DESIGN DATA - US 81				
Traffic	Average Daily			
Current 2021	Pass: NA	Trucks: NA	Total: 65	
Forecast 2041	Pass: NA	Trucks: NA	Total: 79	
Clear Zone Distance: 10'		Design Speed: 20 mph		
Minimum Sight Dist. for Stopping: NA		Bridges: HL-93		
Sight Dist. for No Passing Zone: NA				
Pavement Design Life (years): NA				
Design Accumulated One-way ESALs: NA				

DESIGN DATA - I-29				
Traffic	Average Daily			
Current 2019	Pass: 3.581	Trucks: 1,069	Total: 4,650	
Forecast 2039	Pass: 4,823	Trucks: 1,588	Total: 6,411	
Clear Zone Dist. 30'		Design Speed: 75 mph		
Minimum Sight Dist. for Stopping: NA		Bridges: HL-93		
Full Control of Access, No Point of Access Other Than at Interchange Ramps				
Pavement Design Life (years) NA				
Design Accumulated One-way ESALs: NA				

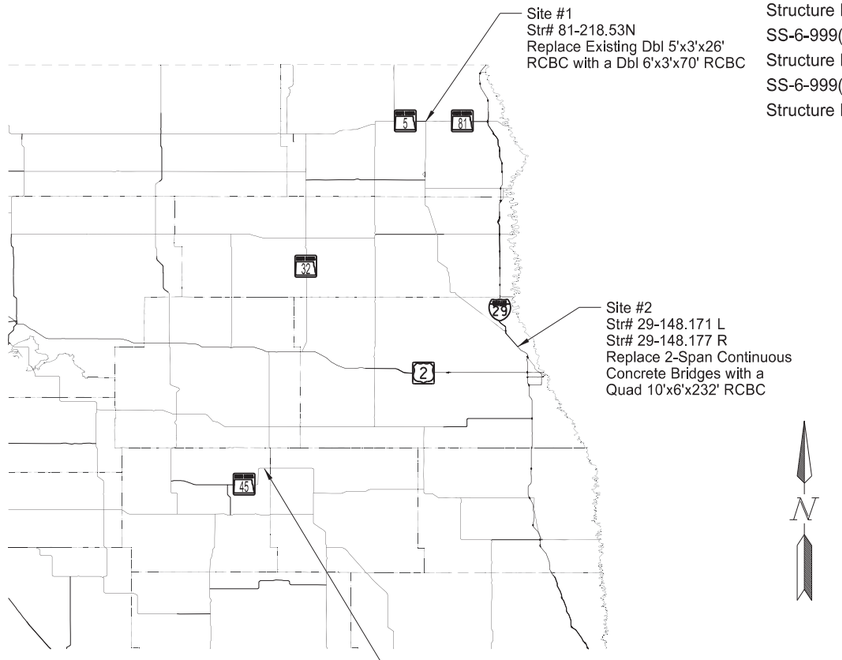
DESIGN DATA - ND 45				
Traffic	Average Daily			
Current 2021	Pass: NA	Trucks: NA	Total: 370	
Forecast 2041	Pass: NA	Trucks: NA	Total: 465	
Clear Zone Distance: 26'		Design Speed: 65 mph		
Minimum Sight Dist. for Stopping: NA		Bridges: NA		
Sight Dist. for No Passing Zone: NA				
Pavement Design Life (years) NA				
Design Accumulated One-way ESALs: NA				

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	23343	1	1

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

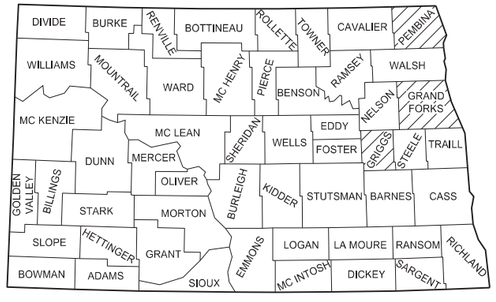
SS-6-999(050)

GF District
Various Locations
Structure Replacement



GOVERNING SPECIFICATIONS	Date Published and Adopted by the North Dakota Department of Transportation
Standard Specifications	4/1/2023
Supplemental Specifications	NONE

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
SS-6-999(050) - Site #1 Structure Replacement	.02	.02
SS-6-999(050) - Site #2 Structure Replacement	.62	.62
SS-6-999(050) - Site #3 Structure Replacement	.38	.38



STATE COUNTY MAP

DESIGNER
Gayle Cox, PE
DESIGNER
Daniel Duppong
DESIGNER
Lane Herbert

ND DEPARTMENT OF TRANSPORTATION
OFFICE OF PROJECT DEVELOPMENT
Thorenson, Jason R.
09/06/23

BROSZ ENGINEERING, INC.
REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	2	1

TABLE OF CONTENTS

PLAN SECTIONS

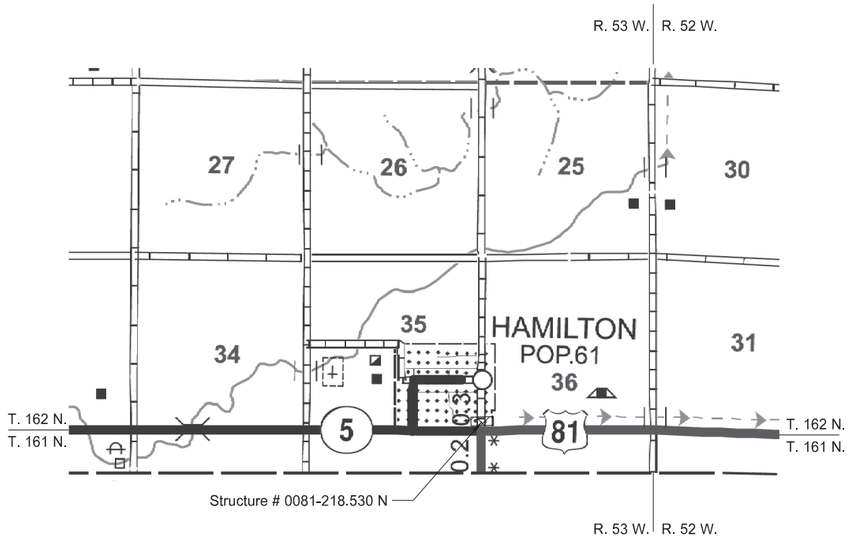
SPECIAL PROVISIONS

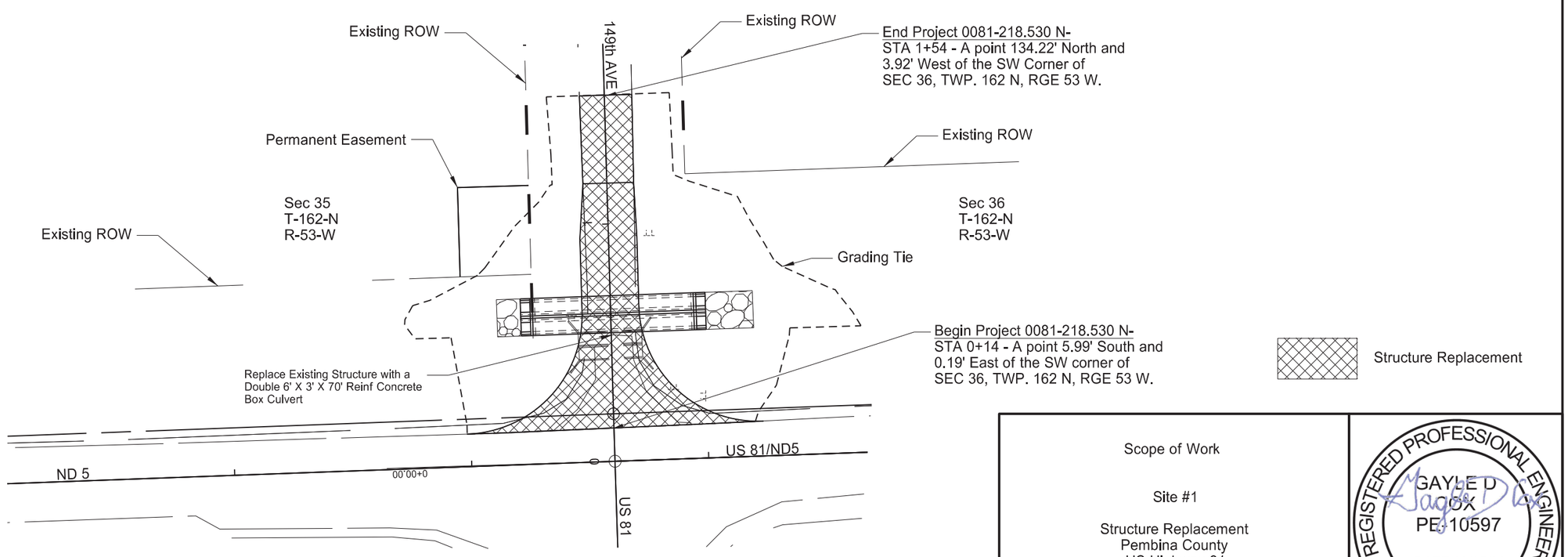
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	2	2

TABLE OF CONTENTS

LIST OF STANDARD DRAWINGS

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	4	1





Scope of Work

Site #1

Structure Replacement
Pembina County
US Highway 81
JCT US 81 & ND 5
Str# 81-218.530N

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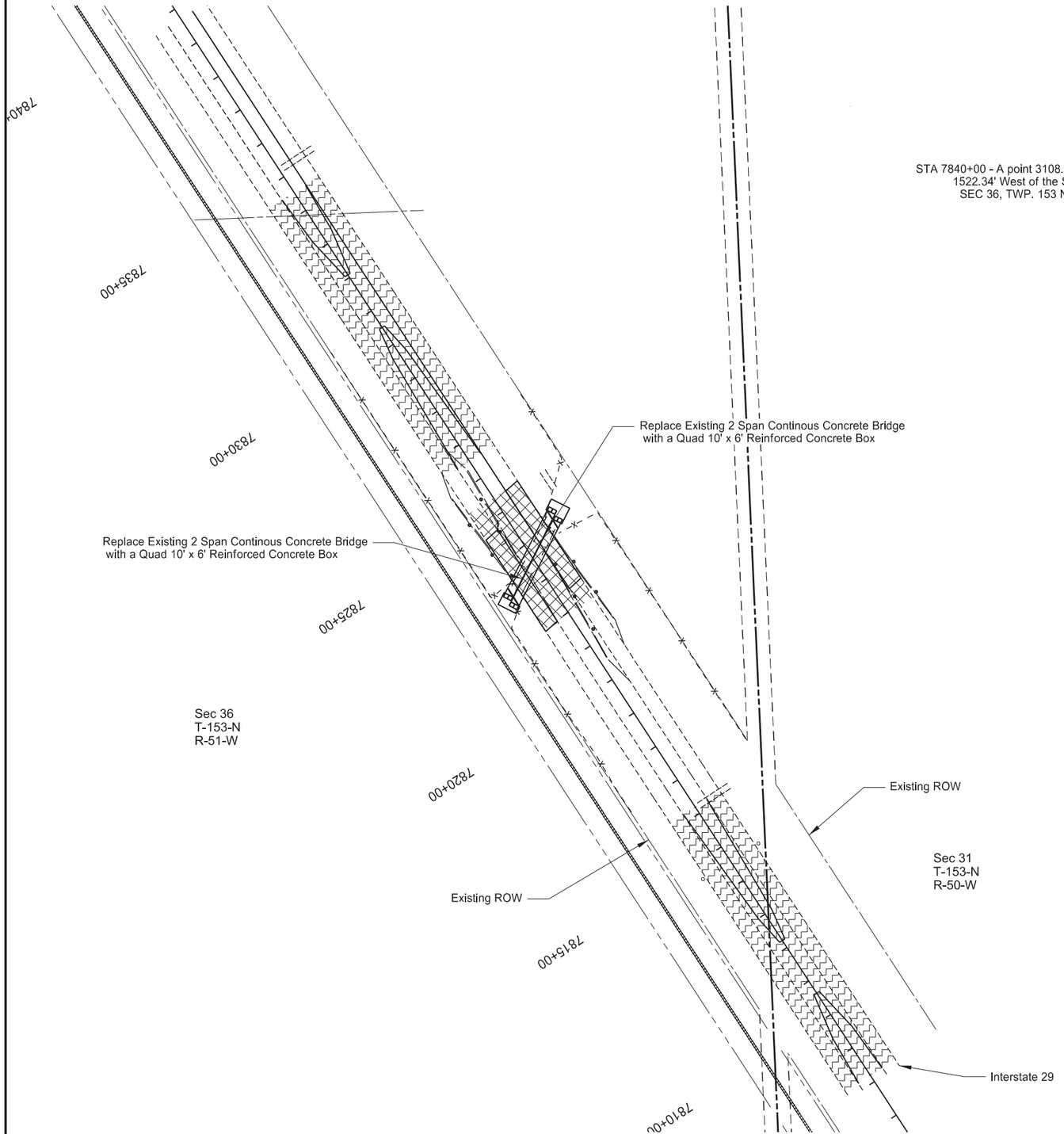
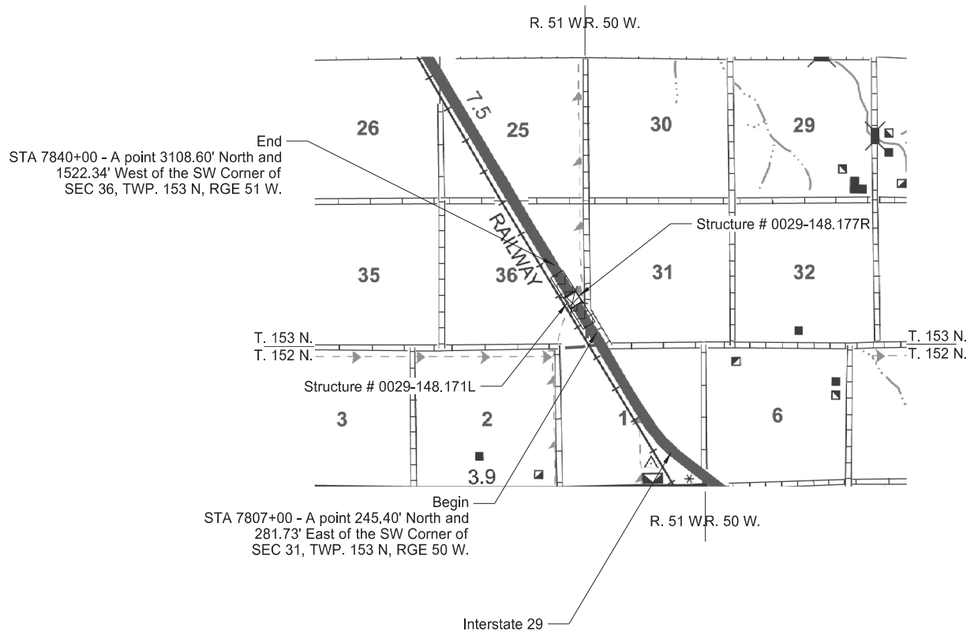
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	4	2





Structure Replacement

Median Crossover

Scope of Work

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

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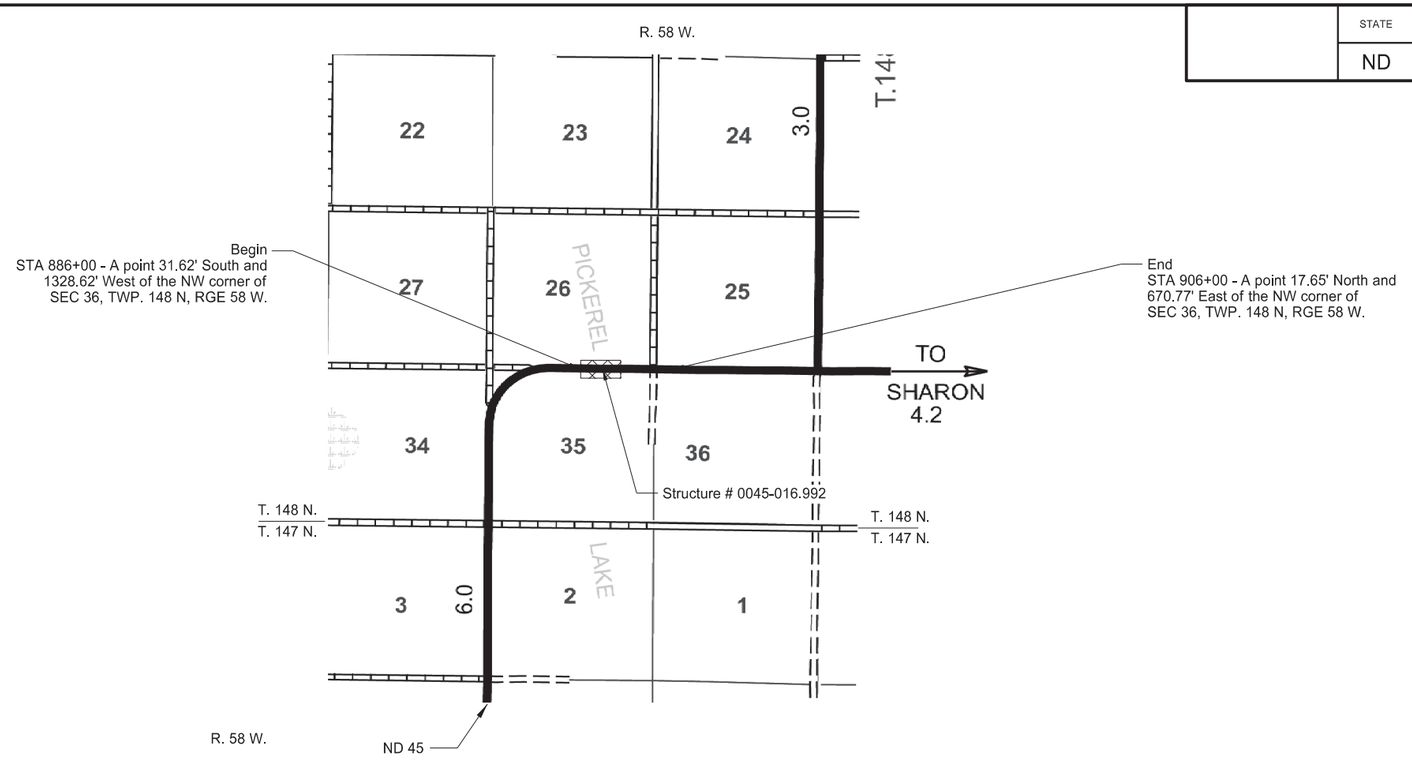
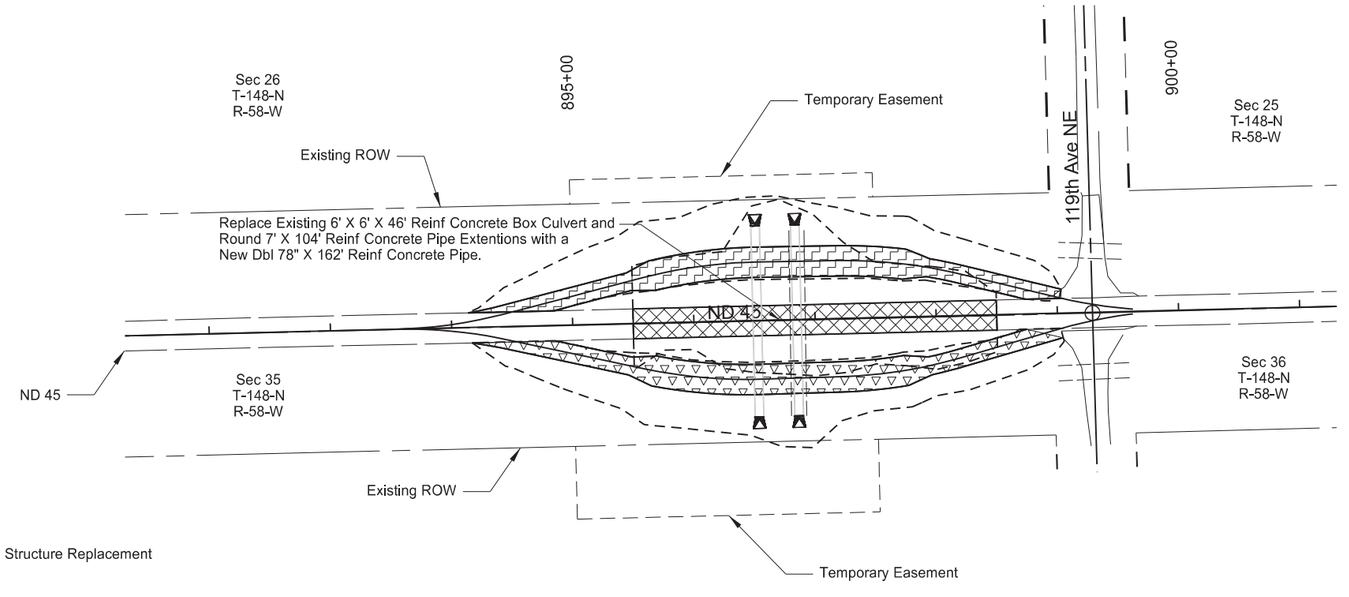
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	4	3





Structure Replacement

North Bypass

South Bypass

Scope of Work

Site #3

Structure Replacement
Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	6	1

NOTES

100-P01 COORDINATION OF PROJECTS: One project is in the vicinity of this project and will be under contract during the 2024 construction season. The project is IM-6-029(173)147 located from RP 147.226 to RP 161.700 NB only.

100-P02 COORDINATION OF WORK – SITE #1: Contact the Hamilton City Auditor, Kathy Brooks (701)-520-2233 at least 7 days in advance of construction.

No work is allowed to occur during the Pembina County Fair at Site #1 which is anticipated to take place between July 3rd to July 6th, 2024. 149th Ave NE shall remain open during the entirety of the fair.

No work is allowed to occur at Site #1 during beet harvest. Typical dates for the beet harvest are October 1st to October 15th. 149th Ave NE shall remain open during the entirety of the sugar beet harvest.

105-200 UTILITY COORDINATION: A utility coordination meeting is required.

107-P01 DETOUR – SITE #1: Follow the requirements of Haul Road for the detour on Site #1, which consists of Page Avenue and 5th Street.

108-100 WEEKLY PLANNING & REPORTING MEETING: A weekly planning and reporting meeting is required.

202-P01 REMOVAL OF PAVEMENT: Removal of concrete pavement and bituminous surfacing includes removal of existing concrete, asphalt, and aggregate as shown in the existing typical sections in Section 30.

202-P02 REMOVAL OF TEMPORARY BYPASS: Include removal of embankment, pipe conduit, regrading, removal of asphalt pavement and removal of base course material in the price bid for “Removal of Temporary Bypass.”

202-P03 REMOVAL OF STRUCTURE – SITE 3: The existing structure is a single 6’ x 6’ x 46’ reinforced concrete box culvert.

The bid item “REMOVAL OF STRUCTURE” includes all work required to remove all structure components.

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

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

302-110 BASE COURSE: Trim base course as specified in Section 302.04 C.2, “Surface Tolerance Type B”.

302-P01 TRAFFIC SERVICE AGGREGATE: Traffic Service Aggregate will consist of class 13 aggregate as defined in Section 816.02.

302-P02 TRAFFIC SERVICE AGGREGATE MAINTENANCE: Use a blade to maintain a smooth and compacted surface on the temporary bypass at all times. Provide dust control as necessary utilizing water or similar methods. Include all costs for maintenance in the contract unit price for “Traffic Service Aggregate”.

704-100 TRAFFIC CONTROL SUPERVISOR: Provide a Traffic Control Supervisor.

704-200 STATE FURNISHED MEDIAN BARRIER:

Site #2

Obtain (119) 2.5’ x 10’ concrete barriers. They can be picked up and returned to the Grand Forks District yard at 1951 N Washington St. in Grand Forks, ND 58201. Contact Jesse Kadrmas at the Grand Forks District office at 701-787-6500 to facilitate the exchanges.

Section 704.04 J “Precast Concrete Median Barrier (State Furnished)” applies to the contract item “State Furnished Median Barrier”.

If returning barriers with connection components, coordinate the delivery location for the connecting components with the Engineer. Some 4 inch x 4 inch boards are available at the return location. Provide any additional 4 inch x 4 inch boards necessary to stack barriers. The boards will become property of the Department.

Payment for the State Furnished Median Barrier will follow Section 704.06 D “Precast Concrete Median Barrier (State Furnished)”. Include all costs associated with median barriers in the contract unit price for “State Furnished Median Barrier”.

Site #3

Obtain (36) 2.5’ x 10’ concrete barriers. They can be picked up and returned to the Grand Forks District yard at 1951 N Washington St. in Grand Forks, ND 58201. Contact the Grand Forks District office at 701-787-6500 to facilitate the exchanges.

Section 704.04 J “Precast Concrete Median Barrier (State Furnished)” applies to the contract item “State Furnished Median Barrier”.

If returning barriers with connection components, coordinate the delivery location for the connecting components with the Engineer. Some 4 inch x 4 inch boards are available at the return location. Provide any additional 4 inch x 4 inch boards necessary to stack barriers. The boards will become property of the Department.

Payment for the State Furnished Median Barrier will follow Section 704.06 D “Precast Concrete Median Barrier (State Furnished)”. Include all costs associated with median barriers in the contract unit price for “State Furnished Median Barrier”.

704-300 FLASHING BEACON: Provide solar powered flashing beacons that meet the requirements of the MUTCD and ITE. Provide beacons that are visible for a distance of 0.25 miles (1,320 feet) and are capable of operating for 20 days without a solar charge.

Include all costs for materials, equipment, labor, and incidentals in the contract unit price for "Flashing Beacon".

704-301 SEQUENCING ARROW PANEL – TYPE C – CROSSOVER: Provide solar powered arrow panels that meet the requirements of the MUTCD and ITE and that are capable of operating for 20 days without a solar charge.

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

NOTES

Include all costs for materials, equipment, labor, and incidentals in the contract unit price for "Sequencing Arrow Panel – Type C – Crossover".

704-450 LANE CLOSURE – SIGNAL CONTROL/FLAGGING CONTROL: Install either the signal controlled lane closure on Standard D-704-16 or the flagging controlled lane closure on Standard D-704-17.

Obtain an electrical source for traffic signals. Solar powered signals may be used. Place generators a minimum of 60 feet from the roadway centerline, unless the generator and signal are part of a trailer mounted unit.

Place utility poles and equipment a minimum of 60 feet from the roadway centerline and place power conductors a minimum of 6 inches below the ground surface. Remove poles after they are no longer necessary.

The Engineer will measure individual traffic control devices, other than the signal system and flaggers, shown on the standards. Payment will be made at the respective contract unit price.

Include the cost of either a traffic signal system or flaggers in the contract unit price for “Lane Closure – Signal Control/Flagging Control”.

704-510 OBLITERATION OF PAVEMENT MARKINGS: Masking of pavement markings designated for obliteration is allowed. Choose to remove or mask marking as specified in Section 704.04 N, "Obliteration of Pavement Markings".

704-P01 TRAFFIC CONTROL: The traffic control devices list has been developed using the layouts shown in the plans and the following layouts shown on the Standard Drawings. The traffic control devices will comply with the following Standard Drawings:
D-704-16 Lane Closure on a Two Lane Road Using Traffic Control Signals
D-704-17 Sign Layout for One Lane Closure Two Lane Roadway
D-704-23, Type Q Short Term Urban Detour (Site 1)
D-704-24, Type R, Type U Shoulder Work
D-704-35 Sign Layout for One Lane Closure – Interstate System

704-P02 TRAFFIC CONTROL PHASING: The traffic control details, as indicated on the plans, have been developed on the basis that this project will be constructed in phases as described below. The work zone traffic control summary lists include the required number of devices for each described work area. Devices have been included for all 3 sites to be worked on concurrently. Remove and reset devices for each phase of construction. The costs associated with removing and resetting traffic control devices is included in the bid price for “Traffic Control Signs”.

The construction phasing plan is listed below. Only one phase may be active at a time and each phase must be completed before proceeding to the next phase unless otherwise specified. If electing to utilize a different phasing plan, submit a detailed traffic control plan to the Engineer for approval a minimum of 14 days prior to installing traffic control devices.

Site #2

Phase 1: Close interior lanes on northbound and southbound I-29.
- Install signs and devices in accordance with Standard D-704-35 and the work zone traffic control layout sheets in Section 100.
- Construct median crossovers
- Construct temporary guardrail

Phase 2: Close northbound I-29 lanes and divert traffic to southbound I-29 lanes.
- 30 consecutive working days will be allowed for head-to-head traffic operation on the southbound roadway. Working days will be counted as provided by Standard Specification 108.06, except Saturdays will be counted as a working day.
- Install signs and devices in accordance with Standard D-704-35 and the work zone traffic control layout sheets in Section 100.
- Remove existing structure and pavement on northbound I-29.
- Construct east half of the reinforced concrete box culvert and northbound roadway.

Phase 3: Close interior lanes on northbound and southbound I-29.
- Install signs and devices in accordance with Standard D-704-35 and the work zone traffic control layout sheets in Section 100.
- Install traffic control for Phase 4

Phase 4: Close southbound I-29 lanes and divert traffic to northbound I-29 lanes.
- 30 consecutive working days will be allowed for head-to-head traffic operation on the northbound roadway. Working days will be counted as provided by Standard Specification 108.06, except Saturdays will be counted as a working day.
- Install signs and devices in accordance with Standard D-704-35 and the work zone traffic control layout sheets in Section 100.
- Remove existing structure and pavement on southbound I-29.
- Construct west half of the reinforced concrete box culvert and southbound roadway.

Phase 5: Close interior lanes on northbound and southbound I-29.
- Install signs and devices in accordance with Standard D-704-35 and the work zone traffic control layout sheets in Section 100.
- Complete median grading
- Remove median crossovers

Site #3

Phase 1: Close westbound shoulder on ND 45
- Install signs and devices in accordance with Standard D-704-24, type R and the work zone traffic control layout sheets in Section 100.
- Construct northern temporary bypass
- Install temporary 84” pipe extensions to the north side of the existing culvert to provide temporary extension.

Phase 2: Place traffic on the northern temporary bypass
- Install signs and devices in accordance with Standard D-704-16 and the work zone traffic control layout sheets in Section 100.
- Remove existing pavement.
- Install temporary 84” pipe extensions to the south side of the existing culvert to provide temporary extension.
- Construct the south half of the permanent 78” reinforced concrete pipe at Station 896+53. Place temporary pipe extensions as detailed in Section 51.

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

NOTES

- Construct southern temporary bypass

Phase 3: Place traffic on the southern temporary bypass
- Install signs and devices in accordance with Standard D-704-16 and the work zone traffic control layout sheets in Section 100.
- Construct the north half of the 78” reinforced concrete pipe at Station 896+53. Place temporary pipe extensions as detailed in Section 51
- Construct temporary stream diversion utilizing pipe at Station 896+53.

Phase 4: Place traffic on the northern temporary bypass
- Install signs and devices in accordance with Standard D-704-16 and the work zone traffic control layout sheets in Section 100.
- Remove the south half of the existing structure and pipe.
- Construct the south half of the permanent 78” reinforced concrete pipe at Station 896+86. Place temporary pipe extensions as detailed in Section 51
- Dewater existing scour hole and then place embankment material to repair scour hole. Place erosion control blanket once the area has been repaired.

Phase 5: Place traffic on the southern temporary bypass
- Install signs and devices in accordance with Standard D-704-16 and the work zone traffic control layout sheets in Section 100.
- Remove the north half of the existing structure and pipe.
- Construct the north half of the permanent 78” reinforced concrete pipe at Station 896+86.
- Remove temporary stream diversion
- Remove the 78” temporary pipe extension at Station 896+53 and install flared end section.
- Remove northern temporary bypass.
- Install aggregate and asphalt for the roadway.

Phase 6: Close eastbound shoulder on ND 45
- Install signs and devices in accordance with Standard D-704-24, Type R and the work zone traffic control layout sheets in Section 100.
- Remove the 78” temporary pipe extension at Station 896+53 and install flared end section.
- Remove the southern temporary bypass

706-P01 FIELD OFFICE: Provide a field office which meets the following requirements:

1. Be completely insulated and weather tight.
2. Minimum total area of 450 square feet.
3. Indoor bathroom facilities, sewer and potable water.
4. Have a dependable source of electricity for power and lights with a minimum of 6 electrical outlets spaced throughout the building and light fixtures spaced to uniformly light the entire interior (lumens required 110 foot-candles).
5. Be wired for DSL Broadband internet with wireless Wi-Fi and have the capability to allow for hard wiring the computer. Include the cost of the installation and monthly fees.
6. A heating and cooling system that is capable of maintaining the temperature between 65°F and 78°F year around.
7. A minimum of 3 desks and 3 desk chairs, 3 extra chairs, a drawer file cabinet with at least two drawers, one table minimum of 2.5 ft x 5 ft.
8. Photocopy machine/Printer capable of 11x17 photocopies/prints and toner to last the duration of the project. Engineer will provide paper. Other features to include digital coping & scanning. (Fax capabilities can be included but not necessary).
9. The location of the field office will be on, or as close to the project as possible on Site #3 and approved by the Engineer. Any rental fees will be paid by the Contractor.
10. Make the field office available for occupancy one week before the start of the project and remain through project completion.
11. Heat, electric, internet service, sewer, and water hookups to be furnished by Contractor, Contractor to pay utility bills.

All requirements of the Field Office are subject to approval by the Engineer. Include the costs for the field office in the bid item "Field Office" and the Schedule for Payment is as follows:

- 25% when set up on site.
- 50% when 30% of the work is complete.
- 75% when 60% of the work is complete.
- 100% when project is complete.

706-P01 AGGREGATE LABORATORY: Provide an aggregate laboratory as close to the project as possible on Site #3 with the approval of the Engineer.

752-P01 FENCING: Place Temporary/permanent fencing prior to removing existing fencing. Temporary fencing will consist of 3-strand barbed wire and will be placed around temporary construction easements where existing fence is removed until permanent fencing is in place. The cost to install and remove temporary fencing will be included in the price bid for “Temporary Fence.” With the approval of the Engineer, field fit temporary fencing in areas of deep draws and wooded areas. Verify the need for temporary fencing with the property owner/tenant.

762-050 PAVEMENT MARKING: If the Engineer and Contractor agree, plan quantity will be used as the measurement for payment for pavement marking items.

764-P01 W-BEAM GUARDRAIL: Deliver the removed guardrail materials deemed salvageable by the Engineer to the NDDOT Maintenance Storage Yard in Grand Forks, and neatly stack them at a location designated by the Engineer. The address of the NDDOT Storage Yard is:

Grand Forks District
1951 N Washington St.
Grand Forks, ND.

Include all costs to remove and deliver guardrail materials in the contract unit price for the “Remove W-Beam Guardrail & Posts” and “Remove End Treatment & Transition”.

764-P02 W-BEAM GUARDRAIL END TERMINALS FOR TWO-WAY TRAFFIC: Two W-beam guardrail end terminals are required for protection on the SB bridge during two-way traffic operation.

For Phase 1, install a thrie beam terminal connector, a 12’-6” thrie beam section (double thickness), two 12’-6” W-beam rail sections, and a W-beam guardrail end terminal, at each corner, as shown in the plans.

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	6	4

NOTES

The W-beam guardrail end terminals and additional guardrail materials, required for two-way traffic will remain the property of the contractor and be removed when no longer needed for two-way traffic operation. The W-beam guardrail end terminals will be measured and paid for by number of W-beam guardrail end terminals required and accepted by the engineer and include all materials, including single slope to thrie beam connector plates, thrie beam teriminal connectors, W-beam terminal connectors, thrie beam rail sections, thrie to W-beam rail transition sections, W-beam rail sections, and all necessary posts, blocks, hardware, equipment, and labor.

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	6	5

ENVIRONMENTAL NOTES

ENVIRONMENTAL NOTES (EN): The North Dakota Department of Transportation and the Federal Highway Administration *has* made environmental commitments to secure approval of this project. The following environmental notes are requirements to comply with these commitments:

EN-1 AQUATIC NUISANCE SPECIES (ANS): Equipment that was last used outside of North Dakota or within a Class I infested waterbody (identified on the North Dakota Game and Fish Department (NDGFD) website) requires an inspection by NDGFD. Notify the NDGFD at least 10 business days prior to pumps, watercraft, or any equipment entering a public water to allow the NDGFD sufficient time to inspect any and all such equipment for ANS. Contact the NDGFD ANS Coordinator, Ben Holen by e-mail - bholen@nd.gov for equipment inspections. Supply one of the following to the engineer as proof of compliance prior to work taking place in the water: (1) the NDGFD inspection report, (2) documented NDGFD correspondence (email or signed letter).

EN-2 TEMPORARY WETLAND IMPACT: Temporary impact areas within wetlands and or other waters are incorporated into the plans for this project. Remove temporary fill placed and sedimentation in wetlands or other waters. Restore these wetlands to preconstruction contours.

EN-3 AQUATIC ORGANISM PASSAGE: The inverts of pipe at Site #3, Structure #45-016.992, shall be set one foot below the existing grade of the stream channel to accommodate aquatic organism movements through the pipe.

REGISTERED PROFESSIONAL ENGINEER
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PE-10597
DATE 09/06/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	8	1

Estimated Quantities

SPEC	CODE	ITEM DESCRIPTION	UNIT	SITE 1	SITE 2	SITE 3		TOTAL
103	0100	CONTRACT BOND	L SUM	0.34	0.33	0.33		1
202	0104	REMOVAL OF STRUCTURE	EA	1	2	1		4
202	0114	REMOVAL OF CONCRETE PAVEMENT	SY		2862			2862
202	0132	REMOVAL OF BITUMINOUS SURFACING	SY	112	641	1100		1853
202	0174	REMOVAL OF PIPE ALL TYPES AND SIZES	LF			190		190
202	0312	REMOVE EXISTING FENCE	LF		409	975		1384
202	0350	REMOVAL OF TEMPORARY BYPASS	EA		2	2		4
203	0101	COMMON EXCAVATION-TYPE A	CY	234	1051	13		1298
203	0109	TOPSOIL	CY	200	2814	1022		4036
203	0140	BORROW-EXCAVATION	CY	238	3832	8254		12324
210	0050	BOX CULVERT EXCAVATION	EA	1	1			2
210	0210	FOUNDATION FILL	CY	705	5933			6638
210	0405	FOUNDATION PREPARATION-BOX CULVERT	EA	1	1			2
216	0100	WATER	M GAL	40	421	108		569
251	0200	SEEDING CLASS II	ACRE	0.26	2	2.31		4.57
251	2000	TEMPORARY COVER CROP	ACRE	0.26	2	2.31		4.57
253	0101	STRAW MULCH	ACRE	0.52	4	4.62		9.14
255	0102	ECB TYPE 2	SY			361		361
256	0200	RIPRAP GRADE II	CY	35	129			164
261	0112	FIBER ROLLS 12IN	LF	908	6237	3455		10600
261	0113	REMOVE FIBER ROLLS 12IN	LF	504	2722	1655		4881
262	0100	FLOTATION SILT CURTAIN	LF	27	43	113		183
262	0101	REMOVE FLOTATION SILT CURTAIN	LF	27	43	113		183
302	0050	TRAFFIC SERVICE AGGREGATE	TON			730		730
302	0120	AGGREGATE BASE COURSE CL 5	TON	218	6785	225		7228
430	0500	COMMERCIAL GRADE HOT MIX ASPHALT	TON	85	1869	461		2415
550	0305	9IN NON-REINF CONCRETE PVMT CL AE-DOWELED	SY		672			672
550	0310	10IN NON REINF CONCRETE PVMT CL AE-DOWELED	SY		1024			1024
606	0603	6FT X 3FT PRECAST RCB CULVERT	LF	140				140
606	3006	DBL 10FT X 6FT PRECAST RCB CULVERT	LF		464			464
606	4603	6FT X 3FT PRECAST RCB END SECTION	EA	4				4
606	7006	DBL 10FT X 6FT PRECAST RCB END SECTION	EA		4			4
624	3005	CONNECTION PLATE MODIFICATION	EA		1			1
702	0100	MOBILIZATION	L SUM	0.34	0.33	0.33		1
704	1000	TRAFFIC CONTROL SIGNS	UNIT	600	1986	850		3436
704	1018	LANE CLOSURE-SIGNAL CONTROL/FLAGGING CONTROL	EA			1		1
704	1036	ATTENUATION DEVICE-TYPE B-30	EA			4		4
704	1045	ATTENUATION DEVICE-TYPE B-75	EA		4			4
704	1052	TYPE III BARRICADE	EA	7	7	10		24
704	1060	DELINEATOR DRUMS	EA	8	54	12		74
704	1067	TUBULAR MARKERS	EA	28	64			92
704	1072	FLEXIBLE DELINEATORS	EA		41			41
704	1080	STACKABLE VERTICAL PANELS	EA			55		55
704	1081	VERTICAL PANELS-BACK TO BACK	EA		6			6
704	1088	SEQUENCING ARROW PANEL-TYPE C-CROSSOVER	EA		2			2
704	1500	OBLITERATION OF PAVEMENT MARKING	SF		1370			1370
704	3511	STATE FURNISHED MEDIAN BARRIER	LF		1190	360		1550

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	8	2

Estimated Quantities

SPEC	CODE	ITEM DESCRIPTION	UNIT	SITE 1	SITE 2	SITE 3		TOTAL
704	8015	VEHICLE SPEED FEEDBACK SIGN	EA		1			1
706	0400	FIELD OFFICE	EA			1		1
706	0500	AGGREGATE LABORATORY	EA			1		1
709	0100	GEOSYNTHETIC MATERIAL TYPE G	SY	179	7033			7212
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	92	1515			1607
714	4100	PIPE CONDUIT 18IN	LF		1008			1008
714	4150	PIPE CONDUIT 78IN	LF			358		358
714	4155	PIPE CONDUIT 84IN	LF			26		26
714	9660	REMOVE & RELAY END SECTION-ALL TYPE & SIZES	EA			2		2
720	0110	RIGHT OF WAY MARKERS	EA	3				3
720	0130	IRON PIN R/W MONUMENTS	EA	3				3
752	0320	FENCE BARBED WIRE 4 STRAND-STEEL POST	LF		290	951		1241
752	0905	TEMPORARY FENCE	LF		253	660		913
752	3150	CORNER ASSEMBLY BARBED WIRE-WOOD POST	EA		4	4		8
754	0110	FLAT SHEET FOR SIGNS-TYPE XI REFL SHEETING	SF	13				13
754	0112	FLAT SHEET FOR SIGNS-TYPE IV REFL SHEETING	SF	25				25
754	0206	STEEL GALV POSTS-TELESCOPING PERFORATED TUBE	LF	64				64
754	0592	RESET SIGN PANEL	EA	1				1
754	0596	RESET MILE POST	EA			1		1
754	0803	OBJECT MARKERS - TYPE III	EA	4	4			8
754	0805	OBJECT MARKERS - CULVERTS	EA			4		4
760	0021	SINUSOIDAL RUMBLE STRIP - CONCRETE SHOULDER	MILE		0.2			0.2
760	0025	SINUSOIDAL RUMBLE STRIP - ASPHALT SHOULDER	MILE			0.12		0.12
760	0027	SINUSOIDAL RUMBLE STRIP - ASPHALT CENTERLINE	MILE			0.06		0.06
762	0110	EPOXY PVMT MK 4IN LINE-GROOVED	LF		1054			1054
762	0113	EPOXY PVMT MK 4IN LINE	LF			675		675
762	0200	RAISED PAVEMENT MARKERS	EA		2378			2378
762	0430	SHORT TERM 4IN LINE-TYPE NR	LF			150		150
762	1305	PREFORMED PATTERNED PVMT MK 4IN LINE-GROOVED	LF		132			132
764	0145	W-BEAM GUARDRAIL END TERMINAL	EA		2			2
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS	LF			975		975
764	2081	REMOVE END TREATMENT & TRANSITION	EA			6		6
772	2110	FLASHING BEACON-POST MOUNTED	EA		2			2
900	1001	TEMPORARY STREAM DIVERSION - SITE 1	EA	1				1
900	1002	TEMPORARY STREAM DIVERSION - SITE 2	EA		1			1
900	1003	TEMPORARY STREAM DIVERSION - SITE 3	EA			1		1

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	10	1

Basis of Estimate	Unit	Quantity Per
Aggregate Base CL5 @ 1.875 TON/CY	TON	217.8
Commercial Grade Asphalt	TON	84.70
*Asphalt Cement @ 6.0%	TON	5.08
*Tack Coat @0.05 Gal/SY (1st Lift)	Gal	20.60

*Provided for informational purpose, Incidental to Commercial Grade Asphalt

Earthwork Summary						
Location	Common Excavation- Type A (Pay Item)	Box Culvert Excavation (Pay Item)	Embankment Volume	Adjusted Embankment Volume	Borrow - Excavation (Pay Item)	Topsoil (Pay Item)
	CY		CY	CY	CY	CY
	A		B	C = B * 1.25	D = C - A	E
US 81						
Sta 00+14 to 01+54	233.9		684.2	855.3	621.4	199.6
Box Culvert Excavation		383.7			-383.7	
Totals=	**233.9**	**383.7**	**684.2**	**855.3**	**237.7**	**199.6**

REMOVAL OF BITUMINOUS SURFACING			
Sta. 0+14 to 1+54	Area (sf)	Quantity	Unit
Existing Approach Asphalt	1004.5	112	SY
	Total	112	SY

Iron Pin R/W Monuments					
Alignment	Station	Offset	Description	Iron Pin	R/W Marker
EX149	0+79.51	-63.00	R/W	Y	Y
EX149	1+17.21	-63.00	R/W	Y	Y
EX149	1+17.21	-33.00	R/W	Y	Y

216 - 0100 WATER				
Description	Basis	Amount	Unit	Quantity
Dust Pallative	25 M Gal/Mile	0.020	M GAL	0
Aggregate	20 Gal/Ton	1,540	M GAL	31
Embankment	10 Gal/CY	855.3	M GAL	9
			TOTAL:	40

Water
25 Mgal/Mile for Subgrade Preparation
25 Mgal/Mile for Dust Palliative
20 Gal/Ton for Aggregates
10 Gal/CY for Embankment

Basis of Estimate

Site #1

Structure Replacement
Pembina County
US Highway 81
JCT US 81 & ND 5
Str# 81-218.530N

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	10	2

BASIS OF ESTIMATE		I-29 SB			I-29 NB			Crossovers			
		9" Concrete 20" Aggregate Base Course			10" Concrete 4" Aggregate Base Course			6" Commercial Grade Asphalt 18" Aggregate Base			
		Station	Station		Station	Station		Station	Station		
		7821+94	7824+67		7822+51	7825+42		7808+18	7816+20		
								7826+51	7834+53		Mainline
		Total Stations	2.73		Total Stations	2.91		Total Stations	16.04		
Material	**Unit**	Width (ft)	Area (sf)	Quantity per Station	Width (ft)	Area (sf)	Quantity per Station	Width (ft)	Area (sf)	Total Quantity	TOTAL
Aggregate Base CL5 @ 1.875 TON/CY (Based on SF on Typical Sections)	TON	44.66	64.6	448.3	44.66	15.2	105.3	Varies		5255.1	6,785
Commercial Grade Asphalt	Ton							Varies		1868.5	1,868.5
*Asphalt Cement @ 6.0%	Ton							Varies		112.1	112.1
*Tack Coat @ 0.05 Gal/SY (1st Lift)	Gal							Varies		280.3	280.3
*Tack Coat @ 0.05 Gal/SY (2nd Lift)	Gal							Varies		280.3	280.3
Non-Reinforced Concrete Pavement CL AE - Doweled	SY	38.00	22.16	246.2	38.00	31.66	351.8				1695.9
Geosynthetic Material Type G	SY							Varies		5605.4	5605.4

*Provided for informational purpose, Incidental to Commercial Grade Asphalt

Earthwork Summary						
Location	Common Excavation- Type A (Pay Item)	Box Culvert Excavation	Embankment Volume	Adjusted Embankment Volume	Borrow - Excavation (Pay Item)	Topsoil (Pay Item)
	CY	CY	CY	CY	CY	CY
	A		B	C = B * 1.25	D = C - A	E
I-29						
Sta 7821+94 to 7825+42	266.7		1007.3	1259.1	992.4	696.9
Box Culvert Excavation						
Box Culvert		4230.0			-992.4	
South Crossover						
Sta 7808+18 to 7816+20	347.2		2134.4	2668.0	2320.8	1064.5
North Crossover						
Sta 7826+51 to 7834+53	437.3		1559.1	1948.9	1511.6	1053.0
Totals=	**1051.2**	**4230.0**	**4700.8**	**5876.0**	**3832.4**	**2814.4**

216 - 0100 WATER				
Description	Basis	Amount	Unit	Quantity
Dust Pallative	25 M Gal/Mile	0.1	M GAL	3
Subgrade Preparation	25 M Gal/Mile		M GAL	0
Aggregate	20 Gal/Ton	17,999	M GAL	360
Embankment	10 Gal/CY	5876	M GAL	59
			TOTAL:	421

Water
25 Mgal/Mile for Subgrade Preparation
25 Mgal/Mile for Dust Palliative
20 Gal/Ton for Aggregates
10 Gal/CY for Embankment

Basis of Estimate

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	10	3

762 - 0110 EPOXY PVMT MK 4IN LINE-GROOVED				
Yellow Edge Lines	7821+94 LT	7824+30 LT	236	236
	7822+50 RT	7825+41 RT	291	291
White Edge Lines	7821+94 LT	7824+30 LT	236	236
	7822+50 RT	7825+41 RT	291	291
			TOTAL:	**1054**

762 - 1305 PREFORMED PATTERNED PVMT MK 4IN LINE-GROOVED				
Location	Start Station	End Station	Measured Length	Painted Length
White Skips 0.25 ft/ft	7821+94 LT	7824+30 LT	236	59
	7822+50 RT	7825+41 RT	291	73
			TOTAL:	**132**

Rumble Strips I-29			
	Begin Station	End Station	Total (Miles)
Rumble Strips - Concrete Shoulder South Bound	7821+94	7824+30	0.09
Rumble Strips - Concrete Shoulder North Bound	7822+50	7825+41	0.11

Basis of Estimate

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	10	4

BASIS OF ESTIMATE		ND 45			Temporary Bypasses - 15'			Temporary Bypasses - 25'			
		7.5" Commercial Grade Asphalt 3.5" Aggregate Base			6" Traffic Service Aggregate			6" Traffic Service Aggregate			
		Station		Station	Station		Station	Station		Station	
		895+50		898+50	9+52		10+62	10+62		12+89	
					12+89		14+12				
					9+55		10+61	10+61		12+89	
					12+89		14+13				
		Total		3.00	Total		4.63	Total		4.55	
Material	**Unit**	Width (ft)	Area (sf)	Quantity per Station	Width (ft)	Area (sf)	Quantity per Station	Width (ft)	Area (sf)	Quantity per Station	**Mainline** TOTAL
Aggregate Base CL5 @ 1.875 TON/CY (Based on SF on Typical Sections)	TON	36.00	10.8	75.1							225
Traffic Service Aggregate @ 1.875 TON/CY	TON	35.50	10.7		15.00	9.0	62.4	25.00	14.0	96.9	730
Commercial Grade Asphalt	Ton	33.0	20.73	153.6							460.67
*Asphalt Cement @ 6.0%	Ton	33.0	20.73	9.2							27.64
*Tack Coat @ 0.05 Gal/SY (1st Lift)	Gal	32.0		17.8							53.33
*Tack Coat @ 0.05 Gal/SY (2nd Lift)	Gal	28.5		15.8							47.50
*Fog Seal @ 0.05 Gal/SY (Final Lift)	Gal	35.0		19.4							58.33

*Provided for informational purpose, Incidental to Commercial Grade Asphalt.

Earthwork Summary						
Location	Common Excavation- Type A (Pay Item)	Common Excavation- Waste (Pay Item)	Embankment Volume	Adjusted Embankment Volume	Borrow - Excavation (Pay Item)	Topsoil (Pay Item)
	CY		CY	CY	CY	CY
	A		B	C = B * 1.25	D = C - A	E
Mainline EX 45						
Sta 895+50 to 898+50	9.9		439.5	549.4	539.5	407.0
North Temporary Bypass						
Sta 9+52 to 14+12	1.5		3167.8	3959.8	3958.3	260.4
South Temporary Bypass						
Sta 9+55 to 14+13	1.0		2809.4	3511.8	3510.8	354.2
Scour Hole Repair	0					
Sta 896+81 RT			197	245.8	245.8	0
Totals=	**12.4**	**0.0**	**6613.4**	**8266.7**	**8254.3**	**1021.6**

REMOVAL OF BITUMINOUS SURFACING			
Sta. 895+50 to 898+50	Length	Width	SY
Existing Mainline Asphalt	300	33	1100.0

216 - 0100 WATER				
Description	Basis	Amount	Unit	Quantity
Dust Pallative	25 M Gal/Mile	0.231	M GAL	6
Subgrade Preparation	25 M Gal/Mile		M GAL	0
Aggregate	20 Gal/Ton	955	M GAL	19
Embankment	10 Gal/CY	8266.7	M GAL	83
			TOTAL:	108

Water
25 Mgal/Mile for Subgrade Preparation
25 Mgal/Mile for Dust Pallative
20 Gal/Ton for Aggregates
10 Gal/CY for Embankment

Basis of Estimate

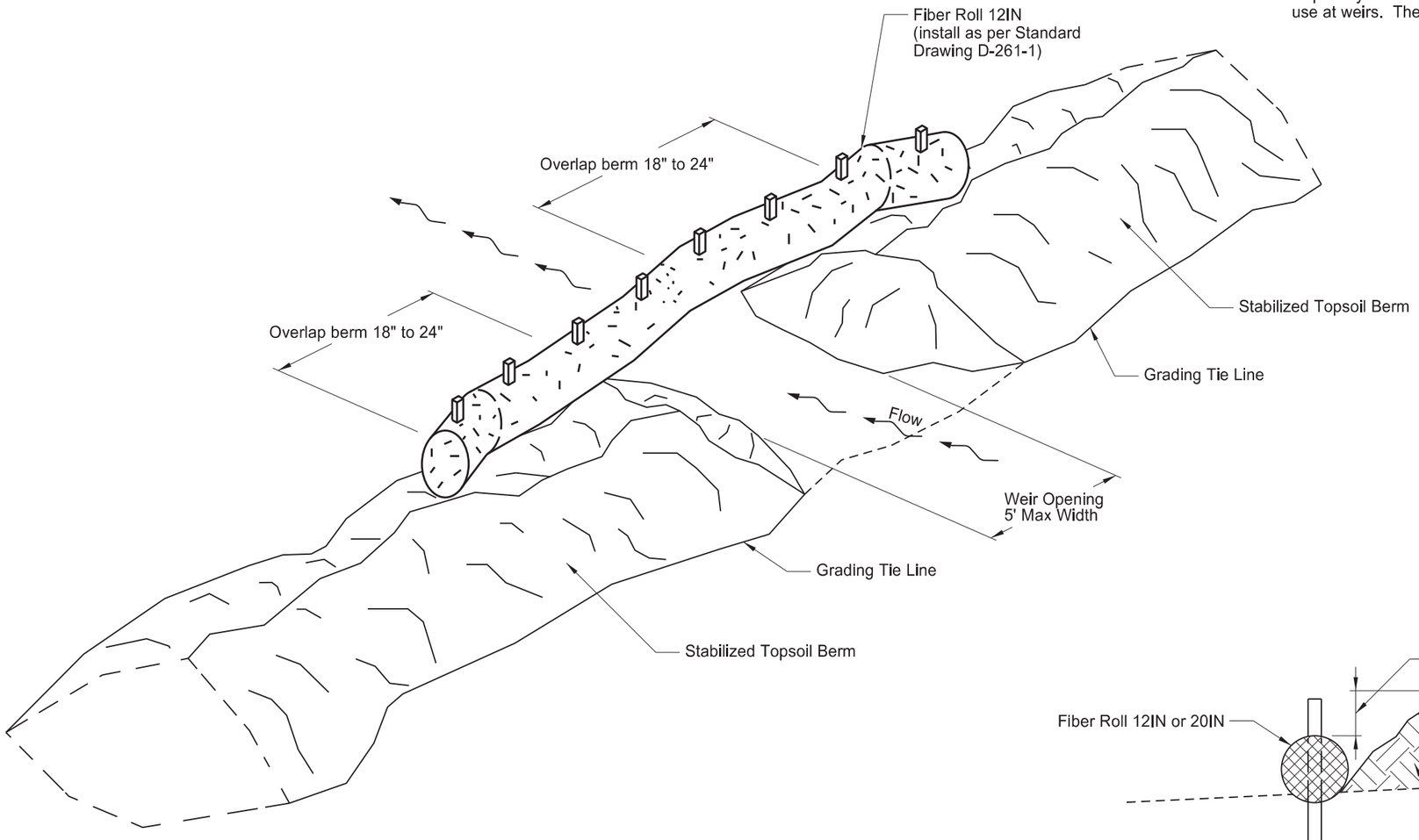
Site #3

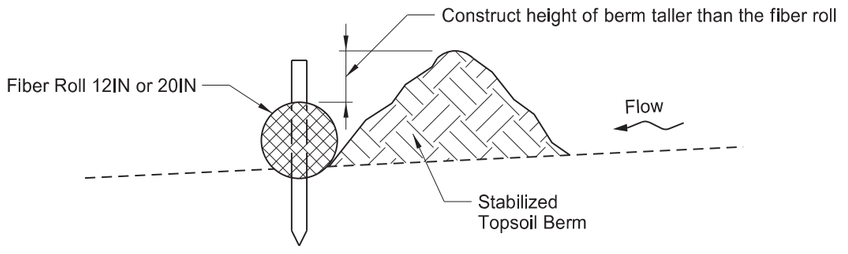
Structure Replacement
Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D. COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	20	1

A quantity of 300 LF of Fiber Roll 12IN has been included in the quantities for use at weirs. The Engineer will measure the actual quantity required in the field.





Topsoil Berm Detail

Notes:

1. Windrow the existing topsoil from the foreslope to create a berm at the grading tie line.
2. Stabilize berms in accordance with the Construction General Permit.
3. Place weirs intermittently throughout the length of the berm to allow stormwater to drain through the berm.
4. Avoid placing weirs adjacent to waterbodies.
5. Install fiber rolls as the weirs are created in the topsoil berm.
6. Include costs to create, stabilize, maintain, and dismantle the berm in the unit price bid for "Topsoil".
7. Include costs for fiber rolls in the unit price bid for "Fiber Rolls 12IN".

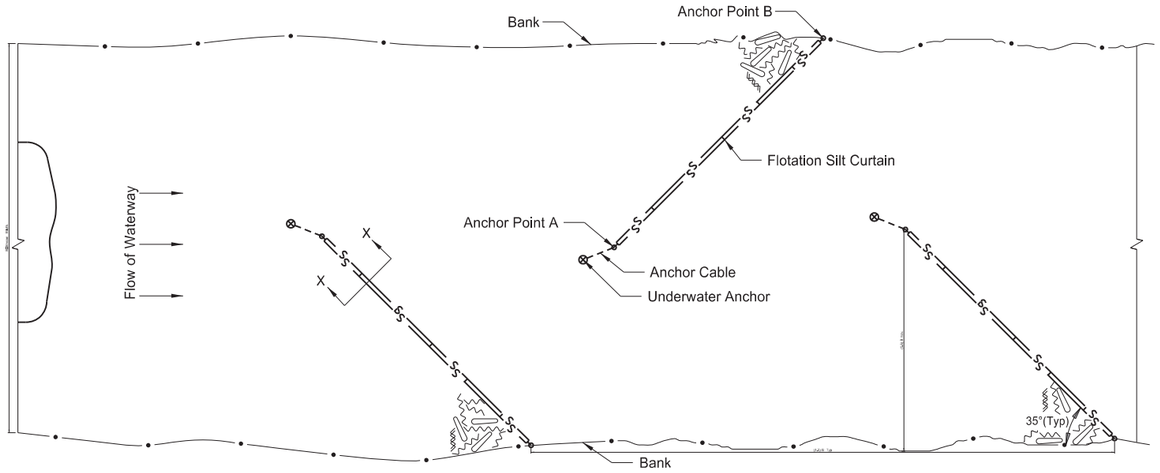
Temporary Topsoil Berm and Weir Detail

Structure Replacement

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	20	2

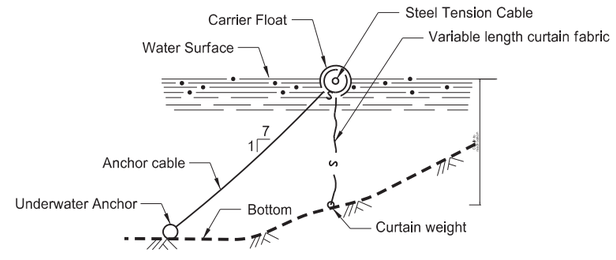
TYPICAL INSTALLATIONS
May vary with conditions



PLAN VIEW

FLOTATION SILT CURTAIN - TYPE HERRING BONE PATTERN

DESIGN GUIDELINES:
When temporary work encroaches more than ⅓ width of the stream
Or where stream width doesn't allow use of Type Moving Water



SECTION X-X
FLOTATION SILT CURTAINS

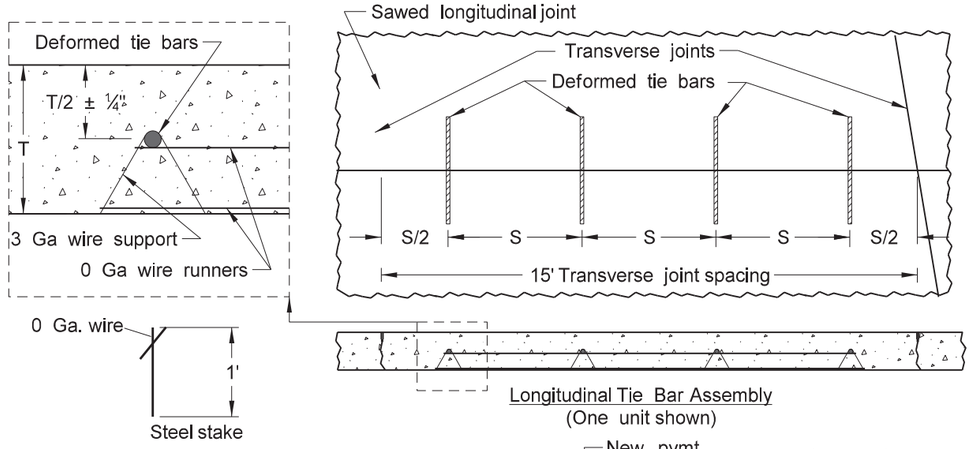
Note:
Maximum water velocity for moving water = 5 ft/sec

Temporary Erosion Control - Flotation Silt Curtain

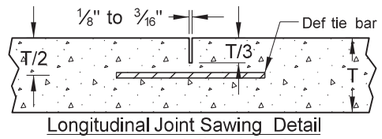
Structure Replacement

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

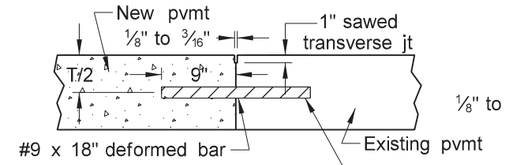
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	20	3



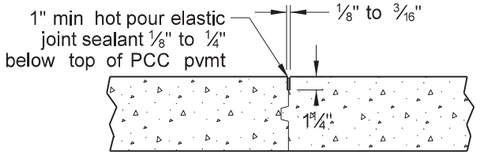
Longitudinal Tie Bar Assembly
(One unit shown)



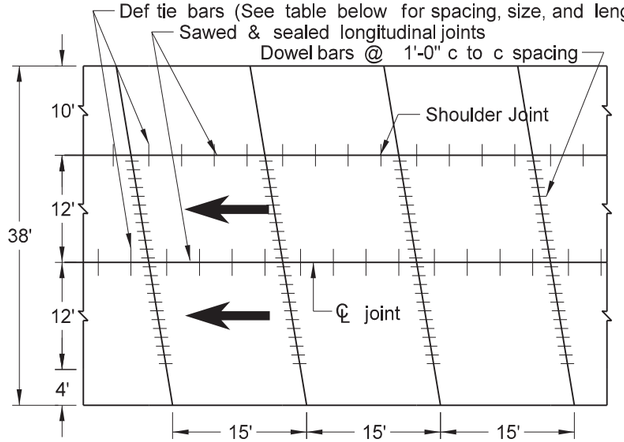
Longitudinal Joint Sawing Detail
(sawed and tied joints)



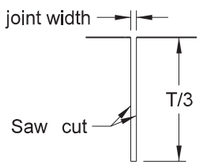
Deformed Bar Installation (2'-0" c to c)
(Transverse Joints)



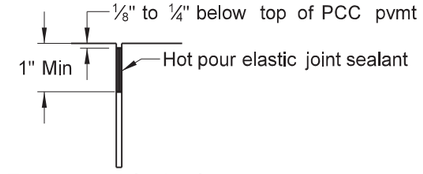
Longitudinal Joint Sealing Detail
(non-tied keyed joints)



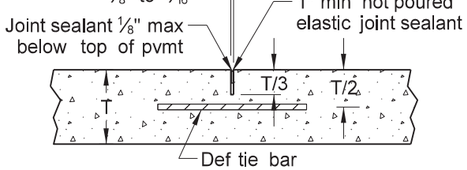
Mainline Joints
15' joint spacing



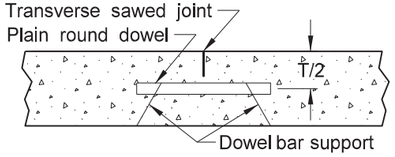
Transverse Joint Sawing



Transverse Joint Sealing



Longitudinal Joint Sealing Detail
(sawed and tied joints)



Doweled Transverse Joint

Notes:

1. S = Tiebar spacing
2. T = Pavement thickness
3. Place dowels in ramp tapers also.
4. Place no tie bar within 15" of a transverse joint.

Transverse Joint Dowel Bars

Joint Location	Dia x Length
ML	1¼" x 18"

	Grade 40 Longitudinal Joint Tie Bars		
PCC Depth	9"	10"	
Mainline Centerline			
Bar Size x Length (S=30")	#5 x 30"		
Bar Size x Length (S=45")	#6 x 36"		
10' Shoulder Joint			
Bar Size x Length (S=30")	#4 x 24"		
Bar Size x Length (S=45")	#5 x 30"		

	Grade 60 Longitudinal Joint Tie Bars		
PCC Depth	9"	10"	
Mainline Centerline			
Bar Size x Length (S=30")	#4 x 36"		
Bar Size x Length (S=45")	#5 x 42"		
10' Shoulder Joint			
Bar Size x Length (S=30")	#3 x 30"		
Bar Size x Length (S=45")	#4 x 36"		

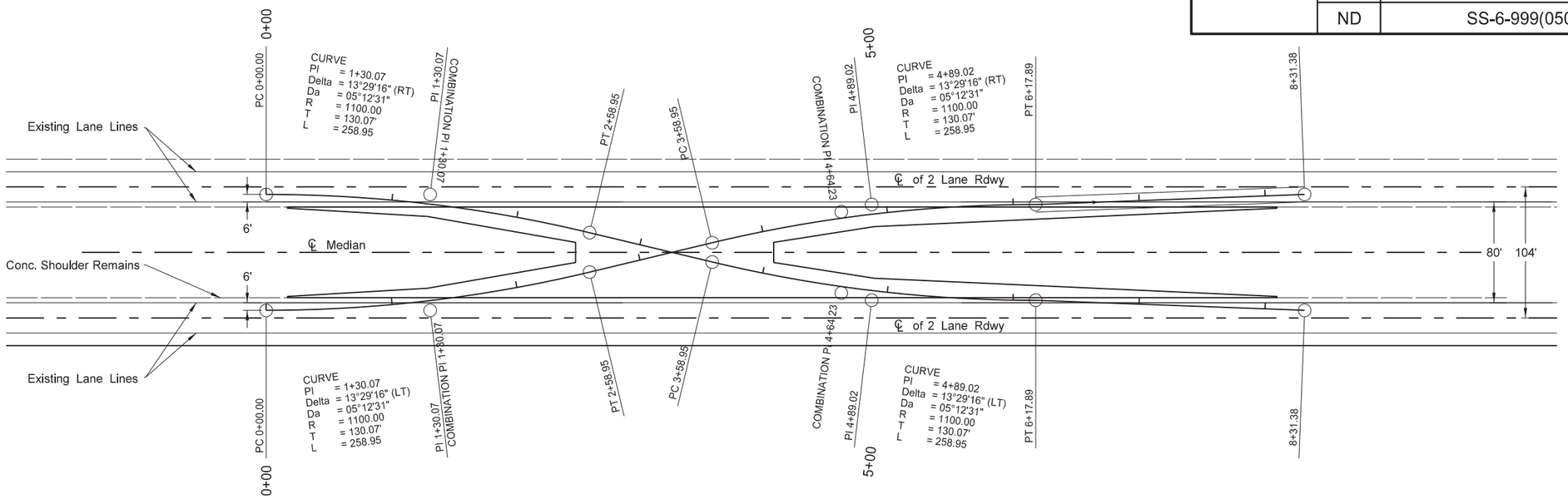
PCC Pavement - Perpendicular Joints @ 15' Spacing
and 10' Wide Full Depth PCC Outside Shoulder

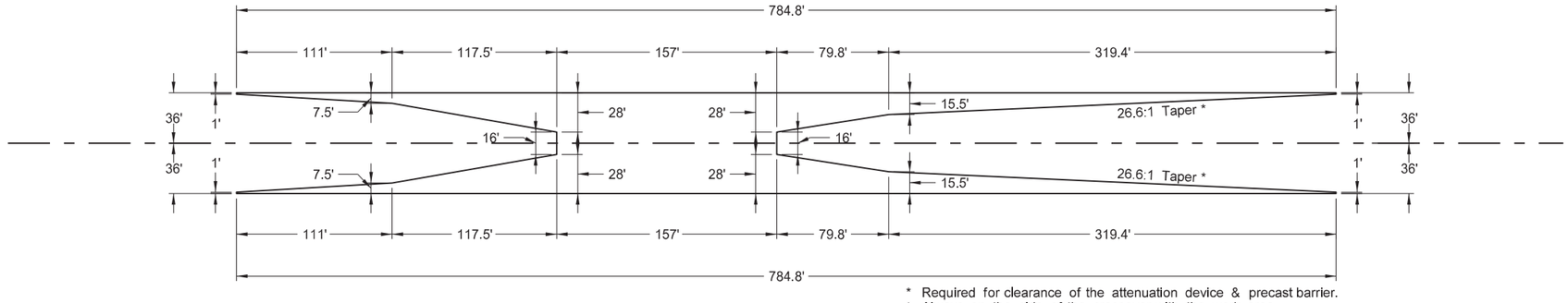
Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D
FOX
PE-10597
DATE 09/05/23
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	20	4





* Required for clearance of the attenuation device & precast barrier.
* Always on the side of the crossover with the work area

Median Crossover Design Speed = 40 MPH
Taper Length $L = WS^2 / 60$

8 | L = 213 / 26.6:1 Taper

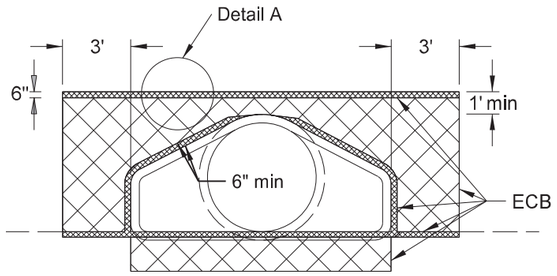
Double Median Crossover
80' Median Width
104' CL to CL

Site #2

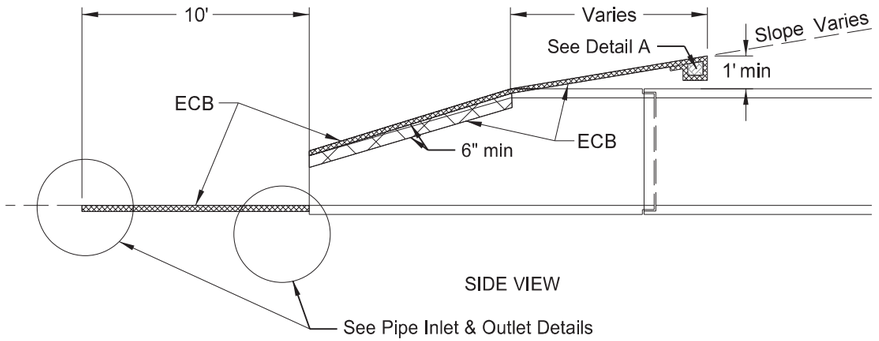
Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	20	5

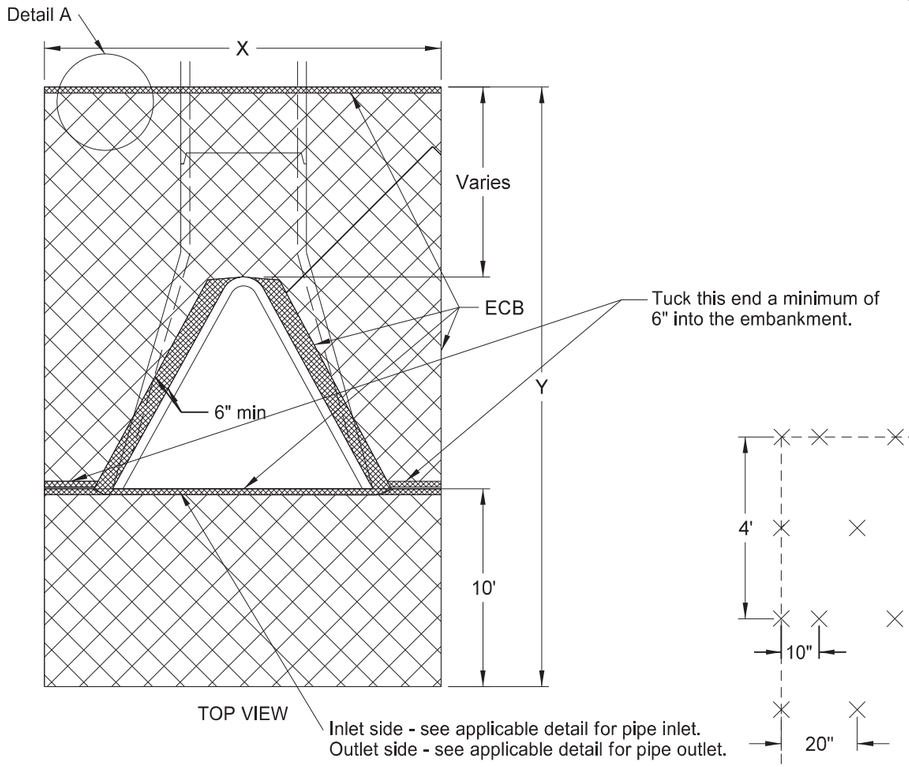


FRONT VIEW



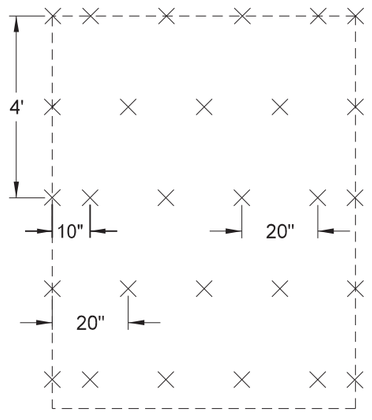
SIDE VIEW

Erosion Control Blanket (ECB)								
Location to be Protected Station	Culvert Type Appr/CL	Pipe Diam (Inch)	No	Unit Quantity (SY)	Total Quantity Type 1 (SY)	Type 2 (SY)	Type 3 (SY)	Type 4 (SY)
896+52 Rt	CL	78	2	33	-	33	-	-
896+85 Rt	CL	78	2	33	-	33	-	-
Total (SYs)					-	66	-	-



TOP VIEW

NOTE: Tuck the ECB a minimum of 6" into the embankment (against the flared end section) around the opening of the flared end section.

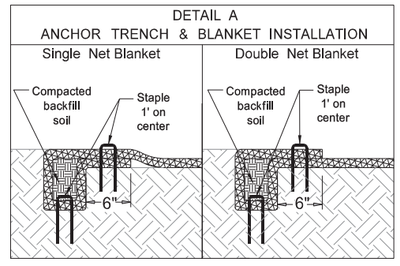


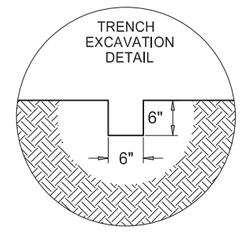
STAPLE PATTERN

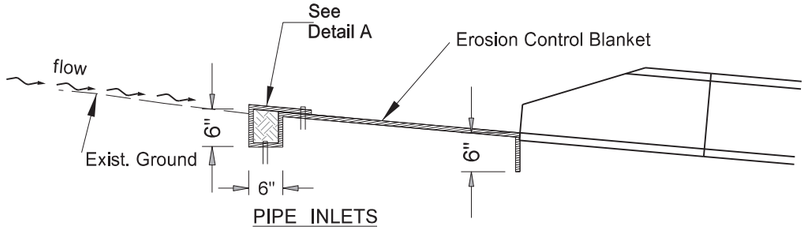
APPROACH CULVERTS				
DIA	X	Y	Surface area to be protected	ECB
In	Ft	Ft	SF	SY
15	9.0	20.0	176.0	20
18	9.5	20.7	190.7	22
21	9.5	21.0	190.9	22
24	10.5	21.6	214.1	24
27	11.0	22.0	226.3	25
30	11.6	22.5	241.5	27
36	12.7	23.3	268.8	30
42	13.3	23.3	279.7	31
48	13.8	24.0	293.2	33
54	14.5	23.4	300.6	34
60	15.0	23.0	307.5	35
66	15.6	24.0	325.6	37
72	16.2	24.5	340.6	38
Note: Quantities based on 8:1 slope.				

CENTERLINE CULVERTS				
DIA	X	Y	Surface area to be protected	ECB
In	Ft	Ft	SF	SY
24	10.5	19.6	193.1	22
27	11.0	20.0	204.3	23
30	11.6	20.5	218.3	25
36	12.7	21.2	242.1	27
42	13.3	21.2	251.8	28
48	13.8	22.0	265.6	30
54	14.5	21.5	273.7	31
60	15.0	21.0	278.3	31
66	15.6	22.0	295.7	33
72	16.2	22.5	309.2	35
Note: Quantities based on 6:1 slope.				

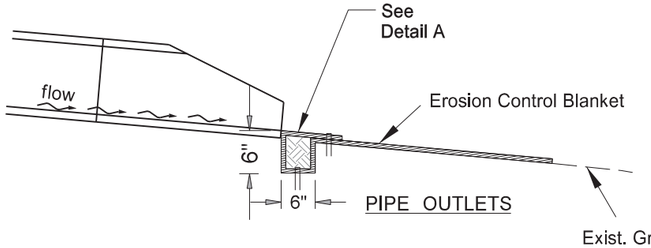
CENTERLINE CULVERTS				
DIA	X	Y	Surface area to be protected	ECB
In	Ft	Ft	SF	SY
24	10.5	17.6	172.1	20
27	11.0	18.0	182.3	21
30	11.6	18.5	195.1	22
36	12.7	19.2	216.7	24
42	13.3	19.2	225.2	25
48	13.8	20.0	238.0	27
54	14.5	19.5	244.7	28
60	15.0	19.0	248.3	28
66	15.6	20.0	264.5	30
72	16.2	20.5	276.8	31
78	16.8	21.5	301.2	33
Note: Quantities based on 4:1 slope.				







PIPE INLETS



PIPE OUTLETS

Erosion Control at Culvert Flared End Sections

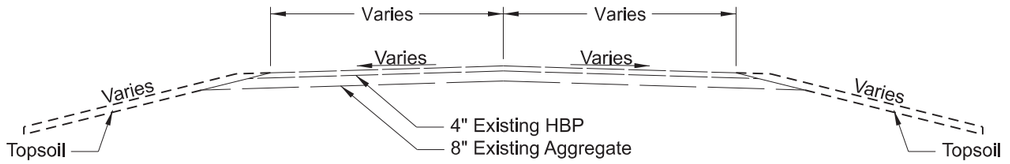
Site #3

Structure Replacement
Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

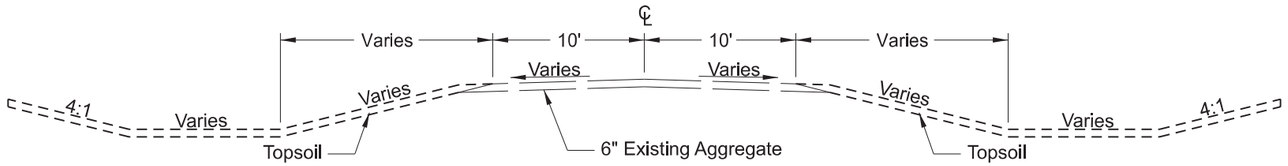
REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

8/28/2023 3:33:59 PM laneh S:\2022proj\Watford City\2206113\Project\6999.050\PlanSheets\020GD_001_CULV_END_PROTECTION.dgn

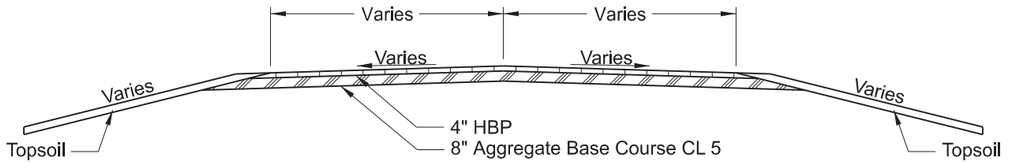
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	30	1



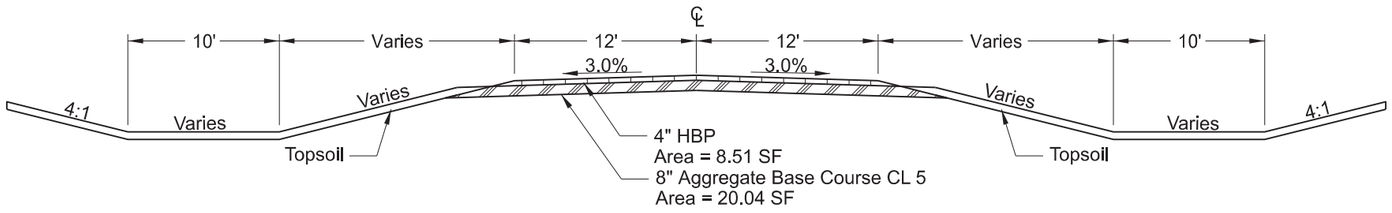
EXISTING TYPICAL SECTION
Sta 0+14.0 to Sta 0+53.0



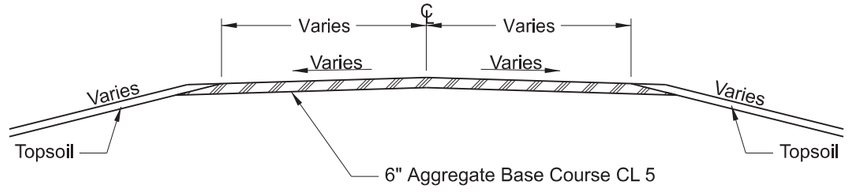
EXISTING TYPICAL SECTION
Sta 0+53.0 to Sta 1+17.0



PROPOSED TYPICAL SECTION
Sta 0+14.0 to Sta 0+64.7



PROPOSED TYPICAL SECTION
Sta 0+64.7 to Sta 1+17.0



PROPOSED TYPICAL SECTION
Sta 1+17.0 to Sta 1+54.0

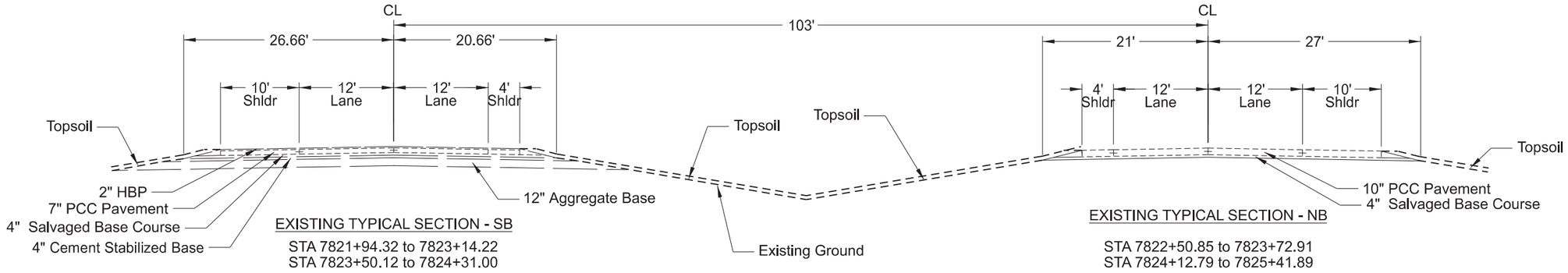
Typical Sections

Site #1

Structure Replacement
Pembina County
US Highway 81
JCT US 81 & ND 5
Str# 81-218.530N

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	30	2

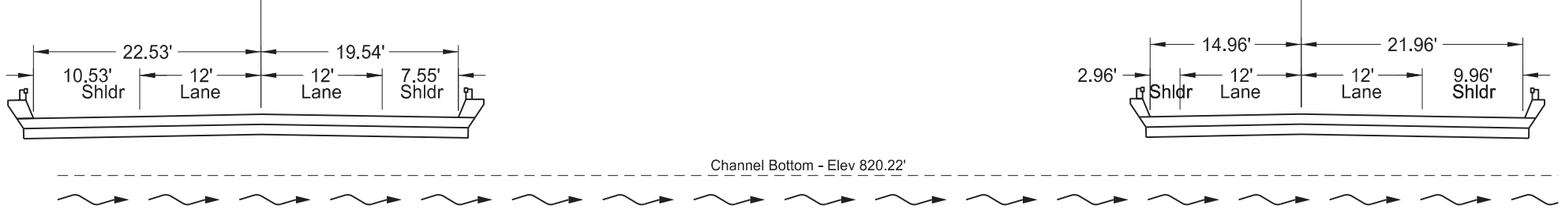


EXISTING TYPICAL SECTION - SB

STA 7821+94.32 to 7823+14.22
STA 7823+50.12 to 7824+31.00

EXISTING TYPICAL SECTION - NB

STA 7822+50.85 to 7823+72.91
STA 7824+12.79 to 7825+41.89



EXISTING TYPICAL SECTION - SB

STA 7823+14.22 to 7823+50.12

EXISTING TYPICAL SECTION - NB

STA 7823+72.91 to 7824+12.79

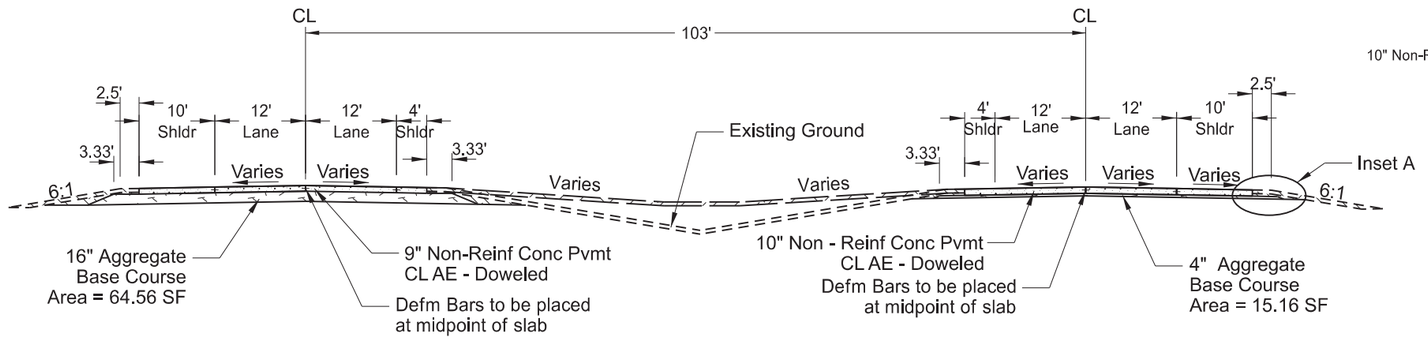
Typical Sections

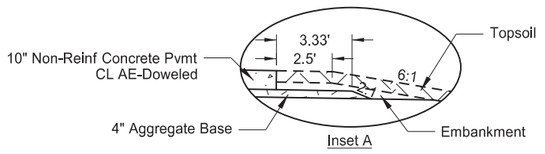
Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

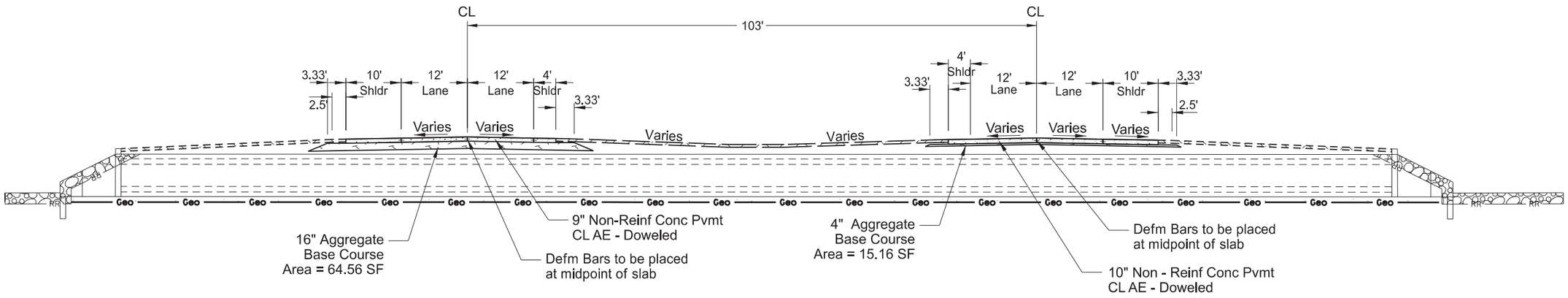
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	30	3





PROPOSED TYPICAL SECTION - SB
STA 7821+94.32 to 7823+05.92
STA 7823+57.78 to 7824+67.27

PROPOSED TYPICAL SECTION - NB
STA 7822+50.85 to 7823+67.23
STA 7824+19.04 to 7825+41.89



PROPOSED TYPICAL SECTION - SB (above box culvert)
STA 7823+05.92 to 7823+57.78

PROPOSED TYPICAL SECTION - NB (above box culvert)
STA 7823+67.23 to 78124+19.04

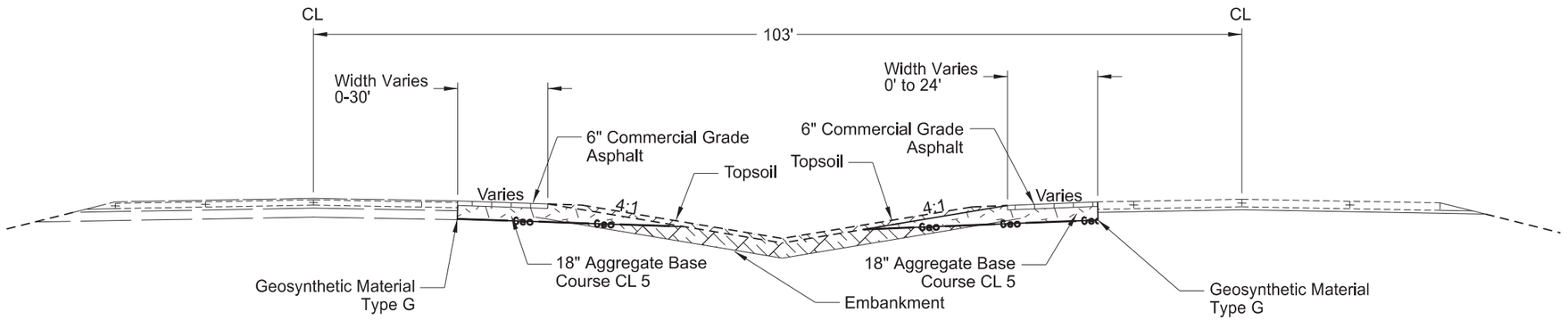
Typical Sections

Site #2

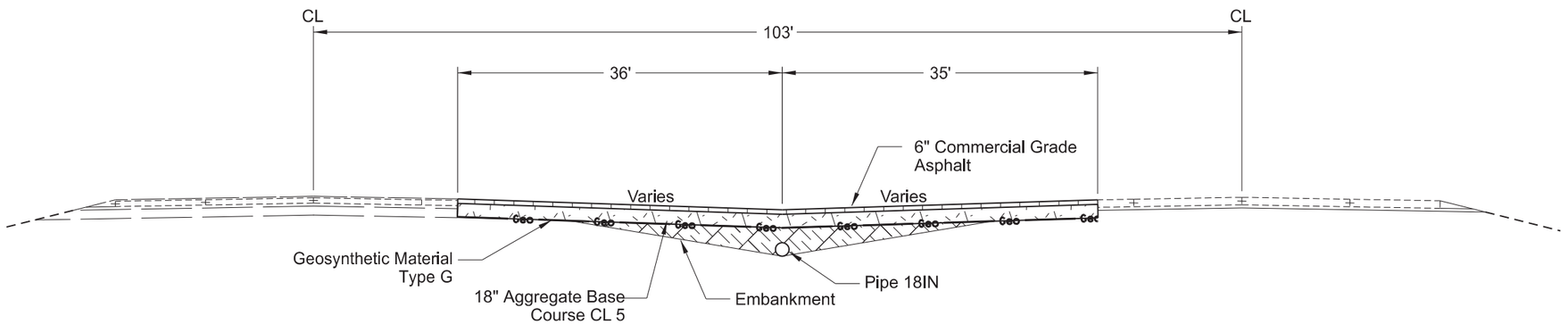
Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	30	4



PROPOSED TYPICAL SECTION - MEDIAN CROSSOVER
STA 7808+18.38 to 7810+63.88
STA 7812+20.88 to 7816+20.08
STA 7826+51.33 to 7830+50.54
STA 7833+64.54 to 7834+53.03



PROPOSED TYPICAL SECTION - MEDIAN CROSSOVER
STA 7810+63.88 to 7812+20.88
STA 7830+50.54 to 7833+64.54

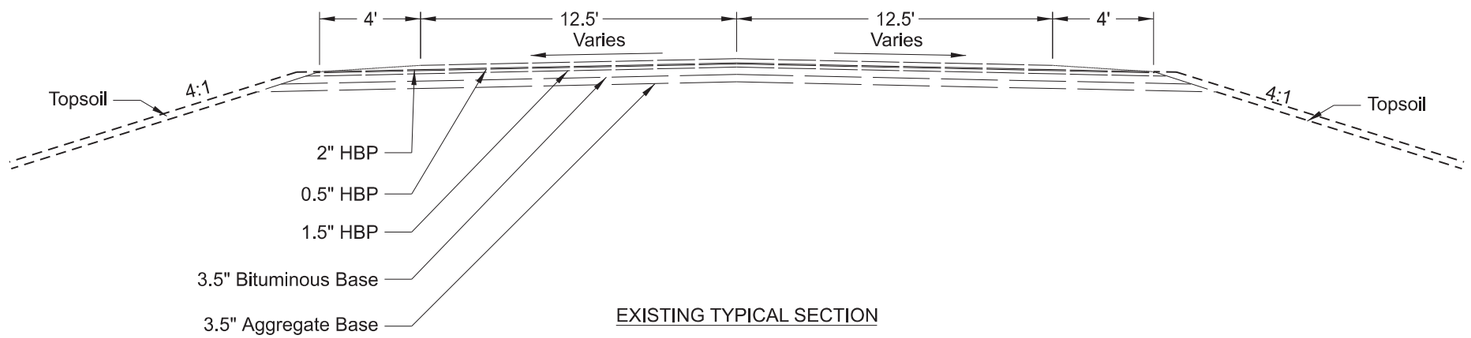
Typical Sections

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

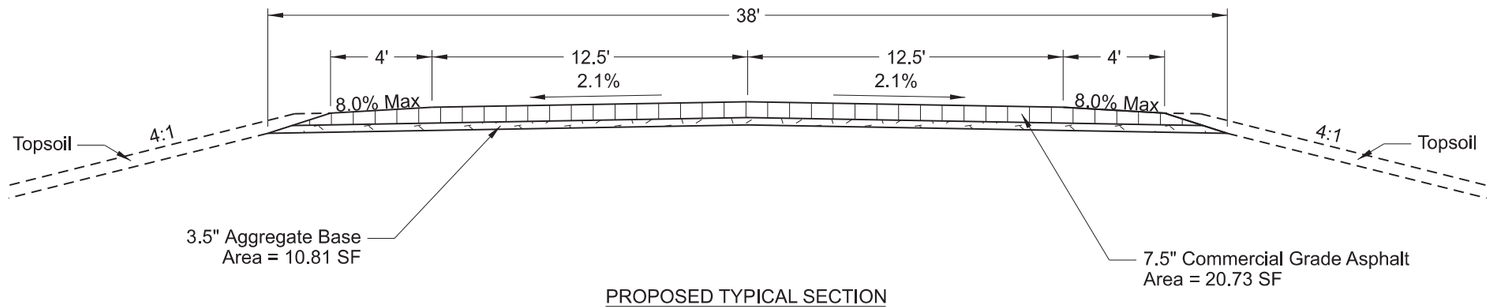
REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	30	5



EXISTING TYPICAL SECTION

Sta 895+50 to 898+50



PROPOSED TYPICAL SECTION

Sta 895+50 to 898+50

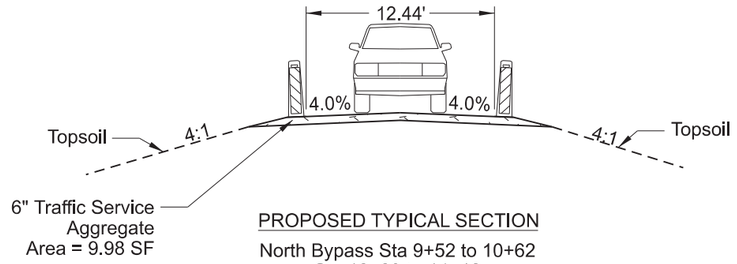
Typical Sections

Site #3

Structure Replacement
Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

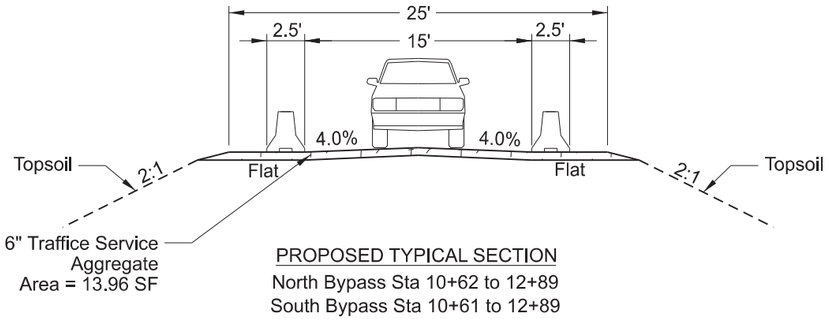
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	30	6



PROPOSED TYPICAL SECTION

North Bypass Sta 9+52 to 10+62
Sta 12+89 to 14+12

South Bypass Sta 9+55 to 10+61
Sta 12+89 to 14+13



PROPOSED TYPICAL SECTION

North Bypass Sta 10+62 to 12+89
South Bypass Sta 10+61 to 12+89

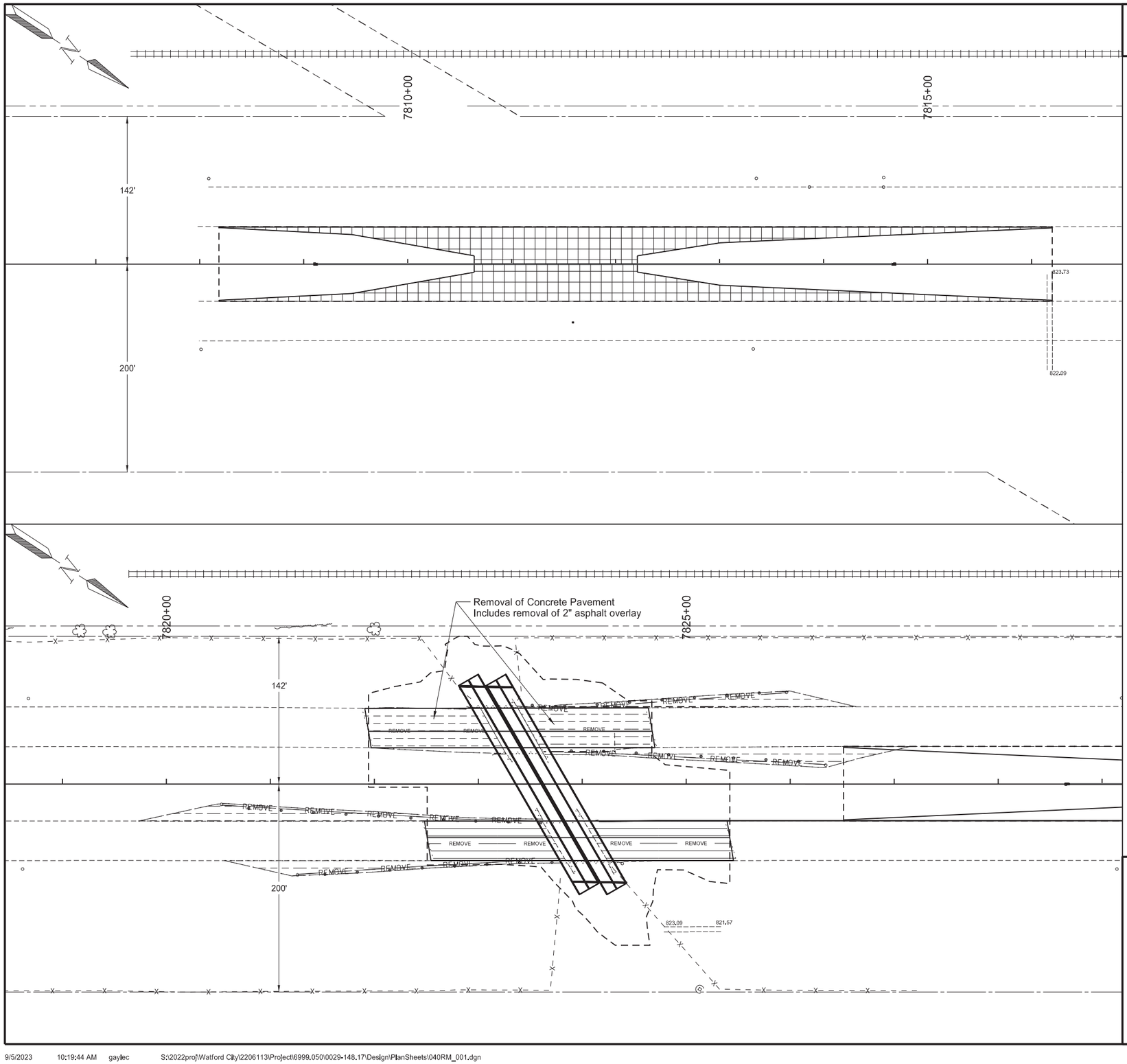
Bypass Typical Section

Site #3

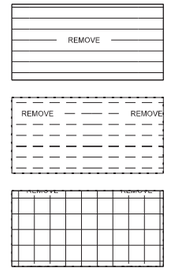
Structure Replacement
Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	40	1



SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	**0114**	**REMOVAL OF CONCRETE PAVEMENT**		
		STA 7821+94 to 7823+27 LT	SY	548
		STA 7822+51 to 7823+84 RT	SY	518
		STA 7823+38 to 7827+15 LT	SY	1253
		STA 7824+01 to 7825+42 RT	SY	543
202	**0132**	**REMOVAL OF BITUMINOUS SURFACING**		
		STA 7819+73 to 7823+85 RT	SY	641
202	**0350**	**REMOVAL OF TEMPORARY BYPASS**		
		STA 7808+18 to 7816+20 CL	EA	1
764	**0151**	**REMOVE W-BEAM GUARDRAIL & POSTS**		
		STA 7821+03 to 7823+62 RT	LF	259
		STA 7821+76 to 7823+84 RT	LF	209
		STA 7823+37 to 7825+47 LT	LF	210
		STA 7823+83 to 7825+84 LT	LF	201
764	**2081**	**REMOVE END TREATMENT & TRANSITION**		
		STA 7820+53 to 7821+03 RT	EA	1
		STA 7821+26 to 7821+76 RT	EA	1
		STA 7825+47 to 7825+96 LT	EA	1
		STA 7825+84 to 7826+34 LT	EA	1



Removal of Bituminous Pavement

Removal of Concrete Pavement

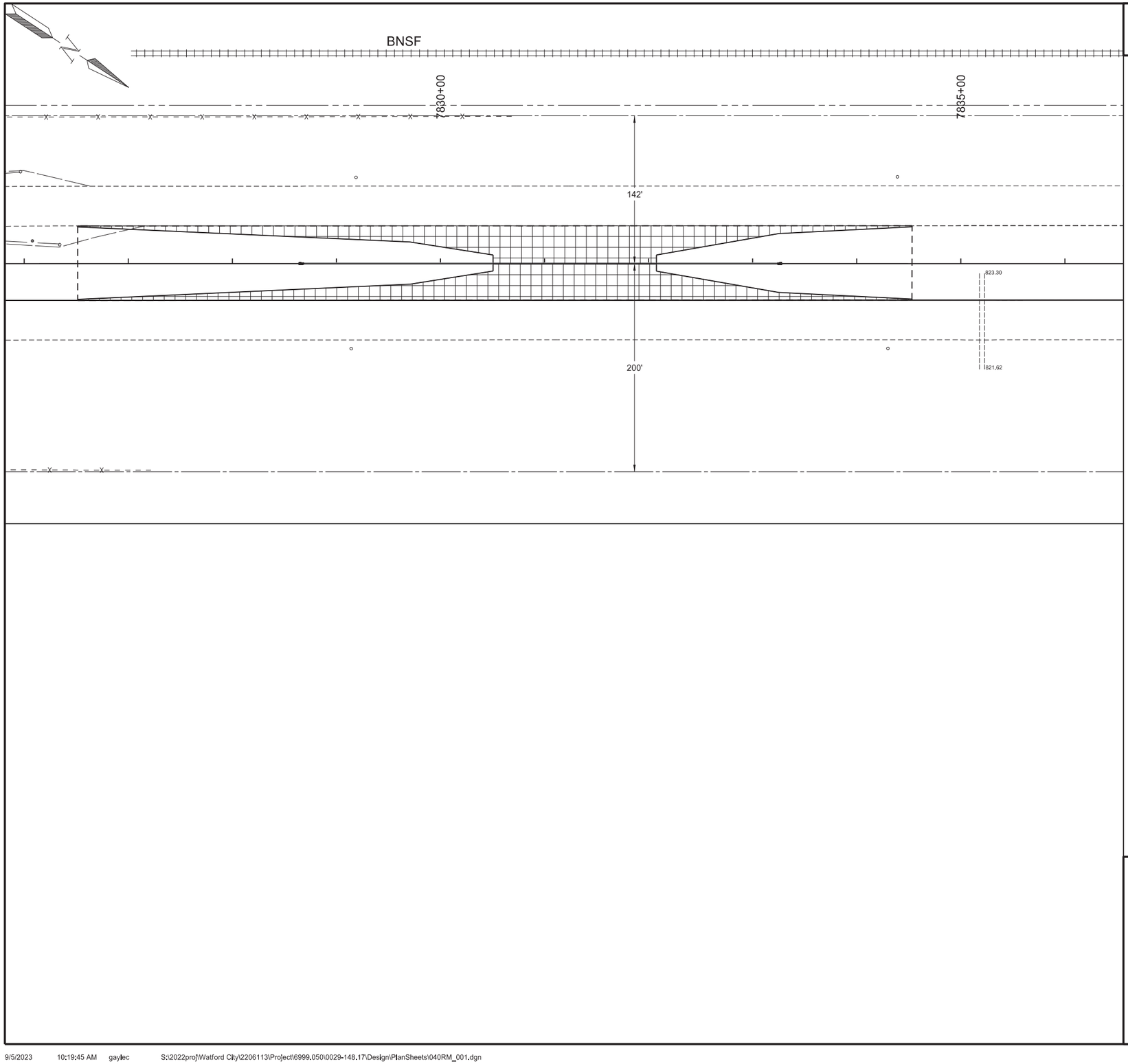
Removal of Temporary Bypass

Removals

Site #2

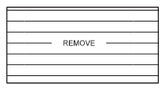
Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

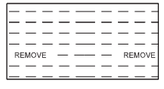


	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	40	2

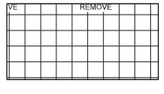
SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	0350	REMOVAL OF TEMPORARY BYPASS		
		STA 7826+51 to 7834+53 CL	EA	1



Removal of Bituminous Pavement



Removal of Concrete Pavement



Removal of Temporary Bypass

Removals

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	50	1

HYDRAULIC DATA FOR SS-6-999(050) (A)									
				25-YEAR DATA				100-YEAR DATA	
STATION	EXISTING PIPE	PROPOSED PIPE SIZE	DRAINAGE AREA (ACRES)	DESIGN DISCHARGE (CFS)	DESIGN HEADWATER (FT)	DESIGN VELOCITY (FPS)	DESIGN STAGE (NAVD 88)	100-YEAR DISCHARGE (CFS)	100-YEAR STAGE (NAVD 88)
896+52	N/A	78" (B)	32569.1	510.5	8.99	9.04	1436.56	878.9	1445.90
896+85	6'x6' RCB	78" (B)							

(A) Hydraulic data provided is for smooth-walled (Manning's n=0.012) type conduits.
(B) Culvert has been sunk 12" based on 2017 Nationwide Permit Regional Conditions.

REGISTERED PROFESSIONAL ENGINEER
RANDALL SANDVIG
PE-8783
DATE 9/5/23
NORTH DAKOTA

Culvert Hydraulic Data

ND Hwy 45
2 Miles West of ND 32

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	51	1

Begin Station / Location	Begin Offset	End Station / Location	End Offset	Pipe Installation (Pay Item)			Allowable Material	Required Diameter	Steel Pipe Coatings	Steel Pipe Corrugations or Spiral Ribs	Steel Pipe Minimum Thickness	Geosynthetic Material - Type G (Pay Item)	(*) End Sections		Applicable Backfill
				In	Bid Item	LF		In	Type		In	SY	Begin EA	End EA	
7809+13	CL	7814+65	CL	18	Pipe Conduit	552	Reinforced Concrete Pipe - Class III **(barrel length = 552 LF)**	18					FES	FES	Specification 714.04 A
							Corrugated Steel Pipe	18	P	2	0.064				
							Spiral Rib Steel Pipe	18	P	3/4, 1	0.064				
							Polypropylene Pipe (AASHTO M330, Type S)	18							
7828+68	CL	7833+24	CL	18	Pipe Conduit	456	Reinforced Concrete Pipe - Class III **(barrel length = 456 LF)**	18					FES	FES	Specification 714.04 A
							Corrugated Steel Pipe	18	A, P	2	0.109				
							Corrugated Steel Pipe	18	P	3, 5	0.064				
							Spiral Rib Steel Pipe	18	P	3/4, 1	0.079				

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

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

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

(*) End sections are measured and paid for separately for pipe extensions.
FES = Flared End Section
TES = Traversable End Section

Allowable Pipe List

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	51	2

Begin Station / Location	Begin Offset	End Station / Location	End Offset	Pipe Installation (Pay Item)			Allowable Material	Required Diameter	Steel Pipe Coatings	Steel Pipe Corrugations or Spiral Ribs	Steel Pipe Minimum Thickness	Geosynthetic Material - Type G (Pay Item)	(*) End Sections		Applicable Backfill
				In	Bid Item	LF		In	Type		In	SY	Begin EA	End EA	
896+52	78.4' LT	896+52	79.6' RT	78	Pipe Conduit	158	Reinforced Concrete Pipe - Class IV **(barrel length = 158 LF)**	78				184	FES	FES	Standard D-714-25
896+85	78.4' LT	896+85	79.6' RT	78	Pipe Conduit	158	Reinforced Concrete Pipe - Class IV **(barrel length = 158 LF)**	78				184	FES	FES	Standard D-714-25

The following table contains culvert extensions to be removed upon removal of the bypasses. Culvert extensions will become the property of the contractor after completion of project.

896+52	78.4' LT	896+52	92.4' LT	78	Pipe Conduit	14	Reinforced Concrete Pipe - Class III **(barrel length = 14 LF)**	78							Specification 714.04 A
896+52	79.6' RT	896+52	93.6' RT	78	Pipe Conduit	14	Reinforced Concrete Pipe - Class III **(barrel length = 14 LF)**	78							Specification 714.04 A
896+86	72.1' LT	896+86	88.1' LT	84	Pipe Conduit	16	Reinforced Concrete Pipe - Class III **(barrel length = 16 LF)**	78							Specification 714.04 A
896+85	79.2' RT	896+85	89.2' RT	84	Pipe Conduit	10	Reinforced Concrete Pipe - Class III **(barrel length = 10 LF)**	84							Specification 714.04 A
896+85	79.6' RT	896+85	93.6' RT	78	Pipe Conduit	14	Reinforced Concrete Pipe - Class III **(barrel length = 14 LF)**	78							Specification 714.04 A

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

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

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

(*) End sections are measured and paid for separately for pipe extensions.
FES = Flared End Section
TES = Traversable End Section

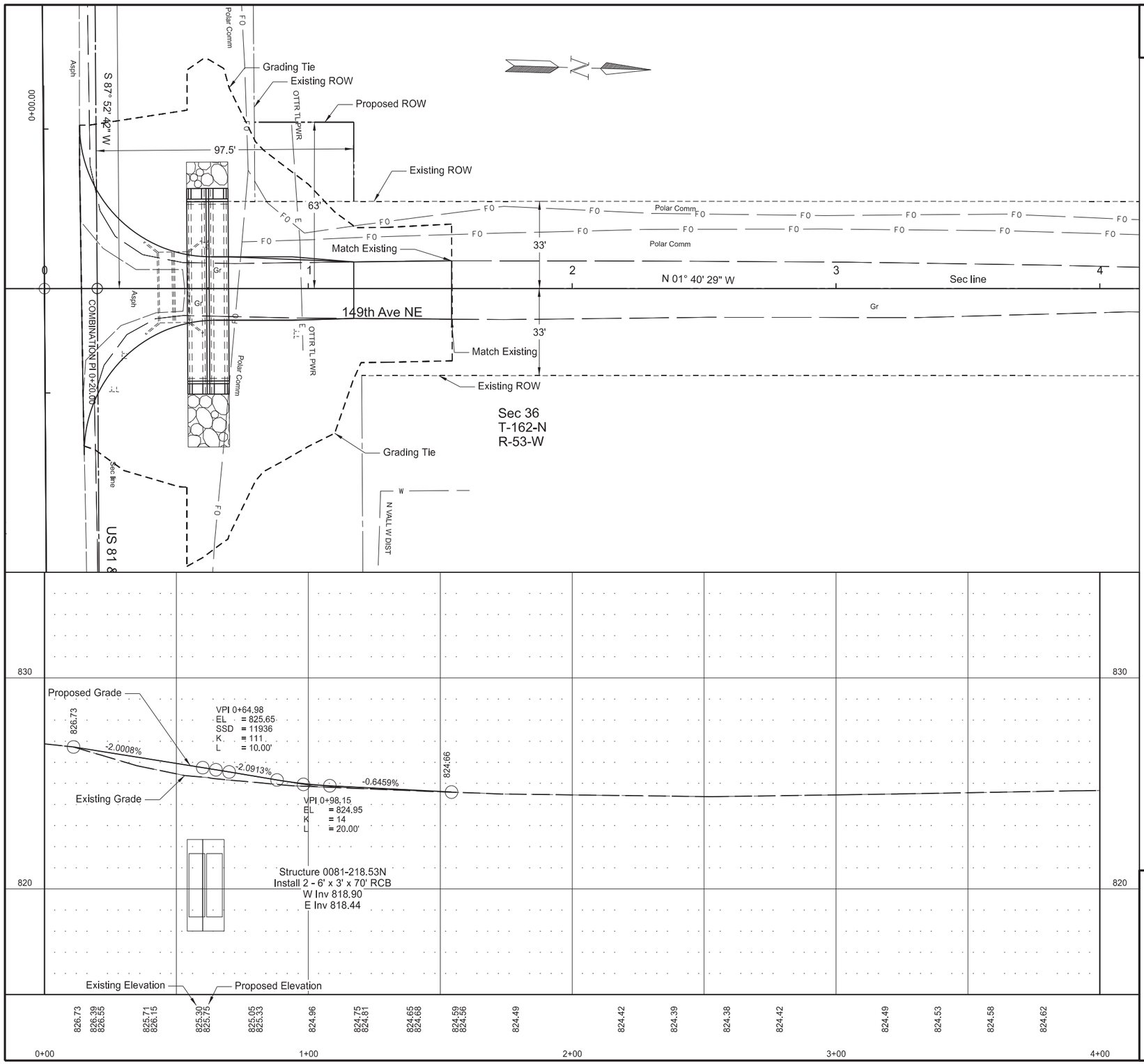
Allowable Pipe List

Site #3

Structure Replacement
Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	60	1



Plan & Profile

Site #1

Structure Replacement
Pembina County
US Highway 81
JCT US 81 & ND 5
Str# 81-218.530N

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PE-10597
DATE 09/06/23
NORTH DAKOTA

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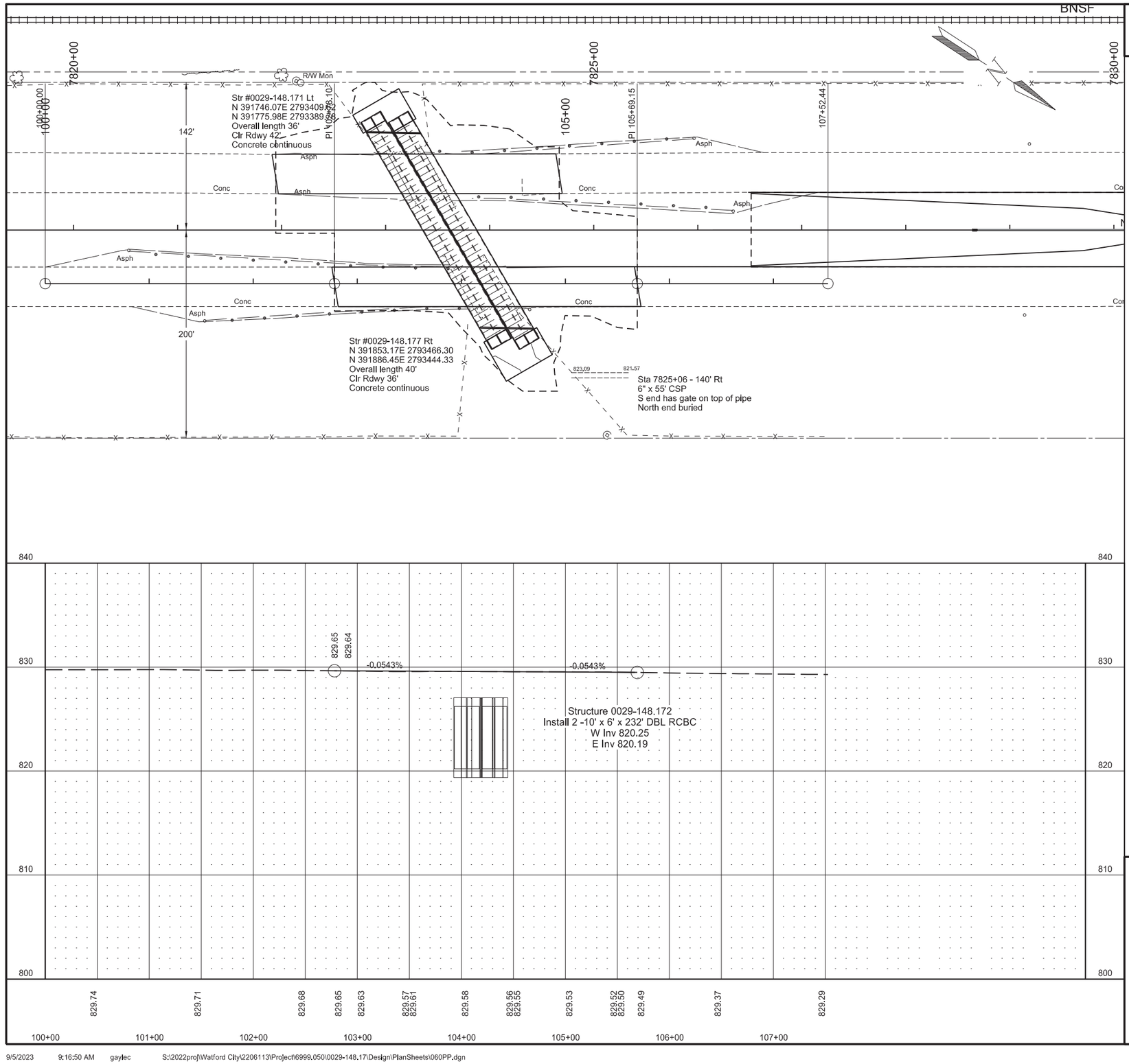

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	60	2

Plan & Profile
North Bound

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

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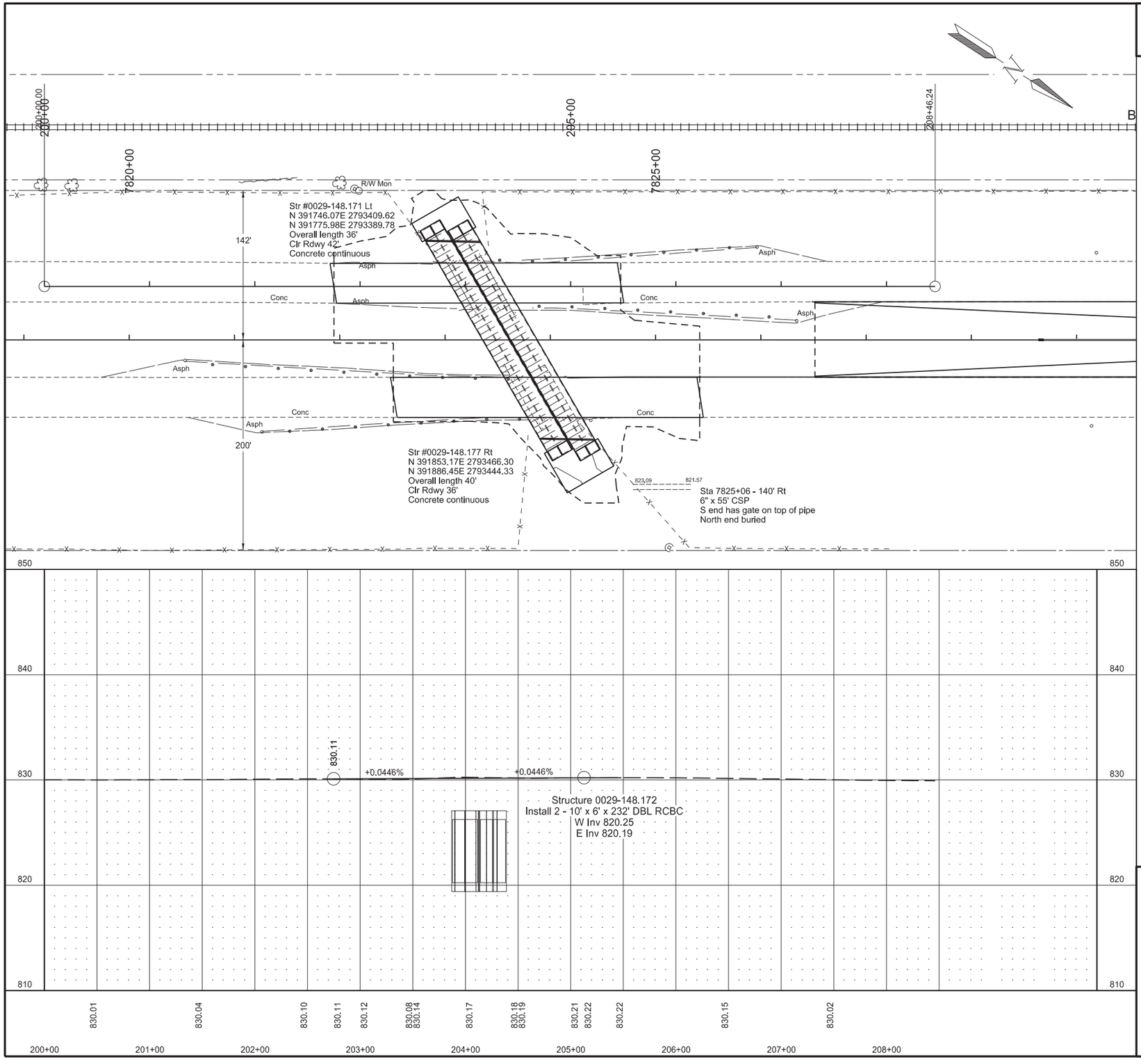
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	60	3



Plan & Profile
South Bound

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

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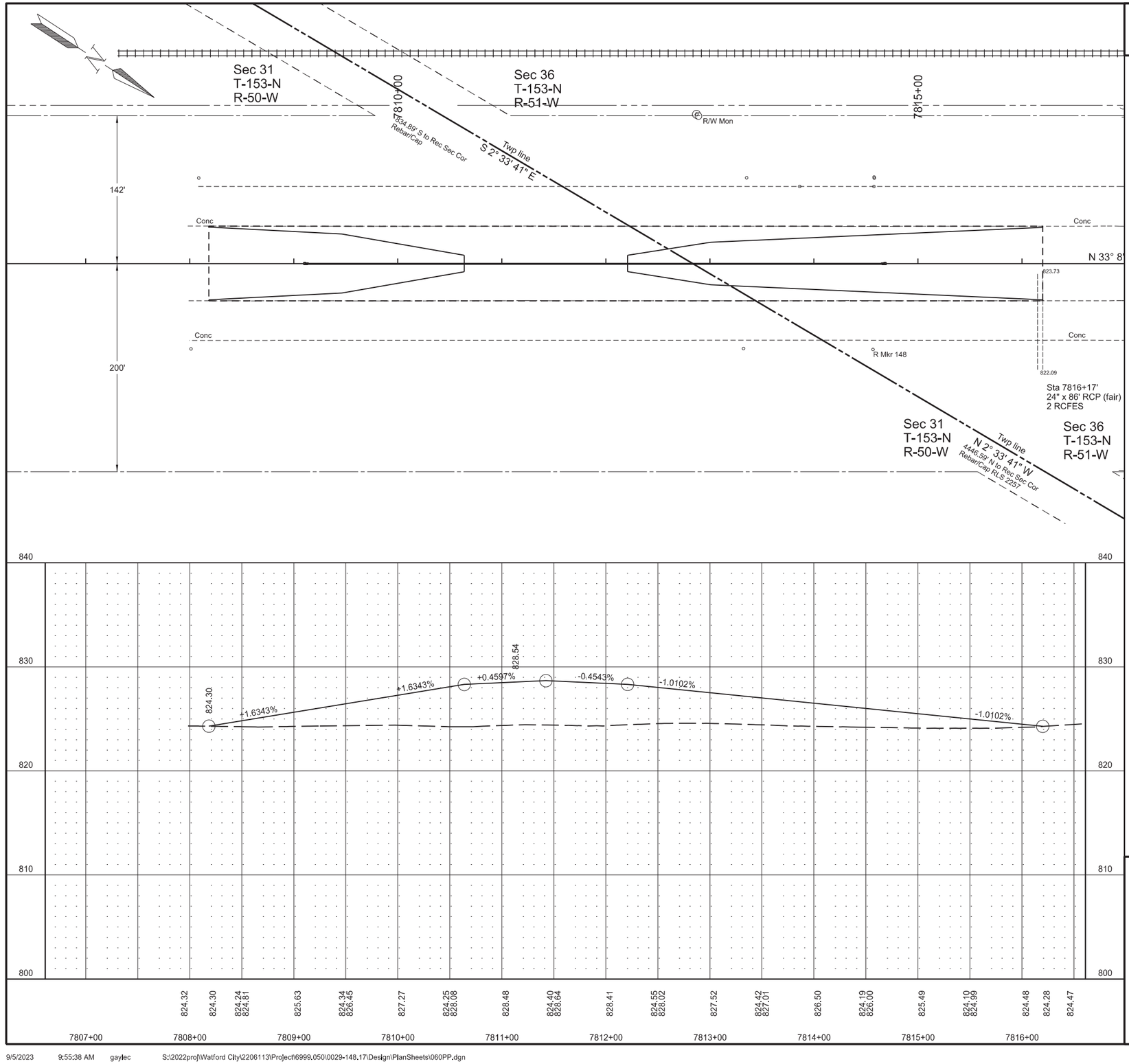
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	60	4

SPEC	CODE	BID ITEM	UNIT	QUANTITY
714	4100	PIPE CONDUIT 18IN		
		STA 7809+13 to 7814+65 CL	LF	552



Plan & Profile
South Crossover

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

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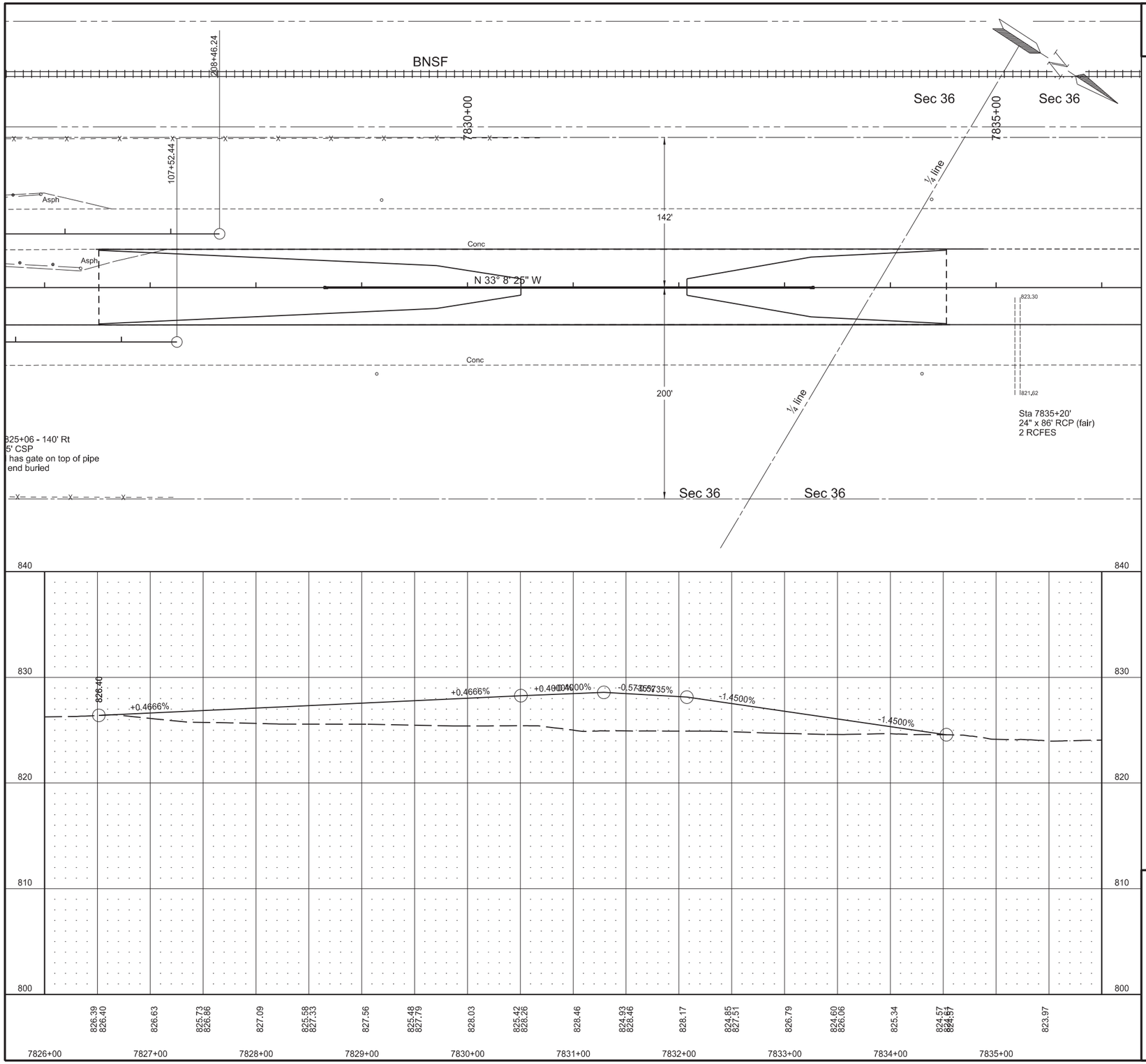
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	60	5

SPEC	CODE	BID ITEM	UNIT	QUANTITY
714	4100	PIPE CONDUIT 18IN		
		STA 7828+68 to 7833+24 CL	LF	456



Plan & Profile
North Crossover

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

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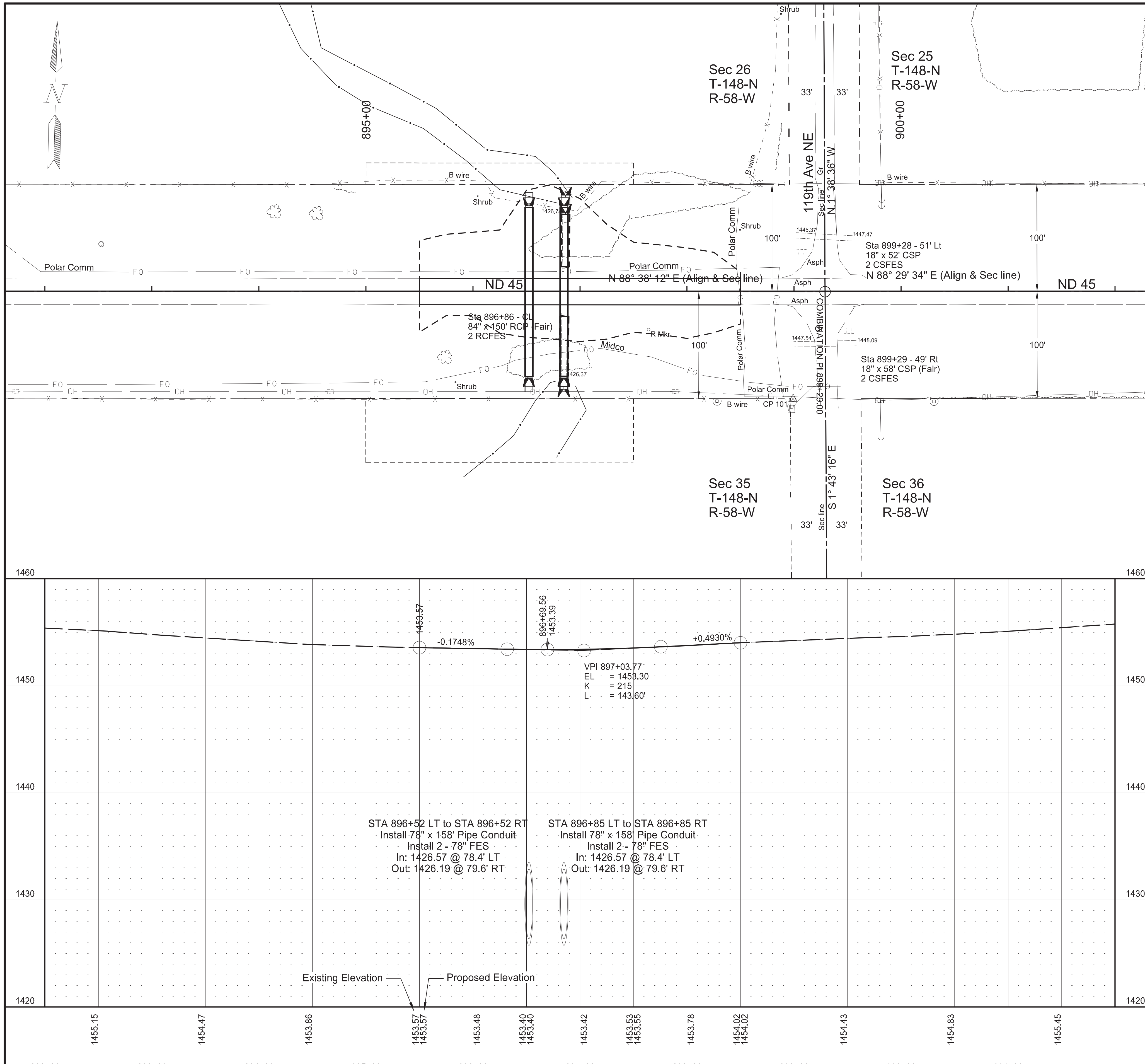
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	60	6

SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	0104	REMOVAL OF STRUCTURE		
		STA 896+86 CL	EA	1
202	0174	REMOVAL OF PIPE ALL TYPE & SIZES		
		STA 896+86 CL	LF	122
714	4150	PIPE CONDUIT 78IN		
		STA 896+52 CL	LF	158
		STA 896+85 CL	LF	158



Sec 26
T-148-N
R-58-W
Sec 25
T-148-N
R-58-W
Sec 35
T-148-N
R-58-W
Sec 36
T-148-N
R-58-W
119th Ave NE
N 1° 38' 36" W
S 1° 43' 16" E
ND 45
N 88° 38' 12" E (Align & Sec line)
N 88° 29' 34" E (Align & Sec line)
Sta 896+86 - CL
84" x 150' RCP (Fair)
2 RCFES
Sta 899+28 - 51' Lt
18" x 52' CSP
2 CSFES
Sta 899+29 - 49' Rt
18" x 58' CSP (Fair)
2 CSFES
COMBINATION PI 899+29.00
Polar Comm
Midco
B wire
Shrub
CP 101
VPI 897+03.77
EL = 1453.30
K = 215
L = 143.60'
-0.1748%
+0.4930%
STA 896+52 LT to STA 896+52 RT
Install 78" x 158' Pipe Conduit
Install 2 - 78" FES
In: 1426.57 @ 78.4' LT
Out: 1426.19 @ 79.6' RT
STA 896+85 LT to STA 896+85 RT
Install 78" x 158' Pipe Conduit
Install 2 - 78" FES
In: 1426.57 @ 78.4' LT
Out: 1426.19 @ 79.6' RT
Existing Elevation
Proposed Elevation

Plan & Profile

Site #3

Structure Replacement
Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	60	7

SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	174	REMOVAL OF PIPE ALL TYPE & SIZES		
		STA 896+52 LT	LF	14
		STA 896+86 LT	LF	16
302	0050	TRAFFIC SERVICE AGGREGATE		
		STA 9+52 to 14+12	TON	365
714	4150	PIPE CONDUIT 78IN		
		STA 896+52 LT	LF	14
714	4155	PIPE CONDUIT 84IN		
		STA 896+86 LT	LF	16
714	9630	REMOVE & RELAY END SECTION-ALL TYPES & SIZES		
		STA 896+86 LT	EA	1

Plan & Profile
North Bypass

Site #3

Structure Replacement
Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	60	8

SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	0174	REMOVAL OF PIPE ALL TYPE & SIZES		
		STA 896+52 RT	LF	14
		STA 896+85 RT	LF	14
		STA 896+85 RT	LF	10
302	0050	TRAFFIC SERVICE AGGREGATE		
		STA 9+55 to 14+13	TON	365
714	4150	PIPE CONDUIT 78IN		
		STA 896+52 RT	LF	14
		STA 896+85 RT	LF	14
714	4155	PIPE CONDUIT 84IN		
		STA 896+85 RT	LF	10
714	9630	REMOVE & RELAY END SECTION-ALL TYPES & SIZES		
		STA 896+86 RT	EA	1

Plan & Profile
South Bypass

Site #3

Structure Replacement
Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	75	1

Wetland Impact Table

Wetland Number	Location	Wetland Type	Wetland Feature	USACE Jurisdictional Wetlands[1]	Wetland Impact					Wetland Mitigation		
					Wetland Impacts Acre(s)			USFWS Easement Impacts Acre(s)		Mitigation Proposed		
					Temp.	Perm. (Fill/Drain)	Perm. (Cut)	Temp.	Perm.	EO 11990	USACE	USFWS
#7A	Sec. 2, T161N, R53W	Ditch	Created	Y				N/A	N/A			
#7B	Sec. 2, T161N, R53W	Ditch	Created	Y				N/A	N/A			
#7C	Sec.35, T162N, R53W	Ditch	Created	Y	0.016	0.019		N/A	N/A	N	N	N
#7D	Sec.35, T162N, R53W	Ditch	Created	Y				N/A	N/A			
#7E	Sec.36, T162N, R53W	Ditch	Created	Y	0.003	0.008		N/A	N/A	N	N	N
#7F	Sec.36, T162N, R53W	Ditch	Created	Y	0.013	0.020		N/A	N/A	N	N	N
#7G	Sec. 1, T161N, R53W	Ditch	Created	Y				N/A	N/A			
#7H	Sec. 1, T161N, R53W	Ditch	Created	Y				N/A	N/A			
				Totals	**0.032**	**0.047**						

Impact Summary Table

Permanent Impact Summary		Temporary Impacts and additional information	
Wetland Type	Total Acre(s)	WaterType	Total Acre(s)
Natural/JD (Fill/Drain)	0.000	Temporary Wetland JD	0.032
Natural/Non-JD (Fill/Drain)	0.000	Non-JD Wetland Temporary	0.000
Artificial/JD (Fill/Drain)	0.047		
Artificial /Non-JD (Fill/Drain))	0.000	Permanent OW	0.000
Total	**0.047**	Temporary OW	0.000
JD Natural (Cut)	0.000	Permanent OW-d	0.000
JD Artificial (Cut)	0.000	Temporary OW-d	0.000
Non-JD Natural (Cut)	0.000		
Non-JD Artificial (Cut)	0.000		
Total	**0.000**		

Other Waters-d Impact Table

Number	Location	Type	Feature	USACE Jurisdictional[1]	Impacts to Other Waters						Other Water Mitigation						
					Acres			Linear Feet			Mitigation Proposed			Onsite Mitigation Method		Onsite Constructed Location	
					Temp.	Perm. (Fill/Drain)	Perm. (Cut)	Temp.	Perm. (Fill/Drain)	Perm. (Cut)	EO 11990	USACE	USFWS	Mitigation Location; Ratio	Onsite Acre(s)	Onsite Constructed Site #	Onsite Constructed Size Acre(s)
#OW 8A-d	Sec.35, T162N, R53W	Ephemeral Swale	Natural	Y													
#OW 8B-d	Sec.2, T161N, R53W	Ephemeral Swale	Natural	Y													
				Totals	**0.000**	**0.000**		**0.0**	**0.0**						**0.000**		**0.000**

[1] A wetland Jurisdictional Determination was issued by the USACE on 11/30/22; NWO-2009-02487-BIS

Mitigation Summary Table

	Location	Ditch Shift Acre(s)	Onsite Acre(s)	11990 Bank Acre(s)	USACE/11990 Bank Acre(s)	USFWS Bank Acre(s)
USACE Only	NA	0.000	0.000		0.000	
EO 11990 Only	NA	0.000	0.000	0.000		
USACE/11990	NA	0.000	0.000		0.000	
USFWS	NA	0.000				0.000
	Total	**0**	**0**	**0**	**0**	**0**

Wetland Tables

Site #1

Structure Replacement
Pembina County
US Highway 81
JCT US 81 & ND 5
Str# 81-218.530N

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	75	2

Existing ROW

HAMILTON

Other Water 8A-d

Wetland 7C
Temporary Impact = 0.016 Acres
Permanent Impact = 0.019 Acres

Wetland 7C

0+00.00

17736+00

Grading Tie

Existing ROW

Wetland 7D

0 1 2 3 4 5

149th Ave NE

COMBINATION PI 0+20.00

17731+95 - 42' Rt to SW end

US 81 & ND 5

Wetland 7E

Sec 36
T-162-N
R-53-W

Grading Tie

Wetland 7E
Temporary Impact = 0.003 Acres
Permanent Impact = 0.008 Acres

Wetland 7F

Wetland 7F
Temporary Impact = 0.013 Acres
Permanent Impact = 0.020 Acres

Wetland 7G

Existing ROW

17732+85 - 65' Lt to S
36" x 2' CSP (Good)
Gate on S end

Permanent Wetland Impact

Temporary Wetland Impact

Wetland Impacts

Site #1

Structure Replacement
Pembina County
US Highway 81
JCT US 81 & ND 5
Str# 81-218.530N

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PE-10597
DATE 09/05/23
NORTH DAKOTA

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	75	3

Wetland Impact Table

Wetland Number	Location	Wetland Type	Wetland Feature	USACE Jurisdictional Wetlands[1]	Wetland Impact					Wetland Mitigation		
					Wetland Impacts Acre(s)			USFWS Easement Impacts Acre(s)		Mitigation Proposed		
					Temp.	Perm. (Fill/Drain)	Perm. (Cut)	Temp.	Perm.	EO 11990	USACE	USFWS
#9	Sec. 36, T153N, R51W	Ditch	Natural	Y						N	N	N
#10	Sec. 36, T153N, R51W	Ditch	Created	Y	0.004	0.000				N	N	N
#12A	Sec. 36, T153N, R51W	Ditch	Created	Y	0.380	0.000				N	N	N
#12B	Sec. 36, T153N, R51W	Ditch	Created	Y						N	N	N
#13	Sec. 36, T153N, R51W	Ditch	Created	Y	0.007	0.004				N	N	N
#14	Sec. 36, T153N, R51W	Ditch	Created	Y	0.010	0.000				N	N	N
#15A	Sec. 36, T153N, R51W	Ditch	Created	Y	0.290	0.040				N	N	N
#15B	Sec. 36, T153N, R51W	Ditch	Created	Y						N	N	N
				Totals	**0.691**	**0.044**						

Other Waters Impact Table

Number	Location	Type	Feature	USACE Jurisdictional[1]	Impacts to Other Waters						Other Water Mitigation				
					Acres			Linear Feet			Mitigation Proposed			USACE Mitigation Bank	
					Temp.	Perm. (Fill/Drain)	Perm. (Cut)	Temp.	Perm. (Fill/Drain)	Perm. (Cut)	EO 11990	USACE	USFWS	Location	Acre(s)
#OW 11	Sec.36, T153N, R51W	County Drain	Created	Y	0.050	0.210	0.000	30.000	295.000	0.000	N	Y	N	Kirkeby/Schuster Bank (2:1)	0.344
				Totals	**0.050**	**0.210**	**0.000**	**30.000**	**295.000**	**0.000**					**0.344**

[1] A wetland Jurisdictional Determination was issued by USACE on 11/14/222; NWO-2022-1687-BIS

Wetland Tables

Site #2

Structure Replacement

Grand Forks County

4 Miles South of Manvel

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	75	4

Impact Summary Table			
Permanent Impact Summary		Temporary Impacts and additional information	
Wetland Type	Total Acre(s)	WaterType	Total Acre(s)
Natural/JD (Fill/Drain)	0.000	Temporary Wetland JD	0.691
Natural/Non-JD (Fill/Drain)	0.000	Non-JD Wetland Temporary	0.000
Artificial/JD (Fill/Drain)	0.044		
Artificial /Non-JD (Fill/Drain))	0.000	Permanent OW	0.210
Total	**0.044**	Temporary OW	0.050
JD Natural (Cut)	0.000	Permanent OW-d	0.000
JD Artificial (Cut)	0.000	Temporary OW-d	0.000
Non-JD Natural (Cut)	0.000		
Non-JD Artificial (Cut)	0.000		
Total	**0.000**		

Mitigation Summary Table						
	Location	Ditch Shift Acre(s)	Onsite Acre(s)	11990 Bank Acre(s)	USACE/11990 Bank Acre(s)	USFWS Bank Acre(s)
USACE Only	Kirkeby/Schuster Bank				0.344	
EO 11990 Only	NA					
USACE/11990	NA					
USFWS	NA					
	Total	**0**	**0**	**0**	**0.344**	**0**

Wetland Tables

Site #2

Structure Replacement

Grand Forks County

4 Miles South of Manvel

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	75	5

BNSF

7810+00

7815+00

Existing Row

Conc

Conc

Wetland 12A

823.73

Wetland 12A
Temporary Impact = 0.38 Acres
Permanent Impact = 0.00 Acres

Conc

Conc

Grading Tie

822.09

Sta 7816+17'
24" x 86' RCP (fair)
2 RCFES

Existing Row

Wetland 9

7820+00

Existing Row

7825+00

Wetland 10

Wetland 14

Wetland 14
Temporary Impact = 0.01 Acres
Permanent Impact Fill = 0.00 Acres

Wetland 10
Temporary Impact = 0.004 Acres
Permanent Impact Fill = 0.000 Acres

Asph

Grading Tie

Asph

Conc

Asph

Conc

Asph

Other Water 11

Asph

Other Water 11
Temporary Impact = 0.05 Acres
Permanent Impact Fill = 0.21 Acres

Grading Tie

Conc

Conc

Asph

Grading Tie

Wetland 12

Wetland 13

823.09

821.57

Sta 7825+06 - 140' Rt
6" x 55' CSP
S end has gate on top of pipe
North end buried

Wetland 13
Temporary Impact = 0.007 Acres
Permanent Impact = 0.004 Acres

Existing Row

Permanent Wetland Impact

Temporary Wetland Impact

Permanent Other Water Impact

Temporary Other Water Impact

Wetland Impacts

Site #2

Structure Replacement

Grand Forks County

4 Miles South of Manvel

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GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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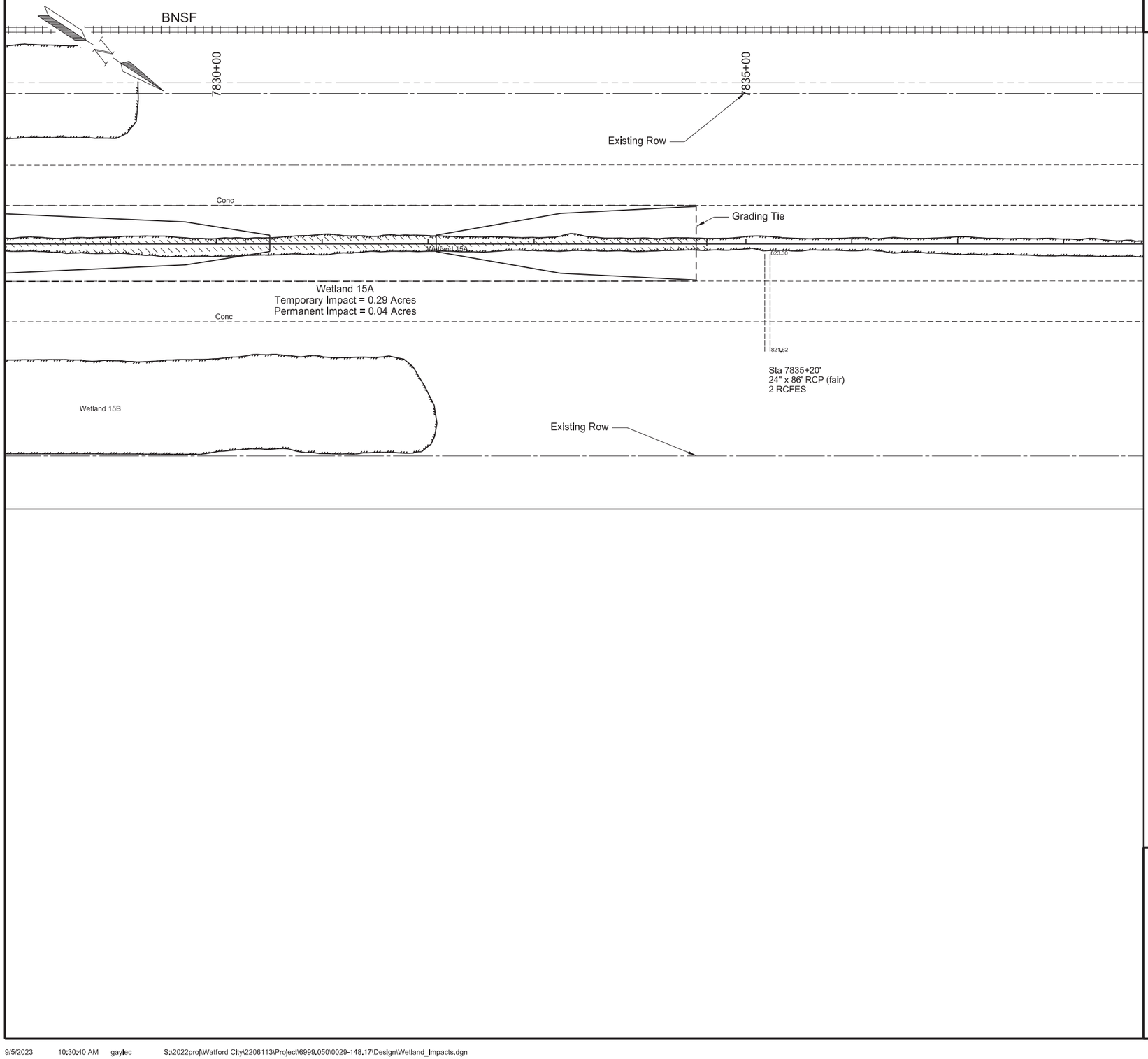
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	75	6



Temporary Wetland Impact

Wetland Impacts

Site #2

Structure Replacement

Grand Forks County

4 Miles South of Manvel

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	75	7

Wetland Impact Table

Wetland Number	Location	Wetland Type	Wetland Feature	USACE Jurisdictional Wetlands[1]	Wetland Impact					Wetland Mitigation		
					Wetland Impacts Acre(s)			USFWS Easement Impacts Acre(s)		Mitigation Proposed		
					Temp.	Perm. (Fill/Drain)	Perm. (Cut)	Temp.	Perm.	EO 11990	USACE	USFWS
#1	Sec.26 & 35, T148N, R58W	Ditch	Created	Y	0.020							
#2A	Sec.26, T148N, R58W	Basin	Natural	Y								
#2C	Sec.26, T148N, R58W	Slope	Natural	Y								
#4A	Sec.26 & 35, T148N, R58W	Slope	Natural	Y	0.160	0.000					N	
#4B	Sec.26, T148N, R58W	Ditch	Created	Y								
#4C	Sec.25, T148N, R58W	Ditch	Created	Y								
#4D	Sec.25 & 36, T148N, R58W	Ditch	Created	Y								
#5A	Sec.35, T148N, R58W	Ditch	Natural	Y								
#5B	Sec.35, T148N, R58W	Ditch	Created	Y								
#6A	Sec.35, T148N, R58W	Ditch	Created	Y	0.060	0.000					N	
#6B	Sec.36, T148N, R58W	Ditch	Created	Y								
#6C	Sec.36, T148N, R58W	Ditch	Created	Y								
				Totals	**0.240**	**0.000**						

Wetland Tables

Site #3

Structure Replacement

Griggs County

2 Miles West of ND 32

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	75	8

Other Waters Impact Table

Number	Location	Type	Feature	USACE Jurisdictional[1]	Impacts to Other Waters: Acres: Temp.	Acres: Perm. (Fill/Drain)	Acres: Perm. (Cut)	Linear Feet: Temp.	Linear Feet: Perm. (Fill/Drain)	Linear Feet: Perm. (Cut)	Other Water Mitigation: Mitigation Proposed: EO 11990	Mitigation Proposed: USACE	Mitigation Proposed: USFWS	Onsite Mitigation Method: Mitigation Location; Ratio	Onsite Mitigation Method: Onsite Acre(s)	Onsite Constructed Location: Onsite Constructed Site #	Onsite Constructed Location: Onsite Constructed Size Acre(s)
#OW 3A	Sec.26, T148N, R58W	Stream	Natural	Y	0.070	0.010		32.000	6.000			N					
#OW 3B	Sec.35, T148N, R58W	Stream	Natural	Y	0.130	0.000		72.000				N					
				Totals	**0.200**	**0.010**	**0.000**	**104.000**	**6.000**	**0.000**					**0.000**		**0.000**

Other Waters-d Impact Table

Number	Location	Type	Feature	USACE Jurisdictional[1]	Impacts to Other Waters: Acres: Temp.	Acres: Perm. (Fill/Drain)	Acres: Perm. (Cut)	Linear Feet: Temp.	Linear Feet: Perm. (Fill/Drain)	Linear Feet: Perm. (Cut)	Other Water Mitigation: Mitigation Proposed: EO 11990	Mitigation Proposed: USACE	Mitigation Proposed: USFWS
#OW 2B-d	Sec.26, T148N, R58W	Ephemeral Swale	Natural	N									
				Totals	**0.000**	**0.000**		**0.0**	**0.0**				

[1] A wetland Jurisdictional Determination was issued by the USACE on 11/07/2022; NWO-2022-01685-BIS

Impact Summary Table

Permanent Impact Summary: Wetland Type	Total Acre(s)	Temporary Impacts and additional information: WaterType	Total Acre(s)
Natural/JD (Fill/Drain)	0.000	Temporary Wetland JD	0.240
Natural/Non-JD (Fill/Drain)	0.000	Non-JD Wetland Temporary	0.000
Artificial/JD (Fill/Drain)	0.000		
Artificial /Non-JD (Fill/Drain))	0.000	Permanent OW	0.010
Total	**0.000**	Temporary OW	0.200
JD Natural (Cut)	0.000	Permanent OW-d	0.000
JD Artificial (Cut)	0.000	Temporary OW-d	0.000
Non-JD Natural (Cut)	0.000		
Non-JD Artificial (Cut)	0.000		
Total	**0.000**		

Mitigation Summary Table

	Location	Ditch Shift Acre(s)	Onsite Acre(s)	11990 Bank Acre(s)	USACE/11990 Bank Acre(s)	USFWS Bank Acre(s)
USACE Only	NA	0.000	0.000		0.000	
EO 11990 Only	NA	0.000	0.000	0.000		
USACE/11990	NA	0.000	0.000		0.000	
USFWS	NA	0.000				0.000
	Total	**0**	**0**	**0**	**0**	**0**

Wetland Tables

Site #3

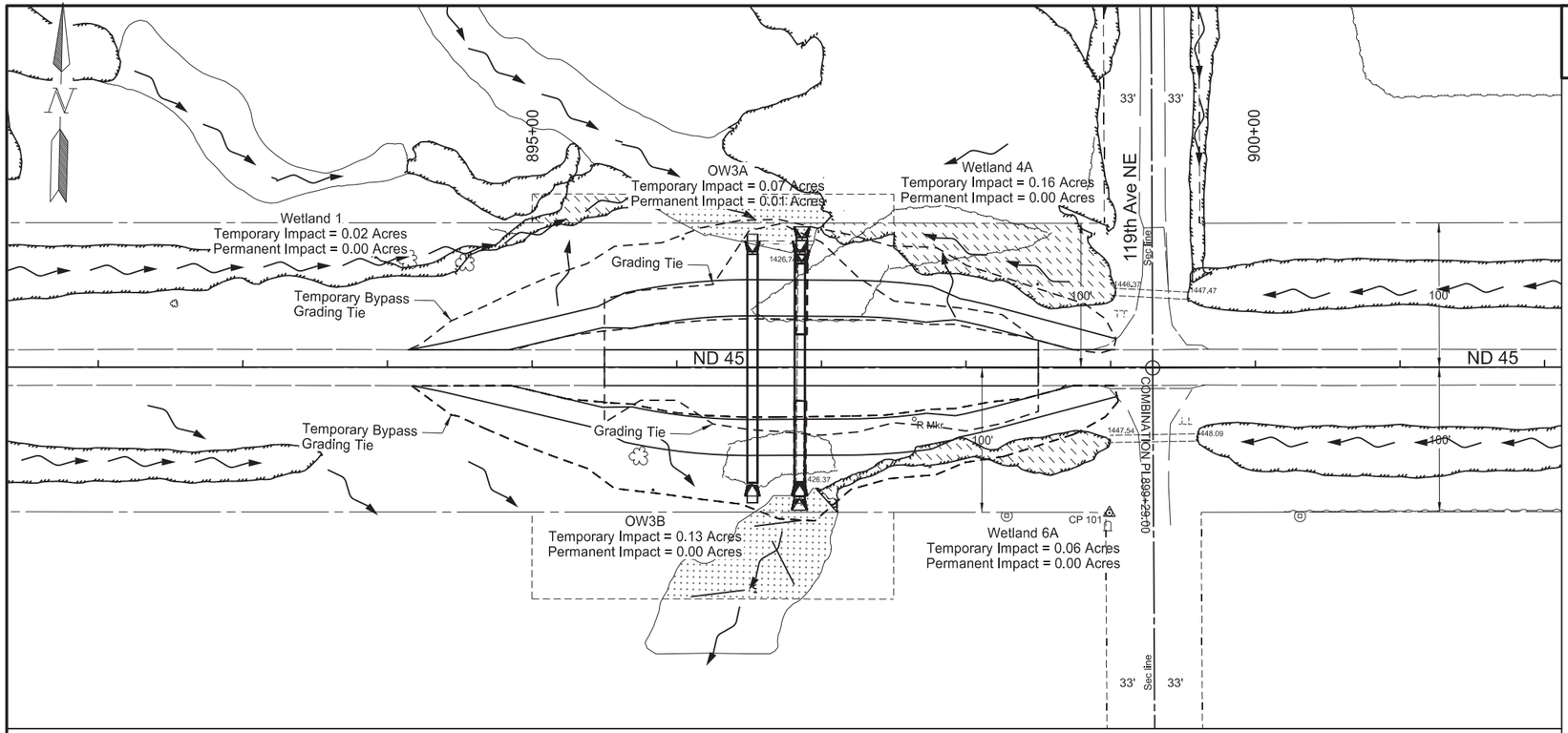
Structure Replacement

Griggs County

2 Miles West of ND 32

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	75	9



Temporary Wetland Impact

Other Water Temproary Impact

Other Water Permanent Impact

Wetland Impacts

Site #3

Structure Replacement

Griggs County

2 Miles West of ND 32

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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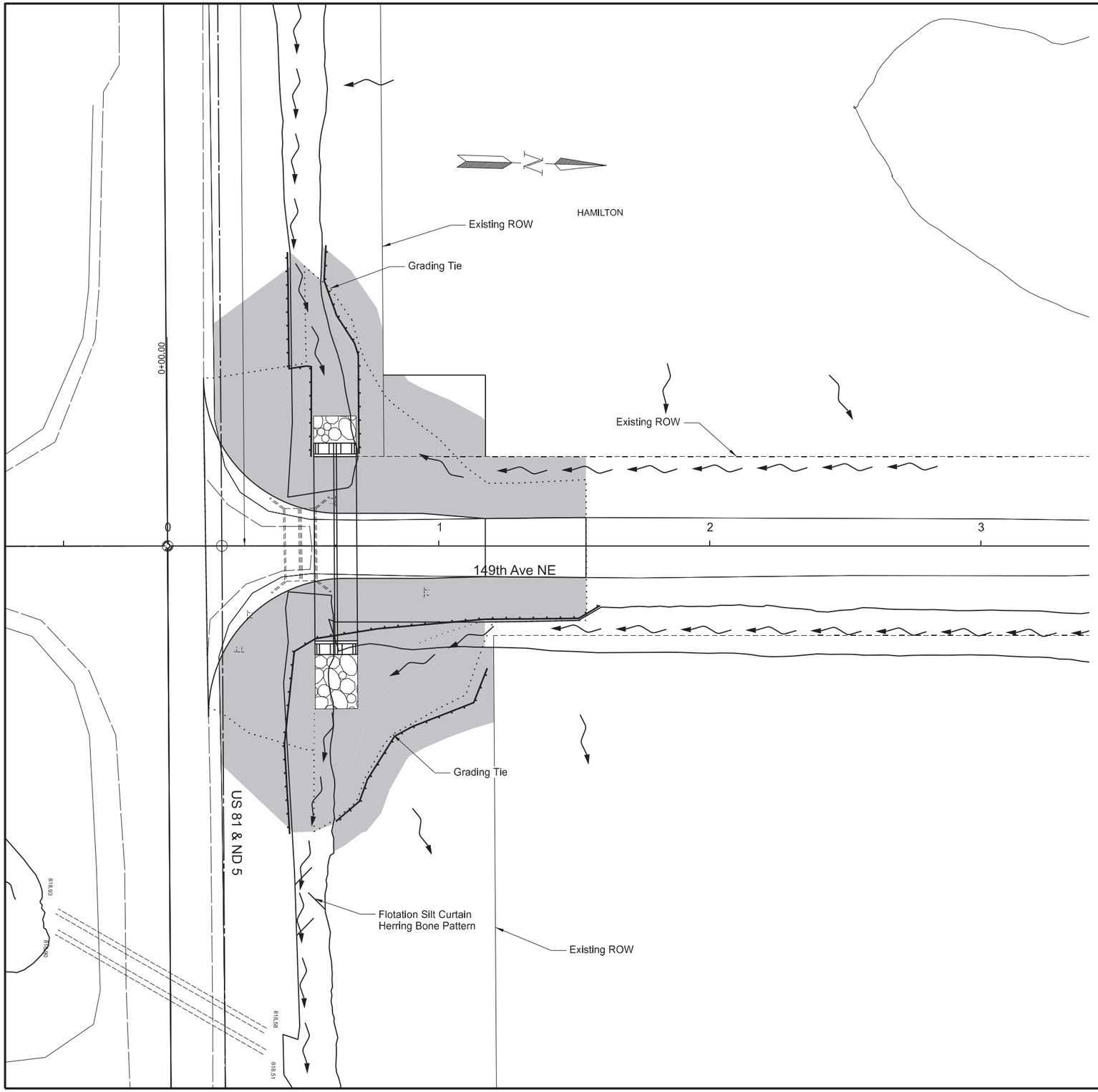


	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	76	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	**2000**	**TEMPORARY COVER CROP**		
		STA. 00+17 - 01+27 LT	ACRE	0.15
		STA. 00+18 - 01+27 RT	ACRE	0.16
253	**0100**	**STRAW MULCH**		
		STA. 00+17 - 01+27 LT	ACRE	0.15
		STA. 00+18 - 01+27 RT	ACRE	0.16
261	**0112**	**FIBER ROLLS 12 IN**		
		Fiber Rolls	LF	404
261	**0113**	**REMOVE FIBER ROLLS 12 IN**		
		Fiber Rolls	LF	404
262	**0100**	**FLOTATION SILT CURTAIN**		
		STA. 0+42 - 0+57 RT	LF	27
262	**0101**	**REMOVE FLOTATION SILT CURTAIN**		
		STA. 0+42 - 0+57 RT	LF	27

Floating Silt Curtain

Station to Station			Floating Silt Curtain (LF)	
			LT	RT
0+42	to	0+57		27

Fiber Rolls

Station to Station			Fiber Rolls 12" (LF)	
			LT	RT
0+45	to	0+54	84	
0+46	to	1+55		183
0+57	to	0+70	80	
0+61	to	1+58		92

Temporary Cover Crop and Straw Mulch

Fiber Rolls

Flow Arrow

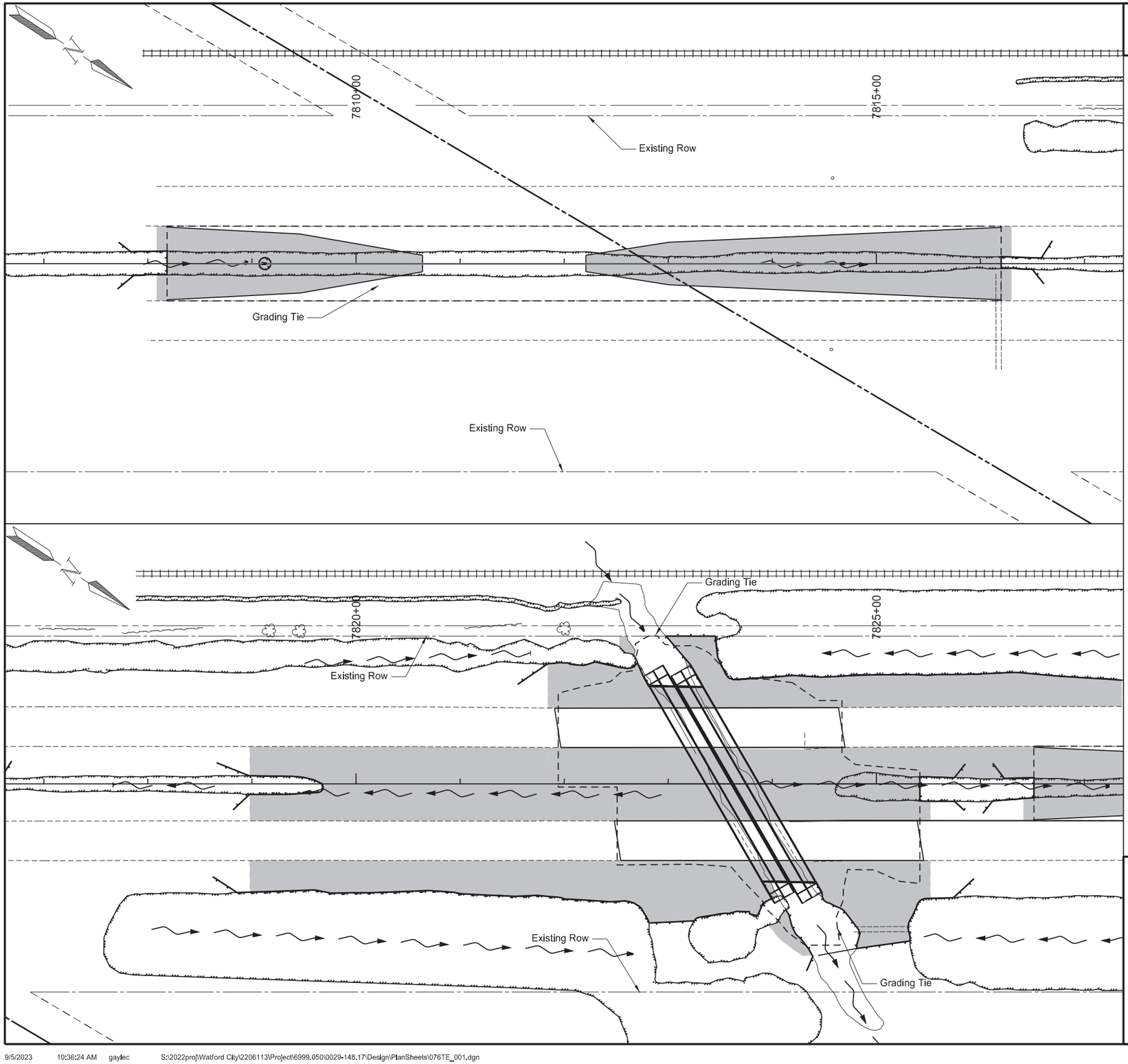
s Flotation Silt Curtain

Temporary Erosion Control

Site #1

Structure Replacement
Pembina County
US Highway 81
JCT US 81 & ND 5
Str# 81-218.530N

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	76	2

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	2000	**TEMPORARY COVER CROP**		
		STA. 7808+08 - 7816+30 CL	ACRE	0.77
		STA. 7818+98 - 7827+36 LT	ACRE	1.00
		STA. 7818+98 - 7825+52 RT	ACRE	1.13
253	0100	**STRAW MULCH**		
		STA. 7808+08 - 7816+30 CL	ACRE	0.77
		STA. 7818+98 - 7827+36 LT	ACRE	1.00
		STA. 7818+98 - 7825+52 RT	ACRE	1.13
262	0100	**FLOTATION SILT CURTAIN**		
		STA. 7824+38 - 7824+81 RT	LF	43
262	0101	**REMOVE FLOTATION SILT CURTAIN**		
		STA. 7824+38 - 7824+81 RT	LF	43

Temporary Cover Crop & Straw Mulch

Fiber Rolls

Flow Arrow

S — Flotation Silt Curtain

Temporary Erosion Control

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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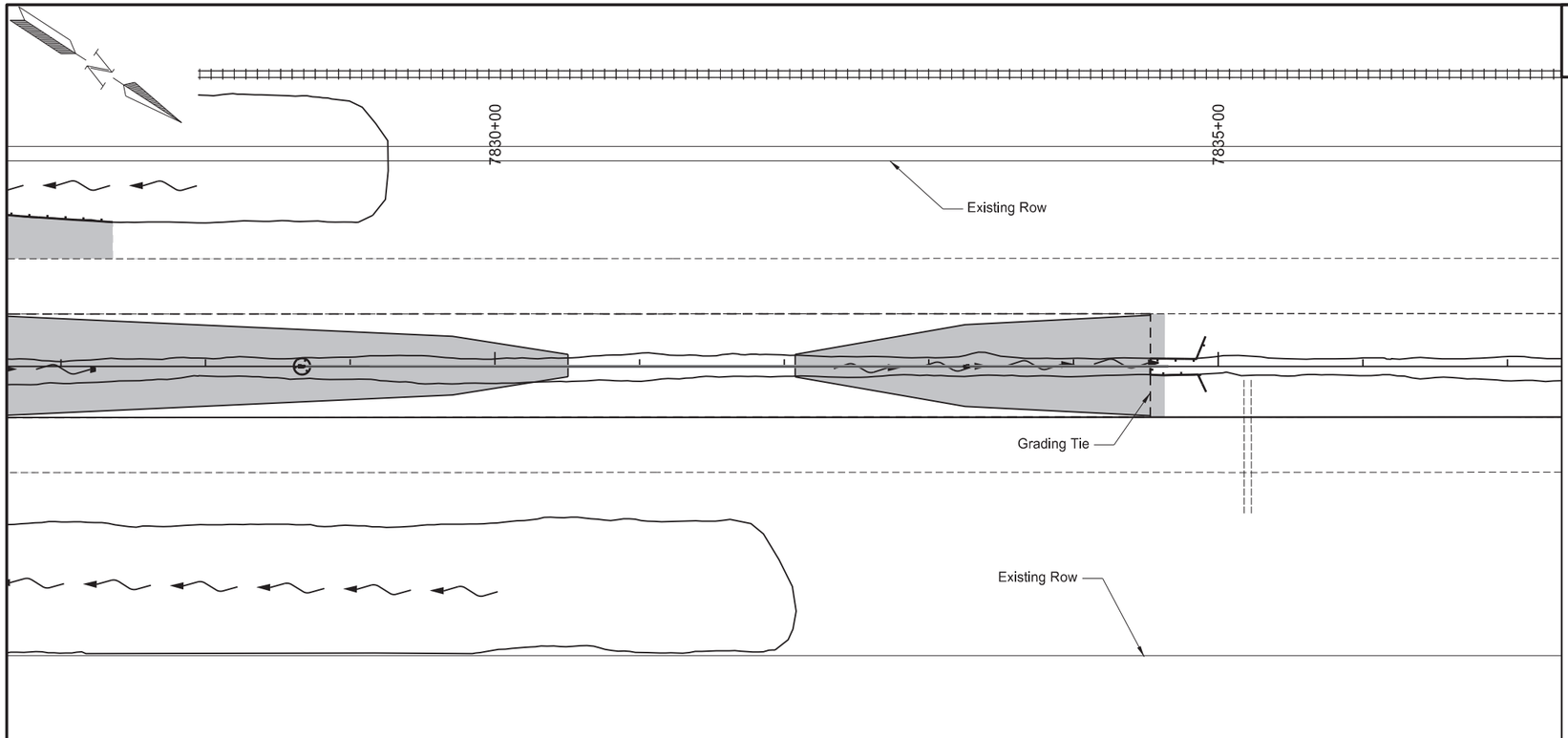

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	76	3

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	2000	**TEMPORARY COVER CROP**		
		STA. 7826+41 - 7834+64 CL	ACRE	0.76
253	0100	**STRAW MULCH**		
		STA. 7826+41 - 7834+64 CL	ACRE	0.76
261	0112	**FIBER ROLLS 12 IN**		
		STA 7809+75 to 7834+25	LF	2713
261	0113	**REMOVE FIBER ROLLS 12 IN**		
		STA 7809+75 to 7834+25	LF	2713

Station to Station			Fiber Rolls 12" (LF)		
			LT	Median	RT
7807+71	to	7808+18		125	
7816+20	to	7816+69		117	
7818+66	to	7819+68		204	
7818+62	to	7823+99			586
7821+55	to	7822+81	150		
7822+98	to	7827+36	527		
7824+13	to	7824+33			68
7824+42	to	7825+94			236
7825+42	to	7827+58			289
7825+42	to	7825+86		120	
7826+02	to	7826+52		121	
7834+53	to	7834+92		106	

Pipe End Section Fiber Rolls	
Station	Fiber Rolls 12" (LF)
	Median
7809+12	32
7828+67	32

Temporary Cover Crop & Straw Mulch

Fiber Rolls

Flow Arrow

s — Floating Silt Curtain

Temporary Erosion Control

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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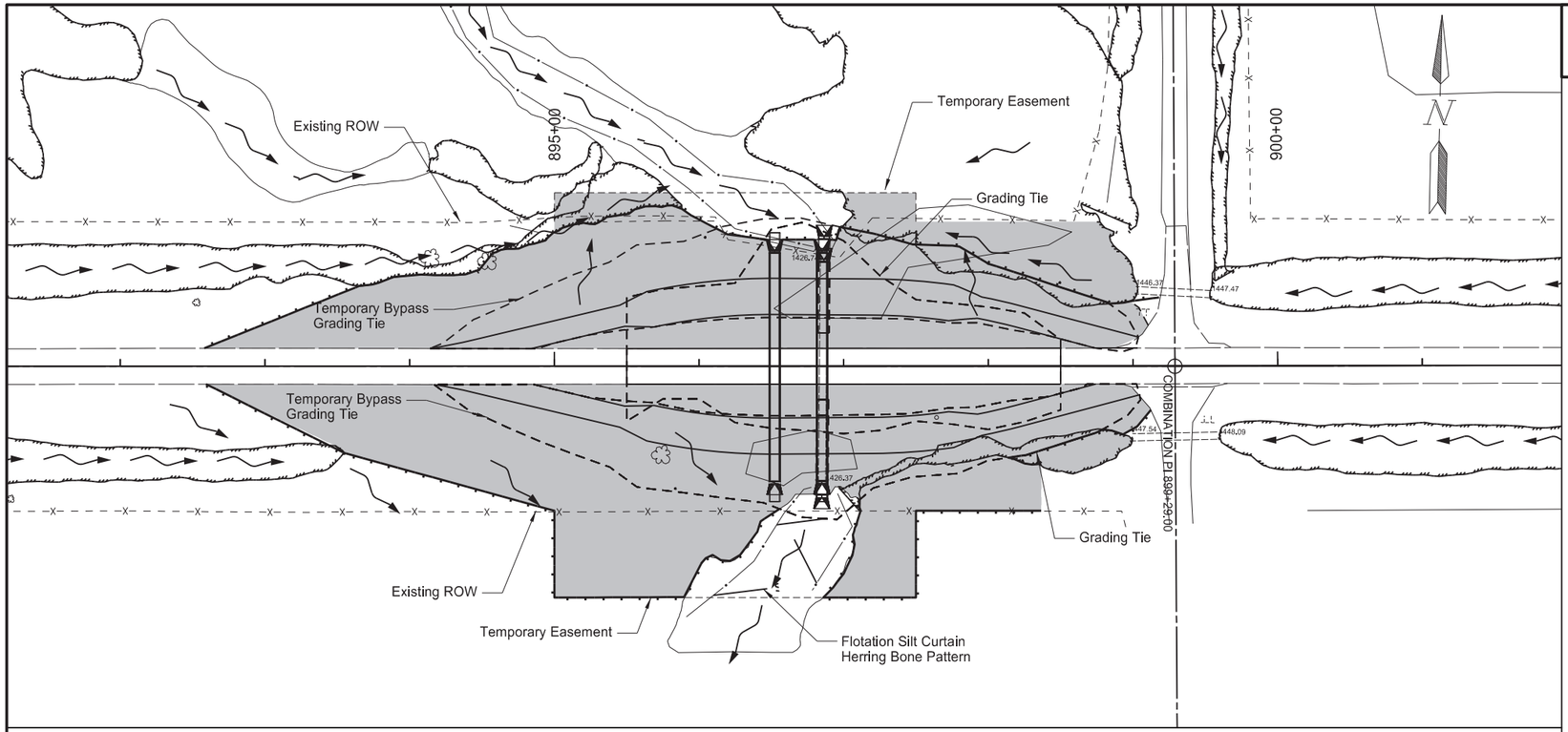


	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	76	4

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	2000	**TEMPORARY COVER CROP**		
		STA 892+58 - 899+10 LT	ACRE	1.06
		STA 892+59 - 899+12 RT	ACRE	1.25
253	0100	**STRAW MULCH**		
		STA 892+58 - 899+10 LT	ACRE	1.06
		STA 892+59 - 899+12 RT	ACRE	1.25
261	0112	**FIBER ROLLS 12 IN**		
		Fiber Rolls	LF	1455
261	0113	**REMOVE FIBER ROLLS 12 IN**		
		Fiber Rolls	LF	1455
262	0100	**FLOTATION SILT CURTAIN**		
		STA 896+10 - 896+81 RT	LF	113
262	0101	**REMOVE FLOTATION SILT CURTAIN**		
		STA 896+10 - 896+81 RT	LF	113

R/W Fiber Rolls

Station to Station			Fiber Rolls 12" (LF)	
			LT	RT
892+58	to	899+18	699	
892+59	to	896+55		444
897+12	to	898+36		179
898+14		899+12		133

Flotation Silt Curtain

Station to Station			Flotation Silt Curtain (LF)	
			LT	RT
896+10	to	896+81		113

Temporary Crop Cover & Straw Mulch

Fiber Rolls

Flow Arrow

s Floating Silt Curtain

Temporary Erosion Control

Site #3

Structure Replacement
Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

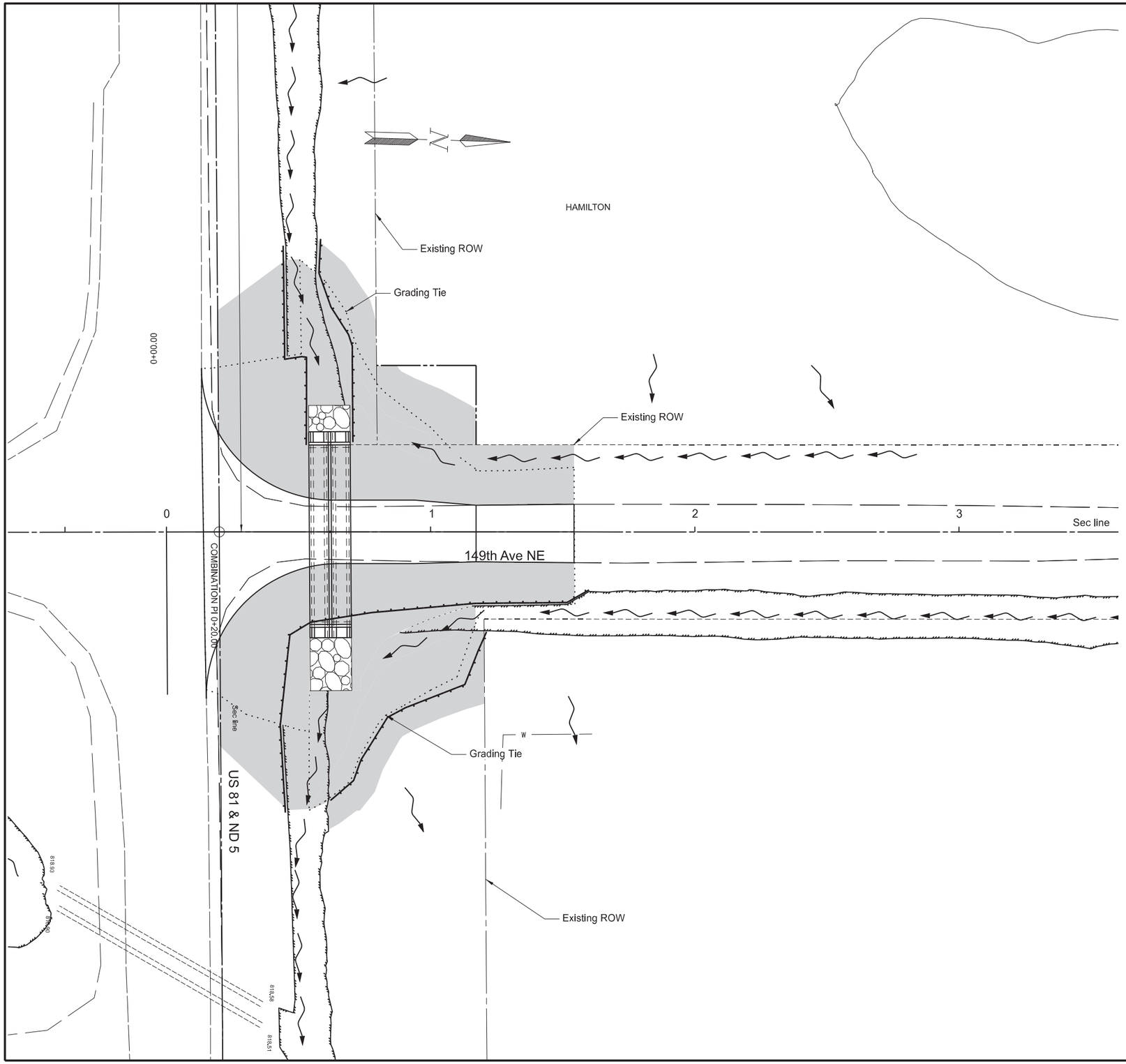
REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	77	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	**0200**	**SEEDING CLASS II**		
		STA.00+17 - 01+27 LT	ACRE	0.15
		STA. 00+18 - 01+27 RT	ACRE	0.16
253	**0100**	**STRAW MULCH**		
		STA.00+17 - 01+27 LT	ACRE	0.15
		STA. 00+18 - 01+27 RT	ACRE	0.16
261	**0112**	**FIBER ROLLS 12 IN**		
		Fiber Rolls	LF	404

Fiber Rolls

Station to Station			Fiber Rolls 12" (LF)	
			LT	RT
0+45	to	0+54	84	
0+46	to	1+55		148
0+57	to	0+70	80	
0+61	to	1+58		92



Seeding Class II & Straw Mulch

Fiber Rolls

Flow Arrow

Permanent Erosion Control

Site #1

Structure Replacement
Pembina County
US Highway 81
JCT US 81 & ND 5
Str# 81-218.530N

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE 10597
DATE 09/05/23
NORTH DAKOTA

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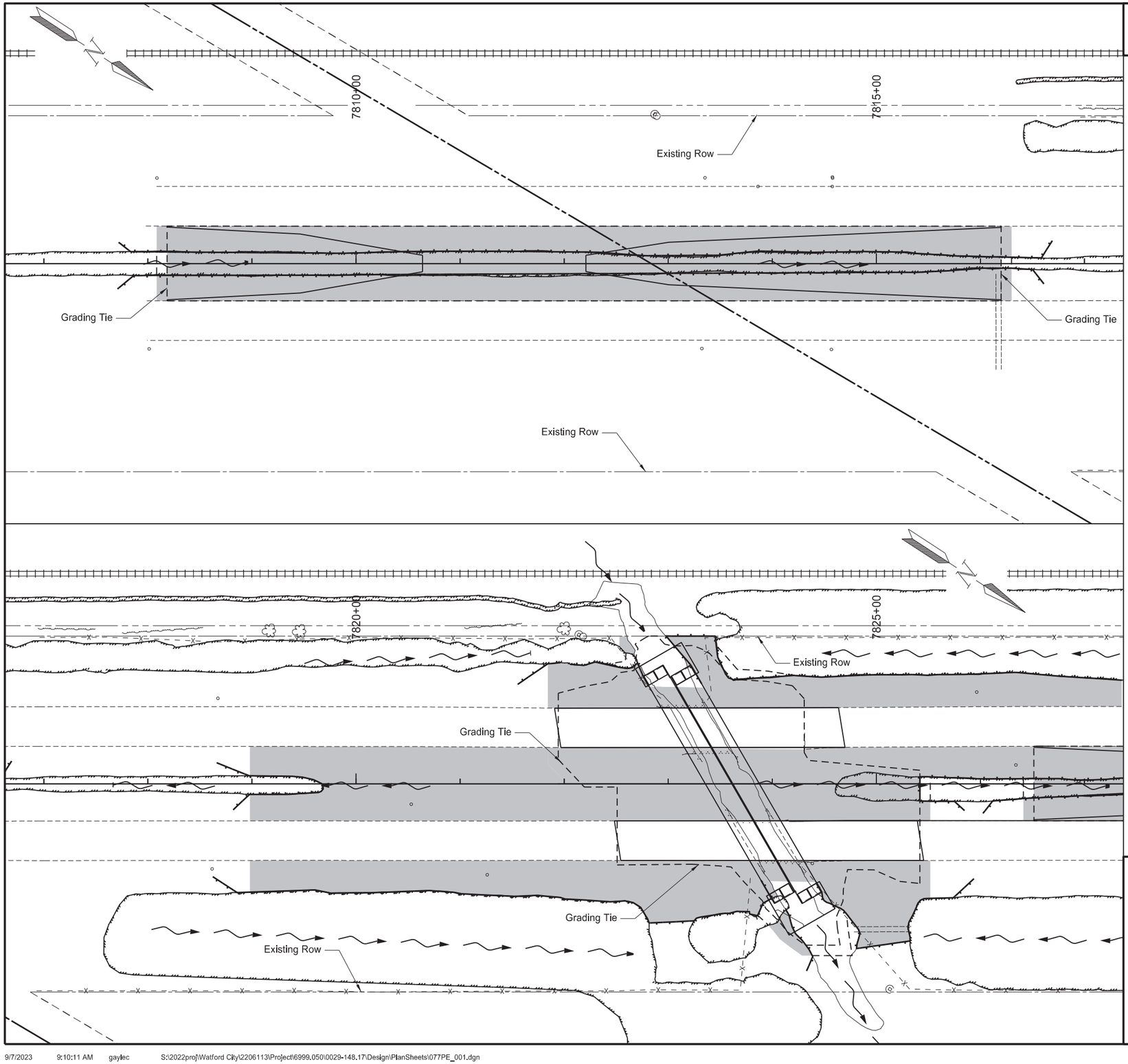
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	77	2

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	**0200**	**SEEDING CLASS II**		
		STA. 7808+08 - 7816+30 CL	ACRE	1.34
		STA. 7818+98 - 7827+36 LT	ACRE	1.00
		STA. 7818+98 - 7825+52 RT	ACRE	1.12
253	**0100**	**STRAW MULCH**		
		STA. 7808+08 - 7816+30 CL	ACRE	1.34
		STA. 7818+98 - 7827+36 LT	ACRE	1.00
		STA. 7818+98 - 7825+52 RT	ACRE	1.12



Seeding Class II & Straw Mulch

Fiber Rolls

Flow Arrow

Permanent Erosion Control

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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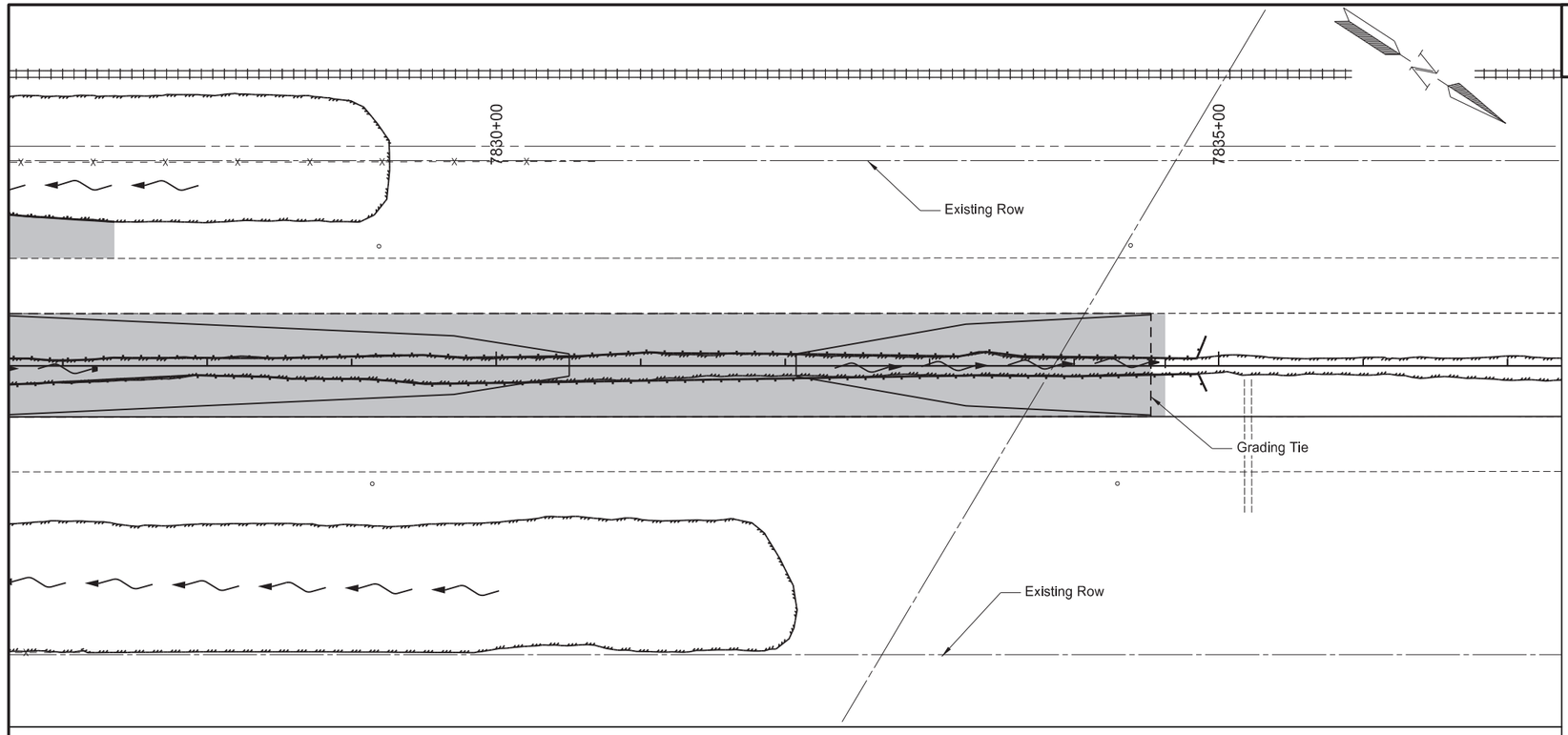


	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	77	3

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	0200	**SEEDING CLASS II**		
		STA. 7826+41 - 7834+63 CL	ACRE	1.34
253	0100	**STRAW MULCH**		
		STA. 7826+41 - 7834+63 CL	ACRE	1.34
261	0112	**FIBER ROLLS 12 IN**		
		STA. 7809+75 - 7834+25	LF	5506

Station to Station			Fiber Rolls 12" (LF)		
			LT	Median	RT
7807+72	to	7816+69		910	
7807+71	to	7816+61		902	
7818+66	to	7819+68		204	
7818+62	to	7823+99			586
7821+55	to	7821+96	47		
7822+06	to	7822+81	93		
7822+98	to	7827+36	527		
7824+13	to	7824+33			68
7824+42	to	7825+94			236
7825+42	to	7834+91		1030	
7826+02	to	7834+92		903	

Seeding Class II & Straw Mulch

Fiber Rolls

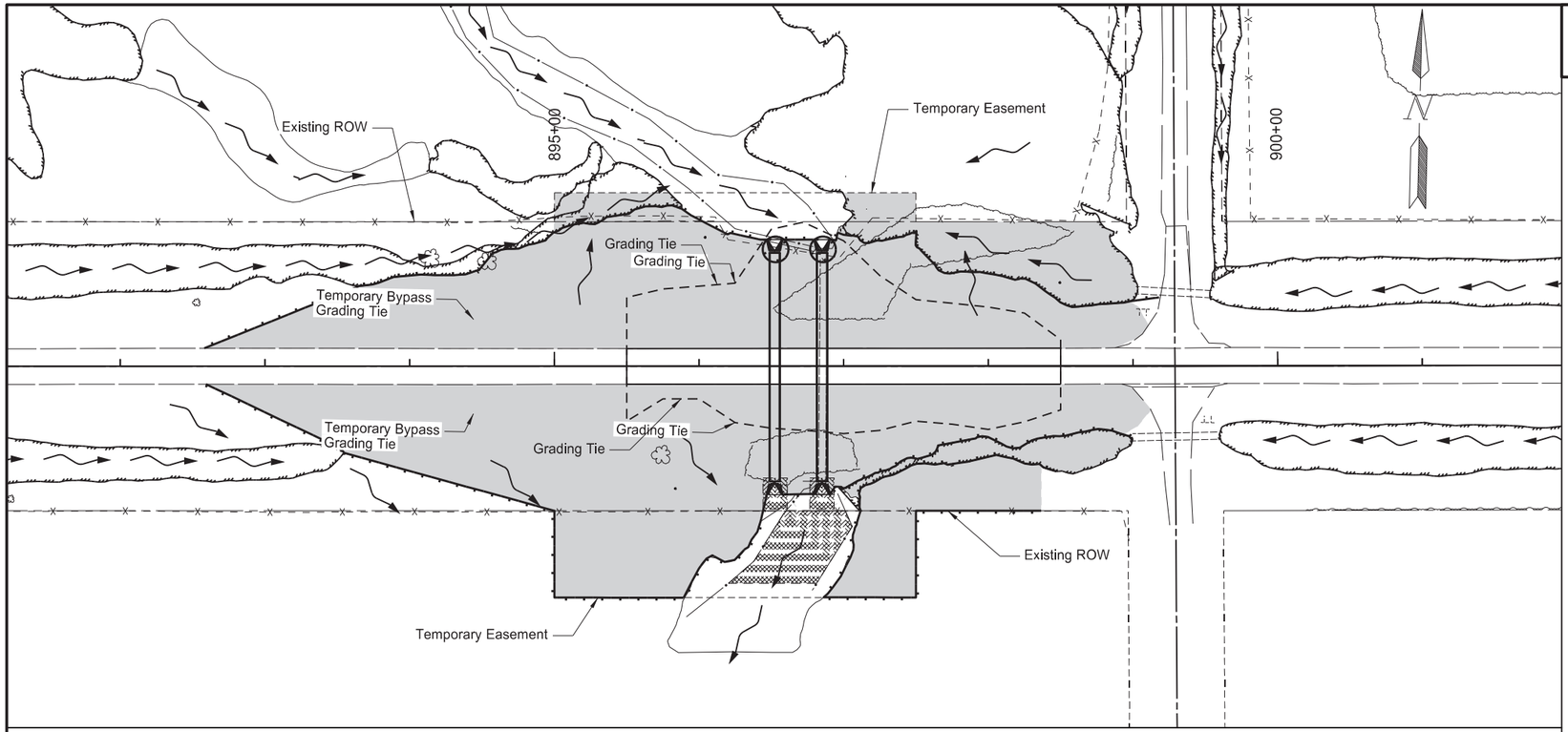
Flow Arrow

Permanent Erosion Control

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	77	4

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	0200	**SEEDING CLASS II**		
		STA. 892+58 - 899+11 LT	ACRE	1.06
		STA. 892+59 - 899+12 RT	ACRE	1.25
253	0100	**STRAW MULCH**		
		STA. 892+58 - 899+11 LT	ACRE	1.06
		STA. 892+59 - 899+12 RT	ACRE	1.25
255	0102	**ECB TYPE 2**		
		896+52 RT	SY	33
		896+85 RT	SY	33
		896+81 RT Scour Repair	SY	295
261	0112	**FIBER ROLLS 12 IN**		
		Fiber Rolls	LF	1800

R/W Fiber Rolls

Station to Station			Fiber Rolls 12" (LF)	
			LT	RT
892+59	to	899+00		714
897+06	to	898+47		330
898+58	to	899+18	692	

Seeding Class II & Straw Mulch

Fiber Rolls

Flow Arrow

Permanent Erosion Control

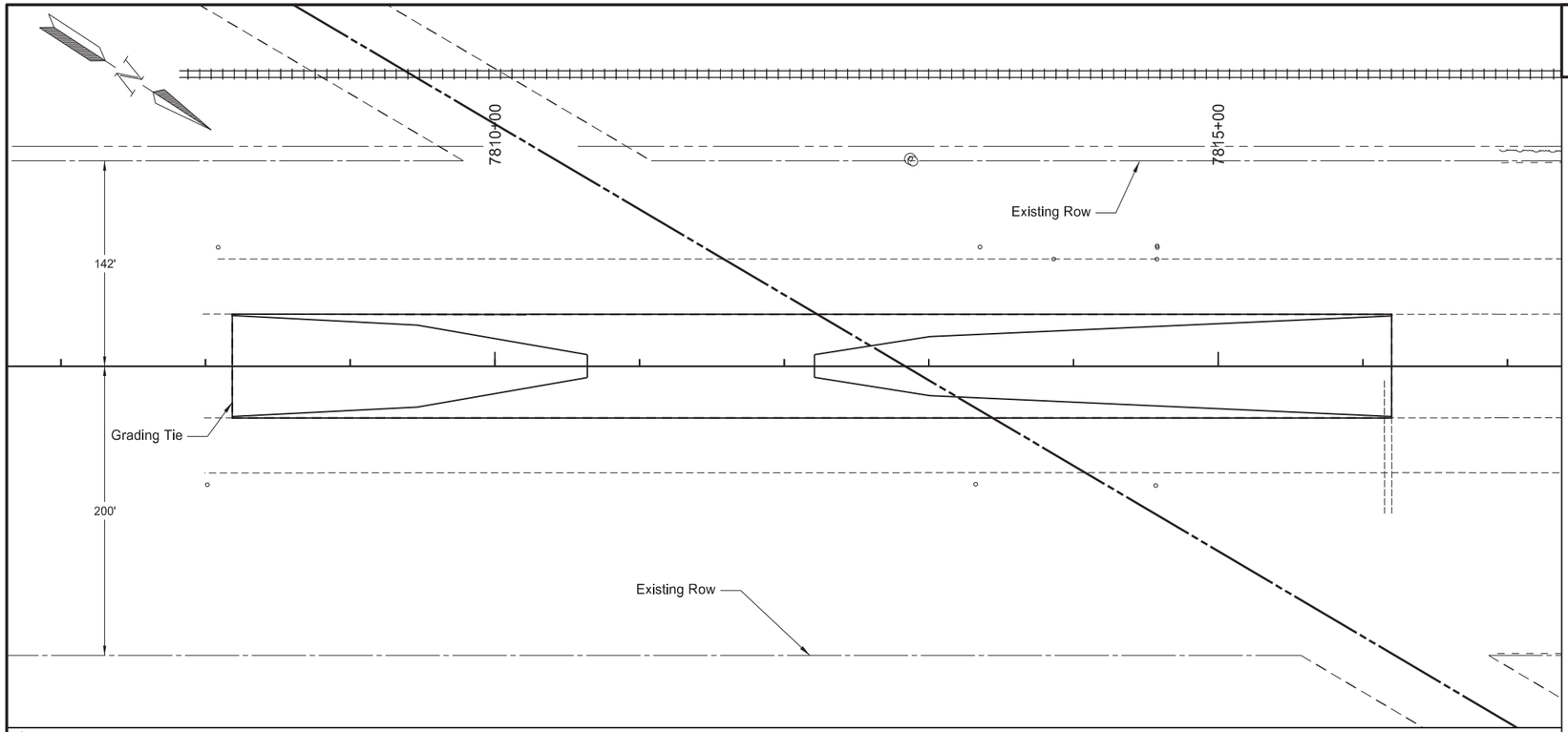
Site #3

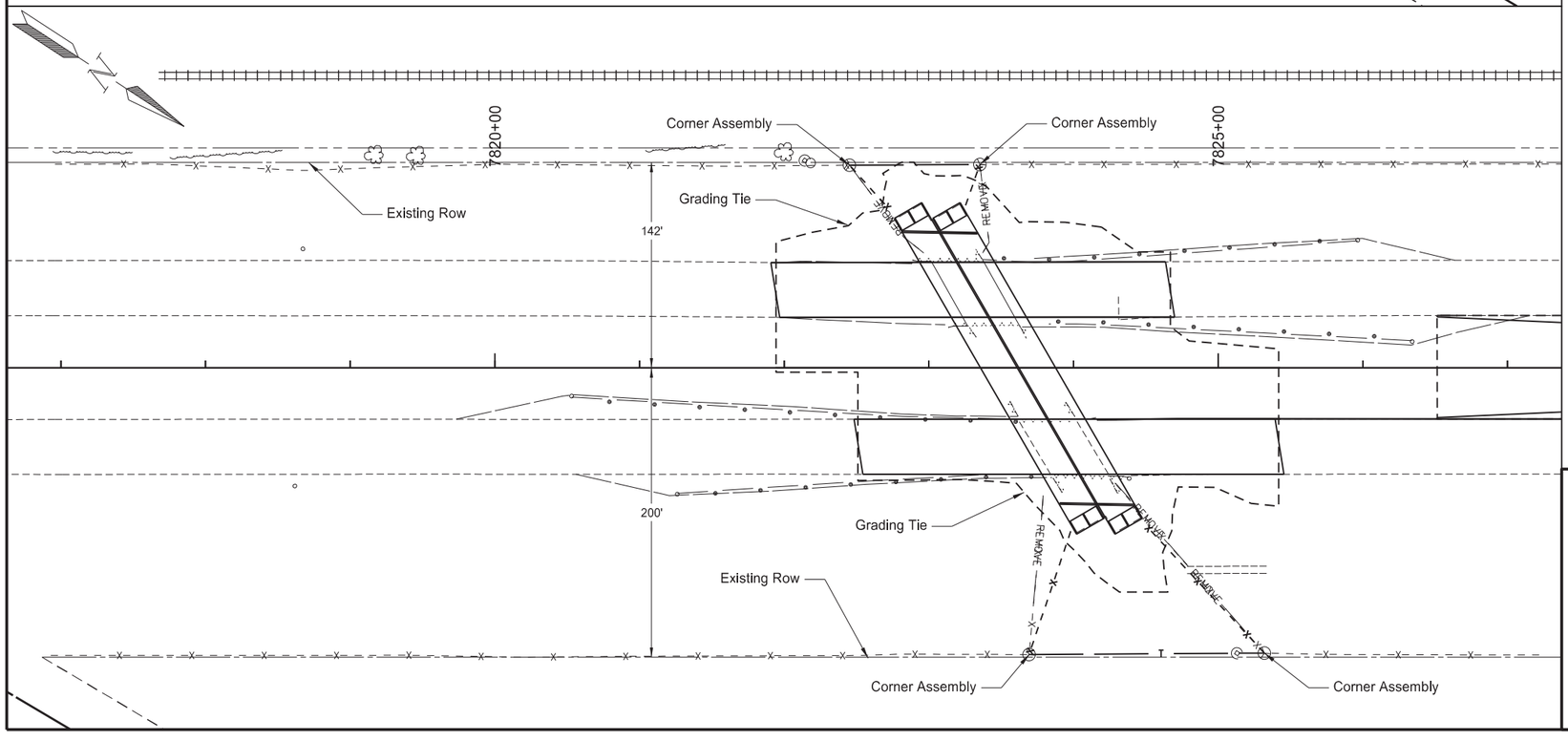
Structure Replacement
Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE 10597
DATE 09/05/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	80	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	312	**REMOVE EXISTING FENCE**		
		Sta. 7822+45 to 7822+96 LT	LF	80
		Sta. 7823+69 to 7823+79 RT	LF	110
		Sta. 7823+35 to 7823+37 LT	LF	63
		Sta. 7825+31 to 7824+29 RT	LF	156
752	320	**FENCE BARBED WIRE 4 STRAND-STEEL POST**		
		Sta. 7822+45 to 7822+72 LT	LF	42
		Sta. 7823+69 to 7823+99 RT	LF	94
		Sta. 7823+35 to 7823+24 LT	LF	34
		Sta. 7825+31 to 7824+50 RT	LF	120
752	905	**TEMPORARY FENCE**		
		Sta. 7822+45 to 7823+35 LT	LF	90
		Sta. 7823+69 to 7825+31 RT	LF	163
752	3150	**CORNER ASSEMBLY BARBED WIRE-WOOD POST**		
		Sta. 7822+45 - 140' LT	EA	1
		Sta. 7823+69 - 198' RT	EA	1
		Sta. 7823+35 - 140' LT	EA	1
		Sta. 7825+31 - 197' RT	EA	1





REMOVE — Removal of Fence

T — Temp Fence

X- - - -X- - - - Fencing

Fencing

Site #2

Structure Replacement
Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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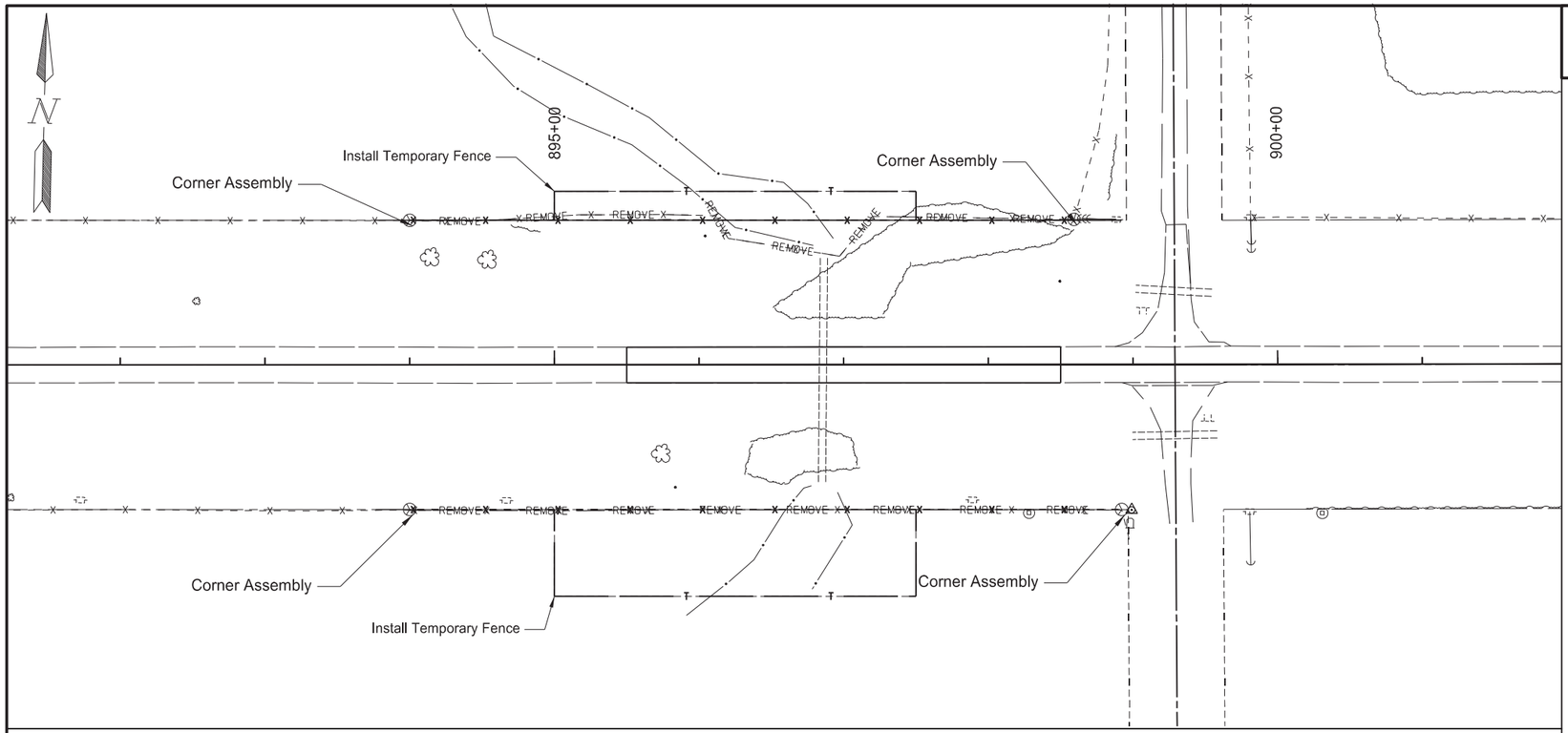


	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	80	2

SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	312	**REMOVE EXISTING FENCE**		
		Sta 894+00 to 898+59 LT	LF	483
		Sta 894+00 to 898+92 RT	LF	492
752	320	**FENCE BARBED WIRE 4 STRAND-STEEL POST**		
		Sta 894+00 to 898+59 LT	LF	459
		Sta 894+00 to 898+92 RT	LF	492
752	905	**TEMPORARY FENCE**		
		Sta 895+00 to 897+50 LT	LF	290
		Sta 895+00 to 897+50 RT	LF	370
752	3150	**CORNER ASSEMBLY BARBED WIRE-WOOD POST**		
		Sta. 894+00 - 100' RT	EA	1
		Sta. 898+52 - 100' RT	EA	1
		Sta. 894+00 - 100' LT	EA	1
		Sta. 898+59 - 100' LT	EA	1

— REMOVE — Removal of Fence

——— ——— T Temp Fence

x– – – –x– – – – Fencing

Fencing

Site #3

Structure Replacement
Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - Jct US 81 and ND 5

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	81	1

HORIZONTAL ALIGNMENT

PNT	STATION	NORTHING	EASTING
US 81 (Chain: EX81)			
BEG Rec Sec Cor	11486+42.57	667613.99	2704324.07
Station equation US 81 (EX81) at 149th Ave NE (EX149)			
US 81 END	11538+38.40	672807.27	2704161.21
149th Ave NE PI	0+00	672807.27	2704161.21
US 81 (Chain: EX81)			
BEG	17725+60.53	672788.77	2703661.65
Station equation ND 5 (EX5) at US 81 (EX81) and 149th Ave NE (EX149)			
US 81 PI	11538+38.40	672807.27	2704161.21
149th Ave NE PI	0+00	672807.27	2704161.21
ND 5 PI	17730+60.43	672807.27	2704161.21
PC	17733+57.27	672817.89	2704457.86
PI C12	17735+97.46	672826.48	2704697.90
PRC	17738+37.58	672845.12	2704937.37
PI C14	17740+77.78	672863.52	2705173.76
PT	17743+17.90	672872.11	2705413.80
Rec Sec Cor END	17782+92.78	673014.25	2709386.14
149th Ave NE (Chain: EX149)			
BEG	0+00.00	672807.27	2704161.21
PI	0+20.00	672827.27	2704160.59
End	26+44.82	675450.96	2704083.87

CURVE DATA

ARC DEFINITION

C12

PI STA	=	17735+97.46
Delta	=	2° 24' 06" LT
Da	=	0° 30' 00"
R	=	11459.19'
T	=	240.19'
L	=	480.32'

C14

PI STA	=	17740+80.85
Delta	=	2° 24' 06" RT
Da	=	0° 30' 00"
R	=	11459.19'
T	=	240.19'
L	=	480.31'

US PUBLIC LAND SURVEY DATA

CORNER	IRN	NORTHING	EASTING
T-162-N R-53-W			
E¼ Cor Sec 35	M-11	675450.96	2704083.87
T-161-N R-53-W			
NE Cor Sec 2	A-11	672827.27	2704160.59

SURVEY CONTROL POINTS

PNT	NORTHING	EASTING	ELEV	STATION	OFFSET	MONUMENT DESCRIPTION
PRIMARY CONTROL						
CP401	672666.26	2703578.27	823.77	11537+16	587' Lt (EX81)	
CP402	673009.13	2706771.87	821.48	17756+83	88' Lt (EX5)	
CP403	669175.86	2704184.52	824.55	11502+08	91' Lt (EX81)	

NOTES: Sheet 1 of 1

Date Survey Completed 06/22/22

☐ Assumed Coordinates

☒ All coordinates on this sheet are Pembina County ground coordinates. They are derived from the NAD83(2011) reference frame; North Dakota North Zone Combination Factor (cf) = 0.9999640

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

INITIALIZING BENCH MARK
NDGPS Stations (OPUS)

☒ NAVD-88

☐ _____

☐ GEOID12B ☐ _____

☒ GEOID18

REGISTERED PROFESSIONAL LAND SURVEYOR
DUSTIN JORDAN
LS-10478
DATE 9/6/2023
NORTH DAKOTA

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - I-29 over COUNTY DRAIN NO 11, 4 SOUTH OF MANVEL

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	81	2

HORIZONTAL ALIGNMENT

PNT	STATION	NORTHING	EASTING
I 29 (Chain: EX29)			
BEG	7803+11.55	390097.23	2794547.45
Sec Xing			
Sec Xing	7864+59.13	395244.80	2791186.62
END			
I 29 SB (Chain: PR_29SB)			
BEG	200+00.00	391415.71	2793625.95
END	208+46.24	392124.29	2793163.32
I 29 NB (Chain: PR_29NB)			
BEG	100+00.00	391516.35	2793682.40
PI	102+78.10	391749.21	2793530.36
PI	105+69.15	391992.91	2793371.25
END	107+52.44	392146.39	2793271.04

CURVE DATA

ARC DEFINITION

US PUBLIC LAND SURVEY DATA

CORNER	IRN	NORTHING	EASTING
T-153-N R-51-W			
NW Cor Sec 36	L-11	395136.49	2788560.43
T-153-N R-51-W			
SE Cor Sec 36	N-13	390077.09	2794053.35

SURVEY CONTROL POINTS

PNT	NORTHING	EASTING	ELEV	STATION	OFFSET	MONUMENT DESCRIPTION
PRIMARY CONTROL						
GPS10	390034.67	2793006.82	828.37	7811+01	1324' Lt	
GPS301	395356.43	2791100.31	827.75	N/A	N/A	
GPS302	390273.66	2799280.65	824.25	N/A	N/A	

NOTES: Sheet 1 of 1

Date Survey Completed 06/29/22

☐ Assumed Coordinates

☒ All coordinates on this sheet are Grand Forks County ground coordinates. They are derived from the NAD83(2011) reference frame; North Dakota North Zone Combination Factor (cf) = 0.9998805

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

INITIALIZING BENCH MARK
NDGPS Stations (OPUS)

☒ NAVD-88

☐ _____

☐ GEOID12B ☐ _____

☒ GEOID18

REGISTERED PROFESSIONAL LAND SURVEYOR
DUSTIN JORDAN
LS-10478
DATE 9/6/2023
NORTH DAKOTA

9/6/2023 9:16:50 AM gaylec S:\2022proj\Watford City\2206113\Project\6999.050\0029-148.17\Survey\081CD_001.dgn

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - ND 45, 2 WEST OF ND 32

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	81	3

HORIZONTAL ALIGNMENT

PNT	STATION	NORTHING	EASTING
ND 45 (Chain: EX45)			
BEG Rec Sec Cor	846+39.93	229134.15	2578518.70
Rec Sec Cor	899+29.00	229259.98	2583806.27
Rec Sec Cor END	952+30.19	229399.42	2589105.63
North Bypass (Chain: BYPASS)			
BEG START	0+00.00	229225.98	2582377.68
PC	8+53.26	229246.28	2583230.69
PI	9+00.00	229247.40	2583277.42
PT	9+46.32	229259.25	2583322.64
PC	10+62.45	229288.71	2583434.96
PI	11+10.52	229300.90	2583481.47
PT	11+58.14	229301.73	2583529.53
PC	12+25.19	229302.89	2583596.58
PI	12+76.02	229303.76	2583647.39
PT	13+26.29	229291.91	2583696.81
PC	14+07.81	229272.89	2583776.07
PI	14+60.45	229260.60	2583827.26
PT	15+12.49	229261.98	2583879.89
END	21+09.85	229277.63	2584477.04
South Bypass (Chain: SOUTH BYPASS)			
BEG START	0+00.00	229225.98	2582377.68
PC	8+53.26	229246.28	2583230.69
PI	9+00.00	229247.40	2583277.42
PT	9+46.32	229237.70	2583323.15
PC	10+62.45	229213.62	2583436.75
PI	11+10.52	229203.66	2583483.78
PT	11+58.14	229205.11	2583531.83
PC	12+24.94	229207.14	2583598.60
PI	12+76.02	229208.69	2583649.66
PT	13+26.54	229223.02	2583698.68
PC	14+08.58	229246.04	2583777.43
PI	14+60.50	229260.60	2583827.26
PT	15+11.84	229261.96	2583879.16
END	21+09.93	229277.63	2584477.04

CURVE DATA

ARC DEFINITION

North Bypass (Chain: BYPASS)			
PI STA =	9+00.00	PI STA =	11+10.52
Delta =	13° 19' 51" LT	Delta =	13° 42' 24" RT
Da =	14° 19' 26"	Da =	14° 19' 26"
R =	400.00'	R =	400.00'
T =	46.74'	T =	48.07'
L =	93.07'	L =	95.69'
PI STA =	12+76.02	PI STA =	15+12.49
Delta =	14° 28' 53" RT	Delta =	14° 59' 42" LT
Da =	14°19' 26"	Da =	14°19' 26"
R =	400.00'	R =	400.00'
T =	50.82'	T =	52.64'
L =	101.10'	L =	104.69'
South Bypass (Chain: SOUTH BYPASS)			
PI STA =	9+00.00	PI STA =	11+10.52
Delta =	13° 19' 51" RT	Delta =	13° 42' 24" LT
Da =	14° 19' 26"	Da =	14° 19' 26"
R =	400.00'	R =	400.00'
T =	46.74'	T =	48.07'
L =	93.07'	L =	95.69'
PI STA =	12+76.02	PI STA =	14+60.50
Delta =	14° 33' 12" LT	Delta =	14° 47' 28" RT
Da =	14°19' 26"	Da =	14°19' 26"
R =	400.00'	R =	400.00'
T =	51.08'	T =	51.92'
L =	101.60'	L =	103.26'

US PUBLIC LAND SURVEY DATA

CORNER	IRN	NORTHING	EASTING
T-148-N R-58-W			
NW Cor Sec 35	L-9	229134.15	2578518.70
SE Cor Sec 26	L-11	229259.98	2583806.27
SE Cor Sec 25	L-13	229399.42	2589105.63

SURVEY CONTROL POINTS

PNT	NORTHING	EASTING	ELEV	STATION	OFFSET
MONUMENT DESCRIPTION					
PRIMARY CONTROL					
CP10	229117.56	2581176.15	1463.03	872+96	80' Rt
½" Rebar w/ Aluminum Cap					
CP101	229159.00	2583778.77	1470.17	898+99	100' Rt
½" Rebar w/ Aluminum Cap					
BM 102	229375.96	2585095.46	1468.80	912+21	82' Lt
Brass Cap					

REFERENCE MARKERS

R Mkr #	NORTHING	EASTING	STATION	O\S	ALIGNMENT
17	229220.62	2583642.39	897+64.23	35' Rt	EX45

NOTES: Sheet 1 of 1

Date Survey Completed 06/22/22

☐ Assumed Coordinates

☒ All coordinates on this sheet are Griggs County ground coordinates. They are derived from the NAD83(2011) reference frame; North Dakota North Zone Combination Factor (cf) = 0.9999295

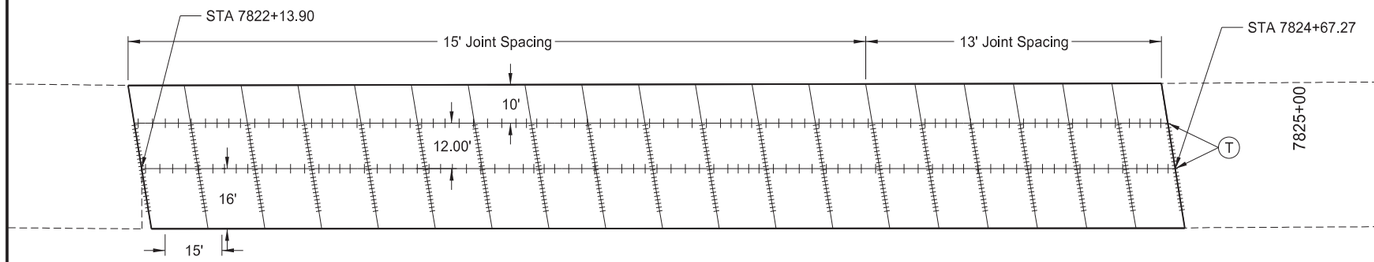
All coordinates and measurements on this document derived from the International Foot definition.

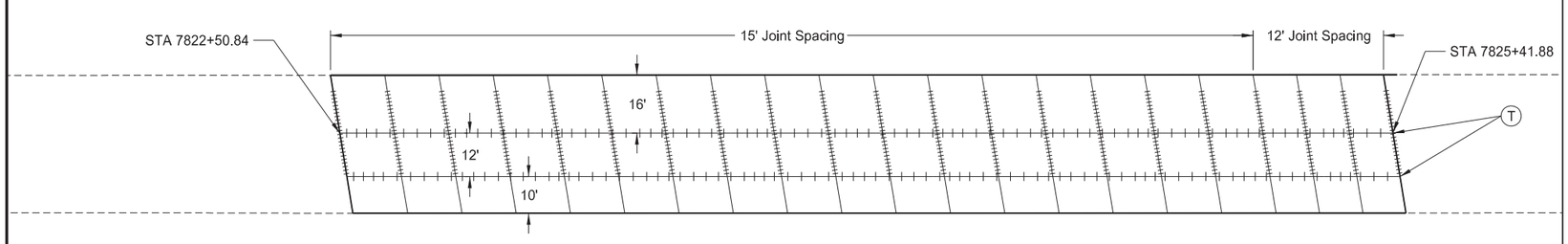
INITIALIZING BENCH MARK
NDGPS Stations (OPUS)

☒ NAVD-88
☐ _____
☐ GEOID12B ☐ _____
☒ GEOID18

REGISTERED PROFESSIONAL LAND SURVEYOR
DUSTIN JORDAN
LS-10478
DATE 9/6/2023
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	90	1





SPEC	CODE	BID ITEM	UNIT	QUANTITY
550	305	9IN NON-REIN CONCRETE PVMT AL AE-DOWELED		
		Sta. 7821+94.32 to 7824+67.27 LT	SY	672
550	310	10IN NON-REIN CONCRETE PVMT AL AE-DOWELED		
		Sta. 7822+50.85 to 7825+41.89 RT	SY	1024

T — Tied Joint - See Detail

Doweled Joint

Transverse Joint

Paving Layout

Site #2

Structure Replacement

Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
E5-1-48	48"x48"	EXIT GORE		35	
G20-1-60	60"x24"	ROAD WORK NEXT __ MILES		28	
G20-1b-60	60"x24"	NO WORK IN PROGRESS (Sign and installation only)		18	
G20-2-48	**48"x24"**	**END ROAD WORK**	**4**	**26**	**104**
G20-4-36	36"x18"	PILOT CAR FOLLOW ME (Mounted to back of pilot car)		18	
G20-4b-36	36"x30"	WAIT FOR PILOT CAR		18	
G20-50a-72	72"x36"	ROAD WORK NEXT __ MILES RT & LT ARROWS		43	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW		36	
G20-55-96	96"x48"	SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT		59	
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)		11	
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**	**5**	**15**	**75**
M4-10-48	**48"x18"**	**DETOUR (INSIDE ARROW) RIGHT or LEFT (Mounted on barricade)**	**2**	**7**	**14**
M5-1-21	21"x15"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)		7	
M5-1-30	30"x21"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)		9	
M6-1-21	21"x15"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)		7	
M6-1-30	30"x21"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)		9	
M6-3-21	21"x15"	DIRECTIONAL ARROW UP (Mounted on route marker post)		7	
R1-1-48	48"x48"	STOP		32	
R1-2-60	60"x60"	YIELD		29	
R2-1-36	36"x48"	SPEED LIMIT __ (Portable only)		30	
R2-1-48	**48"x60"**	**SPEED LIMIT __**	**2**	**39**	**78**
R2-1aP-24	**24"x18"**	**MINIMUM FEE $80 (Mounted on Speed Limit post)**	**1**	**10**	**10**
R3-2-48	48"x48"	NO LEFT TURN		35	
R4-1-48	48"x60"	DO NOT PASS		39	
R4-7-48	48"x60"	KEEP RIGHT		39	
R5-1-48	48"x48"	DO NOT ENTER		35	
R6-1-54	54"x18"	ONE WAY RIGHT or LEFT (Mounted on STOP or DO NOT ENTER post)		14	
R7-1-12	12"x18"	NO PARKING ANY TIME		11	
R10-6-24	24"x36"	STOP HERE ON RED		16	
R11-2-48	**48"x30"**	**ROAD CLOSED (Mounted on barricade)**	**2**	**12**	**24**
R11-2a-48	48"x30"	STREET CLOSED (Mounted on barricade)		12	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC (Mounted on barricade)		15	
W1-3-48	48"x48"	REVERSE TURN RIGHT or LEFT		35	
W1-4-48	48"x48"	REVERSE CURVE RIGHT or LEFT		35	
W1-4b-48	48"x48"	TWO LANE REVERSE CURVE RIGHT or LEFT		35	
W1-6-48	48"x24"	ONE DIRECTION LARGE ARROW		26	
W3-1-48	48"x48"	STOP AHEAD		35	
W3-3-48	48"x48"	SIGNAL AHEAD		35	
W3-4-48	48"x48"	BE PREPARED TO STOP		35	
W3-5-48	**48"x48"**	**SPEED REDUCTION AHEAD**	**1**	**35**	**35**
W4-2-48	48"x48"	LANE ENDS RIGHT or LEFT		35	
W5-1-48	**48"x48"**	**ROAD NARROWS**	**1**	**35**	**35**
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE		35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW		35	
W6-3-48	48"x48"	TWO WAY TRAFFIC		35	
W8-1-48	48"x48"	BUMP		35	
W8-3-48	48"x48"	PAVEMENT ENDS		35	
W8-7-48	48"x48"	LOOSE GRAVEL		35	
W8-11-48	48"x48"	UNEVEN LANES		35	
W8-12-48	48"x48"	NO CENTER LINE		35	
W8-17-48	48"x48"	SHOULDER DROP-OFF SYMBOL		35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY		35	
W8-54-48	48"x48"	TRUCKS ENTERING AHEAD or __ FT or _ MILE		35	
W8-55-48	48"x48"	TRUCKS CROSSING AHEAD or __ FT or _ MILE		35	
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY		35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL		35	
W13-1P-30	30"x30"	__ MPH ADVISORY SPEED PLAQUE (Mounted on warning sign post)		14	
W14-3-64	64"x48"	NO PASSING ZONE		28	
W16-2P-30	30"x24"	__ FEET PLAQUE (Mounted on warning sign post)		10	
W20-1-48	**48"x48"**	**ROAD WORK AHEAD or _FT or _ MILE**	**3**	**35**	**105**
W20-2-48	**48"x48"**	**DETOUR AHEAD or __ FT or _ MILE**	**1**	**35**	**35**
W20-3-48	**48"x48"**	**ROAD or STREET CLOSED AHEAD or __ FT or _ MILE**	**1**	**35**	**35**
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or __ FT or _ MILE		35	
W20-5-48	48"x48"	RIGHT or CENTER or LEFT LANE CLOSED AHEAD or __ FT or _ MILE		35	
W20-7-48	48"x48"	FLAGGER		35	
W20-8-18	18"x18"	STOP - SLOW PADDLE Back to Back		5	
W20-52P-54	54"x12"	NEXT __ MILES (Mounted on warning sign post)		12	
W21-1-48	48"x48"	WORKERS		35	
W21-2-48	48"x48"	FRESH OIL		35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT or _ MILE		35	
W21-5-48	48"x48"	SHOULDER WORK		35	
W21-5a-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED		35	
W21-5b-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT or _ MILE		35	

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
W21-6-48	48"x48"	SURVEY CREW		35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT		35	
W21-51-48	48"x48"	MATERIAL ON ROADWAY		35	
W21-52-48	48"x48"	PAVEMENT BREAKS		35	
W21-53-48	48"x48"	RUMBLE STRIPS AHEAD		35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK		35	
W24-1-48	48"x48"	DOUBLE REVERSE CURVE		35	

SPECIAL SIGNS

SPEC & CODE

704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS**	**550**

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	FLAGGING	MHR	
704-1048	PORTABLE RUMBLE STRIPS	EACH	
704-1050	TYPE I BARRICADES	EACH	
704-1052	**TYPE III BARRICADES**	**EACH**	**7**
704-1060	**DELINEATOR DRUMS**	**EACH**	**8**
704-1065	TRAFFIC CONES	EACH	
704-1067	**TUBULAR MARKERS**	**EACH**	**28**
704-1070	DELINEATOR	EACH	
704-1072	FLEXIBLE DELINEATORS	EACH	
704-1080	STACKABLE VERTICAL PANELS	EACH	
704-1081	VERTICAL PANELS - BACK TO BACK	EACH	
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH	
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH	
704-1087	SEQUENCING ARROW PANEL - TYPE C	EACH	
704-1500	OBLITERATION OF PVMT MK	SF	
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF	
704-3510	PRECAST CONCRETE MED BARRIER - STATE FURNISHED	EACH	
762-0200	RAISED PAVEMENT MARKERS	EACH	
762-0420	SHORT TERM 4IN LINE - TYPE R	LF	
762-0430	SHORT TERM 4IN LINE - TYPE NR	LF	

NOTE:
If additional signs are required, units will be calculated using the formula from Section III-18.06 of the Design Manual.
http://www.dot.nd.gov/

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

Traffic Control Devices List
Site #1
Structure Replacement
Pembina County
JCT US 81 & ND 5

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	100	2

Wall St

DETOUR xxxxFT
W20-2-48
Post Mounted

DETOUR
M4-9L-30
Post Mounted

DETOUR
M4-9R-30
Post Mounted

ROAD CLOSED AHEAD
W20-3-48
Post Mounted

See D704-23, Type Q

END ROAD WORK
G20-2a-48
Post Mounted

5th St

DETOUR
M4-9R-30
Post Mounted

DETOUR
M4-9L-30
Post Mounted

DETOUR
M4-10R-48
Barricade Mounted

ROAD CLOSED
R-11-2-48
Barricade Mounted

N

Crowston Ave

Page Ave

149th Ave NE

Crowston Ave

See D704-24, Type U For Sign Spacing

R2-1-36
SPEED LIMIT 40
MINIMUM FEE $80
R2-1aP-24
Post Mounted

SPEED LIMIT 40
W3-5-48
Post Mounted

ROAD NARROWS
W5-1-48
Post Mounted

ROAD WORK AHEAD
W20-1-48
Post Mounted

Project Location

DETOUR
M4-10L-30
Barricade Mounted

ROAD CLOSED
R-11-2-48
Barricade Mounted

END ROAD WORK
SPEED LIMIT 65

DETOUR
M4-9R-30
Post Mounted

City of Hamilton

ND 5

US 81

END ROAD WORK
G20-2-48
Post Mounted

ROAD WORK AHEAD
W20-1-48
Post Mounted

US 81

END ROAD WORK
G20-2a-48
Post Mounted

ROAD WORK AHEAD
W20-1-48
Post Mounted

Traffic Control

Site #1

Structure Replacement

Pembina County
US Highway 81
JCT US 81 & ND 5
Str# 81-218.530N

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	100	3

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED BY PHASE NO. 1	2	3	4	5	TOTAL AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
E5-1-48	48"x48"	EXIT GORE							35	
G20-1-60	60"x24"	ROAD WORK NEXT __ MILES							28	
G20-1b-60	60"x24"	NO WORK IN PROGRESS (Sign and installation only)							18	
G20-2-48	**48"x24"**	**END ROAD WORK**	**4**	**2**	**4**	**2**	**4**	**4**	**26**	**104**
G20-4-36	36"x18"	PILOT CAR FOLLOW ME (Mounted to back of pilot car)							18	
G20-4b-36	36"x30"	WAIT FOR PILOT CAR							18	
G20-50a-72	72"x36"	ROAD WORK NEXT __ MILES RT & LT ARROWS							43	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW							36	
G20-55-96	**96"x48"**	**SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT**	**4**	**4**	**4**	**4**	**4**	**4**	**59**	**236**
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)							11	
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 (INSIDE ARROW) RIGHT or LEFT (Mounted on barricade)							7	
M5-1-21	21"x15"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)							7	
M5-1-30	30"x21"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)							9	
M6-1-21	21"x15"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)							7	
M6-1-30	30"x21"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)							9	
M6-3-21	21"x15"	DIRECTIONAL ARROW UP (Mounted on route marker post)							7	
R1-1-48	48"x48"	STOP							32	
R1-2-60	60"x60"	YIELD							29	
R2-1-36	**36"x48"**	**SPEED LIMIT __ (Portable only)**	**4**		**4**		**4**	**4**	**30**	**120**
R2-1-48	**48"x60"**	**SPEED LIMIT __**	**8**	**8**	**8**	**8**	**8**	**8**	**39**	**312**
R2-1aP-24	**24"x18"**	**MINIMUM FEE $80 (Mounted on Speed Limit post)**	**8**	**6**	**8**	**6**	**8**	**8**	**10**	**80**
R3-2-48	48"x48"	NO LEFT TURN							35	
R4-1-48	**48"x60"**	**DO NOT PASS**		**2**		**2**		**2**	**39**	**78**
R4-7-48	**48"x60"**	**KEEP RIGHT**		**2**		**2**		**2**	**39**	**78**
R5-1-48	48"x48"	DO NOT ENTER							35	
R6-1-54	54"x18"	ONE WAY RIGHT or LEFT (Mounted on STOP or DO NOT ENTER post)							14	
R7-1-12	12"x18"	NO PARKING ANY TIME							11	
R10-6-24	24"x36"	STOP HERE ON RED							16	
R11-2-48	**48"x30"**	**ROAD CLOSED (Mounted on barricade)**		**2**		**2**		**2**	**12**	**24**
R11-2a-48	48"x30"	STREET CLOSED (Mounted on barricade)							12	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)							15	
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)							15	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC (Mounted on barricade)							15	
W1-3-48	48"x48"	REVERSE TURN RIGHT or LEFT							35	
W1-4-48	**48"x48"**	**REVERSE CURVE RIGHT or LEFT**		**2**		**2**		**2**	**35**	**70**
W1-4b-48	48"x48"	TWO LANE REVERSE CURVE RIGHT or LEFT							35	
W1-6-48	48"x24"	ONE DIRECTION LARGE ARROW							26	
W1-6-60	**60"x30"**	**ONE DIRECTION LARGE ARROW**		**2**		**2**		**2**	**31**	**62**
W3-1-48	48"x48"	STOP AHEAD							35	
W3-3-48	48"x48"	SIGNAL AHEAD							35	
W3-4-48	48"x48"	BE PREPARED TO STOP							35	
W3-5-48	**48"x48"**	**SPEED REDUCTION AHEAD**	**4**	**4**	**4**	**4**	**4**	**4**	**35**	**140**
W4-2-48	**48"x48"**	**LANE ENDS RIGHT or LEFT**	**4**	**4**	**4**	**4**	**4**	**4**	**35**	**140**
W5-1-48	48"x48"	ROAD NARROWS							35	
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE							35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW							35	
W6-3-48	**48"x48"**	**TWO WAY TRAFFIC**		**2**		**2**		**2**	**35**	**70**
W8-1-48	48"x48"	BUMP							35	
W8-3-48	48"x48"	PAVEMENT ENDS							35	
W8-7-48	48"x48"	LOOSE GRAVEL							35	
W8-11-48	48"x48"	UNEVEN LANES							35	
W8-12-48	48"x48"	NO CENTER LINE							35	
W8-17-48	48"x48"	SHOULDER DROP-OFF SYMBOL							35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY							35	
W8-54-48	48"x48"	TRUCKS ENTERING AHEAD or __ FT or _ MILE							35	
W8-55-48	48"x48"	TRUCKS CROSSING AHEAD or __ FT or _ MILE							35	
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY							35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL							35	
W13-1P-30	**30"x30"**	**__ MPH ADVISORY SPEED PLAQUE (Mounted on warning sign post)**		**2**		**2**		**2**	**14**	**28**
W14-3-64	64"x48"	NO PASSING ZONE							28	
W16-2P-30	30"x24"	__ FEET PLAQUE (Mounted on warning sign post)							10	
W20-1-48	**48"x48"**	**ROAD WORK AHEAD or _FT or _ MILE**	**4**	**4**	**4**	**4**	**4**	**4**	**35**	**140**
W20-2-48	48"x48"	DETOUR AHEAD or __ FT or _ MILE							35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or __ FT or _ MILE							35	
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or __ FT or _ MILE							35	
W20-5-48	**48"x48"**	**RIGHT or CENTER or LEFT LANE CLOSED AHEAD or __ FT or _ MILE**	**4**	**8**	**4**	**8**	**4**	**8**	**35**	**280**
W20-7-48	48"x48"	FLAGGER							35	
W20-8-18	18"x18"	STOP - SLOW PADDLE Back to Back							5	
W20-52P-54	**54"x12"**	**NEXT __ MILES (Mounted on warning sign post)**		**2**		**2**		**2**	**12**	**24**
W21-1-48	48"x48"	WORKERS							35	
W21-2-48	48"x48"	FRESH OIL							35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT or _ MILE							35	
W21-5-48	48"x48"	SHOULDER WORK							35	
W21-5a-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED							35	

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED BY PHASE NO. 1	2	3	4	5	TOTAL AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
W21-5b-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT or _ MILE							35	
W21-6-48	48"x48"	SURVEY CREW							35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT							35	
W21-51-48	48"x48"	MATERIAL ON ROADWAY							35	
W21-52-48	48"x48"	PAVEMENT BREAKS							35	
W21-53-48	48"x48"	RUMBLE STRIPS AHEAD							35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK							35	
W24-1-48	48"x48"	DOUBLE REVERSE CURVE							35	

SPECIAL SIGNS

SPEC & CODE		
704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS 1986**

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY BY PHASE NO. 1	2	3	4	5	TOTAL QUANTITY
704-0100	FLAGGING	MHR						
704-1041	ATTENUATION DEVICE-TYPE B-55	EACH						
704-1045	**ATTENUATION DEVICE-TYPE B-75**	EACH		**2**		**2**		**2**
704-1048	PORTABLE RUMBLE STRIPS	EACH						
704-1050	TYPE I BARRICADES	EACH						
704-1052	**TYPE III BARRICADES**	EACH	**2**	**7**	**2**	**7**	**2**	**7**
704-1060	**DELINEATOR DRUMS**	EACH	**54**	**53**	**54**	**53**	**54**	**54**
704-1065	TRAFFIC CONES	EACH						
704-1067	**TUBULAR MARKERS**	EACH	**64**		**64**		**64**	**64**
704-1070	DELINEATOR	EACH						
704-1072	**FLEXIBLE DELINEATORS**	EACH		**41**		**41**		**41**
704-1080	STACKABLE VERTICAL PANELS	EACH						
704-1081	VERTICAL PANELS - BACK TO BACK	EACH						
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH						
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH						
704-1087	**SEQUENCING ARROW PANEL - TYPE C**	EACH	**2**		**2**		**2**	**2**
704-1088	**SEQUENCING ARROW PANEL - TYPE C - CROSSOVER**	EACH		**2**		**2**		**2**
704-1500	**OBLITERATION OF PVMT MK**	SF		**685**		**685**		**1370**
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF						
704-3510	PRECAST CONCRETE MED BARRIER - STATE FURNISHED	EACH						
704-3511	**STATE FURNISHED MEDIAN BARRIER**	LF		**790**		**1190**		**1190**
762-0200	**RAISED PAVEMENT MARKERS**	EACH		**1189**		**1189**		**2378**
762-0420	SHORT TERM 4IN LINE - TYPE R	LF						
762-0430	SHORT TERM 4IN LINE - TYPE NR	LF						
772-2110	**FLASHING BEACON - POST MOUNTED**	EACH		**2**		**2**		**2**

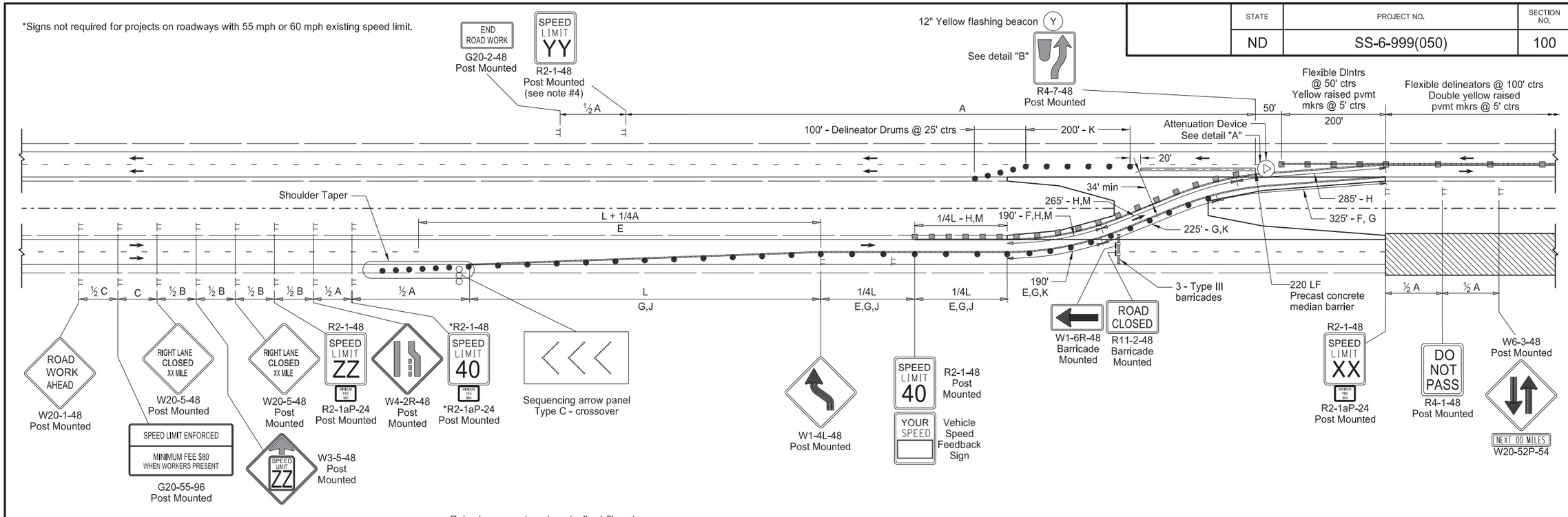
NOTE:
If additional signs are required, units will be calculated using the formula from Section III-18.06 of the Design Manual.
http://www.dot.nd.gov/

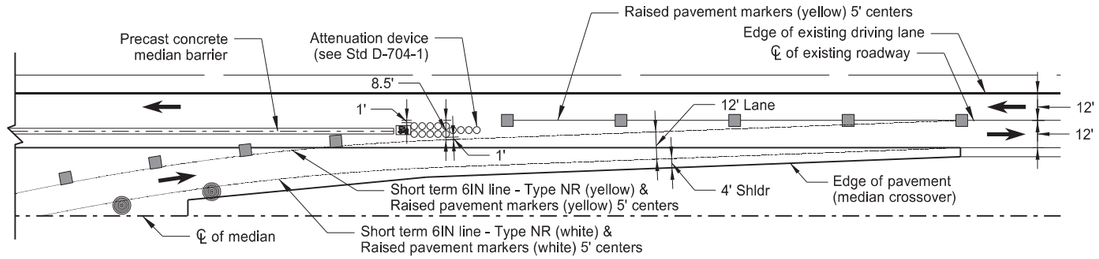
REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

Traffic Control Devices List
Site #2
Structure Replacement
Grand Forks County
4 Miles South of Manvel

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	100	4

*Signs not required for projects on roadways with 55 mph or 60 mph existing speed limit.





DETAIL "A"

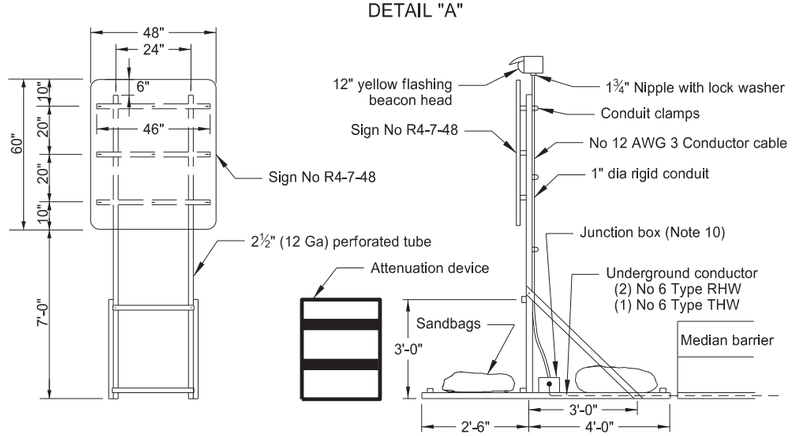
ROADWAY EXISTING SPEED LIMIT	SPEED LIMIT TO BE USED		
	XX	YY	ZZ
55	50	55	40
60	50	60	40
65	55	65	55
70	60	70	55
75	65	75	55

ADVANCE WARNING SIGN SPACING			
ROAD TYPE	Minimum Distance Between Signs (ft)		
	A	B	C
Urban Expressway and Freeway (55 mph to 65 mph)	850	1,350	2,200
Rural Expressway and Freeway (70 mph to 75 mph)	1,000	1,500	2,640

KEY

Type III barricae	Work area
Sign	Sequencing arrow panel
Flagger	Delineator drum
	Flexible Delineator

LEGEND
E Obliteration of pavement marking (10' line, 30' skip, ℄)
F Obliteration of pavement marking (edge lines)
G Short Term 6IN Line - Type NR (white) & raised pavement markers (white) 5' centers
H Short Term 6IN Line - Type NR (yellow) & raised pavement markers (yellow) 5' centers
J Drums spaced @ "S" centers
K Drums spaced @ 40' centers
M Flexible Delineators spaced @ 40' centers (O/s 2' from edge of lane line)



Place conductor behind barricade away from traffic, tie at each barrier connection, and drape above the ground. Place conductors a minimum of 6" underground between the barrier and pole.

DETAIL "B"

Notes:
1. Variables:
   S=Numerical value of posted speed limit, off-peak 85th percentile speed prior to work starting, or anticipated operating speed in MPH.
   W=Width of offset in feet
   L=Taper length in feet. Speeds 45 mph or greater L=WS.
2. Place signs and barricades on the roadway on moveable assemblies. Mount signs on barricades with the sign bottom on the top of the top barricade bar.
3. Install signs R4-1-48, W6-3-48, and W20-52P-54 at one mile increments and after each interchange.
4. Place the speed limit sign only if the crossover is more than 1 mile from an interchange exit ramp.
5. Place Sequencing Arrow Panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface. Use Type C on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater)
6. Cover existing speed limit signs within a reduced speed zone.
7. Upon approval, the Engineer will measure obliterated or covered pavement marking as Obliteration of Pavement Marking.
8. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
9. Reduce speed when placing traffic control devices. Place "Minimum Fee $80" signs below speed limit signs in reduced speed areas. Place "Work Zone Speed Limit Enforced" sign in advance of the project at the time traffic control devices are installed.
10. Determine proper size, waterproof junction box, and attach to skid or vertical brace assembly.

Traffic Control System
Median Crossover

Site #2

Structure Replacement

Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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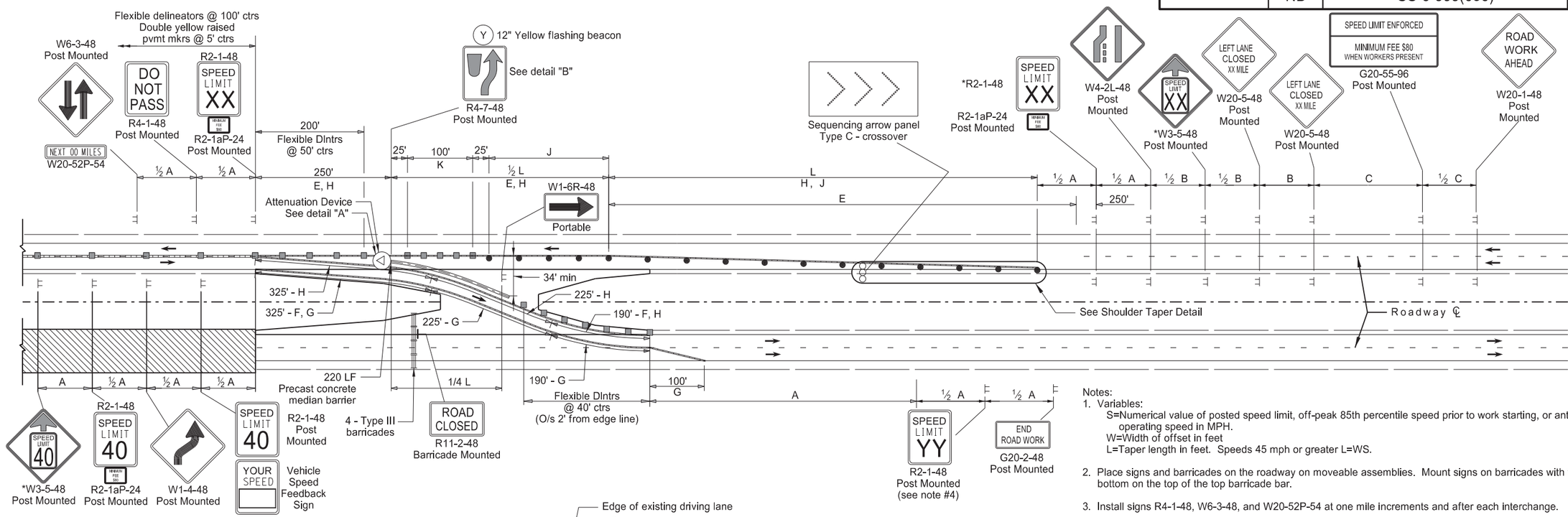
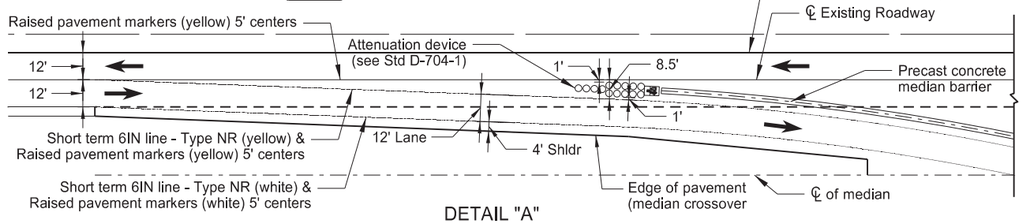
*Not required for projects on roadways with 55 mph existing speed limit.

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	100	5



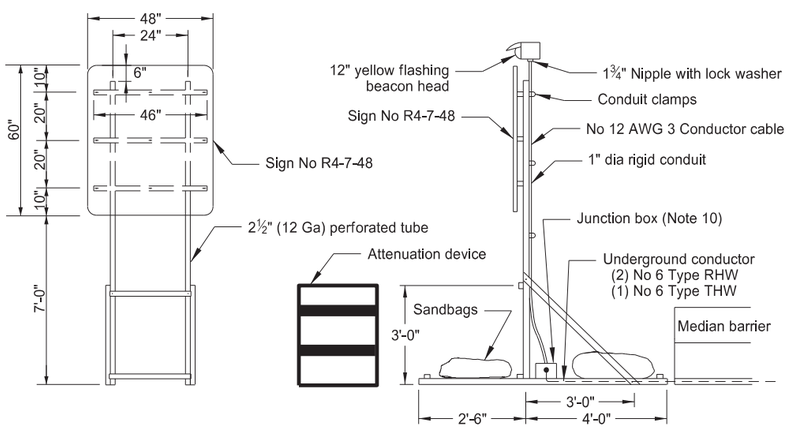


DETAIL "A"

KEY

Type III barricae	Work area
Sign	Sequencing arrow panel
Flagger	Delineator drum
	Flexible Delineator

LEGEND
E Obliteration of pavement marking (10' line, 30' skip, ℄)
F Obliteration of pavement marking (edge lines)
G Short Term 6IN Line - Type NR (white) & raised pavement markers (white) 5' centers
H Short Term 6IN Line - Type NR (yellow) & raised pavement markers (yellow) 5' centers
J Drums spaced @ "S" centers
K Flexible delineators-4 spaces @ 25'

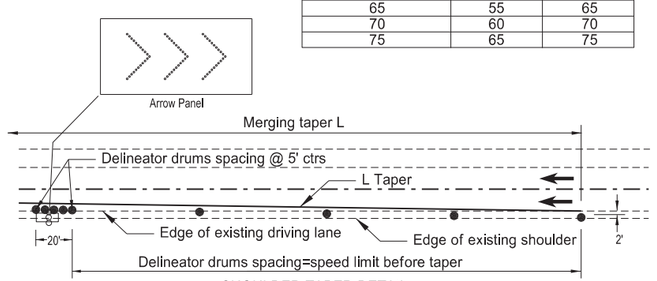


Place conductor behind barricade away from traffic, tie at each barrier connection, and drape above the ground. Place conductors a minimum of 6" underground between the barrier and pole.

DETAIL "B"

ADVANCE WARNING SIGN SPACING			
ROAD TYPE	Minimum Distance Between Signs (ft)		
	A	B	C
Urban Expressway and Freeway (55 mph to 65 mph)	850	1,350	2,200
Rural Expressway and Freeway (70 mph to 75 mph)	1,000	1,500	2,640

ROADWAY EXISTING SPEED LIMIT	SPEED LIMIT TO BE USED	
	XX	YY
55	50	55
60	50	60
65	55	65
70	60	70
75	65	75



SHOULDER TAPER DETAIL

Notes:
1. Variables:
   S=Numerical value of posted speed limit, off-peak 85th percentile speed prior to work starting, or anticipated operating speed in MPH.
   W=Width of offset in feet
   L=Taper length in feet. Speeds 45 mph or greater L=WS.
2. Place signs and barricades on the roadway on moveable assemblies. Mount signs on barricades with the sign bottom on the top of the top barricade bar.
3. Install signs R4-1-48, W6-3-48, and W20-52P-54 at one mile increments and after each interchange.
4. Place the speed limit sign only if the crossover is more than 1 mile from an interchange exit ramp.
5. Place Sequencing Arrow Panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface. Use Type C on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater)
6. Cover existing speed limit signs within a reduced speed zone.
7. Upon approval, the Engineer will measure obliterated or covered pavement marking as Obliteration of Pavement Marking.
8. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
9. Reduce speed when placing traffic control devices. Place "Minimum Fee $80" signs below speed limit signs in reduced speed areas. Place "Work Zone Speed Limit Enforced" sign in advance of the project at the time traffic control devices are installed.
10. Determine proper size, waterproof junction box, and attach to skid or vertical brace assembly.

Traffic Control System
Median Crossover

Site #2

Structure Replacement

Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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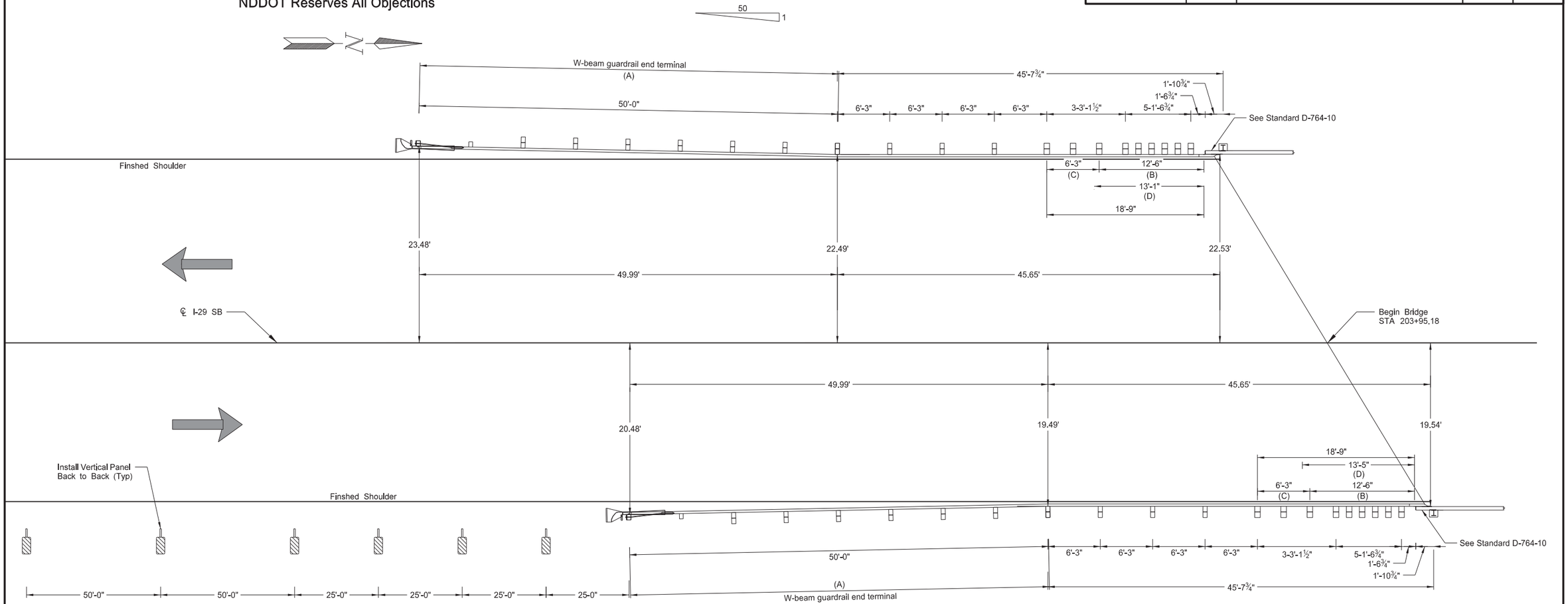
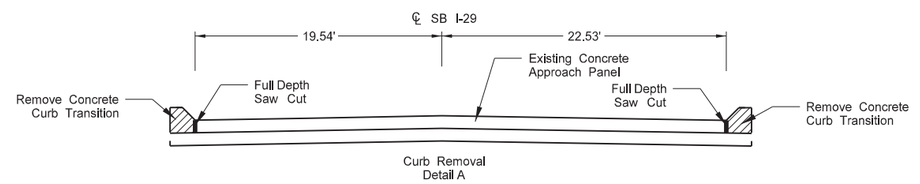
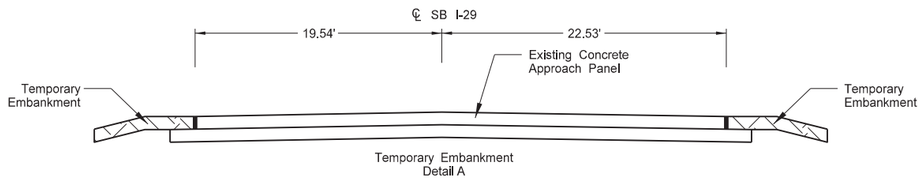
407 Documents § 23 U.S.C.
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	100	6







SPEC	CODE	BID ITEM	UNIT	QUANTITY
704	1081	**VERTICAL PANELS-BACK TO BACK**		
		STA 201+09.86 to 202+84.86 Rt Mdn	EA	6
764	0145	**W-BEAM GUARDRAIL END TERMINAL**		
		STA 202+86.78 to 203+82.32 Lt	EA	1
		STA 203+09.86 to 204+07.50 Rt	EA	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
764	0151	**REMOVE W-BEAM GUARDRAIL & POSTS**		
		STA 203+34.67 to 203+82.32 Lt	LF	48
		STA 203+09.86 to 204+07.50 Rt	LF	48
764	2081	**REMOVE END TREATMENT & TRANSITION**		
		STA 202+86.78 to 203+36.78 Lt	EA	1
		STA 203+09.86 to 203+59.86 Rt	EA	1

(A) Install Sequential Kinking Terminal as the W-beam guardrail end terminal at this location

Include all costs to install and remove w-bewam guardrail in the price bid for "W-Beam Guardrail End Terminal".

(B) Thrie beam rail section (Double Thickness)

(C) W-Thrie beam transition rail section (Double Thickness)

(D) Remove existing concrete curb transition prior to installation. See Detail A

Note:

Temporary guardrail shown to be installed during Phase 1 construction.

Guardrail Layout - Phase 1

Site #2
County Drain No. 11
Structure Replacement

Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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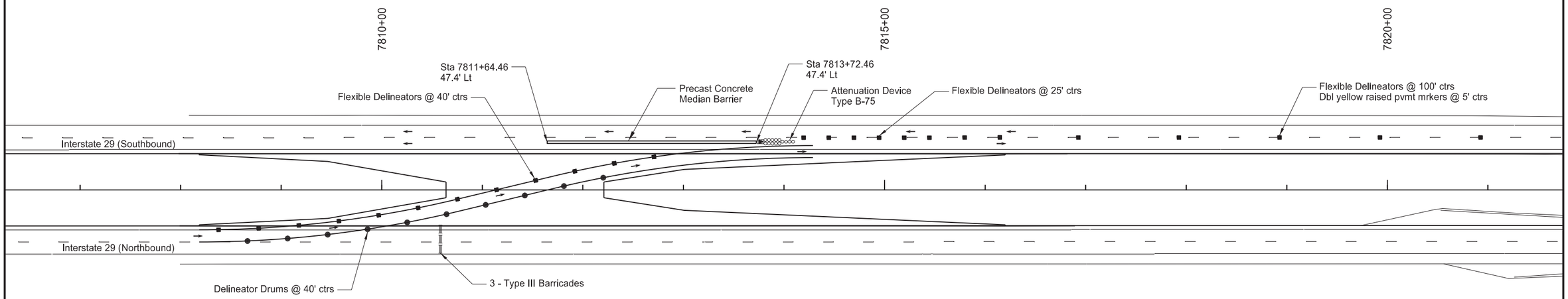

LEGEND

- Stackable Vertical Panel
- Delineator Drum
- Type III Barricade
- Tubular Marker
- Flexible Delineator

Traffic Control - Phase 2

Site #2

Structure Replacement

Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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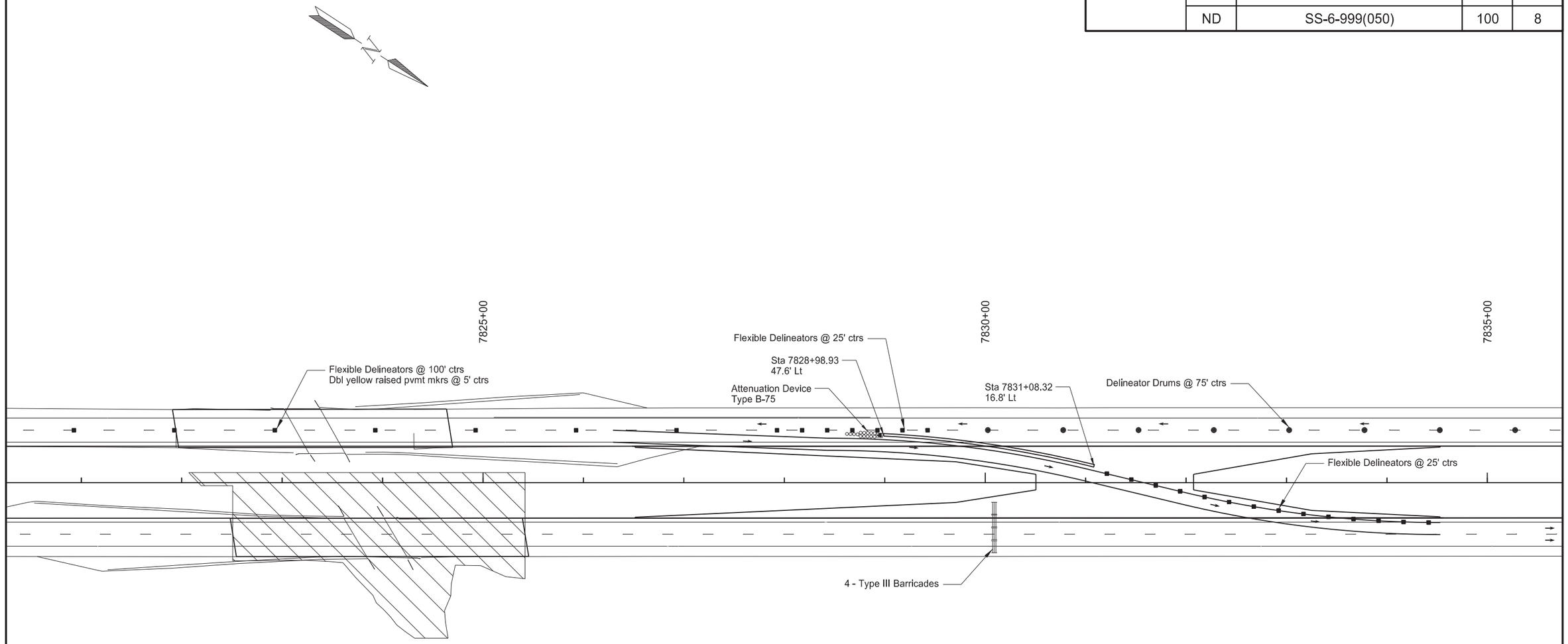
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	100	8



LEGEND

- Stackable Vertical Panel
- Delineator Drum
- Type III Barricade
- Tubular Marker
- Flexible Delineator

Traffic Control - Phase 2

Site #2

Structure Replacement

Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

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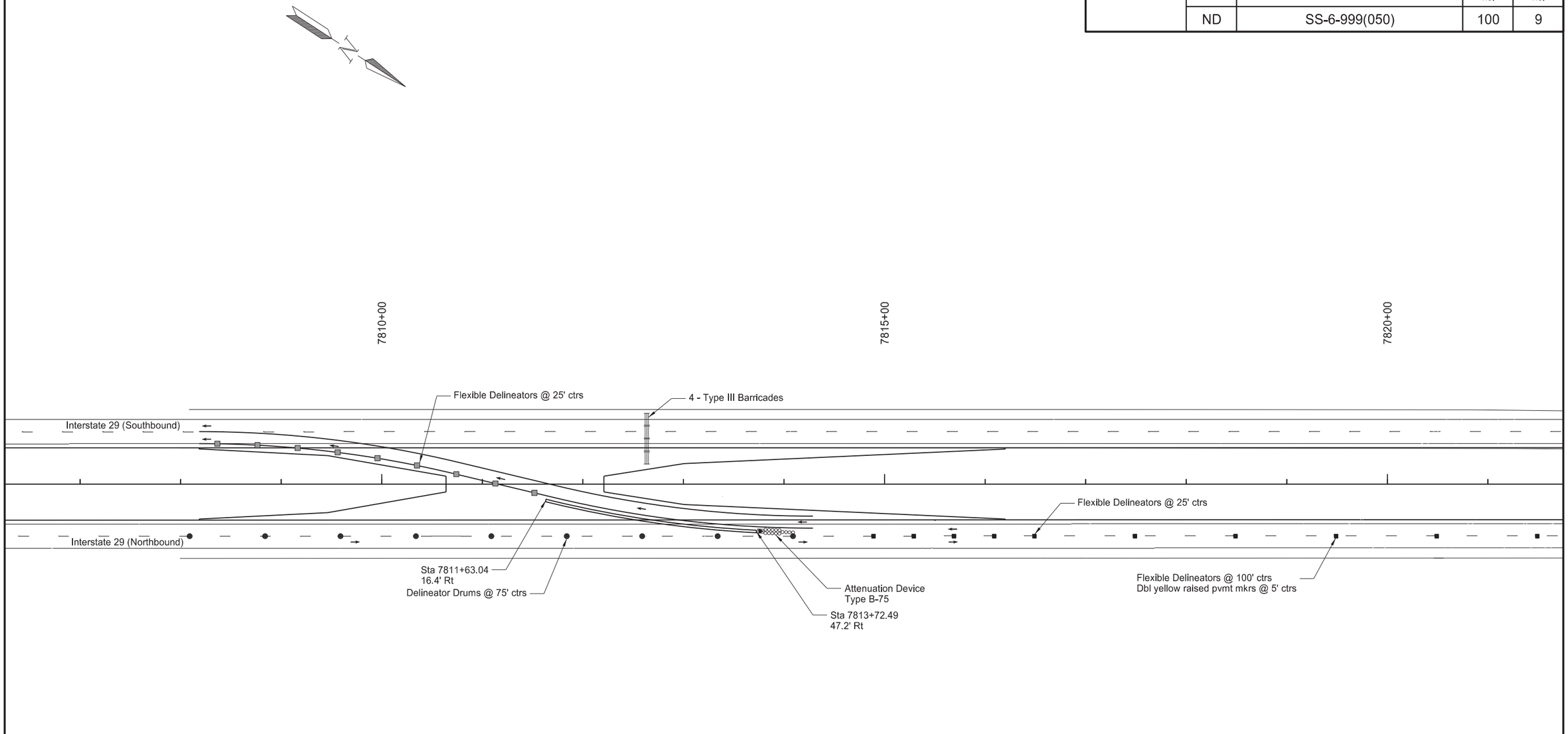

LEGEND

- Stackable Vertical Panel
- Delineator Drum
- Type III Barricade
- Tubular Marker
- Flexible Delineator

Traffic Control - Phase 4

Site #2

Structure Replacement

Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D [illegible]
PE-10597
DATE 09/05/23
NORTH DAKOTA

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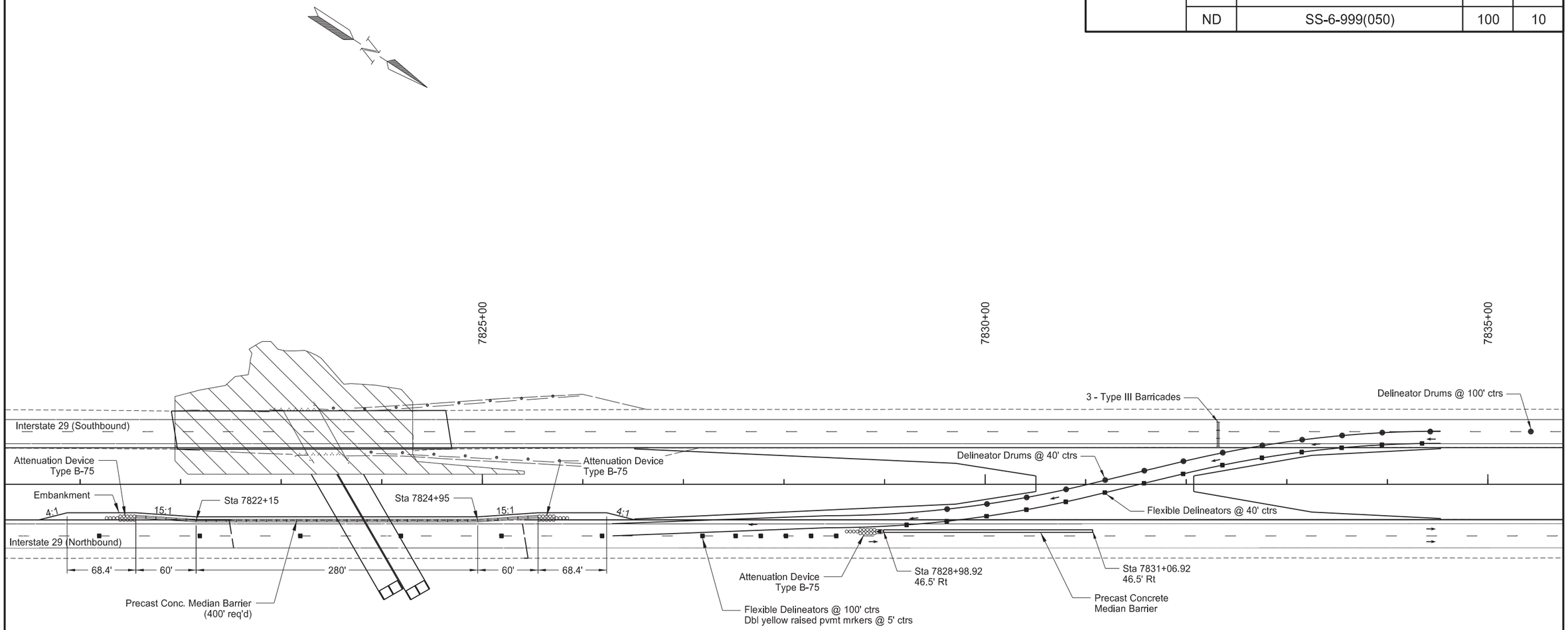
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	100	10



LEGEND

- Stackable Vertical Panel
- Delineator Drum
- Type III Barricade
- Tubular Marker
- Flexible Delineator

Traffic Control - Phase 4

Site #2

Structure Replacement

Grand Forks County
Interstate 29
4 Miles South of Manvel
Str# 29-148.172

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	100	11

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED BY PHASE NO. 1	2	3	4	5	TOTAL AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
E5-1-48	48"x48"	EXIT GORE							35	
G20-1-60	60"x24"	ROAD WORK NEXT __ MILES							28	
G20-1b-60	60"x24"	NO WORK IN PROGRESS (Sign and installation only)							18	
G20-2-48	**48"x24"**	**END ROAD WORK**	**2**	**2**	**2**	**2**	**2**	**2**	**26**	**52**
G20-4-36	36"x18"	PILOT CAR FOLLOW ME (Mounted to back of pilot car)							18	
G20-4b-36	36"x30"	WAIT FOR PILOT CAR							18	
G20-50a-72	72"x36"	ROAD WORK NEXT __ MILES RT & LT ARROWS							43	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW							36	
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)							11	
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 (INSIDE ARROW) RIGHT or LEFT (Mounted on barricade)							7	
M5-1-21	21"x15"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)							7	
M5-1-30	30"x21"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)							9	
M6-1-21	21"x15"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)							7	
M6-1-30	30"x21"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)							9	
M6-3-21	21"x15"	DIRECTIONAL ARROW UP (Mounted on route marker post)							7	
R1-1-48	48"x48"	STOP							32	
R1-2-60	60"x60"	YIELD							29	
R2-1-36	**36"x48"**	**SPEED LIMIT __ (Portable only)**	**2**					**2**	**30**	**60**
R2-1-48	**48"x60"**	**SPEED LIMIT __**	**2**	**4**	**4**	**4**	**4**	**4**	**39**	**156**
R2-1aP-24	**24"x18"**	**MINIMUM FEE $80 (Mounted on Speed Limit post)**	**2**	**2**	**2**	**2**	**2**	**2**	**10**	**20**
R3-2-48	48"x48"	NO LEFT TURN							35	
R4-1-48	48"x60"	DO NOT PASS							39	
R4-7-48	48"x60"	KEEP RIGHT							39	
R5-1-48	48"x48"	DO NOT ENTER							35	
R6-1-54	54"x18"	ONE WAY RIGHT or LEFT (Mounted on STOP or DO NOT ENTER post)							14	
R7-1-12	12"x18"	NO PARKING ANY TIME							11	
R10-6-24	**24"x36"**	**STOP HERE ON RED**		**2**	**2**	**2**	**2**	**2**	**16**	**32**
R11-2-48	**48"x30"**	**ROAD CLOSED (Mounted on barricade)**		**1**	**1**	**1**	**1**	**1**	**12**	**12**
R11-2a-48	48"x30"	STREET CLOSED (Mounted on barricade)							12	
R11-3a-60	**60"x30"**	**ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)**		**1**	**1**	**1**	**1**	**1**	**15**	**15**
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)							15	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC (Mounted on barricade)							15	
W1-3-48	48"x48"	REVERSE TURN RIGHT or LEFT							35	
W1-4-48	**48"x48"**	**REVERSE CURVE RIGHT or LEFT**		**1**	**1**	**1**	**1**	**1**	**35**	**35**
W1-4b-48	48"x48"	TWO LANE REVERSE CURVE RIGHT or LEFT							35	
W1-6-48	48"x24"	ONE DIRECTION LARGE ARROW							26	
W3-1-48	48"x48"	STOP AHEAD							35	
W3-3-48	**48"x48"**	**SIGNAL AHEAD**		**2**	**2**	**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**	**2**	**2**	**35**	**70**
W4-2-48	48"x48"	LANE ENDS RIGHT or LEFT							35	
W5-1-48	48"x48"	ROAD NARROWS							35	
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE							35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW							35	
W6-3-48	48"x48"	TWO WAY TRAFFIC							35	
W8-1-48	48"x48"	BUMP							35	
W8-3-48	48"x48"	PAVEMENT ENDS							35	
W8-7-48	48"x48"	LOOSE GRAVEL							35	
W8-11-48	48"x48"	UNEVEN LANES							35	
W8-12-48	48"x48"	NO CENTER LINE							35	
W8-17-48	48"x48"	SHOULDER DROP-OFF SYMBOL							35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY							35	
W8-54-48	48"x48"	TRUCKS ENTERING AHEAD or __ FT or _ MILE							35	
W8-55-48	48"x48"	TRUCKS CROSSING AHEAD or __ FT or _ MILE							35	
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY							35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL							35	
W13-1P-30	30"x30"	__ MPH ADVISORY SPEED PLAQUE (Mounted on warning sign post)							14	
W14-3-64	64"x48"	NO PASSING ZONE							28	
W16-2P-30	30"x24"	__ FEET PLAQUE (Mounted on warning sign post)							10	
W20-1-48	**48"x48"**	**ROAD WORK AHEAD or _FT or _ MILE**	**2**	**2**	**2**	**2**	**2**	**2**	**35**	**70**
W20-2-48	48"x48"	DETOUR AHEAD or __ FT or _ MILE							35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or __ FT or _ MILE							35	
W20-4-48	**48"x48"**	**ONE LANE ROAD AHEAD or __ FT or _ MILE**		**2**	**2**	**2**	**2**	**2**	**35**	**70**
W20-5-48	48"x48"	RIGHT or CENTER or LEFT LANE CLOSED AHEAD or __ FT or _ MILE							35	
W20-7-48	**48"x48"**	**FLAGGER**		**2**	**2**	**2**	**2**	**2**	**35**	**70**
W20-8-18	**18"x18"**	**STOP - SLOW PADDLE Back to Back**		**2**	**2**	**2**	**2**	**2**	**5**	**10**
W20-52P-54	54"x12"	NEXT __ MILES (Mounted on warning sign post)							12	
W21-1-48	48"x48"	WORKERS							35	
W21-2-48	48"x48"	FRESH OIL							35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT or _ MILE							35	
W21-5-48	**48"x48"**	**SHOULDER WORK**	**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 or _ MILE							35	

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED BY PHASE NO. 1	2	3	4	5	TOTAL AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
W21-6-48	48"x48"	SURVEY CREW							35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT							35	
W21-51-48	48"x48"	MATERIAL ON ROADWAY							35	
W21-52-48	48"x48"	PAVEMENT BREAKS							35	
W21-53-48	48"x48"	RUMBLE STRIPS AHEAD							35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK							35	
W24-1-48	48"x48"	DOUBLE REVERSE CURVE							35	

SPECIAL SIGNS

SPEC & CODE

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

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY BY PHASE NO. 1	2	3	4	5	TOTAL QUANTITY
704-0100	FLAGGING	MHR						
704-1018	**LANE CLOSURE-SIGNAL CONTROL/FLAGGING CONTROL**	EACH		**1**	**1**	**1**	**1**	**1**
704-1036	**ATTENUATION DEVICE-TYPE B-30**	EACH		**4**	**4**	**4**	**4**	**4**
704-1048	**PORTABLE RUMBLE STRIPS**	EACH		**2**	**2**	**2**	**2**	**2**
704-1050	TYPE I BARRICADES	EACH						
704-1052	**TYPE III BARRICADES**	EACH		**10**	**10**	**10**	**10**	**10**
704-1060	**DELINEATOR DRUMS**	EACH		**12**	**12**	**12**	**12**	**12**
704-1065	TRAFFIC CONES	EACH						
704-1067	TUBULAR MARKERS	EACH						
704-1070	DELINEATOR	EACH						
704-1072	FLEXIBLE DELINEATORS	EACH						
704-1080	**STACKABLE VERTICAL PANELS**	EACH	**55**					**55**
704-1081	VERTICAL PANELS - BACK TO BACK	EACH						
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH						
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH						
704-1087	SEQUENCING ARROW PANEL - TYPE C	EACH						
704-1500	OBLITERATION OF PVMT MK	SF						
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF						
704-3510	PRECAST CONCRETE MED BARRIER - STATE FURNISHED	EACH						
704-3511	**STATE FURNISHED MEDIAN BARRIER**	LF		**180**	**180**	**180**	**180**	**180**
762-0200	RAISED PAVEMENT MARKERS	EACH						
762-0420	SHORT TERM 4IN LINE - TYPE R	LF						
762-0426	SHORT TERM 24IN LINE-TYPE R	LF						
762-0430	SHORT TERM 4IN LINE - TYPE NR	LF						

NOTE:
If additional signs are required, units will be calculated using the formula from Section III-18.06 of the Design Manual.
http://www.dot.nd.gov/

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

Traffic Control Devices List
Site #3
Structure Replacement
Griggs County
2 Miles West of ND 32

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	100	12

N

890+00

See D704-24 For Sign Spacing

SPEED LIMIT 65 — R2-1-48

END ROAD WORK — G-20-48

895+00

900+00

See D704-24 For Sign Spacing

SPEED LIMIT 45 MINIMUM FEE $80 — R2-1-48, R2-1a-24

SPEED LIMIT 45 — W3-5-48

SPEED LIMIT ENFORCED MINIMUM FEE $80 WHEN WORKERS PRESENT — G-20-55-96

SHOULDER WORK — W21-5-48

ROAD WORK AHEAD — W20-1-48

See D704-24 For Sign Spacing

ROAD WORK AHEAD — W20-1-48

SHOULDER WORK — W21-5-48

SPEED LIMIT ENFORCED MINIMUM FEE $80 WHEN WORKERS PRESENT — G-20-55-96

SPEED LIMIT 45 — W3-5-48

SPEED LIMIT 45 MINIMUM FEE $80 — R2-1-48, R2-1a-24

See D704-24 For Sign Spacing

END ROAD WORK — G-20-48

SPEED LIMIT 65 — R2-1-48

Stackable Vertical Panel

Delinator Drums

Type III Barricade

Tubular Marker

Work Zone

Traffic Control - Phase 1

Site #3

Structure Replacement

Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	100	13

N

890+00

895+00

900+00

ROAD CLOSED
00 MILES AHEAD
LOCAL TRAFFIC ONLY
R11-3a-60
Barricade Mounted

ROAD CLOSED
R11-2-48
Barricade Mounted

See D704-16 For Sign Spacing

SPEED LIMIT 65
R2-1-48

END ROAD WORK
G-20-48

Begin Barriers
11+30 LT
9 EA (2.5' Wide x 10' Long)

Begin Barriers
11+30 RT
9 EA (2.5' Wide x 10' Long)

End Barriers
12+19 LT

End Barriers
12+19 RT

W1-4R-48

STOP HERE ON RED
R10-6L-24

See D704-16 For Sign Spacing

SPEED LIMIT 25
MINIMUM FEE $80
R2-1-48
R2-1a-24

W3-3-48

W3-5-48

ONE LANE ROAD AHEAD
W20-4-48

SPEED LIMIT ENFORCED
MINIMUM FEE $80 WHEN WORKERS PRESENT
G-20-55-96

ROAD WORK AHEAD
W20-1-48

Temporary Traffic Signal

Temporary Traffic Signal

See D704-16 For Sign Spacing

ROAD WORK AHEAD
W20-1-48

SPEED LIMIT ENFORCED
MINIMUM FEE $80 WHEN WORKERS PRESENT
G-20-55-96

ONE LANE ROAD AHEAD
W20-4-48

W3-5-48

W3-3-48

SPEED LIMIT 25
MINIMUM FEE $80
R2-1-48
R2-1a-24

STOP HERE ON RED
R10-6L-24

See D704-16 For Sign Spacing

END ROAD WORK
G-20-48

SPEED LIMIT 65
R2-1-48

Stackable Vertical Panel

Delinator Drums

Type III Barricade

Tubular Marker

Work Zone

Traffic Control - Phase 2

Site #3

Structure Replacement

Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D. COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	100	14

N

890+00

895+00

900+00

ROAD CLOSED
00 MILES AHEAD
LOCAL TRAFFIC ONLY
R11-3a-60
Barricade Mounted

ROAD CLOSED
R11-2-48
Barricade Mounted

See D704-16 For Sign Spacing

SPEED LIMIT 65
R2-1-48

END ROAD WORK
G-20-48

STOP HERE ON RED
R10-6L-24

SPEED LIMIT 25
MINIMUM FEE $80
R2-1-48
R2-1a-24

See D704-16 For Sign Spacing

W3-3-48

W3-5-48

ONE LANE ROAD AHEAD
W20-4-48

SPEED LIMIT ENFORCED
MINIMUM FEE $80 WHEN WORKERS PRESENT
G-20-55-96

ROAD WORK AHEAD
W20-1-48

Temporary Traffic Signal

End Barriers
12+19 LT

End Barriers
12+19 RT

Begin Barriers
11+30 LT
9 EA (2.5' Wide x 10' Long)

Begin Barriers
11+30 RT
9 EA (2.5' Wide x 10' Long)

Temporary Traffic Signal

See D704-16 For Sign Spacing

ROAD WORK AHEAD
W20-1-48

SPEED LIMIT ENFORCED
MINIMUM FEE $80 WHEN WORKERS PRESENT
G-20-55-96

ONE LANE ROAD AHEAD
W20-4-48

W3-5-48

W3-3-48

SPEED LIMIT 25
MINIMUM FEE $80
R2-1-48
R2-1a-24

STOP HERE ON RED
R10-6L-24

W1-4R-48

See D704-16 For Sign Spacing

END ROAD WORK
G-20-48

SPEED LIMIT 65
R2-1-48

Stackable Vertical Panel

Delinator Drums

Type III Barricade

Tubular Marker

Work Zone

Traffic Control - Phase 3

Site #3

Structure Replacement

Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	100	15

N

890+00

895+00

900+00

ROAD CLOSED
00 MILES AHEAD
LOCAL TRAFFIC ONLY
R11-3a-60
Barricade Mounted

ROAD CLOSED
R11-2-48
Barricade Mounted

See D704-16 For Sign Spacing

SPEED LIMIT 65
R2-1-48

END ROAD WORK
G-20-48

W1-4R-48

STOP HERE ON RED
R10-6L-24

See D704-16 For Sign Spacing

SPEED LIMIT 25
MINIMUM FEE $80
R2-1-48
R2-1a-24

W3-3-48

W3-5-48

ONE LANE ROAD AHEAD
W20-4-48

SPEED LIMIT ENFORCED
MINIMUM FEE $80 WHEN WORKERS PRESENT
G-20-55-96

ROAD WORK AHEAD
W20-1-48

Begin Barriers
11+30 LT
9 EA (2.5' Wide x 10' Long)

Begin Barriers
11+30 RT
9 EA (2.5' Wide x 10' Long)

End Barriers
12+19 LT

End Barriers
12+19 RT

Temporary Traffic Signal

Temporary Traffic Signal

See D704-16 For Sign Spacing

ROAD WORK AHEAD
W20-1-48

SPEED LIMIT ENFORCED
MINIMUM FEE $80 WHEN WORKERS PRESENT
G-20-55-96

ONE LANE ROAD AHEAD
W20-4-48

W3-5-48

W3-3-48

SPEED LIMIT 25
MINIMUM FEE $80
R2-1-48
R2-1a-24

STOP HERE ON RED
R10-6L-24

See D704-16 For Sign Spacing

END ROAD WORK
G-20-48

SPEED LIMIT 65
R2-1-48

Stackable Vertical Panel

Delinator Drums

Type III Barricade

Tubular Marker

Work Zone

Traffic Control - Phase 4

Site #3

Structure Replacement

Griggs County

2 Miles West of ND 32

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

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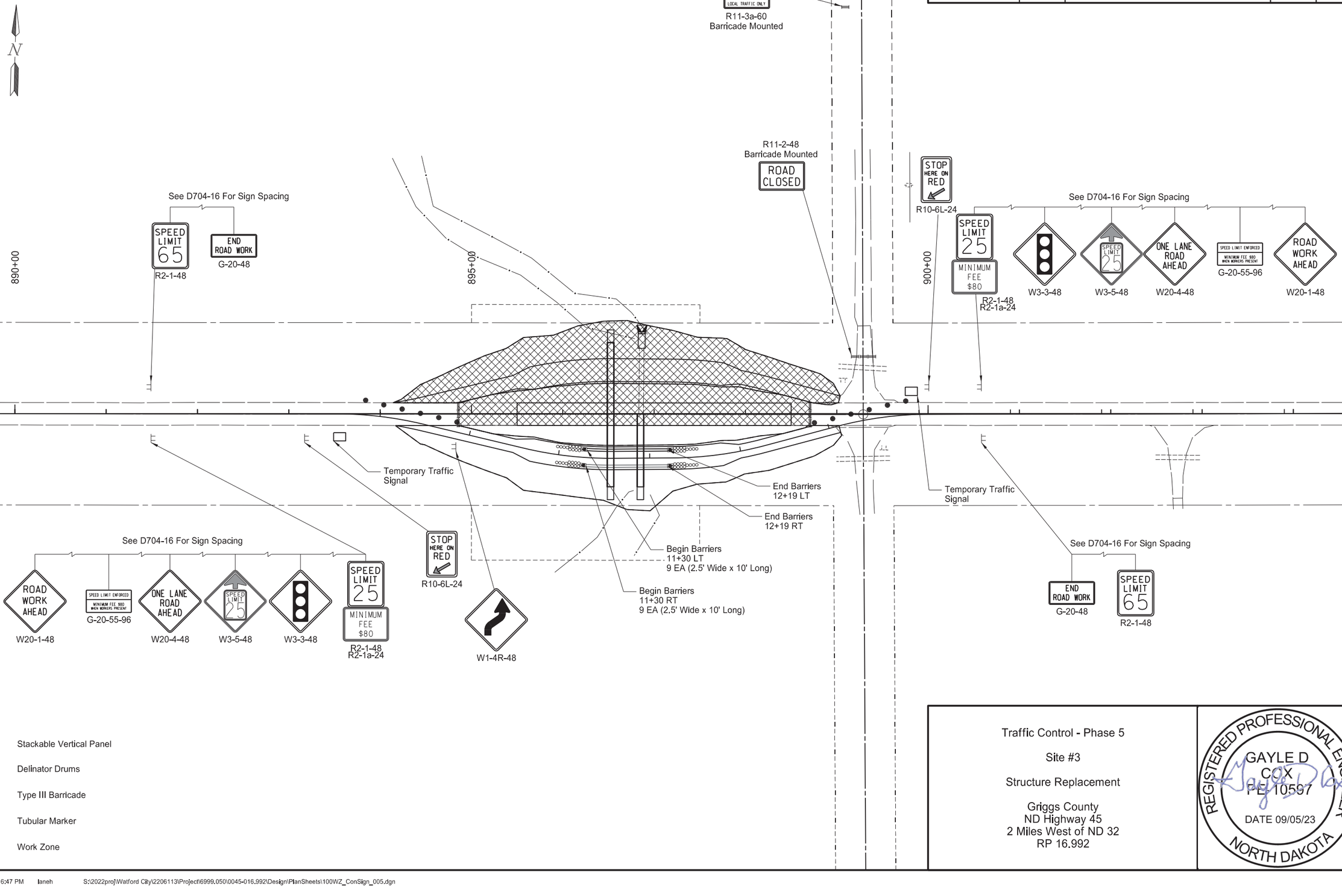
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	100	16



Traffic Control - Phase 5

Site #3

Structure Replacement

Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D
COX
PE 10597
DATE 09/05/23
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	100	17

N

890+00

See D704-24 For Sign Spacing

SPEED LIMIT 65 — R2-1-48

END ROAD WORK — G-20-48

895+00

900+00

See D704-24 For Sign Spacing

SPEED LIMIT 45 / MINIMUM FEE $80 — R2-1-48, R2-1a-24

SPEED LIMIT 45 — W3-5-48

SPEED LIMIT ENFORCED / MINIMUM FEE $80 WHEN WORKERS PRESENT — G-20-55-96

SHOULDER WORK — W21-5-48

ROAD WORK AHEAD — W20-1-48

See D704-24 For Sign Spacing

ROAD WORK AHEAD — W20-1-48

SHOULDER WORK — W21-5-48

SPEED LIMIT ENFORCED / MINIMUM FEE $80 WHEN WORKERS PRESENT — G-20-55-96

SPEED LIMIT 45 — W3-5-48

SPEED LIMIT 45 / MINIMUM FEE $80 — R2-1-48, R2-1a-24

See D704-24 For Sign Spacing

END ROAD WORK — G-20-48

SPEED LIMIT 65 — R2-1-48

Stackable Vertical Panel

Delinator Drums

Type III Barricade

Tubular Marker

Work Zone

Note:
1. Phase 6 Traffic Control Devices will match Phase 1 in the Traffic Control Device List.

Traffic Control - Phase 6

Site #3

Structure Replacement

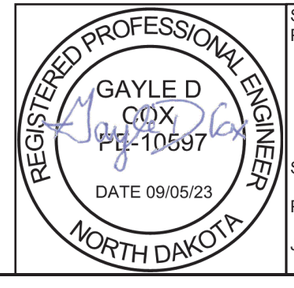
Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

8/29/2023 1:16:48 PM laneh S:\2022proj\Watford City\2206113\Project\6999.050\0045-016.992\Design\PlanSheets\100WZ_ConSign_006.dgn

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
N.D.	SS-6-999(050)	110	1

Station / RP	Sign No.	Assembly No.	Flat Sheet For Signs IV SF	Flat Sheet For Signs XI SF	Sign Support Length 1st LF	2nd LF	3rd LF	4th LF	Vert Clear-ance FT	Support Size	Max Post Len LF	Sleeve Length 1st LF	2nd LF	3rd LF	4th LF	Sleeve Size	Anchor EA	Anchor LF	Anchor Size	Reset Sign Panel EA	Reset Sign Support EA	Break-Away EA	Comments
0+30 Rt	405	405	12.4		9.7				5.0	2.25 x 2.25 12 ga	13.5	1.3				2.5 x 2.5 12 ga	1	4	3 x 3 7 ga			1	
0+39 Lt	SA 2B			5.2	11.3				5.0	2.5 x 2.5 10 ga	13.7						1	4	3 x 3 7 ga	1		1	
1+15 Rt	46	46		8.0	15.7				5.0	2.25 x 2.25 12 ga	17.7	4.9				2.5 x 2.5 12 ga	1	4	3 x 3 7 ga			1	
17732+73 Lt	405	405	12.4		11.6				5.0	2.25 x 2.25 12 ga	13.5	3.3				2.5 x 2.5 12 ga	1	4	3 x 3 7 ga			1	
Sub Total			24.8	13.2		**Total**	48.3										**Total**	16.0		1	0	4	
Grand Total			**24.8**	**13.2**		**Total**	**48.3**										**Total**	**16**	**0**	**1**	**0**	**4**	



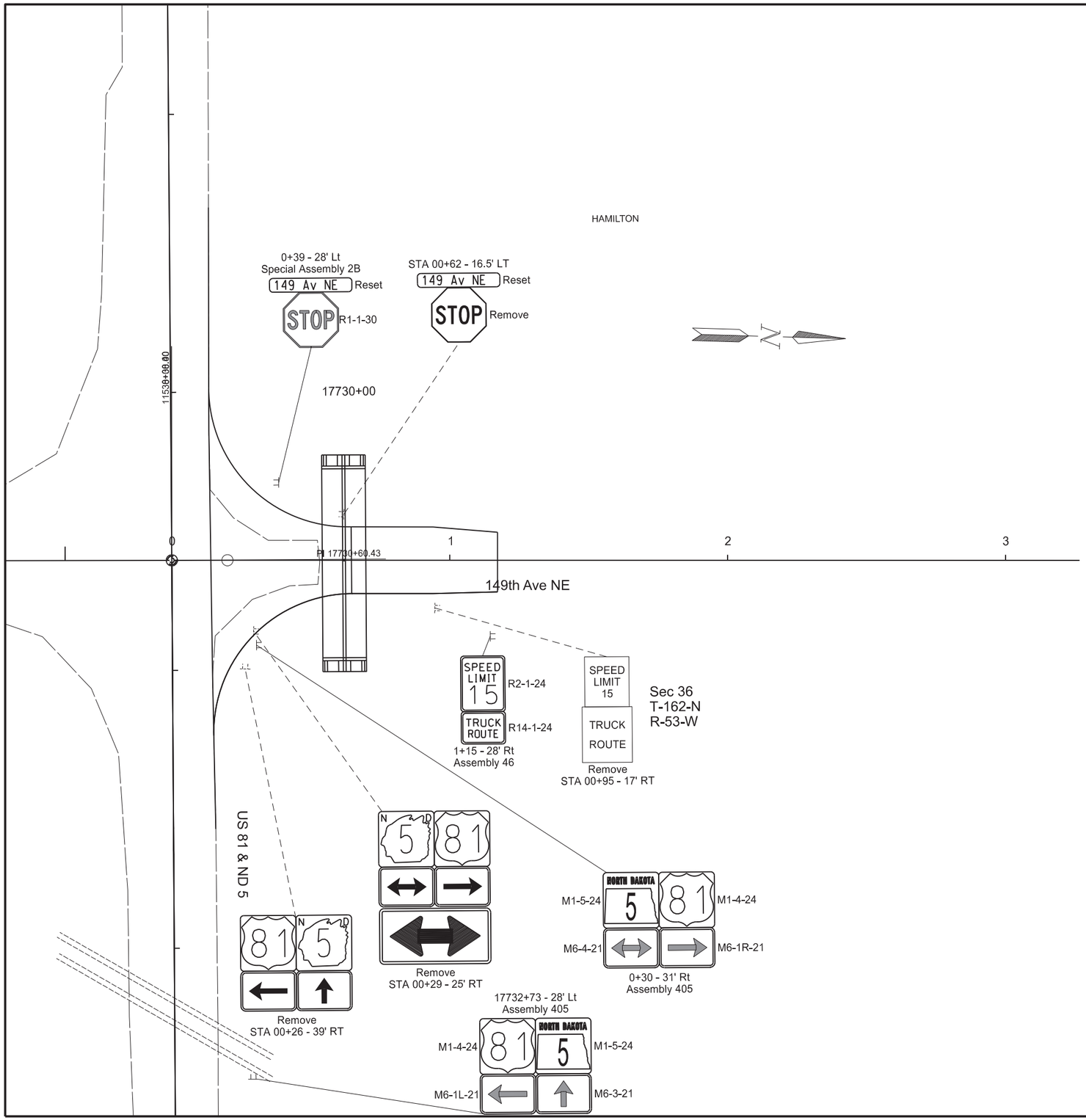
Sign Summary
Perforated Tube

Structure Replacement

Pembina County

JCT US 81 & ND 5

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	110	2



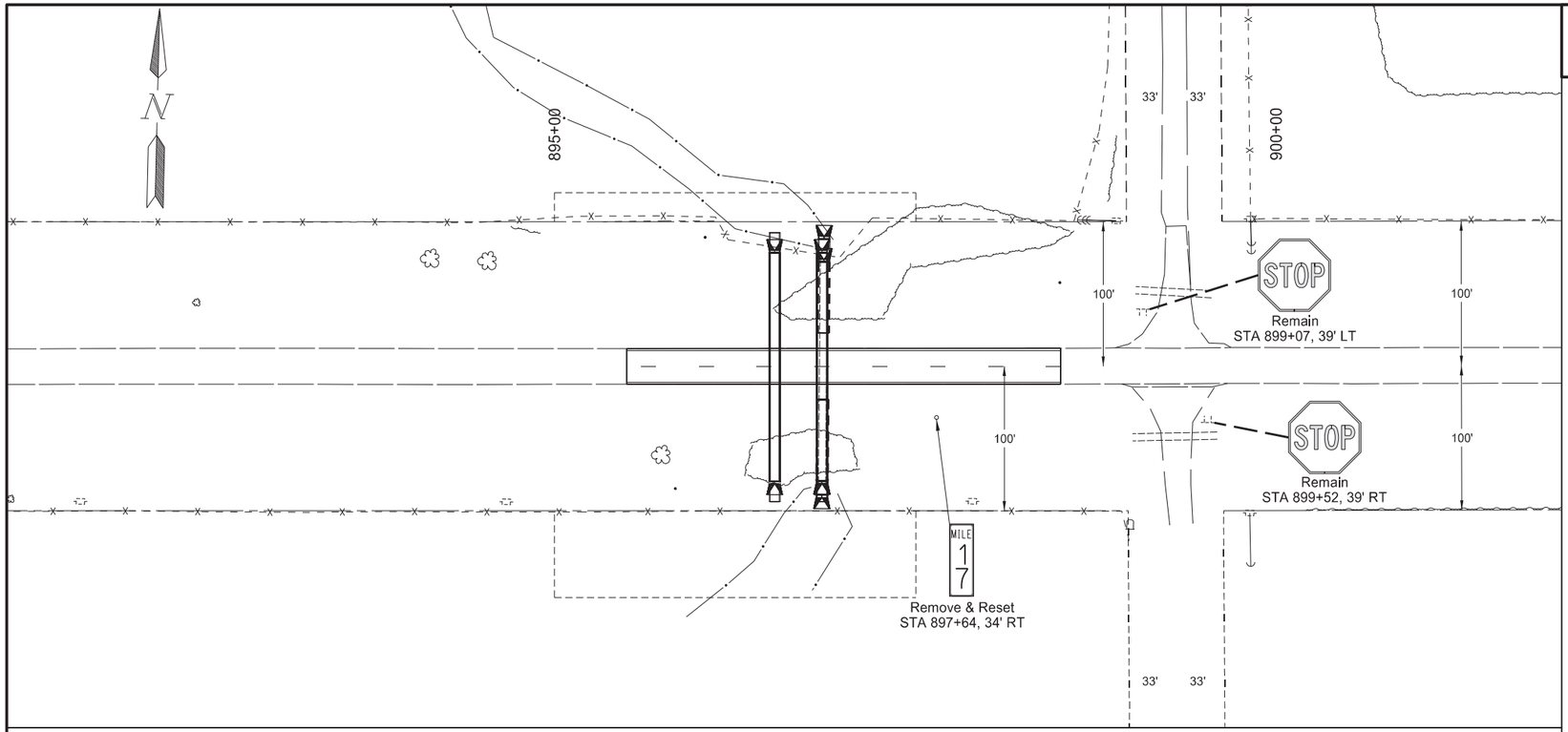
Sign Layout

Site #1

Structure Replacement

Pembina County
US Highway 81
JCT US 81 & ND 5
Str# 81-218.530N

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/05/23
NORTH DAKOTA



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	110	3

SPEC	CODE	BID ITEM	UNIT	QUANTITY
754	596	RESET MILE POST		
		STA 897+64 RT	EA	1

Sign Layout

Site #3

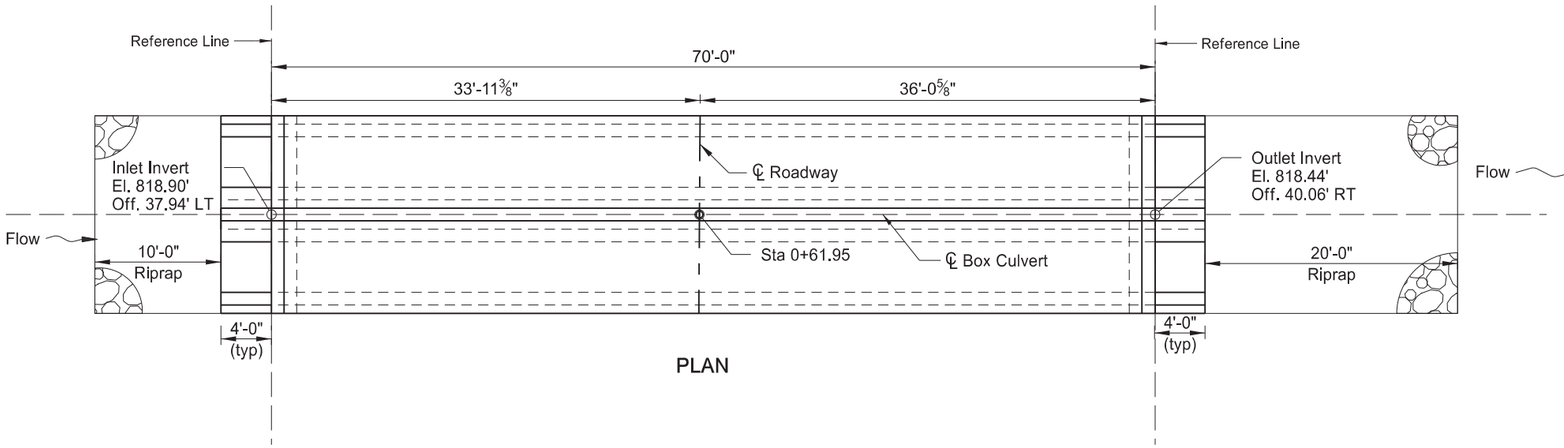
Structure Replacement

Griggs County
ND Highway 45
2 Miles West of ND 32
RP 16.992

REGISTERED PROFESSIONAL ENGINEER
GAYLE D
COX
PE-10597
DATE 09/05/23
NORTH DAKOTA

23 U.S.C. 407
NDDOT Reserves All Objections

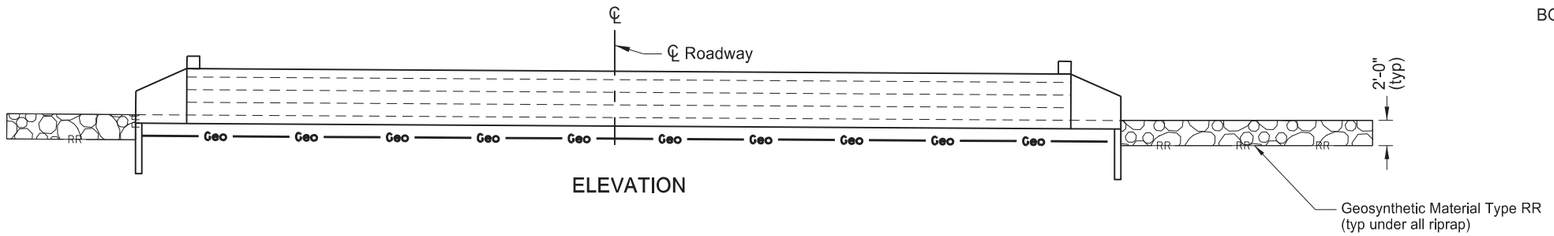
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	170	1



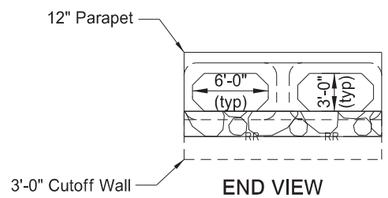
PLAN

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

FACTORED DESIGN MOMENTS (SINGLE)		FACTORED DESIGN SHEARS (DOUBLE)	
WALL MOMENT	6,220 ft-lbs	WALL SHEAR	760 lbs
ROOF MOMENTS		ROOF SHEARS	
CORNER	5,930 ft-lbs	CORNER	7,570 lbs
BOTTOM	8,910 ft-lbs	WALL	7,570 lbs
TOP	980 ft-lbs	FLOOR SHEARS	
FLOOR MOMENTS		CORNER	6,990 lbs
CORNER	6,430 ft-lbs	WALL	6,990 lbs
TOP	8,610 ft-lbs		
BOTTOM	500 ft-lbs		



ELEVATION



END VIEW

HYDRAULIC DATA:

Drainage Area	2.982	sq mi
Stream Gradient	0.00049	ft/ft
Design Frequency	10	yr
Design Discharge	81.3	cfs
Design Headwater Stage	821.55	ft
Design Tailwater Stage	821.15	ft
Velocity Through Culvert	2.54	fps
100-Year Frequency Discharge	110.6	cfs
100-Year Frequency Headwater	825.33	ft
Overtopping Stage	925.33	ft
Overtopping Discharge	NA	cfs

BOX CULVERT BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
202	0104	REMOVAL OF STRUCTURE	EA	1
210	0050	BOX CULVERT EXCAVATION	EA	1
210	0210	FOUNDATION FILL	CY	705
210	0405	FOUNDATION PREPARATION-BOX CULVERT	EA	1
256	0200	RIPRAP GRADE II	CY	35
606	0603	6FT X 3FT PRECAST RCB CULVERT	LF	140
606	4603	6FT X 3FT PRECAST RCB END SECTION	EA	4
709	0100	GEOSYNTHETIC MATERIAL TYPE G	SY	179
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	92

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

SPECIAL PROVISIONS	
SSP 2	MIGRATORY BIRD TREATY ACT

STANDARD DRAWINGS
D-714-22

HL-93 DESIGN LOADING

SIDE APPROACH OVER HIGHWAY DITCH
JCT US 81 AND ND 5

CLEAR SPAN 2 X 6' CLEAR HEIGHT 3'
MAXIMUM FILL 5'

PRECAST CONCRETE
DOUBLE BOX CULVERT LAYOUT

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

Thorenson, Jason R.
09/07/23

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	170	2

NOTES

100-P01 **SCOPE OF WORK:** Work at this site consists of removing an existing structure and building a new double barrel 6' x 3' x 70'-0" precast concrete box culvert.

202-P01 **REMOVAL OF STRUCTURE:** The existing structure is a double 5' x 3' x 26' RCB.

The bid item "REMOVAL OF STRUCTURE" includes all work required to remove all structure components.

606-P01 **PRECAST SECTION**: Tie the barrel sections together with 1" diameter tie bolts as shown on Standard Drawing D-714-22. Place two ties per exterior wall at each joint located at third points of the wall clear height.

Cast holes at 3'0" centers through the last end section and into the cutoff wall to receive 3/4" diameter reinforcing bars. Cast holes in the first end section at 2'0 centers for 3/4" diameter reinforcing bars to attach the parapet. Cast parapet against the sections. Install the bars according to the manufacturer' recommendations, with a high strength adhesive specifically intended for concrete anchorage, in accordance with Section 806.02. Payment for the end section includes the cutoff wall and parapet.

Install the barrel sections with a maximum gap of ¾" wide. Install each line of barrels to terminate within 1" of the begin and end points of the adjacent barrel lines.

Provide a distance of 1'-0" between separate precast units. Fill this gap with a controlled density backfill. The gap between the end sections will use AE-3 concrete on controlled density backfill or Class 41 aggregate Include the AE-3 concrete, controlled density backfill or Class 41 and rebar used for the 12" cap in the price bid for the Precast RCB Culvert.

606-P02 **JOINTS**: Provide joints in accordance with Section 606.04.E.3, with the exception that a 12" minimum width waterproof membrane is allowable around the exterior surfaces of the box culvert walls and roof.

910-P01 **CONTROLLED DENSITY BACKFILL**: Controlled density backfill consists of cement, water, fly ash and aggregate at the ratio specified below. Place controlled density backfill as shown in the plans. Mix the material continuously during pumping or placement to keep the solution from separating.

MIX DESIGN 1

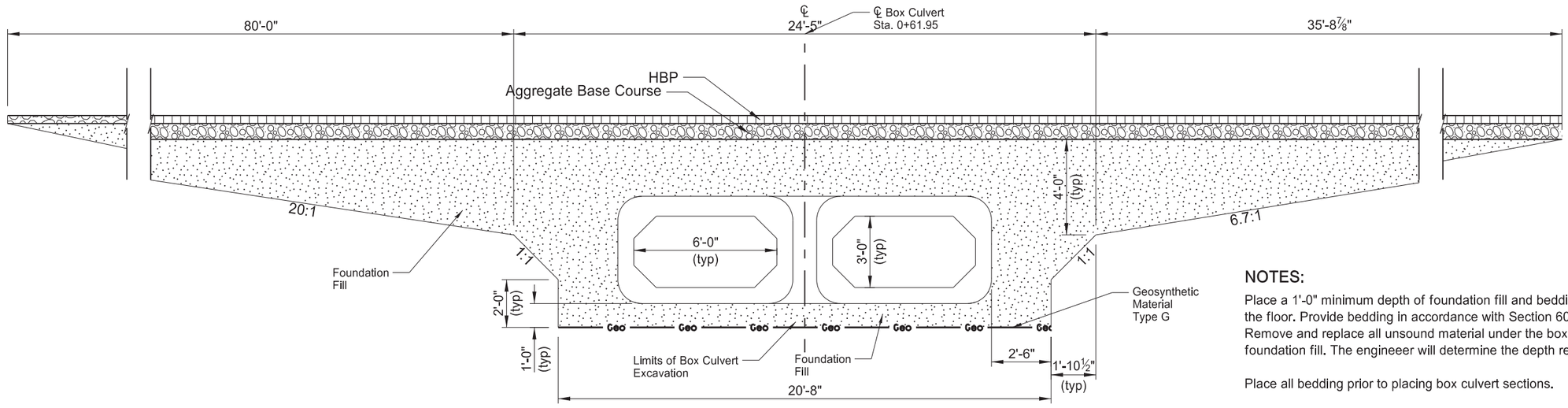
Cement	75 lbs
Fly Ash	125 lbs
Fine Aggregate	2600 lbs
Water	416.5 gals

Include the controlled density backfill and materials used for the 12" cap in the price bid for "6Ft X 3Ft Precast RCB Culvert."

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

23 U.S.C. 407
NDDOT Reserves All Objections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	170	3



(SHOWING SECTION ALONG ℄ ROADWAY

NOTES:

Place a 1'-0" minimum depth of foundation fill and bedding under the floor. Provide bedding in accordance with Section 606.E.1. Remove and replace all unsound material under the box with foundation fill. The engineeer will determine the depth required.

Place all bedding prior to placing box culvert sections.

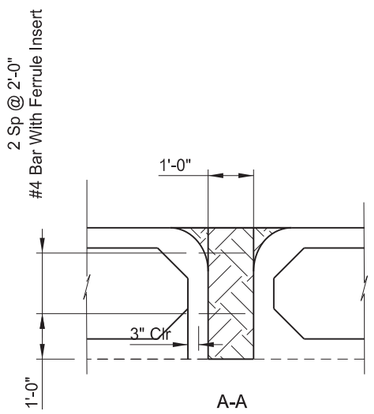
Extend the geosynthetic material and foundation fill to the end of the apron.

NOTES:

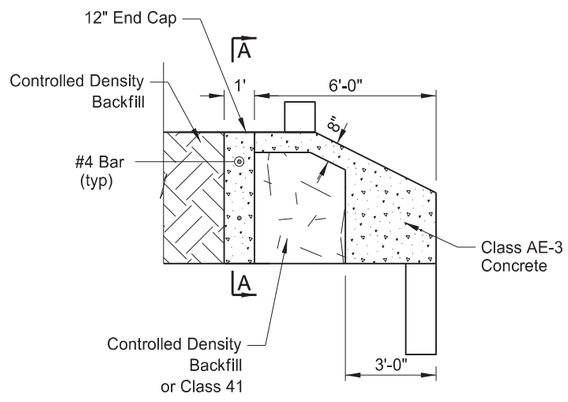
The intent of this detail is to show only the placement of the controlled density backfill between adjacent barrels. The representation of the size of barrels is arbitrary.

Embed the ferrule insert with #4 bar into the side of last barrel section maintaining a 3" minimum clearance from the other box culvert. Spacing measured 1'-0" from bottom of box and spaced at 2'-0" up the front face.

Install the #4 bars according to the manufacturer's recommendations, with a high strength adhesive specifically intended for concrete anchorage and that meets the requirements of Section 806.02.



ELEVATION



CONTROLLED DENSITY BACKFILL DETAIL

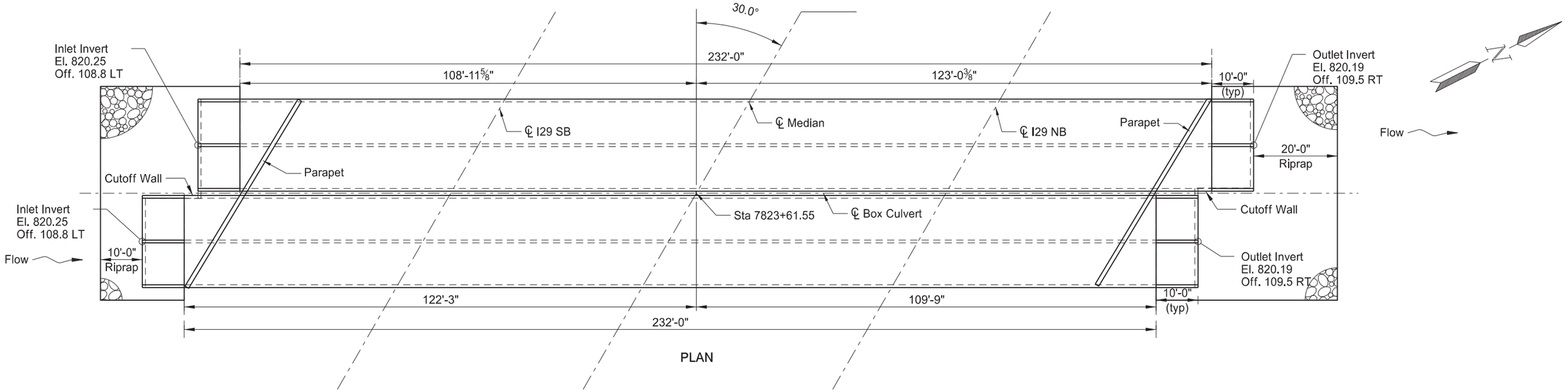
REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

SIDE APPPROACH OVER HIGHWAY DITCH
JCT US 81 AND ND 5

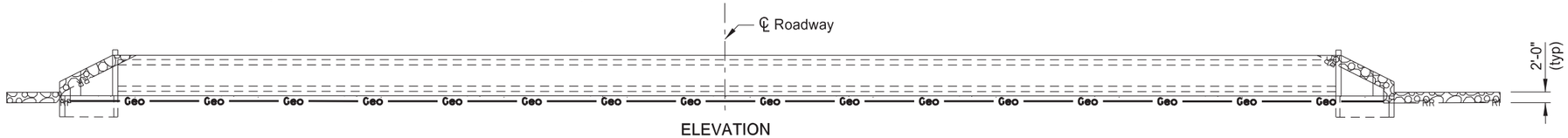
EXCAVATION & FOUNDATION FILL DETAIL

23 U.S.C. 407
NDDOT Reserves All Objections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	170	4



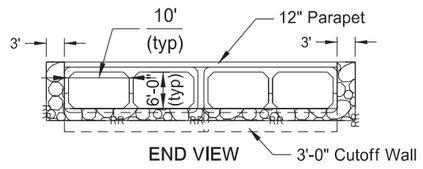
PLAN



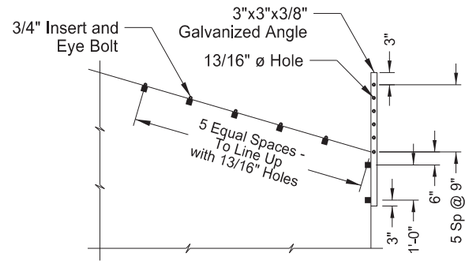
ELEVATION

For a double barrel box culvert with 10" thick roof, 10" floor and 8" walls, the following total factored moments and shears would result from the application of the required loads:

FACTORED DESIGN MOMENTS (DOUBLE)		FACTORED DESIGN SHEARS (DOUBLE)	
WALL MOMENT	5,150 ft-lbs	WALL SHEAR	1,980 lbs
ROOF MOMENTS		ROOF SHEARS	
CORNER	7,510 ft-lbs	CORNER	9,660 lbs
BOTTOM	17,190 ft-lbs	WALL	11,770 lbs
TOP	12,680 ft-lbs	FLOOR SHEARS	
FLOOR MOMENTS		CORNER	5,430 lbs
CORNER	4,210 ft-lbs	WALL	8,180 lbs
TOP	10,760 ft-lbs		
BOTTOM	11,840 ft-lbs		



END VIEW



END SECTION FENCE
ANCHOR INSERT DETAIL

HYDRAULIC DATA:

Drainage Area	18.89	sq mi
Stream Gradient	0.0005	ft/ft
Design Frequency	50	yr
Design Discharge	514.8	cfs
Design Headwater Stage	825.09	ft
Design Tailwater Stage	825.13	ft
Velocity Through Culvert	1.78	fps
100-Year Frequency Discharge	623.4	cfs
100-Year Frequency Headwater	825.31	ft
Overtopping Stage	829.92	ft
Overtopping Discharge	N/A	cfs

BOX CULVERT BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
202	0104	REMOVAL OF STRUCTURE	EA	2
210	0050	BOX CULVERT EXCAVATION	EA	1
210	0210	FOUNDATION FILL	CY	5933
210	0405	FOUNDATION PREPARATION-BOX CULVERT	EA	1
256	0200	RIPRAP GRADE II	CY	129
606	3006	DBL 10FT X 6FT PRECAST RCB CULVERT	LF	464
606	7006	DBL 10FT X 6FT PRECAST RCB END SECTION	EA	4
709	0100	GEOSYNTHETIC MATERIAL TYPE G	SY	1428
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	1515

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

SPECIAL PROVISIONS	
SSP 2	MIGRATORY BIRD TREATY ACT

STANDARD DRAWINGS
D-714-22

HL-93 DESIGN LOADING

4 MILES SOUTH OF MANVEL
COUNTY DRAIN NO. 11

CLEAR SPAN 4 X 10'
CLEAR HEIGHT 6'
MAXIMUM FILL 4'
PRECAST CONCRETE
QUAD BOX CULVERT LAYOUT

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

Thorenson, Jason R.
09/07/23

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	170	5

NOTES

100-P01 **SCOPE OF WORK:** Work at this site consists of removing two existing structures and building a new quad barrel 10' x 6’ x 228'-0" precast concrete box culvert.

202-P01 **REMOVAL OF STRUCTURE:** The existing structures are a 2 span 36-foot concrete slab bridge and a 2 span 40-foot concrete slab bridge.

The bid item “REMOVAL OF STRUCTURE” includes all work required to remove all structure components.

606-P01 **PRECAST SECTION**: Tie the barrel sections together with 1" diameter tie bolts as shown on Standard Drawing D-714-22. Place two ties per exterior wall at each joint located at third points of the wall clear height.

Cast holes at 3’0” centers through the last end section and into the cutoff wall to receive 3/4” diameter reinforcing bars. Cast holes in the first end section at 2’0 centers for 3/4” diameter reinforcing bars to attach the parapet. Cast parapet against the sections. Install the bars according to the manufacturer’ recommendations, with a high strength adhesive specifically intended for concrete anchorage, in accordance with Section 806.02. Payment for the end section includes the cutoff wall and parapet.

Install the barrel sections with a maximum gap of ¾” wide.

Provide a distance of 1'-0" between separate precast units. Fill this gap with a controlled density backfill. The gap between the end sections will use AE-3 concrete on controlled density backfill or Class 41 aggregate Include the AE-3 concrete, controlled density backfill or Class 41 and rebar used for the 12” cap in the price bid for the Precast RCB Culvert.

606-P02 **JOINTS**: Provide joints in accordance with Section 606.04.E.3, with the exception that a 12” minimum width waterproof membrane is allowable around the exterior surfaces of the box culvert walls and roof.

910-P01 **CONTROLLED DENSITY BACKFILL**: Controlled density backfill consists of cement, water, fly ash and aggregate at the ratio specified below. Place controlled density backfill as shown in the plans. Mix the material continuously during pumping or placement to keep the solution from separating.

MIX DESIGN 1

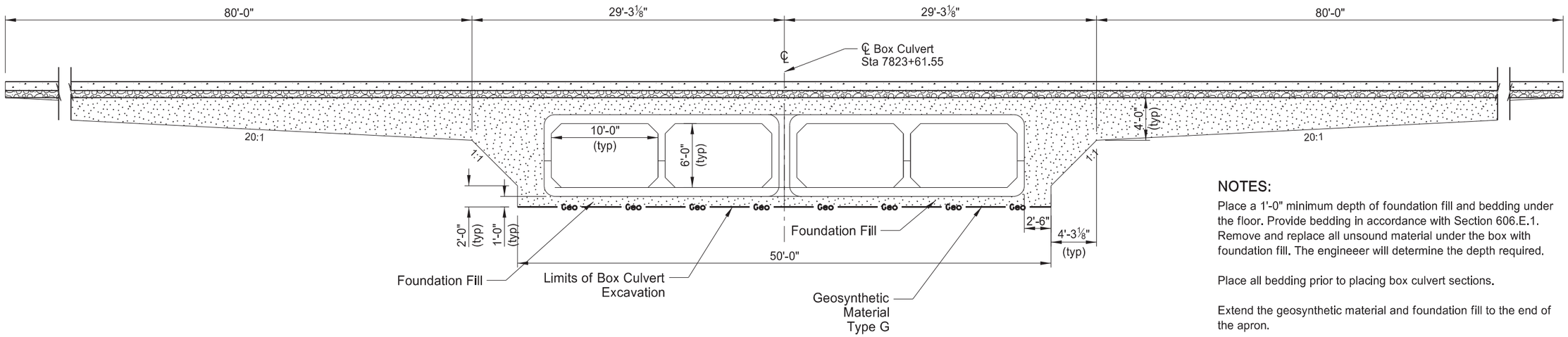
Cement	75 lbs
Fly Ash	125 lbs
Fine Aggregate	2600 lbs
Water	416.5 gals

Include the controlled density backfill and materials used for the 12” cap in the price bid for “DBL 10Ft X 6Ft Precast RCB Culvert.”

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

23 U.S.C. 407
NDDOT Reserves All Objections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	170	6

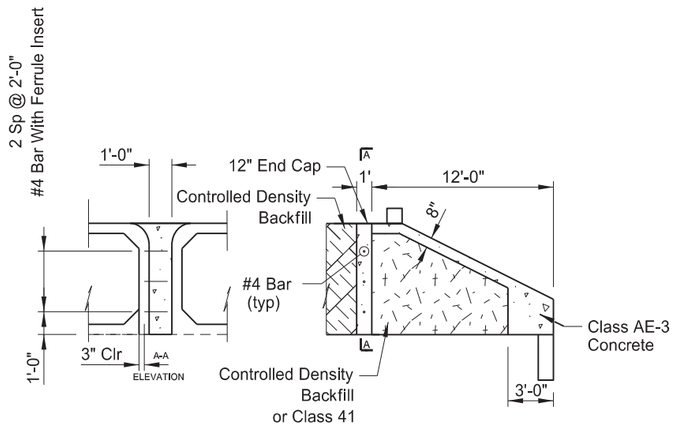


NOTES:

Place a 1'-0" minimum depth of foundation fill and bedding under the floor. Provide bedding in accordance with Section 606.E.1. Remove and replace all unsound material under the box with foundation fill. The engineeer will determine the depth required.

Place all bedding prior to placing box culvert sections.

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



CONTROLLED DENSITY BACKFILL DETAIL

NOTES:

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

Embed the ferrule insert with #4 bar into the side of last barrel section maintaining a 3" minimum clearance from the other box culvert. Spacing measured 1'-0" from bottom of box and spaced at 2'-0" up the front face.

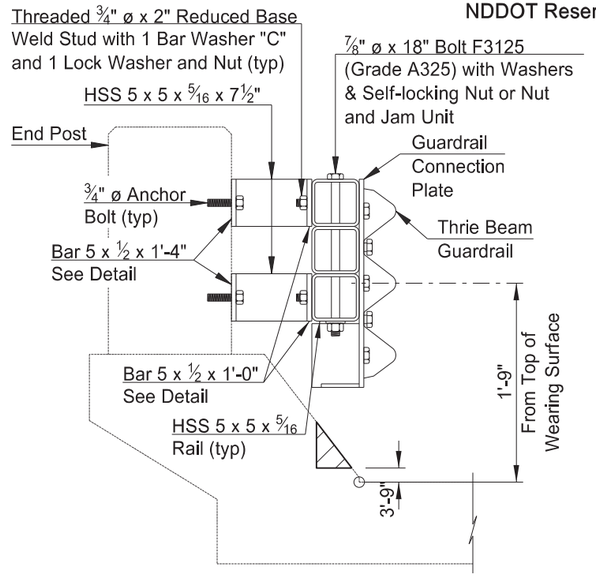
Install the #4 bars according to the manufacturer's recommendations, with a high strength adhesive specifically intended for concrete anchorage and that meets the requirements of Section 806.02.

REGISTERED PROFESSIONAL ENGINEER
GAYLE D
COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

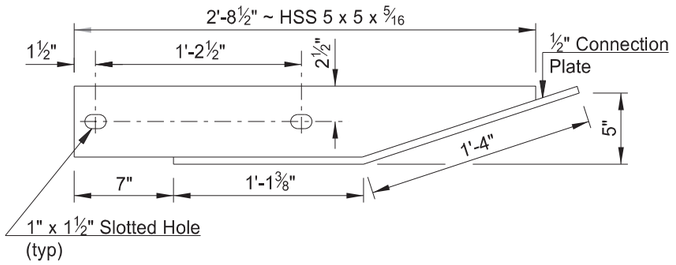
4 MILES SOUTH OF MANVEL
COUNTY DRAIN NO. 11

EXCAVATION & FOUNDATION
FILL DETAIL

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	170	7

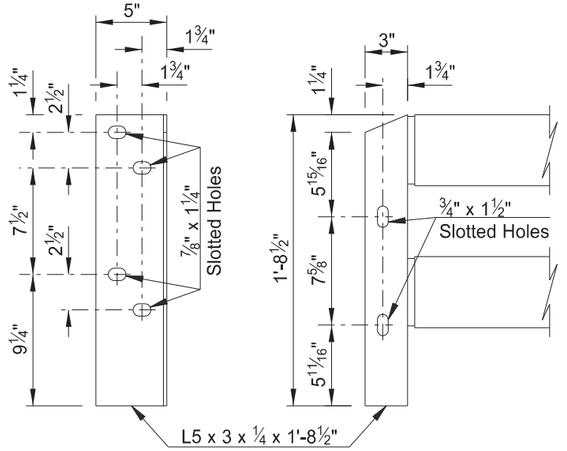


CONNECTION DETAIL



(2 REQUIRED)

GUARDRAIL CONNECTION PLATE DETAILS



(2 REQUIRED)

CONNECTION ANGLE DETAILS

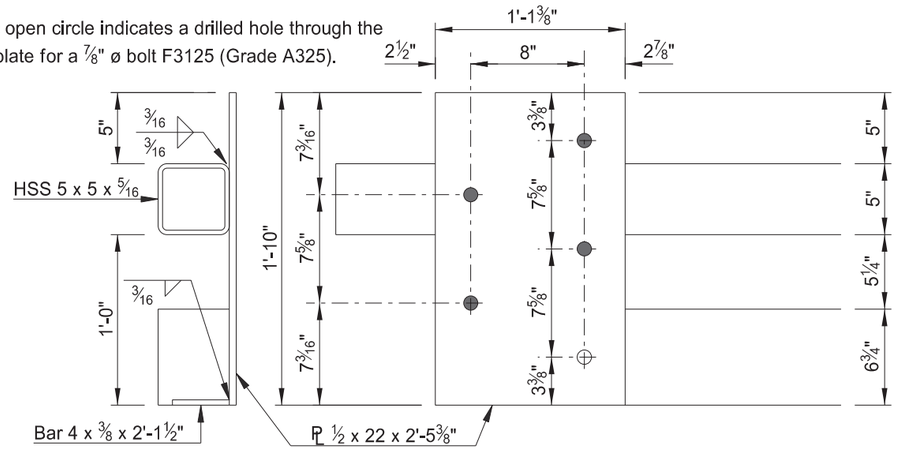
NOTES:

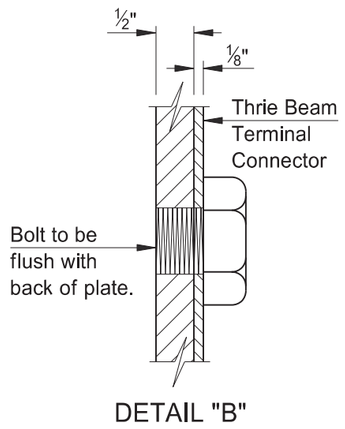
Work at this site consists of installing guardrail connection plates at the exit end of the bridge. Include the connection plate, connection angle, welded studs, concrete removal and labor required to install the connections plates in the bid item "W-Beam Guardrail End Terminal".

Provide bolts and anchor bolts that meet the requirements of ASTM F3125 Grade 325 or ASTM A449. Provide reduced base weld studs that meet the requirements of ASTM A108.

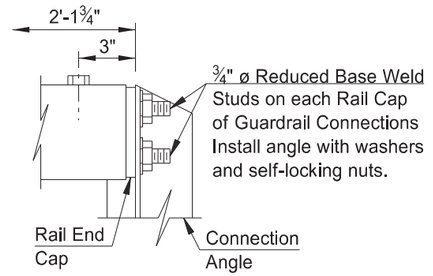
The filled circles indicate drilled and tapped holes for ⅞ ø bolts F3215 (Grade A325). See Detail "B."

The open circle indicates a drilled hole through the ½" plate for a ⅞" ø bolt F3125 (Grade A325).





DETAIL "B"



RAIL CAP DETAIL

REGISTERED PROFESSIONAL ENGINEER
GAYLE D COX
PE-10597
DATE 09/06/23
NORTH DAKOTA

4 MILES SOUTH OF MANVEL
COUNTY DRAIN NO. 11

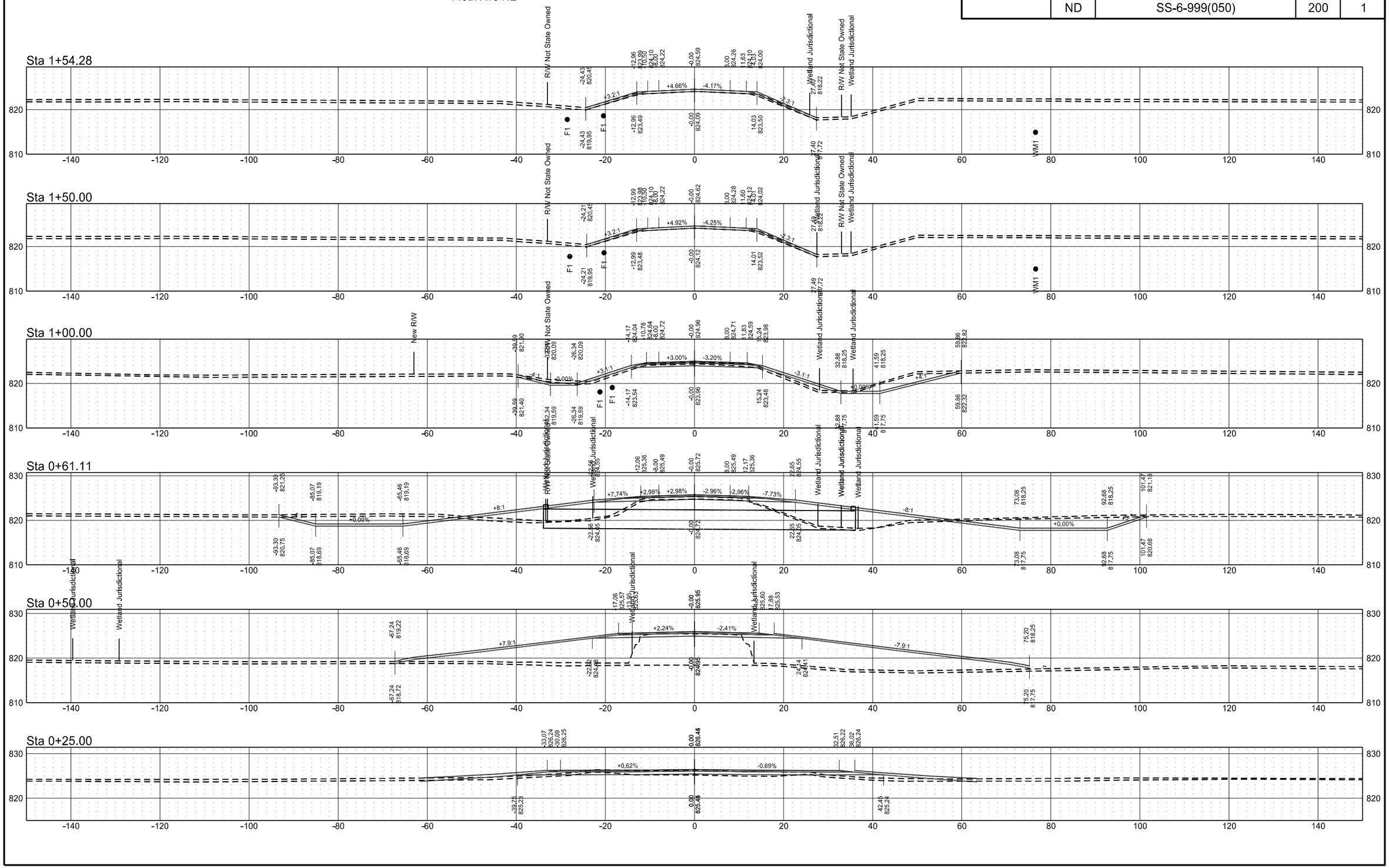
GUARDRAIL CONNECTION PLATE DETAILS

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION

Thorenson, Jason R.
09/07/23

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	1

149th Ave NE



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Interstate 29
PR29

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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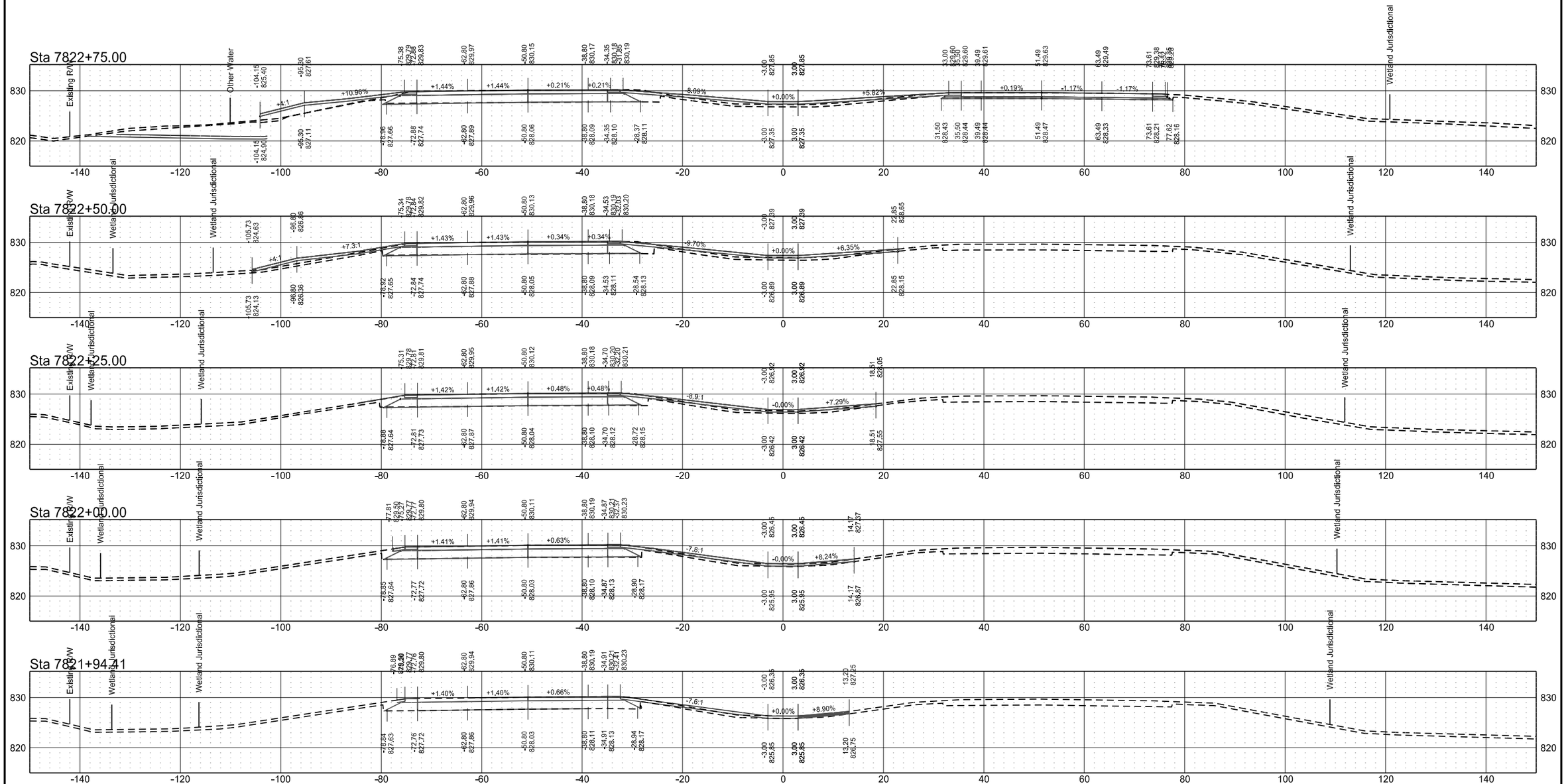

Interstate 29
PR29

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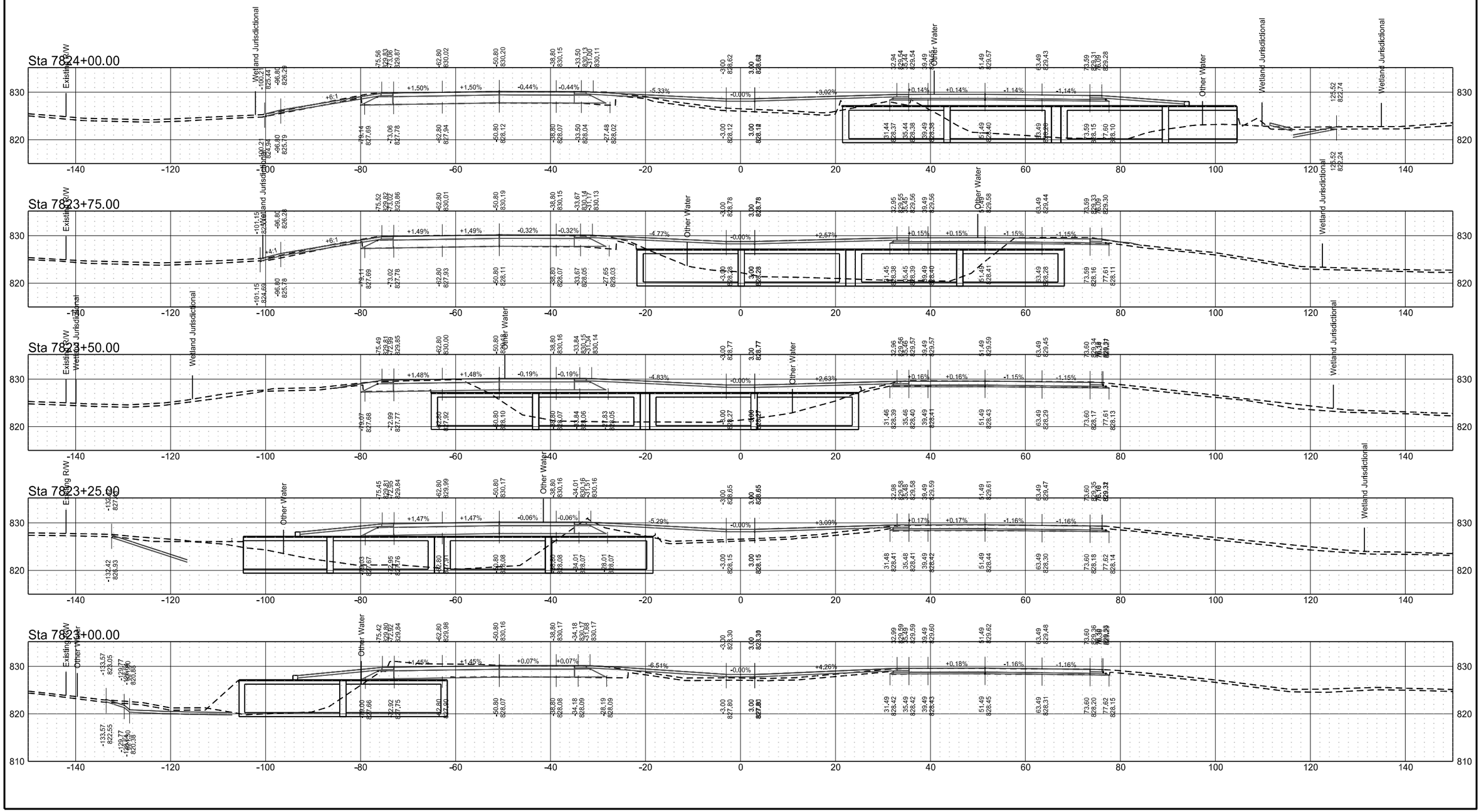

Interstate 29
PR29

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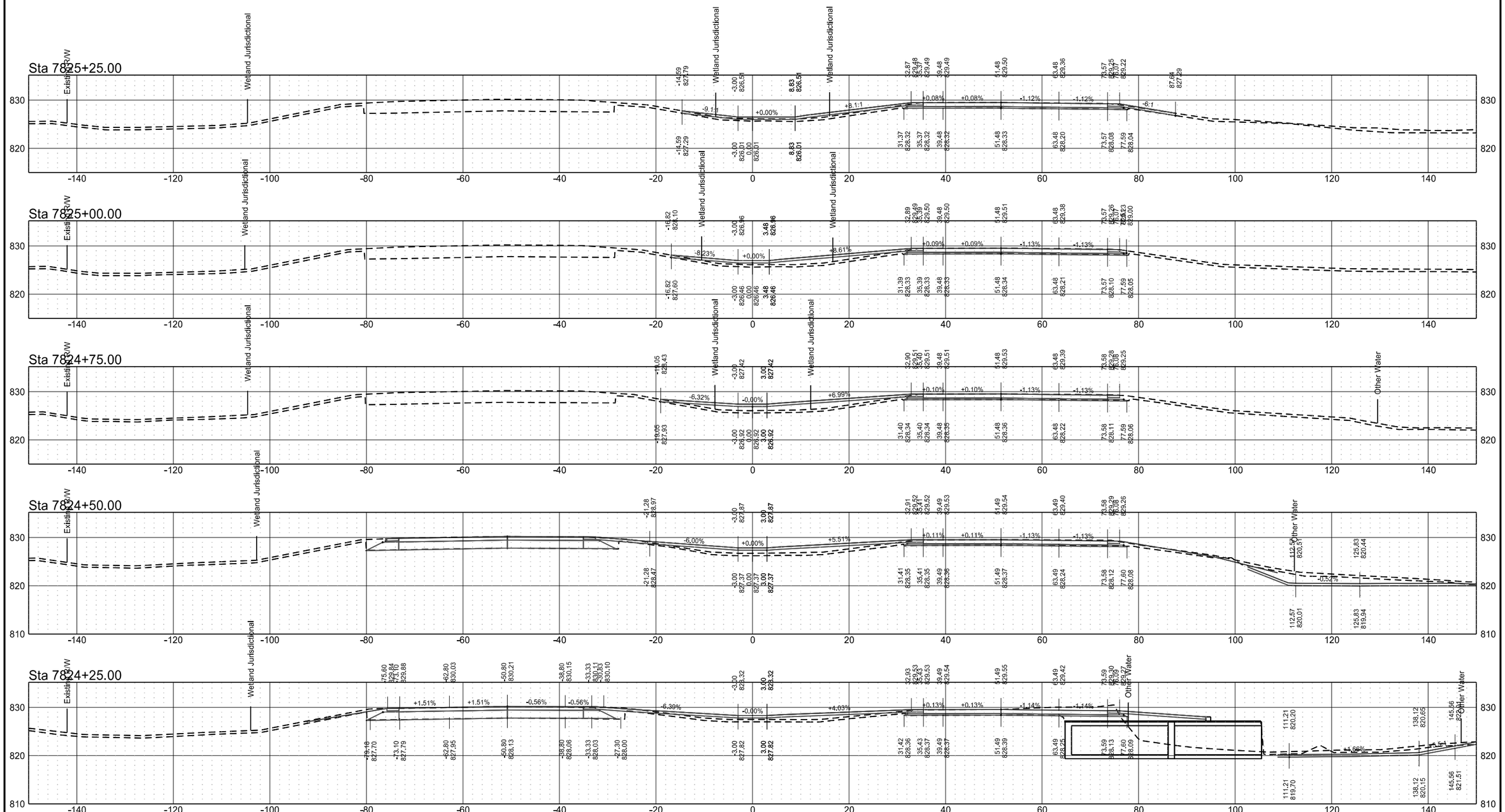
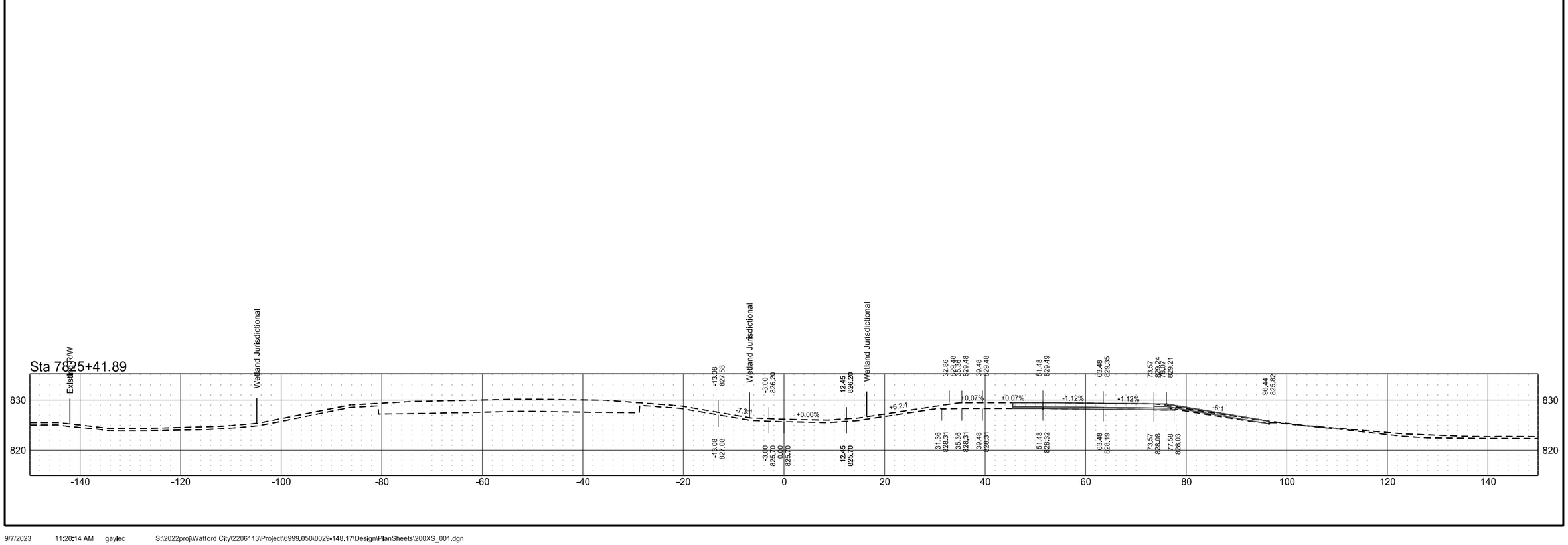


Interstate 29
PR29

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	5



Interstate 29
South Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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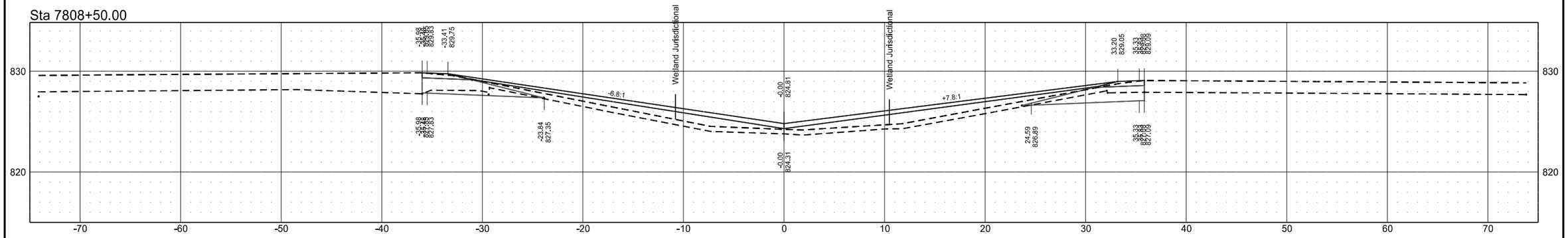
Sta 7808+50.00



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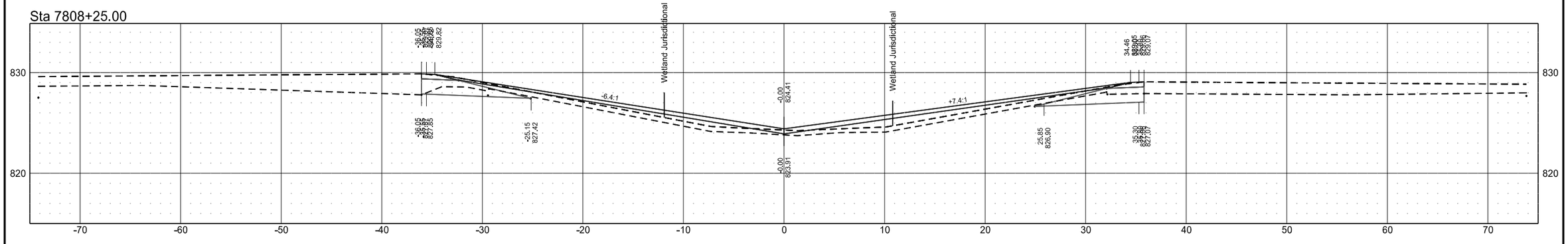
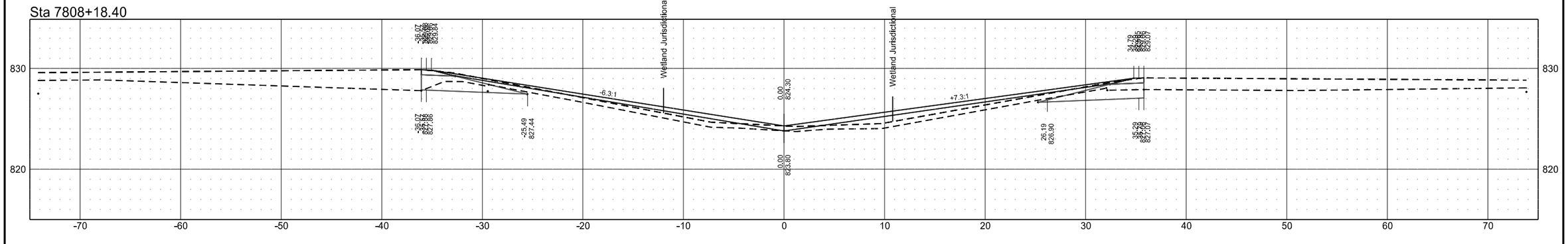


Sta 7808+18.40



Interstate 29
South Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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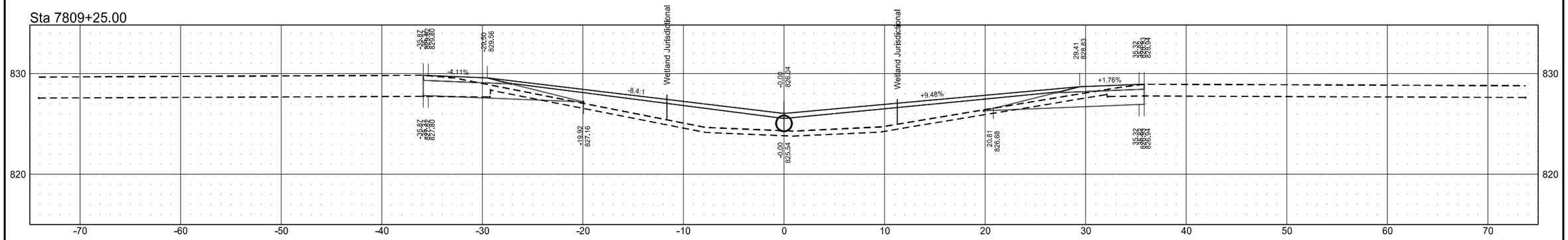
Sta 7809+25.00



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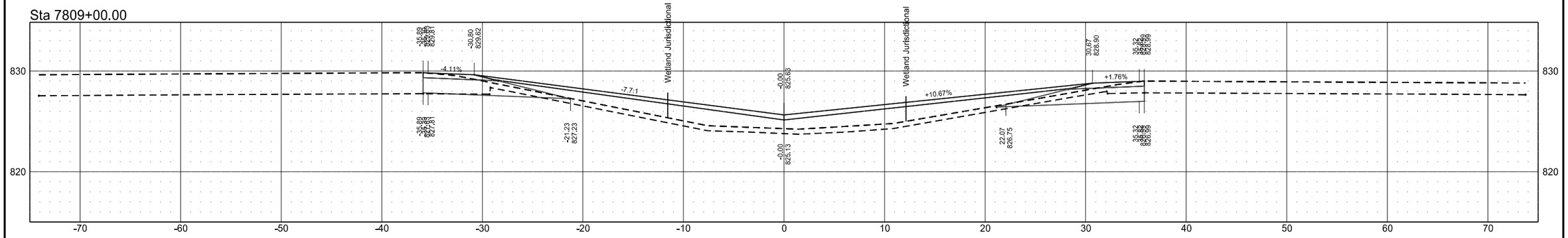
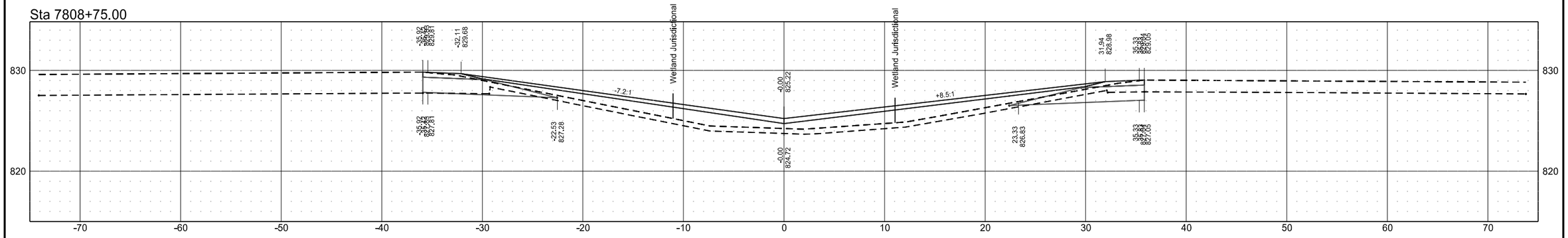


Sta 7808+75.00



Interstate 29
South Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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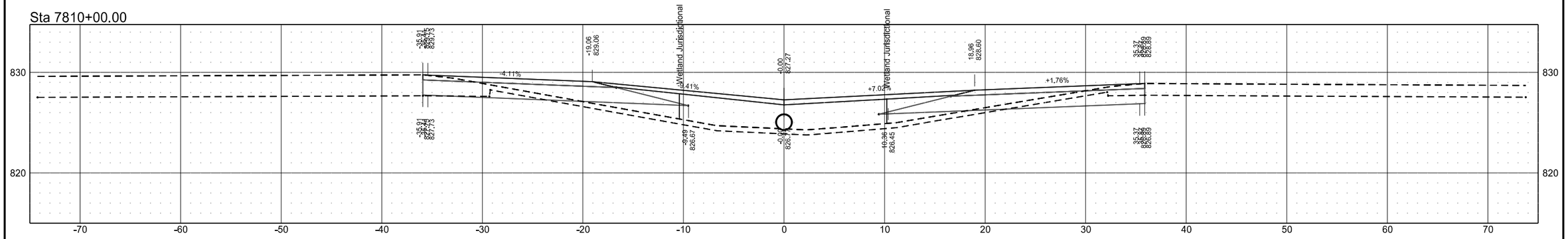
Sta 7810+00.00



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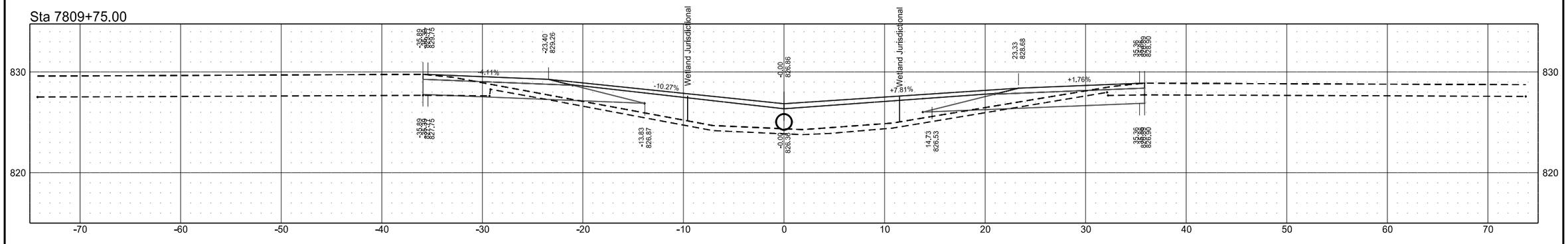

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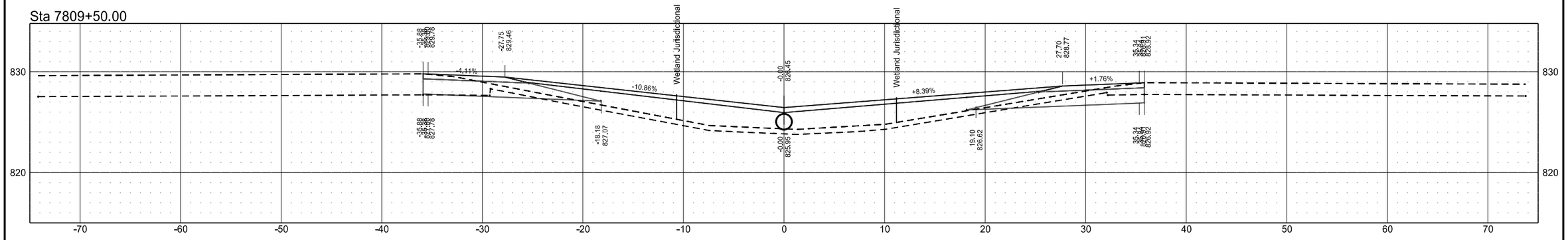
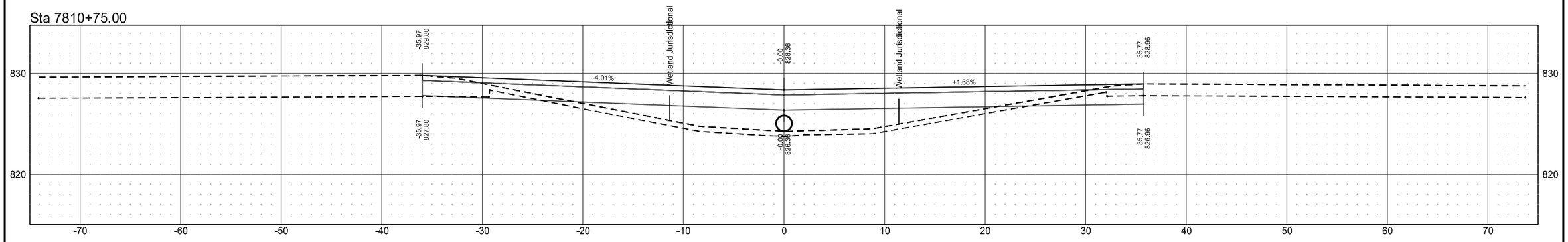


Interstate 29
South Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	9

Sta 7810+75.00



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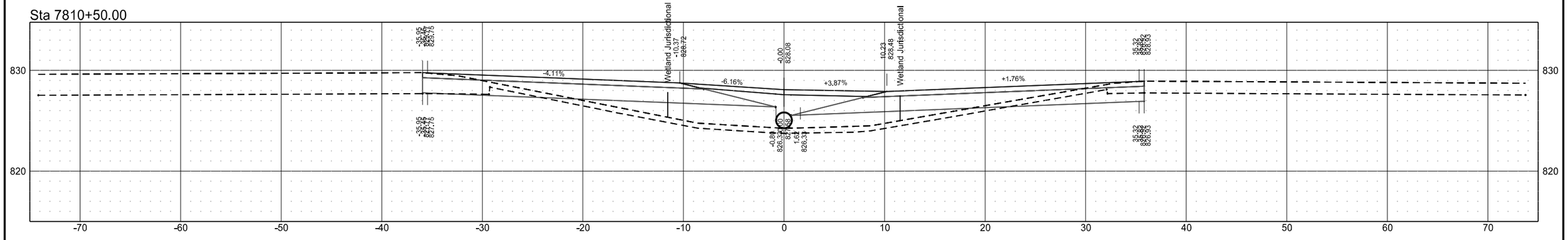

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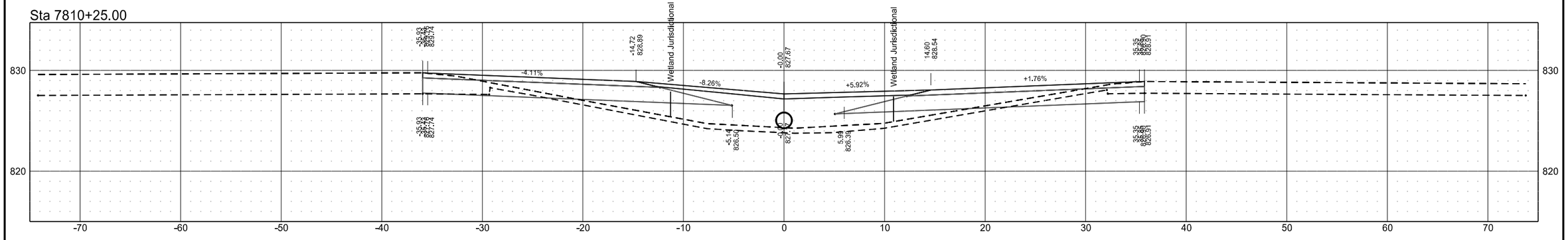
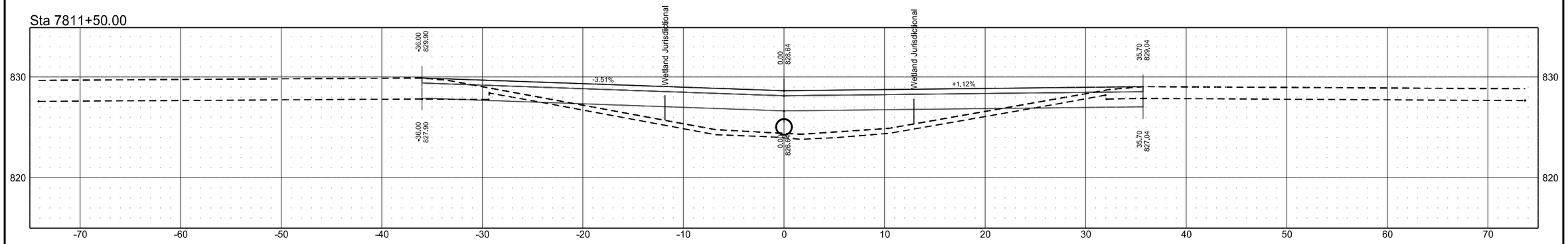


Interstate 29
South Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	10

Sta 7811+50.00



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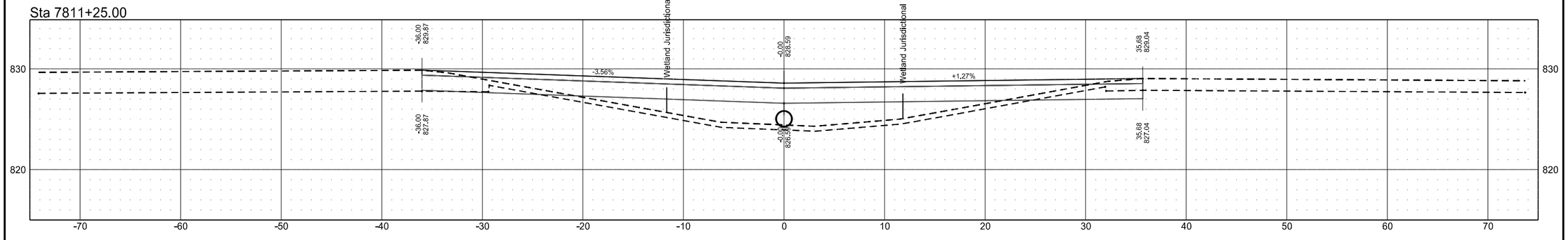

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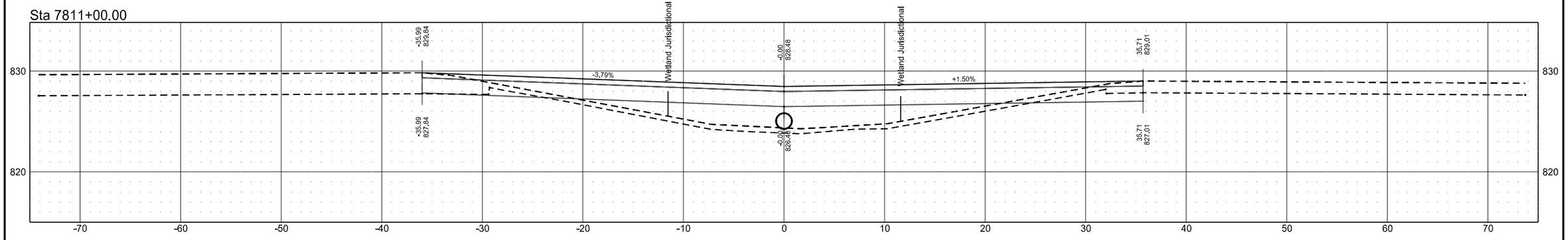
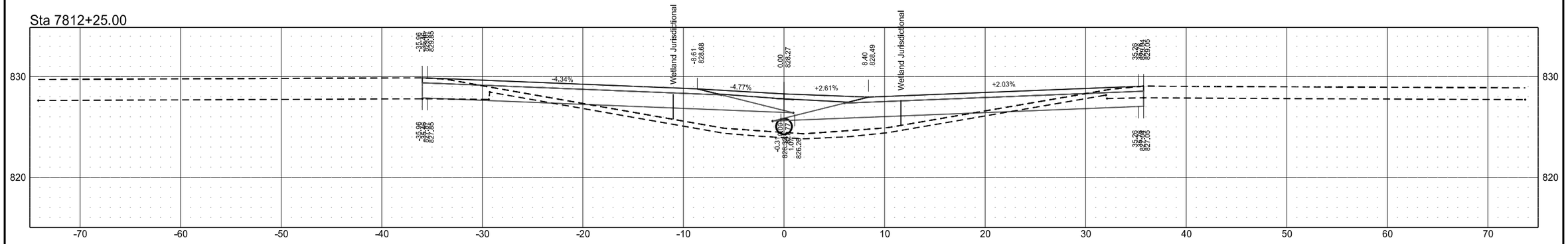


Interstate 29
South Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	11

Sta 7812+25.00



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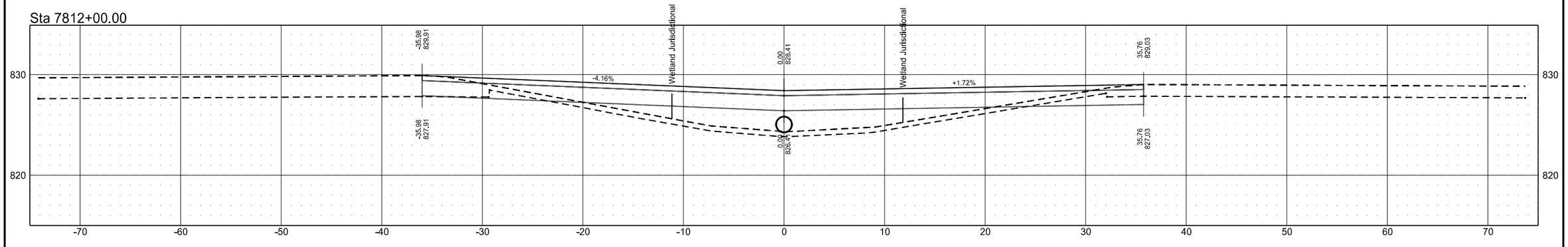

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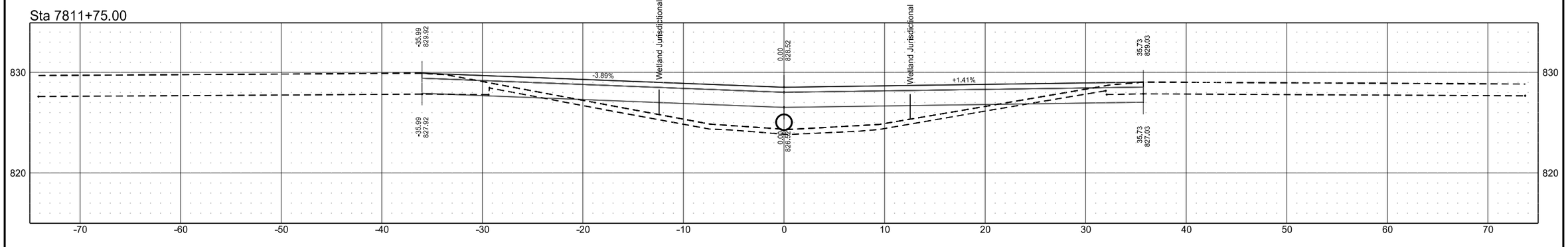
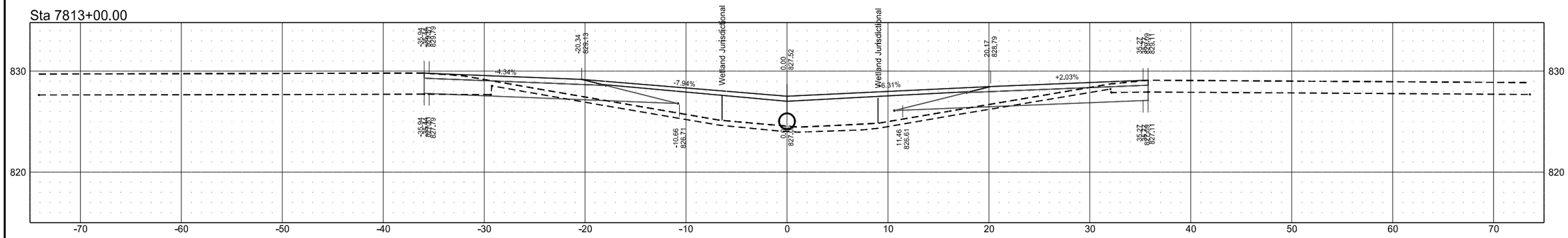


Interstate 29
South Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	12

Sta 7813+00.00



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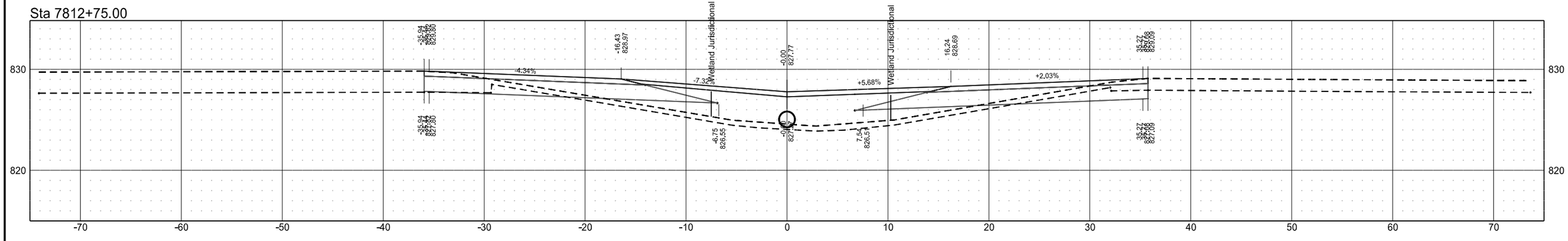

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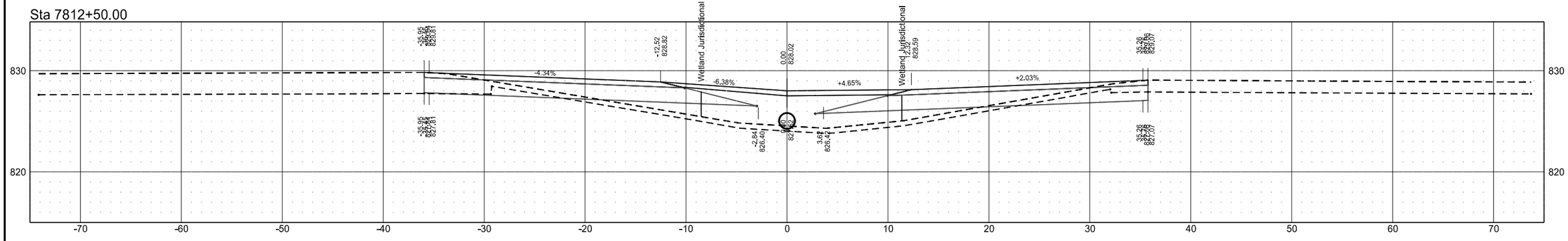
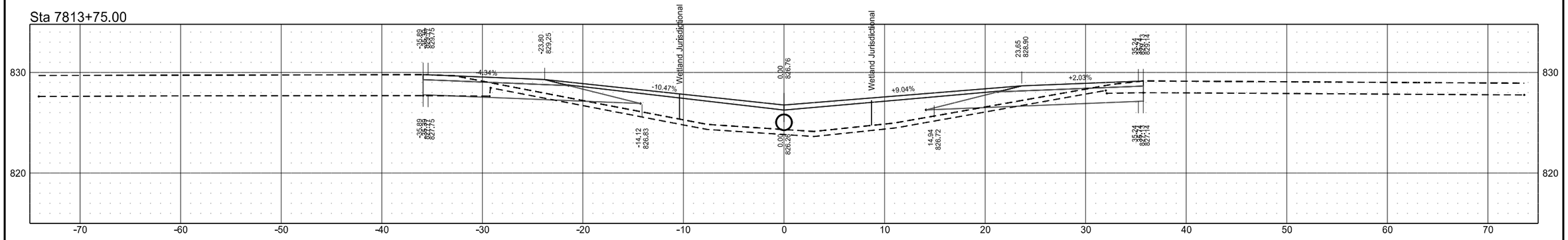


Interstate 29
South Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	13

Sta 7813+75.00



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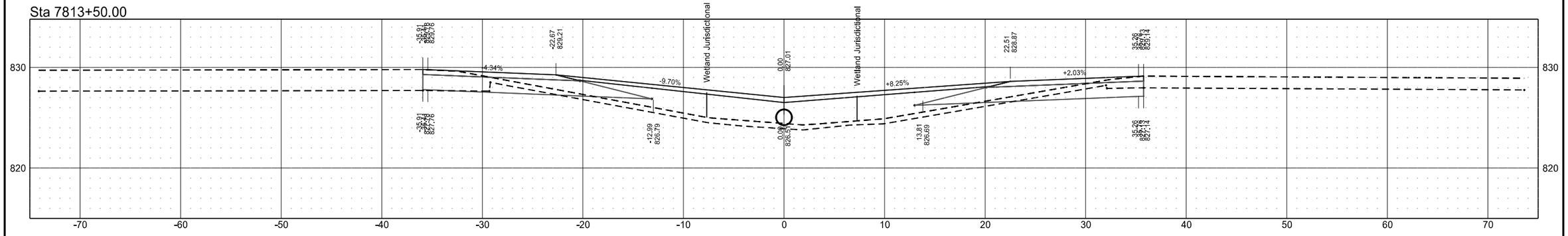

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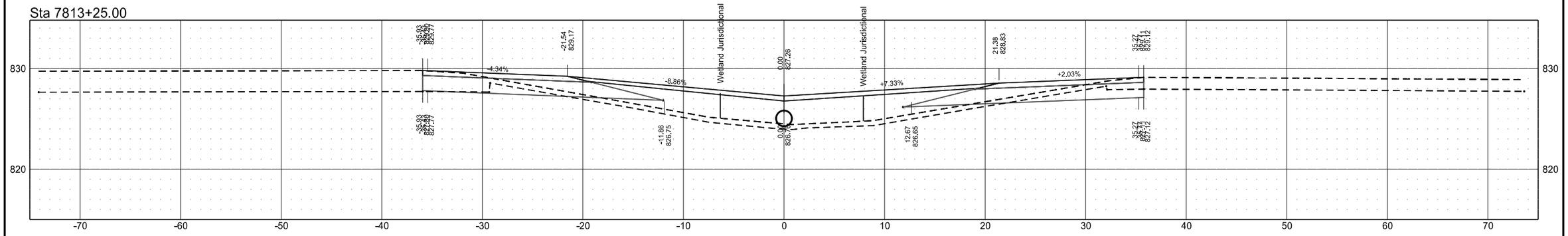

Interstate 29
South Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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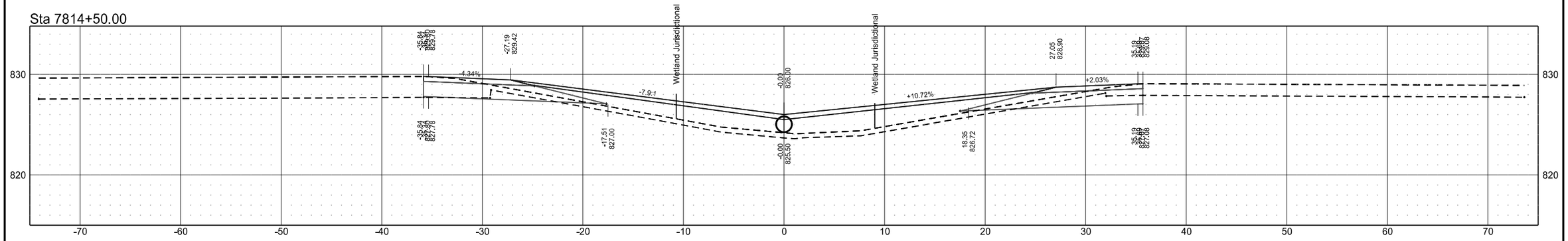
Sta 7814+50.00



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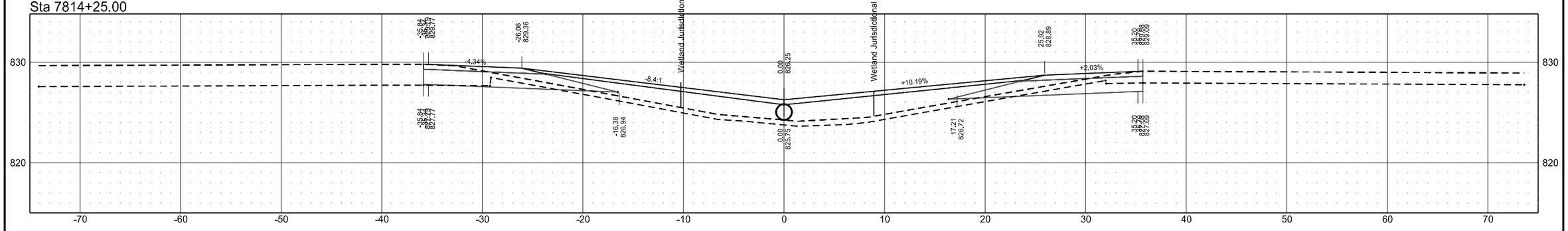

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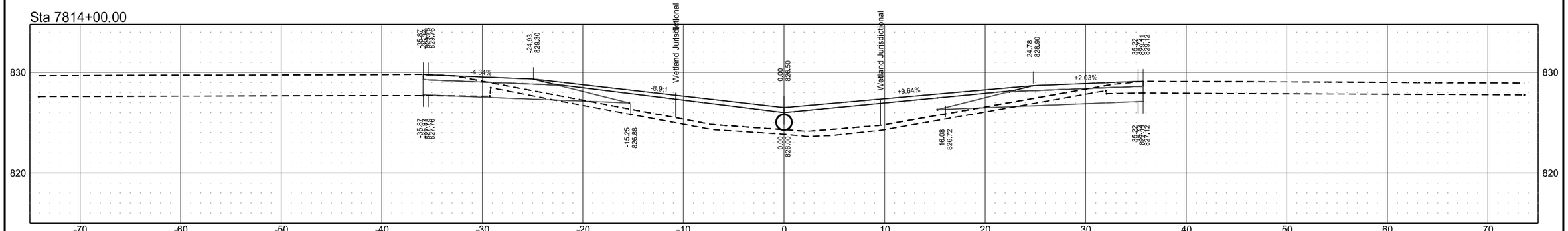

Interstate 29
South Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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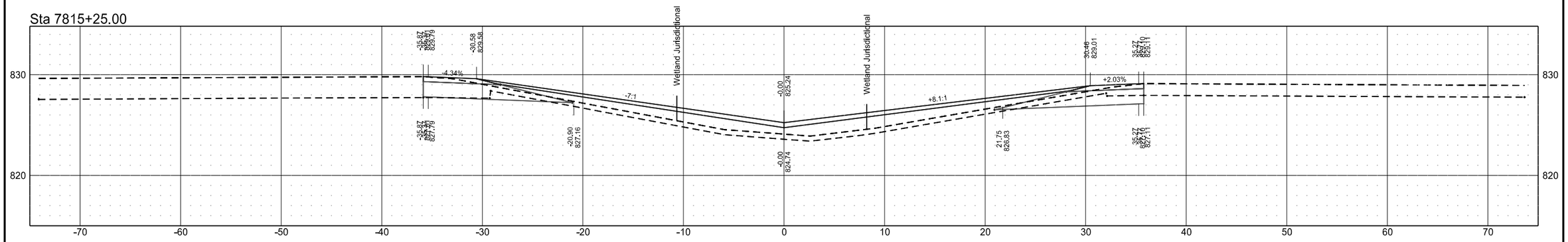
Sta 7815+25.00



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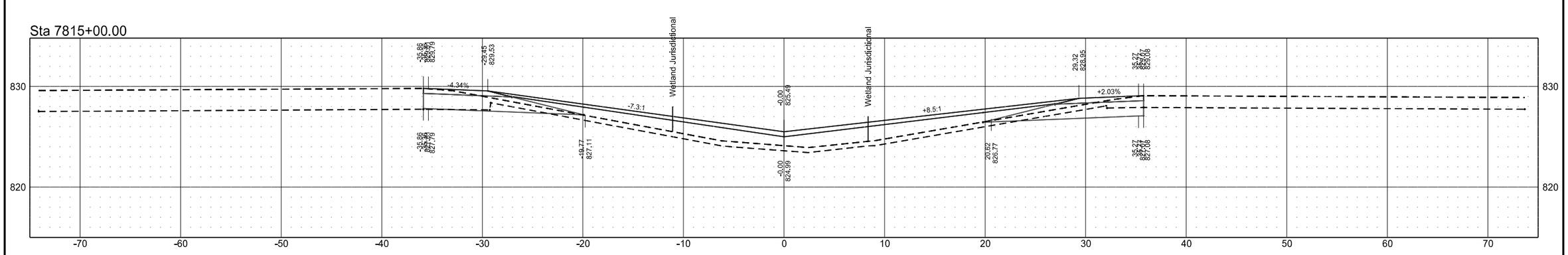

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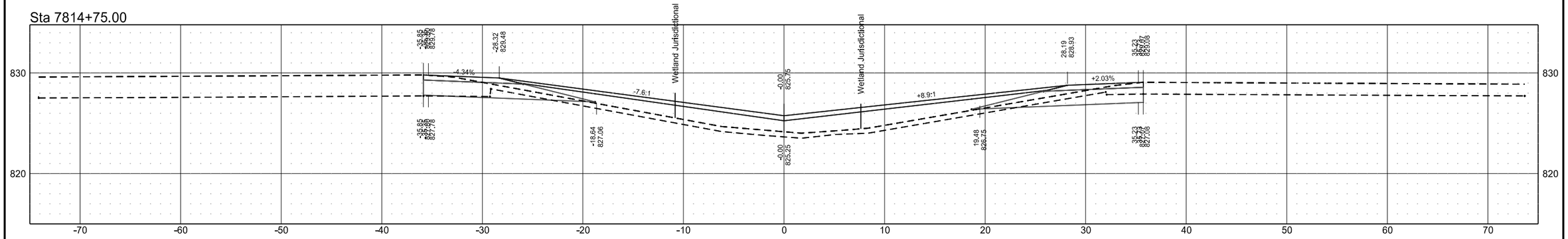
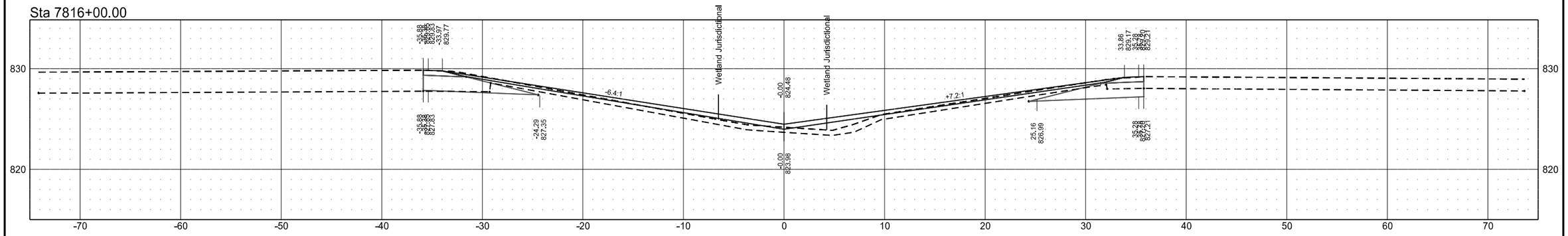


Interstate 29
South Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	16

Sta 7816+00.00



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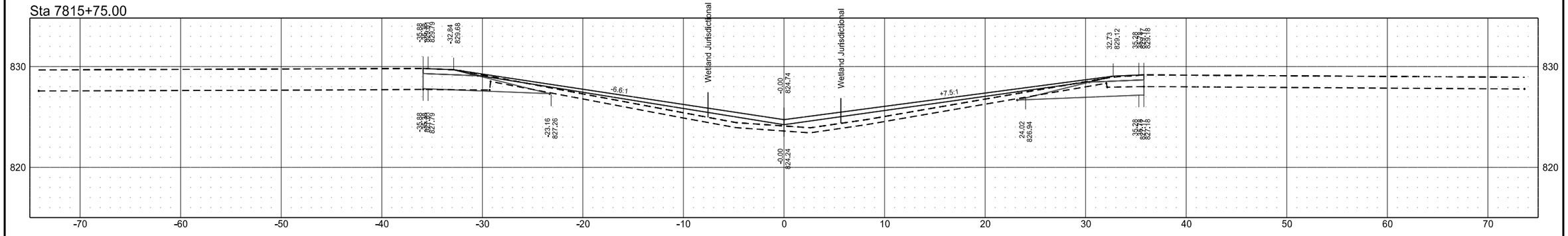

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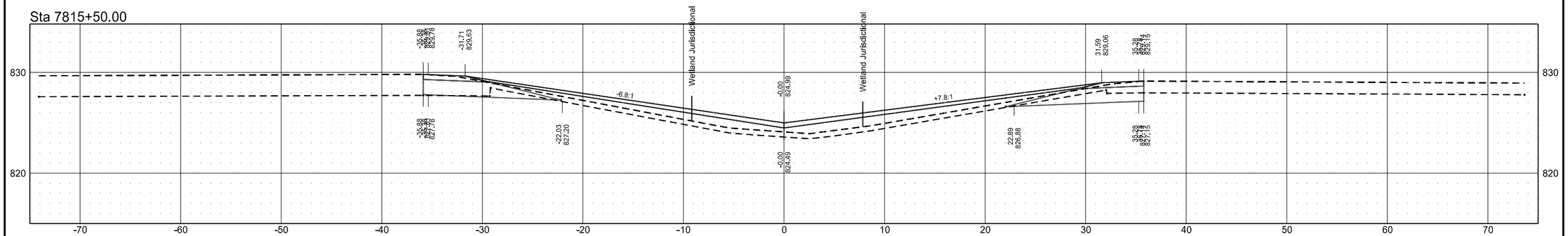
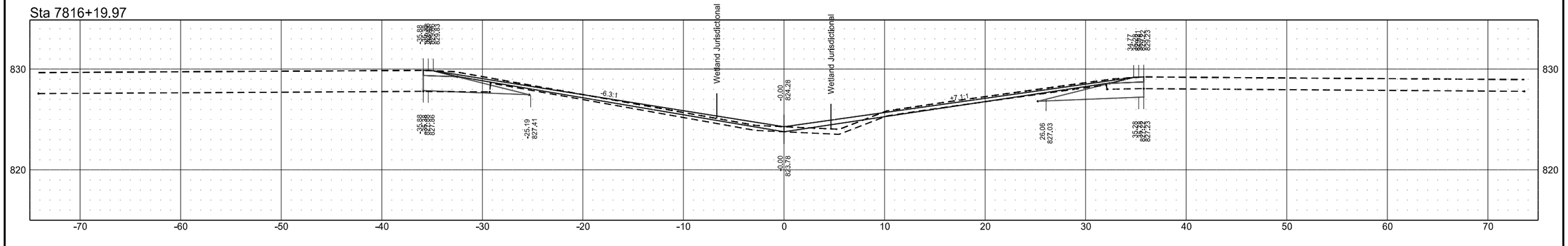


Interstate 29
South Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	17

Sta 7816+19.97



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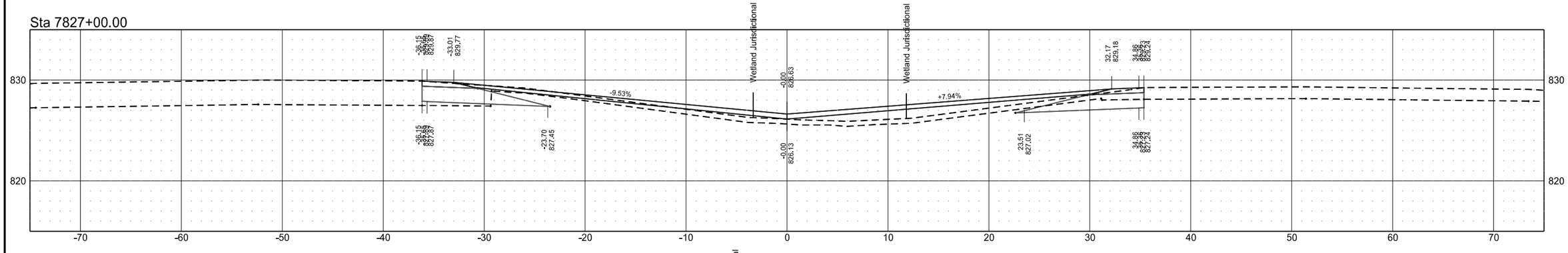
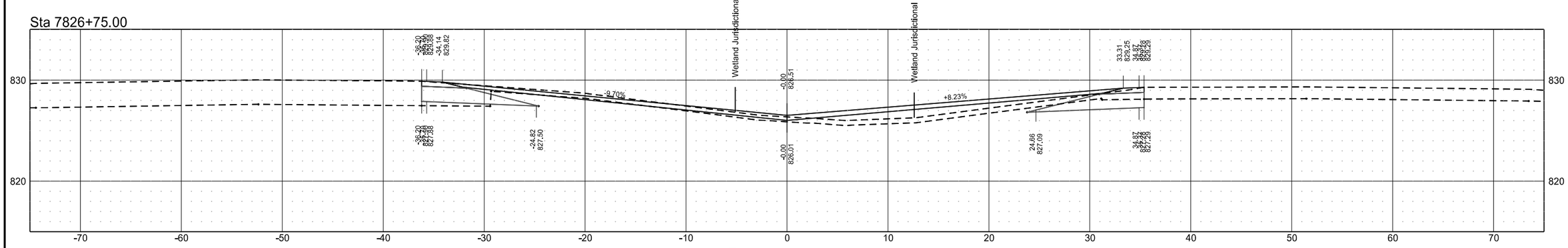
Interstate 29
North Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	18

Sta 7827+00.00



Sta 7826+75.00



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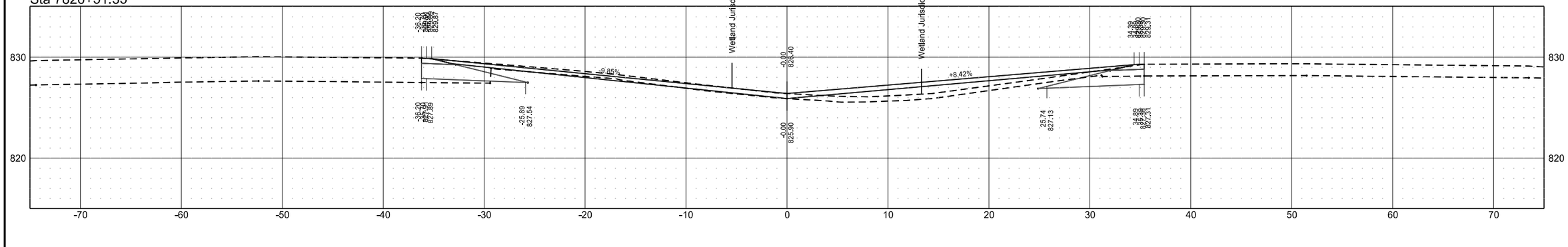
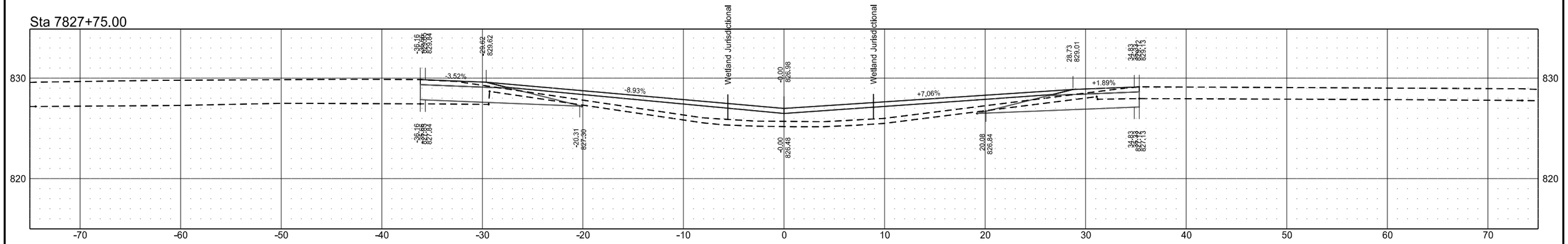


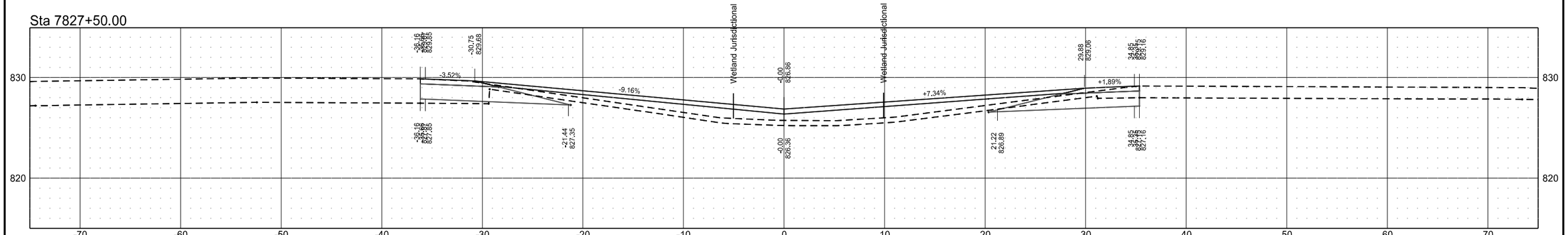
Interstate 29
North Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	19

Sta 7827+75.00



Sta 7827+50.00



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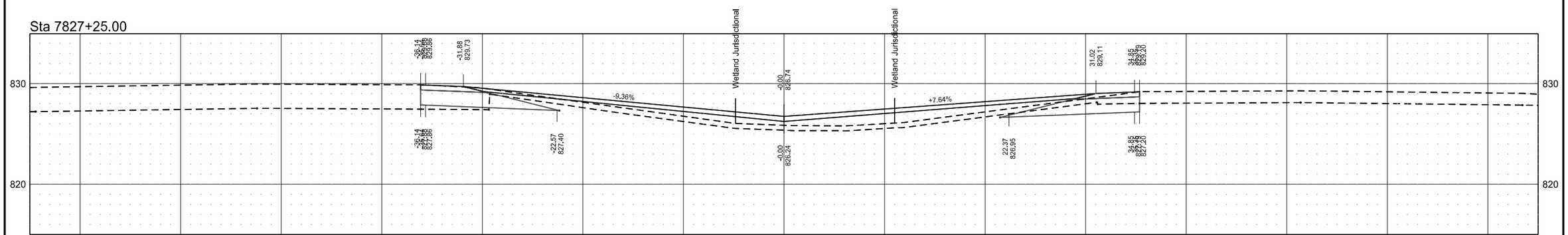
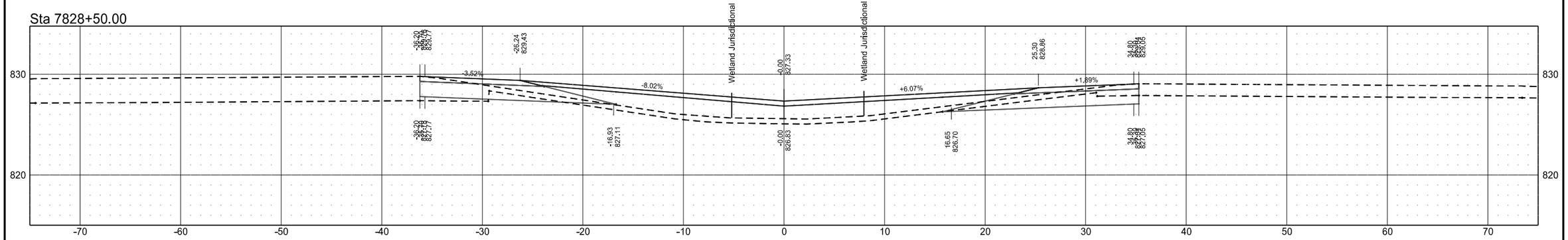


Interstate 29
North Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	20

Sta 7828+50.00



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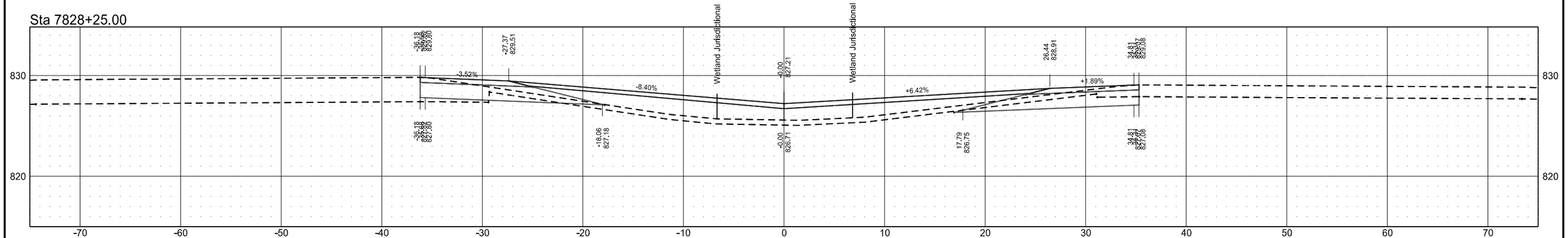

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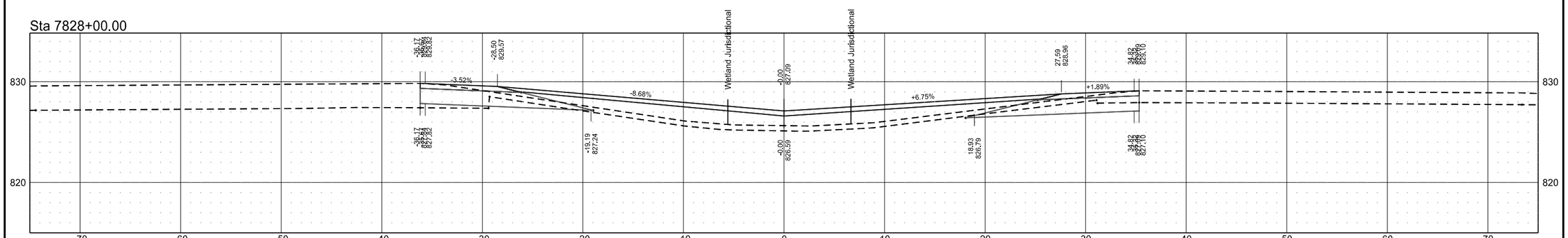
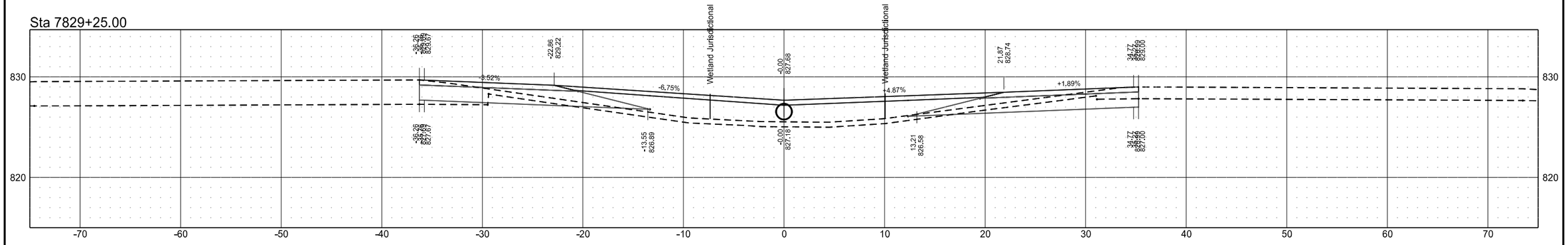


Interstate 29
North Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	21

Sta 7829+25.00



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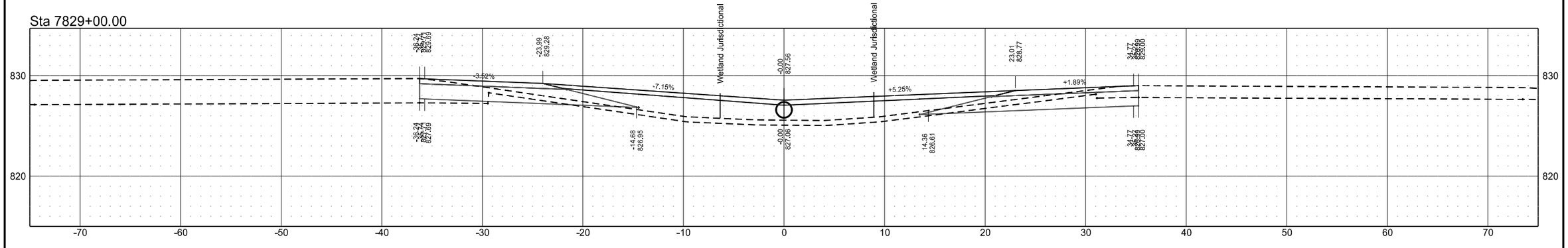

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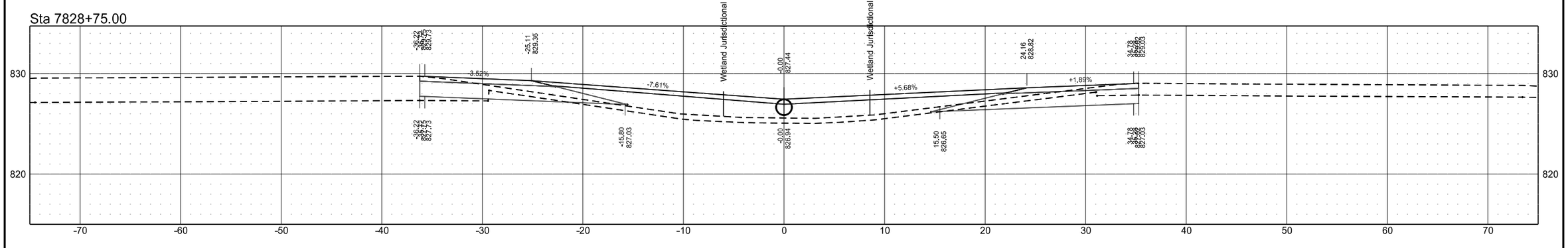

Interstate 29
North Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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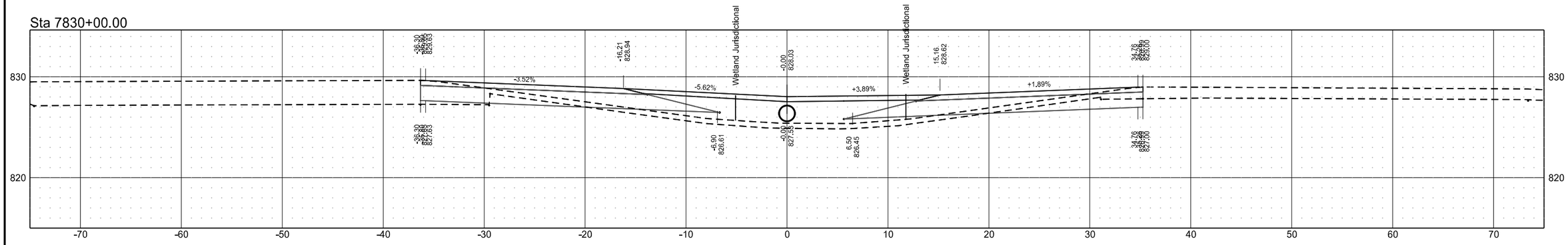
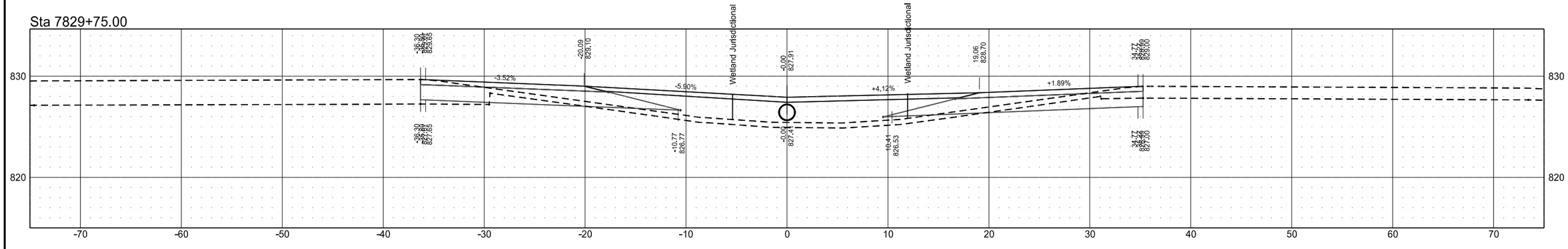
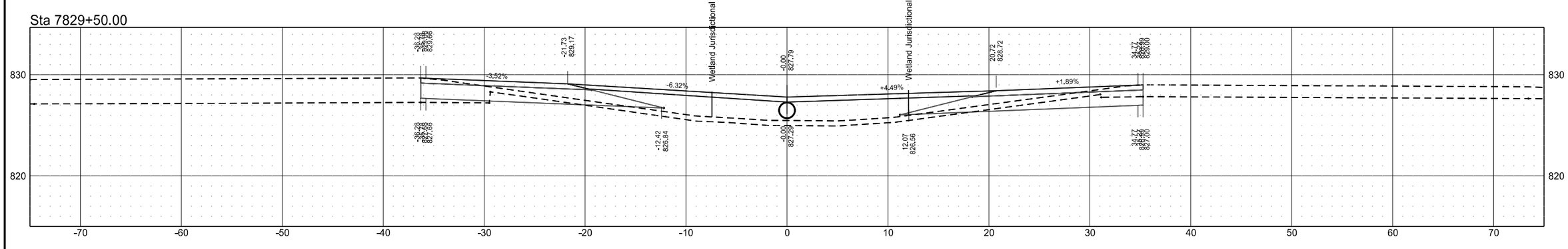
Sta 7830+00.00



Sta 7829+75.00



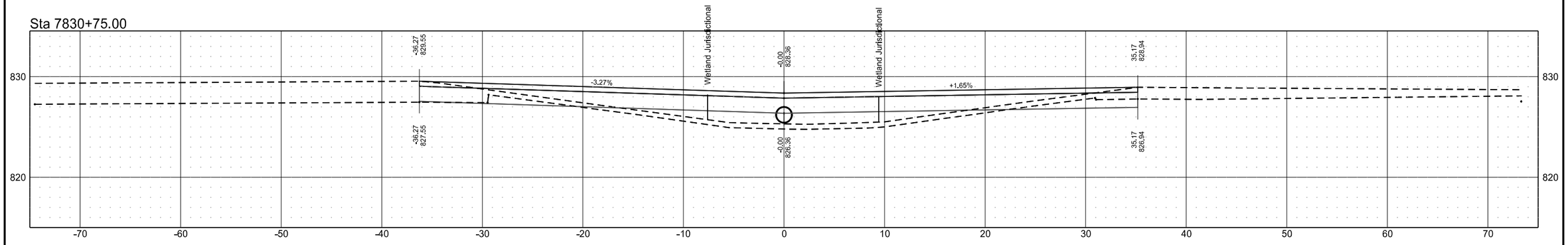
Sta 7829+50.00



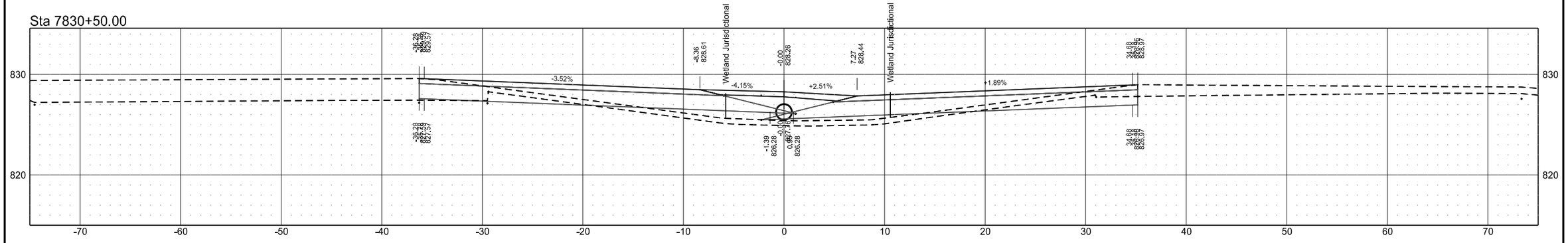
Interstate 29
North Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	23

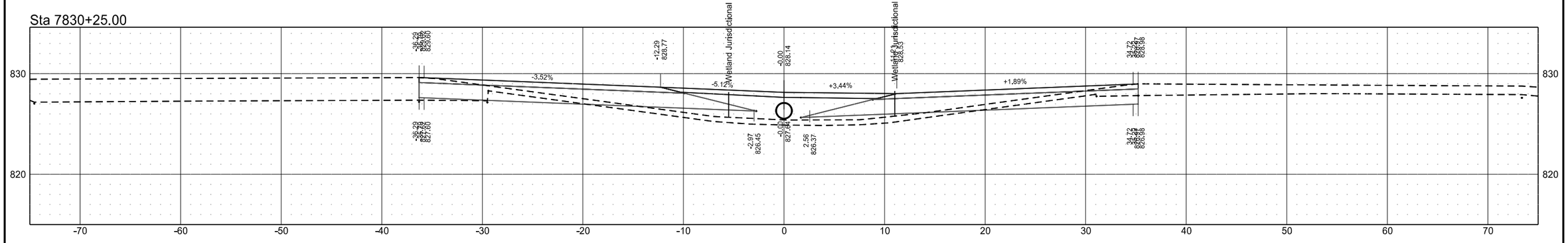
Sta 7830+75.00



Sta 7830+50.00



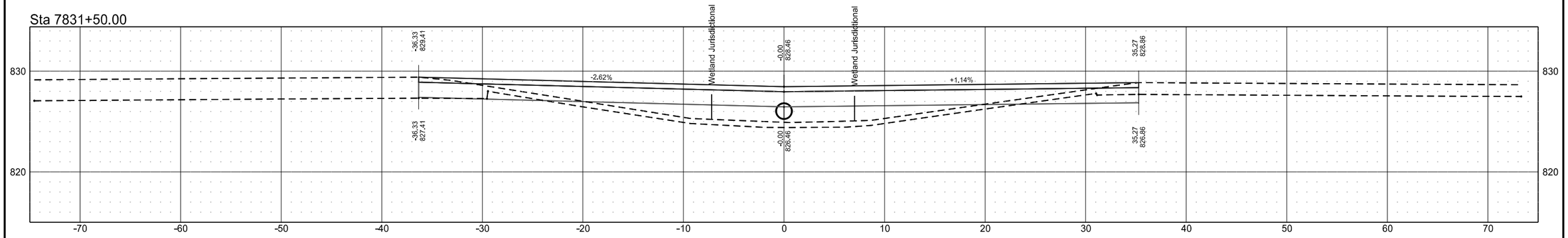
Sta 7830+25.00



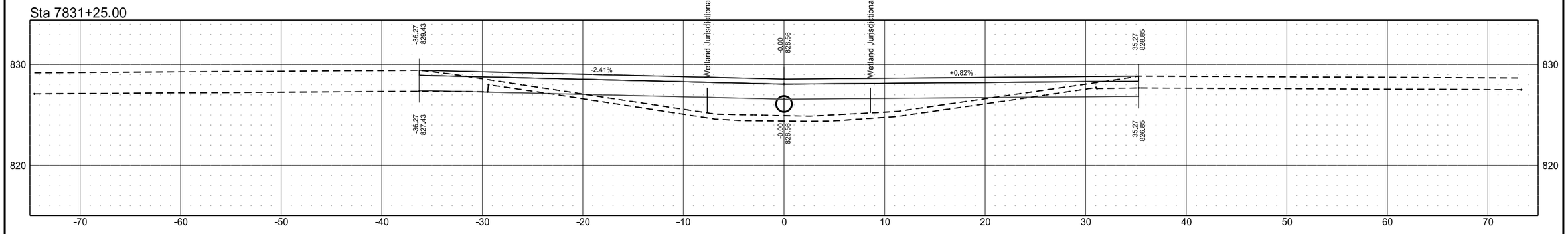
Interstate 29
North Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	24

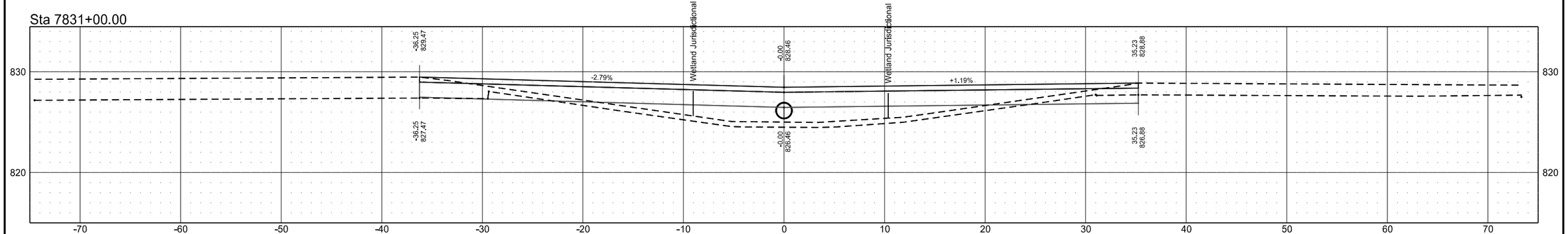
Sta 7831+50.00



Sta 7831+25.00



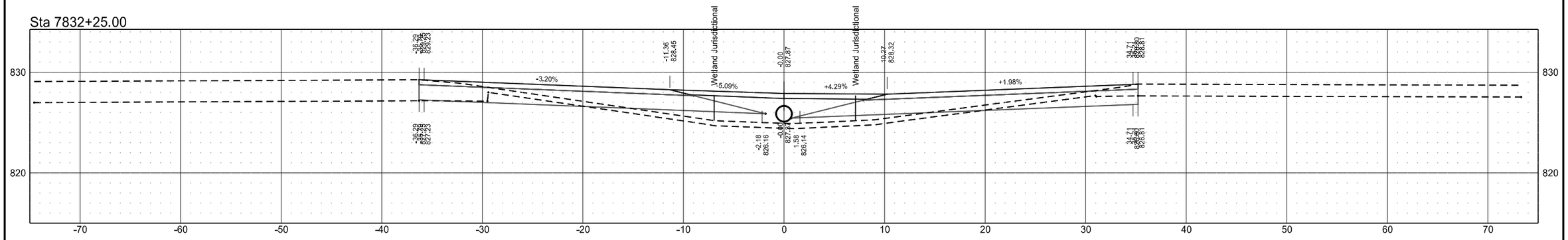
Sta 7831+00.00



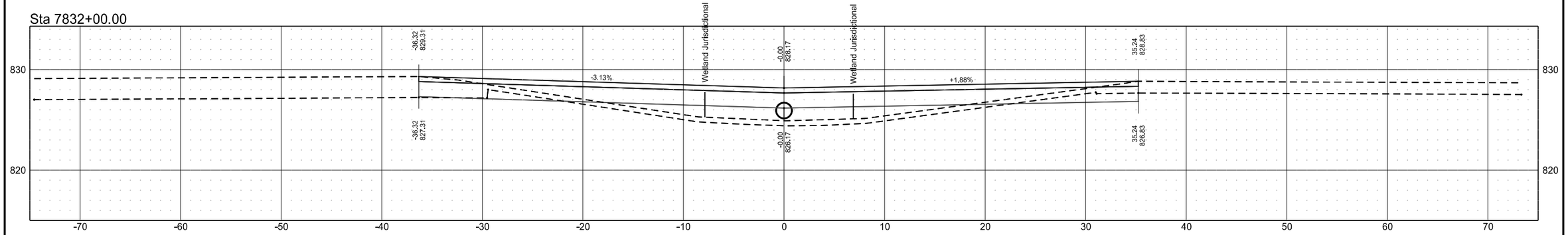
Interstate 29
North Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	25

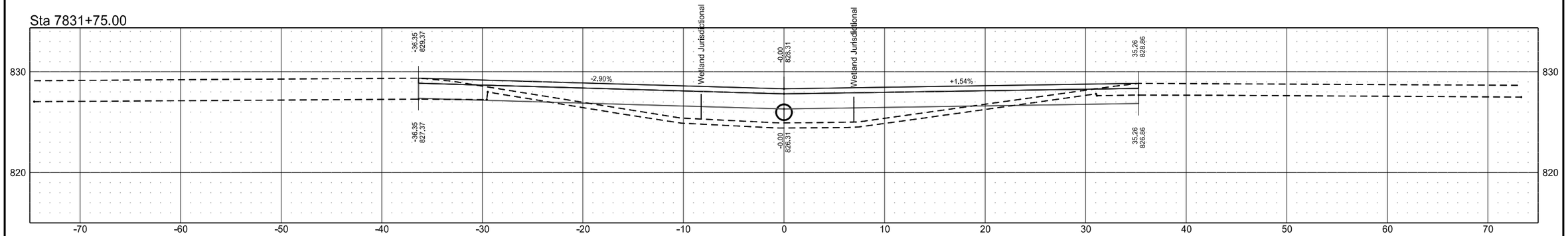
Sta 7832+25.00



Sta 7832+00.00



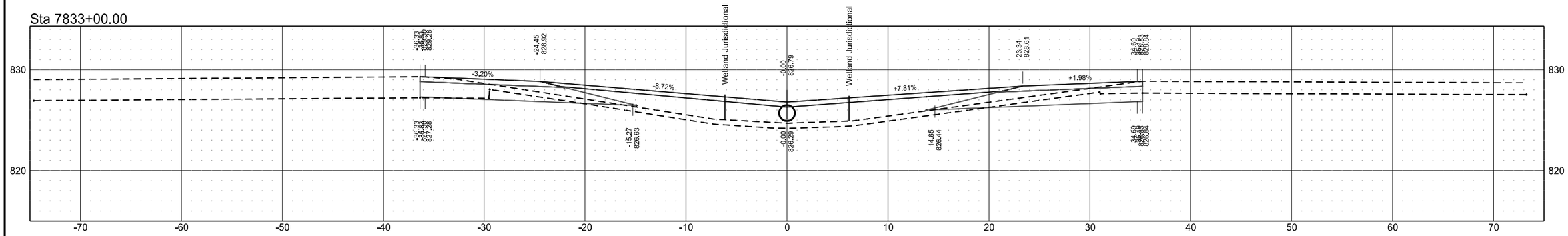
Sta 7831+75.00



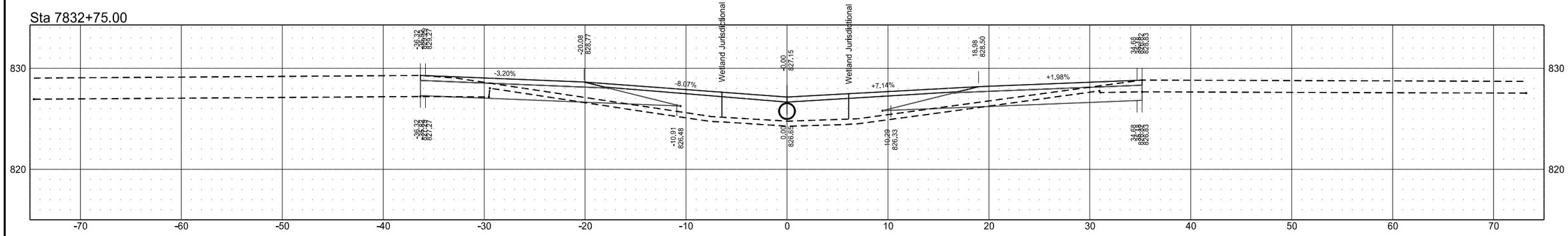
Interstate 29
North Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	26

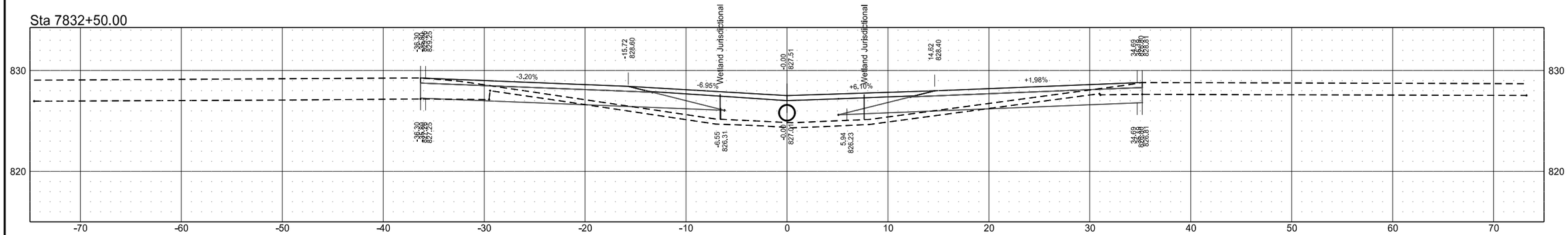
Sta 7833+00.00



Sta 7832+75.00



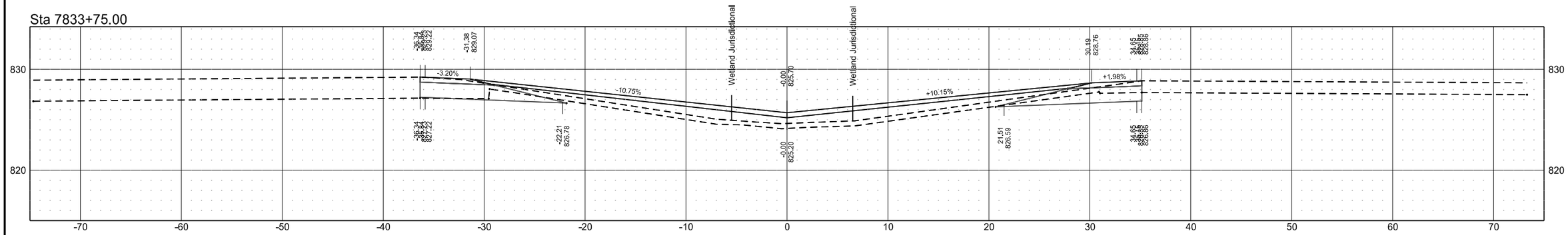
Sta 7832+50.00



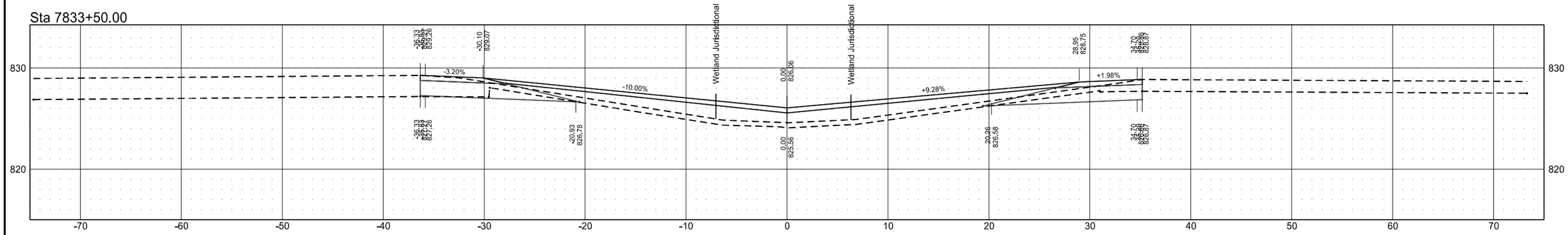
Interstate 29
North Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	27

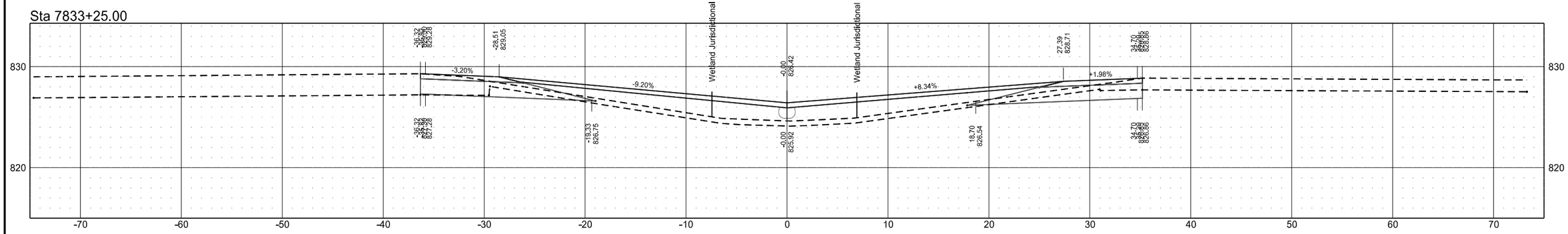
Sta 7833+75.00



Sta 7833+50.00



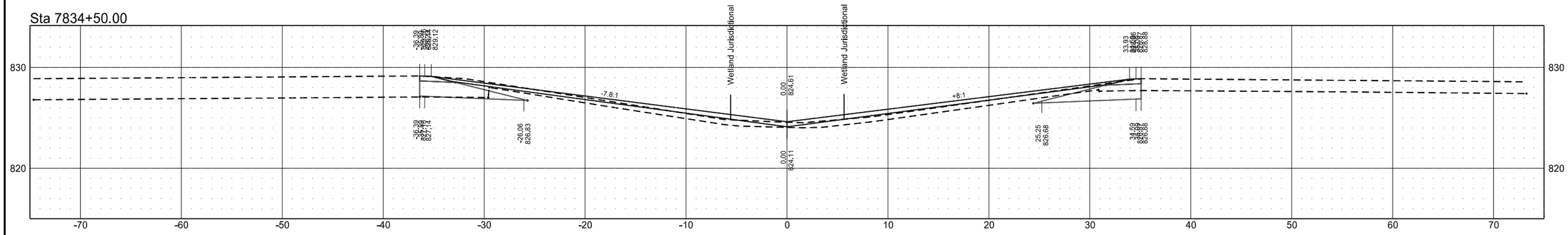
Sta 7833+25.00



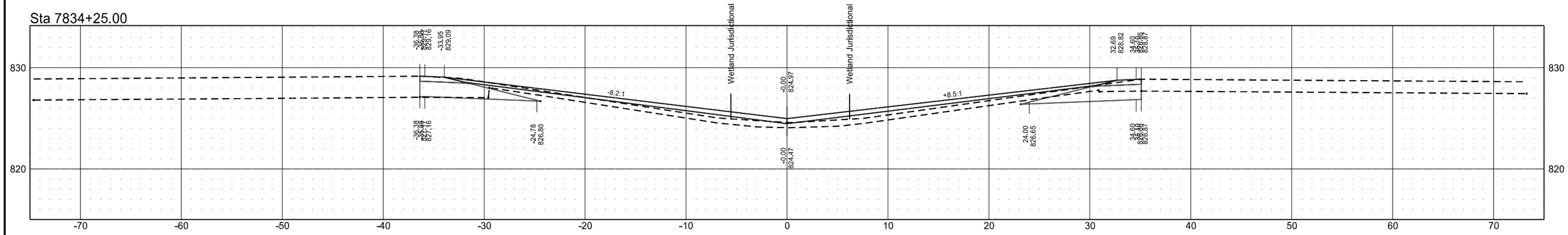
Interstate 29
North Crossover

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	28

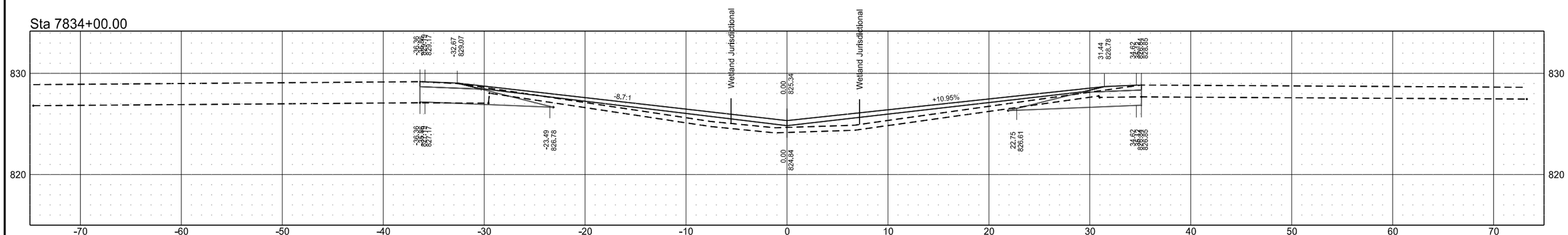
Sta 7834+50.00



Sta 7834+25.00



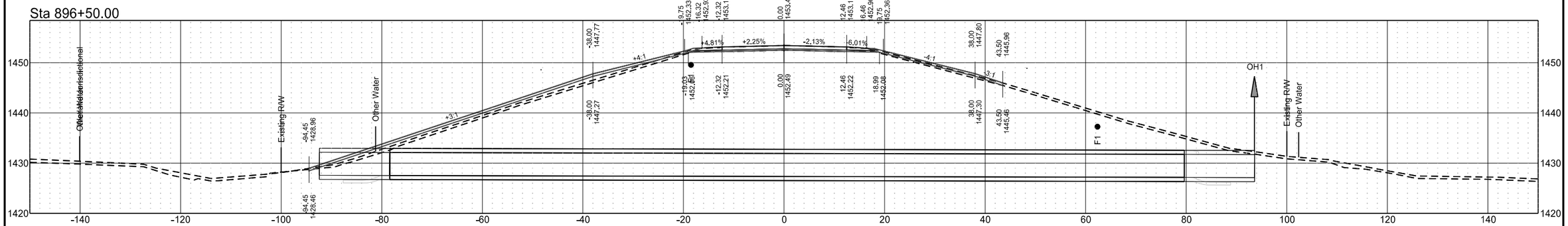
Sta 7834+00.00



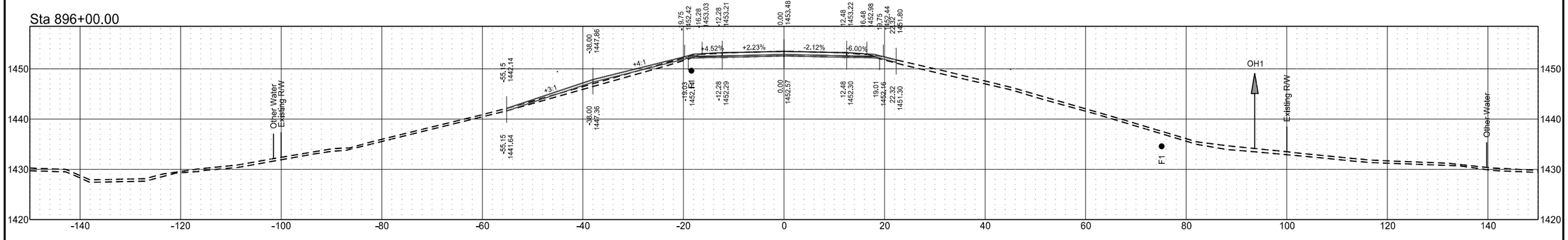
ND Highway 45
PR45

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	29

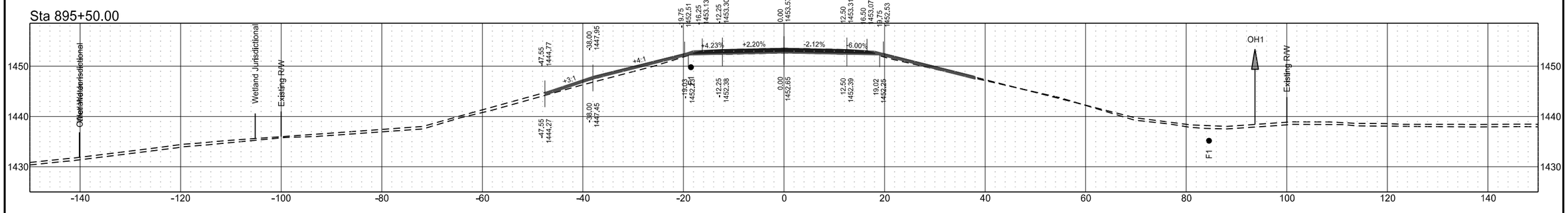
Sta 896+50.00



Sta 896+00.00



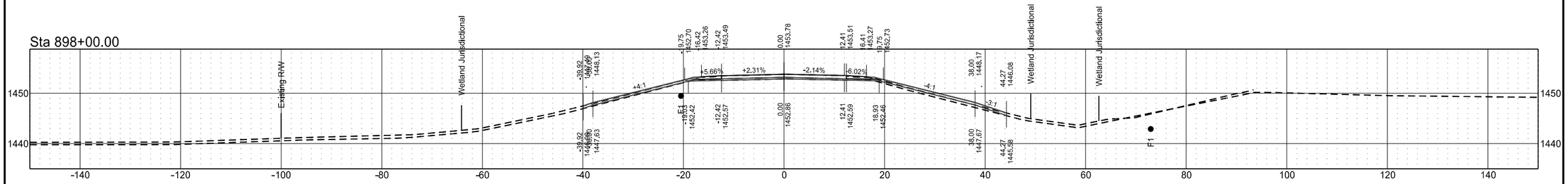
Sta 895+50.00



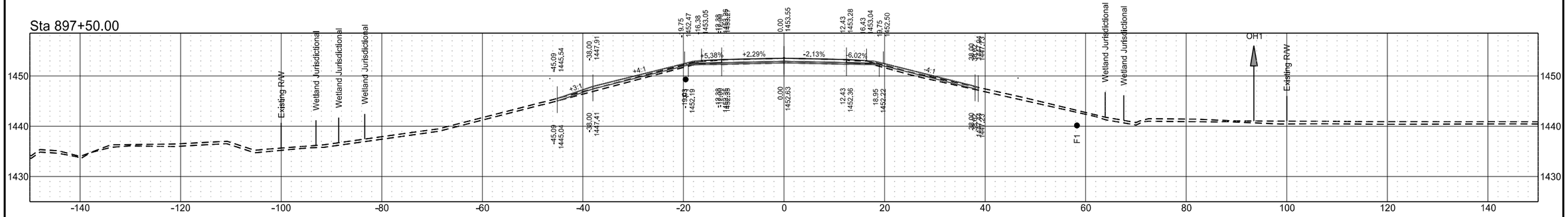
ND Highway 45
PR45

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	30

Sta 898+00.00



Sta 897+50.00



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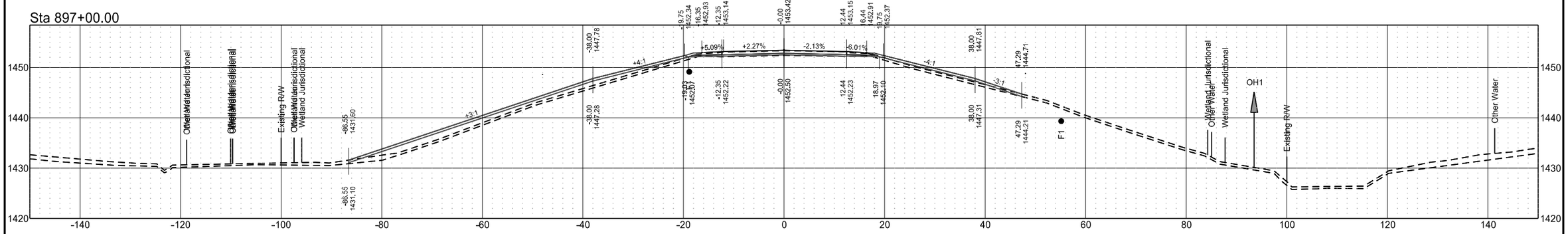
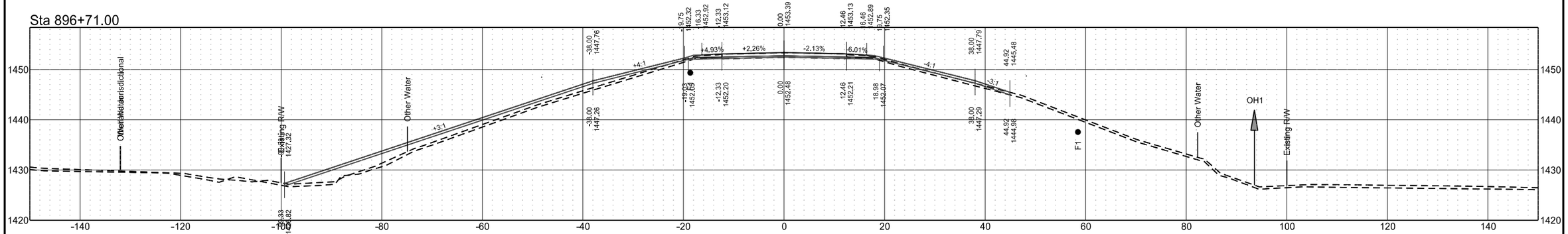
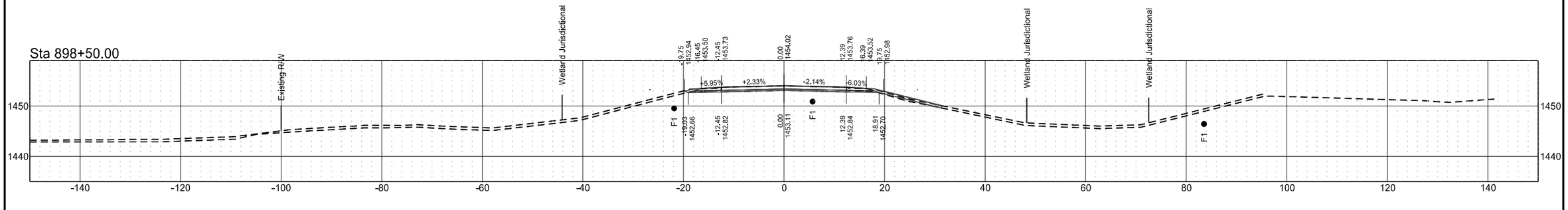


Sta 896+71.00



ND Highway 45
PR45

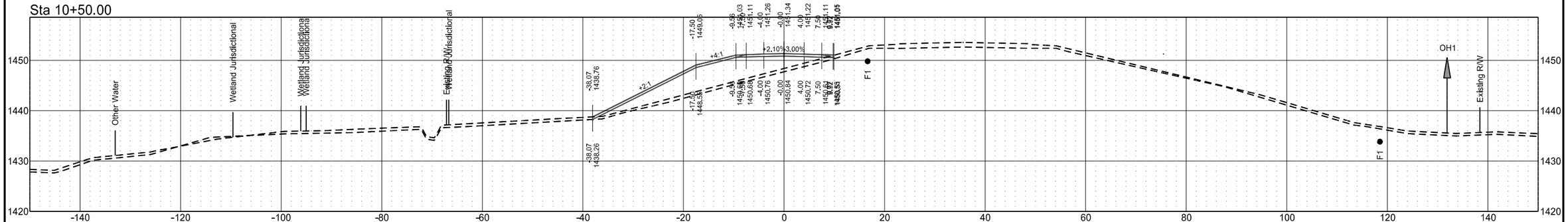
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	31



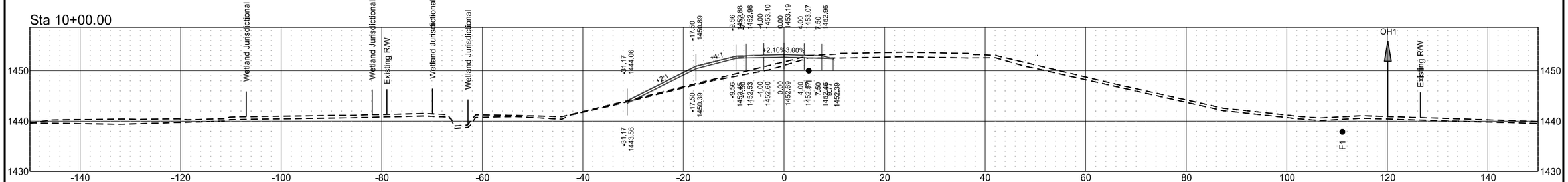
ND Highway 45
North Bypass

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	32

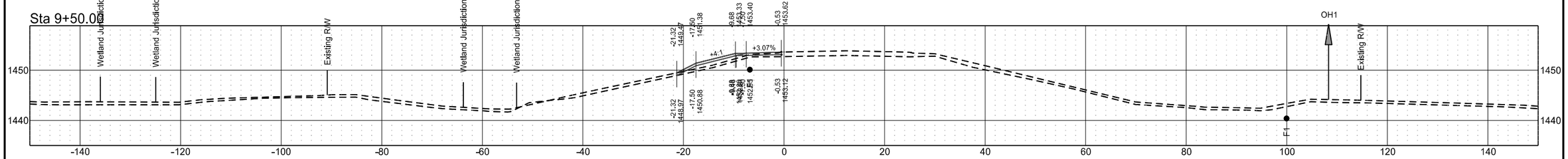
Sta 10+50.00



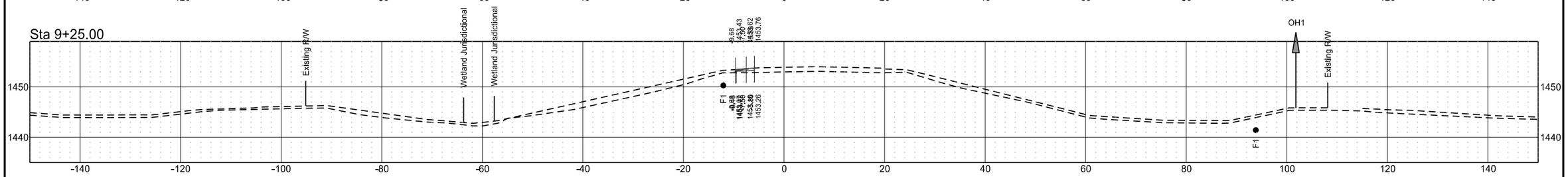
Sta 10+00.00



Sta 9+50.00



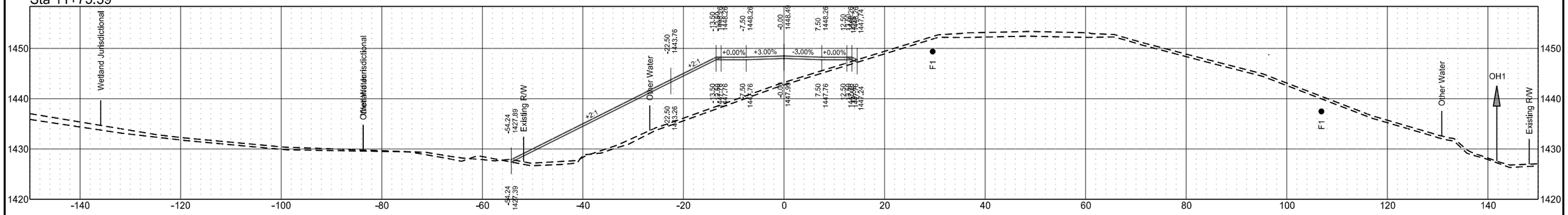
Sta 9+25.00



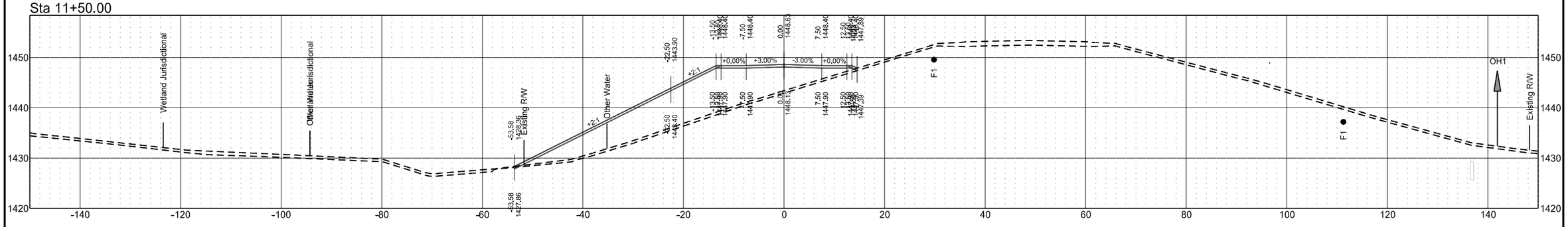
ND Highway 45
North Bypass

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	33

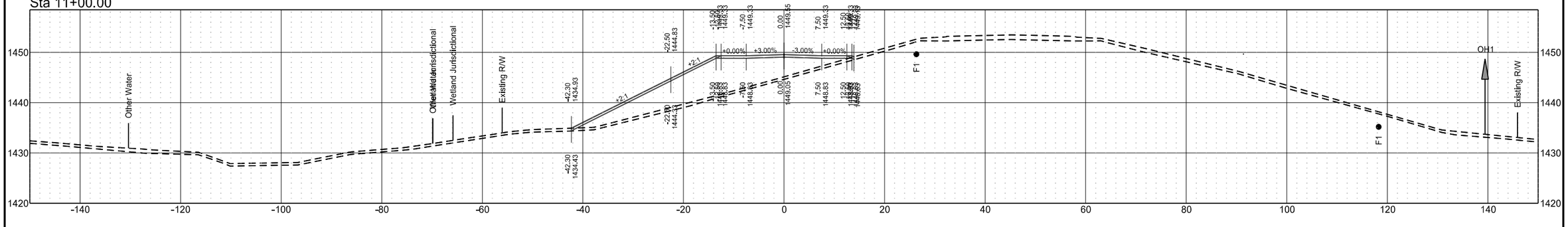
Sta 11+75.39



Sta 11+50.00



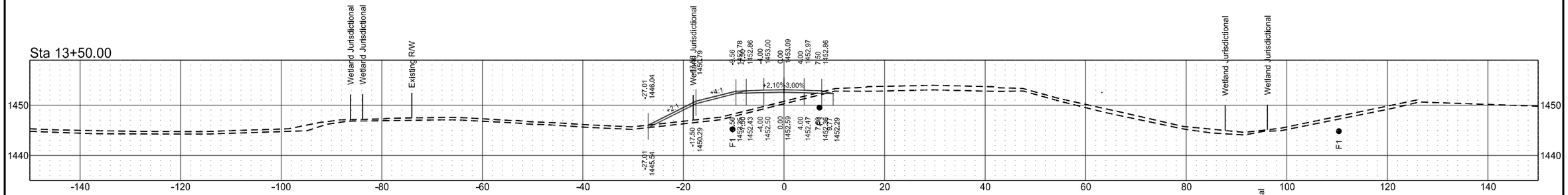
Sta 11+00.00



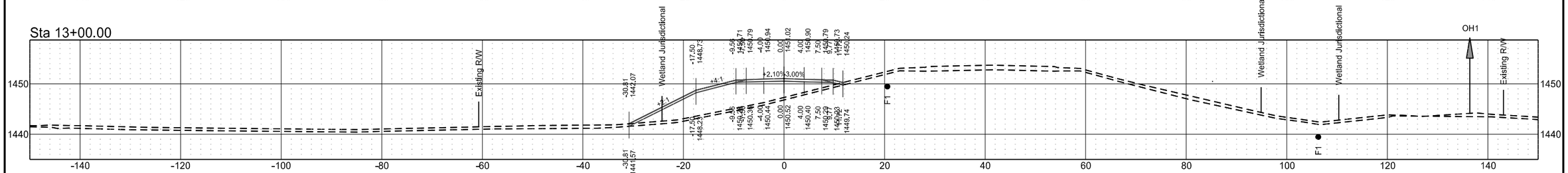
ND Highway 45
North Bypass

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	34

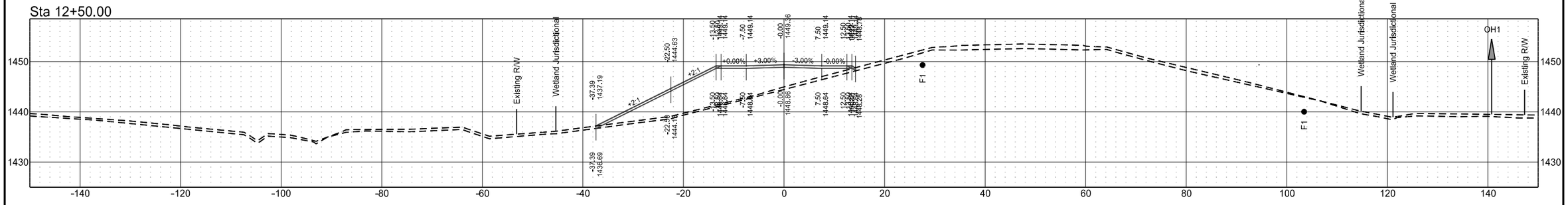
Sta 13+50.00



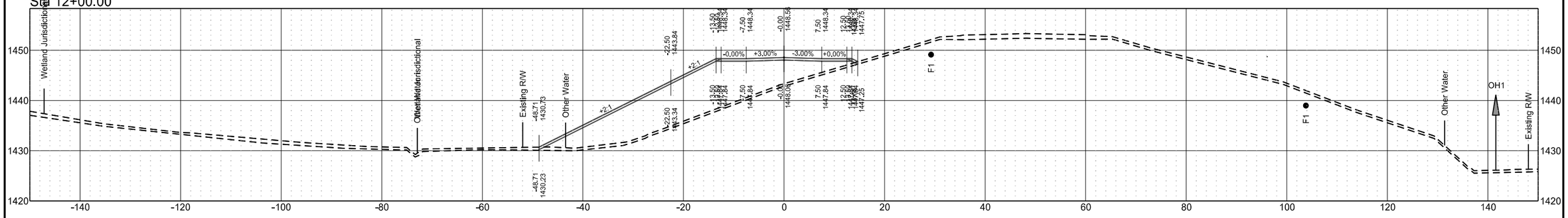
Sta 13+00.00



Sta 12+50.00

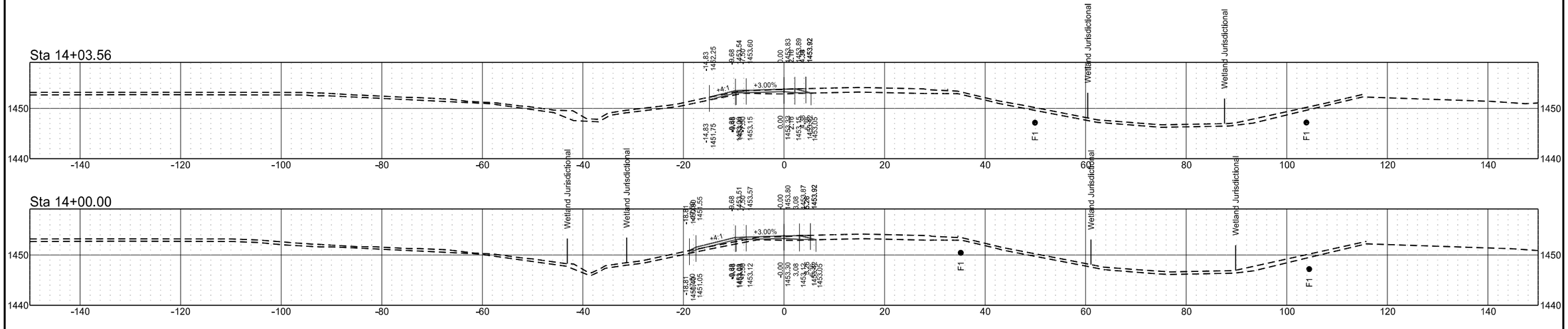


Sta 12+00.00



ND Highway 45
North Bypass

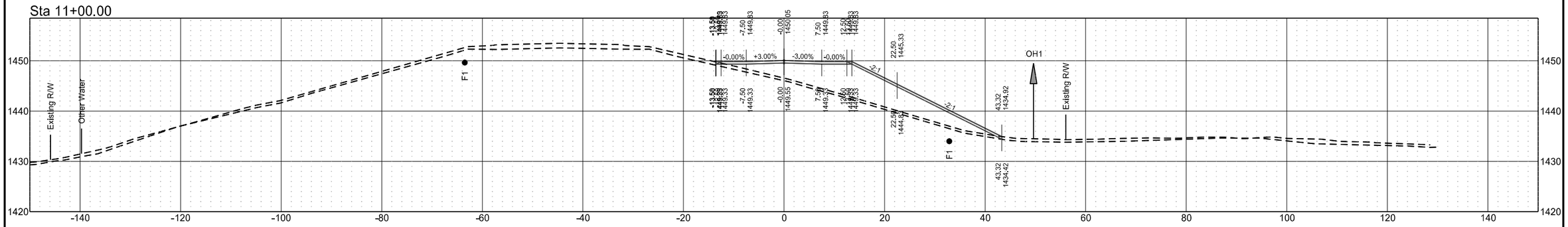
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	35



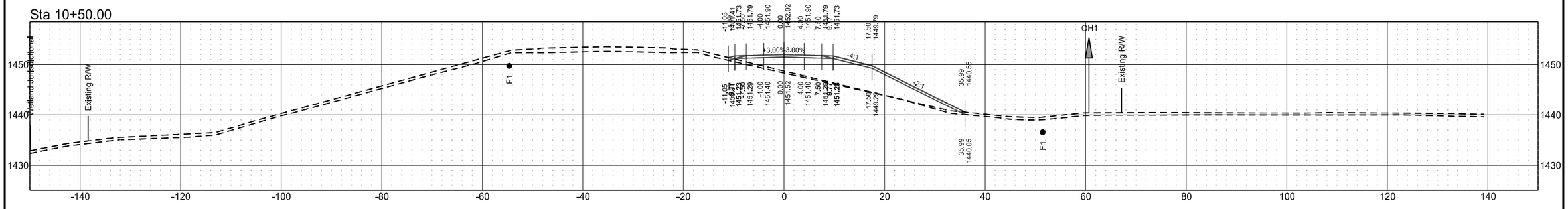
ND Highway 45
South Bypass

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	36

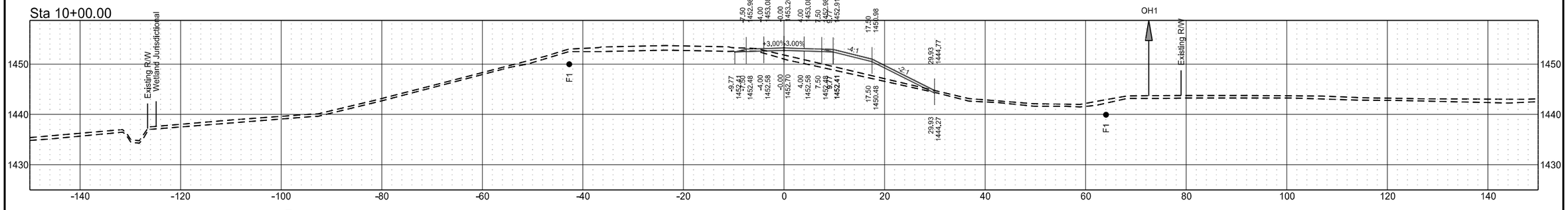
Sta 11+00.00



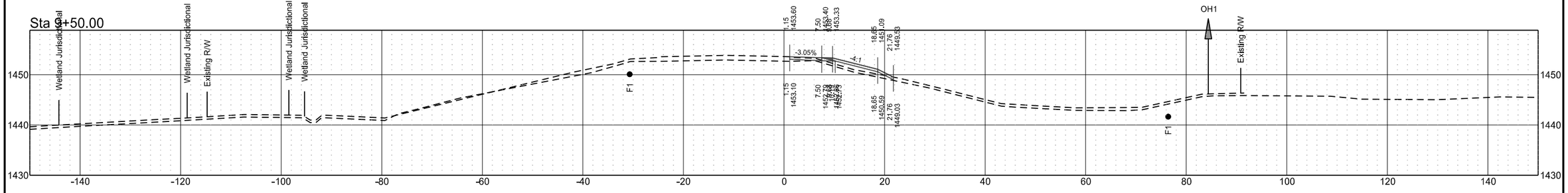
Sta 10+50.00



Sta 10+00.00



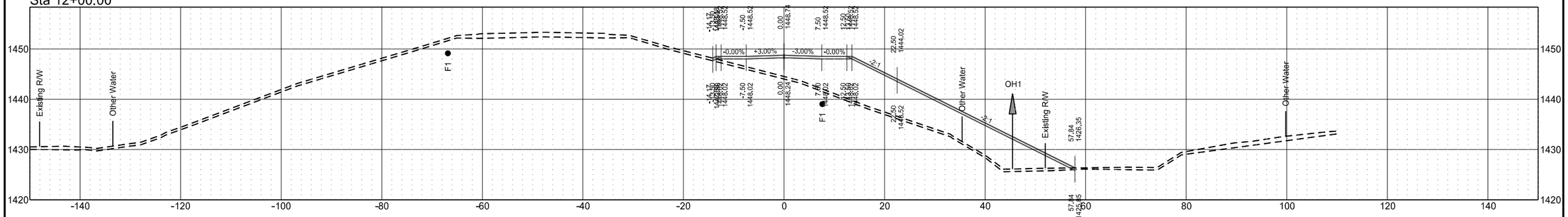
Sta 9+50.00



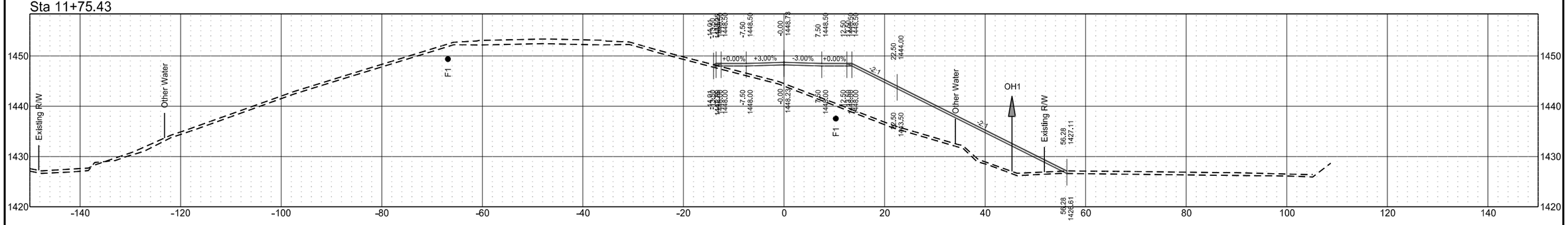
ND Highway 45
South Bypass

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	37

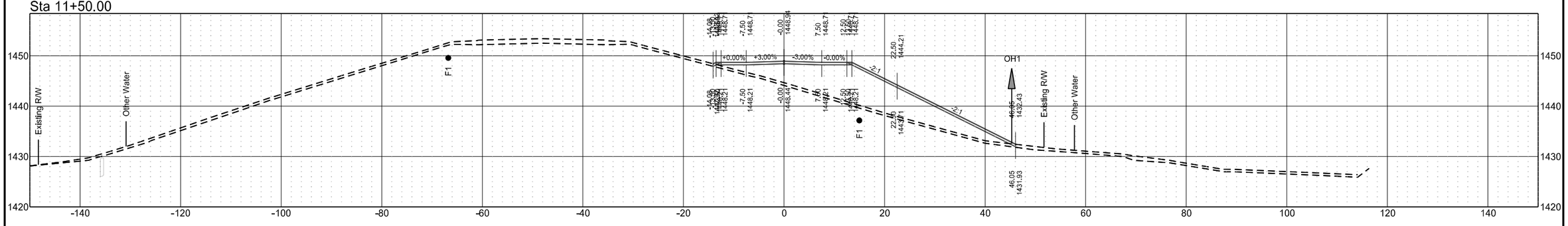
Sta 12+00.00



Sta 11+75.43

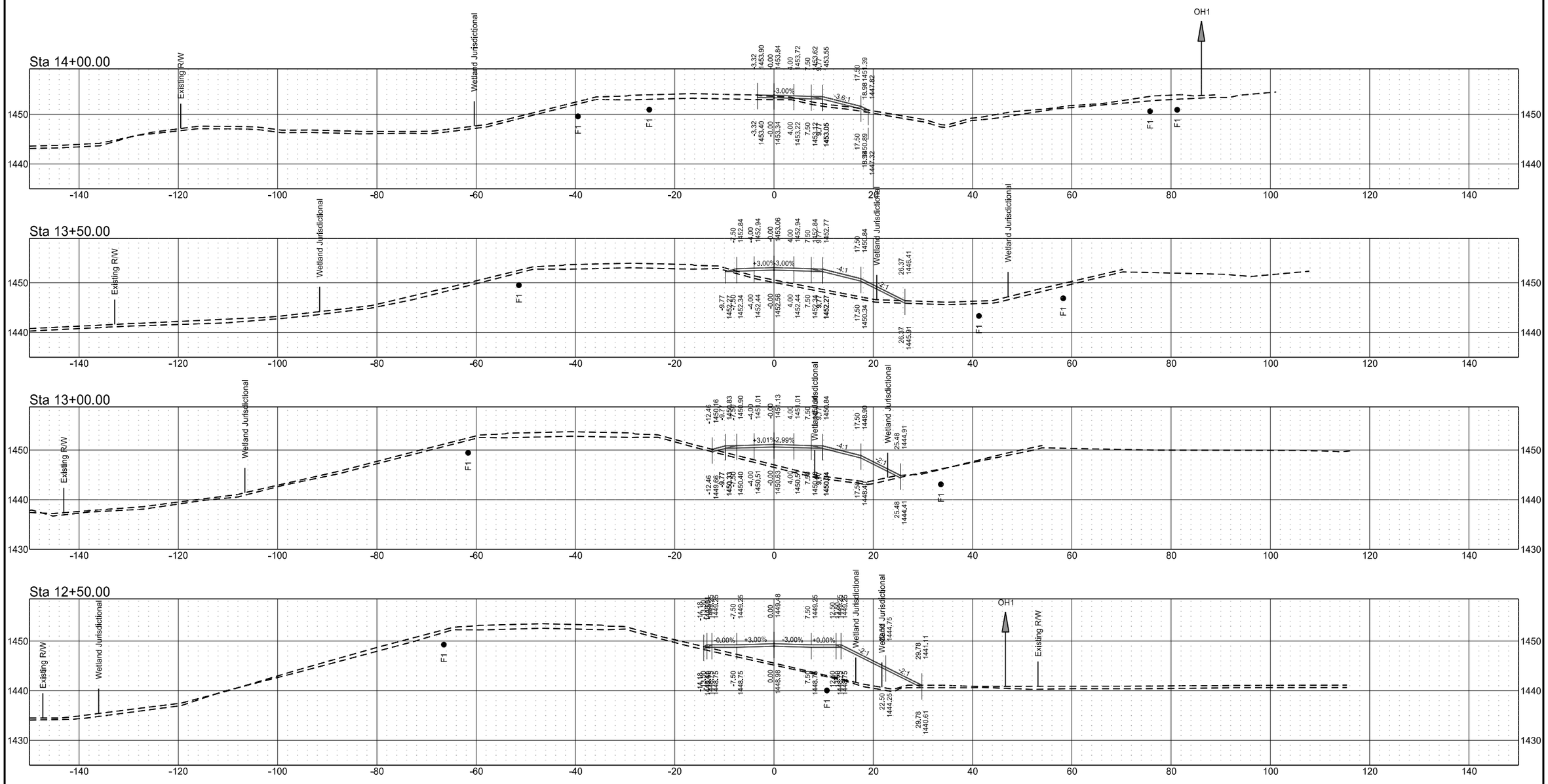


Sta 11+50.00



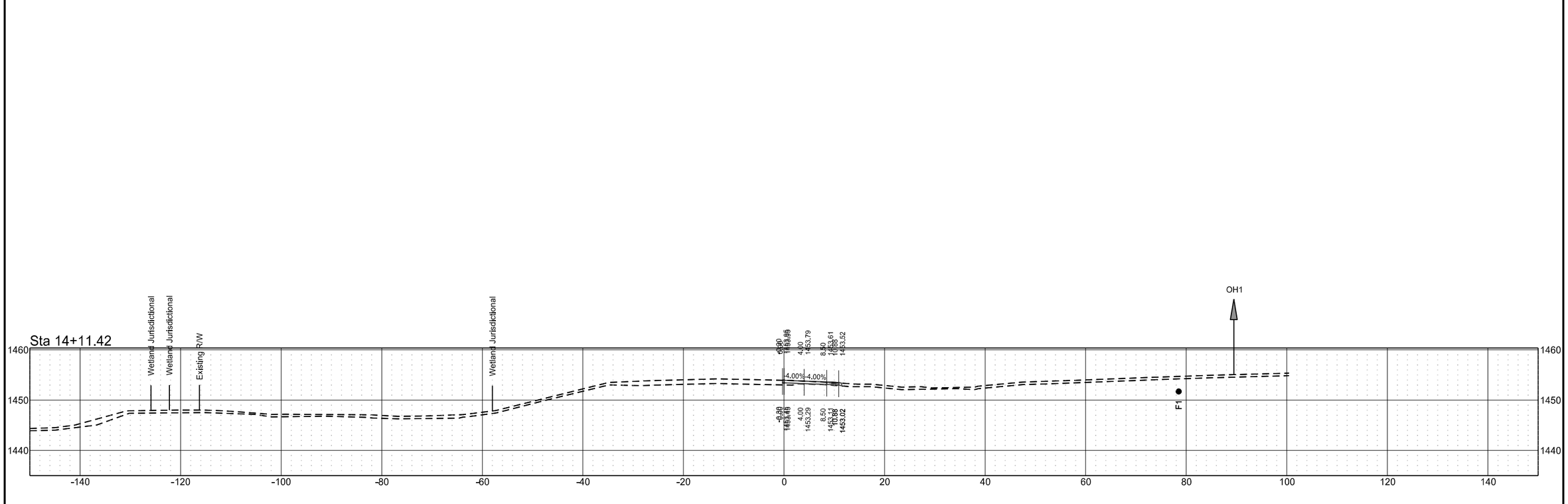
ND Highway 45
South Bypass

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-6-999(050)	200	38



ND Highway 45
South Bypass

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-6-999(050)	200	39



NDDOT ABBREVIATIONS

D-101-1

?	This is a special text character used in the labeling of existing features. It indicates a feature that has an unknown characteristic, potentially based on: lack of description, location accuracy or purpose.
Abn	abandoned
Abut	abutment
Adj	adjusted
Aggr	aggregate
Ahd	ahead
ARV	air release valve
Align	alignment
Al	alley
Alt	alternate
Alum	aluminum
ADA	Americans with Disabilities Act
&	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
Bk	back
BF	back face
Balc	balcony
B Wire	barbed wire
Barr	barricade
Btry	battery
BI	beehive inlet
Beg	begin
BG	below grade
BM	bench mark
Bkwy	bikeway
Bit	bituminous
Blk	block
BH	bore hole
Bot	bottom
Blvd	Boulevard
Bndry	boundary
Brkwy	breakaway
Br	bridge
Bldg	building
Bus.	business
BV	butterfly valve
Byp	bypass
C Gdrl	cable guardrail
Calc	calculate
CIP	cast iron pipe
CB	catch basin
CRS	cationic rapid setting
C Gd	cattle guard
C To C	center to center
CL or ℄	centerline
Ch	chain
Chnlk	chain-link
Ch Blk	channel block
Ch Ch	channel change
Chk	check
Chsld	chiseled
Cir	circle
Cl	class
Clnt	clean-out
Clr	clear
Cl&gr	clearing & grubbing
Comb.	combination
Coml	commercial
Compr	compression
CADD	computer aided drafting & design
Conc	concrete
CECB	concrete erosion control blanket
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
CSFES	corrugated steel flared end section
CSP	corrugated steel pipe
CSTES	corrugated steel traversable end section
Co	County
Crse	course
Ct	Court
Xarm	cross arm
Xbuck	cross buck
Xsec	cross sections
Xing	crossing
Xrd	crossroad
Crn	crown
Culv	culvert
C&G	curb & gutter
CI	curb inlet
CR	curb ramp
C	cut
Dd Ld	dead load
Defl	deflection
Defm	deformed
Dlnt	delineate
Dlntr	delineator
Depr	depression
Desc	description
Det	detail
DWP	detectable warning panel
Dtr	detour
Dia or ø	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
Evgr	evergreen
Exc	excavation
Exst	existing
Exp	expansion
Expy	Expressway
E	external of curve
Extru	extruded
FOS	factor of safety
Fed	Federal
FP	feed point
Fn	fence
Fn P	fence post
FO	fiber optic
FD	field drive
F	fill
FAA	fine aggregate angularity
FH	fire hydrant
Fl	flange
Flrd	flared
FES	flared end section
F Bcn	flashing beacon
FA	flight auger sample
FL	flow line
Ftg	footing
FM	force main
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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
04-23-18	General Revisions
09-20-18	General Revisions
12-18-20	General Revisions
08-16-22	General Revisions

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NDDOT ABBREVIATIONS

D-101-2

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
Gov	government
Grd	graded/grade
Grnd	ground
GWM	ground water monitor
Gdrl	guardrail
Gtr	gutter
H Plg	H piling
Hdwl	headwall
Ht	height
Hel	helical
HDPE	high density polyethylene
HM	high mast
HP	high pressure
HPS	high pressure sodium
HTCG	high tension cable guardrail
Hwy	highway
Hor	horizontal
HBP	hot bituminous pavement
HMA	hot mix asphalt
Hyd	hydrant
Ph	hydrogen ion content
Id	identification
Incl	inclinometer tube
IMH	inlet manhole
ID	inside diameter
Inst	instrument
Intchg	interchange
Intmdt	intermediate
Intscn	intersection
Inv	invert
IP	iron pipe
Jt	joint
Jct	junction
Ln	lane
Lg	large
Lat	latitude
Lt	left
Lens	lenses
Lvl	level
Lvlng	leveling
Lht	light
LP	light pole
Ltg	lighting
Liq	liquid
LL	liquid limit
Loc	location
Long.	longitude
Lp	loop
LD	loop detector
Lum	luminaire
Mb	mailbox
ML	main line
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
MGS	Midwest Guardrail System
MM	mile marker
MP	mile post
Min	minimum
Misc	miscellaneous
Mon	monument
Mnd	mound
Mtbl	mountable
Mtd	mounted
Mtg	mounting
Mk	muck
Neop	neoprene
Ntwk	network
N	North
NE	North East
NW	North West
NB	Northbound
No. or #	number
Obsc	obscure(d)
Ocpd	occupied
Ocpy	occupy
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
PSD	passing sight distance
Pvmt	pavement
Ped	pedestal
Ped	pedestrian
PPP	pedestrian pushbutton post
Pen.	penetration
Perf	perforated
Per.	perimeter
Perm	permanent
PL	pipeline
Pl	place
P&P	plan & profile
PL	plastic limit
Pl or ℄	plate
Pt	point
PE	polyethylene
PVC	polyvinyl chloride
PCC	Portland Cement concrete
PP	power pole
Preempt	preemption
Prefab	prefabricated
Prfmd or Pref	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
RC	rapid curing
Rec	record
Rcy	recycle
RAP	recycled asphalt pavement
RPCC	recycled portland cement concrete
Ref	reference
R Mkr	reference marker
RM	reference monument
RP	reference point
Refl	reflectorized
RCB	reinforced concrete box
RCES	reinforced concrete end section
RCFES	reinforced concrete flared end section
RCP	reinforced concrete pipe
RCPS	reinforced concrete pipe sewer
RCTES	reinforced concrete traversable end section
Reinf	reinforcement
Res	reservation
Res	residence
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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
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Salv	salvage(d)
San	sanitary sewer line
Sec	section
SL	section line
Sep	separation
Seq	sequence
Serv	service
Sht	sheet
Shtng	sheeting
Shldr	shoulder
Sw or Sdwk	sidewalk
SD	sight distance
SN	sign number
Sig	signal
Sgl	single
SRCP	slotted reinforced concrete pipe
SC	slow curing
SS	slow setting
Sm	small
S	South
SE	South East
SW	South West
SB	Southbound
Sp	spaces
Spcl	special
SA	special assembly
SP	special provisions
G	specific gravity
Spk	spike
SB	split barrel sample
SH	sprinkler head
SV	sprinkler valve
Sq	square
Stk	stake
Std	standard
N	standard penetration test
Std Specs	standard specifications
Stm L	steam line
SEC	steel encased concrete
SMA	stone matrix asphalt
SSD	stopping sight distance
SD	storm drain
St	street
SPP	structural plate pipe
SPPA	structural plate pipe arch
Str	structure
Subd	subdivision
Sub	subgrade
Sub Prep	subgrade preperation
Ss	subsoil
SS	supplement specification
Supp	supplemental
Surf	surfacing
Surv	survey
Sym	symmetrical

Tel	telephone
Tel B	Telephone Booth
Tel P	telephone pole
Tv	television
Temp	temperature
Temp	temporary
TBM	temporary bench mark
T	thinwall tube sample
Ts	topsoil
Traf	traffic
TSCB	traffic signal control box
Tr	trail
Transf	transformer
Trans	transition
TT	transmission tower
TES	traversable end section
Trans	transverse
Trtd	treated
Trmt	treatment
Qc	triaxial compression
TERO	tribal employment rights ordinance
Tpl	triple
Typ	typical
Qu	unconfined compressive strength
Ugrnd	underground
Util	utility
VG	valley gutter
Vap	vapor
Vert	vertical
VCP	vitrified clay pipe
Vol	volume
VSFS	vehicle speed feedback sign
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
Wrng	wearing
WIM	weigh in motion
W	west
WB	westbound
Wrng	wiring
W/	with
W/o	without
WC	witness corner

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REVISIONS	
DATE	CHANGE
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NDDOT ABBREVIATIONS

MEASUREMENTS

ac	acres
A	ampere
Bd Ft	board feet
Cd	candela
cm	centimeter
C	coulomb
CF	cubic feet
m3	cubic meter
m3/s	cubic meters per second
CY	cubic yard
CY/mi	cubic yards per mile
D or Deg	degree
F	Fahrenheit
F	farad
ft	feet/foot
Gal	gallon
G	giga
Ha	hectare
H	henry
Hz	hertz
hr	hour(s)
in	inch
J	joule
K	kelvin
kN	kilo newton
kPa	kilo pascal
kg	kilogram
kg/m3	kilogram per cubic meter
km	kilometer
K	Kip(s)
LF	linear foot
L	litre
Lm	lumen
L sum	lump sum
Lx	lux
M Hr	man hour
M	mega
m	meter
m/s	meters per second
mi	mile
mL	milliliter
mm	millimeter
mm/hr	millimeters per hour
n	nano
N	newton
Pa	pascal
lb	pounds
sec	seconds
S	siemens
SF	square feet
km2	square kilometer
m2	square meter
SY	square yard
Sta Yd	station yards
SI	Systems International
T	tesla
T/mi	tons per mile
V	volt
W	watt
Wb	weber

SURVEY DESCRIPTIONS

Az	azimuth
Bs	backsight
Brg	bearing
BP Cap	blue plastic cap
BS	both sides
BC	brass cap
CS	curve to spiral
Eq	equation
E	external of curve
FS	far side
FB	field book
Fs	foresight
Geod	geodetic
GIS	Geographical Information System
GPS	Global Positioning System
HI	height of instrument
IM	iron monument
I Pn	iron pin
LS	Land Surveyor (licensed)
LSIT	Land Surveyor In Training
L	length of curve
LC	long chord
LB	level book
Mer	meridian
M	mid ordinate of curve
NGS	National Geodetic Survey
NS	near side
Obsn	observation
Off Loc	office location
OP Cap	orange plastic cap
PK	Parker-Kalon nail
P Cap	plastic cap
PP Cap	pink plastic cap
PCC	point of compound curve
PC	point of curve
PI	point of intersection
PRC	point of reverse curvature
PT	point of tangent
POC	point on curve
POT	point on tangent
RTP	random traverse point
Rge	range
RP Cap	red plastic cap
SC	spiral to curve
ST	spiral to tangent
Sta	station
SE	superelevation
Tan	tangent
T	tangent (semi)
TS	tangent to spiral
Twp	township
TB	transit book
TP	traverse point
TP	turning point
USC&G	US Coast & Geodetic Survey
USGS	US Geologic Survey
VC	vertical curve
WGS	World Geodetic System
YP Cap	yellow plastic cap
Z	zenith

SOIL TYPES

Cl	clay
Cl F	clay fill
Cl Hvy	clay heavy
Cl Lm	clay loam
Co S	coal slack
C Gr	coarse gravel
CS	coarse sand
FS	fine sand
Gr	gravel
Lig Co	lignite coal
Lig Sl	lignite slack
Lm	loam
Rk	rock
Sd	sand
Sdy Cl	sandy clay
Sdy Cl Lm	sandy clay loam
Sdy Fl	sandy fill
Sdy Lm	sandy loam
Sc	scoria
Sh	shale
Si Cl	silt clay
Si Cl Lm	silty clay loam
Si Lm	silty loam

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
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REVISIONS

DATE	CHANGE
12-18-20	Sheet Added - Continued from D-101-3

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

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

07-01-14

REVISIONS

DATE	CHANGE
04-23-18	General Revisions
09-20-18	General Revisions
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LINE STYLES

D-101-20

Existing Topography

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

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

Proposed Topography

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

Existing Utilities

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

Proposed Utilities

- 24 Inch Pipe
- Reinforced Concrete Pipe
- Under Drain
- Edge Drain

Traffic Utilities

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

Sign Structures

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
09-23-16 12-18-20	Added and Revised Items, Organized by Functional Groups General Revisions

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LINE STYLES

D-101-21

Right Of Way

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

Boundary Control

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

Cross Sections and Typicals

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

Geotechnical

- Geotextile Fabric Type D (D — D)
- Geogrid (Geo — Geo)
- Geotextile Fabric Type R (R — R)
- Geotextile Fabric Type R1 (R — R)
- Geotextile Fabric Type RR (RR — RR)
- Geotextile Fabric Type S (S — S)
- Subgrade Reinforcement

Countours

- Failure Line
- Depression Contours
- Supplemental Contour

Profile

- Subgrade, Subcut or Ditch Grade
- Topsoil Profile

Striping

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

Pavement Joints

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

Bridge Details

- Small Hidden Object
- Large Hidden Object
- Phantom Object
- Existing Conditions Object
- Centerline Main
- Centerline Secondary
- Excavation Limits
- Proposed Ground
- Sheet Piling

Erosion Control

- Limits of Const Transition Line
- Bale Check
- Rock Check
- Floating Silt Curtain (S — S)
- Silt Fence (SF — SF)
- Excavation Limits
- Fiber Rolls

Environmental

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

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07-01-14	
REVISIONS	
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SYMBOLS

D-101-30

North Arrow (Half Scale)

Alignment Data Point

Alignment Monument

Spot Elevation

Existing Miscellaneous Spot

Existing Access Control Arrow

Existing Benchmark

Reset USGS Marker

Iron Monument Found

Iron Pin R/W Monument

Property Corner

Iron Pin Reference Monument

Right of Way Marker (Exst, Ppsd, Reset)

Existing Federal Reference Corner

Existing Section Corner (Full, Quarter, Sixteenth, Meander)

Existing Witness Corner

Existing Control Point (CP, GPS-RTK, TRI)

Existing Traverse PI Aerial Panel

Existing Reference Marker Point NGS

Existing EFB Misc

Existing Bush or Shrub

Existing Large Evergreen Tree

Existing Small Evergreen Tree

Existing Large Tree

Existing Small Tree

Existing Tree Trunk

Cairn or Stone Circle

Existing Artifact

Existing Satellite Dish

Existing Weather Station

Existing Windmill or Tower

Reinforced Pavement

CSB Continuous Split Barrel Sample

FA Flight Auger Sample

SB Split Barrel Sample

T Thinwall Tube Sample

N Standard Penetration Test

Incl Inclinometer Tube

Excavation Unit

Existing Ground Water Well Bore Hole

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions

KIRK J. HOFF
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PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

Kirk J Hoff

12 18 2020

SYMBOLS

D-101-31

- Flexible Delineator
- Flexible Delineator Type A (Exst, Ppsd)
- Flexible Delineator Type B (Exst, Ppsd)
- Flexible Delineator Type C (Exst, Ppsd)
- Flexible Delineator Type D (Exst, Ppsd)
- Flexible Delineator Type E (Exst, Ppsd)
- Delineator Type A (Exst, Ppsd, Diamond Grade-Reset)
- Delineator Type B (Exst, Ppsd, Diamond Grade-Reset)
- Delineator Type C (Exst, Ppsd, Diamond Grade)
- Delineator Type D (Exst, Ppsd, Diamond Grade)
- Delineator Type E (Exst, Ppsd, Diamond Grade)
- Barricade (Type I, Type II, Type III}
- Arrow Panel (Caution Mode, Double Direction, Left Directional, Right Directional, Sequencing, Truck Mounted)
- Attenuation Device
- Truck Mounted Attenuator
- Delineator Drums
- Flagger
- Tubular Marker
- Traffic Cone
- Back to Back Vertical Panel Sign

- Highway Sign (Exst, Ppsd)
- Mile Post Type A (Exst-Ppsd-Reset)
- Mile Post Type B (Exst, Ppsd)
- Mile Post Type C (Exst, Ppsd)
- Object Marker Type I (Exst, Ppsd)
- Object Marker Type II (Exst, Ppsd)
- Object Marker Type III (Exst, Ppsd)
- Existing Reference Marker
- Road Closure Gate 18 Ft (Exst, Ppsd)
- Road Closure Gate 28 Ft (Exst, Ppsd)
- Road Closure Gate 40 Ft (Exst, Ppsd)
- Existing Railroad Battery Box
- Existing RR Profile Spot
- Existing Railroad Crossbuck
- Existing Railroad Frog
- Existing Mailbox (Private, Federal)

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions

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Kirk J Hoff

12 18 2020

SYMBOLS

D-101-32

- Existing Luminaire
- Luminaire LED
- Existing Light Standard Luminaire
- Relocate Light Standard
- Light Standard Light LED Luminaire
- Light Standard 35 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 100 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 150 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 400 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 700 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire
- Emergency Vehicle Detector
- Video Detection Camera

- High Mast Light Standard 3 Luminaire (Exst, Ppsd)
- High Mast Light Standard 4 Luminaire (Exst, Ppsd)
- High Mast Light Standard 5 Luminaire (Exst, Ppsd)
- High Mast Light Standard 6 Luminaire (Exst, Ppsd)
- High Mast Light Standard 7 Luminaire (Exst, Ppsd)
- High Mast Light Standard 8 Luminaire (Exst, Ppsd)
- High Mast Light Standard 9 Luminaire (Exst, Ppsd)
- High Mast Light Standard 10 Luminaire (Exst, Ppsd)
- Overhead Sign Structure Load Center (Exst, Ppsd)
- Traffic Signal Controller (Exst, Ppsd)
- Pad Mounted Traffic Signal Controller (Exst, Ppsd)
- Flashing Beacon (Exst, Ppsd)
- Concrete Foundation (Exst, Ppsd)
- Pipe Mounted Flasher (Exst, Ppsd)
- Pad Mounted Feed Point (Exst, Ppsd)
- Pipe Mounted Feed Point with Pad (Exst, Ppsd)
- Pole Mounted Feed Point (Exst, Ppsd)
- Junction Box (Exst, Ppsd)
- Existing Pedestrian Head with Number
- Existing Signal Head
- Pole Mounted Head
- Existing Lighting Standard Pole

- Existing Traffic Signal Standard
- Pull Box (Exst-Ppsd-Undefined)
- Intelligent Transportation Pull Box (Exst, Ppsd)
- Transformer (Exst, Ppsd)
- Power Pole (Exst-Ppsd-with Transformer)
- Wood Pole (Exst, Ppsd)
- Pedestrian Push Button Post (Exst, Ppsd)
- Existing Pole
- Existing Telephone Pole
- Existing Post
- Connection Conductor (Ground, Neutral, Phase 1, Phase 2)

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions

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NORTH DAKOTA
12 18 2020

SYMBOLS

D-101-33

Existing Manhole (Electrical, Gas, Telephone)

Water Manhole (Exst, Exst with Valve)

Sanitary Sewer Manhole (Exst, Ppsd, Exst with Valve)

Sanitary Force Main Manhole (Exst, Ppsd, Exst with Valve)

Storm Drain Manhole (Exst, Ppsd, Exst with Inlet, Ppsd with Inlet)

Force Main Storm Drain Manhole (Exst, Exst with Valve)

Manhole (Ppsd, Ppsd 48 Inch, Exst Undefined)

Existing Water Appurtenance

Sprinkler Head (Exst, Ppsd)

Fire Hydrant (Exst, Ppsd)

Cleanout (Exst Sanitary, Underdrain)

Existing Catch Basin Inlet (Round, Square)

Existing Curb Inlet (Round, Square)

Existing Slotted Reinforced Concrete Pipe

Catch Basin (Riser 30 Inch, Beehive, Type A)

Inlet Mountable Curb (Type A, Type B)

Inlet Saddle Base (Type 1, Type 2)

Inlet Special (Catch Basin, Type 1, Type A)

Inlet (Tee, Type 1, Type 2, Type 2 Double)

Median Drain

Headwall (Exst, Ppsd, Ppsd Single with Vegitation Barrier,
Ppsd Double with Vegitation Barrier)

Cap or Stub
Exst Gas, Exst Sanitary, Exst Storm Drain, Ppsd Storm Drain, Exst Water

Existing Pedestal
Electrical, Telephone, Fiber Optic Telephone, TV, Fiber Optic TV, Undefined

Existing Pipe Vent
Gas, Fuel, Sanitary, Storm Drain, Water, Undefined

Valve
Exst Gas, Exst Water, Ppsd Water, Exst Undefined

Pump
Sanitary, Storm Drain, Exst Water

Corrugated Metal End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)

Reinforced Concrete End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)

Existing Utility Marker

Existing Meter

Existing Fuel Dispensers

Existing Fuel Filler Pipes

Existing Fuel Leak Sensors

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions Sheet added - Continued from D-101-32

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12 18 2020

Cross Section Legend

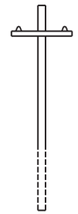
D-101-40

Description	Longitudinal Parallel to Roadway	Transverse Perpendicular to Roadway*
Cable Line	CBL1	CBL2
Conduit Line	CDU1	CDU2
Electric Line	E1	E2
Fiber Optic Line	F1	F2
Gas Main Line	GM1	GM2
Gas Service Line	GS1	GS2
Gas Transmission Line	GT1	GT2
Fuel Pipeline	PL1	PL2
Sanitary Sewer Force Main	SSF1	SSF2
Sanitary Sewer	SS1	SS2
Steam Line	STE1	STE2
Storm Drain (Assumed Depth)	SD1	SD2
Telephone Line	T1	T2
TV Line	TV1	TV2
Water Main Line	WM1	WM2
Water Service Line	WS1	WS2

Description	Longitudinal Parallel to Roadway	Transverse Perpendicular to Roadway*
Overhead Power Transmission Line	OHT1	OHT2
Overhead Line	OH1	OH2

Light Standard - Multiple Variations
- Concrete
- Steel
- Wood
- with Traffic Signal

Pole - Multiple Variations
- Utility
- Brace
- Feed Point
- Guy
- Power
- Power Structure
- Power with Light
- Power with Transformer



Manhole - Multiple Variations
- Electric
- Fiber Optic
- Gas
- Inlet
- Sanitary Force Main
- Sanitary
- Sanitary with Valve
- Steam
- Storm
- Storm Force Main
- Storm with Valve
- Telephone
- Water
- Water with Meter
- Water with Valve
- Water with Air Release Valve

Anchor

High Tension Cable Guardrail

* Usually the transverse utilities are shown on a cross section with 2 or more symbols. The utility runs from one symbol to the other, but the connection may not be shown.

Connection to infer that probably will not be displayed

When storm drain invert elevations are NOT used to draw pipe, they will appear as shown to the left. When invert elevations are used to draw pipe, they will be a cross section similar to the graphics shown below.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-20-18	
REVISIONS	
DATE	CHANGE
6/14/2023	CADD Standards Update

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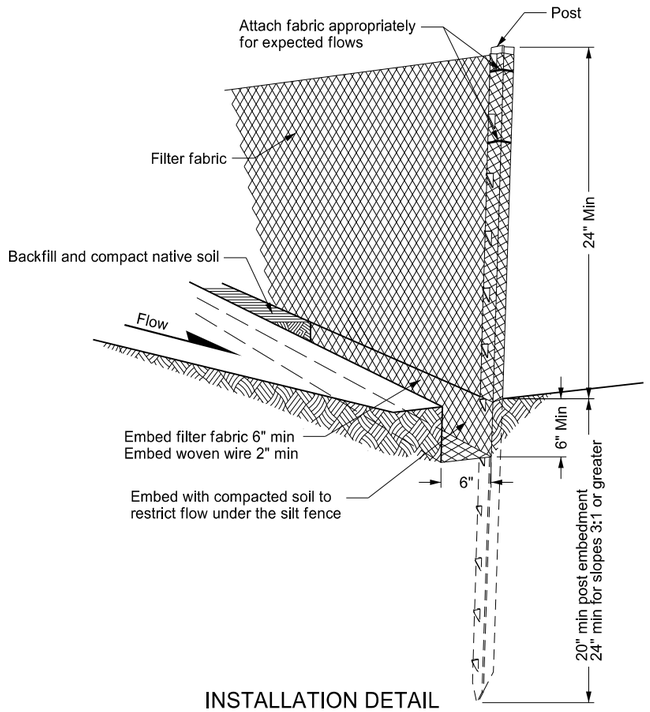
06/14/23

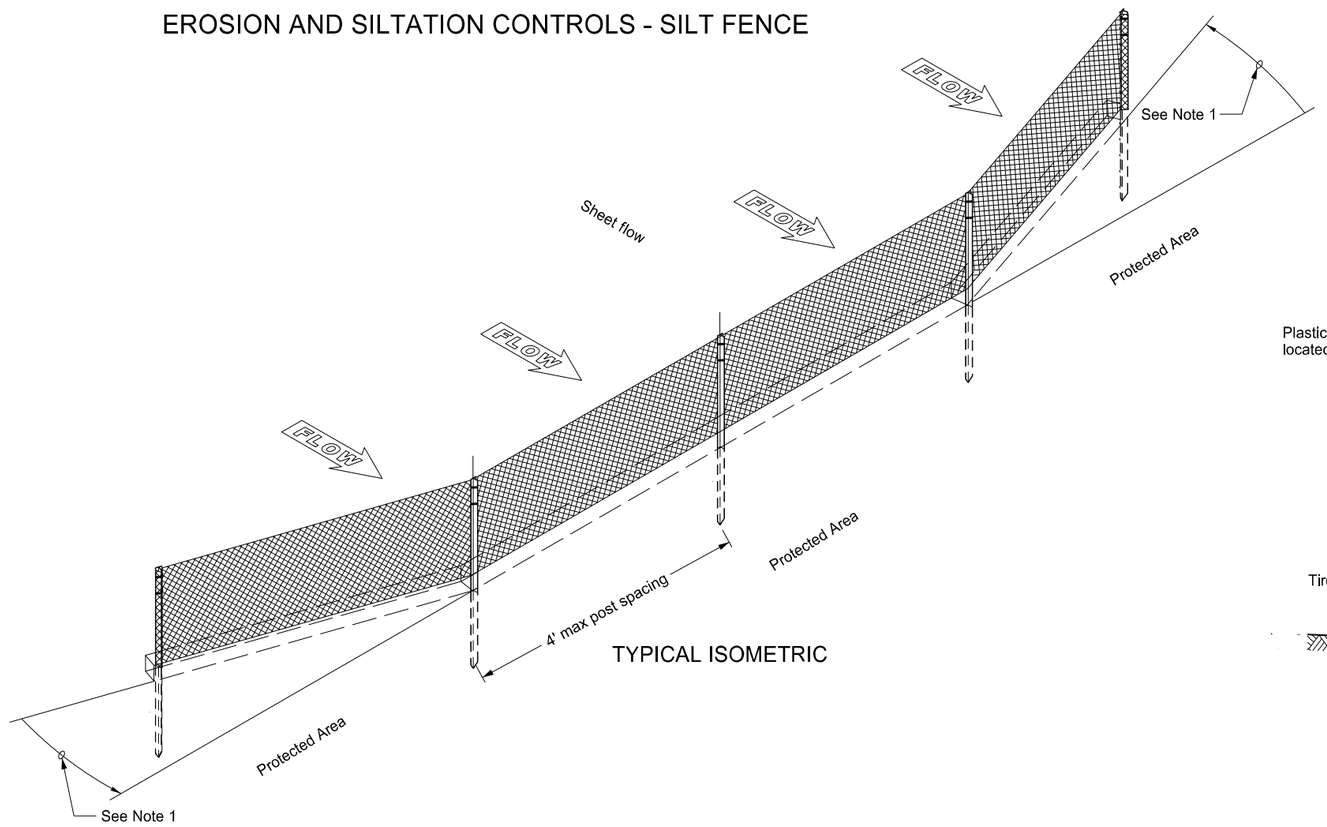
EROSION AND SILTATION CONTROLS - SILT FENCE

D-260-1

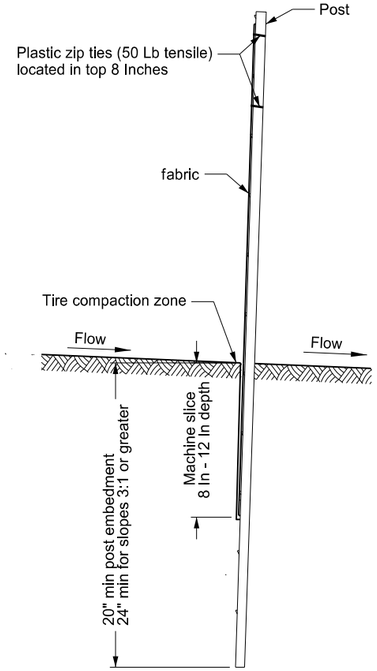


INSTALLATION DETAIL

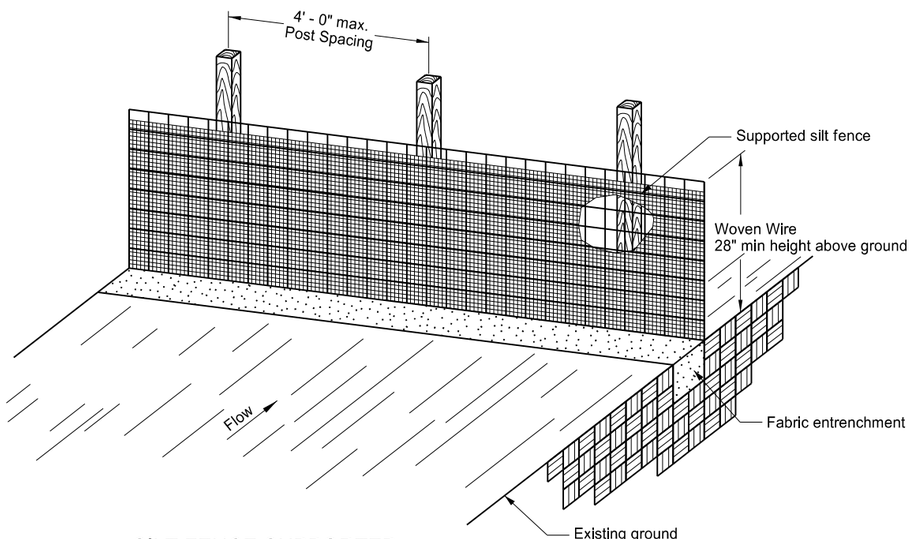
Minimize disturbance of ground around trench and smooth surface after excavation to avoid concentrating flows. Compact to prevent undercutting flows.



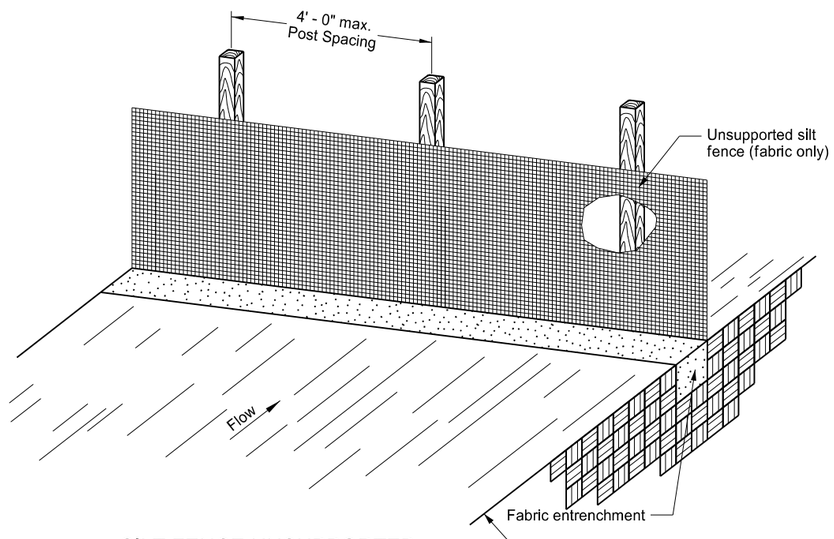
TYPICAL ISOMETRIC



MACHINE SLICED SILT FENCE



SILT FENCE SUPPORTED



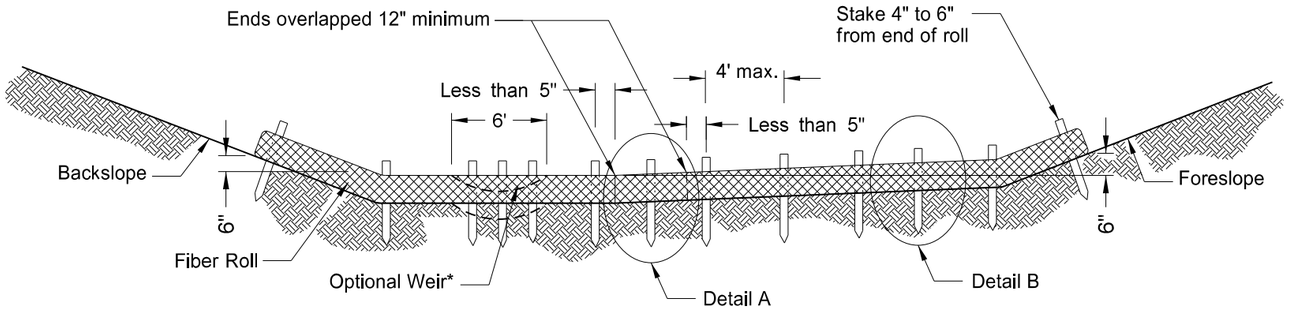
SILT FENCE UNSUPPORTED

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Standard drawing resulted from splitting standard D-708-2.
06-27-16 08-27-19	Revised details & added new ones. New Design Engineer PE Stamp.

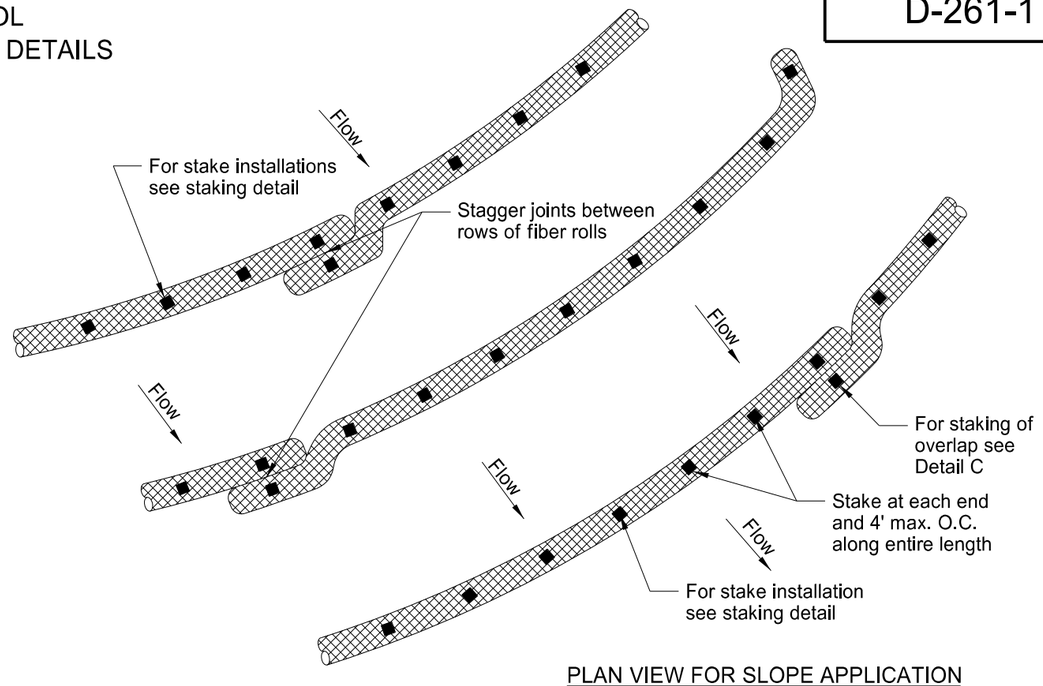
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 08/27/19 and the original document is stored at the North Dakota Department of Transportation

EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

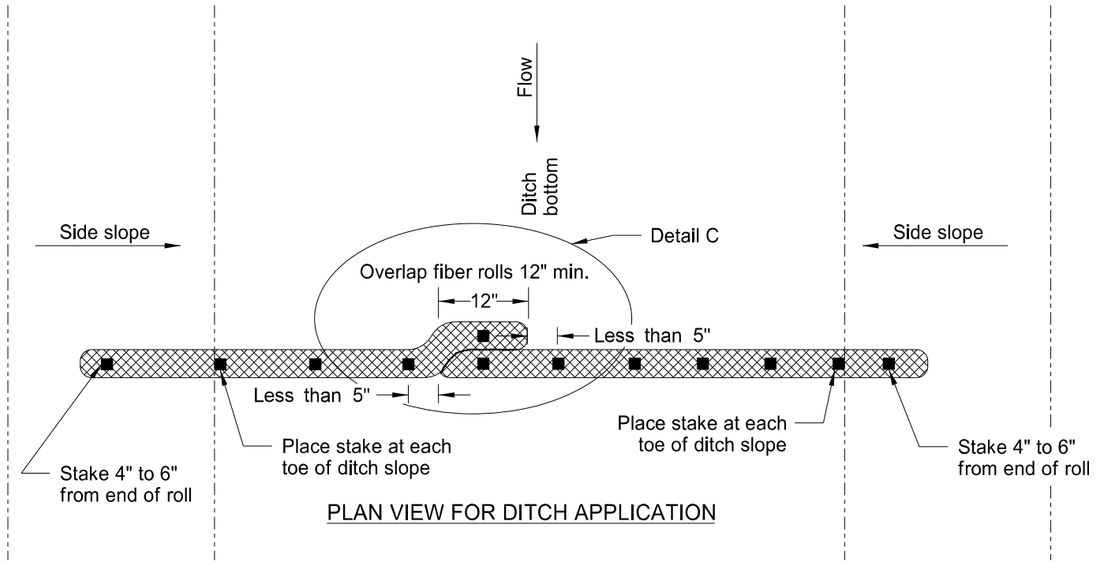


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

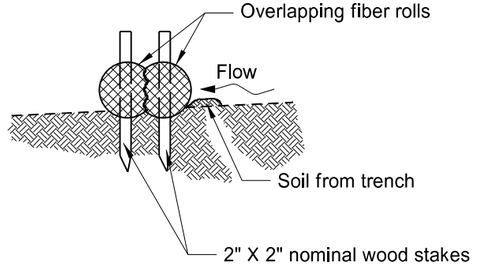
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



PLAN VIEW FOR SLOPE APPLICATION

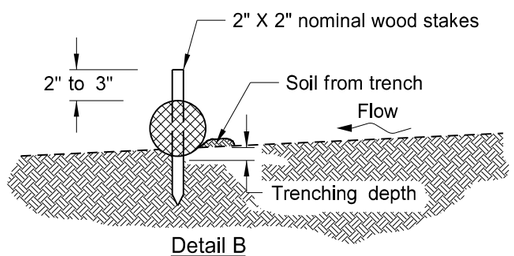


PLAN VIEW FOR DITCH APPLICATION



Detail A

Fiber Roll Overlapping Staking Detail



Detail B

Fiber Roll Staking Detail

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

11-18-10

REVISIONS

DATE	CHANGE
06-10-13	Added plan view for ditch and slope application. Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.
06-26-14	Changed standard drawing number from D-708-7 to D-261-1.
08-27-19	New Design Engineer PE Stamp

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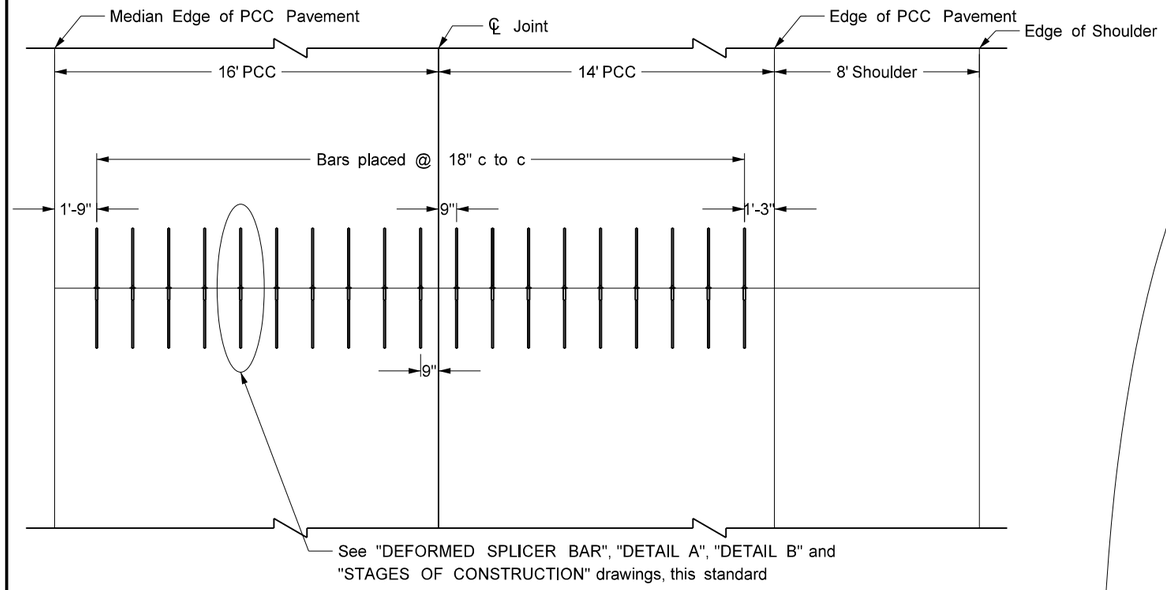
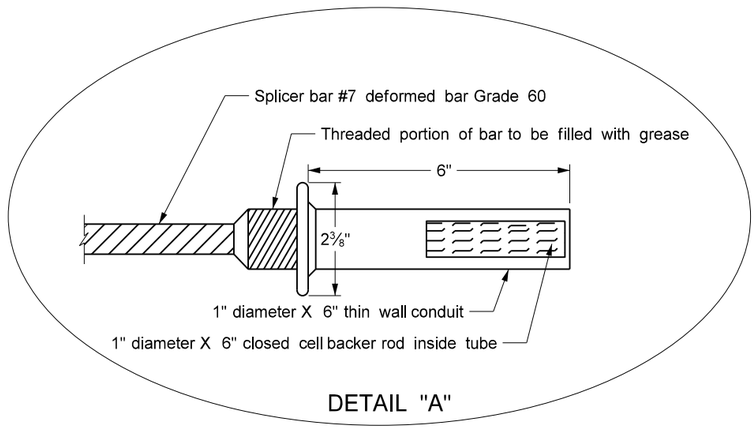
TRANSVERSE CONSTRUCTION JOINT

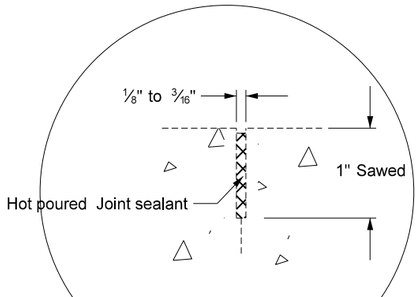
D-550-5



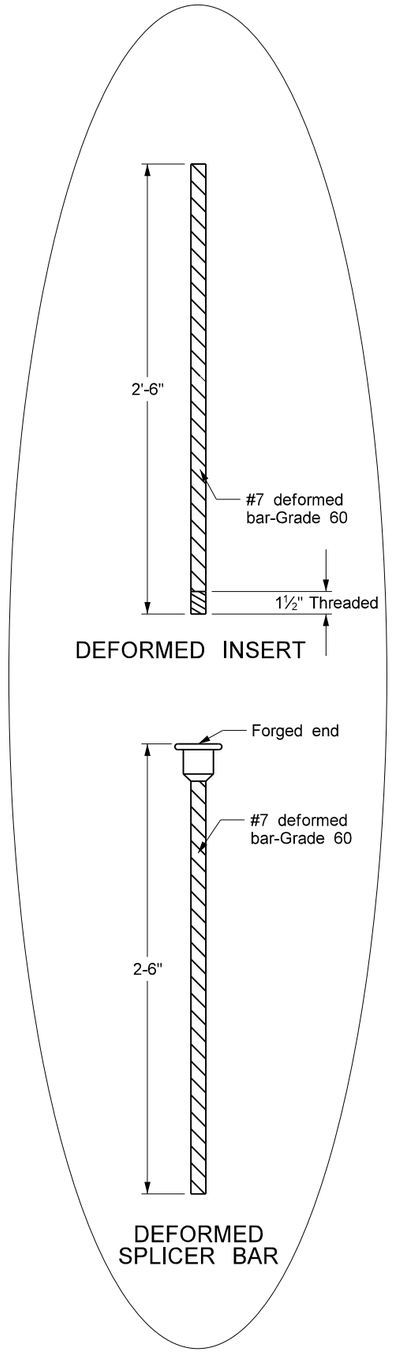
PLAN VIEW



DETAIL "A"



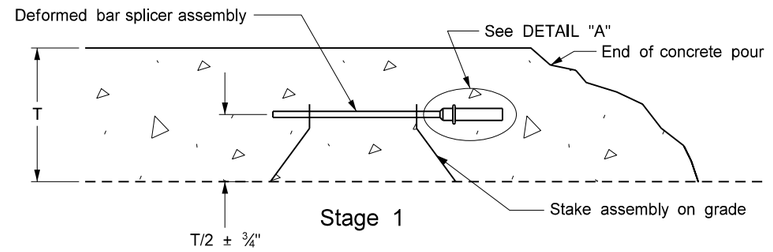
DETAIL "B"



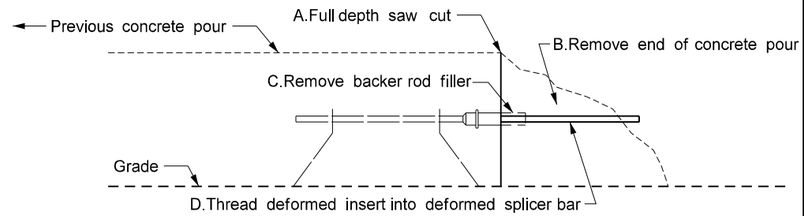
DEFORMED INSERT

DEFORMED SPLICER BAR

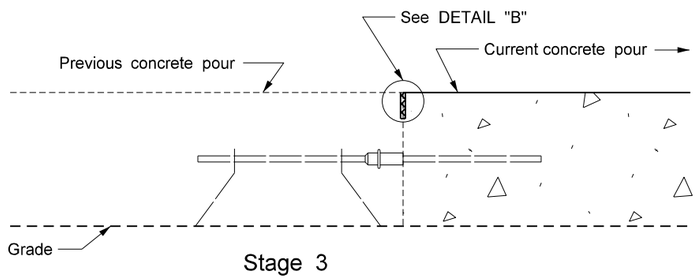
STAGES OF CONSTRUCTION



Stage 1



Stage 2



Stage 3

Notes

1. Saw and seal all construction joints.
2. Include all costs for transverse construction joints in the price bid for PCC pavement.
3. Do not saturate the subgrade during the sawing operation.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-2010	
REVISIONS	
DATE	CHANGE
3-16-16 8-27-19	Revised Joint Details & notes. New Design Engr PE Stamp.

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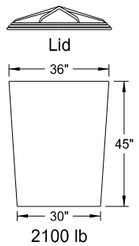
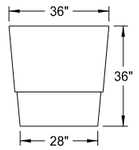
ATTENUATION DEVICE

D-704-1

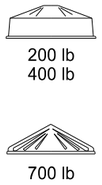


2100 lb

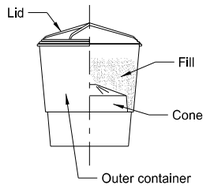


200, 400, 700 and 1400 lb

Outer Containers

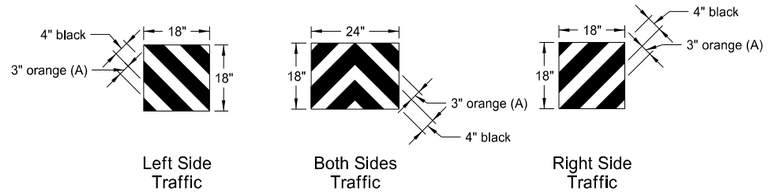


Cones



Typical Assembly

Typical Module Construction Detail

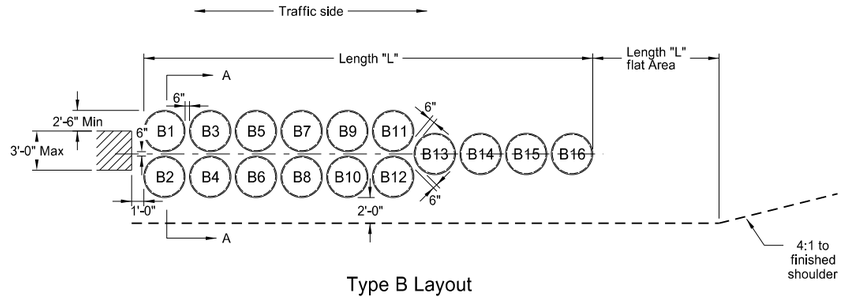


Left Side Traffic | Both Sides Traffic | Right Side Traffic

Reflective Sheet Detail

Note:
Apply Type IV reflective sheeting (as specified in the NDDOT Standard Specifications) directly to the outer container of the last attenuation device facing traffic, following the details above. Or apply the sheet to a metallic sheet and attach it to the container with approved fasteners.

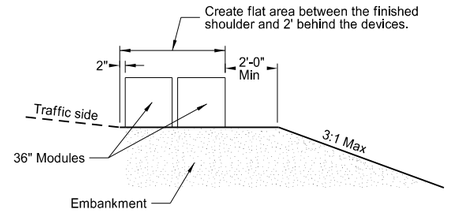
(A) Use 3" orange sheeting for temporary installations, and 3" yellow sheeting for permanent installations.



Type B Layout

Note:
Angle attenuation devices 10 degrees towards traffic when placed at piers offset from roadway.

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



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) Use modules manufactured from frangible polyethylene material which shatters upon impact.
   B) Fill modules with class 43 aggregate meeting NDDOT Standard Specifications aggregate requirements. Use fill with a unit weight of at least 100 pounds per cubic foot. Use fill with a moisture content of 2% or less when left over winter.

2. Modules
   Provide modules in two sizes containing volumes of either 2, 4, 7, 14, or 21 cubic feet minimum.
   A) Provide three components for 2, 4, or 7 cubic foot module containers:
      1) A 14 C.F., yellow outer container.
      2) A black lid securely locking over the top lip of the container.
      3) A variable cone-shaped supporting insert capable of supporting 200, 400, or 700 pounds of sand mass to allow for three sizes of modules. Place cone inserts inside the 14 cubic foot container.
   B) Provide two components for the 14 cubic foot module container:
      1) A 14 C.F., yellow outer container.
      2) A black lid securely locking over the top lip of the container.
   C) Provide two components for the 21 cubic foot module container:
      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 installations use 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 approved equal modules. As an option, place attenuation devices on 3½" maximum thickness pallets to facilitate maintenance.

4. For permanent installations use Barrel Attenuation Device consisting of one-piece outer sand container modules with separate detachable lid. Energite attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, TrafFix barrels manufactured by TrafFix Devices, Inc. of San Clemente, CA, or approved equal meet these requirements.

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
7-18-14	Revised sheeting in reflective sheet detail
9-27-17	Update to active voice
10-03-19	New Design Engr PE Stamp

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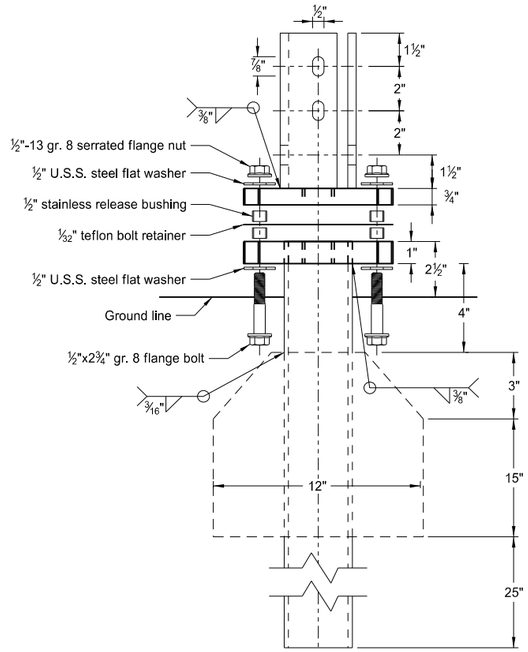
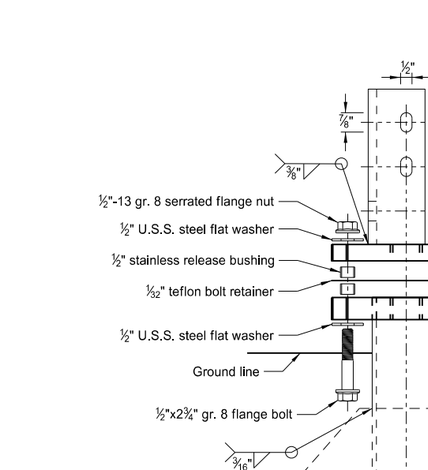
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

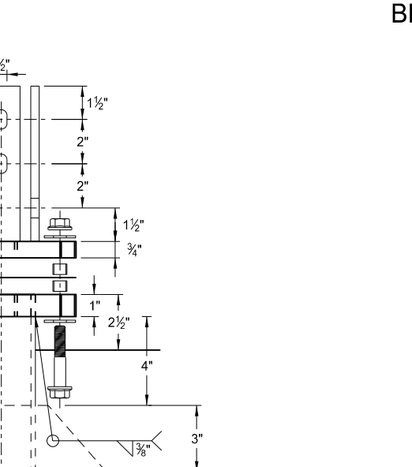
D-704-7



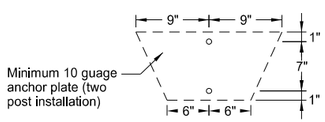
Multi-Directional
Slip Base Assembly



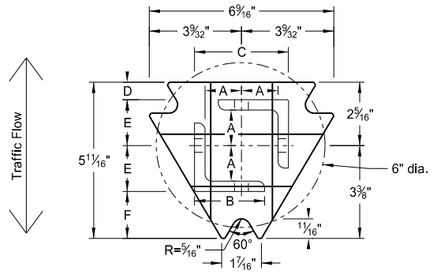
Anchor Unit and Post Assembly



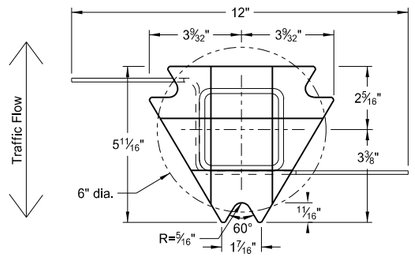
Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly



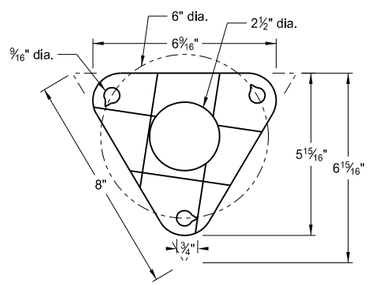
Perforated Tube



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



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



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

Notes:

1. Torque slip base bolts as specified by manufacturer.
2. Use anchor with 43.9 KSI yield strength and 59.3 KSI tensile strength.
3. Provide 4" vertical clearance for anchor or breakaway base. Measure the 4"x60" measurement above and below post location and back and ahead of post.
4. In concrete sidewalk, use same anchor without wings.
5. Provide more than 7' between the first and fourth posts of a four post sign.

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

Properties of Telescoping Perforated Tube						
Tube Size in.	Wall Thickness in.	U.S. Standard Gauge	Weight per Foot lbs.	Moment of Inertia in.⁴	Cross Sec. Area in.²	Section Modulus in.³
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2³/16 x 2³/16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.785

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

(A) Use breakaway base when support is placed in weak soils. Engineer determines if soils are weak.

(B) For additional wind load, insert the 2³/16"x10 ga. into 2½"x10 ga.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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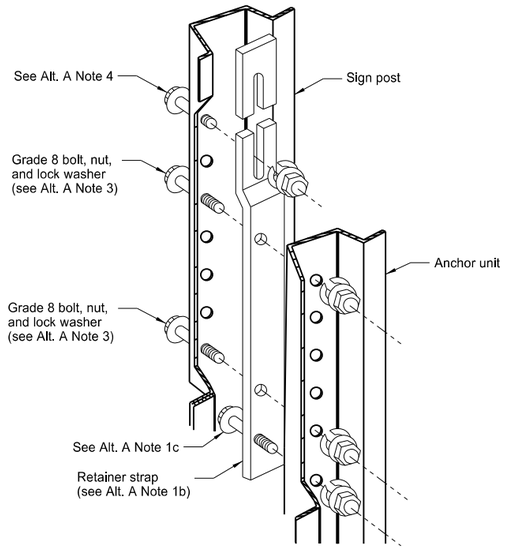
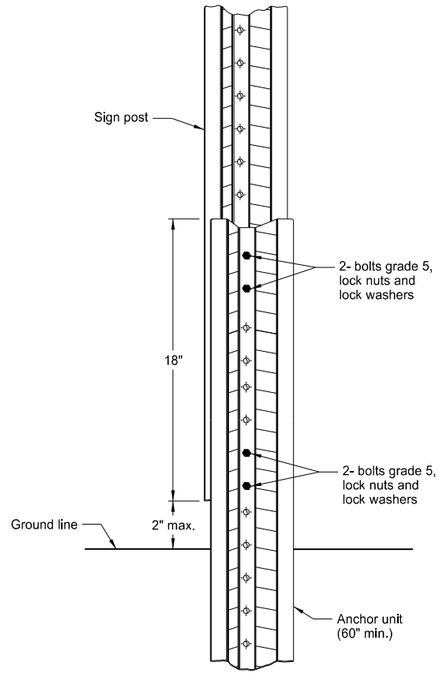
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

U-Channel Post

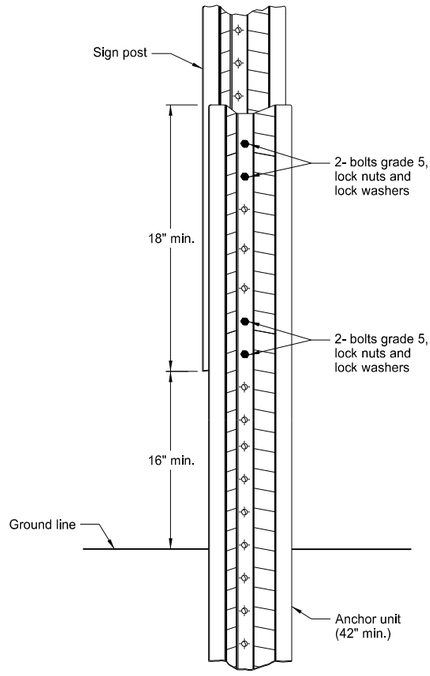


Detail A



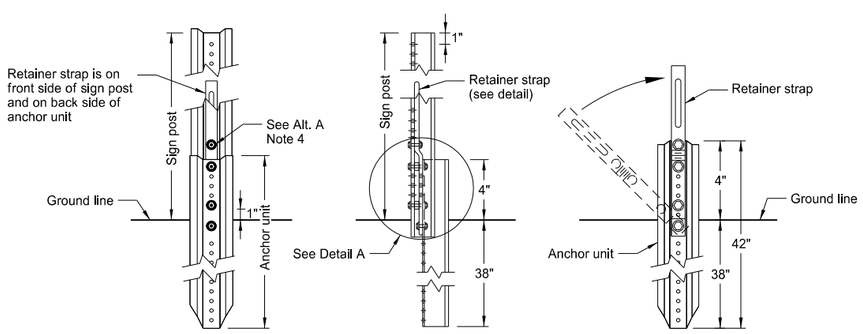
Breakaway U-Channel Splice Detail
Alternate B
(2.5 and 3 lb/ft)

Install a maximum of 3 posts within 7'.



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

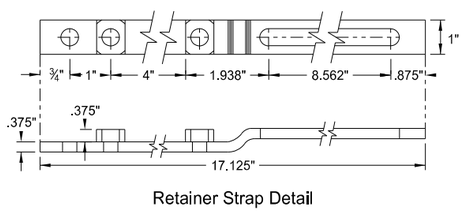
Install a maximum of 3 posts within 7'.



Front View Side View Back View

Breakaway U-Channel Detail
Alternate A

Install a maximum of 2 posts within 7'.



Retainer Strap Detail

Alternate A Steps of Installation:

1. a) Drive anchor unit to within 12" of ground level.
   b) Establish proper assembly by lining up bottom hole of retainer strap with 6th hole from the top of the anchor unit.
   c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
   d) Rotate strap 90° to left.
2. a) Drive anchor unit to 4" above ground.
   b) Rotate strap to vertical position.
3. a) Place 5/16"x2" bolt, lock washer and nut in bottom of sign post to facilitate alignment of sign post with proper hole in anchor unit.
   b) Alternately tighten two connector bolts.
4. Complete assembly by tightening 5/16"x2" bolt (this fastens sign post to retainer strap).
5. Properly nest base post, strap, and sign post. 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.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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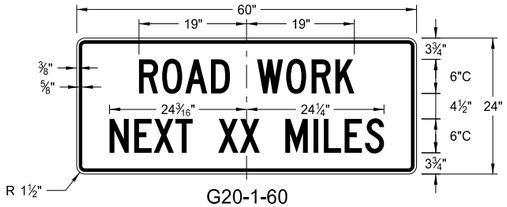
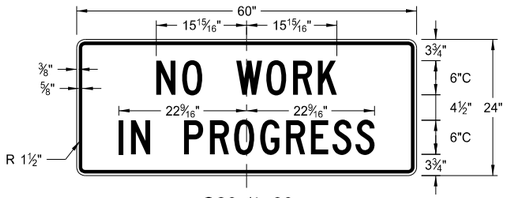
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



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



G20-1b-60
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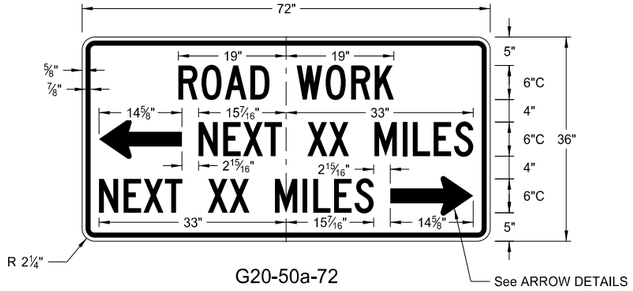
Background: orange



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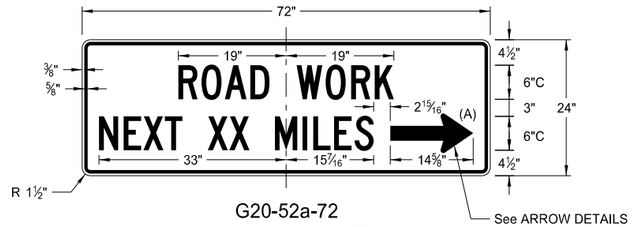
Background: orange



G20-52a-72
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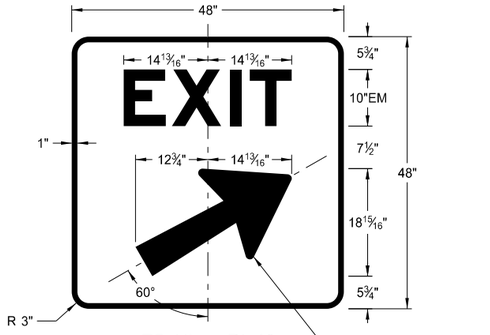
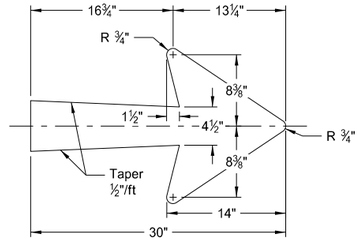
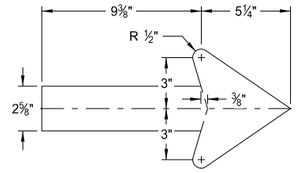
Background: orange



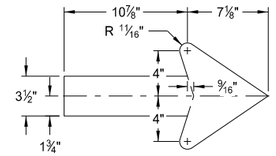
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



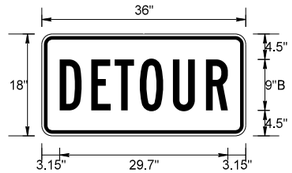
E5-1-48



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



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



M4-8-36
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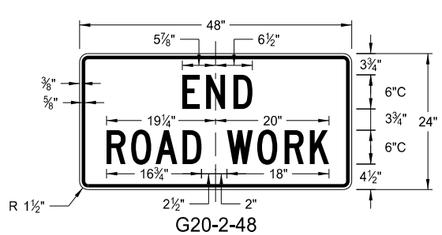
Background: orange



G20-2-48
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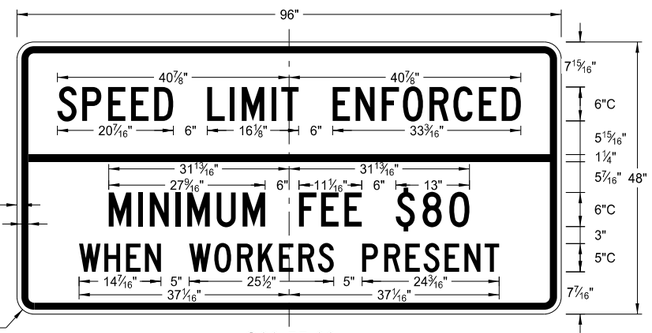
Background: orange



G20-55-96
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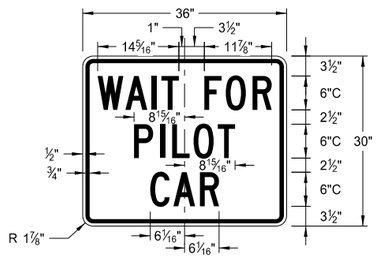
Background: orange



G20-4b-36
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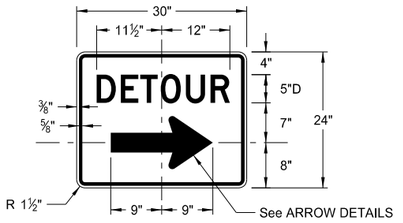
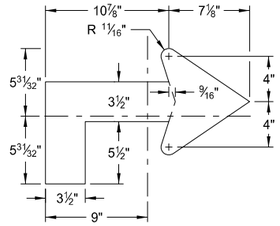
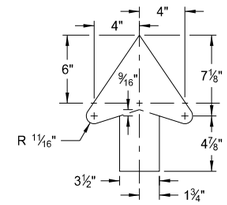
Background: orange



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



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



M4-9-30
Straight

ARROW DETAILS

NOTES:

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17 10-03-19	Added sign & background color New Design Engineer PE Stamp

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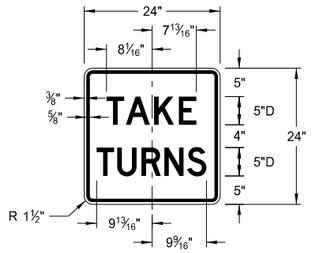
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



R1-50P-24
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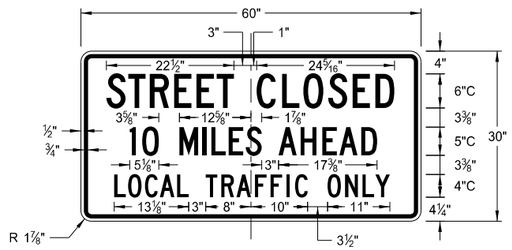
Background: white



R11-3c-60
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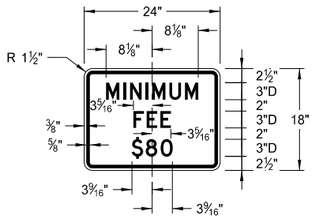

R2-1aP-24
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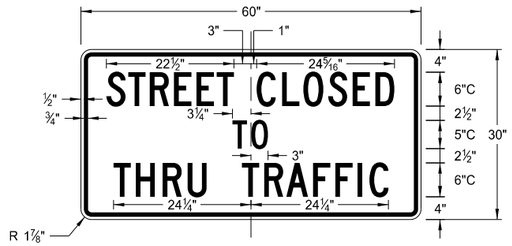

R11-4a-60
Legend: black (non-refl)
Background: white

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Revised sign number
10-03-19	New Design Engineer PE Stamp

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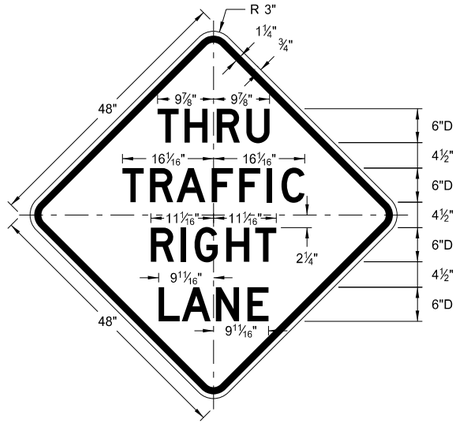
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



W5-8-48
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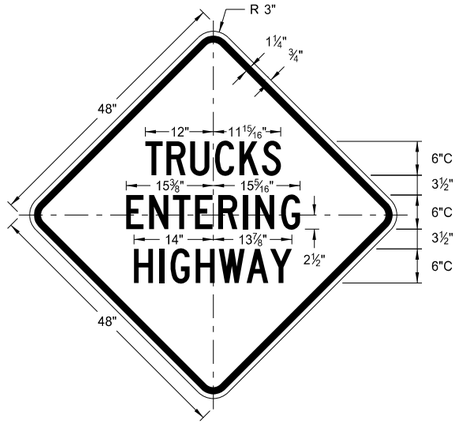
Background: orange



W8-53-48
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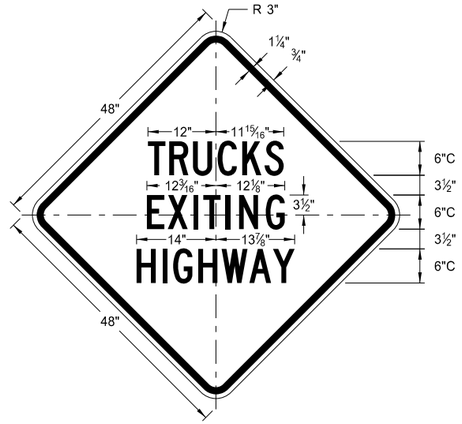
Background: orange



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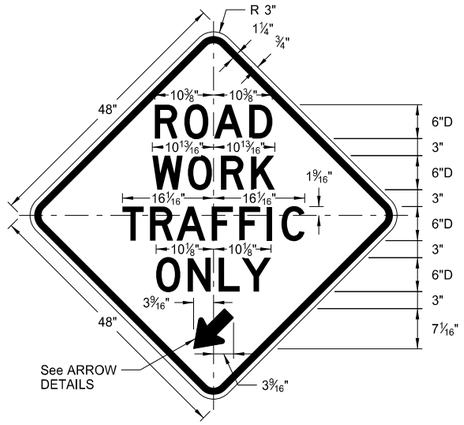
Background: orange



W5-9-48
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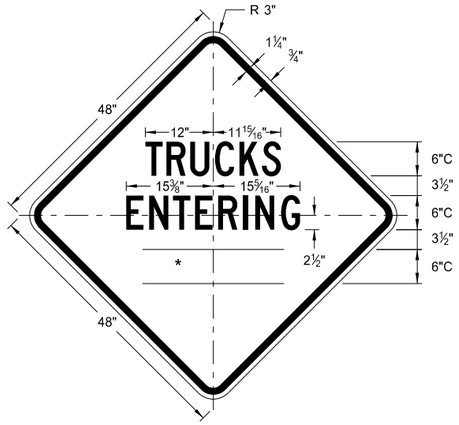
Background: orange



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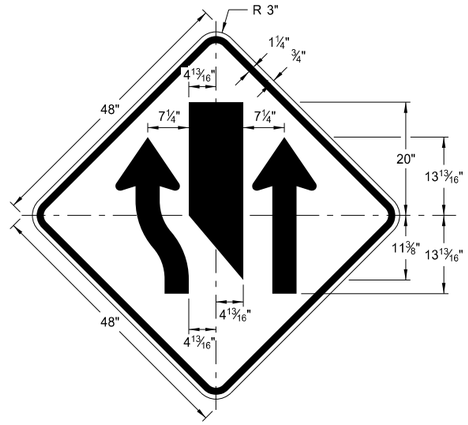
Background: orange



W9-3a-48
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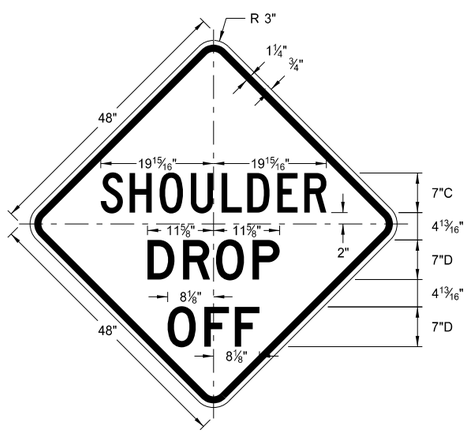
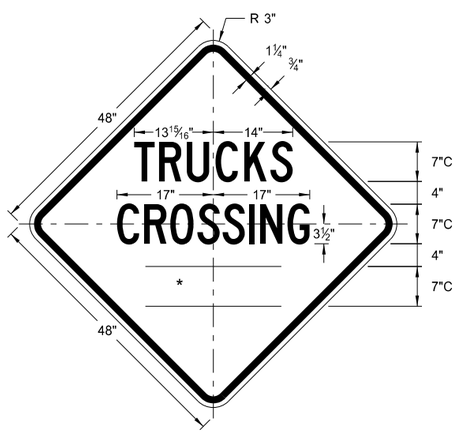


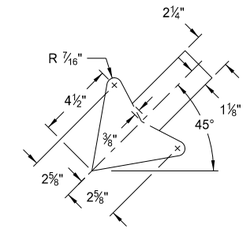
W8-9a-48
Legend: black (non-refl)
Background: orange



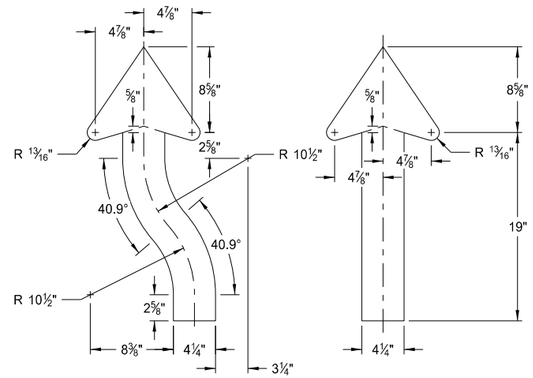
W8-55-48
Legend: black (non-refl)
Background: orange

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

* DISTANCE MESSAGES



W5-9-48



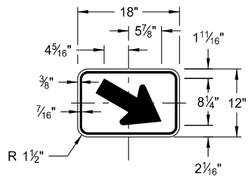
W9-3a-48

ARROW DETAILS

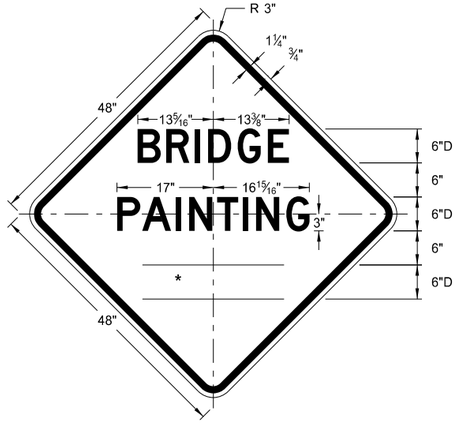
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Updated sign number
5-31-18	Revised sign and arrow details
10-03-19	New Design Engineer PE Stamp

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/03/19 and the original document is stored at the North Dakota Department of Transportation

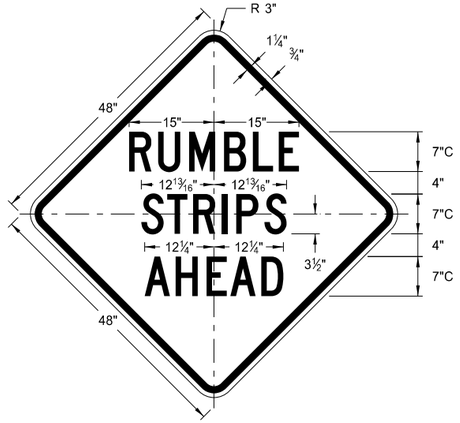
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



W16-7aP-18
Legend: black (non-refl)
Background: orange



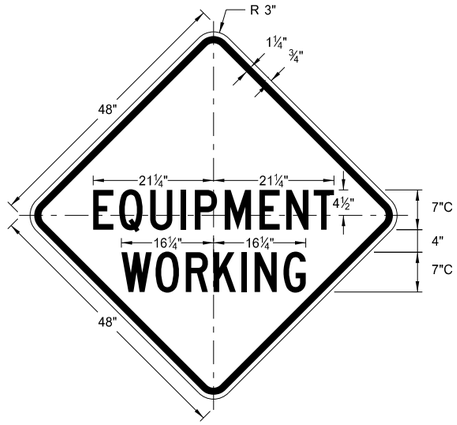
W21-50-48
Legend: black (non-refl)
Background: orange



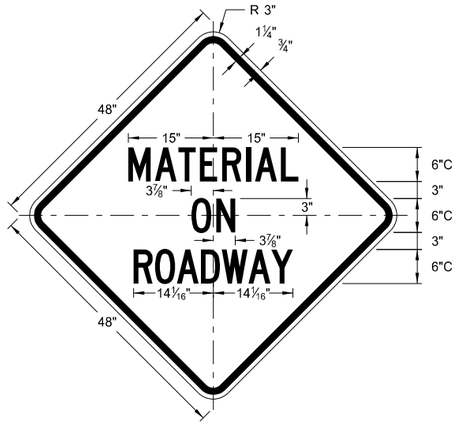
W21-53-48
Legend: black (non-refl)
Background: orange

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

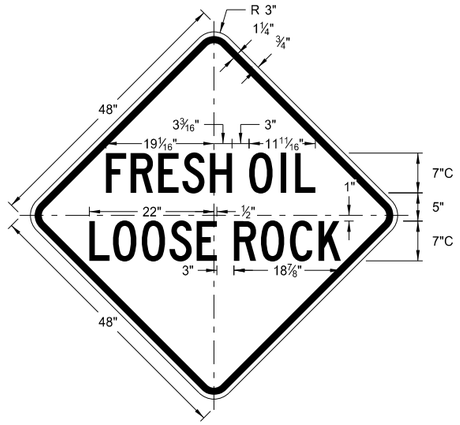
* DISTANCE MESSAGES



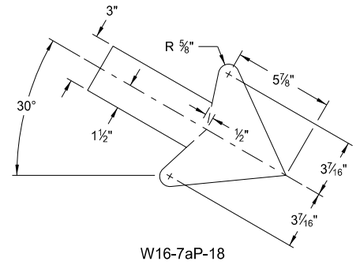
W20-51-48
Legend: black (non-refl)
Background: orange



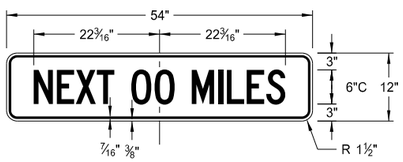
W21-51-48
Legend: black (non-refl)
Background: orange



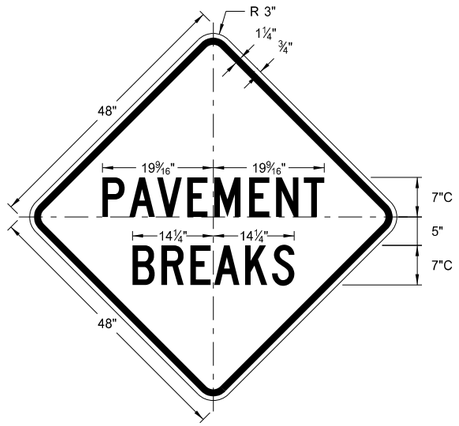
W22-8-48
Legend: black (non-refl)
Background: orange



W16-7aP-18



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



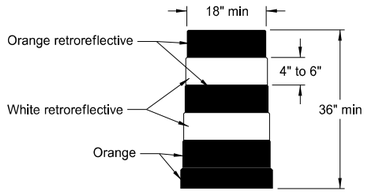
W21-52-48
Legend: black (non-refl)
Background: orange

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
5-31-18	
REVISIONS	
DATE	CHANGE
11-01-19	Added details for sign W16-7aP-18.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

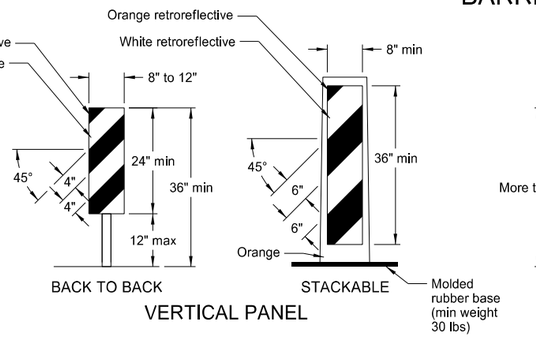
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



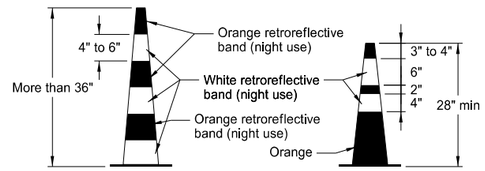
DELINEATOR DRUM

Provide horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide for drum markings. Use a minimum of two orange and two white stripes with the top stripe being orange for each drum. Do not exceed 3" nonretroreflectorized spaces between the horizontal orange and white stripes. Avoid placement of stripes on drum ribs or indentations. Use closed top drums that will not allow collection of debris. Do not place ballast on the top of drum.



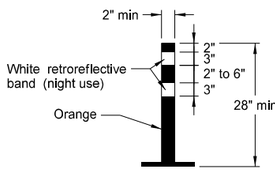
VERTICAL PANEL

Provide alternating orange and white retroreflective stripes, sloping downward in direction vehicular traffic is to pass. Place retroreflective sheeting on both sides of panel with a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective material on the vertical panel is 36 inches or more, use a stripe width of 6 inches.



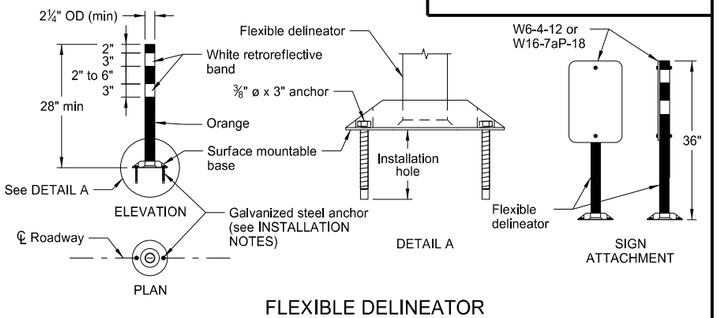
TRAFFIC CONE

Provide retroreflectorization of cones more than 36" in height by alternating orange and white retroreflective stripes. Use a minimum of two orange and two white stripes for each cone with the top stripe being orange. Use maximum 3" nonretroreflectorized space between the orange and white stripes.



TUBULAR MARKER

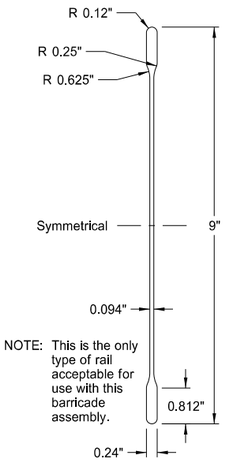
Provide retroreflectorization of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



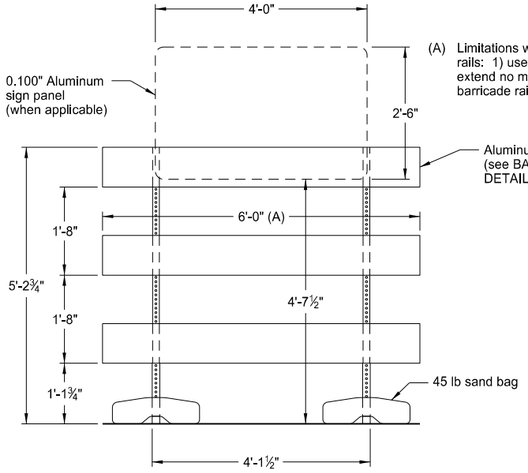
FLEXIBLE DELINEATOR

INSTALLATION NOTES:

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

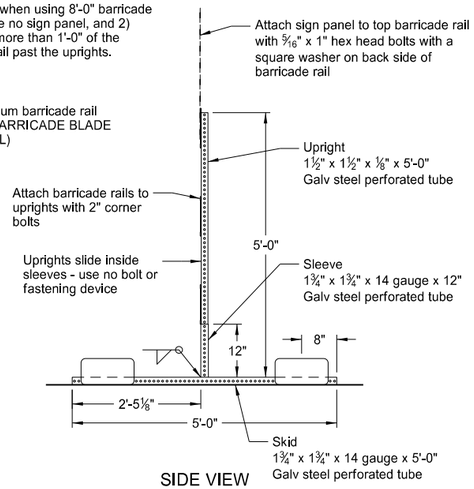


BARRICADE BLADE DETAIL



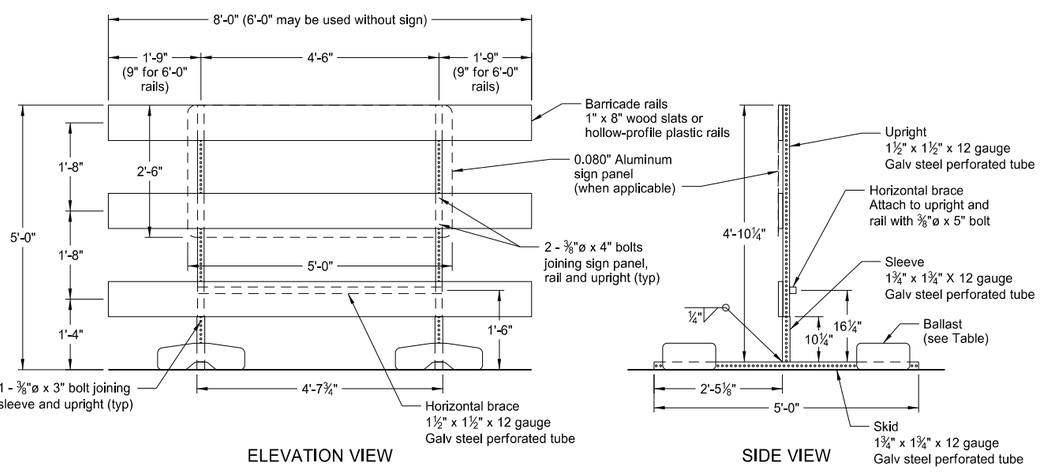
ELEVATION VIEW

(A) Limitations when using 8'-0" barricade rails: 1) use no sign panel, and 2) extend no more than 1'-0" of the barricade rail past the uprights.



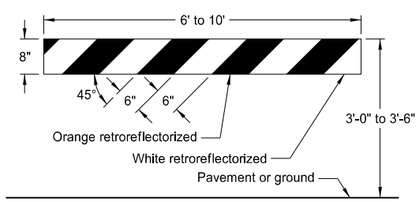
SIDE VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

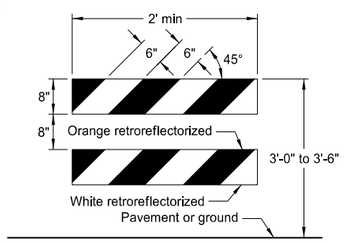


BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

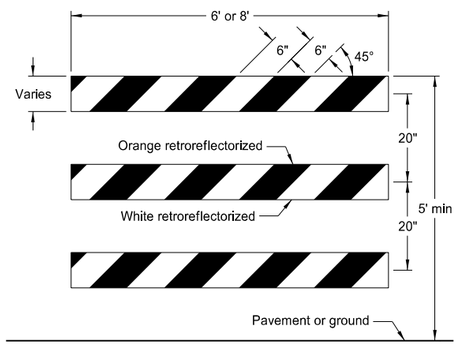
NOTE: For barricade markings use alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Place retroreflective sheeting on both sides of the rails with a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the barricade length is less than 36", use a rail stripe width of 4".



TYPE I BARRICADE

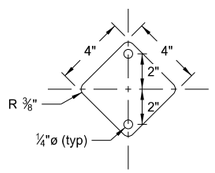


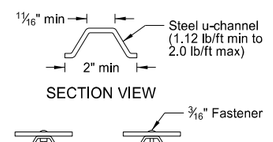
TYPE II BARRICADE

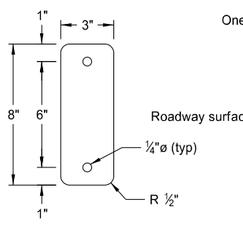


TYPE III BARRICADE

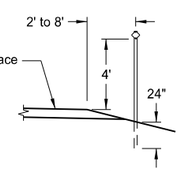
BARRICADE RAIL DETAILS







REFLECTOR DETAIL



ELEVATION

DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

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

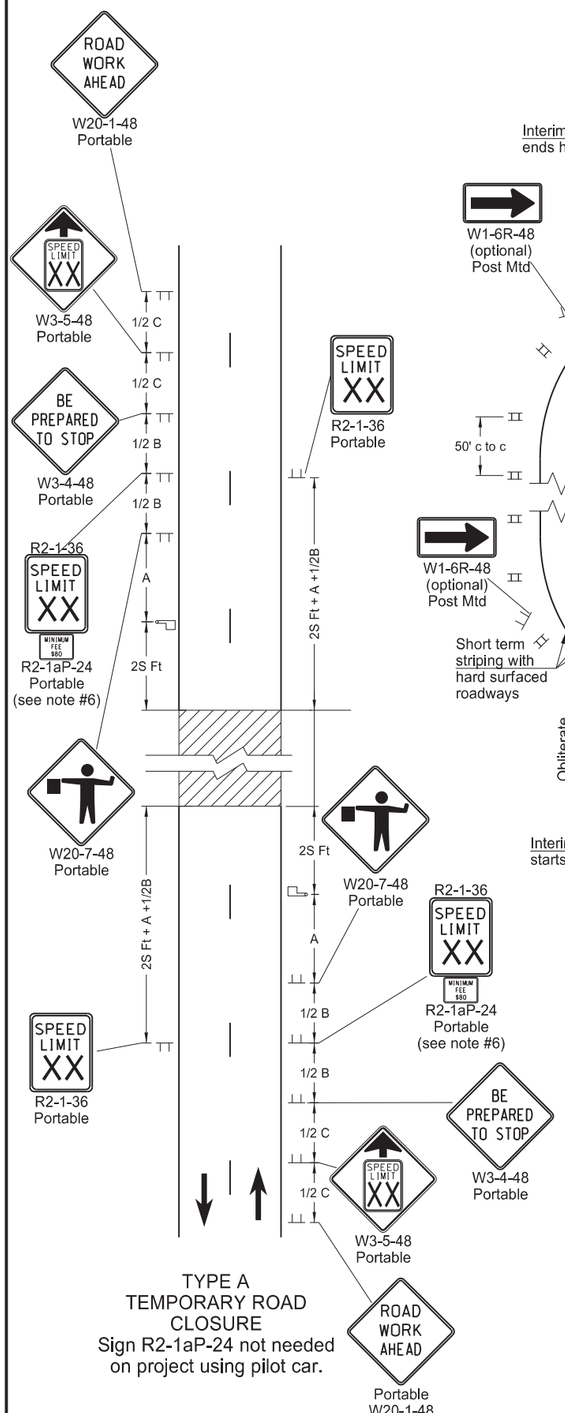
Note: Number of sandbags based on a wind speed of 55 MPH. Sandbags assumed to be placed at or near the ends of the skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
9-27-17 11-01-19	Updated to active voice Revised details for Flexible Delineator

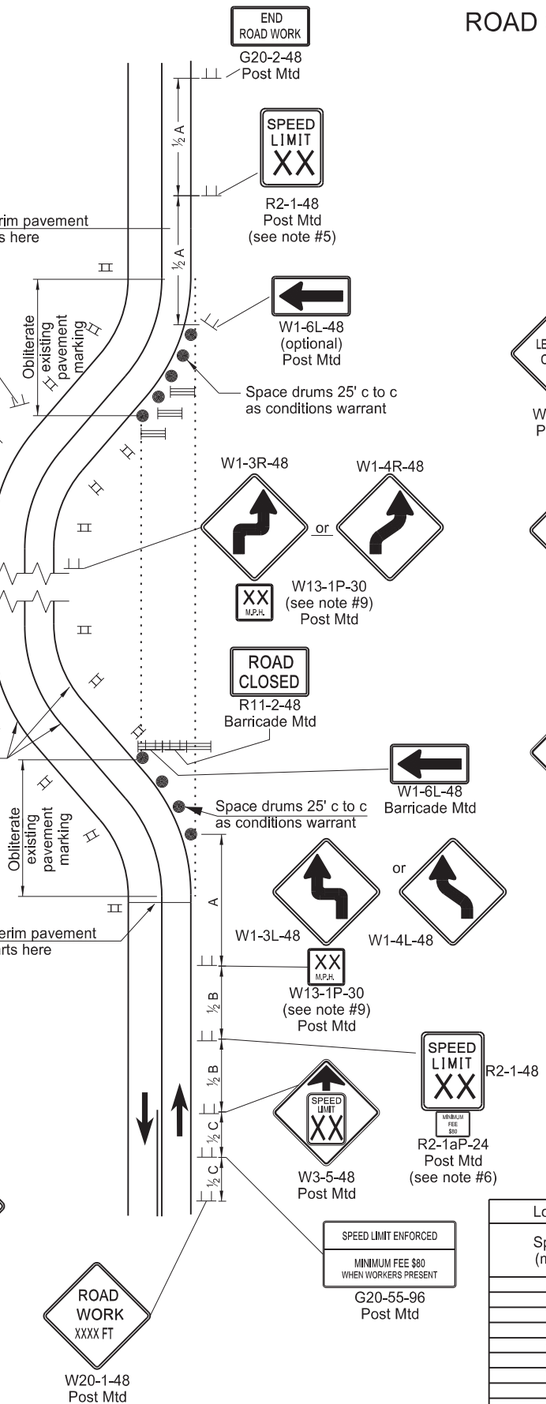
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

ROAD CLOSURE LAYOUTS

D-704-15



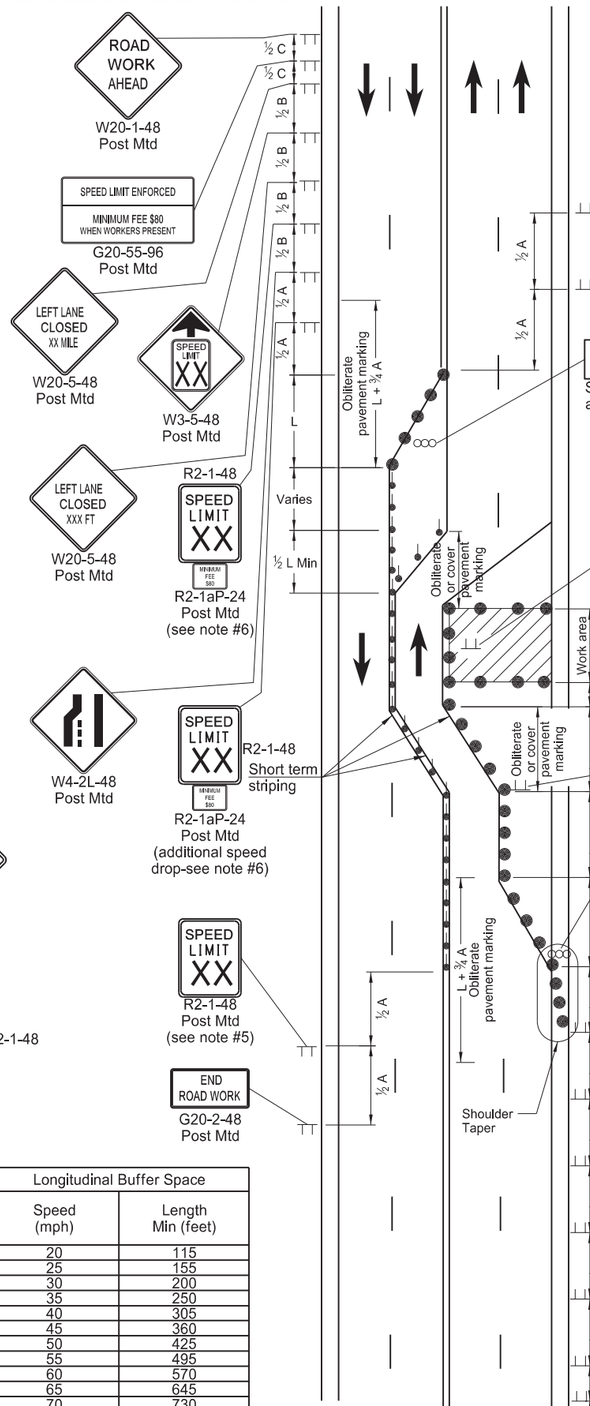
TYPE A
TEMPORARY ROAD CLOSURE
Sign R2-1aP-24 not needed on project using pilot car.

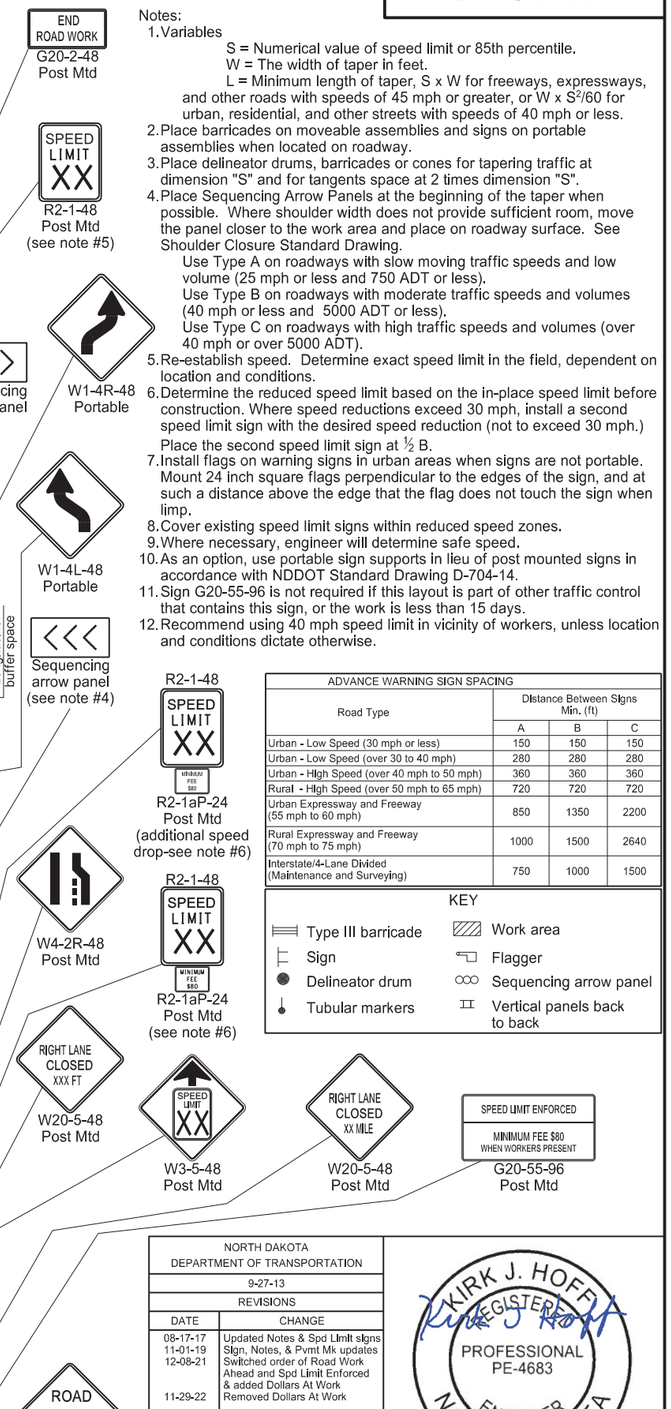


TYPE B
ROAD CLOSURE WITH A DIVERSION

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

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





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

4 lane undivided highway with half the roadway closed.

Notes:

1. Variables
   S = Numerical value of speed limit or 85th percentile.
   W = The width of taper in feet.
   L = Minimum length of taper, S x W for freeways, expressways, and other roads with speeds of 45 mph or greater, or W x $S^2/60$ for urban, residential, and other streets with speeds of 40 mph or less.
2. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
3. Place delineator drums, barricades or cones for tapering traffic at dimension "S" and for tangents space at 2 times dimension "S".
4. Place Sequencing Arrow Panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on roadway surface. See Shoulder Closure Standard Drawing.
   Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
   Use Type B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
   Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
5. Re-establish speed. Determine exact speed limit in the field, dependent on location and conditions.
6. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½ B.
7. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
8. Cover existing speed limit signs within reduced speed zones.
9. Where necessary, engineer will determine safe speed.
10. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
11. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.
12. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

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

KEY

- Type III barricade
- Sign
- Delineator drum
- Tubular markers
- Work area
- Flagger
- Sequencing arrow panel
- Vertical panels back to back

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

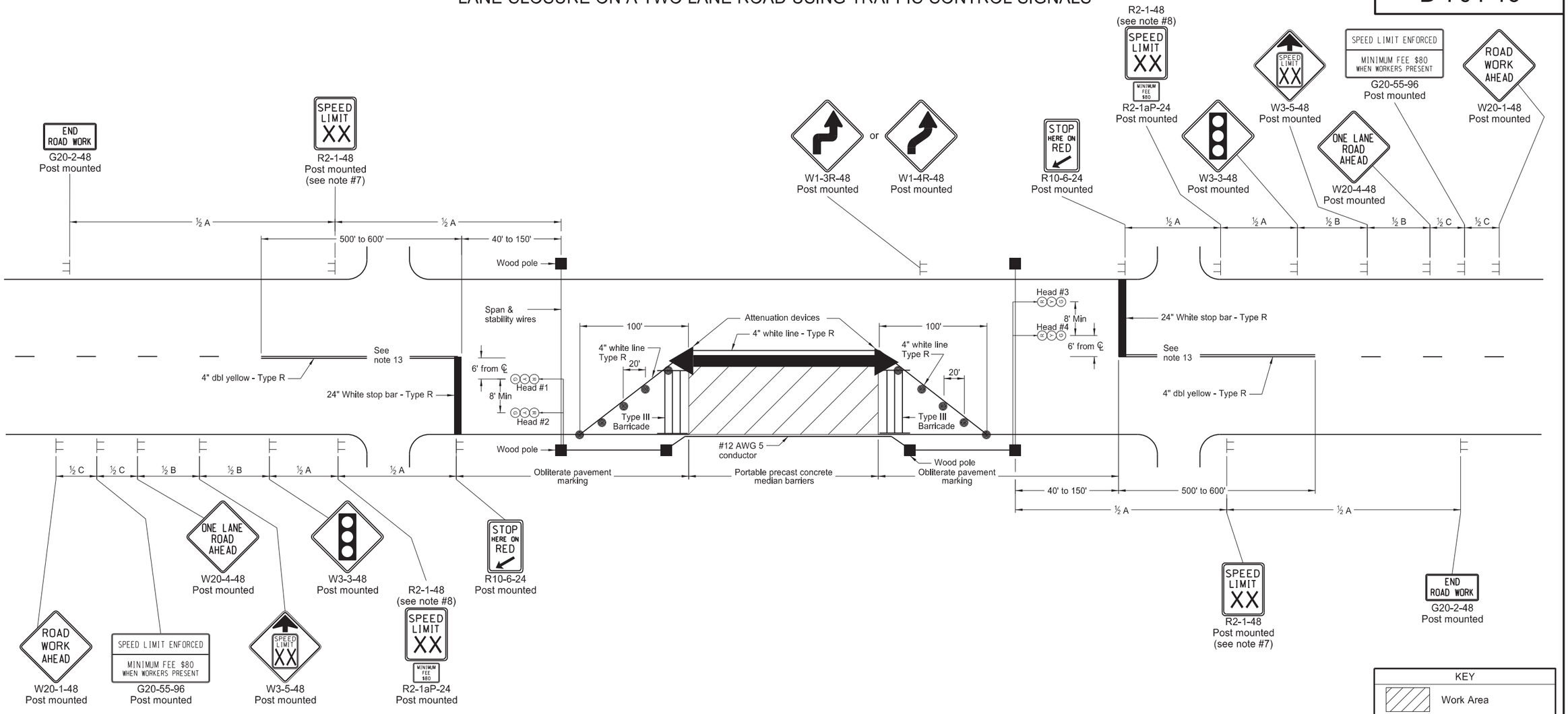
DATE	CHANGE
08-17-17	Updated Notes & Spd Limit signs
11-01-19	Sign, Notes, & Pvmt Mk updates
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

11/29/22

LANE CLOSURE ON A TWO LANE ROAD USING TRAFFIC CONTROL SIGNALS

D-704-16



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

Notes:

1. Span conductor overhead between poles except on bridges, where it may alternately be attached and supported by the bridge structure. When conductor is supported by the bridge structure, attach conductor to avoid interference with bridge construction. Attach conductor on either side of bridge as determined by field personnel.
2. Locate controller on a wood pole in the cable run between signal heads for through traffic movements.
3. The timing schedule is suggested trial setting. Check signals in operation frequently to obtain the most efficient timing schedule.
4. Place wood poles a minimum of 16 feet from edge of driving lane. Provide a minimum 16 to 19 feet clearance from the center line of the roadway to the bottom of traffic signal heads suspended over the roadway.
5. Place traffic signal heads with 12 inch red, yellow and green lenses and 5 inch louvered backplates.
6. See standard drawing "Span Wire Mounted Traffic Signals" for interim traffic construction details.
7. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
8. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 MPH.) Place the second speed limit sign at ½ B.
9. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
10. Cover existing speed limit signs within a reduced speed zone.
11. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
12. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
13. Continue double yellow centerline thru private drives.
14. Sign G20-55-96 is not required this layout is part of other traffic control that contains this sign, or if work is less than 15 days.
15. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
16. As an option, use solar powered signals instead of wood pole signal system.

KEY

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

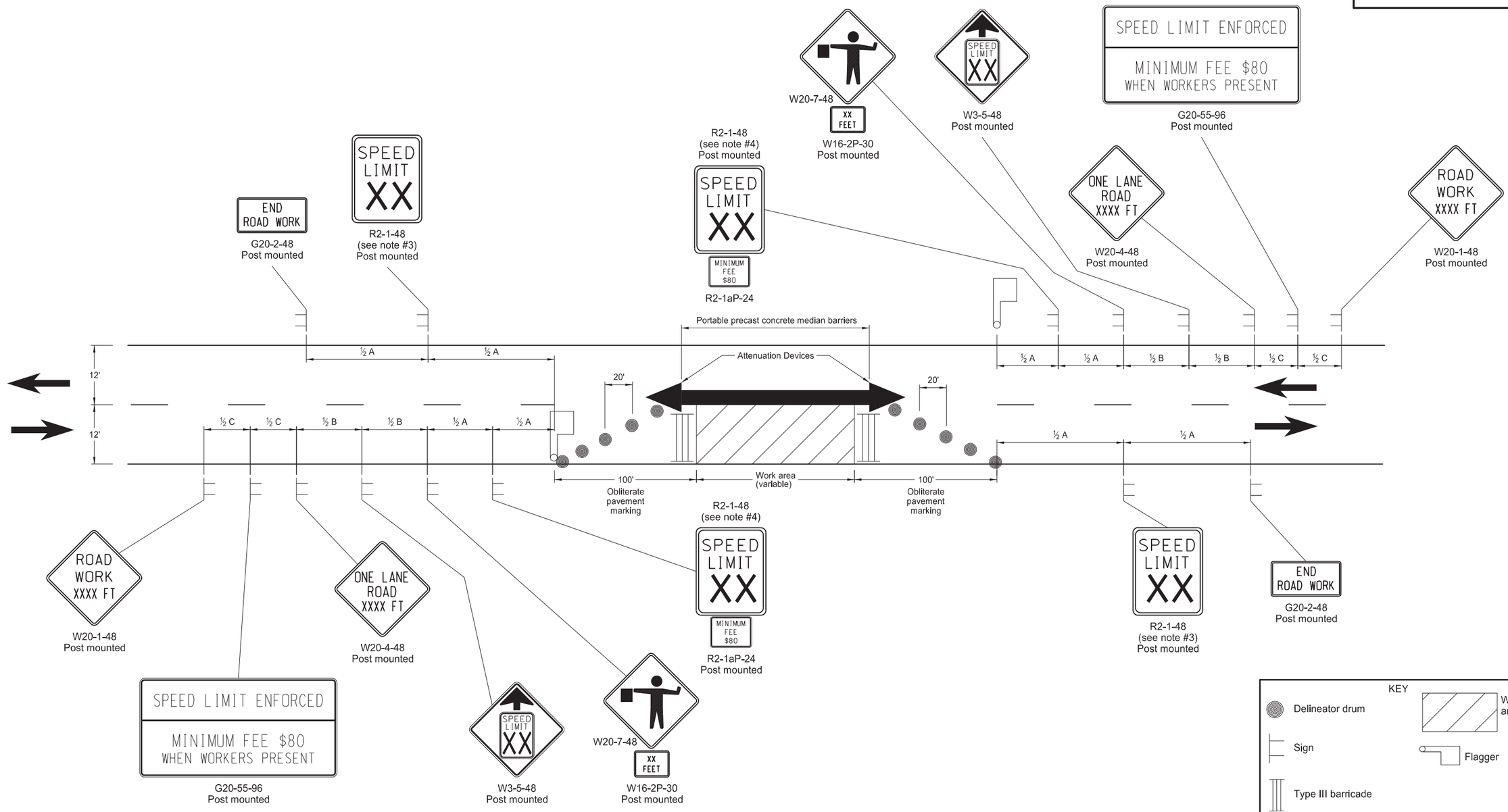
DATE	CHANGE
11-20-15	Revised Note 6 & Renumbered Minimum Fee plaque
08-17-17	Revised notes & added note
11-01-19	Revise sign #s & pvmt mk type
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work

KIRK J. HOFFE REGISTERED PROFESSIONAL PE-4683 ENGINEER NORTH DAKOTA

11/29/22

SIGN LAYOUT FOR ONE LANE CLOSURE TWO LANE ROADWAY

D-704-17



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

Notes:

1. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
2. Remove existing striping as required. Use back to back delineators when inslope is 4:1 or flatter and roadway alignment is visible to approaching vehicles. Place back to back vertical panels when roadways have steep slopes and alignment is not visible to approaching traffic.
3. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
4. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 MPH.) Place the second speed limit sign at ½B.
5. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
6. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
7. Cover existing speed limit signs within a reduced speed zone.
8. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or if work is less than 15 days.
9. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

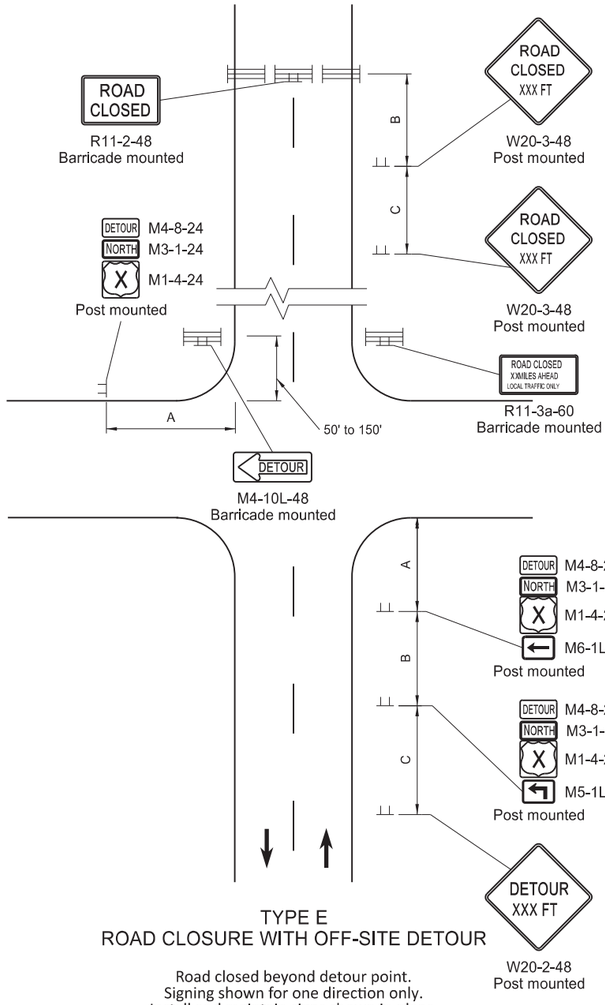
DATE	CHANGE
08-17-17	Note update & sign numbers
11-01-19	Removed signs & revised note
12-08-21	Switched order of Road Work XXXX and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

11/29/22

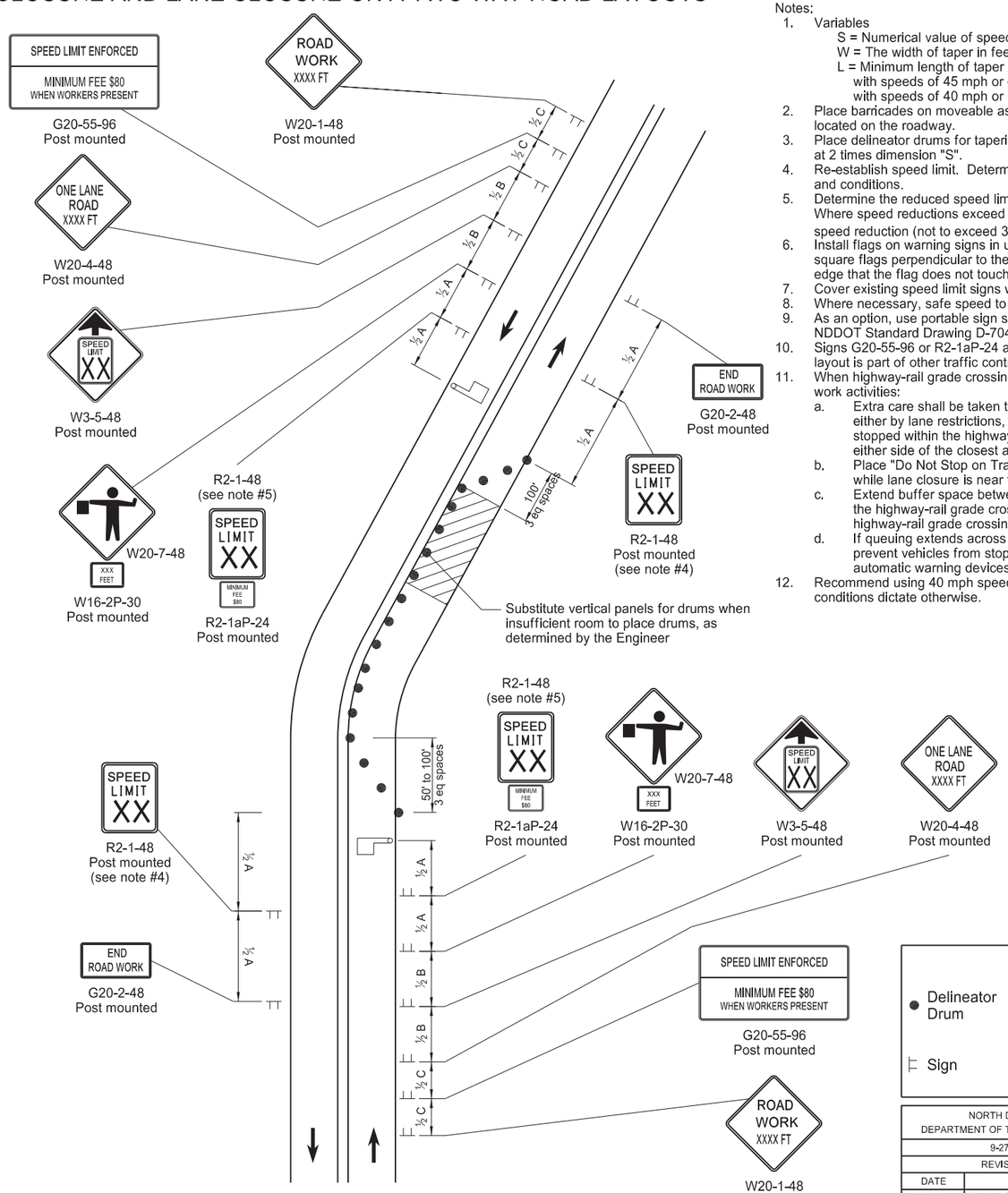
ROAD CLOSURE AND LANE CLOSURE ON A TWO WAY ROAD LAYOUTS

D-704-19



TYPE E
ROAD CLOSURE WITH OFF-SITE DETOUR

Road closed beyond detour point.
Signing shown for one direction only.
Install and maintain signs shown in plans.



TYPE F
LANE CLOSURE ON A TWO LANE ROAD USING FLAGGERS

Two lane highway with one lane closed.
Flagger at point visible to approaching traffic.

Notes:

1. Variables
   S = Numerical value of speed limit or 85th percentile.
   W = The width of taper in feet
   L = Minimum length of taper in feet. S x W for freeways, expressways, and roads with speeds of 45 mph or greater, or W x $S^2/60$ for urban, residential, and streets with speeds of 40 mph or less.
2. Place barricades on moveable assemblies and signs on portable assemblies when located on the roadway.
3. Place delineator drums for tapering traffic at 3 equal spaces and for tangents space them at 2 times dimension "S".
4. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
5. Determine the reduced speed limit based on the in place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place second speed limit sign at ½B.
6. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
7. Cover existing speed limit signs within a reduced speed zone.
8. Where necessary, safe speed to be determined by the Engineer.
9. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
10. Signs G20-55-96 or R2-1aP-24 are not required when pilot car operation is used, if this layout is part of other traffic control that contains this sign, or if work is less than 15 days.
11. When highway-rail grade crossings exist either within or in the vicinity of the roadway work activities:
    a. Extra care shall be taken to minimize the probability of conditions being created, either by lane restrictions, flagging or other operations, where vehicles might be stopped within the highway-rail grade crossing (considered as being 15 feet on either side of the closest and farthest rail.)
    b. Place "Do Not Stop on Tracks" sign (R8-8-24) near cross buck in each direction while lane closure is near tracks.
    c. Extend buffer space between work zone and lane closure transition upstream of the highway-rail grade crossing to prevent flagging queue from extending across highway-rail grade crossing.
    d. If queuing extends across highway-rail crossing, provide flagger at crossing to prevent vehicles from stopping within the crossing (even when automatic warning devices are in place.)
12. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

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

KEY

- Delineator Drum
- Type III Barricade
- Flagger
- Sign
- Work/Hazard Area

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

DATE	CHANGE
03-13-14	Revised Sign Cell "ROAD WORK XXX FT"
08-17-17	Update notes & sign numbers
11-01-19	Revised signs, sign #s, & notes
12-08-21	Switched order of Road Work XXX and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work

KIRK J. HOFF
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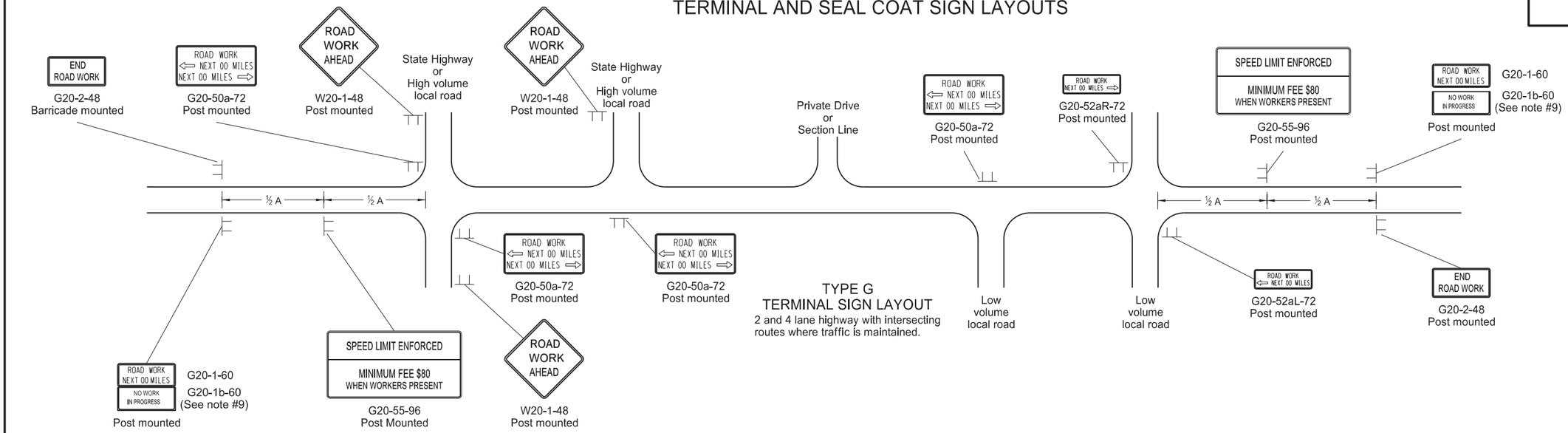
NORTH DAKOTA

11/29/22

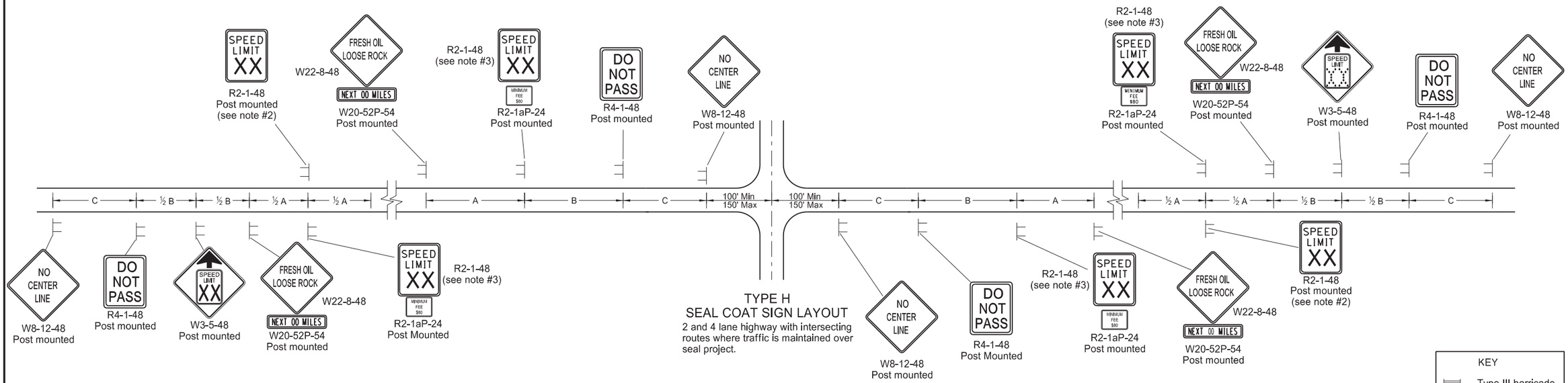
TERMINAL AND SEAL COAT SIGN LAYOUTS

D-704-20



TYPE G
TERMINAL SIGN LAYOUT

2 and 4 lane highway with intersecting routes where traffic is maintained.



TYPE H
SEAL COAT SIGN LAYOUT

2 and 4 lane highway with intersecting routes where traffic is maintained over seal project.

KEY
- Type III barricade
- Sign

Notes:
1. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
2. Determine the exact speed limit in the field, based on location and conditions.
3. Determine the reduced speed limit based on the in place speed limit before construction. Where speed limit reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 MPH.) Place the second speed limit sign at ½ B.
4. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
5. Cover existing speed limit signs within a reduced speed zone.
6. On seal coat projects, place signs R2-1-48, R2-1aP-24, R4-1-48, W22-8-48 and W20-52P-54 after all important intersections and at five mile intervals. Place sign W8-12-48 after all important intersections and at 2 mile intervals until short term center line pavement marking is placed.
7. As an option, use portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Drawing D-704-14.
8. Cover or remove speed limit signs from layout Type H when loose aggregate is removed.
9. Install sign G20-1b-60 when work is suspended for winter.
10. Use other traffic control layouts in immediate work areas. Place sign R2-1aP-24 below speed limit signs in reduced speed limit work areas.
11. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.
12. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

DATE	CHANGE
08-17-17	Updated notes & sign numbers
11-01-19	Updated note & sign
12-08-21	Switched order of Road Work and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work

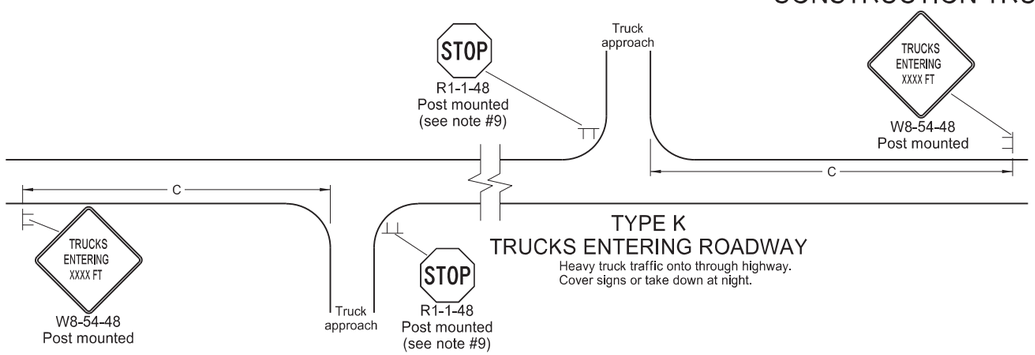
KIRK J. HOFF REGISTERED PROFESSIONAL PE-4683 ENGINEER NORTH DAKOTA

11/29/22

CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

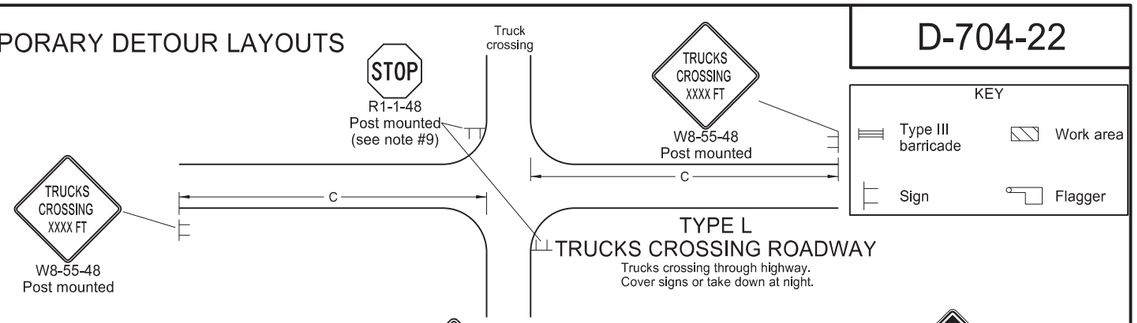
D-704-22

KEY
- Type III barricade
- Work area
- Sign
- Flagger



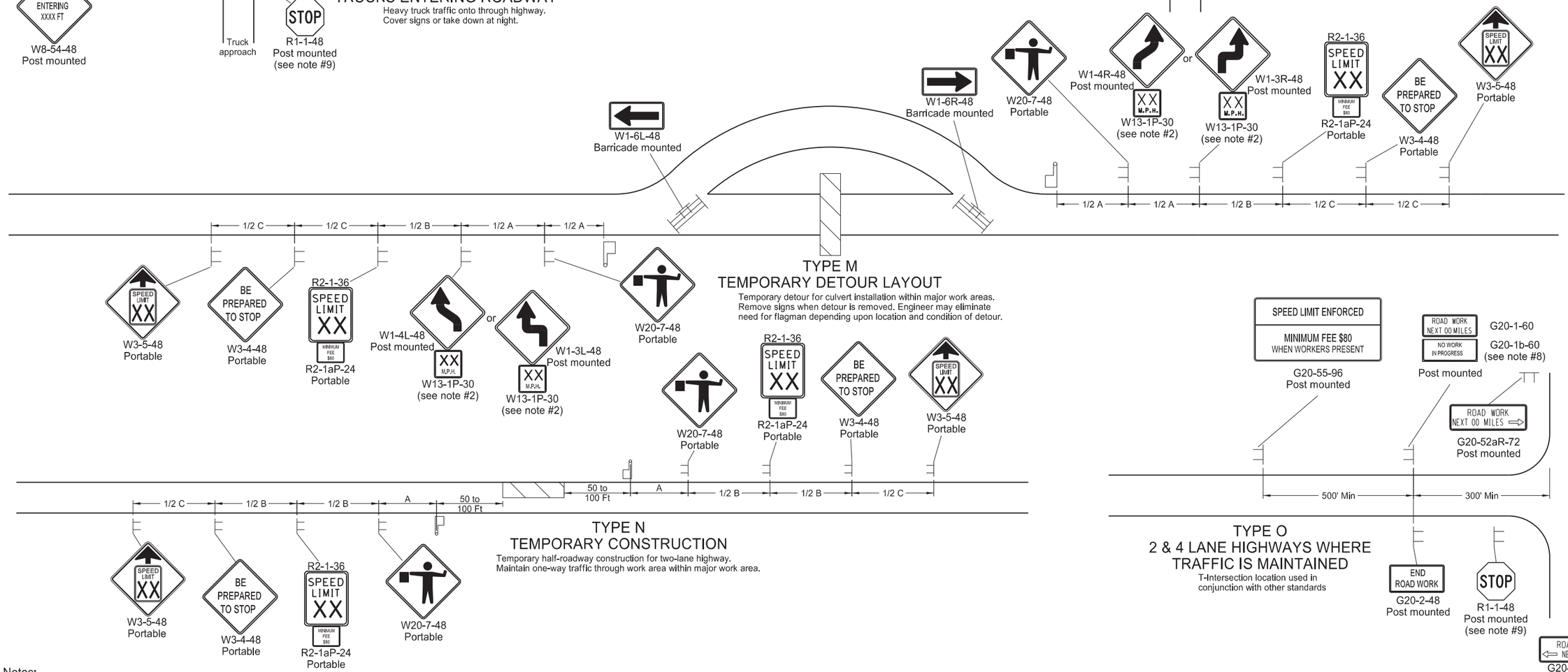
TYPE K
TRUCKS ENTERING ROADWAY

Heavy truck traffic onto through highway.
Cover signs or take down at night.



TYPE L
TRUCKS CROSSING ROADWAY

Trucks crossing through highway.
Cover signs or take down at night.



TYPE M
TEMPORARY DETOUR LAYOUT

Temporary detour for culvert installation within major work areas.
Remove signs when detour is removed. Engineer may eliminate need for flagman depending upon location and condition of detour.

TYPE N
TEMPORARY CONSTRUCTION

Temporary half-roadway construction for two-lane highway.
Maintain one-way traffic through work area within major work areas.

TYPE O
2 & 4 LANE HIGHWAYS WHERE TRAFFIC IS MAINTAINED

T-Intersection location used in conjunction with other standards

Notes:

1. Place barricades on a moveable assemblies and signs on portable assemblies when located on roadway.
2. Where necessary, safe speed to be determined by the Engineer.
3. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½ B.
4. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
5. Cover existing speed limit signs within a reduced speed zone.
6. Covered (when approved by engineer) or obliterated pavement marking measured as Obliteration of Pavement Marking.
7. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
8. Install sign G20-1b-60 when work is suspended for winter.
9. If existing stop sign is in place, a 48" stop sign is not required.
10. Sign G20-55-96 is not required if layout is part of other traffic control that contains this sign, or if work is less than 15 days.
11. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

ADVANCE WARNING SIGN SPACING

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

DATE	CHANGE
08-17-17	Update notes & sign numbers
11-01-19	Revised sign numbers & note 7
12-09-21	Added Speed Limit Enforced and Dollars At Work signs
11-29-22	Removed Dollars At Work

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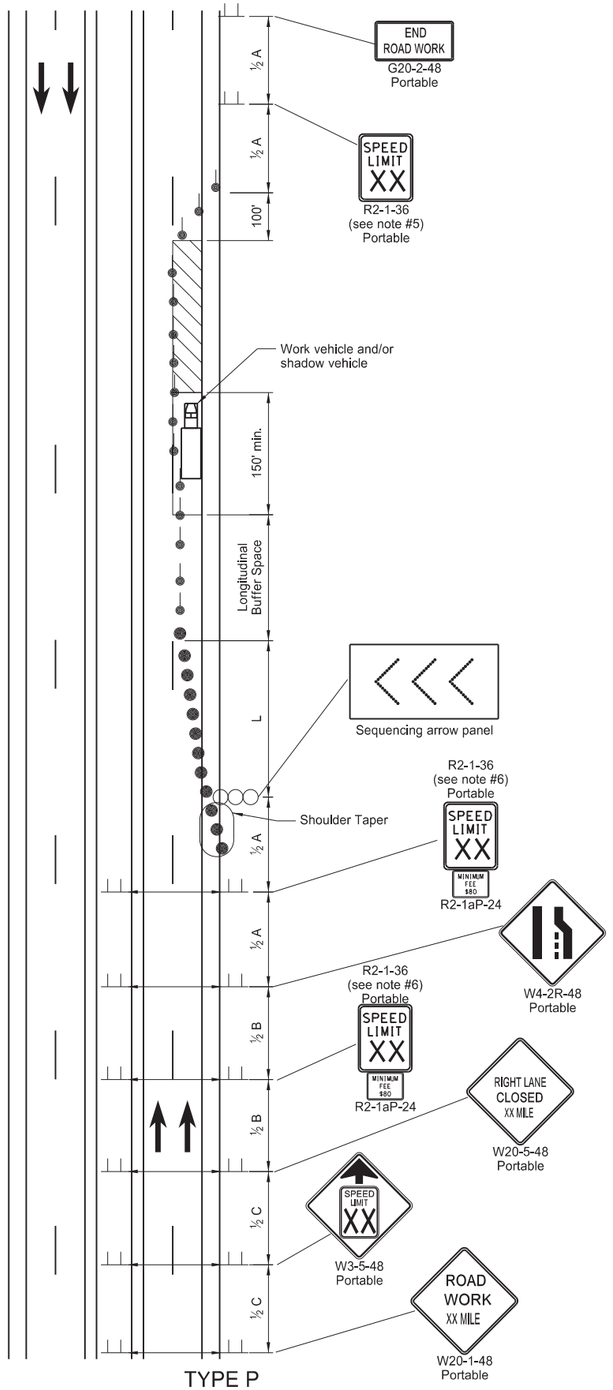
NORTH DAKOTA

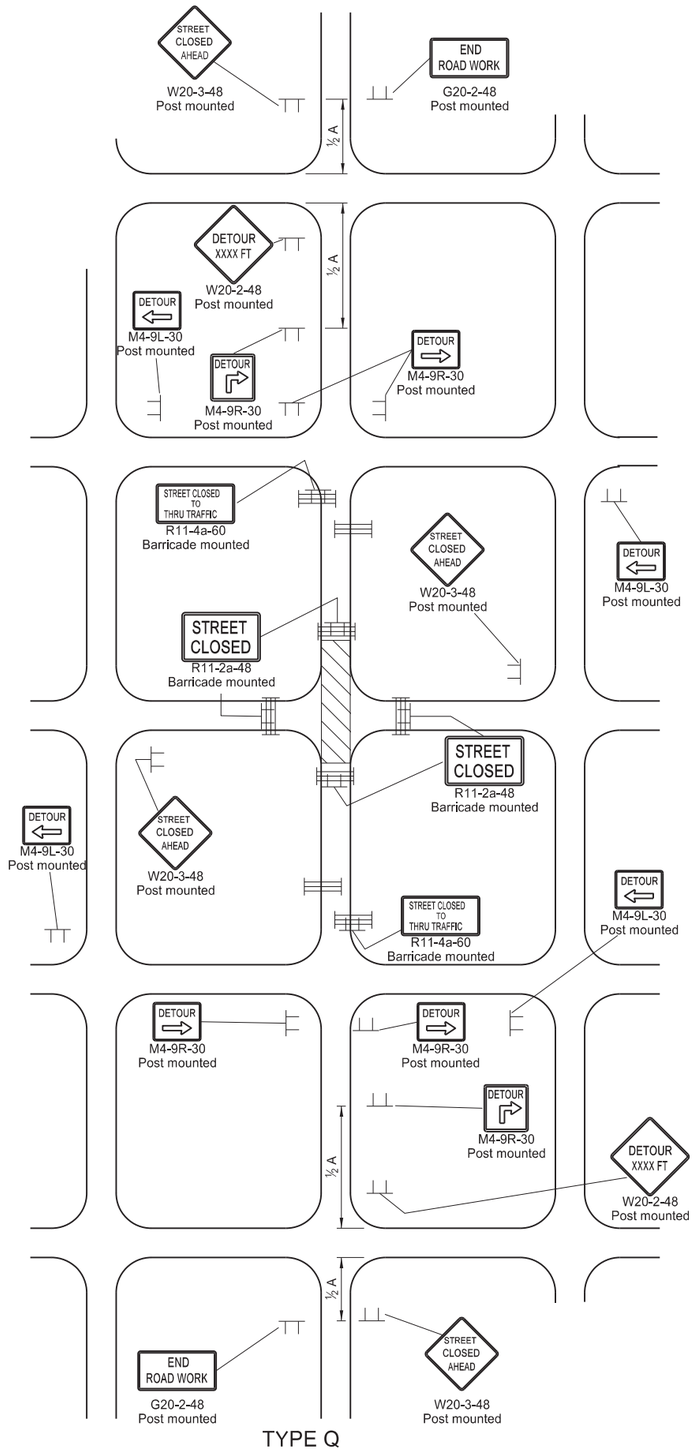
11/29/22

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

D-704-23



TYPE P
STATIONARY LANE CLOSURE ON A DIVIDED HIGHWAY
4 lane divided roadway where ½ of roadway is closed.
Short-term (more than 1 hour within a single daylight period.)



TYPE Q
DETOUR FOR A CLOSED STREET
Where city streets are used for detouring traffic.
Urban projects do not require the G20-55-96 and R2-1aP-24 signs.

Notes:

1. Variables
   S = Numerical value of speed limit or 85th percentile.
   W = The width of taper in feet
   L = Minimum length of taper, S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or
   W x S^2 /60 for urban, residential, and other streets with speeds of 40 mph or less.
2. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
3. Space delineator drums for tapering traffic at dimension "S". Space delineator drums or tubular markers for tangents at 2 times "S".
4. Place Sequencing Arrow Panels at the beginning of taper. Where shoulder width does not provide sufficient room, move panel closer to the work area and place on roadway surface.
   Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
   Use Type B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
   Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
5. Re-established speed limit. Determine exact speed limit in the field, dependent on location and conditions.
6. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½ B.
7. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
8. Cover existing speed limit signs within a reduced speed zone.
9. Covered (when approved by engineer) or obliterated payment marking measured as as Obliteration of Pavement Marking.
10. Change intersection control on detour for Type Q when determined necessary by the engineer.
11. Engineer to determine safe speed where necessary. When parking is present, place signs so they are entirely visible above parked vehicles or at the edge of the parking area so they are visible to oncoming traffic.
12. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
13. Recommend using 40 mph speed limit in vicinity of workers for Layout Type P, unless location and conditions dictate otherwise.

KEY

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

ADVANCE WARNING SIGN SPACING

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

Longitudinal Buffer Space

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

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

DATE	CHANGE
08-17-17	Removed speed limit signs, & updated notes & sign numbers
11-01-19	Revised sign numbers & note
12-08-21	Added Dollars At Work sign
11-29-22	Removed Dollars At Work

KIRK J. HOFF
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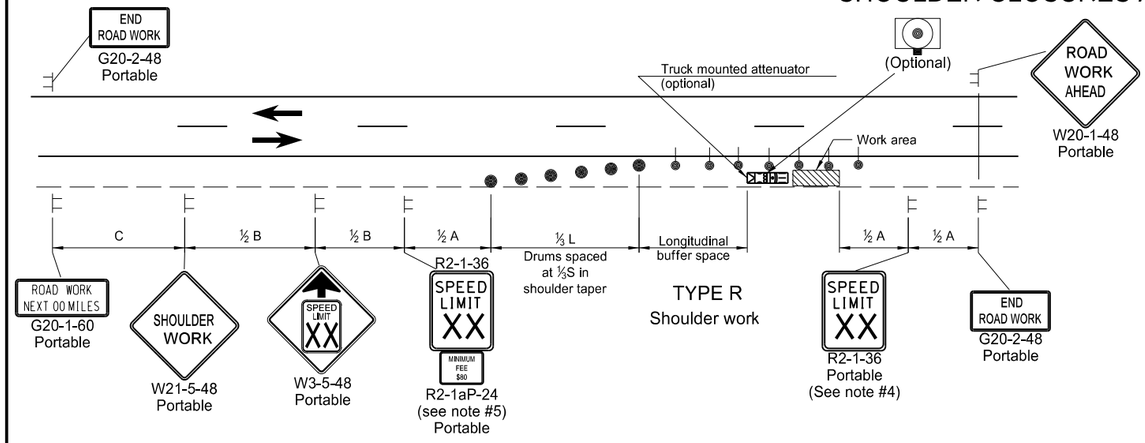
NORTH DAKOTA

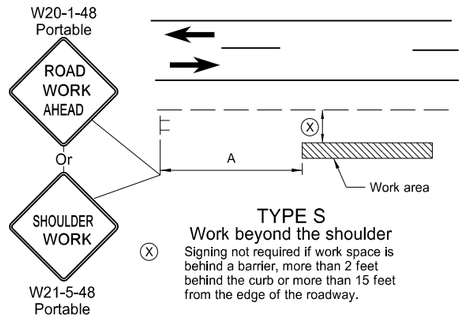
11/29/22

SHOULDER CLOSURES AND BRIDGE PAINTING LAYOUTS

D-704-24

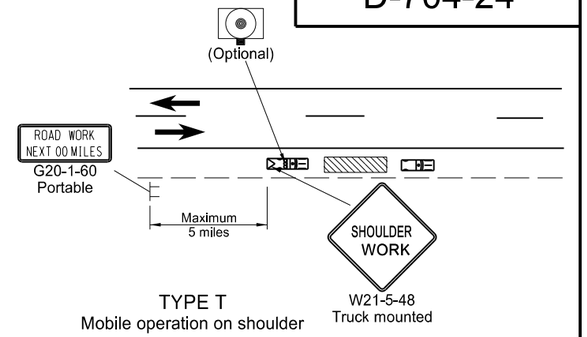


TYPE R
Shoulder work

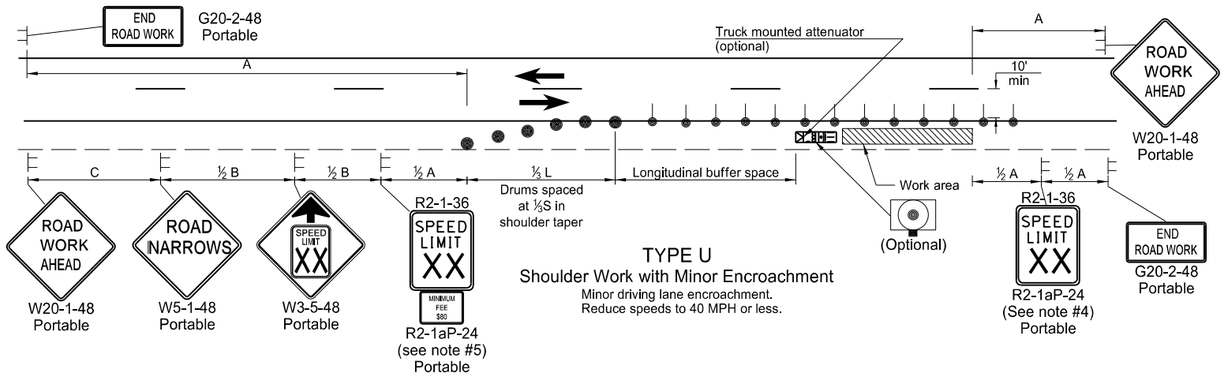


TYPE S
Work beyond the shoulder

Signing not required if work space is behind a barrier, more than 2 feet behind the curb or more than 15 feet from the edge of the roadway.

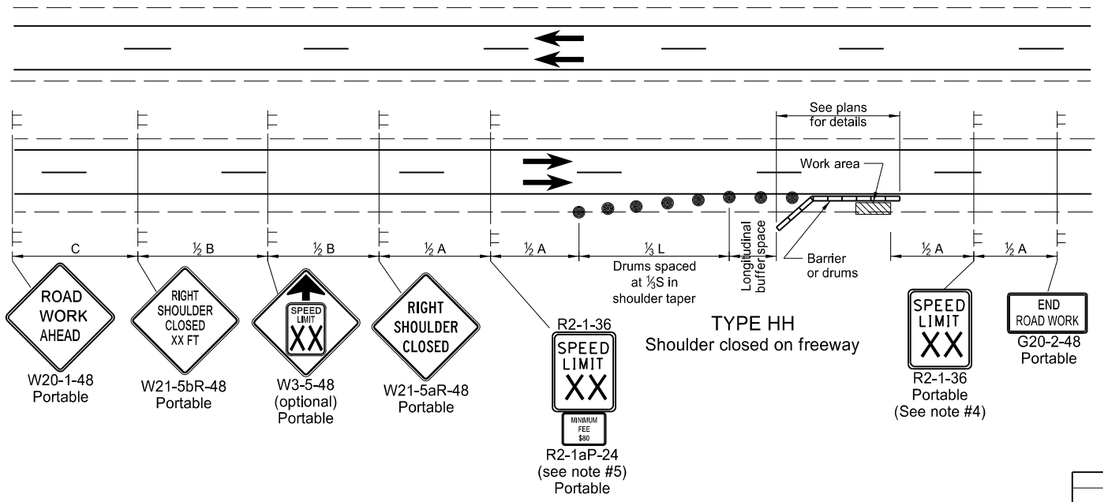


TYPE T
Mobile operation on shoulder

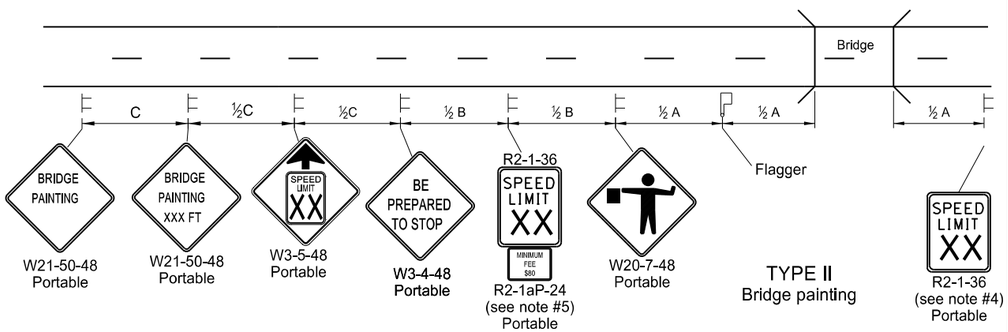


TYPE U
Shoulder Work with Minor Encroachment

Minor driving lane encroachment.
Reduce speeds to 40 MPH or less.



TYPE HH
Shoulder closed on freeway



TYPE II
Bridge painting

Notes
1. Variables
   S = Numerical value of speed limit or 85th percentile.
   W = The width of the taper in feet.
   L = Minimum length of taper, S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x S^2 /60 for urban, residential, and other streets with speeds of 40 mph or less.
2. Space delineator drums for tapering traffic at dimension "S". Space delineator drums or tubular markers for tangents at 2 times "S".
3. Sequencing Arrow Panels
   Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
   UseType B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
   Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
4. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
5. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½B.
6. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
7. Cover existing speed limit signs within a reduced speed zone.
8. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
9. Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

KEY

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

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

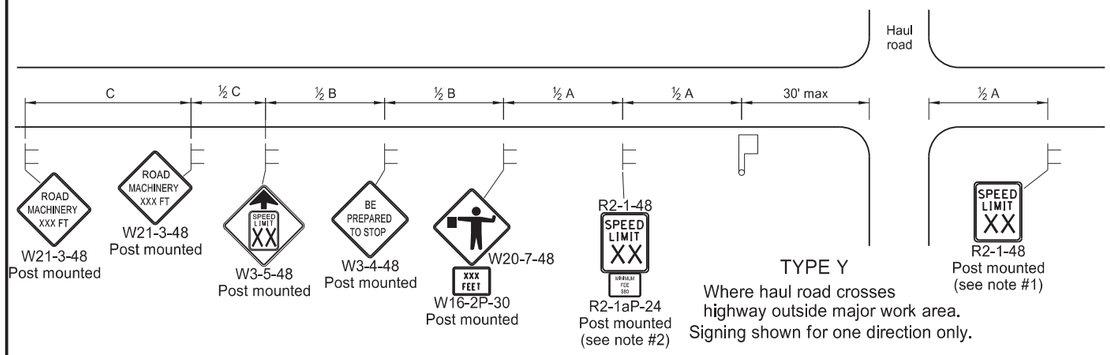
REVISIONS

DATE	CHANGE
8-17-17	Updated notes & revised signs
11-01-19	Revised drum spacing & signs nos.

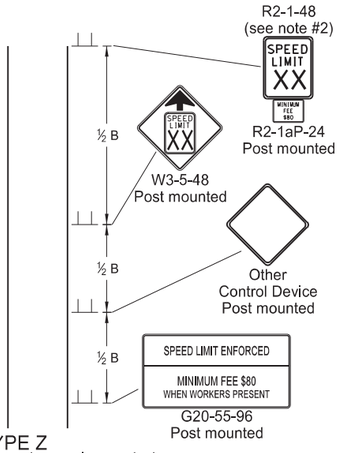
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

MISCELLANEOUS SIGN LAYOUTS

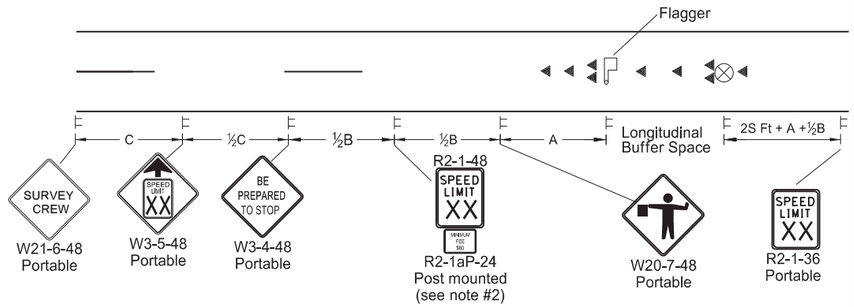
D-704-26



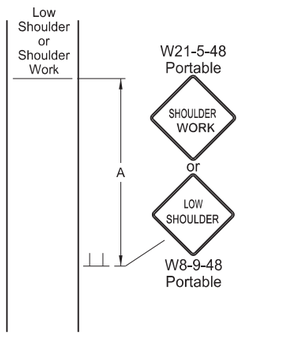
TYPE Y
Where haul road crosses highway outside major work area.
Signing shown for one direction only.



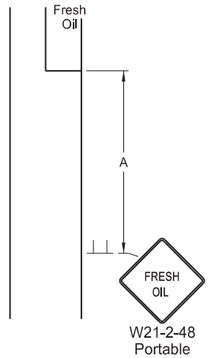
TYPE Z
Where speed zone is needed
Signing shown for one direction only.



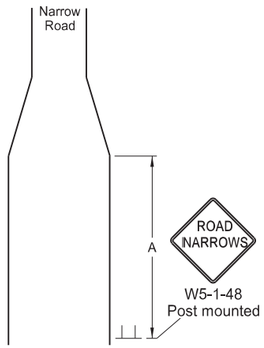
TYPE AA
Where survey crew is used
Signing shown for one direction only.



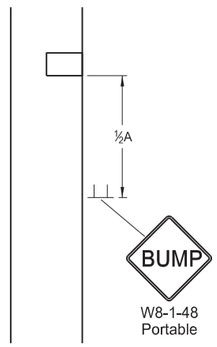
TYPE BB
Within major work area where sign conditions exist



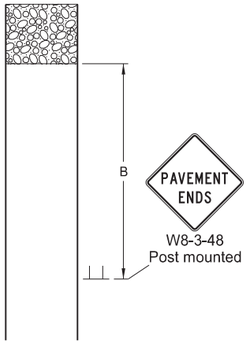
TYPE CC
Where sign conditions exist



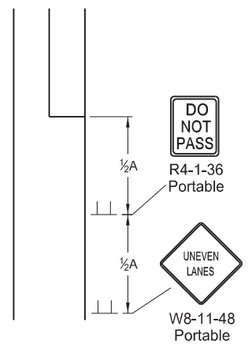
TYPE DD
Where sign conditions exist



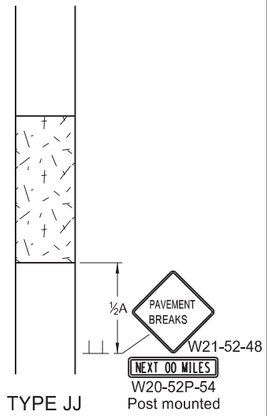
TYPE EE
Where sign conditions exist



TYPE FF
Where sign conditions exist
Signing shown for one direction only.



TYPE GG
Where elevation difference exists between lanes

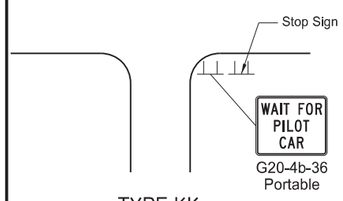


TYPE JJ
For break in pavement.
Install signs when conditions exist and remove when not applicable.
Signing shown for one direction only.

KEY

Flagger	Sign
Cones	Survey Equipment

S = Numerical value of speed limit or 85th percentile.



TYPE KK
At major intersections within pilot car control area

Notes
1. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
2. Determine reduced speed limit based on in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½B.
3. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
4. Cover existing speed limit signs within reduced speed zones.
5. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
6. Sign G20-55-96 is not required if this standard is part of other traffic control layouts, or work is less than 15 days.
7. When pilot car operation is used, place sign G20-4b-36 "Wait For Pilot Car" at major intersections within pilot car control area.
8. Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
9. Layouts shown for one direction only.

ADVANCE WARNING SIGN SPACING

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

Longitudinal Buffer Space

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

* Posted speed, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

DATE	CHANGE
8-17-17	Added speed limit signs. Updated notes & sign numbers.
11-01-19	Revised note 5 & sign numbers.
2-23-23	Revised distance & removed signs.

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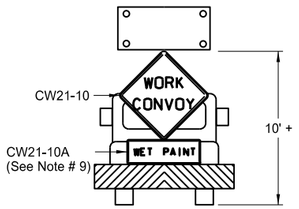
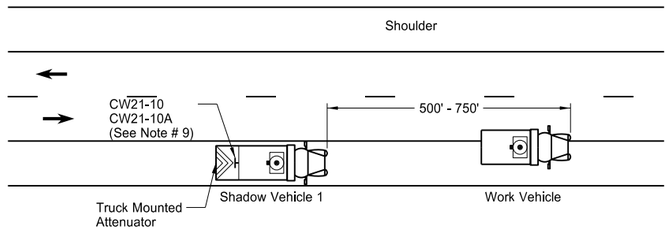
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

02/23/23

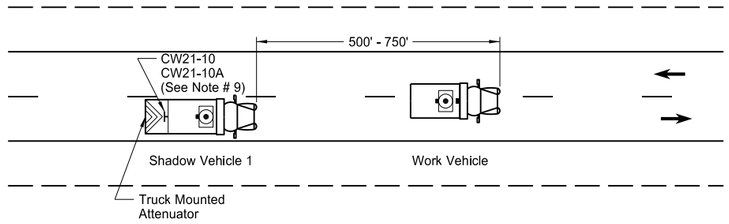
MOBILE OPERATION
(PAVEMENT MARKING)



Typical Shadow Vehicle 1
Two-Way Roaday

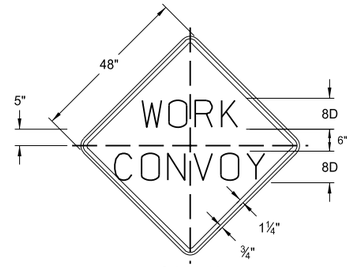


Two-Way Roadway with Paved Shoulders

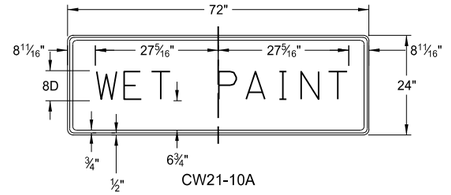


Two-Way Roadway without Paved Shoulders

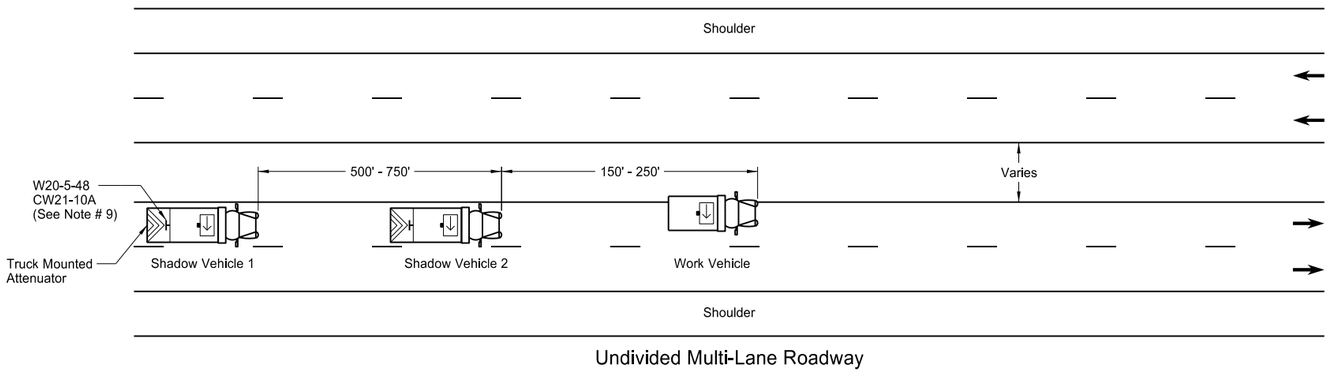
Sign Details



CW21-10

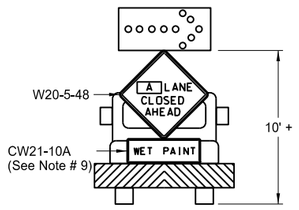


CW21-10A



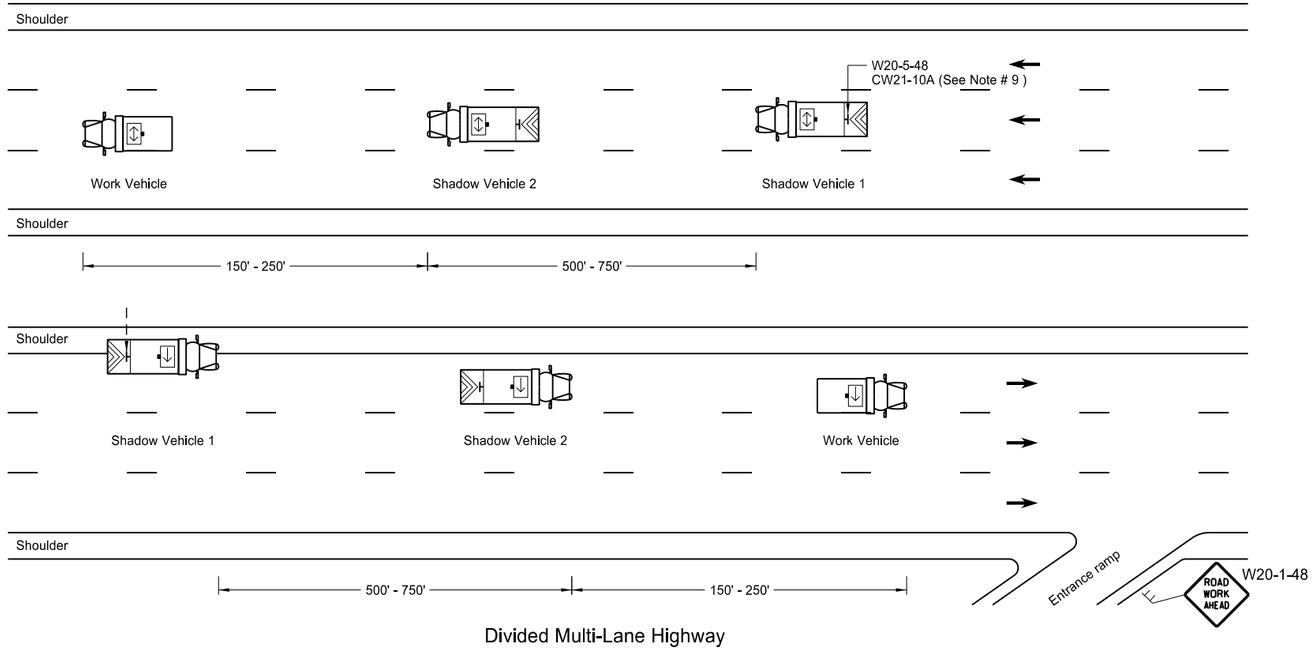
Undivided Multi-Lane Roadway

Notes
1. Use additional vehicles you choose to be in the convoy with truck mounted attenuators, at your own expense.
2. Display yellow rotating beacons or stobe lights on shadow and work vehicles, unless otherwise stated in the plans.
3. Use Type B or Type C flashing arrow panels controlled from inside the vehicle.
4. Provide each vehicle with two-way electronic communication capability.
5. Move shadow vehicle 1 first to shadow other convoy vehicles when convoy changes lane.
6. Vary vehicle spacing between shadow vehicle 1 and shadow vehicle 2 based on sight distance restrictions. Motorists approaching the work convoy need to see trail vehicle in time to slow down and/or change lanes as they approach shadow vehicle.
7. Sign Colors
   Letters = Black
   Border = Black
   Background = Orange
8. As an option, use shadow vehicle 2 the paint tender vehicle.
9. Use sign CW21-10A only during painting operation.
10. Pull over work and shadow vehicles periodically to allow motor vehicle traffic to pass on two lane - two way roadways.



Typical Shadow Vehicle 1 & 2
Multi-Lane Highways

A = Left Right Center



Divided Multi-Lane Highway

KEY

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
6-18-14	Removed shadow vehicle 2 on two lane roadways
9-27-17	Updated to active voice
11-08-19	Changed Standard Heading

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/08/19 and the original document is stored at the North Dakota Department of Transportation

D-704-33

Two-Lane Roadway Portable Rumble Strips

KEY

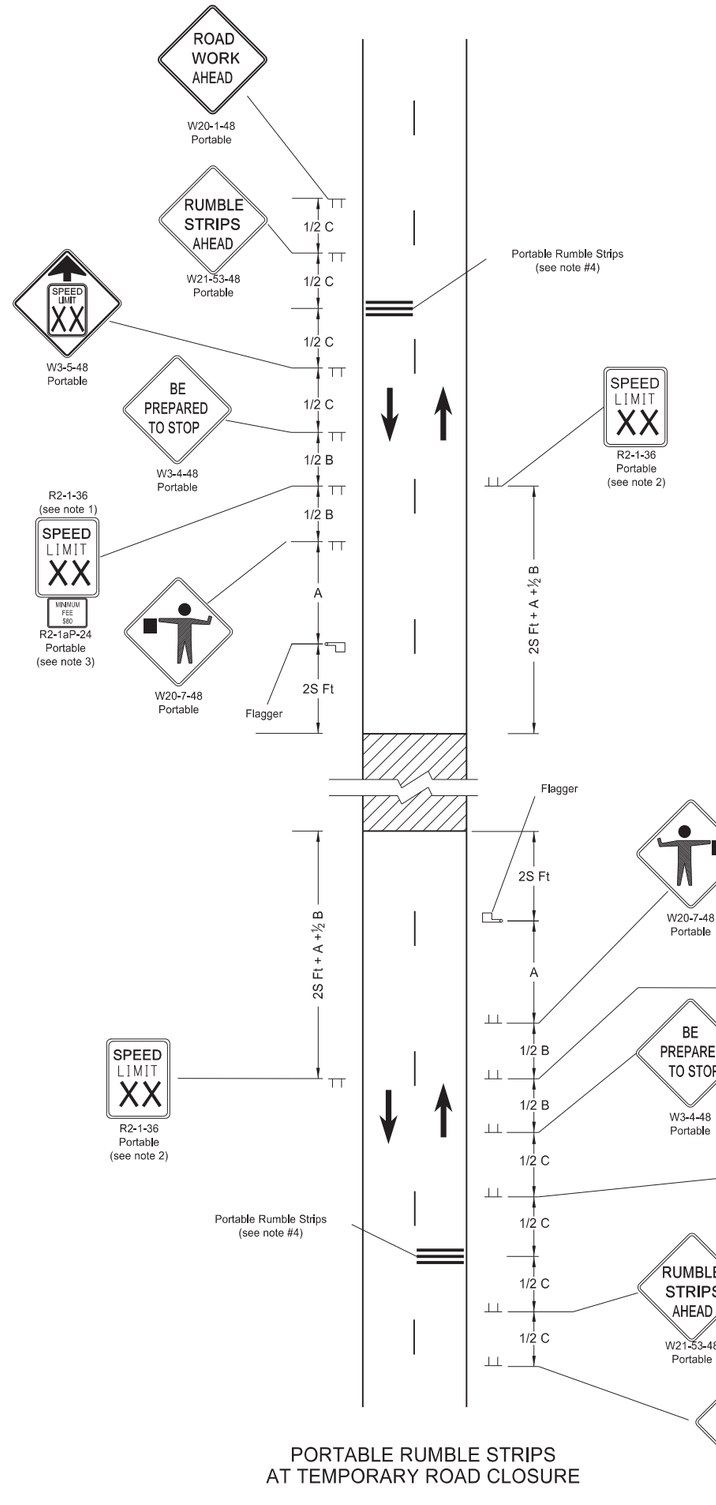
Work area

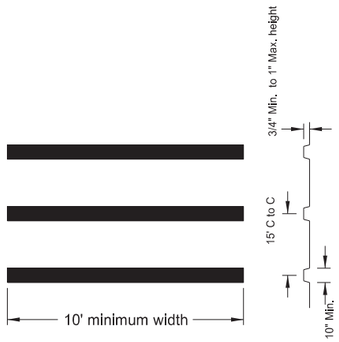
Flagger

Sign

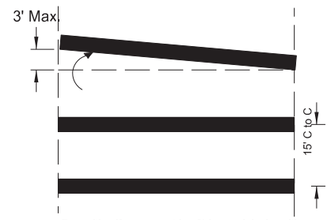
S = Numerical value of speed limit or 85th percentile.

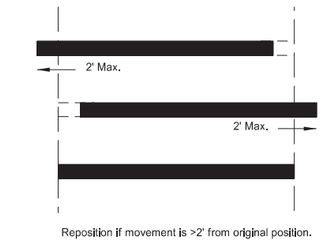
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - High Speed (over 45 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720

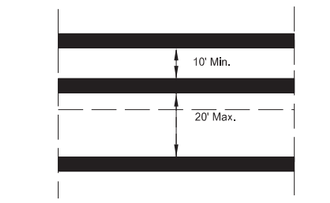




PORTABLE RUMBLE STRIPS ARRAY DETAIL







PORTABLE RUMBLE STRIPS ARRAY
TYPES OF MOVEMENT AND MAXIMUM ALLOWANCES

Notes:

1. Determine speed in the field based on location and conditions.
2. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
3. Sign R2-1aP-24 is not required when pilot car operation is used.
4. Do not use rumble strips on a non paved surface or in a pre-construction speed zone of 45 mph or less.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
02-22-22	
REVISIONS	
DATE	CHANGE
03/07/23	Use changed to min 45 mph.

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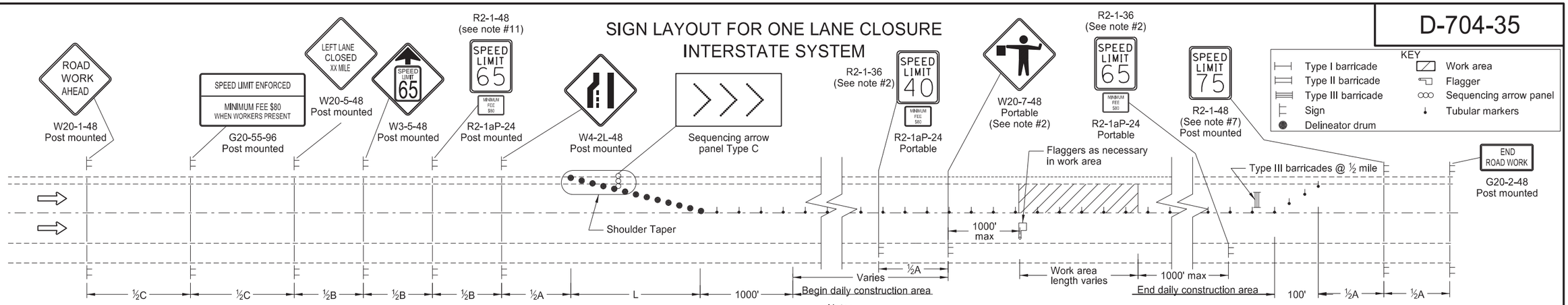
03/07/23

D-704-35

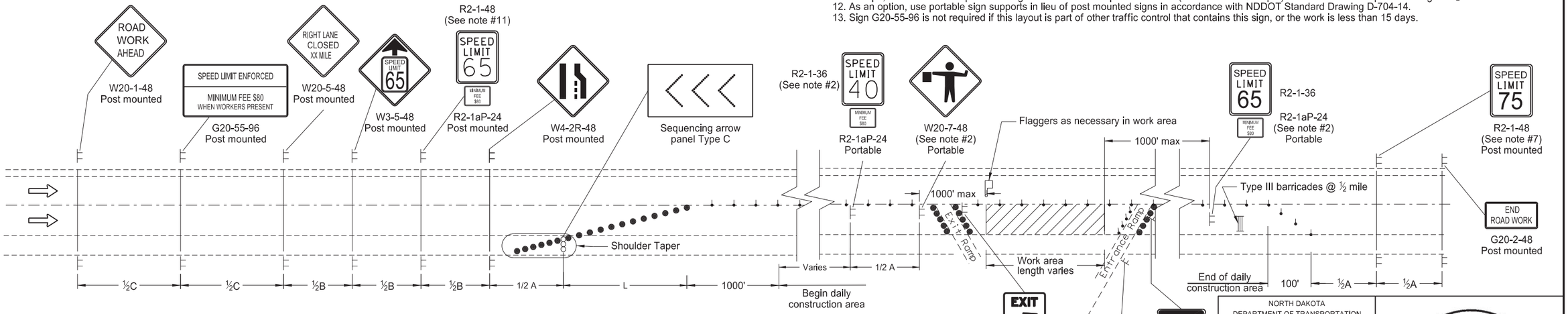
SIGN LAYOUT FOR ONE LANE CLOSURE
INTERSTATE SYSTEM



LEFT LANE CLOSED
WORKERS IN WORK AREA

ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min (ft)		
	A	B	C
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. Install advance signs for flagging when flaggers are flagging.
2. Move the advanced flagger sign and the speed limit signs as the work area moves through the construction zone. When the work area is not visible from the flagger, move the flagger station so the work area is visible. Space the 40 mph speed limit sign at ½A in advance of the flagger sign and move the 65 mph speed limit sign. Cover or remove the 40 mph speed limit and Minimum Fee $80 signs and the 65 mph speed limit sign upon completion of the work day or when workers are not present.
3. RAMPS: When the work area encompasses an entrance ramp, install a 40 mph speed limit sign on the ramp and cover any existing yield sign. Install new yield sign as necessary. Remove the ramp speed limit sign when the main line 40 mph speed zone is moved past the ramp.
4. Variables:
   S=Numerical value of speed limit or 85th percentile
   W=The width of taper.
   L=Minimum length of taper, or SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater, or
   WxSxS/60 for urban, residential, and other streets with speeds of 40 mph or less.
5. Space delineator drums for tapering traffic at the dimension "S". Space tubular markers used for tangents at 2 times dimension "S".
6. Place sequencing arrow panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface.
   Use Type C on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater).
7. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
8. Cover existing speed limit signs within a reduced speed zone.
9. Upon approval, the Engineer will measure obliterated or covered pavement marking as Obliteration of Pavement Marking.
10. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the diamond sign, and at such a distance above the edge that the flag does not touch the sign when limp.
11. Determine the reduced speed limit dependent on the in place speed limit before construction. When speed limits are to be reduced more than 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½B.
12. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
13. Sign G20-55-96 is not required if this layout is part of other traffic control that contains this sign, or the work is less than 15 days.



RIGHT LANE CLOSED
WORKERS IN WORK AREA

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

9-7-2012

REVISIONS

DATE	CHANGE
06-23-14	Revised Note 12
03-15-16	Removed Do Not Pass signs & updated notes
08-17-17	Moved speed signs & added note
10-17-17	Corrected spelling of "shoulder"
11-01-19	Revised tubular Mrkrs symbols
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced, added Dollars At Work, & removed table
11-29-22	Removed Dollars At Work

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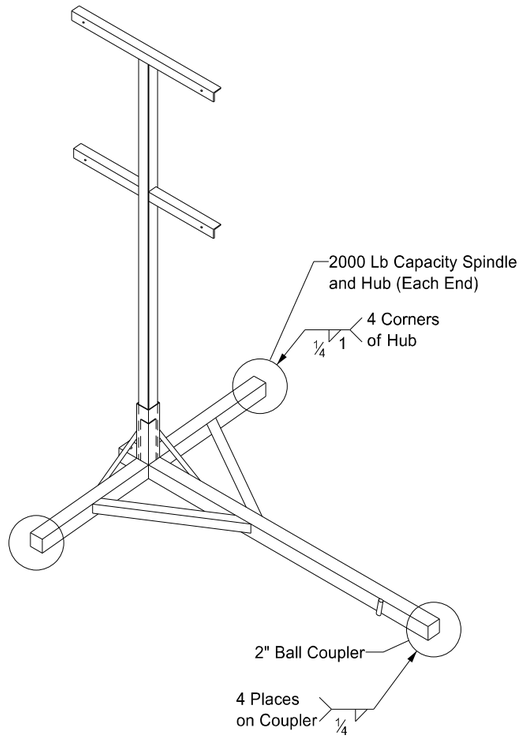
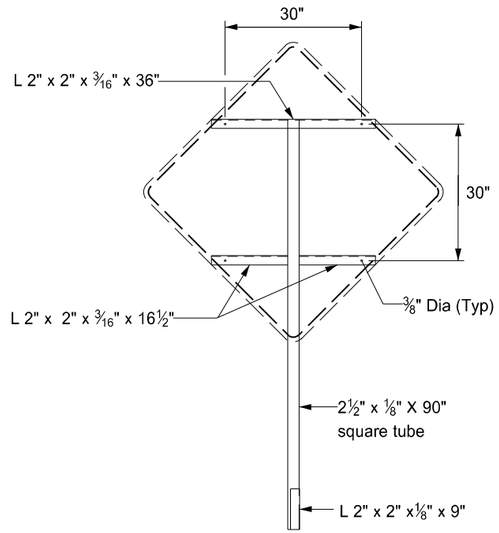
11/29/22

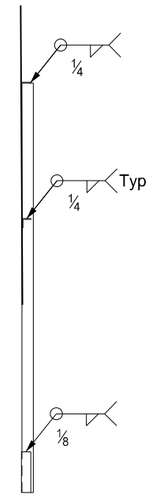
PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50





FRONT

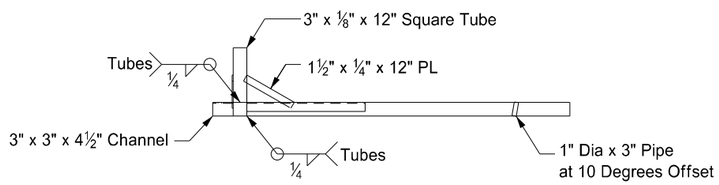


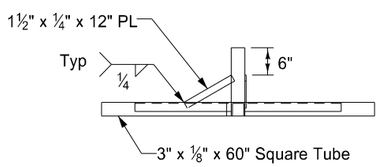
RIGHT

SIGN SUPPORT

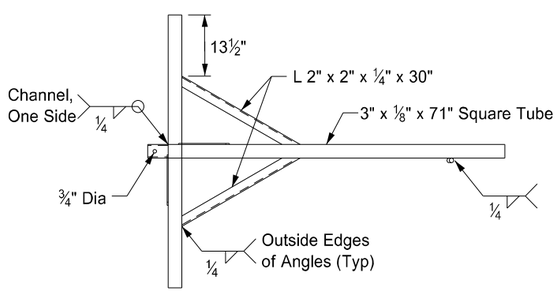
Notes:

1. Maximum 250 pound weight of assembly.
2. Use a 14" wheel and tire.
3. Use no automotive and equipment axle assemblies for trailer-mounted sign supports.
4. Other NCHRP 350 or MASH crash tested assemblies are acceptable.





RIGHT



TOP

TRAILER

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE
12/02/2020	Updated Note to active voice.

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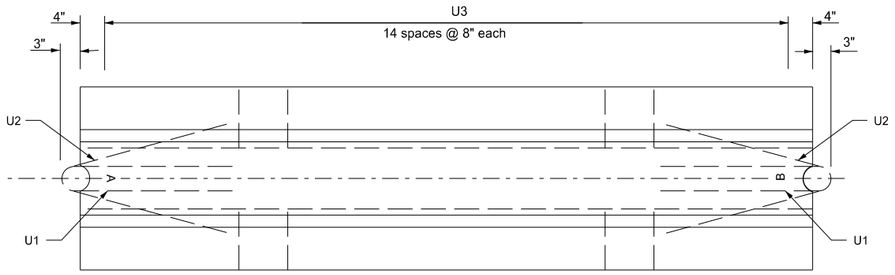
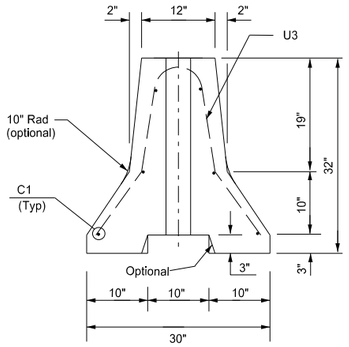
Kirk J Hoff
12 02 2020

PORTABLE PRECAST CONCRETE MEDIAN BARRIER
(TEMPORARY USAGE)

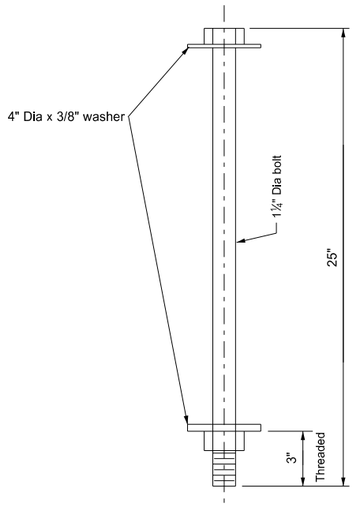
D-704-51



Plan View



End View

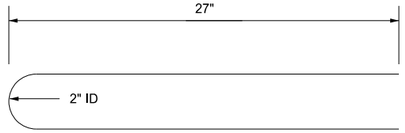


Connecting Bolt Detail

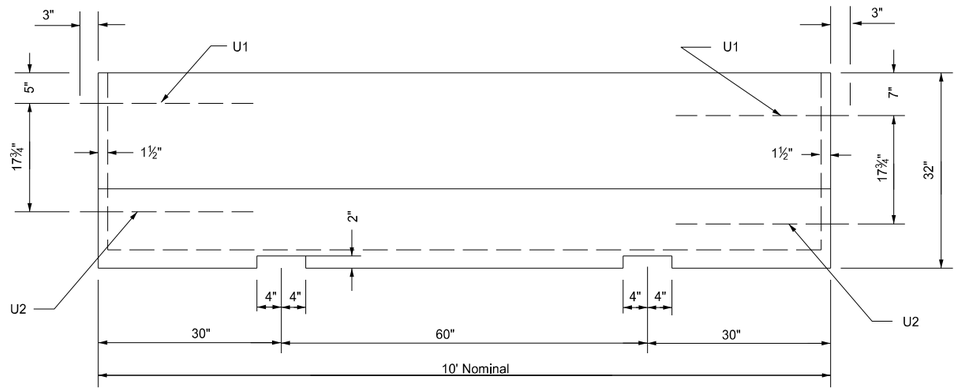
(One per 10 Ft section)

Notes:

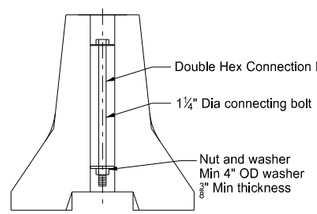
1. Galvanize all exposed hardware as per ASTM A153, except for the loop inserts.
2. Use AAE-3 Concrete.
3. Provide steel in accordance with Section 612 of NDDOT Standard Specifications.
4. Imprint barrier ends A and B as shown with 4 inch letters. Field match A end with B end.
5. Place barrier markers at the center of the barrier at 20' centers.
6. Connect barrier sections with 1 ¼" Dia A-307 double hex connecting bolt. Maintain bottom nut and washer connection for duration of barrier installation.
7. Place barrier to minimize openings between individual sections.



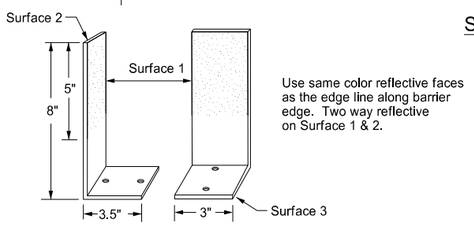
U1 Bar Detail



Side View

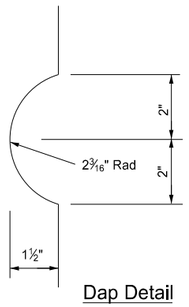


Bolt Connection Detail

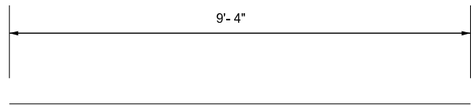


Use same color reflective faces as the edge line along barrier edge. Two way reflective on Surface 1 & 2.

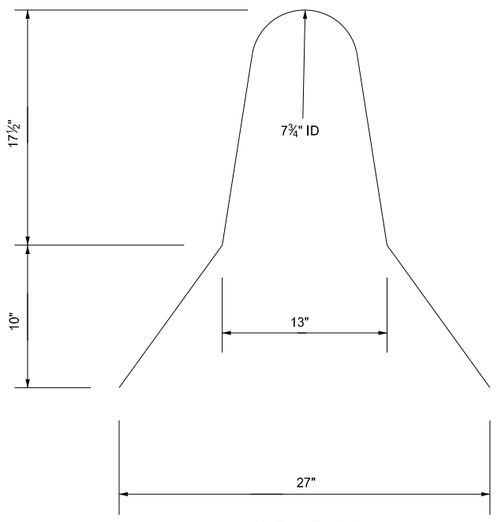
Barrier Marker Detail



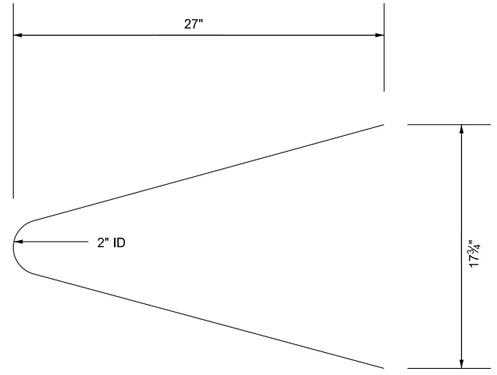
Dap Detail



C1 Bar Detail



U3 Bar Detail



U2 Bar Detail

Marker Body
Use high impact,weatherable engineering thermo-plastic material conforming to the following:

Property	Result	ASTM Test Method
Thickness (min)	.090"	——
Tensile strength (min psi) @ yield	5,500	D638
Impact strength @ -20°F (ft-lbs/in of notch)	3.2	D256 Method A
Impact strength @ 73°F (ft-lbs/in of notch)	14.0	D256 Method A
Flexural strength, PSI ¼" @ 73°F	8,000	D790
Flexural modulus, PSI ¼" @ 73°F	300,000	D790
Elongation @ yield	30%	D638

Reflective Tape
Use retroreflective, acrylic microprism material with acrylic backing, 3" wide, providing the following minimum optical performance with an observation angle of 0.1° measured in candlepower for the reflector:

Entrance Angle	Specific Intensity
Yellow - 4"	136
White - 4"	200

Adhesive
Use factory applied solid butyl rubber ⅛" thick, 2" wide on 2¼" wide release paper on surface 3 to temporarily mount markers to portable concrete barrier.

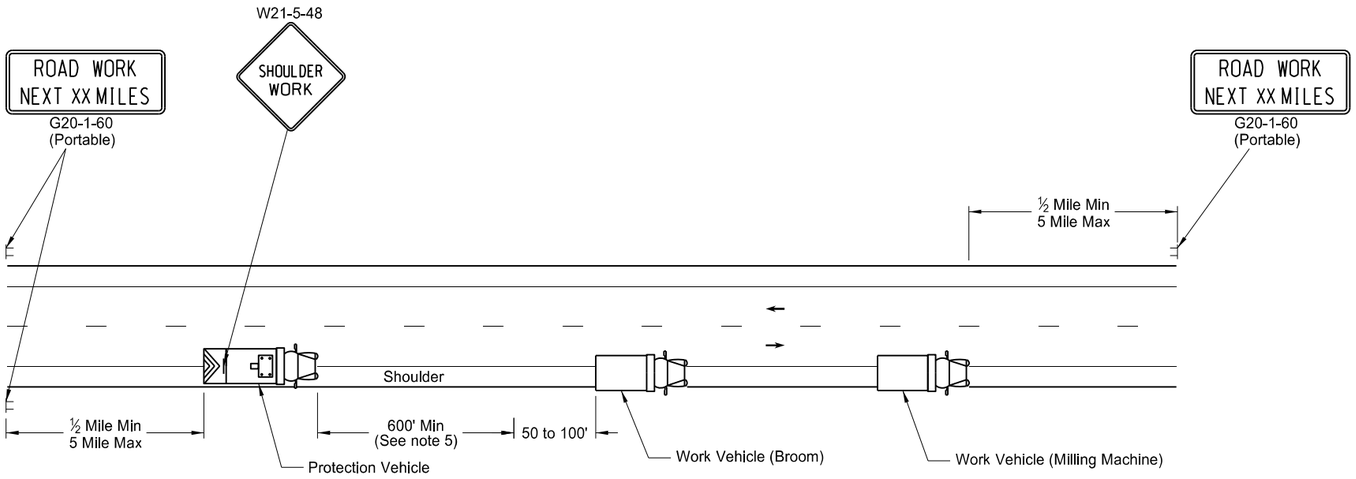
Bar List

Mark	Size	No.	Length	Shape
C1	4	6	9'- 4"	Straight
U1	4	2	4'- 8"	Bent
U2	4	2	4'- 10¼"	Bent
U3	4	15	5'- 4"	Bent

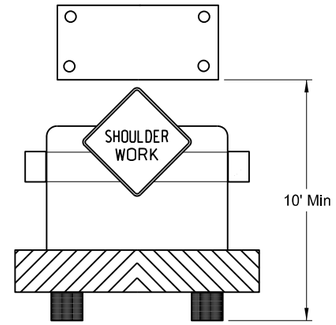
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-20-12	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
11-01-19	New Design Engr PE Stamp

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

MOBILE OPERATION
Grinding Shoulder Rumble Strips



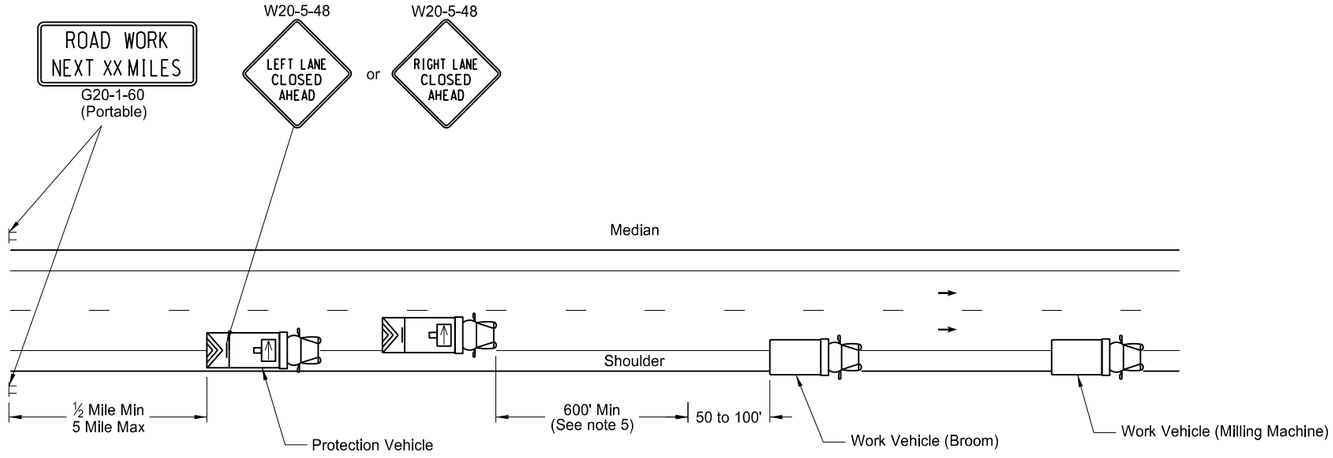
TWO LANE - TWO WAY ROADWAY



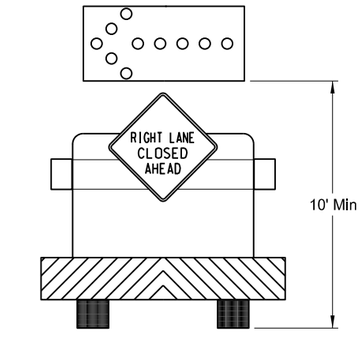
TWO LANE - TWO WAY ROADWAY

Typical Protection Vehicle with
Flashing Arrow Panel In Caution Mode

Notes:
1. Provide truck mounted attenuators on additional vehicles in the convoy, at no additional cost.
2. Provide rotating, flashing, oscillating, or strobe lights on vehicles.
3. Provide Type B or Type C flashing arrow panels that are controlled from inside the vehicle.
4. Provide two - way electronic communication capability in each vehicle.
5. Vary vehicle spacing between the protection vehicle and work vehicle depending on sight distance restrictions. Keep the spacing of the convoy vehicles such that motorists approaching the work convoy can see the protection vehicle in time to slow down and safely pass the work vehicles.
6. Move advance Road Work Ahead signs as the work area moves through the construction zone.

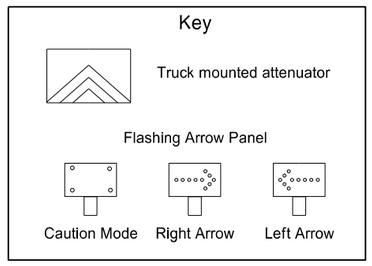


INTERSTATE & 4 LANE DIVIDED HIGHWAY



INTERSTATE & 4 LANE DIVIDED HIGHWAY

Typical Protection Vehicle with Flashing Arrow
Panel In Flashing Arrow Mode



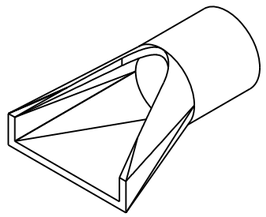
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-15-12	
REVISIONS	
DATE	CHANGE
8-17-17	Updated notes & signs
10-03-19	New Design Engineer PE Stamp

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/3/19 and the original document is stored at the North Dakota Department of Transportation

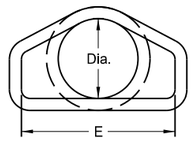
REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS
(Round Pipe)

D-714-1

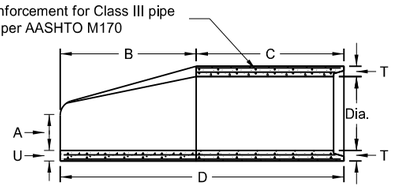
FLARED END SECTION						
TERMINAL DIMENSIONS						
DIA	A	B	C	D	E	U
12	0'-4"	2'-0"	4'-0⅞"	6'-0⅞"	2'-0"	2"
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2¼"
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2½"
21	0'-9"	3'-0"	3'-1"	6'-1"	3'-6"	2¾"
24	0'-9½"	3'-7½"	2'-6"	6'-1½"	4'-0"	3"
27	0'-10½"	4'-0"	2'-1½"	6'-1½"	4'-6"	3¼"
30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



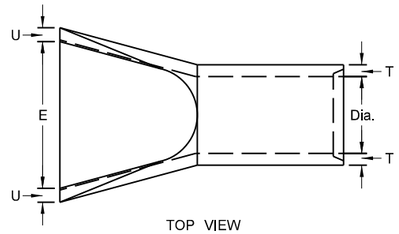
PERSPECTIVE



END VIEW



SIDE VIEW



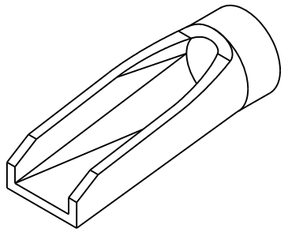
TOP VIEW

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

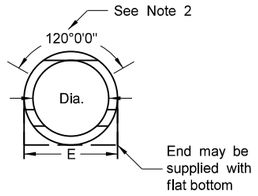
NOTES:

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

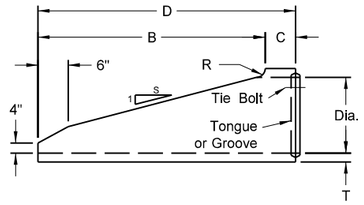
TRAVERSABLE END SECTION						
DIA	B	C	D	E	R	S
15"	4'	9"	4'-9"	1'-7½"	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	3"	6
24"	6'	1'	7'	2'-6"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3½"	4
36"	7'-3"	15"	8'-6"	3'-8"	3"	4



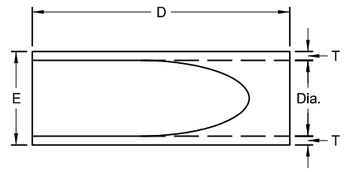
PERSPECTIVE



END VIEW



SIDE VIEW



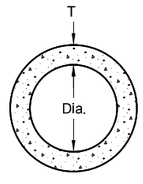
TOP VIEW

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

NOTES (Traversable End Section):

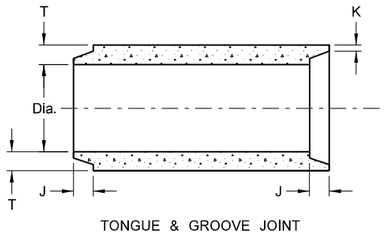
1. Manufactured in accordance with applicable portions of ASTM C76/AASHTO M170.
2. Reinforcement per Class III RCP with double reinforcement in the upper 120° of the full barrel portion.

All Classifications of Round Concrete Pipe					
Internal Dia. of pipe in inches	Cross-Sectional Water Area	Weight per lin. foot of Pipe Std. Wall	Joint J Groove End Min./Max.	Joint K Tongue End Min.	Minimum Wall Thickness (T)
Dia	Sq. ft.	Lbs.	In.	In.	In.
12	0.79	92	1⅛-2⅛	¾	2
15	1.23	127	1⅛-2¼	⅞	2¼
18	1.77	168	1⅛-2⅛	1	2½
21	2.40	214	1⅛-3⅛	1⅛	2¾
24	3.14	265	2¼-3¼	1⅛	3
27	3.98	322	2¼-4	1¼	3¼
30	4.91	384	3¼-4¼	1¼	3½
33	5.94	452	3¼-4¼	1½	3¾
36	7.07	524	3¼-4¼	1½	4
42	9.62	685	3¾-4¾	1¾	4½
48	12.57	685	3⅞-4¾	1⅞	5
54	15.90	1070	4⅛-5¼	2	5½
60	19.63	1296	4½-5½	2¼	6
66	23.76	1542	5-6	2⅝	6½
72	28.27	1810	5⅛-6¾	2⅞	7
78	33.18	2098	6¼-7¼	2⅞	7½
84	38.48	2410	5⅛-7¾	3⅜	8
90	44.18	2793	6¾-8½	3⅛	8½
96	50.27	3092	7-8¼	3½	9
102	56.75	3466	7-8¼	3½	9½
108	63.62	3864	7¼-8½	3¾	10

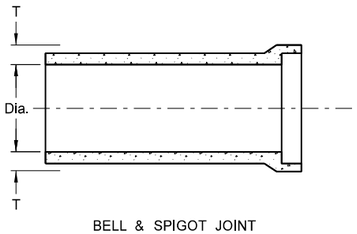


END VIEW

CIRCULAR PIPE

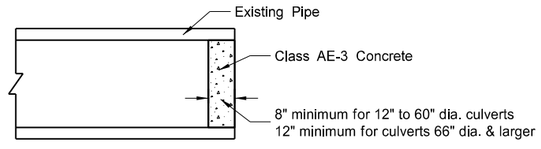


TONGUE & GROOVE JOINT



BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE



CONCRETE PIPE PLUG

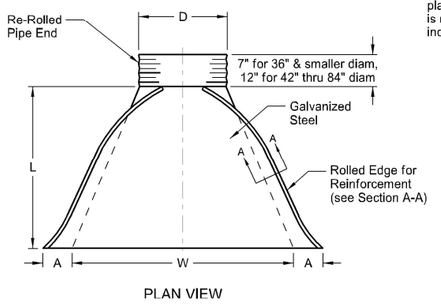
SEE STANDARD DRAWING D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-12-14	
REVISIONS	
DATE	CHANGE
01-21-15	Revised Note 5
11-21-16	Revised End Section Dimensions
09-18-19	Updated Perspective View Details

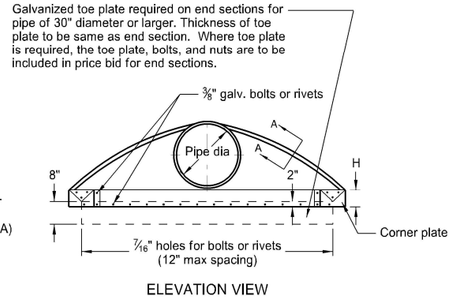
This document was originally issued and sealed by Jon Ketterling Registration Number PE-4684, on 9/18/19 and the original document is stored at the North Dakota Department of Transportation

ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

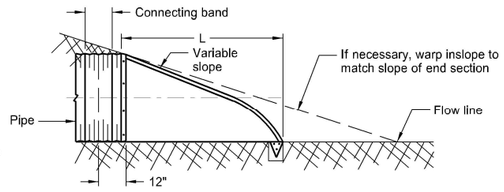
D-714-4



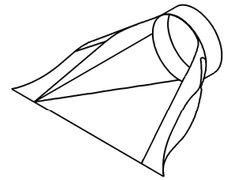
PLAN VIEW



ELEVATION VIEW



TYPICAL CROSS SECTION
(showing connector section)



PERSPECTIVE VIEW

** PIPE DIA.	GALVANIZED THICKNESS	END SECTION DIMENSIONS					APPROX. SLOPE	BODY
		A	B	H	L	W		
IN	IN	IN	IN	IN	IN	IN	RATE	PIECE
15	0.064 - 0.079	7	8	6	26	30	2½:1	1
18	0.064 - 0.109	8	10	6	31	36	2½:1	1
24	0.064 - 0.109	10	13	6	41	48	2½:1	1
30	0.064 - 0.109	12	16	8	51	60	2½:1	1 or 2
36	0.064 - 0.109	14	19	9	60	72	2½:1	2
42	0.064 - 0.138	16	22	11	69	84	2½:1	2
48	0.064 - 0.168	18	27	12	78	90	2¼:1	2
54	0.064 - 0.168	18	30	12	84	102	2:1	2
*60	0.064 - 0.168	18	33	12	87	114	1¾:1	3
*66	0.064 - 0.168	18	36	12	87	120	1½:1	3
*72	0.064 - 0.168	18	39	12	87	126	1½:1	3
*78	0.064 - 0.168	18	42	12	87	132	1¼:1	3
*84	0.064 - 0.168	18	45	12	87	138	1⅛:1	3

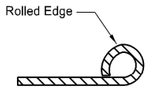
* These sizes have 0.109" sides and 0.138" center panels.

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

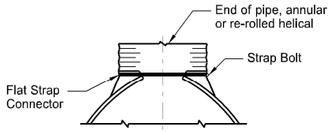
Manufacturers tolerances of above dimensions will be allowed.

Splices to be the lap riveted type.

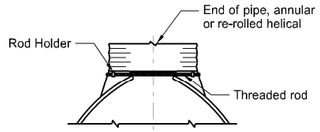
Multiple panel bodies shall have lap seams which are to be tightly joined with ⅜" dia. galv. bolts or rivets. Nuts to be torqued to 25 foot-lbs ±.



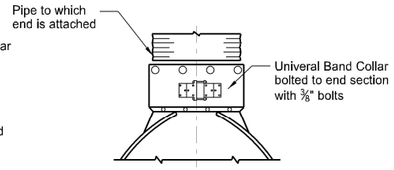
SECTION A-A



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



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

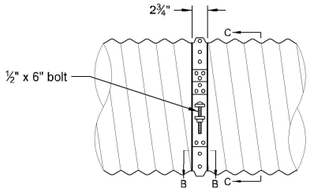


TYPE #3
For all pipe sizes

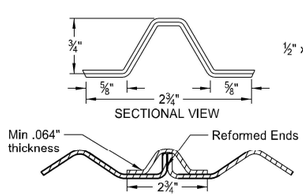
COUPLING BAND DIMENSIONS				
COUPLING TYPE	CORRUGATION PITCH x DEPTH	PIPE SIZE	COUPLING BAND LENGTH	MIN. BAND THICKNESS
Hat Band	2⅔" x ½"	12" - 48"	2¾"	.064"
Annular Band	2⅔" x ½"	12" - 72"	12"	.052"
		78" - 84"	12"	.079"
	3" x 1"	48" - 120"	14"	.052"
Hugger Band	2⅔" x ½" Rerolled End	12" - 72"	10½"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

NOTES:

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

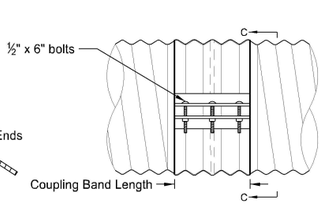


SIDE VIEW

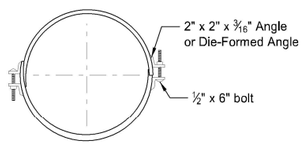


SECTION B-B

HAT BAND FOR FLANGED END PIPE

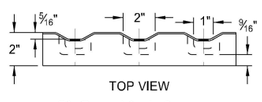


SIDE VIEW

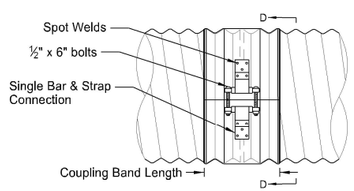


SECTION C-C
Angle Connection

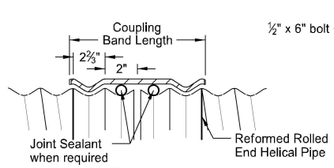
ANNULAR BAND



TOP VIEW
Die-Formed Angle Connector

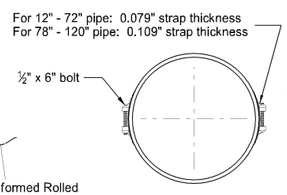


SIDE VIEW

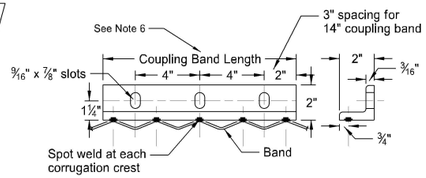


SECTIONAL VIEW

HUGGER COUPLING BAND

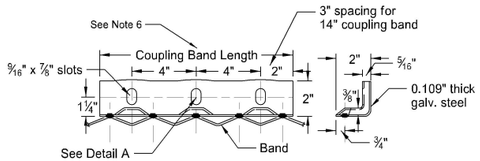


SECTION D-D
Bar & Strap Connection



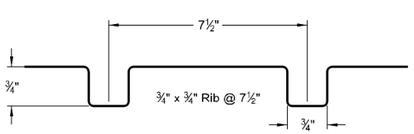
SIDE VIEW END VIEW

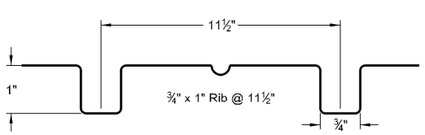
2" x 2" x 3/16" Angle Connector



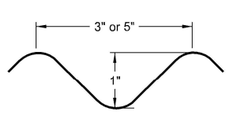
SIDE VIEW END VIEW

Die-Formed Angle Connector

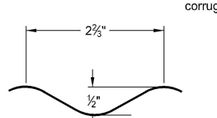




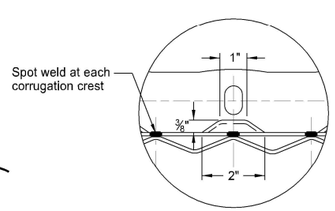
SPIRAL RIB CORRUGATIONS



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



2⅔" x ½" CORRUGATIONS



Detail A

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
08-16-13	
REVISIONS	
DATE	CHANGE
01-07-14	End Section Plan View
02-27-14	3" x 1" Corrugation Detail
09-18-19	Added Perspective View Detail
09-23-22	Galvanized Thickness Table

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09/23/22

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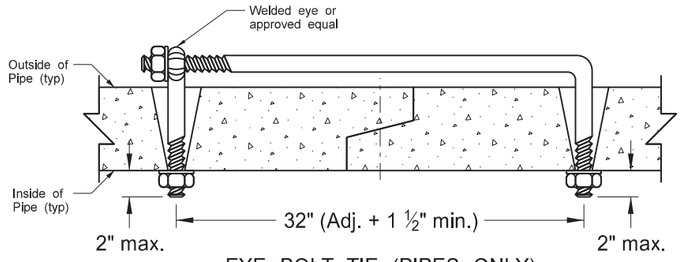
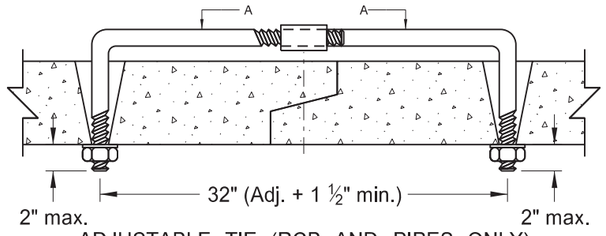
CONCRETE PIPE, CATTLE PASS, OR PRECAST CONCRETE BOX CULVERT TIES

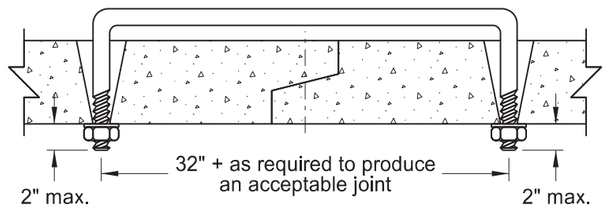
D-714-22



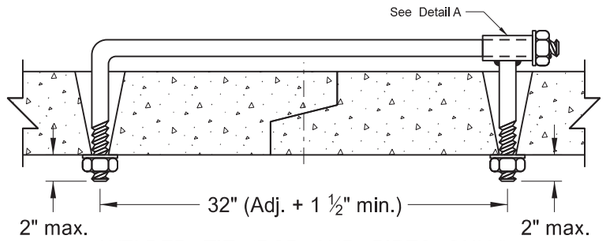
EYE BOLT TIE (PIPES ONLY)



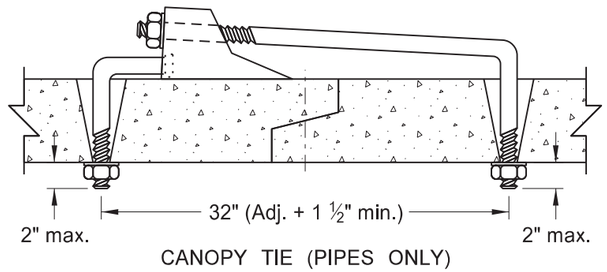
ADJUSTABLE TIE (RCB AND PIPES ONLY)



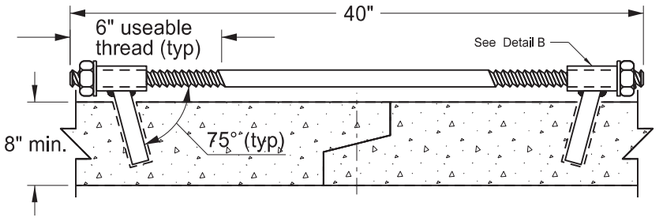
U BOLT TIE (RCB, PIPES, OR CATTLE PASSES)



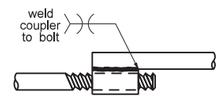
WELDED TIE (RCB AND PIPES ONLY)



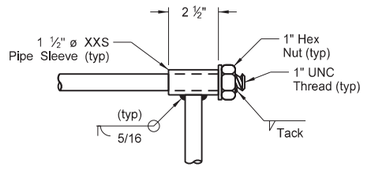
CANOPY TIE (PIPES ONLY)



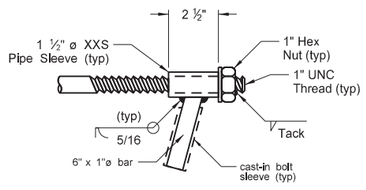
HIDDEN TIE (RCB ONLY)



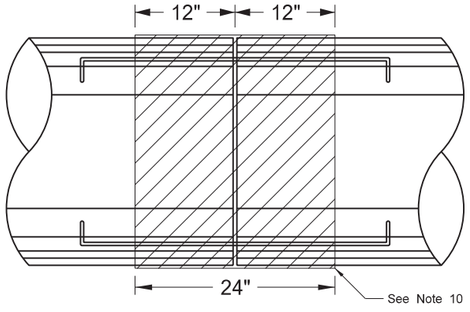
SECTION A-A



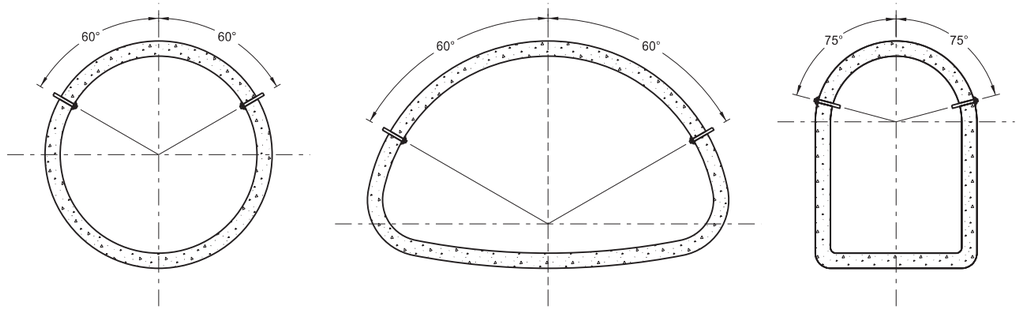
DETAIL A



DETAIL B



PLAN VIEW (PIPES ONLY)



END VIEW

REQUIRED SIZE OF TIE BOLTS		
Pipe Size	Thread ø	XXS Pipe Sleeve Inner ø
18" - 24"	⅝" See note 3	¾"
30" - 66"	¾"	1"
72" - 120"	1"	1 ¼"
RCB/Cattle Pass		

NOTES:

1. The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
2. Insert pipe ties from the inside of the pipes and grout into place for Cattle Pass and Jacked and Bored pipes. Jacked and bored pipes with a diameter of 24" or less do not require pipe ties.
3. Nuts and washers are not required on Jacked and Bored pipes or pipes with a 24" diameter or less. Insert and grout tie bars into place where nuts and washers are not used.
4. Do not use pipe ties to pull the pipe or RCB sections tight. The ties are only for holding sections together.
5. Use only tie bolt assemblies that have been hot dip galvanized in accordance with ASTM A 153.
6. Holes in pipes to accommodate tie bolts can be precast or drilled. Tapered holes are permitted when precast. Use holes that have a diameter ¼" larger than the diameter of the thread. In precast RCB's, use holes that contain cast-in bolt sleeves with an inside diameter of 1 ¼".
7. Select the type of tie bolt used from those shown.
8. Include the cost of precasting or drilling the required holes and furnishing and installing the tie bolts in the price bid for the appropriate conduit or RCB pay item.
9. Tie all centerline and approach RCP culvert joints. Tie the first three joints including the end section of all free ends of storm drain systems. Free ends are defined as any storm drain end which does not terminate at an inlet or manhole. Outfall culverts with end sections which drain adjacent ditches are examples of free ends.
10. Place joint wrap prior to installing ties. Firmly secure the wrap around the full perimeter. For concrete pipes, overlap the joint by 12" in both directions. For box culverts, use a waterproof membrane that meets ASTM C877 (Type III). Provide a membrane that is a minimum of 12" wide and center it at the joint. Provide a minimum overlap of 2.5" at the seams.
11. Use tie bolts that conform to ASTM A 36. Use heavy hex nuts that conform to ASTM A 563. Use washers that conform to ASTM F 436, Type 1. Use welded pipe sleeves and cast-in bolt sleeves that conform to ASTM A 53, Grade B.
12. Tie RCB's at locations shown on the plans.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
3-18-14	
REVISIONS	
DATE	CHANGE
7-21-15	Note 8
6-6-17	Notes 2-11, Table, Title, Lables
8-11-21	Notes 2-12, Table, Lable

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08/11/21

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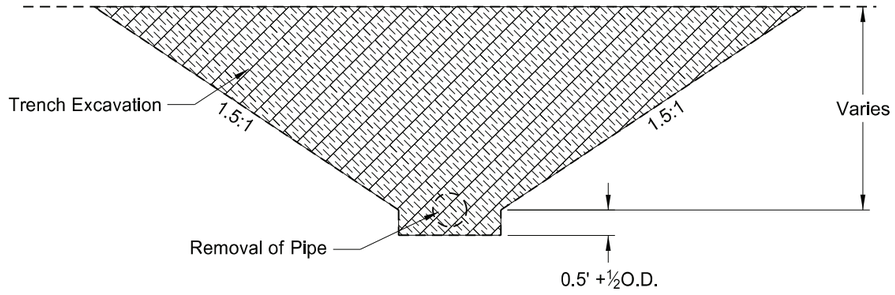
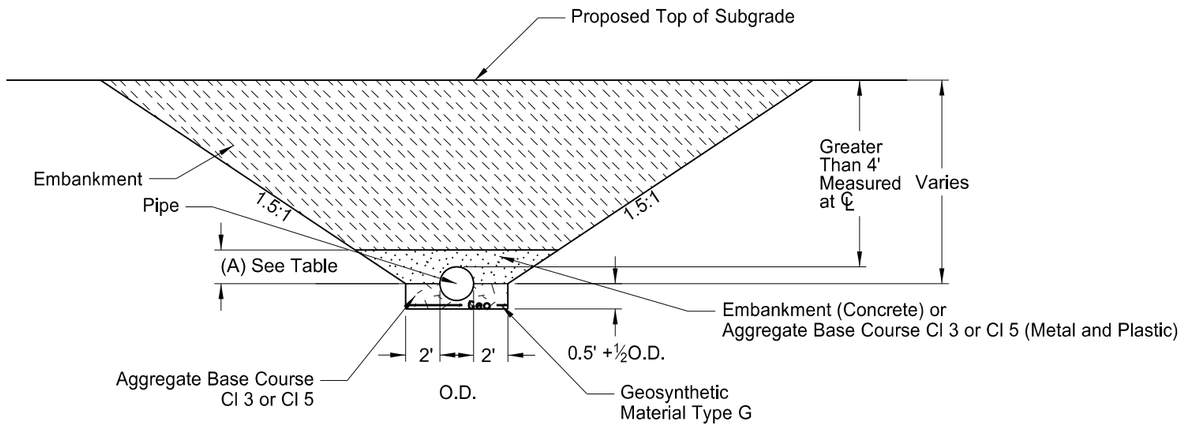
TRANSVERSE MAINLINE PIPE INSTALLATION DETAIL
PIPES MORE THAN 4 FEET BELOW TOP OF SUBGRADE

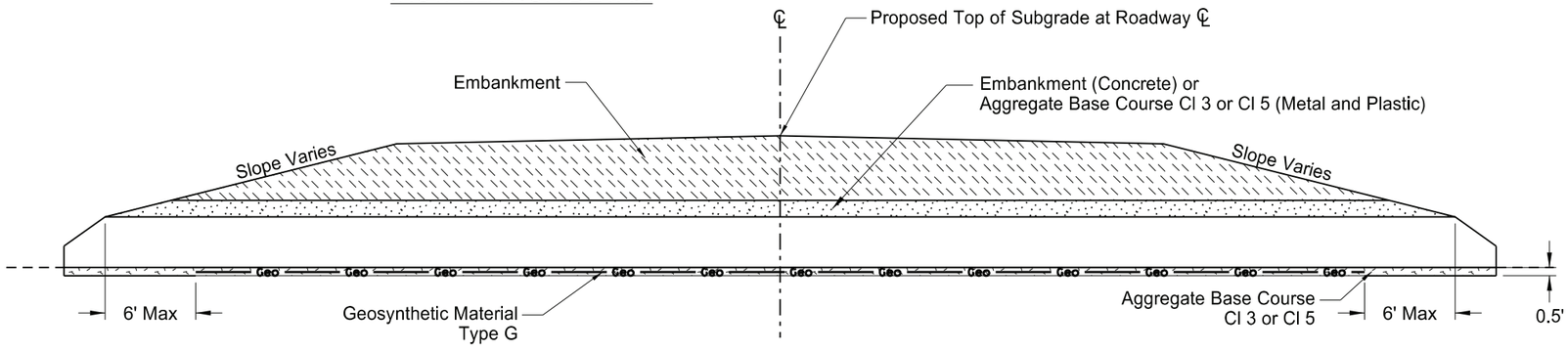
D-714-25



EXCAVATION DETAIL



INSTALLATION DETAIL



CROSS SECTION

Pay Items
1) Pipe*
2) Geosynthetic Material Type G
3) Removal of Pipe (if required)

*Included in Pipe Pay Item
1) Pipe
2) Trench excavation
3) Aggregate Base Course Cl 3 or Cl 5
4) Embankment

NOTES:

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

2) Embankment may be either Borrow Excavation or Common Excavation - Type A.

Backfill Dimensions	
Pipe Materials	Dimension (A)
Concrete	0.5 O.D.
Metal and Plastic	0.5 O.D. + 1 Foot

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

7-26-13

REVISIONS

DATE	CHANGE
10-15-13	Label Formatting
1-21-14	Nomenclature
9-18-15	Title Rewording
12-10-15	Added Plastic Pipe
5-27-20	Replaced R1 Fabric with Geogrid Changed bedding depth

REGISTERED PROFESSIONAL ENGINEER
MATTHEW C KURLE
PE-8777
DATE
05/27/20
NORTH DAKOTA
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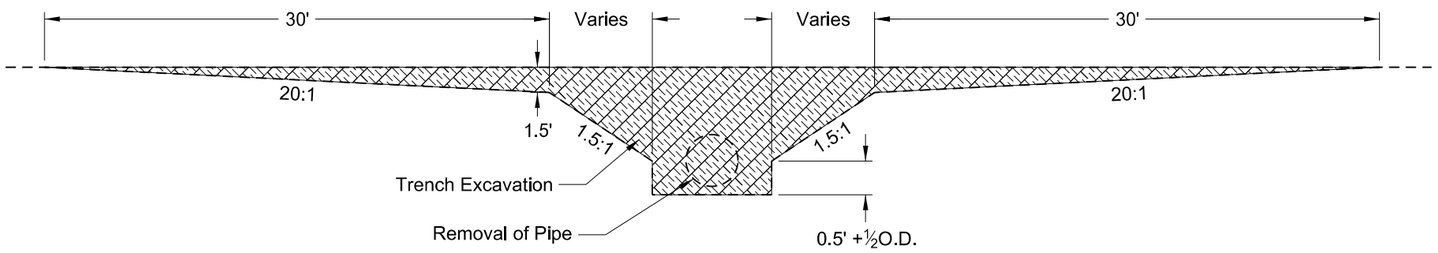
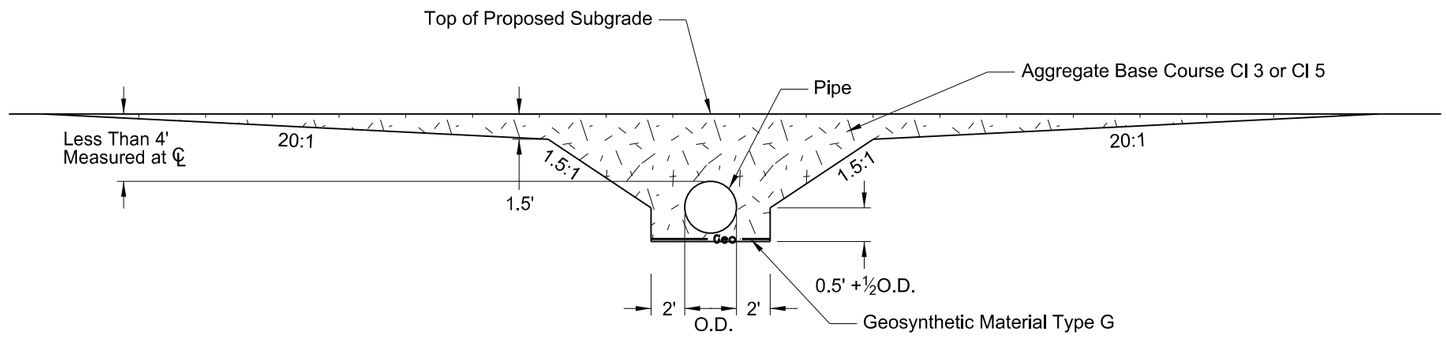
TRANSVERSE MAINLINE PIPE INSTALLATION DETAIL
PIPES 4 FEET OR LESS BELOW TOP OF SUBGRADE

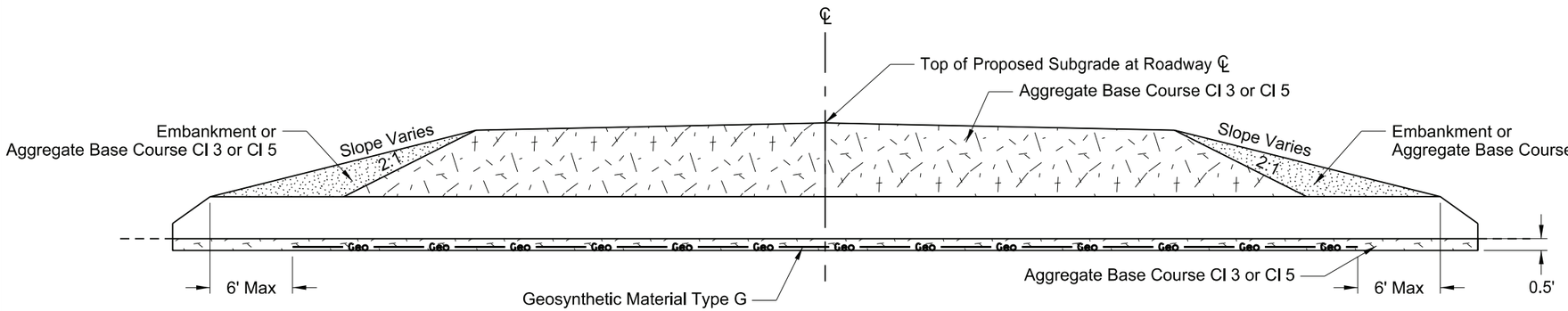
D-714-26



EXCAVATION DETAIL



INSTALLATION DETAIL



CROSS SECTION

Pay Items
1) Pipe*
2) Geosynthetic Material Type G
3) Removal of Pipe (if required)

*Included in Pipe Pay Item
1) Pipe
2) Trench Excavation
3) Aggregate Base Course Cl 3 or Cl 5
4) Embankment

NOTES:

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

2) Embankment may be either borrow Excavation or Common Excavation - Type A

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

7-26-13

REVISIONS

DATE	CHANGE
10-15-13	Label Formatting
1-21-15	Nomenclature
9-18-15	Title Rewording
5-27-20	Replaced R1 Fabric with Geogrid Changed bedding depth

REGISTERED PROFESSIONAL ENGINEER
MATTHEW C KURLE
PE-8777
DATE
05/27/20
NORTH DAKOTA
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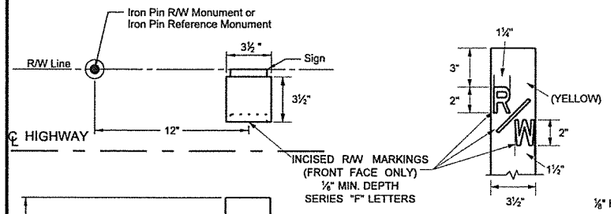
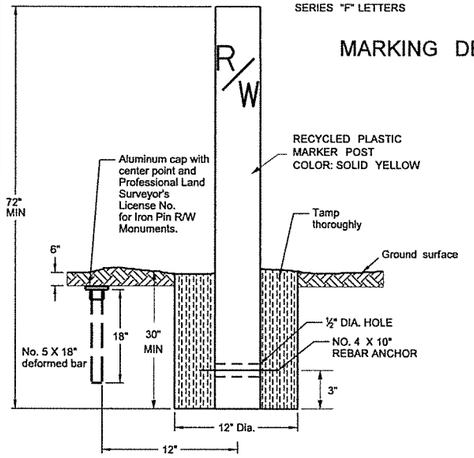
STANDARD MONUMENTS AND RIGHT OF WAY MARKERS

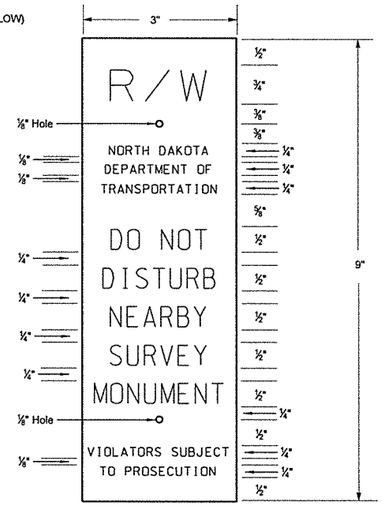
D-720-1



MARKING DETAIL



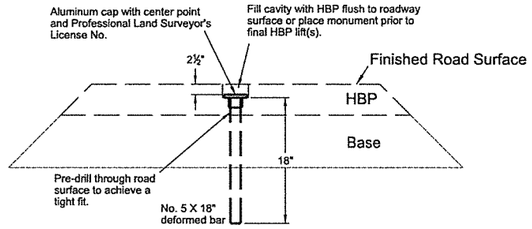
RECYCLED PLASTIC RIGHT OF WAY MARKER (WITNESS POST) DETAILS & IRON PIN REFERENCE AND R/W MONUMENT DETAILS



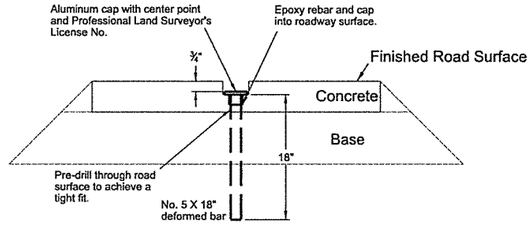
SIGN DETAIL

Black letters on orange high intensity background sheeting meeting ASTM D-4956 Type III or higher on 80 gauge 5052-H38 aluminum. Silk screen graphics. One color print. Attach sign 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. Install sign 2" from top of post.

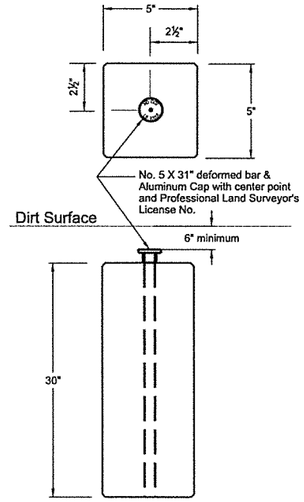
ALIGNMENT MONUMENT DETAILS



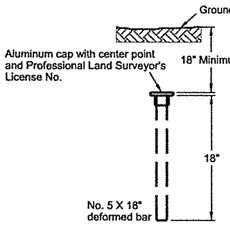
IRON PIN
(Within Finished Roadway Surface)



IRON PIN
(Within Finished Roadway Surface)



PRECAST CONCRETE
(Outside Finished Roadway Surface)
(Inside R/W Limits)



IRON PIN
(Outside Finished Roadway Surface)
(Outside R/W Limits)

NOTES:

Construct and install Alignment Monuments, Iron Pin Reference Monuments, Iron Pin R/W Monuments, and Right of Way Markers (witness posts) according to Section 720 of the Standard Specifications.

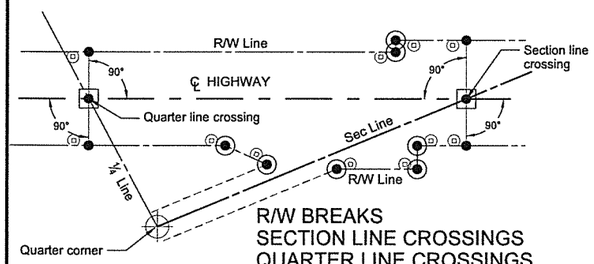
ALIGNMENT MONUMENTS: Place Iron Pin or Precast Concrete Alignment Monuments with aluminum caps on the centerline alignment PI's, section corners, quarter corners, section line crossings, quarter line crossings, and at curve points (PC's, PT's, TS's, and ST's) on the centerline.

IRON PIN R/W MONUMENT: Place Iron Pns with aluminum caps (No. 5 X 18") at breaks on the Right of Way line, and at curve points (PC's, PT's, TS's and ST's) on the Right of Way line.

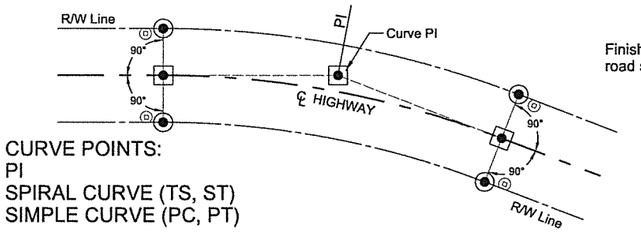
IRON PIN REFERENCE MONUMENT: Place Iron Pins without aluminum caps (No. 5 X 18") as reference monuments on the Right of Way line at section corners, quarter corners, section line crossings, and quarter line crossings.

R/W MARKERS (WITNESS POST) WITHIN DRIVEWAYS: If a single iron Pin R/W or Reference Monument is within a driveway, place right of way marker (witness post) 50 feet back, in stationing, from the Iron Pin Monument along the R/W line. If R/W break is within a driveway, place right of way markers (witness posts) 50 feet back, or ahead from respective Iron Pin R/W Monuments along the R/W lines. Maintain Iron Pin R/W or Reference Monument original position within driveway.

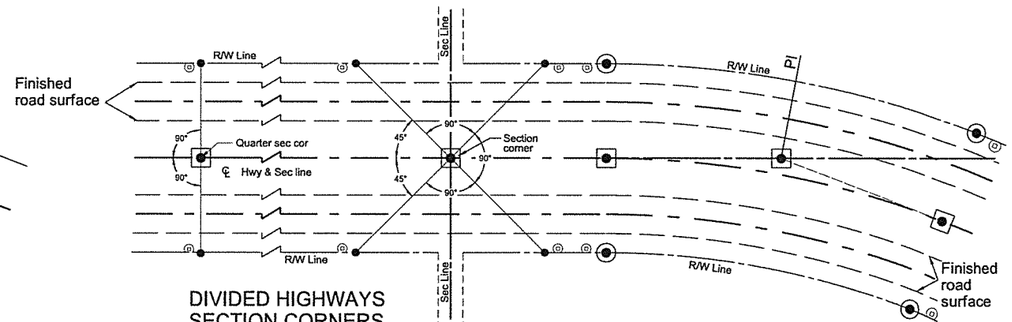
VARIOUS MONUMENT AND MARKER PLACEMENTS



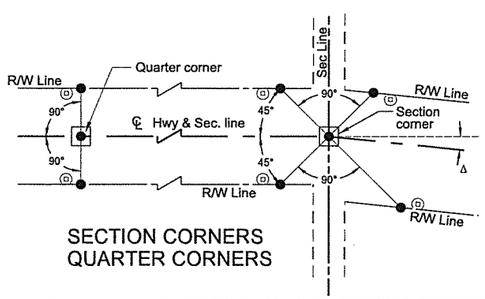
R/W BREAKS
SECTION LINE CROSSINGS
QUARTER LINE CROSSINGS



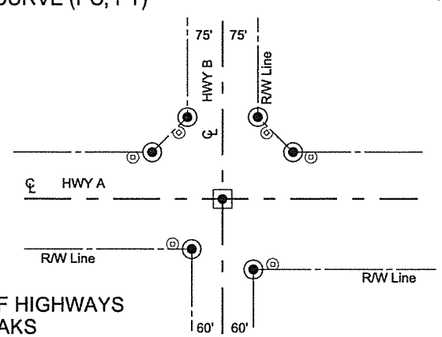
CURVE POINTS:
PI
SPIRAL CURVE (TS, ST)
SIMPLE CURVE (PC, PT)



DIVIDED HIGHWAYS
SECTION CORNERS
QUARTER CORNERS



SECTION CORNERS
QUARTER CORNERS



INTERSECTION OF HIGHWAYS
FLARED R/W BREAKS

LEGEND

- Iron Pin Reference Monument
- R/W Marker (witness post)
- Alignment Monument
- Iron Pin R/W Monument

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
10-3-2013
REVISIONS

DATE	CHANGE
11/12/13	Note for SIGN DETAIL modified to meet ASTM D-4956 Type III or higher on 80 gauge 5052-H38
10/17/17	Updated to active voice.
08/27/19	New Design Engr PE Stamp.

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PROFESSIONAL
PE 4583
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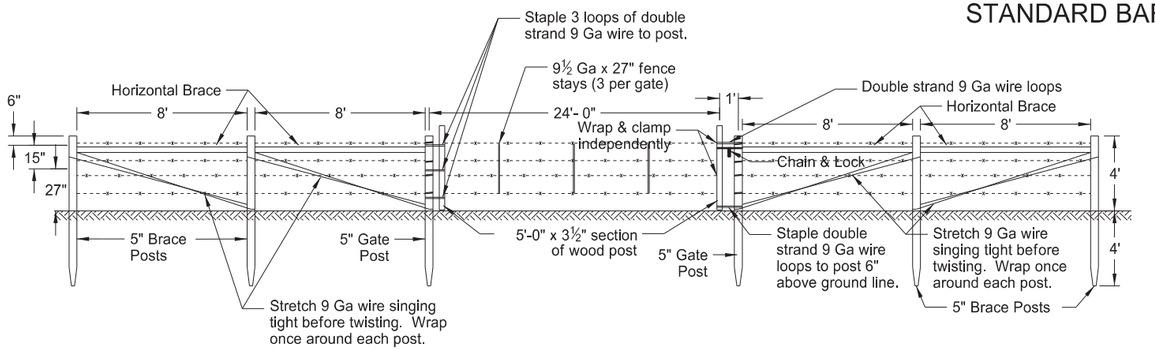
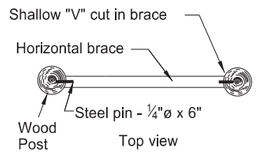
NORTH DAKOTA
8/27/19

STANDARD BARBED WIRE FENCE

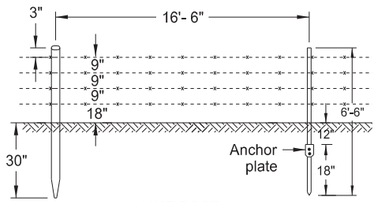
D-752-1



VEHICLE GATE



HORIZONTAL BRACE DETAIL



NOTES

1. No deduction in measured pay length of fence made for gates, corner assemblies, double brace assemblies, fence terminals, or depression fencing. Include all costs for abutment fencing in the price bid for fencing bid items.

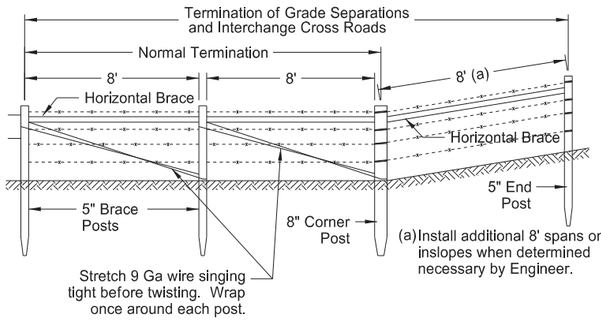
2. Install double brace assemblies at locations shown on the plans or established by the Engineer. Place adjacent fence terminals, corner assemblies, or double brace assemblies at a maximum spacing of 1,320 feet.

3. Include all costs of furnishing and installing inserts and eyebolts in the unit price bid for fencing bid items. Use eyebolts galvanized according to AASHTO designation M-30; inserts of corrosion resistant material do not require galvanization. Use concrete inserts capable of developing the full strength of the ⅝" diameter threaded eyebolt, when installed in concrete.

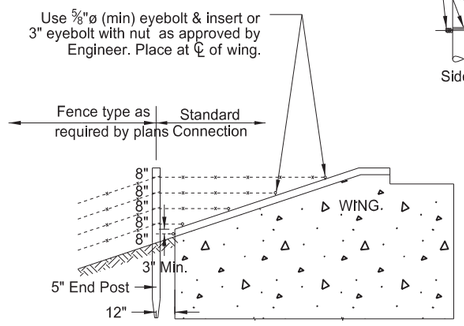
4. Determine post type used, either wood or steel, unless otherwise specified in the plans.

5. Include the cost of bracing at vehicle gates in the price bid for "Vehicle Gate."

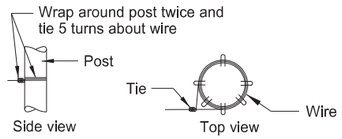
POST SIZES					
	TREATED WOOD		STEEL		
USE OF POST	Post dia.	Post length	Post length	Post wt. Lbs/Ft	Anchor wt. Lbs.
Line post	3½"	6'-6"	6'-6"	1.33	0.67
Corner post	8"	8'	7'	4.10	(Conc.)
End post	5"	8'			
Brace post	5"	8'	7'	3.19	(Conc.)
Gate post	5"	8'			
Horizontal brace	4"	8'	As appoved by the Engineer		



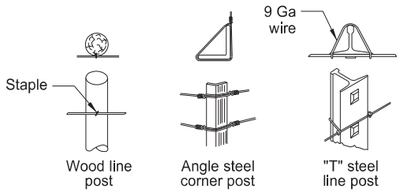
FENCE TERMINAL



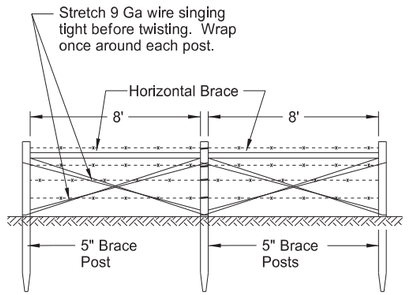
DETAIL FOR TYING FENCE TO WINGS OF ABUTMENTS



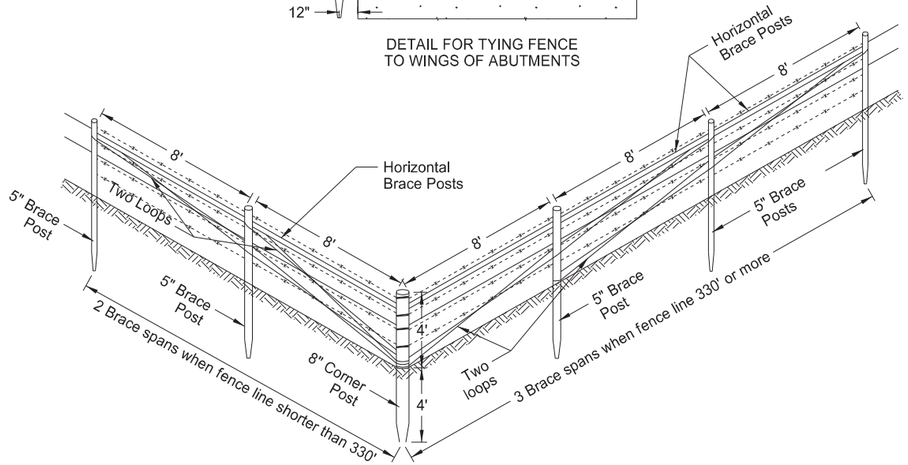
WRAP-AROUND DETAIL



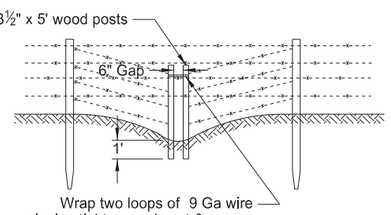
FASTENING TO POSTS



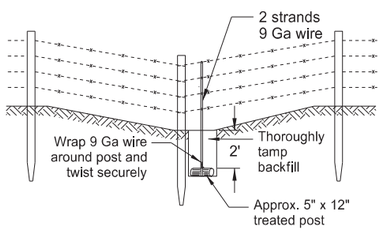
DOUBLE BRACE ASSEMBLY



CORNER ASSEMBLY

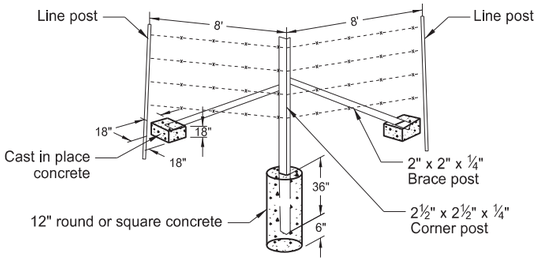


BREAK-AWAY FENCE FOR NARROW DEPRESSIONS SUBJECT TO FLOODING

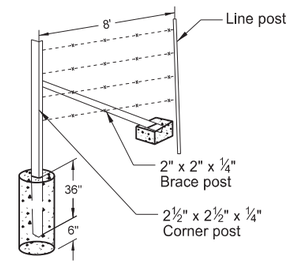


DETAIL FOR ANCHORING FENCES IN DEPRESSIONS*

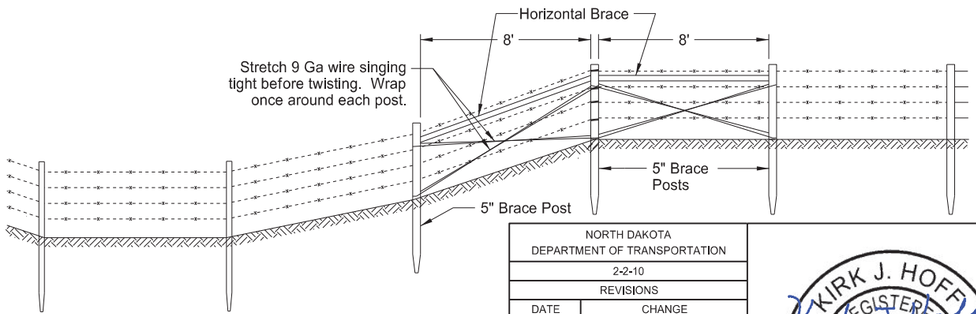
*Determine locations in the field and include in price bid for fencing. Use other methods of anchoring fence if approved by the Engineer.



CORNER AND DOUBLE BRACE ASSEMBLY STEEL POSTS



FENCE TERMINAL STEEL POSTS



FENCING FOR WIDE DEPRESSIONS

Use double brace installation, as shown, on opposite side of depression.

Decrease line post spacing as needed due to terrain.

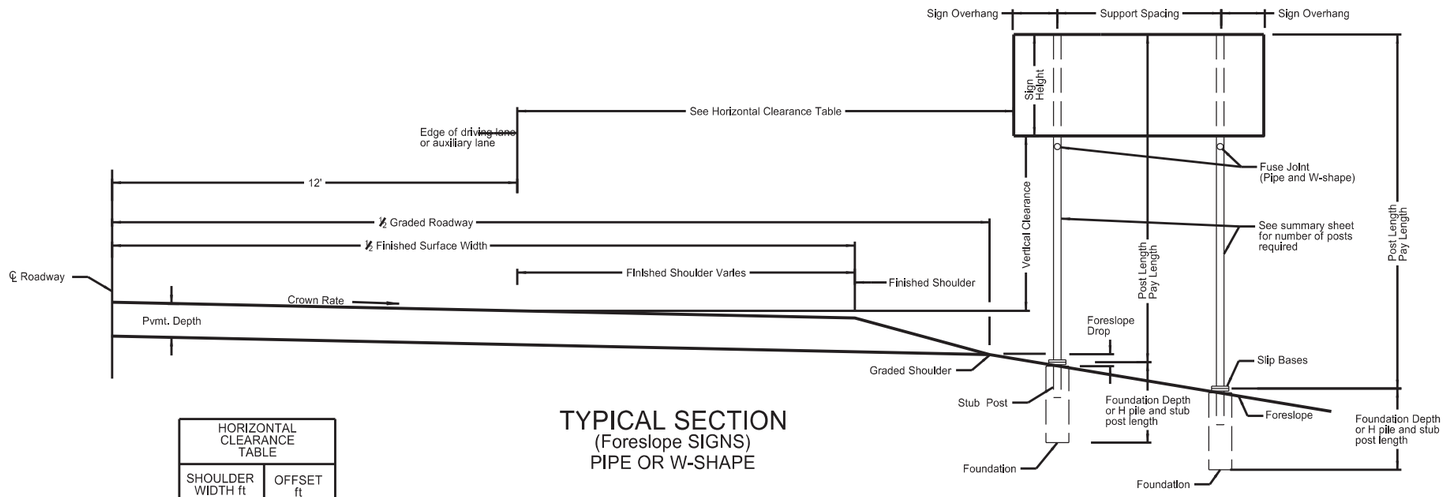
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-2-10	
REVISIONS	
DATE	CHANGE
10-02-12	Notes, steel assemblies/posts.
11-25-13	Revised Vehicle Gate.
10-17-17	Updated to active voice.
02-23-23	Revised post spacing/brace size.

KIRK J. HOFFMANN
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

02/23/23

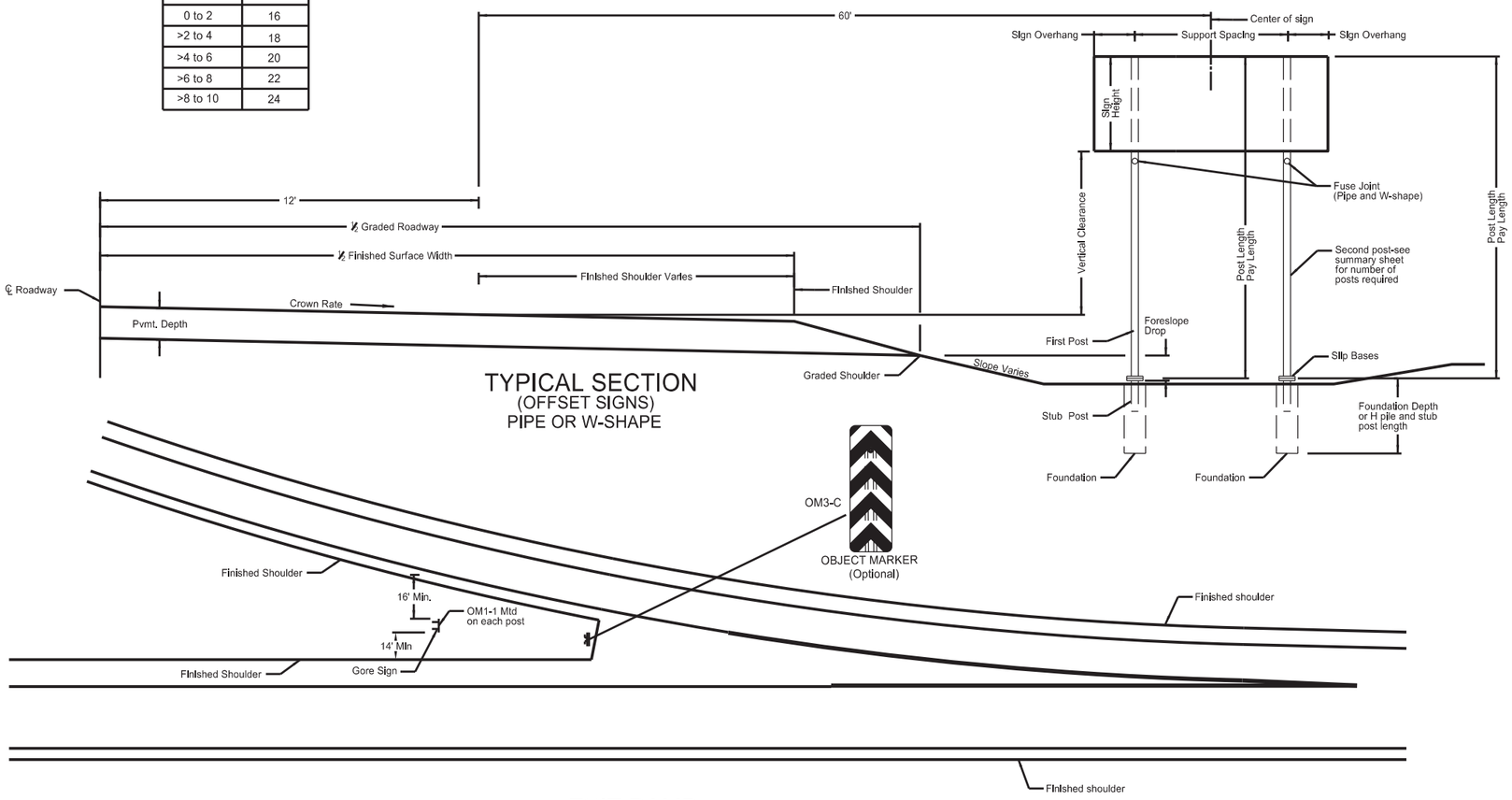
PIPE OR W-SHAPE ASSEMBLY DETAILS

D-754-1



TYPICAL SECTION
(Foreslope SIGNS)
PIPE OR W-SHAPE

HORIZONTAL CLEARANCE TABLE	
SHOULDER WIDTH ft	OFFSET ft
0 to 2	16
>2 to 4	18
>4 to 6	20
>6 to 8	22
>8 to 10	24



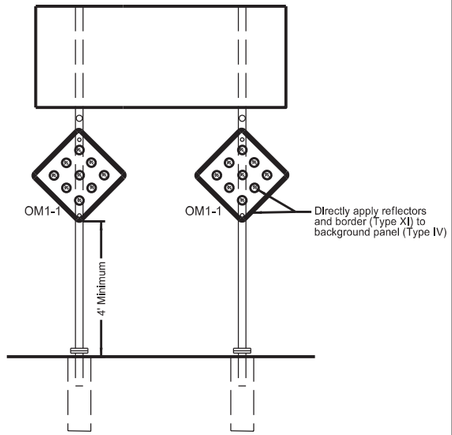
EXIT RAMP
GORE SIGN PLACEMENT

NOTES:

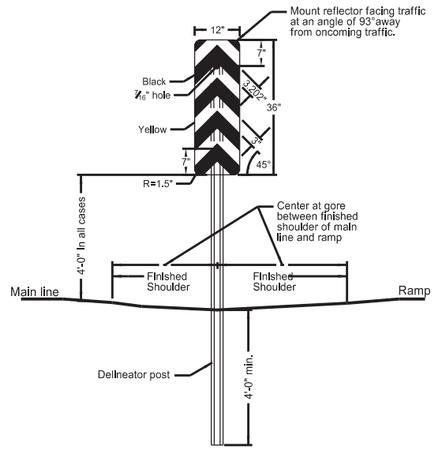
MINIMUM VERTICAL CLEARANCE:
Install signs with a minimum 5 foot vertical clearance from bottom of sign to top edge of the driving lane or auxiliary lane in rural locations. Provide a minimum 7 foot vertical clearance where parking or pedestrian movements occur. Install signs with a minimum 7 foot vertical clearance on freeways, expressways, and multi-lane conventional roadways.

A vertical clearance of 5 feet is acceptable where signs are placed a minimum of 30 feet from the edge of the traveled way.

Place signs a maximum of 6" above the vertical clearance specified above.



GORE SIGN OBJECT MARKER INSTALLATION



OBJECT MARKER INSTALLATION

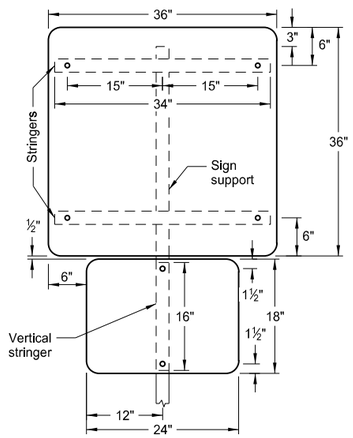
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
7-18-14	Modify notes and update reflective sheeting for object marker. Add correct section number for object marker post.
8-30-18	Updated notes to active voice.
11-26-21	Revised Object Marker signs.

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

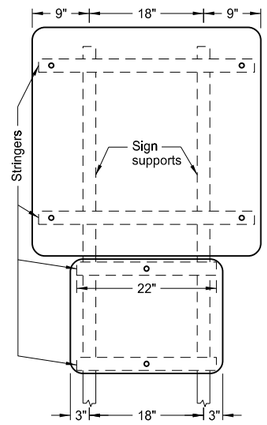
11/26/21

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
REGULATORY, WARNING AND GUIDE SIGNS

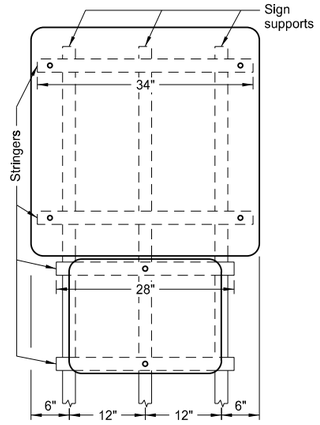
D-754-35



1 Post



2 Posts

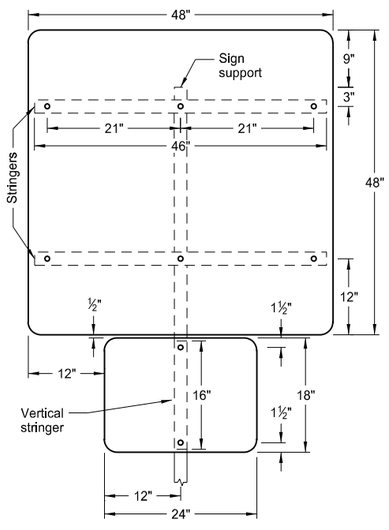


3 Posts

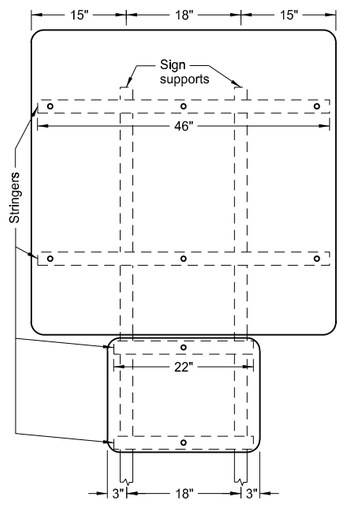
Assembly No. 44

Notes:

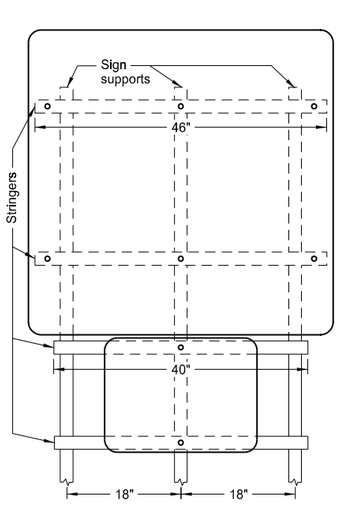
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½"x1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.



1 Post

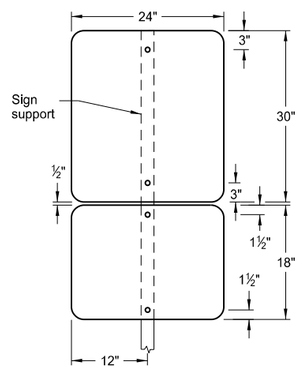


2 Posts

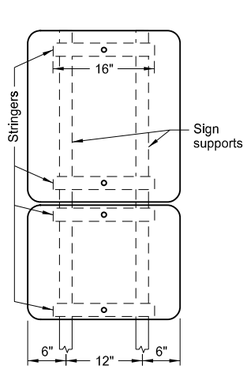


3 Posts

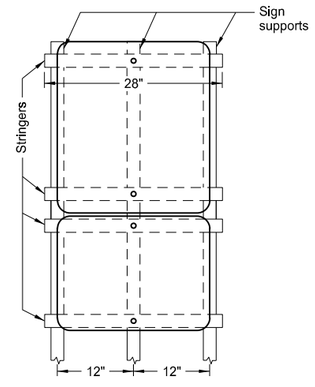
Assembly No. 45



1 Post



2 Posts



3 Posts

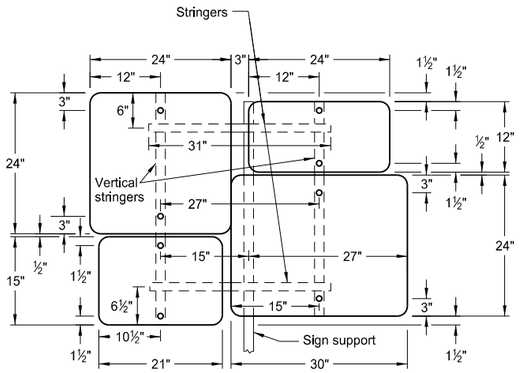
Assembly No. 46

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
8-30-18 8-30-19	Updated note to active voice. New Design Engineer PE Stamp.

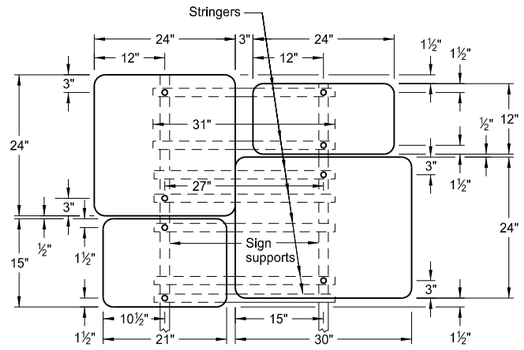
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

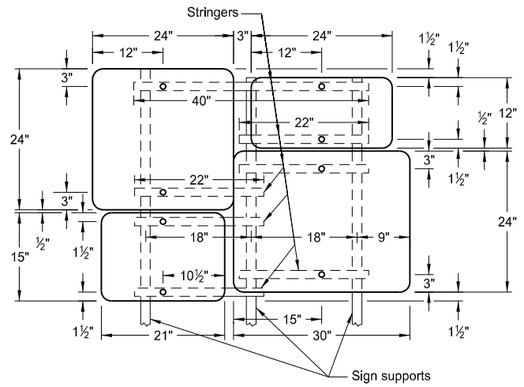
D-754-60



1 Post



2 Posts



3 Posts

ASSEMBLY NO. 403

Notes:

1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½"x1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

1 Post

2 Posts

3 Posts

ASSEMBLY NO. 404

1 Post

2 Posts

3 Posts

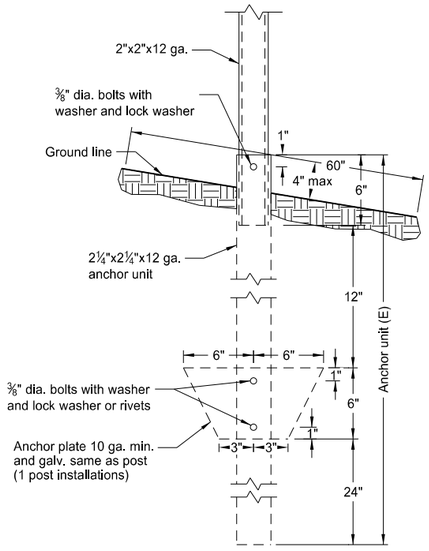
ASSEMBLY NO. 405

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
9-04-19	New Design Engineer PE Stamp.

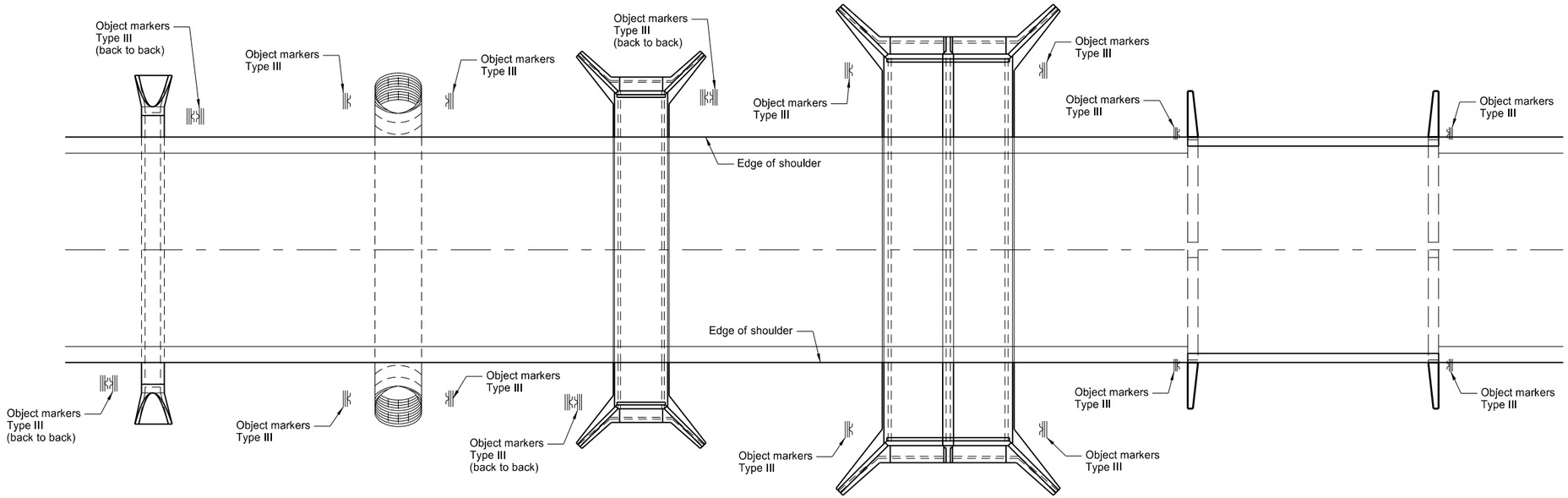
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 9/04/19 and the original document is stored at the North Dakota Department of Transportation

OBJECT MARKERS

D-754-82



Perforated Tube Anchor Unit Assembly



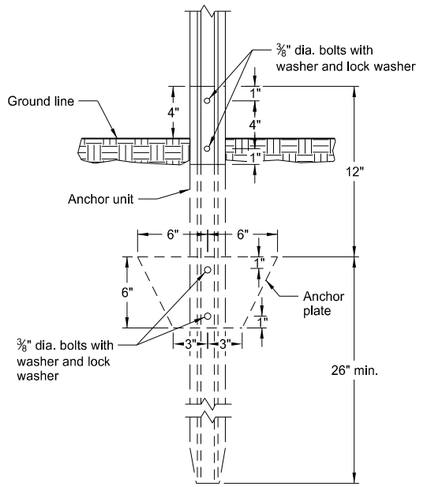
Pipe Culverts
10' max

Pipe Culverts
greater than 10'

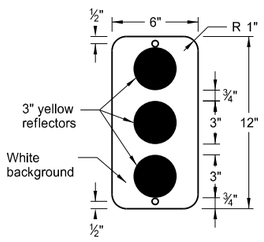
Box Culverts
10' max

Box Culverts
greater than 10'

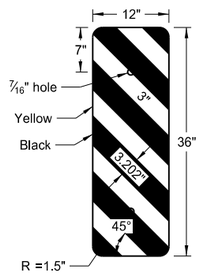
Bridges (B)



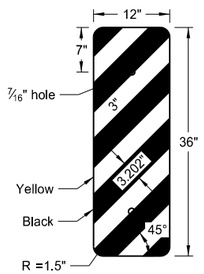
U-Channel Anchor Unit Assembly



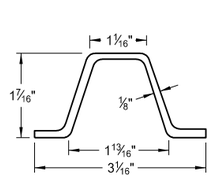
Object Marker
OM2-1V (C)
Type II



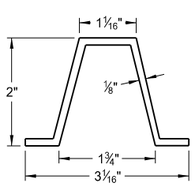
Object Marker Left
OM-3L (C)
Type III



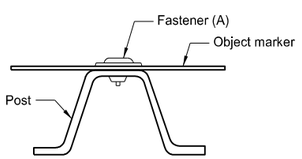
Object Marker Right
OM-3R (C)
Type III



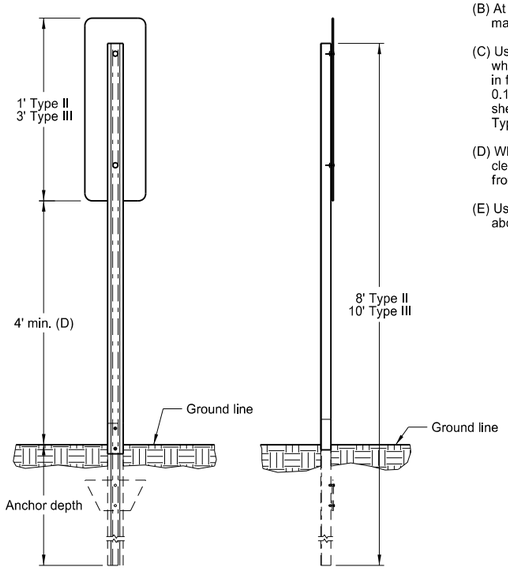
Steel Post Detail
Approx. 2 lb/ft



Aluminum Post Detail
Approx. 0.88 lb/ft



Fastener Detail



Object Marker
Installation Detail

Notes:

(A) Use ⅜" dia. tension pin type or other non-rust vandal resistant fastener with min. outside dia. 13/16" flat washer.

(B) At locations of approach guardrail with reflectors and end terminal with impact head object markers, do not install object markers.

(C) Use two object markers for back to back mountings. On bridges where the distance between wheel guards is less than the approach width, mount object markers vertically on steel posts in front of the bridge railing on each side of highway to mark the horizontal clearance. Use 0.100" minimum thickness sheet aluminum for sign backing material. Use ASTM Type XI sheeting for Type III object markers and ASTM Type IV background sheeting with ASTM Type XI reflectors for Type II object markers.

(D) When object marker is located 8' or less from shoulder or curb, provide 4' minimum vertical clearance from near edge of traveled way to bottom of sign. When located more than 8' from shoulder or curb provide 4' minimum vertical clearance from ground to bottom of sign.

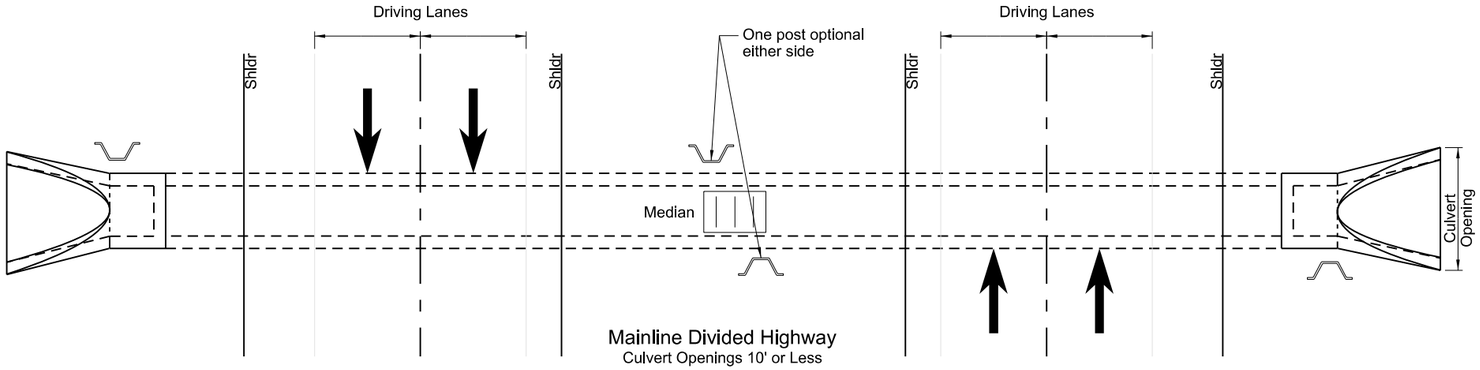
(E) Use 4" vertical clearance for anchor or breakaway base. Provide 4"x60" measurement above and below post location and back and ahead of post.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-18-14	Revised Note C
8-30-18	Updated notes to active voice and removed note.
9-05-19	New Design Engineer PE Stamp.

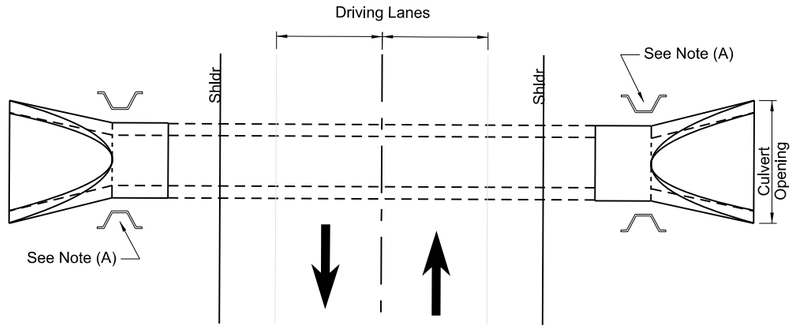
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 9/05/19 and the original document is stored at the North Dakota Department of Transportation

OBJECT MARKERS - CULVERTS

D-754-83

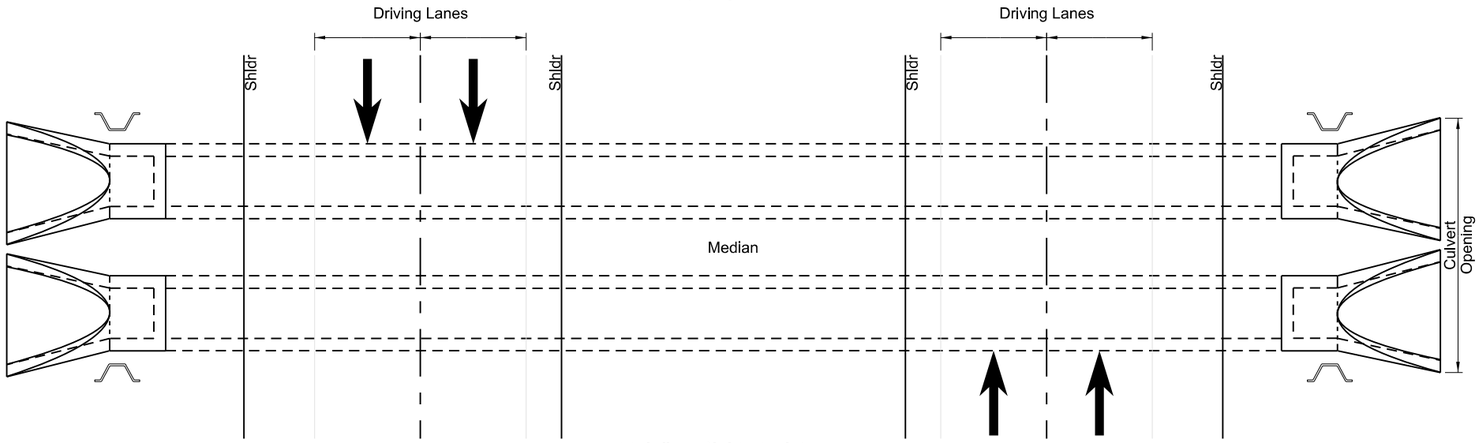


Mainline Divided Highway
Culvert Openings 10' or Less

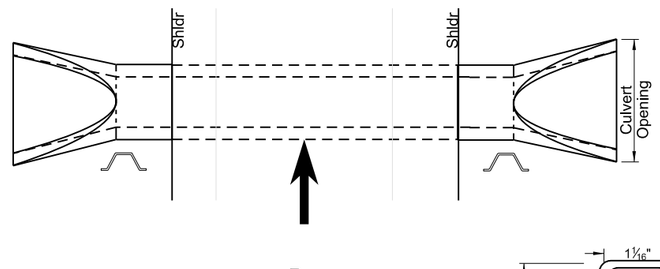


Two-Lane Highway

(A) Install additional marker where multiple pipe installations have a width of greater than 10'.

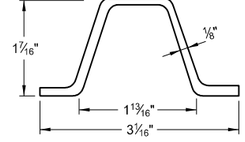


Mainline Divided Highway
Culvert Openings Greater than 10'
Multiple Installations

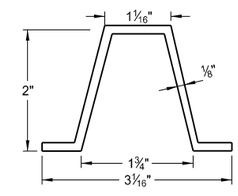


Ramp

Post Location



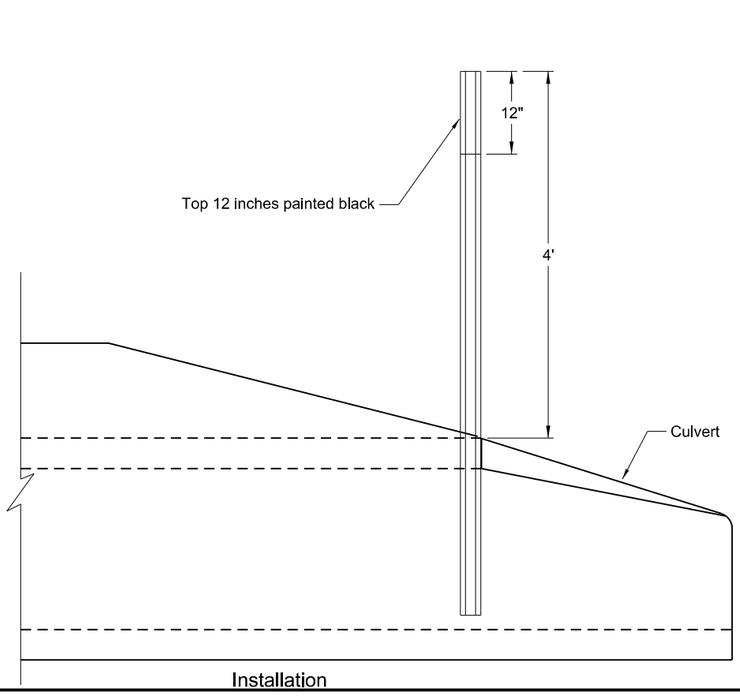
Steel Post Detail
Approx. 2.0 lbs/ft



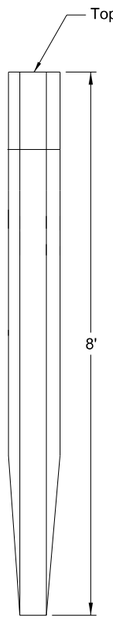
Aluminum Post Detail
Approx. 0.88 lbs/ft

Notes:

Mark each end of culverts crossing the roadway within the right-of-way with a post. Install posts in front of culvert in direction of travel along the side of culvert and one foot from culvert opening unless shown otherwise in plans.



Installation



U-Type Post

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-05-13	
REVISIONS	
DATE	CHANGE
7-7-14	Revised Notes
8-30-18	Updated notes to active voice.
9-05-19	New Design Engineer PE Stamp.

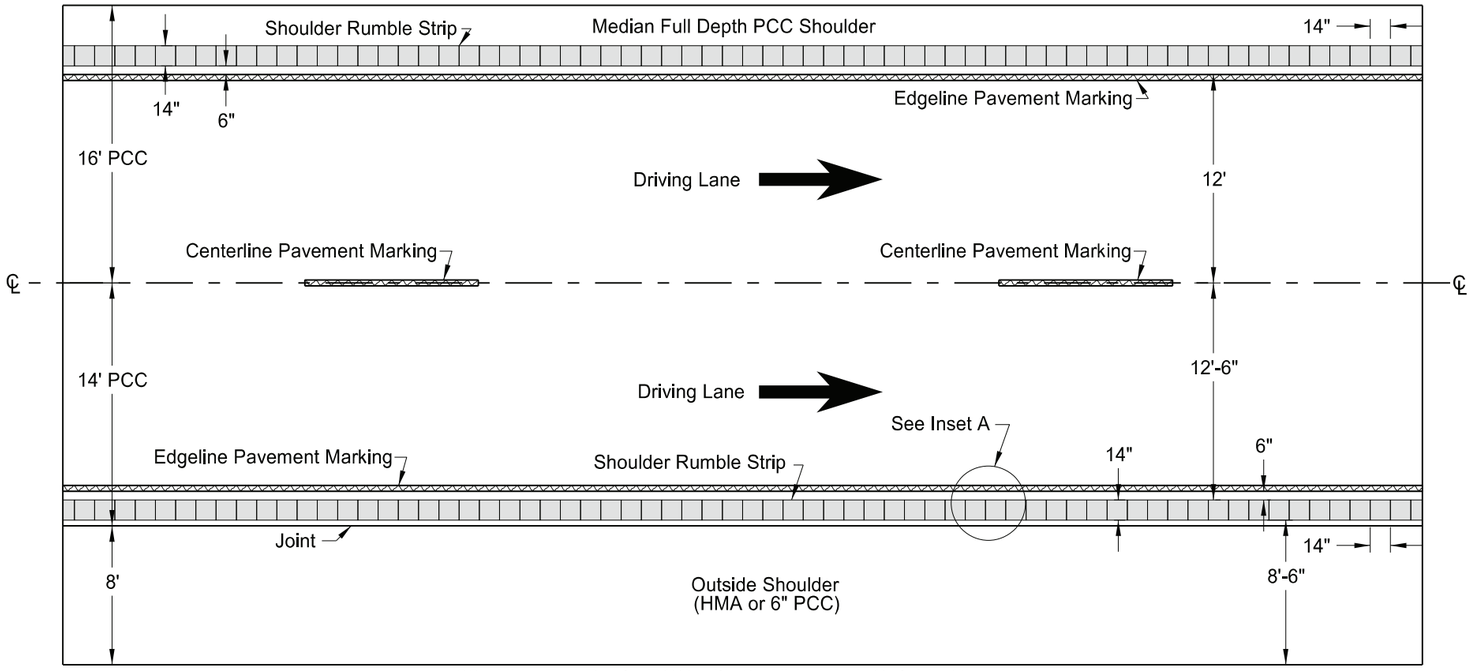
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 9/05/19 and the original document is stored at the North Dakota Department of Transportation

RUMBLE STRIPS
INTERSTATE HIGHWAYS

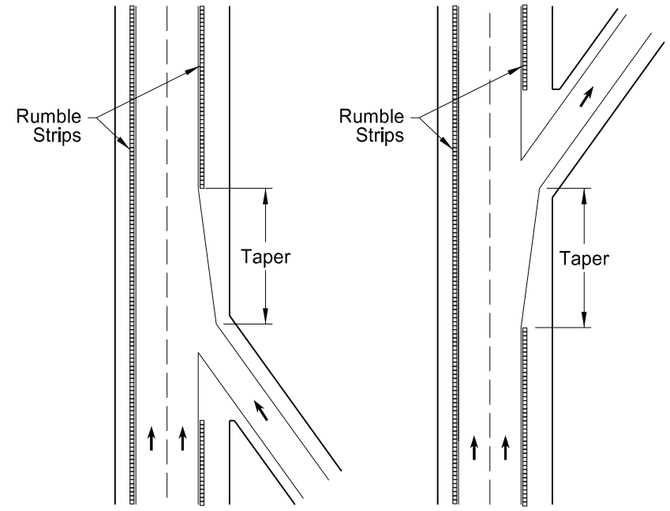
D-760-1

NOTES:

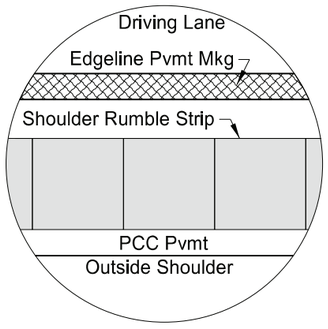
1) Discontinue rumble strips through ramps and tapers.



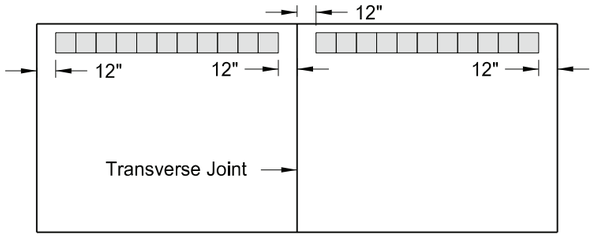
30' Wide Full Depth PCC with 8' Wide HMA Outside Shoulder



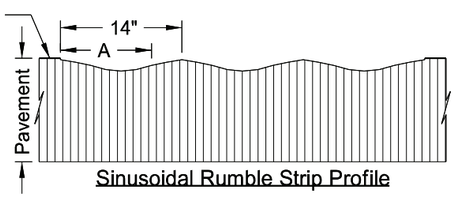
Entrance Ramp Exit Ramp



Inset A - Shoulder Rumble Strip
(Layout for opposite shoulder reversed)



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



Sinusoidal Rumble Strip Profile

Milling Depths		
Location A (in)	Depth	
	MIL	in
0	62.5	1/16
1 3/4	156	5/32
3 1/2	281	9/32
5 1/4	438	7/16
7	500	1/2
8 3/4	438	7/16
10 1/2	281	9/32
12 1/4	156	5/32
14	62.5	1/16

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

12-29-09

REVISIONS

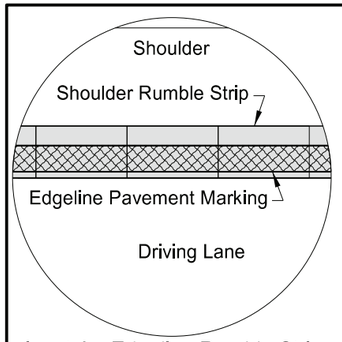
DATE	CHANGE
2-25-10	Note 4 was added.
9-08-11	Revised Notes and D-760-1.
8-30-18	Revised drawings for clarity.
10-25-19	Added missing dimensions.
11-16-21	Added rumbles to end of taper.
5-26-23	Rumble strips made sinusoidal.

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

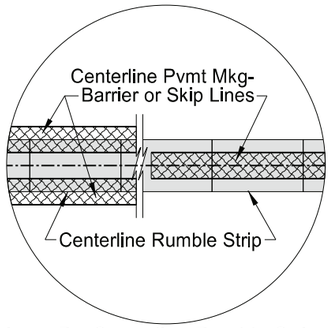
05/26/23

RUMBLE STRIPS
UNDIVIDED HIGHWAYS (SHOULDERS LESS THAN 4')

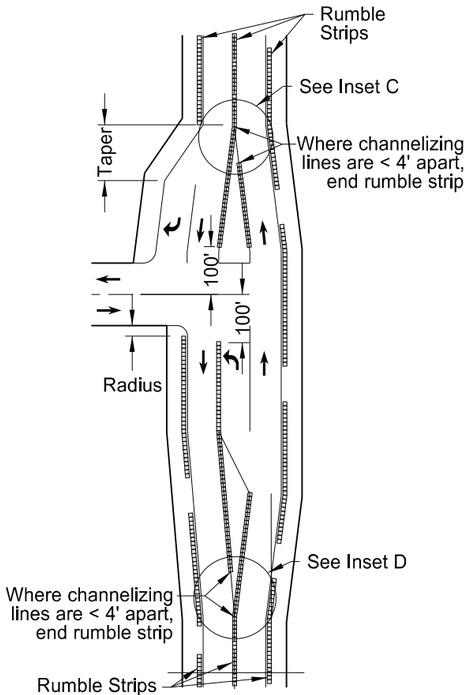
D-760-4



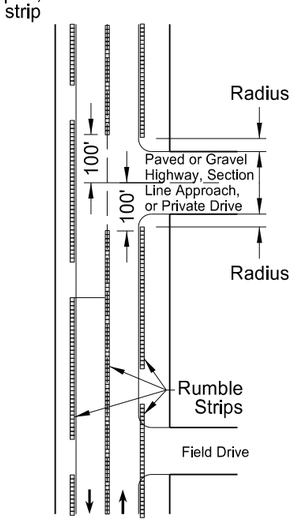
Inset A - Edgeline Rumble Strip
(Layout for opposite shoulder reversed)



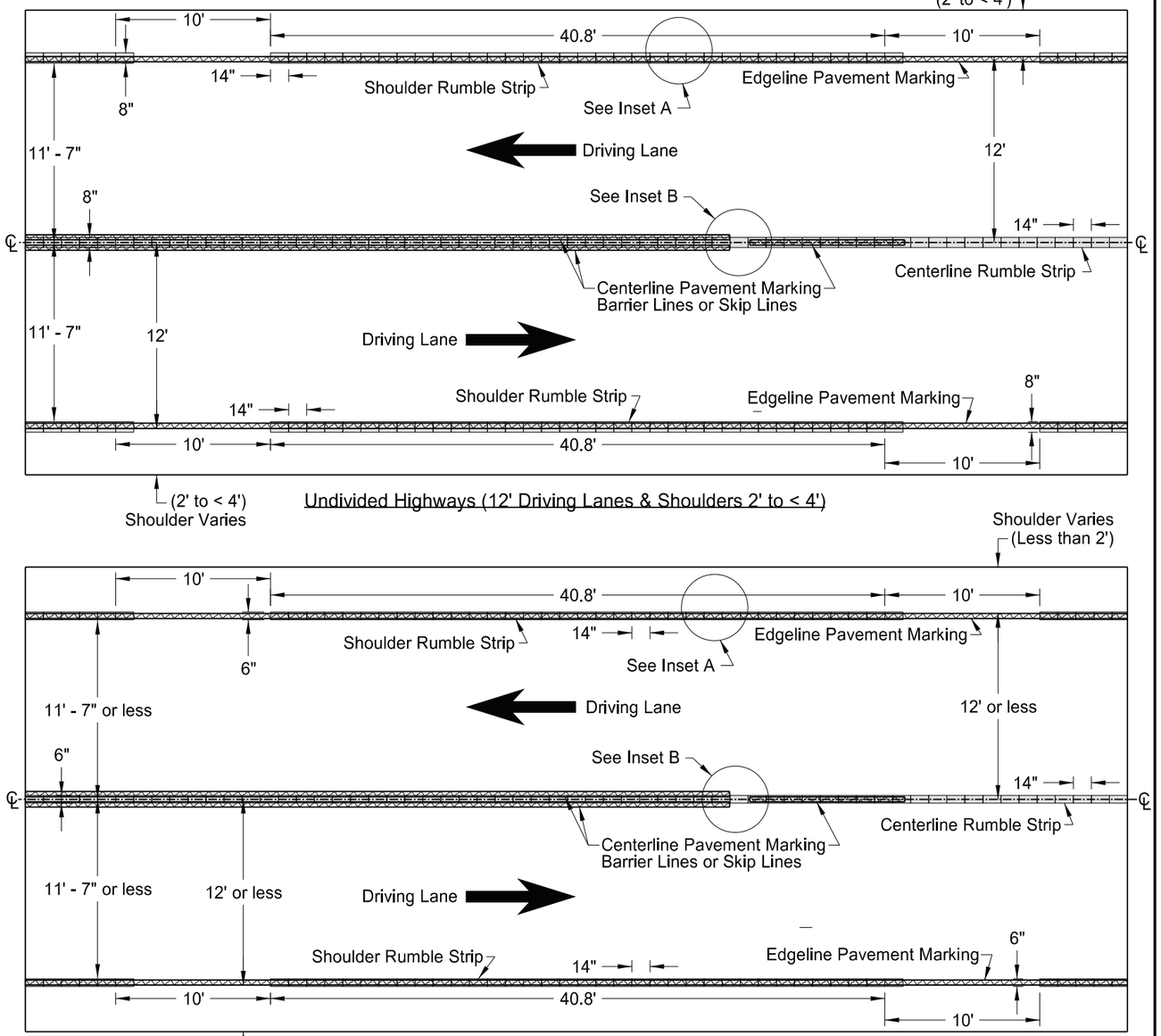
Inset B - Centerline Rumble Strip



Turn Lane
(Right & Left)

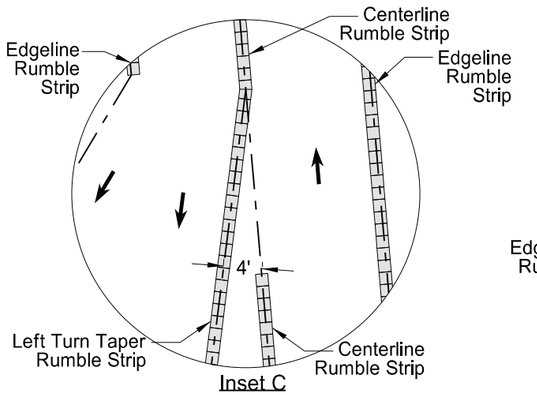


Entrance Roadways

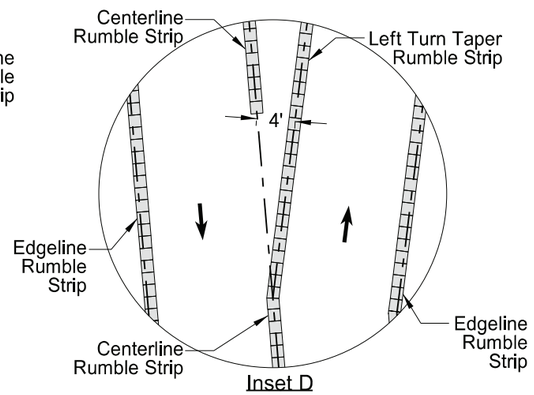


Undivided Highways (12' Driving Lanes & Shoulders 2' to < 4')

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



Inset C



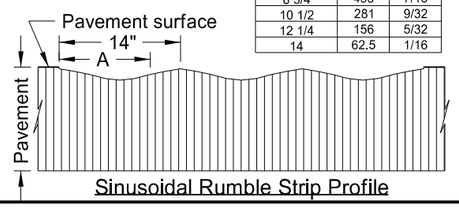
Inset D

NOTES:
1) Discontinue shoulder rumble strips through the entire length of right turn lanes and tapers, and at the radius of paved or gravel highways, section line approaches, or private drives.

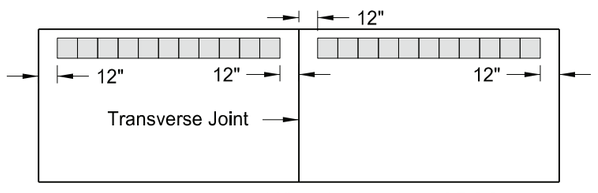
2) Discontinue centerline rumble strips 100' before and after paved or gravel highways, section line approaches, or private drives. Place rumble strips at left turn lanes as shown below.

3) No additional quantity provided for centerline rumble strips on left turn tapers. Include all costs for centerline rumble strips on left turn tapers in the price bid for "Sinusoidal Rumble Strip - Asphalt Centerline" or "Sinusoidal Rumble Strip - Concrete Centerline".

Milling Depths		
Location A (in)	Depth	
	MIL	in
0	62.5	1/16
1 3/4	156	5/32
3 1/2	281	9/32
5 1/4	438	7/16
7	500	1/2
8 3/4	438	7/16
10 1/2	281	9/32
12 1/4	156	5/32
14	62.5	1/16



Sinusoidal Rumble Strip Profile



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

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).
9-08-11	Revised Notes and D-760-4.
1-26-12	Revised details for rumble strip widths and dimensions.
10-25-19	Added missing dimensions.
11-16-21	Revised turn lane rumble layout.
3-07-23	Added Note 3.
5-26-23	Rumble Strips made Sinusoidal.

KIRK J. HOFFT
REGISTERED
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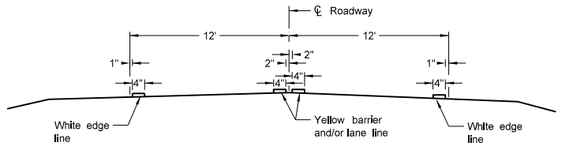
PE-4683
ENGINEER
NORTH DAKOTA

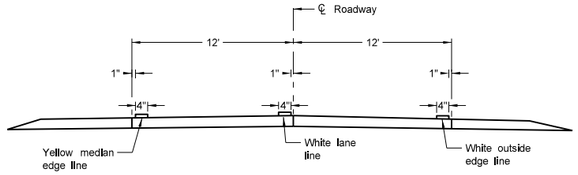
05/26/23

PAVEMENT MARKING

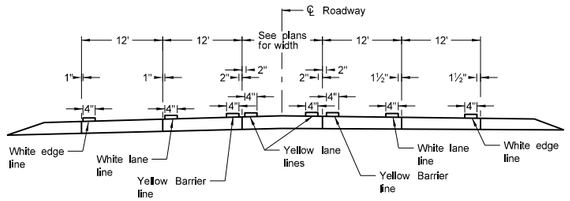
D-762-4



Two Lane Two Way
RURAL ROADWAY



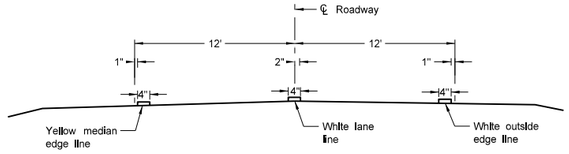
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



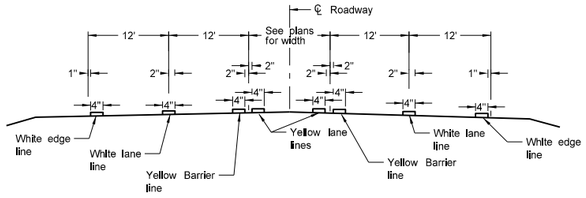
RURAL FIVE LANE ROADWAY
Concrete Section

NOTES:

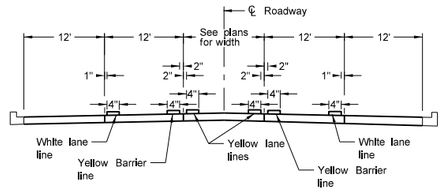
1. Continue edge lines through private drives and field drives. Break edge lines for intersections.



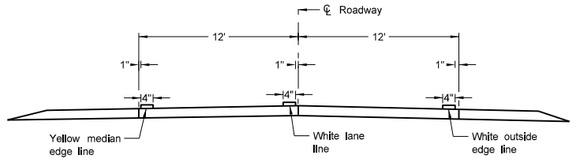
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



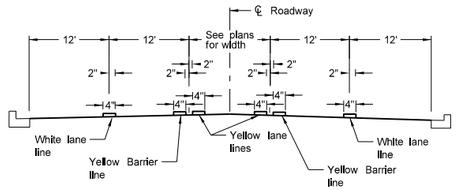
RURAL FIVE LANE ROADWAY
Asphalt Section



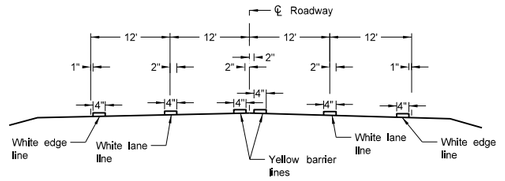
URBAN FIVE LANE SECTION
Concrete Section



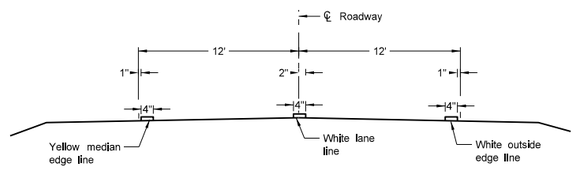
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



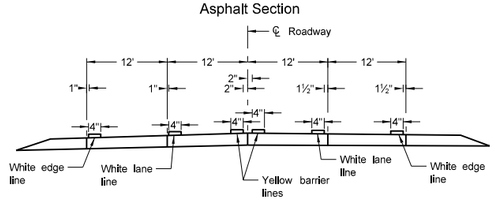
URBAN FIVE LANE SECTION
Asphalt Section



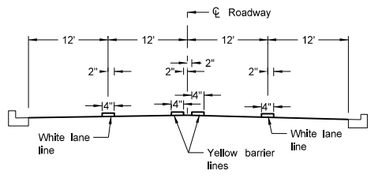
RURAL FOUR LANE ROADWAY
Asphalt Section



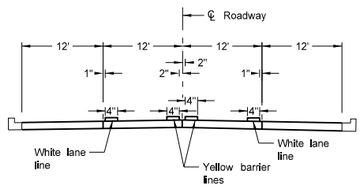
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



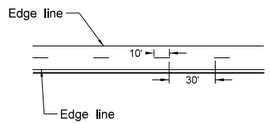
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



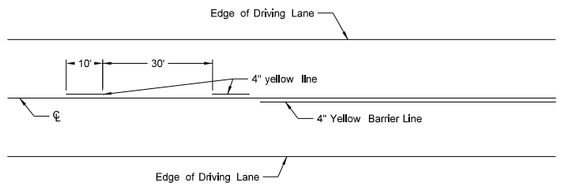
CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
10-17-17 08-27-19	Updated to active voice. New Design Engineer PE Stamp.

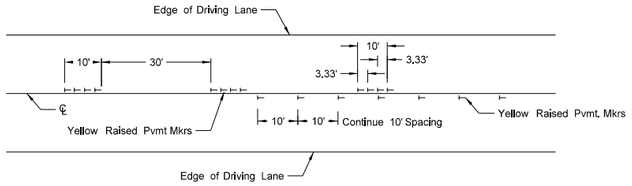
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/27/19 and the original document is stored at the North Dakota Department of Transportation

SHORT-TERM PAVEMENT MARKING

D-762-11

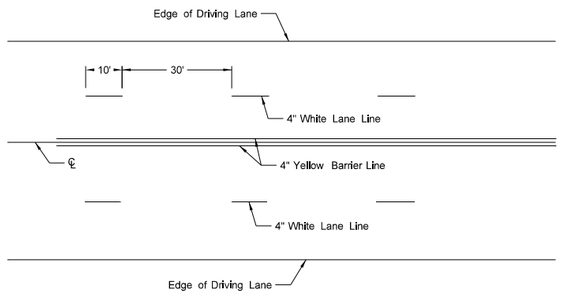


Painted or Tape Lines

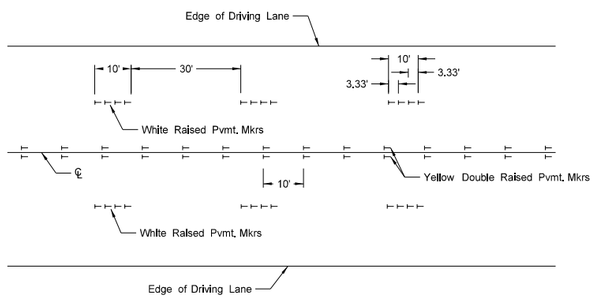


Raised Pavement Markers

TWO-LANE TWO-WAY ROADWAY

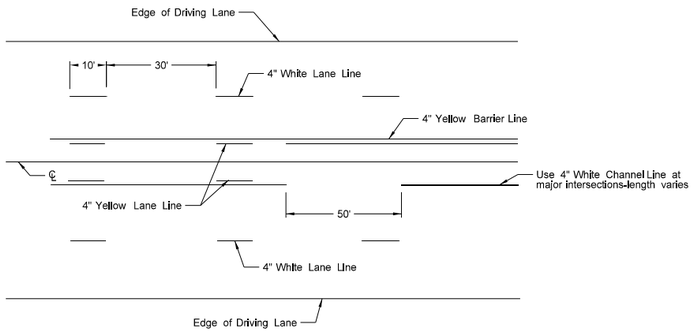


Painted or Tape Lines

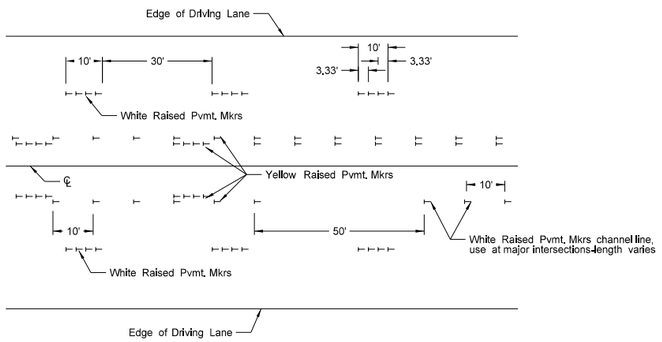


Raised Pavement Markers

FOUR LANE ROADWAY

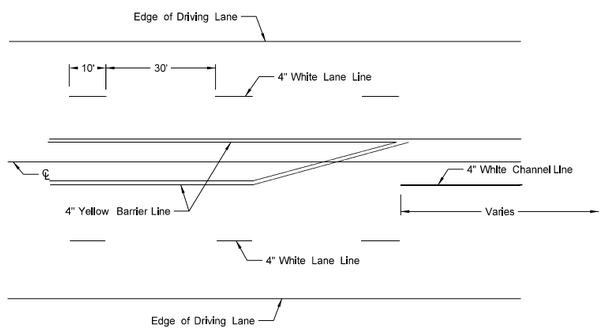


Painted or Tape Lines

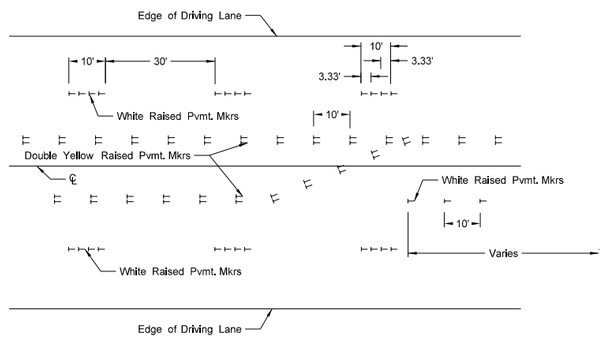


Raised Pavement Markers

FIVE LANE ROADWAY TWO WAY LEFT TURN



Painted or Tape Lines



Raised Pavement Markers

FIVE LANE ROADWAY WITH MARKED ISLANDS

NOTES:

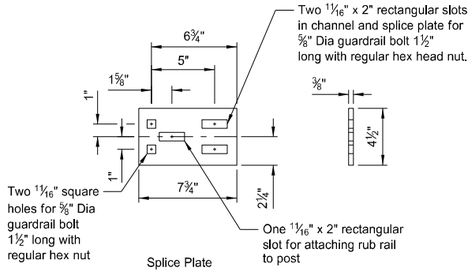
1. Place no passing zones on two-lane two-way roadways as shown. In lieu of short term no passing zone pavement markings, place no passing zone signs. Replace no passing zone signs with short term no passing zone pavement marking within three days.
2. Place short term center line stripe (paint) on top lift to match exact placement of permanent stripe.
3. Remove raised markers and tape markings after permanent pavement marking is installed.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
3-29-16	Re-numbered to be D-762-11 (previously was D-762-6)
10-17-17	Updated to active voice.
8-27-19	New Design Engineer PE Stamp.

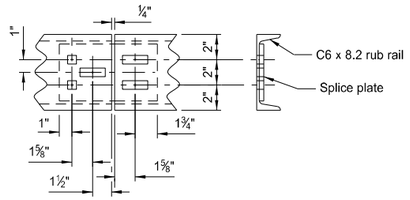
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/27/19 and the original document is stored at the North Dakota Department of Transportation

W-BEAM GUARDRAIL GENERAL DETAILS

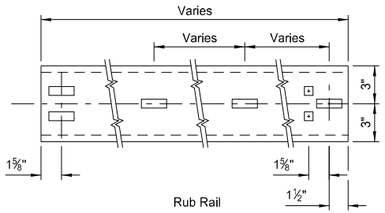
D-764-1



Splice Plate

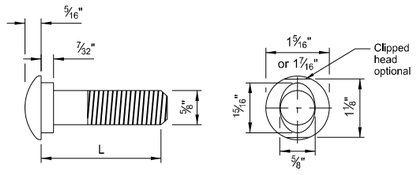


Splice Detail

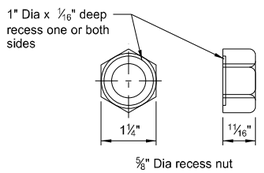


Rub Rail

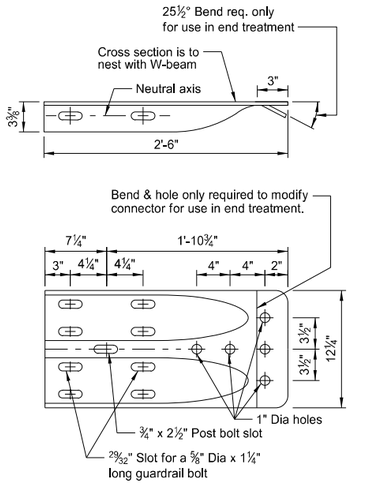
C6x8 RUB RAIL AND SPLICE PLATE



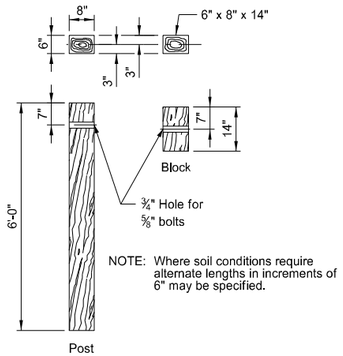
5/8" Diameter Guardrail Bolt	
L	Thread Length
1 1/4"	Full length thread
2"	1 3/4" Min thread length
9 1/2"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length



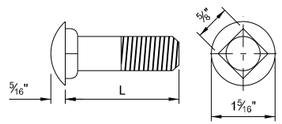
5/8" GUARDRAIL BOLT & RECESS NUT



W BEAM TERMINAL CONNECTOR

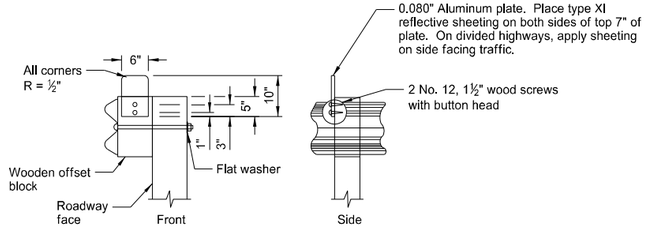


6"x8" TIMBER POST & BLOCK



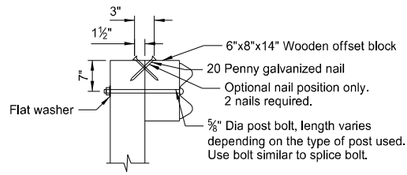
5/8" Diameter Carriage Bolt	
L	Thread Length
1 1/2"	Full length thread
3"	1 1/2" Min thread length
11"	1 3/4" Min thread length
13"	1 3/4" Min thread length

5/8" CARRIAGE BOLT & NUT

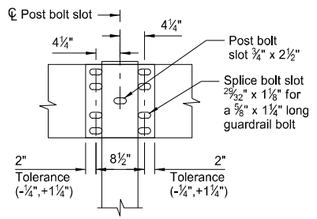


REFLECTORIZED PLATE DETAIL

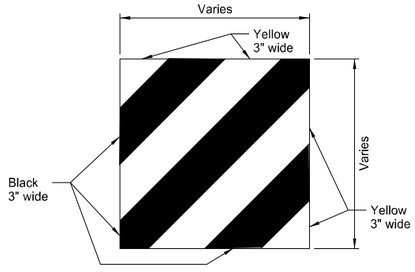
Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.



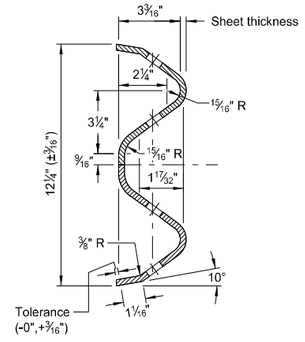
TYPICAL POST ATTACHMENT DETAIL



SPLICE DETAIL



IMPACT HEAD OBJECT MARKER



W-BEAM CROSS SECTION

NOTES:

1. Place reflector plates at the first post and spaced at 25' centers on guardrail less than 250' in length and at 50' centers for guardrail over 250' in length. Use reflector the same color as the pavement marking adjacent to that reflector unless noted otherwise on the plans.
2. Dispose of excess earth from excavations for guard posts as directed by the engineer. Replace bituminous material where guardrail is installed after mat is placed. Include cost of excavation and replacing of bituminous material in the price bid for other items.
3. Place Object Marker within the vertical edges of the Impact Plate. Use type XI retroreflective sheeting meeting the requirements of Section 894.02.E of the standard specifications. Apply sheeting to 0.100 Aluminum sheeting meeting the requirements Section 894.01.A. Attach the Object Marker to the Impact Head Plate with non-rust rivets or some other non-rust attachment device. Slope stripes downward toward the roadway side.
4. Guardrail installation height tolerance = - 1/4" , + 1".
5. Standard W-Beam rail post bolt slot spacing is 6'-3". Post bolt slot spacing of 3'-1 1/2" is acceptable.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-11-13

REVISIONS

DATE	CHANGE
10-25-19	Updated notes to active voice and added Note 5.
12-02-20	Updated clipped head to optional

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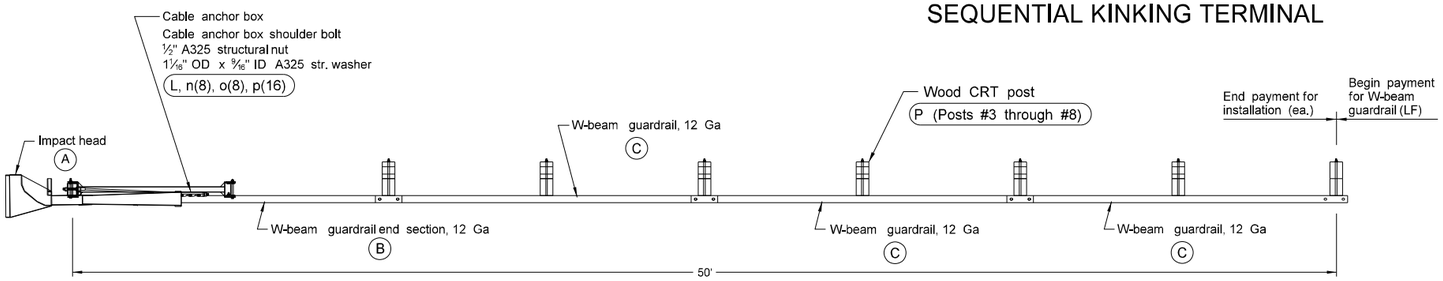
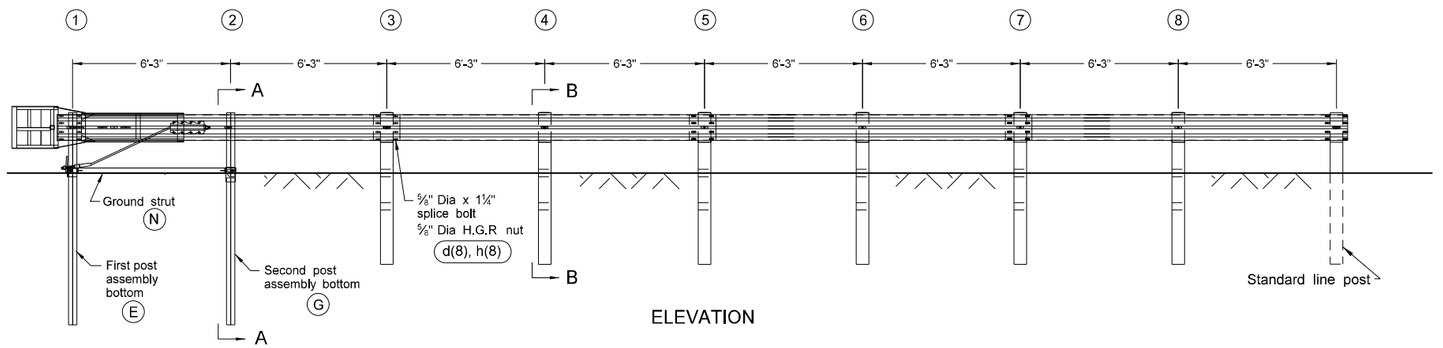
12 02 2020

SEQUENTIAL KINKING TERMINAL

D-764-5



PLAN

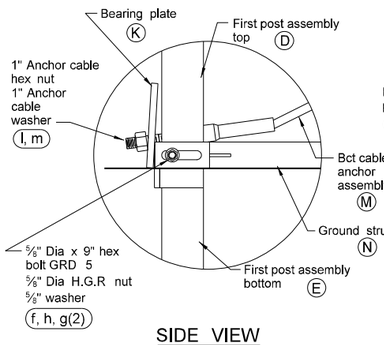


ELEVATION

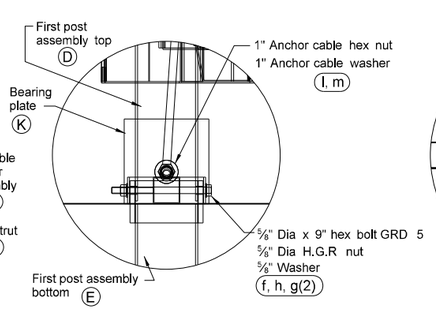
ITEM	QTY	BILL OF MATERIALS
A	1	IMPACT HEAD
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga
C	3	W-BEAM GUARDRAIL, 12 Ga
D	1	FIRST POST ASSEMBLY TOP
E	1	FIRST POST ASSEMBLY BOTTOM
F	1	SECOND POST ASSEMBLY TOP
G	1	SECOND POST ASSEMBLY BOTTOM
K	1	BEARING PLATE
L	1	CABLE ANCHOR BOX
M	1	BCT CABLE ANCHOR ASSEMBLY
N	1	GROUND STRUT HINGED POST
P	6	WOOD CRT POST
R	6	TIMBER BLOCKOUT/RCY EQUIVALENT
		HARDWARE
a	2	1/4 " x 4" HEX BOLT Grade 5
b	4	¼" WASHER
c	2	¼" HEX NUT
d	25	⅝" Dia X 1¼" SPLICE BOLT, POST #2
e	6	⅝" Dia X 18" H.G.R. BOLT (POSTS 3 THRU 8)
f	1	⅝" Dia X 9" HEX BOLT GRD 5
g	8	⅝" WASHER
h	32	⅝" Dia H.G.R. NUT
j	1	¾" Dia X 8½" HEX BOLT GRD A449
k	1	¾" Dia HEX NUT
l	2	1" ANCHOR CABLE HEX NUT
m	2	1" ANCHOR CABLE WASHER
n	8	GROUND STRUT HINGED POST
o	8	½" A325 STRUCTURAL NUT
p	16	1⅛" OD X ⅝" ID A325 STR. WASHER

GENERAL NOTES:

1. Use breakaway posts with the SKT.
2. Use galvanized bolts, nuts, cable assemblies, cable anchors, and bearing plates.
3. Flare the SKT at a rate of up to 25:1 to prevent shoulder encroachment by the impact head.
4. Grade site as needed to prevent lower sections of the posts from protruding more than 4" above ground (measured along a 5' cord).
5. Drive the lower section of the hinged posts without the upper post attached. If the post is placed in a drilled hole, compact the backfill material satisfactorily to prevent settlement.
6. When rock is encountered during excavation, use a 10" diameter post hole, 20" into the rock surface, if approved by the engineer. Place granular material in the bottom of the hole, approximately 2½" deep to provide drainage. Field cut posts 1 & 2 to length, place in the hole, and backfill with adequately compacted material excavated from the hole.
7. Place the breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent the cable from twisting when tightening nuts.
8. "Toe nail" the wood blockouts on post #3 through post #8 with two 20 penny galvanized nails in each rectangular post, to prevent them from turning when the wood shrinks.

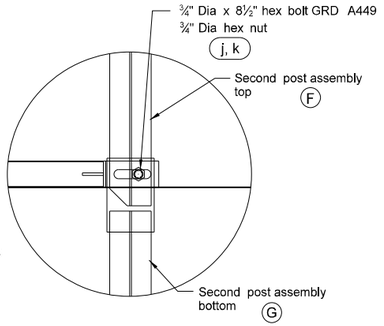


SIDE VIEW

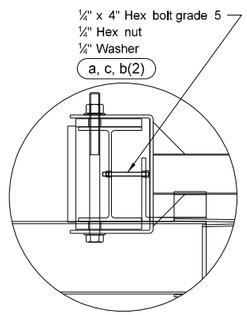


FRONT VIEW

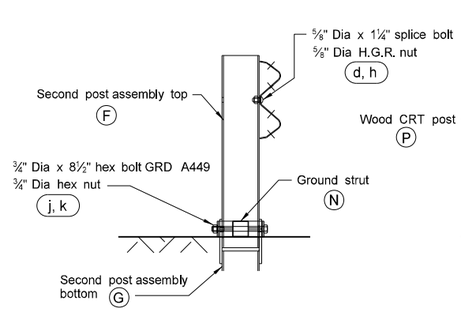
POST #1 CONNECTION DETAILS



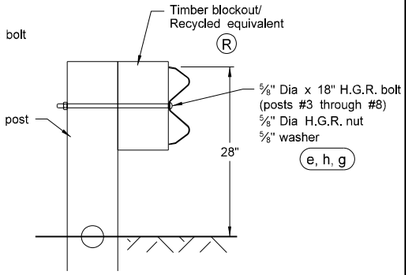
SIDE VIEW DETAIL OF POST #2



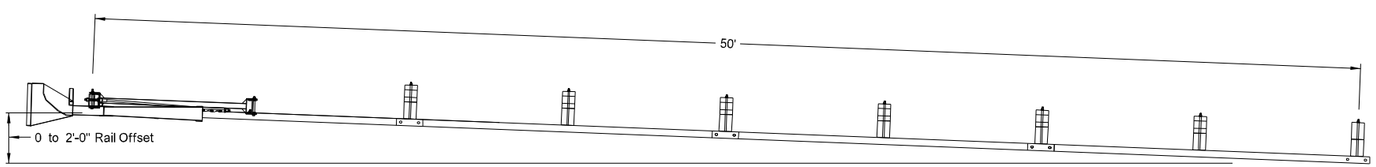
IMPACT HEAD CONNECTION DETAIL



SECTION A-A
Post #2



SECTION B-B
Posts #3 through #8



FLARED INSTALLATION
25:1 maximum flare rate

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DATE	CHANGE
12-02-20	Updated notes to active voice.

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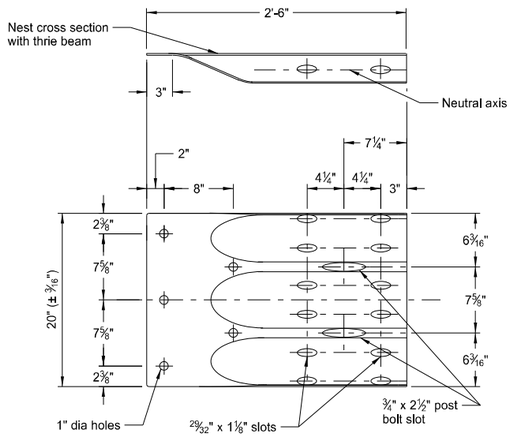
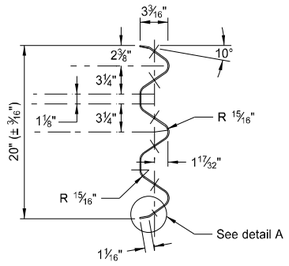
THRIE BEAM TRANSITION TO DOUBLE BOX BEAM RETROFIT

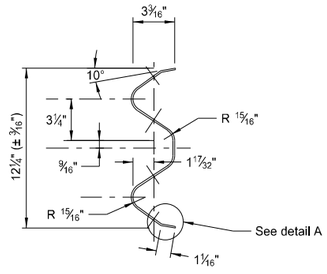
D-764-10



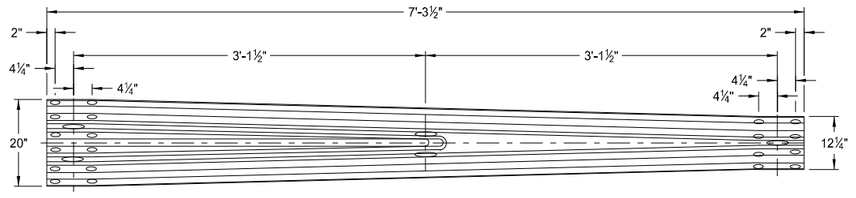
THRIE BEAM TERMINAL CONNECTOR



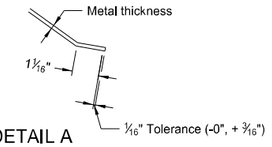
THRIE BEAM END VIEW



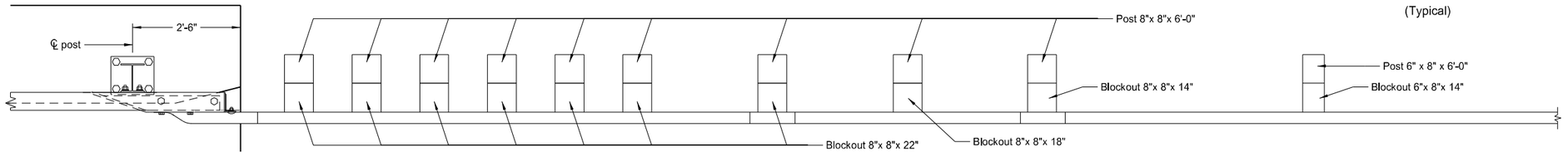
W-BEAM END VIEW



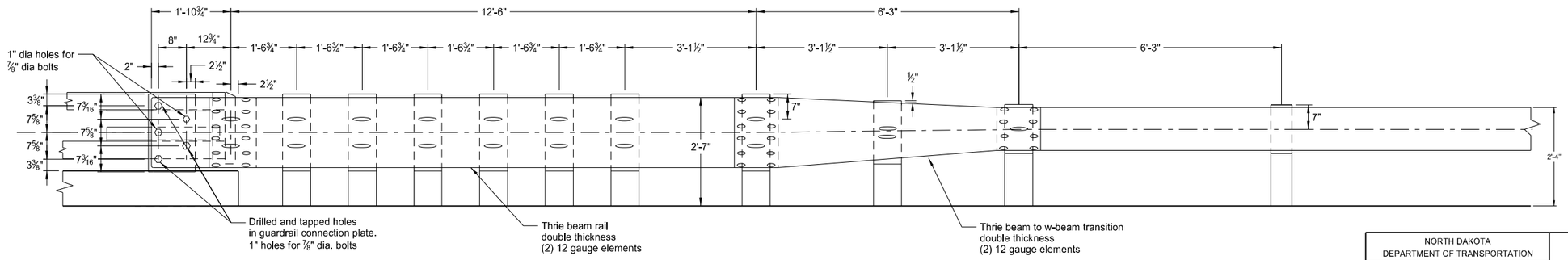
THRIE BEAM TO W-BEAM TRANSITION SECTION



DETAIL A
(Typical)



PLAN



ELEVATION

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DATE	CHANGE
12/02/20	Updated text to active voice.

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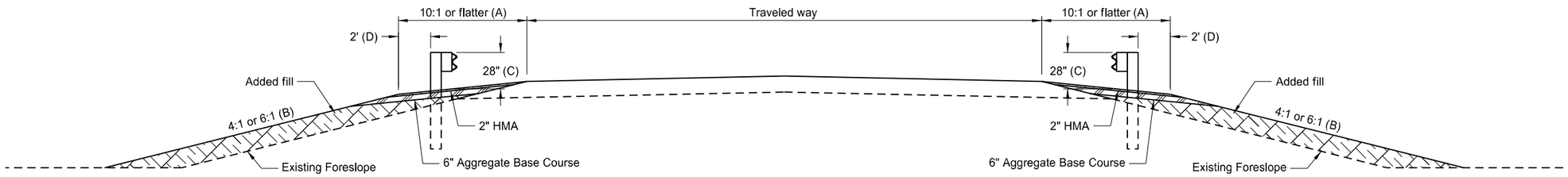
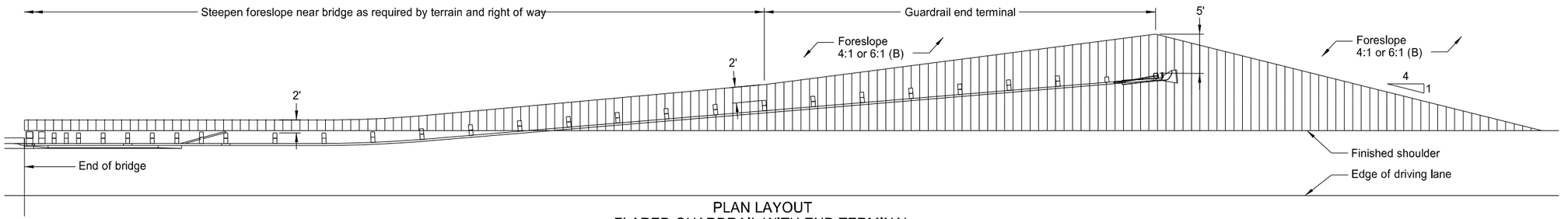
D-764-22

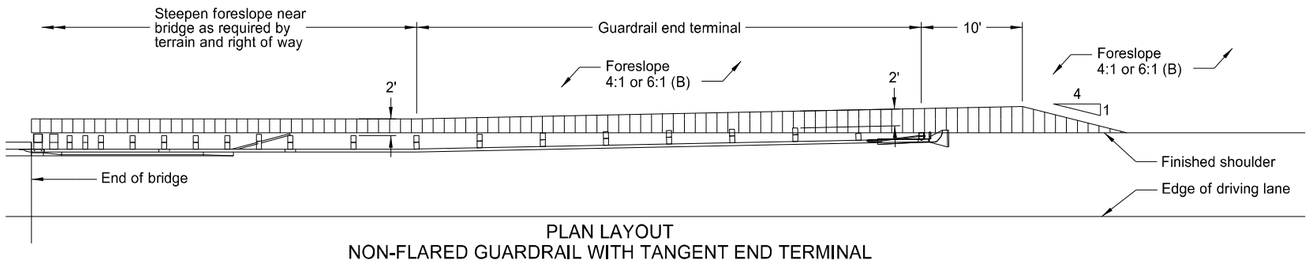
TYPICAL GRADING AT BRIDGE ENDS WITH W-BEAM GUARDRAIL



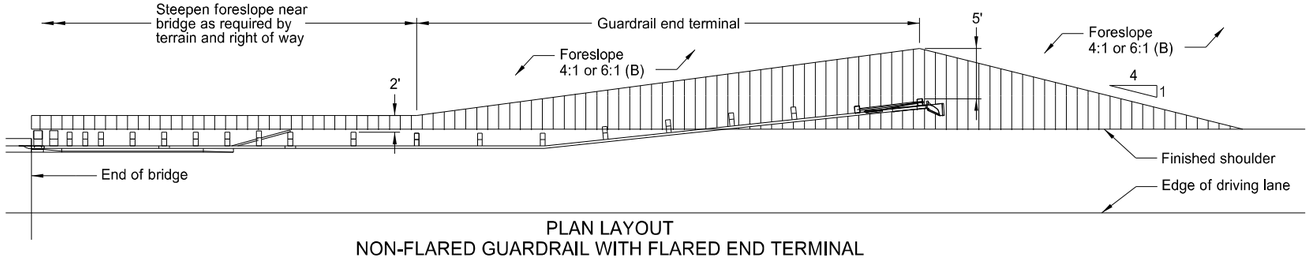
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

(A) Use slope flatter than 10:1 when necessary to provide proper guardrail height.

(B) When normal foreslope is 4:1, use added fill slope of 4:1. When normal foreslope is 6:1, use added fill slope of 6:1.

(C) Measure from top of guardrail to top of surfacing at front face of guardrail.

(D) Dimension at end terminals vary per Plan Layouts shown on this sheet.

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REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.

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