

DESIGN DATA				
Traffic	Average Daily			
Current 2022	Pass: 160	Trucks: 30	Total: 190	
Forecast 2042	Pass: 210	Trucks: 45	Total: 255	
Clear Zone Distance: 18'		Design Speed: 40 MPH		
Minimum Sight Dist. for Stopping: 333'		Bridges: HL-93 Design Loading		
Sight Dist. for No Passing Zone: N/A				
Pavement Design Life 20 (years)				
Design Accumulated One-way Flexible ESALs: 130,411				

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

IM-2-094(186)217

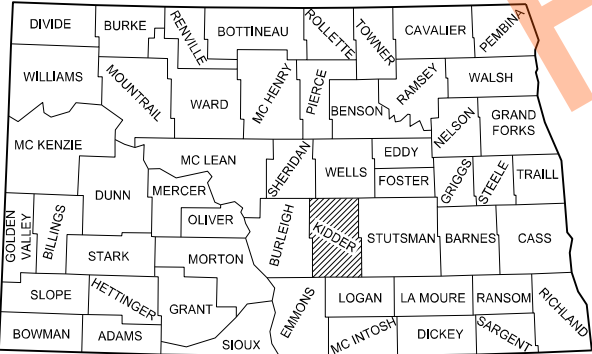
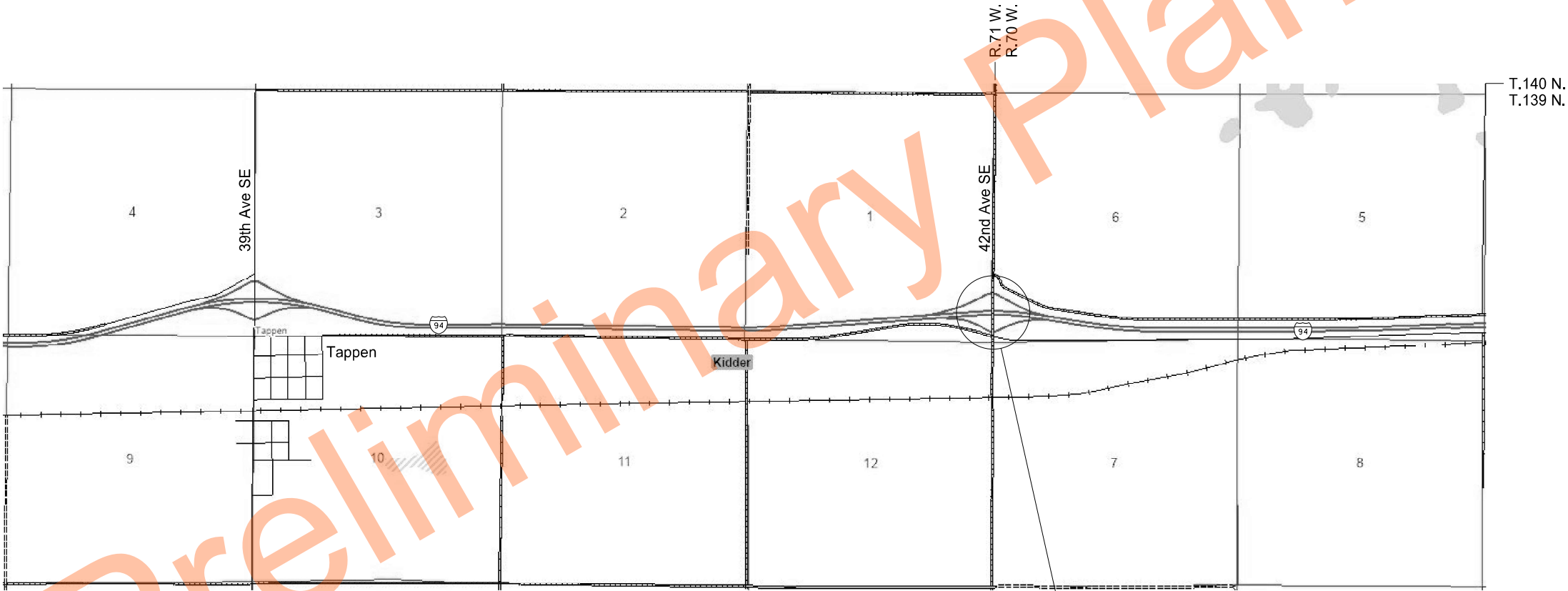
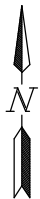
Kidder County
I-94/PETTIBONE INTERCHANGE

Grading, Aggregate Base, HMA Pavement, Structure Removal and Replacement,
Signing, Pavement Marking, and Guardrail

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ND	IM-2-094(186)217	23344	1	1

GOVERNING SPECIFICATIONS	Date Published and Adopted by the North Dakota Department of Transportation
Standard Specifications	7/1/2024
Supplemental Specifications	NONE

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
IM-2-094(186)217	0.379	0.379



STATE COUNTY MAP

ND DEPARTMENT OF TRANSPORTATION
OFFICE OF PROJECT DEVELOPMENT

Jason Thorenson

Jason Thorenson
09/03/25

BRIDGE DIVISION



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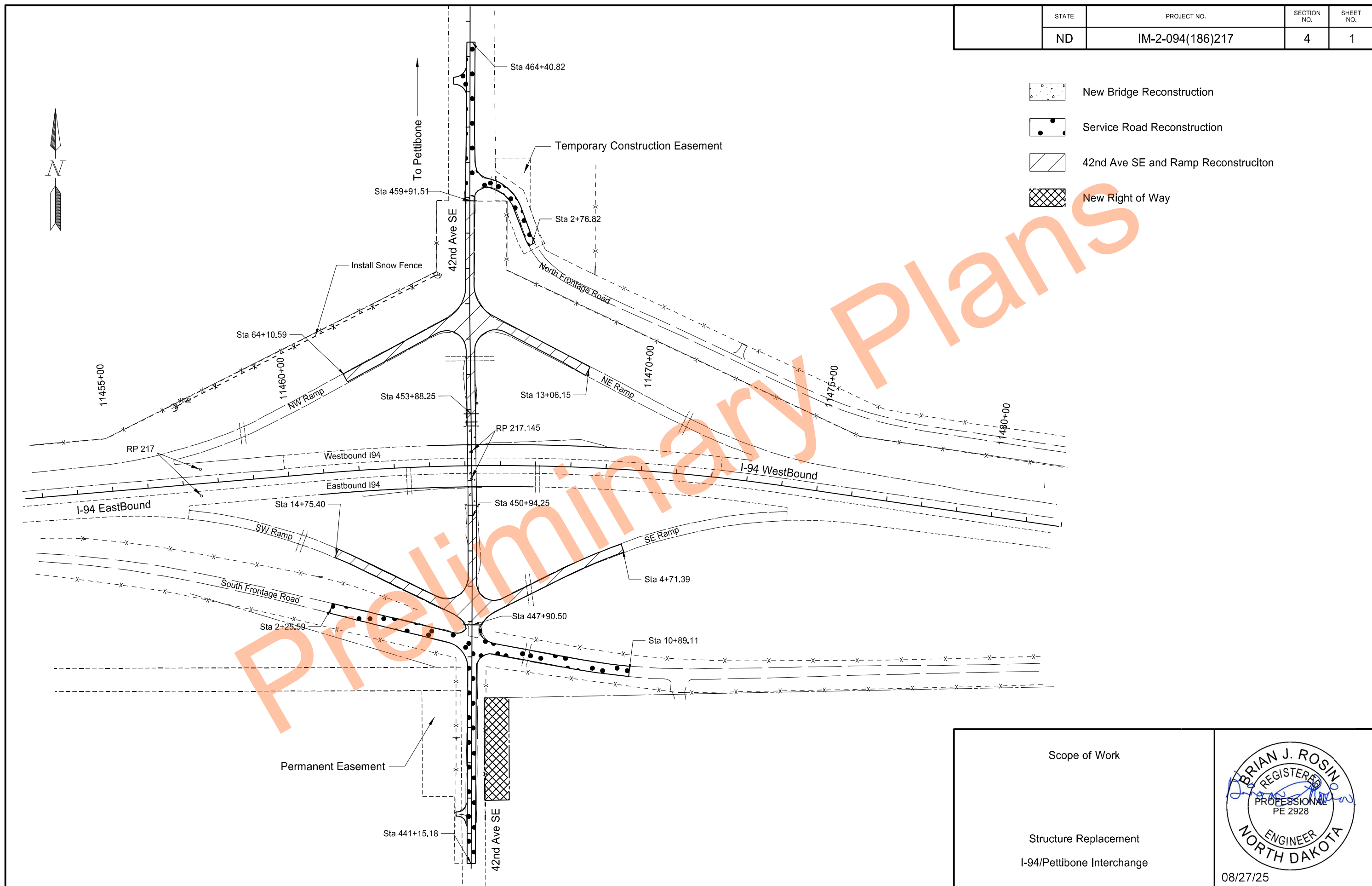
SPECIAL PROVISIONS

Number	Description
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SSP 2	Federal Migratory Bird Treaty Act
SSP 10	E-Ticketing
SP 198(24)	Snow Fence
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D-101-10	NDDOT Utility Company and Organization Abbreviations	D-754-12	Breakaway Coupler System - Structural Details For W-Shape Supports
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D-261-1	Erosion Control - Fiber Roll Placement Details	D-754-53	Sign Punching, Stringer and Support Location Details - Route Marker Signs
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D-704-9	Construction Sign Details - Terminal And Guide Signs	D-764-40	MGS W-Beam Guardrail General Details
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D-704-11, 11A	Construction Sign Details - Warning Signs	D-764-50	MASH SoftStop End Terminal - Steel Post
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D-754-2	Breakaway Coupler System For Standard Pipe - Stub Post		
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NOTES

- 100-P01 LANDOWNER COORDINATION: Notify the landowners two weeks prior to beginning construction so they have adequate notice to move livestock. Landowner contacts are Clint Kramlich at 701.426.8115 and Roger Thorsness 701.316.0045 (or Nancy Fuchs at 701.400.7963).
- 105-200 UTILITY COORDINATION: A utility coordination meeting is required.
- 107-P01 MAINTAINING TRAFFIC –DROP-OFFS: If a shoulder and the adjacent lane are uneven due to milling or paving operations, the requirements of Section 704.04 O, "Traffic Control for Uneven Pavement" apply. If the uneven shoulder and adjacent lane are due to other circumstance, the contents of this note apply. If, at the end of the work-day, drop-offs greater than 2 inches and less than 18 inches or slopes steeper than 4:1 exist between the edge of a traffic lane and the outside edge of the proposed roadway, perform one of the following actions:

• Construct a traversable wedge in the area of the drop-off or steep slope; or

• Close the lane adjacent to the drop-off or steep slope and provide 24-hour flagging or pilot car operations.

When constructing a wedge, construct a wedge composed of aggregate or earthen materials with a 4:1 or flatter slope along the entire length of the area. Compact materials using Type C compaction, as specified in 203.04 G.4, "Compaction Control Type C".

Install stackable vertical panels that meet the requirements of Section 704.03 H, "Stackable Vertical Panels", along the edge of the driving lane closest to the wedge.

The Engineer will measure stackable vertical panels as specified in Section 704.05, "Method of Measurement" and will pay for panels as specified in Section 704.06, "Basis of Payment".

The Engineer will not measure material used to construct the wedge. Include the cost of materials, equipment, labor, and incidentals required for this operation within the bid price for “AGGREGATE BASE COURSE CL 5”.

If a 4:1 or flatter wedge is not installed, provide 24-hour flagging or pilot car operations and associated traffic control at no additional cost to the Department.

107-P02 HAUL ROAD RESTORATION: Use Class 13 aggregate for haul road restoration.

107-P03 MAINTAINING TRAFFIC ON INTERCHANGE RAMPS: Maintain traffic on interchange ramps during removal of existing bridge superstructure and setting of new bridge beams, as directed in Note 704-P02. Unless otherwise approved by the Engineer, the existing bituminous surfacing on the ramps must remain in place or the new surfacing should be already paved when mainline I-94 traffic is being diverted onto the interchange ramps.

201-P01 CLEARING & GRUBBING: Remove existing brush and trees within the seeding limits shown in Section 77 of the Plans. All tree removals will be paid under the “Clearing and Grubbing” bid item regardless of size.
- 202-P01 REMOVE AGGREGATE BASE AND SURFACING: Removal of bituminous surfacing includes removing full bituminous pavement depth and 5” of the 7” base. The bottom 2” of base is considered unsuitable and may remain in place. The existing bituminous pavement and base thicknesses are based on previous construction plans. Actual thicknesses may vary.

203-P01 CONTRACTOR FURNISHED BORROW: Obtain the proper clearance for contractor furnished borrow. Contact the following adjacent land owners identified as borrow clues or stockpile location clues: Clint Kramlich at 701.426.8115 and Roger Thorsness 701.316.0045 (or Nancy Fuchs at 701.400.7963).

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-P01 TRAFFIC SURFACE AGGREGATE: Maintain a minimum of 4” of traffic surface aggregate in the areas designated for roadway travel. Provide temporary service aggregate meeting the requirements of Section 817 for Salvaged Base Course, A quantity of 5,000 tons has been provided for use. No additional payment for aggregate will be made to salvage and relay the material. Include all costs associated with providing, placing, maintaining, removing, and replacing the material in the contract unit price for “Traffic Surface Aggregate”.

430-P01 PAVEMENT PATCHING ON RAMPS: A quantity of 200 tons of Commercial Grade Hot Mix Asphalt has been provided for patching ramps, at location determined by the Engineer, before using ramp detour for mainline traffic.

704-200 STATE FURNISHED MEDIAN BARRIER: Obtain (224) 2.5’ x 10’ concrete barriers. They can be picked up and returned to the Casselton yard at 15482 37th St SE in Casselton ND 58012. The hardware can be picked up and returned to the Fargo District yard at 503 38th St S in Fargo ND 58103. Contact the Fargo District office at 701-239-8900 to facilitate the exchanges.

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.

Include all costs associated with median barriers in the contract unit price for “State Furnished Median Barrier”
- A circular professional engineer seal for Brian J. Rosin, a registered professional engineer in North Dakota with license number PE 2928. The seal includes the text "BRIAN J. ROSIN", "REGISTERED", "PROFESSIONAL", "PE 2928", "ENGINEER", and "NORTH DAKOTA". A signature is written across the seal. Below the seal, the date "04/21/25" is printed.
- 3/17/2025 1:43:41 PM R:\project\20094217.186\design\Sheets\006NT_002_notes1.docm

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704-P01 TRAFFIC CONTROL: Traffic control device quantities are based on the following list:

1. D-704-15, Temporary Road Closure
2. D-704-21, Detour Sign Layouts
3. D-704-22, Layouts Type K and L for construction trucks hauling material.
4. D-704-26, Layout Type JJ for break in pavement.
5. D-704-26, Layouts EE as needed.
6. D-704-35 One Lane Closure for constructing embankment on the median shoulder to accommodate the median barriers and for the placement/removal of these barriers.
7. D-704-58 for the removal of bridge piers and construction of the new bridge

704-P02 WORK ZONE TRAFFIC CONTROL PHASES: The device list and plan sheets have been developed based on the following phases:

Phase 1 - Remove Superstructure:

Close the Pettibone Interchange structure and 42nd Ave SE crossroad (from ramp intersection to ramp intersection). Place detour signing for the crossroad traffic in accordance with the Sec 100 Detour Sign Layout plan sheets. Interchange ramps are to remain open.

When removal of the existing bridge superstructure is taking place over I-94, direct each bound of I-94 traffic onto the ramps. Place signs and devices for the interstate road closure/ramp detour in accordance with Section 100 Ramp Detour Sign Layout. Detouring I-94 traffic onto the ramps is only allowed during daylight hours from 6:00 am to 8:00 pm daily. Signs and devices have been provided for detouring EB I-94 on to the south ramps concurrently with detouring WB I-94 onto the north ramps.

Pending engineers approval, dirt can be placed/stockpiled prior to closing the superstructure.

Phase 2 – Place Barriers on I-94 Shoulders:

Two one-lane closures (one for eastbound I-94 and one for westbound I-94) have been provided to construct the median embankment and placement of the portable barriers shown in D-704-58. Place signs and devices for the two one-lane closures in accordance with D-704-35.

Maintain the detour signing for the crossroad traffic of 42nd Ave SE in accordance with the Sec 100 Detour Sign Layout plan sheets.

In addition, use the two one-lane closures when removing the median barriers and median embankment after the structure and median pier protection are complete.

Phase 3 – Remove Substructure and Construct New Bridge:

Maintain two lanes of traffic in each direction of I-94 while the remaining substructure is being removed, the new structure is being constructed, and the ramps and frontage roads are being reconstructed. Place signs and devices in accordance with Sec 100 Pettibone Interchange plan sheets based on D-704-58 and D-704-15.

In addition, use the interstate road closure/ramp detour (as described in Phase 1) when placing bridge beams over I-94. Incorporate additional signs and devices for the interstate road closure/ramp detour in accordance with Section 100 Ramp Detour Sign Layout.

704-P03 PORTABLE CHANGEABLE MESSAGE SIGN: Install Portable Changeable Message Signs (PCMS) before work begins on the project. The Engineer will determine the locations for PCMS installation. Relocate the PCMS as directed by the Engineer.

Provide an operator trained in the use of the PCMS.

The Engineer will determine the message to be displayed. The operator shall program the message within one hour of the Engineer's request to change the message.

704-P04 MAINLINE TRAFFIC DETOUR: Use of a ramp detour during bridge superstructure removal and placement, barrier removal, and canopy placement and removal over a mainline roadway is restricted to 10 calendar days for the mainline roadway closure in that direction of travel.

Liquidated damages for failure to meet the requirements of this note will be in accordance with Section 108.07. Work will be stopped if the detour ramp traffic exceeds 10 calendar days without written approval from the Engineer.



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- 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. Bathroom facilities, which includes sewer, potable water, and weekly cleaning or weekly service of a portapotty.
 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 copying & 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 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. Provide a field office that is separate or independent from the contractor's field office.
 11. Heat, electric, internet service, sewer, water hookups, and portapotty service 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.

- 714-P01 PLUG PIPE – ALL TYPES & SIZES: Plug and abandon pipe located at Station 455+44 (42nd Ave SE). Pump the pipe full of controlled density backfill to prevent any future collapse or failure of the abandoned pipe. Controlled density backfill consists of cement, water, fly ash, and fine aggregate at the ratio specified below. Mix the material continuously during pumping or placement to keep the solution from separation. Maintain the surface temperature of the newly placed controlled density backfill above 40°F for 5 days. Include all costs for labor, materials, and equipment in the contract unit price bid for “PLUG PIPE – ALL TYPES AND SIZES”.

Mix Design	
Material	Weight (lbs)
Cement	70
Fly Ash	125
Fine Aggregate	2600
Water	50 Gallons

- 714-P02 PIPE CONDUIT 30IN – JACKED OR BORED: Bore or jack pipe indicated as jacked on the plans. If the boring method is used, use of smooth wall steel pipe in lieu of RCP is acceptable. For jacked concrete pipe sections, use the class required for the height of fill, but with a minimum concrete compressive strength of 6,000 psi.
- Install bored or jacked pipe culverts in accordance with section 714 and section 830 of the standard specifications.
- Supply pipe meeting Section 830.02 F, “Smooth Wall Steel Pipe”; pipe meeting ASTM A 252, Grade 2; or pipe meeting ASTM A 53, Grade B.
- Provide pipes with a minimum wall thickness as specified in Table 830-01 of the Standard Specifications.
- Protect the traveling public with proper traffic control and traffic safety measures during the jacking or boring process (while extending the pipe through the undisturbed fill) without disrupting traffic, or damaging roadway grade and surface.
- Bore or jack pipe culvert with equipment that encases the hole as the earth is removed and installs the pipe concurrently. Use an encased hole a maximum of 0.1 foot greater than the outside diameter of the pipe. Do not use water in the boring or jacking process. Use proper cushioning material between the jack and pipe. Remove damaged sections with an unsatisfactory joint and install a new section.
- Start the boring or jacking from the low or downstream end and proceed in straight lines to the grade and alignment as shown on the plans. Maintain flow line elevation at the starting point for boring or jacking within 0.1 ft. of staked grade; do not reverse the flow line at any point; and do not vary the line and grade at any point within the pipe more than 0.5 ft. from the designated line and grade.
- Once the pipe jacking has begun, proceed with the operation without interruption to prevent the pipe from becoming firmly set in the embankment.
- Fill openings greater than 1/4 inch (5 mm) in width between adjacent sections of concrete pipe with 1:2 cement/sand mortar. Tie all concrete pipe sections and end sections in accordance with standard drawing D-714-22. Weld all steel sections continuously around their periphery.



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Include temporary removal and replacement of embankment in the price bid for Pipe Conduit – Jacked or Bored. Use a maximum 2:1 slope beyond the existing pavement section (base, pavement, etc.) for any temporary removal of embankment. Protect and stabilize the slope throughout the jacking or boring process.

The culvert consists of separate bid items for each portion: “Pipe Conduit 30 In –Jacked or Bored” and “Pipe Conduit 30 In”. The pay lengths of the pipe bid items are as shown for the type and size specified per linear foot. Include all costs for required materials, labor, and equipment (including connecting bands or couplers) in the unit price bid for “Pipe Conduit 30 In – Jacked or Bored” and ”Pipe Conduit 30IN”.

Install pipe prior to the proposed embankment fill placement and pipe plug.

720-P01 ALIGNMENT MONUMENT IN BRIDGE DECK: For alignment monuments located within the bridge deck, construct in accordance with Standard Drawing D-720-1 Alignment Monument details for a concrete roadway with the following changes:

- 1. Install the alignment monument into the bridge deck after the longitudinal grooving is complete.
- 2. The No. 5 x 18” deformed bar is not required.
- 3. Recess the top of the aluminum cap 1/8” to 1/4” below the finished bridge deck surface by drilling a hole slightly larger in diameter than the aluminum survey cap.
- 4. Modify the stem depth of the aluminum cap to be placed in a drilled hole of 3/4” max. depth into the bridge deck.
- 5. Epoxy the cap into the bridge deck.

Include all costs for this work in the price bid for “Alignment Monuments”.

752-P01 FENCING: Give the landowner (Roger Thorsness) a 2-week notice, prior to the anticipated fencing removal date, to deactivate the existing electric fence in the field located north of the frontage road in northeast corner of the site. The temporary fencing will not be electric fencing. The contractor will remove the existing fencing (which consists of electric and 3 strand barb wire) prior to construction and reset the fencing after project completion.



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SECTION 130

602-P01 SINGLE SLOPE BARRIER: This work consists of constructing a reinforced concrete single slope barrier at the median bridge pier at the Pettibone Interchange, as shown in the plans.

The single slope barrier consists of a single slope barrier wall on each side of the pier. The barriers taper to a common end. The pay length is from the beginning to the end of the complete barrier wall installation. Each barrier wall will not be measured separately.

Use Class AE concrete meeting Section 602.03B. Design a mix that meets Section 802 and will attain a minimum compressive strength of 4,000 PSI at 28-days. Use grade 60 reinforcing steel meeting Section 612.

Install CI 43 aggregate fill and a 4" thick reinforced concrete cap slab between the two barrier walls as shown in the plans.

Include all costs to construct the single slope barrier in the contract unit price bid "Single Slope Barrier." The work includes furnishing and installing Class AE concrete, grade 60 reinforcing steel, mastic, joint sealant materials, aggregate, and all other materials, equipment and labor required to complete the installations as shown in the plans.

748-P01 CURB & GUTTER – TYPE 1 SPECIAL: Install curb and gutter at the Pettibone Interchange, in accordance with Standard Drawing D-748-1, except for transitions at each end, as shown on Standard Drawing D-764-60. Install #4 rebar with a length that will provide 3" clear distance on each end. Use grade 60 reinforcing steel meeting Section 612.

Include all costs for constructing the curb and gutter as described above in the contract unit price bid for the item "Curb & Gutter – Type 1 Special."

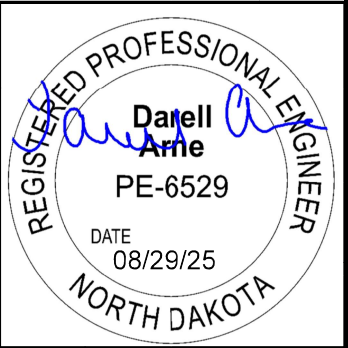
764-P01 BARREL ATTENUATION DEVICE BASES: Construct the bases out of either 2 inches of aggregate base and 6 inches of Class AE concrete meeting 602.03 B or 2 inches of aggregate base and 8 inches of Superpave FAA 45.

Include all costs associated with the construction of the attenuation device bases in the contract unit price bid for "Barrel Attenuation Device -Type B-75."

764-P02 REMOVED W-BEAM GUARDRAIL MATERIALS: Deliver the removed guardrail materials to the NDDOT Maintenance Storage Yard in Medina, and neatly stack them at a location designated by the Engineer. Deliver the W-Beam guardrail rail sections and impact head to the maintenance storage yard. All other materials will become the contractor's property. The address of the NDDOT Maintenance Storage Yard is:

MEDINA NDDOT
3682 55th Ave SE
Medina, ND 58467-9998

Include all costs for delivery of the removed guardrail materials in the contract unit prices bid for "Remove W-Beam Guardrail & Posts," and "Remove End Treatment & Transition."



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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 THREATENED AND ENDANGERED SPECIES: The project is located near/within suitable habitat for the species listed in the following table

SPECIES	HABITAT	PRESENCE
Whooping Crane	Cropland/Wetland Associations	Spring: March 15 - May 15* Fall: September 10 – November 15
Piping Plover	Sparsely Vegetated Islands/Shoreline	April 15 - August 15*
Dakota Skipper	Native Prairie	Year-Round
Rufa Red Knot	Sparsely Vegetated Islands/Shoreline	Spring: April 15 - May 31* Fall: August 1 - September 15*

*Time frames can differ slightly, depending on the year

If any of the above threatened and endangered species are identified within 1 mile of the project, the Contractor will notify the Engineer immediately and cease construction activities in the vicinity until an avoidance area is established. The Engineer will establish an avoidance area that is at least a 0.5 mile and immediately coordinate with the USFWS (701-355-8513), FHWA (701-221-9464), and NDDOT Environmental and Transportation Services (701-328-2592). The Contractor will not resume work within the avoidance area until the Engineer has confirmed with the agencies that work may proceed (either the species have left the area, or approved avoidance/minimization measures have been implemented).

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 WETLAND MITIGATION: Wetland mitigation is required for unavoidable permanent wetland impacts. The wetland mitigation plan is incorporated into the plans for this project. After completion of the mitigation area, the Engineer will complete the Onsite Mitigation Certification Form SFN 61042. Any sedimentation occurring within the mitigation area will be removed.



ESTIMATE OF QUANTITIES

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SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
103	0100	CONTRACT BOND	L SUM	1	1
201	0330	CLEARING & GRUBBING	L SUM	1	1
202	0021	REMOVE AGGREGATE BASE & SURFACING	TON	6,921	6,921
202	0105	REMOVAL OF STRUCTURE	L SUM	1	1
202	0113	REMOVAL OF CONCRETE	CY	6	6
202	0169	REMOVAL OF END SECTION-ALL TYPES & SIZES	EA	2	2
202	0174	REMOVAL OF PIPE ALL TYPES AND SIZES	LF	190	190
202	0312	REMOVE EXISTING FENCE	LF	7,378	7,378
203	0101	COMMON EXCAVATION-TYPE A	CY	5,847	5,847
203	0109	TOPSOIL	CY	13,950	13,950
203	0140	BORROW-EXCAVATION	CY	64,687	64,687
210	0099	CLASS 1 EXCAVATION	L SUM	1	1
210	0201	FOUNDATION PREPARATION	EA	1	1
216	0100	WATER	M GAL	907	907
230	0165	SUBGRADE PREPARATION-TYPE A-12IN	STA	16.36	16.36
251	0200	SEEDING CLASS II	ACRE	11.51	11.51
251	2000	TEMPORARY COVER CROP	ACRE	11.15	11.15
253	0101	STRAW MULCH	ACRE	11.15	11.15
253	0301	BONDED FIBER MATRIX	ACRE	11.51	11.51
255	0102	ECB TYPE 2	SY	190	190
255	0202	TRM TYPE 2	SY	440	440
260	0100	SILT FENCE UNSUPPORTED	LF	325	325
260	0101	REMOVE SILT FENCE UNSUPPORTED	LF	325	325
261	0112	FIBER ROLLS 12IN	LF	28,395	28,395
261	0113	REMOVE FIBER ROLLS 12IN	LF	14,535	14,535
302	0050	TRAFFIC SERVICE AGGREGATE	TON	5,000	5,000
302	0120	AGGREGATE BASE COURSE CL 5	TON	8,945	8,945
401	0050	TACK COAT	GAL	449	449
401	0060	PRIME COAT	GAL	2,152	2,152
430	0045	SUPERPAVE FAA 45	TON	2,549	2,549
430	0500	COMMERCIAL GRADE HOT MIX ASPHALT	TON	200	200
430	5803	PG 58S-28 ASPHALT CEMENT	TON	156	156
602	0500	BRIDGE SUBSTRUCTURE CONCRETE	CY	147.5	147.5

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	8	2

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
602	0510	BRIDGE DECK CONCRETE	CY	298.6	298.6
602	0520	BRIDGE BARRIER CONCRETE	CY	72.2	72.2
602	1134	PILE SUPPORTED APPROACH SLAB	SY	158.1	158.1
602	1220	SINGLE SLOPE BARRIER	LF	112	112
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	1,045	1,045
604	9920	PRESTRESSED I-BEAM-63IN	LF	1,250	1,250
612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS	87,100	87,100
616	5890	STRUCTURAL STEEL	L SUM	1	1
622	0020	STEEL PILING HP 10 X 42	LF	340	340
622	0060	STEEL PILING HP 14 X 73	LF	420	420
622	0070	STEEL PILING HP 14 X 102	LF	350	350
622	7001	DYNAMIC PILE TEST	EA	3	3
702	0100	MOBILIZATION	L SUM	1	1
704	0100	FLAGGING	MHR	925	925
704	1000	TRAFFIC CONTROL SIGNS	UNIT	4,794	4,794
704	1046	ATTENUATION DEVICE-TYPE B-80	EA	2	2
704	1052	TYPE III BARRICADE	EA	22	22
704	1060	DELINEATOR DRUMS	EA	76	76
704	1067	TUBULAR MARKERS	EA	98	98
704	1080	STACKABLE VERTICAL PANELS	EA	50	50
704	1086	SEQUENCING ARROW PANEL-TYPE B	EA	2	2
704	1087	SEQUENCING ARROW PANEL-TYPE C	EA	2	2
704	3511	STATE FURNISHED MEDIAN BARRIER	LF	2,240	2,240
704	4011	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2	2
706	0400	FIELD OFFICE	EA	1	1
706	0500	AGGREGATE LABORATORY	EA	1	1
706	0550	BITUMINOUS LABORATORY	EA	1	1
706	0600	CONTRACTOR'S LABORATORY	EA	1	1
714	4106	PIPE CONDUIT 24IN-APPROACH	LF	91	91
714	4110	PIPE CONDUIT 30IN	LF	162	162
714	4113	PIPE CONDUIT 30IN-APPROACH	LF	91	91
714	4166	PIPE CONDUIT 30IN-JACKED OR BORED	LF	120	120
714	9680	PLUG PIPE-ALL TYPES & SIZES	EA	1	1

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	8	3

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
720	0110	RIGHT OF WAY MARKERS	EA	12	12
720	0125	ALIGNMENT MONUMENTS	EA	2	2
720	0130	IRON PIN R/W MONUMENTS	EA	17	17
748	0141	CURB & GUTTER-TYPE 1 SPECIAL	LF	60	60
752	0110	FENCE BARBED WIRE 3 STRAND-STEEL POST	LF	7,230	7,230
752	0922	FENCE REMOVE & RESET	LF	173	173
752	0993	FENCE TERMINAL	EA	4	4
752	2100	VEHICLE GATE	EA	1	1
752	3150	CORNER ASSEMBLY BARBED WIRE-WOOD POST	EA	16	16
752	3995	DOUBLE BRACE ASSEMBLY-WOOD POST	EA	6	6
752	5000	SNOW FENCE	LF	832	832
754	0110	FLAT SHEET FOR SIGNS-TYPE XI REFL SHEETING	SF	127	127
754	0112	FLAT SHEET FOR SIGNS-TYPE IV REFL SHEETING	SF	33	33
754	0206	STEEL GALV POSTS-TELESCOPING PERFORATED TUBE	LF	425	425
754	0210	GALV STEEL POST-STANDARD PIPE	LF	92	92
754	0214	GALV STEEL POSTS-W-SHAPE POSTS(TWO OR MORE)	LF	111	111
754	0534	PANEL FOR SIGNS-TYPE IV REFLECTIVE SHEETING	SF	36	36
754	0592	RESET SIGN PANEL	EA	15	15
754	0805	OBJECT MARKERS - CULVERTS	EA	4	4
754	1100	CLASS AE CONCRETE-SIGN FOUNDATIONS	CY	3	3
754	1104	REMOVE SIGN FOUNDATION	EA	8	8
762	0422	SHORT TERM 6IN LINE-TYPE R	LF	1,250	1,250
762	0426	SHORT TERM 24IN LINE-TYPE R	LF	145	145
762	1106	PVMT MK PAINTED 6IN LINE	LF	7,214	7,214
762	1124	PVMT MK PAINTED 24IN LINE	LF	145	145
764	0131	W-BEAM GUARDRAIL	LF	183	183
764	0145	W-BEAM GUARDRAIL END TERMINAL	EA	4	4
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS	LF	762	762
764	2081	REMOVE END TREATMENT & TRANSITION	EA	6	6
764	8071	BARREL ATTENUATION DEVICE-TYPE B-75	EA	2	2
766	0100	MAILBOX-ALL TYPES	EA	1	1
930	3000	BRIDGE BENCH MARKS	SET	1	1
930	7012	ROADWAY CANOPY	L SUM	1	1

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	8	4

SPEC CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
930 8230	SHORING	EA	1	1
930 8600	ELASTOMERIC BEARING PAD	SF	40	40
930 8686	AGGREGATE SLOPE PROTECTION	SY	427.3	427.3
930 9537	ABUTMENT UNDERDRAIN SYSTEM	EA	2	2

Preliminary Plans

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	10	1

		42nd Ave SE			North Frontage Road	South Frontage Road	Totals
		441+15 to 447+90 (Gravel)	447+90 to 459+90 (Paved)	459+90 to 464+41 (Gravel)	0+65 to 2+77 (Gravel)	2+25 to 10+89 (Gravel)	
		675 ft	895 ft (Bridge Exception)	451 ft	212 ft	708 ft (42nd Ave Exception)	
Material	Unit	Quantity	Quantity	Quantity	Quantity	Quantity	
302 0120 AGGREGATE BASE COURSE CL 5 @ 1,875 Ton/CY	Ton	894.17	3855.09	587.12	228.19	764.10	6328.67
430 0045 SUPERPAVE FAA 45 @ 2Ton/CY	Ton		1685.67				1685.67
401 0050 TACK COAT @ 0.05 Gal/SY (2nd lift)	Gal		276.58				276.58
401 0060 PRIME COAT @ 0.25 Gal/SY	Gal		1354.19				1354.19
430 5803 PG 58H-34 ASPHALT CEMENT @ 6.1% (2nd Lift - 2")	Ton		45.65				45.65
430 5803 PG 58H-34 ASPHALT CEMENT @ 6.1% (1st Lift - 2.5")	Ton		57.17				57.17

		SW Ramp	SE Ramp	NE Ramp	NW Ramp	Totals
		14+75 to 17+90	1+07 to 4+72	13+06 to 15+38	61+27 to 64+11	
		315 ft	365 ft	232 ft	284 ft	
Material	Unit	Quantity	Quantity	Quantity	Quantity	
302 0120 AGGREGATE BASE COURSE CL 5 @ 1,875 Ton/CY	Ton	689.06	798.44	507.50	621.25	2616.25
430 0045 SUPERPAVE FAA 45 @ 2Ton/CY	Ton	227.50	263.61	167.56	205.11	863.78
401 0050 TACK COAT @ 0.05 Gal/SY (2nd lift)	Gal	45.50	52.72	33.51	41.02	172.76
401 0060 PRIME COAT @ 0.25 Gal/SY	Gal	210.00	243.33	154.67	189.33	797.33
430 5803 PG 58H-34 ASPHALT CEMENT @ 6.1% (2nd Lift - 2")	Ton	6.16	7.14	4.54	5.56	23.39
430 5803 PG 58H-34 ASPHALT CEMENT @ 6.1% (1st Lift - 2.5")	Ton	7.72	8.94	5.68	6.96	29.30

Earthwork Summary

Location	203-0101 COMMON EXCAVATION (Type A)	Embankment*	203-0140 BORROW	203-109 TOPSOIL
	Pay Item		Pay Item	Pay Item
	(CY)		(CY)	(CY)
	A		C=B-A	
42nd Ave - North of I-94 - Includes North Frontage Road, NW Ramp, NE	1030	37689	36659	5075
42nd Ave - South of I-94 - Includes South Frontage Road, SW Ramp, SE	4317	31845	27528	8825
Median Attenuation Device	0	0	0	50
Temp I-94 Shoulders for WZTC	0	500	500	
Removal of Temp I-94 Shoulders for WZTC	500			
Totals	5847	70034	64687	13950

*25% Volume was added to embankment volumes to allow for shrinkage.

Location/Alignment	Start Station	Stop Station	230-0165 SUBGRADE PREPARATION - TYPE A-12IN (Sta)
42nd Ave (OFL), South End	441+15	443+13	1.98
42nd Ave (OFL), North End	462+75	464+41	1.66
South Frontage Road, West End	2+25	4+15	1.90
South Frontage Road, East End	8+58	10+89	2.31
Northeast Ramp	13+06	14+67	1.61
Southeast Ramp	2+37	4+72	2.35
Northwest Ramp	62+63	64+11	1.48
Southwest Ramp	14+75	16+75	2.00
North Frontage Road, East End	1+70	2+77	1.07
Total			16.36

216-0100 Water	Total (MGal)
25 MGal/Mile for Dust Palliative	20
25 MGal/Mile for Subgrade Preparation	8
20 Gal/Ton for Aggregates	179
10 Gal/CY for Embankment	700

766-0100 MAILBOX-ALL TYPES, EA
Sta 460+68, LT

754-0805 Object Markers - Culverts

Location of Pipe Station	Each #
1+68 (SE_Ramp)	2
455+20- CL, Rt - (OFL)	1
455+23- CL, Lt - (OFL)	1

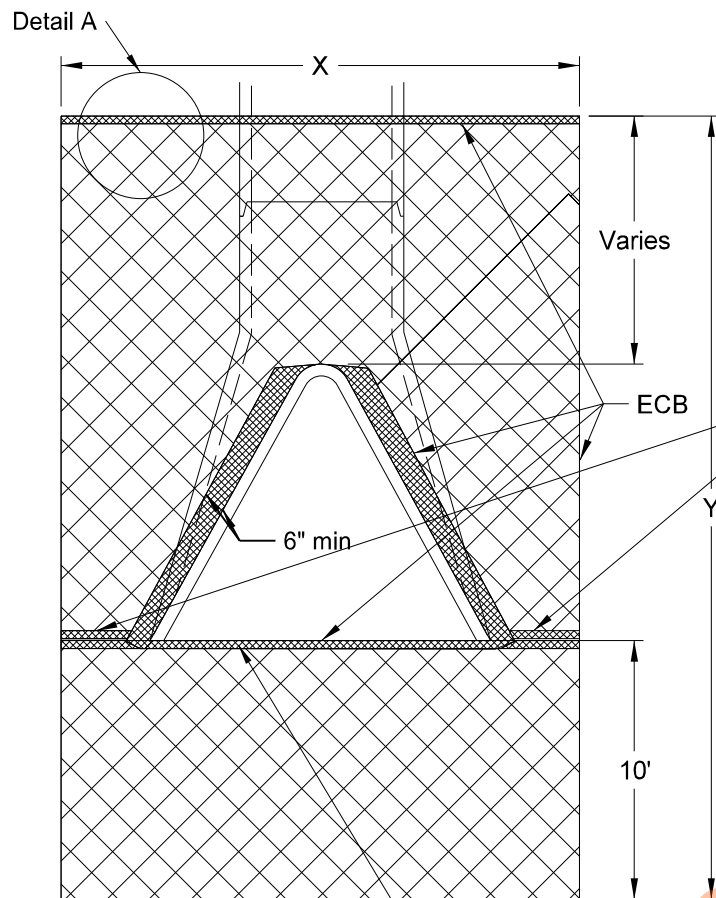
Basis of Estimate

Structure Replacement
I-94/Pettibone Interchange



04/21/25

- See Pipe Inlet & Outlet Details



Inlet side - see applicable detail for pipe inlet.
Outlet side - see applicable detail for pipe outlet.

A diagram of a 4' x 4' grid. The grid is defined by dashed lines. The vertical spacing is labeled as 4' on the left. The horizontal spacing is labeled as 20" on the bottom. A 10" offset is indicated on the left side, showing the distance from the left edge to the first vertical line. The grid is composed of 5 vertical lines and 5 horizontal lines, creating a 4x4 array of squares. 'X' marks are placed at the intersections of the grid lines. A large orange watermark is visible across the center of the diagram.

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.

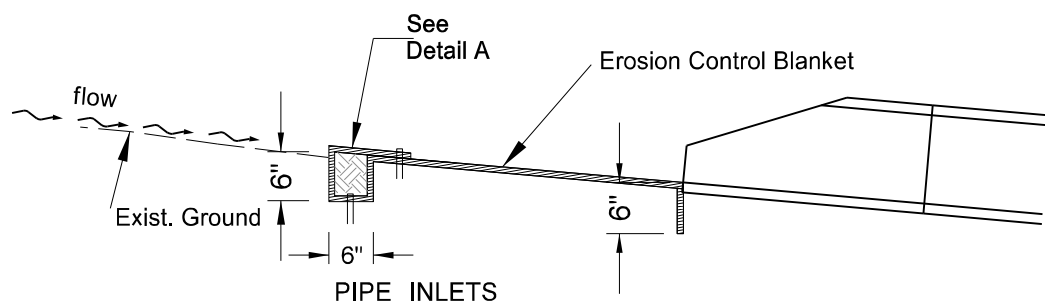
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	20	1

Erosion Control Blanket (ECB)								
Location to be protected	Culvert Type	Pipe Diam (Inch)	No	Unit Quantity	Total Quantity			
Station	Appr/CL			(SY)	Type 1 (SY)	Type 2 (SY)	Type 3 (SY)	Type 4 (SY)
7+98 (FR_S)	Appr	30	2	25		50		
1+68 (Align_SE_Ramp)	CL	30	2	25		50		
455+23 (OFL)	CL	30	2	25		50		
0-58 (FR_N)	Appr	24	2	20		40		
Total (SY)						190		

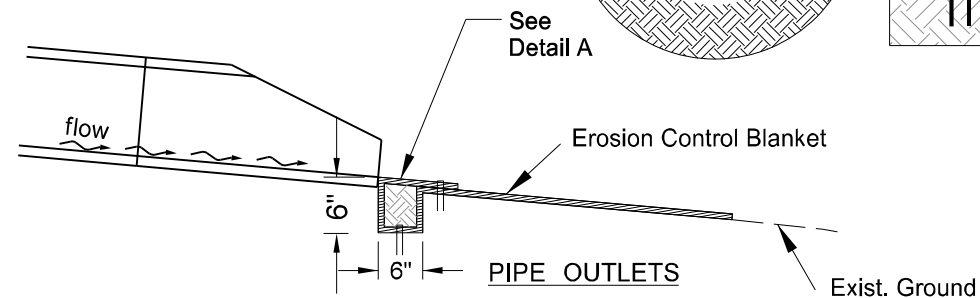
CENTERLINE CULVERTS									
DIA	X	Y	Surface area to be protected	ECB	DIA	X	Y	Surface area to be protected	ECB
In	Ft	Ft	SF	SY	In	Ft	Ft	SF	SY
24	10.5	19.6	193.1	22	24	10.5	17.6	172.1	20
27	11.0	20.0	204.3	23	27	11.0	18.0	182.3	21
30	11.6	20.5	218.3	25	30	11.6	18.5	195.1	22
36	12.7	21.2	242.1	27	36	12.7	19.2	216.7	24
42	13.3	21.2	251.8	28	42	13.3	19.2	225.2	25
48	13.8	22.0	265.6	30	48	13.8	20.0	238.0	27
54	14.5	21.5	273.7	31	54	14.5	19.5	244.7	28
60	15.0	21.0	278.3	31	60	15.0	19.0	248.3	28
66	15.6	22.0	295.7	33	66	15.6	20.0	264.5	30
72	16.2	22.5	309.2	35	72	16.2	20.5	276.8	31
Note: Quantities based on 6:1 slope.					Note: Quantities based on 4:1 slope.				

Note: Quantities based on 6:1 slope.

Note: Quantities based on 4:1 slope.

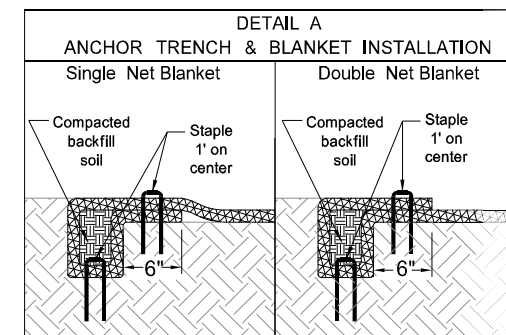


PIPE INLETS



PIPE OUTLETS

Exist. Ground



04/21/25

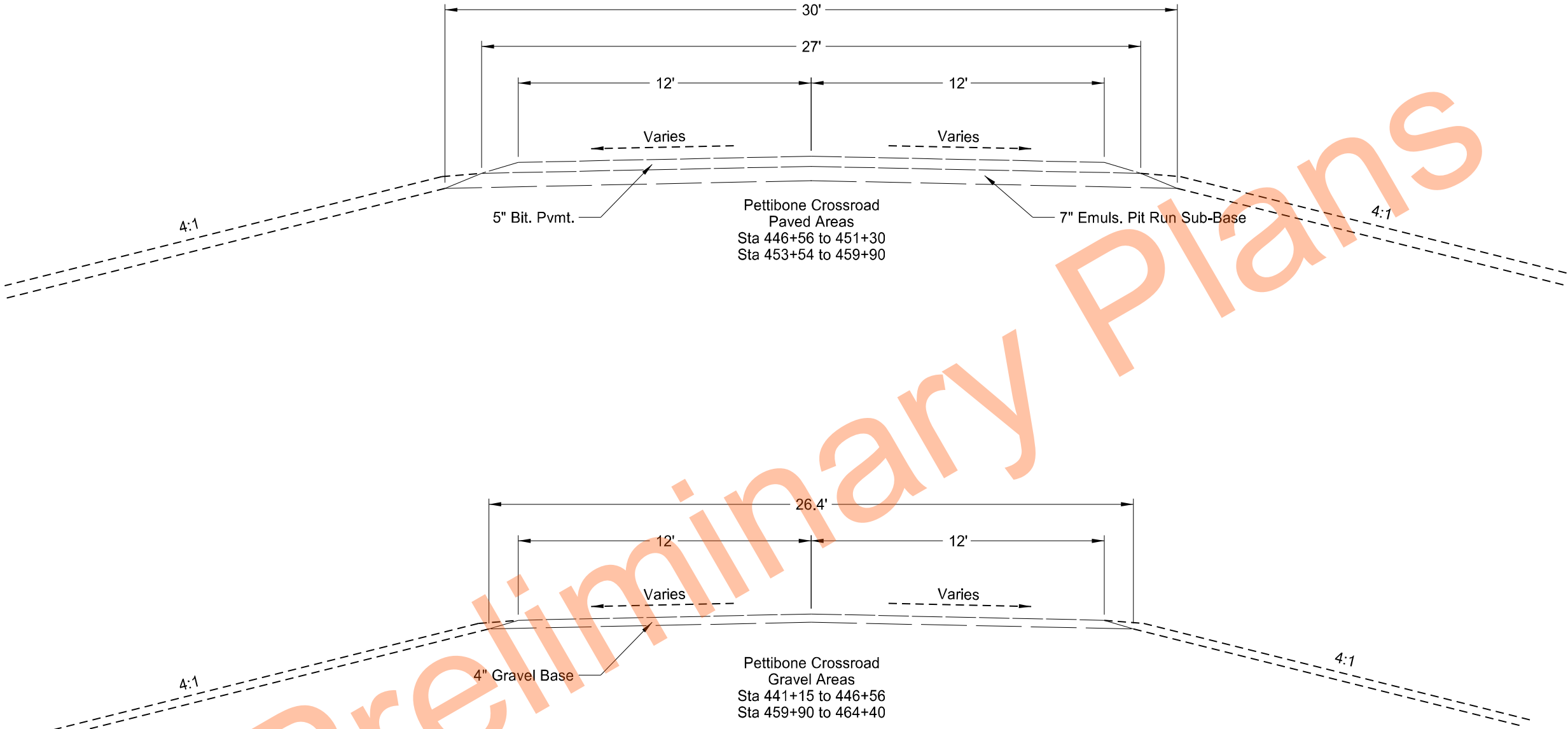


Erosion Control at Culvert Flared End Sections

Structure Replacement

I-94/Pettibone Interchange

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	30	1



Typical Section

Existing Crossroad

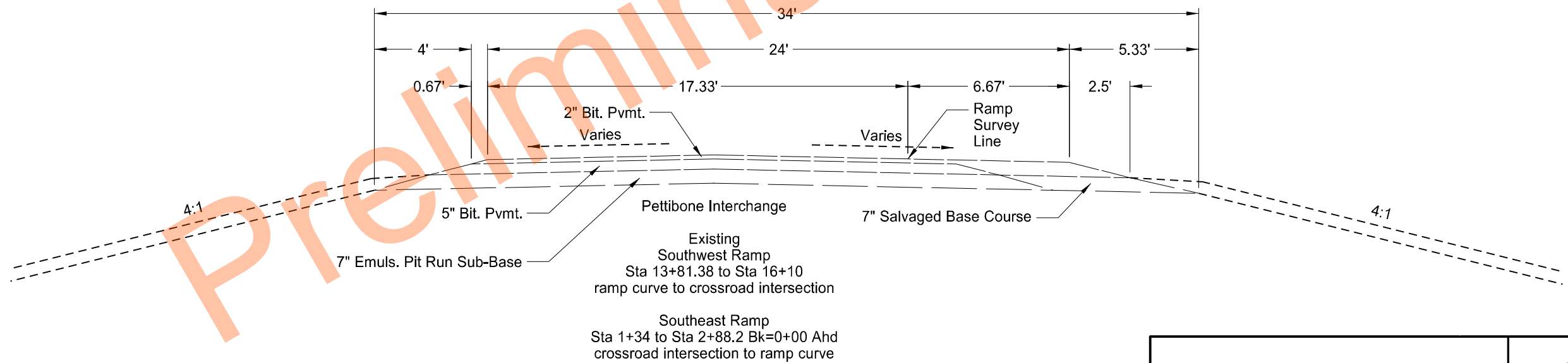
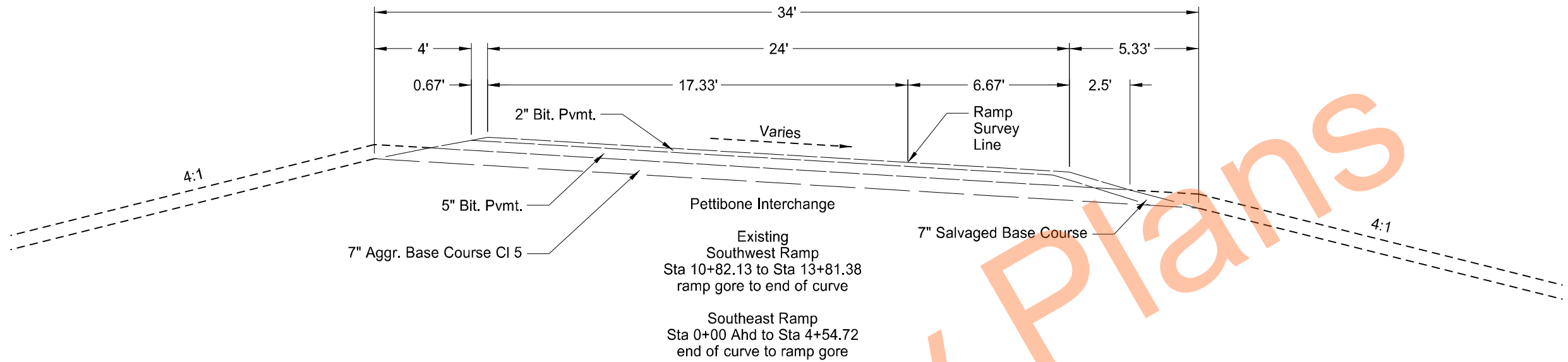
Structure Replacement

I-94/Pettibone Interchange



04/21/25

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	30	2



Typical Sections

Existing SW & SE Ramp

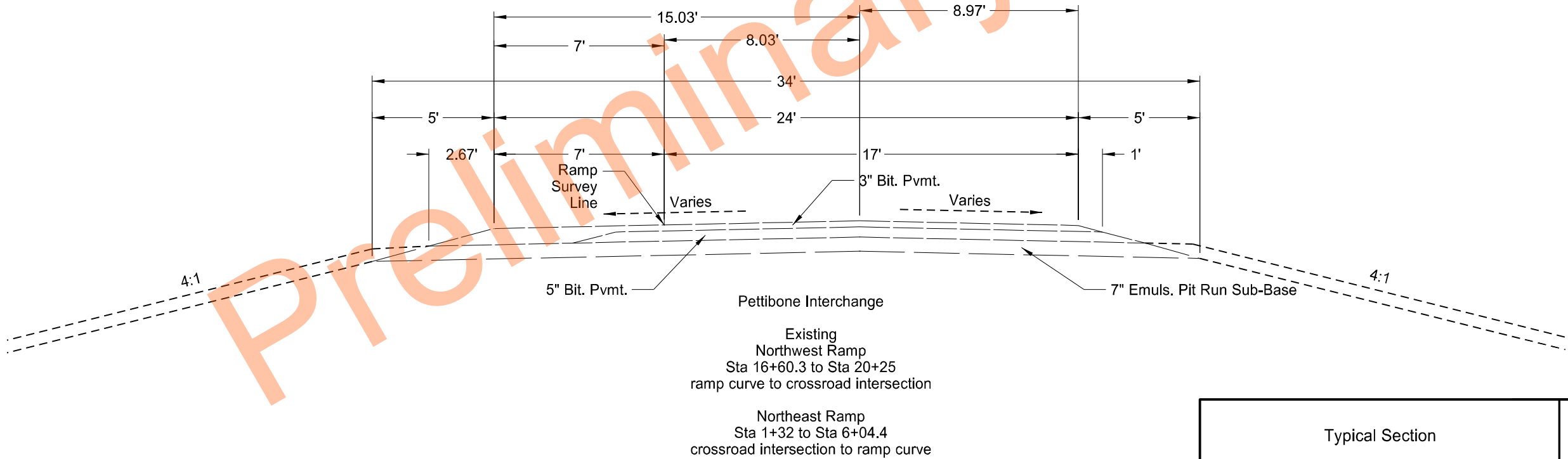
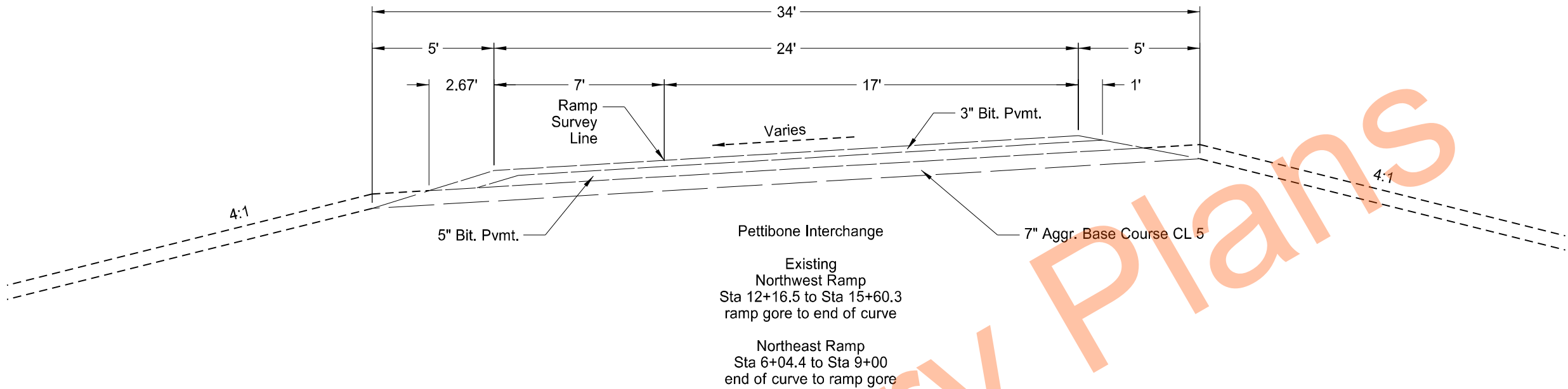
Structure Replacement

I-94/Pettibone Interchange



04/21/25

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	30	3



Typical Section

Existing NE & NW Ramps

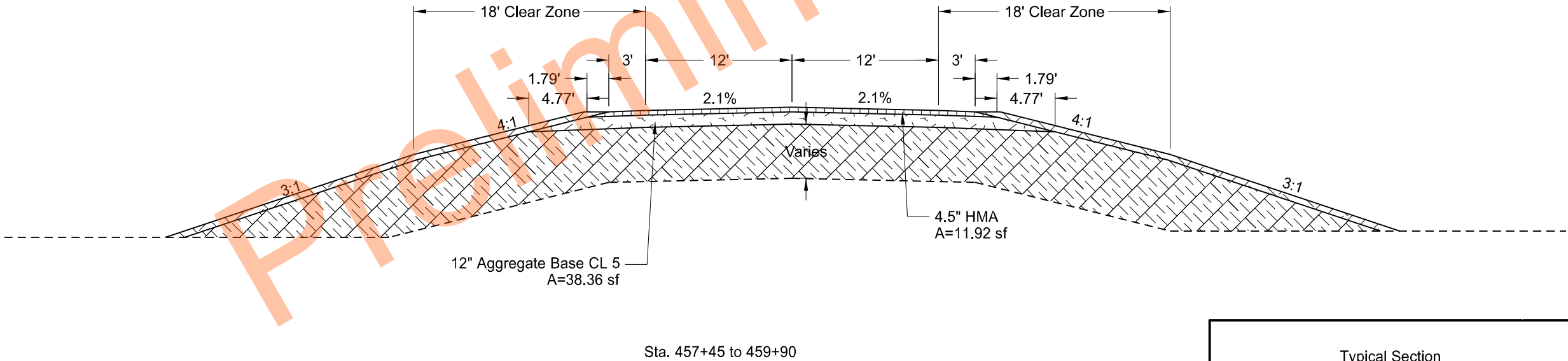
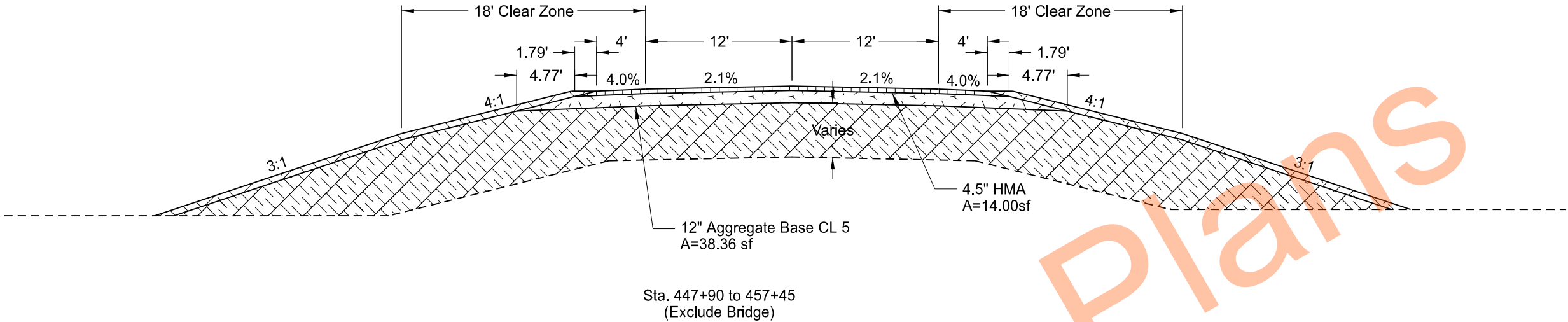
Structure Replacement

I-94/ Pettibone Interchange



04/21/25

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	30	4



Typical Section

Proposed Crossroad

Structure Replacement

I-94/Pettibone Interchange

BRIAN J. ROSIN

REGISTERED

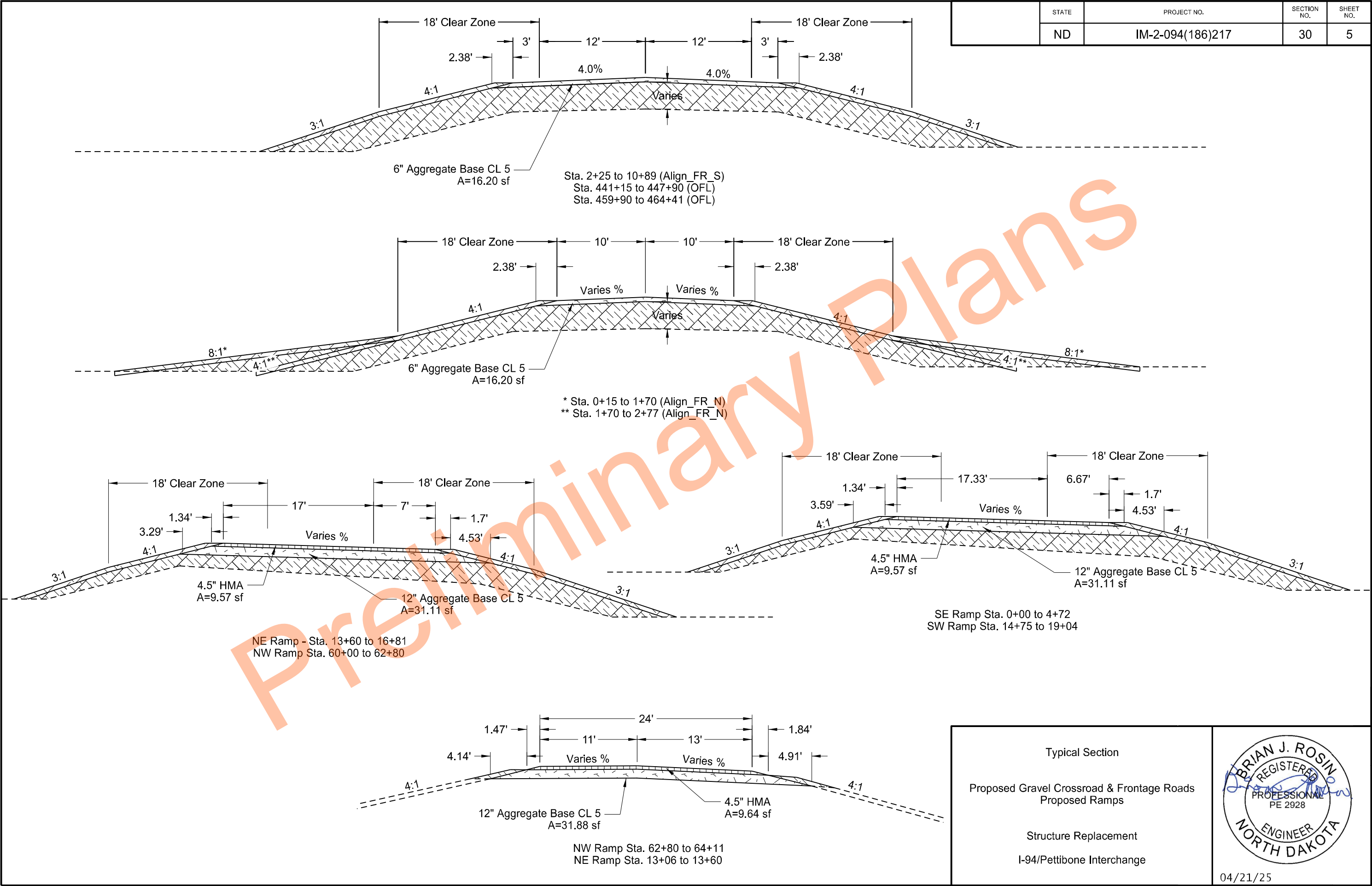
PROFESSIONAL

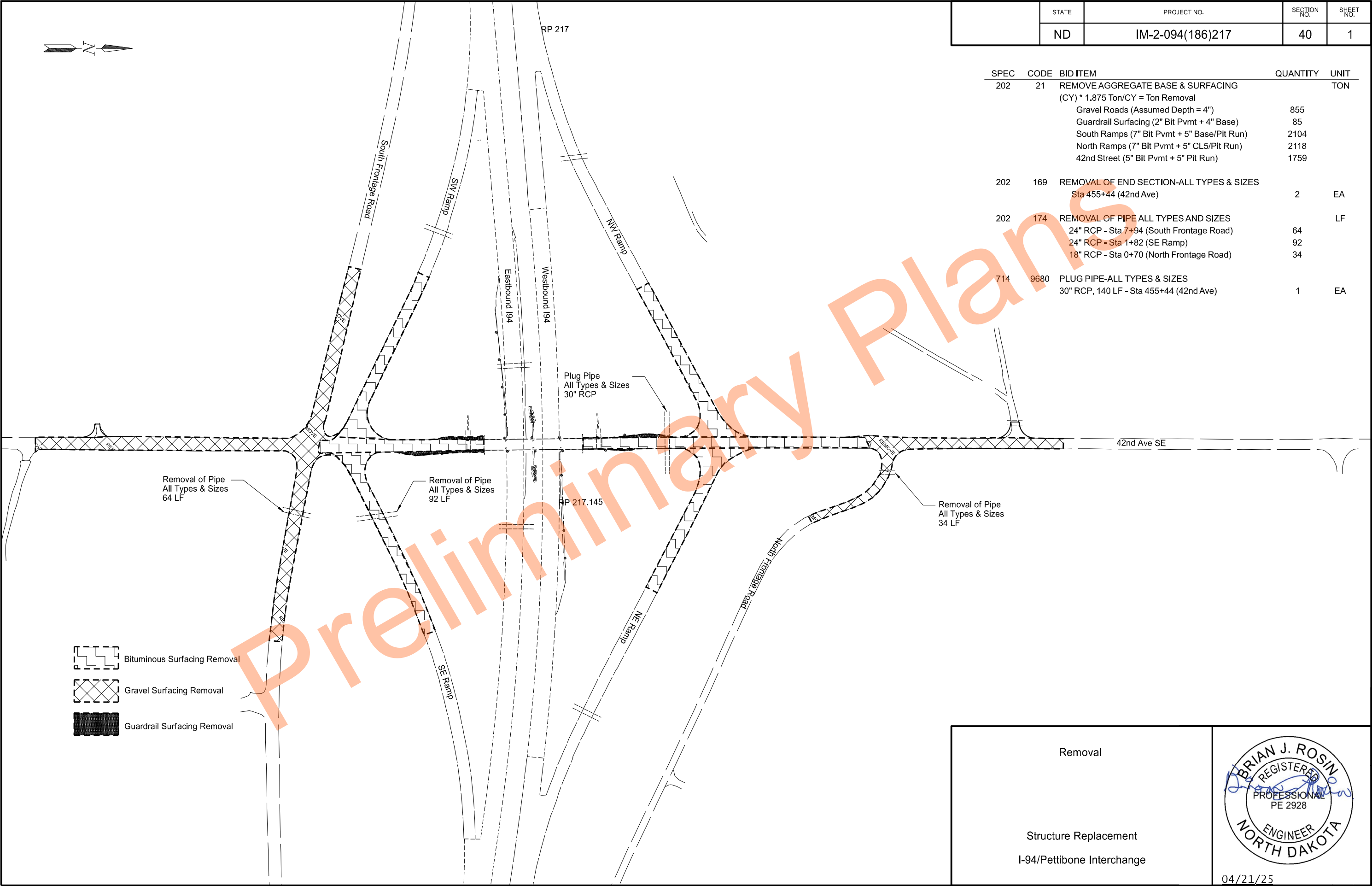
PE 2928

ENGINEER

NORTH DAKOTA

04/21/25





	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	40	1

SPEC	CODE	BID ITEM	QUANTITY	UNIT
202	21	REMOVE AGGREGATE BASE & SURFACING (CY) * 1.875 Ton/CY = Ton Removal		TON
		Gravel Roads (Assumed Depth = 4")	855	
		Guardrail Surfacing (2" Bit Pvmt + 4" Base)	85	
		South Ramps (7" Bit Pvmt + 5" Base/Pit Run)	2104	
		North Ramps (7" Bit Pvmt + 5" CL5/Pit Run)	2118	
		42nd Street (5" Bit Pvmt + 5" Pit Run)	1759	
202	169	REMOVAL OF END SECTION-ALL TYPES & SIZES Sta 455+44 (42nd Ave)	2	EA
202	174	REMOVAL OF PIPE ALL TYPES AND SIZES		LF
		24" RCP - Sta 7+94 (South Frontage Road)	64	
		24" RCP - Sta 1+82 (SE Ramp)	92	
		18" RCP - Sta 0+70 (North Frontage Road)	34	
714	9680	PLUG PIPE-ALL TYPES & SIZES 30" RCP, 140 LF - Sta 455+44 (42nd Ave)	1	EA

- Bituminous Surfacing Removal
- Gravel Surfacing Removal
- Guardrail Surfacing Removal

Removal

Structure Replacement

I-94/Pettibone Interchange

BRIAN J. ROSIN

REGISTERED

PROFESSIONAL

PE 2928

ENGINEER

NORTH DAKOTA

04/21/25

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	50	1

HYDRAULIC DATA FOR IM-2-094(186)217 (A)									
STATION	EXISTING PIPE	PROPOSED PIPE SIZE	DRAINAGE AREA (ACRES)	50-YEAR DATA				100-YEAR DATA	
				DESIGN DISCHARGE (CFS)	DESIGN HEADWATER (FT)	DESIGN VELOCITY (FPS)	DESIGN STAGE (NAVD 88)	100-YEAR DISCHARGE (CFS)	100-YEAR STAGE (NAVD 88)
7+94 (FR_S)	24" RCP	30"	25.5	28.7	3.08	7.47	1810.77	35.5	1811.43
1+83 (Align_SE_Ramp)	24" RCP	30"	9.4	14.4	2.03	5.70	1810.07	17.5	1810.33
455+23 (OFL)	30" RCP	30"	48.4	33.6	4.31	8.09	1813.28	41.6	1814.52
(A) Hydraulic data provided is for smooth-walled (Manning's n=0.012) type conduits.									



Culvert Hydraulic Data

Structure Replacement

I-94/Pettibone Interchange

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	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							Begin	End	
7+93 (FR_S)	45' Rt	7+96 (FR_S)	46.3' Lt	30	Pipe Conduit - Approach	91	Reinforced Concrete Pipe - Class II (barrel length = 88 LF)	In 30	Type A, P	2	0.064	SY -	FES	FES	Specification 714.04 A
							Corrugated Steel Pipe	30							
							Spiral Rib Steel Pipe	30							
							Polypropylene Pipe (AASHTO M330, Type S)	30							
1+68.8 (Align_SE_Ramp)	39.2' Rt	1+98.3 (Align_SE_Ramp)	50.5' Lt	30	Pipe Conduit	93	Reinforced Concrete Pipe - Class II (barrel length = 90 LF)	In 30	Type A, P	2	0.168	SY -	FES	FES	D-714-25
							Corrugated Steel Pipe	30							
							Corrugated Steel Pipe	30							
							Spiral Rib Steel Pipe	30							
455+23 (OFL)	93.8' Lt	455+22 (OFL)	60' Lt	30	Pipe Conduit	34	Reinforced Concrete Pipe - Class IV (barrel length = 32 LF)	In 30	Type A, P	3/4, 1	0.064	SY -	FES	FES	D-714-25
455+22 (OFL)	60' Lt	455+20 (OFL)	60' Rt	30	Pipe Conduit - Jacked or Bored	120	Reinforced Concrete Pipe - Class IV (barrel length = 120 LF)	In 30							
							Smooth Wall Steel Pipe	30							
455+20 (OFL)	60' Rt	455+20 (OFL)	95.4' Rt	30	Pipe Conduit	35	Reinforced Concrete Pipe - Class IV (barrel length = 33 LF)	In 30							
0+58 (FR_N)	41.4' Lt	0-92 (FR_N)	37.2' Rt	24	Pipe Conduit - Approach	91	Reinforced Concrete Pipe - Class III (barrel length = 88 LF)	In 24	Type A, P	2	0.064	SY -	FES	FES	Specification 714.04 A
							Corrugated Steel Pipe	30							
							Spiral Rib Steel Pipe	30							
							Polypropylene Pipe (AASHTO M330, Type S)	30							

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

Structure Replacement
I-94/Pettibone Interchange



04/21/25

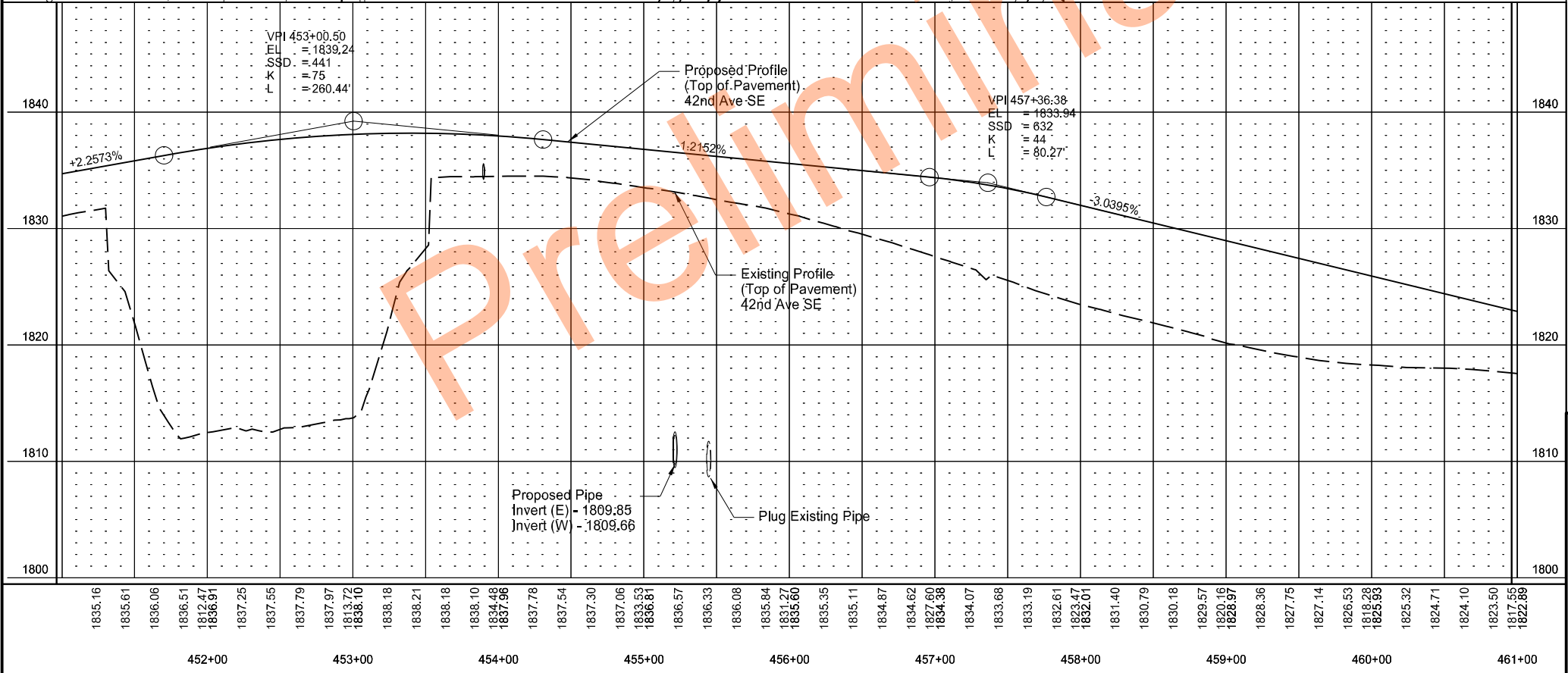
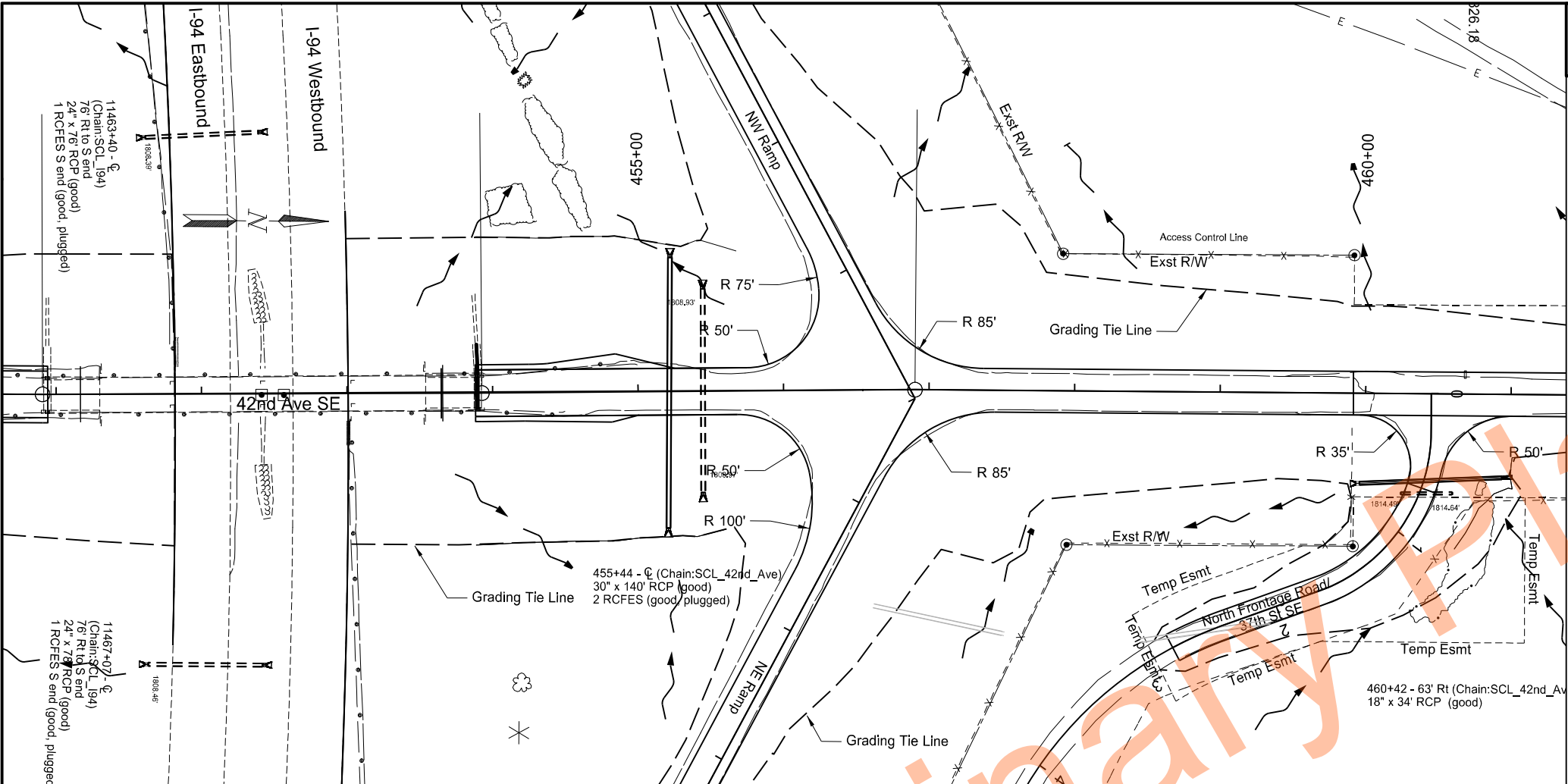
Station	1790	1800	1810	1820	1830
442+00	1793.26	1793.37	1793.87	1794.43	1795.06
443+00	1795.62	1796.06	1796.52	1796.96	1797.32
444+00	1798.19	1798.52	1798.86	1800.08	1800.46
445+00	1801.20	1802.33	1803.52	1804.77	1806.08
446+00	1807.46	1808.86	1810.26	1811.66	1813.06
447+00	1814.45	1815.76	1816.98	1818.11	1819.14
448+00	1820.09	1820.95	1821.71	1822.38	1822.97
449+00	1823.46	1823.88	1824.33	1824.78	1825.19
450+00	1827.29	1828.07	1828.78	1829.43	1829.90
451+00	1831.22	1831.87	1832.43	1833.06	1833.81
	1834.26	1834.71			

Structure Replacement

I-94/Pettibone Interchange



08/27/25



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	60	2

Plan & Profile
42nd_OFL
Sta. 451+00 to 461+00
Structure Replacement
I-94/Pettibone Interchange



08/27/25

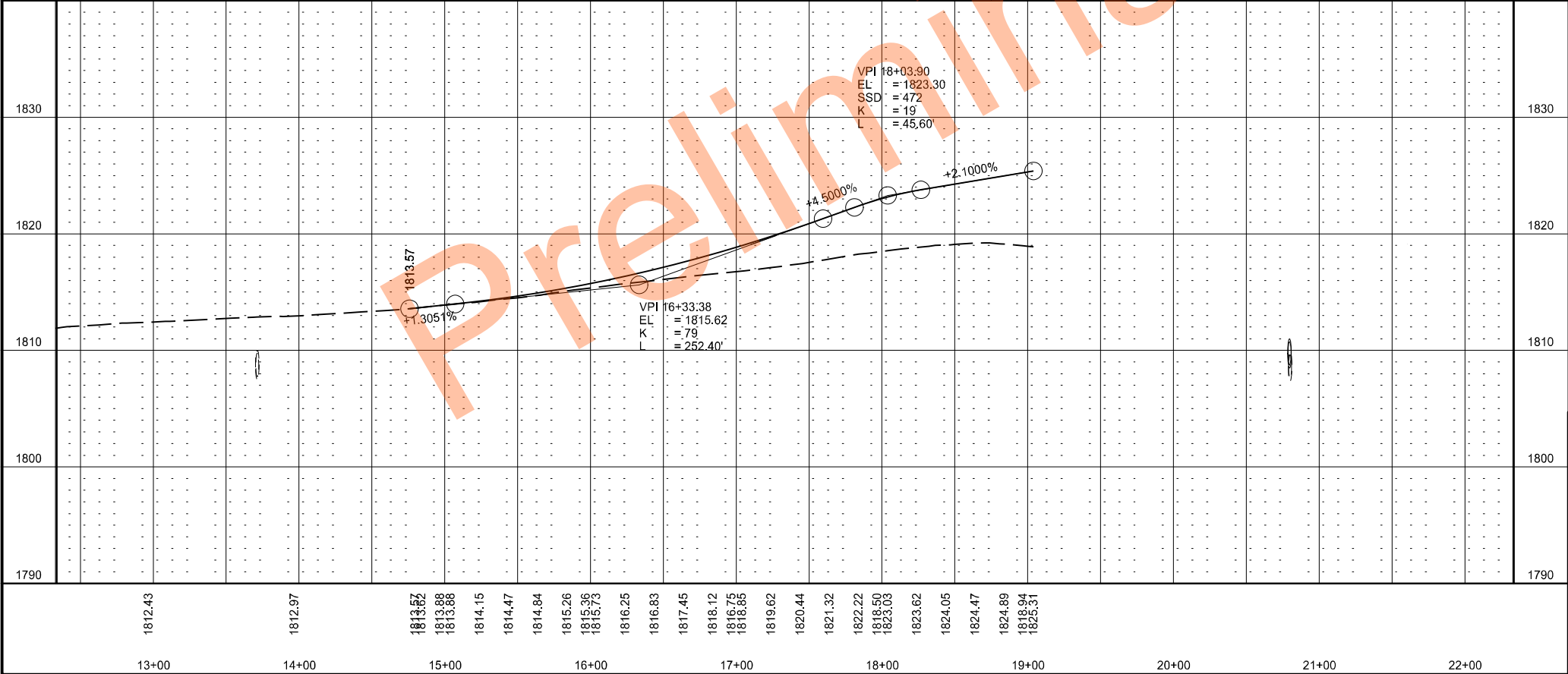
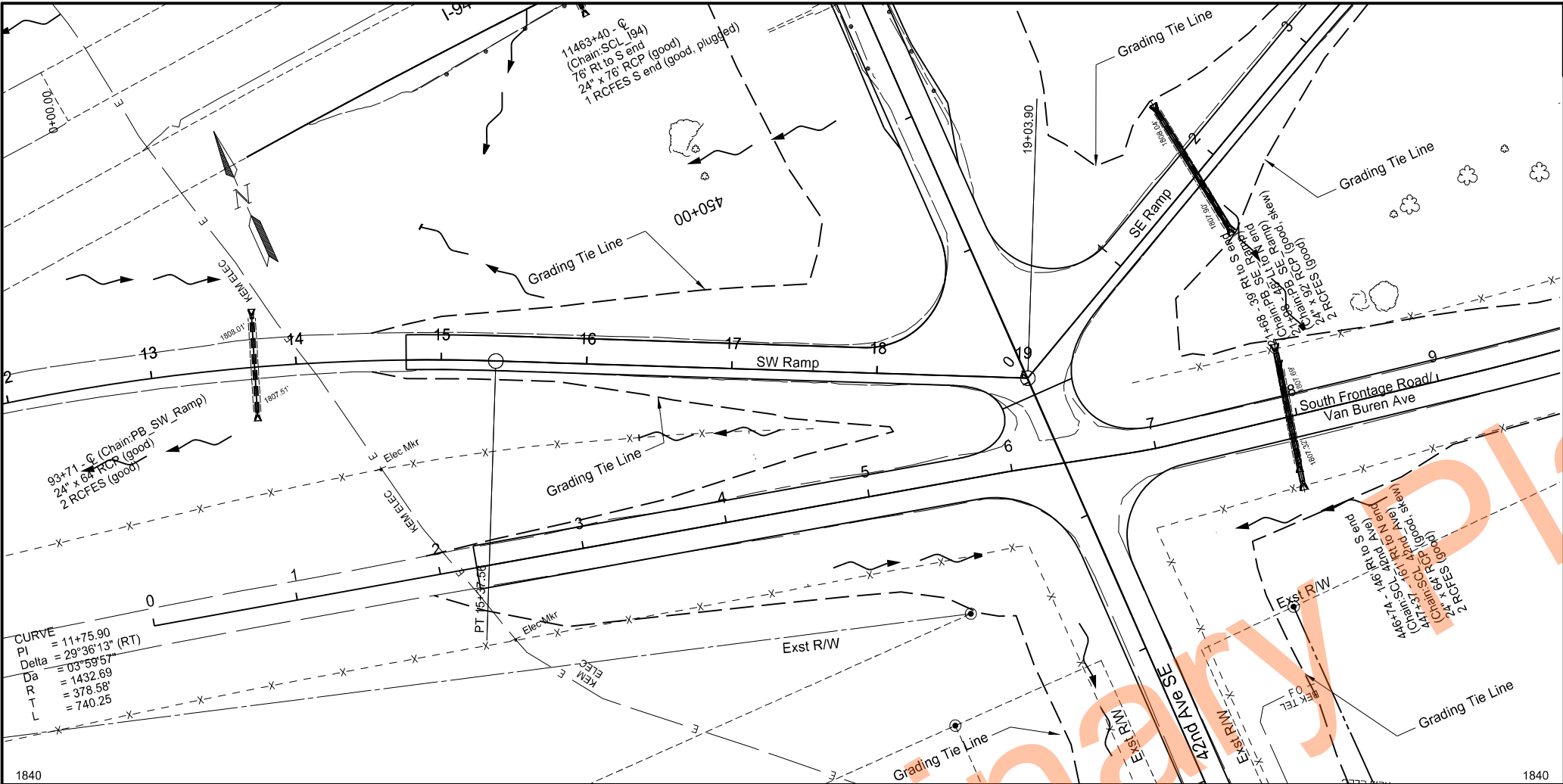
The diagram illustrates a vertical curve for 42nd Ave SE. The vertical axis represents elevation in feet, ranging from 1790 to 1830. The horizontal axis represents stationing, ranging from 462+00 to 471+00. Two profiles are shown: the Proposed Profile (Top of Pavement) and the Existing Profile (Top of Pavement). The Proposed Profile is a dashed line, and the Existing Profile is a solid line. The vertical curve is defined by a vertical intersection (VPI) at station 462+67.26 with an elevation of 1817.80. The curve length (L) is 293.79 feet. The grades are -3.395% and +1.5509%.

Station	Existing Profile (Top of Pavement) Elevation (ft)	Proposed Profile (Top of Pavement) Elevation (ft)
462+00	1822.28	1822.28
462+10	1821.70	1821.70
462+20	1821.19	1821.19
462+30	1820.73	1820.73
462+40	1816.89	1820.34
462+50	1820.02	1820.02
462+60	1819.75	1819.75
462+70	1819.55	1819.55
462+80	1819.41	1819.41
462+90	1818.34	1819.33
463+00	1819.31	1819.31
463+10	1819.36	1819.36
463+20	1819.47	1819.47
463+30	1819.64	1819.64
463+40	1819.86	1819.86
463+50	1820.17	1820.17
463+60	1820.50	1820.50
463+70	1821.47	1821.47
463+80	1823.38	1823.38
463+90	1826.12	1826.12
464+00	1828.35	1828.35
464+10	1829.66	1829.66
464+20	1830.47	1830.47
464+30	1831.16	1831.16

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	60	5

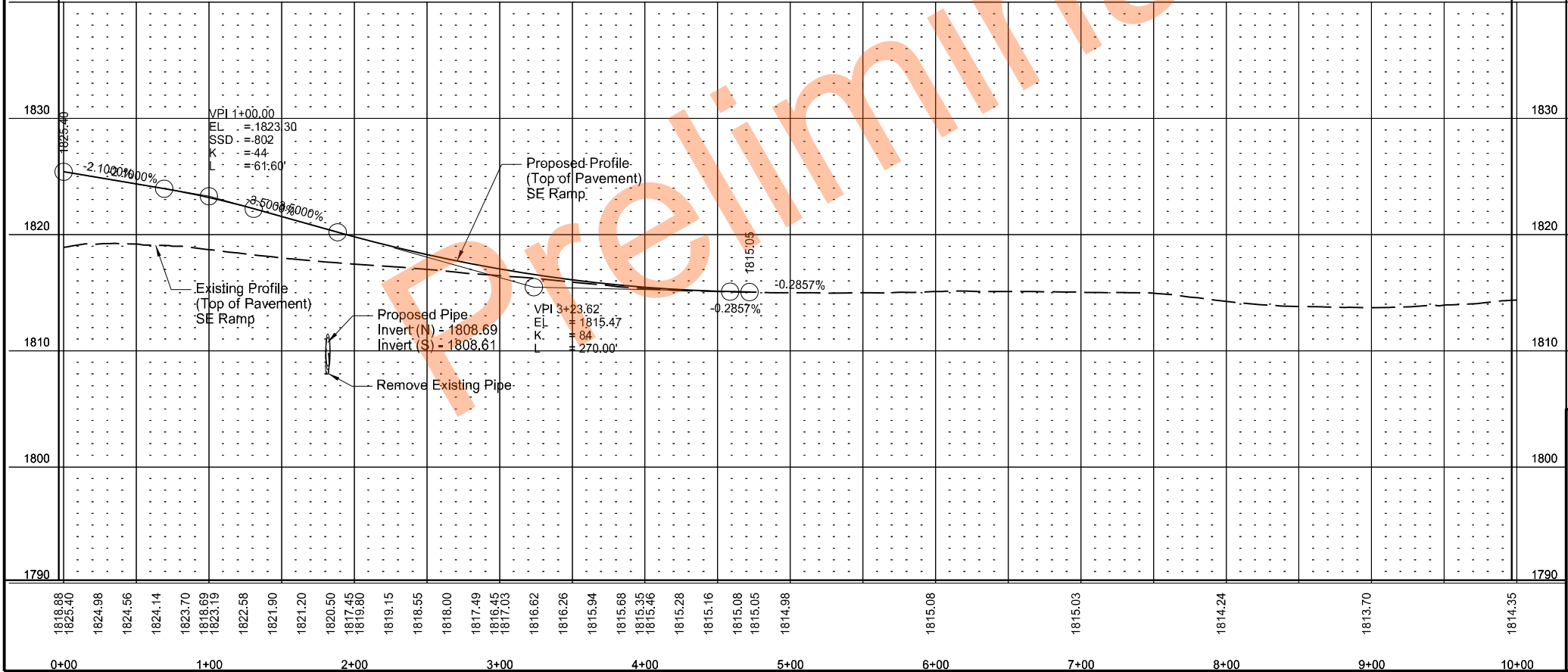
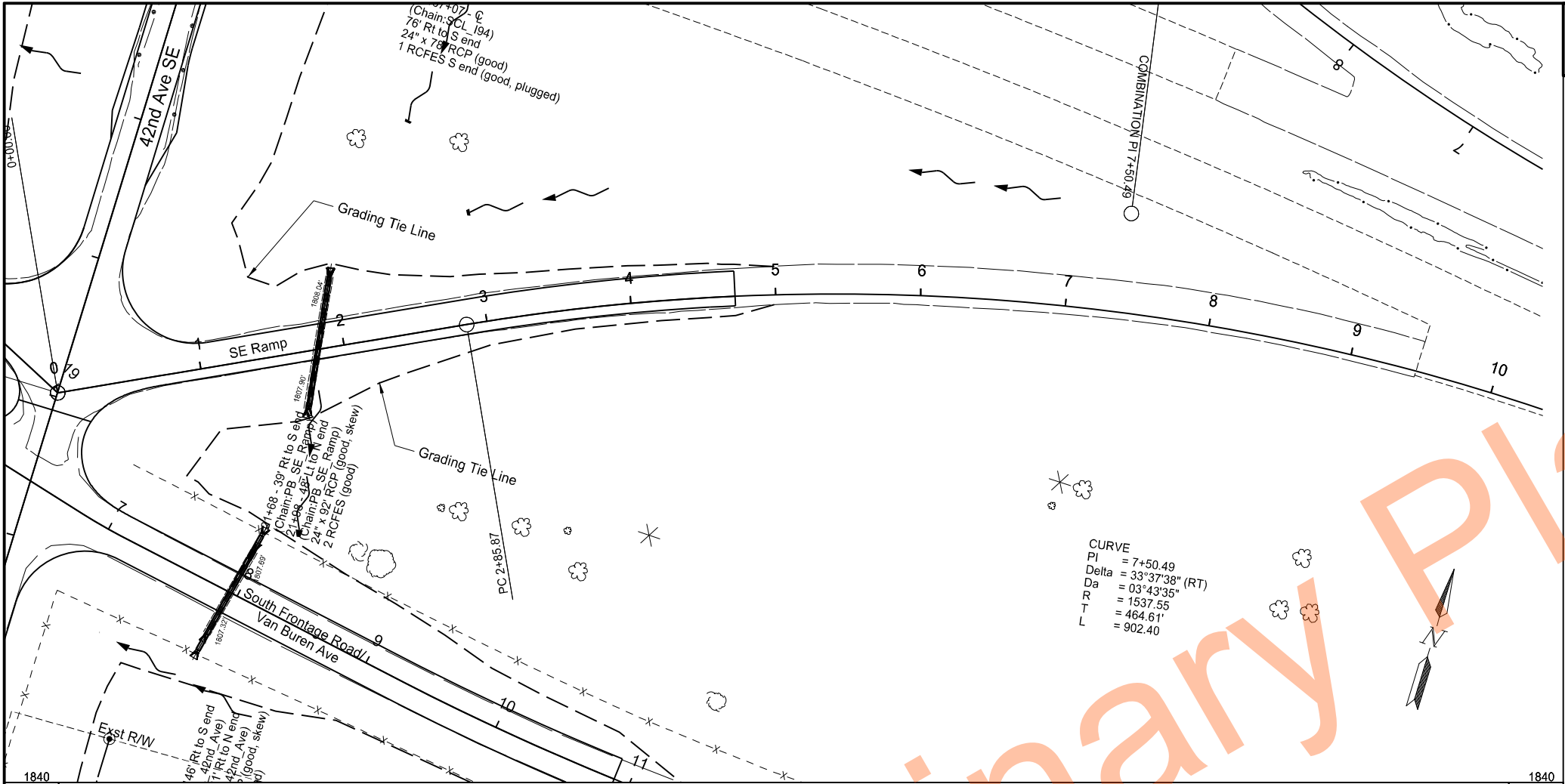
Plan & Profile

SW Ramp
Sta. 13+00 to 22+00

Structure Replacement
I-94/Pettibone Interchange



08/27/25

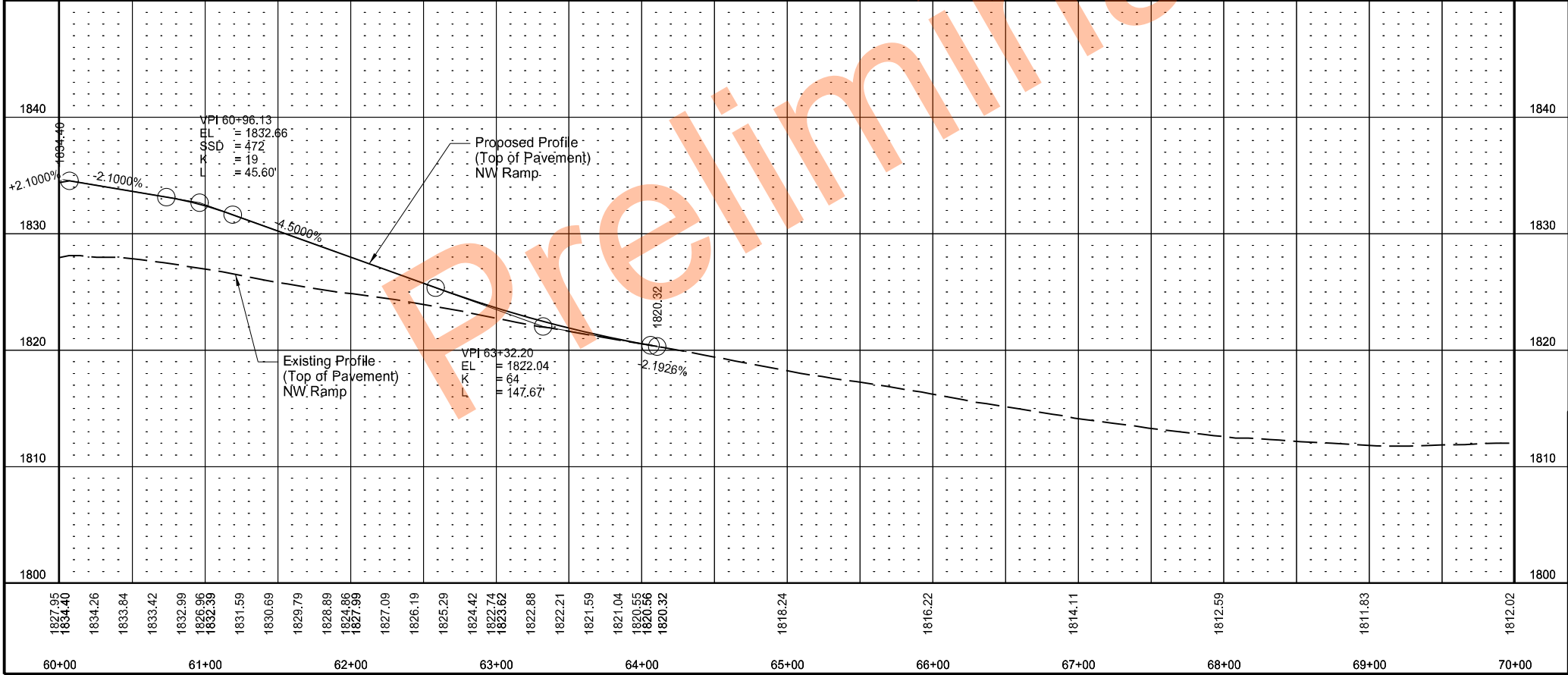
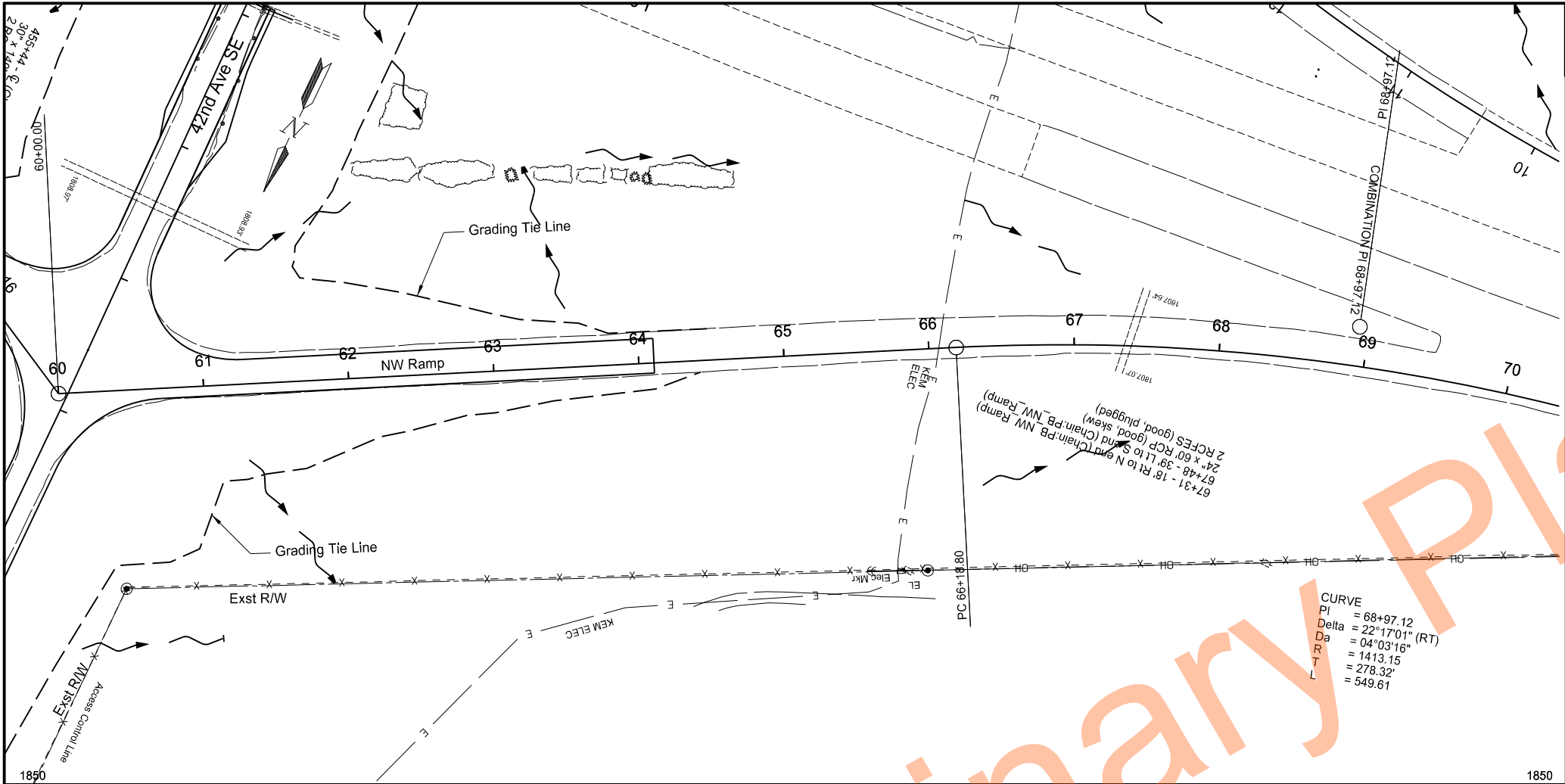


STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	60	6

Plan & Profile
SE Ramp
Sta. 0+00 to 10+00
Structure Replacement
I-94/Pettibone Interchange



08/27/25



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	60	7

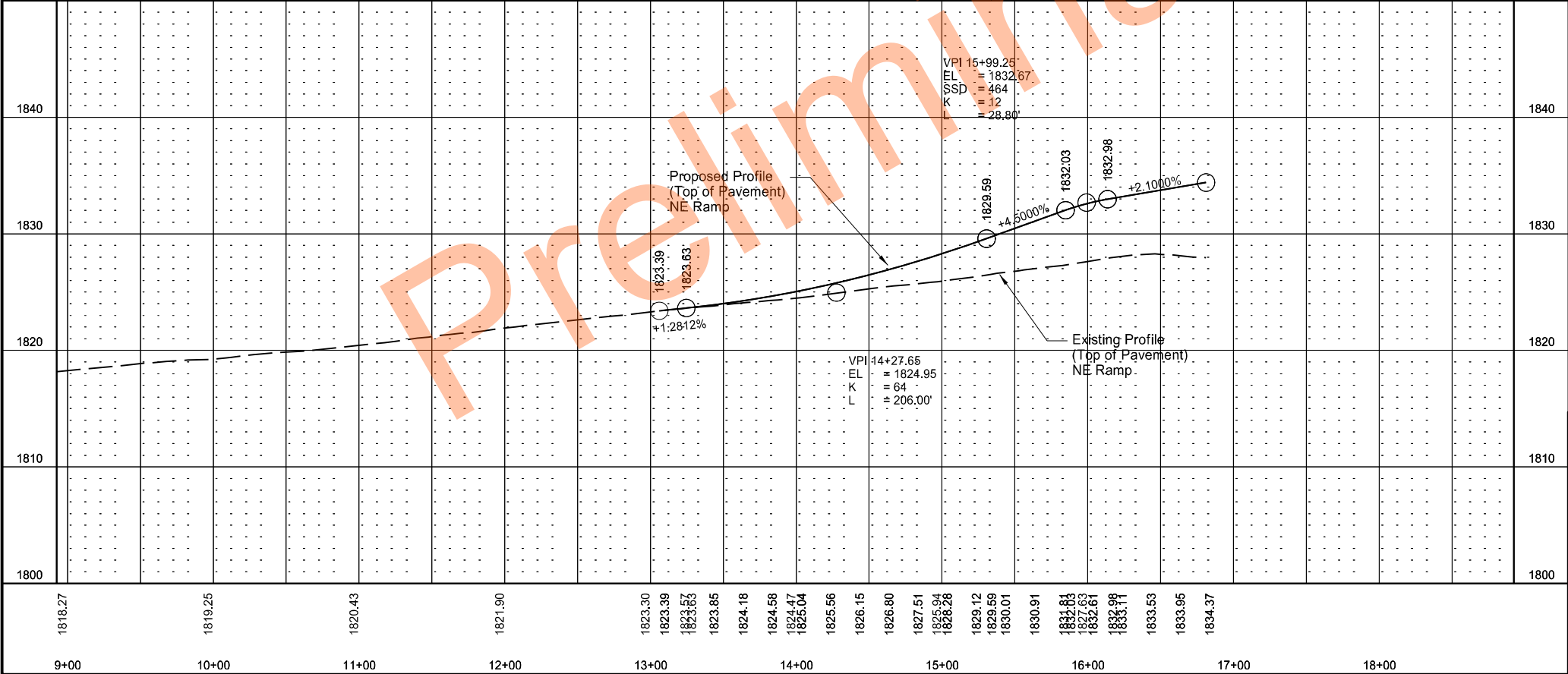
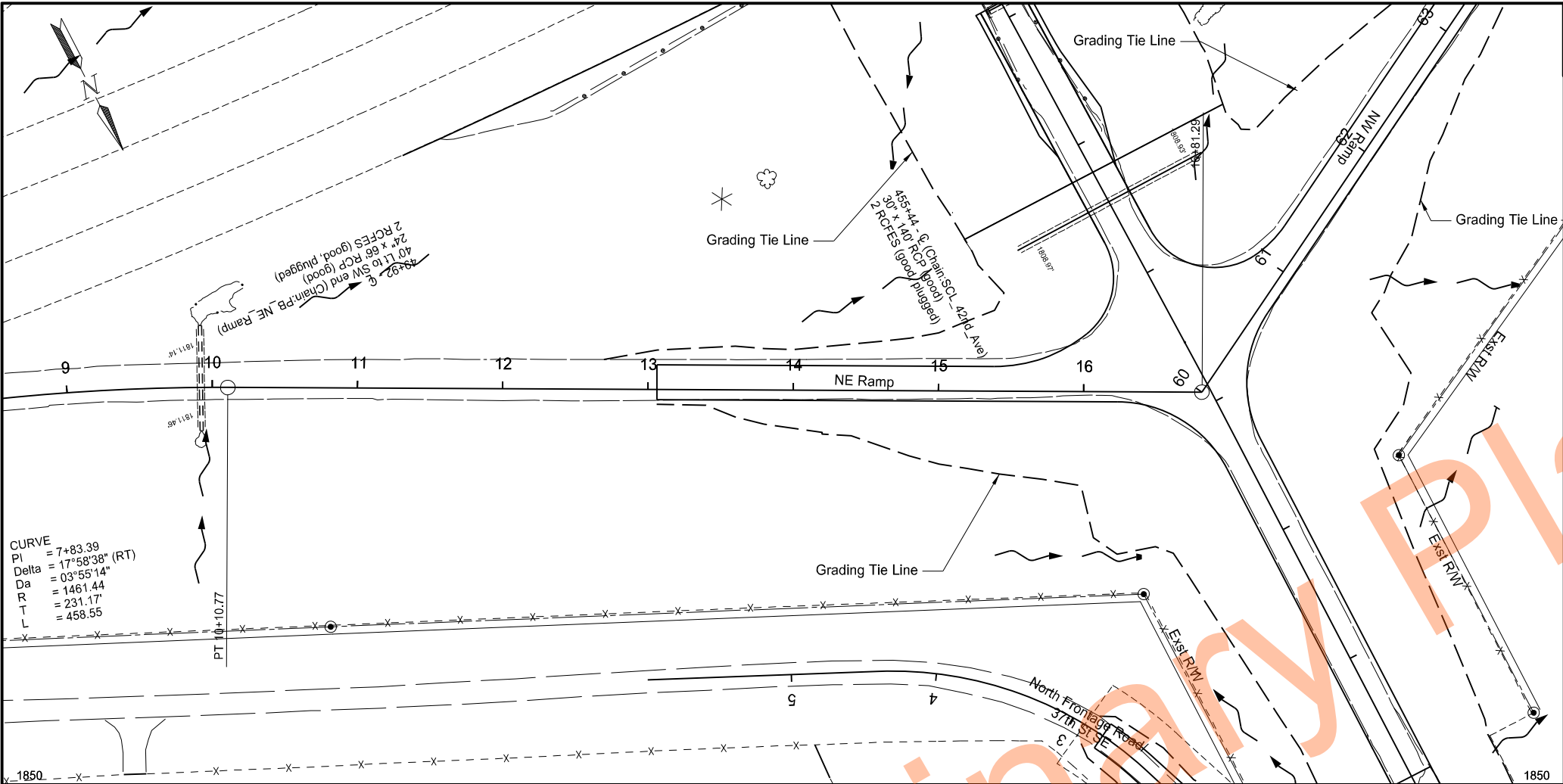
Plan & Profile

NW Ramp
Sta. 60+00 to 70+00

Structure Replacement
I-94/Pettibone Interchange



08/27/25

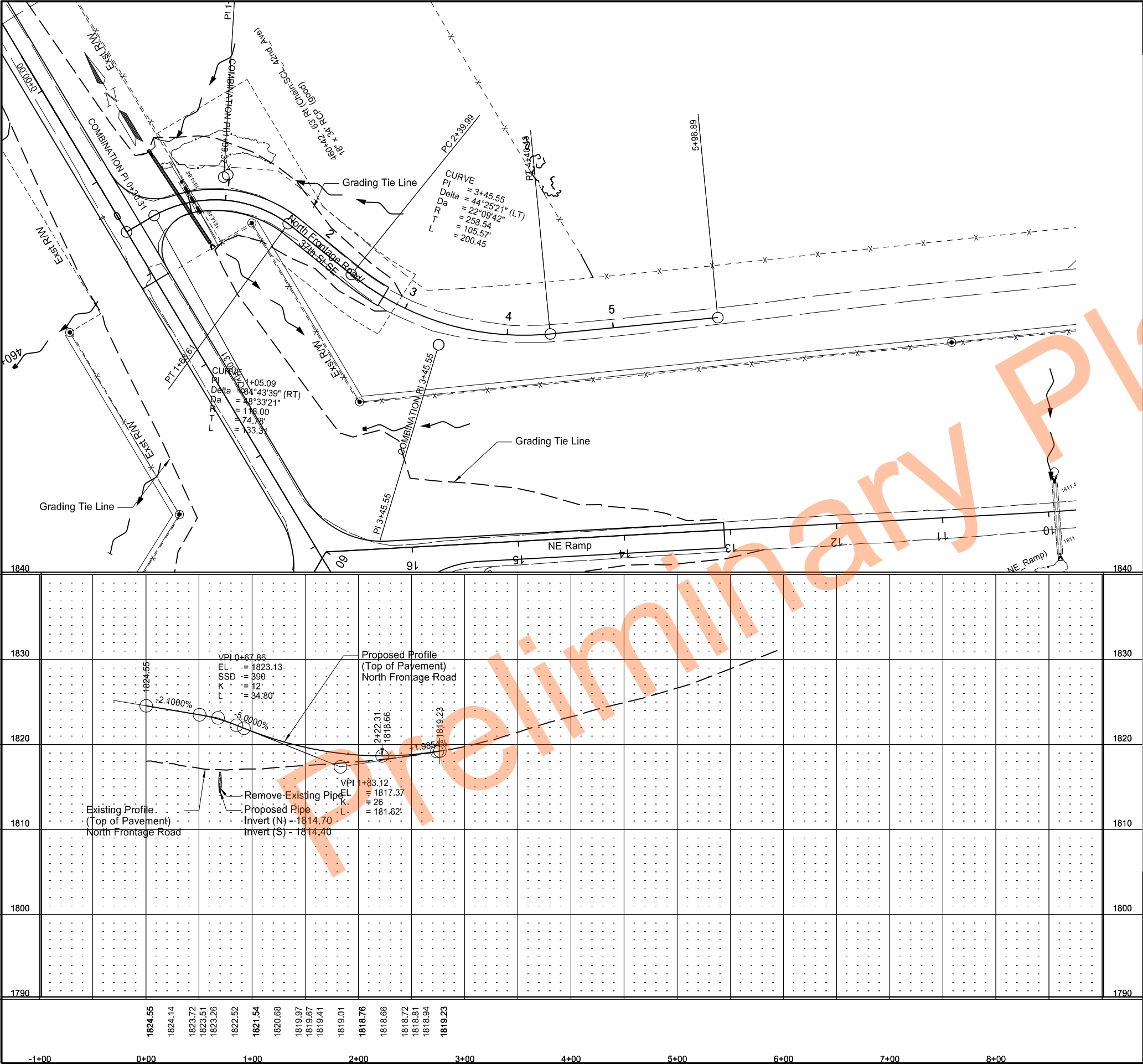


STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	60	8

Plan & Profile
NE Ramp
Sta. 9+00 to 16+81.29
Structure Replacement
I-94/Pettibone Interchange



08/27/25



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	60	9

Plan & Profile

North Frontage Road
Sta. 0+00 to 5+98.89

Structure Replacement
I-94/Pettibone Interchange

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PE 2928

08/27/25

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	75	1

Wetland Impact Table																											
Wetland Number	Location	Wetland Type	Wetland Feature	USACE Jurisdictional Wetlands	Wetland Impact					Wetland Mitigation																	
					Wetland Impacts			Acre(s)		USFWS Easement Acre(s)		Impacts		Mitigation Proposed			USACE/11990 Bank		11990 Bank		USFWS Bank		Onsite Mitigation Method			Onsite Constructed Location	
					Temp.	Perm. (Fill/Drain)	Perm. (Cut)	Temp.	Perm.	EO 11990	USACE	USFWS	Location	Acre(s)	Location	Acre(s)	Location	Acre(s)	Mitigation Location; Ratio	Ditch Shift Acre(s)	Onsite Acre(s)	Onsite Constructed Site #	Onsite Constructed Size Acre(s)				
1	Sec.12, T139N, R71W	Basin	Created	No	-	-	-	-	-	N	N	N															
2	Sec.7, T139N, R70W	Basin	Created	No	-	-	-	-	-	N	N	N															
3	Sec.12, T139N, R71W	Basin	Created	No	-	-	-	-	-	N	N	N															
				Totals	0,000	0,000	0,000	0,000	0,000											0,000	0,000		0,000				

* A wetland Jurisdictional Determination was issues by the USACE on 11/22/2022; NWO-2008-01688-BIS

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	0.000
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	0.000
Total	0.000	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		

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		-	-		-	
EO 11990 Only		-	-	-		
USACE/ 11990		-	-		-	
USFWS		-				-
Total		0.000	0.000	0.000	0.000	0.000

Wetland Table

Structure Replacement
I-94/Pettibone Interchange

BRIAN J. ROSIN

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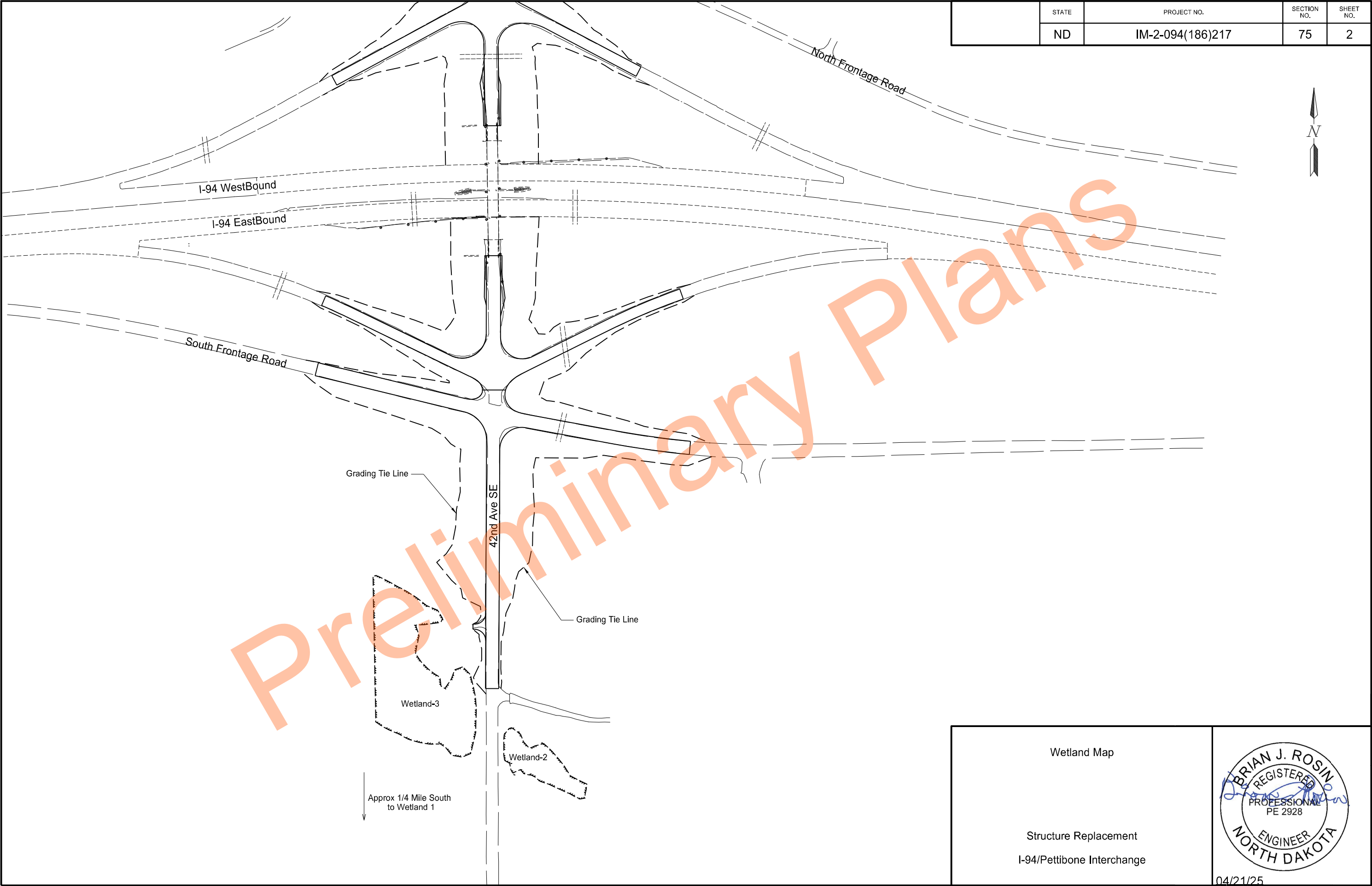
PROFESSIONAL

PE 2928

ENGINEER

NORTH DAKOTA

04/21/25



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	75	2

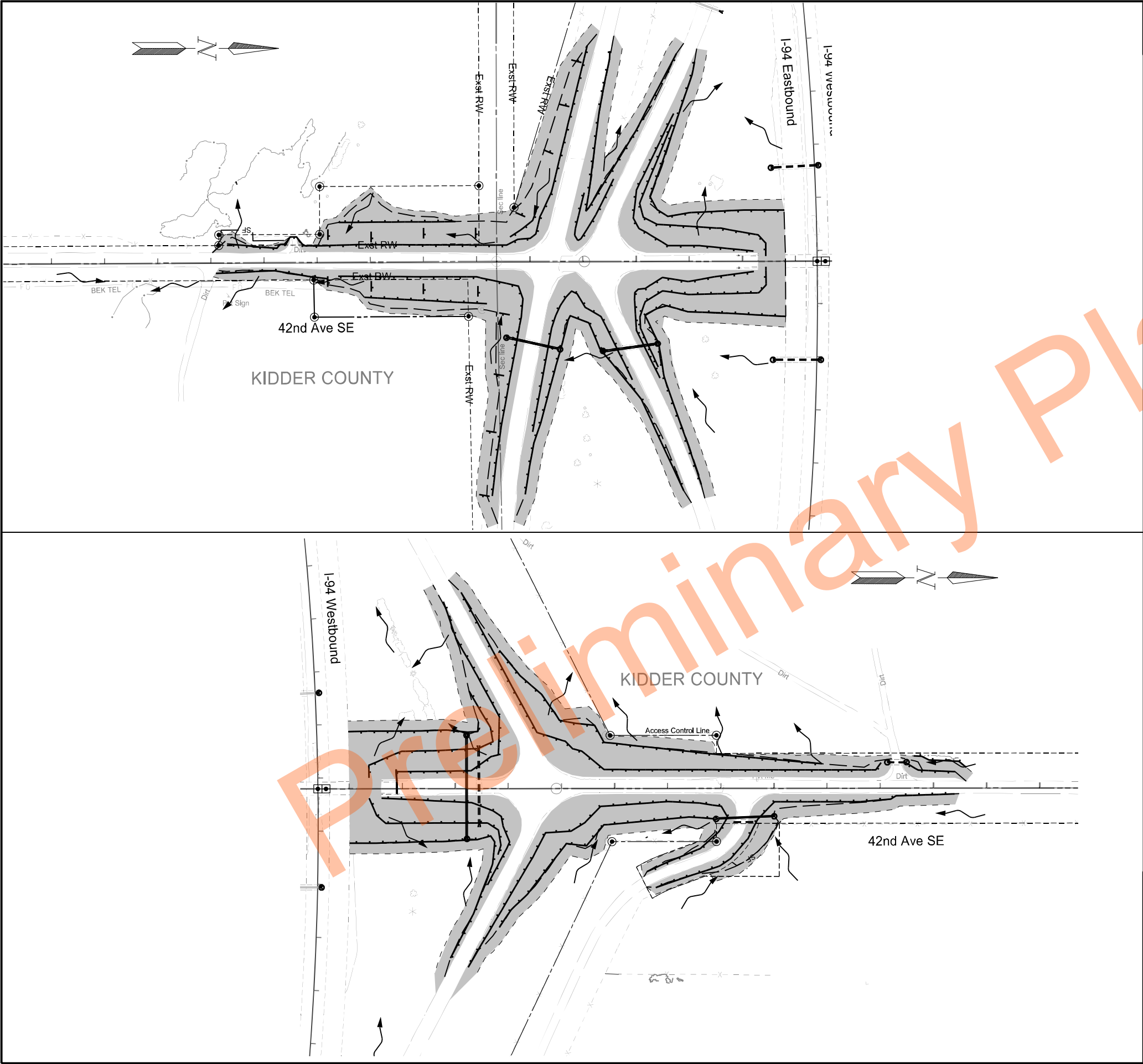
Wetland Map

Structure Replacement

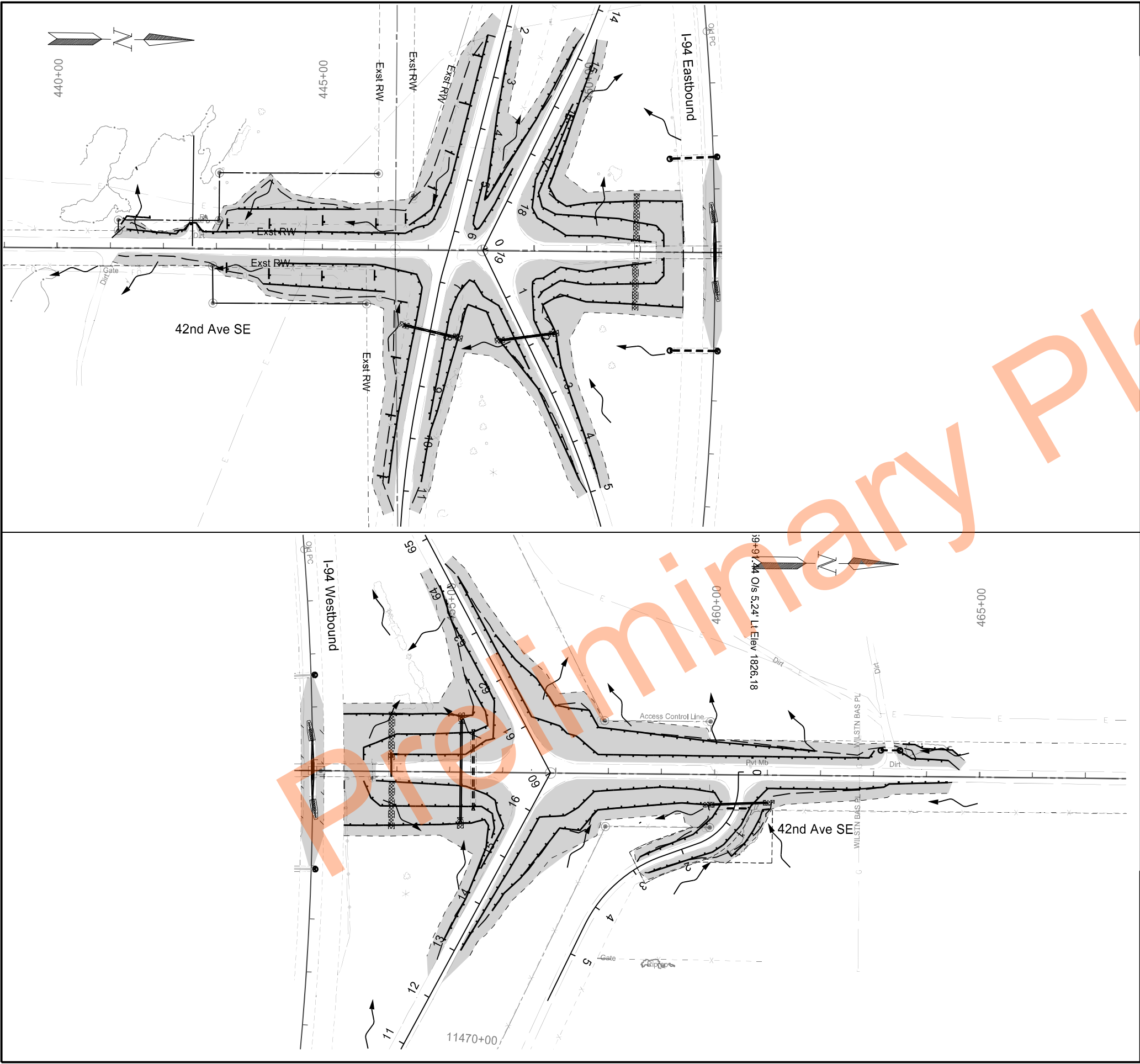
I-94/Pettibone Interchange

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NORTH DAKOTA

04/21/25



		STATE	PROJECT NO.	SECTION NO.	SHEET NO.
		ND	IM-2-094(186)217	76	1
SPEC	CODE	BID ITEM		QUANTITY	UNIT
251	2000	TEMPORARY COVER CROP			ACRE
		SW Quadrant		1.89	
		SE Quadrant		2.18	
		West Side Between Ramps		2.10	
		East Side Between Ramps		1.97	
		NW Quadrant		1.47	
		NE Quadrant		1.54	
253	101	STRAW MULCH			ACRE
		SW Quadrant		1.89	
		SE Quadrant		2.18	
		West Side Between Ramps		2.10	
		East Side Between Ramps		1.97	
		NW Quadrant		1.47	
		NE Quadrant		1.54	
260	100	SILT FENCE UNSUPPORTED			LF
		SW Quadrant		175	
		NE Quadrant		150	
260	101	REMOVE SILT FENCE UNSUPPORTED			LF
		SW Quadrant		175	
		NE Quadrant		150	
261	112	FIBER ROLLS 12IN			LF
		SW Quadrant		2365	
		SE Quadrant		2715	
		West Side Between Ramps		2845	
		East Side Between Ramps		2640	
		NW Quadrant		1930	
		NE Quadrant		2040	
261	113	REMOVE FIBER ROLLS 12IN			LF
		SW Quadrant		2365	
		SE Quadrant		2715	
		West Side Between Ramps		2845	
		East Side Between Ramps		2640	
		NW Quadrant		1930	
		NE Quadrant		2040	
		12" Fiber Roll			
		Temp Seeding & Straw Mulch			
 SF		Silt Fence			
Temporary Erosion Control					
Structure Replacement					
I-94/Pettibone Interchange					
				04/21/25	



		STATE	PROJECT NO.	SECTION NO.	SHEET NO.
		ND	IM-2-094(186)217	77	1
SPEC	CODE	BID ITEM		QUANTITY	UNIT
251	200	SEEDING CLASS II			ACRE
		SW Quadrant		1.90	
		SE Quadrant		2.23	
		West Side Between Ramps		2.26	
		East Side Between Ramps		2.07	
		NW Quadrant		1.47	
		NE Quadrant		1.58	
253	301	BONDED FIBER MATRIX			ACRE
		SW Quadrant		1.90	
		SE Quadrant		2.23	
		West Side Between Ramps		2.26	
		East Side Between Ramps		2.07	
		NW Quadrant		1.47	
		NE Quadrant		1.58	
255	102	ECB TYPE 2			SY
		7+98 (FR_S)		50	
		1+68 (Align_SE_Ramp		50	
		455+23 (OFL)		50	
		0-58 (FR_N)		40	
255	202	TRM TYPE 2			SY
		450+96 Lt & Rt		220	
		455+21 LT & RT		220	
261	112	FIBER ROLLS 12IN			LF
		SW Quadrant		2350	
		SE Quadrant		2335	
		West Side Between Ramps		2605	
		East Side Between Ramps		2515	
		NW Quadrant		1940	
		NE Quadrant		2115	
		12" Fiber Rolls			
		TRM Type 2			
		Permanent Seeding & Bonded Fiber Matrix			
		ECB Type 2			
Permanent Erosion Control					
Structure Replacement					
I-94/Pettibone Interchange					
04/21/25					

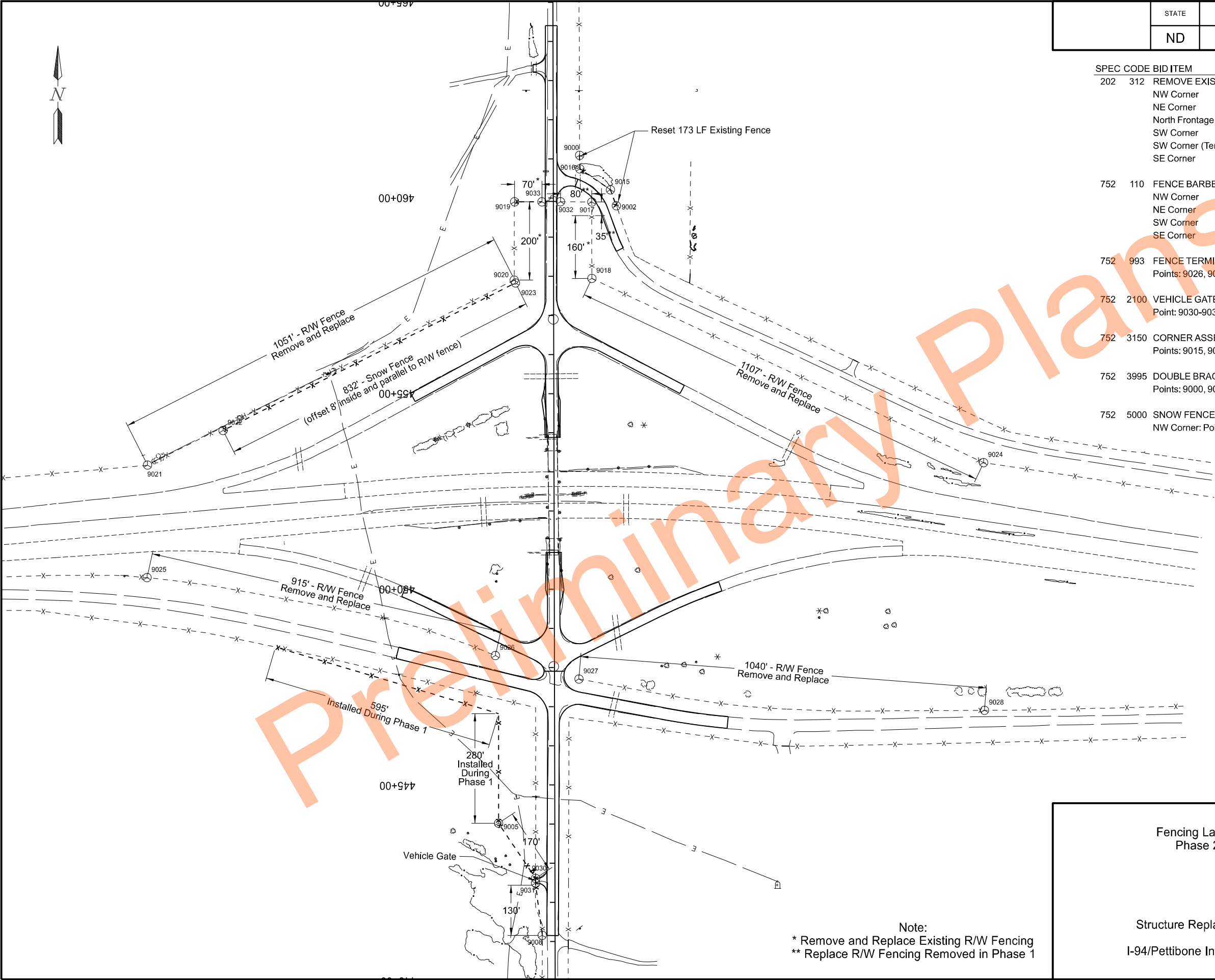
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	80	1

SPEC CODE	BID ITEM	QUANTIT	UNIT
202 312	REMOVE EXISTING FENCE		LF
	North Frontage Road	115	
	SE Corner	840	
	SW Corner	1265	
752 110	FENCE BARBED WIRE 3 STRAND-STEEL POST		LF
	Temporary		
	North Frontage Road	220	
	SW Corner	395	
	Permanent		
	SE Corner	770	
	SW Corner	875	
752 922	FENCE REMOVE & RESET		LF
	North Frontage Road	173	
752 3150	CORNER ASSEMBLY BARBED WIRE-WOOD POST		EA
	Points: 9004, 9005, 9009, 9010, 9011, 9012, 9013	7	
752 3995	DOUBLE BRACE ASSEMBLY-WOOD POST		EA
	Point: 9003	1	

Fencing Points (Alignment SCL 42nd Ave)

POINT	NORTHING	EASTING	STATION	OFFSET
9000	444814.875	2200504.818	461+09.47	66' RT
9001	444814.875	2200597.409	461+09.35	159' RT
9002	444691.262	2200598.743	459+85.74	160' RT
9003	443557.861	2199729.411	448+53.41	711' LT
9004	443387.652	2200299.546	446+82.50	141' LT
9006	443011.171	2200390.953	443+06.13	52' LT
9007	442821.171	2200390.953	441+16.13	52' LT
9008	442821.171	2200410.953	441+16.02	32' LT
9009	442998.776	2200475.57	442+93.26	33' RT
9010	443000.103	2200542.651	442+94.21	100' RT
9011	443290.129	2200541.02	445+84.24	100' RT
9012	443298.334	2200930.484	445+90.25	490' RT
9013	443315.754	2200933.011	446+07.66	492' RT
9014	444662.306	2200538.904	459+56.85	100' RT
9029	443107.652	2200299.546	444+03.12	142' LT
9032	443011.171	2200300.953	443+06.63	142' LT

Fencing Layout Phase 1 Structure Replacement I-94/Pettibone Interchange	
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		STATE	PROJECT NO.	SECTION NO.	SHEET NO.
		ND	IM-2-094(186)217	80	2
SPEC CODE	BID ITEM	QUANTITY	UNIT		
202 312	REMOVE EXISTING FENCE		LF		
	NW Corner	1321			
	NE Corner	1267			
	North Frontage Road (Temp Fencing)	220			
	SW Corner	915			
	SW Corner (Temp Fencing)	395			
	SE Corner	1040			
752 110	FENCE BARBED WIRE 3 STRAND-STEEL POST		LF		
	NW Corner	1321			
	NE Corner	1382			
	SW Corner	1227			
	SE Corner	1040			
752 993	FENCE TERMINAL		EA		
	Points: 9026, 9027, 9032, 9033	4			
752 2100	VEHICLE GATE		EA		
	Point: 9030-9031	1			
752 3150	CORNER ASSEMBLY BARBED WIRE-WOOD POST		EA		
	Points: 9015, 9016, 9017, 9018, 9019, 9020, 9021, 9024, 9029	9			
752 3995	DOUBLE BRACE ASSEMBLY-WOOD POST		EA		
	Points: 9000, 9002, 9008, 9025, 9028	5			
752 5000	SNOW FENCE		LF		
	NW Corner: Point 9022-9023	832			

Fencing Points (Alignment SCL 42nd Ave)

POINT	NORTHING	EASTING	STATION	OFFSET
9000	444814.57	2200506.648	461+09.16	68' RT
9002	444685.801	2200600.514	459+80.27	162' RT
9005	443107.652	2200299.546	444+03.12	142' LT
9008	442821.171	2200410.953	441+16.02	33' LT
9015	444726.491	2200585.328	460+20.98	146' RT
9016	444779.805	2200507.146	460+74.39	68' RT
9017	444695.404	2200537.787	459+89.95	99' RT
9018	444499.903	2200537.91	457+94.45	99' RT
9019	444695.785	2200340.254	459+90.58	99' LT
9020	444495.694	2200339.207	457+90.49	100' LT
9021	444022.912	2199402.273	453+18.87	1037' LT
9022	444111.245	2199595.324	454+06.96	844' LT
9023	444488.346	2200342.574	457+83.14	97' LT
9024	444029.096	2201539.065	453+22.40	1099' RT
9025	443735.257	2199401.099	450+31.22	1039' LT
9026	443536.108	2200291.359	448+30.96	149' LT
9027	443476.021	2200504.876	447+70.61	64' RT
9028	443396.113	2201541.333	446+89.42	1101' RT
9030	442966.432	2200394.204	442+61.37	49' LT
9031	442954.432	2200394.204	442+49.37	49' LT
9032	444695.926	2200457.742	459+90.57	19' RT
9033	444695.785	2200410.254	459+90.49	29' LT

Fencing Layout
Phase 2

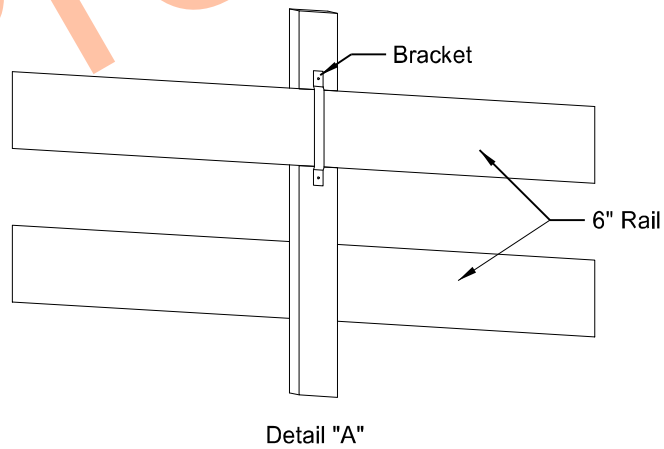
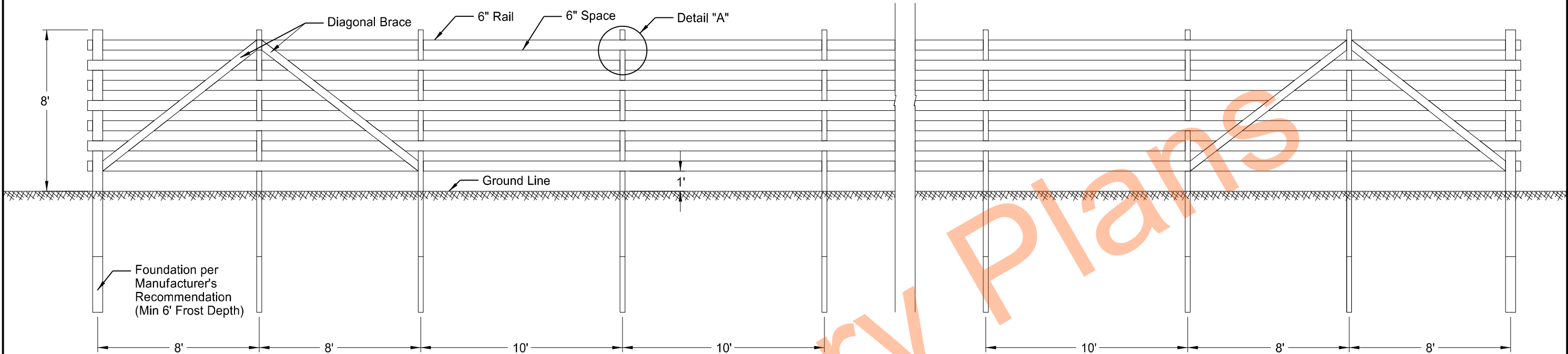
Structure Replacement
I-94/Pettibone Interchange

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08/27/25

Note:
* Remove and Replace Existing R/W Fencing
** Replace R/W Fencing Removed in Phase 1

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	80	3



Snow Fence Detail

Structure Replacement
I-94/Pettibone Interchange



08/27/25

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - I-94/Pettibone Interchange														STATE	PROJECT NO.			SECTION NO.	SHEET NO.
												ND		IM-2-094-(186)217			81	1	
HORIZONTAL ALIGNMENT				CURVE DATA		US PUBLIC LAND SURVEY DATA				SURVEY CONTROL POINTS									
PNT	STATION	NORTHING	EASTING	ARC DEFINITION		CORNER	IRN	NORTHING	EASTING	PNT	NORTHING	EASTING	ELEV	STATION	OFFSET	ALIGNMENT	MONUMENT		
I 94 (SCL_I94)				Curve		T-139-N R-70-W				PRIMARY CONTROL									
Begin	11359+72.78	443,544.78	2,189,909.29	PI STA	= 11415+17.47	PI STA	= 11676+58.68	NW Cor Sec 7	1-C	443,343.13	2,200,440.61	GPS 2	443,552.06	2,209,521.57	1,803.99	11556+13	196' Rt	SCL_I94	#5 x 18" Rebar w/ 1 1/2" Alum Cap Mrk'd NDDOT CONTROL
PC	11410+11.80	443,533.43	2,194,948.29	Delta	= 5° 03' 12" (LT)	Delta	= 6° 39' 51" (RT)	W Qtr Cor Sec 19	1-H	430,133.77	2,200,496.89	GPS 1	443,906.95	2,216,705.40	1,792.30	11628+06	202' Rt	SCL_I94	#5 x 18" Rebar w/ 1 1/2" Alum Cap Mrk'd NDDOT CONTROL
Sec line Xing	11411+93.69 Bk Tan	443,533.02	2,195,130.18	Da	= 0° 30' 00"	Da	= 0° 30' 00"	SW Cor Sec 19	1-J	427,486.82	2,200,508.01								
PI Curve	11415+17.47	443,532.29	2,195,453.96	R	= 11,459.19'	R	= 11,459.19'	NE Cor Sec 7	3-C	443,447.09	2,205,695.60	SECONDARY CONTROL							
PT	11420+22.48	443,575.70	2,195,957.76	T	= 505.67'	T	= 667.18'	NW Cor Sec 9	5-C	443,484.81	2,210,958.79	BM V484 1982	443,691.79	2,189,883.04	1,776.54	N/A	N/A	SCL_I94	Rod in Casing
PC	11461+02.06	443,925.88	2,200,022.28	L	= 1,010.69'	L	= 1,332.85'	NW Cor Sec 10	7-C	443,518.91	2,216,280.50	BM U484	443,681.28	2,195,095.68	1,786.16	11411+60	147' Lt	SCL_I94	Rod in Casing
Station Equation I 94 (SCL_I94) & 42nd Ave SE (SCL_42nd_Ave)								SE Cor Sec 9	7-E	438,182.03	2,216,325.16	BM U484 2006	444,058.68	2,200,453.09	1,834.68	11465+34	112' Lt	SCL_I94	Rod in Casing
I 94	11465+20.24	443,946.55	2,200,439.86	Curve		Spiral Curve		NW Cor Sec 2	9-A	448,841.61	2,221,529.48	BM S484	443,815.40	2,205,716.51	1,808.48	11518+18	168' Lt	SCL_I94	Rod in Casing
42nd Ave SE	452+41.22	443,946.55	2,200,439.86	PI STA	= 11467+70.66	PI STA	= 11718+01.69	NE Cor Sec 10	9-C	443,560.84	2,221,541.84	BM R484 1982	443,988.25	2,210,943.02	1,801.51	11570+54	168' Lt	SCL_I94	Rod in Casing
Rge line Xing	11465+21.16 Bk Tan	443,961.86	2,200,439.84	Delta	= 13° 18' 42" (RT)	Delta	= 33° 34' 04" (RT)	SW Cor Sec 11	9-E	438,278.73	2,221,608.80	BM L484 1982	444,243.47	2,216,240.83	1,791.70	11623+58	157' Lt	SCL_I94	Rod in Casing
PI Curve	11467+70.66	443,983.28	2,200,688.42	Da	= 1° 00' 00"	Da	= 1° 15' 00"	NW Cor Sec 1	11-A	448,897.31	2,226,807.15	RTK 30000	443,540.15	2,200,275.01	1,812.93	11463+37	402' Rt	SCL_I94	#5 x 18" Rebar
PT	11474+33.24	443,885.75	2,201,349.87	R	= 5,729.65'	R	= 4,583.75'	W Qtr Cor Sec 1	11-B	446,257.01	2,226,833.57	RTK 35618	443,864.87	2,200,359.59	1,810.94	11464+37	80' Rt	SCL_I94	#5 x 18" Rebar
PC	11483+95.44	443,745.40	2,202,301.77	T	= 668.60'	Ls	= 200.00'	NW Cor Sec 12	11-C	443,616.70	2,226,859.96	RTK 35619	444,027.05	2,200,506.86	1,812.96	11465+87	80' Lt	SCL_I94	#5 x 18" Rebar
PI Curve	11493+20.52	443,610.46	2,203,216.96	L	= 1,331.18'	Sc	= 1° 15' 00"	SW Cor Sec 12	11-E	438,332.58	2,226,881.22	RTK 34980	444,185.27	2,201,214.55	1,831.80	11472+63	279' Lt	SCL_I94	#5 x 18" Rebar
PT	11502+41.60	443,624.08	2,204,141.95			Ts	= 200.00'	N Qtr Cor Sec 12	12-C	443,643.65	2,229,498.37	RTK 34199	443,442.10	2,202,051.63	1,823.58	11481+92	337' Rt	SCL_I94	#5 x 18" Rebar
PC	11538+34.48	443,676.97	2,207,734.43	Curve		L	= 2,685.47'	S Qtr Cor Sec 12	12-E	438,352.90	2,229,525.55	RTK 30001	443,642.08	2,224,447.99	1,828.32	11706+40	506' Rt	SCL_I94	#5 x 18" Rebar
PI Curve	11543+41.63	443,684.45	2,208,241.53	PI STA	= 11493+20.52														
PT	11548+48.67	443,709.87	2,208,748.04	Delta	= 9° 13' 51" (LT)					T-139-N R-71-W									
POT	11570+00.00	443,817.76	2,210,896.66	Da	= 0° 30' 00"					N Qtr Cor Sec 10	8-C	443,302.55	2,187,236.16						
PC	11669+91.50	444,318.83	2,220,875.59	R	= 11,459.19'					S Qtr Cor Sec 10	8-E	438,004.26	2,187,231.89						
Sec line Xing	11676+56.74 Bk Tan	444,352.19	2,221,539.99	T	= 925.08'					NE Cor Sec 3	9-A	448,588.53	2,189,837.79						
PI Curve	11676+58.68	444,352.29	2,221,541.93	L	= 1,846.16'					SE Cor Sec 3	9-C	443,339.80	2,189,912.19						
PT	11683+24.36	444,308.19	2,222,207.65					SW Cor Sec 11	9-E	438,031.65	2,189,897.98								
TS	11702+09.23	444,183.62	2,224,088.40	Curve						NW Cor Sec 1	11-A	448,623.13	2,195,139.35						
SC	11704+09.23	444,168.95	2,224,287.86	PI STA	= 11543+41.63					NW Cor Sec 12	11-C	443,328.02	2,195,129.81						
PI Spiral	11718+01.69	444,078.36	2,225,677.38	Delta	= 2° 01' 42" (LT)					NE Cor Sec 1	13-A	448,623.13	2,200,434.05						
Sec line Xing	861.90' from ST	443,610.16	2,226,238.19	Da	= 0° 12' 00"					SE Cor Sec 12	13-E	438,067.61	2,200,470.28						
CS	11730+94.70	443,184.84	2,226,745.37	R	= 28,647.90'					E Qtr Cor Sec 12	13-D	440,705.37	2,200,455.44						
Sec line Xing	49.61' from ST	443,089.30	2,226,862.08	T	= 507.15'					All coordinates and measurements on this document derived from the International Foot definition.									
ST	11732+94.70	443,057.79	2,226,899.82	L	= 1,014.19'														
End	11743+29.14	442,394.84	2,227,693.90					NE Cor Sec 33	7-L	454,093.63	2,216,235.70	INITIALIZING BENCH MARK NDGPS Station (OPUS)		☒ NAVD-88 ☐	☐ GEOID12B ☒ GEOID18	REGISTERED PROFESSIONAL LAND SURVEYOR 2015-2024 JOHNSON LS-10169 DATE NORTH DAKOTA 03/02/23			
										Date Survey Completed 10/12/22		☐ Assumed Coordinates ☒ All coordinates on this sheet are Kidder County ground coordinates. They are derived from the NAD83(2011) reference frame; North Dakota South Zone Combination Factor (cf) = 0.9998515							
NOTES: Sheet 1 of 3 Alignment per NDDOT ROW Plat I-01-06(6)1958 and NDDOT Grading Plans IR-094(6)011 1958 Control part of NDDOT Project 2-094(187)221																			

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - I-94/Pettibone Interchange											STATE	PROJECT NO.		SECTION NO.	SHEET NO.
										ND	IM-2-094-(186)217		81	2	
HORIZONTAL ALIGNMENT				CURVE DATA											
PNT	STATION	NORTHING	EASTING	ARC DEFINITION											
42nd Ave SE (SCL_42nd_Ave)						REFERENCE MARKERS									
Begin	420+00.00	440,705.37	2,200,455.45			#	NORTHING	EASTING	STATION	OFFSET	ALIGN				
Sec line Xing	446+37.80	443,343.13	2,200,440.61			215	443,464.83	2,189,122.10	N/A	N/A	N/A				
Station Equation = 42nd Ave SE (SCL_42nd_Ave) & SW Ramp (PB_SW_Ramp) & SE Ramp (PB_SE_Ramp)						215	443,602.27	2,189,118.22	N/A	N/A	N/A				
42nd Ave SE	448+02.87	443,508.20	2,200,440.40			217	443,829.62	2,199,679.84	11457+53	67' Rt	SCL_I94				
SW Ramp	99+03.90	443,508.20	2,200,440.40			217	443,964.24	2,199,669.98	11457+54	68' Lt	SCL_I94				
SE Ramp	20+00.00	443,508.20	2,200,440.40			222	443,749.80	2,225,992.76	11721+61	68' Lt	SCL_I94				
Station Equation = 42nd Ave SE (SCL_42nd_Ave) & NW Ramp (PB_NW_Ramp) & NE Ramp (PB_NE_Ramp)															
42nd Ave SE	456+90.24	444,395.57	2,200,439.30												
NW Ramp	60+00.00	444,395.57	2,200,439.30												
NE Ramp	56+81.29	444,395.57	2,200,439.30												
End	476+86.75	446,392.07	2,200,436.82												
NW Ramp (PB_NW_Ramp)				Curve											
Begin/ 42nd Ave SE	60+00.00	444,395.57	2,200,439.30	PI STA	= 68+97.12										
PC	66+18.80	444,101.24	2,199,894.99	Delta	= 22° 17' 01" (RT)										
PI Curve	68+97.12	443,968.85	2,199,650.17	Da	= 4° 03' 16"										
PT	71+68.40	443,939.19	2,199,373.43	R	= 1,413.15'										
End	79+58.80	443,854.95	2,198,587.53	T	= 278.32'										
				L	= 549.61'										
NE Ramp (PB_NE_Ramp)				Curve											
Begin	40+00.00	443,840.74	2,202,008.60	PI STA	= 47+83.39										
PC	45+52.22	443,935.17	2,201,464.52	Delta	= 17° 58' 38" (RT)										
PI Curve	47+83.39	443,974.70	2,201,236.75	Da	= 3° 55' 14"										
PT	50+10.77	444,082.60	2,201,032.30	R	= 1,461.44'										
End/ 42nd Ave SE	56+81.29	444,395.57	2,200,439.30	T	= 231.17'										
				L	= 458.55'										
SE Ramp (PB_SE_Ramp)				Curve											
Begin/ 42nd Ave SE	20+00.00	443,508.20	2,200,440.40	PI STA	= 27+50.49										
PC	22+85.87	443,635.33	2,200,696.45	Delta	= 33° 37' 38" (RT)										
PI Curve	27+50.49	443,841.95	2,201,112.59	Da	= 3° 43' 35"										
PT	31+88.27	443,783.54	2,201,573.52	R	= 1,537.55'										
End	37+82.85	443,708.80	2,202,163.38	T	= 464.61'										
				L	= 902.40'										
NOTES: Sheet 2 of 3 Alignment per NDDOT ROW Plat I-01-06(6)1958 and NDDOT Grading Plans IR-094(6)011 1958 Control part of NDDOT Project 2-094(187)221										All coordinates and measurements on this document derived from the International Foot definition.			INITIALIZING BENCH MARK NDGPS Station (OPUS) ☒ NAVD-88 ☐ _____ ☐ GEOID12B ☒ GEOID18		
										Date Survey Completed 10/12/22	☐ Assumed Coordinates ☒ All coordinates on this sheet are Kidder County ground coordinates. They are derived from the NAD83(2011) reference frame; North Dakota South Zone Combination Factor (cf) = 0.9998515				
REGISTERED PROFESSIONAL LAND SURVEYOR SIDNEY JOHNSON LS-10169 DATE NORTH DAKOTA 03/02/23															

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - I-94/Pettibone Interchange

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094-(186)217	81	3

[illegible]

NOTES: Sheet 3 of 3

Alignment per NDDOT ROW Plat I-01-06(6)1958 and NDDOT Grading Plans IR-094(6)011 1958
Control part of NDDOT Project 2-094(187)221

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

INITIALIZING BENCH MARK NDGPS Station (OPUS)

☒ NAVD-88

☐ GEOID12B

Page 10 of 10

☒ GEOID18

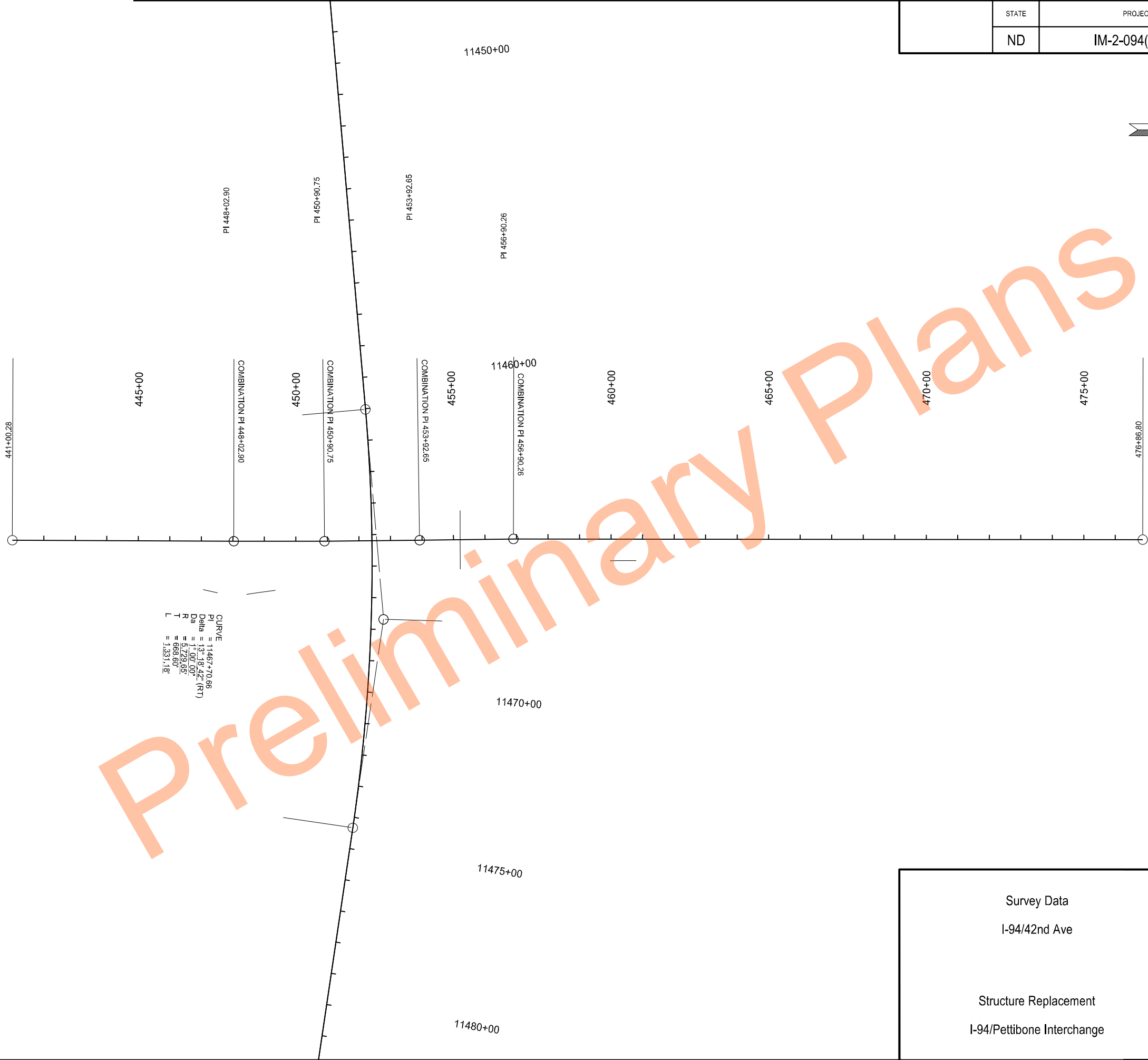
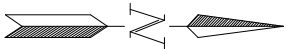
Date Survey Completed 10/12/22

☐ Assumed Coordinates

☒ All coordinates on this sheet are Kidder County ground coordinates.
They are derived from the NAD83(2011) reference frame; North Dakota South Zone Combination Factor (cf) = 0.9998515



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	82	1



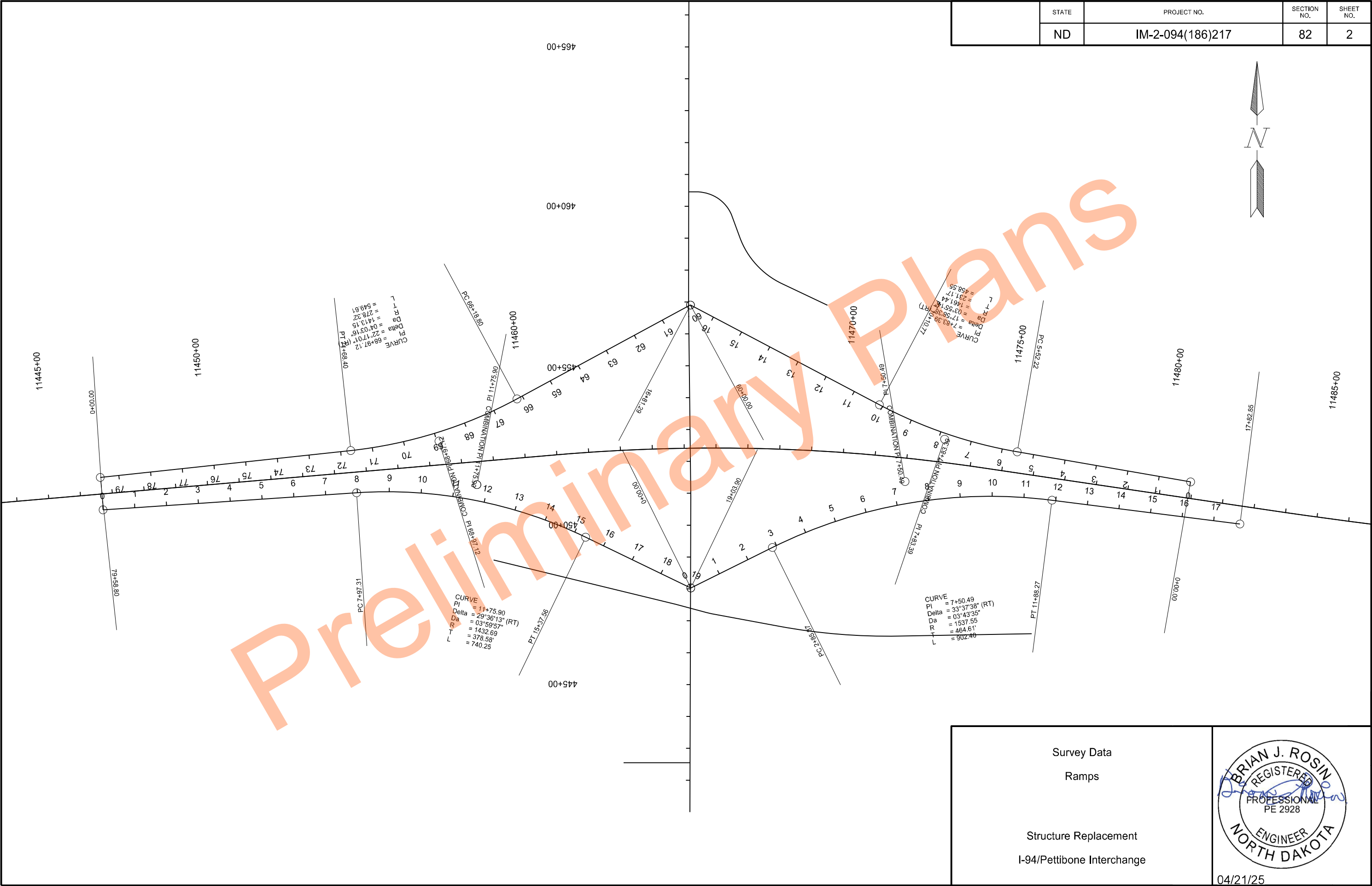
CURVE
PI = 11467+70.66
Delta = 13°-18'-42" (RT)
Ra = 1700.00'
T = 872.965'
L = 666.60'
= 1331.18'

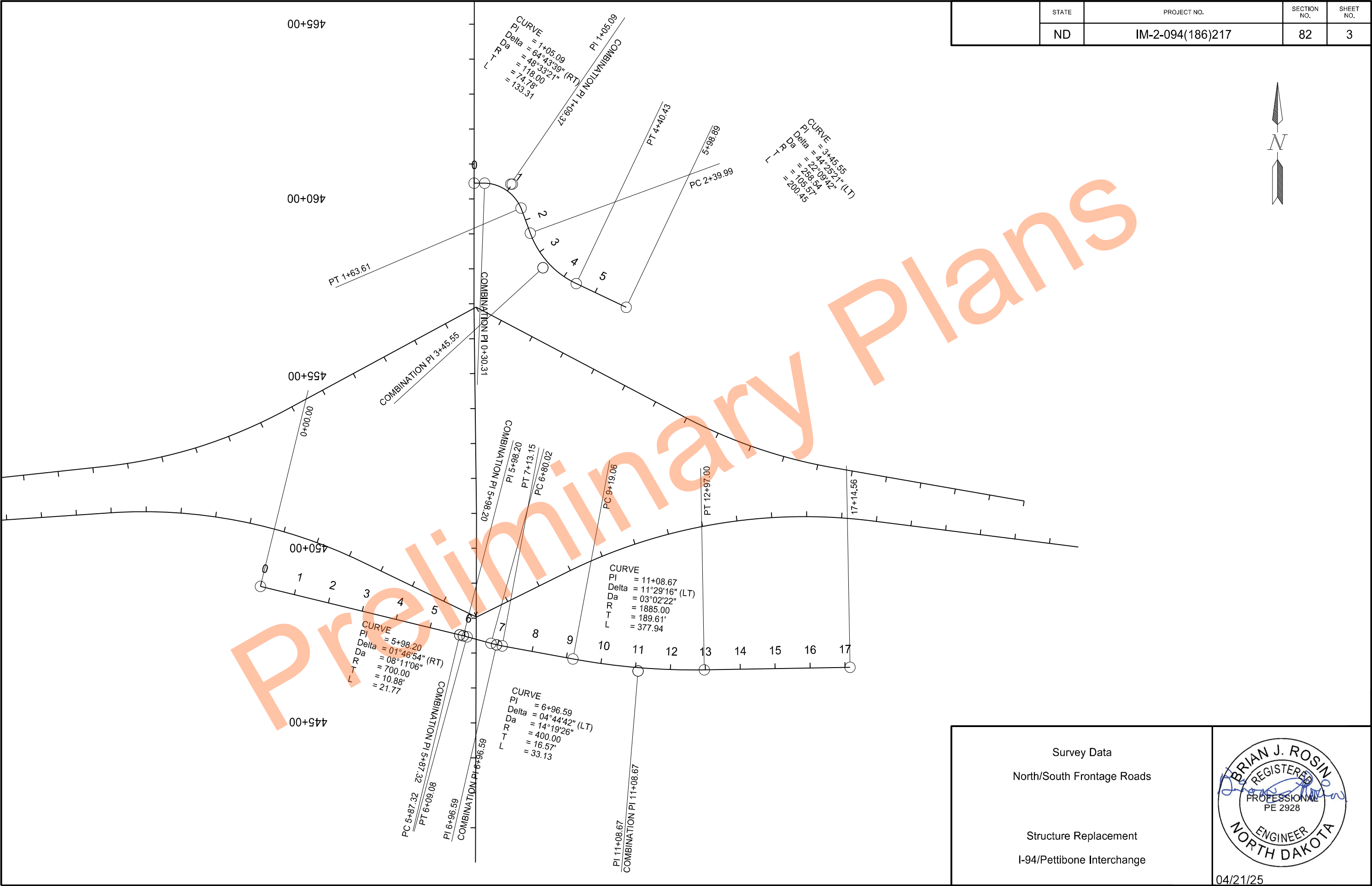
Survey Data
I-94/42nd Ave

Structure Replacement
I-94/Pettibone Interchange

BRIAN J. ROSIN
REGISTERED
PROFESSIONAL
PE 2928
ENGINEER
NORTH DAKOTA

04/21/25





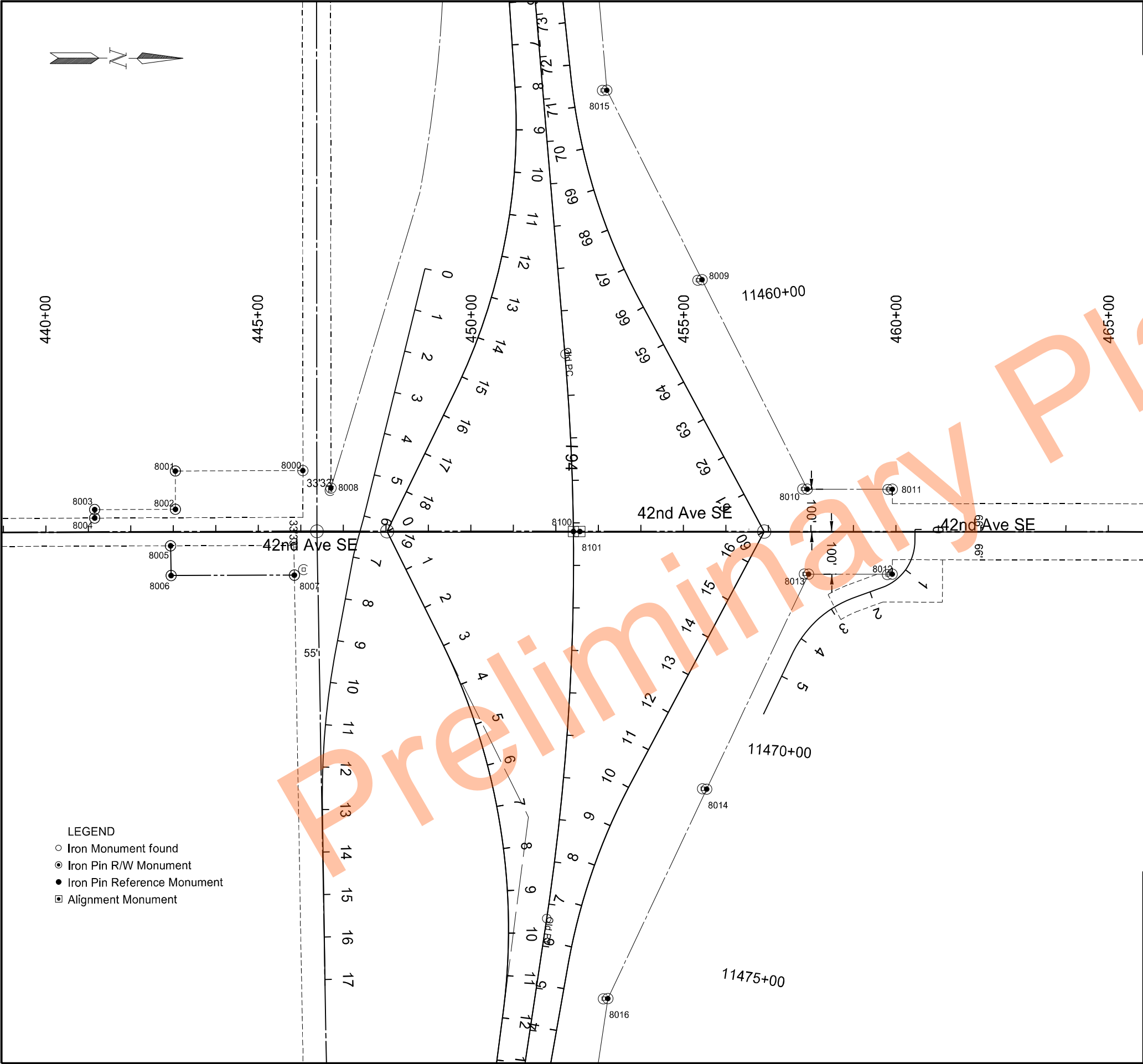
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	82	3

Survey Data
North/South Frontage Roads

Structure Replacement
I-94/Pettibone Interchange

BRIAN J. ROSIN
REGISTERED
PROFESSIONAL
PE 2928
ENGINEER
NORTH DAKOTA

04/21/25



- LEGEND
- Iron Monument found
 - ⦿ Iron Pin R/W Monument
 - Iron Pin Reference Monument
 - ▣ Alignment Monument

R/W Monuments (Alginment SCL_42nd_Ave)

POINT	NORTHING	EASTING	STATION	OFFSET
8004	442820.04	2200410.55	441+14.89	33' LT
8003	442819.99	2200390.55	441+14.94	53' LT
8005	442998.75	2200475.55	442+93.23	33' RT
8006	443000.14	2200545.54	442+94.22	103' RT
8002	443009.98	2200389.48	443+04.94	53' LT
8001	443009.73	2200299.48	443+05.19	143' LT
8007	443290.16	2200543.91	445+84.25	103' RT
8000	443309.72	2200297.79	446+05.19	143' LT
8008	443375.84	2200338.84	446+70.63	101.7' LT
8015	444023.22	2199401.06	453+19.18	1038.7' LT
8016	444029.81	2201539.29	453+23.11	1099.5' RT
8009	444248.19	2199846.63	455+43.60	592.9' LT
8014	444261.46	2201045.74	455+55.37	606.3' RT
8010	444496.73	2200339.18	457+91.52	100' LT
8013	444500.30	2200539.17	457+94.84	100' RT
8012	444697.13	2200538.93	459+91.67	100' RT
8011	444696.88	2200338.93	459+91.67	100' LT

Alignment Monuments (Alginment SCL_42nd_Ave)

POINT	NORTHING	EASTING	STATION	OFFSET
8100	443946.55	2200439.86	452+41.22	0
8101	443961.86	2200439.84	452+56.53	0

Note: Monuments 8000-8004
are pins only, no posts.

R/W Monuments & Alignment Monuments

Structure Replacement
I-94 Pettibone Interchange



04/21/25

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED				TOTAL AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
			BY PHASE NO.						
			1	2	3				
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	7			7	26	182
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	
G20-55-96	96"x48"	SPEED LIMIT ENFORCED - MINIMUM FEE \$150 WHEN WORKERS PRESENT	4	4			4	59	236
M1-1-24	24"x24"	INTERSTATE ROUTE MARKER (Post and installation only)	10	6	10		10	10	100
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)	9	9	11		11	11	121
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)	3	3	5		5	7	35
M3-2-36	36"x18"	EAST (Mounted on route marker post)	5	5	6		6	10	60
M3-2(I)-24	24"x12"	EAST (Mounted on route marker post)	2				2	7	14
M3-3-24	24"x12"	SOUTH (Mounted on route marker post)						7	
M3-4-24	24"x12"	WEST (Mounted on route marker post)	3	3	5		5	7	35
M3-4-36	36"x18"	WEST (Mounted on route marker post)	4	4	5		5	10	50
M3-4(I)-24	24"x12"	WEST (Mounted on route marker post)	2				2	7	14
M4-8-24	24"x12"	DETOUR (Mounted on route marker post)	10	6	10		10	7	70
M4-8-36	36"x18"	DETOUR (Mounted on route marker post)	9	9	11		11	10	110
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)	2	2			2	7	14
M5-1-21	21"x15"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)	2	2	4		4	7	28
M5-1-30	30"x21"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)						9	
M5-2(I)-21	21"x15"	ADVANCE TURN ARROW DIAGONAL RT or LT (Mounted on route marker post)	2				2	7	14
M6-1-21	21"x15"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)	4	4	6		6	7	42
M6-1-30	30"x21"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)	2	2	2		2	9	18
M6-2-30	30"x21"	DIRECTIONAL ARROW DIAGONAL RT or LT (Mounted on route marker post)	2	2	2		2	9	18
M6-2(I)-21	21"x15"	DIRECTIONAL ARROW DIAGONAL RT or LT (Mounted on route marker post)	2				2	7	14
M6-3-21	21"x15"	DIRECTIONAL ARROW UP (Mounted on route marker post)						7	
M6-3-30	30"x21"	DIRECTIONAL ARROW UP (Mounted on route marker post)	5	5	7		7	9	63
R1-1-48	48"x48"	STOP		4	4		4	32	128
R1-2-60	60"x60"	YIELD						29	
R2-1-36	36"x48"	SPEED LIMIT __ (Portable only)	10	4			10	30	300
R2-1-48	48"x60"	SPEED LIMIT __		8	9		9	39	351
R2-1aP-24	24"x18"	MINIMUM FEE \$80 (Mounted on Speed Limit post)						10	
R2-1aP-24	24"x18"	MINIMUM FEE \$150 (Mounted on Speed Limit post)	10	8	7		10	10	100
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		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						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			4		4	35	140
W3-5-48	48"x48"	SPEED REDUCTION AHEAD	4	4	9		9	35	315
W4-2-48	48"x48"	LANE ENDS RIGHT or LEFT	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						35	
W8-1-48	48"x48"	BUMP			10		10	35	350
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	4	4			4	35	140
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	
W13-4p-36	36"x36"	ON RAMP (Mounted on other sign post)			6		6	17	102
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	7			7	35	240

[illegible][illegible]

SPEC & CODE			
704-1000	TRAFFIC CONTROL SIGNS	TOTAL UNITS	4794

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY			TOTAL QUANTITY
			BY PHASE NO.			
			1	2	3	
704-0100	FLAGGING	MHR		50	875	925
704-1046	ATTENUATION DEVICE-TYPE B-80	EA		2	2	2
704-1048	PORTABLE RUMBLE STRIPS	EACH				
704-1050	TYPE I BARRICADES	EACH				
704-1052	TYPE III BARRICADES	EACH	6	2	22	22
704-1060	DELINEATOR DRUMS	EACH	76	46	54	76
704-1065	TRAFFIC CONES	EACH				
704-1067	TUBULAR MARKERS	EACH		28	98	98
704-1070	DELINEATOR	EACH				
704-1072	FLEXIBLE DELINEATORS	EACH				
704-1080	STACKABLE VERTICAL PANELS	EACH			50	50
704-1081	VERTICAL PANELS - BACK TO BACK	EACH				
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH				
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH		2	2	2
704-1087	SEQUENCING ARROW PANEL - TYPE C	EACH	2	2		2
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		2240	2240	2240
704-4011	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2			2
762-0200	RAISED PAVEMENT MARKERS	EACH				
762-0420	SHORT TERM 4IN LINE - TYPE R	LF				
762-0422	SHORT TERM 6IN LINE-TYPE R	LF			1250	1250
762-0426	SHORT TERM 24IN LINE-TYPE R	LF			145	145
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/>

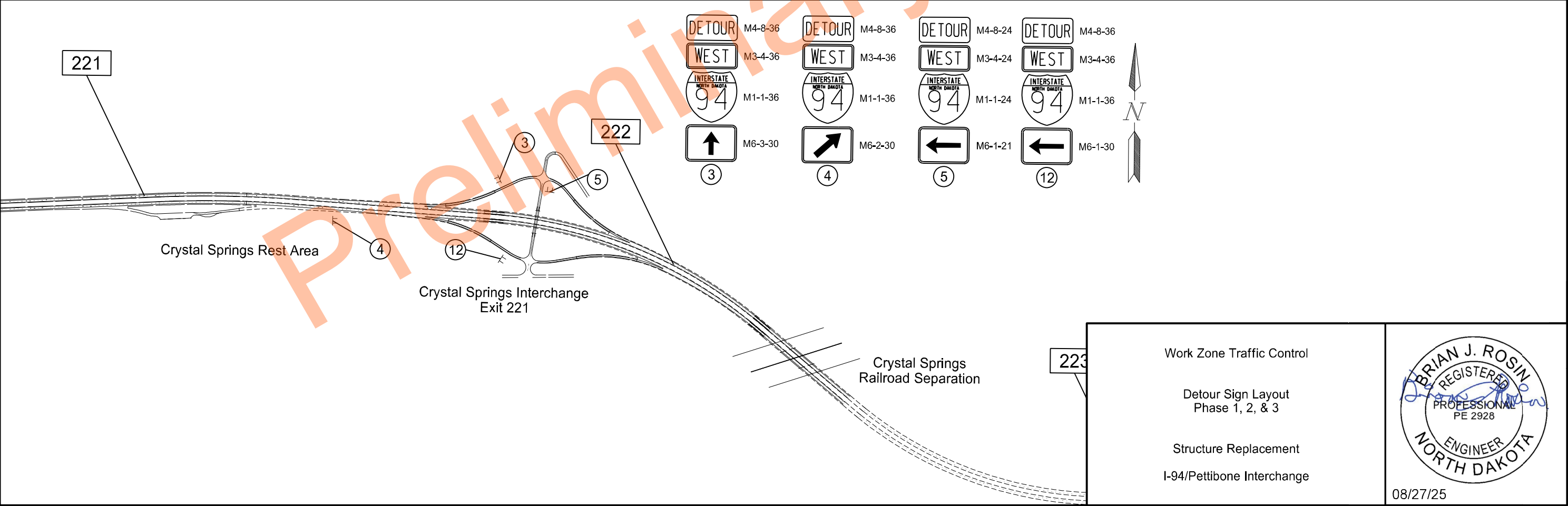
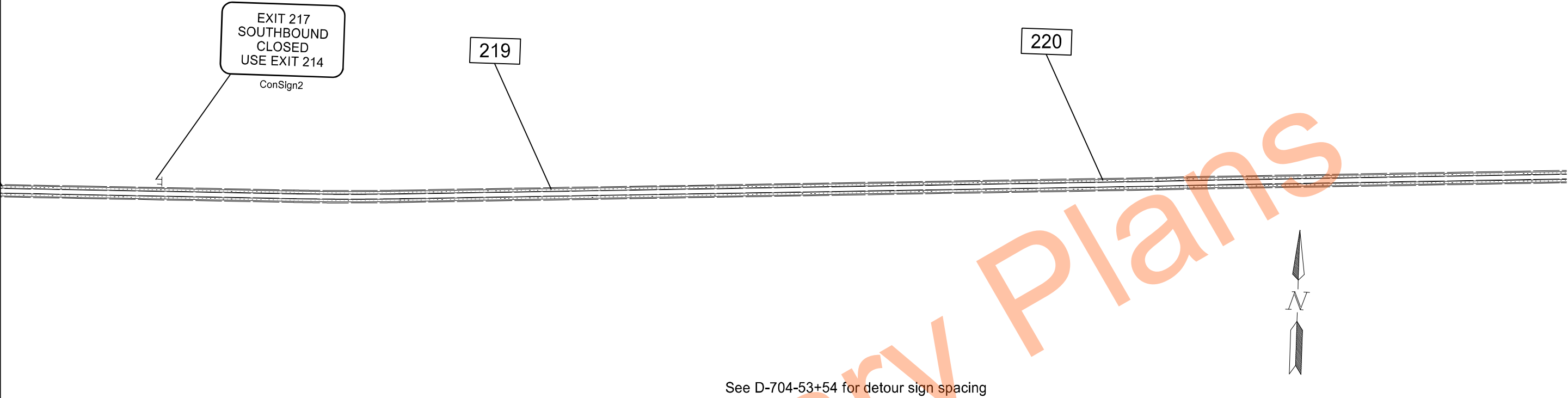


08/27/25

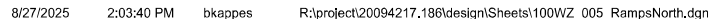
Traffic Control Devices List

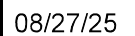
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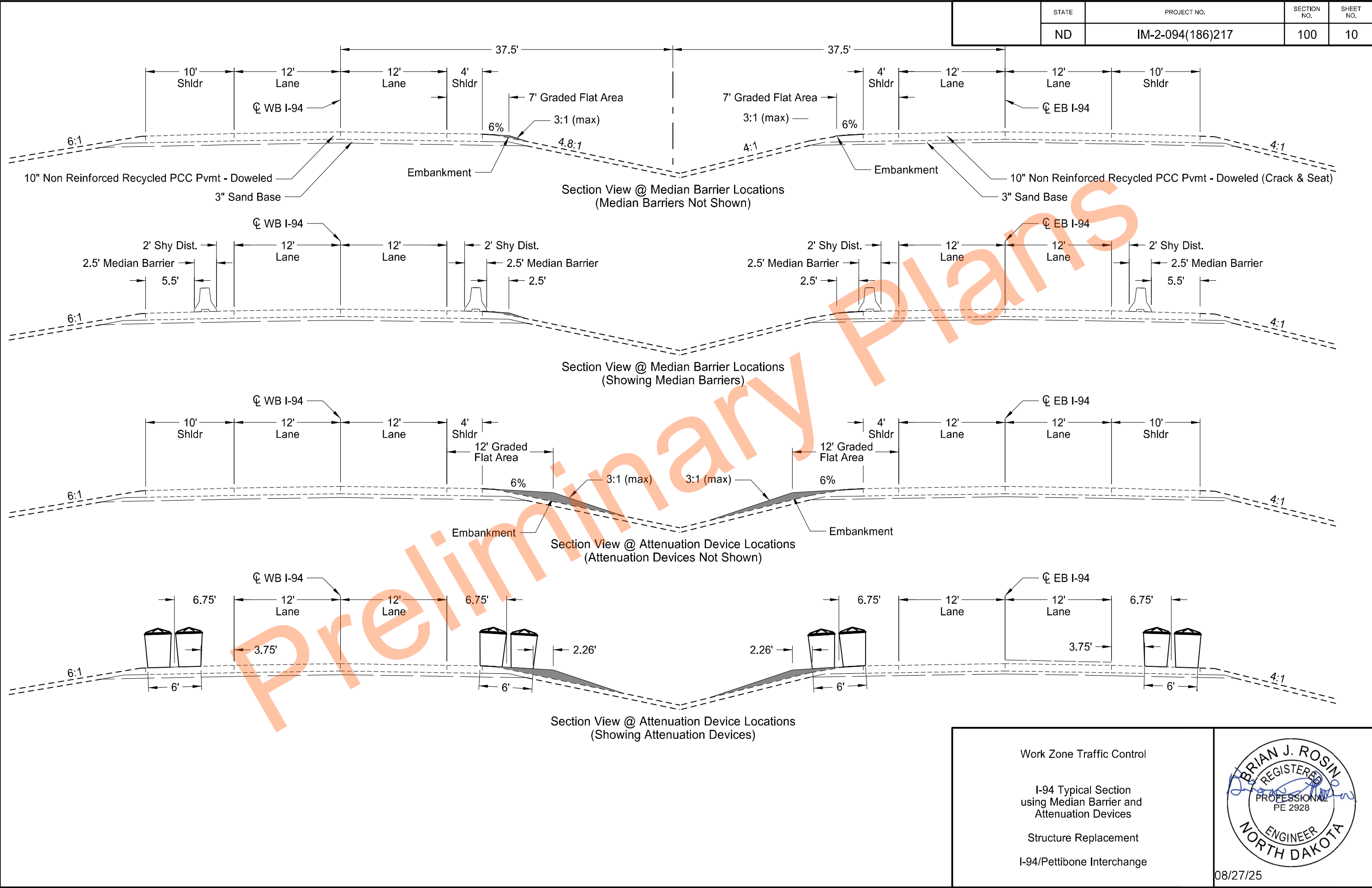
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	100	3











SYMBOL	X	Y	WID	HT	ANGLE

SYMBOL	X	Y	WID	HT	ANGLE

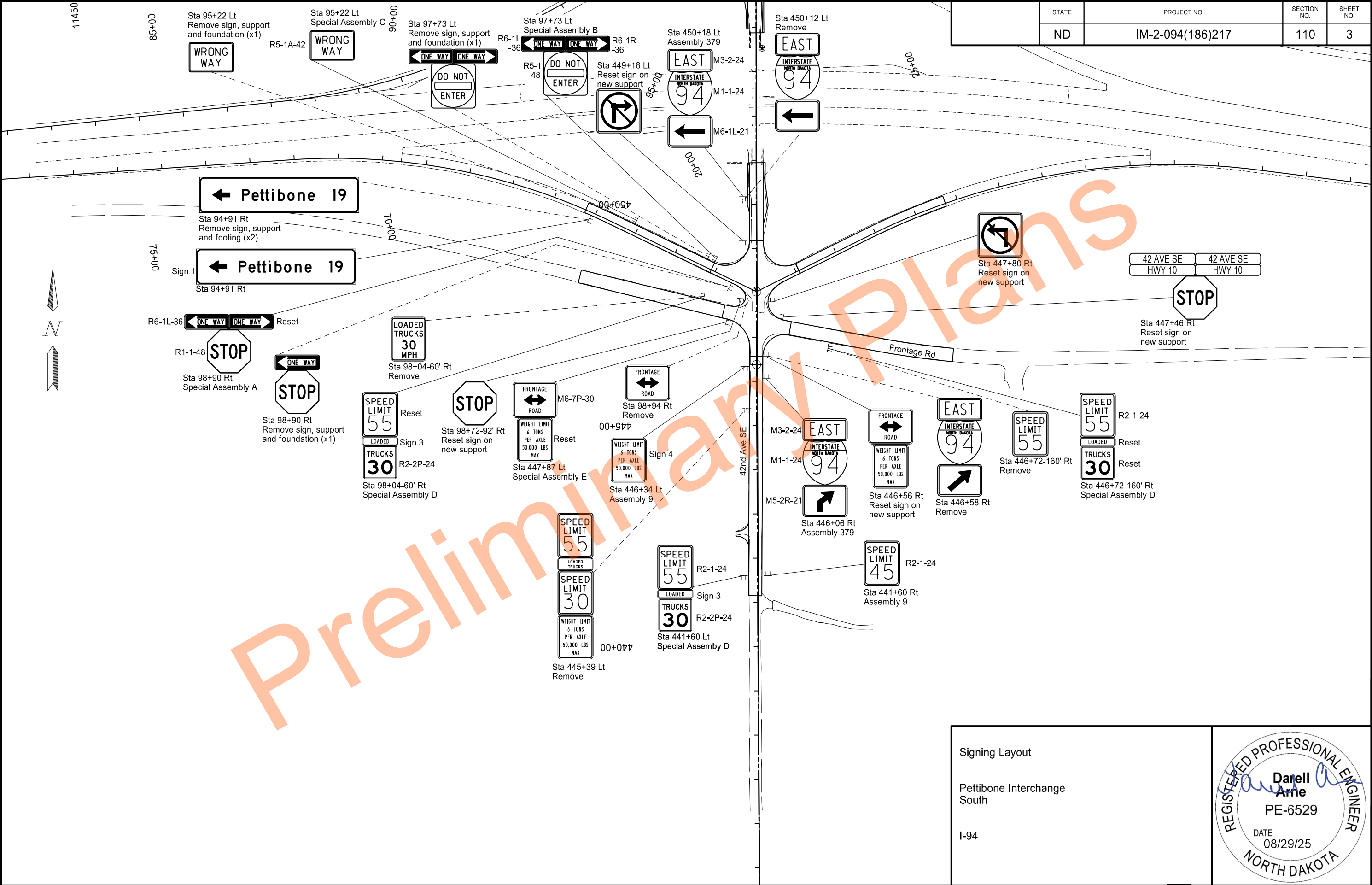
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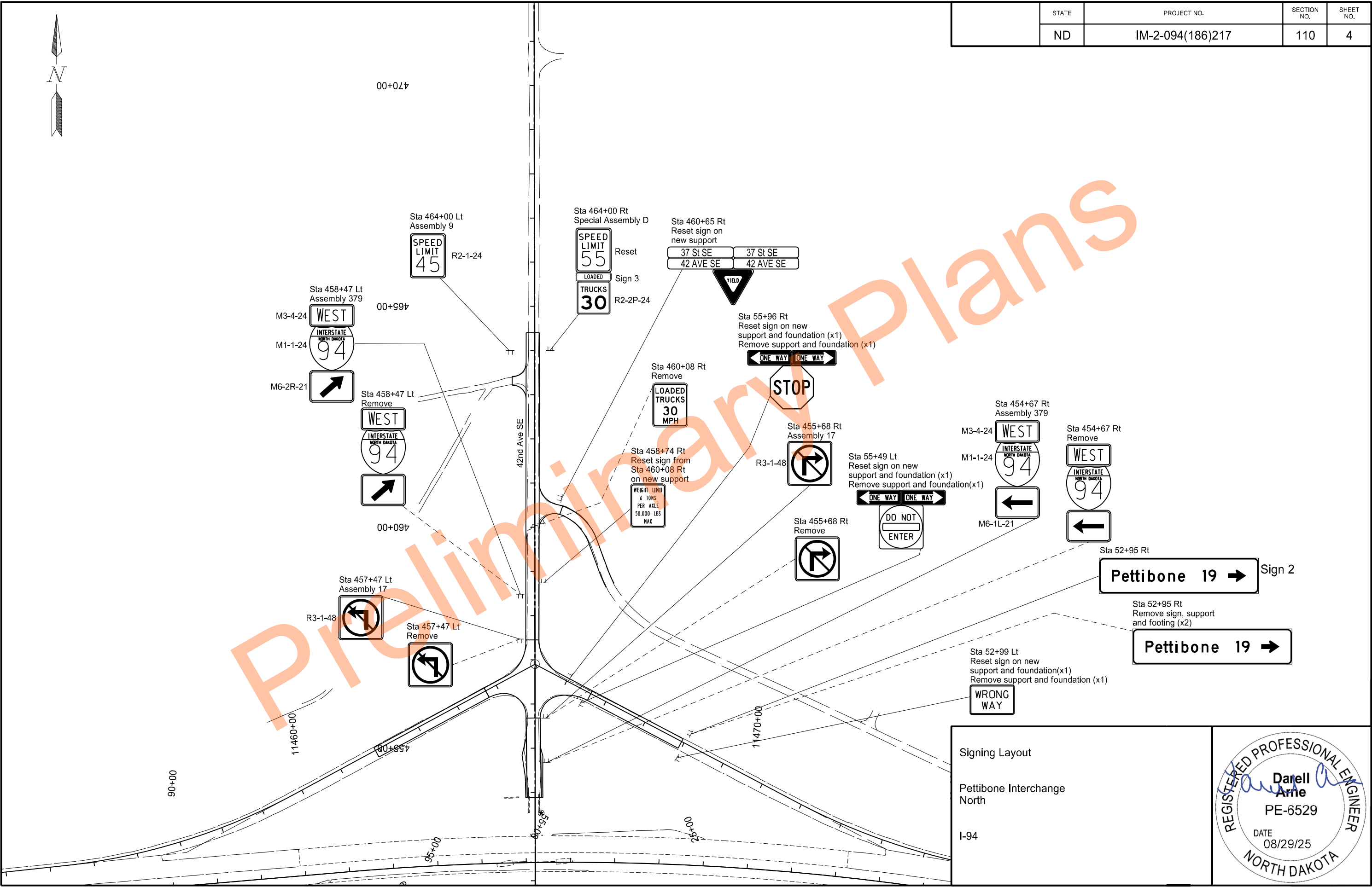
I-94/Pettibone Interchange



																		STATE	PROJECT NO.			SECTION NO.	SHEET NO.	
																	N.D.	IM-2-094(186)217			110	1		
Station / RP	Sign No.	Assembly No.	Flat Sheet For Signs		Sign Support Length				Vert Clear- ance	Support Size	Max Post Len	Sleeve Length				Sleeve Size	Anchor EA	Anchor LF	Anchor Size	Reset Sign Panel EA	Reset Sign Support EA	Break-Away EA	Comments	
			IV SF	XI SF	1st LF	2nd LF	3rd LF	4th LF	FT		LF	LF	LF	LF										
42nd Ave SE																								
441+60 Lt	S.A.D			10.0	14.0				5.0	2.25 x 2.25 12 ga	15.1	4.4			2.5 x 2.5 12 ga	1	4	3 x 3 7 ga			1			
441+60 Rt		9		5.0	12.0				5.0	2.25 x 2.25 12 ga	15.0					1	4	2.5 x 2.5 12 ga						
446+06 Rt		379	8.2		13.3				5.0	2.5 x 2.5 10 ga	15.3					1	4	3 x 3 7 ga			1			
446+34 Lt	SN 4	9		5.0	12.0				5.0	2.25 x 2.25 12 ga	15.0					1	4	2.5 x 2.5 12 ga						
446+56 Rt					13.5				5.0	2.25 x 2.25 12 ga	16.1	3.4			2.5 x 2.5 12 ga	1	4	3 x 3 7 ga	1		1			
447+80 Rt					13.0	13.4			5.0	2.5 x 2.5 10 ga	14.7					2	4	3 x 3 7 ga	1		2			
447+87 Lt	S.A.E			5.0	13.5				5.0	2.25 x 2.25 12 ga	16.1	3.5			2.5 x 2.5 12 ga	1	4	3 x 3 7 ga	1		1			
449+18 Lt					13.0	13.4			5.0	2.5 x 2.5 10 ga	14.7					2	4	3 x 3 7 ga	1		2			
450+18 Lt		379	8.2		13.3				5.0	2.5 x 2.5 10 ga	15.3					1	4	3 x 3 7 ga			1			
454+67 Rt		379	8.2		13.3				5.0	2.5 x 2.5 10 ga	15.3					1	4	3 x 3 7 ga			1			
455+68 Rt		17		16.0	12.2	12.7			5.0	2.5 x 2.5 10 ga	13.9					2	4	3 x 3 7 ga			2			
457+47 Lt		17		16.0	12.2	12.7			5.0	2.5 x 2.5 10 ga	13.9					2	4	3 x 3 7 ga			2			
458+47 Lt		379	8.2		13.3				5.0	2.5 x 2.5 10 ga	15.3					1	4	3 x 3 7 ga			1			
458+74 Rt					12.0				5.0	2.25 x 2.25 12 ga	15.0					1	4	2.5 x 2.5 12 ga	1					
460+65 Rt					13.0				5.0	2.25 x 2.25 12 ga	14.6	3.9			2.5 x 2.5 12 ga	1	4	3 x 3 7 ga	1		1			
464+00 Rt	S.A.D			5.0	14.0				5.0	2.25 x 2.25 12 ga	15.1	4.4			2.5 x 2.5 12 ga	1	4	3 x 3 7 ga	1		1			
464+00 Lt		9		5.0	12.0				5.0	2.25 x 2.25 12 ga	15.0					1	4	2.5 x 2.5 12 ga						
Sub Total			32.8	67.0	Total		271.8										Total	84.0			7	0	17	
South Frontage Rd																								
98+04-60 Rt	S.A.D			5.0	14.0				5.0	2.25 x 2.25 12 ga	15.1	4.4			2.5 x 2.5 12 ga	1	4	3 x 3 7 ga	1		1			
98+72-92 Rt					12.0				5.0	2.25 x 2.25 12 ga	13.7					1	4	2.5 x 2.5 12 ga	1					
446+72-160 Rt	S.A.D			5.0	14.0				5.0	2.25 x 2.25 12 ga	15.1	4.4			2.5 x 2.5 12 ga	1	4	3 x 3 7 ga	1		1			
447+46 Rt					13.0				5.0	2.25 x 2.25 12 ga	14.6	4.0			2.5 x 2.5 12 ga	1	4	3 x 3 7 ga	1		1			
Sub Total			0.0	10.0	Total		53.0										Total	16.0			4	0	3	
Grand Total			32.8	77.0	Total		324.8										Total	100	0	11	0	20		

	Sign Summary Round Steel Pipe & W-Shape Pettibone Interchange I-94
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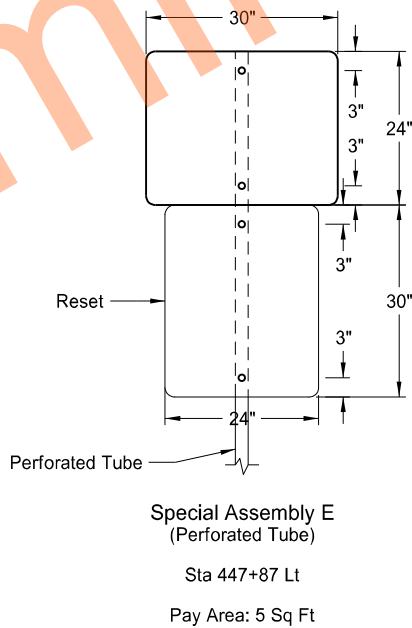
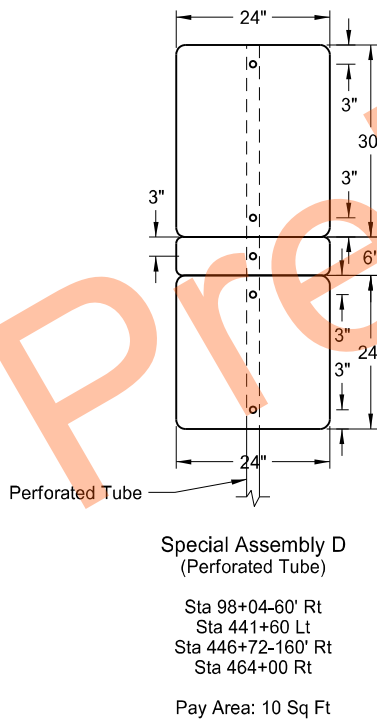
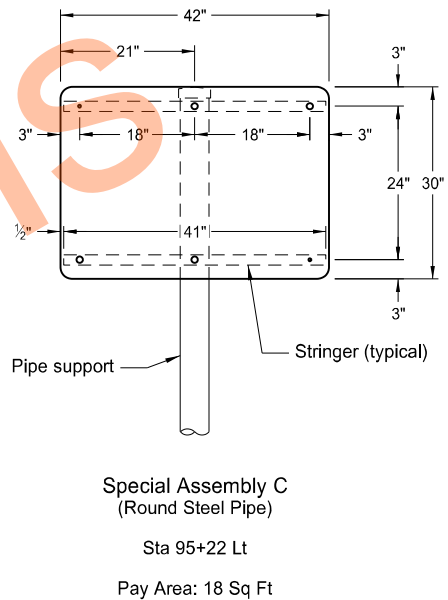
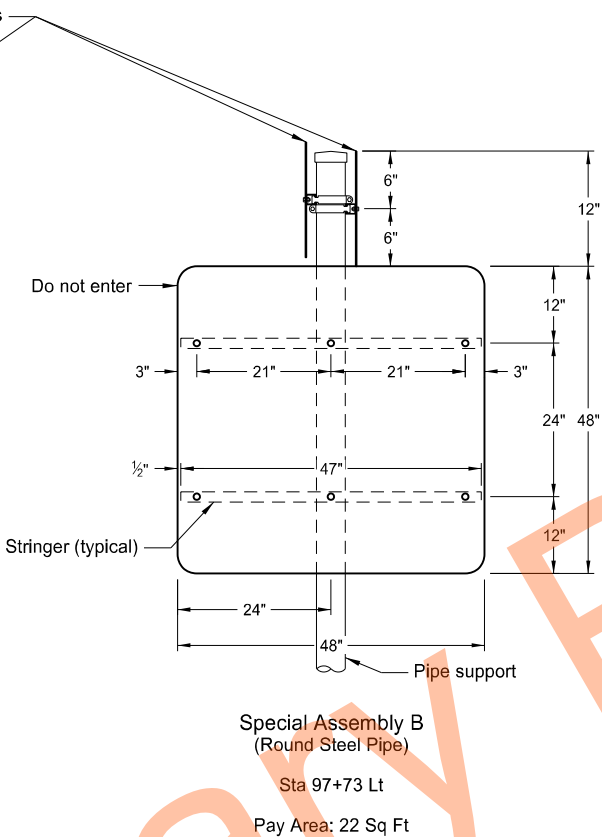
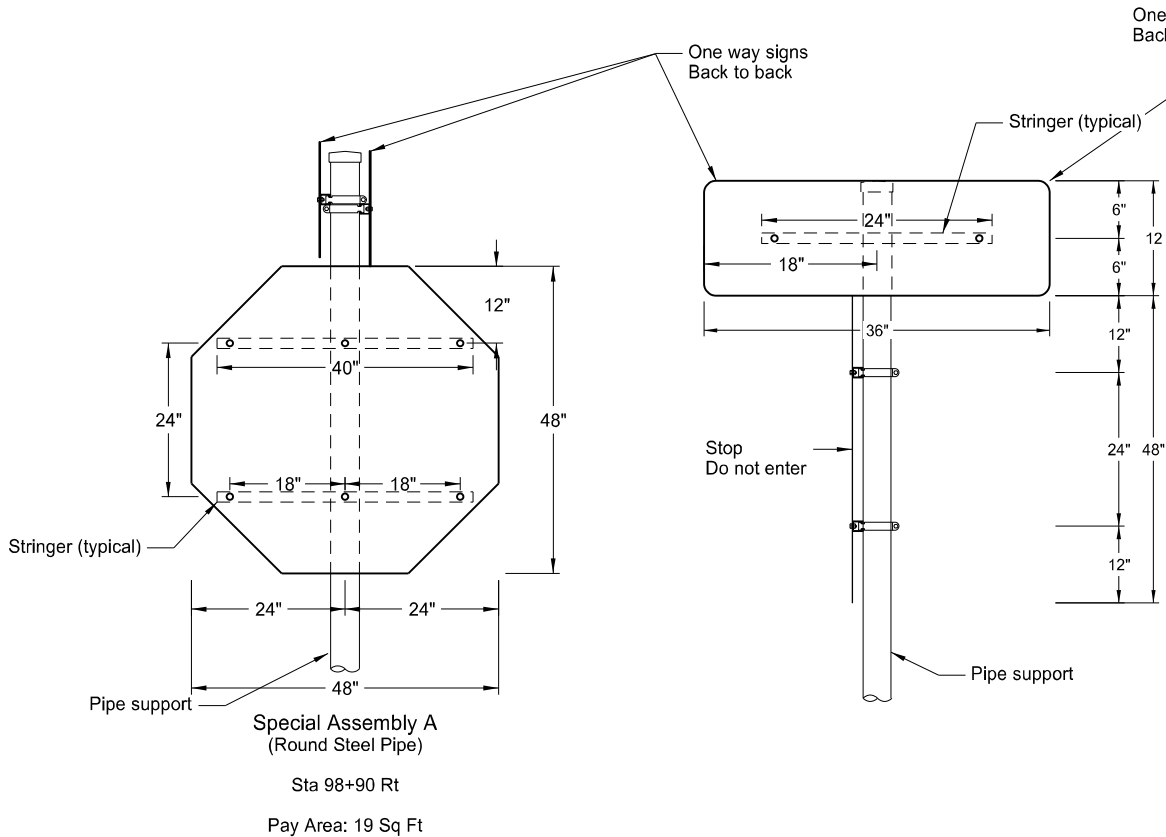




Sign Details	
Pettibone Interchange	
I-94	

Sign Details	
Pettibone Interchange	
I-94	

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	110	7



Sign Assemblies

Pettibone Interchange

I-94



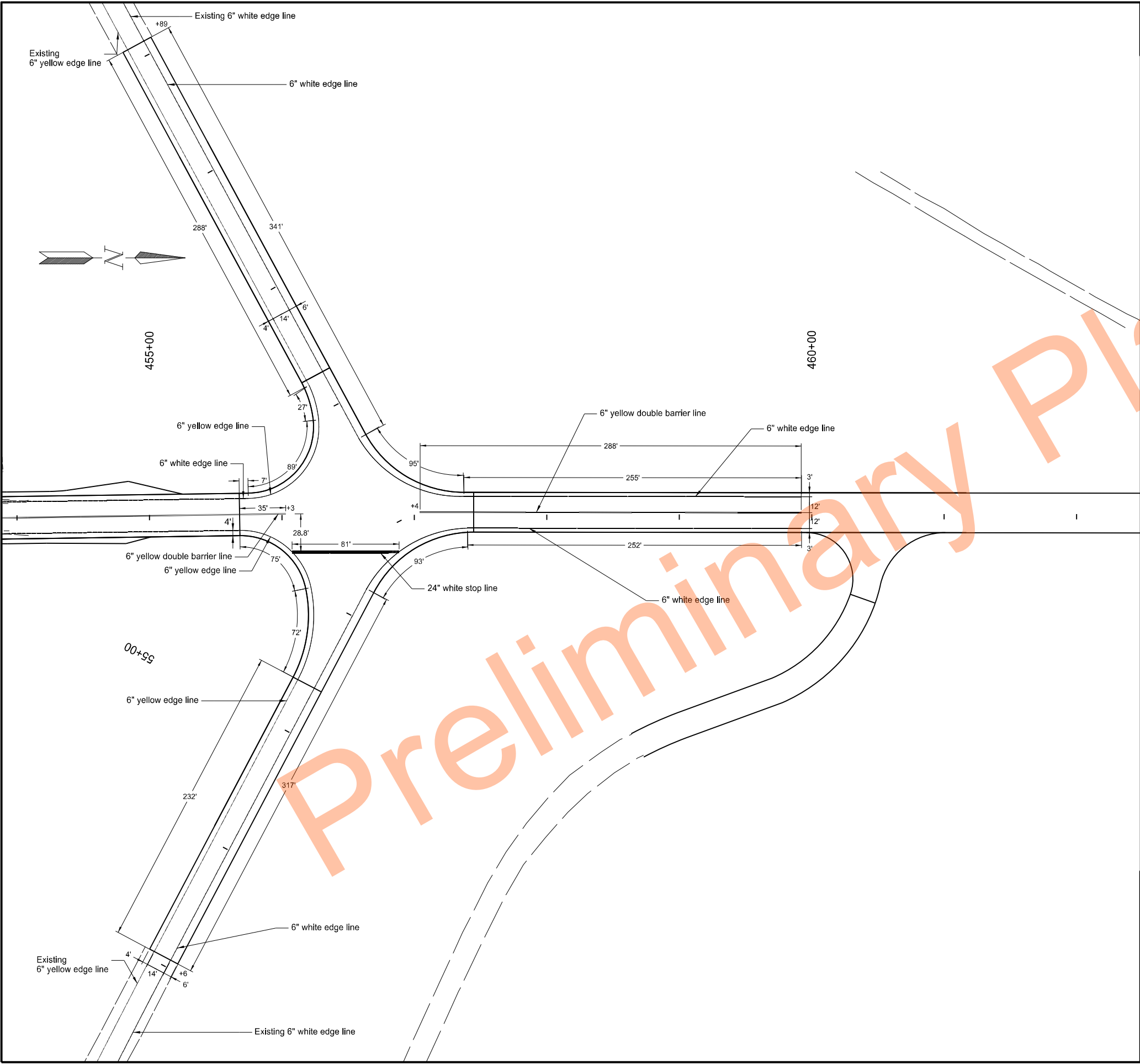
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	120	1

SPEC	CODE	BID ITEM	QTY	UNIT
762	1106	PVMT MK PAINTED 6IN LINE		
		6" white edge line	2195	LF
		6" yellow edge line	910	LF
		6" yellow double barrier line	1314	LF
		Total	4419	LF
762	1124	PVMT MK PAINTED 24IN LINE		
		24" white stop line	64	LF

Pavement Marking Layout

Pettibone Interchange
South & Overpass

I-94



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	120	2

SPEC	CODE	BID ITEM	QTY	UNIT
762	1106	PVMT MK PAINTED 6IN LINE		
		6" white edge line	1360	LF
		6" yellow edge line	783	LF
		6" yellow double barrier line	652	LF
		Total	2795	LF
762	1124	PVMT MK PAINTED 24IN LINE		
		24" white stop line	81	LF

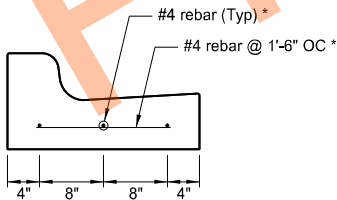
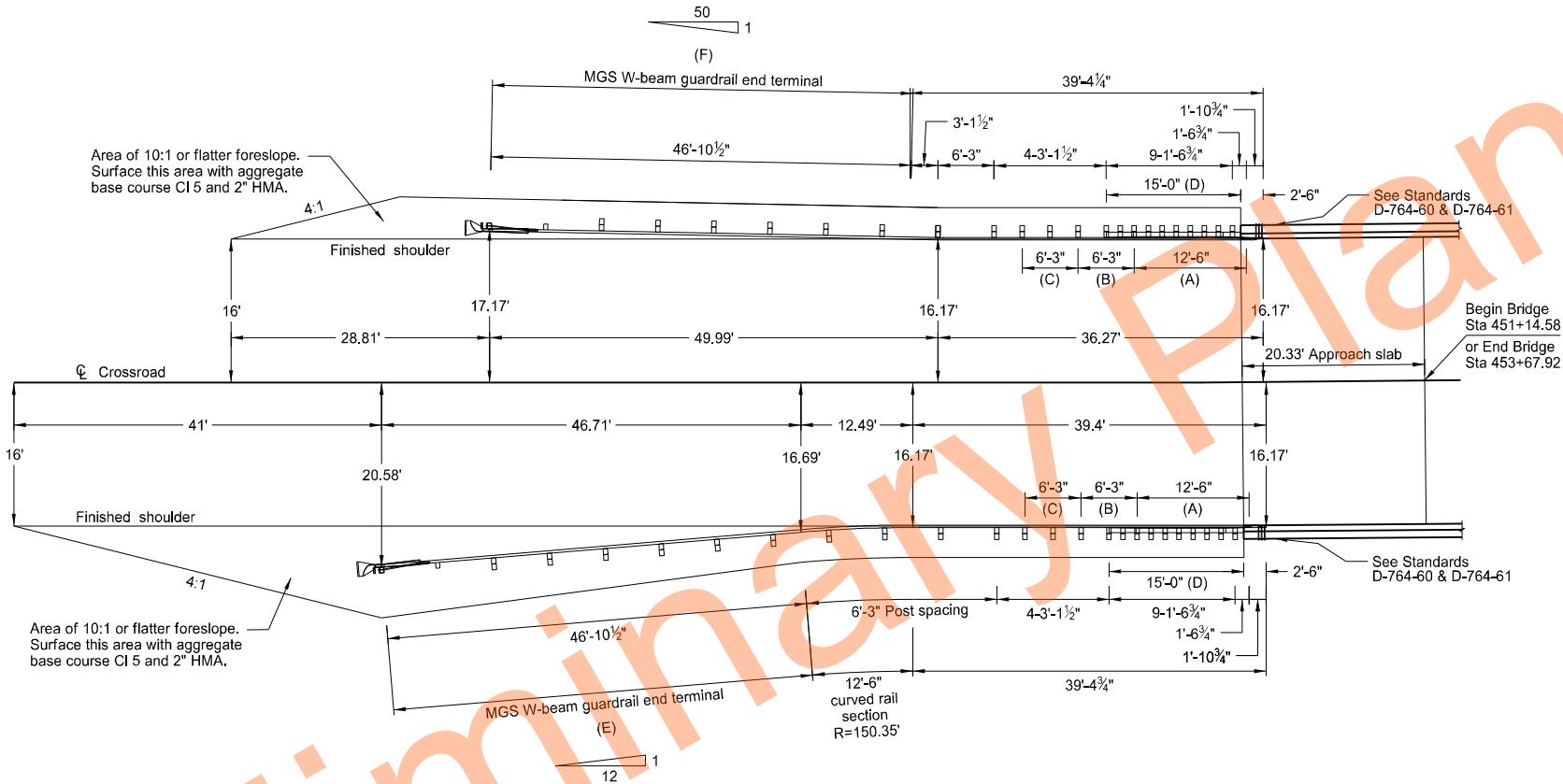
Pavement Marking Layout

Pettibone Interchange
North

I-94



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	130	1



Curb & Gutter Detail

* Install #4 rebar in the curb and gutter section as shown. Use a length of rebar that will provide 3" clear distance to the concrete at each end. Include the cost to furnish and install rebar in the unit cost for "Curb & Gutter - Type 1 Special".

- (A) Thrie beam rail section (double thickness)
- (B) Thrie beam rail section
- (C) Asymmetrical W-Thrie beam transition section
- (D) Curb & gutter - type 1 special. Install in accordance with Standard Drawing D-748-1, except for transitions on each end as shown on Standard Drawing D-764-60.
- (E) Install an MGS FLEAT end terminal at this location. See Standard D-764-38.
- (F) Install either a MASH SKT or a MASH SoftStop Terminal at this location.
If a MASH SKT is installed, install the end terminal as shown above. See Standard D-764-51.
If a MASH SoftStop is installed, install it with the offset as shown on Standard D-764-50. Additional guardrail embankment required is at the contractor's expense.

Thrie/MGS W-Beam Guardrail Layout
At Both Ends of Bridge

Pettibone Interchange Crossroad
RP 217.146

I-94



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

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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MGS W-BEAM GUARDRAIL SUMMARY OF QUANTITIES															
THRIE/MGS W-BEAM GUARDRAIL AT BRIDGE ENDS															
LOCATION	(A) 5/8" Ø x 18" LONG GUARD- RAIL BOLT	(A) 6" x 8" x 6'-0" TIMBER POST	(A) 6" x 8" x 14" TIMBER BLOCK	(A) 5/8" Ø x 1 1/4" LONG GUARD- RAIL BOLT	(A) 12'- 6" STRAIGHT W-BEAM RAIL SECTION	(A) 12'- 6" CURVED W-BEAM RAIL SECTION	(A) REFL- ECTOR- IZED PLATES	(A) 6" x 8" x 7' WOOD POST	(A) 6" x 8" x 19" WOOD OFF- SET BLOCK	(A) 6'-3" W-THRIE BEAM TRANS- ITION SECTION	(A) 6'-3" THRIE BEAM SECTION	(A) 12'-6" DOUBLE THRIE BEAM SECTION	(A) 2'-6" THRIE BEAM TERM- INAL CON- NECTOR	(A) 7/8" Ø x 18" LONG HEX HEAD BOLT	(A) SINGLE SLOPE TO THRIE BEAM CONN- ECTOR PLATE
	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH
Sta 450+44.86 to 450+96.75 Rt	28	11	5	60	1	1	6	6	12	1	1	1	1	5	1
Sta 450+57.36 to 450+96.75 Lt	26	9	3	52	1		5	6	12	1	1	1	1	5	1
Sta 453+85.75 to 454+25.15 Rt	26	9	3	52	1		5	6	12	1	1	1	1	5	1
Sta 453+85.75 to 454+37.64 Lt	28	11	5	60	1	1	6	6	12	1	1	1	1	5	1
TOTAL	108	40	16	224	4	2	22	24	48	4	4	4	4	20	4

- (A) Include these items in the contract unit price bid for "W-Beam Guardrail".
- (B) Remove from mainline I-94

SPEC	CODE	BID ITEM	QTY	UNIT	SPEC	CODE	BID ITEM	QTY	UNIT
202	0113	REMOVAL OF CONCRETE			764	0151	REMOVE W-BEAM GUARDRAIL & POSTS		
		Sta 11464+79.22 to 11465+27.22 Rt	3	CY (B)			Sta 450+36.63 to 451+32.14 Rt	95.7	LF
		Sta 11465+10.41 to 11465+58.41 Lt	3	CY (B)			Sta 450+86.49 to 451+32.14 Lt	45.7	LF
		Total	6	CY			Sta 453+51.94 to 453+97.59 Rt	45.7	LF
748	0141	CURB & GUTTER - TYPE 1 SPECIAL					Sta 453+51.94 to 454+47.45 Lt	95.7	LF
		Sta 450+79.25 to 450+94.25 Rt	15	LF			Sta 11462+58.97 to 11465+00.47 Rt	239.4	LF (B)
		Sta 450+79.25 to 450+94.25 Lt	15	LF			Sta 11465+37.16 to 11467+73.88 Lt	239.4	LF (B)
		Sta 453+88.25 to 454+03.25 Rt	15	LF			Total	761.6	LF
		Sta 453+88.25 to 454+03.25 Lt	15	LF	764	2081	REMOVE END TREATMENT & TRANSITION		
		Total	60	LF			Sta 449+86.80 to 450+36.63 Rt	1	Ea
764	0131	W-BEAM GUARDRAIL					Sta 450+36.50 to 450+86.49 Lt	1	Ea
		Sta 450+44.86 to 450+96.75 Rt	51.9	LF			Sta 453+97.59 to 454+47.58 Rt	1	Ea
		Sta 450+57.36 to 450+96.75 Lt	39.4	LF			Sta 454+47.45 to 454+97.28 Lt	1	Ea
		Sta 453+85.75 to 454+25.15 Rt	39.4	LF			Sta 11462+08.38 to 11462+58.97 Rt	1	Ea (B)
		Sta 453+85.75 to 454+37.64 Lt	51.9	LF			Sta 11467+73.88 to 11468+23.11 Lt	1	Ea (B)
		Total	182.6	LF			Total	6	Ea
764	0145	W-BEAM GUARDRAIL END TERMINAL							
		Sta 449+98.15 to 450+44.86 Rt	1	Ea					
		Sta 450+10.49 to 450+57.36 Lt	1	Ea					
		Sta 454+25.15 to 454+72.01 Rt	1	Ea					
		Sta 454+37.64 to 454+84.35 Lt	1	Ea					
		Total	4	Ea					



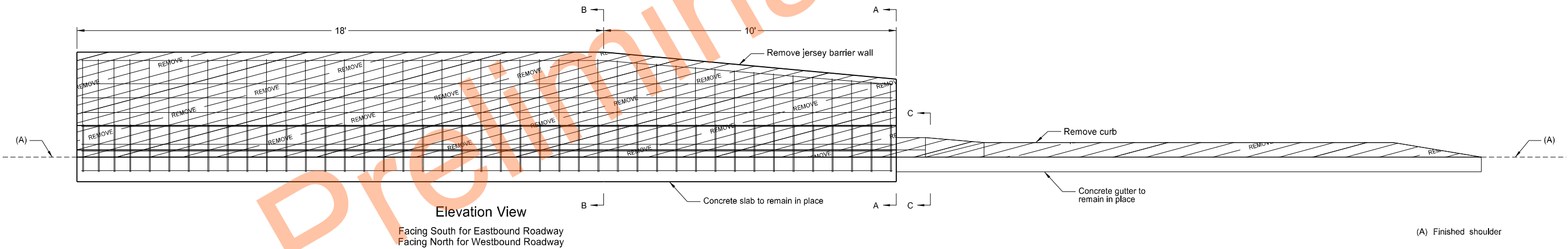
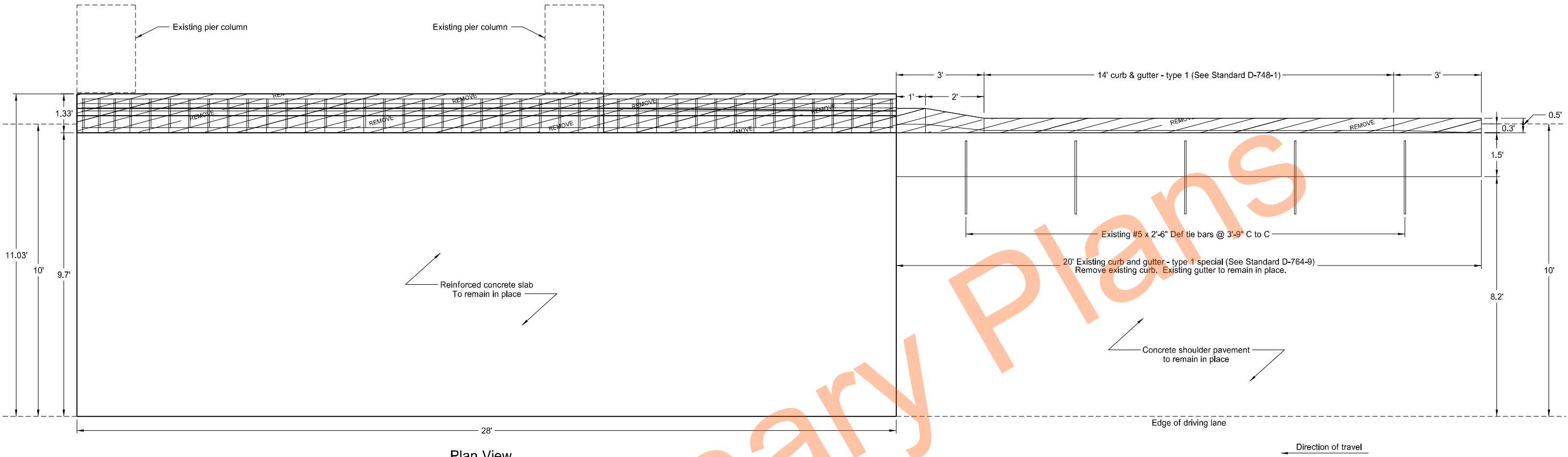
Thrie/MGS W-Beam Guardrail Quantities

Pettibone Interchange Crossroad
RP 217.146

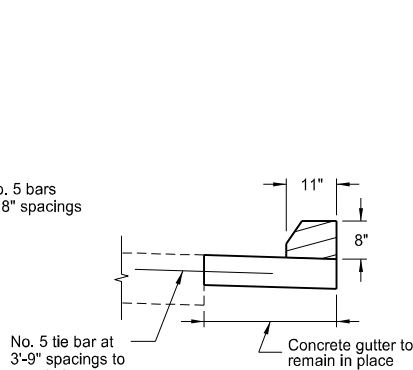
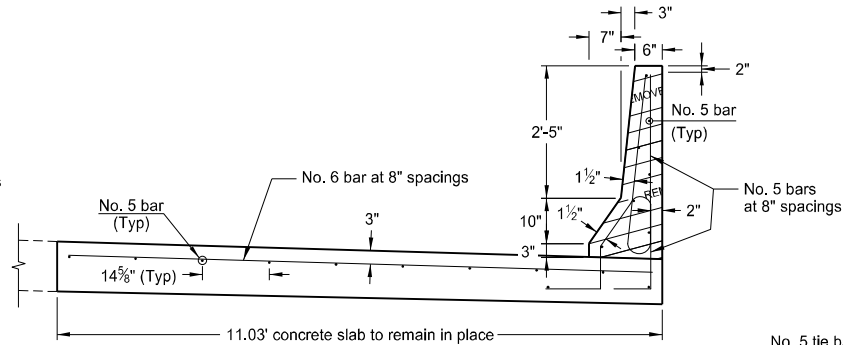
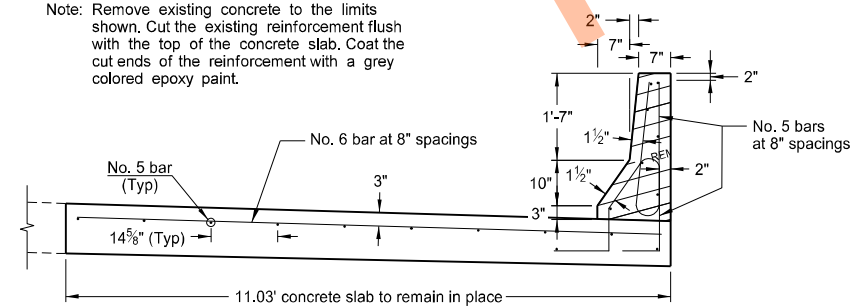
I-94

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

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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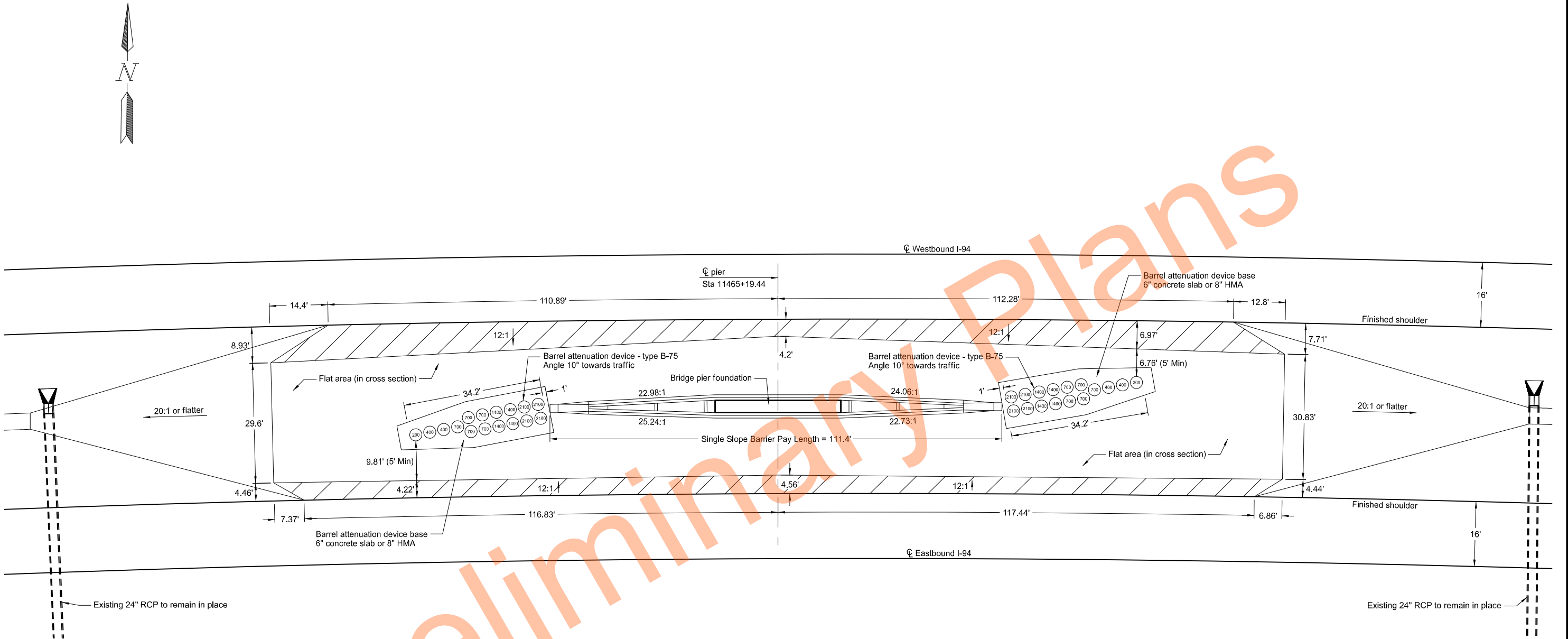
Note: Remove existing concrete to the limits shown. Cut the existing reinforcement flush with the top of the concrete slab. Coat the cut ends of the reinforcement with a grey colored epoxy paint.



Removal of Concrete
Outside Pier Protection
Pettibone Interchange
RP 217.146
Eastbound and Westbound I-94



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	130	4



SPEC	CODE	BID ITEM	QTY	UNIT
602	1220	SINGLE SLOPE BARRIER	111.4	LF
764	8071	BARREL ATTENUATION DEVICE - TYPE B-75	2	EA

Single Slope Barrier and Attenuation Device Layout

Median Pier Protection

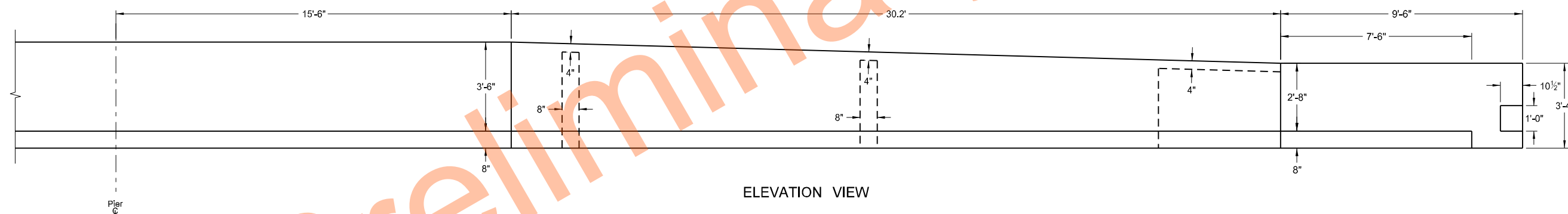
Pettibone Interchange
RP 217.146

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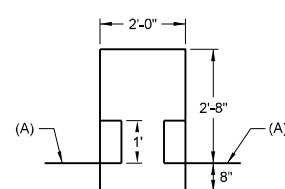


STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	130	5

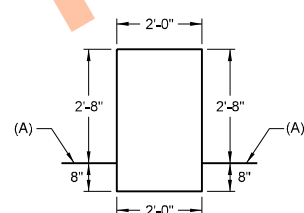
The diagram shows a vertical rod with a central section labeled 'N'. The rod is divided into three parts: a top conical section, a middle cylindrical section labeled 'N', and a bottom conical section. The top and bottom sections are shaded with diagonal lines.



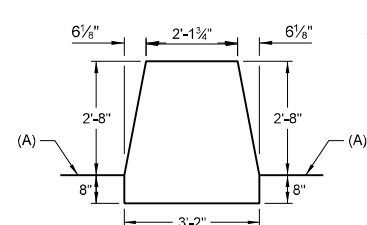
ELEVATION VIEW



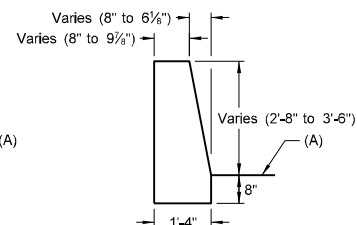
Section A-A



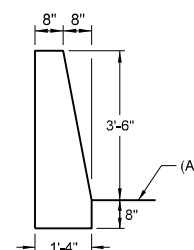
Section B-B



Section C-C



Section D-D



Section E-E

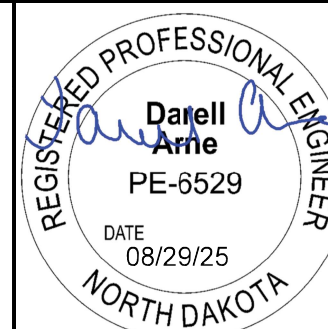
(A) Finished surface

Single Slope Barrier Details

Median Pier Protection

Pettibone Interchange
RP 217.146

1-94



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	130	7

PLAN VIEW

ELEVATION VIEW

SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

SECTION E-E

(A) Finished surface

Single Slope Barrier Details Reinforcing Steel Layout

Median Pier Protection

Pettibone Interchange
RP 217.146

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	130	8

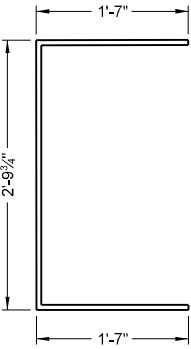
23 U.S.C. § 407 Documents
NDDOT Reserves All Objections

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	130	9

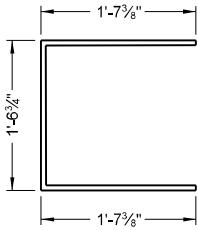
BAR LIST				
MARK	SIZE	NO.	LENGTH	SHAPE
XC1	6	14	5'-11½"	BENT
XC2	5	6	4'-9½"	BENT
XC3	5	4	4'-3"	BENT
XC4	5	48	5'-11½"	BENT
XC5	5	4	6'-3"	BENT
XC6	5	4	6'-6¾"	BENT
XC7	5	4	6'-6¾"	BENT
XC8	5	4	5'-6¼"	BENT
XC9	5	4	5'-6"	BENT
XC10	5	3	4'-6¼"	BENT
XC11	5	3	4'-5½"	BENT
XC12	5	4	6'-6¼"	BENT
XC13	5	4	6'-6"	BENT
XC14	5	4	5'-6¼"	BENT
XC15	5	4	5'-6"	BENT
XC16	5	3	4'-6¾"	BENT
XC17	5	3	4'-6"	BENT
XH1	5	276	4'-7½"	BENT
XT1	5	18	31'-0"	STRAIGHT
XT2	5	36	34'-6"	STRAIGHT
XT3	5	12	9'-4¼"	STRAIGHT
XT4	5	8	8'-7"	STRAIGHT
XU1	5	38	5'-4¾"	BENT
XU2	5	94	7'-0¾"	BENT
XU3	5	36	5'-9¾"	BENT
XU4	5	36	6'-1¾"	BENT
XU5	5	36	6'-5¾"	BENT
XU6	5	36	6'-9¾"	BENT

Construction notes:

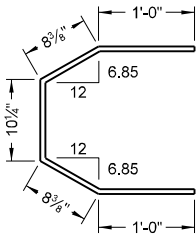
- Construct barriers according to the provisions of Section 602.04 G, except no deflection joints are required. Make ¾" V-grooves in all faces of the barriers at approximately 10 foot spacings.
- Dimensions of bent bars are given out to out. The length of bent bars listed is the sum of the detailing dimensions. All radii are given to the inside of the bend.
- Use grade 60 reinforcing steel meeting Section 612
- Use Class AE concrete meeting Section 602.03B. Design a mix that meets Section 802 and will attain a minimum compressive strength of 4,000 PSI at 28-days.
- Longitudinal reinforcing splice length is 19"
- Surface finish "D" is required for all exposed surfaces of the barrier. See Section 170 for surface finish color.
- An "X" preceding a bar designation indicates an epoxy coated bar



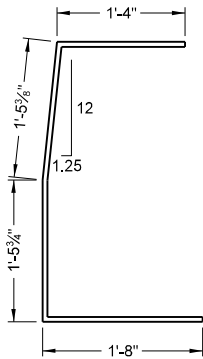
XC1



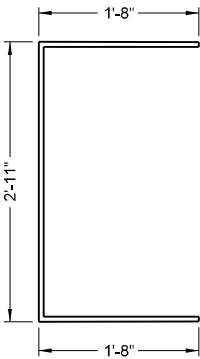
XC2



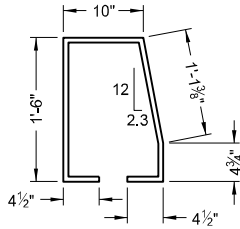
XC3



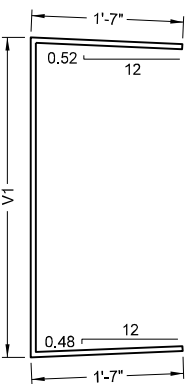
XC4



XC5

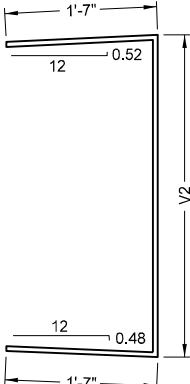


XH1



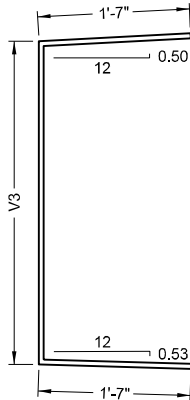
XC7, XC9, XC11

MARK	V1 DIMENSION
XC7	3'-4 1/8"
XC9	2'-4"
XC11	1'-3 7/8"



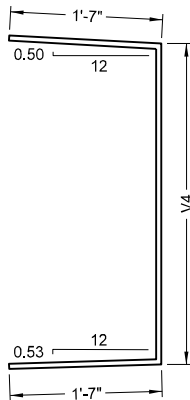
XC6, XC8, XC10

MARK	V2 DIMENSION
XC6	3'-4 3/8"
XC8	2'-4 1/4"
XC10	1'-4 1/8"



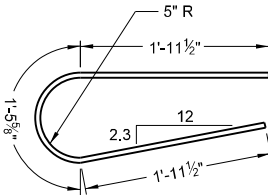
XC12, XC14, XC16

MARK	V3 DIMENSION
XC12	3'-4 1/4"
XC14	2'-4 1/4"
XC16	1'-4 3/8"

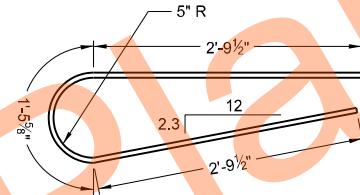


XC13, XC15, XC17

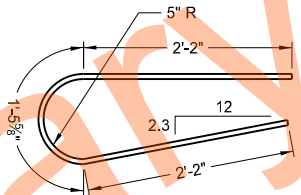
MARK	V4 DIMENSION
XC13	3'-4"
XC15	2'-4"
XC17	1'-4"



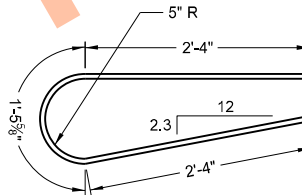
XU1



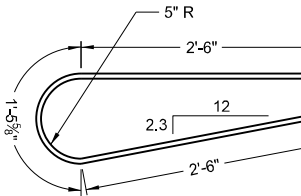
XU2



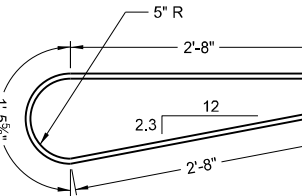
XU3



XU4

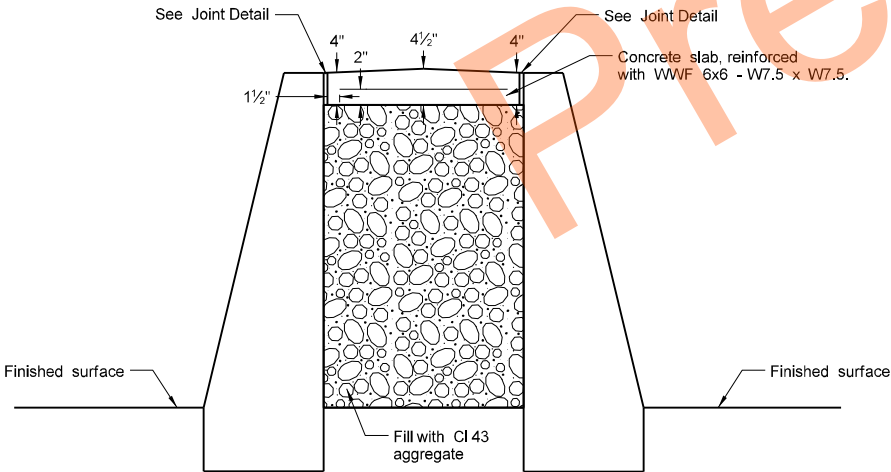


XU5

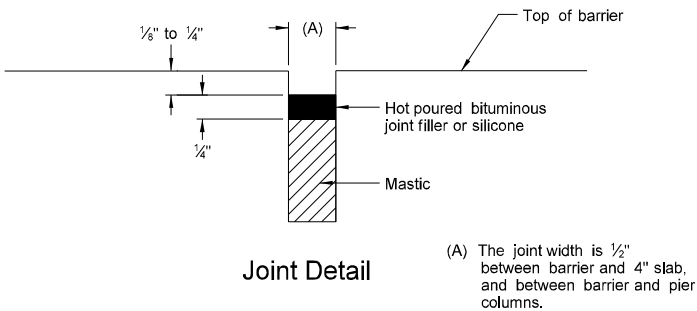


XU6

BENT BAR DETAILS



4" Slab and Aggregate Fill Detail



Joint Detail

(A) The joint width is ½" between barrier and 4" slab, and between barrier and pier columns.

Single Slope Barrier Details, Bent Bar Details, Bar Lists, Joint Detail, 4" Slab and Aggregate Fill Detail

Median Pier Protection

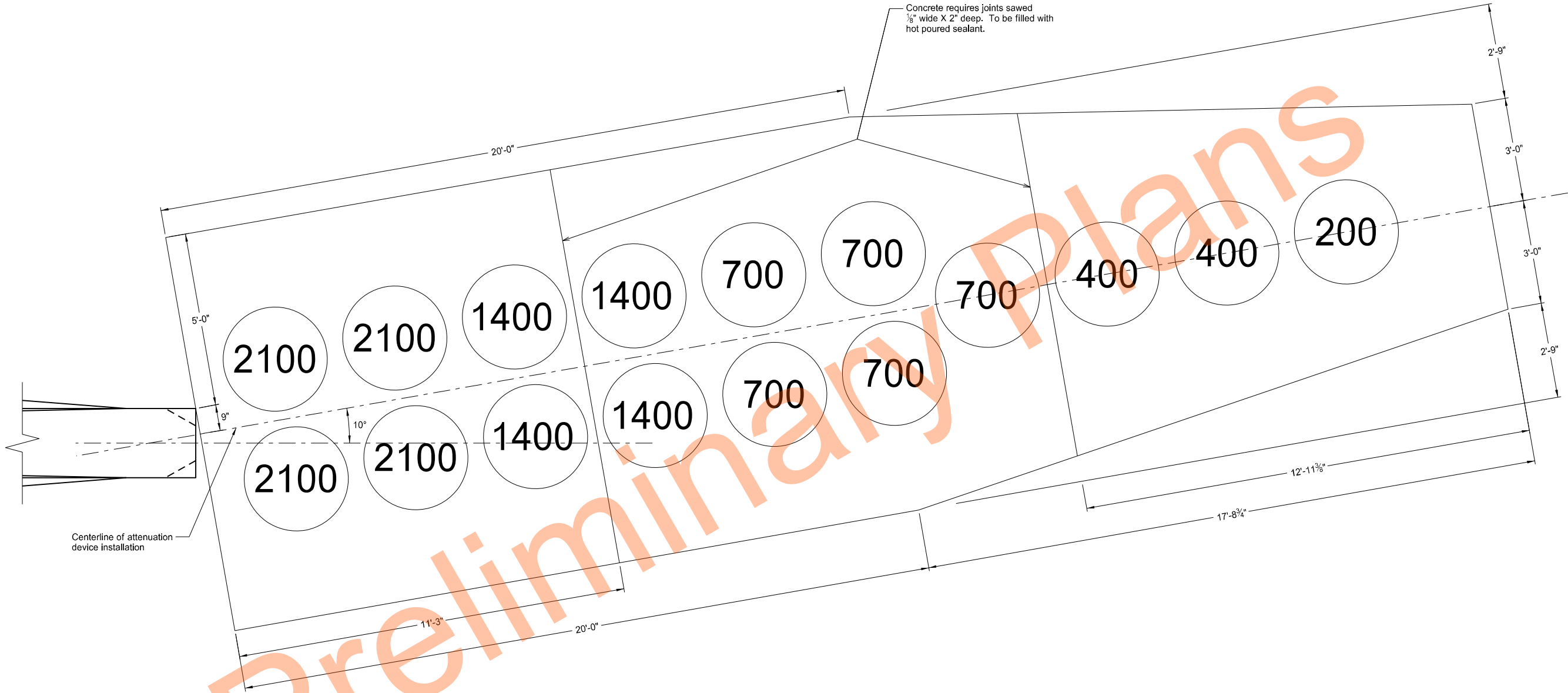
Pettibone Interchange
RP 217.146

I-94



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Plan View
Area = 385.13 square feet

Construct the barrel attenuation device bases using either 2" of aggregate base and 8" of HMA, or 2" of aggregate base and 6" of Class AE concrete meeting 602.03 B. Slightly slope the surface of the bases to facilitate drainage.

Paint the perimeter of each attenuation device module, and the specified mass (weight) of CI 43 aggregate in each module on the surface of the bases.

Include all materials, equipment and labor required to construct the concrete or asphalt slab in the contract unit price bid for item "Barrel Attenuation Device - Type B-75."

Barrel Attenuation Device Base Details

Median Pier Protection

Pettibone Interchange
RP 217.146

I-94



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

STATE

ND

PROJECT NO.

IM-2-094(186)217

SECTION NO.

170

SHEET NO.

2

NOTES

100

SCOPE OF WORK: This project consists of removing an existing bridge and building a new 2-span prestressed concrete I-beam bridge with an overall bridge length of 253'-4" and a clear roadway width of 32'-0".

100

GENERAL: Include the cost of furnishing and placing preformed expansion joint filler, concrete inserts, rebar couplers, silicone sealant, waterproof membrane, and other miscellaneous items in the price bid for the appropriate concrete bid items.

202

REMOVAL OF STRUCTURE: The existing structure is a 4-span prestressed concrete I-beam bridge, 224'-0" long with a clear roadway width of 24'-0", and concrete substructures. The abutments are supported on steel H-piling and the piers are supported on spread footings. There are pier protection items including concrete barriers, barrels, and concrete barrel slabs, adjacent to the middle pier.

Remove the bridge superstructure, concrete abutments, middle pier and middle pier protection items entirely. Cut the abutment piling at a depth 1 foot below the finished grade. Remove the outside piers to a depth 1 foot below the finished ground line. Removal of outside pier protection items are paid separately.

Include all costs for the removal of the bridge and median pier protection items in the contract unit price for "Removal of Structure."

210

EXCAVATION: Include the excavation costs at the abutments, as shown in the "Detail at Abutment", and the excavation costs at the pier in the lump sum bid item, "Class 1 Excavation."

602

BRIDGE CONCRETE: Supply AE Portland Cement Concrete using well graded or optimized aggregates as specified in Section 802.02 B. Design a mix that meets Section 802 and will attain a minimum compressive strength of 4,000 psi at 28-days.

The Engineer will verify the mix design using materials that are to be used on the project. Supply samples of materials as specified in the table below. Provide additional materials upon request.

Material	Sample Size
Cement	100 lbs
SCM	35 lbs
Aggregate	1000 lbs
Admixtures	½ pint each

Deliver the samples and the mix design, including the test results, to the Materials and Research Division a minimum of 14 calendar days before placing concrete. Attach a tag to all samples identifying the Department's project number and the type of material. On the day the material is delivered, provide the Engineer with a copy of the mix design and test results, and notify the Engineer the samples have been delivered.

602

DIAPHRAGMS AND ENDWALLS: Place the pier diaphragm and endwall concrete at the same time as the bridge slab concrete.

602

DECK PLACEMENT: Do not place deck concrete until the entire deck is formed. Place the deck concrete at a minimum rate of 40 CY per hour. Allow the deck to cure a minimum of 72 hours between deck pours.

602

FORM LINERS: Include the cost to provide and install the form liners in the price bid for the appropriate concrete bid items.

602

BARRIERS: Do not construct V-grooves through form liner areas.

602

WATER WASHING EQUIPMENT: In addition to the water-washing equipment listed in Section 602.02 D, a cold water pressure washer that provides a minimum nozzle pressure of 3,000 psi may be used.

602

PENETRATING WATER REPELLENT TREATMENT: Apply penetrating water repellent to the driving surface of the bridge deck and approach slabs prior to crack sealing. Do not allow traffic on the driving surfaces until the solution has completely penetrated and the entire driving surface is dry.

602

CRACK SEALING: After the penetrating water repellent has been applied and is dry, the Engineer will perform a visual inspection of the bridge deck and approach slabs to determine the need for crack sealing. Mark and repair all visible cracks on the top surface measuring 0.012" or greater in width at the widest segment or as directed by the Engineer.

Immediately before applying the sealer, clean the cracks by removing all dust and debris with compressed air. Seal the cracks with a two-part epoxy in accordance with the manufacturer's recommendations. Chase crack with the sealant application to the limits of the crack, including those portions that are narrower than 0.012" wide. Use Paulco TE-2501 (Viking Paints, Inc.), Dural 50 LM (Euclid Chemical Co.), TK-9000 or TK-2110 (TK Products), or an approved equal epoxy sealer.

Include all material, labor, and equipment required to crack seal the bridge deck and approach slabs in the price bid for Bridge Deck Concrete.

602

SPECIAL SURFACE FINISH: Clean the surfaces that are to receive the Tex-Cote surface finish using sandblasting, shot blasting, or water-washing equipment to remove all dirt, grease, oil, efflorescence, and laitance. Ensure any curing compounds and release agents have been completely removed from the surfaces to receive the Tex-Cote surface finish.

Apply Tex-Cote XL 70 Bridge Cote with Silane to the areas listed below. Apply the surface finish in accordance with the manufacturer's recommended application procedures to attain a dry film thickness of 15 mils. Do not apply Tex-Cote special surface finish to any form liner areas.

- All exposed substructure surfaces
- Outside edges of the bridge deck
- Underside of the bridge deck overhang
- Outside and bottom surfaces of the exterior beams
- Exposed endwall areas outside the exterior beams
- All bridge and approach slab barrier surfaces (except form liner areas)

Finish the surface with a uniform texture, color, and appearance free from fins, projections, cavities, and porous areas. Use a sand textured finish. Use gray surface finish color number 36424 meeting AMS-STD-595 for the inside and top surfaces of the bridge and approach slab barriers. Use a color matching the lightest shade of brown used in the Architectural Surface Finish, as it looks applied to the barrier form liner

REGISTERED PROFESSIONAL ENGINEER
JEFFREY R. RENSCH
PE-8211
DATE 08/29/25
NORTH DAKOTA

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23 U.S.C. § 407 Documents
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NOTES

areas, for all other surfaces. Submit to the Engineer a 1’ x 1’ sample of the brown surface finish.

Include all special surface finish costs in the price bid for the appropriate concrete bid items.

602 WEATHER LIMITATIONS: All requests in accordance with 602.04 C.4 “Weather Limitations” require approval from the NDDOT Bridge Division.

602 REMOVAL OF FORMS: Deck slab forms may be removed 1 day after completion of the curing period if the bridge deck concrete has reached 70 percent of the required design strength.

604 PRESTRESSED BEAMS: Set prestressed beams on bearing seats without field bending substructure or beam reinforcing steel.

622 PILING: Drive piling using a diesel hammer meeting the minimum specifications listed below for each substructure unit. The operating energy is the energy a hammer is capable of producing during pile driving under actual project conditions, and shall be estimated to be no greater than 85% of the hammer’s maximum rated energy as specified in the manufacturer’s literature. Submit specifications for all pile hammers proposed for use on the project to the Engineer for review at least 14 calendar days prior to beginning pile driving operations.

Approach Slab Piling: Minimum Ram Weight = 3,500 lbs
Minimum Operating Energy = 32,000 foot-pounds

Abutment Piling: Minimum Ram Weight = 5,500 lbs
Minimum Operating Energy = 53,000 foot-pounds

Pier Piling: Minimum Ram Weight = 6,500 lbs
Minimum Operating Energy = 60,000 foot-pounds

Run the hammer at an energy that produces a penetration at bearing between ½" and 3 inches in the last 10 blows.

If the pile has not reached bearing 10 feet beyond the estimated depth, stop driving the pile and wait 24 hours to allow pile setup to occur. After 24 hours, warm the hammer with a minimum of 20 blows by striking the ground or timber mats. If bearing was not achieved during restrike, continue to drive the pile until bearing is achieved.

930 ROADWAY CANOPY: Construct a canopy above the traveled roadway under the new structure to protect traffic from falling material. The canopy is an added safeguard and does not relieve the Contractor from any responsibility for the safety of the public.

Submit the canopy details, including materials that will be used, to the Engineer for review at least 14 calendar days prior to installation of the canopy. Provide a canopy under the new structure with a minimum vertical clearance of 16'-6" above the traveled roadway. Extend the canopy a minimum distance of 5'-0" beyond the outside edge of the bridge deck and a minimum distance of 5'-0" beyond the edge of the driving lanes beneath the structure. Notify the Engineer two calendar days prior to installation of the canopy. The Engineer will update the NDDOT travel map for the reduced vertical clearance with the canopy in place.

The canopy must be in place before installing formwork for the new deck and remain in place until after the new superstructure is complete. The canopy may be supported from the ground or suspended from the girders. Complete the installation of the canopy in a minimum amount

of time and with the least inconvenience to the public. Remove the canopy after the bridge superstructure is completed.

Include all costs for construction, maintenance, and removal of the canopy system in the contract unit price for “Roadway Canopy.”

930 AGGREGATE SLOPE PROTECTION: Place aggregate slope protection on the embankment slopes as shown.

Clear the subgrade of rubbish and vegetation before placing the aggregate slope protection. Thoroughly compact all loose material. Excavate or backfill as required to obtain the plan cross-section or lines and grades established in the field.

The gradation of the material used to form the slope protection is given in the following chart:

Sieve Size	% Passing
2"	100%
¾"	5-35%
#4	0-5%

The minimum fractured face requirement of the aggregate is 50% by weight on the portion of the aggregate retained on the No. 4 sieve. To be considered fractured the rock must have at least one fractured face.

Deposit, spread, consolidate, and shape the aggregate by mechanical or hand methods to provide a uniform depth and density and produce a uniform surface appearance. Apply MC-250 that meets the requirements of Section 818.02 C, “Medium-Curing Cutback Asphalt” at an approximate rate of 1.8 gallons per square yard. Emulsified asphalts grade CSS-1, CSS-1H, RS-1, or CRS-2 that meet the requirements of Section 818.02 E, “Cationic Emulsified Asphalt,” or Section 818.02 F “Anionic Emulsified Asphalt”, can be substituted for MC-250. Apply the emulsified asphalts at a rate of 2.5 gallons per square yard based on a dilution ratio of 7 parts emulsion to 3 parts water.

The bituminous materials are to penetrate to a depth of not less than one-half the required thickness of the aggregate. Protect adjacent structure surfaces against bituminous splatter.

Include all costs for labor, materials, and equipment to complete this work in the unit price bid for “Aggregate Slope Protection”.

930 SHORING: Install temporary shoring as needed for removal of the center bridge pier. Temporary shoring may only be in place when barriers shown in the Median Barrier Layout are present. Design, construct, maintain, and remove the temporary shoring. Submit a shoring plan to the Engineer at least 14 calendar days prior to installation of the temporary shoring. Include all labor, equipment, and materials required to complete this work, including any excavation required outside the limits of Class 1 Excavation defined in the plans, in the bid item "Shoring". A quantity of 1 EA will be paid for this work.

REGISTERED PROFESSIONAL ENGINEER
JEFFREY R. RENSCH
PE-8211
DATE 08/29/25
NORTH DAKOTA

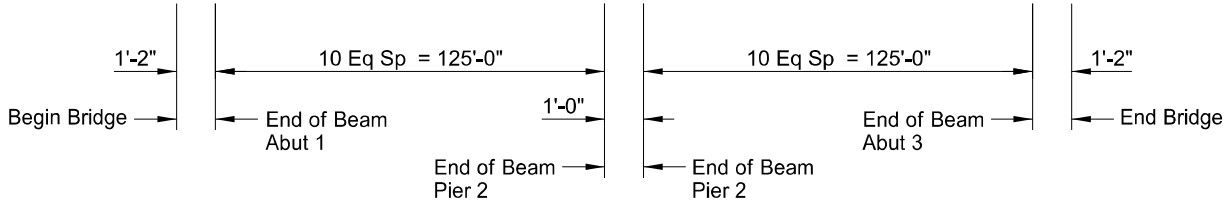
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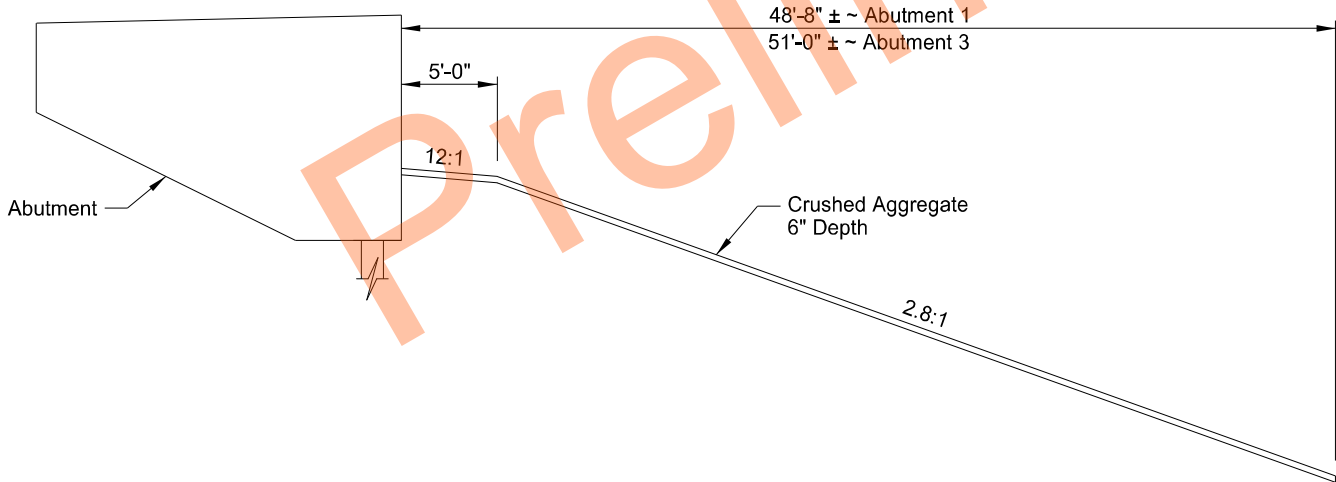
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CL BEAM 1	CL BEAM 2	CL BEAM 3	CL BEAM 4	CL BEAM 5
1834.74	1834.89	1835.04	1834.89	1834.74
1834.76	1834.92	1835.07	1834.92	1834.76
1835.10	1835.25	1835.40	1835.25	1835.10
1835.43	1835.58	1835.73	1835.58	1835.43
1835.75	1835.90	1836.05	1835.90	1835.75
1836.05	1836.20	1836.35	1836.20	1836.05
1836.34	1836.49	1836.64	1836.49	1836.34
1836.59	1836.74	1836.89	1836.74	1836.59
1836.80	1836.95	1837.11	1836.95	1836.80
1836.98	1837.13	1837.29	1837.13	1836.98
1837.13	1837.28	1837.43	1837.28	1837.13
1837.25	1837.41	1837.56	1837.41	1837.25
1837.27	1837.42	1837.57	1837.42	1837.27
1837.47	1837.62	1837.77	1837.62	1837.47
1837.65	1837.80	1837.95	1837.80	1837.65
1837.80	1837.95	1838.10	1837.95	1837.80
1837.91	1838.06	1838.21	1838.06	1837.91
1837.99	1838.14	1838.29	1838.14	1837.99
1838.03	1838.18	1838.33	1838.18	1838.03
1838.03	1838.19	1838.34	1838.19	1838.03
1838.00	1838.16	1838.31	1838.16	1838.00
1837.94	1838.09	1838.25	1838.09	1837.94
1837.86	1838.01	1838.16	1838.01	1837.86
1837.85	1838.00	1838.15	1838.00	1837.85



Beam 1 is the west beam.
SCREED ELEVATIONS



ELEVATION
AGGREGATE SLOPE PROTECTION DETAIL

BRIDGE BID ITEMS				
SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
202	0105	REMOVAL OF STRUCTURE	L SUM	1
210	0099	CLASS 1 EXCAVATION	L SUM	1
210	0201	FOUNDATION PREPARATION	EA	1
602	0500	BRIDGE SUBSTRUCTURE CONCRETE	CY	147.5
602	0510	BRIDGE DECK CONCRETE	CY	298.6
602	0520	BRIDGE BARRIER CONCRETE	CY	72.2
602	1134	PILE SUPPORTED APPROACH SLAB	SY	158.1
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	1,045
604	9920	PRESTRESSED I-BEAM-63IN	LF	1,250
612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS	87,100
616	5890	STRUCTURAL STEEL	L SUM	1
622	0020	STEEL PILING HP 10 X 42	LF	340
622	0060	STEEL PILING HP 14 X 73	LF	420
622	0070	STEEL PILING HP 14 X 102	LF	350
622	7001	DYNAMIC PILE TEST	EA	3
930	3000	BRIDGE BENCH MARKS	SET	1
930	7012	ROADWAY CANOPY	L SUM	1
930	8230	SHORING	EA	1
930	8600	ELASTOMERIC BEARING PAD	SF	40
930	8686	AGGREGATE SLOPE PROTECTION	SY	427.3
930	9537	ABUTMENT UNDERDRAIN SYSTEM	EA	2



I-94/PETTIBONE INTERCHANGE	
SCREED ELEVATIONS, BID ITEM QUANTITIES & SLOPE PROTECTION DETAIL	
DRAWING NO.	94-217.146-4

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NOTE:

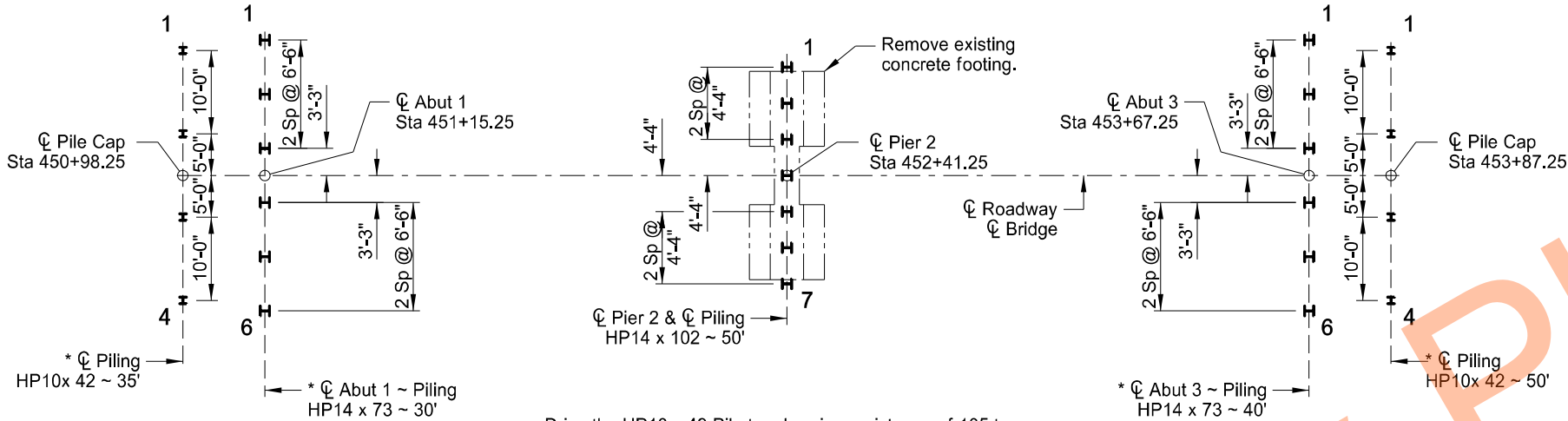
For double acting or single acting diesel hammers, calculate the bearing resistance of piles by the following formula:

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

Where:

ΦR_n = Factored pile bearing resistance, in pounds. The Φ factor is included in equation.
W = Weight of striking parts (ram), in pounds.
M = Weight of parts being driven, in pounds. Includes pile weight, anvil (if any), driving cap, etc.
E = Energy per blow, in foot-pounds.
S = Average penetration of pile in inches per blow for last ten blows.

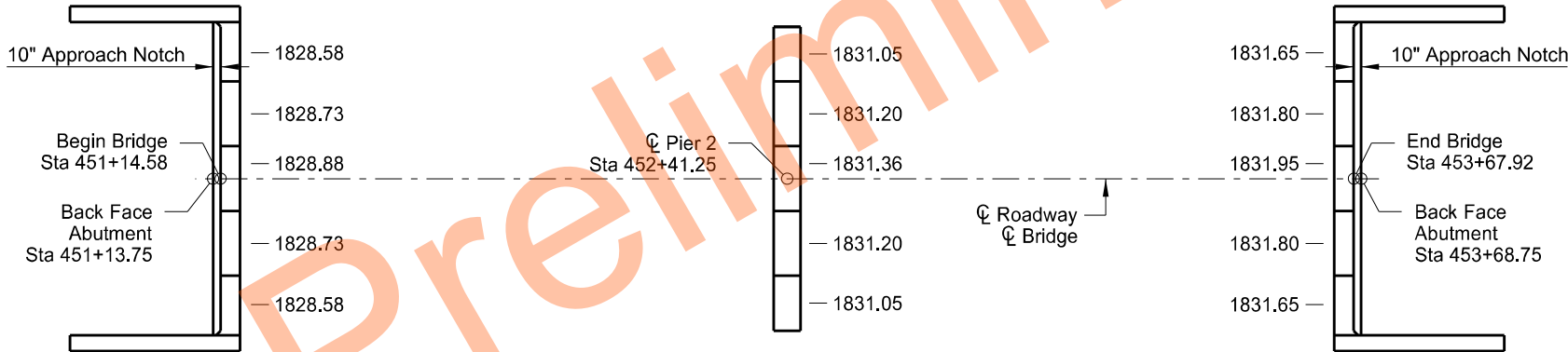
For single acting hammers, calculate E by multiplying observed stroke (ft) and W (lbs).



* Do not drive approach slab or abutment piling until all constructed embankment is in place.

Drive the HP10 x 42 Pile to a bearing resistance of 105 tons.
Drive the HP14 x 73 Pile to a bearing resistance of 180 tons.
Drive the HP14 x 102 Pile to a bearing resistance of 250 tons.

PILING LAYOUT



Elevations shown are to top of finished concrete.

BEARING ELEVATION

PILE COORDINATES			
	PILE	NORTHING	EASTING
APPR SLAB	1	443,800.40	2,200,425.44
	4	443,800.68	2,200,455.44
ABUT 1	1	443,820.39	2,200,424.00
	6	443,820.70	2,200,456.50
PIER 2	1	443,946.41	2,200,426.06
	7	443,946.66	2,200,452.06
ABUT 3	1	444,072.38	2,200,421.62
	6	444,072.68	2,200,454.11
APPR SLAB	1	444,092.39	2,200,422.68
	4	444,092.67	2,200,452.69



I-94/PETTIBONE INTERCHANGE

PILING LAYOUT &
BEARING ELEVATIONS

DRAWING NO. 94-217.146-5

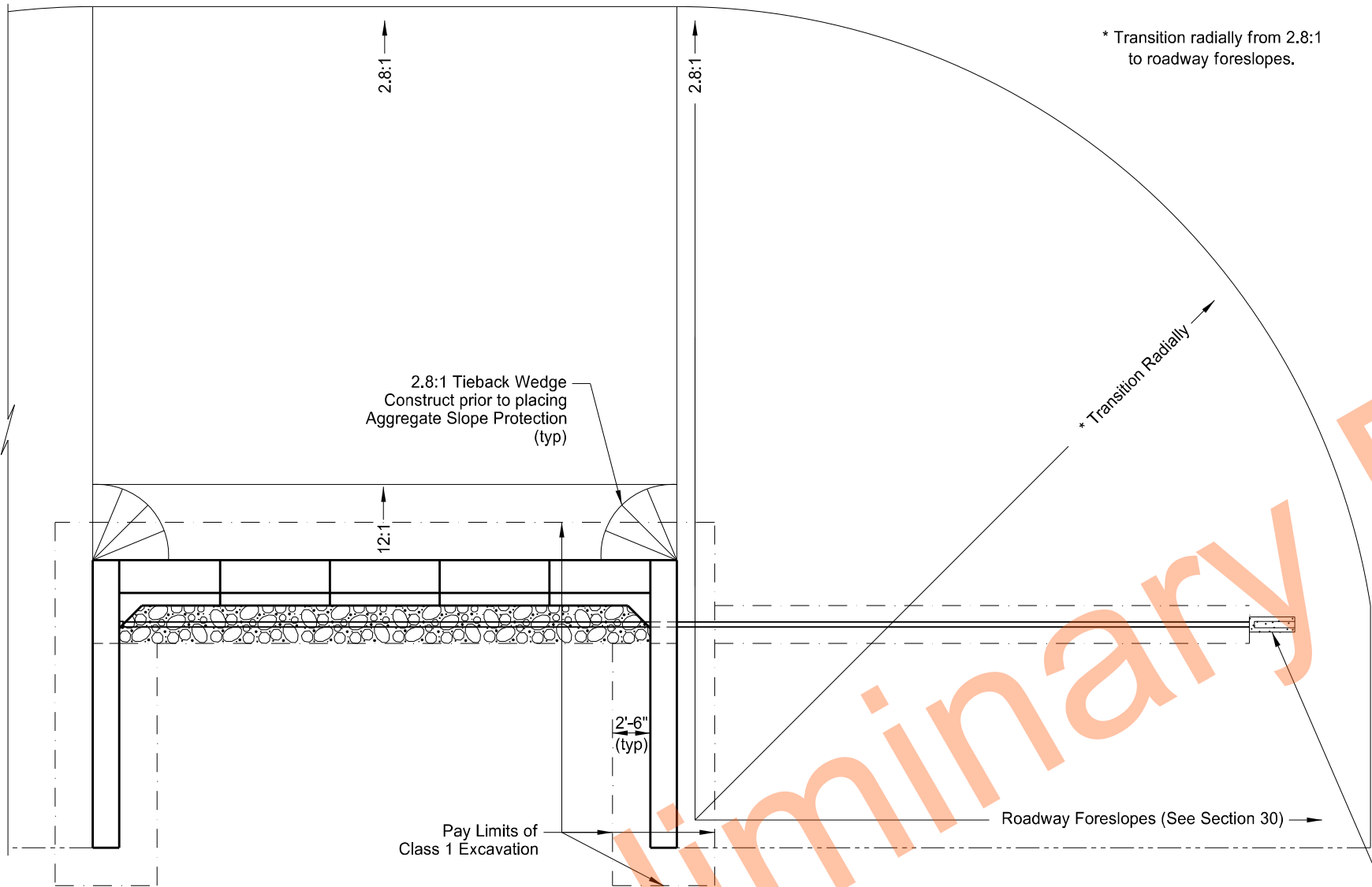
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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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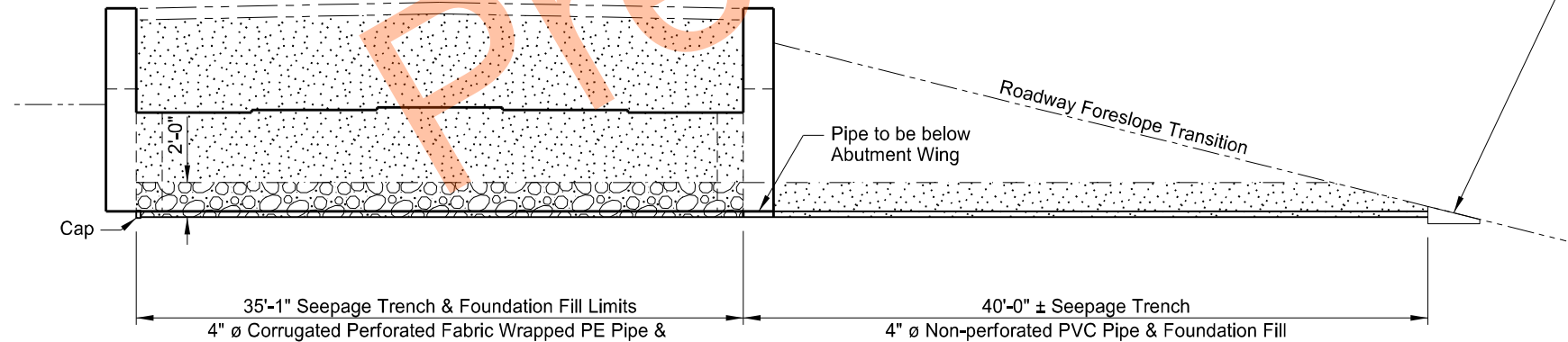
NOTES:

Use corrugated perforated fabric wrapped PE pipe that meets the requirements of Section 830.03 A.4. Provide fabric wrapping for the pipe that meets the requirements of Section 858.01 for D3 or D4 drainage fabric. Provide aggregate that meets the requirements of Section 816.03, Class 43. Provide foundation fill that meets the requirements of Section 210. Compact the foundation fill beneath the approach slab according to Section 714.04 A.10

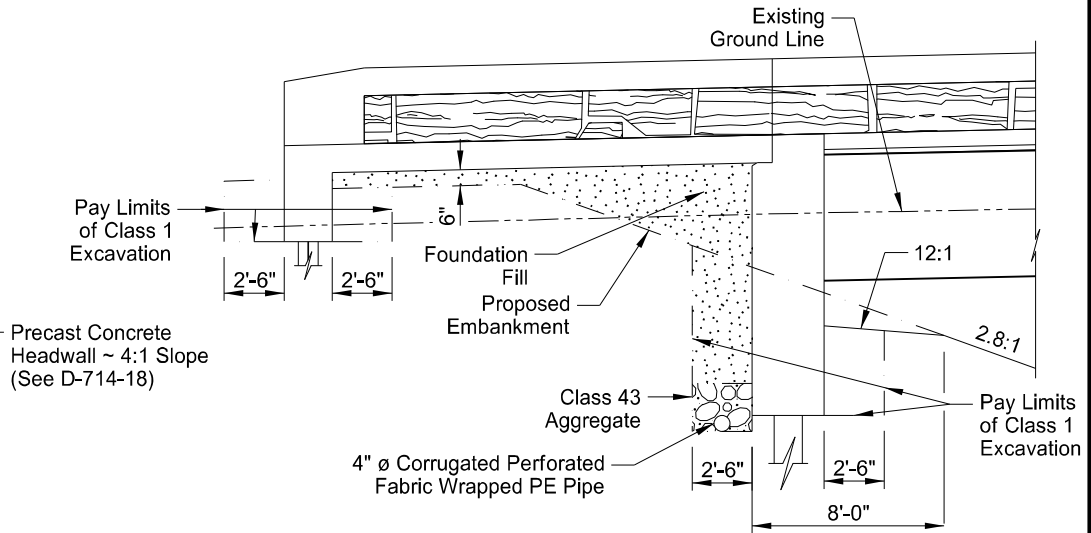
Include the cost to furnish and place the foundation fill, aggregate, corrugated perforated pipe and headwalls in the pay item "Abutment Underdrain System."



ABUTMENT PLAN



BACK FACE OF ABUTMENT



DETAIL AT ABUTMENT



I-94/PETTIBONE INTERCHANGE	
ABUTMENT UNDERDRAIN & EXCAVATION DETAILS	
DRAWING NO.	94-217.146-6

Diagram illustrating the cross-section of a bridge structure, showing dimensions and components:

- Overall width: 38'-7"
- Overall height: 11'-9" (typ)
- Top flange width: 1'-9" (typ)
- Keyway dimensions: 1 1/2" x 10" (typ)
- Waterproof Membrane
- Internal dimensions (from left to right):
 - 5'-7 1/4"
 - 5'-9"
 - 3'-0" (typ)
 - 5'-10 7/8"
 - 5'-9"
 - 5'-7 1/4"
- Bottom reinforcement: 5 Sp @ 6'-6" ~ HP14 x 73 Piling
- End dimensions (from left to right):
 - 3'-0 1/2"
 - 3'-0 1/2"

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	170	7

Technical drawing of a bridge abutment cross-section. The drawing shows the abutment structure with a 10" gap between the back face of the abutment and the bridge slab. A 1 1/2" x 10" keyway is shown at the base of the abutment. The height of the abutment is 5'-10 7/8". The width of the abutment is 3'-0". A waterproof membrane is indicated on the side of the abutment. The drawing also shows the bridge slab and the abutment's connection to the bridge structure.

Labels and dimensions:

- Back Face of Abutment
- 10"
- Begin or End Bridge Slab
- Waterproof Membrane
- 5'-10 7/8"
- 1 1/2" x 10" Keyway
- 3'-0"

A-A

11'-9"

5'-7 1/4"

3'-0"

1'-6" x 1'-6" Fillet (typ)

5'-6"

13'-6"

19'-0"

6'-8"

4'-8" (Abut 1)
5'-0" (Abut 3)

5" (Abut 1)
1" (Abut 3)

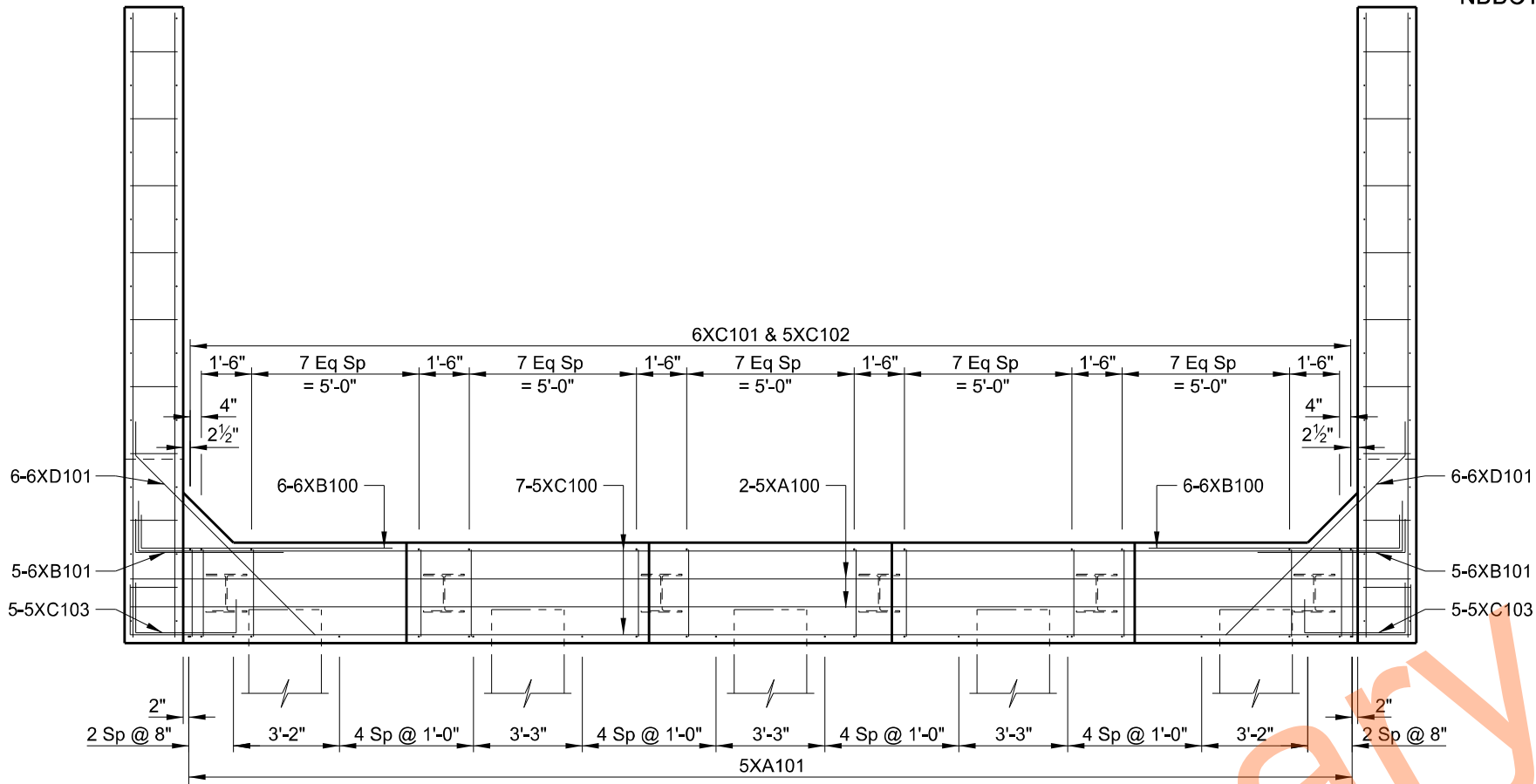
A circular professional engineer seal for the State of North Dakota. The outer ring contains the text "REGISTERED PROFESSIONAL ENGINEER" at the top and "NORTH DAKOTA" at the bottom. In the center, the name "JEFFREY R. RENSCH" is printed above the license number "PE-8211". Below the license number is the date "DATE 08/29/25". A blue ink signature is written across the top half of the seal.

94-217.146-7

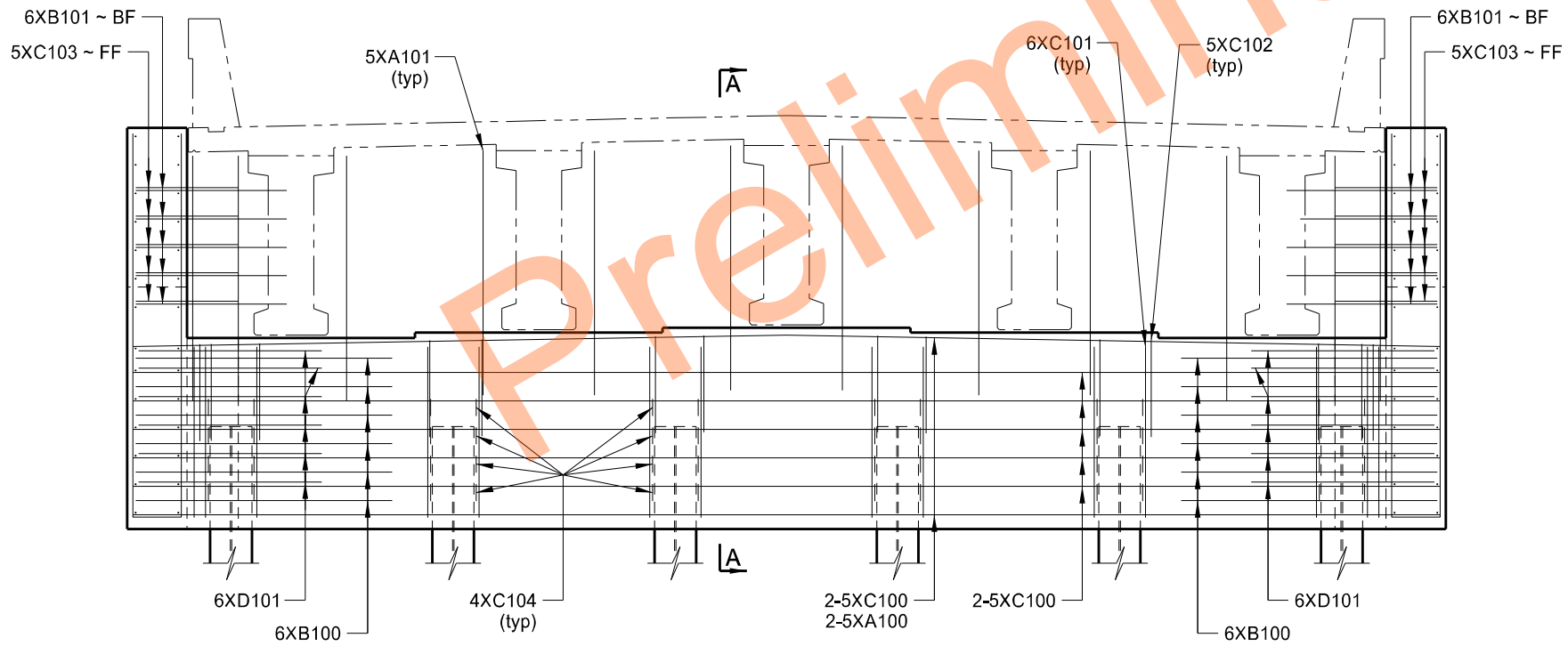
23 U.S.C. § 407 Documents
NDDOT Reserves All Objections

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ND	IM-2-094(186)217	170	8

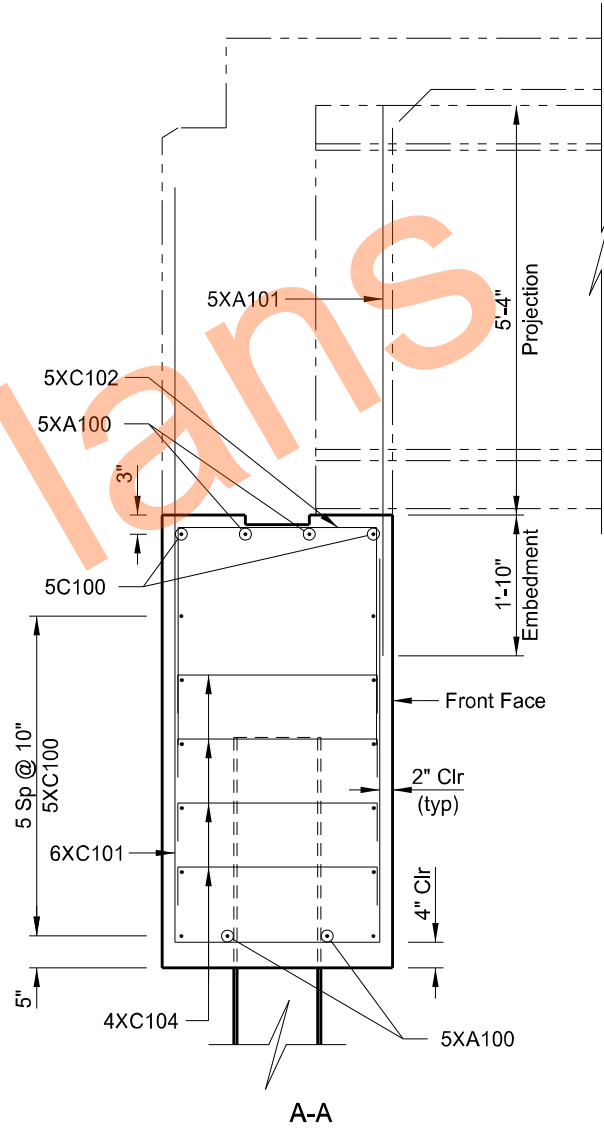
NOTES:
See Dwg 94-217.149-9
for Wingwall Reinforcement.



PLAN



ELEVATION



A-A

NOMECLATURE:
FF = Front Face
BF = Back Face

QUANTITIES

SEE DWG 94-217.146-9

I-94/PETTIBONE INTERCHANGE
(SHOWING REINFORCING)
ABUTMENT DETAILS

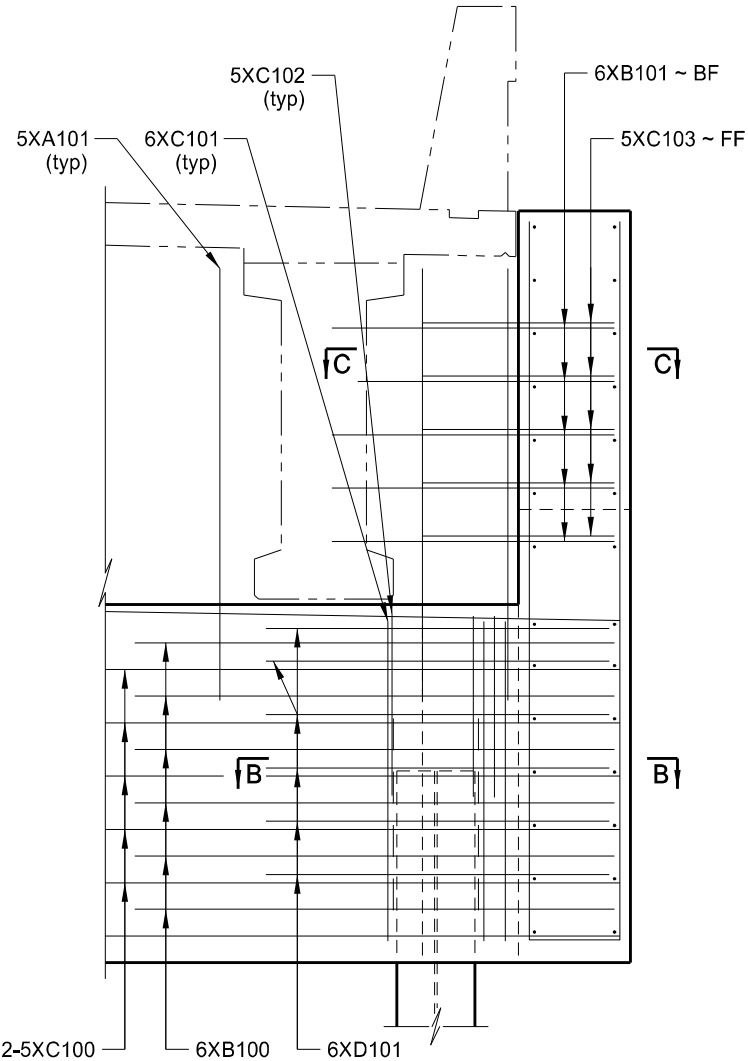
DRAWING NO.

94-217.146-8

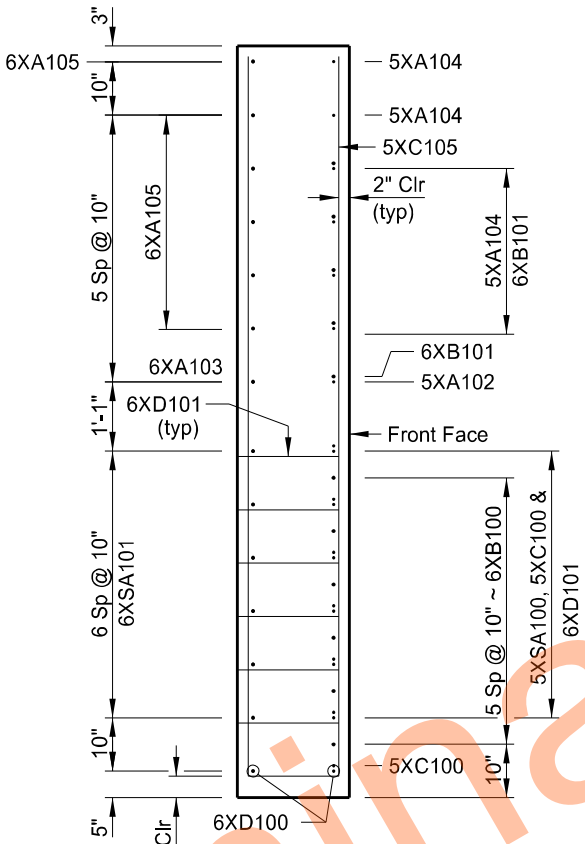


23 U.S.C. § 407 Documents
NDDOT Reserves All Objections

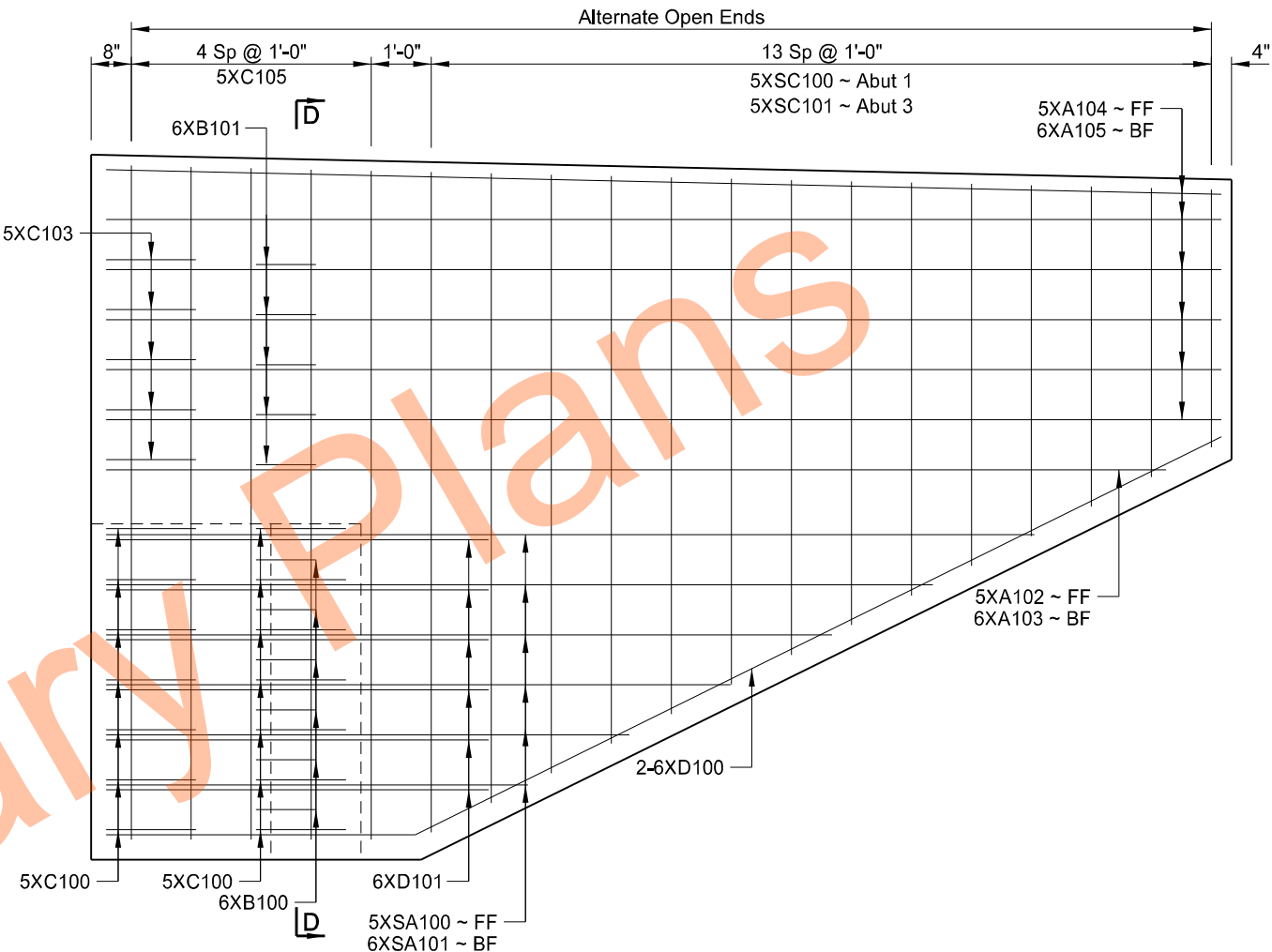
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	170	9



PARTIAL ELEVATION



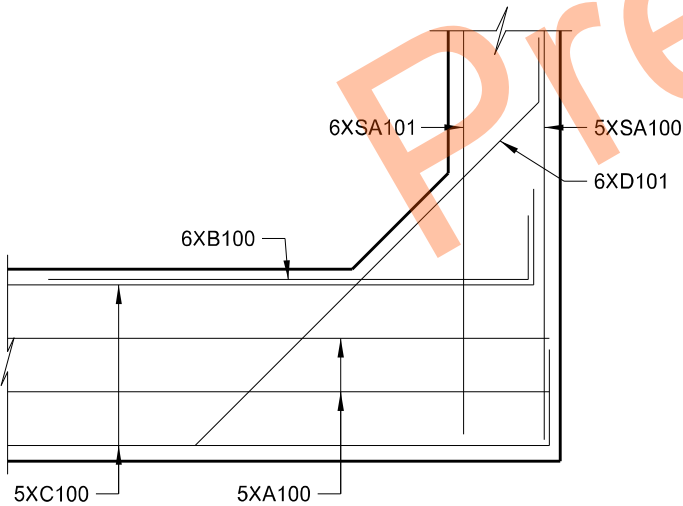
D-D



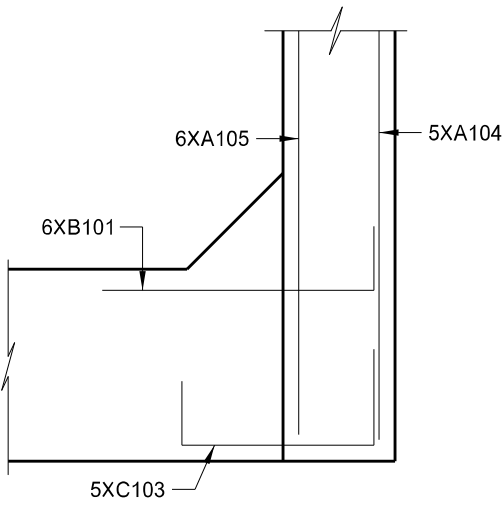
WING ELEVATION

NOMENCLATURE:

FF = Front Face
BF = Back Face



B-B



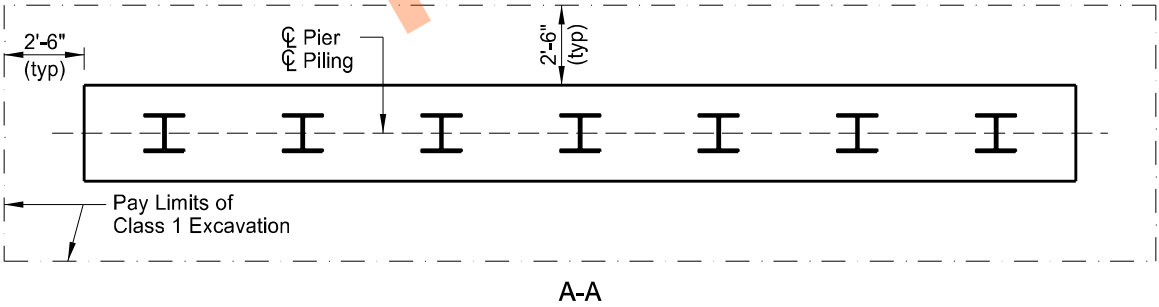
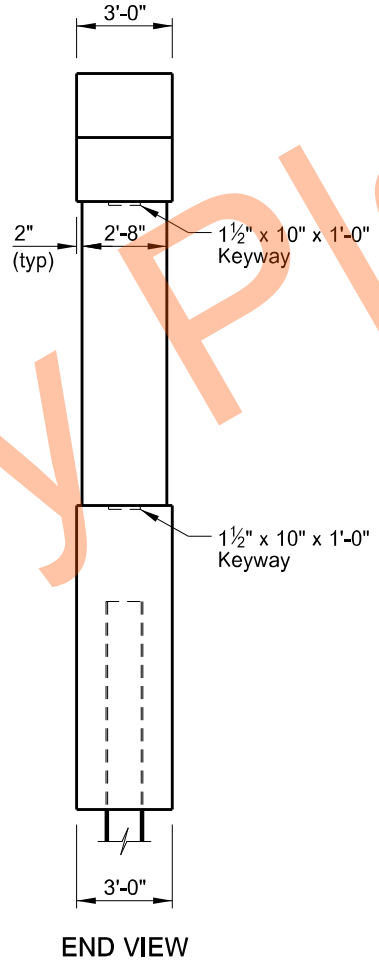
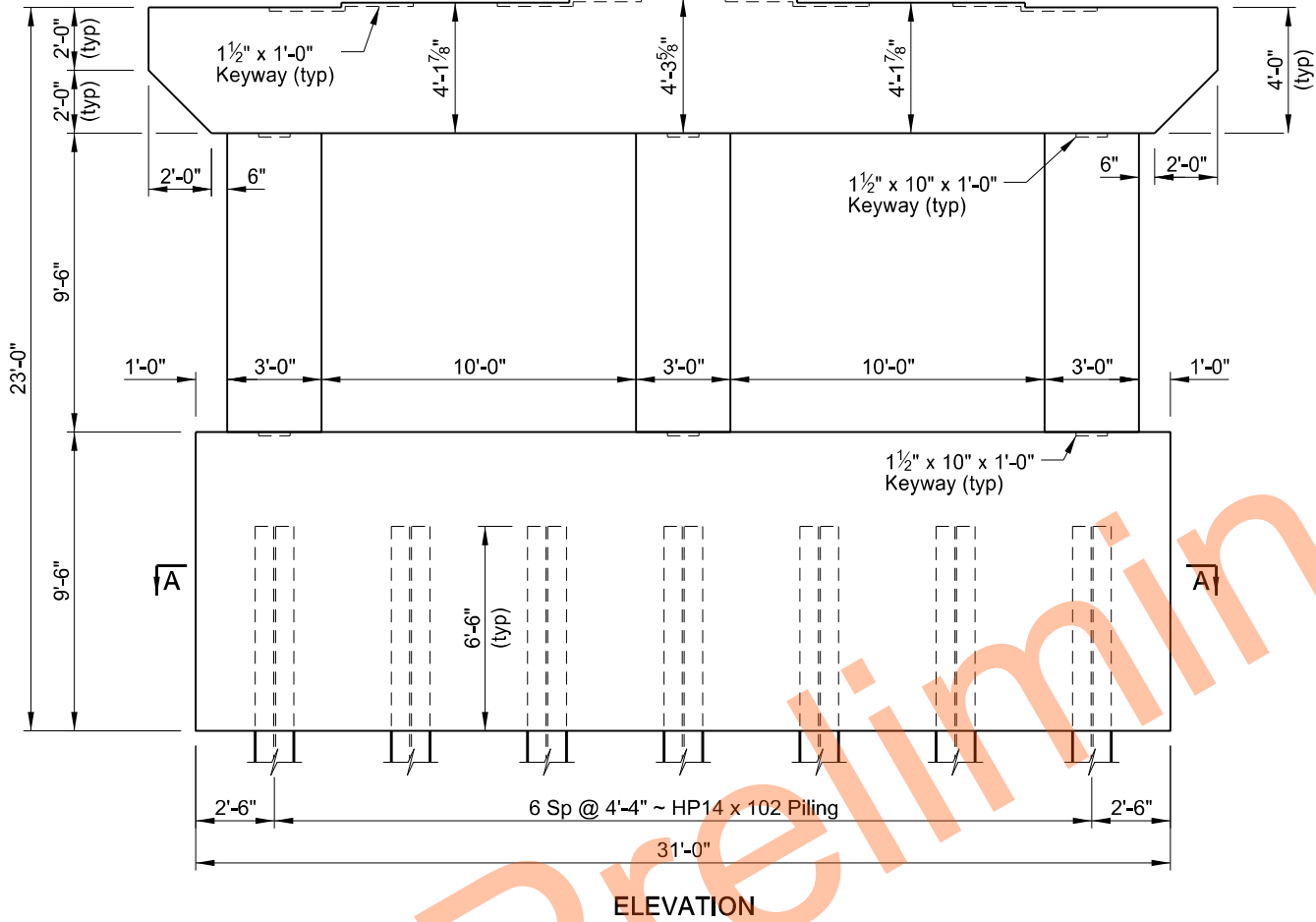
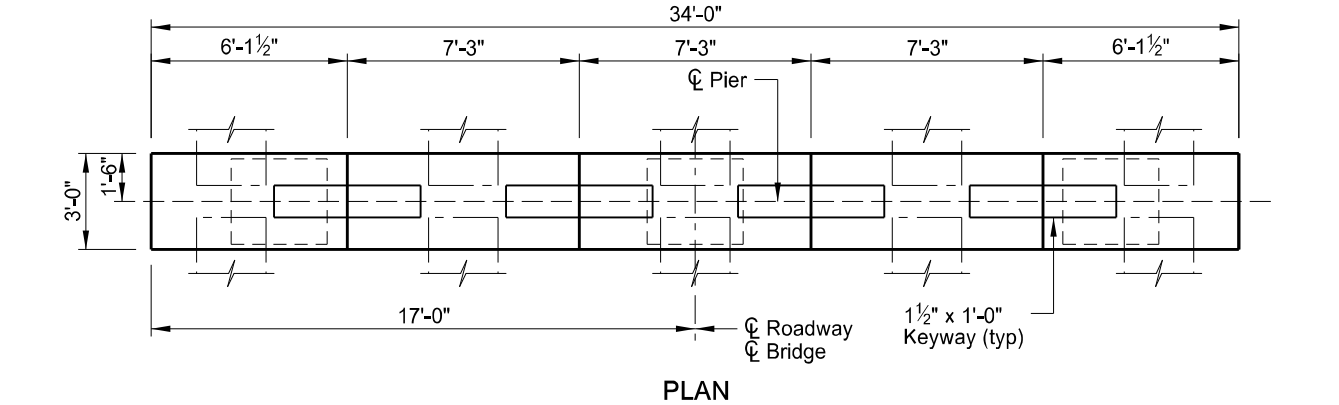
C-C



QUANTITIES (ABUTMENT 1)	
BRIDGE SUBSTRUCTURE CONCRETE	45.4 CY
REINFORCING STEEL (EPOXY)	4,914 LBS
QUANTITIES (ABUTMENT 3)	
BRIDGE SUBSTRUCTURE CONCRETE	45.8 CY
REINFORCING STEEL (EPOXY)	4,926 LBS
I-94/PETTIBONE INTERCHANGE	
(SHOWING REINFORCING)	
ABUTMENT DETAILS	
DRAWING NO.	94-217.146-9

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

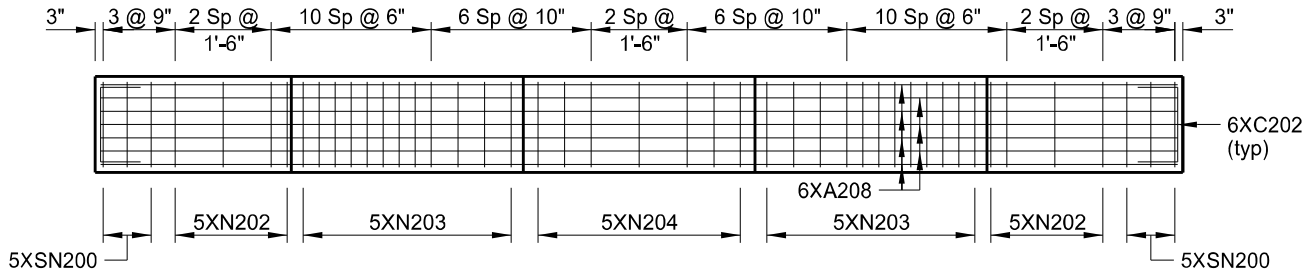
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	170	10



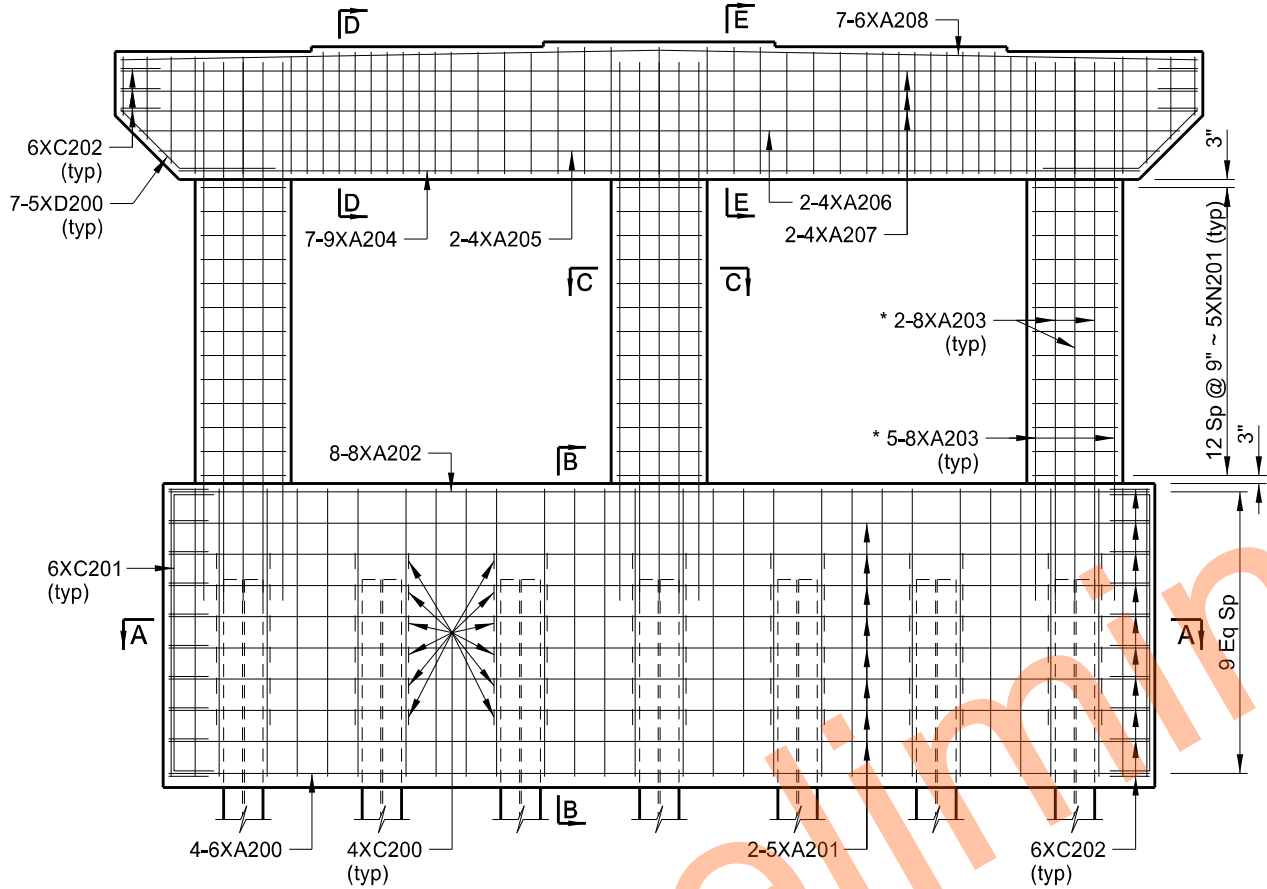
QUANTITIES	
SEE DWG 94-217.146-11	
I-94/PETTIBONE INTERCHANGE	
(SHOWING DIMENSIONS)	
PIER DETAILS	
DRAWING NO.	94-217.146-10

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

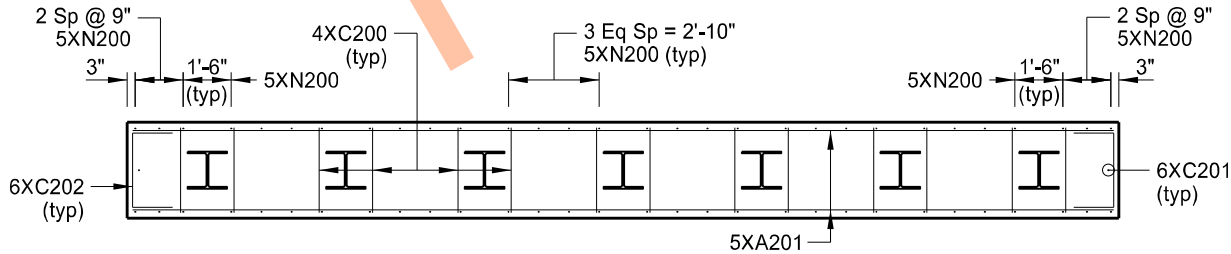
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	170	11



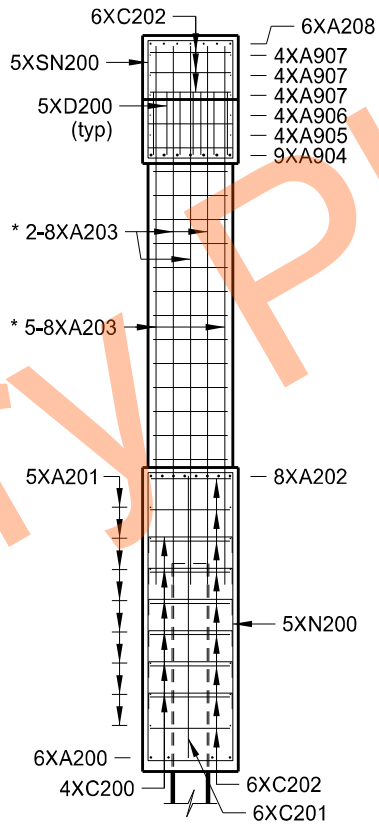
PLAN



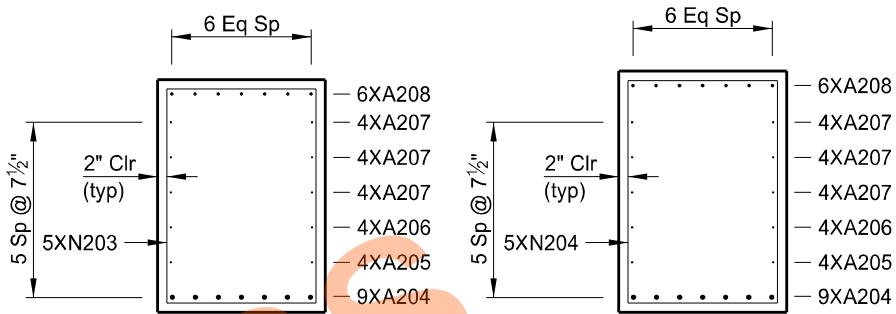
ELEVATION



A-A

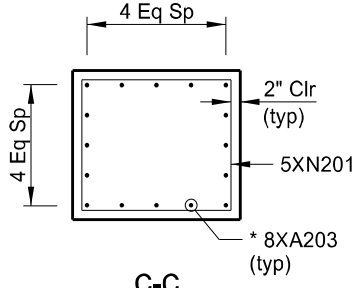


END VIEW



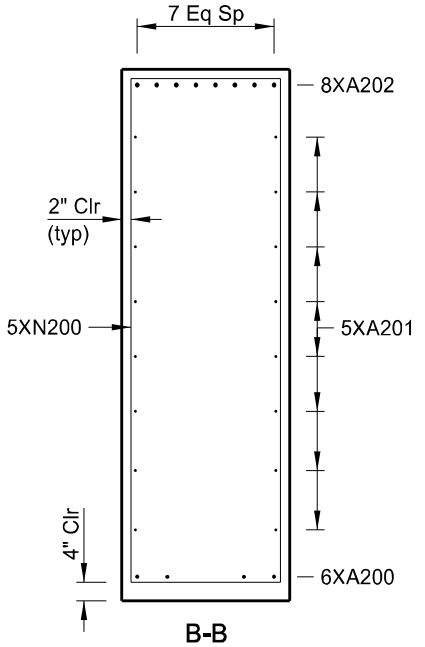
D-D

E-E



C-C

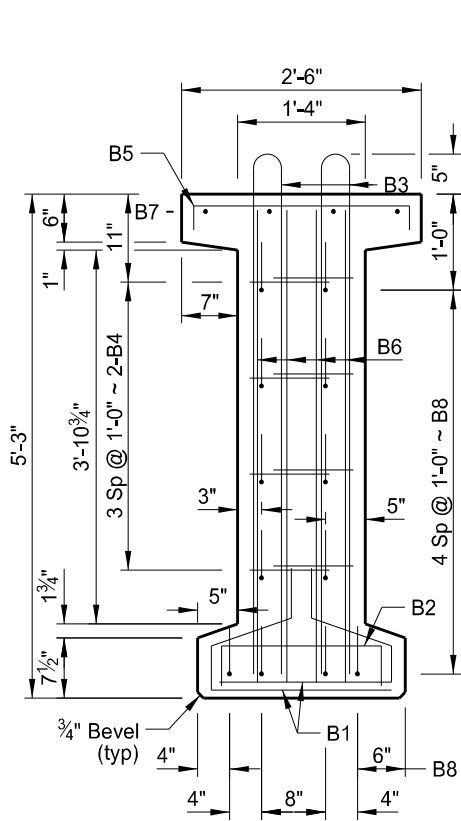
* Embed the 8XA203 bars
3'-8" into the footing wall
and pier cap.



B-B

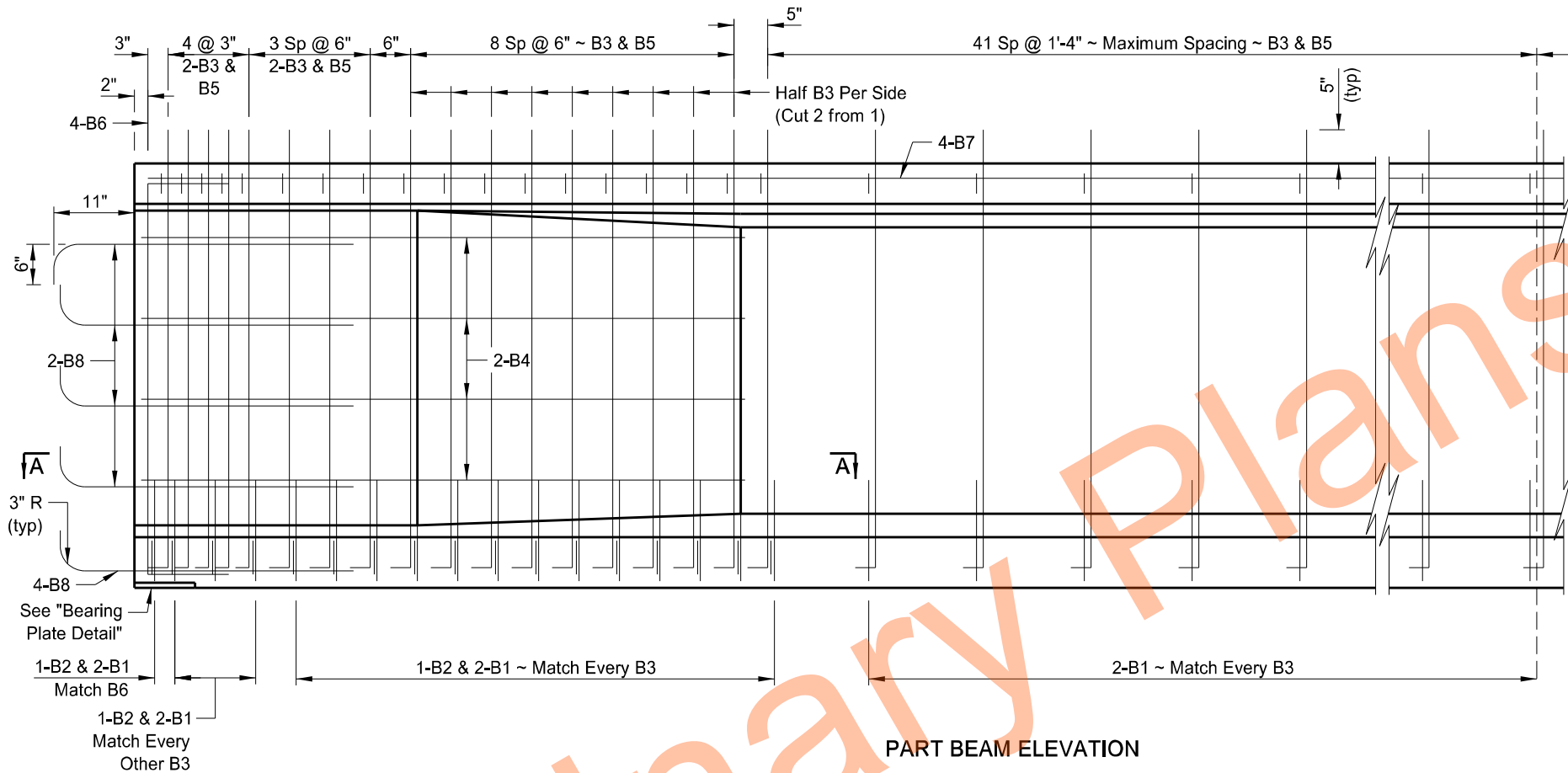
QUANTITIES (PIER)	
BRIDGE SUBSTRUCTURE CONCRETE	56.3 CY
REINFORCING STEEL (EPOXY)	7,158 LBS
I-94/PETTIBONE INTERCHANGE (SHOWING REINFORCING) PIER DETAILS	
DRAWING NO.	94-217.146-11



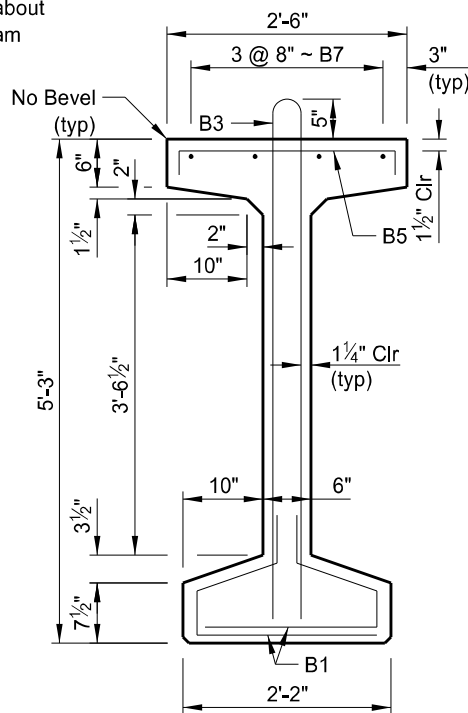


(DETAILS NOT SHOWN ARE
SAME AS "SECTION @ C")

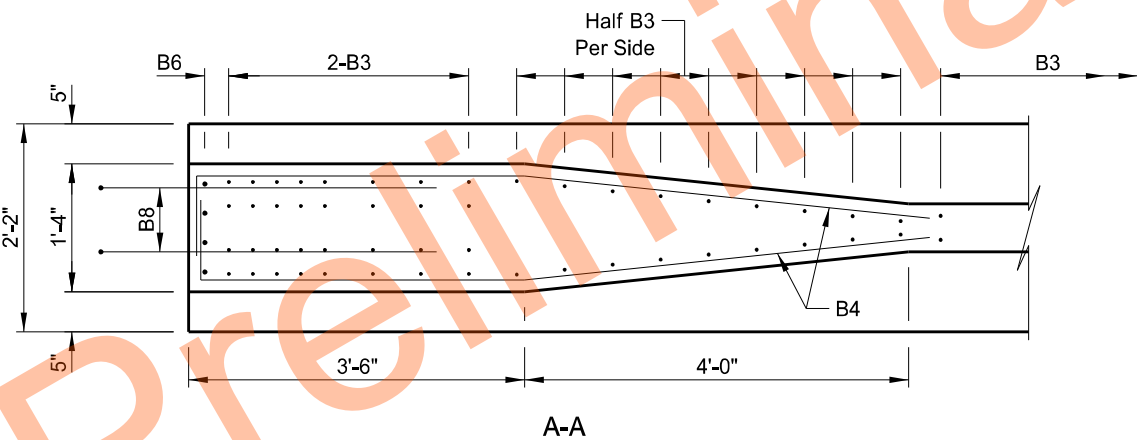
END VIEW



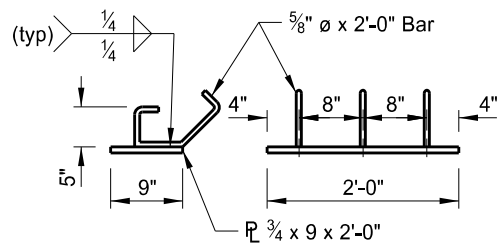
PART BEAM ELEVATION



SECTION @ C

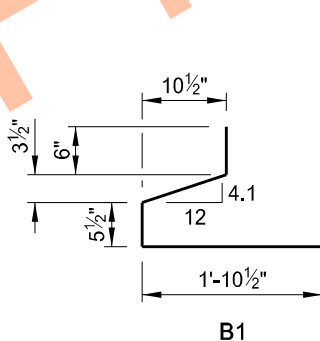


A-A

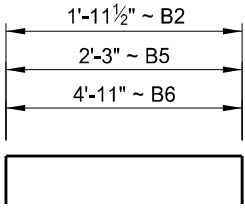


Use ASTM A36 steel. Galvanize per Section 854.
Include in the bid item for Prestressed Beam.

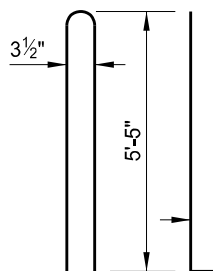
BEARING PLATE DETAIL



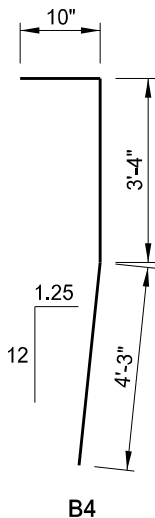
B1



B2, B5 & B6



B3



B4

(DIMENSIONS SHOWN ARE OUT TO OUT)

BENT BAR DETAILS

NOTES:

All bar dimensions shown are out-to-out.

Unless noted otherwise, bend bars to the
bend diameter (D) listed below.

#3 Bar- D = 1 1/2"
#4 Bar- D = 2"
#5 Bar- D = 2 1/2"

BAR LIST ~ ONE BEAM

MARK	SIZE	NO.	LENGTH	SHAPE
B1	3	230	3'-9"	BENT
B2	3	34	2'-10"	BENT
** B3	4	133	11'-6"	BENT
B4	4	16	8'-5"	BENT
B5	3	117	2'-9"	BENT
B6	5	8	6'-11"	BENT
B7	5	16	33'-6"	STR
* B8	5	24	4'-0"	STR

* Field bend as shown (Grade 40).
** Epoxy Coated.



I-94/PETTIBONE INTERCHANGE

PRE-TENSIONED 63"
PRESTRESSED I-BEAM

DRAWING NO.

94-217.146-12

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

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NOTES:

Provide holes and inserts in the beams at the locations shown to accommodate the diaphragm bars. Provide 6AT500 bars threaded to fit the inserts. Use galvanized, epoxy-coated, stainless steel, or non-metallic material for holes and inserts. See Slab Layout for diaphragm location details and required skew angle.

Provide lifting loops or handling hooks as required by the Contractor. Additional inserts, brackets, and hardware may be incorporated into the finished beam for the convenience of the Contractor. Use galvanized, epoxy-coated, stainless steel, or non-metallic material for all inserts, brackets, and hardware if less than 1 inch of concrete cover will be provided in the finished structure.

The required Detensioning Strength indicates the minimum required concrete strength at the time of prestress transfer. The required Acceptance Strength indicates the minimum required concrete strength prior to transporting and erecting the beams.

Y Distances shown in the table are measured from the bottom of the beam to the center of gravity of the strand group listed.

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

BEAM SECTION DATA		
Beam Wt = 787.9 lbs/ft + 5337 lbs for End Blocks		
Beam Length	125.0	ft
Total Beam Weight	51.9	tons
Cross Sectional Area at End Span	1,182.75	in²
Cross Sectional Area at Midspan	732	in²
C.G. from Bottom of Beam at Midspan	31.17	in
Moment of Inertia at Midspan (I)	392,056	in⁴
Section Modulus at Midspan (SB)	12,578	in³

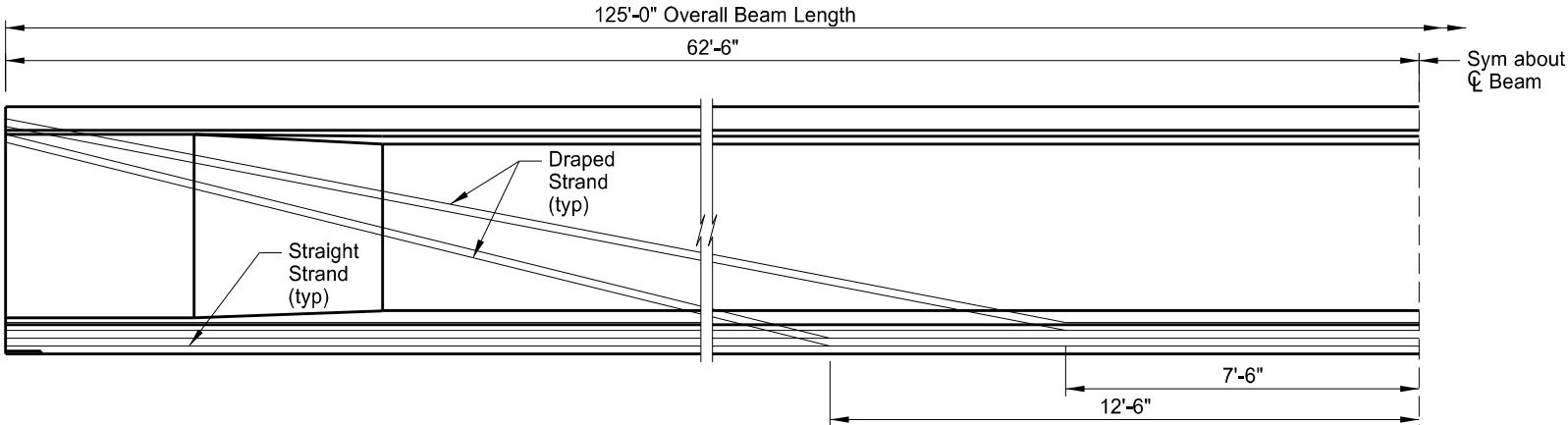
MINIMUM CONCRETE COMPRESSIVE STRENGTH		
Detensioning Strength (f'ci)	7.00	ksi
Acceptance Strength (f'c)	7.00	ksi

PRESTRESSING STRAND DATA			
0.60" Diameter - Grade 270 Prestressing Strands			
Initial Prestress = 0.75 * fpu			
	Number	Y Distance (inches)	
		Midspan	End Span
Straight Strands	28	3.86	3.86
Draped Strands	8	5.00	57.00
Total Strands	36	4.11	15.67

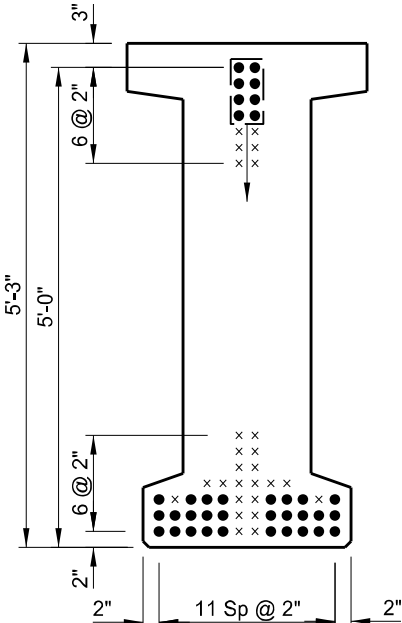
PRESTRESS LOSSES		
Elastic Shortening Loss	18.02	ksi
Long Term Losses	23.41	ksi
Total Losses	41.43	ksi

PRESTRESS FORCES		
Initial Prestress Force	1581.9	kips
Final P/S Force after Losses	1258.3	kips

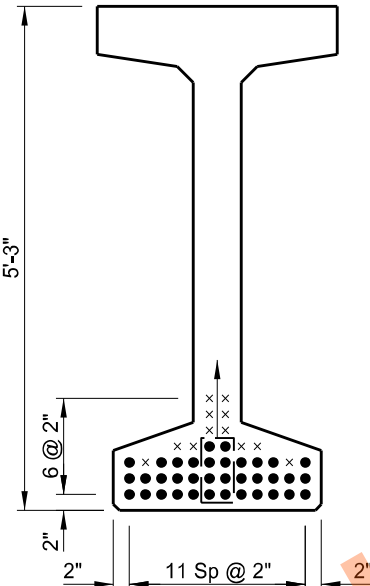
QUANTITIES		(ONE BEAM)
BEAM LENGTH		125.0 LF
I-94/PETTIBONE INTERCHANGE		
PRE-TENSIONED 63" PRESTRESSED I-BEAM		
DRAWING NO.	94-217.146-13	



BEAM ELEVATION

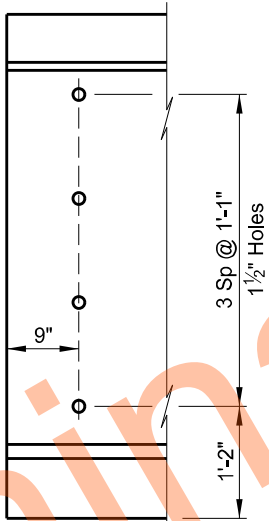


END VIEW



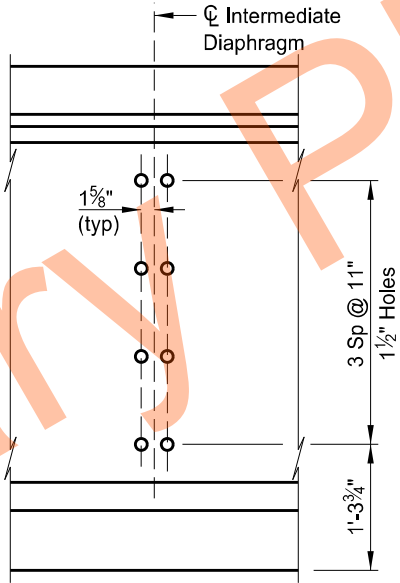
SECTION @ CL

PRESTRESSING STRAND LAYOUT



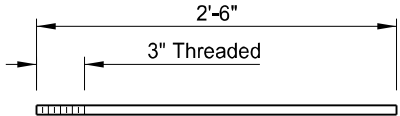
Use holes for all beams at the abutments and for interior beams at the piers. Use inserts for exterior beams at the piers.

ELEVATION
BEAM END DETAIL



Use holes for all beams.

ELEVATION
INTERMEDIATE DIAPHRAGM DETAIL

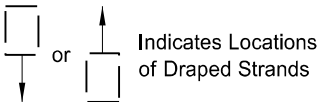


No. 6 Deformed Rebar (Grade 60).
Include in bid item for Prestressed Beam.

6AT500 DETAIL

KEY:

- × Vacant Strand Location
- Filled Strand Location (Bonded)

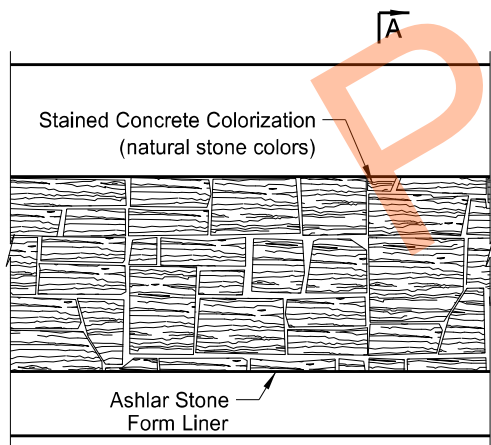
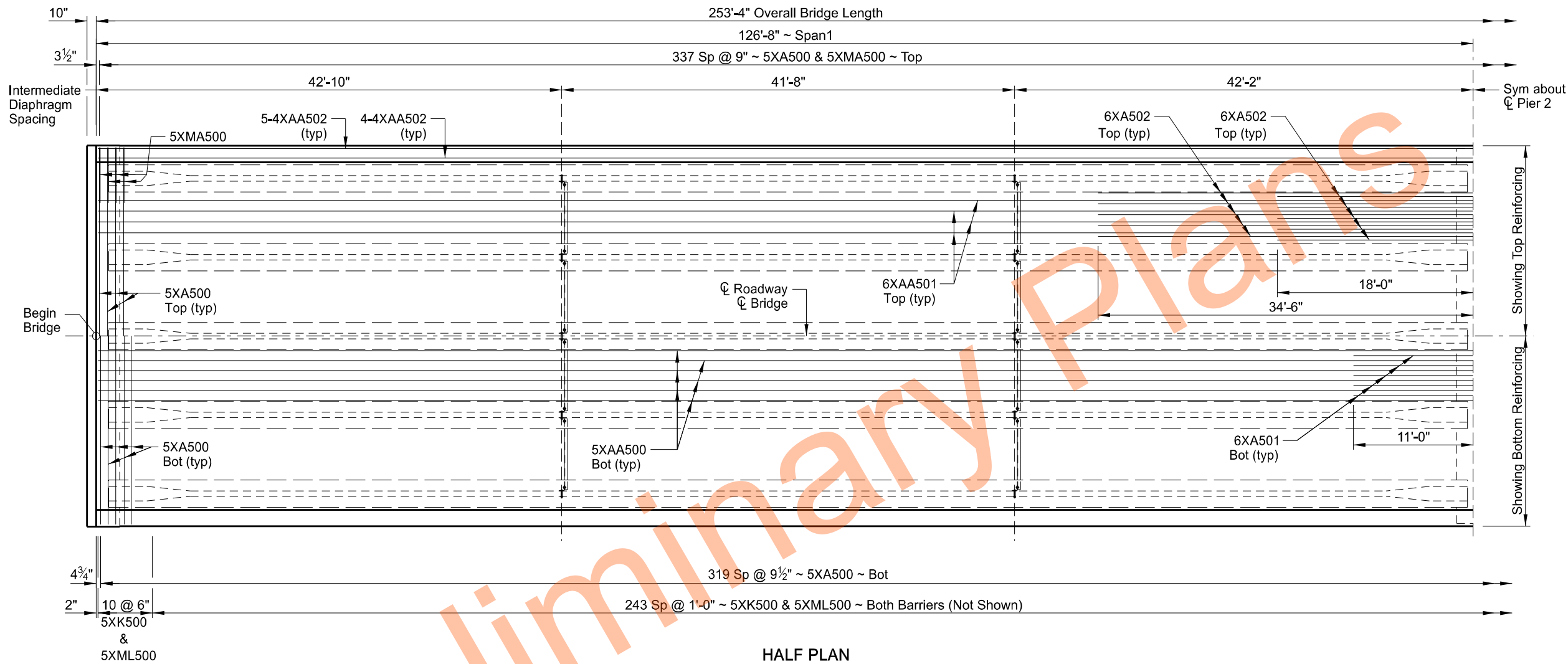


Indicates Locations
of Draped Strands

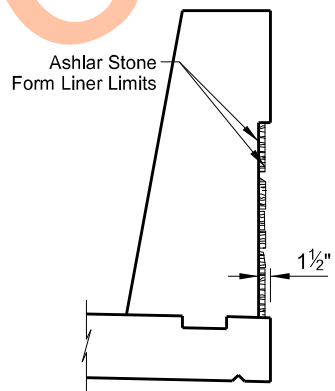


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NDDOT Reserves All Objections

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(SHOWING FORM LINER ~ BACK FACE)
BARRIER ELEVATION



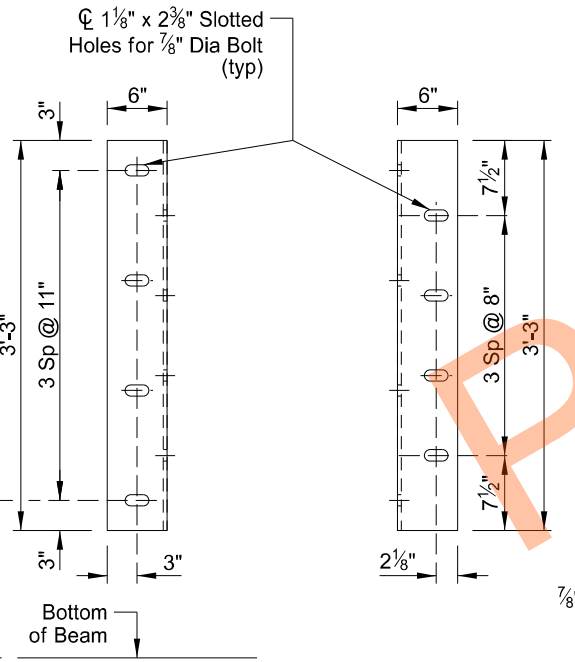
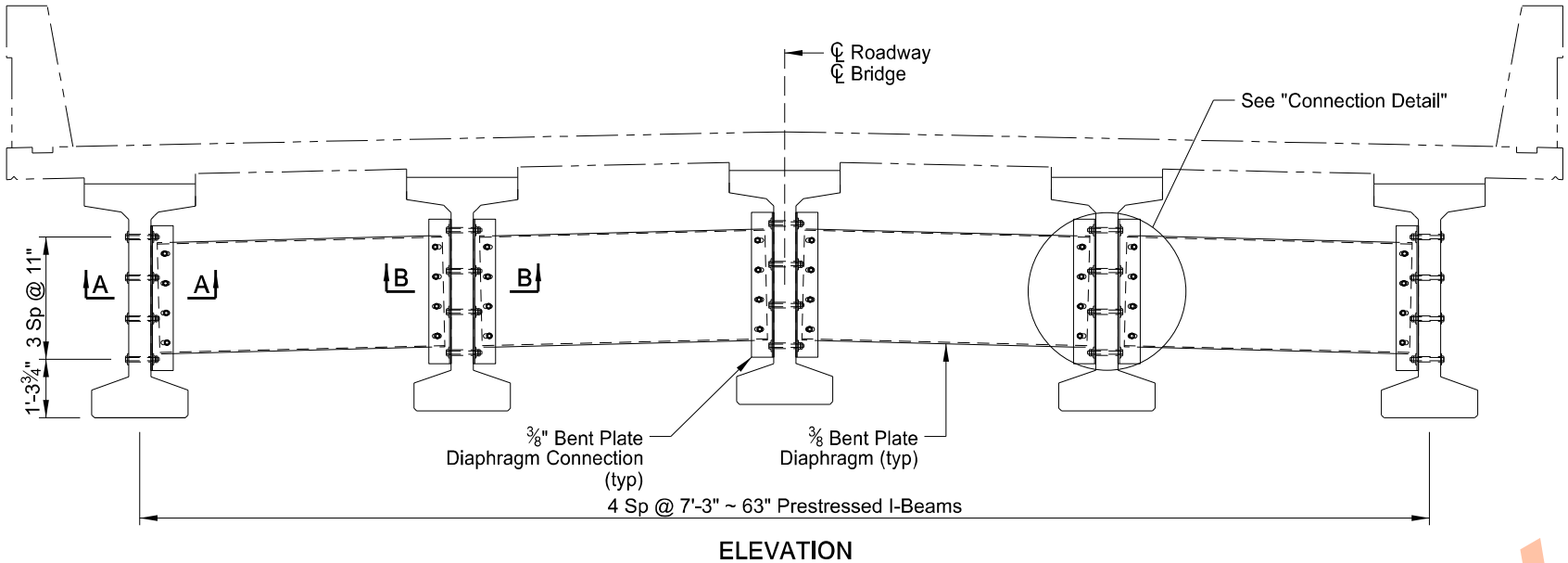
QUANTITIES	
SEE DWG 94-217.146-18	
I-94/PETTIBONE INTERCHANGE	
HALF SLAB LAYOUT	
DRAWING NO.	94-217.146-14

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

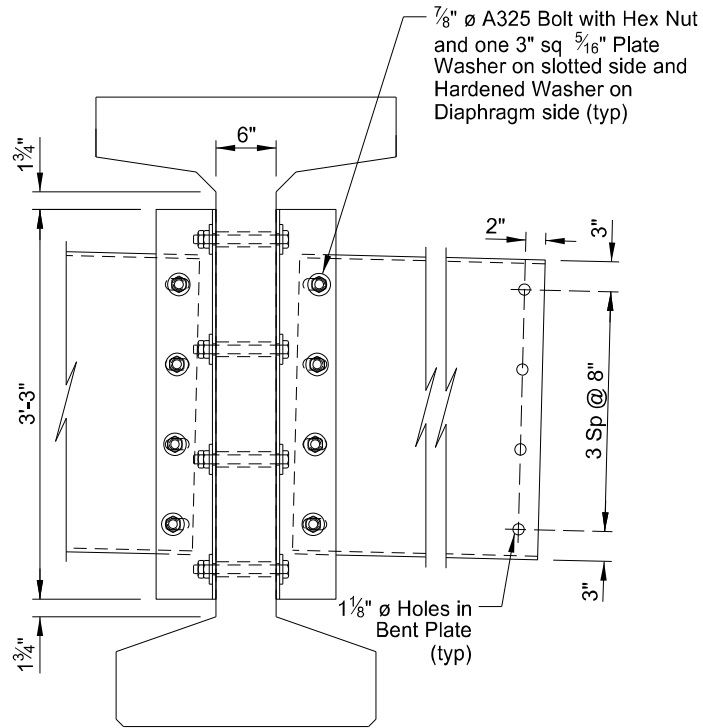
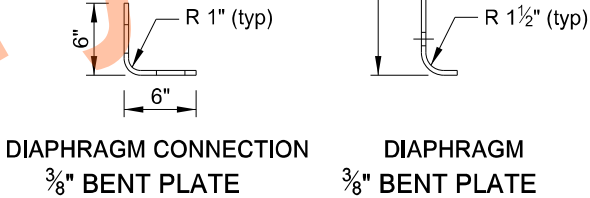
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	170	15

NOTES:

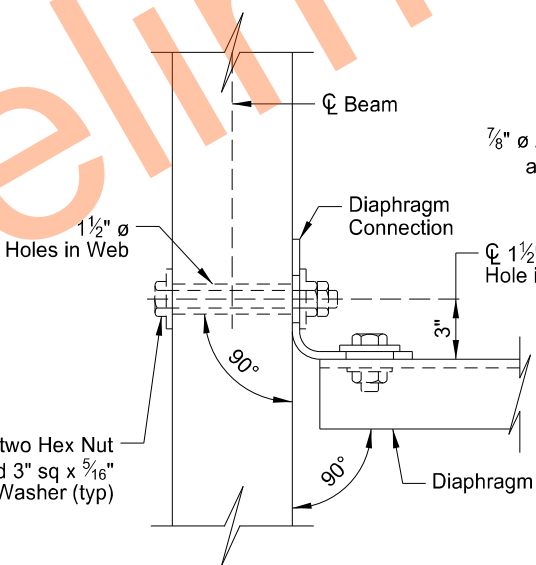
- Use AASHTO M270 Grade 36 structural steel
- Galvanize all structural steel and connection hardware per Section 854
- $\frac{3}{8}$ " x 6" x 6" angles may be substituted for the bent plate diaphragm connection plates shown
- Install diaphragms between adjacent girders in conjunction with girder erection
- Include all costs for furnishing, fabricating, and installing the steel diaphragm in the lump sum price bid for structural steel



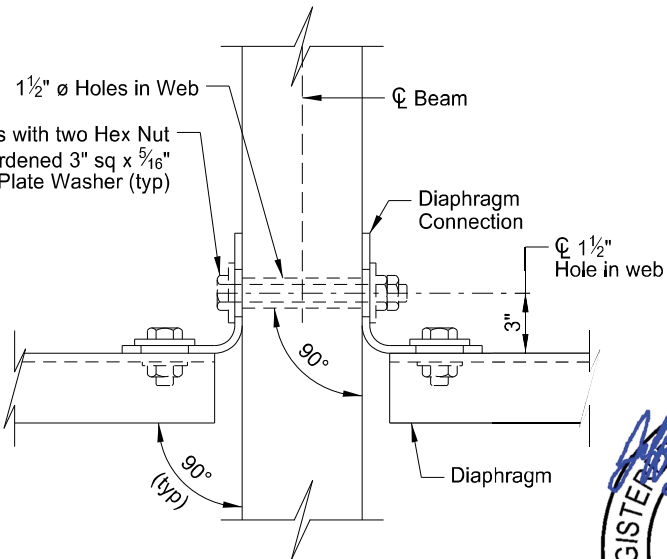
(BEAM FACE) (DIAPHRAGM FACE)
DIAPHRAGM CONNECTION
 $\frac{3}{8}$ " x 12" BENT PLATE



CONNECTION DETAIL



SECTION A-A



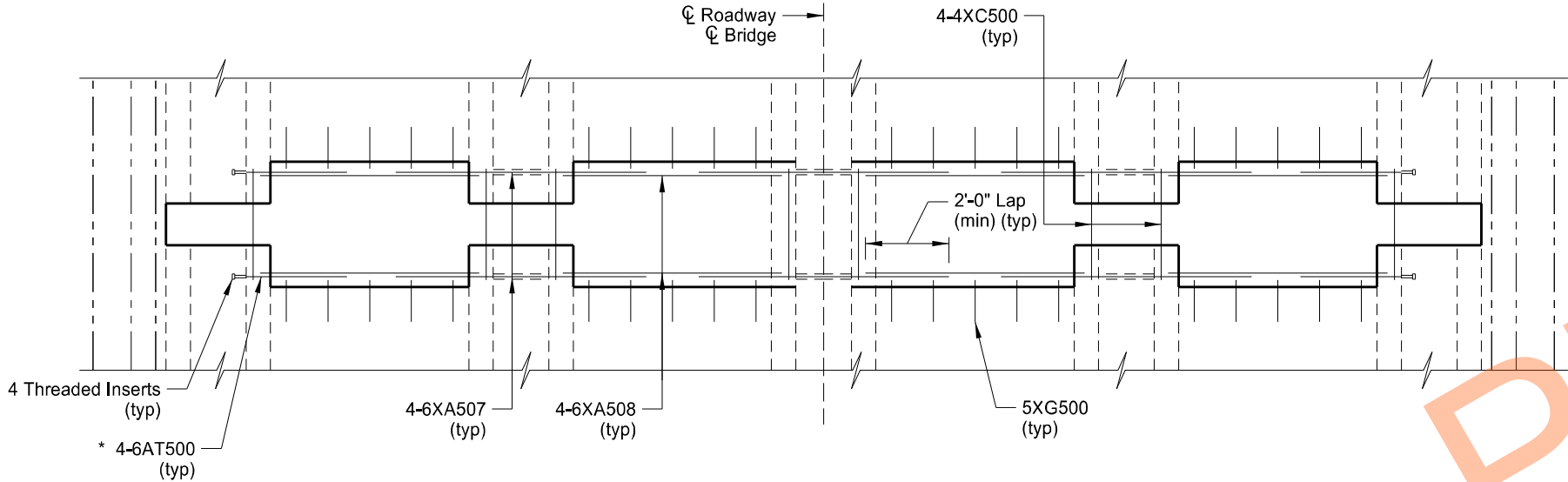
SECTION B-B



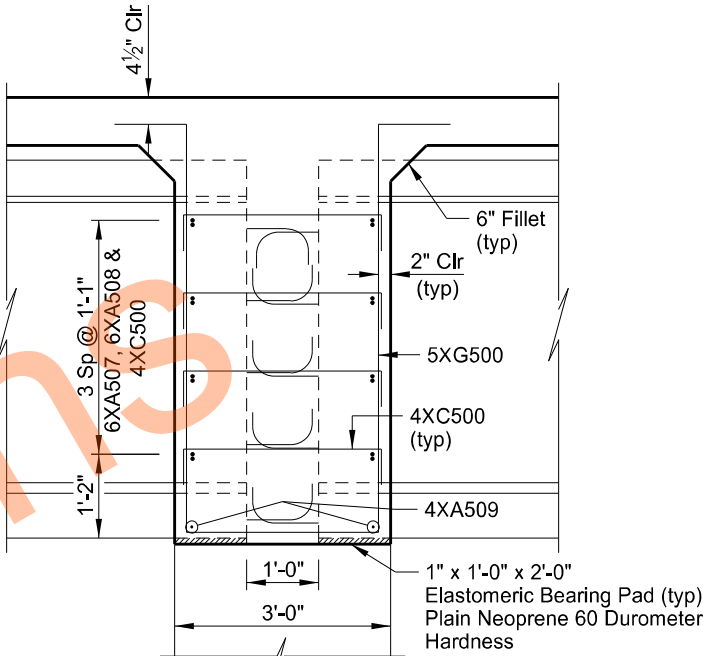
QUANTITIES (ONE INTERMEDIATE DIAPHRAGM)	
STRUCTURAL STEEL	1 L SUM
I-94/PETTIBONE INTERCHANGE	
INTERMEDIATE DIAPHRAGM DETAILS	
DRAWING NO.	94-217.146-15

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

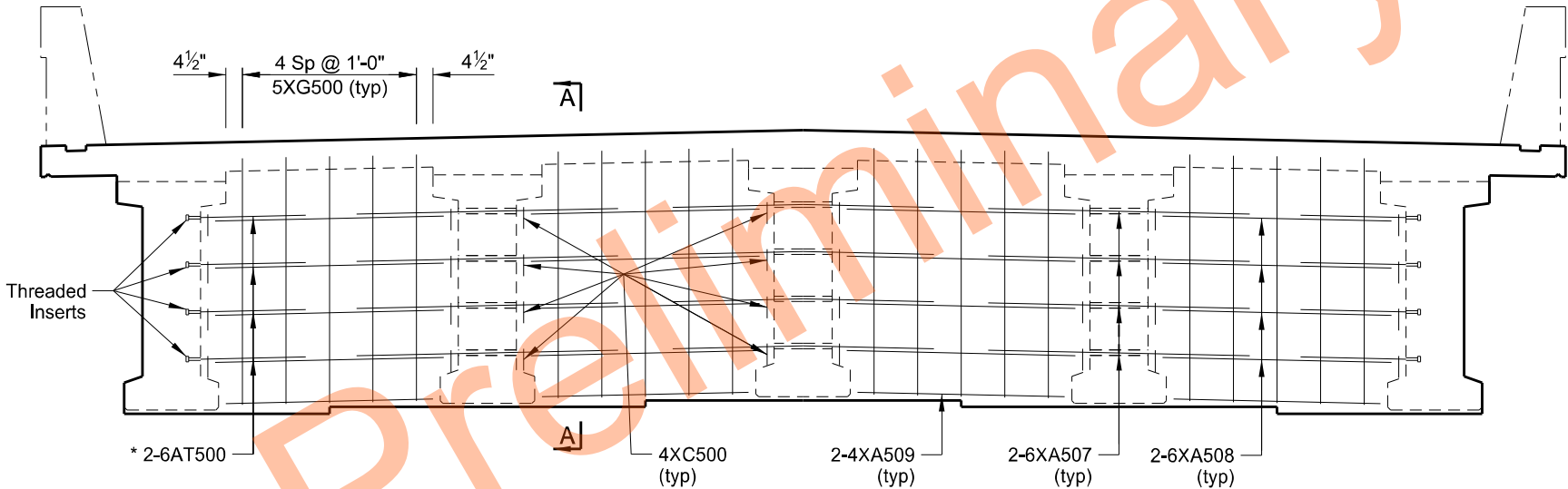
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	170	16



PLAN



A-A



ELEVATION

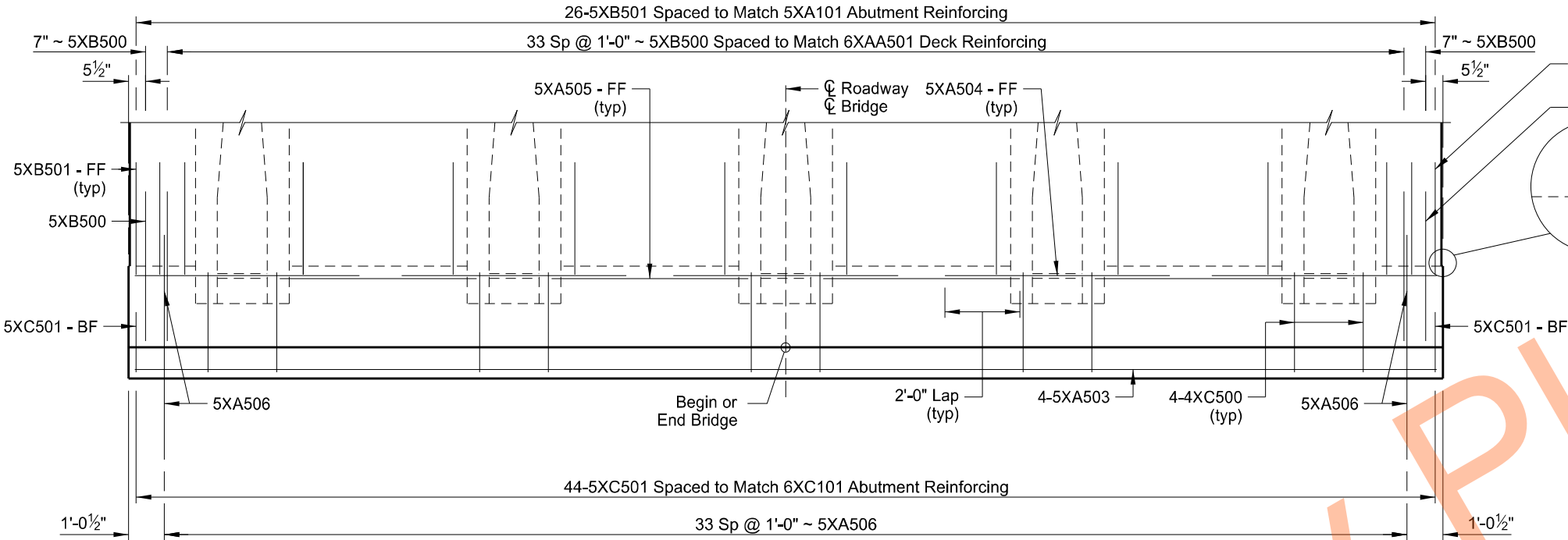
* See "6AT500 Detail" Dgn 94-217.146-13



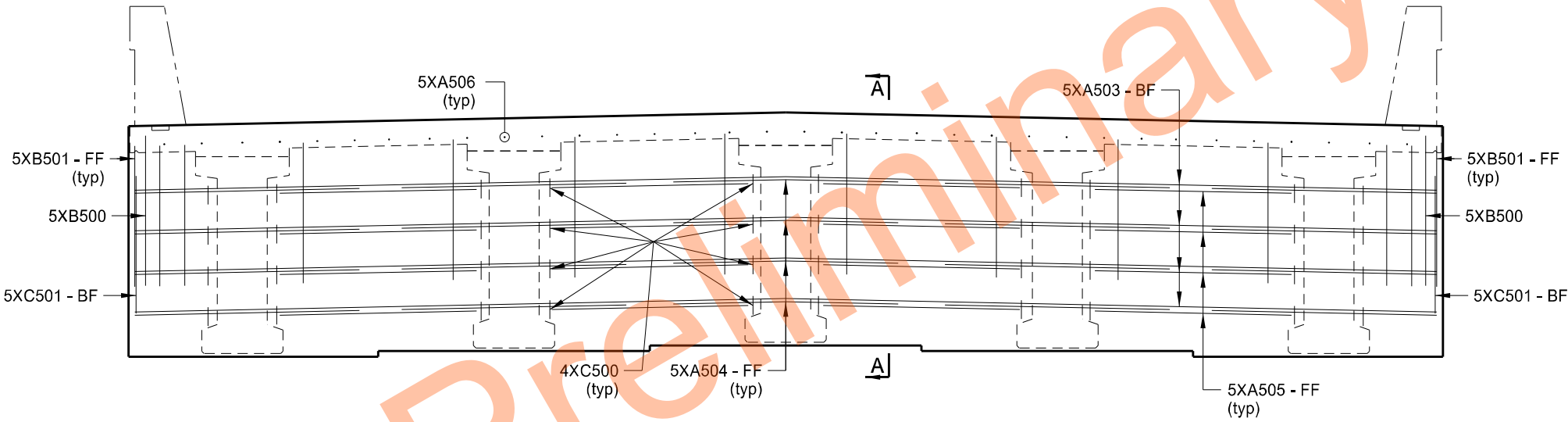
QUANTITIES	
SEE DWG 94-217.146-18	
I-94/PETTIBONE INTERCHANGE	
PIER DIAPHRAGM DETAILS	
DRAWING NO.	94-217.146-16

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

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ND	IM-2-094(186)217	170	17

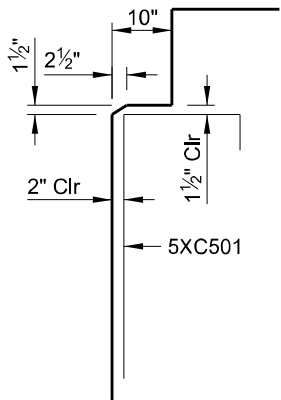


PLAN

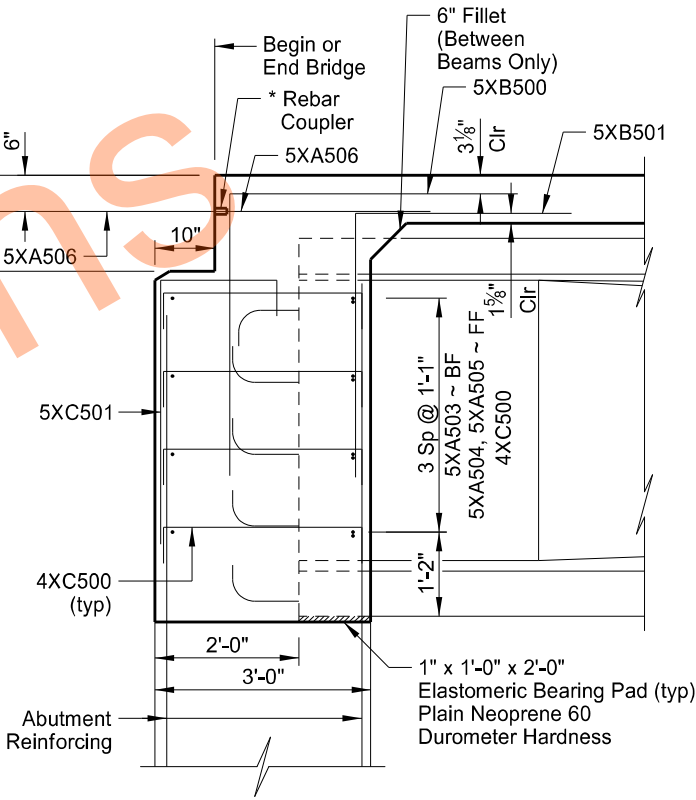


(APPROACH NOTCH NOT SHOWN)
ELEVATION

NOMENCLATURE:
FF = Front Face
BF = Back Face



APPROACH NOTCH DETAIL



A-A

* Use mechanical connectors for the couplers capable of developing 125% of the reinforcing steel specified yield strength. Provide epoxy coated couplers according to Section 836.02 A and repair any damaged epoxy coating according to Section 612.04 E.

NOTE:

Do not install the 5XA506 bars into the approach slab until all of the foundation fill is in place.

Position the 4'-0" leg of 5XB500 bar and the 3'-0" leg of 5XB501 bar horizontal.

QUANTITIES

SEE DWG 94-217.146-18

I-94/PETTIBONE INTERCHANGE

ENDWALL DETAILS

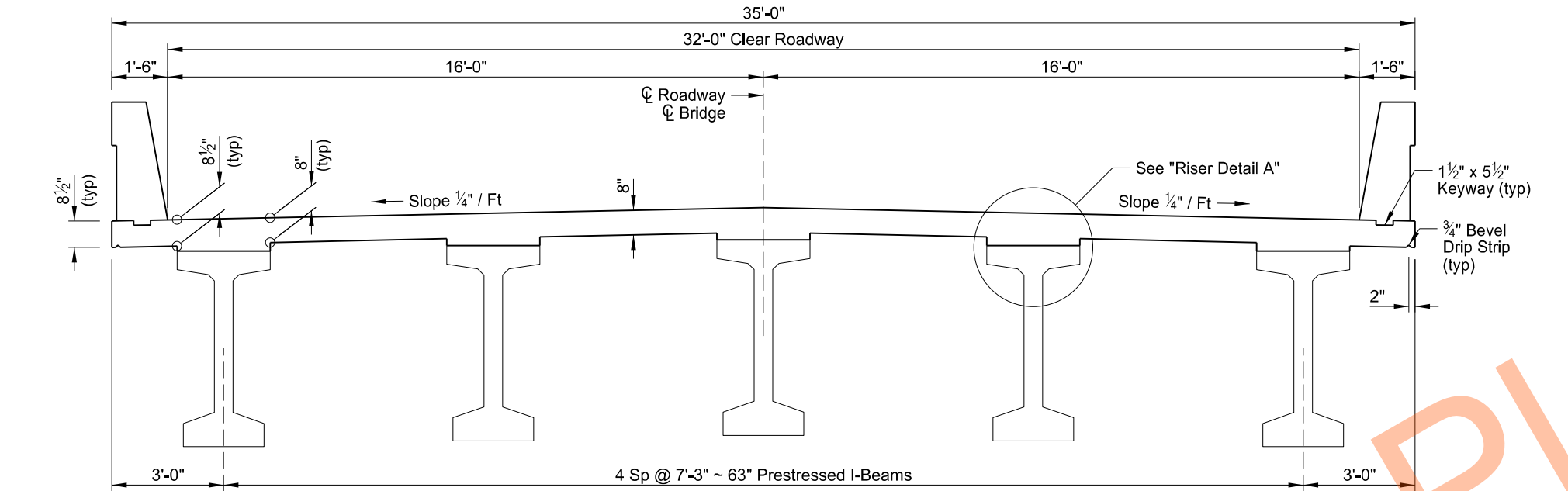
DRAWING NO.

94-217.146-17

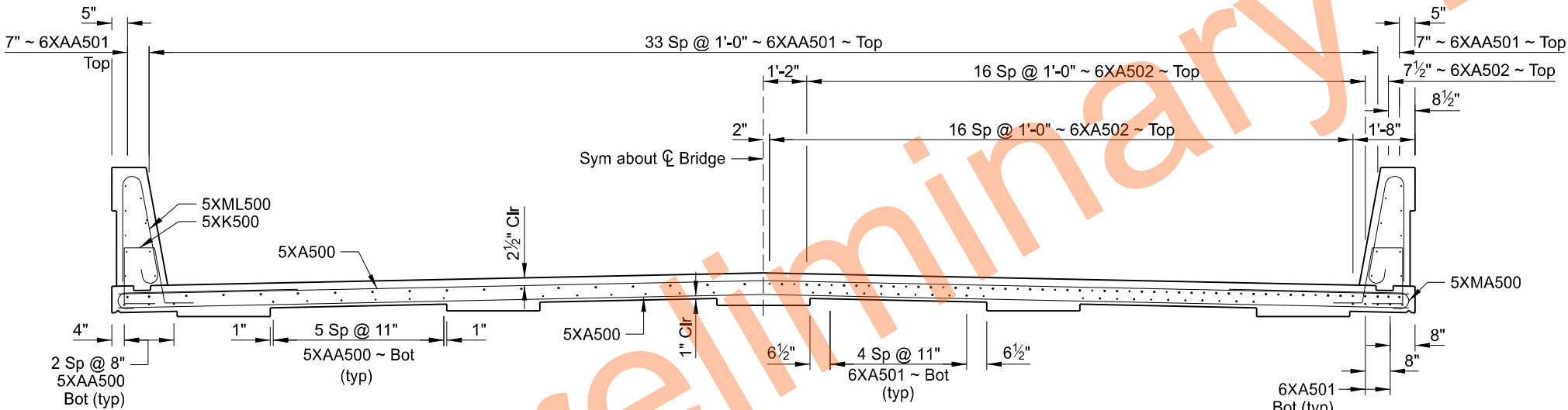


23 U.S.C. § 407 Documents
NDDOT Reserves All Objections

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ND	IM-2-094(186)217	170	18



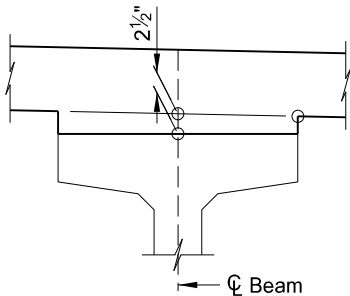
(SHOWING DIMENSIONS)
SLAB SECTION



(SHOWING REINFORCING BETWEEN SUPPORTS)

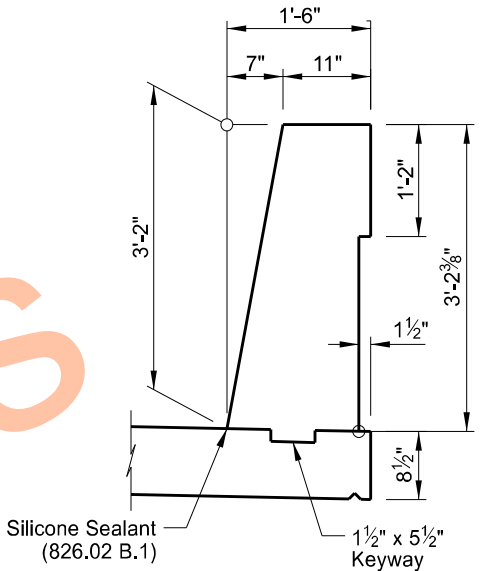
(SHOWING REINFORCING OVER PIERS)

SLAB SECTION

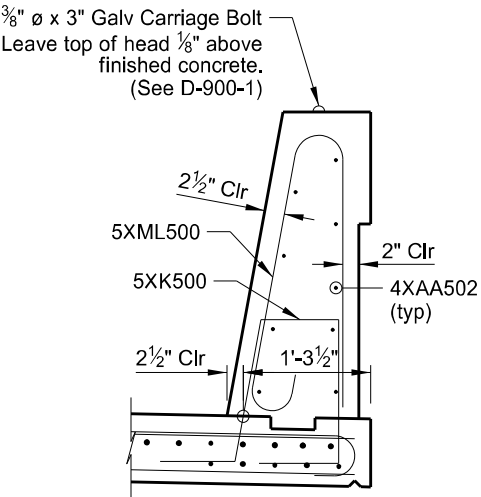


RISER DETAIL A

The 2 1/2" dimension shown is located at the supports. The anticipated midspan riser for span 1 is 1 1/2" and for span 2 is 3". Adjust the riser to maintain the 8" slab thickness.



SHOWING DIMENSIONS



SHOWING REINFORCING
BARRIER DETAIL

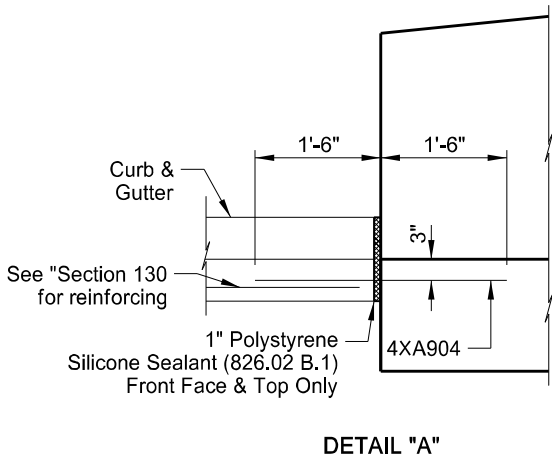
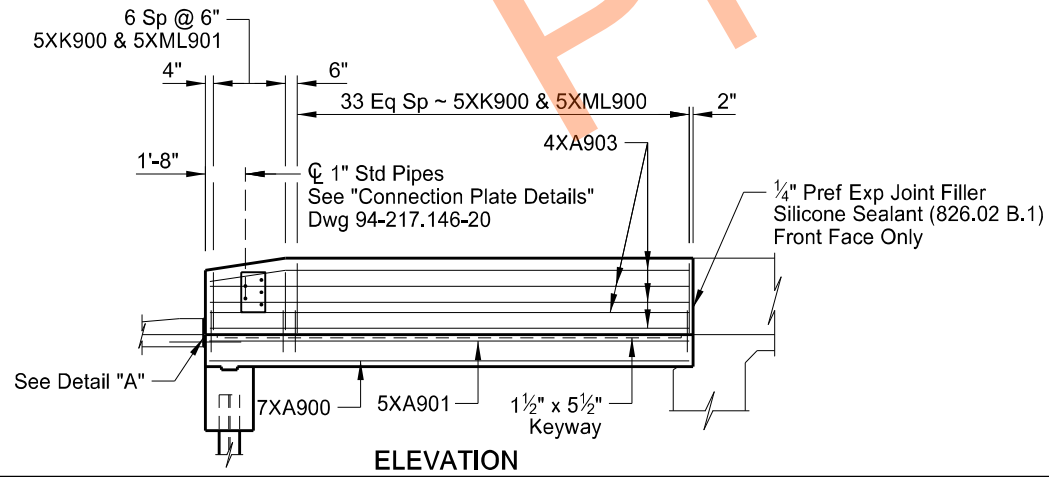
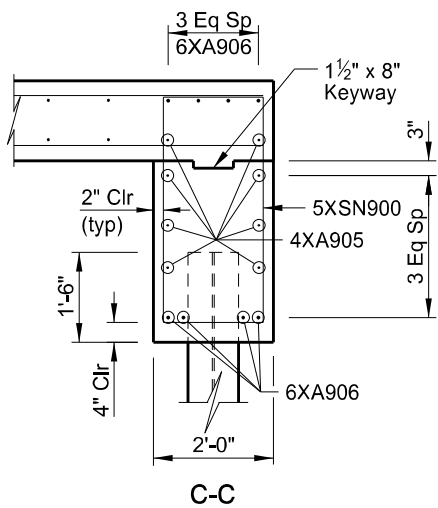
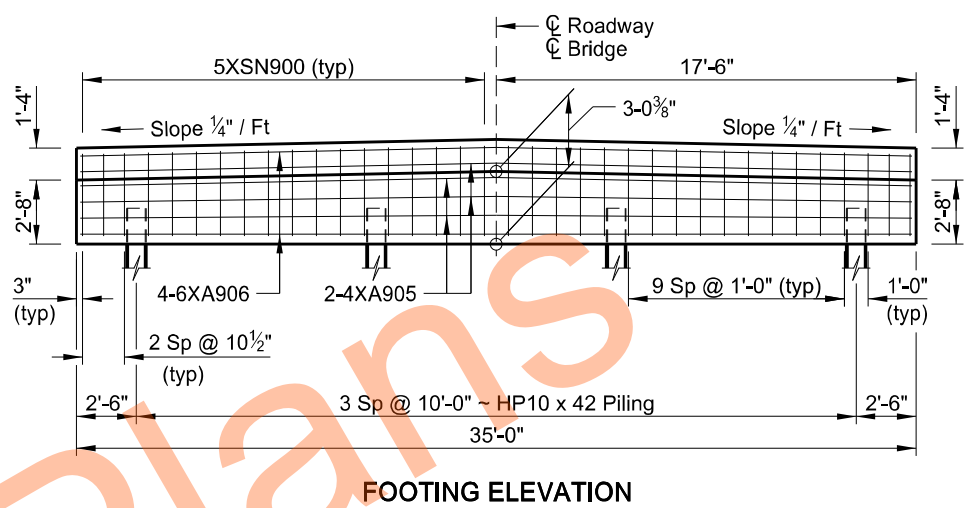
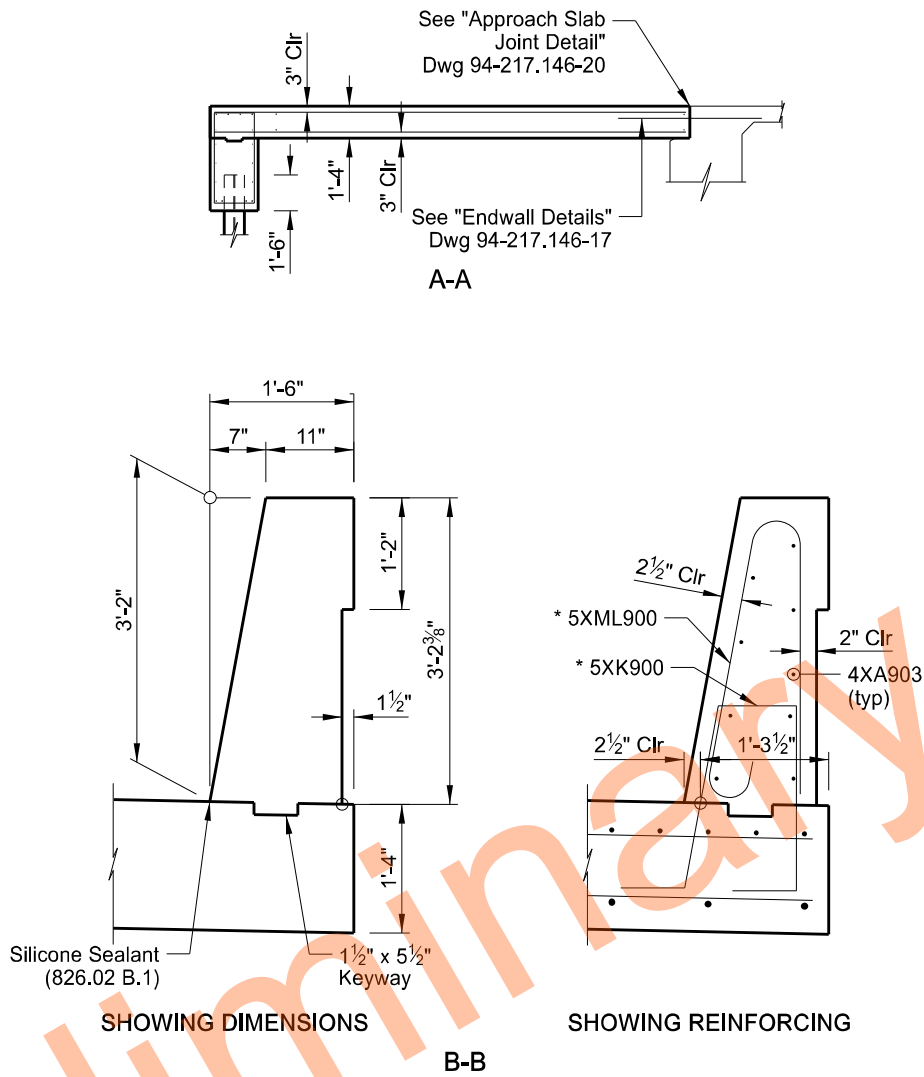
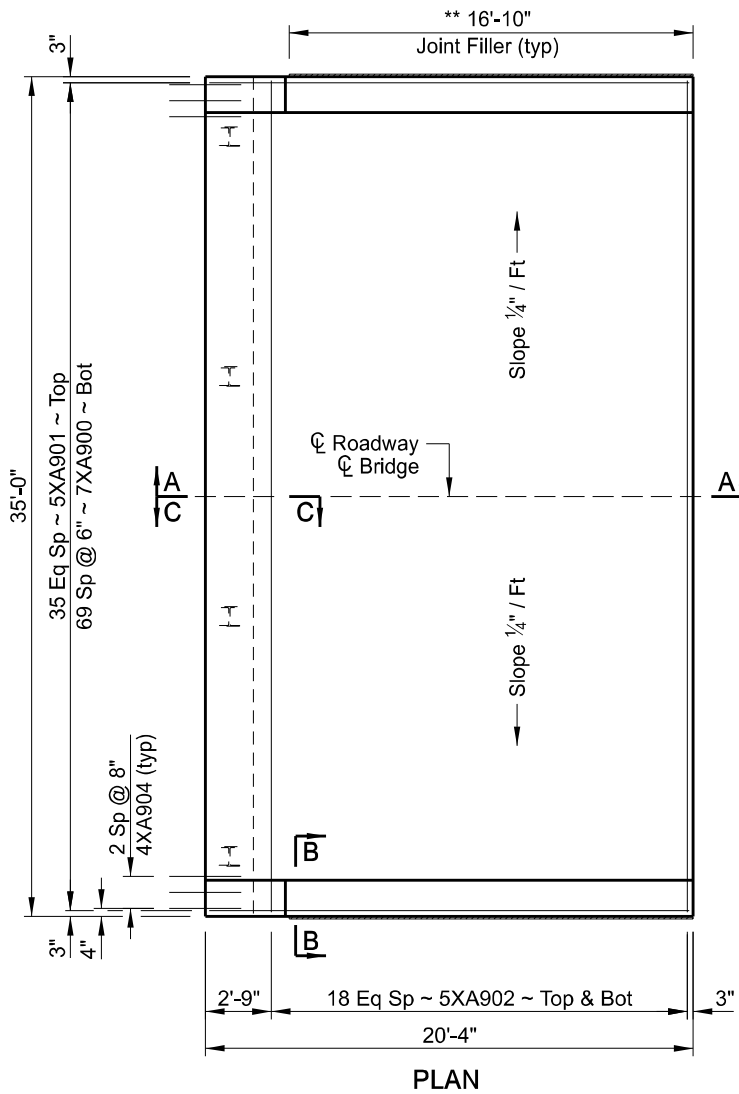
QUANTITIES	
BRIDGE DECK CONCRETE	298.6 CY
BRIDGE BARRIER CONCRETE	72.2 CY
REINFORCING STEEL (EPOXY)	70,103 LBS
I-94/PETTIBONE INTERCHANGE	
SLAB SECTION	
DRAWING NO.	94-217.146-18



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

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	170	19

** 1/2" x 16" Pref Exp Joint Filler
Place between approach
slab & abutment wing (typ).



QUANTITIES	
SEE DWG 94-217.146-20	
I-94/PETTIBONE INTERCHANGE	
APPROACH SLAB DETAILS	
DRAWING NO.	94-217.146-19

NOTES:

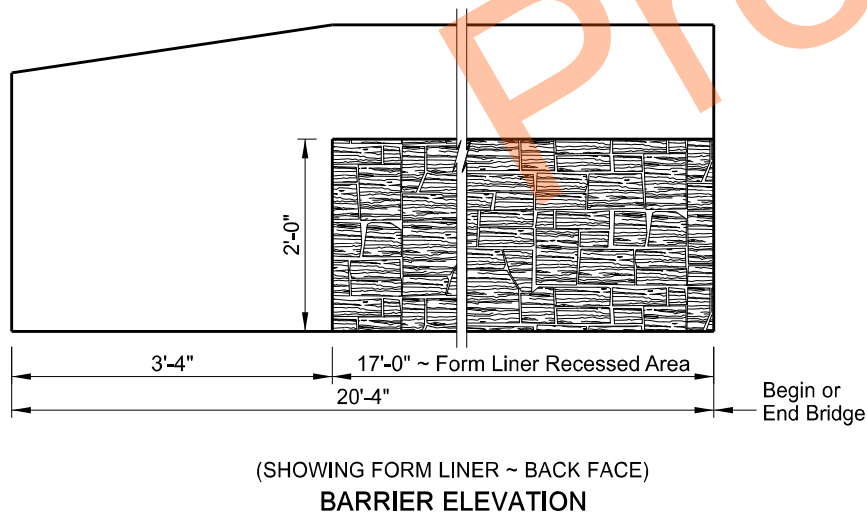
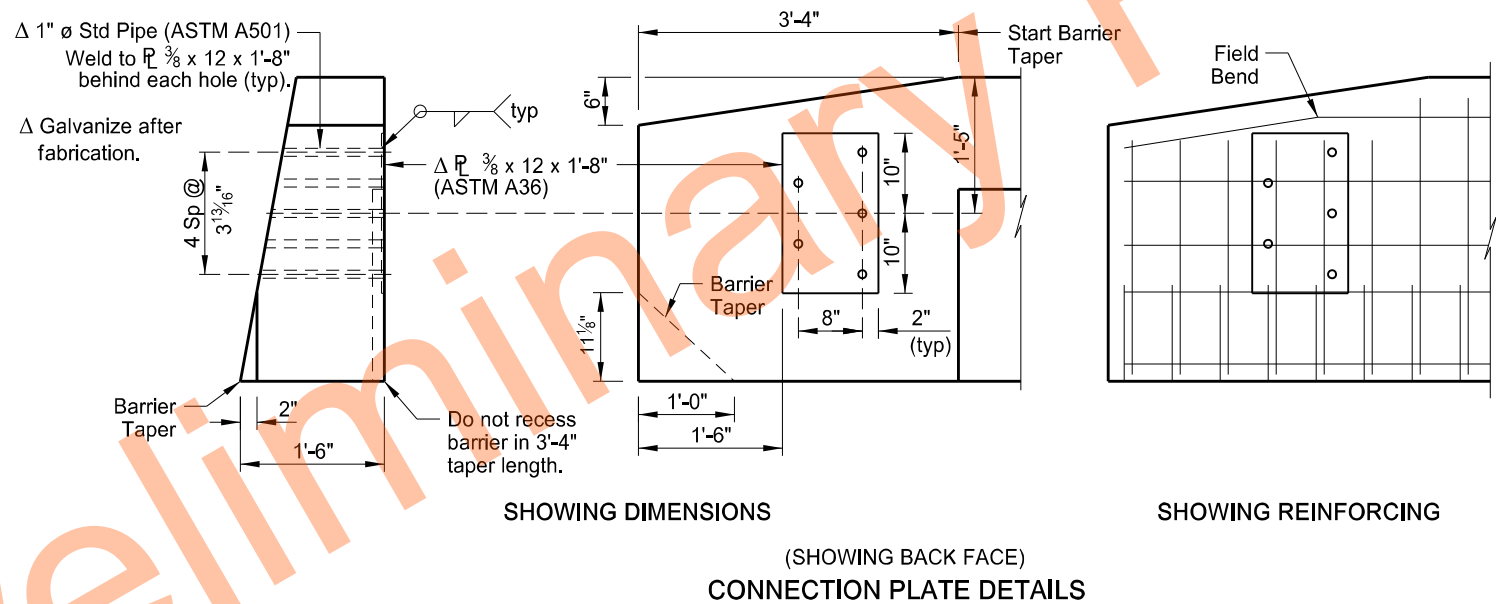
The estimated material quantities shown are for information purposes only. Include the concrete, reinforcing bars, polyethylene film, preformed joint filler, polystyrene, silicone sealant, connection plates and pipes, and labor required to build the approach slabs and barriers in the Approach Slab pay item. Use concrete that meets the requirements of Section 602. Provide grade 60 reinforcing steel that meets the requirements of Section 612. Use polyethylene film that meets the requirements of ASTM C171.

Diagram illustrating the cross-section of a PILE SUPPORTED APPROACH SLAB and BRIDGE connection.

Key components and dimensions shown:

- PILE SUPPORTED APPROACH SLAB** (Left side)
- BRIDGE** (Right side)
- Endwall Reinforcing** (Vertical reinforcement at the joint)
- Top of Slab** (Horizontal line indicating the top surface)
- Silicone Sealant (826.02 B.1)** (Applied to the joint)
- Leave joint sealer 0" to 1/8" below finished surface.** (Instruction for sealant placement)
- 1" Polystyrene** (Insulation layer at the joint)
- Polyethylene Film** (Barrier layer below the slab)
- 1'4"** (Overall height of the approach slab)
- 3/8"** (Dimension of the sealant application)
- 1"** (Dimension of the polystyrene insulation)
- 7"** (Dimension of the polystyrene insulation)
- 4"** (Dimension of the polystyrene insulation)
- 1"** (Dimension of the polystyrene insulation)
- 1/2" x 4" Pref Exp Jt Filler** (Prefabricated joint filler)
- 2 1/2" Wedge of Exp Jt Filler** (Wedge of expanded joint filler)

APPROACH SLAB JOINT DETAIL



QUANTITIES		(ONE SLAB)
APPROACH SLAB		79.1 SY
I-94/PETTIBONE INTERCHANGE APPROACH SLAB DETAILS		
DRAWING NO.	94-217.146-20	

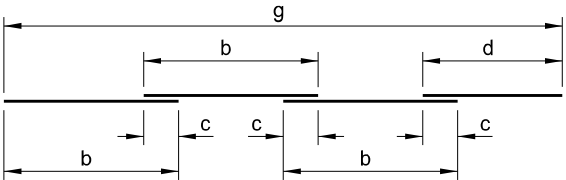
BILL OF REINFORCING STEEL, GRADE 60																							STATE	PROJECT NO.	SECTION NO.	SHEET NO.					
LETTER PREFIX OF BAR MARK DENOTES SHAPE ~ SEE BAR DETAILS																							ND	IM-2-094(186)217		170	23				
LOCATION	SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS								LOCATION	SIZE	MARK	NO. EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS													
					a	b	c	d	e	f	g	h	k							a	b	c	d	e	f	g	h	k			
APPROACH SLAB (ONE SLAB)	7	XA900	70	20'- 0"		20'- 0"																									
	5	XA901	36	20'- 0"		20'- 0"																									
	5	XA902	38	34'- 8"		34'- 8"																									
	4	XA903	18	20'- 0"		20'- 0"																									
	4	XA904	6	3'- 0"		3'- 0"																									
	4	XA905	8	34'- 8"		34'- 8"																									
	6	XA906	8	34'- 8"		34'- 8"																									
	5	XK900	82	6'- 6"	2'- 0"	10"				1'- 1"		10"	2.2	12																	
	5	XML900	68	6'- 7"	11"	2'- 7"	9"				2.375		2.2	12																	
	5	XML901	14	5'- 11"	11"	2'- 3"	9"				2.375		2.2	12																	
	5	XSN900	2	207'- 0"	1'- 8"	3'- 5"	6"	3'- 9"	17																						
		</																													

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	170	24

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

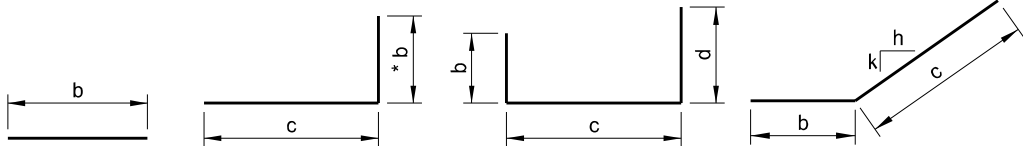
NOTES:

1. Verify the quantity, size, and shape of the bar reinforcement against the structure drawings and immediately notify the Engineer of any discrepancies. Discrepancies in the bar list will not be cause for adjustment of the contract unit price.
2. All dimensions are out to out of bars.
3. Nominal length of each bent bar or cut bar is the sum total of the detailing dimensions for that bar, unless otherwise noted.
4. Turn adjacent "AA" bars end for end so that the splice locations are staggered.
5. The "f" dimension indicates the inside radius unless otherwise noted.
6. An "X" preceding a bar designation indicates an epoxy coated bar.
7. Reinforcing steel bid items do not include bar list quantity of approach slab reinforcing steel. Include the approach slab bar list quantity in the approach slab pay items.



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

AA



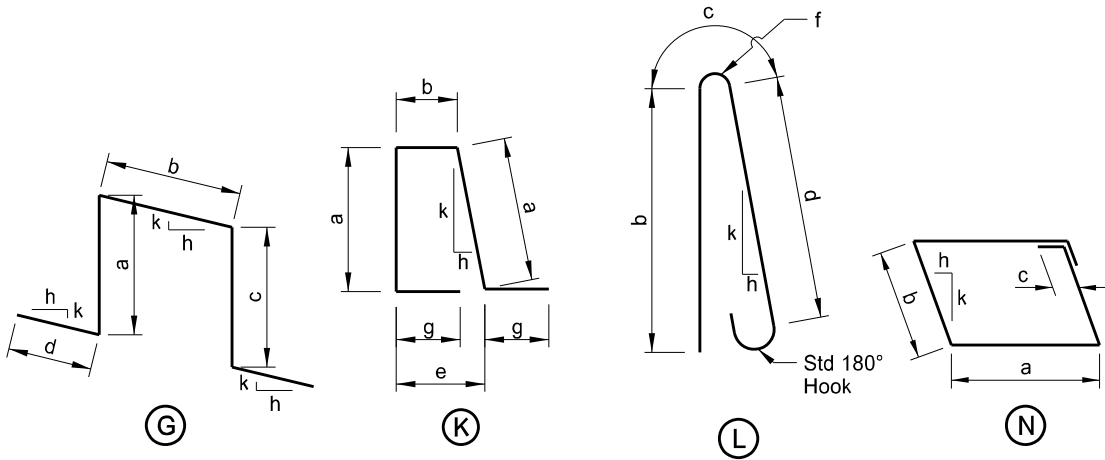
A

B

C

D

* b = Vertical Leg for
XB500 and XB501



E

F

G

H

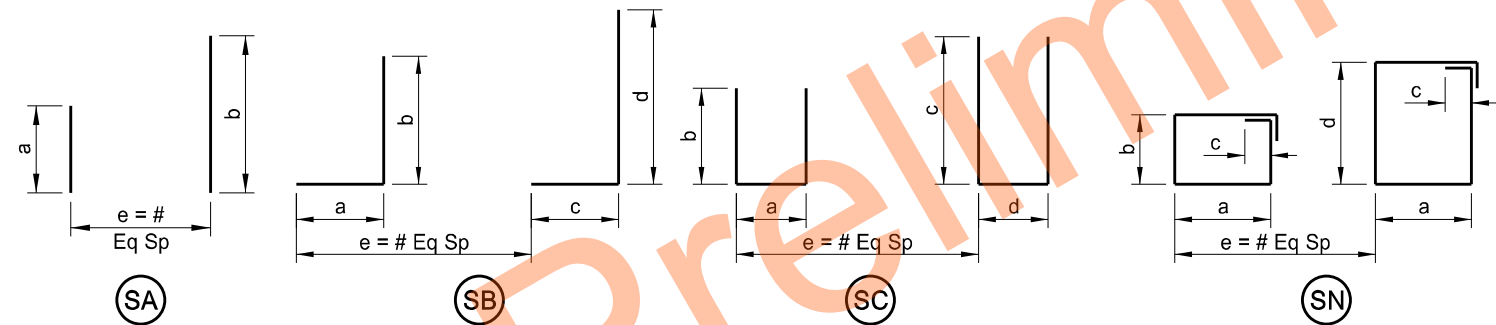
I

J

K

L

M



N

O

P

Q

R

S

T

U

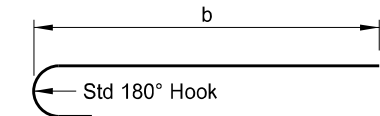
V

W

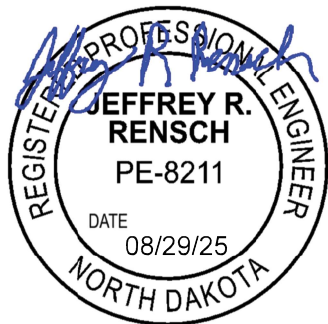
X

Y

Z



MA



I-94/PETTIBONE INTERCHANGE

REINFORCING BAR LIST

DRAWING NO. 94-217.146-24



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

LOG OF BORING SB - 1
PAGE 1 OF 1

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	175	1

PROJECT NUMBER IM-2-094(186)217 DATE STARTED 7/25/22 COMPLETED 7/25/22

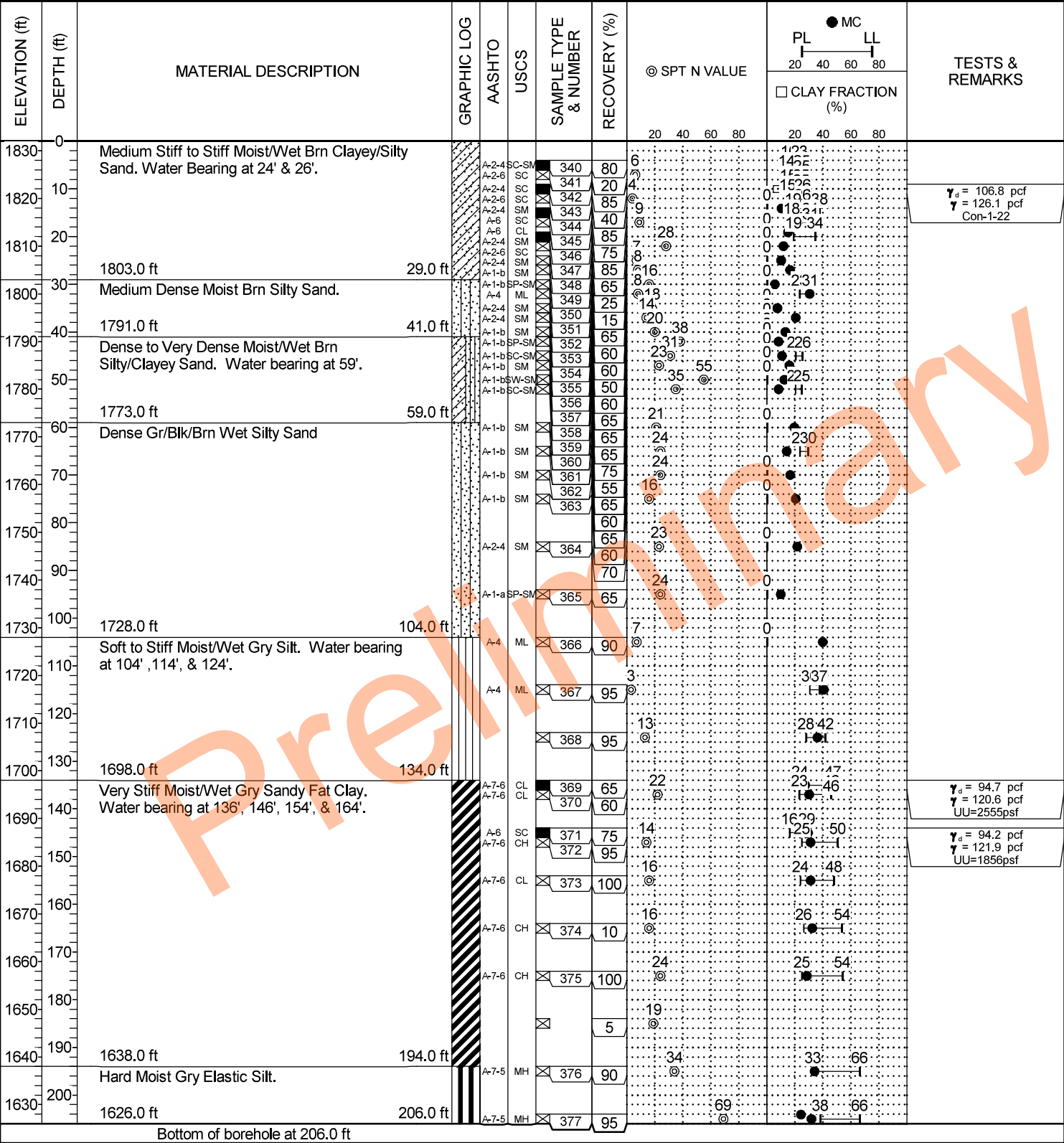
PCN 23444 ELEVATION 1832 ft

LOCATION Kidder County Northing 456283.06 ft Easting 5192031.29 ft

DRILLED BY Dallan LOGGED BY Jamie DRILLING METHOD

ENGINEER

NOTES North Abutment



Boring Log 1



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

LOG OF BORING SB - 2
PAGE 1 OF 1

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-2-094(186)217	175	2

PROJECT NUMBER IM-2-094(186)217 DATE STARTED 7/25/22 COMPLETED 7/25/22

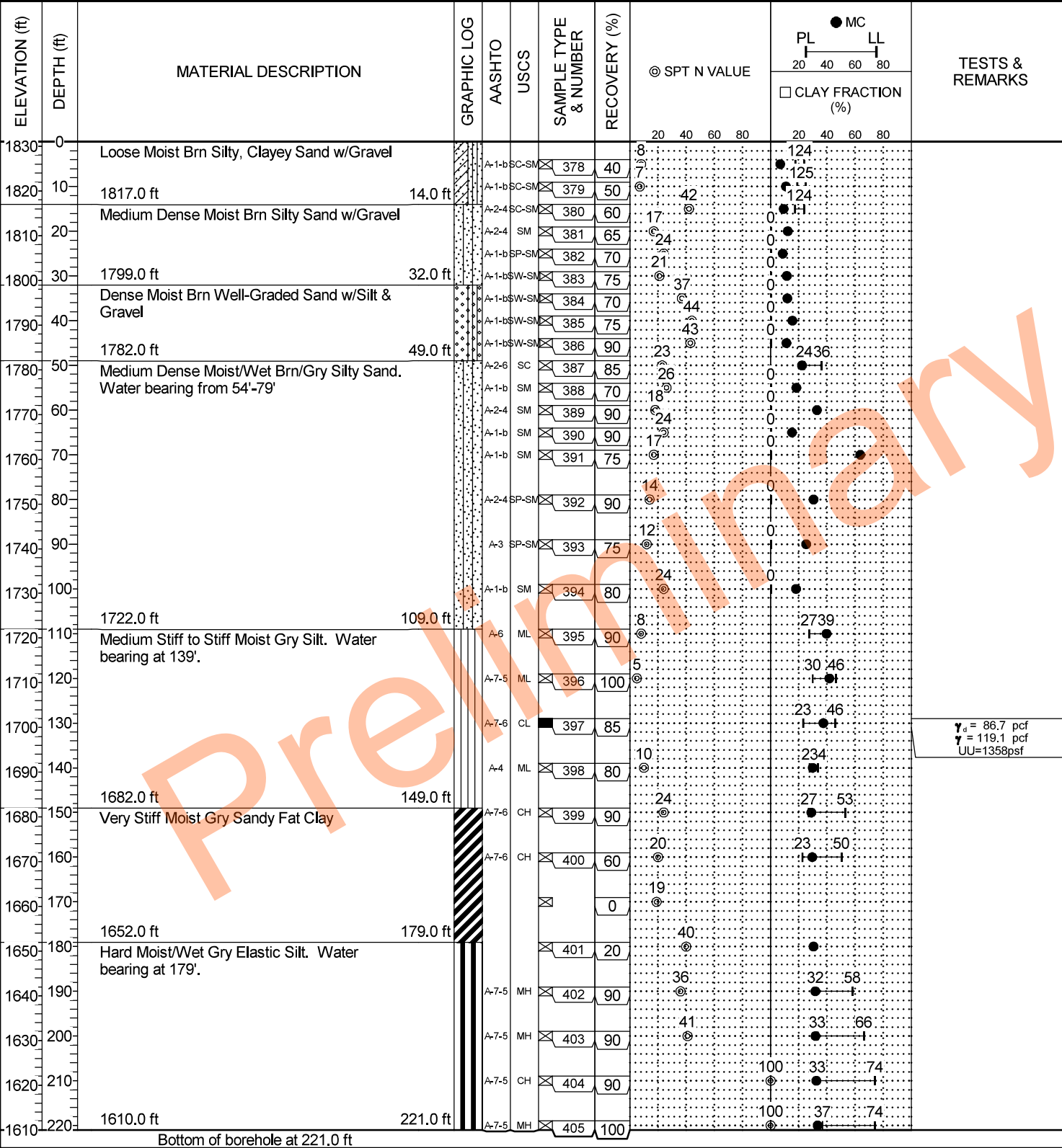
PCN 23444 ELEVATION 1831 ft

LOCATION Kidder County Northing 456276.35 ft Easting 5191961.60 ft

DRILLED BY Dallan LOGGED BY Jamie DRILLING METHOD

ENGINEER

NOTES South Abutment



Boring Log 2

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	200	1



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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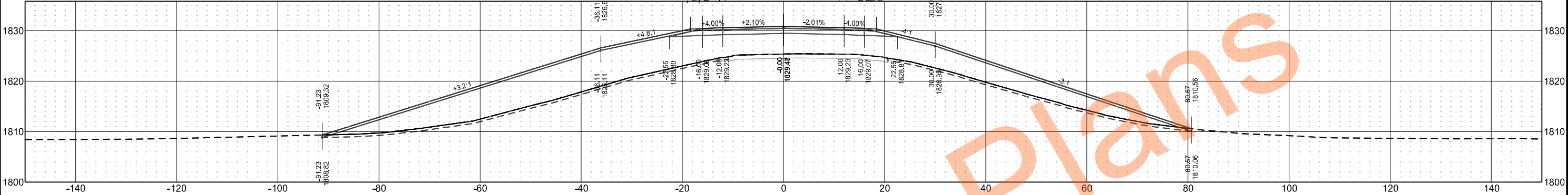
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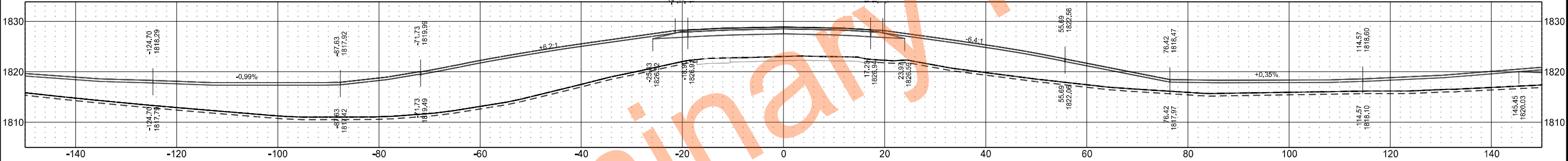
I94/Pettibone Interchange
Cross Sections
42nd Ave (OFL Align)

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	200	4

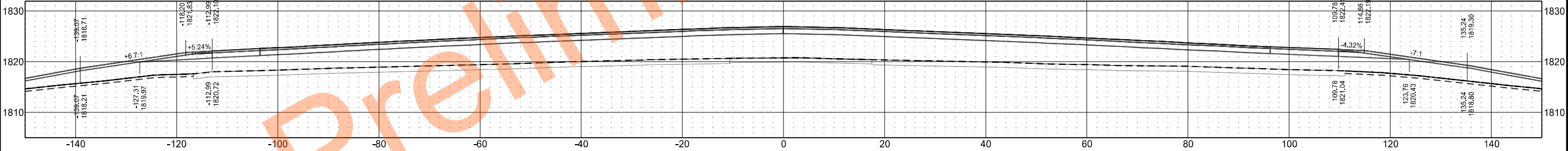
Sta 449+50.00



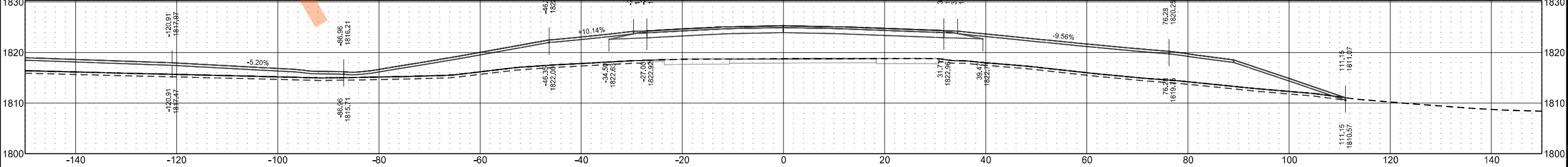
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Sta 448+50.00



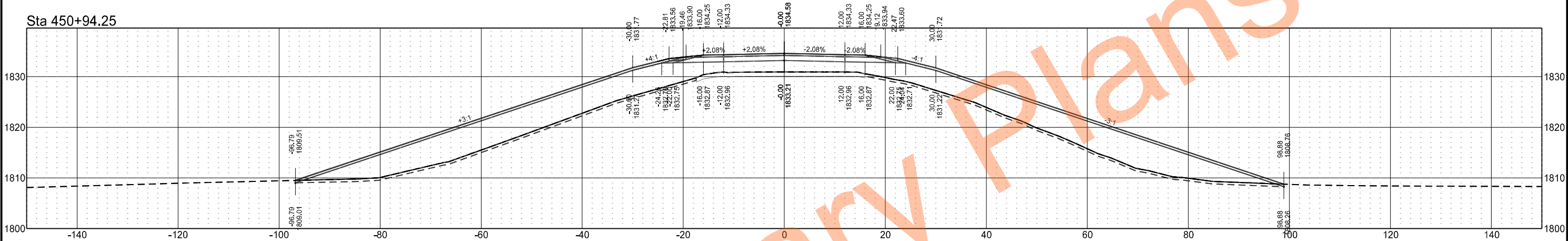
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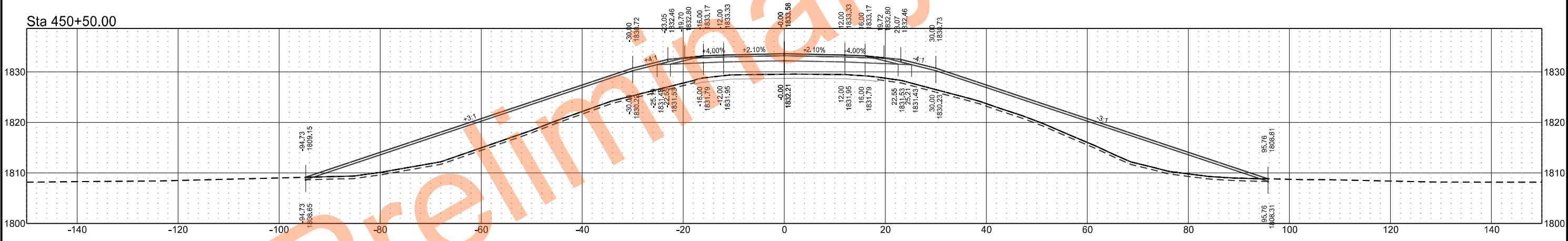
I94/Pettibone Interchange
Cross Sections
42nd Ave (OFL Align)

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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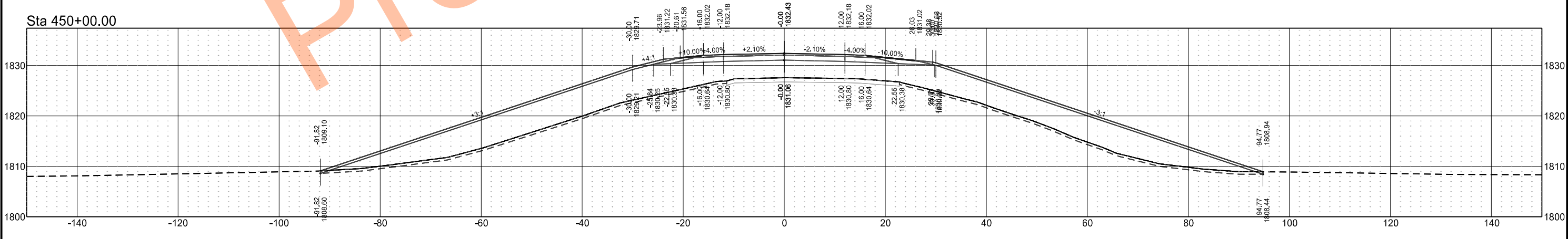
Sta 450+94.25



Sta 450+50.00



Sta 450+00.00



I94/Pettibone Interchange
Cross Sections
NE Ramp

STATE

PROJECT NO.

SECTION NO.

SHEET NO.

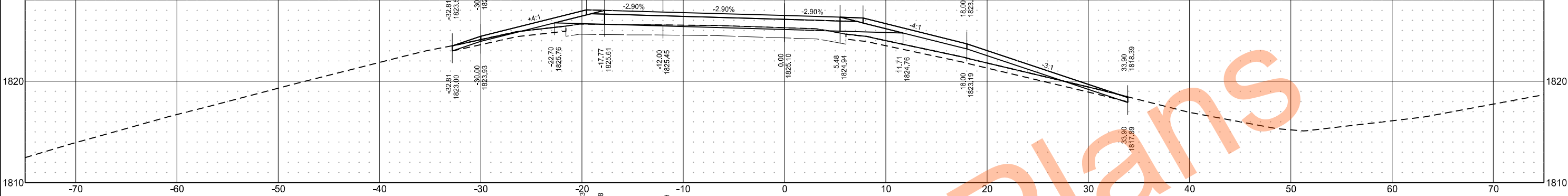
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IM-2-094(186)217

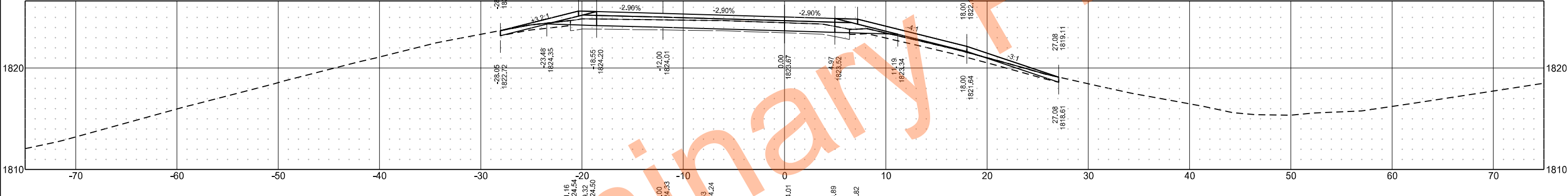
200

6

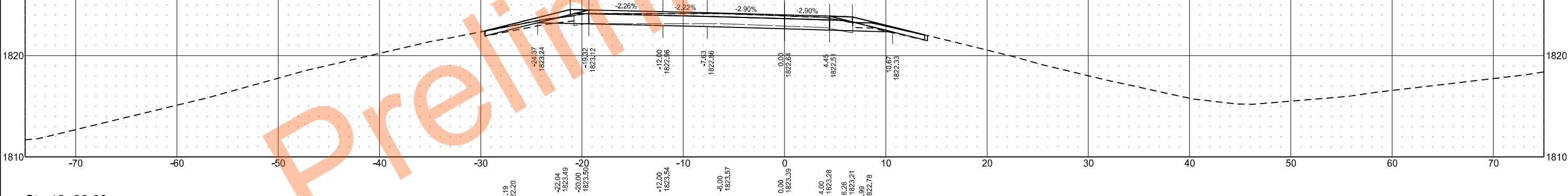
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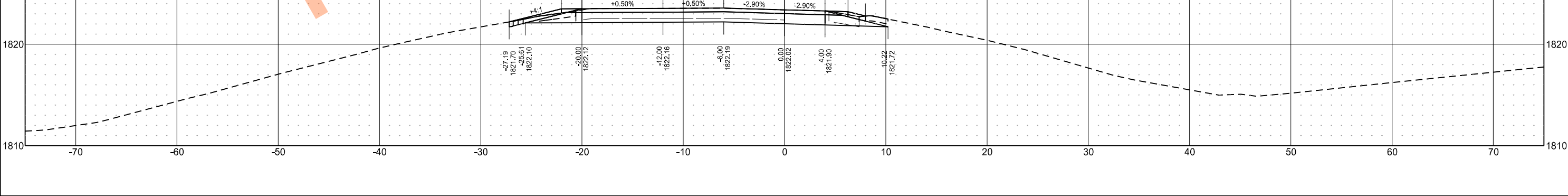
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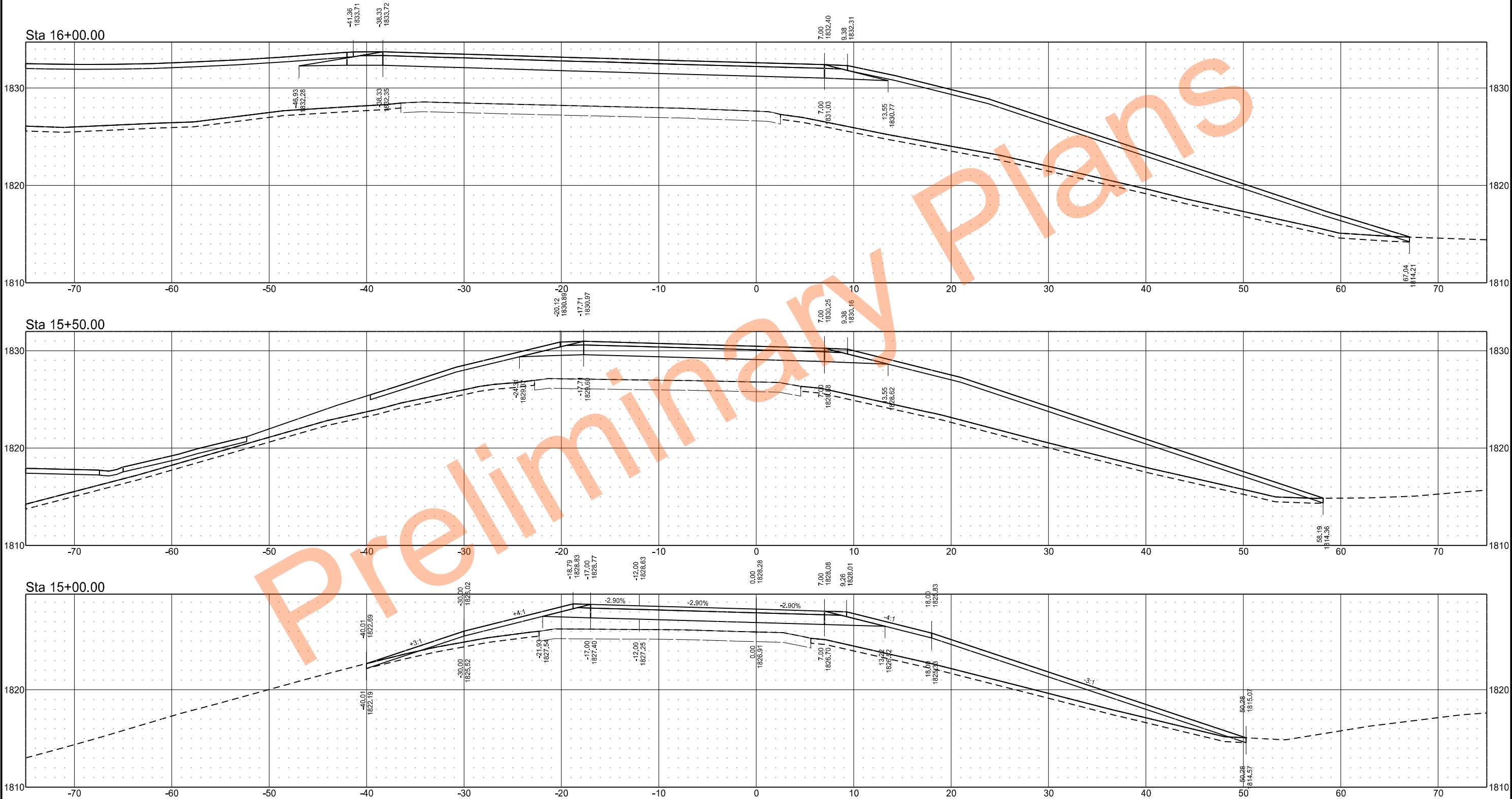


Sta 13+06.09



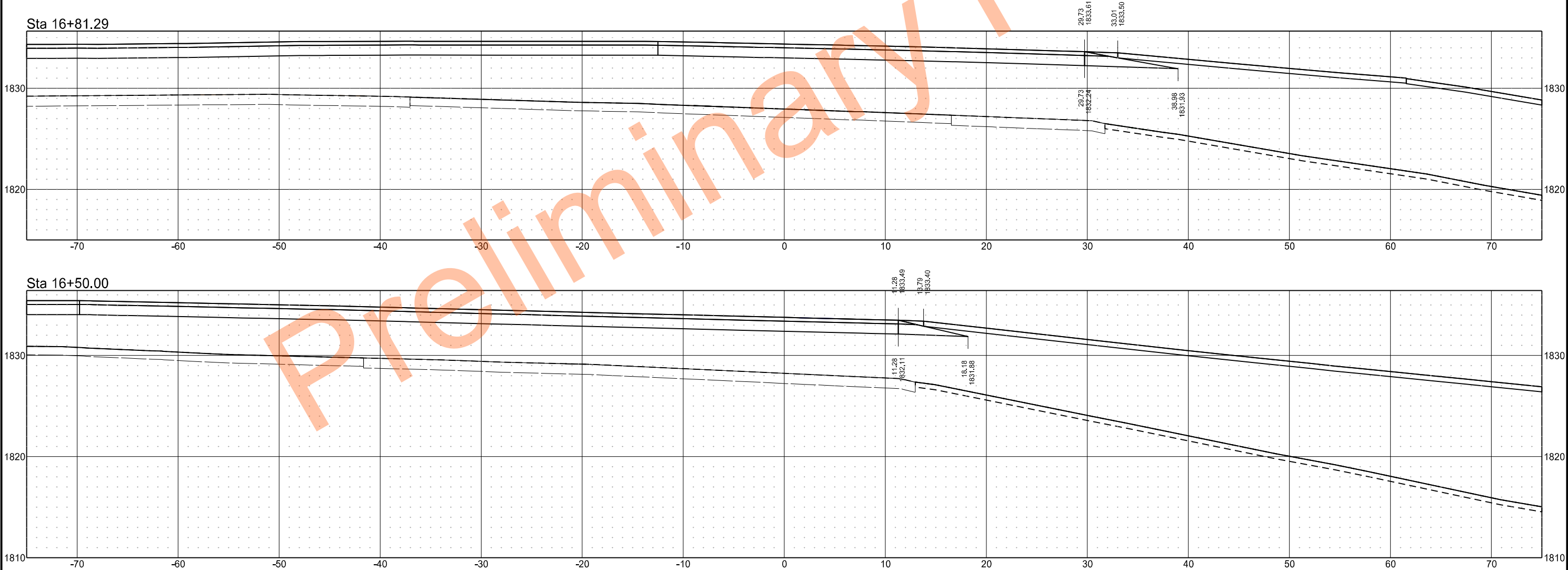
I94/Pettibone Interchange
Cross Sections
NE Ramp

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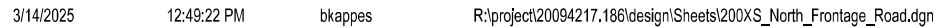


I94/Pettibone Interchange
Cross Sections
NE Ramp

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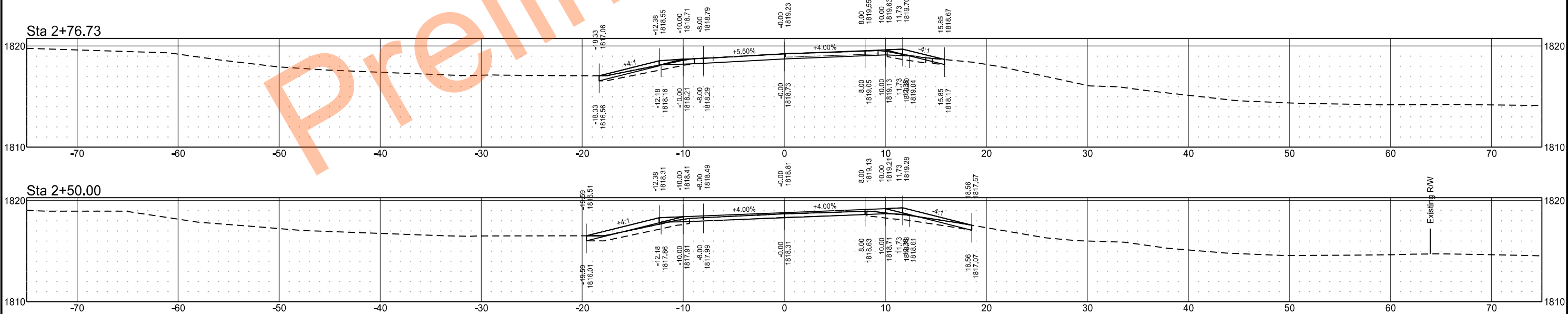


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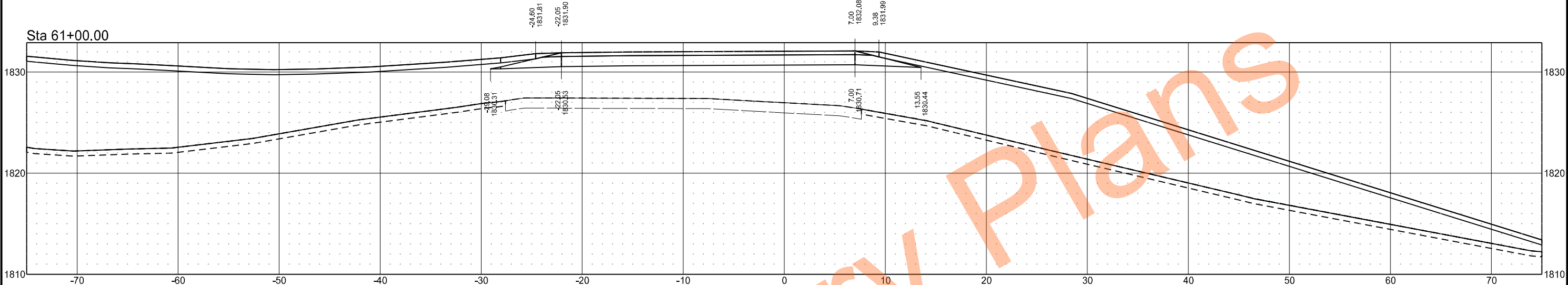
I94/Pettibone Interchange
Cross Sections
North Frontage Road

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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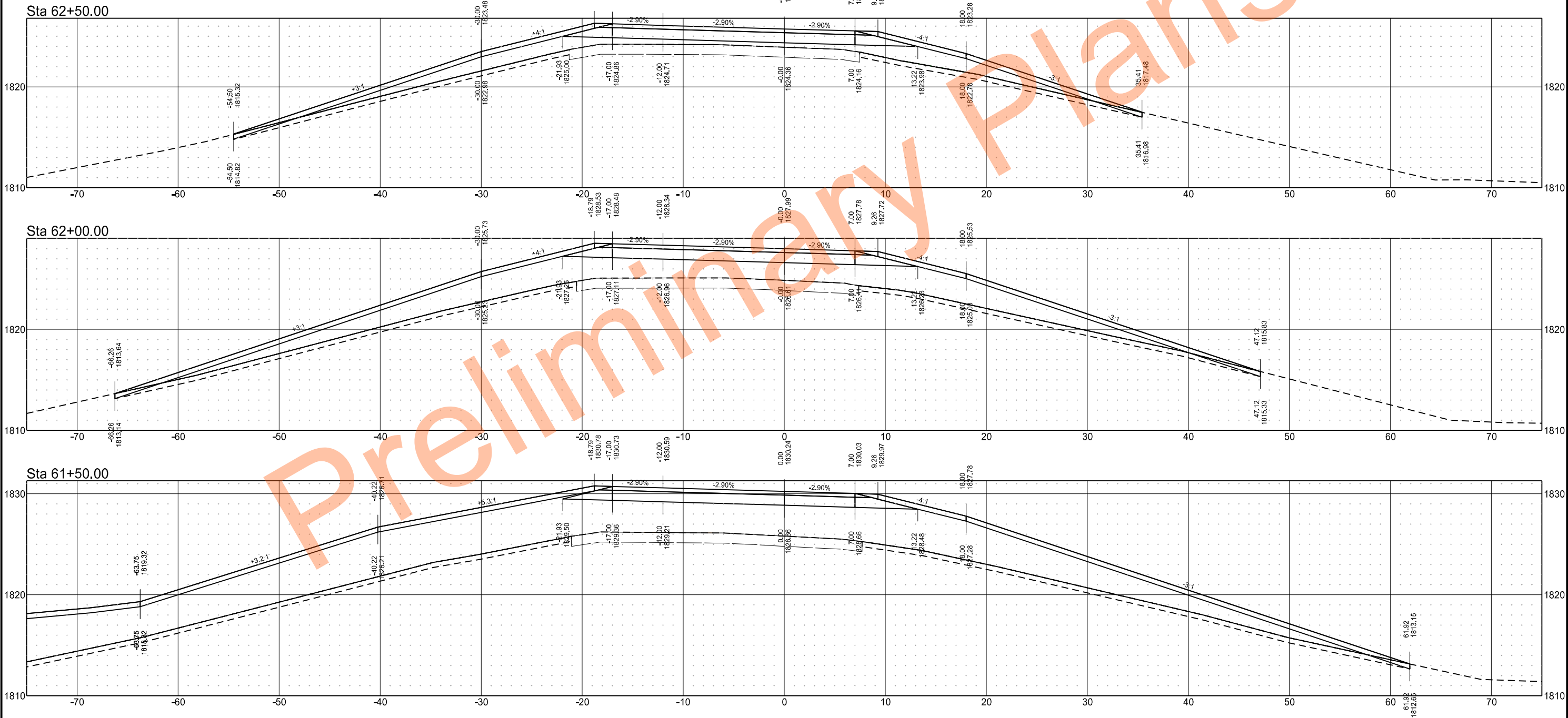
I94/Pettibone Interchange
Cross Sections
NW Ramp

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	200	11



I94/Pettibone Interchange
Cross Sections
NW Ramp

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	200	12



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	200	13



I94/Pettibone Interchange
Cross Sections
SE Ramp

STATE

PROJECT NO.

SECTION NO.

SHEET NO.

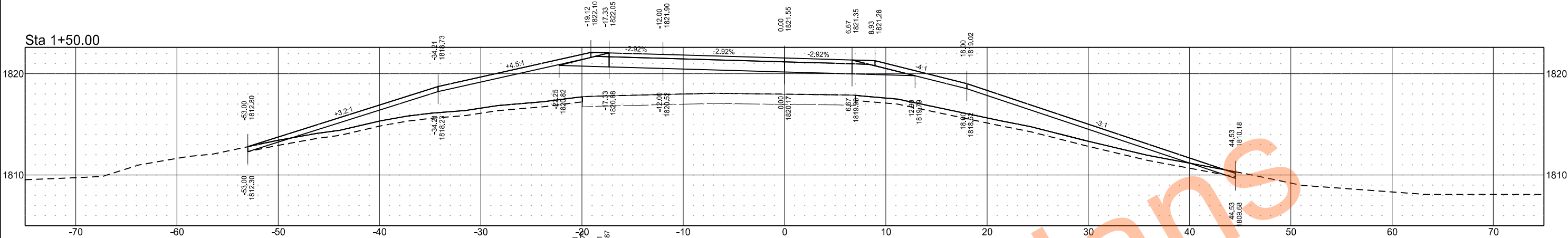
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IM-2-094(186)217

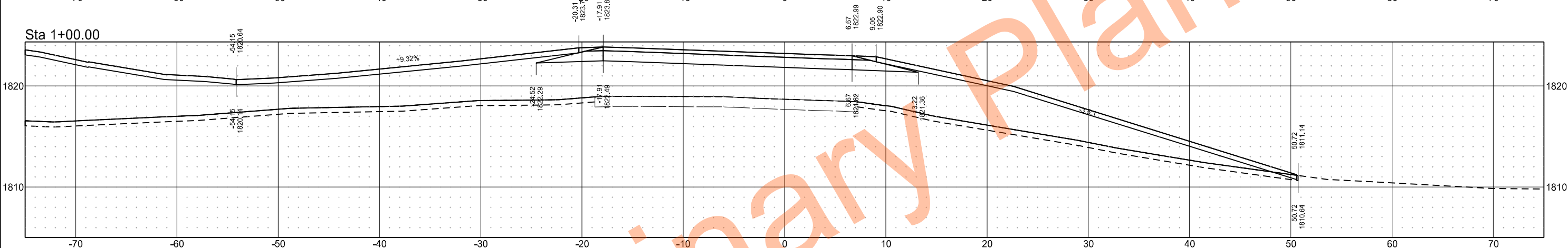
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14

Sta 1+50.00



Sta 1+00.00

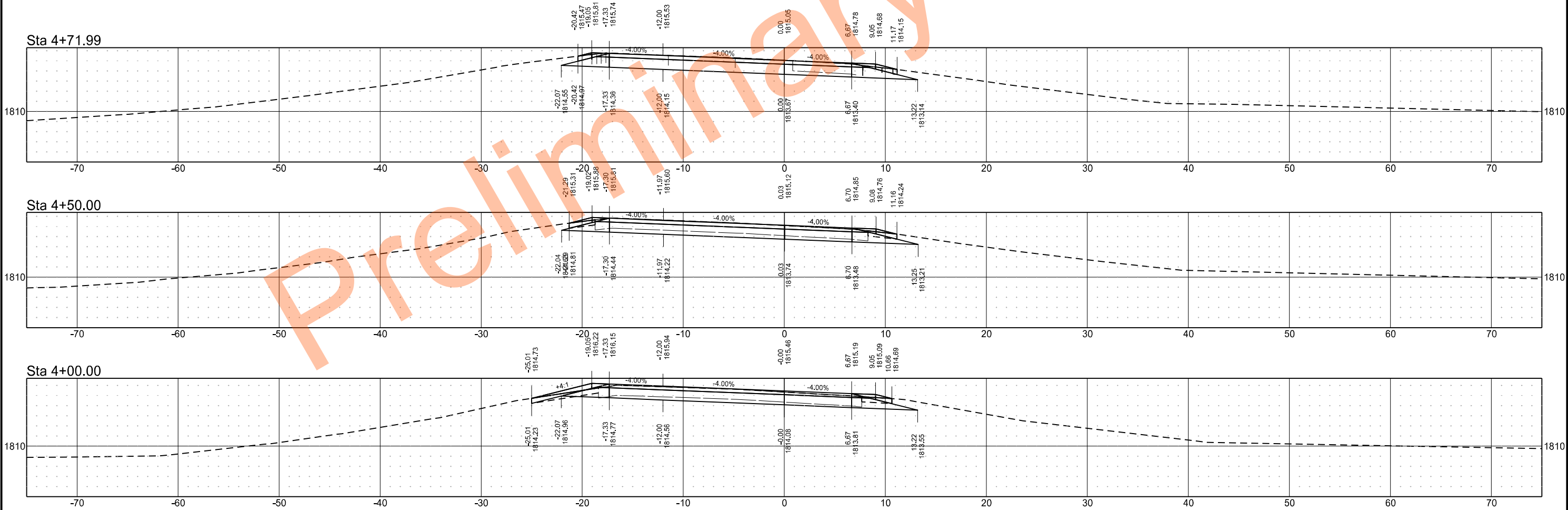


	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	200	15



I94/Pettibone Interchange
Cross Sections
SE Ramp

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	200	16



I94/Pettibone Interchange
Cross Sections
South Frontage Road

STATE

PROJECT NO.

SECTION NO.

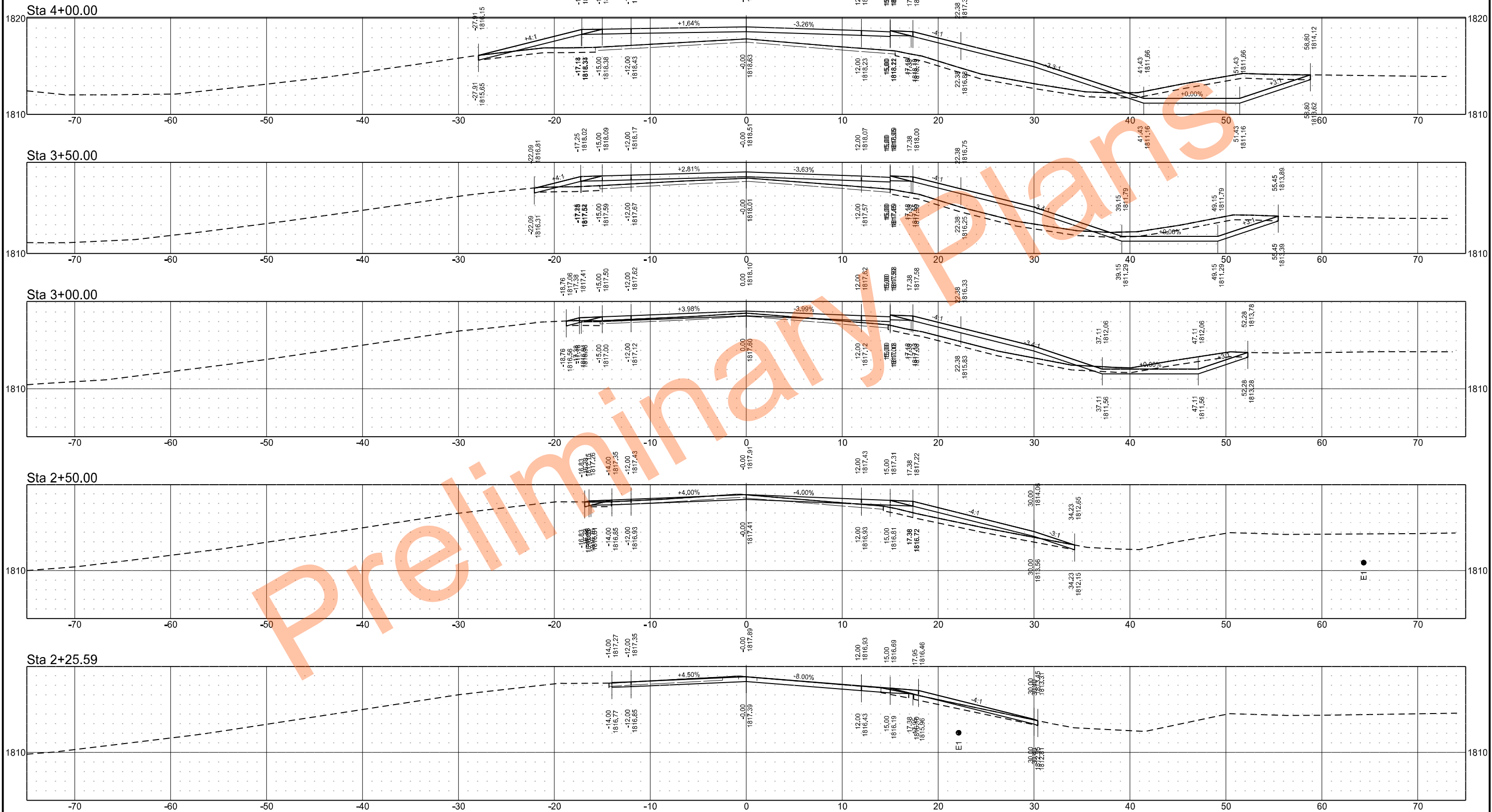
SHEET NO.

ND

IM-2-094(186)217

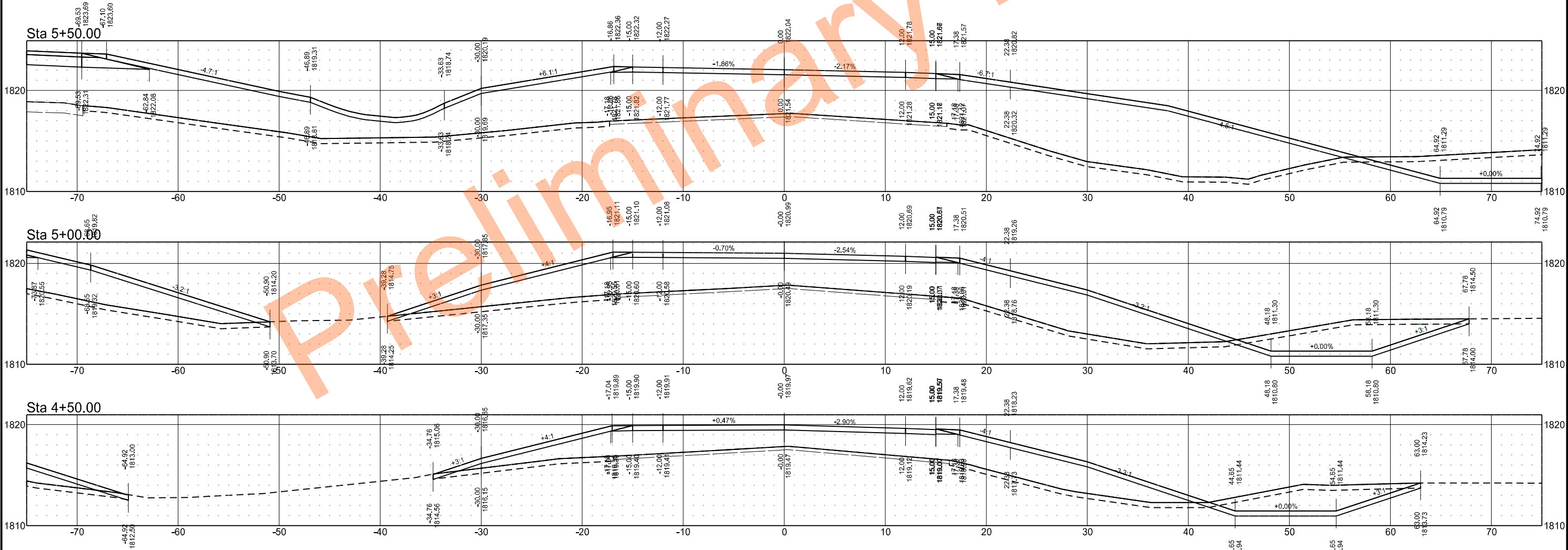
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17



I94/Pettibone Interchange
Cross Sections
South Frontage Road

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	200	18



I94/Pettibone Interchange
Cross Sections
South Frontage Road

STATE

PROJECT NO.

SECTION NO.

SHEET NO.

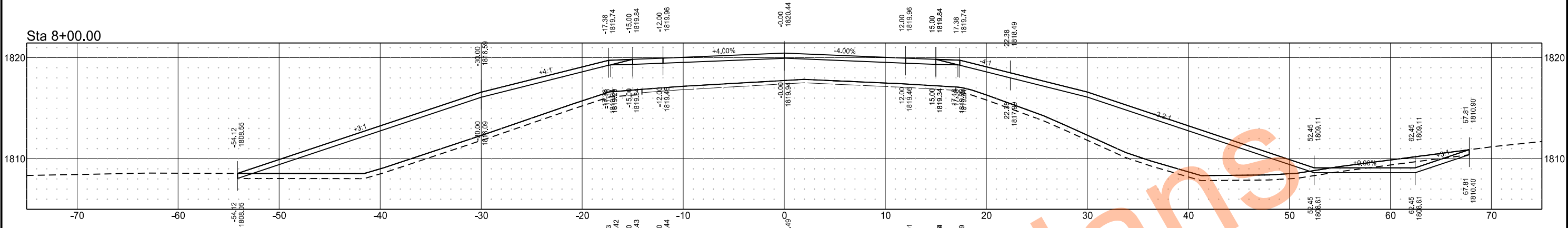
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IM-2-094(186)217

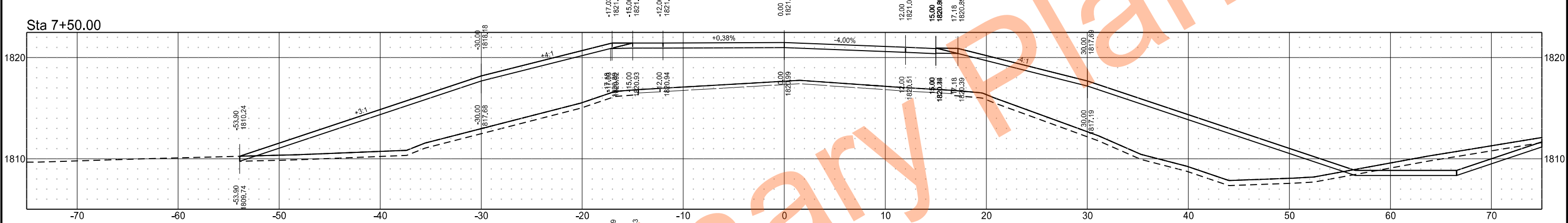
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19

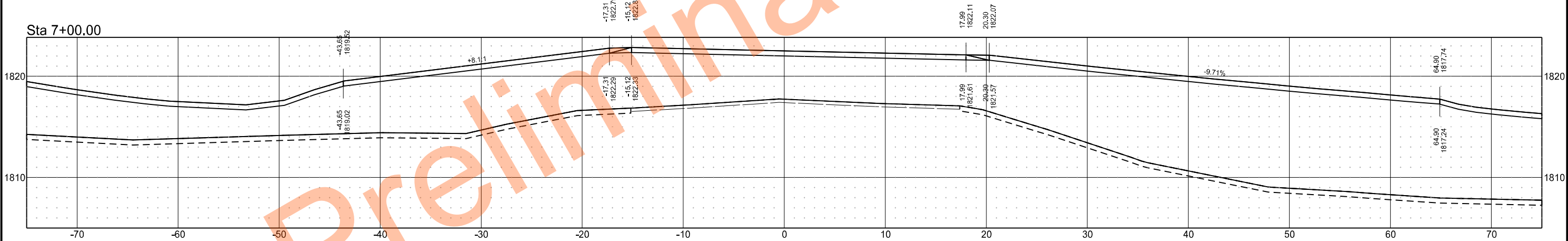
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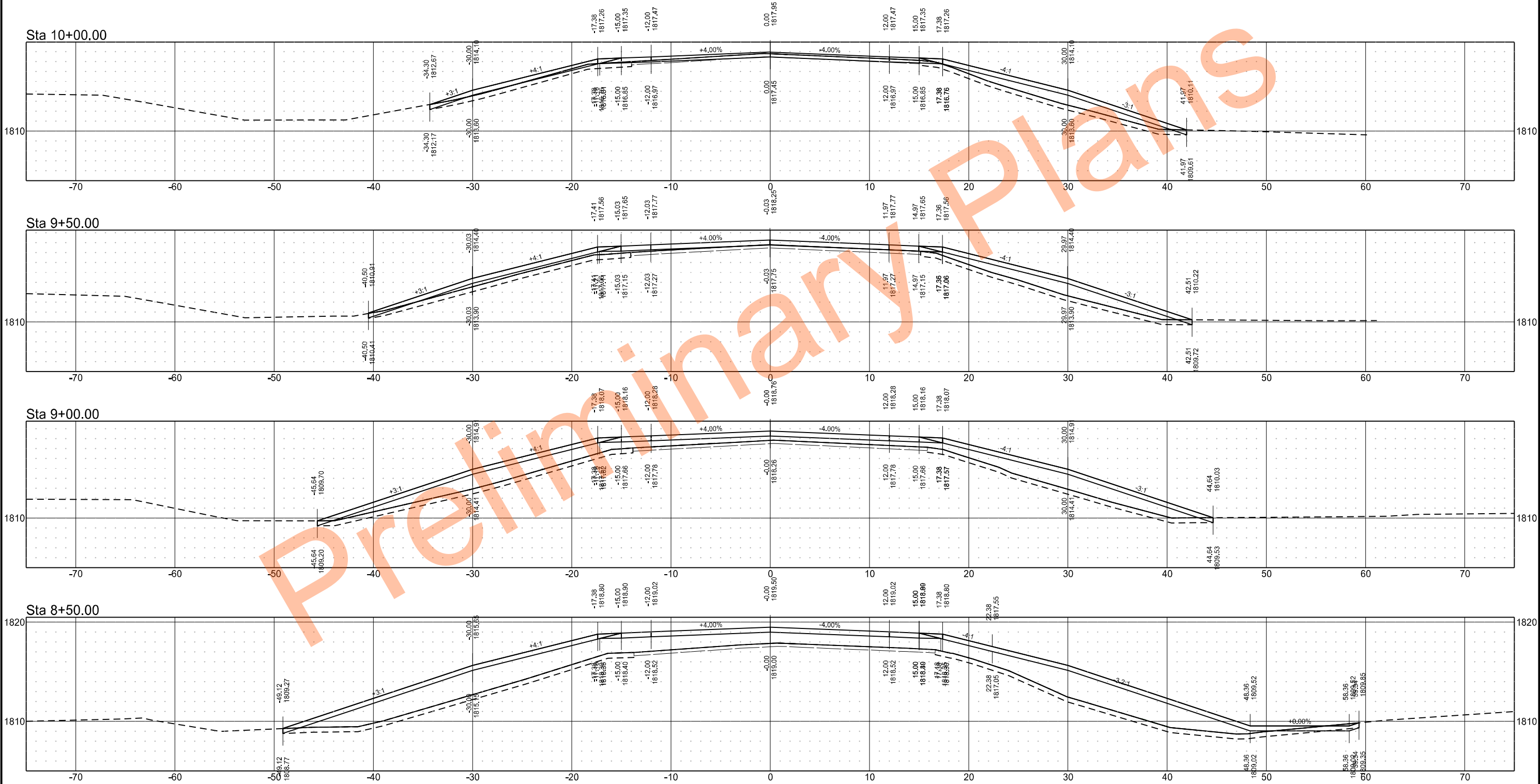


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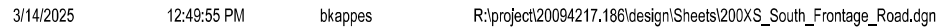


I94/Pettibone Interchange
Cross Sections
South Frontage Road

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	200	20



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	200	21



I94/Pettibone Interchange
Cross Sections
SW Ramp

STATE

PROJECT NO.

SECTION NO.

SHEET NO.

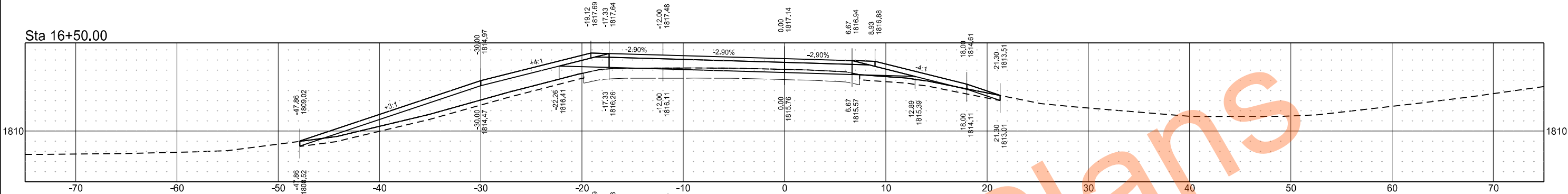
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IM-2-094(186)217

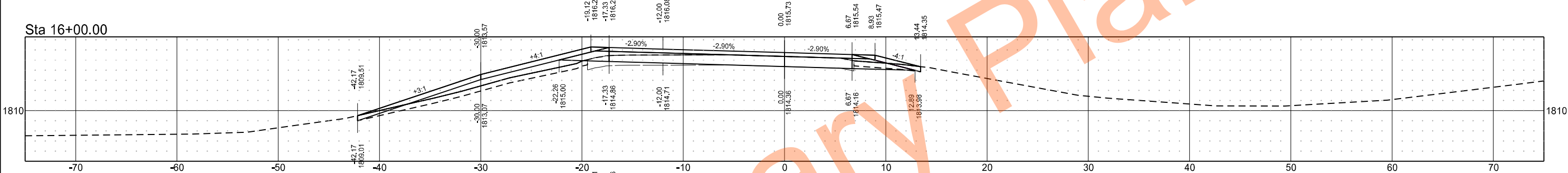
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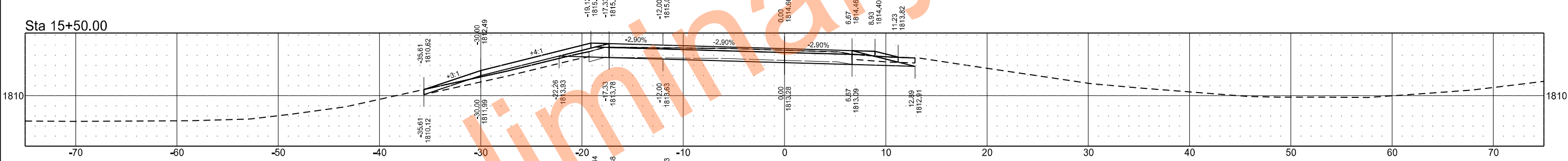
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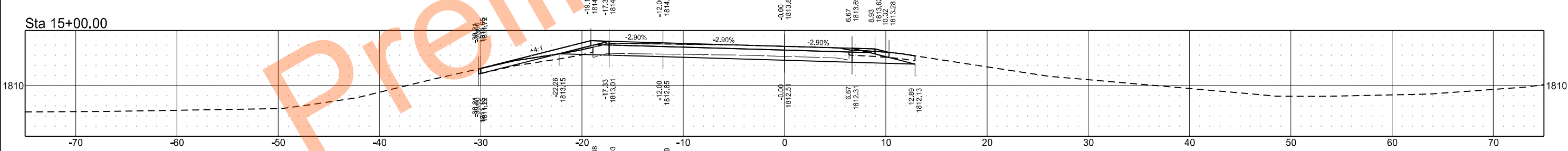
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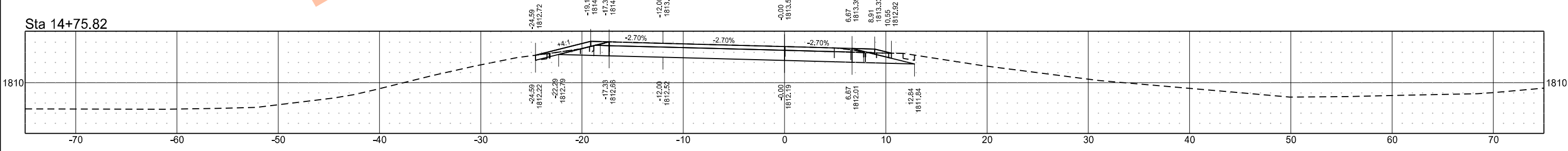
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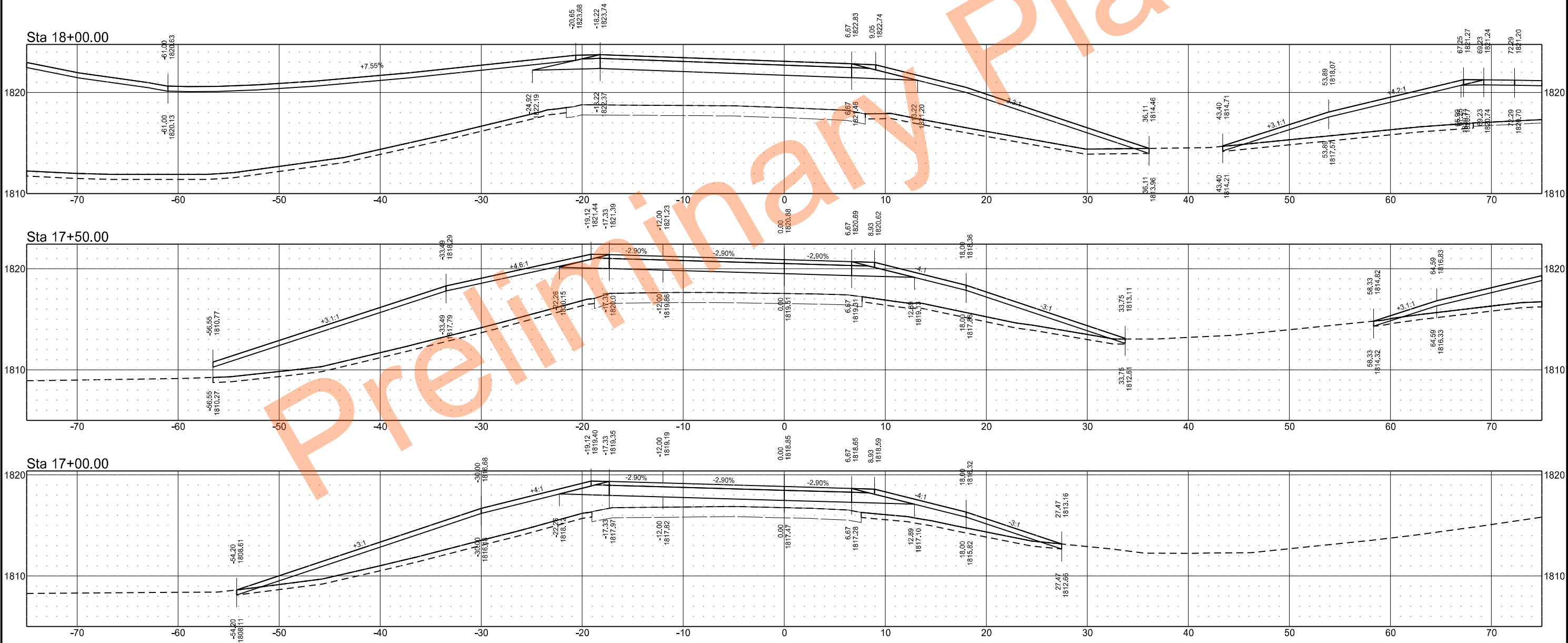


Sta 14+75.82



I94/Pettibone Interchange
Cross Sections
SW Ramp

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-2-094(186)217	200	23



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
Crm crown

Culv culvert
C&G curb & gutter
CI curb inlet
CR curb ramp
C cut

Dd Ld dead load
Defl deflection
Defm deformed
DInt delineate
DIntr 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
EVSE electric vehicle supply equipment
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

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NDDOT ABBREVIATIONS

D-101-3

Salv	salvage(d)	Tel	telephone
San	sanitary sewer line	Tel B	Telephone Booth
Sec	section	Tel P	telephone pole
SL	section line	Tv	television
Sep	separation	Temp	temperature
Seq	sequence	Temp	temporary
Serv	service	TBM	temporary bench mark
Sht	sheet	T	thinwall tube sample
Shtng	sheeting	Ts	topsoil
Shldr	shoulder	Traf	traffic
Sw or Sdwk	sidewalk	TSCB	traffic signal control box
SD	sight distance	Tr	trail
SN	sign number	Transf	transformer
Sig	signal	Trans	transition
Sgl	single	TT	transmission tower
SRCP	slotted reinforced concrete pipe	TES	traversable end section
SC	slow curing	Trans	transverse
SS	slow setting	Trtd	treated
Sm	small	Trmt	treatment
S	South	Qc	triaxial compression
SE	Southeast	TERO	tribal employment rights ordinance
SW	Southwest	Tpl	triple
SB	Southbound	Typ	typical
Sp	spaces		
Spcl	special	Qu	unconfined compressive strength
SA	special assembly	Ugrnd	underground
SP	special provisions	Util	utility
G	specific gravity		
Spk	spike	VG	valley gutter
SB	split barrel sample	Vap	vapor
SH	sprinkler head	Vert	vertical
SV	sprinkler valve	VCP	vitrified clay pipe
Sq	square	Vol	volume
Stk	stake	VSFS	vehicle speed feedback sign
Std	standard		
N	standard penetration test	Wkwy	walkway
Std Specs	standard specifications	W	water content
Stm L	steam line	WGV	water gate valve
SEC	steel encased concrete	WL	water line
SMA	stone matrix asphalt	WM	water main
SSD	stopping sight distance	WMV	water main valve
SD	storm drain	W Mtr	water meter
St	street	WSV	water service valve
SPP	structural plate pipe	WW	water well
SPPA	structural plate pipe arch	Wrng	wearing
Str	structure	WIM	weigh in motion
Subd	subdivision	W	west
Sub	subgrade	WB	westbound
Sub Prep	subgrade preparation	Wrng	wiring
Ss	subsoil	W/	with
SS	supplement specification	W/o	without
Supp	supplemental		
Surf	surfacing		
Surv	survey		
Sym	symmetrical		

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NDDOT ABBREVIATIONS

D-101-4

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
CC	closing corner
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
MC	meander corner
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
SC	standard corner
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
WC	witness corner
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

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

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

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LINE STYLES

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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

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LINE STYLES

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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)
	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
	Geogrid
	Geotextile Fabric Type R
	Geotextile Fabric Type R1
	Geotextile Fabric Type RR
	Geotextile Fabric Type S

Subgrade Reinforcement

Failure Line

Countours

	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
	Silt Fence
	Excavation Limits
	Fiber Rolls

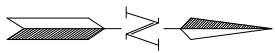
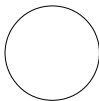
Environmental

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

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SYMBOLS

D-101-30

	North Arrow (Half Scale)		Existing Bush or Shrub		Continuous Split Barrel Sample
	Alignment Data Point		Existing Large Evergreen Tree		Flight Auger Sample
	Alignment Monument		Existing Small Evergreen Tree		Split Barrel Sample
	Spot Elevation		Existing Large Tree		Thinwall Tube Sample
	Existing Miscellaneous Spot		Existing Small Tree		Standard Penetration Test
	Existing Access Control Arrow		Existing Tree Trunk		Inclinometer Tube
	Existing Benchmark		Cairn or Stone Circle		Excavation Unit
	Reset USGS Marker		Existing Artifact		Existing Ground Water Well Bore Hole
	Iron Monument Found		Existing Satellite Dish		
	Iron Pin R/W Monument		Existing Weather Station		
	Property Corner		Existing Windmill or Tower		
	Iron Pin Reference Monument		Reinforced Pavement		
	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				

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SYMBOLS

D-101-31

	Flexible Delineator		Highway Sign (Exst, Ppsd)
	Flexible Delineator Type A (Exst, Ppsd)		Mile Post Type A (Exst-Ppsd-Reset)
	Flexible Delineator Type B (Exst, Ppsd)		Mile Post Type B (Exst, Ppsd)
	Flexible Delineator Type C (Exst, Ppsd)		Mile Post Type C (Exst, Ppsd)
	Flexible Delineator Type D (Exst, Ppsd)		Object Marker Type I (Exst, Ppsd)
	Flexible Delineator Type E (Exst, Ppsd)		Object Marker Type II (Exst, Ppsd)
	Delineator Type A (Exst, Ppsd, Diamond Grade-Reset)		Object Marker Type III (Exst, Ppsd)
	Delineator Type B (Exst, Ppsd, Diamond Grade-Reset)		Existing Reference Marker
	Delineator Type C (Exst, Ppsd, Diamond Grade)		Road Closure Gate 18 Ft (Exst, Ppsd)
	Delineator Type D (Exst, Ppsd, Diamond Grade)		Road Closure Gate 28 Ft (Exst, Ppsd)
	Delineator Type E (Exst, Ppsd, Diamond Grade)		Road Closure Gate 40 Ft (Exst, Ppsd)
	Barricade (Type I, Type II, Type III)		Existing Railroad Battery Box
	Arrow Panel (Caution Mode, Double Direction, Left Directional, Right Directional, Sequencing, Truck Mounted)		Existing RR Profile Spot
	Attenuation Device		Existing Railroad Crossbuck
	Truck Mounted Attenuator		Existing Railroad Frog
	Delineator Drums		Existing Mailbox (Private, Federal)
	Flagger		
	Tubular Marker		
	Traffic Cone		
	Back to Back Vertical Panel Sign		

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SYMBOLS

D-101-32

	Existing Luminaire		High Mast Light Standard 3 Luminaire (Exst, Ppsd)		Existing Traffic Signal Standard
	Luminaire LED		High Mast Light Standard 4 Luminaire (Exst, Ppsd)		Pull Box (Exst-Ppsd-Undefined)
	Existing Light Standard Luminaire		High Mast Light Standard 5 Luminaire (Exst, Ppsd)		Intelligent Transportation Pull Box (Exst, Ppsd)
	Relocate Light Standard		High Mast Light Standard 6 Luminaire (Exst, Ppsd)		Transformer (Exst, Ppsd)
	Light Standard Light LED Luminaire		High Mast Light Standard 7 Luminaire (Exst, Ppsd)		Power Pole (Exst-Ppsd-with Transformer)
	Light Standard 35 Watt High Pressure Sodium Vapor Luminaire		High Mast Light Standard 8 Luminaire (Exst, Ppsd)		Wood Pole (Exst, Ppsd)
	Light Standard 50 Watt High Pressure Sodium Vapor Luminaire		High Mast Light Standard 9 Luminaire (Exst, Ppsd)		Pedestrian Push Button Post (Exst, Ppsd)
	Light Standard 70 Watt High Pressure Sodium Vapor Luminaire		High Mast Light Standard 10 Luminaire (Exst, Ppsd)		Existing Pole
	Light Standard 100 Watt High Pressure Sodium Vapor Luminaire		Overhead Sign Structure Load Center (Exst, Ppsd)		Existing Telephone Pole
	Light Standard 150 Watt High Pressure Sodium Vapor Luminaire		Traffic Signal Controller (Exst, Ppsd)		Existing Post
	Light Standard 200 Watt High Pressure Sodium Vapor Luminaire		Pad Mounted Traffic Signal Controller (Exst, Ppsd)		Connection Conductor (Ground, Neutral, Phase 1, Phase 2)
	Light Standard 250 Watt High Pressure Sodium Vapor Luminaire		Flashing Beacon (Exst, Ppsd)		
	Light Standard 310 Watt High Pressure Sodium Vapor Luminaire		Concrete Foundation (Exst, Ppsd)		
	Light Standard 400 Watt High Pressure Sodium Vapor Luminaire		Pipe Mounted Flasher (Exst, Ppsd)		
	Light Standard 700 Watt High Pressure Sodium Vapor Luminaire		Pad Mounted Feed Point (Exst, Ppsd)		
	Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire		Pipe Mounted Feed Point with Pad (Exst, Ppsd)		
	Emergency Vehicle Detector		Pole Mounted Feed Point (Exst, Ppsd)		
	Video Detection Camera		Junction Box (Exst, Ppsd)		
			Existing Pedestrian Head with Number		
			Existing Signal Head		
			Pole Mounted Head		
			Existing Lighting Standard Pole		

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

KIRK J. HOFF
REGISTERED
PROFESSIONAL
ENGINEER
NORTH DAKOTA
12 18 2020

SYMBOLS

D-101-33

			Existing Manhole (Electrical, Gas, Telephone)		Cap or Stub Exst Gas, Exst Sanitary, Exst Storm Drain, Ppsd Storm Drain, Exst Water
			Water Manhole (Exst, Exst with Valve)		Existing Pedestal Electrical, Telephone, Fiber Optic Telephone, TV, Fiber Optic TV, Undefined
			Sanitary Sewer Manhole (Exst, Ppsd, Exst with Valve)		Existing Pipe Vent Gas, Fuel, Sanitary, Storm Drain, Water, Undefined
			Sanitary Force Main Manhole (Exst, Ppsd, Exst with Valve)		Valve Exst Gas, Exst Water, Ppsd Water, Exst Undefined
			Storm Drain Manhole (Exst, Ppsd, Exst with Inlet, Ppsd with Inlet)		Pump Sanitary, Storm Drain, Exst Water
			Force Main Storm Drain Manhole (Exst, Exst with Valve)		Corrugated Metal End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)
			Manhole (Ppsd, Ppsd 48 Inch, Exst Undefined)		Reinforced Concrete End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)
			Existing Water Appurtenance		Existing Utility Marker
			Sprinkler Head (Exst, Ppsd)		Existing Meter
			Fire Hydrant (Exst, Ppsd)		Existing Fuel Dispensers
			Cleanout (Exst Sanitary, Underdrain)		Existing Fuel Filler Pipes
			Existing Catch Basin Inlet (Round, Square)		Existing Fuel Leak Sensors
			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 Vegetation Barrier, Ppsd Double with Vegetation Barrier)		

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

KIRK J. HOFF
REGISTERED
PROFESSIONAL
ENGINEER
NORTH DAKOTA
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

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

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

Anchor

High Tension Cable Guardrail

Connection to infer that probably will not be displayed

E2

E2

* 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.

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

KIRK J. HOFF

REGISTERED

PROFESSIONAL

PE-4683

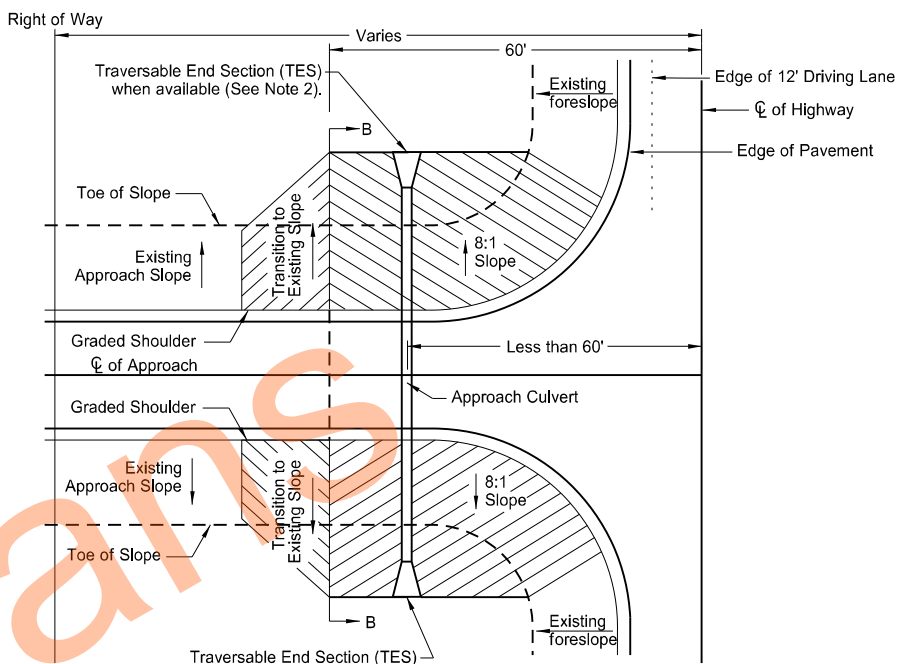
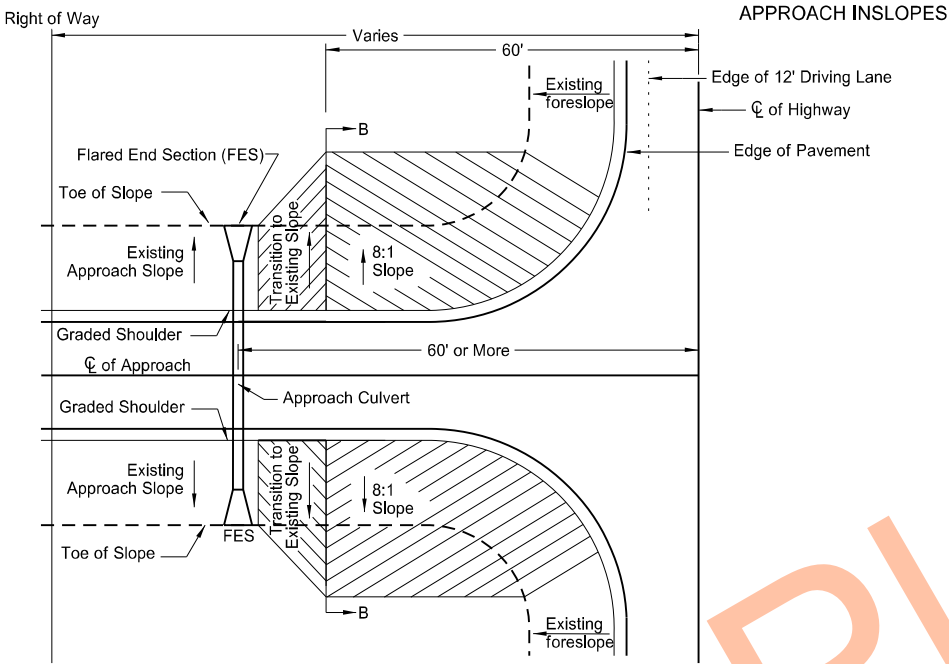
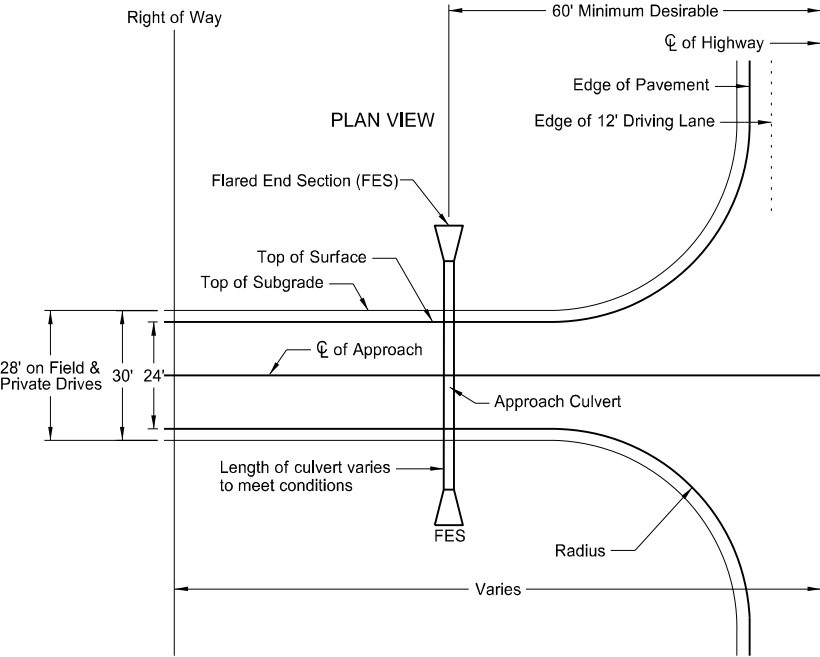
ENGINEER

NORTH DAKOTA

06/14/23

STANDARD RURAL APPROACHES

D-203-8



CASE 1

APPROACH PIPE LOCATED
60' OR MORE FROM C

CASE 2

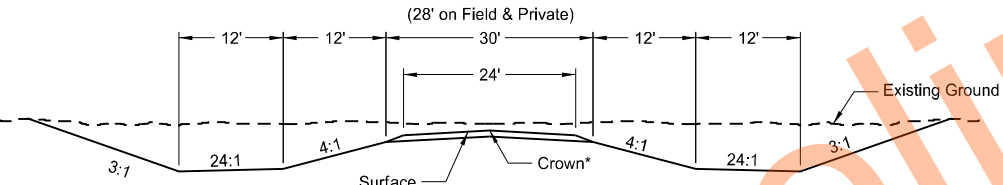
APPROACH PIPE LOCATED
LESS THAN 60' FROM C

Approach Pipe Traversable End Sections (TES)

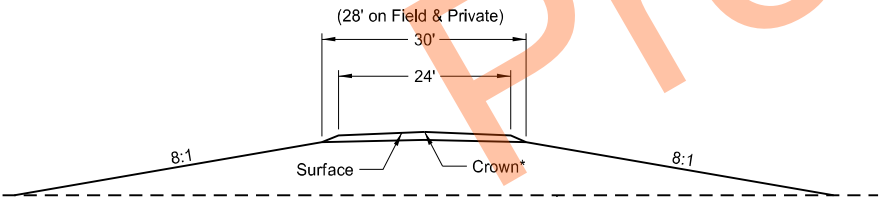
RCP	CSP	CSP Arch
15"	15"	
18"	18"	21"x15"
		24"x18"
24"	24"	28"x20"

CRITERIA FOR RURAL APPROACH TYPES

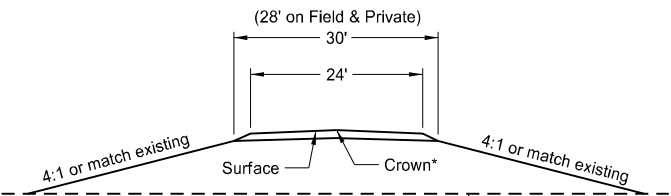
	Field Drives	Private Drives	Low Volume Public Roads
Radius	R=40 ft	R=40 ft	R=50 ft
Maximum Grade	10%	7%	7%
Storage Platform	24 ft	24 ft	50 ft
Vertical Curve Length	10 ft	10 ft	Varies (Min. 20 mph)



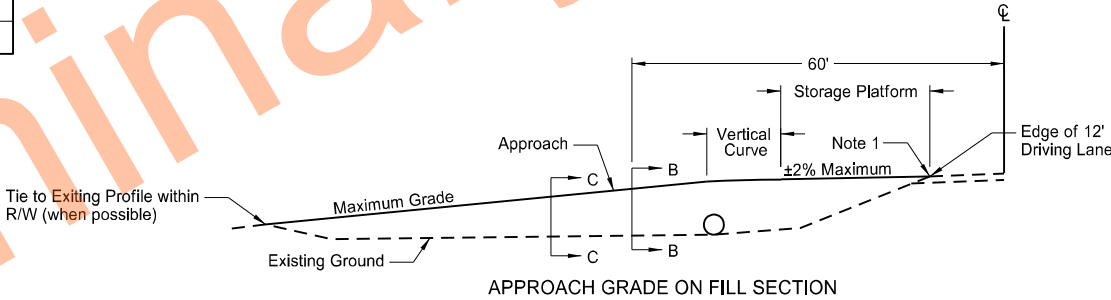
SECTION A-A



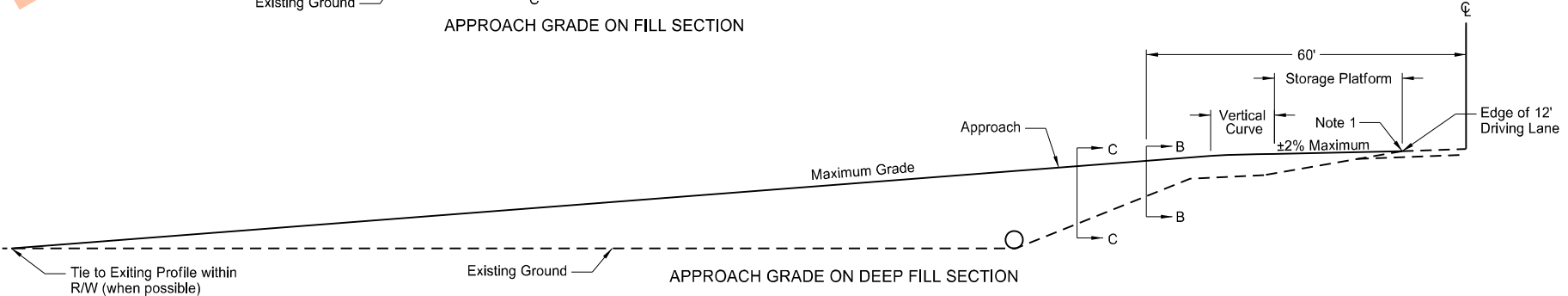
SECTION B-B



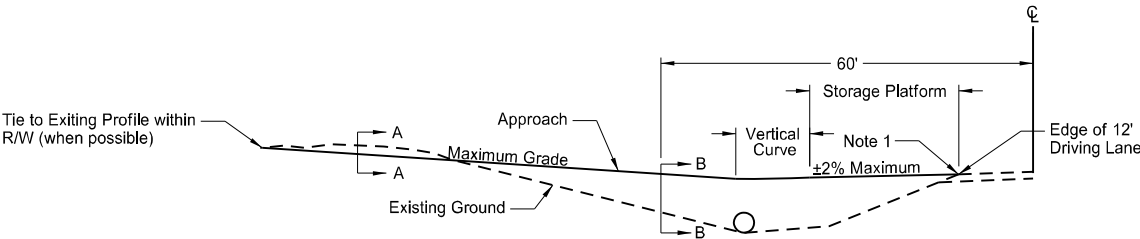
SECTION C-C



APPROACH GRADE ON FILL SECTION



APPROACH GRADE ON DEEP FILL SECTION



APPROACH GRADE ON CUT SECTION

NOTES:

1. 5% Max Rollover between approach storage platform and highway.
2. Approach pipes up to 24" diameter are acceptable (with traversable end sections) for Case 2. Install approach pipes larger than 24" diameter in accordance with Case 1.

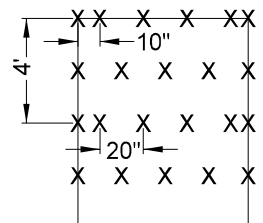
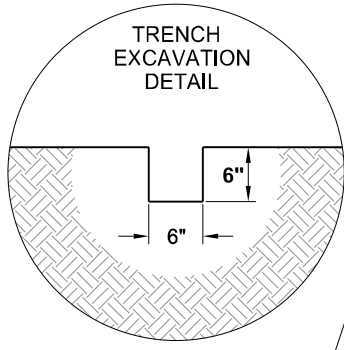
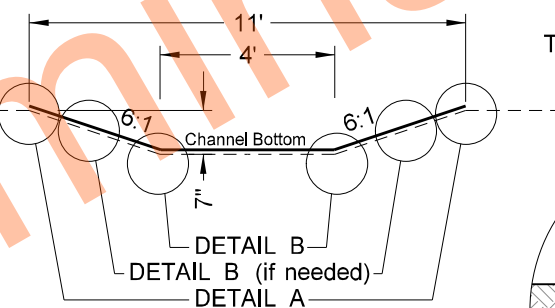
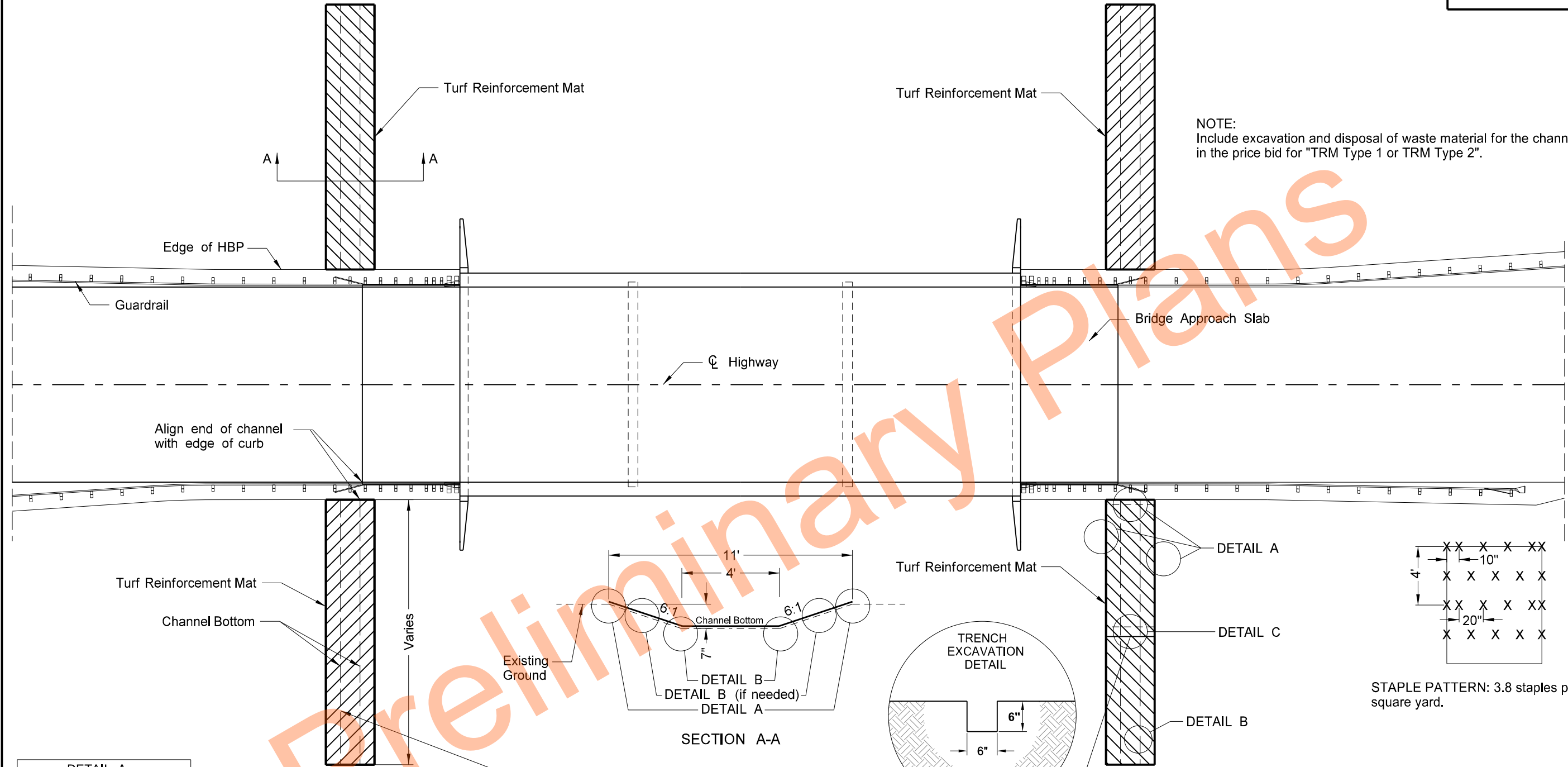
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-25-14	
REVISIONS	
DATE	CHANGE
06-30-17	Revised Radius, Storage Platform, Inslope dimensions, and Note 1
10-25-19	Changed "Inslope" to "Foreslope"
06-29-22	Added "TES", Table, and Note 2



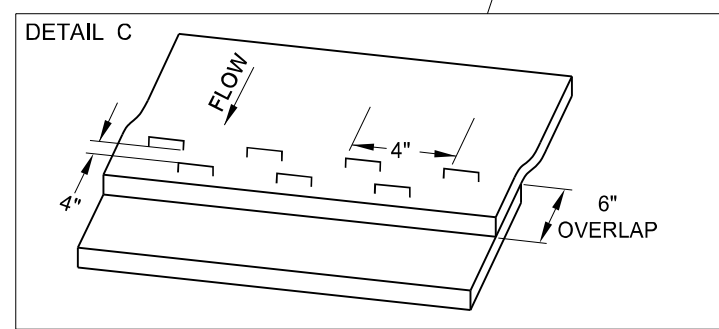
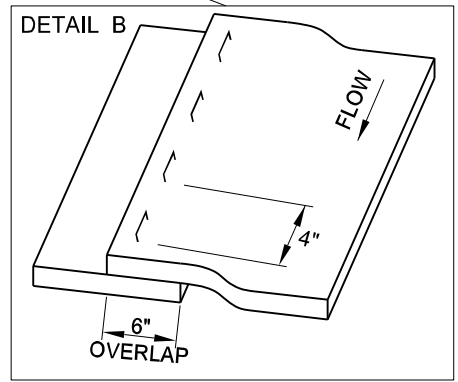
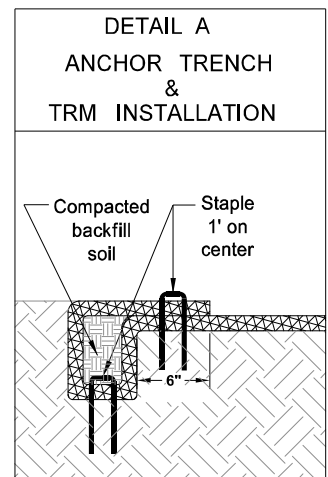
06/29/22

BRIDGE APPROACH SLAB DRAINAGE DETAIL

D-255-1



STAPLE PATTERN: 3.8 staples per square yard.

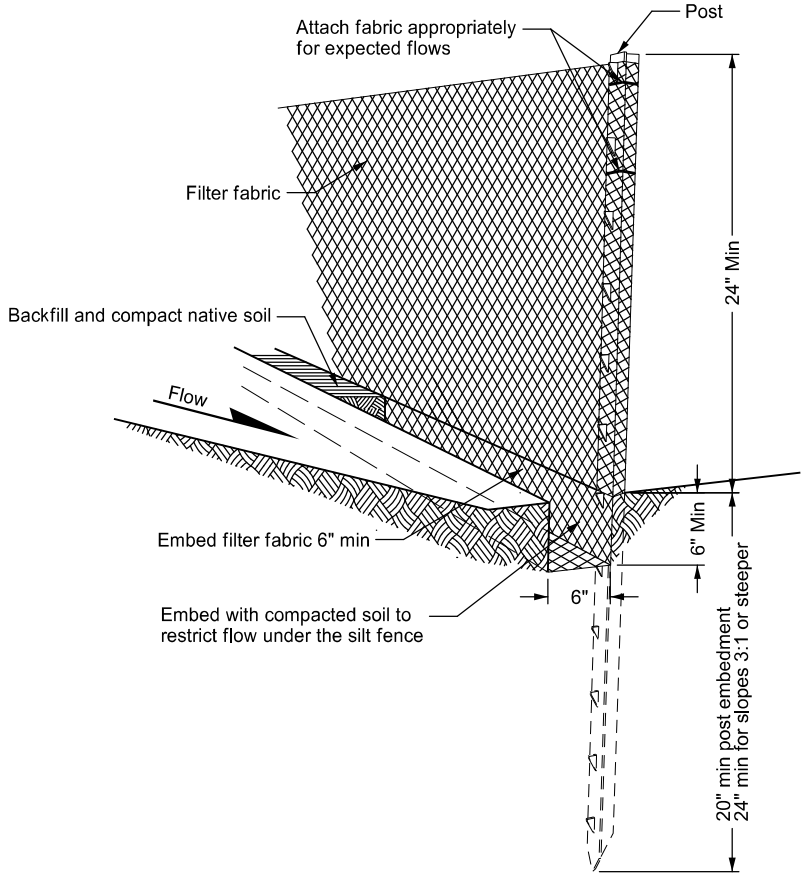


NOTES:
Don't place longitudinal seams along the channel bottom.
Top seam must be minimum 0.5' above the channel bottom.

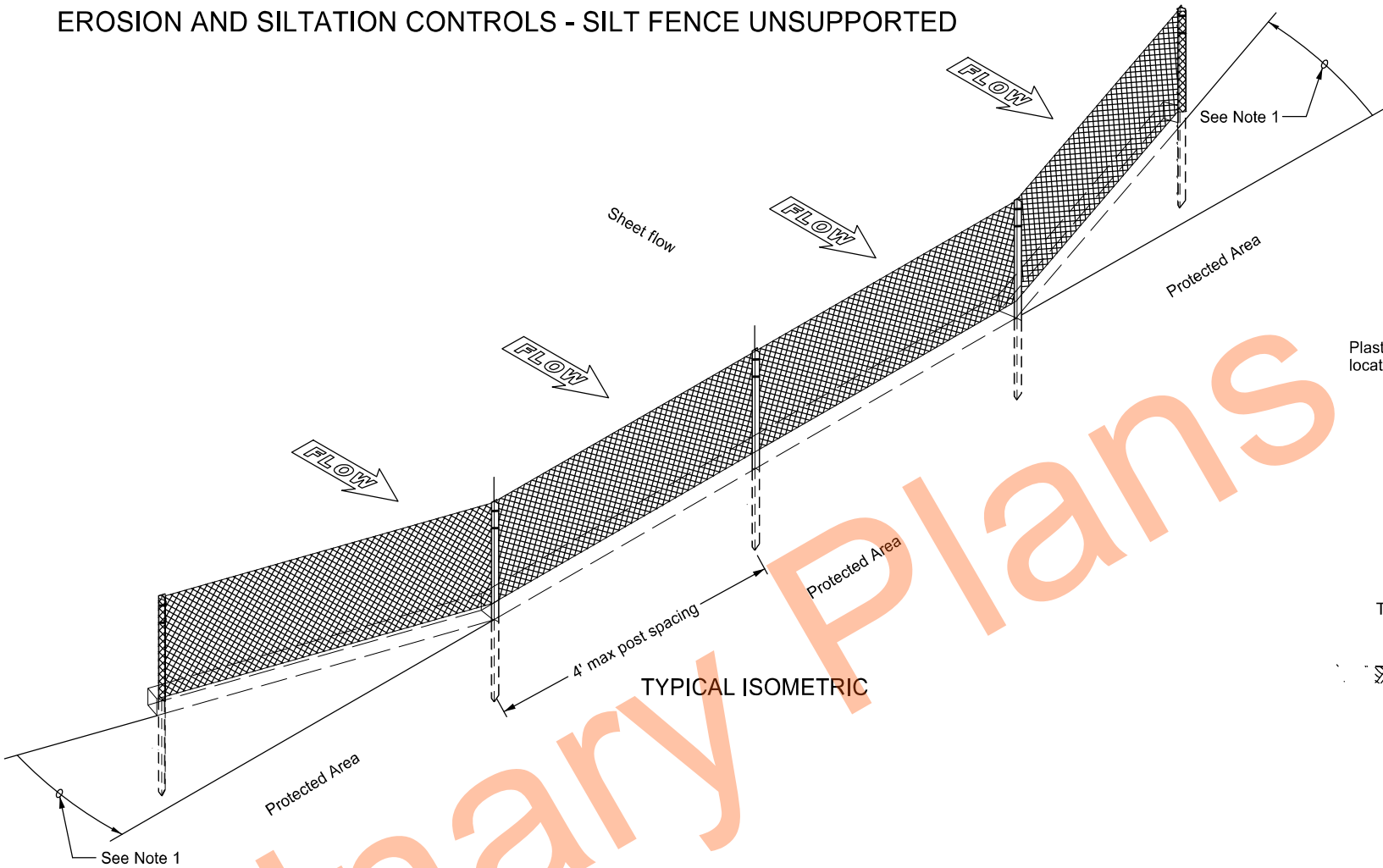
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION		
11-23-10		
REVISIONS		
DATE	CHANGE	
06-26-14	Changed standard drawing number from D-708-4 to D-255-1.	
07-27-15	Changed installation details.	
08-27-19	New Design Engineer PE Stamp.	

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

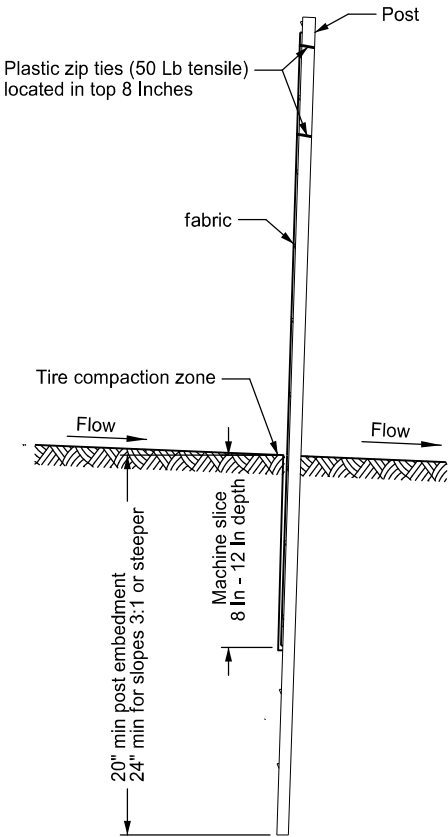
EROSION AND SILTATION CONTROLS - SILT FENCE UNSUPPORTED



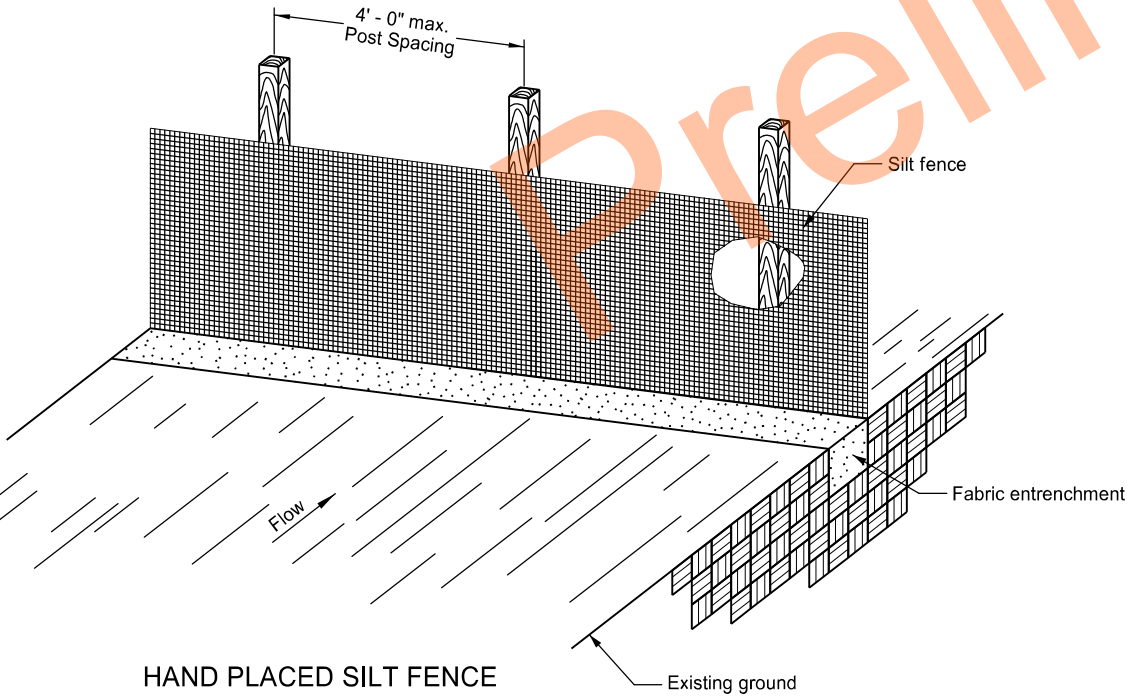
HAND PLACED INSTALLATION DETAIL
Minimize disturbance of ground around trench and smooth surface after excavation to avoid concentrating flows. Compact to prevent undercutting flows.



TYPICAL ISOMETRIC



MACHINE SLICED INSTALLATION DETAIL



HAND PLACED SILT FENCE

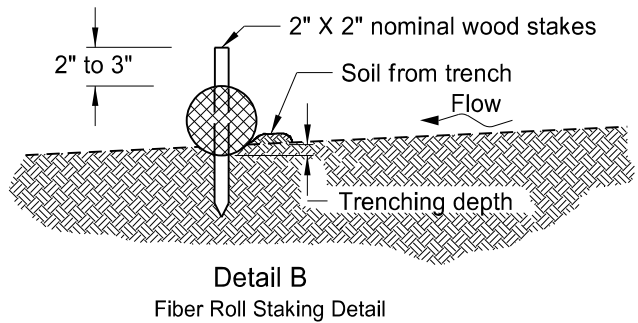
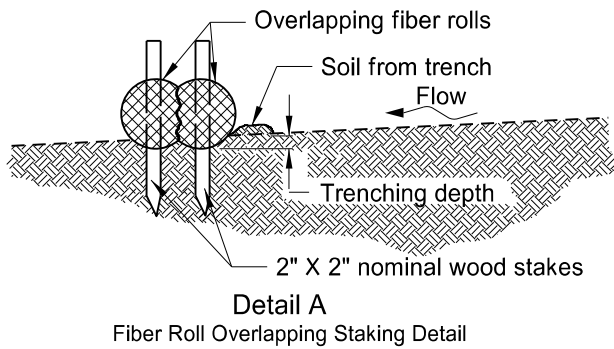
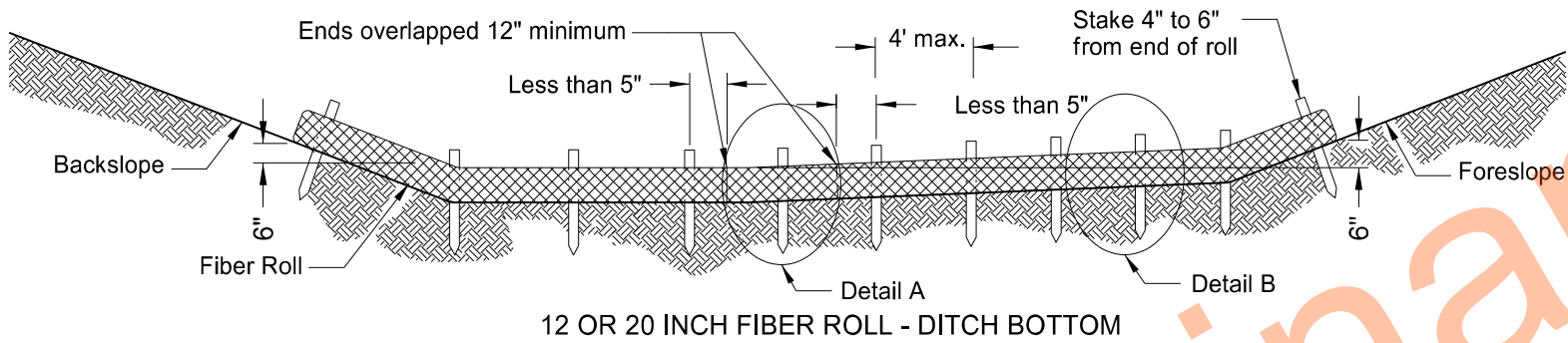
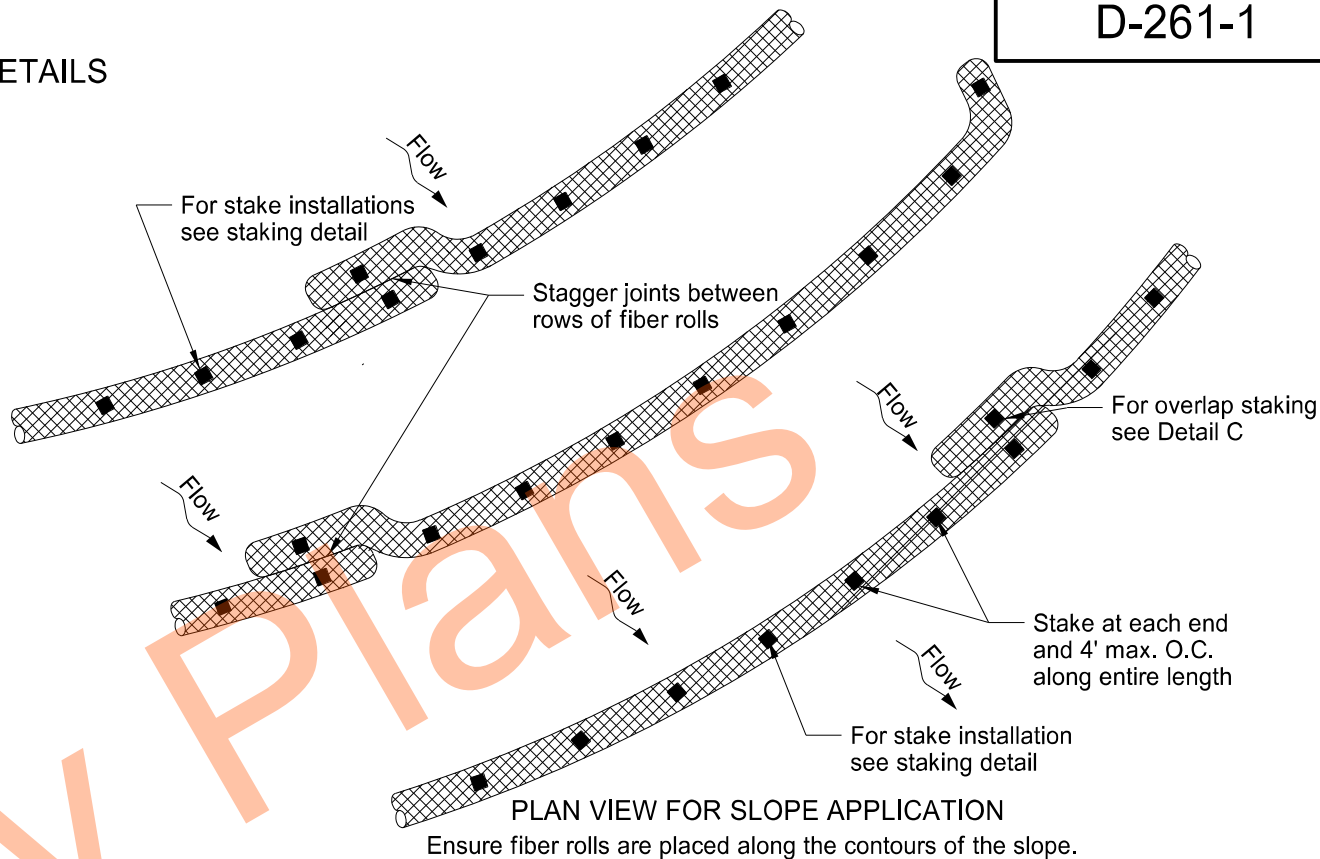
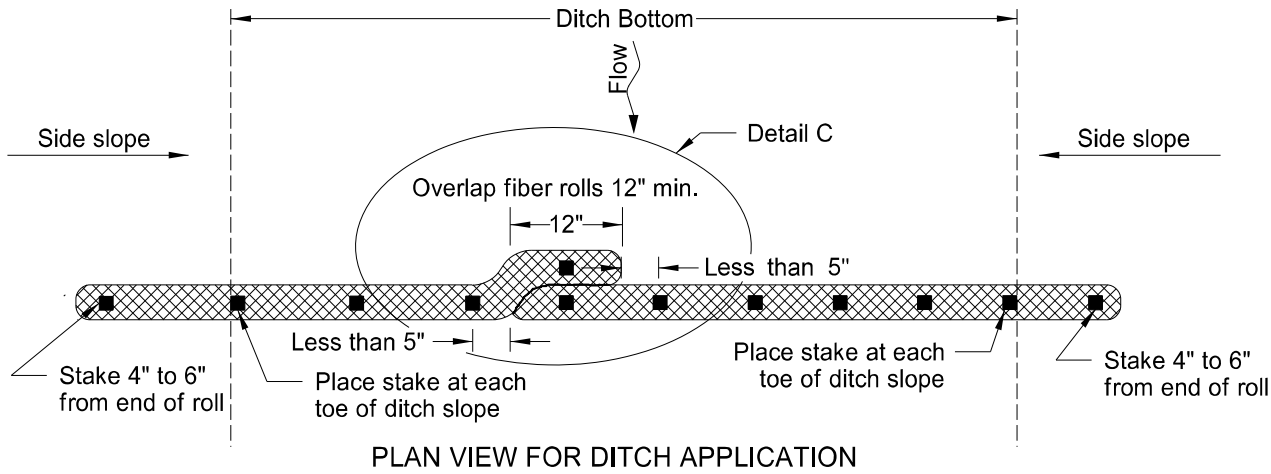
- NOTES:
- 1. Install the ends of the silt fence to point slightly upslope to prevent sediment from flowing around the ends of the fence.
 - 2. Place splices outside low spots.
 - 3. Do not embed silt fence placed in standing water.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Standard drawing resulted from splitting standard D-708-2.
06-27-16	Revised details & added new ones.
08-27-19	New Design Engineer PE Stamp.
07-22-25	Matched Revised Silt Fence Specs.

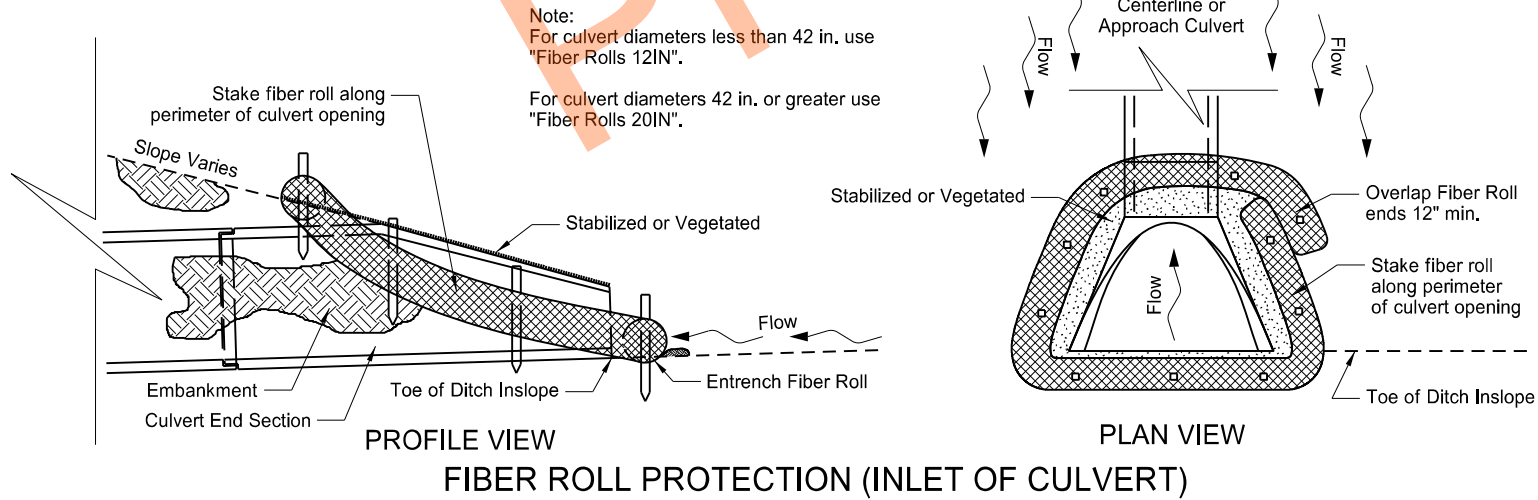


07/22/25

EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS



NOTE: Do not allow runoff to run under or around roll.



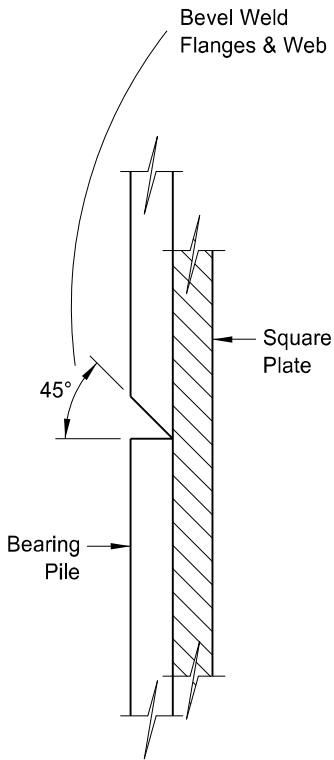
FIBER ROLL DIAMETER	NOMINAL STAKE SIZE	MINIMUM STAKE LENGTH	TRENCH DEPTH	
			MINIMUM	MAXIMUM
6"	2" x 2"	18"	2"	2"
9" or 12"	2" x 2"	24"	2"	3"
20"	2" x 2"	36"	3"	5"

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.
04-22-24	Slope Plan View-overlap change.
03-13-25	Added D-708-6 Culvert Inlet detail.

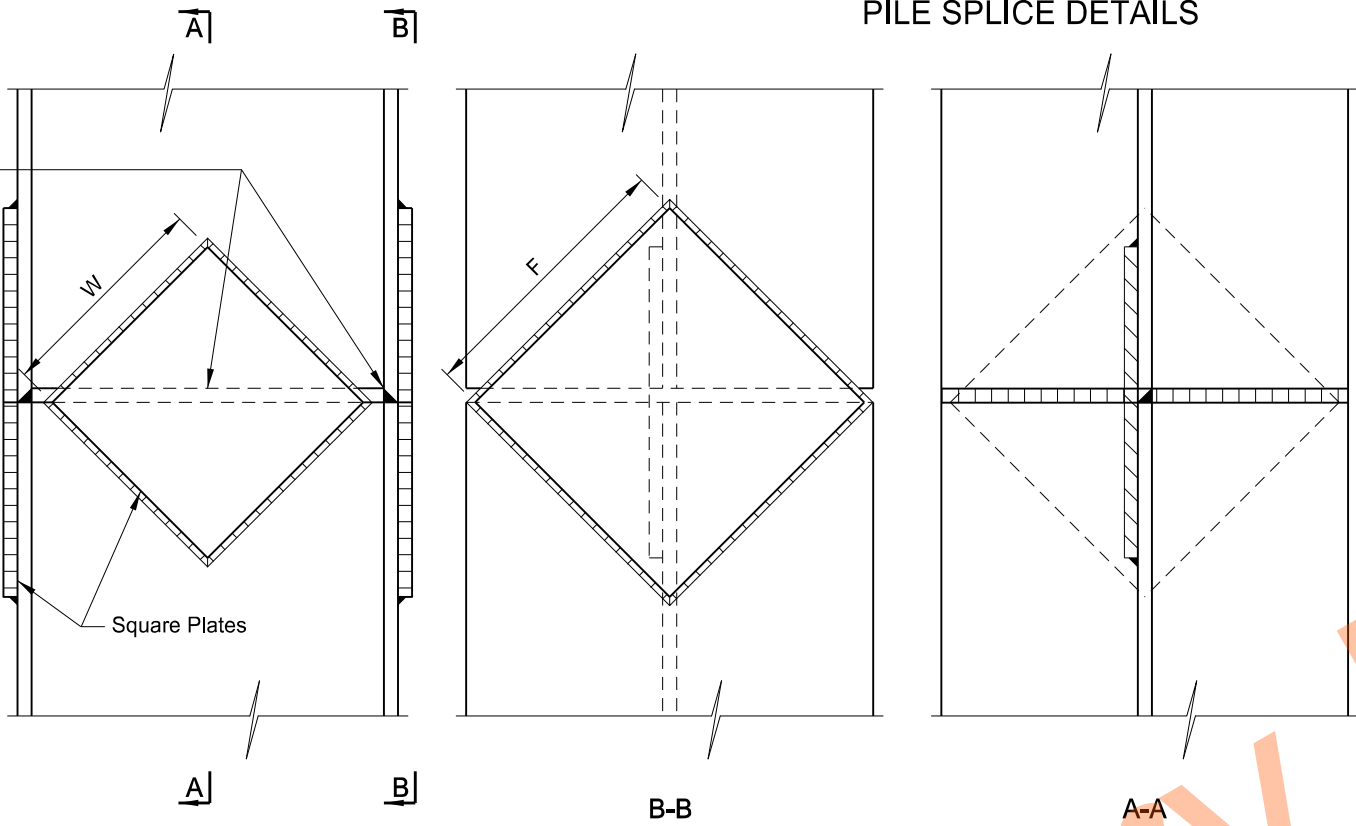


03/13/25

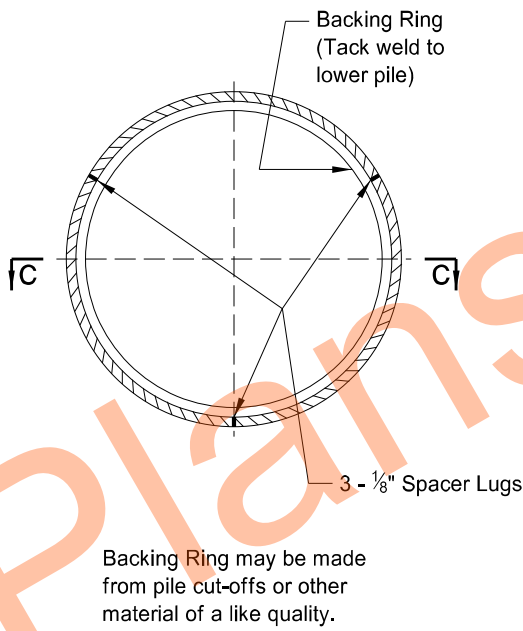
PILE SPLICE DETAILS



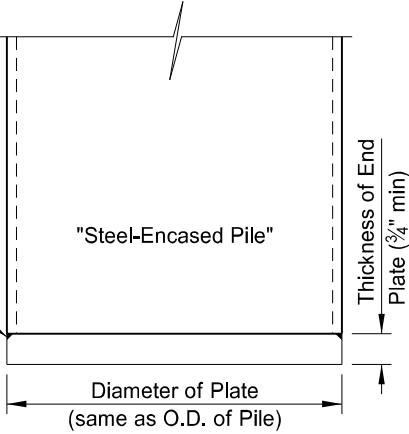
ENLARGED VIEW



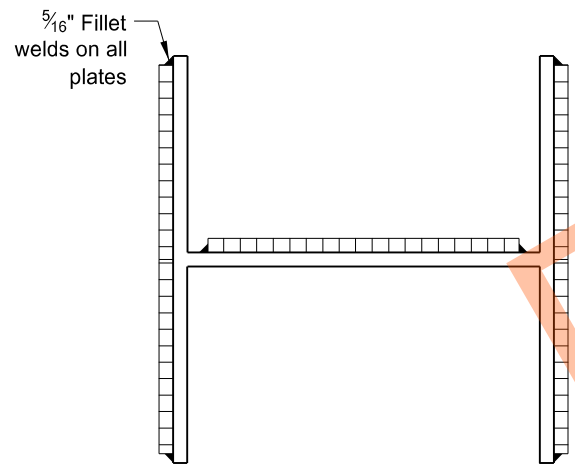
Flame scarf inside of both flanges and one side of web of upper section.



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



END PLATE DETAIL



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

H-PILE SPLICE DETAIL

ALTERNATE H-PILE SPLICE DETAIL

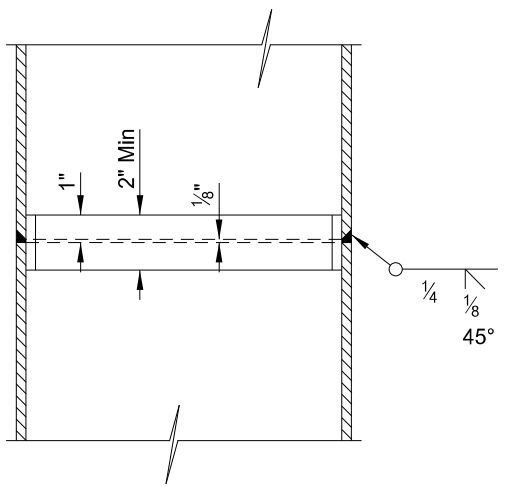
NOTES:

Construct splices in accordance with Section 622. Weld as specified in the latest AASHTO/AWS D 1.5 Bridge Welding Code.

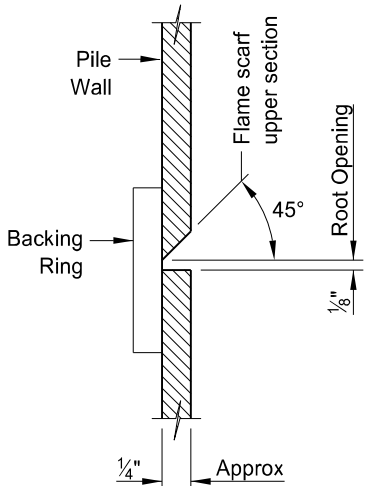
Construct splices in steel H-Piles utilizing complete penetration groove welds in both flanges and the web, or using steel reinforcing plates as shown. If reinforcing plates are used to construct the pile splice, use plates with a minimum thickness equal to the flange thickness of the H-Pile and matching the steel grade of the H-pile.

Use electrodes that meet the requirements of AWS-A5.1, Classification E6010, E6011, or E7018.

* Root gouge to sound metal and weld from the second side if backing material is not used.

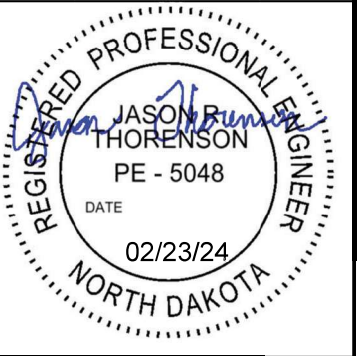


STEEL-ENCASED CONCRETE PILE SPLICE DETAIL

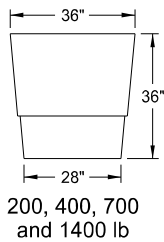
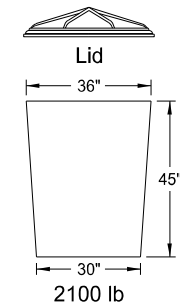


ENLARGED VIEW

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09/14/11	
REVISIONS	
DATE	CHANGE
09/03/19 02/23/24	Updated Signature Updated Signature Revised notes & updated to active voice



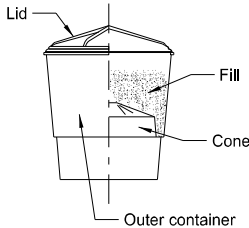
ATTENUATION DEVICE



Outer Containers

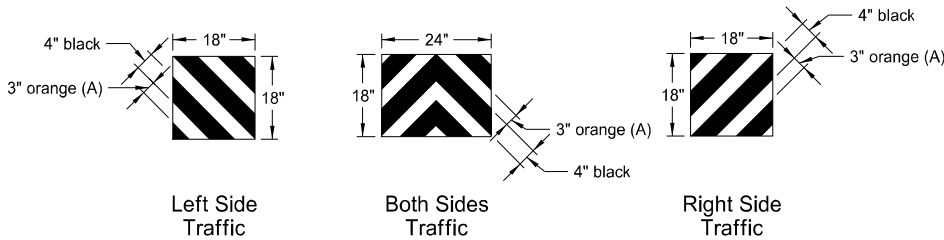


Cones



Typical Assembly

Typical Module Construction Detail

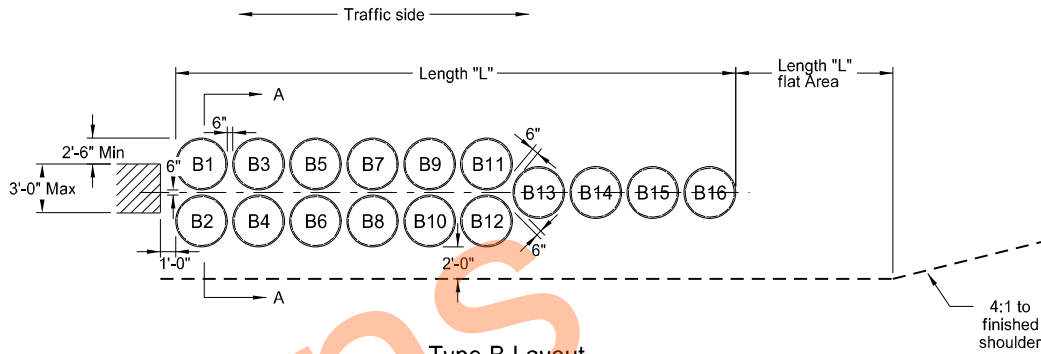


Reflective Sheet Detail

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.

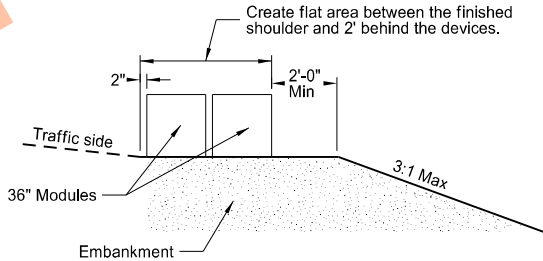
(A) Use 3" orange sheeting for temporary installations, and 3" yellow sheeting for permanent installations.

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



Type B Layout

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



Section A-A
(Type B Layout)

Type B Attenuation Device												
Module Number	Dash Number											
	80	75	70	65	60	55	50	45	40	35	30	25
	Module Weights (LBS)											
B1	2100	2100										
B2	2100	2100										
B3	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100		
B4	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100		
B5	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B6	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B7	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B8	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B9	700	700	700	700	700	700	700	700	700	700	700	700
B10	700	700	700	700	700	700	700	700	700	700	700	700
B11	700	700	700	700	700	700	700	700	700	700	700	700
B12	700	700	700	700	700	700	700	700	700	700	700	700
B13	700	700	700	700	700	700	700	700	700	700	700	700
B14	400	400	400	400	400	400	400	400	400	400	400	400
B15	400	400	400	400	400	400	400	400	400	400	400	400
B16	200	200	200	200	200	200	200	200	200	200	200	200
Length (L)	34.2'	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											
	1	1	1	1	1	1	1	1	1	1	1	1
2100	1	1	1	1	1	1	1	1	1	1	1	1
1400	1	1	1	1	1	1	1	1	1	1	1	1
700	2	2	2	2	2	2	2	2	2	2	2	2
400	1	1	1	1	1	1	1	1	1	1	1	1
200	2	2	2	2	1	1	1	1	1	1	1	1

Notes:

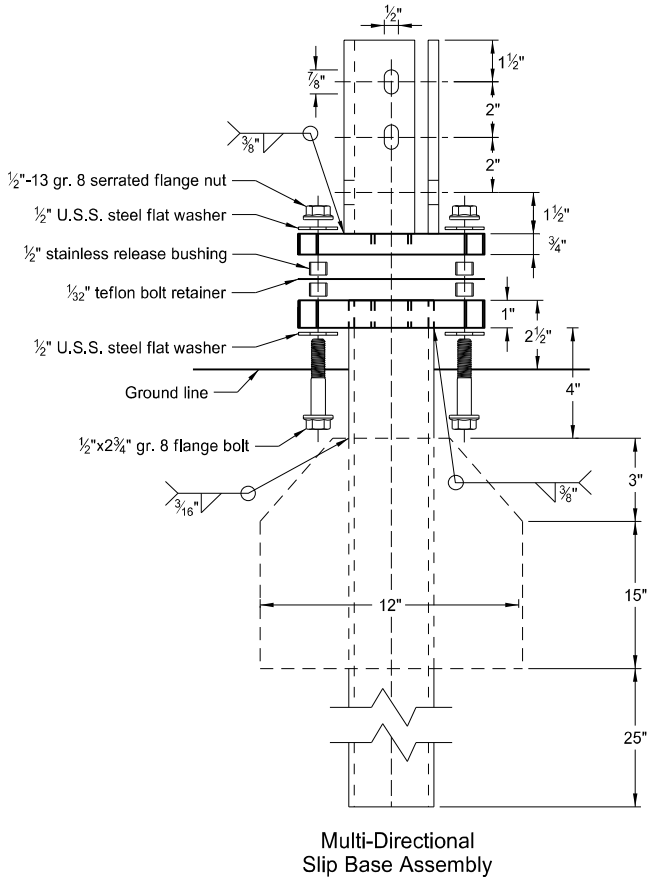
- Materials
 - Use modules manufactured from frangible polyethylene material which shatters upon impact.
 - Fill modules with class 43 aggregate meeting NDDOT Standard Specifications aggregate requirements. Use fill with a unit weight of at least 100 pounds per cubic foot. Use fill with a moisture content of 2% or less when left over winter.
- Modules
 - Provide three components for 2, 4, 7, 14, or 21 cubic feet minimum.
 - A 14 C.F., yellow outer container.
 - A black lid securely locking over the top lip of the container.
 - 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.
 - Provide two components for the 14 cubic foot module container:
 - A 14 C.F., yellow outer container.
 - A black lid securely locking over the top lip of the container.
 - Provide two components for the 21 cubic foot module container:
 - A 36" height X 36" width yellow outer container.
 - A black lid which locks securely over the top of the container.
- 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.
- 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.
- 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
07-18-14	Revised sheeting in reflective sheet detail
09-27-17	Update to active voice
10-03-19	New Design Engr PE Stamp
08-01-24	Electronic Stamp/Signature
06-30-25	Legislative Changes

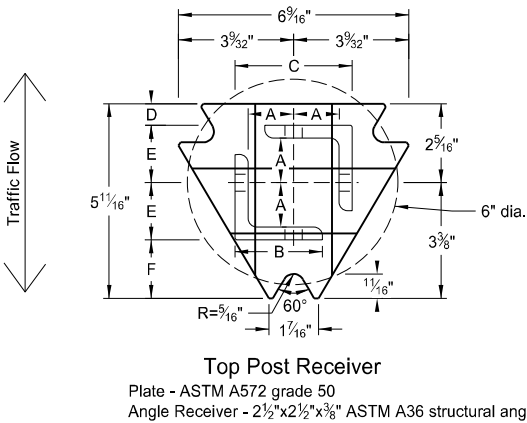


BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7



Perforated Tube



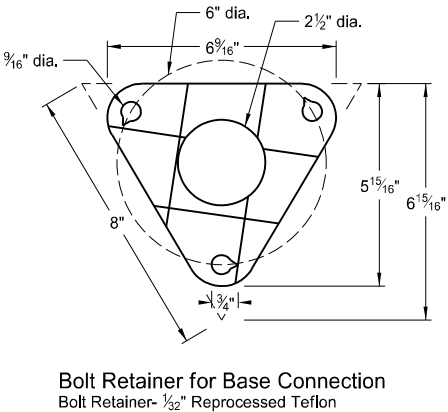
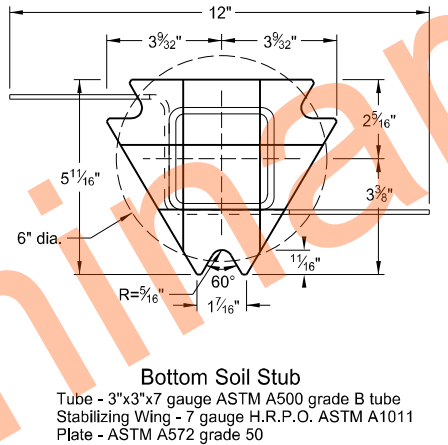
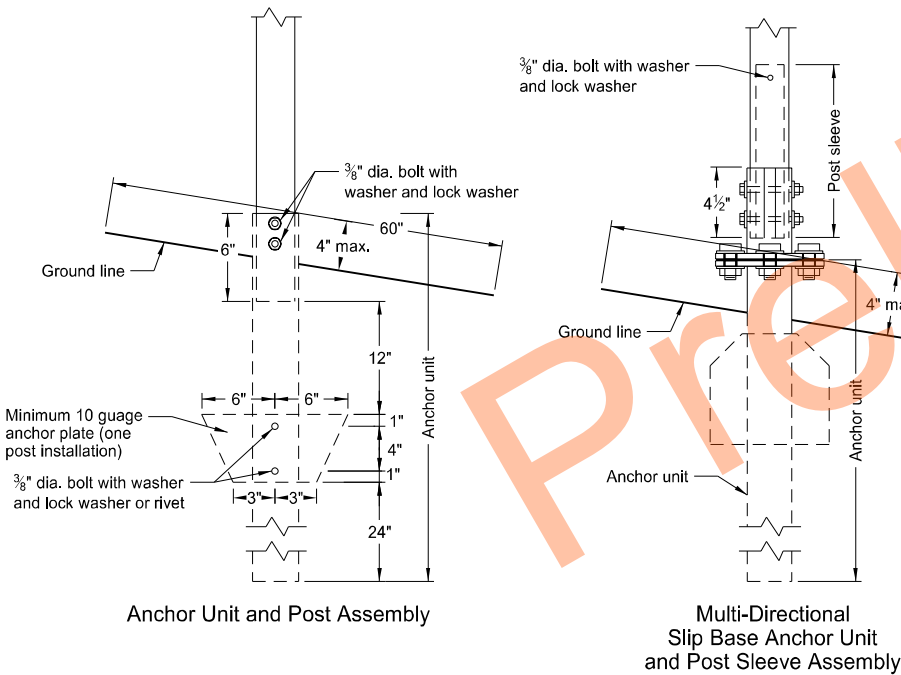
- Notes:
1. Torque slip base bolts as specified by manufacturer.
 2. Use anchor with 43.9 KSI yield strength and 59.3 KSI tensile strength.
 3. Provide 4" vertical clearance for anchor or breakaway base. Measure the 4"x60" measurement above and below post location and back and ahead of post.
 4. In concrete 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 Thickness Gauge	Sleeve Size in.	Wall Thickness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2 1/4
1	2 1/4	12			No	2 1/2
1	2 1/2	12			(A)	3
1	2 1/2	10			Yes	
1	2 1/4	12	2	12	Yes	
1	2 1/2	12	2 1/4	12	Yes	
2	2	12			No	2 1/4
2	2 1/4	12			No	2 1/2
2	2 1/2	12			Yes	
2	2 1/2	12			Yes	
2	2 1/4	10	2	12	Yes	
2	2 1/2	12	2 1/4	12	Yes	
3 & 4	2 1/2	12			Yes	
3 & 4	2 1/2	10			Yes	
3 & 4	2 1/2	12	2 1/4	12	Yes	
3 & 4	2 1/4	12	2	12	Yes	
3 & 4	2 1/2	10	2 3/16	10	Yes	

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
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2 1/2 x 2 1/2	0.105	12	3.141	0.804	0.803	0.643
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.785

Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2 3/16"x10 ga.	1 5/64"	2 1/2"	3 1/32"	2 5/32"	1 33/64"	1 7/8"
2 1/2"x10 ga.	1 1/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"

- (A) Use breakaway base when support is placed in weak soils. Engineer determines if soils are weak.
- (B) For additional wind load, insert the 2 3/16"x10 ga. into 2 1/2"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
8-01-24	Electronic Stamp/Signature

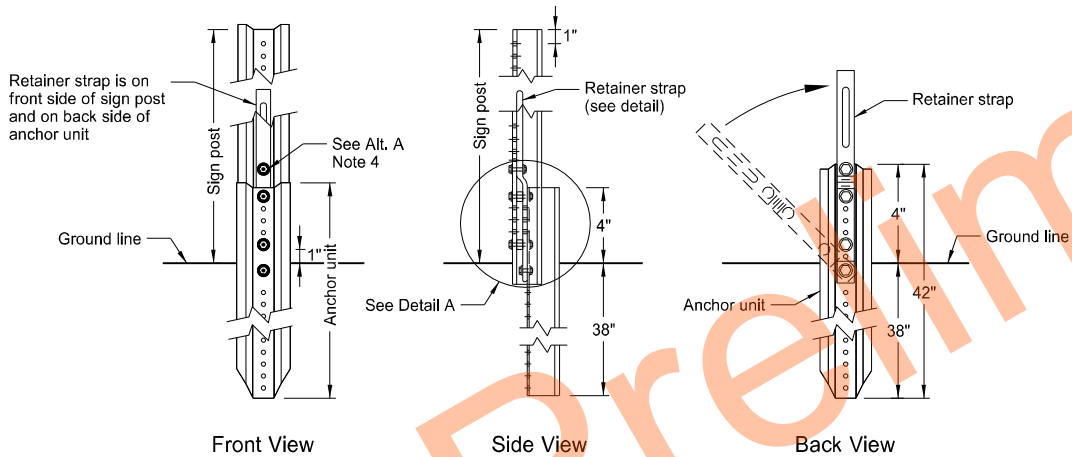
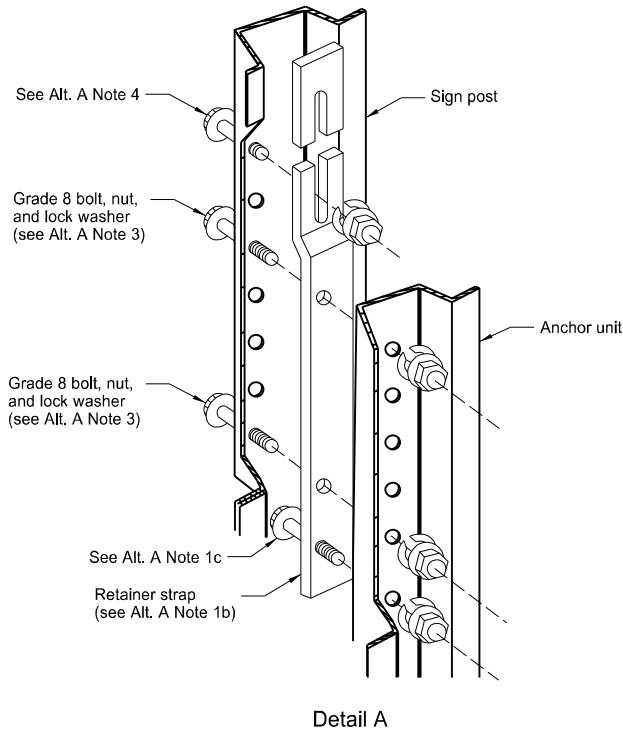


08/01/24

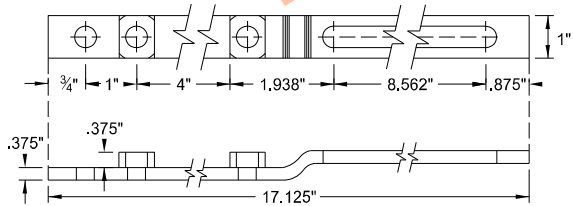
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

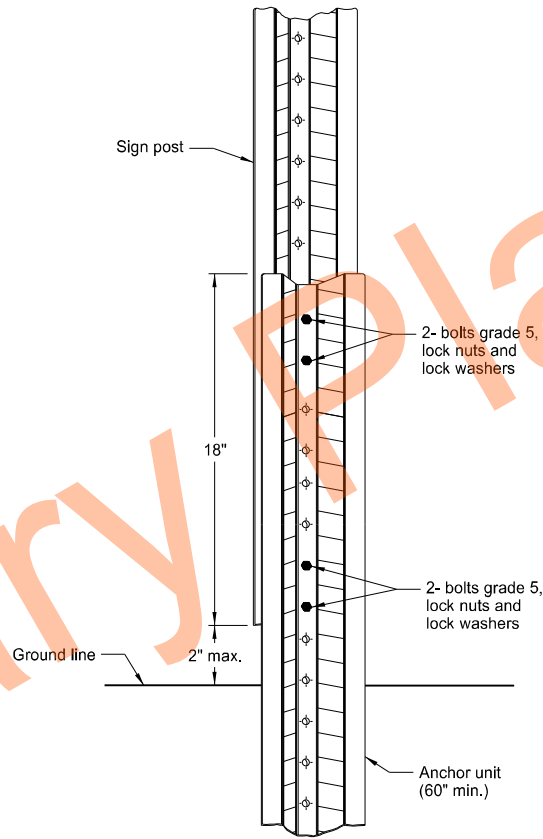
U-Channel Post



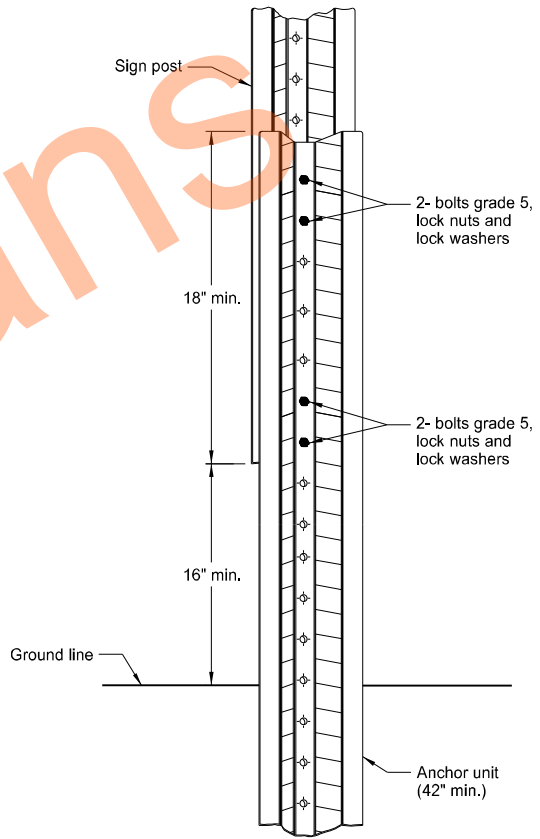
Breakaway U-Channel Detail Alternate A
Install a maximum of 2 posts within 7'.



Retainer Strap Detail



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'.

Alternate A Steps of Installation:

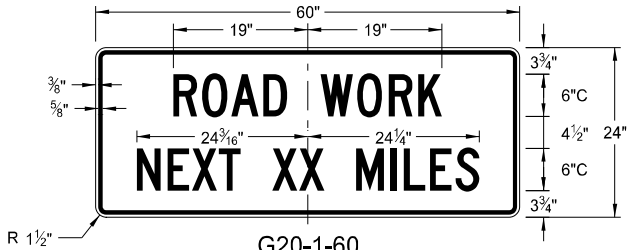
- a) Drive anchor unit to within 12" of ground level.
b) Establish proper assembly by lining up bottom hole of retainer strap with 6th hole from the top of the anchor unit.
c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
d) Rotate strap 90° to left.
- a) Drive anchor unit to 4" above ground.
b) Rotate strap to vertical position.
- 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.
- Complete assembly by tightening 5/16"x2" bolt (this fastens sign post to retainer strap).
- 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
8-01-24	Electronic Stamp/Signature

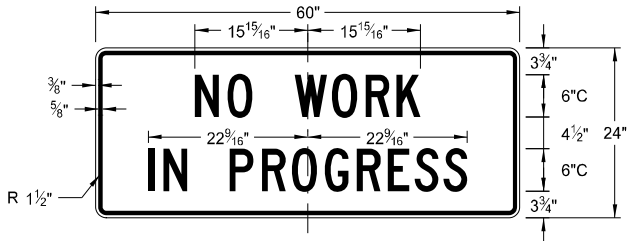


08/01/24

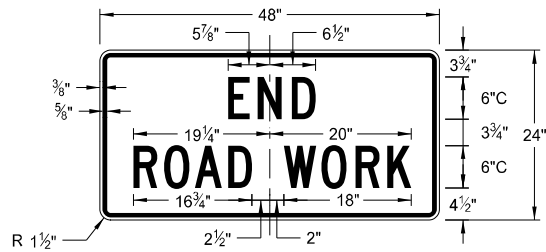
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



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



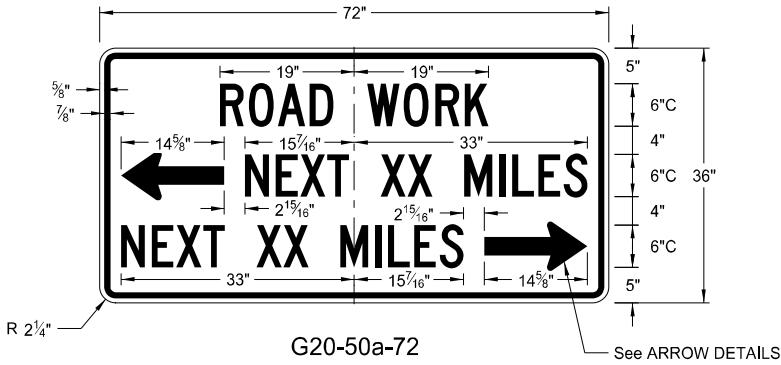
G20-1b-60
Legend: black (non-refl)
Background: orange



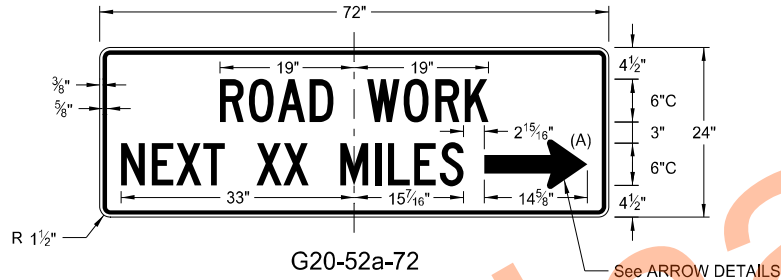
G20-2-48
Legend: black (non-refl)
Background: orange



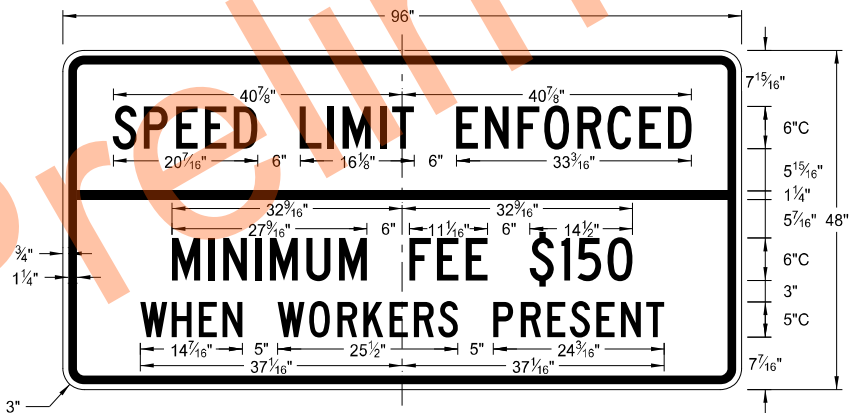
G20-4b-36
Legend: black (non-refl)
Background: orange



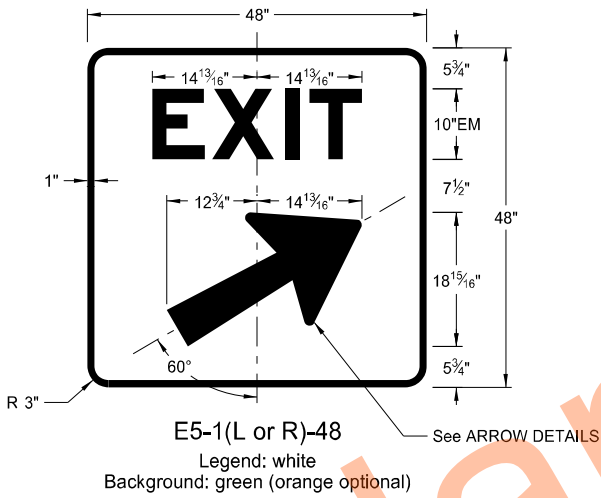
G20-50a-72
Legend: black (non-refl)
Background: orange



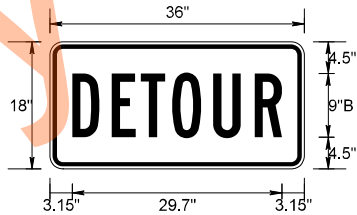
G20-52a-72
Legend: black (non-refl)
Background: orange



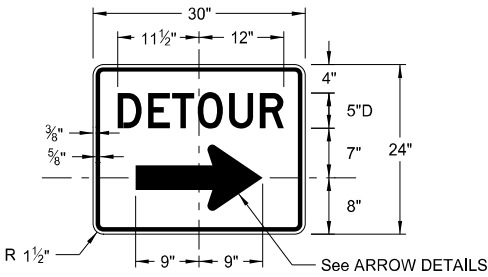
G20-55-96
Legend: black (non-refl)
Background: orange



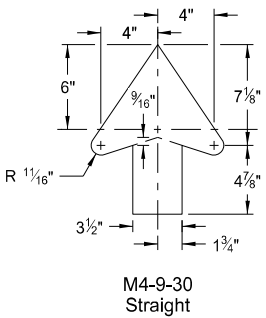
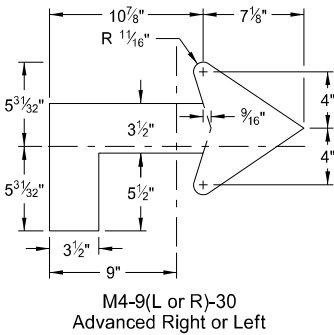
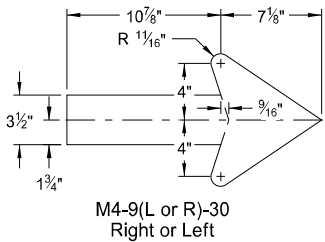
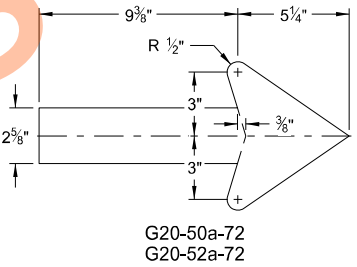
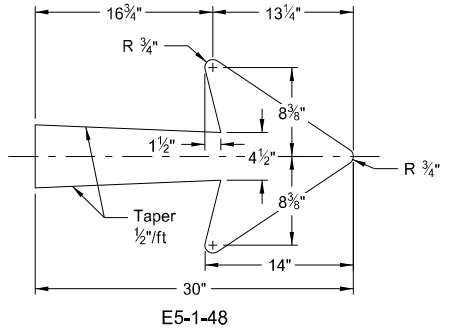
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



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



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



ARROW DETAILS

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
08-17-17	Added sign & background color
10-03-19	New Design Engineer PE Stamp
08-01-24	Electronic Stamp/Signature
06-30-25	Legislative Changes



Technical drawing of a rectangular sign with a black border. The sign text is "STREET CLOSED", "10 MILES AHEAD", and "LOCAL TRAFFIC ONLY". Dimensions are provided for the sign's overall size, mounting holes, and text placement.

Overall dimensions: 60" wide by 30" high.

Mounting holes: 3" diameter, 1" apart.

Text dimensions (from top edge):

- "STREET CLOSED": 22 1/2" wide, 3 3/8" high.
- "10 MILES AHEAD": 24 5/16" wide, 12 3/8" high.
- "LOCAL TRAFFIC ONLY": 17 3/8" wide, 13" high.

Text spacing (from left edge):

- 3 3/8" to "STREET"
- 12 3/8" to "AHEAD"
- 1 7/8" to "LOCAL"
- 13 1/8" to "ONLY"

Text spacing (from right edge):

- 11" to "ONLY"
- 10" to "LOCAL"
- 8" to "AHEAD"
- 13" to "STREET"

Sign height dimensions (from bottom edge):

- 4 1/4" to "LOCAL"
- 4" to "AHEAD"
- 6" to "STREET"

Sign width dimensions (from left edge):

- 1 1/2" to "STREET"
- 3/4" to "AHEAD"
- 1 7/8" to "LOCAL"

Technical drawing of a rectangular sign with dimensions and text. The sign is 24" wide and 18" high. The text on the sign reads "MINIMUM FEE \$150". The dimensions are as follows:

- Overall width: 24"
- Overall height: 18"
- Top horizontal spacing: 8 1/8" (left), 8 1/8" (right)
- Bottom horizontal spacing: 4 5/16" (left), 4 5/16" (right)
- Left vertical spacing: 3 5/16" (top), 3/8" (middle), 5/8" (bottom)
- Right vertical spacing: 2 1/2" (top), 3"D (middle), 2" (middle), 3"D (middle), 2" (middle), 2 1/2" (bottom)
- Radius: R 1 1/2" (top-left corner)

Technical drawing of a rectangular sign with the text "STREET CLOSED TO THRU TRAFFIC". The sign has a black border and a white background. Dimensions are provided in inches:

- Overall width: 60"
- Overall height: 30"
- Text "STREET" width: 22 1/2"
- Text "CLOSED" width: 24 5/16"
- Text "TO" width: 3"
- Text "THRU" width: 24 1/4"
- Text "TRAFFIC" width: 24 1/4"
- Vertical spacing between "STREET" and "CLOSED": 3"
- Vertical spacing between "CLOSED" and "TO": 3 1/4"
- Vertical spacing between "TO" and "THRU": 3"
- Vertical spacing between "THRU" and "TRAFFIC": 3"
- Top mounting hole spacing: 3" (center-to-center), 1" (edge-to-center)
- Bottom mounting hole spacing: 4" (edge-to-center), 6" (center-to-center)
- Left mounting hole spacing: 1/2" (edge-to-center), 3/4" (center-to-center)
- Right mounting hole spacing: 4" (edge-to-center), 6" (center-to-center)
- Corner radius: R 1 1/2"

Technical drawing of a rectangular sign with the text "STREET CLOSED". The sign has a white background and a black border. The text is in a bold, sans-serif font. The dimensions are as follows:

- Overall width: 48"
- Overall height: 30"
- Top border: 5"
- Bottom border: 5"
- Left border: 1 1/4"
- Right border: 1 1/4"
- Text "STREET" width: 18" (split into two 9" segments)
- Text "CLOSED" width: 19" (split into two 9.5" segments)
- Vertical spacing between "STREET" and "CLOSED": 8" (split into two 4" segments)

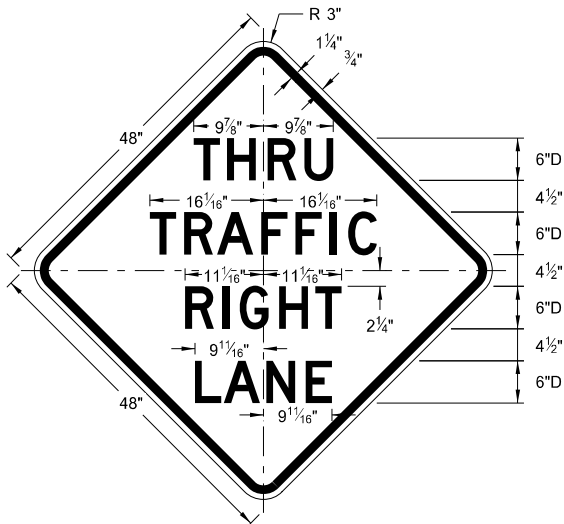
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
08-17-17	Revised sign number
10-03-19	New Design Engineer PE Stamp
08-01-24	Electronic Stamp/Signature
06-30-25	Legislative Changes



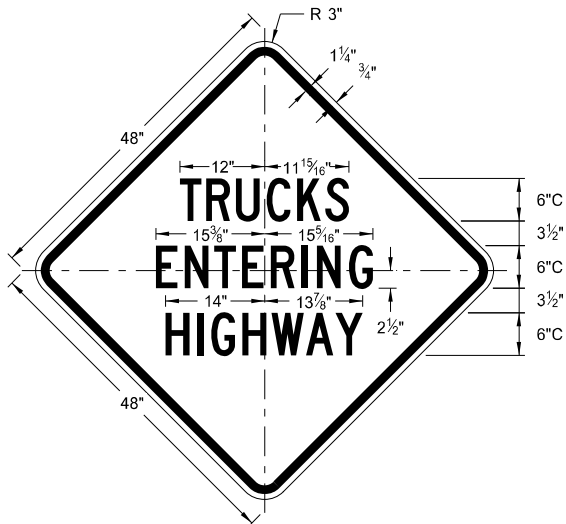
CONSTRUCTION SIGN DETAILS
WARNING SIGNS

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

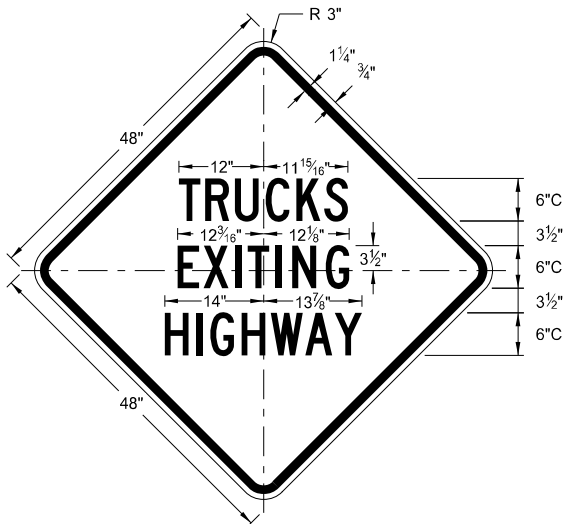
* DISTANCE MESSAGES



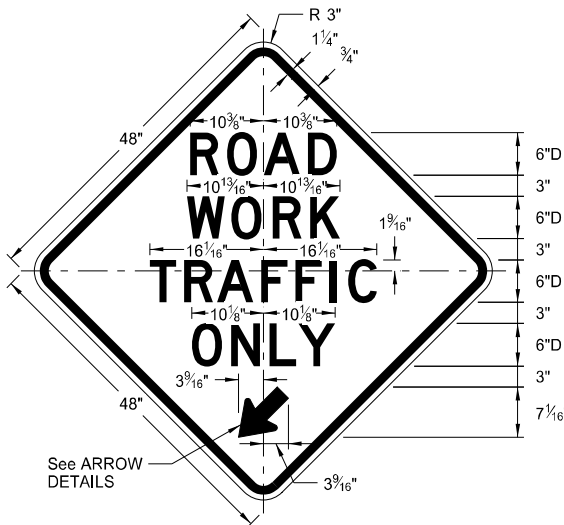
W5-8-48
Legend: black (non-refl)
Background: orange



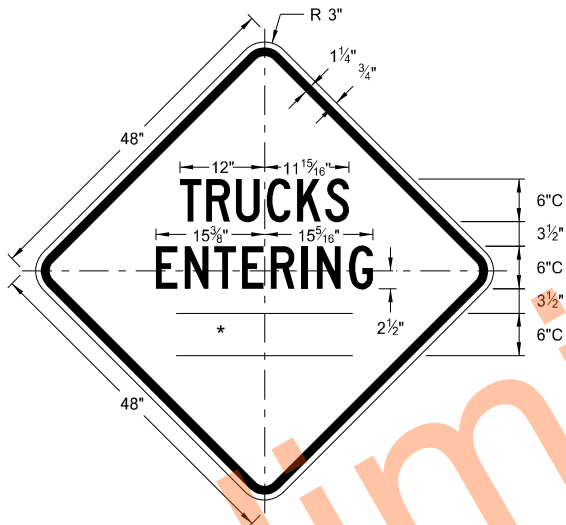
W8-53-48
Legend: black (non-refl)
Background: orange



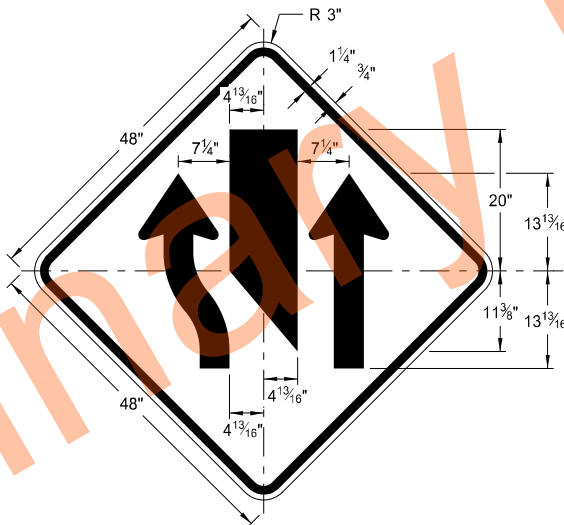
W8-56-48
Legend: black (non-refl)
Background: orange



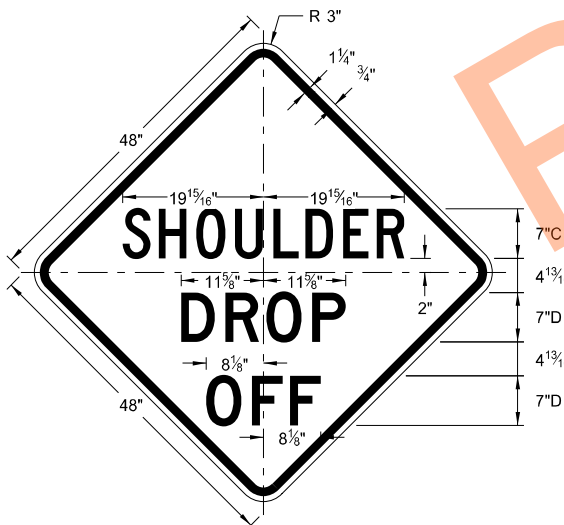
W5-9-48
Legend: black (non-refl)
Background: orange



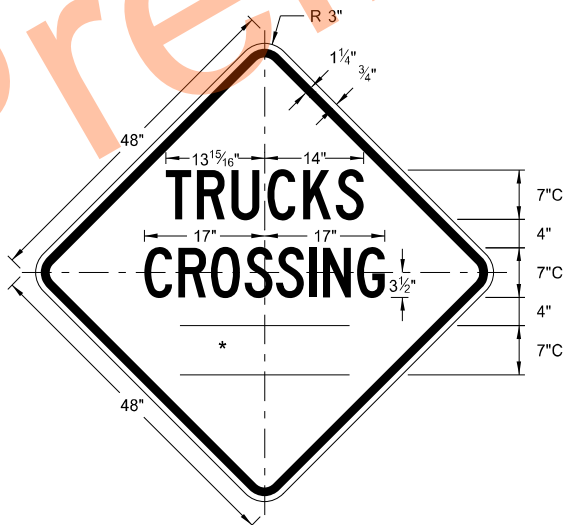
W8-54-48
Legend: black (non-refl)
Background: orange



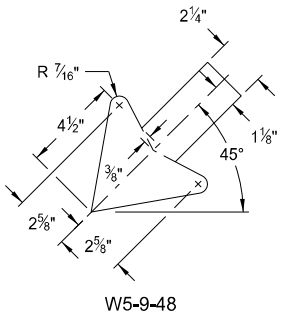
W9-3a-48
Legend: black (non-refl)
Background: orange



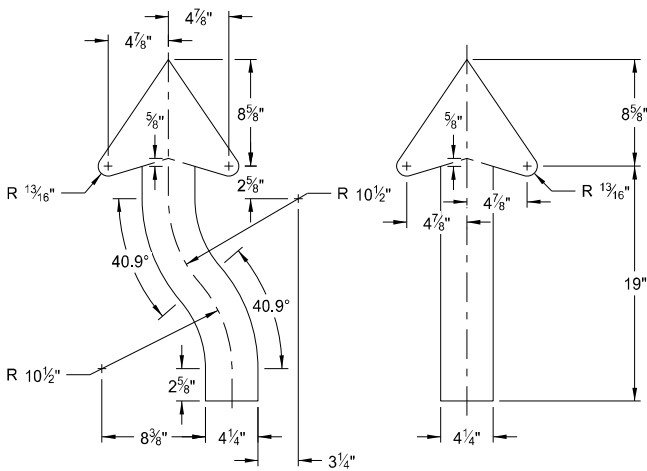
W8-9a-48
Legend: black (non-refl)
Background: orange



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



W5-9-48



W9-3a-48

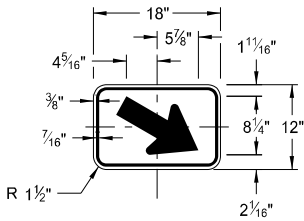
ARROW DETAILS

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
8-01-24	Electronic Stamp/Signature

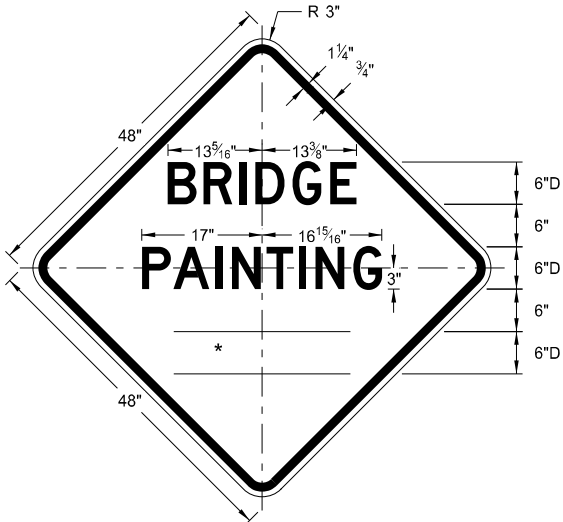


08/01/24

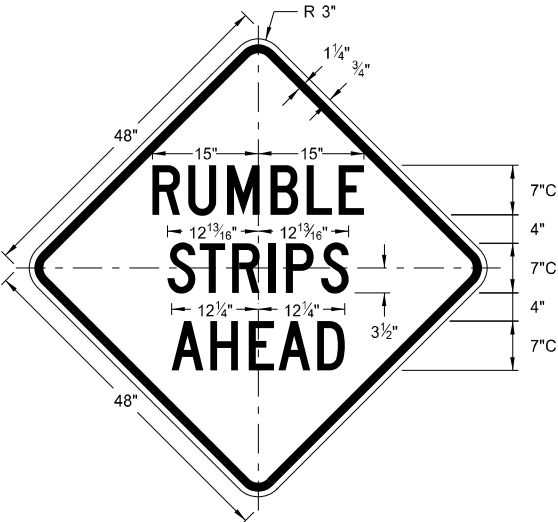
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



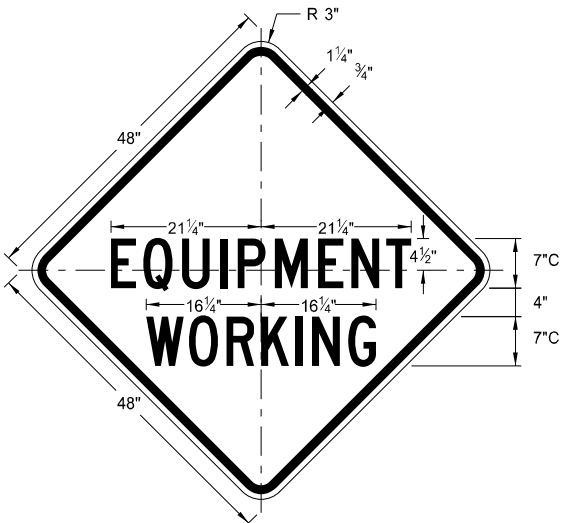
W16-7aP-18
Legend: black (non-refl)
Background: orange



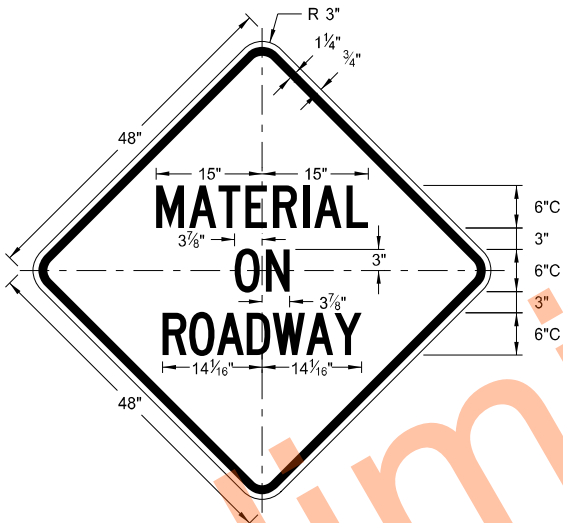
W21-50-48
Legend: black (non-refl)
Background: orange



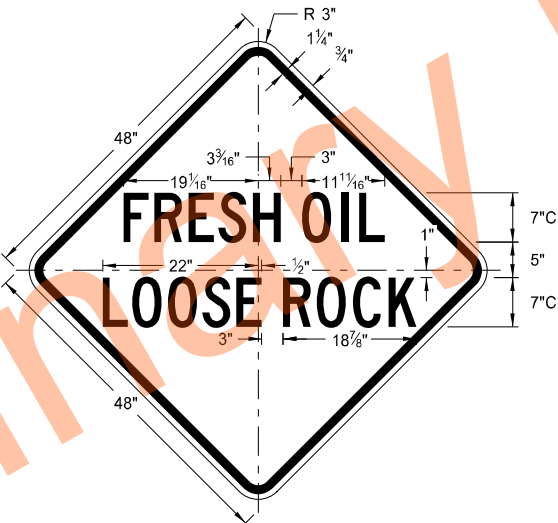
W21-53-48
Legend: black (non-refl)
Background: orange



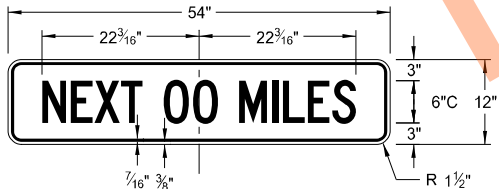
W20-51-48
Legend: black (non-refl)
Background: orange



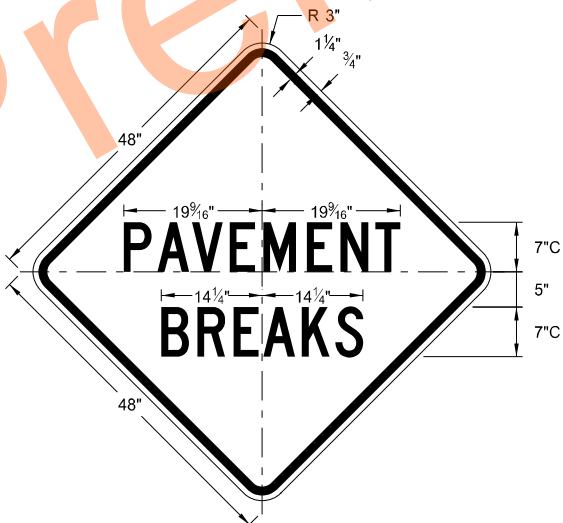
W21-51-48
Legend: black (non-refl)
Background: orange



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



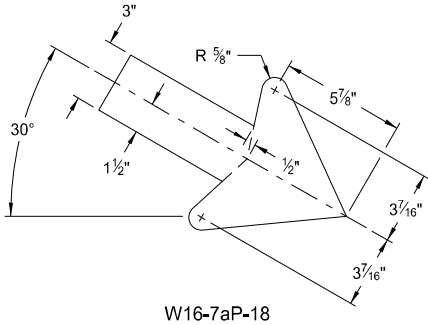
W20-52P-54
Legend: black (non-refl)
Background: orange



W21-52-48
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



W16-7aP-18

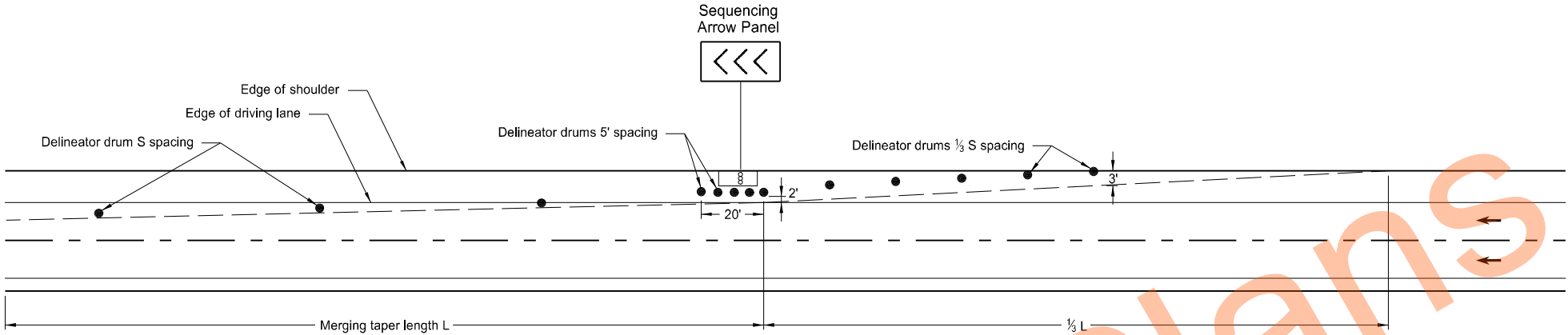
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
5-31-18	
REVISIONS	
DATE	CHANGE
11-01-19	Added details for sign W16-7aP-18.
8-01-24	Electronic Stamp/Signature.



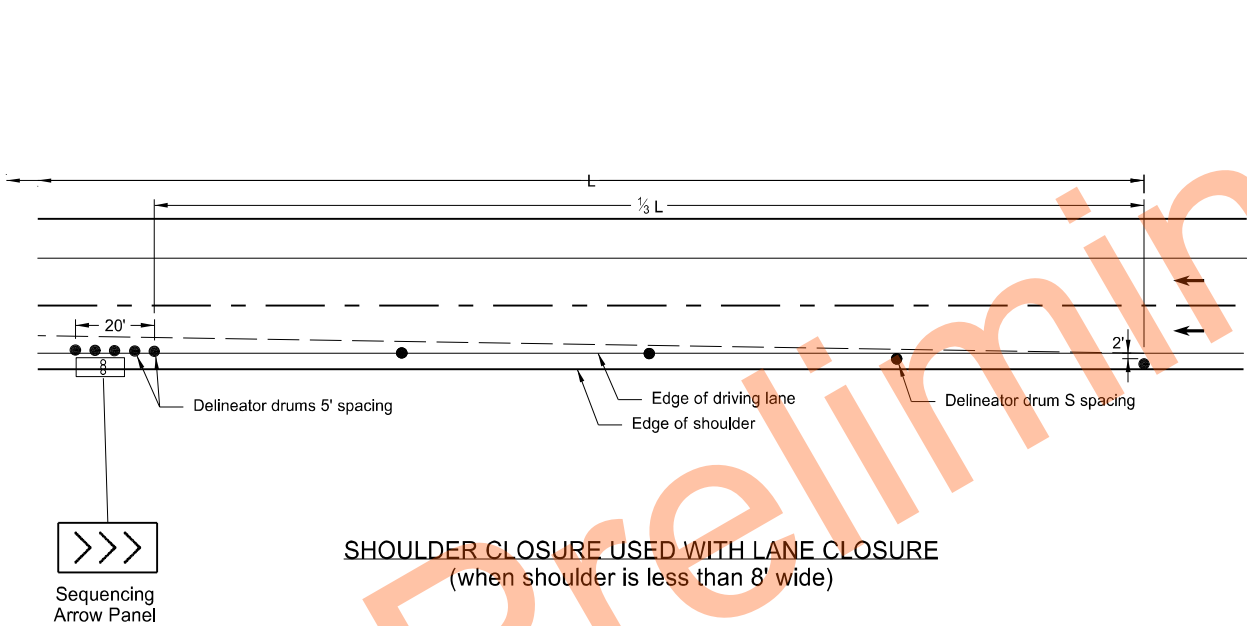
08/01/24

SHOULDER CLOSURE TAPERS

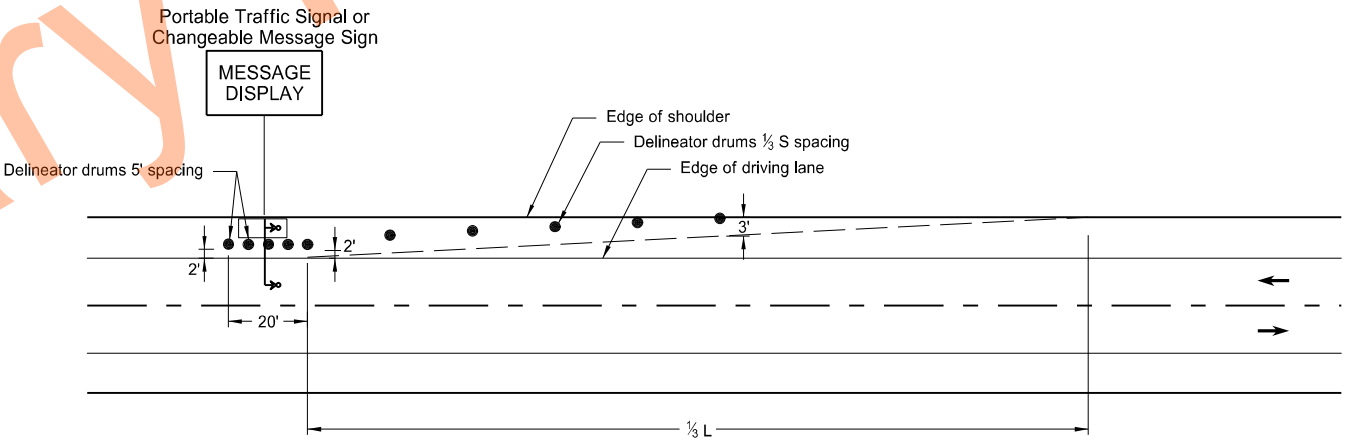
D-704-12



SHOULDER CLOSURE WITH LANE CLOSURE
(when shoulder is 8' or wider)



SHOULDER CLOSURE USED WITH LANE CLOSURE
(when shoulder is less than 8' wide)



PORTABLE TRAFFIC SIGNAL OR CHANGEABLE MESSAGE SIGN ON SHOULDER

KEY

- Delineator Drum
- Message Display
- ∞ Sequencing Arrow Panel
- ↳ Portable Traffic Signal

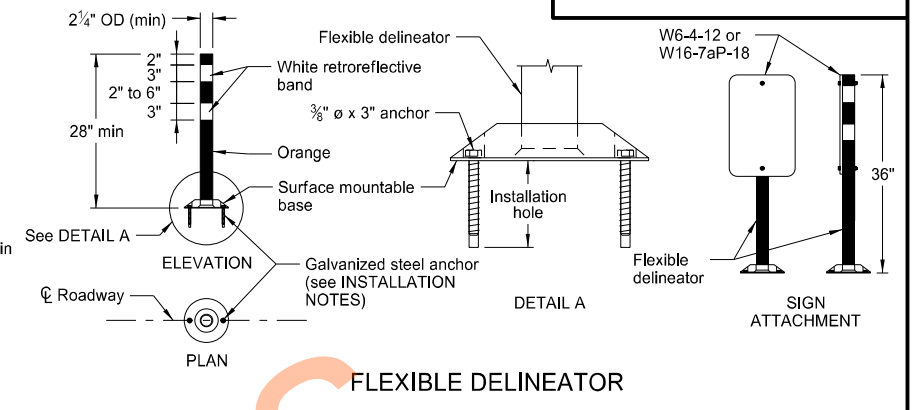
Notes:

- S = Posted Speed Limit in mph
W = Width of offset in feet
L = Taper length in feet
L = $WS^2/60$ (40mph or less)
L = WS (45mph or more)
- If a shoulder taper is used, use a length of approximately $\frac{1}{3}L$. If a shoulder is used as a travel lane, use a normal merging or shifting taper.
- When paved shoulders of 8 foot width or more are closed, use channelizing devices to close shoulder in advance, to delineate beginning of work space, and to direct vehicular traffic to remain within the traveled way.

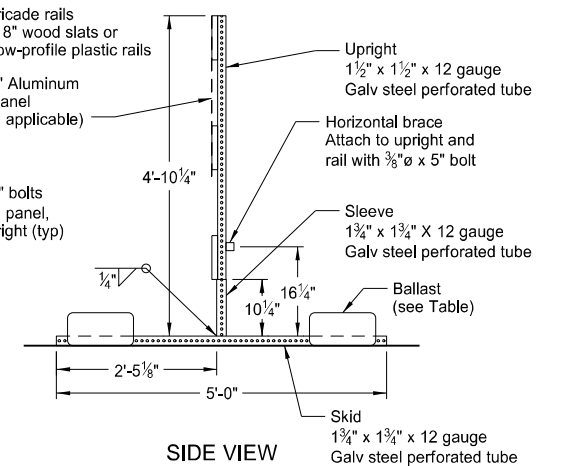
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-25-19	Added L dimension to detail
8-01-24	Electronic Stamp/Signature



08/01/24



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 ASSEMBLY DETAIL (Wood or Plastic Rails)

Diagram illustrating the dimensions and components of a standard traffic warning sign (W1-62):

- Width:** 6' or 8'
- Height:** 20"
- Top Portion:** Orange retroreflective material (height: 5')
- Bottom Portion:** White retroreflective material (height: 20")
- Stripes:** Diagonal stripes (45° angle) with a width of 6" and a spacing of 6".
- Mounting:** The sign is mounted on a post, with a 5' clearance from the ground.
- Surface:** Pavement or ground.

The technical drawings include:

- REFLECTOR DETAIL (Plan View):** A diamond-shaped reflector with a central crosshair. The top and bottom points are labeled "4\"". The left and right points are labeled "R 3/8\"". The top and bottom points are also labeled "2\"". The left and right points are also labeled "2\"". The central crosshair is labeled "1/4\" ø (typ)".
- SECTION VIEW:** A cross-section of the reflector showing a "Steel u-channel (1.12 lb/ft min to 2.0 lb/ft max)". The top flange is labeled "1 1/16\" min". The bottom flange is labeled "2\" min".
- MOUNTING DETAIL:** Two views showing the reflector mounted on a "3/16\" Fastener". The left view is labeled "One Direction" and the right view is labeled "Bi-Directional".
- ELEVATION:** A side view of the reflector showing its profile. The top flange is labeled "2' to 8'". The bottom flange is labeled "4'". The total height is labeled "24\"". The reflector is shown mounted on a "Roadway surface".

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.

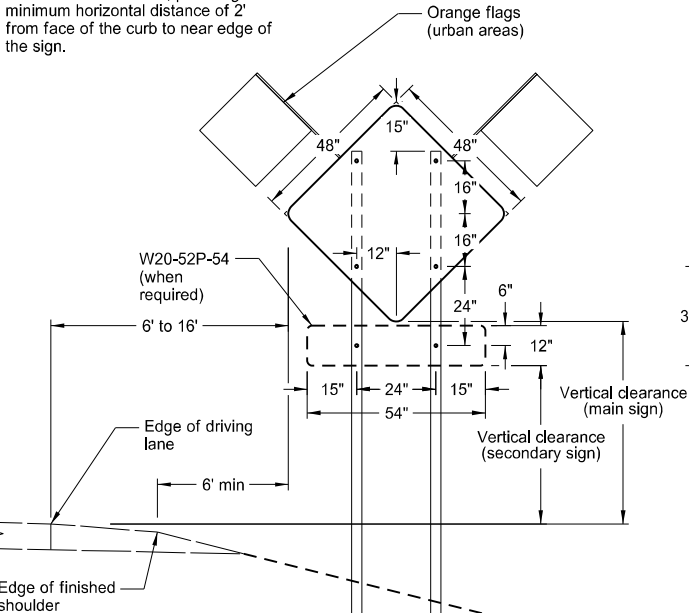
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
11-01-19	Revised details for Flexible Delineator
8-01-24	Electronic Stamp/Signature



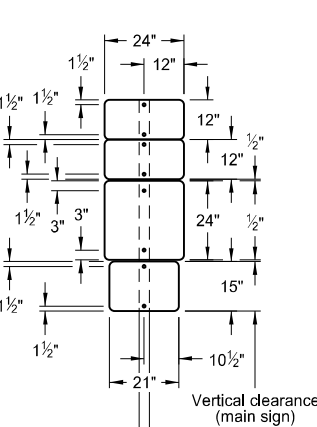
08/01/24

CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

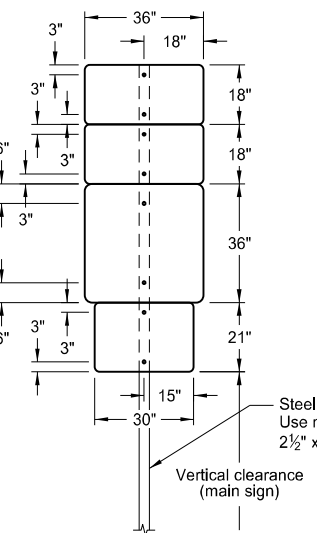
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



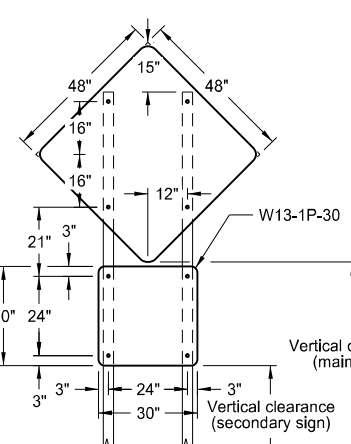
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



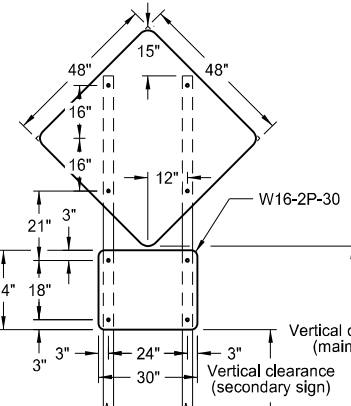
24" x 24"
ROUTE MARKER
ASSEMBLY



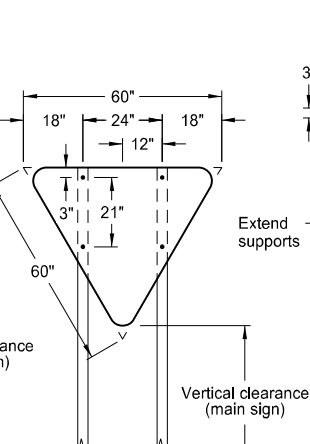
36" x 36"
ROUTE MARKER
ASSEMBLY



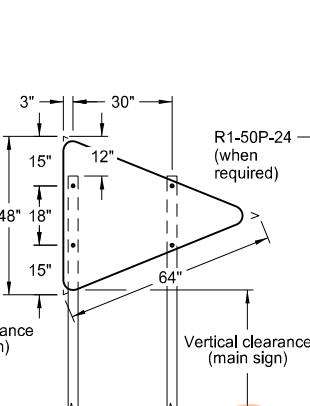
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



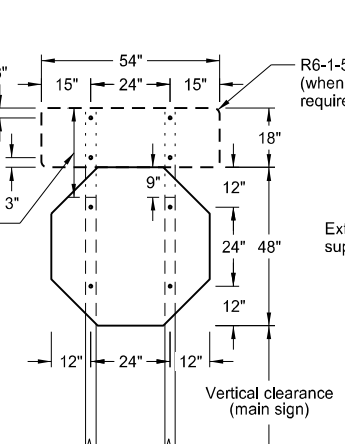
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



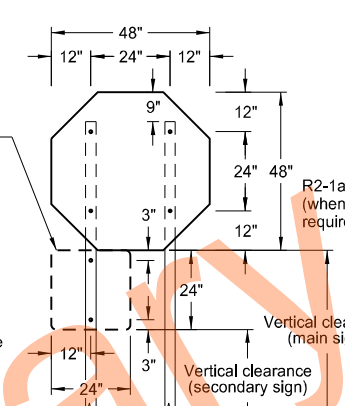
R1-2-60 - YIELD SIGN



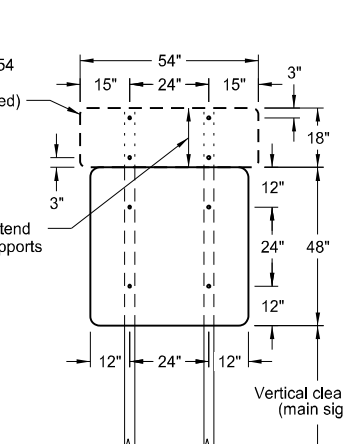
W14-3-64 - PENNANT SIGN



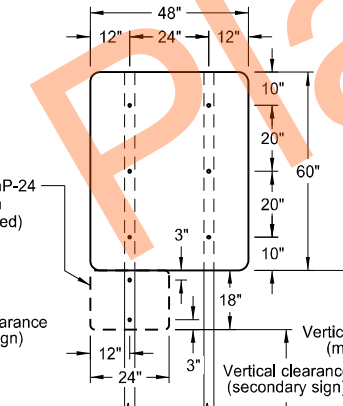
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



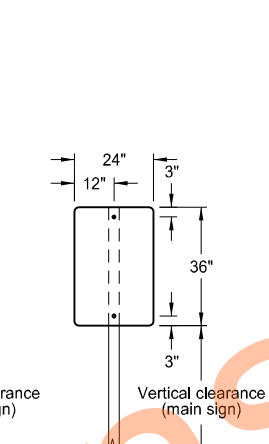
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



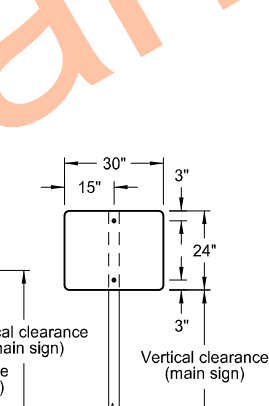
48" x 48" SIGN
(with R6-1-54 sign as required)



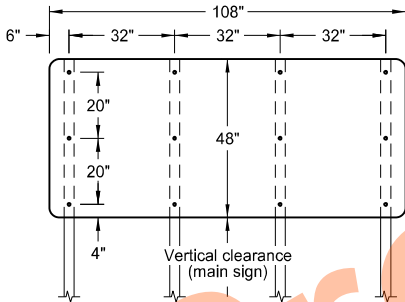
48" x 48" SIGN
(with R2-1aP-24 sign as required)



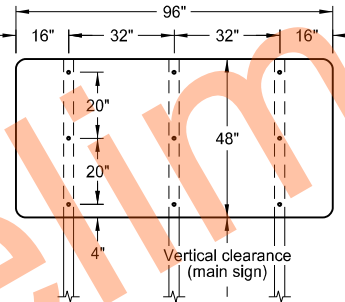
24" x 36" SIGN



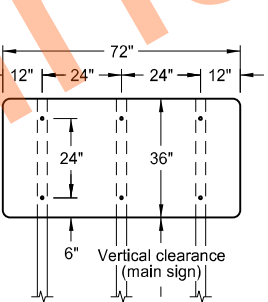
30" x 24" SIGN



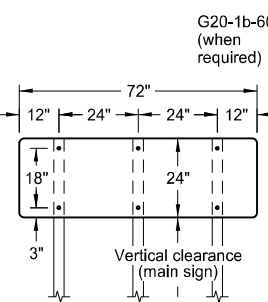
108" x 48" SIGN



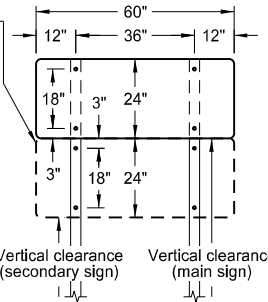
96" x 48" SIGN



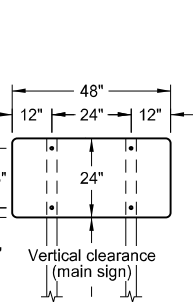
72" x 36" SIGN



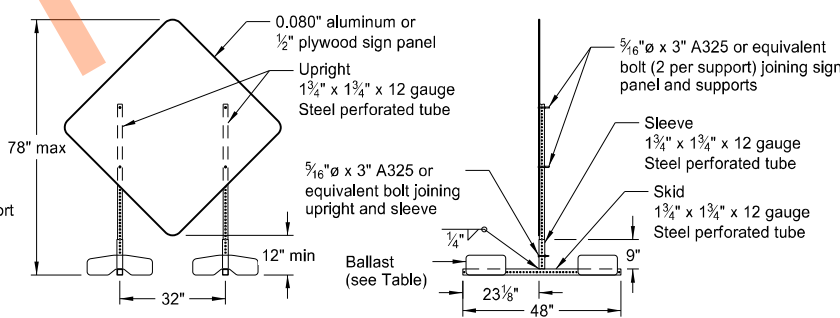
72" x 24" SIGN



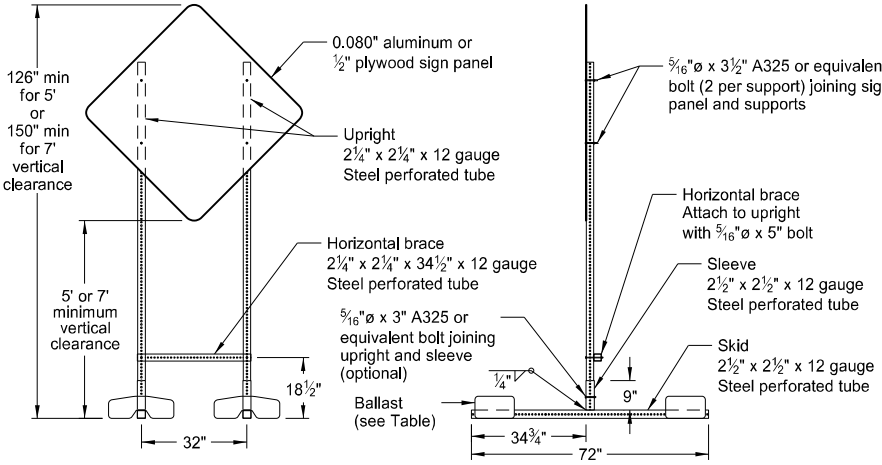
60" x 24" SIGN



48" x 24" SIGN



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

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

Place signs over 50 square feet on 2 1/2" x 2 1/2" perforated tube supports as a minimum.

Do not attach guy wires to sign supports. Attach wind beams behind sign panels when used with u-posts.
2. Sign Panels: Provide sign panels made of 0.100" aluminum, 1/2" plywood, or other approved material, except where noted. Punch all holes round for 3/8" bolts.
3. Alternate Messages: Install and remove alternate message signs on reflectorized plate (without borders) as required. (i.e. "Left" and "Right" message on lane closure sign)
4. Route Marker Auxiliary Signs: Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:

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

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

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

Provide a minimum clearance of 7'-0" from the ground at the post for signs with an area exceeding 50 square feet.

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

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

Restrict signs mounted on portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT details to a maximum surface area of 16 square feet.

MINIMUM BALLAST
(For each side of sign support base)

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

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

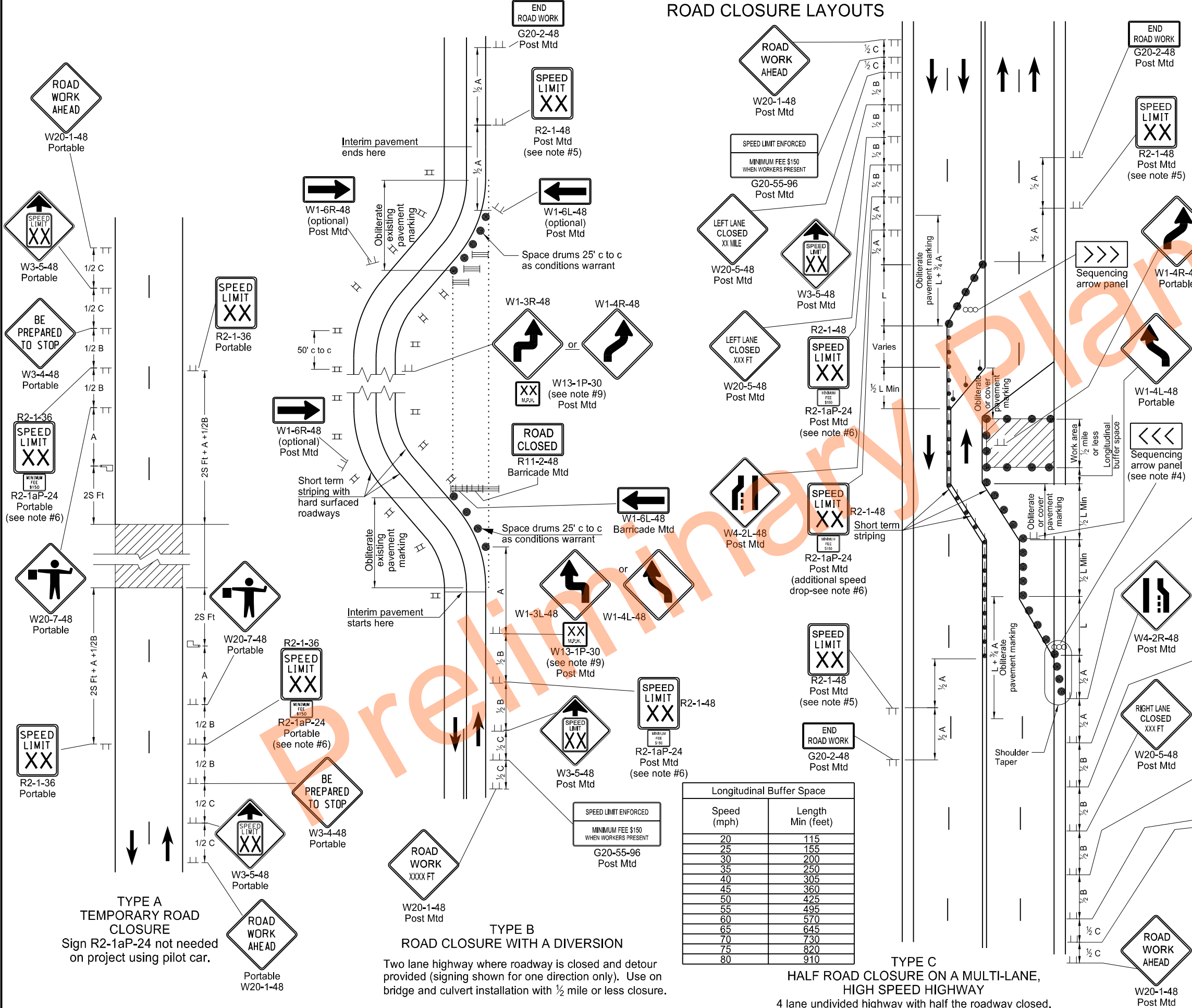
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-13	
REVISIONS	
DATE	CHANGE
11-14-13	Revised Note 6
9-27-17	Updated to active voice
11-01-19	Revised 60"x24" sign detail
8-01-24	Electronic Stamp/Signature



08/01/24

ROAD CLOSURE LAYOUTS

D-704-15



- Notes:
- 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 S²/60 for urban, residential, and other streets with speeds of 40 mph or less.
 - Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
 - Place delineator drums, barricades or cones for tapering traffic at dimension "S" and for tangents space at 2 times dimension "S".
 - 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).
 - Re-establish speed. Determine exact speed limit in the field, dependent on location and conditions.
 - 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 1/2 B.
 - 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.
 - Cover existing speed limit signs within reduced speed zones.
 - Where necessary, engineer will determine safe speed.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - 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.
 - Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

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 80 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

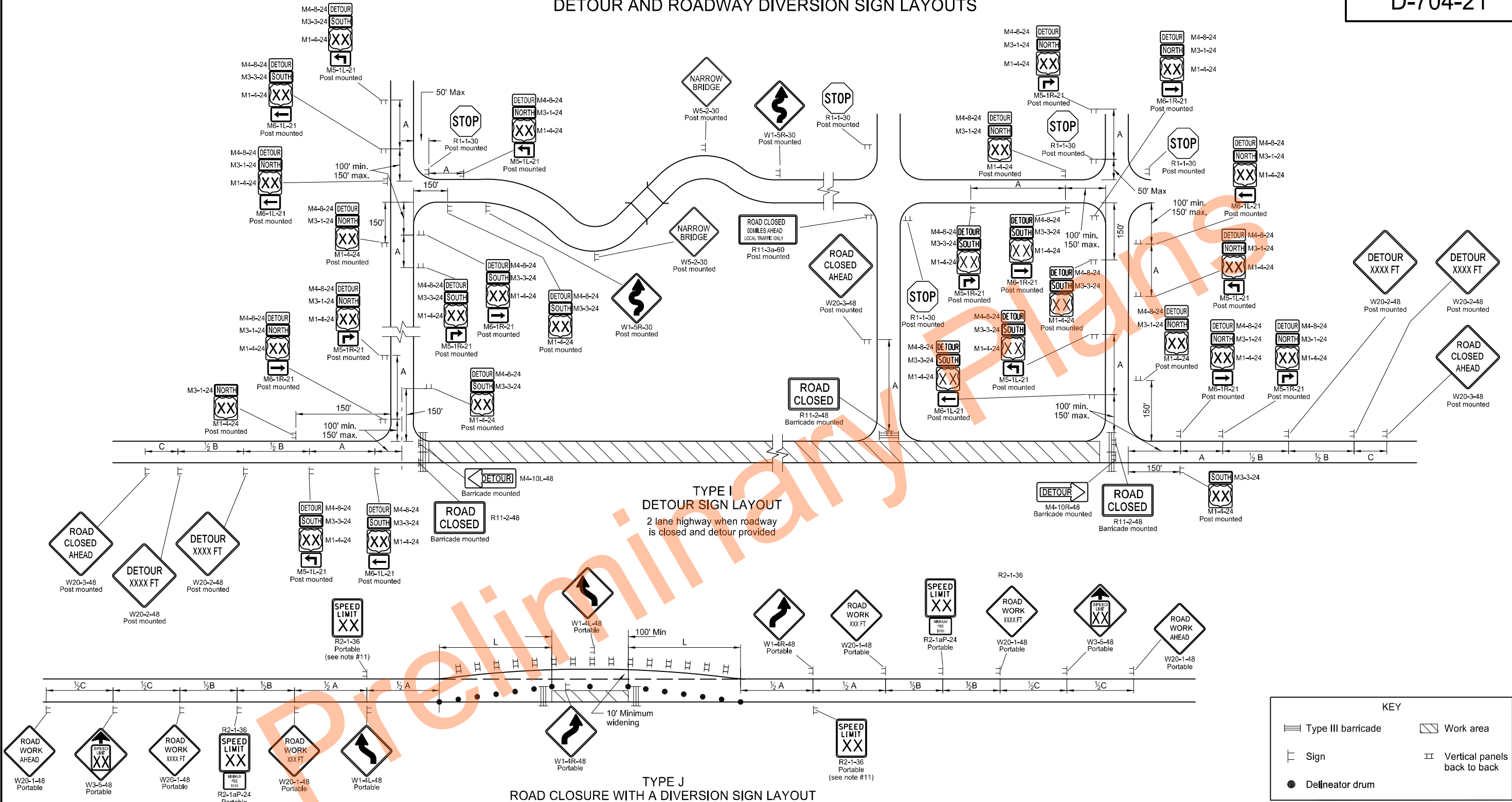
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
08-17-17	Updated Notes & Spd Limit signs
11-01-19	Sign, Notes, & Pmnt Mk updates
12-08-21	Switched order of Road Work Ahead and Spd Limit Enforced & added Dollars At Work
11-29-22	Removed Dollars At Work
06-30-25	Legislative Changes





DETOUR AND ROADWAY DIVERSION SIGN LAYOUTS

D-704-21



- Notes:
- Variables
S=Numerical value of speed limit or 85th percentile. W=The width of taper.
L=Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x S² / 60 for urban, residential, and other streets with speeds of 40 mph or less.
 - Place barricades on moveable assemblies and signs on portable assemblies when on roadway.
 - Space delineator drums and vertical panels at dimension "S" for tapering traffic. Space delineator drums, tubular markers and vertical panels at 2 times "S" for tangents.
 - Determine the reduced speed limit based on the in place speed limit before construction. Where speed limits 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 1/2 B.
 - Install flags on warning signs in urban areas when signs are not portable. Mount 24 inches 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.
 - Cover existing speed limit signs within a reduced speed limit zone.
 - Covered (when approved by engineer) or obliterated pavement marking measured as Obliteration of Pavement Marking.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - If the tangent between tapers is less than 600', as an option, use sign W20-1-48 in place of double reverse curve signs.
 - Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
 - Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.

TYPE J
ROAD CLOSURE WITH A DIVERSION SIGN LAYOUT

2 lane highway with widened section,
traffic maintained in both directions.
Use layout when work is less than 5 days or is within a project.

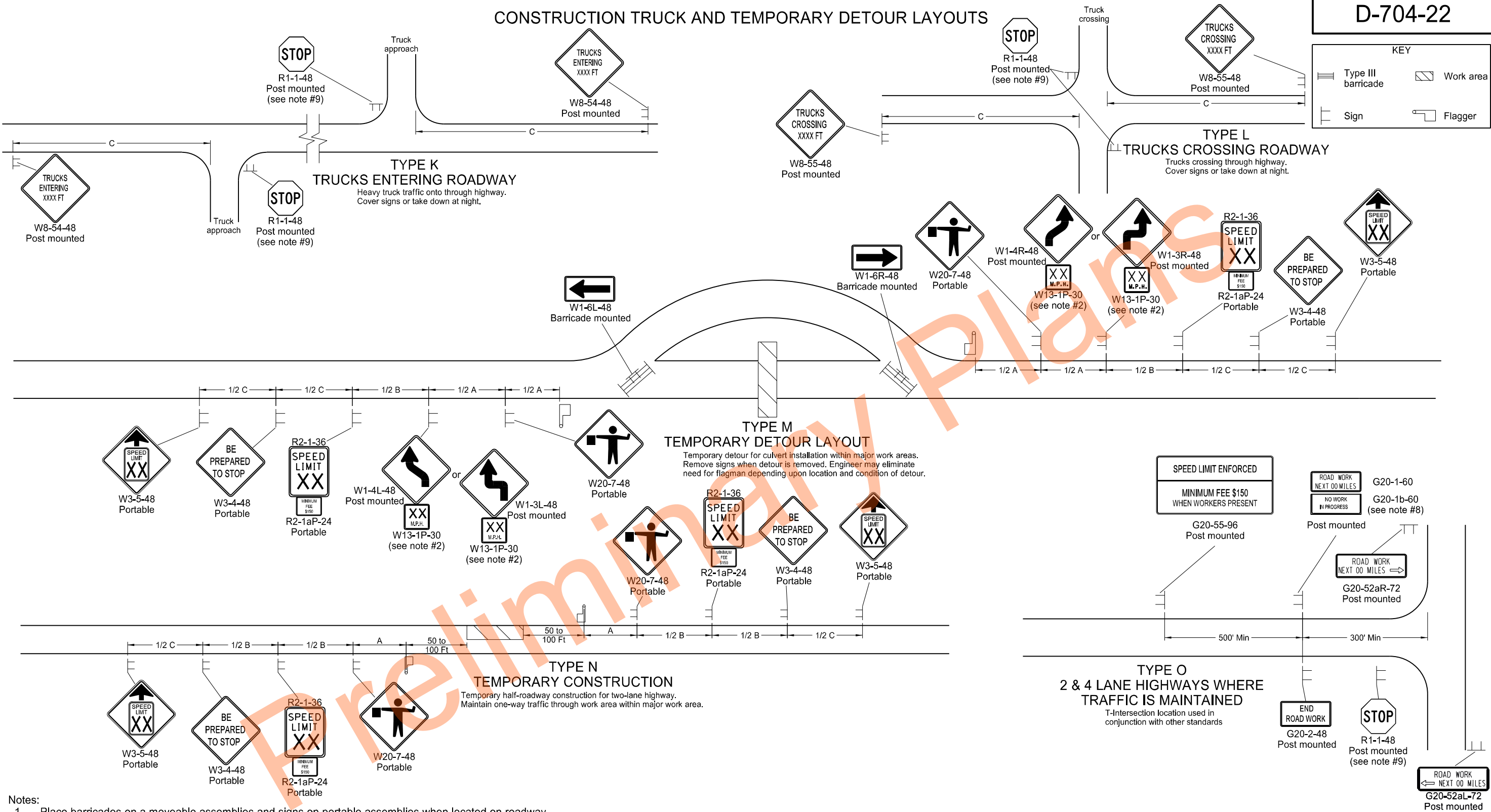
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 80 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 & added speed limit
11-01-19	Revised sign #s and note 8
12-08-21	Added Dollars At Work sign
11-29-22	Removed Dollars At Work
06-30-25	Legislative Changes



CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

D-704-22



Notes:

- Place barricades on a moveable assemblies and signs on portable assemblies when located on roadway.
- Where necessary, safe speed to be determined by the Engineer.
- 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 1/2 B.
- 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.
- Cover existing speed limit signs within a reduced speed zone.
- Covered (when approved by engineer) or obliterated pavement marking measured as Obliteration of Pavement Marking.
- As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
- Install sign G20-1b-60 when work is suspended for winter.
- If existing stop sign is in place, a 48" stop sign is not required.
- 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.
- Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

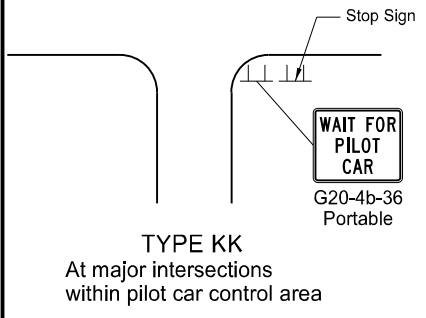
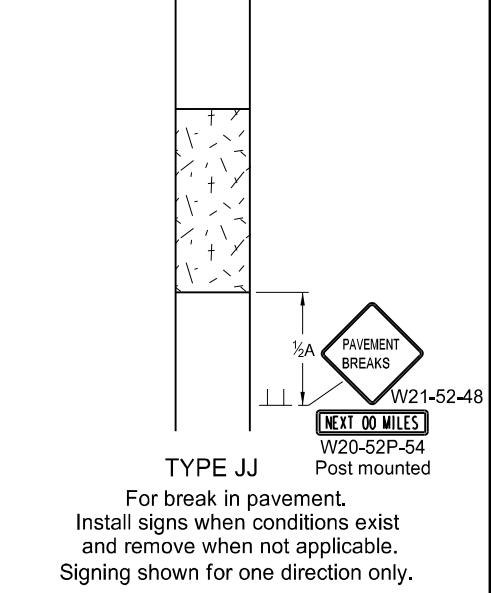
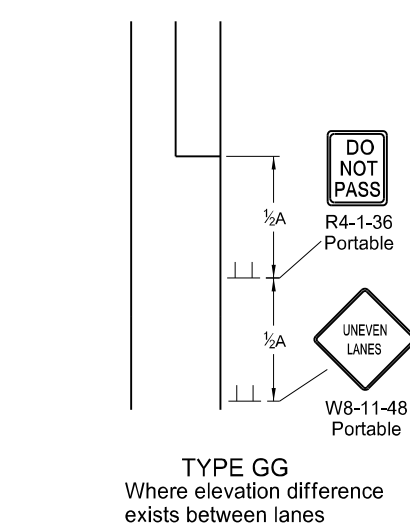
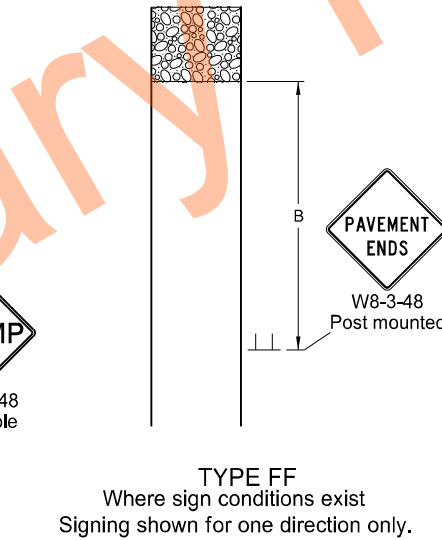
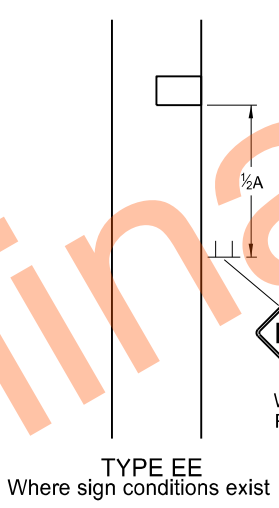
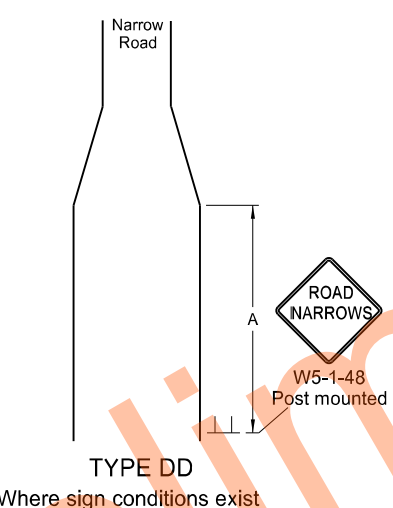
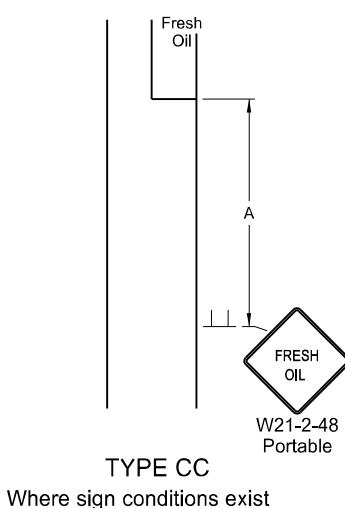
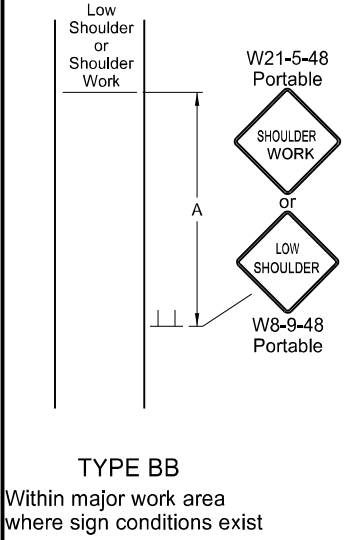
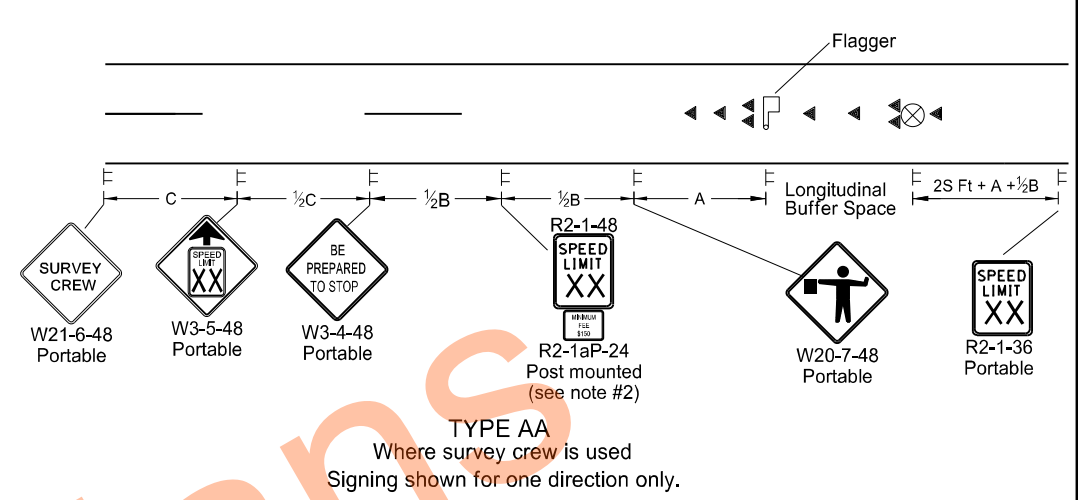
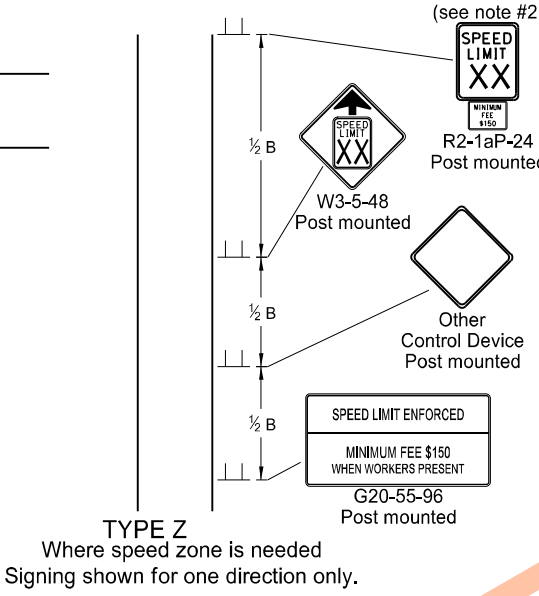
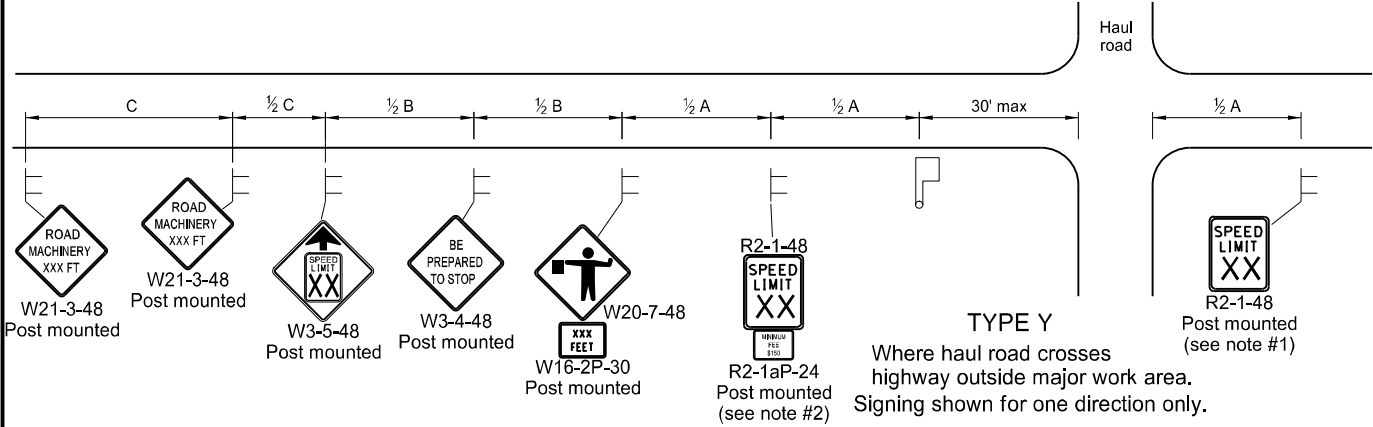
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 80 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
06-30-25	Legislative Changes



MISCELLANEOUS SIGN LAYOUTS

D-704-26



- 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 1/2 B.
 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 80 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
80	910

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

KEY

- Flagger
- Sign
- Cones
- Survey Equipment

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

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

9-27-13

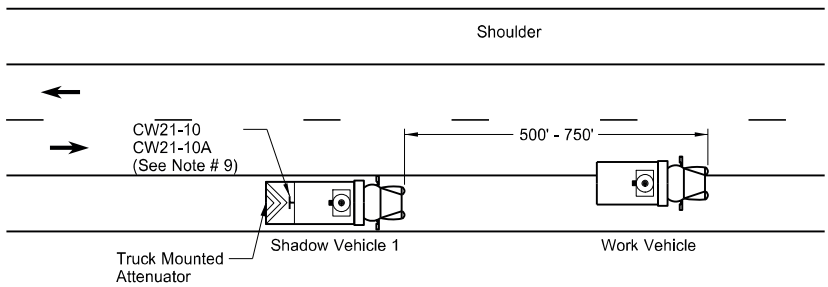
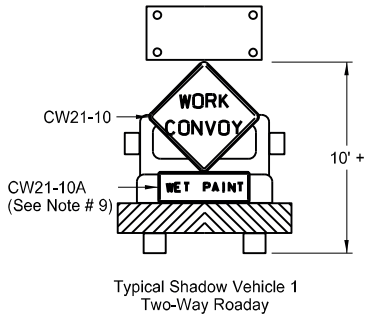
REVISIONS

DATE	CHANGE
08-17-17	Added speed limit signs. Updated notes & sign numbers
11-01-19	Revised note 5 & sign numbers
02-23-23	Revised distance & removed signs
06-30-25	Legislative Changes

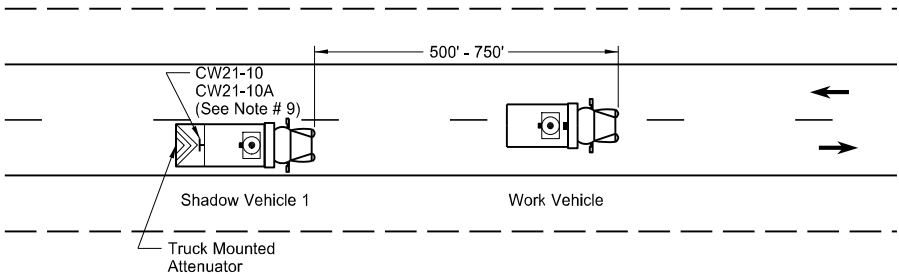
KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
06/30/25
ENGINEER
NORTH DAKOTA

MOBILE OPERATION
(PAVEMENT MARKING)

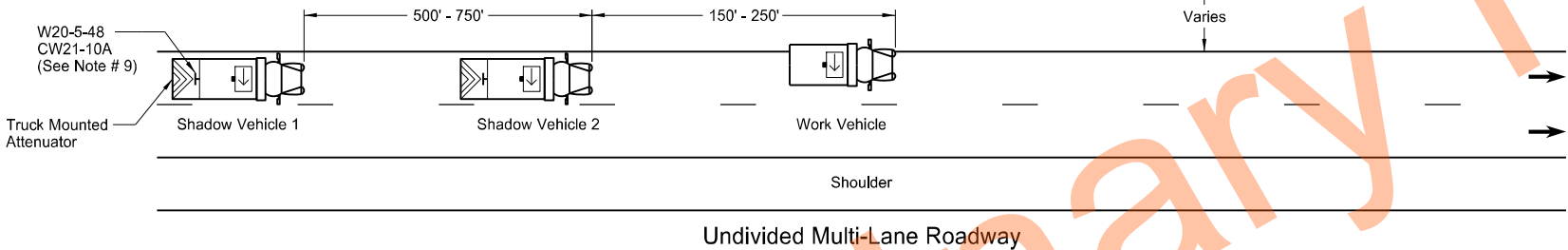
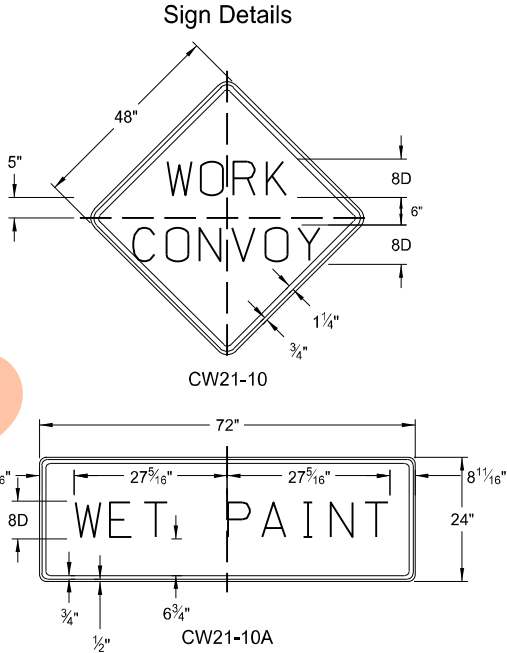
D-704-27



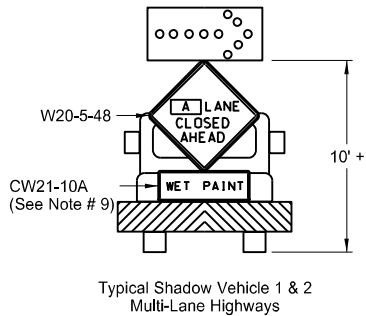
Two-Way Roadway with Paved Shoulders



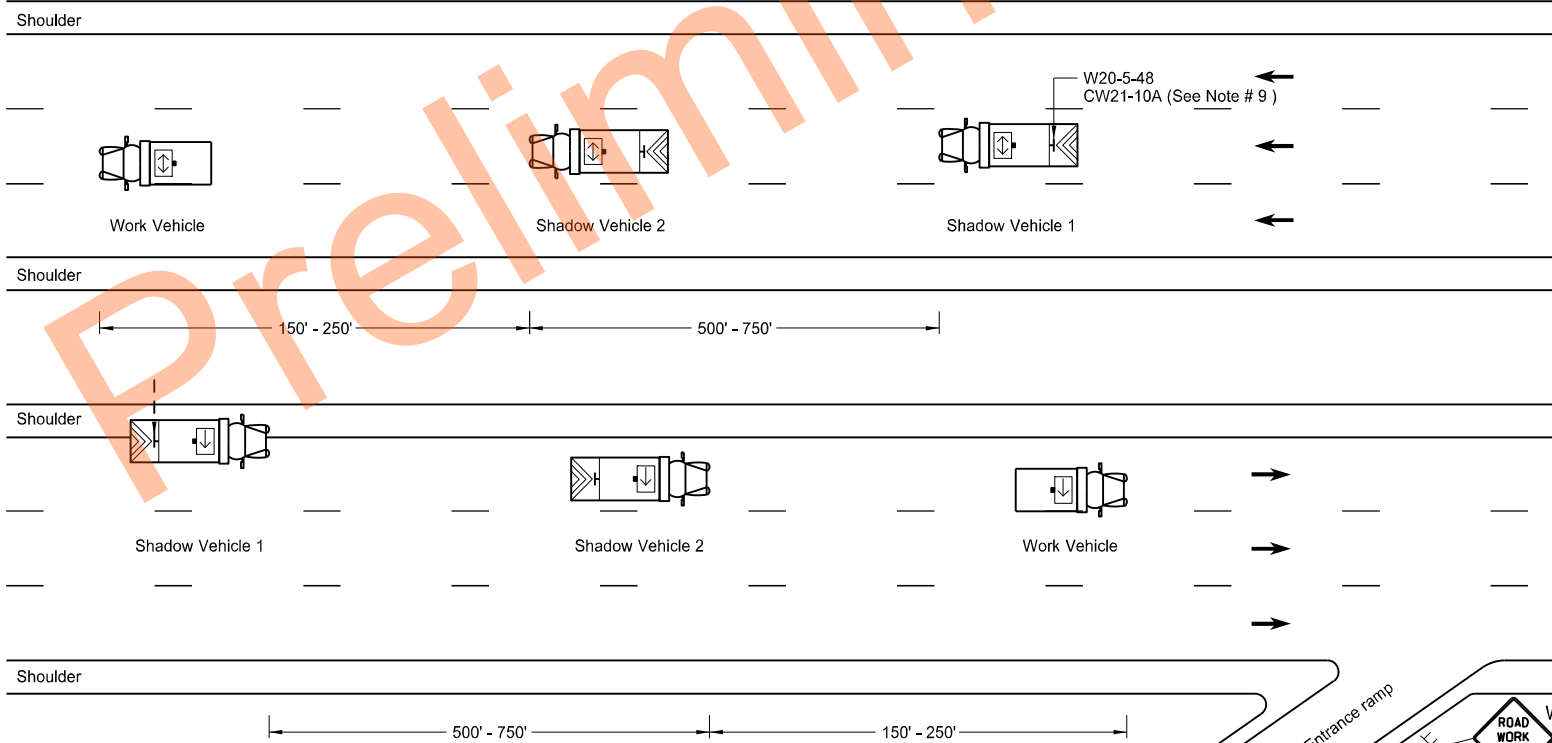
Two-Way Roadway without Paved Shoulders



Undivided Multi-Lane Roadway

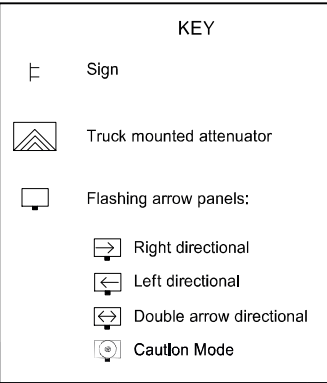


A = Left Right Center



Divided Multi-Lane Highway

- 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 strobe 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.



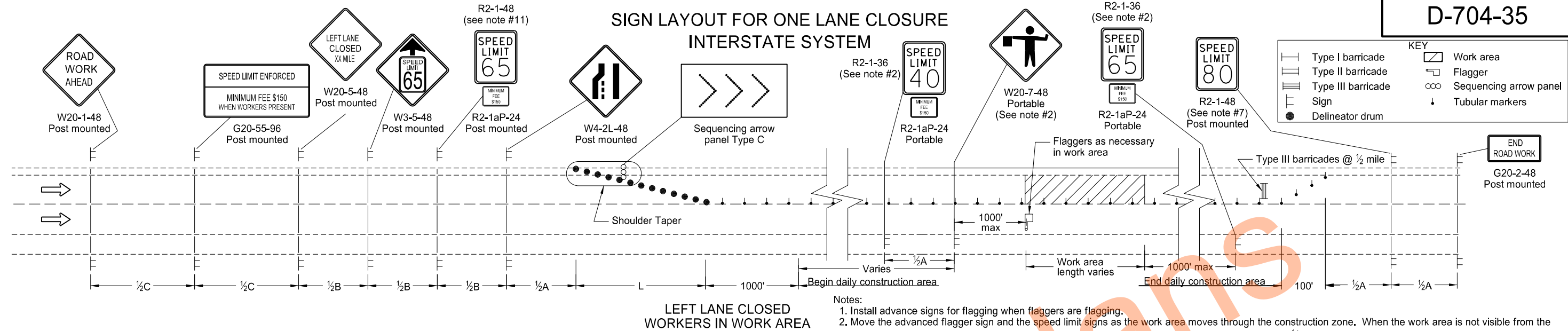
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
6-18-14	Removed shadow vehicle 2 on two lane roadways
9-27-17	Updated to active voice
11-08-19	Changed Standard Heading
8-02-24	Electronic Stamp/Signature.



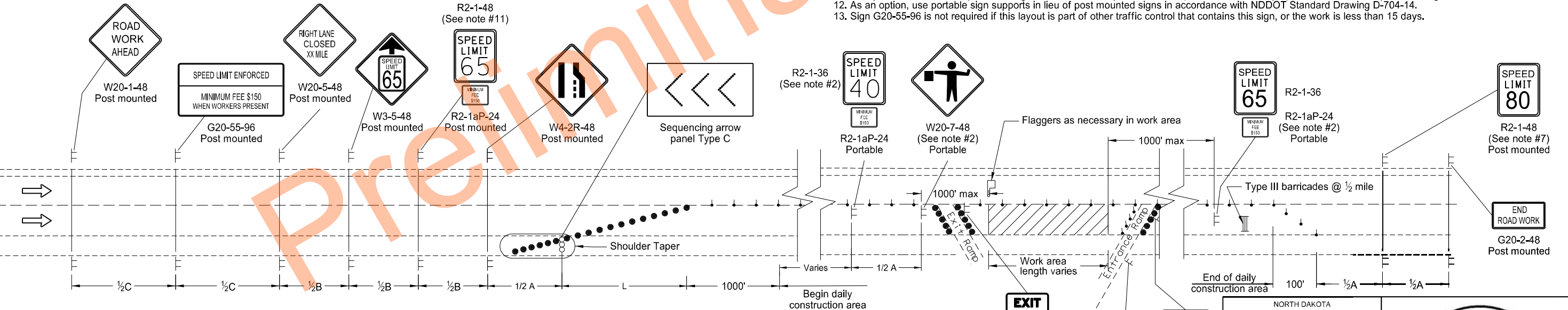
08/02/24

SIGN LAYOUT FOR ONE LANE CLOSURE
INTERSTATE SYSTEM

D-704-35



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 80 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 1/2A 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 \$150 signs and the 65 mph speed limit sign upon completion of the work day or when workers are not present.
 3. RAMP: 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 1/2B.
 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.

EXIT
E5-1-48
Portable

SPEED LIMIT ENFORCED
MINIMUM FEE \$150
WHEN WORKERS PRESENT

G20-55-96
Post mounted
Install this sign only when ramp volume is 1000 ADT or more

R2-1-36
SPEED LIMIT 40
Portable
(see notes #2 & #3)

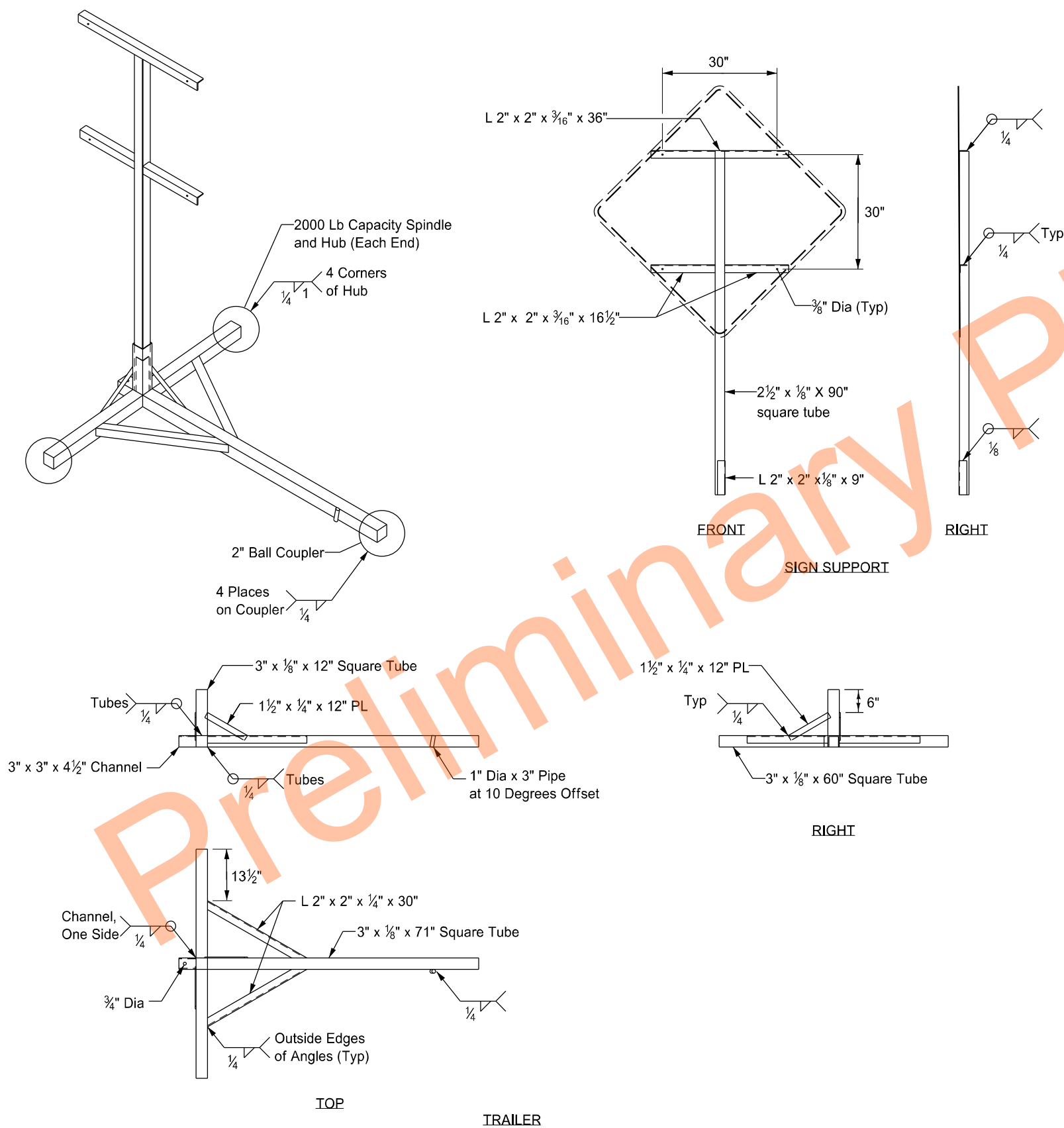
R1-2-60
Portable

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 Mkrs 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
06-30-25	Legislative Changes



PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



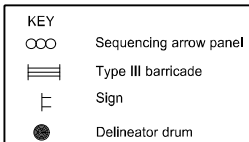
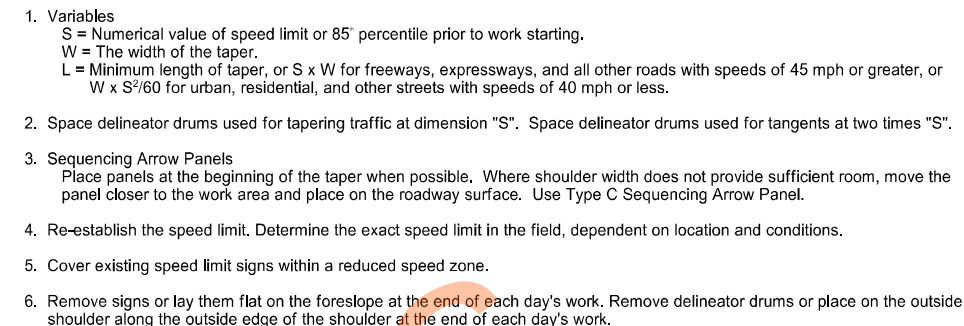
- Notes:
- ①. Maximum 250 pound weight of assembly.
 - ②. Use a 14" wheel and tire.
 - ③. Use no automotive and equipment axle assemblies for trailer-mounted sign supports.
 - ④. Other NCHRP 350 or MASH crash tested assemblies are acceptable.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE
12/02/2020	Updated Note to active voice.

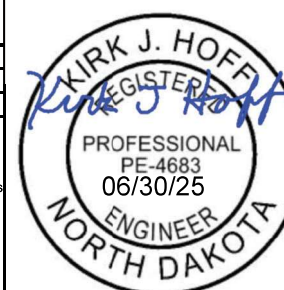
KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

12 02 2020

D-704-52

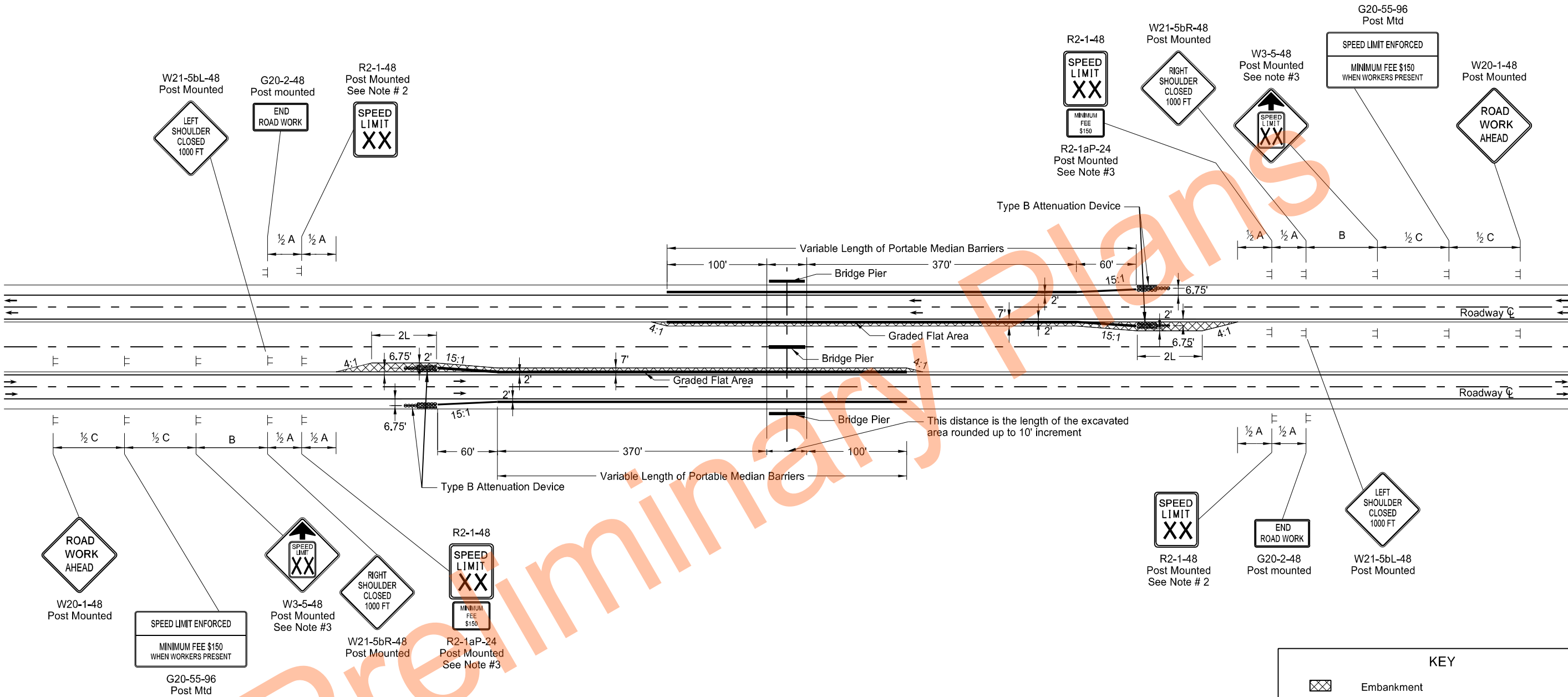


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09-05-12	
REVISIONS	
DATE	CHANGE
06-24-14	Updated sign sizes and added mounting type
03-15-16	Removed Do Not Pass signs and updated notes
11-01-19	Revised note, sign #, & del drums
08-02-24	Electronic Stamp/Signature
06-30-25	Legislative Changes



Divided Highway Operation for Overhead Structure, Pier, and Footing Replacement

D-704-58



KEY

- Embankment
- Sign
- Type B Attenuation Device
- Portable Median Barrier

- Notes:
- Use when a bridge structure is being constructed.
 - Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
 - 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 1/2 B.
 - Close roadway at separations or use ramps at interchanges during removal and installation of beams. See notes in the plans for traffic control requirements for this operation.
 - 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.

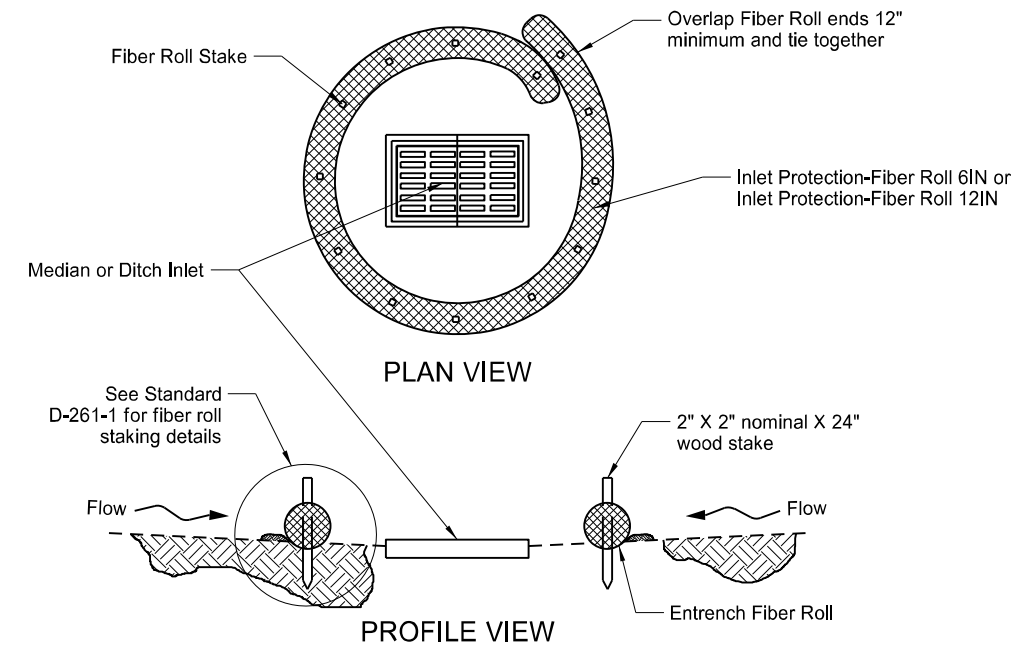
L = length of attenuation device

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 80 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

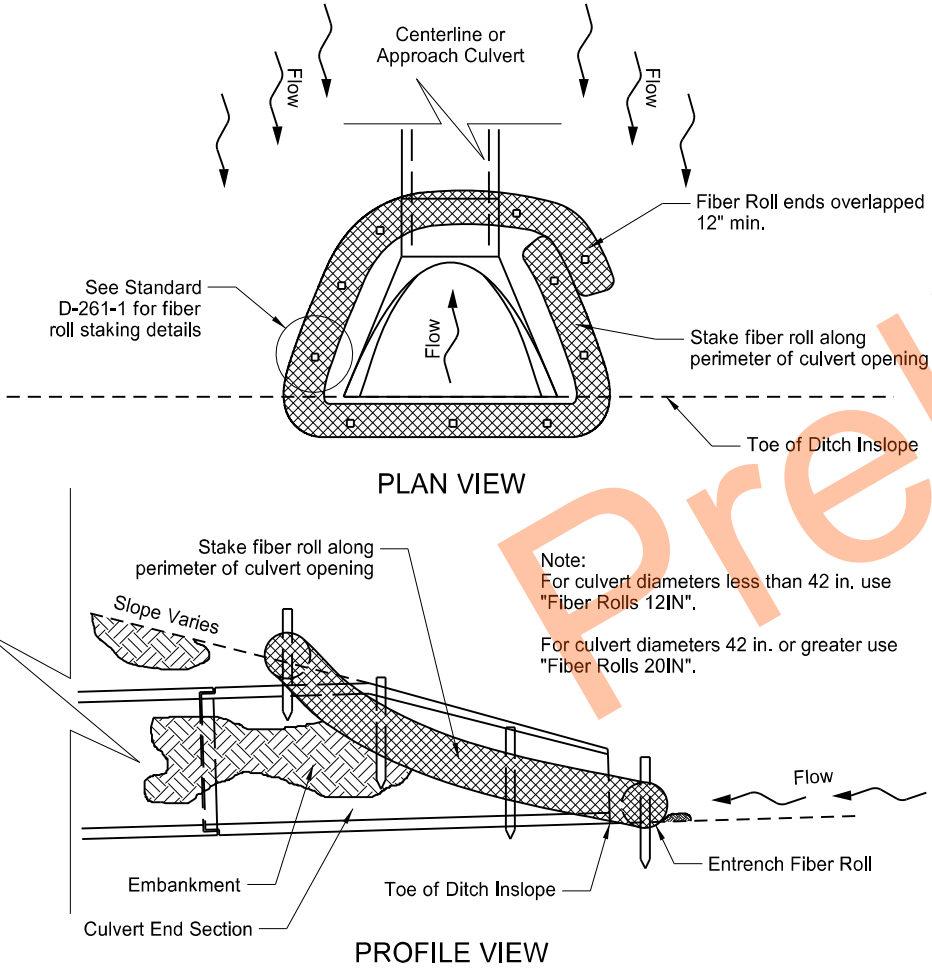
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-18-15	
REVISIONS	
DATE	CHANGE
09-18-15	Revised Standard Description
09-27-17	Updated to active voice
11-01-19	Atten Device, hatching, & sign #s
12-08-21	Added Minimum Fee sign and Dollars At Work sign
11-29-22	Removed Dollars At Work
08-21-24	Portable Median Barrier Wordling
06-30-25	Legislative Changes



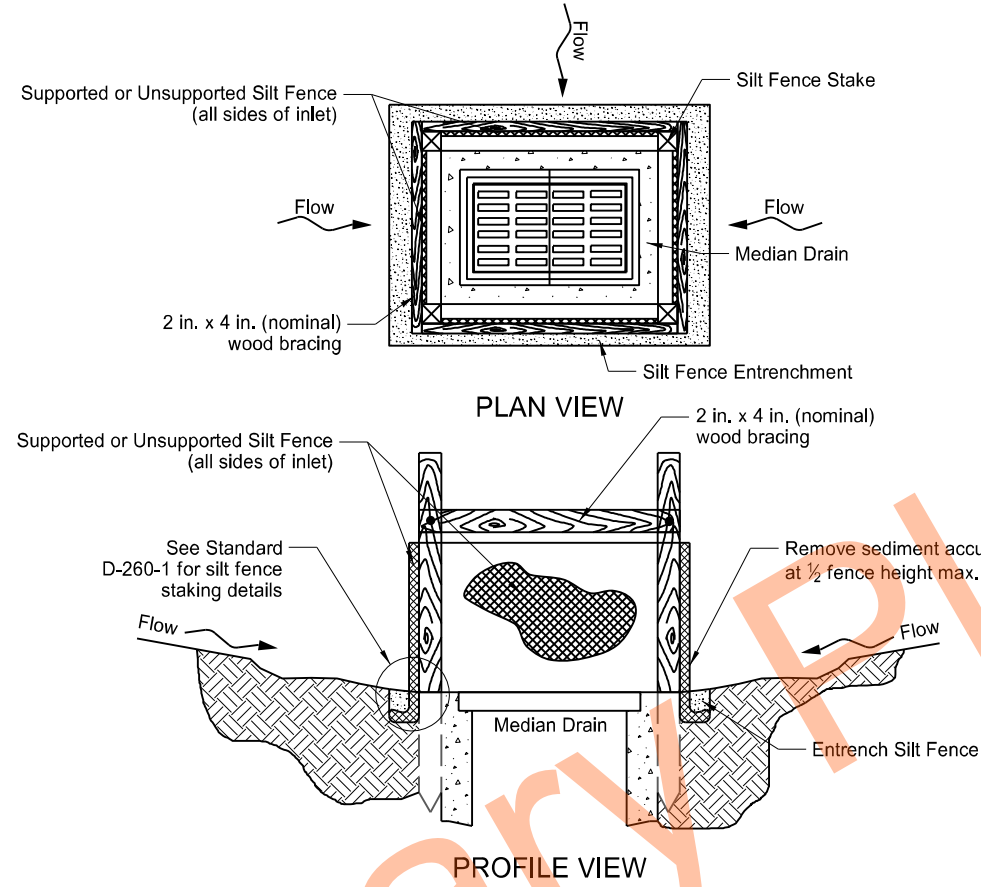
EROSION AND SILTATION CONTROLS
MEDIAN OR DITCH INLET PROTECTION



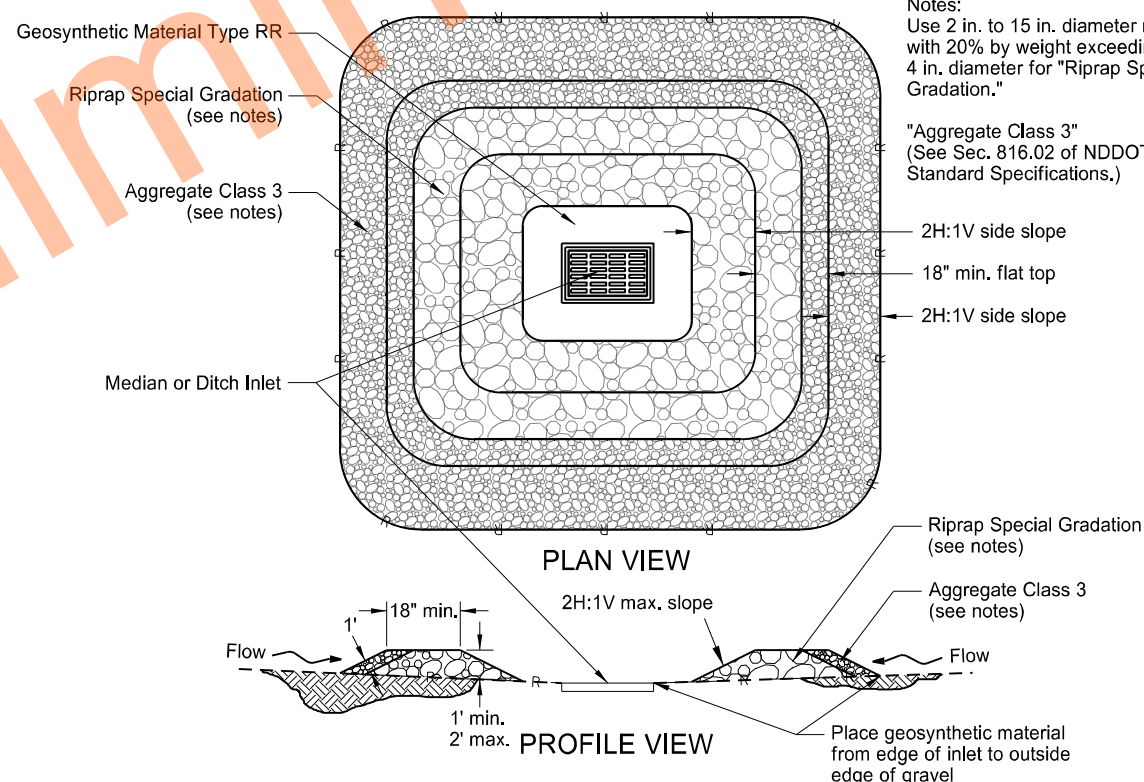
FIBER ROLL PROTECTION
(MEDIAN OR DITCH INLET)



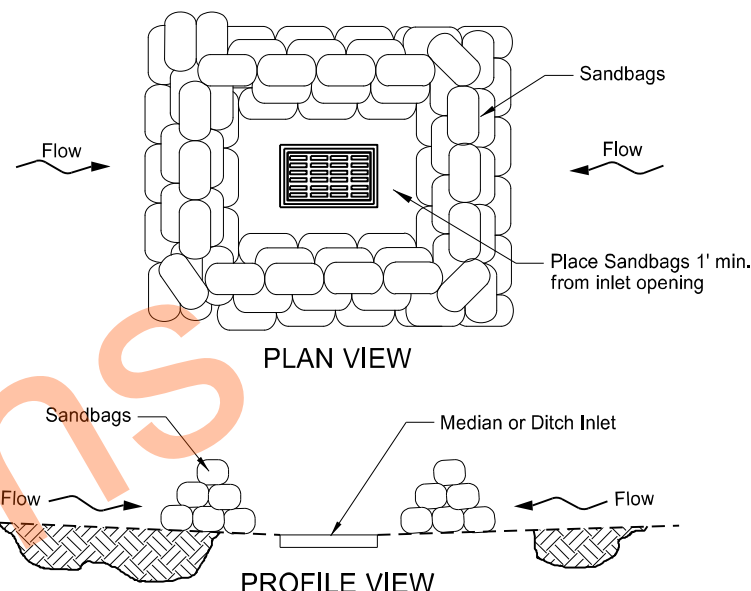
FIBER ROLL PROTECTION
(INLET OF CULVERT)



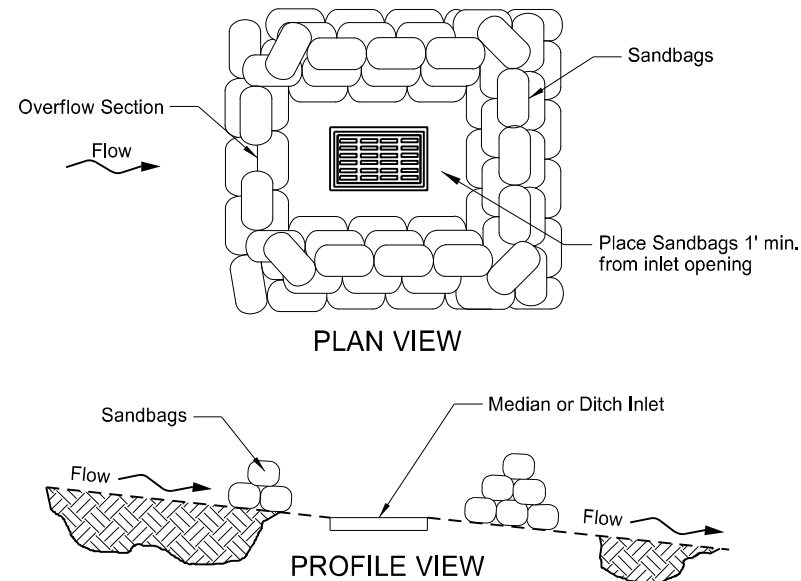
SILT FENCE PROTECTION
(MEDIAN OR DITCH INLET)



GRAVEL INLET PROTECTION
(MEDIAN OR DITCH INLET)



SANDBAG PROTECTION
(LOW POINT)

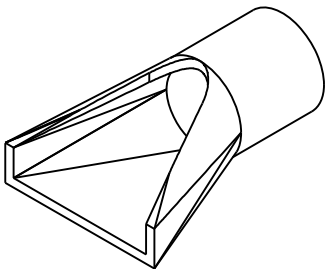


SANDBAG PROTECTION
(ON SLOPE)

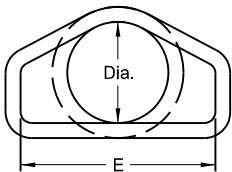
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Updated reference to standard drawing number for fiber roll staking details.
10-01-14	Updated reference to standard drawing number for silt fence.
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp.

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

FLARED END SECTION						
TERMINAL DIMENSIONS						
DIA	A	B	C	D	E	U
12	0'-4"	2'-0"	4'-0 ⁷ / ₈ "	6'-0 ⁷ / ₈ "	2'-0"	2"
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2 ¹ / ₂ "
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2 ¹ / ₂ "
21	0'-9"	3'-0"	3'-1"	6'-1"	3'-6"	2 ¹ / ₂ "
24	0'-9 ¹ / ₂ "	3'-7 ¹ / ₂ "	2'-6"	6'-1 ¹ / ₂ "	4'-0"	3"
27	0'-10 ¹ / ₂ "	4'-0"	2'-1 ¹ / ₂ "	6'-1 ¹ / ₂ "	4'-6"	3 ¹ / ₂ "
30	1'-0"	4'-6"	1'-7 ³ / ₄ "	6'-1 ³ / ₄ "	5'-0"	3 ¹ / ₂ "
36	1'-3"	5'-3"	2'-9"	8'-0"	6'-0"	4"
42	1'-9"	5'-3"	2'-9"	8'-0"	6'-6"	4 ¹ / ₂ "
48	2'-0"	6'-0"	2'-0"	8'-0"	7'-0"	5"
54	2'-3"	5'-5"	2'-9 ¹ / ₄ "	8'-2 ¹ / ₄ "	7'-6"	5 ¹ / ₂ "
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	5"
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	5 ¹ / ₂ "
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	6"
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	6 ¹ / ₂ "
84	3'-0"	7'-6 ¹ / ₂ "	1'-9"	9'-3 ¹ / ₂ "	10'-0"	6 ¹ / ₂ "
90	3'-5"	7'-3 ¹ / ₂ "	2'-0"	9'-3 ¹ / ₄ "	11'-0"	6 ¹ / ₂ "

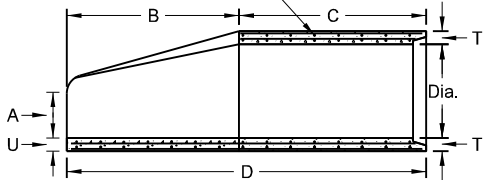


PERSPECTIVE

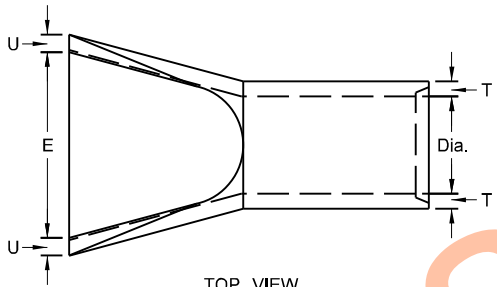


END VIEW

Standard Reinforcement for Class III pipe reinforced as per AASHTO M170



SIDE VIEW



TOP VIEW

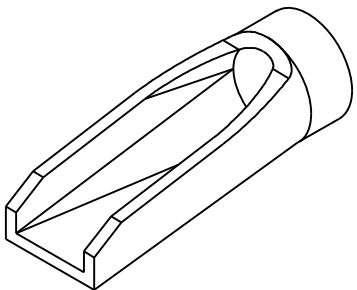
NOTES:

- All reinforcing steel shall meet AASHTO M170 requirements.
- 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.
- Laying length of pipe: 12" to 66" (incl.) = not less than 4 feet
66" to 108" (incl.) = not less than 6 feet
- Joints shall be sealed with rubber gaskets or with sealer approved by the engineer whenever pipe are specified for storm drain or sanitary sewers.
- 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.

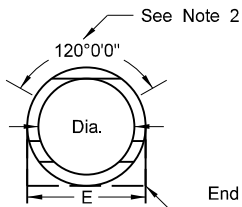
REINFORCED CONCRETE PIPE - FLARED END SECTION

Reinforcement to be equivalent to Class III RCP

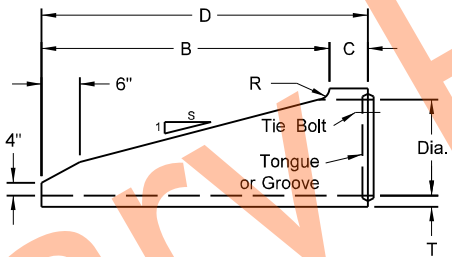
TRAVERSABLE END SECTION						
DIA	B	C	D	E	R	S
15"	4'	9"	4'-9"	1'-7 ¹ / ₂ "	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	3"	6
24"	6'	1'	7'	2'-6"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3 ¹ / ₂ "	4
36"	7'-3"	15"	8'-6"	3'-8"	3"	4



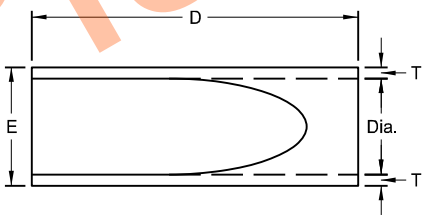
PERSPECTIVE



END VIEW



SIDE VIEW



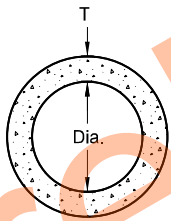
TOP VIEW

NOTES (Traversable End Section):

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

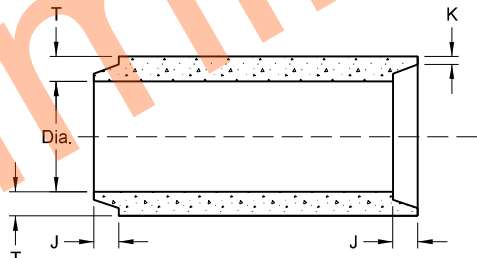
REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION

Reinforcement to be equivalent to Class III RCP

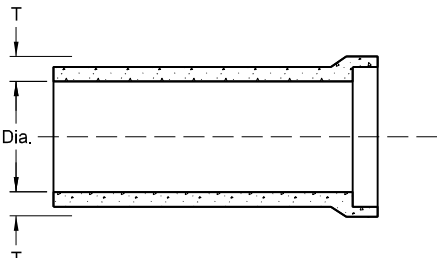


END VIEW

CIRCULAR PIPE

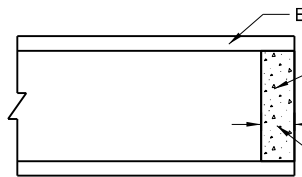


TONGUE & GROOVE JOINT



BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE



CONCRETE PIPE PLUG

All Classifications of Round Concrete Pipe						
Internal Dia. of pipe in inches	Cross-Sectional Water Area	Weight per lin. foot of pipe	Joint J Groove End Min. Max.	Joint K Tongue & Groove Min.	Minimum Wall Thickness (T)	
Dia	Sq. ft.	Lbs.	In.	In.	In.	
12	0.79	92	1 ¹ / ₂ -2 ¹ / ₂	3/4	2	
15	1.23	127	1 ¹ / ₂ -2 ¹ / ₄	7/8	2 ¹ / ₄	
18	1.77	168	1 ¹ / ₂ -2 ¹ / ₂	1	2 ¹ / ₂	
21	2.40	214	1 ¹ / ₂ -3 ¹ / ₈	1 ¹ / ₈	2 ¹ / ₂	
24	3.14	265	2 ¹ / ₂ -3 ¹ / ₄	1 ¹ / ₈	3	
27	3.98	322	2 ¹ / ₂ -4	1 ¹ / ₄	3 ¹ / ₄	
30	4.91	384	3 ¹ / ₄ -4 ¹ / ₄	1 ¹ / ₄	3 ¹ / ₂	
33	5.94	452	3 ¹ / ₄ -4 ¹ / ₄	1 ¹ / ₂	3 ¹ / ₄	
36	7.07	524	3 ¹ / ₄ -4 ¹ / ₄	1 ¹ / ₂	4	
42	9.62	685	3 ¹ / ₄ -4 ¹ / ₄	1 ³ / ₄	4 ¹ / ₂	
48	12.57	685	3 ¹ / ₄ -4 ¹ / ₄	1 ³ / ₄	5	
54	15.90	1070	4 ¹ / ₂ -5 ¹ / ₄	2	5 ¹ / ₂	
60	19.63	1296	4 ¹ / ₂ -5 ¹ / ₂	2 ¹ / ₄	6	
66	23.76	1542	5-6	2 ³ / ₈	6 ¹ / ₂	
72	28.27	1810	5 ¹ / ₂ -6 ³ / ₄	2 ³ / ₈	7	
78	33.18	2098	6 ¹ / ₄ -7 ¹ / ₄	2 ³ / ₈	7 ¹ / ₂	
84	38.48	2410	5 ¹ / ₂ -7 ¹ / ₄	3 ³ / ₈	8	
90	44.18	2793	6 ³ / ₄ -8 ¹ / ₂	3 ³ / ₈	8 ¹ / ₂	
96	50.27	3092	7-8 ¹ / ₄	3 ¹ / ₂	9	
102	56.75	3466	7-8 ¹ / ₄	3 ¹ / ₂	9 ¹ / ₂	
108	63.62	3864	7 ¹ / ₄ -8 ¹ / ₂	3 ¹ / ₂	10	

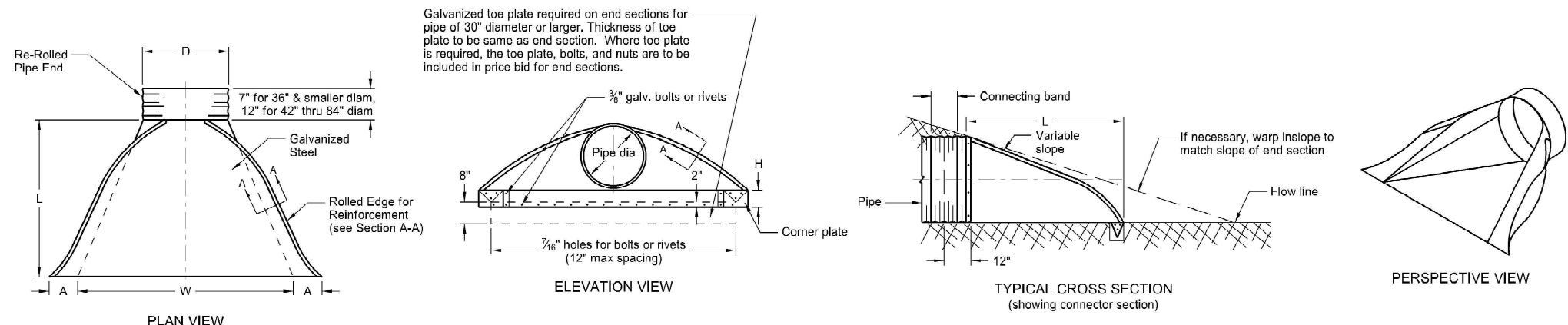
SEE STANDARD DRAWING D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

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



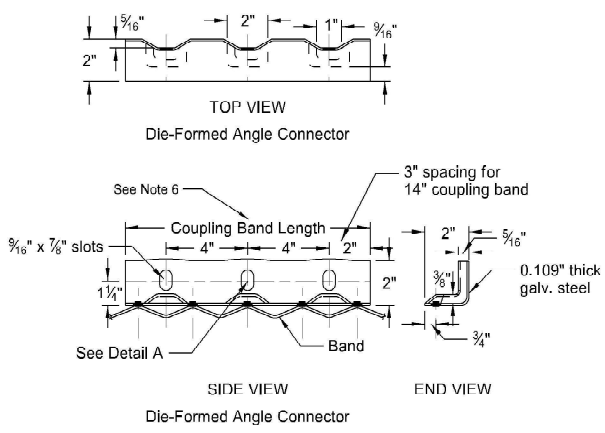
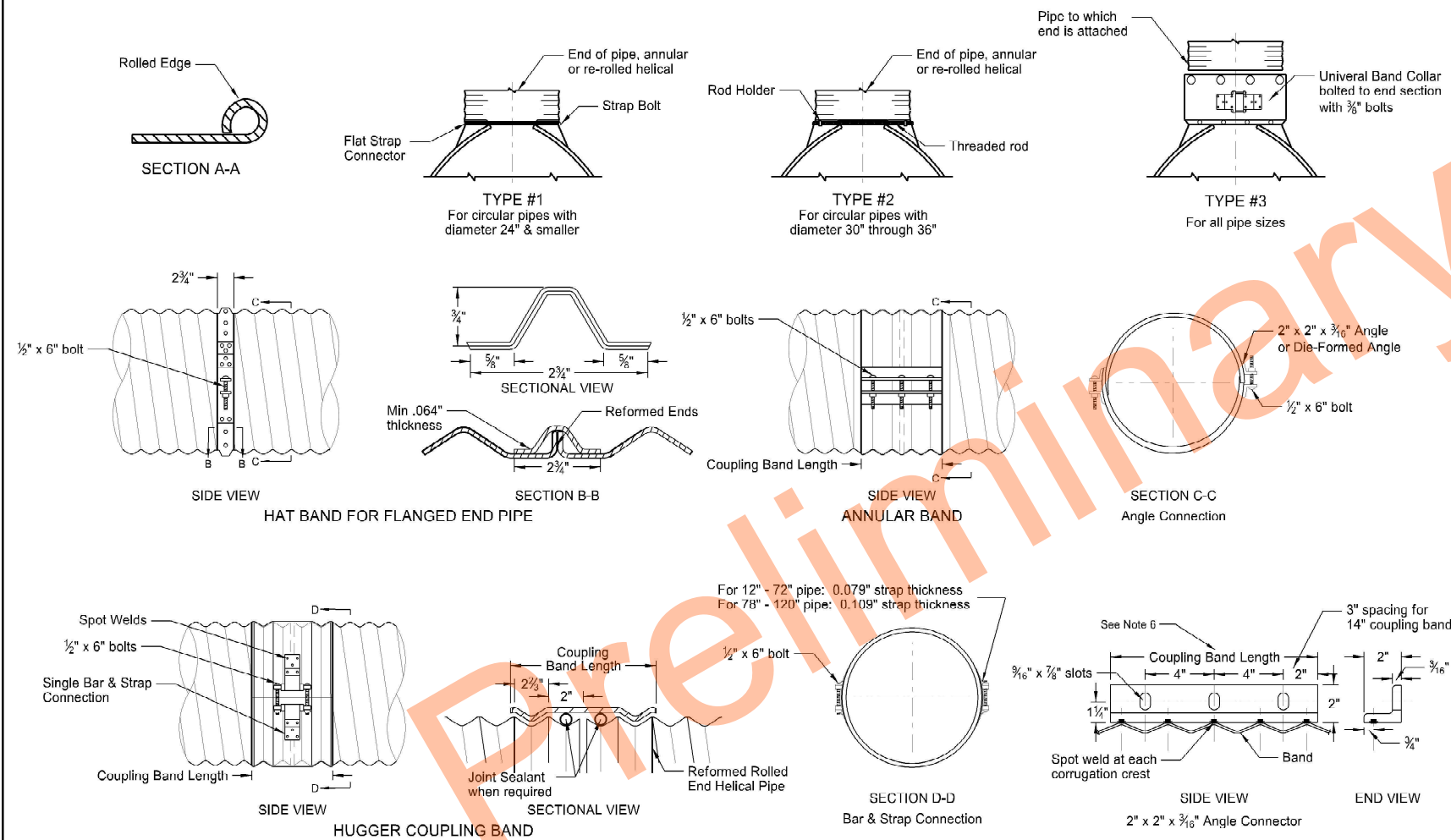
PIPE DIA.	GALVANIZED THICKNESS	END SECTION DIMENSIONS						APPROX. SLOPE RATE	BODY
		A	B	H	L	W			
IN	IN	IN	IN	IN	IN	IN			
15	0.064 - 0.079	7	8	6	26	30		2 1/2:1	1
18	0.064 - 0.109	8	10	6	31	36		2 1/2:1	1
24	0.064 - 0.109	10	13	6	41	48		2 1/2:1	1
30	0.064 - 0.109	12	16	8	51	60		2 1/2:1	1 or 2
36	0.064 - 0.109	14	19	9	60	72		2 1/2:1	2
42	0.064 - 0.138	16	22	11	69	84		2 1/2:1	2
48	0.064 - 0.168	18	27	12	78	90		2 1/2:1	2
54	0.064 - 0.168	18	30	12	84	102		2:1	2
60	0.064 - 0.108	18	33	12	87	114		1 1/2:1	3
66	0.064 - 0.168	18	36	12	87	120		1 1/2:1	3
72	0.064 - 0.168	18	39	12	87	126		1 1/2:1	3
78	0.064 - 0.168	18	42	12	87	132		1 1/2:1	3
84	0.064 - 0.168	18	45	12	87	138		1 1/2:1	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 3/8" dia. galv. bolts or rivets. Nuts to be torqued to 25 foot-lbs ±.

- NOTES:
- Pipes and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
 - 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 1/4" galv. angle for 60" through 72" dia. and 2 1/2" x 2 1/2" x 1/4" galv. angle for 78" and 84" dia.. Angles are to be attached by galv. 3/8" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
 - 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.
 - 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.
 - 1/2" x 8" bolts may be used as a substitute for the 1/2" x 6" bolts shown in the details.
 - Coupling bands wider than 14" may be used if a minimum of four 1/2" bolts with maximum spacing of 6 1/2" are used for the connection.
 - Length of spot welds shall be minimum 1/2".

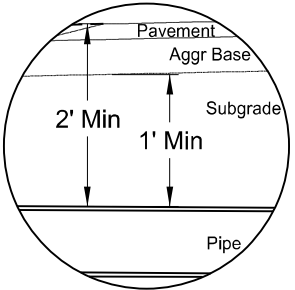
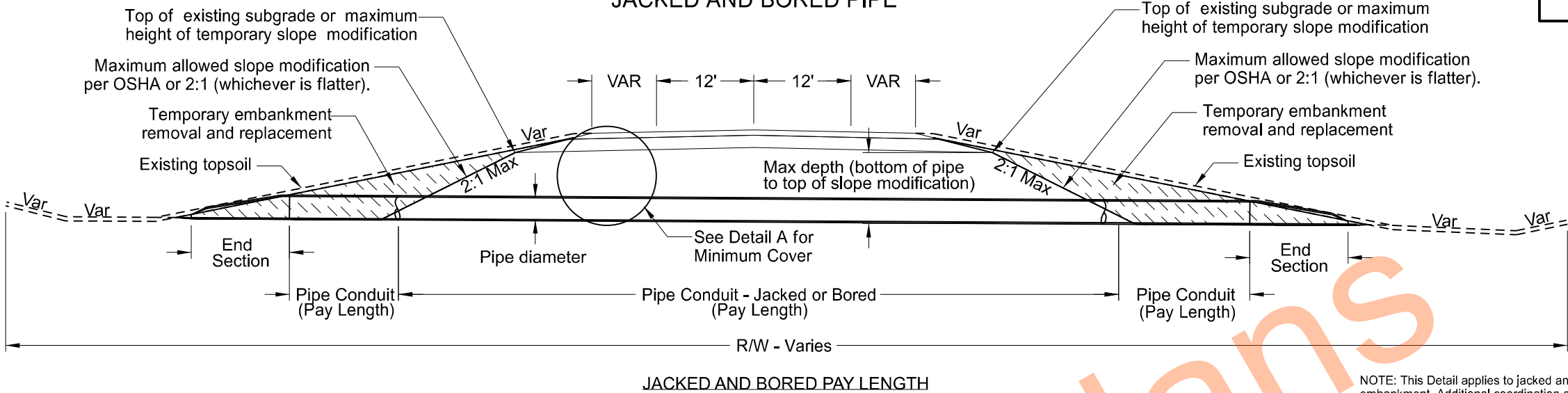
COUPLING BAND DIMENSIONS				
COUPLING TYPE	CORRUGATION PITCH x DEPTH	PIPE SIZE	COUPLING BAND LENGTH	MIN. BAND THICKNESS
Hat Band	2 3/4" x 1/2"	12" - 48"	2 3/4"	.064"
Annular Band	2 3/8" x 1/2"	12" - 72"	12"	.052"
		78" - 84"	12"	.079"
Hugger Band	2 3/8" x 1/2"	12" - 72"	10 1/2"	.052"
		78" - 84"	10 1/2"	.079"
	3" x 1"	48" - 120"	10 1/2"	.052"
		48" - 120"	12"	.064"



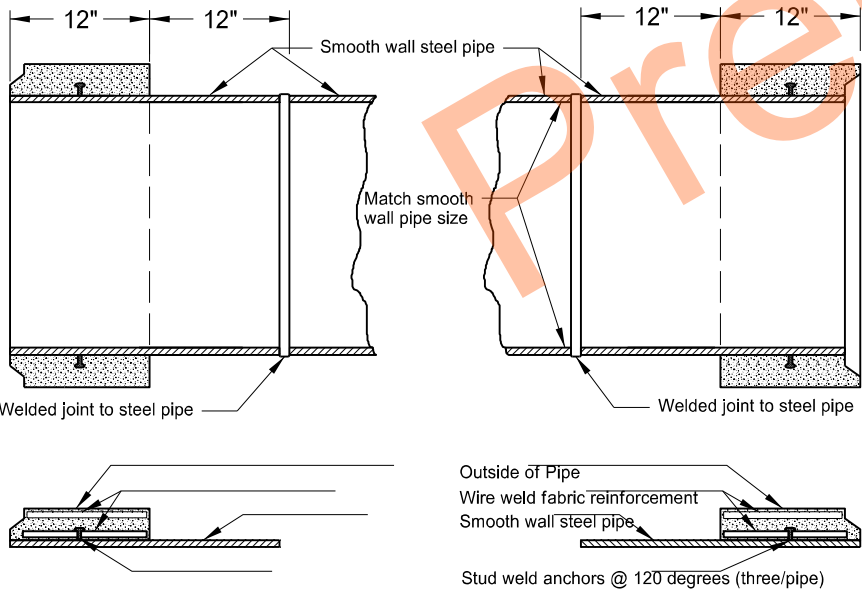
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
08-16-13	
REVISIONS	
DATE	CHANGE
01-07-14	End Section Plan View
02-27-14	3" x 1" Corrugation Detail
09-18-19	Added Perspective View Detail
09-23-22	Galvanized Thickness Table

Professional Engineer Seal for Nathan D Kettner, State of North Dakota, License No. PE-4684, dated 09/23/22.

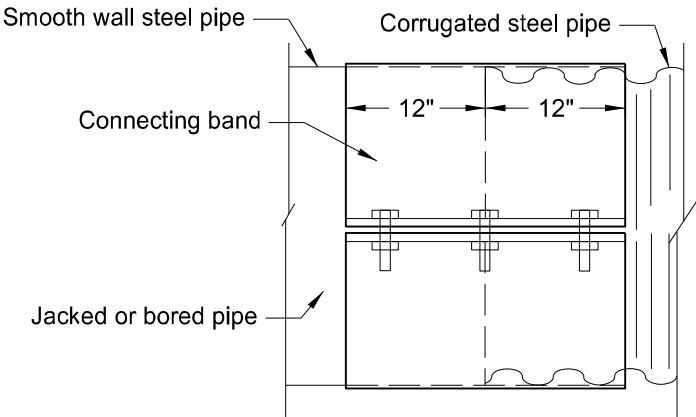
JACKED AND BORED PIPE



Detail A - Minimum Cover
2' Top of Pavement to Top of Pipe,
and 1' Top of Subgrade to Top of Pipe



DETAIL FOR JOINING SMOOTH WALL
STEEL PIPE TO REINFORCED CONCRETE PIPE



CONNECTING BAND FOR JOINING SMOOTH
WALL STEEL PIPE TO CORRUGATED PIPE

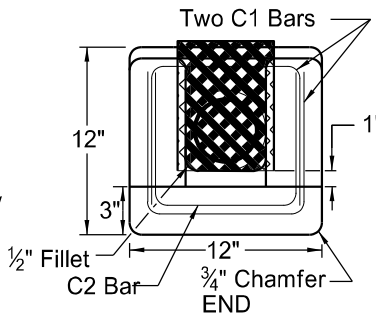
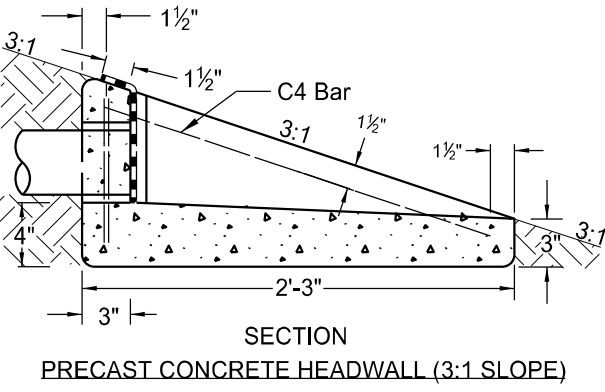
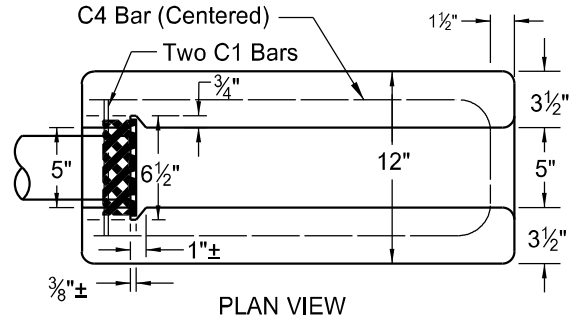
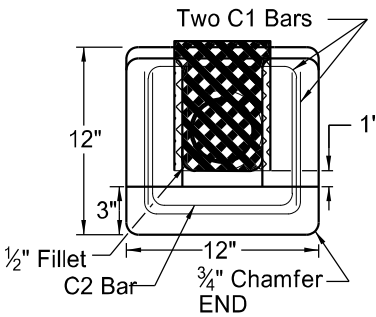
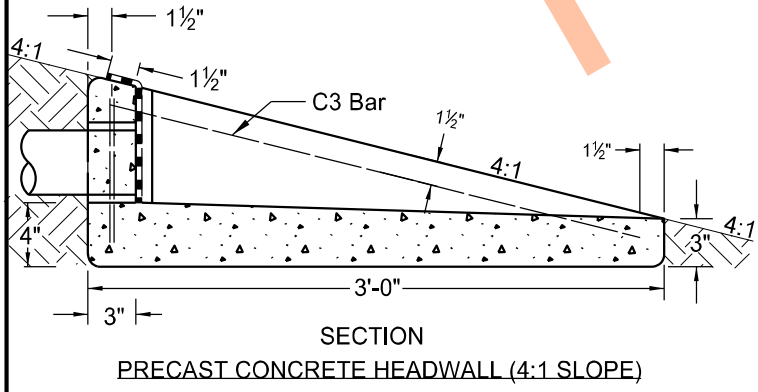
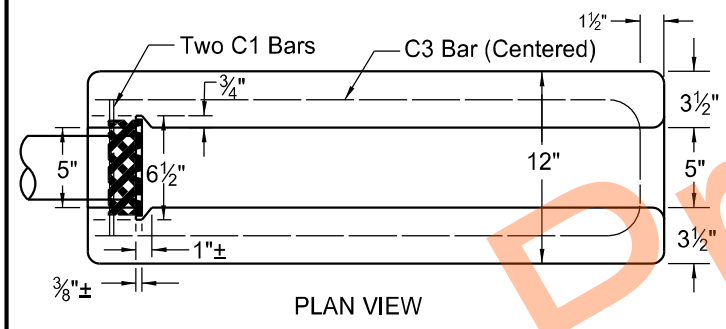
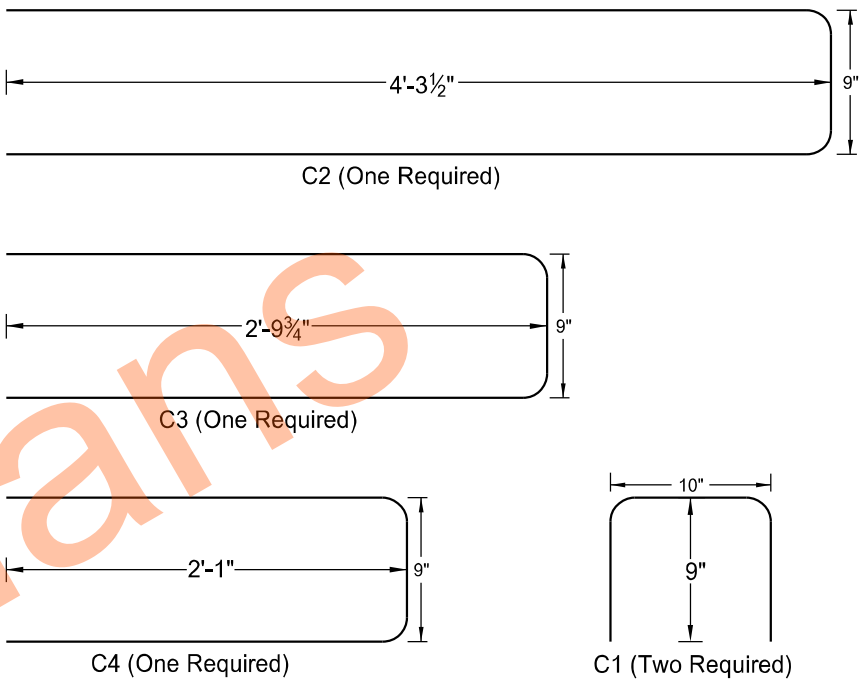
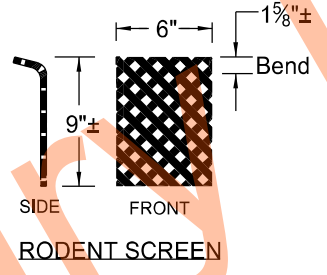
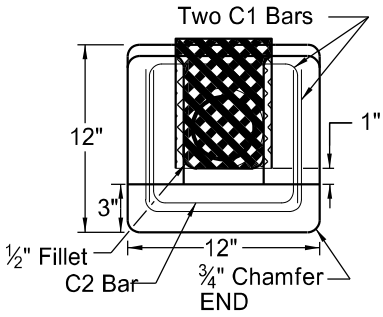
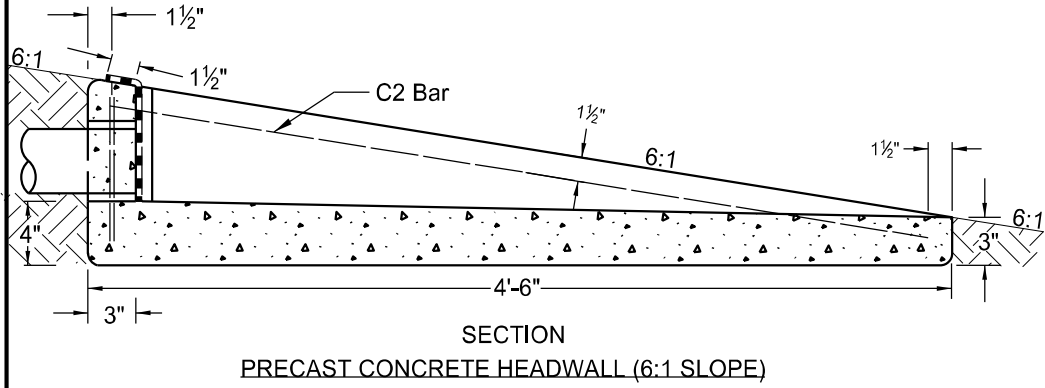
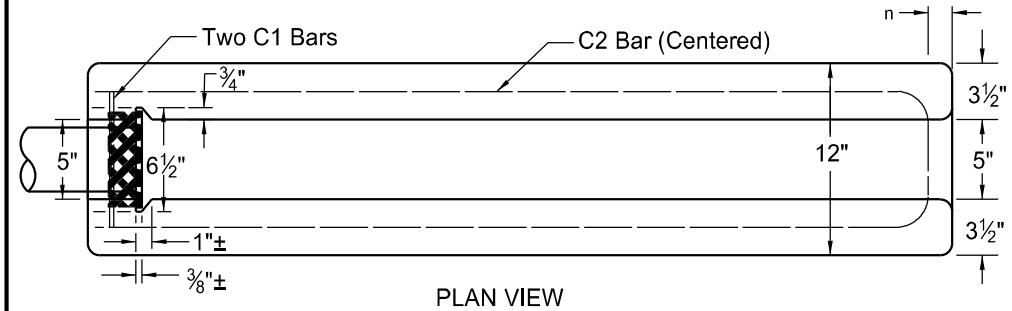
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-15-2022	
REVISIONS	
DATE	CHANGE
08-31-2023	Corrected spelling of corrugated.



08/31/23

PRECAST CONCRETE HEADWALL DETAILS

D-714-18



NOTES:

RODENT SCREEN: Fabricate rodent screen from flattened expanded metal with screen openings of approximately 0.25 square inches. Use 16 ga metal, hot dip galvanized after fabrication, for the screen.

REINFORCING BARS: Use No. 4 deformed steel reinforcing bars.

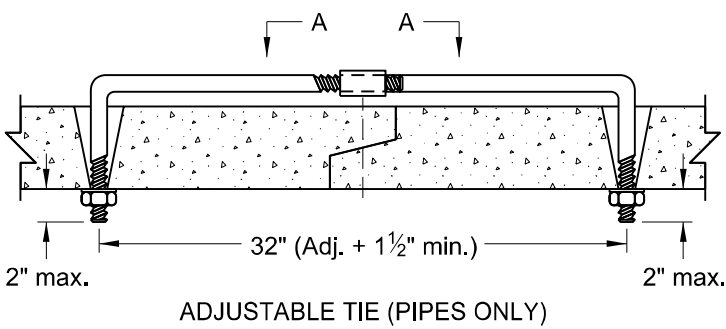
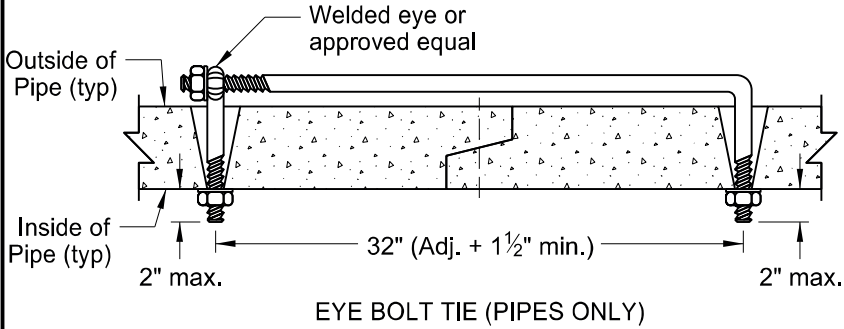
BENT BARS: Bent bar dimensions given out to out.

SLOPE: Match headwall slope to foreslope.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-27-2010	
REVISIONS	
DATE	CHANGE
12/02/2020	Removed drainable base details Added 4:1 and 3:1 Headwalls

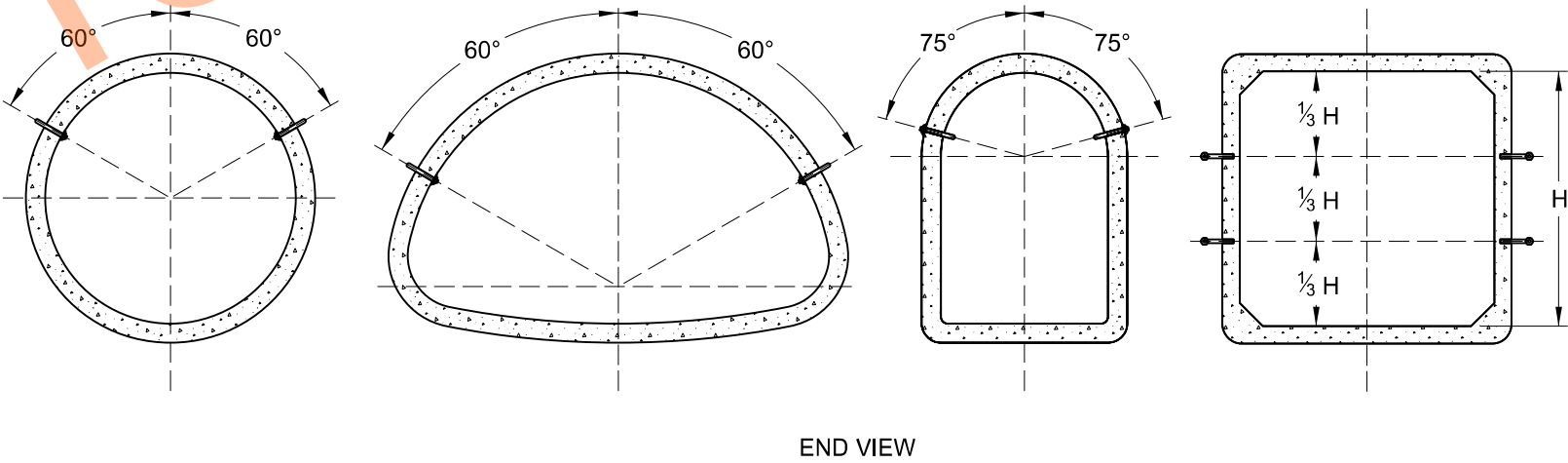
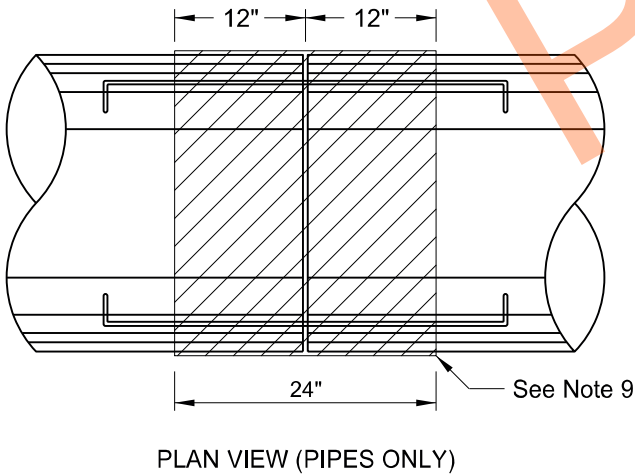
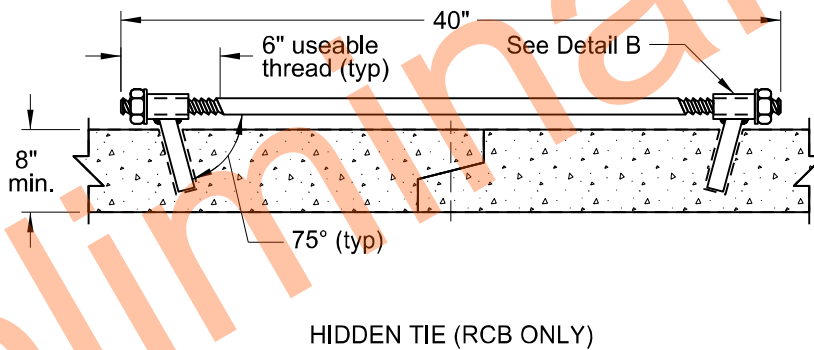
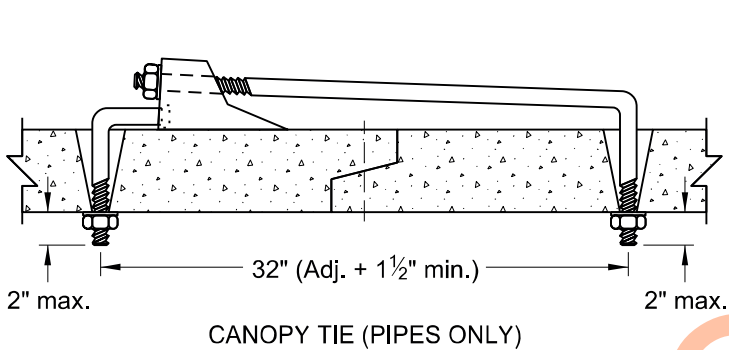
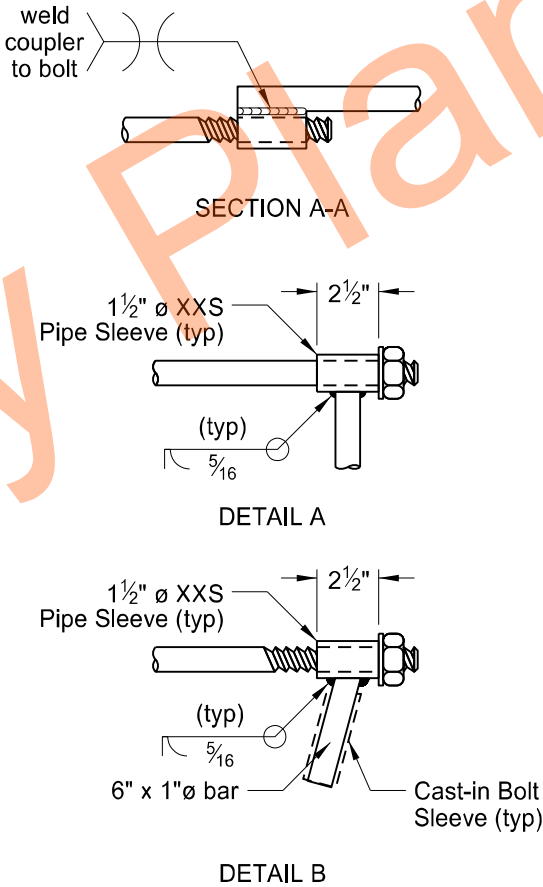
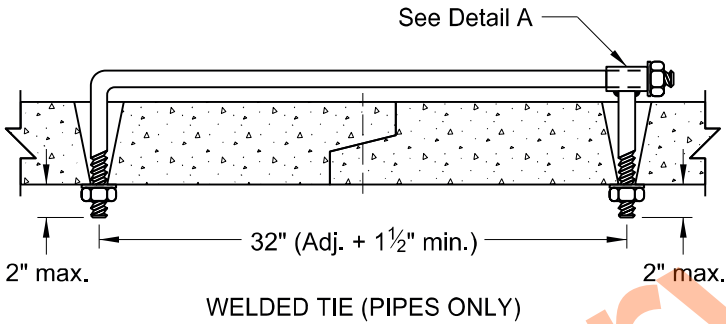
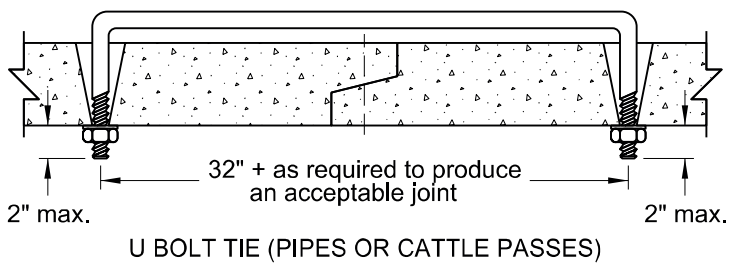


CONCRETE PIPE, CATTLE PASS, OR
PRECAST CONCRETE BOX CULVERT TIES



REQUIRED SIZE OF TIE BOLTS		
PIPE SIZE	THREAD Ø	XXS PIPE SLEEVE INNER Ø
18" - 24"	5/8"	3/4"
30" - 66"	3/4"	1"
72" - 120"	1"	1 1/4"
RCB/CATTLE PASS	1"	1 1/4"

- NOTES:
- The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
 - 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.
 - 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.
 - Do not use pipe ties to pull the pipe or RCB sections tight. The ties are only for holding sections together.
 - Use only tie bolt assemblies that have been hot dip galvanized in accordance with ASTM A 153.
 - Holes in pipes to accommodate tie bolts will be precast. Tapered holes are permitted. Use holes that have a diameter 1/4" 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 1/4".
 - Include the cost of precasting the required holes and furnishing and installing the tie bolts in the price bid for the appropriate conduit or RCB pay item.
 - Tie all centerline and approach RCP culvert joints. Tie all joints including the end sections 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.
 - Place joint wrap prior to installing ties. Firmly secure the wrap around the full perimeter. For concrete pipes, use Type S2 geotextile fabric and overlap the joint by 12" in both directions. For box culverts, use a waterproof membrane that meets ASTM C990. 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.
 - 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.
 - Provide lock washers or burr threads of concrete box ties after installation and tightening to prevent nut rotation.
 - Tie RCB's as noted in the plans.

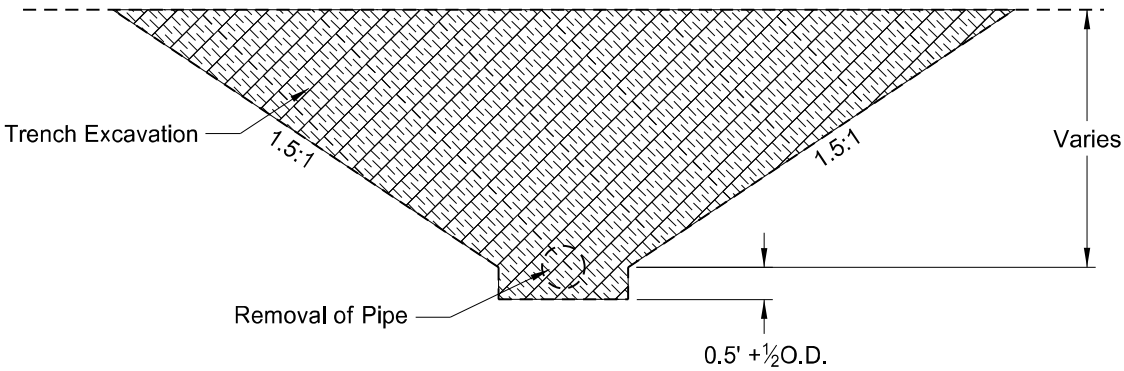


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
3-18-14	
REVISIONS	
DATE	CHANGE
7-21-15	Note 8
6-6-17	Notes 2-11 Table, Title, Labels
8-11-21	Notes 2-12 Table, Label
01-17-25	Notes 9-13 Table, Labels Section A-A, End View

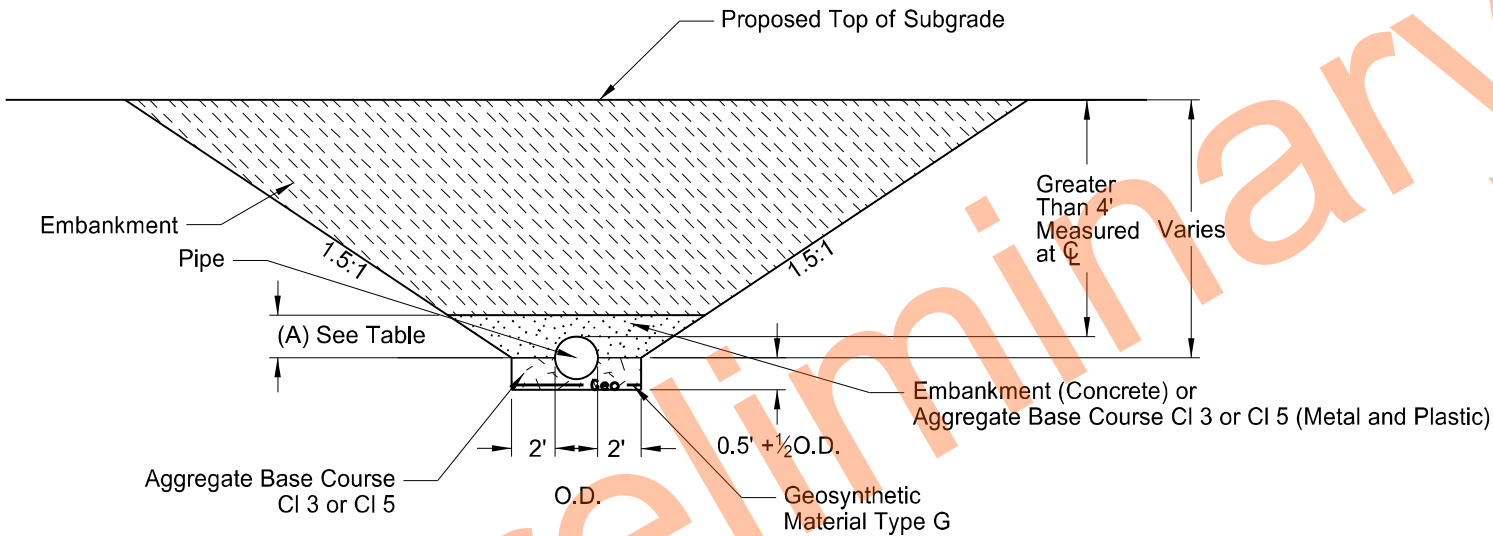


TRANSVERSE MAINLINE PIPE INSTALLATION DETAIL
PIPES MORE THAN 4 FEET BELOW TOP OF SUBGRADE

D-714-25



EXCAVATION DETAIL



INSTALLATION DETAIL

Pay Items

- 1) Pipe*
- 2) Geosynthetic Material Type G
- 3) Removal of Pipe (if required)

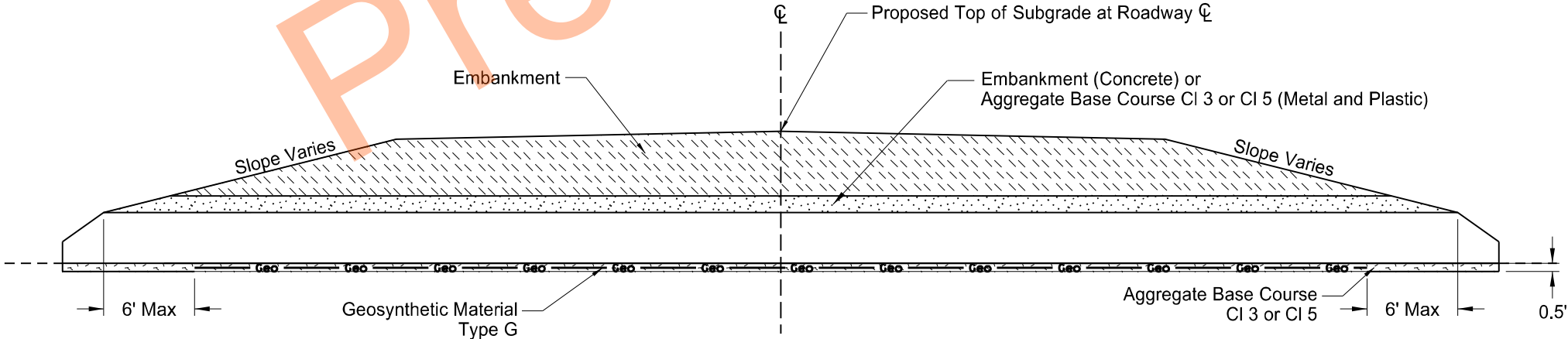
*Included in Pipe Pay Item

- 1) Pipe
- 2) Trench excavation
- 3) Aggregate Base Course CI 3 or CI 5
- 4) Embankment

NOTES:

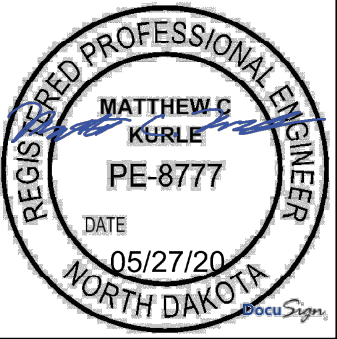
- 1) This drawing applies to new/replaced mainline and paved intersection roadways (including ramps). It does not include pipes in approaches.
- 2) Embankment may be either Borrow Excavation or Common Excavation - Type A.

Backfill Dimensions	
Pipe Materials	Dimension (A)
Concrete	0.5 O.D.
Metal and Plastic	0.5 O.D. + 1 Foot



CROSS SECTION

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



STANDARD MONUMENTS AND RIGHT OF WAY MARKERS

D-720-1

NOTES:

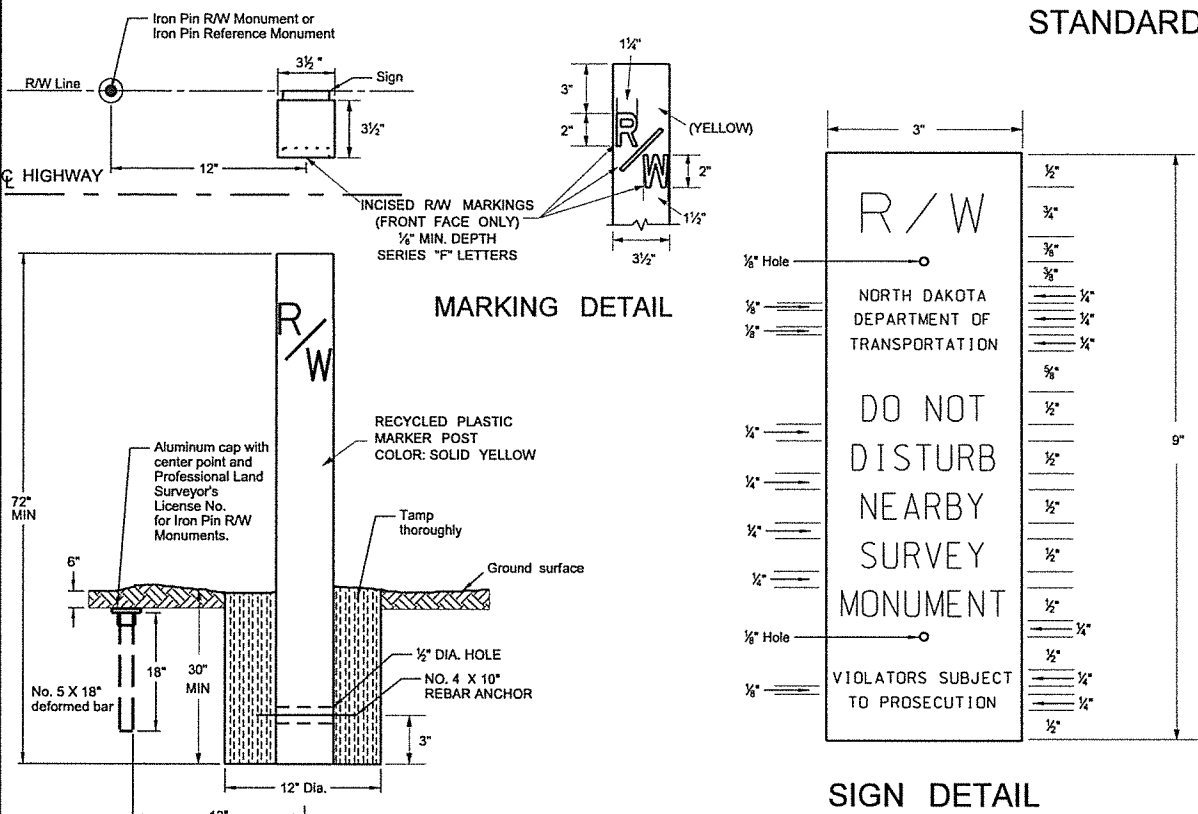
Construct and install Alignment Monuments, Iron Pin Reference Monuments, Iron Pin R/W Monuments, and Right of Way Markers (witness posts) according to Section 720 of the Standard Specifications.

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 Pins 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.

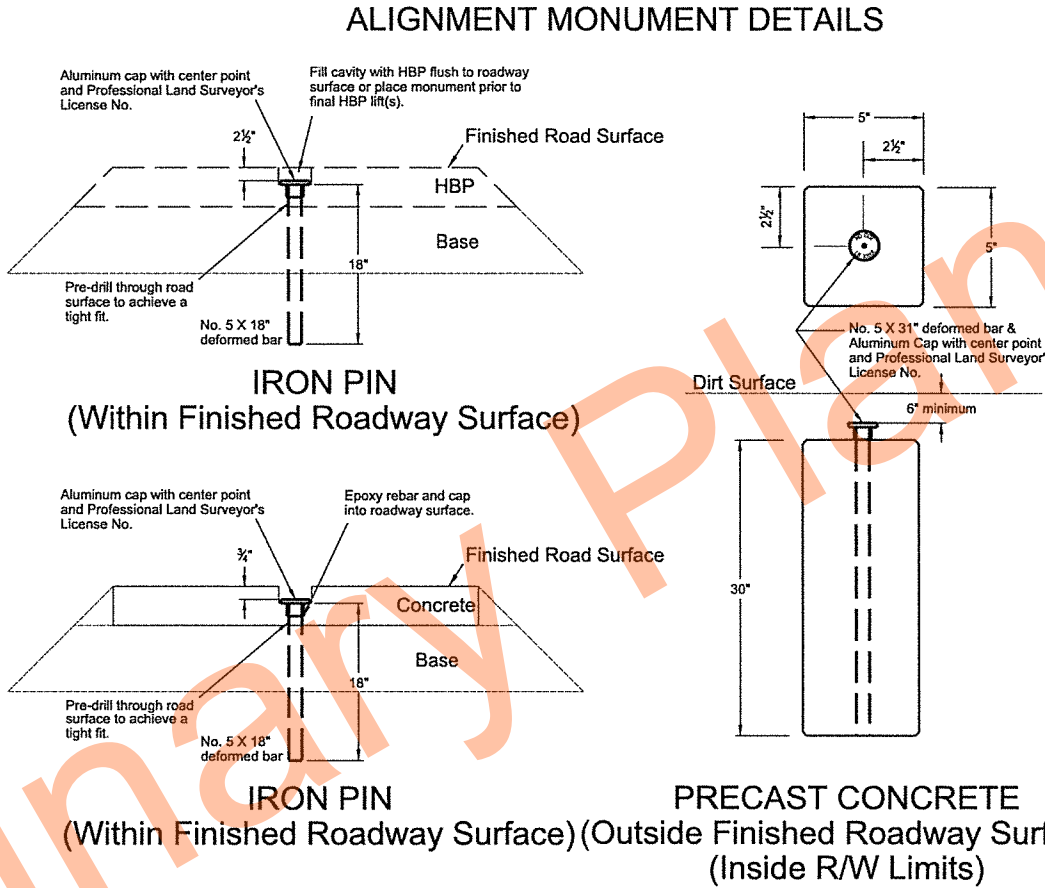
IRON PIN REFERENCE MONUMENT: Place Iron Pins without aluminum caps (No. 5 X 18") as reference monuments on the Right of Way line at section corners, quarter corners, section line crossings, and quarter line crossings.

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.

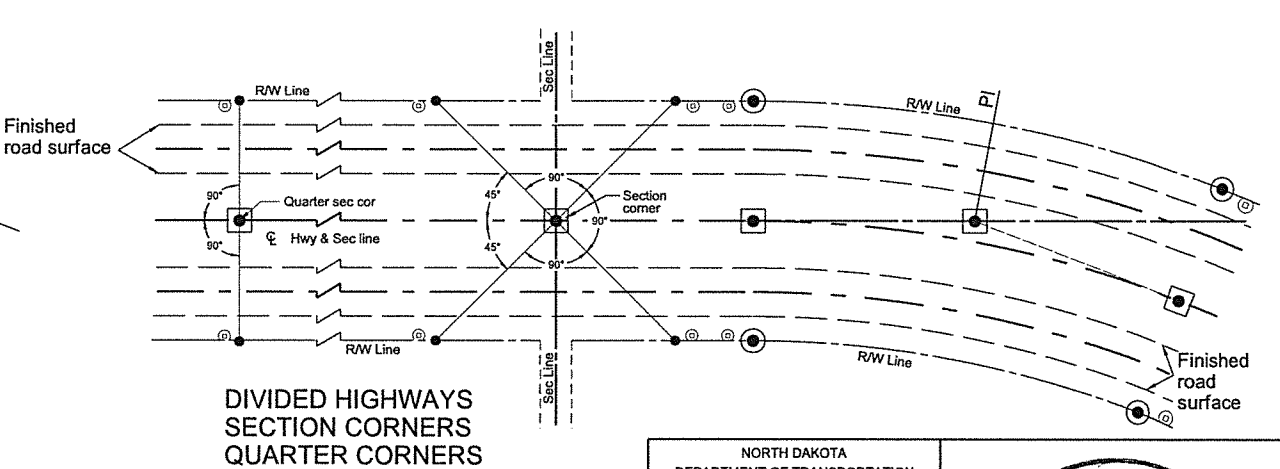
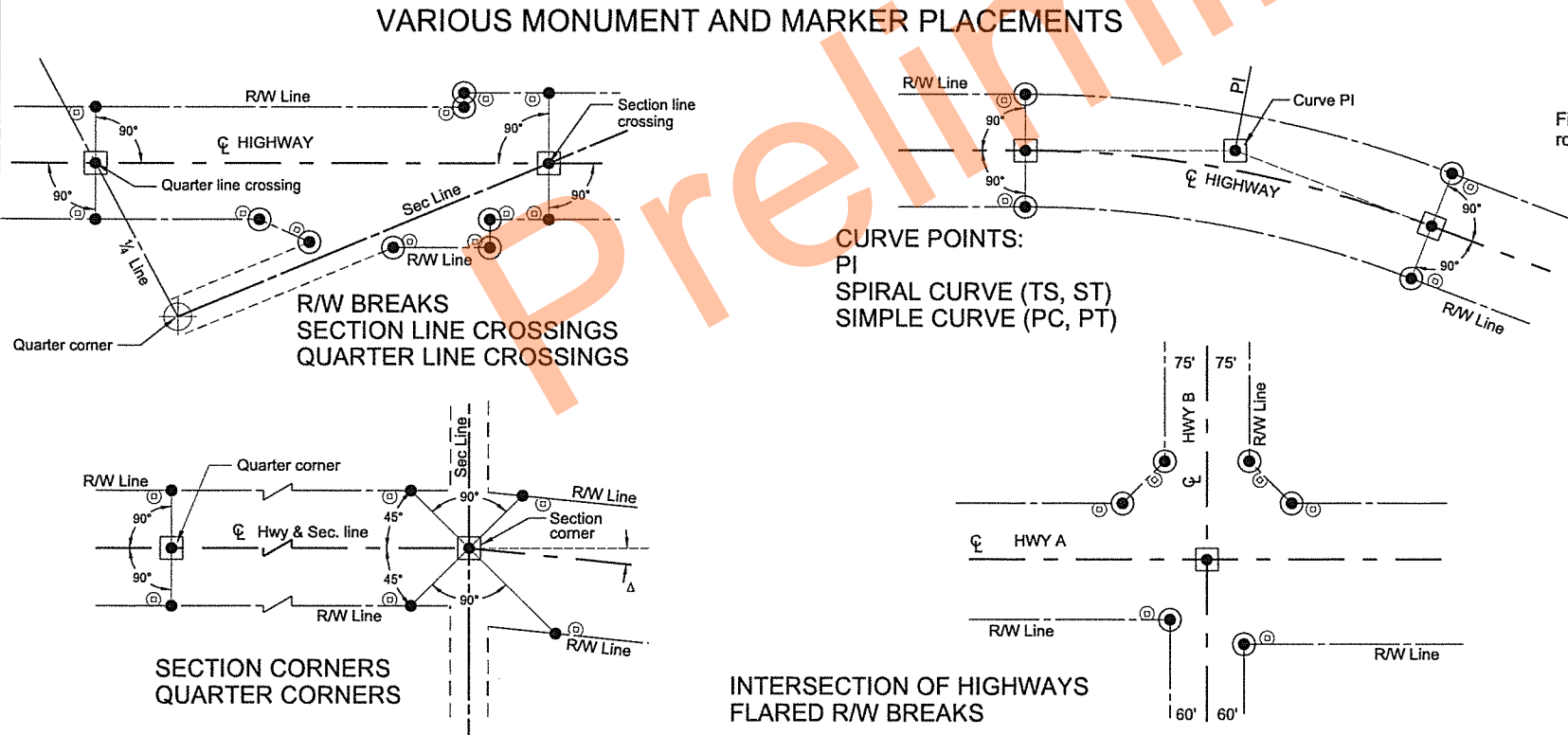


RECYCLED PLASTIC RIGHT OF WAY MARKER (WITNESS POST) DETAILS & IRON PIN REFERENCE AND R/W MONUMENT DETAILS

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.



IRON PIN (Within Finished Roadway Surface) PRECAST CONCRETE (Within Finished Roadway Surface) (Outside Finished Roadway Surface) (Inside R/W Limits) IRON PIN (Outside Finished Roadway Surface) (Outside R/W Limits)

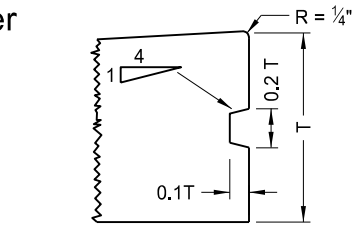
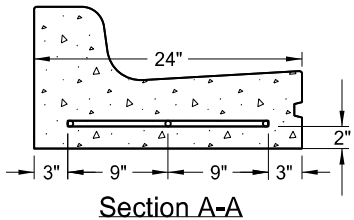
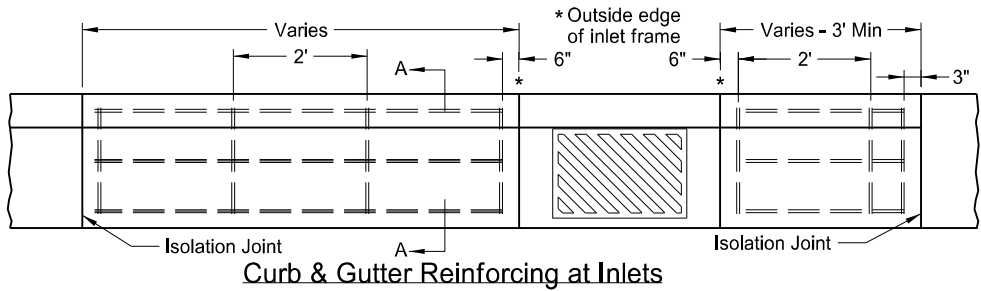


- LEGEND**
- Iron Pin Reference Monument
 - ⊙ R/W Marker (witness post)
 - Alignment Monument
 - Iron Pin R/W Monument

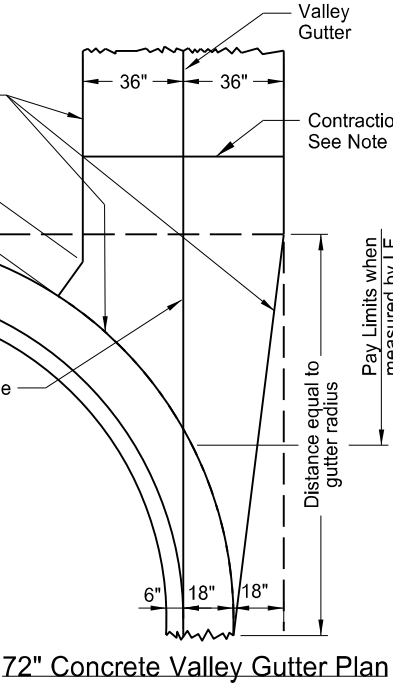
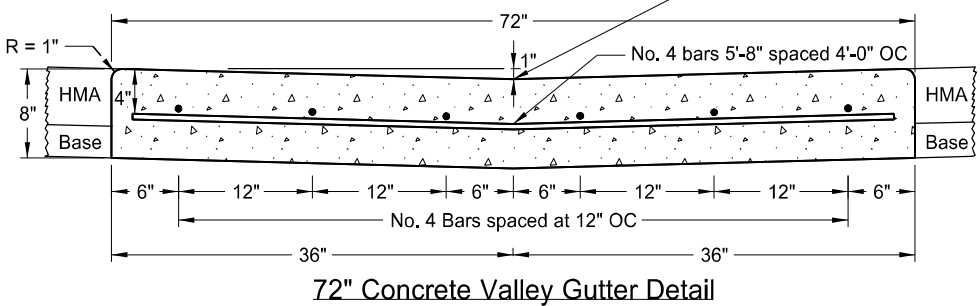
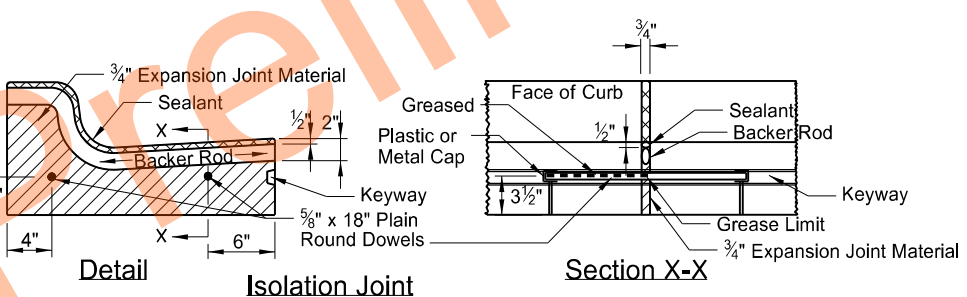
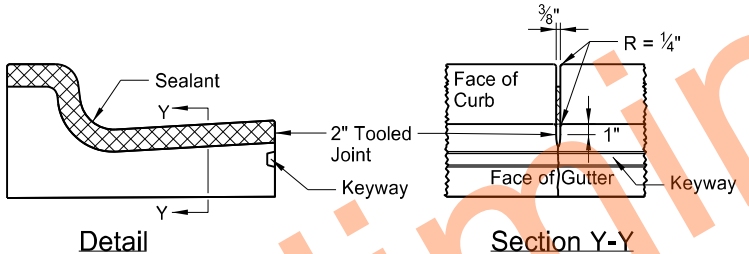
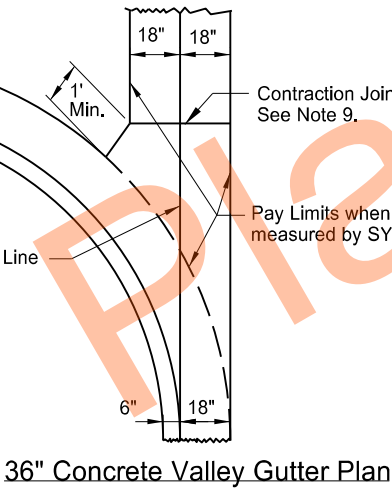
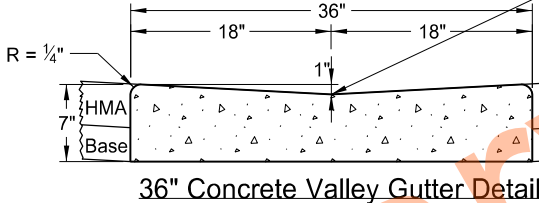
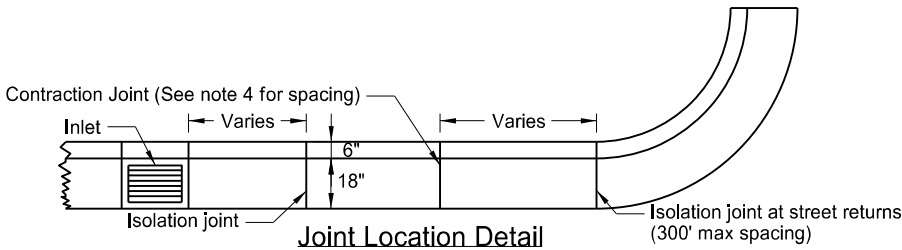
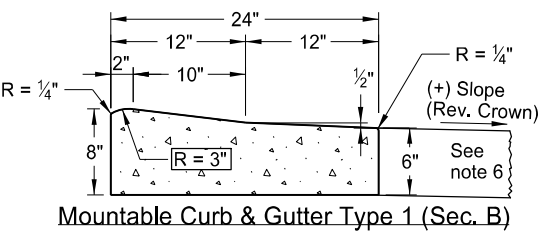
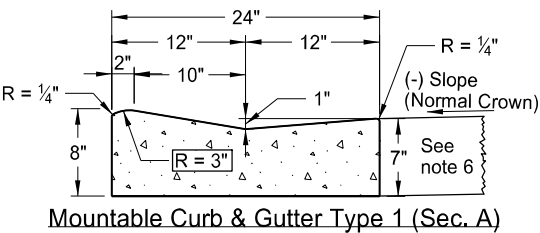
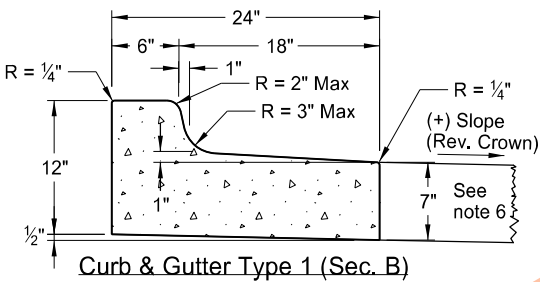
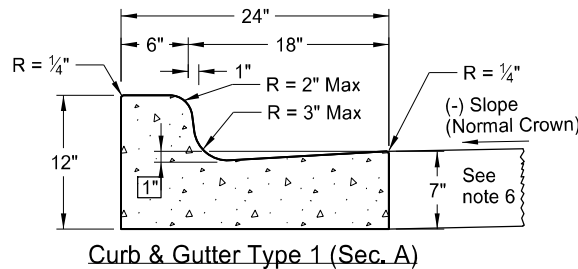
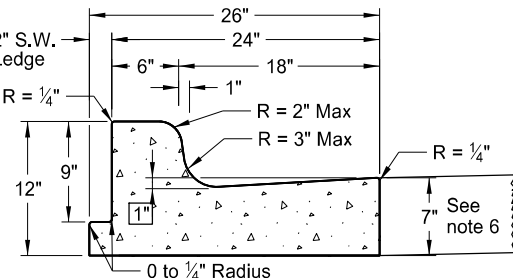
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE
11/12/13	Note for SIGN DETAIL modified to meet ASTM D-4956 Type III or higher on 80 gauge 5052-H38
10/17/17	Updated to active voice.
08/27/19	New Design Engr PE Stamp.



Curb & Gutter and Valley Gutter



- NOTES:
1. Use Curb and Gutter Type 1 (Sec. A & B). Use section "A" with (-) pavement slopes and section "B" with (+) pavement slopes.
 2. Contraction Joints: Tool the Curb & Gutter 2" as shown on the contraction joint details.
 3. Isolation Joints: Use 3/4" expansion joint material for isolation joints. Form the backer rod and joint sealant opening with a pre-cut piece of wood or other material approved by the engineer. Dowel supports are not required on the second pour at a cold joint. Install plastic or metal caps and greased dowels in the cold joint for the second pour.
 4. Joint Spacing: For hot mix asphalt pavements use a 10' max joint spacing for the curb and gutter with panels on each side of the inlets. For concrete pavements match the joint spacing for the curb and gutter to the pavement joint on PCC Pavements (approximately 15' spacing.)
 5. Joint sealing: For contraction joint, use joint sealant that conforms to section 826.02B. Use sealant for expansion joints specified in note 3 above. Tool and install sealant in accordance with the manufacturer's recommendations.
 6. Curb & Gutter-Pavement Interface: For hot mix asphalt pavement use gutter depth shown. For PCC pavements, either match gutter depth to adjacent pavement depth or construct gutter depth shown.
 7. Tie curb and gutter to abutting PCC pavement with No. 4 bars, 2'-0" in length, spaced at 3'-9" centers for 15' joint spacing (maximum spacing of 4' centers).
 8. On street returns and other locations where new curb and gutter ends and does not abut existing curb and gutter, taper the last two (2) feet of the curb from 6" in height to 0". Install a 1/2" premolded full depth isolation joint (the same shape as the curb and gutter just ahead of the taper) with an 18" plain round bar across the joint.
 9. Valley Gutter Joints: Form, saw, or score 1/8" min. to 3/8" max. width contraction joints (a minimum 2" depth) at approx 10' intervals. Seal the joints with hot poured elastic type joint sealer (Section 826.02A.2 of the Standard Specifications.) Include all costs for the joint and sealant in the price bid for Valley Gutter.
 10. Reinforcing at Inlets: Use #4 deformed reinforcing bars without splices. Include all costs for reinforcing bars at inlets (even inlets located on radii) in the price bid for "Curb & Gutter - Type 1" or "Curb & Gutter Mountable - Type 1." Extend reinforcement to the second joint (with rebar placed through the first joint) in cases where the 3' minimum panel length can't be obtained.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-7-2013	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
08-27-19	New Design Engr PE Stamp.
10-30-24	Revised bar size & notes.



10/30/24

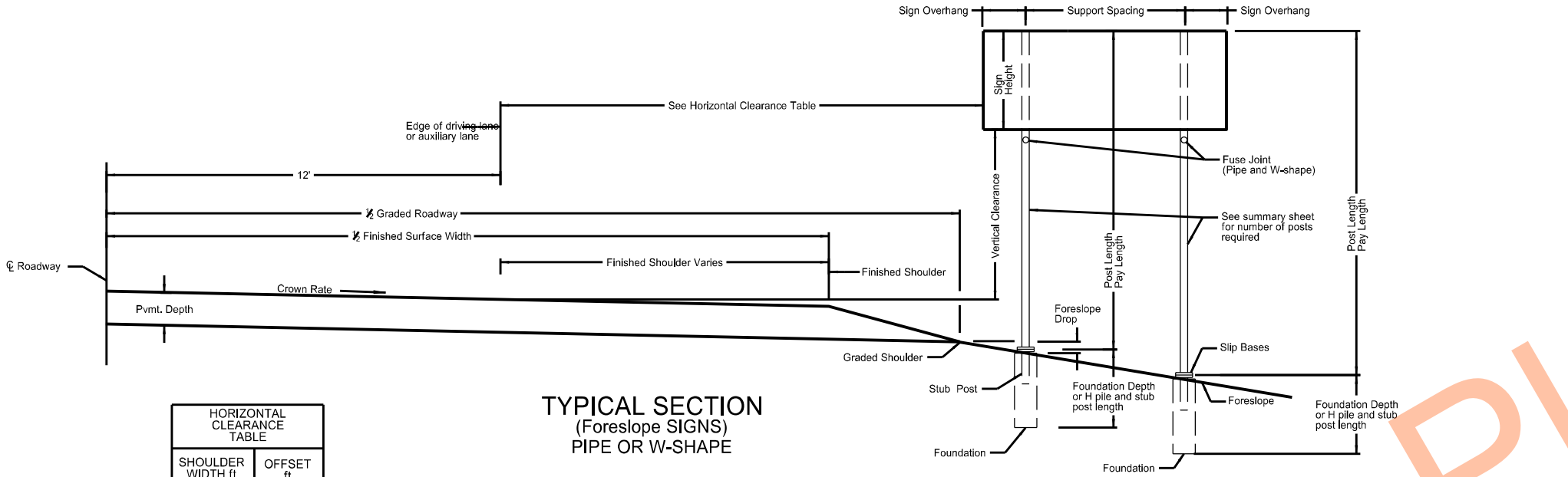
PIPE OR W-SHAPE ASSEMBLY DETAILS

D-754-1

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.

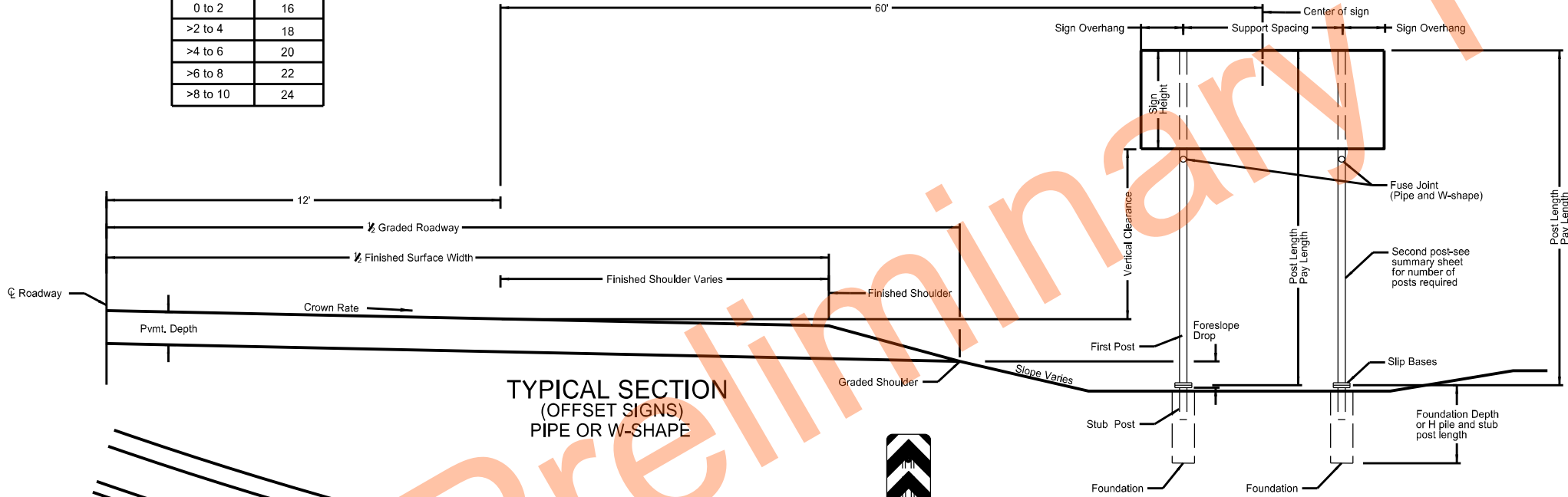
A vertical clearance of 5 feet is acceptable where signs are placed a minimum of 30 feet from the edge of the traveled way.

Place signs a maximum of 6" above the vertical clearance specified above.

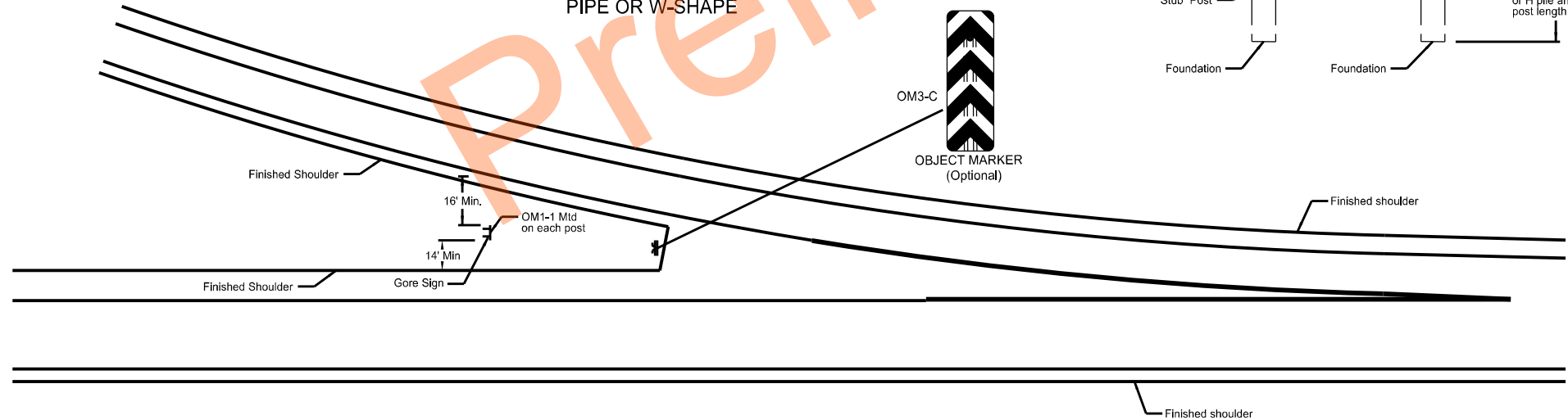


HORIZONTAL CLEARANCE TABLE	
SHOULDER WIDTH ft	OFFSET ft
0 to 2	16
>2 to 4	18
>4 to 6	20
>6 to 8	22
>8 to 10	24

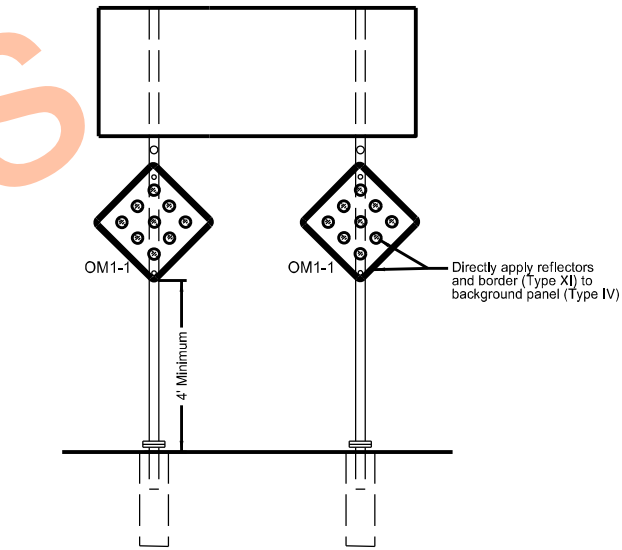
TYPICAL SECTION
(FORESLOPE SIGNS)
PIPE OR W-SHAPE



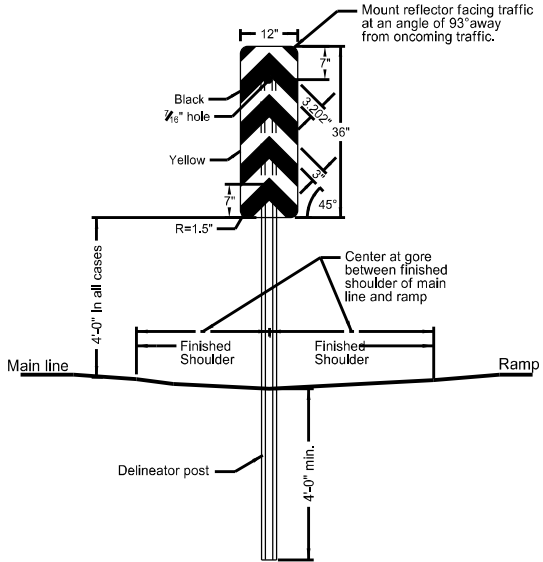
TYPICAL SECTION
(OFFSET SIGNS)
PIPE OR W-SHAPE



EXIT RAMP
GORE SIGN PLACEMENT



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.

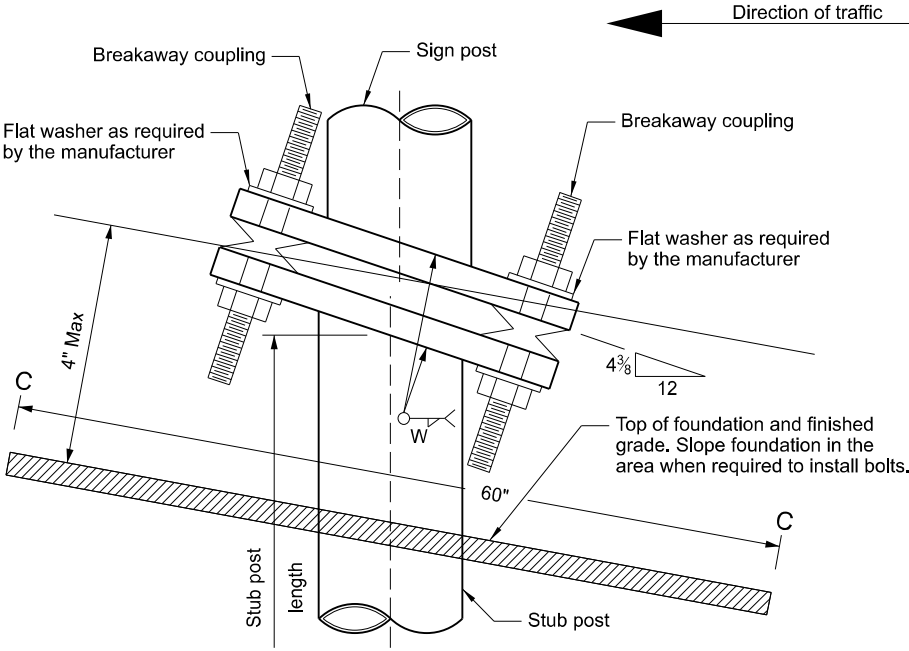


11/26/21

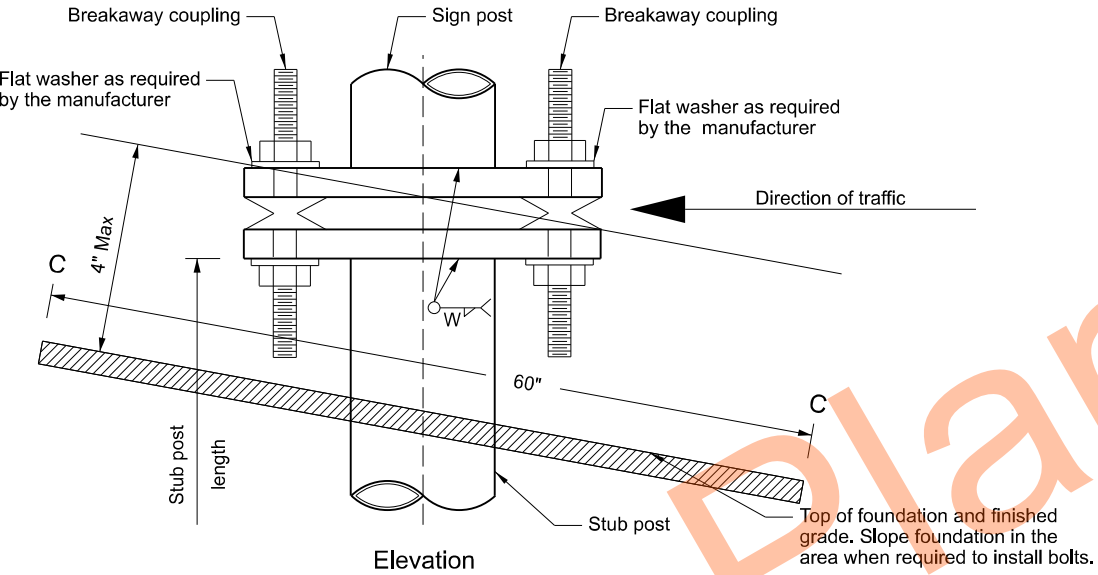
Breakaway Coupler System
for Standard Pipe
Stub Post

Notes:

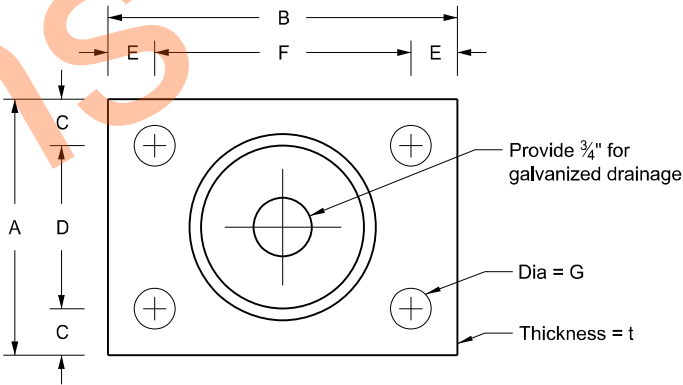
1. In lieu of the breakaway base system on standards D-754-3 and D-754-4, use a breakaway coupler system. Manufacture the breakaway coupler system from material meeting the requirements of ASTM A325 fasteners with the special requirements as specified by DENT BREAKAWAY IND., INC. which meets the requirements of NCHRP Report 350.
2. Fuse Joint Cuts - For steel posts cut after galvanizing, either galvanize cut after fabrication, or treat cut surface in accordance with ASTM A780. Aluminum posts need no treatment.
3. Shim as required to plumb post.
4. Tighten all bolts the maximum possible with 12" to 15" wrench.



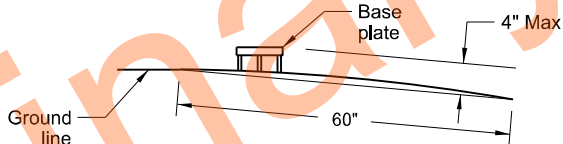
Single Post Sign and Stub Post
Type A



Two or More Post Sign and Stub Post
For two post signs with 8' or more post spacing
and all three or more post signs
Type C

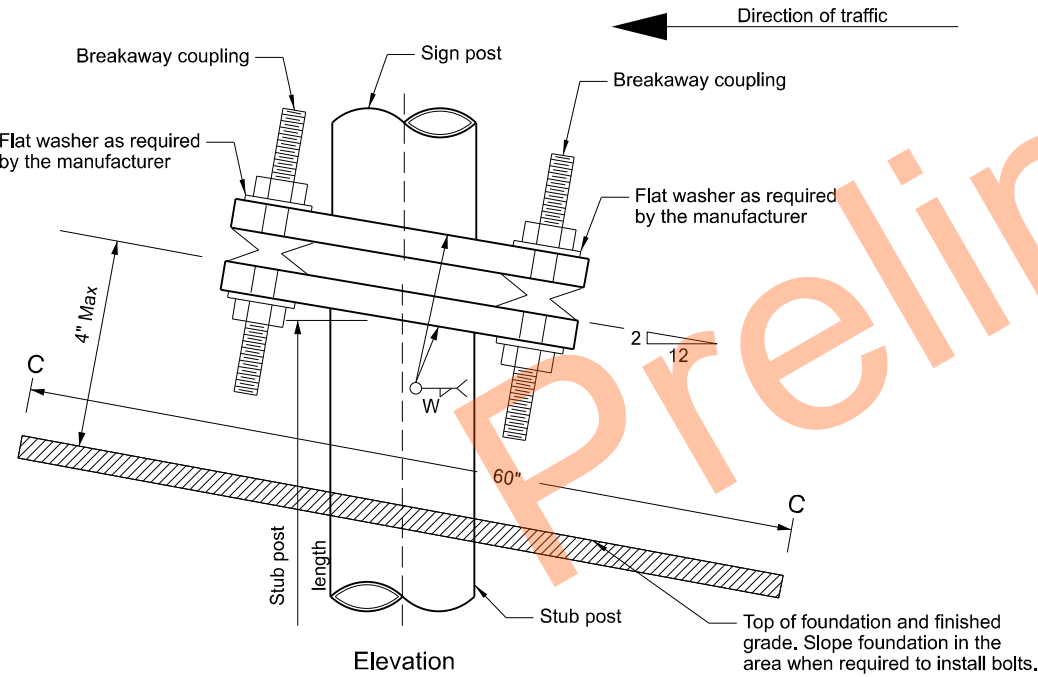


Plan Base Plate

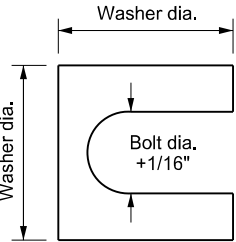


Section C - C

Max. protection of the stub post is 4" above a 60" chord aligned radially to the center line of the highway and connecting any point, within the length of the chord, on the ground surface on one side of the support to a point in the ground surface on the other side.



Two Post Sign and Stub Post
For signs with less than 8' post spacing
Type B



Shim Detail

Furnish 2 - .012"± thick and 2 - .032"± thick shims per post. Fabricate shims from brass shim stock or strip conforming to ASTM B36.

Dimension Nom. Pipe Size	Base Table Data										
	Breakaway Coupling	A	B	C	D	E	F	G	t	W	Stub Post Length
Steel											
3 1/2"	1/2" x 4 1/2"	5 1/2"	8 3/8"	13 1/16"	3 7/8"	13 1/16"	6 3/4"	9 1/16"	3/4"	3/8"	1'-6"
4"	5/8" x 4 1/2"	5 1/2"	8 3/4"	1"	3 1/2"	1"	6 3/4"	11 1/16"	3/4"	3/8"	1'-6"
5"	3/4" x 5 1/4"	6 1/2"	10"	1 1/8"	4 1/4"	1 1/8"	7 3/4"	13 1/16"	1"	7/16"	2'-0"
6"	1" x 5 1/4"	7 1/2"	11 3/4"	1 3/8"	4 3/4"	1 3/8"	9"	1 1/16"	1 1/4"	7/16"	2'-0"
8"	1" x 5 1/4"	9 1/2"	13 1/4"	1 3/8"	6 3/4"	1 3/8"	10 1/2"	1 1/16"	1 1/4"	7/16"	2'-6"
10"	1" x 5 1/4"	11 3/4"	15 1/4"	1 3/8"	9"	1 3/8"	12 1/2"	1 1/16"	1 1/4"	1/2"	3'-0"
12"	1" x 7"	13 3/4"	18"	1 5/8"	10 1/2"	1 5/8"	14 3/4"	1 1/16"	1 1/2"	1/2"	3'-0"
Aluminum											
3 1/2"	1/2" x 4 1/2"	5 1/2"	8 3/8"	13 1/16"	3 7/8"	13 1/16"	6 3/4"	9 1/16"	3/4"	3/8"	1'-6"
4"	5/8" x 4 1/2"	5 1/2"	8 3/4"	1"	3 1/2"	1"	6 3/4"	11 1/16"	1"	7/16"	1'-6"
5"	3/4" x 5 1/4"	6 1/2"	10"	1 1/8"	4 1/4"	1 1/8"	7 3/4"	13 1/16"	1"	1/2"	2'-0"
6"	1" x 5 1/4"	7 1/2"	11 3/4"	1 3/8"	4 3/4"	1 3/8"	9"	1 1/16"	1 1/4"	1/2"	2'-0"
8"	1" x 5 1/4"	9 1/2"	13 1/4"	1 3/8"	6 3/4"	1 3/8"	10 1/2"	1 1/16"	1 1/4"	1/2"	2'-6"
10"	1" x 5 1/4"	11 3/4"	15 1/4"	1 3/8"	9"	1 3/8"	12 1/2"	1 1/16"	1 1/2"	7/16"	3'-0"
12"	1" x 7"	13 3/4"	18"	1 5/8"	10 1/4"	1 5/8"	14 3/4"	1 1/16"	1 3/4"	11/16"	3'-0"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 10-3-2013	
REVISIONS	
DATE	CHANGE
8-30-2018	Updated notes to active voice.
8-29-2019	New Design Engineer PE Stamp.
8-05-2024	Electronic Stamp/Signature.

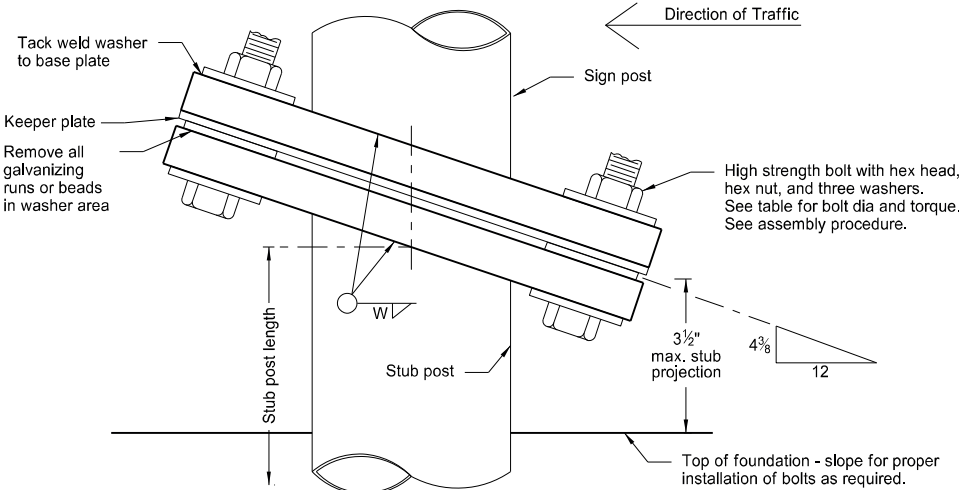


08/05/24

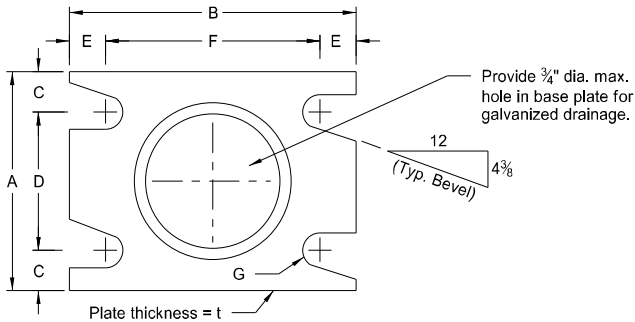
Breakaway System
for Standard Pipe
Stub Post

Notes:
Tack weld aluminum base plate washers to the base, when the base plate is aluminum.
Use standard drawing D-754-6 for fuse plate, hinge plate, and foundation details.

- Assembly Procedure:
- Assemble post to stub with bolts and one flat washer between base plate and keeper plate.
 - Shim as required.
 - Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and shims and to clean bolt threads, then loosen.
 - Retighten bolts in a systematic order to prescribed torque. (see table)
 - Loosen each bolt and fill the gaps between the thread and mating surface with thread locking liquid resin, conforming to ASTM D5363-03 (2008), forming solid, one part assemblies secure from vibration, pressure, and corrosion.
 - Retighten each bolt to prescribed torque in the same order as initial retightening.

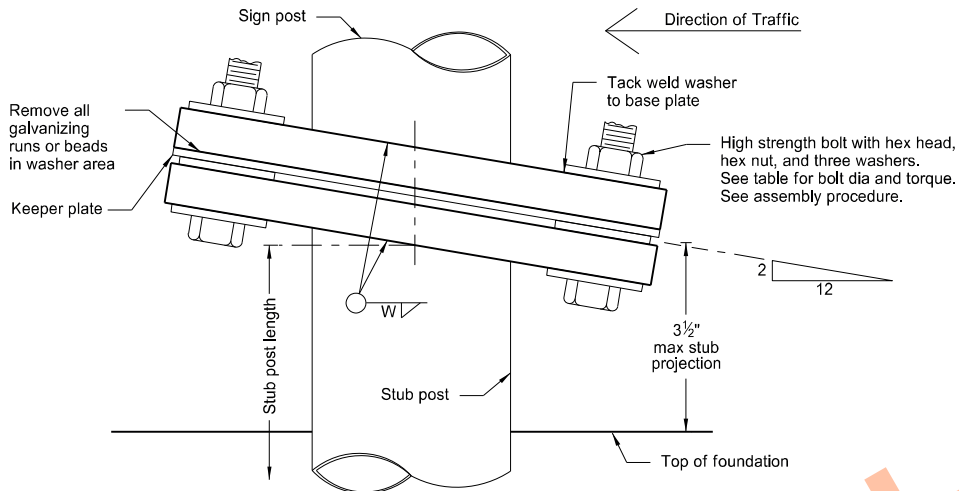


Stub Post Connection - Type A
Elevation View
(Single Post)

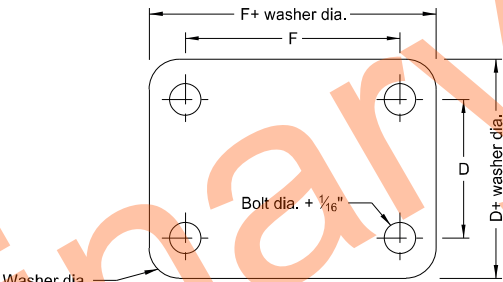


Base Plate Plan View

Place bevel toward roadway on approach side and away on the other side.

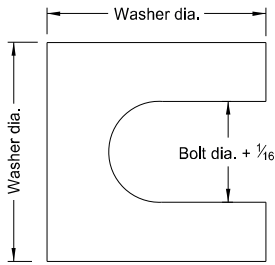


Stub Post Connection - Type B
Elevation View
(Two Posts)



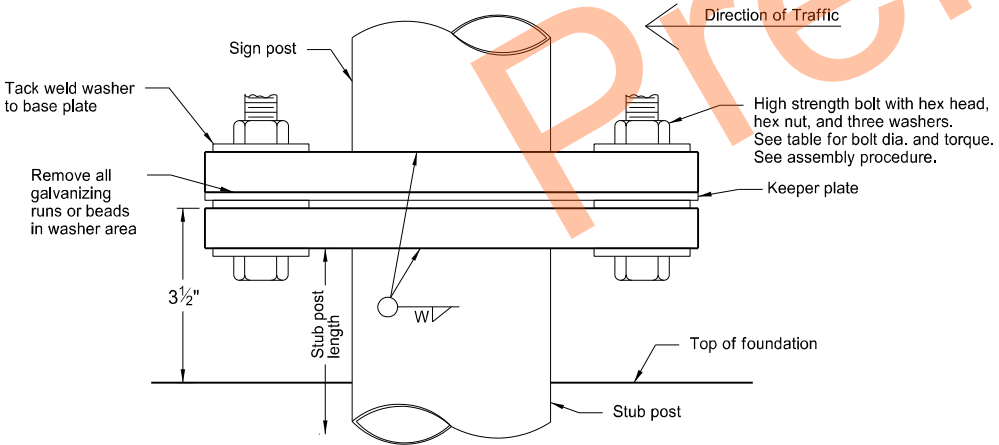
Keeper Plate Detail

Place keeper plate above center washer between top and bottom slip bases. Fabricate keeper plate from 28 gauge material and galvanize after fabrication in conformance with ASTM A653 G60 coating.



Shim Detail

Furnish 2 each $\pm .012$ " thick and 2 each $\pm .032$ " thick shims per post. Fabricate shims from brass shim stock or strip in conformance with ASTM B36.



Stub Post Connection - Type C
Elevation View
(Two Posts)

Base Data Table												
Nominal Post Size dia.	Bolt Size (dia. x length)	Base Bolt Torque ft. lb.	A	B	C	D	E	F	G	t	W	Stub Post Length
Steel												
3 1/2"	1/2"x2 1/2"	12	5 1/2"	8 3/8"	1 3/16"	3 7/8"	1 3/16"	6 3/4"	9/32"	3/4"	3/8"	1'-6"
4"	5/8"x2 3/4"	29	5 1/2"	8 3/4"	1"	3 1/2"	1"	6 3/4"	1 1/32"	3/4"	3/8"	1'-6"
5"	3/4"x3 1/2"	46	6 1/2"	10"	1 1/8"	4 1/4"	1 1/8"	7 3/4"	1 3/32"	1"	7/16"	2'-0"
6"	1"x4 1/4"	61	7 1/2"	11 3/4"	1 3/8"	4 3/4"	1 3/8"	9"	1 7/32"	1 1/4"	7/16"	2'-0"
Aluminum												
3 1/2"	1/2"x2 1/2"	12	5 1/2"	8 3/8"	1 3/16"	3 7/8"	1 3/16"	6 3/4"	9/32"	3/4"	3/8"	1'-6"
4"	5/8"x2 3/4"	29	5 1/2"	8 3/4"	1"	3 1/2"	1"	6 3/4"	1 1/32"	1"	7/16"	1'-6"
5"	3/4"x3 1/2"	46	6 1/2"	10"	1 1/8"	4 1/4"	1 1/8"	7 3/4"	1 3/32"	1"	1/2"	2'-0"
6"	1"x4 1/4"	61	7 1/2"	11 3/4"	1 3/8"	4 3/4"	1 3/8"	9"	1 7/32"	1 1/4"	1/2"	2'-0"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-21-11	
REVISIONS	
DATE	CHANGE
2-28-14	Removed lower post and foundation details.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.
8-05-24	Electronic Stamp/Signature.



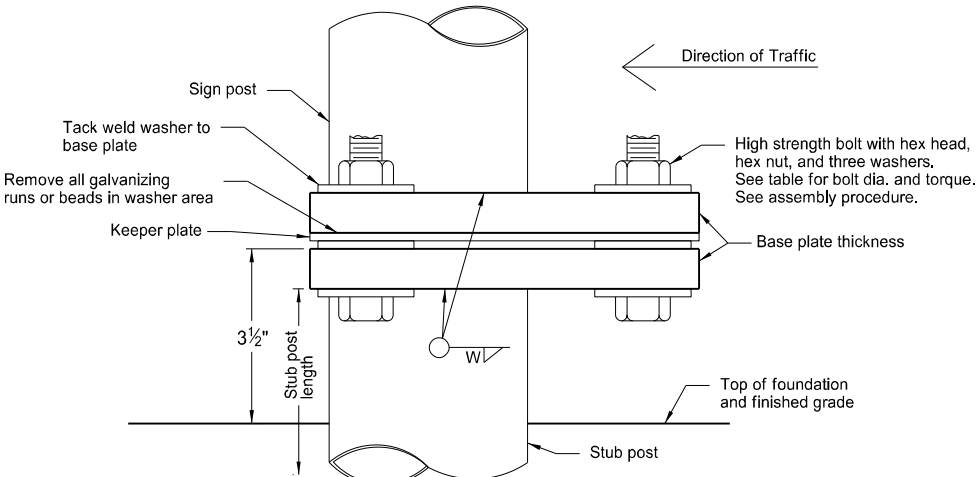
08/05/24

Multi-Directional Breakaway System
for Standard Pipe
Stub Post

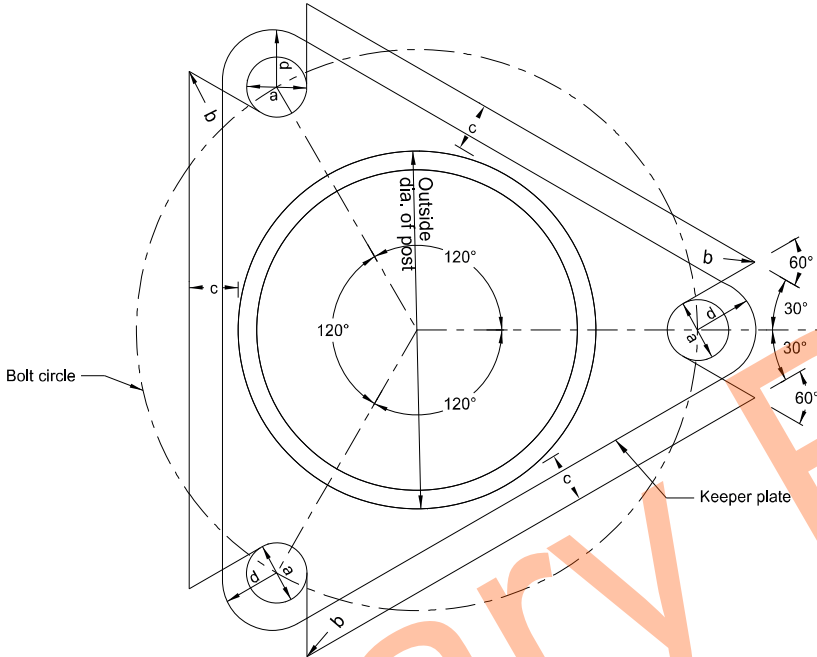
Notes:
Tack weld aluminum base plate washers to the base, when the base plate is fabricated from aluminum.

Use standard drawing D-754-6 for fuse plate, hinge plate, and foundation details.

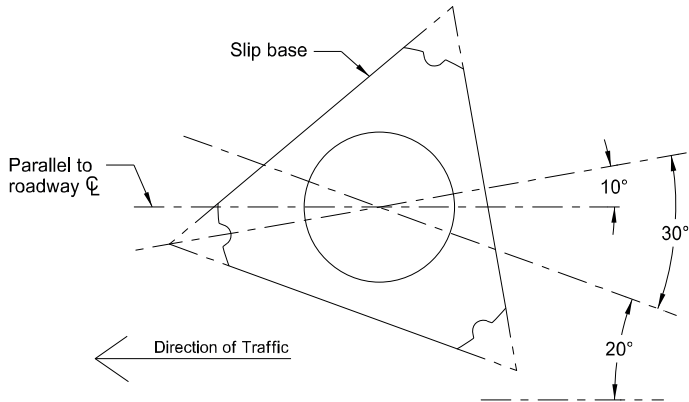
- Assembly Procedure:
1. Assemble post to stub with bolts and one flat washer between base plates and keeper plate.
 2. Shim as required.
 3. Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and shims to clean bolt threads, then loosen.
 4. Retighten bolts in a systematic order to prescribed torque. (see table)
 5. Loosen each bolt and apply thread locking liquid resin conforming to ASTM D5363-03 (2008). Fill gaps between thread and mating surface with thread locker to form solid, one part assemblies secure from vibration, pressure, and corrosion.
 6. Retighten each bolt to prescribed torque in the same order as initial retightening.



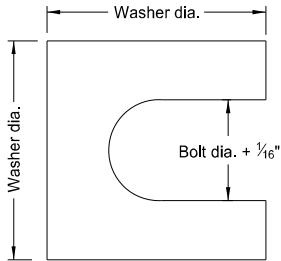
Stub Post Connection - Type D
Elevation View
(Single Post)



Stub Post Detail
Top View



Slip Base Orientation
Top View



Shim Detail

Furnish 2 each ± 0.012 " thick and 2 each ± 0.032 " thick shims per post. Fabricate shims from brass shim stock or strip conforming to ASTM B36.

Base Data Table											
Nominal Post Size dia.	Outside Post dia.	Bolt Circle	a rad.	b rad.	c rad.	Bolt Size (dia. x length)	Base Plate Thickness	W	Base Bolt Torque ft. lb.	d rad.	Stub Post Length
Steel											
3 1/2"	4"	7"	1 1/16"	1/8"	1 1/8"	1"x4"	1 1/4"	5/16"	55	1 1/8"	1'-6"
4"	4.5"	7 1/2"	1 1/16"	1/8"	1 1/8"	1"x4 1/2"	1 1/2"	3/8"	98	1 1/8"	1'-6"
5"	5.563"	9 1/2"	1 5/16"	1/8"	1 1/8"	1 1/4"x5"	1 1/2"	3/8"	167	1 3/8"	2'-0"
Aluminum											
3 1/2"	4"	7"	1 3/16"	1/8"	7/8"	3/4"x3 1/2"	1"	5/16"	43	7/8"	1'-6"
4"	4.5"	7 1/2"	1 3/16"	1/8"	3/4"	3/4"x4"	1 1/4"	5/16"	76	7/8"	1'-6"
5"	5.563"	9 1/2"	1 1/16"	1/8"	1 1/8"	1"x4"	1 1/4"	5/16"	98	1 1/8"	2'-0"
6"	6.625"	10 1/4"	1 1/16"	1/8"	3/4"	1"x4 1/2"	1 1/2"	3/8"	134	1 1/8"	2'-0"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.
8-05-24	Electronic Stamp/Signature.



08/05/24

FOUNDATION DATA FOR STEEL SUPPORTS

D-754-5

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
1' - 4"	4' - 6"	0.23	0.47	4' - 2"	5	6	12	3	6	12
1' - 4"	5' - 0"	0.26	0.52	4' - 8"	5	6	12	3	7	14
1' - 4"	5' - 6"	0.28	0.57	5' - 2"	5	6	12	3	8	16
1' - 4"	6' - 0"	0.31	0.62	5' - 8"	5	6	12	3	8	16
1' - 4"	6' - 6"	0.34	0.67	6' - 2"	5	6	12	3	9	18
1' - 4"	7' - 0"	0.36	0.72	6' - 8"	5	6	12	3	9	18
1' - 4"	7' - 6"	0.39	0.78	7' - 2"	5	6	12	3	10	20
1' - 4"	8' - 0"	0.41	0.83	7' - 8"	5	6	12	3	11	22
1' - 4"	8' - 6"	0.44	0.88	8' - 2"	5	6	12	3	11	22
1' - 4"	9' - 0"	0.47	0.93	8' - 8"	5	6	12	3	12	24
1' - 4"	9' - 6"	0.49	0.98	9' - 2"	5	6	12	3	12	24
1' - 4"	10' - 0"	0.52	1.03	9' - 8"	5	6	12	3	13	26
1' - 4"	10' - 6"	0.54	1.09	10' - 2"	5	6	12	3	14	28
1' - 4"	11' - 0"	0.57	1.14	10' - 8"	5	6	12	3	14	28
1' - 4"	11' - 6"	0.59	1.19	11' - 2"	5	6	12	3	15	30
1' - 4"	12' - 0"	0.62	1.24	11' - 8"	5	6	12	3	15	30

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
1' - 9"	4' - 6"	0.40	0.80	4' - 2"	5	10	20	3	6	12
1' - 9"	5' - 0"	0.45	0.89	4' - 8"	5	10	20	3	7	14
1' - 9"	5' - 6"	0.49	0.98	5' - 2"	5	10	20	3	8	16
1' - 9"	6' - 0"	0.53	1.07	5' - 8"	5	10	20	3	8	16
1' - 9"	6' - 6"	0.58	1.16	6' - 2"	5	10	20	3	9	18
1' - 9"	7' - 0"	0.62	1.25	6' - 8"	5	10	20	3	9	18
1' - 9"	7' - 6"	0.67	1.34	7' - 2"	5	10	20	3	10	20
1' - 9"	8' - 0"	0.71	1.43	7' - 8"	5	10	20	3	11	22
1' - 9"	8' - 6"	0.76	1.51	8' - 2"	5	10	20	3	11	22
1' - 9"	9' - 0"	0.80	1.60	8' - 8"	5	10	20	3	12	24
1' - 9"	9' - 6"	0.85	1.69	9' - 2"	5	10	20	3	12	24
1' - 9"	10' - 0"	0.89	1.78	9' - 8"	5	10	20	3	13	26
1' - 9"	10' - 6"	0.94	1.87	10' - 2"	5	10	20	3	14	28
1' - 9"	11' - 0"	0.98	1.96	10' - 8"	5	10	20	3	14	28
1' - 9"	11' - 6"	1.02	2.05	11' - 2"	5	10	20	3	15	30
1' - 9"	12' - 0"	1.07	2.14	11' - 8"	5	10	20	3	15	30

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
2' - 0"	4' - 6"	0.52	1.05	4' - 2"	6	10	20	3	6	12
2' - 0"	5' - 0"	0.58	1.16	4' - 8"	6	10	20	3	7	14
2' - 0"	5' - 6"	0.64	1.28	5' - 2"	6	10	20	3	8	16
2' - 0"	6' - 0"	0.70	1.40	5' - 8"	6	10	20	3	8	16
2' - 0"	6' - 6"	0.76	1.51	6' - 2"	6	10	20	3	9	18
2' - 0"	7' - 0"	0.81	1.63	6' - 8"	6	10	20	3	9	18
2' - 0"	7' - 6"	0.87	1.75	7' - 2"	6	10	20	3	10	20
2' - 0"	8' - 0"	0.93	1.86	7' - 8"	6	10	20	3	11	22
2' - 0"	8' - 6"	0.99	1.98	8' - 2"	6	10	20	3	11	22
2' - 0"	9' - 0"	1.05	2.09	8' - 8"	6	10	20	3	12	24
2' - 0"	9' - 6"	1.11	2.21	9' - 2"	6	10	20	3	12	24
2' - 0"	10' - 0"	1.16	2.33	9' - 8"	6	10	20	3	13	26
2' - 0"	10' - 6"	1.22	2.44	10' - 2"	6	10	20	3	14	28
2' - 0"	11' - 0"	1.28	2.56	10' - 8"	6	10	20	3	14	28
2' - 0"	11' - 6"	1.34	2.68	11' - 2"	6	10	20	3	15	30
2' - 0"	12' - 0"	1.40	2.79	11' - 8"	6	10	20	3	15	30
2' - 0"	12' - 6"	1.45	2.91	12' - 2"	6	10	20	3	16	32
2' - 0"	13' - 0"	1.51	3.03	12' - 8"	6	10	20	3	17	34
2' - 0"	13' - 6"	1.57	3.14	13' - 2"	6	10	20	3	17	34
2' - 0"	14' - 0"	1.63	3.26	13' - 8"	6	10	20	3	18	36
2' - 0"	14' - 6"	1.69	3.37	14' - 2"	6	10	20	3	18	36
2' - 0"	15' - 0"	1.75	3.49	14' - 8"	6	10	20	3	19	38

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
2' - 4"	4' - 6"	0.71	1.43	4' - 2"	6	14	28	3	6	12
2' - 4"	5' - 0"	0.79	1.58	4' - 8"	6	14	28	3	7	14
2' - 4"	5' - 6"	0.87	1.74	5' - 2"	6	14	28	3	8	16
2' - 4"	6' - 0"	0.95	1.90	5' - 8"	6	14	28	3	8	16
2' - 4"	6' - 6"	1.03	2.06	6' - 2"	6	14	28	3	9	18
2' - 4"	7' - 0"	1.11	2.22	6' - 8"	6	14	28	3	9	18
2' - 4"	7' - 6"	1.19	2.38	7' - 2"	6	14	28	3	10	20
2' - 4"	8' - 0"	1.27	2.53	7' - 8"	6	14	28	3	11	22
2' - 4"	8' - 6"	1.35	2.69	8' - 2"	6	14	28	3	11	22
2' - 4"	9' - 0"	1.43	2.85	8' - 8"	6	14	28	3	12	24
2' - 4"	9' - 6"	1.50	3.01	9' - 2"	6	14	28	3	12	24
2' - 4"	10' - 0"	1.58	3.17	9' - 8"	6	14	28	3	13	26
2' - 4"	10' - 6"	1.66	3.33	10' - 2"	6	14	28	3	14	28
2' - 4"	11' - 0"	1.74	3.48	10' - 8"	6	14	28	3	14	28
2' - 4"	11' - 6"	1.82	3.64	11' - 2"	6	14	28	3	15	30
2' - 4"	12' - 0"	1.90	3.80	11' - 8"	6	14	28	3	15	30
2' - 4"	12' - 6"	1.98	3.96	12' - 2"	6	14	28	3	16	32
2' - 4"	13' - 0"	2.06	4.12	12' - 8"	6	14	28	3	17	34
2' - 4"	13' - 6"	2.14	4.28	13' - 2"	6	14	28	3	17	34
2' - 4"	14' - 0"	2.22	4.43	13' - 8"	6	14	28	3	18	36
2' - 4"	14' - 6"	2.30	4.59	14' - 2"	6	14	28	3	18	36
2' - 4"	15' - 0"	2.38	4.75	14' - 8"	6	14	28	3	19	38
2' - 4"	15' - 6"	2.45	4.91	15' - 2"	6	14	28	3	20	40
2' - 4"	16' - 0"	2.53	5.07	15' - 8"	6	14	28	3	20	40
2' - 4"	16' - 6"	2.61	5.23	16' - 2"	6	14	28	3	21	42
2' - 4"	17' - 0"	2.69	5.38	16' - 8"	6	14	28	3	21	42
2' - 4"	17' - 6"	2.77	5.54	17' - 2"	6	14	28	3	22	44
2' - 4"	18' - 0"	2.85	5.70	17' - 8"	6	14	28	3	23	46

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
2' - 6"	4' - 6"	0.82	1.64	4' - 2"	6	16	32	3	6	12
2' - 6"	5' - 0"	0.91	1.82	4' - 8"	6	16	32	3	7	14
2' - 6"	5' - 6"	1.00	2.00	5' - 2"	6	16	32	3	8	16
2' - 6"	6' - 0"	1.09	2.18	5' - 8"	6	16	32	3	8	16
2' - 6"	6' - 6"	1.18	2.36	6' - 2"	6	16	32	3	9	18
2' - 6"	7' - 0"	1.27	2.55	6' - 8"	6	16	32	3	9	18
2' - 6"	7' - 6"	1.36	2.73	7' - 2"	6	16	32	3	10	20
2' - 6"	8' - 0"	1.45	2.91	7' - 8"	6	16	32	3	11	22
2' - 6"	8' - 6"	1.55	3.09	8' - 2"	6	16	32	3	11	22
2' - 6"	9' - 0"	1.64	3.27	8' - 8"	6	16	32	3	12	24
2' - 6"	9' - 6"	1.73	3.45	9' - 2"	6	16	32	3	12	24
2' - 6"	10' - 0"	1.82	3.64	9' - 8"	6	16	32	3	13	26
2' - 6"	10' - 6"	1.91	3.82	10' - 2"	6	16	32	3	14	28
2' - 6"	11' - 0"	2.00	4.00	10' - 8"	6	16	32	3	14	28
2' - 6"	11' - 6"	2.09	4.18	11' - 2"	6	16	32	3	15	30
2' - 6"	12' - 0"	2.18	4.36	11' - 8"	6	16	32	3	15	30
2' - 6"	12' - 6"	2.27	4.55	12' - 2"	6	16	32	3	16	32
2' - 6"	13' - 0"	2.36	4.73	12' - 8"	6	16	32	3	17	34
2' - 6"	13' - 6"	2.45	4.91	13' - 2"	6	16	32	3	17	34
2' - 6"	14' - 0"	2.55	5.09	13' - 8"	6	16	32	3	18	36
2' - 6"	14' - 6"	2.64	5.27	14' - 2"	6	16	32	3	18	36
2' - 6"	15' - 0"	2.73	5.45	14' - 8"	6	16	32	3	19	38
2' - 6"	15' - 6"	2.82	5.64	15' - 2"	6	16	32	3	20	40
2' - 6"	16' - 0"	2.91	5.82	15' - 8"	6	16	32	3	20	40
2' - 6"	16' - 6"	3.00	6.00	16' - 2"	6	16	32	3	21	42
2' - 6"	17' - 0"	3.09	6.18	16' - 8"	6	16	32	3	21	42
2' - 6"	17' - 6"	3.18	6.36	17' - 2"	6	16	32	3	22	44
2' - 6"	18' - 0"	3.27	6.54	17' - 8"	6	16	32	3	23	46
2' - 6"	18' - 6"	3.36	6.73	18' - 2"	6	16	32	3	23	46
2' - 6"	19' - 0"	3.45	6.91	18' - 8"	6	16	32	3	24	48
2' - 6"	19' - 6"	3.55	7.09	19' - 2"	6	16	32	3	24	48
2' - 6"	20' - 0"	3.64	7.27	19' - 8"	6	16	32	3	25	50

NOTES:

1. Use Grade 60 reinforcing steel.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice,
8-29-19	New Design Engineer PE Stamp,

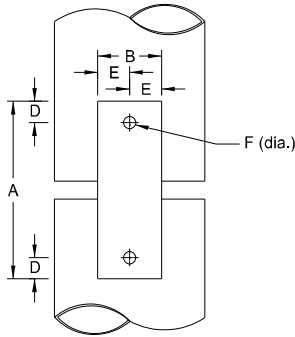
Hinge Plate, Fuse Plate
and Foundation Details
for Standard Pipe

Notes:
Fuse Joint Cuts - For steel posts cut after galvanizing, either galvanize cut after fabrication, or treat cut surface in accordance with ASTM A780. Aluminum posts need no treatment.

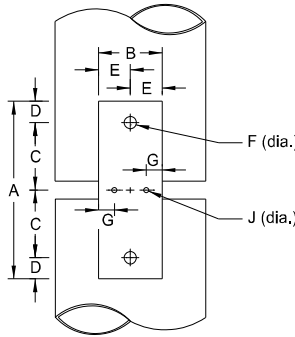
Use standard drawings D-754-2, D-754-3 and D-754-4 for information on breakaway base details.

Maintain the 4" vertical height and 60" diameter horizontal clearance of the break-away base at each post location.

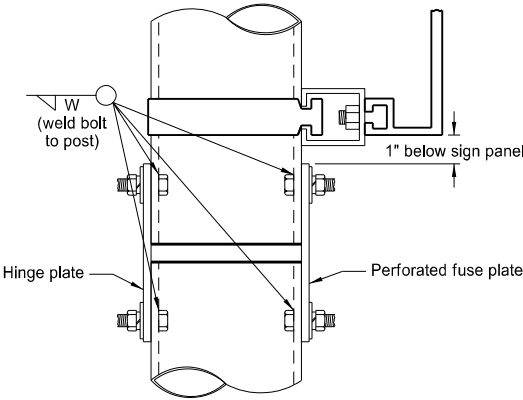
- Assembly Procedure:
1. Assemble hinge plate to post with bolts and one flat washer and lock washer under nut.
 2. Tighten all bolts the maximum possible with 12" to 15" wrench.



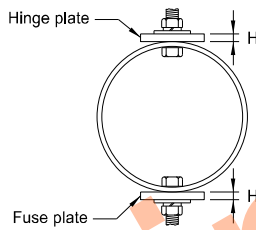
Hinge Plate



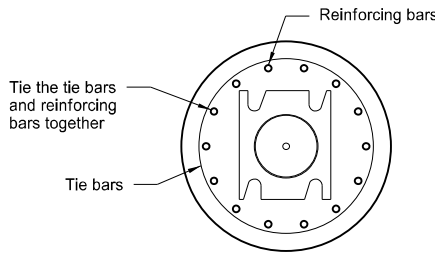
Perforated Fuse Plate



Side View

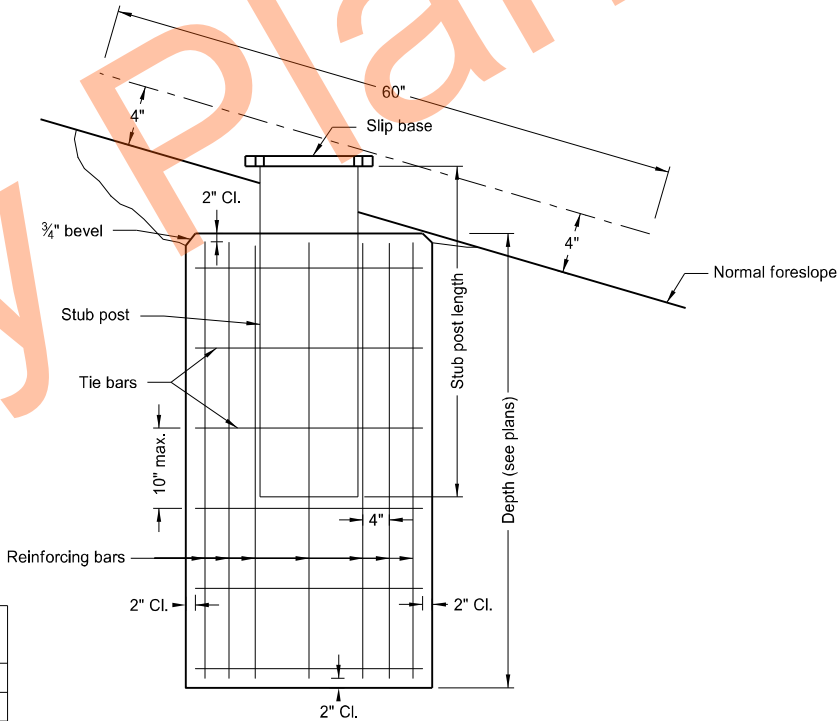


Top View



Top View

See standard drawing D-754-5 for size, number, and length of rebar. Use 3 bolt base plate for Type D.



Foundation
Front View

Foundation detail for breakaway base with stub post connection.

Foundation diameter	Post Size
1'-4"	3 1/2"-4"
1'-9"	5"-6"

Round Metal Posts							
Dimensions				Properties			
Nominal dia. in.	Outside dia. in.	Inside dia. in.	Wall Thickness in.	Weight per Foot Pound	Moment of Inertia in. ⁴	Cross Sec. Area in. ²	Section Diameter in. ²
Steel							
3 1/2	4.000	3.548	.226	9.11	4.788	2.680	2.394
4	4.500	4.026	.237	10.79	7.233	3.174	3.215
5	5.563	5.047	.258	14.62	15.16	4.300	5.449
6	6.625	6.065	.280	18.97	28.14	5.581	8.495
Aluminum							
3 1/2	4.000	3.548	.226	3.151	4.788	2.680	2.394
4	4.500	4.026	.237	3.733	7.232	3.174	3.214
5	5.563	5.047	.258	5.057	15.16	4.300	5.451
6	6.625	6.065	.280	6.564	28.14	5.581	8.496

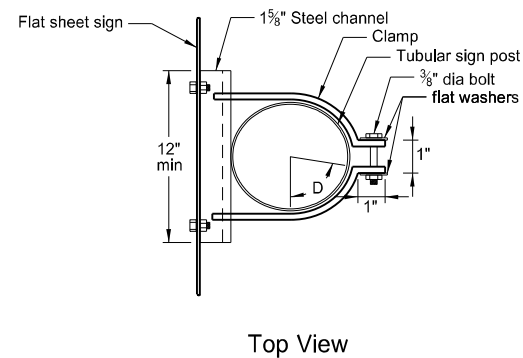
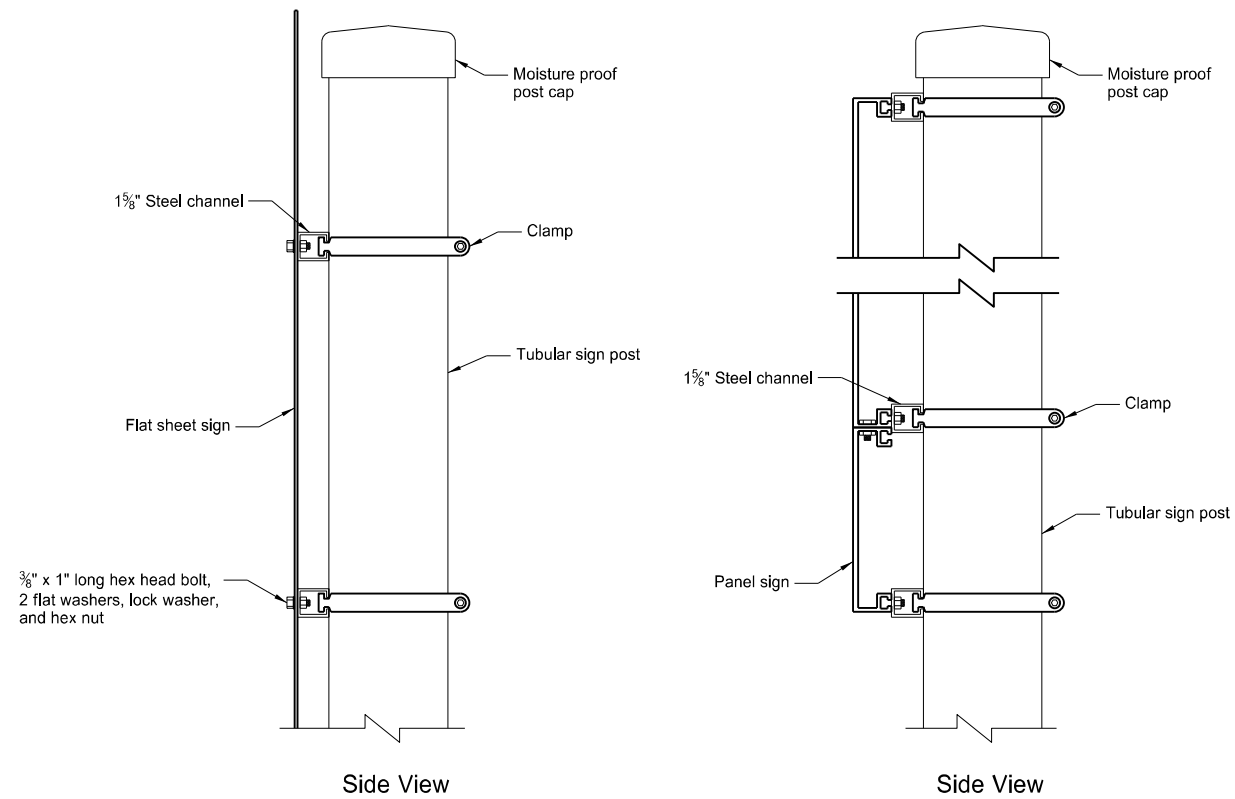
Nominal Pipe Size dia.	Fuse and Hinge Plate Data										
	Bolt Size	A	B	C	D	E	F	G	H	I	J
3 1/2"	1/2" Ø x 1 1/2"	5"	1 3/4"	1 1/16"	1 3/16"	7/8"	9/16"	1 5/32"	1/4"	1 3/32"	7/16"
4"	5/8" Ø x 1 1/2"	5 3/4"	2"	1 7/8"	1"	1"	1 1/16"	1 7/32"	3/8"	1 5/32"	9/16"
5"	5/8" Ø x 1 3/4"	5 3/4"	2"	1 7/8"	1"	1"	1 1/16"	9/16"	1/2"	7/16"	5/8"
6"	3/4" Ø x 2 1/4"	6 1/4"	2 1/4"	2"	1 1/8"	1 1/8"	1 3/16"	5/8"	1/2"	1/2"	5/8"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.
8-05-24	Electronic Stamp/Signature.

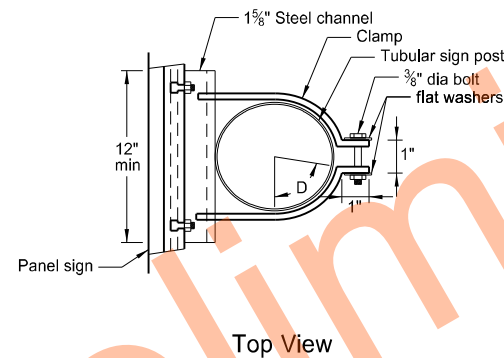


PIPE SUPPORT AND SIGN MOUNTING DETAILS

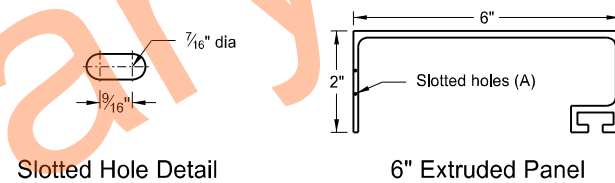
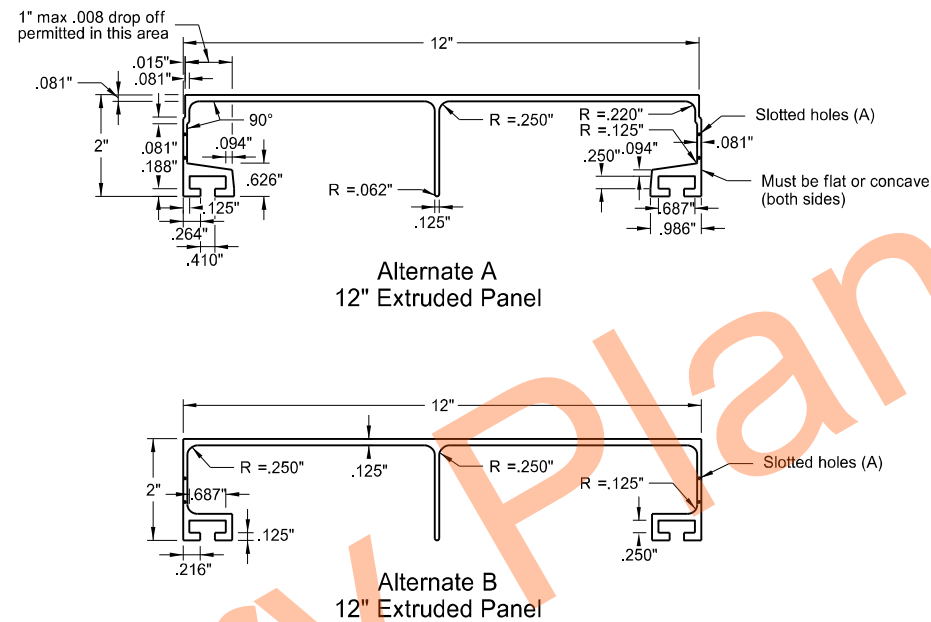
D-754-7



Flat Sheet Sign Clamp Mounting Details



Panel Sign Clamp Mounting Details

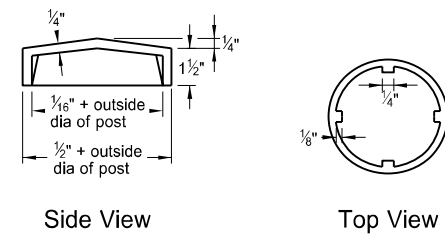
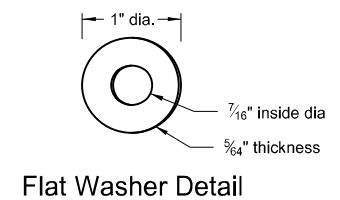


Aluminum Panel Details

(A) Punch slotted holes in aluminum panels at 1'-0" on center, space from end as listed below:

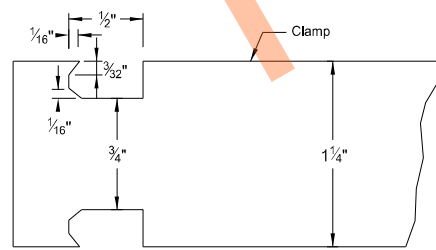
12" even length panels	4'-0" etc.
9" odd + 6" length panels	5'-6" etc.
6" odd length panels	5'-0" etc.
3" even + 6" length panels	4'-6" etc.

Wall thickness = .078" unless specified otherwise.
All inside and outside corners = .031" radius unless specified otherwise.

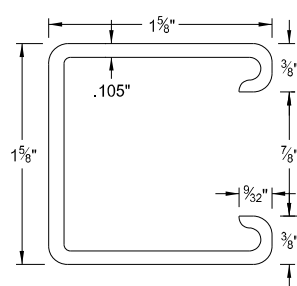


Post Cap Detail

Furnish post caps for all steel or aluminum posts or weld a 1/8" plate all around.



Clamp Detail



Post Size dia	Clamp Gauge min
3 1/2" to 5"	11
6" to 12"	10

Post Size dia (in)	D (in)
3 1/2	3
4	3 3/16
5	5 1/8
6	7 1/16
8	13 1/16
10	20 3/4
12	29 5/8

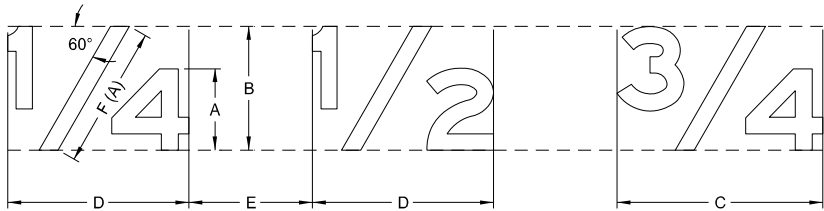
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-21-14	
REVISIONS	
DATE	CHANGE
08-30-18	Updated to active voice, defined bolt & washer for fastening sign.
08-29-19	New Design Engineer PE Stamp.
10-19-22	Added washers to clamp.



10/20/22

LETTER AND ARROW DETAILS

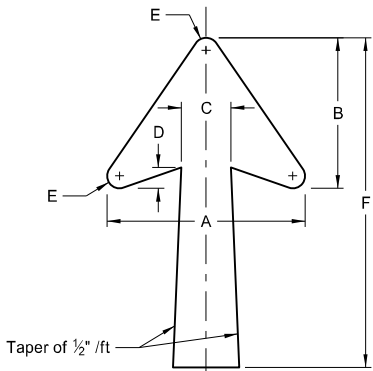
D-754-9



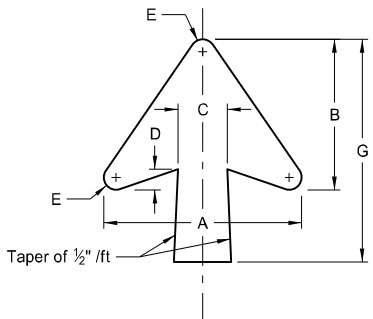
DETERMINE SIZE OF THE FRACTION AS FOLLOWS:

SYMBOL	TITLE	RATIO TO HEIGHT OF CAPITAL OR UPPER CASE
A	Letter height	1.0 of capital or upper case
B	Fraction height	1.5 X A
C	Fraction width	2.5 X A
D	Fraction width	2 X A
E	Space to next character	1 to 1.5 X A
F(A)	Length of diagonal	1.75 X A

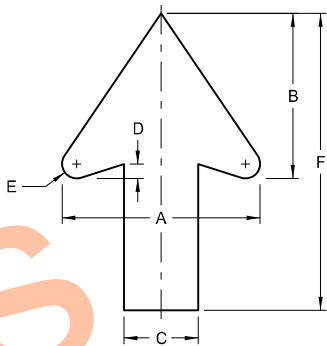
(A) Center diagonal stroke of fraction optically.



TYPE A



TYPE B



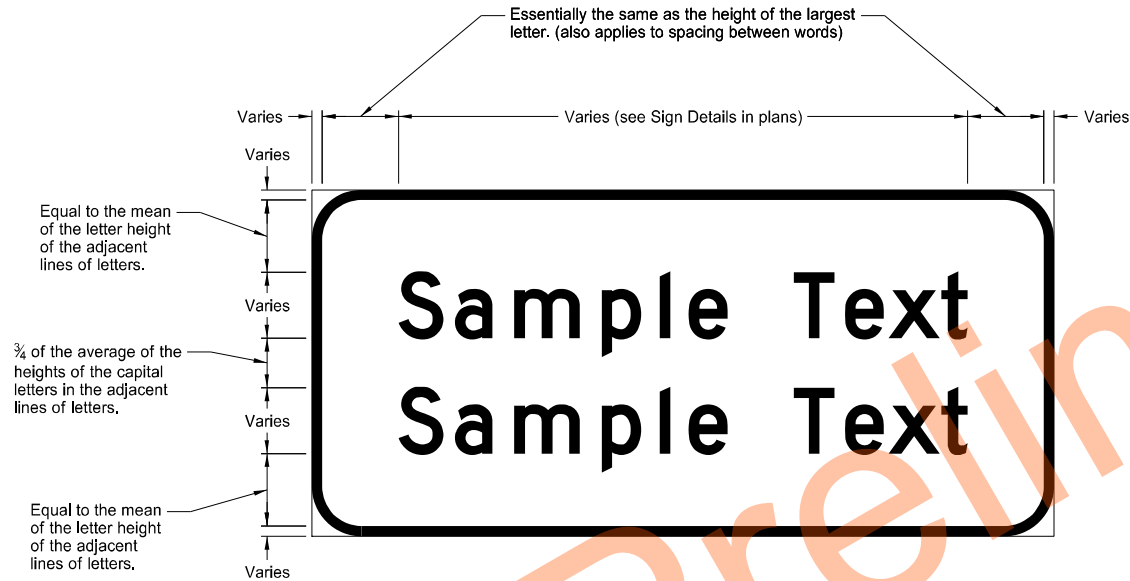
TYPE D

NOTE: Measure rotation angle of arrows counterclockwise from positions shown in details.

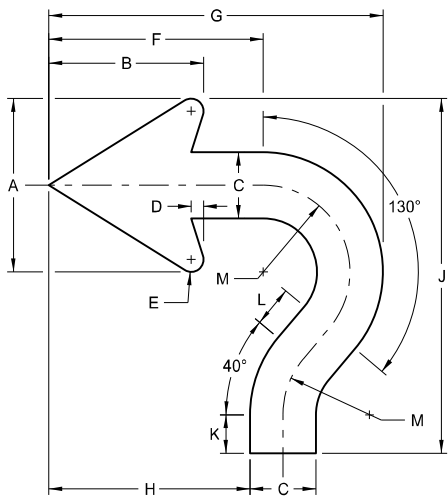
DESIGNATION	LETTER SIZE (Upper Case)	A	B	C	D	E	F	G
ND_6IN	6"	12"	9.125"	3"	1"	0.625"	20"	13.5"
ND_8IN	8"	15.125"	11.563"	3.75"	1.313"	0.813"	25"	17"
ND_10IN	10"	18.25"	14"	4.5"	1.5"	0.75"	30"	20"
ND_12IN	12"							
ND_13IN	13.3"							
ND_16IN	16"	22.25"	17"	5.375"	1.75"	1"	35"	25"
ND_20IN	20"							

NOTE: Arrow size on gore signs is based on the letter size of "EXIT".

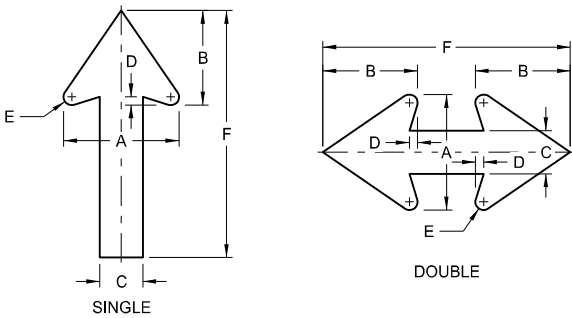
DESIGNATION	LETTER SIZE (Upper Case)	A	B	C	D	E	F
ND_2IN	2"	2"	1.625"	0.75"	0.125"	0.125"	3"
ND_4IN	4"	4"	3.313"	1.5"	0.25"	0.25"	6"
ND_6IN	6"	6"	4.875"	2.25"	0.375"	0.375"	9"
ND_8IN	8"	8"	6.625"	3"	0.5"	0.5"	12"
ND_10IN	10"	10"	8.375"	3.75"	0.75"	0.75"	15"
ND_12IN	12"	12"	10"	4.5"	0.875"	0.875"	18"



TYPICAL SPACING

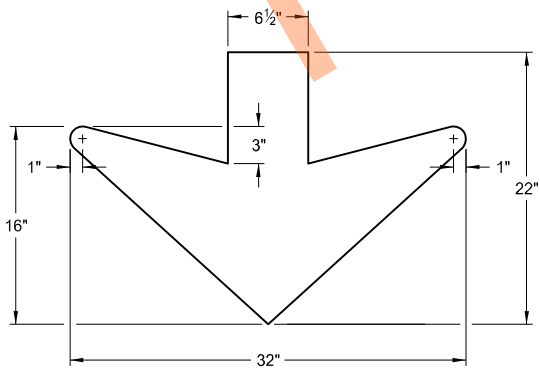


ROUNDOABOUT



SPECIAL

DESIGNATION	A	B	C	D	E	F	USES
ND_0.75IN	2"	1.625"	0.75"	0.125"	0.125"	7.75"	Parking Signs (Regulatory)
ND_2.625IN	7"	5.75"	2.625"	0.5"	0.5"	15"	Frontage Road Signs



DOWN ARROW

DESIGNATION	LETTER SIZE (Upper Case)	A	B	C	D	E	F	G	H	J	K	L	M
ND_6IN	6"	5.25"	4.688"	2"	0.375"	0.375"	6.5"	10.125"	6.094"	10.75"	1.168"	1.25"	2.625"
ND_8IN	8"	7"	5.75"	2.625"	0.5"	0.5"	8.688"	13.5"	8.166"	14.333"	1.557"	1.667"	3.5"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-3-11	
REVISIONS	
DATE	CHANGE
7-8-14	Revised gore sign and added 4" D & D arrow
5-4-16	Revised Distance & Destination and Typical Spacing details
4-23-18	Revised arrow details
8-30-18	Updated notes to active voice.
8-29-19	New Design Engr PE Stamp.
8-05-24	Electronic Stamp/Signature.

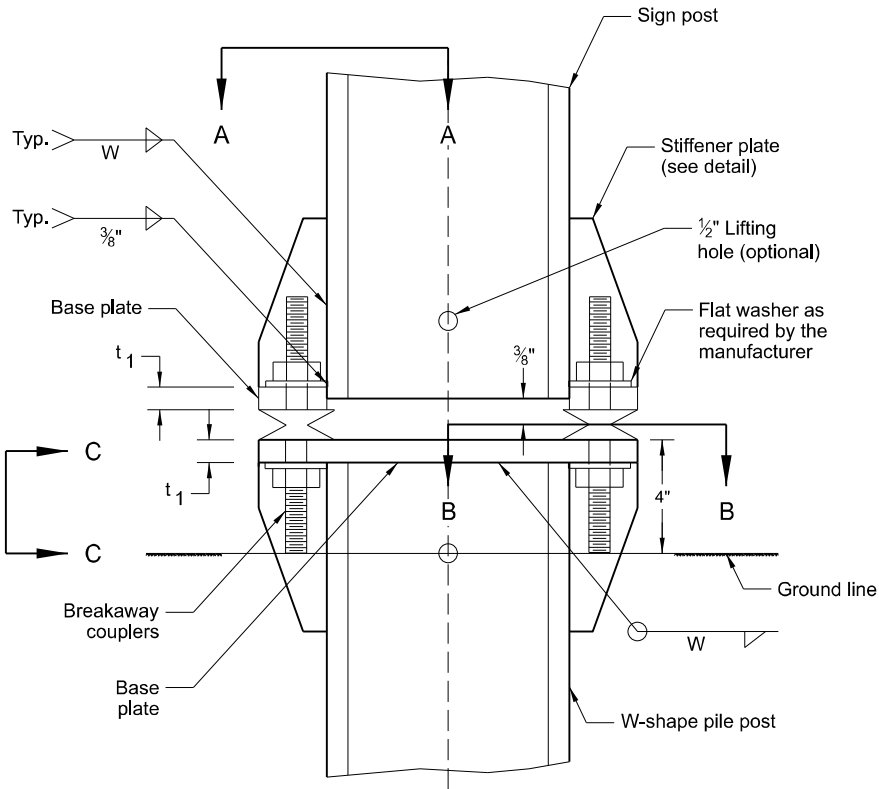


08/05/24

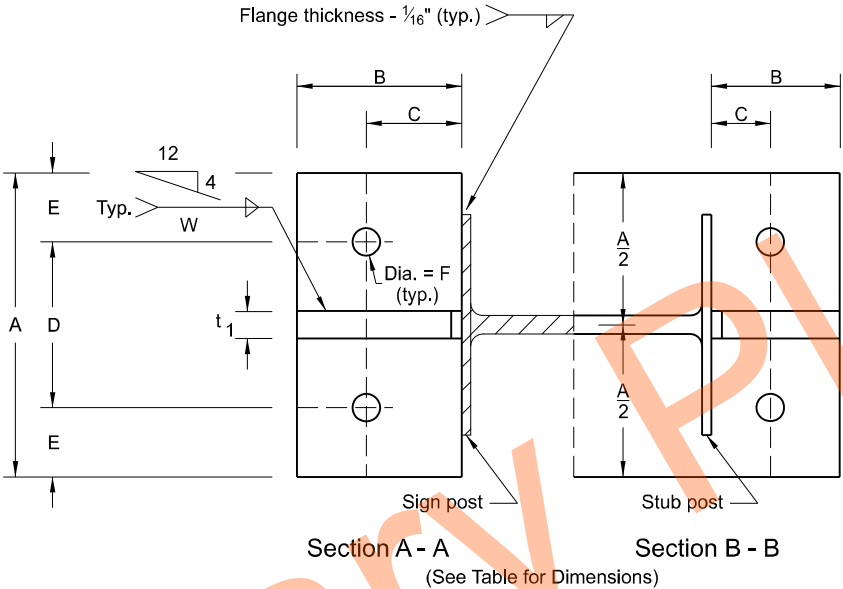
Breakaway Coupler System
Structural Details
for W-Shape Supports

Notes:

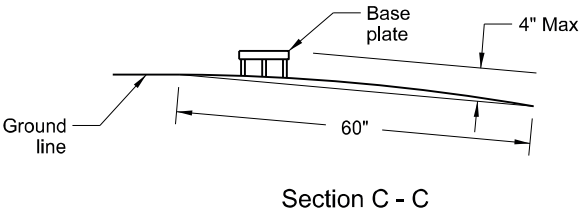
1. Use either the breakaway base system shown on standard D-754-13 or a breakaway coupling system manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements as specified by DENT BREAKAWAY IND., INC. which meets the requirements of NCHRP Report 350.
2. Use structural steel conforming to Sec. 894.03 B.6 and high strength bolts conforming to ASTM - A325. Refer to "Sign Summary" sheet for specific data on each individual sign installation.
3. Use manufacturer's recommendations for assembly procedures.



Sign Post and Stub Post
Elevation

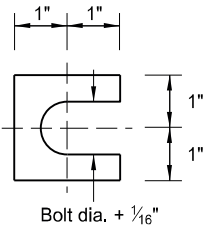


Section A - A Section B - B
(See Table for Dimensions)

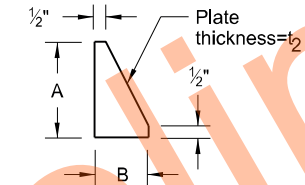


Section C - C

Max. protection of the stub post is 4" above a 60" chord aligned radially to the center line of the highway and connecting any point, within the length of the chord, on the ground surface on one side of the support to a point in the ground surface on the other side.



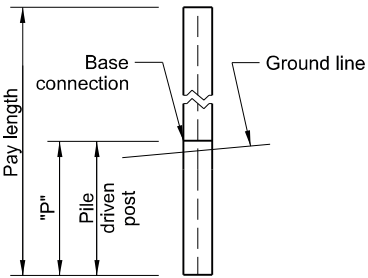
Shim Detail



Stiffener Plate Detail
(See Table for Dimensions)

Furnish 2 - .012"± thick and 2 - .032"± thick shims per post. Fabricate shims from brass shim stock or strip conforming to ASTM B36.

Sections shown are for installations on right shoulder and in gore. Plate slot bevels are opposite hand from that shown for installations on left shoulder.



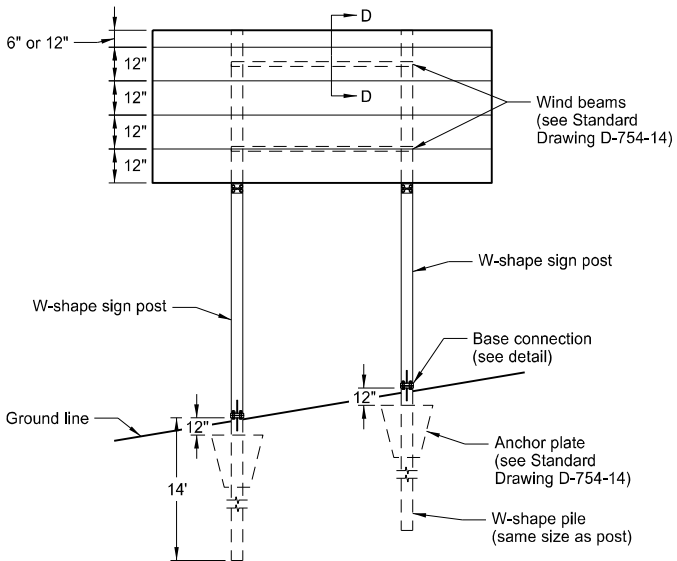
W-Shape - Pile Footing

W-Shape Post & Pile Size	Base Connection Data										Footing Data
	Bolt Size	A	B	C	D	E	t ₁	t ₂	W	F	W-Shape Pile Post "P"
W4X13	3/4" x 5 1/4"	6"	2 1/2"	1 1/2"	3 1/2"	1 1/4"	1"	1/2"	1/4"	13/16"	14'
W5X16											14'
W6X20	7/8" x 5 1/4"	8"	3"	1 3/4"	4"	2"	1 1/4"	1/2"	1/4"	15/16"	14'
W8X24											14'
W8X28	1" x 5 1/4"	8"	3"	2"	4"	2"	1 1/2"	3/4"	5/16"	1 1/16"	14'

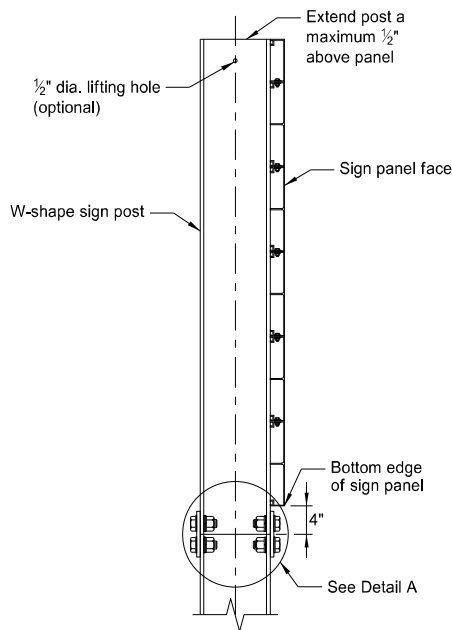
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-2013	
REVISIONS	
DATE	CHANGE
7-8-14	Revised notes 2 and 3.
8-30-18	Updated notes to active voice.
8-28-19	New Design Engineer PE Stamp.
8-05-24	Electronic Stamp/Signature.



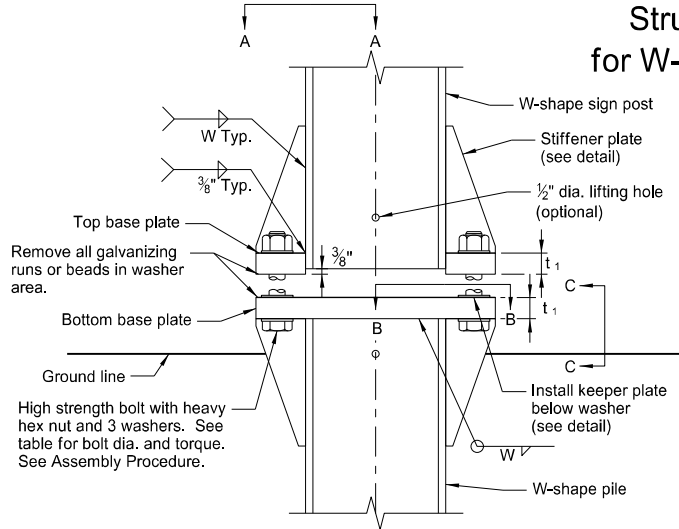
Breakaway System
Structural Details
for W-Shape Supports



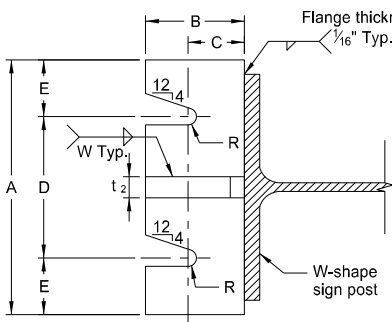
Typical Panel Mounting
on W-shape Sign Posts



Fuse Joint
(Side View)

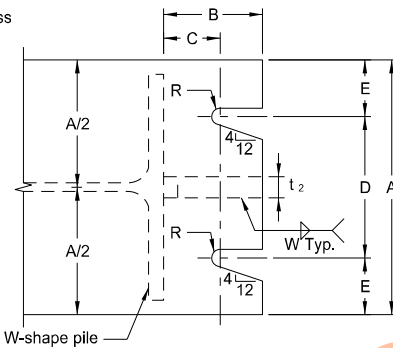


Base Connection Detail

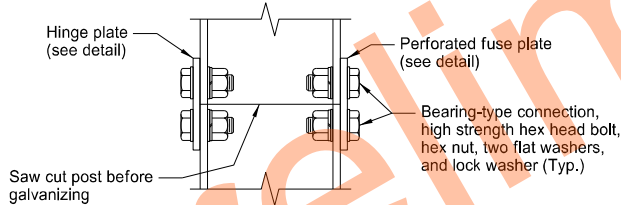


Section A-A

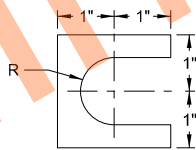
Sections shown for installations on right shoulder. Reverse plate slot
bevels for installations on left shoulder.



Section B-B

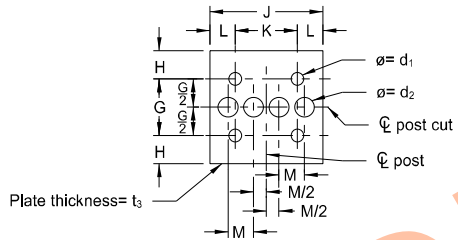


Detail A

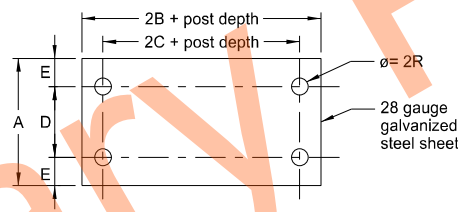


Shim Detail

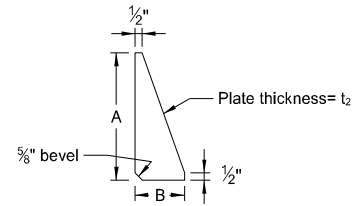
Furnish 2 each .012"± thick and 2 each
.032"± thick shims per post. Shims shall
be fabricated from brass shim stock or
strip conforming to ASTM B36.



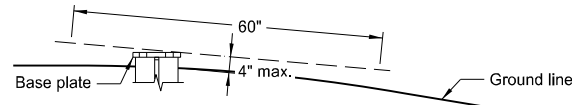
Perforated Fuse Plate



Keeper Plate

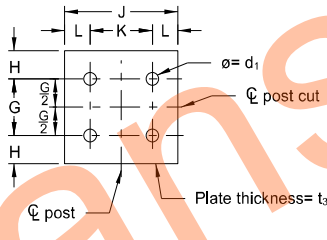


Stiffener Plate

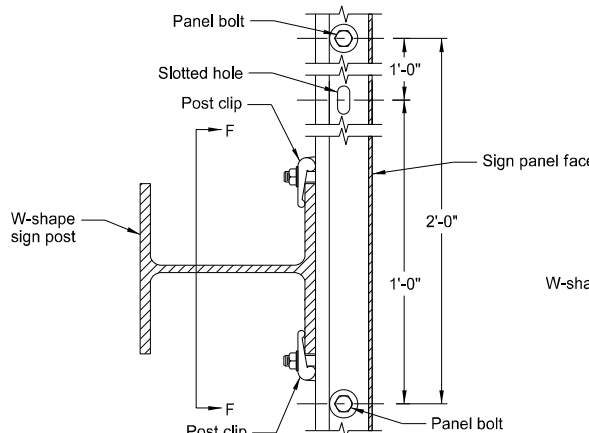


Section C-C
Stub Height Requirements

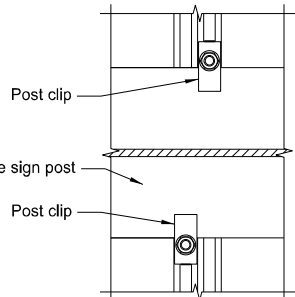
Maximum projection of base plate limits are defined as a line 4"
parallel to any chord, which is perpendicular to, or aligned
radially to, the center line of the highway and has the chord's end
points on the ground surface on opposite sides of the stub post.



Hinge Plate

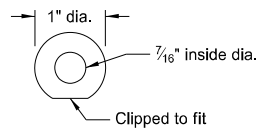


Section E-E



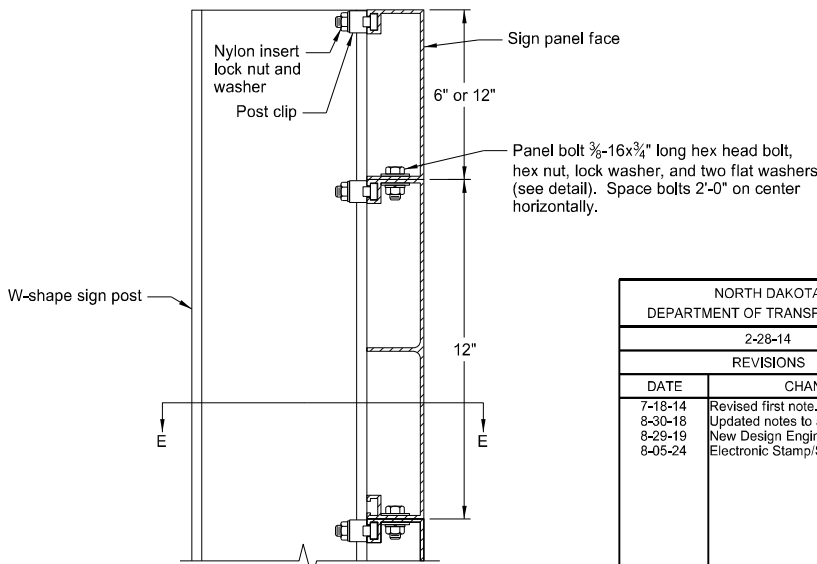
Section F-F

Install post clips on both sides of each post at
each panel joint indicated.



Flat Washer Detail
Thickness = 5/64"

W-Shape Post and Pile Size	Base Connection Dimensions										Fuse and Hinge Plate Dimensions									
	Bolt Size and Torque	A	B	C	D	E	t ₁	t ₂	W	R	G	H	J	K	L	M	d ₁	d ₂	t ₃	Bolt dia.
W4x13	$\frac{3}{4}" \text{ } \varnothing \times 3\frac{1}{2}"$ Torque = 600 in-lb	6"	2½"	1½"	3½"	1¼"	1"	½"	¼"	$\frac{13}{32}"$	2"	1¼"	4"	2¼"	$\frac{7}{8}"$	1"	$\frac{11}{16}"$	¾"	⅜"	⅝"
W5x16	$\frac{3}{4}" \text{ } \varnothing \times 3\frac{1}{2}"$ Torque = 600 in-lb	6"	2½"	1½"	3½"	1¼"	1"	½"	¼"	$\frac{13}{32}"$	2½"	1¼"	5"	2¾"	1⅝"	1⅝"	$\frac{13}{16}"$	$\frac{7}{8}"$	⅜"	¾"
W6x20	$\frac{7}{8}" \text{ } \varnothing \times 4\frac{1}{4}"$ Torque = 800 in-lb	8"	3"	1¾"	4"	2"	1¼"	½"	¼"	$\frac{15}{32}"$	2½"	1¼"	6"	3½"	1¼"	1⅝"	$\frac{13}{16}"$	1⅝"	⅜"	¾"
W8x24	$\frac{7}{8}" \text{ } \varnothing \times 4\frac{1}{4}"$ Torque = 800 in-lb	8"	3"	1¾"	4"	2"	1¼"	½"	¼"	$\frac{15}{32}"$	2½"	1½"	6½"	3½"	1½"	1½"	$\frac{15}{16}"$	1¼"	½"	$\frac{7}{8}"$
W8x28	1" $\varnothing \times 5"$ Torque = 1000 in-lb	8"	3"	2"	4"	2"	1½"	¾"	$\frac{5}{16}"$	$\frac{17}{32}"$	2½"	1½"	6½"	3½"	1½"	1⅝"	1⅞"	1⅝"	½"	1"
W8x31	1⅝" $\varnothing \times 5"$ Torque = 1200 in-lb	9"	3½"	2"	5"	2"	1½"	¾"	$\frac{5}{16}"$	$\frac{19}{32}"$	3"	1¾"	8"	5½"	1¼"	2"	1⅞"	1½"	½"	1"
W10x39	1⅝" $\varnothing \times 5"$ Torque = 1200 in-lb	9"	3½"	2"	5"	2"	1½"	¾"	$\frac{5}{16}"$	$\frac{19}{32}"$	3"	1¾"	8"	5½"	1¼"	1⅞"	1⅞"	1⅝"	½"	1⅝"



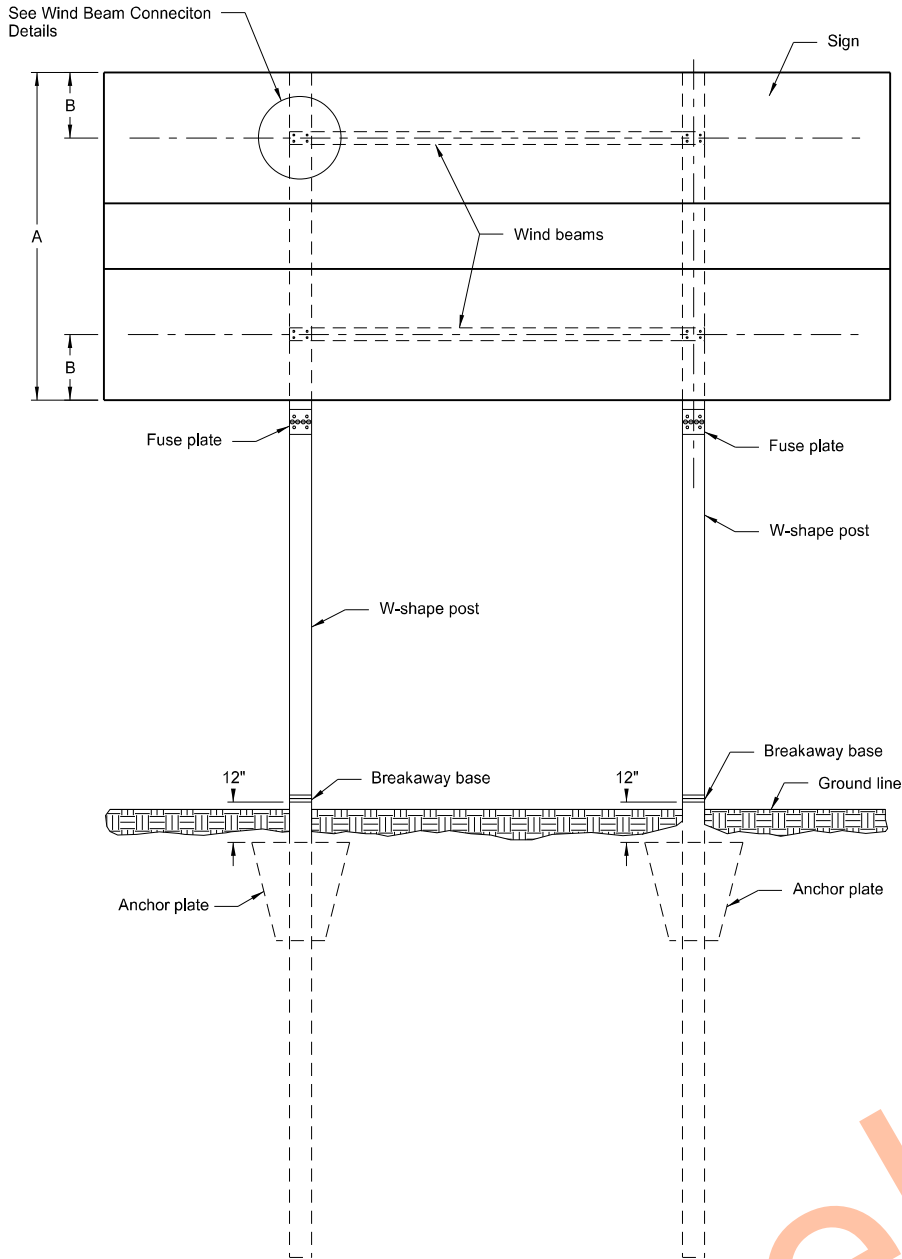
Section D-D

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
7-18-14	Revised first note.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.
8-05-24	Electronic Stamp/Signature.



08/05/24

WIND BEAMS AND ANCHOR PLATES
FOR W-SHAPE SUPPORTS



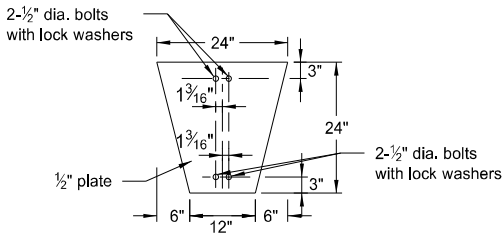
ASSEMBLY DETAIL
FOR WIND BEAMS
AND ANCHOR PLATES

Notes:

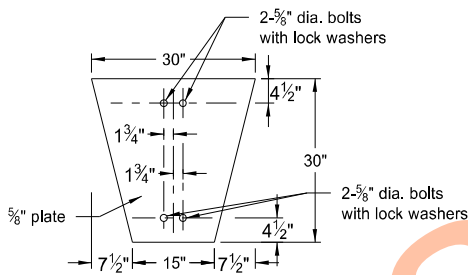
Calculate the B distance using the formula, $B=A/4$.

Use wind beam conforming to Section 894.03 B.6 of the Standard Specifications.

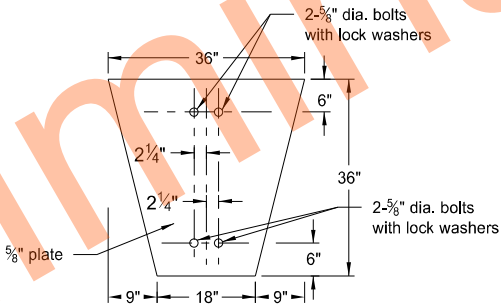
Use bolts conforming to ASTM A307 and galvanized according to ASTM A153.



W4-13 & W5-16

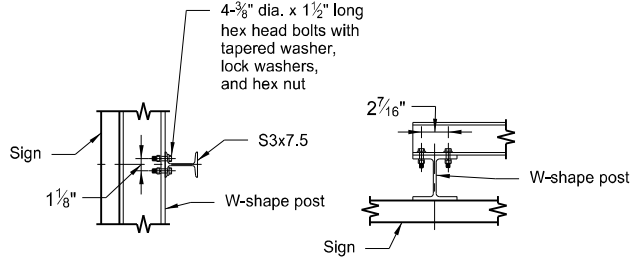


W6-20, W8-24 & W8-28

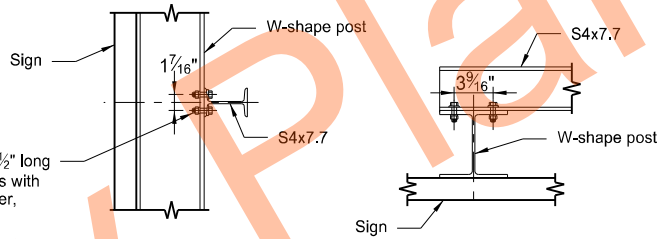


W8-31 & W10-39

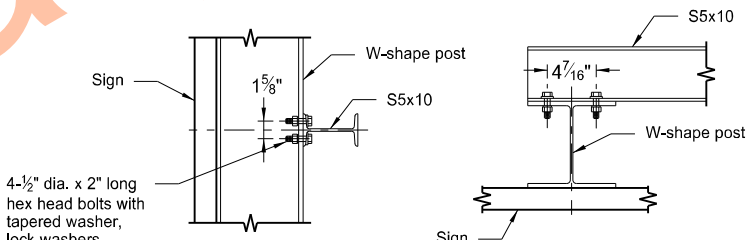
ANCHOR PLATE DETAILS



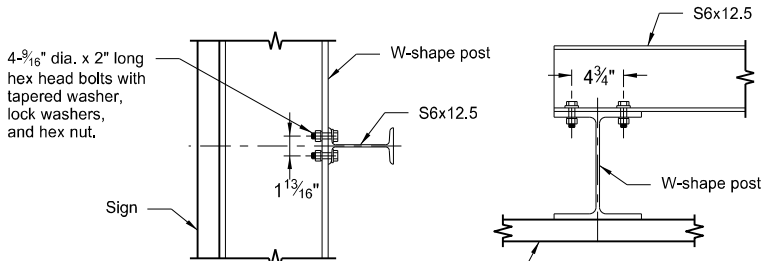
End View
Top View
W4-13 & W5-16



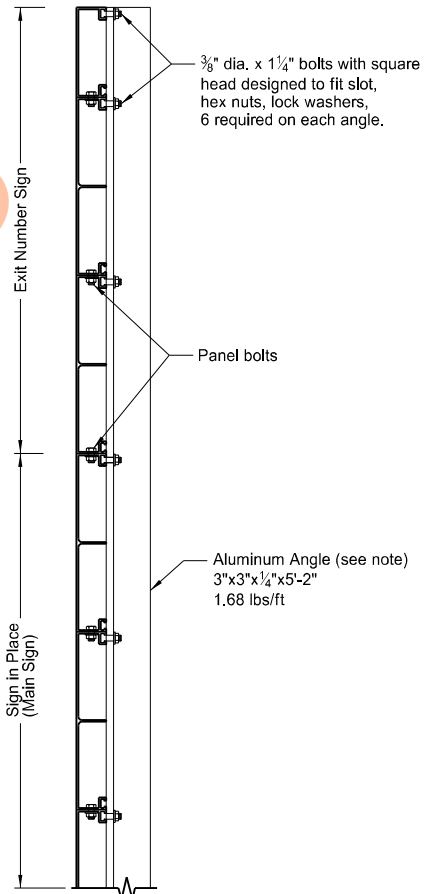
End View
Top View
W6-20, W8-24 and W8-28



End View
Top View
W8-31



End View
Top View
W10-39
WIND BEAM CONNECTION DETAILS



ASSEMBLY DETAIL FOR
EXIT NUMBER SIGNS

Note: Use two aluminum angles on each sign. Vary distance between angles dependent on post spacing of sign in place. Place angles as near as possible to posts. The Engineer will determine exact location.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-8-14	Revised second note.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.
8-05-24	Electronic Stamp/Signature.



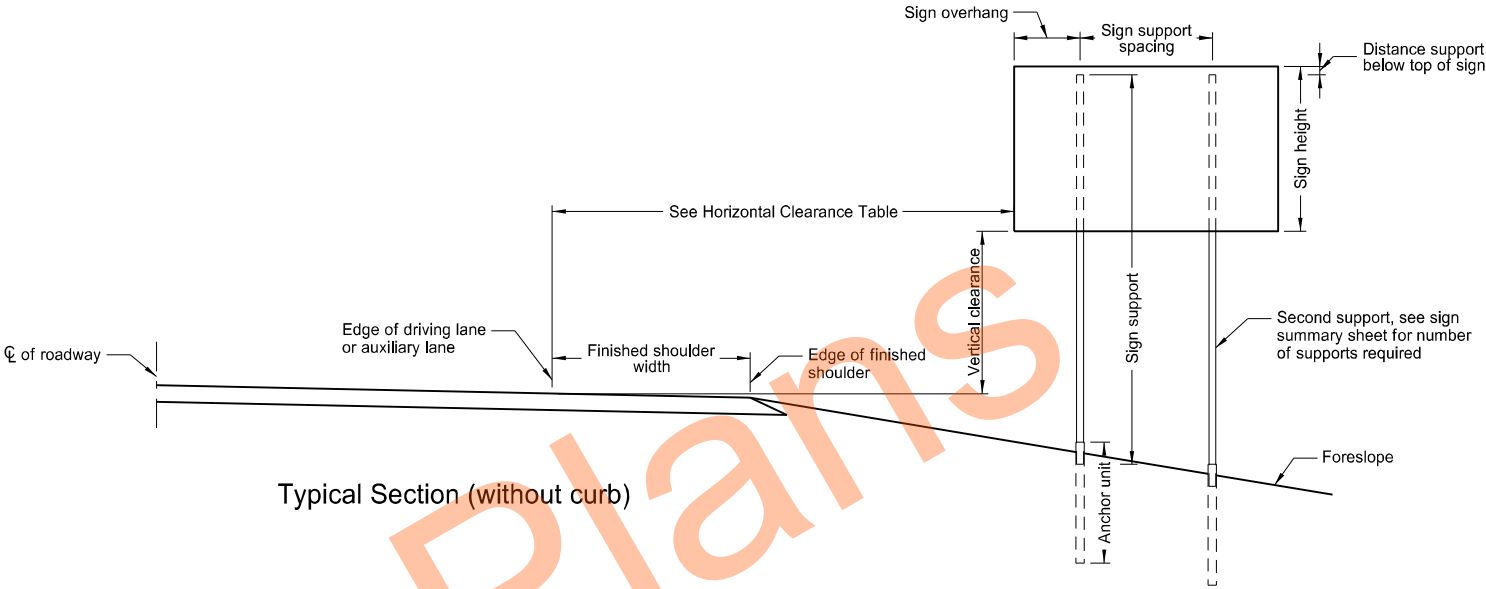
08/05/24

PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

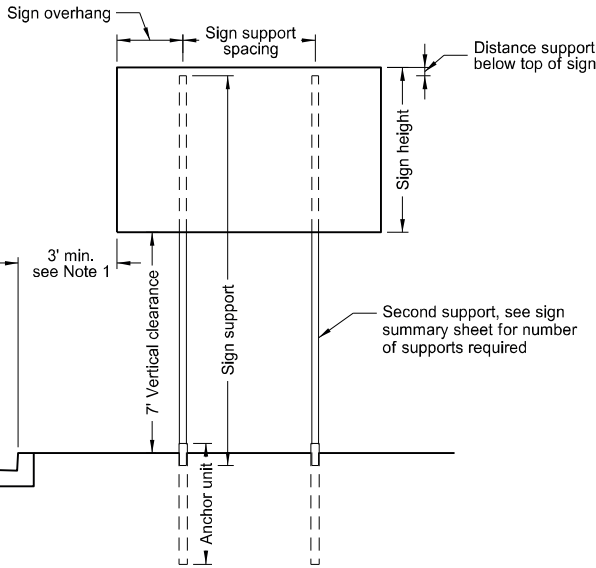
Notes:

1. Curbed Roadways: Use a 3' clearance from face of the curb except where right of way or sidewalk width is limited; Use a minimum 2' clearance. Increase the horizontal clearance if required to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.
2. Minimum vertical clearance: Provide at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane at the side of the road in rural districts. Provide at least 7' clearance to the bottom of the sign, where parking or pedestrian movements occur.
- Install signs on expressways a minimum height of 7'.
- Install adopt-a-highway signs on Freeways at least 7' above the edge of the driving lane.
- Maximum vertical clearance is 6" greater than the minimum vertical clearance.
3. Offset signs: Use a vertical clearance of 5' above the edge of the driving lane for signs placed 30 feet or more from the edge of the traveled way.
4. Provide a horizontal clearance from edge of shared use path to edge of sign of 3', except where width is limited. Provide a minimum clearance of 2'.

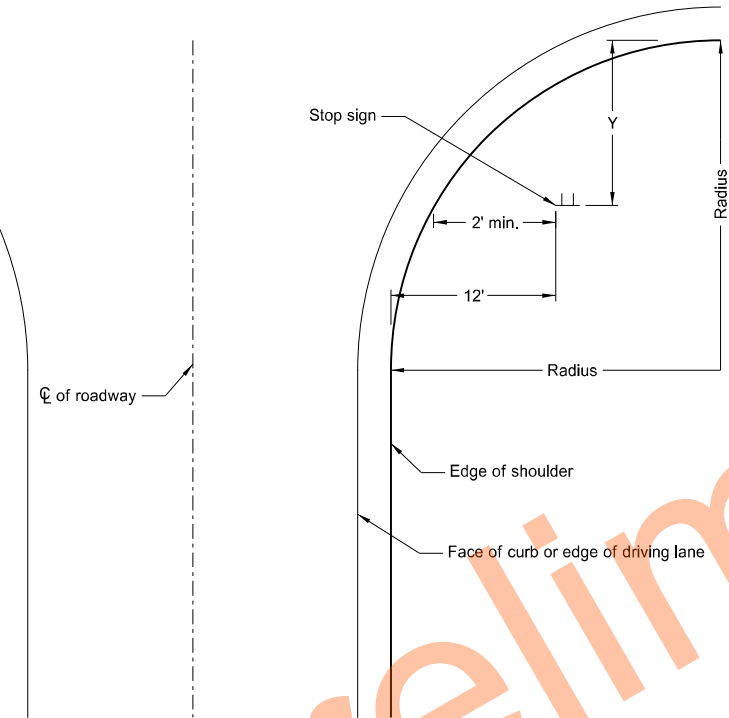


Typical Section (without curb)

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

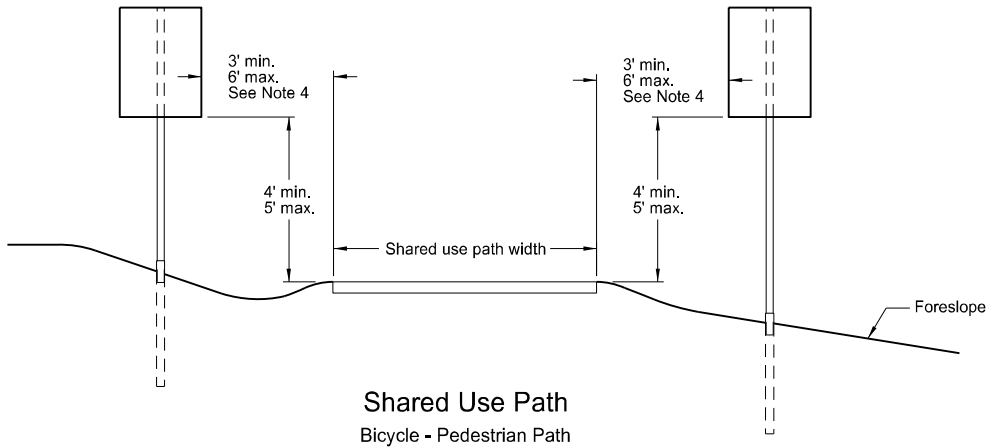


Typical Section (with curb)
Residential or Business District



Stop Sign Location
Wide Throat Intersection
Use layout for the placement of "Stop" signs.

Radius ft.	Y-max. ft.	Y-min. ft.
40	50	15
45	50	18
50	50	21
55	50	25
60	50	28
65	50	32
70	50	35
75	50	39
80	50	43



Shared Use Path
Bicycle - Pedestrian Path

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-8-14	Revised note 2, added note 4,
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.
8-05-24	Electronic Stamp/Signature.



08/05/24

Breakaway Coupler System
for Perforated Tubes

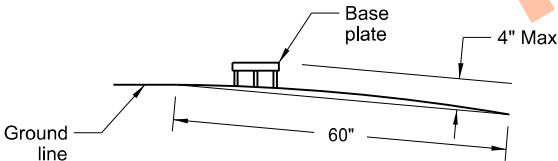
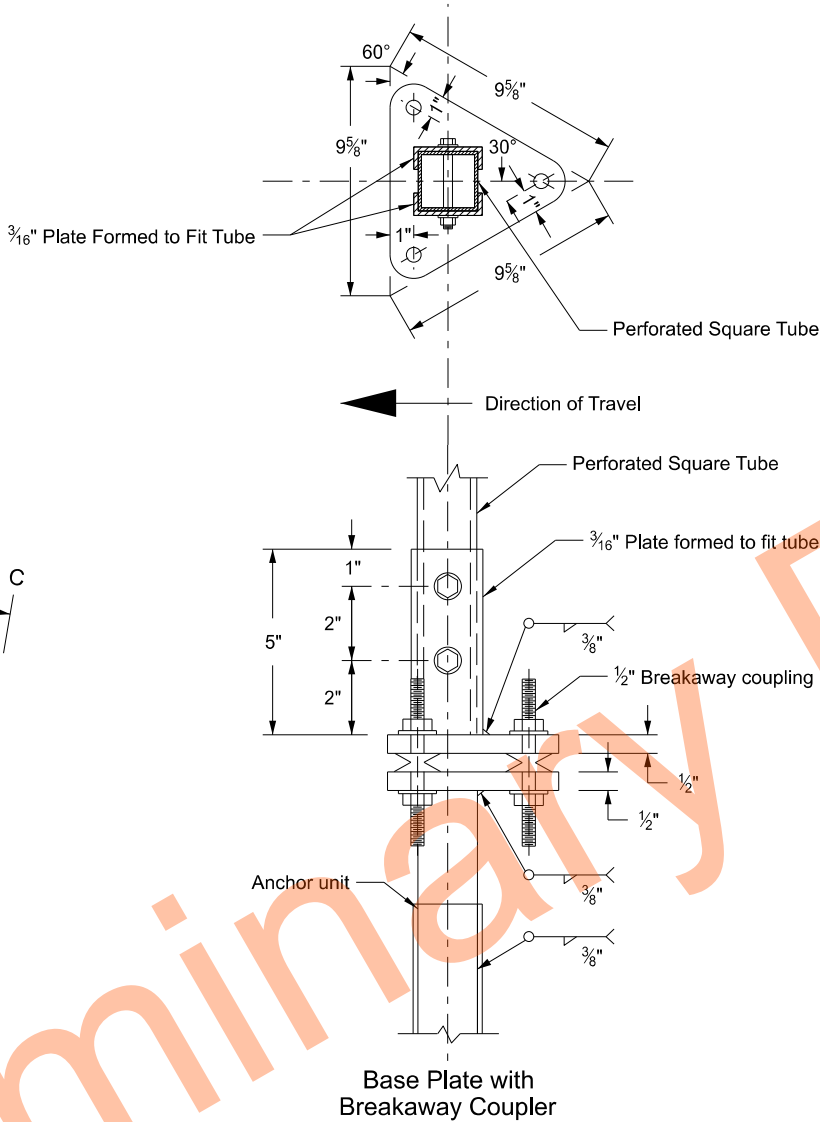
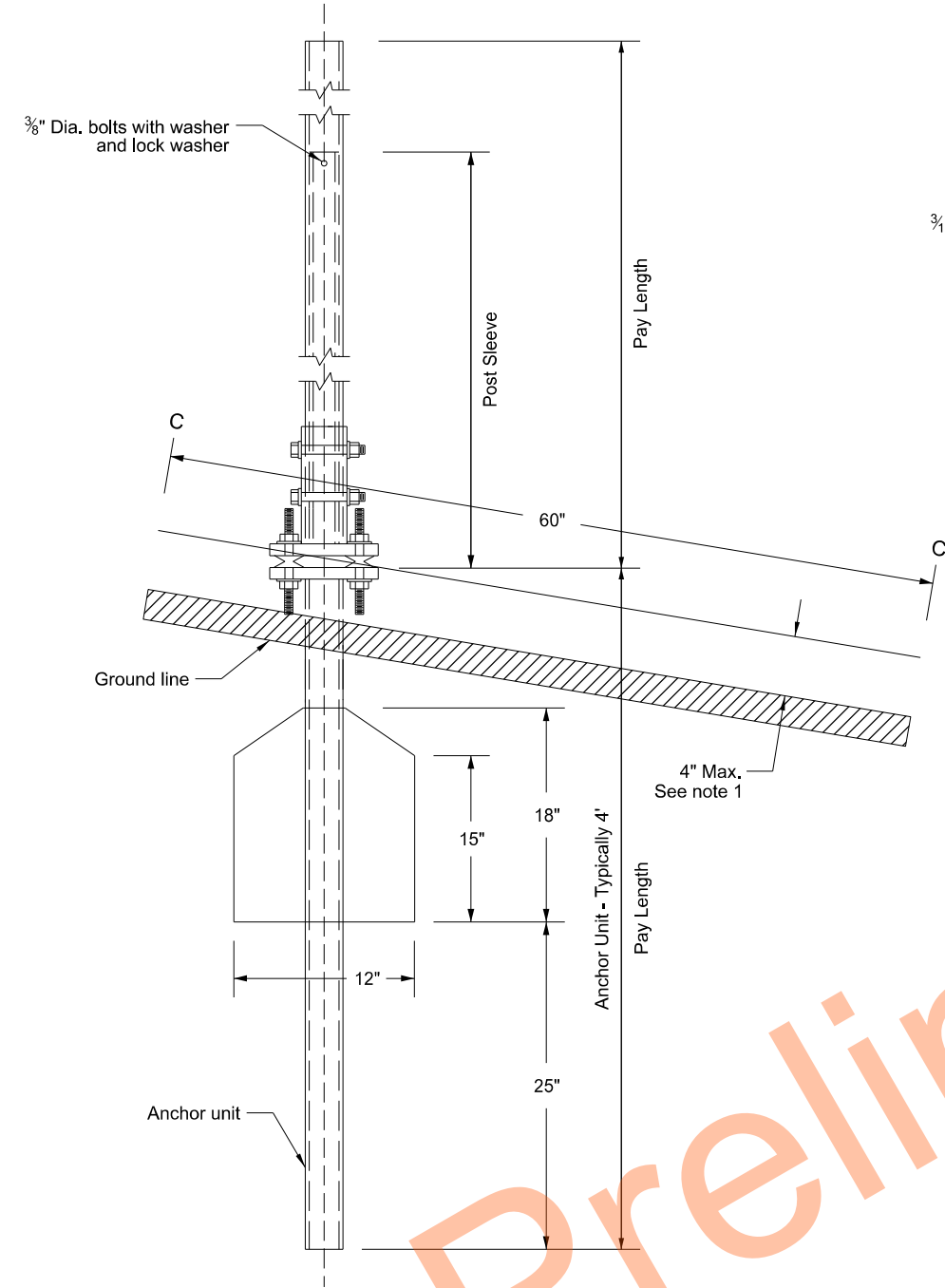
Notes:

1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.
2. Use anchor unit of the same size and specification as the post.
3. Provide a minimum 8' distance between the first and fourth post on four post signs.
4. Use the breakaway base system on standard D-754-24 or the breakaway coupling system manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements specified by DENT BREAKAWAY IND., INC. which meets the test requirements of NCHRP Report 350.

Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2¼	12
1	2¼	12			No	2½	12
1	2½	12			(B)	3(C)	7
1	2½	10			Yes		7
1	2¼	12	2	12	Yes		7
1	2½	12	2¼	12	Yes		7
2	2½	10			Yes		7
2	2¼	12	2	12	Yes		7
2	2½	12	2¼	12	Yes		7
3 & 4	2½	12			Yes		7
3 & 4	2½	10			Yes		7
3 & 4	2½	12	2¼	12	Yes		7
3 & 4	2¼	12	2	12	Yes		7
3 & 4	2½	10	2¾	10	Yes		7

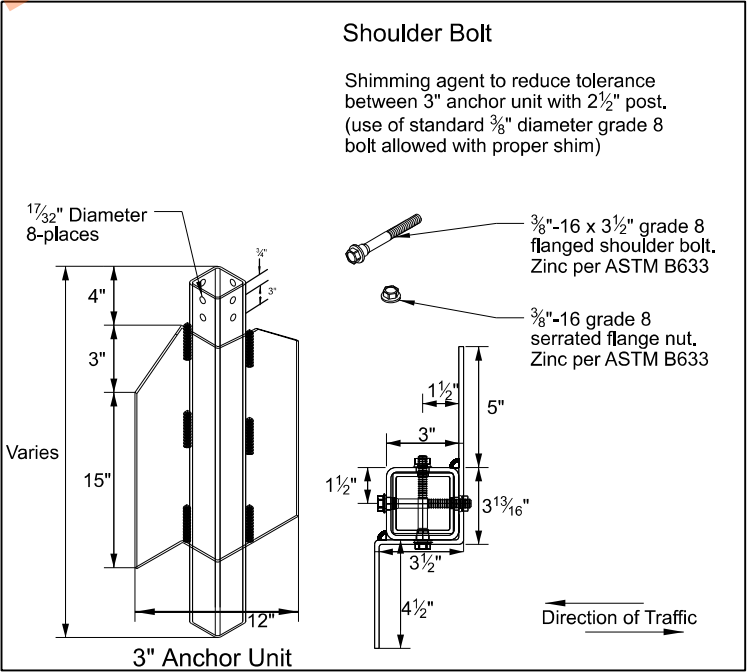
(B) - 2½" 12 gauge posts do not need breakaway bases unless support is placed in boggy, wet, or loose soil areas.

(C) - 3" anchor unit



Section C-C

Max projection of the stub post is 4" above a 60" chord aligned radially to the center line of the highway and connecting any point, within the length of the chord, on the ground surface on one side of the support to a point in the ground surface on the other side.

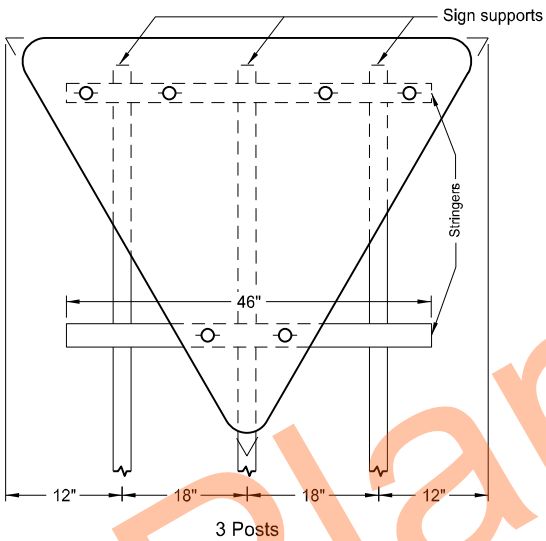
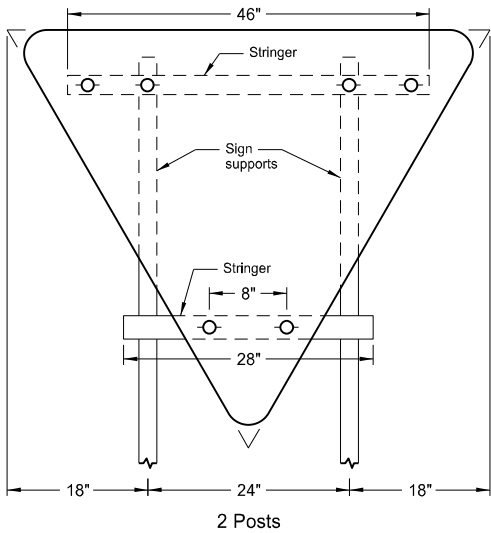
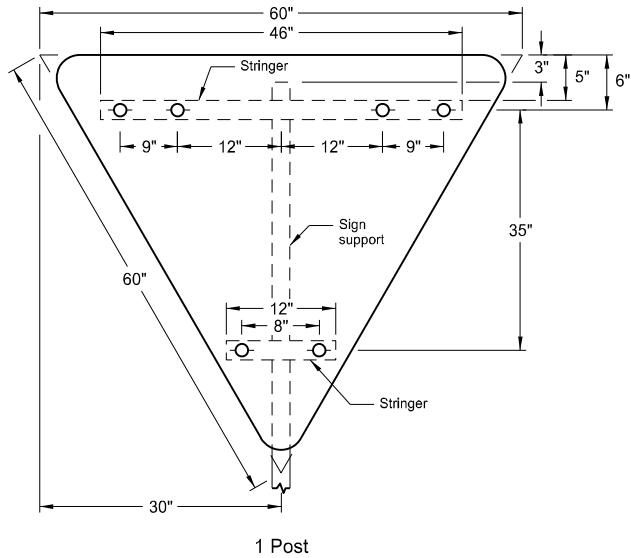


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE
08-30-18	Updated notes to active voice.
08-30-19	New Design Engr PE Stamp.
08-05-24	Electronic Stamp/Signature.
07-22-25	Corrected "typo" in C-C note.

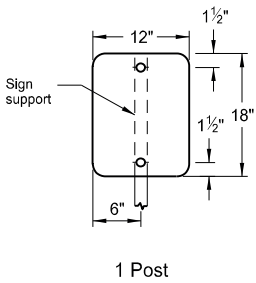


07/22/25

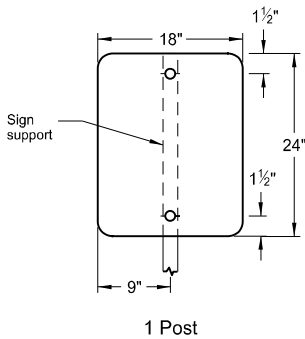
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



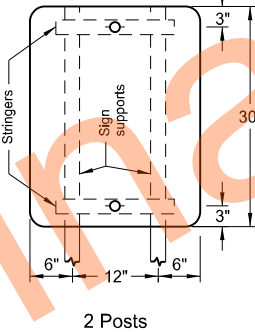
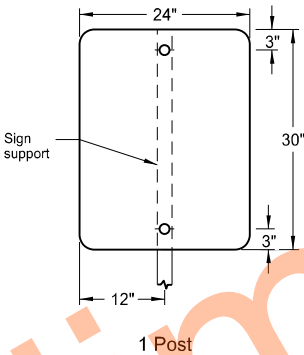
Assembly No. 6



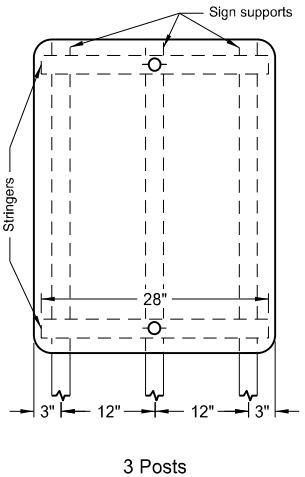
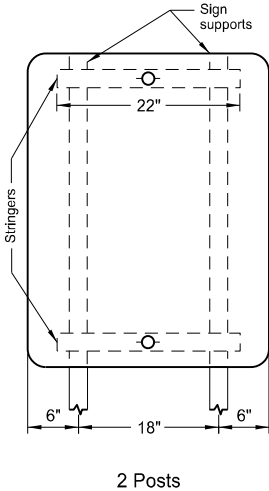
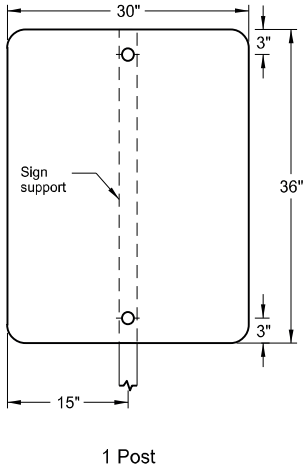
Assembly No. 7



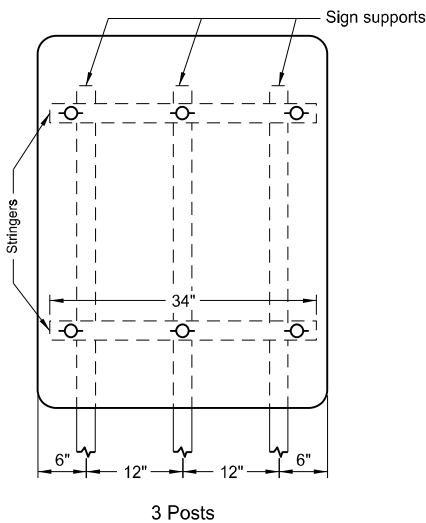
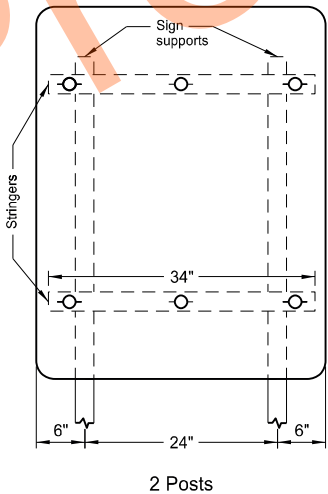
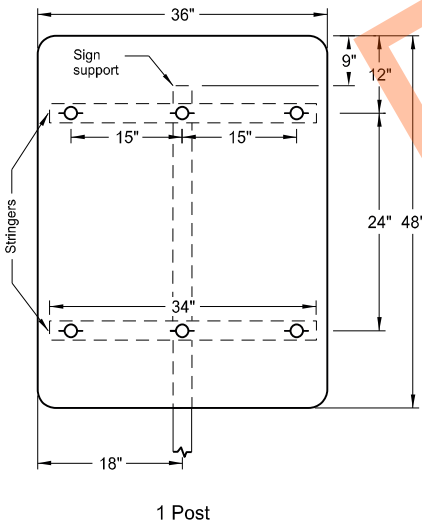
Assembly No. 8



Assembly No. 9



Assembly No. 10



Assembly No. 11

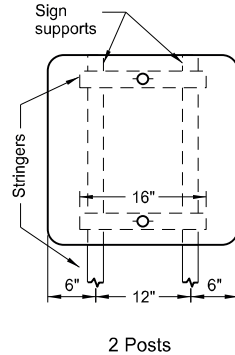
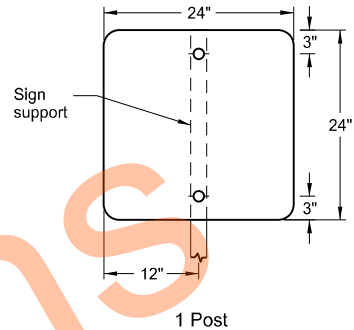
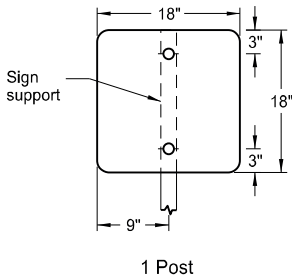
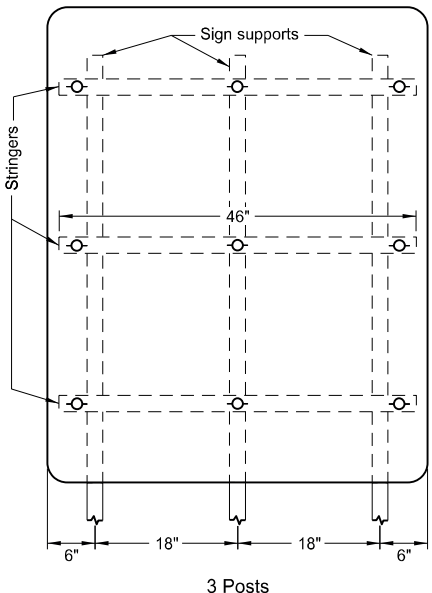
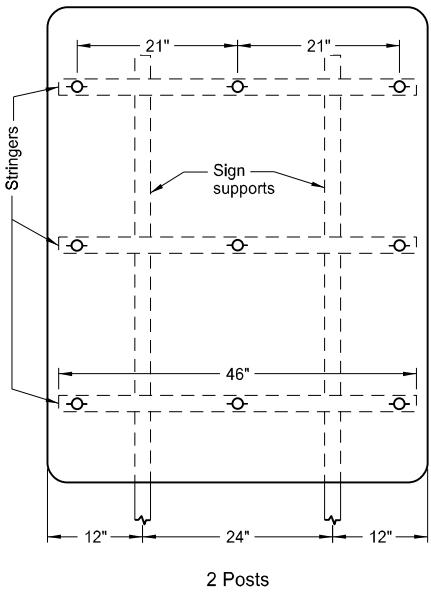
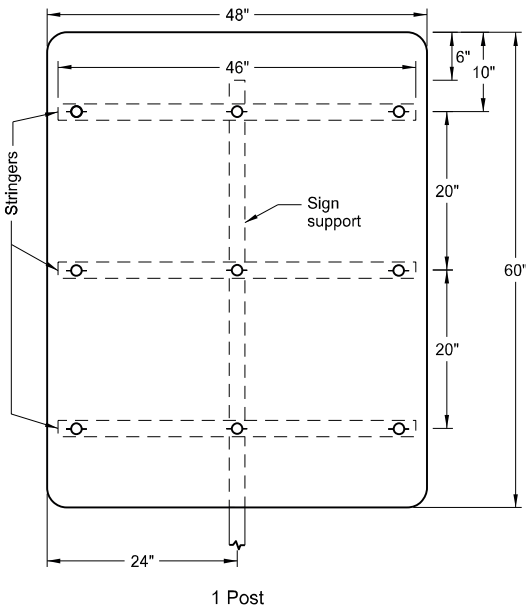
- Notes:
1. Use 0.100 inch minimum thickness sign backing material.
 2. Use 1½" x 1½" perforated square tube stringers.
 3. Punch holes round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.
8-06-24	Electronic Stamp/Signature.



08/06/24

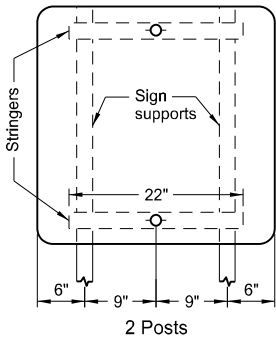
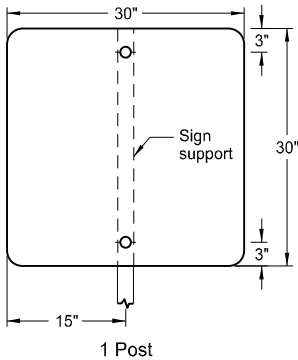
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



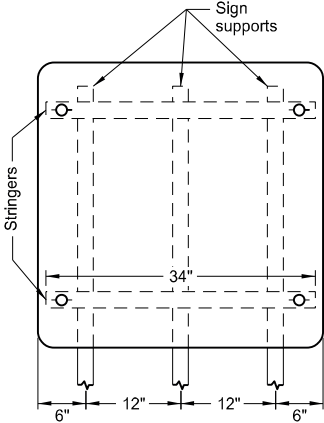
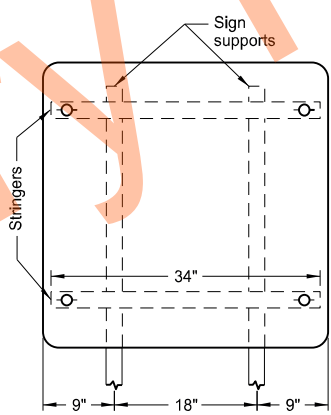
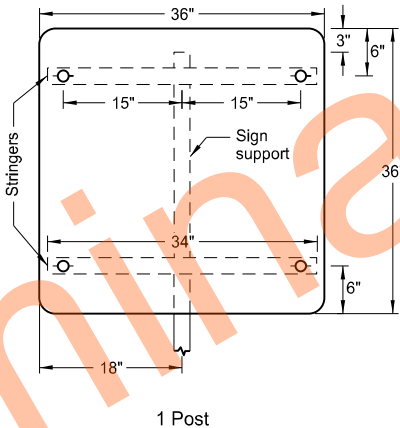
Assembly No. 12

Assembly No. 13

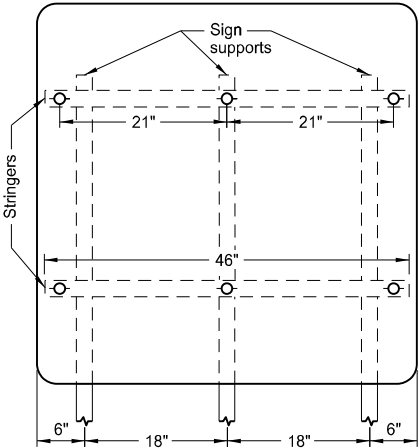
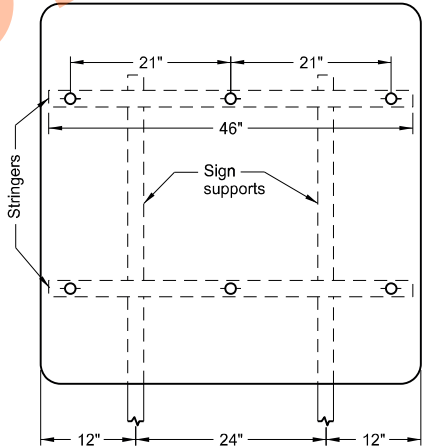
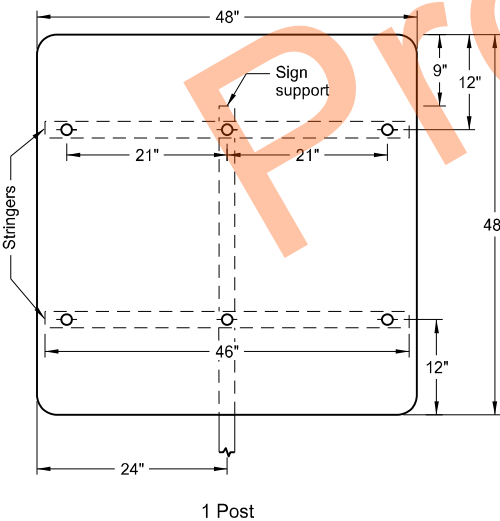
Assembly No. 14



Assembly No. 15



Assembly No. 16



Assembly No. 17

- Notes:
- 1. Use 0.100 inch minimum thickness sign backing material.
 - 2. Use 1½" x 1½" perforated square tube stringers.
 - 3. Punch holes round for ⅜" bolt.

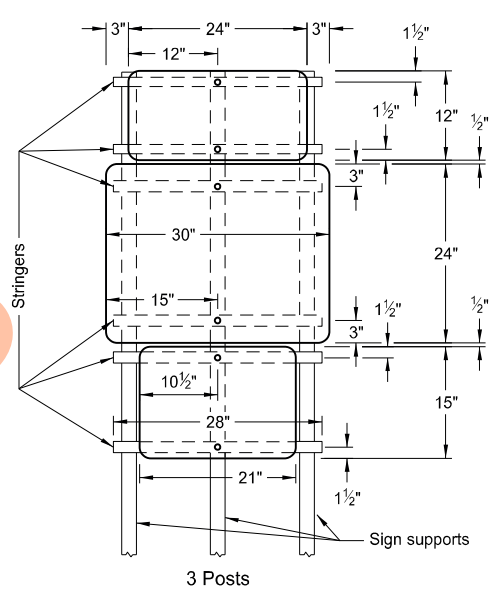
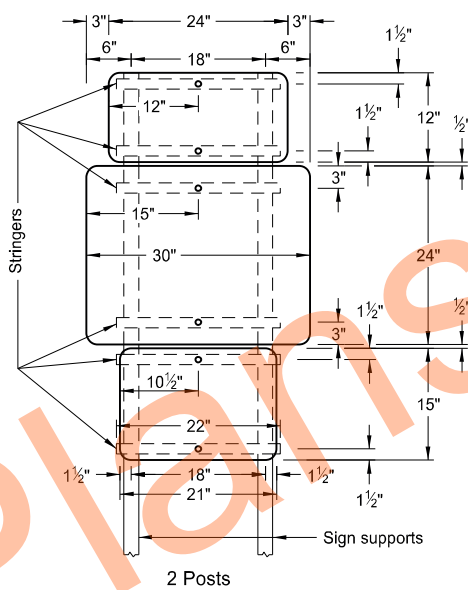
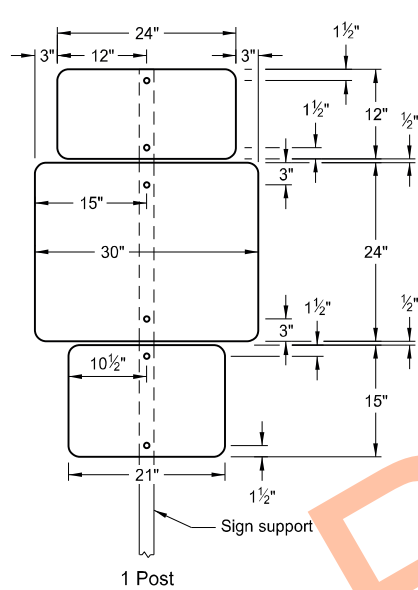
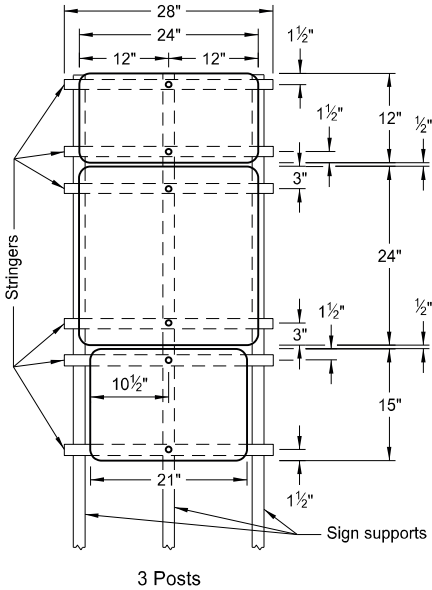
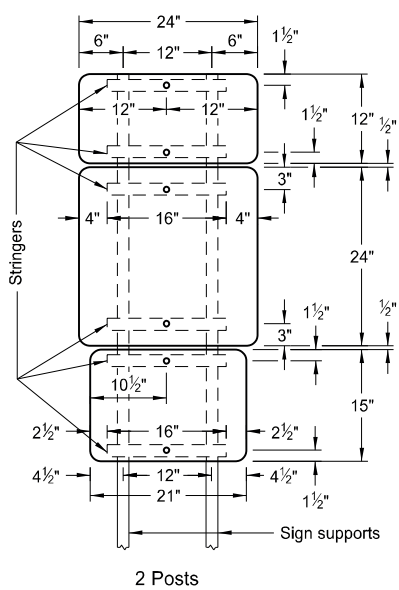
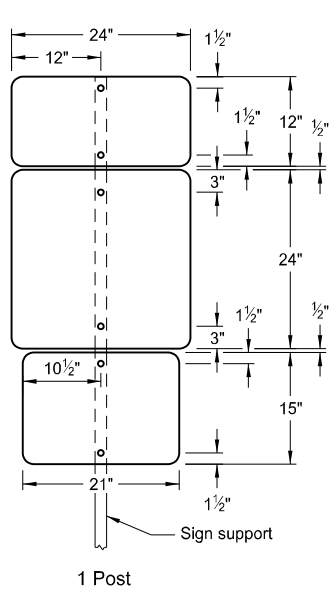
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated to active voice & changed Assembly 16 post spacing.
8-30-19	New Design Engineer PE Stamp.
8-06-24	Electronic Stamp/Signature.



08/06/24

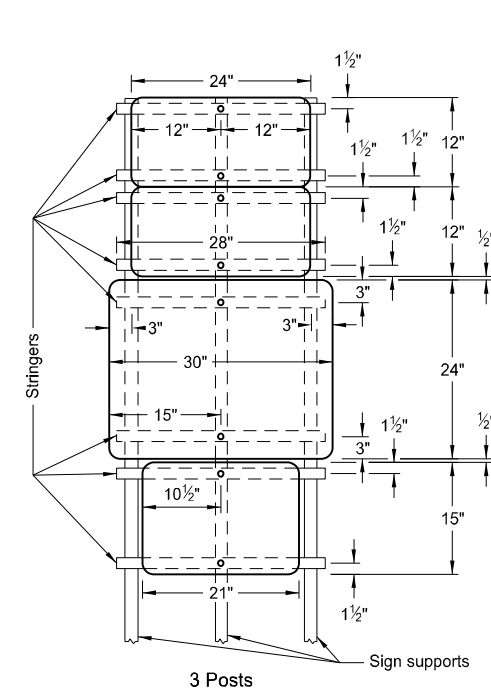
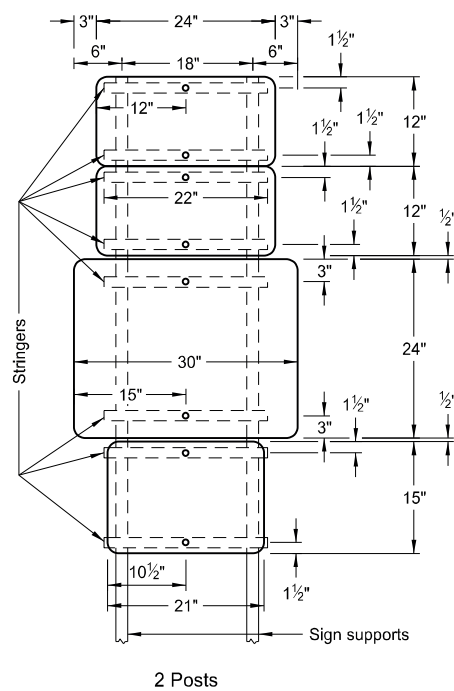
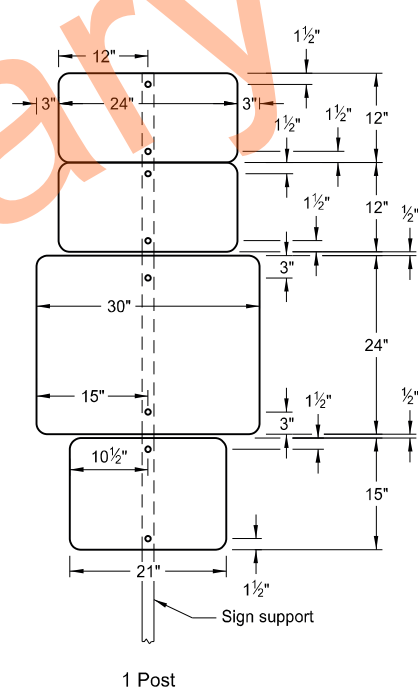
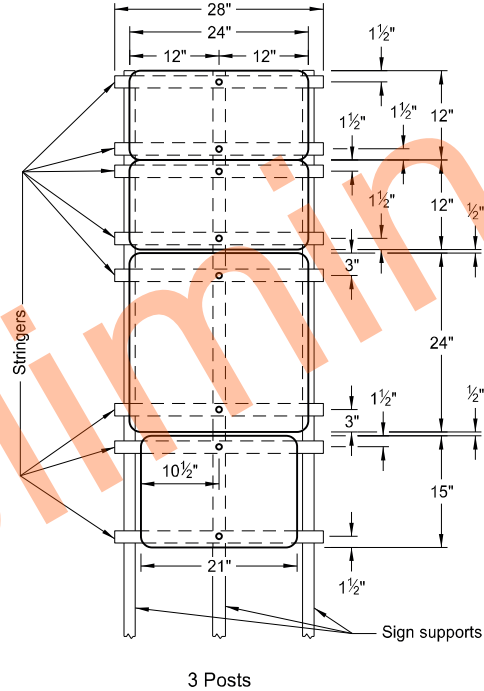
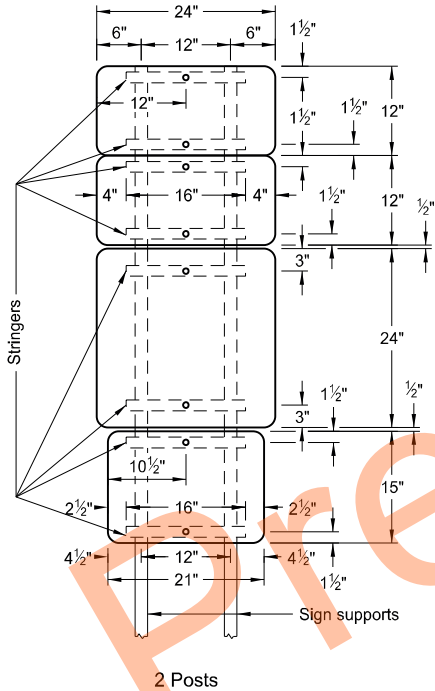
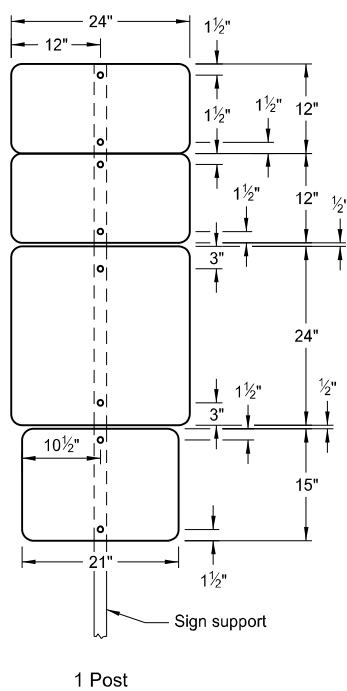
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

D-754-53



ASSEMBLY NO. 379

ASSEMBLY NO. 380



ASSEMBLY NO. 381

ASSEMBLY NO. 382

- Notes:
1. Use 0.100 inch minimum thickness sign backing material.
 2. Use 1 1/2"x1 1/2" perforated square tube stringers.
 3. Punch holes round for 3/8" bolt.

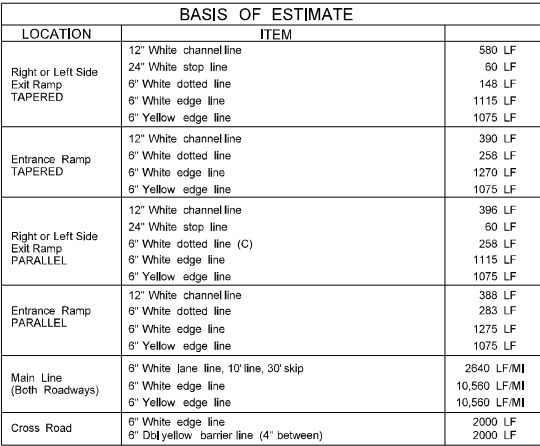
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
9-04-19	New Design Engineer PE Stamp.
8-07-24	Electronic Stamp/Signature.



08/07/24

NOTE:

- (A) Normal width white edge line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph.
Use 4 or 6 inch wide pavement marking for all other roadways with speed limits ≤ 40 mph.
- (B) Normal width yellow edge line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph.
Use 4 or 6 inch wide pavement marking for all other roadways with speed limits ≤ 40 mph.
- (C) Assume "varies" equals 750' for purpose of estimate. Place pavement marking from beginning of taper to the 12" line.
- (D) Beginning of physical gore to theoretical gore.
- (E) If the distance is less than 350' extend the 12" channel line to the theoretical gore, otherwise use 195'.
- (F) Use 195' for estimating purposes.
- (G) Not required for gravel surface crossroad approaches.
- (H) 4' minimum, 15' maximum from nearest edge of intersection traveled way.
- (I) Extend dotted line until it touches the edgeline.

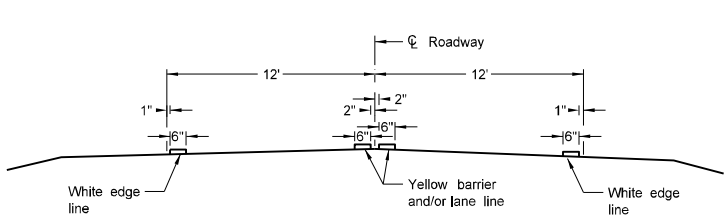


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-3-11	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice
10-25-19	Replaced 2" Max dim with Note (I)
11-05-21	Revised labels
11-22-23	Revised pvmt marking widths
1-17-24	Revised wide pvmt marking widths

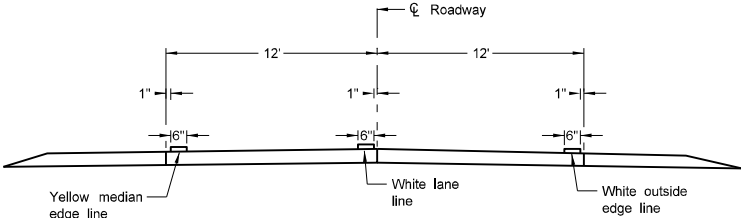


PAVEMENT MARKING

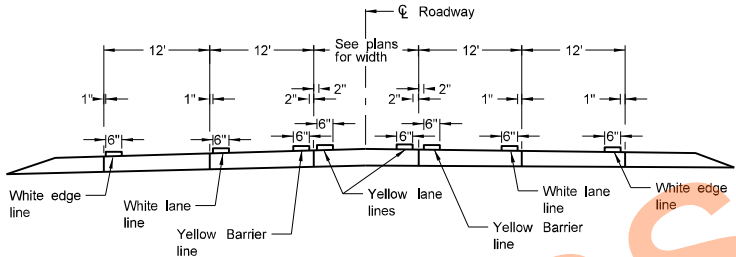
D-762-4



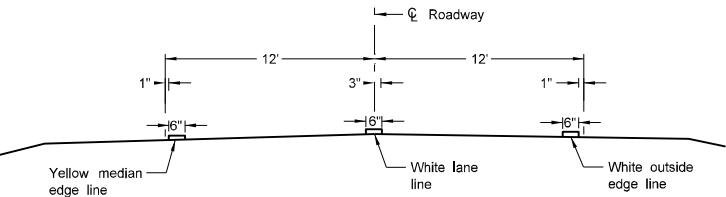
Two Lane Two Way
RURAL ROADWAY



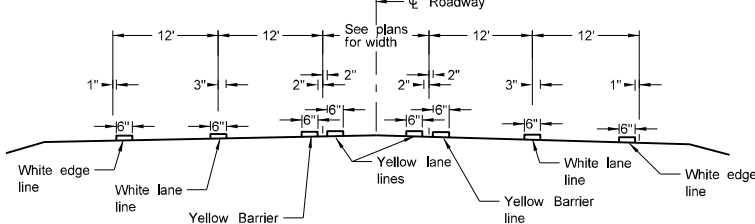
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



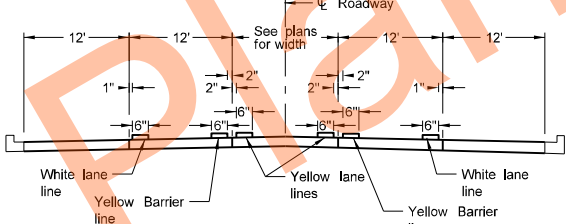
RURAL FIVE LANE ROADWAY
Concrete Section



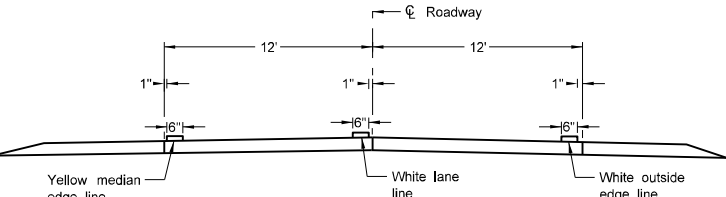
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



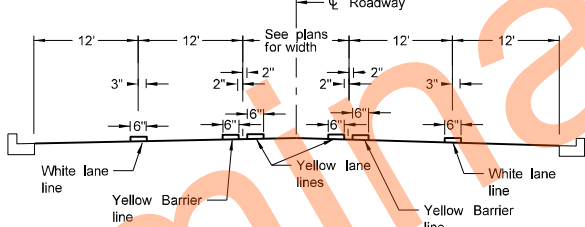
RURAL FIVE LANE ROADWAY
Asphalt Section



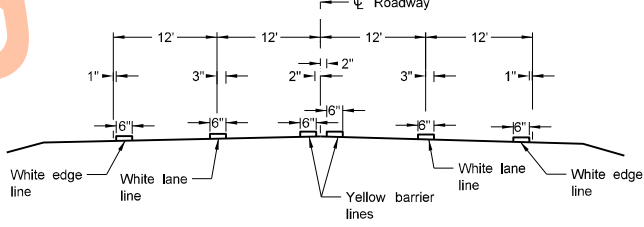
URBAN FIVE LANE SECTION
Concrete Section



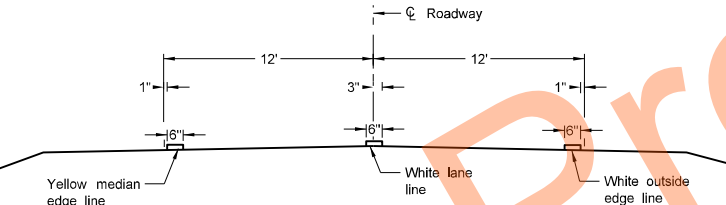
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Concrete Section



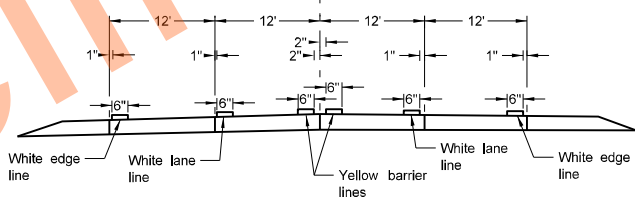
URBAN FIVE LANE SECTION
Asphalt Section



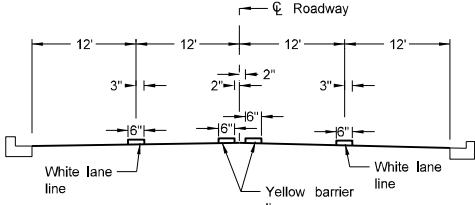
RURAL FOUR LANE ROADWAY
Asphalt Section



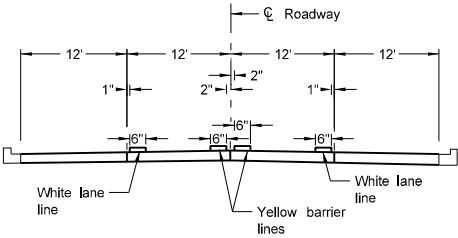
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



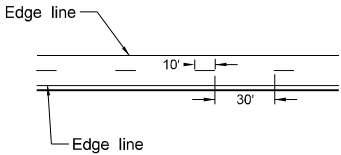
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

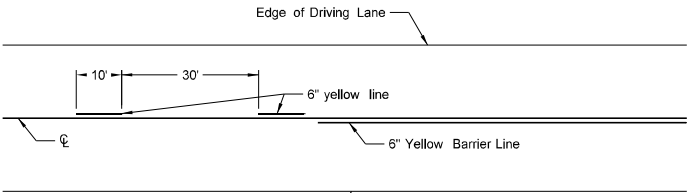
- NOTES:
1. Continue edge lines through private drives and field drives. Break edge lines for intersections.
 2. Normal width line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph.
 3. Use 4 or 6 inch wide pavement marking for all other roadways with speed limits < 40 mph.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp.
11-22-23	Revised pavement marking widths.
07-09-24	Modified Note 1.

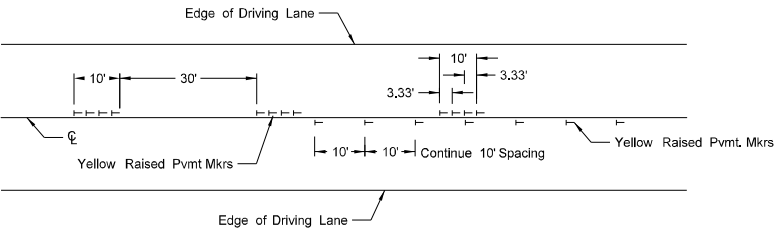


SHORT-TERM PAVEMENT MARKING

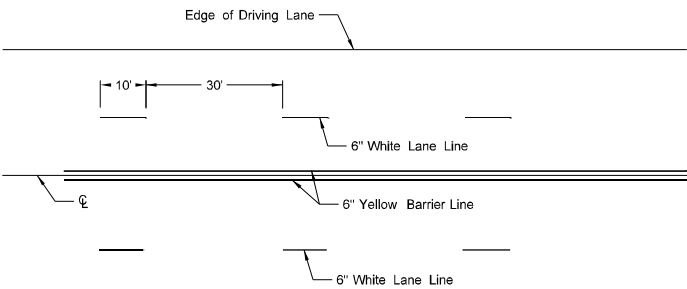
D-762-11



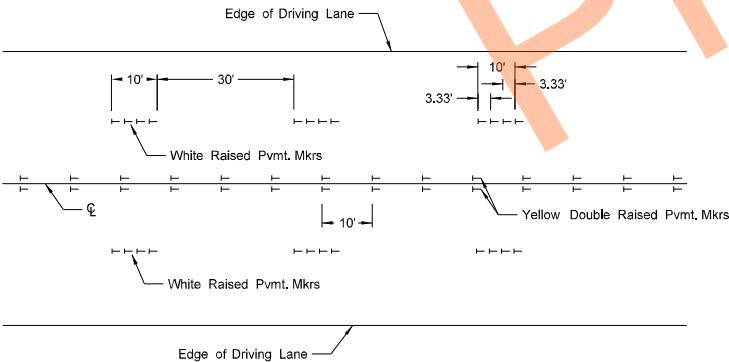
Painted or Tape Lines



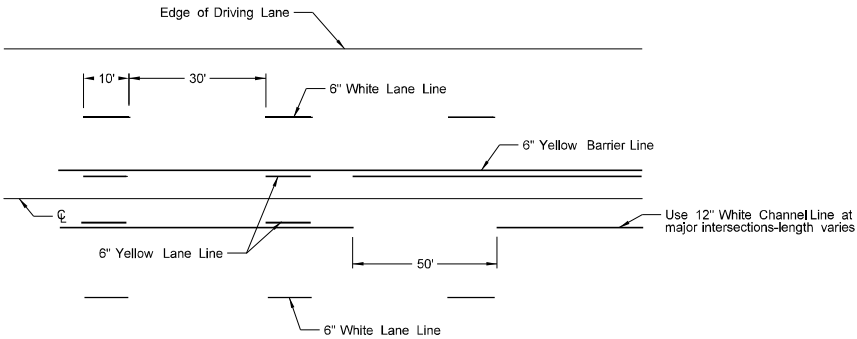
Raised Pavement Markers
TWO-LANE TWO-WAY ROADWAY



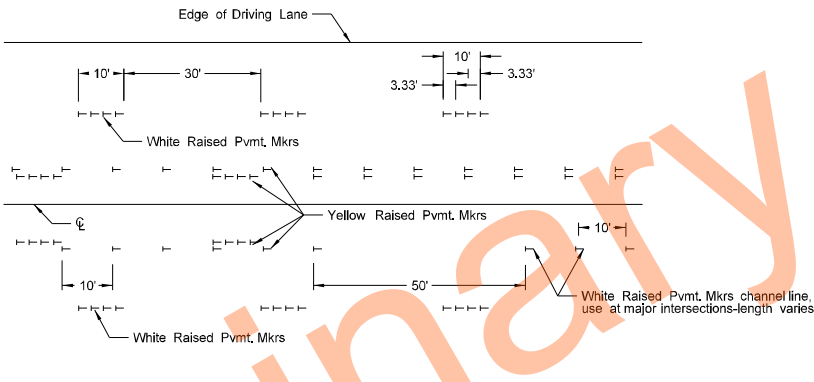
Painted or Tape Lines



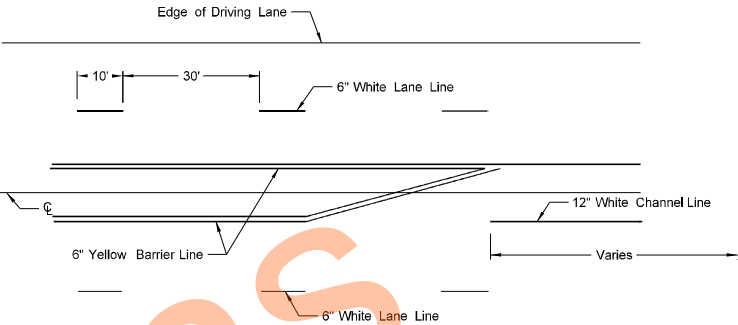
Raised Pavement Markers
FOUR LANE ROADWAY



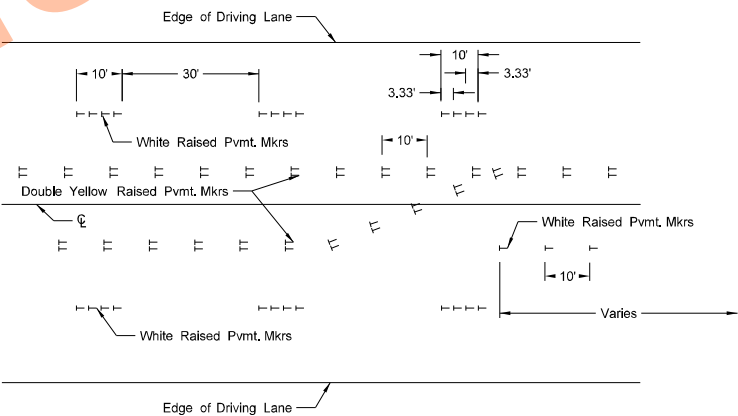
Painted or Tape Lines



Raised Pavement Markers
FIVE LANE ROADWAY TWO WAY LEFT TURN



Painted or Tape Lines



Raised Pavement Markers
FIVE LANE ROADWAY WITH MARKED ISLANDS

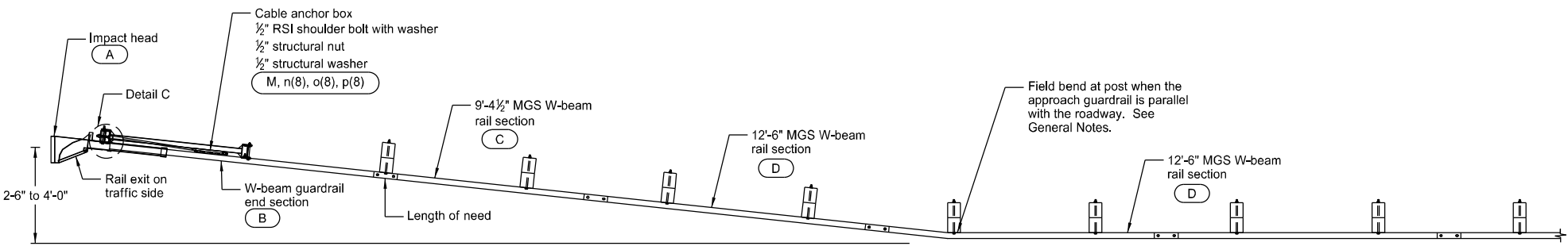
- NOTES:
- Place no passing zones on two-lane two-way roadways as shown. In lieu of short term no passing zone pavement markings, place no passing zone signs. Replace no passing zone signs with short term no passing zone pavement marking within three days.
 - Place short term center line stripe (paint) on top lift to match exact placement of permanent stripe.
 - Remove raised markers and tape markings after permanent pavement marking is installed.
 - Normal width line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph.
 - Use 4 or 6 inch wide pavement marking for all other roadways with speed limits ≤ 40 mph.
 - Wide lines - 8 inches wide if 4 inch normal width lines are used and 12 inches wide if 6 inch normal width lines are used.

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.
11-22-23	Revised pavement marking widths.
1-17-24	Revised wide pvmt marking width.

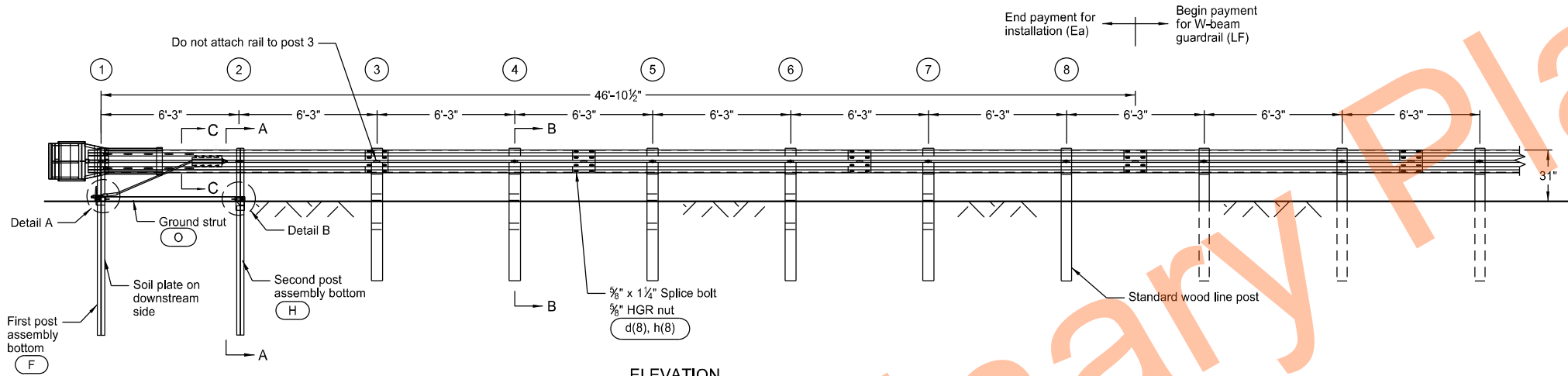


MGS FLARED ENERGY ABSORBING TERMINAL - WOOD POST

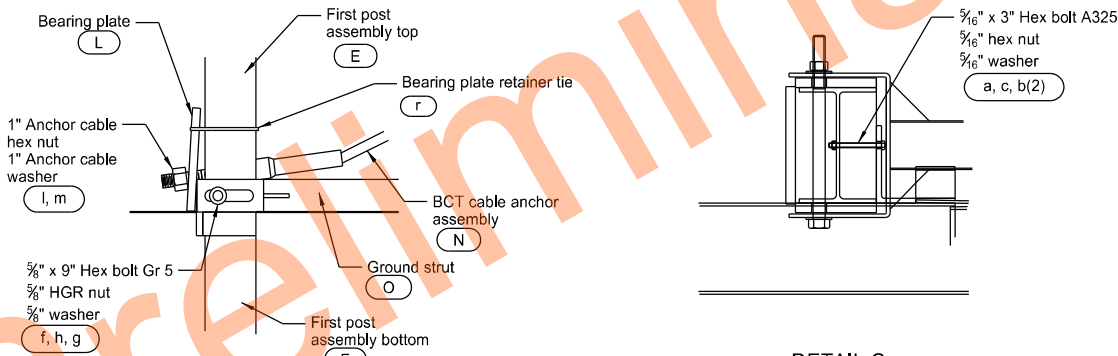
D-764-38



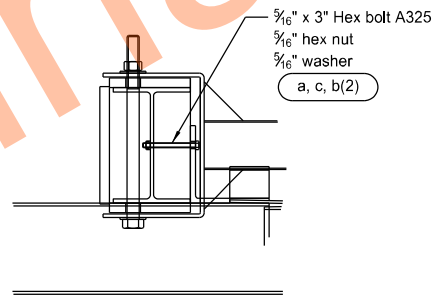
PLAN



ELEVATION

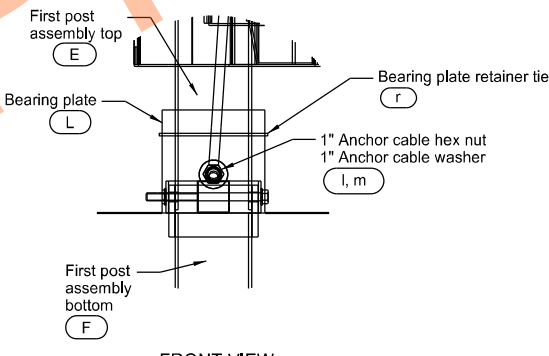


SIDE VIEW



DETAIL C

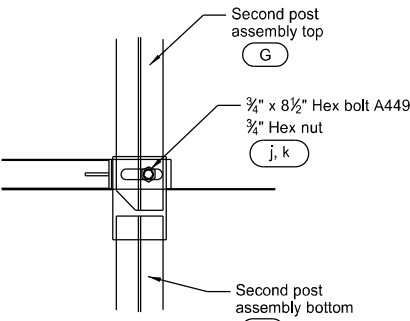
Post 1 (Impact Head connection)



FRONT VIEW

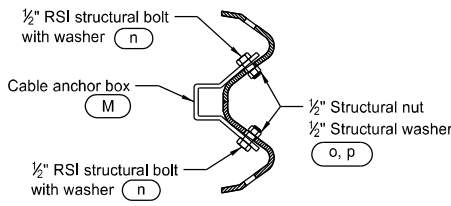
DETAIL A

Post 1

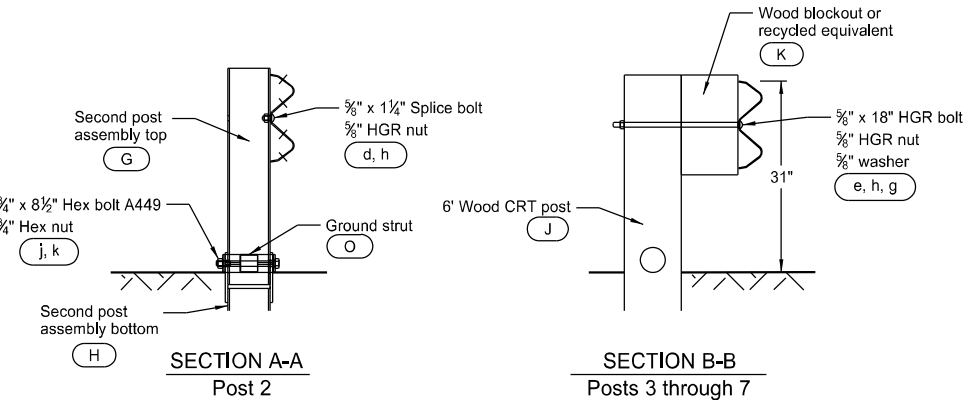


DETAIL B

Post 2



SECTION C-C



SECTION A-A

Post 2

SECTION B-B

Posts 3 through 7

ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	F3000	IMPACT HEAD	1
B	SF1303	W-BEAM GUARDRAIL END SECTION, 12 Ga	1
C	G12025	9'-4 1/2" MGS W-BEAM RAIL SECTION, 12 Ga	1
D	G1203A	12'-6" MGS W-BEAM RAIL SECTION, 12 Ga	2
E	UHP1A	FIRST POST ASSEMBLY TOP	1
F	HP1B	FIRST POST ASSEMBLY BOTTOM	1
G	UHP2A	SECOND POST ASSEMBLY TOP	1
H	HP2B	SECOND POST ASSEMBLY BOTTOM	1
J	UP671	WOOD CRT POST	5
K	P675	WOOD BLOCKOUT OR RECYCLE EQUIVALENT	5
L	E750	BEARING PLATE	1
M	S760	CABLE ANCHOR BOX	1
N	E770	BCT CABLE ANCHOR ASSEMBLY	1
O	S785	GROUND STRUT HINGED POST	1
HARDWARE			
a	B5160304A	5/16" x 3" HEX BOLT A325	2
b	W0516	5/16" WASHER	4
c	N0516	5/16" HEX NUT	2
d	B580122	5/8" Dia x 1 1/4" SPLICE BOLT	33
e	B581802	5/8" Dia X 18" HGR BOLT	5
f	B580904A	5/8" Dia x 9" HEX BOLT GRD 5	1
g	W050	5/8" WASHER	7
h	N050	5/8" Dia HGR NUT	39
j	B340854A	3/4" Dia x 8 1/2" HEX BOLT GRD A449	1
k	N030	3/4" Dia HEX NUT	1
l	N100	1" ANCHOR CABLE HEX NUT	2
m	W100	1" ANCHOR CABLE WASHER	2
n	SB12A	1/2" RSI SHOULDER BOLT WITH WASHER	8
o	N012A	1/2" STRUCTURAL NUT	8
p	W012A	1/2" STRUCTURAL WASHER	8
r	CT-100ST	BEARING PLATE RETAINER TIE	1

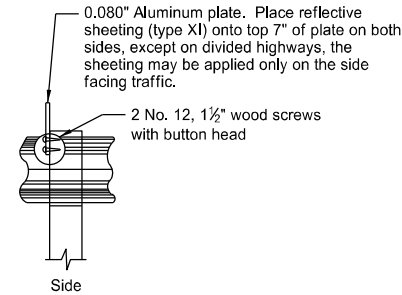
NOTE: Standard wood line post, block, and associated hardware not included in Bill of Materials Table.

GENERAL NOTES:

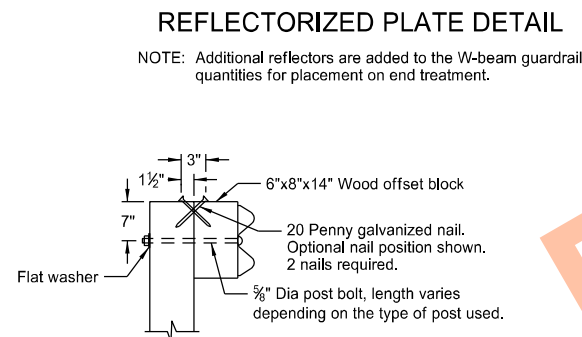
- Wood posts are required with the Flared Energy Absorbing Terminal except posts 1 and 2.
- Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
- Flare the Flared Energy Absorbing Terminal when the approach guardrail is parallel with the roadway. When the approach guardrail is flared at 16:1 to 10:1, ensure the Flared Energy Absorbing Terminal has only the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, ensure the Flared Energy Absorbing Terminal is turned parallel to the roadway.
- Site grade as necessary to ensure the lower sections of the posts do not protrude more than 4" above the ground (measured along a 5' cord).
- Install 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 to prevent settlement.
- Install the breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent cable from twisting when tightening nuts.
- "Toe nail" the wood blockouts to the rectangular wood posts with two 20 penny galvanized nails to prevent them from turning when the wood shrinks.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12-02-20	Updated notes to active voice.

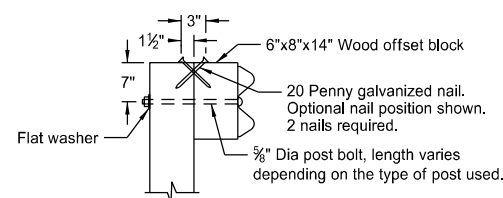




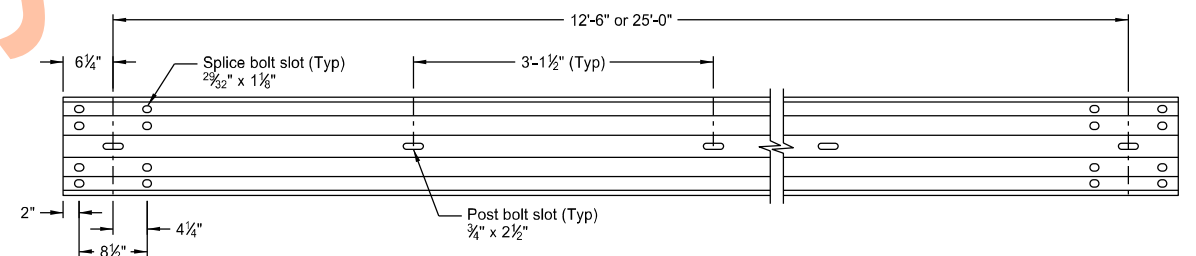
1. Begin reflector plates at the first post and space at 25' centers on guardrail less than 250' length and at 50' centers for guardrail over 250' length. Provide the reflector the same color as the pavement marking adjacent to it unless noted otherwise on the plans.
2. Replacing bituminous material at guardrail post: Dispose all excess earth from excavations for guard posts as directed by the engineer. Replace bituminous material wherever guardrail is installed after mat has been laid. Cost of excavation and replacing of bituminous material to be included in the price bid for other items.
3. Fit the Object Marker within the vertical edges of the Impact Plate. Provide type XI retroreflective sheeting meeting the requirements of Section 894.02.E of the standard specifications. Apply the sheeting to 0.100 Aluminum sheeting meeting the requirements of Section 894.01.A. Attach the Object Marker to the Impact Head Plate with rivets or other attachment device. Ensure the rivets or attachment device are non-rust. Slope the stripes downward toward the roadway side.
4. Guardrail installation height tolerance = $\pm 1"$.



NOTE: Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.



Technical drawing of a post-and-block assembly. The main view shows a vertical post with a total height of 6'-0" and a 7" section at the top. A detail view of the "Block" shows it is 14" high and 6" x 8" x 14". The block has a 3/4" hole for 5/8" bolts. Spacing dimensions of 8", 6", and 3" are indicated between blocks.



12'-6"

3'-1½" (Typ)

6'-3" post spacing

3'-1½" (Typ)

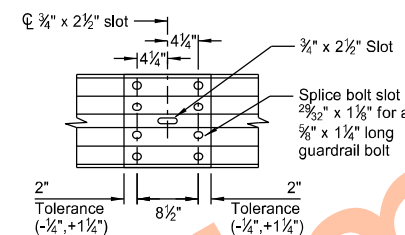
Mid span splice (Typ)

31"

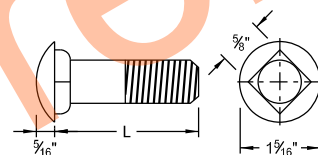
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12-02-20	Updated clipped head to optional



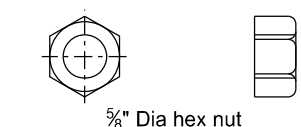
5/8" Diameter Guardrail Bolt	
L	Thread Length
1 1/4"	Full length thread
2"	1 1/4" Min thread length
9 1/2"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length



NOTE: Do not install center bolt in the $\frac{3}{4}$ " x $2\frac{1}{2}$ " slot at mid span splices.



5/8" Diameter Carriage Bolt	
L	Thread Length
1½"	Full length thread
3"	1½" Min thread length
11"	1¾" Min thread length
13"	1¾" Min thread length



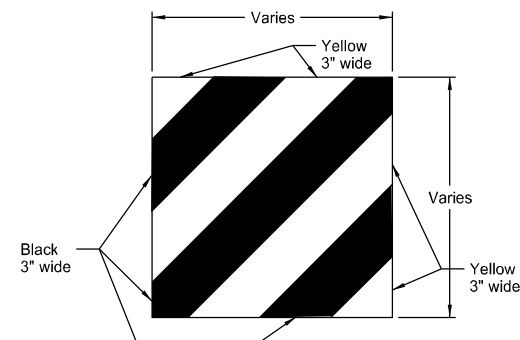
1" Dia x $\frac{1}{16}$ " deep recess one or both sides

$1\frac{1}{4}$ "

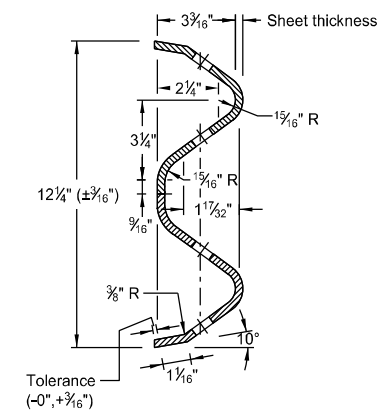
$\frac{5}{8}$ " Dia recess nut

$1\frac{1}{16}$ "

**5/8" GUARDRAIL BOLT
& RECESS NUT**



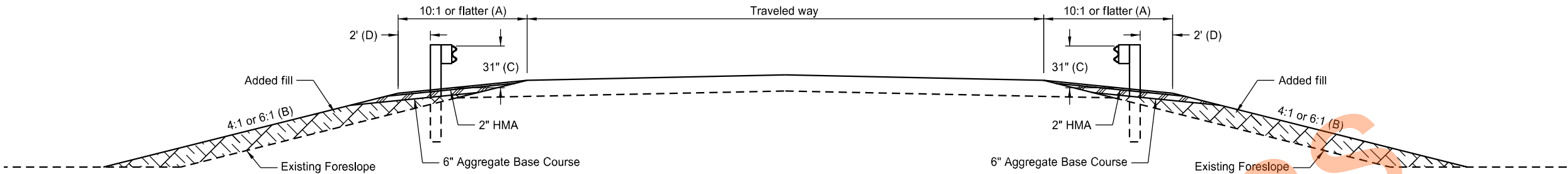
IMPACT HEAD OBJECT MARKER



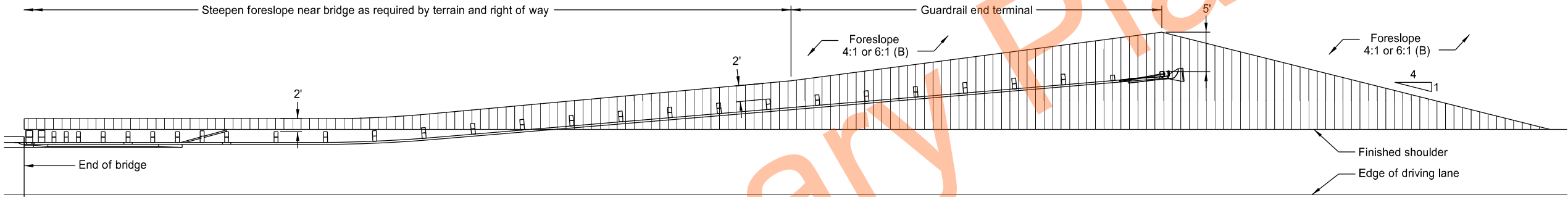
W-BEAM CROSS SECTION

TYPICAL GRADING AT BRIDGE ENDS
WITH MGS W-BEAM GUARDRAIL

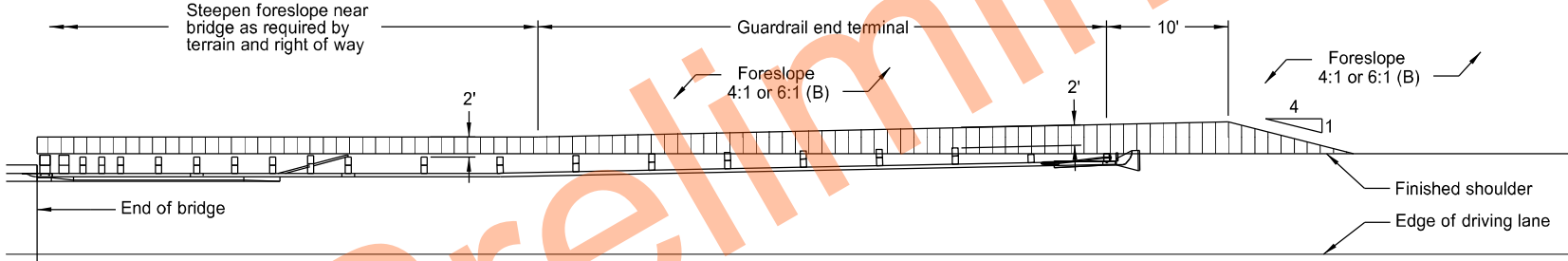
D-764-48



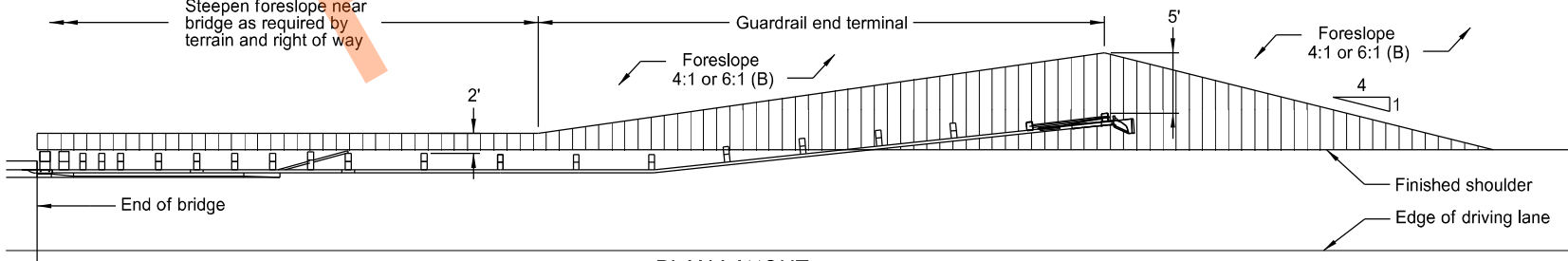
TYPICAL SECTION



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 required 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) Vary dimension at end terminals per Plan Layouts shown on this sheet.

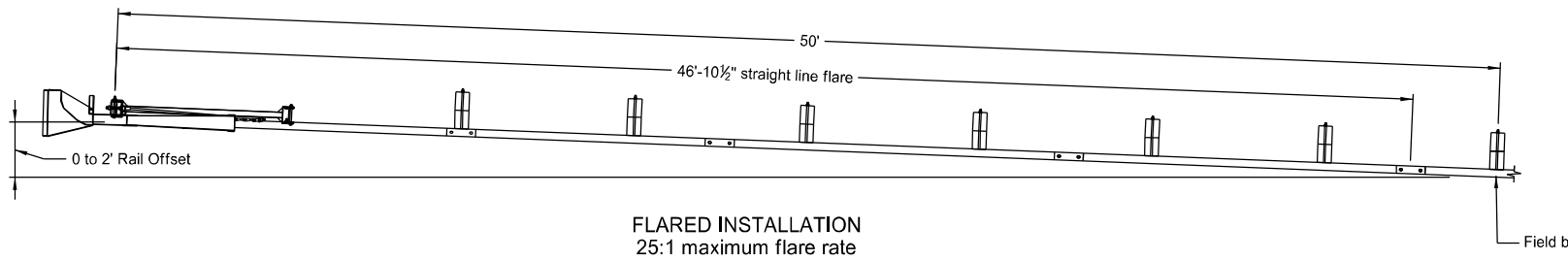
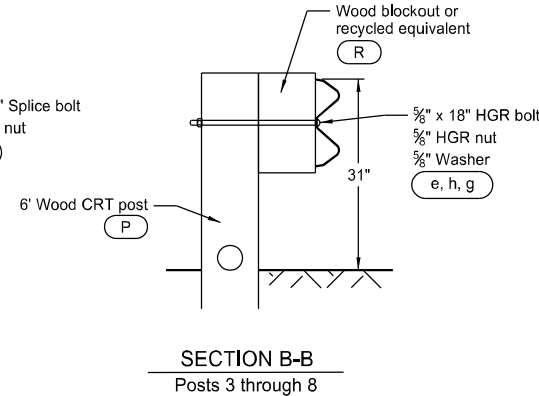
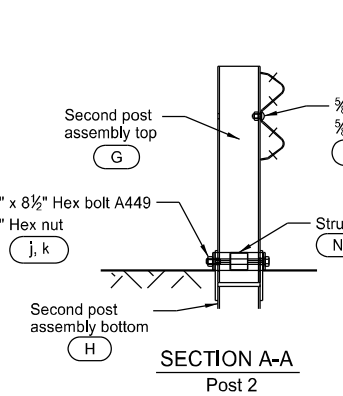
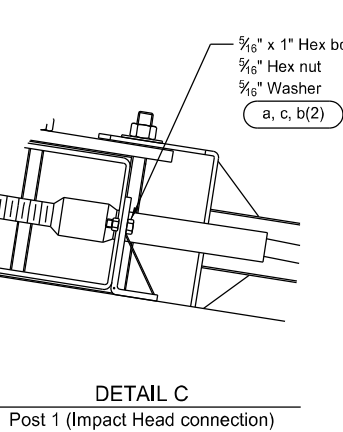
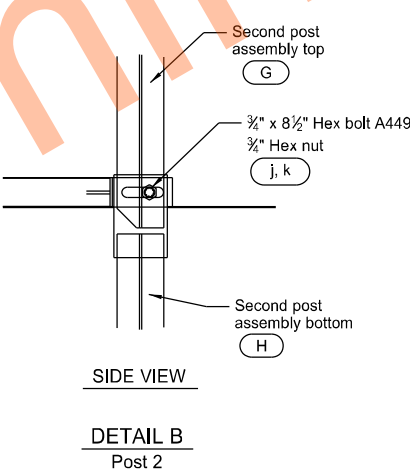
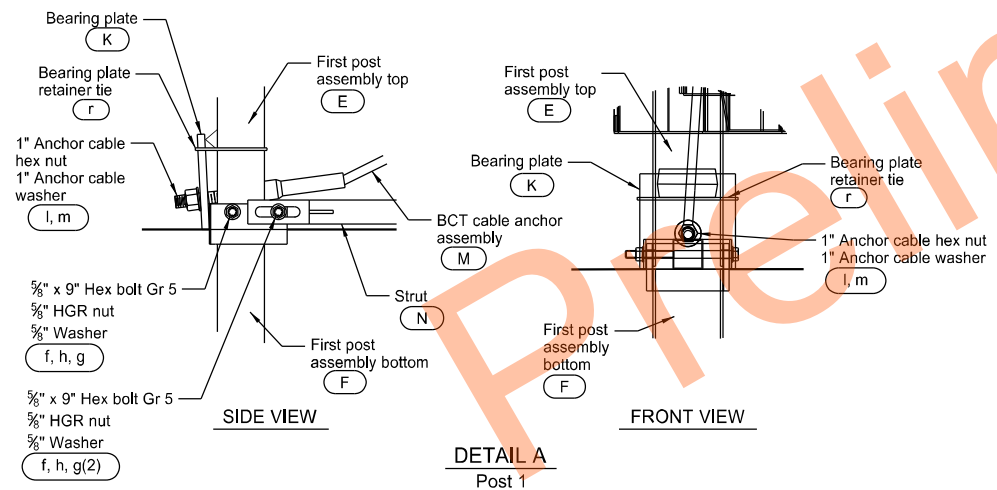
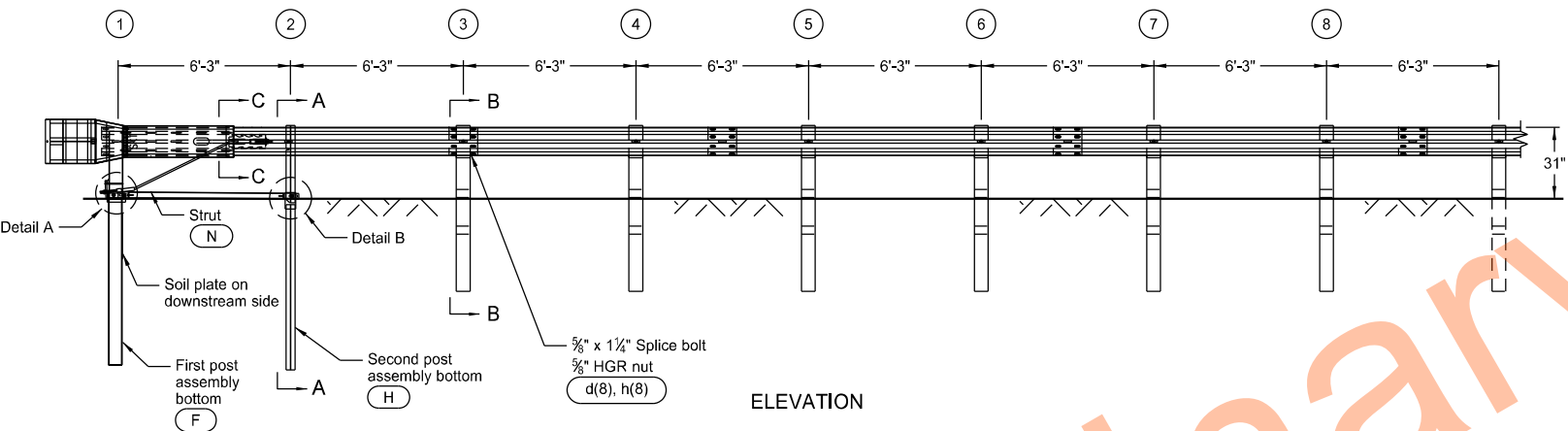
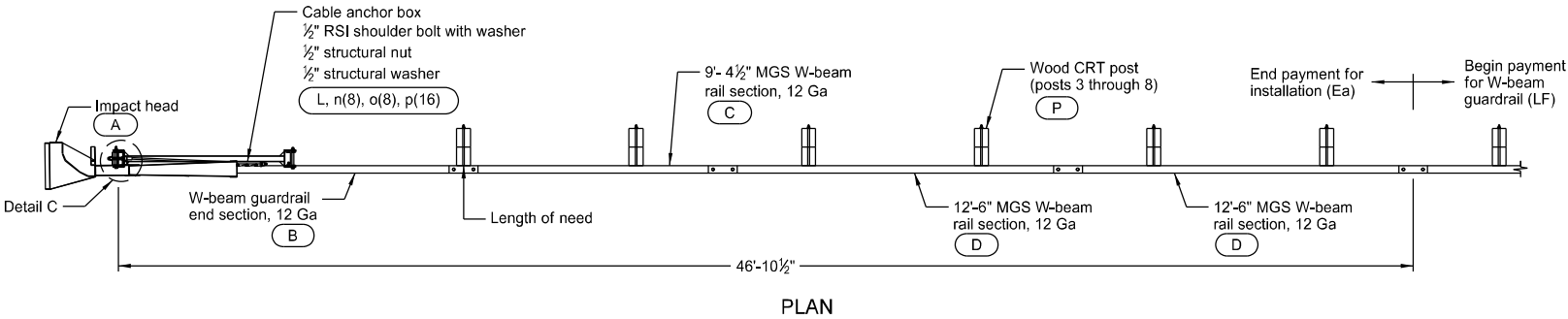
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE
12/02/20	Updated notes to active voice.

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12 02 2020

MASH SEQUENTIAL KINKING TERMINAL - WOOD POST

D-764-51



- GENERAL NOTES:
- Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
 - Flare the MSKT at a rate of up to 25:1, as needed to prevent the impact head from encroaching on the shoulder.
 - Site grade as necessary to ensure the lower sections of posts do not protrude more than 4" above the ground (measured along a 5' cord).
 - Install 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 to prevent settlement.
 - Install breakaway cable assembly taut. Use a locking device (vice grips or channel lock pliers) to prevent the cable from twisting when tightening nuts.
 - "Toe nail" the wood blockouts to the rectangular wood posts at post 3 through post 8 with two 20 penny galvanized nails to prevent them from turning when the wood warps.

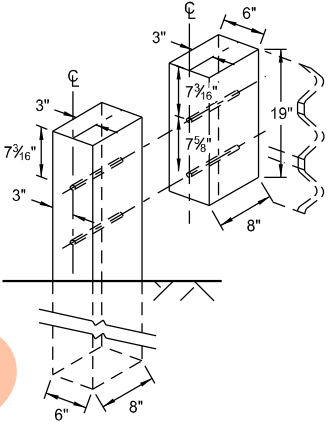
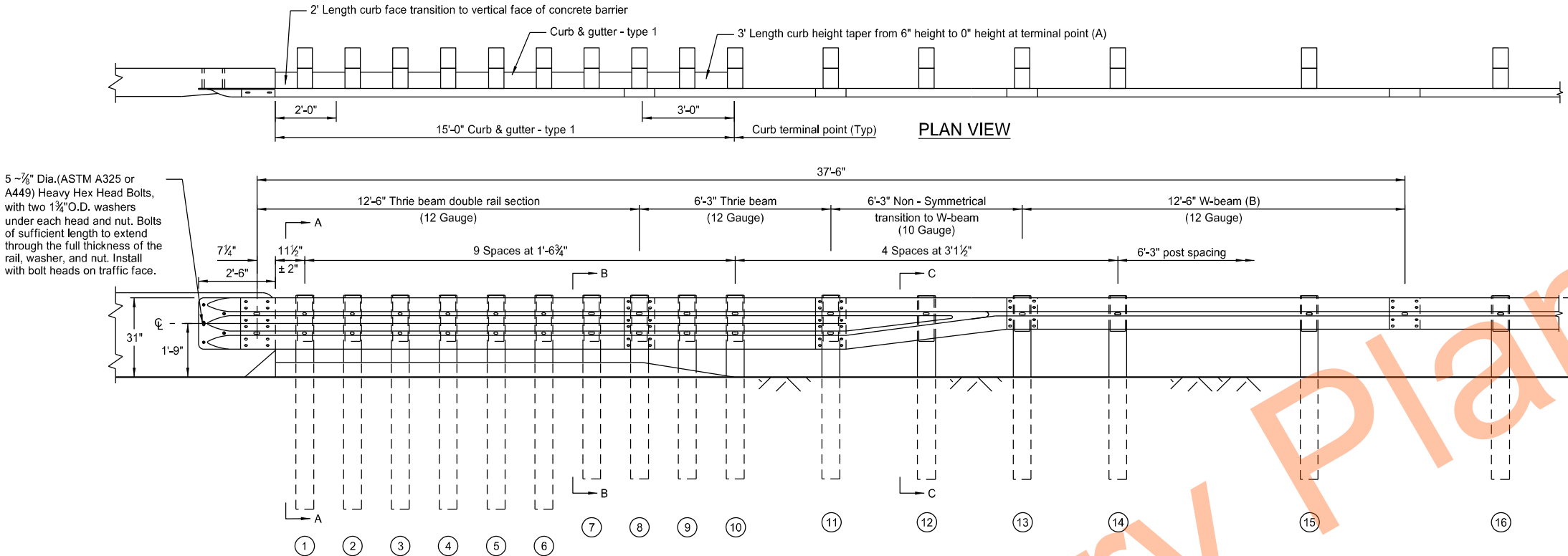
ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	MS3000	IMPACT HEAD	1
B	SF1303	W-BEAM GUARDRAIL END SECTION, 12 Ga	1
C	G12025	9'-4 1/2" MGS W-BEAM RAIL SECTION, 12 Ga	1
D	G1203A	12'-6" MGS W-BEAM RAIL SECTION, 12 Ga	2
E	MTPHP1A	FIRST POST ASSEMBLY TOP (6" X 6" X 1/2" Tube)	1
F	MTPHP1B	FIRST POST ASSEMBLY BOTTOM (6" W6X15)	1
G	UHP2A	SECOND POST ASSEMBLY TOP	1
H	HP2B	SECOND POST ASSEMBLY BOTTOM	1
K	E750	BEARING PLATE	1
L	S760	CABLE ANCHOR BOX	1
M	E770	BCT CABLE ANCHOR ASSEMBLY	1
N	MS785	STRUT	1
P	UP671	6" WOOD CRT POST	6
R	P675	WOOD BLOCKOUT OR RECYCLED EQUIVALENT	6
HARDWARE			
a	B5160104A	5/16" x 1" HEX BOLT GR 5	2
b	W0516	5/16" WASHER	4
c	N0516	5/16" HEX NUT	2
d	B580122	5/8" Dia x 1 1/4" SPLICE BOLT	33
e	B581802	5/8" Dia x 18" HGR BOLT (POSTS 3 THRU 8)	6
f	B580904A	5/8" x 9" HEX BOLT GR 5	2
g	W050	5/8" WASHER	9
h	N050	5/8" Dia HGR NUT	35
j	B340854A	3/4" Dia x 8 1/2" HEX BOLT GRD A449	1
k	N030	3/4" Dia HEX NUT	1
l	N100	1" ANCHOR CABLE HEX NUT	2
m	W100	1" ANCHOR CABLE WASHER	2
n	SB12A	1/2" RSI SHOULDER BOLT WITH WASHER	8
o	N012A	1/2" STRUCTURAL NUT	8
p	W012A	1/2" STRUCTURAL WASHER	8
r	CT-100ST	BEARING PLATE RETAINER TIE	1

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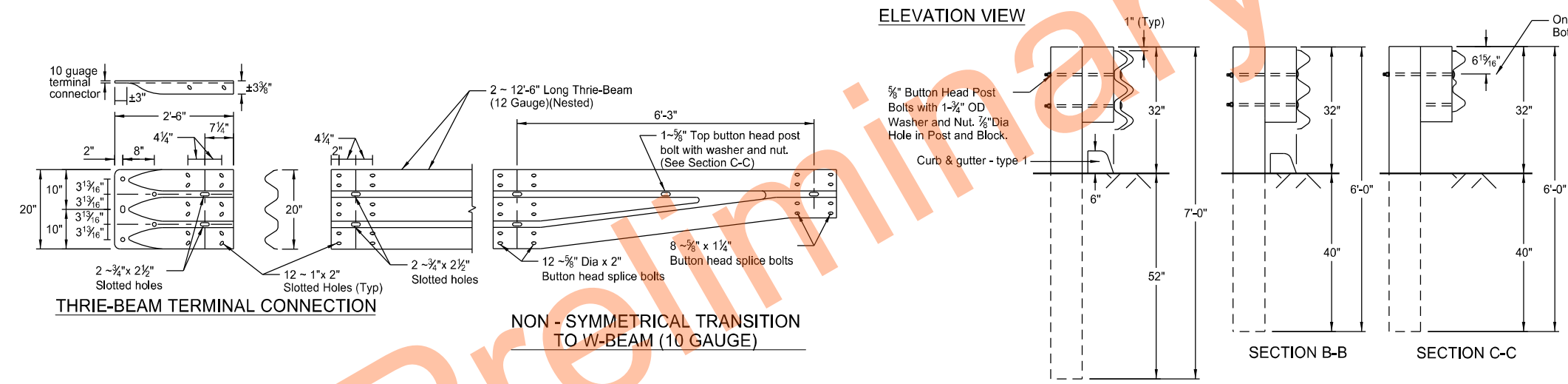
MGS W-BEAM TRANSITION WITH APPROACH CURB TO CONCRETE SINGLE SLOPE OR JERSEY BARRIER

D-764-60

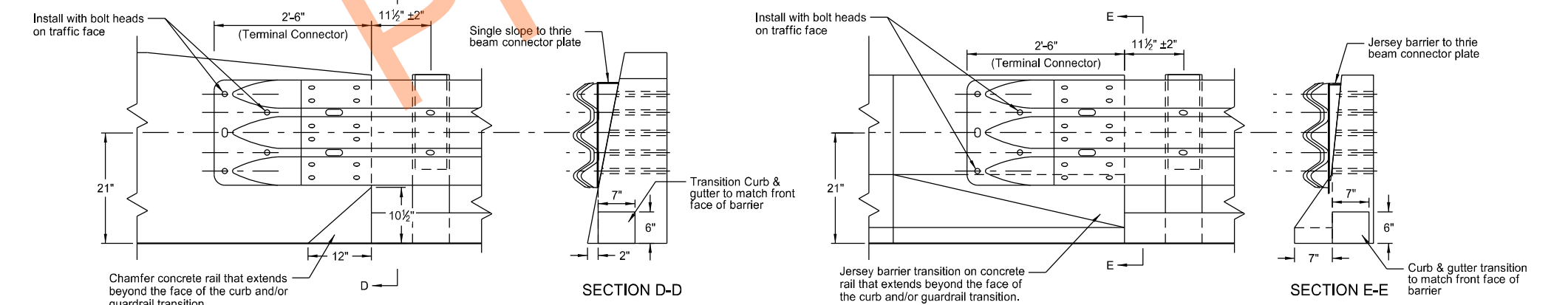


WOOD BLOCK TO RECTANGULAR WOOD POST
(At posts 1 to 11)

TRANSITION POST AND TIMBER BLOCKOUT SIZING		
POST NO.	POST SIZE	BLOCKOUT SIZE
1-6	6" X 8" X 7'-0" long	6" X 8" X 19"
7-12	6" X 8" X 6'-0" long	6" X 8" X 19"
13-16	6" X 8" X 6'-0" long	6" X 8" X 14"



- (A) Where curb is required to continue past 15' length, taper the curb down to 3" height at the terminal point shown above, instead of 0" height. Use 3" height curb between posts 10 and 16.
- (B) Install 12'-6" length W-beam double rail section at location where curb extends past 15' length.



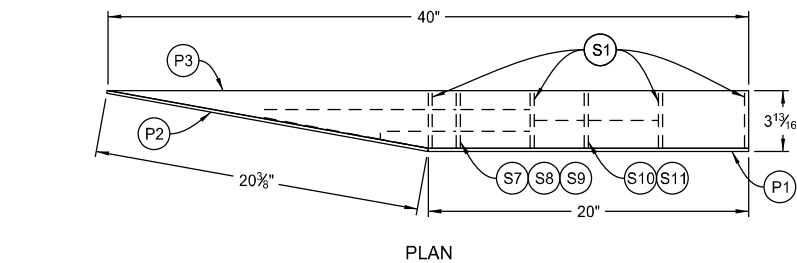
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12 02 2020

CONNECTION TO CONCRETE SINGLE SLOPE BRIDGE RAIL AND TRAFFIC BARRIERS

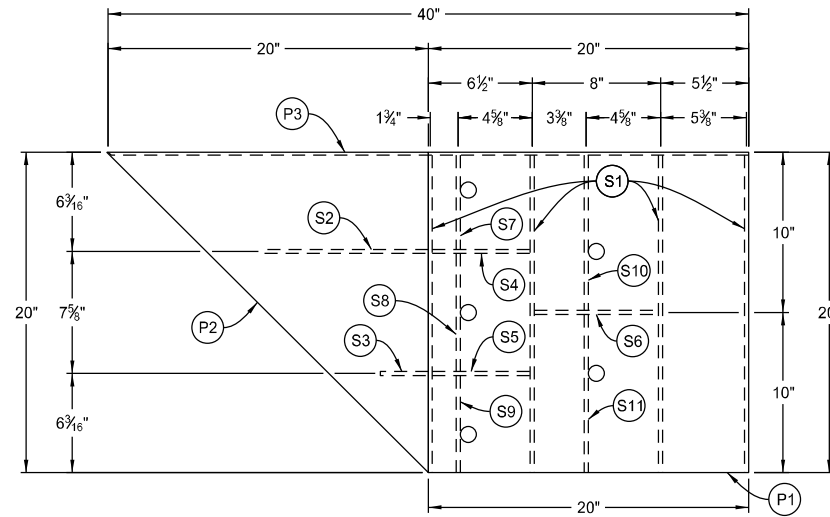
CONNECTION TO CONCRETE JERSEY BARRIER BRIDGE RAIL AND TRAFFIC BARRIERS

SINGLE SLOPE TO THREE BEAM CONNECTOR PLATE DETAILS

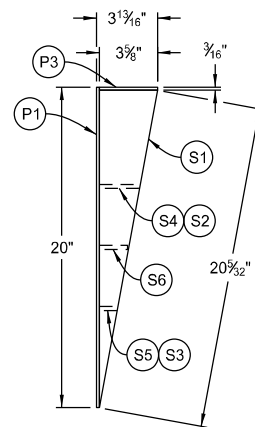


PLAN

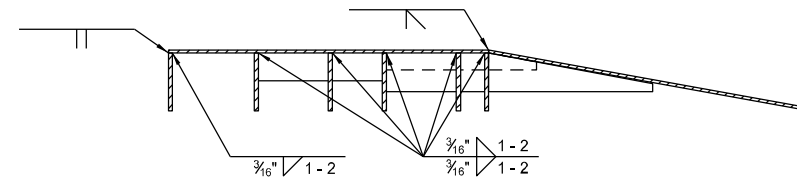
NOTE: Assembly Detail is shown for guardrail installation on right hand side of entrance end of bridge barrier. Mirror for opposite side installation.



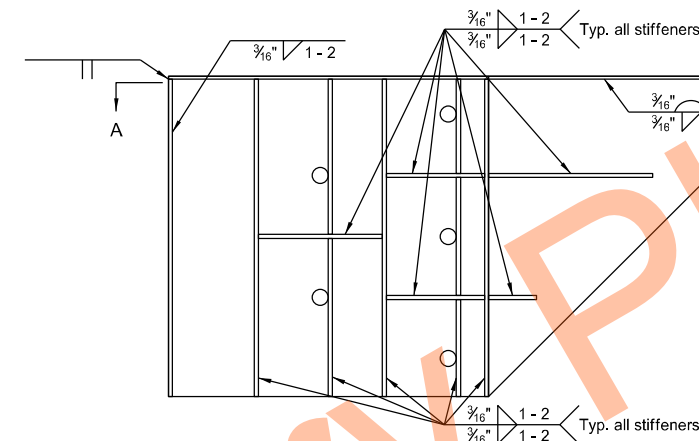
ELEVATION

ASSEMBLY DETAIL
(Front View)

END



SECTION A-A

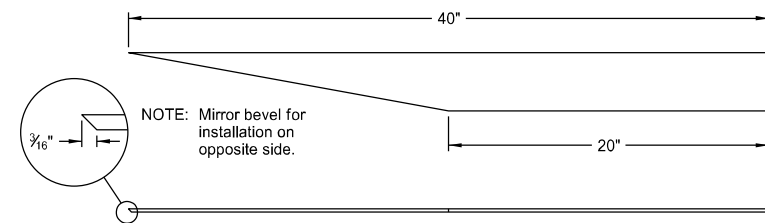
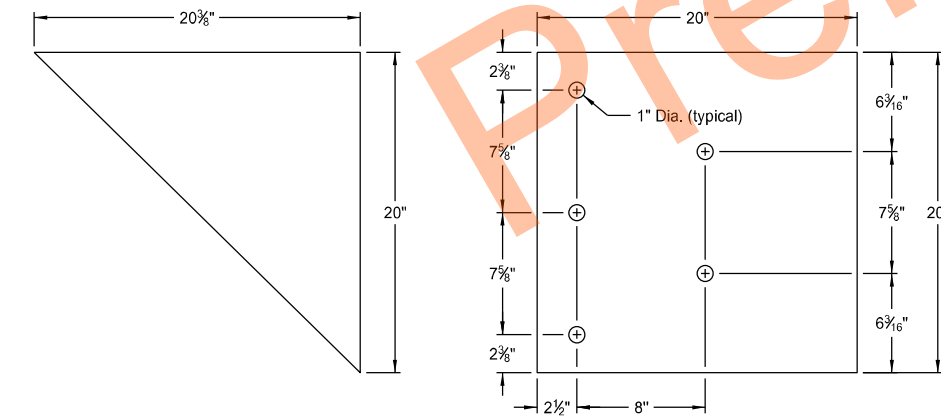


ELEVATION

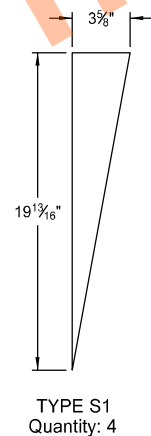
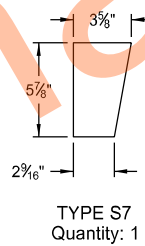
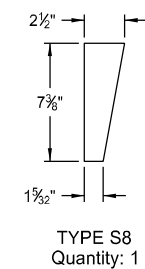
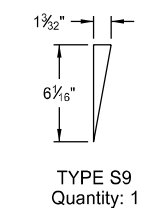
WELDING DETAIL
(Back View)

WELDING INSTRUCTIONS:

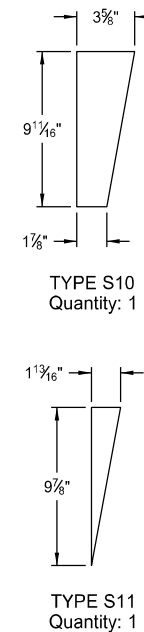
- (A) Weld cover plate P3 as follows:
3/16" continuous back weld on exterior sides and 3/16" fillet weld 1" long spaced at 2" center-to-center on interior sides.
- (B) Weld stiffeners located on the inside of the cover plates as follows:
3/16" fillet weld 1" long spaced at 2" center-to-center.
- (C) Weld cover plates P1 and P2 together with full penetration groove weld.

PICTORIAL DRAWING
(Showing Back of Connector Plate)PLATE P3
Quantity: 1PLATE P2
Quantity: 1PLATE P1
Quantity: 1

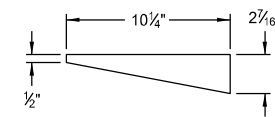
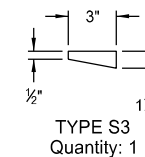
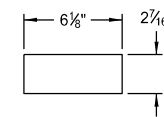
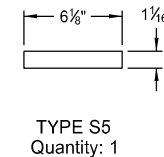
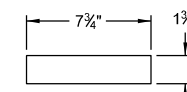
COVER PLATES

TYPE S1
Quantity: 4TYPE S7
Quantity: 1TYPE S8
Quantity: 1TYPE S9
Quantity: 1

VERTICAL PLATES

TYPE S10
Quantity: 1TYPE S11
Quantity: 1

STIFFENER PLATES

TYPE S2
Quantity: 1TYPE S3
Quantity: 1TYPE S4
Quantity: 1TYPE S5
Quantity: 1TYPE S6
Quantity: 1

HORIZONTAL PLATES

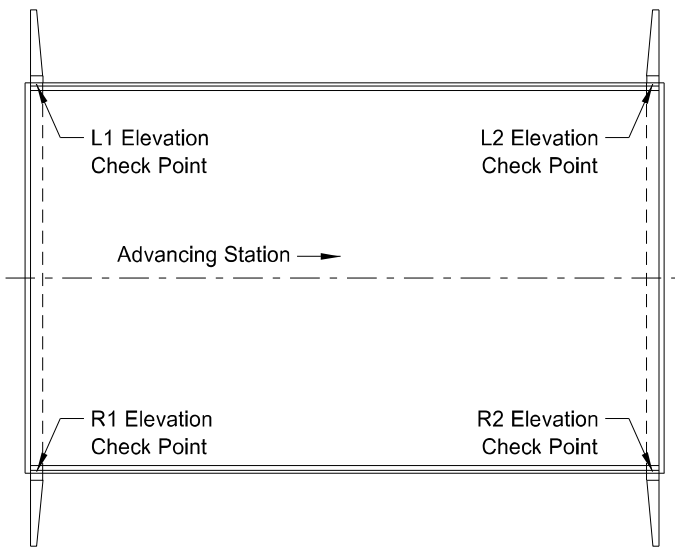
NOTES:

1. Fabricate cover plates P1, P2, and P3 from 3/16" thick ASTM A36 Grade structural steel.
2. Fabricate stiffener plates from 1/4" thick ASTM A36 Grade structural steel.
3. Galvanize connector plate in accordance with AASHTO M111.

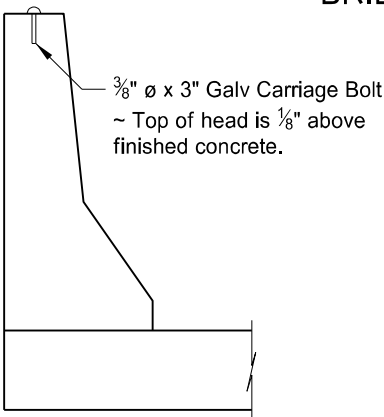
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12-02-20	Updated notes to active voice.



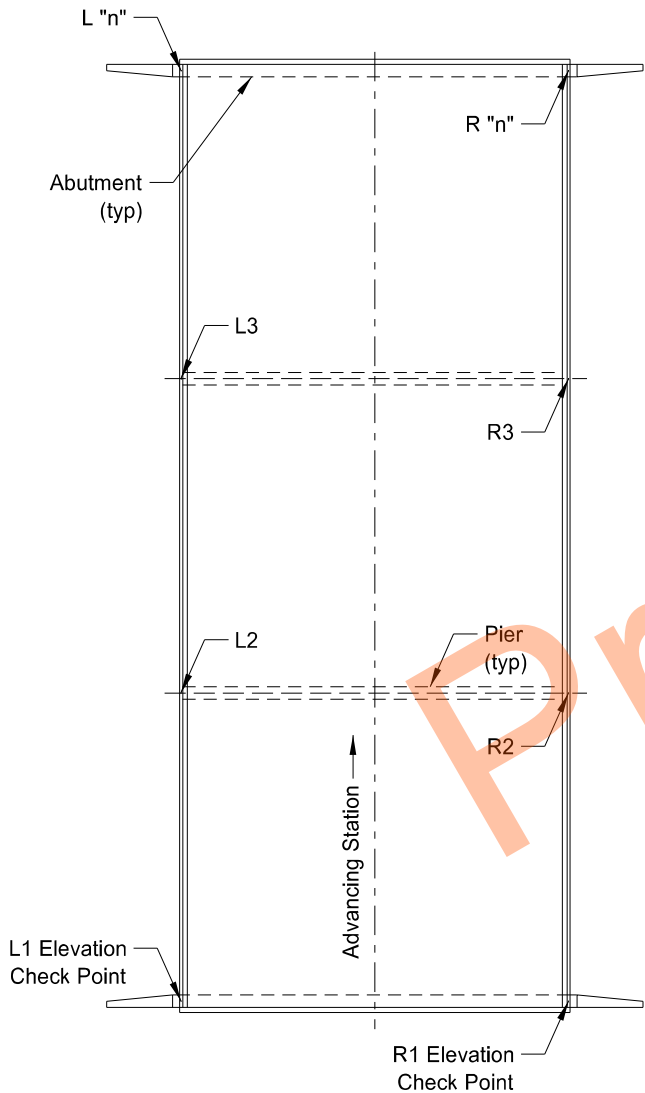
BRIDGE BENCH MARKS



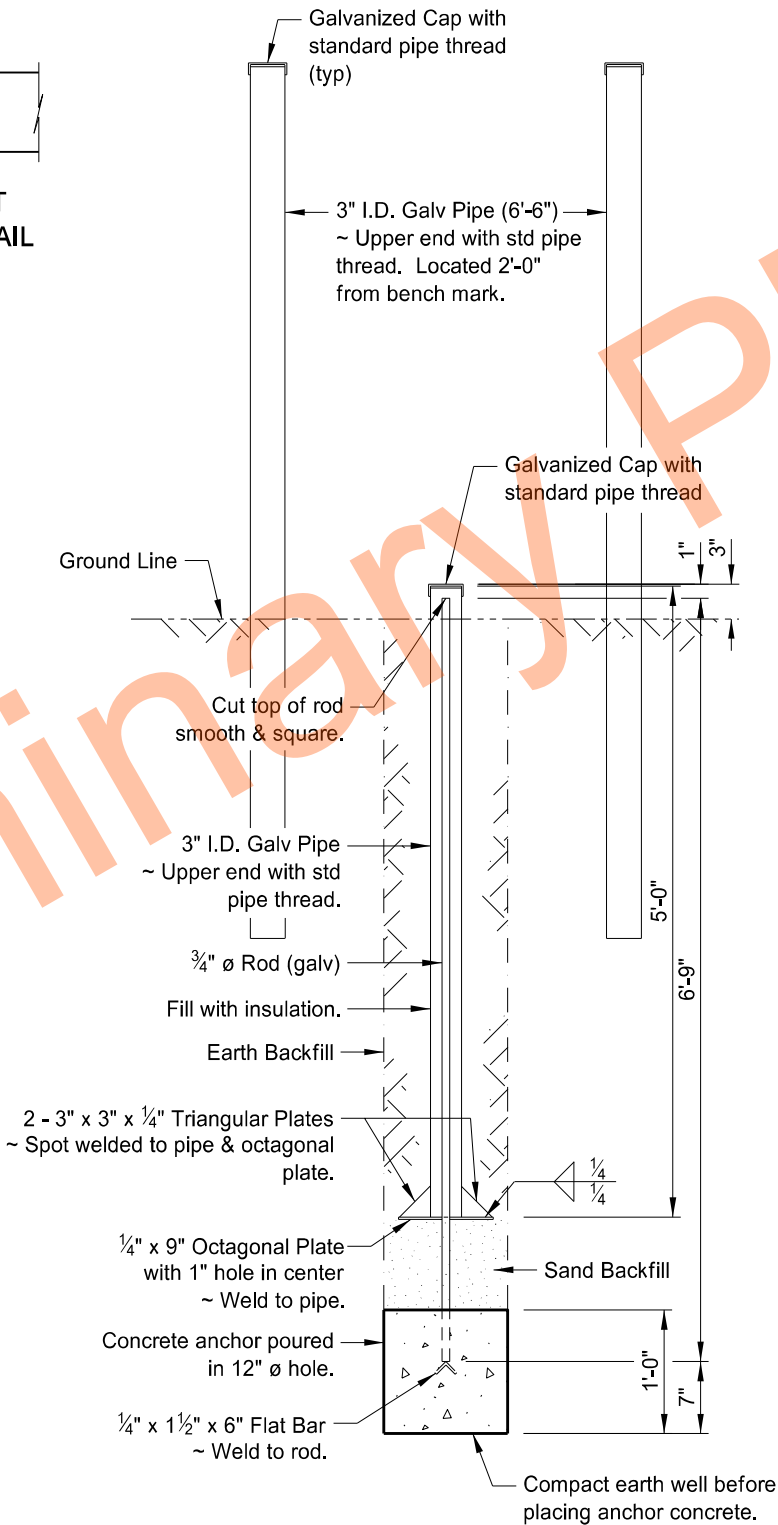
GENERAL LAYOUT FOR SINGLE SPAN



CHECK POINT LOCATION DETAIL



GENERAL LAYOUT FOR MULTIPLE SPAN



BENCH MARK DETAIL

NOTES:

Install elevation check points in the top of the concrete barriers at the locations shown in the General Layout view. Install the checkpoints in the barriers over each substructure unit at each bridge location. Use 3/8" diameter x 3" long galvanized carriage bolts set with the top of the bolt head projected 1/8" above the top of the finished concrete.

Set two bench marks as shown in the Bench Mark Detail at each bridge location. Locate the bench marks diagonally from one another at opposite corners of each bridge. Set the bench marks near the Right of Way line at least 300 feet from the nearest point of the structure. Extend two of the galvanized steel pipes 4'-0" above ground and paint with white paint suitable for painting over galvanized steel surfaces.

The Project Engineer will run a set of levels to determine the elevation of the bridge bench marks and elevation check points immediately after completion of the bridge. List the elevation of Bench Mark #1 as elevation 1,000, or as the actual surveyed elevation. The Project Engineer will record the information of SFN 13420 and submit to the Bridge Engineer.

Galvanize all metal parts per Section 854 after fabrication.

At the time of installation, coat the threads with synthetic grease containing teflon. Screw the cap to a snug fit.

Include the cost of furnishing and installing two bridge bench marks and the number of elevation check points required for one structure in the price bid for each set of Bridge Bench Marks.

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09/14/11	
REVISIONS	
DATE	CHANGE
09/03/19 02/23/24	UPDATED SIGNATURE Updated Signature Revised notes & updated to active voice

