June 1 unless methods to avoid, minimize, or mitigate impacts to fish during migration/spawning are incorporated.

ACTION TAKEN/REQUIRED: No work will be done in the river from April 15 to June 1 unless approval from the ND Game and Fish and the USFWS is obtained.

COMMITMENT NO. 3: A concrete bridge will be demolished as a part of this project. SFN 17987 Asbestos Notification of Demolition and Renovation is required.

ACTION TAKEN/REQUIRED: The contractor will complete and submit SFN 17987 to the North Dakota Department of Health 10 days prior to beginning the activity.

COMMITMENT NO. 4: Active migratory bird nests with eggs or chicks are protected by the Federal Migratory Bird Treaty Act. Demolition on bridges or box culverts with active nesting can not start until nesting season is over unless measures are taken to prevent nesting.

ACTION TAKEN/REQUIRED: The contractor will not be allowed to remove the existing bridge between February 1 and August 15 to avoid take of migratory birds or active migratory bird nests. If a nest where birds are present is found; the contractor shall have an NDDOT qualified biologist conduct a bird/nest survey no more than 5 working days prior to starting work at the structure site. All reasonable, prudent, and effective measures should be identified and implemented to avoid take.

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ENVIRONMENTAL COMMITMENTS

COMMITMENT NO. 5: The contractor shall provide the ND Game & Fish Department a reasonable opportunity to inspect all vessels, motors, trailers, and construction equipment prior to these items being launched into the waters of the state.

ACTION TAKEN/REQUIRED: A minimum of 72 hours notice must be provided for scheduling an inspection. The department's Special Project Biologist, Lynn Schlueter, can be contacted at 701-662-3617 for equipment inspections or any additional information regarding Aquatic Nuisance Species (ANS) prevention protocols.

PERMITS REQUIRED:

- Section 404 Permit (US Army Corps of Engineers)
- Sovereign Lands Permit (ND State Water Commission)

ESTIMATE OF QUANTITIES

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SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
103	0100	CONTRACT BOND	L SUM	1	1
201	0330	CLEARING & GRUBBING	L SUM	1	1
201	0370	REMOVAL OF TREES 10IN	EA	3	3
202	0105	REMOVAL OF STRUCTURE	L SUM	1	1
202	0135	REMOVAL OF BITUMINOUS SURFACING	TON	2,883	2,883
202	0153	SAW BITUMINOUS SURFACING-FULL DEPTH	LF	208	208
202	0169	REMOVAL OF END SECTION-ALL TYPES & SIZES	EA	1	1
202	0174	REMOVAL OF PIPE ALL TYPES AND SIZES	LF	42	42
203	0101	COMMON EXCAVATION-TYPE A	CY	15,639	15,639
203	0109	TOPSOIL	CY	3,656	3,656
203	0140	BORROW-EXCAVATION	CY	9,479	9,479
210	0101	CLASS I EXCAVATION	L SUM	1	1
210	0111	CLASS 2 EXCAVATION	L SUM	1	1
210	0126	CHANNEL EXCAVATION	CY	18,500	18,500
210	0201	FOUNDATION PREPARATION	EA	1	1
216	0100	WATER	M GAL	311	311
302	0100	SALVAGED BASE COURSE	TON	6,819	6,819
401	0100	MC70 OR 250 LIQUID ASPHALT	GAL	2,352	2,352
401	0150	SS1H OR CSS1H OR MS1 EMULSIFIED ASPHALT	GAL	928	928
408	0445	PG 58-28 ASPHALT CEMENT	TON	109.5	109.5
408	0800	SUPERPAVE FAA 40	TON	1,827	1,827
408	9605	CORED SAMPLE-BITUMINOUS PAVEMENT	EA	9	9
411	0100	MILLING PAVEMENT SURFACE	TON	28	28
602	0130	CLASS AAE-3 CONCRETE	CY	397	397
602	1130	CLASS AE-3 CONCRETE	CY	165	165
602	1134	PILE SUPPORTED APPROACH SLAB	SY	153.4	153.4
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	1,131	1,131
604	9915	PRESTRESSED I-BEAM-54IN	LF	1,565	1,565
612	0115	REINFORCING STEEL-GRADE 60	LBS	16,866	16,866
612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS	87,415	87,415
616	0364	STRUCTURAL STEEL M270-GRADE 36	LBS	1,554	1,554
622	0020	STEEL PILING HP 10 X 42	LF	960	960
622	0040	STEEL PILING HP 12 X 53	LF	1,380	1,380

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
622	0070	STEEL PILING HP 14 X 102	LF	1,200	1,200
702	0100	MOBILIZATION	L SUM	1	1
704	0100	FLAGGING	MHR	500	500
704	1000	TRAFFIC CONTROL SIGNS	UNIT	2,412	2,412
704	1018	LANE CLOSURE-SIGNAL CONTROL/FLAGGING CONTROL	EA	1	1
704	1052	TYPE III BARRICADE	EA	6	6
704	1060	DELINEATOR DRUMS	EA	47	47
704	1067	TUBULAR MARKERS	EA	53	53
704	1081	VERTICAL PANELS-BACK TO BACK	EA	60	60
704	1185	PILOT CAR	HR	100	100
708	1020	RIPRAP-LOOSE ROCK	CY	1,919	1,919
708	1375	FLOTATION SILT CURTAIN	LF	500	500
708	1376	REMOVAL FLOTATION SILT CURTAIN	LF	500	500
708	1430	FIBER ROLLS 12IN	LF	4,730	4,730
708	1431	REMOVAL FIBER ROLLS 12IN	LF	2,365	2,365
708	2240	SEEDING-TYPE B-CL II	ACRE	7.7	7.7
708	2260	SEEDING-TYPE B-CL IV	ACRE	7.7	7.7
708	5500	MULCHING	ACRE	15.4	15.4
708	5651	ECB TYPE 2	SY	102	102
708	5661	TRM TYPE 2	SY	193	193
709	0600	GEOTEXTILE FABRIC-TYPE RR	SY	2,878	2,878
714	0820	PIPE CONC REINF 30IN CL III	LF	20	20
714	3033	END SECT-TRAVERSABLE REINF. CONC.30IN	EA	1	1
714	4106	PIPE CONDUIT 24IN-APPROACH	LF	48	48
714	9660	REMOVE & RELAY END SECTION-ALL TYPE & SIZES	EA	1	1
720	0100	MONUMENTS	EA	5	5
720	0110	RIGHT OF WAY MARKERS	EA	20	20
748	0141	CURB & GUTTER-TYPE 1 SPECIAL	LF	80	80
754	0805	OBJECT MARKERS - CULVERTS	EA	4	4
760	0005	RUMBLE STRIPS - ASPHALT SHOULDER	MILE	0.96	0.96
760	0007	RUMBLE STRIPS - ASPHALT CENTERLINE	MILE	0.48	0.48
762	0420	SHORT TERM 4IN LINE-TYPE R	LF	10,886	10,886
762	0426	SHORT TERM 24IN LINE-TYPE R	LF	24	24

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	8	3

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
762	0430	SHORT TERM 4IN LINE-TYPE NR	LF	2,690	2,690
762	1104	PVMT MK PAINTED 4IN LINE	LF	6,512	6,512
762	1500	OBLITERATION OF PVMT MK	SF	42	42
764	0131	W-BEAM GUARDRAIL	LF	195	195
764	0145	W-BEAM GUARDRAIL END TERMINAL	EA	3	3
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS	LF	606	606
764	1050	RESET W-BEAM GUARDRAIL	LF	331	331
764	1059	RESET W-BEAM GUARDRAIL END TERMINAL	EA	4	4
764	2081	REMOVE END TREATMENT & TRANSITION	EA	7	7
930	3000	BRIDGE BENCH MARKS	SET	1	1
930	9536	ABUTMENT UNDERDRAIN SYSTEM	L SUM	1	1

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	10	1

					Reconstruction 2-Lane Tangent Section Sta 1171+90.00 to Sta 1174+09.39 Sta 1175+57.70 to Sta 1179+69.70 Sta 1181+18.00 to Sta 1183+57.00 Sta 1187+15.00 to Sta 1189+54.00 Sta 1191+02.30 to Sta 1195+14.30 Sta 1196+58.53 Ahd to Sta 1198+80.00				Reconstruction 2-Lane Curve Section Sta 1174+09.39 to Sta 1175+57.70 Sta 1179+69.70 to Sta 1181+18.00 Sta 1189+54.00 to Sta 1191+02.30 Sta 1195+14.30 to Sta 1196+62.61 Bk				
					Total Stations = 17.43				Total Stations = 5.93				
SPEC	**CODE**	**BID ITEM**	**UNIT**	Width (ft)	Depth (in)	Quantity per Station	SubTotal	Width (ft)	Depth (in)	Quantity per Station	SubTotal	**TOTAL**
302	0100	SALVAGED BASE COURSE @ 1.875 Ton/CY	TON	34.5	12	270.2	4,710	34.5	12	268.9	1,595	**6,305**
401	0100	MC70 OR 250 LIQUID ASPHALT @ 0.25 Gal/SY (one application on base course)	GAL	34.5		95.8	1,670	34.5		95.8	568	**2,238**
401	0150	SS1H OR CSS1H OR MS1 EMULSIFIED ASPHALT @ 0.05 Gal/SY (2 lifts)	GAL	Avg 32.5		36.1	629	Avg 32.5		36.1	214	**843**
		*BLOTTER MATERIAL CL 44 @ 15 lbs/SY	TON	34.5		2.9	51	34.5		2.9	17	**68**
408	0445	PG 58-28 ASPHALT CEMENT @ 6.0% HBP	TON	32	3.5	4.3	74.9	32	3.5	4.3	25.5	**100.4**
408	0800	SUPERPAVE FAA 40 @ 2 Ton/CY	TON	32	3.5	71.9	1,253	32	3.5	71.8	426	**1,679**

*Blotter Material CL 44 is not to be paid for seperately, but included in the price bid for "MC70 or 250 Liquid Asphalt."

Water

25 MGal/Mile for Dust Palliative
20 Gal/Ton for Salvaged Base Course
10 Gal/CY for Embankment

Topsoil

4" removal and replacement depth

Seeding and Mulching

Seeding - Type B - CL II: Estimated at 7.7 acres
Seeding - Type B - CL IV: Estimated at 7.7 acres
Mulching: Estimated at 15.4 acres

PERMANENT PAVEMENT MARKING

White Edge Lines - Pvmt Mk Painted 4IN Line			
Location	Basis	Quantity	Unit
1170+90 to 1199+80	10,560 LF/mile	5,788	LF

Yellow Centerline Skips - Pvmt Mk Painted 4IN Line			
Location	Basis	Quantity	Unit
1170+90 to 1199+80	1,320 LF/mile	724	LF

NOTE:
Short Term Pavement Marking is included in the Work Zone Traffic Control Sheets.

Removal of Bituminous Surfacing

Bituminous Pavement @ 1.875 Ton/CY:
Mainline based on 5.25" thickness.
Paved Approaches based on 2" thickness.

Base Material @ 1.875 Ton/CY:
Mainline based on 3" thickness.
Approaches based on 4" thickness.

SPEC	CODE	BID ITEM	UNIT	QUANTITY
760	**0005**	**RUMBLE STRIPS - ASPHALT SHOULDER**		
		2 x (Sta 1170+90 to Sta 1183+57)	MILE	0.48
		2 x (Sta 1187+15 to Sta 1199+80)	MILE	0.48
		TOTAL	**MILE**	**0.96**
760	**0007**	**RUMBLE STRIPS - ASPHALT CENTERLINE**		
		(Sta 1170+90 to Sta 1183+57)	MILE	0.24
		(Sta 1187+15 to Sta 1199+80)	MILE	0.24
		TOTAL	**MILE**	**0.48**

Density Cores					Materials Coordinator Cores		
Location	**Length**	**Lifts**	**Lanes**	**Sublots**	**Location**	**Length**	**Cores**
Sta 1171+90 to Sta 1183+57 Sta 1187+15 to Sta 1196+62.61 Bk Sta 1196+58.53 Ahd to Sta 1198+80	2,336 LF	2	2	4	Sta 1171+90 to Sta 1183+57 Sta 1187+15 to Sta 1196+62.61 Bk Sta 1196+58.53 Ahd to Sta 1198+80	2,336 LF	1
Density Cores (2 per Sublot)				**8**	**Material Coordinator Cores**		**1**

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BASIS OF ESTIMATE

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	11	1

EARTHWORK SUMMARY

Location	Excavation (CY)	Pvmt & Aggr Removal from Excavation Areas (CY)	Common Excavation - Type A (CY) Pay Item	Embankment (CY)	Borrow - Excavation (CY) Pay Item	Excess Excavation (CY)	Topsoil from Stripping (CY) Pay Item	Topsoil Required (CY)
	A	B	C = A - B	D	E = D - C (if > 0)	F = C - D (if > 0)	G	H
Sta 1171+90 to Sta 1198+80 (Phase 1)	3,005	0	3,005	11,715	8,710	0	1,473	900
Sta 1171+90 to Sta 1198+80 (Phase 2)	892	279	613	1,337	724	0	526	493
Sta 1171+90 to Sta 1198+80 (Phase 3)	1,537	532	1,005	1,050	45	0	429	474
Sta 1171+90 to Sta 1198+80 (Phase 4)	11,742	726	11,016	2,207	0	8,809	1,228	1,764
TOTALS =	17,176	1,537	**15,639**	16,309	**9,479**	8,809	**3,656**	3,631

Note: Quantity shown for embankment has been increased by 25% to account for shrinkage.

SALVAGED BASE COURSE SUMMARY

Location	Removal of HBP (TON)	Removal of Aggregate (TON)	Material (HBP & Aggregate) Available for Salvage (TON)	Salvaged Base Course Required (TON)
	A	B	C = A + B	D
Sta 1171+90 to Sta 1198+80 (ML - Phase 1)	0	0	0	3,217
Sta 1171+90 to Sta 1198+80 (ML - Phase 2)	334	190	524	1,274
Sta 1171+90 to Sta 1198+80 (ML - Phase 3)	635	363	998	1,814
Sta 1171+90 to Sta 1198+80 (ML - Phase 4)	790	451	1,241	0
Approaches	23	97	120	381
Guardrail Surfacing Areas	0	0	0	133
TOTALS =	1,782	1,101	2,883	6,819

Note: This is not a balance sheet. The contractor must balance their own materials. Material may not be available when needed.

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EARTHWORK SUMMARY AND SALVAGED BASE COURSE SUMMARY

ND 31 - 13 Miles North of SD Border

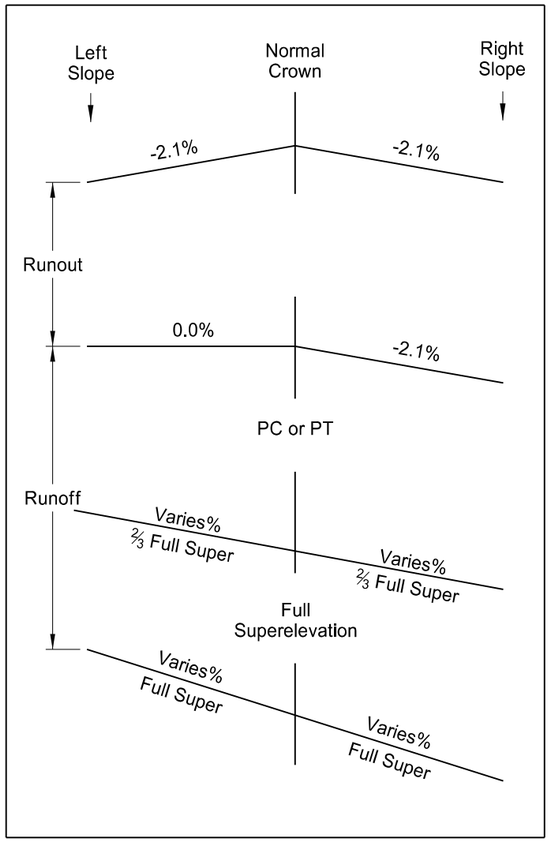
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	20	1

Curve PR31-1		
PC Station		1174+09.39
PI Station		1174+83.59
PT Station		1175+57.70
Delta		5°07'07.74" (LT)
Degree		3°27'05.59"
Length		148.30
Radius		1660
Station	Left Slope	Right Slope
1172+04.91	-2.1	-2.1
1172+75.30	-2.1	0.0
1173+45.70	-2.1	2.1
1174+76.43	-6.0	6.0
1174+90.66	-6.0	6.0
1176+21.39	-2.1	2.1
1176+91.78	-2.1	0.0
1177+62.18	-2.1	-2.1

Curve PR31-2		
PC Station		1179+69.70
PI Station		1180+43.90
PT Station		1181+18.00
Delta		5°07'07.74" (RT)
Degree		3°27'05.59"
Length		148.30
Radius		1660
Station	Left Slope	Right Slope
1177+65.22	-2.1	-2.1
1178+35.61	0.0	-2.1
1179+06.00	2.1	-2.1
1180+36.74	6.0	-6.0
1180+50.96	6.0	-6.0
1181+81.69	2.1	-2.1
1182+52.09	0.0	-2.1
1183+22.48	-2.1	-2.1

Curve PR31-3		
PC Station		1189+54.00
PI Station		1190+28.20
PT Station		1191+02.30
Delta		5°07'07.74" (RT)
Degree		3°27'05.59"
Length		148.30
Radius		1660
Station	Left Slope	Right Slope
1187+49.52	-2.1	-2.1
1188+19.91	0.0	-2.1
1188+90.31	2.1	-2.1
1190+21.04	6.0	-6.0
1190+35.26	6.0	-6.0
1191+66.00	2.1	-2.1
1192+36.39	0.0	-2.1
1193+06.78	-2.1	-2.1

Curve PR31-4		
PC Station		1195+14.30
PI Station		1195+88.51
PT Station		1196+62.61
Delta		5°07'07.74" (LT)
Degree		3°27'05.59"
Length		148.30
Radius		1660
Station	Left Slope	Right Slope
1193+09.82	-2.1	-2.1
1193+80.22	-2.1	0.0
1194+50.61	-2.1	2.1
1195+81.34	-6.0	6.0
1195+95.57	-6.0	6.0
1197+22.23 R 2	-2.1	2.1
1197+92.62 R 2	-2.1	0.0
1198+63.01R 2	-2.1	-2.1



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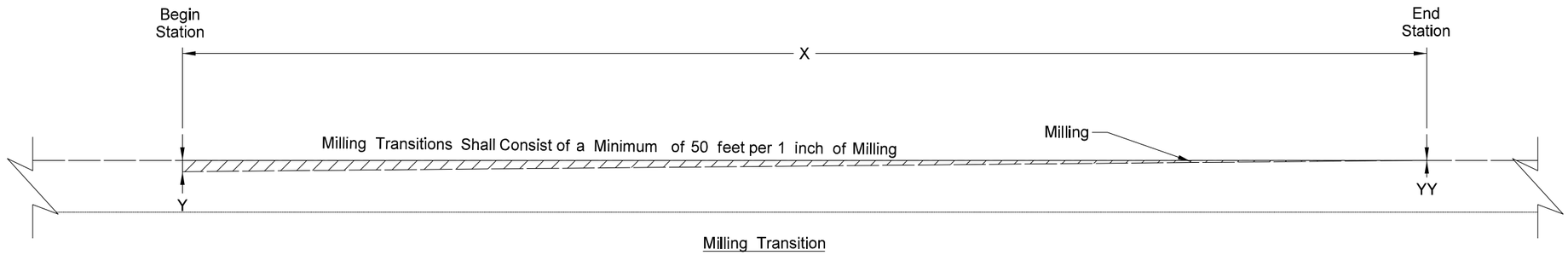
SUPERELEVATIONS

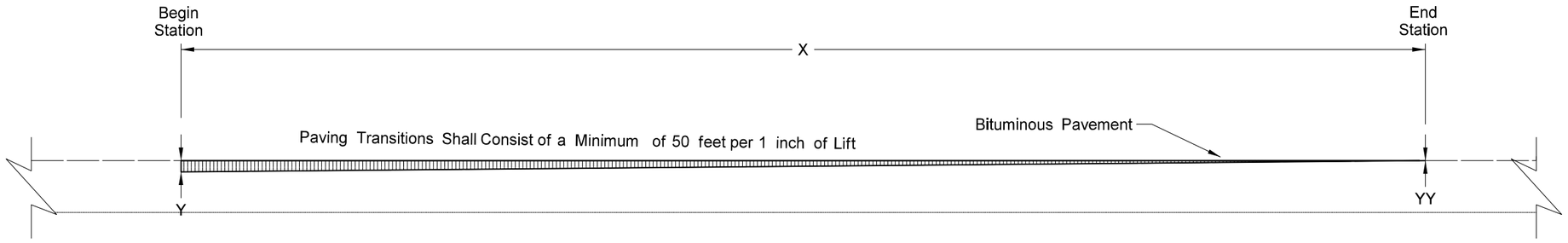
ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	20	2



Milling Transition

Milling Transitions				
X	Begin Station	Y	End Station	YY
100 ft.	1170+90	2 in.	1171+90	0 in.
100 ft.	1199+80	2 in.	1198+80	0 in.



Paving Transition

*Drawing is not to scale

Paving Transitions				
X	Begin Station	Y	End Station	YY
100 ft.	1170+90	2 in.	1171+90	0 in.
100 ft.	1199+80	2 in.	1198+80	0 in.

SPEC	CODE	BID ITEM	UNIT	Quantities	
				Per Transition	Total
202	0153	SAW BITUMINOUS SURFACING - FULL DEPTH	LF	24	48
401	0150	SS1H OR CSS1H OR MS1 EMULSIFIED ASPHALT @ 0.05 Gal/SY	GAL	14	28
408	0445	PG 58-28 ASPHALT CEMENT @ 6.0% HBP	TON	0.9	1.8
408	0800	SUPERPAVE FAA 40 @ 2 Ton/CY	TON	15	30
411	0100	MILLING PAVEMENT SURFACE	TON	14	28

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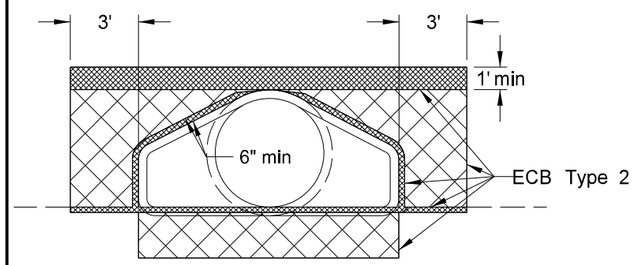
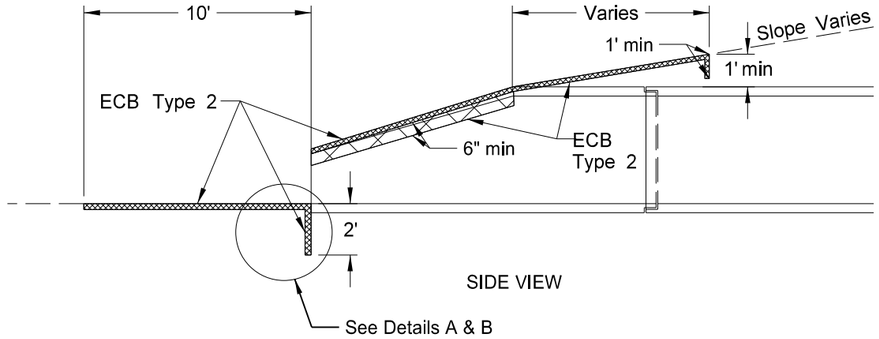
MILLING & PAVING TRANSITION

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	20	3

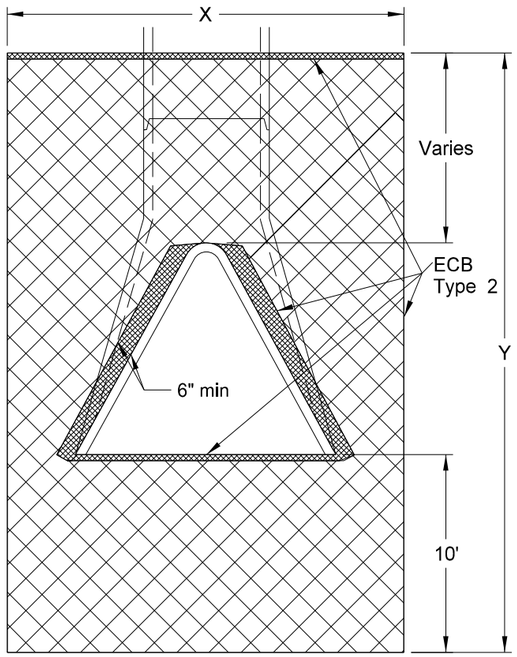


FRONT VIEW



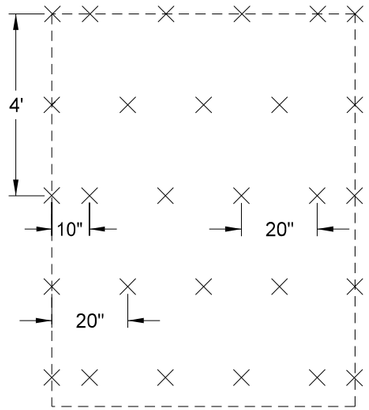
SIDE VIEW

Dia	X	Y	Surface Area to be Protected	ECB Type 2
(In)	(Ft)	(Ft)	(SF)	(SY)
15	9.0	20.0	176.0	20
18	9.5	20.7	190.7	21
21	9.5	21.0	190.9	21
24	10.5	21.6	214.1	24
30	11.6	22.5	241.5	27
36	12.7	23.3	268.8	30
42	13.3	23.3	279.7	31
48	13.8	24.0	293.2	33
54	14.5	23.4	300.6	33
60	15.0	23.0	307.5	34
66	15.6	24.0	325.6	36
72	16.2	24.5	340.6	38



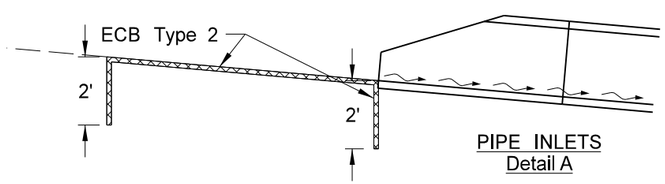
TOP VIEW

NOTE: The ECB shall be tucked a minimum of 1' into the embankment above the flared end section, a minimum of 6" into the embankment (against the flared end section) around the opening of the flared end section, and 2' into the ground at the end of the flared end section.

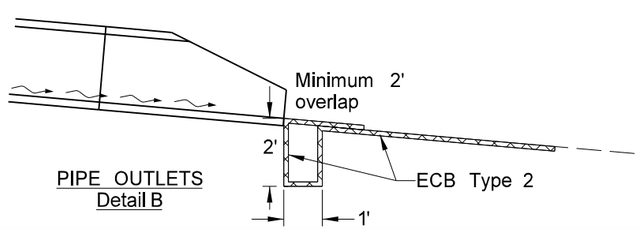


STAPLE PATTERN: 3.8 staples per square yard using 8-inch 11 gauge wire "u" staples

708 5651 ECB TYPE 2				
Location of Surface Area to be Protected	Pipe Dia	No	Unit Quantity	Total Quantity
ND 31	(In)		(SY)	(SY)
1189+05 - Rt	24	2	24	48
1195+05 - Skewed Lt & Rt	30	2	27	54
TOTAL				102



PIPE INLETS
Detail A



PIPE OUTLETS
Detail B

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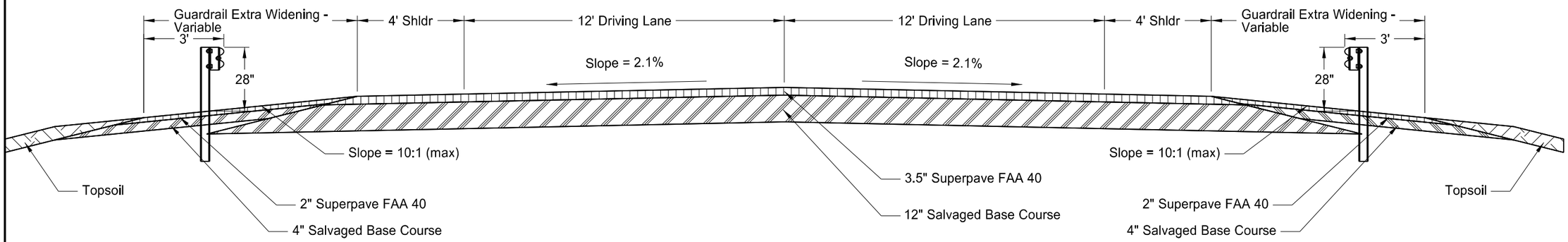
CULVERT END PROTECTION DETAIL

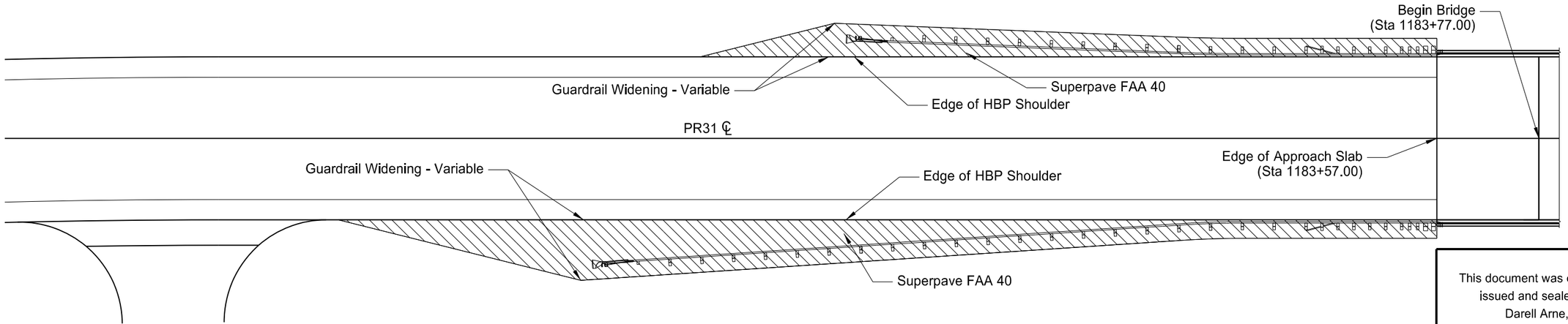
ND 31 - 13 Miles North of SD Border

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	20	4



ND 31 - Structure No. 31-012.802

SPEC	CODE	BID ITEM	UNIT	Begin Bridge Quantities LT	Begin Bridge Quantities RT
302	0100	SALVAGED BASE COURSE @ 1.875 Ton/CY	TON	22	44
401	0100	MC70 OR 250 LIQUID ASPHALT @ 0.25 Gal/SY	GAL	18	39
401	0150	SS1H OR CSS1H OR MS1EMULSIFIED ASPHALT @ 0.05 Gal/SY	GAL	4	8
408	0445	PG 58-28 ASPHALT CEMENT @ 6.0% HBP	TON	0.6	1.2
408	0800	SUPERPAVE FAA 40 @ 2 Ton/CY	TON	9	19



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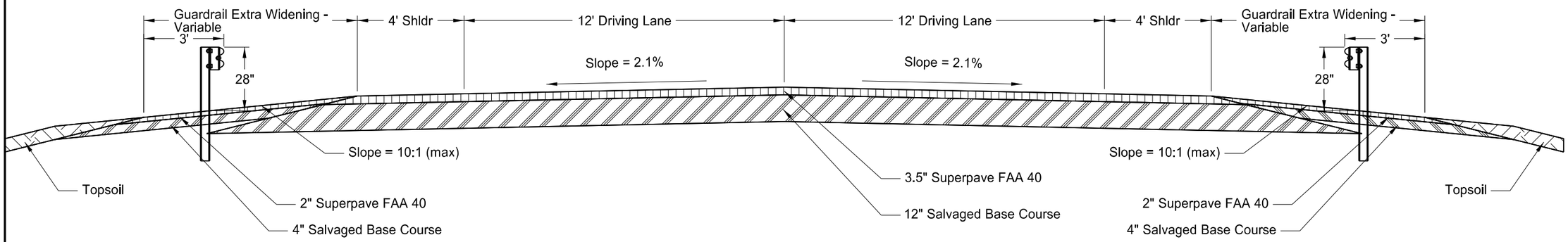
GUARDRAIL SURFACING AT BRIDGE ENDS

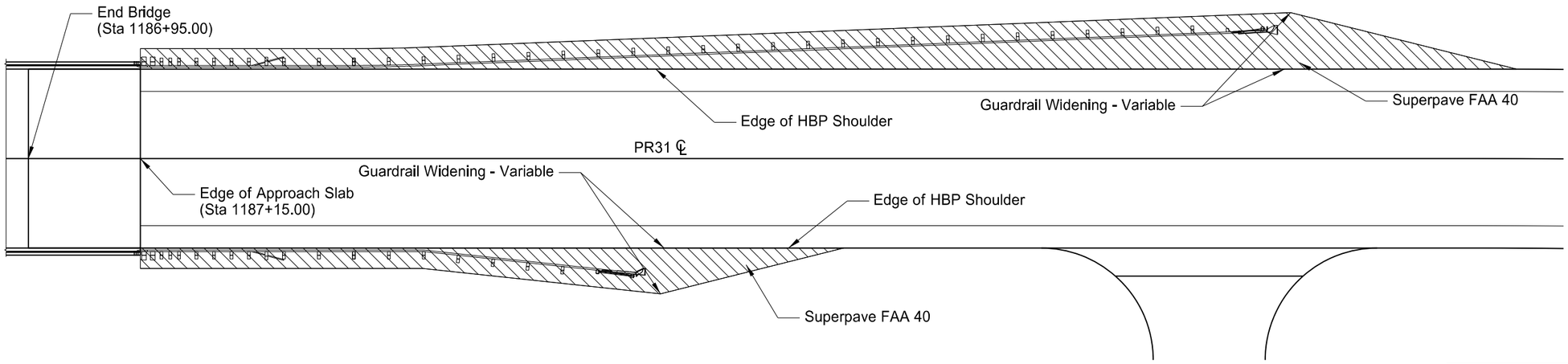
ND 31 - 13 Miles North of SD Border

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	20	5



ND 31 - Structure No. 31-012.802

SPEC	CODE	BID ITEM	UNIT	End Bridge Quantities LT	End Bridge Quantities RT
302	0100	SALVAGED BASE COURSE @ 1.875 Ton/CY	TON	47	20
401	0100	MC70 OR 250 LIQUID ASPHALT @ 0.25 Gal/SY	GAL	41	16
401	0150	SS1H OR CSS1H OR MS1 EMULSIFIED ASPHALT @ 0.05 Gal/SY	GAL	9	4
408	0445	PG 58-28 ASPHALT CEMENT @ 6.0% HBP	TON	1.2	0.5
408	0800	SUPERPAVE FAA 40 @ 2 Ton/CY	TON	20	8



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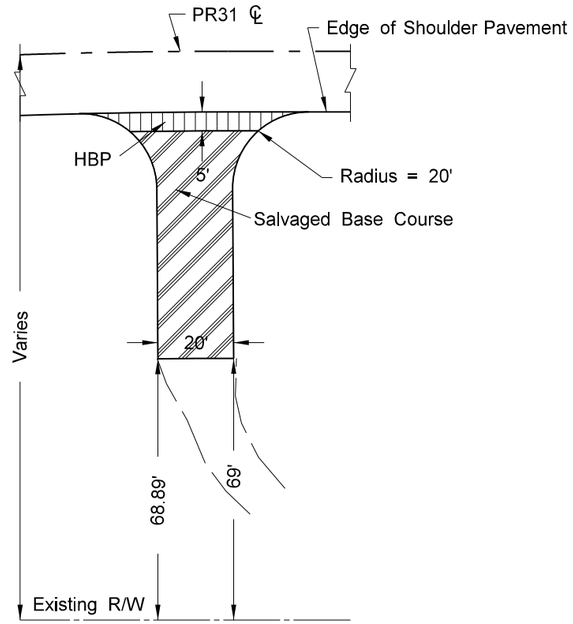
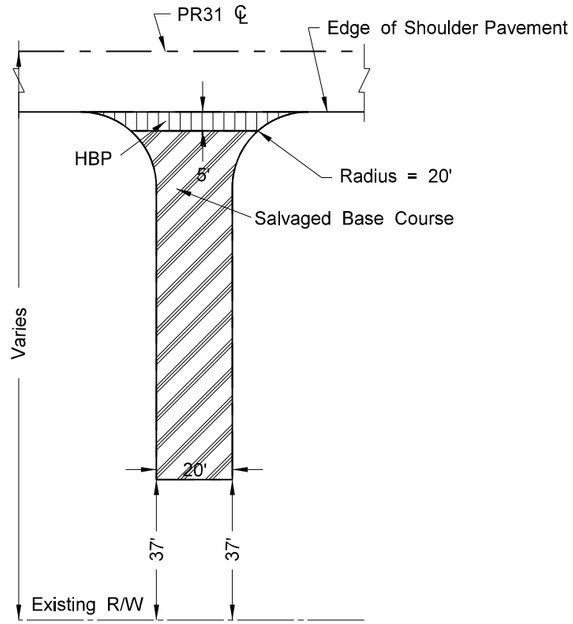
GUARDRAIL SURFACING AT BRIDGE ENDS

ND 31 - 13 Miles North of SD Border

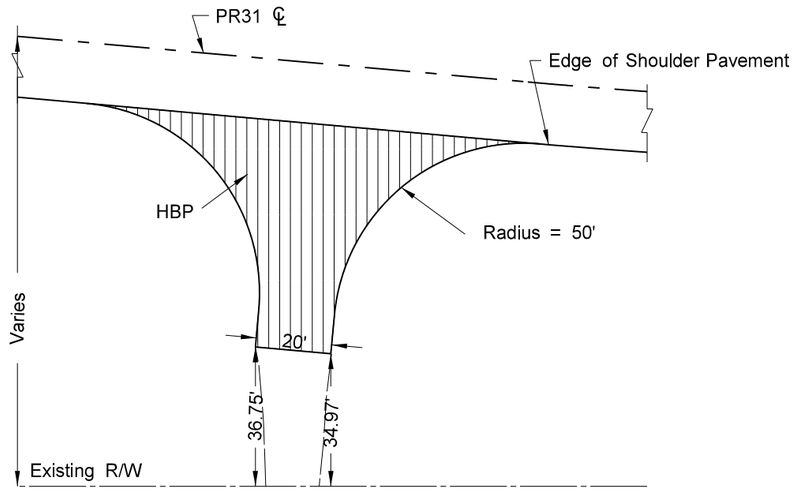
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	20	6



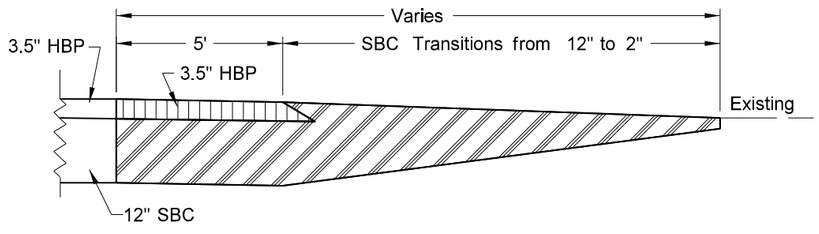
Field Drive Approach
Sta 1181+09.00 (Rt)



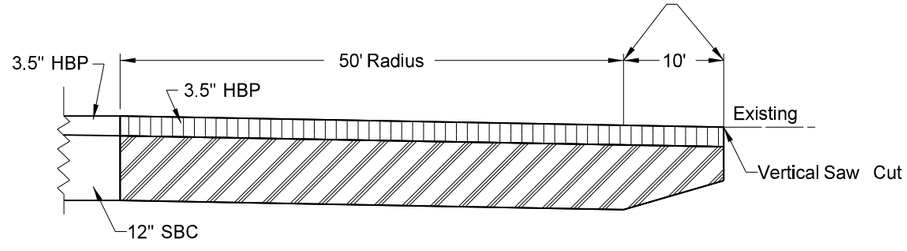
Field Drive Approach
Sta 1189+06.00 (Rt)



Paved Private Drive Approach
Sta 1194+59.00 (Rt)



Field Drive Approach - Profile View
Sta 1181+09.00 (Rt)
Sta 1189+06.00 (Rt)



Paved Private Drive Approach - Profile View
Sta 1194+59.00 (Rt)

BASIS OF ESTIMATE			Location	Field Drive	Field Drive	Paved Private Drive	TOTAL
				Sta 1181+09.00 Rt	Sta 1189+06.00 Rt	Sta 1194+59.00 Rt	
SPEC	CODE	DESCRIPTION	UNIT	Sub Total	Sub Total	Sub Total	
202	0153	SAW BITUMINOUS SURFACING - FULL DEPTH	LF			20	20
302	0100	SALVAGED BASE COURSE @ 1.875 Ton/CY	TON	78	107	196	381
401	0150	SS1H OR CSS1H OR MS1 EMULSIFIED ASPHALT @ 0.05 Gal/SY (2 lifts)	GAL	3	3	26	32
408	0445	PG 58-28 ASPHALT CEMENT @ 6.0% HBP	TON	0.3	0.3	3.2	3.8
408	0800	SUPERPAVE FAA 40 @ 2 Ton/CY	TON	5	5	52	62

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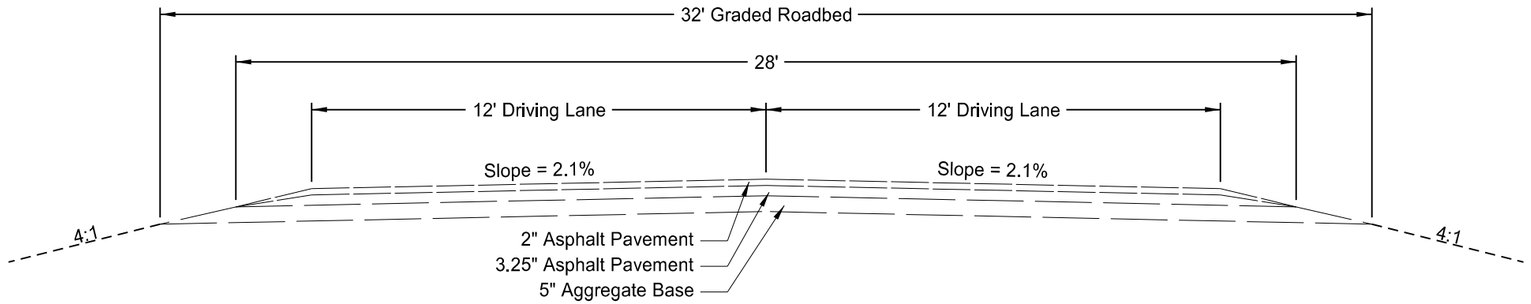
APPROACH PAVING DETAILS

ND 31 - 13 Miles North of SD Border

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	30	1



EXISTING TYPICAL SECTION
Sta 1171+90 to Sta 1184+40.3
Sta 1186+40.3 to Sta 1198+80

Note: Existing Structure No. 31-012.802 is from Sta 1184+40.3 to Sta 1186+40.3.

Note: Existing Stationing is based off of Chain SCL31.

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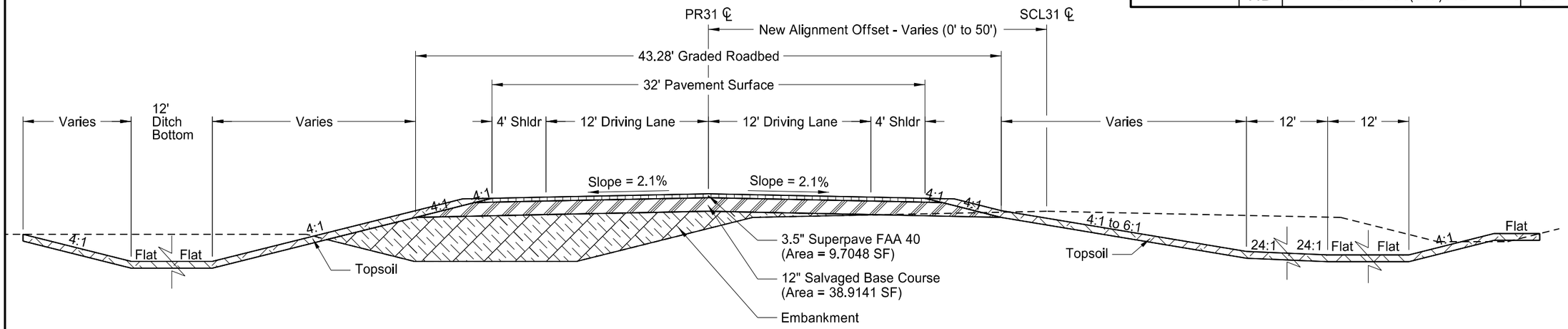
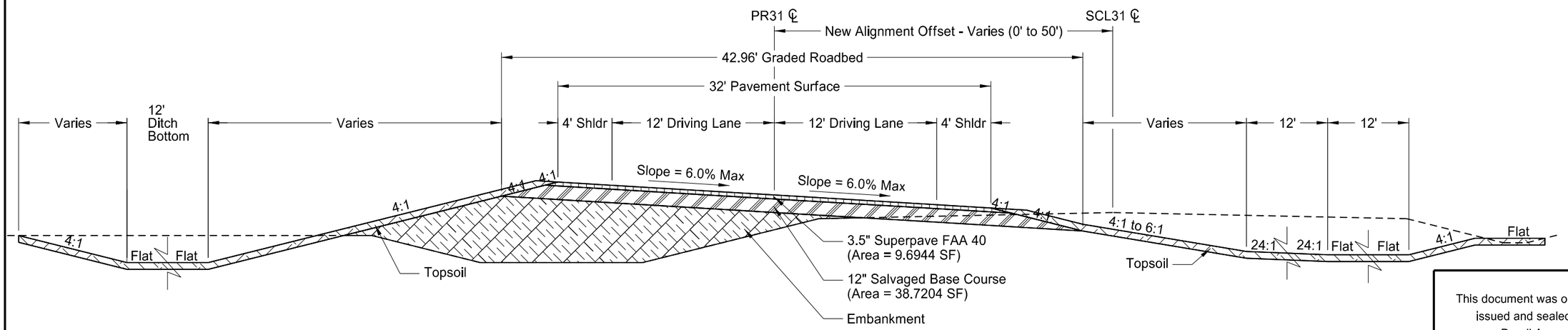
EXISTING TYPICAL SECTION

ND 31 - 13 Miles North of SD Border

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	30	2



PROPOSED TYPICAL SECTION - TANGENT
Sta 1171+90.00 to Sta 1174+09.39
Sta 1175+57.70 to Sta 1179+69.70
Sta 1181+18.00 to Sta 1183+57.00
Sta 1187+15.00 to Sta 1189+54.00
Sta 1191+02.30 to Sta 1195+14.30
Sta 1196+58.53 Ahd to Sta 1198+80.00



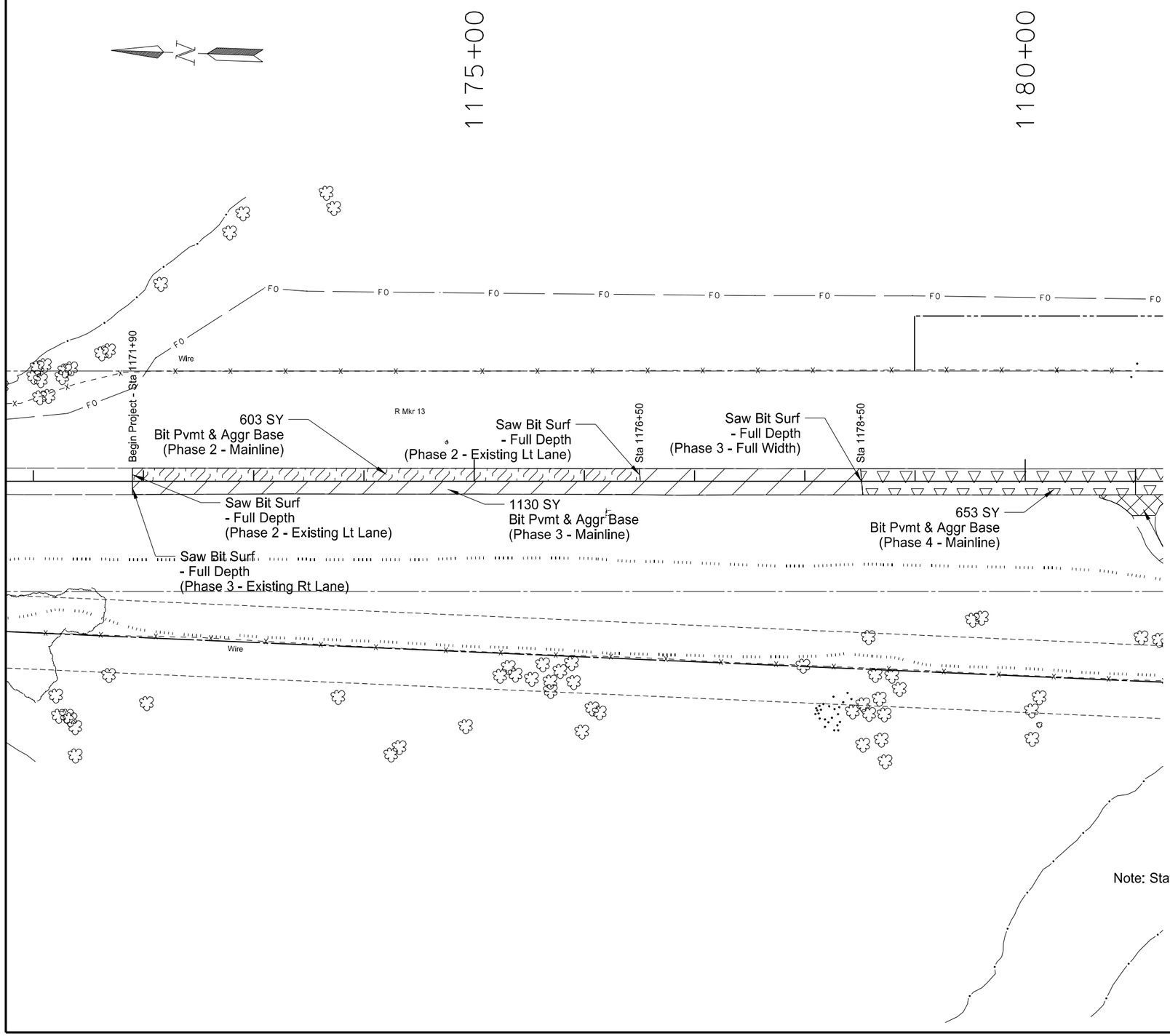
PROPOSED SUPERELEVATED TYPICAL SECTION
Sta 1174+09.39 to Sta 1175+57.70 (SE = 6.0% Rt)
Sta 1179+69.70 to Sta 1181+18.00 (SE = 6.0% Lt)
Sta 1189+54.00 to Sta 1191+02.30 (SE = 6.0% Lt)
Sta 1195+14.30 to Sta 1196+62.61 Bk (SE = 6.0% Rt)

Note 1: All stationing is based off of Chain PR31.
Note 2: Curve stations are from PC to PT. See Section 20 for superelevation transitions.

PROPOSED TYPICAL SECTIONS

ND 31 - 13 Miles North of SD Border

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	40	1



SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	135	**REMOVAL OF BITUMINOUS SURFACING**		
		Bituminous Pavement		
		1171+90 to 1176+50 (Mainline - Phase 2)	TON	165
		1171+90 to 1178+50 (Mainline - Phase 3)	TON	309
		1178+50 to 1181+00 (Mainline - Phase 4)	TON	179
		Aggregate Base		
		1171+90 to 1176+50 (Mainline - Phase 2)	TON	94
		1171+90 to 1178+50 (Mainline - Phase 3)	TON	177
		1178+50 to 1181+00 (Mainline - Phase 4)	TON	102
202	153	**SAW BITUMINOUS SURFACING - FULL DEPTH**		
		1171+90 (Phase 2 - Existing Lt Lane)	LF	12
		1171+90 (Phase 3 - Existing Rt Lane)	LF	12
		1176+50 (Phase 2 - Existing Lt Lane)	LF	12
		1178+50 (Phase 3 - Existing Lt & Rt Lanes)	LF	24

Phase 2 Mainline Removal
(5.25" Bit Pvmt, 3" Aggregate Base)

Phase 3 Mainline Removal
(5.25" Bit Pvmt, 3" Aggregate Base)

Phase 4 Mainline Removal
(5.25" Bit Pvmt, 3" Aggregate Base)

Phase 4 Approach Removal
(4" Aggregate Base)

Phase 4 Approach Removal
(2" Bit Pvmt, 4" Aggregate Base)

Note: Stationing is based off of Chain SCL31.

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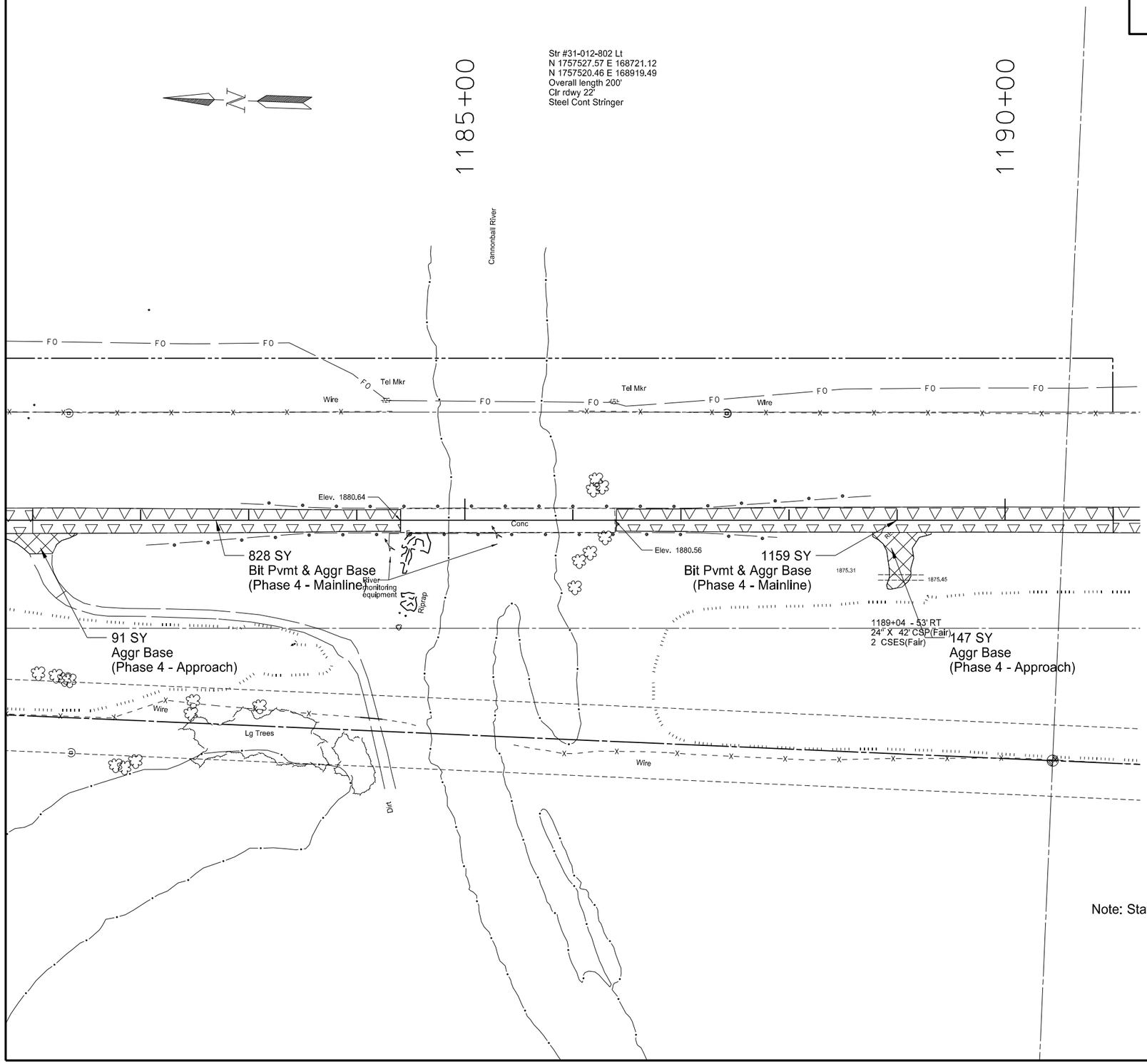
PAVEMENT REMOVALS
Sta 1171+90 to Sta 1181+00

ND 31 - 13 Miles North of SD Border

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	40	2



SPEC	CODE	BID ITEM	UNIT	QUANTITY
201	370	**REMOVAL OF TREES 10IN**		
		Approximately Sta 1186+06 - Near Existing Bridge	EA	3
202	135	**REMOVAL OF BITUMINOUS SURFACING**		
		Bituminous Pavement		
		1181+00 to 1184+40 (Mainline - Phase 4)	TON	226
		1186+40 to 1191+00 (Mainline - Phase 4)	TON	317
		Aggregate Base		
		1181+00 to 1184+40 (Mainline - Phase 4)	TON	129
		1186+40 to 1191+00 (Mainline - Phase 4)	TON	181
		1181+09 (Approach Rt - Phase 4)	TON	19
		1189+04 (Approach Rt - Phase 4)	TON	31

- Phase 2 Mainline Removal (5.25" Bit Pvmt, 3" Aggregate Base)
- Phase 3 Mainline Removal (5.25" Bit Pvmt, 3" Aggregate Base)
- Phase 4 Mainline Removal (5.25" Bit Pvmt, 3" Aggregate Base)
- Phase 4 Approach Removal (4" Aggregate Base)
- Phase 4 Approach Removal (2" Bit Pvmt, 4" Aggregate Base)

Note: Stationing is based off of Chain SCL31.

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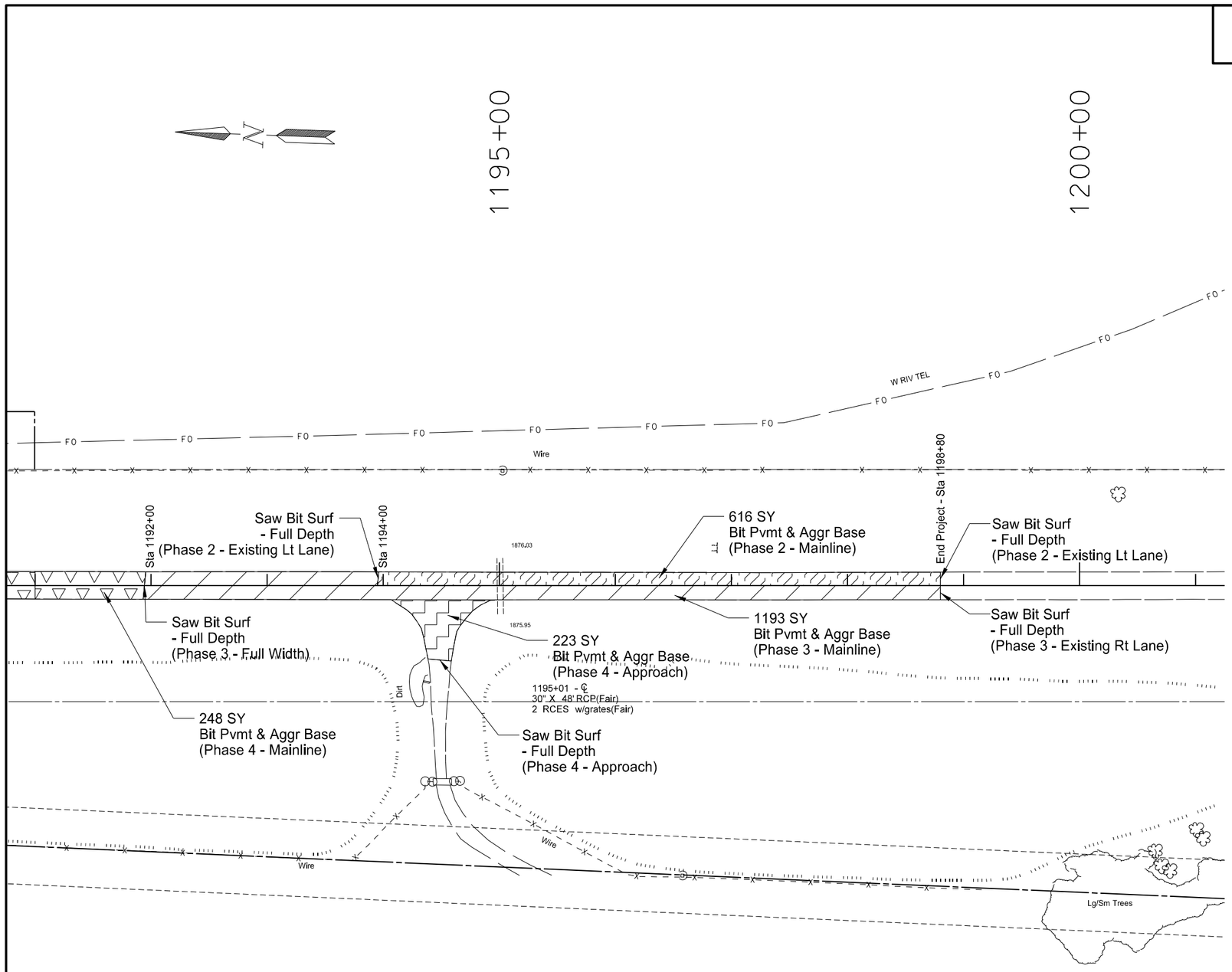
PAVEMENT REMOVALS
Sta 1181+00 to Sta 1191+00

ND 31 - 13 Miles North of SD Border

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	40	3



SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	135	**REMOVAL OF BITUMINOUS SURFACING**		
		Bituminous Pavement		
		1191+00 to 1192+00 (Mainline - Phase 4)	TON	68
		1192+00 to 1198+80 (Mainline - Phase 3)	TON	326
		1194+00 to 1198+80 (Mainline - Phase 2)	TON	169
		1194+49 (Approach Rt - Phase 4)	TON	23
		Aggregate Base		
		1191+00 to 1192+00 (Mainline - Phase 4)	TON	39
		1192+00 to 1198+80 (Mainline - Phase 3)	TON	186
		1194+00 to 1198+80 (Mainline - Phase 2)	TON	96
		1194+49 (Approach Rt - Phase 4)	TON	47
202	153	**SAW BITUMINOUS SURFACING - FULL DEPTH**		
		1192+00 (Phase 3 - Existing Lt & Rt Lanes)	LF	24
		1194+00 (Phase 2 - Existing Lt Lane)	LF	12
		1194+49 (Phase 4 - Approach Rt)	LF	20
		1198+80 (Phase 2 - Existing Lt Lane)	LF	12
		1198+80 (Phase 3 - Existing Rt Lane)	LF	12

Phase 2 Mainline Removal
(5.25" Bit Pvmt, 3" Aggregate Base)

Phase 3 Mainline Removal
(5.25" Bit Pvmt, 3" Aggregate Base)

Phase 4 Mainline Removal
(5.25" Bit Pvmt, 3" Aggregate Base)

Phase 4 Approach Removal
(4" Aggregate Base)

Phase 4 Approach Removal
(2" Bit Pvmt, 4" Aggregate Base)

Note: Stationing is based off of Chain SCL31.

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PAVEMENT REMOVALS
Sta 1191+00 to Sta 1198+80

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	50	1

HYDRAULIC DATA FOR BRS-1-031(017)012 (A)

STATION	EXISTING PIPE	PROPOSED PIPE SIZE	DRAINAGE AREA (ACRES)	25-YEAR DATA				100-YEAR DATA	
				DESIGN DISCHARGE (CFS)	DESIGN HEADWATER (FT)	DESIGN VELOCITY (FPS)	DESIGN STAGE (NAVD 88)	100-YEAR DISCHARGE (CFS)	100-YEAR STAGE (NAVD 88)
1195+05	30" RCP	30" RCP	18.0	19.3	2.32	6.33	1878.89	31.0	1879.76

(A) Hydraulic data provided is for smooth-walled (Manning's n=0.012) type conduits.

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Culvert Hydraulic Data

ND Highway 31

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	51	1

Begin Station / Location	Begin Offset	End Station / Location	End Offset	Length	Pipe Conc Reinf Pay Size	Pipe Conduit - Approach Pay Size	Allowable Material	Required Diameter	Minimum Thickness	End Sections (A) Begin	End Sections (A) End	Remove & Dispose	Remove & Relay	Install New	Applicable Backfill Detail
				LF				In	In	EA	EA	EA	EA	EA	
1188+81	60' Rt	1189+29	60' Rt	48		24	Reinforced Concrete Pipe - Class III **(barrel length = 44 LF)**	24		1	1				N/A
							Zinc Coated Steel (2-2/3" x 1/2" Ribs)	24	0.064						
							Aluminum Coated Steel (Type 2)	24	0.064						
							Polymeric Coated Steel (over zinc or aluminum coated steel)	24	0.064						
							Corrugated Aluminum Alloy Culverts	24	0.060						
							High Density Polyethylene (HDPE)	24							
1195+02	26' Lt	1195+03	16' Lt	10	30		Reinforced Concrete Pipe - Class III **(barrel length = 10 LF)**	30				1		1 (Trav)	D-714-26
1195+08	32' Rt	1195+09	42' Rt	10	30		Reinforced Concrete Pipe - Class III **(barrel length = 10 LF)**	30					1		D-714-26

(A) Not paid for separately, to be included in the price bid for Pipe Conduit.
Note: Trav = Traversable End Section

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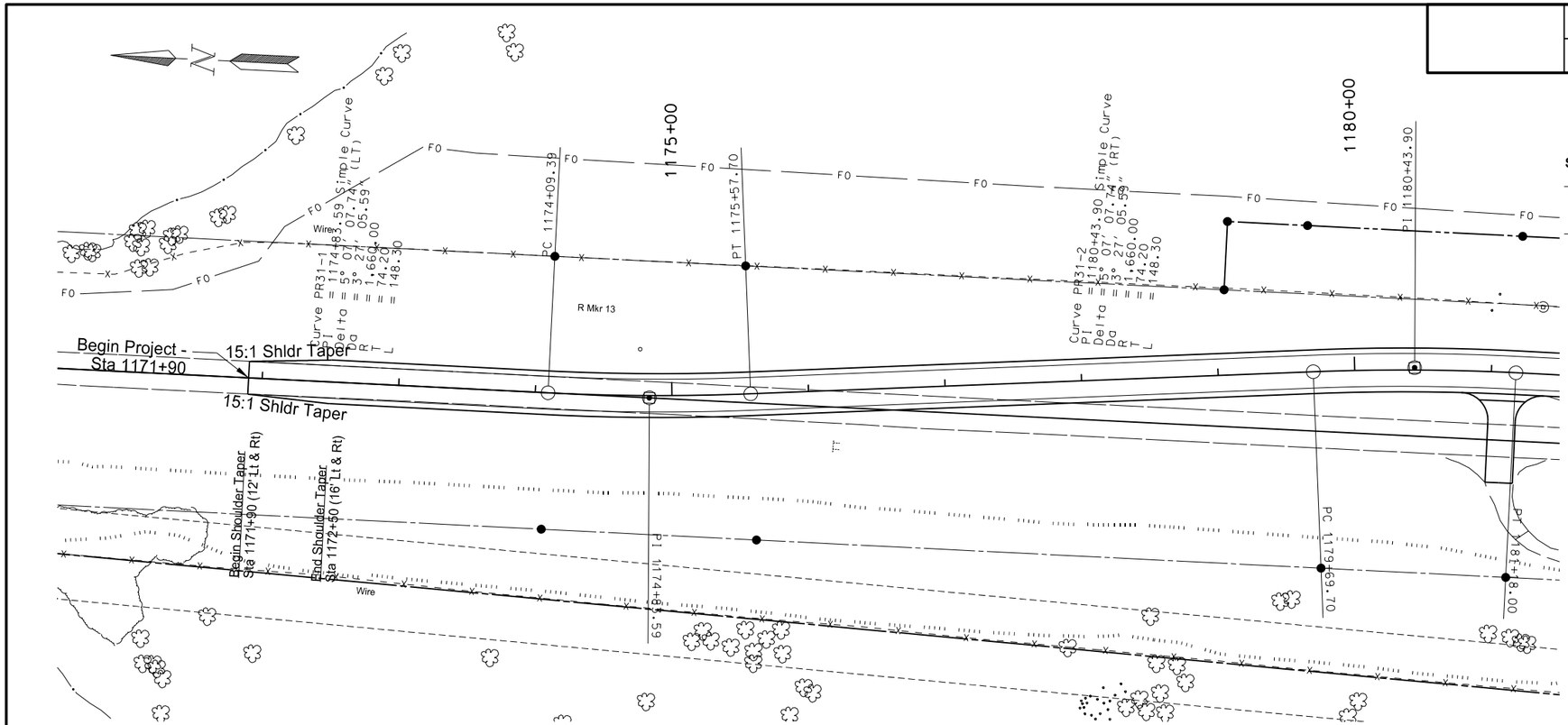
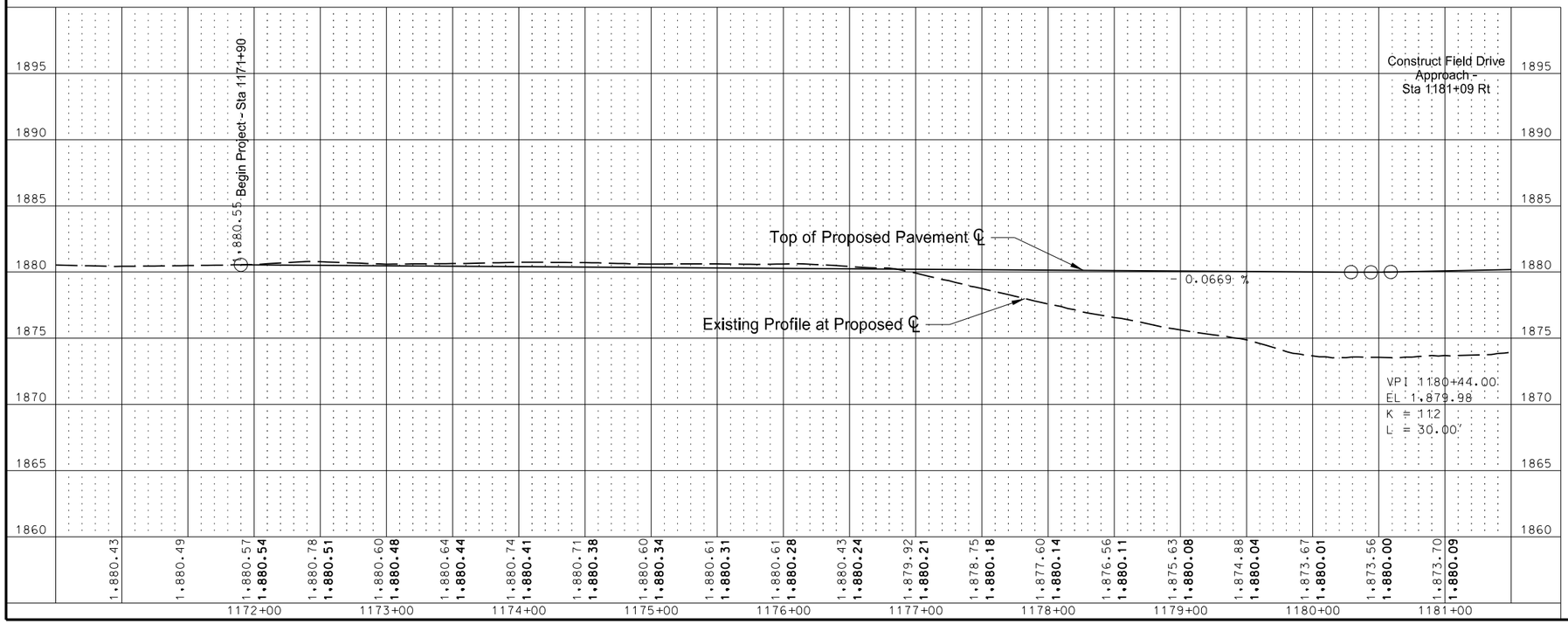
ALLOWABLE PIPE LIST

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	60	1





SPEC CODE		BID ITEM	UNIT	QUANTITY
720	100	**MONUMENTS**		
		1174+83.54 - 1.66' Rt - PI	EA	1
		1180+43.85 - 1.66' Lt - PI	EA	1
720	110	**RIGHT OF WAY MARKERS**		
		1174+09.39 - 100' Lt & 100' Rt	EA	2
		1175+57.70 - 93.75' Lt & 107.05' Rt	EA	2
		1179+06.82 - 62.48' Lt	EA	1
		1179+11.28 - 112.28' Lt	EA	1
		1179+69.70 - 107.05' Lt & 143.95' Rt	EA	2

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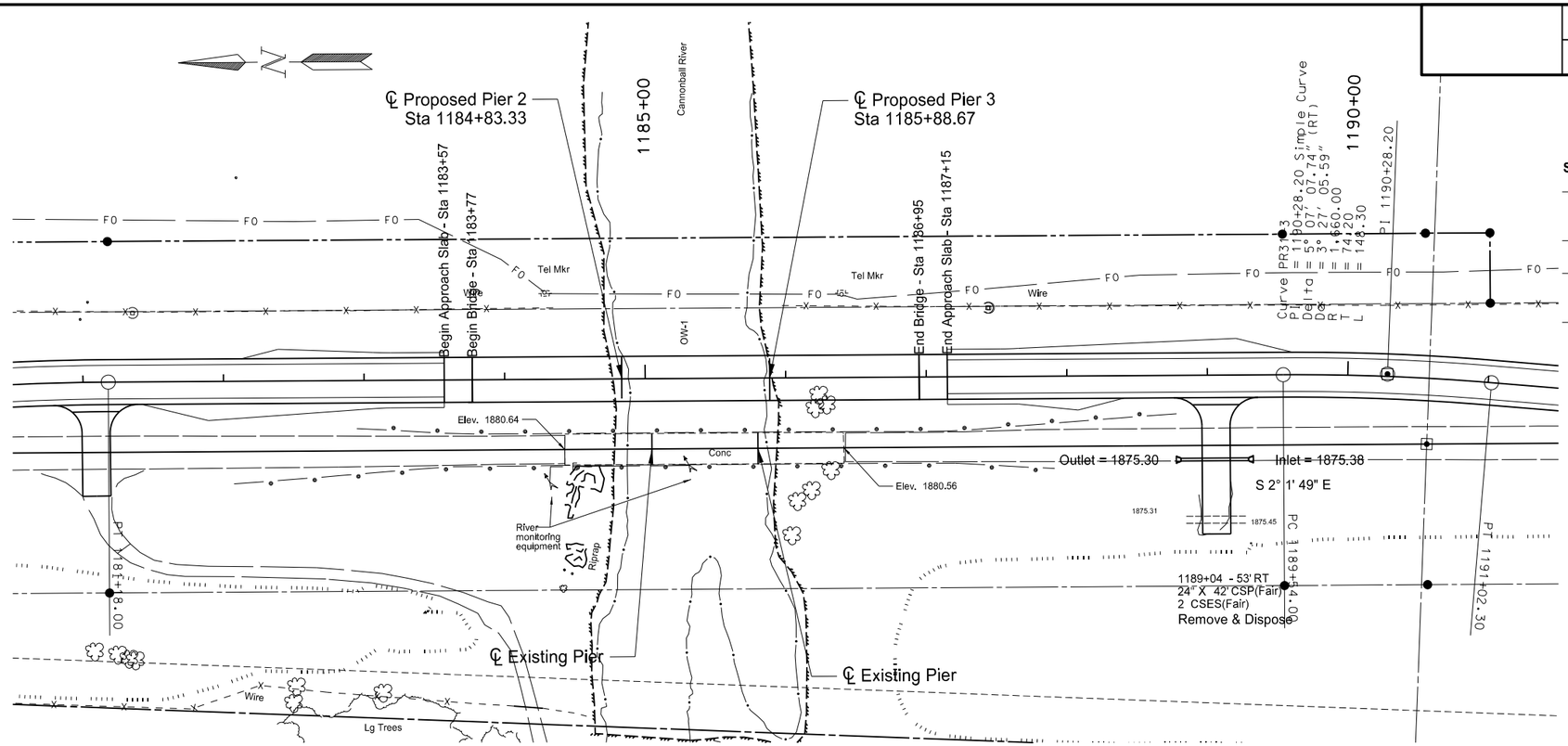
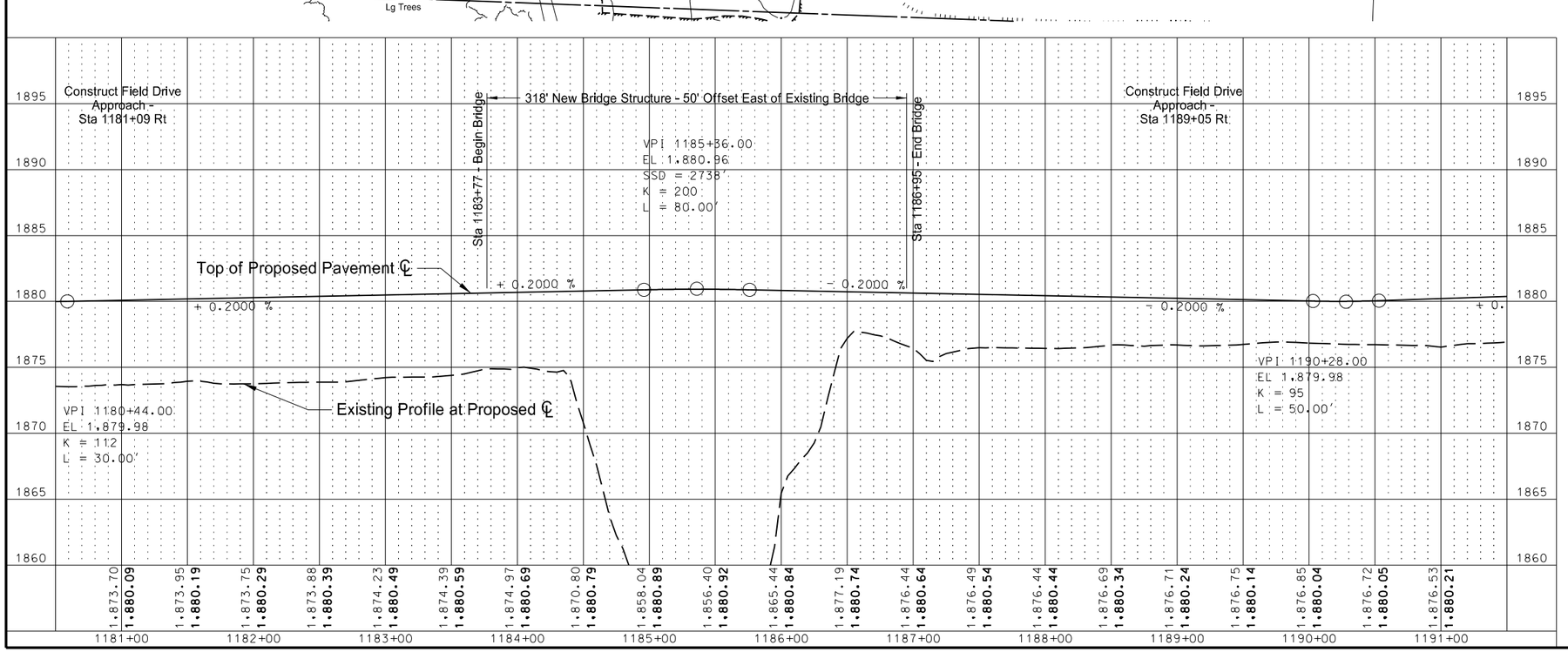
PLAN & PROFILE SHEET
Sta 1171+90 to Sta 1181+00

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	60	2





SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	174	**REMOVAL OF PIPE ALL TYPES AND SIZES**		
		1189+04 Rt (Includes 2-CSES)	LF	42
714	4106	**PIPE CONDUIT 24IN-APPROACH**		
		1189+05 Rt	LF	48
720	100	**MONUMENTS**		
		1190+28.15 - 1.66' Lt - PI	EA	1
		1190+58.84 - 46.78' Rt - Quarter Line Crossing	EA	1
720	110	**RIGHT OF WAY MARKERS**		
		1181+18.00 - 100' Lt & 150' Rt	EA	2
		1189+54.00 - 100' Lt & 150' Rt	EA	2
		1190+49.92 - 102.94' Lt	EA	1
		1190+65.76 - 146.57' Rt	EA	1
		1190+92.97 - 106.19' Lt	EA	1
		1190+97.02 - 56.37' Lt	EA	1

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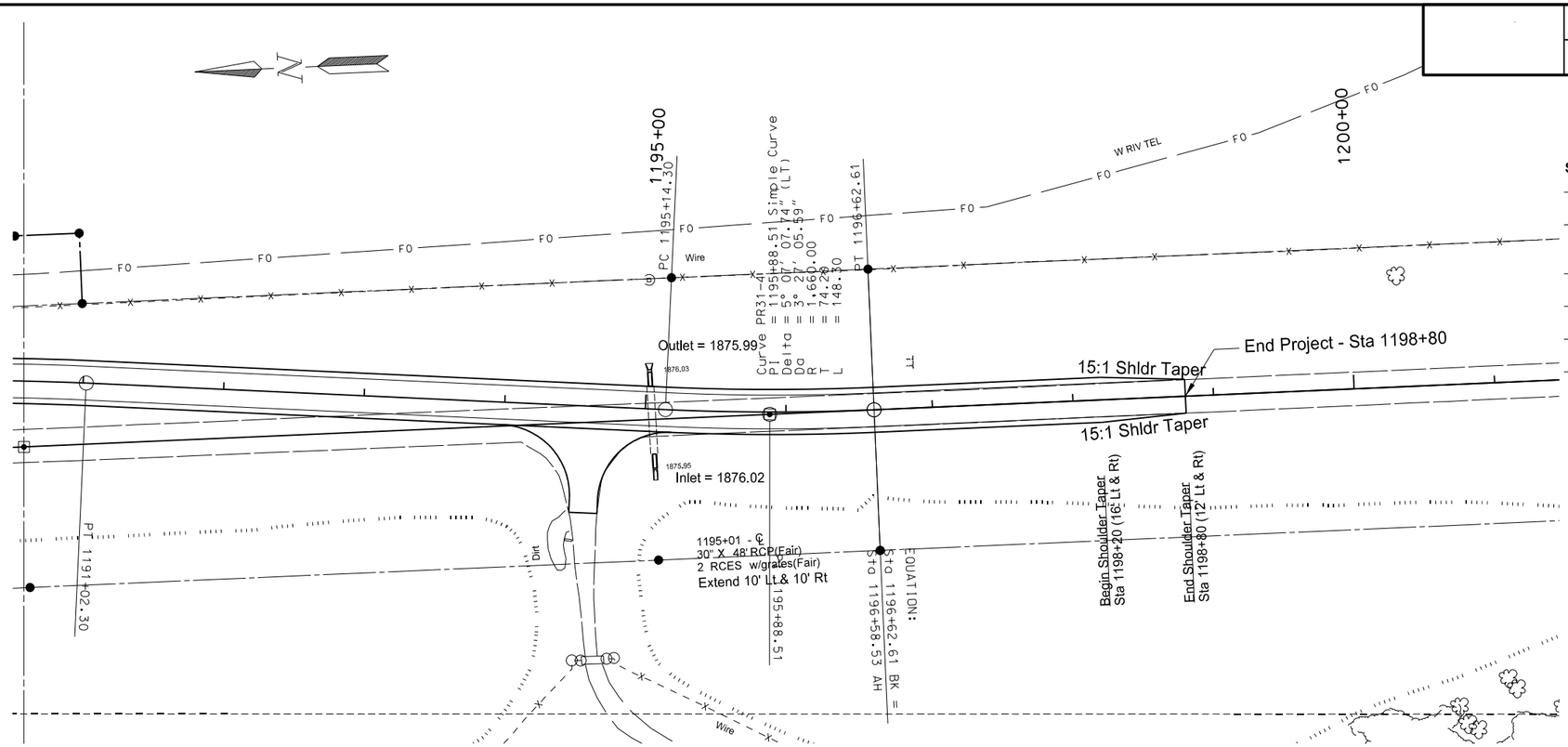
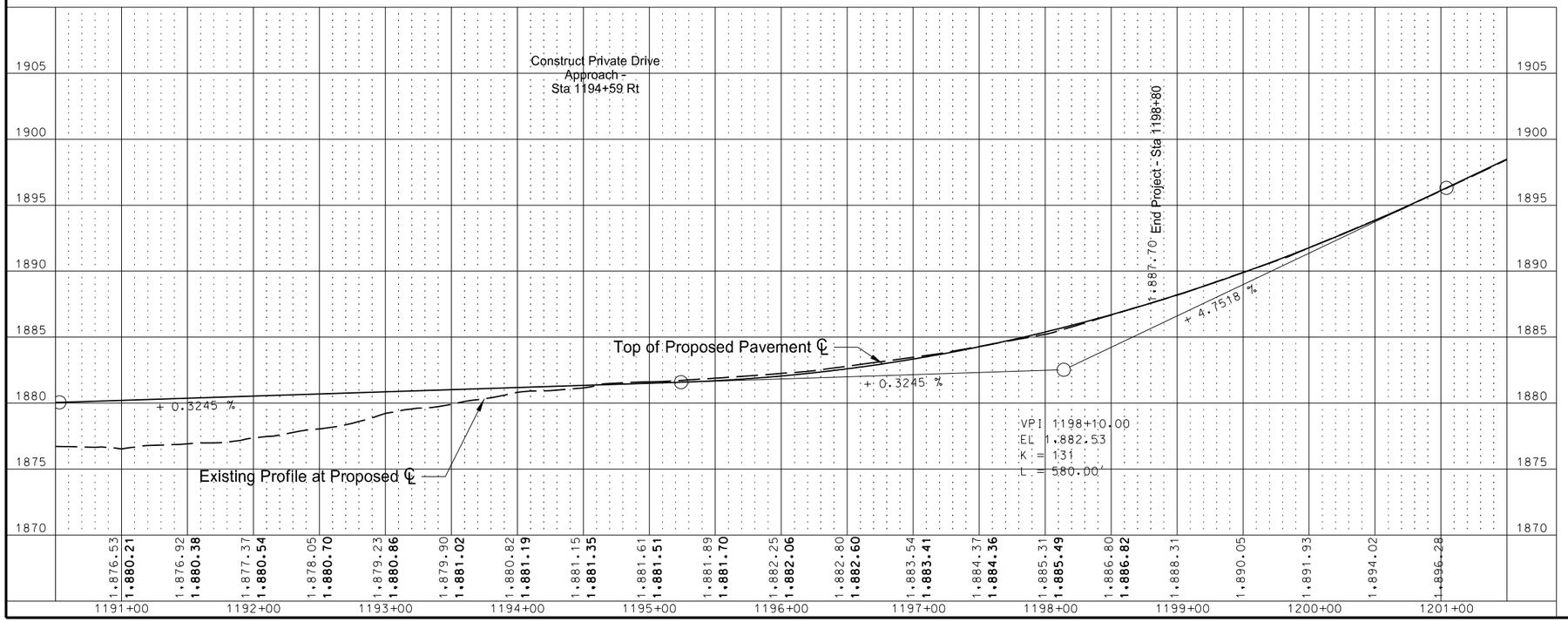
PLAN & PROFILE SHEET
Sta 1181+00 to Sta 1191+00

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	60	3





SPEC CODE		BID ITEM	UNIT	QUANTITY
202	169	**REMOVAL OF END SECTION-ALL TYPES & SIZES**		
		1195+03 CL-LT Extension	EA	1
714	820	**PIPE CONC REINF 30IN CL III**		
		1195+03 CL-LT Extension	LF	10
		1195+08 CL-RT Extension	LF	10
714	3033	**END SECT-TRAVERSABLE REINF. CONC. 30IN**		
		1195+03 CL-LT Extension	EA	1
714	9660	**REMOVE & RELAY END SECTION-ALL TYPE & SIZES**		
		1195+08 CL-RT Extension	EA	1
720	100	**MONUMENTS**		
		1195+88.46 - 1.66' Rt - PI	EA	1
720	110	**RIGHT OF WAY MARKERS**		
		1195+14.30 - 93.75' Lt & 107.05' Rt	EA	2
		1196+62.61 Bk - 100' Lt & 100' Rt	EA	2

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PLAN & PROFILE SHEET
Sta 1191+00 to Sta 1198+80

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	75	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
708	1375	**FLOTATION SILT CURTAIN**		
		Approximately 1184+75 (Temporary)	LF	250
		Approximately 1185+80 (Temporary)	LF	250
708	1376	**REMOVAL FLOTATION SILT CURTAIN**		
		Approximately 1184+75 (Temporary)	LF	250
		Approximately 1185+80 (Temporary)	LF	250
708	1430	**FIBER ROLLS 12IN**		
		1171+90 Lt to 1181+00 Lt (Temporary)	LF	760
		1171+90 Lt to 1181+00 Lt (Permanent)	LF	760
		1171+90 Rt to 1181+00 Rt (Temporary)	LF	460
		1171+90 Rt to 1181+00 Rt (Permanent)	LF	460
		1181+00 Lt to 1191+00 Lt (Temporary)	LF	80
		1181+00 Lt to 1191+00 Lt (Permanent)	LF	80
		1181+00 Rt to 1191+00 Rt (Temporary)	LF	95
		1181+00 Rt to 1191+00 Rt (Permanent)	LF	95
708	1431	**REMOVAL FIBER ROLLS 12IN**		
		1171+90 Lt to 1181+00 Lt (Temporary)	LF	760
		1171+90 Rt to 1181+00 Rt (Temporary)	LF	460
		1181+00 Lt to 1191+00 Lt (Temporary)	LF	80
		1181+00 Rt to 1191+00 Rt (Temporary)	LF	95
708	2240	**SEEDING - TYPE B - CL II**		
		1171+90 Lt to 1181+00 Lt	ACRE	1.09
		1171+90 Rt to 1181+00 Rt	ACRE	1.78
		1181+00 Lt to 1191+00 Lt	ACRE	1.08
		1181+00 Rt to 1191+00 Rt	ACRE	2.04
708	2260	**SEEDING - TYPE B - CL IV**		
		1171+90 Lt to 1181+00 Lt	ACRE	1.09
		1171+90 Rt to 1181+00 Rt	ACRE	1.78
		1181+00 Lt to 1191+00 Lt	ACRE	1.08
		1181+00 Rt to 1191+00 Rt	ACRE	2.04
708	5500	**MULCHING**		
		1171+90 Lt to 1181+00 Lt	ACRE	2.18
		1171+90 Rt to 1181+00 Rt	ACRE	3.56
		1181+00 Lt to 1191+00 Lt	ACRE	2.16
		1181+00 Rt to 1191+00 Rt	ACRE	4.08
708	5661	**TRM TYPE 2**		
		North Approach Slab (Lt & Rt)	SY	101
		South Approach Slab (Lt & Rt)	SY	92

LEGEND

- Flotation Silt Curtain
- Fiber Rolls 12IN
- Seeding and Mulching
- Temporary Other Water Impacts
- Permanent Other Water Impacts (Includes Riprap Placement as shown in bridge plans)
- TRM Type 2

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WETLANDS, EROSION CONTROL, AND SEEDING

ND 31 - 13 Miles North of SD Border

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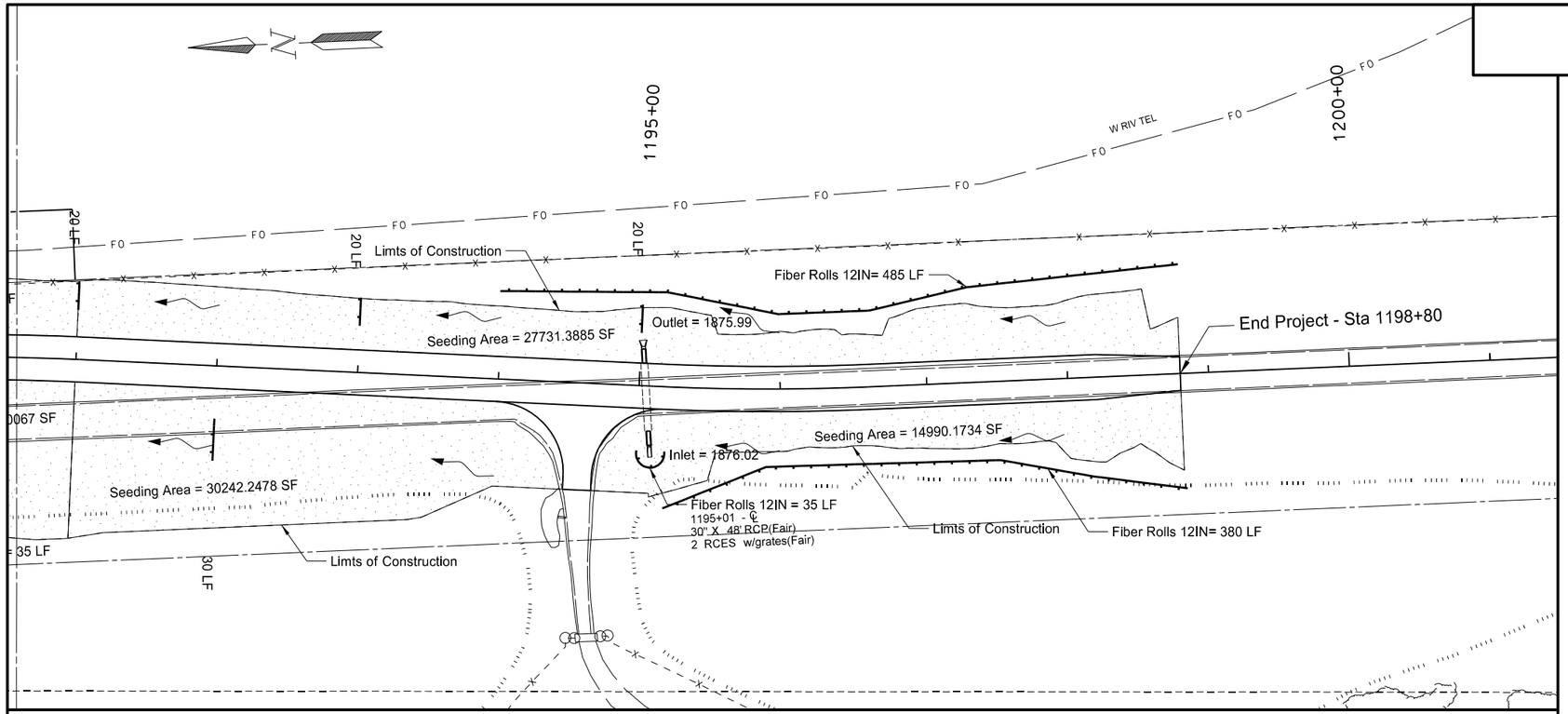

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	75	2

708	**1430**	**FIBER ROLLS 12IN**		
		1191+00 Lt to 1198+80 Lt (Temporary)	LF	525
		1191+00 Lt to 1198+80 Lt (Permanent)	LF	525
		1191+00 Rt to 1198+80 Rt (Temporary)	LF	445
		1191+00 Rt to 1198+80 Rt (Permanent)	LF	445
708	**1431**	**REMOVAL FIBER ROLLS 12IN**		
		1191+00 Lt to 1198+80 Lt (Temporary)	LF	525
		1191+00 Rt to 1198+80 Rt (Temporary)	LF	445
708	**2240**	**SEEDING - TYPE B - CL II**		
		1191+00 Lt to 1198+80 Lt	ACRE	0.64
		1191+00 Rt to 1198+80 Rt	ACRE	1.04
708	**2260**	**SEEDING - TYPE B - CL IV**		
		1191+00 Lt to 1198+80 Lt	ACRE	0.64
		1191+00 Rt to 1198+80 Rt	ACRE	1.04
708	**5500**	**MULCHING**		
		1191+00 Lt to 1198+80 Lt	ACRE	1.28
		1191+00 Rt to 1198+80 Rt	ACRE	2.08

LEGEND

- Flotation Silt Curtain
- Fiber Rolls 12IN
- Seeding and Mulching
- Temporary Other Water Impacts
- Permanent Other Water Impacts (Includes Riprap Placement as shown in bridge plans)
- TRM Type 2

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WETLANDS, EROSION CONTROL, AND SEEDING

ND 31 - 13 Miles North of SD Border

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - ND 31 - 13 miles north of SD border - Cannonball River Bridge

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	81	1

HORIZONTAL ALIGNMENT

PNT	STATION	NORTHING	EASTING
ND 31 (SCL31)			
BEG	1148+33.40	172,519.67	1,757,321.77
PC	1154+24.89	171,931.54	1,757,384.77
PI C402	1158+33.40	171,525.35	1,757,428.27
PT	1162+41.56	171,117.10	1,757,442.75
Sec Xing	1164+06.60	170,952.17	1,757,448.59
PC	1208+25.95	166,535.59	1,757,605.17
PI C401	1216+80.87	165,681.21	1,757,635.46
Twp Xing	AHD TAN 23.60' from PI	165,658.01	1,757,639.78
PT	1225+32.62	164,840.79	1,757,792.19
END	1226+77.70	164,698.16	1,757,818.78

CURVE DATA

ARC DEFINITION		
	C402	C401
PI STA	1158+33.40	1216+80.87
Delta	4° 05' RT	8° 32' LT
D_a	0° 30'	0° 30'
R	11,459.19'	11,459.19'
T	408.51'	854.92'
L	816.67'	1,706.67'

US PUBLIC LAND SURVEY DATA

DESC. SEC-TWP-RGE	NORTHING	EASTING
SW Cor Sec 33 T-131-N R-85-W	165663.70	1757297.78
W 1/4 Cor Sec 33 T-131-N R-85-W	168308.50	1757319.68
NW Cor Sec 33 T-131-N R-85-W	170953.29	1757341.58

REFERENCE MARKERS

R Mkr #	NORTHING	EASTING	STATION	OFFSET
R Mkr 13	169885.57	1757521.64	1174+75	35' LT

SURVEY CONTROL POINTS

PNT	NORTHING	EASTING	ELEV	STATION	OFFSET	CONTROL POINT DESCRIPTION
PRIMARY CONTROL						
GPS 1	164971.88	1757694.00	1953.52	1223+87	73' Rt	#6 Rebar w/ 1 1/2" Plastic cap stamped 'ND DOT PE/LS 1139'
SECONDARY CONTROL						
BM N502	165748.79	1757760.25	1945.41	1216+25	99' Lt	
BM NGS M502	171108.26	1757342.82	1902.04	1162+47	100' Rt	
RTK 500	173367.72	1757354.10	1949.02	N/A	N/A	

NOTES: Sheet 1 of 1

Date Survey Completed / /

☐ Assumed Coordinates

☒ All coordinates on this sheet are Grant County ground coordinates. They are derived from the "North Dakota Coordinate System of 1983", NAD83(CORS), South Zone Combination factor (cf) = 0.9998615

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

INITIALIZING BENCH MARK NDGPS Stations (OPUS)

☒ NAVD-88

☐ NGVD-29

☒ ENGLISH UNITS

☐ METRIC UNITS

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	82	1

Chain PR31 contains:
8000 CUR PR31-1 CUR PR31-2 CUR PR31-3 CUR PR31-4 8010 8001

Beginning chain PR31 description
==========

Point 8000 N 170,359.1404 E 1,757,469.6169 Sta 1170+00.00

Course from 8000 to PC PR31-1 S 2° 01' 49.29" E Dist 409.3905

Curve Data
———

Curve PR31-1
P.I. Station 1174+83.59 N 169,875.8518 E 1,757,486.7501
Delta = 5° 07' 07.74" (LT)
Degree = 3° 27' 05.59"
Tangent = 74.2017
Length = 148.3048
Radius = 1,660.0000
External = 1.6576
Long Chord = 148.2555
Mid. Ord. = 1.6559
P.C. Station 1174+09.39 N 169,950.0069 E 1,757,484.1212
P.T. Station 1175+57.70 N 169,802.2269 E 1,757,495.9848
C.C. N 170,008.8191 E 1,759,143.0791
Back = S 2° 01' 49.29" E
Ahead = S 7° 08' 57.03" E
Chord Bear = S 4° 35' 23.16" E

Course from PT PR31-1 to PC PR31-2 S 7° 08' 57.03" E Dist 412.0000

Curve Data
———

Curve PR31-2
P.I. Station 1180+43.90 N 169,319.8051 E 1,757,556.4941
Delta = 5° 07' 07.74" (RT)
Degree = 3° 27' 05.59"
Tangent = 74.2017
Length = 148.3048
Radius = 1,660.0000
External = 1.6576
Long Chord = 148.2555
Mid. Ord. = 1.6559
P.C. Station 1179+69.70 N 169,393.4300 E 1,757,547.2595
P.T. Station 1181+18.00 N 169,245.6500 E 1,757,559.1230
C.C. N 169,186.8378 E 1,755,900.1651
Back = S 7° 08' 57.03" E
Ahead = S 2° 01' 49.29" E
Chord Bear = S 4° 35' 23.16" E

Course from PT PR31-2 to PC PR31-3 S 2° 01' 49.29" E Dist 836.0000

Curve Data
———

Curve PR31-3
P.I. Station 1190+28.20 N 168,336.0196 E 1,757,591.3705
Delta = 5° 07' 07.74" (RT)
Degree = 3° 27' 05.59"
Tangent = 74.2017
Length = 148.3048
Radius = 1,660.0000
External = 1.6576
Long Chord = 148.2555
Mid. Ord. = 1.6559
P.C. Station 1189+54.00 N 168,410.1748 E 1,757,588.7416
P.T. Station 1191+02.30 N 168,261.9257 E 1,757,587.3727
C.C. N 168,351.3627 E 1,755,929.7838
Back = S 2° 01' 49.29" E
Ahead = S 3° 05' 18.46" W
Chord Bear = S 0° 31' 44.58" W

Course from PT PR31-3 to PC PR31-4 S 3° 05' 18.46" W Dist 412.0000

Curve Data
———

Curve PR31-4
P.I. Station 1195+88.51 N 167,776.4301 E 1,757,561.1773
Delta = 5° 07' 07.74" (LT)
Degree = 3° 27' 05.59"
Tangent = 74.2017
Length = 148.3048
Radius = 1,660.0000
External = 1.6576
Long Chord = 148.2555
Mid. Ord. = 1.6559
P.C. Station 1195+14.30 N 167,850.5241 E 1,757,565.1751
P.T. Station 1196+62.61 N 167,702.2749 E 1,757,563.8062
C.C. N 167,761.0871 E 1,759,222.7640
Back = S 3° 05' 18.46" W
Ahead = S 2° 01' 49.29" E
Chord Bear = S 0° 31' 44.58" W

End Region 1
Equation: Sta 1196+62.61 (BK) = Sta 1196+58.53 (AH)
Begin Region 2

Point 8010 N 167,702.2749 E 1,757,563.8062 Sta 1196+58.53

Course from 8010 to 8001 S 2° 01' 49.29" E Dist 541.4655

Point 8001 N 167,161.1493 E 1,757,582.9898 Sta 1202+00.00

==========
Ending chain PR31 description

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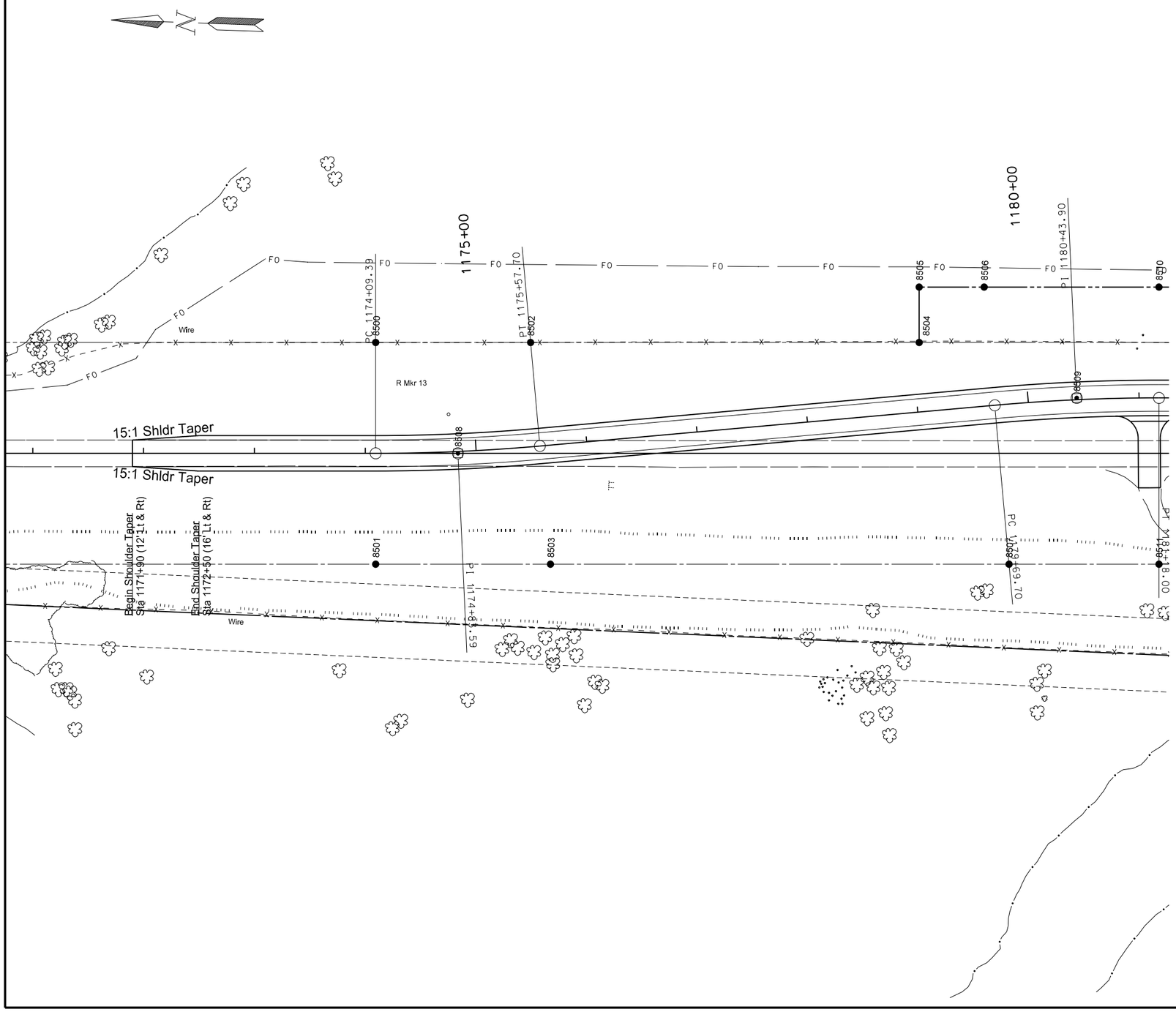
ALIGNMENT DESCRIPTION FOR PR31

ND 31 - 13 Miles North of SD Border

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	82	2



ROW MARKER POINT LOCATIONS

Point	North	East	Station	Offset
8500	169953.5498	1757584.0584	1174+09.39	-100.0000
8501	169946.4640	1757384.1840	1174+09.39	100.0000
8502	169813.8948	1757589.0094	1175+57.70	-93.7535
8503	169788.9045	1757389.7697	1175+57.70	107.0473
8504	169463.5939	1757601.4280	1179+06.82	-62.4795
8505	169465.3654	1757651.3966	1179+11.28	-112.2801
8506	169406.7524	1757653.4745	1179+69.70	-107.0473
8507	169375.5145	1757404.4249	1179+69.70	143.9537

MONUMENT POINT LOCATIONS

Point	North	East	Station	Offset
8508	169875.8518	1757486.7501	1174+83.54	1.6576
8509	169319.8054	1757556.4939	1180+43.85	-1.6574

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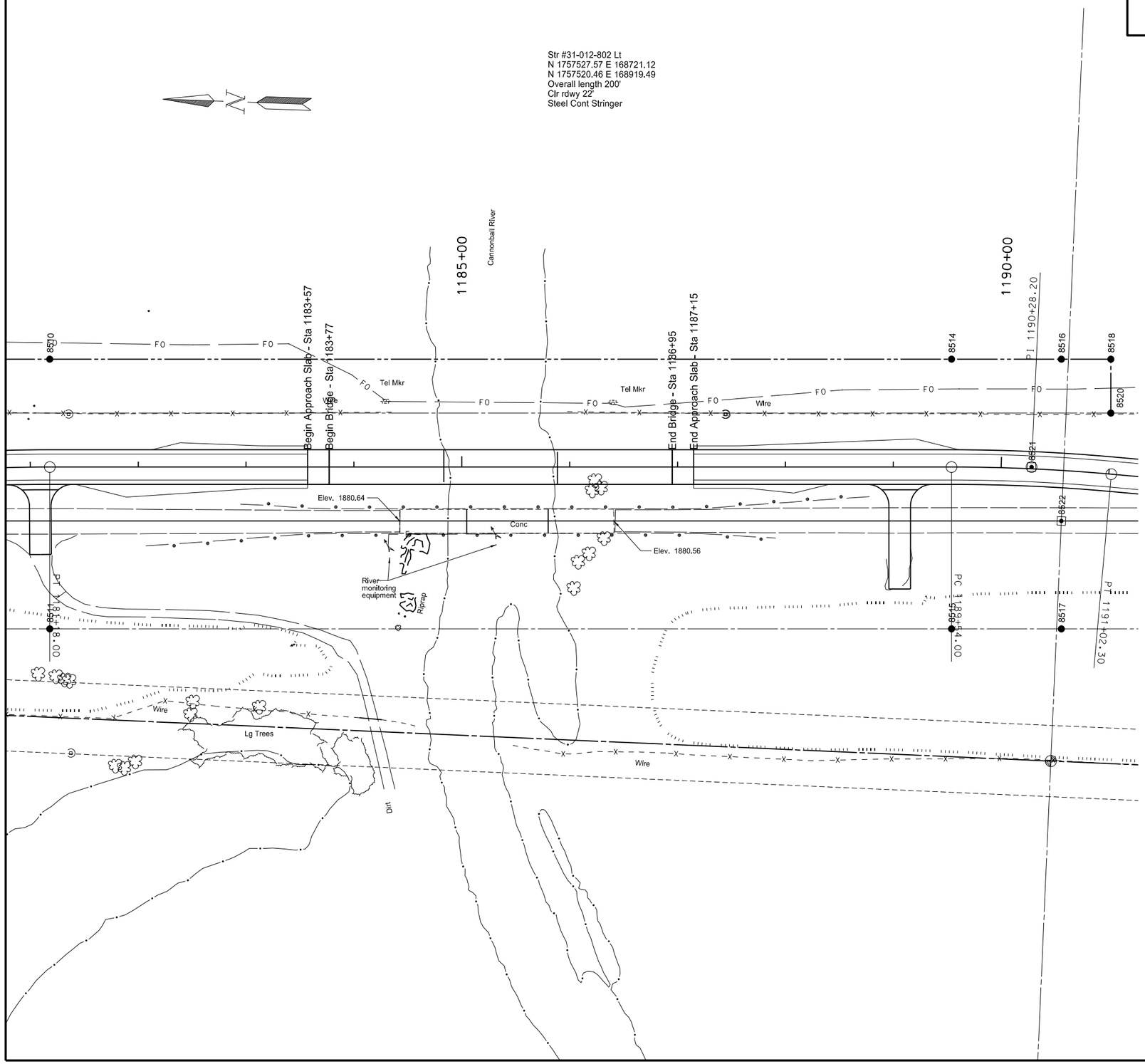
ROW MARKERS AND MONUMENTS
NORTHINGS AND EASTINGS

ND 31 - 13 Miles North of SD Border

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	82	3



ROW MARKER POINT LOCATIONS

Point	North	East	Station	Offset
8510	169249.1929	1757659.0602	1181+18.00	-100.0000
8511	169240.3356	1757409.2172	1181+18.00	150.0000
8514	168413.7177	1757688.6789	1189+54.00	-100.0000
8515	168404.8605	1757438.8358	1189+54.00	150.0000
8516	168311.9682	1757692.2860	1190+49.92	-102.9424
8517	168303.1109	1757442.4430	1190+65.76	146.5715
8518	168266.1186	1757693.9114	1190+92.97	-106.1860
8520	168264.3471	1757643.9428	1190+97.02	-56.3662

MONUMENT POINT LOCATIONS

Point	North	East	Station	Offset
8521	168336.0199	1757591.3703	1190+28.15	-1.6574
8522	168306.6541	1757542.3800	1190+58.84	46.7842

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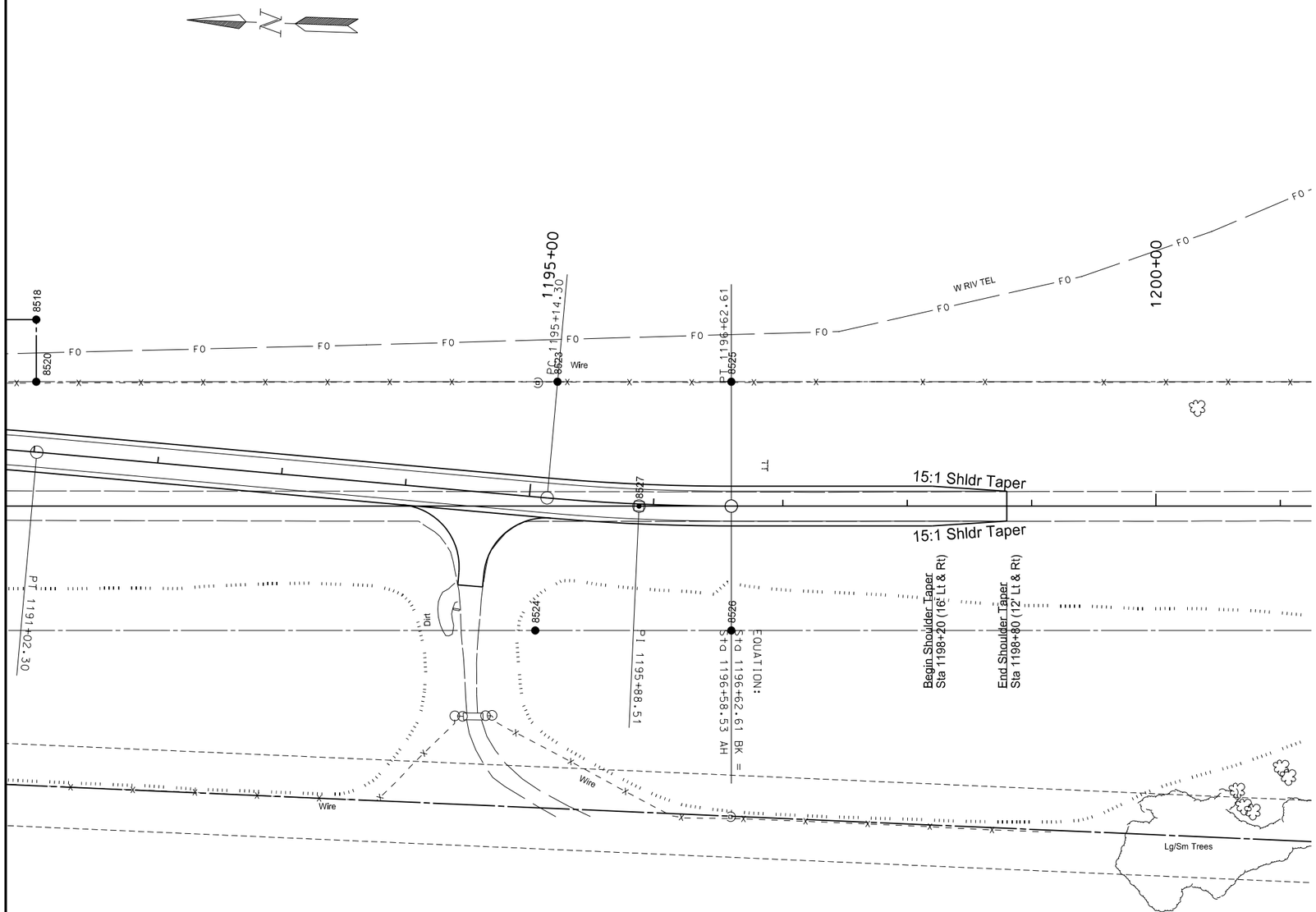
ROW MARKERS AND MONUMENTS
NORTHINGS AND EASTINGS

ND 31 - 13 Miles North of SD Border

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	82	4



ROW MARKER POINT LOCATIONS

Point	North	East	Station	Offset
8523	167845.4729	1757658.7924	1195+14.30	-93.7535
8524	167856.2915	1757458.2833	1195+14.30	107.0473
8525	167705.8178	1757663.7434	1196+62.61	-100.0000
8526	167698.7320	1757463.8690	1196+62.61	100.0000

MONUMENT POINT LOCATIONS

Point	North	East	Station	Offset
8527	167776.4304	1757561.1771	1195+88.46	1.6578

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ROW MARKERS AND MONUMENTS
NORTHINGS AND EASTINGS

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED BY PHASE NO. 1	2	3	4		TOTAL AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
D3-36	36"x6"	STREET NAME SIGN (Sign and installation only)							6	
G20-1a-60	60"x24"	ROAD WORK NEXT __ MILES							34	
G20-1b-60	60"x24"	WORK IN PROGRESS/ NO WORK IN PROGRESS (Sign and installation only)							26	
G20-2a-48	**48"x24"**	**END ROAD WORK**	**2**	**2**	**2**	**2**		**2**	**19**	**38**
G20-4-36	**36"x18"**	**PILOT CAR FOLLOW ME**		**1**	**1**	**1**		**1**	**18**	**18**
G20-10-108	**108"x48"**	**CONTRACTOR SIGN**	**2**	**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**		**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**		**4**	**32**	**128**
R1-1a-18	**18"x18"**	**STOP and SLOW PADDLE Back to Back**	**2**	**4**	**4**	**4**		**4**	**5**	**20**
R1-2-60	60"x60"	YIELD							29	
R2-1-48	**48"x60"**	**SPEED LIMIT __**	**6**	**10**	**10**	**10**		**10**	**39**	**390**
R2-1a-24	**24"x18"**	**MINIMUM FEE $80 (Mounted on Speed Limit post)**		**2**	**2**	**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**		**2**	**2**			**2**	**16**	**32**
R11-2-48	**48"x30"**	**ROAD CLOSED**				**1**		**1**	**28**	**28**
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**		**1**	**1**	**4**		**4**	**35**	**140**
W1-4b-48	48"x48"	DOUBLE RIGHT or LEFT REVERSE CURVE ARROW							35	
W1-6-48	**48"x24"**	**LARGE ARROW**		**2**	**2**	**1**		**2**	**26**	**52**
W3-1-48	48"x48"	STOP AHEAD SYMBOL							35	
W3-3-48	**48"x48"**	**SIGNAL AHEAD SYMBOL**		**2**	**2**			**2**	**35**	**70**
W3-4-48	**48"x48"**	**BE PREPARED TO STOP**	**2**	**2**	**2**	**2**		**2**	**35**	**70**
W3-5-48	**48"x48"**	**SPEED REDUCTION AHEAD**		**2**	**2**	**2**		**2**	**35**	**70**
W4-2-48	48"x48"	RIGHT or LEFT LANE TRANSITION SYMBOL							35	
W5-1-48	**48"x48"**	**ROAD NARROWS**		**2**	**2**	**2**		**2**	**35**	**70**
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**		**2**	**2**	**2**		**2**	**35**	**70**
W8-3-48	**48"x48"**	**PAVEMENT ENDS**		**2**	**2**	**2**		**2**	**35**	**70**
W8-7-48	48"x48"	LOOSE GRAVEL							35	
W8-9a-48	48"x48"	SHOULDER DROP-OFF							35	
W8-11-48	**48"x48"**	**UNEVEN LANES**		**2**	**2**	**2**		**2**	**35**	**70**
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**		**2**	**35**	**70**
W8-55-48	**48"x48"**	**TRUCKS CROSSING AHEAD or __ FT.**	**2**	**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**	**4**	**4**	**4**	**4**		**4**	**35**	**140**
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.**		**2**	**2**			**2**	**35**	**70**
W20-5-48	48"x48"	RIGHT or LEFT LANE CLOSED AHEAD or __ FT.							35	
W20-7a-48	**48"x48"**	**FLAGGING SYMBOL**	**2**	**4**	**4**	**4**		**4**	**35**	**140**
W20-7k-24	**24"x18"**	**__ FEET (Mounted on warning sign post)**	**2**	**4**	**4**	**4**		**4**	**10**	**40**
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**		**2**	**2**	**2**		**2**	**35**	**70**
W21-3-48	**48"x48"**	**ROAD MACHINERY AHEAD or __FT**	**4**	**4**	**4**	**4**		**4**	**35**	**140**

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED BY PHASE NO. 1	2	3	4		TOTAL AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
W21-5-48	**48"x48"**	**SHOULDER WORK**	**2**	**2**	**2**	**2**		**2**	**35**	**70**
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 2412**

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY BY PHASE NO. 1	2	3	4		TOTAL QUANTITY
704-0100	**FLAGGING**	MHR	**50**	**200**	**200**	**50**		**500**
704-1018	**LANE CLOSURE-SIGNAL CONTROLLER/FLAGGING CONTROL**	EACH		**1**	**1**			**1**
704-1035	ATTENUATION DEVICE-TYPE B-25	EACH						
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		**2**	**2**	**6**		**6**
704-1060	**DELINEATOR DRUMS**	EACH		**38**	**38**	**47**		**47**
704-1065	TRAFFIC CONES	EACH						
704-1067	**TUBULAR MARKERS**	EACH		**53**	**53**			**53**
704-1070	DELINEATOR	EACH						
704-1072	FLEXIBLE DELINEATORS	EACH						
704-1081	**VERTICAL PANELS - BACK TO BACK**	EACH			**38**	**60**		**60**
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						
704-1185	**PILOT CAR**	HR		**50**	**50**			**100**
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		**2602**	**2896**	**5388**		**10886**
762-0426	**SHORT TERM 24IN LINE - TYPE R**	LF		**24**				**24**
762-0430	**SHORT TERM 4IN LINE - TYPE NR**	LF		**2690**				**2690**
762-1500	**OBLITERATION OF PVMT MK**	SF		**42**				**42**
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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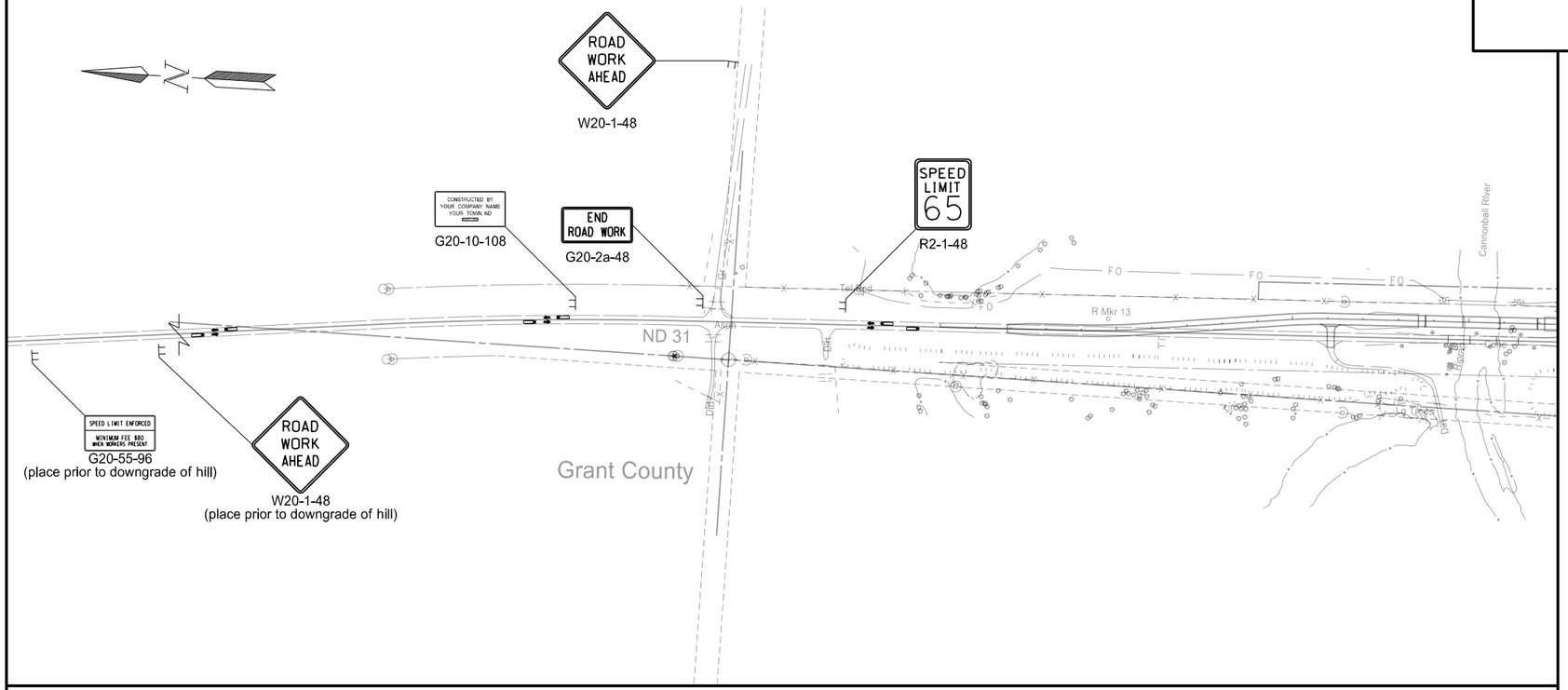
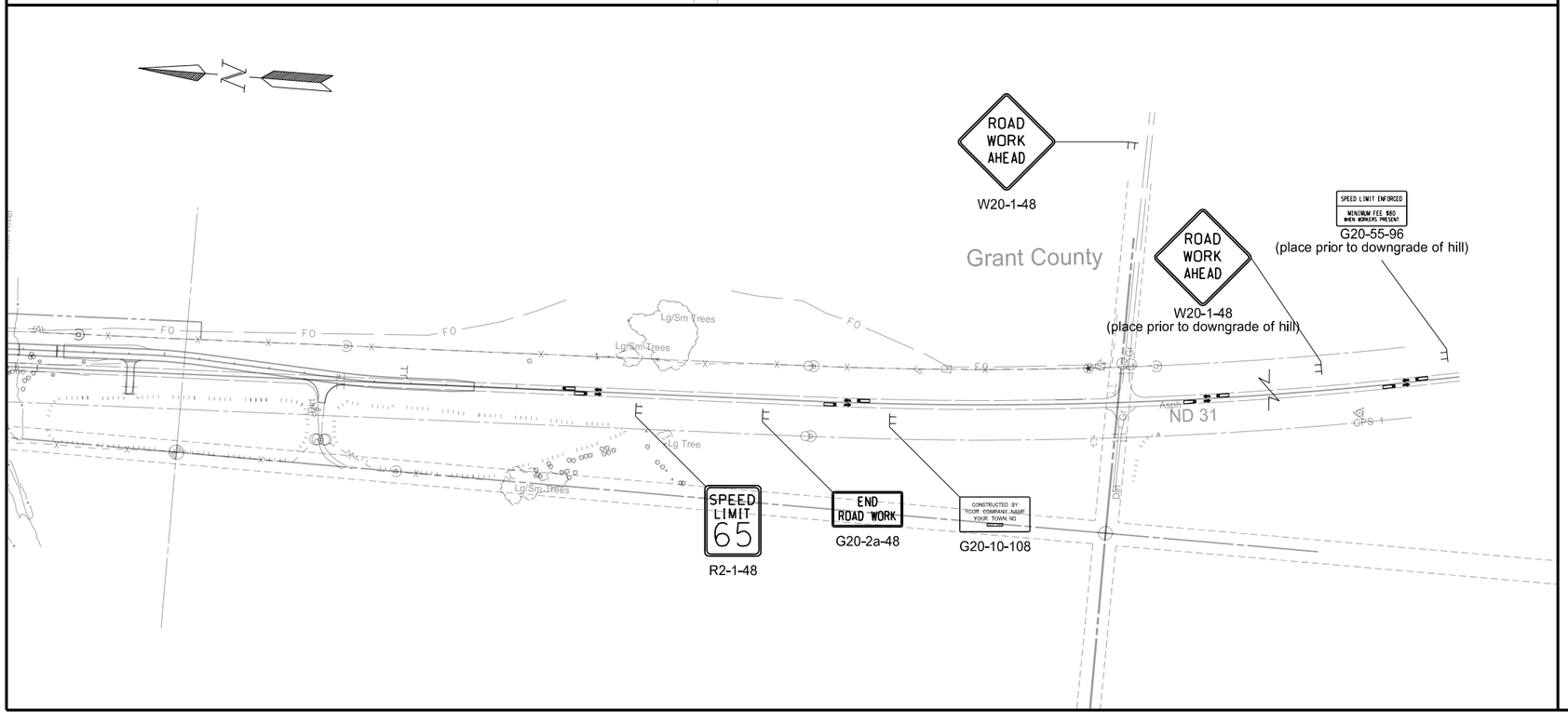
Traffic Control Devices List

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	2





Use Standard Drawing D-704-16 for sign spacing.

Note: Mainline signs G20-55-96 and W20-1-48 shall be placed prior to the big downgrade hills to give drivers a chance to slow down prior to reaching the construction area.

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WORK ZONE TRAFFIC CONTROL
TERMINAL SIGN LAYOUT

ND 31 - 13 Miles North of SD Border

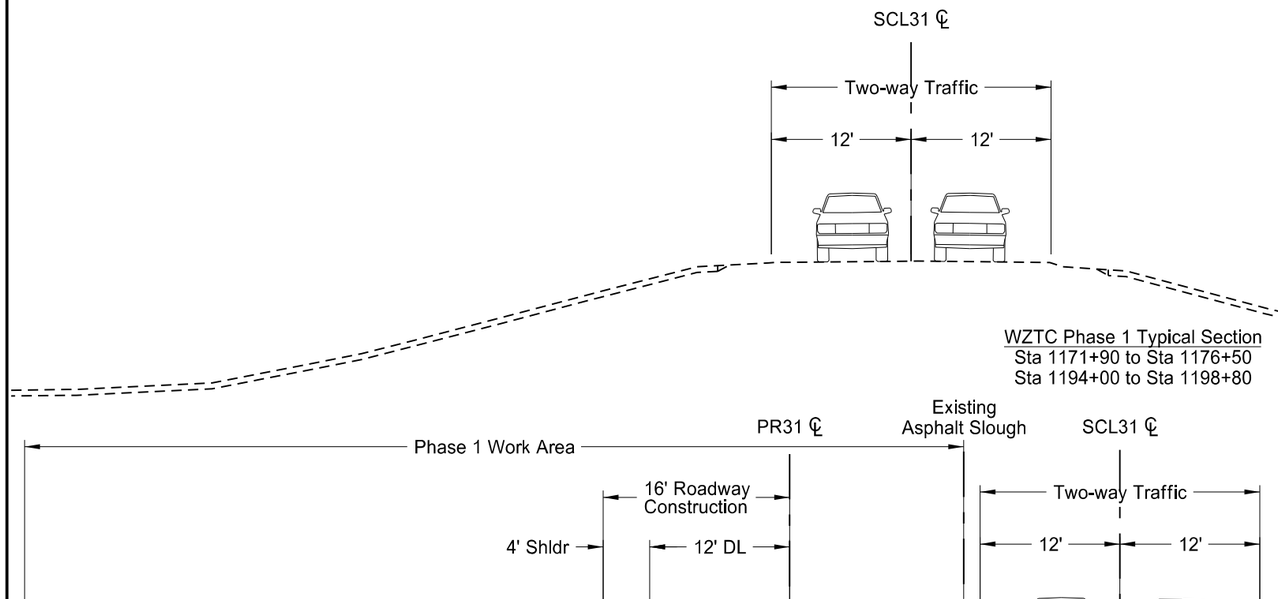
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	100	3

LEGEND:

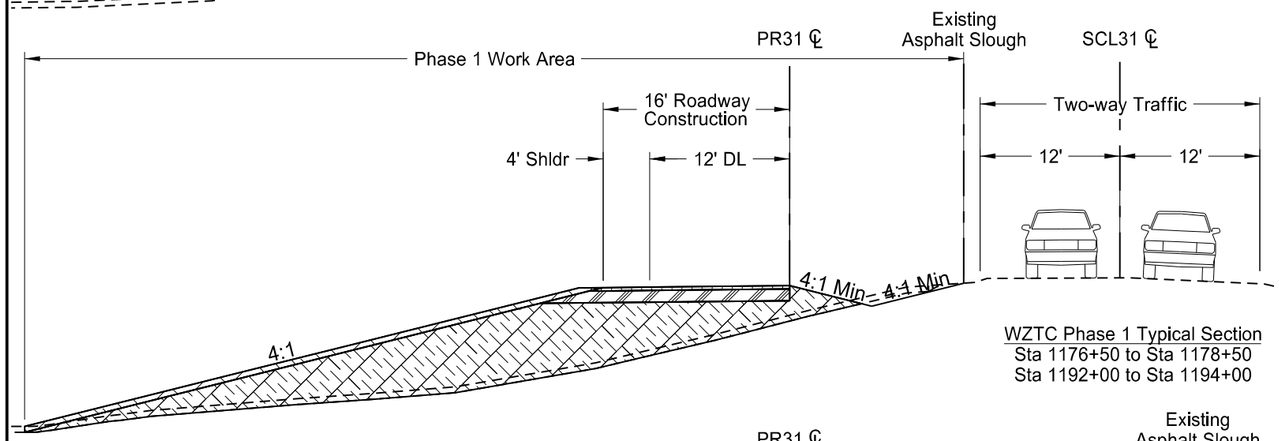
Vertical Panel

Tubular Marker

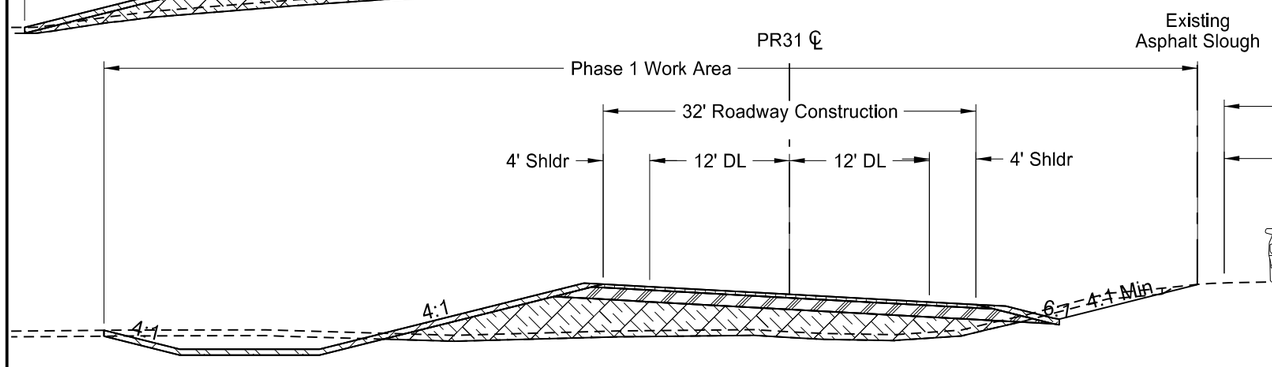
Work to be Performed in Phase 1:
-Two-way traffic shall be maintained on the existing roadway.
-Construct the new bridge, bridge approach slabs, and enough of the new roadway (1 lane or 2 lanes) without impacting the embankment of the existing roadway. (This includes placement of the Salvaged Base Course and prime coat).
-The estimated stationing to perform this work is shown in the typical sections on this page.



WZTC Phase 1 Typical Section
Sta 1171+90 to Sta 1176+50
Sta 1194+00 to Sta 1198+80



WZTC Phase 1 Typical Section
Sta 1176+50 to Sta 1178+50
Sta 1192+00 to Sta 1194+00



WZTC Phase 1 Typical Section
Sta 1178+50 to Sta 1183+57
Sta 1187+15 to Sta 1192+00

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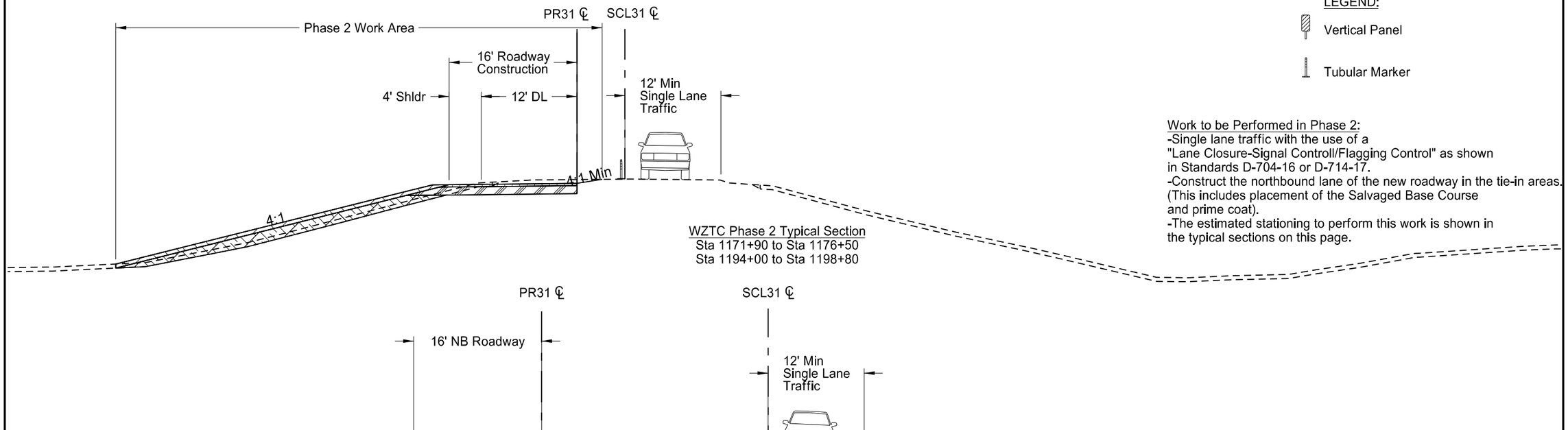
WORK ZONE TRAFFIC CONTROL
PHASE 1 TYPICAL SECTIONS

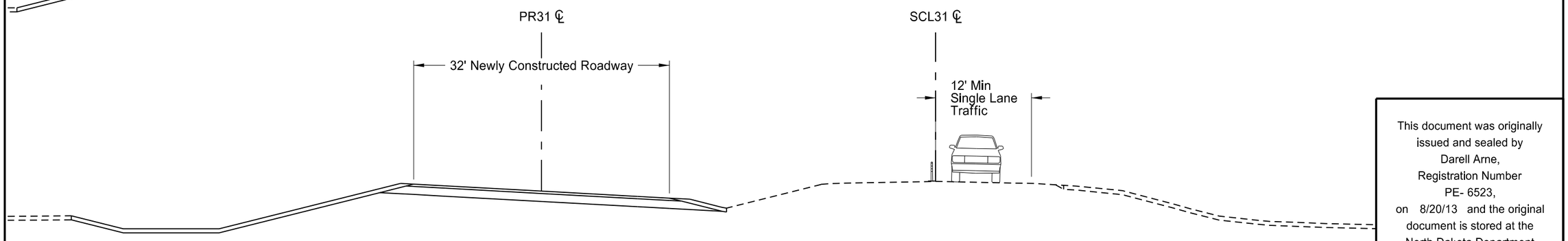
ND 31 - 13 Miles North of SD Border

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	100	4



WZTC Phase 2 Typical Section
Sta 1171+90 to Sta 1176+50
Sta 1194+00 to Sta 1198+80

WZTC Phase 2 Typical Section
Sta 1176+50 to Sta 1178+50
Sta 1192+00 to Sta 1194+00



WZTC Phase 2 Typical Section
Sta 1178+50 to Sta 1192+00

LEGEND:

Vertical Panel

Tubular Marker

Work to be Performed in Phase 2:
-Single lane traffic with the use of a "Lane Closure-Signal Controll/Flagging Control" as shown in Standards D-704-16 or D-714-17.
-Construct the northbound lane of the new roadway in the tie-in areas. (This includes placement of the Salvaged Base Course and prime coat).
-The estimated stationing to perform this work is shown in the typical sections on this page.

* Note: No work is proposed to be done in Phase 2 from Sta 1176+50 to Sta 1194+00 since all proposed surfacing that is needed to carry one lane of traffic to be used for Phase 3 was constructed in Phase 1. See the traffic control phasing layouts.

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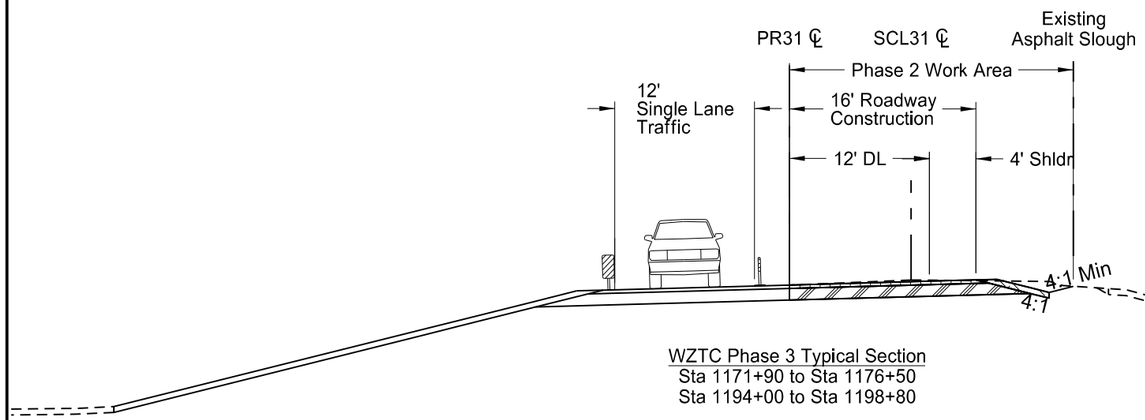
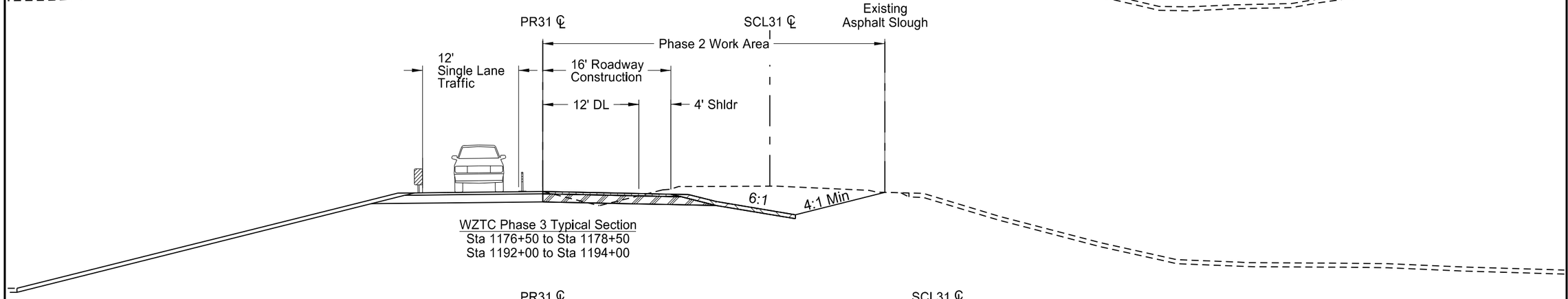
WORK ZONE TRAFFIC CONTROL
PHASE 2 TYPICAL SECTIONS

ND 31 - 13 Miles North of SD Border

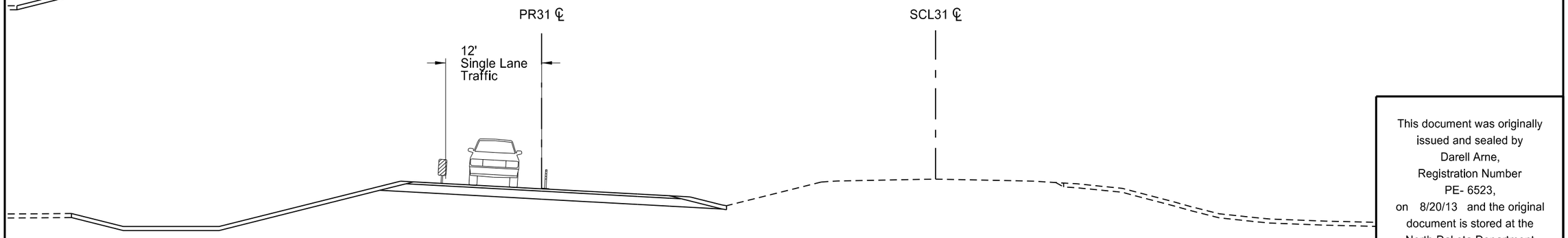
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	100	5



WZTC Phase 3 Typical Section
Sta 1171+90 to Sta 1176+50
Sta 1194+00 to Sta 1198+80



WZTC Phase 3 Typical Section
Sta 1176+50 to Sta 1178+50
Sta 1192+00 to Sta 1194+00



WZTC Phase 3 Typical Section
*Sta 1178+50 to Sta 1192+00

LEGEND:

Vertical Panel

Tubular Marker

Work to be Performed in Phase 3:
-Single lane traffic with the use of a "Lane Closure-Signal Controll/Flagging Control" as shown in Standards D-704-16 or D-714-17.
-Construct the southbound lane of the new roadway in the tie-in areas. (This includes placement of the Salvaged Base Course and prime coat).
-The estimated stationing to perform this work is shown in the typical sections on this page.

* Note: No work is proposed to be done in Phase 3 from Sta 1178+50 to Sta 1192+00 since all proposed surfacing that is needed to carry two way traffic to be used for Phase 4 was constructed in Phase 1. See the traffic control phasing layouts.

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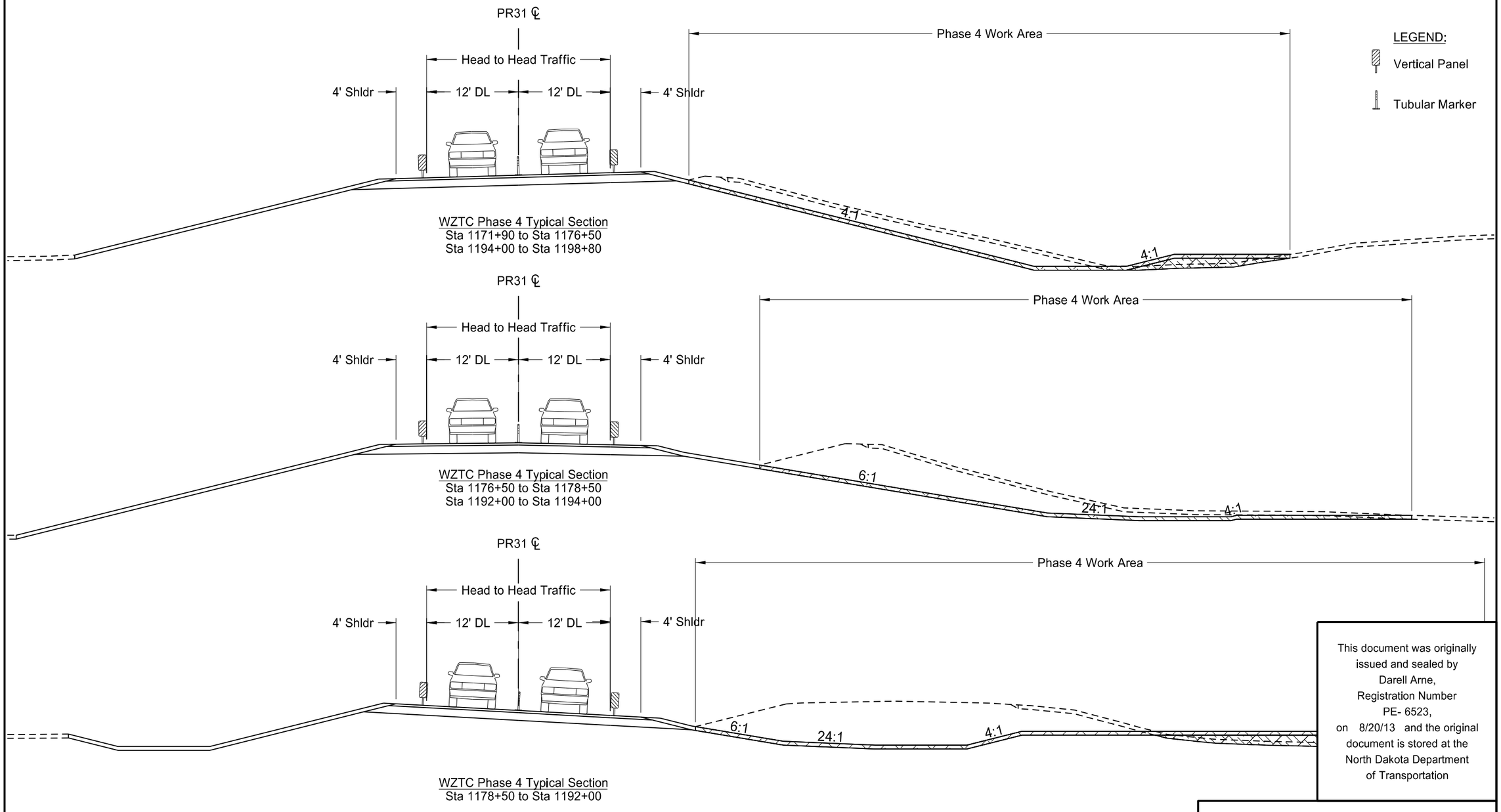
WORK ZONE TRAFFIC CONTROL
PHASE 3 TYPICAL SECTIONS

ND 31 - 13 Miles North of SD Border

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	100	6



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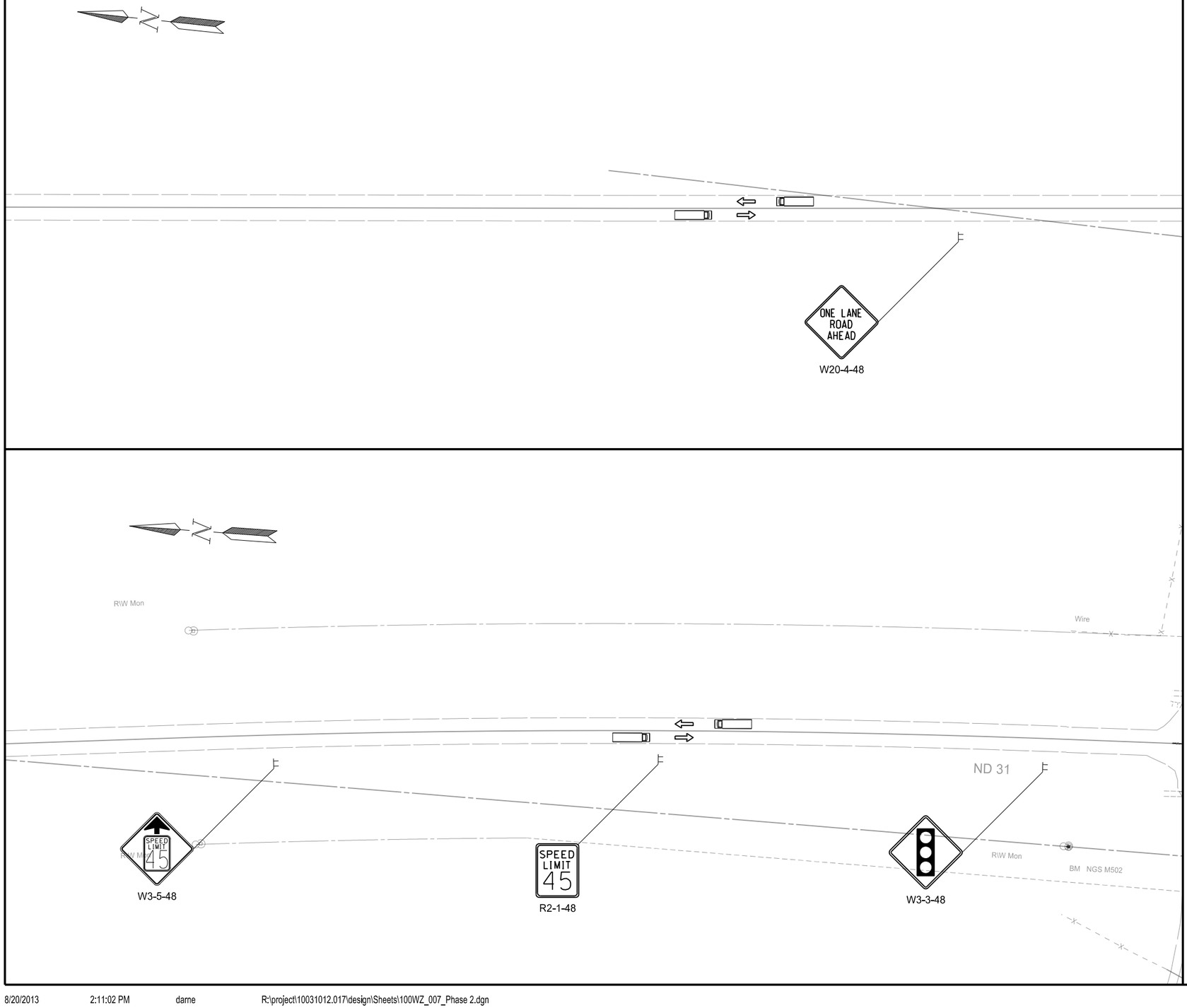
WORK ZONE TRAFFIC CONTROL
PHASE 4 TYPICAL SECTIONS

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	7

Use Standard Drawing D-704-16 for sign spacing.



LEGEND:

- Type III Barricade
- Delineator Drum
- Tubular Marker
- Vertical Panel - Back to Back
- Work Area

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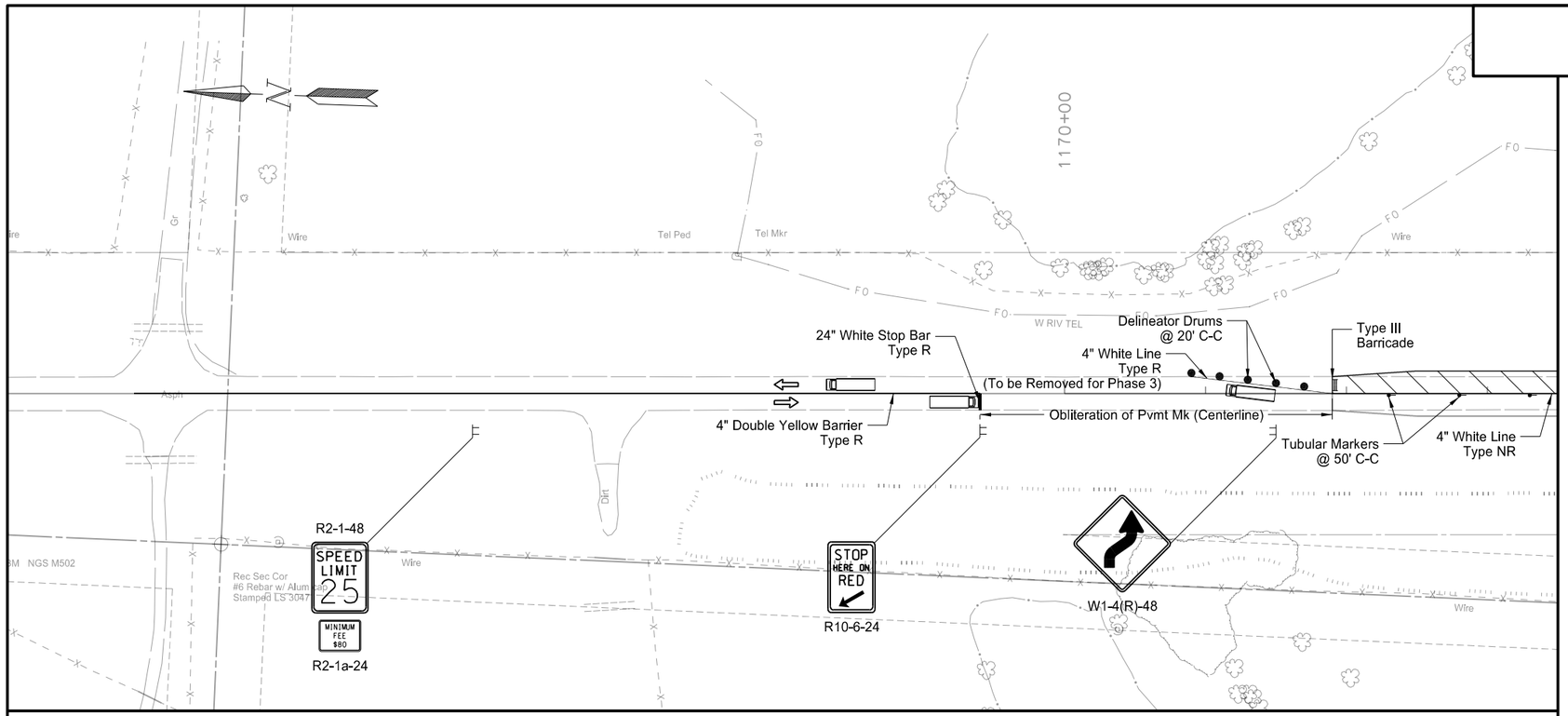
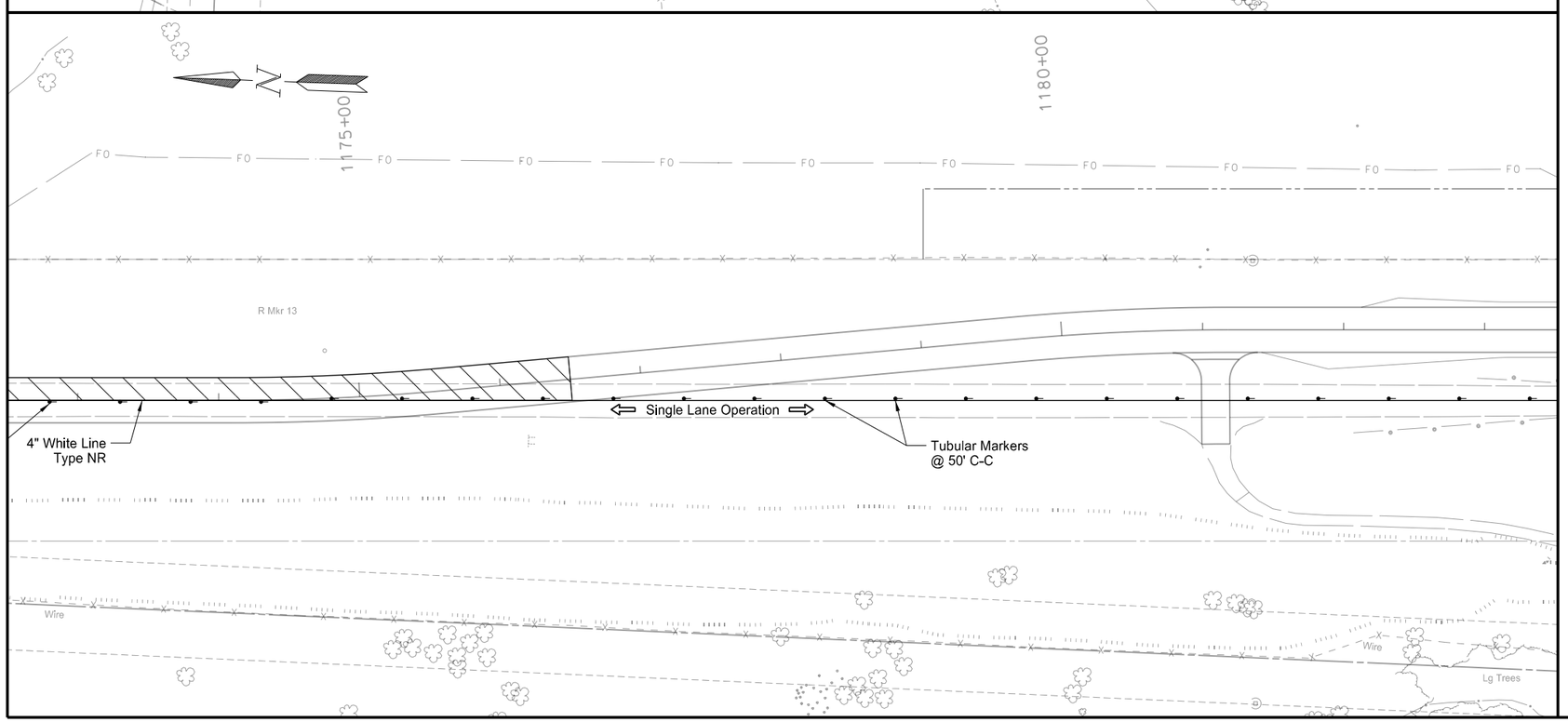
WORK ZONE TRAFFIC CONTROL
PHASE 2 CONSTRUCTION SIGN LAYOUT

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	8





Use Standard Drawing D-704-16 for sign spacing.

SPEC	CODE	BID ITEM	UNIT	QUANTITY
762	420	**SHORT TERM 4IN LINE - TYPE R**		
		1163+40 to 1169+40 (Dbl Yellow Barrier)	LF	1200
		1170+90 to 1171+90 (White Barrier Taper)	LF	101
762	426	**SHORT TERM 24IN LINE - TYPE R**		
		1169+40 (White Stop Bar)	LF	12
762	430	**SHORT TERM 4IN LINE - TYPE NR**		
		1171+90 to 1183+00 (White Barrier - Existing CL)	LF	1110
762	1500	**OBLITERATION OF PVMT MK**		
		1169+40 to 1171+90 (Existing CL)	SF	21

LEGEND:

- Type III Barricade
- Delineator Drum
- Tubular Marker
- Vertical Panel - Back to Back
- Work Area

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WORK ZONE TRAFFIC CONTROL
PHASE 2 CONSTRUCTION SIGN LAYOUT

ND 31 - 13 Miles North of SD Border

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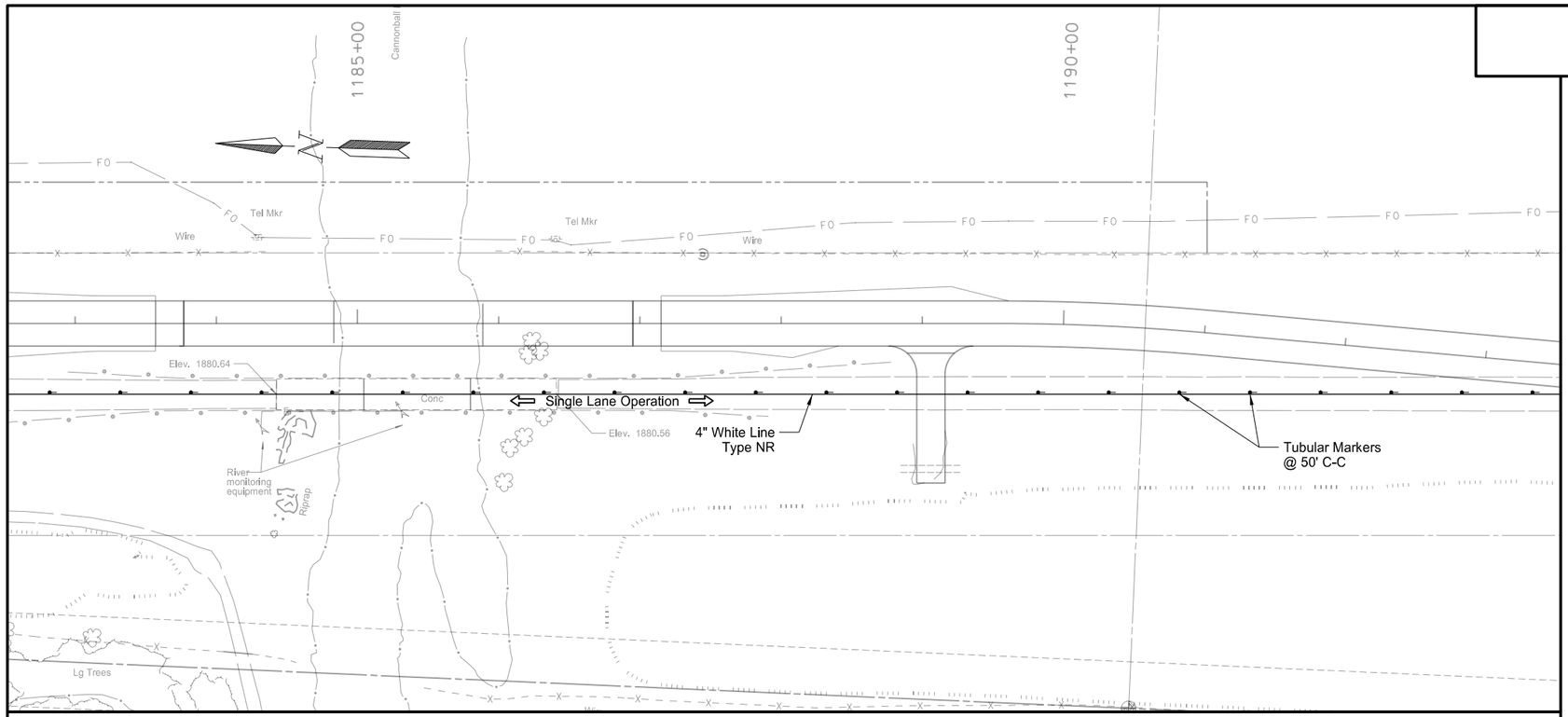
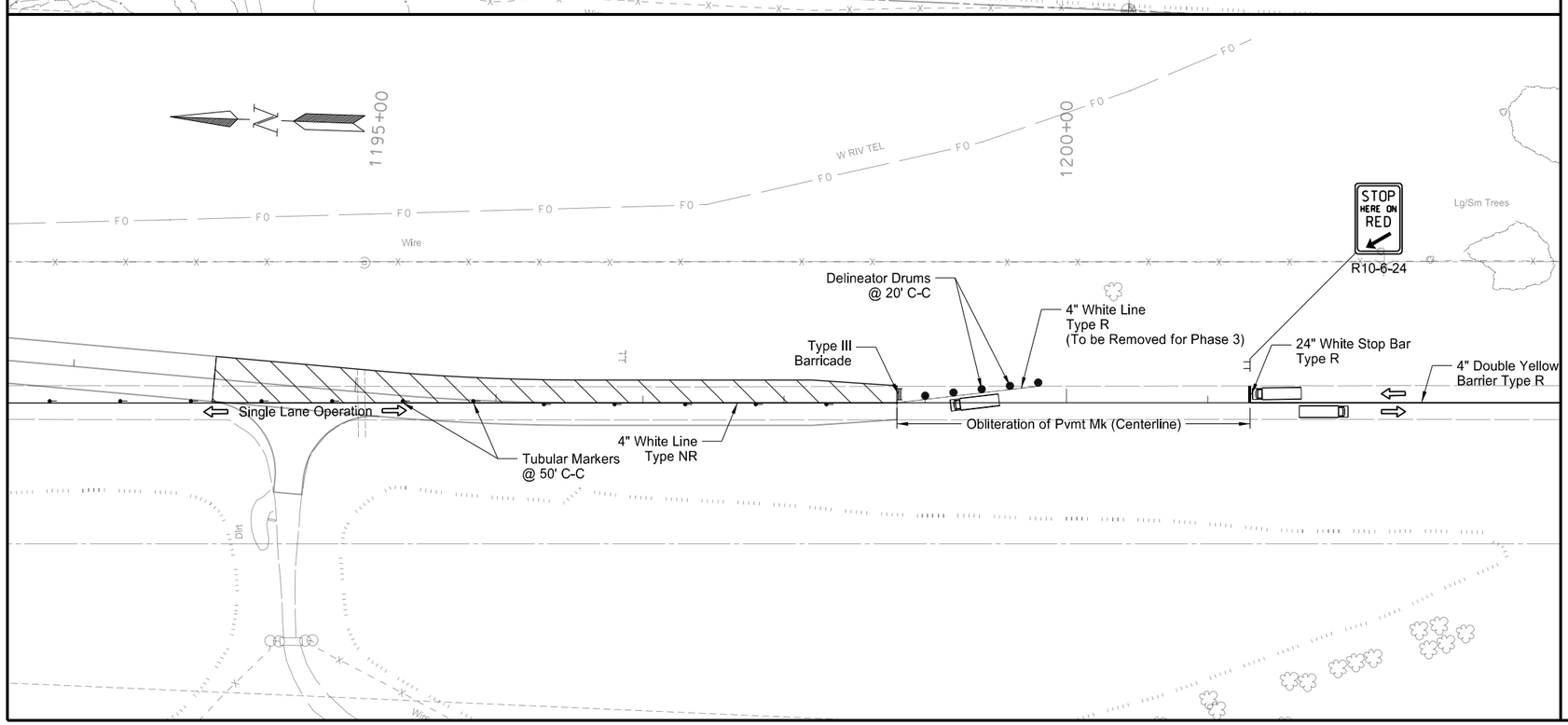
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	9





Use Standard Drawing D-704-16 for sign spacing.

SPEC	CODE	BID ITEM	UNIT	QUANTITY
762	420	**SHORT TERM 4IN LINE - TYPE R**		
		1198+80 to 1199+80 (White Barrier Taper)	LF	101
		1201+30 to 1203+00 (Dbl Yellow Barrier)	LF	340
762	426	**SHORT TERM 24IN LINE - TYPE R**		
		1201+30 (White Stop Bar)	LF	12
762	430	**SHORT TERM 4IN LINE - TYPE NR**		
		1183+00 to 1198+80 (White Barrier - Existing CL)	LF	1580
762	1500	**OBLITERATION OF PVMT MK**		
		1198+80 to 1201+30 (Existing CL)	SF	21

LEGEND:

- Type III Barricade
- Delineator Drum
- Tubular Marker
- Vertical Panel - Back to Back
- Work Area

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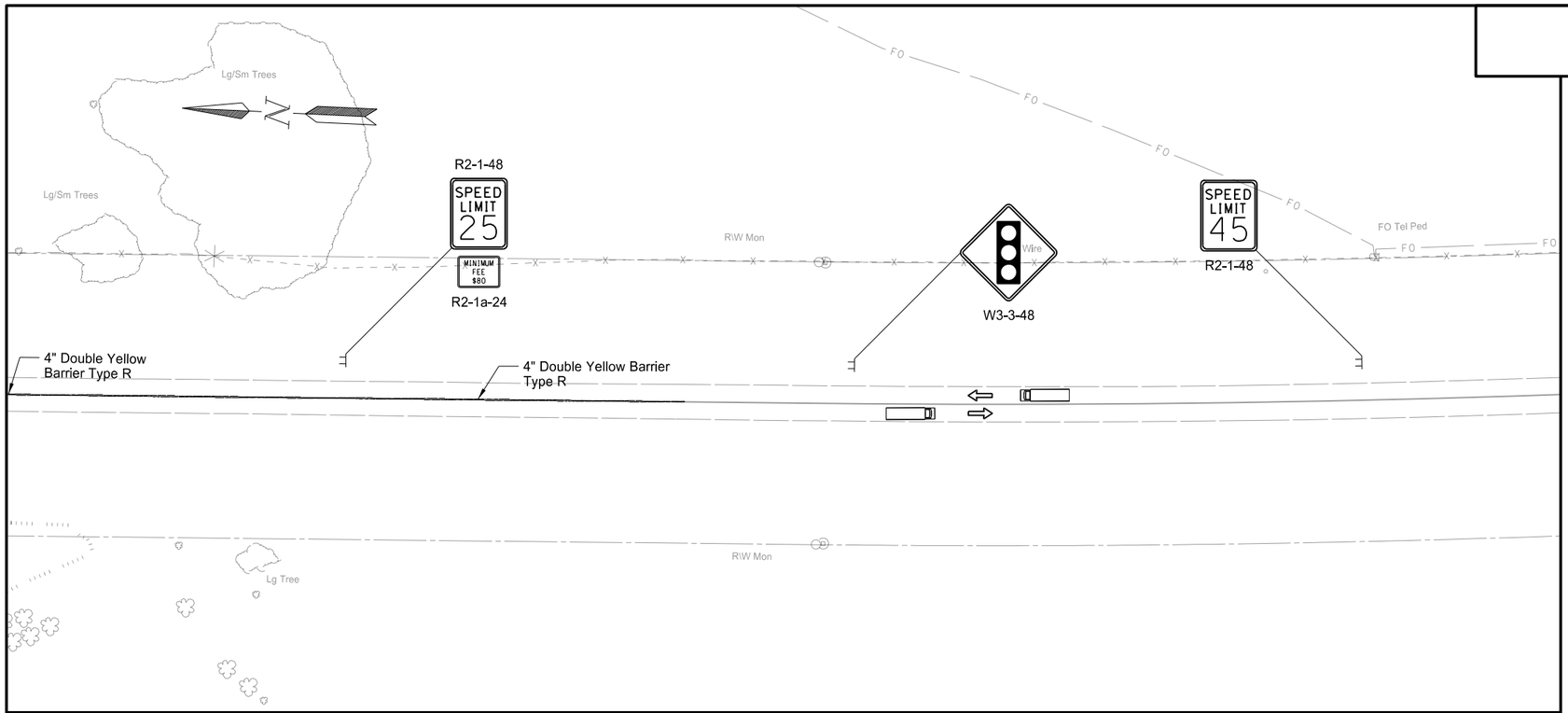
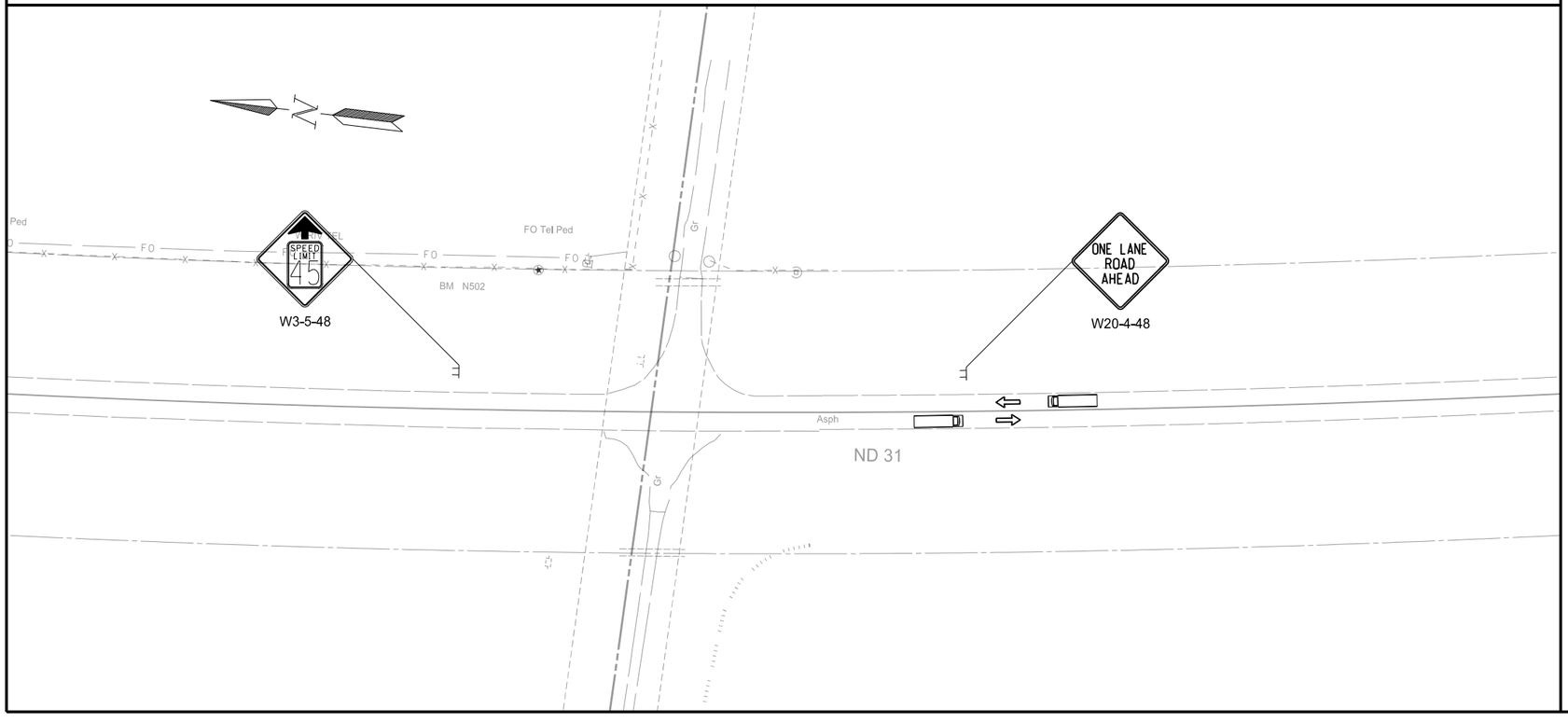
WORK ZONE TRAFFIC CONTROL
PHASE 2 CONSTRUCTION SIGN LAYOUT

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	10





Use Standard Drawing D-704-16 for sign spacing.

SPEC	CODE	BID ITEM	UNIT	QUANTITY
762	420	SHORT TERM 4IN LINE - TYPE R		
		1203+00 to 1207+30 (Dbl Yellow Barrier)	LF	860

LEGEND:

- Type III Barricade
- Delineator Drum
- Tubular Marker
- Vertical Panel - Back to Back
- Work Area

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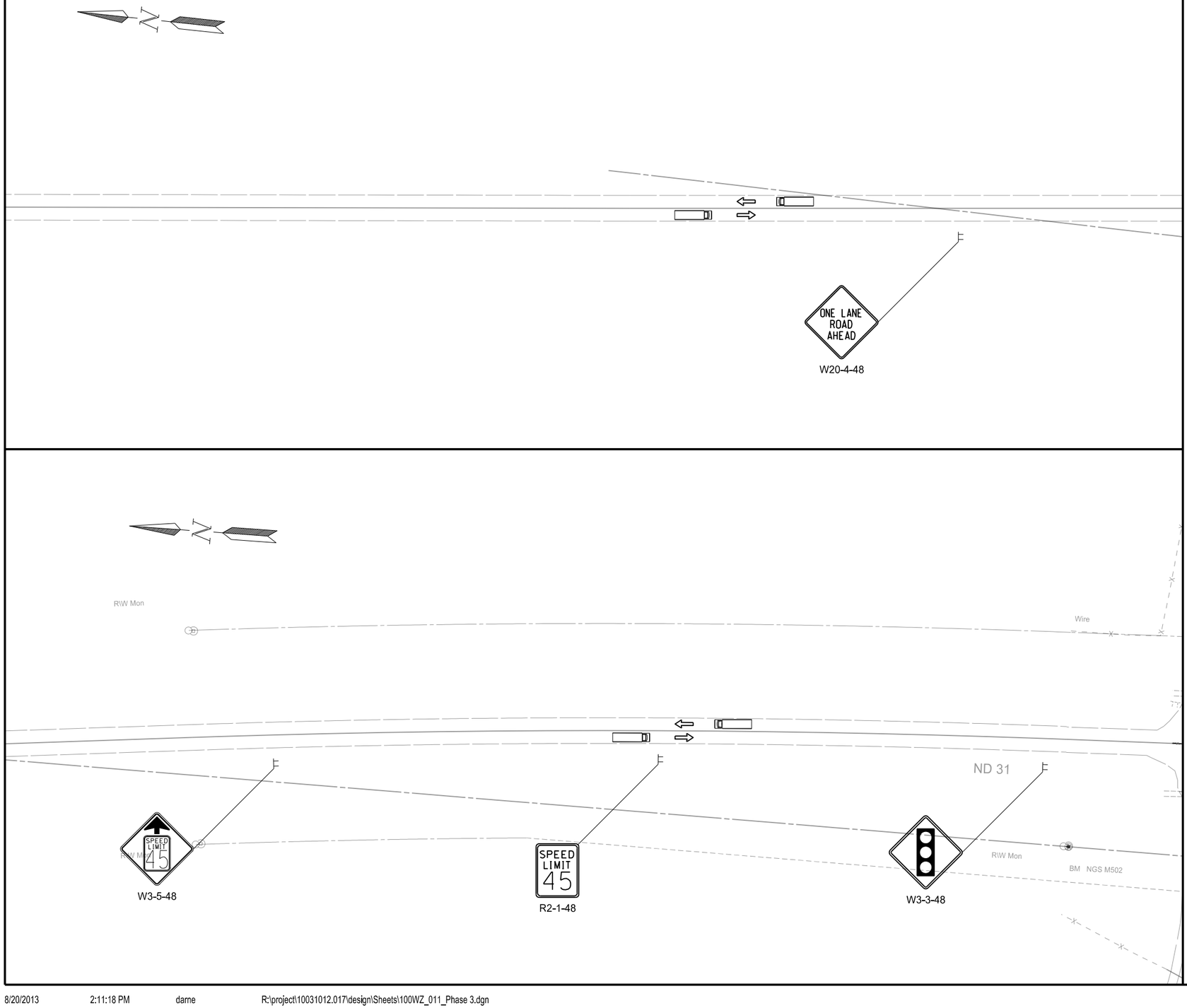
WORK ZONE TRAFFIC CONTROL
PHASE 2 CONSTRUCTION SIGN LAYOUT

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	11

Use Standard Drawing D-704-16 for sign spacing.



LEGEND:

- Type III Barricade
- Delineator Drum
- Tubular Marker
- Vertical Panel - Back to Back
- Work Area

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WORK ZONE TRAFFIC CONTROL
PHASE 3 CONSTRUCTION SIGN LAYOUT

ND 31 - 13 Miles North of SD Border

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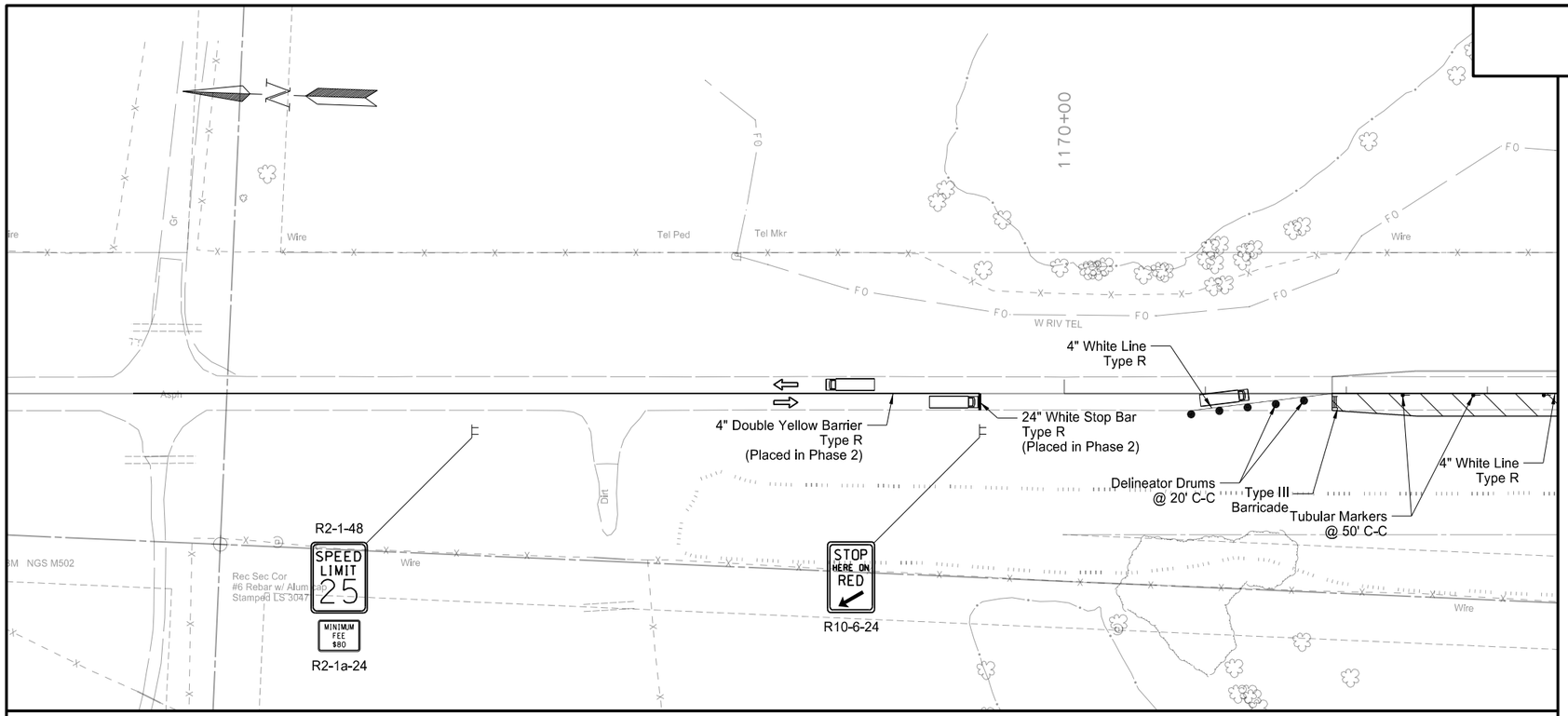
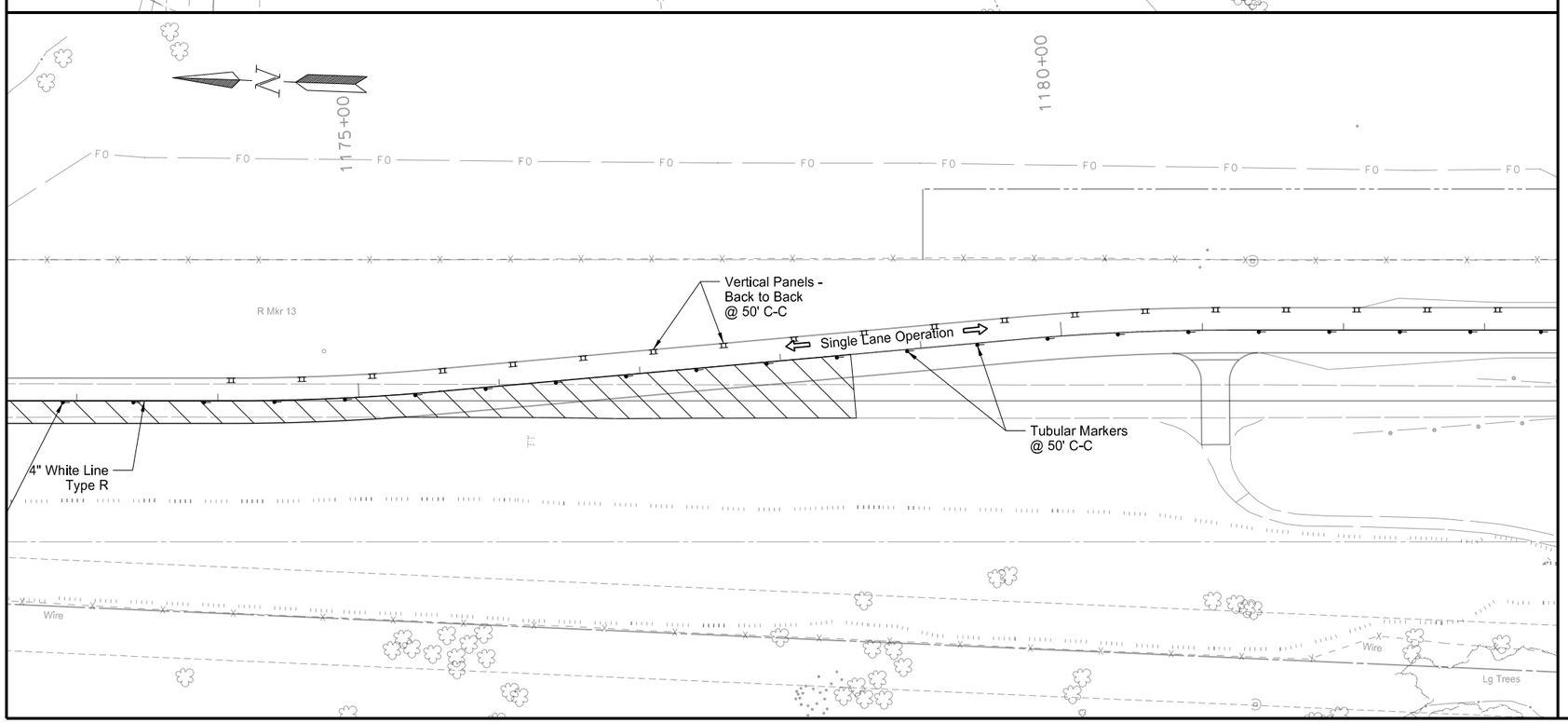
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	12





Use Standard Drawing D-704-16 for sign spacing.

SPEC	CODE	BID ITEM	UNIT	QUANTITY
762	420	SHORT TERM 4IN LINE - TYPE R		
		1170+90 to 1171+90 (White Barrier Taper)	LF	101
		1171+90 to 1183+00 (White Barrier - Proposed CL)	LF	1110

LEGEND:

- Type III Barricade
- Delineator Drum
- Tubular Marker
- Vertical Panel - Back to Back
- Work Area

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WORK ZONE TRAFFIC CONTROL
PHASE 3 CONSTRUCTION SIGN LAYOUT

ND 31 - 13 Miles North of SD Border

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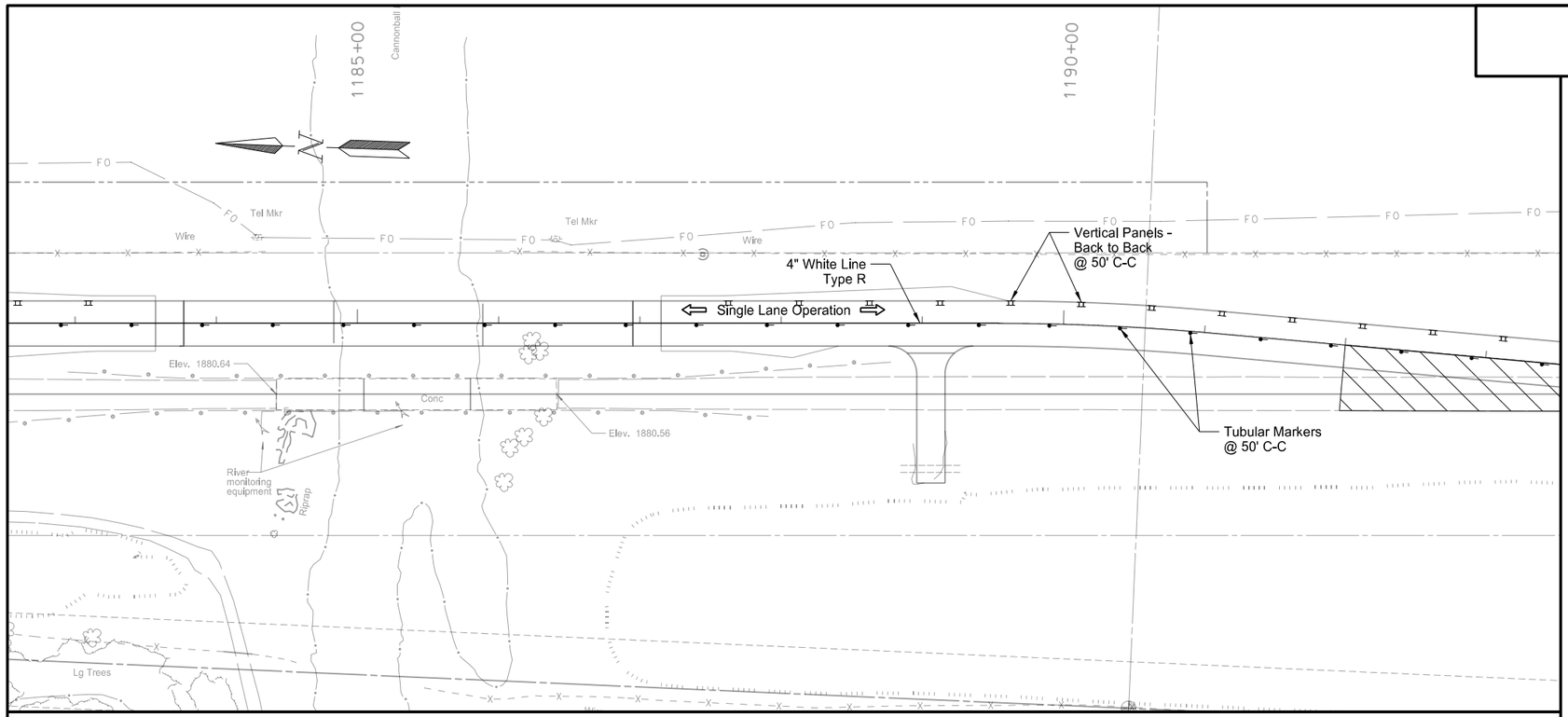
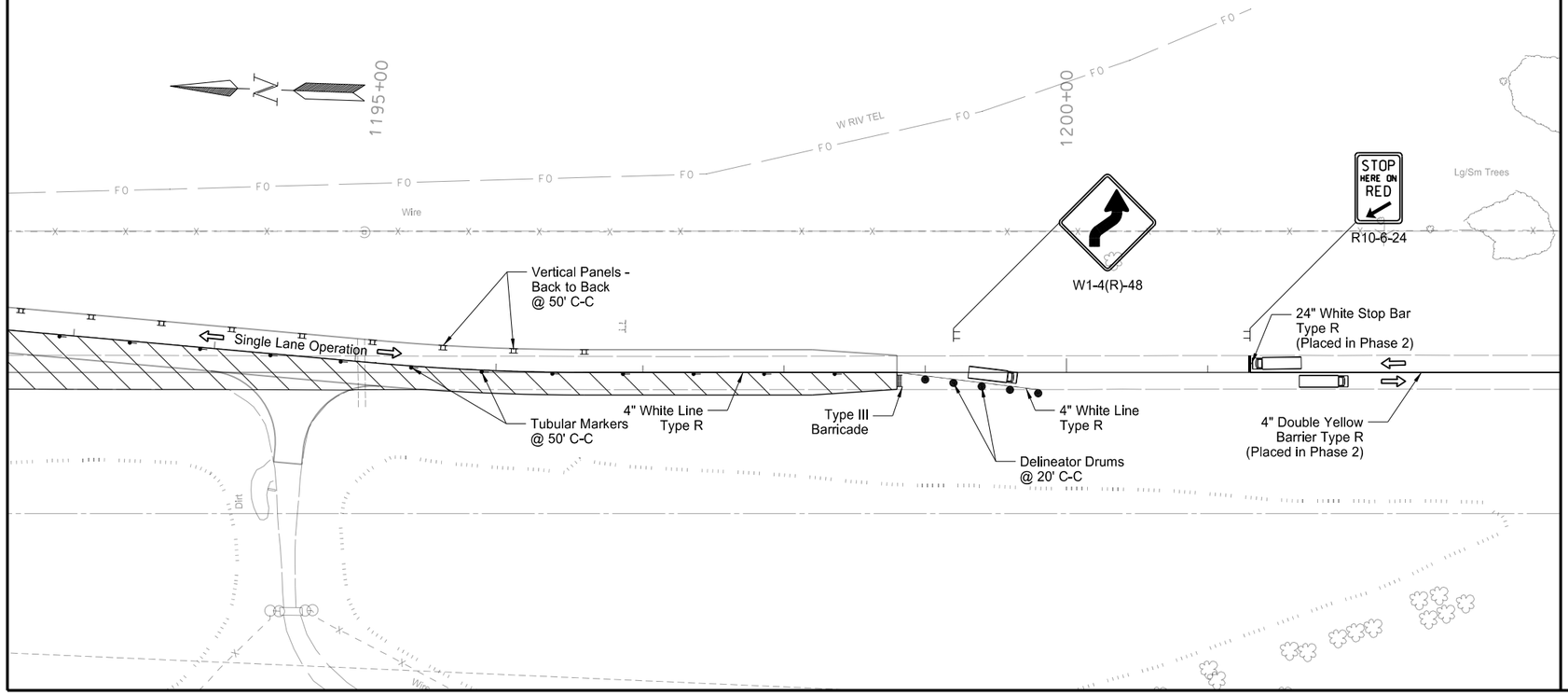
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	13





Use Standard Drawing D-704-16 for sign spacing.

SPEC	CODE	BID ITEM	UNIT	QUANTITY
762	420	**SHORT TERM 4IN LINE - TYPE R**		
		1183+00 to 1198+80 (White Barrier - Proposed CL)	LF	1584
		1198+80 to 1199+80 (White Barrier Taper)	LF	101

LEGEND:

- Type III Barricade
- Delineator Drum
- Tubular Marker
- Vertical Panel - Back to Back
- Work Area

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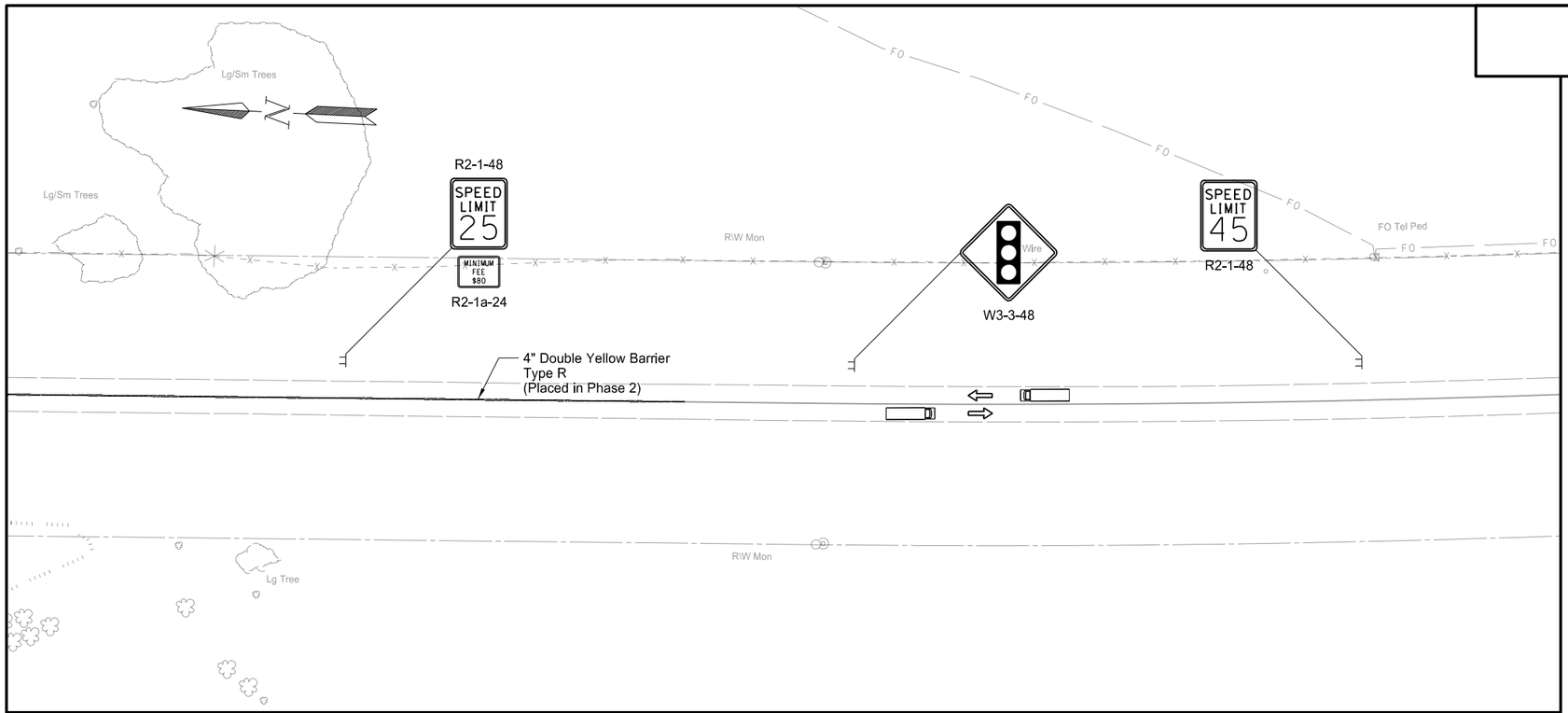
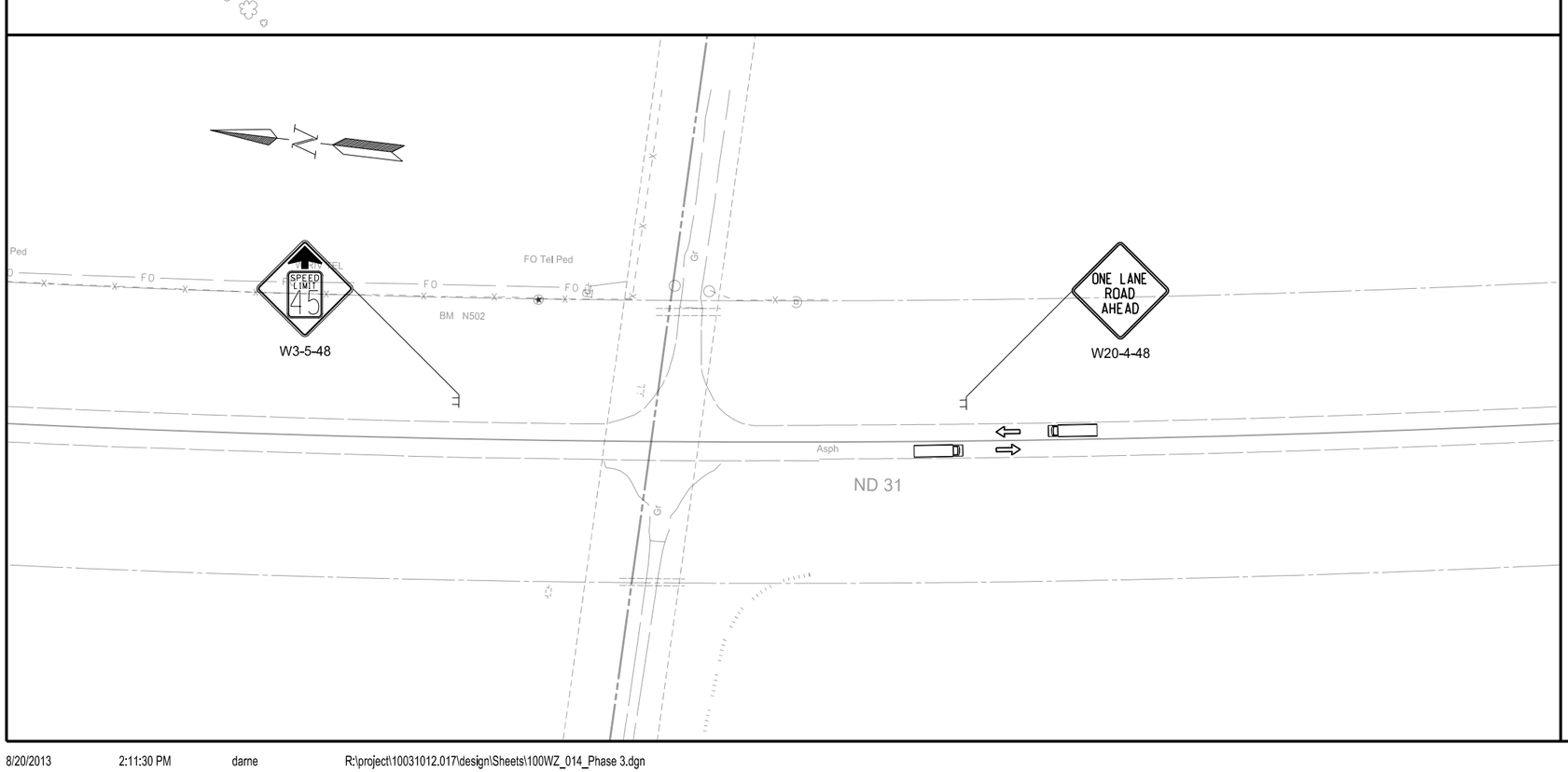
WORK ZONE TRAFFIC CONTROL
PHASE 3 CONSTRUCTION SIGN LAYOUT

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	14

Use Standard Drawing D-704-16 for sign spacing.





LEGEND:

- Type III Barricade
- Delineator Drum
- Tubular Marker
- Vertical Panel - Back to Back
- Work Area

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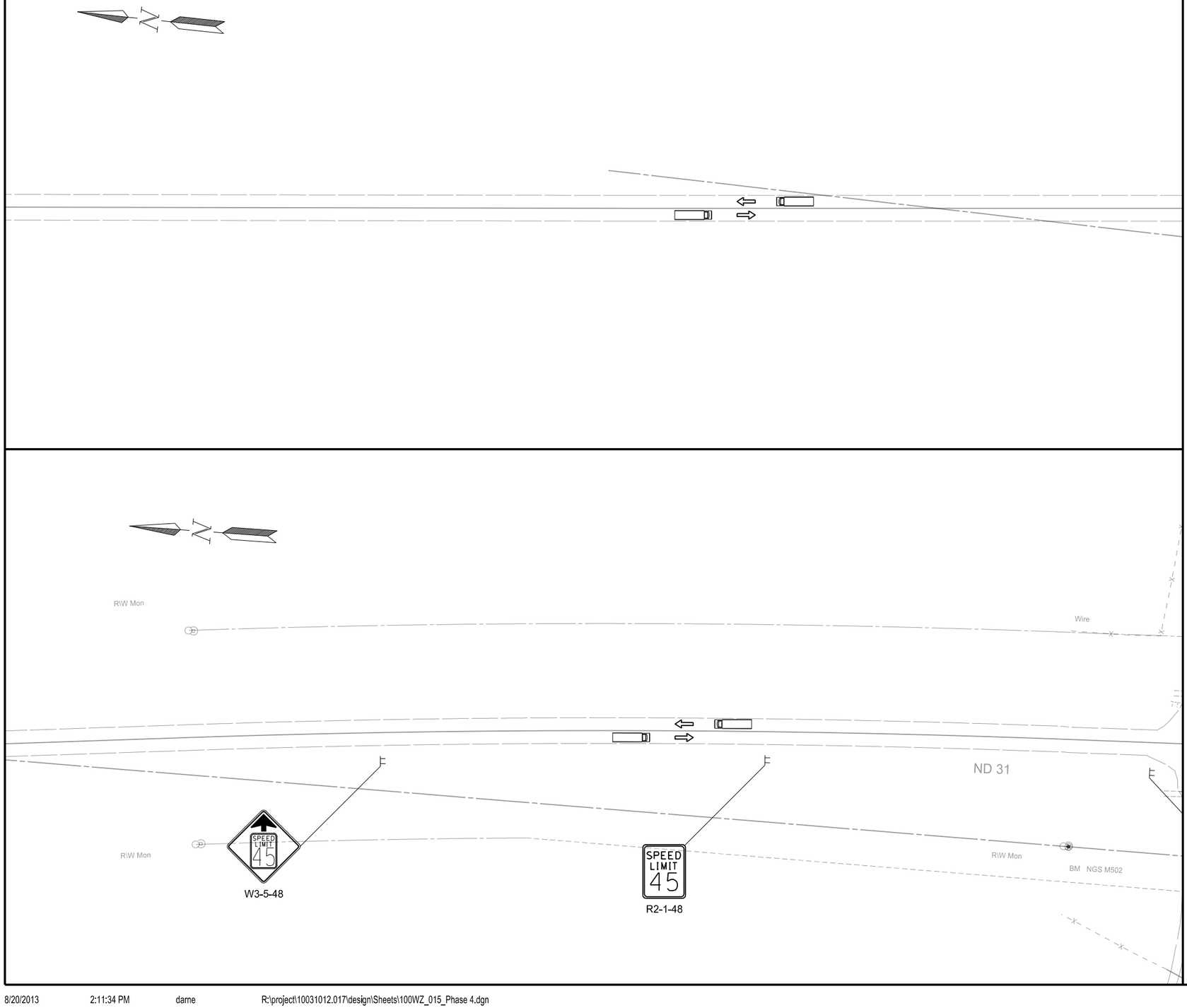
WORK ZONE TRAFFIC CONTROL
PHASE 3 CONSTRUCTION SIGN LAYOUT

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	15



Use Standard Drawing D-704-15 Type B for sign spacing.

LEGEND:

- Type III Barricade
- Delineator Drum
- Tubular Marker
- Vertical Panel - Back to Back
- Work Area

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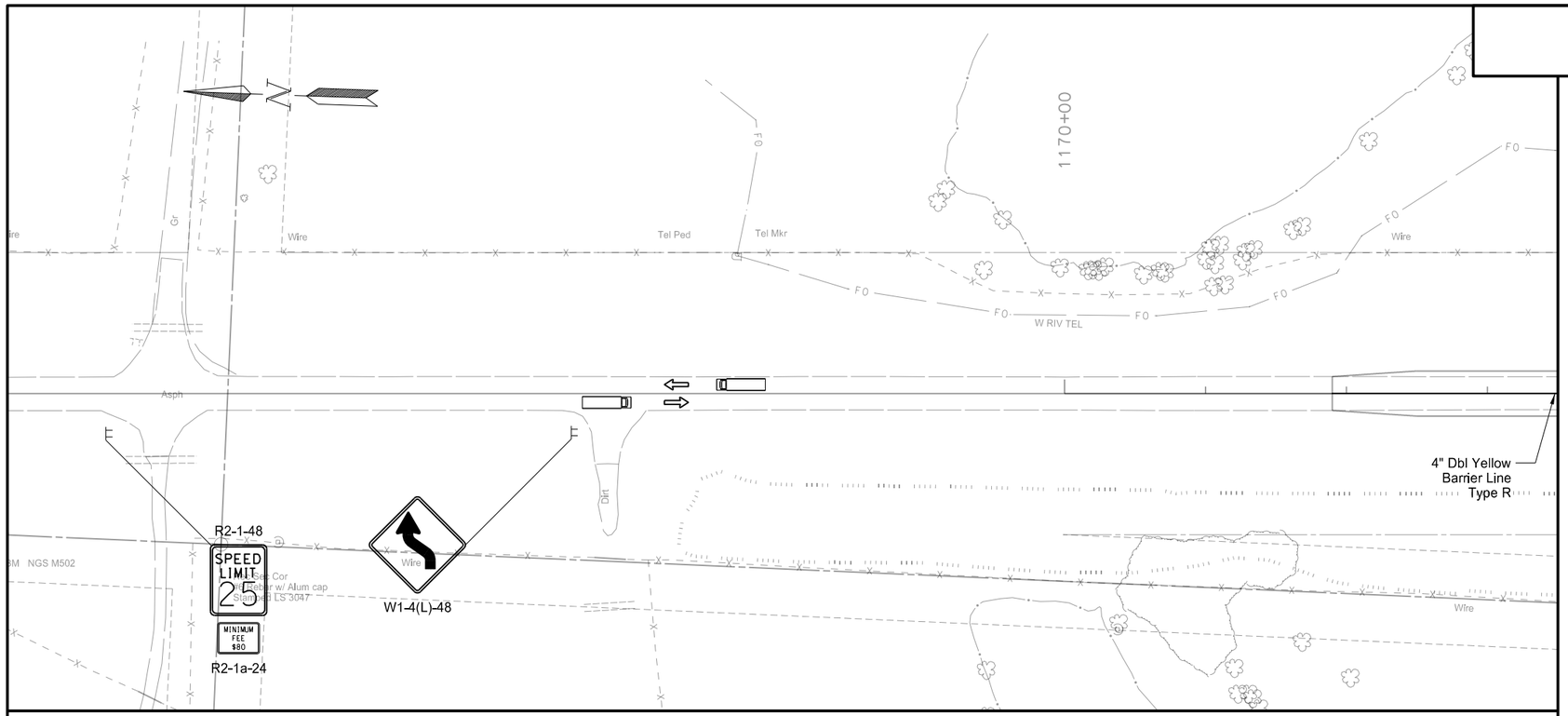
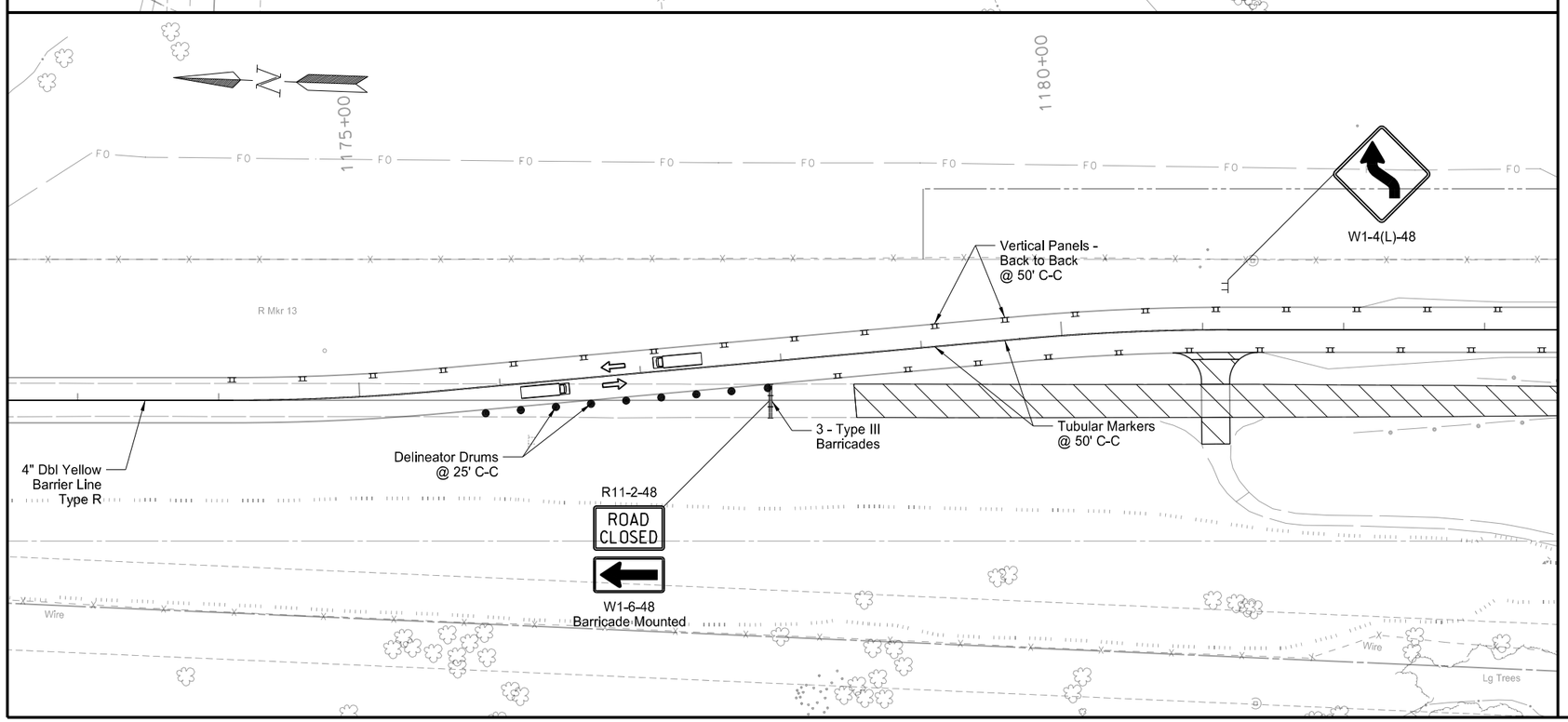
WORK ZONE TRAFFIC CONTROL
PHASE 4 CONSTRUCTION SIGN LAYOUT

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	16





Use Standard Drawing D-704-15 Type B for sign spacing.

SPEC	CODE	BID ITEM	UNIT	QUANTITY
762	420	SHORT TERM 4IN LINE - TYPE R		
		1171+90 to 1183+00 (Yellow Dbl Barrier)	LF	2220

LEGEND:

- Type III Barricade
- Delineator Drum
- Tubular Marker
- Vertical Panel - Back to Back
- Work Area

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WORK ZONE TRAFFIC CONTROL
PHASE 4 CONSTRUCTION SIGN LAYOUT

ND 31 - 13 Miles North of SD Border

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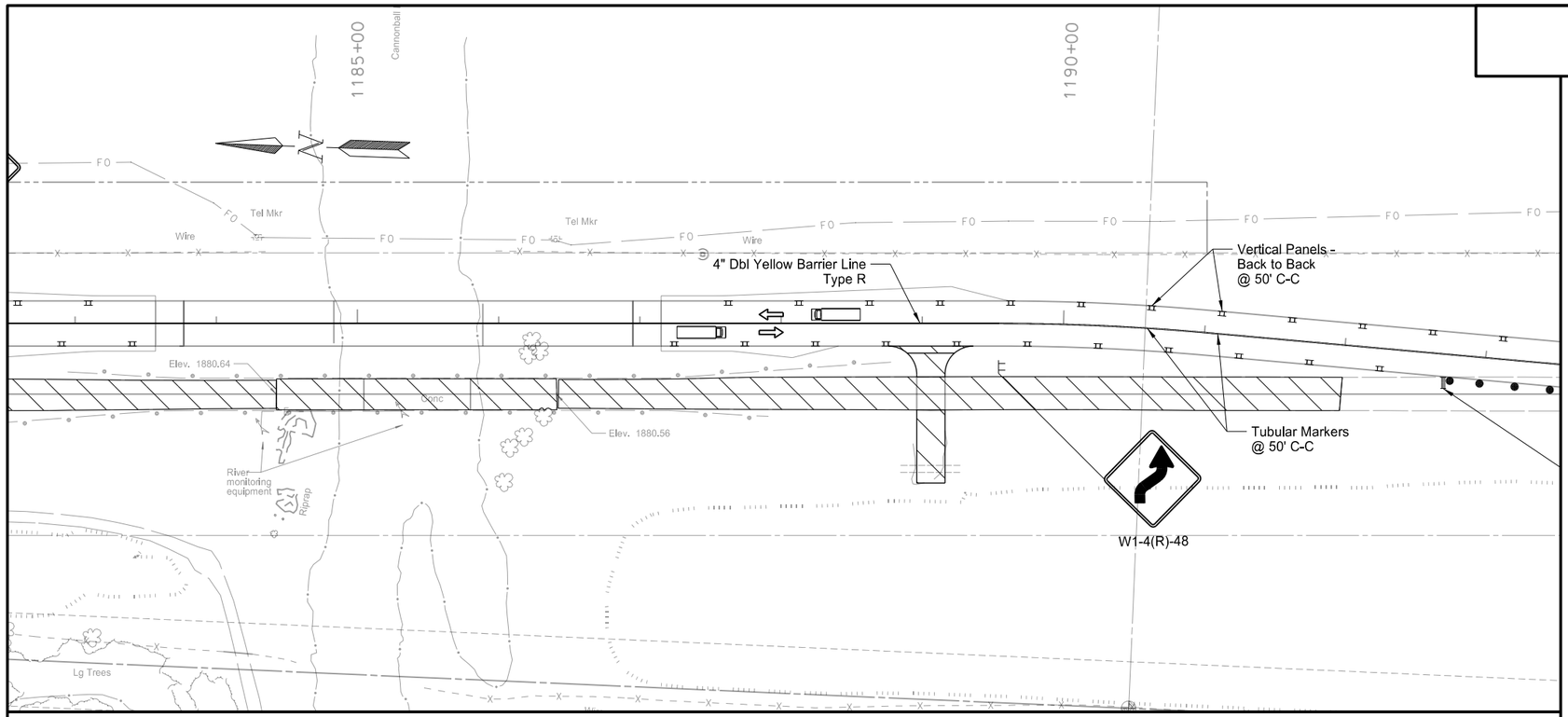
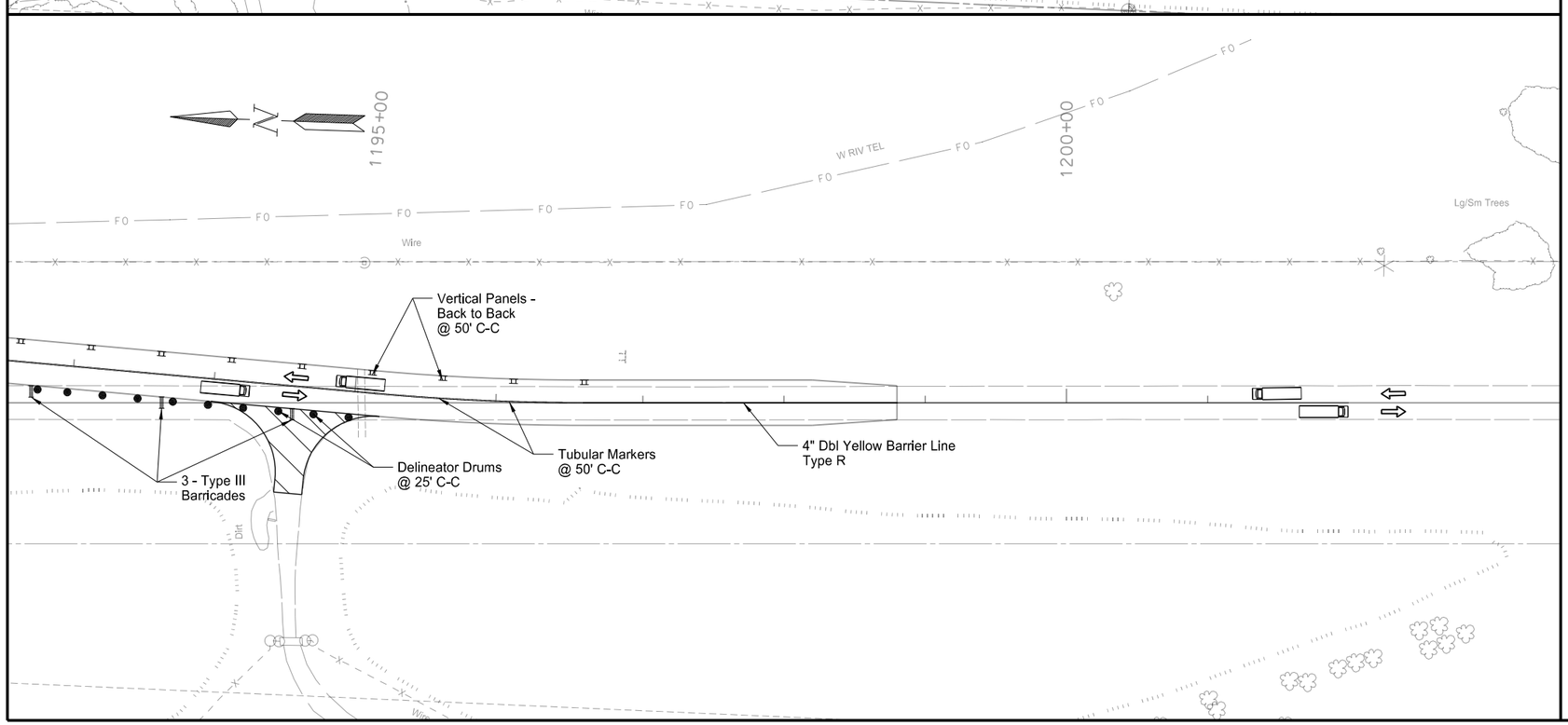
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	17





Use Standard Drawing D-704-15 Type B for sign spacing.

SPEC	CODE	BID ITEM	UNIT	QUANTITY
762	420	SHORT TERM 4IN LINE - TYPE R		
		1183+00 to 1198+80 (Yellow Dbl Barrier)	LF	3168

LEGEND:

- Type III Barricade
- Delineator Drum
- Tubular Marker
- Vertical Panel - Back to Back
- Work Area

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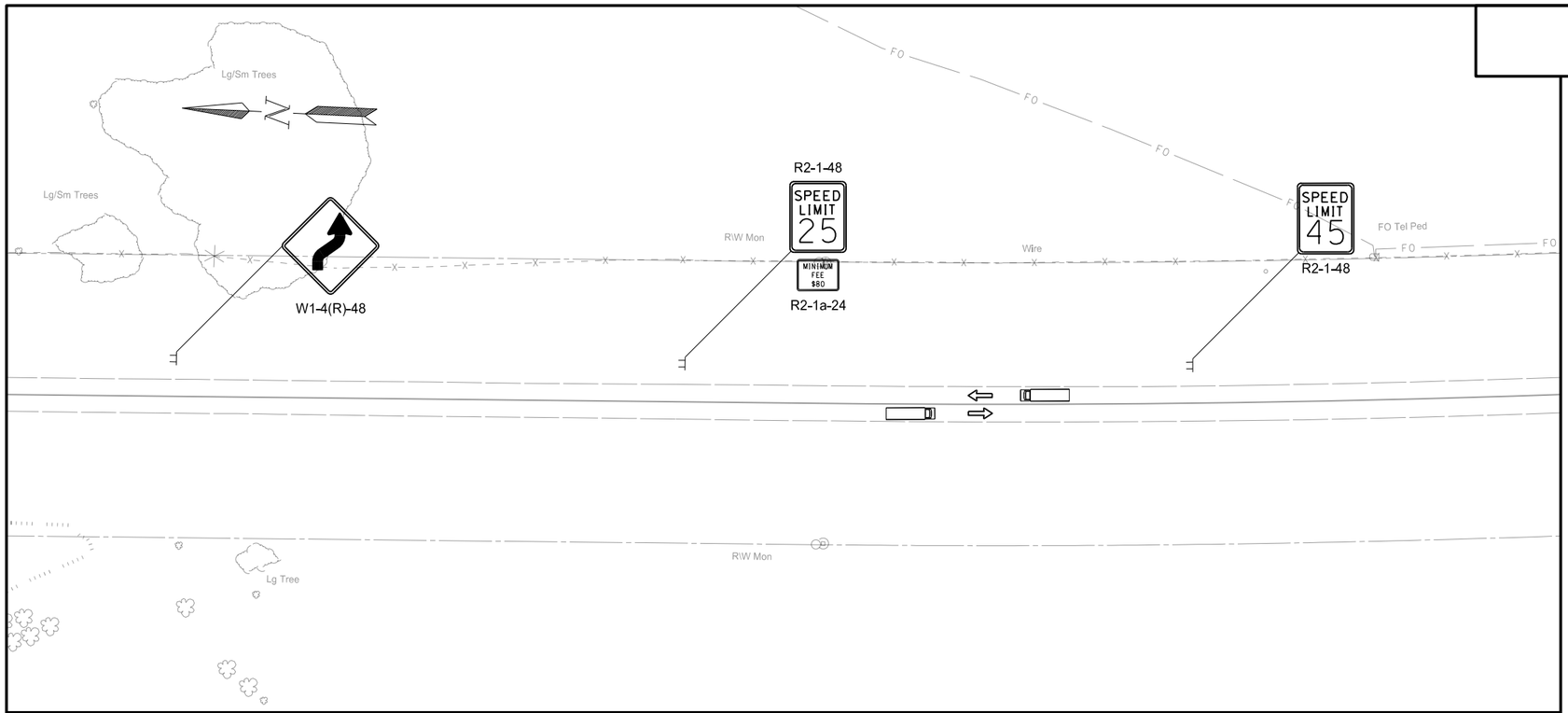
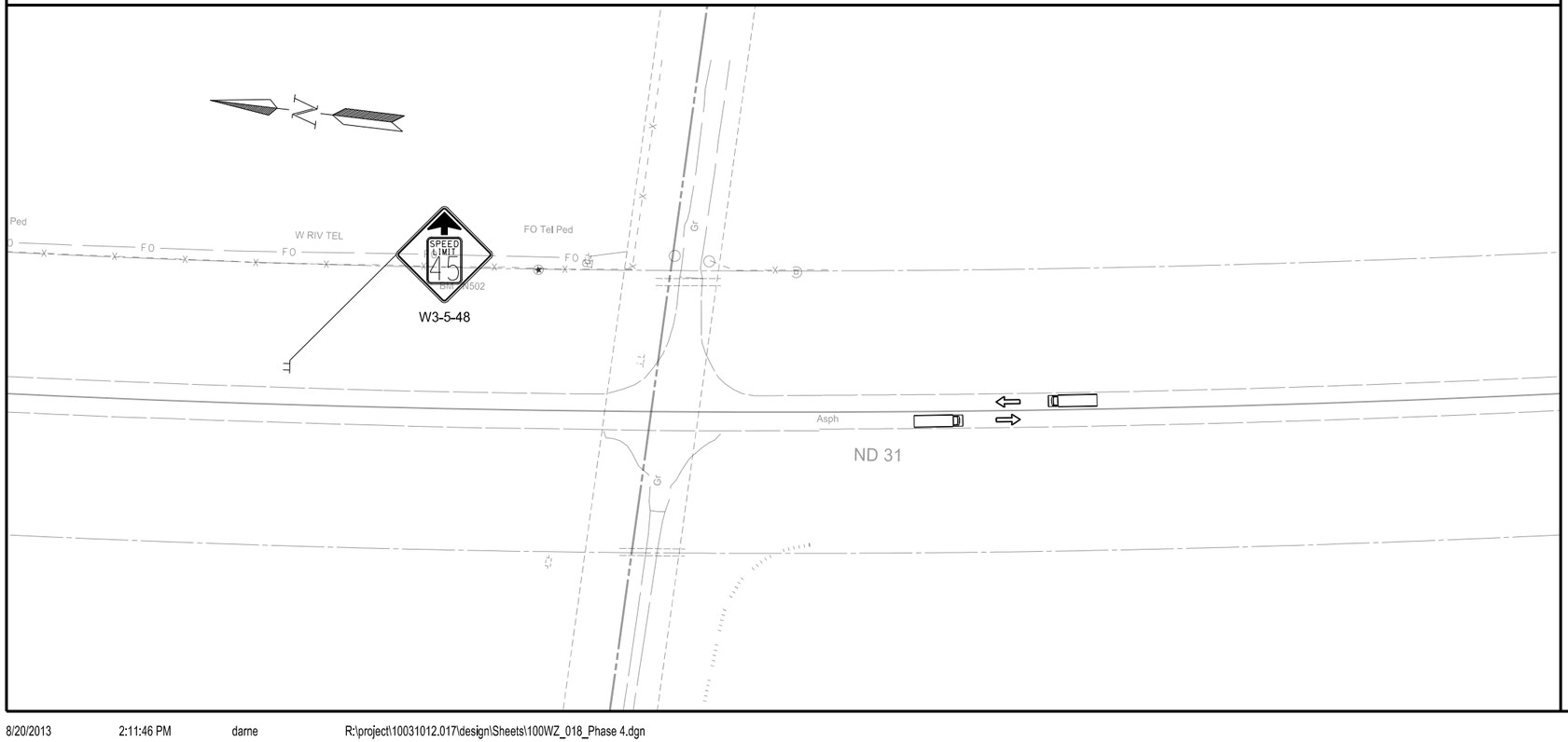
WORK ZONE TRAFFIC CONTROL
PHASE 4 CONSTRUCTION SIGN LAYOUT

ND 31 - 13 Miles North of SD Border

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	18





Use Standard Drawing D-704-15 Type B for sign spacing.

LEGEND:

- Type III Barricade
- Delineator Drum
- Tubular Marker
- Vertical Panel - Back to Back
- Work Area

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WORK ZONE TRAFFIC CONTROL
PHASE 4 CONSTRUCTION SIGN LAYOUT

ND 31 - 13 Miles North of SD Border

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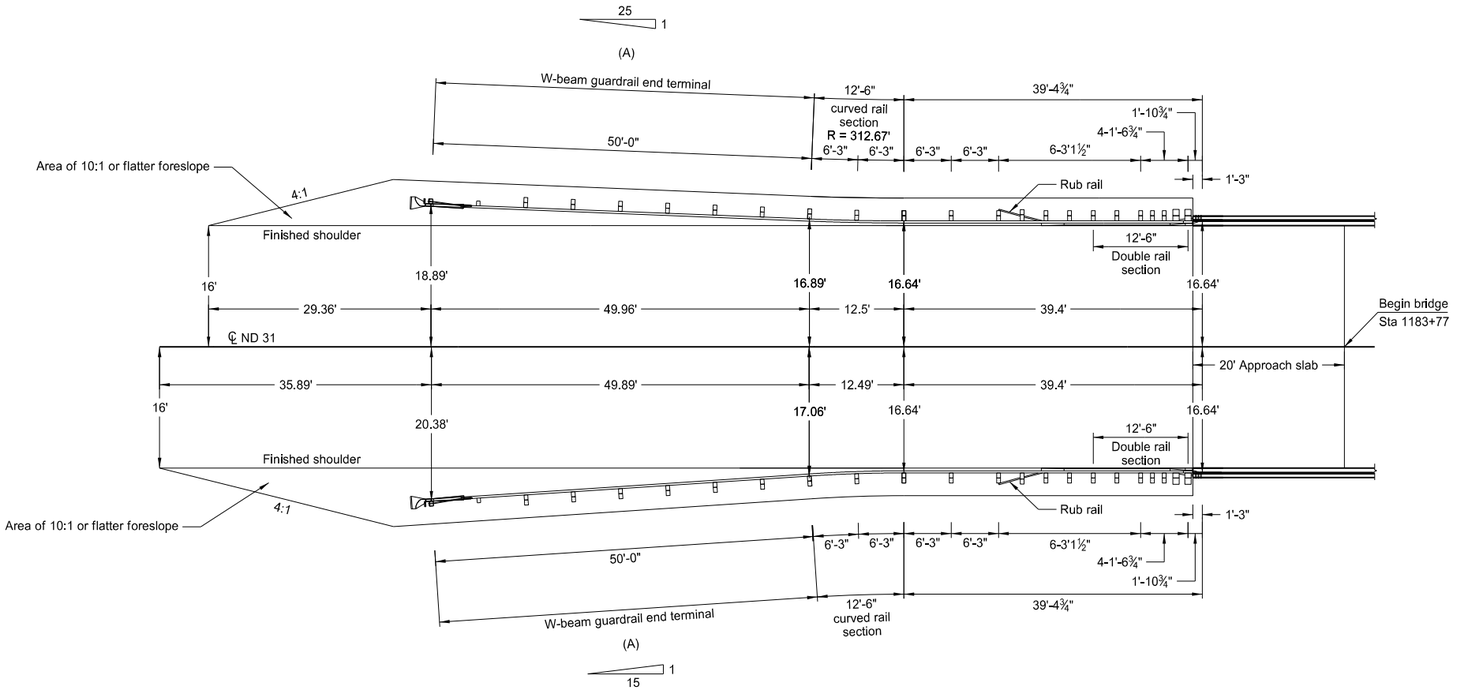
23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	100	19



(A) The W-beam guardrail end terminal to be installed at this location shall be a FLEAT.

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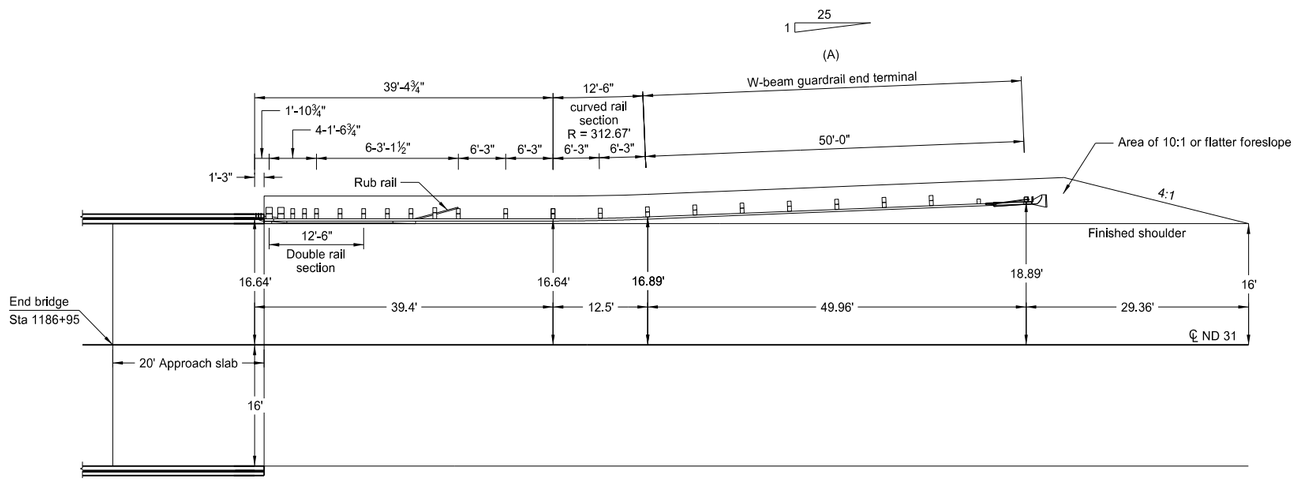
W-Beam Guardrail for Phases 2 & 3
At Beginning of Bridge

Cannonball River Bridge
RP 12.802

ND 31

23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	100	20



(A) The W-beam guardrail end terminal to be installed at this location shall be a FLEAT.

This document was originally issued and sealed by Douglas A. Schumaker, Registration Number PE- 5047, on 08/27/13 and the original document is stored at the North Dakota Department of Transportation

W-Beam Guardrail for Phases 2 & 3
At End of Bridge

Cannonball River Bridge
RP 12.802

ND 31

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	100	21

W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

W-BEAM GUARDRAIL AT BRIDGE ENDS

LOCATION	(A) TERM-INAL CON-NECTOR EACH	(A) 5/8" Ø x 22" LONG GUARD-RAIL BOLT EACH	(A) 5/8" Ø x 20" LONG GUARD-RAIL BOLT EACH	(A) 7/8" Ø x 9" LONG H.S. HEX HEAD BOLT EACH	(A) 5/8" Ø x 18" LONG GUARD-RAIL BOLT EACH	(A) 6"x 8" x 14" WOOD OFF-SET BLOCK EACH	(A) 6"x 8" x 6' TIMBER POST EACH	(A) 5/8" Ø x 1 1/4" LONG GUARD-RAIL BOLT EACH	(A) 12'-6" DOUBLE RAIL SECTION EACH	(A) 12'-6" STRAIGHT RAIL SECTION EACH	(A) 12'-6" CURVED RAIL SECTION EACH	(A) 5/8" Ø x 11" LONG HEX HEAD BOLT EACH	(A) 1/2" Ø x 4" LONG LAG SCREW EACH	(A) 6" x 8" x 7'-0" TIMBER POSTS EACH	(A) RUB RAIL END SHOE EACH	(A) C 6 x 8.2 x 14'-6 1/4" RUB RAIL SECTION EACH	(A) C 6 x 8.2 x 12'-7" BENT RUB RAIL SECTION EACH	(A) 5/8" Ø x 1 1/2" LONG GUARD-RAIL BOLT EACH	(A) 7 3/4" x 4 ½" x 3/8" RUB RAIL SPLICE PLATE EACH	(A) 10"x 10" x 8'-0" TIMBER POST EACH	(A) 10"x 8" x 21" TAPERED TIMBER BLOCK EACH	(A) 6"x 8" x 21" TIMBER BLOCK EACH	(A) 6"x 9 3/4" x 14" TIMBER BLOCK EACH	(A) REFL-ECTOR-IZED PLATES EACH
Sta 1183+06.36 to 1183+58.25 Rt	1	2	10	4	12	5	10	40	1	2	1	2	1	3	1	1	1	4	1	2	2	7	1	6
Sta 1183+06.35 to 1183+58.25 Lt	1	2	10	4	12	5	10	40	1	2	1	2	1	3	1	1	1	4	1	2	2	7	1	6
Sta 1187+13.75 to 1187+65.65 Lt	1	2	10	4	12	5	10	40	1	2	1	2	1	3	1	1	1	4	1	2	2	7	1	6
TOTAL	3	6	30	12	36	15	30	120	3	6	3	6	3	9	3	3	3	12	3	6	6	21	3	18

W-beam guardrail

Sta 1183+06.36 to 1183+58.25 Rt	51.9	LF
Sta 1183+06.35 to 1183+58.25 Lt	51.9	LF
Sta 1187+13.75 to 1187+65.65 Lt	51.9	LF
Total	155.7	LF

Remove W-beam guardrail & posts

Sta 1183+06.36 to 1183+58.25 Rt	51.9	LF	(B)
Sta 1183+06.35 to 1183+58.25 Lt	51.9	LF	(B)
Sta 1187+13.75 to 1187+65.65 Lt	51.9	LF	(B)
Total	155.7	LF	

W-beam guardrail end terminal

Sta 1182+56.47 to 1183+06.36 Rt	1	ea
Sta 1182+56.39 to 1183+06.35 Lt	1	ea
Sta 1187+65.65 to 188+15.61 Lt	1	ea
Total	3	ea

Remove end treatment & transition

Sta 1182+56.47 to 1183+06.36 Rt	1	ea	(B)
Sta 1182+56.39 to 1183+06.35 Lt	1	ea	(B)
Sta 1187+65.65 to 188+15.61 Lt	1	ea	(B)
Total	3	ea	

(A) These items are not to be bid separately but shall be included in the price bid for the item "W-Beam Guardrail".

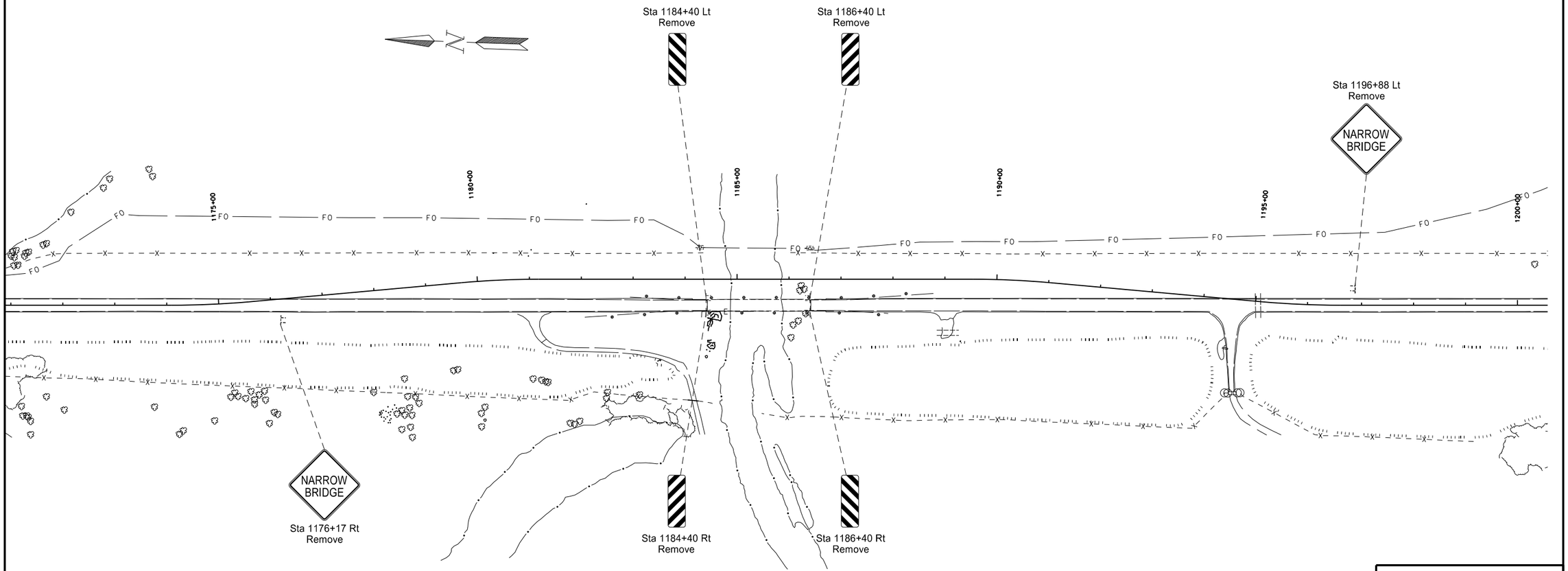
(B) The guardail for two-way traffic at the new bridge shall remain in place during phases 2 and 3 until it is necessary to remove the guardrail for asphalt surfacing of the guardrail embankment. The guardrail shall be removed and reset in the permanent installation. See Section 130 for these reset quantities.

W-Beam Guardrail Quantities for Phases 2 & 3

Cannonball River Bridge
RP 12.802

ND 31

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	110	1



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Sign Removal

ND 31
13 Miles North of SD Border

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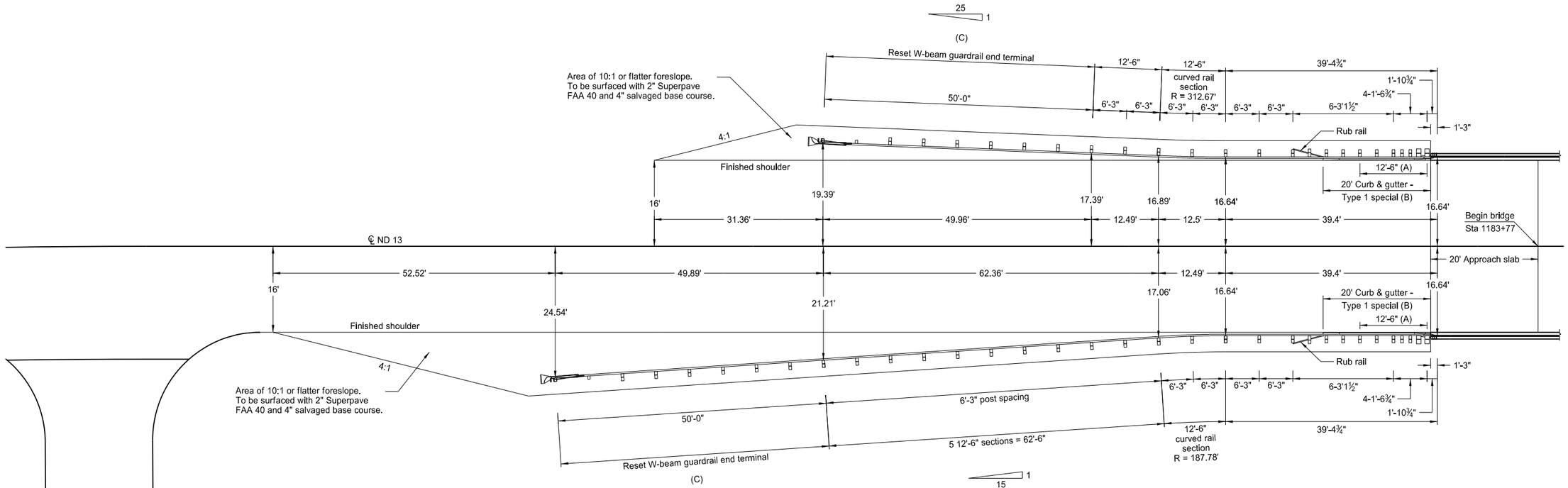
23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	130	1



(A) Double rail section.

(B) The curb and gutter shall be installed in accordance with Standard Drawing D-748-1, except that there shall be height transitions provided for a distance of 3 feet at each end, as shown on Standard Drawing D-764-3.

The curb and gutter shall be measured and paid for by the linear foot as "Curb & gutter - type I special".

(C) The W-beam guardrail end terminal to be reset at this location shall be a FLEAT.

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W-Beam Guardrail Layout
At Beginning of Bridge

Cannonball River Bridge
RP 12.802

ND 31

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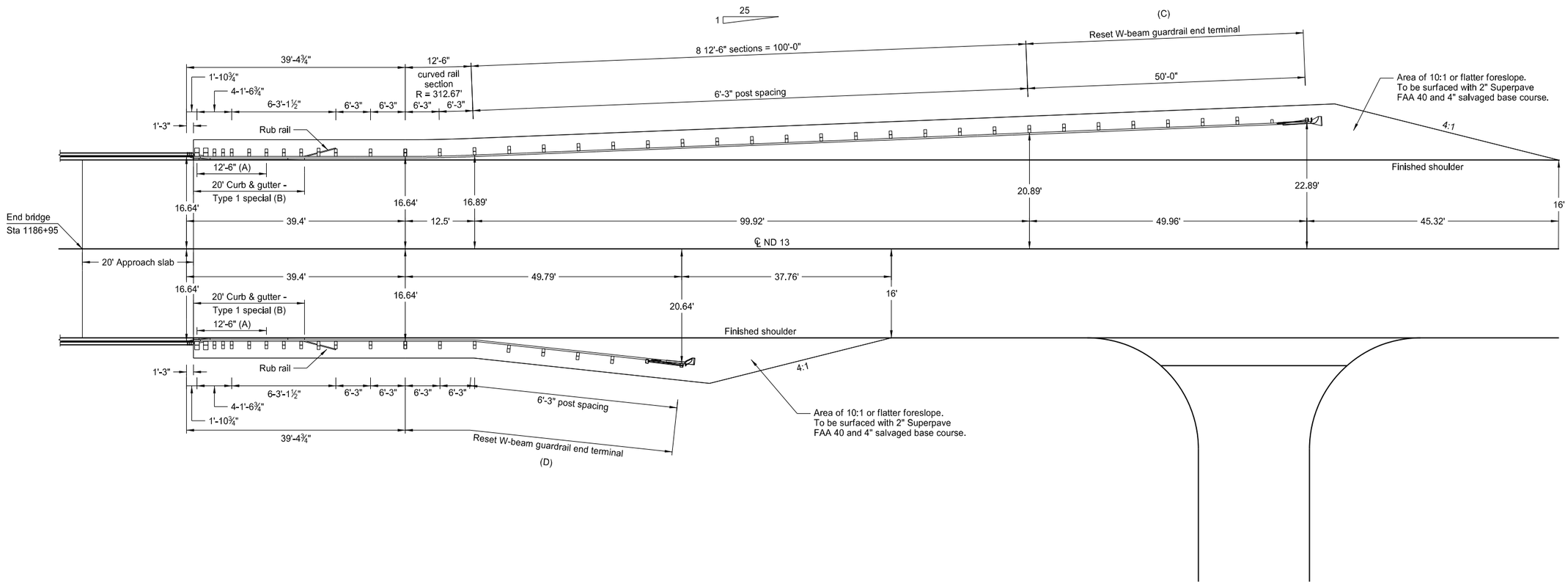
23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	130	2



(A) Double rail section.

(B) The curb and gutter shall be installed in accordance with Standard Drawing D-748-1, except that there shall be height transitions provided for a distance of 3 feet at each end, as shown on Standard Drawing D-764-3.

The curb and gutter shall be measured and paid for by the linear foot as "Curb & gutter - type I special".

(C) The W-beam guardrail end terminal to be reset at this location shall be a FLEAT.

(D) The W-beam guardrail end terminal to be reset at this location shall be a FLEAT with a 4' flare as shown on Standard D-764-2C.

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W-Beam Guardrail Layout
At End of Bridge

Cannonball River Bridge
RP 12.802

ND 31

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	130	3

W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

W-BEAM GUARDRAIL AT BRIDGE ENDS

LOCATION	(A) TERM-INAL CON-NECTOR EACH	(A) 5/8" Ø x 22" LONG GUARD-RAIL BOLT EACH	(A) 5/8" Ø x 20" LONG GUARD-RAIL BOLT EACH	(A) 7/8" Ø x 9" LONG H.S. HEX HEAD BOLT EACH	(A) 5/8" Ø x 18" LONG GUARD-RAIL BOLT EACH	(A) 6"x 8" x 14" WOOD OFF-SET BLOCK EACH	(A) 6"x 8" x 6' TIMBER POST EACH	(A) 5/8" Ø x 1 1/4" LONG GUARD-RAIL BOLT EACH	(A) 12'-6" DOUBLE RAIL SECTION EACH	(A) 12'-6" STRAIGHT RAIL SECTION EACH	(A) 12'-6" CURVED RAIL SECTION EACH	(A) 5/8" Ø x 11" LONG HEX HEAD BOLT EACH	(A) 1/2" Ø x 4" LONG LAG SCREW EACH	(A) 6" x 8" x 7'-0" TIMBER POSTS EACH	(A) RUB RAIL END SHOE EACH	(A) C 6 x 8.2 x 14'-6 1/4" RUB RAIL SECTION EACH	(A) C 6 x 8.2 x 12'-7" BENT RUB RAIL SECTION EACH	(A) 5/8" Ø x 1 1/2" LONG GUARD-RAIL BOLT EACH	(A) 7 3/4" x 4 ½" x 3/8" RUB RAIL SPLICE PLATE EACH	(A) 10"x 10" x 8'-0" TIMBER POST EACH	(A) 10"x 8" x 21" TAPERED TIMBER BLOCK EACH	(A) 6"x 8" x 21" TIMBER BLOCK EACH	(A) 6"x 9 3/4" x 14" TIMBER BLOCK EACH	(A) REFL-ECTOR-IZED PLATES EACH
Sta 1182+44.00 to 1183+58.25 Rt Sta 1182+93.86 to 1183+58.25 Lt Sta 1187+13.75 to 1187+53.15 Rt Sta 1187+13.75 to 1188+65.57 Lt	1	2	10	4	10	3	8	32	1	2		2	1	3	1	1	1	4	1	2	2	7	1	2 5 4
TOTAL	1	2	10	4	10	3	8	32	1	2		2	1	3	1	1	1	4	1	2	2	7	1	11

W-beam guardrail

Sta 1187+13.75 to 1187+53.15 Rt	39.4	LF

Remove W-beam guardrail & posts

Sta 1182+56.87 to 1184+12.85 Rt	156.3	LF
Sta 1183+44.15 to 1184+12.85 Lt	68.8	LF
Sta 1186+67.64 to 1187+36.35 Rt	68.8	LF
Sta 1186+67.64 to 1188+23.63 Lt	156.3	LF
Total	450.2	LF

Curb & gutter - Type 1 special

Sta 1183+37.00 to 1183+57.00 Rt	20	LF
Sta 1183+37.00 to 1183+57.00 Lt	20	LF
Sta 1187+15.00 to 1187+35.00 Rt	20	LF
Sta 1187+15.00 to 1187+35.00 Lt	20	LF
Total	80	LF

Remove end treatment & transition

Sta 1182+07.00 to 1182+56.87 Rt	1	ea
Sta 1182+94.28 to 1183+44.15 Lt	1	ea
Sta 1187+36.35 to 1187+86.22 Rt	1	ea
Sta 1187+23.86 to 1187+73.73 Lt	1	ea
Total	4	ea

Reset W-beam guardrail

Sta 1183+06.36 to 1183+58.25 Rt	51.9	LF	(B)
Sta 1183+06.35 to 1183+58.25 Lt	51.9	LF	(B)
Sta 1187+13.75 to 1187+65.65 Lt	51.9	LF	(B)
Sta 1182+44.00 to 1183+06.36 Rt	62.5	LF	(C)
Sta 1182+93.86 to 1183+06.35 Lt	12.5	LF	(C)
Sta 1187+65.65 to 1188+65.57 Lt	100	LF	(C)
Total	330.7	LF	

Reset W-beam guardrail end terminal

Sta 1181+94.11 to 1182+44.00 Rt	1	ea	(B)
Sta 1182+43.90 to 1182+93.86 Lt	1	ea	(B)
Sta 1187+53.15 to 1188+02.94 Rt	1	ea	(C)
Sta 1188+65.57 to 1189+15.53 Lt	1	ea	(B)
Total	4	ea	

(A) These items are not to be bid separately but shall be included in the price bid for the item "W-Beam Guardrail".

(B) These portions of the reset quantities shall be reset from guardrail for Phases 2 and 3. Reflectorized plates shall also be reset from Phases 2 and 3. See Section 100.

(C) These portions of the reset quantities shall be reset from the guardrail at the existing bridge.

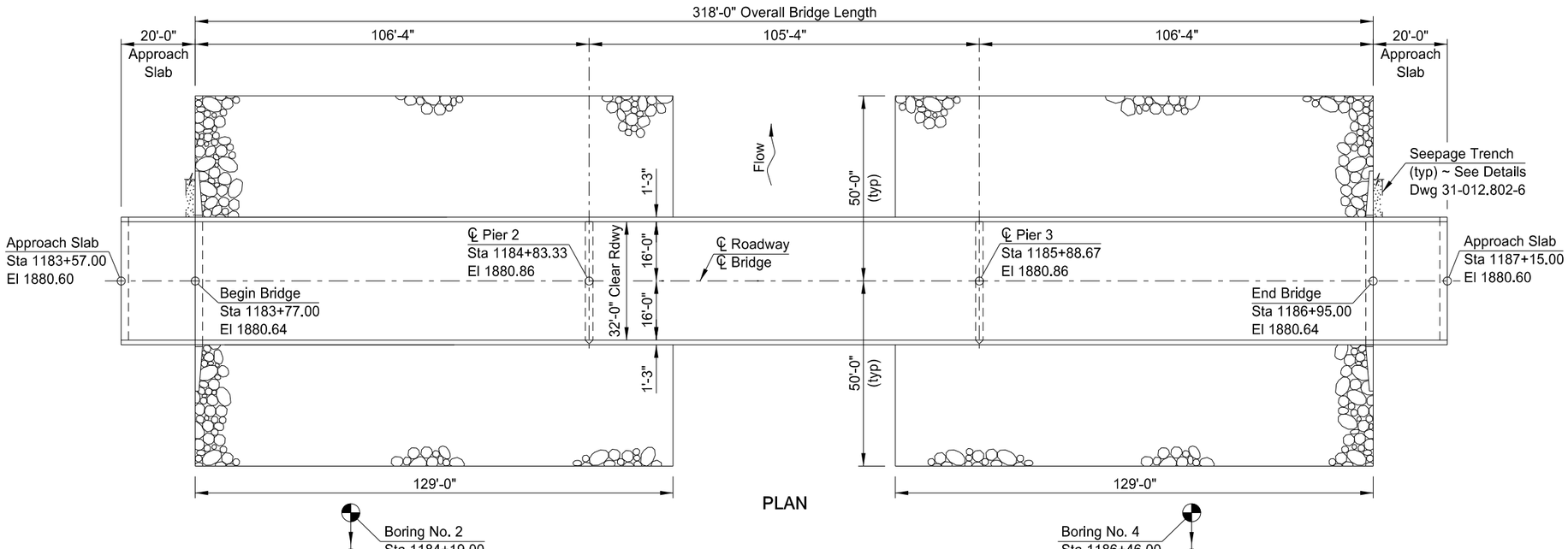
W-Beam Guardrail Quantities

Cannonball River Bridge
RP 12.802

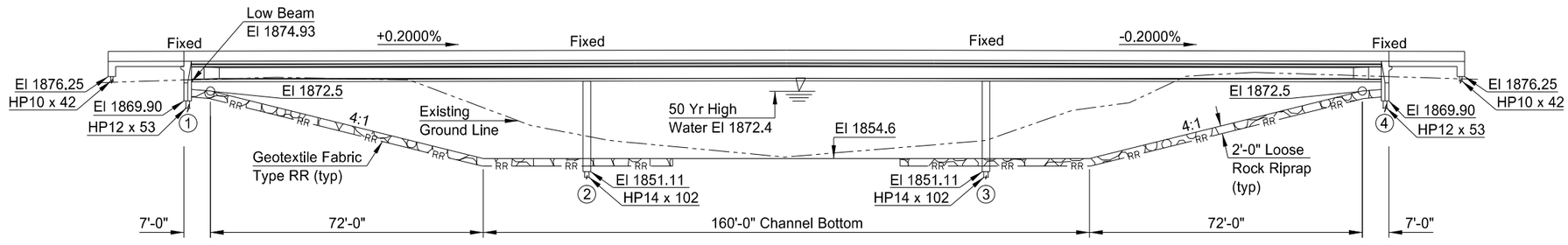
ND 31

23 U.S.C. 409
NDDOT Reserves All Objections

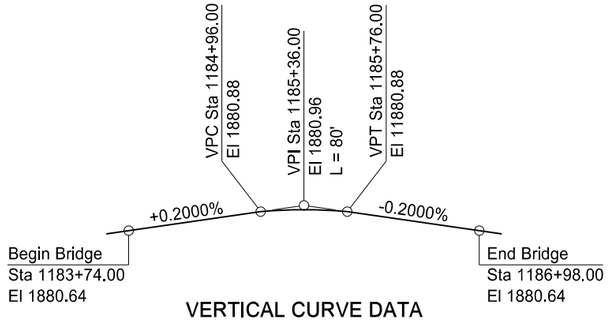
BRIDGE CODE		STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
X081		ND	BRS-1-031(017)012	170	1



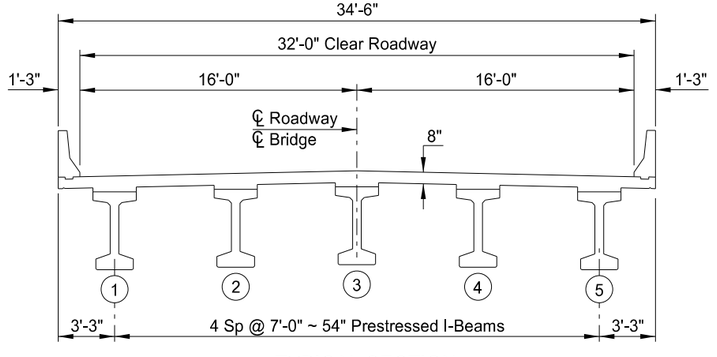
PLAN



ELEVATION



VERTICAL CURVE DATA



TYPICAL SECTION

DESIGN STRENGTHS:

f'c = 3,000 psi ~ Class AE-3 Concrete
f'c = 4,000 psi ~ Class AAE-3 Concrete
f'c = 6,000 psi ~ Prestressed Beam Concrete
fy = 60,000 psi ~ Reinforcing Steel

Load & Resistance Factor Design

HYDRAULIC DATA:

Drainage Area	1640	sq mi
Stream Gradient	.0013	ft/ft
Design Frequency	50	yr
Design Discharge	22,670	cfs
Design Headwater Stage	1872.05	ft
Design Tailwater Stage	1871.94	ft
Velocity Through Bridge	5.78	fps
100-Year Frequency Discharge	31,170	cfs
100-Year Frequency Headwater	1873.46	ft
Overtopping Stage	1880.64	ft
Overtopping Discharge	>500 year event	

SURVEY CONTROL POINTS

POINT	NORTHING	EASTING	ELEVATION
BM N502	165,748.79	1,757,760.25	1,945.41
BM M502	171,108.26	1,757,342.82	1,902.04

STANDARD DRAWINGS

D-622-1, D-900-1

F.W.S. 15 PSF

HL-93 DESIGN LOADING

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
HIGHWAY 31
CANNONBALL RIVER

BRIDGE LAYOUT

PROJECT: BRS-1-031(017)012
STATION: 1185+36.00
GRANT COUNTY

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08/26/13 DATE
Terrence R. Udland BRIDGE ENGINEER

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	170	2

NOTES

100 SCOPE OF WORK: This project consists of building a new 3-span prestressed concrete I-beam bridge with an overall bridge length of 318'-0" and a clear roadway width of 32'-0". The new bridge will be built on the east side of the existing bridge.

100 GENERAL: The cost of furnishing and placing preformed expansion joint filler, concrete inserts, rebar couplers, deck drains, silicone sealant, and other miscellaneous items shall be included in the price bid for Class AE-3 and AAE-3 concrete.

107 HAZARDOUS MATERIAL: The existing structural steel is painted with lead-based paint. Certain Contractor operations could expose employees to hazardous levels of lead. The Contractor shall plan accordingly and shall inform employees of the hazards of lead-based paint. Any loose and peeling paint found on the existing structural steel shall be removed, contained, and disposed of properly.

202 REMOVAL OF STRUCTURE: The existing structure is a 3-span steel girder bridge, 200'-0" long with a clear roadway width of 22'-0". The substructures are made of concrete. The foundations consist of spread footings at the abutments and piers. The substructures shall be removed to a depth of one foot below the proposed channel bottom. All material removed shall become the property of the contractor and shall be disposed of properly off of the right-of-way. The lump sum bid item, “Removal of Structure” shall include all work required to remove the bridge.

In accordance with the Federal Migratory Bird Treaty Act, measures to prevent birds from building new nests or using old nests for active nesting must be incorporated into the project. The Contractor shall remove all nesting sites on the bridge. The Contractor shall remove any new bird nests on a weekly basis. These measures shall be maintained until the existing bridge has been removed. All costs associated with the removal of bird nests shall be included in the bid item “Removal of Structure.”

202 USGS STREAM GAGE REMOVAL: There is a wire weight gage mounted to the existing bridge railing. In addition, a gage house is located at the northwest corner of the existing structure that will need to be relocated. The Engineer shall contact Brent Hanson of the U.S. Geological Survey, 701-250-7420, brhanson@usgs.gov, two weeks prior to the Contractor’s removal of the existing bridge to coordinate this work. The USGS will remove the gage from the existing bridge and relocate the gage house.

210 EXCAVATION: The excavation at the abutments, as shown, shall be included in the lump sum bid item “Class 1 Excavation.” The excavation at the piers, as shown, shall be included in the lump sum bid item “Class 2 Excavation.” All other excavation required to shape the new channel shall be included in the cubic yard bid item “Channel Excavation.”

210 SELECT BACKFILL: Select backfill shall meet the requirements of Section 816.03, Class 3. The backfill shall be placed in layers of not more than 6 inches, moistened or dried as required, and thoroughly compacted with mechanical tamping equipment. Moisture and density controls shall be in accordance with Section 203.02G of the Standard Specifications and compacted to 90% of maximum dry density as determined by AASHTO T-180. The work and material needed for placing the select backfill shall not be bid separately but shall be included in the pay item, “Abutment Underdrain System.” Salvaged aggregate base course may be used in place of select backfill.

602 BRIDGE APPROACH SLABS: Mechanical finishing of the approach slabs shall be required. A tine finish shall be applied using the deck tining requirements. Tining shall start 6" from the beginning and end of the approach slabs. A surface tolerance of 3/16" in 10 feet is also required.

602 DIAPHRAGMS AND ENDWALLS: The intermediate diaphragm concrete shall be placed before the deck concrete and shall cure for at least 72 hours before deck placement. The pier diaphragm and endwall concrete shall be placed at the same time as the deck concrete.

602 DECK CONCRETE: Beams have slight variations in the anticipated camber. To build the deck to the designated thickness will require slight adjustments in deck elevation and/or riser dimensions. These adjustments result in minor concrete quantity discrepancies. The Contractor shall consider this quantity discrepancy when he bids the unit price for Class AAE-3 concrete. The Department will pay plan quantity of Class AAE-3 concrete.

602 PENETRATING WATER REPELLENT TREATMENT: Penetrating water repellent shall be applied to the driving surface of the concrete deck.

602 BRIDGE DECK AND APPROACH SLAB CURING: The bridge deck and approach slabs shall be cured by the wet-cure method. No work shall be done on the bridge deck or approach slabs while the wet cure is in progress, including forming the barriers. No vehicles or equipment not required in the curing process shall be on the bridge deck or approach slabs.

602 DECK PLACEMENT: The deck concrete shall be placed at a minimum rate of 50 CY per hour.

602 SURFACE FINISH “D”: Surface Finish “D” shall be required for the inside and top surfaces of the barrier. This work shall be included in the price bid for Class AAE-3 concrete.

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	170	3

NOTES

616 STRUCTURAL STEEL: Structural steel shall be AASHTO M 270, Grade 36T2, except the requirement for Charpy V-Notch test is waived.

622 PILING: The piling shall be Grade 50 steel.

622 PILING: Piling shall be driven with a steam, air, or diesel hammer with a rated energy and ram weight not less than 164,395 foot-pound-tons, as computed by the formula W(E–26,950) + 1.220E, where W is the weight of the ram in tons and E is the rated hammer energy. In no case shall the ram weight be less than 6,000 pounds. The hammer shall be run at an energy that produces a penetration at bearing between ½" and 3 inches of total penetration for the last 10 blows.

SHOP DRAWINGS: The Contractor shall submit the following shop drawings to the Engineer for review:

1. Prestressed I-Beams

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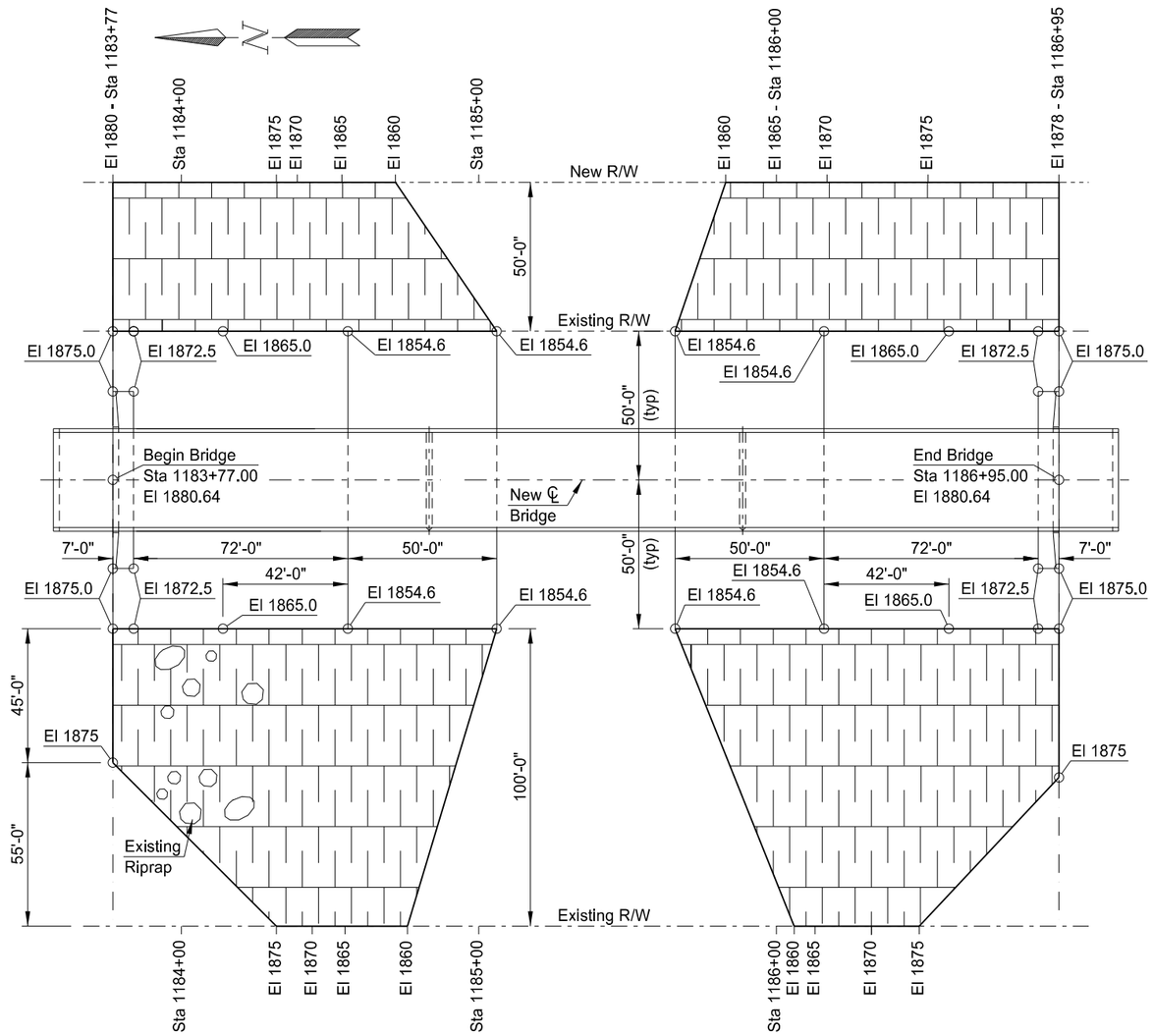


CHANNEL EXCAVATION

Hatched area indicates channel excavation.

NOTES:

The channel excavation under the new bridge is not indicated.

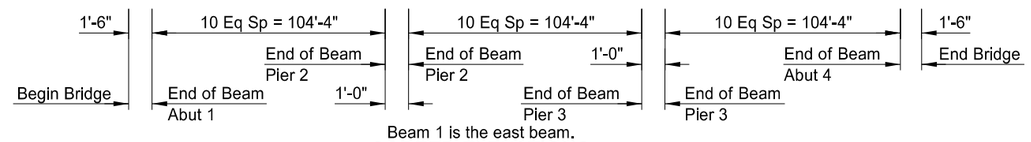
The channel excavation shall transition from the elevations at the edge of the riprap to the existing ground elevations at the Right of Way limits.

Any existing riprap on the north bank of the existing bridge meeting the requirements of Section 708.04 that is disturbed during the channel excavation may be used as riprap for the new structure. This riprap shall be paid for as "Riprap-Loose Rock."

23 U.S.C. 409
NDDOT Reserves All Objections

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	170	4

℄ BEAM 1	1880.35	1880.35	1880.42	.48	.53	.57	.60	.61	.61	.60	.58	1880.56	1880.56	.63	.69	.73	.76	.77	.76	.73	.69	.63	1880.56	1880.56	.58	.60	.61	.61	.60	.57	.53	.48	1880.42	1880.35	1880.35
℄ BEAM 2	1880.50	1880.50	1880.56	.62	.67	.71	.74	.76	.76	.75	.73	1880.71	1880.71	.77	.83	.88	.90	.91	.90	.88	.83	.77	1880.71	1880.71	.73	.75	.76	.76	.74	.71	.67	.62	1880.56	1880.50	1880.50
℄ BEAM 3	1880.64	1880.65	1880.71	.77	.82	.86	.89	.90	.90	.89	.88	1880.85	1880.86	.92	1880.98	1881.02	.05	.06	.05	1881.02	1880.98	.92	1880.86	1880.85	.88	.89	.90	.90	.89	.86	.82	.77	1880.71	1880.65	1880.64
℄ BEAM 4	1880.50	1880.50	1880.56	.62	.67	.71	.74	.76	.76	.75	.73	1880.71	1880.71	.77	.83	.88	.90	.91	.90	.88	.83	.77	1880.71	1880.71	.73	.75	.76	.76	.74	.71	.67	.62	1880.56	1880.50	1880.50
℄ BEAM 5	1880.35	1880.35	1880.42	.48	.53	.57	.60	.61	.61	.60	.58	1880.56	1880.56	.63	.69	.73	.76	.77	.76	.73	.69	.63	1880.56	1880.56	.58	.60	.61	.61	.60	.57	.53	.48	1880.42	1880.35	1880.35



Beam 1 is the east beam.

SCREED ELEVATIONS

BRIDGE BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
202	0105	REMOVAL OF STRUCTURE	L SUM	1
210	0101	CLASS 1 EXCAVATION	L SUM	1
210	0111	CLASS 2 EXCAVATION	L SUM	1
210	0126	CHANNEL EXCAVATION	CY	18,500
210	0201	FOUNDATION PREPARATION	EA	1
602	0130	CLASS AAE-3 CONCRETE	CY	397.0
602	1130	CLASS AE-3 CONCRETE	CY	165.0
602	1134	PILE SUPPORTED APPROACH SLAB	SY	153.4
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	1,131
604	9915	PRESTRESSED I-BEAM-54 IN	LF	1,565.0
612	0115	REINFORCING STEEL-GRADE 60	LBS	16,866
612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS	87,415
616	0364	STRUCTURAL STEEL M270-GRADE 36	LBS	1,554
622	0020	STEEL PILING HP10 X 42	LF	960
622	0040	STEEL PILING HP12 X 53	LF	1,380
622	0070	STEEL PILING HP14 X 102	LF	1,200
708	1020	RIPRAP-LOOSE ROCK	CY	1,919
709	0600	GEOTEXTILE FABRIC-TYPE RR	SY	2,878
930	3000	BRIDGE BENCH MARKS	SET	1
930	9536	ABUTMENT UNDERDRAIN SYSTEM	L SUM	1

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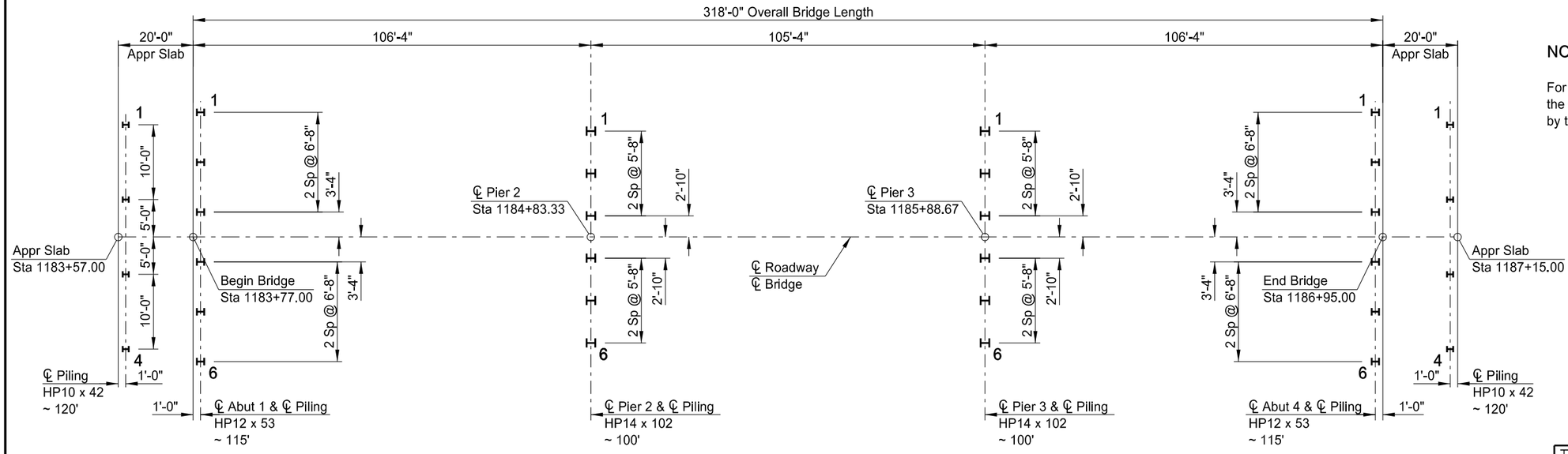
HIGHWAY 31
CANNONBALL RIVER

CHANNEL EXCAVATION, SCREED ELEVATIONS & BID ITEM QUANTITIES

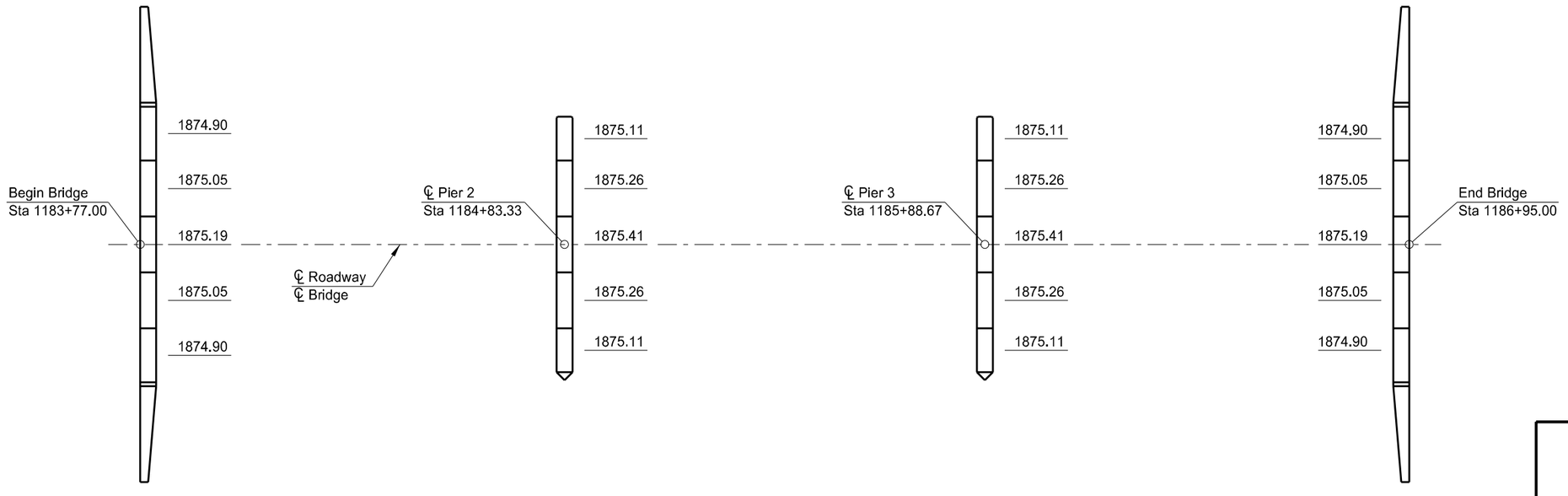
23 U.S.C. 409
NDDOT Reserves All Objections

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	170	5



HP10 x 42 Pile shall be driven to 105 tons.
HP12 x 53 Pile shall be driven to 130 tons.
HP14 x 102 Pile shall be driven to 250 tons.

PILE LAYOUT



Elevations shown are to top of finished concrete.

BEARING ELEVATIONS

NOTE:

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

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

	PILE	NORTHING	EASTING
NORTH APPR SLAB	1	169,006.33	1,757,582.62
	4	169,005.27	1,757,552.64
ABUT 1	1	168,986.40	1,757,584.99
	6	168,985.22	1,757,551.68
PIER 2	1	168,881.05	1,757,586.22
	6	168,880.04	1,757,557.91
PIER 3	1	168,775.78	1,757,589.96
	6	168,774.78	1,757,561.64
ABUT 4	1	168,670.60	1,757,596.19
	6	168,669.42	1,757,562.87
SOUTH APPR SLAB	1	168,650.56	1,757,595.23
	4	168,649.49	1,757,565.25

PILE COORDINATES

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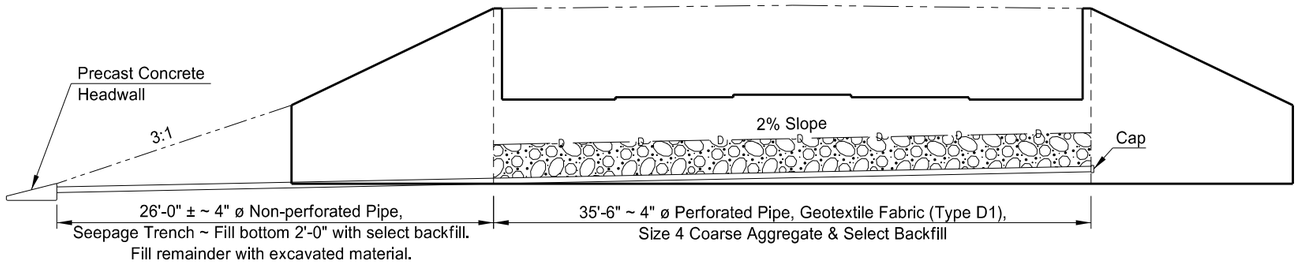
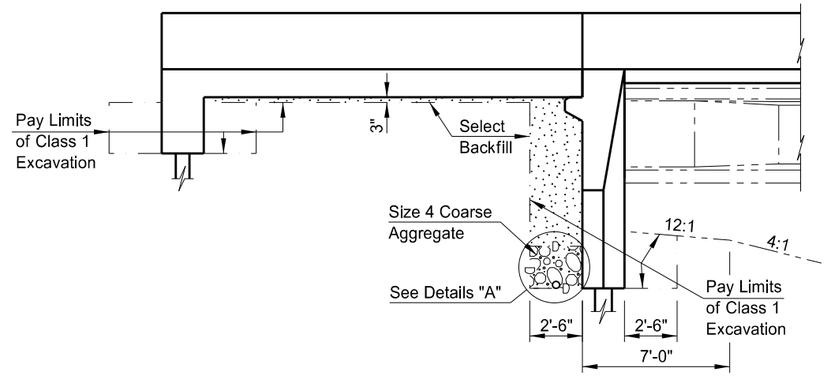
HIGHWAY 31
CANNONBALL RIVER

PILING LAYOUT &
BEARING ELEVATIONS

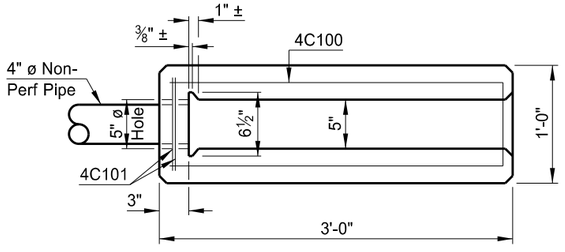
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	170	6



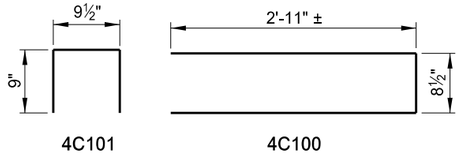
BACK FACE OF ABUTMENT



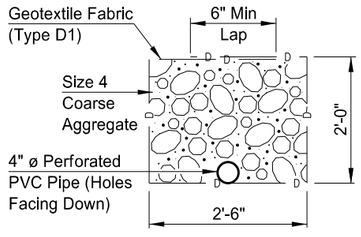
DETAIL AT ABUTMENT



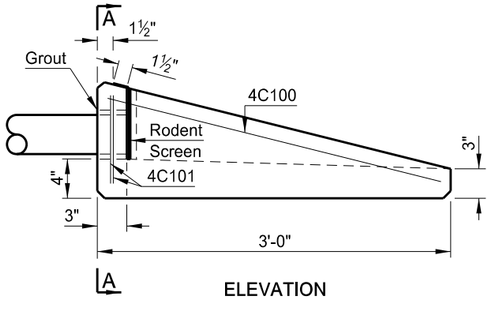
PLAN



BENT BAR DETAILS

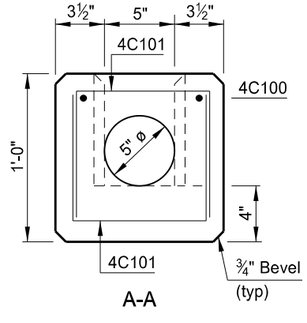


DETAIL "A"

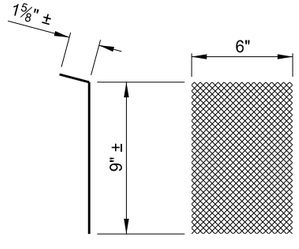


ELEVATION

PRECAST CONCRETE HEADWALL DETAILS



A-A



SIDE VIEW FRONT VIEW

RODENT SCREEN DETAILS

NOTES:

The dimensions for the rodent screen are approximate to allow for bending and a snug fit into the slot in the headwall.

The rodent screen shall be fabricated from flattened, expanded metal with screen openings of approximately 0.25 square inches. The screen shall be 16 gage metal and be hot dip galvanized after fabrication.

The cost to furnish and place the select backfill, coarse aggregate, geotextile fabric, perforated pipe, non-perforated pipe, headwalls and rodent screens shall be included in the pay item "Abutment Underdrain System."

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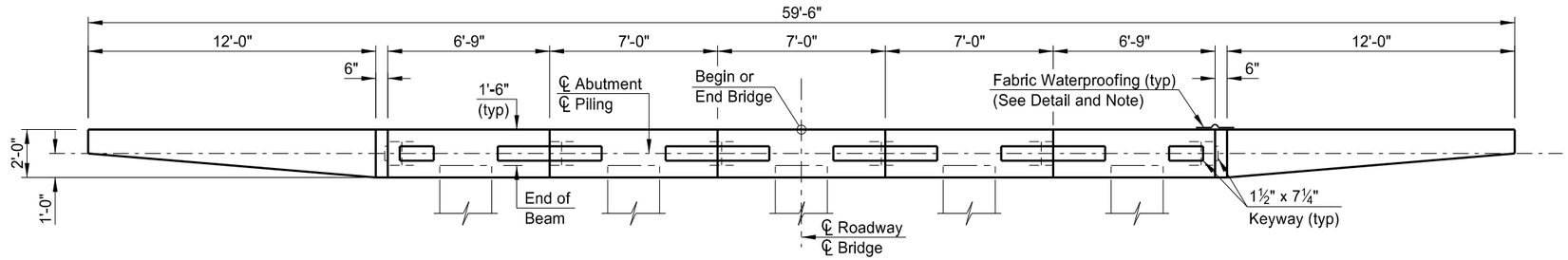
HIGHWAY 31
CANNONBALL RIVER

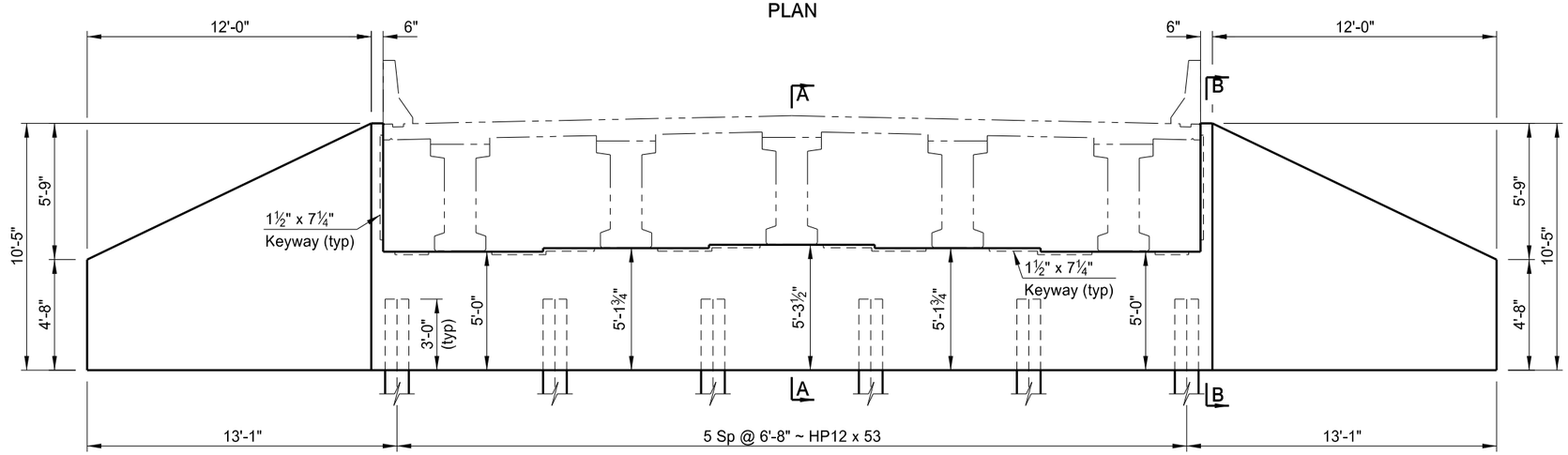
ABUTMENT UNDERDRAIN & EXCAVATION DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

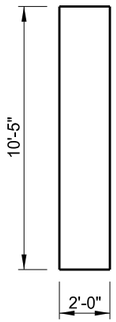
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	170	7



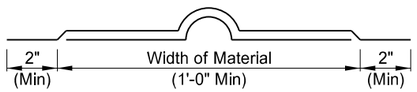
PLAN



ELEVATION

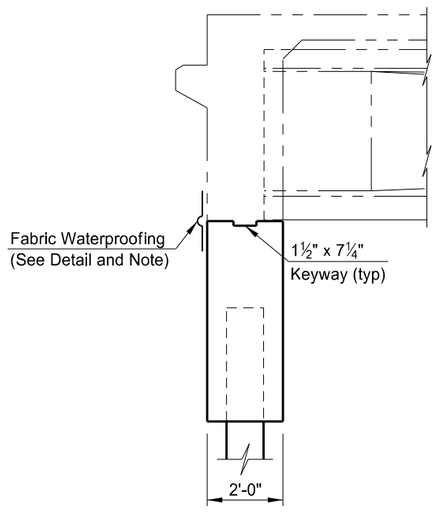


B-B



Fabric waterproofing shall be applied in accordance with Section 740 of the NDDOT Specifications. All material and work shall be included in the pay item "Class AE-3 Concrete."

FABRIC WATERPROOFING DETAIL



A-A

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QUANTITIES

SEE DWG 31-012.802-8

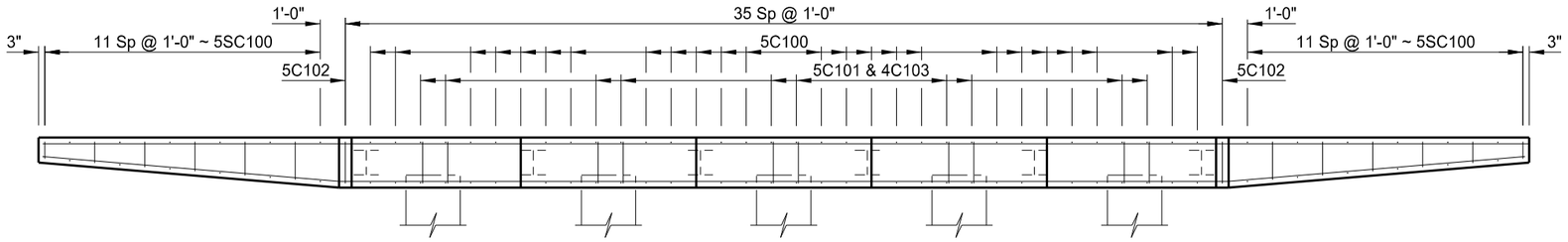
HIGHWAY 31
CANNONBALL RIVER

(SHOWING DIMENSIONS)

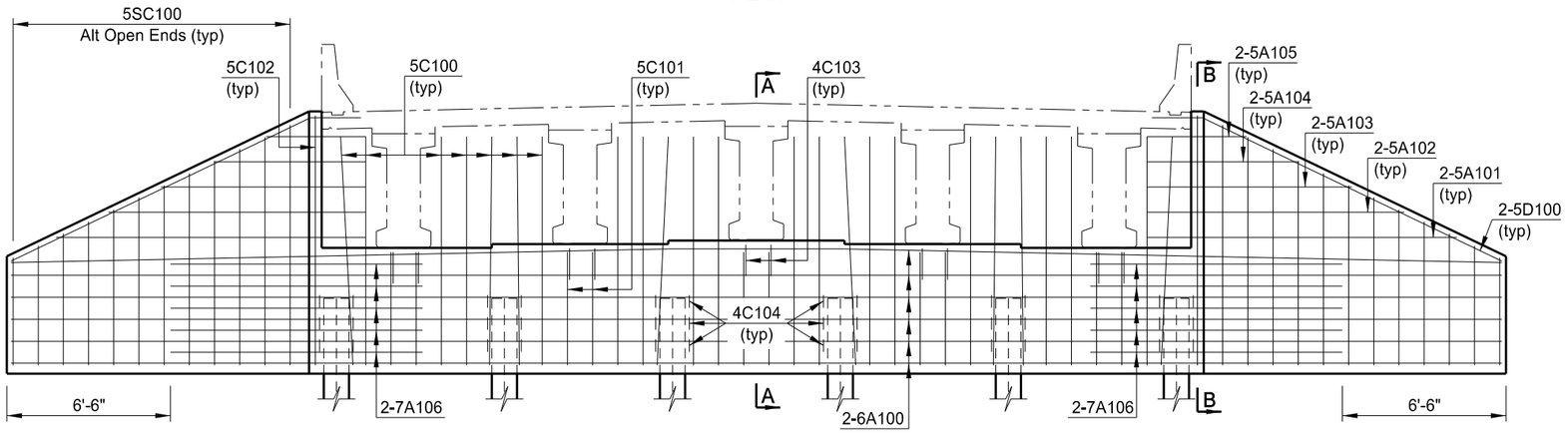
ABUTMENT DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

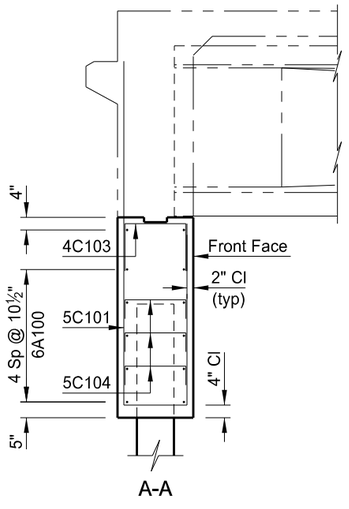
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	170	8



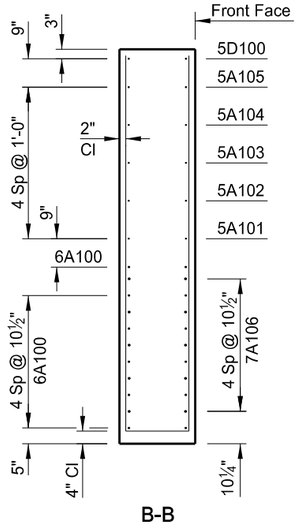
PLAN



ELEVATION



A-A



B-B

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QUANTITIES	(ONE ABUTMENT)
CLASS AE-3 CONCRETE	24.4 CY
REINFORCING STEEL	2,877 LBS

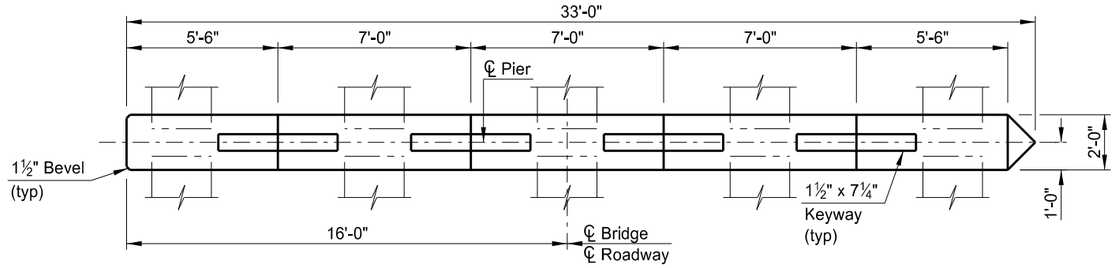
HIGHWAY 31
CANNONBALL RIVER

(SHOWING REINFORCING)

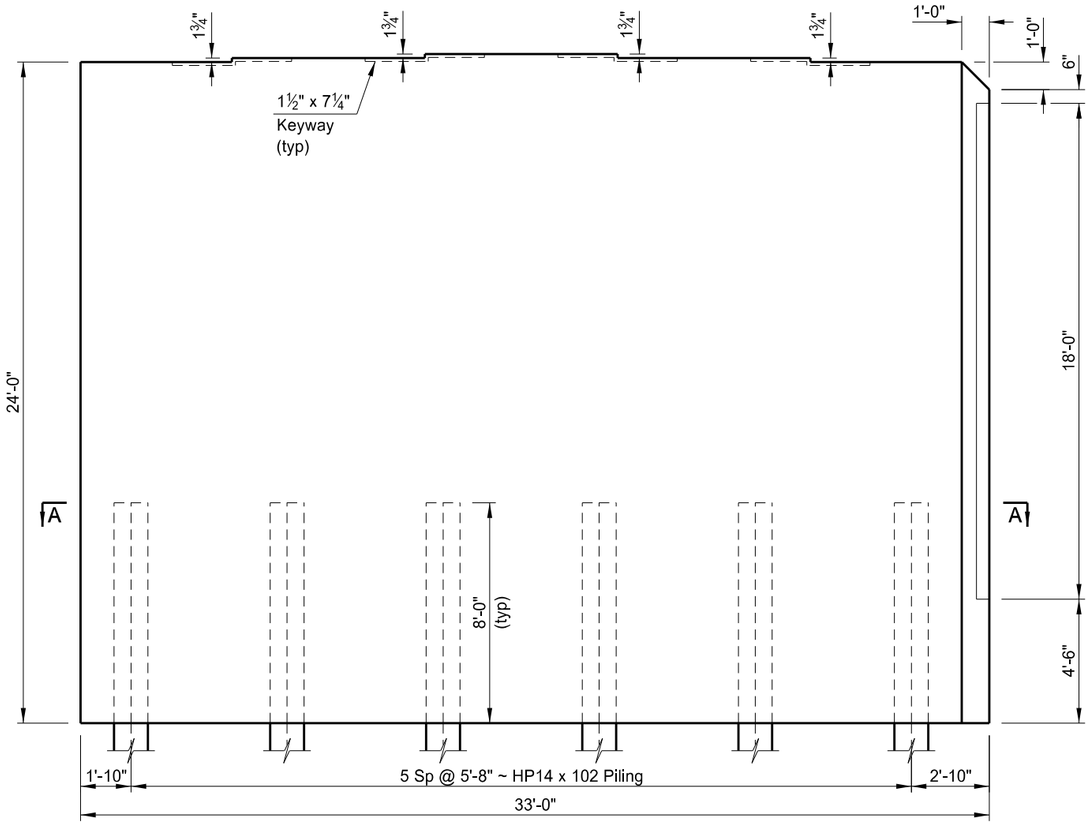
ABUTMENT DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

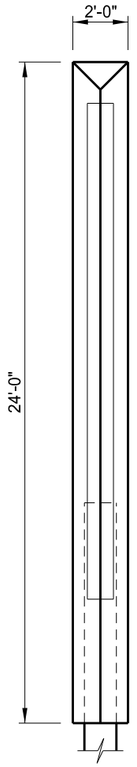
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	170	9



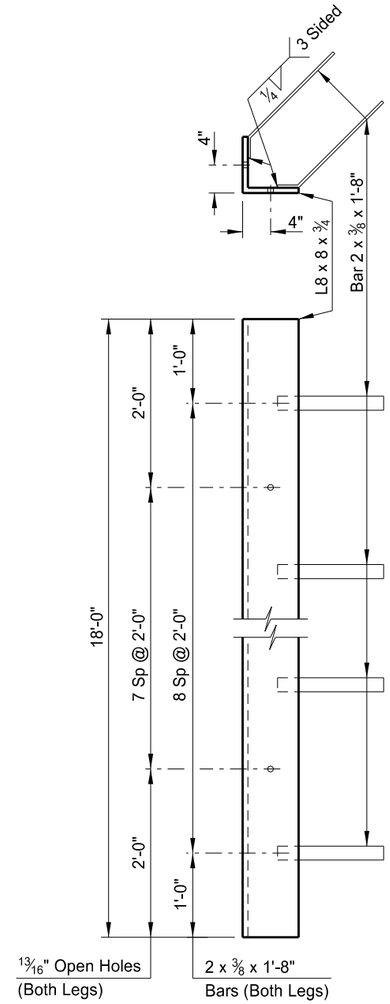
PLAN



ELEVATION

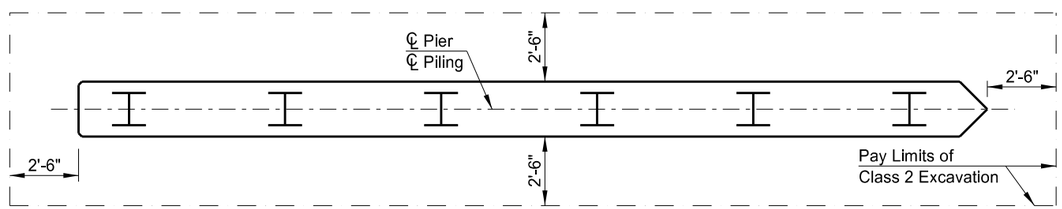


END VIEW



Galvanize in accordance with AASHTO M 111 after fabrication.

ICE NOSE DETAIL



A-A

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QUANTITIES
SEE DWG 31-012.802-10

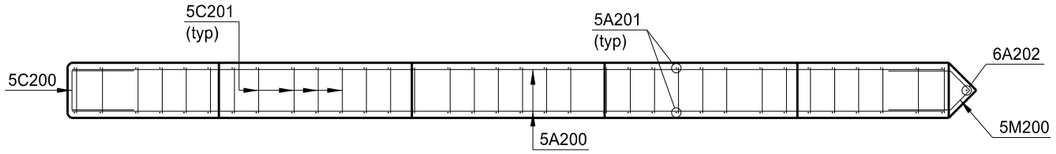
HIGHWAY 31
CANNONBALL RIVER

(SHOWING DIMENSIONS)

PIER DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	170	10



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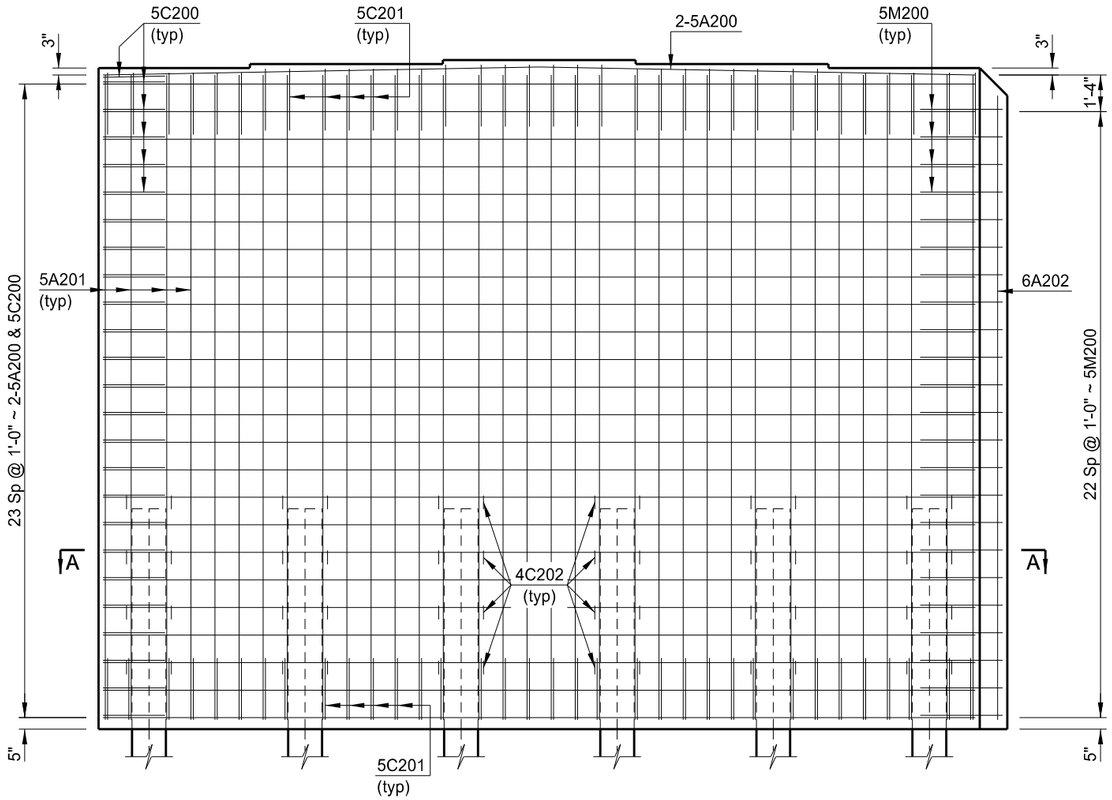
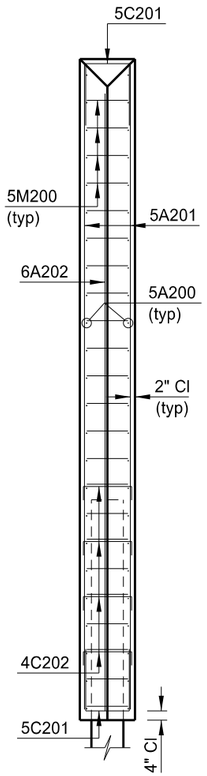
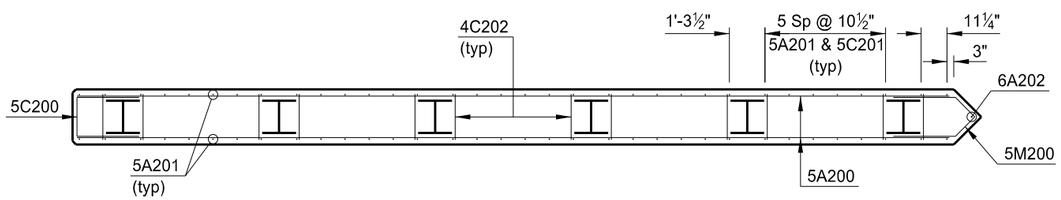


ELEVATION



END VIEW



A-A

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QUANTITIES	(ONE PIER)
CLASS AE-3 CONCRETE	58.1 CY
REINFORCING STEEL	4,186 LBS
STRUCTURAL STEEL	777 LBS

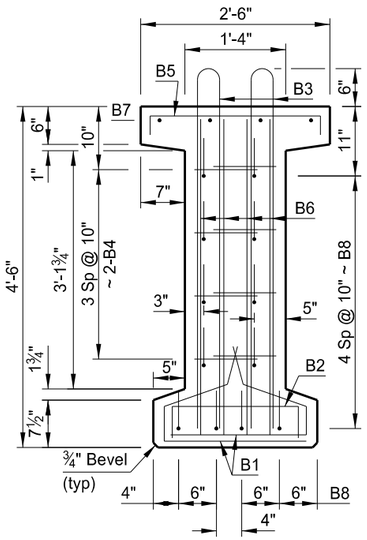
HIGHWAY 31
CANNONBALL RIVER

(SHOWING REINFORCING)

PIER DETAILS

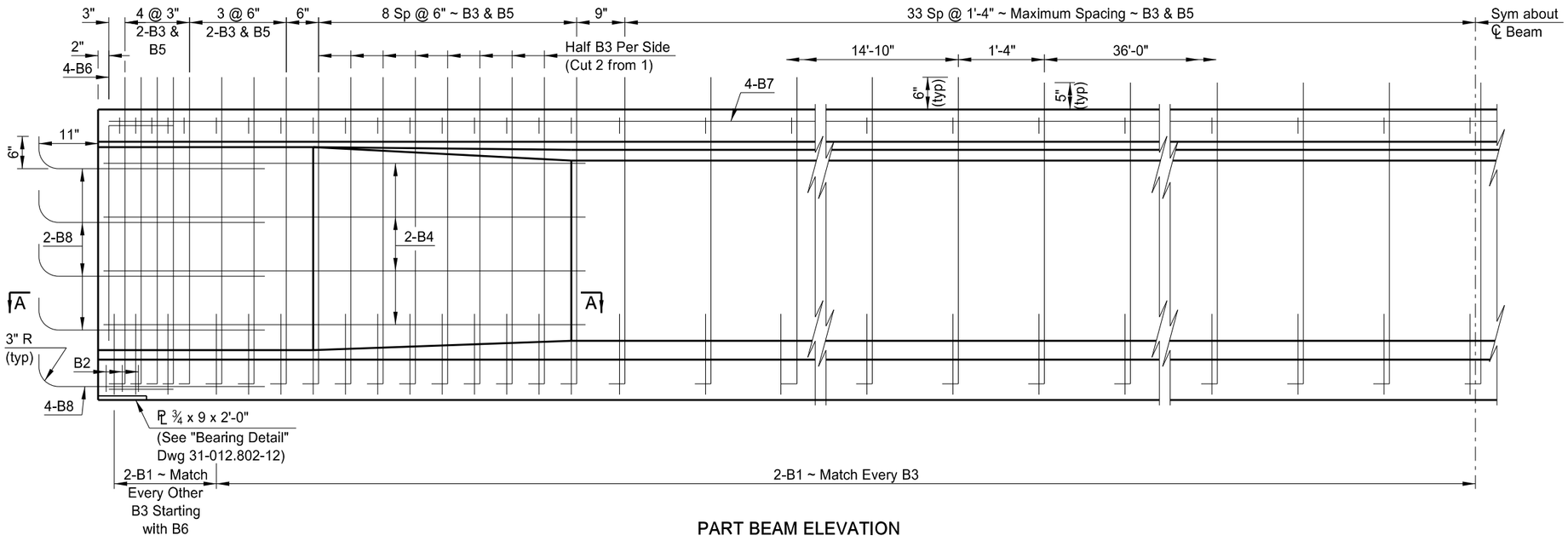
23 U.S.C. 409
NDDOT Reserves All Objections

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	170	11

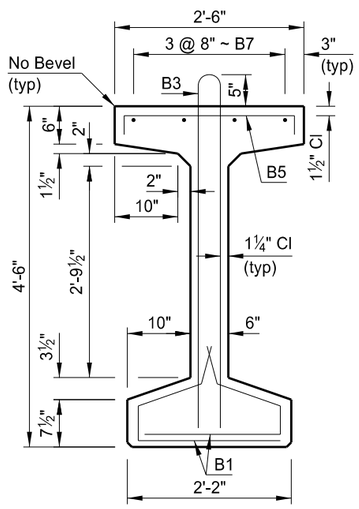


(DETAILS NOT SHOWN ARE SAME AS "SECTION @ ℄")

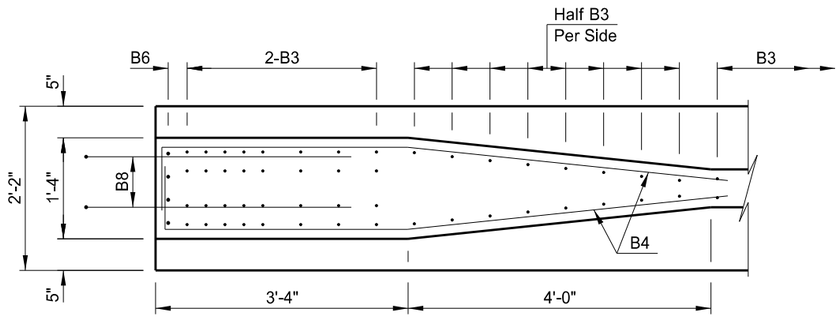
END VIEW



PART BEAM ELEVATION



SECTION @ ℄



A-A

BEAM SECTION DATA
WT = 706.3 LBS/FT + 4011 LBS FOR END BLOCKS
CROSS SECTIONAL AREA AT ℄ SPAN = 678 IN^2
C.G. (FROM BOTTOM) = 26.75 IN
I = 265,828 IN^4
S_B = 9,937 IN^3
END AREA = 1039 IN^2

BAR LIST ~ ONE BEAM				
MARK	SIZE	NO.	LENGTH	SHAPE
B1	4	194	3'-9"	BENT
B2	5	6	2'-6"	BENT
B3	4	117	10'-0"	BENT
B4	4	16	8'-3"	BENT
B5	3	101	2'-9"	BENT
B6	5	8	6'-2"	BENT
B7	5	8	52'-11"	STR
* B8	5	24	4'-0"	STR

* Field bend as shown (Grade 40).

QUANTITIES	(ONE BEAM)
BEAM LENGTH	104'-4"

HIGHWAY 31
CANNONBALL RIVER

PRE-TENSIONED 54"
PRESTRESSED I-BEAM

23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	170	12

NOTES:

At least 14 days prior to the forming and pouring of any beams, the Contractor shall submit shop drawings to the Engineer for review. The shop drawings shall include the total initial prestress force and the losses in the prestress due to elastic shortening, shrinking or creeping of concrete and the relaxation of steel stress as determined by the Contractor for his method of stressing.

Shop drawings shall show strand layout, pull down locations, tensioning forces, elongation and any proposed changes in reinforcing steel.

The final prestress force (remaining after all losses have been accounted for) and its corresponding center of gravity, shall be selected from those on a curve determined by the three values shown.

The beams shall be poured in all steel forms.

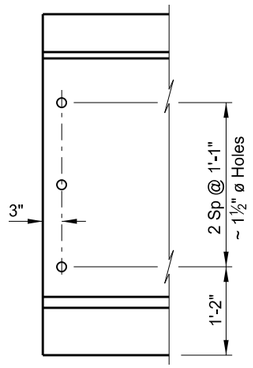
Holes and inserts to accommodate the diaphragm bars shall be provided in the beams at locations as shown.

All reinforcing steel shall have a clearance of 1¼" unless otherwise noted.

Minor changes to the shape of the beam and to reinforcing steel may be made to accommodate the forms of various contractors and their construction methods with the approval of the Engineer.

The tops of the beams shall be rough floated and broomed transversely for bond.

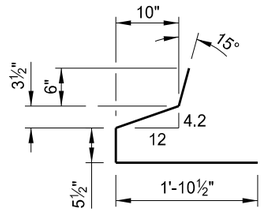
Provide handling hooks or devices as required by the Contractor. Hooks or devices provided will be subject to approval by the Engineer and shall be installed within 4'-0" of the end of beam.



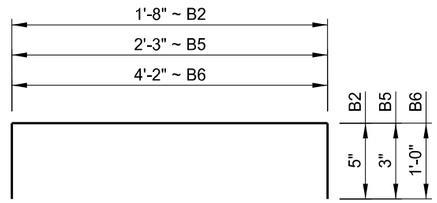
(Holes shall be for all beams at the Abutments & for the interior beams only at the Piers. Inserts shall be used for the exterior beams at the Piers.)

ELEVATION

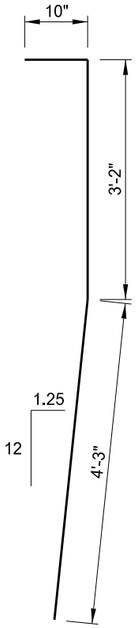
BEAM END DETAIL

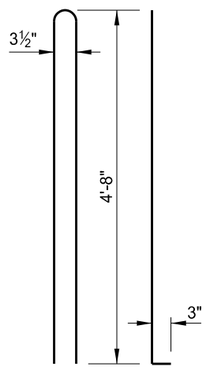


B1



B2, B5 & B6



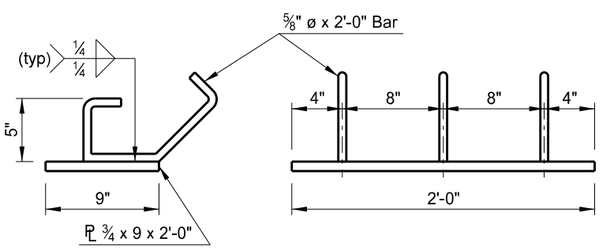


B3 B4

(DIMENSIONS SHOWN ARE OUT TO OUT)

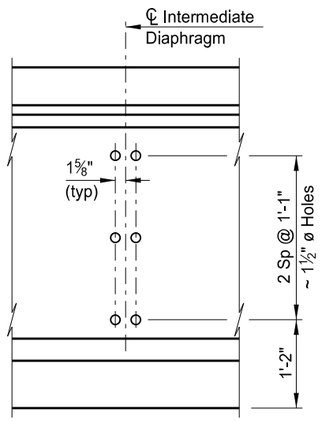
BENT BAR DETAILS

PRESTRESSING DATA			
C.G.	FINAL FORCE	DETENSION STRENGTH	ACCEPTANCE STRENGTH
3.50	938.3 k	6100 psi (Min)	6100 psi (Min)
3.75	944.6 k		
4.00	950.9 k		



(Bearing plate to be Structural Steel M 270 Grade 36 hot dipped galvanized and included in the bid price for the beam.)

BEARING DETAIL



(Holes shall be for interior beams only. Inserts shall be used for the exterior beams. See Dwg 31-012.802-13 for locations.)

ELEVATION

INTERMEDIATE DIAPHRAGM DETAIL

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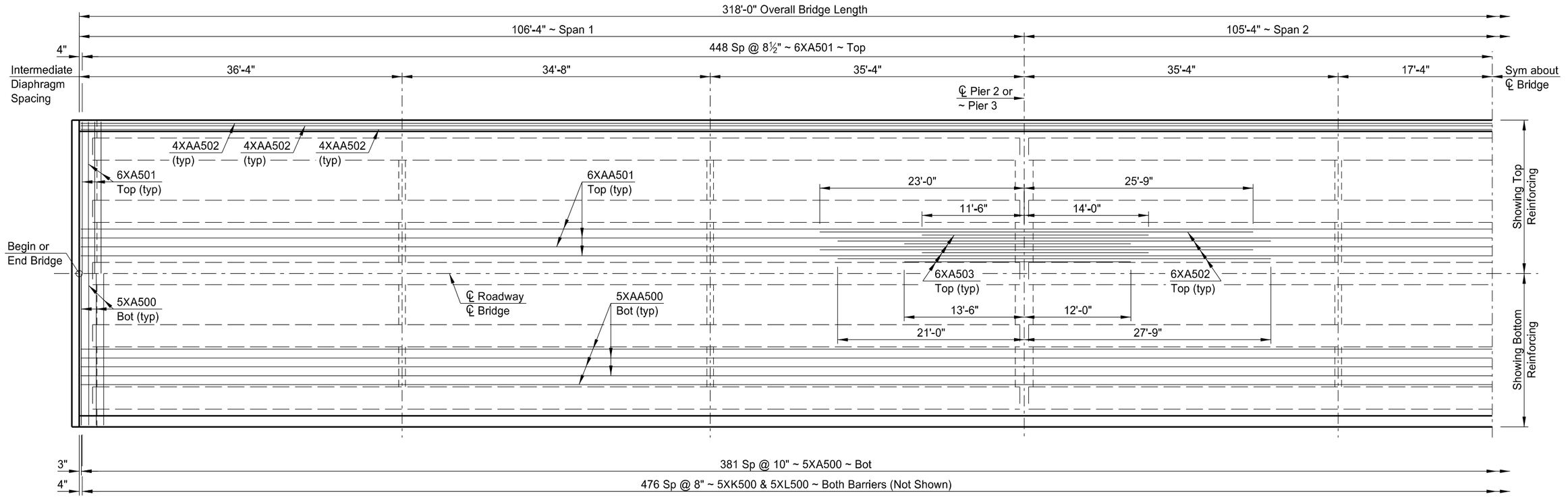
HIGHWAY 31
CANNONBALL RIVER

PRE-TENSIONED 54"
PRESTRESSED I-BEAM

23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	170	13



HALF PLAN

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QUANTITIES

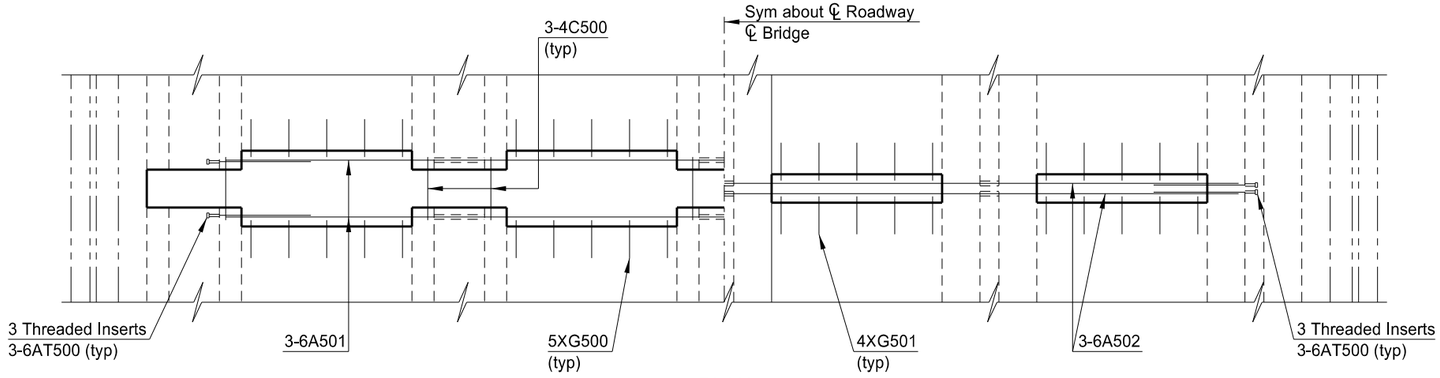
SEE DWG 31-012.802-16

HIGHWAY 31
CANNONBALL RIVER

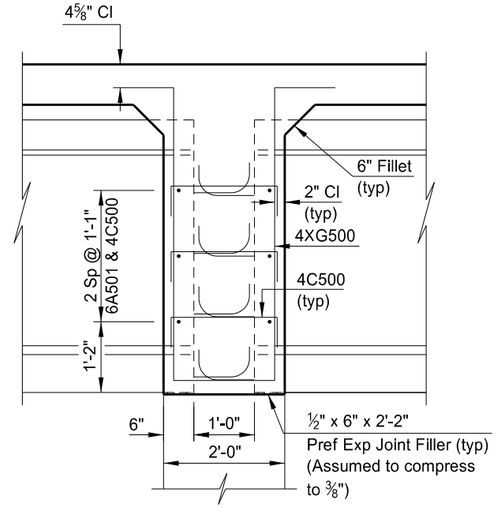
HALF SLAB LAYOUT

23 U.S.C. 409
NDDOT Reserves All Objections

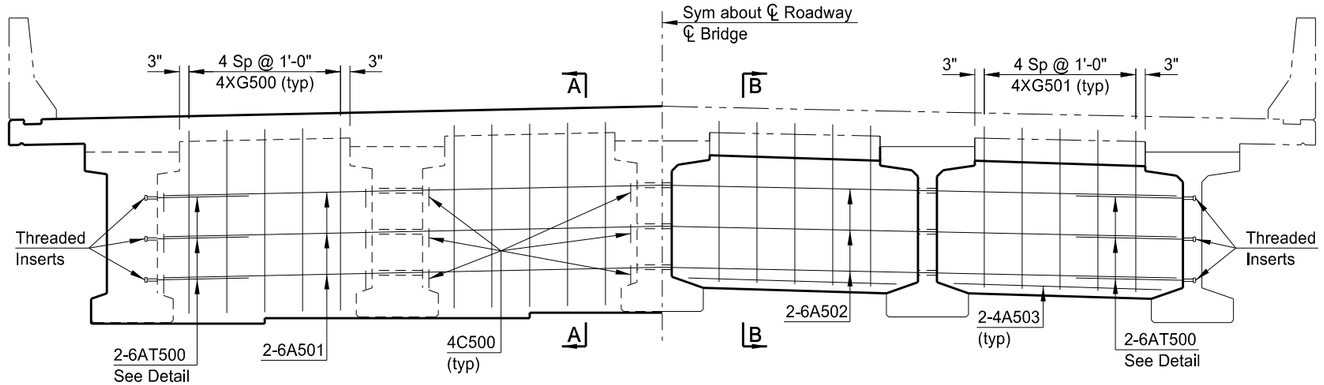
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	170	14



PLAN

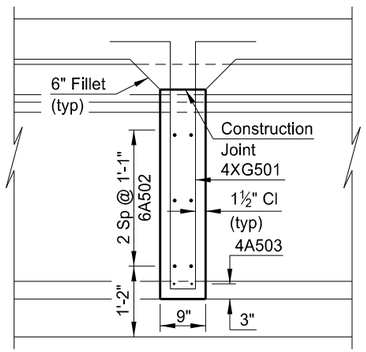


A-A

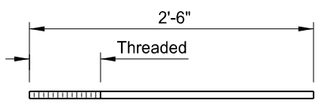


(SHOWING PIER DIAPHRAGM) (SHOWING INTERMEDIATE DIAPHRAGM)

ELEVATION



B-B



No. 6 Reinforcing Steel ~ Included in the Prestressed Beam bid item.

6AT500 DETAIL

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QUANTITIES

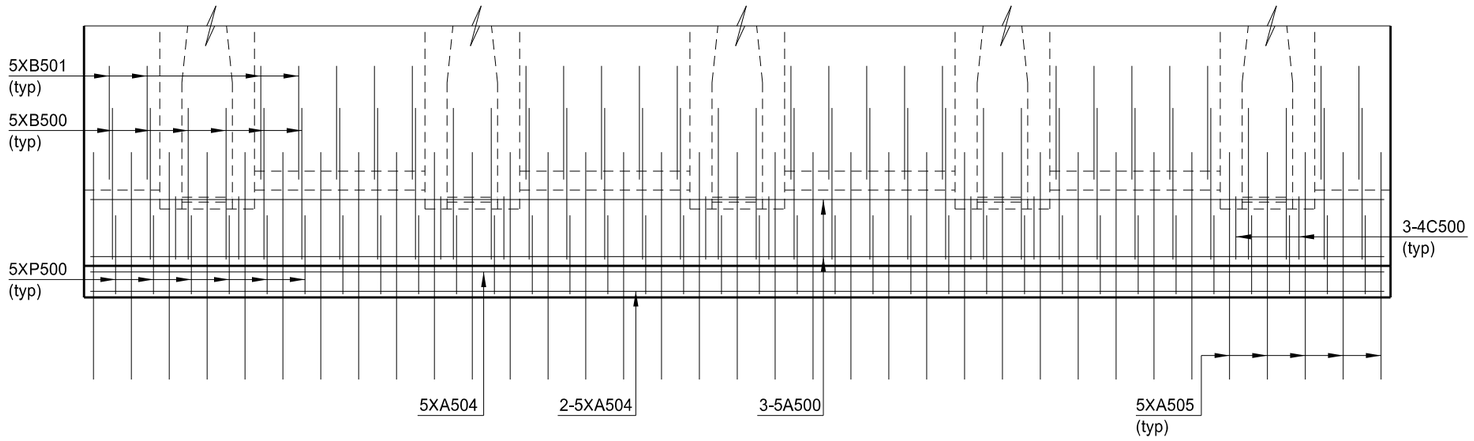
SEE DWG 31-012.802-16

HIGHWAY 31
CANNONBALL RIVER

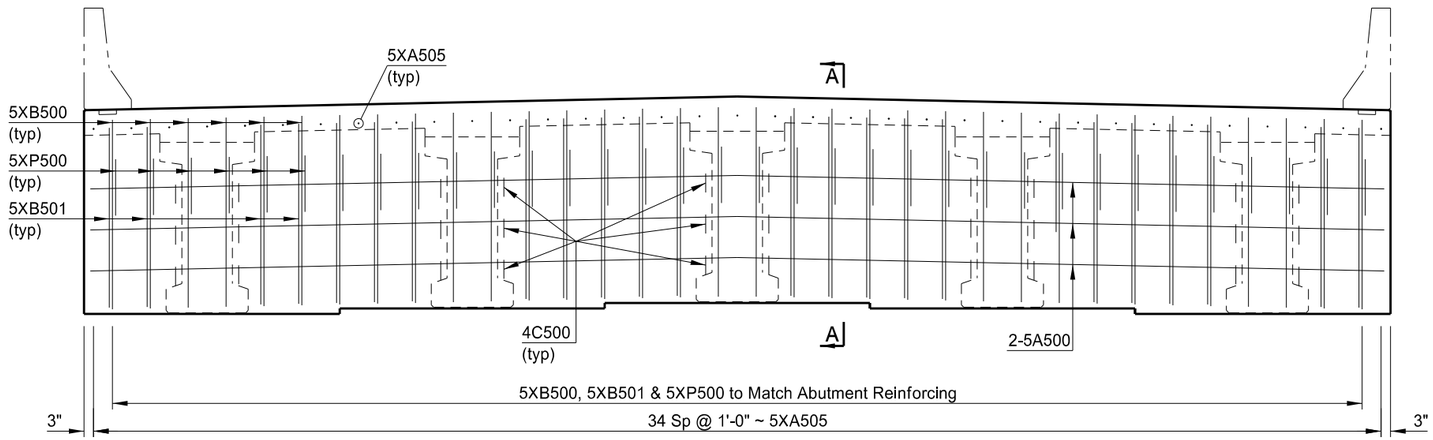
PIER & INTERMEDIATE DIAPHRAGM DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

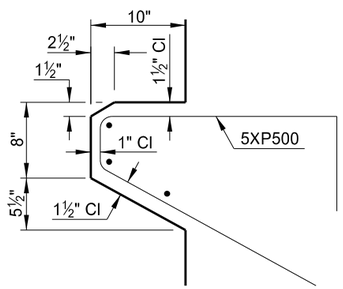
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	170	15



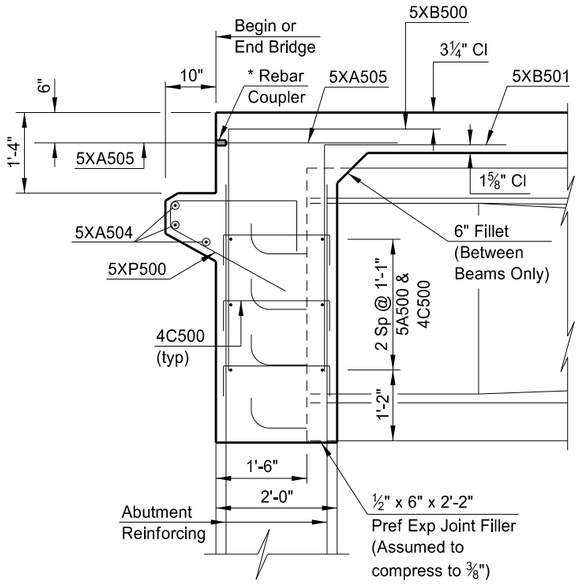
PLAN



(APPROACH LIP NOT SHOWN)
ELEVATION



APPROACH LIP DETAIL



A-A

* The couplers shall be an approved mechanical connector capable of developing 125% of the specified yield strength of the reinforcing steel. The couplers shall be epoxy coated according to AASHTO M 284. Damaged epoxy coating on the couplers shall be repaired according to Section 612.03 E.

NOTE:

The 5XA505 bars extending into the approach slab shall not be installed until all of the select backfill is in place.

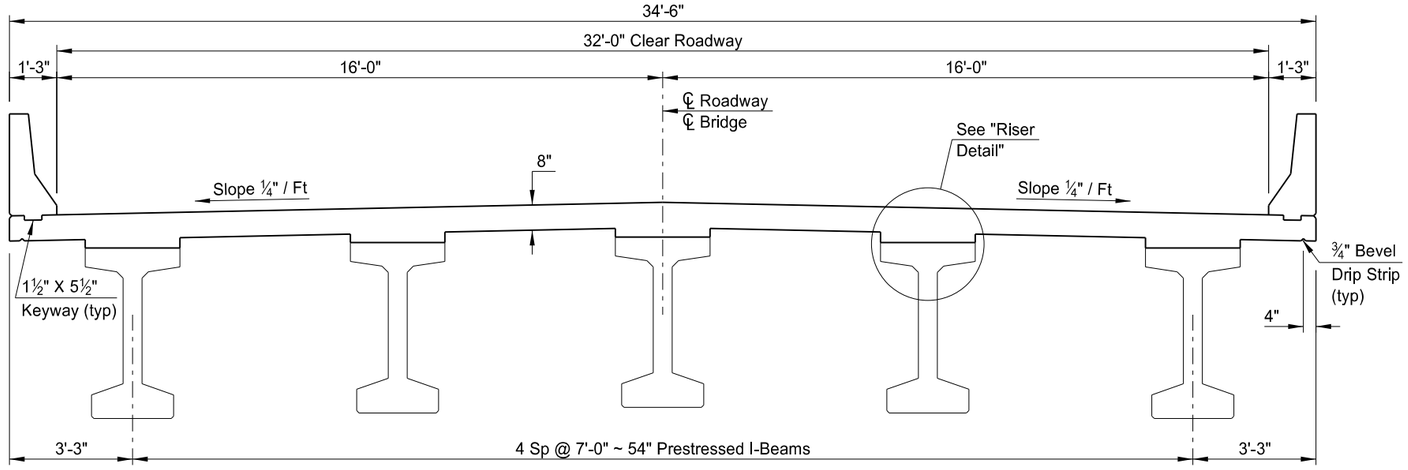
QUANTITIES
SEE DWG 31-012.802-16

HIGHWAY 31
CANNONBALL RIVER

ENDWALL DETAILS

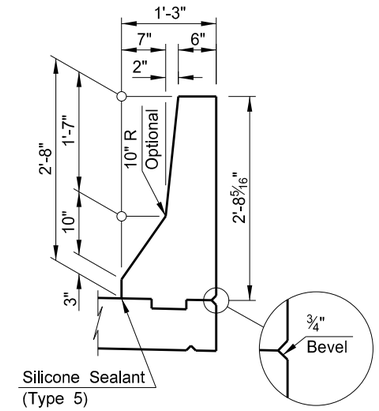
23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	170	16

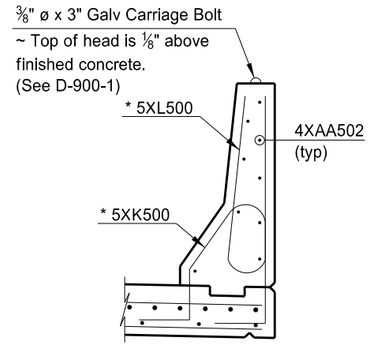


(SHOWING DIMENSIONS)

SLAB SECTION

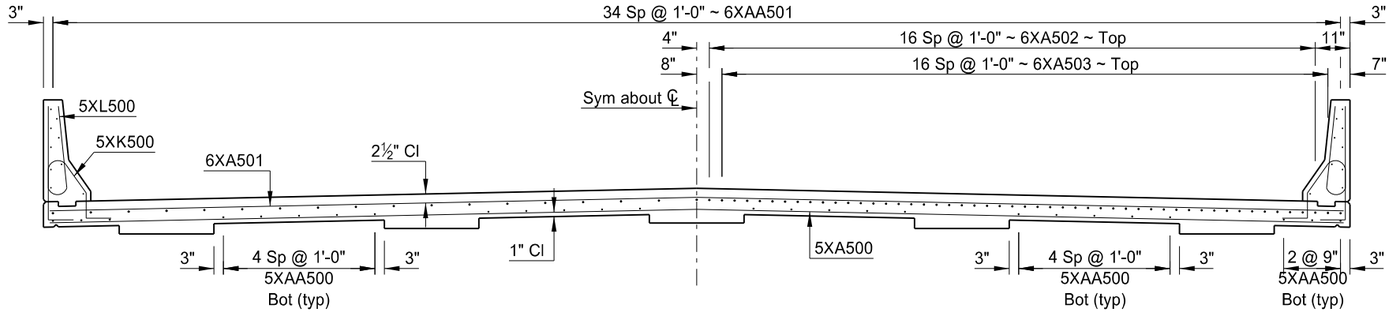


SHOWING DIMENSIONS



SHOWING REINFORCING

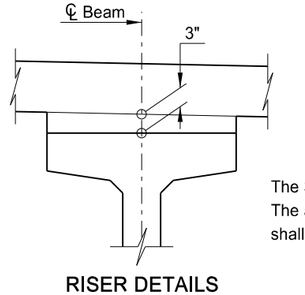
BARRIER DETAIL



(SHOWING REINFORCING BETWEEN SUPPORTS)

(SHOWING REINFORCING OVER PIER)

SLAB SECTION



RISER DETAILS

The 3" dimension shown is located at the supports. The anticipated midspan riser is ½". The riser shall be adjusted to maintain the 8" slab thickness.

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QUANTITIES	
CLASS AAE-3 CONCRETE	397.0 CY
REINFORCING STEEL	2,740 LBS
REINFORCING STEEL (EPOXY)	87,415 LBS

HIGHWAY 31
CANNONBALL RIVER

SLAB SECTION

BILL OF REINFORCING STEEL, GRADE 60

LETTER PREFIX OF BAR MARK DENOTES SHAPE ~ SEE BAR DETAILS

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	170	17

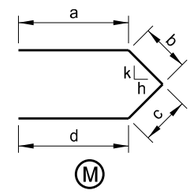
LOCATION	SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS a	b	c	d	e	f	g	h	k
ABUTMENTS	6	A100	24	59'-2"		59'-2"							
	5	A101	8	12'-3"		12'-3"							
	5	A102	8	10'-2"		10'-2"							
	5	A103	8	8'-1"		8'-1"							
	5	A104	8	6'-0"		6'-0"							
	5	A105	8	3'-11"		3'-11"							
	7	A106	40	10'-0"		10'-0"							
	5	C100	48	19'-10"		9'-1"	1'-8"	9'-1"					
	5	C101	20	15'-3"		4'-6"	1'-8"	9'-1"					
	5	C102	4	21'-6"		9'-11"	1'-8"	9'-11"					
	4	C103	20	4'-8"		1'-6"	1'-8"	1'-6"					
	4	C104	72	2'-8"		6"	1'-8"	6"					
	5	D100	8	15'-5"		2'-3"	13'-2"					12	5.75
	5	SC100	4	178'-6"	8"	4'-3"	9'-6"	1'-7"	11				
PIERS	5	A200	100	31'-8"		31'-8"							
	5	A201	136	23'-5"		23'-5"							
	6	A202	2	22'-8"		22'-8"							
	5	C200	50	6'-0"		2'-3"	1'-6"	2'-3"					
	5	C201	136	6'-2"		2'-3"	1'-8"	2'-3"					
	4	C202	96	2'-8"		6"	1'-8"	6"					
	5	M200	46	6'-8"	2'-3"	1'-1"	1'-1"	2'-3"				12	12

LOCATION		SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS a	b	c	d	e	f	g	h	k
SUPERSTRUCTURE	REGULAR	5	A500	12	34'-2"		34'-2"							
		6	A501	12	26'-4"		26'-4"							
		6	A502	36	27'-2"		27'-2"							
		4	A503	48	5'-6"		5'-6"							
		4	C500	108	2'-8"		6"	1'-8"	6"					
	EPOXY	5	XA500	382	34'-2"		34'-2"							
		6	XA501	449	34'-2"		34'-2"							
		6	XA502	68	48'-9"		48'-9"							
		6	XA503	68	25'-6"		25'-6"							
		5	XA504	6	34'-2"		34'-2"							
		5	XA505	140	3'-0"		3'-0"							
		5	XB500	68	8'-0"		4'-0"	4'-0"						
		5	XB501	48	6'-9"		3'-9"	3'-0"						
		4	XG500	40	13'-4"	4'-10"	1'-8"	4'-10"	1'-0"				12	0
		4	XG501	120	10'-8"	4'-1"	6"	4'-1"	1'-0"				12	0
		5	XK500	954	4'-11"	1'-4"	8"	11"	8"	1'-0"	2.5"	8"	8.5	12
		5	XL500	954	5'-0"	3"	2'-2"	8"	2'-2"		2.5"		1.25	12
		5	XP500	68	5'-6"	5"	2'-1"	2'-2"			1.25"	10"	12	6.5
		5	XAA500	26	330'-2"		60'-0"	2'-6"	30'-2"	5		317'-8"		
		6	XAA501	35	328'-10"		60'-0"	2'-3"	28'-10"	5		317'-8"		
		4	XAA502	18	325'-2"		60'-0"	1'-6"	25'-2"	5		317'-8"		

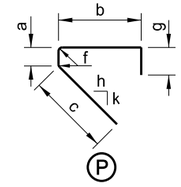
23 U.S.C. 409
NDDOT Reserves All Objections

NOTES:

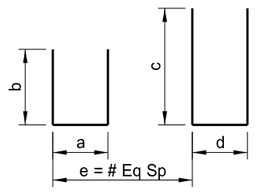
1. Fabrication and tolerances shall be in accordance with the CRSI Manual of Standard Practice.
2. All dimensions are out to out of bars.
3. Nominal length of each bent bar or cut bar is the sum total of the detailing dimensions for that bar, unless otherwise noted.
4. Adjacent "AA" bars shall be turned end for end so that the splice locations are staggered.
5. The "f" dimension indicates the inside radius unless otherwise noted.
6. An "X" preceding a bar designation indicates an epoxy coated bar.



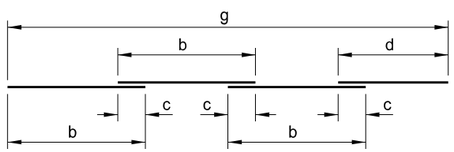
M



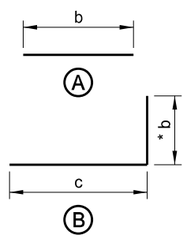
P



SC

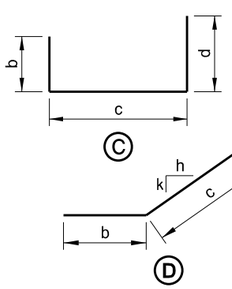


c = Lap Splice (typ)
e = # of "b" Length Pieces in a Set
Total Length per Set = e x b + d
AA

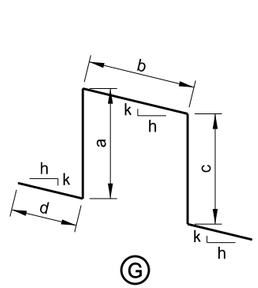


A
B

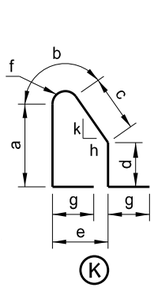
* b = Vertical Leg for XB500 and XB501



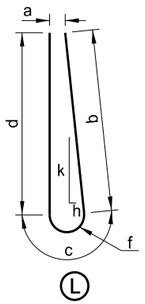
C
D



G



K



L

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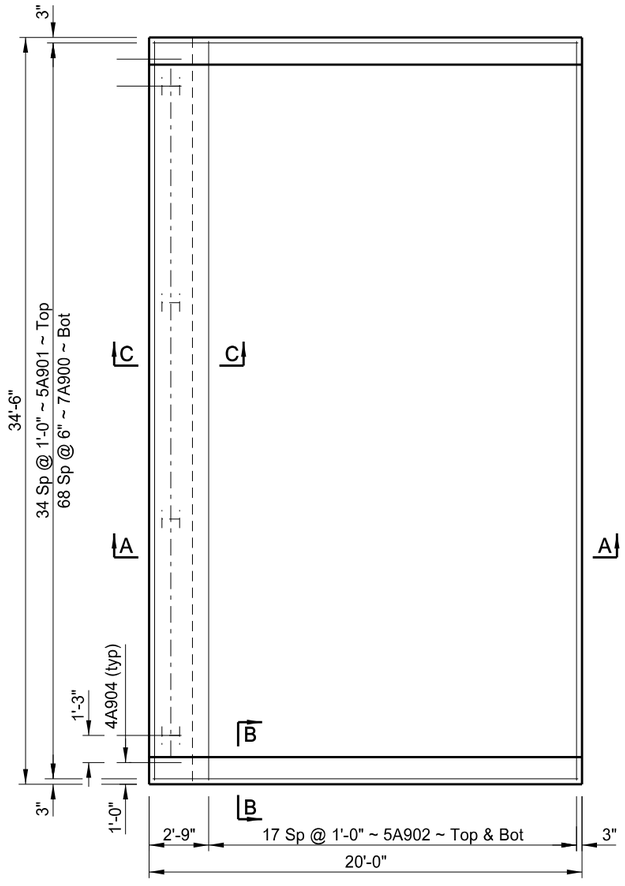
HIGHWAY 31
CANNONBALL RIVER

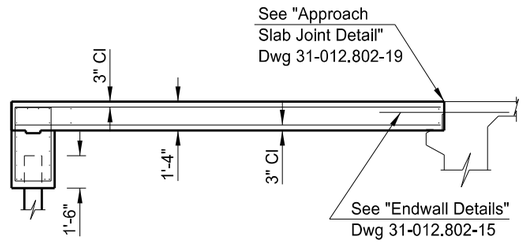
REINFORCING BAR LIST & DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

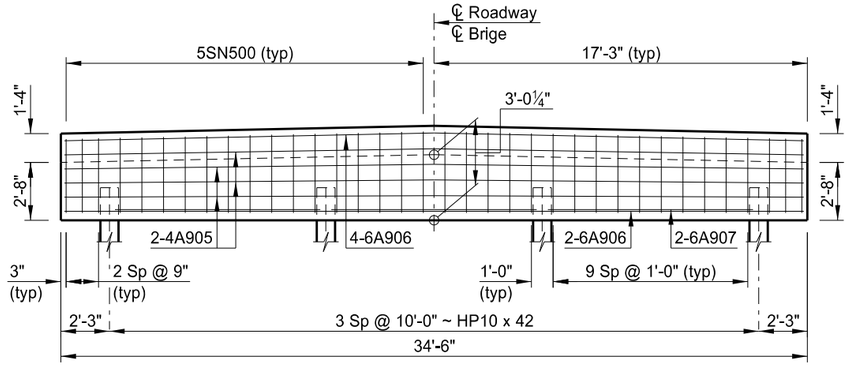
STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRS-1-031(017)012	170	18



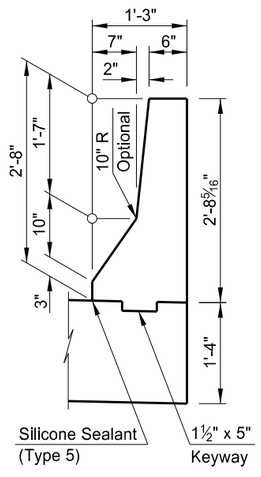
PLAN



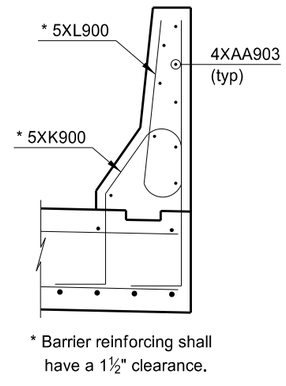
A-A



FOOTING ELEVATION



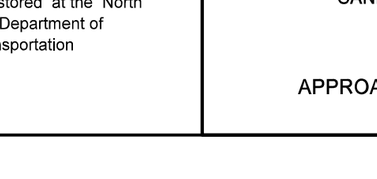
SHOWING DIMENSIONS



* Barrier reinforcing shall have a 1½" clearance.

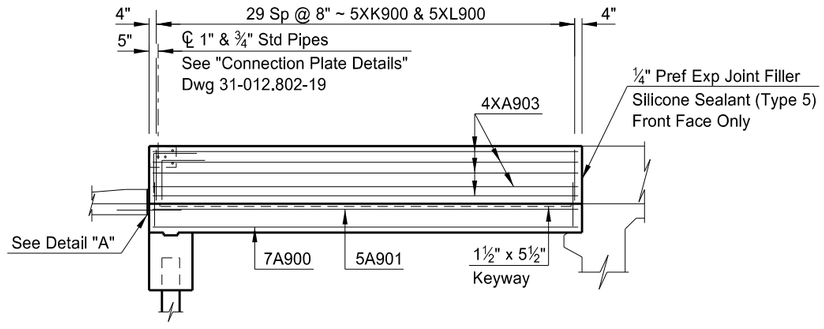
SHOWING REINFORCING

B-B

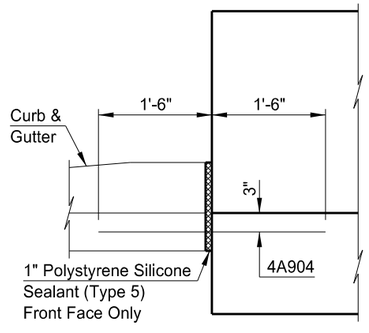


(SHOWING REINFORCING)

C-C



ELEVATION



DETAIL "A"

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QUANTITIES

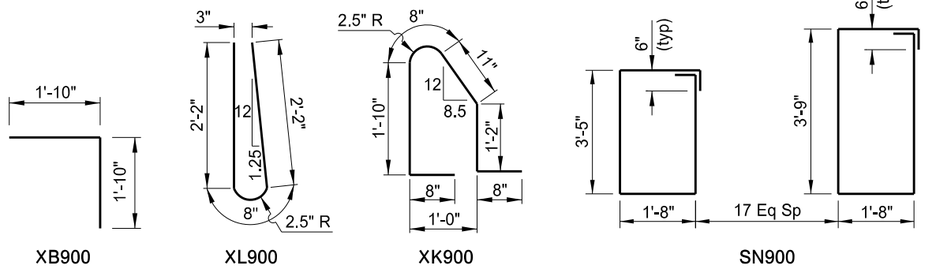
SEE DWG 31-012.802-19

HIGHWAY 31
CANNONBALL RIVER

APPROACH SLAB DETAILS

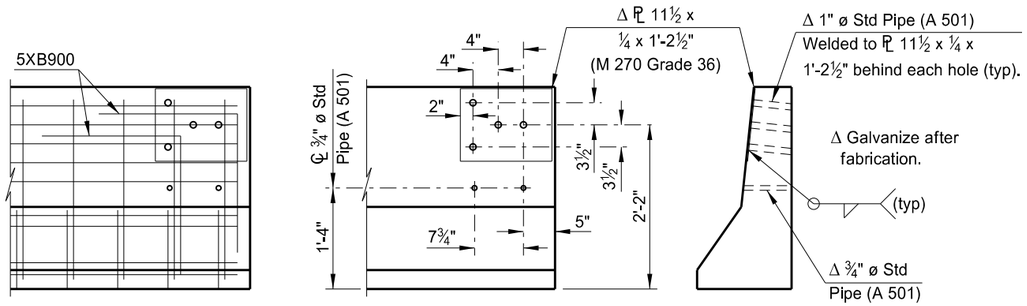
23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	170	19



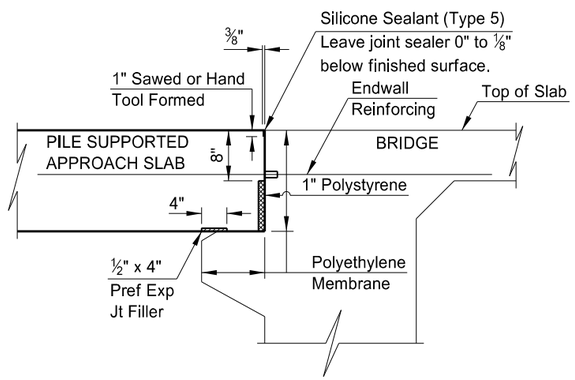
XB900 XL900 XK900 SN900

BENT BAR DETAILS



SHOWING REINFORCING SHOWING DIMENSIONS

(SHOWING FRONT FACE)
CONNECTION PLATE DETAILS



APPROACH SLAB JOINT DETAIL

NOTES:

The estimated material quantities shown are for information purposes only. All materials including concrete, reinforcing bars, polyethylene membrane, preformed joint filler, polystyrene, silicone sealant, connection plates and pipes, and all labor required to build the approach slabs and barriers shall be included in the pay item "Pile Supported Approach Slab." The concrete shall be Class AE-3 and the reinforcing steel shall be Grade 60. The polyethylene membrane shall meet the requirements of AASHTO M 171.

Surface Finish "D" shall be required for all inside and top surfaces of the approach slab barriers.

The bar marks beginning with an "X" indicate an epoxy coated bar. The dimensions shown in the "Bent Bar Details" are out to out.

SKEW ANGLE = 0°

BAR LIST - ONE SLAB

SIZE	MARK	NO.	LENGTH
7	A900	69	19'-8"
5	A901	35	19'-8"
5	A902	36	34'-2"
4	XA903	18	19'-8"
4	A904	4	3'-0"
4	A905	8	34'-2"
6	A906	2	34'-2"
6	A907	6	9'-6"
5	SN900	2	207'-0"
5	XB900	4	3'-8"
5	XK900	60	5'-11"
5	XL900	60	5'-0"

ESTIMATED MATERIAL QUANTITIES

REINFORCING STEEL (LBS)	CONCRETE (CY)
6,520	44.4

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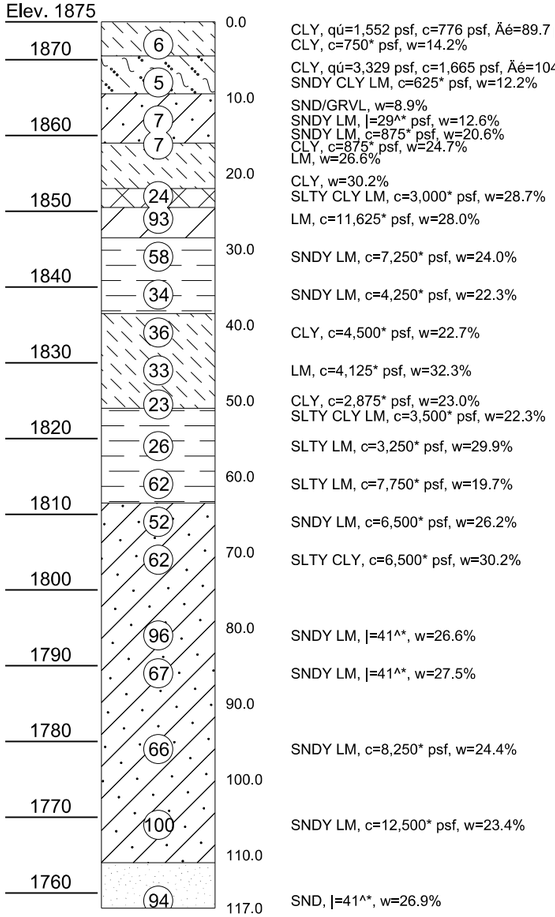
QUANTITIES	(ONE SLAB)
PILE SUPPORTED APPROACH SLAB	76.7 SY

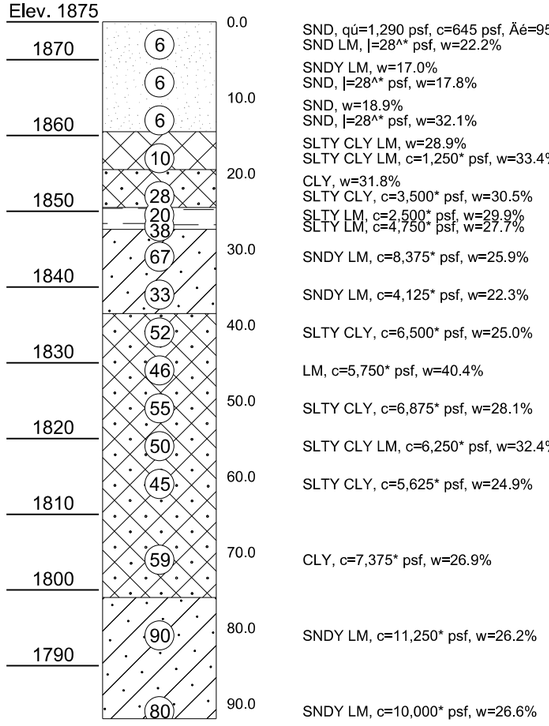
HIGHWAY 31
CANNONBALL RIVER

APPROACH SLAB DETAILS

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	BRS-1-031(017)012	175	1



Boring #1 Station 1186+46 - 35' West of Existing `
Drilled on 4/5/2011 to 4/6/2011



Boring #2 Station 1184+19 - 45' West of Existing `
Drilled on 4/5/2011 to 4/6/2011

Notes:

THE ENCIRCLED NUMBERS INDICATE THE NUMBER OF BLOWS DELIVERED BY A 140 POUND AUTOMATIC HAMMER FROM A HEIGHT OF 30 INCHES TO DRIVE A 2 INCH O.D. SPLIT-BARREL SAMPLER 1 FOOT.

THE BORING DATA SHOWN IS FOR NORTH DAKOTA DEPARTMENT OF TRANSPORTATION'S (NDDOT) DESIGN AND ESTIMATING PURPOSES ONLY. THE BORING LOGS ARE ONLY REPRESENTATIVE OF THE EXACT LOCATION FROM WHICH THE SAMPLES WERE TAKEN AND INTERPRETATION BETWEEN THE SAMPLE LOCATIONS IS DISCOURAGED. THE NDDOT ASSUMES NO RESPONSIBILITY IF THE SOIL CONDITIONS ENCOUNTERED DURING CONSTRUCTION DIFFER FROM THOSE SHOWN. FURTHER SOIL INFORMATION MAY BE AVAILABLE AT:

NDDOT
MATERIALS & RESEARCH DIVISION
300 AIRPORT ROAD
BISMARCK, NORTH DAKOTA 58504-6005
PHONE (701)328-6900

qú=Unconfined Compressive Strength (psf)
w=Moisture Content (%)
|=Friction Angle (deg)
c=Cohesion (psf)
Äé=Dry Density (pcf)
*=These cohesive values and friction angles are estimated from blow counts

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Soil Boring Logs

NDDOT ABBREVIATIONS

D-20-1

Abn	abandoned
Abut	abutment
Ac	acres
Adj	adjusted
Aggr	aggregate
Ahd	ahead
ARV	air release valve
Align	alignment
Al	alley
Alt	alternate
Alum	aluminum
A	ampere
&	and
Appr	approach
Approx	approximate
ACP	asbestos cement pipe
Asph	asphalt
AC	asphalt cement
Assmd	assumed
@	at
Atten	attenuation
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
BLM	Bureau of Land Management
BV	butterfly valve
Byp	bypass
C Gdrl	cable guardrail
Calc	calculate
Cd	candela
CIP	cast iron pipe
CB	catch basin
CRS	cationic rapid setting
C Gd	cattle guard
C To C	center to center
Cl or ℄	centerline
Cm	centimeter
Ch	chain
Chnlk	chain-link
Ch Blk	channel block
Ch Ch	channel change
Chk	check
Chsld	chiseled
Cir	circle
Cl	class
Cl	clay
Cl F	clay fill
Cl Hvy	clay heavy
Cl Lm	clay loam
Clnt	clean-out
Clr	clear
Cl&gr	clearing & grubbing
Co S	coal slack
Comb.	combination
Coml	commercial
Compr	compression
CADD	computer aided drafting & design
Conc	concrete
Cond	conductor
Const	construction
Cont	continuous
CSB	continuous split barrel sample
Contr	contraction
Contr	contractor
CP	control point
Coord	coordinate
Cor	corner
Corr	corrected
CAES	corrugated aluminum end section
CAP	corrugated aluminum pipe
CMES	corrugated metal end section
CMP	corrugated metal pipe
CPVCP	corrugated poly-vinyl chloride pipe
CSES	corrugated steel end section
CSP	corrugated steel pipe
C	coulomb
Co	County
Crse	course
C Gr	course gravel
CS	course sand
Ct	Court
Xarm	cross arm
Xbuck	cross buck
Xsec	cross sections
Xing	crossing
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
FHWA	Federal Highway Administration
FP	feed point
Ft	feet/foot
Fn	fence
Fn P	fence post
FO	fiber optic
FB	field book
FD	field drive
F	fill
FAA	fine aggregate angularity
FS	fine sand
FH	fire hydrant
Fl	flange
Flrd	flared
FES	flared end section

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
06-15-10	
REVISIONS	
DATE	CHANGE
04-20-11 03-15-13	Added Items Added Items

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NDDOT ABBREVIATIONS

D-20-2

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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NDDOT ABBREVIATIONS

D-20-3

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
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
Sig	signal
Si Cl	silt clay
Si Cl Lm	silty clay loam
Si Lm	silty loam
Sgl	single
SC	slow curing
SS	slow setting
Sm	small
S	South
SE	South East
SW	South West
SB	Southbound
Sp	spaces
Spcl	special
SP	special provisions
G	specific gravity
Spk	spike
SC	spiral to curve
ST	spiral to tangent
SB	split barrel sample
SH	sprinkler head
SV	sprinkler valve
Sq	square
SF	square feet
Km2	square kilometer
M2	square meter
SY	square yard
Stk	stake
Std	standard
N	standard penetration test
Std Specs	Standard Specifications
Sta	station
Sta Yd	station yards
Stm L	steam line
SEC	steel encased concrete
SSD	stopping sight distance
SD	storm drain
St	street
SPP	structural plate pipe
SPPA	structural plate pipe arch
Str	structure
Subd	subdivision
Sub	subgrade
Sub Prep	subgrade preperation
Ss	subsoil
SE	superelevation
SS	supplement specification
Supp	supplemental
Surf	surfacing
Surv	survey
Sym	symmetrical
SI	Systems International
Tan	tangent
T	tangent (semi)
TS	tangent to spiral
Tel	telephone
Tel B	Telephone Booth
Tel P	telephone pole
Tv	television
Temp	temperature
Temp	temporary
TBM	temporary bench mark
T	tesla
T	thinwall tube sample
T/mi	tons per mile
Ts	topsoil
Twp or T	township
Traf	traffic
TSCB	traffic signal control box
Tr	trail
Transf	transformer
TB	transit book
Trans	transition
TT	transmission tower
Trans	transverse
Trav	traverse
TP	traverse point
Trtd	treated
Trmt	treatment
Qc	triaxial compression
TERO	Tribal Employment Rights Ordinance
Tpl	triple
TP	turning point
Typ	typical
Qu	unconfined compressive strength
Ugrnd	underground
USC&G	US Coast & Geodetic Survey
USGS	US Geologic Survey
Util	utility
VG	valley gutter
Vap	vapor
Vert	vertical
VC	vertical curve
VCP	vitrified clay pipe
V	volt
Vol	volume
Wkwy	walkway
W	water content
WGV	water gate valve
WL	water line
WM	water main
WMV	water main valve
W Mtr	water meter
WSV	water service valve
WW	water well
W	watt
Wrng	wearing
Wb	weber
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 ABBREVIATIONS

D-20-10

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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Line Styles

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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Line Styles

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

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Symbols

D-20-30

North Arrow (Half Scale)
Truck Mounted Attenuator
Type I Barricade
Type II Barricade
Type III Barricade
Catch Basin
Cairn or Stone Circle
Video Detection Camera
Storm Drain Cap or Stub
Corrugated Metal End Section 18 Inch
Corrugated Metal End Section 24 Inch
Corrugated Metal End Section 30 Inch
Corrugated Metal End Section 36 Inch
Corrugated Metal End Section 42 Inch
Corrugated Metal End Section 48 Inch
Concrete Foundation
Ground Connection Conductor
Neutral Connection Conductor
Phase 1 Connection Conductor
Phase 2 Connection Conductor
Traffic Cone
Signal Controller
Pad Mounted Signal Controller
Alignment Data Point
Emergency Vehicle Detector

Attenuation Device
Diamond Grade Delineator Type A
Diamond Grade Delineator Type B
Diamond Grade Delineator Type C
Diamond Grade Delineator Type D
Diamond Grade Delineator Type E
Flexible Delineator
Flexible Delineator Type A
Flexible Delineator Type B
Flexible Delineator Type C
Flexible Delineator Type D
Flexible Delineator Type E
Delineator Type A
Delineator Type A Reset
Delineator Type B
Delineator Type B Reset
Delineator Type C
Delineator Type D
Delineator Type E
Delineator Drums
Spot Elevation
Existing Access Control Arrow
Existing Artifact
Existing Flashing Beacon
Existing Benchmark

Existing Railroad Battery Box
Existing Bush or Shrub
Existing Gas Cap or Stub
Existing Sanitary Cap or Stub
Existing Storm Drain Cap or Stub
Existing Water Cap or Stub
Existing Sanitary Cleanout
Existing Concrete Foundation
Existing Traffic Signal Controller
Existing Pad Mounted Signal Controller
Existing Sixteenth Section Corner
Existing Quarter Section Corner
Existing Section Corner
Existing Railroad Crossbuck
Existing Satellite Dish
Existing Fuel Dispensers
Existing Flexible Delineator Type A
Existing Flexible Delineator Type B
Existing Flexible Delineator Type C
Existing Flexible Delineator Type D
Existing Flexible Delineator Type E
Existing Delineator Type A
Existing Delineator Type B
Existing Delineator Type C
Existing Delineator Type D

Existing Delineator Type E
Existing EFB Misc
Existing Flashing Beacon
Existing Pipe Mounted Flasher
Existing Pad Mounted Feed Point
Existing Pipe Mounted Feed Point with Pad
Existing Pole Mounted Feed Point
Existing Railroad Frog
Existing Snow Gate 18
Existing Snow Gate 28
Existing Snow Gate 40
Existing Headwall
Existing Pedestrian Head with Number
Existing Signal Head
Existing Sprinkler Head
Existing Fire Hydrant
Existing Catch Basin Drop Inlet
Existing Curb Inlet
Existing Manhole Inlet
Existing Junction Box

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Symbols

D-20-31

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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Symbols

D-20-32

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
4-20-11	
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DATE	CHANGE

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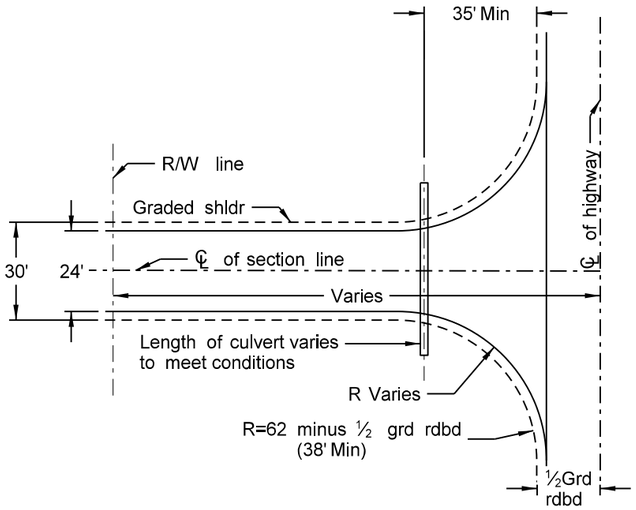
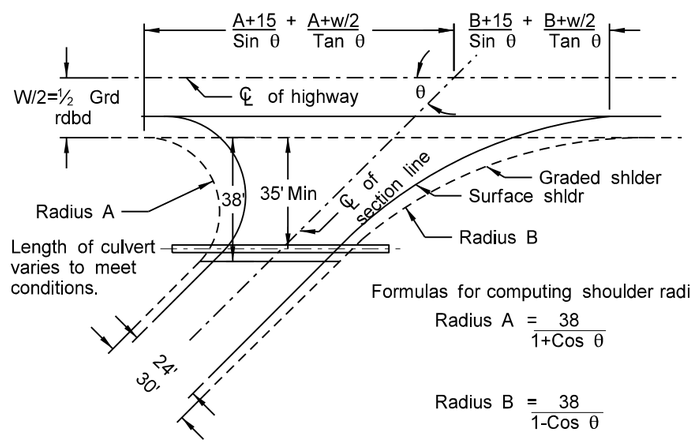
SECTION LINE & PRIVATE DRIVE APPROACHES
(RURAL)

D-203-08



PLAN VIEW SECTION LINE APPROACH (WITHOUT SKEW)

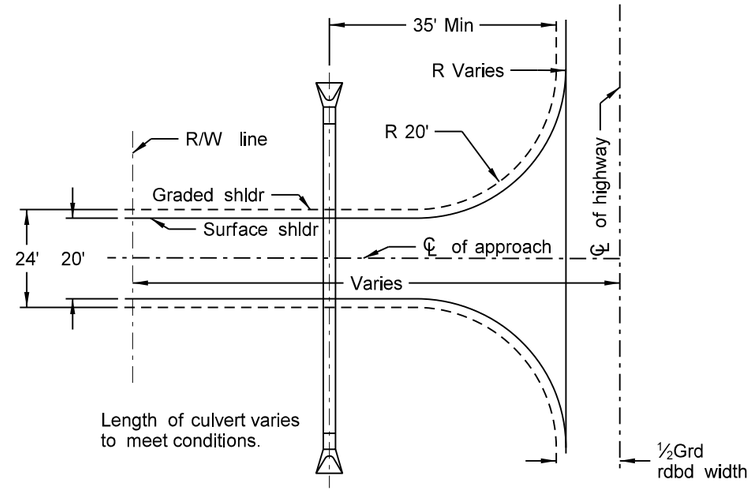


Formulas for computing shoulder radii

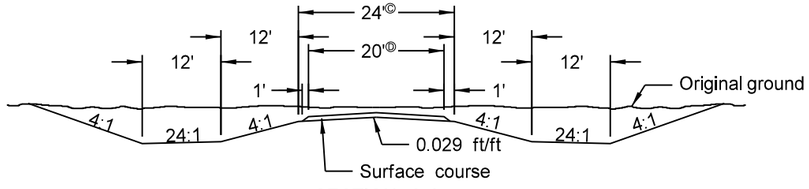
$$\text{Radius A} = \frac{38}{1+\cos\theta}$$

$$\text{Radius B} = \frac{38}{1-\cos\theta}$$

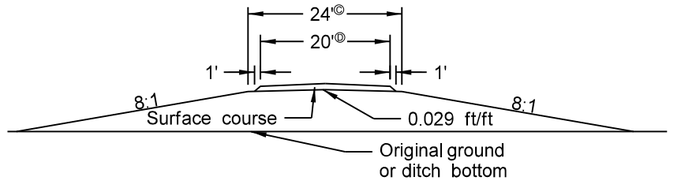
PLAN VIEW SECTION LINE APPROACH (SKEWED)



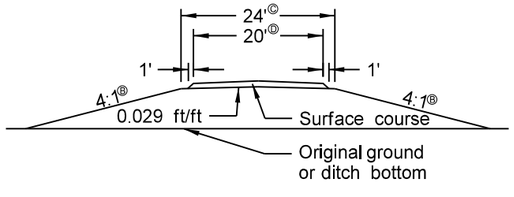
PLAN VIEW PRIVATE DRIVE APPROACH



SECTION A-A



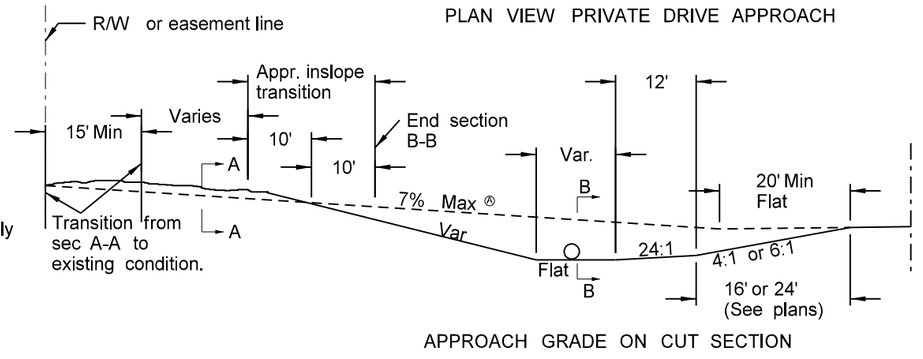
SECTION B-B



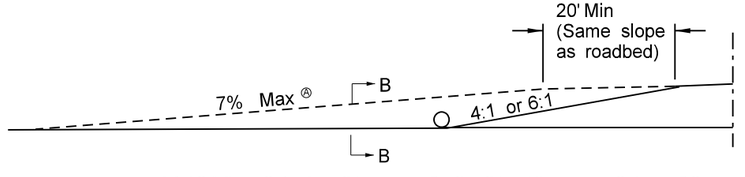
SECTION C-C

NOTES:
1. Dimensions shown for surfacing are for aggregate surface course or bituminous surface constructed with grading contract.
2. Approach grades and typical sections apply to both private drives and section line approaches.
3. Pipes shall be installed per Manufacturer's recommendations. Deflection testing may be performed at the discretion of the Engineer.

FOOT NOTES
Ⓐ 10% Max on field drives
Ⓑ 3:1 Slope - 20' to 30' fill
2:1 Slope on fills over 30'
Ⓒ 30' on sec. line approaches
Ⓓ 24' on sec line approaches



APPROACH GRADE ON CUT SECTION



APPROACH GRADE ON FILL SECTION 12 FEET OR LESS

APPROACH GRADE ON FILL SECTION OVER 12 FEET

On low traffic volume secondary projects the secondary slope is omitted and the inslope is steepened beyond the 24' line on fill sections over 8' in height

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
06-03-03	Revised roadway crown
12-01-04	PE Stamp added
04-05-06	General revisions
12-08-08	Format revisions/added Note 3

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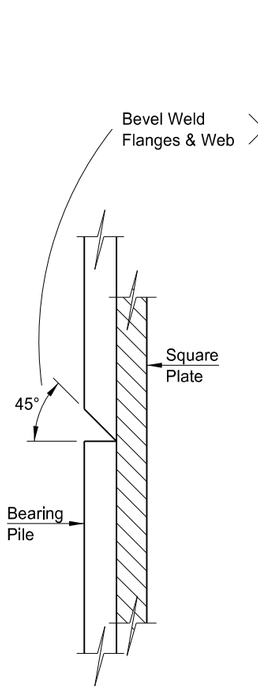
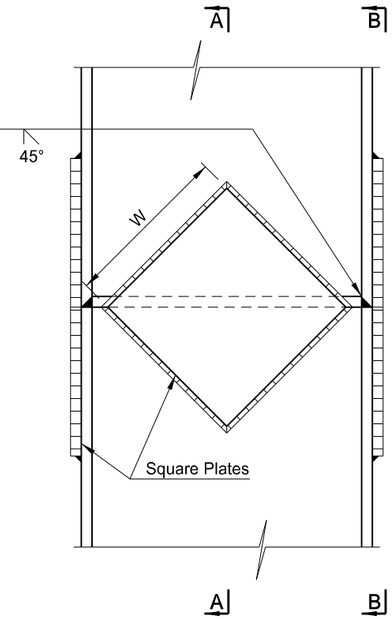
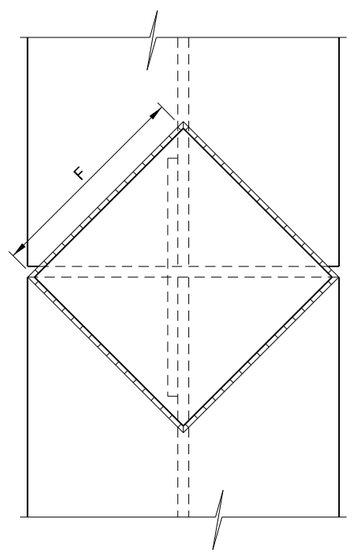
PILE SPLICE DETAILS

D-622-1

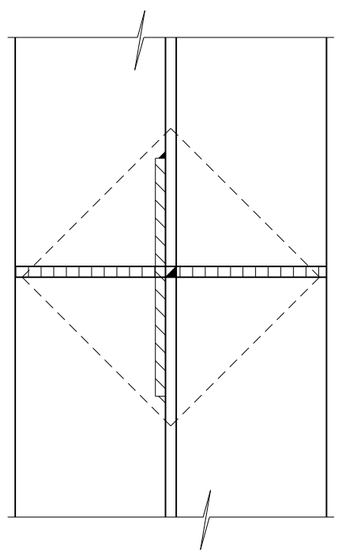


ENLARGED VIEW



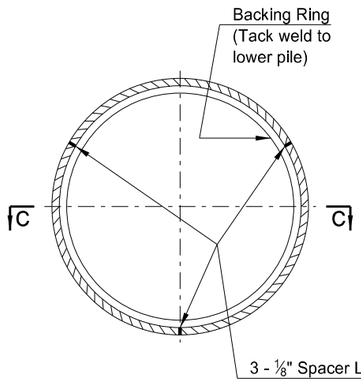


B-B

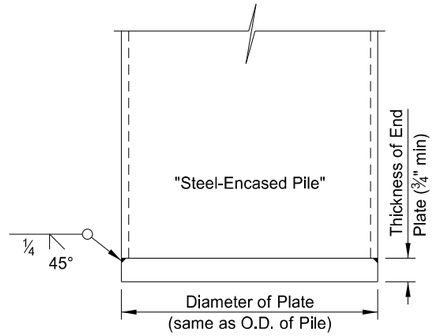


A-A

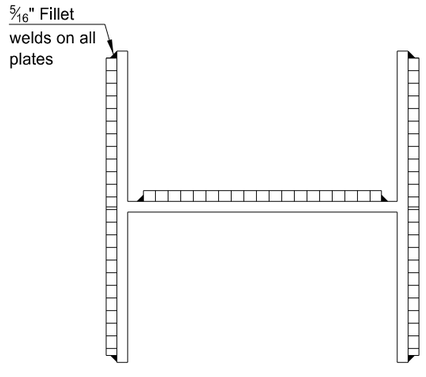
Flame scarf inside of both flanges and one side of web of upper section.



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

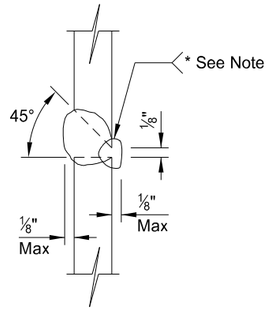


END PLATE DETAIL

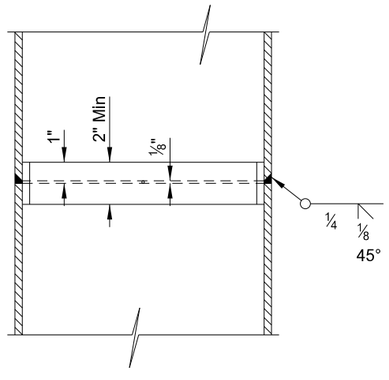


PILE	8"	10"	12"	14"
"F" FLANGE	5"	6½"	8"	10"
"W" WEB	4"	5½"	6½"	8"

H-PILE SPLICE DETAIL

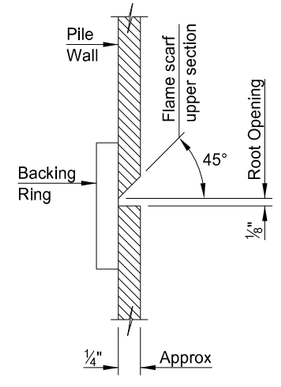


ALTERNATE H-PILE SPLICE DETAIL



C-C

STEEL-ENCASED CONCRETE PILE SPLICE DETAIL



ENLARGED VIEW

NOTES:

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

AWS classification E7OXX Low Hydrogen Electrodes shall be used.

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

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

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

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

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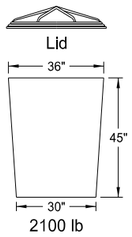
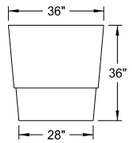
ATTENUATION DEVICE

D-704-1



2100 lb



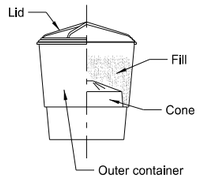
200, 400, 700 and 1400 lb

Outer Containers

200 lb
400 lb

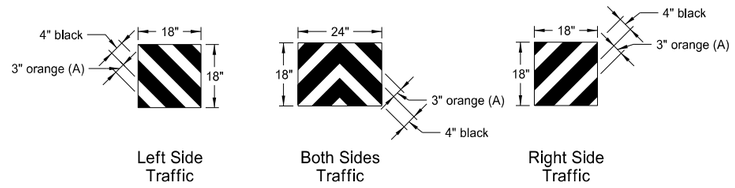
700 lb

Cones



Typical Assembly

Typical Module Construction Detail



Left Side Traffic

Both Sides Traffic

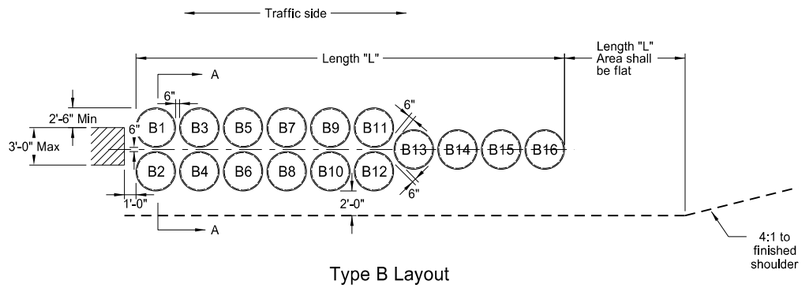
Right Side Traffic

Reflective Sheet Detail

Note:
The last attenuation device facing traffic shall have a reflective sheet, following the details above, directly applied to the outer container. The sheet may also be applied to a metallic sheet and attached to the container with approved fasteners. The reflective sheeting shall be Type III C as specified in NDDOT Standard Specifications.

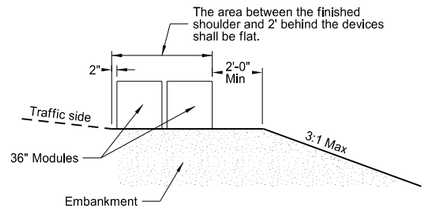
(A) 3" orange sheeting shall be used for temporary installations, and 3" yellow sheeting shall be used for permanent installations.

Fill Chart					
	Module Weights (LBS)				
	200	400	700	1400	2100
Distance from top edge	8½"	5"	4"	3"	0"



Type B Layout

Note:
When attenuation devices are placed at piers offset from roadway, they shall be angled 10 degrees towards traffic.



Section A-A
(Type B Layout)

Type B Attenuation Device											
Module Number	Dash Number										
	75	70	65	60	55	50	45	40	35	30	25
	Module Weights (LBS)										
B1	2100										
B2	2100										
B3	2100	2100	2100	2100	2100	2100	2100	2100	2100		
B4	2100	2100	2100	2100	2100	2100	2100	2100	2100		
B5	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B6	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B7	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B8	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B9	700	700	700	700	700	700	700	700	700	700	700
B10	700	700	700	700	700	700	700	700	700	700	700
B11	700	700	700	700	700	700	700	700	700	700	700
B12	700	700	700	700	700	700	700	700	700	700	700
B13	700	700	700	700	700	700	700	700	700	700	700
B14	400	400	400	400	400	400	400	400	400	400	400
B15	400	400	400	400	400	400	400	400	400	400	400
B16	200	200	200	200	200	200	200	200	200	200	200
Length (L)	34.2'	30.7'	30.7'	30.7'	30.7'	30.7'	30.7'	30.7'	30.7'	27.2'	27.2'
Module Weights (LBS)	Replacement Module										
2100	1	1	1	1	1	1	1	1	1		
1400	1	1	1	1	1	1	1	1	1	1	1
700	2	2	2	2	2	2	2	2	2	2	2
400	1	1	1	1	1	1	1	1	1	1	1
200	2	2	2	1	1	1	1	1	1	1	1

Notes:

1. Materials
   A) Modules shall be manufactured from a frangible polyethylene material which will shatter upon impact.
   B) Modules shall be filled with class 43 aggregate meeting the requirements for aggregate according to NDDOT Standard Specifications. The fill unit weight shall be at least 100 pounds per cubic foot. Fill left over winter shall have a moisture content of 2% or less.

2. Modules
   The modules shall be provided in two sizes to contain volumes of either 2, 4, 7, 14, or 21 cubic feet as a minimum.
   A) The module for the 2, 4 or 7 cubic foot container shall consist of three components:
      1) A 14 C.F., yellow outer container.
      2) A black lid which locks securely over the top lip of the container.
      3) A cone-shaped supporting insert. The insert shall be varied to allow for the three sizes of modules and capable of supporting 200, 400, or 700 pounds of sand mass. The cone inserts shall be placed inside the 14 cubic foot container.
   B) The module for the 21 cubic foot container shall consist of two components:
      1) A 36" height X 36" width yellow outer container.
      2) A black lid which locks securely over the top of the container.

3. For temporary use: The modules shall be Energite or Fitch attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, TrafFix barrels manufactured by TrafFix Devices, Inc. of San Clemente, CA, or an approved equal. The attenuation devices may be placed on pallets to facilitate maintenance. Pallets shall have a maximum thickness of 3½".

4. For permanent use: Barrel Attenuation Device installations, the outer sand container portion of the modules shall consist of a one-piece container with separate detachable lid. The modules which meet these requirements are Energite attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, TrafFix barrels manufactured by TrafFix Devices, Inc. of San Clemente, CA, or an approved equal. Modules having outer sand containers assembled from multiple pieces shall not be accepted for permanent installations.

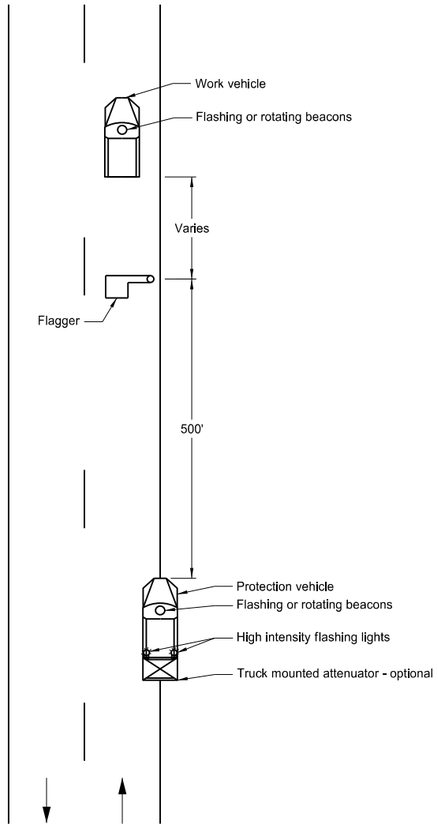
5. The Typical Module Construction Detail and Type B Layout are based on the Energite Crash Cushion manufactured by Energy Absorption. The manufacturer of other sand filled attenuation modules shall provide any necessary layouts and details required which differ from those shown here.

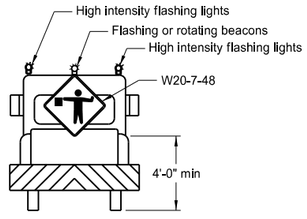
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE

TRAFFIC CONTROL FOR CORING OF HOT BITUMINOUS PAVEMENT

D-704-2

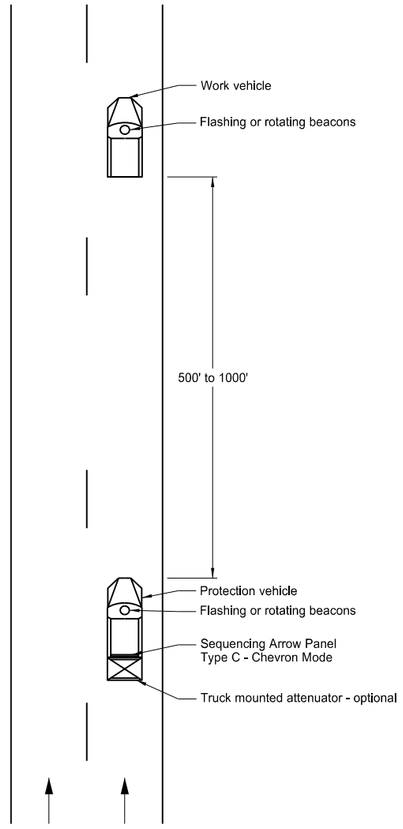
Two Lane, Two Way Roadways

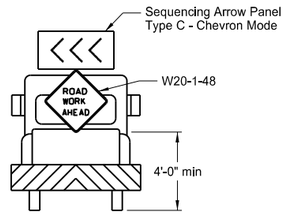




Typical Protection Vehicle

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

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 9/25/2012 and the original document is stored at the North Dakota Department of Transportation

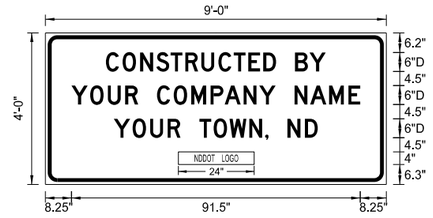
CONSTRUCTION SIGN DETAIL

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: 3A 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

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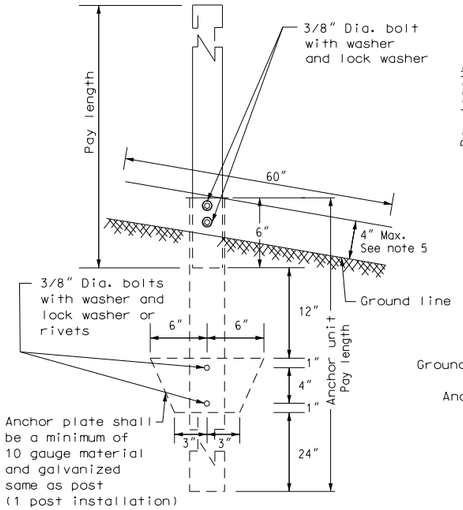
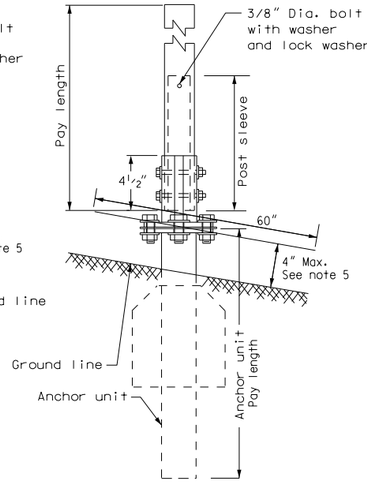
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

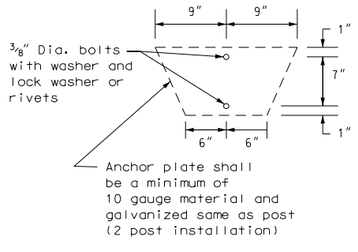
PERFORATED TUBE

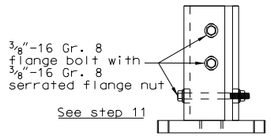


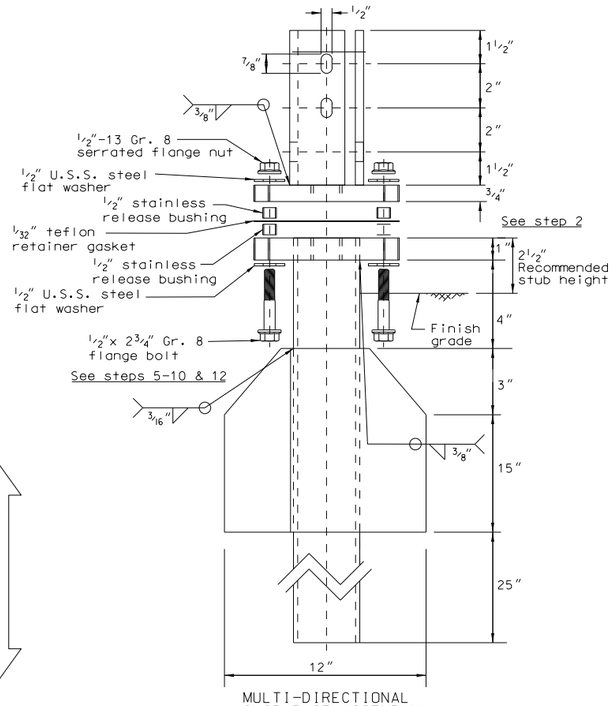
ANCHOR UNIT AND POST ASSEMBLY



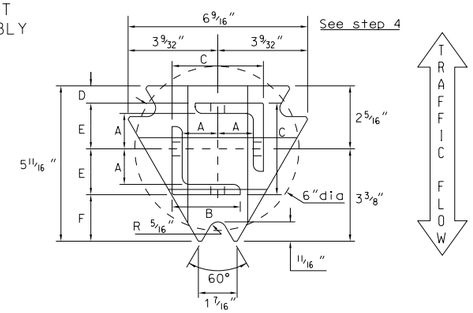
SLIP BASE ANCHOR UNIT AND POST SLEEVE ASSEMBLY







MULTI-DIRECTIONAL SLIP BASE ASSEMBLY

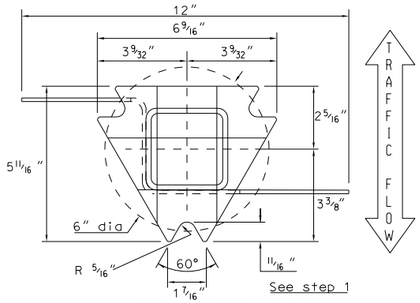


TOP POST RECEIVER

Materials: Plate - ASTM A572 grade 50
Angle receiver - 2 1/2"x 2 1/2"x 3/8" ASTM A36 structural angle

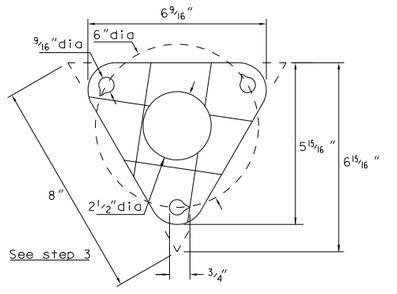
TOP POST RECEIVER DATA TABLE						
Square Post Sizes	A	B	C	D	E	F
2 3/16" x 10 Ga. Square Post	1 9/64"	2 1/2"	3 1/32"	25/32"	1 33/64"	1 7/8"
2 1/2" x 10 Ga. Square Post	1 9/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"

2 3/16" x 10 gauge may be inserted into 2 1/2" x 10 gauge for additional wind load.



BOTTOM SOIL STUB

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



BOLT RETAINER FOR BASE CONNECTION

Materials: 1/32" reprocessed Teflon

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

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

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

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

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

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

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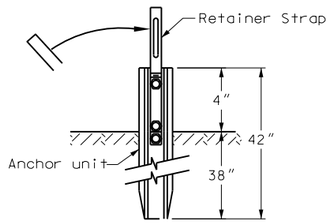
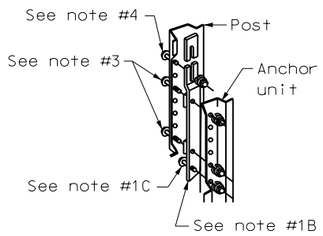
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

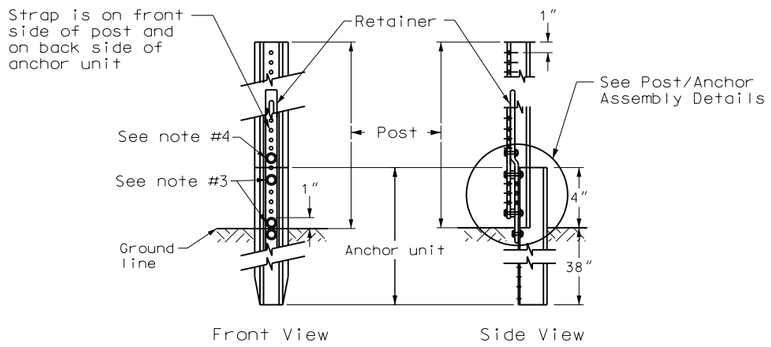
FLANGED CHANNEL



Anchor Unit &
Strap Assembly Detail



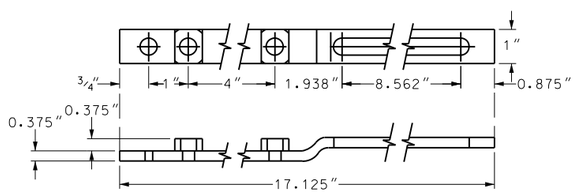
Post/Anchor
Assembly Details



Sign Post Assembly Detail

STEPS OF INSTALLATION

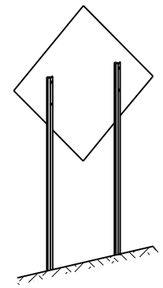
1. A) Drive anchor unit to within 12″ of ground level.
   B) Proper assembly established by lining up the top 3/4″ slot of retainer spacer strap with top hole of anchor unit.
   C) Assemble strap to back of anchor unit using 3/8″-16 UNC x 2.0″ long bolt, lock washer and nut.
   D) Rotate strap 90° to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



Retainer/Spacer Strap Detail

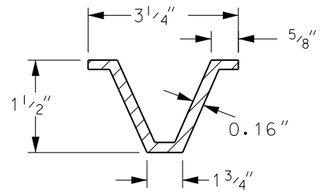
CHANNEL SIZE IN.	WALL THICKNESS IN.	WEIGHT PER FOOT LBS.	MOMENT OF INERTIA IN.4	CROSS SECT. AREA IN. SQ.	SECTION MODULUS IN.3
1.516 x 3.125"	.116	2.00	.179	.590	.225
1.532 x 3.125"	.124	2.25	.201	.648	.254
1.562 x 3.125"	.132	2.50	.233	.748	.289
1.578 x 3.125"	.140	2.75	.271	.819	.329
1.750 x 3.500"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

3 LB/FT U POSTS



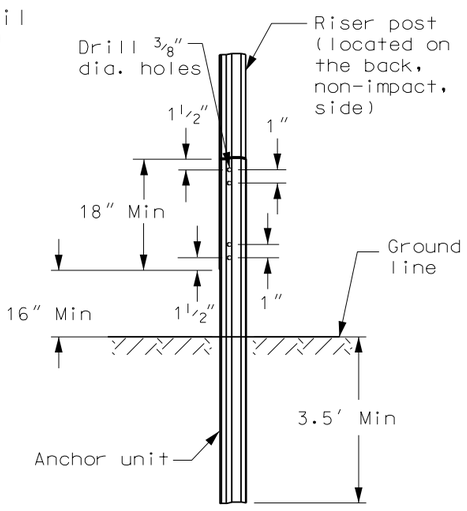
Typical
Installation

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



U-Post Detail
(3 lb/ft)

U-Channel Splice
Option 1



U-Channel Splice
Option 2

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

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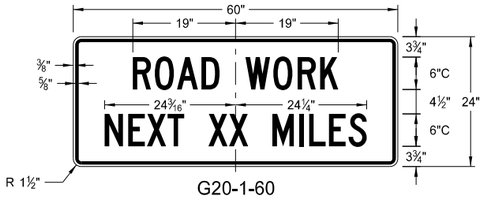
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



G20-1-60
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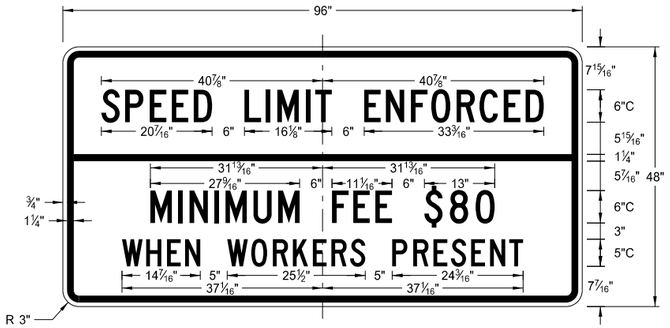
Background: orange

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



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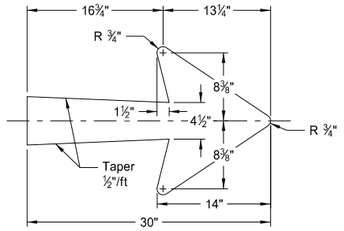
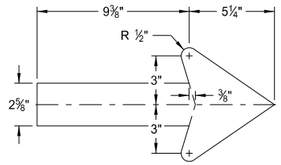
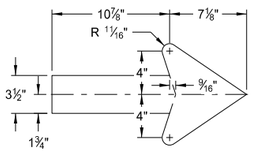


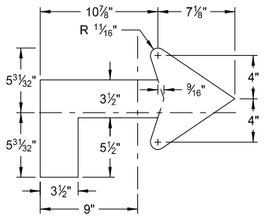
E5-1-48



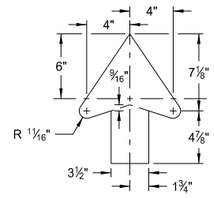
G20-50a-72
G20-52a-72



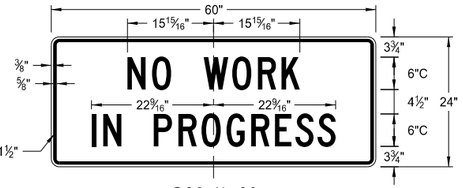
M4-9(L or R)-30
Right or Left



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



M4-9-30
Straight



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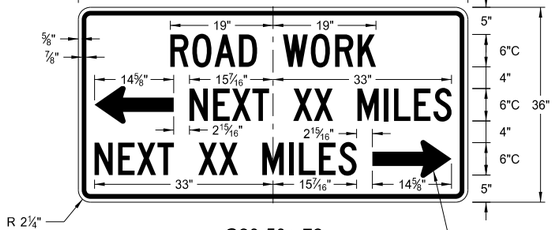

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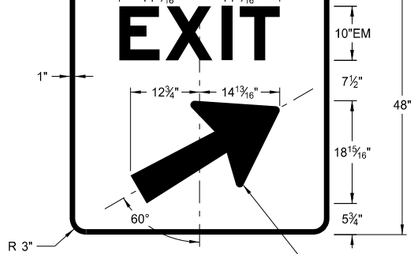

E5-1(L or R)-48
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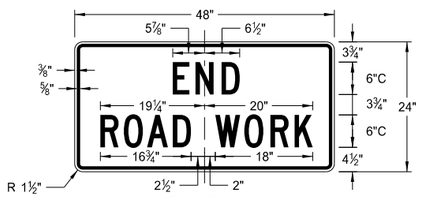
Background: green



G20-2-48
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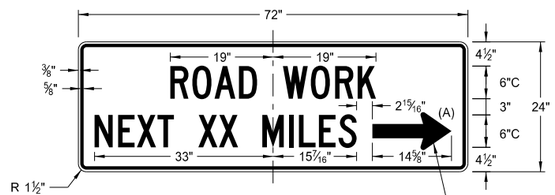
Background: orange



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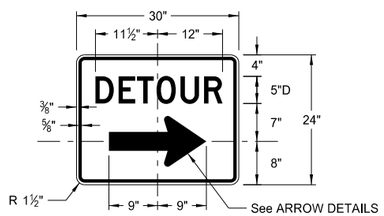

M4-9(L or R)-30 &
M4-9-30
Legend: black (non-refl)
Background: orange

ARROW DETAILS

NOTES:

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

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

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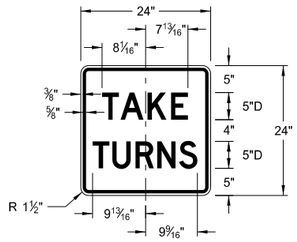
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



R1-50-24
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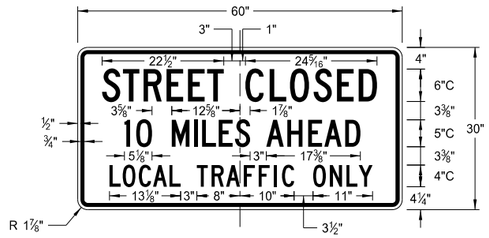
Background: white



R11-3c-60
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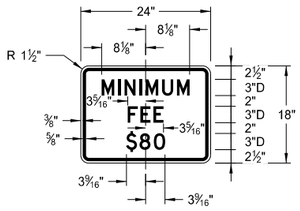

R2-1a-24
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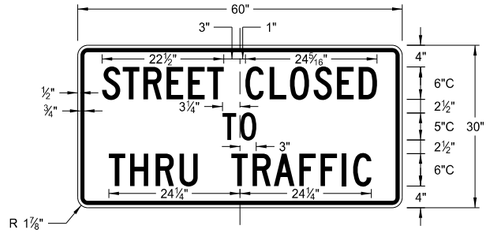

R11-4a-60
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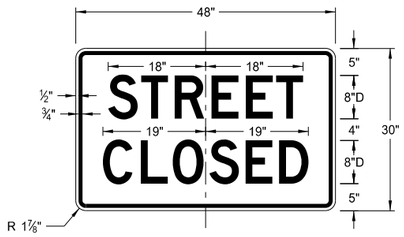

R11-2a-48
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8-13-13	
REVISIONS	
DATE	CHANGE

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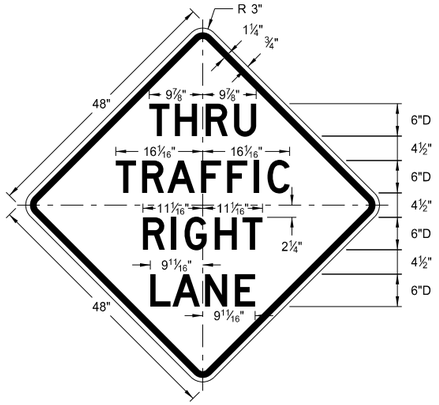
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



W5-8-48
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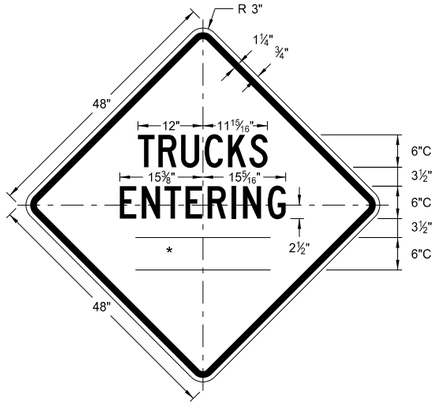
Background: orange



W8-54-48
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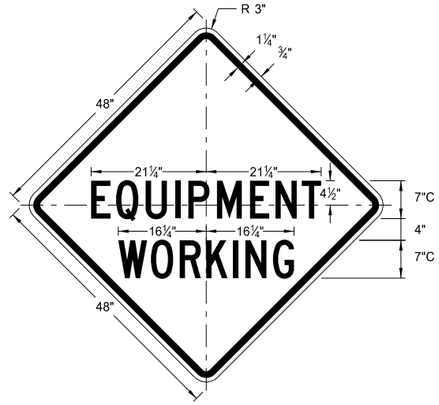

W20-51-48
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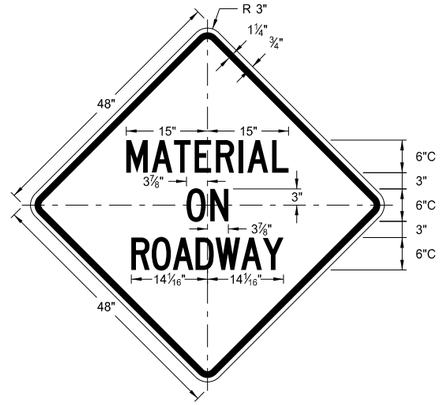
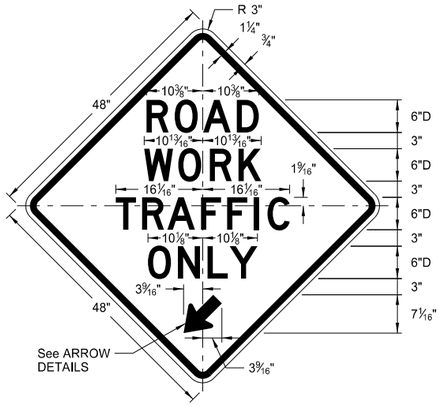
Background: orange



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

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

* DISTANCE MESSAGES



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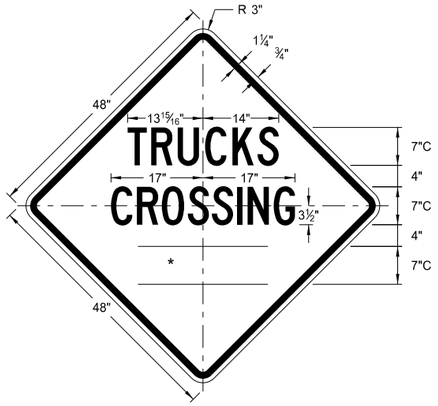
Background: orange



W8-55-48
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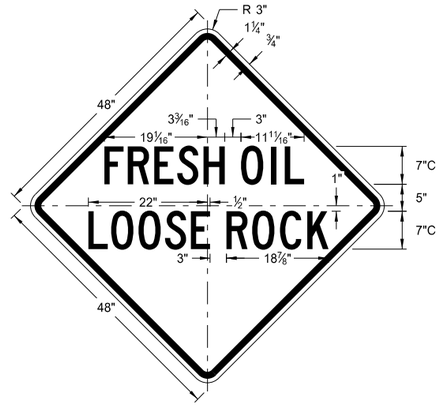
Background: orange

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



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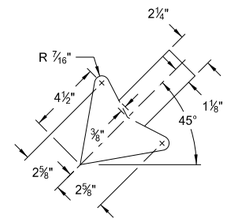
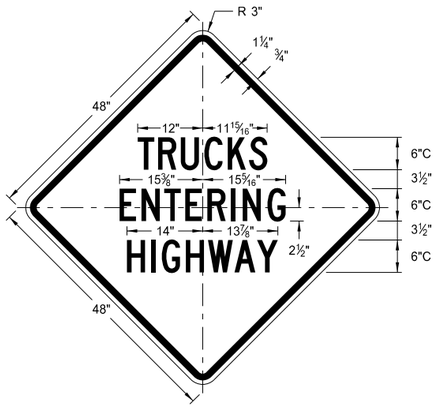


W5-9-48

ARROW DETAILS



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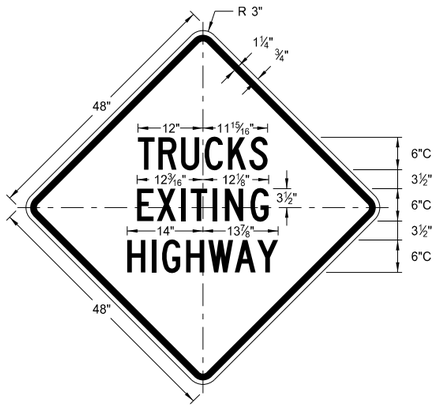

W8-56-48
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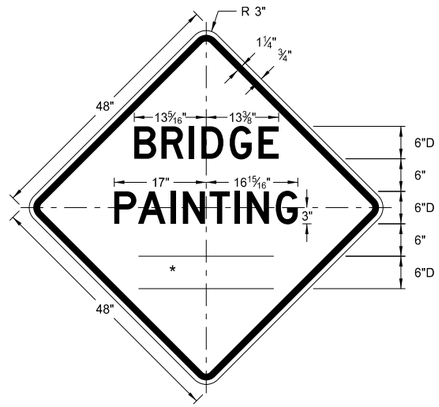
Background: orange



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

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

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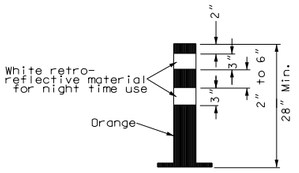
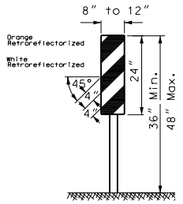
BARRICADE DETAILS AND CHANNELIZING DEVICES



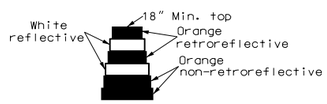
TUBULAR MARKER



VERTICAL PANEL

(Retroreflective sheeting shall be placed on both sides)

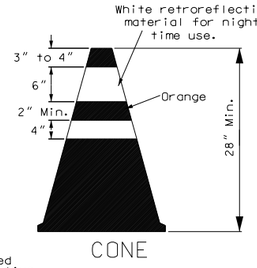
NOTE: Vertical panels used on the expressways or other high speed roadways shall be 12" by 24"



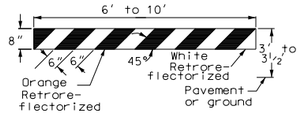
DELINEATOR DRUM

36" Min. height

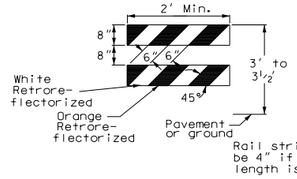
The markings on drums shall be orange and white stripes 4 to 6 inches wide. There shall be at least two orange and two white stripes. Where drums have ribs or indentations, there shall be no retroreflectorized sheeting in this area. This space shall be no more than 2 inches wide. The drum surface shall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



CONE

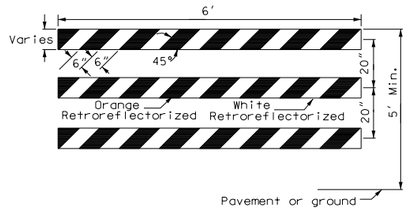


TYPE I BARRICADE



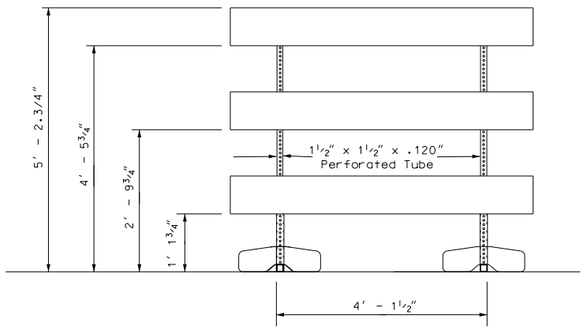
TYPE II BARRICADE

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

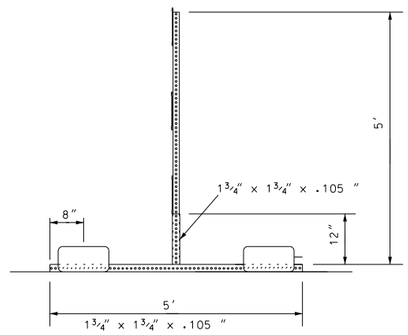


TYPE III BARRICADE

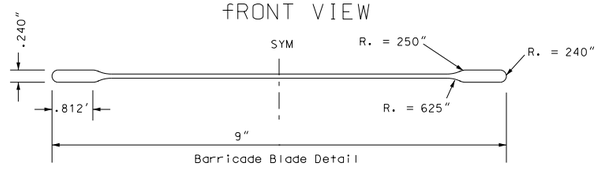
BARRICADES:
Number of retroreflectorized rail faces:
Type I - 2 (One each direction)
Type II - 4 (Two each direction)
Type III- 6 (Three in each direction)



fRONT VIEW



END VIEW



Barricade Blade Detail

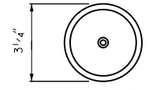
Ballast = 45lb sandbag at the end of each leg.

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

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

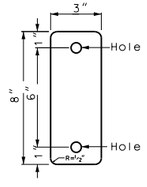
Masts slide inside vertical portion of legs. No bolts or fastenings devices used.

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



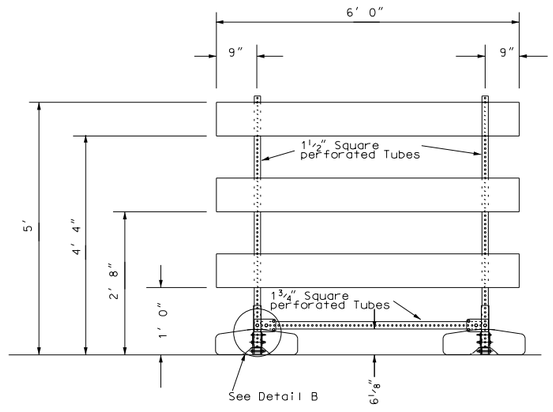
ACRYLIC PLASTIC REFLECTOR

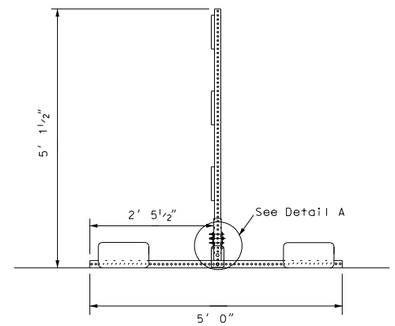
Delineator reflector shall meet the requirements of section 894

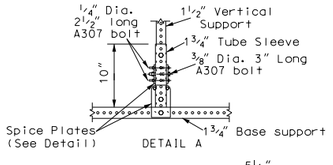


DELINEATOR REFLECTOR

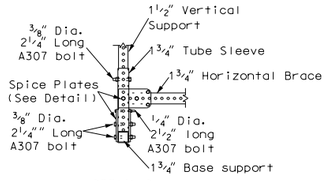
3"x8"- 18 Gauge galvanized steel sheet or 0.080" aluminum plate with white retroreflective sheeting (Type 3A or 3B) as specified in Section 894 of the Standard Specifications.



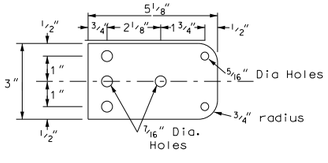




DETAIL A



DETAIL B

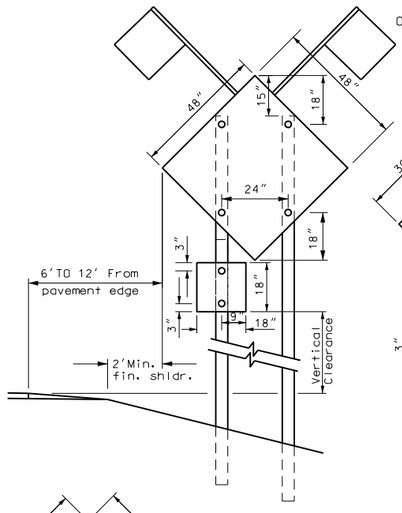


SPLICE PLATE

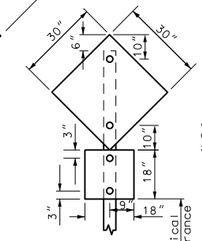
BARRICADE ASSEMBLY DETAIL
(Use when Plastic I-Beam w/ 1½" Hollow Core Flanges or 1" x 8" x72" wood boards.

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

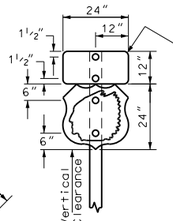
CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS



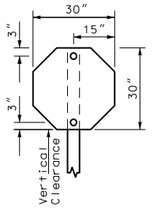
POST MOUNTING
48"x48" Signs



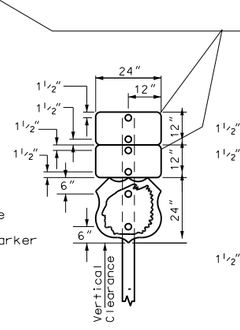
POST MOUNTING
30"x30" Signs



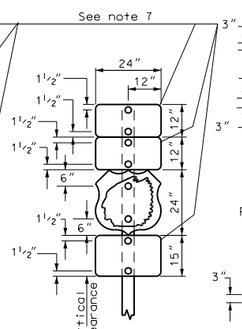
POST MOUNTING
Assemblies with one cardinal direction sign & one route marker



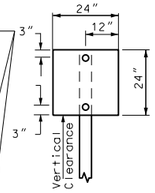
POST MOUNTING
Sign R1-1-30



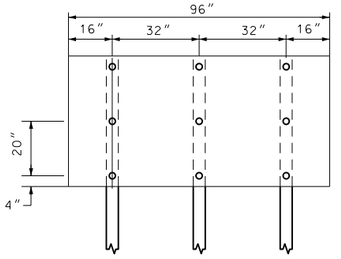
POST MOUNTING
Assemblies with one cardinal direction sign, one detour sign & one route marker



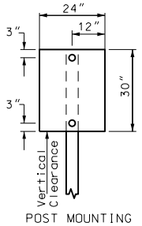
POST MOUNTING
Assemblies with one cardinal direction sign, one detour sign, one route marker & one directional arrow.



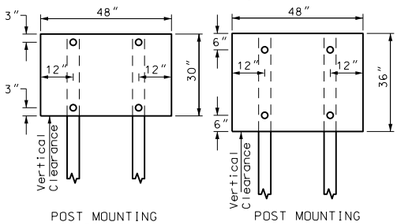
POST MOUNTING
24"x24" Signs



POST MOUNTING
48"x96" Signs

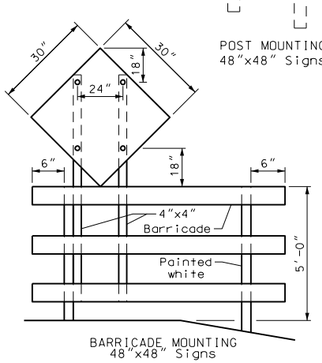


POST MOUNTING
24"x30" Signs

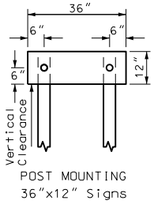


POST MOUNTING
48"x30" Signs

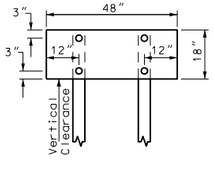
POST MOUNTING
48"x36" Signs



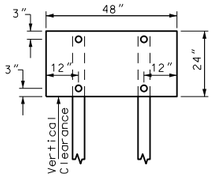
BARRICADE MOUNTING
48"x48" Signs



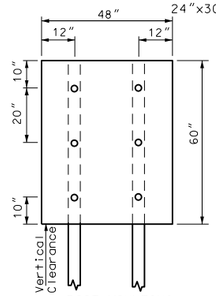
POST MOUNTING
36"x12" Signs



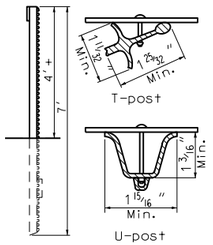
POST MOUNTING
48"x18" Signs



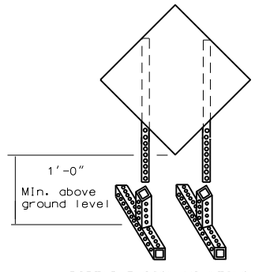
POST MOUNTING
48"x24" Signs



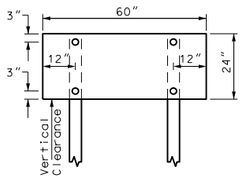
POST MOUNTING
48"x60" Signs



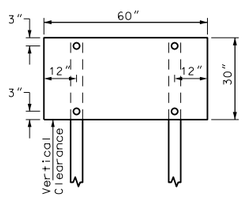
DELINEATOR ATTACHMENT AND POST MOUNTING DETAILS



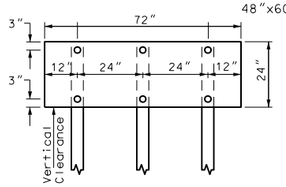
PORTABLE SIGN MOUNTING



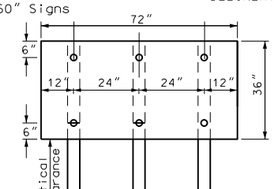
POST MOUNTING
60"x24" Signs



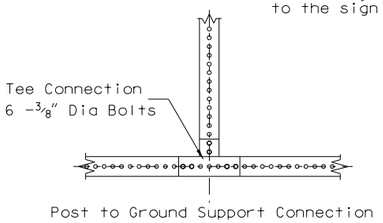
POST MOUNTING
60"x30" Signs



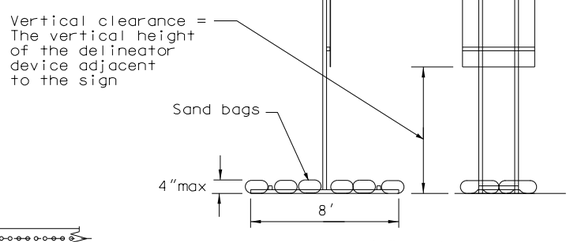
POST MOUNTING
72"x24" Signs



POST MOUNTING
72"x36" Signs

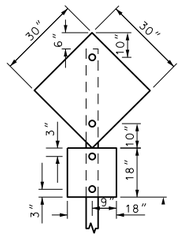


Post to Ground Support Connection

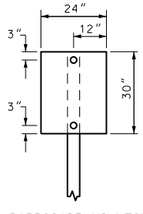


Post sizes shall be 2 1/4" perforated tube

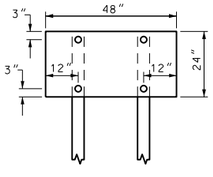
SKID MOUNTED SIGNS



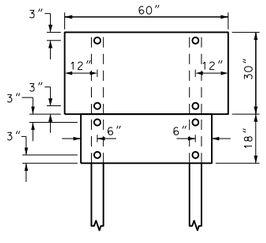
BARRICADE MOUNTING
30"x30" Signs



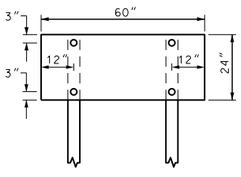
BARRICADE MOUNTING
24"x30" Signs



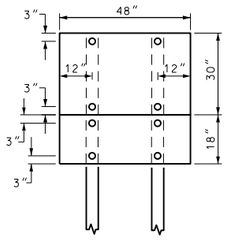
BARRICADE MOUNTING
48"x24" Signs



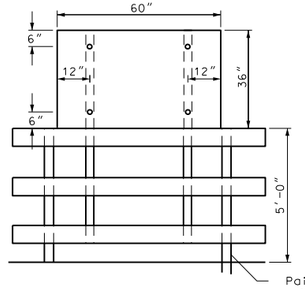
BARRICADE MOUNTING
60"x30" & 48"x18" Signs



BARRICADE MOUNTING
60"x24" Signs



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



BARRICADE MOUNTING
G20-1-60 Signs

NOTES:

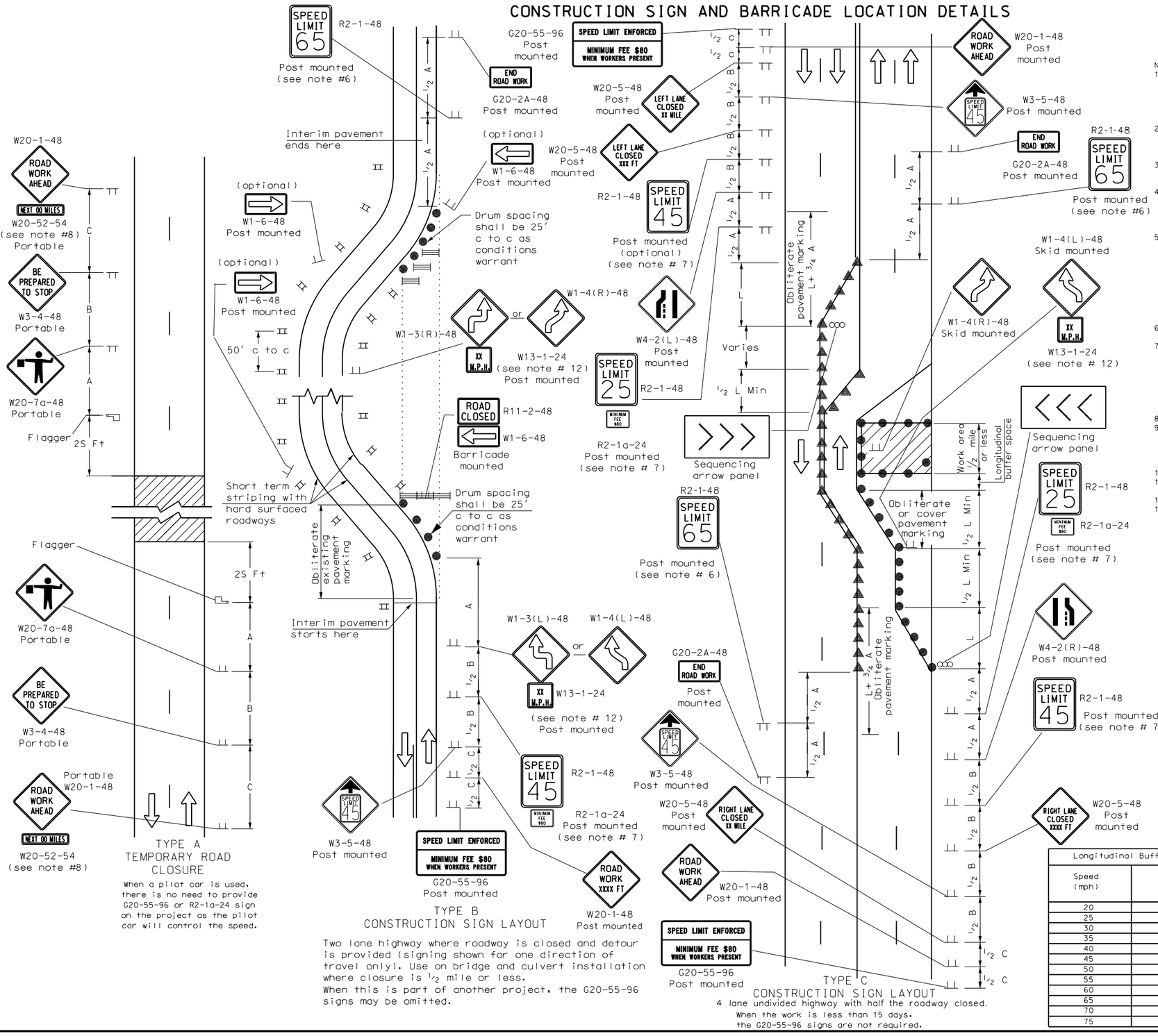
1. Barricade and Sign Supports: Wooden supports shall be painted white. Steel supports shall be galvanized or painted.
2. Barricade Mounting Signs: The bottom of the sign shall be flush with the top of the top rail. Wood sign posts shall be 4"x4" min. SFS or equivalent steel posts. All barricades and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

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

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

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

D-704-15



Notes

1. Variables
   S = Numerical value of speed limit or 85th percentile.
   W = The width of taper.
   L = Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x S²/60 for urban, residential, and other streets with speeds of 40 mph or less.
2. Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on roadway shall be placed on skid mounted assemblies.
3. Delineator drums, barricades or cones used for tapering traffic shall be spaced at the dimension "S". Delineator drums or cones used for tangents shall be spaced at 2 times dimension "S".
4. Existing striping shall be removed as required. Delineators will only be used when foreslope is 1V:4H or better and roadway alignment is visible to approaching vehicles. Vertical panels shall be used where roadways has steep slopes and alignment is not visible to approaching vehicles. Delineators and vertical panels shall be installed back to back.
5. Sequencing Arrow Panels
   Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface.
   Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph and 750 ADT or less).
   Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less).
   Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 5000 ADT).
6. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
7. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at ½ B.
8. Use when work area is 1 mile or longer.
9. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
10. Existing speed limit signs within a reduced speed zone shall be covered.
11. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
12. Where necessary, safe speed to be determined by the Engineer.
13. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.

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

KEY

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-1-86

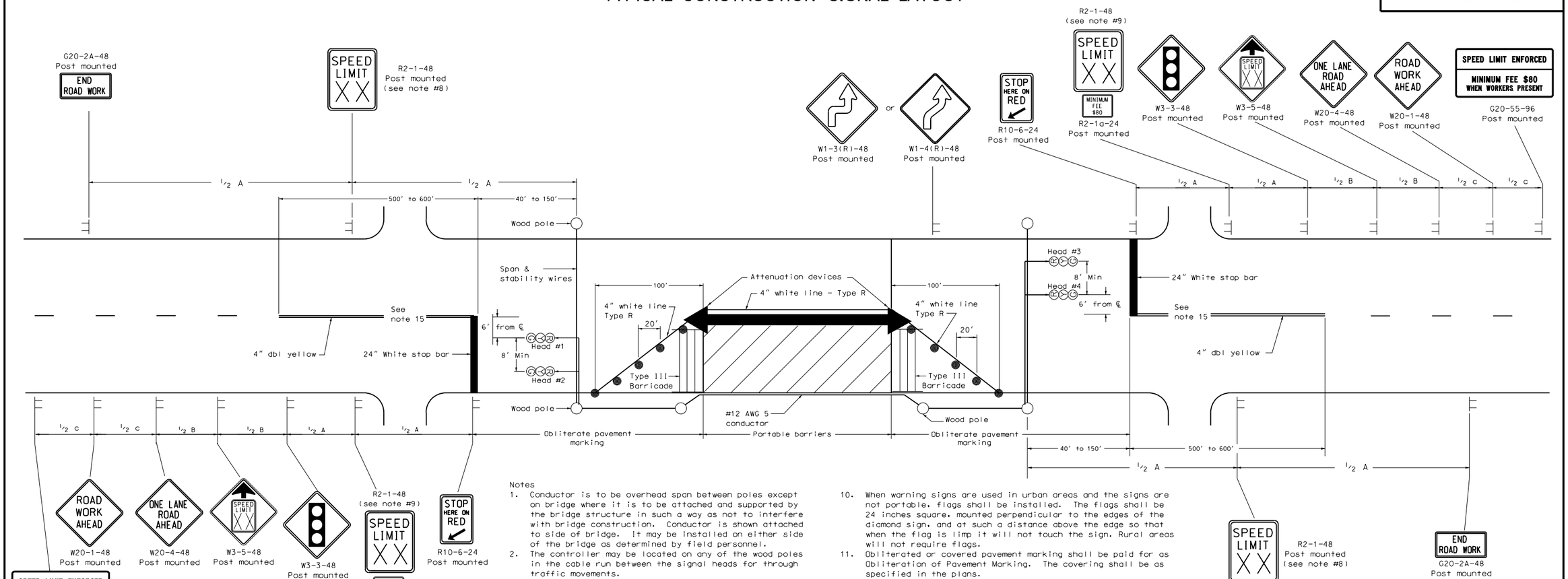
REVISIONS

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

This document was originally issued and sealed by Mark S Gaydos Registration Number PE-4518, on 07/05/05 and the original document is stored at the North Dakota Department of Transportation

TYPICAL CONSTRUCTION SIGNAL LAYOUT

D-704-16



Notes

1. Conductor is to be overhead span between poles except on bridge where it is to be attached and supported by the bridge structure in such a way as not to interfere with bridge construction. Conductor is shown attached to side of bridge. It may be installed on either side of the bridge as determined by field personnel.
2. The controller may be located on any of the wood poles in the cable run between the signal heads for through traffic movements.
3. The timing schedule is suggested trial setting. Frequent checks of signals in operation shall be made to obtain the most efficient timing schedule.
4. The wood poles shall be placed a minimum of 16 feet from the edge of the driving lane. The wood poles shall be of sufficient length to provide a minimum of 16 to 19 feet clearance from the center line of the roadway to the bottom of traffic signal heads suspended over the roadway.
5. Traffic signal heads shall have 12 inch red, yellow and green lenses. The signal heads shall have 5 inch louvered backplates.
6. For interim traffic construction detail see standard drawing D-772-6.
7. Delineator drums used for tapering traffic shall be spaced at 20 ft. center to center.
8. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
9. The reduced speed limit shall be determined dependent on the in-place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
10. 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.
11. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be as specified in the plans.
12. Existing speed limit signs within a reduced speed zone shall be covered.
13. Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on the roadway shall be placed on skid mounted assemblies.
14. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
15. Double yellow centerline shall continue thru private drives.
16. 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.

KEY

- Work Area
- Type III Barricade
- Sign
- Delineator Drum

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

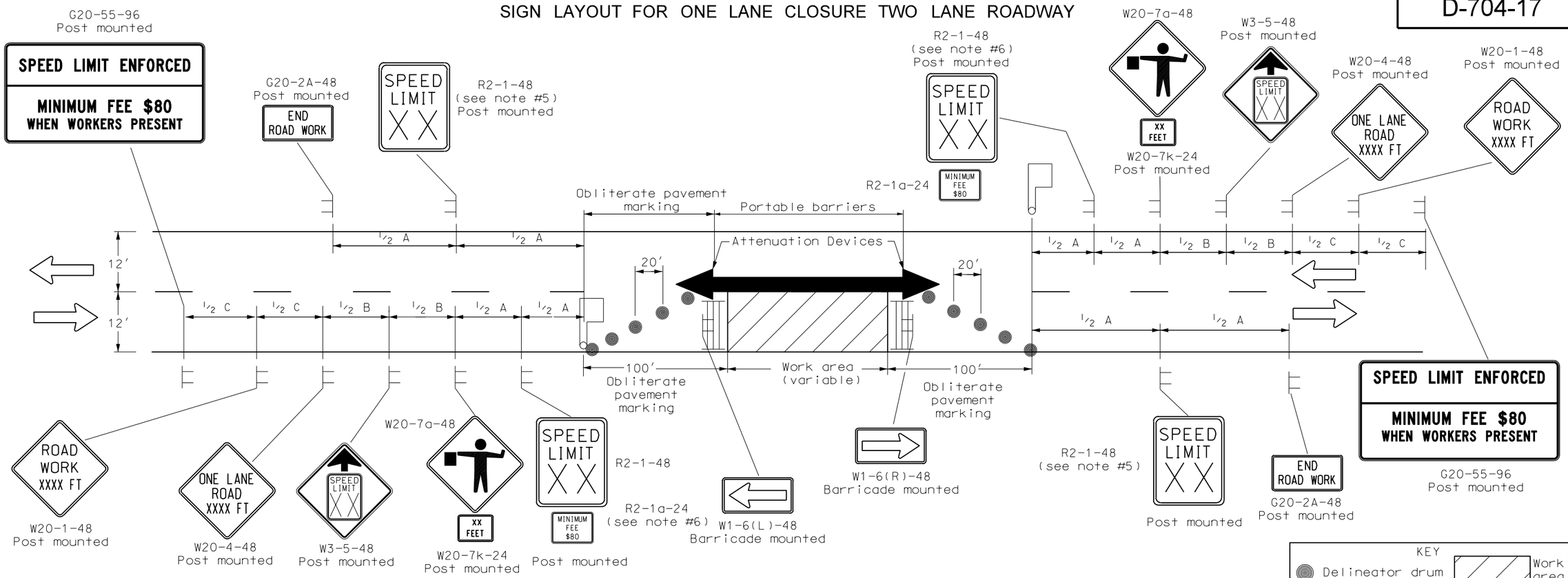
SUGGESTED TIMING AND SIGNAL SEQUENCE						
Heads 1 & 2	Green	Yellow	Red			
Heads 3 & 4		Red		Green	Yellow	Red
Time Cycle = 90 seconds	18.0	4.5	22.5	18.0	4.5	22.5
Percent of Cycle	20	5	25	20	5	25

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
03-01-88	
REVISIONS	
DATE	CHANGE
05-01-00	Note 6
01-05-01	Revised note 7
07-19-02	Reversed End Road Work & speed limit signs
07-25-03	Revised R2-1a and W20-1
04-01-04	Rev. fee sign & Warning sign spacing, add note 16 Revised note 9
12-01-04	PE Stamp added
02-16-05	Added W1-3(R)-48
06-29-05	Replaced R2-5a with W3-5. Rev. Adv. Warning Table. Rev. Note 9

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

SIGN LAYOUT FOR ONE LANE CLOSURE TWO LANE ROADWAY

D-704-17



Notes

1. Floodlights shall be provided to mark flagger stations at night. The lighting shall not create a disabling glare for drivers. Placement and elimination of potential glare can best be determined by driving through and observing the floodlighted area from each direction on the main roadway after lighting is set up.
2. Barricade shown to be placed on roadway shall be on a movable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on the roadway shall be placed on skid mounted assembly.
3. Delineator drums used for tapering traffic shall be spaced at 20 ft. center to center
4. Existing striping shall be removed as required. Delineators will only be used when inslope is 4:1 or better and roadway alignment is visible to approaching vehicles. Vertical panels shall be used where roadways have steep slopes and alignment is not visible to approaching vehicles. Delineators and vertical panels shall be installed back to back.
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 1/2 B.
7. 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.
8. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
9. Where necessary, safe speed to be determined by the Engineer.
10. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
11. Existing speed limit signs within a reduced speed zone shall be covered.
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.

KEY

- Delineator drum
- Work area
- Sign
- Flagger
- Type III barricade

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-1-86

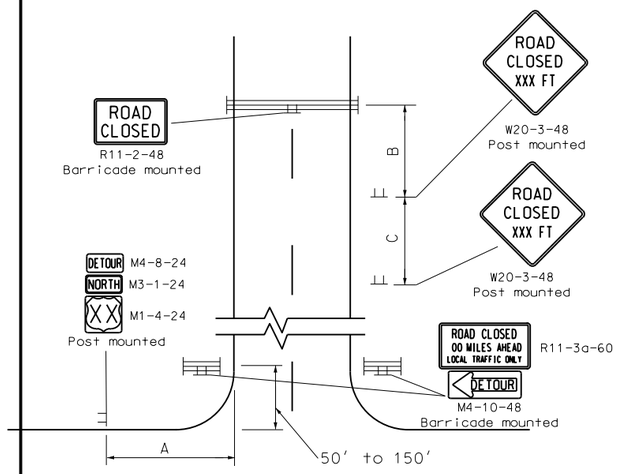
REVISIONS

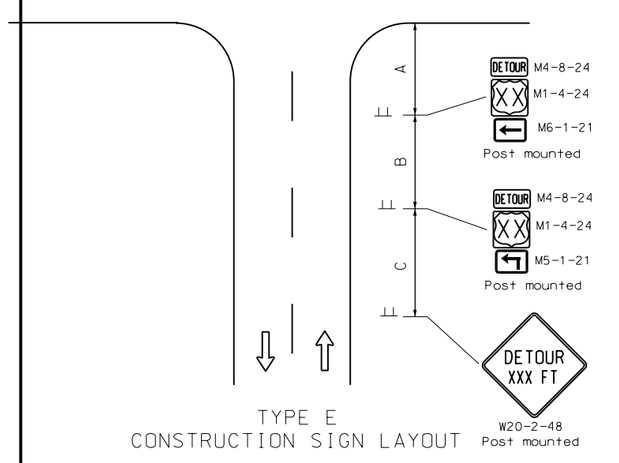
DATE	CHANGE
01-31-97	Sign spacing
10-01-99	General revisions
03-29-00	Minor revisions
01-05-01	Revised note 3
07-19-02	Reversed End Road Work & speed limit signs
07-25-03	Revised R2-1a and W20-1
04-01-04	Rev. fee sign & Warning Sign Spacing.rev note 6, add note 12
12-01-04	PE Stamp added
06-29-05	Replaced R2-5a with W3-5, Rev. Adv. Warning Table, Rev. Note 6

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

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

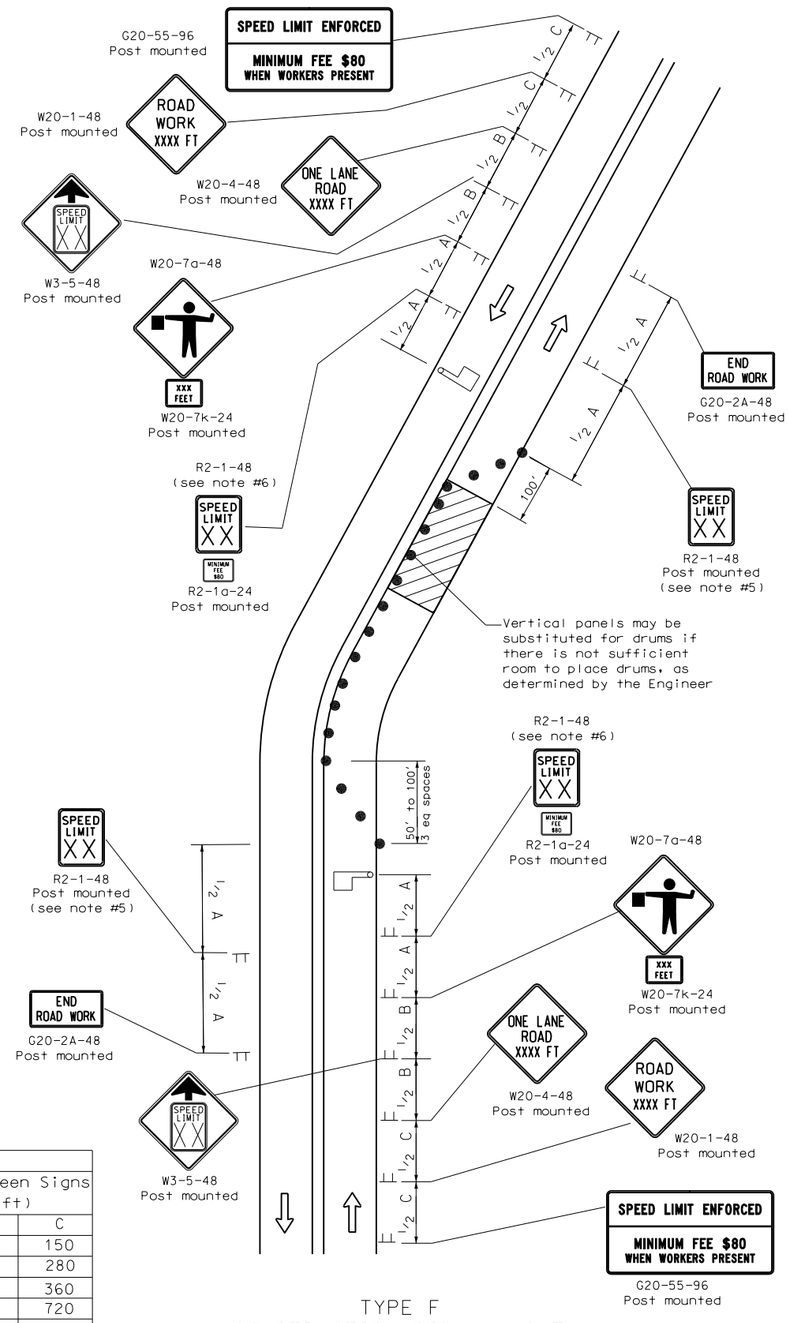
D-704-19





TYPE E
CONSTRUCTION SIGN LAYOUT

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



TYPE F
CONSTRUCTION SIGN LAYOUT

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

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

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
   $W \times S^2/60$ for urban, residential, and other streets with speeds of 40 mph or less.
2. Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on the roadway shall be placed on skid mounted assemblies.
3. Delineator drums used for tapering traffic shall be placed at 3 equal spaces.
4. Delineator drums for tangents shall be spaced at 2 times dimension "S".
5. Sequencing Arrow Panels
   Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface.
   Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph and 750 ADT or less).
   Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less).
   Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 5000 ADT).
6. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
7. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at $\frac{1}{2}$ B.
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. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
11. Where necessary, safe speed to be determined by the Engineer.
12. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
13. G20-55-96 or R2-1a-24 sign are not required when a pilot car operation is used.

KEY

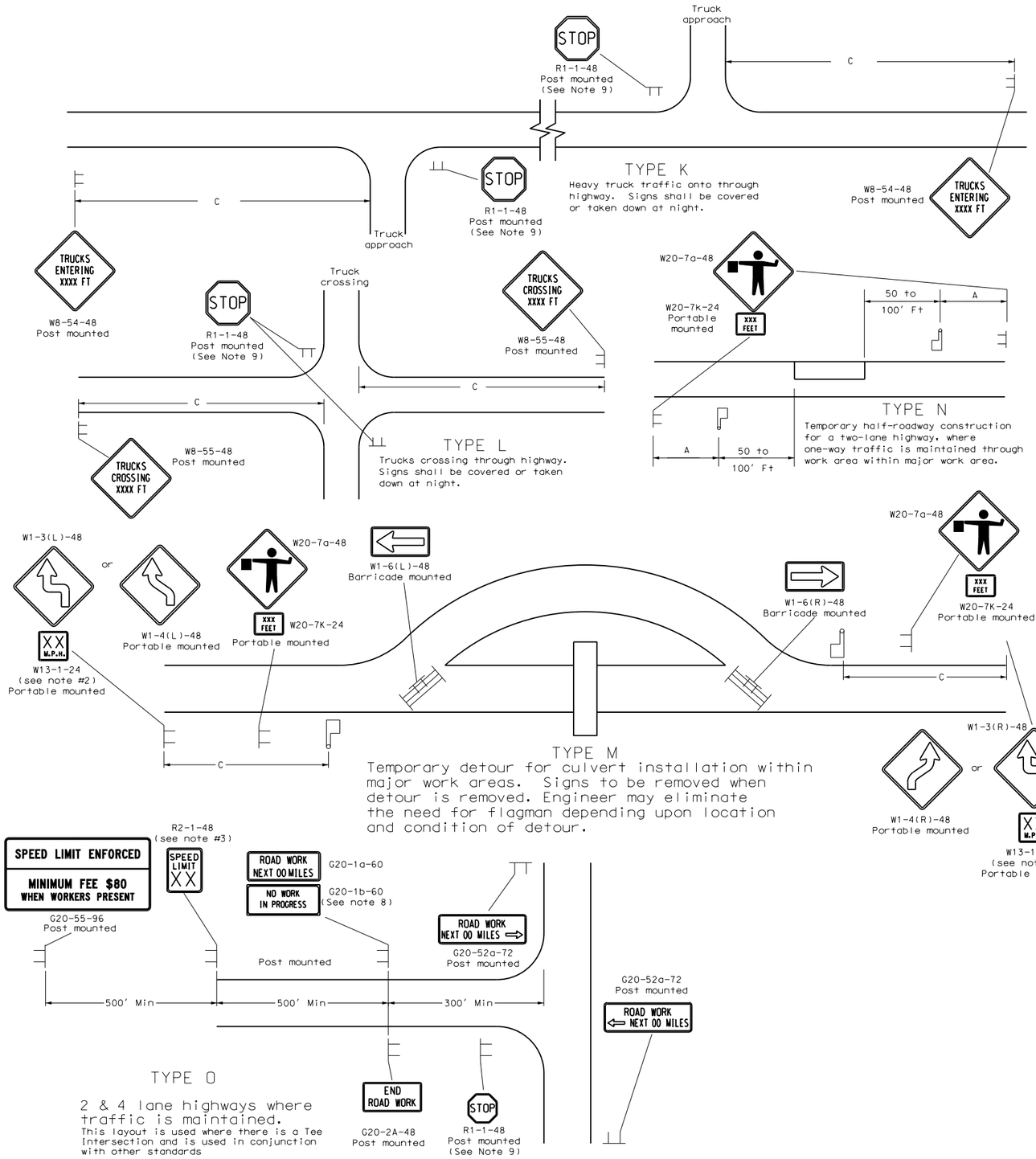
Delineator Drum	Type I Barricade	Flagger	
Type A Delineator	Type II Barricade	Sequencing Arrow Panel	
Sign	Type III Barricade	Work/Hazard Area	
Cone			

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
07-19-02	Reversed End Road Work & Speed Limit Signs
07-25-03	Revised R2-1a and W20-1
01-16-04	Revised type F
04-01-04	Revised fee sign & Warning sign spacing. Rev. note 6. add note 12
12-01-04	PE stamp added
06-29-05	Added W3-5 to type F. Rev. Adv. Warning Table. Rev. Note 6
04-05-06	Showed signing for opposite direction
02-16-07	Added W3-5-48 to opposite direction of Type F layout

This document was originally issued and sealed by MARK S GAYDOS Registration Number PE-4518, on02/16/2007and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

D-704-22



Notes

1. Barricade shown to be placed on roadway shall be on a moveable assembly. on the top of the top barricade bar. Sign shown to be placed on the roadway Sign to be mounted on barricades shall be mounted with the sign bottom shall be placed on skid mounted assemblies.
2. Where necessary, safe speed to be determined by the Engineer.
3. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at $^1/_2$ B.
4. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
5. Existing speed limit signs within a reduced speed zone shall be covered.
6. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
7. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
8. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
9. If existing stop sign is in place, a 48" stop sign is not required.

KEY

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

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

10-1-86

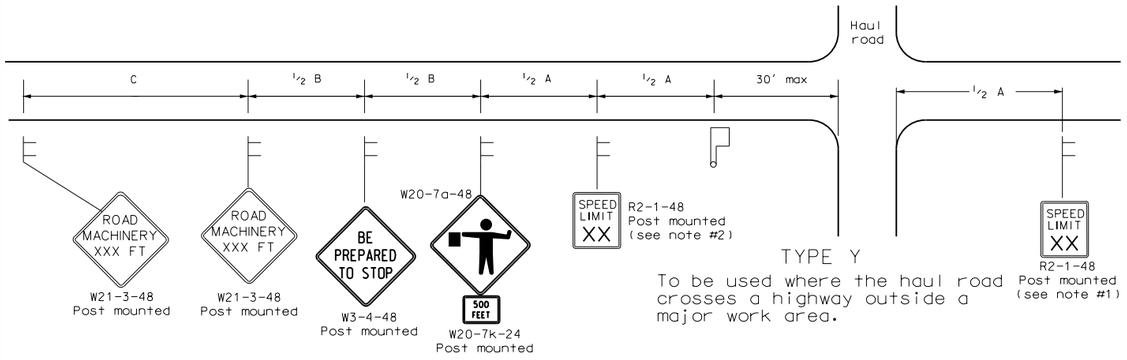
REVISIONS

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

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

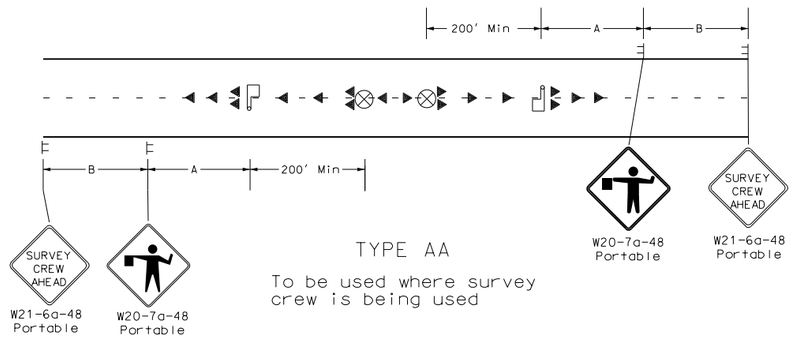
CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

D-704-26



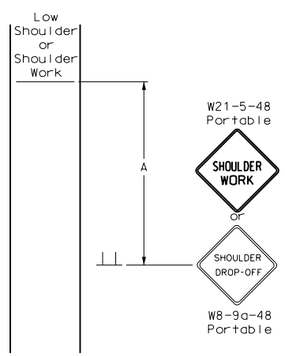
TYPE Y

To be used where the haul road crosses a highway outside a major work area.



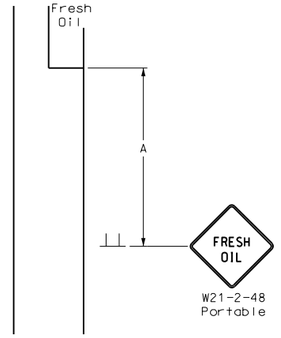
TYPE AA

To be used where survey crew is being used



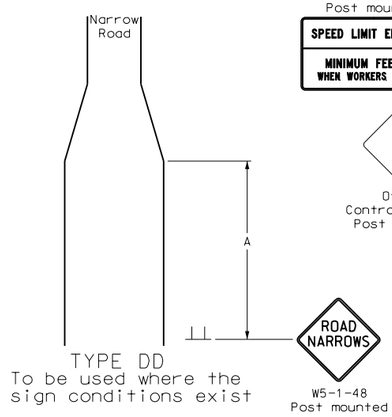
TYPE BB

To be used within a major work area where the sign conditions exist



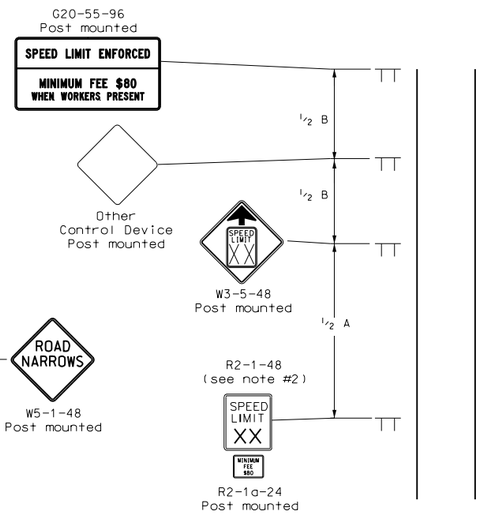
TYPE CC

To be used where the sign conditions exist



TYPE DD

To be used where the sign conditions exist

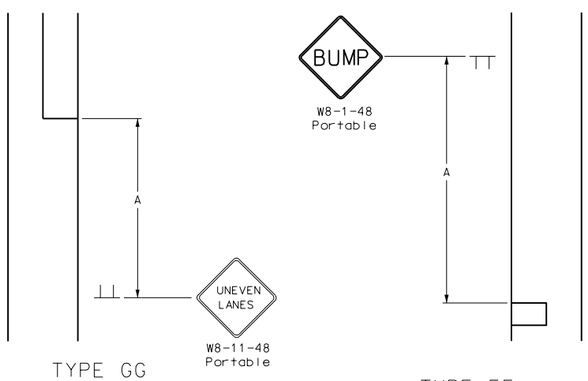


TYPE Z

To be used where speed zone is needed

Notes

1. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
2. 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.
3. 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.
4. Existing speed limit signs within a reduced speed zone shall be covered.
5. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
6. G20-55-96 or R2-1a-24 signs are not required if this standard is part of other traffic control layouts, or the work is less than 5 days.

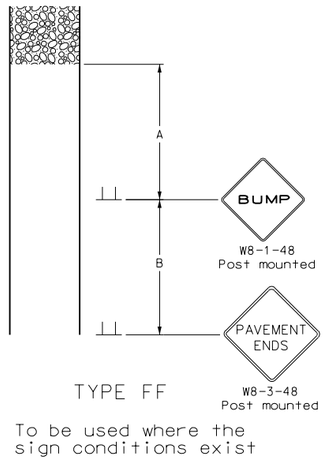


TYPE GG

To be used where a difference of elevation between lanes exist

TYPE EE

To be used where the sign conditions exist



TYPE FF

To be used where the sign conditions exist

KEY

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-1-86

REVISIONS

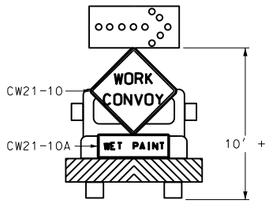
DATE	CHANGE
09-03-96	70 mph
01-31-97	Sign spacing
10-01-99	General Revision
07-19-02	Revised spacing of Speed Limit Signs
01-30-03	Pavement end sign
07-25-03	Revised R2-1a
04-01-04	Rev. fee sign & warning sign spacing. Add note 6
12-01-04	PE Stamp added
06-29-05	Replaced R2-5a with W3-5, Rev. Adv. Warning Table, Rev. Note 2
07-05-05	Changed W20-7b to W3-4

This document was originally issued and sealed by Mark S Gaydos Registration Number PE-4518, on 07/05/05 and the original document is stored at the North Dakota Department of Transportation

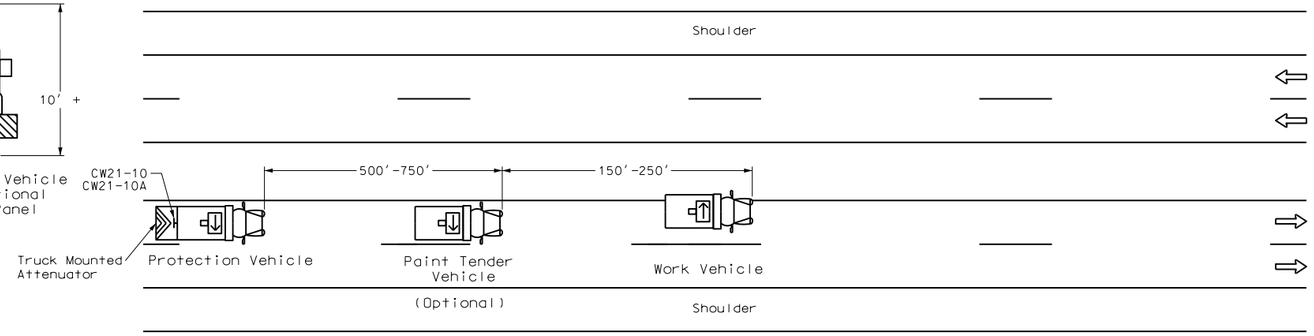
TRAFFIC CONTROL PLAN FOR MOVING OPERATIONS ON CONVENTIONAL HIGHWAYS

(Pavement Marking)

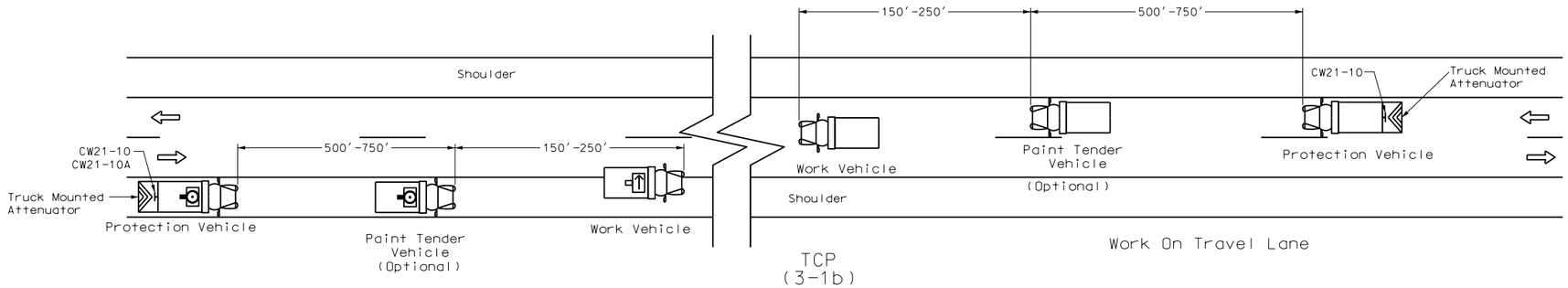
D-704-27



Typical Protection Vehicle with Right Directional Flashing Arrow Panel

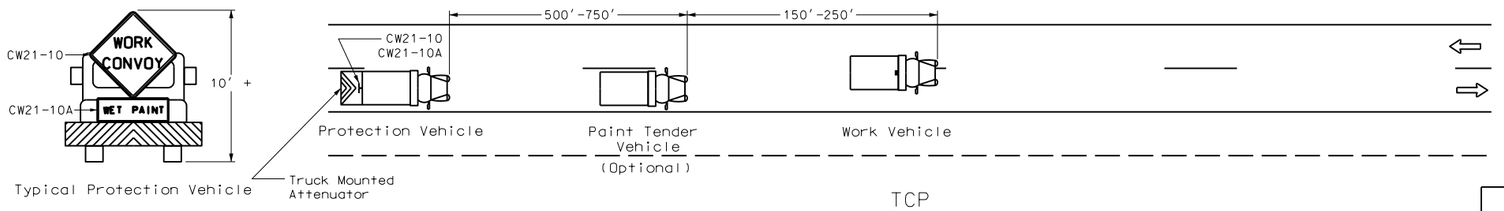


TCP
(3-1a)
Undivided Multi lane Roadway



TCP
(3-1b)

Work On Shoulder | Two-Way Roadway with Paved Shoulders | Work On Travel Lane

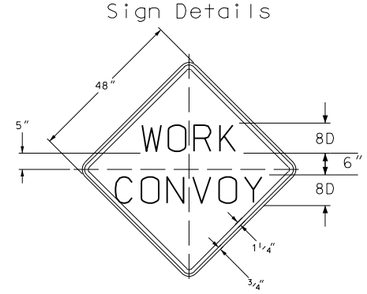


Typical Protection Vehicle

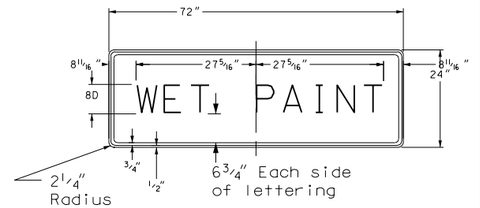
TCP
(3-1c)
Two-Way Roadway without Paved Shoulders

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 contractors expense.
2. All traffic control devices shall be in accordance with the "Manual on Uniform Traffic Control Devices" (MUTCD), latest edition.
3. The use of yellow rotating beacons or strobe lights on vehicles is required unless otherwise stated elsewhere in the plans.
4. Flashing arrow panels shall be Type B or Type C. The panel operation shall be controlled from inside the vehicle.
5. Each vehicle shall have two-way radio communication capability.
6. When work convoys must change lanes, the protection vehicle should change lanes first to shadow other convoy vehicles.
7. Vehicle spacing between the protection vehicle and paint tender vehicle will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the protection vehicle in time to slow down and/or change lanes as they approach the trail vehicle.
8. Sign Colors
   Letters = Black
   Border = Black
   Background = Orange

Sign Details



CW21-10



CW21-10A

KEY

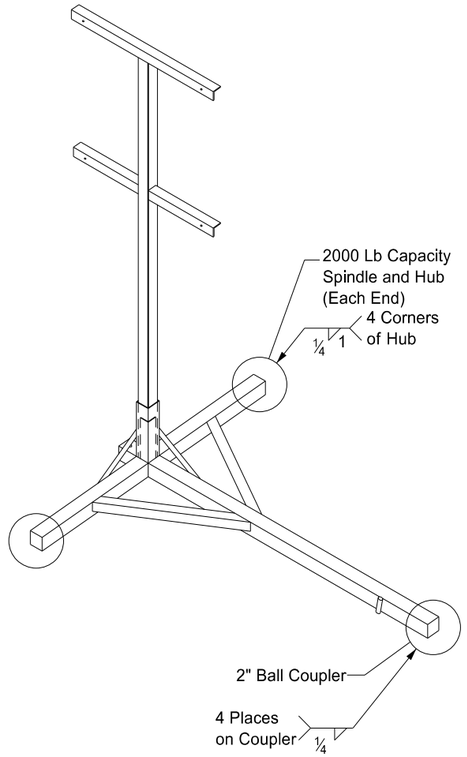
- Truck mounted attenuator
- Flashing arrow panels:
  - Right directional
  - Left directional
  - Double arrow directional
  - Caution Mode

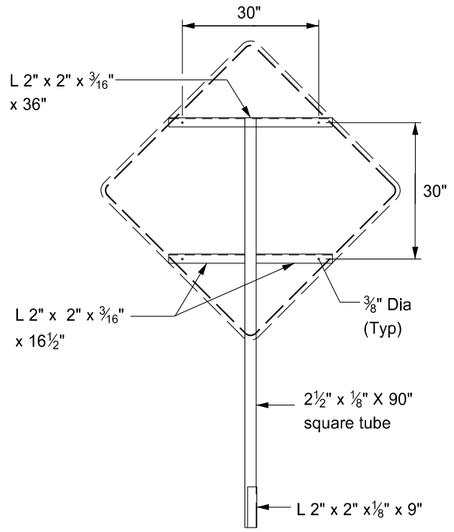
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
01-22-92	
REVISIONS	
DATE	CHANGE
02-24-93	General
03-15-95	General
06-21-95	Remove caution mode
10-01-99	General Revisions
07-25-00	General Revisions
12-01-04	PE Stamp added

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

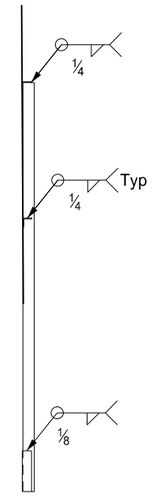
PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



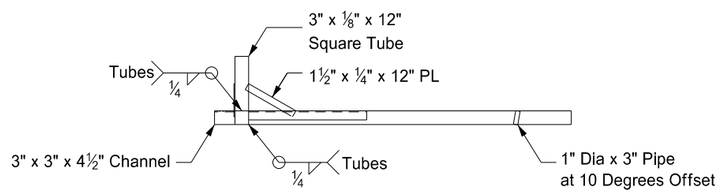


FRONT

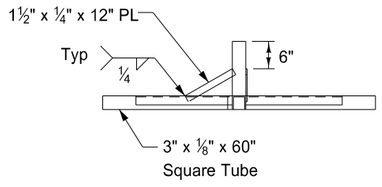


RIGHT

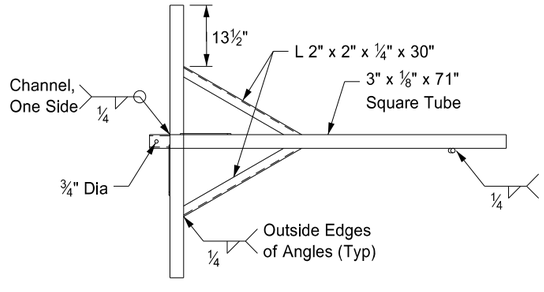
SIGN SUPPORT



FRONT



RIGHT



TOP

TRAILER

Notes:

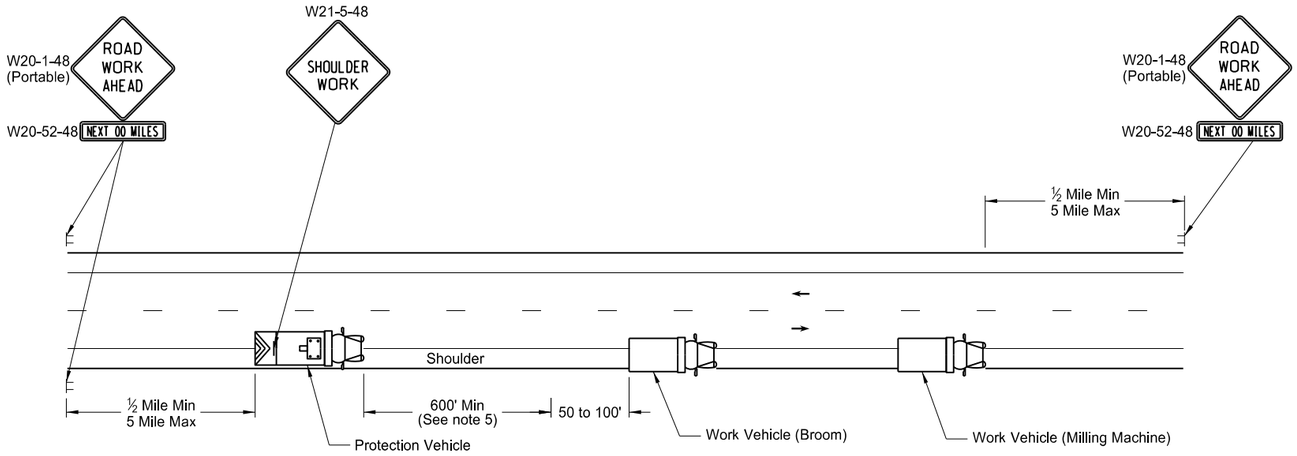
1. The maximum weight of the assembly is 250 pounds.
2. Use a 14" wheel and tire.
3. Automotive and equipment axle assemblies may not be used for trailer-mounted sign supports.
4. Other NCHRP 350 crash tested assemblies are acceptable.

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

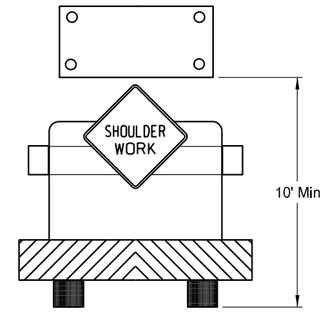
This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 11/23/10 and the original document is stored at the North Dakota Department of Transportation

MOBILE OPERATION
Grinding Shoulder Rumble Strips

D-704-56



TWO LANE - TWO WAY ROADWAY

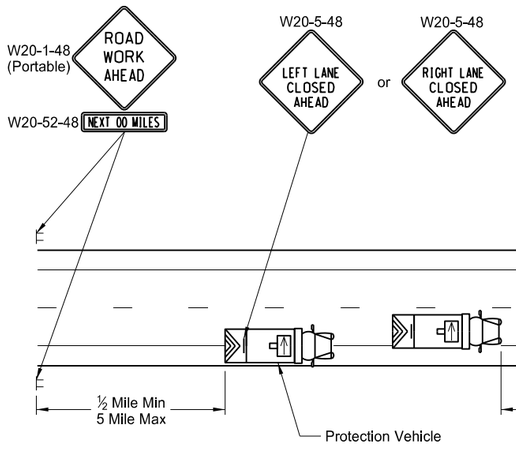


TWO LANE - TWO WAY ROADWAY

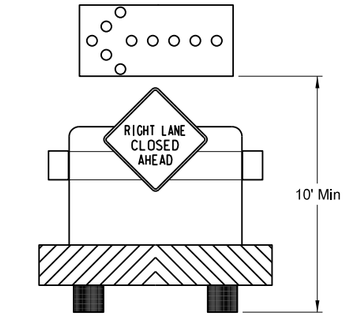
Typical Protection Vehicle with
Flashing Arrow Panel In Caution Mode

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 contractors expense.
2. Vehicles shall have a rotating, flashing, oscillating or strobe lights.
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. Vehicle spacing between the protection vehicle and work vehicle will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the protection vehicle in time to slow down and safely pass the work vehicles.
6. ROAD WORK AHEAD SIGN: Advance Road Work Ahead signs shall be moved as the work area moves through the construction zone.
7. Next XX Miles sign required when the distance from Road Work Ahead sign to the work location is two miles or greater.

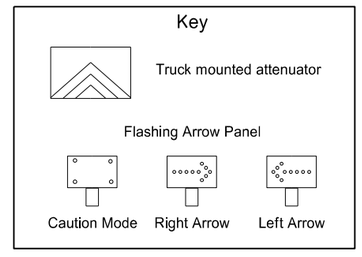


INTERSTATE & 4 LANE DIVIDED HIGHWAY



INTERSTATE & 4 LANE DIVIDED HIGHWAY

Typical Protection Vehicle with Flashing Arrow
Panel In Flashing Arrow Mode



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-15-12	
REVISIONS	
DATE	CHANGE

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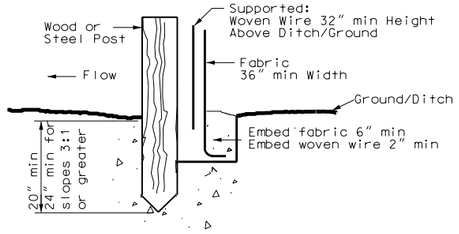
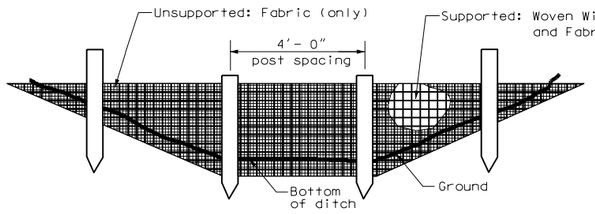
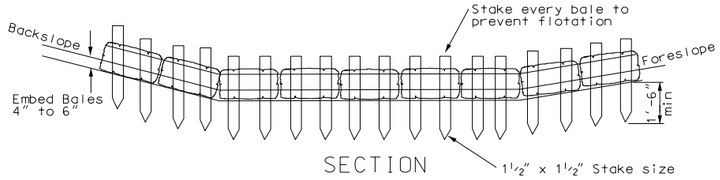
EROSION AND SILTATION CONTROLS

D-708-2

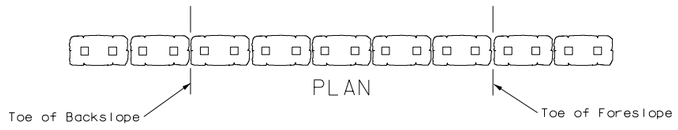




SILT FENCE
Supported and Unsupported

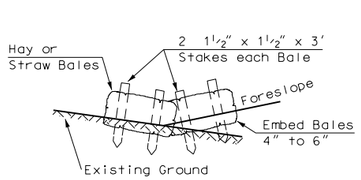


SECTION

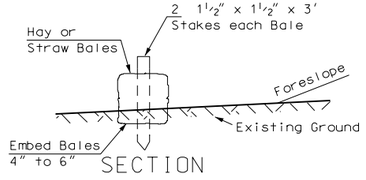


PLAN

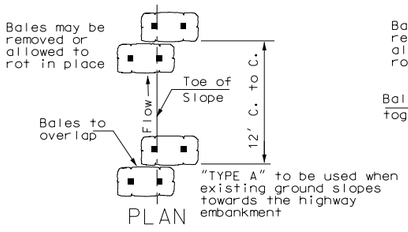
"TYPE A"



SECTION

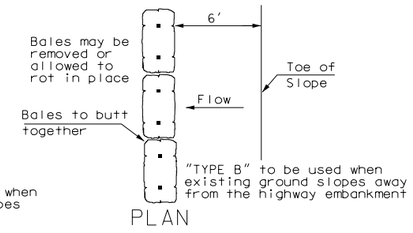


SECTION



PLAN

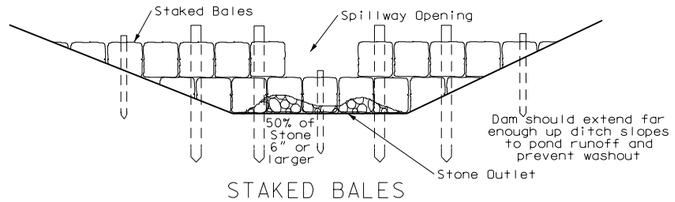
"TYPE B"



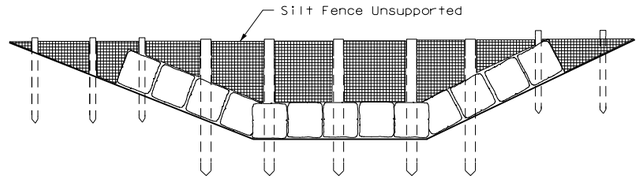
PLAN

"TYPE C"

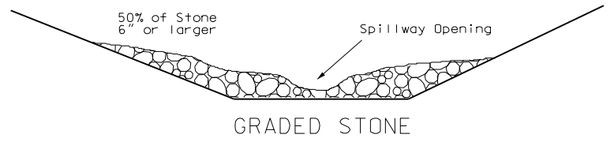
BALED HAY OR STRAW EROSION CHECKS



STAKED BALES

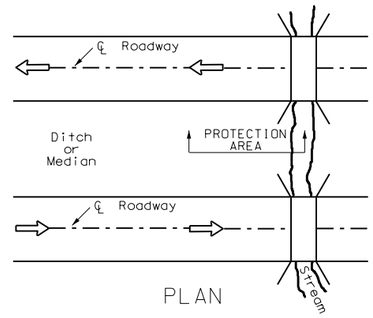


FENCE-BACKED BALES

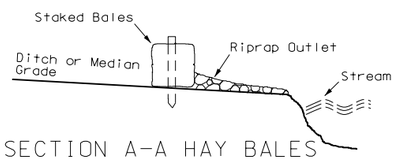


GRADED STONE

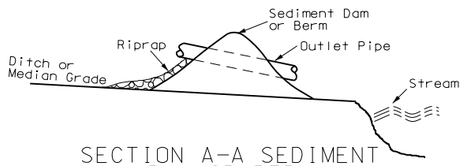
DITCH EROSION DAMS



PLAN

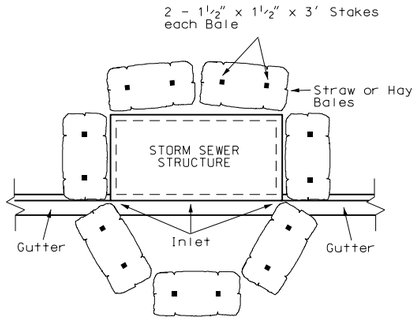


SECTION A-A HAY BALES

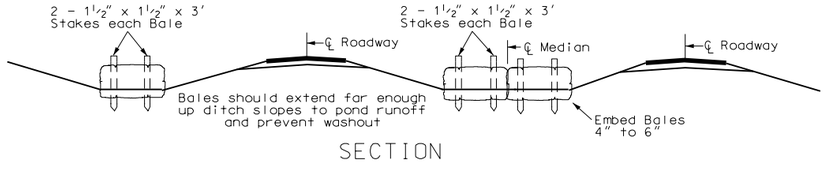


SECTION A-A SEDIMENT DAM OR BERM

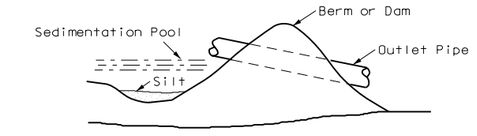
MEDIAN OR DITCH PROTECTION AT STREAM CROSSING



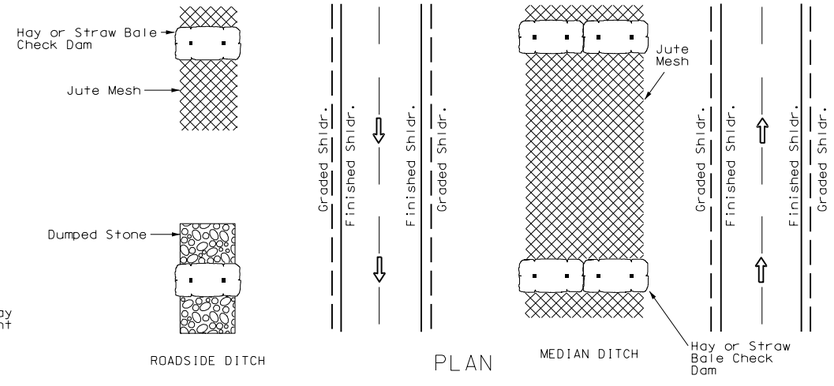
STORM SEWER INLET EROSION & SILTATION BARRIER



SECTION



SMALL SEDIMENT DAM OR BERM



STONE, JUTE, MESH, OR SOD DITCH & MEDIAN EROSION CONTROL

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
09-04-92	Ditch check
09-16-92	Sediment cont. fencing
01-31-95	General revisions
10-09-02	Sediment fence
01-24-04	Silt fence
02-06-04	Rev silt fence details
12-01-04	PE Stamp added

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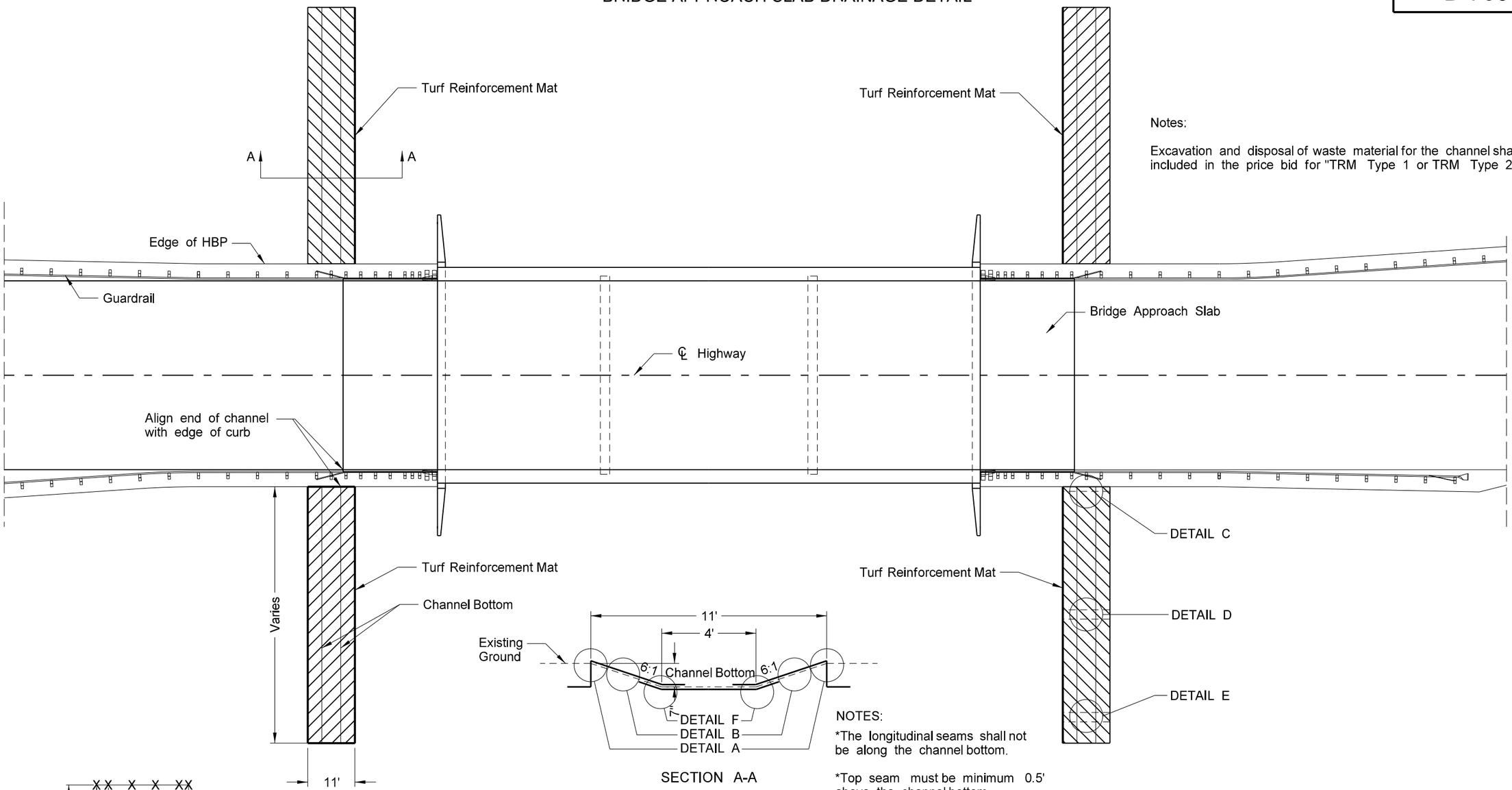
BRIDGE APPROACH SLAB DRAINAGE DETAIL

D-708-4



Notes:

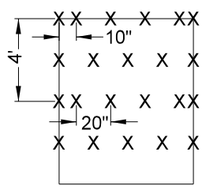
Excavation and disposal of waste material for the channel shall be included in the price bid for "TRM Type 1 or TRM Type 2".

SECTION A-A

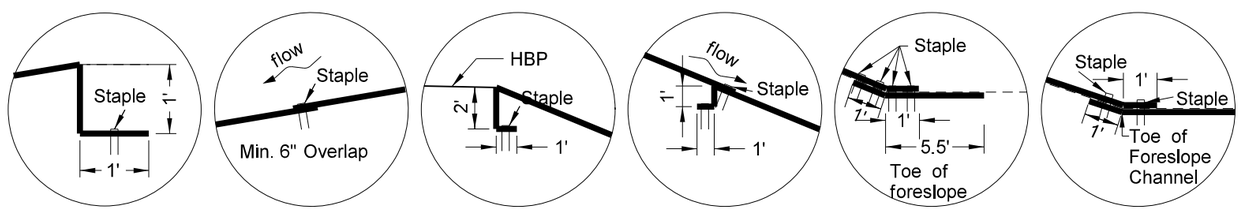
NOTES:

*The longitudinal seams shall not be along the channel bottom.

*Top seam must be minimum 0.5' above the channel bottom.



STAPLE PATTERN: 3.8 staples per square yard.



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

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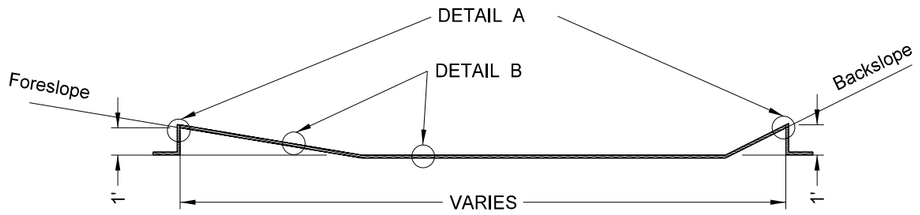
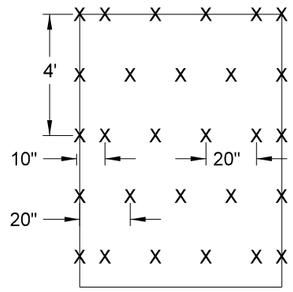
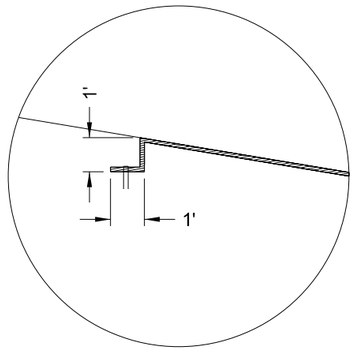
EROSION AND SILTATION CONTROL
BLANKET INSTALLATION



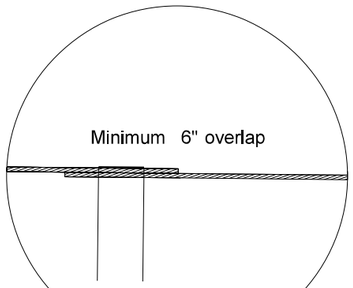
DITCH



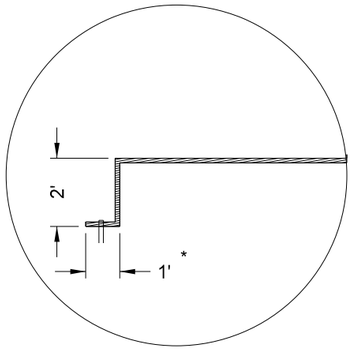
STAPLE PATTERN: 3.8 staples per square yard using 8-inch 11 gauge wire "u" staples.



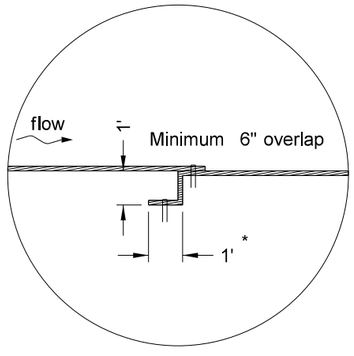
DETAIL A



DETAIL B

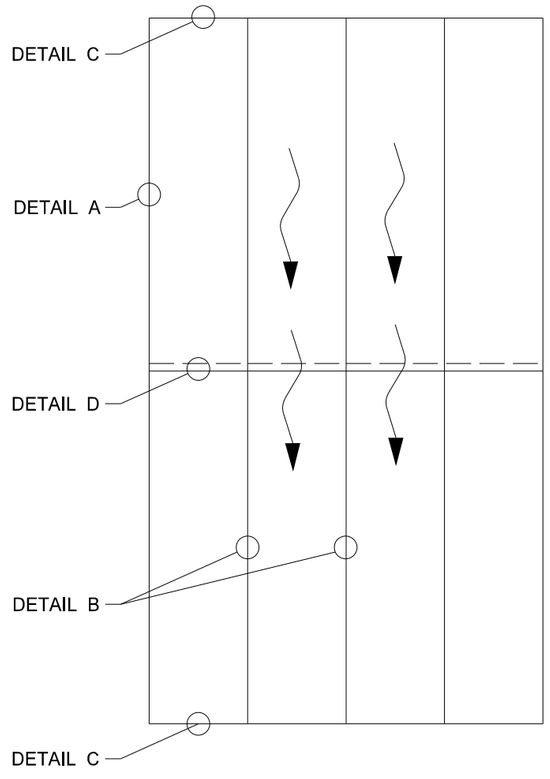


DETAIL C



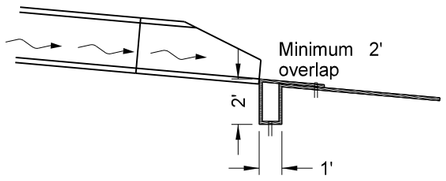
DETAIL D

* This tie may be placed ahead or back.

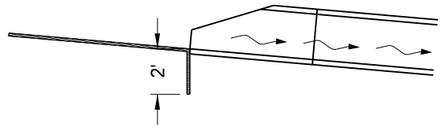


BLANKET LAYOUT

Note: Beginning and ending of erosion control blanket areas shall be installed as DETAIL C.



PIPE OUTLETS



PIPE INLETS

INSTALLATION AT PIPE ENDS

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-13-06	
REVISIONS	
DATE	CHANGE

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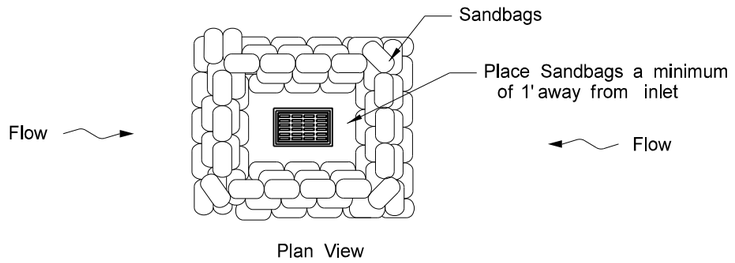
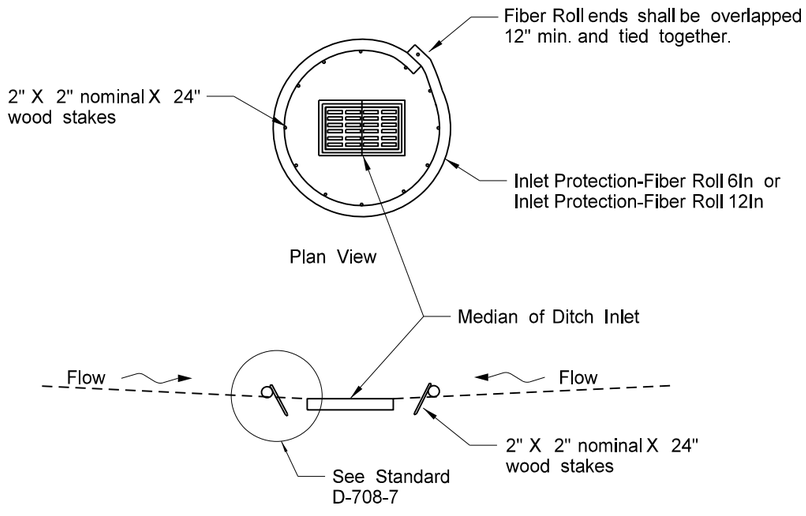
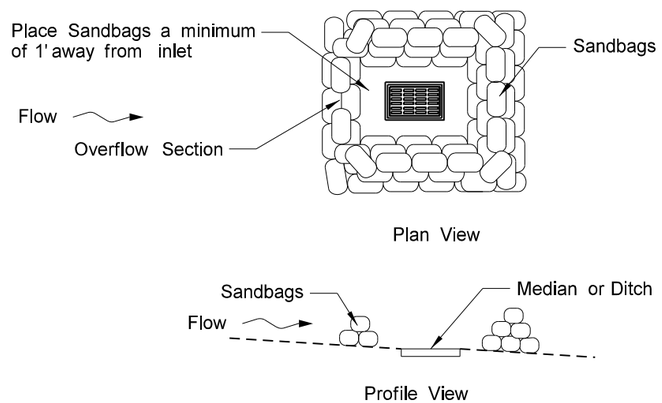
EROSION CONTROL
MEDIAN OR DITCH INLET PROTECTION

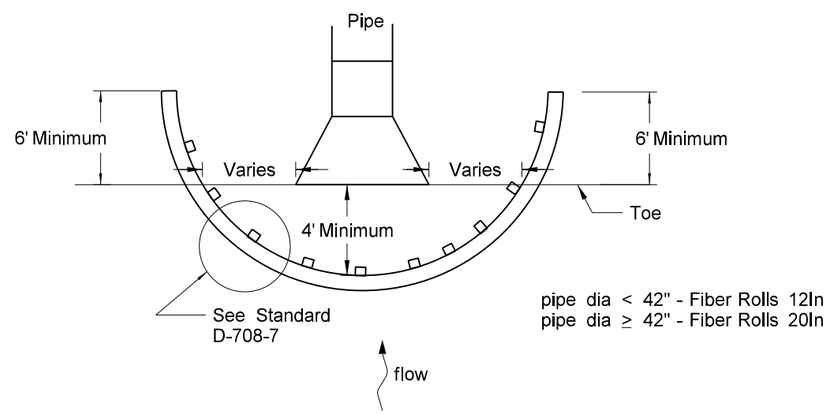


SANDBAG PROTECTION
LOW POINT





SANDBAG PROTECTION
ON SLOPE



pipe dia < 42" - Fiber Rolls 12In
pipe dia ≥ 42" - Fiber Rolls 20In

FIBER ROLL PROTECTION
INLET OF PIPE END

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-13-06	
REVISIONS	
DATE	CHANGE
12-14-07	Added 12" Fiber roll overlap, option of butting fiber roll ends removed.

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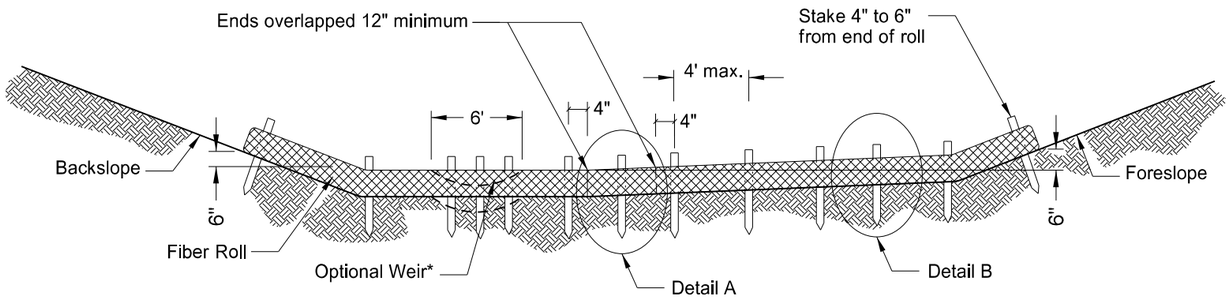
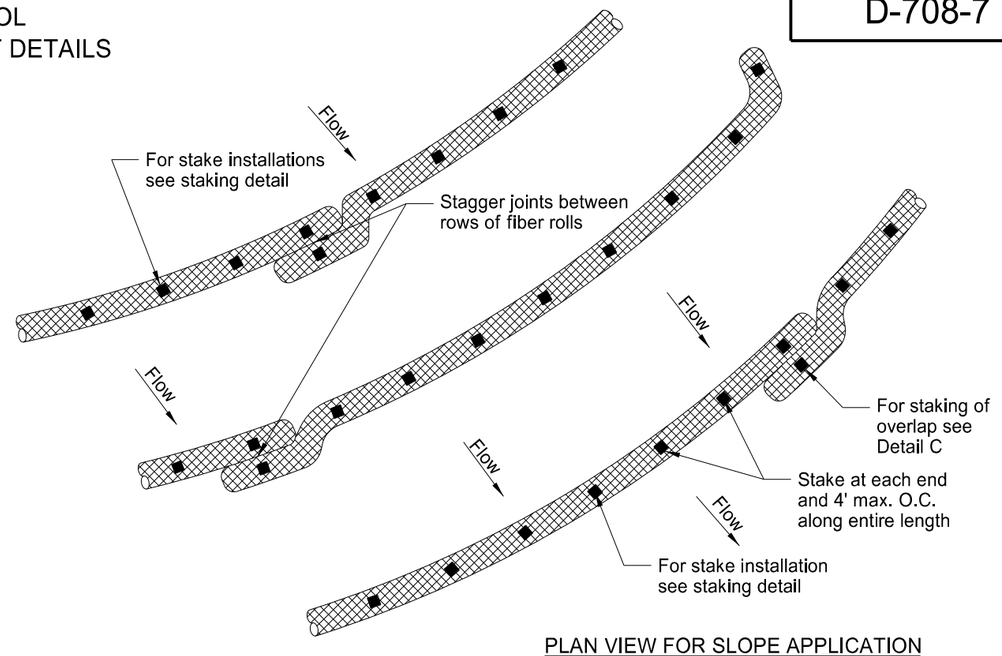
EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

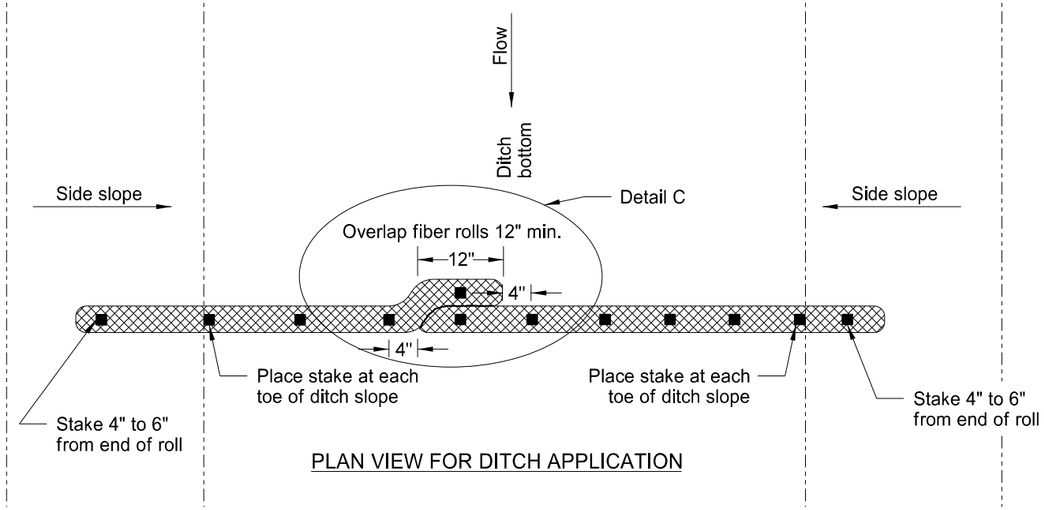


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

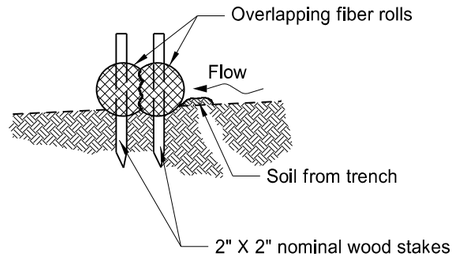
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



PLAN VIEW FOR SLOPE APPLICATION

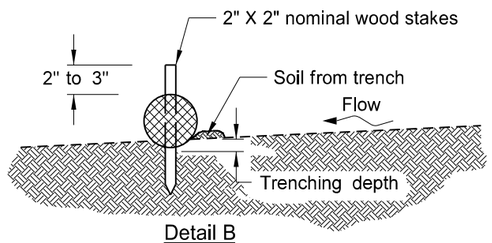


PLAN VIEW FOR DITCH APPLICATION



Detail A

Fiber Roll Overlapping Staking Detail



Detail B

Fiber Roll Staking Detail

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

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

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

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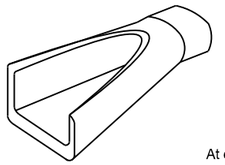
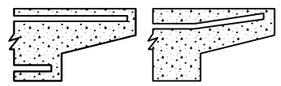
REINFORCED CONCRETE PIPE CULVERT AND END SECTIONS

D-714-01



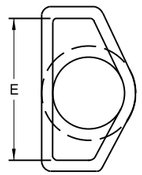
PERSPECTIVE



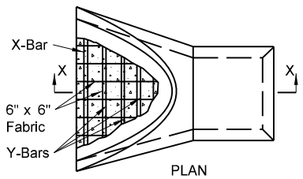
ARRANGEMENT FOR REINFORCEMENT

At end of 36" to 106" pipe.

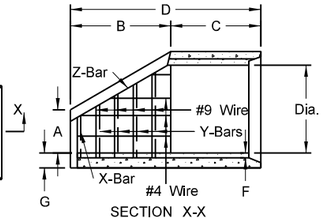
At end of 12" to 33" pipe.



END VIEW

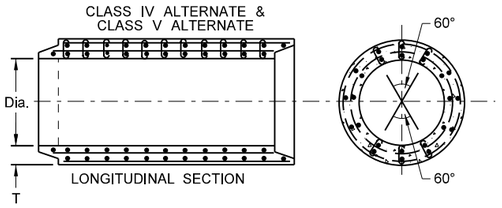


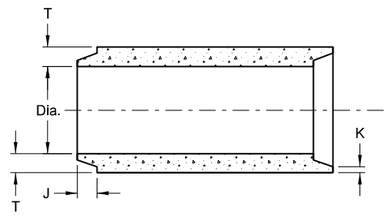
PLAN



SECTION X-X
END SECTION

Equivalent to Class III Pipe





END SECTION

TERMINAL DIMENSIONS								REINFORCING STEEL		
DIA	A	B	C	D	E	F	G	X	Y	Z
12	0'-4"	2'-0"	4'-0⅞"	6'-0⅞"	2'-0"	2"	2"	2-1/4" x 2'	6-1/4"x 2' @ 6"c.c.	2-1/4"x 4'
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2¼"	2¼"	2-1/4" x 2½'	6-1/4"x 2½' @ 6"c.c.	2-3/8"x 4'
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2½"	2½"	2-3/8" x 3'	6-1/4"x 3' @ 6"c.c.	2-3/8"x 4'
21	0'-9"	3'-0"	3'-1½"	6'-1½"	3'-6"	2¾"	2¾"	2-3/8" x 3½'	8-1/4"x 3½' @ 6"c.c.	2-3/8"x 5'
24	0'-9½"	3'-7½"	2'-6"	6'-1½"	4'-0"	3"	3"	2-1/2" x 4'	8-3/8"x 4' @ 8"c.c.	2-3/8"x 6'
27	0'-10½"	4'-1½"	2'-0"	6'-1½"	4'-6"	3¼"	3¼"	2-1/2 " x 5'	8-3/8"x 5' @ 9"c.c.	2-3/8"x 6'
30	1'-0"	4'-6"	1'-7⅜"	6'-1¾"	5'-0"	3½"	3½"	2-1/2 " x 5'	12-3/8"x 5' @ 8"c.c.	2-1/2"x 6'
36	1'-3"	5'-3"	2'-10¾"	8'-1⅜"	6'-0"	4"	4"	2-1/2 " x 6'	12-3/8"x 6' @ 6"c.c.	2-1/2"x 8'
42	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	4½"	4½"	2-1/2" x 7'	12-1/2"x 7' @ 9"c.c.	2-1/2"x 8'
48	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"	5"	5"	2-1/2" x 8'	16-1/2"x 8' @ 8"c.c.	2-1/2"x 8'
54	2'-3"	5'-5"	2'-9¼"	8'-2¼"	7'-6"	5½"	5½"	2-1/2" x 8'	16-1/2"x 8' @ 7"c.c.	2-1/2"x 8'
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	6"	5"	2-1/2" x 9'	16-1/2"x 9' @ 6"c.c.	2-1/2"x 9'
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	6½"	5½"	2-1/2" x 9'	22-1/2"x 9' @ 6"c.c.	2-1/2"x 9'
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	7"	6"	2-1/2" x 10'	24-1/2"x 10' @ 6"c.c.	2-1/2"x 9'
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	7½"	6½"	2-1/2" x 10'	28-1/2"x 10' @ 6"c.c.	2-1/2"x 10'
84	3'-0"	7'-6½"	1'-9"	9'-3½"	10'-0"	8"	6½"	4-1/2" x 10'	28-1/2"x 10' @ 6"c.c.	4-1/2"x 10'
90	3'-5"	7'-3½"	2'-0"	9'-3½"	11'-0"	8½"	6½"	4-1/2" x 11'	28-1/2"x 11' @ 6"c.c.	4-1/2"x 10'

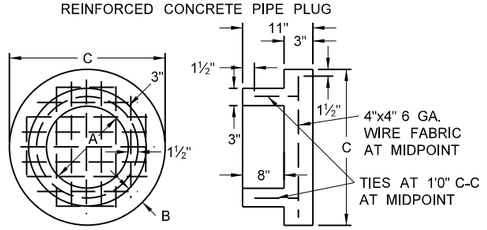
			All Classifications of Round Concrete Pipe			CLASS IV ALTERNATE								CLASS V ALTERNATE						
						D-LOAD TO PRODUCE A 0.01 INCH CRACK														
						2000								3000						
						D-LOAD TO PRODUCE ULTIMATE LOAD														
						3000								3750						
						5000 P.S.I.								5000 P.S.I.						
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)	Inner Cage	Ellip Cage	Outer Cage	Shear Steel			Height of Fill Normal Backfill		Inner Cage	Ellip Cage	Outer Cage	Shear Steel			Height of Fill Normal Backfill
						Ai	Ae	Ao	N	S	Ar			Ai	Ae	Ao	N	S	Ar	
Dia	Sq. ft.	Lbs.	In.	In.	In.	Sq.In	Sq.In	Sq.In	No.	In.	Sq.in	Ft.		Sq.in	Sq.in	Sq.in	No.	In.	Sq.in	Ft.
12	0.79	92	1⅛-2⅜	¾	2															
15	1.23	127	1¼-2¾	⅞	2¼															
18	1.77	168	1⅜-2⅞	1	2½															
21	2.40	214	1⅜-3⅛	1⅛	2¾															
24	3.14	265	2⅜-3¾	1⅛	3															
27	3.98	322	2⅜-4	1¼	3¼															
30	4.91	384	3¼-4¼	1¼	3½															
33	5.94	452	3¼-4¼	1½	3¾															
36	7.07	524	3¼-4¼	1½	4															
42	9.62	685	3¼-4¾	1¾	4½															
48	12.57	685	3⅝-4¾	1⅞	5									.66	.33	.50	8	4	.22	24-35
54	15.90	1070	4⅛-5¼	2	5½									.74	.37	.56	9	4	.22	24-35
60	19.63	1296	4½-5½	2¼	6	.54	.27	.41	7	6	.22	16-24		.82	.41	.62	7	6	.22	24-35
66	23.76	1542	5-6	2⅜	6½	.60	.30	.45	8	6	.22	16-24		.88	.44	.66	8	6	.22	24-35
72	28.27	1810	5½-6¾	2⅝	7	.64	.32	.48	8	6	.23	16-24		.96	.48	.72	8	6	.23	24-35
78	33.18	2098	6¼-7¼	2⅞	7½	.70	.35	.53	9	6	.25	16-24		1.04	.52	.78	9	6	.25	24-35
84	38.48	2410	5½-7¾	3⅛	8	.76	.38	.57	10	6	.28	16-24		1.12	.56	.84	10	6	.28	24-35
90	44.18	2793	6¾-8½	3⅛	8½	.82	.43	.62	11	6	.31	16-24		1.20	.65	.90	11	6	.31	24-35
96	50.27	3092	7-8¼	3½	9	.88	.46	.66	11	6	.34	16-24		1.32		.99	11	8	.34	24-35
102	56.75	3466	7-8¼	3½	9½	.94	.52	.71	12	6	.37	16-24		1.42		1.07	12	8	.37	24-35
108	63.62	3864	7¼-8½	3¾	10	1.02	.57	.76	12	6	.40	16-24								

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

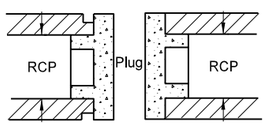
SEE STANDARD D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

REINFORCED CONCRETE PIPE PLUG

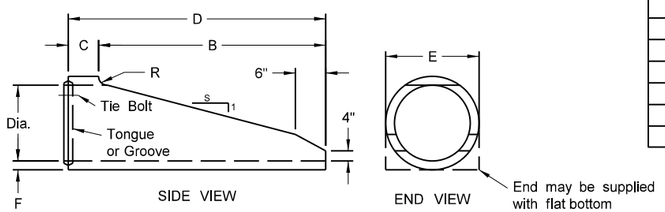
CONCRETE PIPE PLUG			
DIMENSIONS (in inches)			
PIPE DIAMETER	A	B	C
15	8	2.25	19.5
18	11	3.0	23.0
21	14	3.25	26.5
24	17	3.50	30.0
27	20	3.75	33.5
30	23	4.0	37.0
33	26	4.25	40.5
36	29	4.50	44.0
42	35	5.0	51.0
48	41	5.50	58.0



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



TRAVERSABLE END SECTION



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

NOTES (Traversable End Section):

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

NOTES:

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-1-86

REVISIONS

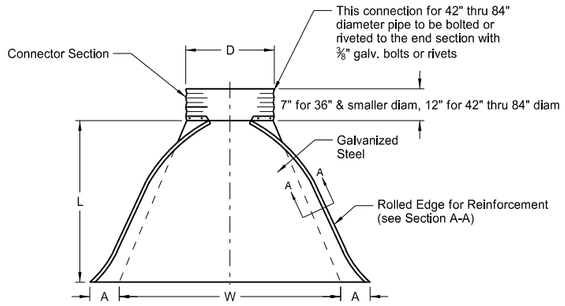
DATE	CHANGE
11-05-86	Note added
07-17-87	Added pipe plug detail
09-01-88	Reinforcement cage
03-10-95	General revisions
12-23-98	Note # 6, 30° FES
12-01-04	PE stamp added
12-08-08	Major Revisions

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

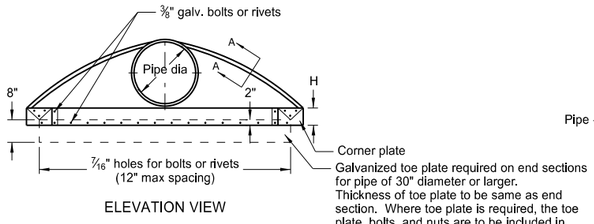
8/8/2013 R:\SUPPORT\DESSTD\D714-01.dgn

ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

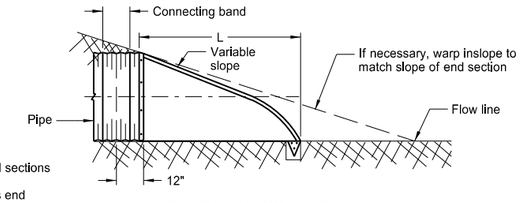
D-714-4



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

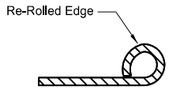
* These sizes have 0.109" sides and 0.138" center panels.

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

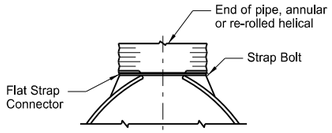
Manufacturers tolerances of above dimensions will be allowed.

Splices to be the lap riveted type.

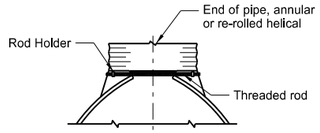
Multiple panel bodies shall have lap seams which are to be tightly joined with ⅜" dia. galv. bolts or rivets. Nuts to be torqued to 25 foot-lbs ±.



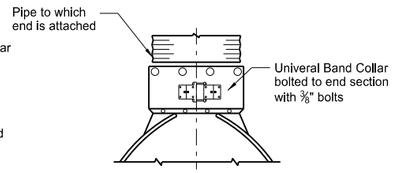
SECTION A-A



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



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

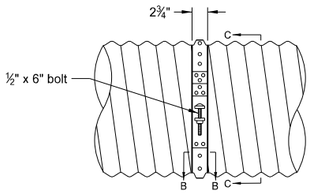


TYPE #3
For all pipe sizes

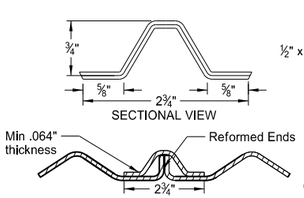
COUPLING BAND DIMENSIONS				
COUPLING TYPE	CORRUGATION PITCH x DEPTH	PIPE SIZE	COUPLING BAND LENGTH	MIN. BAND THICKNESS
Hat Band	2⅔" x ½"	12" - 48"	2¾"	.064"
Annular Band	2⅔" x ½"	12" - 72"	12"	.052"
		78" - 84"	12"	.079"
	3" x 1"	48" - 120"	14"	.052"
Hugger Band	2⅔" x ½" Rerolled End	12" - 72"	10½"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

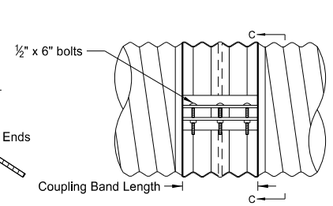


SIDE VIEW

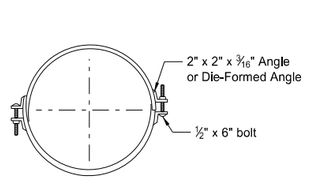


SECTION B-B

HAT BAND FOR FLANGED END PIPE

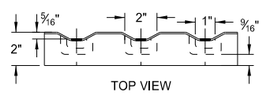


SIDE VIEW

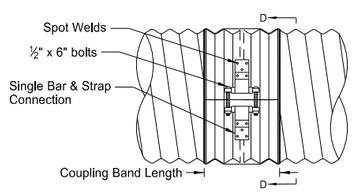


SECTION C-C
Angle Connection

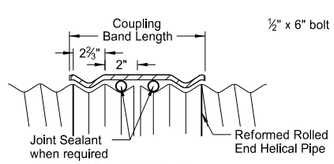
ANNULAR BAND



Die-Formed Angle Connector

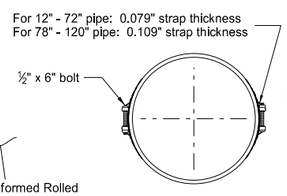


SIDE VIEW

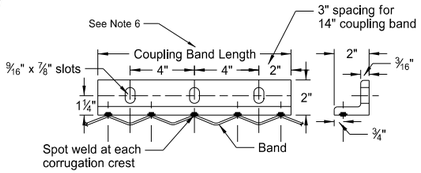


SECTIONAL VIEW

HUGGER COUPLING BAND



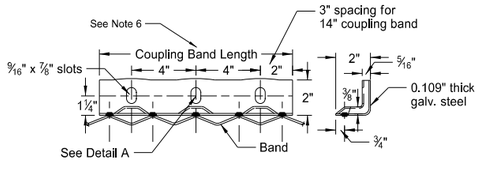
SECTION D-D
Bar & Strap Connection



SIDE VIEW

END VIEW

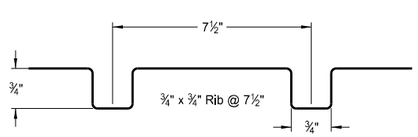
2" x 2" x 3/16" Angle Connector

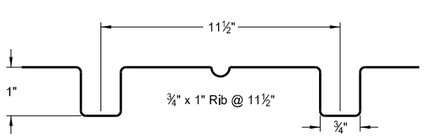


SIDE VIEW

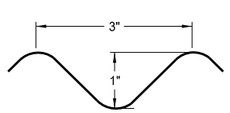
END VIEW

Die-Formed Angle Connector

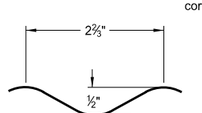




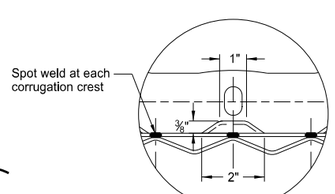
SPIRAL RIB CORRUGATIONS



3" x 1" CORRUGATIONS
(5"X1" corrugation may be used in lieu of 3"x1")



2⅔" x ½" CORRUGATIONS



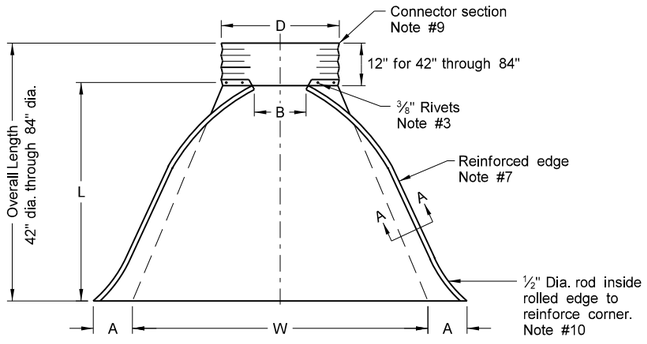
Detail A

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
08-06-13	
REVISIONS	
DATE	CHANGE

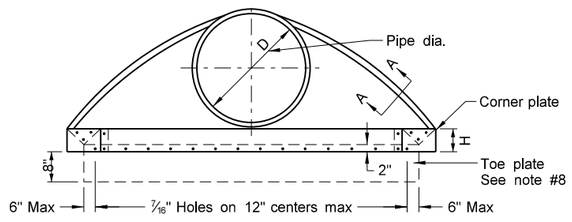
This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674 , on 08/06/2013 and the original document is stored at the North Dakota Department of Transportation

CORRUGATED ALUMINUM PIPE CULVERT AND END SECTIONS (ROUND PIPE)

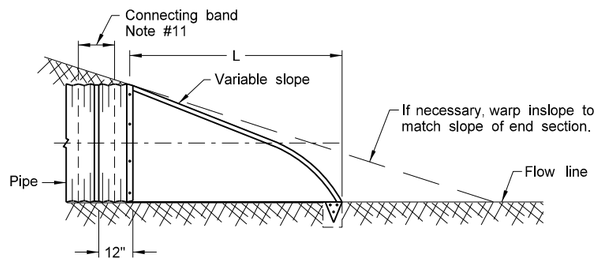
D-714-06



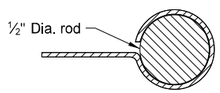
PLAN



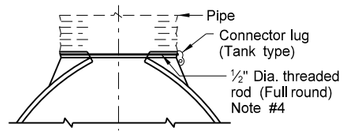
ELEVATION



TYPICAL CROSS SECTION
(Showing connector section)



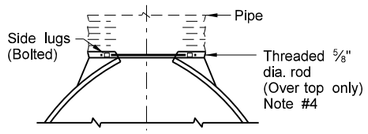
SECTION A-A



Sizes 18" & 24" only

½" Dia. threaded rod	
Pipe size	Length
18"	65"
24"	83"

2½" Threaded length both ends. ½"-13 UNC thread.

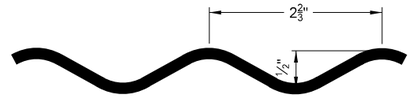


Sizes 30" & 36" only

⅝" Dia. threaded rod	
Pipe size	Length
30"	22¼"
36"	25⅜"

1¾" Thread length both ends. ⅝"-11 UNC thread

ROD CONNECTION DETAIL



2⅔" x ½" CORRUGATIONS

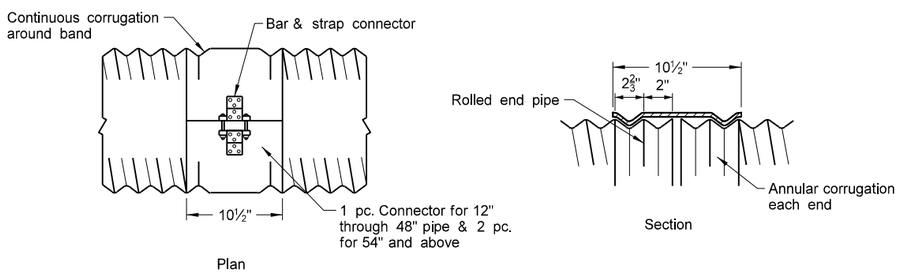
END SECTION									
* * PIPE DIA.	WATERWAY AREA	GALV. THICK.	DIMENSIONS					APPROX. SLOPE	BODY
			A	B	H	L	W		
IN	SQ FT		IN	IN	IN	IN	IN	RATE	PIECE
18	1.8	0.060	8	10	6	31	36	2½:1	1
24	3.1	0.060	10	13	6	41	48	2½:1	1
30	4.9	0.075	12	16	8	51	60	2½:1	1 or 2
36	7.1	0.075	14	19	9	60	72	2½:1	2
42	9.6	0.105	16	22	11	69	84	2½:1	2
48	12.6	0.105	18	27	12	78	90	2¼:1	2
54	16.0	0.105	18	30	12	84	102	2 :1	2
* 60	19.6	0.105	18	33	12	87	114	1⅞:1	3
* 66	23.8	0.105	18	36	12	87	120	1½:1	3
* 72	28.3	0.105	18	39	12	87	126	1 1/3:1	3
* 78	33.2	0.105	18	42	12	87	132	1¼:1	3
* 84	38.5	0.105	18	45	12	87	138	1 1/6:1	3

* These sizes have 0.135" thick center panels.

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

Manufacturers tolerances of above dimensions will be allowed.

78" and 84" diameter pipe shall be 5% vertically elongated.



CONNECTING BAND DETAILS FOR HELICAL, WELDED-SEAM CULVERT

NOTES:

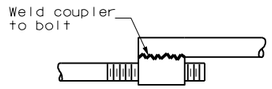
1. End sections shall be made from aluminum alloy 3004-0, clad 5% each side with alloy 7072.
2. Corner plate shall be the same material and thickness as end section.
3. Rivets shall be aluminum alloy 6053-T4.
4. Threaded rods shall be aluminum alloy 6061-T6.
5. Connector & side lugs, bolts, and nuts shall be hot-dipped galvanized steel.
6. Multiple panel bodies shall have 2" lap seams which are to be tightly joined with ⅜" diameter rivets spaced 6" c. to c.
7. Top edge of all end sections to have rolled edge reinforcement (See section A-A). The rolled edge is to be supplemented with 2"x2"x¼" aluminum alloy angle for 60" through 72" diameter and 2½"x2½"x¼ angle for 78" and 84" diameter. Angles to be attached by ⅜" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
8. Aluminum alloy toe plate required on end sections for pipe of 30" diameter or larger. Thickness of toe plate to be same as end section. Where toe plate is needed, the toe plate, nuts, and bolts are to be included in price bid for end sections.
9. Connector section, when specified, shall be corrugated aluminum alloy pipe culvert.
10. Reinforcement for edge of end section shall be alloy 6063-F.
11. Pipe and connection bands shall conform to applicable sections of NDDOT Standard specifications and to AASHTO M-196 and M-211.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
04-28-89	Toe plate note
06-25-03	Revised layout
12-01-04	PE Stamp added
12-08-08	Removed min/max fill info

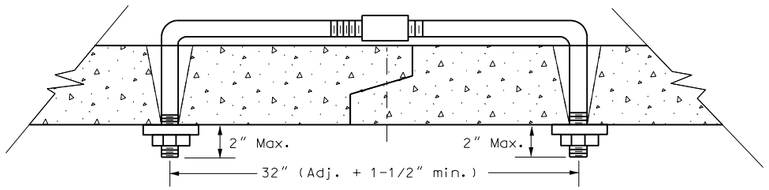
This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674 , on 12/08/2008 and the original document is stored at the North Dakota Department of Transportation

D-714-22

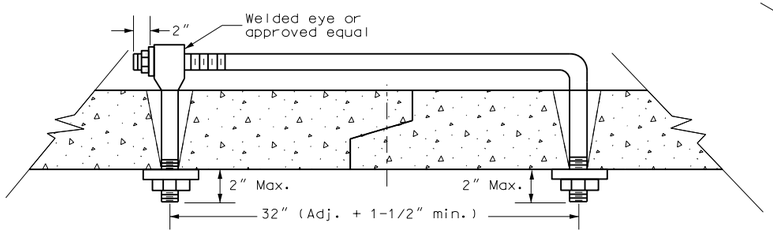
CONCRETE PIPE TIES



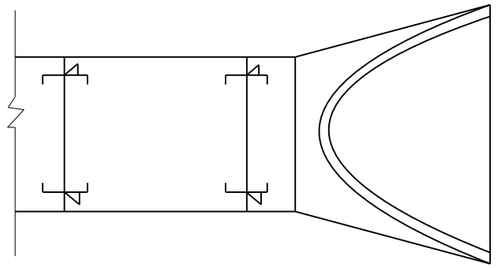
TOP VIEW

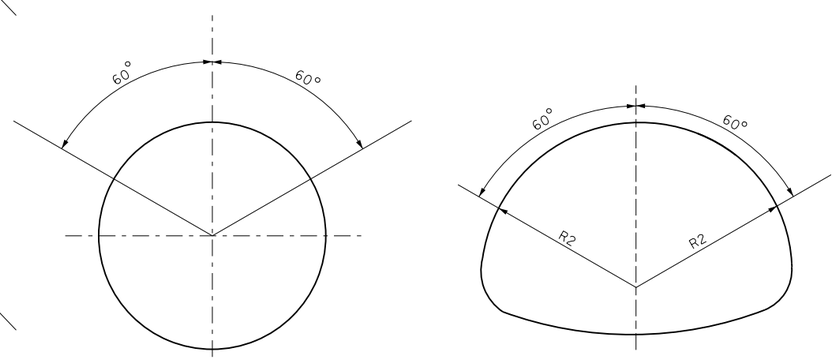


ADJUSTABLE TIE



EYE BOLT TIE



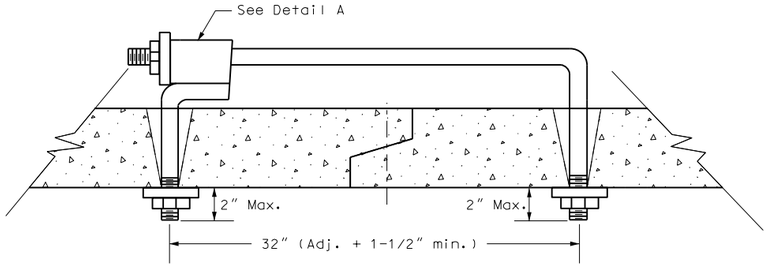


PLACEMENT OF HOLES

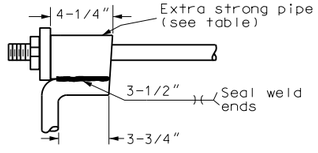
REQUIRED SIZE OF TIE BOLTS					
Pipe Size (Inches)	Thread Dia.	Pipe Size (Inches)	Thread Dia.	Pipe Size (Inches)	Thread Dia.
12	5/8" (See note 2)	30	3/4"	72	1"
15		33		78	
18		36		84	
21		42		90	
24		48		96	
27		54		102	
		60		108	
		66		120	
				132	

NOTES:

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

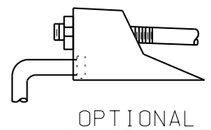


WELDED PIPE TIE

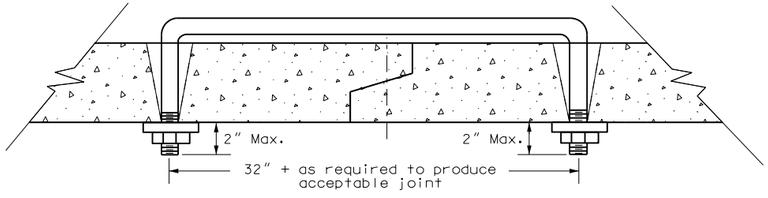


DETAIL A

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



OPTIONAL CANOPY TIE



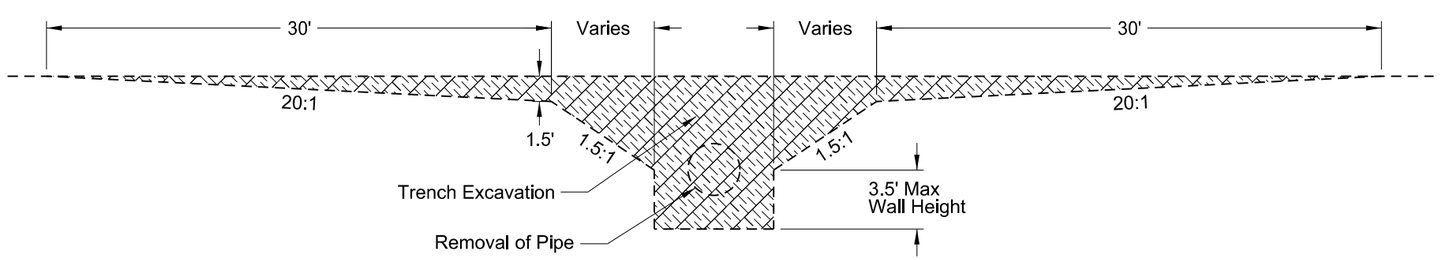
U BOLT TIE

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

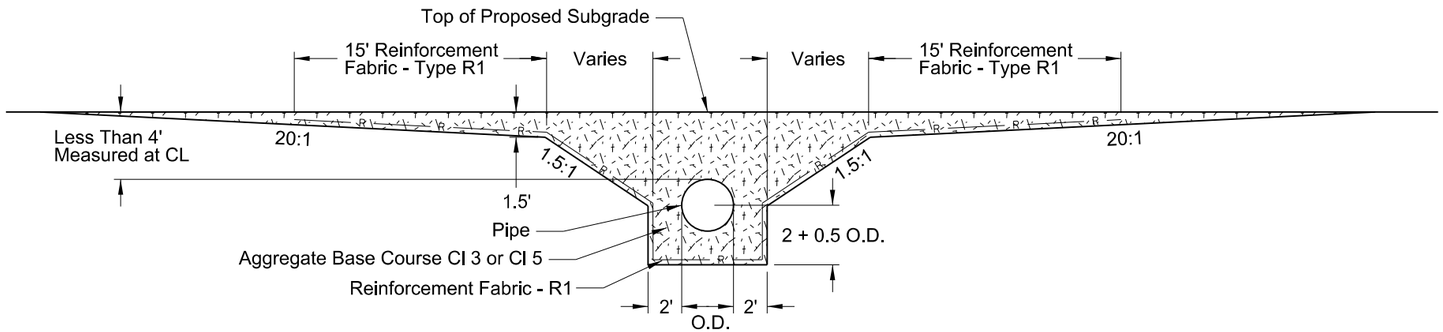
This document was originally issued and sealed by MARK S GAYDOS, Registration Number PE-4518, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

TRANSVERSE MAINLINE PIPE EXCAVATION AND INSTALLATION DETAIL FOR PIPES 4 FEET OR LESS BELOW THE TOP OF THE PROPOSED SUBGRADE

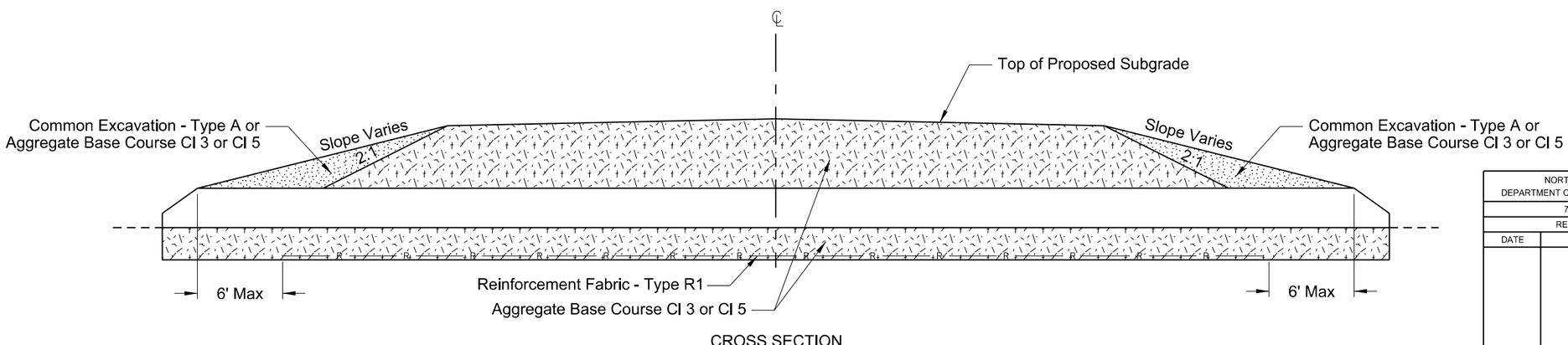
D-714-26



EXCAVATION DETAIL - PROFILE VIEW



INSTALLATION DETAIL - PROFILE VIEW



CROSS SECTION

Pay Items
1) Pipe*
2) Reinforcement Fabric - Type R1
3) Removal of Pipe (if required)

*Included in Pipe Pay Item
1) Pipe
2) Trench Excavation
3) Aggregate Base Course CI 3 or CI 5
4) Common Excavation - Type A

NOTES:

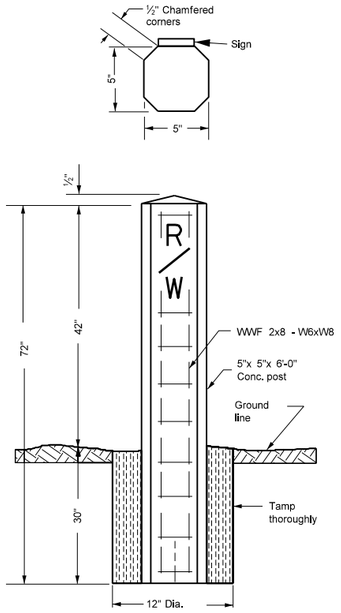
1) This drawing applies to new/replaced mainline and paved intersection roadway pipes only (including ramps). It does not include pipes in approaches.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-26-13	
REVISIONS	
DATE	CHANGE

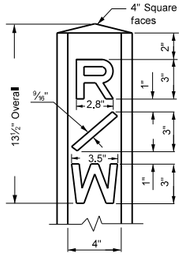
This document was originally issued and sealed by Ron Horner, Registration Number PE-2087, on 7/26/13 and the original document is stored at the North Dakota Department of Transportation

STANDARD MONUMENTS AND RIGHT OF WAY MARKERS

D-720-1

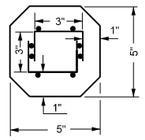


MARKER DETAIL



MARKING DETAIL

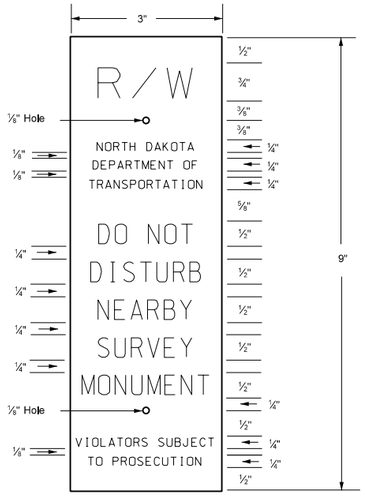
Incised letters (1/4" min.)
3" high on one side.
Series "F" letters.



REINFORCING DETAIL

MARKER DETAIL

CONCRETE RIGHT OF WAY MARKER DETAILS



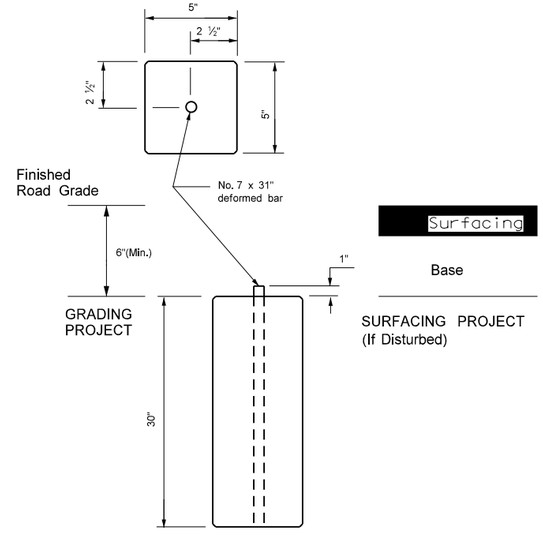
SIGN DETAIL

Black letters on orange background. 40 Gauge stamped aluminum plate. Baked enamel finish. Silk screen graphics. One color print. Sign shall be attached by drilling two holes in the face of the post (side facing the private owner, away from the Department of Transportation right of way). Put inserts into the holes and mount the sign with #4 vandal proof screws. Sign shall be installed 2" from top of post.

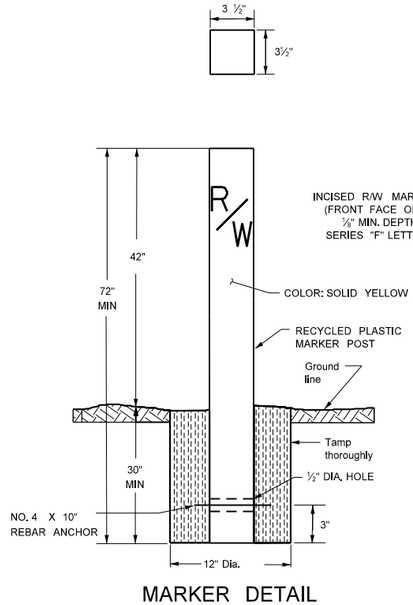
NOTES

The construction and installation of precast concrete alignment monuments and right of way markers (witness posts) shall conform to Section 720 of the Standard Specifications. The markers shall be placed on the right of way line 12" from the iron pin as shown in the details. All markers shall be installed with the letter side facing the project. A 3" x 9" sign (see details on this sheet) will be attached to the back side of the markers.

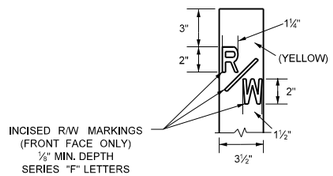
IRON MONUMENTS (PINS):
Iron pins (1" x 24") will be furnished and placed by the NDDOT (or surveying consultant personnel working on highway projects) on the Right of Way line at section lines, right of way breaks, curve points, and near the mid point of each mile. The iron pins will also be placed on the centerline alignment curve points and POT's (see diagram below). The pins at the mid point can be eliminated if the curve points or right of way breaks are in the immediate vicinity.



PRECAST CONCRETE ALIGNMENT MONUMENT

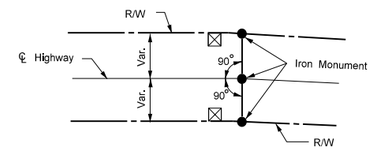


MARKER DETAIL

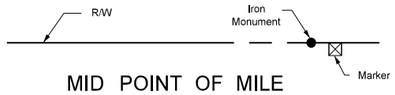


MARKING DETAIL

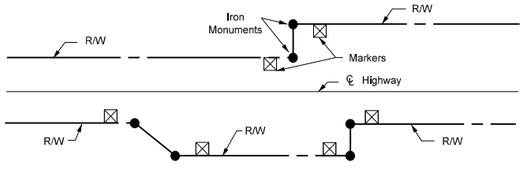
RECYCLED PLASTIC RIGHT OF WAY MARKER DETAILS



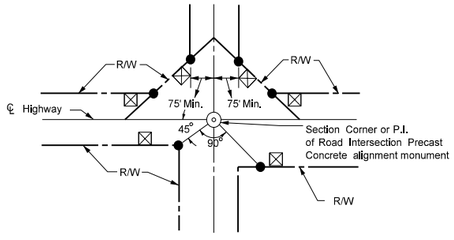
CURVE POINTS (PC, PT, TS, SC, CS, ST, etc.)



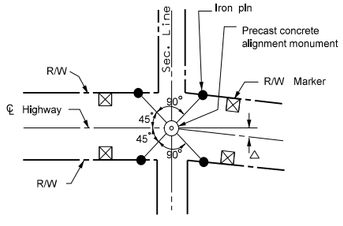
MID POINT OF MILE



MARKERS AT R/W BREAKS



FLARED R/W BREAKS



SECTION CORNERS, QUARTER CORNERS, SECTION LINE CROSSINGS, & PI's

VARIOUS MONUMENT AND MARKER PLACEMENTS

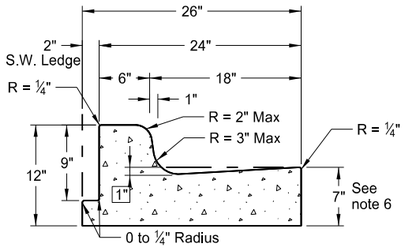
KEY
- ● Iron Monument (pin)
- ⊠ R/W Marker (witness post)
- ⊙ Precast Concrete Alignment Monument

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
12-16-87	Note change
05-01-90	Steel post note
09-03-96	Sign detail
08-05-98	Revised notes
10-26-98	General revisions
12-23-98	Note Revisions
12-05-00	Add plastic R/W marker, Rev. note
02-18-03	Revised notes
12-01-04	PE Stamp added
11-28-05	Revised monument to pin
02-14-07	Added "witness posts"
08-06-07	Removed beveled edges on plastic r/w markers

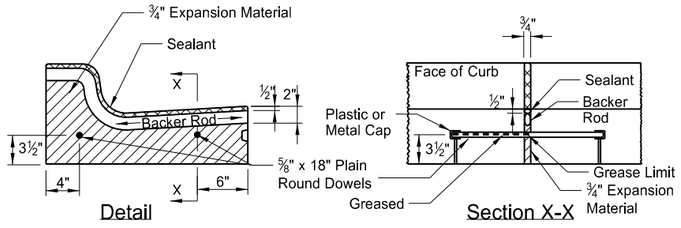
This document was originally issued and sealed by MARK S GAYDOS Registration Number PE- 4518 , on 08/06/07 and the original document is stored at the North Dakota Department of Transportation

Curb & Gutter and Valley Gutter

D-748-1

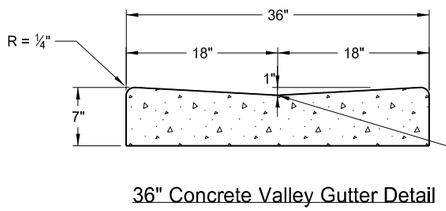


Curb & Gutter Type 1 (Sec. A & B)
Adjacent to Concrete Sidewalk, Median, or Parking Lot.
(Sec. A shown. See Sec B for additional details.)

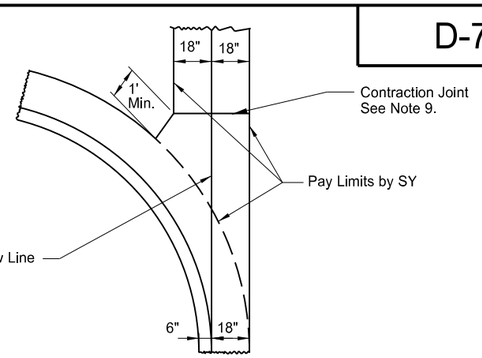


Detail — Section X-X

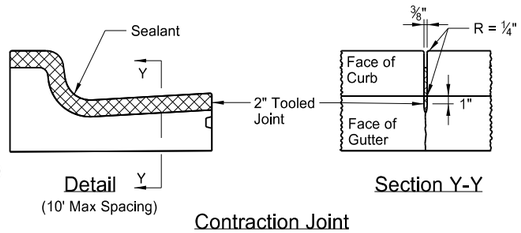
Isolation Joint



36" Concrete Valley Gutter Detail

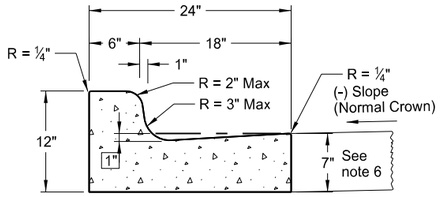


36" Concrete Valley Gutter Plan

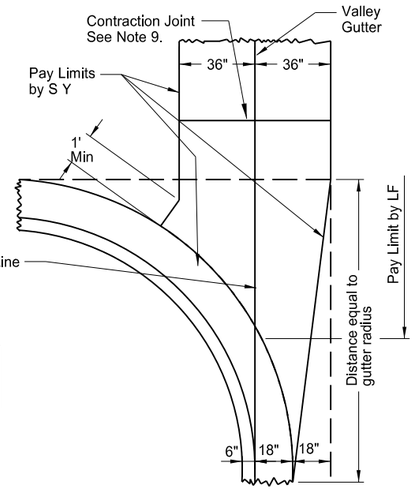


Detail (10' Max Spacing) — Section Y-Y

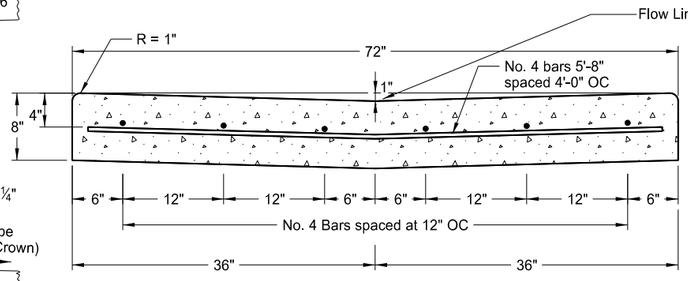
Contraction Joint



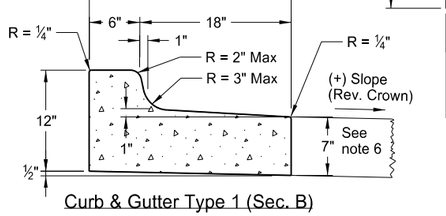
Curb & Gutter Type 1 (Sec. A)



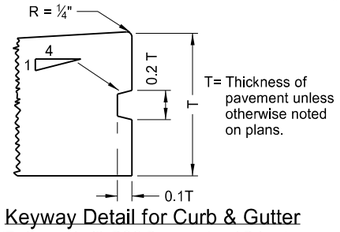
72" Concrete Valley Gutter Plan



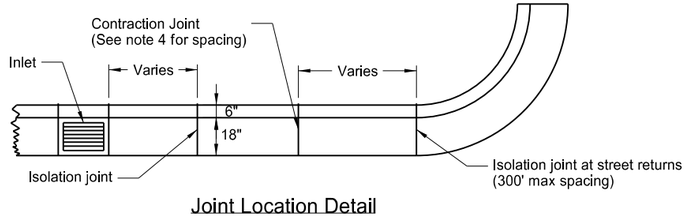
72" Concrete Valley Gutter Detail



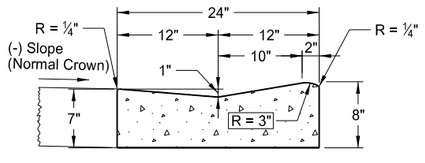
Curb & Gutter Type 1 (Sec. B)



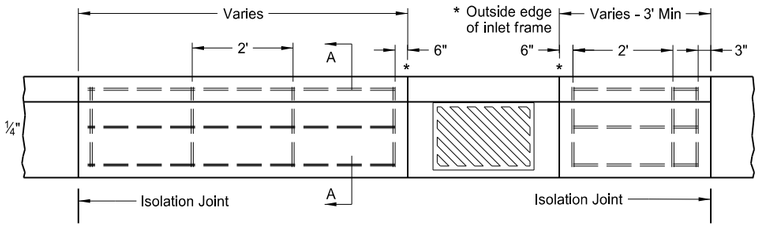
Keyway Detail for Curb & Gutter
(To be used with PCC Pavement and Drives)



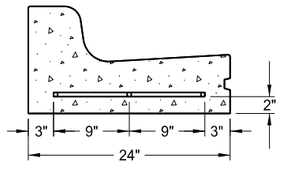
Joint Location Detail



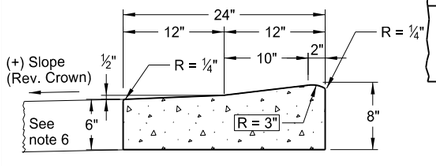
Mountable Curb & Gutter Type 1 (Sec. A)



Curb & Gutter Reinforcing at Inlets



Section A-A



Mountable Curb & Gutter Type 1 (Sec. B)

NOTES:

1. Curb and Gutter Type 1 (Sec. A & B) to be used. Section "A" to be used with (-) pavement slopes and section "B" to be used with (+) pavement slopes.
2. Contraction Joints: Tool the Curb & Gutter 2" as shown on the contraction joint details.
3. Isolation Joints: Isolation joint material shall be 3/4" preformed expansion joint filler conforming to the standard specifications. The opening for the backer rod and joint sealant shall be formed by a pre-cut piece of wood or other material approved by the engineer. Dowel supports are not required on the second pour at a cold joint, plastic or metal caps and greased dowels shall be installed in the cold joint for the second pour.
4. Joint Spacing: For hot bituminous pavements the joint spacing for the curb and gutter shall be 10' max. with the panels on each side of the inlets. For concrete pavements the joint spacing for the curb and gutter shall match the pavement joint on PCC Pavements of approximately 15' spacing.
5. Joint sealing: All contraction and isolation joints shall be sealed as shown in the details. The joint sealant for contraction joints shall conform to section 826.02B.The sealant for expansion joints shall be as specified in note 3 above. The sealant shall be tooled and installed in accordance with the manufacturer's recommendations.
6. Depth of Face of Gutter: For hot bituminous pavement the depth of gutter shall be 7" as shown. For PCC pavements, the Contractor has the option to match the depth of gutter to the depth of the adjacent PCC pavement or to construct a 7" depth as shown.
7. When the curb and gutter abuts PCC pavement, it shall be tied to the PCC pavement. The tie bar shall consist of a No. 3 bar, 1'-6" in length spaced 4' center to center.
8. On street returns and other locations where the new curb and gutter ends and does not abut existing curb and gutter, the end two (2) feet of the curb shall be tapered from 6" in height to 0". A 1/2" premolded isolation joint which is full depth and the same shape as the curb and gutter shall be installed just ahead of the taper. An 18" tie bar shall be installed across the joint.
9. Valley Gutter Joints: Contraction joints are required at approx. 10' intervals. The contraction joints shall be ⅛" min. to ⅜" max. in width. The joints shall be formed by sawing or scoring to a minimum depth of 2". The joint sealant shall be a hot poured elastic type joint sealer in accordance with Section 826.02A.2 of the Standard Specifications. The joint and sealant shall be included in the price bid for Valley Gutter.

NOTE: All bars shall be #4 deformed reinforcing bars. Splices will not be permitted. Reinforcing bars at inlet locations will not be paid for separately, but shall be included in the price bid for "Curb and Gutter - Type 1." This includes inlets located on radii. The reinforcement shall be extended to the second joint (rebar placed through the first joint) in cases where the 3' min. panel length cannot be obtained.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-7-2013	
REVISIONS	
DATE	CHANGE

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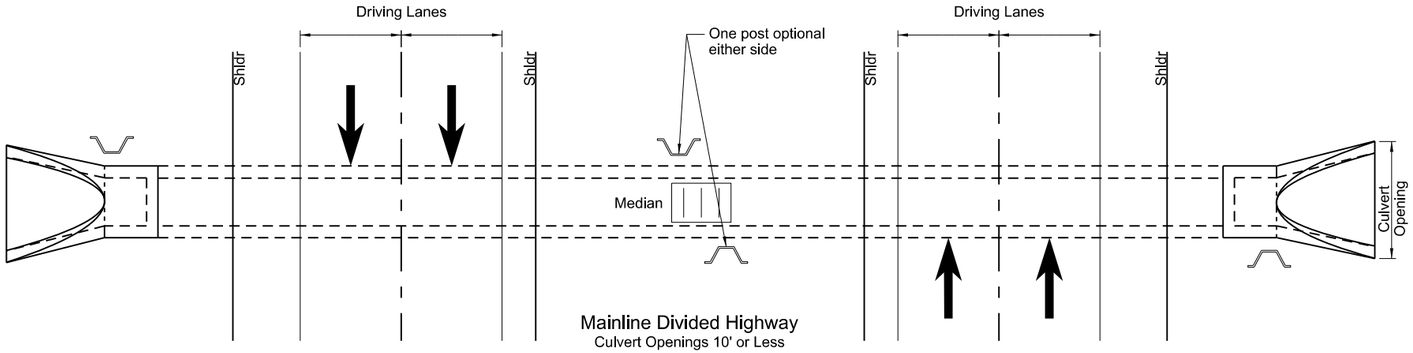
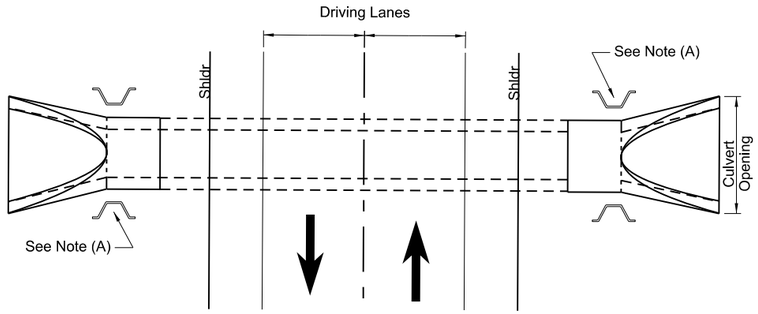
OBJECT MARKERS - CULVERTS

D-754-83

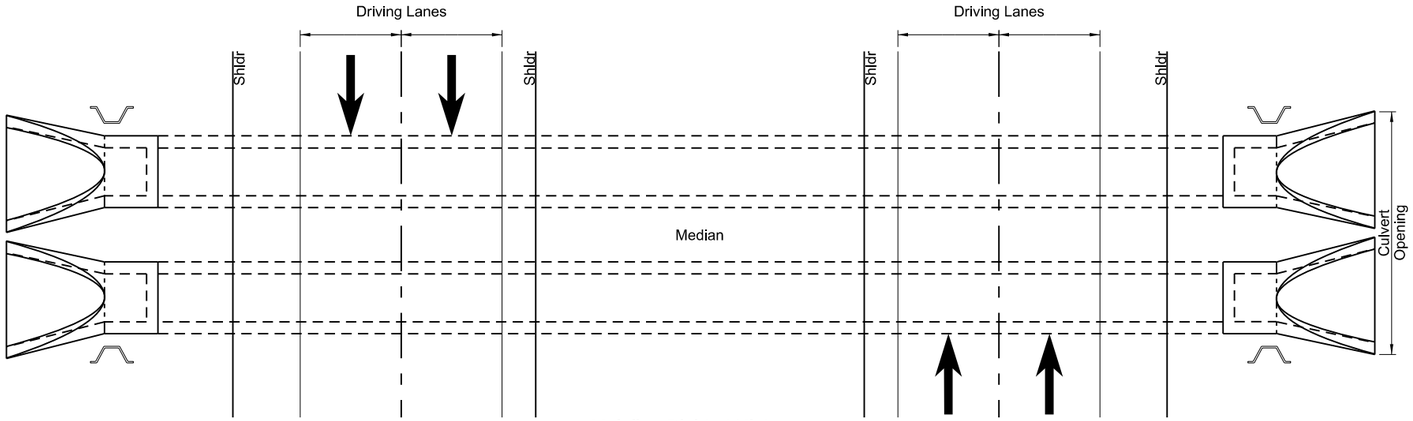


Mainline Divided Highway
Culvert Openings 10' or Less

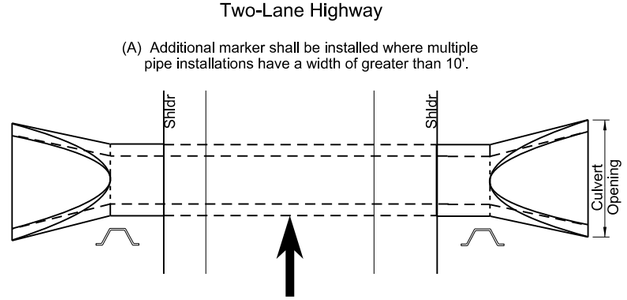


Two-Lane Highway

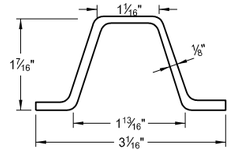
(A) Additional marker shall be installed where multiple pipe installations have a width of greater than 10'.



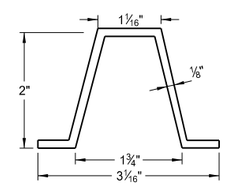
Mainline Divided Highway
Culvert Openings Greater than 10'
Multiple Installations



Ramp



Steel Post Detail
Approx. 2.0 lbs/ft



Aluminum Post Detail
Approx. 0.88 lbs/ft

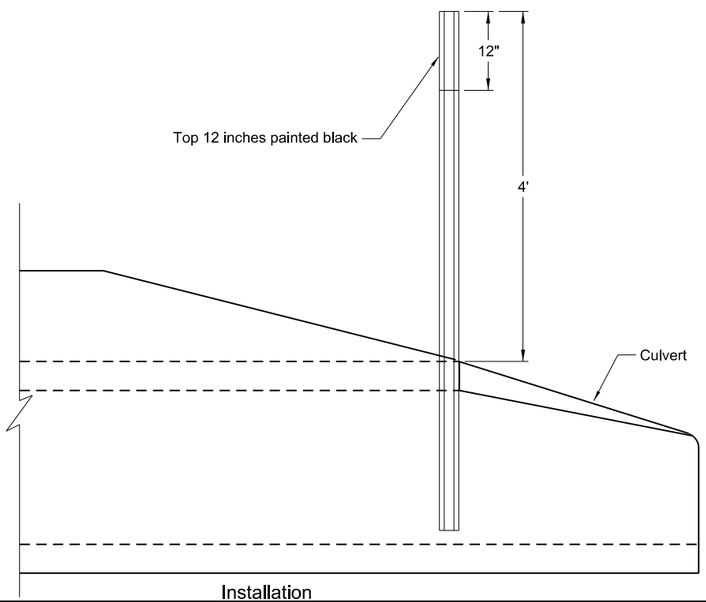
Post Location

Notes:

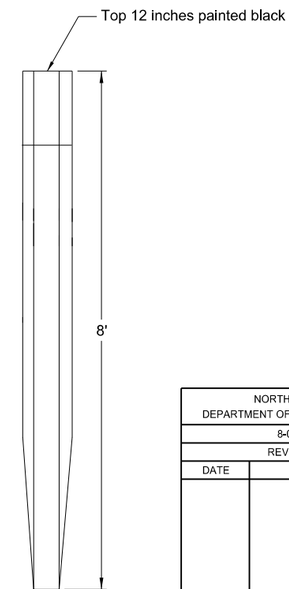
Installation: Construction requirements shall meet 754.03E.2. Each end of culverts crossing the roadway within the right-of-way shall be marked with a post as shown. Posts are to be installed in front of the culvert in the direction of travel along the side of the culvert and one foot from the culvert opening unless shown otherwise on the plans.

Posts: Posts shall conform to section 894.06A of the Standard Specifications with the exception that the post may or may not have holes drilled.

Basis of Payment: The quantity will be measured by the number of object markers each installed. All costs for furnishing and installing the markers shall be included in the price bid for the item "Object Markers - Culverts".



Installation



U-Type Post

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-05-13	
REVISIONS	
DATE	CHANGE

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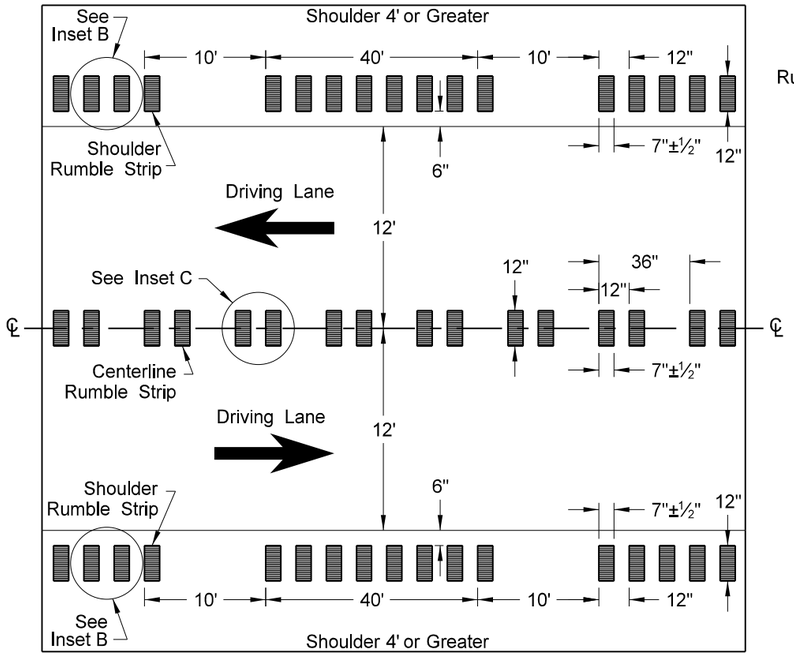
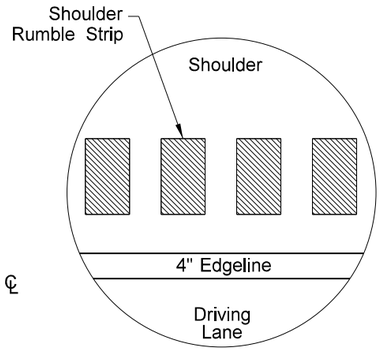
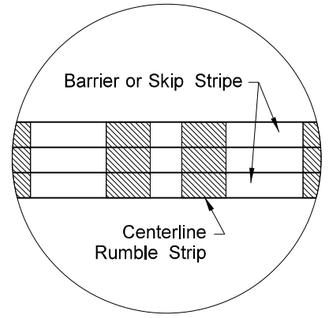
RUMBLE STRIPS
UNDIVIDED HIGHWAYS (SHOULDERS 4' OR GREATER)



Undivided Highways (Shoulders 4' or Greater)



Inset B - Shoulder Rumble Strip

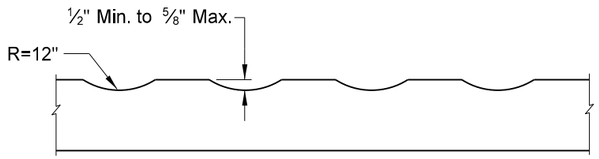


Inset C - Centerline Rumble Strip

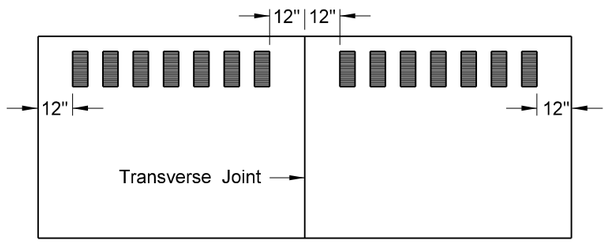
NOTES:

1) Discontinue shoulder 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.

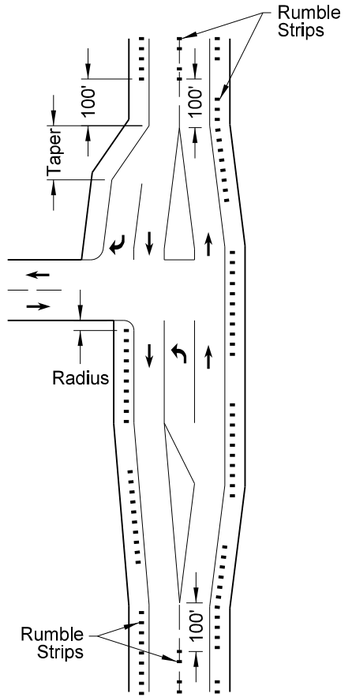
2) Discontinue centerline rumble strips through the entire length of left turn lanes, 100' before left turn lane tapers and median islands, and 100' before and after a paved or gravel highway, section line, approach, or private drive.



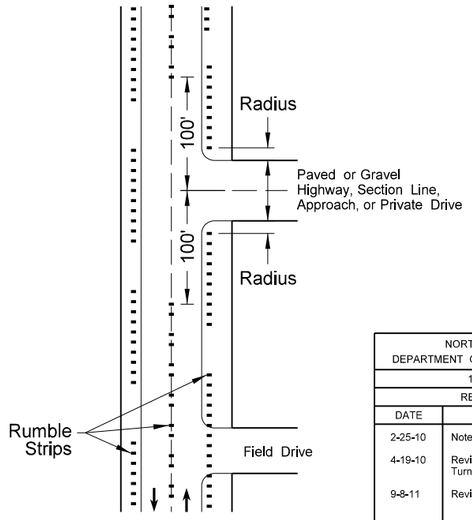
Profile of Rumble Strips - Bituminous and PCC Pavements



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



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-760-3.

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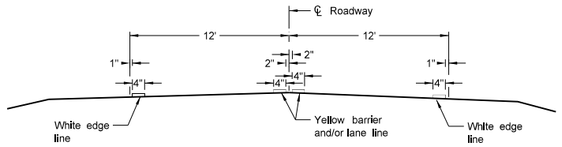
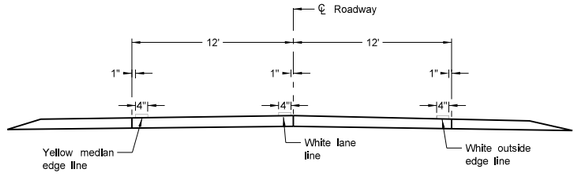
PAVEMENT MARKING

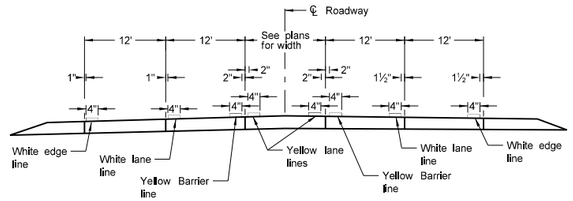
D-762-4



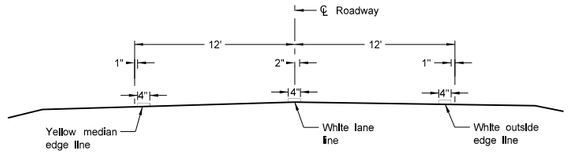
Two Lane Two Way
RURAL ROADWAY



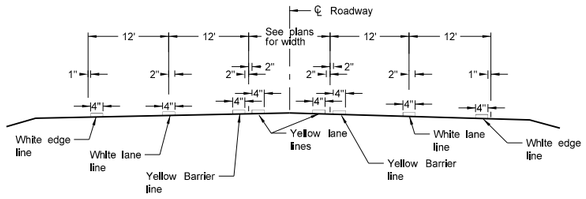
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



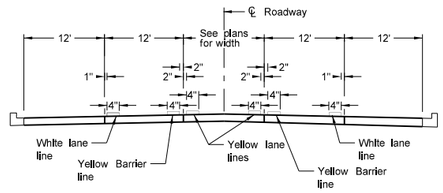
RURAL FIVE LANE ROADWAY
Concrete Section



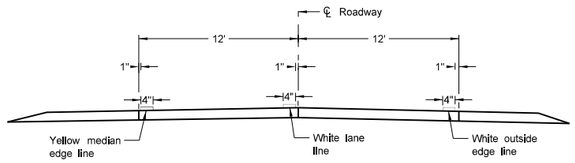
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



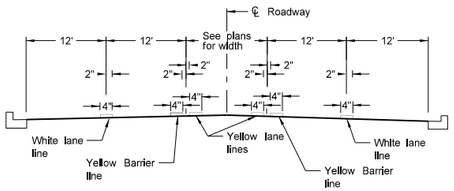
RURAL FIVE LANE ROADWAY
Asphalt Section



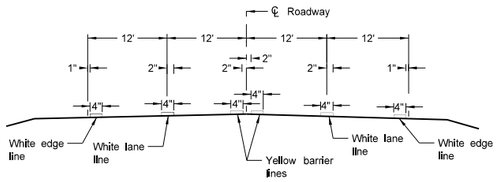
URBAN FIVE LANE SECTION
Concrete Section



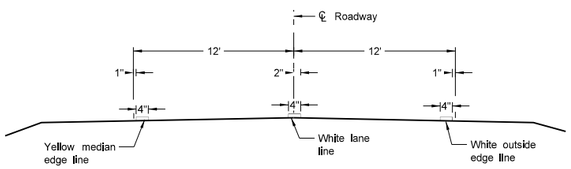
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



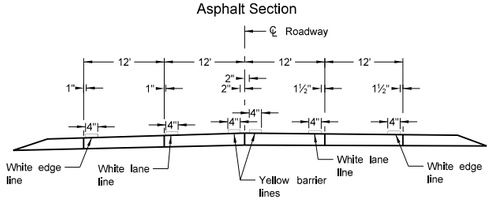
URBAN FIVE LANE SECTION
Asphalt Section



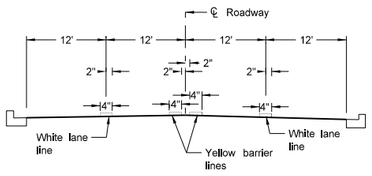
RURAL FOUR LANE ROADWAY
Asphalt Section



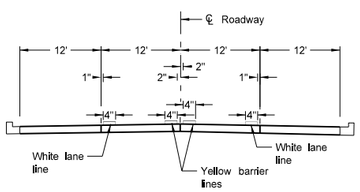
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



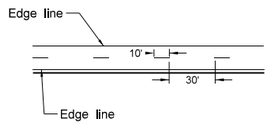
RURAL FOUR LANE ROADWAY
Concrete Section



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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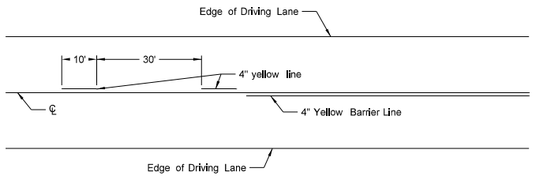
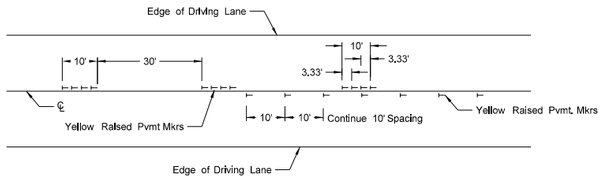
SHORT-TERM PAVEMENT MARKING

D-762-6

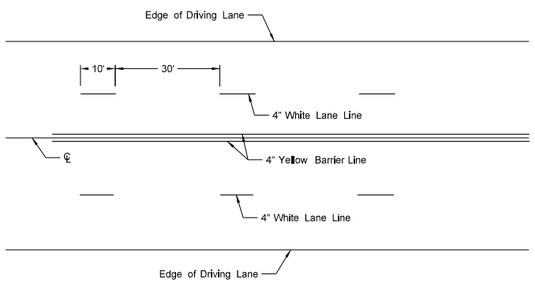


Painted or Tape Lines

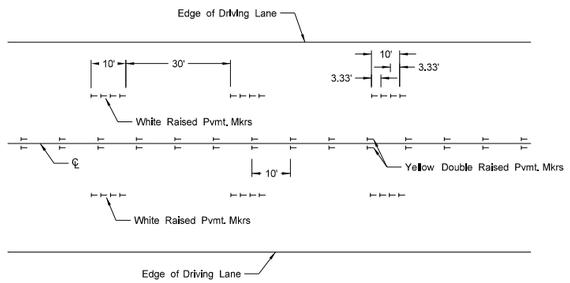


Raised Pavement Markers

TWO-LANE TWO-WAY ROADWAY

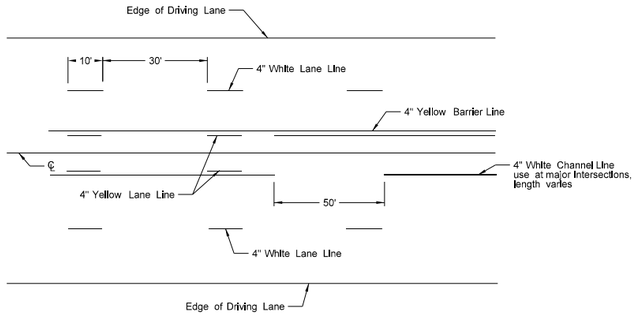


Painted or Tape Lines

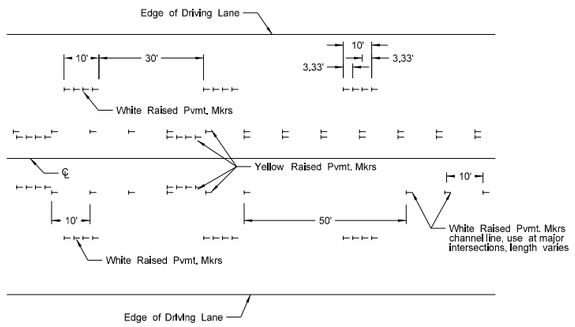


Raised Pavement Markers

FOUR LANE ROADWAY

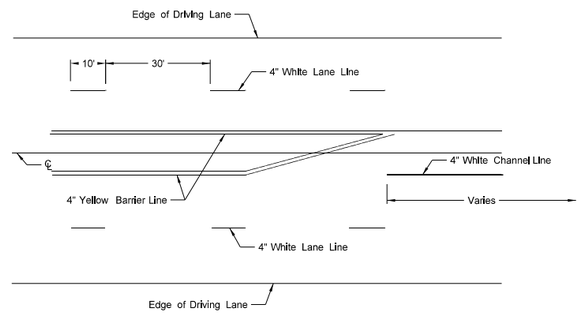


Painted or Tape Lines

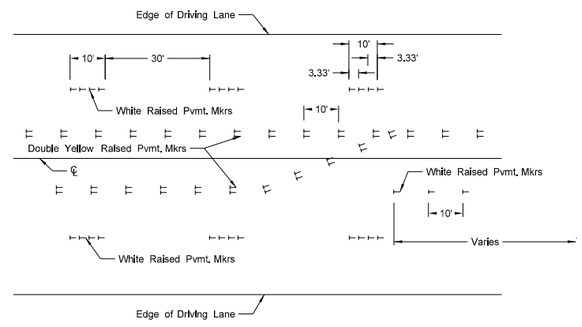


Raised Pavement Markers

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.

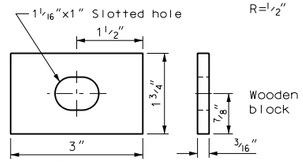
3. Raised markers and tape markings shall be removed after permanent pavement marking has been installed. Removed markings shall become the property of the contractor.

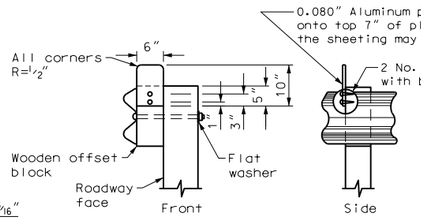
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

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

BEAM GUARDRAIL GENERAL DETAILS

D-764-1



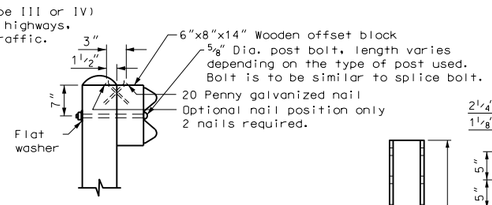


0.080" Aluminum plate. Place reflective sheeting (type III or IV) onto top 7" of plate on both sides, except on divided highways, the sheeting may be applied only on the side facing traffic.

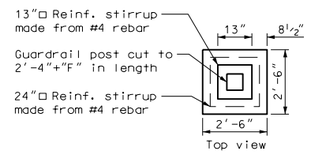
2 No. 12. 1 1/2" wood screws with button head

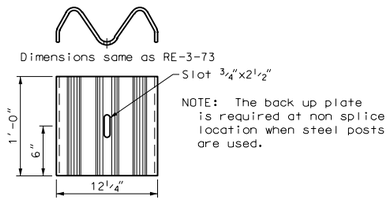
REFLECTORIZED PLATE DETAIL

2 additional reflectors are added to the w-beam guardrail quantities for placement on end treatment.

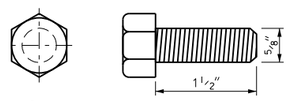


TYPICAL POST ATTACHMENT DETAIL





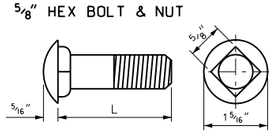
RECTANGULAR PLATE WASHER



5/8" -11 Hex bolt

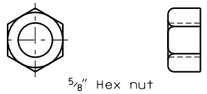
5/8" -11 Hex nut

5/8" HEX BOLT & NUT



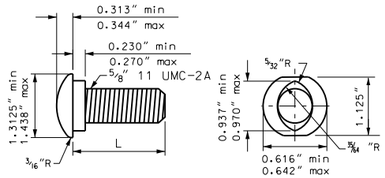
5/8" Dia. carriage bolt

L	THREAD LENGTH
1 1/2"	Full length thread
3"	1 1/2" Min thread length
11"	1 3/4" Min thread length
13"	1 3/4" Min thread length



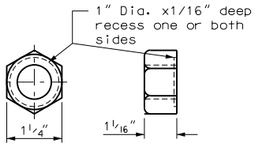
5/8" Hex nut

5/8" CARRIAGE BOLT & NUT



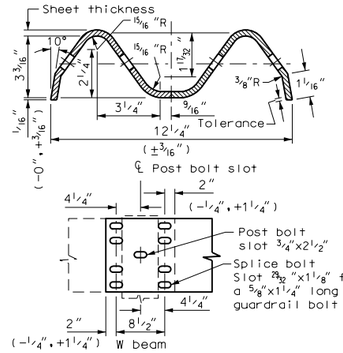
5/8" Dia. guardrail bolt

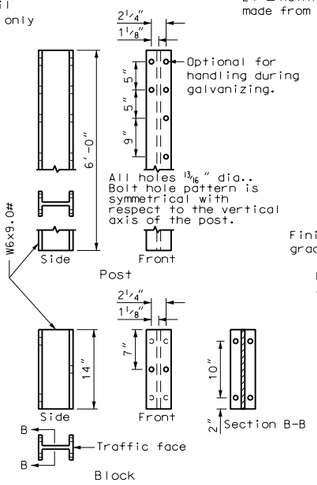
L	THREAD LENGTH
1 1/4"	Full length thread
2"	1 3/4" Min thread length
9 1/2"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length

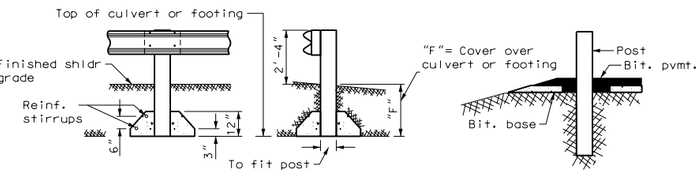


5/8" Dia. recess nut

5/8" GUARDRAIL BOLT & RECESS NUT

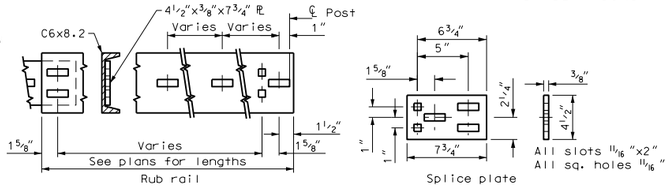






DETAIL OF CONCRETE PEDESTAL FOR POSTS

REPLACEMENT OF SURFACING



C6x8 RUB RAIL AND SPLICE PLATE

NOTES:

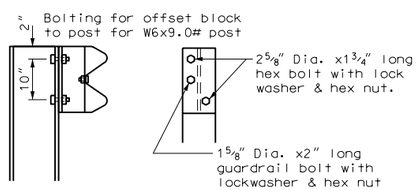
Reflectorized plates: Reflector plates shall begin at first post and be spaced at 25' centers on guardrail less than 250' in length and at 50' centers for guardrail over 250' in length. The reflector shall be the same color as the pavement marking adjacent to that reflector unless noted otherwise on the plans.

Detail of concrete pedestal for posts: To be used over culverts or footings when dimension "F" is less than 3'-8". When round posts are used and the pedestal required, the post hole in the pedestal shall be varied as required by the post shape.

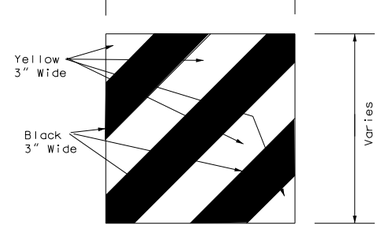
Manner of replacing bit. material at guardrail post: All excess earth from excavations for guard posts shall be disposed of as directed by the engineer. Replace bit. material wherever guardrail is installed after mat has been laid. Cost of excavation and replacing of bit. material to be included in the price bid for other items.

The Object Marker shall fit within the vertical edges of the Impact Plate . The retroreflective sheeting shall be type IIIA sheeting meeting the requirements of Section 894.02.b of the standard specifications. The sheeting shall be applied to .100 Aluminum sheeting meeting the requirements Section 894.01.a. The Object Marker shall attached to the Impact Head plate with rivets or some other attachment device. The rivets or attachment device shall be non-rust. The Stripes shall slope downward toward the roadway side.

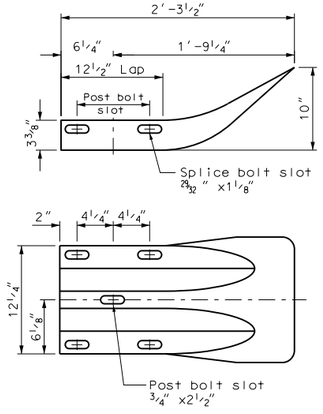
Guardrail installation height tolerance = ± 1".



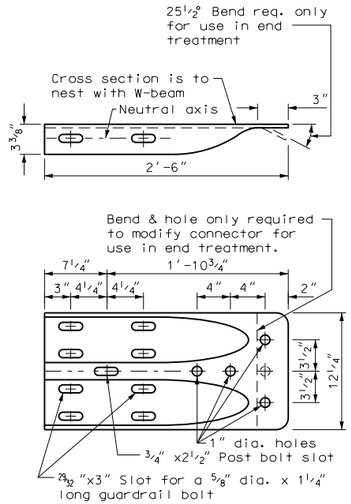
TYPICAL W POST ATTACHMENT DETAIL



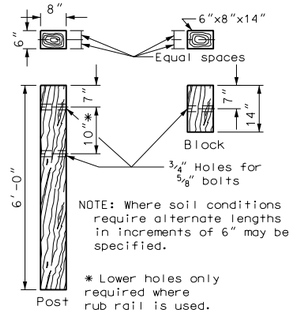
IMPACT HEAD OBJECT MARKER



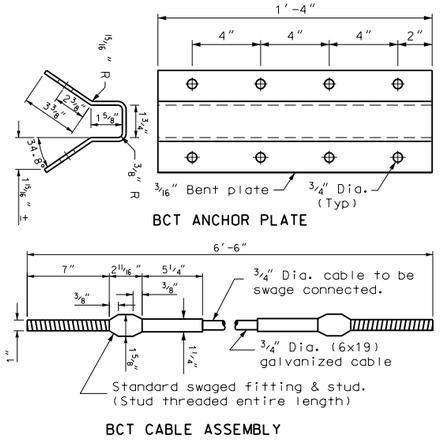
W BEAM END SECTION (FLARED)



W BEAM TERMINAL CONNECTOR

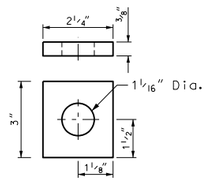


6x8 TIMBER POST & BLOCK



BCT ANCHOR PLATE

BCT CABLE ASSEMBLY



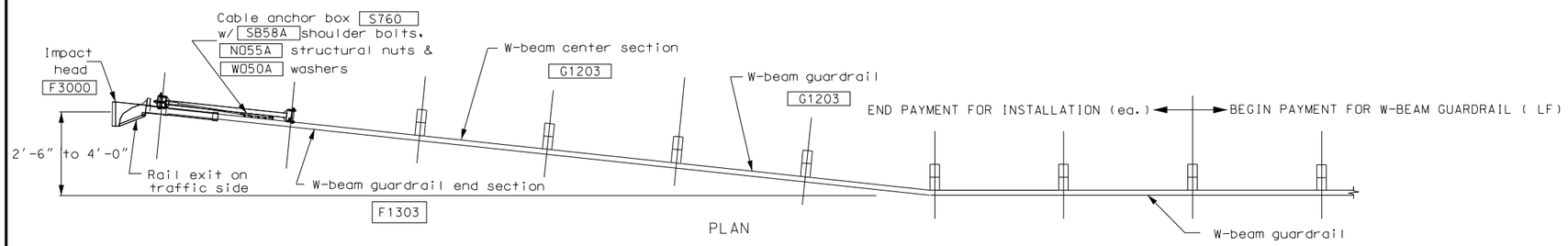
BCT CABLE END PLATE

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09-01-98	
REVISIONS	
DATE	CHANGE
11-22-02	Delete Z post, rev. note
12-01-04	PE Stamp added
01-30-07	Revised impact head object marker
09-12-07	Revised guardrail height from 27" to 28" and added grl height tolerance to notes

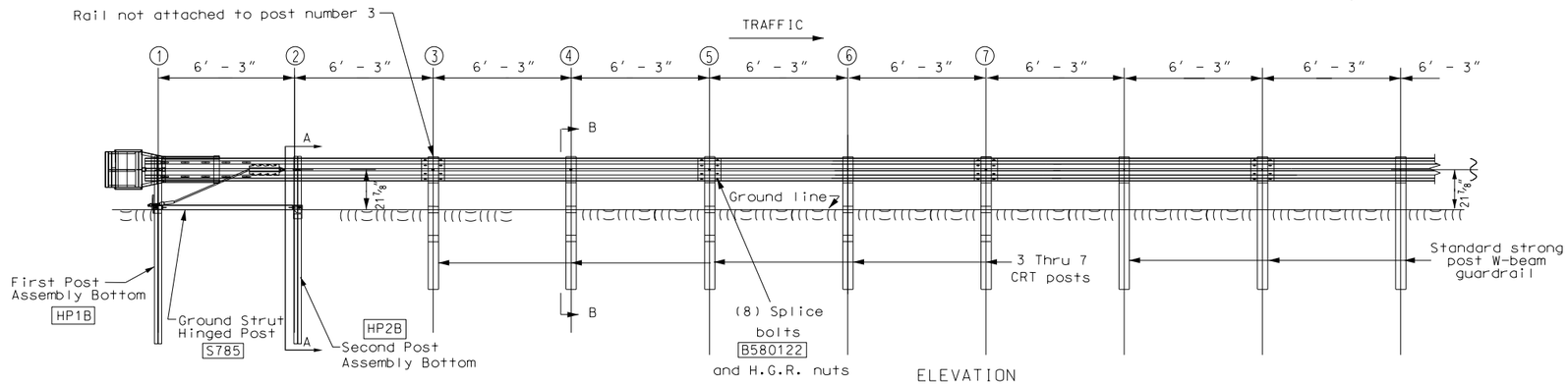
This document was originally issued and sealed by Mark S Gaydos, Registration Number PE- 4518 , on 09/12/07 and the original document is stored at the North Dakota Department of Transportation

FLARED ENERGY ABSORBING TERMINAL FOR STEEL BREAKAWAY SYSTEM

D-764-2C



PLAN

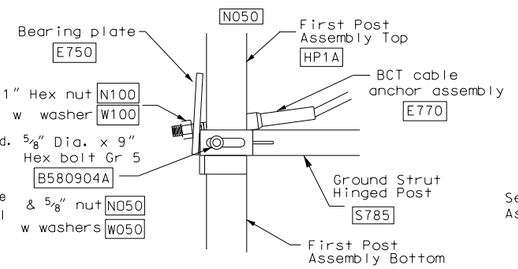


ELEVATION

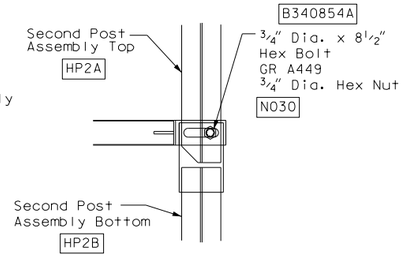
ITEM #	QTY	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA.
G1203	2	W-BEAM GUARDRAIL, 12 GA.
HP1A	1	FIRST POST ASSEMBLY TOP
HP1B	1	FIRST POST ASSEMBLY BOTTOM
HP2A	1	SECOND POST ASSEMBLY TOP
HP2B	1	SECOND POST ASSEMBLY BOTTOM
P671	5	WOOD CRT POST
P675	5	TIMBER BLOCKOUT OR RECYCLED EQUIV.
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
S785	1	GROUND STRUT HINGED POST
		HARDWARE (ALL DIMENSIONS IN INCHES)
B140404	2	1/4 Dia. x 4 HEX BOLT
W014	4	1/4 WASHER
N014	2	1/4 HEX NUT
B580122	17	5/8 Dia. x 1 1/4 SPLICE BOLT
B581802	4	5/8" Dia. x 10" H.G.R. BOLT (POSTS 3 THRU 6)
B580904A	1	5/8 Dia. x 9 HEX BOLT GR 5
W050	5	5/8 WASHER
N050	22	5/8 Dia. H.G.R. NUT
B340854A	1	3/4 Dia. x 8 1/2 HEX BOLT GR A449
N030	1	3/4 Dia. HEX NUT
N100	2	1 ANCHOR CABLE HEX NUT
W100	2	1 ANCHOR CABLE WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N055A	8	1/2 A325 STRUCTURAL NUT
W050A	16	1 1/16 OD x 9/16 ID A325 STR. WASHER

GENERAL NOTES

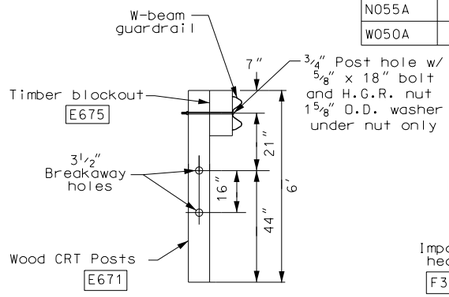
1. Wood posts are required with the Flared Energy Absorbing Terminal except post 1 and 2.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The lower sections of the posts shall not protrude more than 4 inches above the ground (measured along a 60 inch cord).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



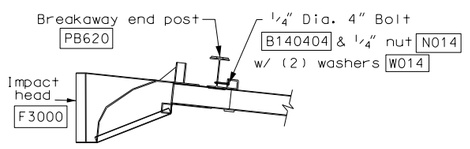
SIDE VIEW



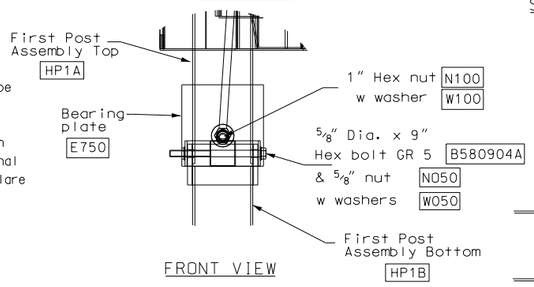
SIDE VIEW DETAIL OF POST #2



SECTION B-B
POST 3 THRU 7

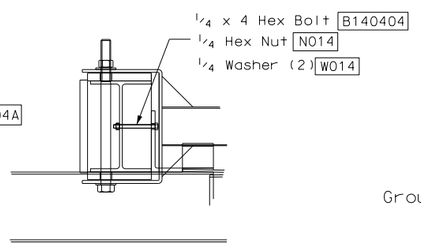


IMPACT HEAD CONNECTING DETAIL

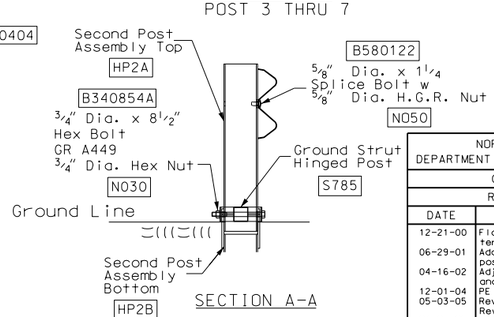


FRONT VIEW

POST #1 CONNECTION DETAILS



IMPACT HEAD CONNECTION DETAIL



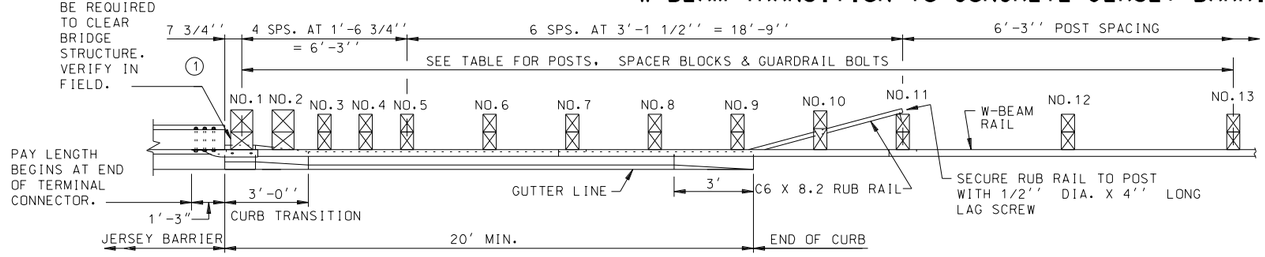
SECTION A-A
at Post #2

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09-01-98	
REVISIONS	
DATE	CHANGE
12-21-00	Flared energy absorbing terminal note
06-29-01	Added steel breakaway post
04-16-02	Adjusted post spacing and eliminated one post
12-01-04	PE Stamp added
05-03-05	Revised posts 1 & 2. Revised notes
04-05-06	Changed CRT post & blockout Qty. to 5 and added T to section B-B
01-04-07	General revisions
09-12-07	Rev. dimension to center of guardrail to 21⅛"

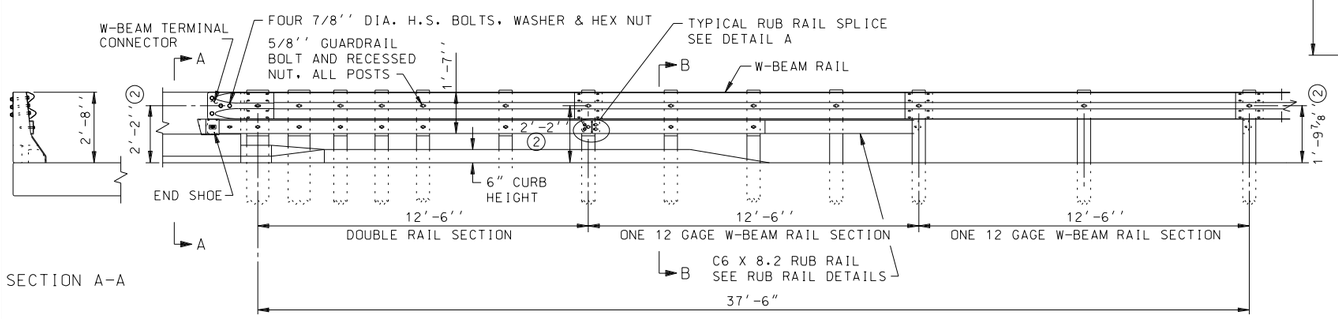
This document was originally issued and sealed by Mark S Gaydos, Registration Number PE-4518, on 09/12/07 and the original document is stored at the North Dakota Department of Transportation

W-BEAM TRANSITION TO CONCRETE JERSEY BARRIER WITH APPROACH CURB

D-764-3



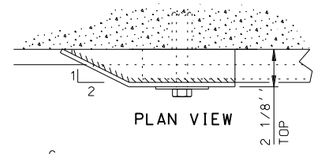
PLAN



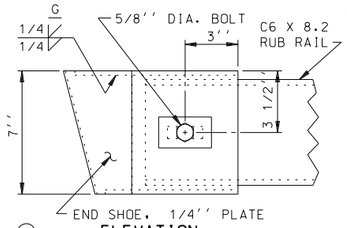
SECTION A-A

ELEVATION

GENERAL ASSEMBLY DETAILS

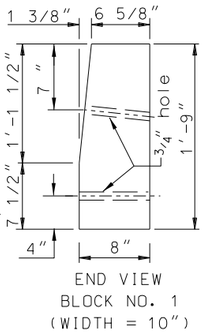


PLAN VIEW

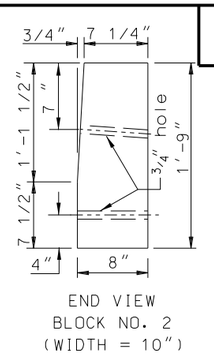


ELEVATION

RUB RAIL END SHOE ASSEMBLY

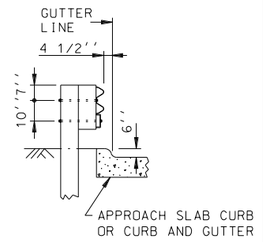


END VIEW BLOCK NO. 1 (WIDTH = 10")



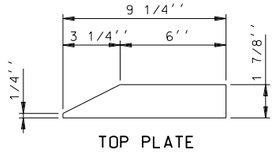
END VIEW BLOCK NO. 2 (WIDTH = 10")

TAPERED TIMBER BLOCK DETAILS

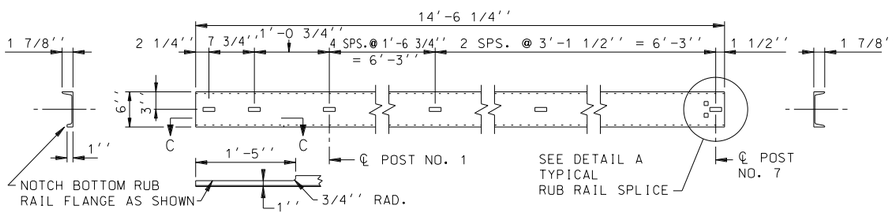


SECTION B-B

POST, TIMBER BLOCK & BOLT TABLE		
DESCRIPTION	POST NO.	SIZE
POST	1 & 2	10'' X 10'' X 8'-0'' MIN. LONG
	3-5	6'' X 8''X 7'-0''MIN. LONG
	6-13	6'' X 8''X 6'-0''MIN. LONG
SPACER BLOCK	1-2	10'' X 8'' X 21'' TAPERED BLOCK
	3-9	6'' X 8'' X 21''
	10	6'' X 9 3/4" X 14''
	11-13	6'' X 8'' X 14''
GUARDRAIL BOLT & RECESSED NUT	1 & 2 & 10	5/8'' DIA. X 20'' - GUARDRAIL
	3-9,11-13	5/8'' DIA. X 18'' - GUARDRAIL
	1-2	5/8'' DIA. X 22''- RUB RAIL
	3-9	5/8'' DIA. X 20''- RUB RAIL

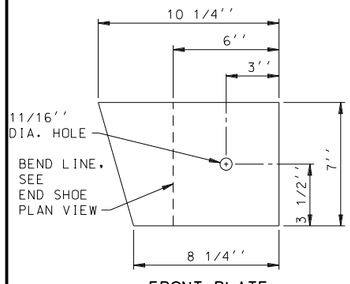


TOP PLATE

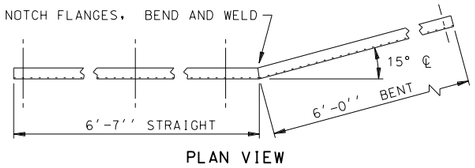


END VIEW SECTION C-C ELEVATION END VIEW

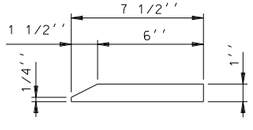
RUB RAIL STRAIGHT SECTION



FRONT PLATE

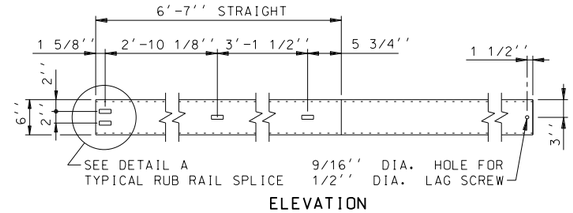


PLAN VIEW



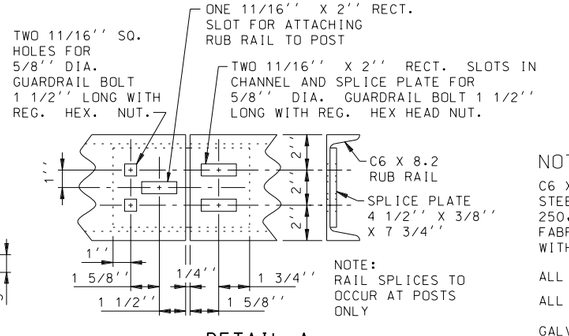
BOTTOM PLATE

END SHOE PLATE DETAILS
(1/4'' PLATE)



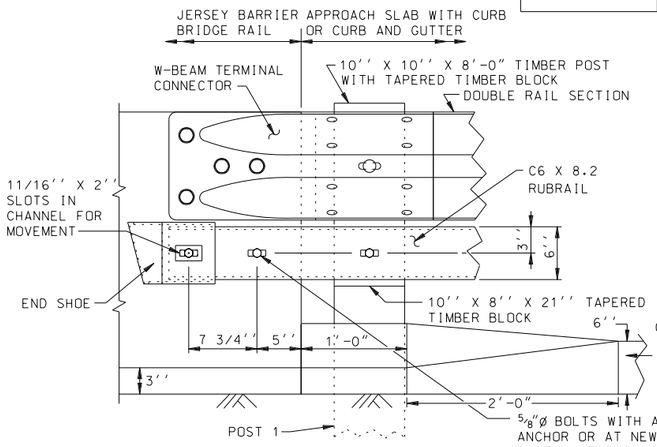
ELEVATION

RUB RAIL BENT SECTION

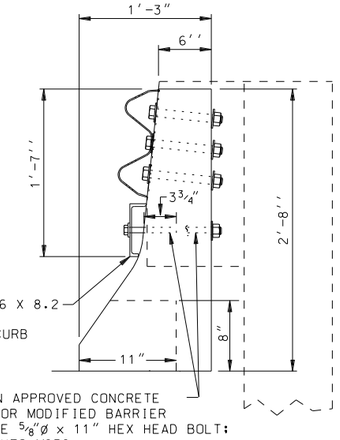


DETAIL A

TYPICAL RUB RAIL SPLICE



TRAFFIC SIDE ELEVATION



END VIEW

RAIL ATTACHMENT AND CURB DETAIL

NOTES:

C6 X 8.2 RUB RAIL AND STRUCTURAL STEEL SHALL BE AASHTO M270M GRADE 250, AND SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH AASHTO M111.

ALL SLOTTED HOLES ARE 11/16'' X 2''.

ALL SQUARE HOLES ARE 11/16''.

GALVANIZE ALL HARDWARE IN ACCORDANCE WITH AASHTO M232.

ALL POSTS AND BLOCKS FOR THE W-BEAM GUARDRAIL SHALL BE TIMBER.

(1) ADDITIONAL BLOCKING MAY BE REQUIRED AT POST NO. 1.

(2) HEIGHT IS 2'-2'' FROM 0'TO 12'-6'' FROM BRIDGE. HEIGHT TAPERS FROM 2'-2'' TO 1'-9 7/8'' BETWEEN 12'-6'' TO 37'-6" FROM BRIDGE.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-19-02	
REVISIONS	
DATE	CHANGE
02-07-03	Rev rail attachment
12-01-04	PE Stamp added
07-05-06	General revisions
08-24-06	Revised table
09-12-07	Rev. dimension to center of guardrail to 1'-9 7/8"

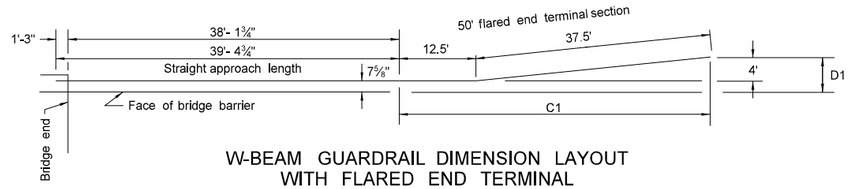
This document was originally issued and sealed by Mark S Gaydos, Registration Number PE-4518, on 09/12/07 and the original document is stored at the North Dakota Department of Transportation

GUARDRAIL AT BRIDGE ENDS
65 MPH DESIGN SPEED

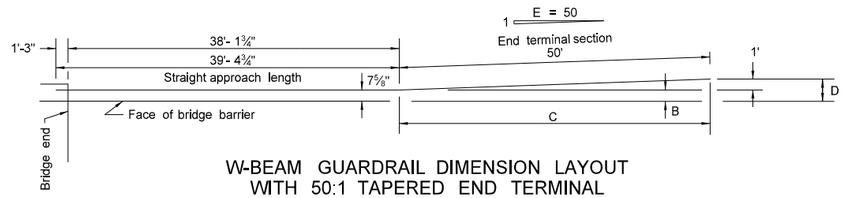
D-764-8A

LENGTH OF NEED TABLE 65 MPH DESIGN SPEED

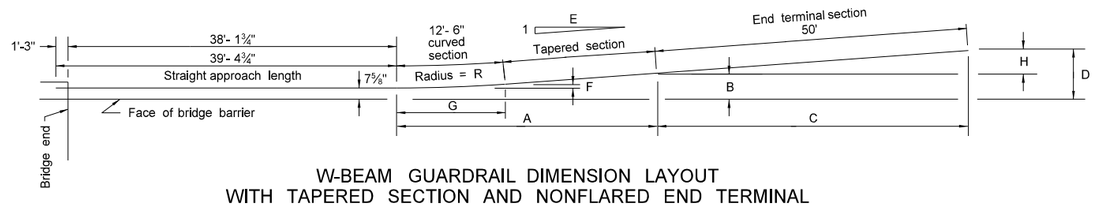
DESIGN TRAFFIC VOLUME	CLEAR ROADWAY WIDTH OF BRIDGE	② STRAIGHT APPROACH LENGTH	APPROACH SIDE								OPPOSITE SIDE							
			A	③ B	C	③ D	C1	③ D1	E	TOTAL W-BEAM LENGTH ①	A	③ B	C	③ D	C1	③ D1	E	TOTAL W-BEAM LENGTH ①
		FT	FT	FT	FT	FT	FT	FT		FT	FT	FT	FT	FT	FT	FT		FT
UNDER 750 ADT	48	39.4	12.49	1.05	49.89	4.38			15	51.9	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	46	39.4	24.96	1.88	49.89	5.21			15	64.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	44	39.4	24.96	1.88	49.89	5.21			15	64.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	42	39.4	37.43	2.71	49.89	6.04			15	76.9	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	40	39.4	49.91	3.55	49.89	6.87			15	89.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	38	39.4	49.91	3.55	49.89	6.87			15	89.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	36	39.4	62.38	4.38	49.89	7.70			15	101.9	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	34	39.4	74.85	5.21	49.89	8.53			15	114.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	32	39.4	74.85	5.21	49.89	8.53			15	114.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	30	39.4	87.32	6.04	49.89	9.37			15	126.9	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	28	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9
	26	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9
	24	39.4	112.27	7.70	49.89	11.03			15	151.9	12.49	1.05	49.89	4.38			15	51.9
750 - 1500 ADT	48	39.4	49.91	3.55	49.89	6.87			15	89.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	46	39.4	62.38	4.38	49.89	7.70			15	101.9	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	44	39.4	62.38	4.38	49.89	7.70			15	101.9	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	42	39.4	74.85	5.21	49.89	8.53			15	114.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	40	39.4	74.85	5.21	49.89	8.53			15	114.4	0.00	0.64	49.99	1.64	49.79	4.64	50	39.4
	38	39.4	87.32	6.04	49.89	9.37			15	126.9	12.49	1.05	49.89	4.38			15	51.9
	36	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9
	34	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9
	32	39.4	112.27	7.70	49.89	11.03			15	151.9	24.96	1.88	49.89	5.21			15	64.4
	30	39.4	112.27	7.70	49.89	11.03			15	151.9	24.96	1.88	49.89	5.21			15	64.4
	28	39.4	124.74	8.53	49.89	11.86			15	164.4	37.43	2.71	49.89	6.04			15	76.9
	26	39.4	124.74	8.53	49.89	11.86			15	164.4	37.43	2.71	49.89	6.04			15	76.9
	24	39.4	137.21	9.37	49.89	12.69			15	176.9	49.91	3.55	49.89	6.87			15	89.4
1500 - 2000 ADT	48	39.4	74.85	5.21	49.89	8.53			15	114.4	12.49	1.05	49.89	4.38			15	51.9
	46	39.4	87.32	6.04	49.89	9.37			15	126.9	12.49	1.05	49.89	4.38			15	51.9
	44	39.4	87.32	6.04	49.89	9.37			15	126.9	12.49	1.05	49.89	4.38			15	51.9
	42	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9
	40	39.4	99.80	6.87	49.89	10.20			15	139.4	24.96	1.88	49.89	5.21			15	64.4
	38	39.4	112.27	7.70	49.89	11.03			15	151.9	24.96	1.88	49.89	5.21			15	64.4
	36	39.4	112.27	7.70	49.89	11.03			15	151.9	37.43	2.71	49.89	6.04			15	76.9
	34	39.4	124.74	8.53	49.89	11.86			15	164.4	49.91	3.55	49.89	6.87			15	89.4
	32	39.4	124.74	8.53	49.89	11.86			15	164.4	49.91	3.55	49.89	6.87			15	89.4
	30	39.4	137.21	9.37	49.89	12.69			15	176.9	62.38	4.38	49.89	7.70			15	101.9
	28	39.4	137.21	9.37	49.89	12.69			15	176.9	62.38	4.38	49.89	7.70			15	101.9
	26	39.4	149.69	10.20	49.89	13.52			15	189.4	74.85	5.21	49.89	8.53			15	114.4
	24	39.4	149.69	10.20	49.89	13.52			15	189.4	74.85	5.21	49.89	8.53			15	114.4
2000 - 6000 ADT	48	39.4	87.32	6.04	49.89	9.37			15	126.9	12.49	1.05	49.89	4.38			15	51.9
	46	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9
	44	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9
	42	39.4	112.27	7.70	49.89	11.03			15	151.9	24.96	1.88	49.89	5.21			15	64.4
	40	39.4	112.27	7.70	49.89	11.03			15	151.9	37.43	2.71	49.89	6.04			15	76.9
	38	39.4	124.74	8.53	49.89	11.86			15	164.4	37.43	2.71	49.89	6.04			15	76.9
	36	39.4	124.74	8.53	49.89	11.86			15	164.4	49.91	3.55	49.89	6.87			15	89.4
	34	39.4	137.21	9.37	49.89	12.69			15	176.9	49.91	3.55	49.89	6.87			15	89.4
	32	39.4	149.69	10.20	49.89	13.52			15	189.4	62.38	4.38	49.89	7.70			15	101.9
	30	39.4	149.69	10.20	49.89	13.52			15	189.4	62.38	4.38	49.89	7.70			15	101.9
	28	39.4	162.16	11.03	49.89	14.36			15	201.9	74.85	5.21	49.89	8.53			15	114.4
	26	39.4	162.16	11.03	49.89	14.36			15	201.9	74.85	5.21	49.89	8.53			15	114.4
	24	39.4	174.63	11.86	49.89	15.19			15	214.4	87.32	6.04	49.89	9.37			15	126.9
OVER 6000 ADT	48	39.4	99.80	6.87	49.89	10.20			15	139.4	12.49	1.05	49.89	4.38			15	51.9
	46	39.4	112.27	7.70	49.89	11.03			15	151.9	24.96	1.88	49.89	5.21			15	64.4
	44	39.4	112.27	7.70	49.89	11.03			15	151.9	37.43	2.71	49.89	6.04			15	76.9
	42	39.4	124.74	8.53	49.89	11.86			15	164.4	37.43	2.71	49.89	6.04			15	76.9
	40	39.4	124.74	8.53	49.89	11.86			15	164.4	49.91	3.55	49.89	6.87			15	89.4
	38	39.4	137.21	9.37	49.89	12.69			15	176.9	49.91	3.55	49.89	6.87			15	89.4
	36	39.4	149.69	10.20	49.89	13.52			15	189.4	62.38	4.38	49.89	7.70			15	101.9
	34	39.4	149.69	10.20	49.89	13.52			15	189.4	62.38	4.38	49.89	7.70			15	101.9
	32	39.4	162.16	11.03	49.89	14.36			15	201.9	74.85	5.21	49.89	8.53			15	114.4
	30	39.4	162.16	11.03	49.89	14.36			15	201.9	74.85	5.21	49.89	8.53			15	114.4
	28	39.4	174.63	11.86	49.89	15.19			15	214.4	87.32	6.04	49.89	9.37			15	126.9
	26	39.4	174.63	11.86	49.89	15.19			15	214.4	99.80	6.87	49.89	10.20			15	139.4
	24	39.4	187.10	12.69	49.89	16.02			15	226.9	99.80	6.87	49.89	10.20			15	139.4



W-BEAM GUARDRAIL DIMENSION LAYOUT
WITH FLARED END TERMINAL



W-BEAM GUARDRAIL DIMENSION LAYOUT
WITH 50:1 TAPERED END TERMINAL



W-BEAM GUARDRAIL DIMENSION LAYOUT
WITH TAPERED SECTION AND NONFLARED END TERMINAL

DESIGN SPEED	F	G	H	R
	FT	FT	FT	FT
65	0.42	12.49	3.33	187.78

NOTES:

On divided highways use distance from roadway centerline to bridge rail x 2 and use this as clear roadway width of the bridge to determine guardrail length.

The contractor shall use wood posts for W-beam guardrail.

① Does not include end terminal section

② The 39.4' straight approach length is for use with the transition shown on Standard Drawing D-764-3.

For the transition shown on Standard Drawing D-764-3A, revise straight approach length to 45.65'.

③ Dimensions "B", "D" and "D1" include the 7⅝" (0.64') offset from the lower face of jersey barrier to the rear face of the W-beam guardrail.

For installations using the transition shown on Standard Drawing D-764-3A, subtract 0.64' from the dimensions "B", "D" and "D1", to obtain offset from face of guardrail connection plate.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

09-01-98

REVISIONS

DATE	CHANGE
12-21-00	Revised flared end treatment
08-09-01	Revised note
07-05-02	Values in column C
12-18-02	Revised table
01-29-03	Revised table
12-01-04	PE Stamp added
01-04-07	Revised tables and layouts
02-16-07	Added notes ② and ③, revised length of need table
07-31-07	Revised note ②

This document was originally issued and sealed by MARK S GAYDOS Registration Number PE- 4518 , on 07/31/07 and the original document is stored at the North Dakota Department of Transportation

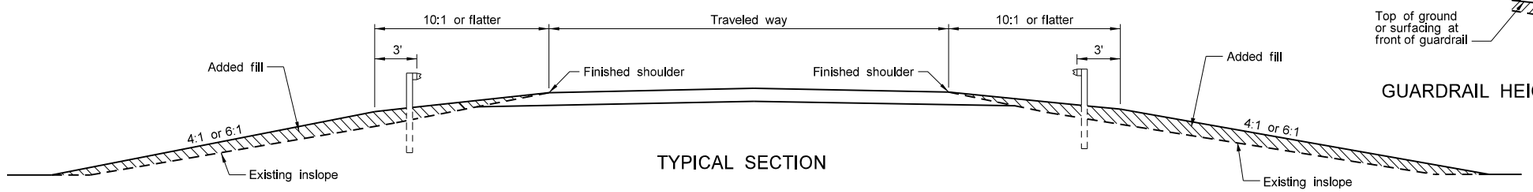
8/8/2013 R:\SUPPORT\DESSTD\D764-08A.dgn

D-764-12A

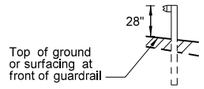
GUARDRAIL EMBANKMENT DIMENSION TABLE

DESIGN TRAFFIC VOLUME	CLEAR ROADWAY WIDTH OF BRIDGE	APPROACH SIDE						OPPOSITE SIDE					
		STRAIGHT AND FLARED GUARDRAIL		END TREATMENT TERMINAL NON-FLARED		END TREATMENT TERMINAL FLARED		STRAIGHT AND FLARED GUARDRAIL		END TREATMENT TERMINAL NON-FLARED		END TREATMENT TERMINAL FLARED	
		① A	② B	C	② D	C1	② D1	① A	② B	C	② D	C1	② D1
		FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT
UNDER 750 ADT	48	51.9	1.1	49.9	4.4			38.2	0.6	50.0	1.6	49.8	4.6
	46	64.4	1.9	49.9	5.2			38.2	0.6	50.0	1.6	49.8	4.6
	44	64.4	1.9	49.9	5.2			38.2	0.6	50.0	1.6	49.8	4.6
	42	76.8	2.7	49.9	6.0			38.2	0.6	50.0	1.6	49.8	4.6
	40	89.3	3.6	49.9	6.9			38.2	0.6	50.0	1.6	49.8	4.6
	38	89.3	3.6	49.9	6.9			38.2	0.6	50.0	1.6	49.8	4.6
	36	101.8	4.4	49.9	7.7			38.2	0.6	50.0	1.6	49.8	4.6
	34	114.3	5.2	49.9	8.5			38.2	0.6	50.0	1.6	49.8	4.6
	32	114.3	5.2	49.9	8.5			38.2	0.6	50.0	1.6	49.8	4.6
	30	126.7	6.0	49.9	9.4			38.2	0.6	50.0	1.6	49.8	4.6
	28	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	26	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	24	151.7	7.7	49.9	11.0			63.1	1.1	49.9	4.4		
750 - 1500 ADT	48	89.3	3.6	49.9	6.9			38.2	0.6	50.0	1.6	49.8	4.6
	46	101.8	4.4	49.9	7.7			38.2	0.6	50.0	1.6	49.8	4.6
	44	101.8	4.4	49.9	7.7			38.2	0.6	50.0	1.6	49.8	4.6
	42	114.3	5.2	49.9	8.5			38.2	0.6	50.0	1.6	49.8	4.6
	40	114.3	5.2	49.9	8.5			38.2	0.6	50.0	1.6	49.8	4.6
	38	126.7	6.0	49.9	9.4			63.1	1.1	49.9	4.4		
	36	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	34	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	32	151.7	7.7	49.9	11.0			75.6	1.9	49.9	5.2		
	30	151.7	7.7	49.9	11.0			75.6	1.9	49.9	5.2		
	28	164.1	8.5	49.9	11.9			88.1	2.7	49.9	6.0		
	26	164.1	8.5	49.9	11.9			88.1	2.7	49.9	6.0		
	24	176.6	9.4	49.9	12.7			100.6	3.6	49.9	6.9		
1500 - 2000 ADT	48	114.3	5.2	49.9	8.5			63.1	1.1	49.9	4.4		
	46	126.7	6.0	49.9	9.4			63.1	1.1	49.9	4.4		
	44	126.7	6.0	49.9	9.4			63.1	1.1	49.9	4.4		
	42	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	40	139.2	6.9	49.9	10.2			75.6	1.9	49.9	5.2		
	38	151.7	7.7	49.9	11.0			75.6	1.9	49.9	5.2		
	36	151.7	7.7	49.9	11.0			88.1	2.7	49.9	6.0		
	34	164.1	8.5	49.9	11.9			100.6	3.6	49.9	6.9		
	32	164.1	8.5	49.9	11.9			100.6	3.6	49.9	6.9		
	30	176.6	9.4	49.9	12.7			113.0	4.4	49.9	7.7		
	28	176.6	9.4	49.9	12.7			113.0	4.4	49.9	7.7		
	26	189.1	10.2	49.9	13.5			125.5	5.2	49.9	8.5		
	24	189.1	10.2	49.9	13.5			125.5	5.2	49.9	8.5		
2000 - 6000 ADT	48	126.7	6.0	49.9	9.4			63.1	1.1	49.9	4.4		
	46	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	44	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	42	151.7	7.7	49.9	11.0			75.6	1.9	49.9	5.2		
	40	151.7	7.7	49.9	11.0			88.1	2.7	49.9	6.0		
	38	164.1	8.5	49.9	11.9			88.1	2.7	49.9	6.0		
	36	164.1	8.5	49.9	11.9			100.6	3.6	49.9	6.9		
	34	176.6	9.4	49.9	12.7			100.6	3.6	49.9	6.9		
	32	189.1	10.2	49.9	13.5			113.0	4.4	49.9	7.7		
	30	189.1	10.2	49.9	13.5			113.0	4.4	49.9	7.7		
	28	201.6	11.0	49.9	14.4			125.5	5.2	49.9	8.5		
	26	201.6	11.0	49.9	14.4			125.5	5.2	49.9	8.5		
	24	214.0	11.9	49.9	15.2			138.0	6.0	49.9	9.4		
OVER 6000 ADT	48	139.2	6.9	49.9	10.2			63.1	1.1	49.9	4.4		
	46	151.7	7.7	49.9	11.0			75.6	1.9	49.9	5.2		
	44	151.7	7.7	49.9	11.0			88.1	2.7	49.9	6.0		
	42	164.1	8.5	49.9	11.9			88.1	2.7	49.9	6.0		
	40	164.1	8.5	49.9	11.9			100.6	3.6	49.9	6.9		
	38	176.6	9.4	49.9	12.7			100.6	3.6	49.9	6.9		
	36	189.1	10.2	49.9	13.5			113.0	4.4	49.9	7.7		
	34	189.1	10.2	49.9	13.5			113.0	4.4	49.9	7.7		
	32	201.6	11.0	49.9	14.4			125.5	5.2	49.9	8.5		
	30	201.6	11.0	49.9	14.4			125.5	5.2	49.9	8.5		
	28	214.0	11.9	49.9	15.2			138.0	6.0	49.9	9.4		
	26	214.0	11.9	49.9	15.2			150.4	6.9	49.9	10.2		
	24	226.5	12.7	49.9	16.0			150.4	6.9	49.9	10.2		

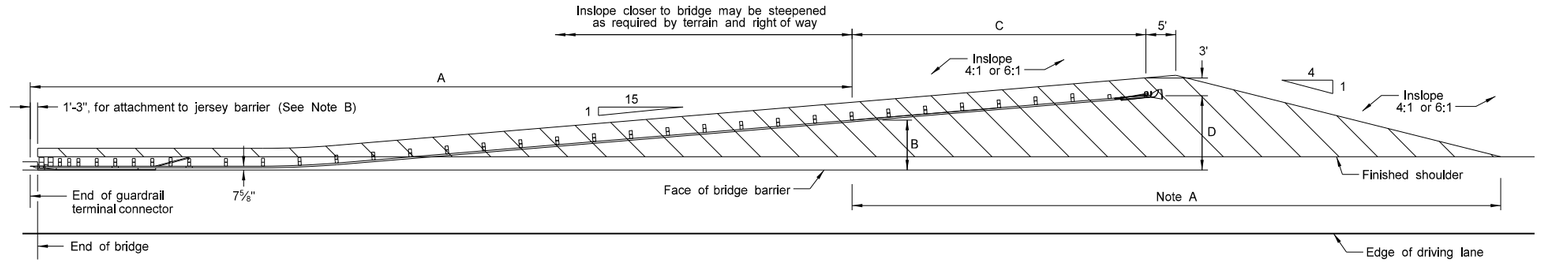
TYPICAL GRADING AT BRIDGE ENDS WITH FLARED W-BEAM GUARDRAIL 65 MPH DESIGN SPEED



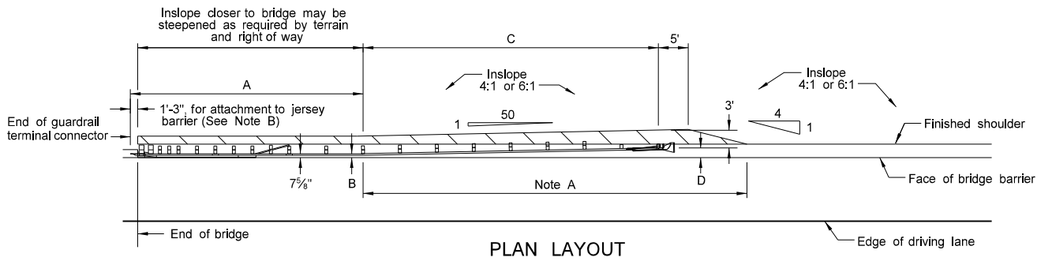
TYPICAL SECTION



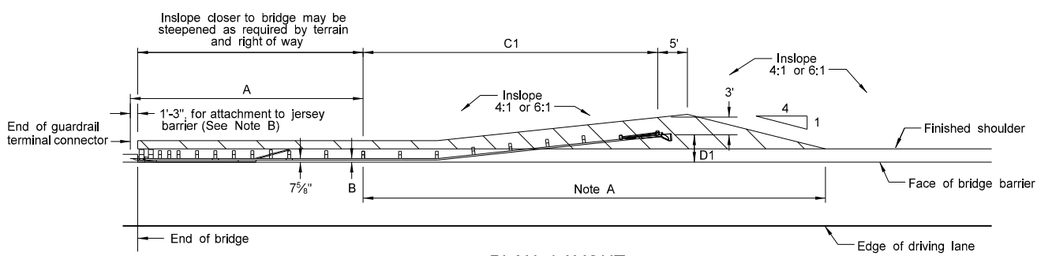
GUARDRAIL HEIGHT



PLAN LAYOUT
NON-FLARED END TERMINAL



PLAN LAYOUT
50:1 TAPERED END TERMINAL
(WHERE "C" = 50')



PLAN LAYOUT
FLARED END TERMINAL

Note A: This area may have to be placed at flatter than 10:1 to provide the proper guardrail height.

Note B: For guardrail installed in accordance with Standard Drawing D-764-3A, the thrie beam terminal connector installation location must be determined from the bridge railing plans.

NOTES:

The design traffic volumes (ADT) shall be as shown on title sheet under traffic forecast.

Where normal inslope is 4:1, the added fill shall be 4:1.
Where normal inslope is 6:1, the added fill shall be 6:1.

① The values shown for dimension "A" are applicable for W-beam guardrail installations attached to jersey barrier as shown on Standard Drawing D-764-3.

When the guardrail installation is in accordance with Standard Drawing D-764-3A, dimension "A" shall be revised by adding 6.3' to the tabulated value.

② The values shown for dimensions "B", "D" and "D1" are applicable for W-beam guardrail installations attached to jersey barrier as shown on Standard Drawing D-764-3.

When the guardrail installation is in accordance with Standard Drawing D-764-3A, dimensions "B", "D", and "D1" shall be revised by subtracting 0.6' from the tabulated value.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

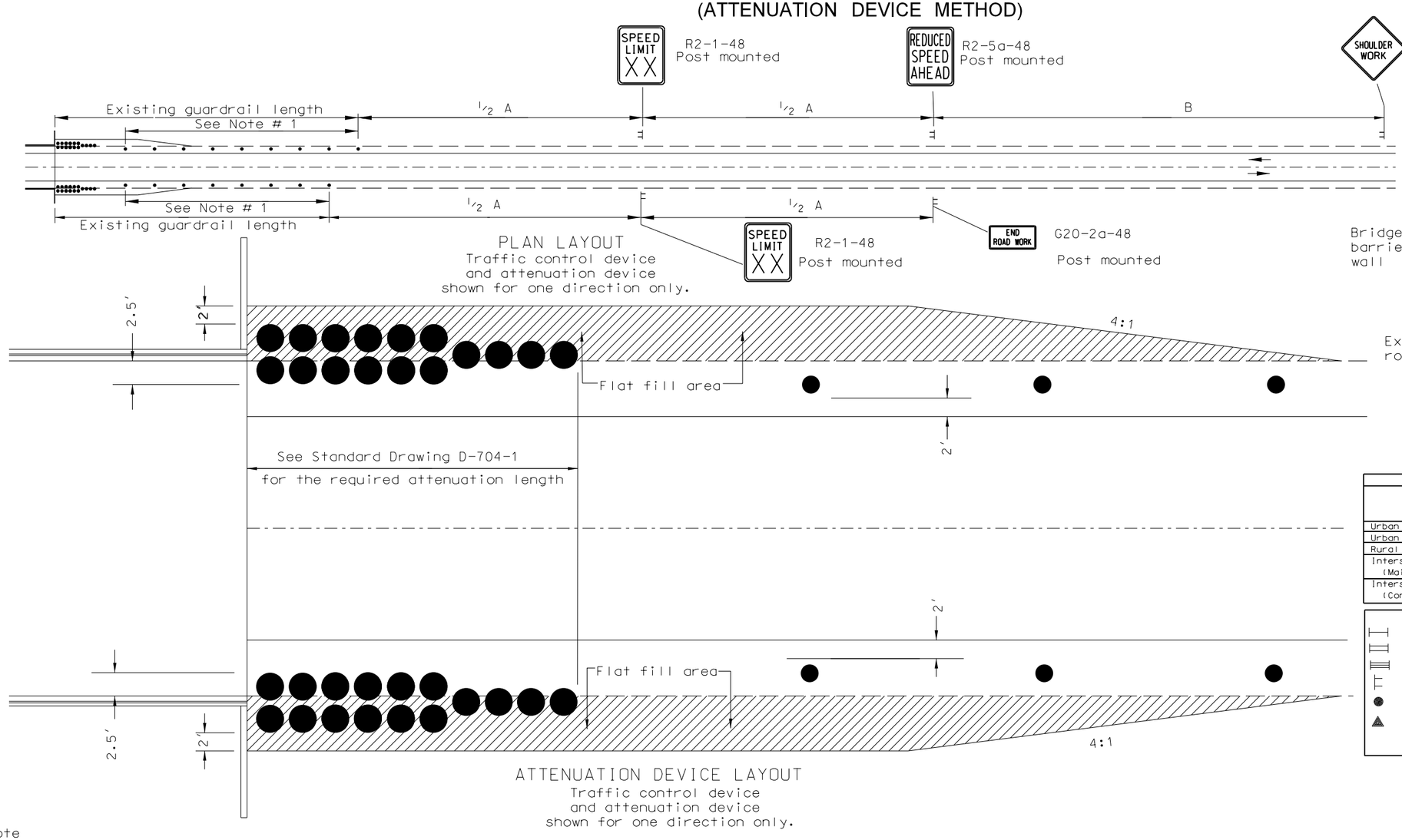
09-01-98

REVISIONS

DATE	CHANGE
10-29-98	Offset dimensions
12-21-00	Revise flared end treatment
04-02-02	Revised table
12-06-02	Revised table
12-01-04	PE Stamp added
01-04-07	Revised table and layouts
02-16-07	Added notes ①,②, B, revised table and layouts
09-13-07	Revised guardrail height from 27" to 28"

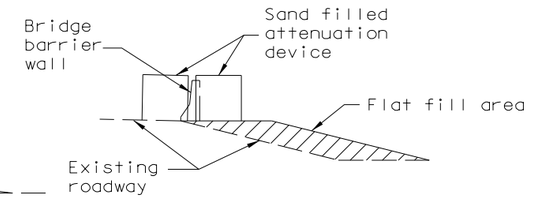
D-764-29

SHORT TERM END TREATMENT FOR BRIDGES (ATTENUATION DEVICE METHOD)



PLAN LAYOUT
Traffic control device
and attenuation device
shown for one direction only.

ATTENUATION DEVICE LAYOUT
Traffic control device
and attenuation device
shown for one direction only.



TYPICAL SECTION

ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs (ft)		
	A	B	C
Urban - Low Speed (less than 40 mph)	200	200	200
Urban - High Speed (40 mph or more)	350	350	350
Rural	500	500	500
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500
Interstate/4-Lane Divided (Construction)	1000	1600	2600

KEY

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

Note

1. If the shoulder width is less than 3′, the vertical panels shall be used and placed as far from the driving lane as possible and still be on the finished shoulder. When there is no shoulder, the vertical panels shall be placed as near as possible to the driving lane on the in slope of the shoulder.

2. If the bridge is within construction zone signing, the reduced speed ahead sign can be eliminated.

3. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceeds 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 20 mph. Where speed limits are to be reduced more than 20 mph, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 20 mph. the second speed limit shall be placed at ½ B.

4. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.

5. 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 20 mph. Where speed limits are to be reduced more than 20 mph, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 20 mph. The second speed limit sign shall be placed at ½ B.

6. Existing speed limit signs within a reduced speed zone shall be covered.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
01-22-04	
REVISIONS	
DATE	CHANGE
12-01-04	PE stamp added

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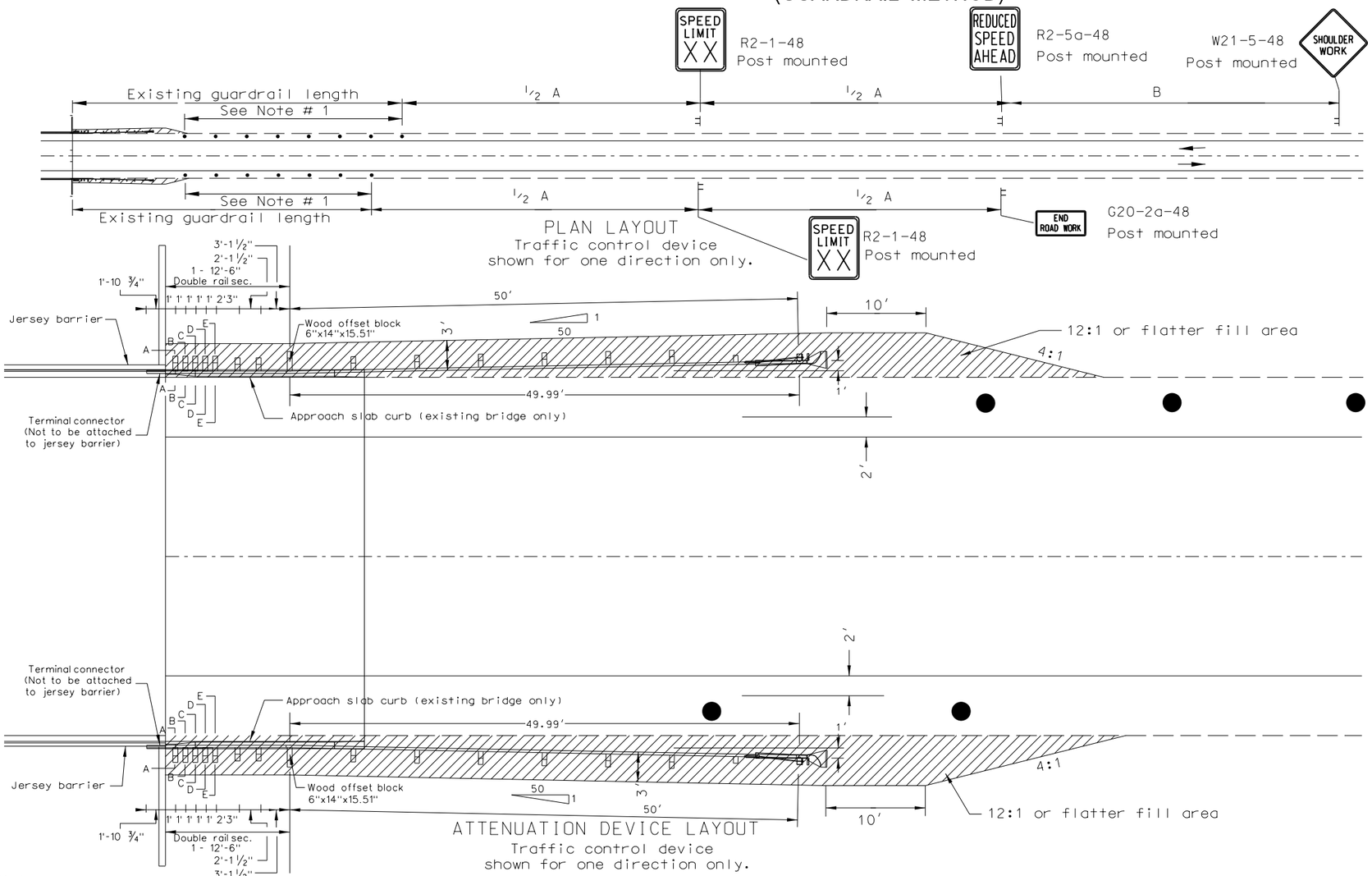
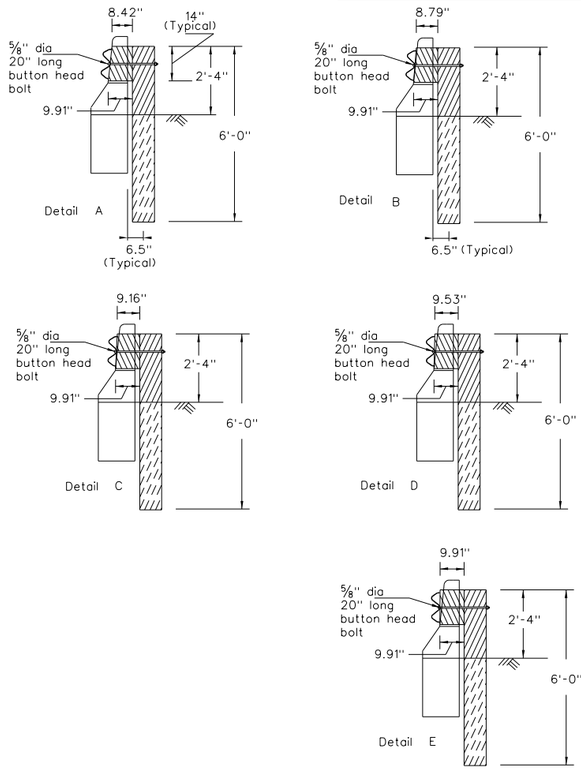
SHORT TERM END TREATMENT FOR BRIDGES
(GUARDRAIL METHOD)

D-764-30





ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs (ft)		
	A	B	C
Urban - Low Speed (less than 40 mph)	200	200	200
Urban - High Speed (40 mph or more)	350	350	350
Rural	500	500	500
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500
Interstate/4-Lane Divided (Construction)	1000	1600	2600

KEY

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

Note

1. If the shoulder width is less than 3', the vertical panels shall be used and placed as far from the driving lane as possible and still be on the finished shoulder. When there is no shoulder, the vertical panels shall be placed as near as possible to the driving lane on the inslope of the shoulder.
2. If the bridge is within construction zone signing, the reduced speed ahead sign can be eliminated.
3. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceeds 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 20 mph. Where speed limits are to be reduced more than 20 mph, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 20 mph. the second speed limit shall be placed at 1/2 B.
4. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
5. 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 20 mph. Where speed limits are to be reduced more than 20 mph, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 20 mph. The second speed limit sign shall be placed at 1/2 B.
6. Existing speed limit signs within a reduced speed zone shall be covered.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
01-22-04	
REVISIONS	
DATE	CHANGE
12-01-04	PE Stamp added

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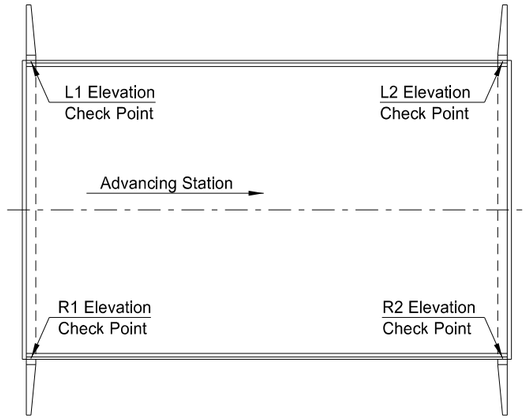
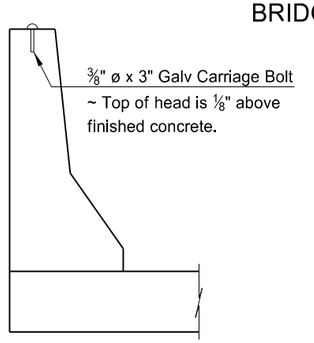
BRIDGE BENCH MARKS

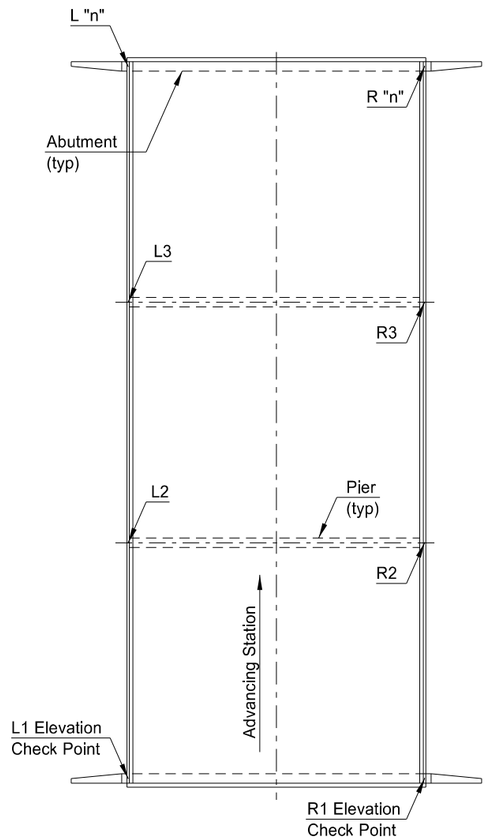
D-900-1



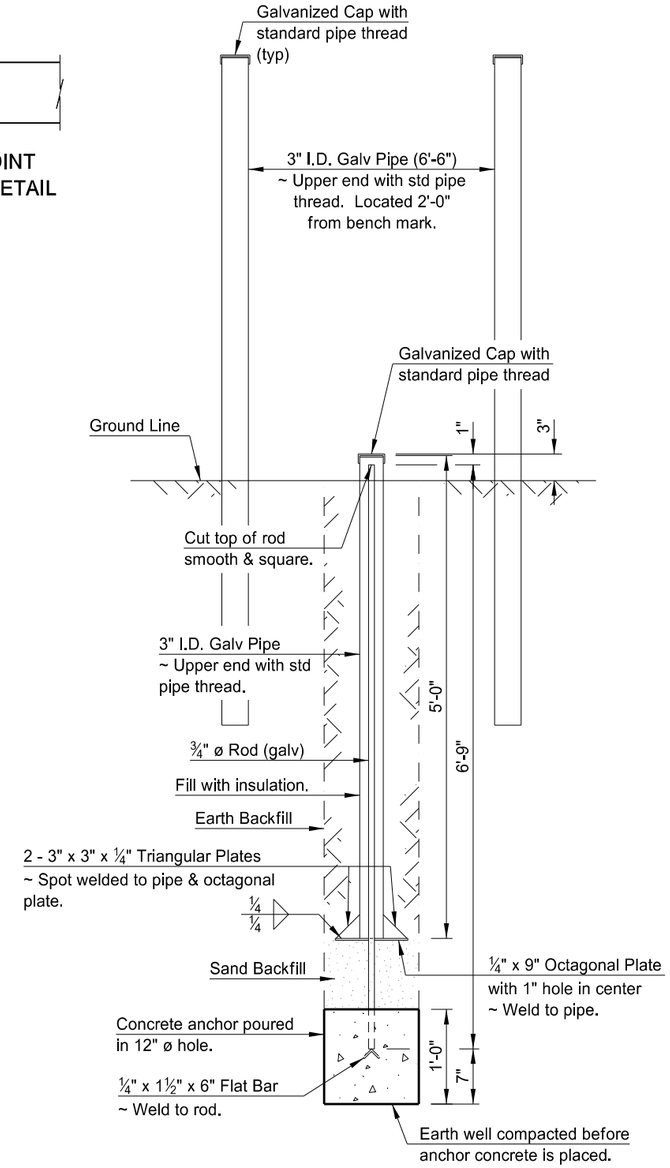
GENERAL LAYOUT FOR
SINGLE SPAN



CHECK POINT
LOCATION DETAIL



GENERAL LAYOUT FOR
MULTIPLE SPAN



BENCH MARK DETAIL

NOTES:

Elevation check points shall consist of ⅜" ø x 3" galvanized carriage bolts (or equal) set in the concrete barrier at the points indicated on the General Layout sketches. The top of the bolt head shall project above the finished concrete ⅛". Elevation check points shall be placed on each barrier over each unit of the substructure for each bridge at a structural location.

Two bench marks as detailed hereon shall be set at diagonal opposite positions away from the structure location and at least 300 feet from the nearest point on the bridge or bridges (if more than one at a location). These bench marks shall be constructed as detailed on this sheet and located near the Highway Right of Way lines. The two pipes shall extend 4'-0" above ground and be painted with two coats of white paint suitable for galvanized steel surfaces.

The Project Engineer shall run a set of levels determining the elevation of each check point on the structure and the two bench marks immediately after the completion of the bridge. Bench Mark #1 can be listed as having elevation 1000 or the actual surveyed elevation. This information shall be recorded on SFN 13420 and submitted to the Bridge Engineer with adequate information locating each check point and bench mark.

All metal parts are to be hot dip galvanized after punching, shearing, welding and fabrication.

Threads of cap and pipe are not to be galvanized. At the time of installation these threads are to be coated with synthetic grease with teflon and cap screwed to a snug fit.

METHOD OF MEASUREMENT:

Each set of Bridge Bench Marks consisting of two bench marks and the required number of elevation check points shall be considered as one unit for bidding purposes and the quantity to be paid for shall be the number of sets of bridge bench marks which have been installed complete in place and accepted by the Engineer.

BASIS OF PAYMENT:

Bridge Bench Marks shall be paid for at the contract price bid for each set of Bridge Bench Marks, which price shall be full compensation for all excavation, backfill and clean-up, and for furnishing, hauling and placing all elevation check points, galvanized pipe, caps, rods, sand backfill, concrete, rock equipment, tools and incidentals, including galvanizing and greasing, necessary to complete this item.

GALVANIZING:

After fabrication the complete assembly shall be hot-dip galvanized.

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

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